STORMWATER POLLUTION PREVENTION PLAN

LOCATION
Carver Court Subdivision
Upper Mannix Road
Town of East Greenbush
State of New York

PREPARED FOR
CLDZ LLC
494 Western Turnpike
Altamont, NY 12009

Date Prepared
May 26, 2021
Revised 7/28/21
Revised 1/25/22

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1.0 PROJECT DESCRIPTION

Carver Court Subdivision is a 91+/- acre cluster subdivision located in the Town of East Greenbush, Rensselaer County. The property has frontage on Upper Mannix Road and Thompson Hill Road. The parcel is located within the R-B Zone and is owned by CLDZ Development LLC.

It is proposed to develop the parcel as cluster subdivision with smaller lots, larger open space and the same allowable density as a traditional subdivision. This allows for the minimized land disturbance on the parcel. A traditional subdivision has been demonstrated to show that there can be 110 residential building lots developed on the parcel under the current zoning requirements. It is proposed to develop 110 residential units which will consist of estate building lots, cottage building lots and duplex town homes. Through utilizing the cluster development provision it is possible to leave 42.61 Acres or 47% of the parcel as open space.

The proposed lots will be developed on 6,048 L.F. of new town roadways. All primary access will be off of Upper Mannix Road with emergency access provided to Thompson Hill Road. Additional connection points have been stubbed for connections to the parcels to the north and west of the development.

Water service to the parcel will be accessed off of Thompson Hill Road. An 8” PVC watermain will be looped through the parcel and loop to the new watermain in Tech Valley Drive.

A low pressure sanitary sewer system has been designed the convey sanitary effluent from the proposed residences to the existing gravity sewer main on Thompson Hill Road. The low pressure sanitary sewer will consist of individual privately owned grinder pumps for the cottage and estate lots and an HOA pump for each duplex building.

Under existing conditions, storm water on the site flows to three different offsite locations. However, two of the offsite locations flow into the same wetland complex off the parcel to the south. These two analysis point are known as analysis points A and B. The third analysis point flows off the parcel to the east and is limited to only the northeast corner of the subject parcel. The balance of the parcel flows towards either A or B.

There are approximately 9.2 Acres of USACOE Jurisdictional Wetlands on the subject parcel. The proposed development will disturb approximately 0.20 Acres of wetlands for the necessary road crossings. An individual permit application with the USACOE and Joint Permit Application have been applied for. USACOE wetlands do not have any required buffer areas; however, the Town of East Greenbush limits development within 50’ of their boundaries.

1.1 NATURE OF CONSTRUCTION

The project will consist of the disturbance 40 acres and stabilizations of approximately 40 acres of land. The disturbance activities will include the clearing and grubbing of vegetation within the area of the new buildings, roads and open spaces.

1.2 INTENDED SEQUENCE OF DISTURBANCE

It is intended to develop the site in three phases. The following is the intended sequence of disturbance for the construction:

Phase 1

Phase 1 will involve the construction of Road 1 from Station 0+00 to 10+00 and the entire construction of Road 2 as well as all necessary utilities and the utility connections to Thompson Hill Road. The houses will be constructed along the roadway as sales permit.

1. File NOI with the NYSDEC
2. Installation of all silt fences. (Anticipated Start Date 3-1-21)
3. Install stabilized construction off the terminus off Upper Mannix Road
4. Clear and grub vegetation in the area of the proposed attenuation basins. (2 Acres)
5. Stabilize attenuation basins. (2 Acres)
6. Clear and grub Road 1 to station 10+00 and Road 2 (5 Acres)
7. Install utilities within the Road ROW.
8. Stabilize road ROW with subbase and mulch outside of the pavement limits. (5 Acres)
9. Install utilities to Thompson Hill Road (1 Acre)
10. Stabilize utility cooridors.
11. Pave Roads
12. Install bio-retention basins and dry swales.
13. Clear and grub individual lots Construct Buildings and driveways (5.0 Acres)
14. Landscape areas around buildings and stabilize. (5.0 Acres)
15. Remove silt fence upon 85% vegetative cover. (Anticipated Completion 6-30-22)

Phase 2

Phase 2 will involve the construction of the remainder of Road 1 and Road 3 as well as all necessary utilities. The houses will be constructed along the roadways as sales permit.

1. Installation of all silt fences. (Anticipated Start Date 6-30-22)
2. Install stabilized construction off the terminus off Road 1
3. Clear and grub vegetation in the area of the proposed attenuation basins. (2 Acres)
4. Stabilize attenuation basins. (2 Acres)
5. Clear and grub Road 1 and Road 3 (4 Acres)
6. Install utilities within the Road ROW.
7. Stabilize road ROW with subbase and mulch outside of the pavement limits. (4 Acres)

8. Pave Roads
9. Install bio-retention basins and dry swales.
10. Clear and grub individual lots Construct Buildings and driveways in 5 acre areas stabilizing if necessary to maintain a 5 acre maximum.
11. Landscape areas around buildings and stabilize. (5.0 Acres)
12. Remove silt fence upon 85% vegetative cover. (Anticipated Completion 7-30-23)

Phase 3

Phase 3 will involve the construction of Roads 4 and 5

1. Installation of all silt fences. (Anticipated Start Date 7-30-23)
2. Install stabilized construction off the at the intersection of Road 4 and Road 1
3. Clear and grub vegetation in the area of the proposed attenuation basin. (1 Acres)
4. Stabilize attenuation basins. (4 Acres)
5. Clear and grub Road 1 and Road 3 (2 Acres)
6. Install utilities within the Road ROW.
7. Stabilize road ROW with subbase and mulch outside of the pavement limits. (2 Acres)
8. Pave Roads
9. Install bio-retention basins and dry swales.
10. Clear and grub individual lots Construct Buildings and driveways in 5 acre areas stabilizing if necessary to maintain a 5 acre maximum.
11. Landscape areas around buildings and stabilize. (5.0 Acres)
12. Remove silt fence upon 85% vegetative cover. (Anticipated Completion 9-30-24)

If weather prevents the application of permanent stabilization of any open areas as described above, the soil shall be stabilized through the application of mulch and or wood chips until such time that seeding may occur. The mulch/wood chips shall be applied in accordance with Section 3 of the New York State Standards and Specifications for Erosion and Sediment Control.

1.3 AREA OF DISTURBANCE

The project will consist of the disturbance 40 acres and stabilization of approximately 40 acres of land. This project also requires compliance the NYSEC GP-0-20-001. Under no circumstances shall more the 5.0 Acres be disturbed at any time without the necessary waiver.

1.4 SITE LOCATION MAP

Refer to Appendix A of this report “Site Location Map”

2.0 STORMWATER MANAGEMENT OBJECTIVES

For drainage analysis of this project, both hydrology and hydraulics was accomplished using the HydroCAD computer modeling system. This computer program uses SCS TR-20 and Tr-55 models to determine runoff from the site as a result of a storm event and calculate culvert sizes in storm sewer systems. Site information is input into HydroCAD through a series of nodes, which can be subcatchments, reaches, ponds, or links. A subcatchment is a drainage area within the site. It can represent the drainage into a catch basin, culvert, stream, or detention basin. Area, length, slope, and CN values are input into subcatchment descriptions. A reach is used to model storm water transport throughout a site. A reach can represent a stream, drainage ditch, or a culvert. Channel geometry, pipe size, slope, Manning's n, and base flow are input into reach descriptions. Ponds are used to model areas of storage within a site. A pond can represent a detention basin, wetland, or any other situation where standing water may be present. Pond area at different elevations, primary outflow structure, and secondary outflow structure are input into pond descriptions. A link is used to incorporate runoff information from other HydroCAD models.

The proposed storm water management system has been designed to meet the New York State Stormwater Design Manual (NYSSDM) August 2015 edition. This version of the NYSSDM requires runoff reduction volume as well as encouraging green infrastructure techniques. Planners and designers must address a five step approach to site planning and SMP selection. The following is the five step process and applicable design considerations for this project.

1. Site planning to preserve natural features and reduce impervious cover.

    - This site has been designed to minimize the impervious cover to the maximum extent practical.

2. Calculation of the water quality volume for the site

    - The water quality volume for the site has been calculated and can be found in Appendix E of this document.

3. Incorporation of green infrastructure techniques and standard SMP's with Runoff Reduction Volume (RRv) capacity.

    - The following Green Infrastructure Techniques have been incorporated in the stormwater management design.
      Table 3.1 Green Infrastructure Planning
        - Preservation of Undisturbed Areas - The limits of clearing have been maximized to the maximum extent practical given the required grading and infrastructure on the site. The proposed development has been limited to a small portion of the upland area available.
        - Soil Restoration – Soil restoration will be applied as require in Table 5.3 of the NYSSDM.

  - Roadway Reduction - The road widths have been minimized to the maximum extent practical.
  - Sidewalk Reduction – Sidewalks have been eliminated from the design
  - Reduction of Clearing and Grading - The limits of clearing has been maximized to the maximum extent practical given the required grading and infrastructure on the site.
  - Building Footprint Reduction - The buildings footprints have been reduced to the maximum extent practical.
  - Locating Development in Less Sensitive Areas – The proposed development has been located away from the wetland areas and flood plains with no impacts on either.
  - Preservation of Buffers – Natural buffers around the wetland areas have been preserved.
  - Open space design – The subdivision has been designed as a cluster subdivision which is the basis for open space design.
  - Driveway Reduction – The driveways lengths have been reduced to the maximum extent practical.

- The following Green infrastructure techniques in Table 3.1 have not been applied for the flowing reasons:
  - Parking reduction – There are no off street parking spaces other than driveway spaces to reduce.
  - Cul-de-sac Reduction – Cul-de-sacs are a requirement by the Town.

- Table 3.2 Green Infrastructure Techniques Acceptable for RRv.
  - Sheet flow – Sheet flow has been utilized as much as possible
  - Disconnection of rooftop runoff – The majority roofs on the site will shed onto the landscaped areas and flow into the storm water management system
  - Conservation of Natural Areas - Approximately 43 Acres of the 92 Acres will be reserved as green space with much of it un-disturbed entirely. This provides conservation of wetlands, stream channels and flood plains.
  - Vegetated or open swale - Dry Swales have been incorporated throughout the site at key locations.

- The following Green infrastructure techniques in Table 3.2 have not been applied for the flowing reasons:
  - Stream day lighting for re-development projects- This is not considered a re-development project furthermore, there are no streams on or adjacent to the site.
  - Green Roofs – Green roofs are cost prohibitive for this type of construction.

- Storm water planter – Storm water planters are not proposed; however, it is intended to utilize bio-retention basins
- Rain tank or cistern – The use of these devices would be cost prohibitive with respect to the project.
- Tree Plantings or Tree Box- The proposed landscaping plan includes deciduous and conifer tree plantings throughout the site.

4. Use of standard SMP's where applicable to treat the port of water quality volume not addressed by green infrastructure techniques and standard SMP's with RRv capacity.

    - It is proposed to utilize bio-retention basins and dry swales to treat 100% of the WQv for each drainage area.

5. Design of volume and peak rate of control practices where required.

    - Through a combination of the dry swales, the bio-retention basins and a dry attenuation basin at one drainage area, the peak rate of runoff is controlled for each analysis point as well as overall from the parcel.

2.1 Existing Conditions

1. Soils

According to the "Soil Survey of Rensselaer County", Soils found within the area of analysis are as follows:

Soil Type	Abbreviation	Description	Soil Group
Alden	An	Silt Loa,	C/D
Bernarston	Be	Gravelly Silt Loam	C/D
Madalin	Mb	Silt Loam	C/D
Natchaug	Nt	muck	A/D
Raynham	Ra	Silt Loam	C/D

Five test pits were performed at each of the storm water management locations. All of the test pits were consistent with little variability and can be summarized as follows:

0 – 8” – Loamy Br. Topsoil
8”-42” – Silty gravel with shale bedrock
42” – Ripable shale bedrock
50” – Refusal
No Groundwater
No Mottling

Due to the depth to bedrock and wetlands, the lower hydrologic group was utilized for each of the soils with dual soil groups for both pre-development and post-development conditions.

As stated above the proposed development has been separated into three different analysis points. While three of the analysis points ultimately convey storm water to the headwaters of Becker Brook, each analysis point has been analyzed as a standalone discharge point for both water quantity and quality analysis.

Analysis Point A – Is located at the southeasterly portion of the parcel. The majority of the onsite wetlands drain to this location including those analyzed in Analysis Point B which flows off site before coming back onto the subject parcel.

Analysis Point B – Is located slightly north of Analysis Point A on the subject parcel property line. It is located within a wetland complex that drains off site before coming back onto the subject parcel.

Analysis Point C – Is located near the easterly property boundary on the northern most portion of the subject parcel. A portion of the stormwater from the ridge east flows to this analysis point.

2.2 Water Quantity Analysis

Analysis Point A

Analysis point A will receive storm water from the first 1500 l.f. of Road 1 as well as all of Road 2. Stormwater discharging to this location will be treated and attenuated via combination of dry swales, a bio-retention basin and two attenuation basins. This analysis point will also receive stormwater from a large quantity of undeveloped area that drains into the wetlands.

Analysis Point B

Analysis point B will receive storm water from the remainder of Road 1 and the majority of Road 3, Road 4 and Road 5. As stated this analysis point is within a wetland complex that flows off site before flowing back on site and ultimately to analysis point A. Stormwater discharging to this location will be treated and attenuated via combination of dry swales and two attenuation basins. This analysis point will also receive stormwater from a large quantity of undeveloped area that drains into the wetlands.

Analysis Point C

Analysis point C will receive storm water from the cul-de-sacs on Roads 3 and 4. Stormwater discharging to this location will be treated and attenuated via combination of dry swales, a bio-retention basin and two attenuation basins. This analysis point will also receive stormwater from undeveloped areas that drain towards this analysis point

Below is a table showing a comparison of the pre-development and post development runoff rates for each analysis point for the 10 year and 100 year storm events. The Cornell Extreme Storm Values were utilized for this location and were found to be 3.85 Inches for the 10 year storm and 6.6 Inches for the 100 Year Storm.

	10 Year Storm 3.6 In.			100 Year Storm 5.98 In.		
Analysis Point	Existing (cfs)	Proposed (cfs)	% Red.	Existing (cfs)	Proposed (cfs)	% Red.
A	45.73	42.01	0%	105.03	104.77	4.7%
B	34.18	27.69	4.4%	78.65	67.94	6.5%
C	14.47	9.13	17.2%	33.25	25.83	12.8%

It can be seen that for all storm events, the peak rate of runoff to the analysis point has been reduced. The complete drainage calculations can be found in Appendix C of this document.

2.2 Water Quality Analysis

The required water quality volume and runoff reduction volume for the proposed development are being provided by the implementation various standard storm water management practices. The NYSDEC GI Worksheets can be found in Appendix E of this document. In summary the following was required and provided.

Below is a summary of what is required and provided for each analysis point:

Analysis Point A
RRv. Required = 0.075 Acre-ft
WQv Required = 0.394 Acre-ft

RRv Provided = 0.084 Acre-ft
WQv Provided = 0.394 Acre-ft

Analysis Point B
RRv. Required = 0.078 Acre-ft
WQv Required = 0.419 Acre-ft

RRv Provided = 0.095 Acre-ft
WQv Provided = 0.419 Acre-ft

Analysis Point C
RRv. Required = 0.037 Acre-ft
WQv Required = 0.192 Acre-ft

RRv Provided = 0.047 Acre-ft
WQv Provided = 0.192 Acre-ft

Total Site Requirements
RRv. Required = 0.19 Ac-ft< RRv Provided = 0.226 Ac-ft
WQv Required = 1.005 Ac-ft = WQv Provided = 1.005 Ac-ft

Analysis Point	Required WQv (Ac*ft)	Provided WQv (Ac*ft)	Required RRv (Ac*ft)	Provided RRv (Ac*ft)	GI Worksheet Reference
A	0.394	0.394	0.075	0.084	Design Points 1, 2a & 2B
B	0.419	0.419	0.078	0.095	Design Points 3 & 5
C	0.192	0.192	0.037	0.047	Design Points 6a & 6b
Totals	**1.005**	**1.005**	**0.19**	**0.226**	

The table above has demonstrated that we have adequately met the require RRv and WQv for the proposed project. However we were unable to reduce the entire WQv as suggested but not required for the following reasons:

- The depth to bedrock significantly limits the treatment practices that can be utilized on the site. In many areas we were limited to dry swales; however, due to grading in two areas we were able to provide bio-retention basins.
- In order to achieve reducing the entire WQv, additional areas deemed to be open space and undisturbed would need to be cleared and graded diminishing the benefits.
- The large open space and wetland areas can support the runoff from the parcel

For SMP design, details and construction specifications please refer to the Carver Court Cluster Subdivision Plans as approved by the Town of East Greenbush.

3.0 Post Construction Conditions

3.1 Maintenance Bioretention Area, Dry Swale and Pretreatment Filter Strips

3.1.1 Inspections

The Bioretention should be inspected monthly. The bioretention areas should also be mulched annually. The filter strips should be inspected after major storm events to ensure outlet remains clear. Items to check for include (but are not limited to):

- Washing away of mulch
- Clogging of french drain
- Health of the vegetation
- Sediment build up in the bottom of the swales
- Ponding within the swales
- Cracking, erosion or seepage of the side slopes
- Evidence of clogging at inlets or outlets
- Rill or gully erosion
- Brush, shrub or tree growth on embankments.
- Lack of vigor and density of the grass turf on the embankments.

The Dry Swale shall also be inspected monthly. The inspection should identify any erosion, ponding or sediment deposition.

3.1.2 Mowing

The side slopes of the embankments of the swale should be mowed at least six times a year and resultant yard wastes should be collected and disposed of offsite.

3.1.3 Debris and Litter Control

Removal of debris and litter should be accomplished during mowing operations. Inlet and outlet structures should be cleared of all debris and litter.

3.1.4 Structural Repairs and Replacement

Components of the bioretention area or swale, which require repair or replacement, should be addressed immediately following identification.

3.2 Sediment Removal

Cleanout frequency of swales is dependent upon volume of inflow and sediment load.

When sediment removal is required, the original grades depicted on the project drawings should be reestablished by a qualified contractor.

Dry Swales

If ponding or sediment deposition is noted in the dry swale, the sediment and or soil shall be removed. If the planting soil is removed due to ponding, it shall be replaced with new planting soil and stabilized immediately.

Forbays and attenuation pond

The forbay to the ponds shall be cleaned out whenever 50% of the forbay capacity is reached on the sediment marker. The pond itself shall be maintained to allow free flow into the pond and through the outlet. Invasive vegetation shall be removed and the aquatic bench shall be maintained. The pond shall be reviewed annually to determine if dredging is necessary.

3.2.1 Maintenance of Construction Litter, Chemicals and Debris

The site shall be reviewed daily by the construction manager to verify that all construction litter and debris are properly contained on site. This includes but not limited to trash and building materials. It shall be contained in such a manner to prevent migration off site or into the storm water facilities on and off site.

Construction materials shall be kept in one location in a neat orderly fashion. Crusher run will should typically be brought onto site and graded by the individual truckload.

There shall be no chemicals or debris stored on the site. Construction materials shall be limited to crushed stone, stabilization fabric and storm sewer pipe and structures. A spill cleanup kit shall be on site at all times to prevent any spillage from migrating into the on or off site storm water conveyance systems.

3.2.2 Soil Restoration

Since the soils on the site are classified as Hydraulic Soil Group C and D soils, soil restoration is not required on the parcel.

3.3 Winter Maintenance

To prevent impacts to storm water management facilities, the following winter maintenance limitations, restrictions or requirements are recommended:

- Remove snow and ice from inlet structures, basin inlet and outlet structures and away from culvert end sections.
- Snow removed from paved areas should not be piled at the inlets/outlets of the storm water management basin.
- Use of deicing materials should be limited to sand and "environmentally friendly" chemical products. Use of salt mixtures should be kept to a minimum.
- Sand used for deicing should be clean, course material free of fines, silt and clay.
- Materials used for deicing should be removed during the early spring by sweeping and/or vacuuming.

3.4 Post Construction Inspections

The proposed storm water management practice will be maintained by the Town of East Greenbush. A deed restriction shall be implemented to assure that the SMP's are maintained in accordance with the O & M Manual.

3.5 Conservation Area Management

The area noted on the plan as Open Space/Natural Buffer shall be maintained as such. The areas noted on the plans as the cleared area and walking trails shall be maintained as such for public use. The construction of complementary structures and improvements shall be permitted. The cutting of trees should be minimized unless the tree is deemed hazardous. The understory shall be allowed to develop naturally with minimal clearing or trimming.

3.6 Pollution Controls

The contractor is responsible for employing necessary pollution controls on the site during construction. This includes but is not limited to the following:

- Spills – A spill cleanup kit shall be located on the parcel prior to the start of construction. Any spills shall be cleaned up in accordance with all local, state and federal regulations. If warranted by code, the NYSDEC shall be notified of said spills.
- Trash - The site superintendent shall inspect the site daily and clean up any trash or debris to prevent migration off site.

4.0 CONTROLS

4.1 Erosion and Sediment Control

The operator shall initiate stabilization measures as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently been ceased. This requirement does not apply to the following:

- Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently ceased is precluded by snow cover or frozen ground conditions, stabilization measures shall be initiated as soon as practicable.

- Where construction activity on a portion of the site is temporarily ceased, and earth-disturbing activities will be resumed within 7 days, temporary stabilization measures need not be initiated on that portion of the site.

4.2 Erosion and Sediment Controls – Structural Practices

The site will be the most susceptible to erosion and sediment problems during the construction phase of the project. This can result in sedimentation in the nearby streams, rivers and wetlands.

Silt fencing – Silt fencing shall be placed as shown on the plan and as deemed necessary by the qualified inspector and/or trained construction manager during construction to comply with the New York State Guidelines for Urban Sediment and Erosion Control.

Seeding - All disturbed areas will be seeded as final grading has been completed and the area will no longer be disturbed and dust will be controlled on roadways with water. All seeding and fertilization shall be completed in accordance with Section 3 of the New York State Standards and Specifications for Erosion and Sediment Control.

Mulching - Mulching can be used alone or with seed depending on the desired outcome. Mulching shall be performed in accordance with Section 3 of the New York State Standards and Specifications for Erosion and Sediment Control. Mulch shall consist of hay or straw and shall be applied with a minimum thickness of 3” over disturbed areas. If soil can be seen through the mulch layer additional mulch is required.

Topsoiling – All disturbed areas will be topsoiled prior to the application of seed and mulch. Topsoil shall comply with Section 3 of the New York State Standards and Specifications for Erosion and Sediment Control.

4.3 Other Controls

On site generation of dust and tracking of sediment shall be minimized. A tracking pad/stabilized construction entrance shall be constructed at all access points.

4.4 Approved Local or Regional Control Plans

This storm water pollution prevention plan has been prepared in accordance with all local, regional, state and federal guidelines.

5.0 MAINTENANCE

All erosion control measures shall be maintained in accordance Section 7 of the New York State Guidelines for Urban Erosion and Sediment Control.

- The site superintendent shall inspect all erosion control measures at the beginning of each workday. If deficiencies are noted the erosion control measure shall be repaired or replaced prior to beginning work on that work day.
- On Fridays, the erosion control measures shall be inspected at noon. If deficiencies are noted, the measures shall be repaired or replaced prior to closing down for the weekend.
- If the site superintendent identifies that an erosion control measure is not working properly or not designed properly, the site superintendent shall contact a licensed professional immediately to review the deficiency and give recommendations.
- The site superintendent shall keep a daily log of the erosion and sediment measures and effectiveness.

Sediment Control Deficiencies include but are not limited to the following:

- Fallen, broken, torn, un-keyed or bulging silt fence.
- Inadequate mulching
- Torn sediment filters
- Soil rilling in diversion ditches.
- Out of place or decomposing hay bales.
- Sediment on roadways

6.0 INSPECTIONS

6.1 **T**he operator shall have a qualified professional conduct an assessment of the site prior to construction activities. The professional shall certify in a report that the appropriate erosion and sediment controls described in the SWPPP and required by Part II.D of Permit No. GP-00-20-001 are installed or implemented to ensure overall preparedness of the site for the commencement of construction. Following the commencement of construction, erosion control devices shall be inspected once a week. The erosion control devices will be cleaned and repaired as necessary to insure proper operation. Following each inspection, the qualified professional shall document the following:

1. On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work with the next 14-day period.
2. Indicate on a site map all areas of the site that have undergone active site work during the previous 14 days.
3. Indicate all disturbed site areas that have not undergone active site work during the previous 14 days.
4. Inspect all sediment control practices and record the approximated degree of sediment accumulation as a percentage of storage volume.
5. Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of the barrier or diversion system and containment systems. Identify any evidence of rill or gully erosion occurring on slops and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along barrier or diversion systems. Record the depth of sediment within containment structures, any erosion near outlet and overflow structures, and verify the ability of rock filters around perforated riser pipes to pass water
6. All deficiencies that are identified with the implementation of the SWPPP.

6.2 Inspection Reports

The operator shall maintain a record of all inspection reports in a site logbook, which will be made available to permitting upon request. Prior to the commencement of construction, the engineer shall certify in the site logbook that the SWPPP meets all Federal, State and local erosion and sediment control requirements.

6.3 Revisions to the SWPPP

Based on the inspections described above, the pollution prevention measures identified in this plan shall be revised as appropriate, but in no case later than (7) seven calendar days following the inspection. Such modifications shall provide for timely implementations of any changes to the plan within seven (7) calendar days following the inspection.

7.0 NON-STORMWATER DISCHARGES

There are no known non-storm water discharges from the site, such as dewatering operations associated with the development of this site. If there is a need to discharge any non-storm water from the site, measures must be in place to protect the downstream storm drainage system.

If groundwater weeps are identified by the site superintendent or the site inspector in an area which can result in a runoff violation prevent the effectiveness of the erosion control plan, these weeps shall be collected with an infiltration trench as shown on the detail sheets and diverted to the closed storm water management system.

8.0 WINTER SHUTDOWN PLAN

The contractor shall implement the following procedures in order to stabilize the site against erosion during a period of winter shutdown. In areas where vegetation has not been established when the winter shutdown is to be implemented, the contractor shall implement one or more of the following devices.

- Jute/Coconut fiber blankets
- Geotextile
- Hay/straw or mulch
- Tackifier
- Alternate method to be approved by the Design and City Engineer.

Inspections shall proceed as outlined in the inspection section of this document. Inspections shall also be conducted after significant snowmelt has been documented. If damage has been documented during the inspection, the contractor shall provide repairs prior to the next scheduled inspection.

9.0 CONTRACTORS CERTIFICATION

All contractors and subcontractors involved with erosion control measures on this poject shall sign and date a copy of the following certification statement before undertaking any construction activity at the project site.

"I certify under penalty of law that I understand and agree to comply with the terms and conditions of the pollution prevention plan for the construction site identified in such plan as a condition of authorization to discharge storm water. I also understand that the operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPEDES") general permit for storm water discharges form construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. In addition this SWPPP was prepared in accordance with all federal, state and local erosion and sediment control requirements."

Contractor:

Company:____

Name:____

Title:___________________________ Date:____________________

Subcontractor:

Company:____

Name:____

Title:___________________________ Date:____________________

Subcontractor:

Company:____

Name:____

Title:___________________________ Date:____________________

Subcontractor:

Company:____

Name:____

Title:______________________________ Date:______________________

Subcontractor:

Company:____

Name:____

Title:______________________________ Date:______________________

Subcontractor:

Company:____

Name:____

Title:______________________________ Date:______________________

Subcontractor:

Company:____

Name:____

Title:______________________________ Date:______________________

10.0 OPERATOR/OWNER CERTIFICATION

"I certify under penalty of law that this document and all attachments were Prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law."

"I also certify that the SWPPP has been prepared in accordance with all federal, state and local regulations"
"

Operator/Owner:

Company:____

Name:____

Title:______________________________ Date:______________________

Signature: ____

11.0 CERTIFICATION OF SWPPP PREPARER

"I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the NYSDEC GP-00-20-001. Furthermore, I understand that certifying false, incorrect, or inaccurate information is a violation of NYSDEC GP-00-20-001 and could subject me to criminal, civil and/or administrative proceedings.

Engineer:

Company: Brett L. Steenburgh PE, PLLC

Name: Brett L. Steenburgh

Title: President

Signature: ____

Date:____________________

APPENDIX A

Site Location Map

Search

Area of Interest

Open All | Close All

AOI Properties

Clear AOI

AOI Information

Name

Map Unit Symbols
- Use Soil Survey Area Map Unit Symbols
- Use National Map Unit Symbols

Area (acres) 84.8

Soil Data Available from Web Soil Survey

Rensselaer County, New York (NY083)

Data Availability	Tabular and Spatial, complete
Tabular Data	Version 14, Jun 11, 2020
Spatial Data	Version 6, Sep 16, 2019

Clear AOI

Import AOI

Export AOI

Quick Navigation

Address

State and County

Soil Survey Area

Latitude and Longitude or Current Location

PLSS (Section, Township, Range)

Bureau of Land Management

Department of Defense

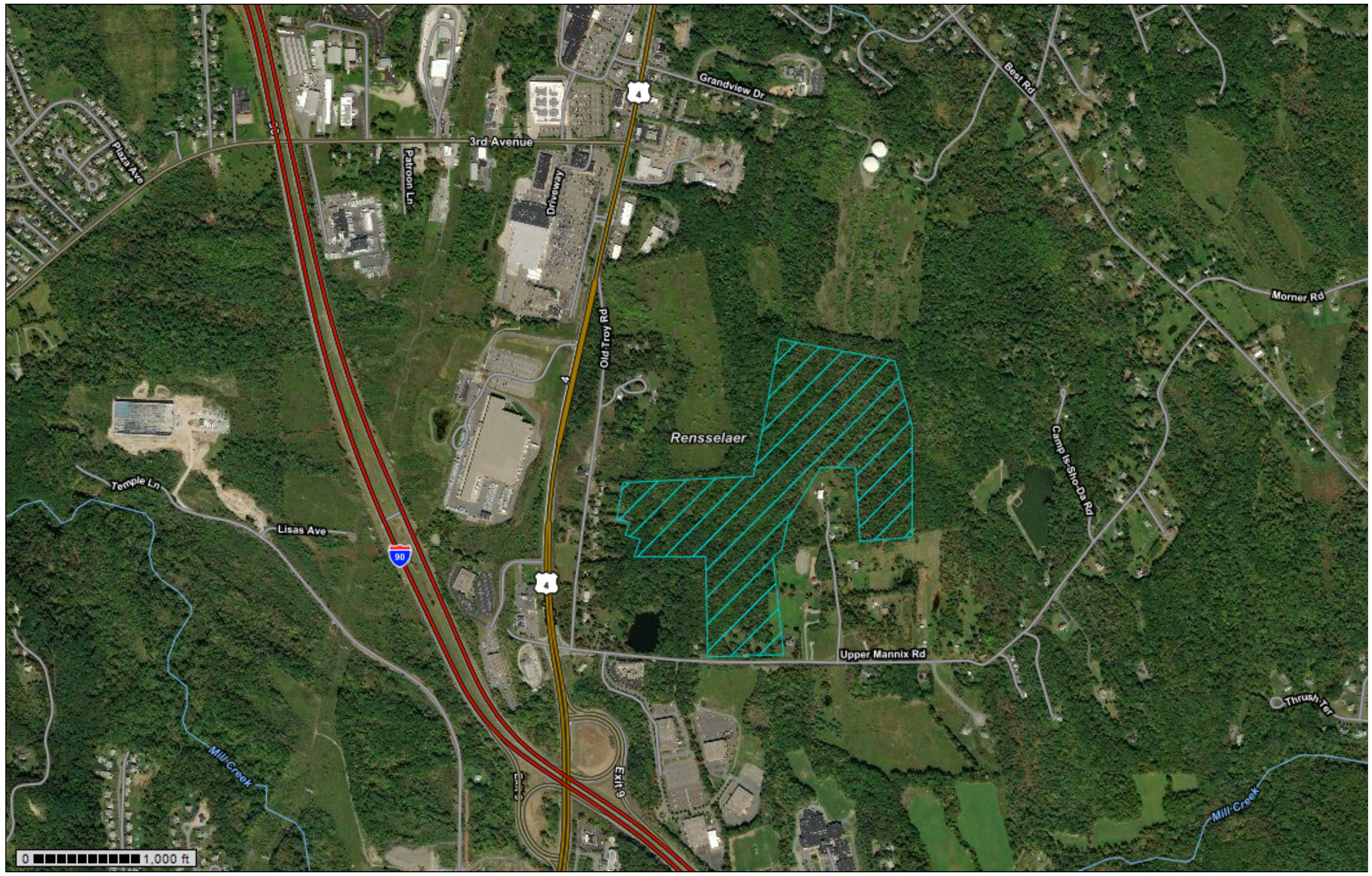
Forest Service

National Park Service

Hydrologic Unit

Area of Interest Interactive Map

View Extent Contiguous U.S. | Scale (not to scale)



APPENDIX B

Erosion Control Plans

LEGEND

- PROPERTY LINE
- PROPOSED STORM SEWER W/ CATCH BASIN
- PROPOSED LOW PRESSURE SANITARY SEWER W/ CLEANOUT
- PROPOSED SILT FENCE
- EXISTING CONTOUR
- PROPOSED CONTOUR
- EROSION AND SEDIMENT CONTROL BLANKET (SEE NOTE 8)

MAINTENANCE

1. SEDIMENT SHALL BE REMOVED FROM SEDIMENT TRAPS WHENEVER THEIR CAPACITY HAS BEEN REDUCED BY 50%.

2. ALL EROSION AND SEDIMENT CONTROL DEVICES SHALL BE INSPECTED WITHIN 24 HOURS OF A STORM EVENT BY THE SITE CONTRACTOR AND REPAIRED AND/OR MODIFIED AS REQUIRED TO BE GOOD WORKABLE CONDITION.

3. THE CONTRACTOR SHALL CONDUCT AN INSPECTION OF THE SITE ON A DAILY BASIS TO COLLECT LITTER AND CONSTRUCTION DEBRIS AND DISPOSE OF LEGALLY.

4. ANY STOCKPILES OF FILL, TOPSOIL, EXCAVATED MATERIAL SHALL BE COVERED OR CONTAINED BY SEDIMENT CONTROL FENCE TO PREVENT EROSION.

GENERAL E & SC NOTES;

1. NO MATERIAL AND/OR EQUIPMENT SHALL BE STOCKPILED OR STORED IN THE LOCATION OF THE SEPTIC FIELDS.

2. IT IS ASSUMED THAT DUE TO THE HIGH PERMIABILITY OF THE ON SITE SOILS NO SEDIMENT BASINS SHALL BE REQUIRED; HOWEVER, IF SEDIMENT BASINS ARE ARE DEEMED NECESSARY DURING CONSTRUCTION, THEY SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE NYS GUIDELINES FOR EROSION AND SEDIMENT CONTROL.

S.W.P.P.P. REQUIREMENTS

1. THE CONTRACTOR UNDERTAKING SITE CONSTRUCTION OF THIS PROJECT MUST SIGN THE CERTIFICATION IN THE SWPPP AND BE FAMILIAR WITH ALL REQUIREMENTS OF THE SWPPP AND REQUIREMENTS OF THE NYS DEC SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITY – PERMIT No.–GP–00–20–001.

2. THE CONTRACTOR MUST IS RESPONSIBLE TO COMPLY WITH THE TERMS OF THE NYS DEC SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITY – PERMIT No. GP–0–20–001. COPIES OF THE GENERAL PERMIT ARE AVAILABLE BY CALLING DEC (518) 402–8109 AND ON LINE. ADDITIONALLY, THE CONTRACTOR SHALL COMPLY WITH ALL TOWN OF EAST GREENBUSH MS4 REGULATIONS.

3. A NOTICE OF INTENT (NOI) MUST BE SUBMITTED TO DEC PRIOR TO INITIATING WORK.

4. THE SWPPP INCLUDES INFORMATION ON ALL DRAWINGS AND THE STORMWATER POLLUTION PREVENTION PLAN

5. PRIOR TO COMMENCEMENT OF CONSTRUCTION, THE CONTRACTOR SHALL HAVE THE ENGINEER CONDUCT AN ASSESSMENT OF THE SITE AND CERTIFY IN AN INSPECTION REPORT THAT THE APPROPRIATE EROSION AND SEDIMENT CONTROLS HAVE BEEN ADEQUATELY INSTALLED. FOLLOWING COMMENCEMENT OF CONSTRUCTION, THE ENGINEER SHALL MAKE SITE INSPECTIONS EVERY 7 DAYS. AND SHALL PREPARE A REPORT AS REQUIRED BY THE GP–0–20–001.

6. THE CONTRACTOR SHALL MAINTAIN A RECORD OF ALL INSPECTION REPORTS IN A SITE LOG BOOK, MAINTAINED ON SITE AND AVAILABLE TO THE PERMITTING AUTHORITY UPON REQUEST.

7. AT COMPLETION OF CONSTRUCTION, THE CONTRACTOR SHALL PERFORM A FINAL INSPECTION TO CERTIFY THAT THE SITE HAS UNDERGONE FINAL STABILIZATION AND THAT ALL TEMPORARY EROSION AND SEDIMENTATION CONTROLS HAVE BEEN REMOVED. UPON CERTIFICATION OF COMPLETION A NOTICE OF TERMINATION (NOT) SHALL BE SUBMITTED TO NYS DEC.

8. ALL SLOPES STEEPER THAN A 1V:4H SHALL BE STABILIZED WITH SEED, FERTILIZER AND A ROLLED EROSION CONTROL BLANKET.

9. ALL SLOPES LESS THAN A 1V:4H SHALL BE STABILIZED WITH SEED, FERTILIZER AND MULCH

10. ALL SEED, MULCH AND FERTILIZER APPLICATION RATES SHALL BE IN ACCORDANCE WITH THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL "THE BLUE BOOK".

11. ALL WORK PERFORMED ON THE SITE SHALL BE IN ACCORDANCE WITH THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL "THE BLUE BOOK".

12. ALL WORK PERFORMED IN ACCORDANCE WITH THE SWPPP.

13. PROJECT CONSTRUCTION SHALL BE PHASED SUCH THAT SOIL DISTURBANCE SHALL NOT EXCEED FIVE (5.0) ACRES AT A TIME.

14. THE OWNER AND APPLICANT ACKNOWLEDGE THAT THE PROPOSED PRIVATELY OWNED AND MAINTANED STORM SEWER SYSTEM WAS DESIGNED BY THEIR ENGINEER TO CONVEY THE 10 YEAR STORM EVENT AND PERIODIC PONDING OF STORMWATER WILL OCCASIONALLY OCCUR ON THE SITE. THE TOWN OF ROTTERDAM AND TOWN DESIGNATED ENGINEER SHALL BE HELD HARMLESS FOR THIS DESIGN OR CONDITION.

DECOMPACTION NOTES

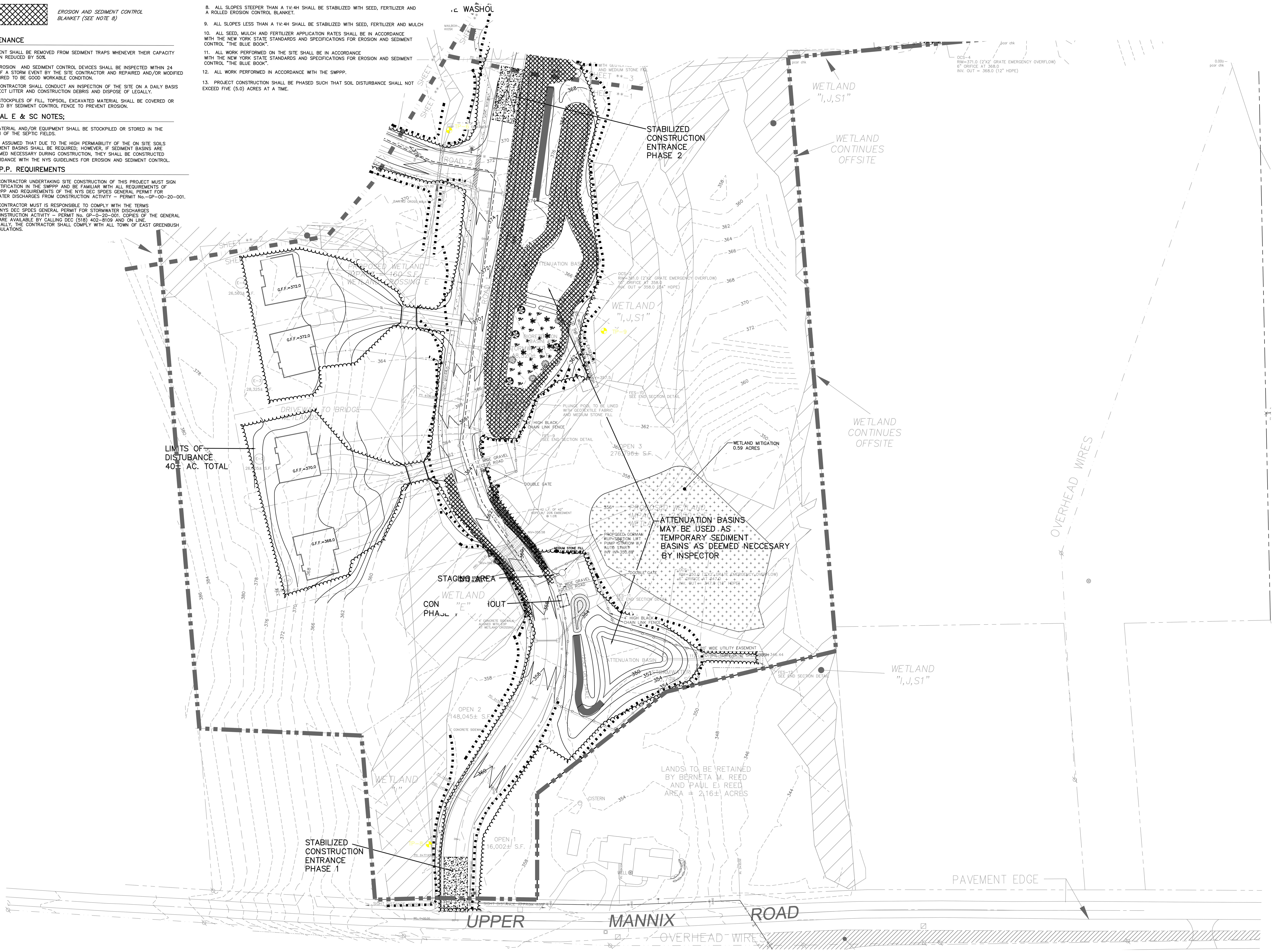
1. ALL AREAS NOTED AS A DECOMPACTION AREA SHALL BE DECOMPACTED IN ACCORDANCE THE NEW YORK STATE DEC PUBLICATION "DEEP RIPPING AND DECOMPACTION 2008"

2. ALL OTHER DISTURBED AREAS SHALL BE RESTORED IN ACCORDANCE WITH TABLE 5.3 OF THE NYSSDM FOR THE APPROPRIATE SOIL HYDROLOGIC SOIL GROUP (GROUP A).

3. EVERY EFFORT SHOULD BE MADE TO UTILIZE THE HAUL ROADS SHOWN ON THE PLAN FOR HEAVY CONSTRUCTION TRAFFIC (I.E. DUMP TRUCKS, CONCRETE TRUCKS, EXCAVATORS ETC.) IF AN AREA OUTSIDE OF THE HAUL ROAD AND WITHIN AN INFILTRATION PRACTICE (IE POROUS ASPHALT, INFILTRATION TRENCH ETC.) IS DISTURBED BY HEAVY CONSTRUCTION TRAFFIC IT SHALL BE DECOMPACTED IN ACCORDANCE WITH NOTE 1 ABOVE.

DISTURBANCE AREA NOTE

1. AT NO TIME SHALL THE TOTAL DISTURBANCE EXCEED 5 ACRES. FOR AREAS OF DISTURBANCE AND SEQUENCE PLEASE REFER TO THE PROJECT SWPPP WHICH OUTLINES HOW THIS CAN BE ACHIEVED



NOTE: 48 HOURS PRIOR TO ANY CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL CONTACT THE U.F.P.O. TO LOCATE ALL UNDERGROUND UTILITIES. 1-800-962-7962

NO.	DATE:	REVISIONS	BY:
3	01/25/22	REVISED AS PER TDE AND E. GREENBUSH COMMENTS	
2	11/03/21	REVISED AS PER CAC AND USACOE COMMENTS	
1	7/27/21	REVISED AS PER TDE COMMENTS DATED 7/8/21	

BRETT L. STEENBURGH, P.E.
N.Y.S. LIC. NO. 075458

APPLICANT:
CLDZ LLC
494 WESTERN TURNPIKE
ALTAMONT, NY 12009

BRETT L. STEENBURGH, P.E. PLLC
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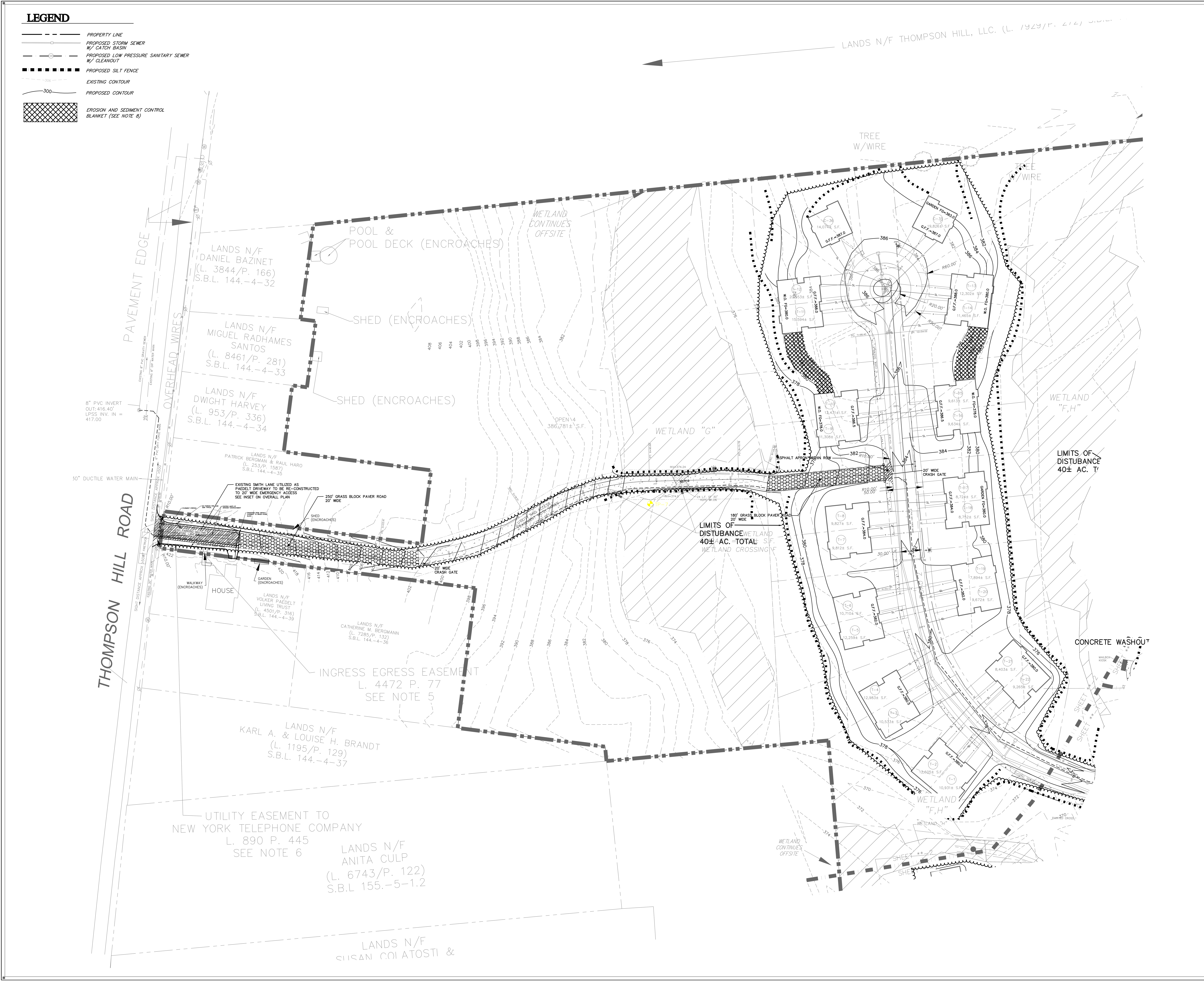
E & SC PLAN
CLDZ, LLC
CARVER COURT
TOWN OF EAST GREENBUSH
COUNTY OF RENSSELAER STATE OF NEW YORK

DRAWN BY: BLS
CADD FILE:
CHECKED BY:
JOB NO.
SCALE: 1" = 40'
DATE: FEBRUARY 15, 2021
SHEET ESC-1



NOTE: 48 HOURS PRIOR TO ANY CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL CONTACT THE U.F.P.O. TO LOCATE ALL UNDERGROUND UTILITIES. 1-800-962-7962

REVISIONS

BRETT L. STEENBURGH, P.E. N.Y.S. LIC. NO. 075458

APPLICANT:
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CADD FILE:
JOB NO.
DATE: FEBRUARY 15, 2021
SCALE: 1" = 40'
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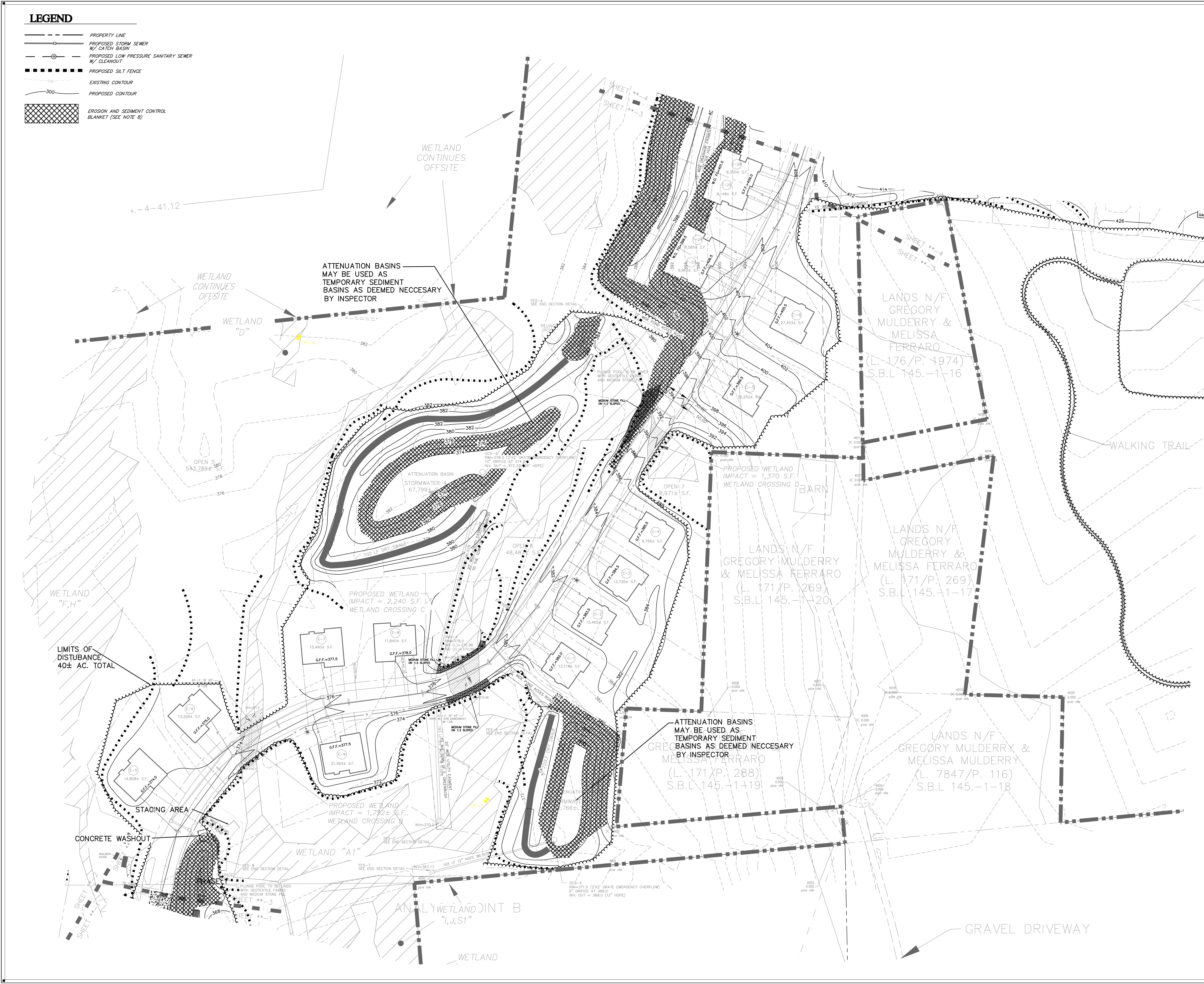

NOTE: 48 HOURS PRIOR TO ANY CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL CONTACT THE U.F.P.O. TO LOCATE ALL UNDERGROUND UTILITIES. 1-800-962-7962

NO.	DATE:	REVISIONS	BY:
3	01/25/22	REVISED AS PER TDE AND E. GREENBUSH COMMENTS	
2	11/03/21	REVISED AS PER CAC AND USACOE COMMENTS	
1	7/27/21	REVISED AS PER TDE COMMENTS DATED 7/8/21	

BRETT L. STEENBURGH, P.E.
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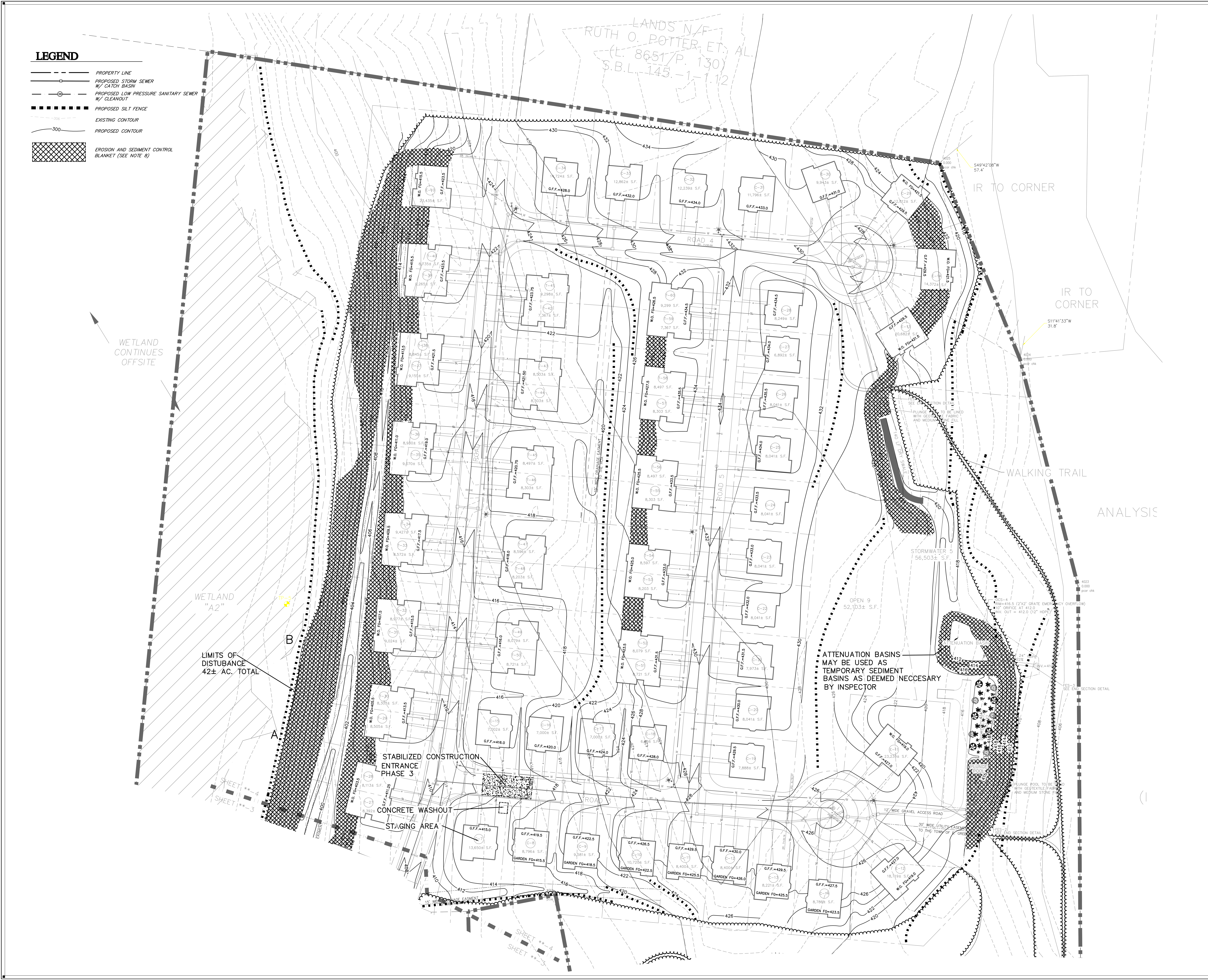
JOB NO.
SCALE: 1" = 40'
DATE: FEBRUARY 15, 2021
SHEET ESC-3



NOTE: 48 HOURS PRIOR TO ANY CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL CONTACT THE U.F.P.O. TO LOCATE ALL UNDERGROUND UTILITIES. 1-800-962-7962

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SCALE: 1" = 40'
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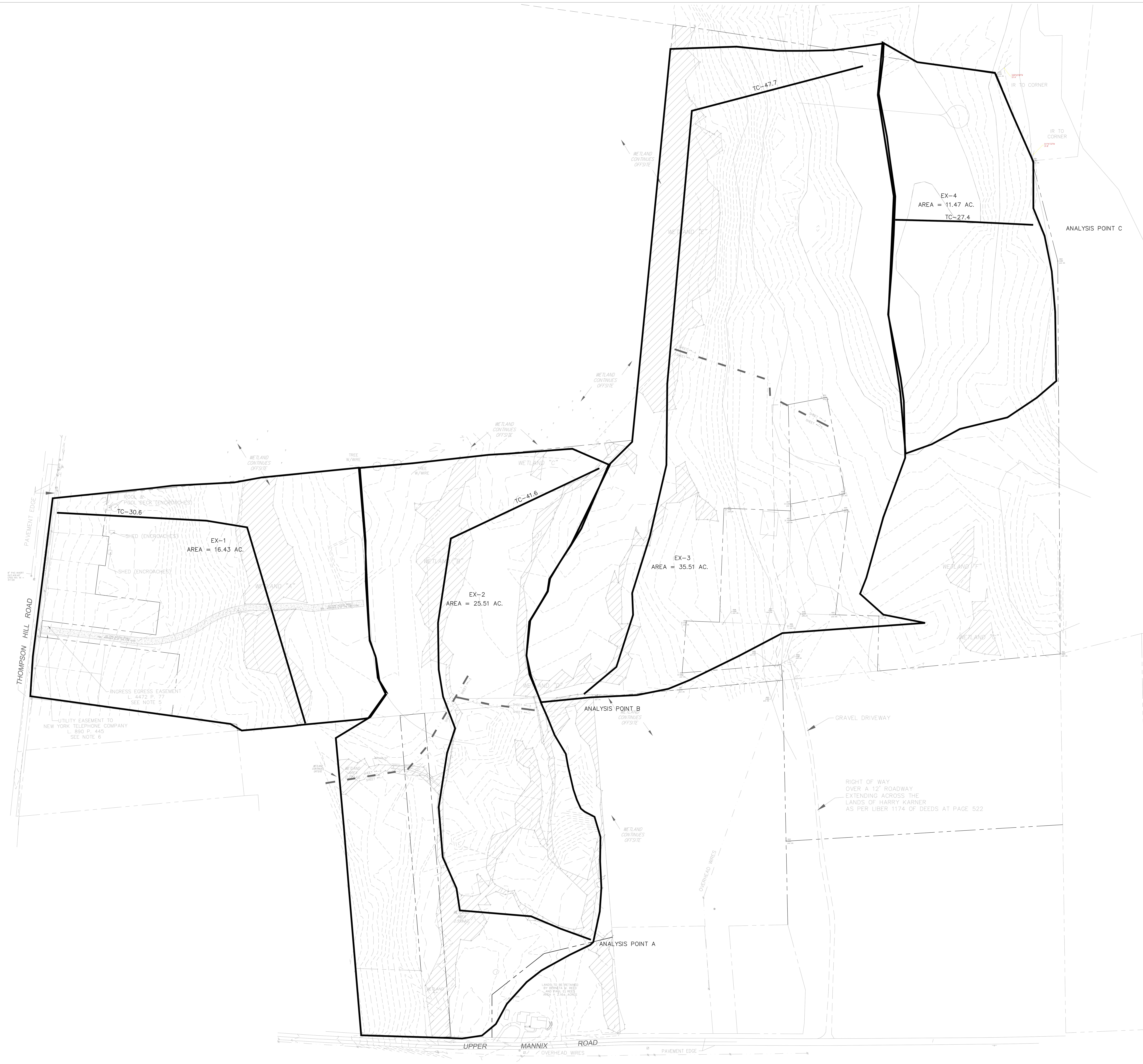
APPENDIX C

Drainage Calculations



NOTE: 48 HOURS PRIOR TO ANY CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL CONTACT THE U.F.P.O. TO LOCATE ALL UNDERGROUND UTILITIES. 1-800-962-7962

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EX DRAINAGE AREAS
CLDZ, LLC
CARVER COURT
TOWN OF EAST GREENBUSH
COUNTY OF RENSSELAER STATE OF NEW YORK

DRAWN BY: BLS
DATE: FEBRUARY 15, 2021
SCALE: 1" = 100'
SHEET SP-1

NOTE: 48 HOURS PRIOR TO ANY CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL CONTACT THE U.F.P.O. TO LOCATE ALL UNDERGROUND UTILITIES. 1-800-962-7962

NO.	DATE	REVISIONS	BY

BRETT L. STEENBURGH, P.E.
N.Y.S. LIC. NO. 075458

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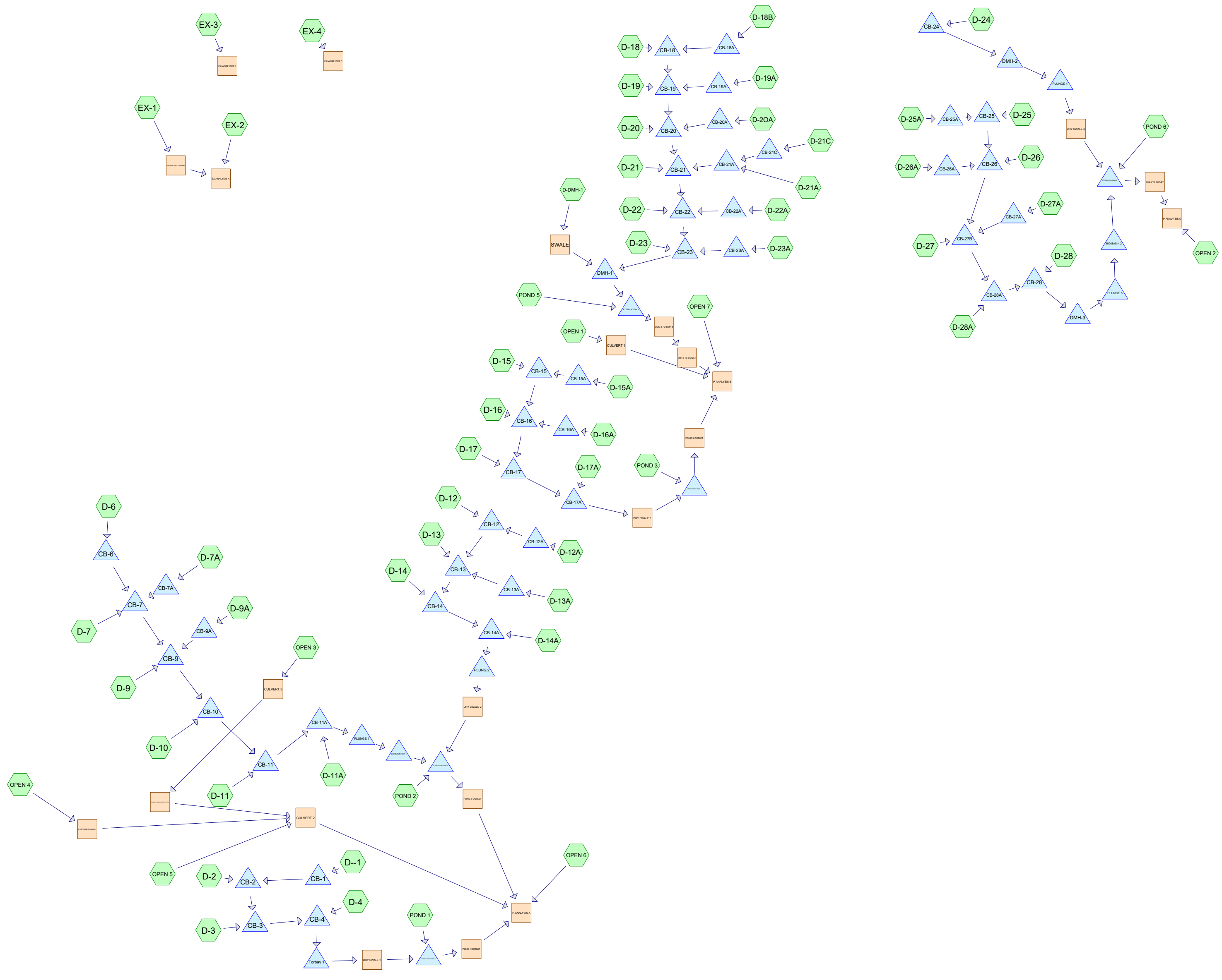
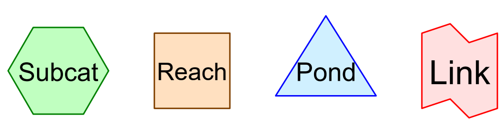
PROPOSED DRAINAGE AREAS

CLDZ, LLC
CARVER COURT
TOWN OF EAST GREENBUSH
COUNTY OF RENSSELAER STATE OF NEW YORK

DRAWN BY: BLS
CHECKED BY:
CADD FILE:
JOB NO.
DATE: FEBRUARY 15, 2021
SCALE: 1" = 100'
SHEET SP-1





Drainage Diagram for Carver Court

Prepared by {enter your company name here} 5/26/2021

HydroCAD® 6.00 s/n 000694 © 1986-2001 Applied Microcomputer Systems

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, TYPEII~2 Rainfall=3.85"
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment D--1: D-1
Tc=6.0 min CN=98 Area=4,262 sf Runoff= 0.36 cfs 0.027 af

Subcatchment D-10: D-10
Tc=6.0 min CN=98 Area=3,302 sf Runoff= 0.28 cfs 0.021 af

Subcatchment D-11: D-11
Tc=6.0 min CN=98 Area=3,099 sf Runoff= 0.26 cfs 0.020 af

Subcatchment D-11A: D-11A
Tc=6.0 min CN=98 Area=2,486 sf Runoff= 0.21 cfs 0.016 af

Subcatchment D-12: D-12
Tc=16.6 min CN=87 Area=18,053 sf Runoff= 0.87 cfs 0.081 af

Subcatchment D-12A: D-12A
Tc=11.9 min CN=87 Area=17,038 sf Runoff= 0.93 cfs 0.076 af

Subcatchment D-13: D-13
Tc=6.0 min CN=94 Area=8,280 sf Runoff= 0.65 cfs 0.048 af

Subcatchment D-13A: D-13A
Tc=6.0 min CN=98 Area=2,837 sf Runoff= 0.24 cfs 0.018 af

Subcatchment D-14: D-14
Tc=20.7 min CN=87 Area=21,592 sf Runoff= 0.96 cfs 0.096 af

Subcatchment D-14A: D-14A
Tc=6.0 min CN=98 Area=5,177 sf Runoff= 0.44 cfs 0.033 af

Subcatchment D-15: D-15
Tc=6.0 min CN=98 Area=2,000 sf Runoff= 0.17 cfs 0.013 af

Subcatchment D-15A: D-15A
Tc=12.1 min CN=91 Area=7,050 sf Runoff= 0.43 cfs 0.037 af

Subcatchment D-16: D-16
Tc=6.0 min CN=98 Area=2,580 sf Runoff= 0.22 cfs 0.017 af

Subcatchment D-16A: D-16A
Tc=9.8 min CN=92 Area=8,484 sf Runoff= 0.57 cfs 0.046 af

Subcatchment D-17: D-17
Tc=6.0 min CN=98 Area=3,577 sf Runoff= 0.30 cfs 0.023 af

Subcatchment D-17A: D-17A
Tc=12.4 min CN=88 Area=22,859 sf Runoff= 1.28 cfs 0.106 af

Subcatchment D-18: D-18
Tc=15.4 min CN=86 Area=9,762 sf Runoff= 0.47 cfs 0.042 af

Subcatchment D-18B: D-18
Tc=20.3 min CN=87 Area=86,619 sf Runoff= 3.87 cfs 0.387 af

Subcatchment D-19: D-19
Tc=17.2 min CN=88 Area=27,495 sf Runoff= 1.36 cfs 0.128 af

Subcatchment D-19A: D-19A
Tc=17.3 min CN=85 Area=85,319 sf Runoff= 3.80 cfs 0.354 af

Subcatchment D-2: D-2
Tc=6.0 min CN=98 Area=4,523 sf Runoff= 0.38 cfs 0.029 af

Subcatchment D-20: D-20
Tc=13.4 min CN=91 Area=17,867 sf Runoff= 1.06 cfs 0.093 af

Subcatchment D-21: D-21
Tc=17.1 min CN=87 Area=13,201 sf Runoff= 0.63 cfs 0.059 af

Subcatchment D-21A: D-21A
Tc=22.0 min CN=89 Area=38,849 sf Runoff= 1.79 cfs 0.187 af

Subcatchment D-21C: D-21C
Tc=19.1 min CN=86 Area=1.196 ac Runoff= 2.31 cfs 0.224 af

Subcatchment D-22: D-22
Tc=12.3 min CN=87 Area=9,713 sf Runoff= 0.53 cfs 0.044 af

Subcatchment D-22A: D-22A
Tc=6.0 min CN=93 Area=3,475 sf Runoff= 0.27 cfs 0.019 af

Subcatchment D-23: D-23
Tc=13.1 min CN=89 Area=12,626 sf Runoff= 0.71 cfs 0.061 af

Subcatchment D-23A: D-23A
Tc=11.0 min CN=86 Area=0.401 ac Runoff= 0.95 cfs 0.075 af

Subcatchment D-24: D-24
Tc=21.4 min CN=89 Area=39,239 sf Runoff= 1.83 cfs 0.189 af

Subcatchment D-25: D-25
Tc=21.7 min CN=88 Area=22,353 sf Runoff= 1.01 cfs 0.104 af

Subcatchment D-25A: D-25A
Tc=13.0 min CN=86 Area=19,613 sf Runoff= 1.00 cfs 0.085 af

Subcatchment D-26: D-26
Tc=23.0 min CN=90 Area=32,858 sf Runoff= 1.54 cfs 0.164 af

Subcatchment D-26A: D-26A
Tc=14.3 min CN=88 Area=22,077 sf Runoff= 1.17 cfs 0.103 af

Subcatchment D-27: D-27
Tc=16.3 min CN=91 Area=10,860 sf Runoff= 0.60 cfs 0.056 af

Subcatchment D-27A: D-27A
Tc=6.0 min CN=88 Area=3,503 sf Runoff= 0.24 cfs 0.016 af

Subcatchment D-28: D-28
Tc=17.1 min CN=88 Area=25,225 sf Runoff= 1.25 cfs 0.117 af

Subcatchment D-28A: D-28A
Tc=6.0 min CN=93 Area=4,067 sf Runoff= 0.31 cfs 0.023 af

Subcatchment D-2OA: D-20A
Tc=22.3 min CN=85 Area=52,267 sf Runoff= 2.10 cfs 0.216 af

Subcatchment D-3: D-3
Tc=6.0 min CN=98 Area=8,167 sf Runoff= 0.69 cfs 0.053 af

Subcatchment D-4: D-4
Tc=6.0 min CN=98 Area=8,318 sf Runoff= 0.70 cfs 0.054 af

Subcatchment D-6: D-6
Tc=17.1 min CN=88 Area=44,426 sf Runoff= 2.20 cfs 0.206 af

Subcatchment D-7: D-7
Tc=21.4 min CN=88 Area=29,922 sf Runoff= 1.35 cfs 0.139 af

Subcatchment D-7A: D-7A
Tc=21.4 min CN=88 Area=29,500 sf Runoff= 1.33 cfs 0.137 af

Subcatchment D-9: D-9
Tc=16.4 min CN=88 Area=39,040 sf Runoff= 1.97 cfs 0.181 af

Subcatchment D-9A: CB-9A
Tc=16.4 min CN=88 Area=27,189 sf Runoff= 1.37 cfs 0.126 af

Subcatchment D-DMH-1: D-DMH-1
Tc=6.0 min CN=85 Area=69,237 sf Runoff= 4.24 cfs 0.288 af

Subcatchment EX-1: EX-1

Tc=30.6 min CN=79 Area=16.430 ac Runoff= 19.73 cfs 2.317 af

Subcatchment EX-2: EX-2

Tc=41.6 min CN=79 Area=25.510 ac Runoff= 26.39 cfs 3.582 af

Subcatchment EX-3: EX-3

Tc=47.7 min CN=79 Area=35.510 ac Runoff= 34.18 cfs 4.974 af

Subcatchment EX-4: EX-4

Tc=27.4 min CN=79 Area=11.470 ac Runoff= 14.48 cfs 1.620 af

Subcatchment OPEN 1: OIPEN 1

Tc=42.8 min CN=79 Area=426,190 sf Runoff= 9.99 cfs 1.373 af

Subcatchment OPEN 2: OPEN 2

Tc=13.4 min CN=79 Area=168,705 sf Runoff= 6.51 cfs 0.550 af

Subcatchment OPEN 3: OPEN 3

Tc=50.3 min CN=79 Area=319,952 sf Runoff= 6.87 cfs 1.028 af

Subcatchment OPEN 4: OPEN 4

Tc=29.2 min CN=80 Area=632,860 sf Runoff= 18.60 cfs 2.138 af

Subcatchment OPEN 5: OPEN 5

Tc=29.8 min CN=79 Area=326,510 sf Runoff= 9.12 cfs 1.057 af

Subcatchment OPEN 6: OPEN 6

Tc=35.7 min CN=79 Area=224,401 sf Runoff= 5.76 cfs 0.725 af

Subcatchment OPEN 7: OPEN 7

Tc=36.5 min CN=79 Area=457,482 sf Runoff= 11.60 cfs 1.478 af

Subcatchment POND 1: POND 1

Tc=6.0 min CN=80 Area=17,554 sf Runoff= 0.89 cfs 0.060 af

Subcatchment POND 2: POND 2

Tc=6.0 min CN=80 Area=49,954 sf Runoff= 2.53 cfs 0.170 af

Subcatchment POND 3: POND 3

Tc=6.0 min CN=80 Area=42,753 sf Runoff= 2.16 cfs 0.146 af

Subcatchment POND 5: POND 5

Tc=6.0 min CN=80 Area=50,948 sf Runoff= 2.58 cfs 0.174 af

Subcatchment POND 6: POND 6

Tc=15.4 min CN=80 Area=140,626 sf Runoff= 5.40 cfs 0.478 af

Reach CULVERT 1: CULVERT 1 Inflow= 9.99 cfs 1.373 af
Length= 42.0' Max Vel= 7.1 fps Capacity= 108.99 cfs Outflow= 9.98 cfs 1.373 af

Reach CULVERT 2: CULVERT 2 Inflow= 31.72 cfs 4.209 af
Length= 46.0' Max Vel= 9.8 fps Capacity= 108.99 cfs Outflow= 31.71 cfs 4.209 af

Reach CULVERT 3: CULVERT 3 Inflow= 6.87 cfs 1.028 af
Length= 42.0' Max Vel= 6.3 fps Capacity= 108.99 cfs Outflow= 6.87 cfs 1.028 af

Reach DMH-5 TO OUTLET: DMH-5 TO OUTLET Inflow= 5.45 cfs 2.319 af
Length= 193.0' Max Vel= 4.9 fps Capacity= 17.28 cfs Outflow= 5.45 cfs 2.317 af

Reach DRY SWALE 1: DRY SWALE 1 Inflow= 2.11 cfs 0.141 af
Length= 125.0' Max Vel= 1.0 fps Capacity= 59.21 cfs Outflow= 1.97 cfs 0.141 af

Reach DRY SWALE 2: DRY SWALE 2 Inflow= 3.44 cfs 0.331 af
Length= 140.0' Max Vel= 1.3 fps Capacity= 58.97 cfs Outflow= 3.41 cfs 0.330 af

Reach DRY SWALE 3: DRY SWALE 3 Inflow= 2.81 cfs 0.241 af
Length= 220.0' Max Vel= 1.2 fps Capacity= 58.97 cfs Outflow= 2.69 cfs 0.239 af

Reach DRY SWALE 4: (new node) Inflow= 0.00 cfs 0.000 af
Length= 140.0' Max Vel= 0.0 fps Capacity= 58.97 cfs Outflow= 0.00 cfs 0.000 af

Reach EX ANALYSIS A: EX ANALYSIS A Inflow= 45.73 cfs 5.887 af
Length= 10.0' Max Vel= 7.9 fps Capacity= 71.84 cfs Outflow= 45.73 cfs 5.886 af

Reach EX-ANALYSIS B: EX ANALYSIS B Inflow= 34.18 cfs 4.974 af
Length= 10.0' Max Vel= 7.2 fps Capacity= 71.84 cfs Outflow= 34.18 cfs 4.974 af

Reach EX-ANALYSIS C: EX-ANALYSIS C Inflow= 14.48 cfs 1.620 af
Length= 10.0' Max Vel= 5.6 fps Capacity= 71.84 cfs Outflow= 14.47 cfs 1.619 af

Reach EX-WETLAND CHANNEL: EX WETLAND CHANNEL 1 TO 2 Inflow= 19.73 cfs 2.317 af
Length= 1,200.0' Max Vel= 5.7 fps Capacity= 66.95 cfs Outflow= 19.46 cfs 2.304 af

Reach OCS-3 TO DMH-5: OCS3 TO DMH5 Inflow= 5.45 cfs 2.321 af
Length= 274.0' Max Vel= 4.9 fps Capacity= 17.33 cfs Outflow= 5.45 cfs 2.319 af

Reach OCS-4 TO OUTLET: OCS-4 TO OUTLET Inflow= 4.84 cfs 0.991 af
Length= 62.0' Max Vel= 9.2 fps Capacity= 44.02 cfs Outflow= 4.84 cfs 0.991 af

Reach P-ANALYISIS C: P-ANALYSIS C Inflow= 9.14 cfs 1.541 af
Length= 10.0' Max Vel= 4.9 fps Capacity= 71.84 cfs Outflow= 9.13 cfs 1.541 af

Reach P-ANALYSIS A: P-ANALYSIS A Inflow= 42.02 cfs 6.314 af
Length= 10.0' Max Vel= 7.7 fps Capacity= 71.84 cfs Outflow= 42.01 cfs 6.313 af

Reach P-ANALYSIS B: P-ANALYSIS B Inflow= 27.69 cfs 5.532 af
Length= 10.0' Max Vel= 6.8 fps Capacity= 71.84 cfs Outflow= 27.69 cfs 5.532 af

Reach P-WETLAND CHANNEL: p WETLAND CHANNEL 1 TO 2 Inflow= 18.60 cfs 2.138 af
Length= 900.0' Max Vel= 6.0 fps Capacity= 74.86 cfs Outflow= 18.44 cfs 2.130 af

Reach POND 1 OUTLET: POND 1 OUTLET Inflow= 0.84 cfs 0.191 af
Length= 112.0' Max Vel= 3.1 fps Capacity= 2.73 cfs Outflow= 0.84 cfs 0.191 af

Reach POND 2 OUTLET: POND 2 OUTLET Inflow= 4.13 cfs 1.190 af
Length= 100.0' Max Vel= 4.5 fps Capacity= 17.33 cfs Outflow= 4.13 cfs 1.189 af

Reach POND 3 OUTLET: POND 3 OUTLET Inflow= 1.07 cfs 0.364 af
Length= 165.0' Max Vel= 3.3 fps Capacity= 2.74 cfs Outflow= 1.07 cfs 0.364 af

Reach SWALE: SWALE Inflow= 4.24 cfs 0.288 af
Length= 1,050.0' Max Vel= 2.1 fps Capacity= 6.90 cfs Outflow= 3.20 cfs 0.285 af

Reach SWALE FROM CULVERT 3 TO 2: SWALE FROM CULVERT 3 TO 2 Inflow= 6.87 cfs 1.028 af
Length= 800.0' Max Vel= 3.5 fps Capacity= 32.86 cfs Outflow= 6.80 cfs 1.022 af

Pond ATTENUATION 1: ATTENUATION POND 1 Peak Storage= 38,937 cf Inflow= 23.27 cfs 2.346 af
Primary= 5.45 cfs 2.321 af Outflow= 5.45 cfs 2.321 af

Pond ATTENUATION BASIN 1: ATTENUATION BASIN 1 Peak Storage= 3,303 cf Inflow= 2.69 cfs 0.201 af
Primary= 0.84 cfs 0.191 af Outflow= 0.84 cfs 0.191 af

Pond ATTENUATION BASIN 2: ATTENUATION BASIN 2 Peak Storage= 16,300 cf Inflow= 9.42 cfs 1.225 af
Primary= 4.13 cfs 1.190 af Outflow= 4.13 cfs 1.190 af

Pond ATTENUATION BASIN 6: ATTENUATION BASIN 6 Peak Storage= 12,175 cf Inflow= 10.49 cfs 1.013 af
Primary= 4.84 cfs 0.991 af Outflow= 4.84 cfs 0.991 af

Pond ATTENUATION POND 3: ATTENUATION POND 3 Peak Storage= 6,933 cf Inflow= 3.98 cfs 0.385 af
Primary= 1.07 cfs 0.364 af Outflow= 1.07 cfs 0.364 af

Pond BIO BASIN 2: BIO BASIN 2 Peak Storage= 4,112 cf Inflow= 6.29 cfs 0.592 af
Primary= 6.00 cfs 0.535 af Outflow= 6.00 cfs 0.535 af

Pond BIORETENTION 1: BIORETENTION BASIN 1 Peak Storage= 10,394 cf Inflow= 8.46 cfs 0.803 af
Primary= 5.77 cfs 0.725 af Outflow= 5.77 cfs 0.725 af

Pond CB-1: CB-1 Peak Storage= 6 cf Inflow= 0.36 cfs 0.027 af
Primary= 0.36 cfs 0.027 af Outflow= 0.36 cfs 0.027 af

Pond CB-10: CB-10 Peak Storage= 21 cf Inflow= 8.24 cfs 0.810 af
Primary= 8.24 cfs 0.810 af Outflow= 8.24 cfs 0.810 af

Pond CB-11: CB-11
Peak Storage= 23 cf Inflow= 8.37 cfs 0.830 af
Primary= 8.37 cfs 0.830 af Outflow= 8.37 cfs 0.830 af

Pond CB-11A: CB-11A
Peak Storage= 23 cf Inflow= 8.47 cfs 0.846 af
Primary= 8.47 cfs 0.846 af Outflow= 8.47 cfs 0.846 af

Pond CB-12: CB-12
Peak Storage= 12 cf Inflow= 1.76 cfs 0.157 af
Primary= 1.76 cfs 0.157 af Outflow= 1.76 cfs 0.157 af

Pond CB-12A: CB-12A
Peak Storage= 9 cf Inflow= 0.93 cfs 0.076 af
Primary= 0.93 cfs 0.076 af Outflow= 0.93 cfs 0.076 af

Pond CB-13: CB-13
Peak Storage= 14 cf Inflow= 2.40 cfs 0.223 af
Primary= 2.40 cfs 0.223 af Outflow= 2.40 cfs 0.223 af

Pond CB-13A: CB-13A
Peak Storage= 4 cf Inflow= 0.24 cfs 0.018 af
Primary= 0.24 cfs 0.018 af Outflow= 0.24 cfs 0.018 af

Pond CB-14: CB-14
Peak Storage= 16 cf Inflow= 3.16 cfs 0.319 af
Primary= 3.16 cfs 0.319 af Outflow= 3.16 cfs 0.319 af

Pond CB-14A: CB-14A
Peak Storage= 17 cf Inflow= 3.47 cfs 0.353 af
Primary= 3.47 cfs 0.353 af Outflow= 3.47 cfs 0.353 af

Pond CB-15: CB-15
Peak Storage= 6 cf Inflow= 0.56 cfs 0.049 af
Primary= 0.56 cfs 0.049 af Outflow= 0.56 cfs 0.049 af

Pond CB-15A: CB-15A
Peak Storage= 6 cf Inflow= 0.43 cfs 0.037 af
Primary= 0.43 cfs 0.037 af Outflow= 0.43 cfs 0.037 af

Pond CB-16: CB-16
Peak Storage= 10 cf Inflow= 1.32 cfs 0.112 af
Primary= 1.32 cfs 0.111 af Outflow= 1.32 cfs 0.111 af

Pond CB-16A: CB-16A
Peak Storage= 7 cf Inflow= 0.57 cfs 0.046 af
Primary= 0.57 cfs 0.046 af Outflow= 0.57 cfs 0.046 af

Pond CB-17: CB-17
Peak Storage= 13 cf Inflow= 1.60 cfs 0.135 af
Primary= 1.60 cfs 0.135 af Outflow= 1.60 cfs 0.135 af

Pond CB-17A: CB-17A
Peak Storage= 19 cf Inflow= 2.81 cfs 0.241 af
Primary= 2.81 cfs 0.241 af Outflow= 2.81 cfs 0.241 af

Pond CB-18: CB-18
Peak Storage= 16 cf Inflow= 4.32 cfs 0.429 af
Primary= 4.32 cfs 0.429 af Outflow= 4.32 cfs 0.429 af

Pond CB-18A: CB-18A AND B
Peak Storage= 18 cf Inflow= 3.87 cfs 0.387 af
Primary= 3.87 cfs 0.387 af Outflow= 3.87 cfs 0.387 af

Pond CB-19: CB-19 Peak Storage= 22 cf Inflow= 9.44 cfs 0.910 af
Primary= 9.44 cfs 0.910 af Outflow= 9.44 cfs 0.910 af

Pond CB-19A: CB-19A Peak Storage= 15 cf Inflow= 3.80 cfs 0.354 af
Primary= 3.80 cfs 0.354 af Outflow= 3.80 cfs 0.354 af

Pond CB-2: CB-2 Peak Storage= 7 cf Inflow= 0.74 cfs 0.057 af
Primary= 0.74 cfs 0.057 af Outflow= 0.74 cfs 0.057 af

Pond CB-20: CB-20 Peak Storage= 27 cf Inflow= 12.40 cfs 1.219 af
Primary= 12.40 cfs 1.219 af Outflow= 12.40 cfs 1.219 af

Pond CB-20A: CB-20A Peak Storage= 14 cf Inflow= 2.10 cfs 0.216 af
Primary= 2.10 cfs 0.216 af Outflow= 2.10 cfs 0.216 af

Pond CB-21: CB-21 Peak Storage= 29 cf Inflow= 17.10 cfs 1.689 af
Primary= 17.10 cfs 1.689 af Outflow= 17.10 cfs 1.689 af

Pond CB-21A: CB-21A Peak Storage= 16 cf Inflow= 4.08 cfs 0.411 af
Primary= 4.08 cfs 0.411 af Outflow= 4.08 cfs 0.411 af

Pond CB-21C: CB-21C Peak Storage= 17 cf Inflow= 2.31 cfs 0.224 af
Primary= 2.31 cfs 0.224 af Outflow= 2.31 cfs 0.224 af

Pond CB-22: CB-22 Peak Storage= 29 cf Inflow= 17.66 cfs 1.752 af
Primary= 17.66 cfs 1.752 af Outflow= 17.66 cfs 1.752 af

Pond CB-22A: CB-22A Peak Storage= 5 cf Inflow= 0.27 cfs 0.019 af
Primary= 0.27 cfs 0.019 af Outflow= 0.27 cfs 0.019 af

Pond CB-23: CB-23 Peak Storage= 31 cf Inflow= 19.02 cfs 1.888 af
Primary= 19.02 cfs 1.888 af Outflow= 19.02 cfs 1.888 af

Pond CB-23A: CB-23A Peak Storage= 10 cf Inflow= 0.95 cfs 0.075 af
Primary= 0.95 cfs 0.075 af Outflow= 0.95 cfs 0.075 af

Pond CB-24: CB-24 Peak Storage= 14 cf Inflow= 1.83 cfs 0.189 af
Primary= 1.83 cfs 0.189 af Outflow= 1.83 cfs 0.189 af

Pond CB-25: CB-25 Peak Storage= 12 cf Inflow= 1.90 cfs 0.188 af
Primary= 1.90 cfs 0.188 af Outflow= 1.90 cfs 0.188 af

Pond CB-25A: CB-25A Peak Storage= 10 cf Inflow= 1.00 cfs 0.085 af
Primary= 1.00 cfs 0.085 af Outflow= 1.00 cfs 0.085 af

Pond CB-26: CB-26 Peak Storage= 18 cf Inflow= 4.45 cfs 0.454 af
Primary= 4.45 cfs 0.454 af Outflow= 4.45 cfs 0.454 af

Pond CB-26A: CB-26A Peak Storage= 9 cf Inflow= 1.17 cfs 0.103 af
Primary= 1.17 cfs 0.103 af Outflow= 1.17 cfs 0.103 af

Pond CB-27A: CB-27A Peak Storage= 4 cf Inflow= 0.24 cfs 0.016 af
Primary= 0.24 cfs 0.016 af Outflow= 0.24 cfs 0.016 af

Pond CB-27B: CB-27.B Peak Storage= 18 cf Inflow= 5.17 cfs 0.527 af
Primary= 5.17 cfs 0.527 af Outflow= 5.17 cfs 0.527 af

Pond CB-28: CB-28 Peak Storage= 26 cf Inflow= 6.58 cfs 0.666 af
Primary= 6.58 cfs 0.666 af Outflow= 6.58 cfs 0.666 af

Pond CB-28A: CB-28A Peak Storage= 22 cf Inflow= 5.33 cfs 0.549 af
Primary= 5.33 cfs 0.549 af Outflow= 5.33 cfs 0.549 af

Pond CB-3: CB-3 Peak Storage= 12 cf Inflow= 1.43 cfs 0.109 af
Primary= 1.43 cfs 0.109 af Outflow= 1.43 cfs 0.109 af

Pond CB-4: CB-4 Peak Storage= 16 cf Inflow= 2.13 cfs 0.163 af
Primary= 2.13 cfs 0.163 af Outflow= 2.13 cfs 0.163 af

Pond CB-6: CB-6 Peak Storage= 13 cf Inflow= 2.20 cfs 0.206 af
Primary= 2.20 cfs 0.206 af Outflow= 2.20 cfs 0.206 af

Pond CB-7: CB-7 Peak Storage= 17 cf Inflow= 4.83 cfs 0.482 af
Primary= 4.83 cfs 0.482 af Outflow= 4.83 cfs 0.482 af

Pond CB-7A: CB-7A Peak Storage= 10 cf Inflow= 1.33 cfs 0.137 af
Primary= 1.34 cfs 0.137 af Outflow= 1.34 cfs 0.137 af

Pond CB-9: CB-9 Peak Storage= 22 cf Inflow= 8.11 cfs 0.789 af
Primary= 8.11 cfs 0.789 af Outflow= 8.11 cfs 0.789 af

Pond CB-9A: CB-9A Peak Storage= 10 cf Inflow= 1.37 cfs 0.126 af
Primary= 1.37 cfs 0.126 af Outflow= 1.37 cfs 0.126 af

Pond DMH-1: DMH-1 Peak Storage= 40 cf Inflow= 21.98 cfs 2.172 af
Primary= 21.98 cfs 2.172 af Outflow= 21.98 cfs 2.172 af

Pond DMH-2: DMH-2 Peak Storage= 12 cf Inflow= 1.83 cfs 0.189 af
Primary= 1.83 cfs 0.189 af Outflow= 1.83 cfs 0.189 af

Pond DMH-3: DMH-3 Peak Storage= 24 cf Inflow= 6.58 cfs 0.666 af
Primary= 6.58 cfs 0.666 af Outflow= 6.58 cfs 0.666 af

Pond Forbay 1: FORBAY 1 Peak Storage= 1,087 cf Inflow= 2.13 cfs 0.163 af
Primary= 2.11 cfs 0.141 af Outflow= 2.11 cfs 0.141 af

Pond PLUNG 2: PLUNGE 2
Peak Storage= 1,333 cf Inflow= 3.47 cfs 0.353 af
Primary= 3.44 cfs 0.331 af Outflow= 3.44 cfs 0.331 af

Pond PLUNGE 1: PLUNGE 1
Peak Storage= 2,249 cf Inflow= 8.47 cfs 0.846 af
Primary= 8.46 cfs 0.803 af Outflow= 8.46 cfs 0.803 af

Pond PLUNGE 4: PLUNGE 4
Peak Storage= 8,212 cf Inflow= 1.83 cfs 0.189 af
Primary= 0.00 cfs 0.000 af Outflow= 0.00 cfs 0.000 af

Pond PLUNGE 5: PLUNGE 5
Peak Storage= 4,939 cf Inflow= 6.58 cfs 0.666 af
Primary= 6.29 cfs 0.592 af Outflow= 6.29 cfs 0.592 af

Runoff Area = 177.476 ac Volume = 26.504 af Average Depth = 1.79"

Subcatchment D--1: D-1

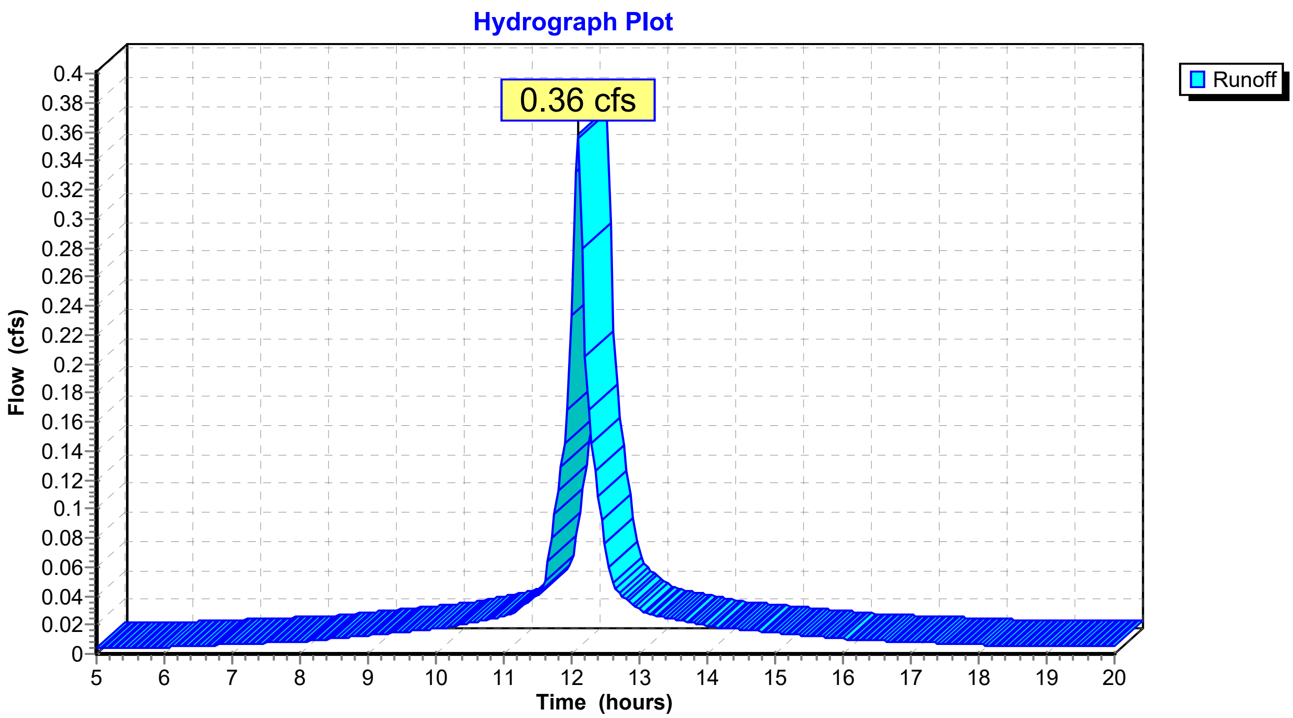
Runoff = 0.36 cfs @ 12.09 hrs, Volume= 0.027 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
4,262	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D--1: D-1



Subcatchment D-10: D-10

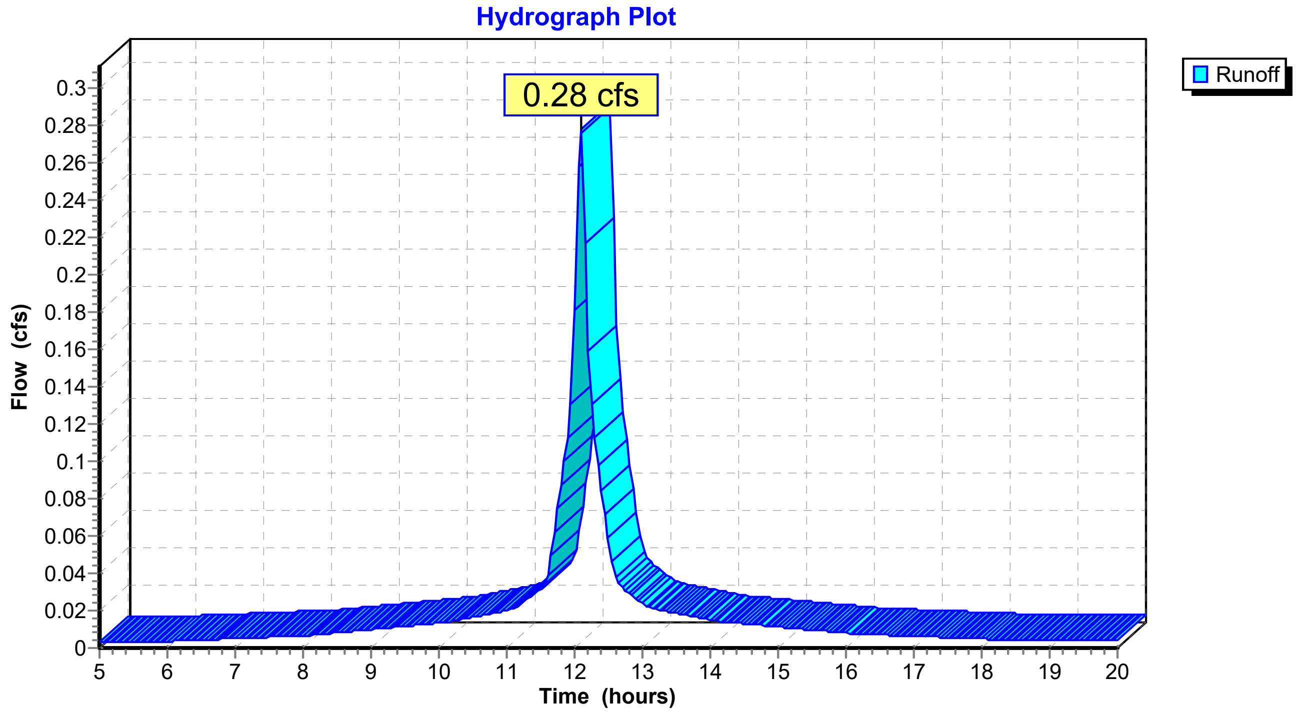
Runoff = 0.28 cfs @ 12.09 hrs, Volume= 0.021 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
3,302	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-10: D-10



Subcatchment D-11: D-11

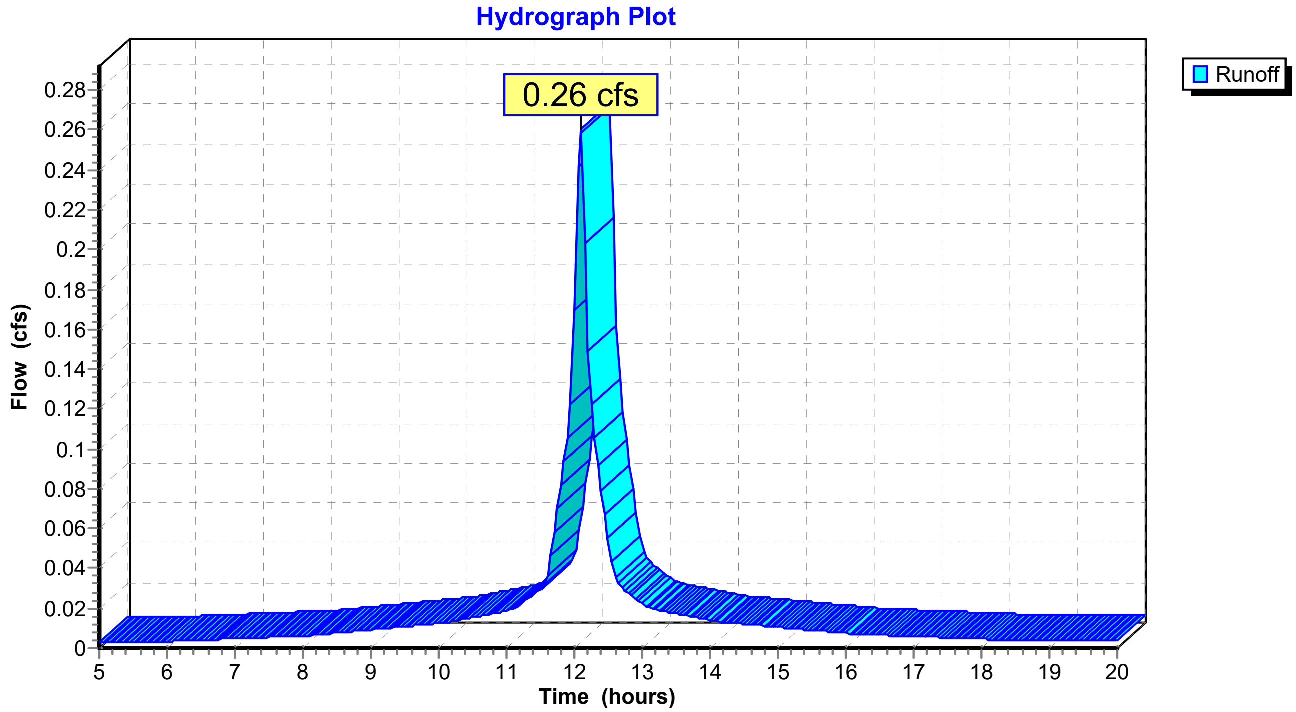
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 0.020 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
3,099	98	Paved roads w/curbs & sewers

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR 55 MIN**

Subcatchment D-11: D-11



Subcatchment D-11A: D-11A

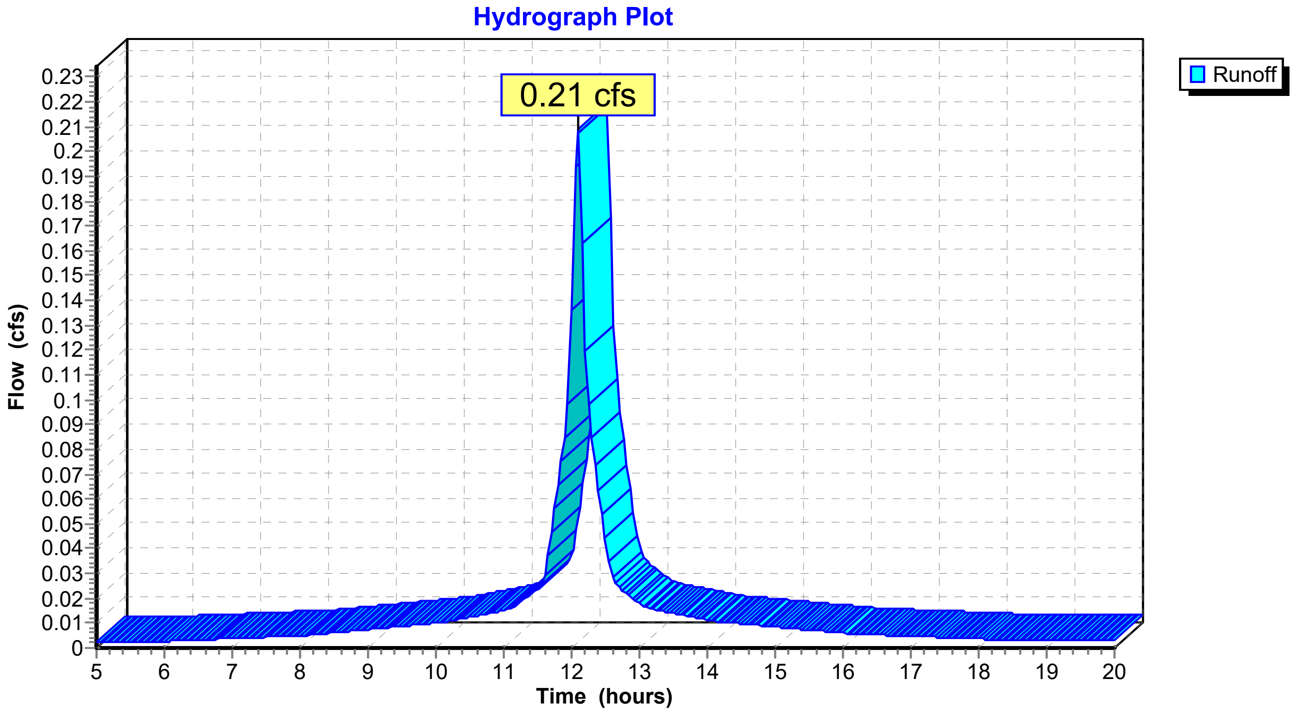
Runoff = 0.21 cfs @ 12.09 hrs, Volume= 0.016 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
2,486	98	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-11A: D-11A



Subcatchment D-12: D-12

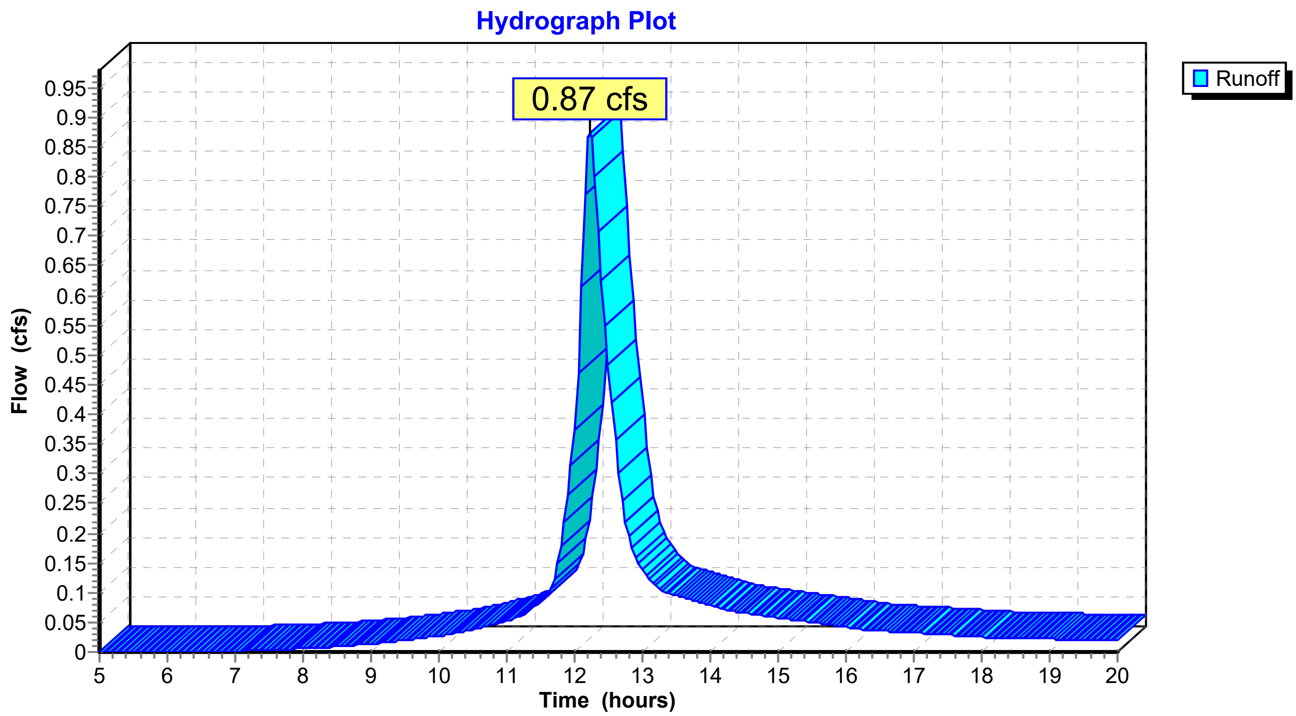
Runoff = 0.87 cfs @ 12.23 hrs, Volume= 0.081 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
7,375	98	Paved parking & roofs
10,678	80	>75% Grass cover, Good, HSG D
18,053	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	75	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.3	50	0.0150	2.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.6	125	Total			

Subcatchment D-12: D-12



Subcatchment D-12A: D-12A

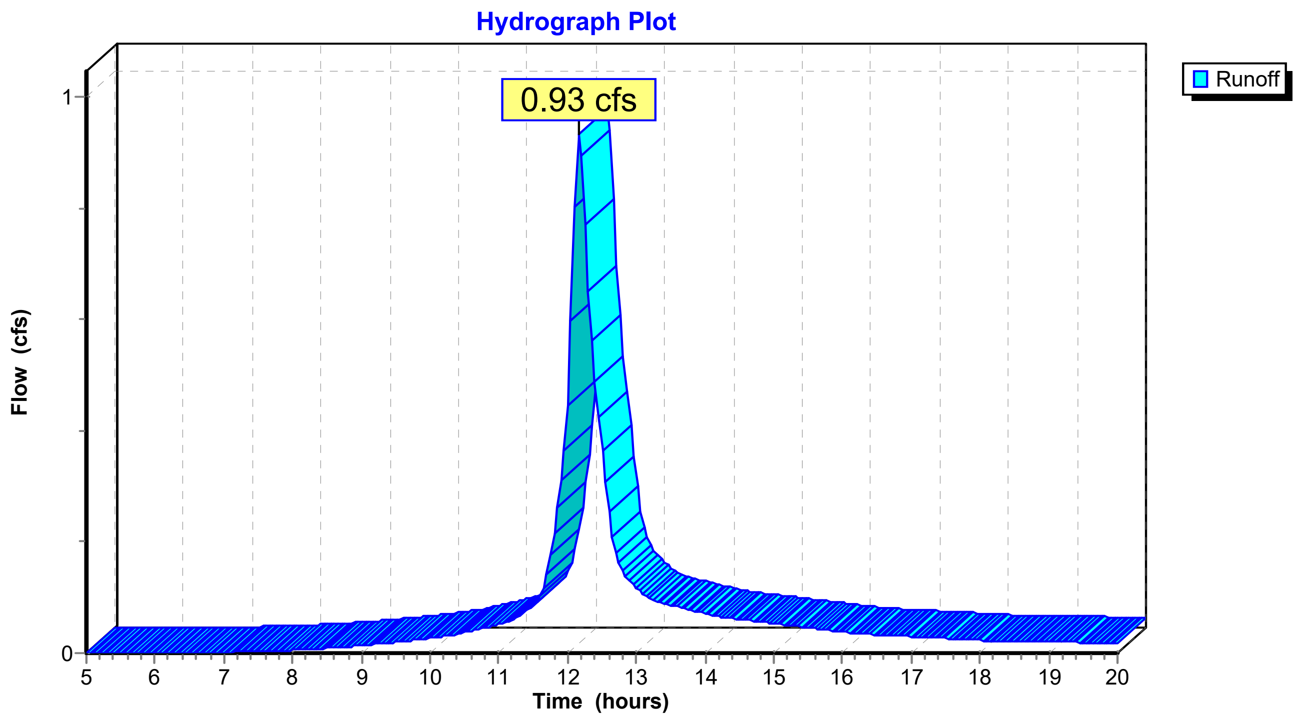
Runoff = 0.93 cfs @ 12.16 hrs, Volume= 0.076 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
6,750	98	Paved parking & roofs
10,288	80	>75% Grass cover, Good, HSG D
17,038	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	80	0.0250	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"

Subcatchment D-12A: D-12A



Subcatchment D-13: D-13

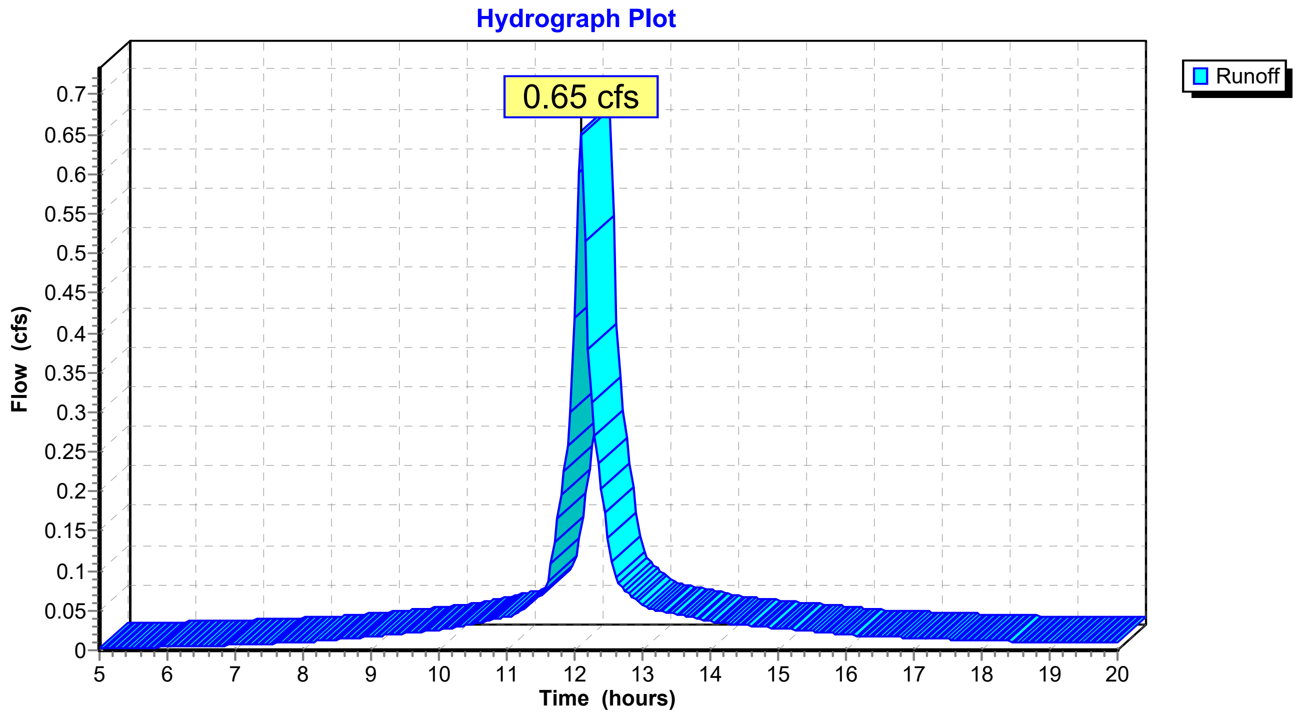
Runoff = 0.65 cfs @ 12.09 hrs, Volume= 0.048 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
6,280	98	Paved parking & roofs
2,000	80	>75% Grass cover, Good, HSG D
8,280	94	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-13: D-13



Subcatchment D-13A: D-13A

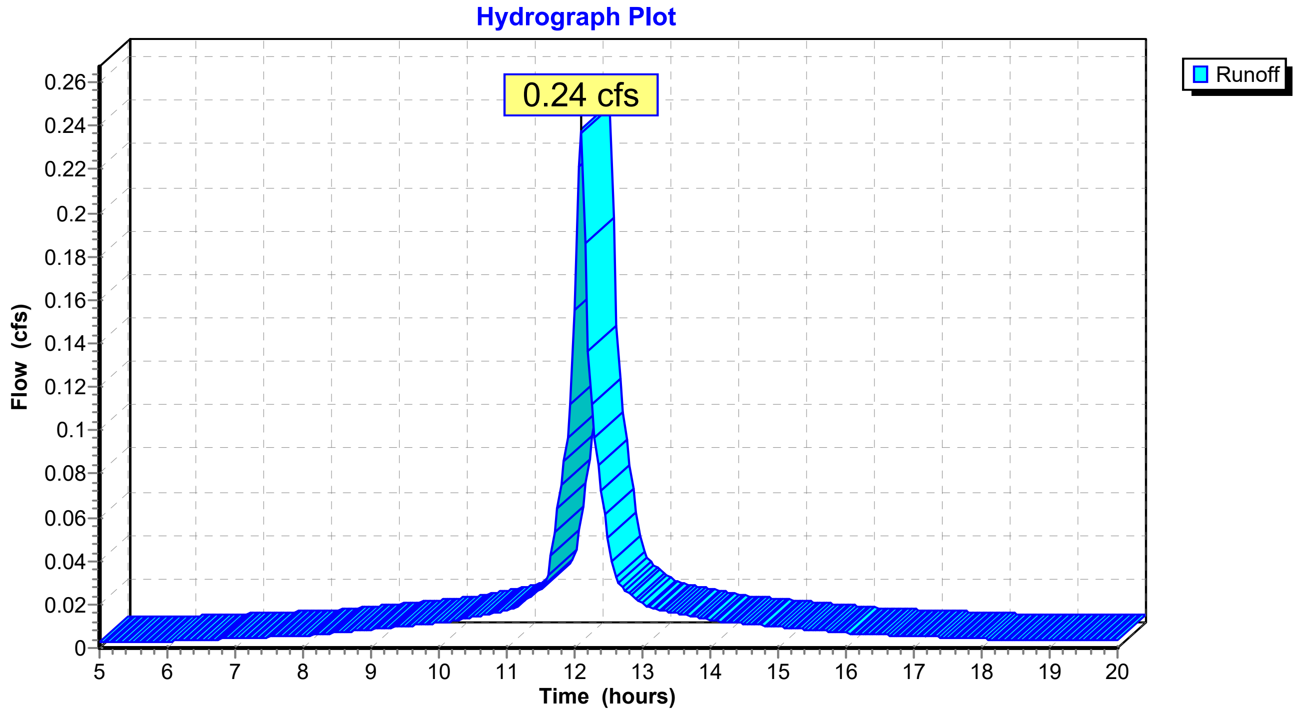
Runoff = 0.24 cfs @ 12.09 hrs, Volume= 0.018 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
2,837	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-13A: D-13A



Subcatchment D-14: D-14

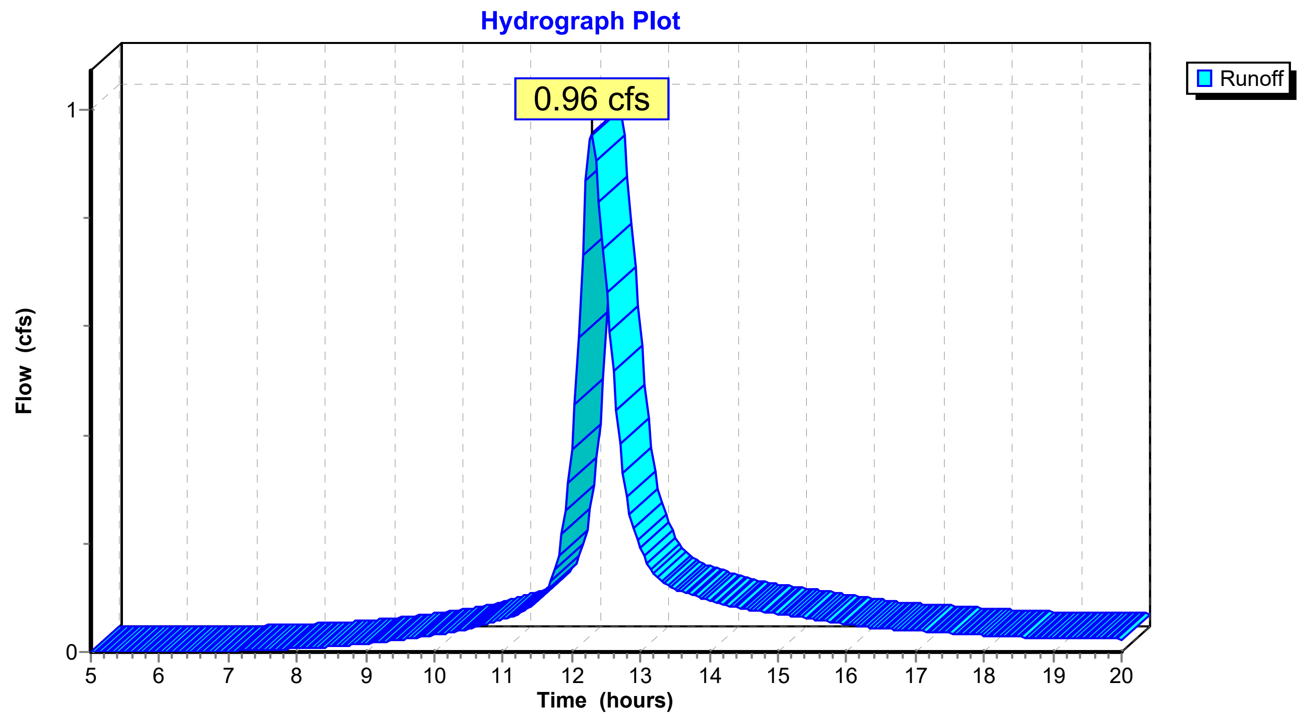
Runoff = 0.96 cfs @ 12.28 hrs, Volume= 0.096 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
8,000	98	Paved parking & roofs
13,592	80	>75% Grass cover, Good, HSG D
21,592	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.2	25	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	125	Total			

Subcatchment D-14: D-14



Subcatchment D-14A: D-14A

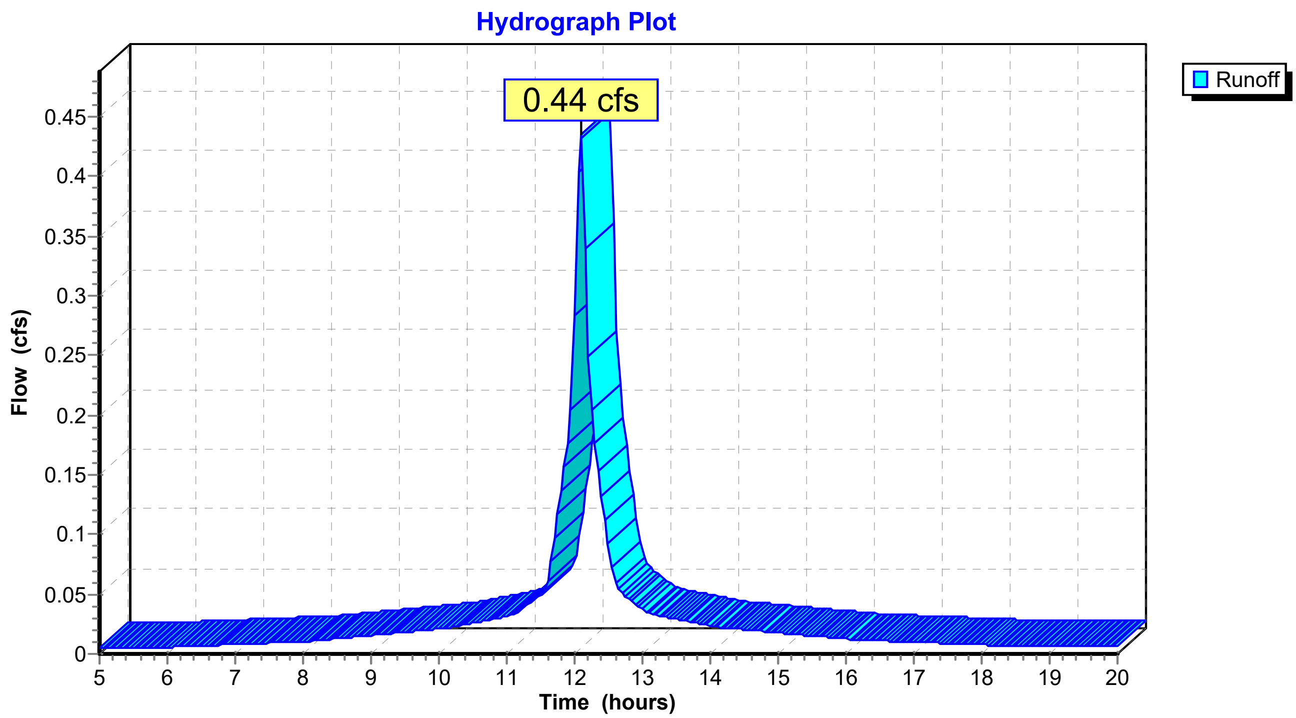
Runoff = 0.44 cfs @ 12.09 hrs, Volume= 0.033 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
5,177	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-14A: D-14A



Subcatchment D-15: D-15

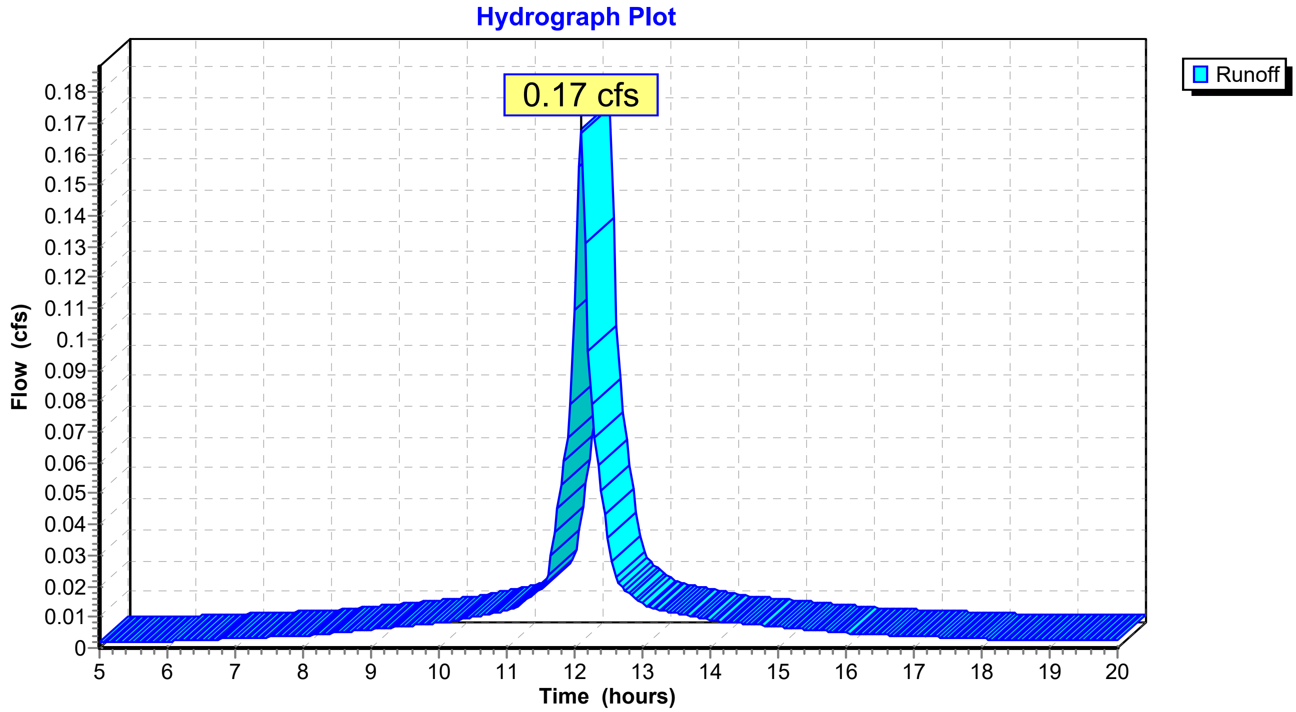
Runoff = 0.17 cfs @ 12.09 hrs, Volume= 0.013 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
2,000	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, tr 55 MIN**

Subcatchment D-15: D-15



Subcatchment D-15A: D-15A

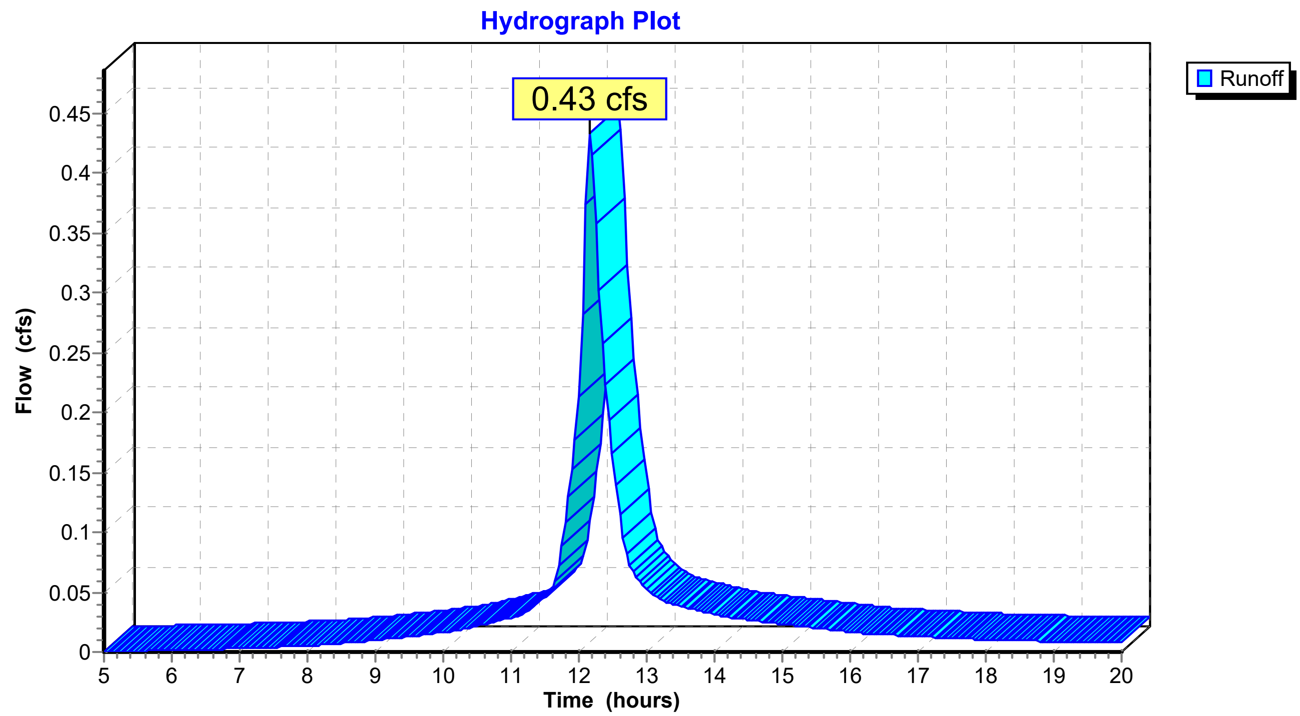
Runoff = 0.43 cfs @ 12.16 hrs, Volume= 0.037 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
4,300	98	Paved parking & roofs
2,750	80	>75% Grass cover, Good, HSG D
7,050	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.3	75	0.0500	4.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.1	125	Total			

Subcatchment D-15A: D-15A



Subcatchment D-16: D-16

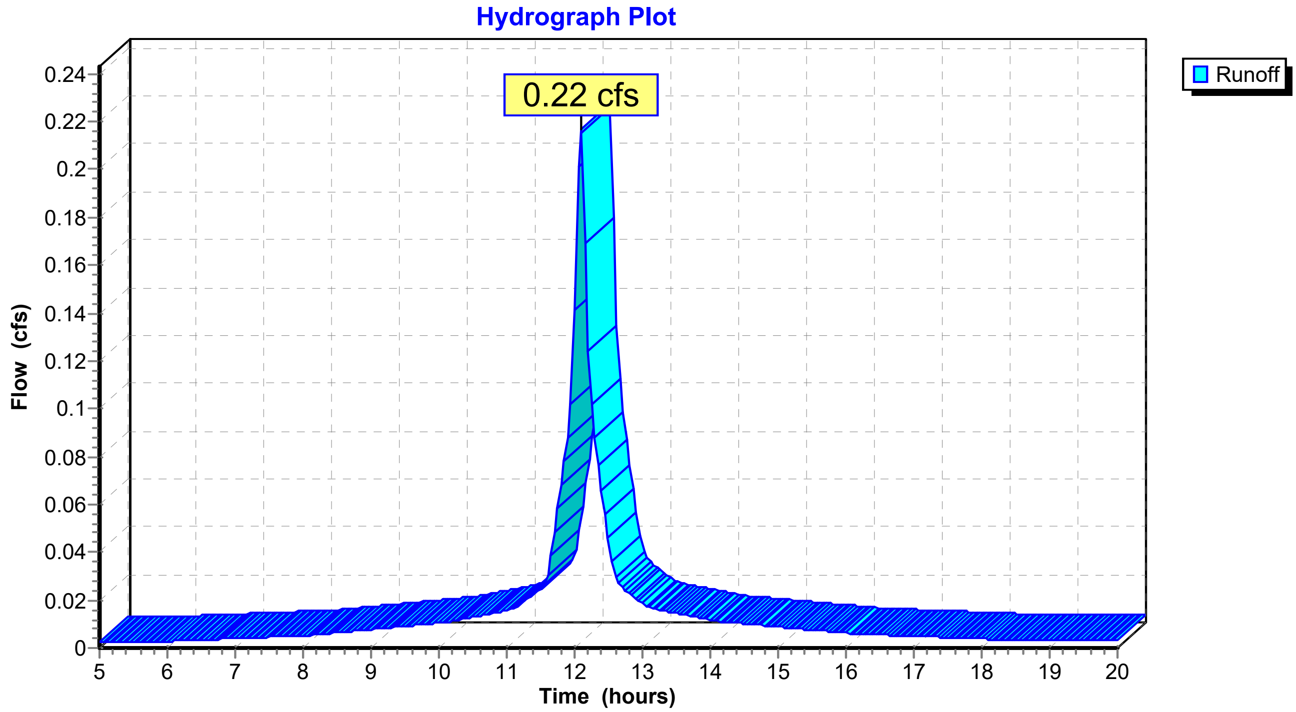
Runoff = 0.22 cfs @ 12.09 hrs, Volume= 0.017 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
2,580	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, tr 55 MIN**

Subcatchment D-16: D-16



Subcatchment D-16A: D-16A

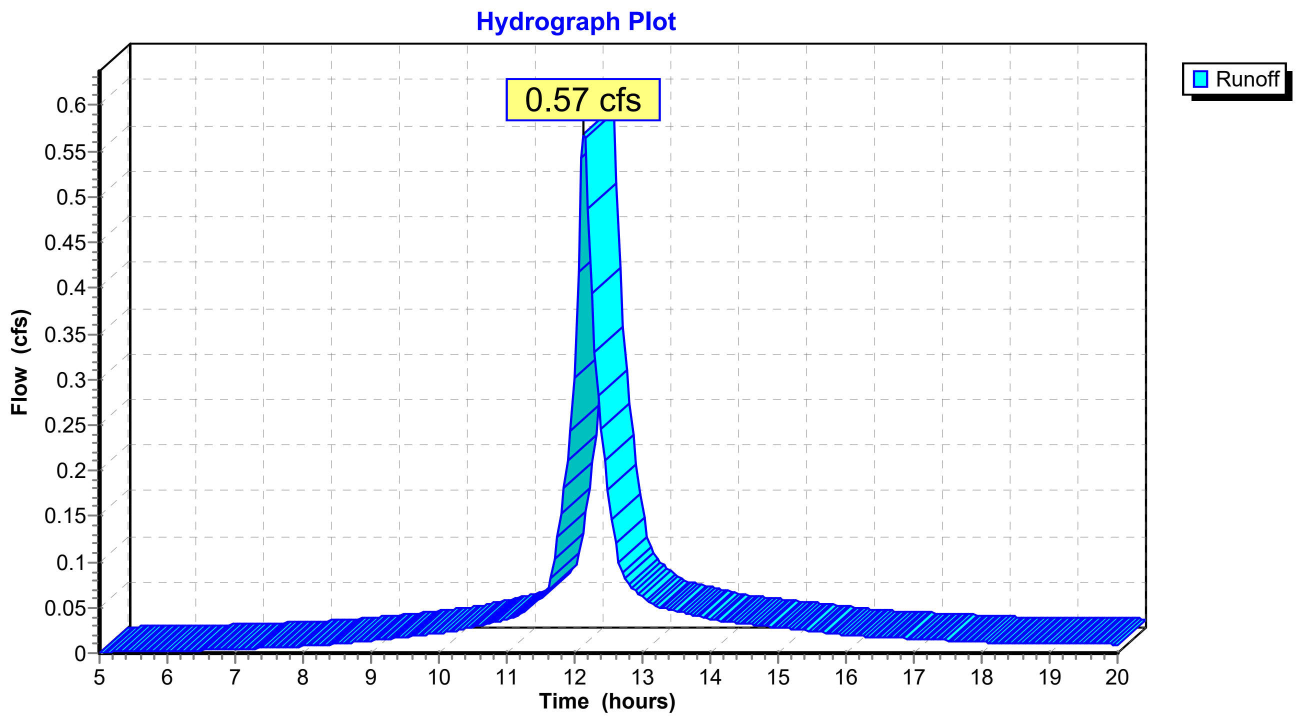
Runoff = 0.57 cfs @ 12.14 hrs, Volume= 0.046 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
5,500	98	
2,984	80	>75% Grass cover, Good, HSG D
8,484	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	40	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"

Subcatchment D-16A: D-16A



Subcatchment D-17: D-17

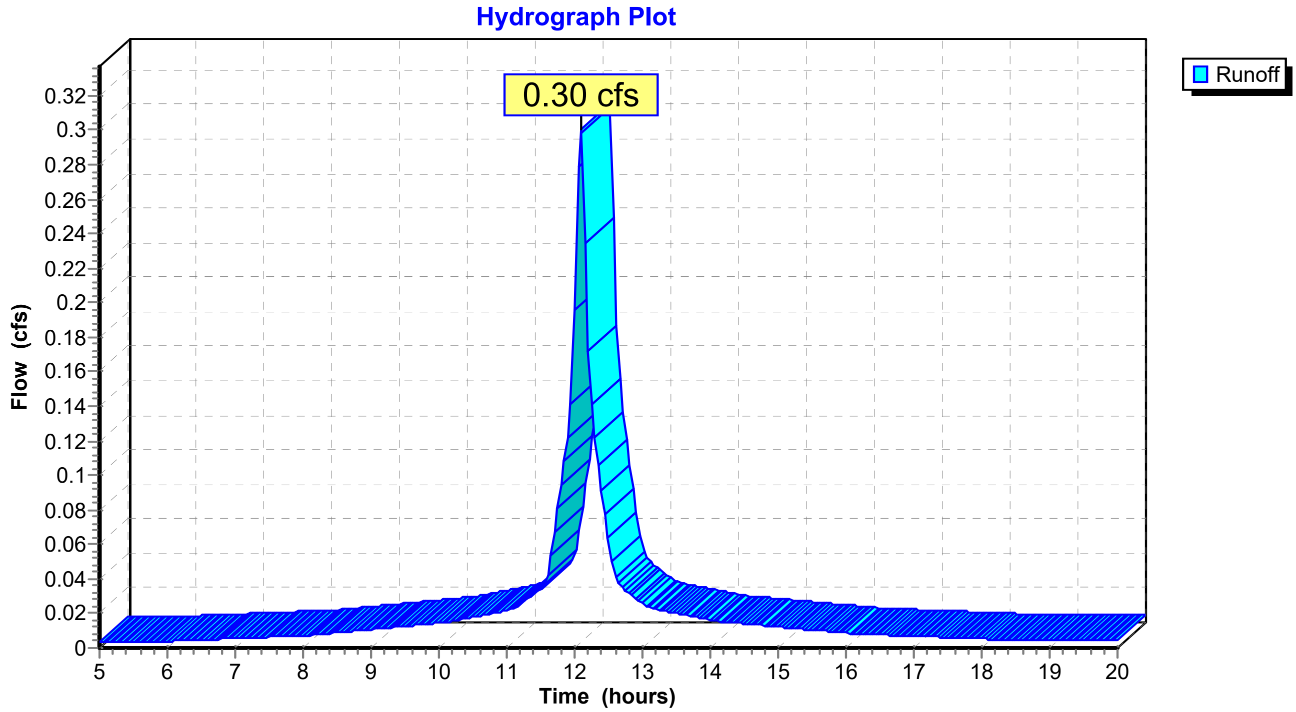
Runoff = 0.30 cfs @ 12.09 hrs, Volume= 0.023 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
3,577	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR 55 MIN**

Subcatchment D-17: D-17



Subcatchment D-17A: D-17A

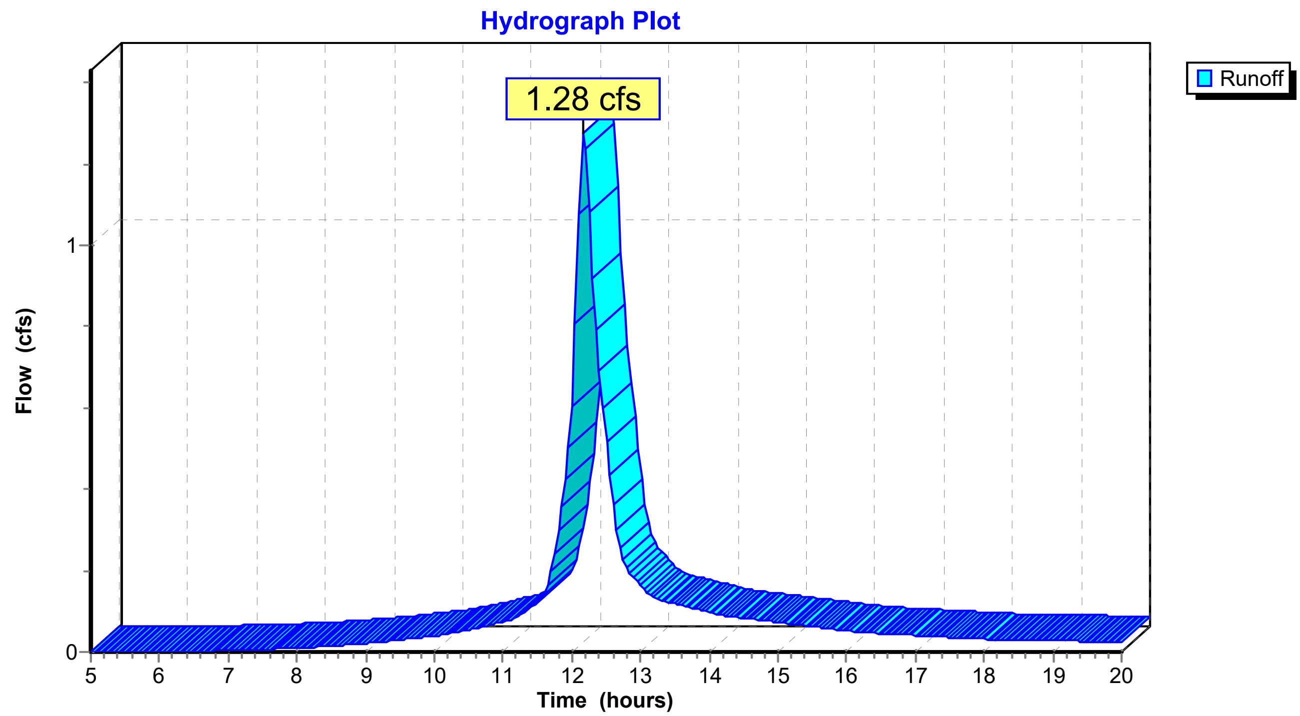
Runoff = 1.28 cfs @ 12.17 hrs, Volume= 0.106 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
10,500	98	Paved roads w/curbs & sewers
12,359	80	>75% Grass cover, Good, HSG D
22,859	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.6	150	0.0400	4.1		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.4	200	Total			

Subcatchment D-17A: D-17A



Subcatchment D-18: D-18

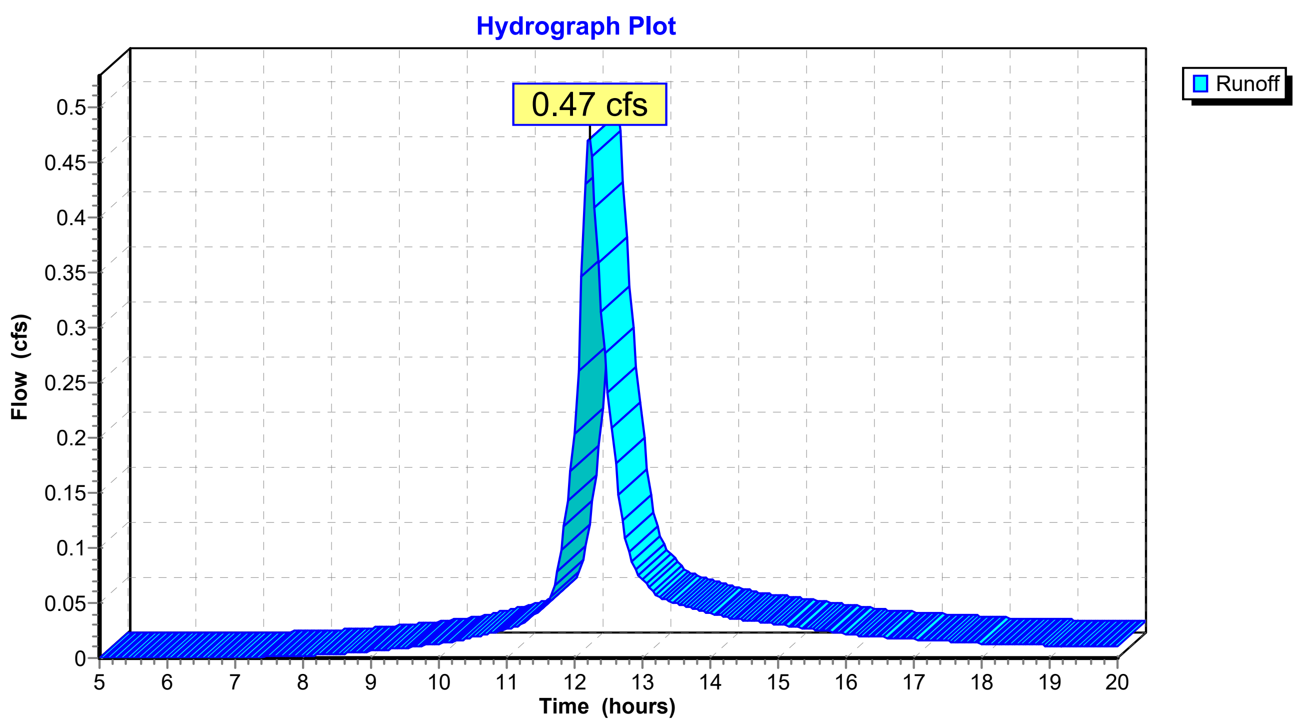
Runoff = 0.47 cfs @ 12.21 hrs, Volume= 0.042 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
3,000	98	Paved parking & roofs
6,762	80	>75% Grass cover, Good, HSG D
9,762	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	70	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"

Subcatchment D-18: D-18



Subcatchment D-18B: D-18

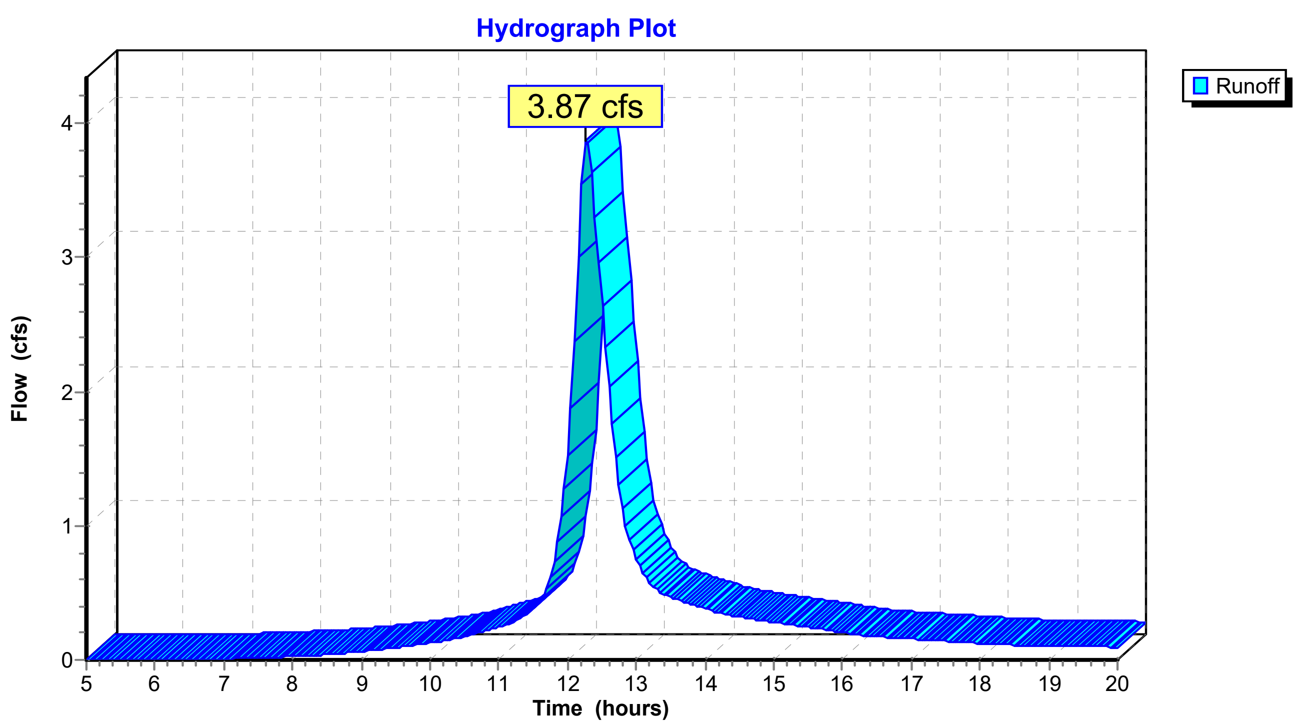
Runoff = 3.87 cfs @ 12.28 hrs, Volume= 0.387 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
34,270	98	Paved parking & roofs
52,349	80	>75% Grass cover, Good, HSG D
86,619	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	100	0.0400	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
1.9	100	0.0300	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	180	0.0500	4.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.3	380	Total			

Subcatchment D-18B: D-18



Subcatchment D-19: D-19

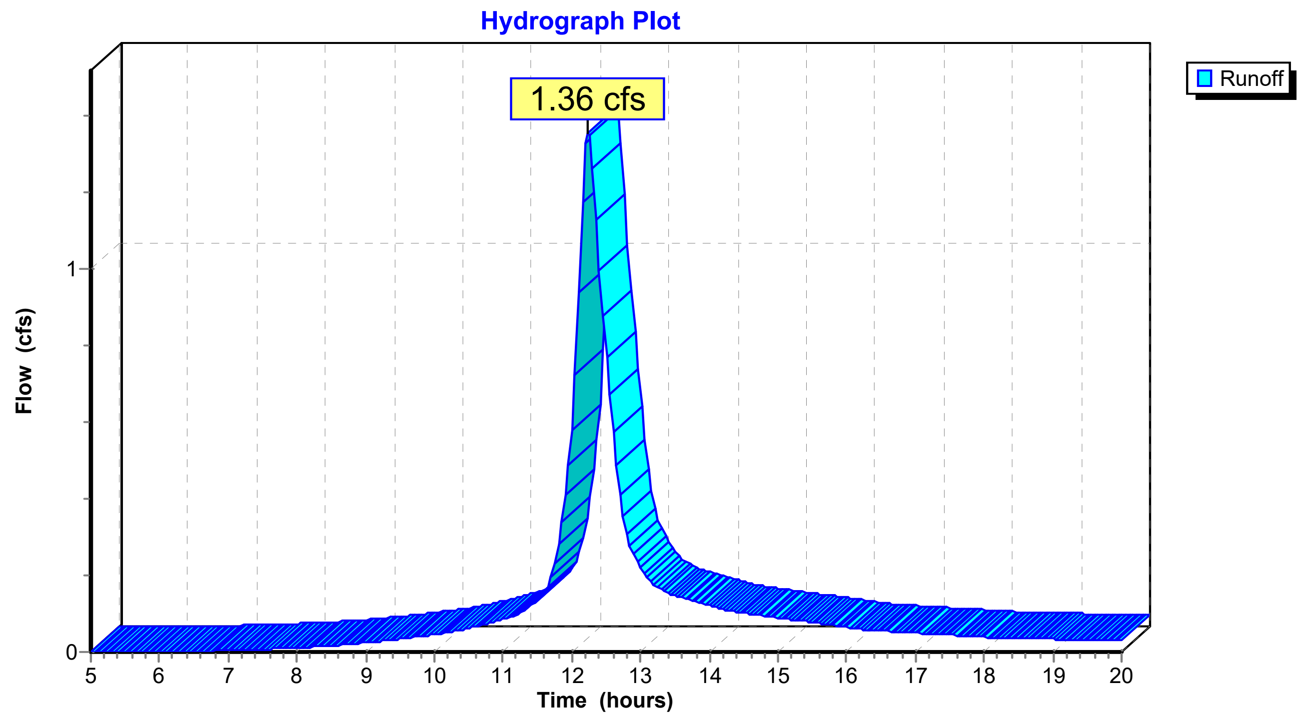
Runoff = 1.36 cfs @ 12.23 hrs, Volume= 0.128 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
12,375	98	Paved parking & roofs
15,120	80	>75% Grass cover, Good, HSG D
27,495	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	70	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.8	225	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
17.2	295	Total			

Subcatchment D-19: D-19



Subcatchment D-19A: D-19A

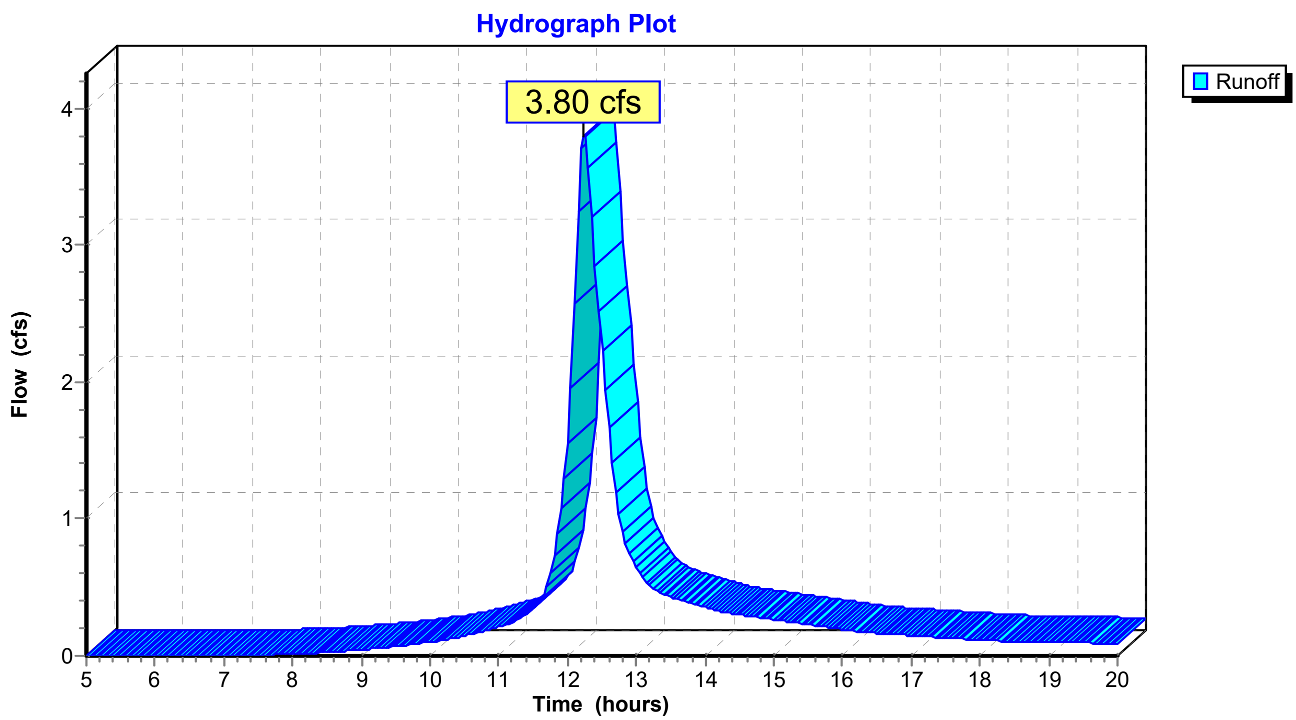
Runoff = 3.80 cfs @ 12.24 hrs, Volume= 0.354 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
22,500	98	Paved parking & roofs
62,819	80	>75% Grass cover, Good, HSG D
85,319	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0250	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
2.3	292	0.0200	2.1		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.8	100	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
17.3	492	Total			

Subcatchment D-19A: D-19A



Subcatchment D-2: D-2

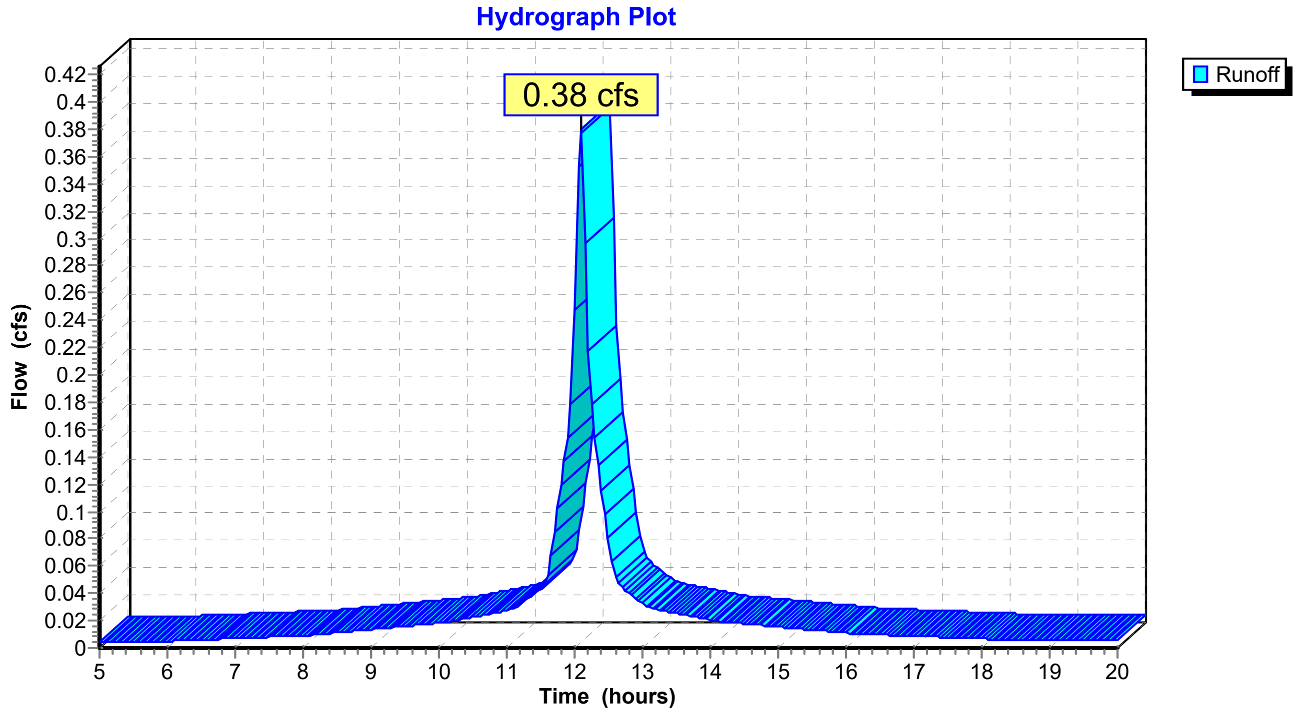
Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.029 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
4,523	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-2: D-2



Subcatchment D-20: D-20

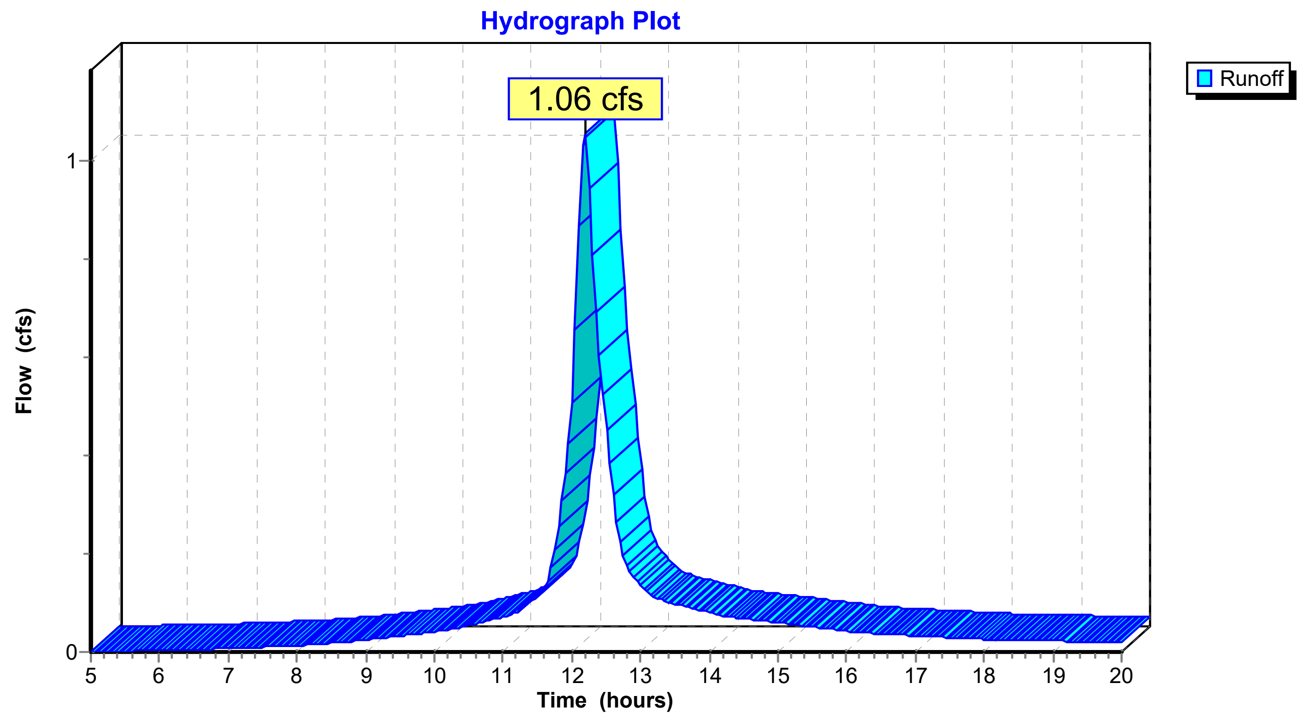
Runoff = 1.06 cfs @ 12.18 hrs, Volume= 0.093 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
11,110	98	Paved parking & roofs
6,757	80	>75% Grass cover, Good, HSG D
17,867	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.6	200	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.4	250	Total			

Subcatchment D-20: D-20



Subcatchment D-21: D-21

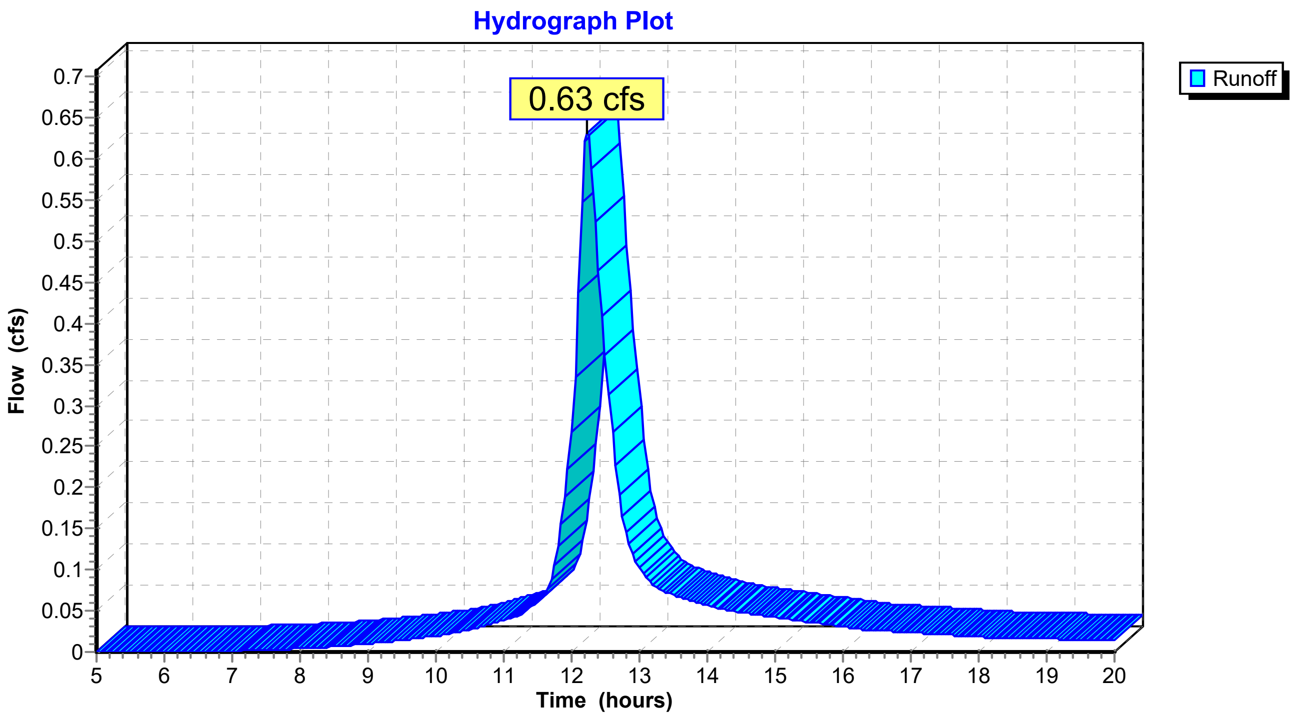
Runoff = 0.63 cfs @ 12.23 hrs, Volume= 0.059 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
5,250	98	Paved roads w/curbs & sewers
7,951	80	>75% Grass cover, Good, HSG D
13,201	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	75	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.8	150	0.0250	3.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
17.1	225	Total			

Subcatchment D-21: D-21



Subcatchment D-21A: D-21A

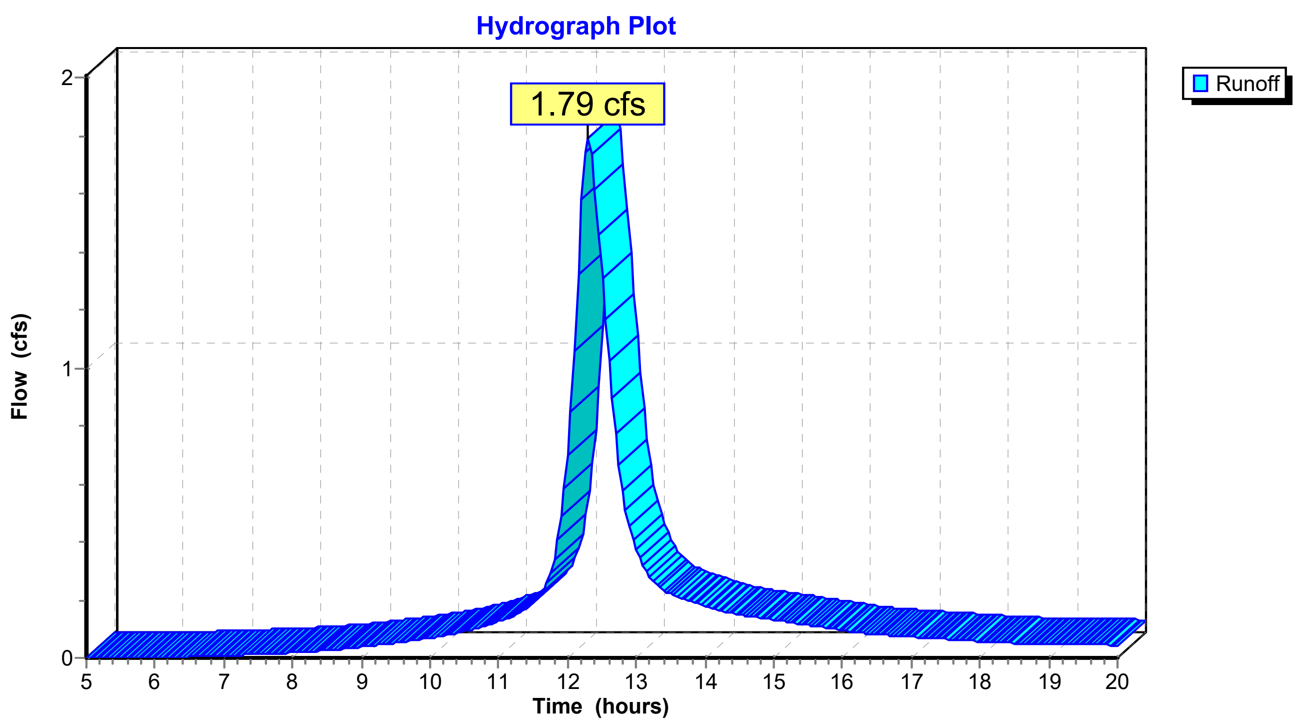
Runoff = 1.79 cfs @ 12.30 hrs, Volume= 0.187 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
19,000	98	Paved parking & roofs
19,849	80	>75% Grass cover, Good, HSG D
38,849	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.5	400	0.0500	4.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
22.0	500	Total			

Subcatchment D-21A: D-21A



Subcatchment D-21C: D-21C

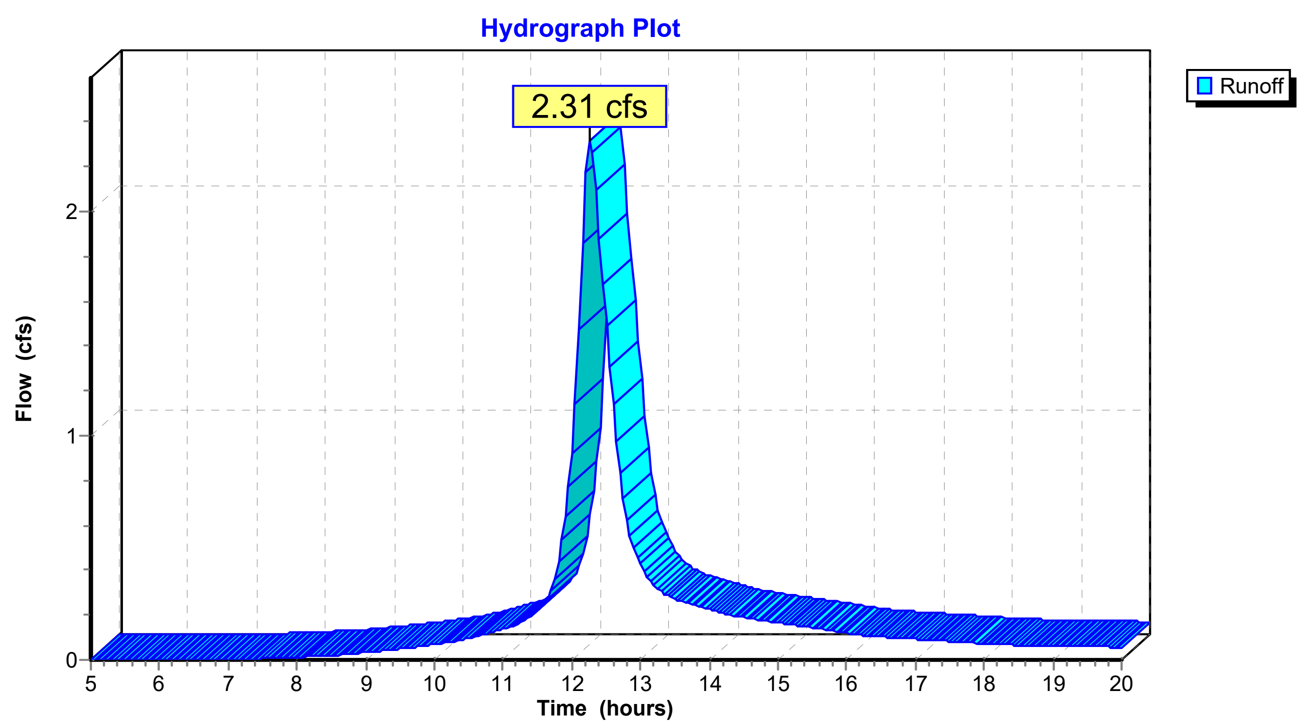
Runoff = 2.31 cfs @ 12.26 hrs, Volume= 0.224 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (ac)	CN	Description
0.386	98	Paved parking & roofs
0.810	80	>75% Grass cover, Good, HSG D
1.196	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4	100	0.0150	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.7	80	0.0150	1.8		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.0	275	0.0500	4.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.1	455	Total			

Subcatchment D-21C: D-21C



Subcatchment D-22: D-22

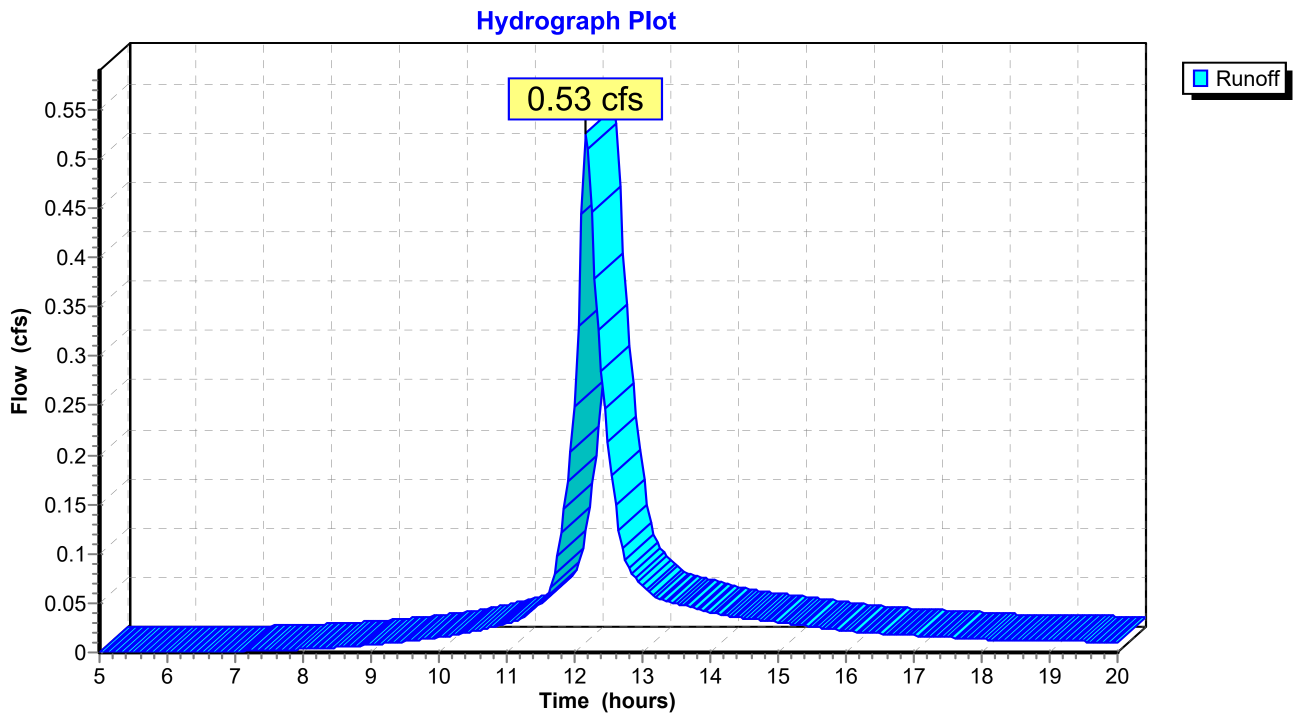
Runoff = 0.53 cfs @ 12.17 hrs, Volume= 0.044 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
4,011	98	Paved parking & roofs
5,702	80	>75% Grass cover, Good, HSG D
9,713	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.5	100	0.0250	3.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.3	150	Total			

Subcatchment D-22: D-22



Subcatchment D-22A: D-22A

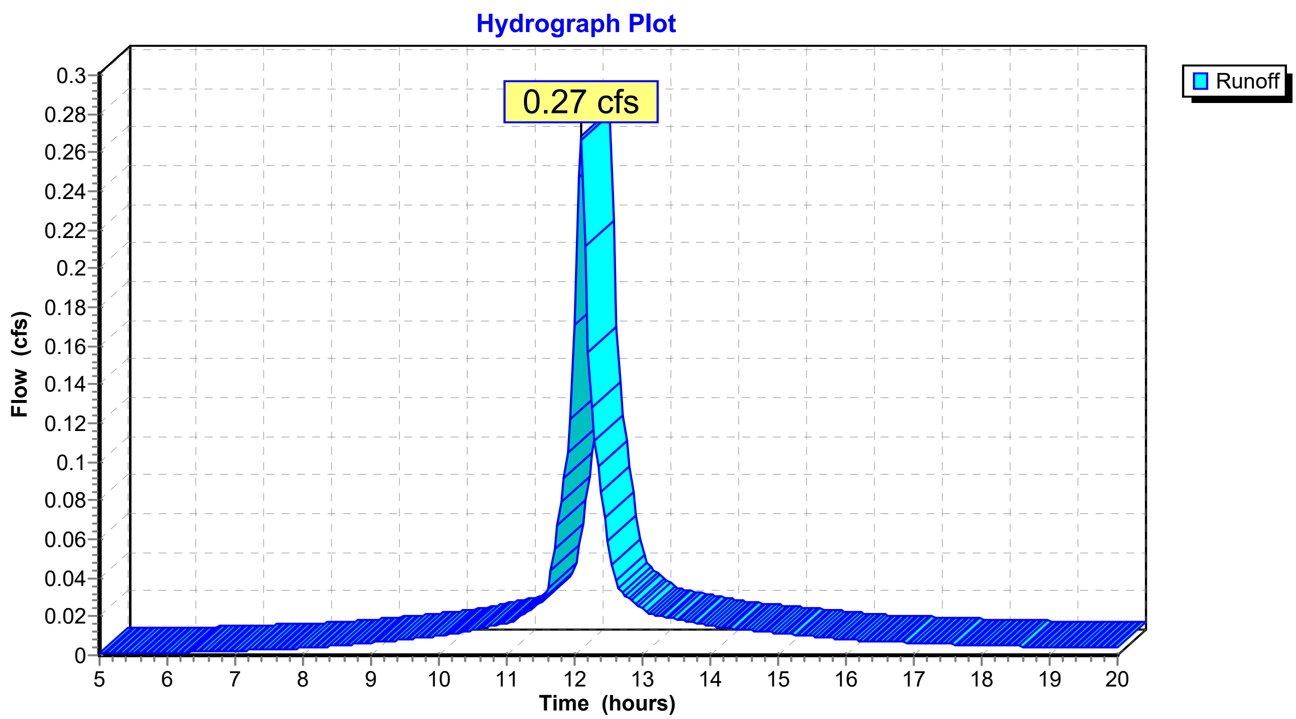
Runoff = 0.27 cfs @ 12.09 hrs, Volume= 0.019 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
2,475	98	Paved parking & roofs
1,000	80	>75% Grass cover, Good, HSG D
3,475	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, tr55 MIN**

Subcatchment D-22A: D-22A



Subcatchment D-23: D-23

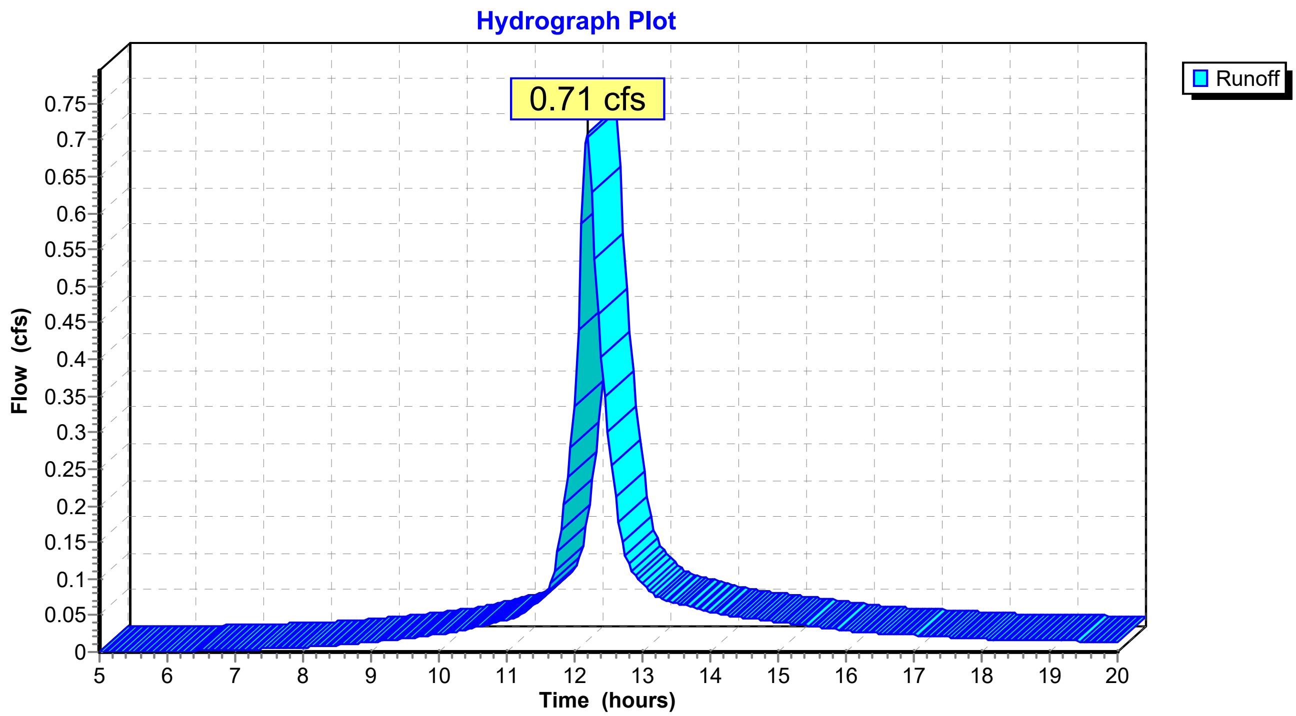
Runoff = 0.71 cfs @ 12.18 hrs, Volume= 0.061 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
6,000	98	Paved parking & roofs
6,626	80	>75% Grass cover, Good, HSG D
12,626	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.3	250	0.0250	3.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.1	300	Total			

Subcatchment D-23: D-23



Subcatchment D-23A: D-23A

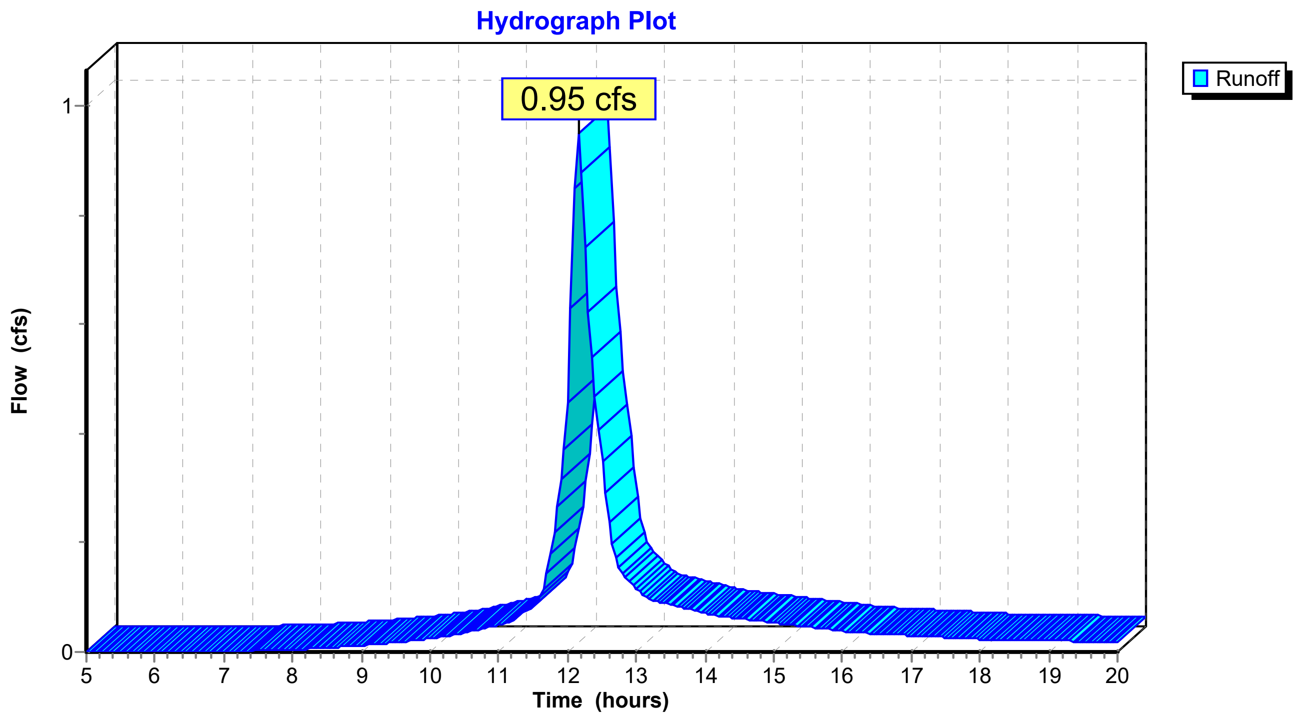
Runoff = 0.95 cfs @ 12.15 hrs, Volume= 0.075 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (ac)	CN	Description
0.126	98	Paved parking & roofs
0.275	80	>75% Grass cover, Good, HSG D
0.401	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	75	0.0300	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.5	100	0.0250	3.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.0	175	Total			

Subcatchment D-23A: D-23A



Subcatchment D-24: D-24

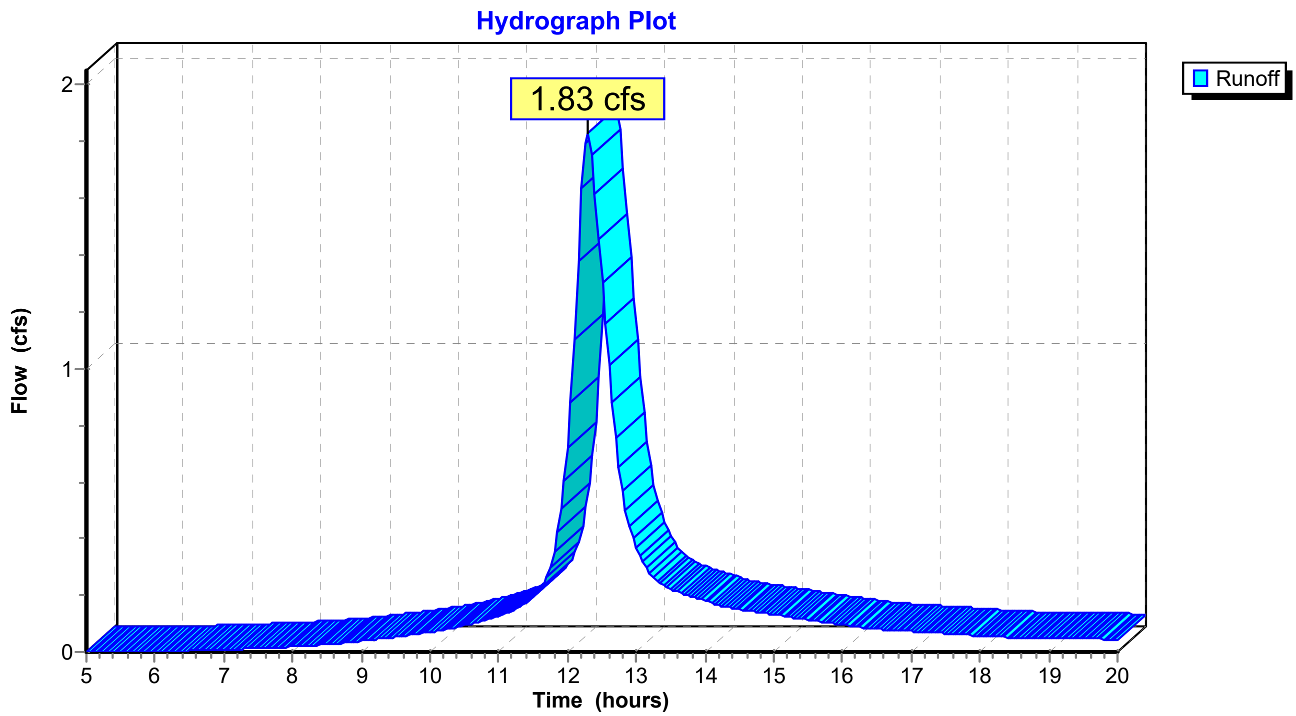
Runoff = 1.83 cfs @ 12.29 hrs, Volume= 0.189 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
20,500	98	Paved parking & roofs
18,739	80	>75% Grass cover, Good, HSG D
39,239	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.9	200	0.0300	3.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
21.4	300	Total			

Subcatchment D-24: D-24



Subcatchment D-25: D-25

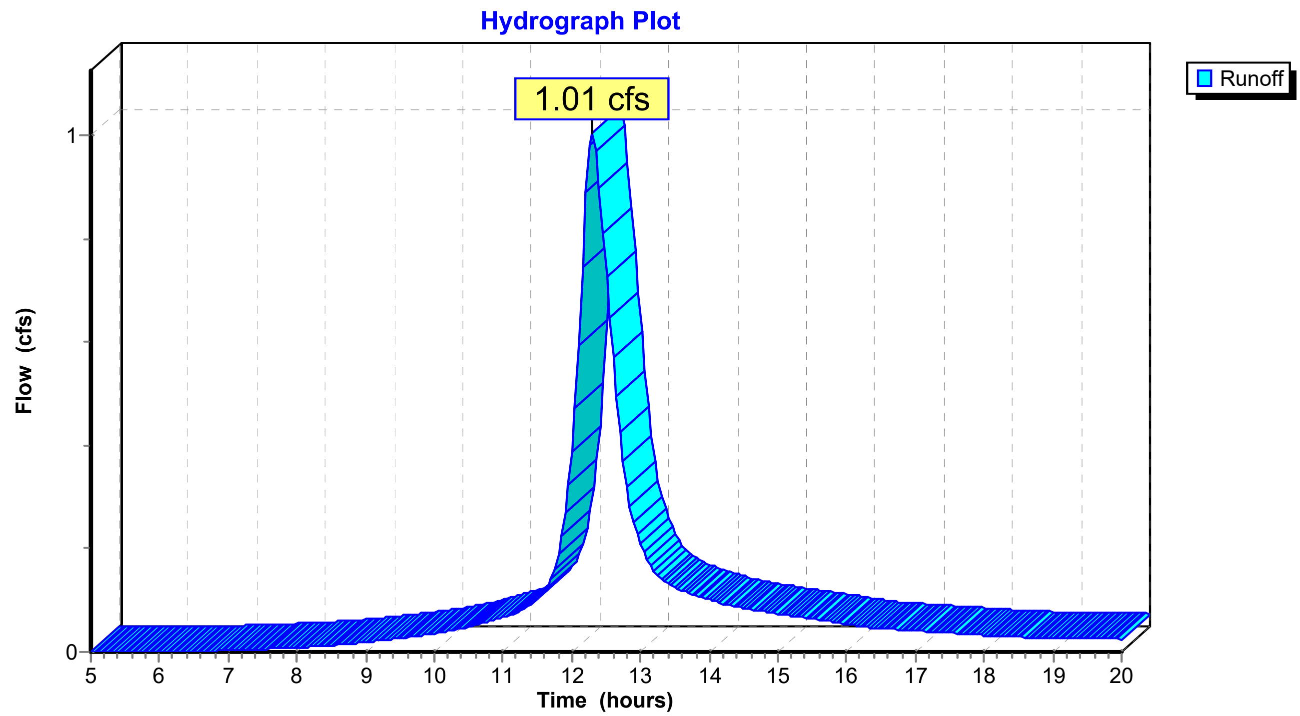
Runoff = 1.01 cfs @ 12.30 hrs, Volume= 0.104 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
10,500	98	Paved parking & roofs
11,853	80	>75% Grass cover, Good, HSG D
22,353	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.2	150	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
21.7	250	Total			

Subcatchment D-25: D-25



Subcatchment D-25A: D-25A

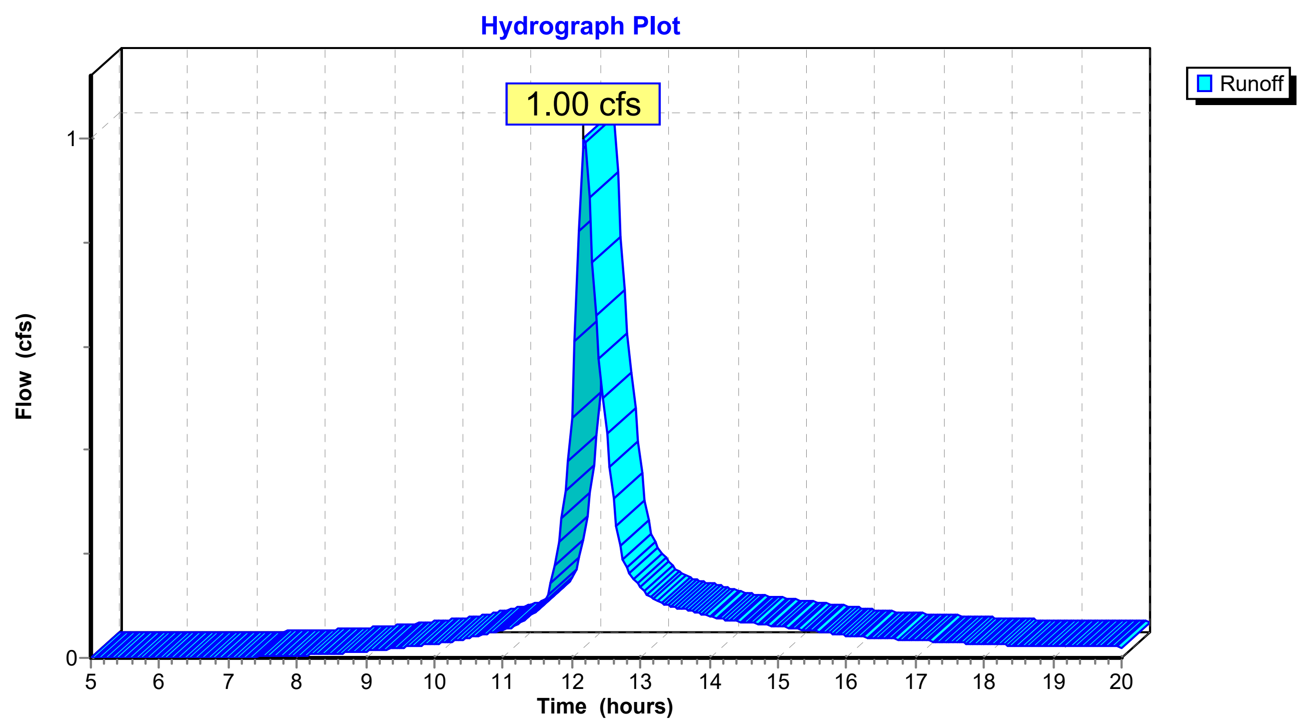
Runoff = 1.00 cfs @ 12.18 hrs, Volume= 0.085 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
7,000	98	Paved parking & roofs
12,613	80	>75% Grass cover, Good, HSG D
19,613	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.2	150	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.0	200	Total			

Subcatchment D-25A: D-25A



Subcatchment D-26: D-26

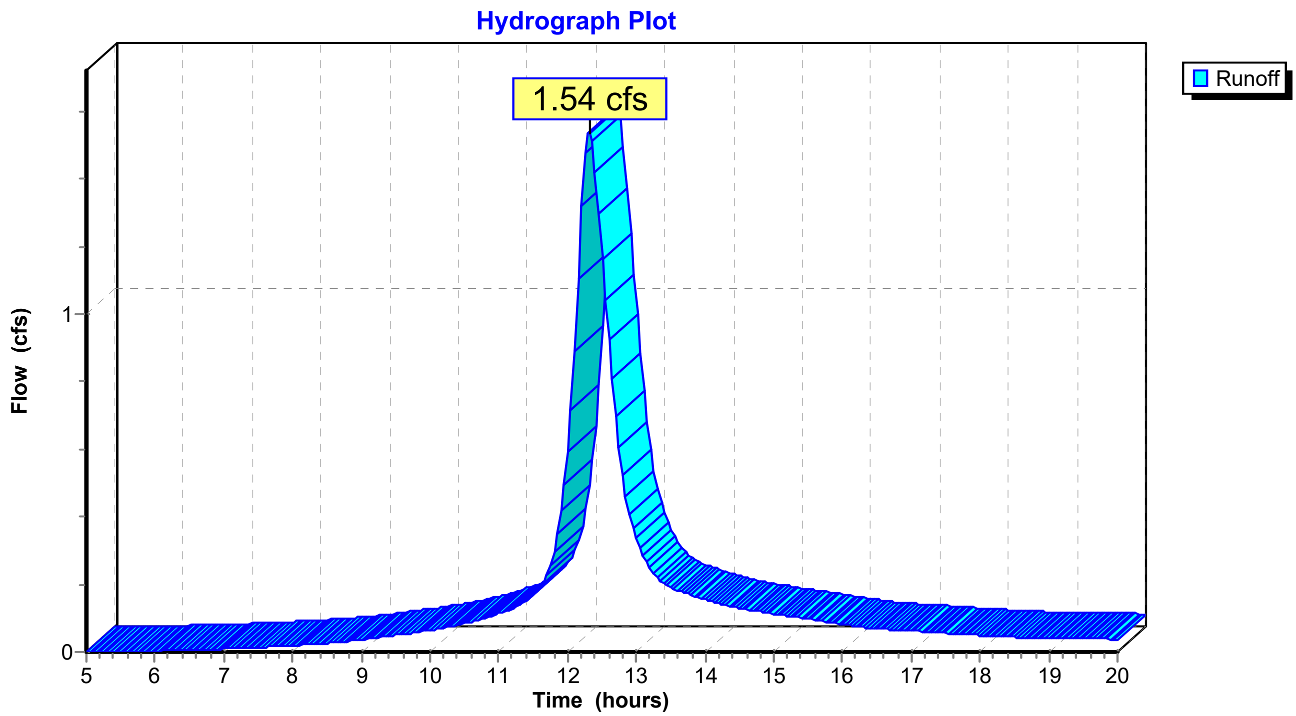
Runoff = 1.54 cfs @ 12.31 hrs, Volume= 0.164 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
17,750	98	Paved parking & roofs
15,108	80	>75% Grass cover, Good, HSG D
32,858	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
2.5	300	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
23.0	400	Total			

Subcatchment D-26: D-26



Subcatchment D-26A: D-26A

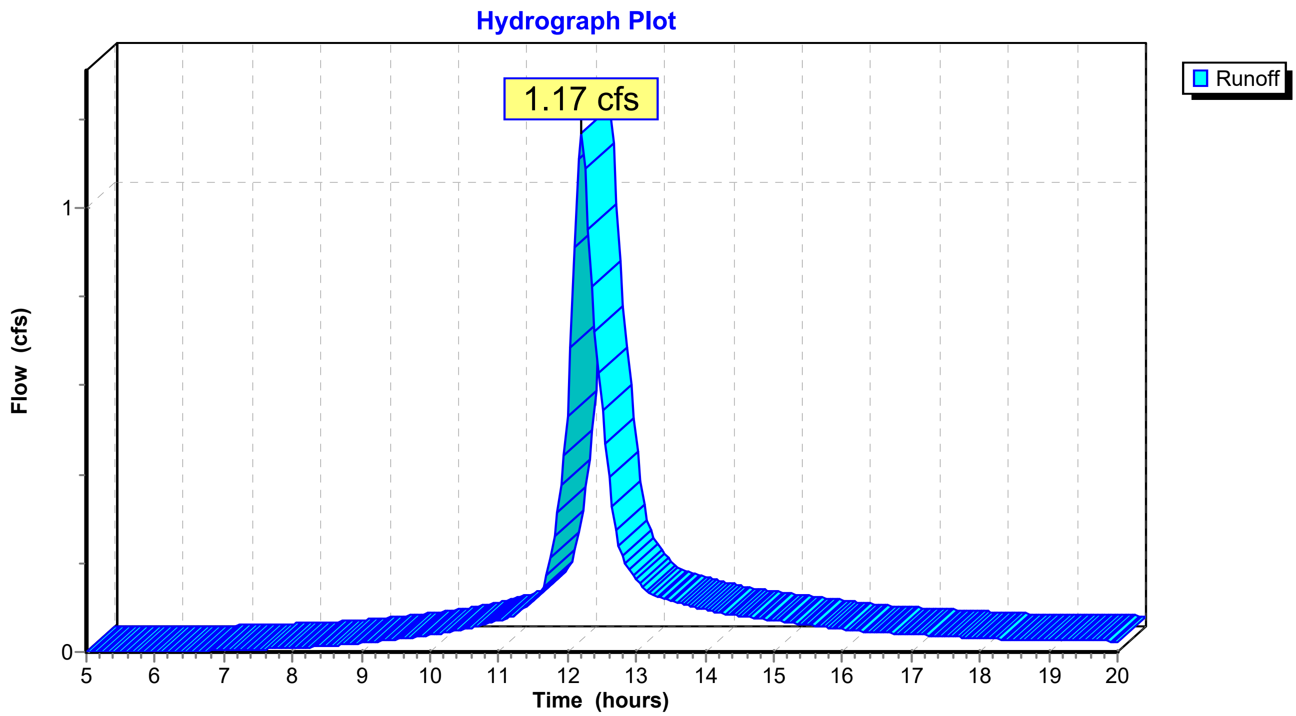
Runoff = 1.17 cfs @ 12.20 hrs, Volume= 0.103 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
9,250	98	Paved parking & roofs
12,827	80	>75% Grass cover, Good, HSG D
22,077	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
2.5	300	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
14.3	350	Total			

Subcatchment D-26A: D-26A



Subcatchment D-27: D-27

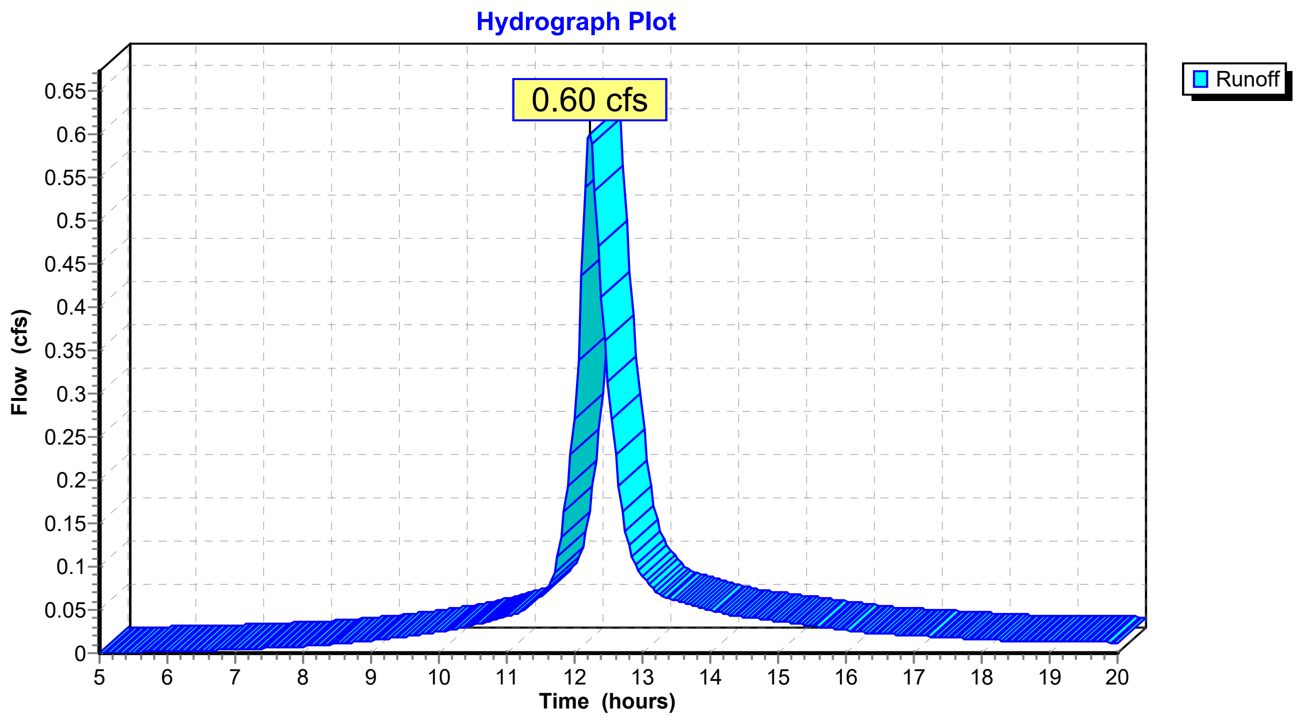
Runoff = 0.60 cfs @ 12.22 hrs, Volume= 0.056 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
6,500	98	Paved parking & roofs
4,360	80	>75% Grass cover, Good, HSG D
10,860	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	75	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"

Subcatchment D-27: D-27



Subcatchment D-27A: D-27A

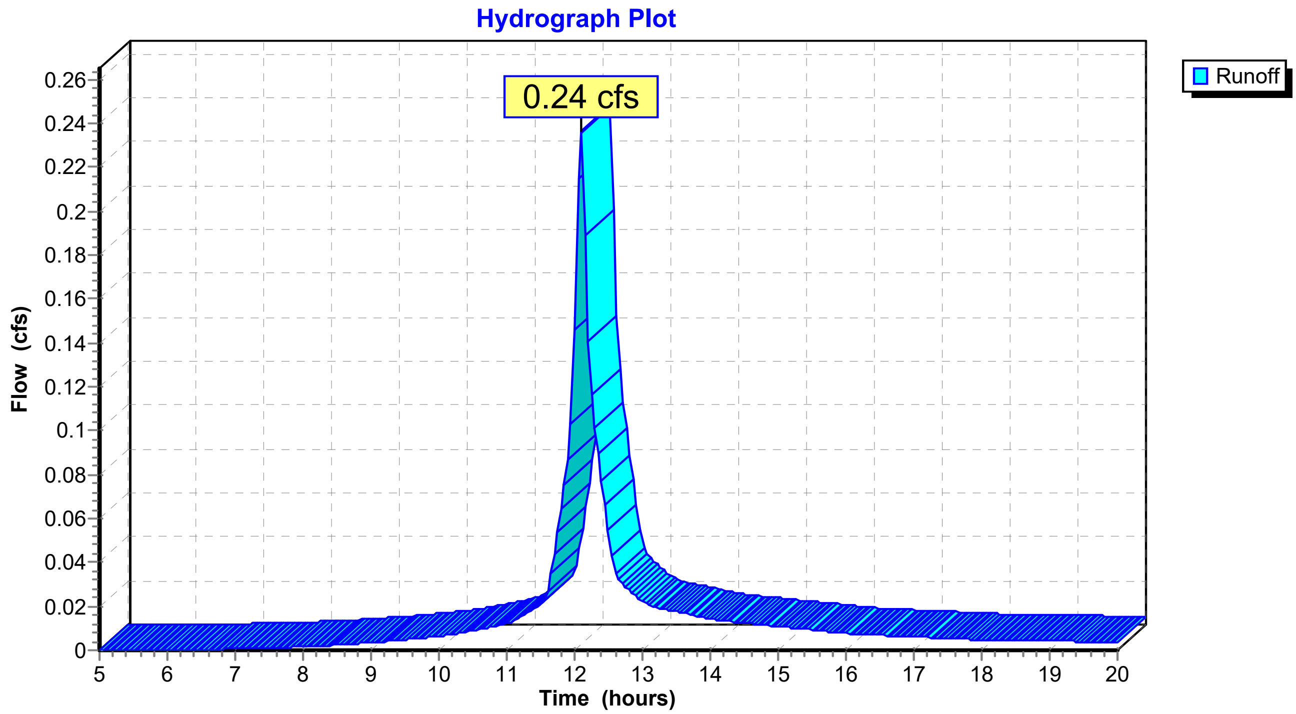
Runoff = 0.24 cfs @ 12.09 hrs, Volume= 0.016 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
1,503	98	Paved parking & roofs
2,000	80	>75% Grass cover, Good, HSG D
3,503	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-27A: D-27A



Subcatchment D-28: D-28

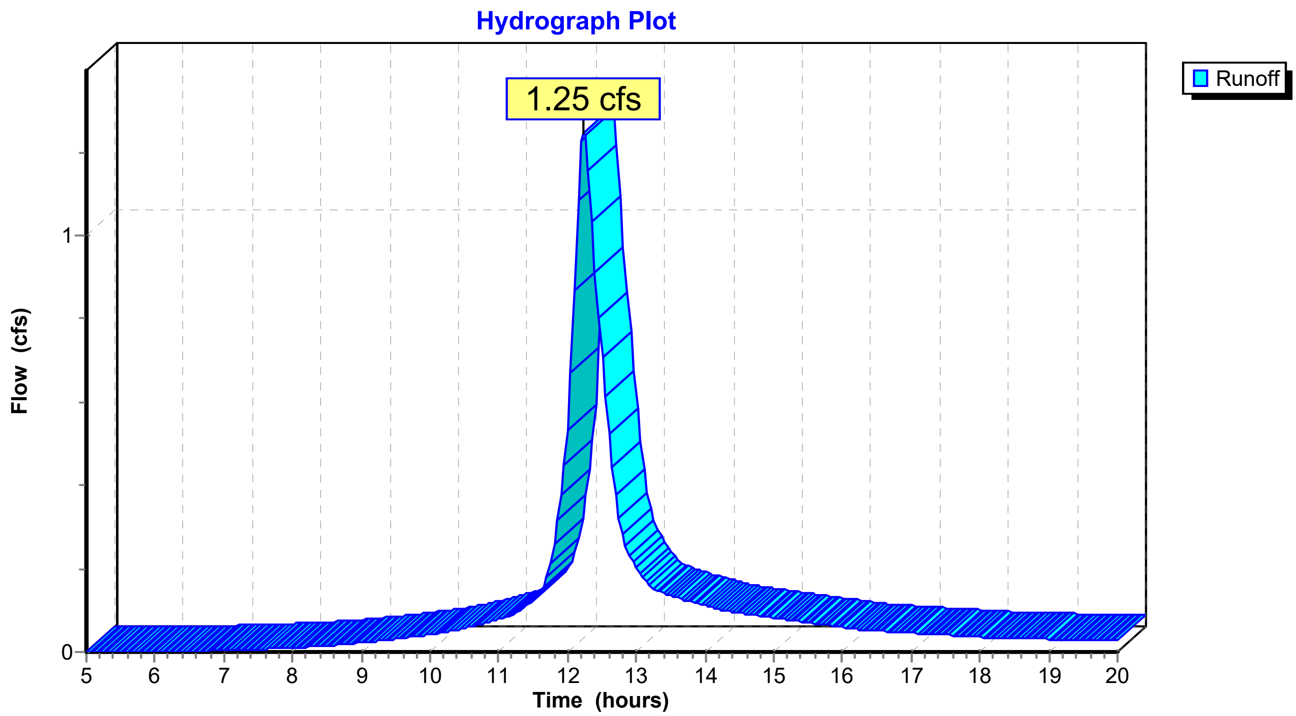
Runoff = 1.25 cfs @ 12.23 hrs, Volume= 0.117 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
11,000	98	Paved parking & roofs
14,225	80	>75% Grass cover, Good, HSG D
25,225	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	75	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.8	100	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
17.1	175	Total			

Subcatchment D-28: D-28



Subcatchment D-28A: D-28A

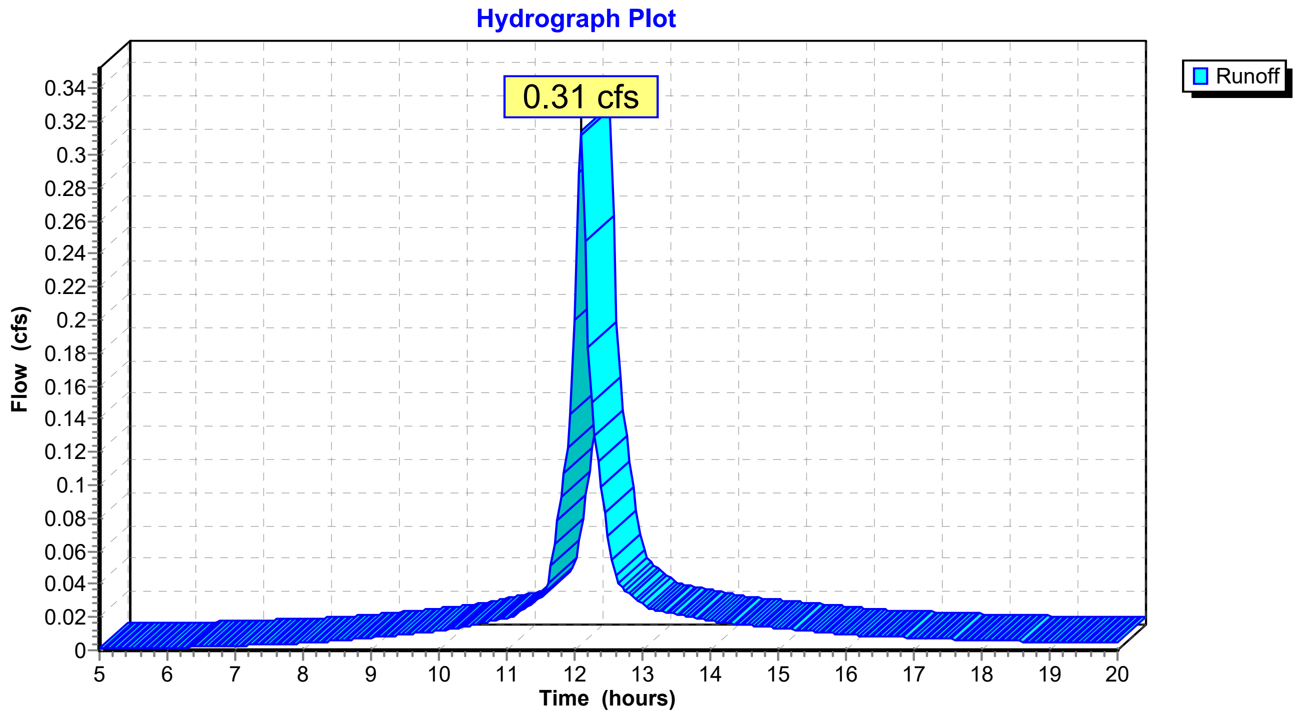
Runoff = 0.31 cfs @ 12.09 hrs, Volume= 0.023 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
3,000	98	Paved parking & roofs
1,067	80	>75% Grass cover, Good, HSG D
4,067	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-28A: D-28A



Subcatchment D-2OA: D-20A

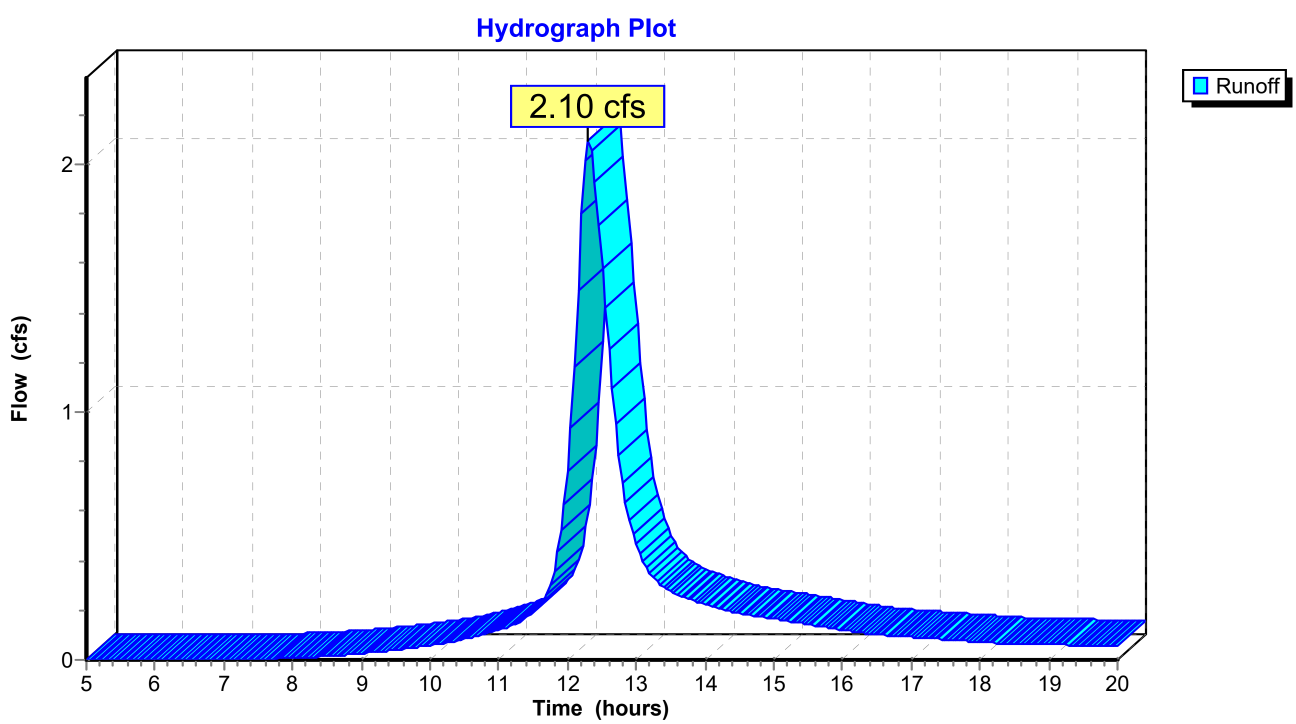
Runoff = 2.10 cfs @ 12.31 hrs, Volume= 0.216 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
15,000	98	Paved roads w/curbs & sewers
37,267	80	>75% Grass cover, Good, HSG D
52,267	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.1	100	0.0100	1.5		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.7	80	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
22.3	280	Total			

Subcatchment D-2OA: D-20A



Subcatchment D-3: D-3

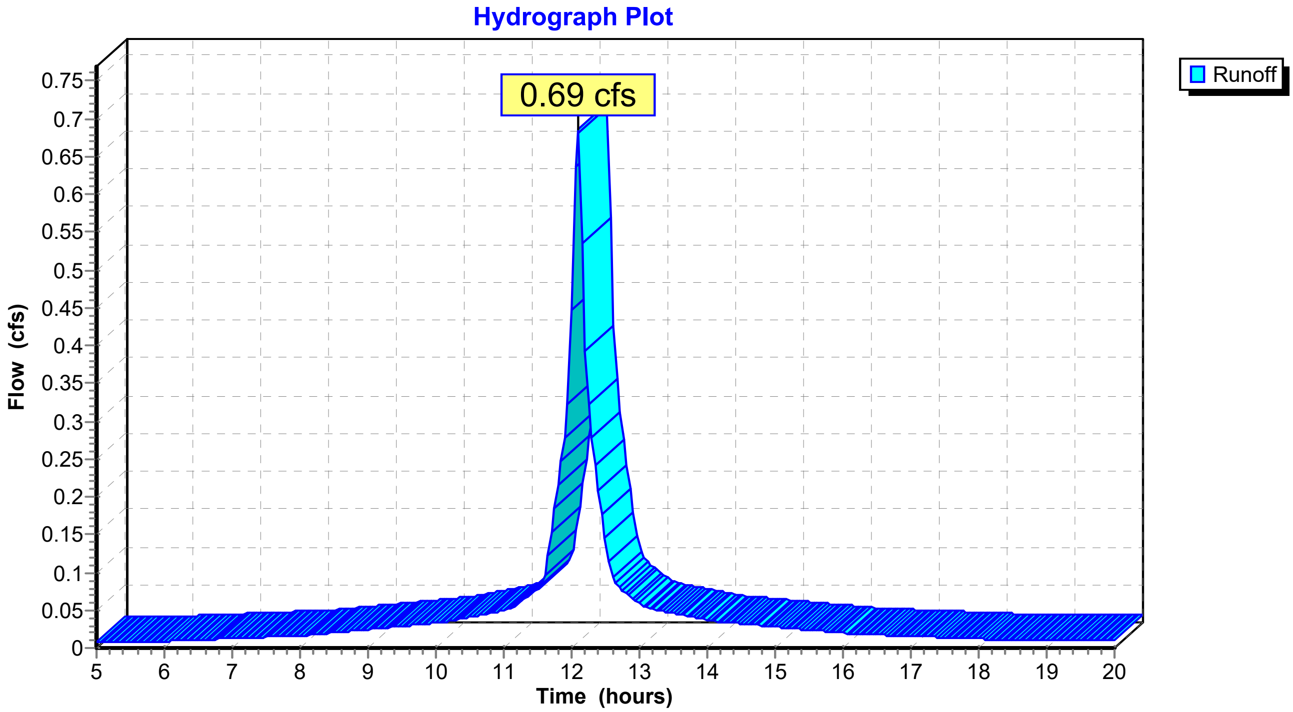
Runoff = 0.69 cfs @ 12.09 hrs, Volume= 0.053 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
8,167	98	Paved roads w/curbs & sewers

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-3: D-3



Subcatchment D-4: D-4

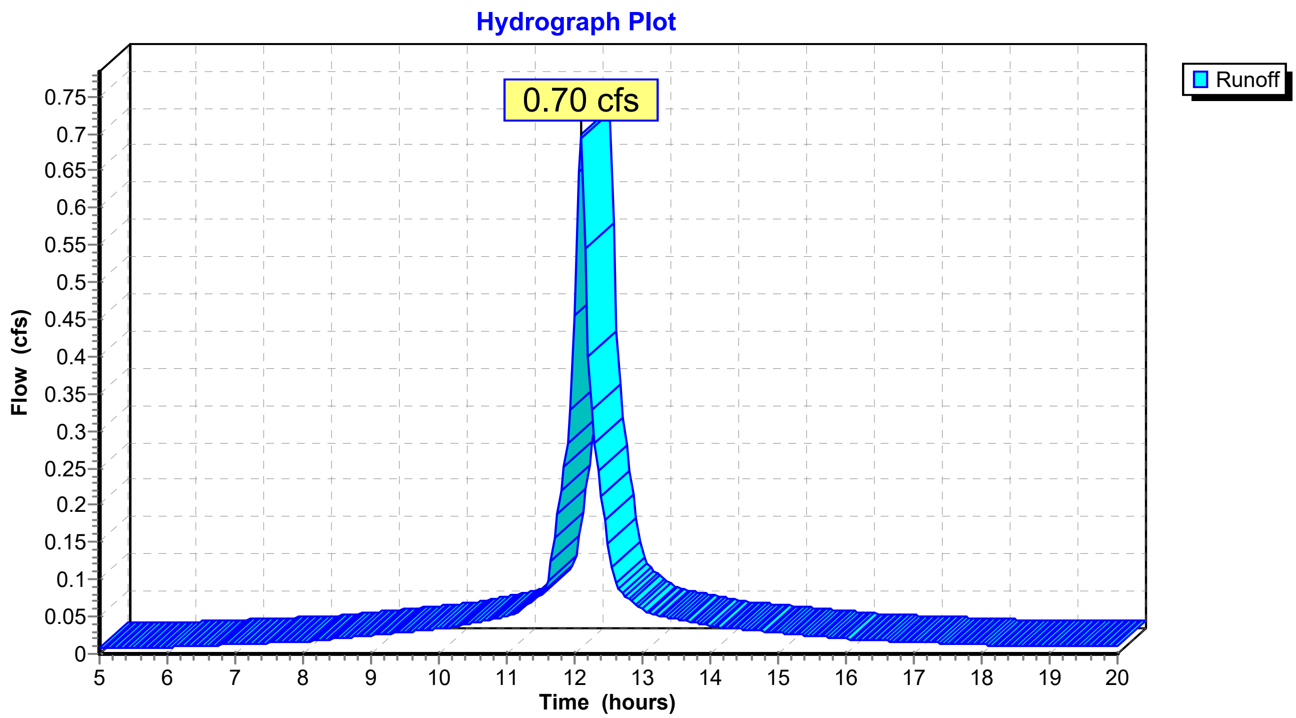
Runoff = 0.70 cfs @ 12.09 hrs, Volume= 0.054 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
8,318	98	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-4: D-4



Subcatchment D-6: D-6

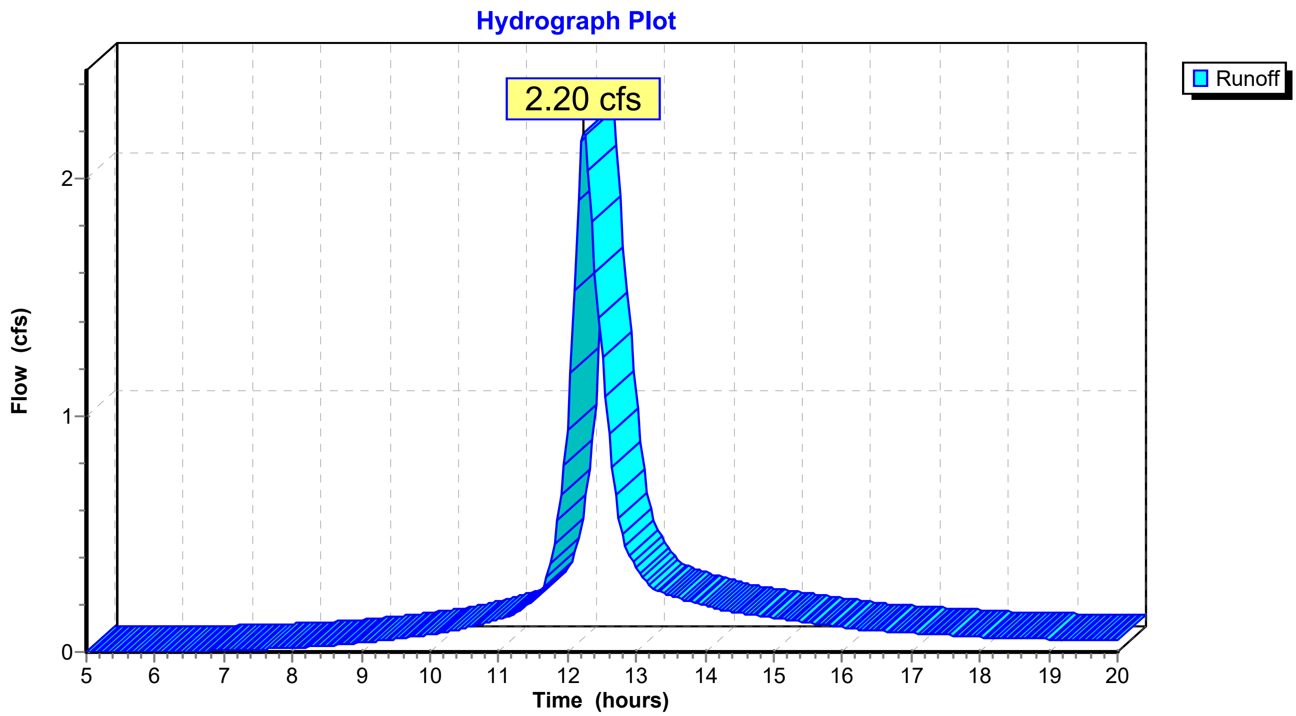
Runoff = 2.20 cfs @ 12.23 hrs, Volume= 0.206 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
18,800	98	Paved parking & roofs
25,626	80	>75% Grass cover, Good, HSG D
44,426	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	75	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.8	100	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
17.1	175	Total			

Subcatchment D-6: D-6



Subcatchment D-7: D-7

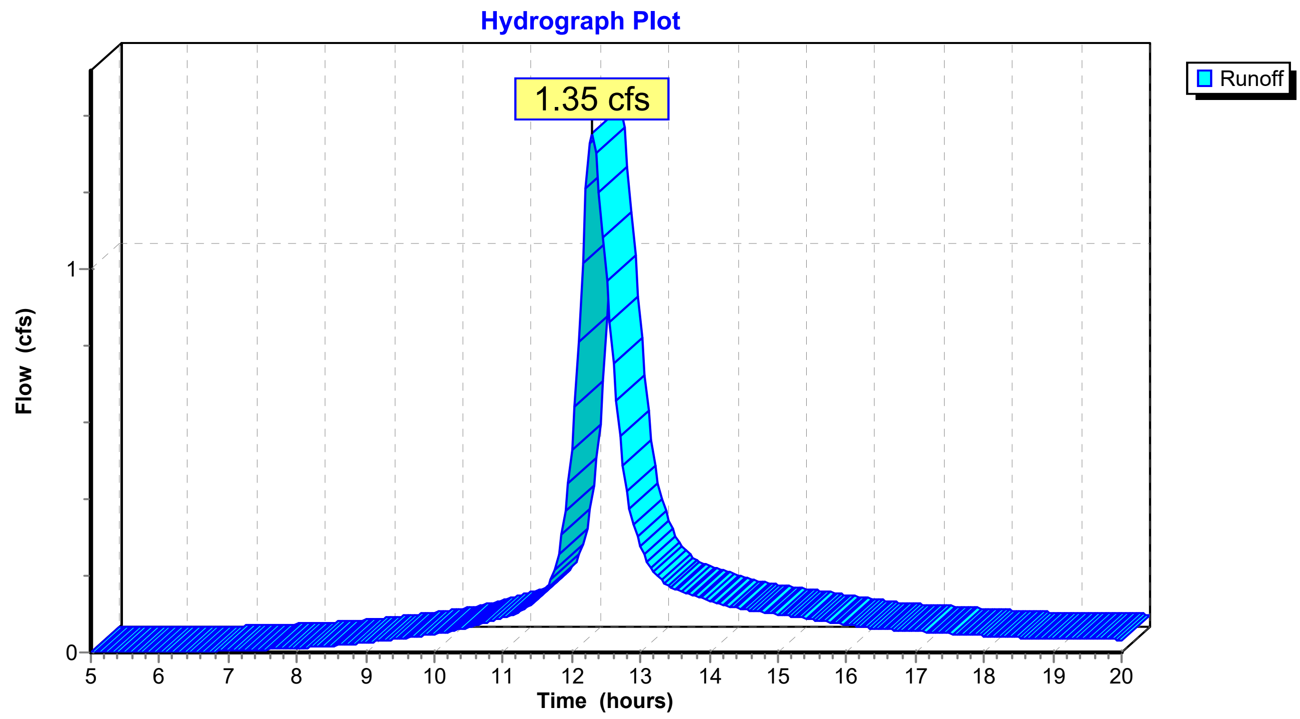
Runoff = 1.35 cfs @ 12.29 hrs, Volume= 0.139 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
12,500	98	Paved parking & roofs
17,422	80	>75% Grass cover, Good, HSG D
29,922	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.9	200	0.0300	3.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
21.4	300	Total			

Subcatchment D-7: D-7



Subcatchment D-7A: D-7A

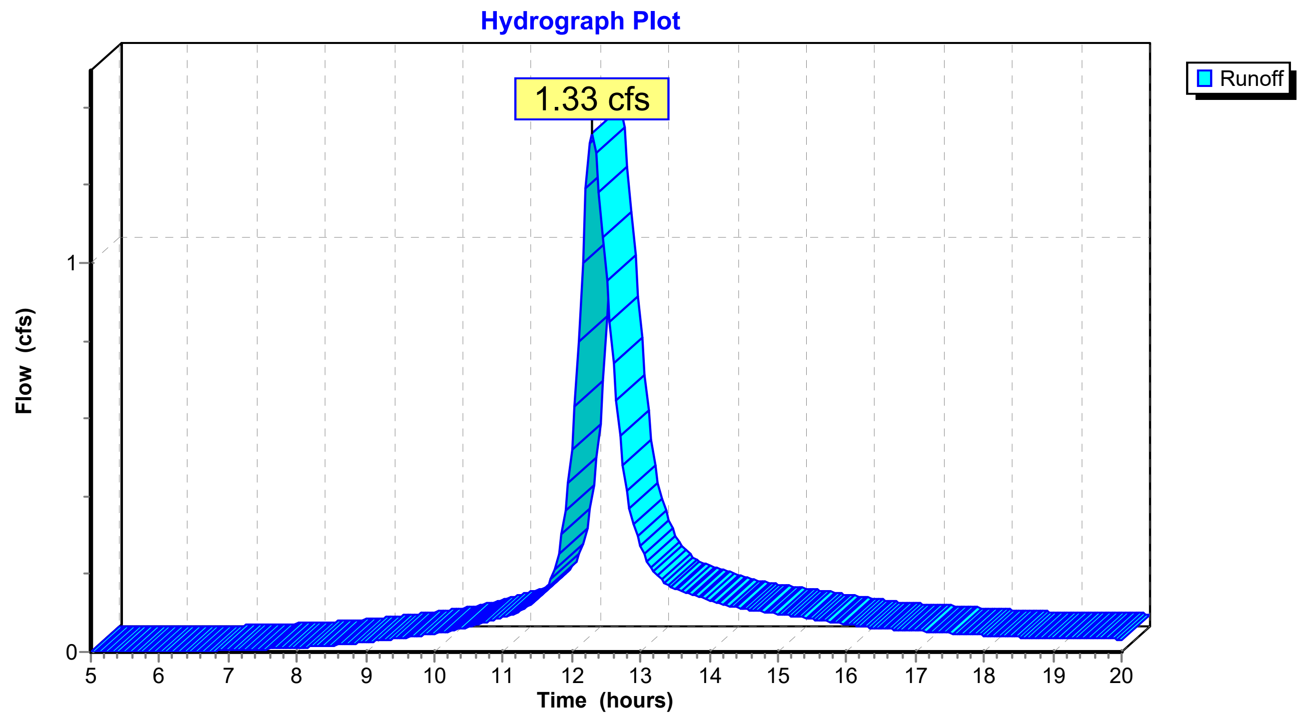
Runoff = 1.33 cfs @ 12.29 hrs, Volume= 0.137 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
12,500	98	Paved parking & roofs
17,000	80	>75% Grass cover, Good, HSG D
29,500	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.9	200	0.0300	3.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
21.4	300	Total			

Subcatchment D-7A: D-7A



Subcatchment D-9: D-9

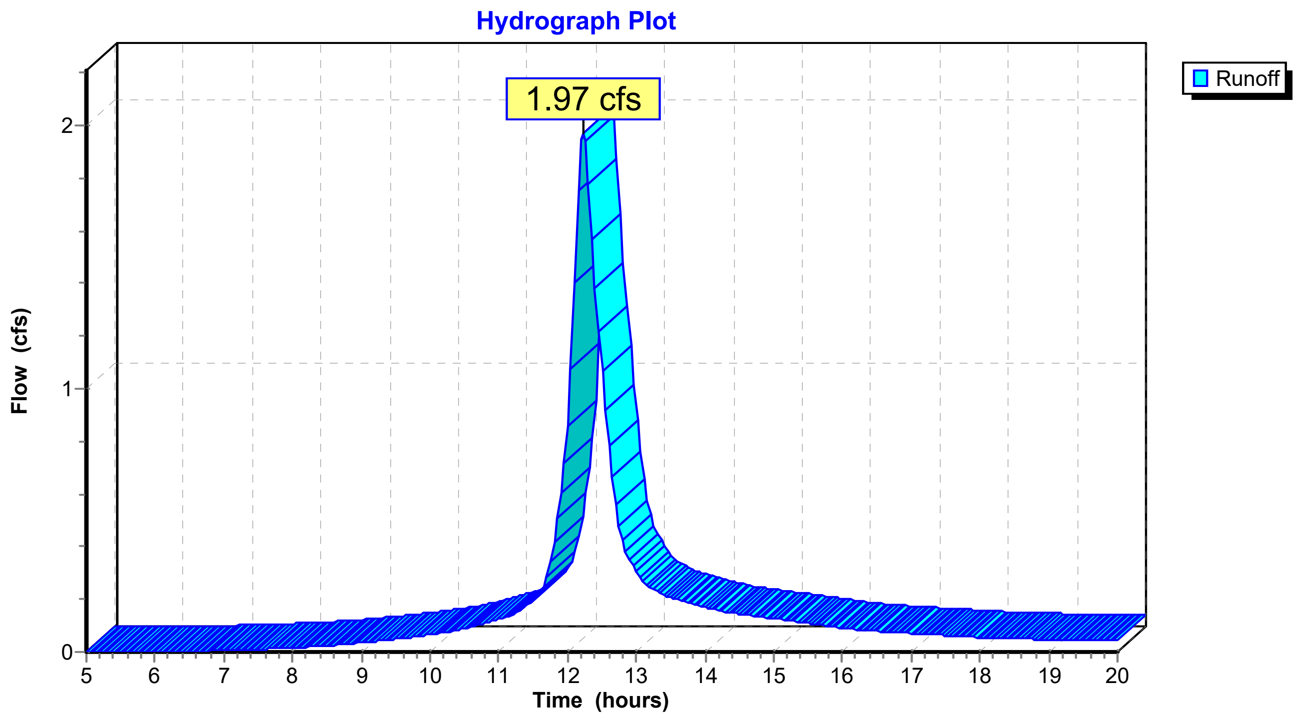
Runoff = 1.97 cfs @ 12.22 hrs, Volume= 0.181 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
16,500	98	Paved parking & roofs
22,540	80	>75% Grass cover, Good, HSG D
39,040	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	70	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.0	200	0.0250	3.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.4	270	Total			

Subcatchment D-9: D-9



Subcatchment D-9A: CB-9A

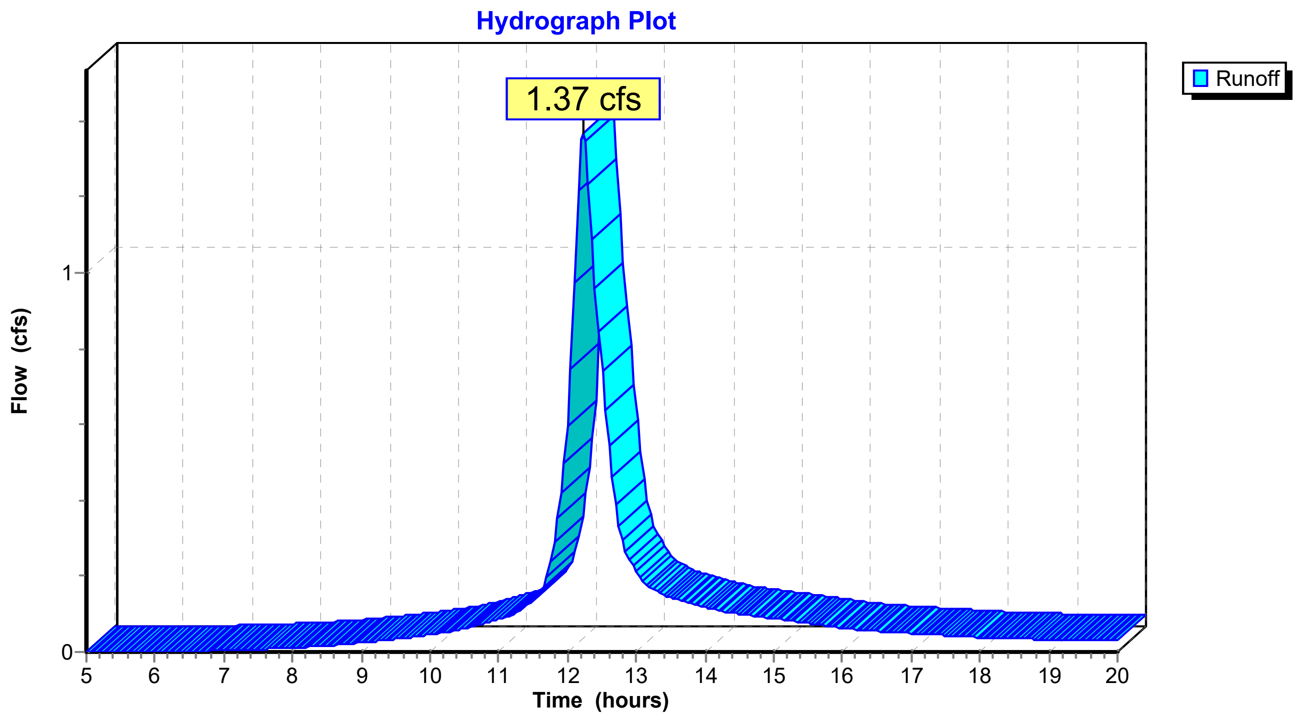
Runoff = 1.37 cfs @ 12.22 hrs, Volume= 0.126 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
12,500	98	Paved parking & roofs
14,689	80	>75% Grass cover, Good, HSG D
27,189	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	70	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.0	200	0.0250	3.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.4	270	Total			

Subcatchment D-9A: CB-9A



Subcatchment D-DMH-1: D-DMH-1

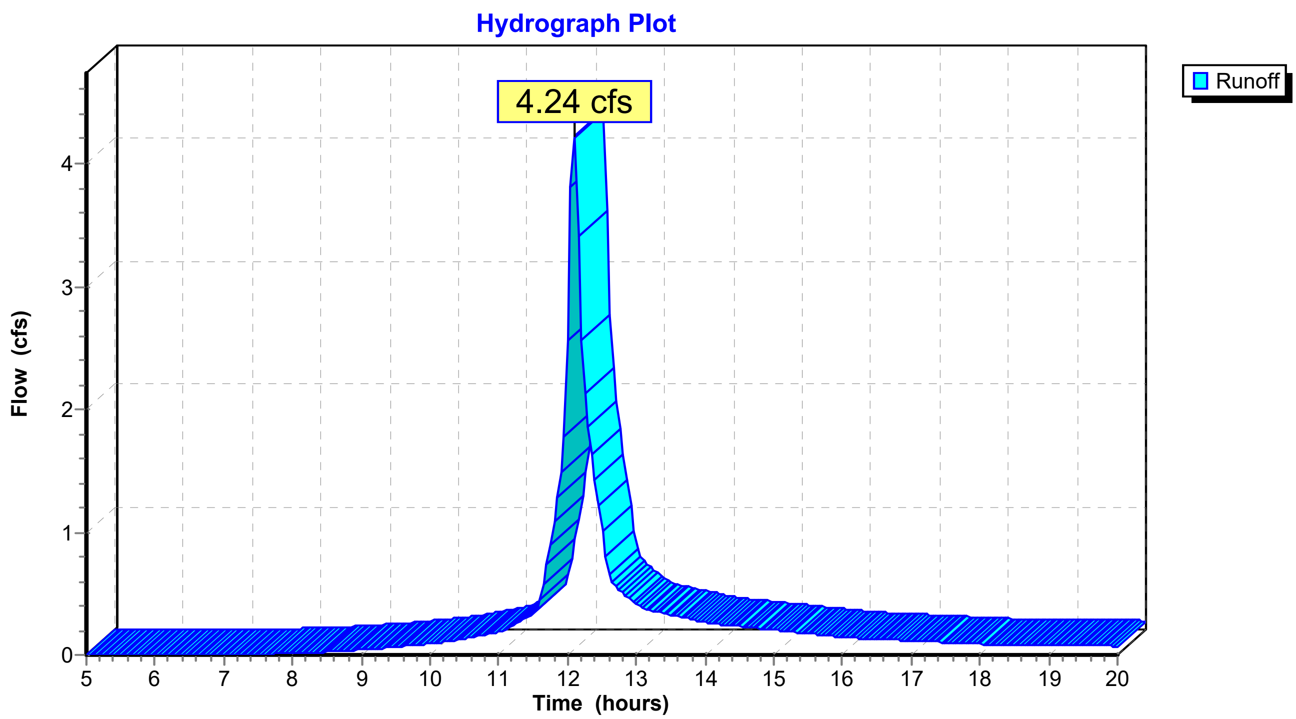
Runoff = 4.24 cfs @ 12.09 hrs, Volume= 0.288 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
18,600	98	Paved parking & roofs
50,637	80	>75% Grass cover, Good, HSG D
69,237	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	40	0.0800	0.2		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.7					**Direct Entry, MAKE TR 55 6 MIN MIN**
6.0	40	Total			

Subcatchment D-DMH-1: D-DMH-1



Subcatchment EX-1: EX-1

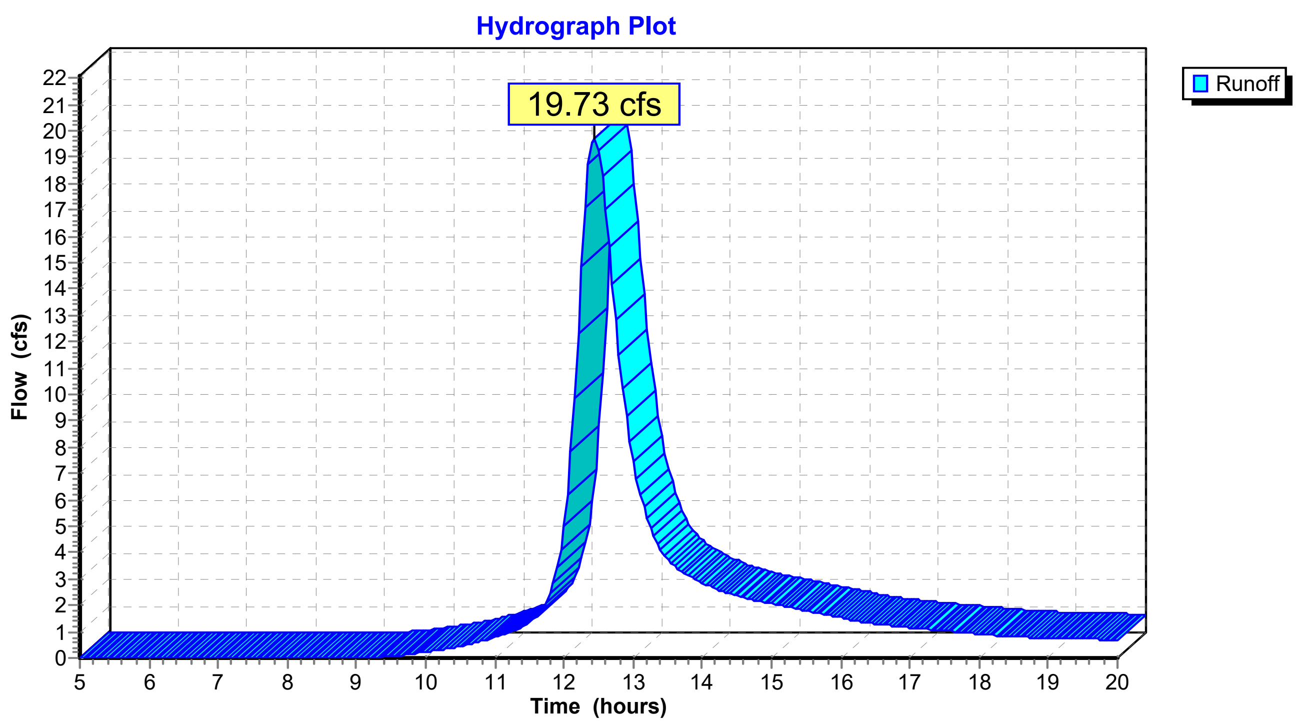
Runoff = 19.73 cfs @ 12.44 hrs, Volume= 2.317 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (ac)	CN	Description
16.430	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0700	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
16.4	1,100	0.0500	1.1		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
30.6	1,200	Total			

Subcatchment EX-1: EX-1



Subcatchment EX-2: EX-2

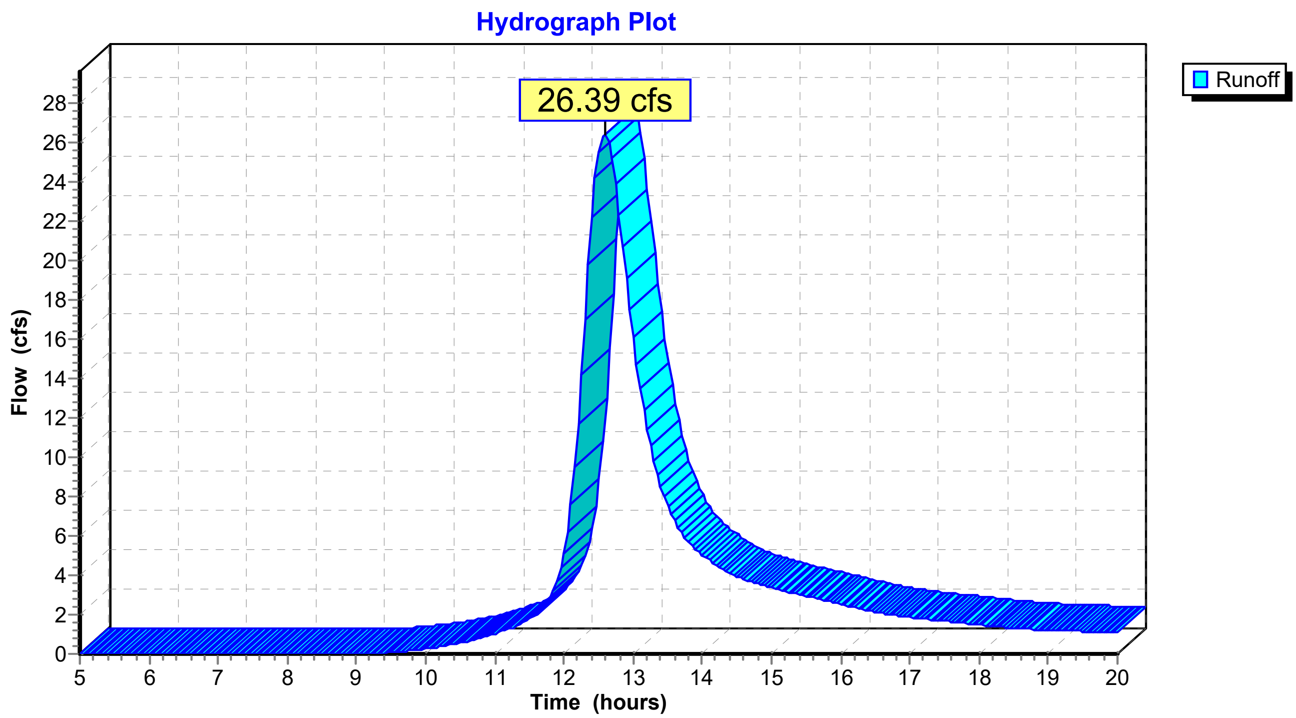
Runoff = 26.39 cfs @ 12.59 hrs, Volume= 3.582 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (ac)	CN	Description
25.510	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	100	0.0250	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
17.8	1,000	0.0350	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	1,000	0.0350	7.0	35.17	**Channel Flow,** Area= 5.0 sf Perim= 6.0' r= 0.83' n= 0.035
41.6	2,100	Total			

Subcatchment EX-2: EX-2



Subcatchment EX-3: EX-3

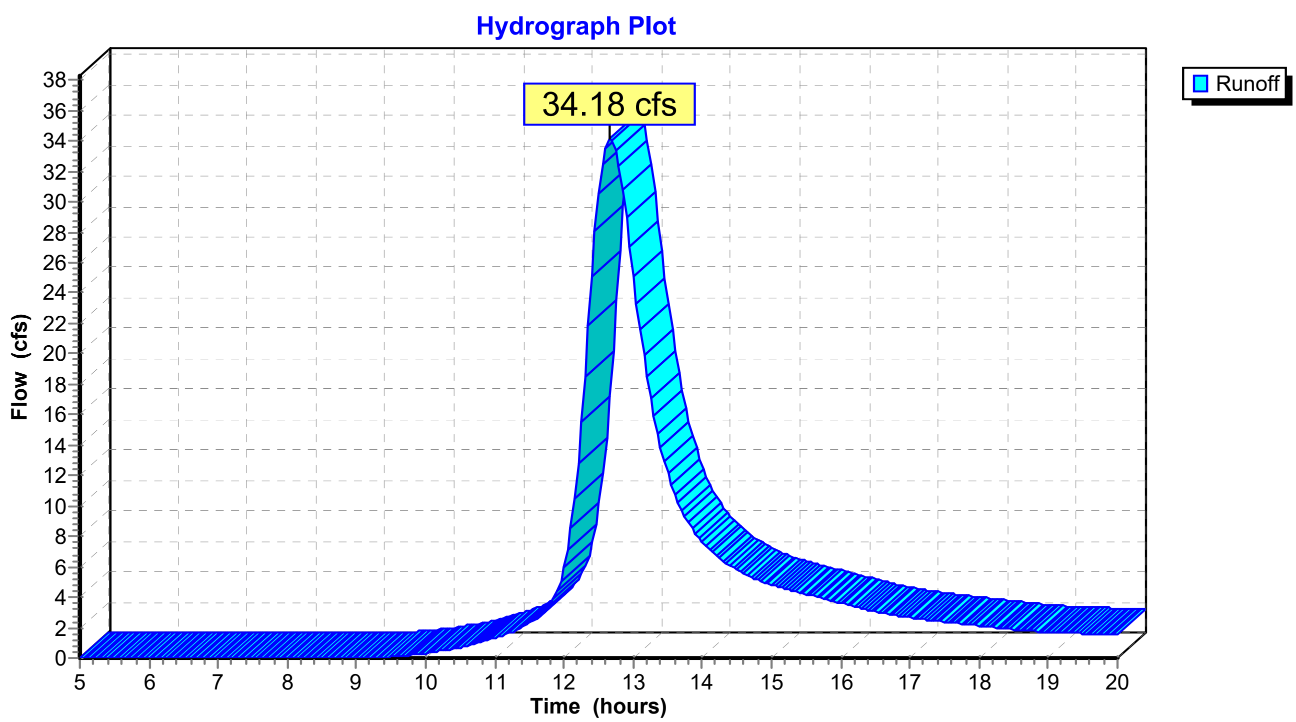
Runoff = 34.18 cfs @ 12.67 hrs, Volume= 4.974 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (ac)	CN	Description
35.510	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0800	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
34.3	2,300	0.0500	1.1		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
47.7	2,400	Total			

Subcatchment EX-3: EX-3



Subcatchment EX-4: EX-4

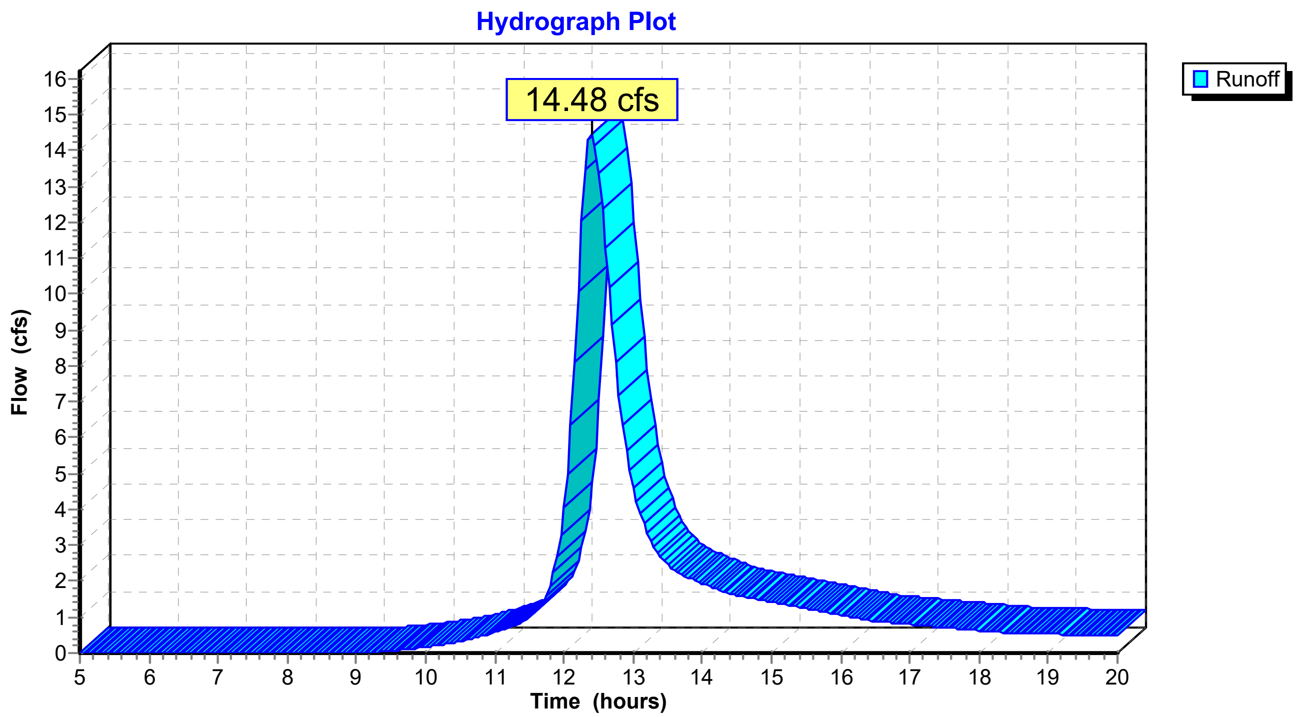
Runoff = 14.48 cfs @ 12.39 hrs, Volume= 1.620 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (ac)	CN	Description
11.470	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	100	0.0250	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
6.0	400	0.0500	1.1		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
27.4	500	Total			

Subcatchment EX-4: EX-4



Subcatchment OPEN 1: OIPEN 1

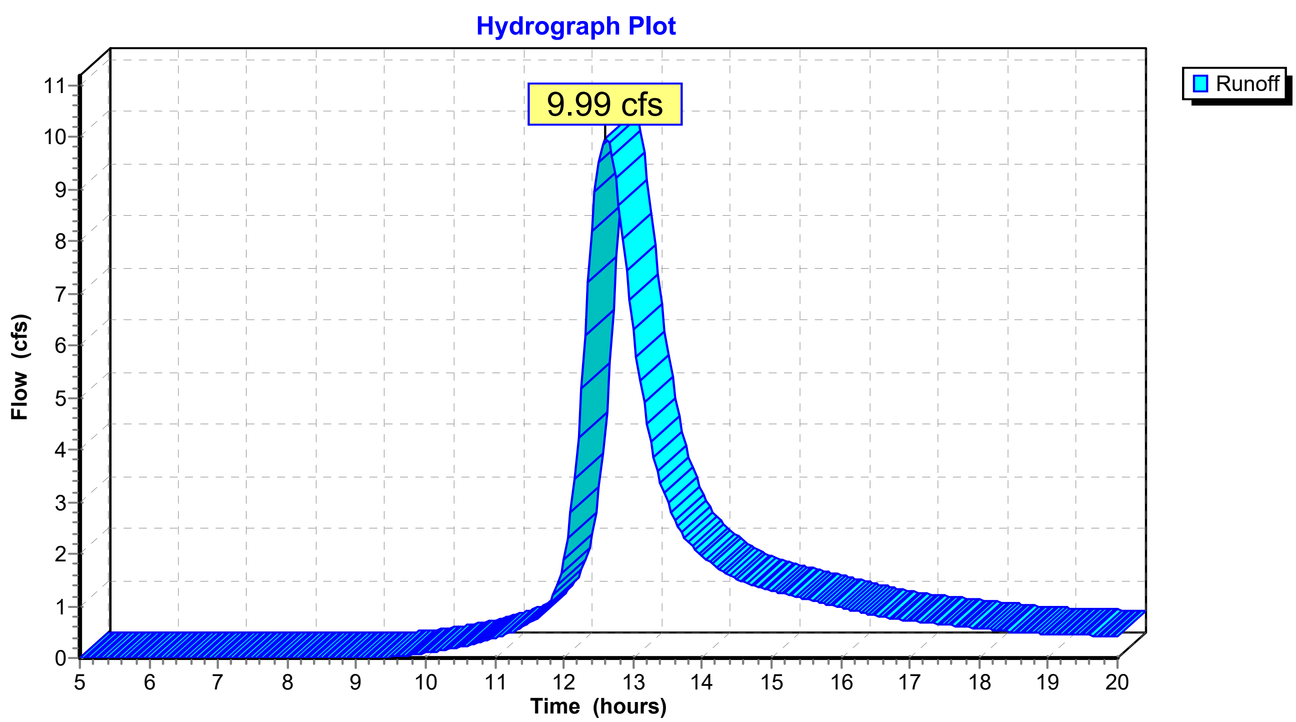
Runoff = 9.99 cfs @ 12.60 hrs, Volume= 1.373 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
426,190	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	100	0.0500	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
26.6	1,380	0.0300	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.8	1,480	Total			

Subcatchment OPEN 1: OIPEN 1



Subcatchment OPEN 2: OPEN 2

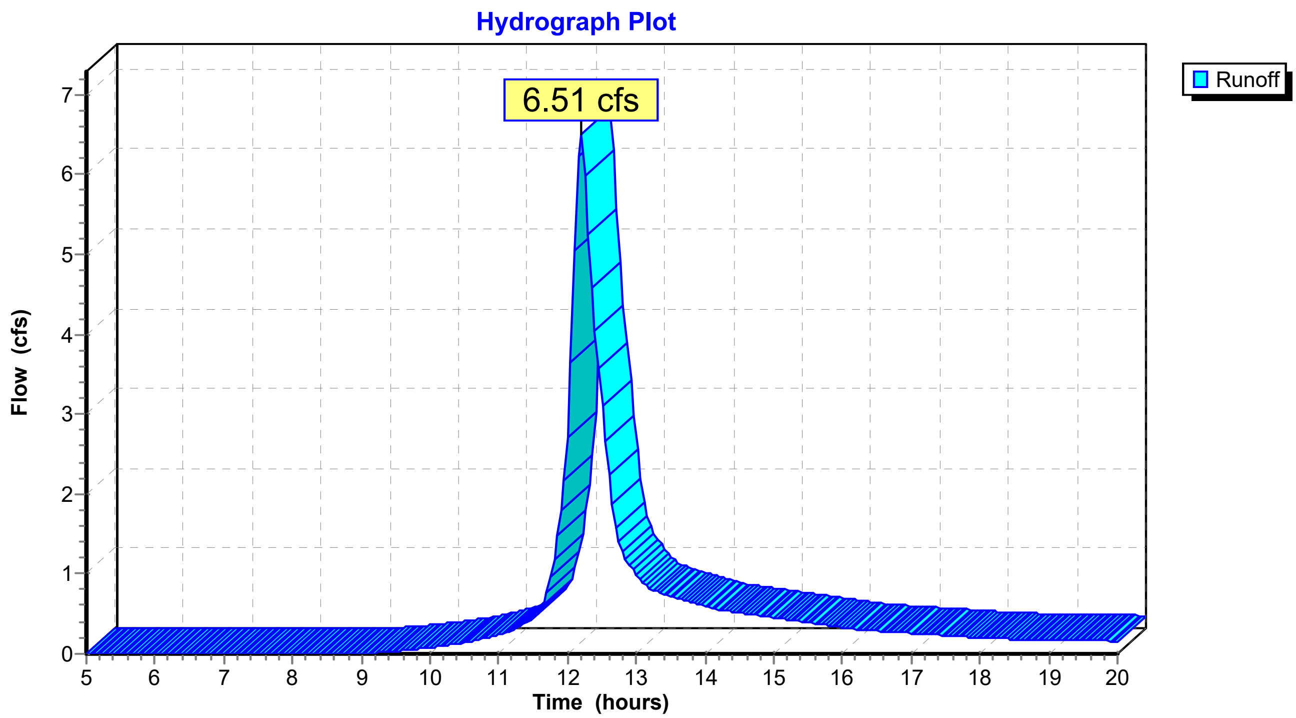
Runoff = 6.51 cfs @ 12.19 hrs, Volume= 0.550 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
168,705	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0800	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"

Subcatchment OPEN 2: OPEN 2



Subcatchment OPEN 3: OPEN 3

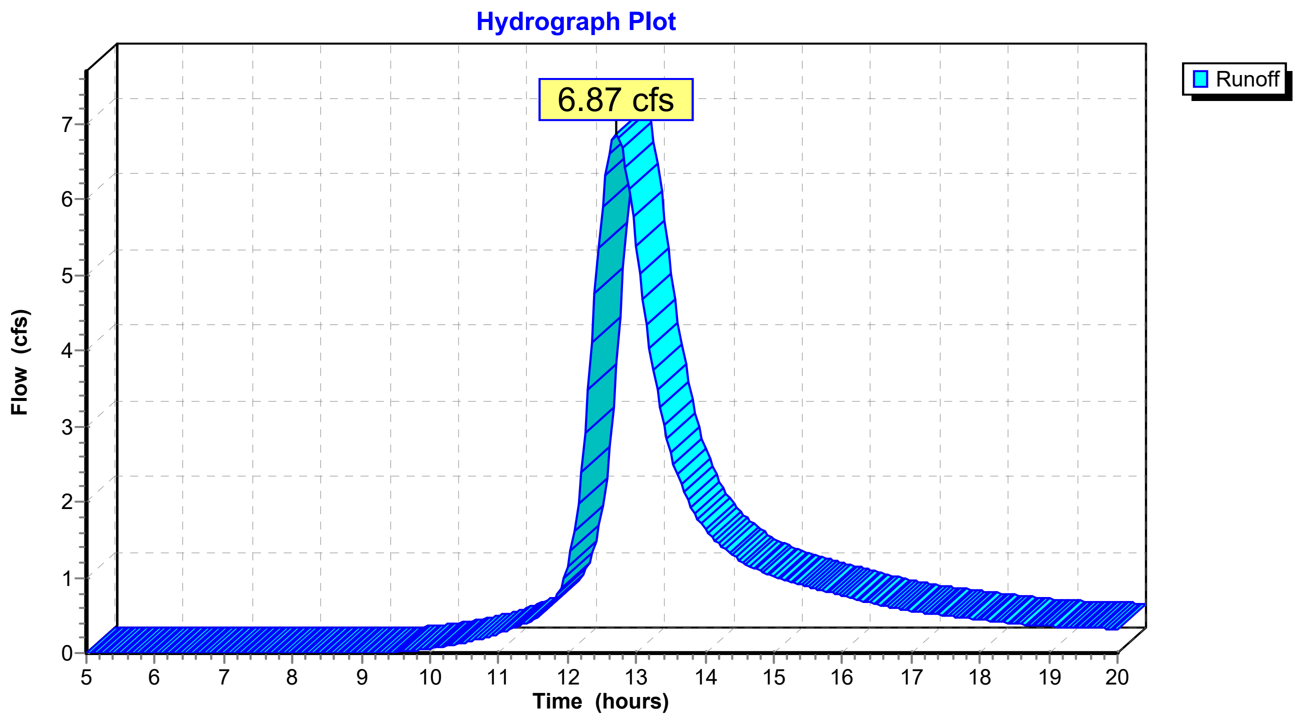
Runoff = 6.87 cfs @ 12.70 hrs, Volume= 1.028 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
319,952	79	Woods/grass comb., Good, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.2	100	0.0150	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
24.1	885	0.0150	0.6		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
50.3	985	Total			

Subcatchment OPEN 3: OPEN 3



Subcatchment OPEN 4: OPEN 4

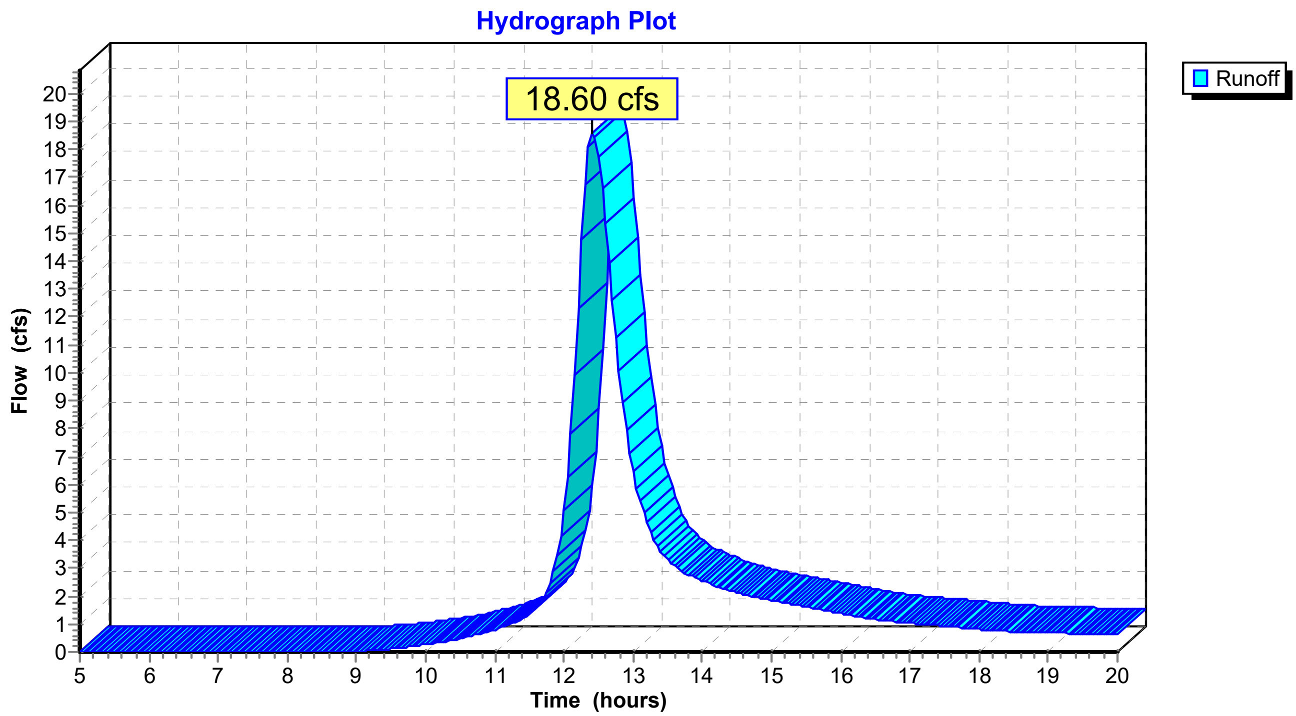
Runoff = 18.60 cfs @ 12.41 hrs, Volume= 2.138 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
614,560	79	Woods, Fair, HSG D
18,300	98	Paved parking & roofs
632,860	80	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.1	100	0.0600	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
14.1	1,200	0.0800	1.4		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
29.2	1,300	Total			

Subcatchment OPEN 4: OPEN 4



Subcatchment OPEN 5: OPEN 5

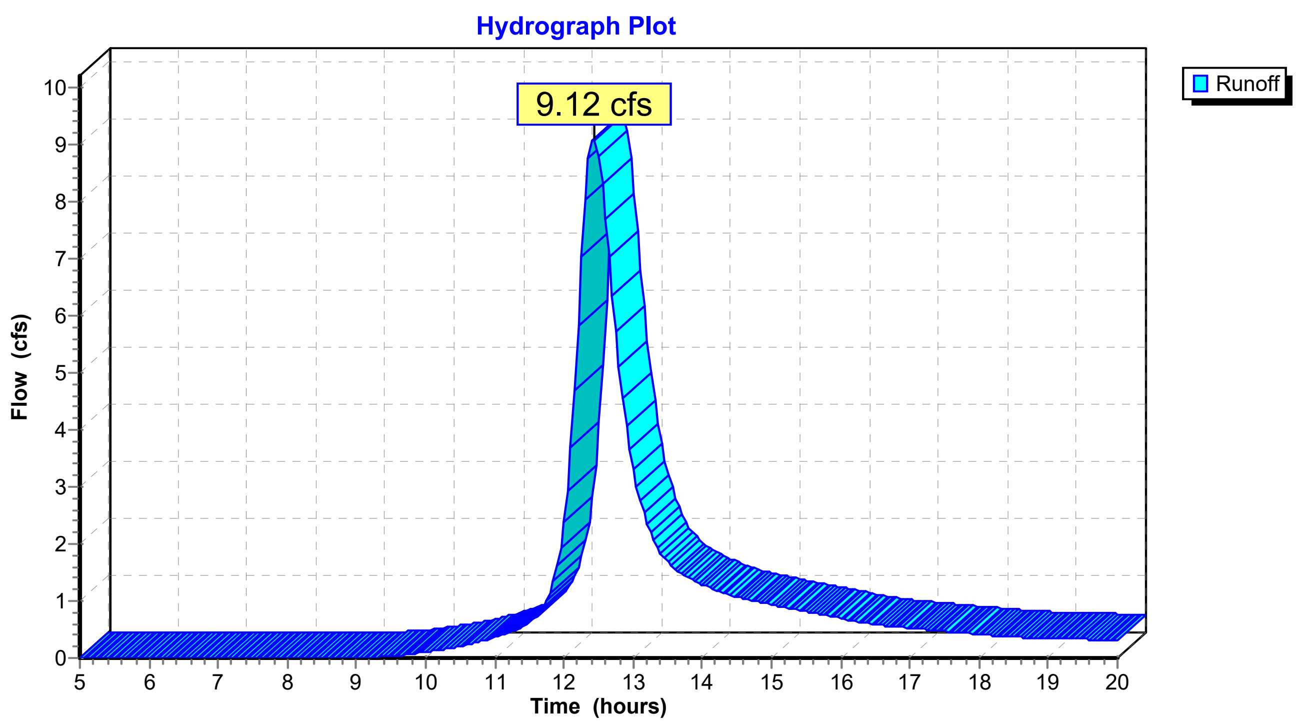
Runoff = 9.12 cfs @ 12.42 hrs, Volume= 1.057 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
326,510	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	100	0.0400	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
12.1	630	0.0300	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
29.8	730	Total			

Subcatchment OPEN 5: OPEN 5



Subcatchment OPEN 6: OPEN 6

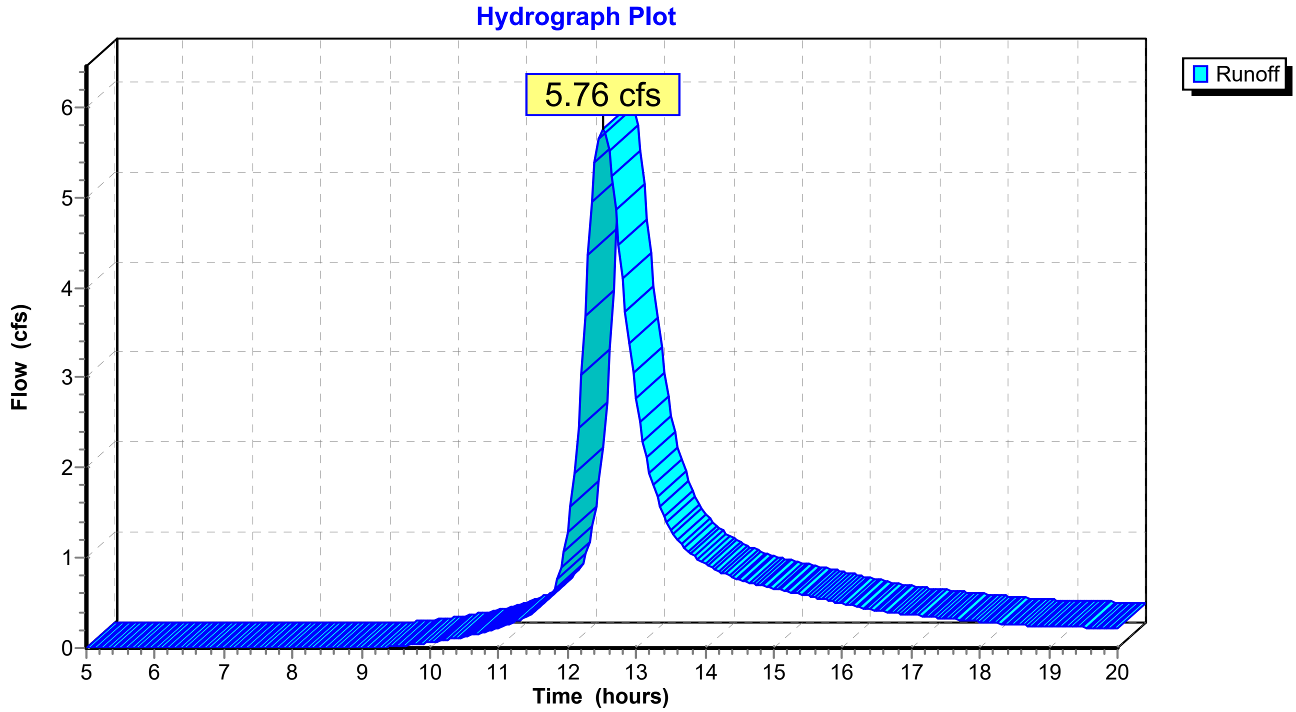
Runoff = 5.76 cfs @ 12.51 hrs, Volume= 0.725 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
224,401	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	100	0.0250	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
14.3	800	0.0350	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
35.7	900	Total			

Subcatchment OPEN 6: OPEN 6



Subcatchment OPEN 7: OPEN 7

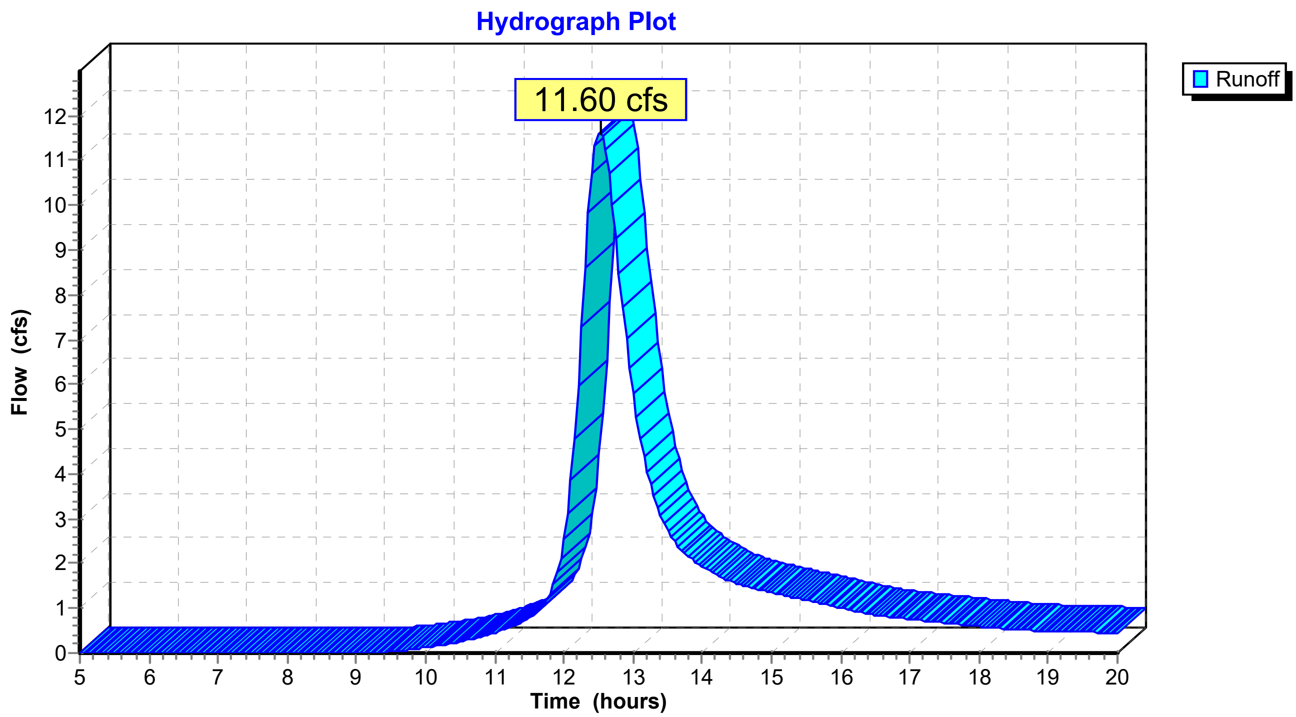
Runoff = 11.60 cfs @ 12.52 hrs, Volume= 1.478 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
457,482	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.7	100	0.0350	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
17.8	1,000	0.0350	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
36.5	1,100	Total			

Subcatchment OPEN 7: OPEN 7



Subcatchment POND 1: POND 1

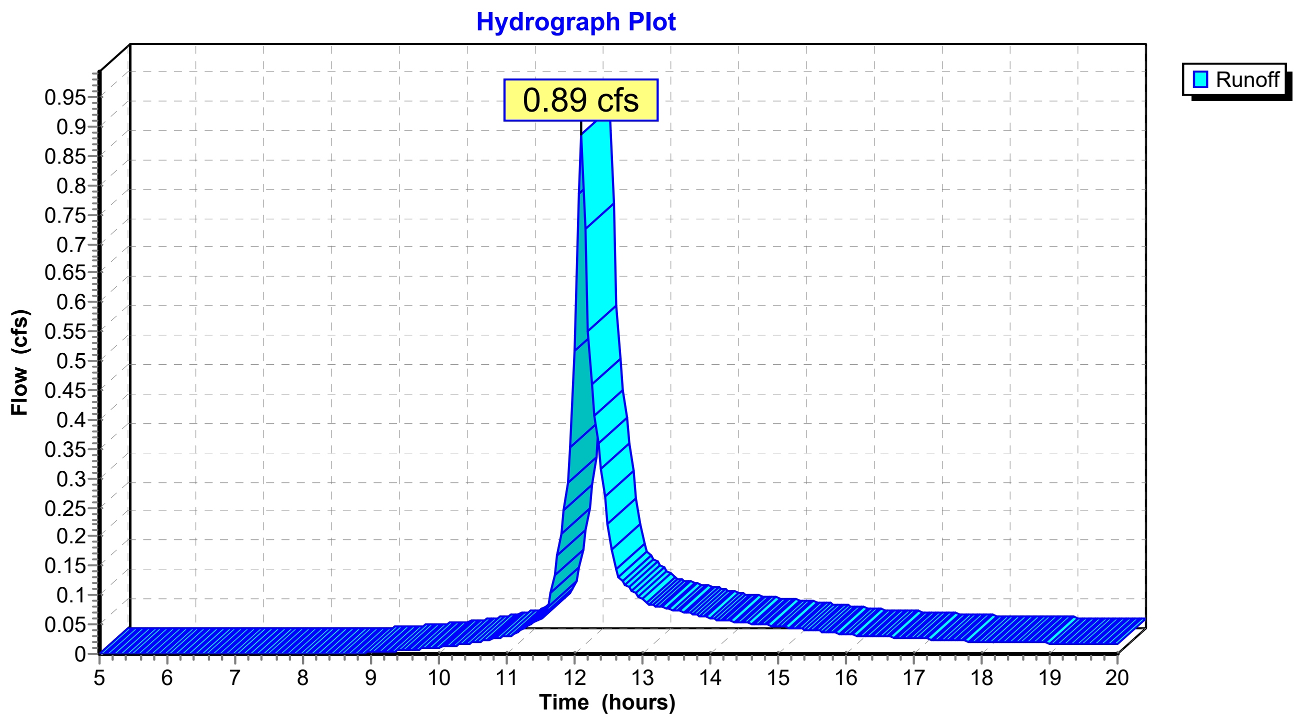
Runoff = 0.89 cfs @ 12.09 hrs, Volume= 0.060 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
17,554	80	>75% Grass cover, Good, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR 55 MIN**

Subcatchment POND 1: POND 1



Subcatchment POND 2: POND 2

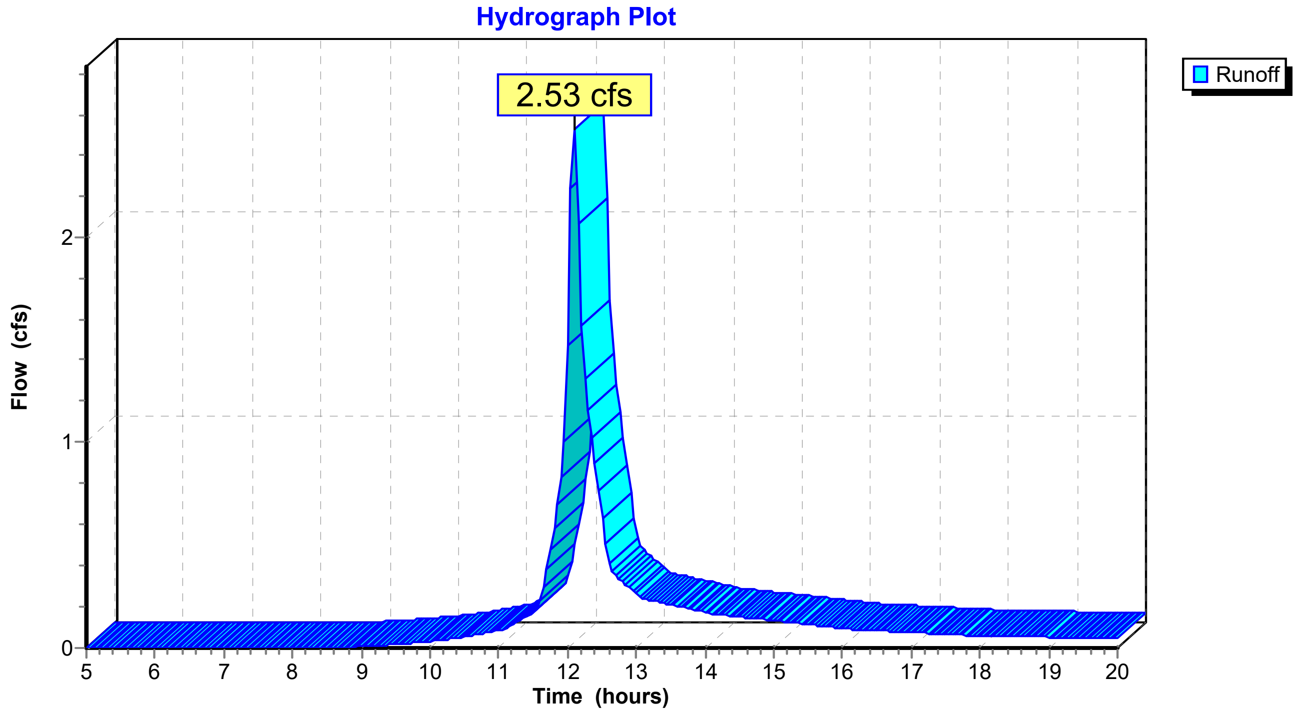
Runoff = 2.53 cfs @ 12.09 hrs, Volume= 0.170 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
49,954	80	>75% Grass cover, Good, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment POND 2: POND 2



Subcatchment POND 3: POND 3

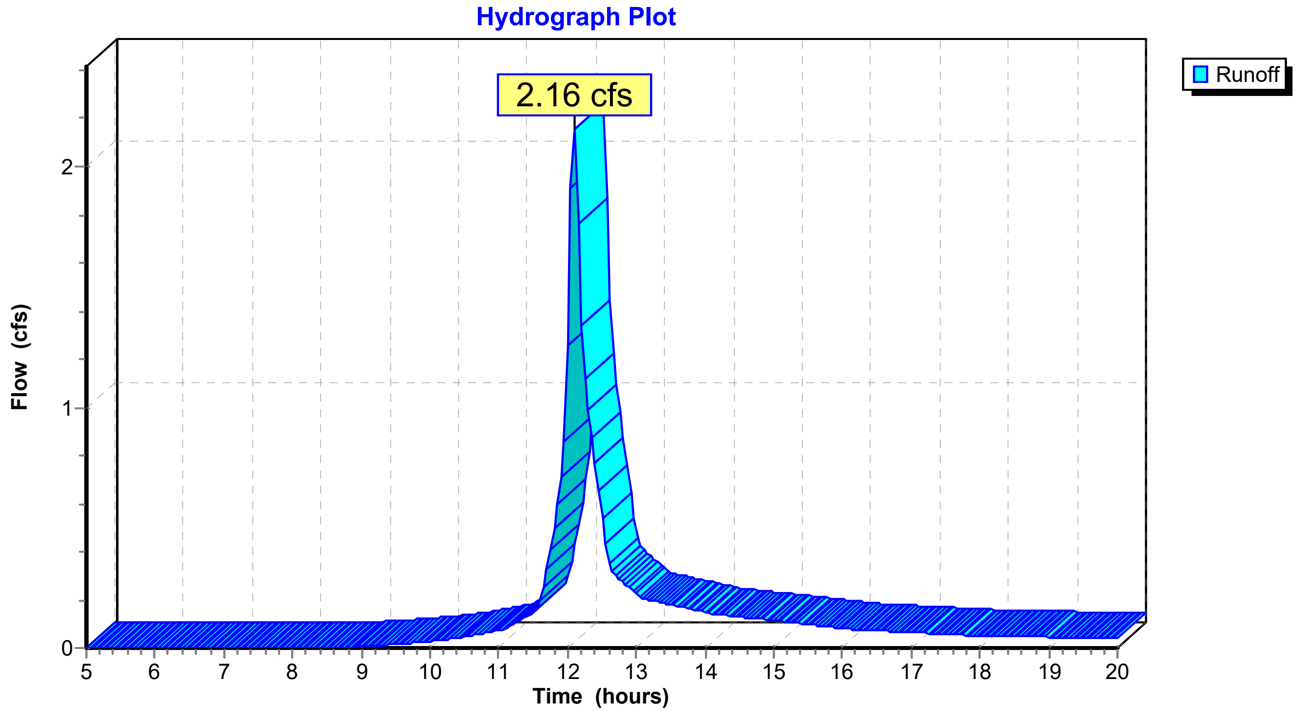
Runoff = 2.16 cfs @ 12.09 hrs, Volume= 0.146 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
42,753	80	>75% Grass cover, Good, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment POND 3: POND 3



Subcatchment POND 5: POND 5

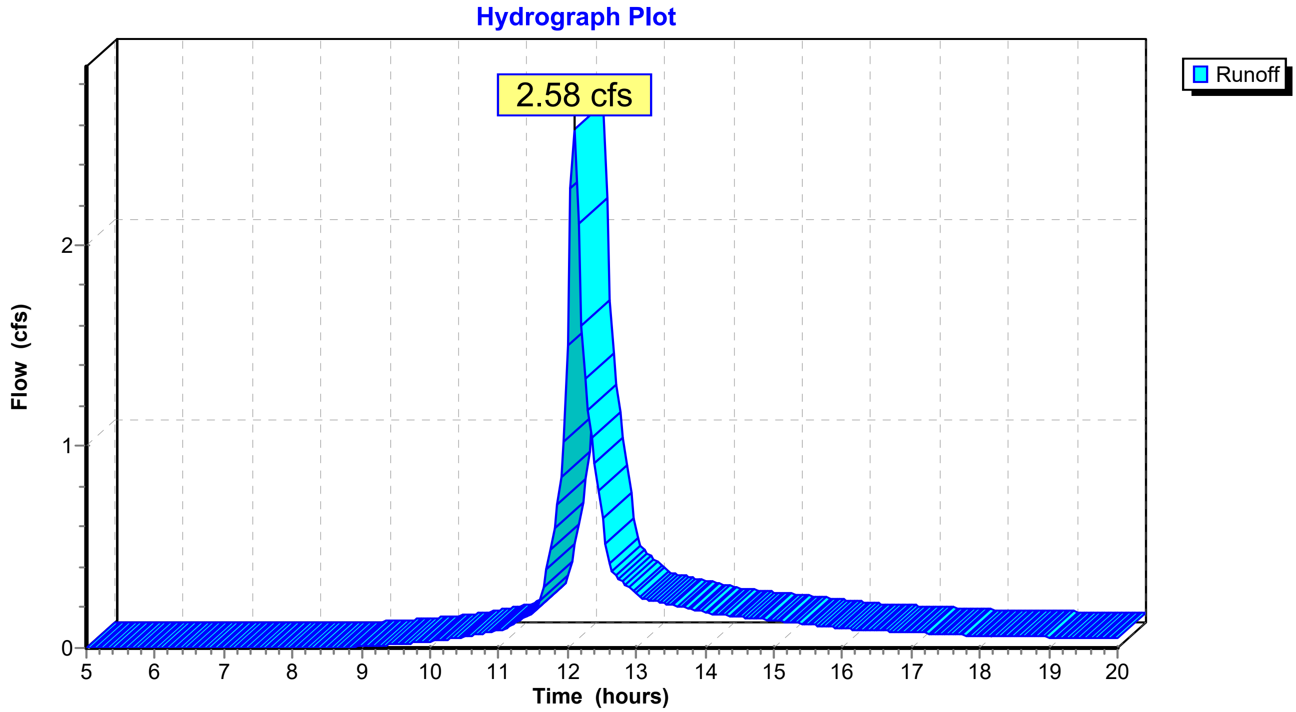
Runoff = 2.58 cfs @ 12.09 hrs, Volume= 0.174 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
50,948	80	>75% Grass cover, Good, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment POND 5: POND 5



Subcatchment POND 6: POND 6

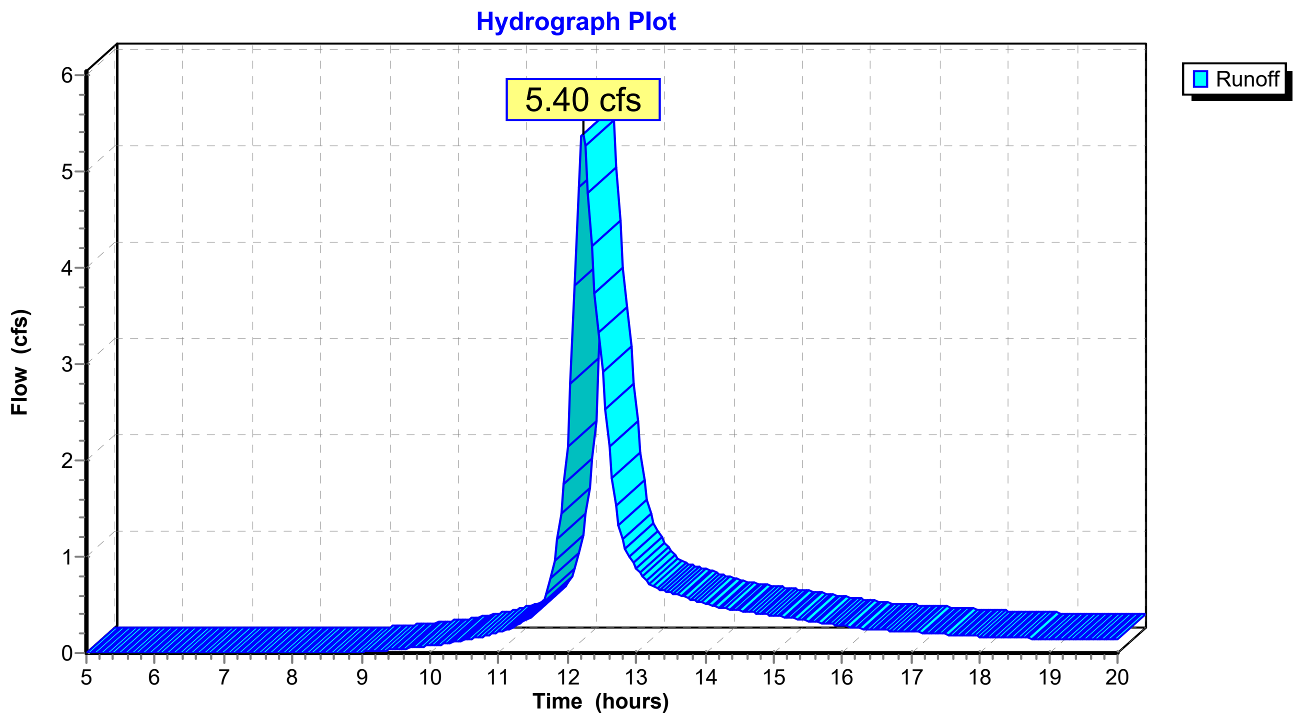
Runoff = 5.40 cfs @ 12.22 hrs, Volume= 0.478 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=3.85"

Area (sf)	CN	Description
140,626	80	>75% Grass cover, Good, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0250	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.2	180	0.0300	2.6		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.4	280	Total			

Subcatchment POND 6: POND 6



Reach CULVERT 1: CULVERT 1

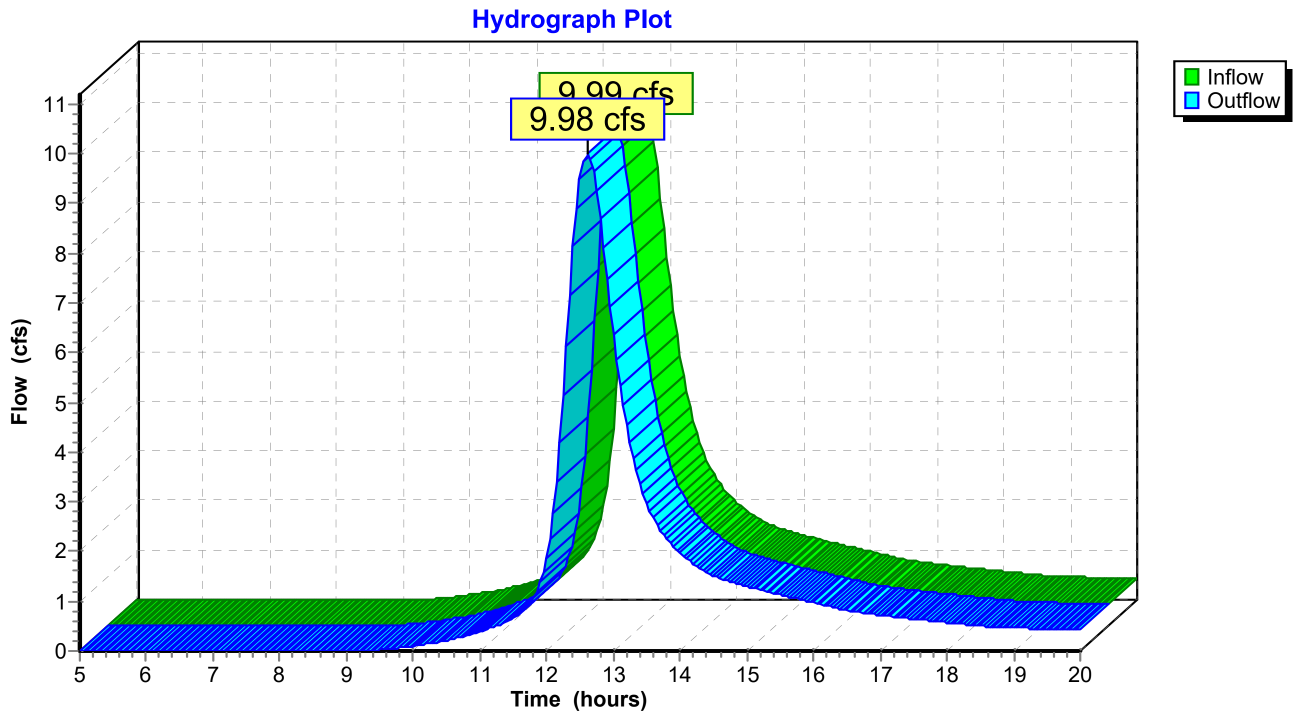
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow = 9.99 cfs @ 12.60 hrs, Volume= 1.373 af
Outflow = 9.98 cfs @ 12.61 hrs, Volume= 1.373 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.1 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.4 fps, Avg. Travel Time= 0.2 min

Peak Depth= 0.72'
Capacity at bank full= 108.99 cfs
42.0" Diameter Pipe n= 0.012 Length= 42.0' Slope= 0.0100 '/'

Reach CULVERT 1: CULVERT 1



Reach CULVERT 2: CULVERT 2

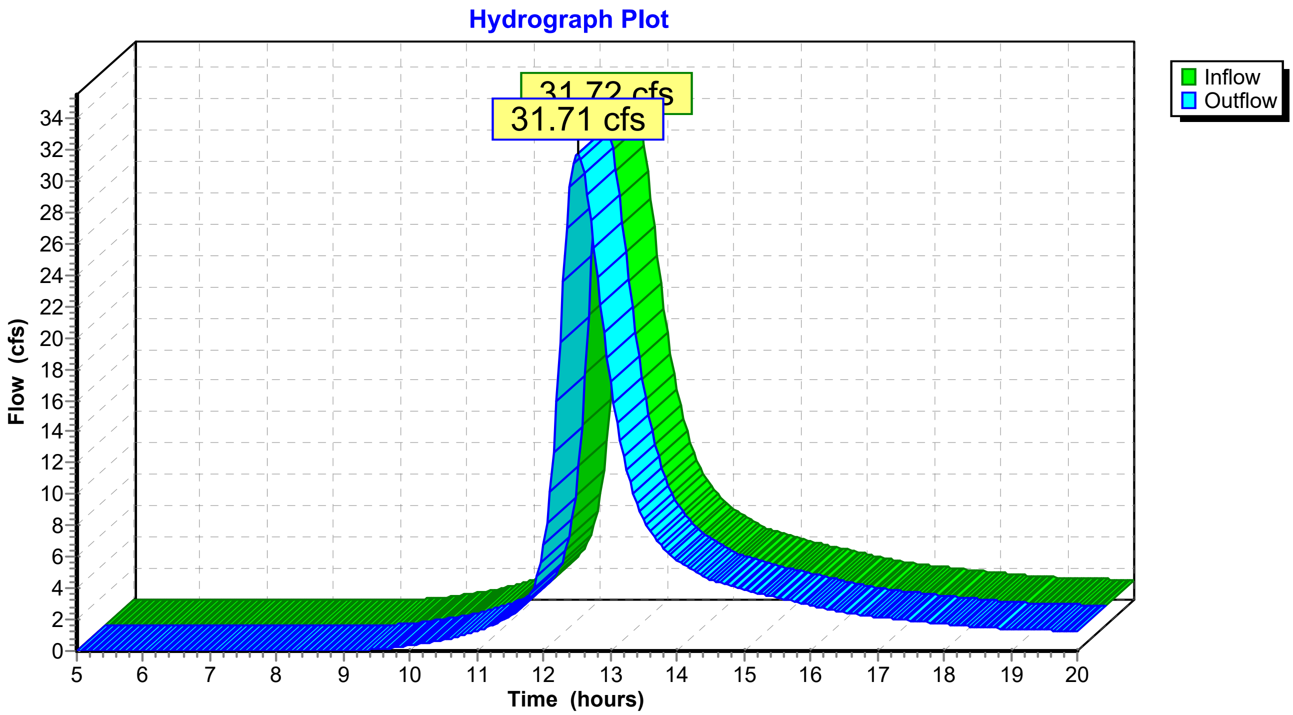
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow	=	31.72 cfs @	12.51 hrs,	Volume=	4.209 af
Outflow	=	31.71 cfs @	12.51 hrs,	Volume=	4.209 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.8 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.8 fps, Avg. Travel Time= 0.2 min

Peak Depth= 1.29'
Capacity at bank full= 108.99 cfs
42.0" Diameter Pipe n= 0.012 Length= 46.0' Slope= 0.0100 '/'

Reach CULVERT 2: CULVERT 2



Reach CULVERT 3: CULVERT 3

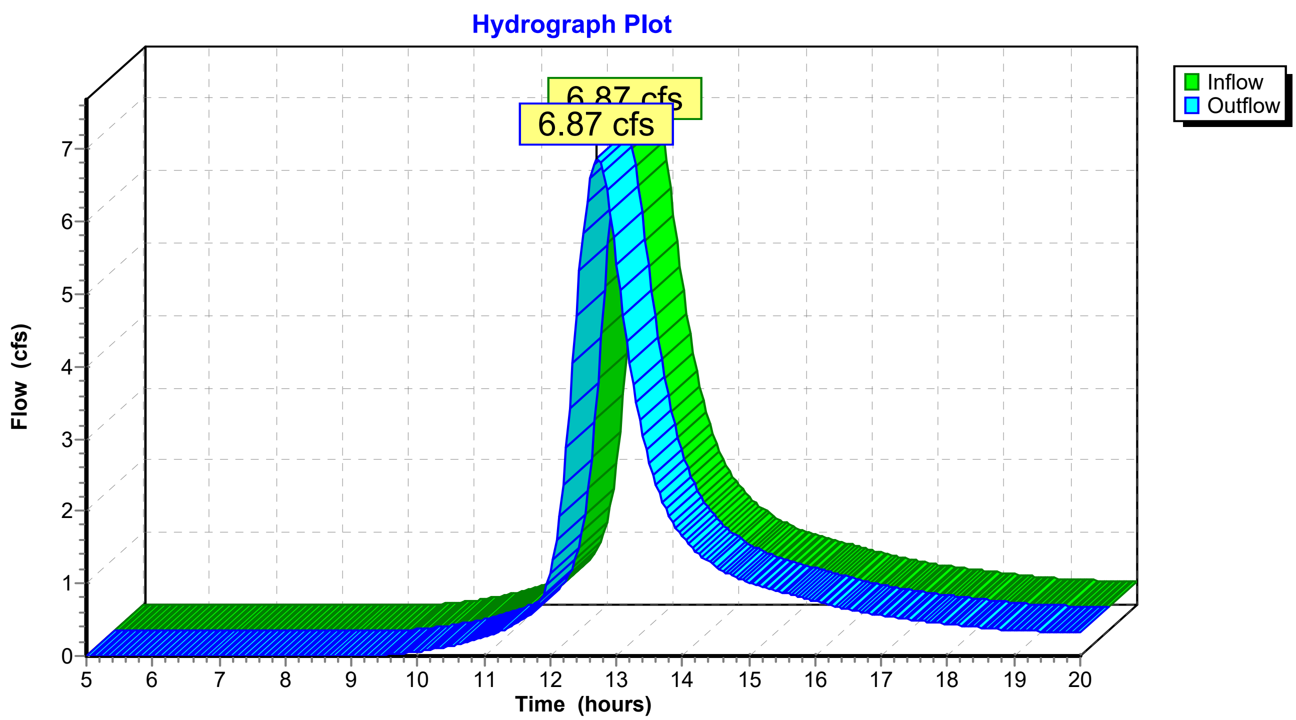
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow	=	6.87 cfs @	12.70 hrs, Volume=	1.028 af	
Outflow	=	6.87 cfs @	12.71 hrs, Volume=	1.028 af,	Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.3 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.2 fps, Avg. Travel Time= 0.2 min

Peak Depth= 0.60'
Capacity at bank full= 108.99 cfs
42.0" Diameter Pipe n= 0.012 Length= 42.0' Slope= 0.0100 '/'

Reach CULVERT 3: CULVERT 3



Reach DMH-5 TO OUTLET: DMH-5 TO OUTLET

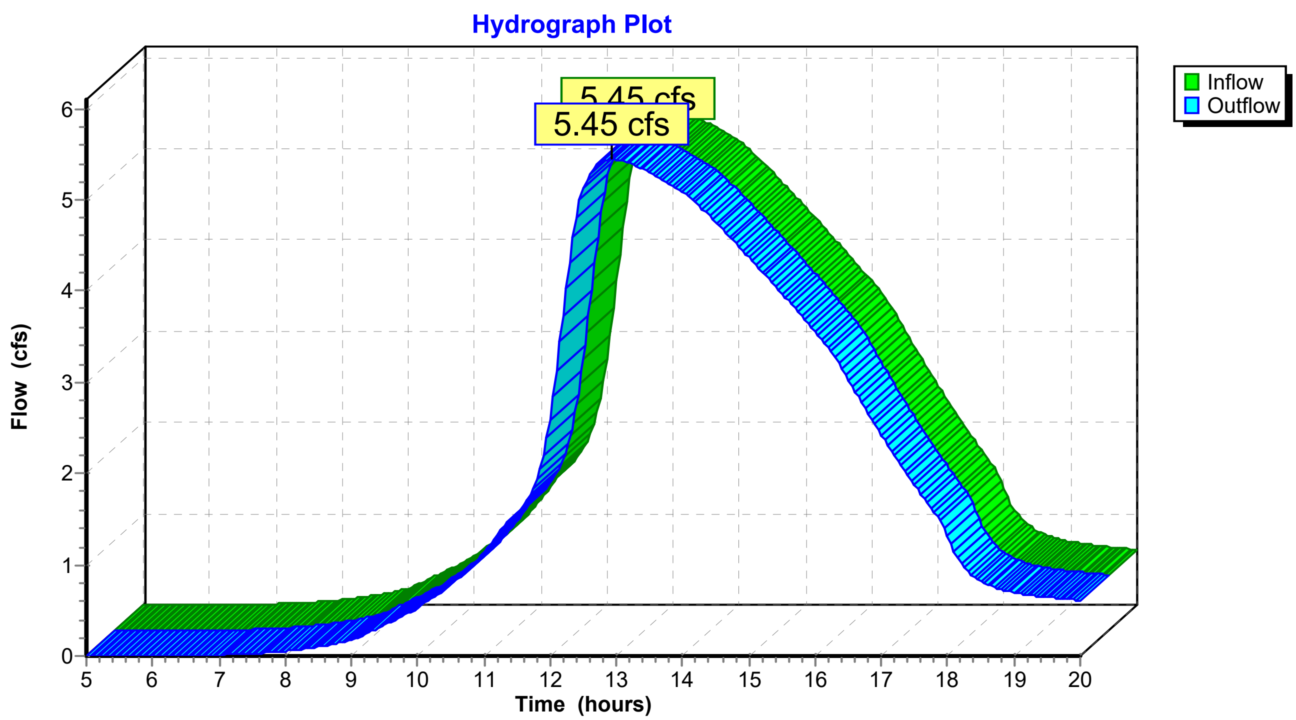
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow = 5.45 cfs @ 12.91 hrs, Volume= 2.319 af
Outflow = 5.45 cfs @ 12.92 hrs, Volume= 2.317 af, Atten= 0%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.9 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 3.0 fps, Avg. Travel Time= 1.1 min

Peak Depth= 0.77'
Capacity at bank full= 17.28 cfs
24.0" Diameter Pipe n= 0.012 Length= 193.0' Slope= 0.0050 '/'

Reach DMH-5 TO OUTLET: DMH-5 TO OUTLET



Reach DRY SWALE 1: DRY SWALE 1

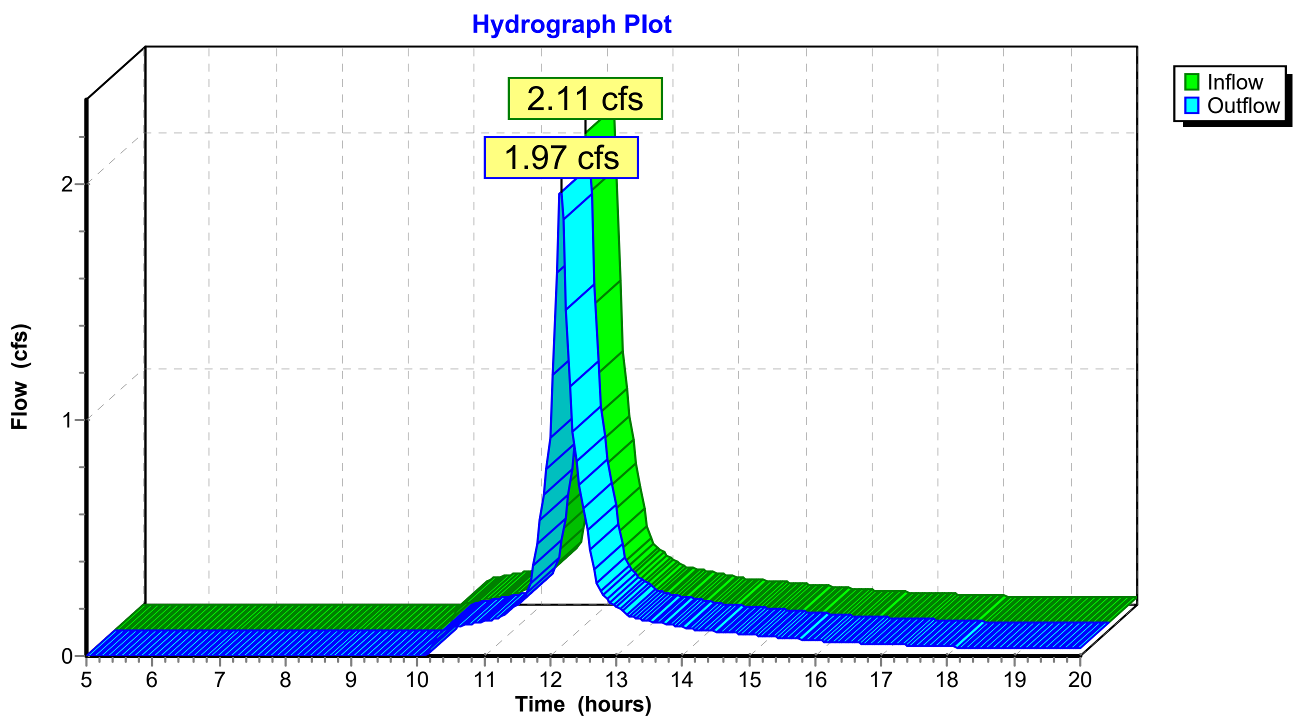
[65] Warning: Inlet elevation not specified

Inflow	=	2.11 cfs @	12.10 hrs,	Volume=	0.141 af
Outflow	=	1.97 cfs @	12.16 hrs,	Volume=	0.141 af, Atten= 6%, Lag= 3.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.0 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 5.9 min

Peak Depth= 0.22'
Capacity at bank full= 59.21 cfs
8.00' x 1.50' deep channel, n= 0.035 Length= 125.0' Slope= 0.0050 '/'
Side Slope Z-value= 3.0 '/'

Reach DRY SWALE 1: DRY SWALE 1



Reach DRY SWALE 2: DRY SWALE 2

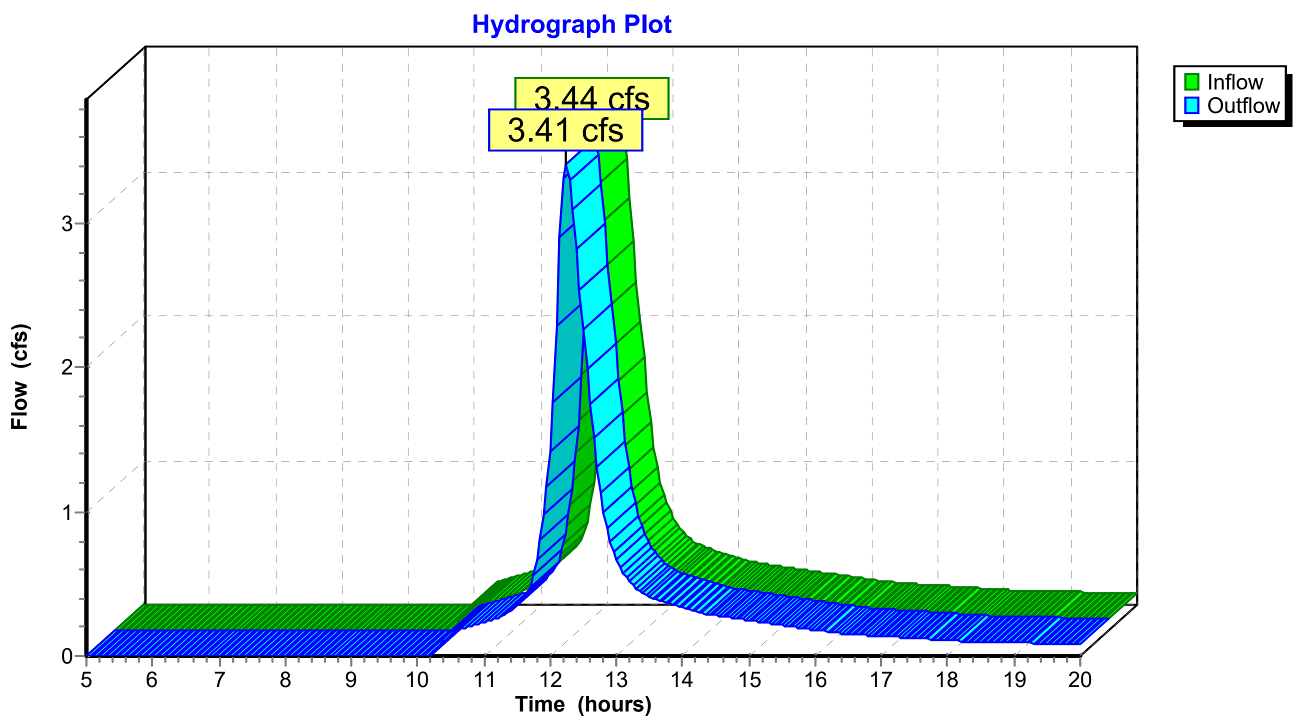
[65] Warning: Inlet elevation not specified

Inflow	=	3.44 cfs @	12.19 hrs,	Volume=	0.331 af
Outflow	=	3.41 cfs @	12.25 hrs,	Volume=	0.330 af, Atten= 1%, Lag= 3.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.3 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.5 fps, Avg. Travel Time= 4.7 min

Peak Depth= 0.30'
Capacity at bank full= 58.97 cfs
8.00' x 1.50' deep channel, n= 0.035 Length= 140.0' Slope= 0.0050 '/'
Side Slope Z-value= 3.0 '/'

Reach DRY SWALE 2: DRY SWALE 2



Reach DRY SWALE 3: DRY SWALE 3

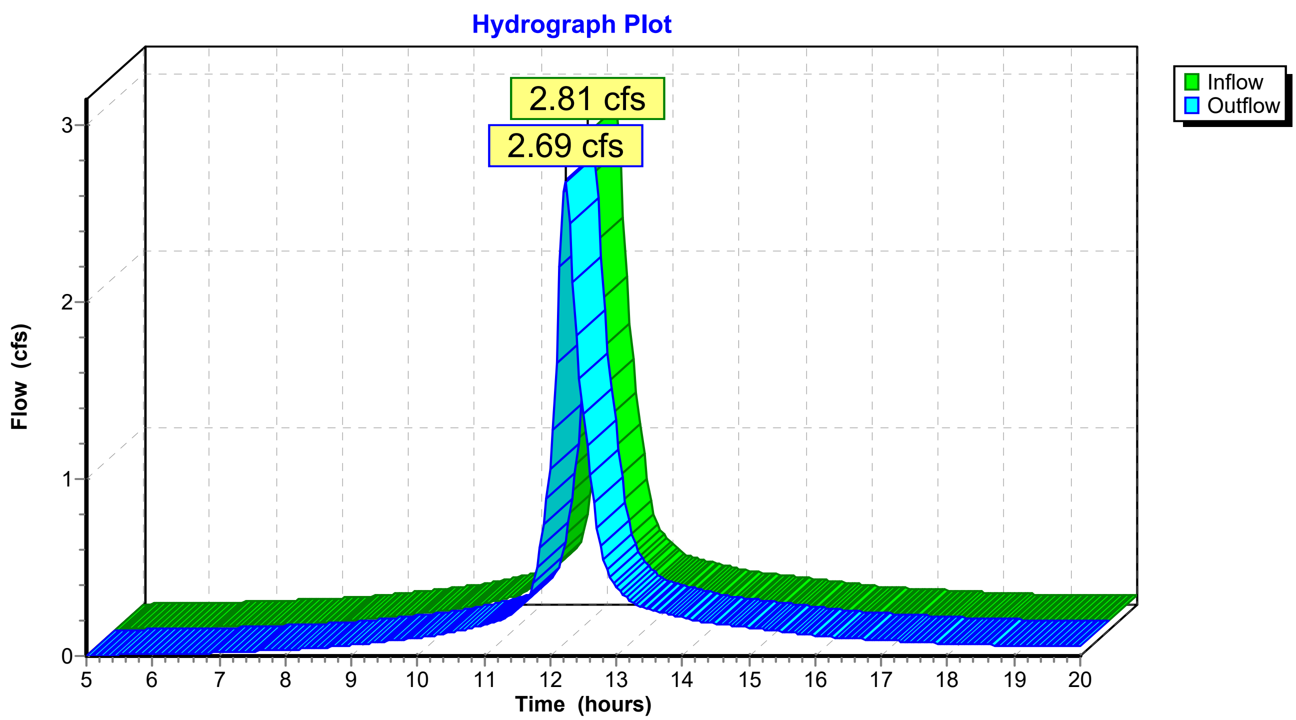
[65] Warning: Inlet elevation not specified

Inflow	=	2.81 cfs @	12.15 hrs, Volume=	0.241 af
Outflow	=	2.69 cfs @	12.24 hrs, Volume=	0.239 af, Atten= 4%, Lag= 5.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.2 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 10.2 min

Peak Depth= 0.26'
Capacity at bank full= 58.97 cfs
8.00' x 1.50' deep channel, n= 0.035 Length= 220.0' Slope= 0.0050 '/'
Side Slope Z-value= 3.0 '/'

Reach DRY SWALE 3: DRY SWALE 3



Reach DRY SWALE 4: (new node)

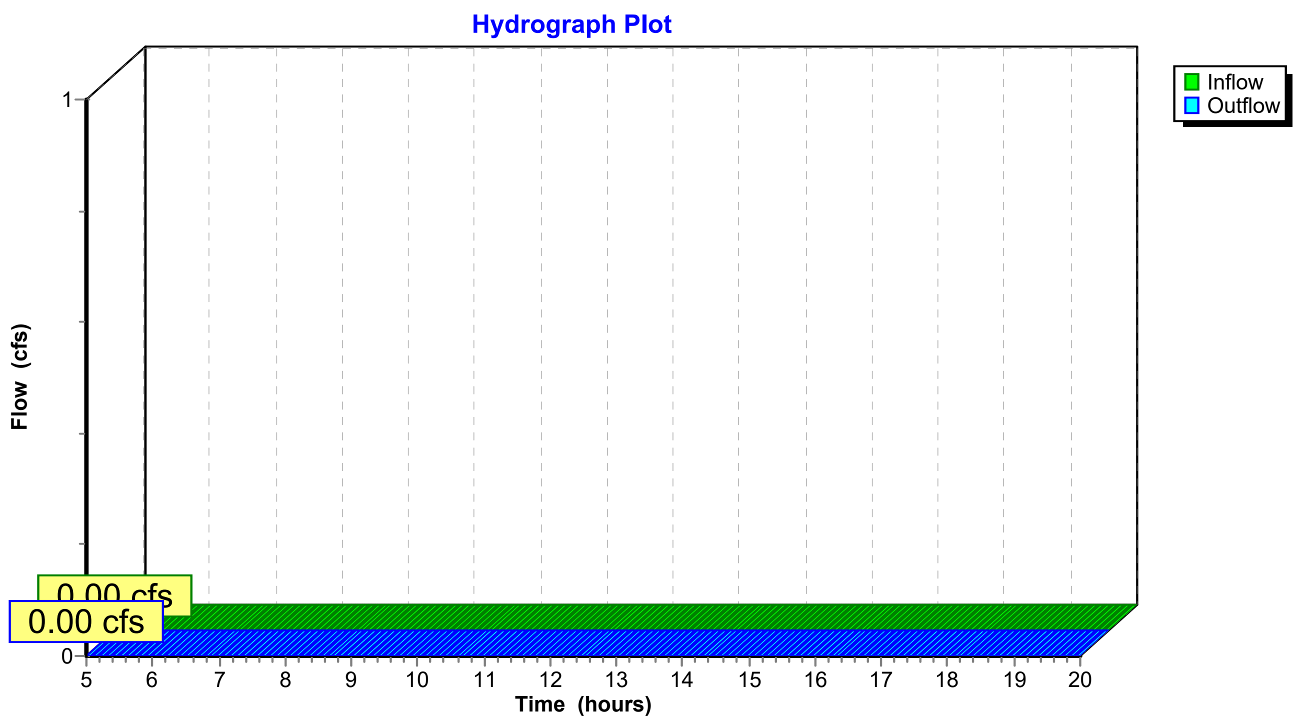
[65] Warning: Inlet elevation not specified

Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.0 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.0 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.00'
Capacity at bank full= 58.97 cfs
8.00' x 1.50' deep channel, n= 0.035 Length= 140.0' Slope= 0.0050 '/'
Side Slope Z-value= 3.0 '/'

Reach DRY SWALE 4: (new node)



Reach EX ANALYSIS A: EX ANALYSIS A

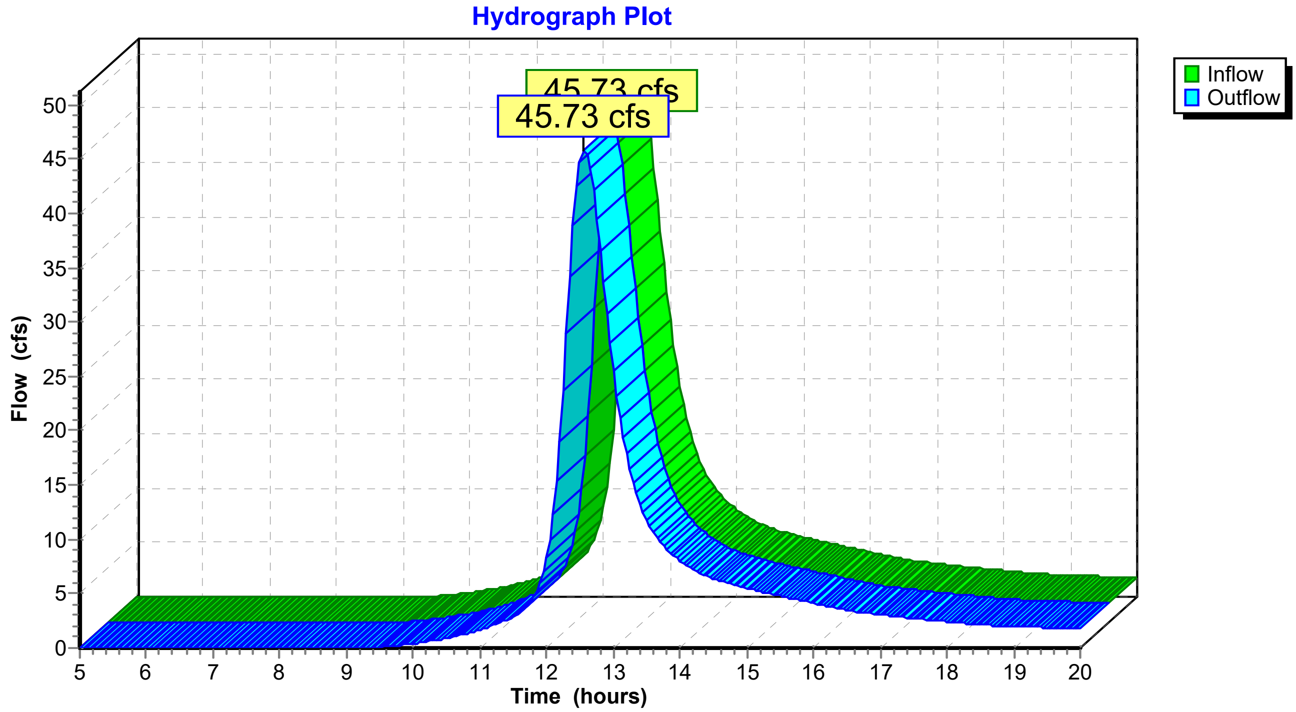
[65] Warning: Inlet elevation not specified

Inflow = 45.73 cfs @ 12.56 hrs, Volume= 5.887 af
Outflow = 45.73 cfs @ 12.56 hrs, Volume= 5.886 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.9 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.7 fps, Avg. Travel Time= 0.0 min

Peak Depth= 1.21'
Capacity at bank full= 71.84 cfs
8.00' x 1.50' deep Parabolic Channel, n= 0.035 Length= 10.0' Slope= 0.0500 '/'

Reach EX ANALYSIS A: EX ANALYSIS A



Reach EX-ANALYSIS B: EX ANALYSIS B

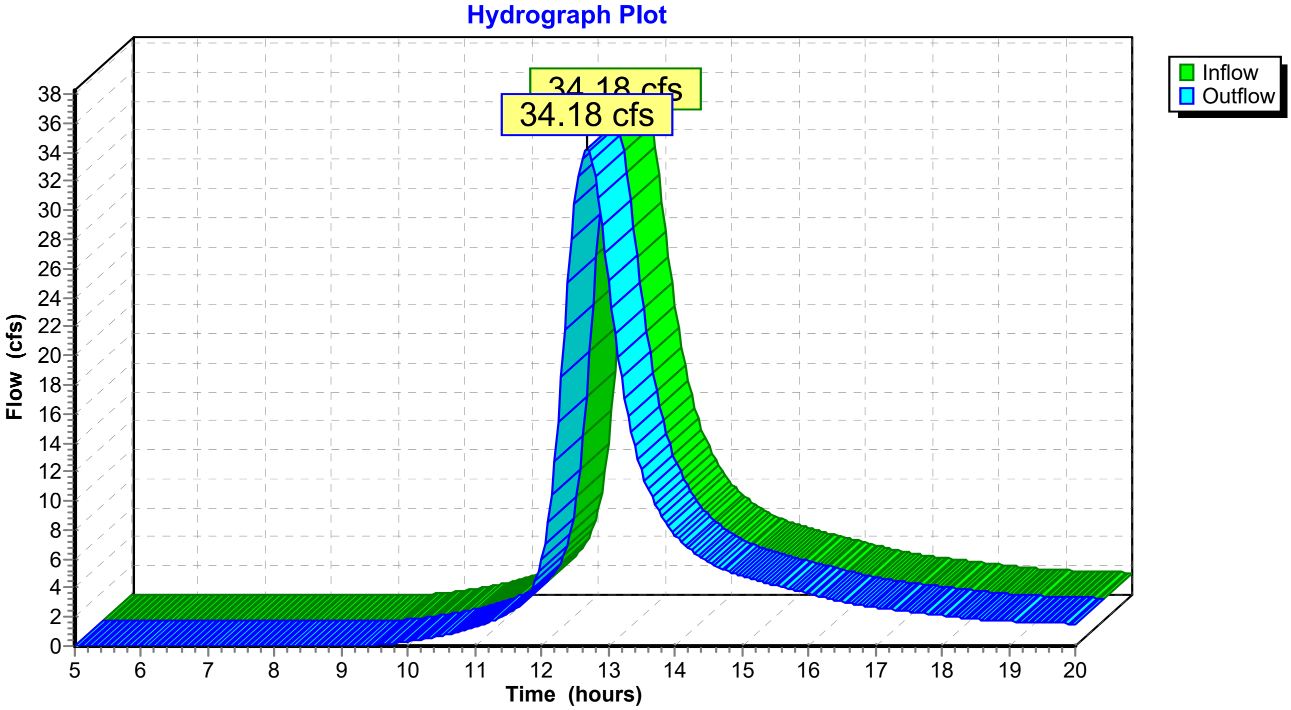
[65] Warning: Inlet elevation not specified

Inflow	=	34.18 cfs @	12.67 hrs, Volume=	4.974 af
Outflow	=	34.18 cfs @	12.67 hrs, Volume=	4.974 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.2 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.5 fps, Avg. Travel Time= 0.0 min

Peak Depth= 1.06'
Capacity at bank full= 71.84 cfs
8.00' x 1.50' deep Parabolic Channel, n= 0.035 Length= 10.0' Slope= 0.0500 '/'

Reach EX-ANALYSIS B: EX ANALYSIS B



Reach EX-ANALYSIS C: EX-ANALYSIS C

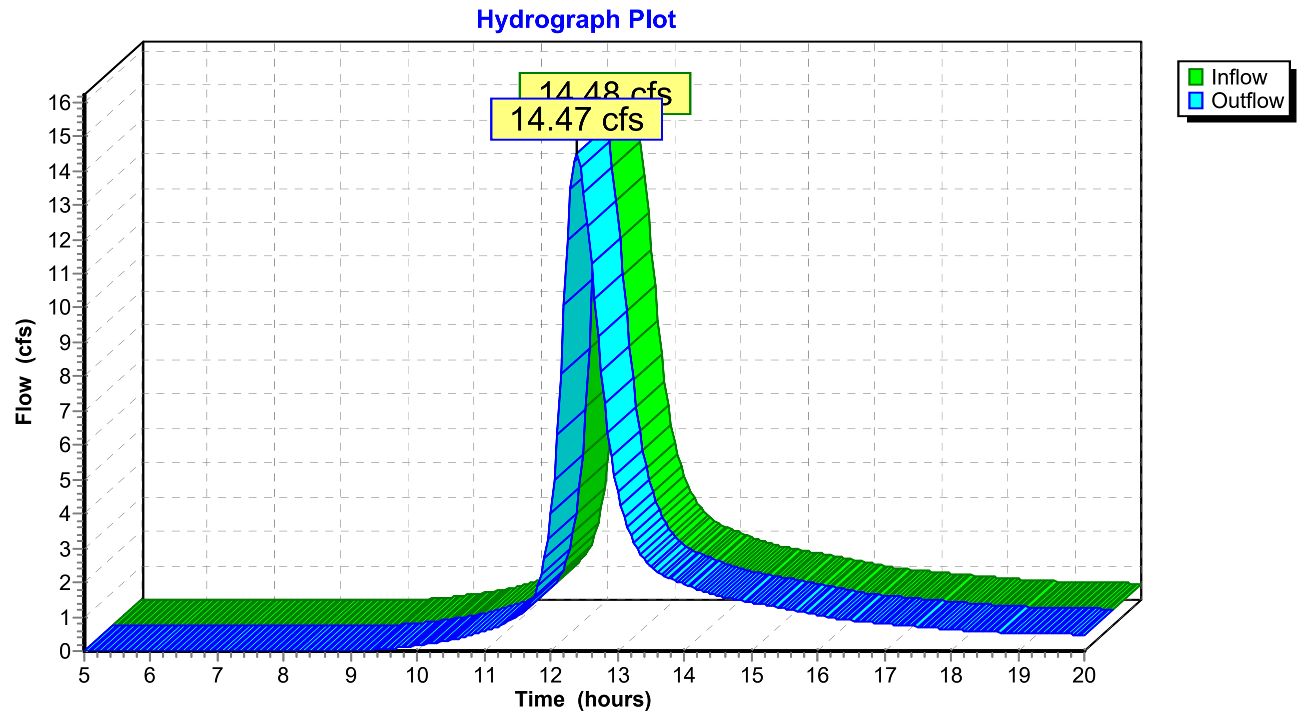
[65] Warning: Inlet elevation not specified

Inflow	=	14.48 cfs @	12.39 hrs, Volume=	1.620 af
Outflow	=	14.47 cfs @	12.39 hrs, Volume=	1.619 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.6 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.5 fps, Avg. Travel Time= 0.1 min

Peak Depth= 0.71'
Capacity at bank full= 71.84 cfs
8.00' x 1.50' deep Parabolic Channel, n= 0.035 Length= 10.0' Slope= 0.0500 '/'

Reach EX-ANALYSIS C: EX-ANALYSIS C



Reach EX-WETLAND CHANNEL: EX WETLAND CHANNEL 1 TO 2

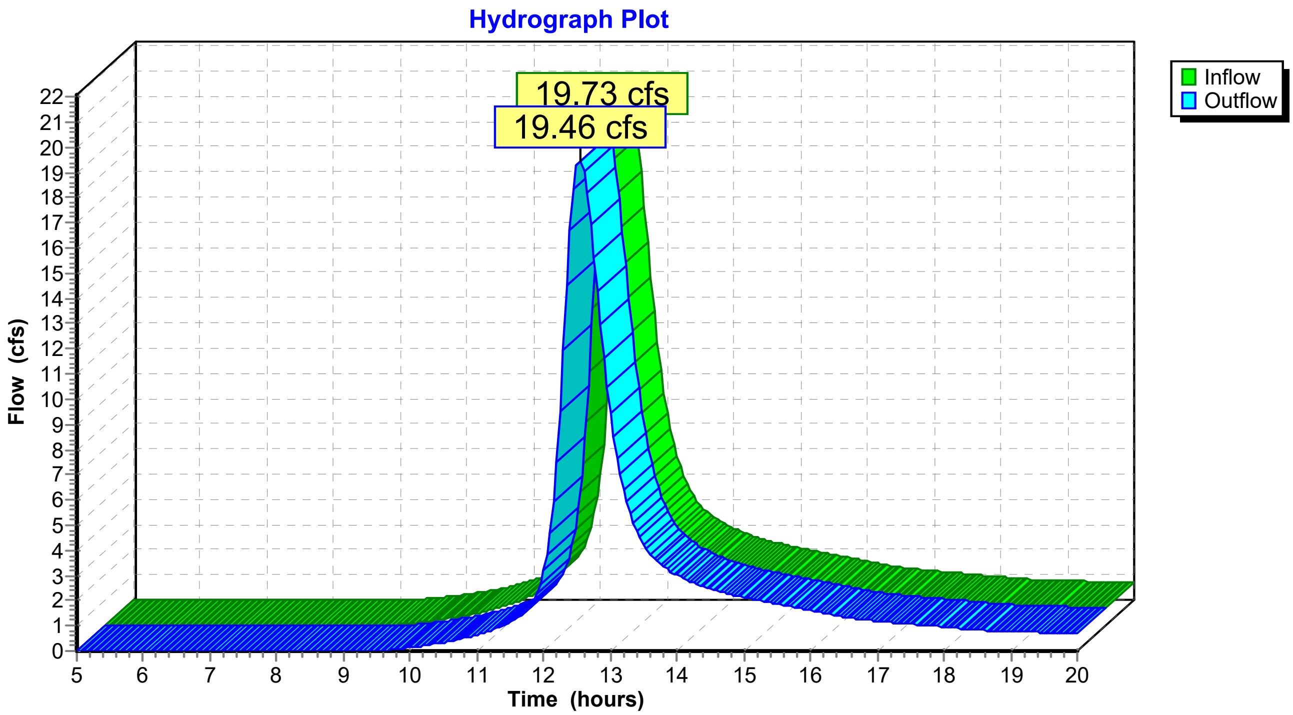
[65] Warning: Inlet elevation not specified

Inflow	=	19.73 cfs @	12.44 hrs, Volume=	2.317 af
Outflow	=	19.46 cfs @	12.54 hrs, Volume=	2.304 af, Atten= 1%, Lag= 6.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.7 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 2.6 fps, Avg. Travel Time= 7.7 min

Peak Depth= 0.86'
Capacity at bank full= 66.95 cfs
8.00' x 1.54' deep Parabolic Channel, n= 0.035 Length= 1,200.0' Slope= 0.0400 '/'

Reach EX-WETLAND CHANNEL: EX WETLAND CHANNEL 1 TO 2



Reach OCS-3 TO DMH-5: OCS3 TO DMH5

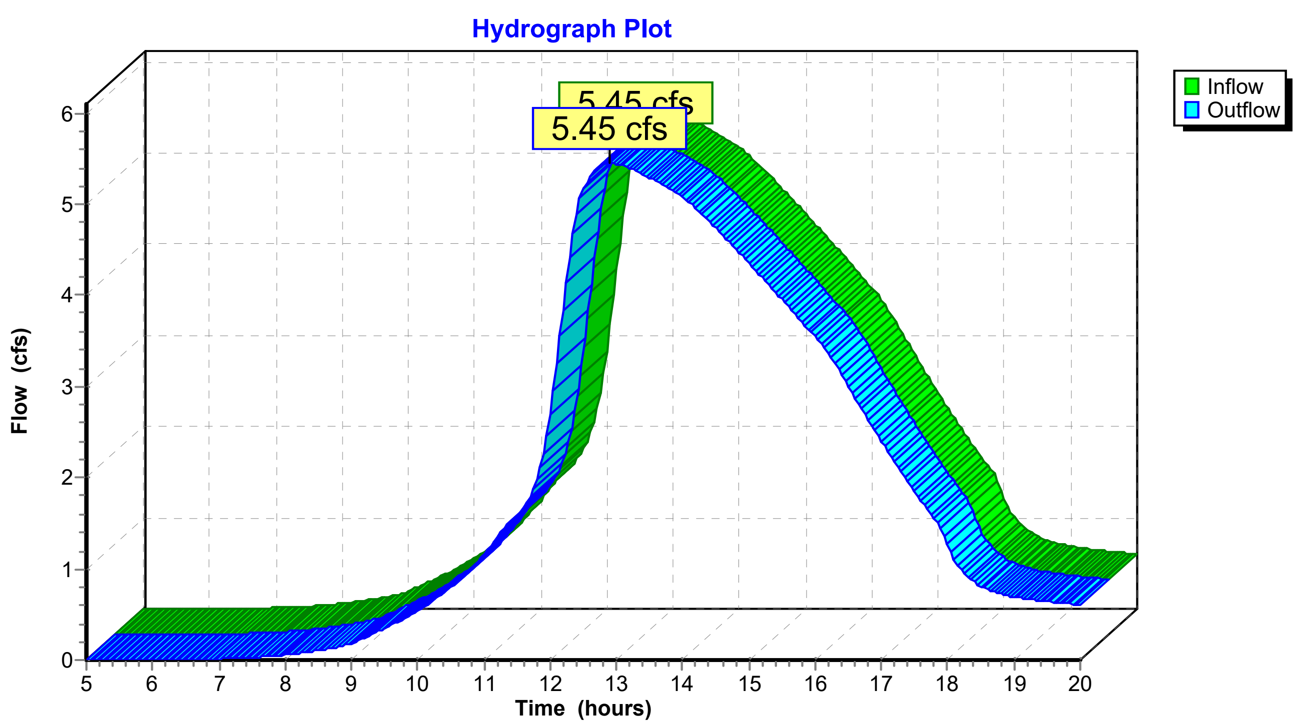
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow = 5.45 cfs @ 12.88 hrs, Volume= 2.321 af
Outflow = 5.45 cfs @ 12.91 hrs, Volume= 2.319 af, Atten= 0%, Lag= 1.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.9 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 3.0 fps, Avg. Travel Time= 1.5 min

Peak Depth= 0.77'
Capacity at bank full= 17.33 cfs
24.0" Diameter Pipe n= 0.012 Length= 274.0' Slope= 0.0050 '/'

Reach OCS-3 TO DMH-5: OCS3 TO DMH5



Reach OCS-4 TO OUTLET: OCS-4 TO OUTLET

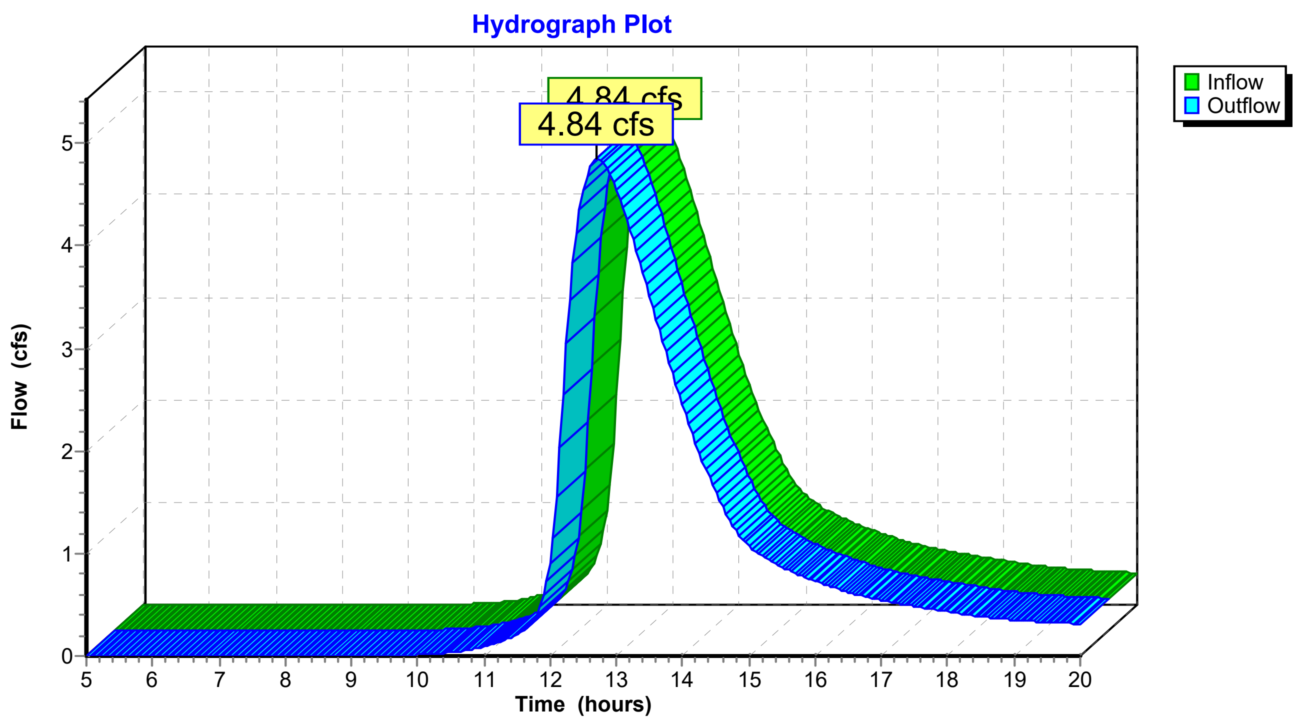
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow	=	4.84 cfs @	12.71 hrs,	Volume=	0.991 af
Outflow	=	4.84 cfs @	12.71 hrs,	Volume=	0.991 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.2 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.9 fps, Avg. Travel Time= 0.2 min

Peak Depth= 0.45'
Capacity at bank full= 44.02 cfs
24.0" Diameter Pipe n= 0.012 Length= 62.0' Slope= 0.0323 '/'

Reach OCS-4 TO OUTLET: OCS-4 TO OUTLET



Reach P-ANALYISIS C: P-ANALYSIS C

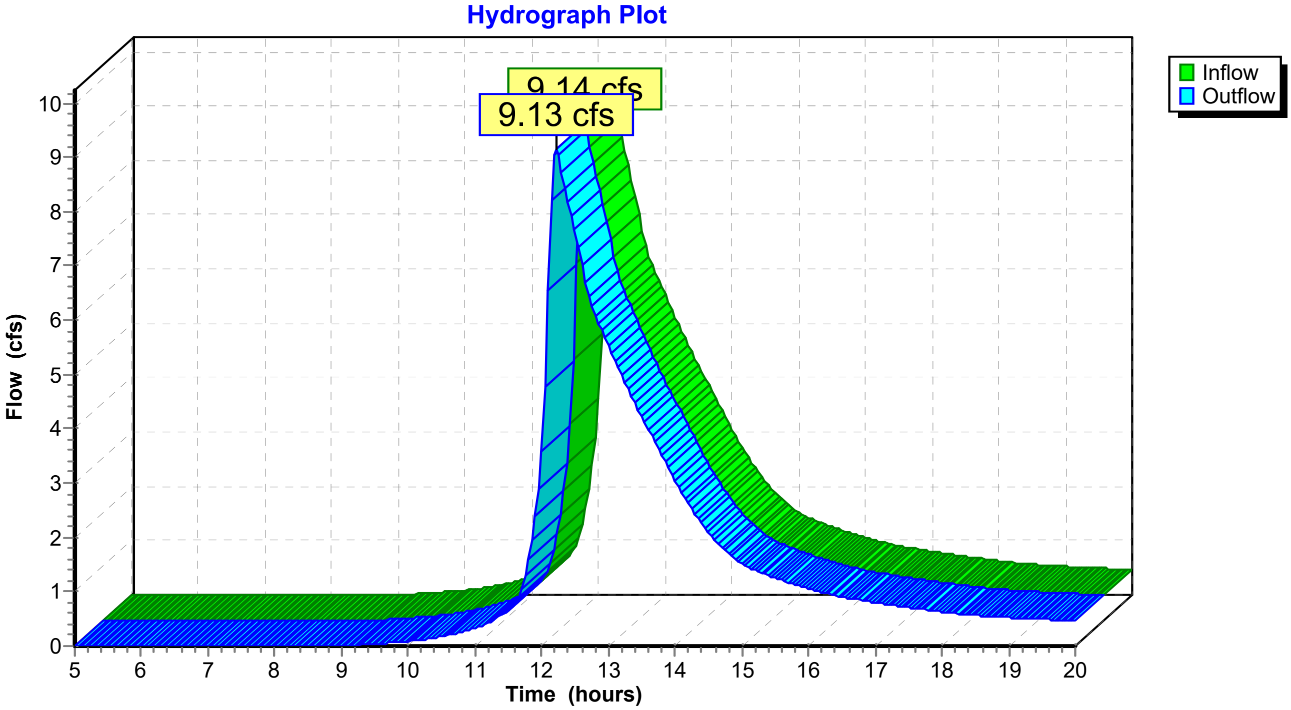
[65] Warning: Inlet elevation not specified

Inflow	=	9.14 cfs @	12.22 hrs,	Volume=	1.541 af
Outflow	=	9.13 cfs @	12.22 hrs,	Volume=	1.541 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.9 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.5 fps, Avg. Travel Time= 0.1 min

Peak Depth= 0.57'
Capacity at bank full= 71.84 cfs
8.00' x 1.50' deep Parabolic Channel, n= 0.035 Length= 10.0' Slope= 0.0500 '/'

Reach P-ANALYISIS C: P-ANALYSIS C



Reach P-ANALYSIS A: P-ANALYSIS A

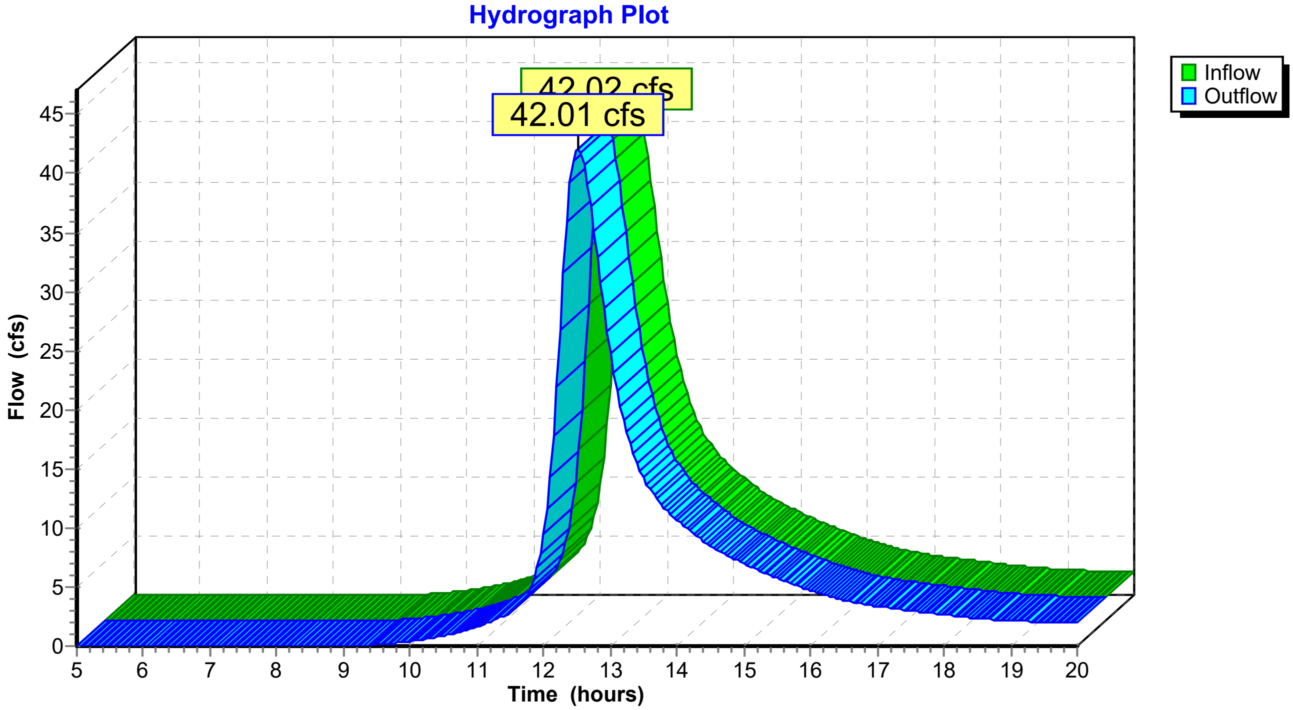
[65] Warning: Inlet elevation not specified

Inflow	=	42.02 cfs @	12.51 hrs, Volume=	6.314 af	
Outflow	=	42.01 cfs @	12.51 hrs, Volume=	6.313 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.7 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.8 fps, Avg. Travel Time= 0.0 min

Peak Depth= 1.16'
Capacity at bank full= 71.84 cfs
8.00' x 1.50' deep Parabolic Channel, n= 0.035 Length= 10.0' Slope= 0.0500 '/'

Reach P-ANALYSIS A: P-ANALYSIS A



Reach P-ANALYSIS B: P-ANALYSIS B

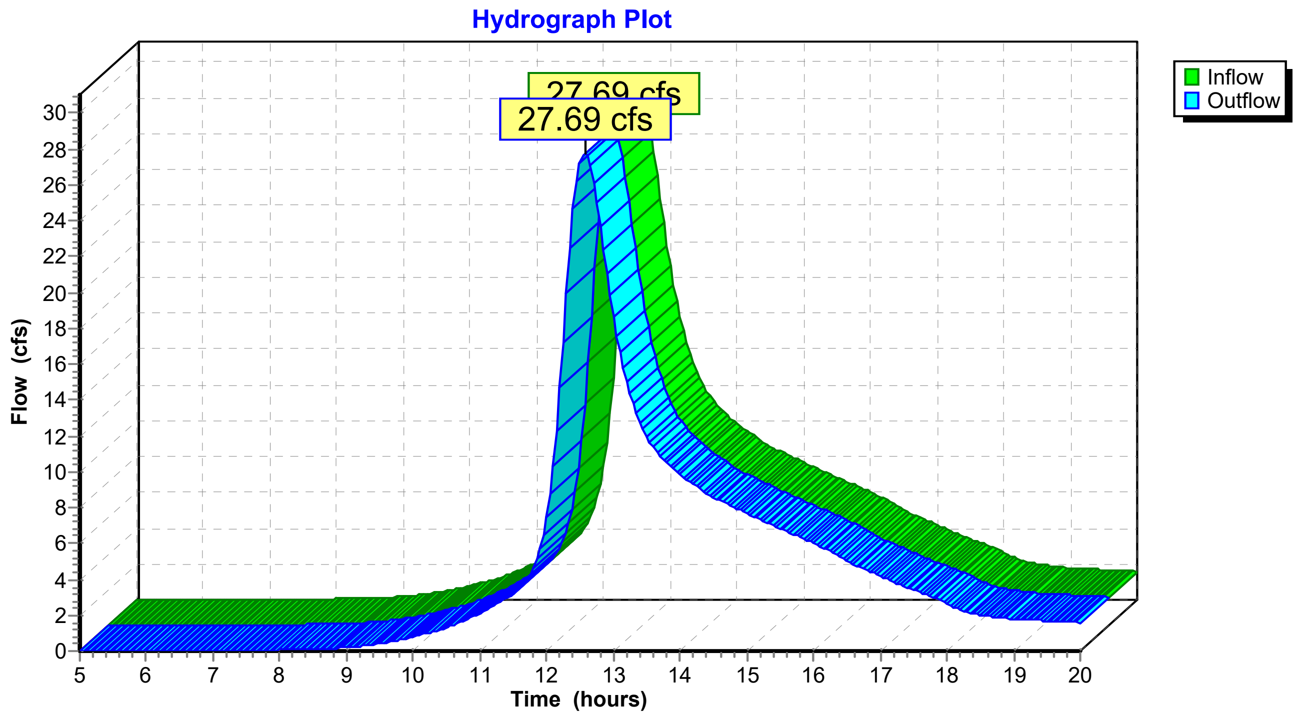
[65] Warning: Inlet elevation not specified

Inflow = 27.69 cfs @ 12.57 hrs, Volume= 5.532 af
Outflow = 27.69 cfs @ 12.57 hrs, Volume= 5.532 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.8 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.1 fps, Avg. Travel Time= 0.1 min

Peak Depth= 0.96'
Capacity at bank full= 71.84 cfs
8.00' x 1.50' deep Parabolic Channel, n= 0.035 Length= 10.0' Slope= 0.0500 '/'

Reach P-ANALYSIS B: P-ANALYSIS B



Reach P-WETLAND CHANNEL: p WETLAND CHANNEL 1 TO 2

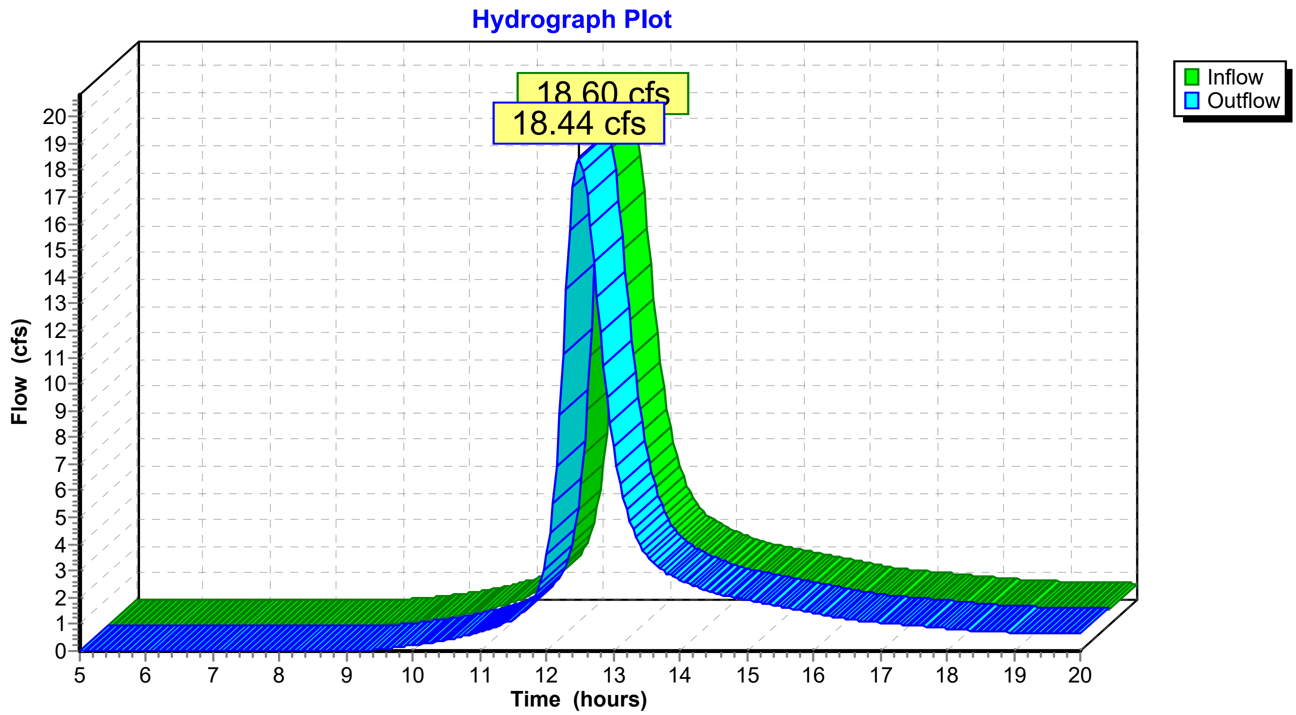
[65] Warning: Inlet elevation not specified

Inflow	=	18.60 cfs @	12.41 hrs, Volume=	2.138 af	
Outflow	=	18.44 cfs @	12.49 hrs, Volume=	2.130 af,	Atten= 1%, Lag= 4.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.0 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 2.7 fps, Avg. Travel Time= 5.5 min

Peak Depth= 0.80'
Capacity at bank full= 74.86 cfs
8.00' x 1.54' deep Parabolic Channel, n= 0.035 Length= 900.0' Slope= 0.0500 '/'

Reach P-WETLAND CHANNEL: p WETLAND CHANNEL 1 TO 2



Reach POND 1 OUTLET: POND 1 OUTLET

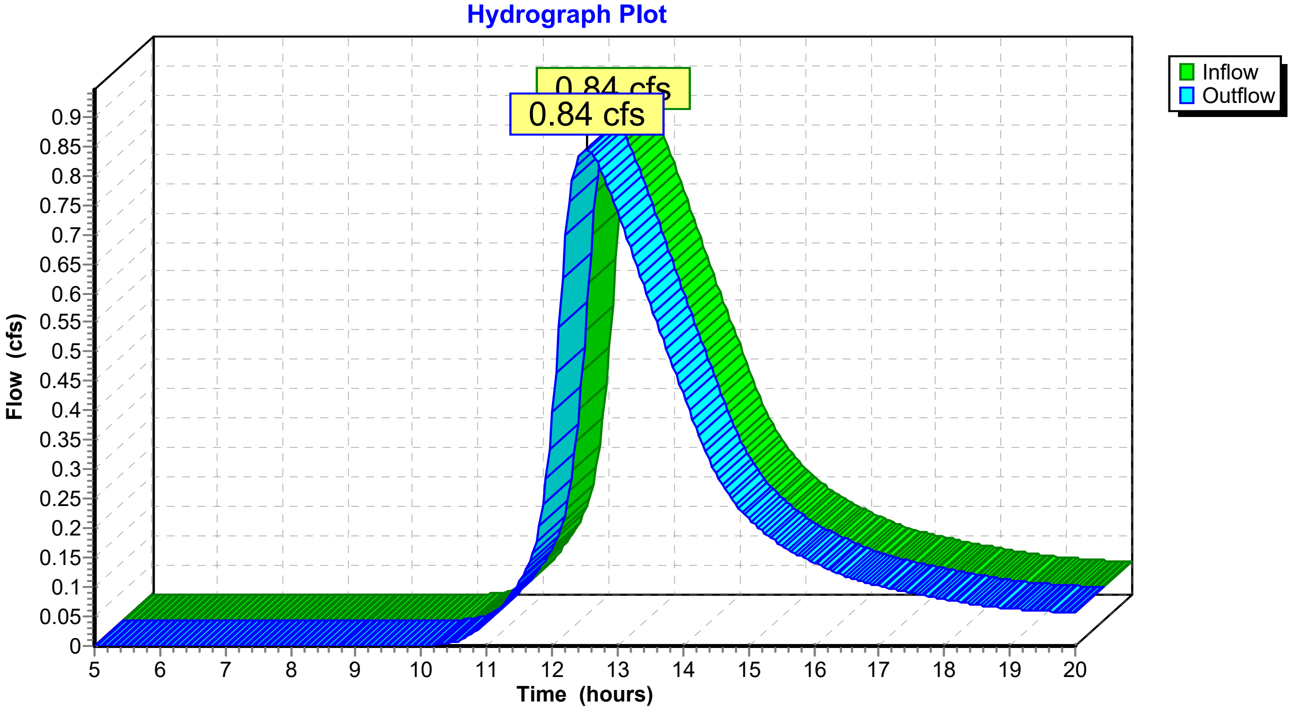
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow	=	0.84 cfs @	12.50 hrs,	Volume=	0.191 af
Outflow	=	0.84 cfs @	12.52 hrs,	Volume=	0.191 af, Atten= 0%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.1 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.7 fps, Avg. Travel Time= 1.1 min

Peak Depth= 0.38'
Capacity at bank full= 2.73 cfs
12.0" Diameter Pipe n= 0.012 Length= 112.0' Slope= 0.0050 '/'

Reach POND 1 OUTLET: POND 1 OUTLET



Reach POND 2 OUTLET: POND 2 OUTLET

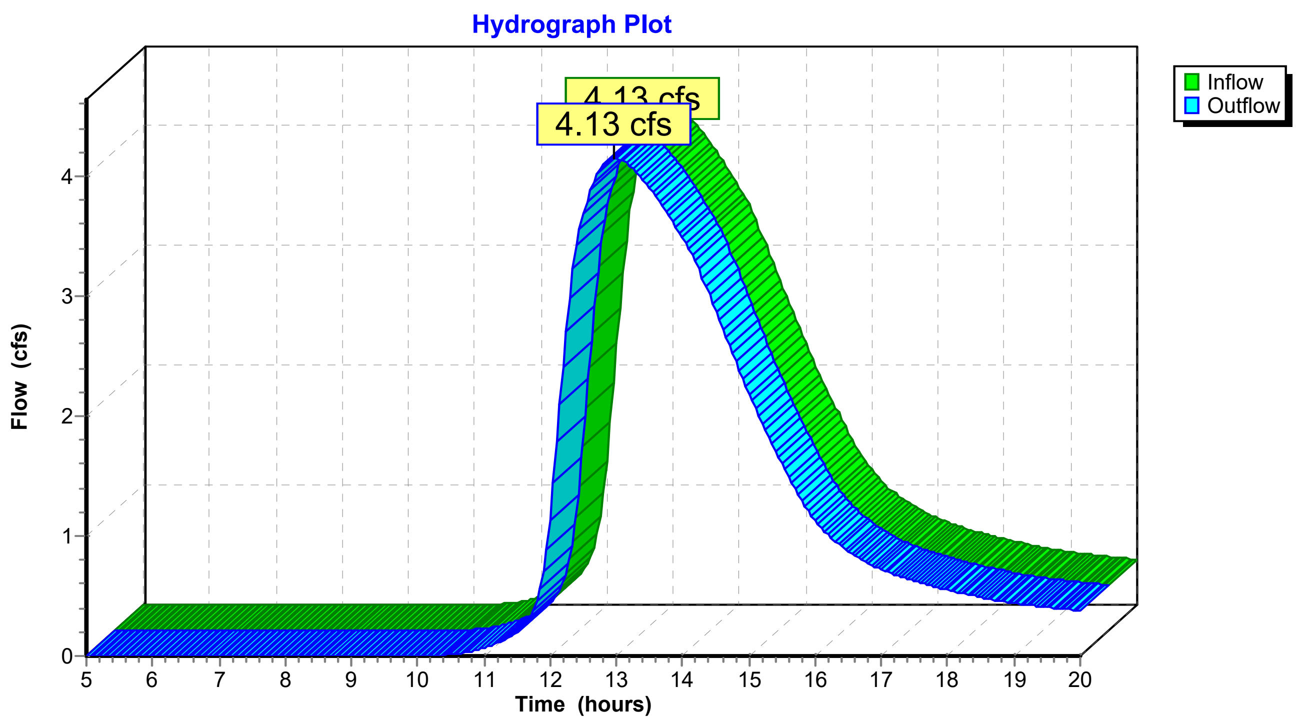
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow	=	4.13 cfs @	12.96 hrs,	Volume=	1.190 af
Outflow	=	4.13 cfs @	12.98 hrs,	Volume=	1.189 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.5 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.7 fps, Avg. Travel Time= 0.6 min

Peak Depth= 0.66'
Capacity at bank full= 17.33 cfs
24.0" Diameter Pipe n= 0.012 Length= 100.0' Slope= 0.0050 '/'

Reach POND 2 OUTLET: POND 2 OUTLET



Reach POND 3 OUTLET: POND 3 OUTLET

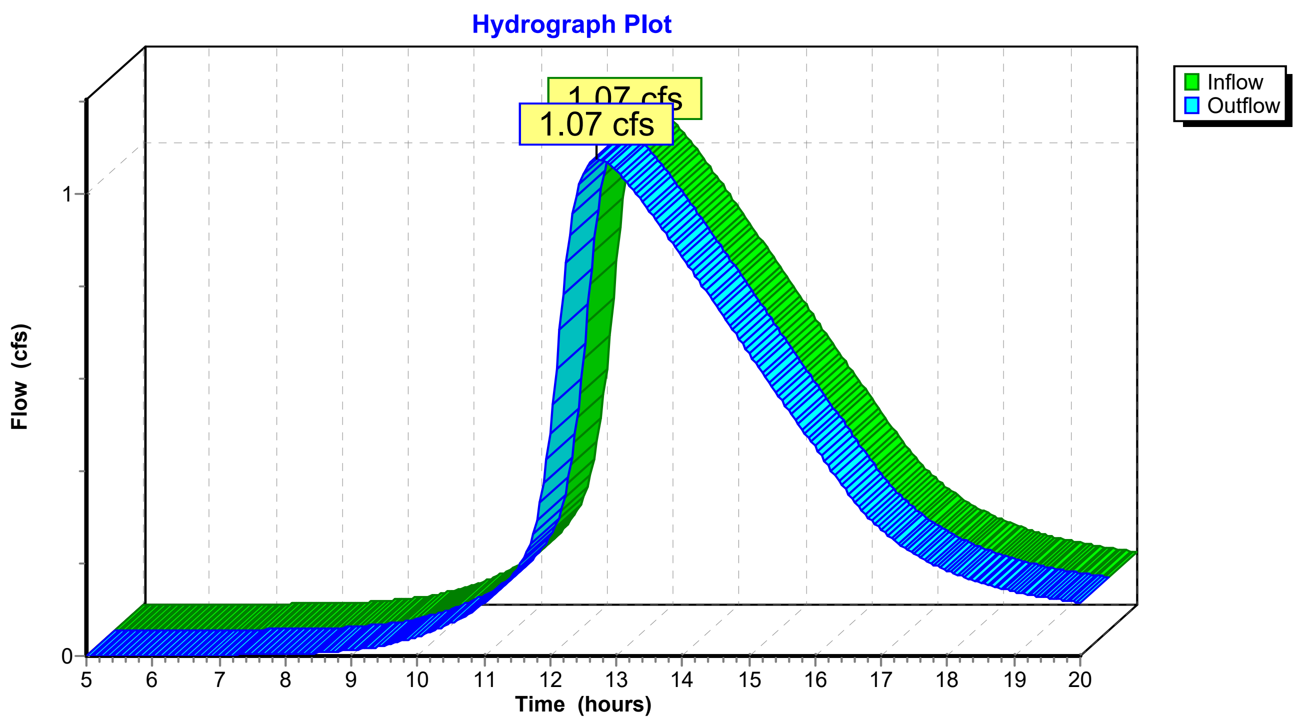
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow = 1.07 cfs @ 12.69 hrs, Volume= 0.364 af
Outflow = 1.07 cfs @ 12.71 hrs, Volume= 0.364 af, Atten= 0%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.3 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.8 fps, Avg. Travel Time= 1.5 min

Peak Depth= 0.44'
Capacity at bank full= 2.74 cfs
12.0" Diameter Pipe n= 0.012 Length= 165.0' Slope= 0.0050 '/'

Reach POND 3 OUTLET: POND 3 OUTLET



Reach SWALE: SWALE

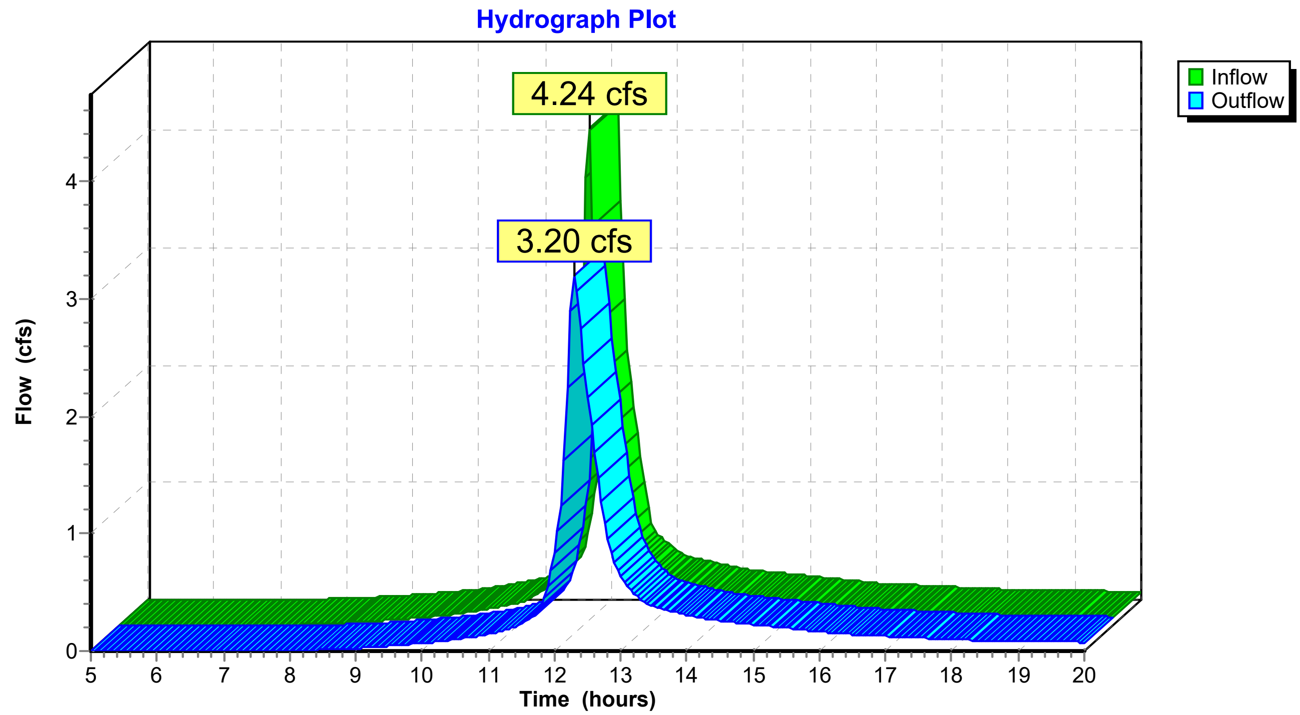
[65] Warning: Inlet elevation not specified

Inflow	=	4.24 cfs @	12.09 hrs,	Volume=	0.288 af
Outflow	=	3.20 cfs @	12.31 hrs,	Volume=	0.285 af, Atten= 24%, Lag= 13.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.1 fps, Min. Travel Time= 8.4 min
Avg. Velocity = 0.8 fps, Avg. Travel Time= 21.2 min

Peak Depth= 0.70'
Capacity at bank full= 6.90 cfs
4.00' x 1.00' deep Parabolic Channel, n= 0.040 Length= 1,050.0' Slope= 0.0100 '/'

Reach SWALE: SWALE



Reach SWALE FROM CULVERT 3 TO 2: SWALE FROM CULVERT 3 TO 2

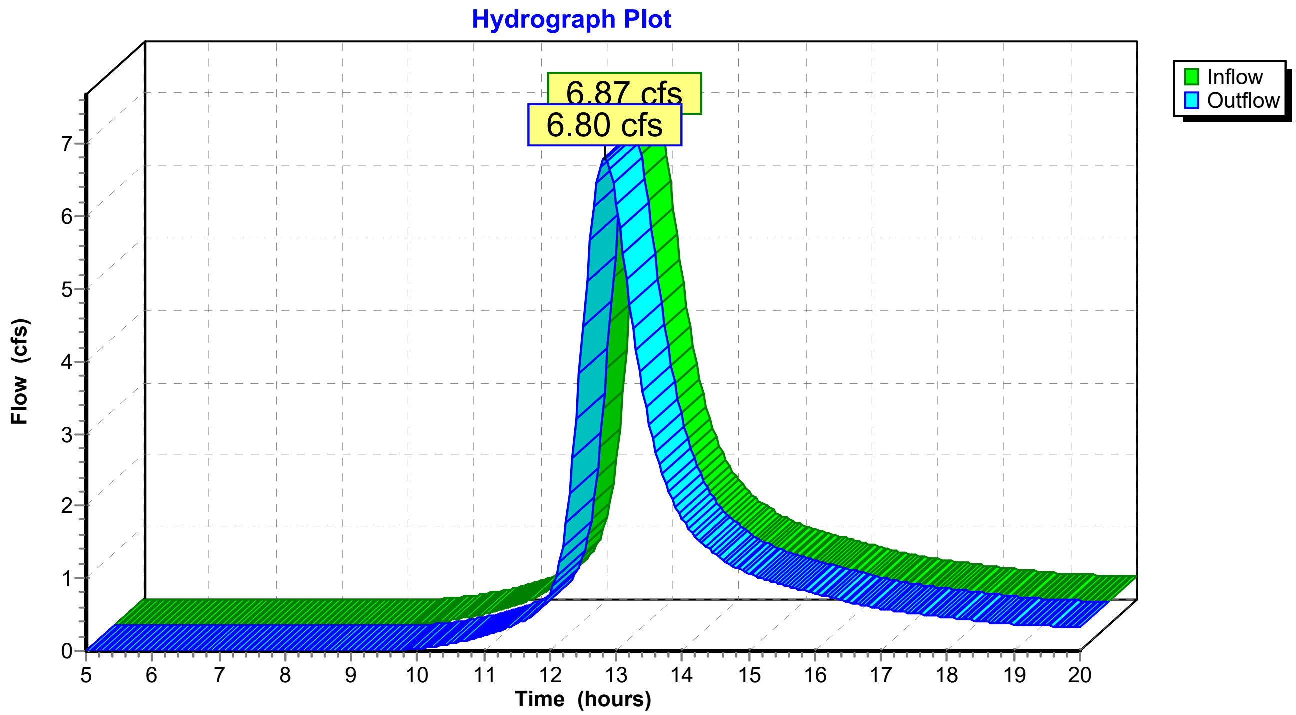
[65] Warning: Inlet elevation not specified

Inflow = 6.87 cfs @ 12.71 hrs, Volume= 1.028 af
Outflow = 6.80 cfs @ 12.82 hrs, Volume= 1.022 af, Atten= 1%, Lag= 6.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.5 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 1.7 fps, Avg. Travel Time= 7.7 min

Peak Depth= 0.71'
Capacity at bank full= 32.86 cfs
6.00' x 1.50' deep Parabolic Channel, n= 0.035 Length= 800.0' Slope= 0.0200 '/'

Reach SWALE FROM CULVERT 3 TO 2: SWALE FROM CULVERT 3 TO 2



Pond ATTENUATION 1: ATTENUATION POND 1

Inflow	=	23.27 cfs @	12.26 hrs, Volume=	2.346 af
Outflow	=	5.45 cfs @	12.88 hrs, Volume=	2.321 af, Atten= 77%, Lag= 37.1 min
Primary	=	5.45 cfs @	12.88 hrs, Volume=	2.321 af

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

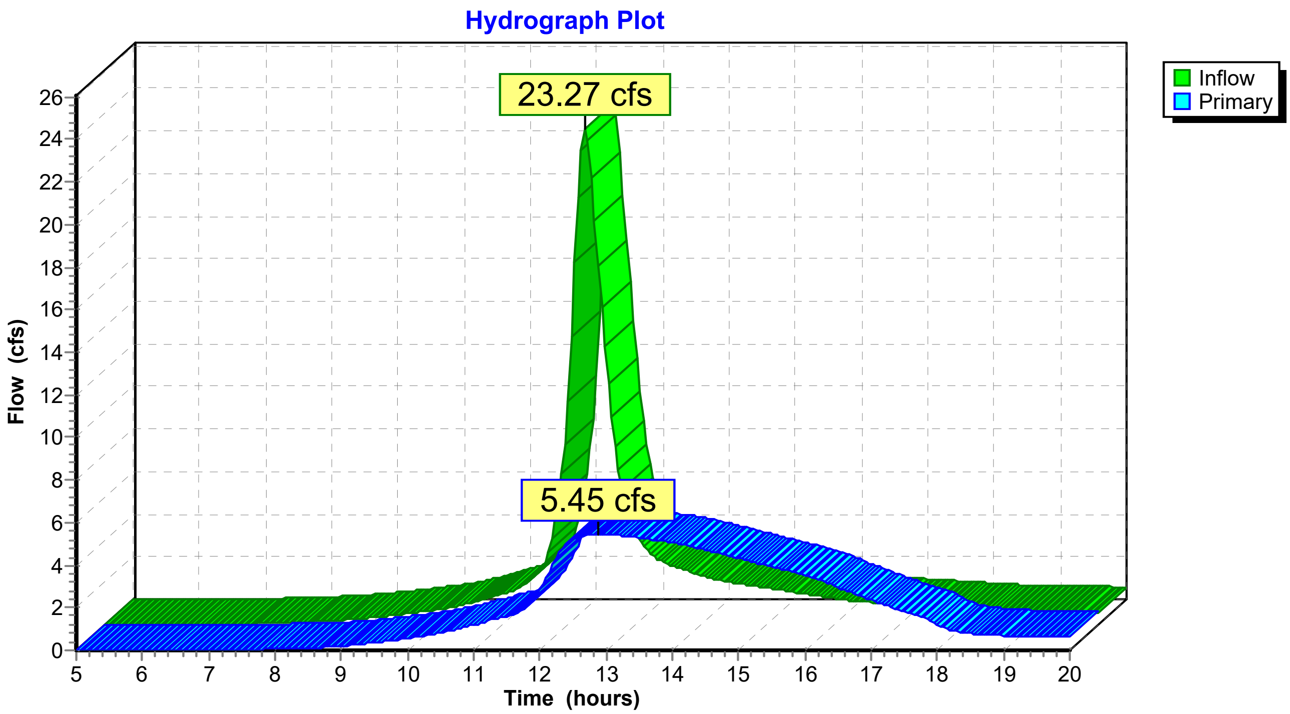
Peak Elev= 376.63' Storage= 38,937 cf
Plug-Flow detention time= 74.3 min calculated for 2.313 af (99% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.33	5,500	0	0
374.00	7,295	10,684	10,684
376.00	11,800	19,095	29,779
378.00	17,108	28,908	58,687
380.00	36,500	53,608	112,295

Primary OutFlow (Free Discharge)
—1=Orifice/Grate
—2=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	372.33'	**10.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
2	Primary	378.00'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond ATTENUATION 1: ATTENUATION POND 1



Pond ATTENUATION BASIN 1: ATTENUATION BASIN 1

Inflow	=	2.69 cfs @	12.14 hrs, Volume=	0.201 af
Outflow	=	0.84 cfs @	12.50 hrs, Volume=	0.191 af, Atten= 69%, Lag= 21.5 min
Primary	=	0.84 cfs @	12.50 hrs, Volume=	0.191 af

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

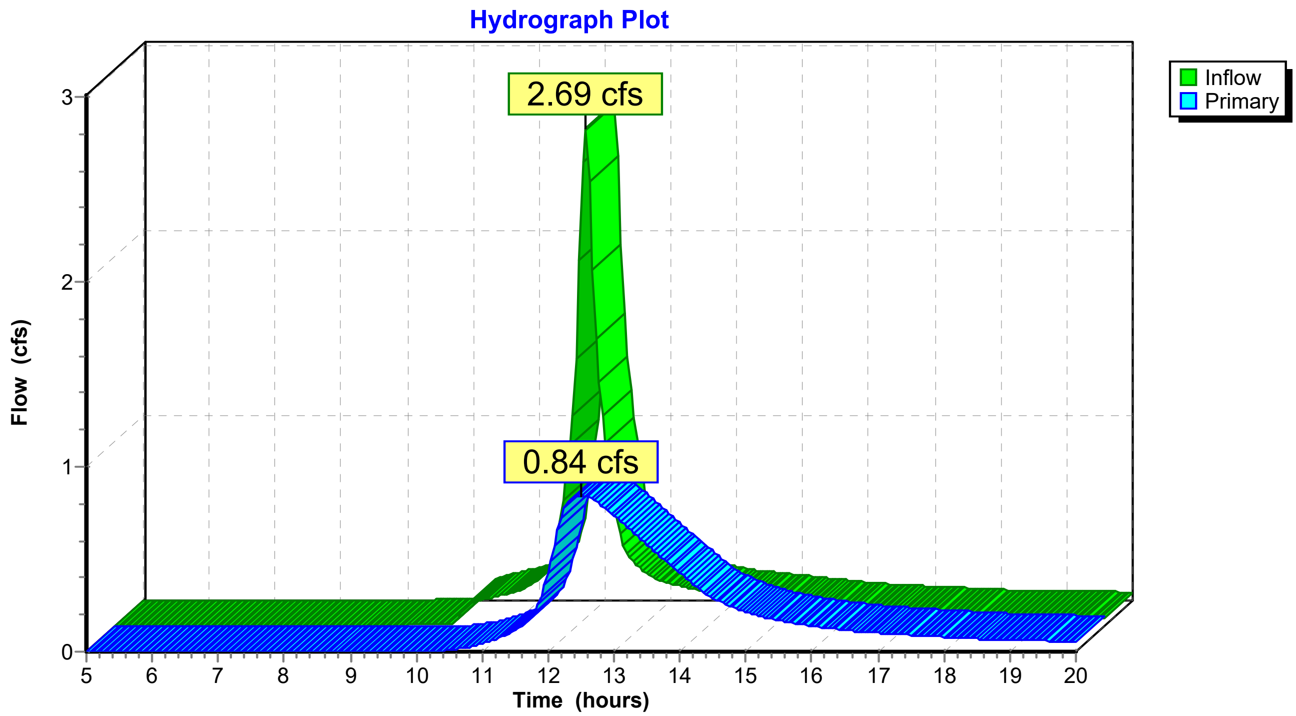
Peak Elev= 348.05' Storage= 3,303 cf
Plug-Flow detention time= 66.7 min calculated for 0.190 af (95% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
347.00	2,800	0	0
350.00	3,500	9,450	9,450
352.00	5,600	9,100	18,550

Primary OutFlow (Free Discharge)
1=Orifice/Grate
2=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	347.00'	**6.0" Vert. Orifice/Grate** C= 0.600
2	Primary	350.00'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond ATTENUATION BASIN 1: ATTENUATION BASIN 1



Pond ATTENUATION BASIN 2: ATTENUATION BASIN 2

Inflow	=	9.42 cfs @	12.36 hrs,	Volume=	1.225 af
Outflow	=	4.13 cfs @	12.96 hrs,	Volume=	1.190 af, Atten= 56%, Lag= 36.1 min
Primary	=	4.13 cfs @	12.96 hrs,	Volume=	1.190 af

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

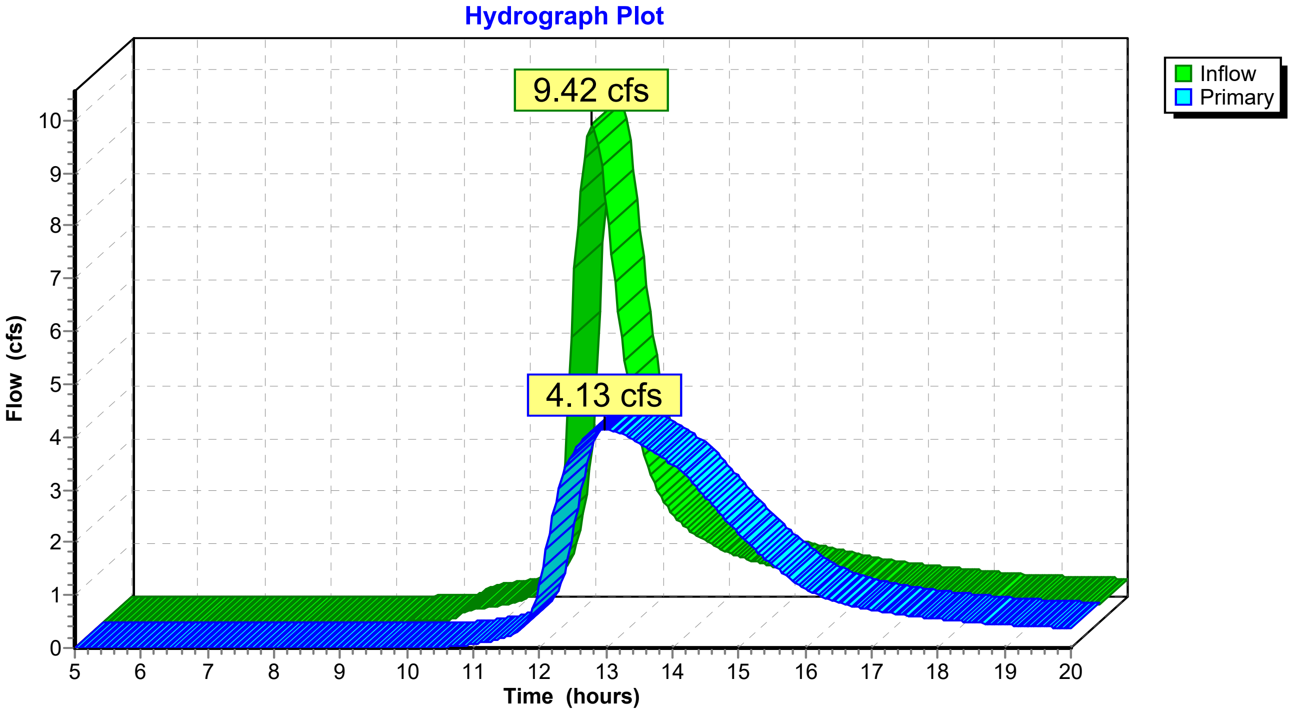
Peak Elev= 360.89' Storage= 16,300 cf
Plug-Flow detention time= 53.0 min calculated for 1.190 af (97% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
358.00	3,879	0	0
360.00	5,800	9,679	9,679
362.00	9,000	14,800	24,479
364.00	23,500	32,500	56,979

Primary OutFlow (Free Discharge)
—1=Orifice/Grate
—2=Orifice/Grate
—3=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	358.00'	**10.0" Vert. Orifice/Grate** C= 0.600
2	Primary	361.00'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600
3	Primary	362.50'	**5.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4. Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76

Pond ATTENUATION BASIN 2: ATTENUATION BASIN 2



Pond ATTENUATION BASIN 6: ATTENUATION BASIN 6

Inflow	=	10.49 cfs @	12.29 hrs, Volume=	1.013 af
Outflow	=	4.84 cfs @	12.71 hrs, Volume=	0.991 af, Atten= 54%, Lag= 25.0 min
Primary	=	4.84 cfs @	12.71 hrs, Volume=	0.991 af

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

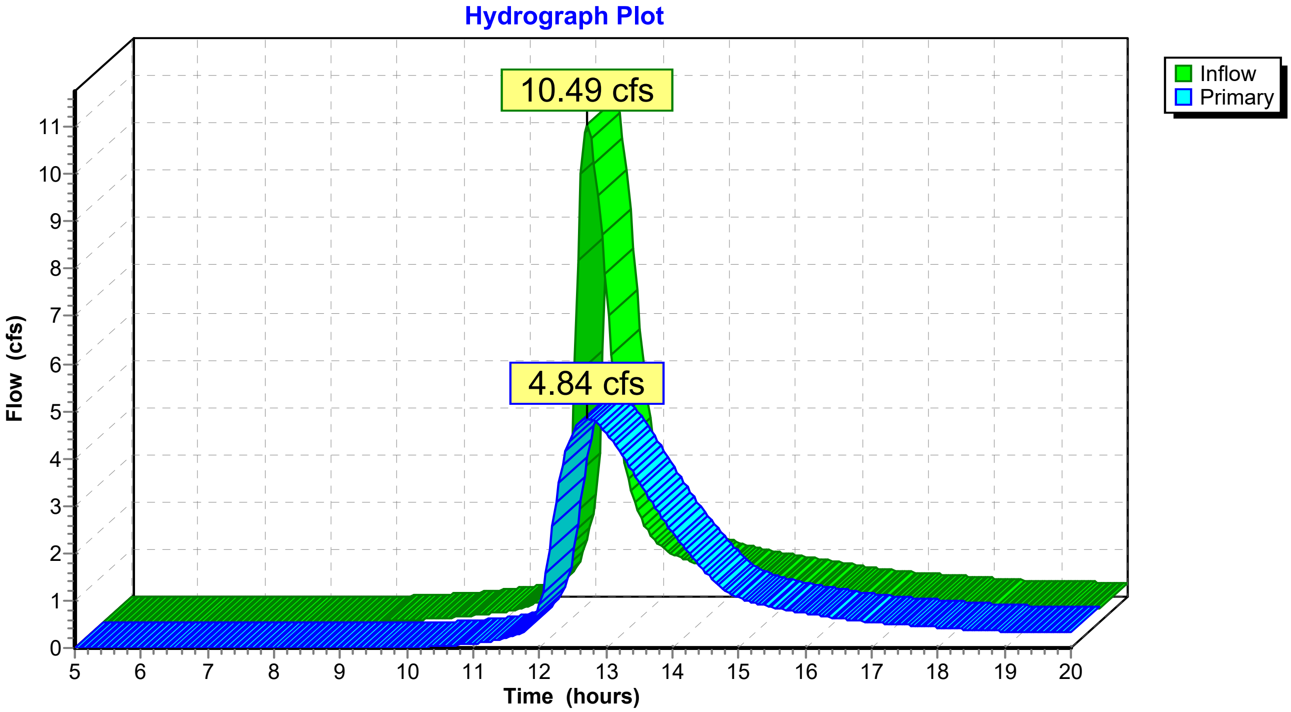
Peak Elev= 415.82' Storage= 12,175 cf
Plug-Flow detention time= 35.4 min calculated for 0.988 af (98% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
412.00	1,875	0	0
416.00	4,500	12,750	12,750
418.00	9,000	13,500	26,250

Primary OutFlow (Free Discharge)
1=Orifice/Grate
2=Orifice/Grate
3=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	412.00'	**10.0" Vert. Orifice/Grate** C= 0.600
2	Primary	416.50'	**2.00' x 2.00' Vert. Orifice/Grate** C= 0.600
3	Primary	417.00'	**5.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4. Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76

Pond ATTENUATION BASIN 6: ATTENUATION BASIN 6



Pond ATTENUATION POND 3: ATTENUATION POND 3

Inflow	=	3.98 cfs @	12.17 hrs, Volume=	0.385 af
Outflow	=	1.07 cfs @	12.69 hrs, Volume=	0.364 af, Atten= 73%, Lag= 30.8 min
Primary	=	1.07 cfs @	12.69 hrs, Volume=	0.364 af

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

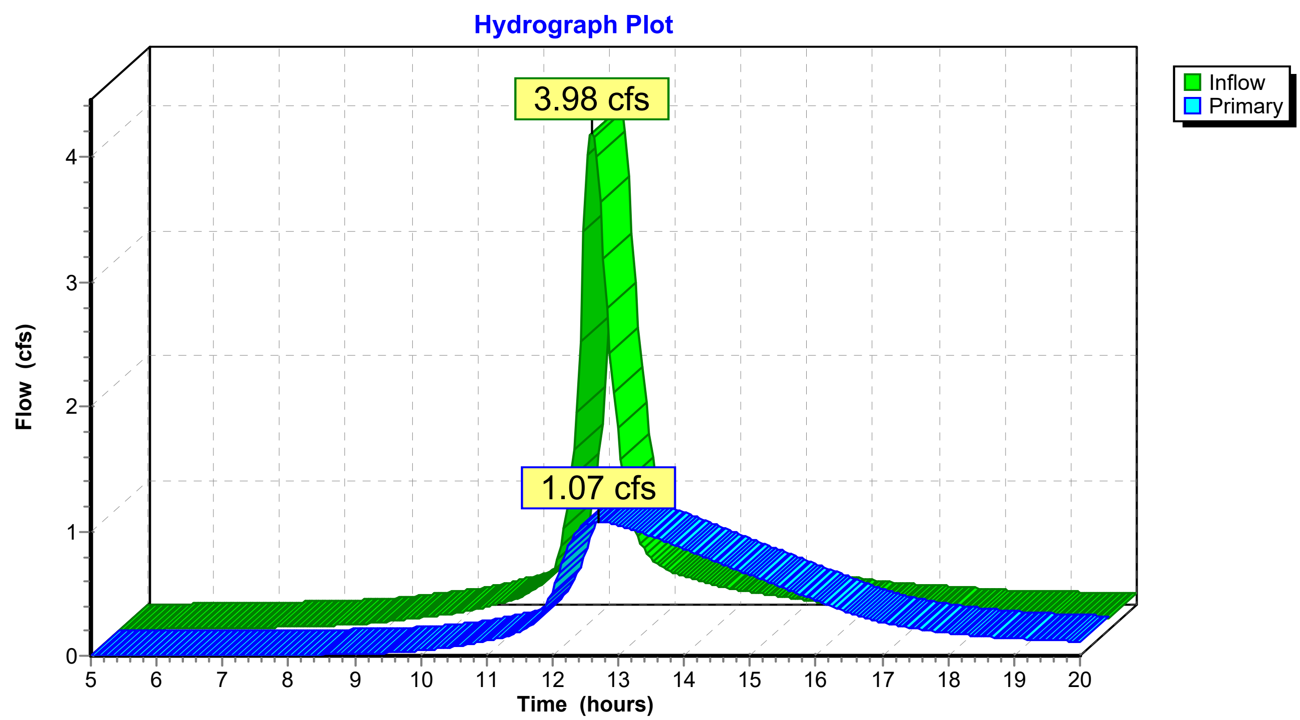
Peak Elev= 369.54' Storage= 6,933 cf
Plug-Flow detention time= 94.4 min calculated for 0.363 af (94% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
368.00	3,500	0	0
370.00	5,500	9,000	9,000
372.00	10,000	15,500	24,500

Primary OutFlow (Free Discharge)
1=Orifice/Grate
2=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	368.00'	**6.0" Vert. Orifice/Grate** C= 0.600
2	Primary	371.00'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond ATTENUATION POND 3: ATTENUATION POND 3



Pond BIO BASIN 2: BIO BASIN 2

[91] Warning: Storage range exceeded by 0.14'
[80] Warning: Exceeded Pond PLUNGE 5 by 0.23' @ 19.95 hrs (1.89 cfs)

Inflow	=	6.29 cfs @	12.30 hrs,	Volume=	0.592 af
Outflow	=	6.00 cfs @	12.37 hrs,	Volume=	0.535 af, Atten= 5%, Lag= 4.3 min
Primary	=	6.00 cfs @	12.37 hrs,	Volume=	0.535 af

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

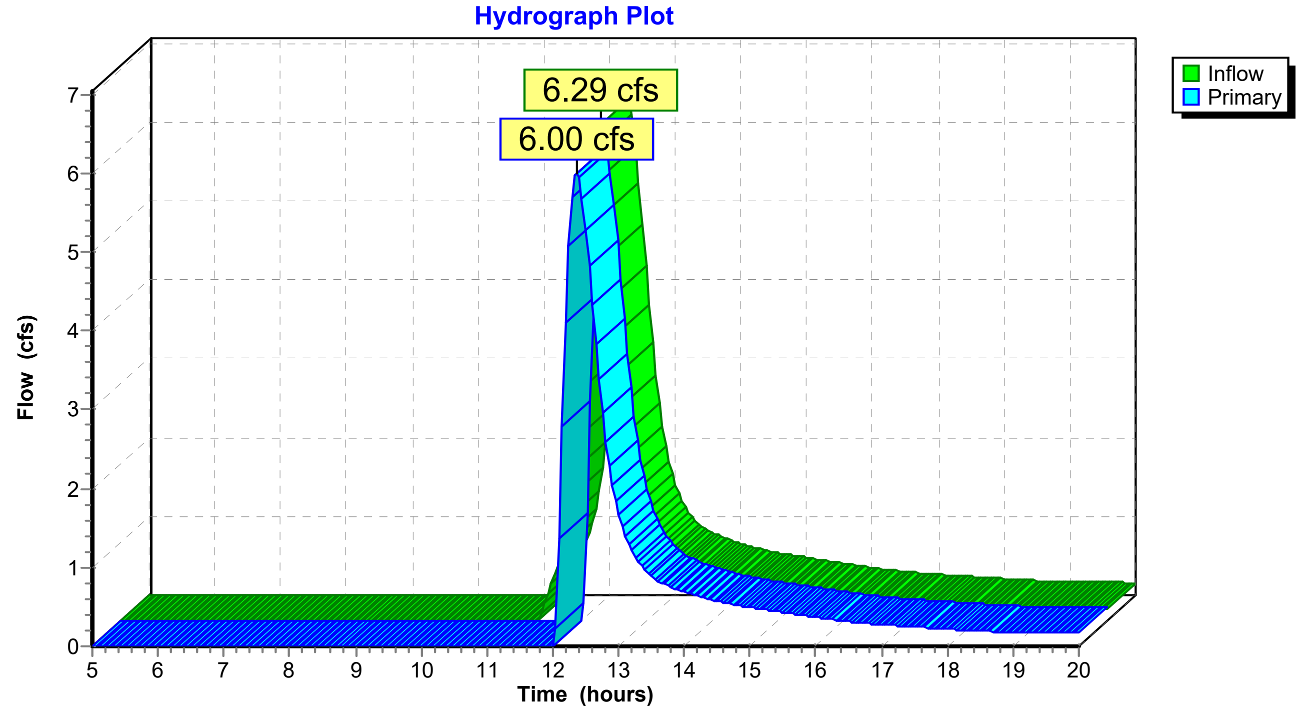
Peak Elev= 418.14' Storage= 4,112 cf
Plug-Flow detention time= 44.6 min calculated for 0.533 af (90% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
417.25	4,200	0	0
418.00	5,000	3,450	3,450

Primary OutFlow (Free Discharge)
1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	417.75'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Pond BIO BASIN 2: BIO BASIN 2



Pond BIORETENTION 1: BIORETENTION BASIN 1

[80] Warning: Exceeded Pond PLUNGE 1 by 0.65' @ 12.80 hrs (11.56 cfs)

Inflow = 8.46 cfs @ 12.25 hrs, Volume= 0.803 af
Outflow = 5.77 cfs @ 12.47 hrs, Volume= 0.725 af, Atten= 32%, Lag= 12.9 min
Primary = 5.77 cfs @ 12.47 hrs, Volume= 0.725 af

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

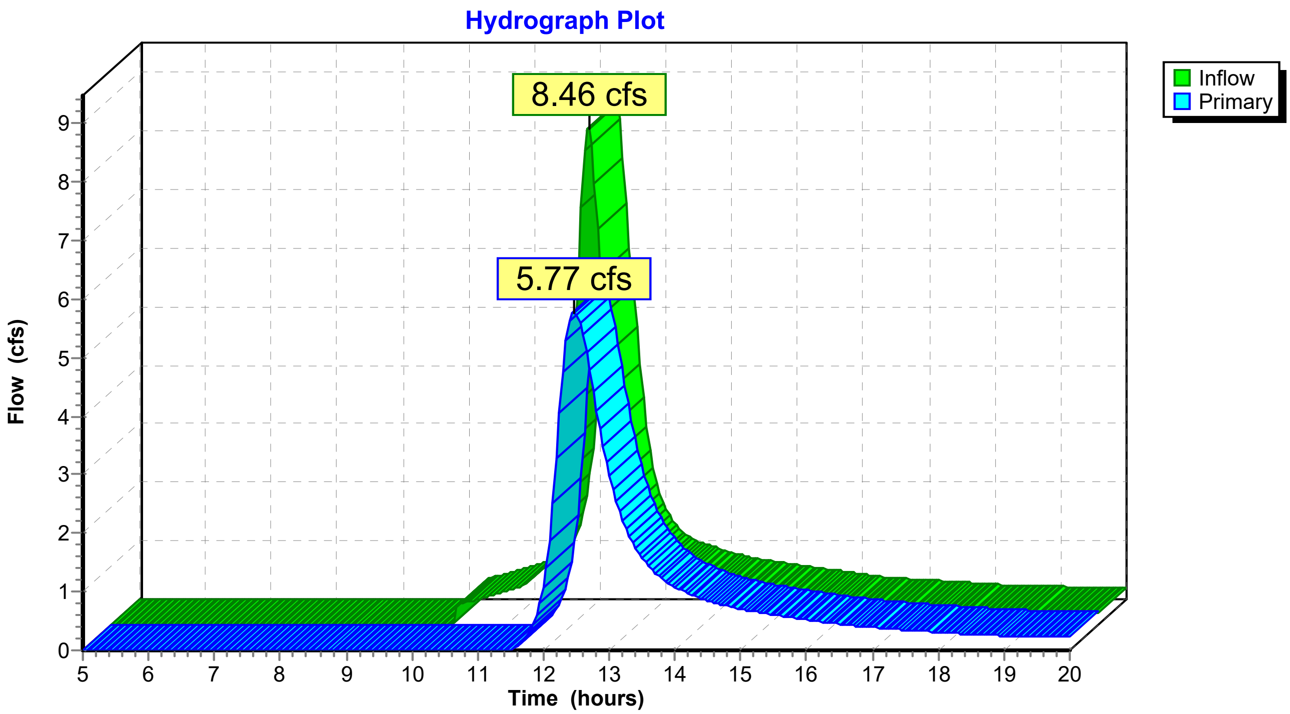
Peak Elev= 362.58' Storage= 10,394 cf
Plug-Flow detention time= 65.6 min calculated for 0.723 af (90% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
361.50	4,800	0	0
362.00	5,200	2,500	2,500
364.00	22,000	27,200	29,700

Primary OutFlow (Free Discharge)
└─1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	362.00'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Pond BIORETENTION 1: BIORETENTION BASIN 1



Pond CB-1: CB-1

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1

Inflow	=	0.36 cfs @	12.09 hrs,	Volume=	0.027 af
Outflow	=	0.36 cfs @	12.09 hrs,	Volume=	0.027 af, Atten= 0%, Lag= 0.2 min
Primary	=	0.36 cfs @	12.09 hrs,	Volume=	0.027 af

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

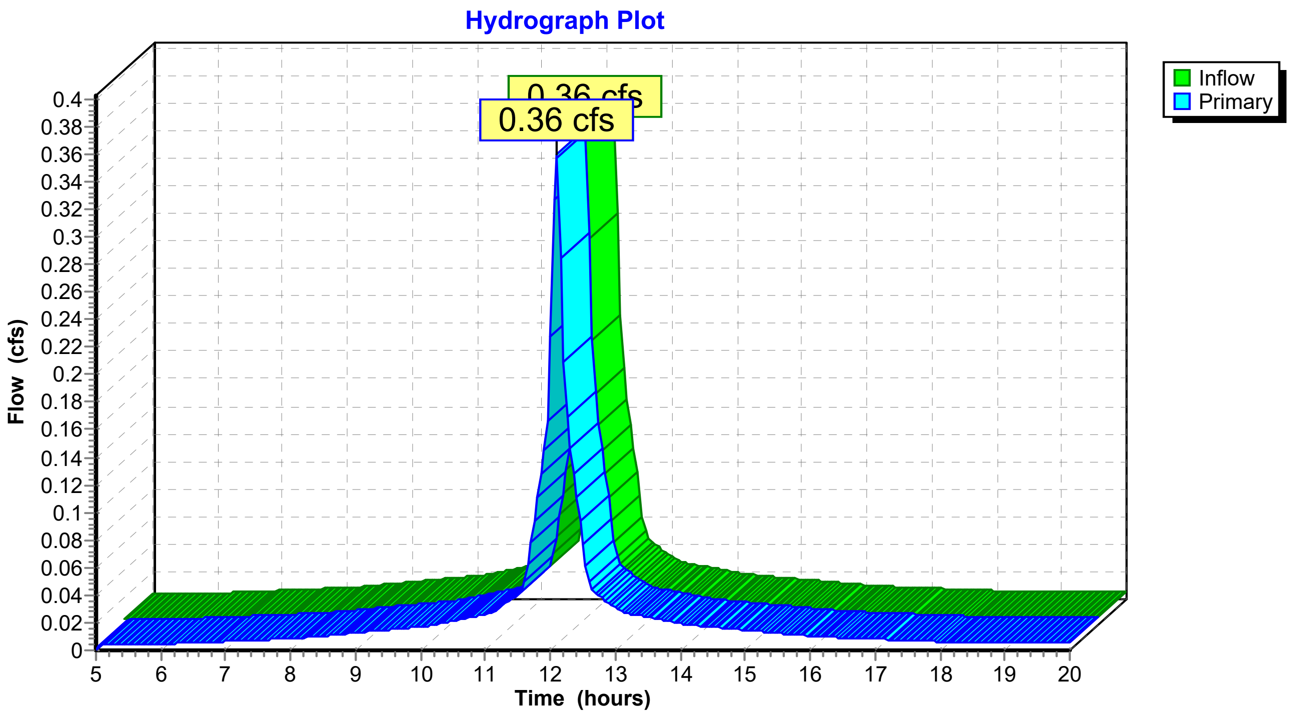
Peak Elev= 358.10' Storage= 6 cf
Plug-Flow detention time= 1.1 min calculated for 0.027 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.75	16	0	0
360.25	16	40	40

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	357.75'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 357.63' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-1: CB-1



Pond CB-10: CB-10

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-9 Primary device # 1 INLET by 0.34'

Inflow	=	8.24 cfs @	12.24 hrs, Volume=	0.810 af
Outflow	=	8.24 cfs @	12.24 hrs, Volume=	0.810 af, Atten= 0%, Lag= 0.0 min
Primary	=	8.24 cfs @	12.24 hrs, Volume=	0.810 af

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

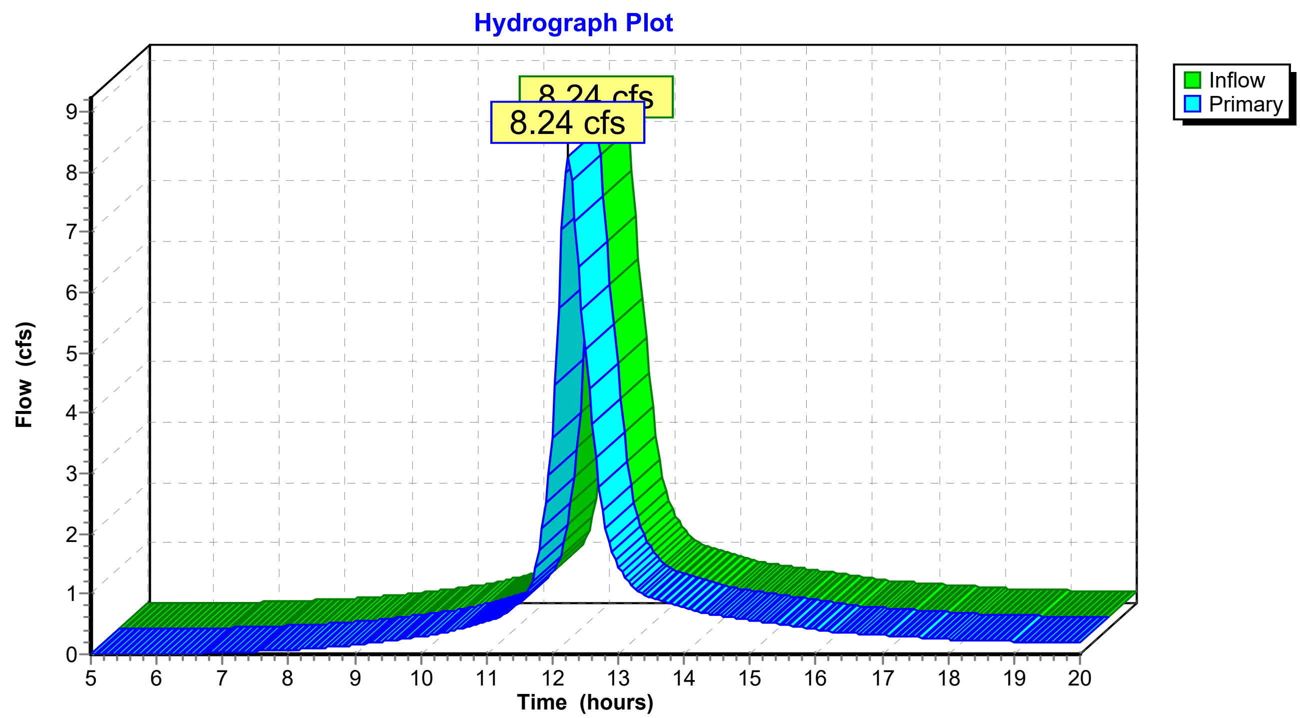
Peak Elev= 370.97' Storage= 21 cf
Plug-Flow detention time= 0.1 min calculated for 0.810 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
369.68	16	0	0
373.74	16	65	65

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	369.68'	**24.0" x 181.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 364.65' S= 0.0278 '/' n= 0.012 Cc= 0.900

Pond CB-10: CB-10



Pond CB-11: CB-11

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-10 Primary device # 1 OUTLET by 1.45'

Inflow	=	8.37 cfs @	12.24 hrs,	Volume=	0.830 af
Outflow	=	8.37 cfs @	12.24 hrs,	Volume=	0.830 af, Atten= 0%, Lag= 0.0 min
Primary	=	8.37 cfs @	12.24 hrs,	Volume=	0.830 af

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

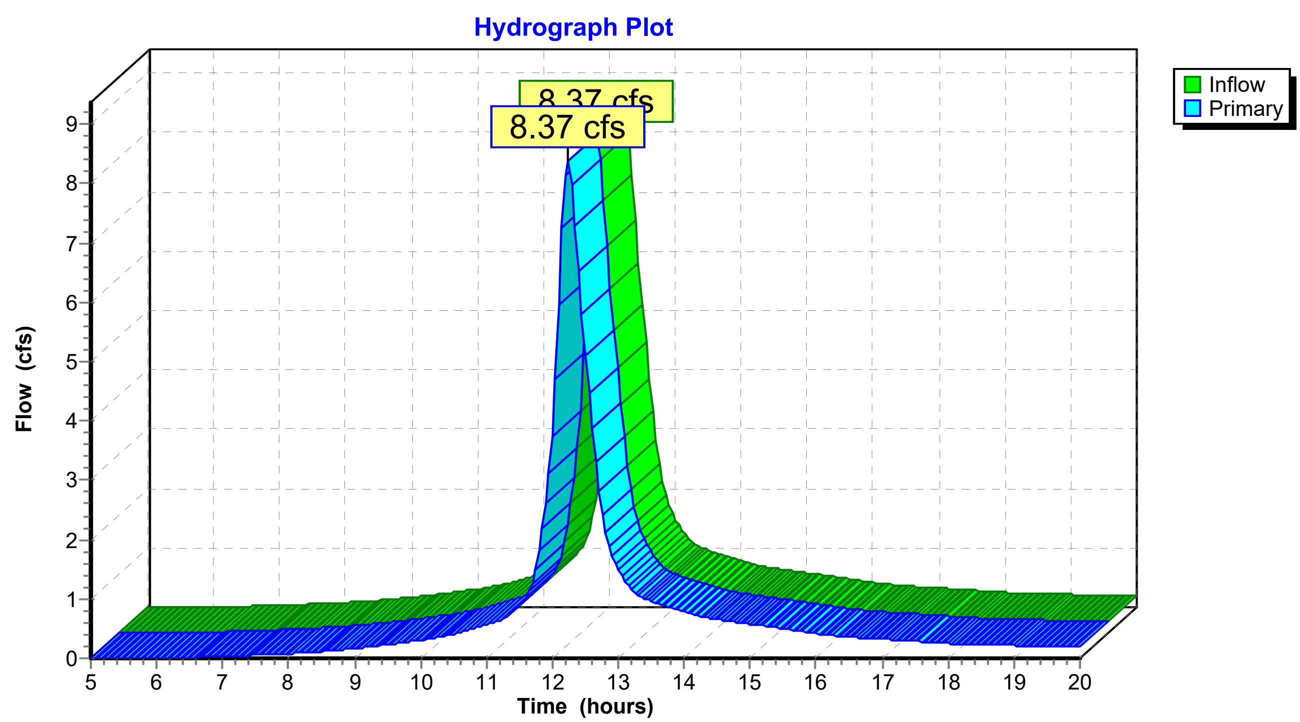
Peak Elev= 366.10' Storage= 23 cf
Plug-Flow detention time= 0.1 min calculated for 0.827 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
364.64	16	0	0
368.14	16	56	56

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	364.64'	**24.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 364.40' S= 0.0100 '/' n= 0.012 Cc= 0.900

Pond CB-11: CB-11



Pond CB-11A: CB-11A

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-11 Primary device # 1 INLET by 1.20'

Inflow	=	8.47 cfs @	12.24 hrs,	Volume=	0.846 af
Outflow	=	8.47 cfs @	12.24 hrs,	Volume=	0.846 af, Atten= 0%, Lag= 0.0 min
Primary	=	8.47 cfs @	12.24 hrs,	Volume=	0.846 af

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

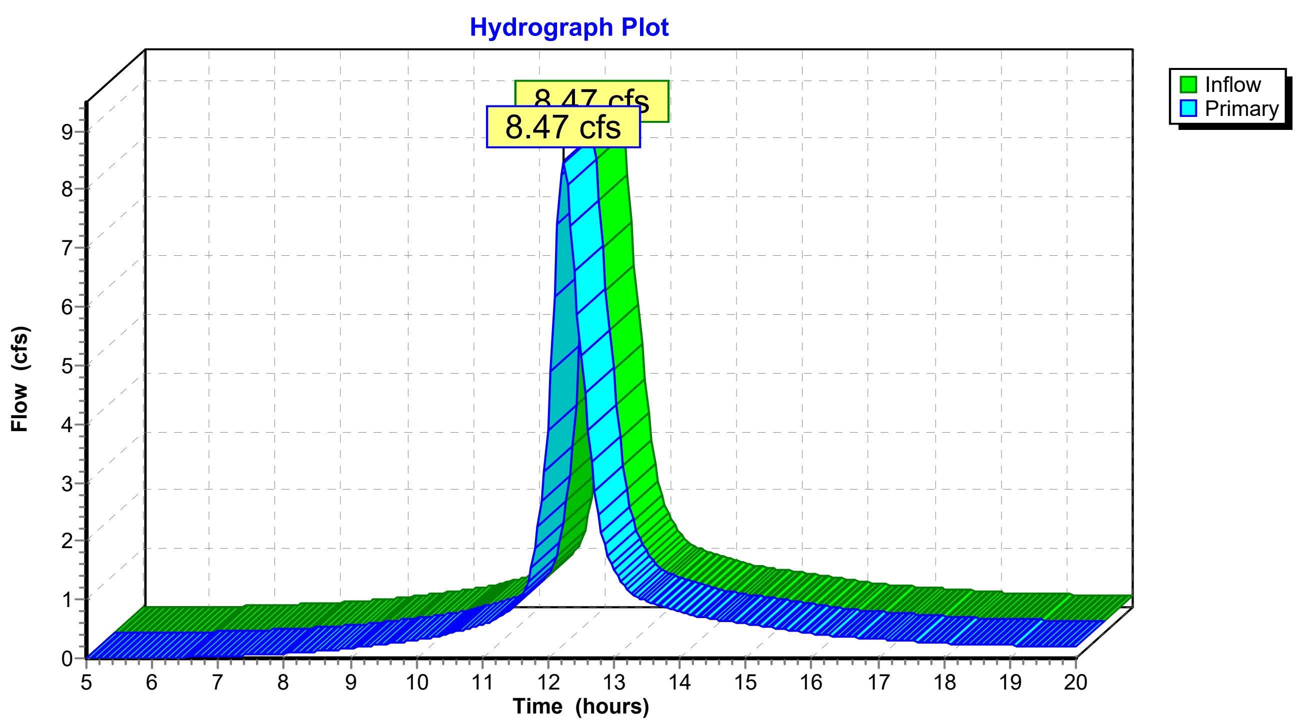
Peak Elev= 365.84' Storage= 23 cf
Plug-Flow detention time= 0.1 min calculated for 0.846 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
364.40	16	0	0
368.14	16	60	60

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	364.40'	**24.0" x 32.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 364.08' S= 0.0100 '/' n= 0.012 Cc= 0.900

Pond CB-11A: CB-11A



Pond CB-12: CB-12

[88] Warning: Qout>Qin may require Finer Routing>1
[80] Warning: Exceeded Pond CB-12A by 0.04' @ 12.25 hrs (0.36 cfs)

Inflow	=	1.76 cfs @	12.19 hrs, Volume=	0.157 af
Outflow	=	1.76 cfs @	12.19 hrs, Volume=	0.157 af, Atten= 0%, Lag= 0.1 min
Primary	=	1.76 cfs @	12.19 hrs, Volume=	0.157 af

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

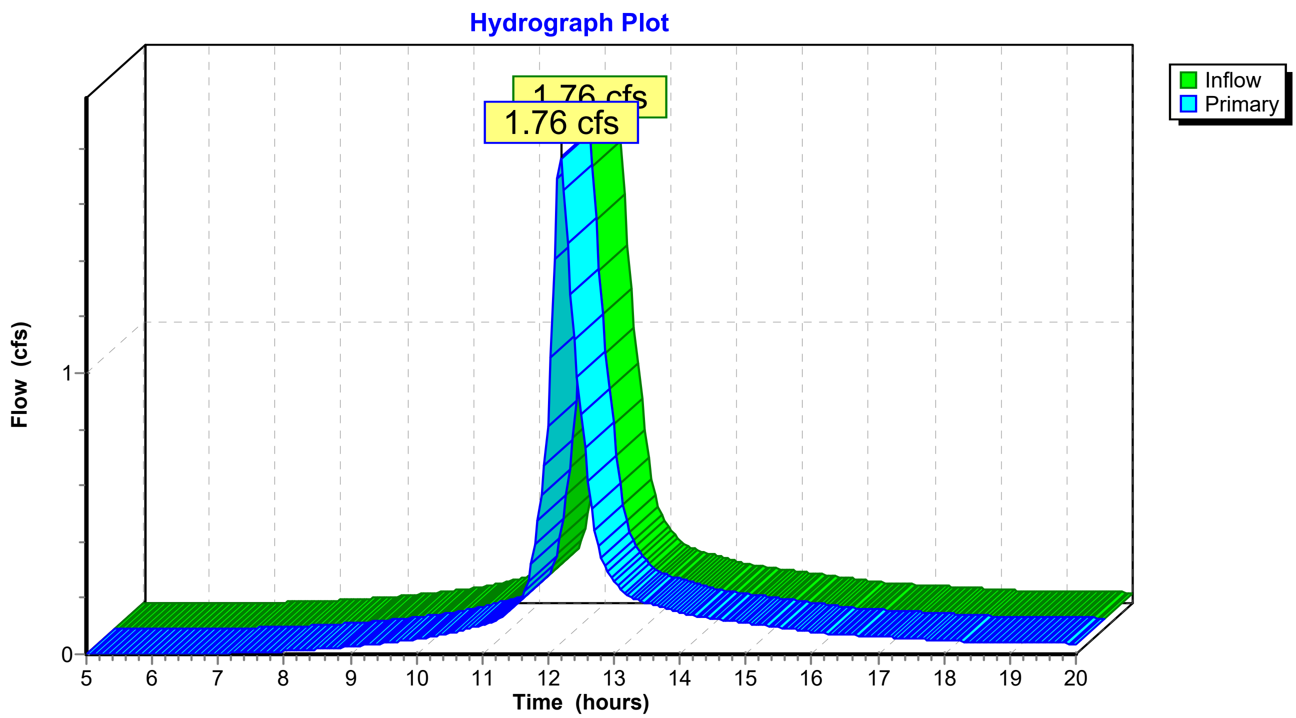
Peak Elev= 372.72' Storage= 12 cf
Plug-Flow detention time= 0.3 min calculated for 0.156 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.00	16	0	0
374.68	16	43	43

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	372.00'	**12.0" x 136.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 370.40' S= 0.0118 '/' n= 0.012 Cc= 0.900

Pond CB-12: CB-12



Pond CB-12A: CB-12A

Inflow	=	0.93 cfs @	12.16 hrs, Volume=	0.076 af
Outflow	=	0.93 cfs @	12.17 hrs, Volume=	0.076 af, Atten= 0%, Lag= 0.1 min
Primary	=	0.93 cfs @	12.17 hrs, Volume=	0.076 af

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

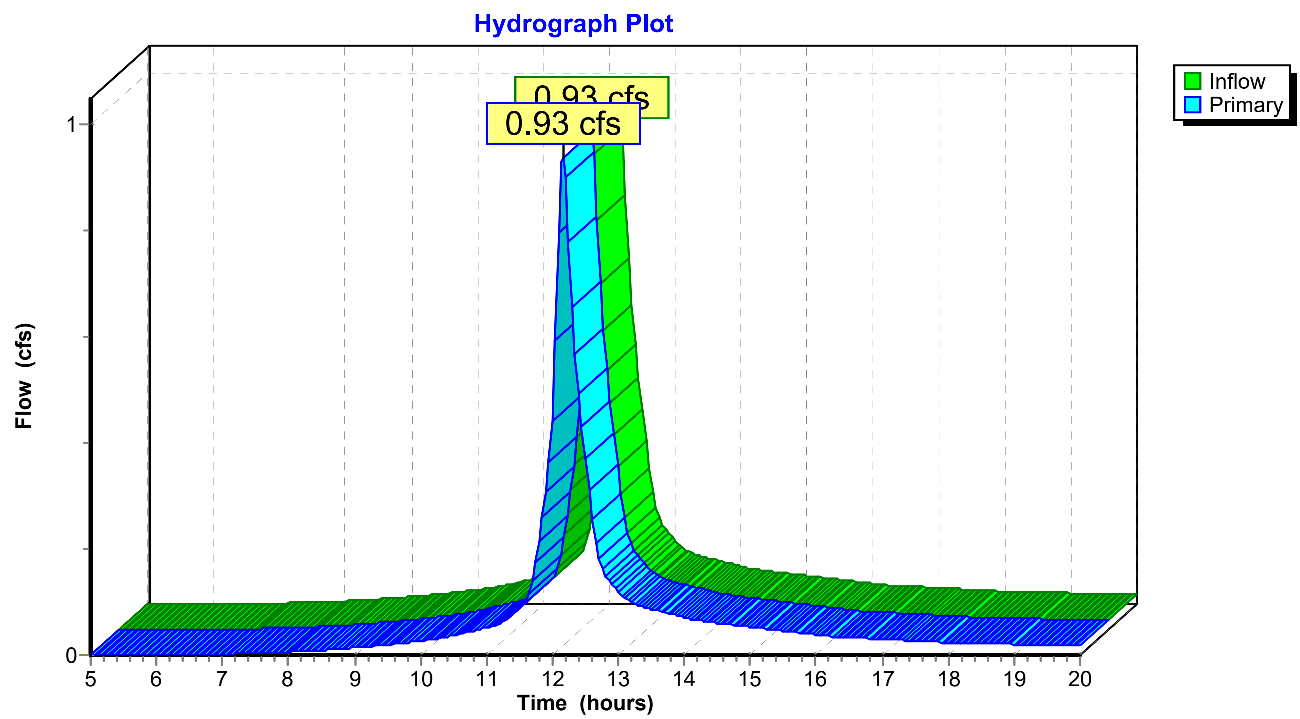
Peak Elev= 372.71' Storage= 9 cf
Plug-Flow detention time= 0.5 min calculated for 0.076 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.12	16	0	0
374.62	16	40	40

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	372.12'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 372.00' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-12A: CB-12A



Pond CB-13: CB-13

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-12 Primary device # 1 OUTLET by 0.89'
[80] Warning: Exceeded Pond CB-13A by 0.35' @ 12.15 hrs (0.98 cfs)

Inflow	=	2.40 cfs @	12.15 hrs, Volume=	0.223 af	
Outflow	=	2.40 cfs @	12.15 hrs, Volume=	0.223 af,	Atten= 0%, Lag= 0.1 min
Primary	=	2.40 cfs @	12.15 hrs, Volume=	0.223 af	

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

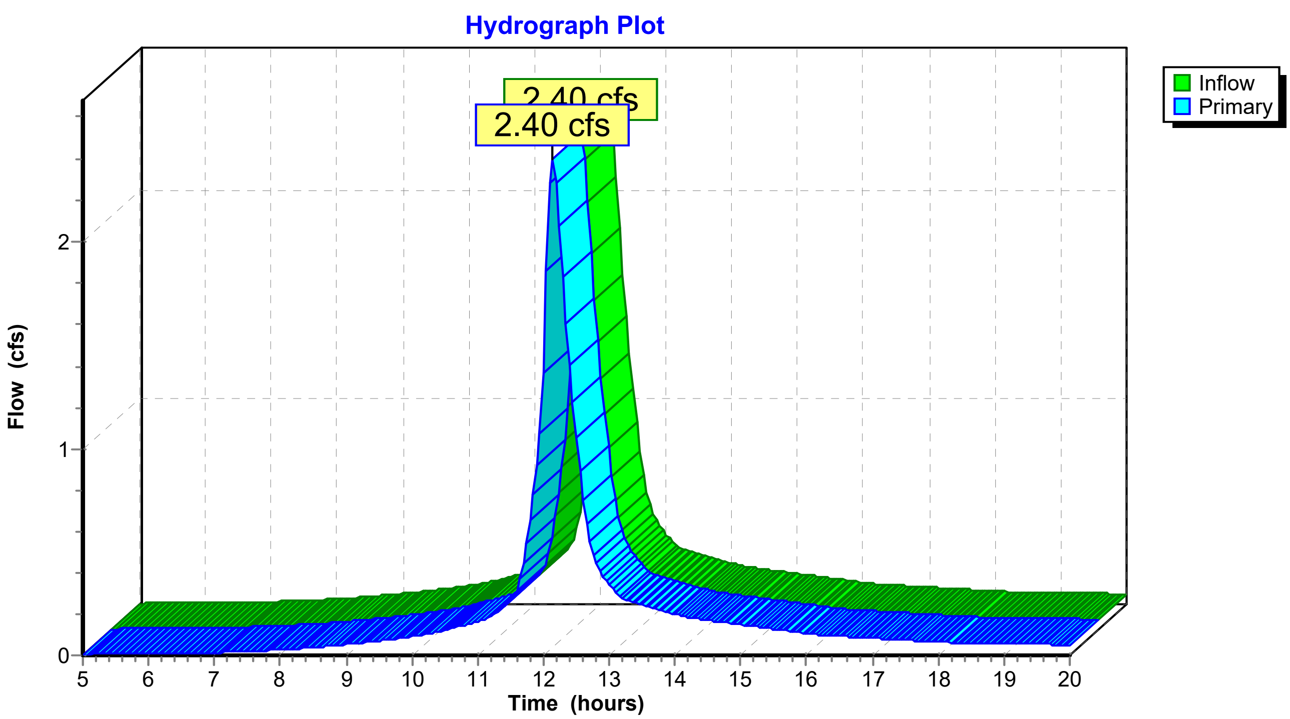
Peak Elev= 371.29' Storage= 14 cf
Plug-Flow detention time= 0.3 min calculated for 0.223 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
370.39	16	0	0
373.39	16	48	48

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	370.39'	**12.0" x 131.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 368.77' S= 0.0124 '/' n= 0.012 Cc= 0.900

Pond CB-13: CB-13



Pond CB-13A: CB-13A

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	0.24 cfs @	12.09 hrs, Volume=	0.018 af
Outflow	=	0.24 cfs @	12.09 hrs, Volume=	0.018 af, Atten= 0%, Lag= 0.2 min
Primary	=	0.24 cfs @	12.09 hrs, Volume=	0.018 af

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

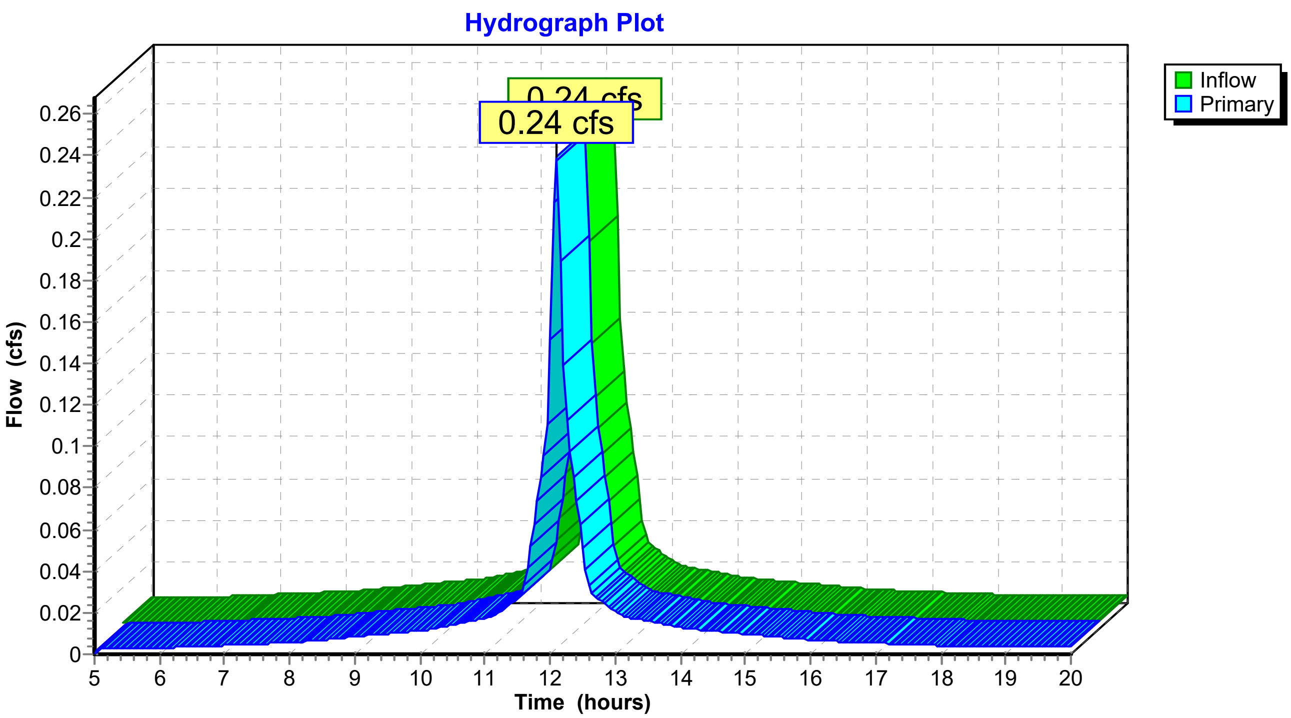
Peak Elev= 370.97' Storage= 4 cf
Plug-Flow detention time= 1.1 min calculated for 0.018 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
370.73	16	0	0
373.23	16	40	40

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	370.73'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 370.39' S= 0.0142 '/' n= 0.012 Cc= 0.900

Pond CB-13A: CB-13A



Pond CB-14: CB-14

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-13 Primary device # 1 OUTLET by 0.99'

Inflow	=	3.16 cfs @	12.18 hrs,	Volume=	0.319 af
Outflow	=	3.16 cfs @	12.18 hrs,	Volume=	0.319 af, Atten= 0%, Lag= 0.1 min
Primary	=	3.16 cfs @	12.18 hrs,	Volume=	0.319 af

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

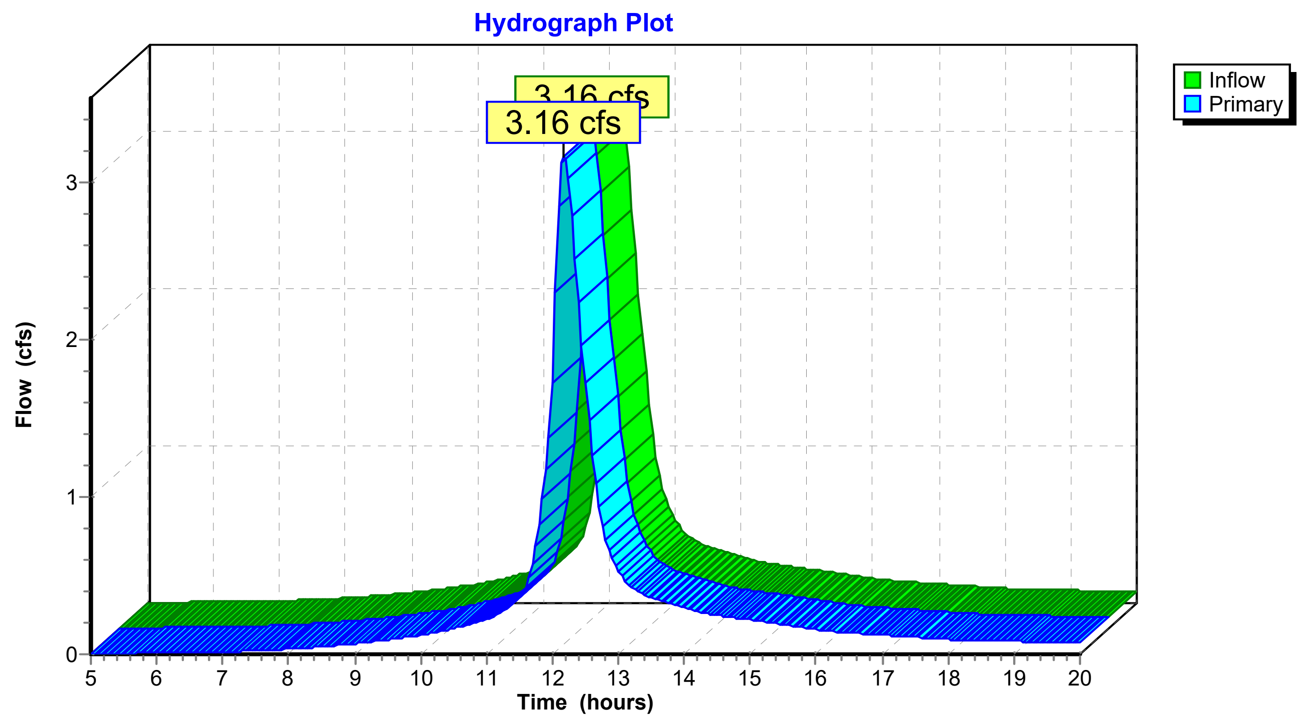
Peak Elev= 369.76' Storage= 16 cf
Plug-Flow detention time= 0.2 min calculated for 0.319 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
368.76	16	0	0
372.26	16	56	56

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	368.76'	**18.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 368.64' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-14: CB-14



Pond CB-14A: CB-14A

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-14 Primary device # 1 INLET by 0.92'

Inflow	=	3.47 cfs @	12.16 hrs,	Volume=	0.353 af
Outflow	=	3.47 cfs @	12.16 hrs,	Volume=	0.353 af, Atten= 0%, Lag= 0.0 min
Primary	=	3.47 cfs @	12.16 hrs,	Volume=	0.353 af

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

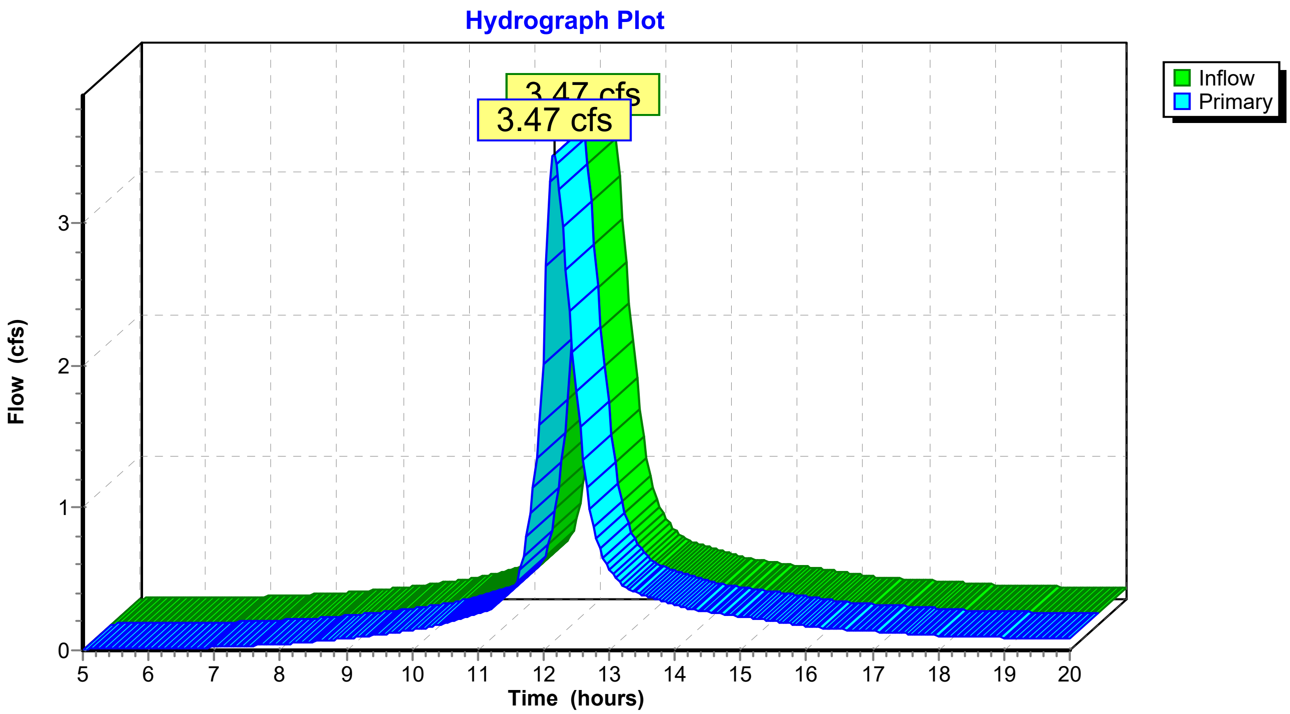
Peak Elev= 369.68' Storage= 17 cf
Plug-Flow detention time= 0.2 min calculated for 0.353 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
368.64	16	0	0
372.26	16	58	58

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	368.64'	**18.0" x 36.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 368.46' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-14A: CB-14A



Pond CB-15: CB-15

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-15A Primary device # 1 INLET by 0.26'

Inflow	=	0.56 cfs @	12.14 hrs, Volume=	0.049 af	
Outflow	=	0.56 cfs @	12.14 hrs, Volume=	0.049 af,	Atten= 0%, Lag= 0.1 min
Primary	=	0.56 cfs @	12.14 hrs, Volume=	0.049 af	

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

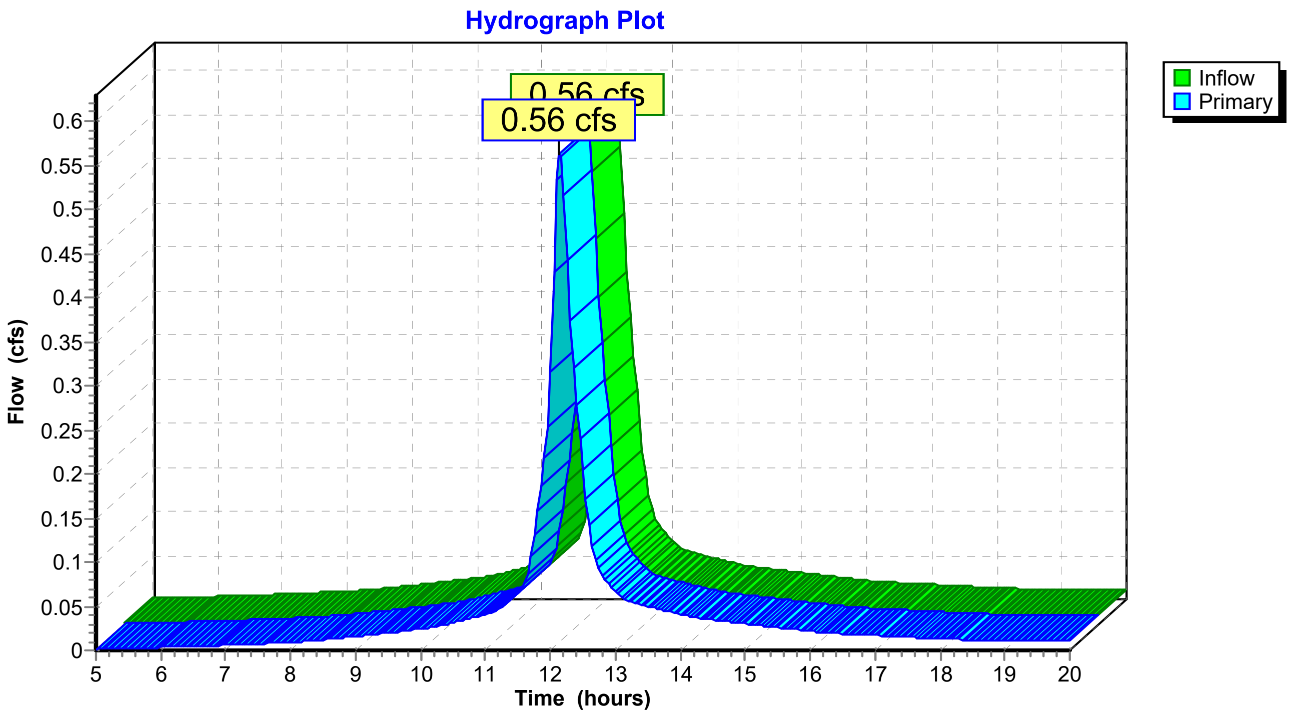
Peak Elev= 390.06' Storage= 6 cf
Plug-Flow detention time= 0.6 min calculated for 0.049 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
389.68	16	0	0
392.30	16	42	42

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	389.68'	**12.0" x 181.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 380.11' S= 0.0529 '/' n= 0.012 Cc= 0.900

Pond CB-15: CB-15



Pond CB-15A: CB-15A

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	0.43 cfs @	12.16 hrs, Volume=	0.037 af
Outflow	=	0.43 cfs @	12.17 hrs, Volume=	0.037 af, Atten= 0%, Lag= 0.1 min
Primary	=	0.43 cfs @	12.17 hrs, Volume=	0.037 af

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

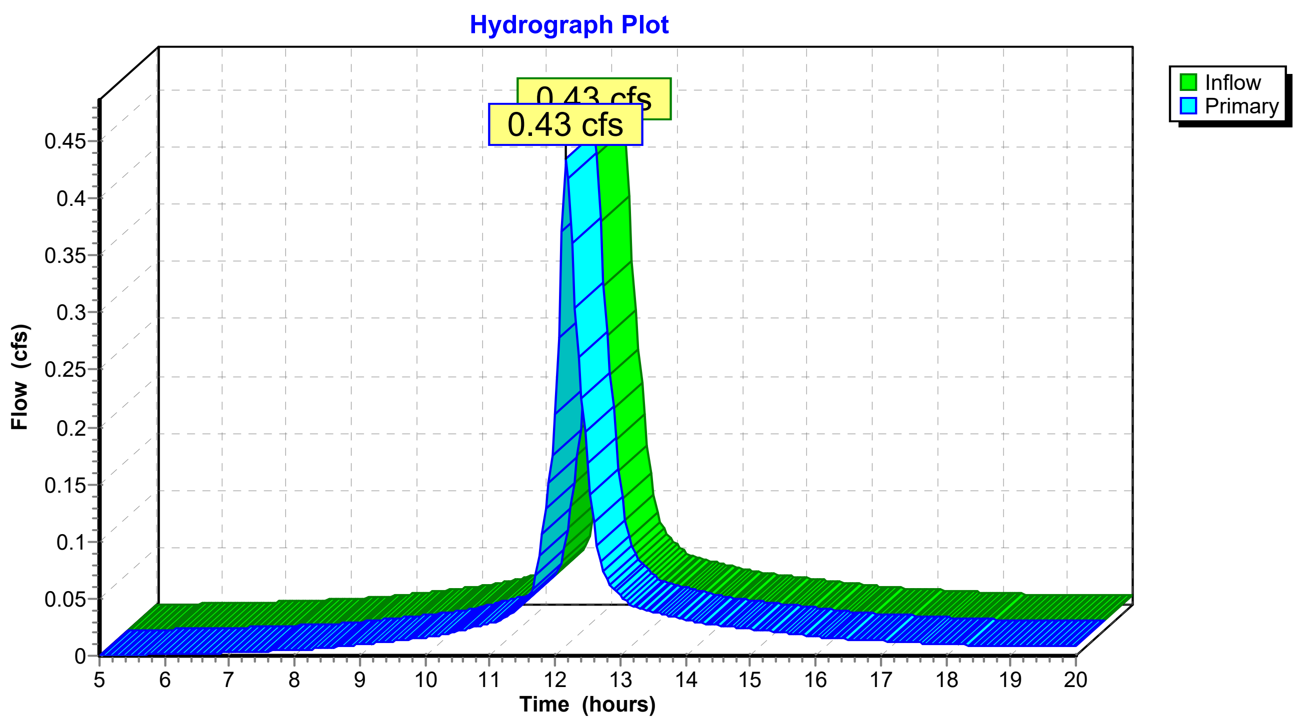
Peak Elev= 390.17' Storage= 6 cf
Plug-Flow detention time= 0.7 min calculated for 0.037 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
389.80	16	0	0
392.30	16	40	40

Primary OutFlow (Free Discharge)
└1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	389.80'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 389.68' S= 0.0050 '/' n= 0.010 Cc= 0.900

Pond CB-15A: CB-15A



Pond CB-16: CB-16

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-15 Primary device # 1 OUTLET by 0.49'

Inflow	=	1.32 cfs @	12.13 hrs,	Volume=	0.112 af
Outflow	=	1.32 cfs @	12.13 hrs,	Volume=	0.111 af, Atten= 0%, Lag= 0.1 min
Primary	=	1.32 cfs @	12.13 hrs,	Volume=	0.111 af

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

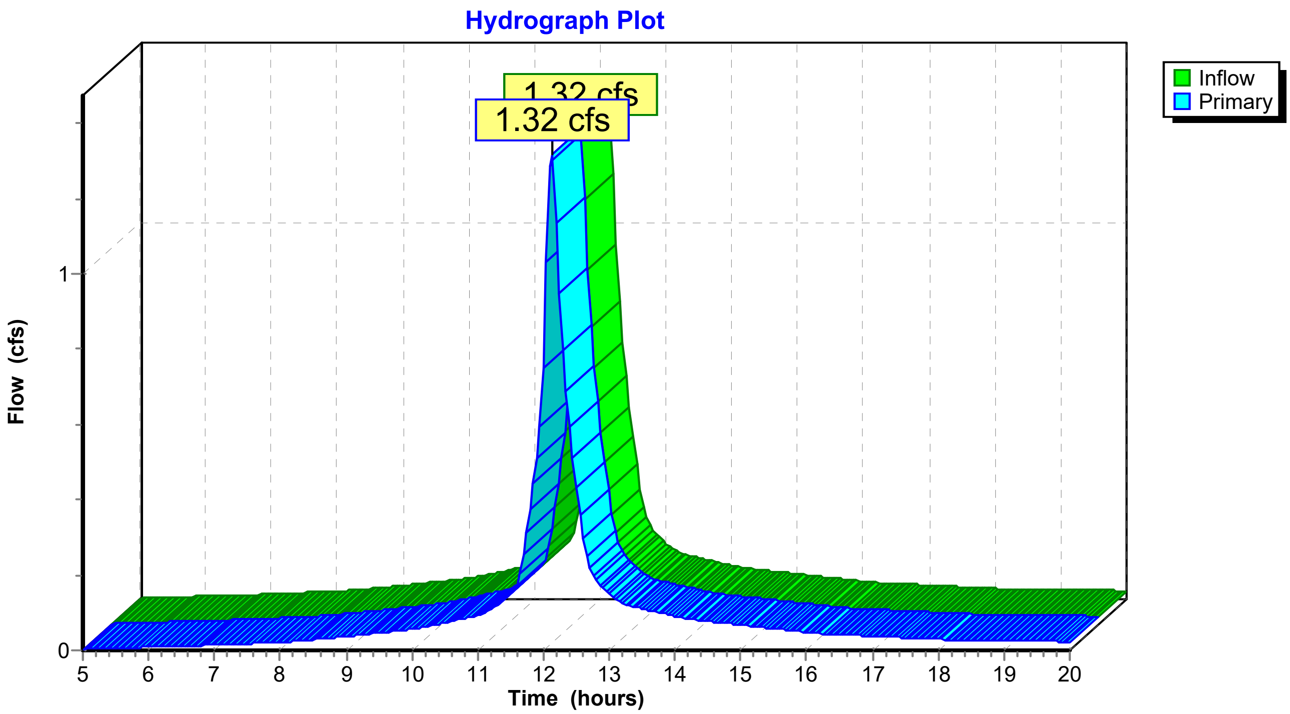
Peak Elev= 380.61' Storage= 10 cf
Plug-Flow detention time= 0.4 min calculated for 0.111 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
380.00	16	0	0
383.09	16	49	49

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	380.00'	**12.0" x 209.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 374.00' S= 0.0287 '/' n= 0.012 Cc= 0.900

Pond CB-16: CB-16



Pond CB-16A: CB-16A

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	0.57 cfs @	12.14 hrs,	Volume=	0.046 af
Outflow	=	0.57 cfs @	12.14 hrs,	Volume=	0.046 af, Atten= 0%, Lag= 0.1 min
Primary	=	0.57 cfs @	12.14 hrs,	Volume=	0.046 af

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

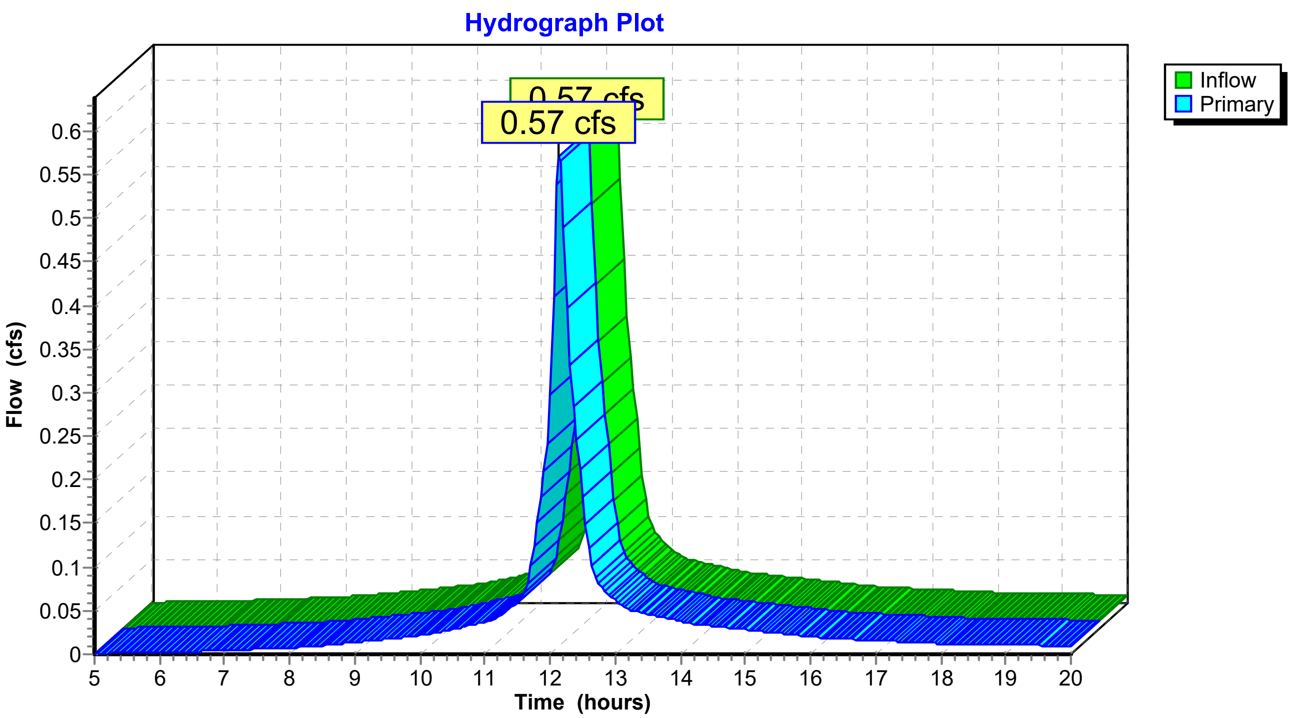
Peak Elev= 381.81' Storage= 7 cf
Plug-Flow detention time= 0.6 min calculated for 0.045 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
381.40	16	0	0
383.09	16	27	27

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	381.40'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 381.20' S= 0.0083 '/' n= 0.012 Cc= 0.900

Pond CB-16A: CB-16A



Pond CB-17: CB-17

[82] Warning: Early inflow requires earlier time span
[79] Warning: Submerged Pond CB-16 Primary device # 1 OUTLET by 0.82'

Inflow	=	1.60 cfs @ 12.12 hrs,	Volume=	0.135 af
Outflow	=	1.60 cfs @ 12.12 hrs,	Volume=	0.135 af, Atten= 0%, Lag= 0.1 min
Primary	=	1.60 cfs @ 12.12 hrs,	Volume=	0.135 af

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

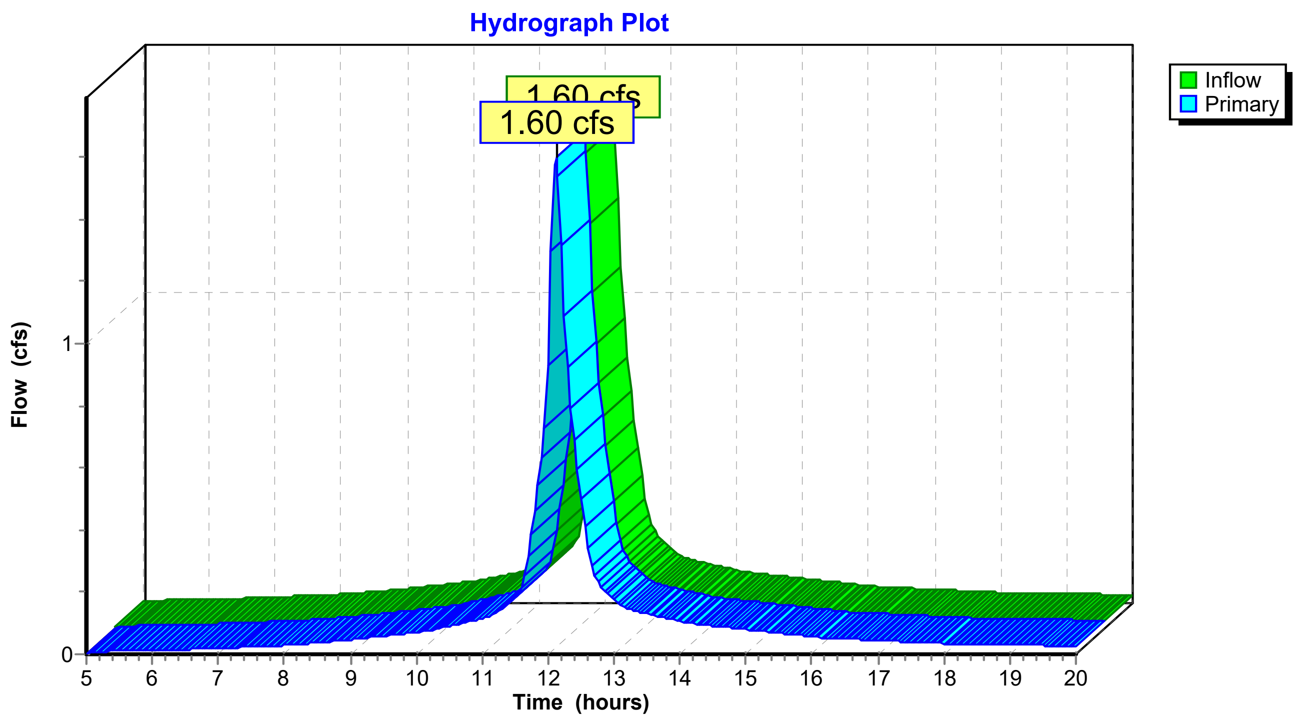
Peak Elev= 374.82' Storage= 13 cf
Plug-Flow detention time= 0.4 min calculated for 0.134 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
374.01	16	0	0
377.51	16	56	56

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	374.01'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 373.89' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-17: CB-17



Pond CB-17A: CB-17A

[85] Warning: Oscillations may require Finer Routing>1
[80] Warning: Exceeded Pond CB-17 by 0.29' @ 12.15 hrs (2.04 cfs)

Inflow	=	2.81 cfs @	12.14 hrs,	Volume=	0.241 af
Outflow	=	2.81 cfs @	12.15 hrs,	Volume=	0.241 af, Atten= 0%, Lag= 0.1 min
Primary	=	2.81 cfs @	12.15 hrs,	Volume=	0.241 af

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

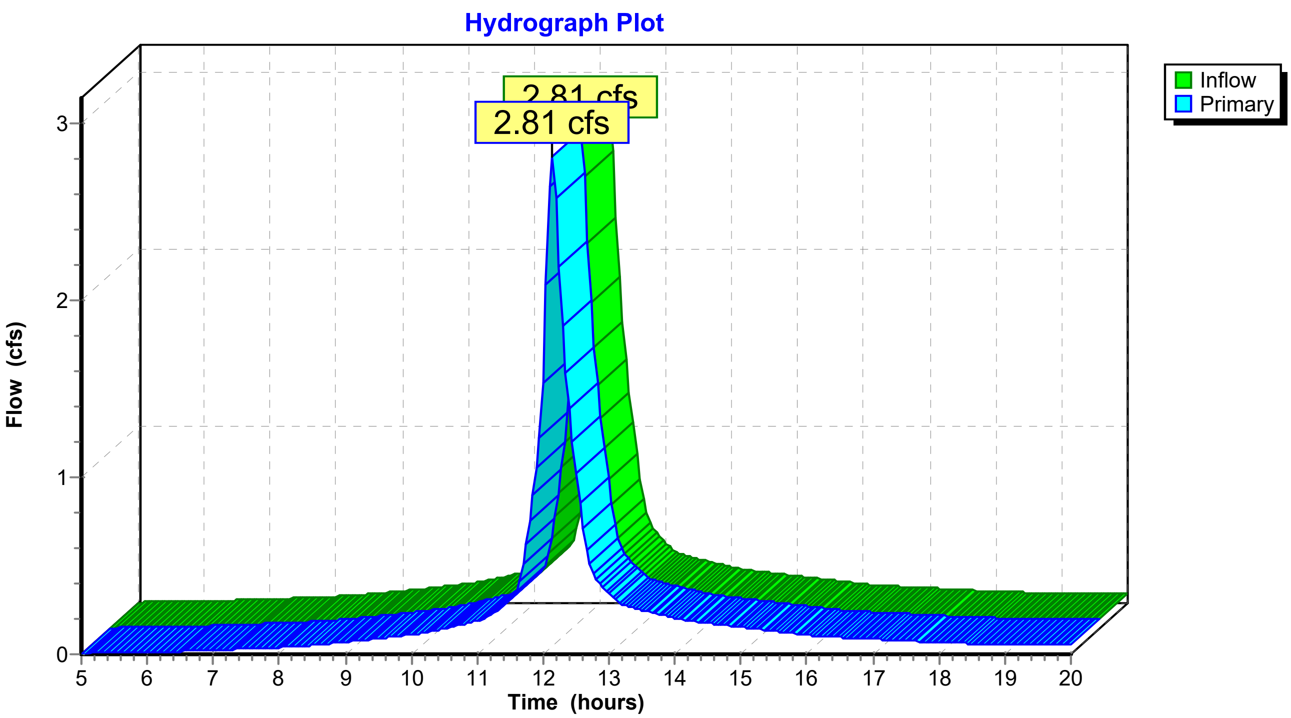
Peak Elev= 375.10' Storage= 19 cf
Plug-Flow detention time= 0.3 min calculated for 0.241 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.89	16	0	0
377.57	16	59	59

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	373.89'	**12.0" x 93.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 373.43' S= 0.0049 '/' n= 0.012 Cc= 0.900

Pond CB-17A: CB-17A



Pond CB-18: CB-18

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-18A Primary device # 1 INLET by 0.39'

Inflow	=	4.32 cfs @	12.27 hrs,	Volume=	0.429 af
Outflow	=	4.32 cfs @	12.27 hrs,	Volume=	0.429 af, Atten= 0%, Lag= 0.0 min
Primary	=	4.32 cfs @	12.27 hrs,	Volume=	0.429 af

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

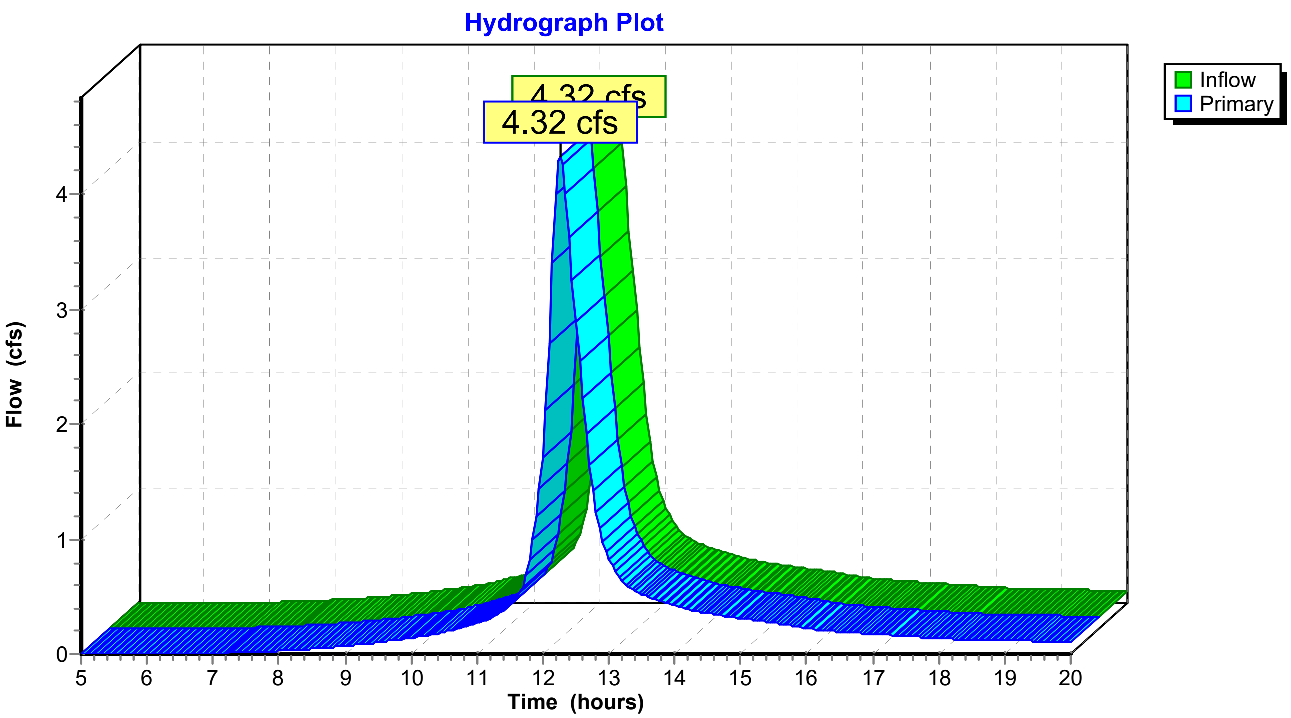
Peak Elev= 417.95' Storage= 16 cf
Plug-Flow detention time= 0.2 min calculated for 0.428 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
416.94	16	0	0
420.56	16	58	58

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	416.94'	**18.0" x 345.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 412.97' S= 0.0115 '/' n= 0.012 Cc= 0.900

Pond CB-18: CB-18



Pond CB-18A: CB-18A AND B

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	3.87 cfs @	12.28 hrs, Volume=	0.387 af
Outflow	=	3.87 cfs @	12.28 hrs, Volume=	0.387 af, Atten= 0%, Lag= 0.1 min
Primary	=	3.87 cfs @	12.28 hrs, Volume=	0.387 af

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

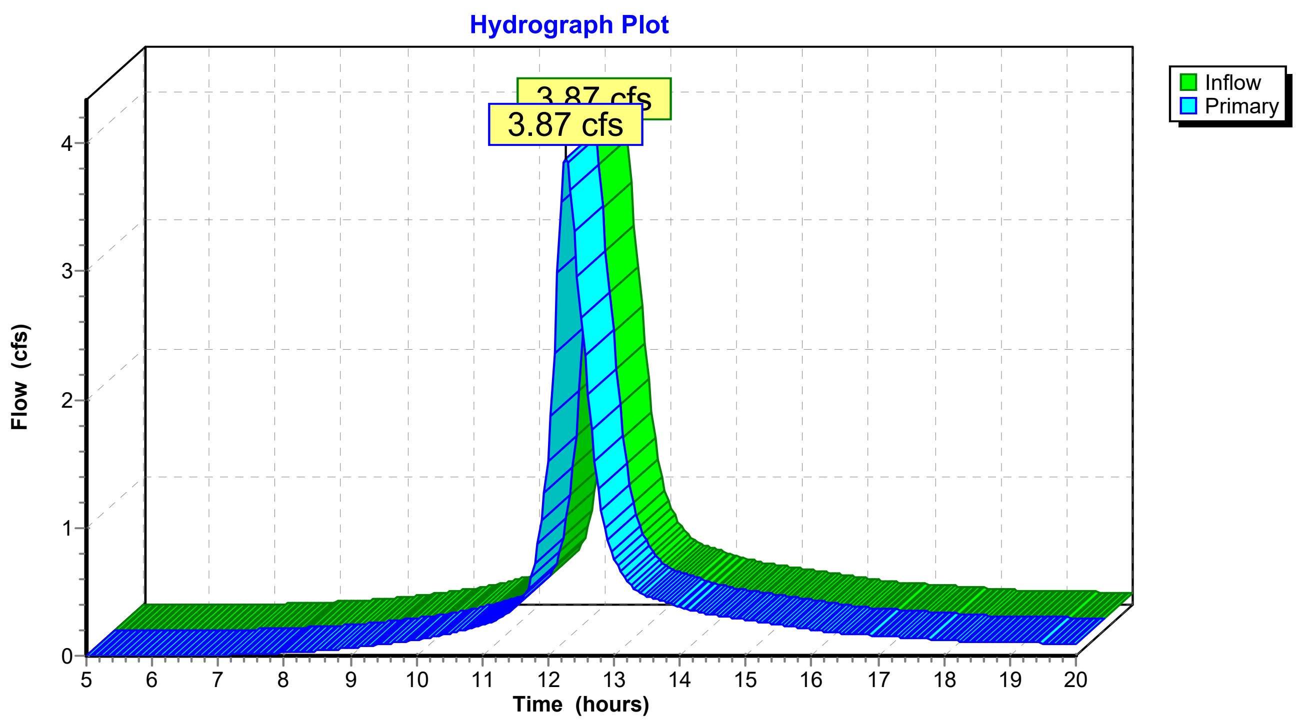
Peak Elev= 418.69' Storage= 18 cf
Plug-Flow detention time= 0.2 min calculated for 0.387 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
417.59	16	0	0
420.56	16	48	48

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	417.56'	**18.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 417.44' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-18A: CB-18A AND B



Pond CB-19: CB-19

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-18 Primary device # 1 OUTLET by 0.80'
[79] Warning: Submerged Pond CB-19A Primary device # 1 OUTLET by 0.30'

Inflow	=	9.44 cfs @	12.25 hrs, Volume=	0.910 af
Outflow	=	9.44 cfs @	12.25 hrs, Volume=	0.910 af, Atten= 0%, Lag= 0.0 min
Primary	=	9.44 cfs @	12.25 hrs, Volume=	0.910 af

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

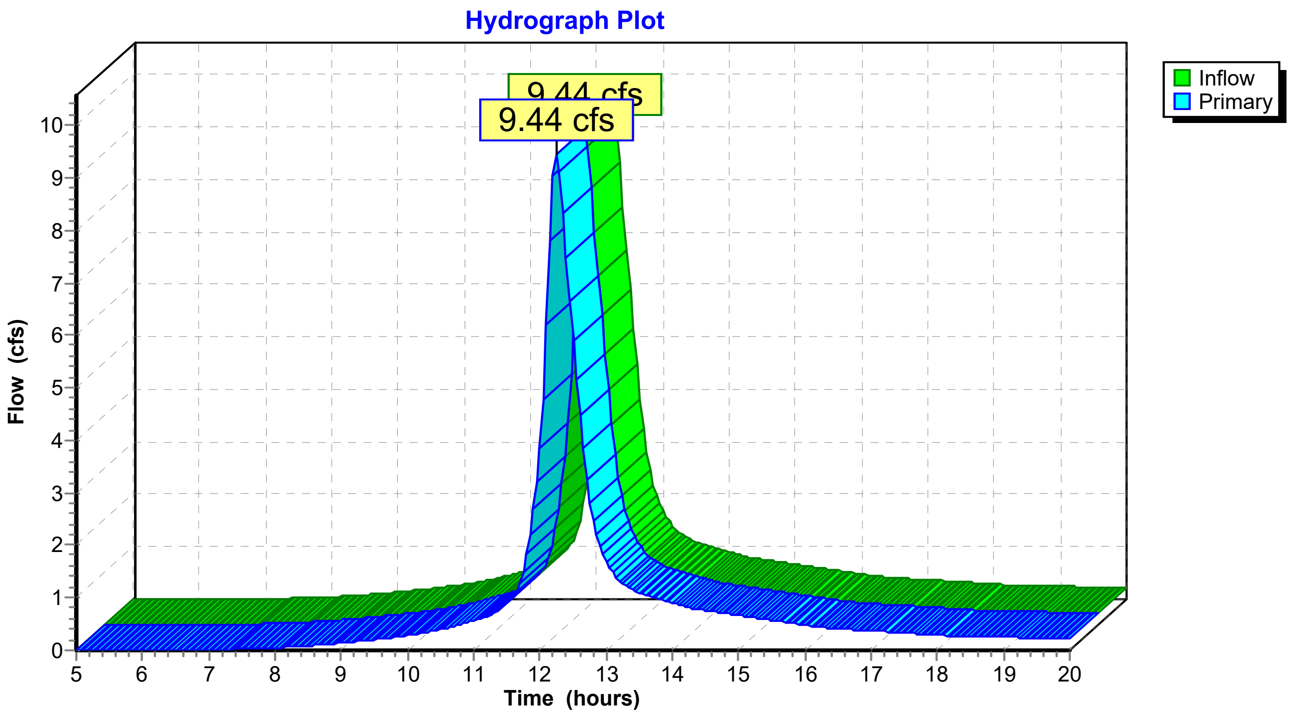
Peak Elev= 413.77' Storage= 22 cf
Plug-Flow detention time= 0.1 min calculated for 0.910 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
412.37	16	0	0
416.47	16	66	66

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	412.37'	**24.0" x 228.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 409.25' S= 0.0137 '/' n= 0.012 Cc= 0.900

Pond CB-19: CB-19



Pond CB-19A: CB-19A

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	3.80 cfs @	12.24 hrs, Volume=	0.354 af
Outflow	=	3.80 cfs @	12.24 hrs, Volume=	0.354 af, Atten= 0%, Lag= 0.0 min
Primary	=	3.80 cfs @	12.24 hrs, Volume=	0.354 af

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

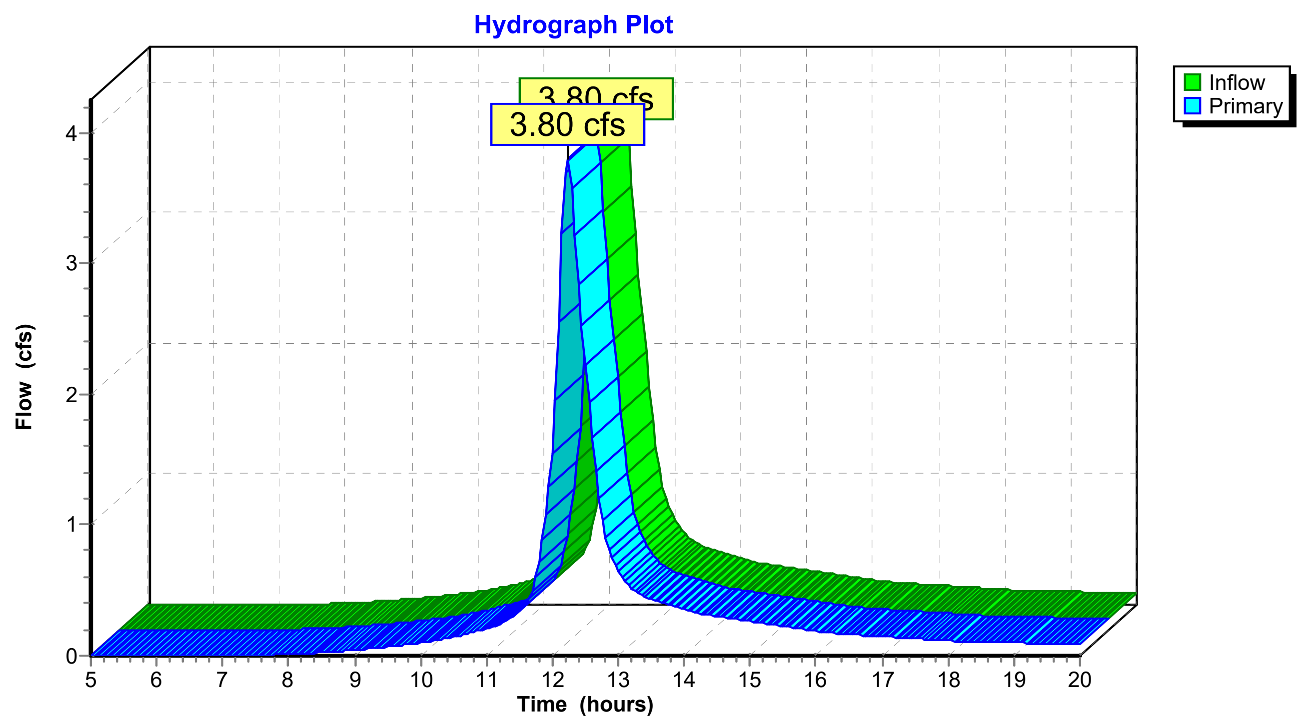
Peak Elev= 415.90' Storage= 15 cf
Plug-Flow detention time= 0.2 min calculated for 0.354 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
414.97	16	0	0
416.64	16	27	27

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	414.97'	**18.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 413.47' S= 0.0625 '/' n= 0.012 Cc= 0.900

Pond CB-19A: CB-19A



Pond CB-2: CB-2

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-1 Primary device # 1 INLET by 0.31'

Inflow	=	0.74 cfs @	12.09 hrs,	Volume=	0.057 af	
Outflow	=	0.74 cfs @	12.09 hrs,	Volume=	0.057 af,	Atten= 0%, Lag= 0.1 min
Primary	=	0.74 cfs @	12.09 hrs,	Volume=	0.057 af	

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

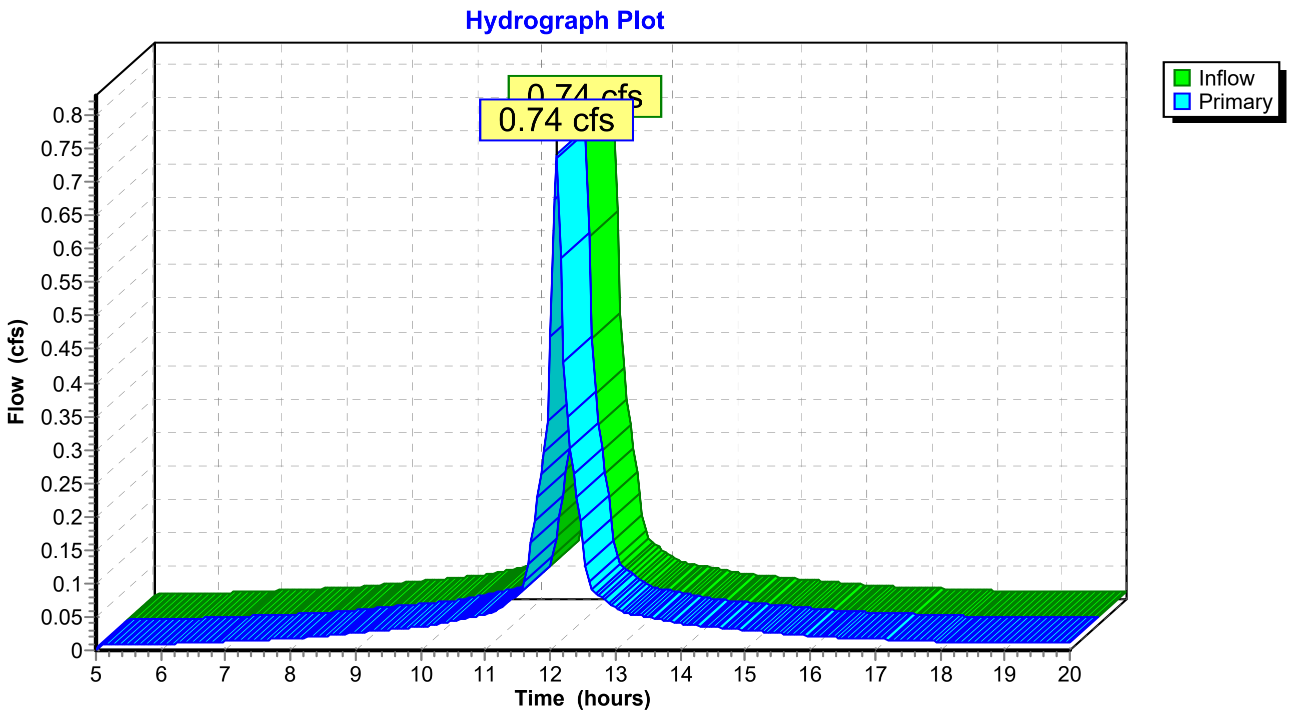
Peak Elev= 358.07' Storage= 7 cf
Plug-Flow detention time= 0.6 min calculated for 0.057 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.63	16	0	0
360.25	16	42	42

Primary OutFlow (Free Discharge)
↑—1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	357.63'	**12.0" x 114.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 354.51' S= 0.0274 '/' n= 0.012 Cc= 0.900

Pond CB-2: CB-2



Pond CB-20: CB-20

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-19 Primary device # 1 OUTLET by 1.68'
[79] Warning: Submerged Pond CB-20A Primary device # 1 INLET by 0.43'

Inflow	=	12.40 cfs @	12.25 hrs,	Volume=	1.219 af
Outflow	=	12.40 cfs @	12.25 hrs,	Volume=	1.219 af, Atten= 0%, Lag= 0.0 min
Primary	=	12.40 cfs @	12.25 hrs,	Volume=	1.219 af

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

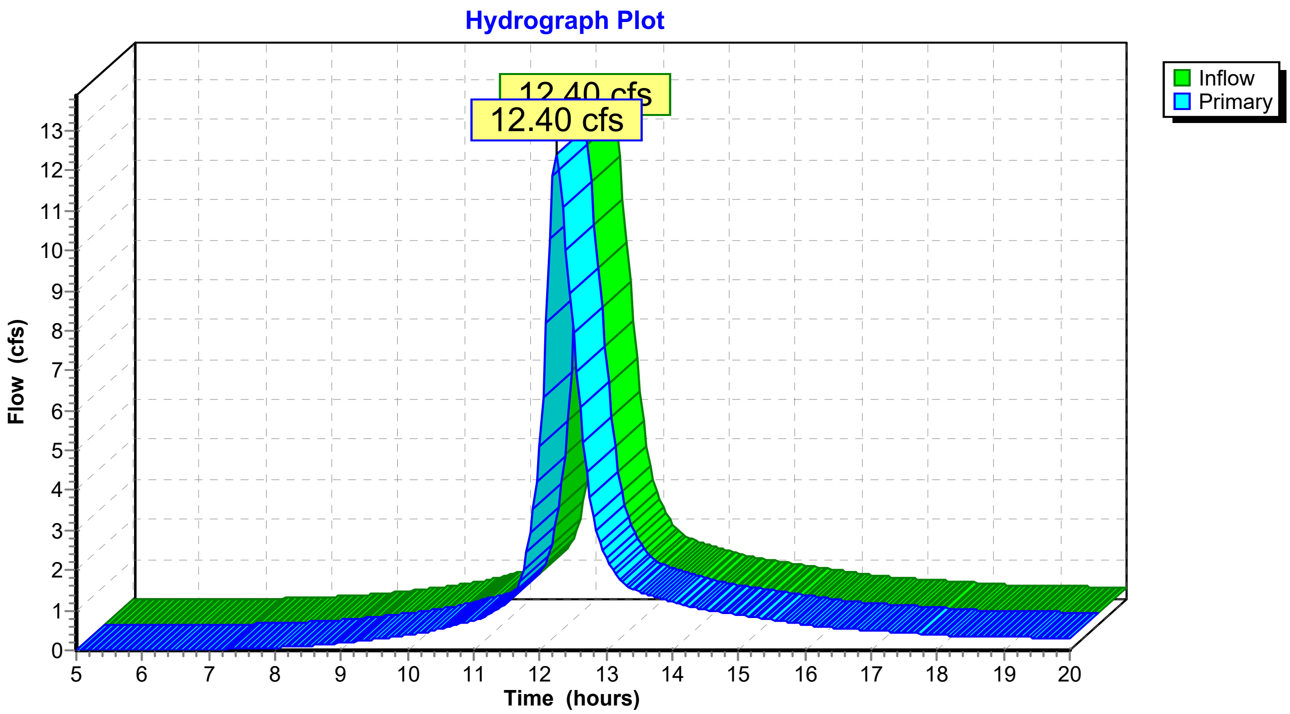
Peak Elev= 410.93' Storage= 27 cf
Plug-Flow detention time= 0.1 min calculated for 1.219 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
409.25	16	0	0
412.75	16	56	56

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	409.25'	**24.0" x 170.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 405.65' S= 0.0212 '/' n= 0.012 Cc= 0.900

Pond CB-20: CB-20



Pond CB-20A: CB-20A

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	2.10 cfs @	12.31 hrs,	Volume=	0.216 af
Outflow	=	2.10 cfs @	12.31 hrs,	Volume=	0.216 af, Atten= 0%, Lag= 0.1 min
Primary	=	2.10 cfs @	12.31 hrs,	Volume=	0.216 af

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

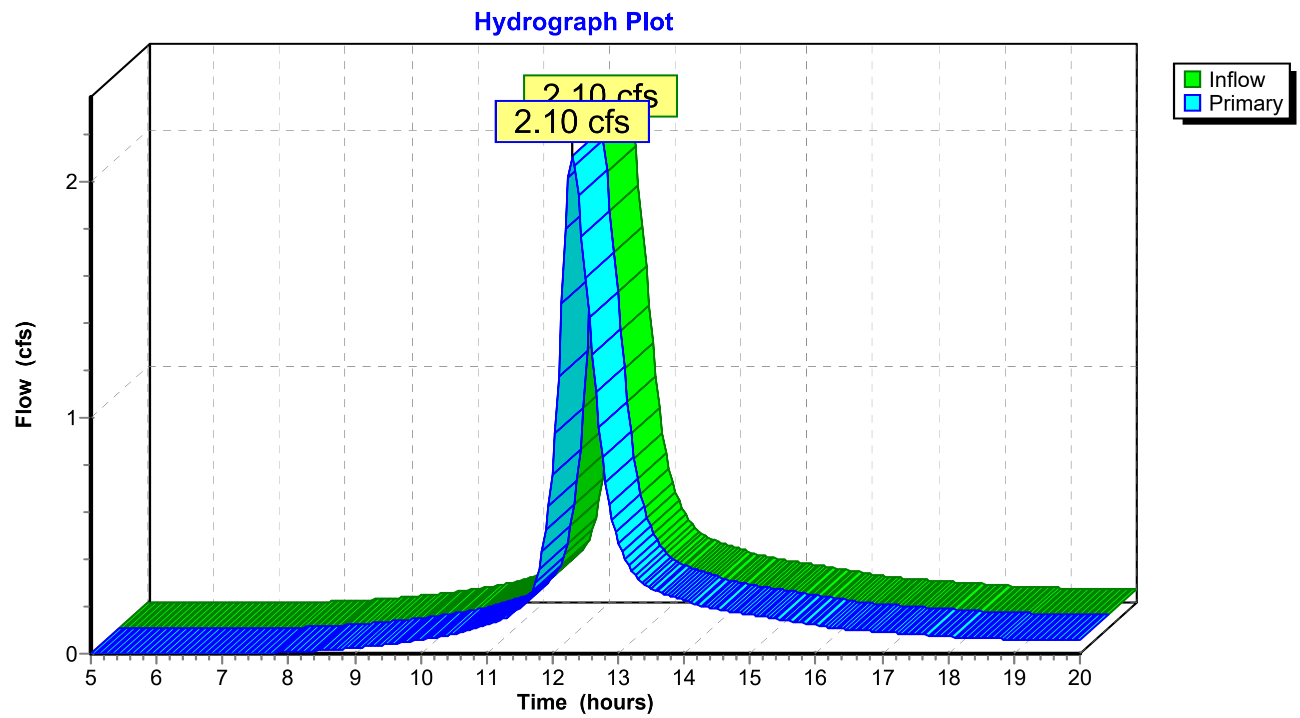
Peak Elev= 411.37' Storage= 14 cf
Plug-Flow detention time= 0.2 min calculated for 0.216 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
410.50	16	0	0
412.75	16	36	36

Primary OutFlow (Free Discharge)
↑—1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	410.50'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 410.25' S= 0.0104 '/' n= 0.012 Cc= 0.900

Pond CB-20A: CB-20A



Pond CB-21: CB-21

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-20 Primary device # 1 OUTLET by 1.47'
[79] Warning: Submerged Pond CB-21A Primary device # 1 INLET by 0.41'

Inflow	=	17.10 cfs @	12.26 hrs,	Volume=	1.689 af
Outflow	=	17.10 cfs @	12.26 hrs,	Volume=	1.689 af, Atten= 0%, Lag= 0.0 min
Primary	=	17.10 cfs @	12.26 hrs,	Volume=	1.689 af

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

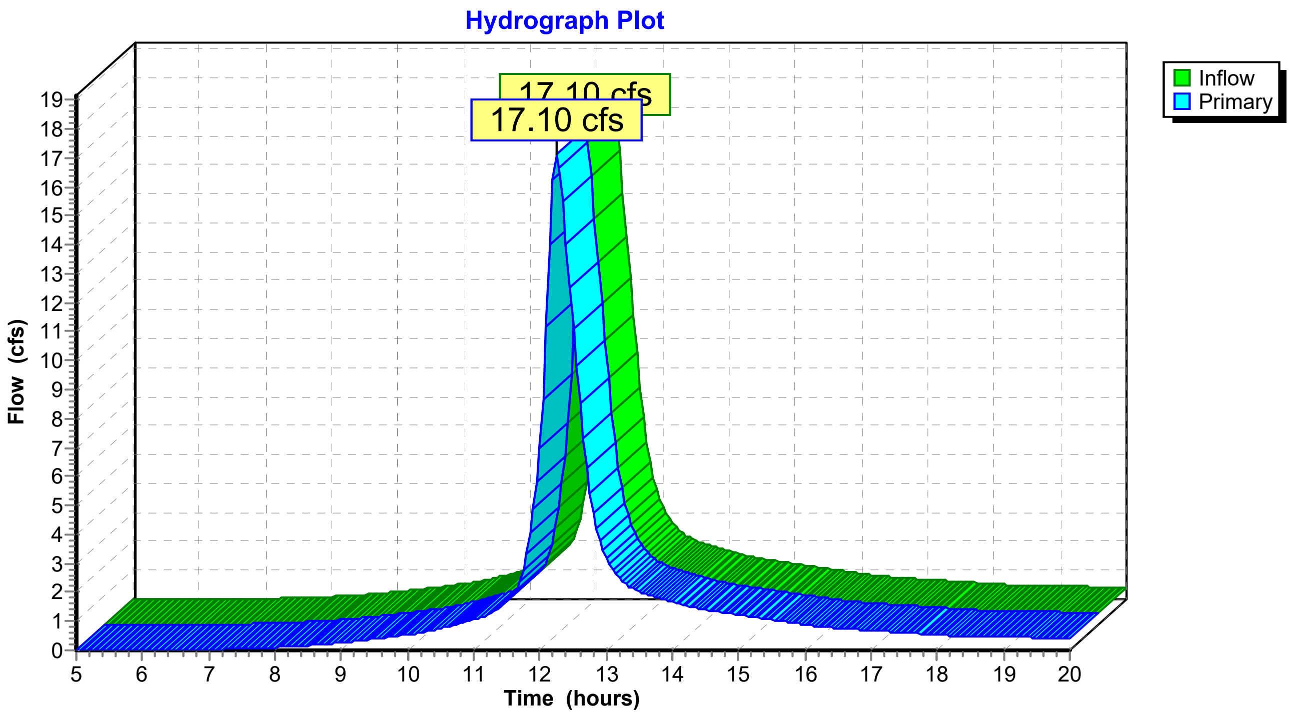
Peak Elev= 407.12' Storage= 29 cf
Plug-Flow detention time= 0.1 min calculated for 1.689 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
405.33	16	0	0
409.63	16	69	69

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	405.33'	**30.0" x 136.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 403.00' S= 0.0171 '/' n= 0.012 Cc= 0.900

Pond CB-21: CB-21



Pond CB-21A: CB-21A

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	4.08 cfs @	12.28 hrs, Volume=	0.411 af
Outflow	=	4.08 cfs @	12.28 hrs, Volume=	0.411 af, Atten= 0%, Lag= 0.1 min
Primary	=	4.08 cfs @	12.28 hrs, Volume=	0.411 af

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

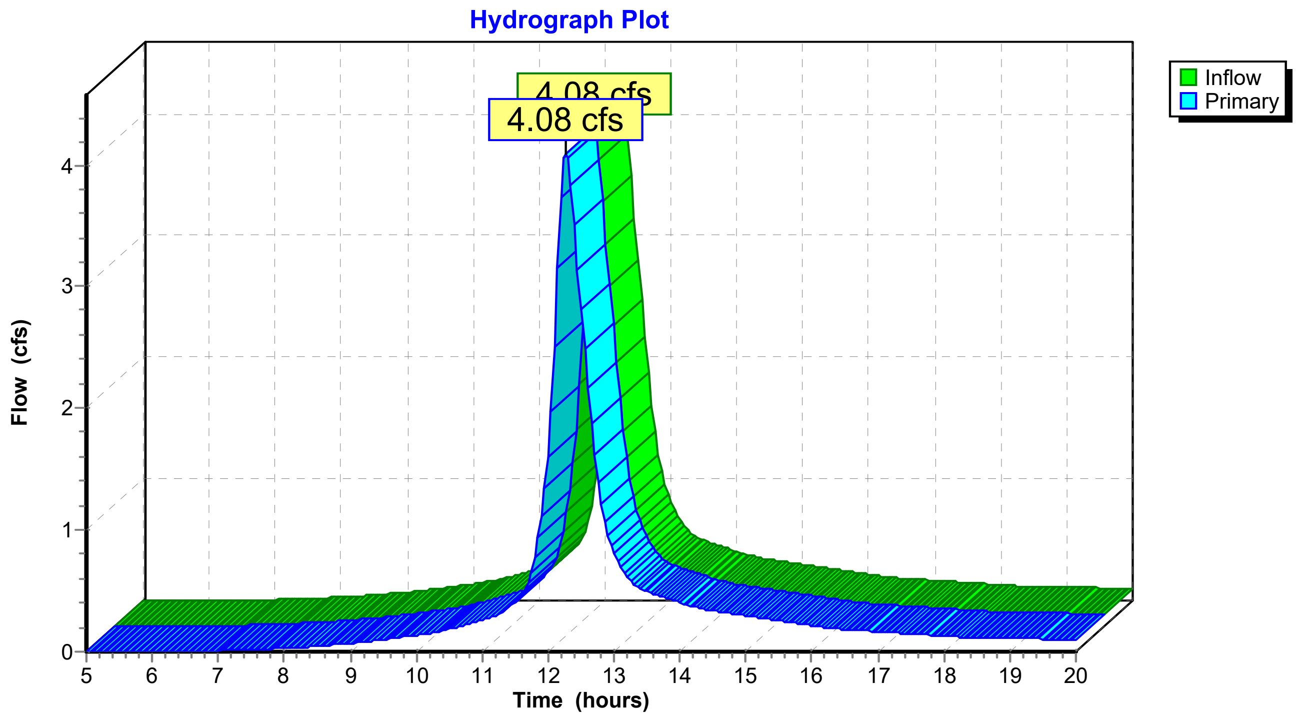
Peak Elev= 407.71' Storage= 16 cf
Plug-Flow detention time= 0.2 min calculated for 0.411 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
406.71	16	0	0
409.71	16	48	48

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	406.71'	**18.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 406.33' S= 0.0158 '/' n= 0.012 Cc= 0.900

Pond CB-21A: CB-21A



Pond CB-21C: CB-21C

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	2.31 cfs @	12.26 hrs, Volume=	0.224 af
Outflow	=	2.31 cfs @	12.26 hrs, Volume=	0.224 af, Atten= 0%, Lag= 0.1 min
Primary	=	2.31 cfs @	12.26 hrs, Volume=	0.224 af

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

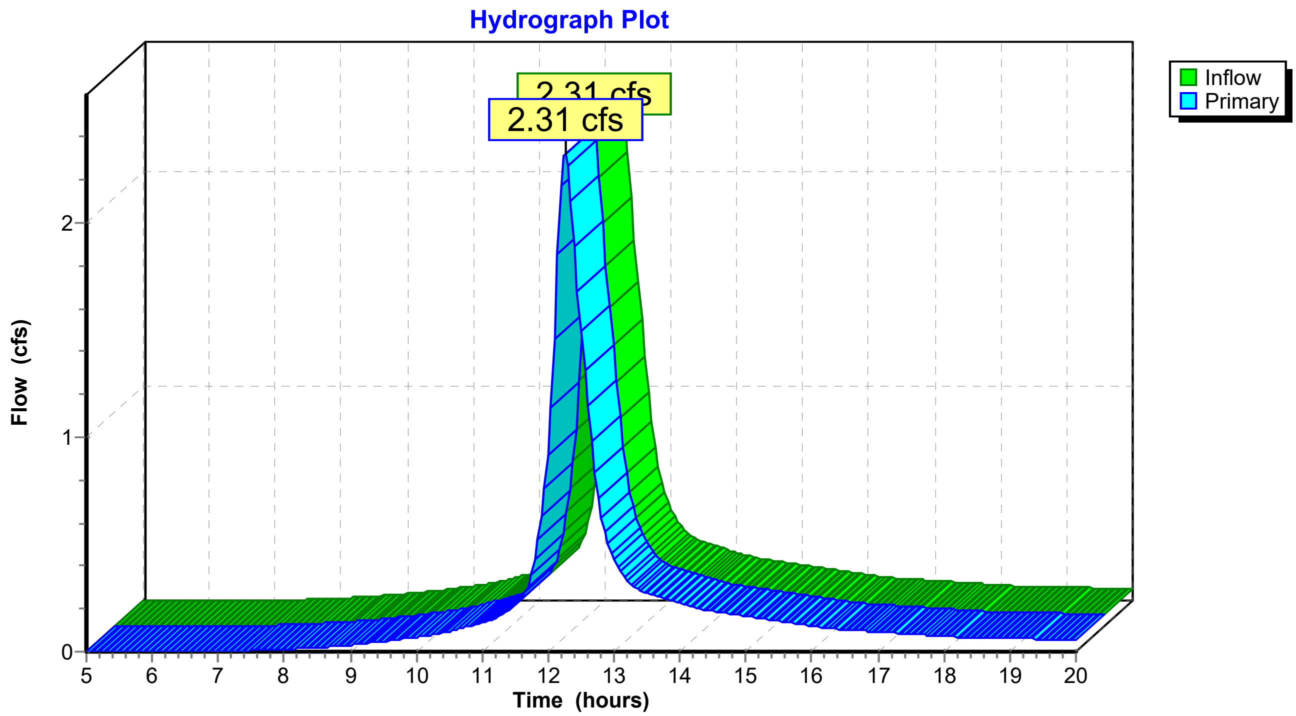
Peak Elev= 409.26' Storage= 17 cf
Plug-Flow detention time= 0.3 min calculated for 0.223 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
408.22	16	0	0
411.22	16	48	48

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	408.22'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 408.10' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-21C: CB-21C



Pond CB-22: CB-22

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-21 Primary device # 1 OUTLET by 1.82'
[79] Warning: Submerged Pond CB-22A Primary device # 1 INLET by 0.20'

Inflow	=	17.66 cfs @	12.26 hrs,	Volume=	1.752 af
Outflow	=	17.66 cfs @	12.26 hrs,	Volume=	1.752 af, Atten= 0%, Lag= 0.0 min
Primary	=	17.66 cfs @	12.26 hrs,	Volume=	1.752 af

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

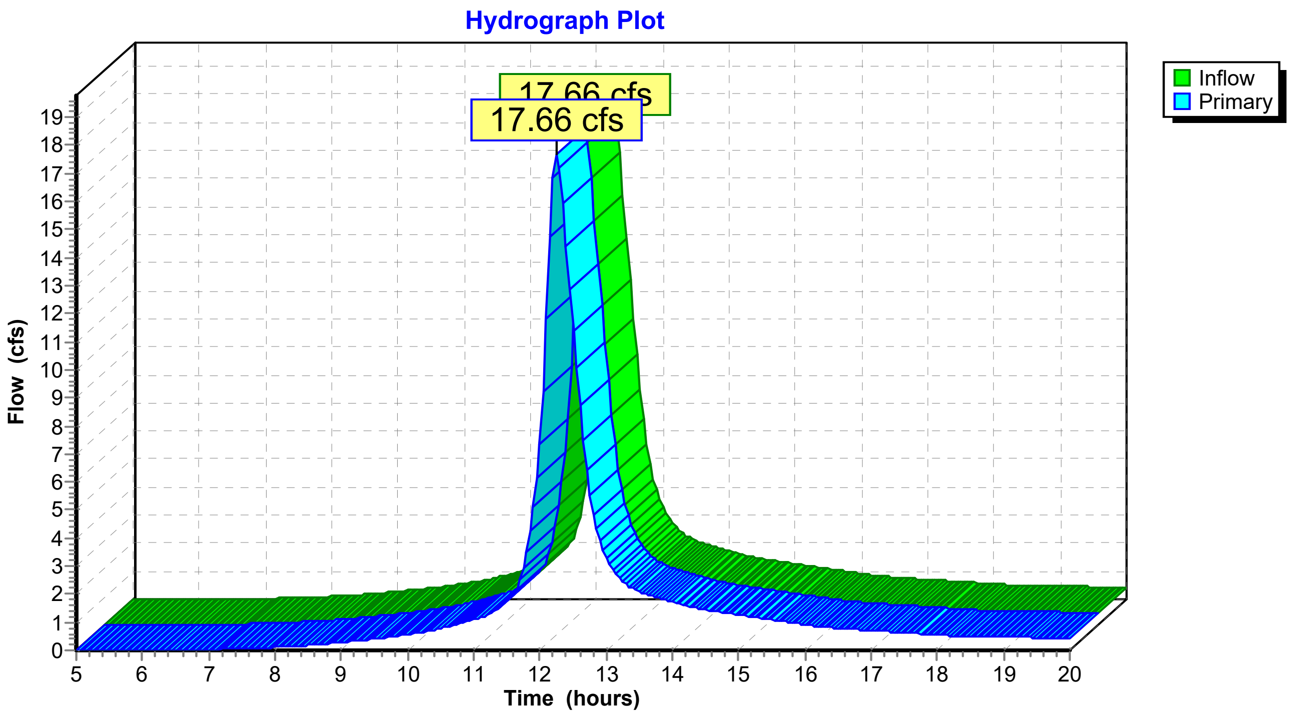
Peak Elev= 404.83' Storage= 29 cf
Plug-Flow detention time= 0.1 min calculated for 1.746 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
403.00	16	0	0
407.16	16	67	67

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	403.00'	**30.0" x 196.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 396.30' S= 0.0342 '/' n= 0.012 Cc= 0.900

Pond CB-22: CB-22



Pond CB-22A: CB-22A

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	0.27 cfs @	12.09 hrs,	Volume=	0.019 af
Outflow	=	0.27 cfs @	12.09 hrs,	Volume=	0.019 af, Atten= 0%, Lag= 0.2 min
Primary	=	0.27 cfs @	12.09 hrs,	Volume=	0.019 af

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

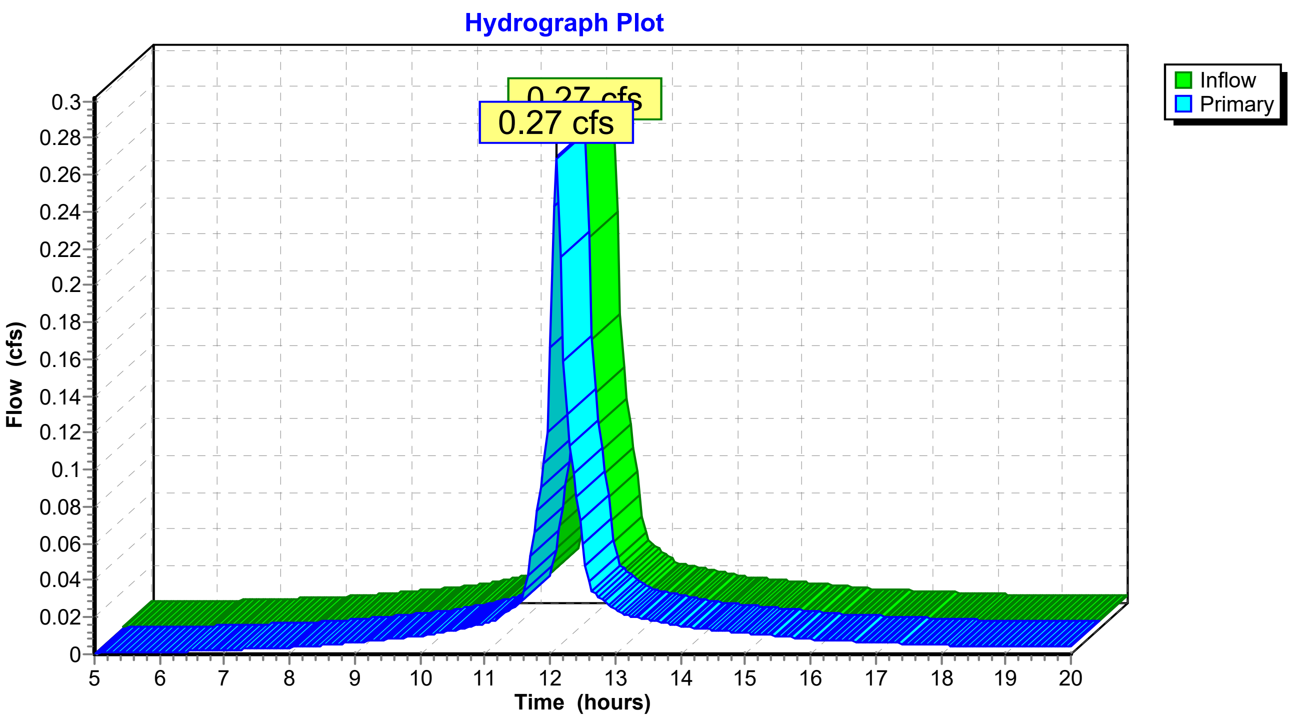
Peak Elev= 404.92' Storage= 5 cf
Plug-Flow detention time= 1.1 min calculated for 0.019 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
404.62	16	0	0
407.20	16	41	41

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	404.62'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 404.50' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-22A: CB-22A



Pond CB-23: CB-23

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-22 Primary device # 1 OUTLET by 1.93'
[79] Warning: Submerged Pond CB-23A Primary device # 1 INLET by 0.30'

Inflow	=	19.02 cfs @	12.25 hrs,	Volume=	1.888 af
Outflow	=	19.02 cfs @	12.25 hrs,	Volume=	1.888 af, Atten= 0%, Lag= 0.0 min
Primary	=	19.02 cfs @	12.25 hrs,	Volume=	1.888 af

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

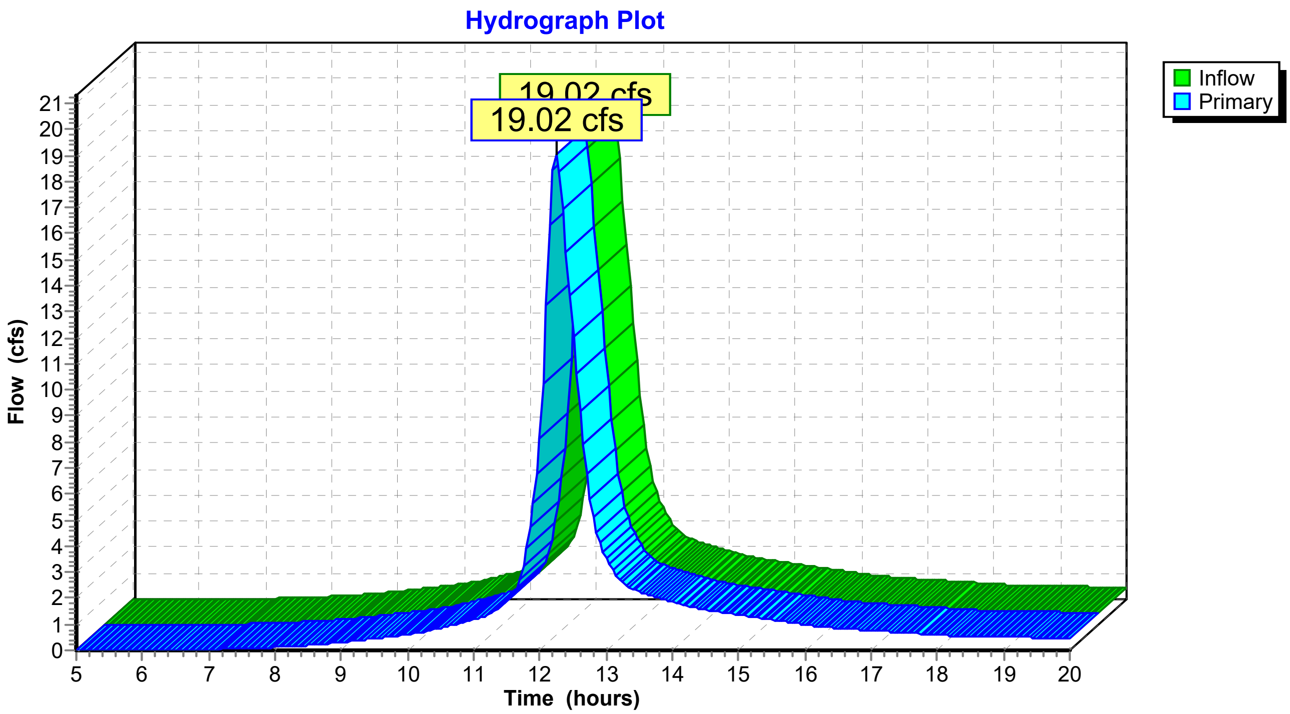
Peak Elev= 398.23' Storage= 31 cf
Plug-Flow detention time= 0.1 min calculated for 1.881 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
396.31	16	0	0
400.43	16	66	66

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	396.31'	**30.0" x 135.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 383.20' S= 0.0971 '/' n= 0.012 Cc= 0.900

Pond CB-23: CB-23



Pond CB-23A: CB-23A

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	0.95 cfs @	12.15 hrs,	Volume=	0.075 af
Outflow	=	0.95 cfs @	12.16 hrs,	Volume=	0.075 af, Atten= 0%, Lag= 0.1 min
Primary	=	0.95 cfs @	12.16 hrs,	Volume=	0.075 af

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

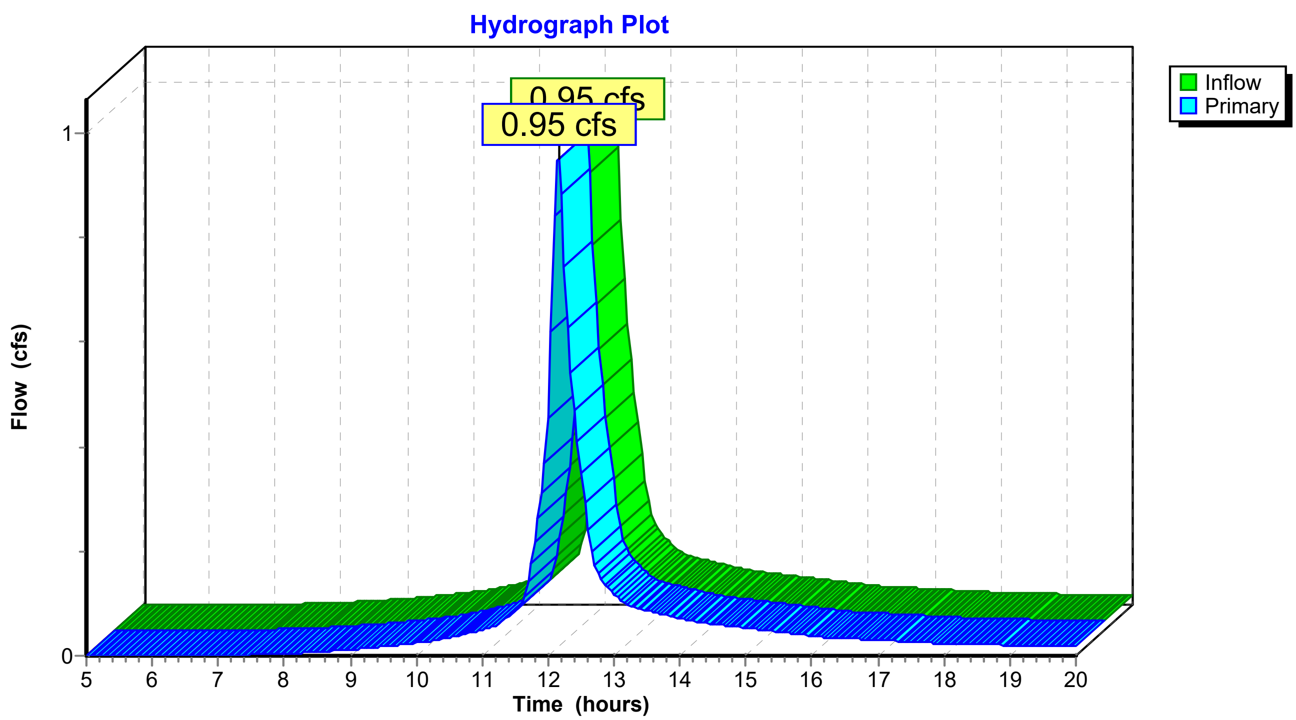
Peak Elev= 398.53' Storage= 10 cf
Plug-Flow detention time= 0.5 min calculated for 0.075 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
397.93	16	0	0
400.43	16	40	40

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	397.93'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 397.81' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-23A: CB-23A



Pond CB-24: CB-24

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	1.83 cfs @	12.29 hrs, Volume=	0.189 af
Outflow	=	1.83 cfs @	12.29 hrs, Volume=	0.189 af, Atten= 0%, Lag= 0.1 min
Primary	=	1.83 cfs @	12.29 hrs, Volume=	0.189 af

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

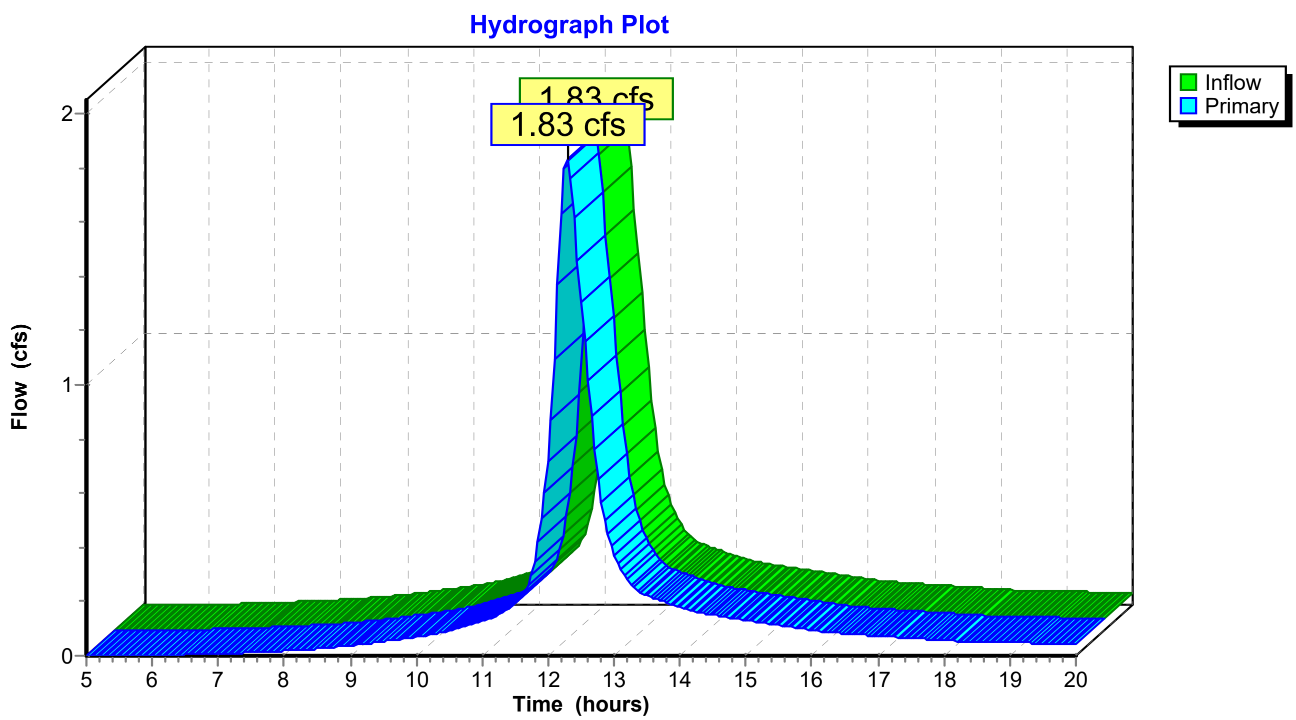
Peak Elev= 424.95' Storage= 14 cf
Plug-Flow detention time= 0.3 min calculated for 0.188 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
424.09	16	0	0
427.50	16	55	55

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	424.09'	**12.0" x 56.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 423.81' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-24: CB-24



Pond CB-25: CB-25

[88] Warning: Qout>Qin may require Finer Routing>1
[80] Warning: Exceeded Pond CB-25A by 0.09' @ 12.35 hrs (0.50 cfs)

Inflow	=	1.90 cfs @	12.22 hrs,	Volume=	0.188 af
Outflow	=	1.90 cfs @	12.22 hrs,	Volume=	0.188 af, Atten= 0%, Lag= 0.1 min
Primary	=	1.90 cfs @	12.22 hrs,	Volume=	0.188 af

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

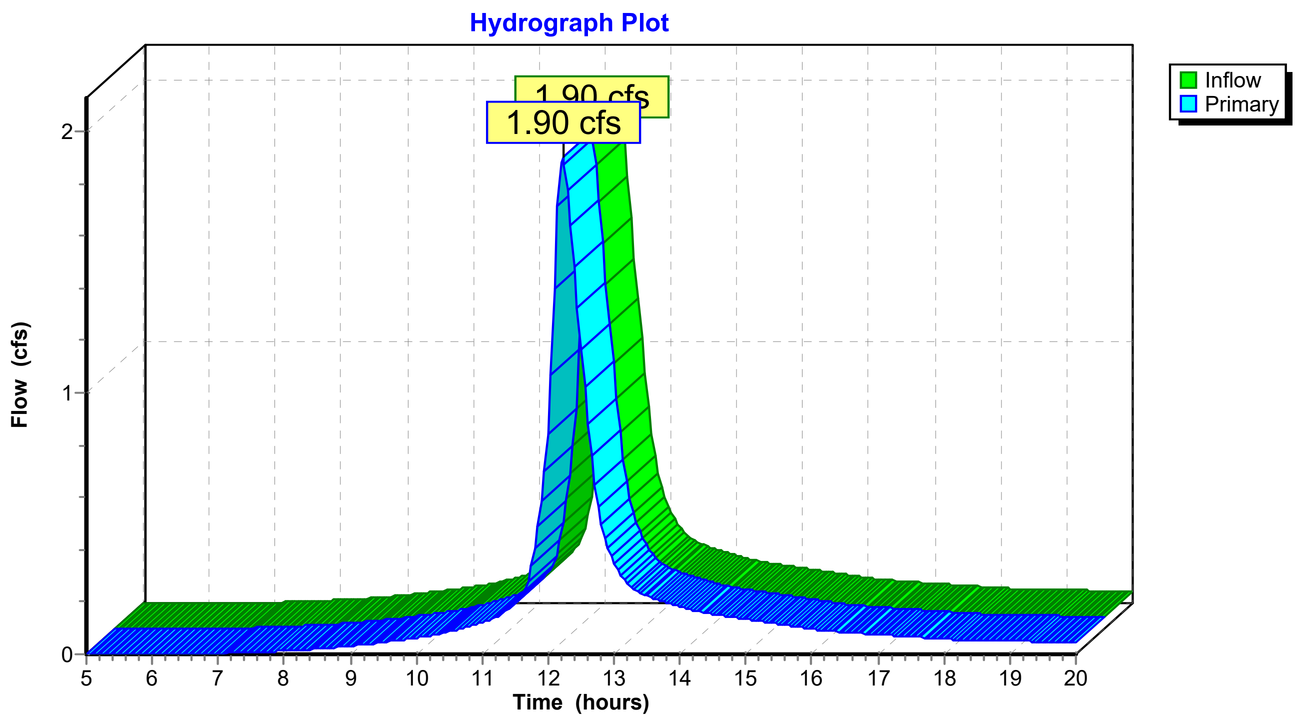
Peak Elev= 428.73' Storage= 12 cf
Plug-Flow detention time= 0.3 min calculated for 0.188 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
427.97	16	0	0
430.59	16	42	42

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	427.97'	**12.0" x 337.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 424.84' S= 0.0093 '/' n= 0.012 Cc= 0.900

Pond CB-25: CB-25



Pond CB-25A: CB-25A

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	1.00 cfs @	12.18 hrs, Volume=	0.085 af	
Outflow	=	1.00 cfs @	12.18 hrs, Volume=	0.085 af,	Atten= 0%, Lag= 0.1 min
Primary	=	1.00 cfs @	12.18 hrs, Volume=	0.085 af	

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

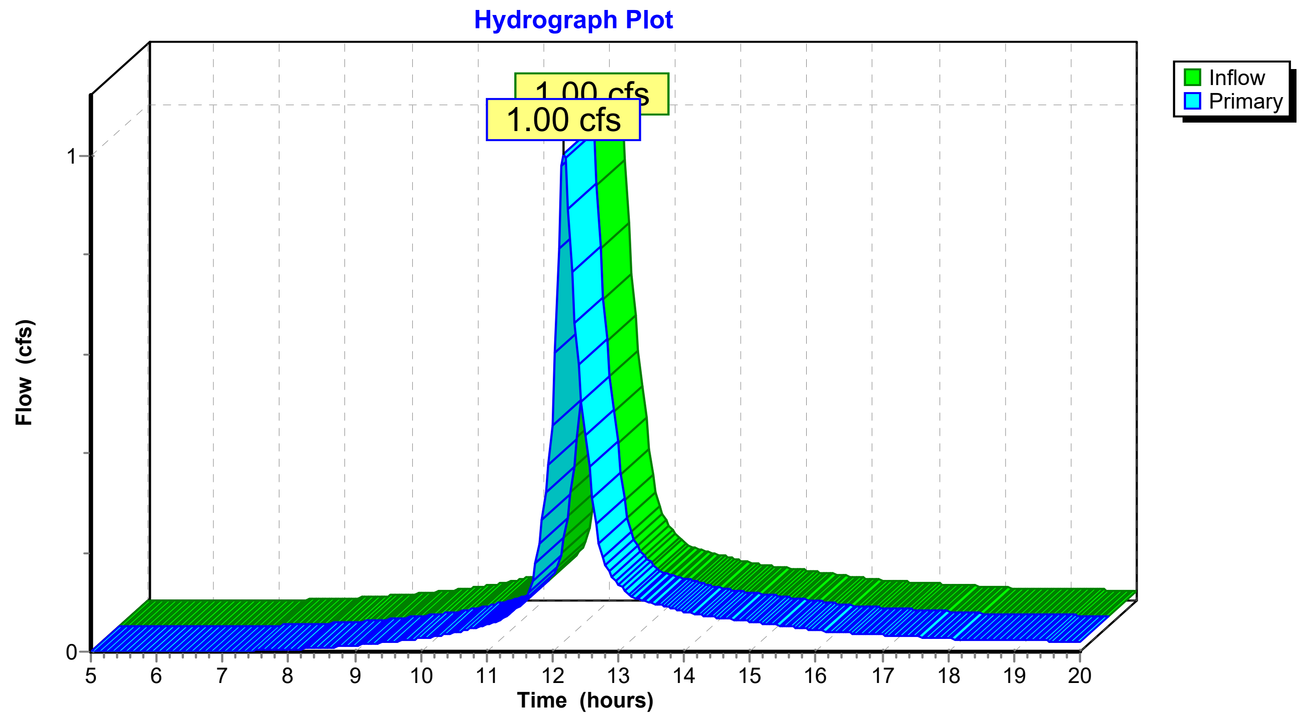
Peak Elev= 428.70' Storage= 10 cf
Plug-Flow detention time= 0.4 min calculated for 0.085 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
428.09	16	0	0
430.59	16	40	40

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	428.09'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 427.97' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-25A: CB-25A



Pond CB-26: CB-26

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-25 Primary device # 1 OUTLET by 1.11'
[80] Warning: Exceeded Pond CB-26A by 0.11' @ 12.30 hrs (0.64 cfs)

Inflow	=	4.45 cfs @	12.24 hrs,	Volume=	0.454 af
Outflow	=	4.45 cfs @	12.24 hrs,	Volume=	0.454 af, Atten= 0%, Lag= 0.0 min
Primary	=	4.45 cfs @	12.24 hrs,	Volume=	0.454 af

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

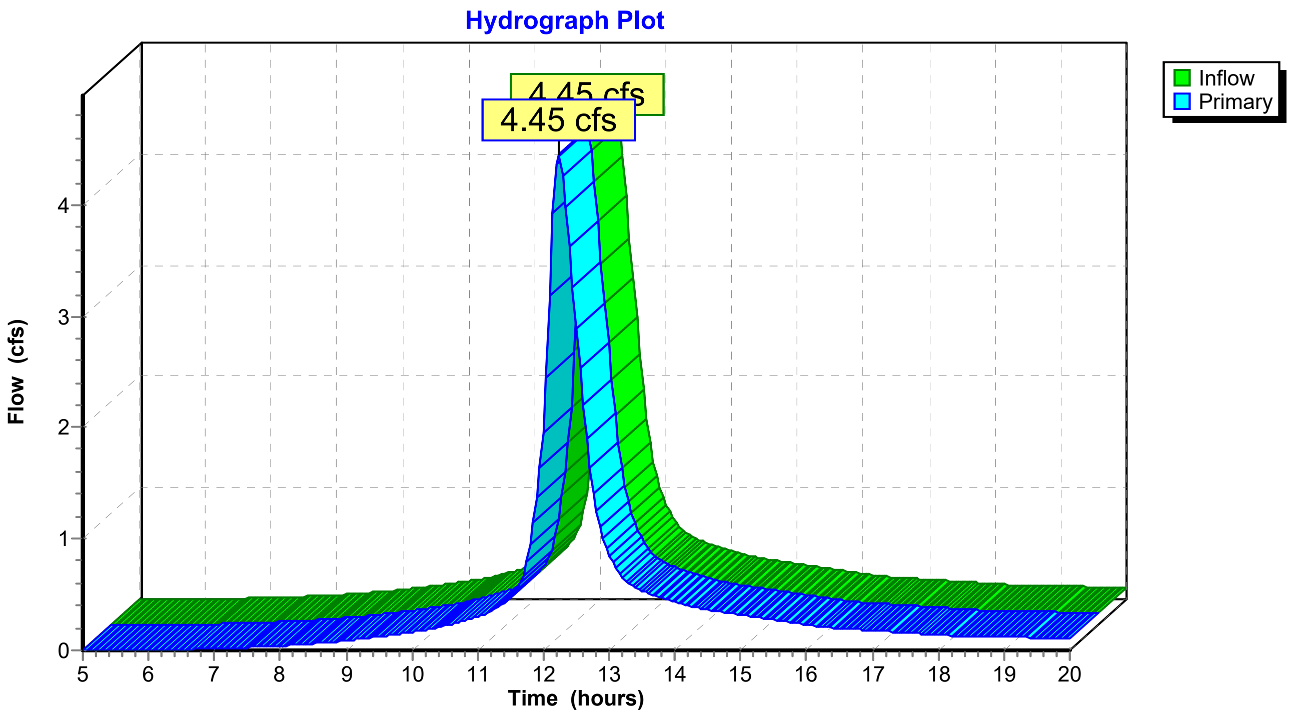
Peak Elev= 425.95' Storage= 18 cf
Plug-Flow detention time= 0.2 min calculated for 0.454 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
424.83	16	0	0
427.83	16	48	48

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	424.83'	**18.0" x 132.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 424.12' S= 0.0054 '/' n= 0.012 Cc= 0.900

Pond CB-26: CB-26



Pond CB-26A: CB-26A

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	1.17 cfs @	12.20 hrs,	Volume=	0.103 af
Outflow	=	1.17 cfs @	12.20 hrs,	Volume=	0.103 af, Atten= 0%, Lag= 0.1 min
Primary	=	1.17 cfs @	12.20 hrs,	Volume=	0.103 af

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

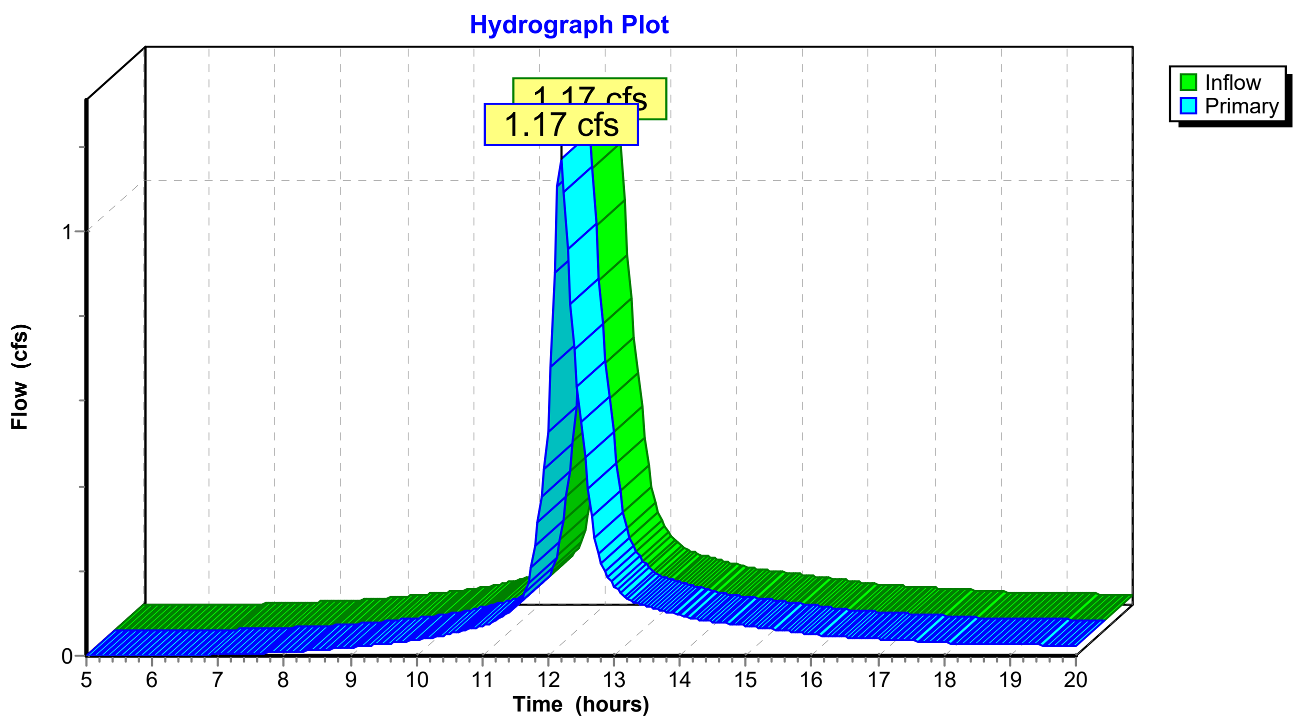
Peak Elev= 425.87' Storage= 9 cf
Plug-Flow detention time= 0.3 min calculated for 0.102 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
425.31	16	0	0
427.81	16	40	40

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	425.31'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 424.83' S= 0.0200 '/' n= 0.012 Cc= 0.900

Pond CB-26A: CB-26A



Pond CB-27A: CB-27A

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	0.24 cfs @	12.09 hrs, Volume=	0.016 af
Outflow	=	0.24 cfs @	12.09 hrs, Volume=	0.016 af, Atten= 0%, Lag= 0.2 min
Primary	=	0.24 cfs @	12.09 hrs, Volume=	0.016 af

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

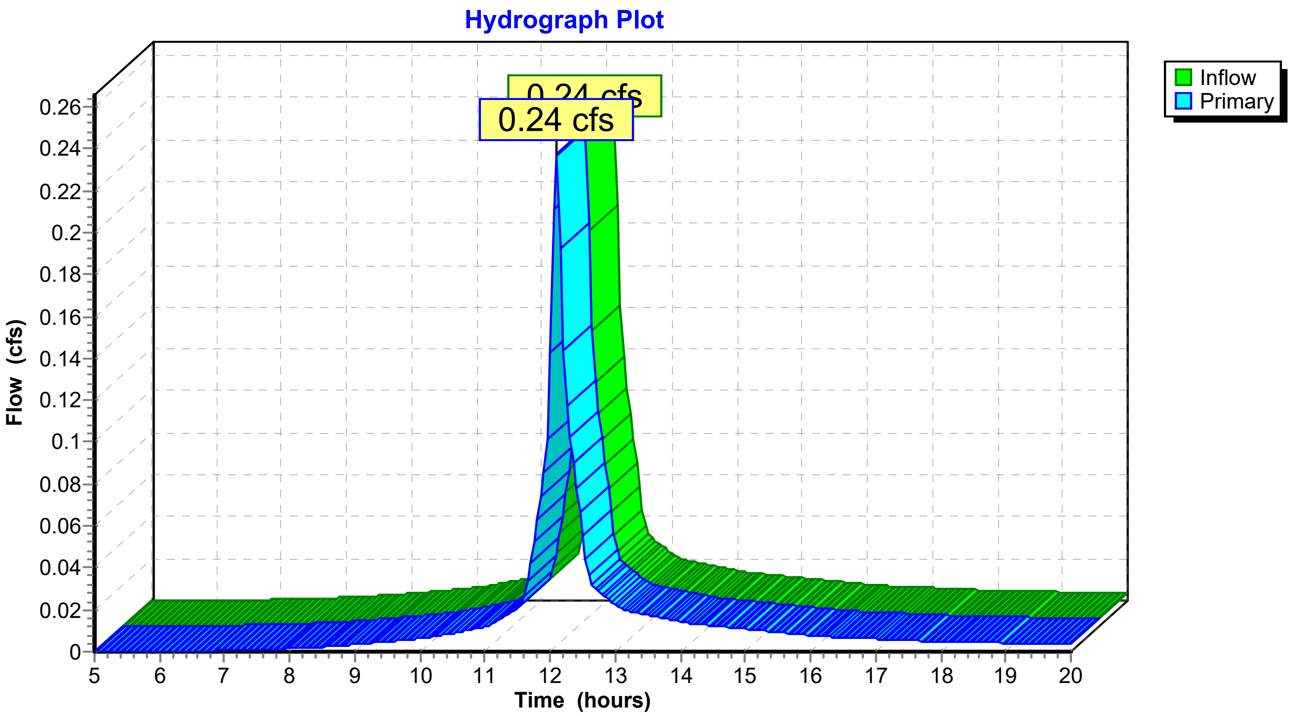
Peak Elev= 424.85' Storage= 4 cf
Plug-Flow detention time= 0.8 min calculated for 0.016 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
424.61	16	0	0
427.11	16	40	40

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	424.61'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 423.61' S= 0.0417 '/' n= 0.012 Cc= 0.900

Pond CB-27A: CB-27A



Pond CB-27B: CB-27.B

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-26 Primary device # 1 OUTLET by 0.62'
[79] Warning: Submerged Pond CB-27A Primary device # 1 INLET by 0.13'

Inflow	=	5.17 cfs @	12.23 hrs,	Volume=	0.527 af
Outflow	=	5.17 cfs @	12.23 hrs,	Volume=	0.527 af, Atten= 0%, Lag= 0.0 min
Primary	=	5.17 cfs @	12.23 hrs,	Volume=	0.527 af

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

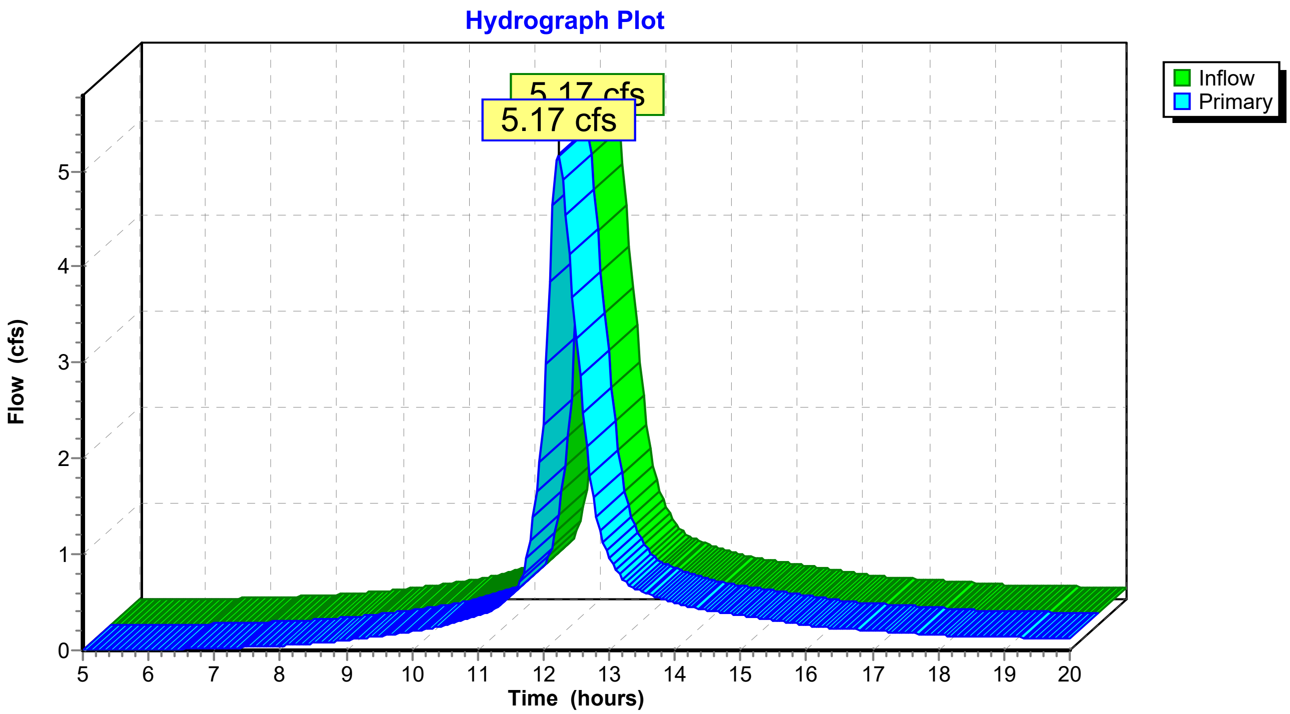
Peak Elev= 424.74' Storage= 18 cf
Plug-Flow detention time= 0.1 min calculated for 0.527 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
423.61	16	0	0
427.11	16	56	56

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	423.61'	**18.0" x 84.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 420.95' S= 0.0317 '/' n= 0.012 Cc= 0.900

Pond CB-27B: CB-27.B



Pond CB-28: CB-28

[88] Warning: Qout>Qin may require Finer Routing>1
[80] Warning: Exceeded Pond CB-28A by 0.11' @ 12.25 hrs (2.85 cfs)

Inflow	=	6.58 cfs @	12.23 hrs,	Volume=	0.666 af
Outflow	=	6.58 cfs @	12.23 hrs,	Volume=	0.666 af, Atten= 0%, Lag= 0.1 min
Primary	=	6.58 cfs @	12.23 hrs,	Volume=	0.666 af

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

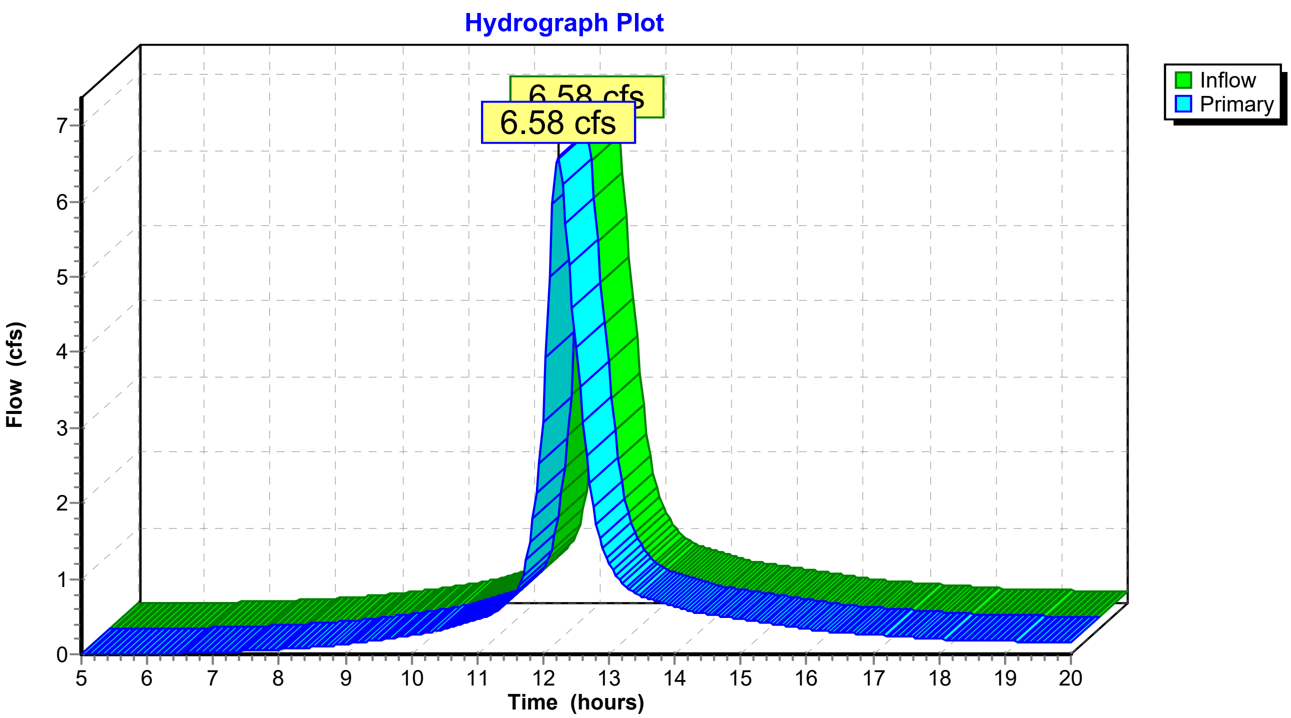
Peak Elev= 422.45' Storage= 26 cf
Plug-Flow detention time= 0.2 min calculated for 0.666 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.83	16	0	0
424.45	16	58	58

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	420.83'	**18.0" x 16.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 420.75' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-28: CB-28



Pond CB-28A: CB-28A

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-27B Primary device # 1 OUTLET by 1.38'

Inflow	=	5.33 cfs @	12.23 hrs,	Volume=	0.549 af
Outflow	=	5.33 cfs @	12.23 hrs,	Volume=	0.549 af, Atten= 0%, Lag= 0.1 min
Primary	=	5.33 cfs @	12.23 hrs,	Volume=	0.549 af

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

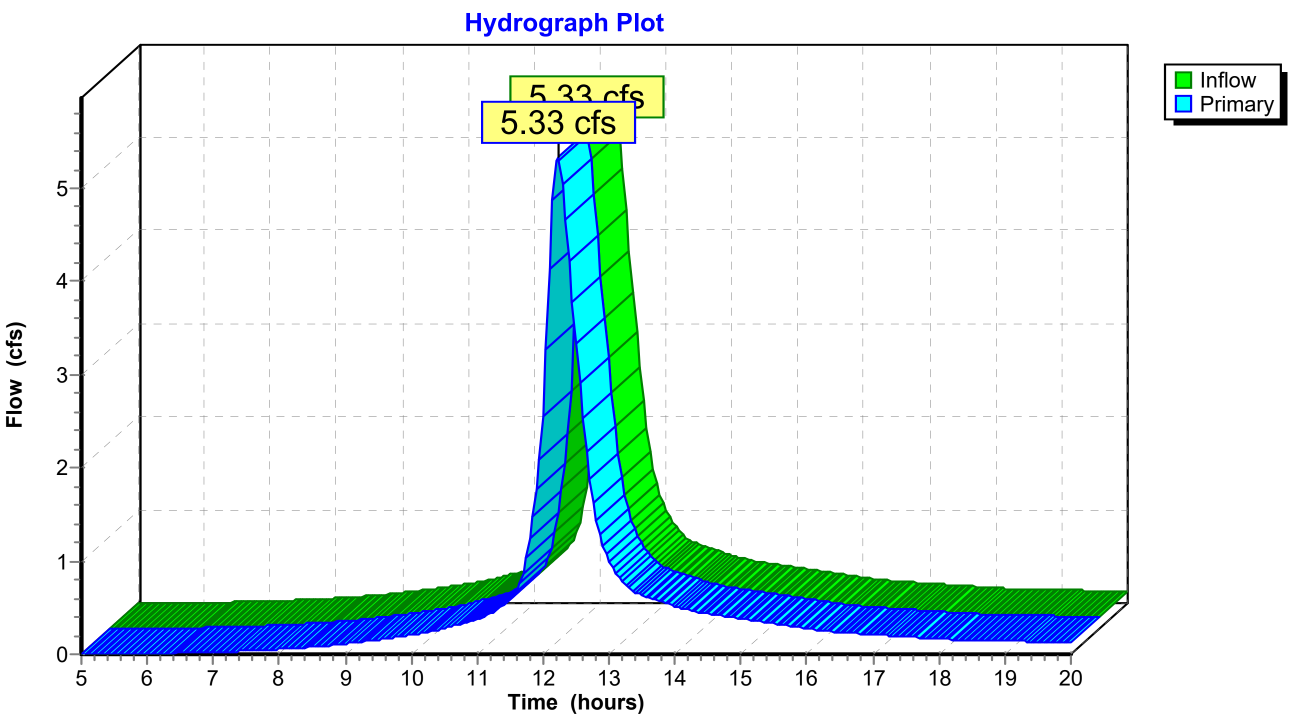
Peak Elev= 422.33' Storage= 22 cf
Plug-Flow detention time= 0.2 min calculated for 0.549 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.95	16	0	0
424.45	16	56	56

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	420.95'	**18.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 420.83' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-28A: CB-28A



Pond CB-3: CB-3

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1
[79] Warning: Submerged Pond CB-2 Primary device # 1 OUTLET by 0.75'

Inflow	=	1.43 cfs @	12.09 hrs,	Volume=	0.109 af
Outflow	=	1.43 cfs @	12.09 hrs,	Volume=	0.109 af, Atten= 0%, Lag= 0.1 min
Primary	=	1.43 cfs @	12.09 hrs,	Volume=	0.109 af

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

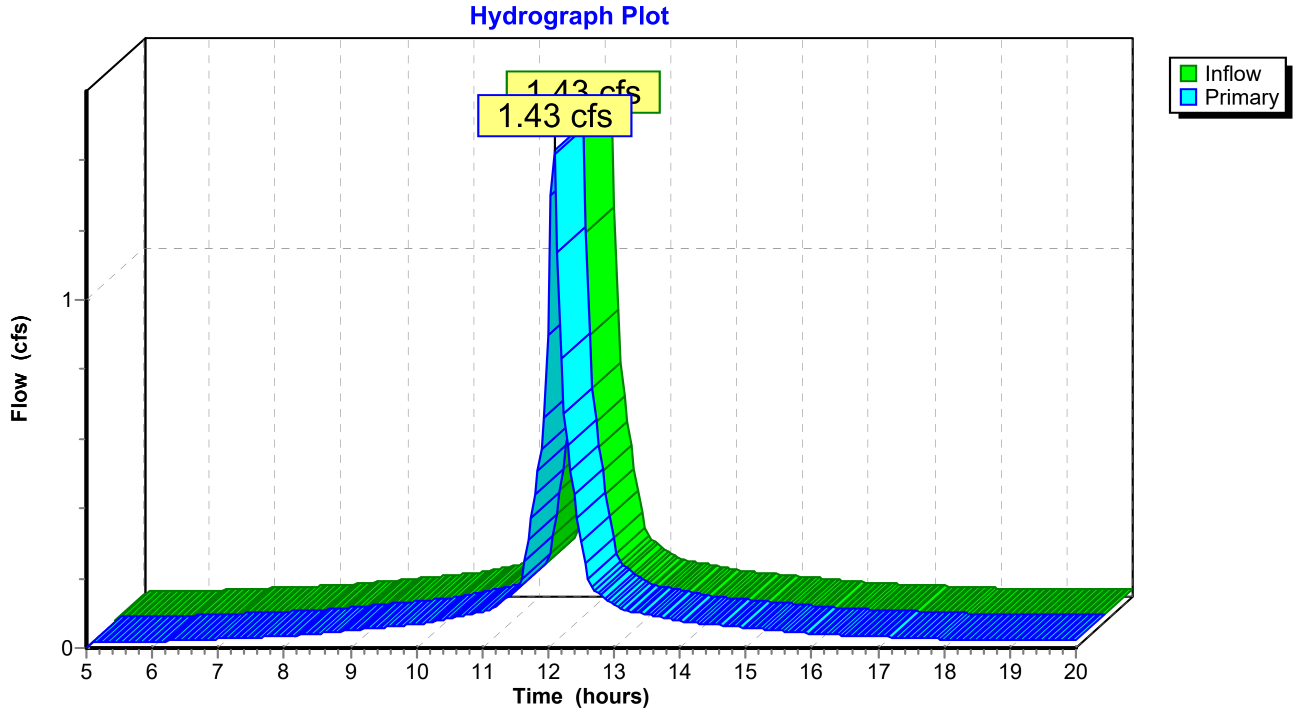
Peak Elev= 355.26' Storage= 12 cf
Plug-Flow detention time= 0.6 min calculated for 0.109 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
354.50	16	0	0
357.50	16	48	48

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	354.50'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 354.38' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-3: CB-3


Hydrograph Plot
1.43 cfs
1.43 cfs
Inflow
Primary
Flow (cfs)
0
1
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Time (hours)

Pond CB-4: CB-4

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1
[80] Warning: Exceeded Pond CB-3 by 0.10' @ 12.10 hrs (0.97 cfs)

Inflow	=	2.13 cfs @	12.09 hrs,	Volume=	0.163 af
Outflow	=	2.13 cfs @	12.09 hrs,	Volume=	0.163 af, Atten= 0%, Lag= 0.1 min
Primary	=	2.13 cfs @	12.09 hrs,	Volume=	0.163 af

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

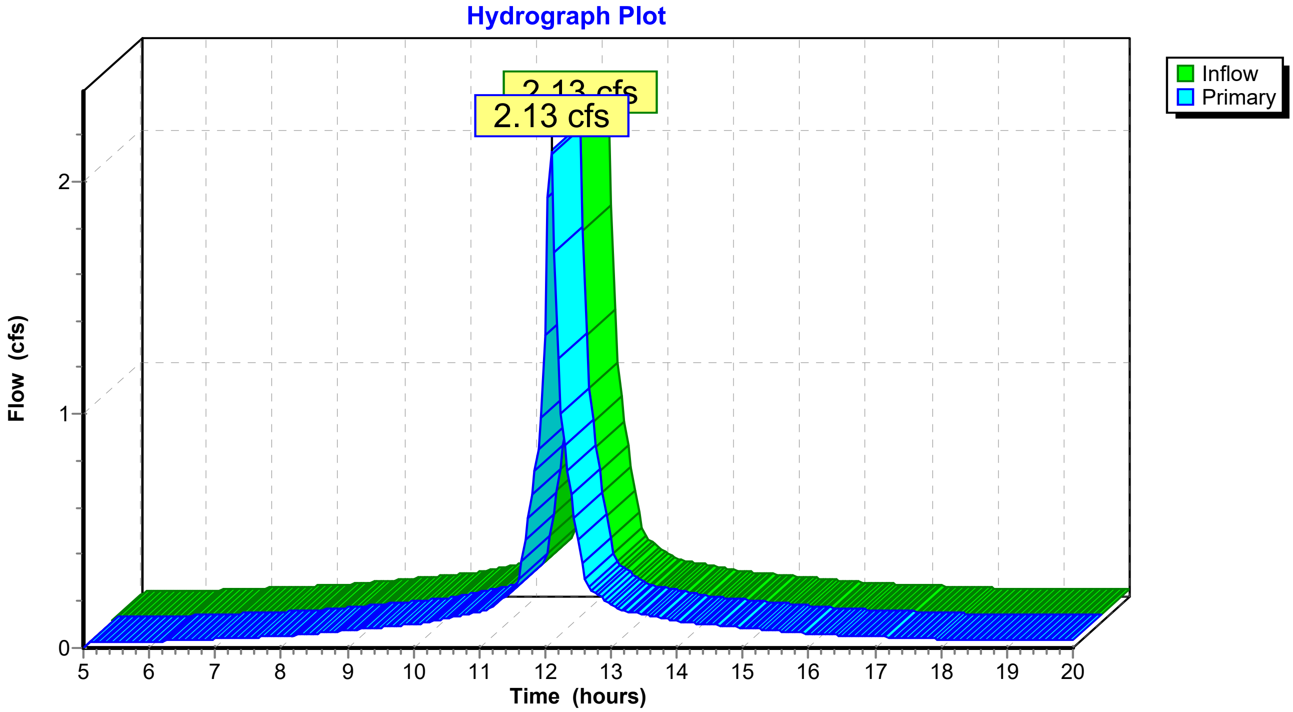
Peak Elev= 355.36' Storage= 16 cf
Plug-Flow detention time= 0.4 min calculated for 0.163 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
354.38	16	0	0
357.50	16	50	50

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	354.38'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 354.26' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-4: CB-4


Hydrograph Plot
2.13 cfs
2.13 cfs
Inflow
Primary
Flow (cfs)
0
1
2
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Time (hours)

Pond CB-6: CB-6

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	2.20 cfs @	12.23 hrs, Volume=	0.206 af
Outflow	=	2.20 cfs @	12.23 hrs, Volume=	0.206 af, Atten= 0%, Lag= 0.1 min
Primary	=	2.20 cfs @	12.23 hrs, Volume=	0.206 af

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

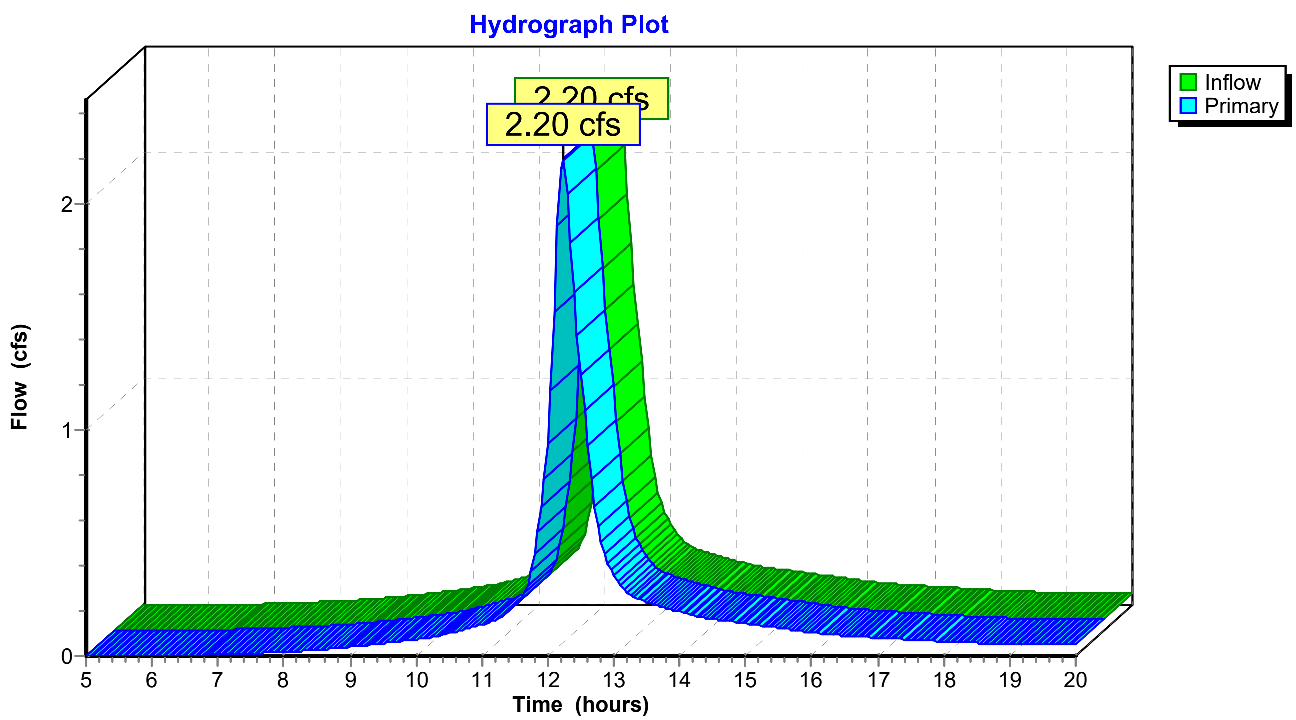
Peak Elev= 384.01' Storage= 13 cf
Plug-Flow detention time= 0.2 min calculated for 0.205 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
383.17	16	0	0
385.27	16	34	34

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	383.17'	**12.0" x 390.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 0.00' S= 0.9825 '/' n= 0.017 Cc= 0.900

Pond CB-6: CB-6



Pond CB-7: CB-7

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-6 Primary device # 1 OUTLET by 377.72'
[79] Warning: Submerged Pond CB-7A Primary device # 1 INLET by 0.58'

Inflow	=	4.83 cfs @	12.26 hrs,	Volume=	0.482 af
Outflow	=	4.83 cfs @	12.26 hrs,	Volume=	0.482 af, Atten= 0%, Lag= 0.0 min
Primary	=	4.83 cfs @	12.26 hrs,	Volume=	0.482 af

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

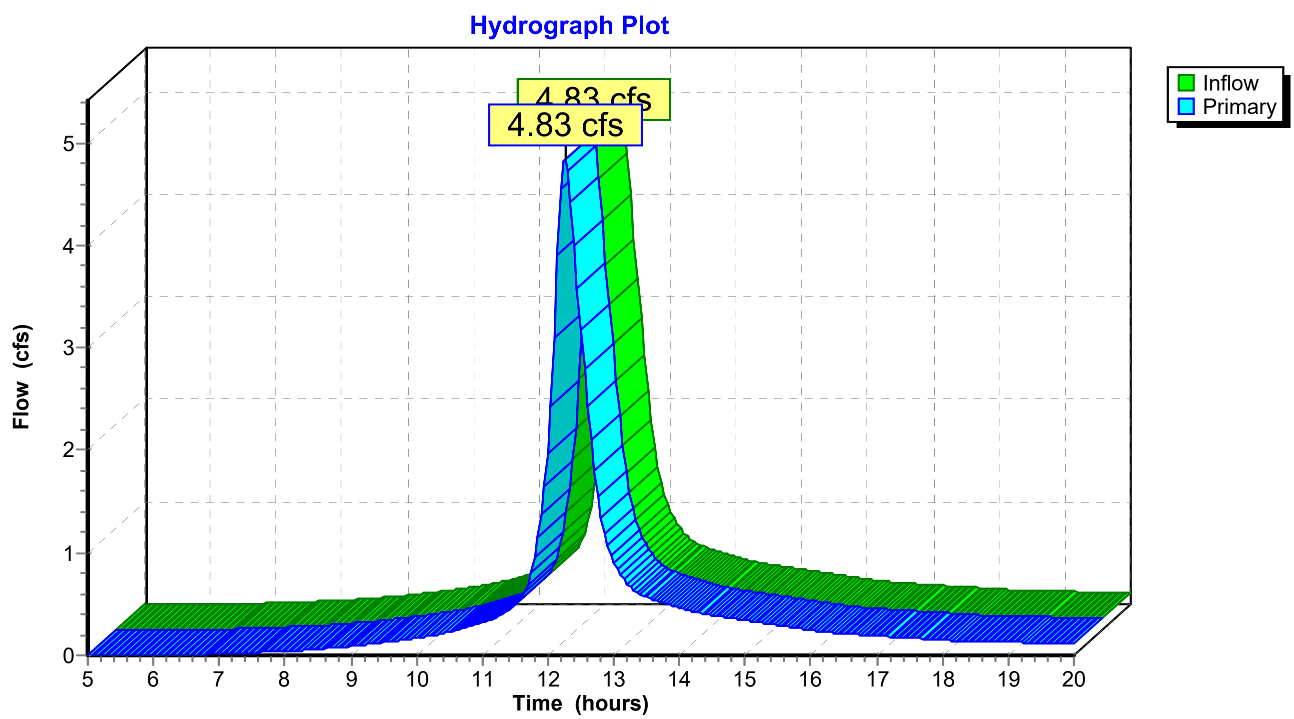
Peak Elev= 377.72' Storage= 17 cf
Plug-Flow detention time= 0.1 min calculated for 0.480 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
376.64	16	0	0
379.64	16	48	48

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	376.64'	**18.0" x 160.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 373.76' S= 0.0180 '/' n= 0.012 Cc= 0.900

Pond CB-7: CB-7



Pond CB-7A: CB-7A

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	1.33 cfs @	12.29 hrs,	Volume=	0.137 af
Outflow	=	1.34 cfs @	12.29 hrs,	Volume=	0.137 af, Atten= 0%, Lag= 0.1 min
Primary	=	1.34 cfs @	12.29 hrs,	Volume=	0.137 af

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

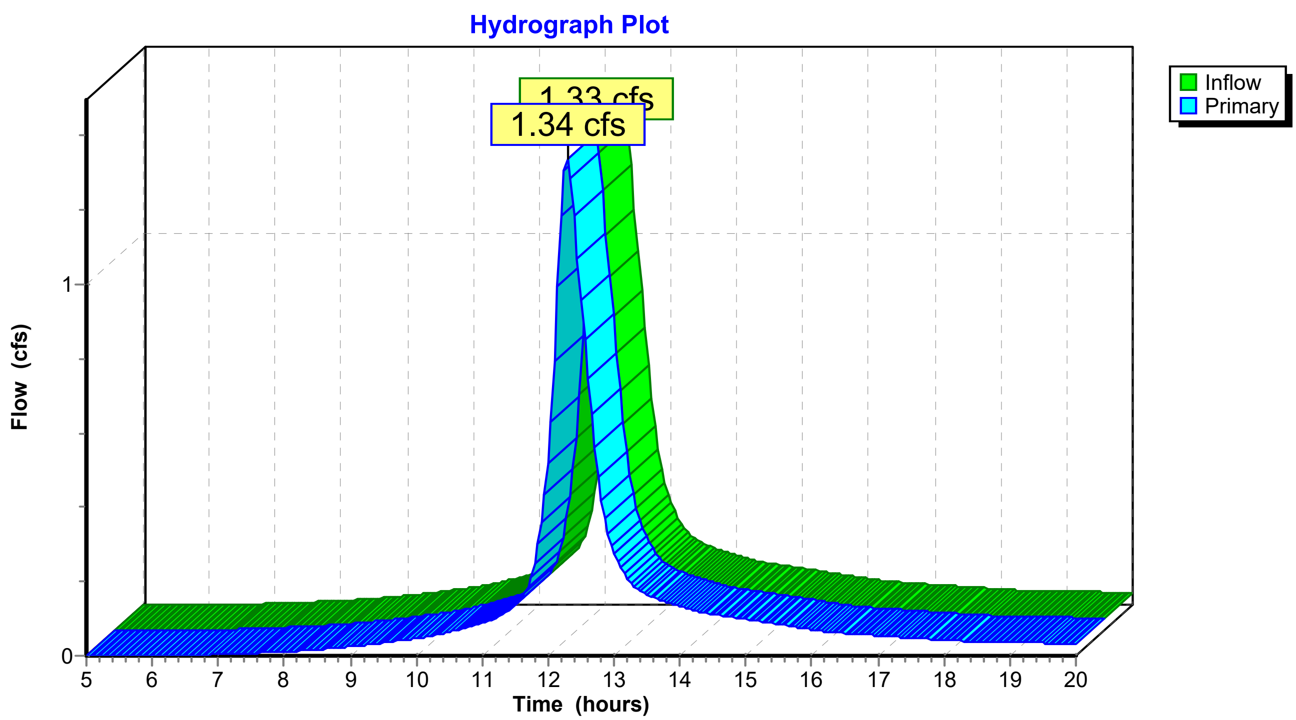
Peak Elev= 377.75' Storage= 10 cf
Plug-Flow detention time= 0.3 min calculated for 0.136 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
377.14	16	0	0
379.64	16	40	40

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	377.14'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 376.64' S= 0.0208 '/' n= 0.012 Cc= 0.900

Pond CB-7A: CB-7A



Pond CB-9: CB-9

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	8.11 cfs @	12.25 hrs,	Volume=	0.789 af
Outflow	=	8.11 cfs @	12.25 hrs,	Volume=	0.789 af, Atten= 0%, Lag= 0.0 min
Primary	=	8.11 cfs @	12.25 hrs,	Volume=	0.789 af

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

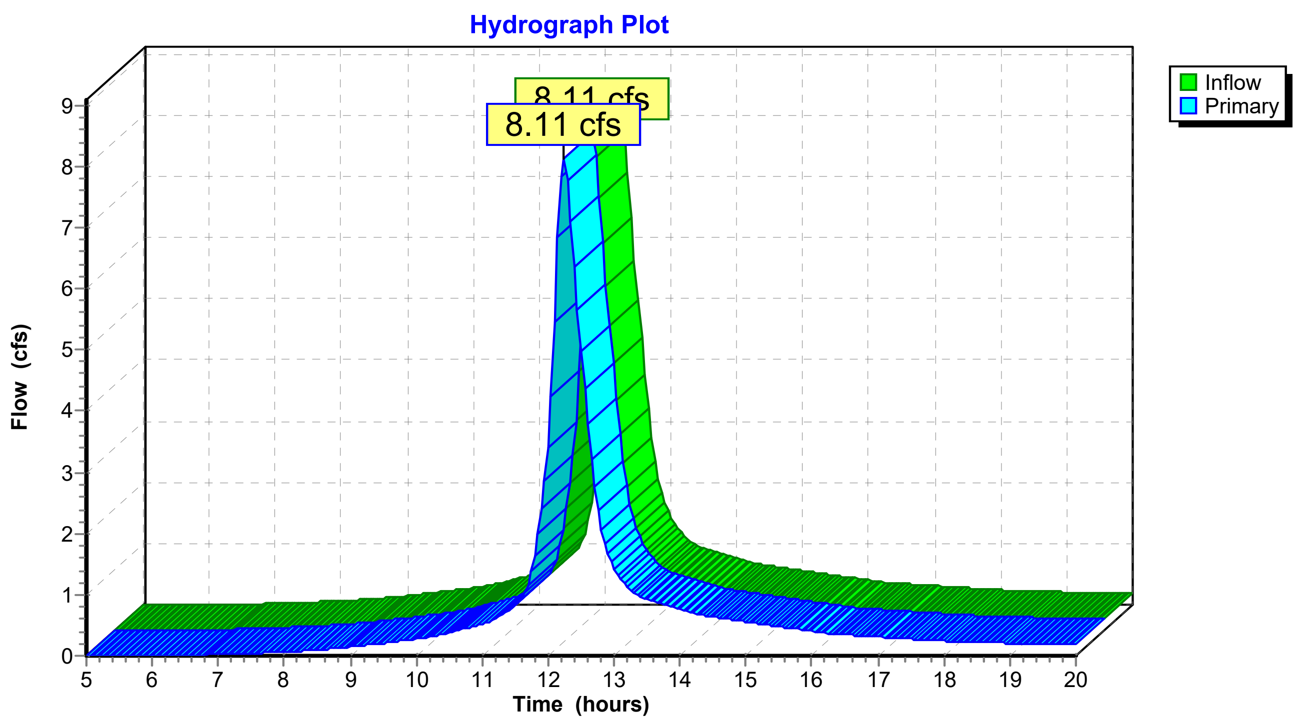
Peak Elev= 372.02' Storage= 22 cf
Plug-Flow detention time= 0.1 min calculated for 0.786 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
370.63	16	0	0
375.80	16	83	83

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	370.63'	**24.0" x 190.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 369.68' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-9: CB-9



Pond CB-9A: CB-9A

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	1.37 cfs @	12.22 hrs, Volume=	0.126 af
Outflow	=	1.37 cfs @	12.22 hrs, Volume=	0.126 af, Atten= 0%, Lag= 0.1 min
Primary	=	1.37 cfs @	12.22 hrs, Volume=	0.126 af

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

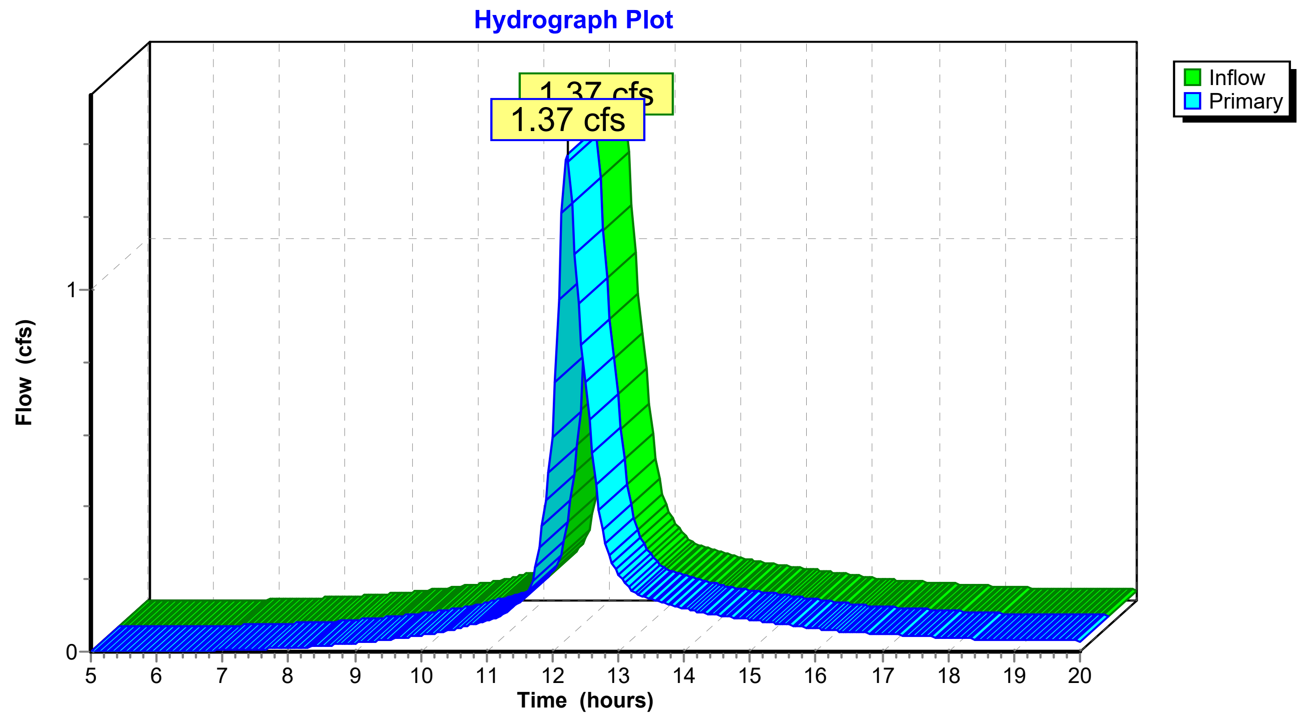
Peak Elev= 373.31' Storage= 10 cf
Plug-Flow detention time= 0.3 min calculated for 0.126 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.67	16	0	0
375.67	16	48	48

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	372.67'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 372.37' S= 0.0125 '/' n= 0.012 Cc= 0.900

Pond CB-9A: CB-9A



Pond DMH-1: DMH-1

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-23 Primary device # 1 OUTLET by 2.51'

Inflow	=	21.98 cfs @	12.26 hrs,	Volume=	2.172 af
Outflow	=	21.98 cfs @	12.26 hrs,	Volume=	2.172 af, Atten= 0%, Lag= 0.0 min
Primary	=	21.98 cfs @	12.26 hrs,	Volume=	2.172 af

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

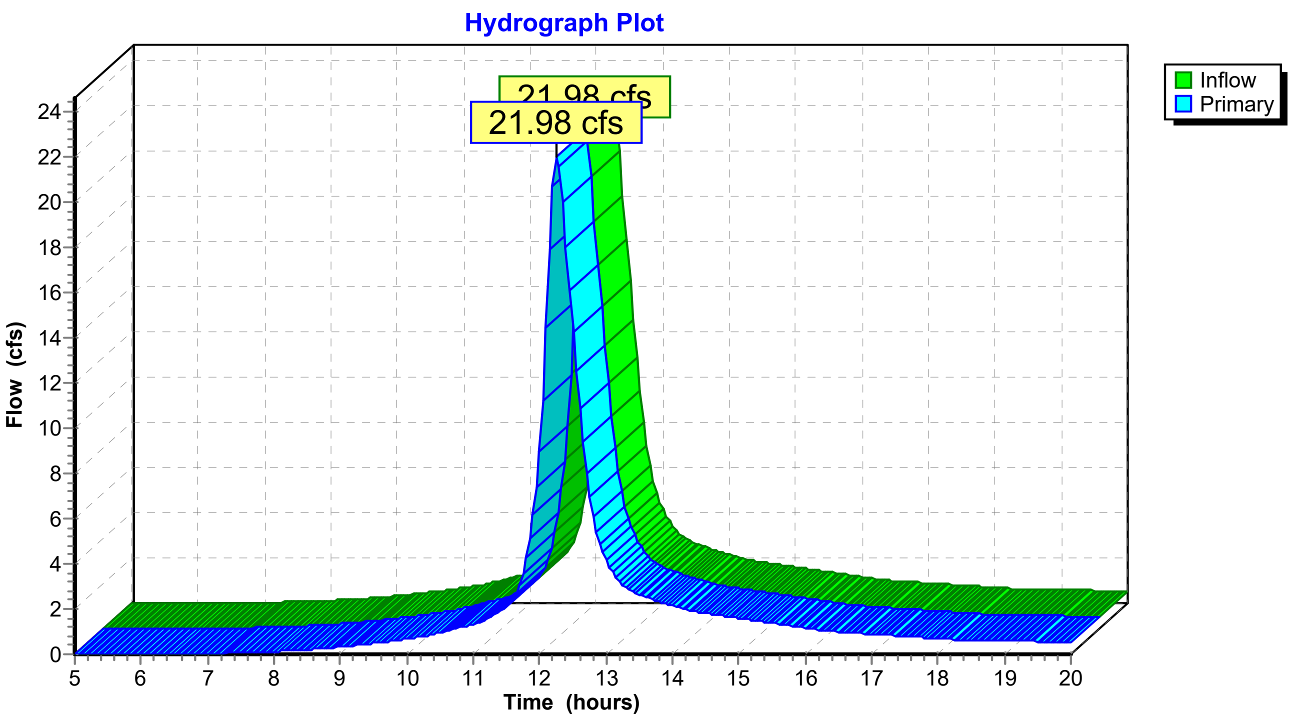
Peak Elev= 385.72' Storage= 40 cf
Plug-Flow detention time= 0.1 min calculated for 2.165 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
383.25	16	0	0
387.25	16	64	64

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	383.25'	**30.0" x 65.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 382.93' S= 0.0049 '/' n= 0.012 Cc= 0.900

Pond DMH-1: DMH-1



Pond DMH-2: DMH-2

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-24 Primary device # 1 INLET by 0.46'

Inflow	=	1.83 cfs @	12.29 hrs,	Volume=	0.189 af
Outflow	=	1.83 cfs @	12.29 hrs,	Volume=	0.189 af, Atten= 0%, Lag= 0.1 min
Primary	=	1.83 cfs @	12.29 hrs,	Volume=	0.189 af

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

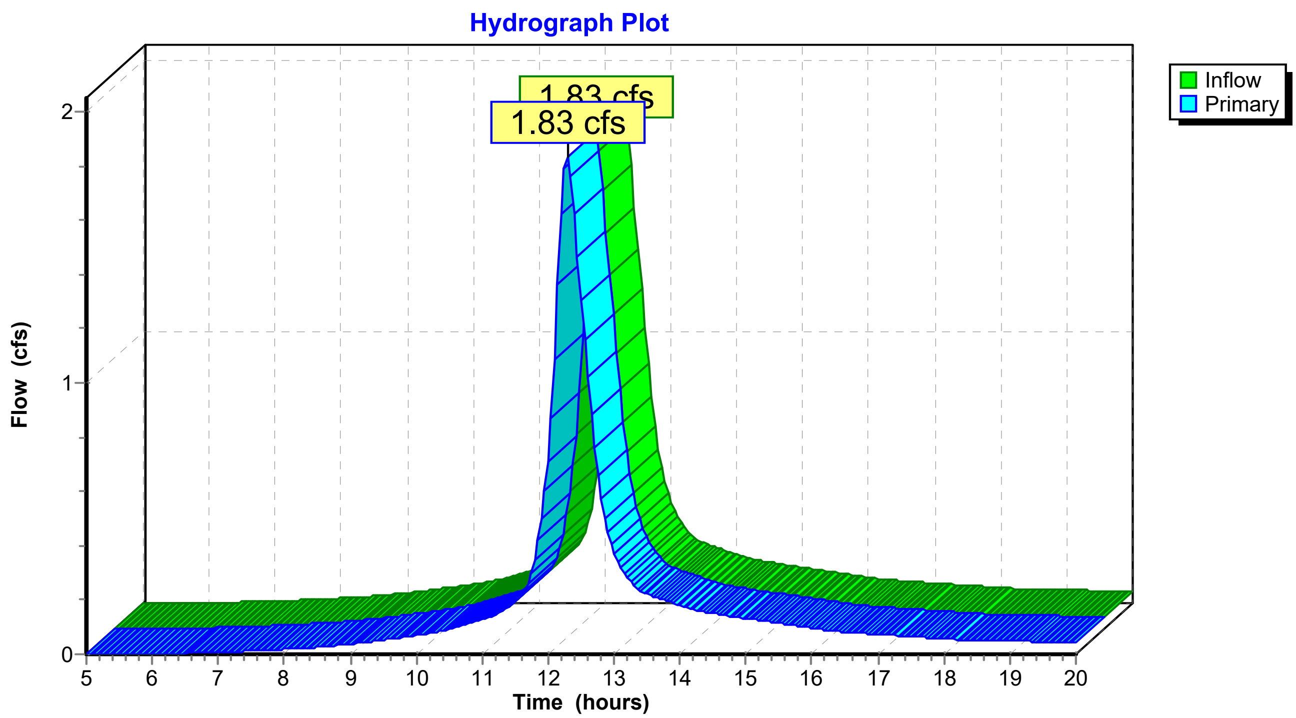
Peak Elev= 424.55' Storage= 12 cf
Plug-Flow detention time= 0.3 min calculated for 0.188 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
423.81	16	0	0
428.67	16	78	78

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	423.81'	**12.0" x 151.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 421.38' S= 0.0161 '/' n= 0.012 Cc= 0.900

Pond DMH-2: DMH-2



Pond DMH-3: DMH-3

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-28 Primary device # 1 INLET by 1.40'

Inflow	=	6.58 cfs @	12.23 hrs,	Volume=	0.666 af
Outflow	=	6.58 cfs @	12.23 hrs,	Volume=	0.666 af, Atten= 0%, Lag= 0.1 min
Primary	=	6.58 cfs @	12.23 hrs,	Volume=	0.666 af

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

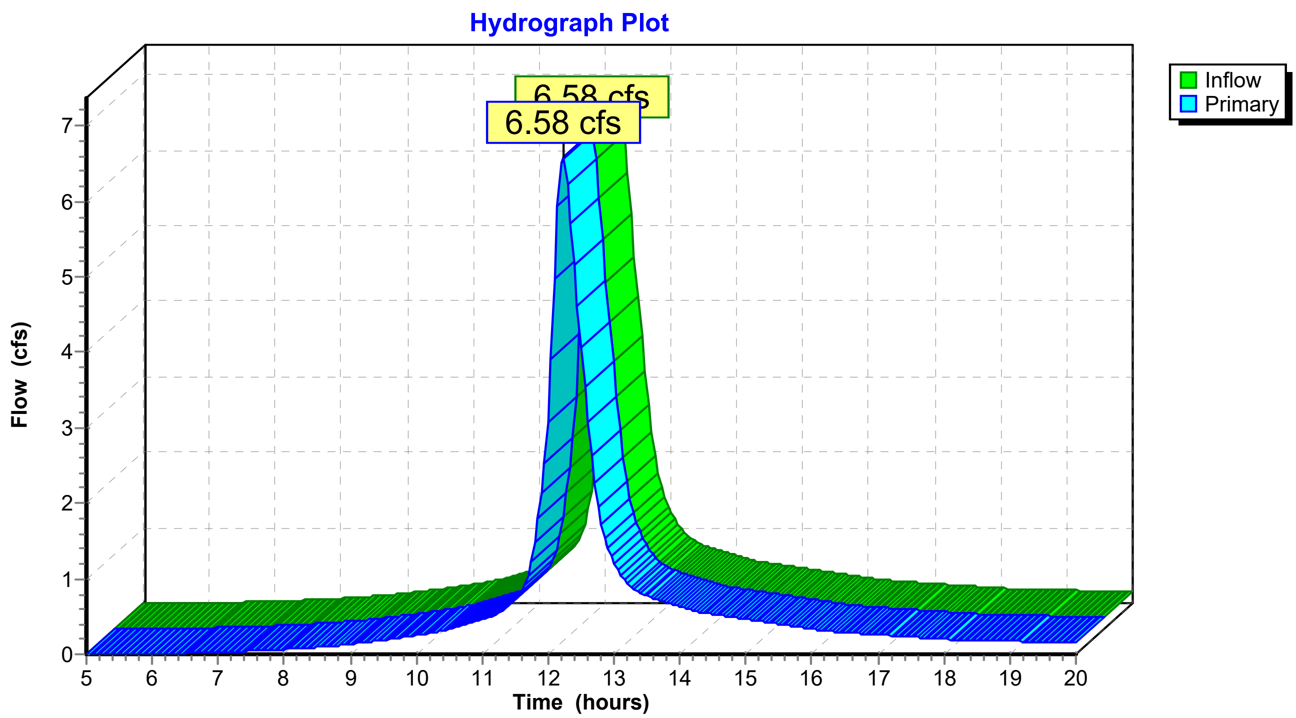
Peak Elev= 422.24' Storage= 24 cf
Plug-Flow detention time= 0.1 min calculated for 0.666 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.75	16	0	0
425.43	16	75	75

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	420.75'	**18.0" x 145.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 420.02' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond DMH-3: DMH-3



Pond Forbay 1: FORBAY 1

Inflow	=	2.13 cfs @	12.09 hrs,	Volume=	0.163 af
Outflow	=	2.11 cfs @	12.10 hrs,	Volume=	0.141 af, Atten= 1%, Lag= 0.9 min
Primary	=	2.11 cfs @	12.10 hrs,	Volume=	0.141 af

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

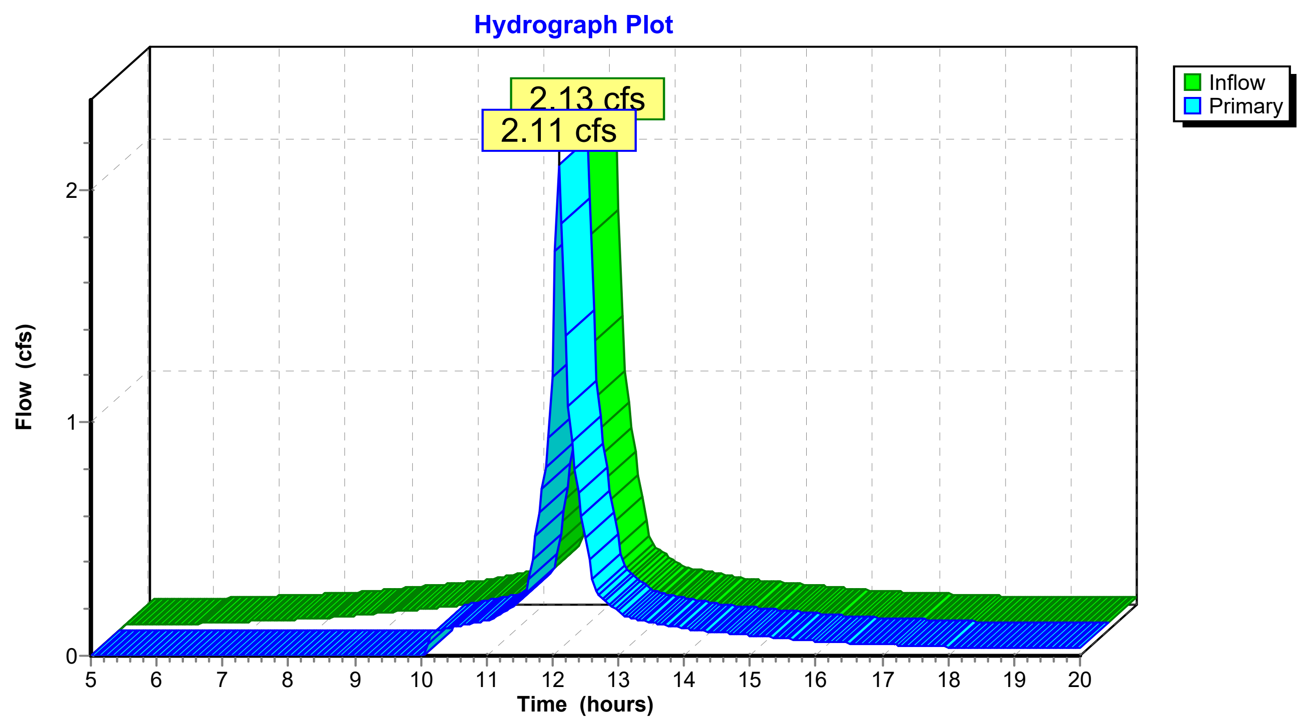
Peak Elev= 353.30' Storage= 1,087 cf
Plug-Flow detention time= 80.0 min calculated for 0.141 af (87% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
350.00	80	0	0
352.00	315	395	395
354.00	750	1,065	1,460

Primary OutFlow (Free Discharge)
└─1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	353.00'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Pond Forbay 1: FORBAY 1



Pond PLUNG 2: PLUNGE 2

Inflow	=	3.47 cfs @	12.16 hrs, Volume=	0.353 af	
Outflow	=	3.44 cfs @	12.19 hrs, Volume=	0.331 af,	Atten= 1%, Lag= 1.6 min
Primary	=	3.44 cfs @	12.19 hrs, Volume=	0.331 af	

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

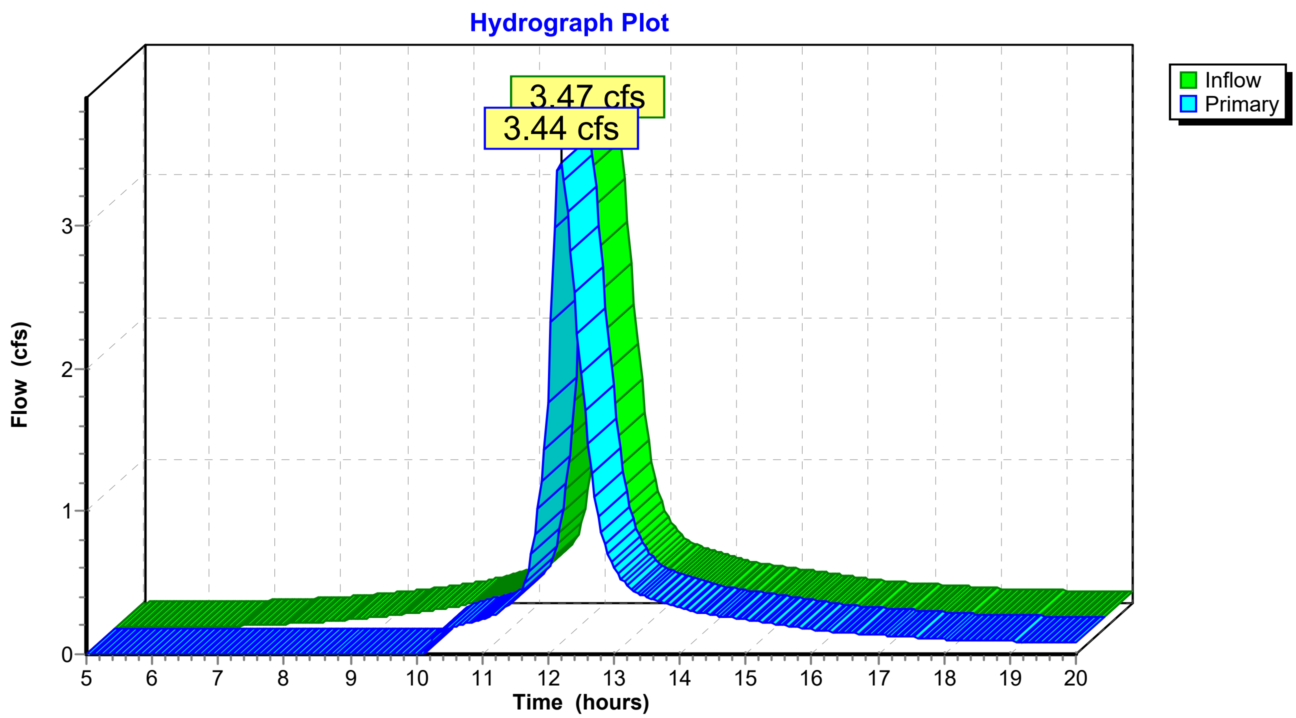
Peak Elev= 366.41' Storage= 1,333 cf
Plug-Flow detention time= 39.8 min calculated for 0.331 af (94% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
363.00	100	0	0
364.00	150	125	125
366.00	622	772	897
367.00	1,500	1,061	1,958

Primary OutFlow (Free Discharge)
└─1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	366.00'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Pond PLUNG 2: PLUNGE 2



Pond PLUNGE 1: PLUNGE 1

[91] Warning: Storage range exceeded by 0.28'

Inflow	=	8.47 cfs @	12.24 hrs, Volume=	0.846 af
Outflow	=	8.46 cfs @	12.25 hrs, Volume=	0.803 af, Atten= 0%, Lag= 0.7 min
Primary	=	8.46 cfs @	12.25 hrs, Volume=	0.803 af

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

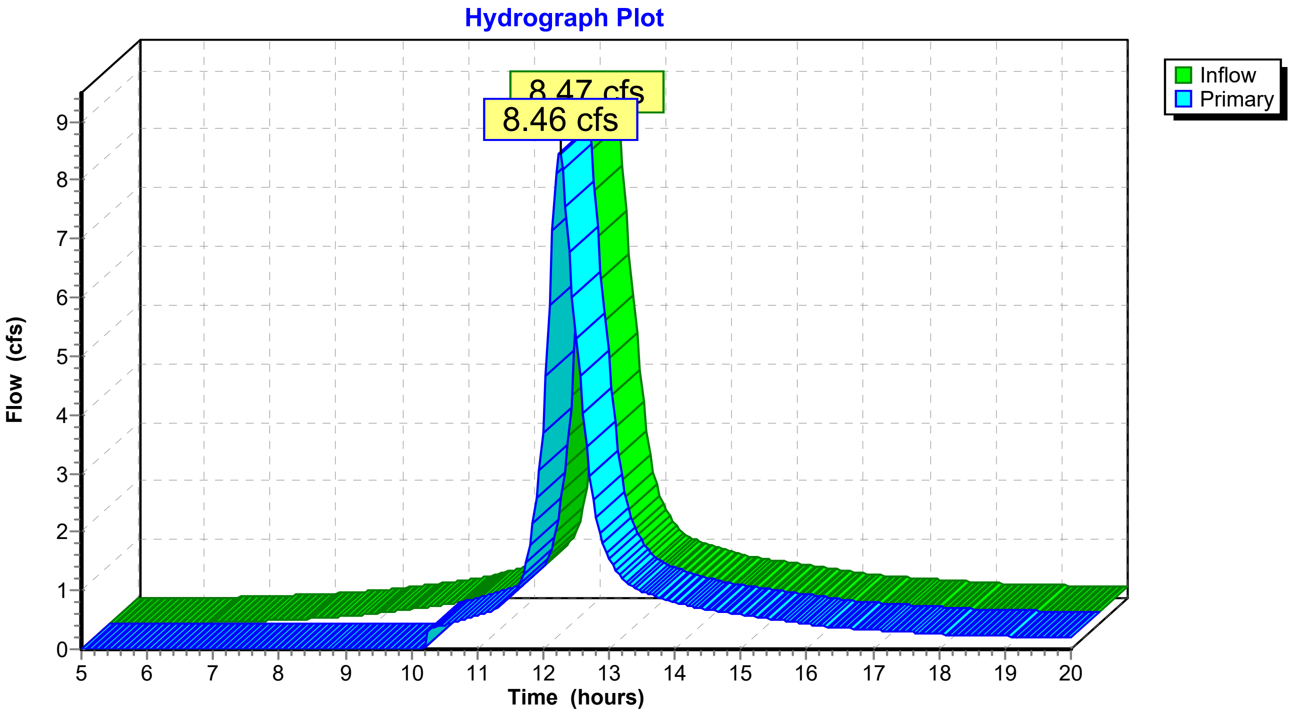
Peak Elev= 362.28' Storage= 2,249 cf
Plug-Flow detention time= 31.9 min calculated for 0.803 af (95% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
358.00	50	0	0
362.00	1,000	2,100	2,100

Primary OutFlow (Free Discharge)
└─1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	361.50'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Pond PLUNGE 1: PLUNGE 1



Pond PLUNGE 4: PLUNGE 4

[91] Warning: Storage range exceeded by 31.18'
[80] Warning: Exceeded Pond DMH-2 by 31.24' @ 19.95 hrs (14.97 cfs)

Inflow	=	1.83 cfs @	12.29 hrs,	Volume=	0.189 af	
Outflow	=	0.00 cfs @	5.00 hrs,	Volume=	0.000 af,	Atten= 100%, Lag= 0.0 min
Primary	=	0.00 cfs @	5.00 hrs,	Volume=	0.000 af	

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

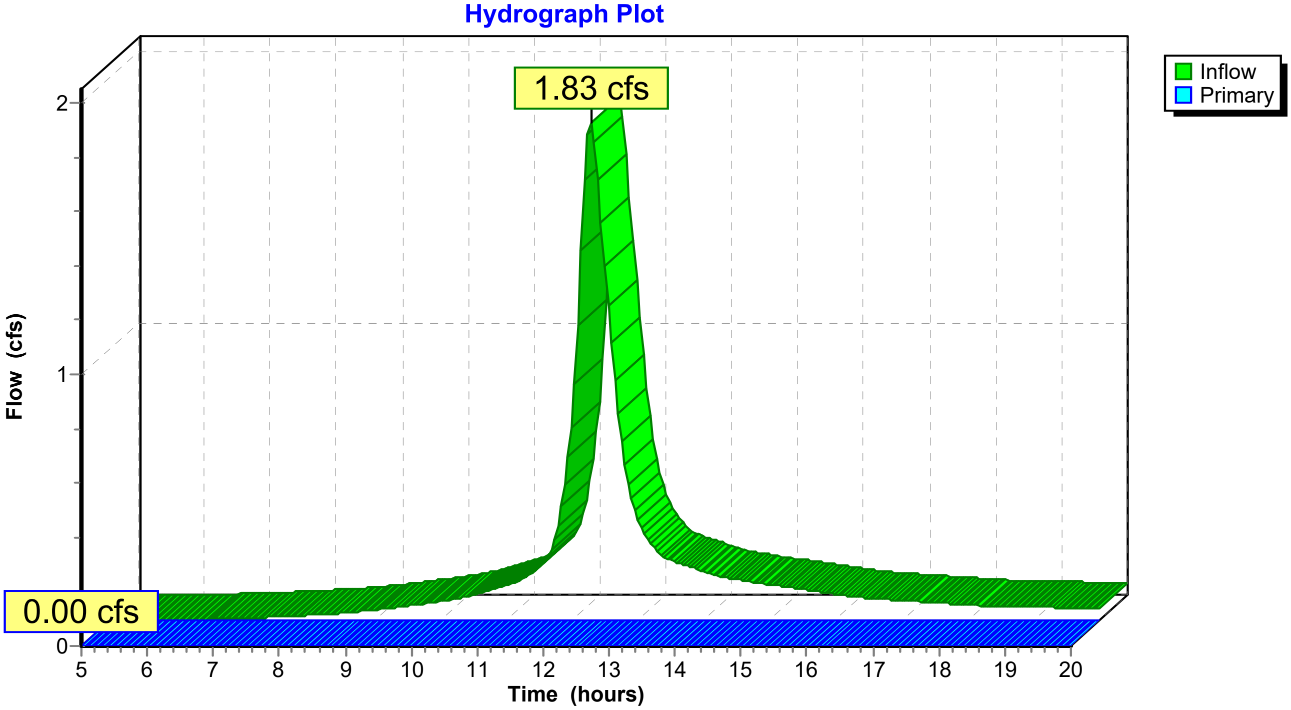
Peak Elev= 455.18' Storage= 8,212 cf
Plug-Flow detention time= (not calculated)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.00	40	0	0
422.00	125	165	165
424.00	360	485	650

Primary OutFlow (Free Discharge)
└─1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	424.00'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Pond PLUNGE 4: PLUNGE 4



Pond PLUNGE 5: PLUNGE 5

[91] Warning: Storage range exceeded by 0.12'

Inflow	=	6.58 cfs @	12.23 hrs,	Volume=	0.666 af
Outflow	=	6.29 cfs @	12.30 hrs,	Volume=	0.592 af, Atten= 4%, Lag= 3.9 min
Primary	=	6.29 cfs @	12.30 hrs,	Volume=	0.592 af

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

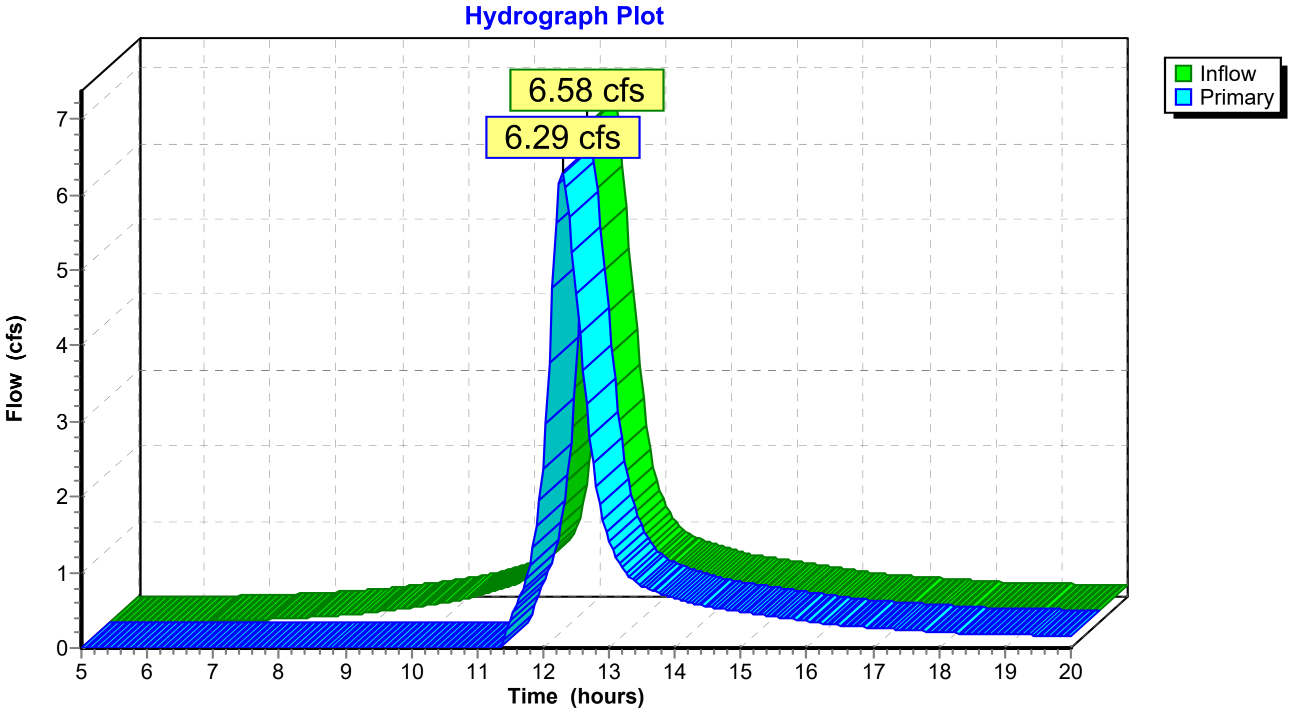
Peak Elev= 418.12' Storage= 4,939 cf
Plug-Flow detention time= 61.5 min calculated for 0.590 af (88% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
414.00	125	0	0
416.00	700	825	825
417.00	900	800	1,625
418.00	5,000	2,950	4,575

Primary OutFlow (Free Discharge)
└1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	417.50'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Pond PLUNGE 5: PLUNGE 5



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, TYPEII~2 Rainfall=6.60"
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment D--1: D-1
Tc=6.0 min CN=98 Area=4,262 sf Runoff= 0.62 cfs 0.048 af

Subcatchment D-10: D-10
Tc=6.0 min CN=98 Area=3,302 sf Runoff= 0.48 cfs 0.037 af

Subcatchment D-11: D-11
Tc=6.0 min CN=98 Area=3,099 sf Runoff= 0.45 cfs 0.035 af

Subcatchment D-11A: D-11A
Tc=6.0 min CN=98 Area=2,486 sf Runoff= 0.36 cfs 0.028 af

Subcatchment D-12: D-12
Tc=16.6 min CN=87 Area=18,053 sf Runoff= 1.74 cfs 0.166 af

Subcatchment D-12A: D-12A
Tc=11.9 min CN=87 Area=17,038 sf Runoff= 1.85 cfs 0.157 af

Subcatchment D-13: D-13
Tc=6.0 min CN=94 Area=8,280 sf Runoff= 1.17 cfs 0.088 af

Subcatchment D-13A: D-13A
Tc=6.0 min CN=98 Area=2,837 sf Runoff= 0.41 cfs 0.032 af

Subcatchment D-14: D-14
Tc=20.7 min CN=87 Area=21,592 sf Runoff= 1.91 cfs 0.198 af

Subcatchment D-14A: D-14A
Tc=6.0 min CN=98 Area=5,177 sf Runoff= 0.75 cfs 0.058 af

Subcatchment D-15: D-15
Tc=6.0 min CN=98 Area=2,000 sf Runoff= 0.29 cfs 0.022 af

Subcatchment D-15A: D-15A
Tc=12.1 min CN=91 Area=7,050 sf Runoff= 0.81 cfs 0.071 af

Subcatchment D-16: D-16
Tc=6.0 min CN=98 Area=2,580 sf Runoff= 0.37 cfs 0.029 af

Subcatchment D-16A: D-16A
Tc=9.8 min CN=92 Area=8,484 sf Runoff= 1.05 cfs 0.087 af

Subcatchment D-17: D-17
Tc=6.0 min CN=98 Area=3,577 sf Runoff= 0.52 cfs 0.040 af

Subcatchment D-17A: D-17A
Tc=12.4 min CN=88 Area=22,859 sf Runoff= 2.49 cfs 0.215 af

Subcatchment D-18: D-18
Tc=15.4 min CN=86 Area=9,762 sf Runoff= 0.95 cfs 0.088 af

Subcatchment D-18B: D-18
Tc=20.3 min CN=87 Area=86,619 sf Runoff= 7.72 cfs 0.795 af

Subcatchment D-19: D-19
Tc=17.2 min CN=88 Area=27,495 sf Runoff= 2.65 cfs 0.258 af

Subcatchment D-19A: D-19A
Tc=17.3 min CN=85 Area=85,319 sf Runoff= 7.80 cfs 0.748 af

Subcatchment D-2: D-2
Tc=6.0 min CN=98 Area=4,523 sf Runoff= 0.66 cfs 0.051 af

Subcatchment D-20: D-20
Tc=13.4 min CN=91 Area=17,867 sf Runoff= 1.97 cfs 0.179 af

Subcatchment D-21: D-21
Tc=17.1 min CN=87 Area=13,201 sf Runoff= 1.26 cfs 0.121 af

Subcatchment D-21A: D-21A
Tc=22.0 min CN=89 Area=38,849 sf Runoff= 3.46 cfs 0.372 af

Subcatchment D-21C: D-21C
Tc=19.1 min CN=86 Area=1.196 ac Runoff= 4.68 cfs 0.467 af

Subcatchment D-22: D-22
Tc=12.3 min CN=87 Area=9,713 sf Runoff= 1.05 cfs 0.089 af

Subcatchment D-22A: D-22A
Tc=6.0 min CN=93 Area=3,475 sf Runoff= 0.49 cfs 0.036 af

Subcatchment D-23: D-23
Tc=13.1 min CN=89 Area=12,626 sf Runoff= 1.36 cfs 0.121 af

Subcatchment D-23A: D-23A
Tc=11.0 min CN=86 Area=0.401 ac Runoff= 1.92 cfs 0.157 af

Subcatchment D-24: D-24
Tc=21.4 min CN=89 Area=39,239 sf Runoff= 3.53 cfs 0.376 af

Subcatchment D-25: D-25
Tc=21.7 min CN=88 Area=22,353 sf Runoff= 1.97 cfs 0.210 af

Subcatchment D-25A: D-25A
Tc=13.0 min CN=86 Area=19,613 sf Runoff= 2.03 cfs 0.176 af

Subcatchment D-26: D-26
Tc=23.0 min CN=90 Area=32,858 sf Runoff= 2.91 cfs 0.322 af

Subcatchment D-26A: D-26A
Tc=14.3 min CN=88 Area=22,077 sf Runoff= 2.29 cfs 0.207 af

Subcatchment D-27: D-27
Tc=16.3 min CN=91 Area=10,860 sf Runoff= 1.12 cfs 0.109 af

Subcatchment D-27A: D-27A
Tc=6.0 min CN=88 Area=3,503 sf Runoff= 0.46 cfs 0.033 af

Subcatchment D-28: D-28
Tc=17.1 min CN=88 Area=25,225 sf Runoff= 2.44 cfs 0.237 af

Subcatchment D-28A: D-28A
Tc=6.0 min CN=93 Area=4,067 sf Runoff= 0.57 cfs 0.042 af

Subcatchment D-2OA: D-20A
Tc=22.3 min CN=85 Area=52,267 sf Runoff= 4.32 cfs 0.457 af

Subcatchment D-3: D-3
Tc=6.0 min CN=98 Area=8,167 sf Runoff= 1.18 cfs 0.092 af

Subcatchment D-4: D-4
Tc=6.0 min CN=98 Area=8,318 sf Runoff= 1.21 cfs 0.093 af

Subcatchment D-6: D-6
Tc=17.1 min CN=88 Area=44,426 sf Runoff= 4.30 cfs 0.417 af

Subcatchment D-7: D-7
Tc=21.4 min CN=88 Area=29,922 sf Runoff= 2.65 cfs 0.281 af

Subcatchment D-7A: D-7A
Tc=21.4 min CN=88 Area=29,500 sf Runoff= 2.61 cfs 0.277 af

Subcatchment D-9: D-9
Tc=16.4 min CN=88 Area=39,040 sf Runoff= 3.85 cfs 0.367 af

Subcatchment D-9A: CB-9A
Tc=16.4 min CN=88 Area=27,189 sf Runoff= 2.68 cfs 0.255 af

Subcatchment D-DMH-1: D-DMH-1
Tc=6.0 min CN=85 Area=69,237 sf Runoff= 8.66 cfs 0.609 af

Subcatchment EX-1: EX-1
Tc=30.6 min CN=79 Area=16.430 ac Runoff= 45.38 cfs 5.377 af

Subcatchment EX-2: EX-2
Tc=41.6 min CN=79 Area=25.510 ac Runoff= 60.70 cfs 8.319 af

Subcatchment EX-3: EX-3
Tc=47.7 min CN=79 Area=35.510 ac Runoff= 78.65 cfs 11.557 af

Subcatchment EX-4: EX-4
Tc=27.4 min CN=79 Area=11.470 ac Runoff= 33.25 cfs 3.758 af

Subcatchment OPEN 1: OIPEN 1
Tc=42.8 min CN=79 Area=426,190 sf Runoff= 22.96 cfs 3.189 af

Subcatchment OPEN 2: OPEN 2
Tc=13.4 min CN=79 Area=168,705 sf Runoff= 14.94 cfs 1.275 af

Subcatchment OPEN 3: OPEN 3
Tc=50.3 min CN=79 Area=319,952 sf Runoff= 15.81 cfs 2.388 af

Subcatchment OPEN 4: OPEN 4
Tc=29.2 min CN=80 Area=632,860 sf Runoff= 41.89 cfs 4.883 af

Subcatchment OPEN 5: OPEN 5
Tc=29.8 min CN=79 Area=326,510 sf Runoff= 20.95 cfs 2.454 af

Subcatchment OPEN 6: OPEN 6
Tc=35.7 min CN=79 Area=224,401 sf Runoff= 13.23 cfs 1.683 af

Subcatchment OPEN 7: OPEN 7
Tc=36.5 min CN=79 Area=457,482 sf Runoff= 26.66 cfs 3.431 af

Subcatchment POND 1: POND 1
Tc=6.0 min CN=80 Area=17,554 sf Runoff= 1.99 cfs 0.136 af

Subcatchment POND 2: POND 2
Tc=6.0 min CN=80 Area=49,954 sf Runoff= 5.65 cfs 0.388 af

Subcatchment POND 3: POND 3
Tc=6.0 min CN=80 Area=42,753 sf Runoff= 4.84 cfs 0.332 af

Subcatchment POND 5: POND 5
Tc=6.0 min CN=80 Area=50,948 sf Runoff= 5.76 cfs 0.396 af

Subcatchment POND 6: POND 6
Tc=15.4 min CN=80 Area=140,626 sf Runoff= 12.16 cfs 1.090 af

Reach CULVERT 1: CULVERT 1 Inflow= 22.96 cfs 3.189 af
Length= 42.0' Max Vel= 9.0 fps Capacity= 108.99 cfs Outflow= 22.95 cfs 3.189 af

Reach CULVERT 2: CULVERT 2 Inflow= 72.95 cfs 9.703 af
Length= 46.0' Max Vel= 12.1 fps Capacity= 108.99 cfs Outflow= 72.93 cfs 9.703 af

Reach CULVERT 3: CULVERT 3 Inflow= 15.81 cfs 2.388 af
Length= 42.0' Max Vel= 8.1 fps Capacity= 108.99 cfs Outflow= 15.80 cfs 2.388 af

Reach DMH-5 TO OUTLET: DMH-5 TO OUTLET Inflow= 17.33 cfs 4.793 af
Length= 193.0' Max Vel= 6.3 fps Capacity= 17.28 cfs Outflow= 17.33 cfs 4.789 af

Reach DRY SWALE 1: DRY SWALE 1 Inflow= 3.65 cfs 0.262 af
Length= 125.0' Max Vel= 1.3 fps Capacity= 59.21 cfs Outflow= 3.43 cfs 0.262 af

Reach DRY SWALE 2: DRY SWALE 2 Inflow= 6.69 cfs 0.676 af
Length= 140.0' Max Vel= 1.6 fps Capacity= 58.97 cfs Outflow= 6.62 cfs 0.675 af

Reach DRY SWALE 3: DRY SWALE 3 Inflow= 5.28 cfs 0.463 af
Length= 220.0' Max Vel= 1.4 fps Capacity= 58.97 cfs Outflow= 5.10 cfs 0.462 af

Reach DRY SWALE 4: (new node) Inflow= 0.00 cfs 0.000 af
Length= 140.0' Max Vel= 0.0 fps Capacity= 58.97 cfs Outflow= 0.00 cfs 0.000 af

Reach EX ANALYSIS A: EX ANALYSIS A Inflow= 105.04 cfs 13.677 af
Length= 10.0' Max Vel= 9.9 fps Capacity= 71.84 cfs Outflow= 105.03 cfs 13.677 af

Reach EX-ANALYSIS B: EX ANALYSIS B Inflow= 78.65 cfs 11.557 af
Length= 10.0' Max Vel= 9.2 fps Capacity= 71.84 cfs Outflow= 78.65 cfs 11.557 af

Reach EX-ANALYSIS C: EX-ANALYSIS C Inflow= 33.25 cfs 3.758 af
Length= 10.0' Max Vel= 7.2 fps Capacity= 71.84 cfs Outflow= 33.25 cfs 3.758 af

Reach EX-WETLAND CHANNEL: EX WETLAND CHANNEL 1 TO 2 Inflow= 45.38 cfs 5.377 af
Length= 1,200.0' Max Vel= 7.3 fps Capacity= 66.95 cfs Outflow= 44.98 cfs 5.358 af

Reach OCS-3 TO DMH-5: OCS3 TO DMH5 Inflow= 21.66 cfs 4.799 af
Length= 274.0' Max Vel= 6.3 fps Capacity= 17.33 cfs Outflow= 17.33 cfs 4.793 af

Reach OCS-4 TO OUTLET: OCS-4 TO OUTLET Inflow= 17.93 cfs 2.260 af
Length= 62.0' Max Vel= 13.3 fps Capacity= 44.02 cfs Outflow= 17.91 cfs 2.260 af

Reach P-ANALYISIS C: P-ANALYSIS C Inflow= 25.83 cfs 3.535 af
Length= 10.0' Max Vel= 6.6 fps Capacity= 71.84 cfs Outflow= 25.83 cfs 3.535 af

Reach P-ANALYSIS A: P-ANALYSIS A Inflow= 104.76 cfs 14.348 af
Length= 10.0' Max Vel= 9.9 fps Capacity= 71.84 cfs Outflow= 104.77 cfs 14.348 af

Reach P-ANALYSIS B: P-ANALYSIS B Inflow= 67.95 cfs 12.169 af
Length= 10.0' Max Vel= 8.8 fps Capacity= 71.84 cfs Outflow= 67.94 cfs 12.169 af

Reach P-WETLAND CHANNEL: p WETLAND CHANNEL 1 TO 2 Inflow= 41.89 cfs 4.883 af
Length= 900.0' Max Vel= 7.7 fps Capacity= 74.86 cfs Outflow= 41.60 cfs 4.871 af

Reach POND 1 OUTLET: POND 1 OUTLET Inflow= 1.29 cfs 0.385 af
Length= 112.0' Max Vel= 3.4 fps Capacity= 2.73 cfs Outflow= 1.29 cfs 0.385 af

Reach POND 2 OUTLET: POND 2 OUTLET Inflow= 19.29 cfs 2.578 af
Length= 100.0' Max Vel= 6.3 fps Capacity= 17.33 cfs Outflow= 17.35 cfs 2.577 af

Reach POND 3 OUTLET: POND 3 OUTLET Inflow= 1.52 cfs 0.761 af
Length= 165.0' Max Vel= 3.6 fps Capacity= 2.74 cfs Outflow= 1.52 cfs 0.760 af

Reach SWALE: SWALE Inflow= 8.66 cfs 0.609 af
Length= 1,050.0' Max Vel= 2.6 fps Capacity= 6.90 cfs Outflow= 6.93 cfs 0.603 af

Reach SWALE FROM CULVERT 3 TO 2: SWALE FROM CULVERT 3 TO 2 Inflow= 15.80 cfs 2.388 af
Length= 800.0' Max Vel= 4.4 fps Capacity= 32.86 cfs Outflow= 15.73 cfs 2.379 af

Pond ATTENUATION 1: ATTENUATION POND 1 Peak Storage= 77,216 cf Inflow= 47.80 cfs 4.887 af
Primary= 21.66 cfs 4.799 af Outflow= 21.66 cfs 4.799 af

Pond ATTENUATION BASIN 1: ATTENUATION BASIN 1 Peak Storage= 6,619 cf Inflow= 5.11 cfs 0.398 af
Primary= 1.29 cfs 0.385 af Outflow= 1.29 cfs 0.385 af

Pond ATTENUATION BASIN 2: ATTENUATION BASIN 2 Peak Storage= 22,082 cf Inflow= 20.41 cfs 2.627 af
Primary= 19.29 cfs 2.578 af Outflow= 19.29 cfs 2.578 af

Pond ATTENUATION BASIN 6: ATTENUATION BASIN 6 Peak Storage= 23,126 cf Inflow= 22.16 cfs 2.290 af
Primary= 17.93 cfs 2.260 af Outflow= 17.93 cfs 2.260 af

Pond ATTENUATION POND 3: ATTENUATION POND 3 Peak Storage= 15,425 cf Inflow= 8.31 cfs 0.794 af
Primary= 1.52 cfs 0.761 af Outflow= 1.52 cfs 0.761 af

Pond BIO BASIN 2: BIO BASIN 2 Peak Storage= 5,463 cf Inflow= 12.23 cfs 1.258 af
Primary= 11.71 cfs 1.200 af Outflow= 11.71 cfs 1.200 af

Pond BIORETENTION 1: BIORETENTION BASIN 1 Peak Storage= 15,739 cf Inflow= 16.48 cfs 1.652 af
Primary= 12.74 cfs 1.564 af Outflow= 12.74 cfs 1.564 af

Pond CB-1: CB-1 Peak Storage= 7 cf Inflow= 0.62 cfs 0.048 af
Primary= 0.62 cfs 0.048 af Outflow= 0.62 cfs 0.048 af

Pond CB-10: CB-10 Peak Storage= 34 cf Inflow= 16.10 cfs 1.633 af
Primary= 16.11 cfs 1.633 af Outflow= 16.11 cfs 1.633 af

Pond CB-11: CB-11
Peak Storage= 37 cf Inflow= 16.32 cfs 1.667 af
Primary= 16.32 cfs 1.667 af Outflow= 16.32 cfs 1.667 af

Pond CB-11A: CB-11A
Peak Storage= 37 cf Inflow= 16.50 cfs 1.695 af
Primary= 16.50 cfs 1.695 af Outflow= 16.50 cfs 1.695 af

Pond CB-12: CB-12
Peak Storage= 22 cf Inflow= 3.50 cfs 0.322 af
Primary= 3.51 cfs 0.322 af Outflow= 3.51 cfs 0.322 af

Pond CB-12A: CB-12A
Peak Storage= 14 cf Inflow= 1.85 cfs 0.157 af
Primary= 1.85 cfs 0.157 af Outflow= 1.85 cfs 0.157 af

Pond CB-13: CB-13
Peak Storage= 33 cf Inflow= 4.63 cfs 0.442 af
Primary= 4.62 cfs 0.442 af Outflow= 4.62 cfs 0.442 af

Pond CB-13A: CB-13A
Peak Storage= 5 cf Inflow= 0.41 cfs 0.032 af
Primary= 0.41 cfs 0.032 af Outflow= 0.41 cfs 0.032 af

Pond CB-14: CB-14
Peak Storage= 25 cf Inflow= 6.22 cfs 0.640 af
Primary= 6.22 cfs 0.640 af Outflow= 6.22 cfs 0.640 af

Pond CB-14A: CB-14A
Peak Storage= 26 cf Inflow= 6.72 cfs 0.698 af
Primary= 6.72 cfs 0.698 af Outflow= 6.72 cfs 0.698 af

Pond CB-15: CB-15
Peak Storage= 8 cf Inflow= 1.03 cfs 0.093 af
Primary= 1.03 cfs 0.093 af Outflow= 1.03 cfs 0.093 af

Pond CB-15A: CB-15A
Peak Storage= 8 cf Inflow= 0.81 cfs 0.071 af
Primary= 0.81 cfs 0.071 af Outflow= 0.81 cfs 0.071 af

Pond CB-16: CB-16
Peak Storage= 14 cf Inflow= 2.40 cfs 0.209 af
Primary= 2.40 cfs 0.209 af Outflow= 2.40 cfs 0.209 af

Pond CB-16A: CB-16A
Peak Storage= 9 cf Inflow= 1.05 cfs 0.087 af
Primary= 1.05 cfs 0.087 af Outflow= 1.05 cfs 0.087 af

Pond CB-17: CB-17
Peak Storage= 20 cf Inflow= 2.89 cfs 0.249 af
Primary= 2.89 cfs 0.249 af Outflow= 2.89 cfs 0.249 af

Pond CB-17A: CB-17A
Peak Storage= 53 cf Inflow= 5.27 cfs 0.463 af
Primary= 5.28 cfs 0.463 af Outflow= 5.28 cfs 0.463 af

Pond CB-18: CB-18
Peak Storage= 28 cf Inflow= 8.61 cfs 0.882 af
Primary= 8.61 cfs 0.882 af Outflow= 8.61 cfs 0.882 af

Pond CB-18A: CB-18A AND B
Peak Storage= 29 cf Inflow= 7.72 cfs 0.795 af
Primary= 7.72 cfs 0.794 af Outflow= 7.72 cfs 0.794 af

Pond CB-19: CB-19	Peak Storage= 41 cf Inflow= 19.00 cfs 1.888 af Primary= 19.00 cfs 1.888 af Outflow= 19.00 cfs 1.888 af
Pond CB-19A: CB-19A	Peak Storage= 25 cf Inflow= 7.80 cfs 0.748 af Primary= 7.81 cfs 0.748 af Outflow= 7.81 cfs 0.748 af
Pond CB-2: CB-2	Peak Storage= 10 cf Inflow= 1.28 cfs 0.099 af Primary= 1.28 cfs 0.099 af Outflow= 1.28 cfs 0.099 af
Pond CB-20: CB-20	Peak Storage= 59 cf Inflow= 24.93 cfs 2.524 af Primary= 24.94 cfs 2.524 af Outflow= 24.94 cfs 2.524 af
Pond CB-20A: CB-20A	Peak Storage= 29 cf Inflow= 4.32 cfs 0.457 af Primary= 4.32 cfs 0.457 af Outflow= 4.32 cfs 0.457 af
Pond CB-21: CB-21	Peak Storage= 54 cf Inflow= 34.25 cfs 3.484 af Primary= 34.25 cfs 3.484 af Outflow= 34.25 cfs 3.484 af
Pond CB-21A: CB-21A	Peak Storage= 27 cf Inflow= 8.11 cfs 0.839 af Primary= 8.11 cfs 0.839 af Outflow= 8.11 cfs 0.839 af
Pond CB-21C: CB-21C	Peak Storage= 33 cf Inflow= 4.68 cfs 0.467 af Primary= 4.69 cfs 0.467 af Outflow= 4.69 cfs 0.467 af
Pond CB-22: CB-22	Peak Storage= 56 cf Inflow= 35.34 cfs 3.610 af Primary= 35.33 cfs 3.609 af Outflow= 35.33 cfs 3.609 af
Pond CB-22A: CB-22A	Peak Storage= 7 cf Inflow= 0.49 cfs 0.036 af Primary= 0.49 cfs 0.036 af Outflow= 0.49 cfs 0.036 af
Pond CB-23: CB-23	Peak Storage= 61 cf Inflow= 38.01 cfs 3.888 af Primary= 38.02 cfs 3.887 af Outflow= 38.02 cfs 3.887 af
Pond CB-23A: CB-23A	Peak Storage= 15 cf Inflow= 1.92 cfs 0.157 af Primary= 1.92 cfs 0.157 af Outflow= 1.92 cfs 0.157 af
Pond CB-24: CB-24	Peak Storage= 26 cf Inflow= 3.53 cfs 0.376 af Primary= 3.52 cfs 0.376 af Outflow= 3.52 cfs 0.376 af
Pond CB-25: CB-25	Peak Storage= 26 cf Inflow= 3.79 cfs 0.386 af Primary= 3.78 cfs 0.386 af Outflow= 3.78 cfs 0.386 af
Pond CB-25A: CB-25A	Peak Storage= 15 cf Inflow= 2.03 cfs 0.176 af Primary= 2.02 cfs 0.176 af Outflow= 2.02 cfs 0.176 af
Pond CB-26: CB-26	Peak Storage= 34 cf Inflow= 8.69 cfs 0.914 af Primary= 8.72 cfs 0.914 af Outflow= 8.72 cfs 0.914 af

Pond CB-26A: CB-26A Peak Storage= 14 cf Inflow= 2.29 cfs 0.207 af
Primary= 2.29 cfs 0.207 af Outflow= 2.29 cfs 0.207 af

Pond CB-27A: CB-27A Peak Storage= 5 cf Inflow= 0.46 cfs 0.033 af
Primary= 0.46 cfs 0.033 af Outflow= 0.46 cfs 0.033 af

Pond CB-27B: CB-27.B Peak Storage= 34 cf Inflow= 10.06 cfs 1.056 af
Primary= 10.06 cfs 1.056 af Outflow= 10.06 cfs 1.056 af

Pond CB-28: CB-28 Peak Storage= 48 cf Inflow= 12.79 cfs 1.335 af
Primary= 12.79 cfs 1.335 af Outflow= 12.79 cfs 1.335 af

Pond CB-28A: CB-28A Peak Storage= 38 cf Inflow= 10.34 cfs 1.098 af
Primary= 10.35 cfs 1.098 af Outflow= 10.35 cfs 1.098 af

Pond CB-3: CB-3 Peak Storage= 18 cf Inflow= 2.46 cfs 0.190 af
Primary= 2.46 cfs 0.190 af Outflow= 2.46 cfs 0.190 af

Pond CB-4: CB-4 Peak Storage= 26 cf Inflow= 3.67 cfs 0.284 af
Primary= 3.69 cfs 0.284 af Outflow= 3.69 cfs 0.284 af

Pond CB-6: CB-6 Peak Storage= 29 cf Inflow= 4.30 cfs 0.417 af
Primary= 4.30 cfs 0.417 af Outflow= 4.30 cfs 0.417 af

Pond CB-7: CB-7 Peak Storage= 32 cf Inflow= 9.47 cfs 0.974 af
Primary= 9.46 cfs 0.974 af Outflow= 9.46 cfs 0.974 af

Pond CB-7A: CB-7A Peak Storage= 16 cf Inflow= 2.61 cfs 0.277 af
Primary= 2.61 cfs 0.277 af Outflow= 2.61 cfs 0.277 af

Pond CB-9: CB-9 Peak Storage= 36 cf Inflow= 15.87 cfs 1.596 af
Primary= 15.87 cfs 1.596 af Outflow= 15.87 cfs 1.596 af

Pond CB-9A: CB-9A Peak Storage= 16 cf Inflow= 2.68 cfs 0.255 af
Primary= 2.68 cfs 0.255 af Outflow= 2.68 cfs 0.255 af

Pond DMH-1: DMH-1 Peak Storage= 76 cf Inflow= 44.88 cfs 4.491 af
Primary= 44.92 cfs 4.491 af Outflow= 44.92 cfs 4.491 af

Pond DMH-2: DMH-2 Peak Storage= 22 cf Inflow= 3.52 cfs 0.376 af
Primary= 3.52 cfs 0.376 af Outflow= 3.52 cfs 0.376 af

Pond DMH-3: DMH-3 Peak Storage= 61 cf Inflow= 12.79 cfs 1.335 af
Primary= 12.80 cfs 1.335 af Outflow= 12.80 cfs 1.335 af

Pond Forbay 1: FORBAY 1 Peak Storage= 1,155 cf Inflow= 3.69 cfs 0.284 af
Primary= 3.65 cfs 0.262 af Outflow= 3.65 cfs 0.262 af

Pond PLUNG 2: PLUNGE 2
Peak Storage= 1,577 cf Inflow= 6.72 cfs 0.698 af
Primary= 6.69 cfs 0.676 af Outflow= 6.69 cfs 0.676 af

Pond PLUNGE 1: PLUNGE 1
Peak Storage= 2,559 cf Inflow= 16.50 cfs 1.695 af
Primary= 16.48 cfs 1.652 af Outflow= 16.48 cfs 1.652 af

Pond PLUNGE 4: PLUNGE 4
Peak Storage= 16,367 cf Inflow= 3.52 cfs 0.376 af
Primary= 0.00 cfs 0.000 af Outflow= 0.00 cfs 0.000 af

Pond PLUNGE 5: PLUNGE 5
Peak Storage= 6,231 cf Inflow= 12.80 cfs 1.335 af
Primary= 12.23 cfs 1.258 af Outflow= 12.23 cfs 1.258 af

Runoff Area = 177.476 ac Volume = 60.009 af Average Depth = 4.06"

Subcatchment D--1: D-1

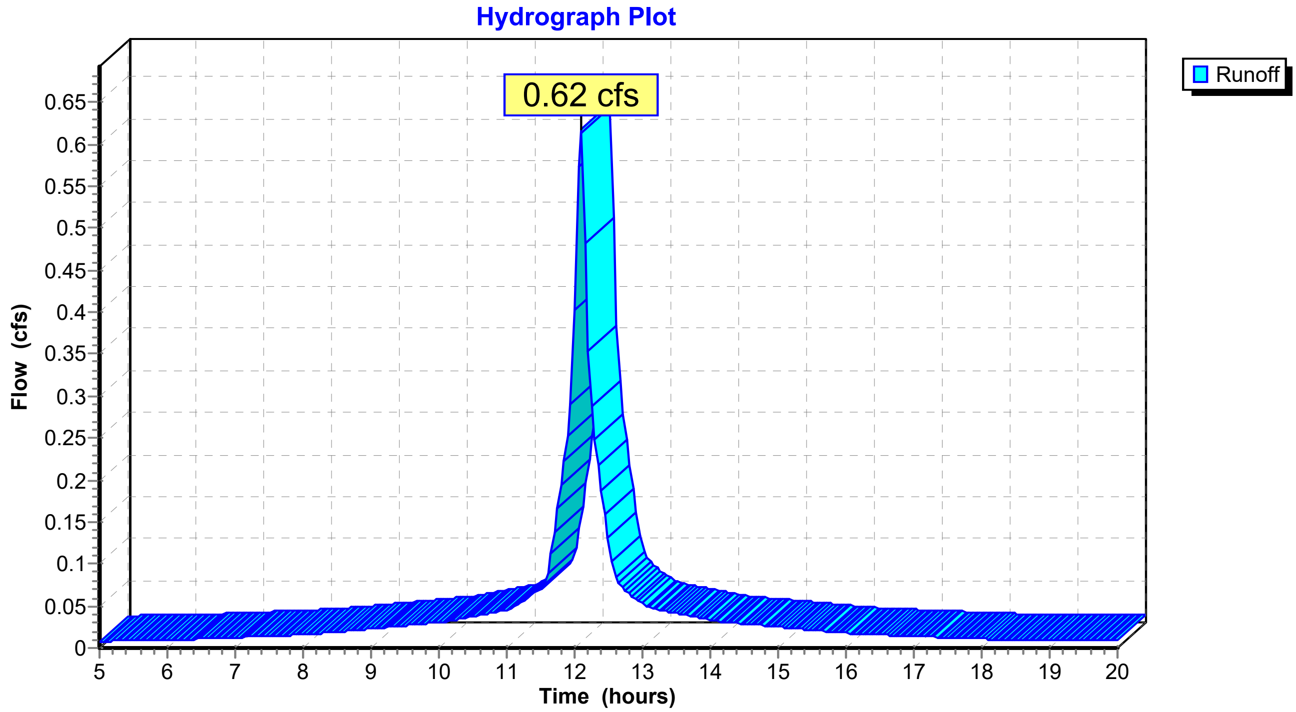
Runoff = 0.62 cfs @ 12.09 hrs, Volume= 0.048 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
4,262	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D--1: D-1



Subcatchment D-10: D-10

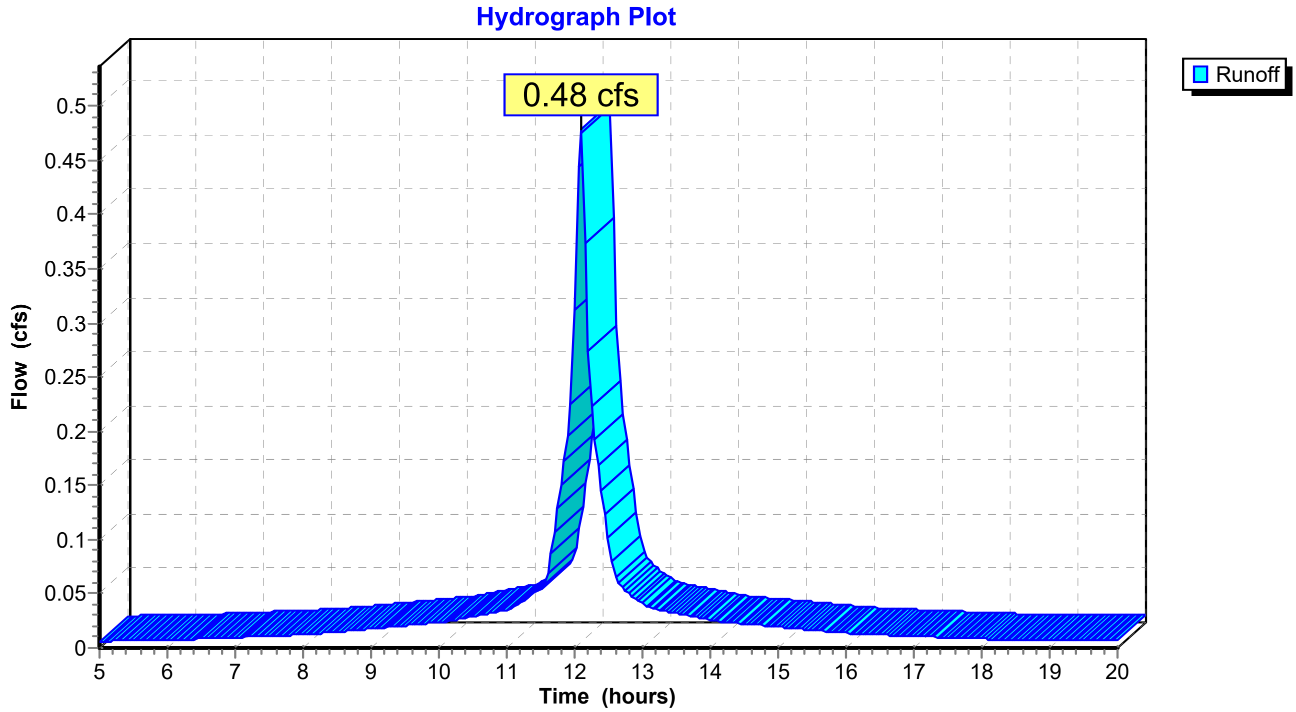
Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.037 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
3,302	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-10: D-10



Subcatchment D-11: D-11

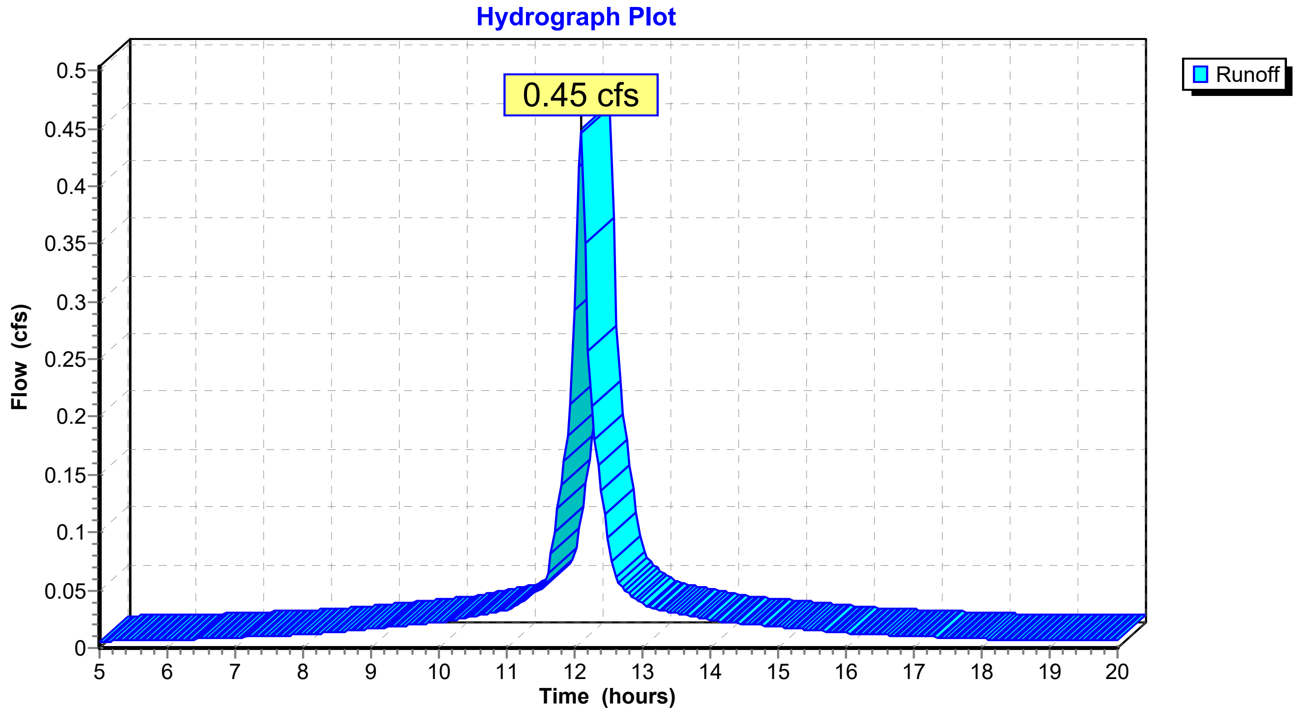
Runoff = 0.45 cfs @ 12.09 hrs, Volume= 0.035 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
3,099	98	Paved roads w/curbs & sewers

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR 55 MIN**

Subcatchment D-11: D-11



Subcatchment D-11A: D-11A

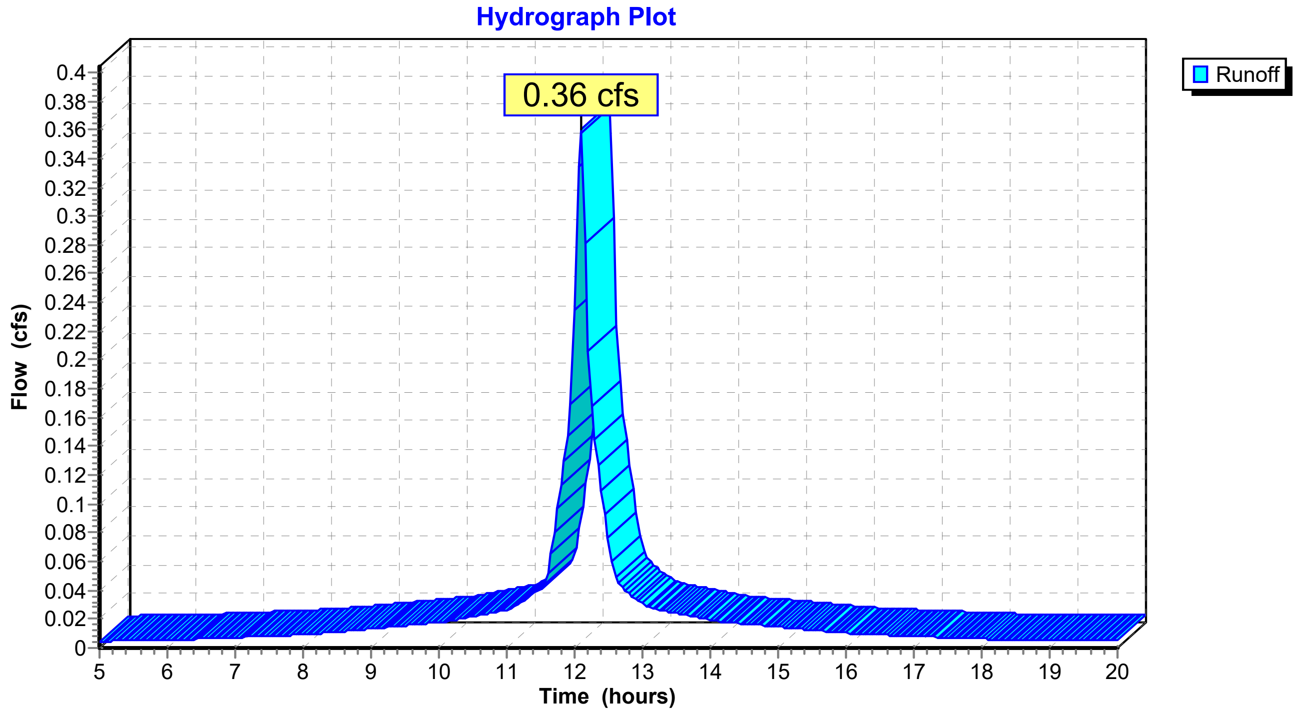
Runoff = 0.36 cfs @ 12.09 hrs, Volume= 0.028 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
2,486	98	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-11A: D-11A



Subcatchment D-12: D-12

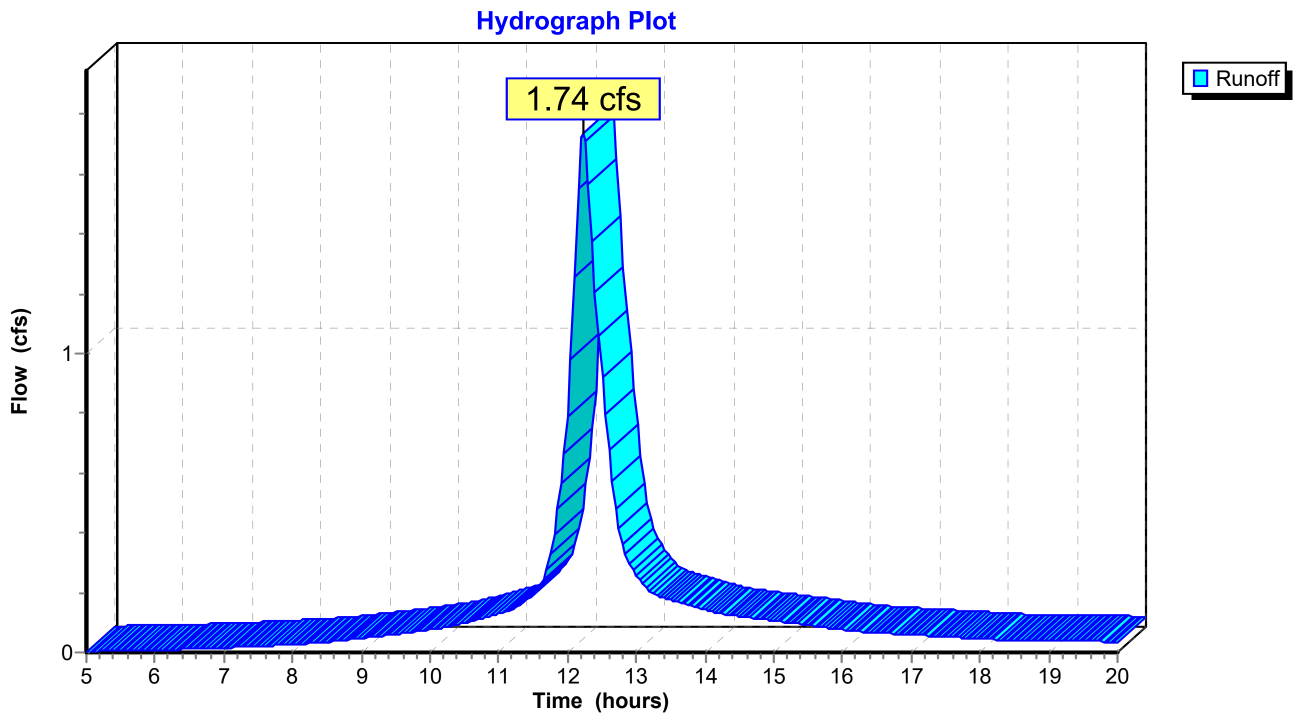
Runoff = 1.74 cfs @ 12.22 hrs, Volume= 0.166 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
7,375	98	Paved parking & roofs
10,678	80	>75% Grass cover, Good, HSG D
18,053	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	75	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.3	50	0.0150	2.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.6	125	Total			

Subcatchment D-12: D-12



Subcatchment D-12A: D-12A

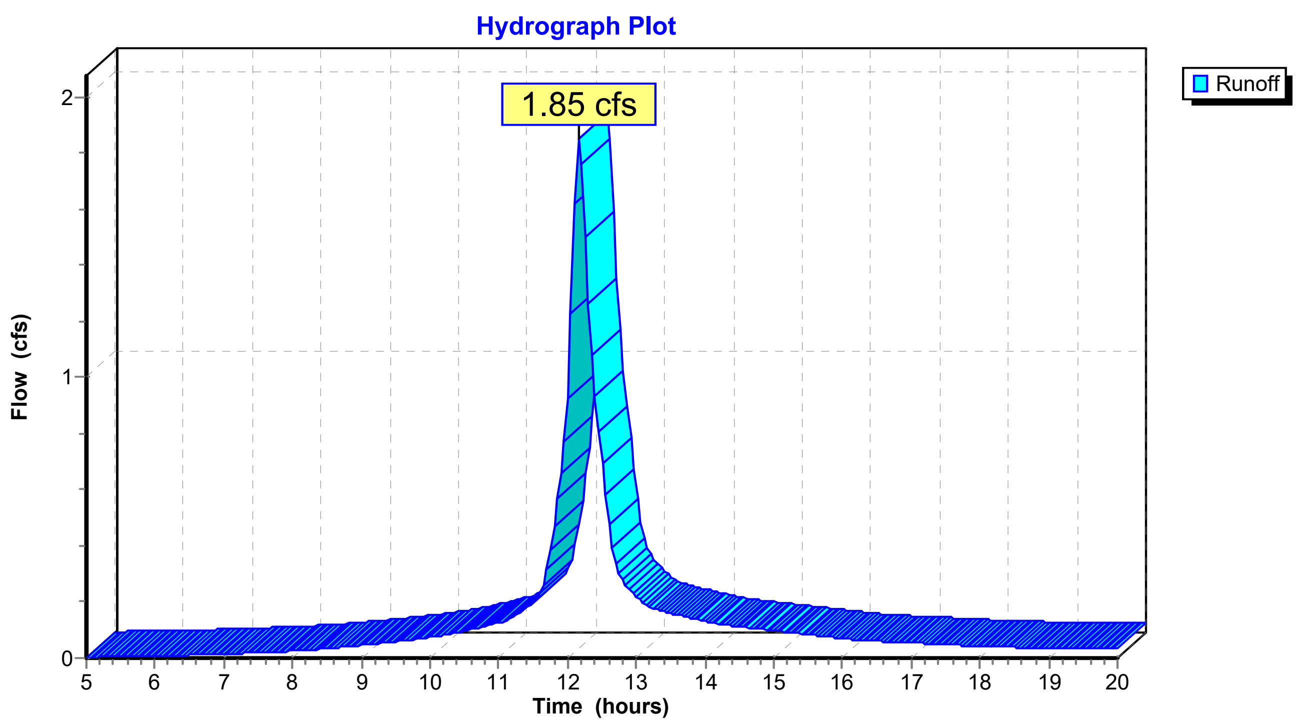
Runoff = 1.85 cfs @ 12.16 hrs, Volume= 0.157 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
6,750	98	Paved parking & roofs
10,288	80	>75% Grass cover, Good, HSG D
17,038	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	80	0.0250	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"

Subcatchment D-12A: D-12A



Subcatchment D-13: D-13

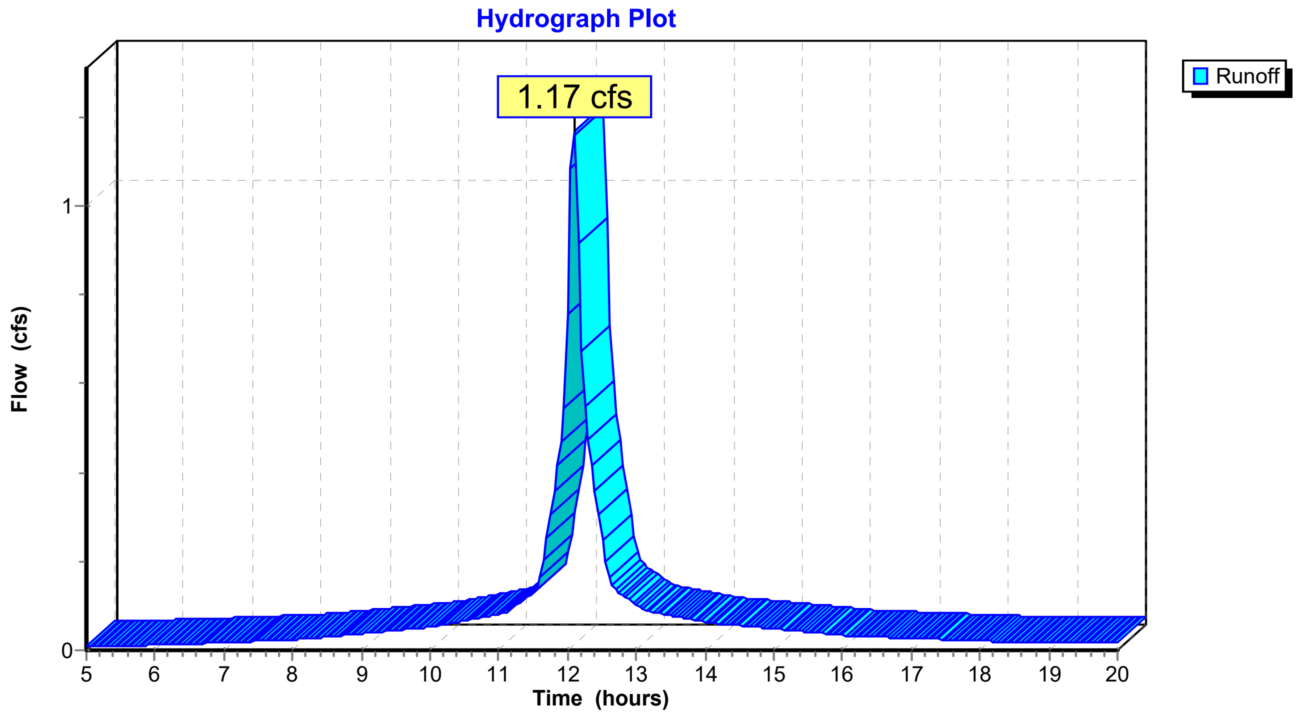
Runoff = 1.17 cfs @ 12.09 hrs, Volume= 0.088 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
6,280	98	Paved parking & roofs
2,000	80	>75% Grass cover, Good, HSG D
8,280	94	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-13: D-13



Subcatchment D-13A: D-13A

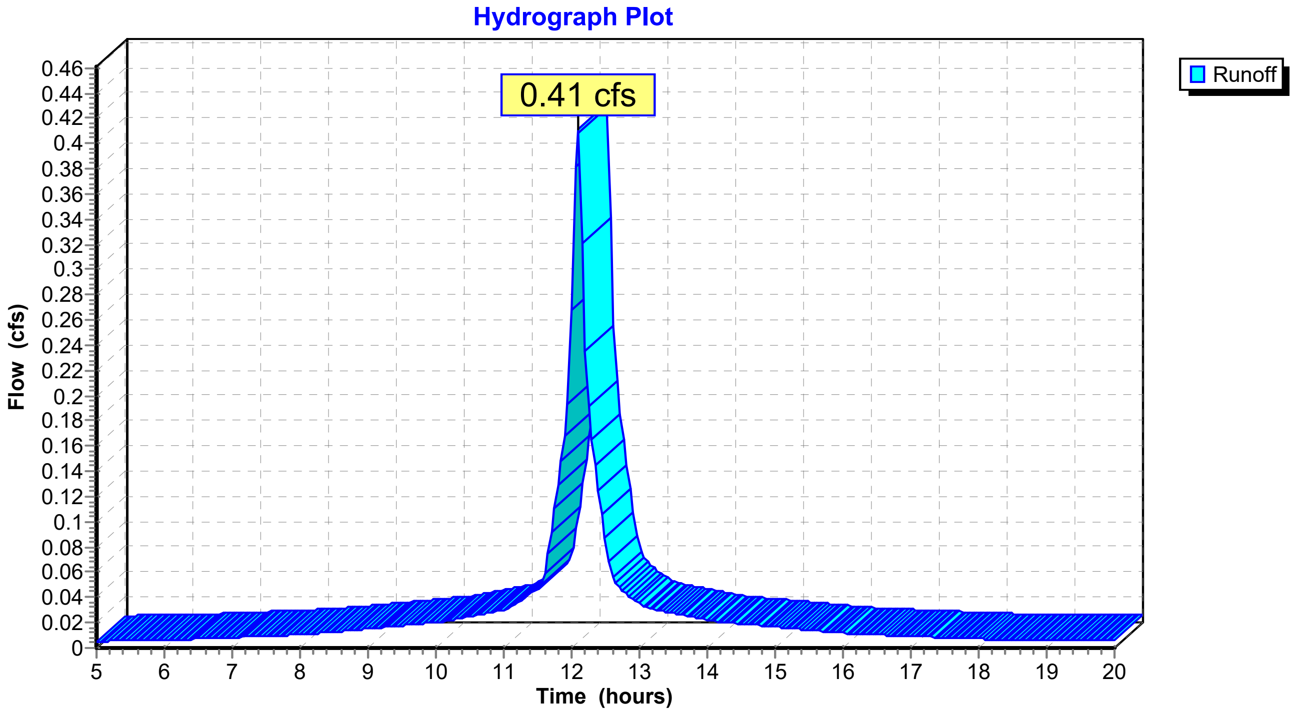
Runoff = 0.41 cfs @ 12.09 hrs, Volume= 0.032 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
2,837	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-13A: D-13A



Subcatchment D-14: D-14

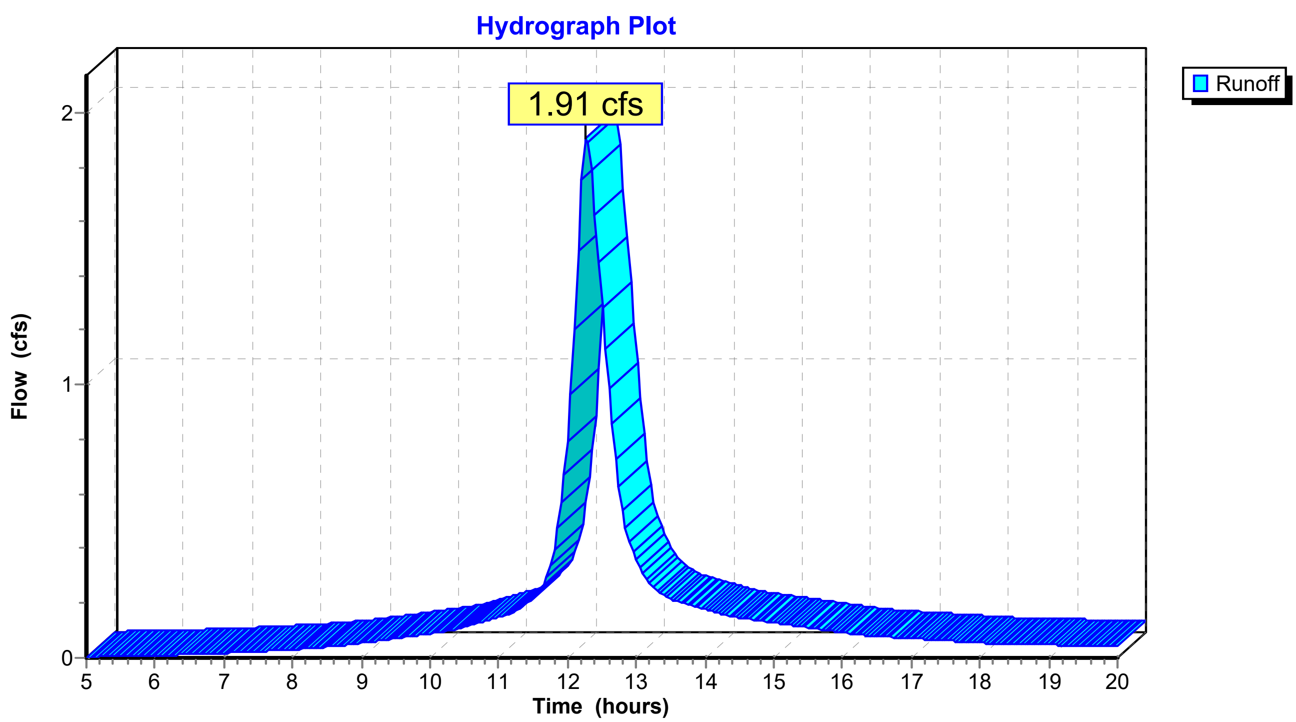
Runoff = 1.91 cfs @ 12.28 hrs, Volume= 0.198 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
8,000	98	Paved parking & roofs
13,592	80	>75% Grass cover, Good, HSG D
21,592	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.2	25	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	125	Total			

Subcatchment D-14: D-14



Subcatchment D-14A: D-14A

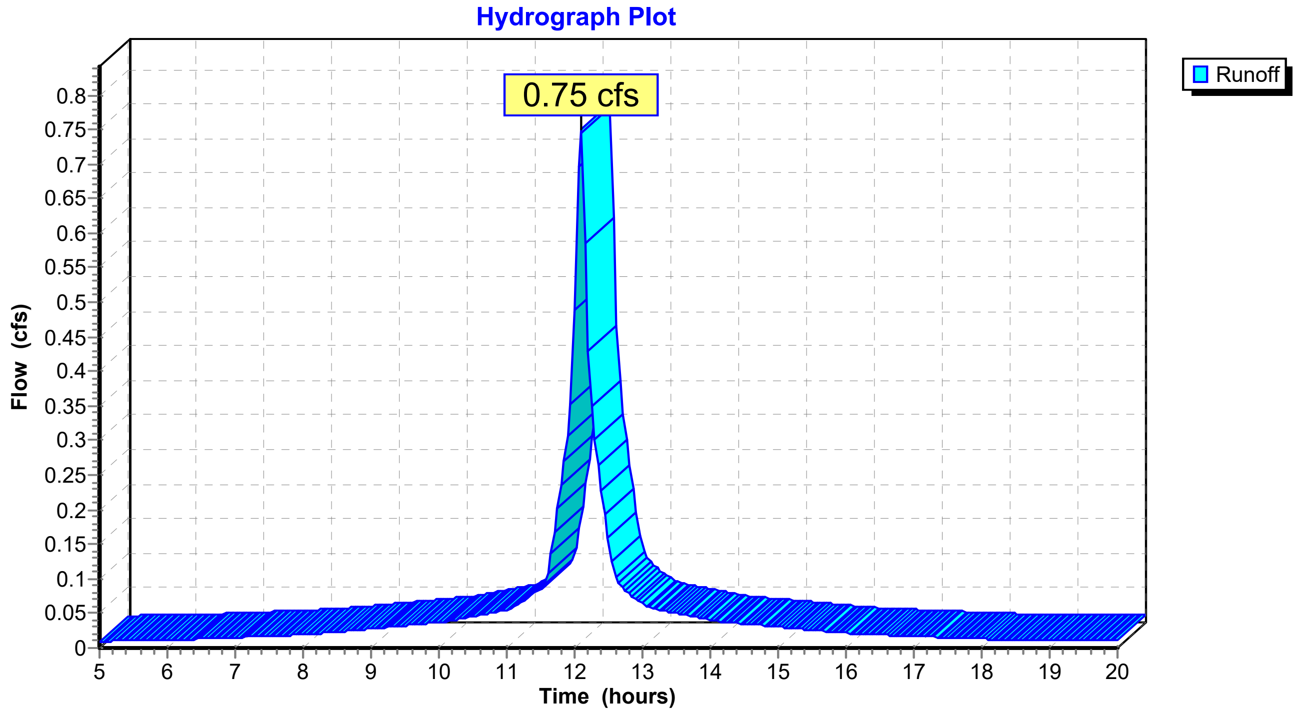
Runoff = 0.75 cfs @ 12.09 hrs, Volume= 0.058 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
5,177	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-14A: D-14A



Subcatchment D-15: D-15

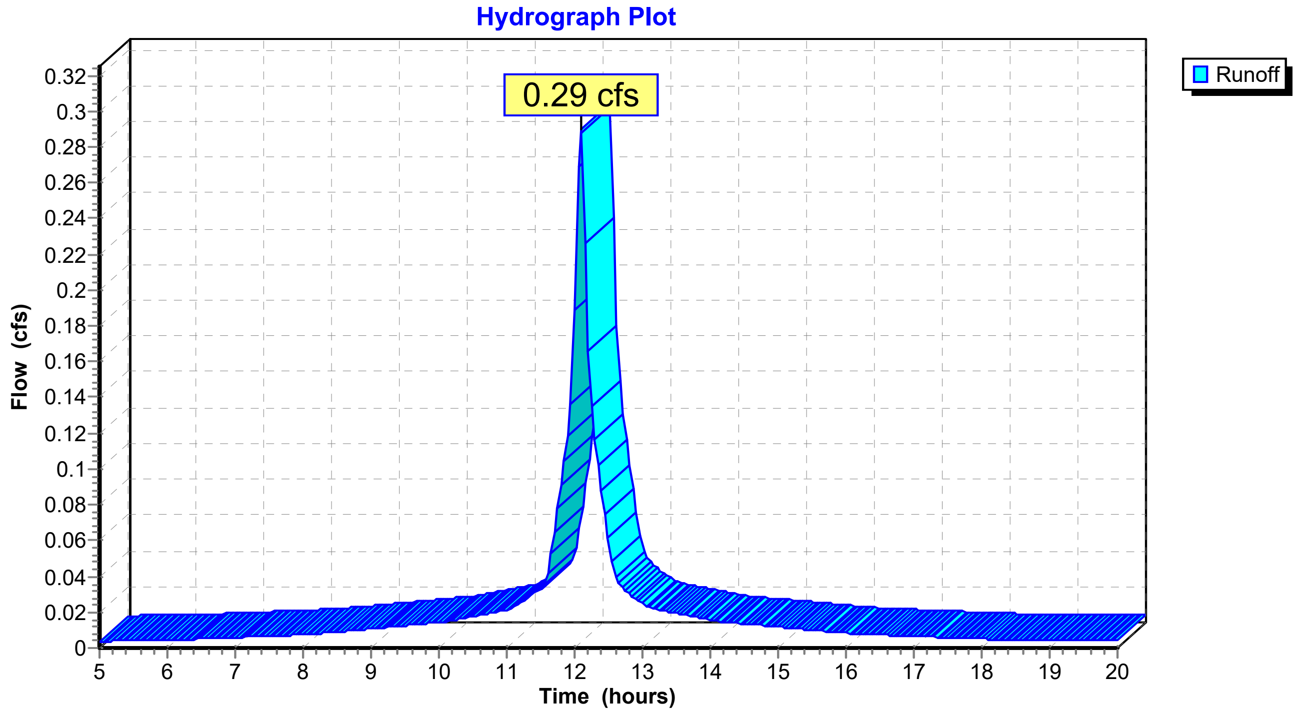
Runoff = 0.29 cfs @ 12.09 hrs, Volume= 0.022 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
2,000	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, tr 55 MIN**

Subcatchment D-15: D-15



Subcatchment D-15A: D-15A

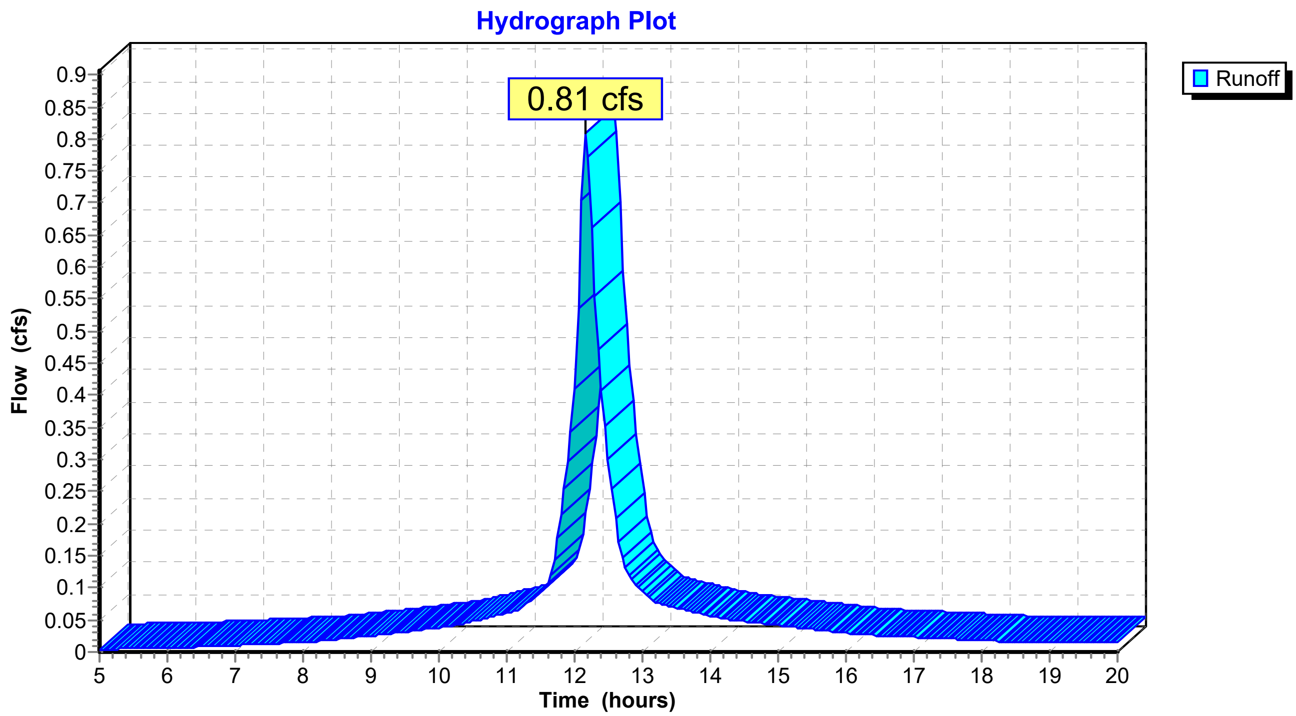
Runoff = 0.81 cfs @ 12.16 hrs, Volume= 0.071 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
4,300	98	Paved parking & roofs
2,750	80	>75% Grass cover, Good, HSG D
7,050	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.3	75	0.0500	4.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.1	125	Total			

Subcatchment D-15A: D-15A



Subcatchment D-16: D-16

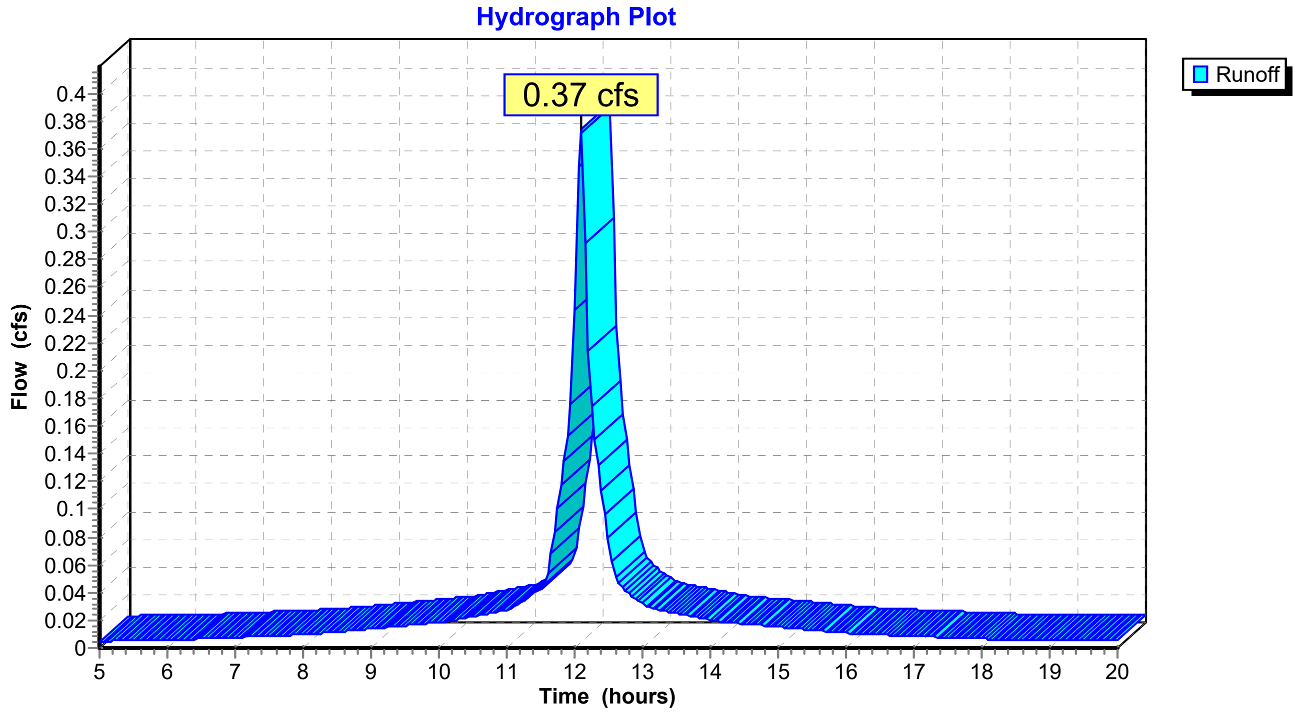
Runoff = 0.37 cfs @ 12.09 hrs, Volume= 0.029 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
2,580	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, tr 55 MIN**

Subcatchment D-16: D-16



Subcatchment D-16A: D-16A

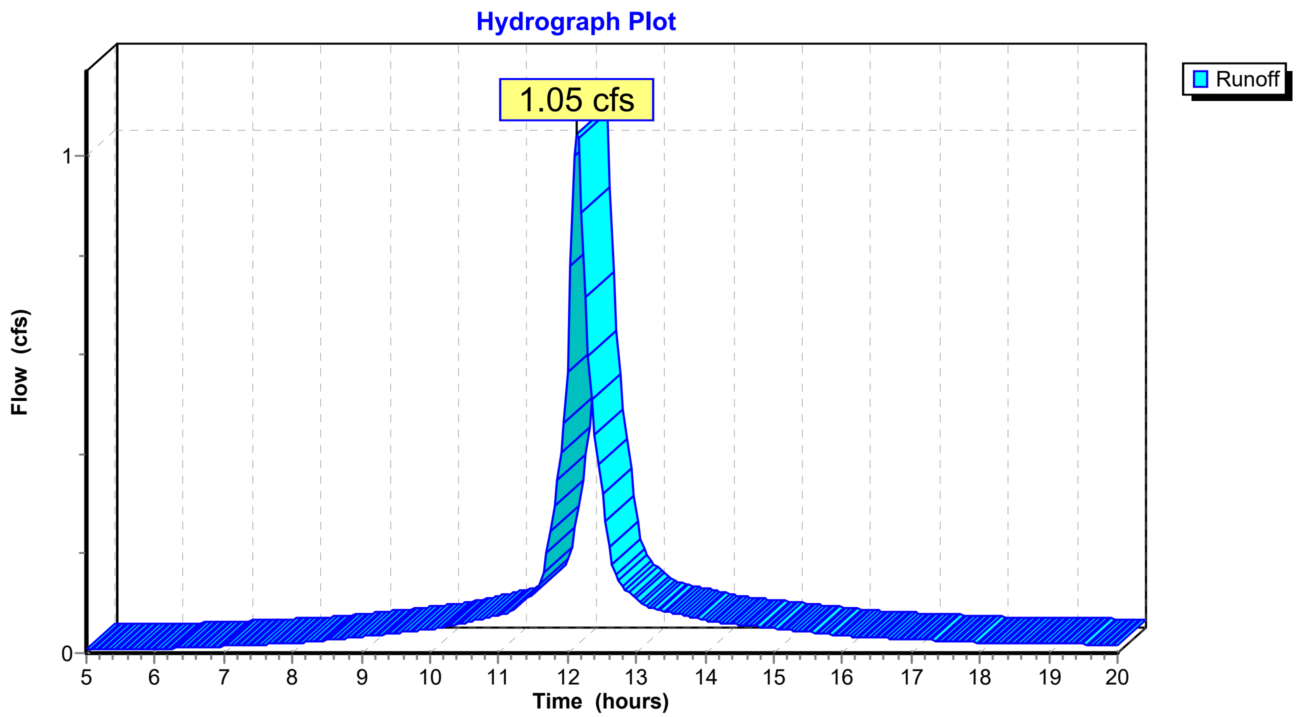
Runoff = 1.05 cfs @ 12.13 hrs, Volume= 0.087 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
5,500	98	
2,984	80	>75% Grass cover, Good, HSG D
8,484	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	40	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"

Subcatchment D-16A: D-16A



Subcatchment D-17: D-17

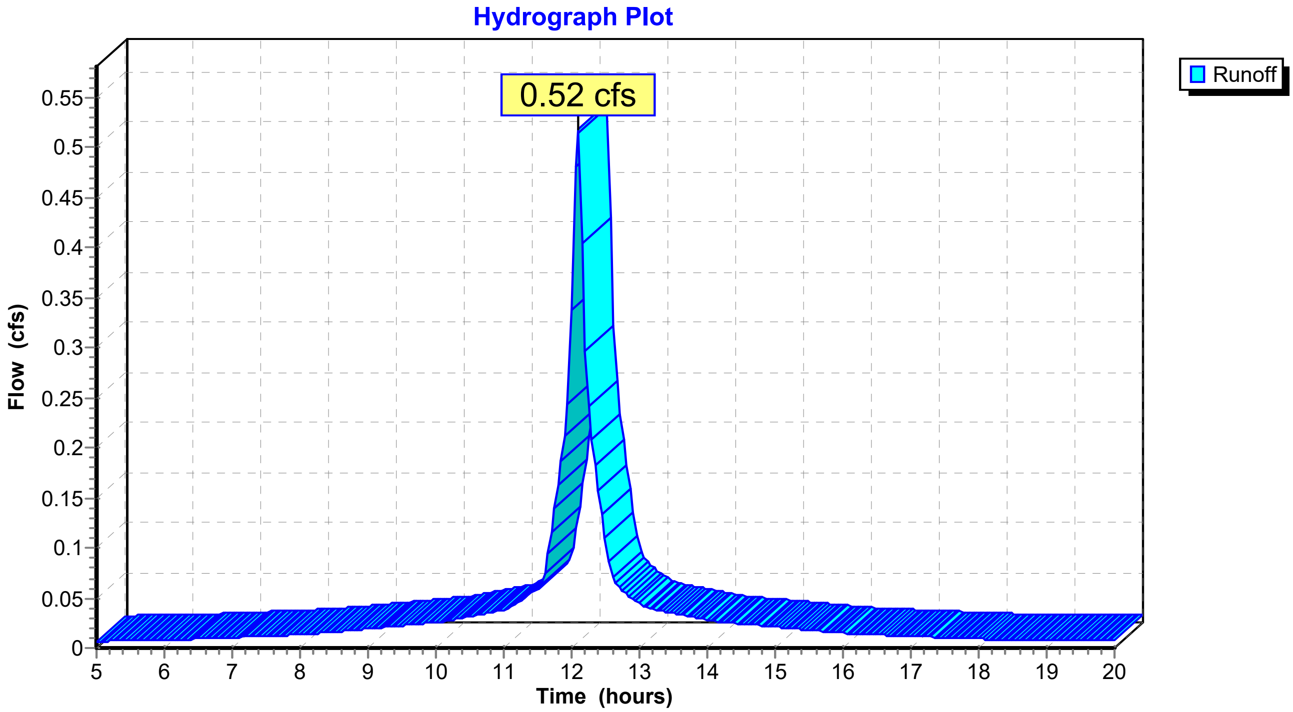
Runoff = 0.52 cfs @ 12.09 hrs, Volume= 0.040 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
3,577	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR 55 MIN**

Subcatchment D-17: D-17



Subcatchment D-17A: D-17A

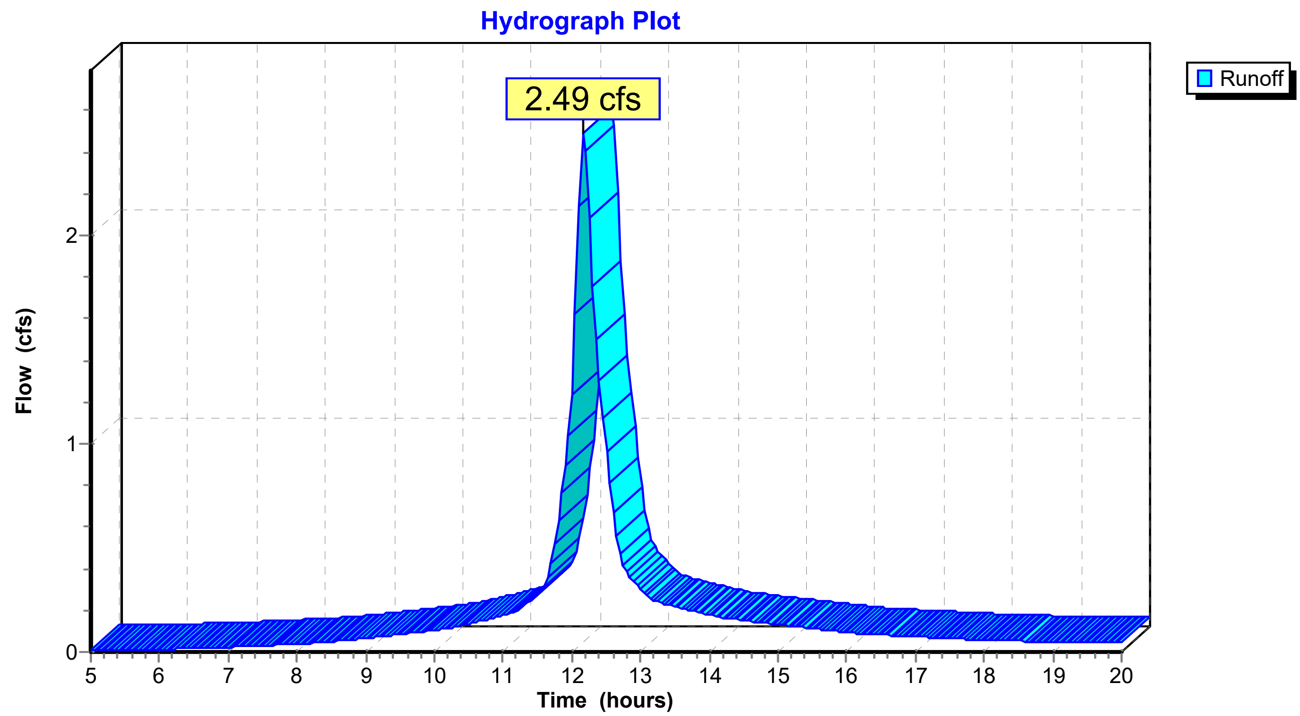
Runoff = 2.49 cfs @ 12.17 hrs, Volume= 0.215 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
10,500	98	Paved roads w/curbs & sewers
12,359	80	>75% Grass cover, Good, HSG D
22,859	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.6	150	0.0400	4.1		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.4	200	Total			

Subcatchment D-17A: D-17A



Subcatchment D-18: D-18

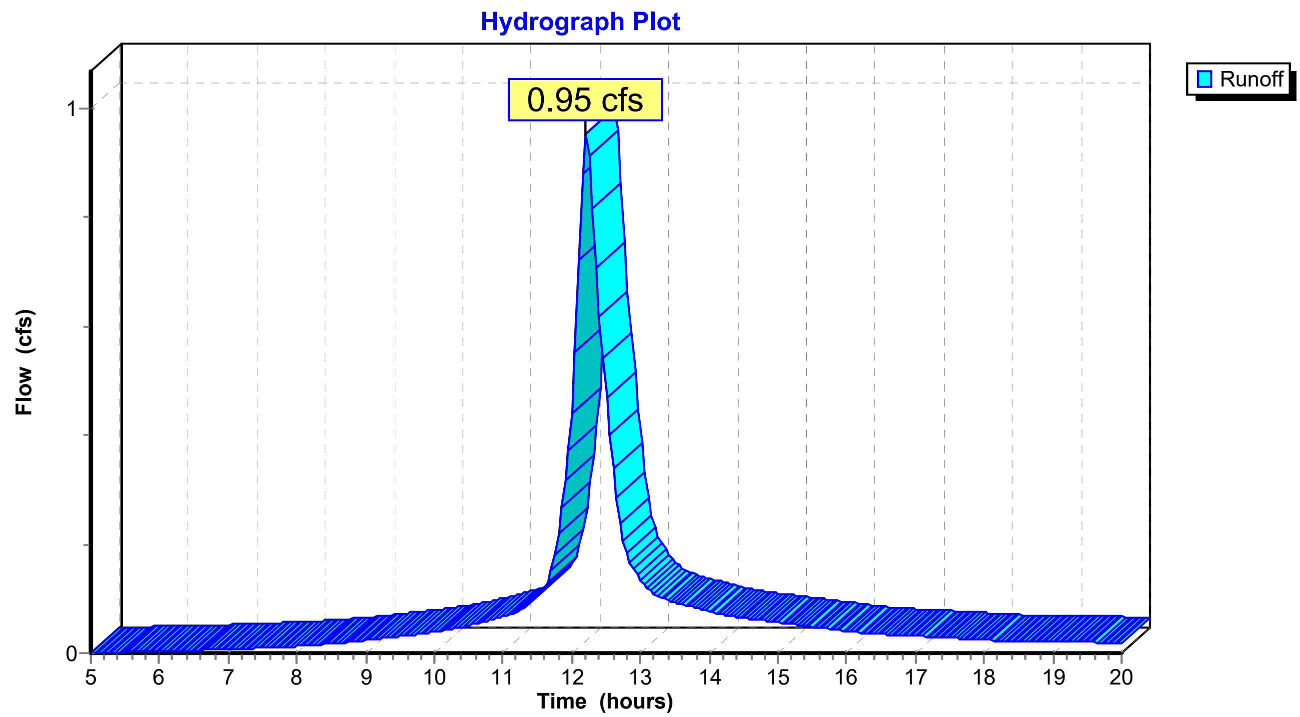
Runoff = 0.95 cfs @ 12.21 hrs, Volume= 0.088 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
3,000	98	Paved parking & roofs
6,762	80	>75% Grass cover, Good, HSG D
9,762	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	70	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"

Subcatchment D-18: D-18



Subcatchment D-18B: D-18

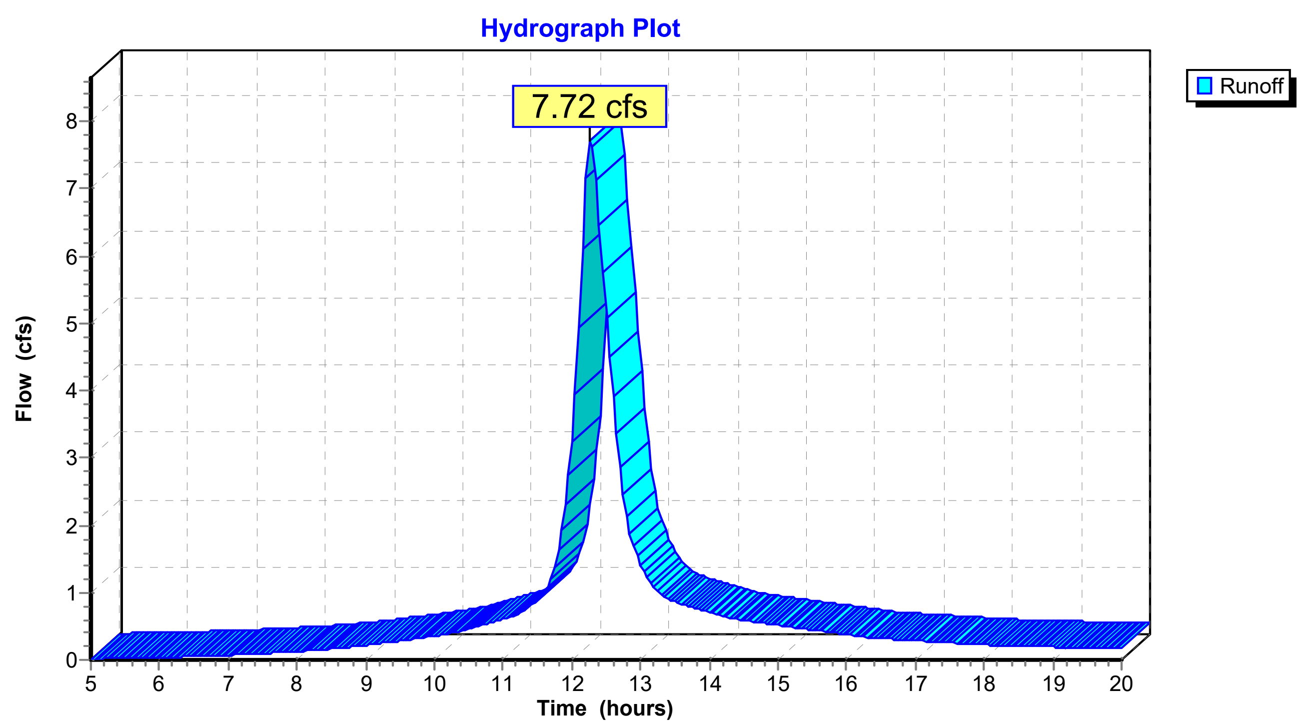
Runoff = 7.72 cfs @ 12.27 hrs, Volume= 0.795 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
34,270	98	Paved parking & roofs
52,349	80	>75% Grass cover, Good, HSG D
86,619	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	100	0.0400	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
1.9	100	0.0300	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	180	0.0500	4.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.3	380	Total			

Subcatchment D-18B: D-18



Subcatchment D-19: D-19

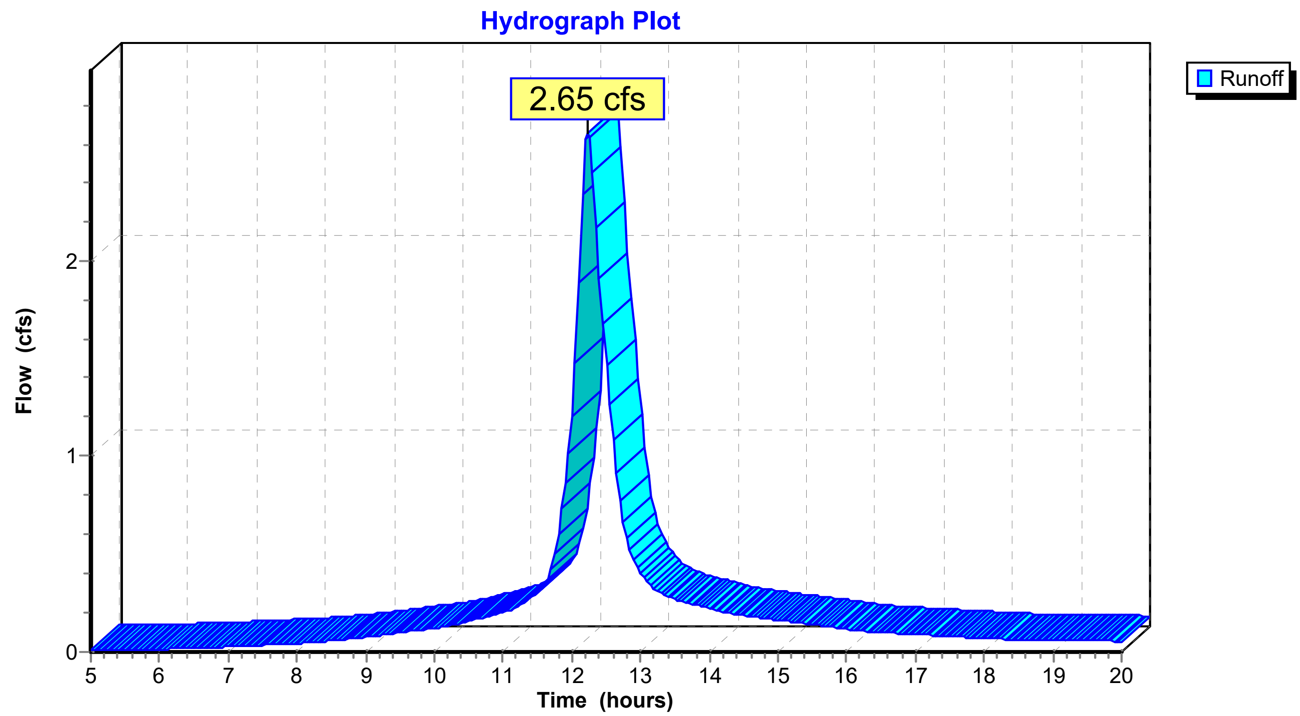
Runoff = 2.65 cfs @ 12.23 hrs, Volume= 0.258 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
12,375	98	Paved parking & roofs
15,120	80	>75% Grass cover, Good, HSG D
27,495	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	70	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.8	225	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
17.2	295	Total			

Subcatchment D-19: D-19



Subcatchment D-19A: D-19A

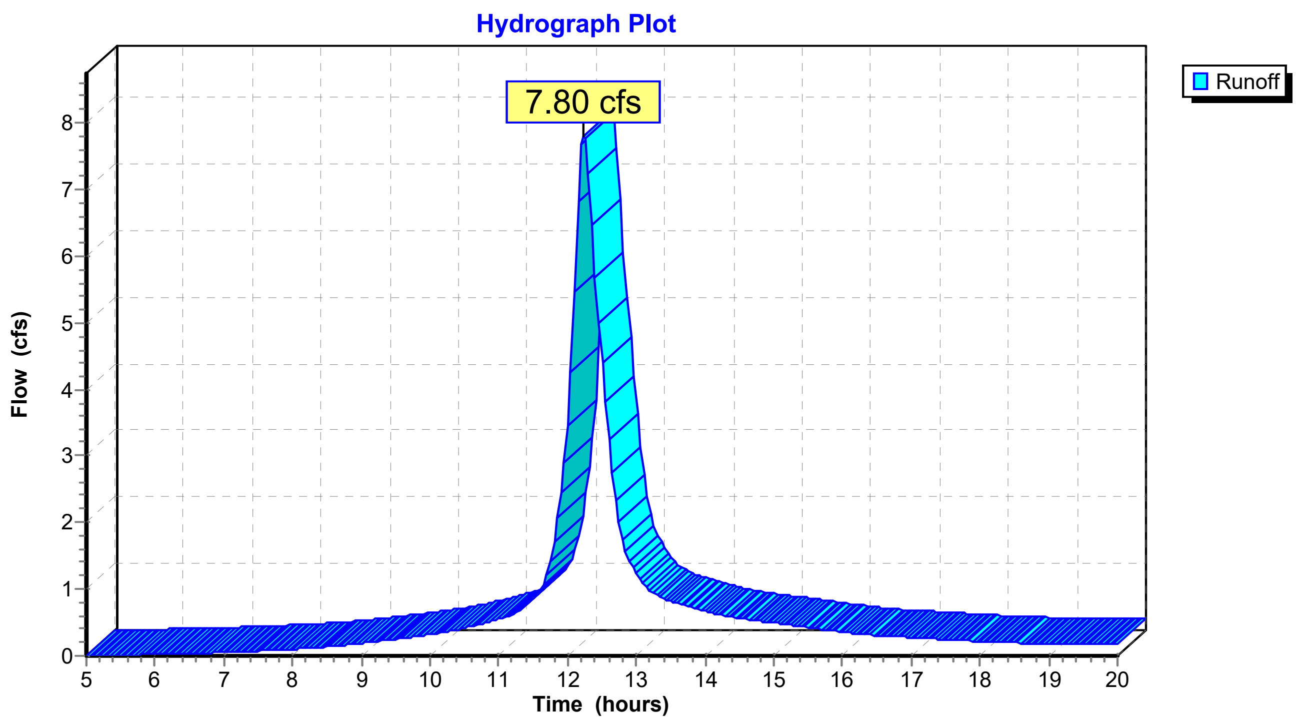
Runoff = 7.80 cfs @ 12.23 hrs, Volume= 0.748 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
22,500	98	Paved parking & roofs
62,819	80	>75% Grass cover, Good, HSG D
85,319	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0250	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
2.3	292	0.0200	2.1		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.8	100	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
17.3	492	Total			

Subcatchment D-19A: D-19A



Subcatchment D-2: D-2

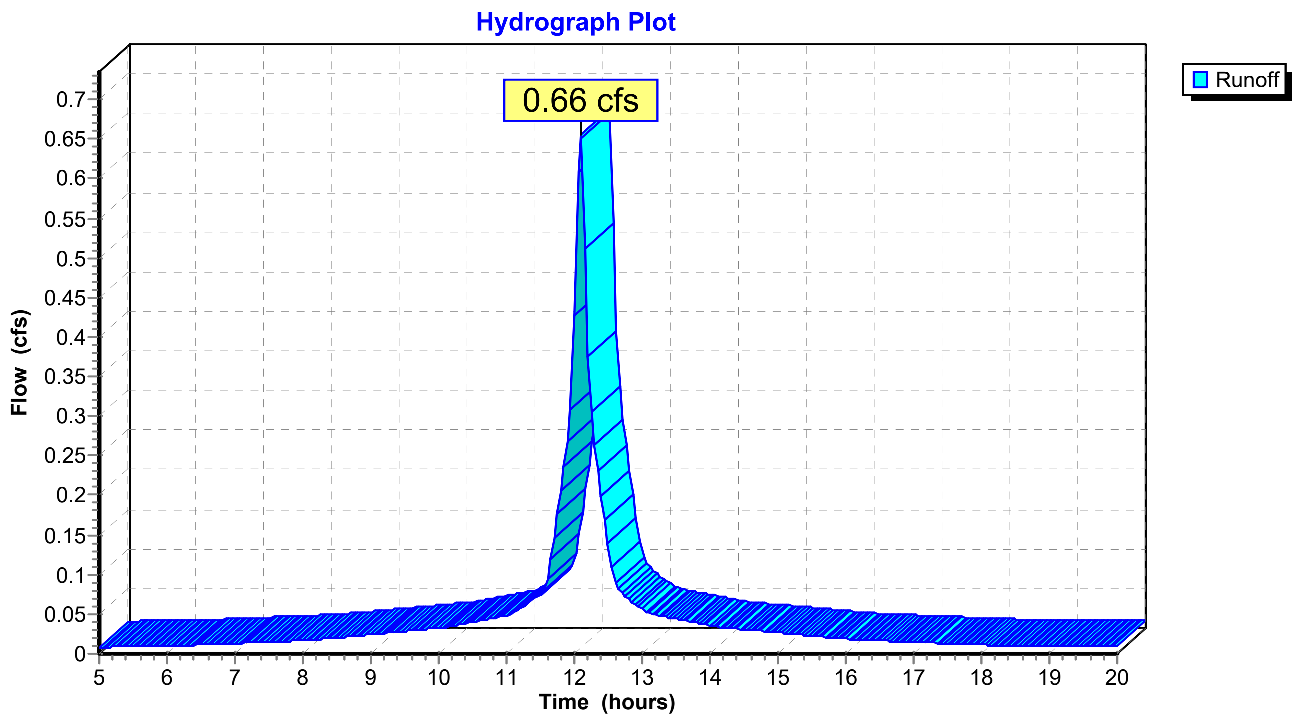
Runoff = 0.66 cfs @ 12.09 hrs, Volume= 0.051 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
4,523	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-2: D-2



Subcatchment D-20: D-20

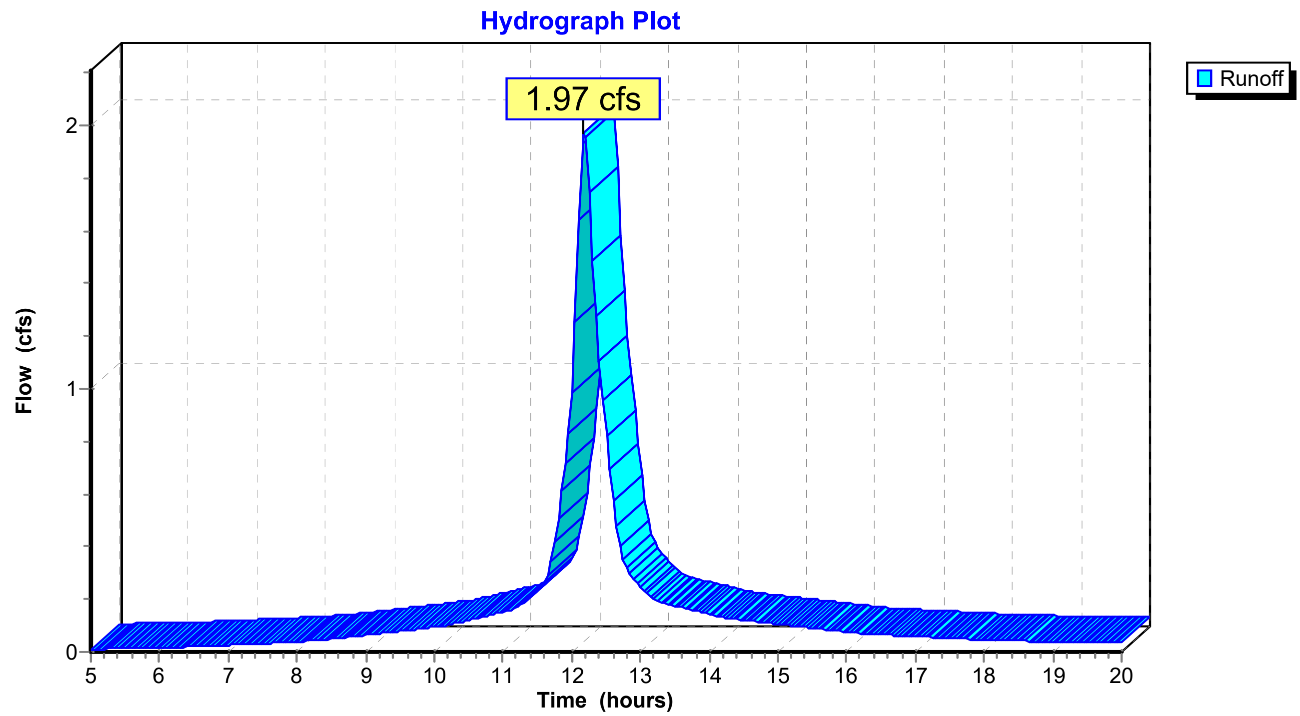
Runoff = 1.97 cfs @ 12.18 hrs, Volume= 0.179 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
11,110	98	Paved parking & roofs
6,757	80	>75% Grass cover, Good, HSG D
17,867	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.6	200	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.4	250	Total			

Subcatchment D-20: D-20



Subcatchment D-21: D-21

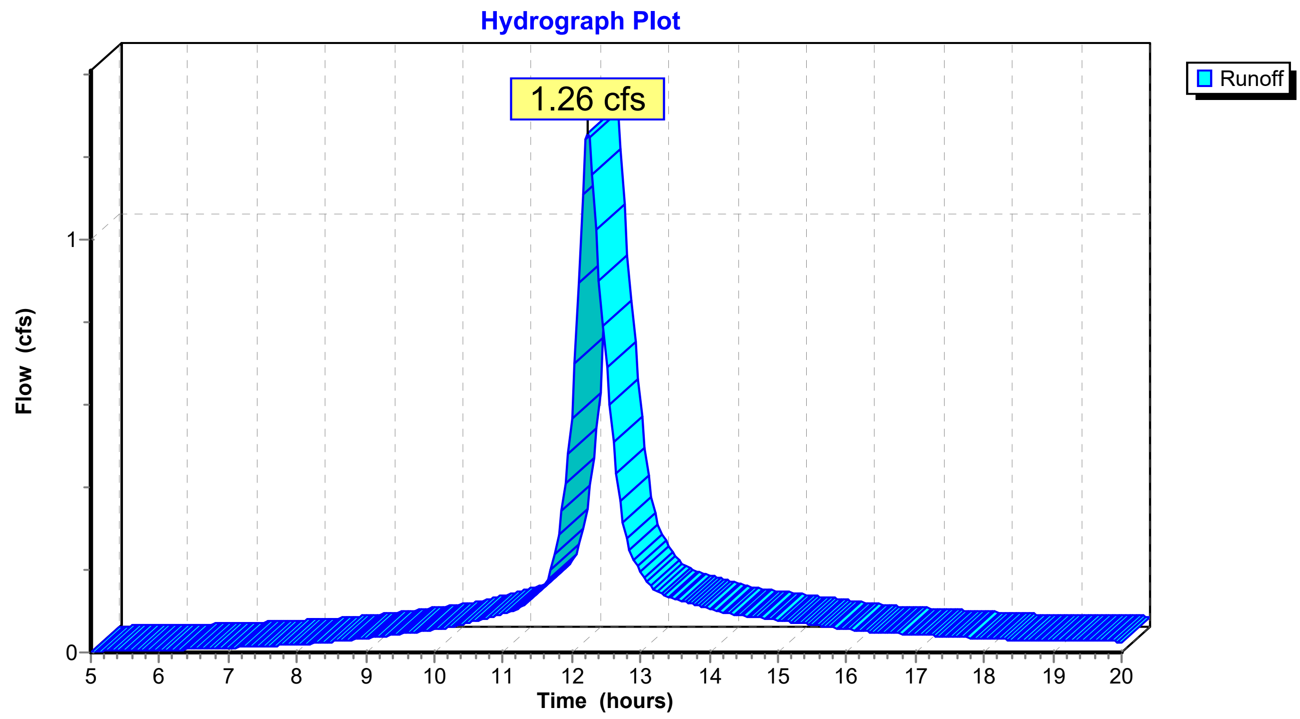
Runoff = 1.26 cfs @ 12.23 hrs, Volume= 0.121 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
5,250	98	Paved roads w/curbs & sewers
7,951	80	>75% Grass cover, Good, HSG D
13,201	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	75	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.8	150	0.0250	3.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
17.1	225	Total			

Subcatchment D-21: D-21



Subcatchment D-21A: D-21A

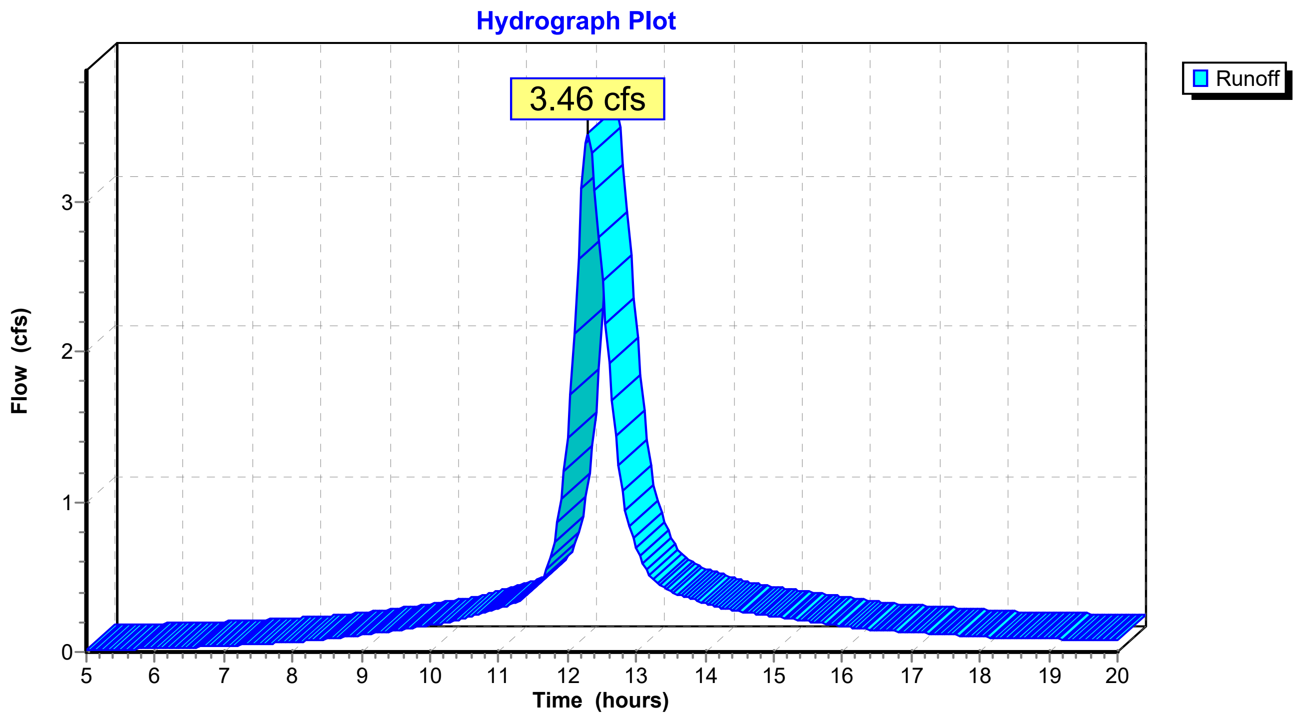
Runoff = 3.46 cfs @ 12.29 hrs, Volume= 0.372 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
19,000	98	Paved parking & roofs
19,849	80	>75% Grass cover, Good, HSG D
38,849	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.5	400	0.0500	4.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
22.0	500	Total			

Subcatchment D-21A: D-21A



Subcatchment D-21C: D-21C

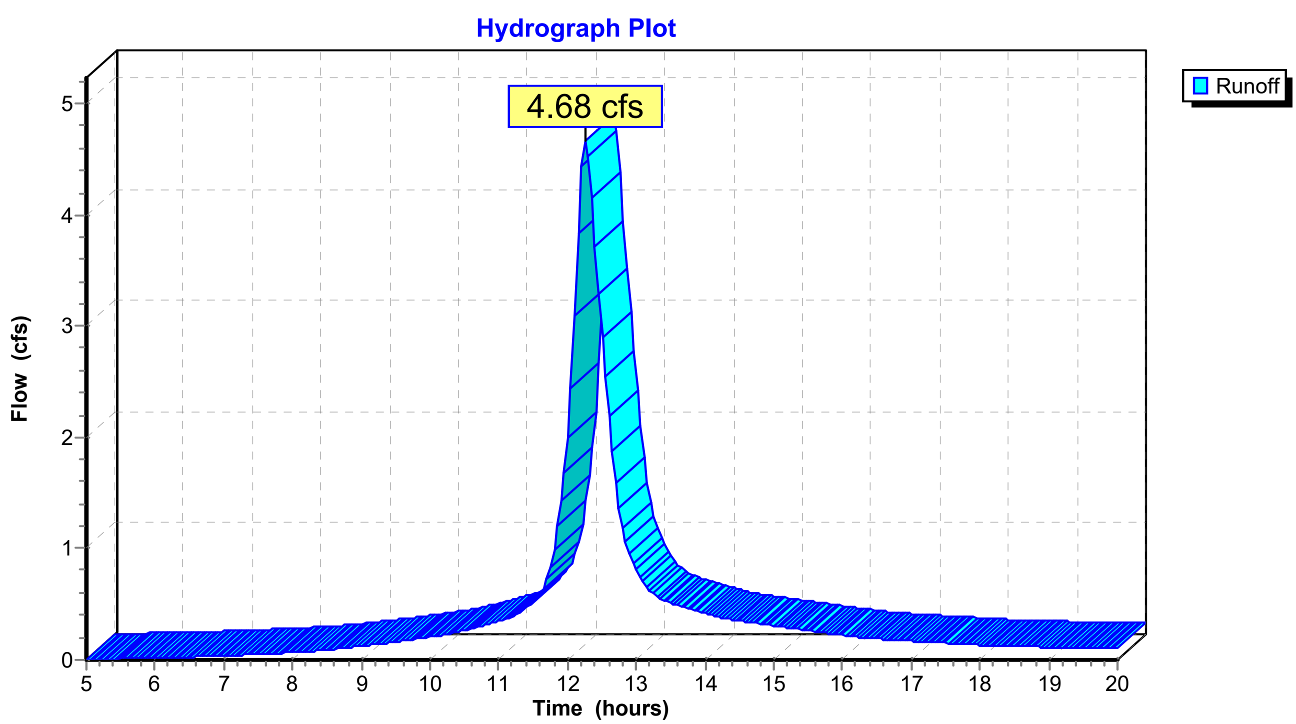
Runoff = 4.68 cfs @ 12.26 hrs, Volume= 0.467 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (ac)	CN	Description
0.386	98	Paved parking & roofs
0.810	80	>75% Grass cover, Good, HSG D
1.196	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4	100	0.0150	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.7	80	0.0150	1.8		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.0	275	0.0500	4.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
19.1	455	Total			

Subcatchment D-21C: D-21C



Subcatchment D-22: D-22

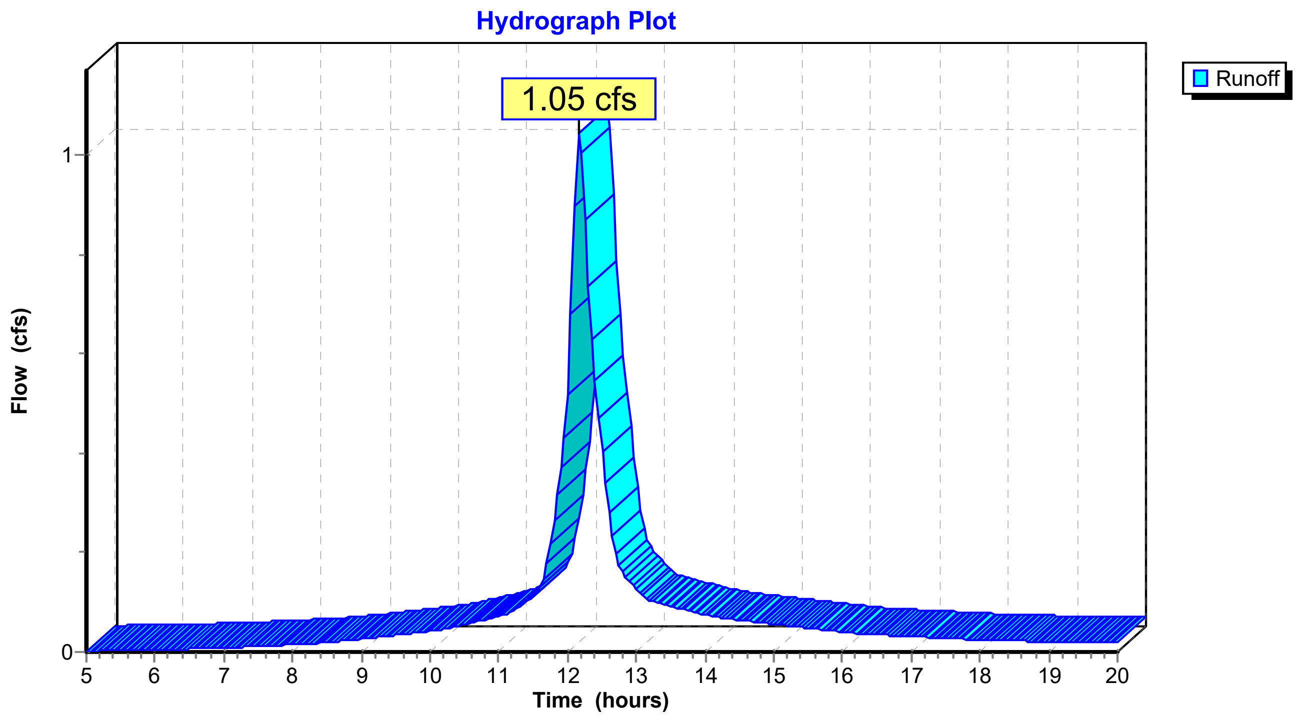
Runoff = 1.05 cfs @ 12.17 hrs, Volume= 0.089 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
4,011	98	Paved parking & roofs
5,702	80	>75% Grass cover, Good, HSG D
9,713	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.5	100	0.0250	3.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.3	150	Total			

Subcatchment D-22: D-22



Subcatchment D-22A: D-22A

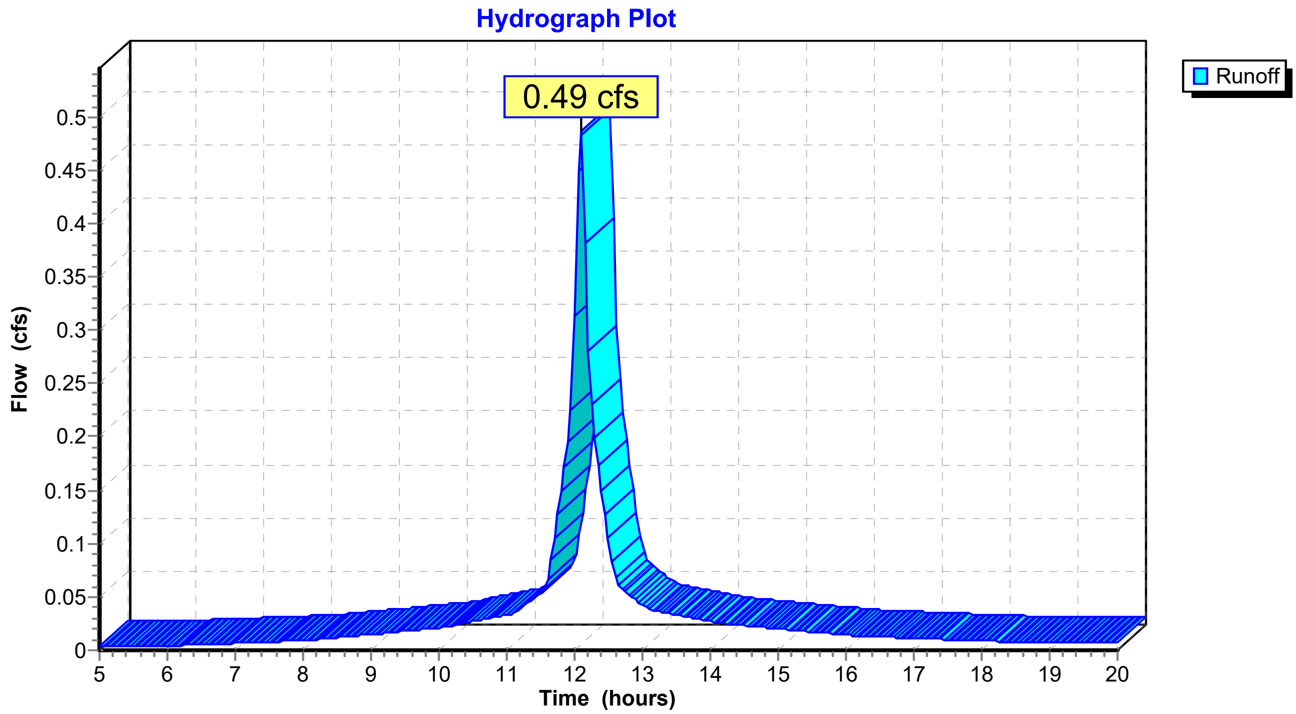
Runoff = 0.49 cfs @ 12.09 hrs, Volume= 0.036 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
2,475	98	Paved parking & roofs
1,000	80	>75% Grass cover, Good, HSG D
3,475	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, tr55 MIN**

Subcatchment D-22A: D-22A



Subcatchment D-23: D-23

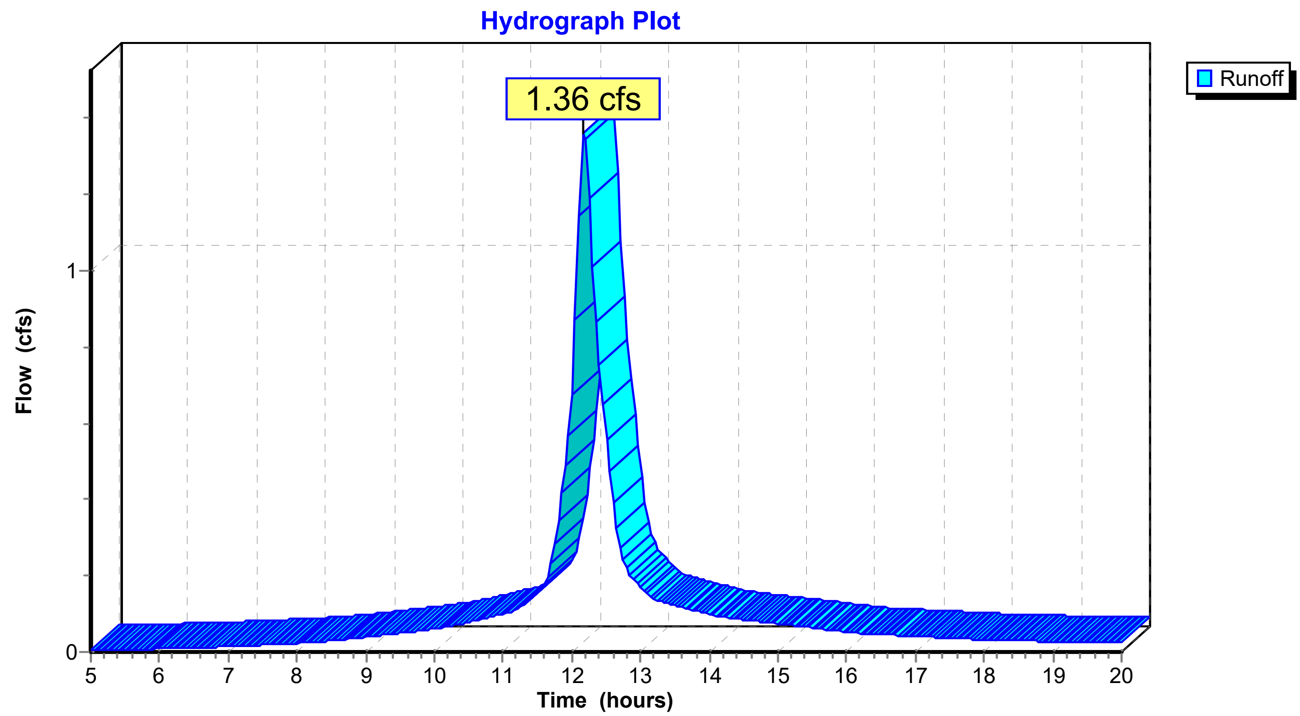
Runoff = 1.36 cfs @ 12.18 hrs, Volume= 0.121 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
6,000	98	Paved parking & roofs
6,626	80	>75% Grass cover, Good, HSG D
12,626	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.3	250	0.0250	3.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.1	300	Total			

Subcatchment D-23: D-23



Subcatchment D-23A: D-23A

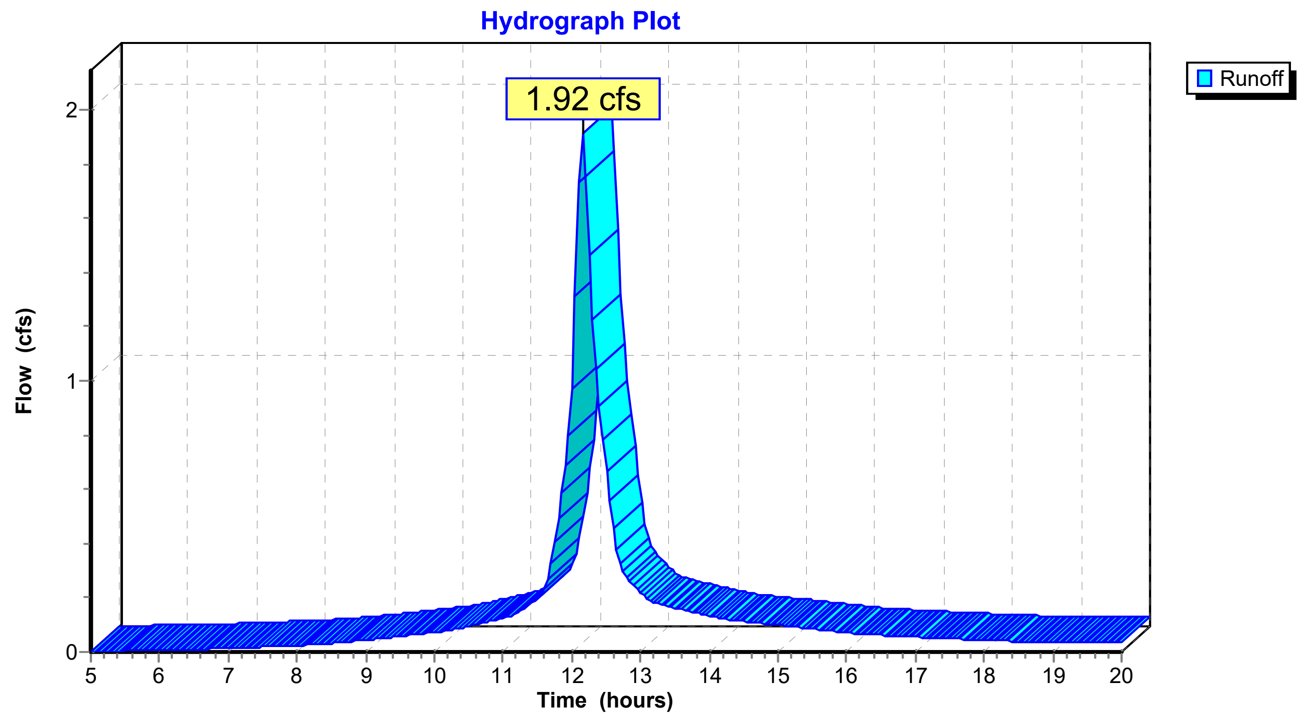
Runoff = 1.92 cfs @ 12.15 hrs, Volume= 0.157 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (ac)	CN	Description
0.126	98	Paved parking & roofs
0.275	80	>75% Grass cover, Good, HSG D
0.401	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	75	0.0300	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.5	100	0.0250	3.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.0	175	Total			

Subcatchment D-23A: D-23A



Subcatchment D-24: D-24

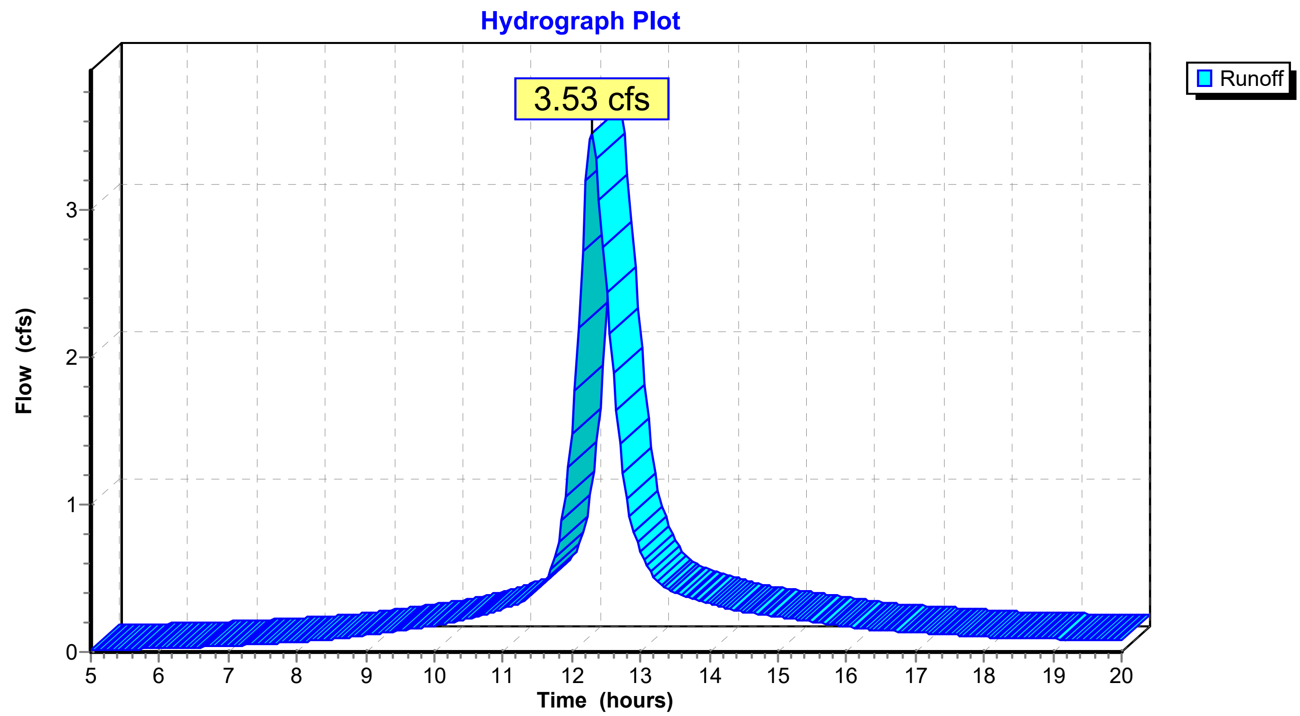
Runoff = 3.53 cfs @ 12.28 hrs, Volume= 0.376 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
20,500	98	Paved parking & roofs
18,739	80	>75% Grass cover, Good, HSG D
39,239	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.9	200	0.0300	3.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
21.4	300	Total			

Subcatchment D-24: D-24



Subcatchment D-25: D-25

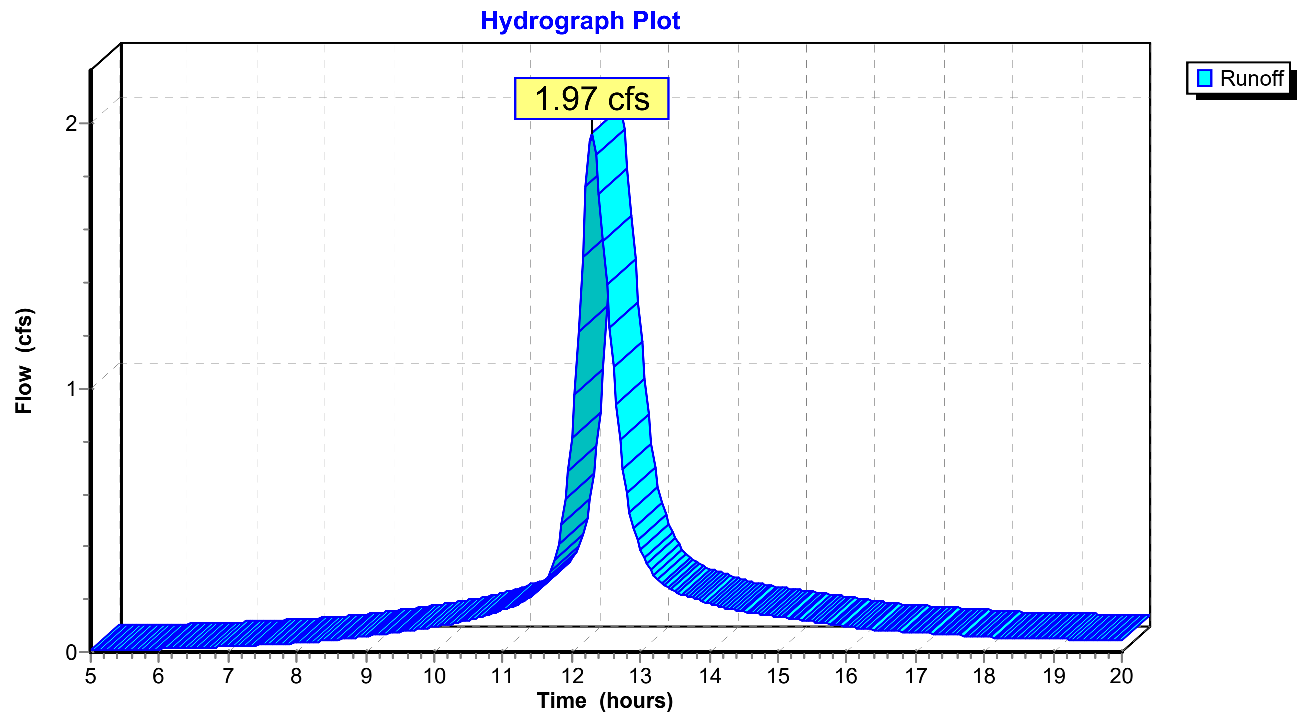
Runoff = 1.97 cfs @ 12.29 hrs, Volume= 0.210 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
10,500	98	Paved parking & roofs
11,853	80	>75% Grass cover, Good, HSG D
22,353	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.2	150	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
21.7	250	Total			

Subcatchment D-25: D-25



Subcatchment D-25A: D-25A

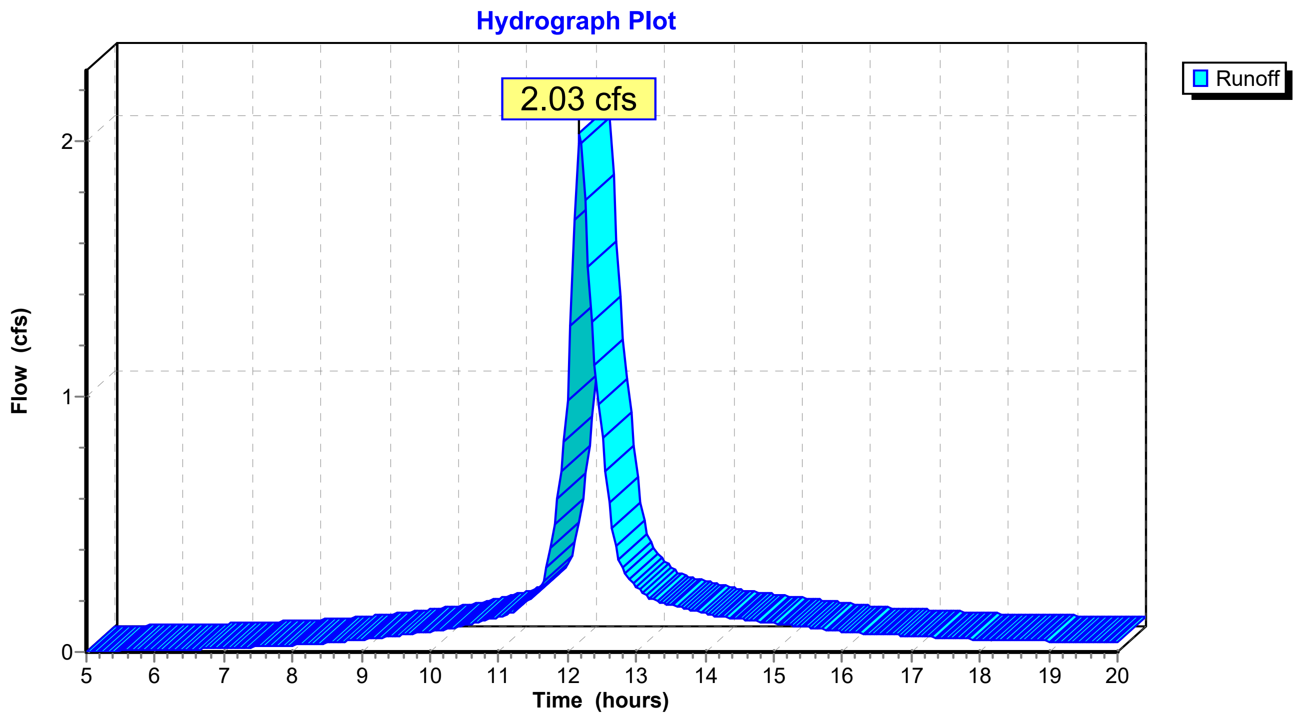
Runoff = 2.03 cfs @ 12.17 hrs, Volume= 0.176 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
7,000	98	Paved parking & roofs
12,613	80	>75% Grass cover, Good, HSG D
19,613	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.2	150	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.0	200	Total			

Subcatchment D-25A: D-25A



Subcatchment D-26: D-26

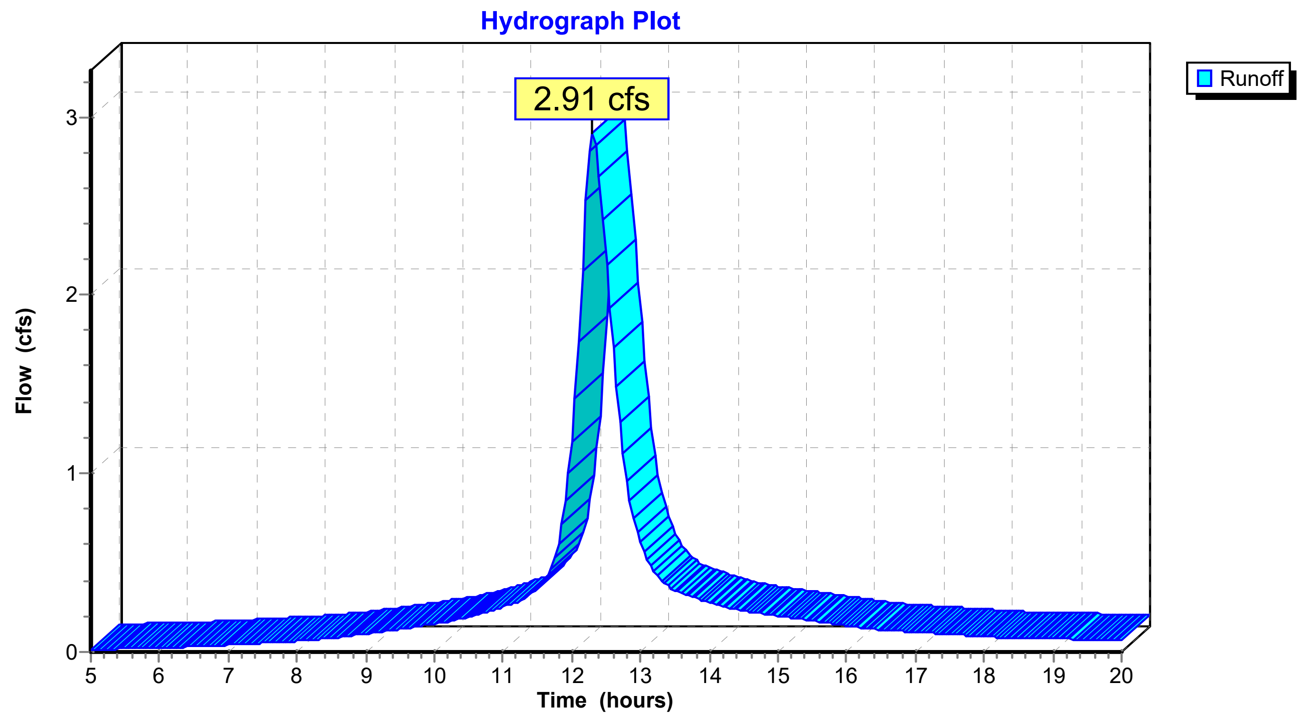
Runoff = 2.91 cfs @ 12.31 hrs, Volume= 0.322 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
17,750	98	Paved parking & roofs
15,108	80	>75% Grass cover, Good, HSG D
32,858	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
2.5	300	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
23.0	400	Total			

Subcatchment D-26: D-26



Subcatchment D-26A: D-26A

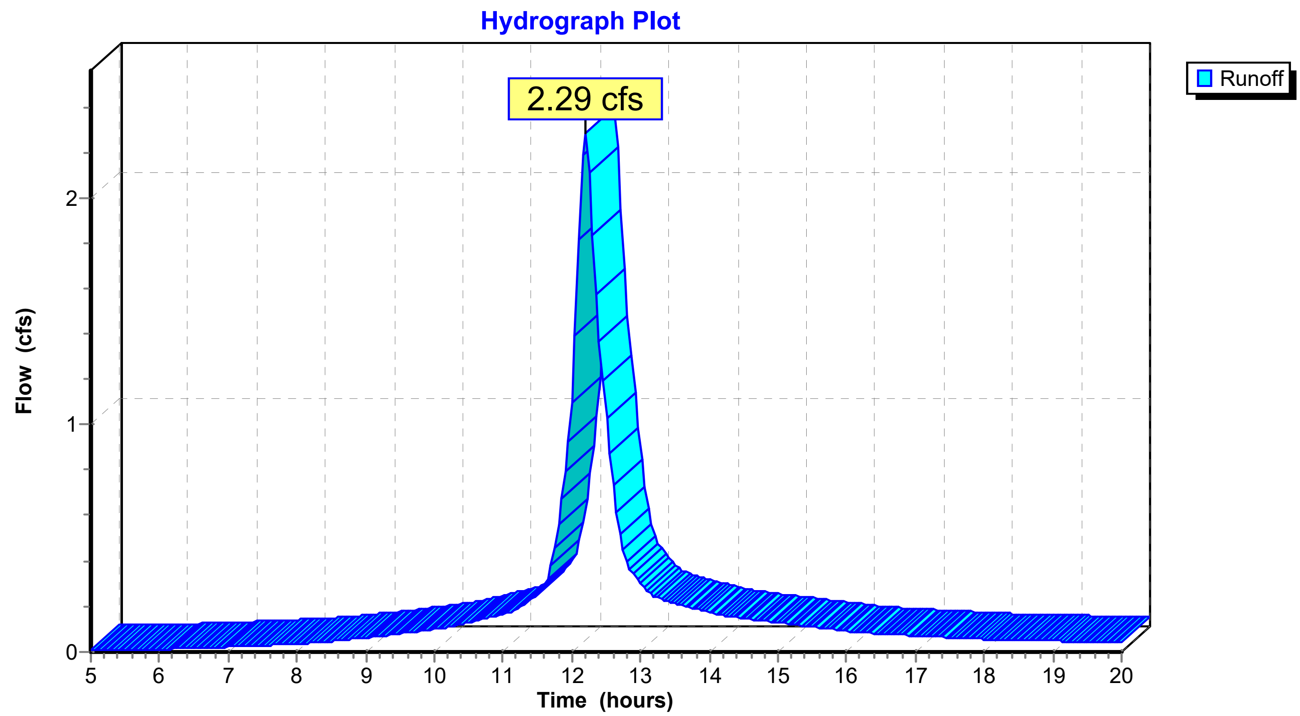
Runoff = 2.29 cfs @ 12.19 hrs, Volume= 0.207 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
9,250	98	Paved parking & roofs
12,827	80	>75% Grass cover, Good, HSG D
22,077	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
2.5	300	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
14.3	350	Total			

Subcatchment D-26A: D-26A



Subcatchment D-27: D-27

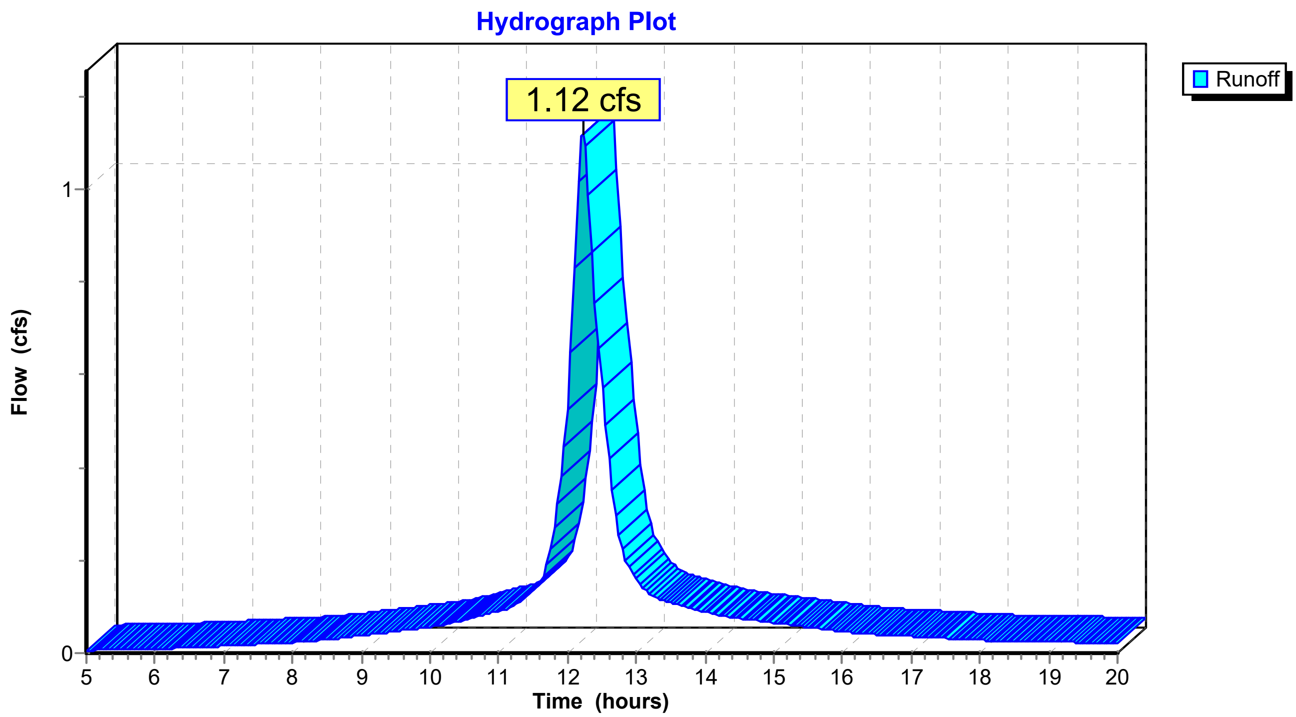
Runoff = 1.12 cfs @ 12.22 hrs, Volume= 0.109 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
6,500	98	Paved parking & roofs
4,360	80	>75% Grass cover, Good, HSG D
10,860	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	75	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"

Subcatchment D-27: D-27



Subcatchment D-27A: D-27A

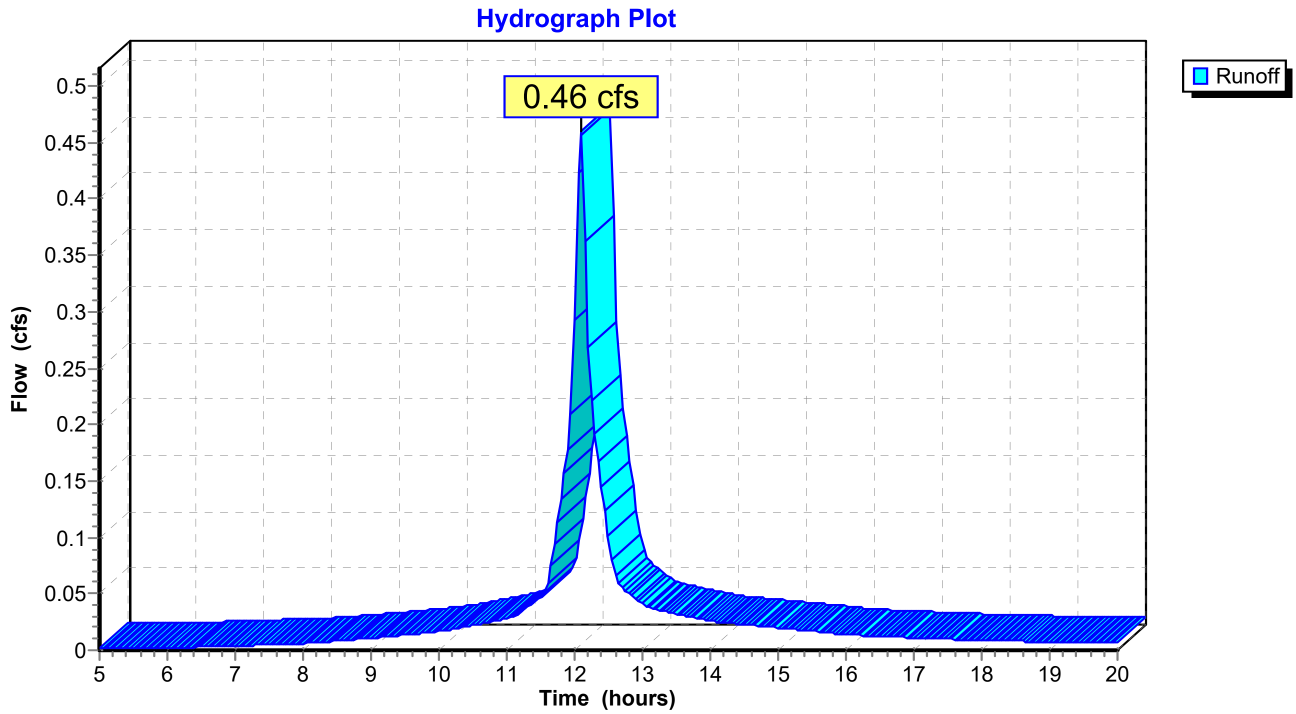
Runoff = 0.46 cfs @ 12.09 hrs, Volume= 0.033 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
1,503	98	Paved parking & roofs
2,000	80	>75% Grass cover, Good, HSG D
3,503	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-27A: D-27A



Subcatchment D-28: D-28

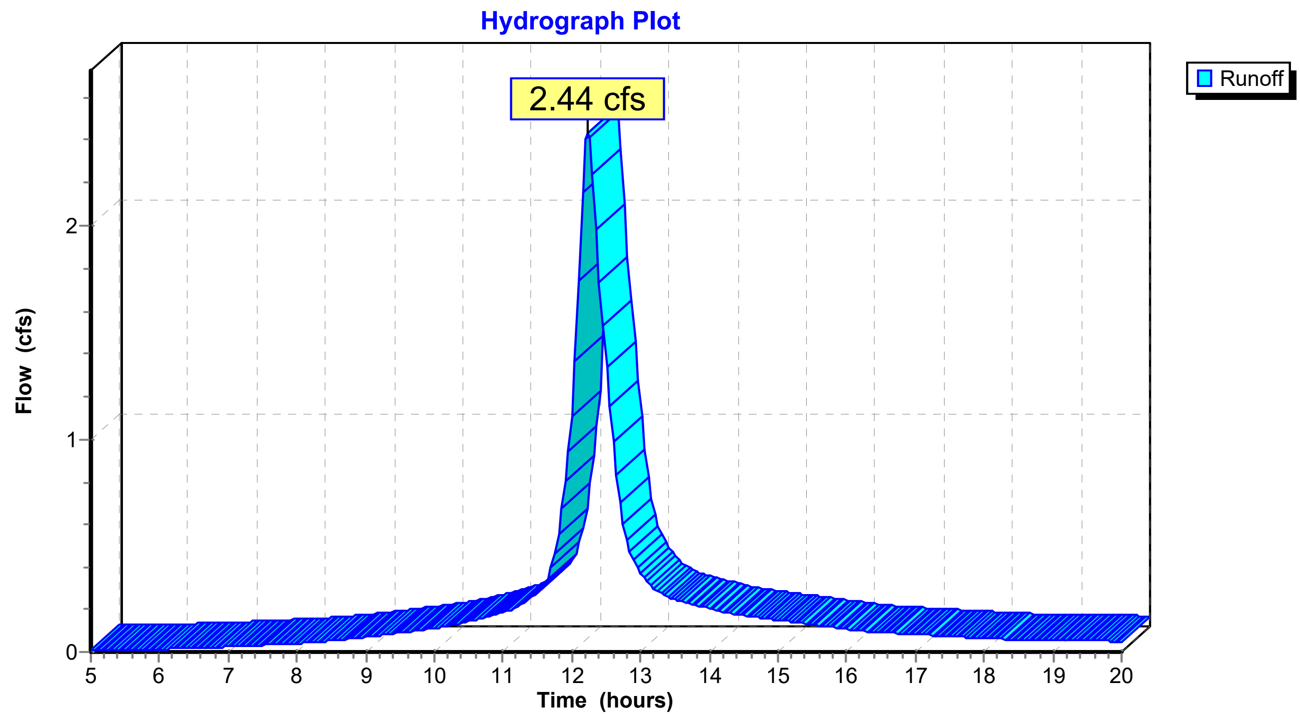
Runoff = 2.44 cfs @ 12.23 hrs, Volume= 0.237 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
11,000	98	Paved parking & roofs
14,225	80	>75% Grass cover, Good, HSG D
25,225	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	75	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.8	100	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
17.1	175	Total			

Subcatchment D-28: D-28



Subcatchment D-28A: D-28A

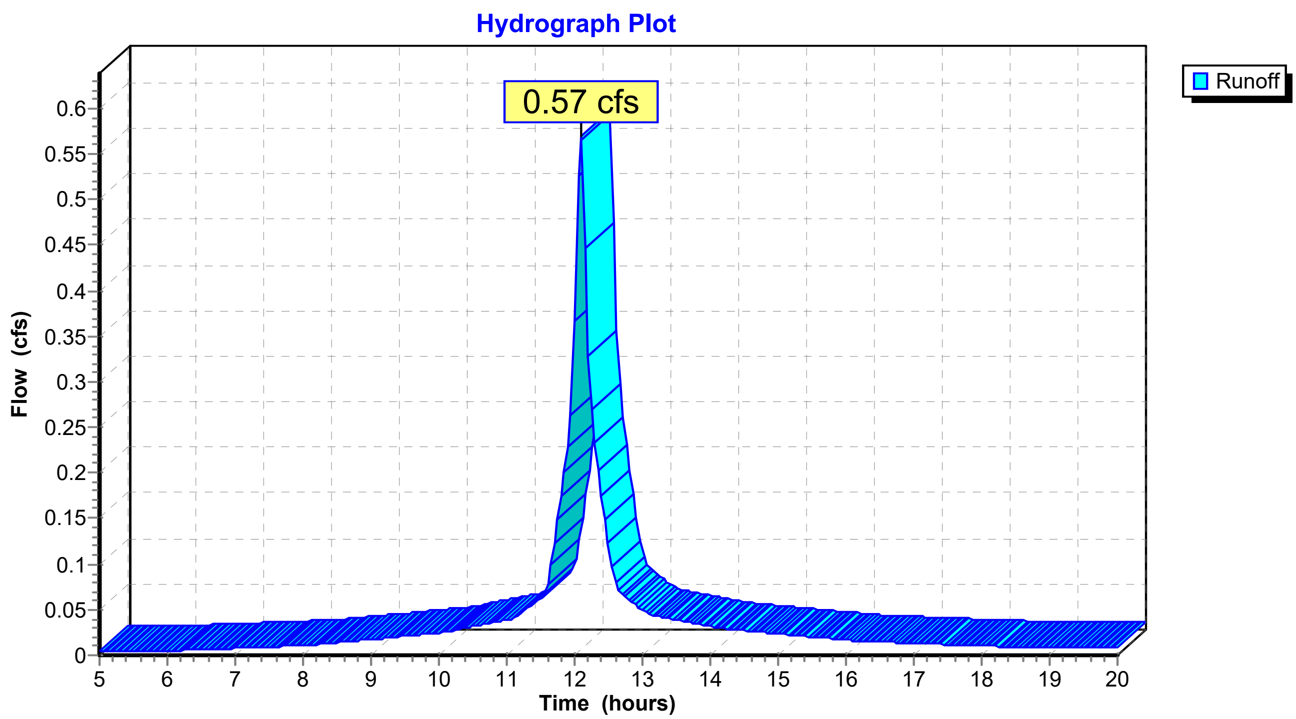
Runoff = 0.57 cfs @ 12.09 hrs, Volume= 0.042 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
3,000	98	Paved parking & roofs
1,067	80	>75% Grass cover, Good, HSG D
4,067	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-28A: D-28A



Subcatchment D-2OA: D-20A

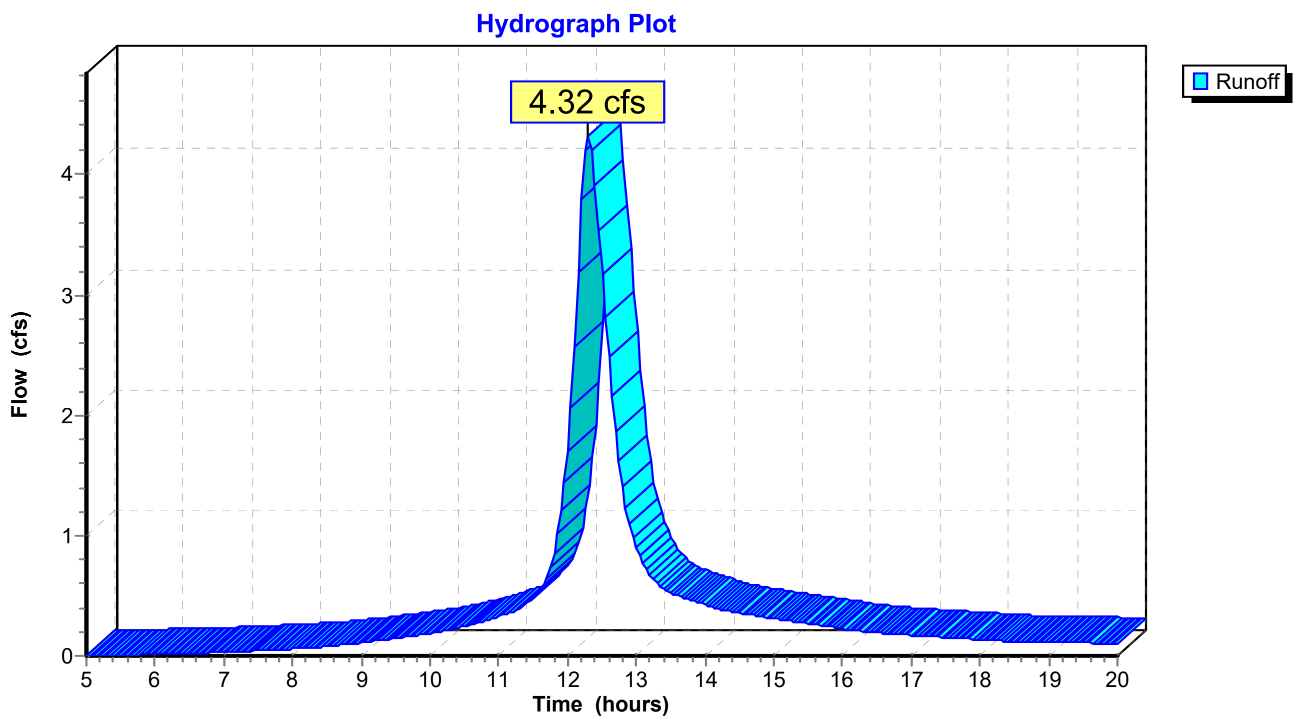
Runoff = 4.32 cfs @ 12.30 hrs, Volume= 0.457 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
15,000	98	Paved roads w/curbs & sewers
37,267	80	>75% Grass cover, Good, HSG D
52,267	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.1	100	0.0100	1.5		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.7	80	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
22.3	280	Total			

Subcatchment D-2OA: D-20A



Subcatchment D-3: D-3

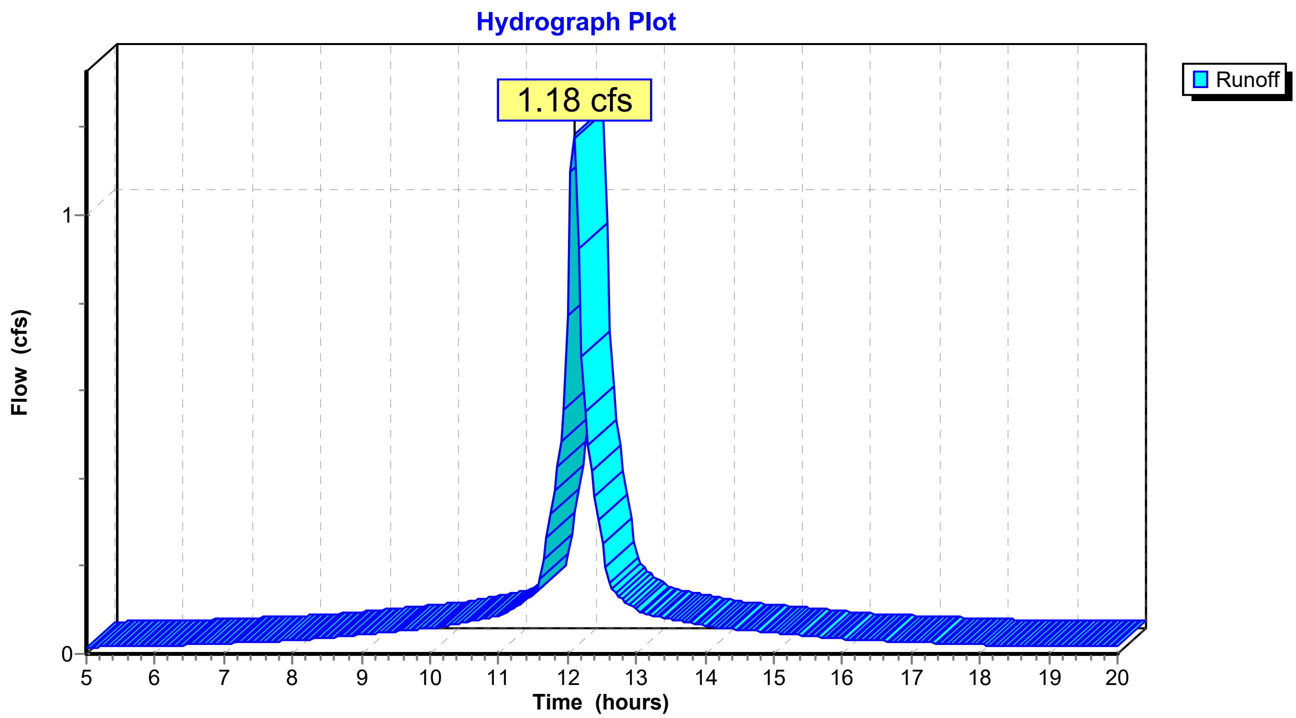
Runoff = 1.18 cfs @ 12.09 hrs, Volume= 0.092 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
8,167	98	Paved roads w/curbs & sewers

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-3: D-3



Subcatchment D-4: D-4

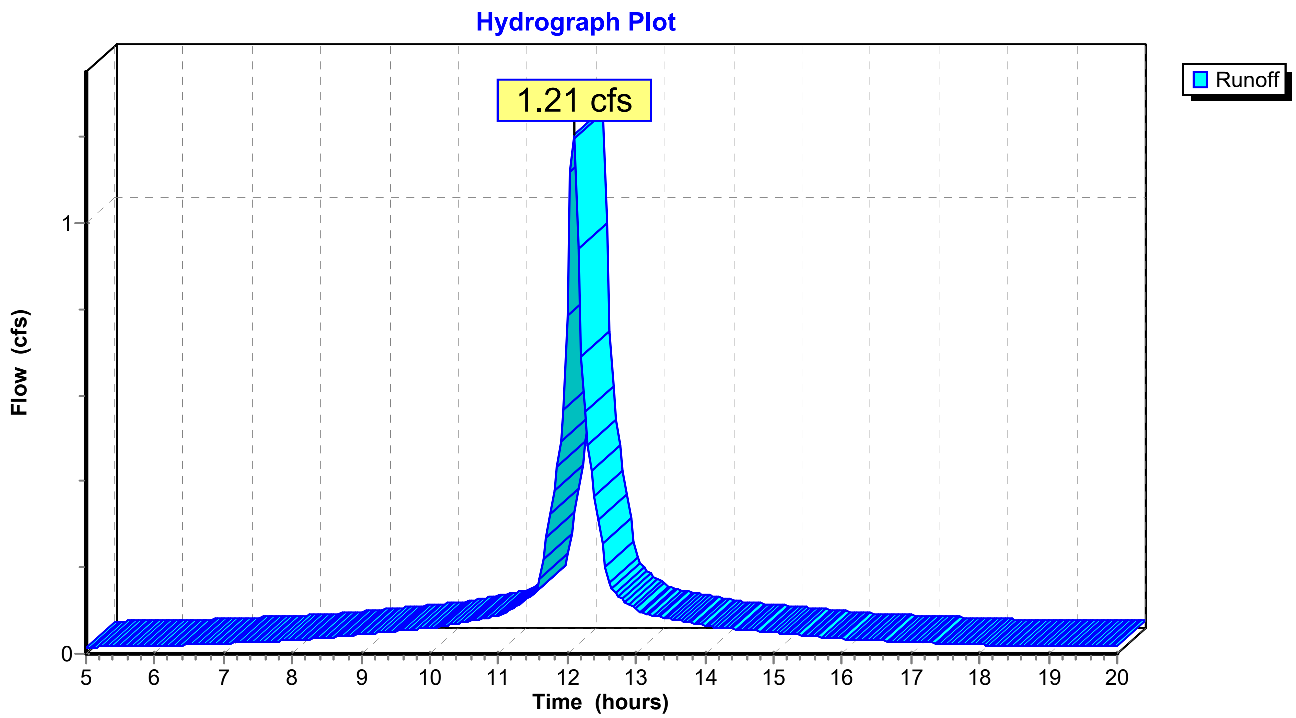
Runoff = 1.21 cfs @ 12.09 hrs, Volume= 0.093 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
8,318	98	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment D-4: D-4



Subcatchment D-6: D-6

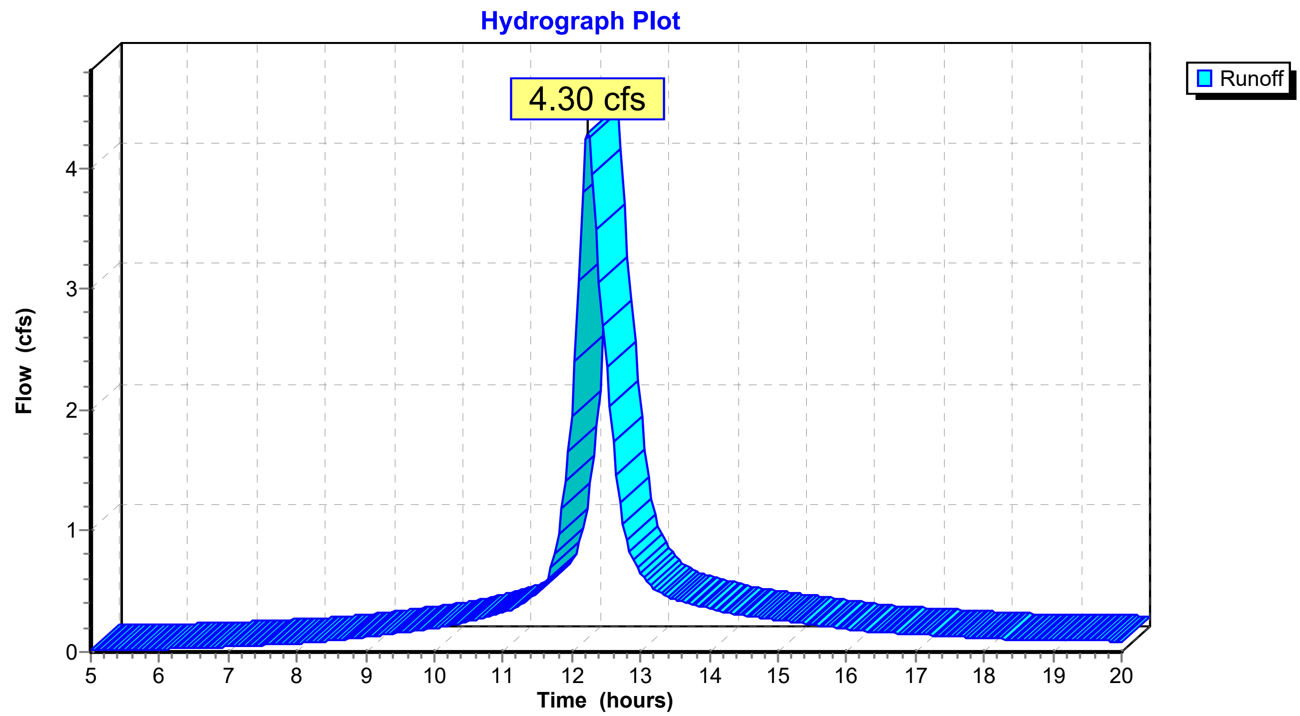
Runoff = 4.30 cfs @ 12.23 hrs, Volume= 0.417 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
18,800	98	Paved parking & roofs
25,626	80	>75% Grass cover, Good, HSG D
44,426	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	75	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.8	100	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
17.1	175	Total			

Subcatchment D-6: D-6



Subcatchment D-7: D-7

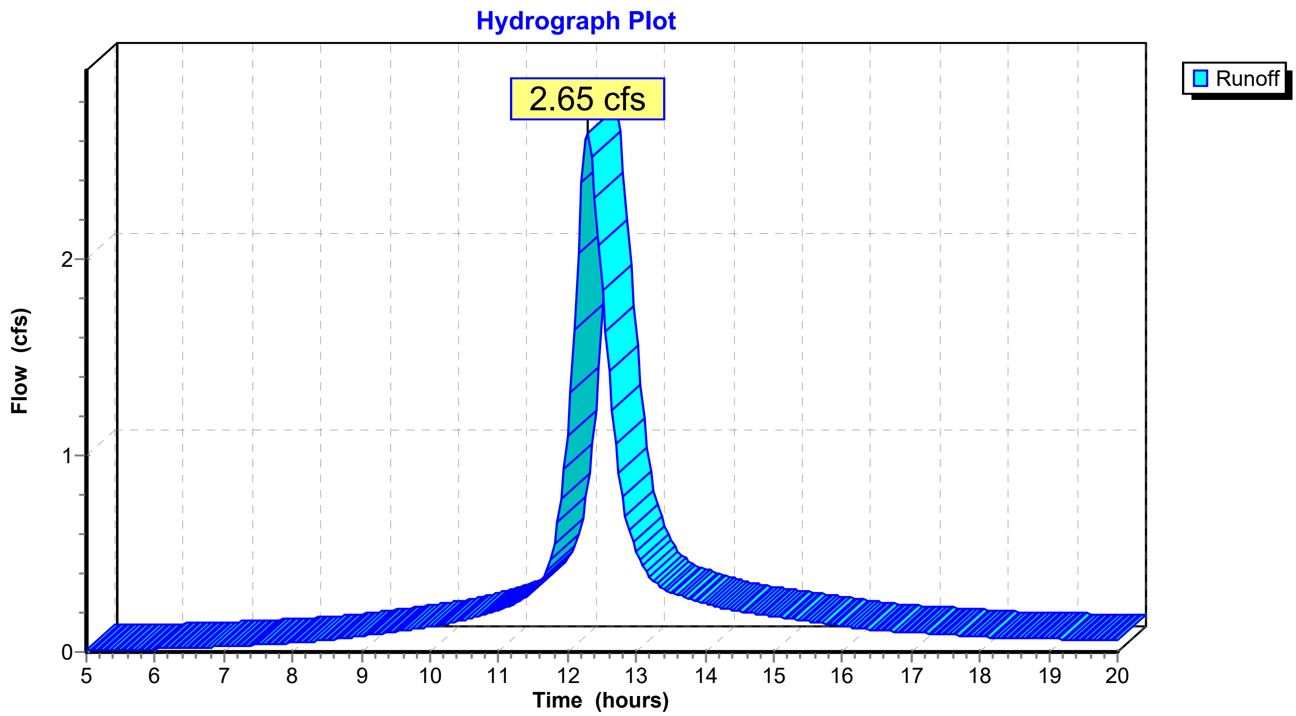
Runoff = 2.65 cfs @ 12.29 hrs, Volume= 0.281 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
12,500	98	Paved parking & roofs
17,422	80	>75% Grass cover, Good, HSG D
29,922	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.9	200	0.0300	3.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
21.4	300	Total			

Subcatchment D-7: D-7



Subcatchment D-7A: D-7A

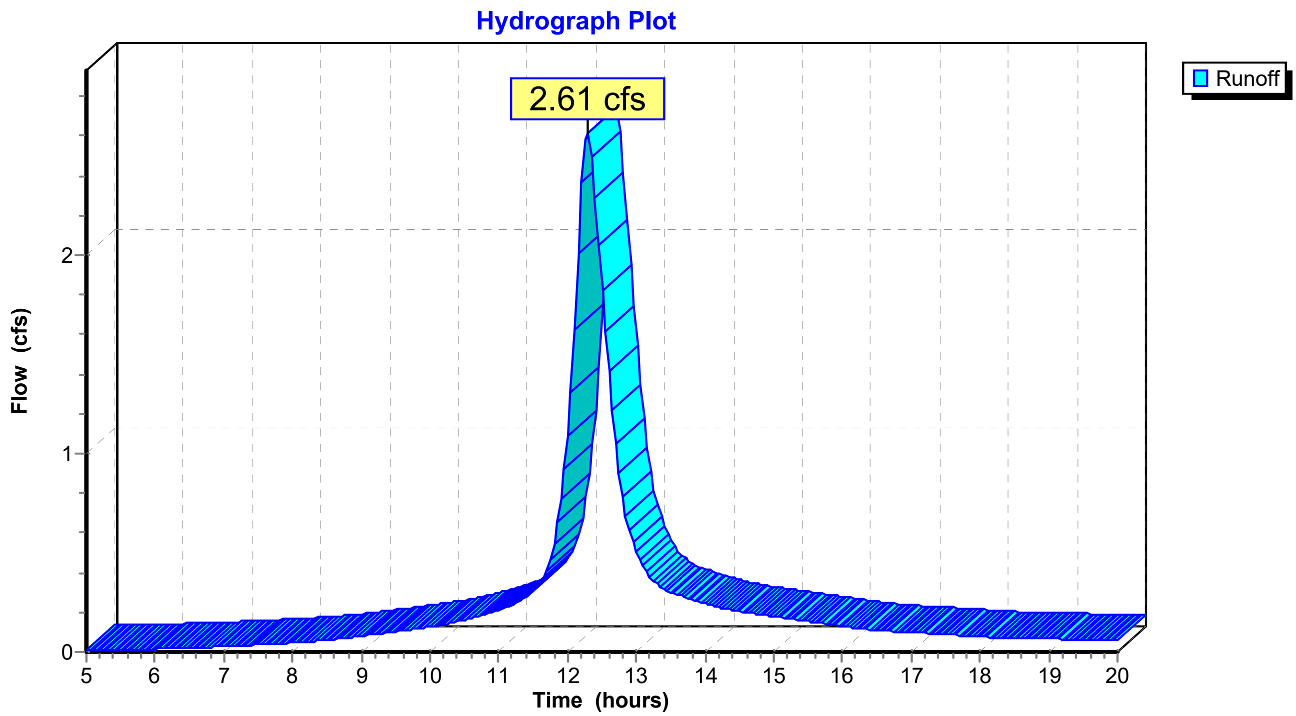
Runoff = 2.61 cfs @ 12.29 hrs, Volume= 0.277 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
12,500	98	Paved parking & roofs
17,000	80	>75% Grass cover, Good, HSG D
29,500	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.9	200	0.0300	3.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
21.4	300	Total			

Subcatchment D-7A: D-7A



Subcatchment D-9: D-9

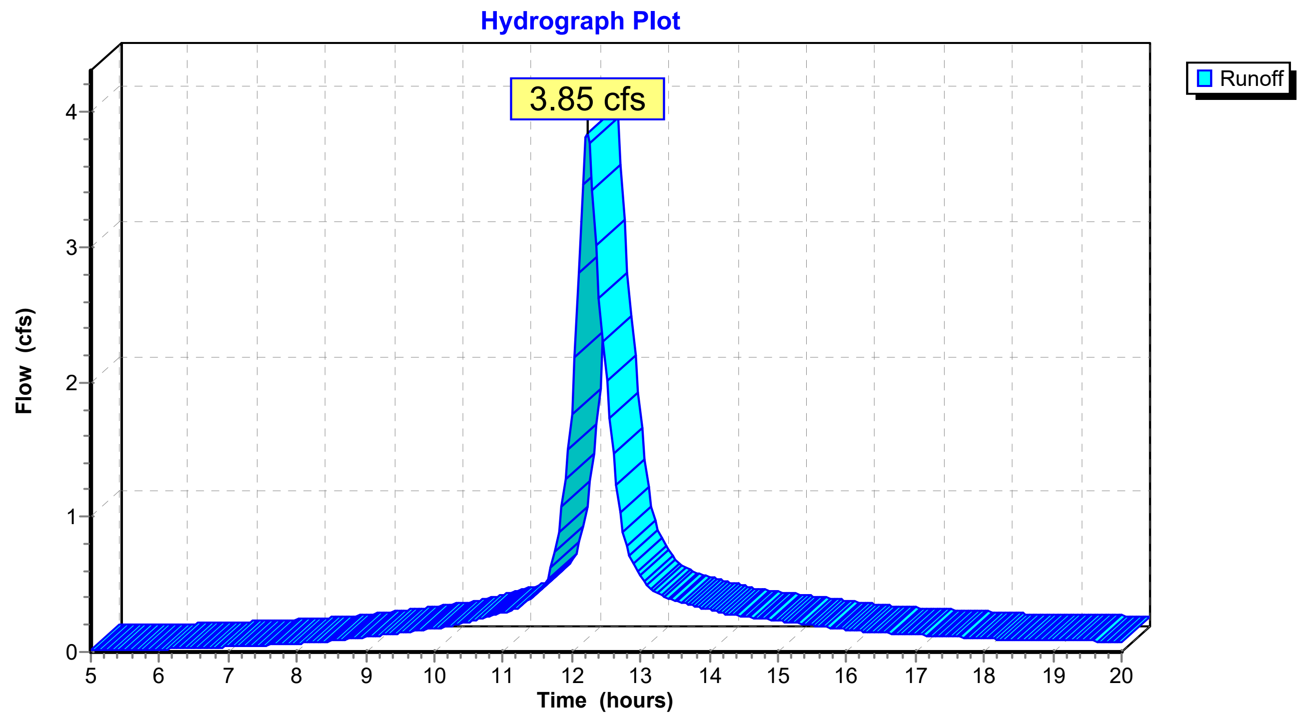
Runoff = 3.85 cfs @ 12.22 hrs, Volume= 0.367 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
16,500	98	Paved parking & roofs
22,540	80	>75% Grass cover, Good, HSG D
39,040	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	70	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.0	200	0.0250	3.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.4	270	Total			

Subcatchment D-9: D-9



Subcatchment D-9A: CB-9A

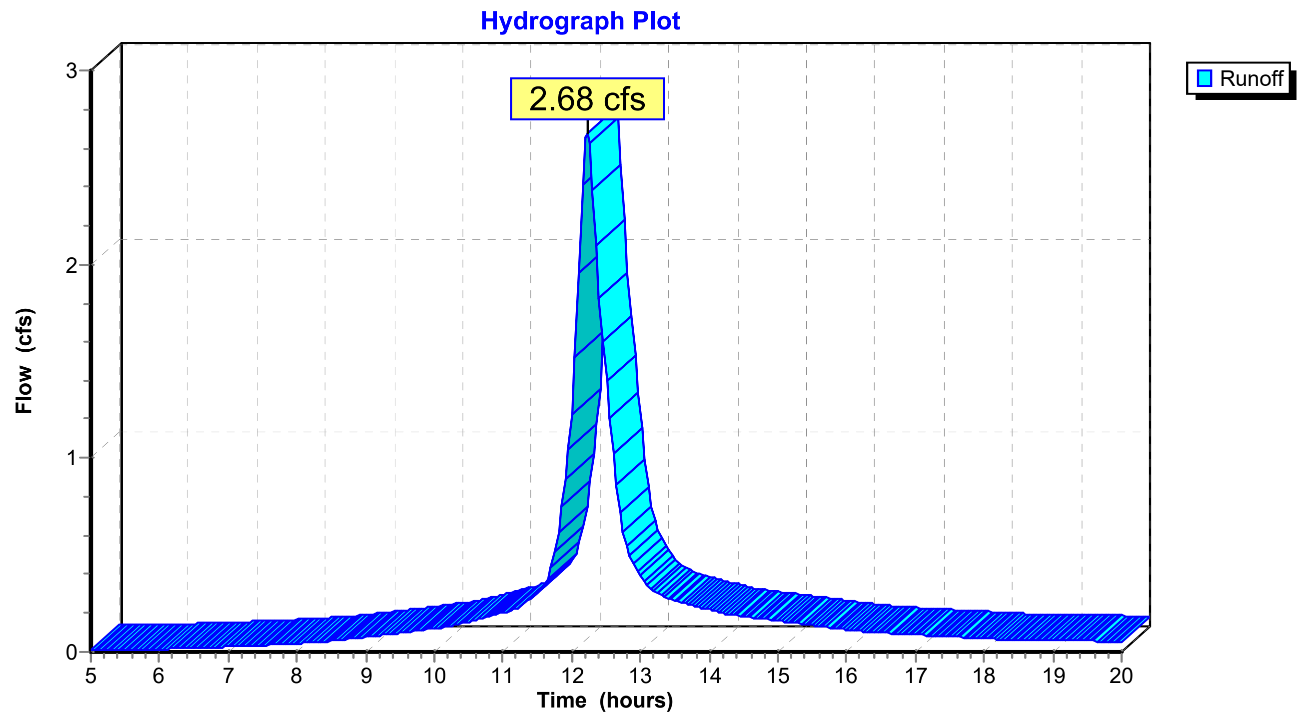
Runoff = 2.68 cfs @ 12.22 hrs, Volume= 0.255 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
12,500	98	Paved parking & roofs
14,689	80	>75% Grass cover, Good, HSG D
27,189	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	70	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.0	200	0.0250	3.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.4	270	Total			

Subcatchment D-9A: CB-9A



Subcatchment D-DMH-1: D-DMH-1

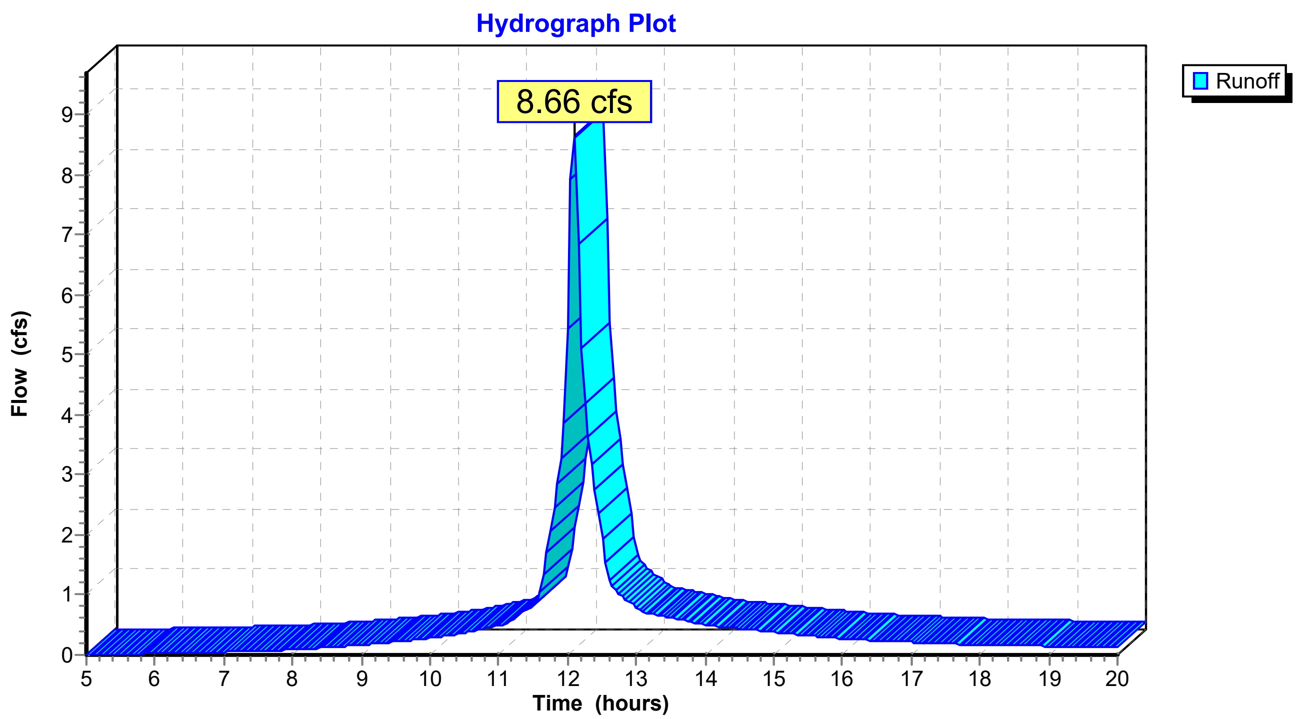
Runoff = 8.66 cfs @ 12.09 hrs, Volume= 0.609 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
18,600	98	Paved parking & roofs
50,637	80	>75% Grass cover, Good, HSG D
69,237	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	40	0.0800	0.2		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.7					**Direct Entry, MAKE TR 55 6 MIN MIN**
6.0	40	Total			

Subcatchment D-DMH-1: D-DMH-1



Subcatchment EX-1: EX-1

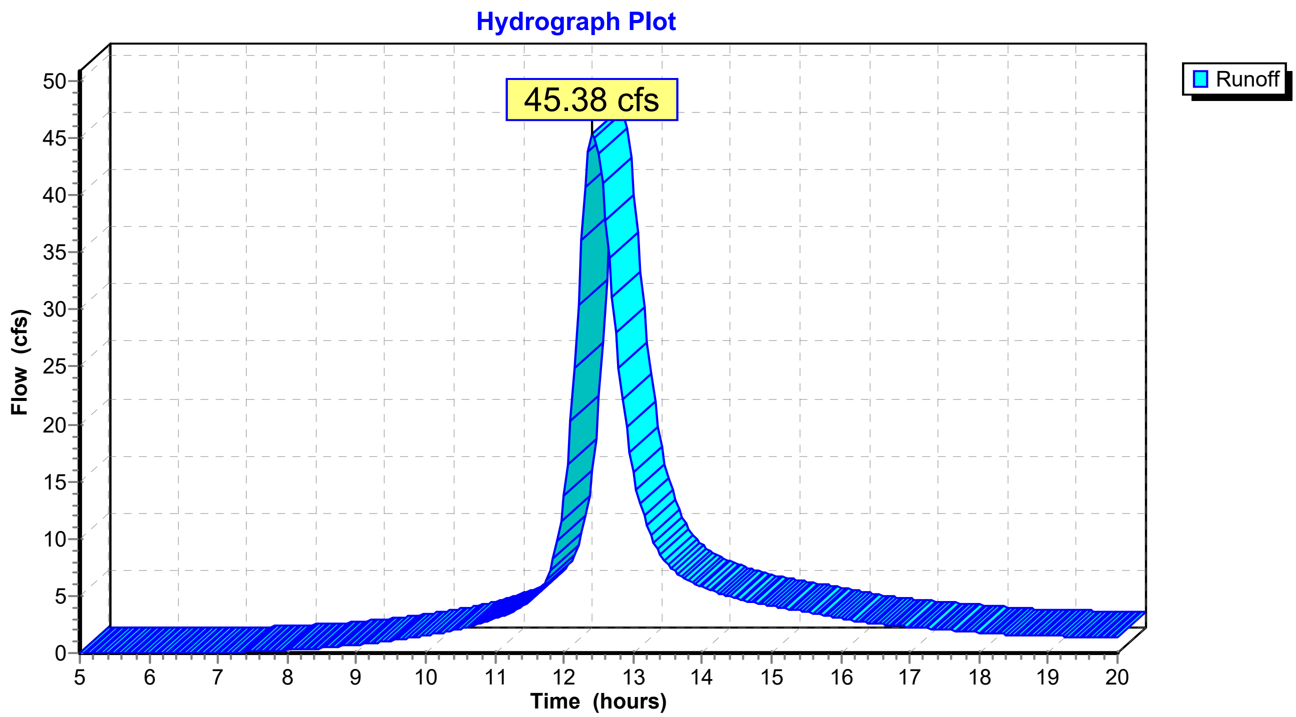
Runoff = 45.38 cfs @ 12.42 hrs, Volume= 5.377 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (ac)	CN	Description
16.430	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0700	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
16.4	1,100	0.0500	1.1		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
30.6	1,200	Total			

Subcatchment EX-1: EX-1



Subcatchment EX-2: EX-2

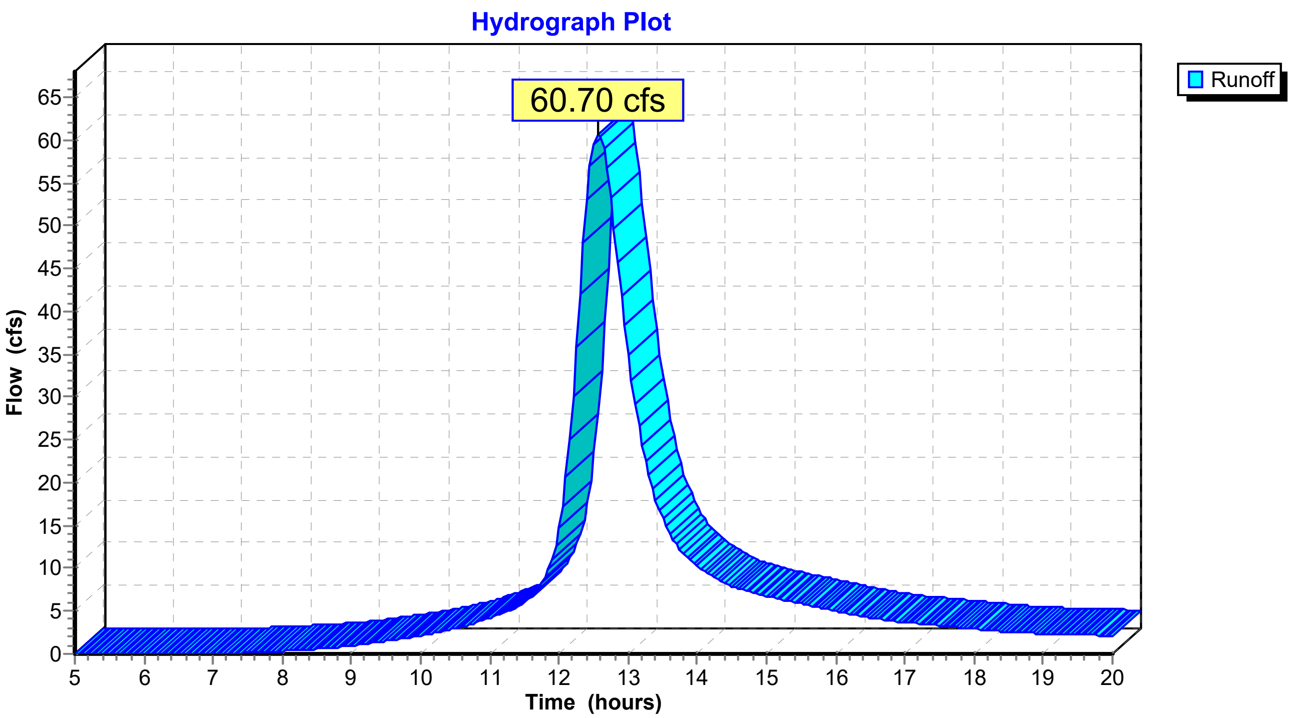
Runoff = 60.70 cfs @ 12.57 hrs, Volume= 8.319 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (ac)	CN	Description
25.510	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	100	0.0250	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
17.8	1,000	0.0350	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	1,000	0.0350	7.0	35.17	**Channel Flow,** Area= 5.0 sf Perim= 6.0' r= 0.83' n= 0.035
41.6	2,100	Total			

Subcatchment EX-2: EX-2



Subcatchment EX-3: EX-3

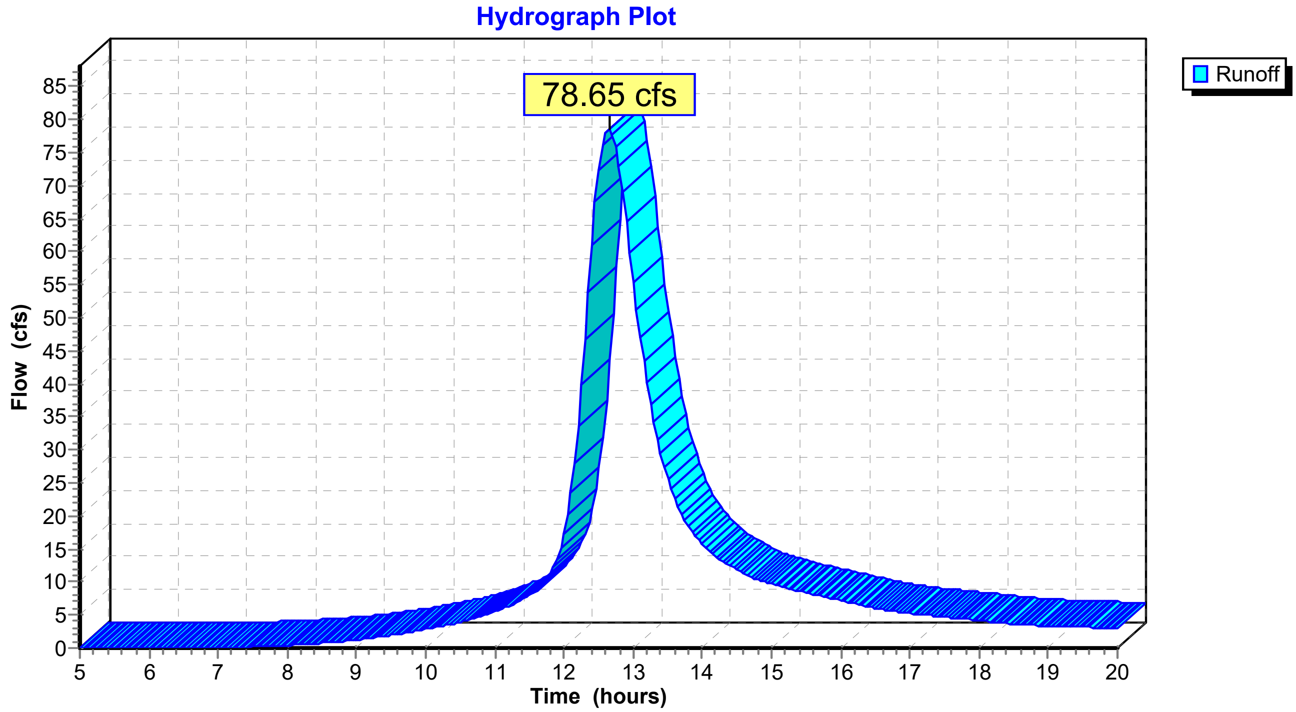
Runoff = 78.65 cfs @ 12.65 hrs, Volume= 11.557 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (ac)	CN	Description
35.510	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0800	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
34.3	2,300	0.0500	1.1		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
47.7	2,400	Total			

Subcatchment EX-3: EX-3



Subcatchment EX-4: EX-4

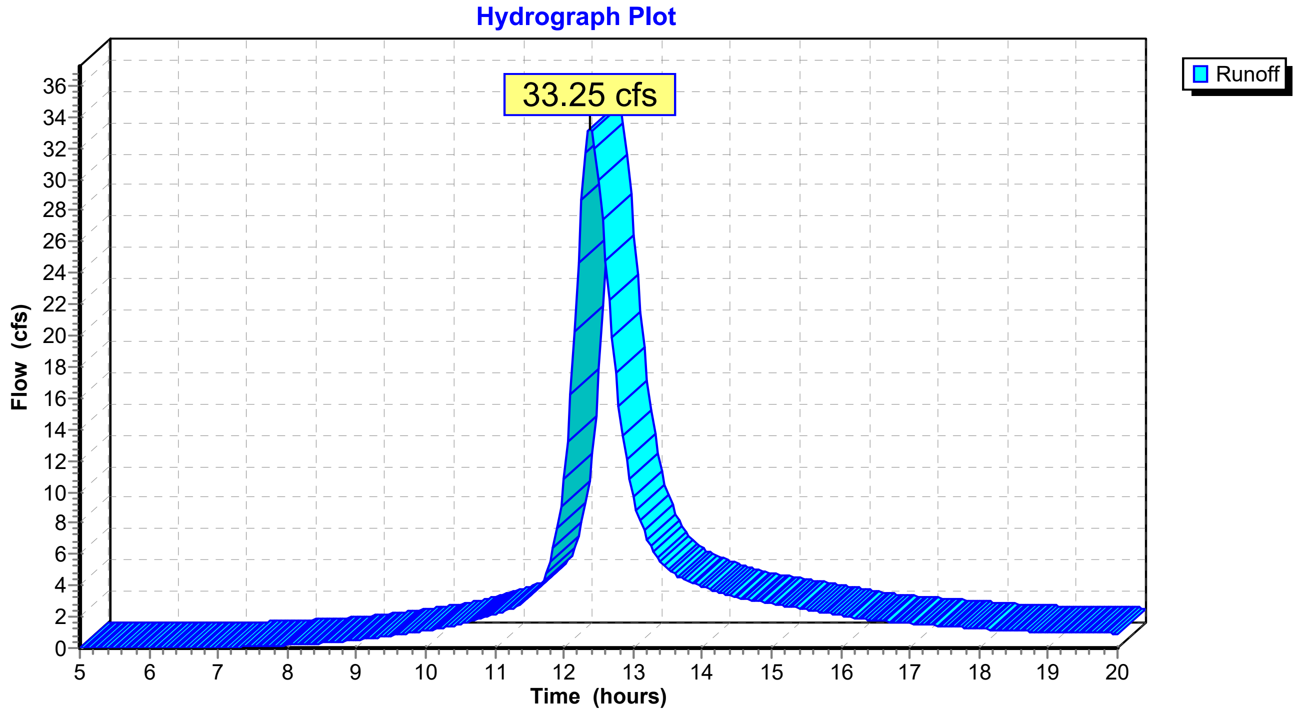
Runoff = 33.25 cfs @ 12.38 hrs, Volume= 3.758 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (ac)	CN	Description
11.470	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	100	0.0250	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
6.0	400	0.0500	1.1		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
27.4	500	Total			

Subcatchment EX-4: EX-4



Subcatchment OPEN 1: OIPEN 1

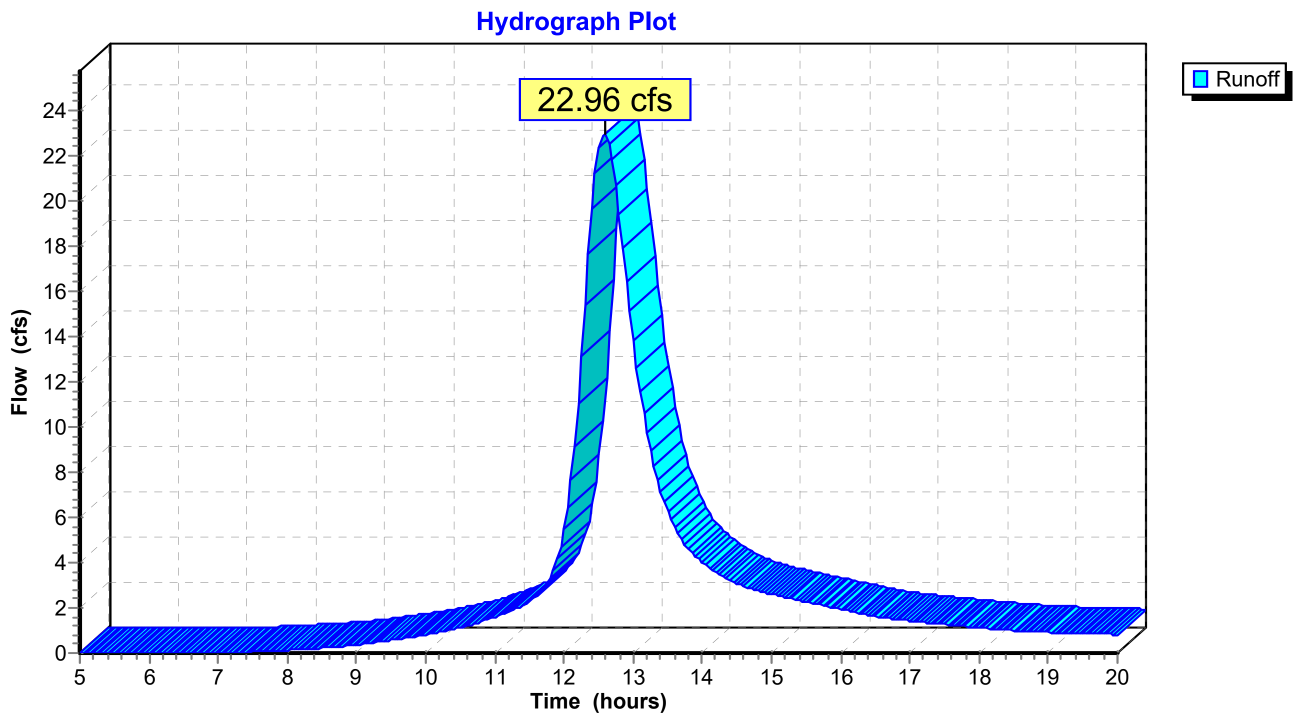
Runoff = 22.96 cfs @ 12.59 hrs, Volume= 3.189 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
426,190	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	100	0.0500	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
26.6	1,380	0.0300	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.8	1,480	Total			

Subcatchment OPEN 1: OIPEN 1



Subcatchment OPEN 2: OPEN 2

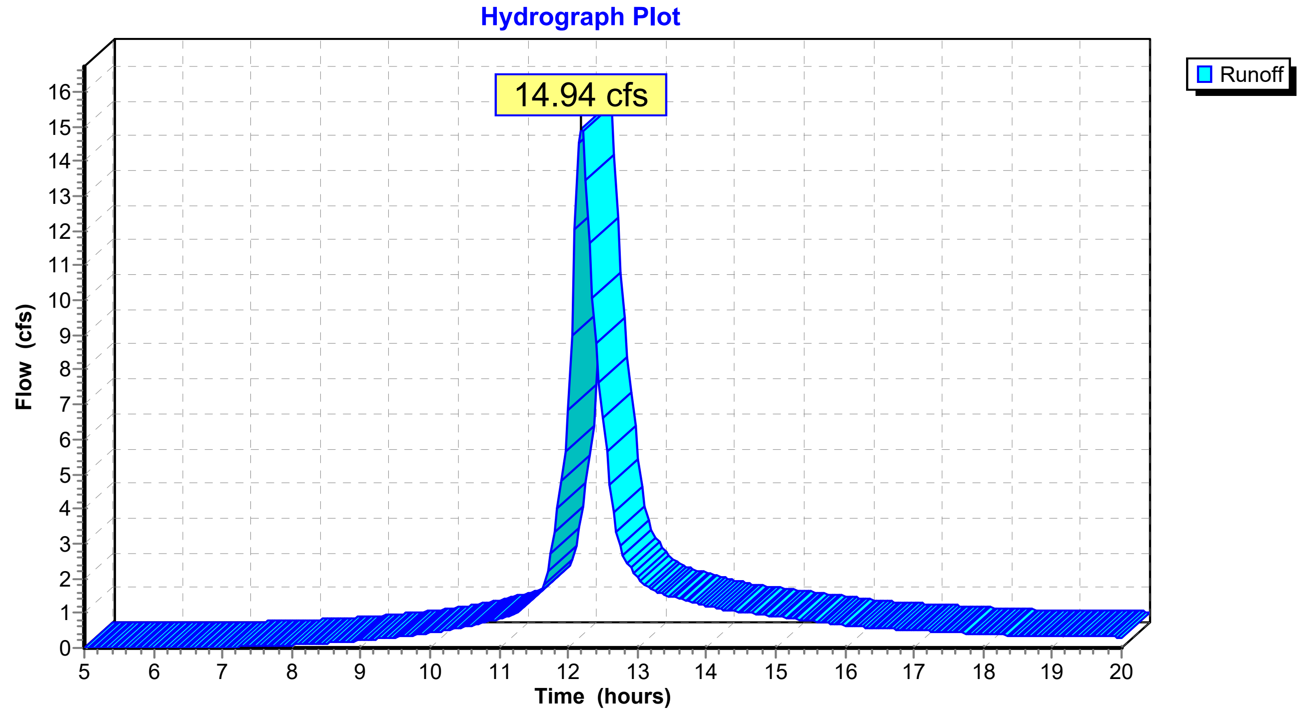
Runoff = 14.94 cfs @ 12.19 hrs, Volume= 1.275 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
168,705	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0800	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"

Subcatchment OPEN 2: OPEN 2



Subcatchment OPEN 3: OPEN 3

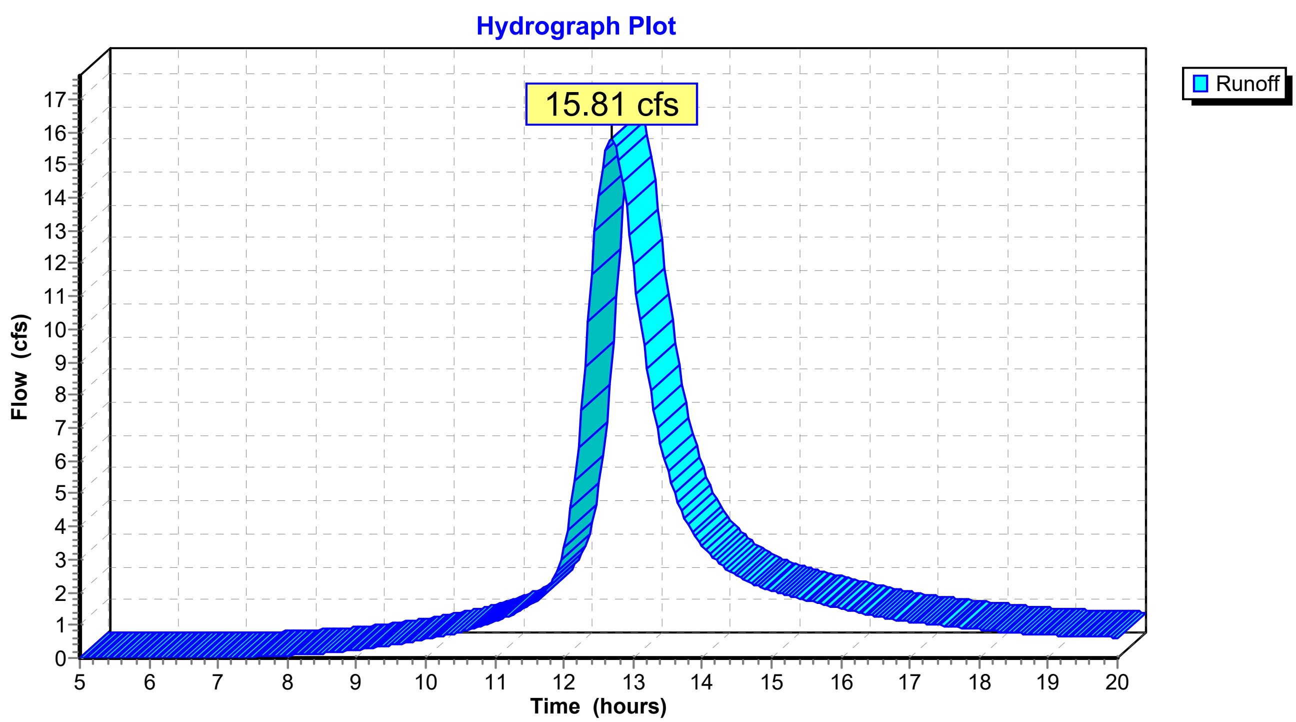
Runoff = 15.81 cfs @ 12.68 hrs, Volume= 2.388 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
319,952	79	Woods/grass comb., Good, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.2	100	0.0150	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
24.1	885	0.0150	0.6		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
50.3	985	Total			

Subcatchment OPEN 3: OPEN 3



Subcatchment OPEN 4: OPEN 4

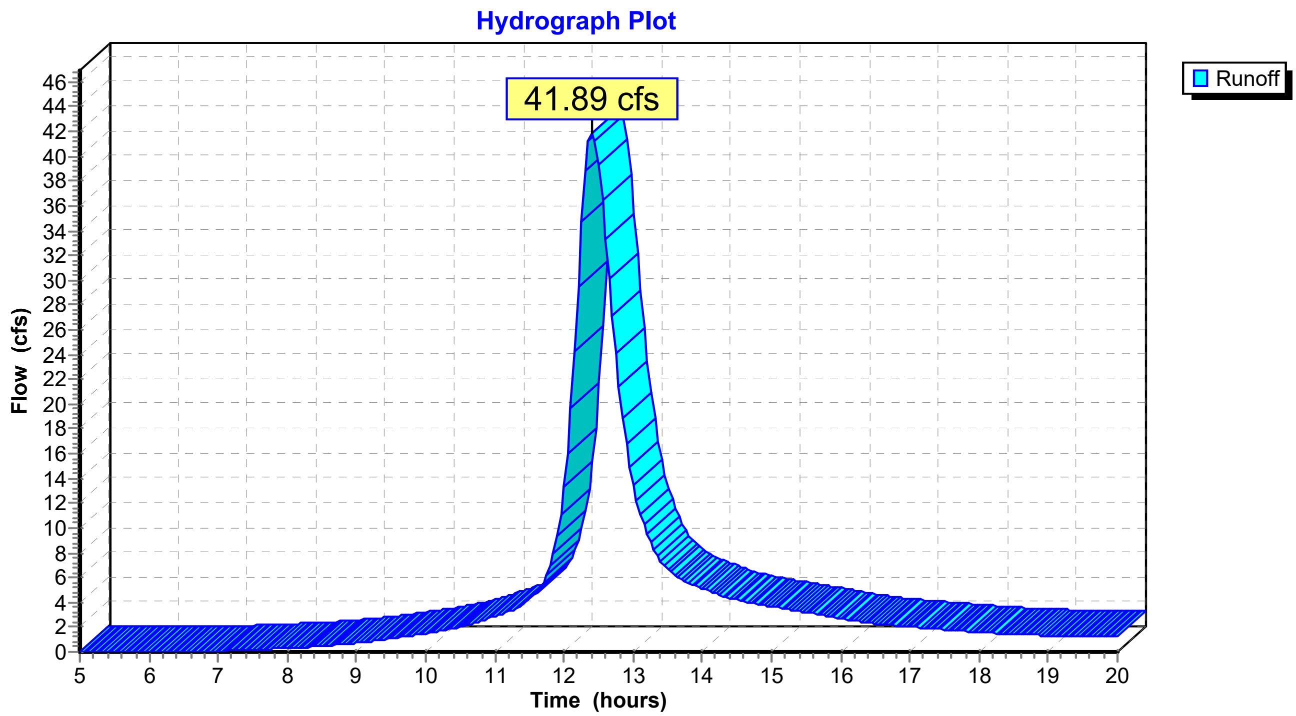
Runoff = 41.89 cfs @ 12.40 hrs, Volume= 4.883 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
614,560	79	Woods, Fair, HSG D
18,300	98	Paved parking & roofs
632,860	80	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.1	100	0.0600	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
14.1	1,200	0.0800	1.4		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
29.2	1,300	Total			

Subcatchment OPEN 4: OPEN 4



Subcatchment OPEN 5: OPEN 5

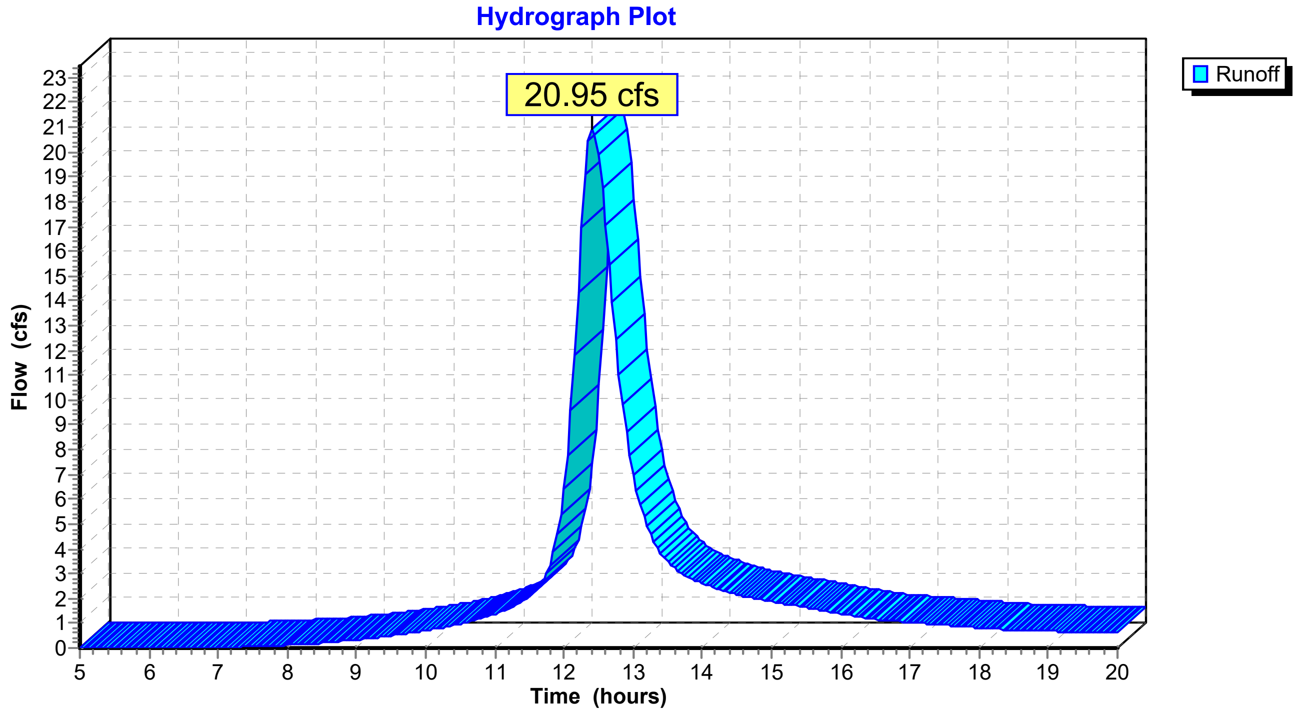
Runoff = 20.95 cfs @ 12.41 hrs, Volume= 2.454 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
326,510	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	100	0.0400	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
12.1	630	0.0300	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
29.8	730	Total			

Subcatchment OPEN 5: OPEN 5



Subcatchment OPEN 6: OPEN 6

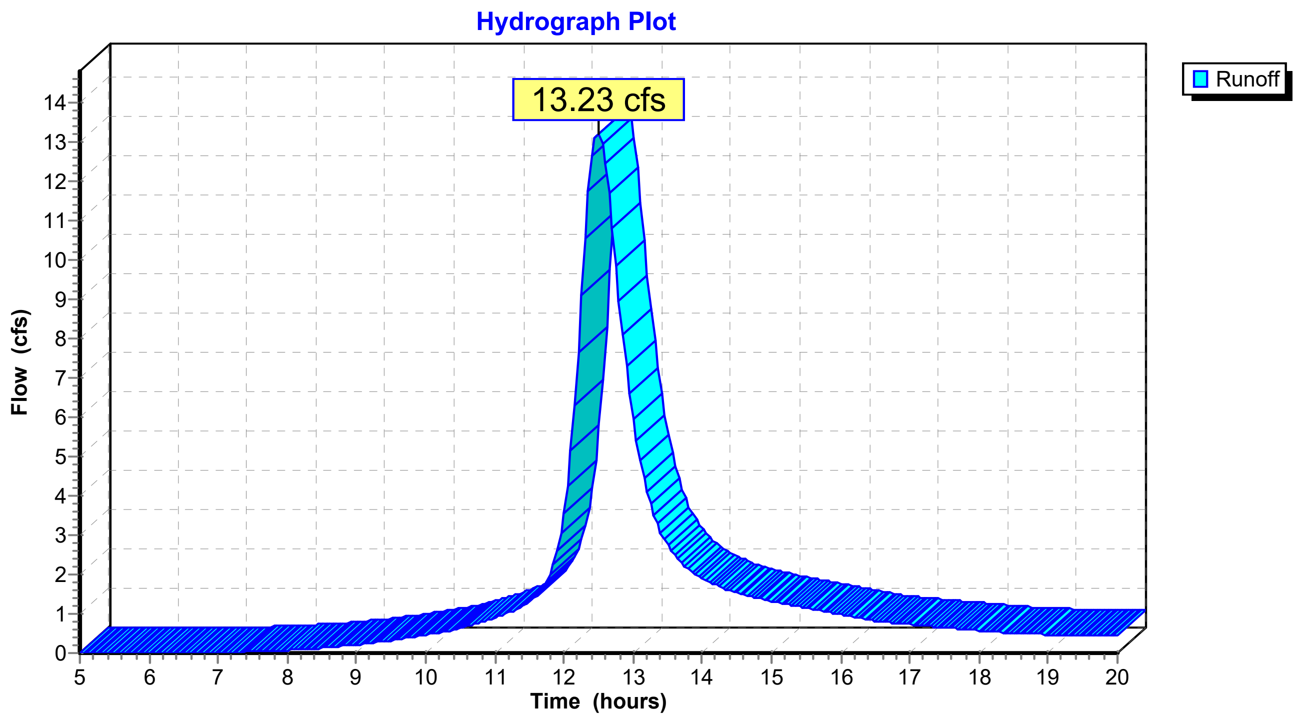
Runoff = 13.23 cfs @ 12.49 hrs, Volume= 1.683 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
224,401	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	100	0.0250	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
14.3	800	0.0350	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
35.7	900	Total			

Subcatchment OPEN 6: OPEN 6



Subcatchment OPEN 7: OPEN 7

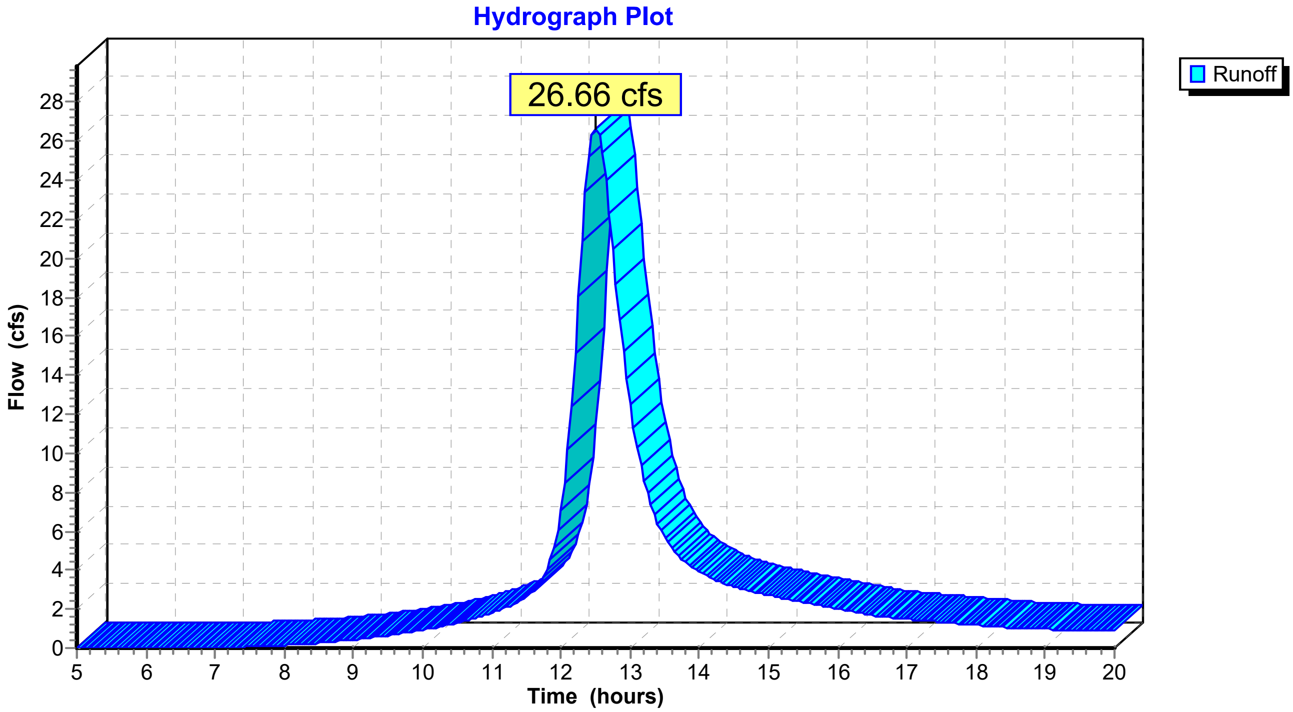
Runoff = 26.66 cfs @ 12.50 hrs, Volume= 3.431 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
457,482	79	Woods, Fair, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.7	100	0.0350	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.70"
17.8	1,000	0.0350	0.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
36.5	1,100	Total			

Subcatchment OPEN 7: OPEN 7



Subcatchment POND 1: POND 1

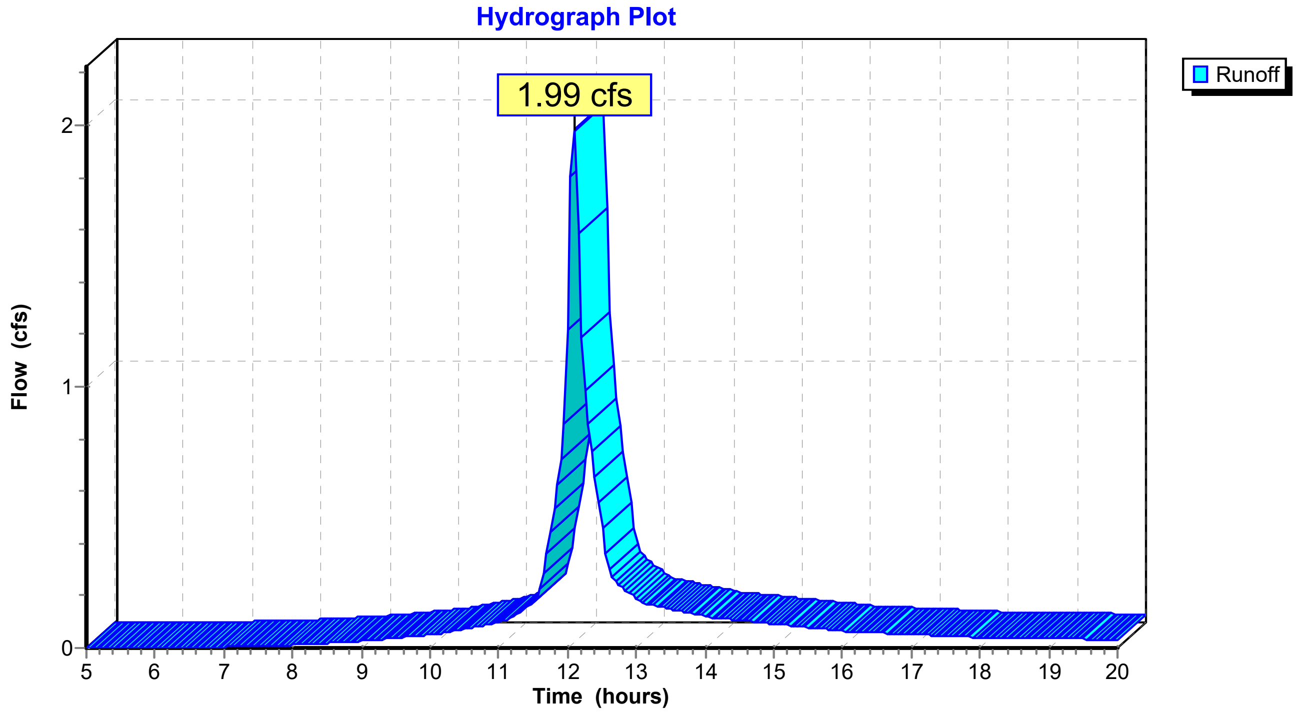
Runoff = 1.99 cfs @ 12.09 hrs, Volume= 0.136 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
17,554	80	>75% Grass cover, Good, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR 55 MIN**

Subcatchment POND 1: POND 1



Subcatchment POND 2: POND 2

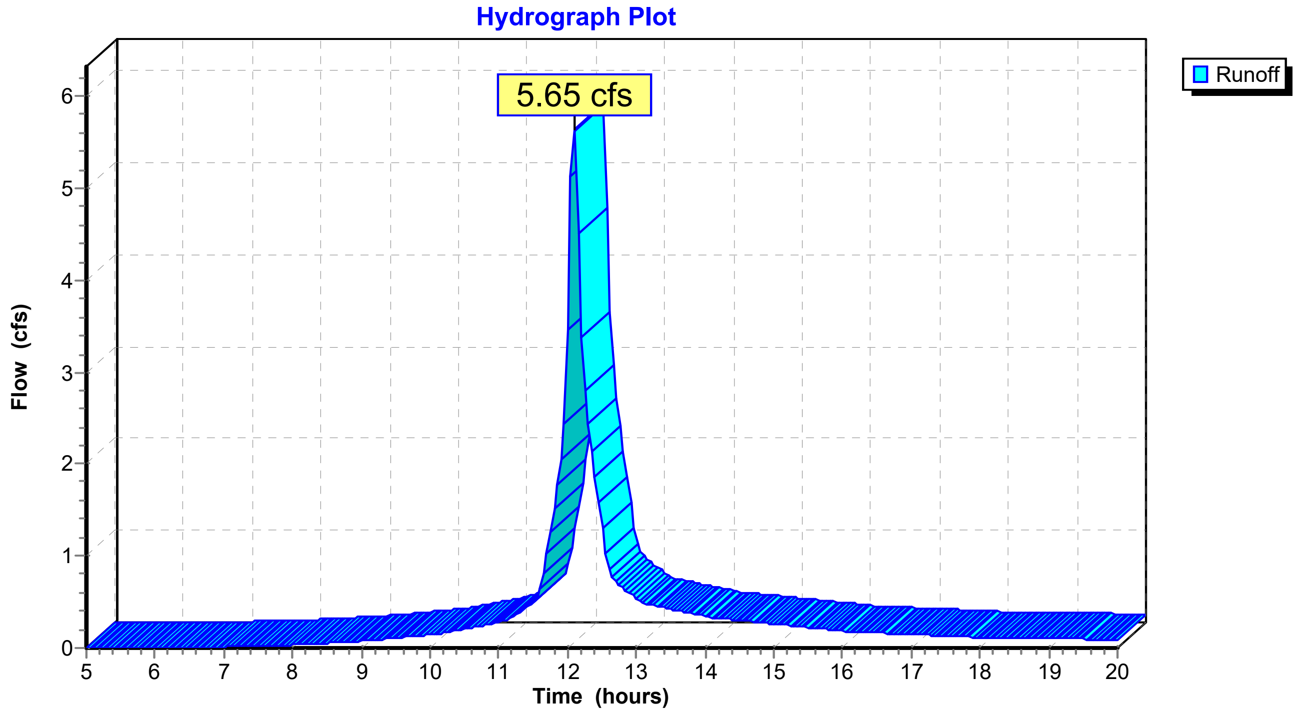
Runoff = 5.65 cfs @ 12.09 hrs, Volume= 0.388 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
49,954	80	>75% Grass cover, Good, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment POND 2: POND 2



Subcatchment POND 3: POND 3

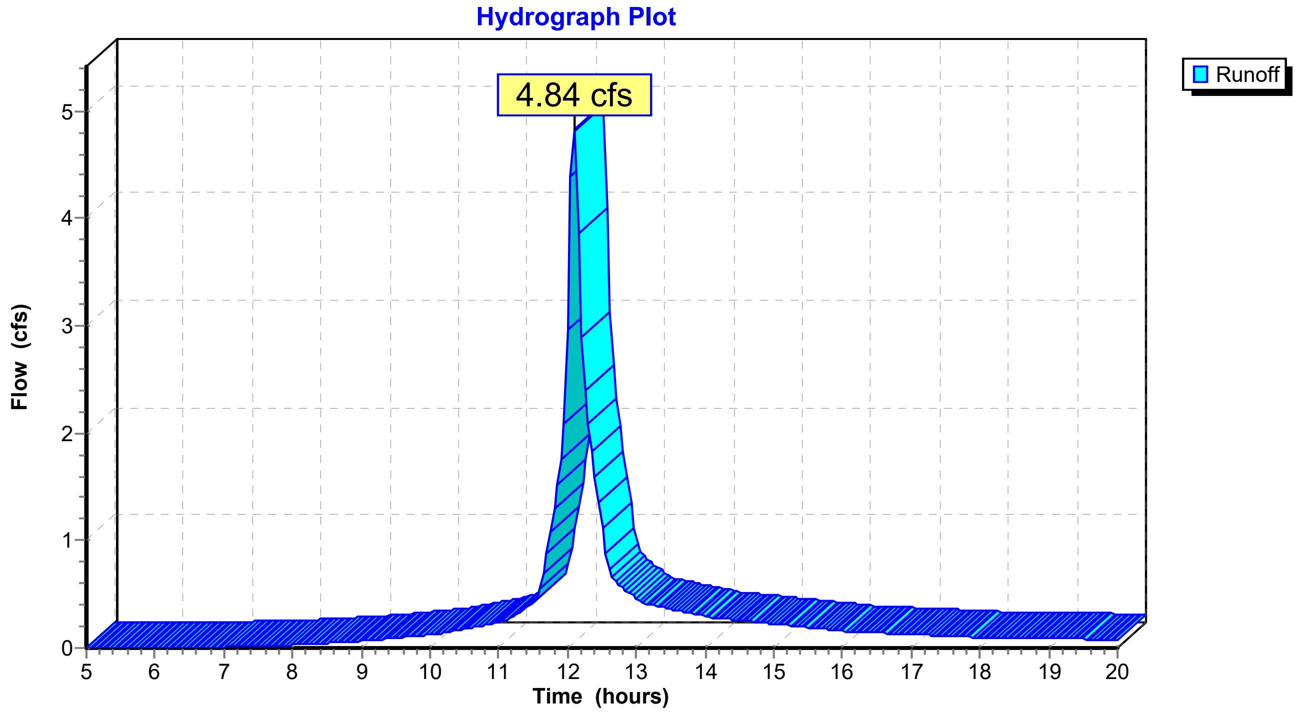
Runoff = 4.84 cfs @ 12.09 hrs, Volume= 0.332 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
42,753	80	>75% Grass cover, Good, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment POND 3: POND 3



Subcatchment POND 5: POND 5

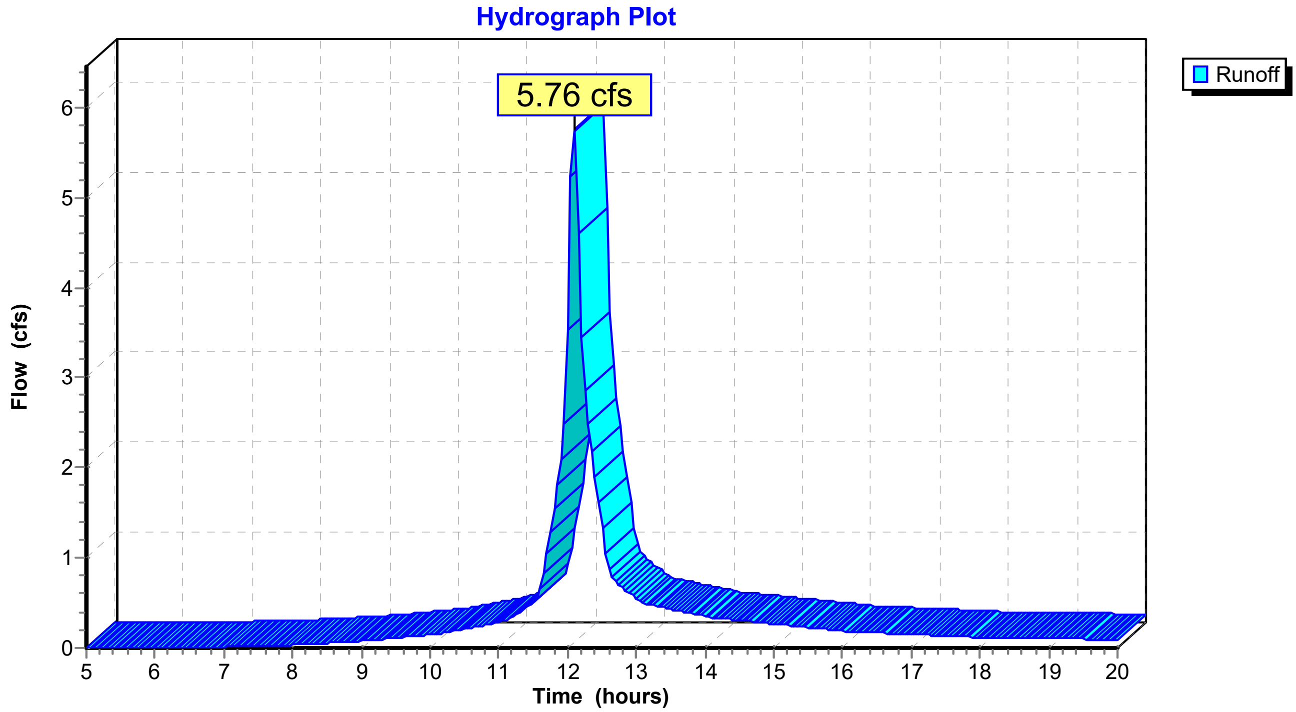
Runoff = 5.76 cfs @ 12.09 hrs, Volume= 0.396 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
50,948	80	>75% Grass cover, Good, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR55 MIN**

Subcatchment POND 5: POND 5



Subcatchment POND 6: POND 6

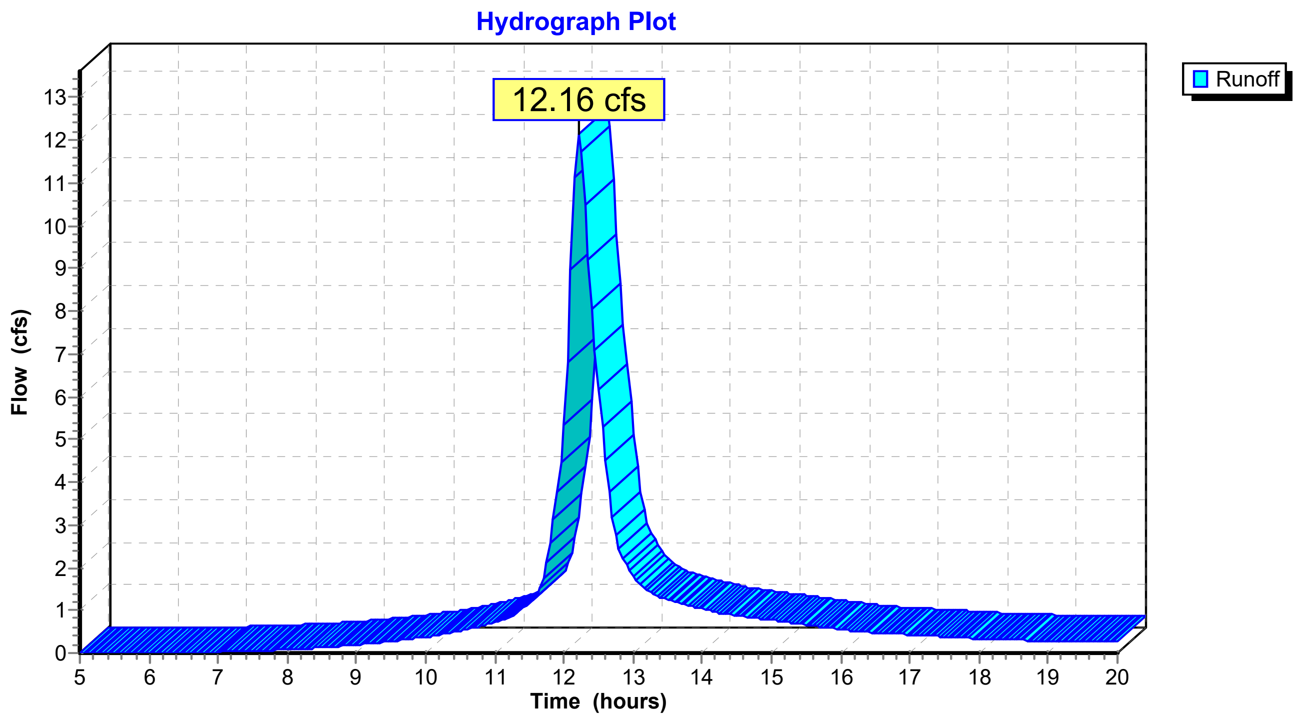
Runoff = 12.16 cfs @ 12.21 hrs, Volume= 1.090 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
TYPEII~2 Rainfall=6.60"

Area (sf)	CN	Description
140,626	80	>75% Grass cover, Good, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0250	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
1.2	180	0.0300	2.6		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.4	280	Total			

Subcatchment POND 6: POND 6



Reach CULVERT 1: CULVERT 1

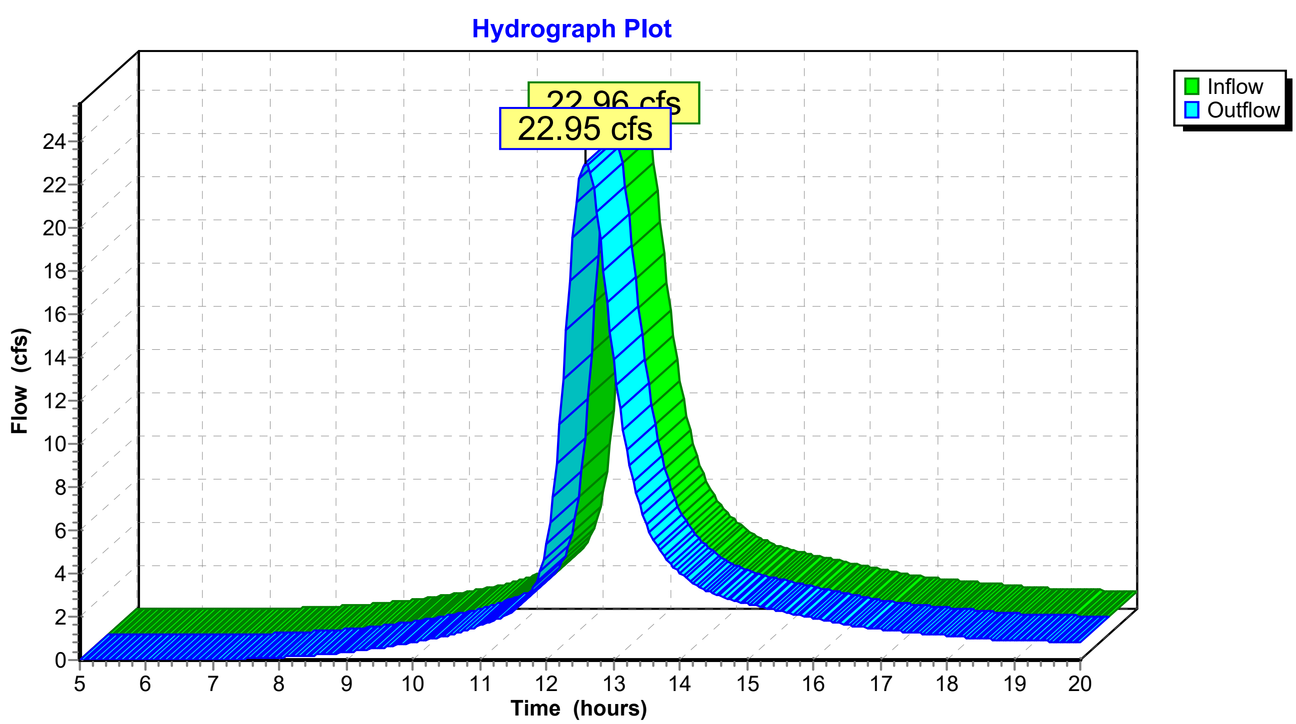
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow	=	22.96 cfs @	12.59 hrs, Volume=	3.189 af
Outflow	=	22.95 cfs @	12.59 hrs, Volume=	3.189 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.0 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.1 fps, Avg. Travel Time= 0.2 min

Peak Depth= 1.09'
Capacity at bank full= 108.99 cfs
42.0" Diameter Pipe n= 0.012 Length= 42.0' Slope= 0.0100 '/'

Reach CULVERT 1: CULVERT 1



Reach CULVERT 2: CULVERT 2

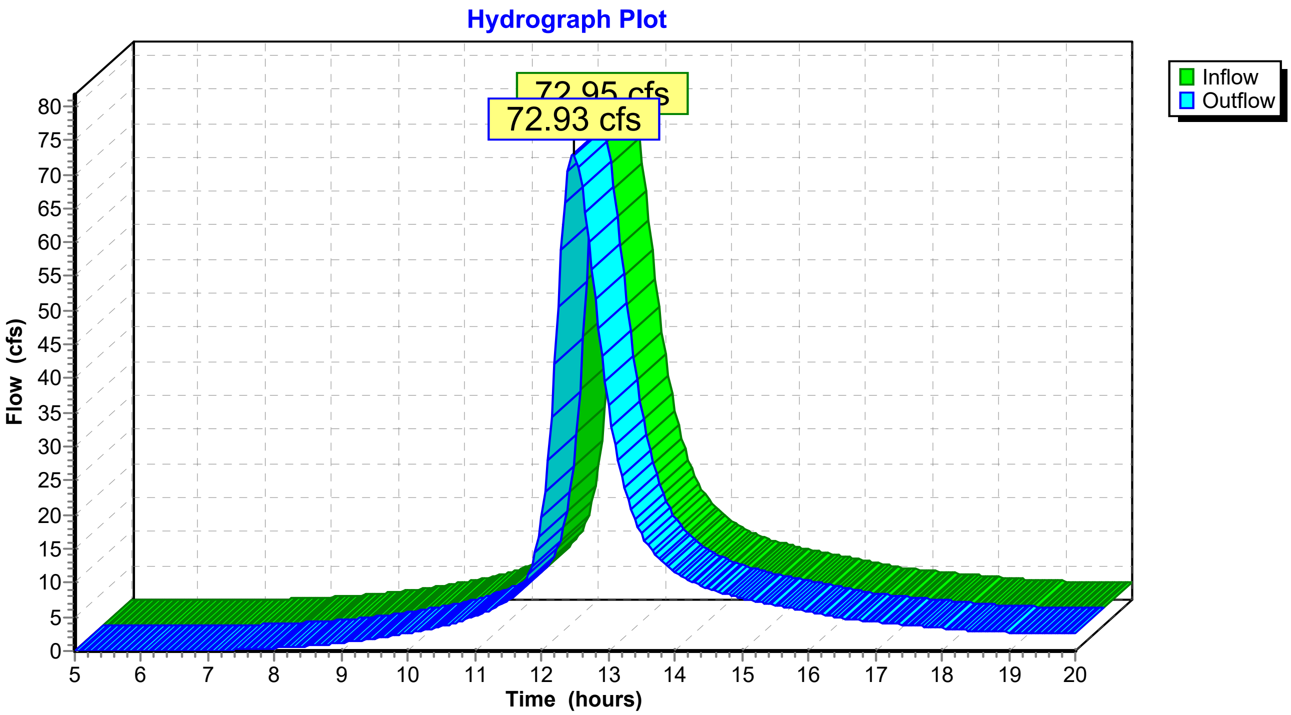
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow	=	72.95 cfs @	12.48 hrs, Volume=	9.703 af
Outflow	=	72.93 cfs @	12.48 hrs, Volume=	9.703 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.1 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 5.6 fps, Avg. Travel Time= 0.1 min

Peak Depth= 2.09'
Capacity at bank full= 108.99 cfs
42.0" Diameter Pipe n= 0.012 Length= 46.0' Slope= 0.0100 '/'

Reach CULVERT 2: CULVERT 2



Reach CULVERT 3: CULVERT 3

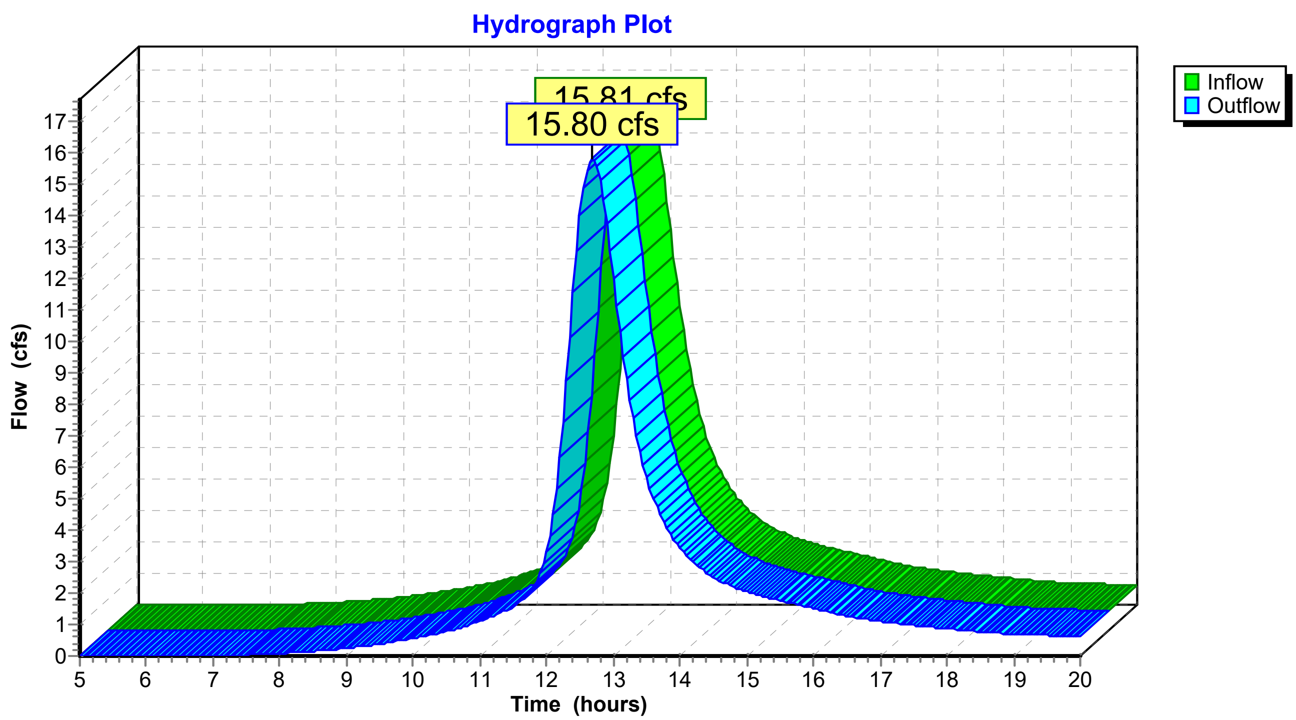
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow	=	15.81 cfs @	12.68 hrs,	Volume=	2.388 af
Outflow	=	15.80 cfs @	12.68 hrs,	Volume=	2.388 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.1 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.7 fps, Avg. Travel Time= 0.2 min

Peak Depth= 0.90'
Capacity at bank full= 108.99 cfs
42.0" Diameter Pipe n= 0.012 Length= 42.0' Slope= 0.0100 '/'

Reach CULVERT 3: CULVERT 3



Reach DMH-5 TO OUTLET: DMH-5 TO OUTLET

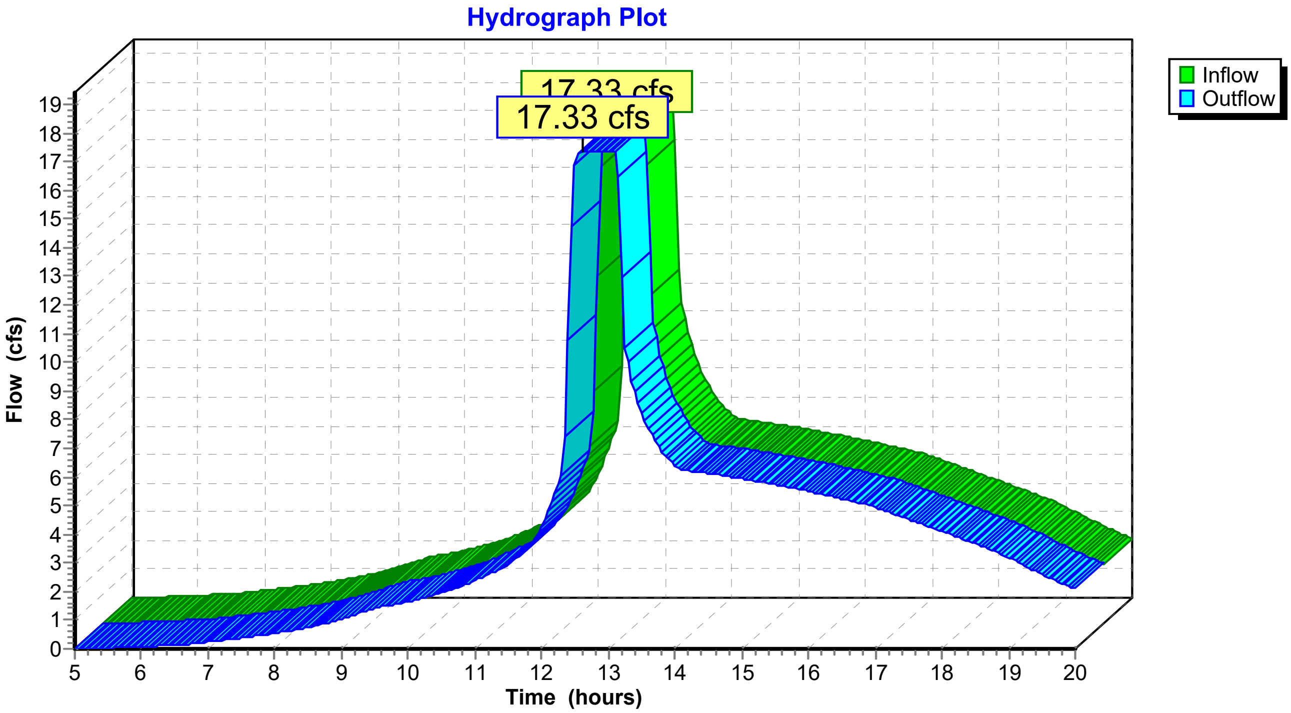
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified
[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	17.33 cfs @	12.55 hrs, Volume=	4.793 af
Outflow	=	17.33 cfs @	12.60 hrs, Volume=	4.789 af, Atten= 0%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.3 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 3.9 fps, Avg. Travel Time= 0.8 min

Peak Depth= 1.64'
Capacity at bank full= 17.28 cfs
24.0" Diameter Pipe n= 0.012 Length= 193.0' Slope= 0.0050 '/'

Reach DMH-5 TO OUTLET: DMH-5 TO OUTLET



Reach DRY SWALE 1: DRY SWALE 1

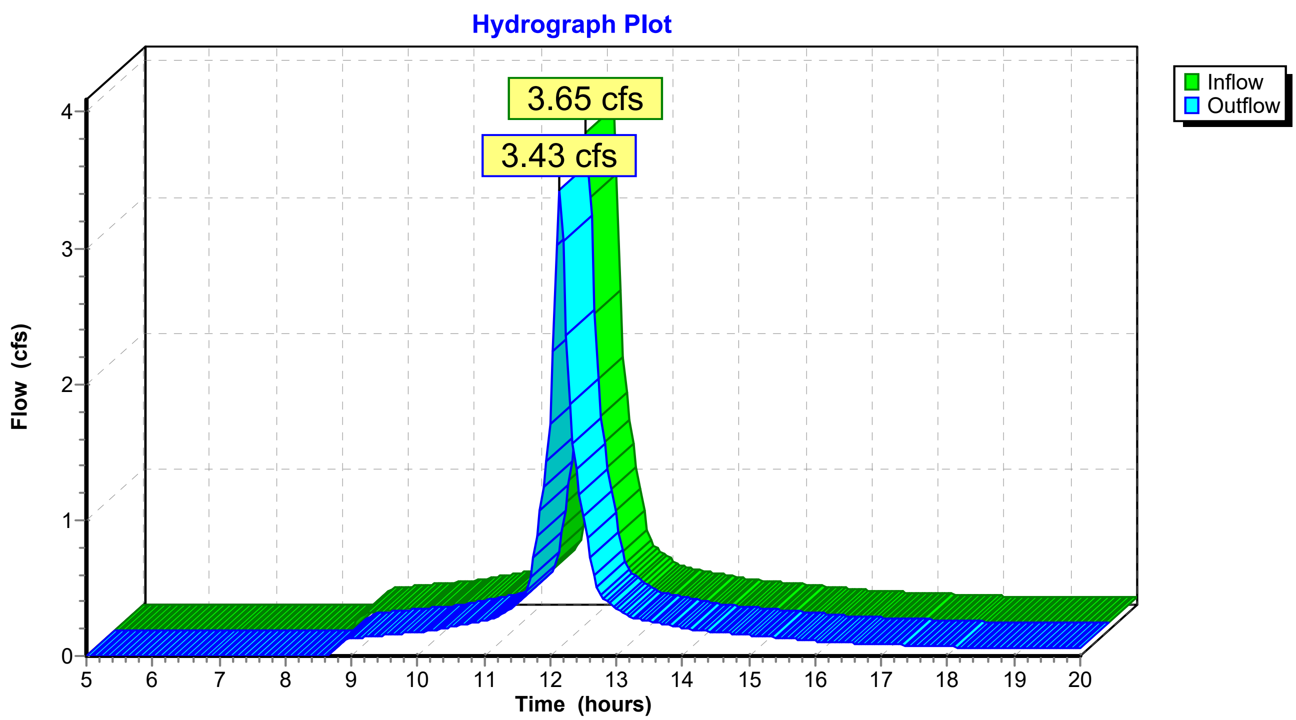
[65] Warning: Inlet elevation not specified

Inflow	=	3.65 cfs @	12.10 hrs, Volume=	0.262 af
Outflow	=	3.43 cfs @	12.15 hrs, Volume=	0.262 af, Atten= 6%, Lag= 2.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.3 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 4.9 min

Peak Depth= 0.31'
Capacity at bank full= 59.21 cfs
8.00' x 1.50' deep channel, n= 0.035 Length= 125.0' Slope= 0.0050 '/'
Side Slope Z-value= 3.0 '/'

Reach DRY SWALE 1: DRY SWALE 1



Reach DRY SWALE 2: DRY SWALE 2

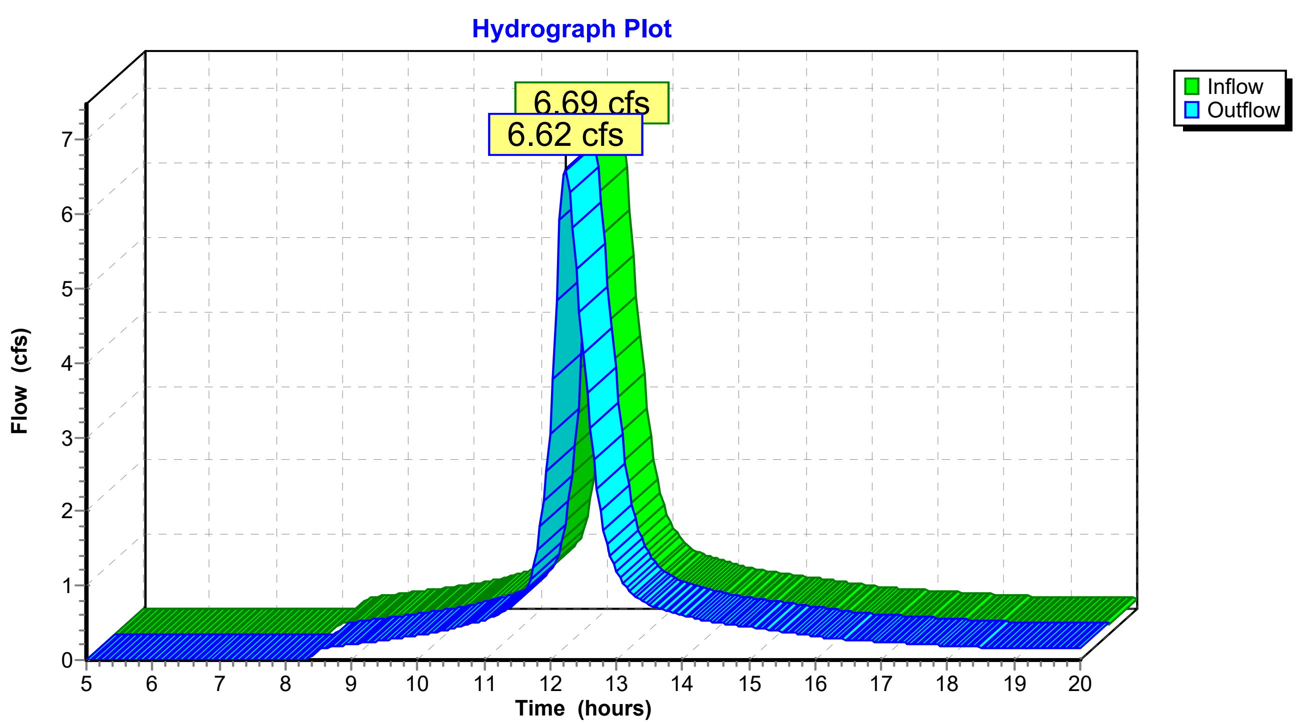
[65] Warning: Inlet elevation not specified

Inflow	=	6.69 cfs @	12.19 hrs, Volume=	0.676 af
Outflow	=	6.62 cfs @	12.23 hrs, Volume=	0.675 af, Atten= 1%, Lag= 2.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.6 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.6 fps, Avg. Travel Time= 3.9 min

Peak Depth= 0.45'
Capacity at bank full= 58.97 cfs
8.00' x 1.50' deep channel, n= 0.035 Length= 140.0' Slope= 0.0050 '/'
Side Slope Z-value= 3.0 '/'

Reach DRY SWALE 2: DRY SWALE 2



Reach DRY SWALE 3: DRY SWALE 3

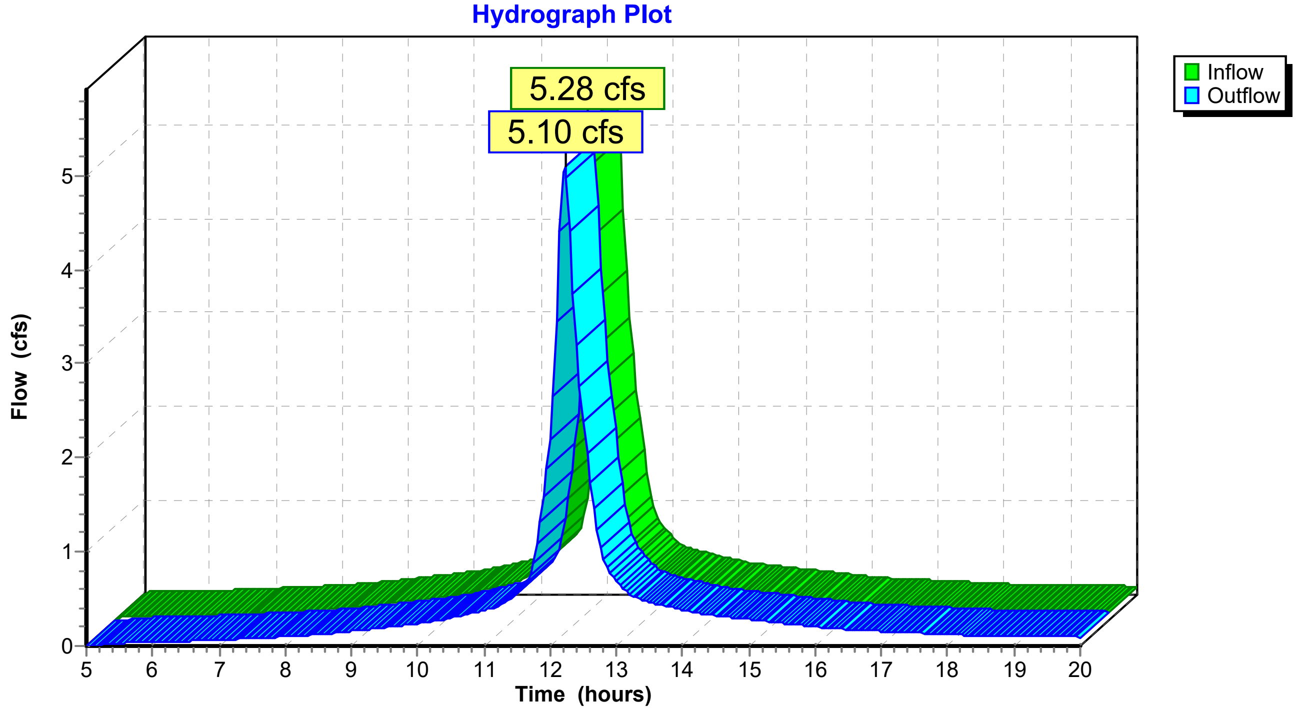
[65] Warning: Inlet elevation not specified

Inflow	=	5.28 cfs @	12.15 hrs, Volume=	0.463 af
Outflow	=	5.10 cfs @	12.22 hrs, Volume=	0.462 af, Atten= 3%, Lag= 4.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.4 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.5 fps, Avg. Travel Time= 7.9 min

Peak Depth= 0.38'
Capacity at bank full= 58.97 cfs
8.00' x 1.50' deep channel, n= 0.035 Length= 220.0' Slope= 0.0050 '/'
Side Slope Z-value= 3.0 '/'

Reach DRY SWALE 3: DRY SWALE 3



Reach DRY SWALE 4: (new node)

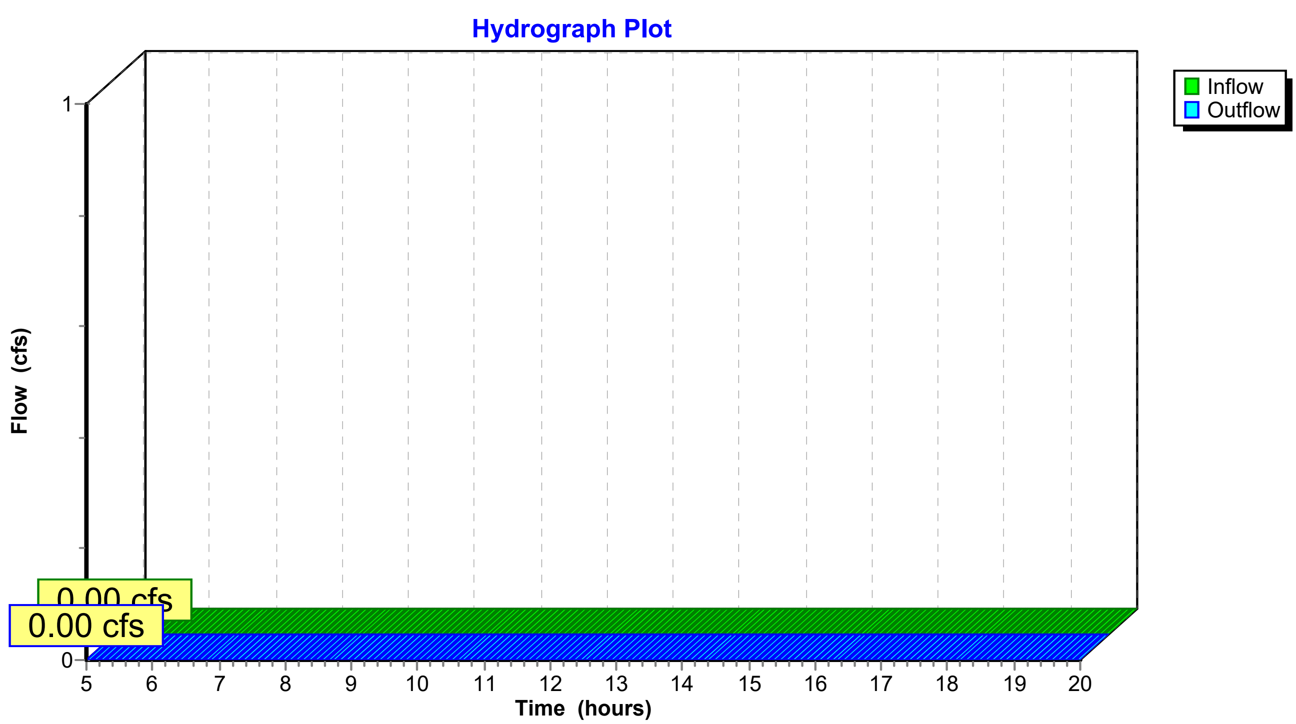
[65] Warning: Inlet elevation not specified

Inflow	=	0.00 cfs @	5.00 hrs,	Volume=	0.000 af
Outflow	=	0.00 cfs @	5.00 hrs,	Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.0 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.0 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.00'
Capacity at bank full= 58.97 cfs
8.00' x 1.50' deep channel, n= 0.035 Length= 140.0' Slope= 0.0050 '/'
Side Slope Z-value= 3.0 '/'

Reach DRY SWALE 4: (new node)



Reach EX ANALYSIS A: EX ANALYSIS A

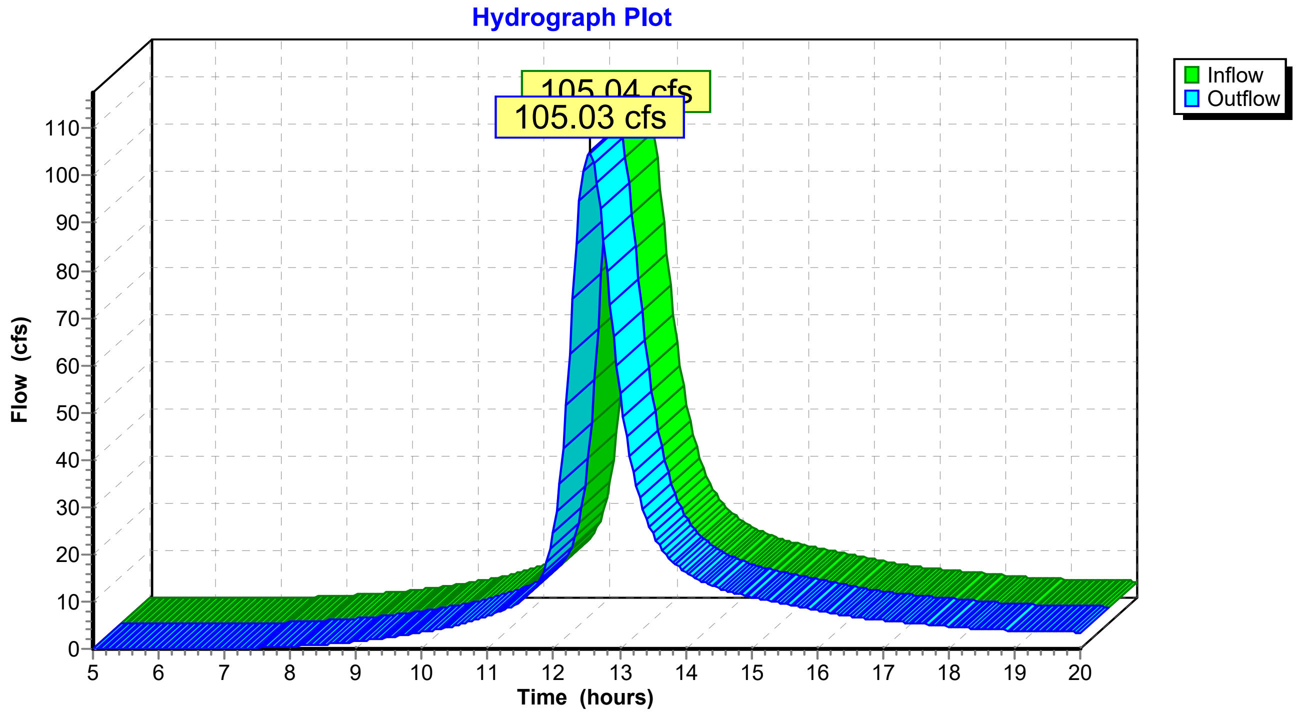
[65] Warning: Inlet elevation not specified
[91] Warning: Storage range exceeded by 0.33'
[55] Hint: Peak inflow is 146% of Manning's capacity

Inflow = 105.04 cfs @ 12.53 hrs, Volume= 13.677 af
Outflow = 105.03 cfs @ 12.53 hrs, Volume= 13.677 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.9 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.4 fps, Avg. Travel Time= 0.0 min

Peak Depth= 1.83'
Capacity at bank full= 71.84 cfs
8.00' x 1.50' deep Parabolic Channel, n= 0.035 Length= 10.0' Slope= 0.0500 '/'

Reach EX ANALYSIS A: EX ANALYSIS A



Reach EX-ANALYSIS B: EX ANALYSIS B

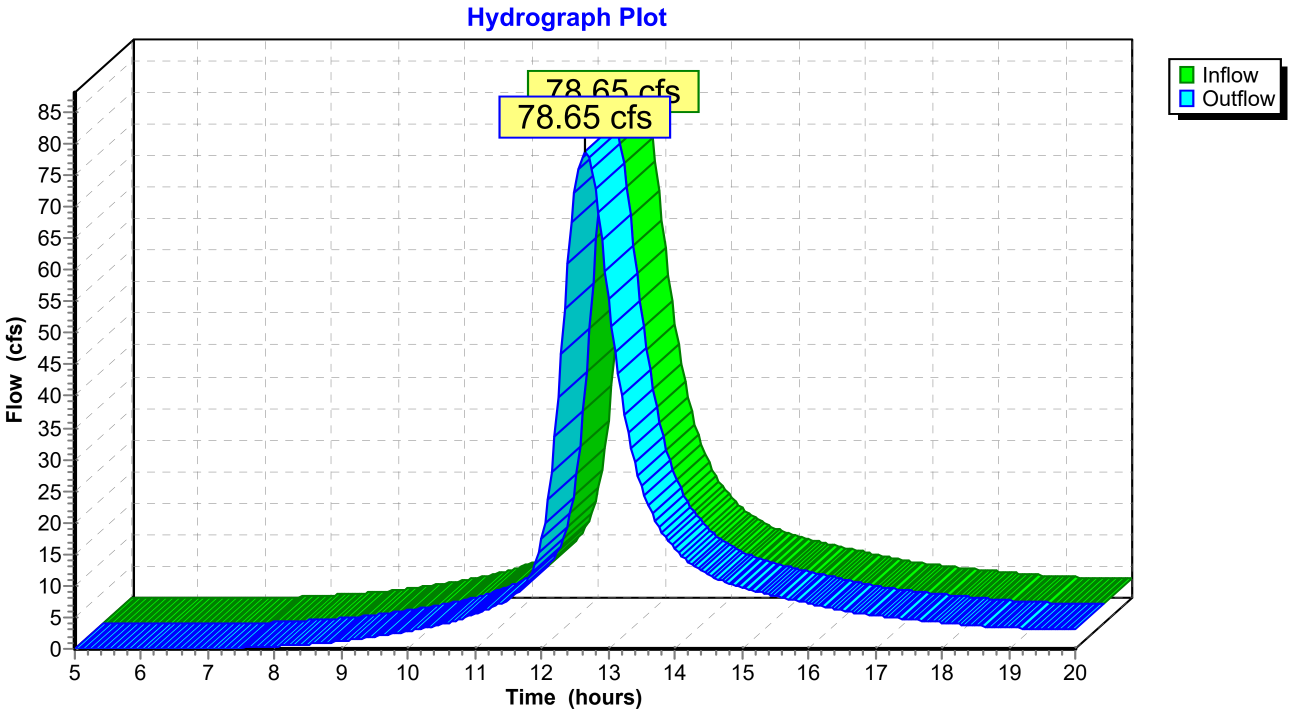
[65] Warning: Inlet elevation not specified
[91] Warning: Storage range exceeded by 0.07'
[55] Hint: Peak inflow is 109% of Manning's capacity

Inflow = 78.65 cfs @ 12.65 hrs, Volume= 11.557 af
Outflow = 78.65 cfs @ 12.65 hrs, Volume= 11.557 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.2 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.2 fps, Avg. Travel Time= 0.0 min

Peak Depth= 1.57'
Capacity at bank full= 71.84 cfs
8.00' x 1.50' deep Parabolic Channel, n= 0.035 Length= 10.0' Slope= 0.0500 '/'

Reach EX-ANALYSIS B: EX ANALYSIS B



Reach EX-ANALYSIS C: EX-ANALYSIS C

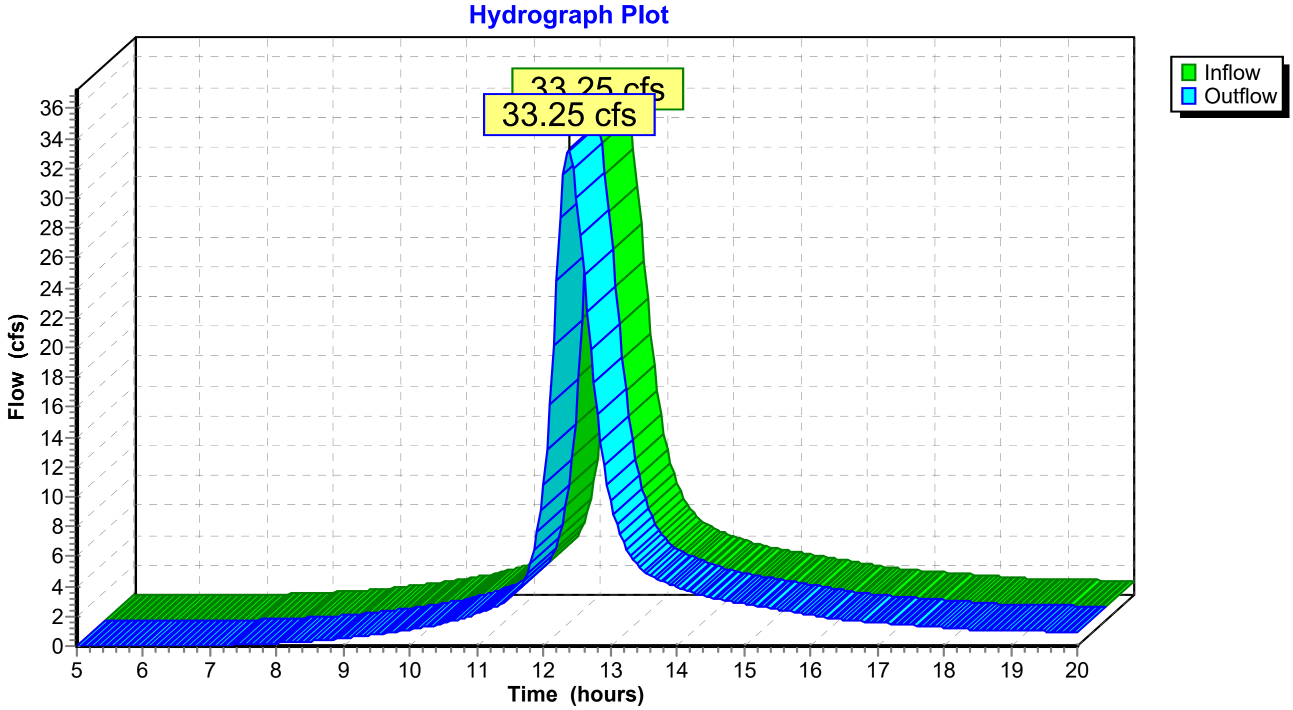
[65] Warning: Inlet elevation not specified

Inflow	=	33.25 cfs @	12.38 hrs, Volume=	3.758 af
Outflow	=	33.25 cfs @	12.38 hrs, Volume=	3.758 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.2 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.0 fps, Avg. Travel Time= 0.1 min

Peak Depth= 1.04'
Capacity at bank full= 71.84 cfs
8.00' x 1.50' deep Parabolic Channel, n= 0.035 Length= 10.0' Slope= 0.0500 '/'

Reach EX-ANALYSIS C: EX-ANALYSIS C



Reach EX-WETLAND CHANNEL: EX WETLAND CHANNEL 1 TO 2

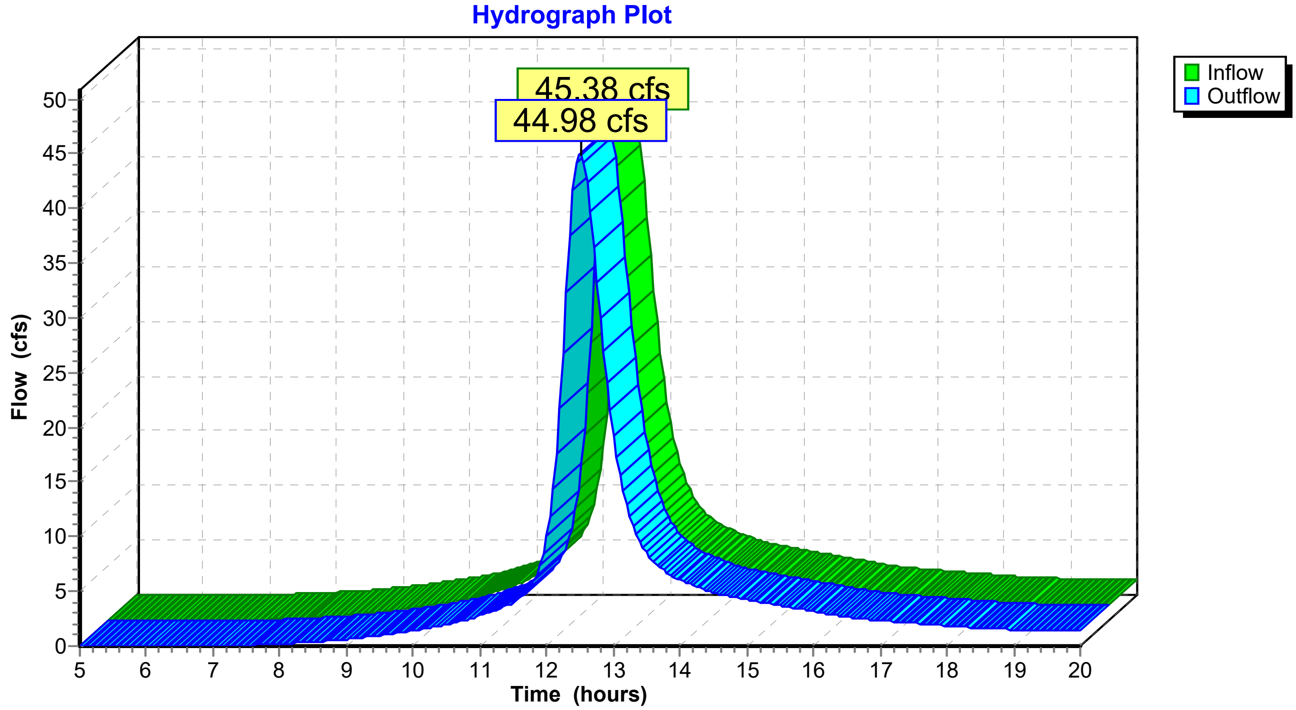
[65] Warning: Inlet elevation not specified

Inflow	=	45.38 cfs @	12.42 hrs,	Volume=	5.377 af
Outflow	=	44.98 cfs @	12.50 hrs,	Volume=	5.358 af, Atten= 1%, Lag= 4.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.3 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 3.1 fps, Avg. Travel Time= 6.5 min

Peak Depth= 1.28'
Capacity at bank full= 66.95 cfs
8.00' x 1.54' deep Parabolic Channel, n= 0.035 Length= 1,200.0' Slope= 0.0400 '/'

Reach EX-WETLAND CHANNEL: EX WETLAND CHANNEL 1 TO 2



Reach OCS-3 TO DMH-5: OCS3 TO DMH5

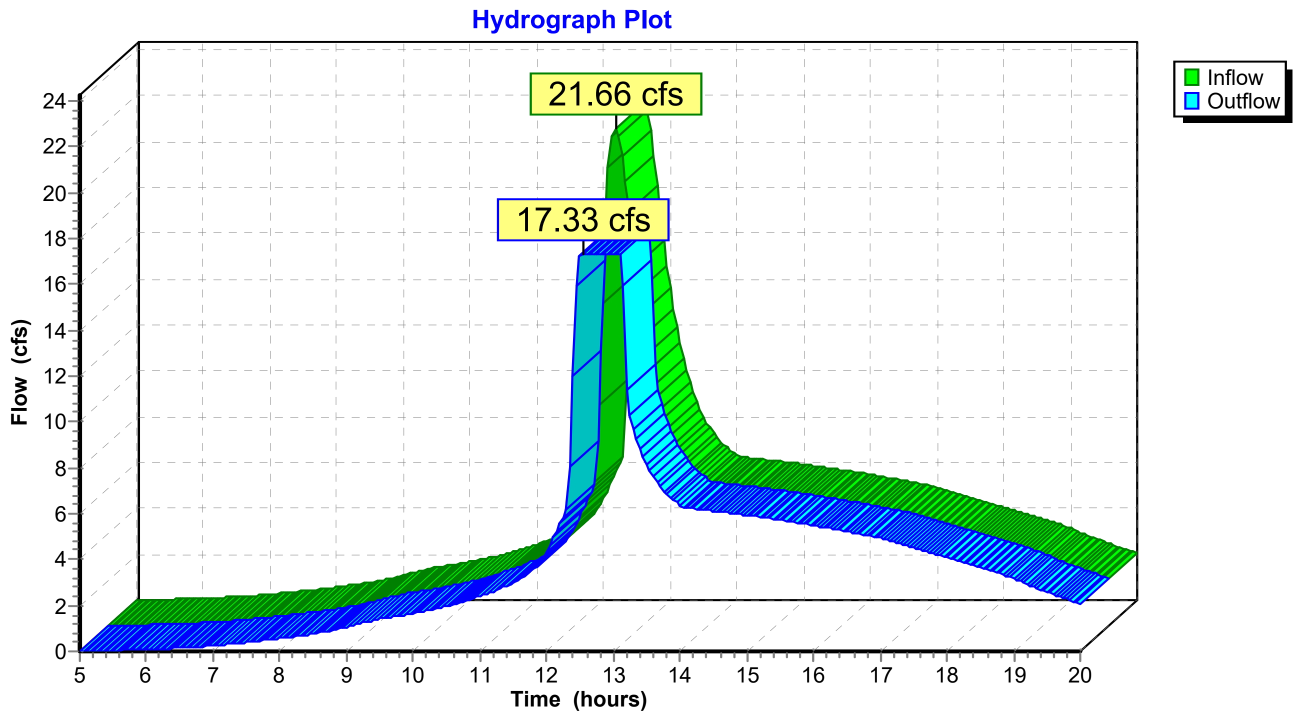
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified
[55] Hint: Peak inflow is 125% of Manning's capacity
[76] Warning: Detained 0.08 af (Pond w/culvert advised)

Inflow = 21.66 cfs @ 12.60 hrs, Volume= 4.799 af
Outflow = 17.33 cfs @ 12.55 hrs, Volume= 4.793 af, Atten= 20%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.3 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 3.8 fps, Avg. Travel Time= 1.2 min

Peak Depth= 2.00'
Capacity at bank full= 17.33 cfs
24.0" Diameter Pipe n= 0.012 Length= 274.0' Slope= 0.0050 '/'

Reach OCS-3 TO DMH-5: OCS3 TO DMH5



Reach OCS-4 TO OUTLET: OCS-4 TO OUTLET

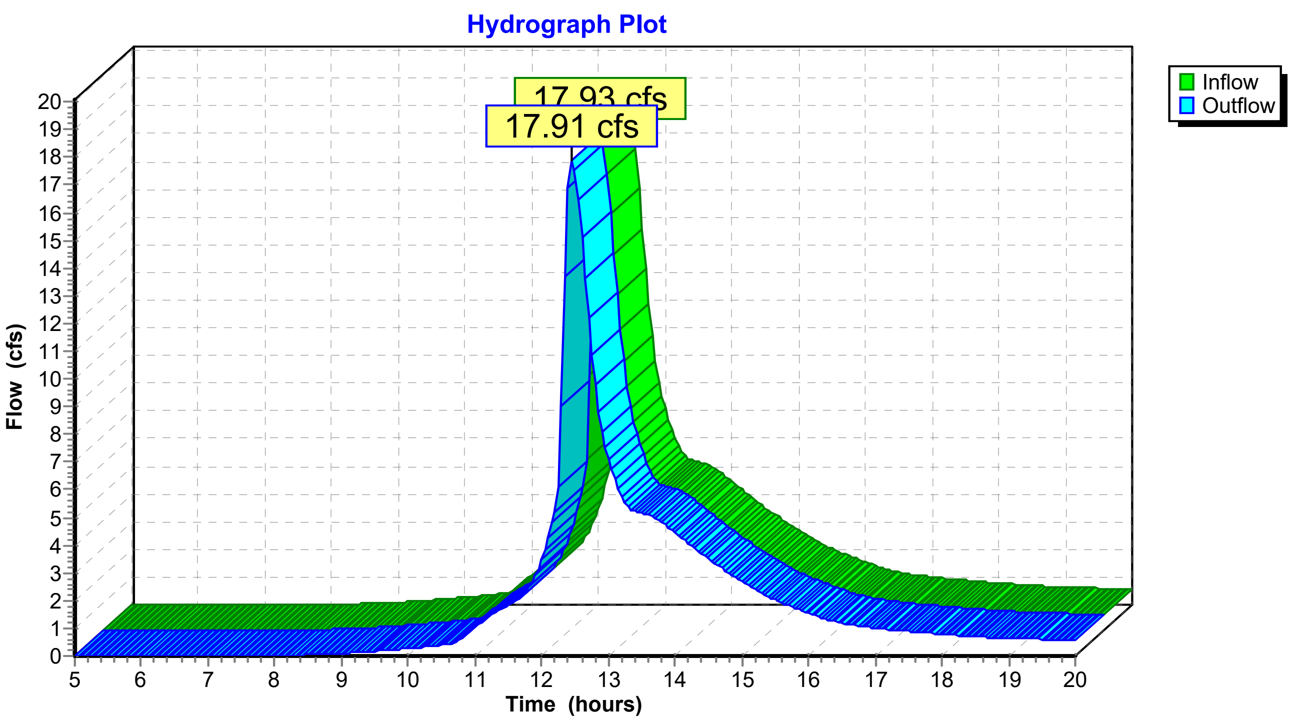
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow	=	17.93 cfs @	12.46 hrs, Volume=	2.260 af
Outflow	=	17.91 cfs @	12.46 hrs, Volume=	2.260 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.3 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 5.7 fps, Avg. Travel Time= 0.2 min

Peak Depth= 0.89'
Capacity at bank full= 44.02 cfs
24.0" Diameter Pipe n= 0.012 Length= 62.0' Slope= 0.0323 '/'

Reach OCS-4 TO OUTLET: OCS-4 TO OUTLET



Reach P-ANALYISIS C: P-ANALYSIS C

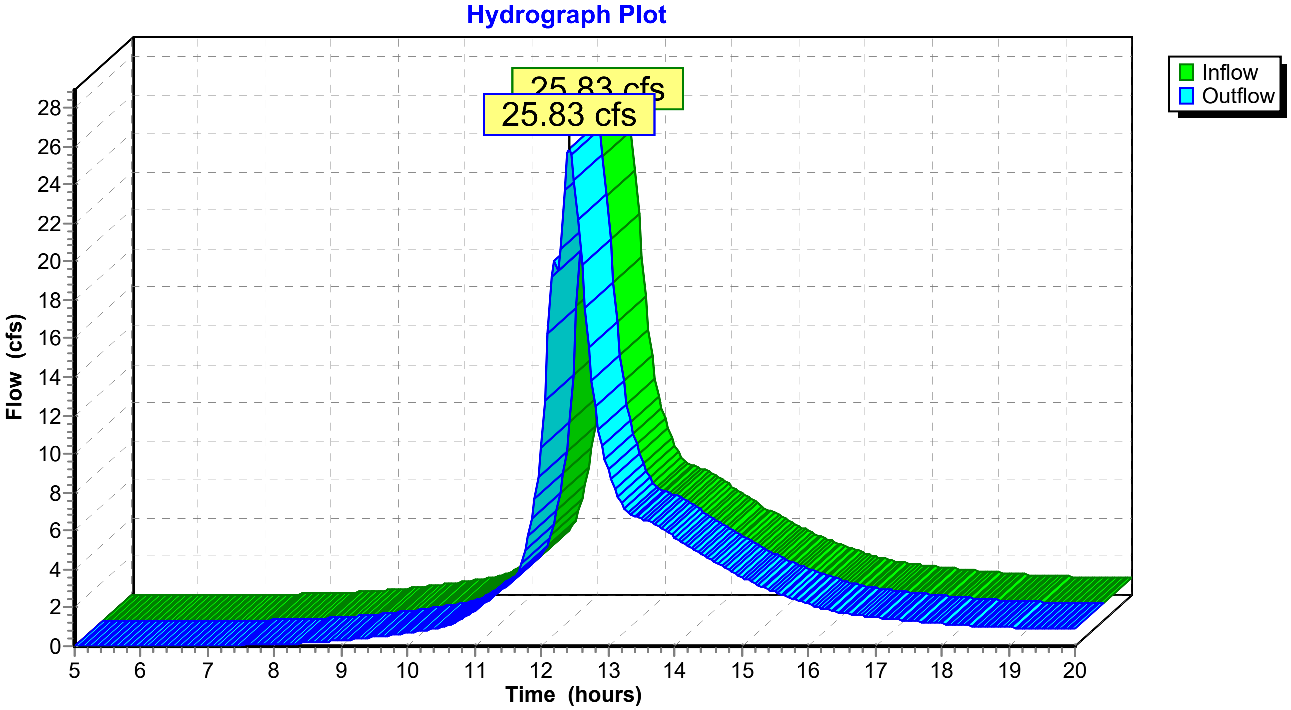
[65] Warning: Inlet elevation not specified

Inflow	=	25.83 cfs @	12.42 hrs,	Volume=	3.535 af
Outflow	=	25.83 cfs @	12.42 hrs,	Volume=	3.535 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.6 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.9 fps, Avg. Travel Time= 0.1 min

Peak Depth= 0.93'
Capacity at bank full= 71.84 cfs
8.00' x 1.50' deep Parabolic Channel, n= 0.035 Length= 10.0' Slope= 0.0500 '/'

Reach P-ANALYISIS C: P-ANALYSIS C



Reach P-ANALYSIS A: P-ANALYSIS A

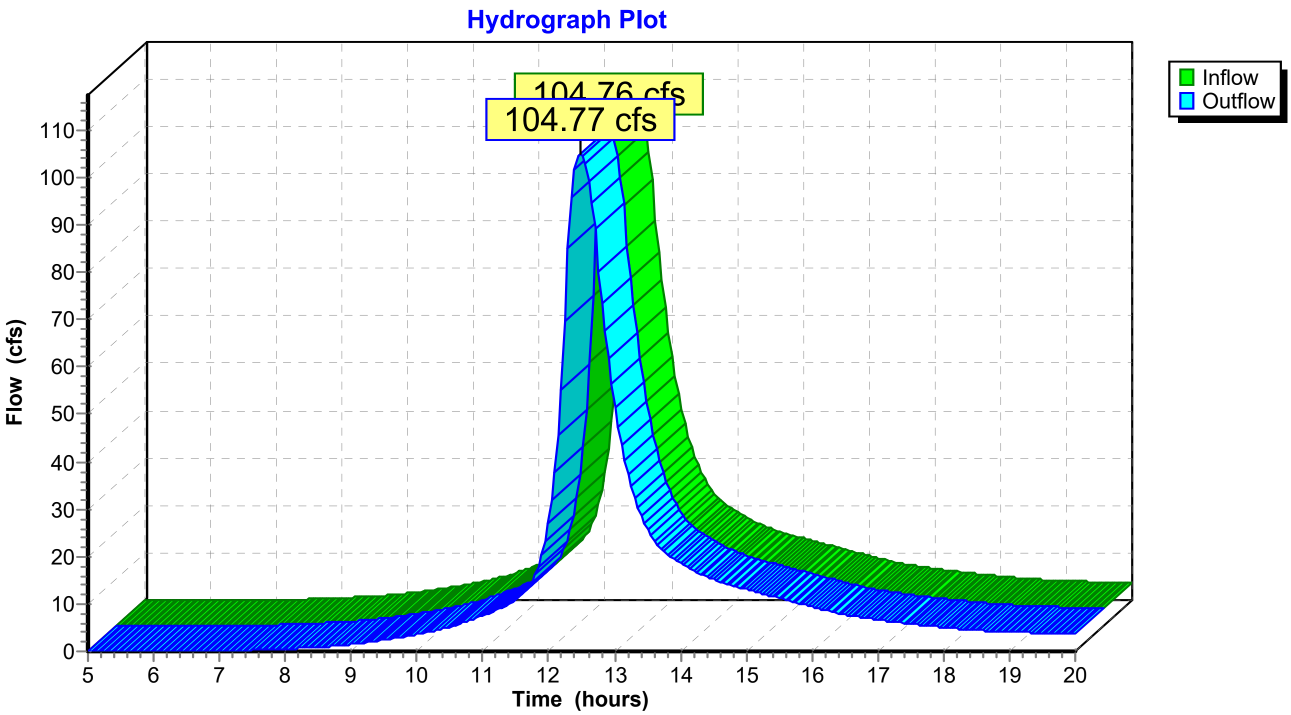
[65] Warning: Inlet elevation not specified
[91] Warning: Storage range exceeded by 0.33'
[55] Hint: Peak inflow is 146% of Manning's capacity
[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	104.76 cfs @	12.48 hrs,	Volume=	14.348 af
Outflow	=	104.77 cfs @	12.48 hrs,	Volume=	14.348 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.9 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.4 fps, Avg. Travel Time= 0.0 min

Peak Depth= 1.83'
Capacity at bank full= 71.84 cfs
8.00' x 1.50' deep Parabolic Channel, n= 0.035 Length= 10.0' Slope= 0.0500 '/'

Reach P-ANALYSIS A: P-ANALYSIS A



Reach P-ANALYSIS B: P-ANALYSIS B

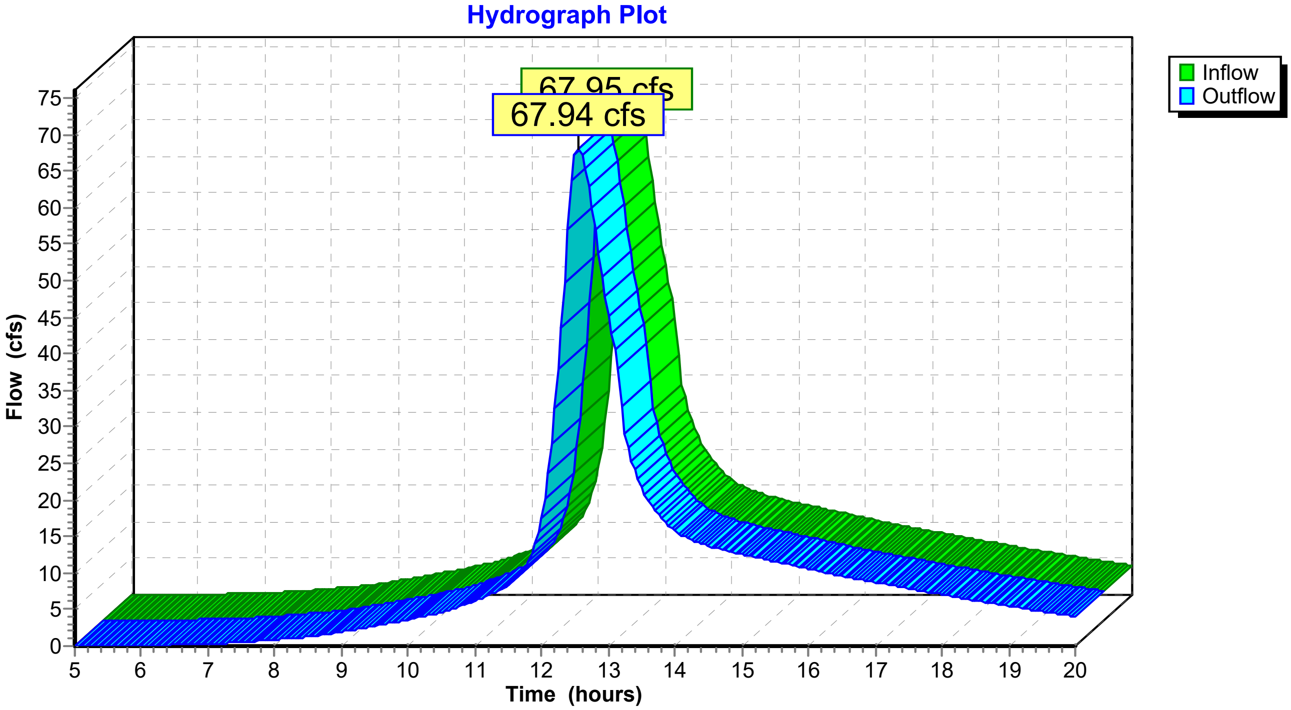
[65] Warning: Inlet elevation not specified

Inflow	=	67.95 cfs @	12.55 hrs,	Volume=	12.169 af
Outflow	=	67.94 cfs @	12.55 hrs,	Volume=	12.169 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.8 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.2 fps, Avg. Travel Time= 0.0 min

Peak Depth= 1.46'
Capacity at bank full= 71.84 cfs
8.00' x 1.50' deep Parabolic Channel, n= 0.035 Length= 10.0' Slope= 0.0500 '/'

Reach P-ANALYSIS B: P-ANALYSIS B



Reach P-WETLAND CHANNEL: p WETLAND CHANNEL 1 TO 2

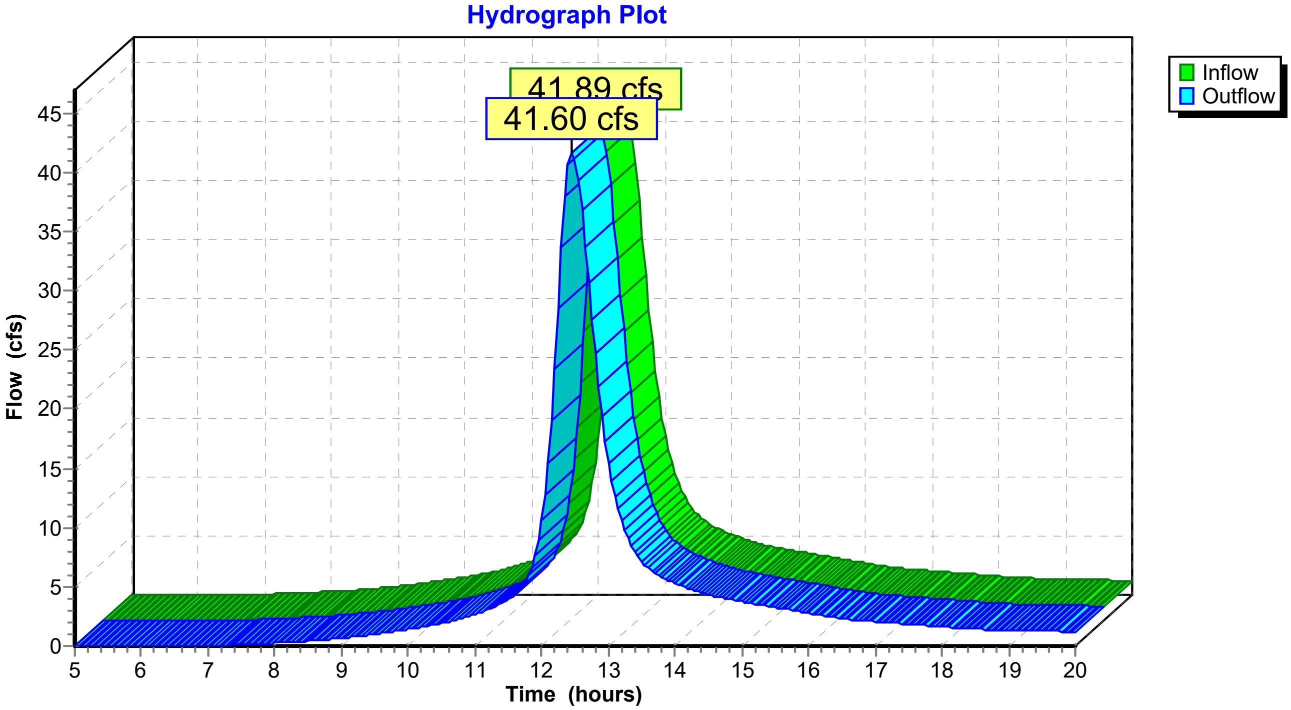
[65] Warning: Inlet elevation not specified

Inflow	=	41.89 cfs @	12.40 hrs, Volume=	4.883 af
Outflow	=	41.60 cfs @	12.46 hrs, Volume=	4.871 af, Atten= 1%, Lag= 3.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.7 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 3.2 fps, Avg. Travel Time= 4.7 min

Peak Depth= 1.17'
Capacity at bank full= 74.86 cfs
8.00' x 1.54' deep Parabolic Channel, n= 0.035 Length= 900.0' Slope= 0.0500 '/'

Reach P-WETLAND CHANNEL: p WETLAND CHANNEL 1 TO 2



Reach POND 1 OUTLET: POND 1 OUTLET

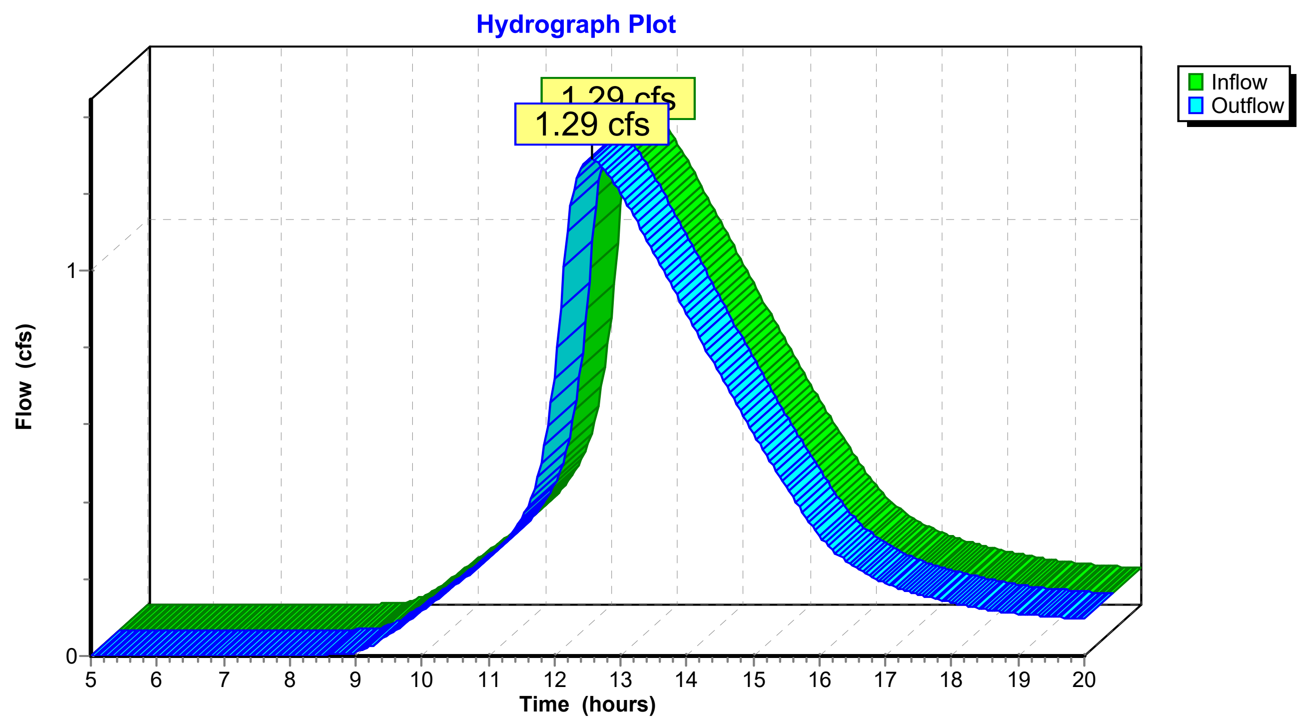
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow	=	1.29 cfs @	12.54 hrs,	Volume=	0.385 af
Outflow	=	1.29 cfs @	12.56 hrs,	Volume=	0.385 af, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.4 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.0 fps, Avg. Travel Time= 0.9 min

Peak Depth= 0.48'
Capacity at bank full= 2.73 cfs
12.0" Diameter Pipe n= 0.012 Length= 112.0' Slope= 0.0050 '/'

Reach POND 1 OUTLET: POND 1 OUTLET



Reach POND 2 OUTLET: POND 2 OUTLET

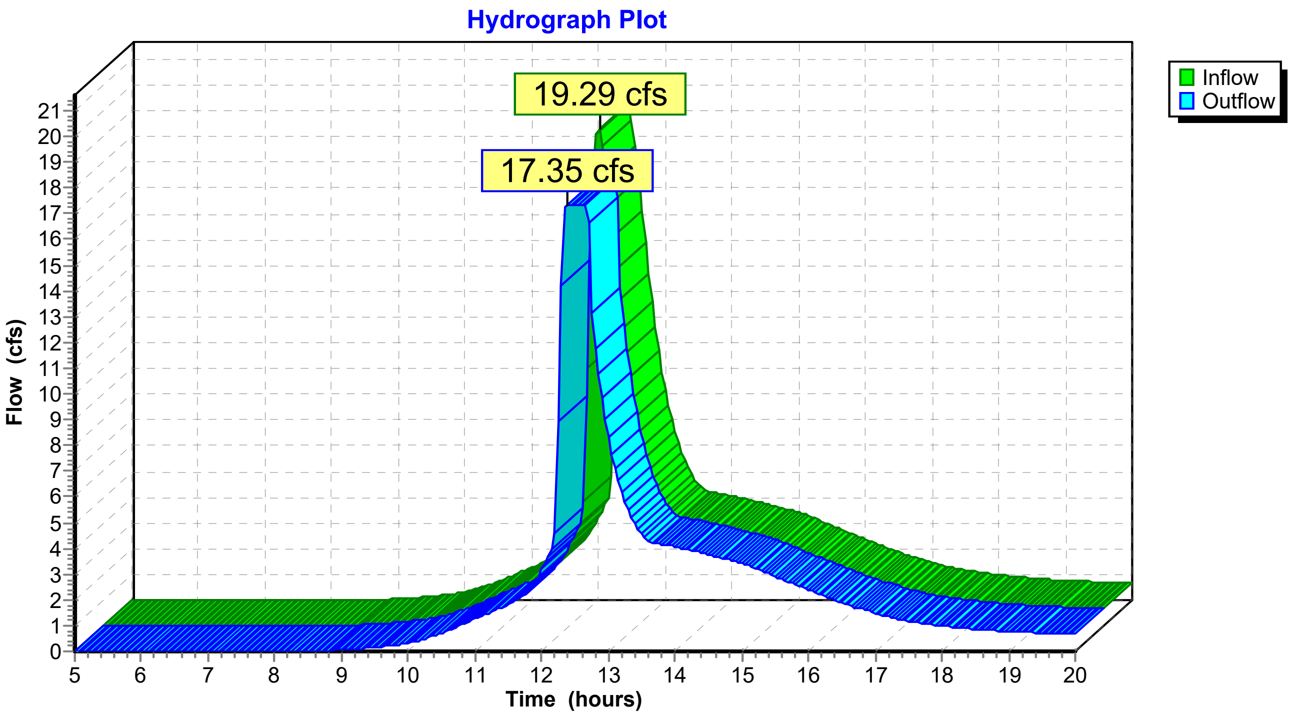
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified
[55] Hint: Peak inflow is 111% of Manning's capacity
[76] Warning: Detained 0.02 af (Pond w/culvert advised)

Inflow	=	19.29 cfs @	12.43 hrs,	Volume=	2.578 af
Outflow	=	17.35 cfs @	12.40 hrs,	Volume=	2.577 af, Atten= 10%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.3 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.0 fps, Avg. Travel Time= 0.6 min

Peak Depth= 2.00'
Capacity at bank full= 17.33 cfs
24.0" Diameter Pipe n= 0.012 Length= 100.0' Slope= 0.0050 '/'

Reach POND 2 OUTLET: POND 2 OUTLET



Reach POND 3 OUTLET: POND 3 OUTLET

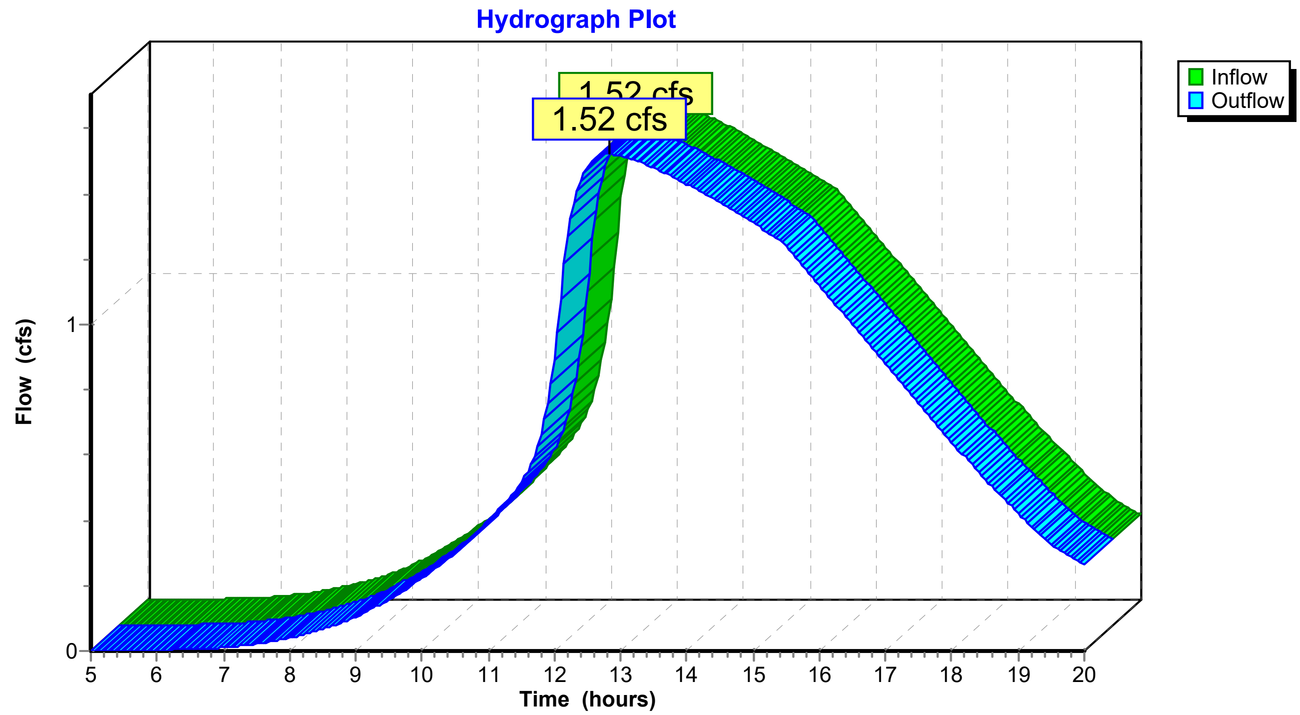
[52] Hint: Inlet conditions not evaluated
[65] Warning: Inlet elevation not specified

Inflow	=	1.52 cfs @	12.79 hrs, Volume=	0.761 af	
Outflow	=	1.52 cfs @	12.82 hrs, Volume=	0.760 af,	Atten= 0%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.6 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 1.1 min

Peak Depth= 0.53'
Capacity at bank full= 2.74 cfs
12.0" Diameter Pipe n= 0.012 Length= 165.0' Slope= 0.0050 '/'

Reach POND 3 OUTLET: POND 3 OUTLET



Reach SWALE: SWALE

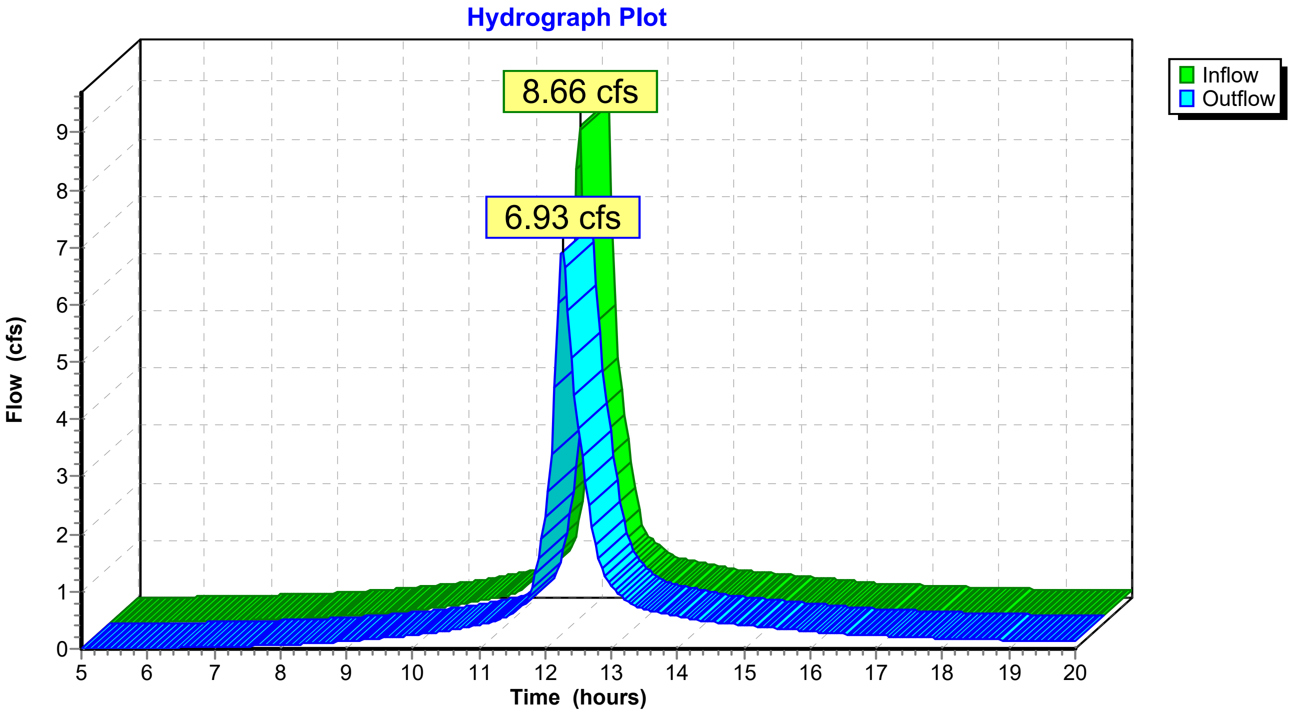
[65] Warning: Inlet elevation not specified
[91] Warning: Storage range exceeded by 0.01'
[55] Hint: Peak inflow is 126% of Manning's capacity

Inflow	=	8.66 cfs @	12.09 hrs,	Volume=	0.609 af
Outflow	=	6.93 cfs @	12.26 hrs,	Volume=	0.603 af, Atten= 20%, Lag= 10.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.6 fps, Min. Travel Time= 6.7 min
Avg. Velocity = 1.0 fps, Avg. Travel Time= 17.9 min

Peak Depth= 1.01'
Capacity at bank full= 6.90 cfs
4.00' x 1.00' deep Parabolic Channel, n= 0.040 Length= 1,050.0' Slope= 0.0100 '/'

Reach SWALE: SWALE



Reach SWALE FROM CULVERT 3 TO 2: SWALE FROM CULVERT 3 TO 2

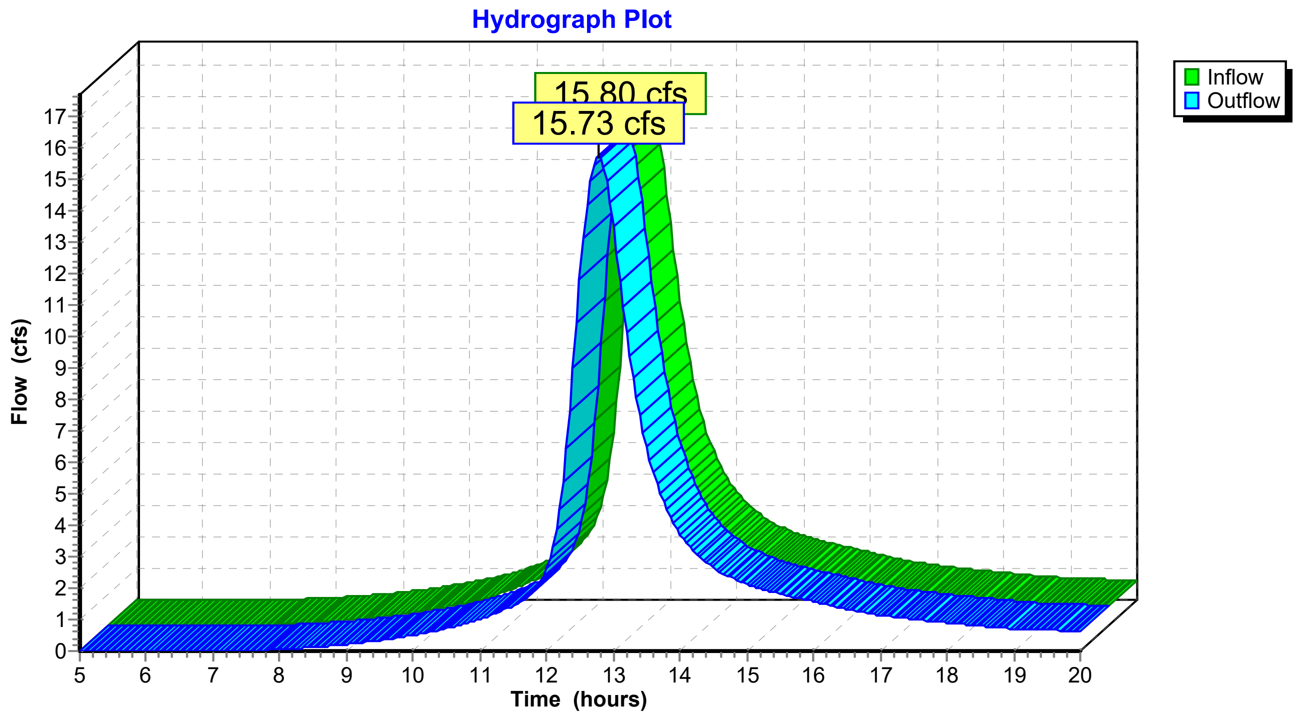
[65] Warning: Inlet elevation not specified

Inflow	=	15.80 cfs @	12.68 hrs, Volume=	2.388 af
Outflow	=	15.73 cfs @	12.77 hrs, Volume=	2.379 af, Atten= 0%, Lag= 5.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.4 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 2.1 fps, Avg. Travel Time= 6.5 min

Peak Depth= 1.06'
Capacity at bank full= 32.86 cfs
6.00' x 1.50' deep Parabolic Channel, n= 0.035 Length= 800.0' Slope= 0.0200 '/'

Reach SWALE FROM CULVERT 3 TO 2: SWALE FROM CULVERT 3 TO 2



Pond ATTENUATION 1: ATTENUATION POND 1

Inflow	=	47.80 cfs @	12.24 hrs,	Volume=	4.887 af
Outflow	=	21.66 cfs @	12.60 hrs,	Volume=	4.799 af, Atten= 55%, Lag= 21.4 min
Primary	=	21.66 cfs @	12.60 hrs,	Volume=	4.799 af

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

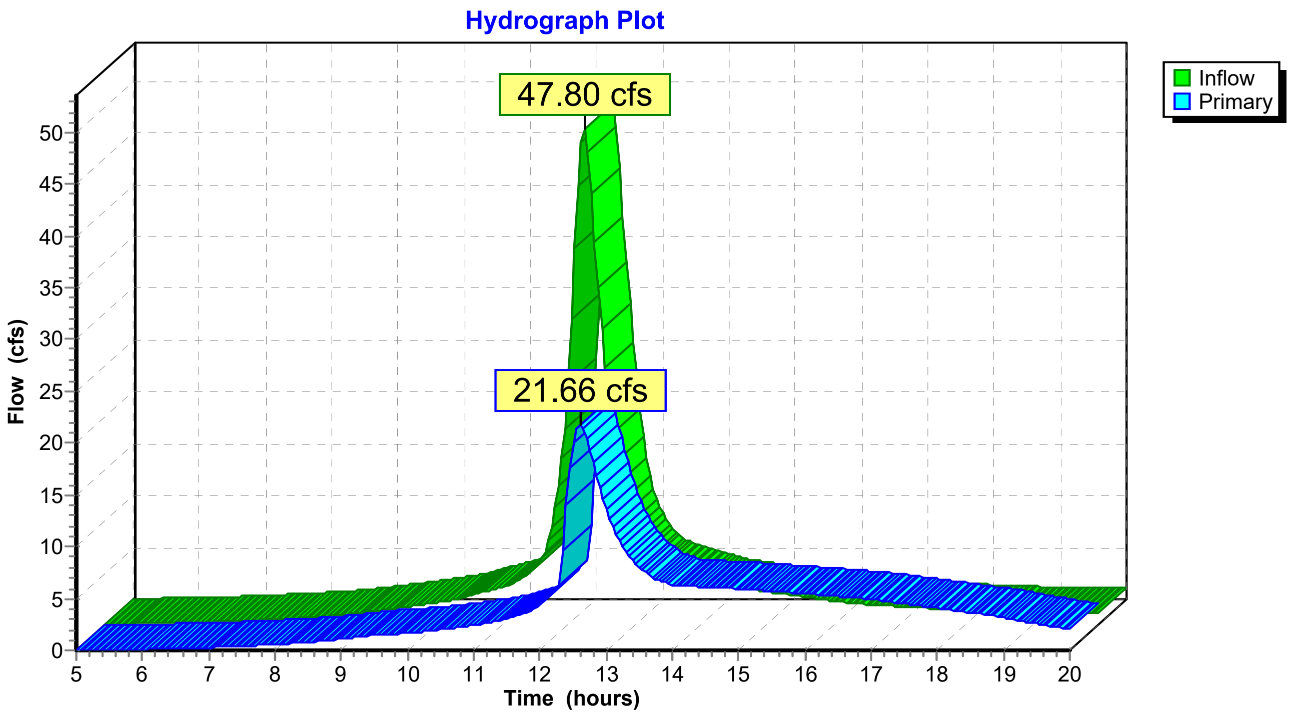
Peak Elev= 378.69' Storage= 77,216 cf
Plug-Flow detention time= 91.5 min calculated for 4.799 af (98% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.33	5,500	0	0
374.00	7,295	10,684	10,684
376.00	11,800	19,095	29,779
378.00	17,108	28,908	58,687
380.00	36,500	53,608	112,295

Primary OutFlow (Free Discharge)
—1=Orifice/Grate
—2=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	372.33'	**10.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
2	Primary	378.00'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond ATTENUATION 1: ATTENUATION POND 1



Pond ATTENUATION BASIN 1: ATTENUATION BASIN 1

Inflow	=	5.11 cfs @	12.13 hrs, Volume=	0.398 af
Outflow	=	1.29 cfs @	12.54 hrs, Volume=	0.385 af, Atten= 75%, Lag= 24.8 min
Primary	=	1.29 cfs @	12.54 hrs, Volume=	0.385 af

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

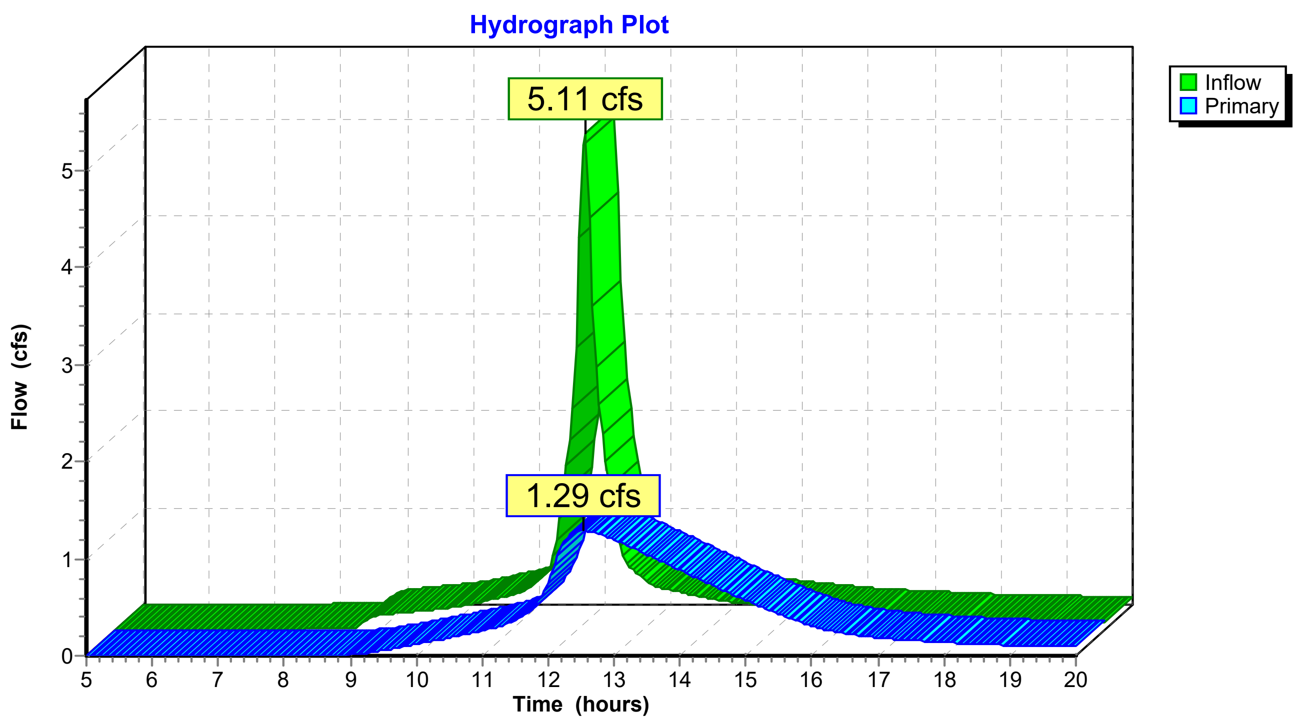
Peak Elev= 349.10' Storage= 6,619 cf
Plug-Flow detention time= 70.6 min calculated for 0.384 af (96% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
347.00	2,800	0	0
350.00	3,500	9,450	9,450
352.00	5,600	9,100	18,550

Primary OutFlow (Free Discharge)
—1=Orifice/Grate
—2=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	347.00'	**6.0" Vert. Orifice/Grate** C= 0.600
2	Primary	350.00'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond ATTENUATION BASIN 1: ATTENUATION BASIN 1



Pond ATTENUATION BASIN 2: ATTENUATION BASIN 2

Inflow	=	20.41 cfs @	12.33 hrs,	Volume=	2.627 af
Outflow	=	19.29 cfs @	12.43 hrs,	Volume=	2.578 af, Atten= 5%, Lag= 6.1 min
Primary	=	19.29 cfs @	12.43 hrs,	Volume=	2.578 af

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

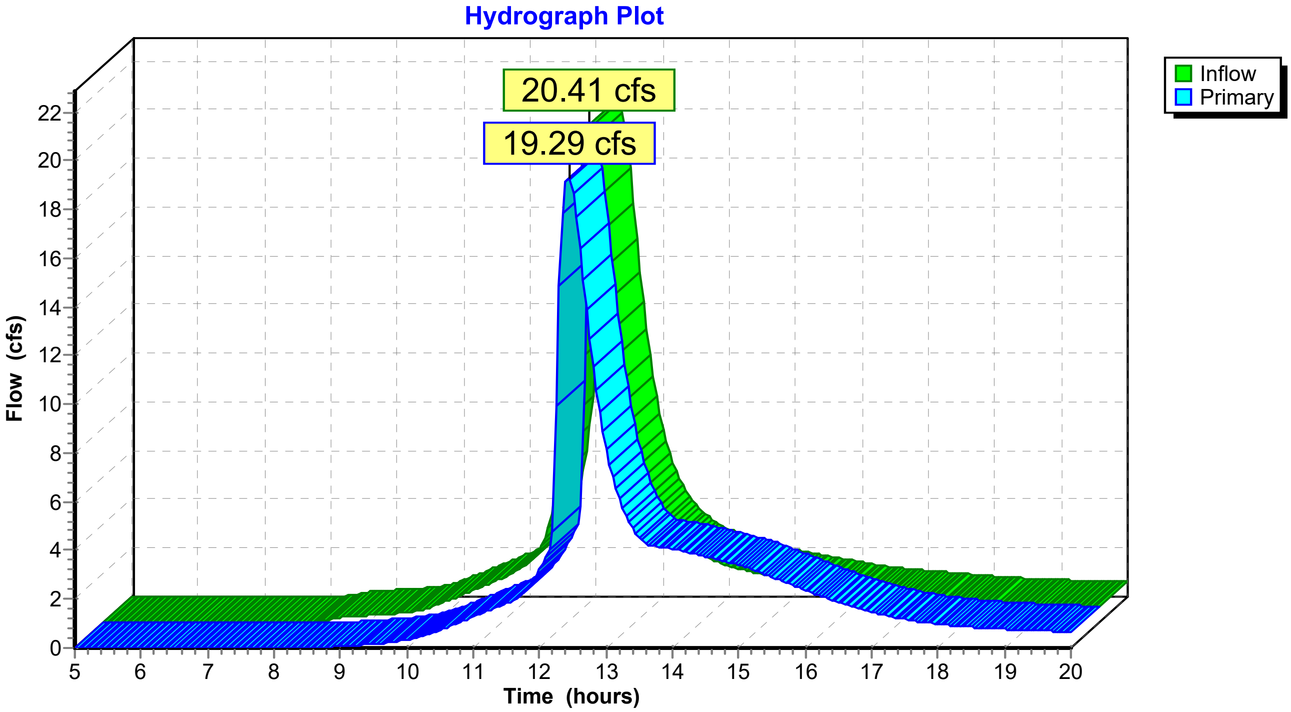
Peak Elev= 361.68' Storage= 22,082 cf
Plug-Flow detention time= 41.3 min calculated for 2.578 af (98% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
358.00	3,879	0	0
360.00	5,800	9,679	9,679
362.00	9,000	14,800	24,479
364.00	23,500	32,500	56,979

Primary OutFlow (Free Discharge)
1=Orifice/Grate
2=Orifice/Grate
3=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	358.00'	**10.0" Vert. Orifice/Grate** C= 0.600
2	Primary	361.00'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600
3	Primary	362.50'	**5.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4. Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76

Pond ATTENUATION BASIN 2: ATTENUATION BASIN 2



Pond ATTENUATION BASIN 6: ATTENUATION BASIN 6

Inflow	=	22.16 cfs @	12.26 hrs, Volume=	2.290 af
Outflow	=	17.93 cfs @	12.46 hrs, Volume=	2.260 af, Atten= 19%, Lag= 11.8 min
Primary	=	17.93 cfs @	12.46 hrs, Volume=	2.260 af

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

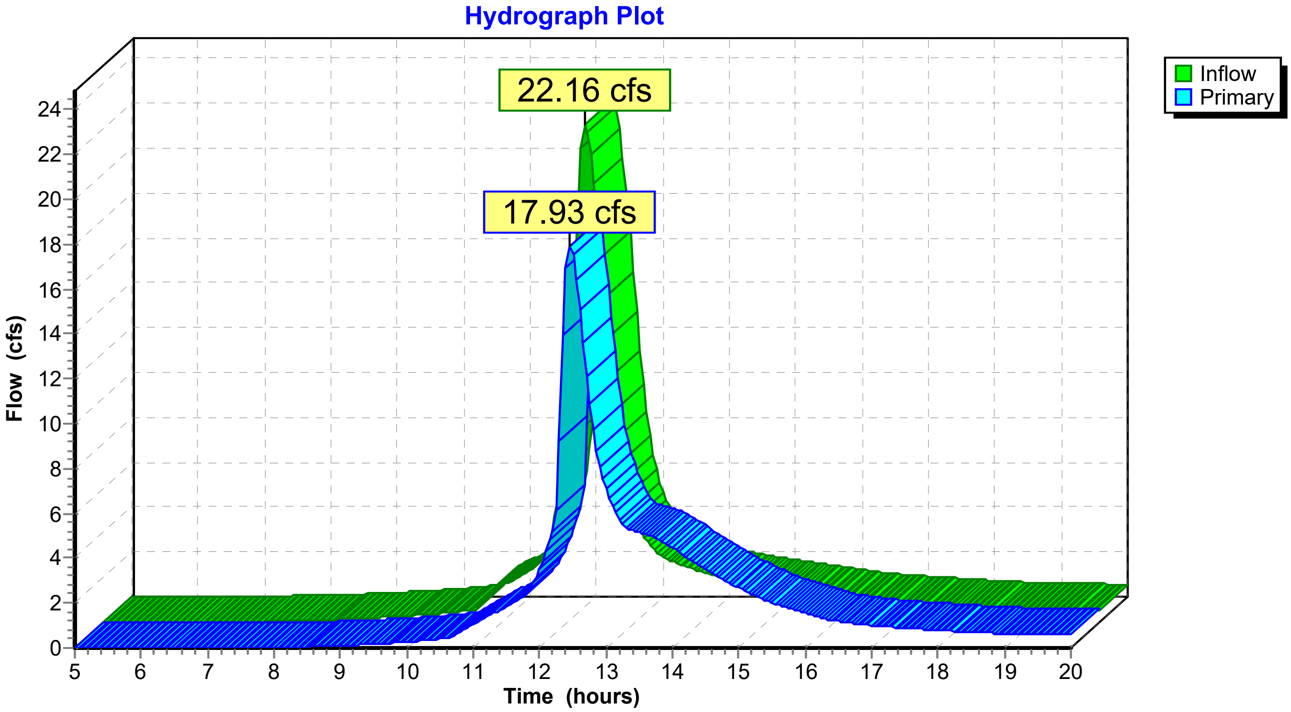
Peak Elev= 417.54' Storage= 23,126 cf
Plug-Flow detention time= 33.7 min calculated for 2.260 af (99% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
412.00	1,875	0	0
416.00	4,500	12,750	12,750
418.00	9,000	13,500	26,250

Primary OutFlow (Free Discharge)
1=Orifice/Grate
2=Orifice/Grate
3=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	412.00'	**10.0" Vert. Orifice/Grate** C= 0.600
2	Primary	416.50'	**2.00' x 2.00' Vert. Orifice/Grate** C= 0.600
3	Primary	417.00'	**5.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.0 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76

Pond ATTENUATION BASIN 6: ATTENUATION BASIN 6



Pond ATTENUATION POND 3: ATTENUATION POND 3

Inflow	=	8.31 cfs @	12.13 hrs, Volume=	0.794 af	
Outflow	=	1.52 cfs @	12.79 hrs, Volume=	0.761 af,	Atten= 82%, Lag= 39.8 min
Primary	=	1.52 cfs @	12.79 hrs, Volume=	0.761 af	

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

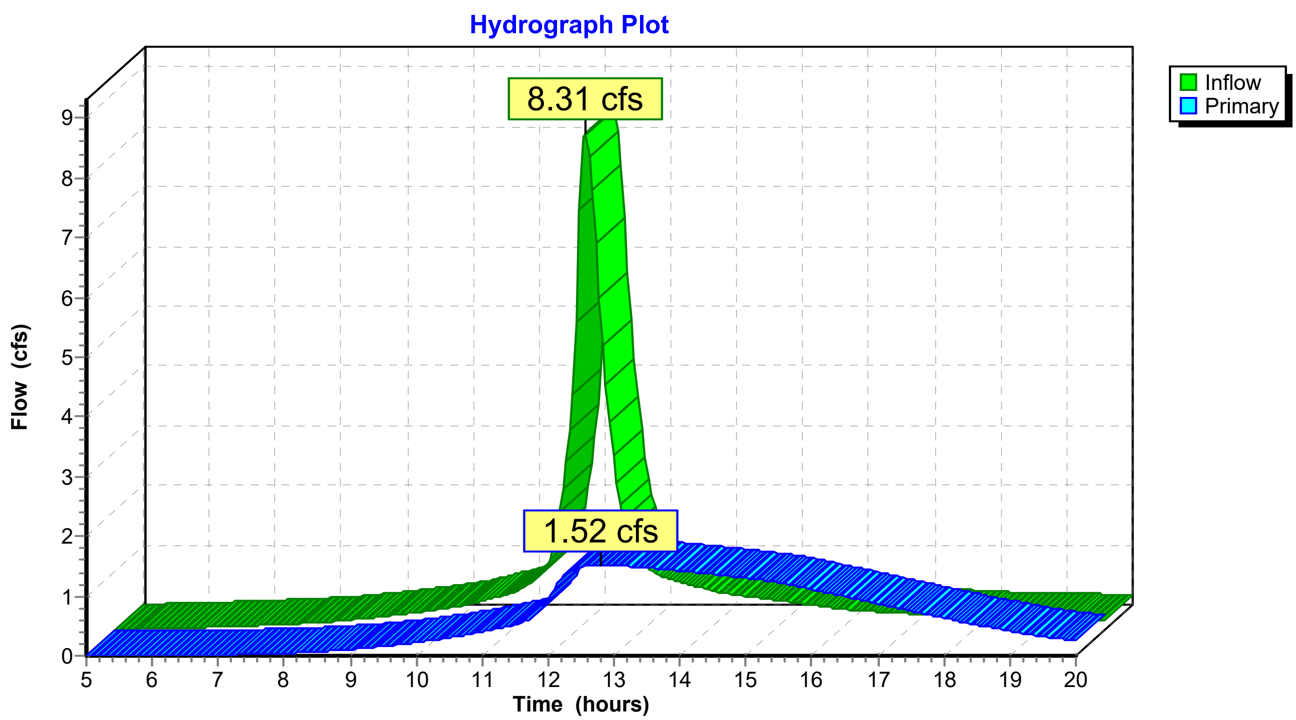
Peak Elev= 370.83' Storage= 15,425 cf
Plug-Flow detention time= 121.5 min calculated for 0.758 af (95% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
368.00	3,500	0	0
370.00	5,500	9,000	9,000
372.00	10,000	15,500	24,500

Primary OutFlow (Free Discharge)
1=Orifice/Grate
2=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	368.00'	**6.0" Vert. Orifice/Grate** C= 0.600
2	Primary	371.00'	**2.00' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond ATTENUATION POND 3: ATTENUATION POND 3



Pond BIO BASIN 2: BIO BASIN 2

[91] Warning: Storage range exceeded by 0.44'
[80] Warning: Exceeded Pond PLUNGE 5 by 0.22' @ 19.95 hrs (2.01 cfs)

Inflow	=	12.23 cfs @	12.29 hrs,	Volume=	1.258 af
Outflow	=	11.71 cfs @	12.36 hrs,	Volume=	1.200 af, Atten= 4%, Lag= 4.0 min
Primary	=	11.71 cfs @	12.36 hrs,	Volume=	1.200 af

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

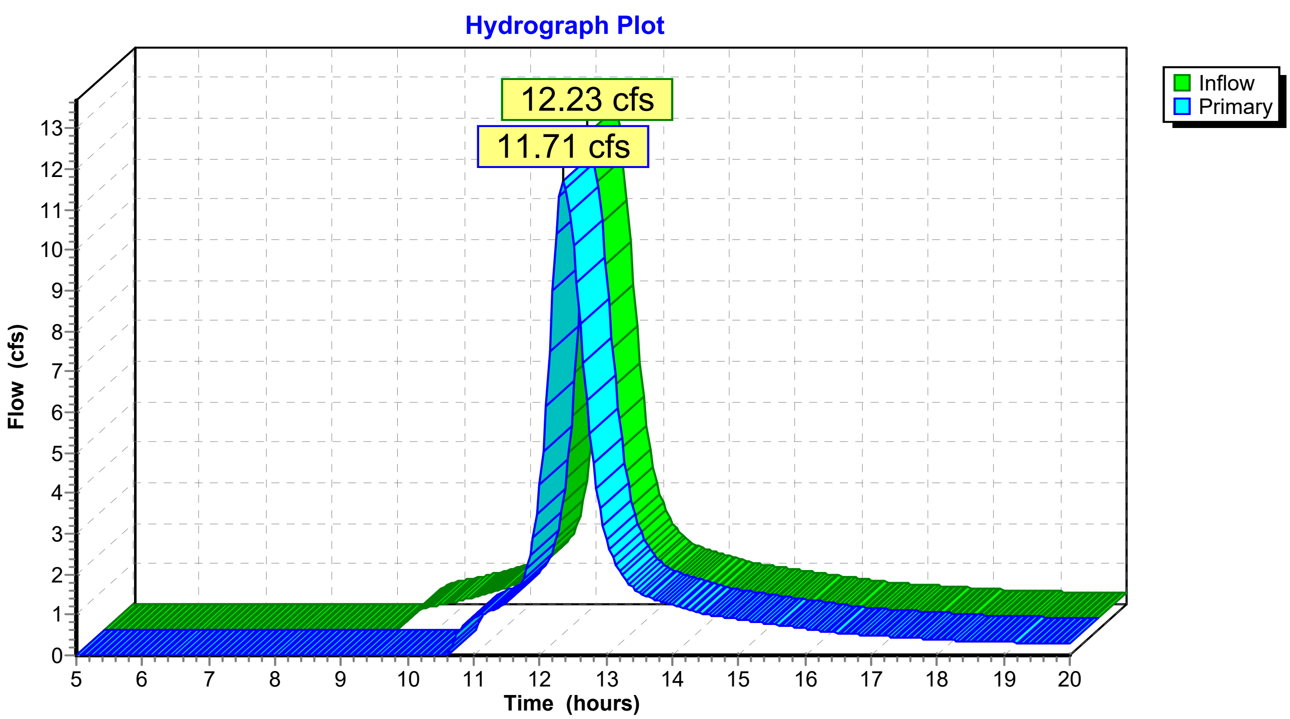
Peak Elev= 418.44' Storage= 5,463 cf
Plug-Flow detention time= 29.2 min calculated for 1.196 af (95% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
417.25	4,200	0	0
418.00	5,000	3,450	3,450

Primary OutFlow (Free Discharge)
└─1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	417.75'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Pond BIO BASIN 2: BIO BASIN 2



Pond BIORETENTION 1: BIORETENTION BASIN 1

[80] Warning: Exceeded Pond PLUNGE 1 by 0.73' @ 12.75 hrs (16.62 cfs)

Inflow	=	16.48 cfs @	12.25 hrs,	Volume=	1.652 af
Outflow	=	12.74 cfs @	12.41 hrs,	Volume=	1.564 af, Atten= 23%, Lag= 9.6 min
Primary	=	12.74 cfs @	12.41 hrs,	Volume=	1.564 af

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

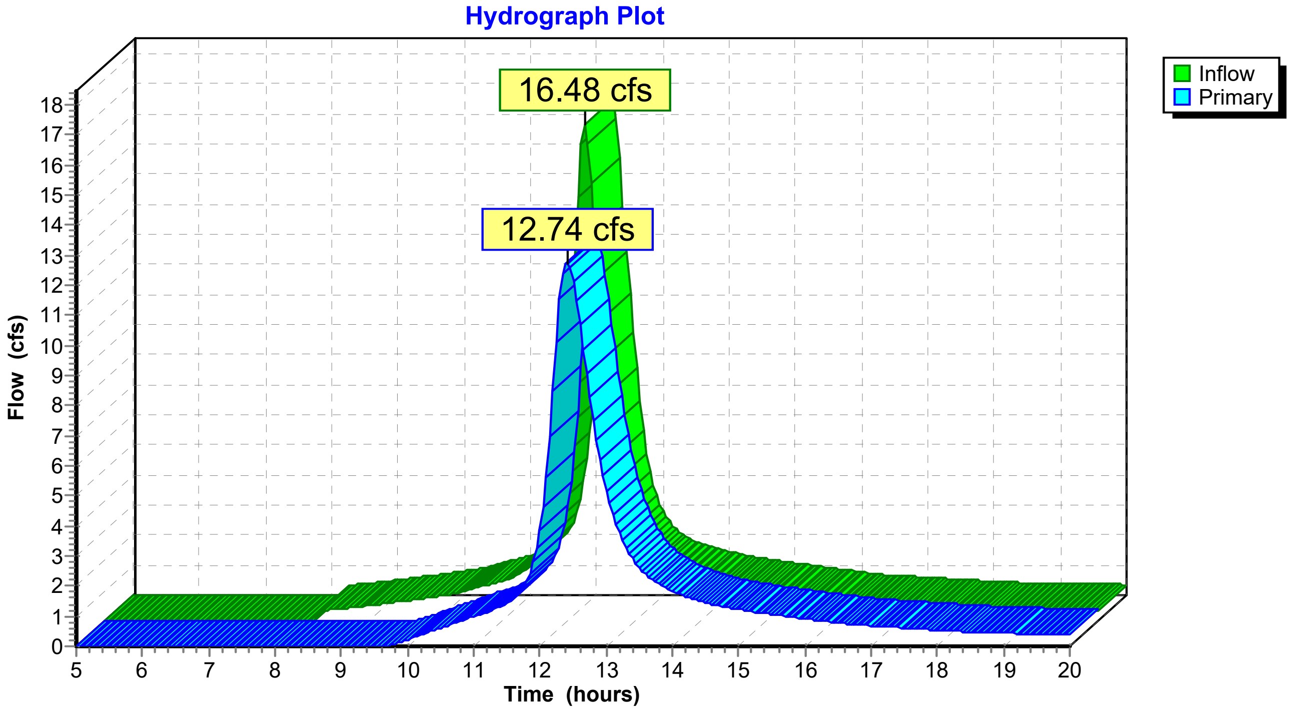
Peak Elev= 362.97' Storage= 15,739 cf
Plug-Flow detention time= 48.6 min calculated for 1.559 af (94% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
361.50	4,800	0	0
362.00	5,200	2,500	2,500
364.00	22,000	27,200	29,700

Primary OutFlow (Free Discharge)
1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	362.00'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Pond BIORETENTION 1: BIORETENTION BASIN 1



Pond CB-1: CB-1

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1

Inflow	=	0.62 cfs @	12.09 hrs,	Volume=	0.048 af
Outflow	=	0.62 cfs @	12.09 hrs,	Volume=	0.048 af, Atten= 0%, Lag= 0.1 min
Primary	=	0.62 cfs @	12.09 hrs,	Volume=	0.048 af

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

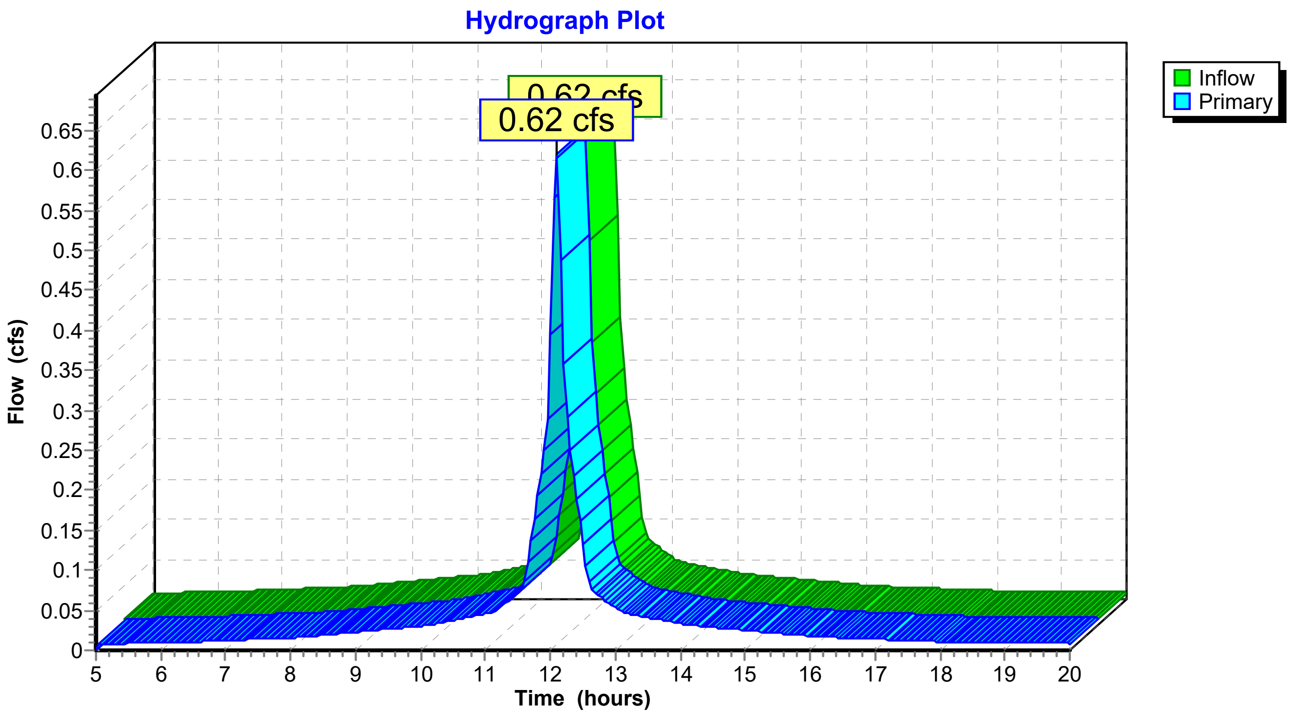
Peak Elev= 358.22' Storage= 7 cf
Plug-Flow detention time= 1.0 min calculated for 0.048 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.75	16	0	0
360.25	16	40	40

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	357.75'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 357.63' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-1: CB-1



Pond CB-10: CB-10

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-9 Primary device # 1 INLET by 1.18'

Inflow	=	16.10 cfs @ 12.24 hrs,	Volume=	1.633 af
Outflow	=	16.11 cfs @ 12.24 hrs,	Volume=	1.633 af, Atten= 0%, Lag= 0.0 min
Primary	=	16.11 cfs @ 12.24 hrs,	Volume=	1.633 af

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

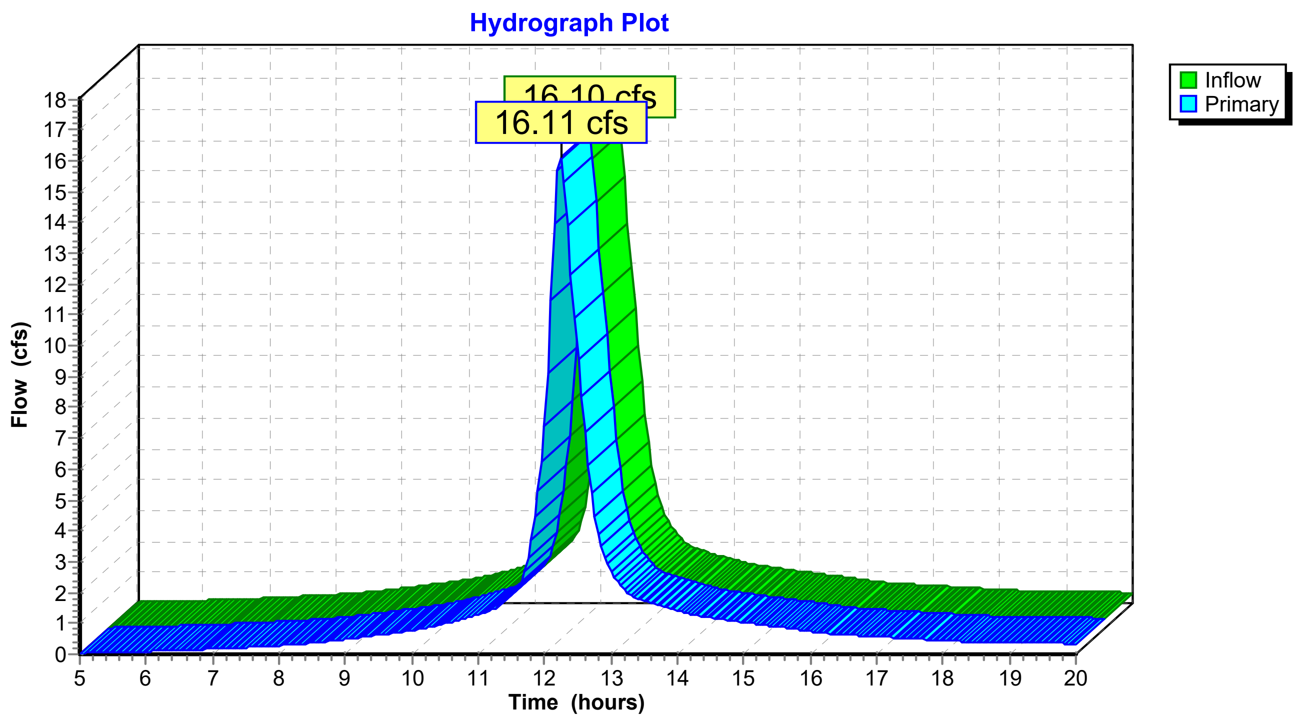
Peak Elev= 371.81' Storage= 34 cf
Plug-Flow detention time= 0.1 min calculated for 1.633 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
369.68	16	0	0
373.74	16	65	65

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	369.68'	**24.0" x 181.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 364.65' S= 0.0278 '/' n= 0.012 Cc= 0.900

Pond CB-10: CB-10



Pond CB-11: CB-11

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-10 Primary device # 1 OUTLET by 2.33'

Inflow	=	16.32 cfs @	12.24 hrs, Volume=	1.667 af
Outflow	=	16.32 cfs @	12.24 hrs, Volume=	1.667 af, Atten= 0%, Lag= 0.0 min
Primary	=	16.32 cfs @	12.24 hrs, Volume=	1.667 af

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

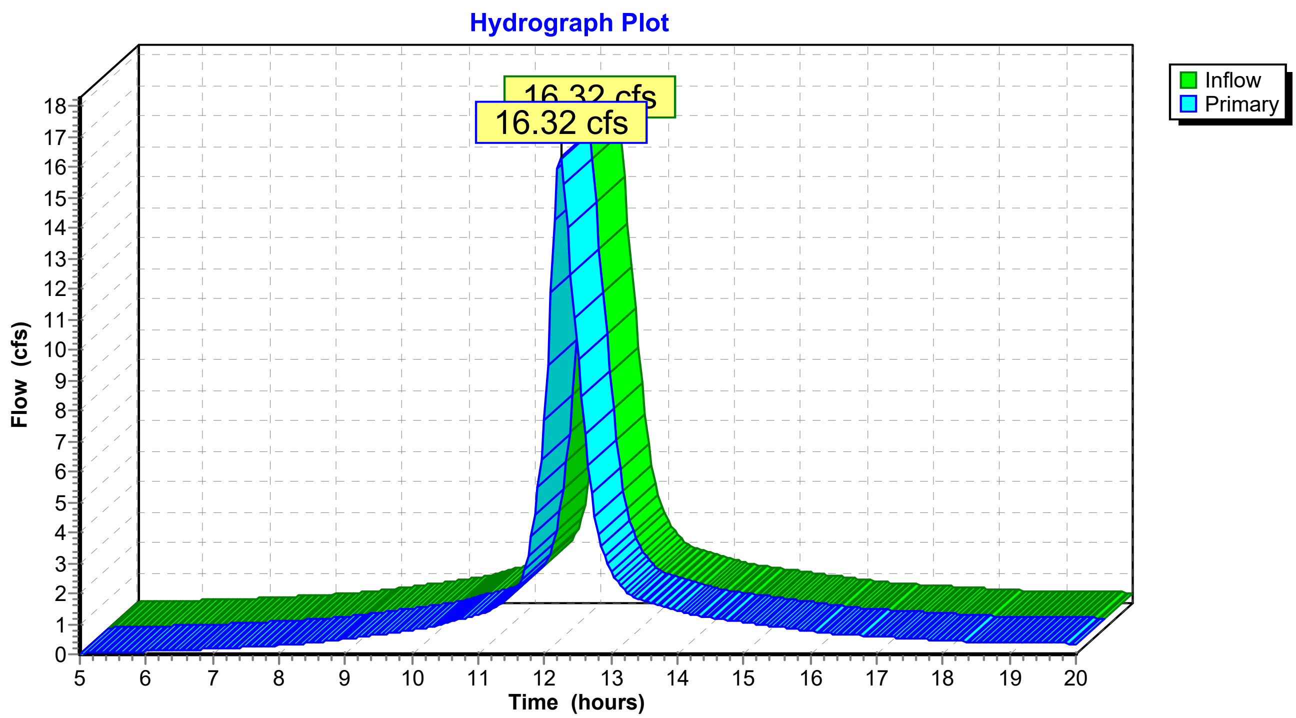
Peak Elev= 366.98' Storage= 37 cf
Plug-Flow detention time= 0.1 min calculated for 1.667 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
364.64	16	0	0
368.14	16	56	56

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	364.64'	**24.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 364.40' S= 0.0100 '/' n= 0.012 Cc= 0.900

Pond CB-11: CB-11



Pond CB-11A: CB-11A

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-11 Primary device # 1 INLET by 2.06'

Inflow	=	16.50 cfs @	12.24 hrs, Volume=	1.695 af	
Outflow	=	16.50 cfs @	12.24 hrs, Volume=	1.695 af,	Atten= 0%, Lag= 0.0 min
Primary	=	16.50 cfs @	12.24 hrs, Volume=	1.695 af	

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

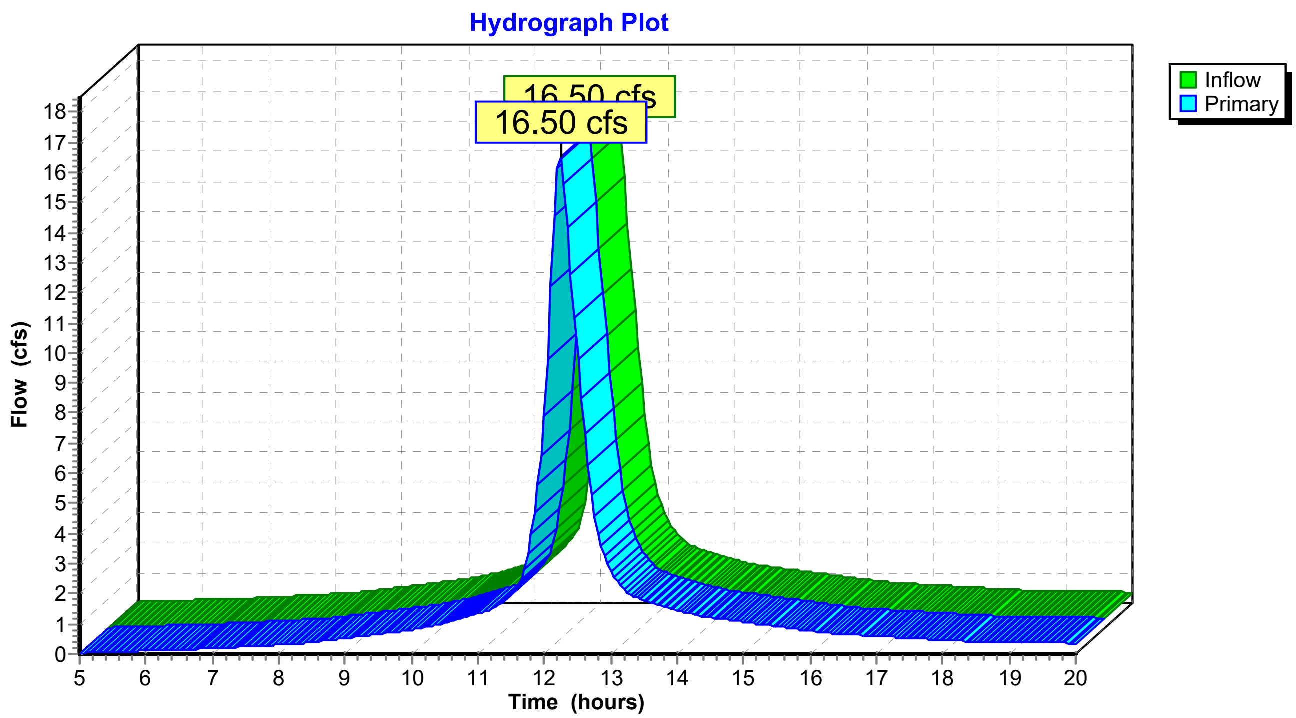
Peak Elev= 366.70' Storage= 37 cf
Plug-Flow detention time= 0.1 min calculated for 1.695 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
364.40	16	0	0
368.14	16	60	60

Primary OutFlow (Free Discharge)
└1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	364.40'	**24.0" x 32.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 364.08' S= 0.0100 '/' n= 0.012 Cc= 0.900

Pond CB-11A: CB-11A



Pond CB-12: CB-12

[88] Warning: Qout>Qin may require Finer Routing>1
[80] Warning: Exceeded Pond CB-12A by 0.37' @ 12.20 hrs (2.30 cfs)

Inflow	=	3.50 cfs @	12.19 hrs, Volume=	0.322 af
Outflow	=	3.51 cfs @	12.19 hrs, Volume=	0.322 af, Atten= 0%, Lag= 0.2 min
Primary	=	3.51 cfs @	12.19 hrs, Volume=	0.322 af

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

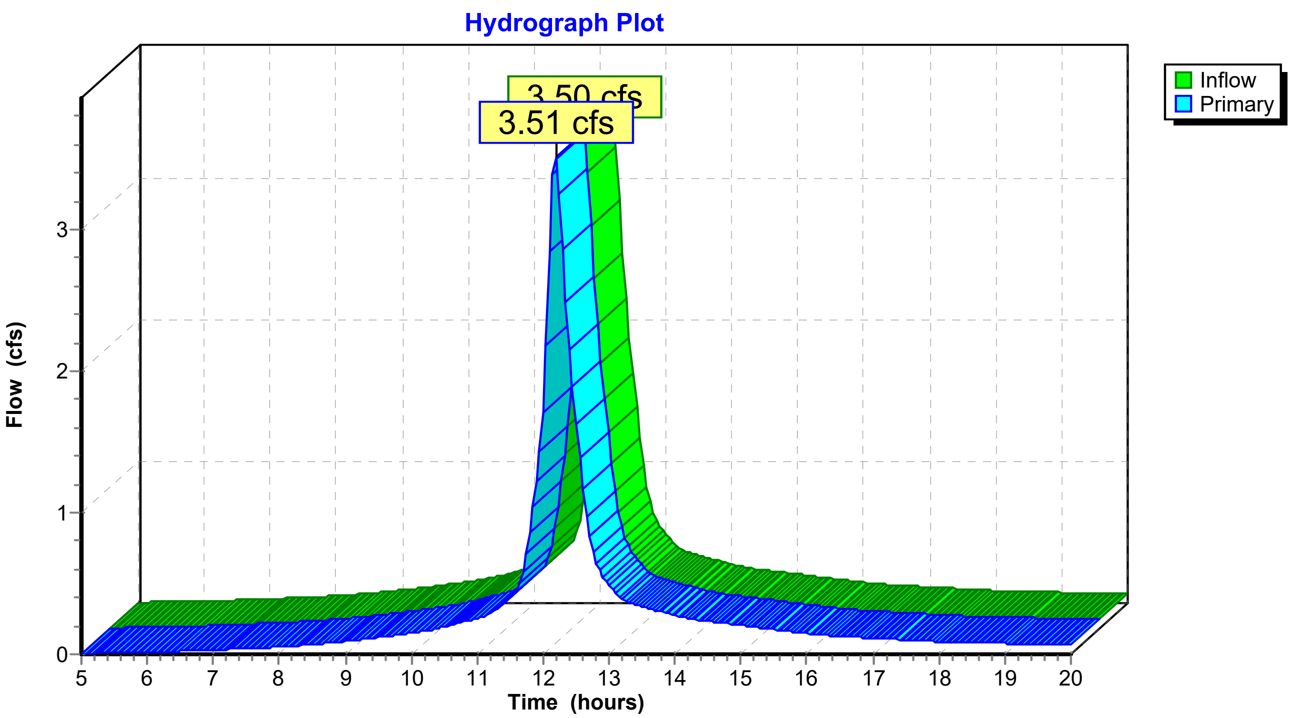
Peak Elev= 373.36' Storage= 22 cf
Plug-Flow detention time= 0.2 min calculated for 0.322 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.00	16	0	0
374.68	16	43	43

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	372.00'	**12.0" x 136.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 370.40' S= 0.0118 '/' n= 0.012 Cc= 0.900

Pond CB-12: CB-12



Pond CB-12A: CB-12A

[82] Warning: Early inflow requires earlier time span

Inflow	=	1.85 cfs @	12.16 hrs, Volume=	0.157 af
Outflow	=	1.85 cfs @	12.16 hrs, Volume=	0.157 af, Atten= 0%, Lag= 0.1 min
Primary	=	1.85 cfs @	12.16 hrs, Volume=	0.157 af

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

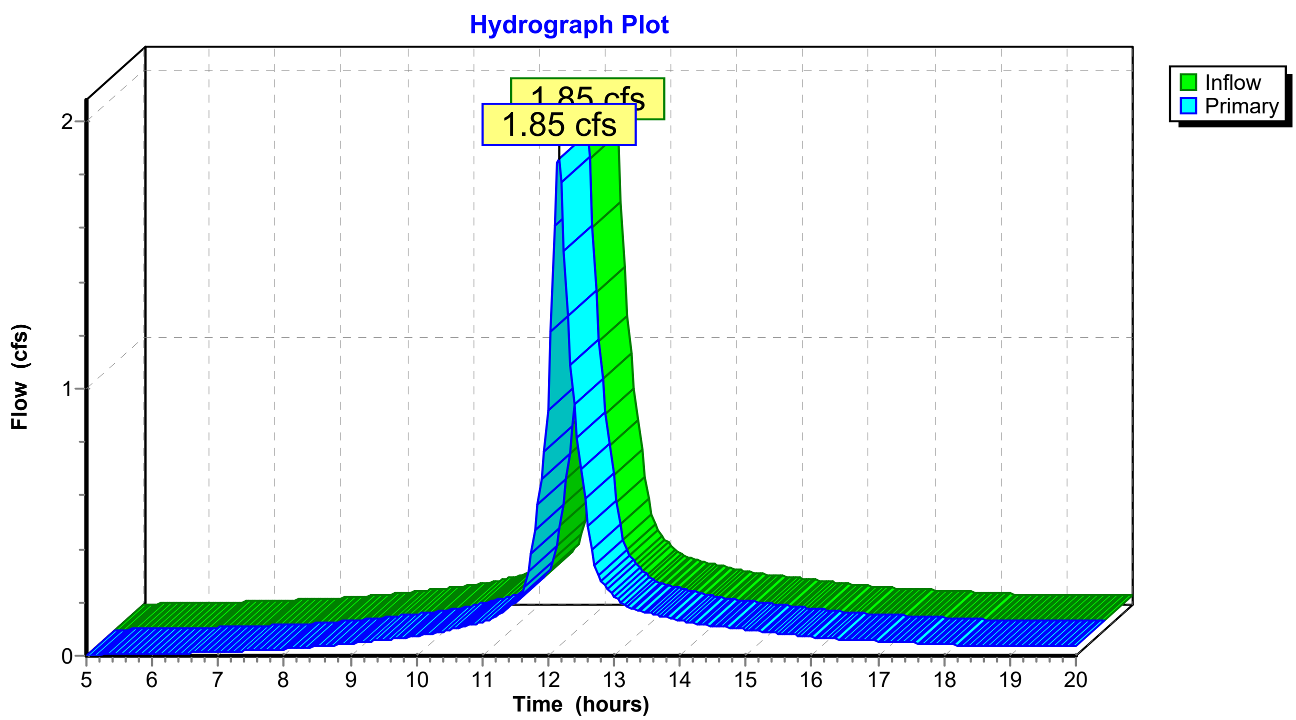
Peak Elev= 373.01' Storage= 14 cf
Plug-Flow detention time= 0.4 min calculated for 0.156 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.12	16	0	0
374.62	16	40	40

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	372.12'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 372.00' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-12A: CB-12A



Pond CB-13: CB-13

[82] Warning: Early inflow requires earlier time span
[79] Warning: Submerged Pond CB-12 Primary device # 1 INLET by 0.46'
[80] Warning: Exceeded Pond CB-13A by 1.45' @ 12.15 hrs (4.19 cfs)

Inflow	=	4.63 cfs @	12.15 hrs, Volume=	0.442 af	
Outflow	=	4.62 cfs @	12.15 hrs, Volume=	0.442 af,	Atten= 0%, Lag= 0.3 min
Primary	=	4.62 cfs @	12.15 hrs, Volume=	0.442 af	

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

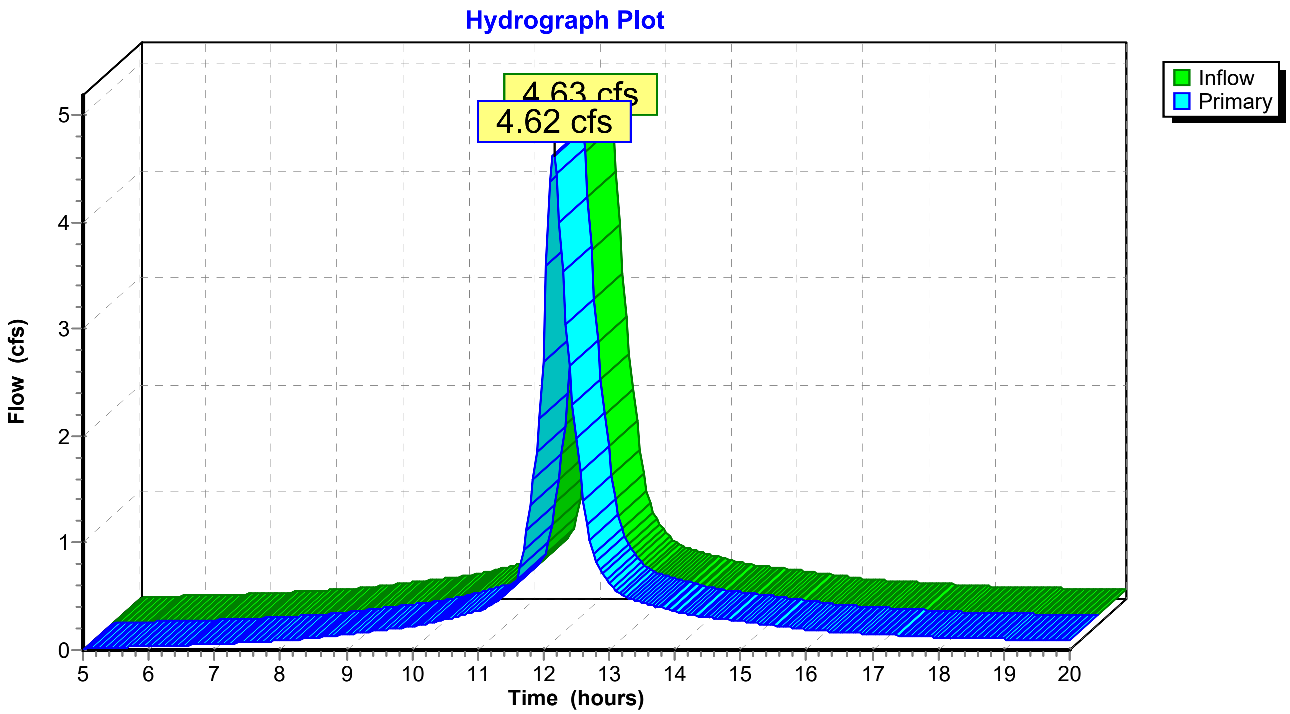
Peak Elev= 372.46' Storage= 33 cf
Plug-Flow detention time= 0.2 min calculated for 0.442 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
370.39	16	0	0
373.39	16	48	48

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	370.39'	**12.0" x 131.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 368.77' S= 0.0124 '/' n= 0.012 Cc= 0.900

Pond CB-13: CB-13



Pond CB-13A: CB-13A

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1

Inflow	=	0.41 cfs @	12.09 hrs,	Volume=	0.032 af
Outflow	=	0.41 cfs @	12.09 hrs,	Volume=	0.032 af, Atten= 0%, Lag= 0.1 min
Primary	=	0.41 cfs @	12.09 hrs,	Volume=	0.032 af

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

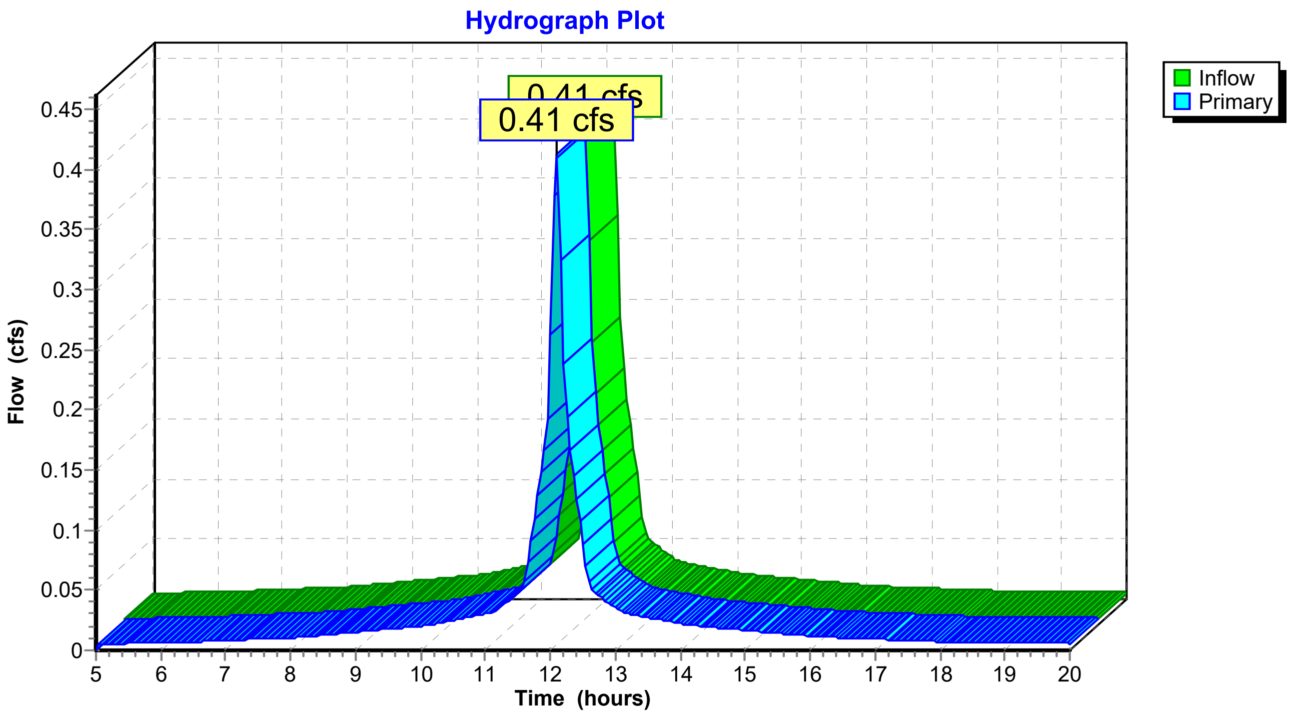
Peak Elev= 371.05' Storage= 5 cf
Plug-Flow detention time= 1.0 min calculated for 0.032 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
370.73	16	0	0
373.23	16	40	40

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	370.73'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 370.39' S= 0.0142 '/' n= 0.012 Cc= 0.900

Pond CB-13A: CB-13A



Pond CB-14: CB-14

[85] Warning: Oscillations may require Finer Routing>1
[79] Warning: Submerged Pond CB-13 Primary device # 1 OUTLET by 1.53'

Inflow	=	6.22 cfs @	12.19 hrs, Volume=	0.640 af
Outflow	=	6.22 cfs @	12.19 hrs, Volume=	0.640 af, Atten= 0%, Lag= 0.0 min
Primary	=	6.22 cfs @	12.19 hrs, Volume=	0.640 af

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

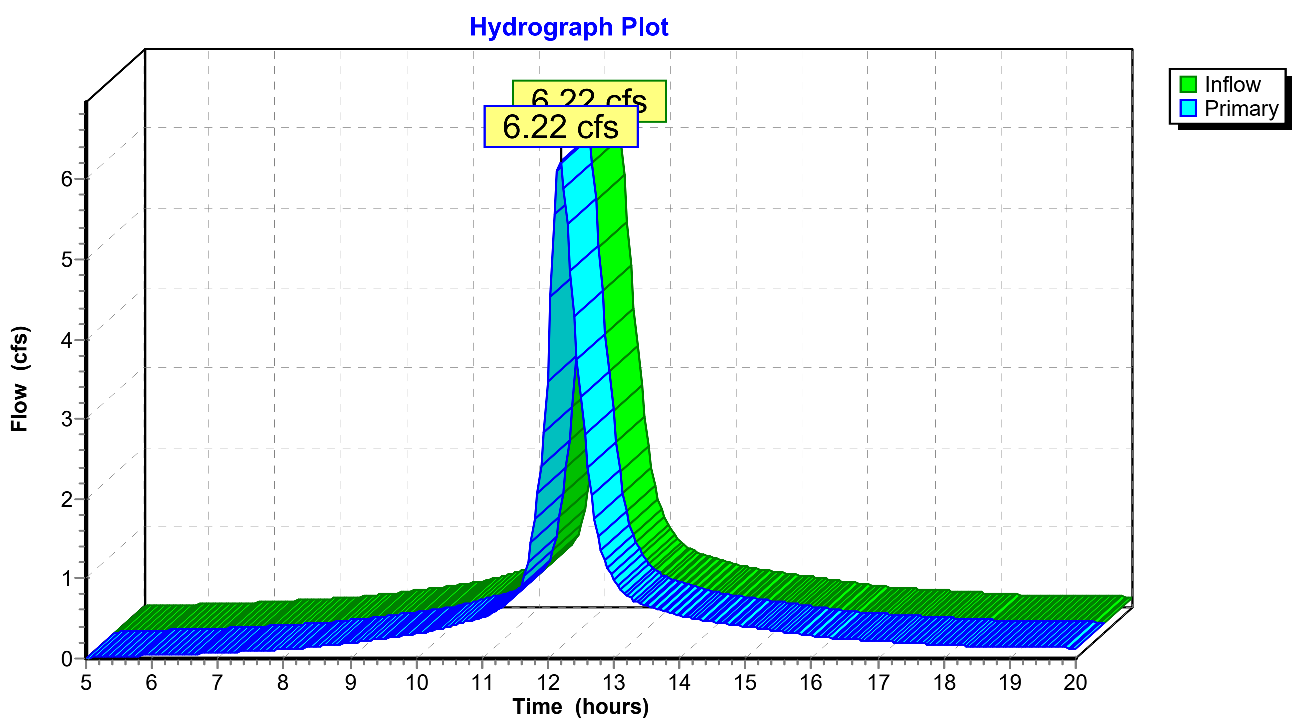
Peak Elev= 370.30' Storage= 25 cf
Plug-Flow detention time= 0.2 min calculated for 0.640 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
368.76	16	0	0
372.26	16	56	56

Primary OutFlow (Free Discharge)
└1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	368.76'	**18.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 368.64' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-14: CB-14



Pond CB-14A: CB-14A

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-14 Primary device # 1 INLET by 1.49'

Inflow	=	6.72 cfs @	12.17 hrs,	Volume=	0.698 af
Outflow	=	6.72 cfs @	12.17 hrs,	Volume=	0.698 af, Atten= 0%, Lag= 0.0 min
Primary	=	6.72 cfs @	12.17 hrs,	Volume=	0.698 af

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

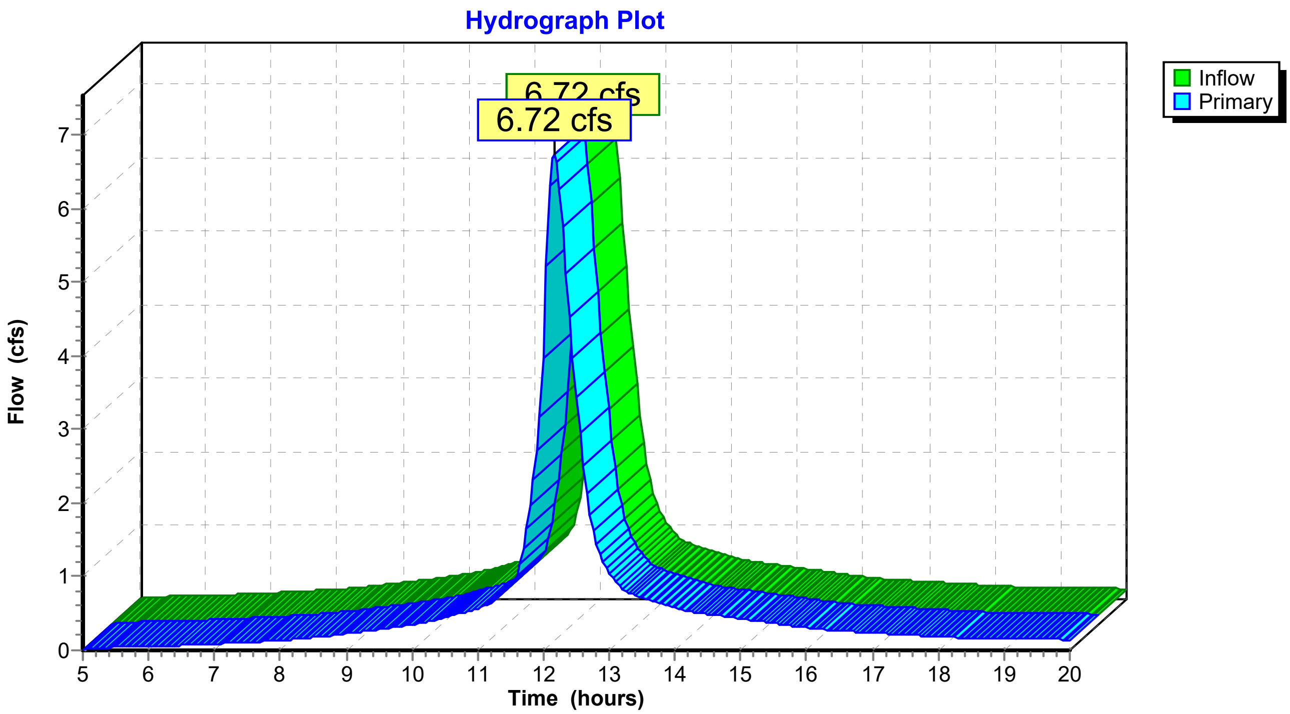
Peak Elev= 370.25' Storage= 26 cf
Plug-Flow detention time= 0.2 min calculated for 0.698 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
368.64	16	0	0
372.26	16	58	58

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	368.64'	**18.0" x 36.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 368.46' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-14A: CB-14A



Pond CB-15: CB-15

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1
[79] Warning: Submerged Pond CB-15A Primary device # 1 INLET by 0.41'

Inflow	=	1.03 cfs @	12.14 hrs, Volume=	0.093 af	
Outflow	=	1.03 cfs @	12.14 hrs, Volume=	0.093 af,	Atten= 0%, Lag= 0.1 min
Primary	=	1.03 cfs @	12.14 hrs, Volume=	0.093 af	

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

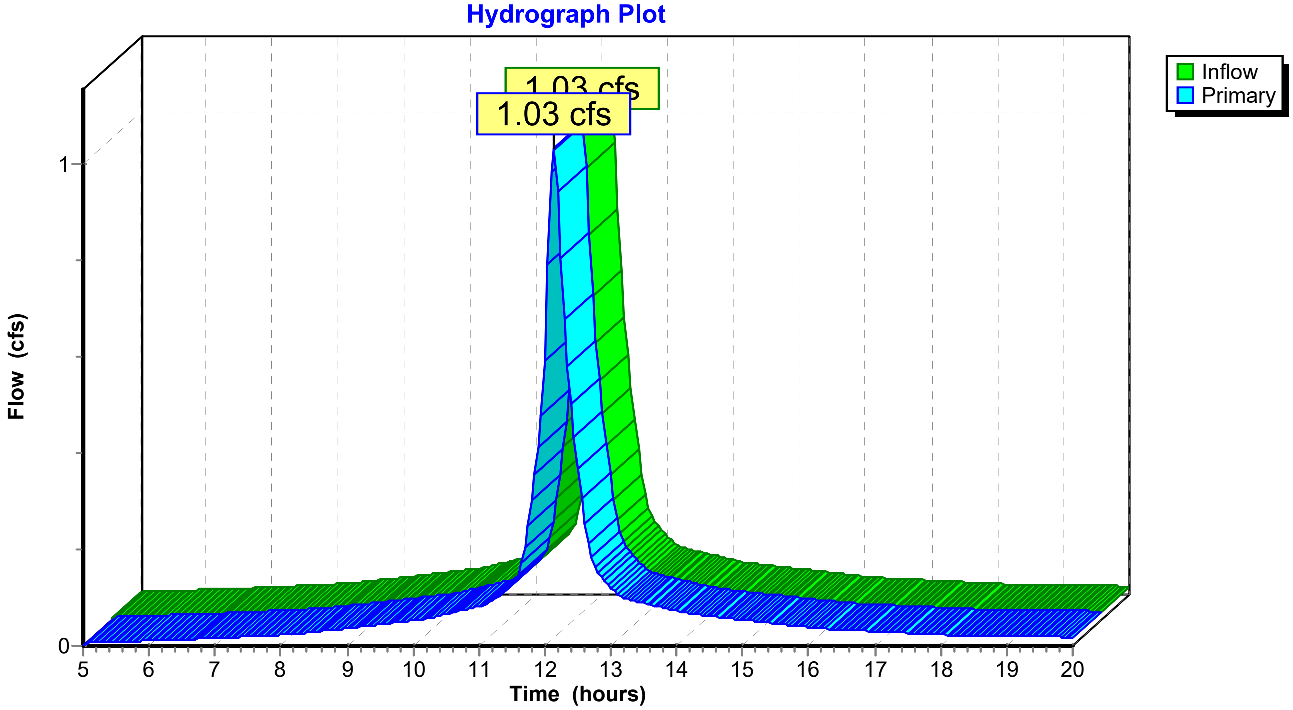
Peak Elev= 390.21' Storage= 8 cf
Plug-Flow detention time= 0.5 min calculated for 0.093 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
389.68	16	0	0
392.30	16	42	42

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	389.68'	**12.0" x 181.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 380.11' S= 0.0529 '/' n= 0.012 Cc= 0.900

Pond CB-15: CB-15



Pond CB-15A: CB-15A

[82] Warning: Early inflow requires earlier time span
[85] Warning: Oscillations may require Finer Routing>1

Inflow	=	0.81 cfs @	12.16 hrs,	Volume=	0.071 af
Outflow	=	0.81 cfs @	12.16 hrs,	Volume=	0.071 af, Atten= 0%, Lag= 0.1 min
Primary	=	0.81 cfs @	12.16 hrs,	Volume=	0.071 af

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

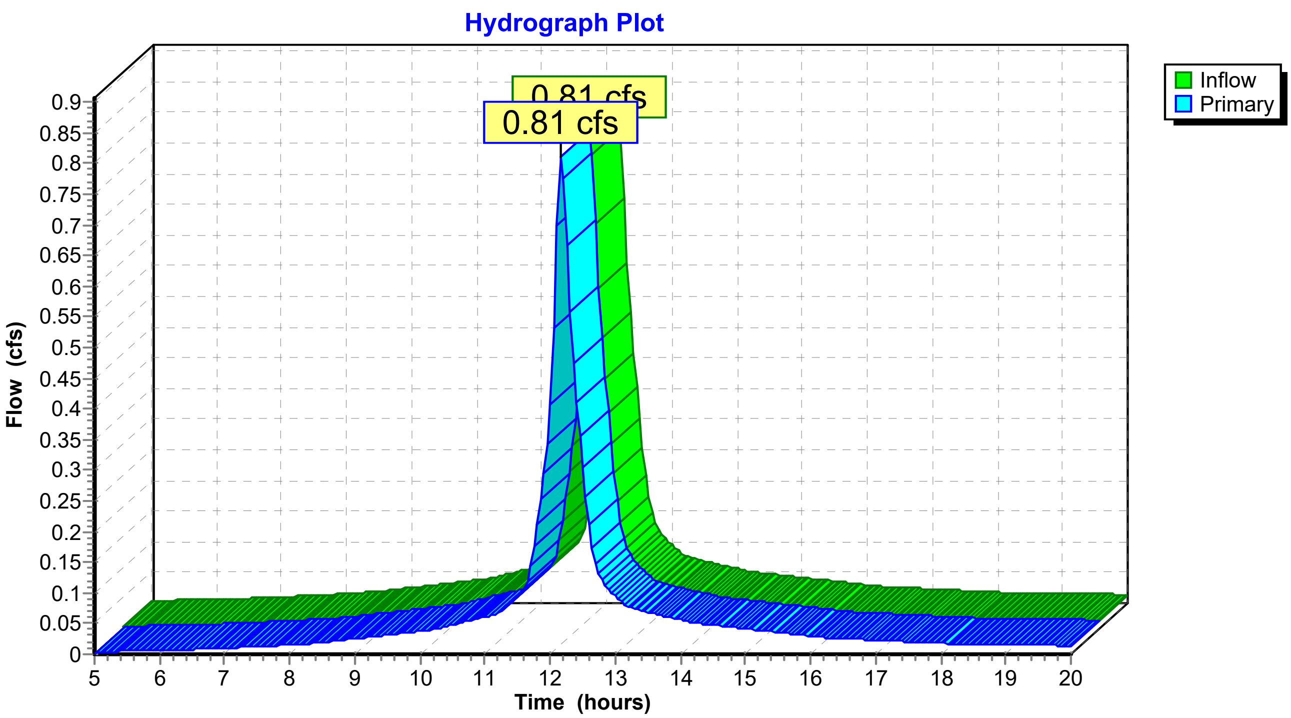
Peak Elev= 390.33' Storage= 8 cf
Plug-Flow detention time= 0.6 min calculated for 0.071 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
389.80	16	0	0
392.30	16	40	40

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	389.80'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 389.68' S= 0.0050 '/' n= 0.010 Cc= 0.900

Pond CB-15A: CB-15A



Pond CB-16: CB-16

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-15 Primary device # 1 OUTLET by 0.78'

Inflow	=	2.40 cfs @	12.13 hrs,	Volume=	0.209 af
Outflow	=	2.40 cfs @	12.13 hrs,	Volume=	0.209 af, Atten= 0%, Lag= 0.1 min
Primary	=	2.40 cfs @	12.13 hrs,	Volume=	0.209 af

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

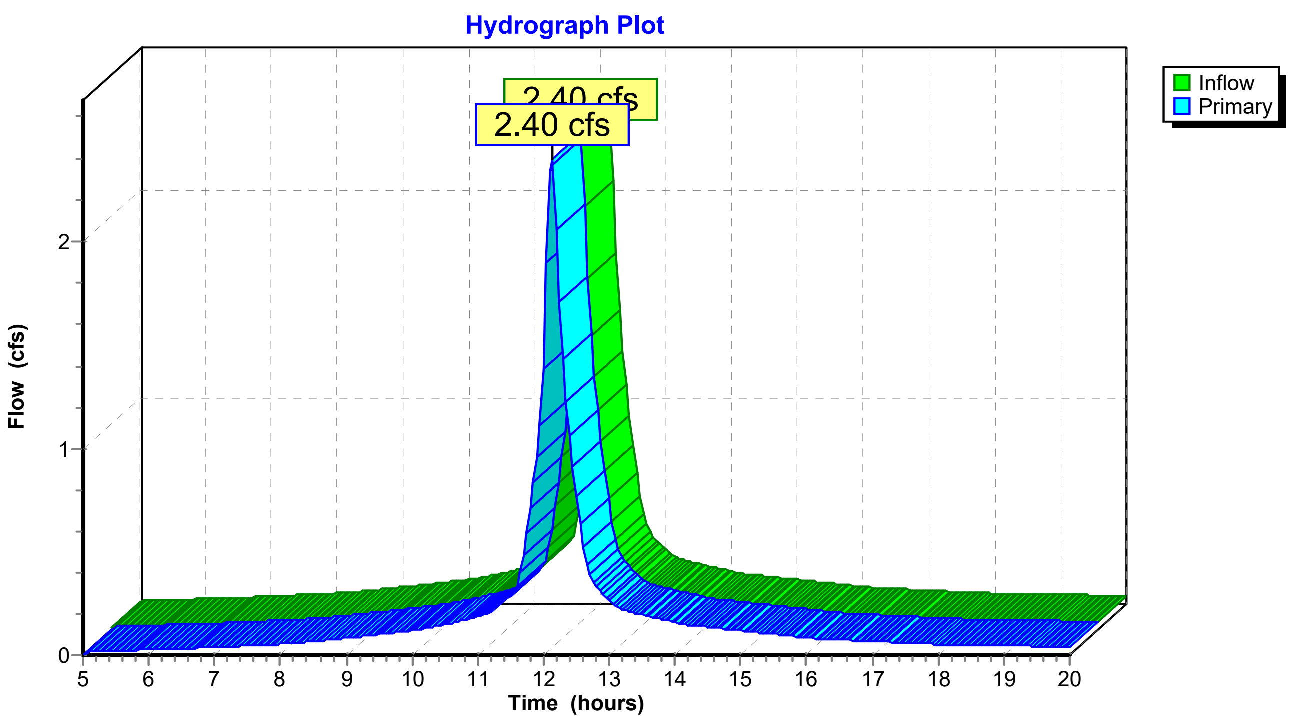
Peak Elev= 380.90' Storage= 14 cf
Plug-Flow detention time= 0.3 min calculated for 0.209 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
380.00	16	0	0
383.09	16	49	49

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	380.00'	**12.0" x 209.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 374.00' S= 0.0287 '/' n= 0.012 Cc= 0.900

Pond CB-16: CB-16



Pond CB-16A: CB-16A

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1

Inflow	=	1.05 cfs @	12.13 hrs, Volume=	0.087 af
Outflow	=	1.05 cfs @	12.14 hrs, Volume=	0.087 af, Atten= 0%, Lag= 0.1 min
Primary	=	1.05 cfs @	12.14 hrs, Volume=	0.087 af

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

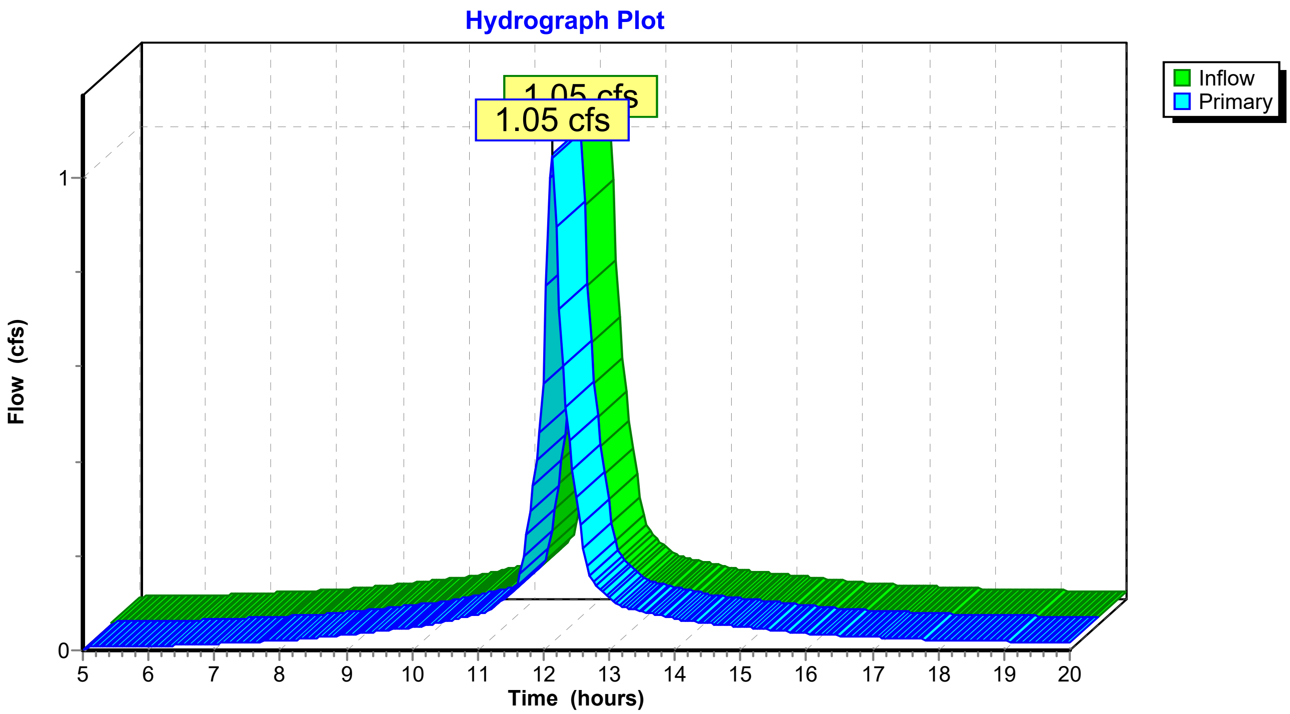
Peak Elev= 381.98' Storage= 9 cf
Plug-Flow detention time= 0.6 min calculated for 0.086 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
381.40	16	0	0
383.09	16	27	27

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	381.40'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 381.20' S= 0.0083 '/' n= 0.012 Cc= 0.900

Pond CB-16A: CB-16A



Pond CB-17: CB-17

[82] Warning: Early inflow requires earlier time span
[79] Warning: Submerged Pond CB-16 Primary device # 1 OUTLET by 1.27'

Inflow	=	2.89 cfs @	12.12 hrs, Volume=	0.249 af	
Outflow	=	2.89 cfs @	12.12 hrs, Volume=	0.249 af,	Atten= 0%, Lag= 0.2 min
Primary	=	2.89 cfs @	12.12 hrs, Volume=	0.249 af	

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

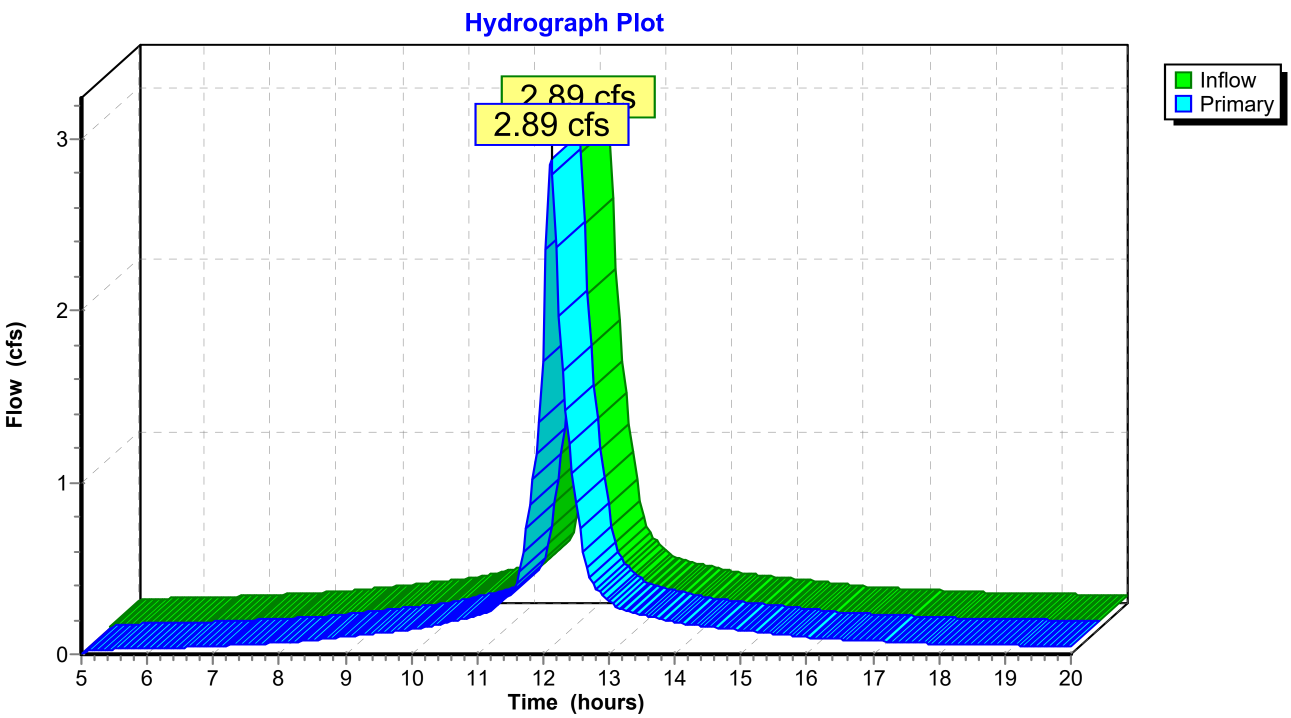
Peak Elev= 375.28' Storage= 20 cf
Plug-Flow detention time= 0.3 min calculated for 0.248 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
374.01	16	0	0
377.51	16	56	56

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	374.01'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 373.89' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-17: CB-17



Pond CB-17A: CB-17A

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[80] Warning: Exceeded Pond CB-17 by 1.99' @ 12.15 hrs (5.34 cfs)

Inflow	=	5.27 cfs @	12.14 hrs, Volume=	0.463 af
Outflow	=	5.28 cfs @	12.15 hrs, Volume=	0.463 af, Atten= 0%, Lag= 0.3 min
Primary	=	5.28 cfs @	12.15 hrs, Volume=	0.463 af

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

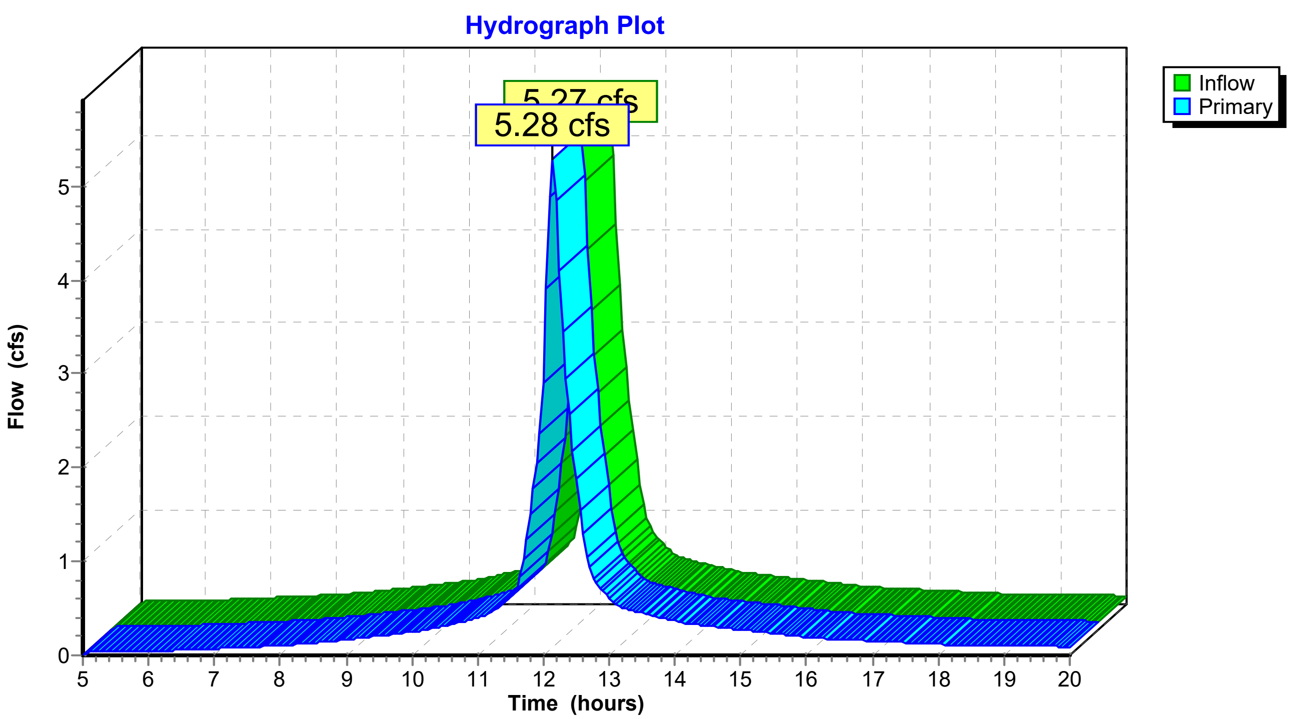
Peak Elev= 377.23' Storage= 53 cf
Plug-Flow detention time= 0.2 min calculated for 0.462 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.89	16	0	0
377.57	16	59	59

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	373.89'	**12.0" x 93.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 373.43' S= 0.0049 '/' n= 0.012 Cc= 0.900

Pond CB-17A: CB-17A



Pond CB-18: CB-18

[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1
[79] Warning: Submerged Pond CB-18A Primary device # 1 INLET by 1.15'

Inflow	=	8.61 cfs @	12.26 hrs,	Volume=	0.882 af
Outflow	=	8.61 cfs @	12.26 hrs,	Volume=	0.882 af, Atten= 0%, Lag= 0.0 min
Primary	=	8.61 cfs @	12.26 hrs,	Volume=	0.882 af

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

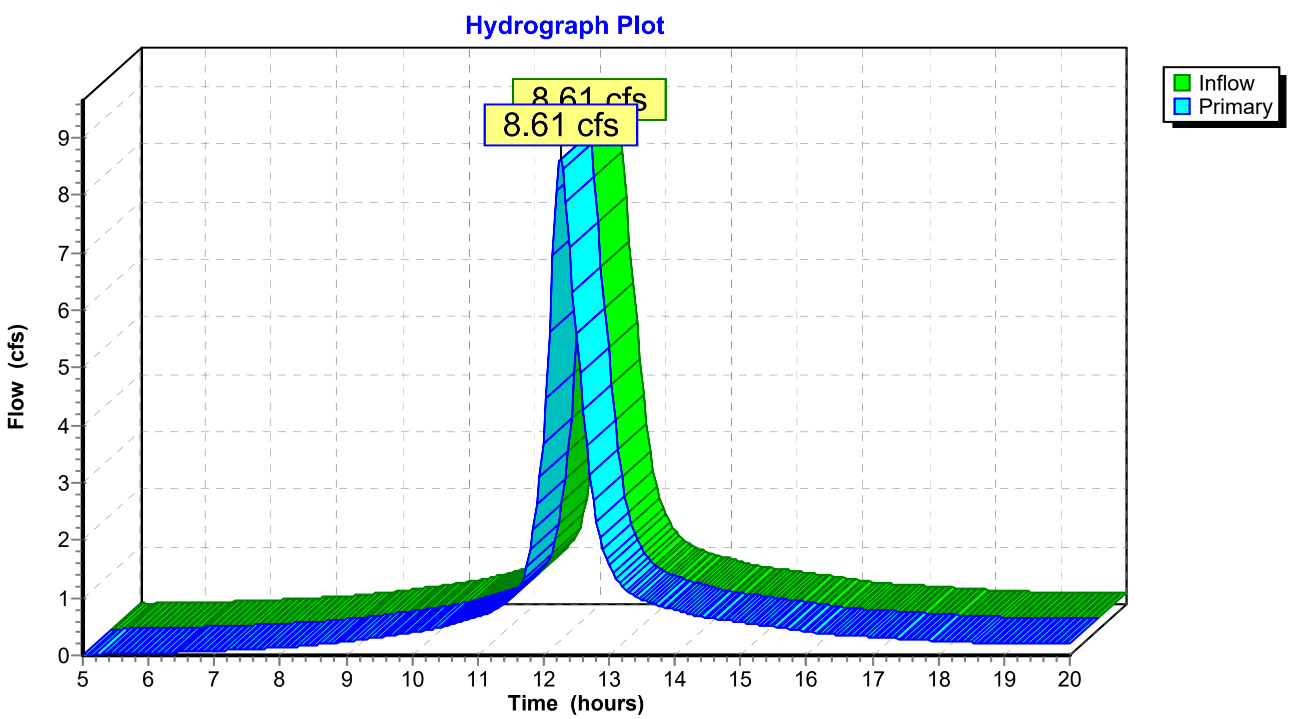
Peak Elev= 418.71' Storage= 28 cf
Plug-Flow detention time= 0.1 min calculated for 0.879 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
416.94	16	0	0
420.56	16	58	58

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	416.94'	**18.0" x 345.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 412.97' S= 0.0115 '/' n= 0.012 Cc= 0.900

Pond CB-18: CB-18



Pond CB-18A: CB-18A AND B

[82] Warning: Early inflow requires earlier time span
[85] Warning: Oscillations may require Finer Routing>1

Inflow	=	7.72 cfs @	12.27 hrs,	Volume=	0.795 af
Outflow	=	7.72 cfs @	12.27 hrs,	Volume=	0.794 af, Atten= 0%, Lag= 0.1 min
Primary	=	7.72 cfs @	12.27 hrs,	Volume=	0.794 af

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

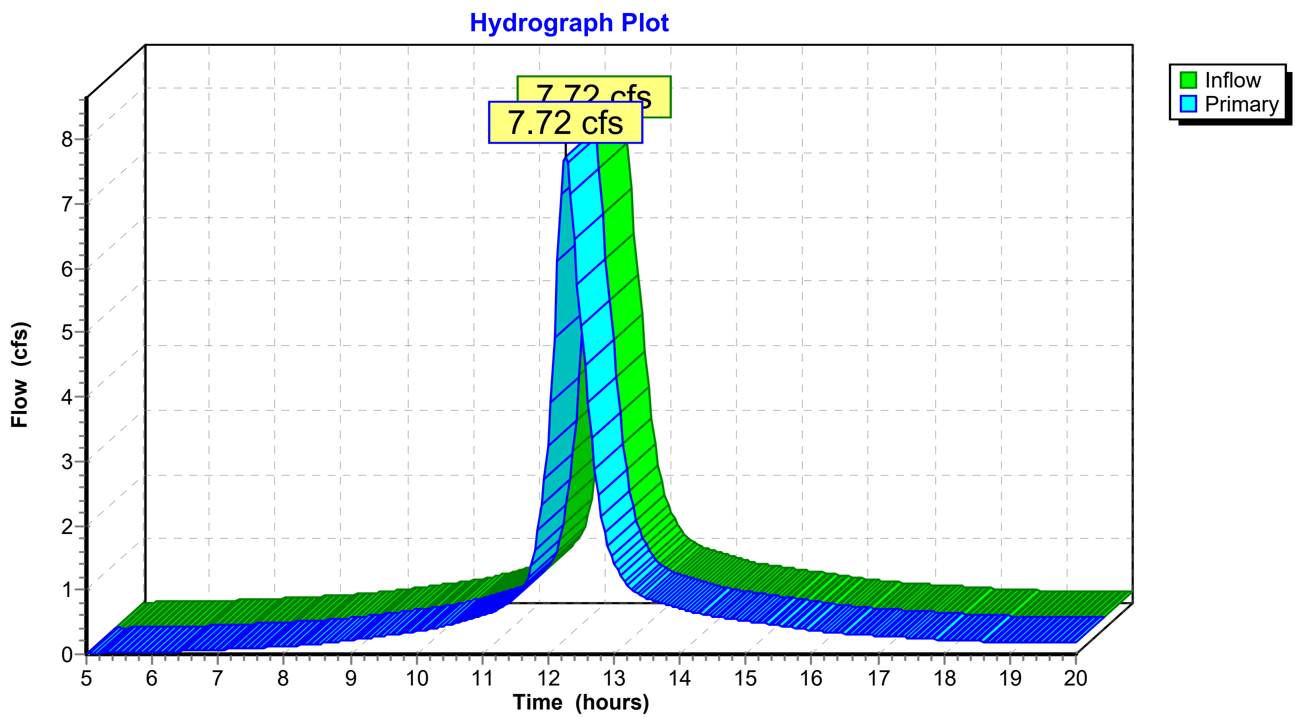
Peak Elev= 419.39' Storage= 29 cf
Plug-Flow detention time= 0.2 min calculated for 0.792 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
417.59	16	0	0
420.56	16	48	48

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	417.56'	**18.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 417.44' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-18A: CB-18A AND B



Pond CB-19: CB-19

[79] Warning: Submerged Pond CB-18 Primary device # 1 OUTLET by 1.98'
[79] Warning: Submerged Pond CB-19A Primary device # 1 OUTLET by 1.48'

Inflow	=	19.00 cfs @	12.25 hrs,	Volume=	1.888 af
Outflow	=	19.00 cfs @	12.25 hrs,	Volume=	1.888 af, Atten= 0%, Lag= 0.0 min
Primary	=	19.00 cfs @	12.25 hrs,	Volume=	1.888 af

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

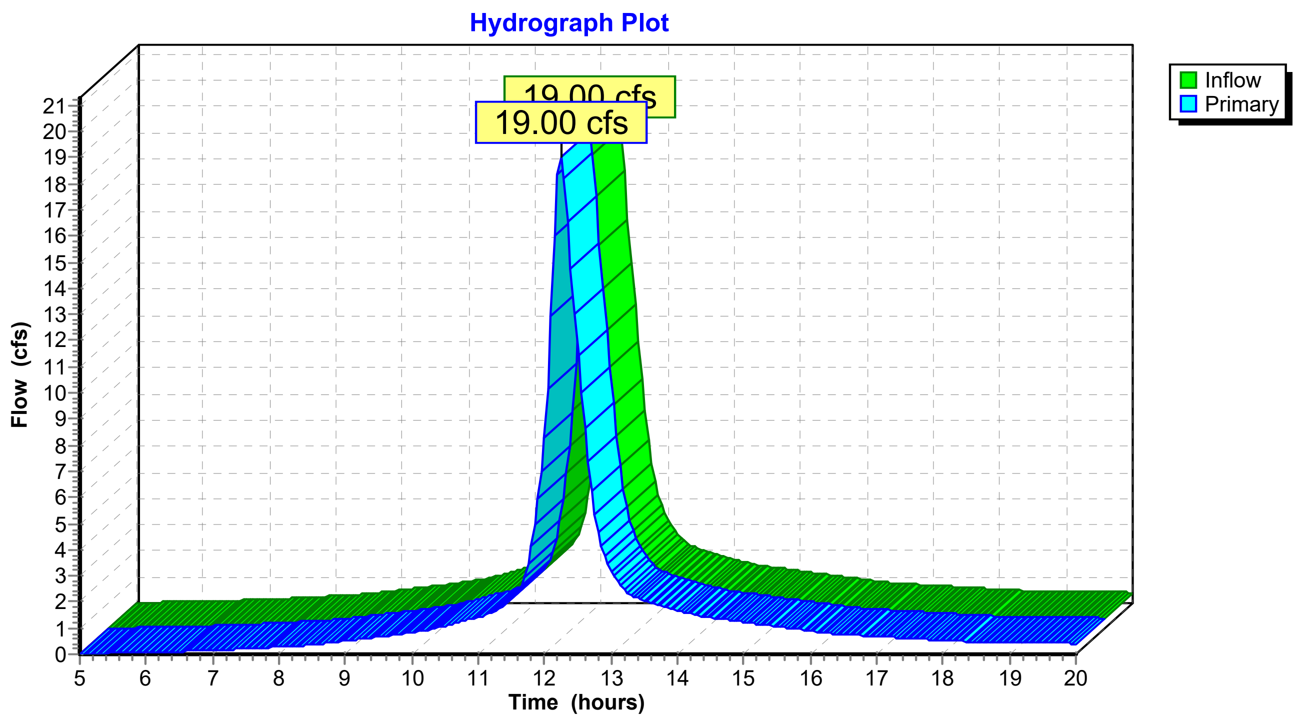
Peak Elev= 414.95' Storage= 41 cf
Plug-Flow detention time= 0.1 min calculated for 1.881 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
412.37	16	0	0
416.47	16	66	66

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	412.37'	**24.0" x 228.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 409.25' S= 0.0137 '/' n= 0.012 Cc= 0.900

Pond CB-19: CB-19



Pond CB-19A: CB-19A

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	7.80 cfs @	12.23 hrs, Volume=	0.748 af
Outflow	=	7.81 cfs @	12.23 hrs, Volume=	0.748 af, Atten= 0%, Lag= 0.1 min
Primary	=	7.81 cfs @	12.23 hrs, Volume=	0.748 af

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

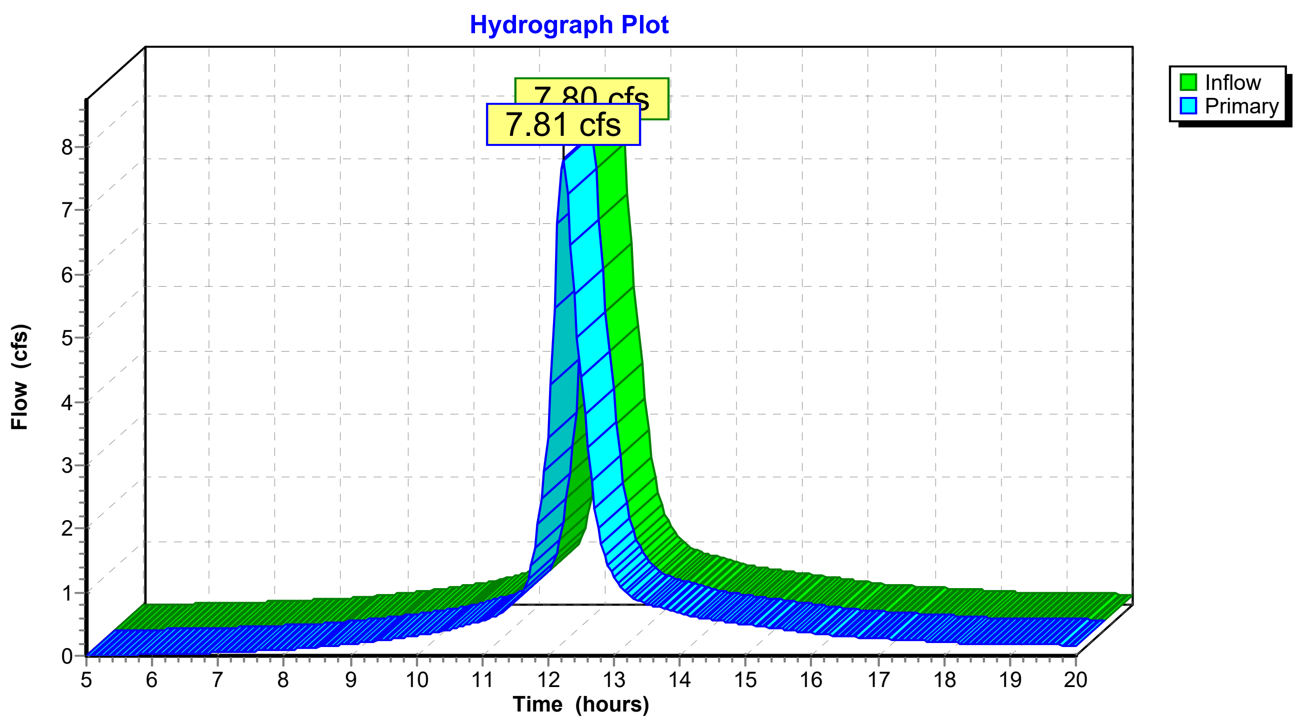
Peak Elev= 416.56' Storage= 25 cf
Plug-Flow detention time= 0.1 min calculated for 0.748 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
414.97	16	0	0
416.64	16	27	27

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	414.97'	**18.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 413.47' S= 0.0625 '/' n= 0.012 Cc= 0.900

Pond CB-19A: CB-19A



Pond CB-2: CB-2

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[80] Warning: Exceeded Pond CB-1 by 0.01' @ 12.10 hrs (0.10 cfs)

Inflow	=	1.28 cfs @	12.09 hrs,	Volume=	0.099 af
Outflow	=	1.28 cfs @	12.09 hrs,	Volume=	0.099 af, Atten= 0%, Lag= 0.1 min
Primary	=	1.28 cfs @	12.09 hrs,	Volume=	0.099 af

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

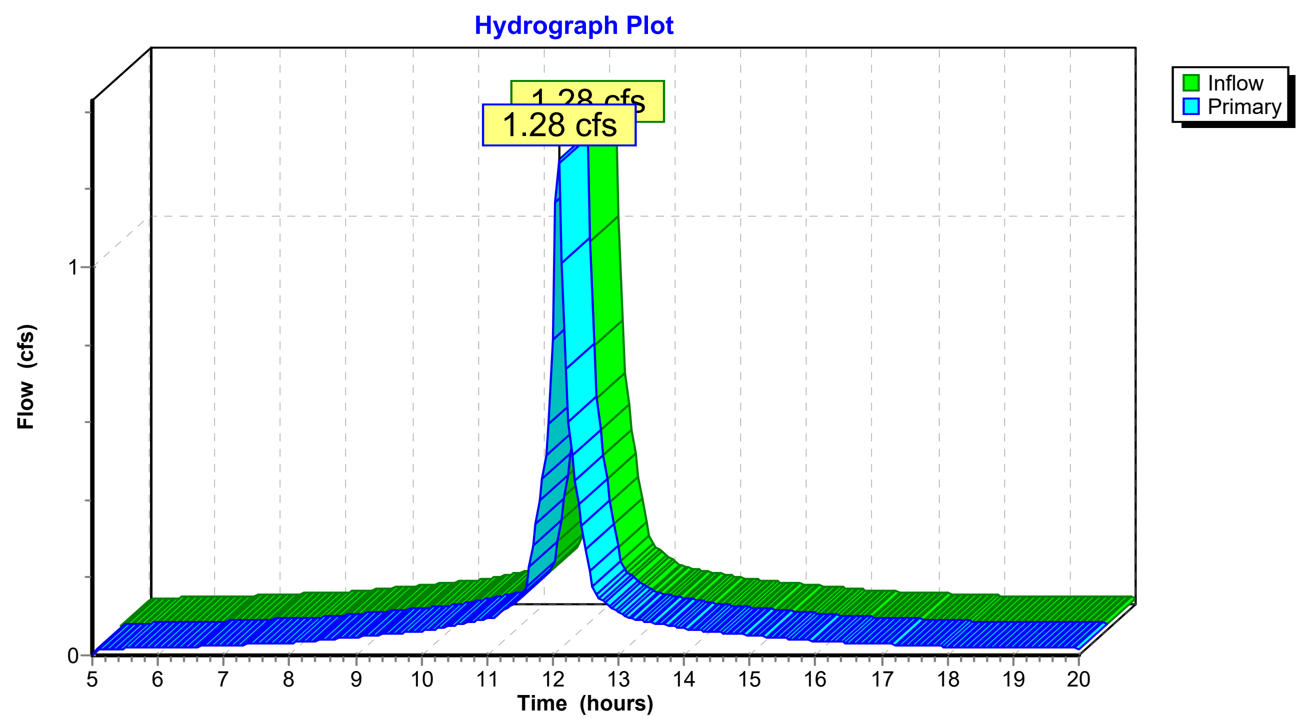
Peak Elev= 358.22' Storage= 10 cf
Plug-Flow detention time= 0.5 min calculated for 0.098 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.63	16	0	0
360.25	16	42	42

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	357.63'	**12.0" x 114.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 354.51' S= 0.0274 '/' n= 0.012 Cc= 0.900

Pond CB-2: CB-2



Pond CB-20: CB-20

[91] Warning: Storage range exceeded by 0.21'
[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-19 Primary device # 1 INLET by 0.59'
[80] Warning: Exceeded Pond CB-20A by 0.75' @ 12.20 hrs (3.28 cfs)

Inflow	=	24.93 cfs @	12.25 hrs, Volume=	2.524 af	
Outflow	=	24.94 cfs @	12.25 hrs, Volume=	2.524 af,	Atten= 0%, Lag= 0.1 min
Primary	=	24.94 cfs @	12.25 hrs, Volume=	2.524 af	

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

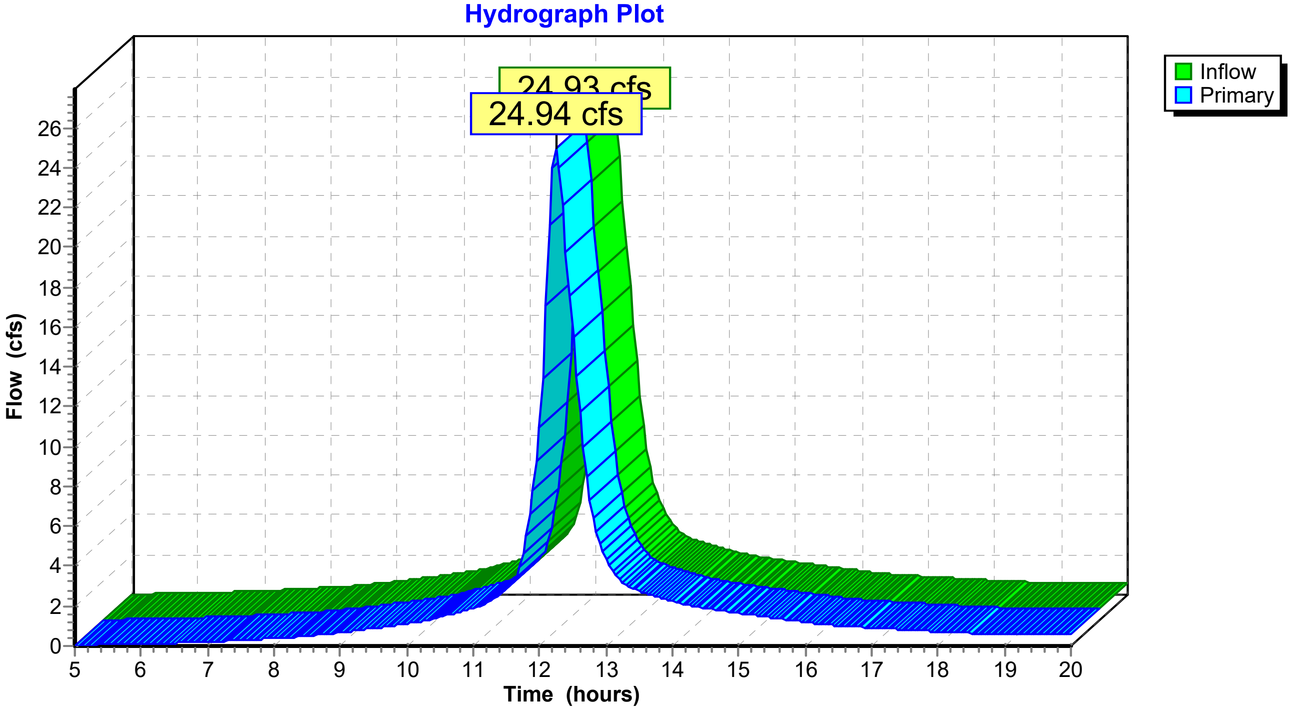
Peak Elev= 412.96' Storage= 59 cf
Plug-Flow detention time= 0.1 min calculated for 2.524 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
409.25	16	0	0
412.75	16	56	56

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	409.25'	**24.0" x 170.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 405.65' S= 0.0212 '/' n= 0.012 Cc= 0.900

Pond CB-20: CB-20



Pond CB-20A: CB-20A

Inflow	=	4.32 cfs @ 12.30 hrs,	Volume=	0.457 af
Outflow	=	4.32 cfs @ 12.30 hrs,	Volume=	0.457 af, Atten= 0%, Lag= 0.2 min
Primary	=	4.32 cfs @ 12.30 hrs,	Volume=	0.457 af

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

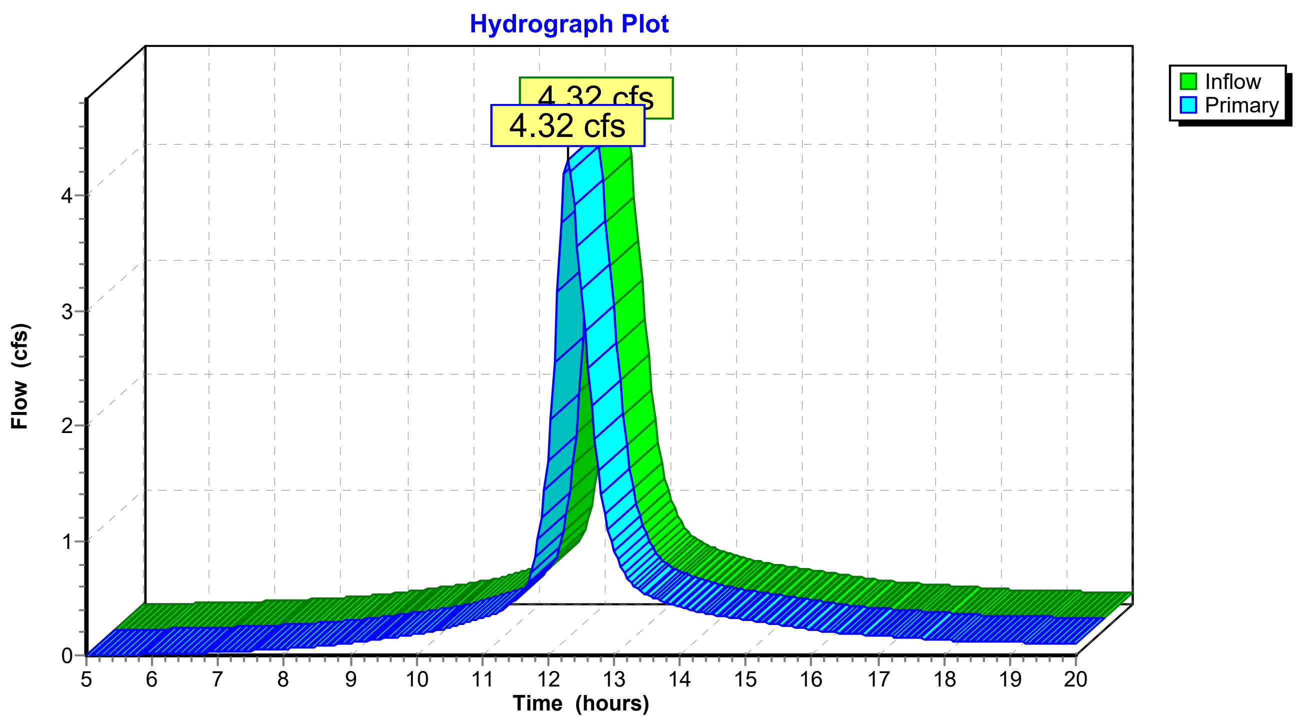
Peak Elev= 412.30' Storage= 29 cf
Plug-Flow detention time= 0.2 min calculated for 0.456 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
410.50	16	0	0
412.75	16	36	36

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	410.50'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 410.25' S= 0.0104 '/' n= 0.012 Cc= 0.900

Pond CB-20A: CB-20A



Pond CB-21: CB-21

[85] Warning: Oscillations may require Finer Routing>1
[79] Warning: Submerged Pond CB-20 Primary device # 1 OUTLET by 3.03'
[80] Warning: Exceeded Pond CB-21A by 0.32' @ 12.25 hrs (4.82 cfs)

Inflow	=	34.25 cfs @	12.25 hrs, Volume=	3.484 af	
Outflow	=	34.25 cfs @	12.25 hrs, Volume=	3.484 af,	Atten= 0%, Lag= 0.0 min
Primary	=	34.25 cfs @	12.25 hrs, Volume=	3.484 af	

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

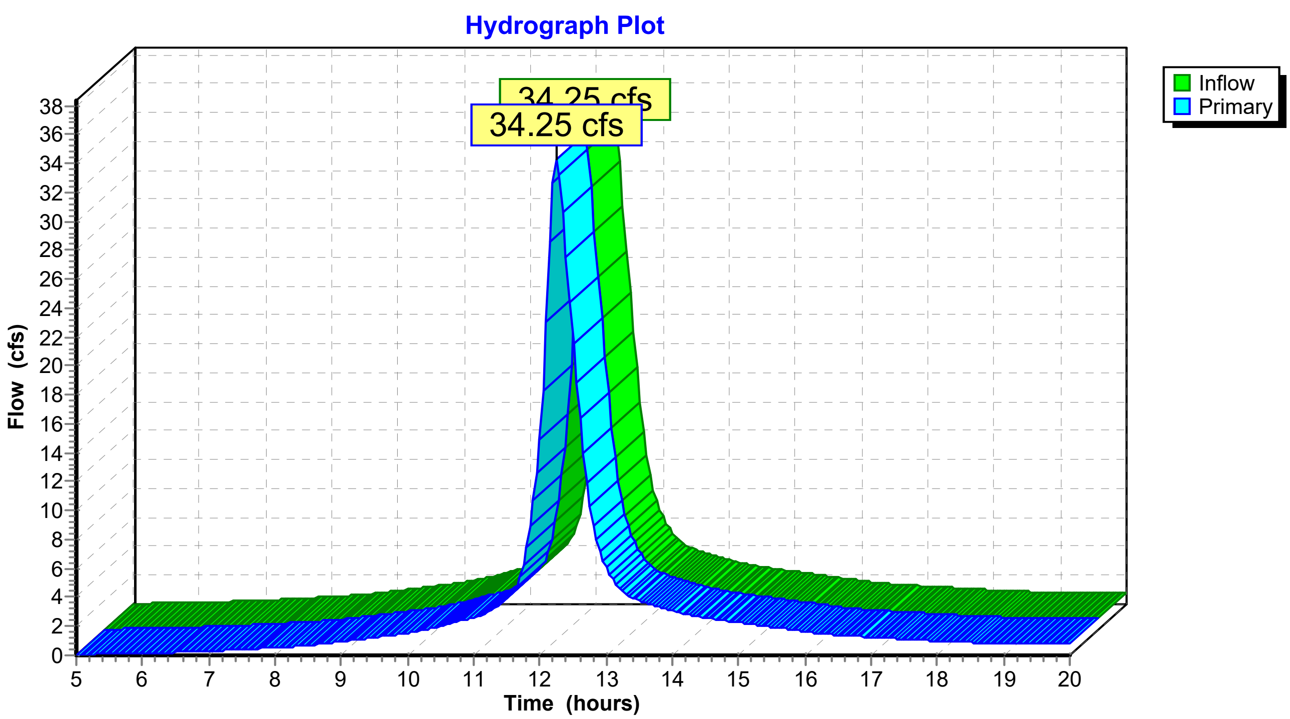
Peak Elev= 408.68' Storage= 54 cf
Plug-Flow detention time= 0.1 min calculated for 3.484 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
405.33	16	0	0
409.63	16	69	69

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	405.33'	**30.0" x 136.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 403.00' S= 0.0171 '/' n= 0.012 Cc= 0.900

Pond CB-21: CB-21



Pond CB-21A: CB-21A

[82] Warning: Early inflow requires earlier time span
[85] Warning: Oscillations may require Finer Routing>1
[79] Warning: Submerged Pond CB-21C Primary device # 1 INLET by 0.14'

Inflow	=	8.11 cfs @	12.27 hrs,	Volume=	0.839 af
Outflow	=	8.11 cfs @	12.27 hrs,	Volume=	0.839 af, Atten= 0%, Lag= 0.1 min
Primary	=	8.11 cfs @	12.27 hrs,	Volume=	0.839 af

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

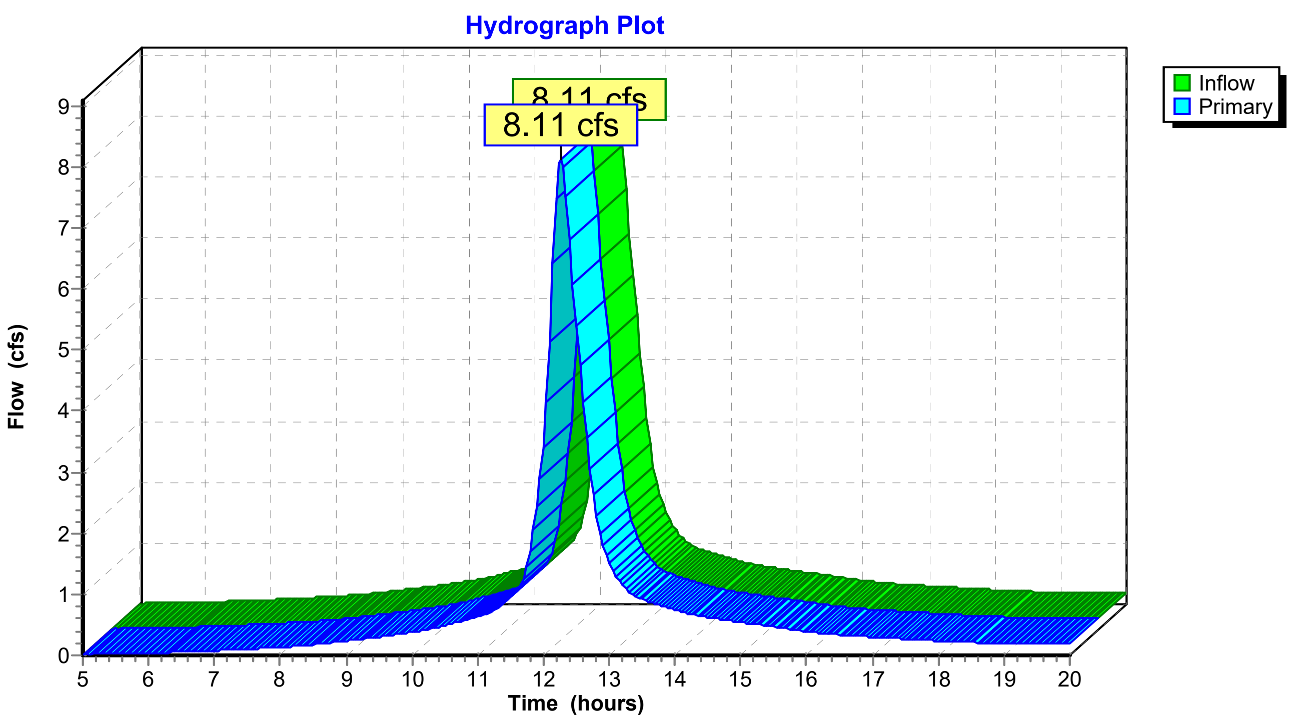
Peak Elev= 408.37' Storage= 27 cf
Plug-Flow detention time= 0.1 min calculated for 0.837 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
406.71	16	0	0
409.71	16	48	48

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	406.71'	**18.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 406.33' S= 0.0158 '/' n= 0.012 Cc= 0.900

Pond CB-21A: CB-21A



Pond CB-21C: CB-21C

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	4.68 cfs @	12.26 hrs, Volume=	0.467 af
Outflow	=	4.69 cfs @	12.26 hrs, Volume=	0.467 af, Atten= 0%, Lag= 0.1 min
Primary	=	4.69 cfs @	12.26 hrs, Volume=	0.467 af

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

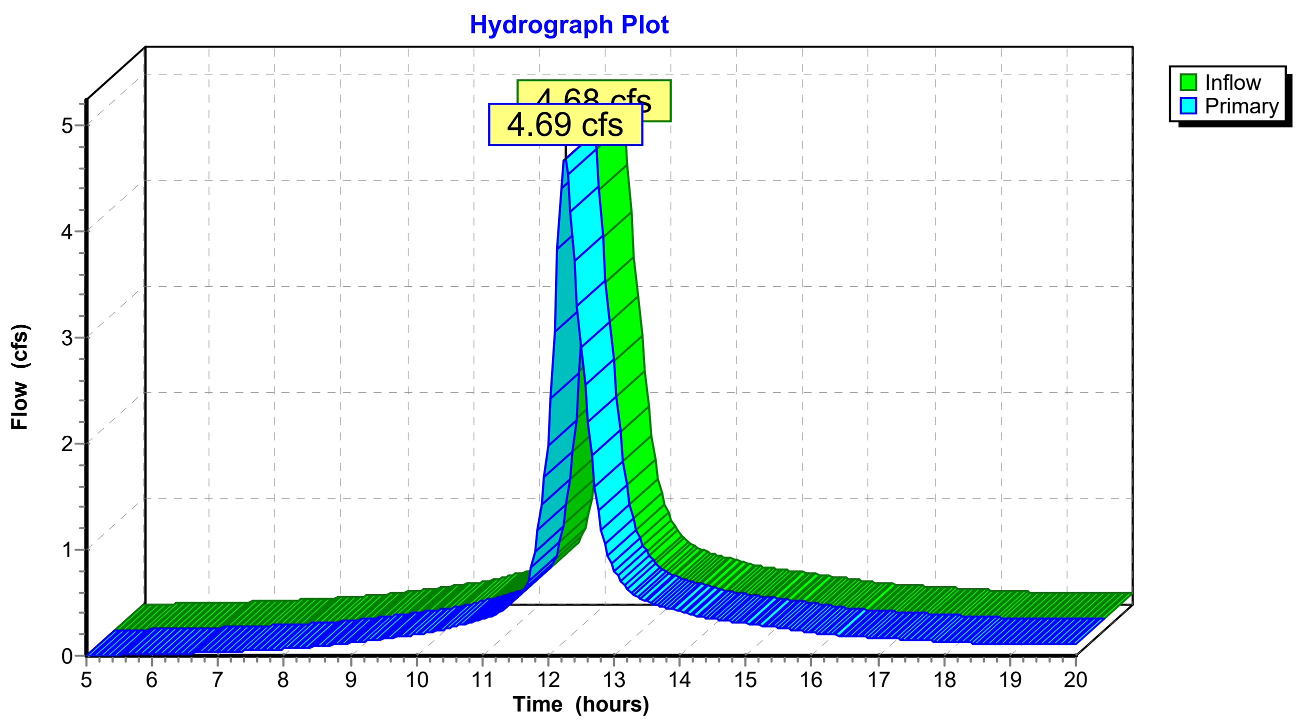
Peak Elev= 410.28' Storage= 33 cf
Plug-Flow detention time= 0.2 min calculated for 0.466 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
408.22	16	0	0
411.22	16	48	48

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	408.22'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 408.10' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-21C: CB-21C



Pond CB-22: CB-22

[79] Warning: Submerged Pond CB-21 Primary device # 1 INLET by 1.15'
[80] Warning: Exceeded Pond CB-22A by 1.59' @ 12.25 hrs (4.27 cfs)

Inflow	=	35.34 cfs @	12.25 hrs, Volume=	3.610 af	
Outflow	=	35.33 cfs @	12.25 hrs, Volume=	3.609 af,	Atten= 0%, Lag= 0.0 min
Primary	=	35.33 cfs @	12.25 hrs, Volume=	3.609 af	

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

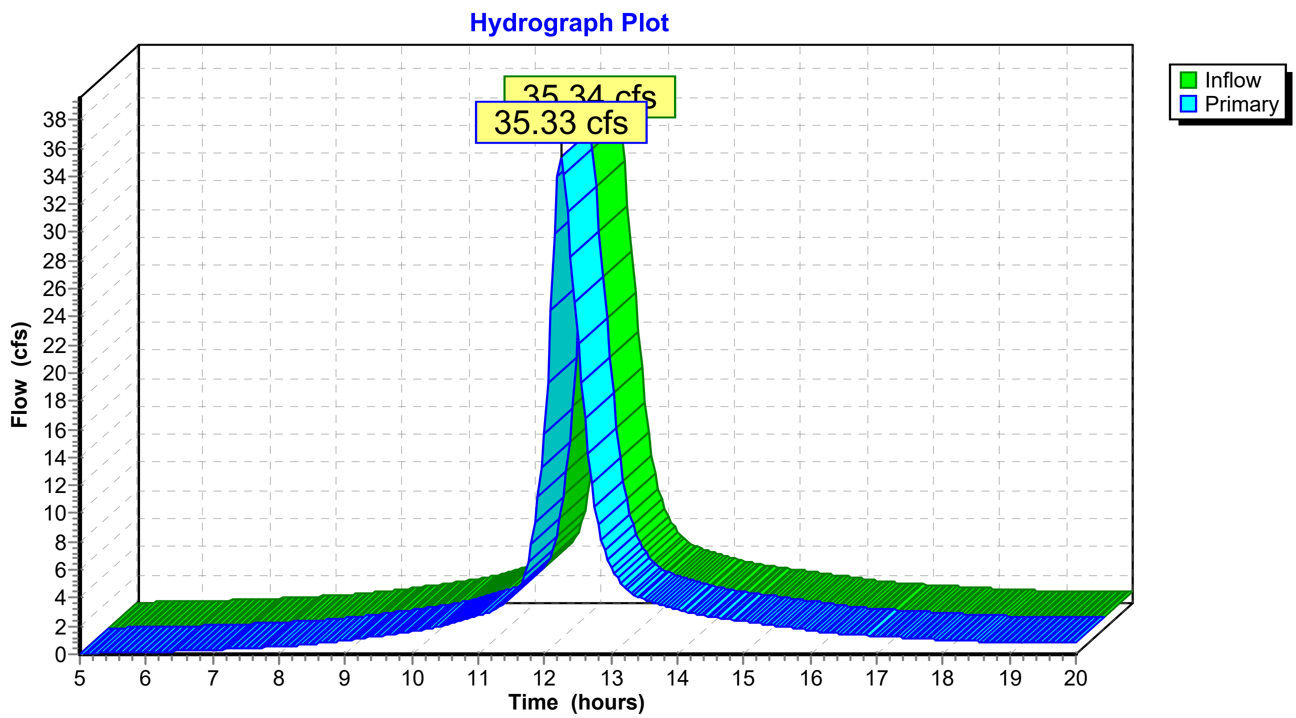
Peak Elev= 406.48' Storage= 56 cf
Plug-Flow detention time= 0.1 min calculated for 3.597 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
403.00	16	0	0
407.16	16	67	67

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	403.00'	**30.0" x 196.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 396.30' S= 0.0342 '/' n= 0.012 Cc= 0.900

Pond CB-22: CB-22



Pond CB-22A: CB-22A

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1

Inflow	=	0.49 cfs @	12.09 hrs,	Volume=	0.036 af
Outflow	=	0.49 cfs @	12.09 hrs,	Volume=	0.036 af, Atten= 0%, Lag= 0.2 min
Primary	=	0.49 cfs @	12.09 hrs,	Volume=	0.036 af

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

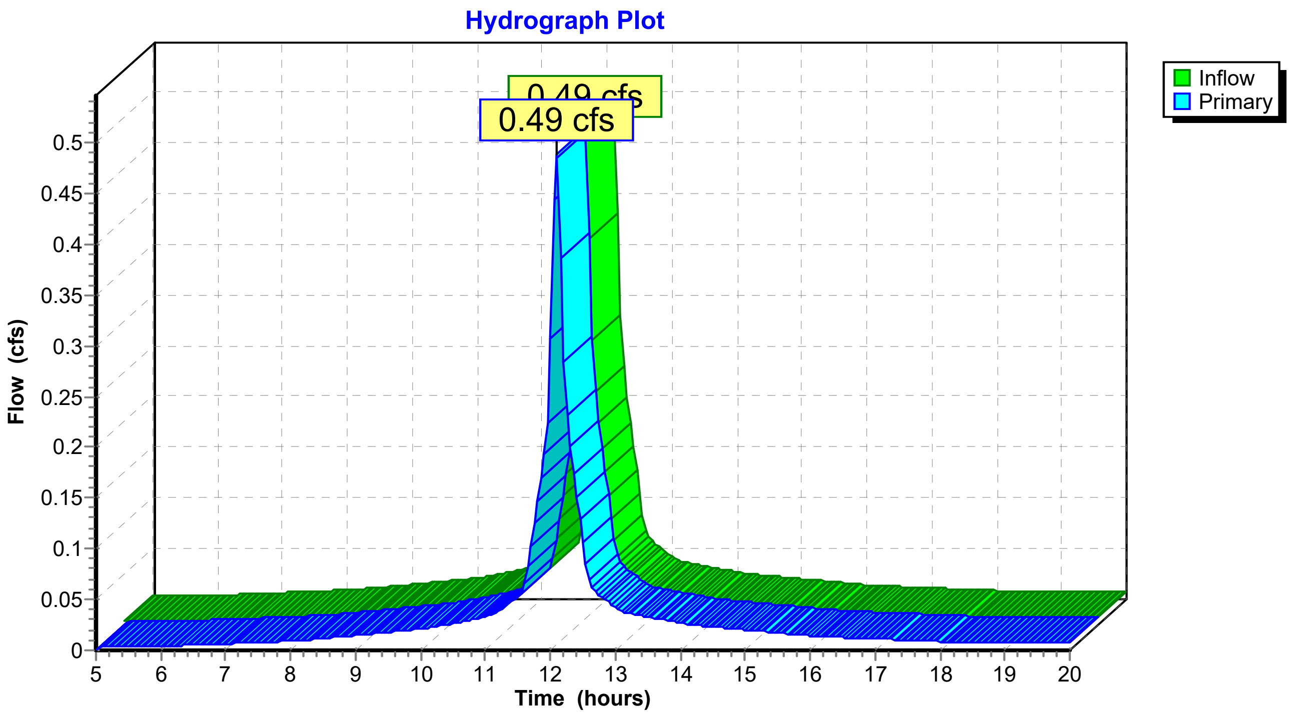
Peak Elev= 405.03' Storage= 7 cf
Plug-Flow detention time= 0.9 min calculated for 0.036 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
404.62	16	0	0
407.20	16	41	41

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	404.62'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 404.50' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-22A: CB-22A



Pond CB-23: CB-23

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-22 Primary device # 1 OUTLET by 3.84'
[80] Warning: Exceeded Pond CB-23A by 1.44' @ 12.25 hrs (4.54 cfs)

Inflow	=	38.01 cfs @	12.24 hrs, Volume=	3.888 af	
Outflow	=	38.02 cfs @	12.24 hrs, Volume=	3.887 af,	Atten= 0%, Lag= 0.0 min
Primary	=	38.02 cfs @	12.24 hrs, Volume=	3.887 af	

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

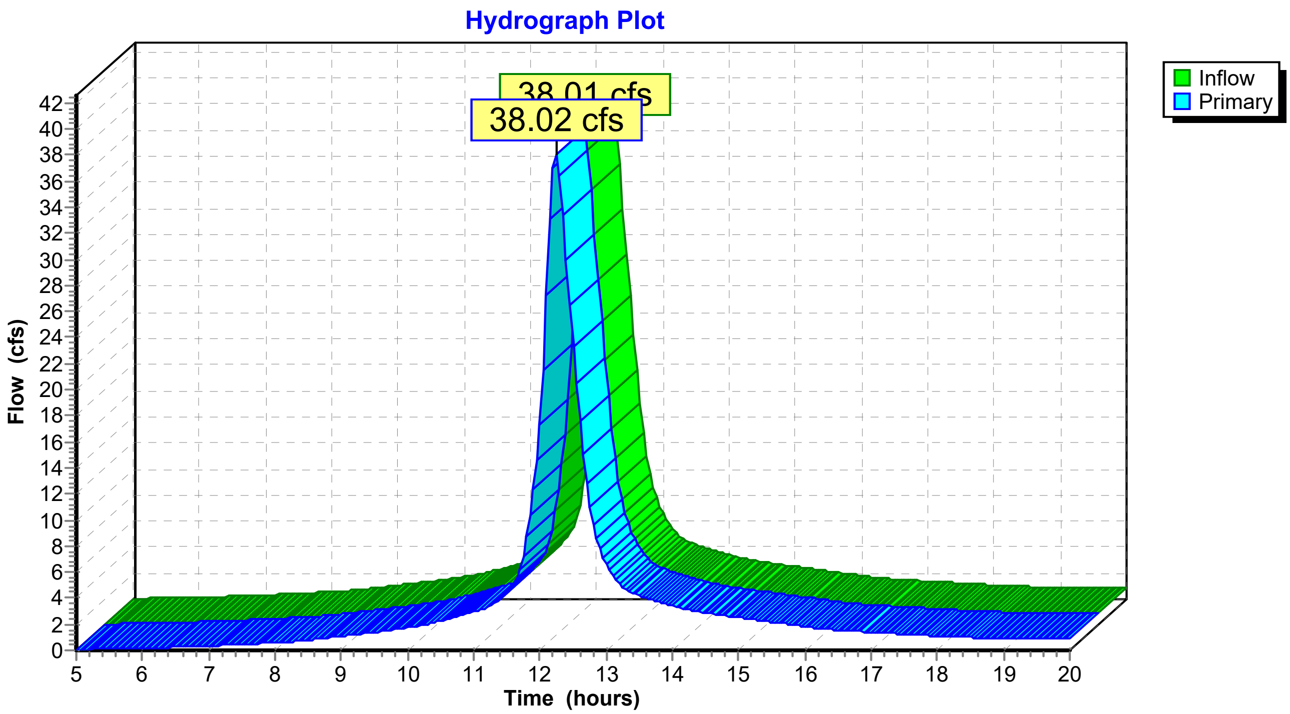
Peak Elev= 400.15' Storage= 61 cf
Plug-Flow detention time= 0.1 min calculated for 3.887 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
396.31	16	0	0
400.43	16	66	66

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	396.31'	**30.0" x 135.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 383.20' S= 0.0971 '/' n= 0.012 Cc= 0.900

Pond CB-23: CB-23



Pond CB-23A: CB-23A

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	1.92 cfs @	12.15 hrs, Volume=	0.157 af
Outflow	=	1.92 cfs @	12.15 hrs, Volume=	0.157 af, Atten= 0%, Lag= 0.1 min
Primary	=	1.92 cfs @	12.15 hrs, Volume=	0.157 af

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

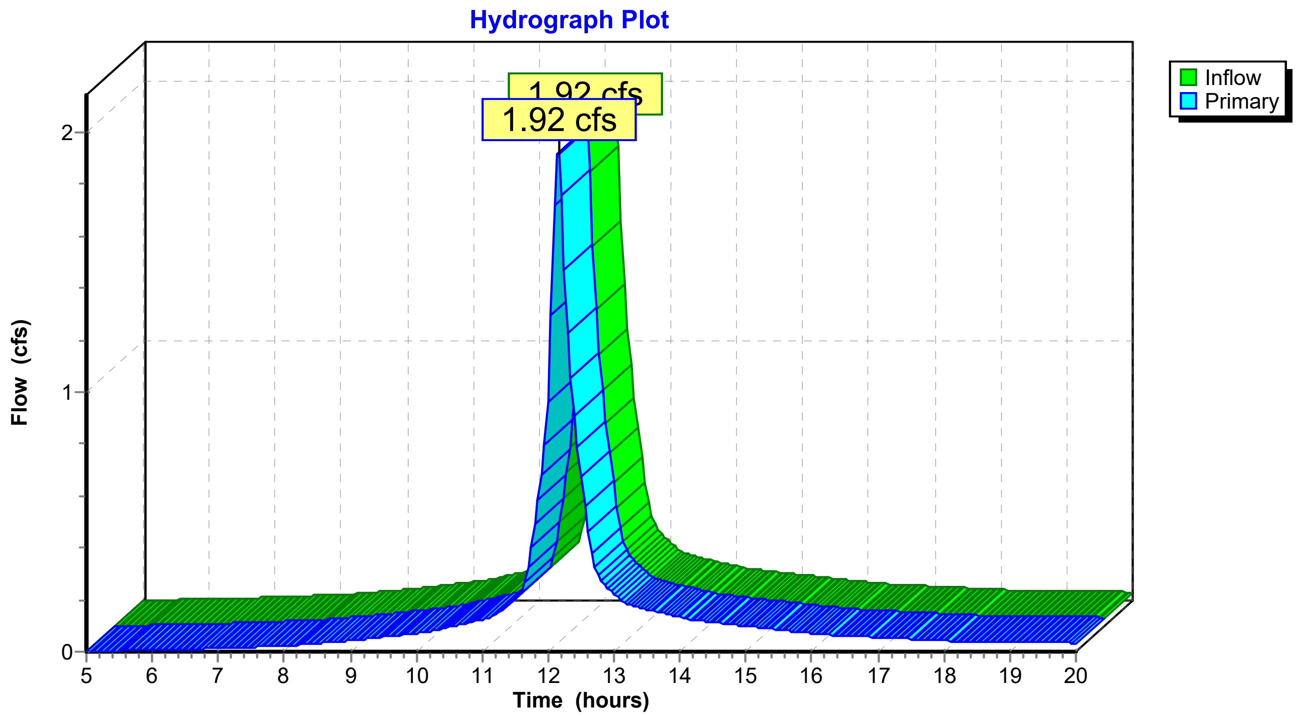
Peak Elev= 398.84' Storage= 15 cf
Plug-Flow detention time= 0.4 min calculated for 0.157 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
397.93	16	0	0
400.43	16	40	40

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	397.93'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 397.81' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-23A: CB-23A



Pond CB-24: CB-24

[82] Warning: Early inflow requires earlier time span

Inflow	=	3.53 cfs @	12.28 hrs, Volume=	0.376 af
Outflow	=	3.52 cfs @	12.28 hrs, Volume=	0.376 af, Atten= 0%, Lag= 0.0 min
Primary	=	3.52 cfs @	12.28 hrs, Volume=	0.376 af

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

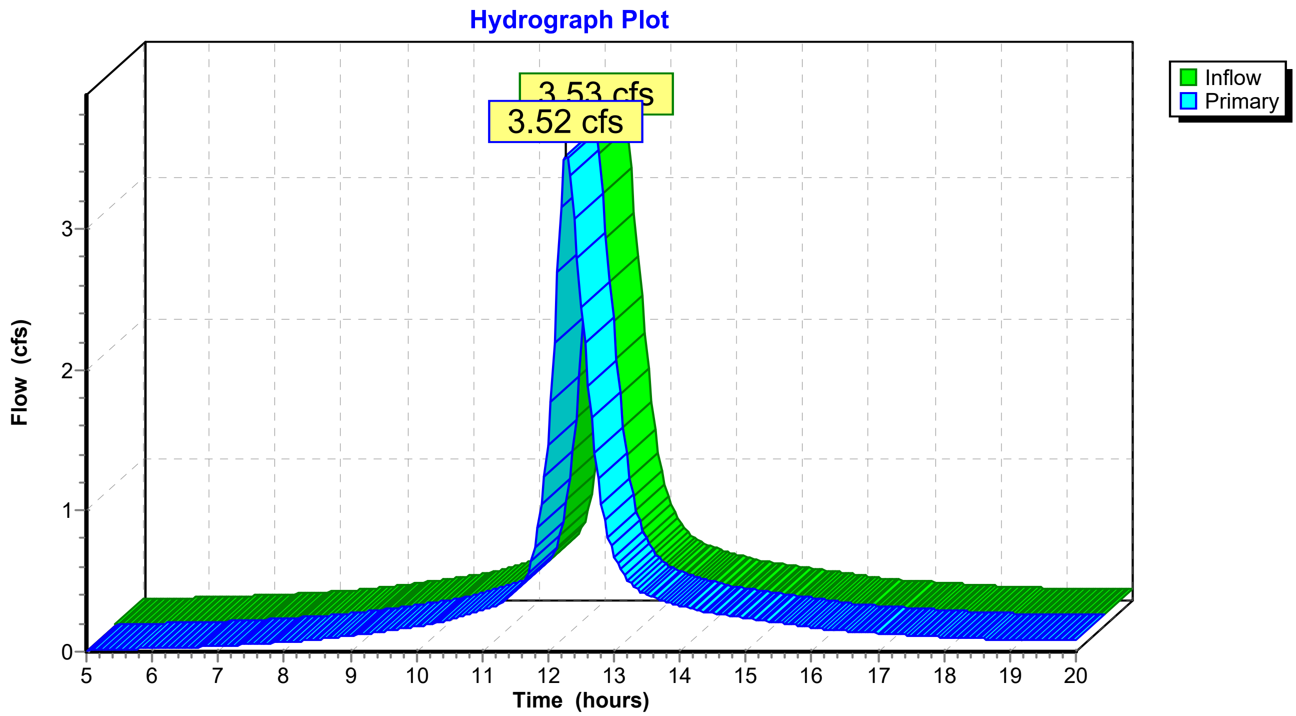
Peak Elev= 425.74' Storage= 26 cf
Plug-Flow detention time= 0.3 min calculated for 0.375 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
424.09	16	0	0
427.50	16	55	55

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	424.09'	**12.0" x 56.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 423.81' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-24: CB-24



Pond CB-25: CB-25

[82] Warning: Early inflow requires earlier time span
[80] Warning: Exceeded Pond CB-25A by 0.58' @ 12.25 hrs (2.87 cfs)

Inflow	=	3.79 cfs @	12.22 hrs,	Volume=	0.386 af	
Outflow	=	3.78 cfs @	12.22 hrs,	Volume=	0.386 af,	Atten= 0%, Lag= 0.4 min
Primary	=	3.78 cfs @	12.22 hrs,	Volume=	0.386 af	

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

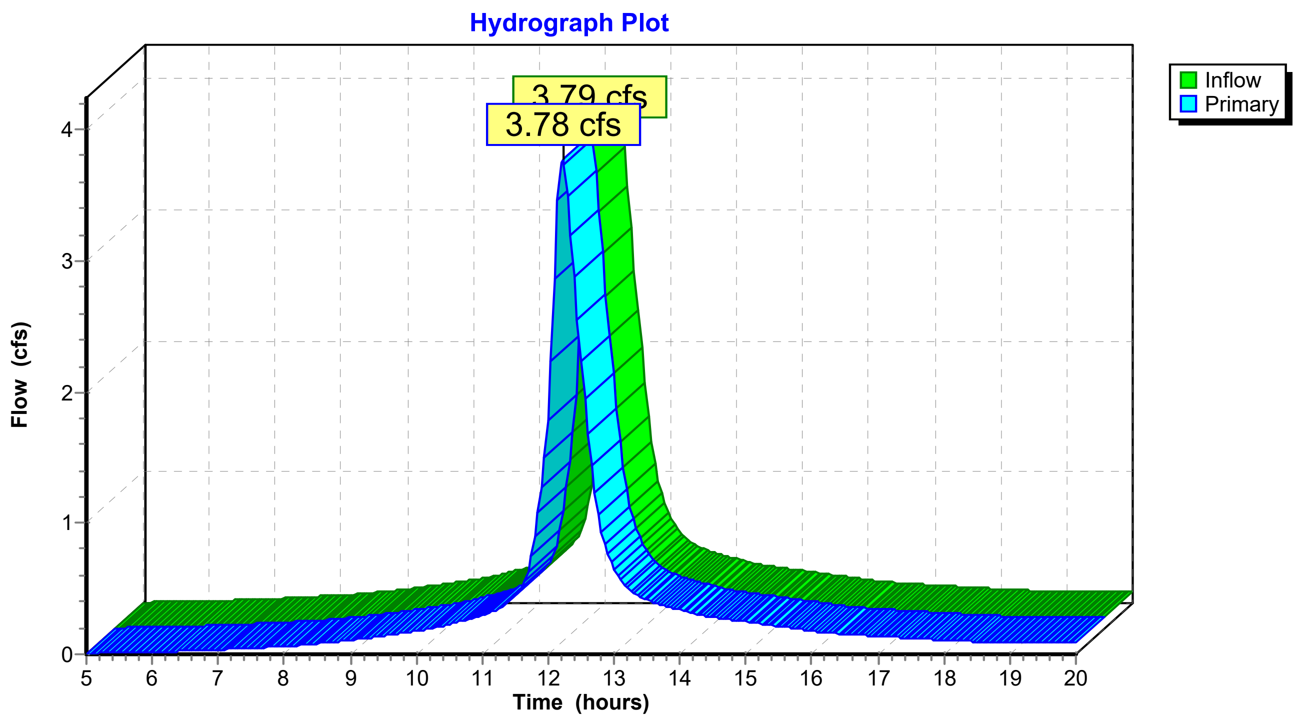
Peak Elev= 429.58' Storage= 26 cf
Plug-Flow detention time= 0.2 min calculated for 0.386 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
427.97	16	0	0
430.59	16	42	42

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	427.97'	**12.0" x 337.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 424.84' S= 0.0093 '/' n= 0.012 Cc= 0.900

Pond CB-25: CB-25



Pond CB-25A: CB-25A

Inflow	=	2.03 cfs @	12.17 hrs,	Volume=	0.176 af
Outflow	=	2.02 cfs @	12.18 hrs,	Volume=	0.176 af, Atten= 0%, Lag= 0.1 min
Primary	=	2.02 cfs @	12.18 hrs,	Volume=	0.176 af

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

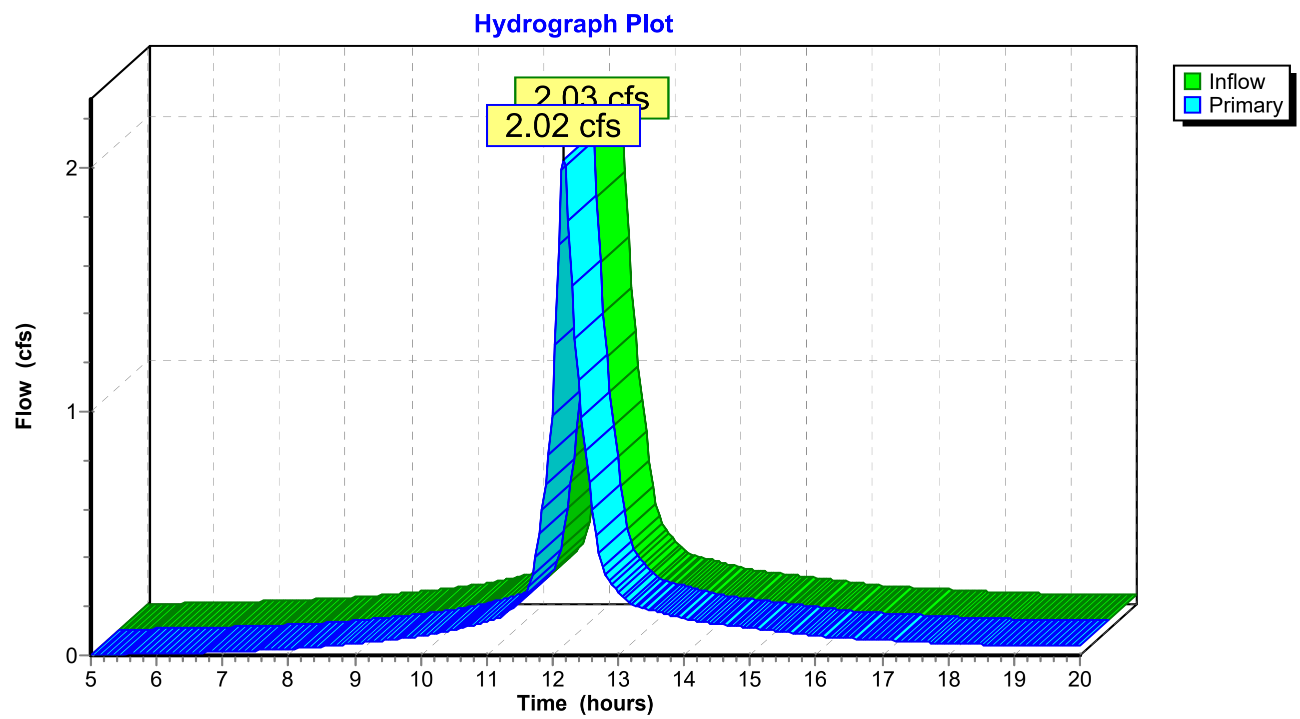
Peak Elev= 429.04' Storage= 15 cf
Plug-Flow detention time= 0.3 min calculated for 0.176 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
428.09	16	0	0
430.59	16	40	40

Primary OutFlow (Free Discharge)
└1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	428.09'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 427.97' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-25A: CB-25A



Pond CB-26: CB-26

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-25 Primary device # 1 OUTLET by 2.12'
[80] Warning: Exceeded Pond CB-26A by 0.83' @ 12.25 hrs (3.45 cfs)

Inflow	=	8.69 cfs @	12.23 hrs, Volume=	0.914 af	
Outflow	=	8.72 cfs @	12.24 hrs, Volume=	0.914 af,	Atten= 0%, Lag= 0.3 min
Primary	=	8.72 cfs @	12.24 hrs, Volume=	0.914 af	

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

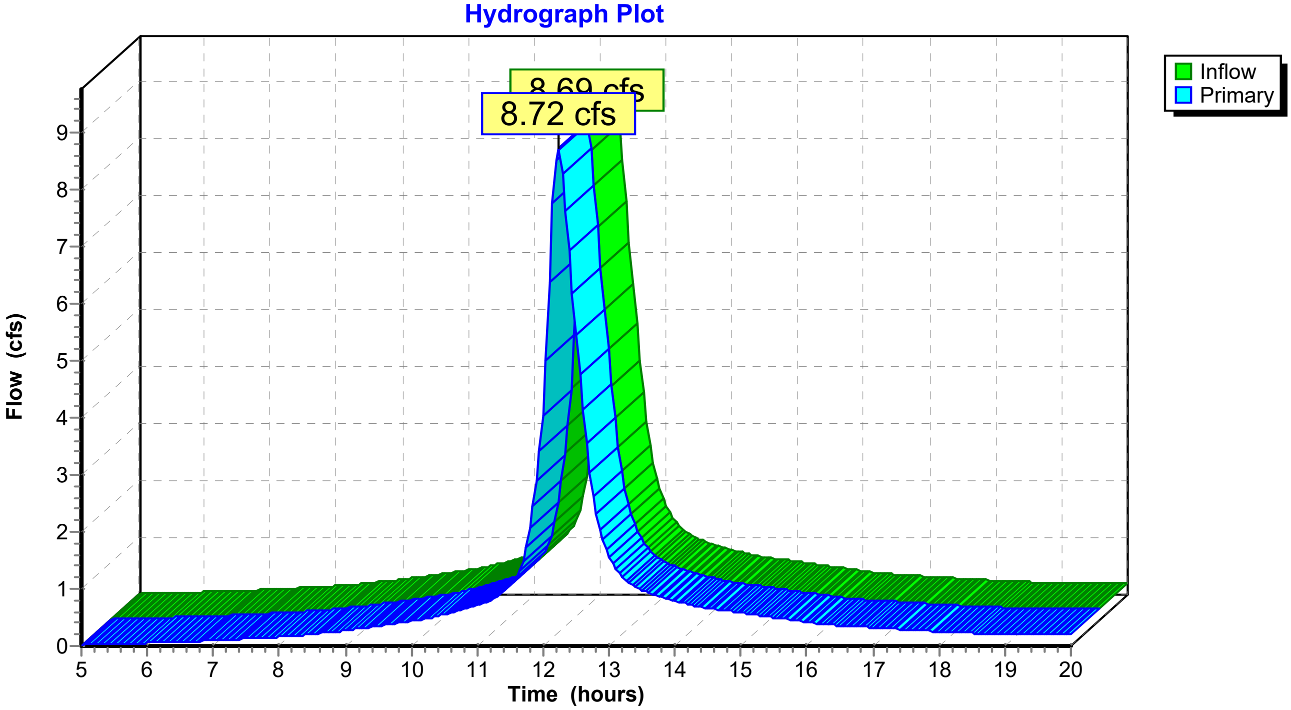
Peak Elev= 426.98' Storage= 34 cf
Plug-Flow detention time= 0.2 min calculated for 0.911 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
424.83	16	0	0
427.83	16	48	48

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	424.83'	**18.0" x 132.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 424.12' S= 0.0054 '/' n= 0.012 Cc= 0.900

Pond CB-26: CB-26



Pond CB-26A: CB-26A

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	2.29 cfs @	12.19 hrs, Volume=	0.207 af
Outflow	=	2.29 cfs @	12.19 hrs, Volume=	0.207 af, Atten= 0%, Lag= 0.1 min
Primary	=	2.29 cfs @	12.19 hrs, Volume=	0.207 af

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

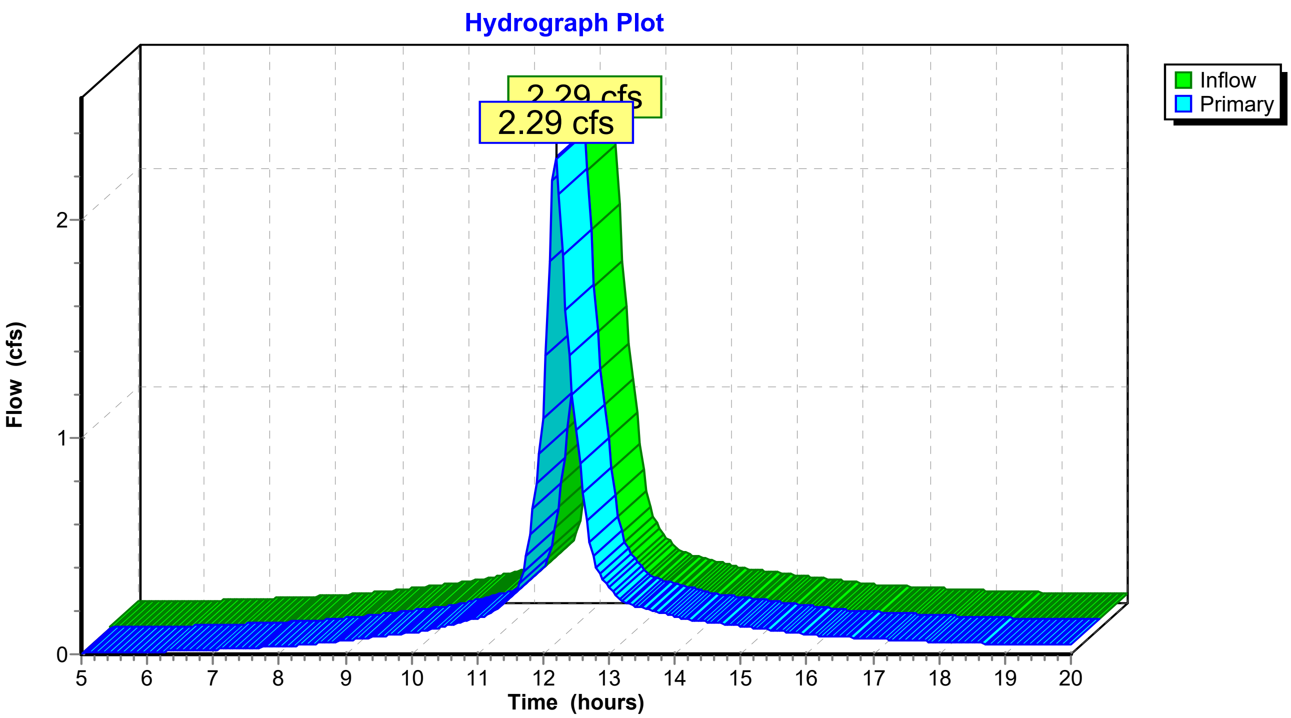
Peak Elev= 426.18' Storage= 14 cf
Plug-Flow detention time= 0.3 min calculated for 0.207 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
425.31	16	0	0
427.81	16	40	40

Primary OutFlow (Free Discharge)
└1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	425.31'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 424.83' S= 0.0200 '/' n= 0.012 Cc= 0.900

Pond CB-26A: CB-26A



Pond CB-27A: CB-27A

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	0.46 cfs @	12.09 hrs, Volume=	0.033 af
Outflow	=	0.46 cfs @	12.09 hrs, Volume=	0.033 af, Atten= 0%, Lag= 0.1 min
Primary	=	0.46 cfs @	12.09 hrs, Volume=	0.033 af

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

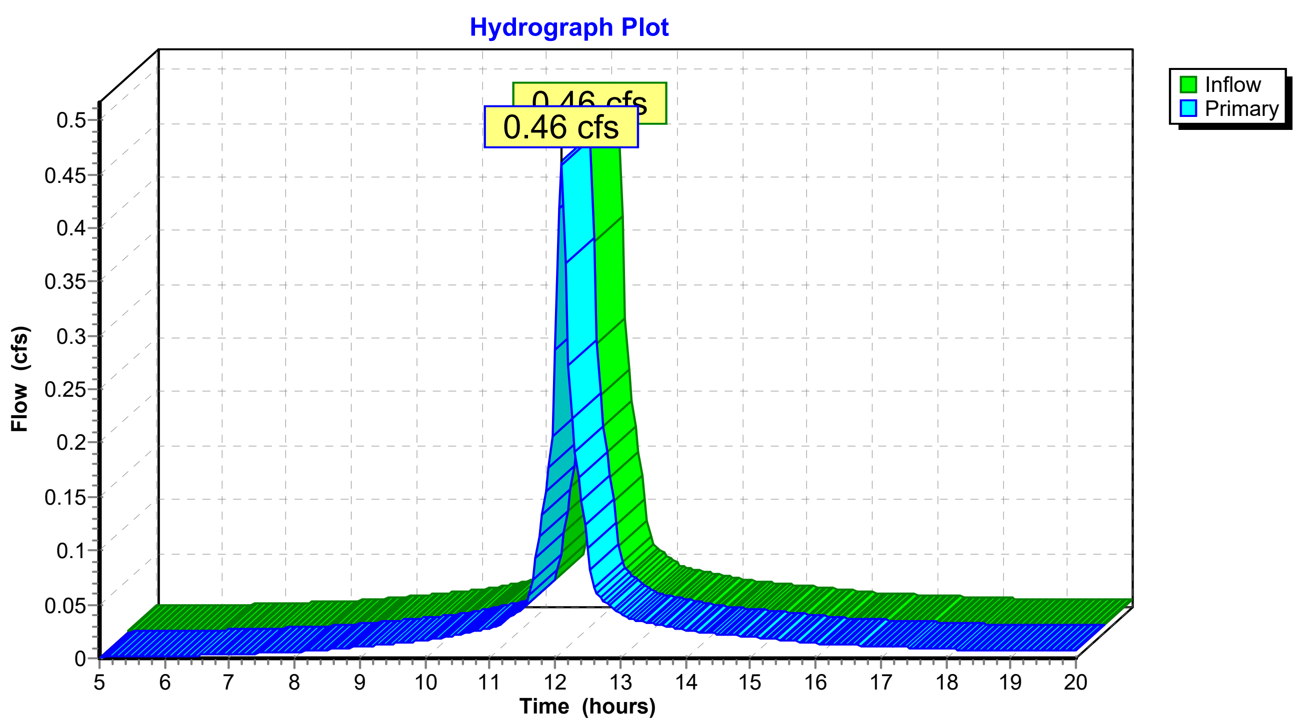
Peak Elev= 424.95' Storage= 5 cf
Plug-Flow detention time= 0.7 min calculated for 0.033 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
424.61	16	0	0
427.11	16	40	40

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	424.61'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 423.61' S= 0.0417 '/' n= 0.012 Cc= 0.900

Pond CB-27A: CB-27A



Pond CB-27B: CB-27.B

[85] Warning: Oscillations may require Finer Routing>1
[79] Warning: Submerged Pond CB-26 Primary device # 1 INLET by 0.92'
[80] Warning: Exceeded Pond CB-27A by 0.91' @ 12.25 hrs (3.02 cfs)

Inflow	=	10.06 cfs @	12.23 hrs,	Volume=	1.056 af
Outflow	=	10.06 cfs @	12.23 hrs,	Volume=	1.056 af, Atten= 0%, Lag= 0.1 min
Primary	=	10.06 cfs @	12.23 hrs,	Volume=	1.056 af

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

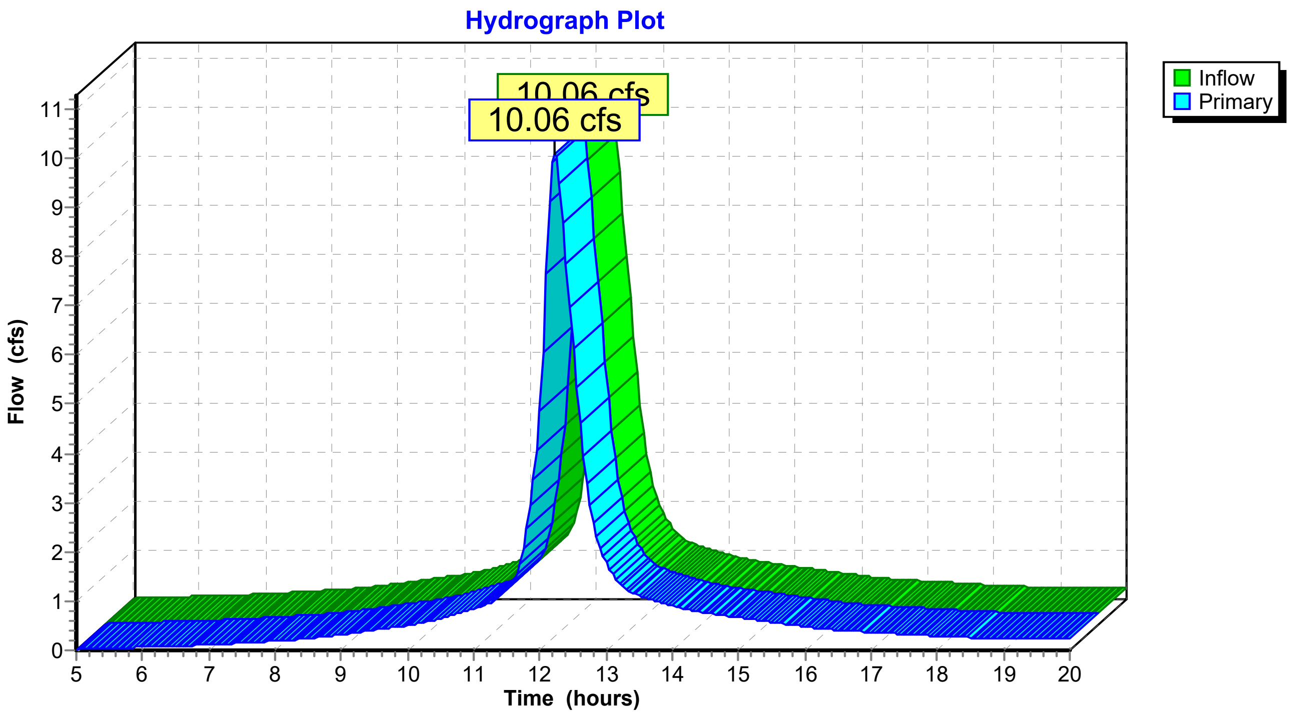
Peak Elev= 425.76' Storage= 34 cf
Plug-Flow detention time= 0.1 min calculated for 1.052 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
423.61	16	0	0
427.11	16	56	56

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	423.61'	**18.0" x 84.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 420.95' S= 0.0317 '/' n= 0.012 Cc= 0.900

Pond CB-27B: CB-27.B



Pond CB-28: CB-28

[88] Warning: Qout>Qin may require Finer Routing>1
[80] Warning: Exceeded Pond CB-28A by 0.50' @ 12.25 hrs (6.02 cfs)

Inflow	=	12.79 cfs @	12.23 hrs,	Volume=	1.335 af
Outflow	=	12.79 cfs @	12.23 hrs,	Volume=	1.335 af, Atten= 0%, Lag= 0.1 min
Primary	=	12.79 cfs @	12.23 hrs,	Volume=	1.335 af

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

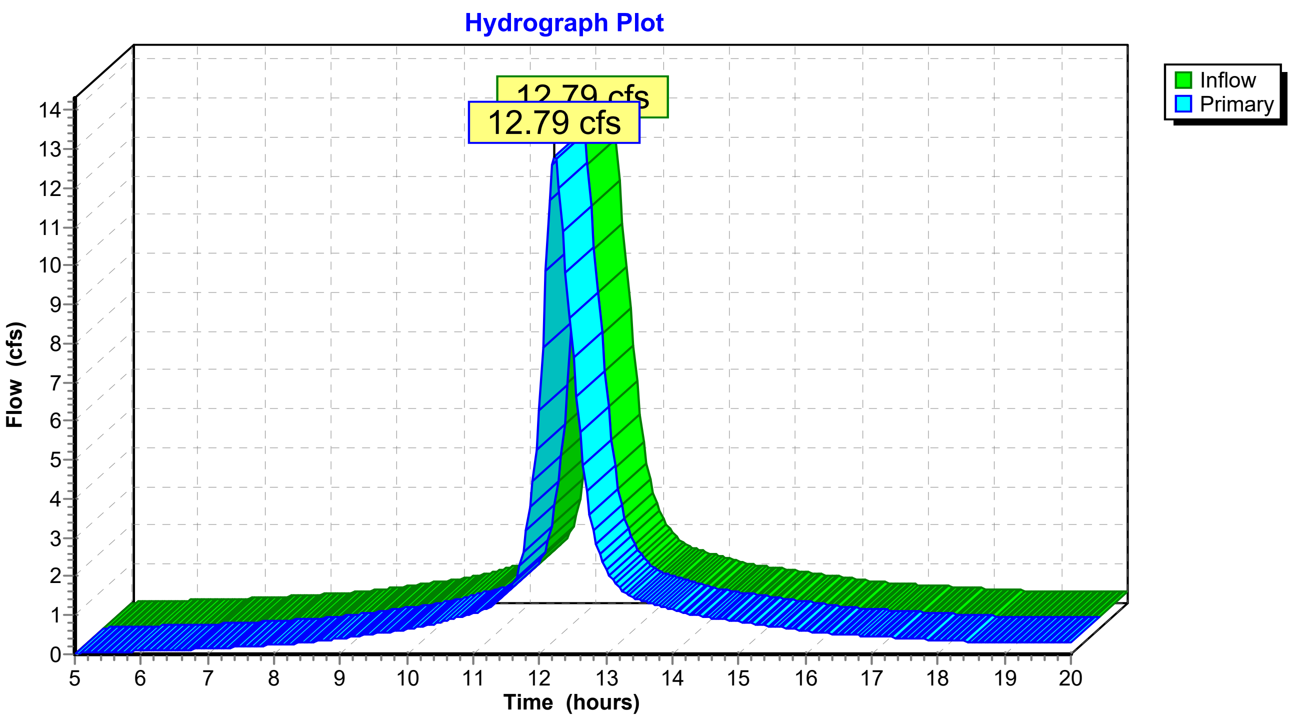
Peak Elev= 423.84' Storage= 48 cf
Plug-Flow detention time= 0.1 min calculated for 1.335 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.83	16	0	0
424.45	16	58	58

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	420.83'	**18.0" x 16.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 420.75' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-28: CB-28



Pond CB-28A: CB-28A

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-27B Primary device # 1 OUTLET by 2.37'

Inflow	=	10.34 cfs @	12.23 hrs,	Volume=	1.098 af
Outflow	=	10.35 cfs @	12.23 hrs,	Volume=	1.098 af, Atten= 0%, Lag= 0.1 min
Primary	=	10.35 cfs @	12.23 hrs,	Volume=	1.098 af

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

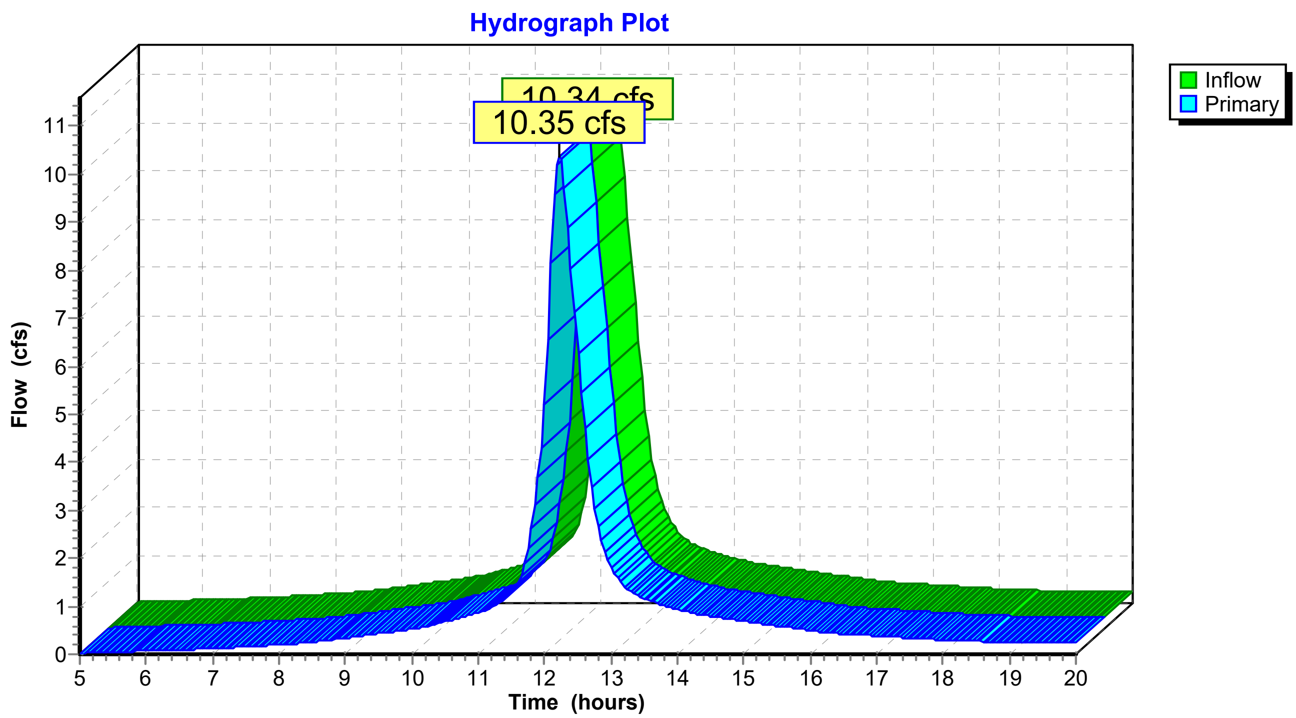
Peak Elev= 423.33' Storage= 38 cf
Plug-Flow detention time= 0.1 min calculated for 1.094 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.95	16	0	0
424.45	16	56	56

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	420.95'	**18.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 420.83' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-28A: CB-28A



Pond CB-3: CB-3

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-2 Primary device # 1 OUTLET by 1.08'

Inflow	=	2.46 cfs @	12.09 hrs,	Volume=	0.190 af
Outflow	=	2.46 cfs @	12.09 hrs,	Volume=	0.190 af, Atten= 0%, Lag= 0.1 min
Primary	=	2.46 cfs @	12.09 hrs,	Volume=	0.190 af

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

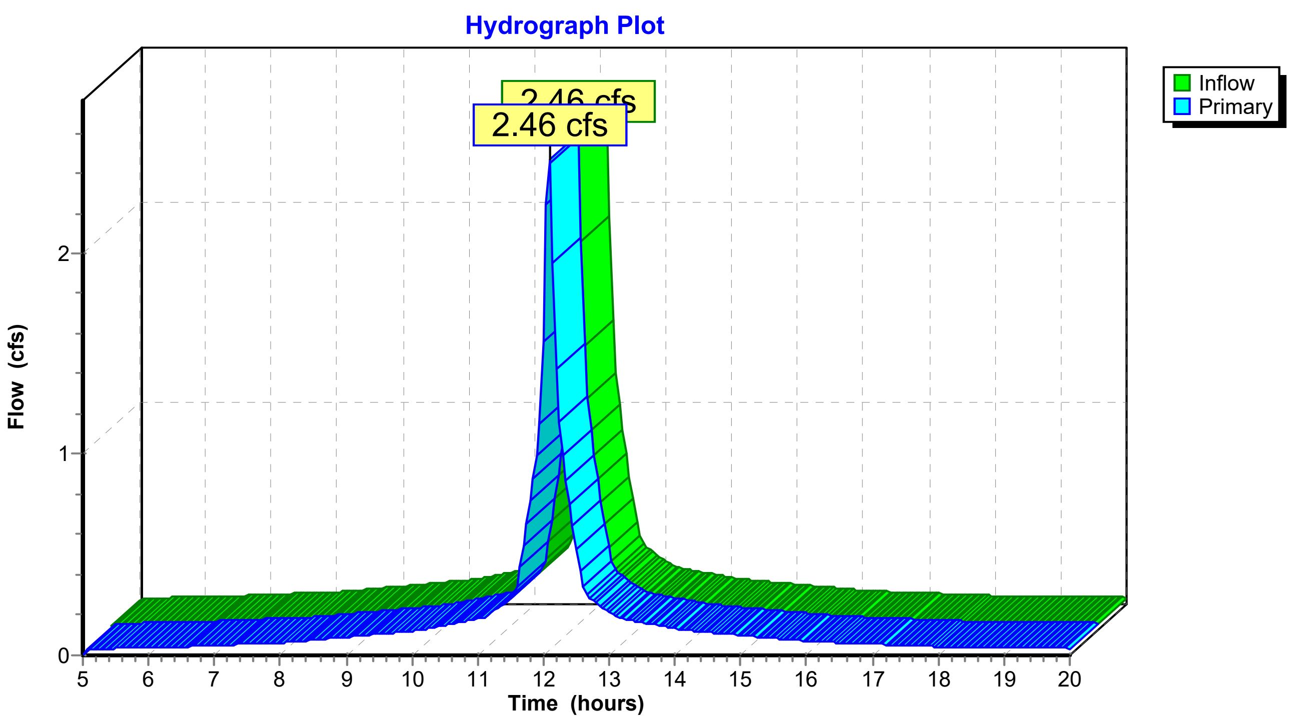
Peak Elev= 355.60' Storage= 18 cf
Plug-Flow detention time= 0.5 min calculated for 0.190 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
354.50	16	0	0
357.50	16	48	48

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	354.50'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 354.38' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-3: CB-3



Pond CB-4: CB-4

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[80] Warning: Exceeded Pond CB-3 by 0.39' @ 12.10 hrs (2.38 cfs)

Inflow	=	3.67 cfs @	12.09 hrs, Volume=	0.284 af	
Outflow	=	3.69 cfs @	12.09 hrs, Volume=	0.284 af,	Atten= 0%, Lag= 0.1 min
Primary	=	3.69 cfs @	12.09 hrs, Volume=	0.284 af	

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

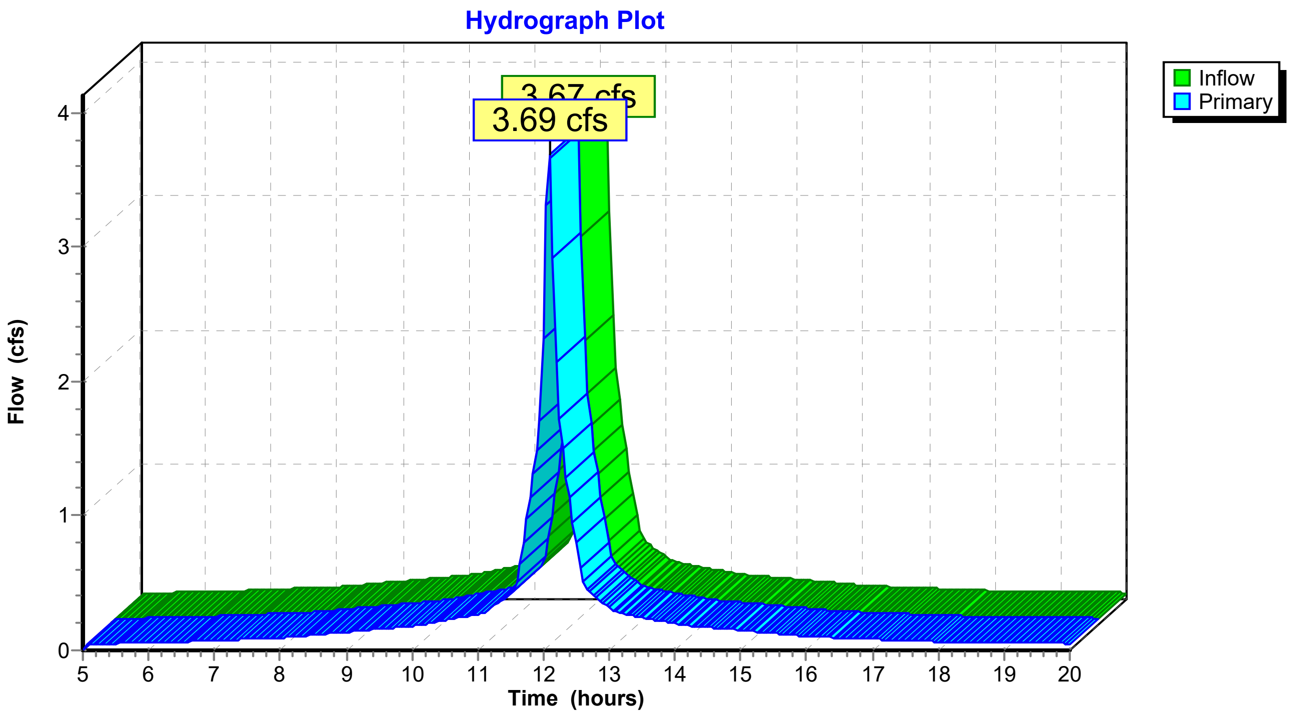
Peak Elev= 355.99' Storage= 26 cf
Plug-Flow detention time= 0.4 min calculated for 0.284 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
354.38	16	0	0
357.50	16	50	50

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	354.38'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 354.26' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-4: CB-4



Pond CB-6: CB-6

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1

Inflow	=	4.30 cfs @	12.23 hrs,	Volume=	0.417 af
Outflow	=	4.30 cfs @	12.23 hrs,	Volume=	0.417 af, Atten= 0%, Lag= 0.2 min
Primary	=	4.30 cfs @	12.23 hrs,	Volume=	0.417 af

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

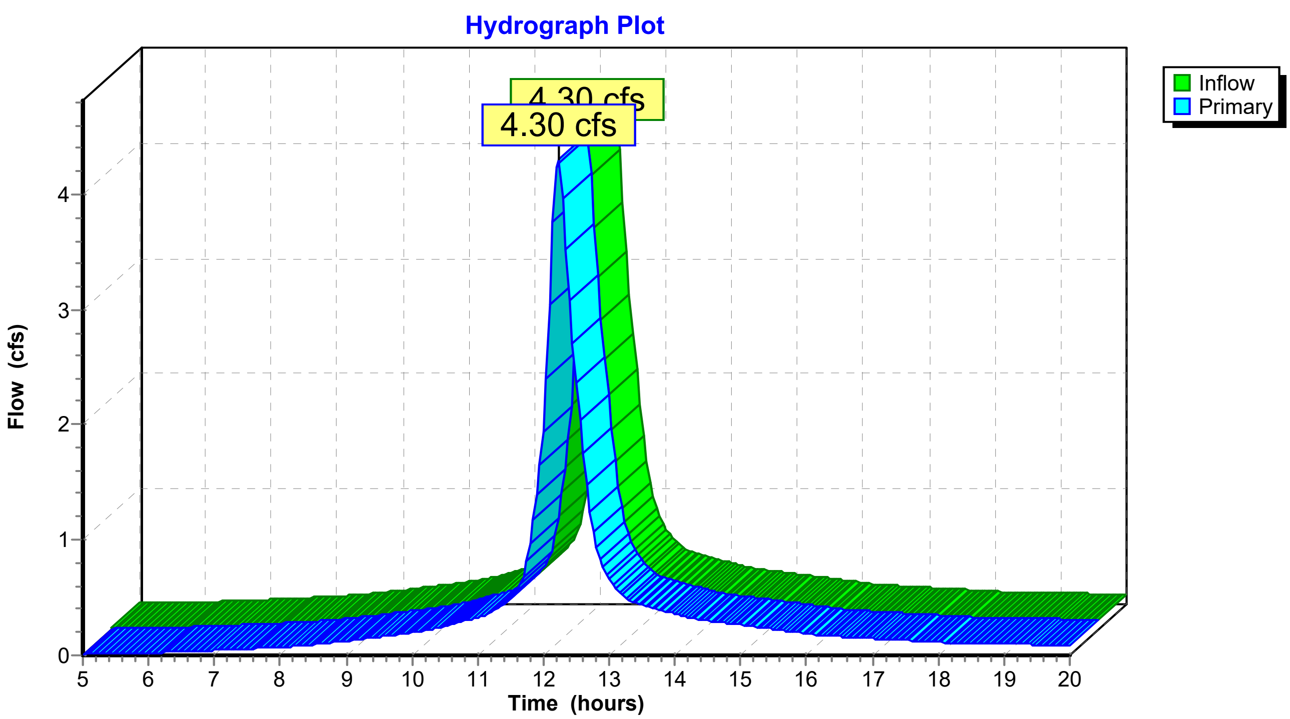
Peak Elev= 384.96' Storage= 29 cf
Plug-Flow detention time= 0.2 min calculated for 0.416 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
383.17	16	0	0
385.27	16	34	34

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	383.17'	**12.0" x 390.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 0.00' S= 0.9825 '/' n= 0.017 Cc= 0.900

Pond CB-6: CB-6



Pond CB-7: CB-7

[85] Warning: Oscillations may require Finer Routing>1
[79] Warning: Submerged Pond CB-6 Primary device # 1 OUTLET by 378.62'
[80] Warning: Exceeded Pond CB-7A by 0.53' @ 12.25 hrs (2.75 cfs)

Inflow	=	9.47 cfs @	12.26 hrs,	Volume=	0.974 af
Outflow	=	9.46 cfs @	12.26 hrs,	Volume=	0.974 af, Atten= 0%, Lag= 0.1 min
Primary	=	9.46 cfs @	12.26 hrs,	Volume=	0.974 af

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

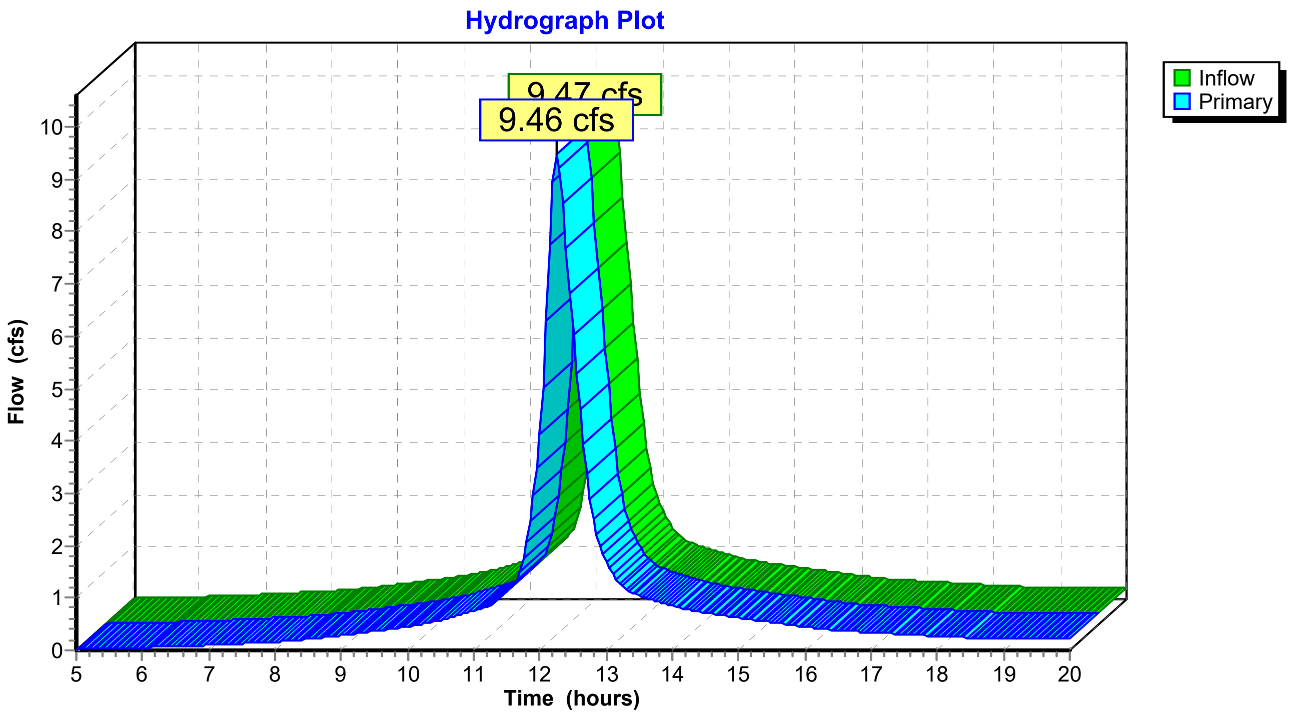
Peak Elev= 378.63' Storage= 32 cf
Plug-Flow detention time= 0.1 min calculated for 0.971 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
376.64	16	0	0
379.64	16	48	48

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	376.64'	**18.0" x 160.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 373.76' S= 0.0180 '/' n= 0.012 Cc= 0.900

Pond CB-7: CB-7



Pond CB-7A: CB-7A

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require Finer Routing>1

Inflow	=	2.61 cfs @	12.29 hrs,	Volume=	0.277 af
Outflow	=	2.61 cfs @	12.29 hrs,	Volume=	0.277 af, Atten= 0%, Lag= 0.1 min
Primary	=	2.61 cfs @	12.29 hrs,	Volume=	0.277 af

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

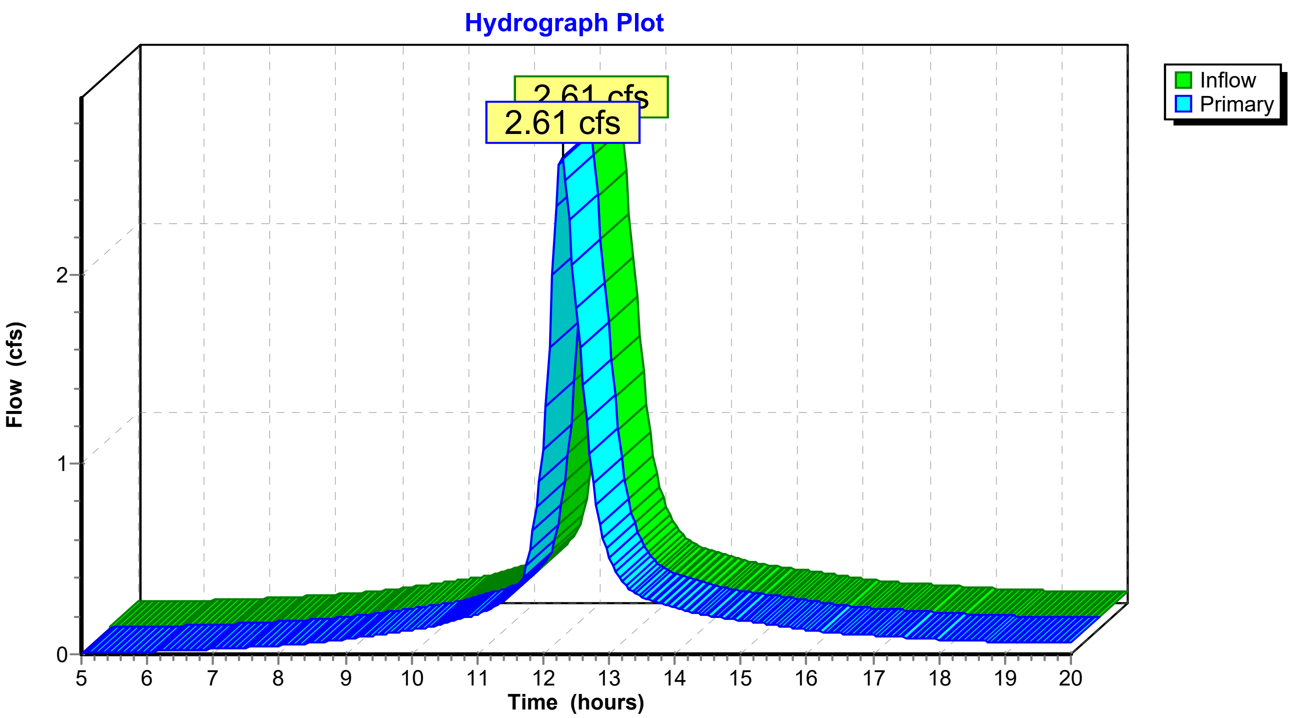
Peak Elev= 378.11' Storage= 16 cf
Plug-Flow detention time= 0.3 min calculated for 0.276 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
377.14	16	0	0
379.64	16	40	40

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	377.14'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 376.64' S= 0.0208 '/' n= 0.012 Cc= 0.900

Pond CB-7A: CB-7A



Pond CB-9: CB-9

[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-9A Primary device # 1 INLET by 0.20'

Inflow	=	15.87 cfs @	12.24 hrs,	Volume=	1.596 af
Outflow	=	15.87 cfs @	12.24 hrs,	Volume=	1.596 af, Atten= 0%, Lag= 0.0 min
Primary	=	15.87 cfs @	12.24 hrs,	Volume=	1.596 af

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

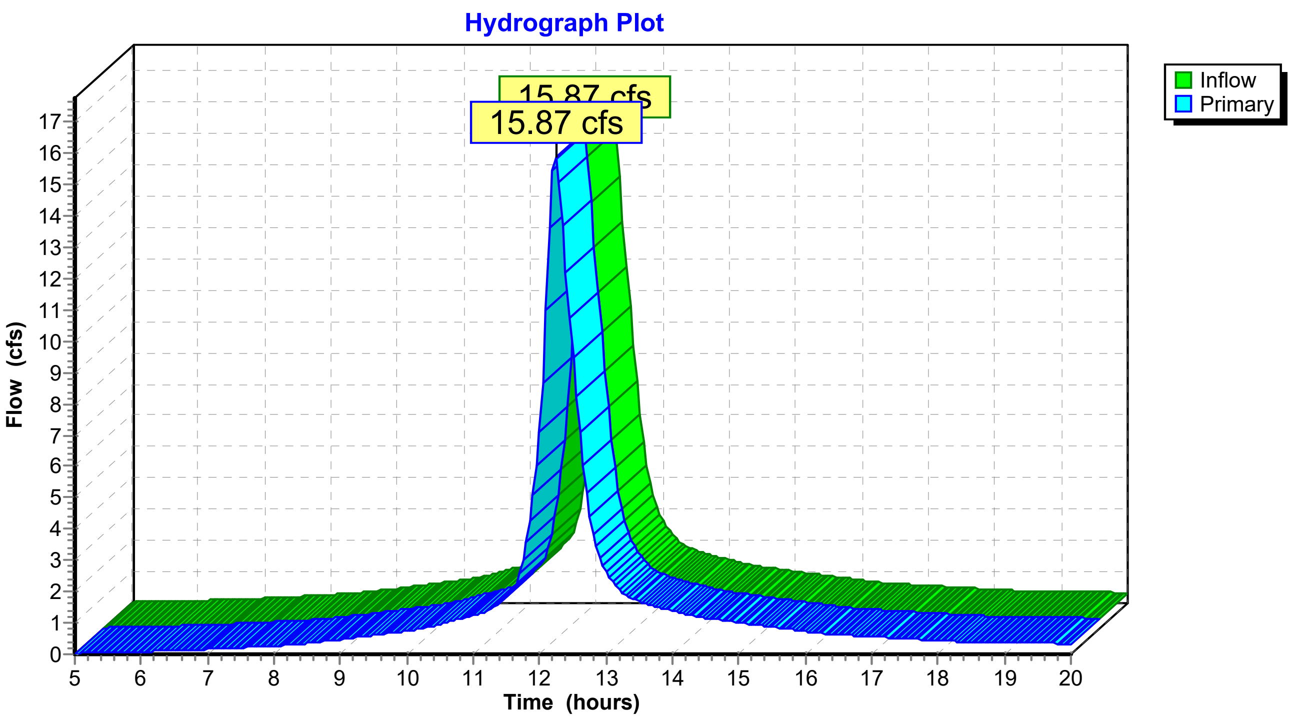
Peak Elev= 372.87' Storage= 36 cf
Plug-Flow detention time= 0.1 min calculated for 1.590 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
370.63	16	0	0
375.80	16	83	83

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	370.63'	**24.0" x 190.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 369.68' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond CB-9: CB-9



Pond CB-9A: CB-9A

[82] Warning: Early inflow requires earlier time span

Inflow	=	2.68 cfs @	12.22 hrs, Volume=	0.255 af
Outflow	=	2.68 cfs @	12.22 hrs, Volume=	0.255 af, Atten= 0%, Lag= 0.1 min
Primary	=	2.68 cfs @	12.22 hrs, Volume=	0.255 af

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

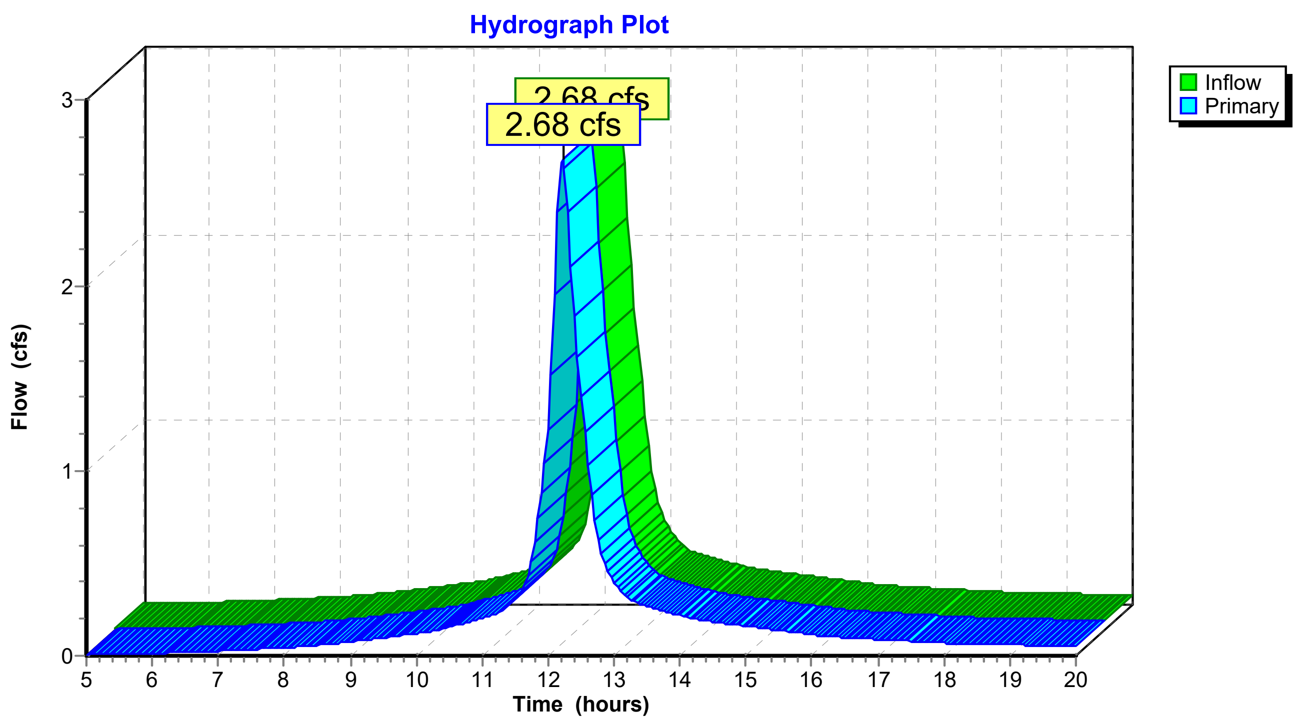
Peak Elev= 373.68' Storage= 16 cf
Plug-Flow detention time= 0.3 min calculated for 0.255 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.67	16	0	0
375.67	16	48	48

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	372.67'	**12.0" x 24.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 372.37' S= 0.0125 '/' n= 0.012 Cc= 0.900

Pond CB-9A: CB-9A



Pond DMH-1: DMH-1

[91] Warning: Storage range exceeded by 0.72'
[88] Warning: Qout>Qin may require Finer Routing>1
[79] Warning: Submerged Pond CB-23 Primary device # 1 OUTLET by 4.77'

Inflow	=	44.88 cfs @ 12.25 hrs,	Volume=	4.491 af
Outflow	=	44.92 cfs @ 12.25 hrs,	Volume=	4.491 af, Atten= 0%, Lag= 0.0 min
Primary	=	44.92 cfs @ 12.25 hrs,	Volume=	4.491 af

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

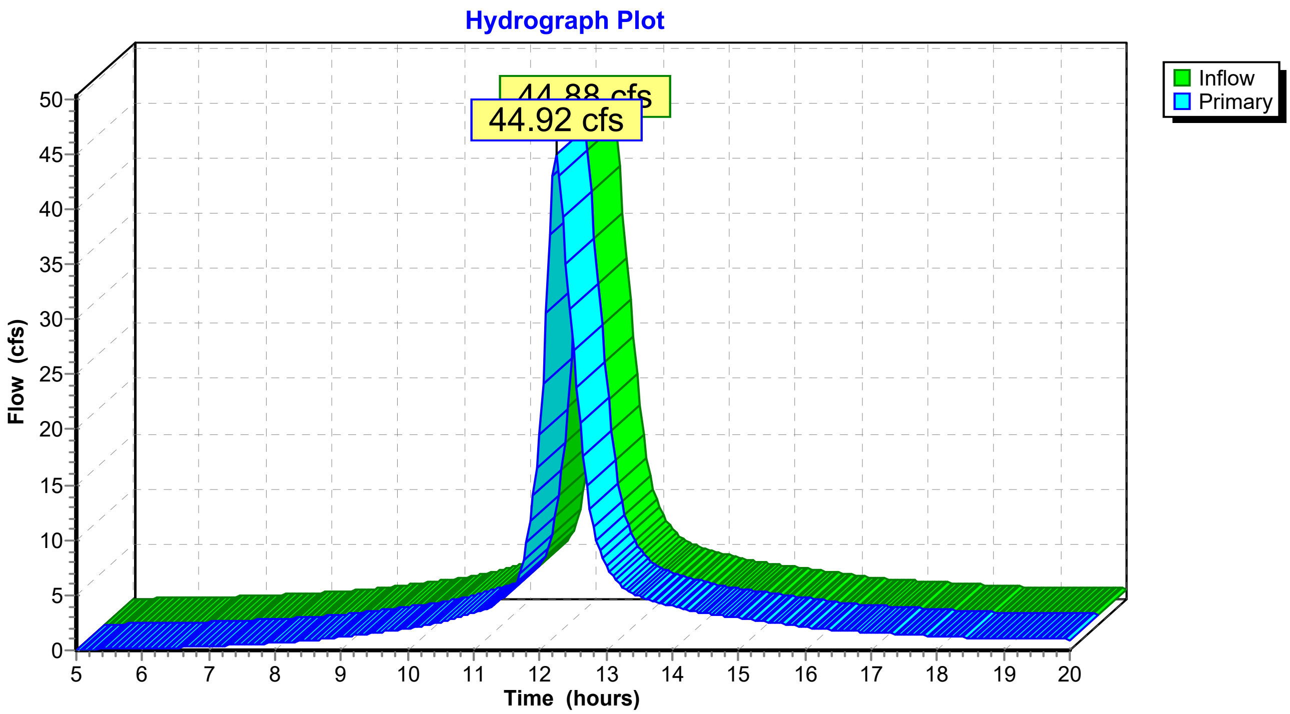
Peak Elev= 387.97' Storage= 76 cf
Plug-Flow detention time= 0.1 min calculated for 4.476 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
383.25	16	0	0
387.25	16	64	64

Primary OutFlow (Free Discharge)
1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	383.25'	**30.0" x 65.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 382.93' S= 0.0049 '/' n= 0.012 Cc= 0.900

Pond DMH-1: DMH-1



Pond DMH-2: DMH-2

[88] Warning: Qout>Qin may require Finer Routing>1
[85] Warning: Oscillations may require Finer Routing>1
[79] Warning: Submerged Pond CB-24 Primary device # 1 INLET by 1.09'

Inflow	=	3.52 cfs @	12.28 hrs,	Volume=	0.376 af
Outflow	=	3.52 cfs @	12.29 hrs,	Volume=	0.376 af, Atten= 0%, Lag= 0.3 min
Primary	=	3.52 cfs @	12.29 hrs,	Volume=	0.376 af

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

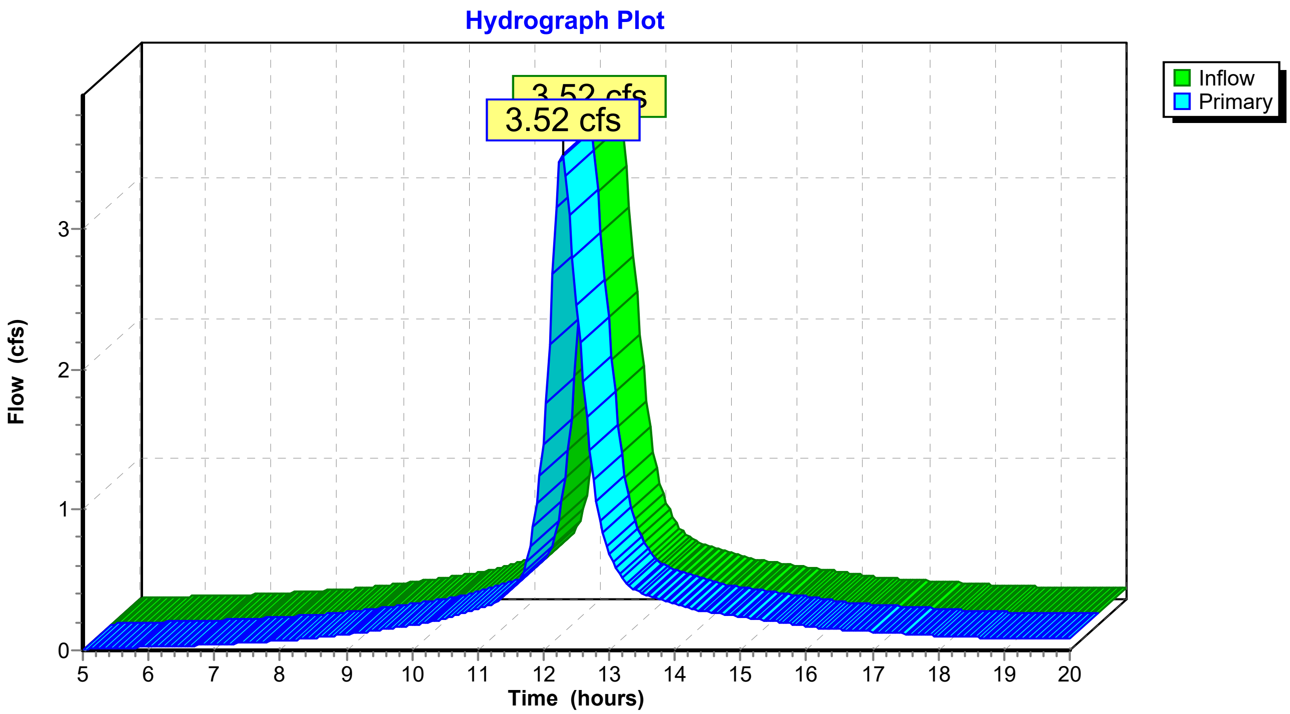
Peak Elev= 425.18' Storage= 22 cf
Plug-Flow detention time= 0.2 min calculated for 0.375 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
423.81	16	0	0
428.67	16	78	78

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	423.81'	**12.0" x 151.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 421.38' S= 0.0161 '/' n= 0.012 Cc= 0.900

Pond DMH-2: DMH-2



Pond DMH-3: DMH-3

[88] Warning: Qout>Qin may require Finer Routing>1
[80] Warning: Exceeded Pond CB-28 by 0.75' @ 12.25 hrs (7.35 cfs)

Inflow	=	12.79 cfs @	12.23 hrs, Volume=	1.335 af
Outflow	=	12.80 cfs @	12.24 hrs, Volume=	1.335 af, Atten= 0%, Lag= 0.2 min
Primary	=	12.80 cfs @	12.24 hrs, Volume=	1.335 af

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

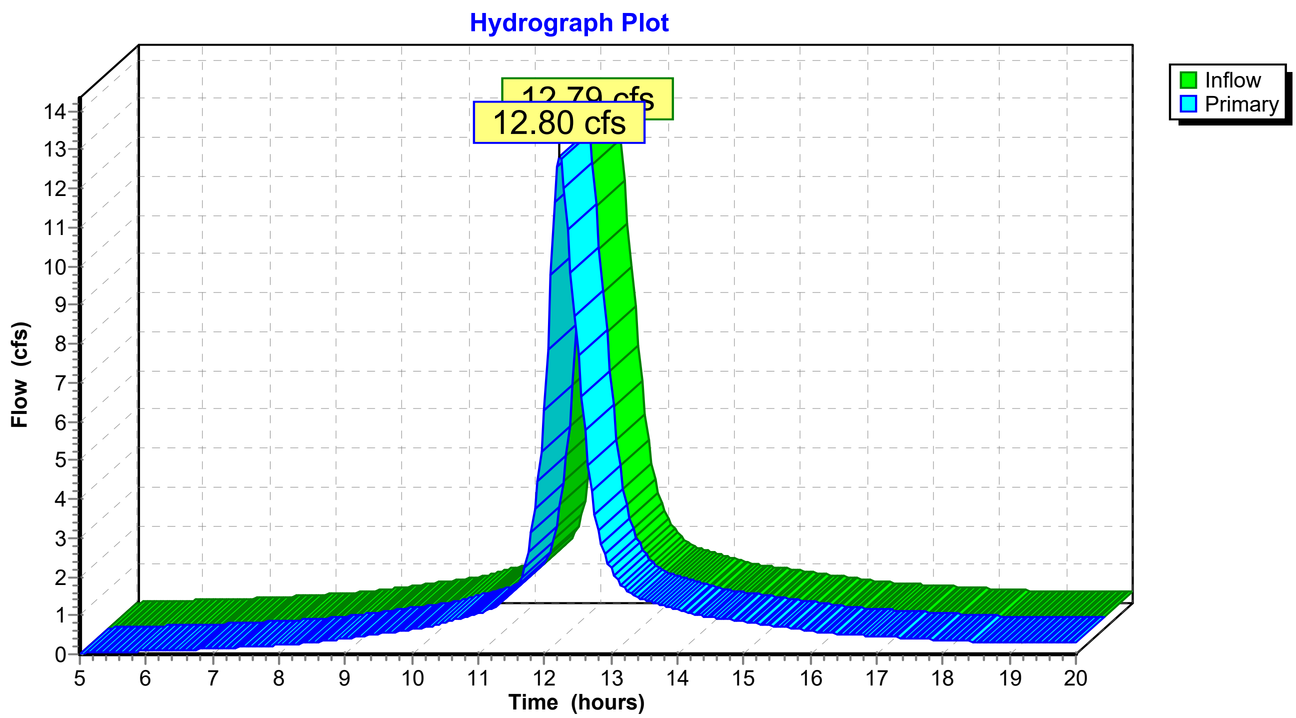
Peak Elev= 424.58' Storage= 61 cf
Plug-Flow detention time= 0.1 min calculated for 1.335 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.75	16	0	0
425.43	16	75	75

Primary OutFlow (Free Discharge)
└─1=Culvert

#	Routing	Invert	Outlet Devices
1	Primary	420.75'	**18.0" x 145.0' long Culvert** RCP, sq.cut end projecting, Ke= 0.500 Outlet Invert= 420.02' S= 0.0050 '/' n= 0.012 Cc= 0.900

Pond DMH-3: DMH-3



Pond Forbay 1: FORBAY 1

Inflow	=	3.69 cfs @	12.09 hrs,	Volume=	0.284 af
Outflow	=	3.65 cfs @	12.10 hrs,	Volume=	0.262 af, Atten= 1%, Lag= 0.7 min
Primary	=	3.65 cfs @	12.10 hrs,	Volume=	0.262 af

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

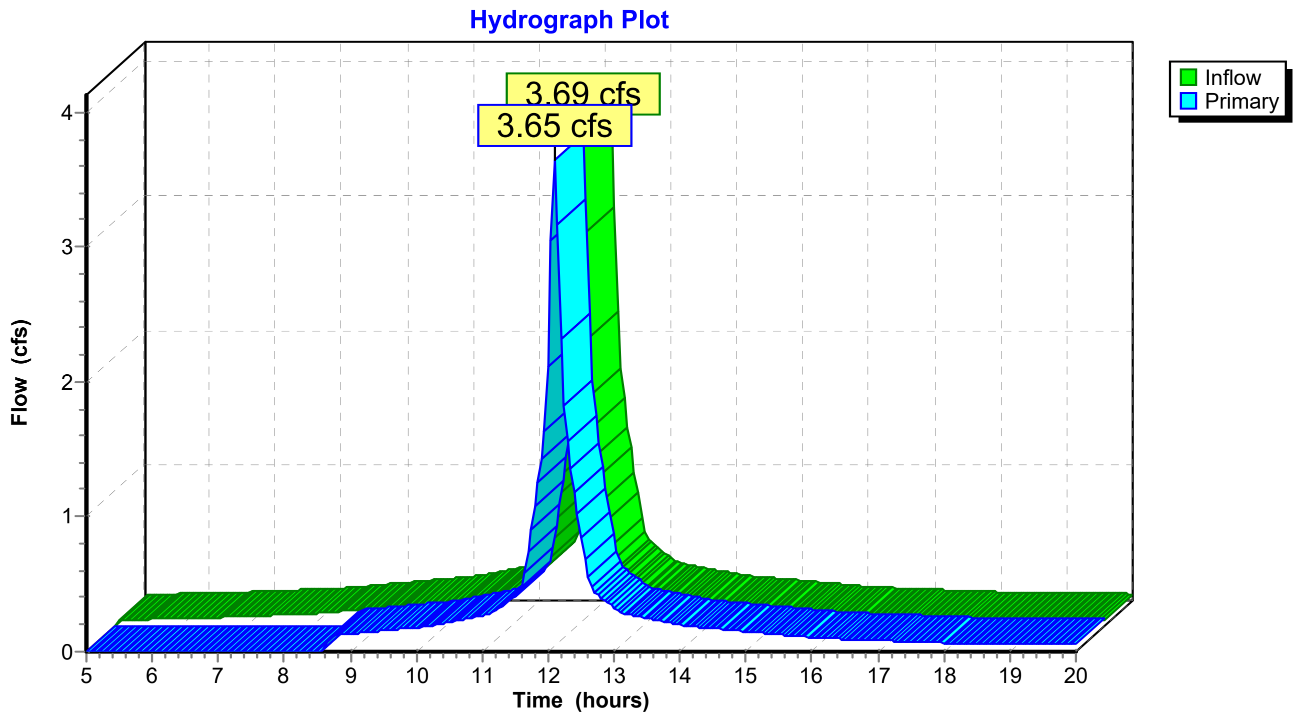
Peak Elev= 353.43' Storage= 1,155 cf
Plug-Flow detention time= 53.7 min calculated for 0.261 af (92% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
350.00	80	0	0
352.00	315	395	395
354.00	750	1,065	1,460

Primary OutFlow (Free Discharge)
└─1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	353.00'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Pond Forbay 1: FORBAY 1



Pond PLUNG 2: PLUNGE 2

Inflow = 6.72 cfs @ 12.17 hrs, Volume= 0.698 af
Outflow = 6.69 cfs @ 12.19 hrs, Volume= 0.676 af, Atten= 1%, Lag= 1.2 min
Primary = 6.69 cfs @ 12.19 hrs, Volume= 0.676 af

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

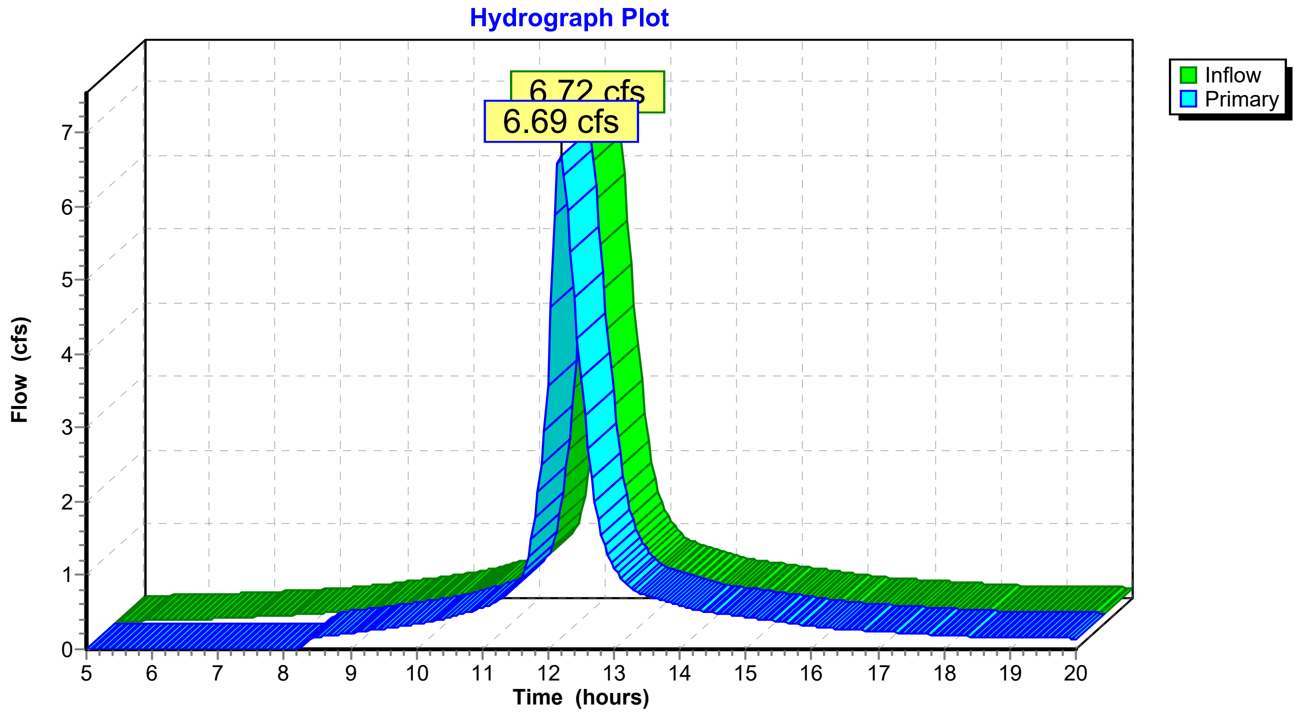
Peak Elev= 366.64' Storage= 1,577 cf
Plug-Flow detention time= 24.7 min calculated for 0.674 af (97% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
363.00	100	0	0
364.00	150	125	125
366.00	622	772	897
367.00	1,500	1,061	1,958

Primary OutFlow (Free Discharge)
└─1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	366.00'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Pond PLUNG 2: PLUNGE 2



Pond PLUNGE 1: PLUNGE 1

[91] Warning: Storage range exceeded by 0.88'

Inflow	=	16.50 cfs @	12.24 hrs, Volume=	1.695 af
Outflow	=	16.48 cfs @	12.25 hrs, Volume=	1.652 af, Atten= 0%, Lag= 0.7 min
Primary	=	16.48 cfs @	12.25 hrs, Volume=	1.652 af

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

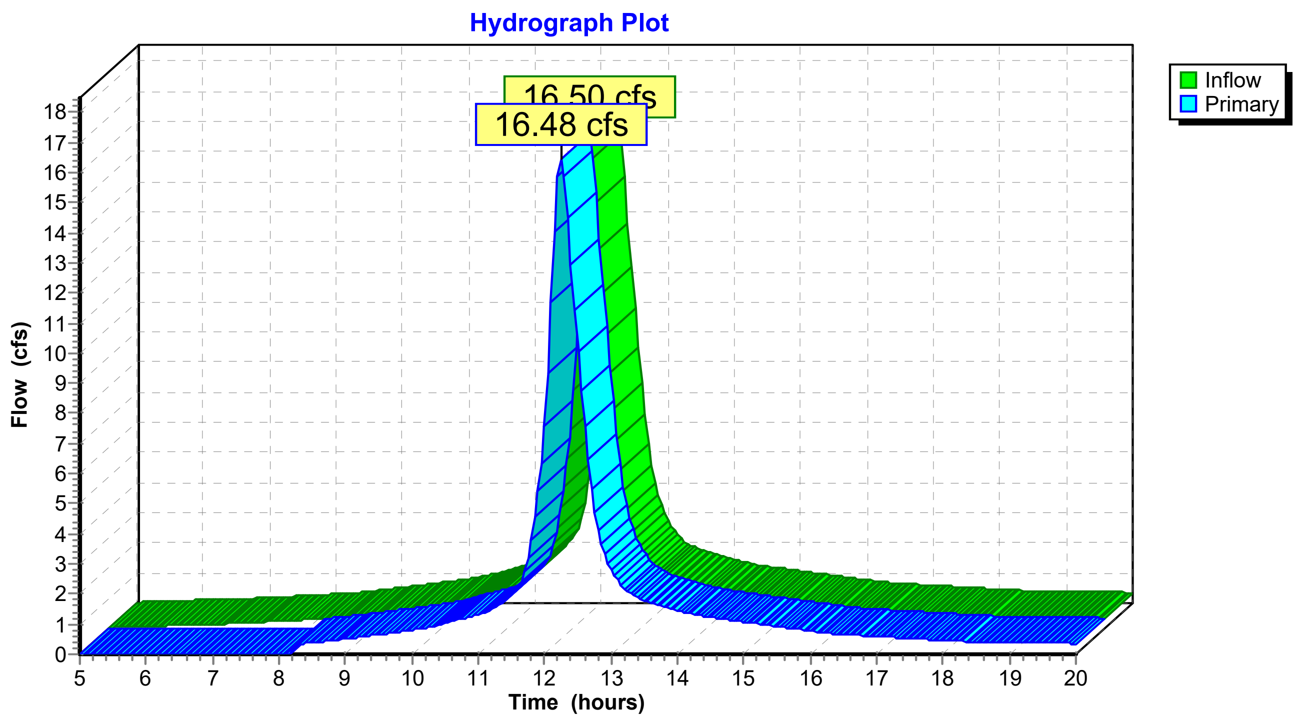
Peak Elev= 362.88' Storage= 2,559 cf
Plug-Flow detention time= 19.7 min calculated for 1.652 af (97% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
358.00	50	0	0
362.00	1,000	2,100	2,100

Primary OutFlow (Free Discharge)
└─1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	361.50'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Pond PLUNGE 1: PLUNGE 1



Pond PLUNGE 4: PLUNGE 4

[91] Warning: Storage range exceeded by 64.81'
[80] Warning: Exceeded Pond DMH-2 by 64.81' @ 19.95 hrs (21.56 cfs)

Inflow = 3.52 cfs @ 12.29 hrs, Volume= 0.376 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

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

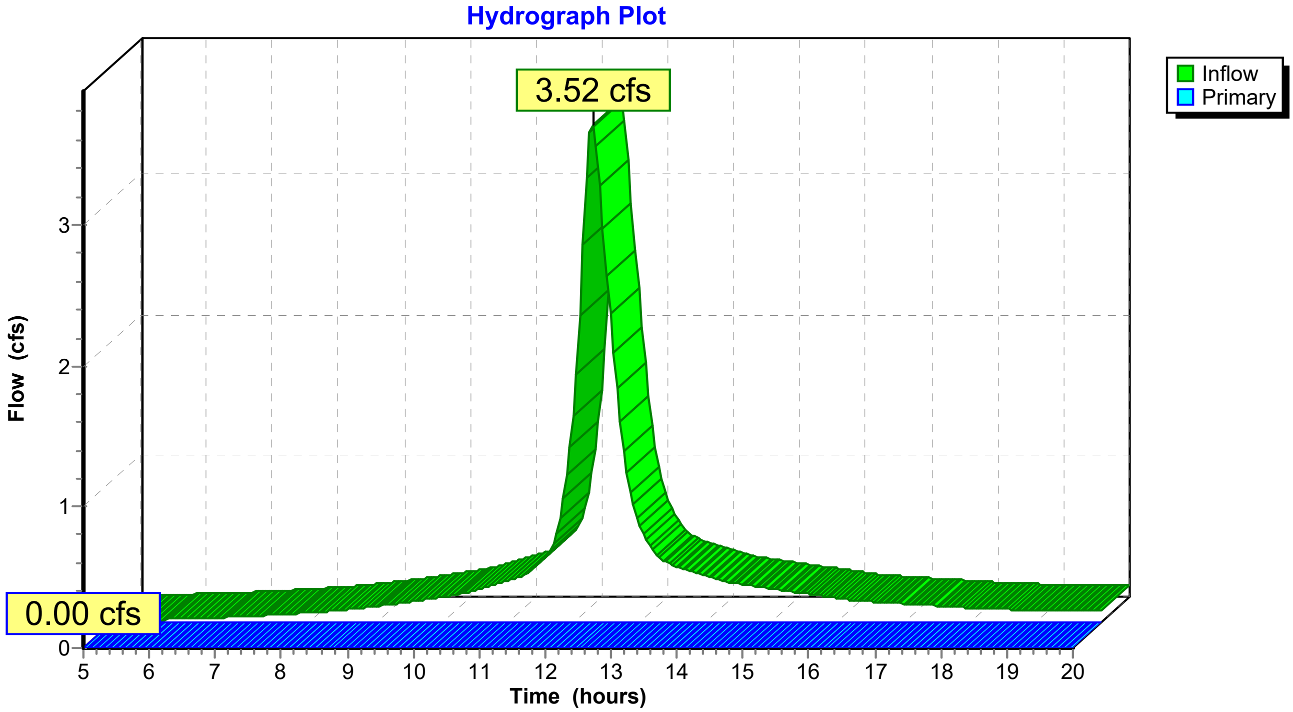
Peak Elev= 488.81' Storage= 16,367 cf
Plug-Flow detention time= (not calculated)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.00	40	0	0
422.00	125	165	165
424.00	360	485	650

Primary OutFlow (Free Discharge)
1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	424.00'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Pond PLUNGE 4: PLUNGE 4



Pond PLUNGE 5: PLUNGE 5

[91] Warning: Storage range exceeded by 0.56'

Inflow	=	12.80 cfs @	12.24 hrs, Volume=	1.335 af	
Outflow	=	12.23 cfs @	12.29 hrs, Volume=	1.258 af,	Atten= 4%, Lag= 3.4 min
Primary	=	12.23 cfs @	12.29 hrs, Volume=	1.258 af	

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

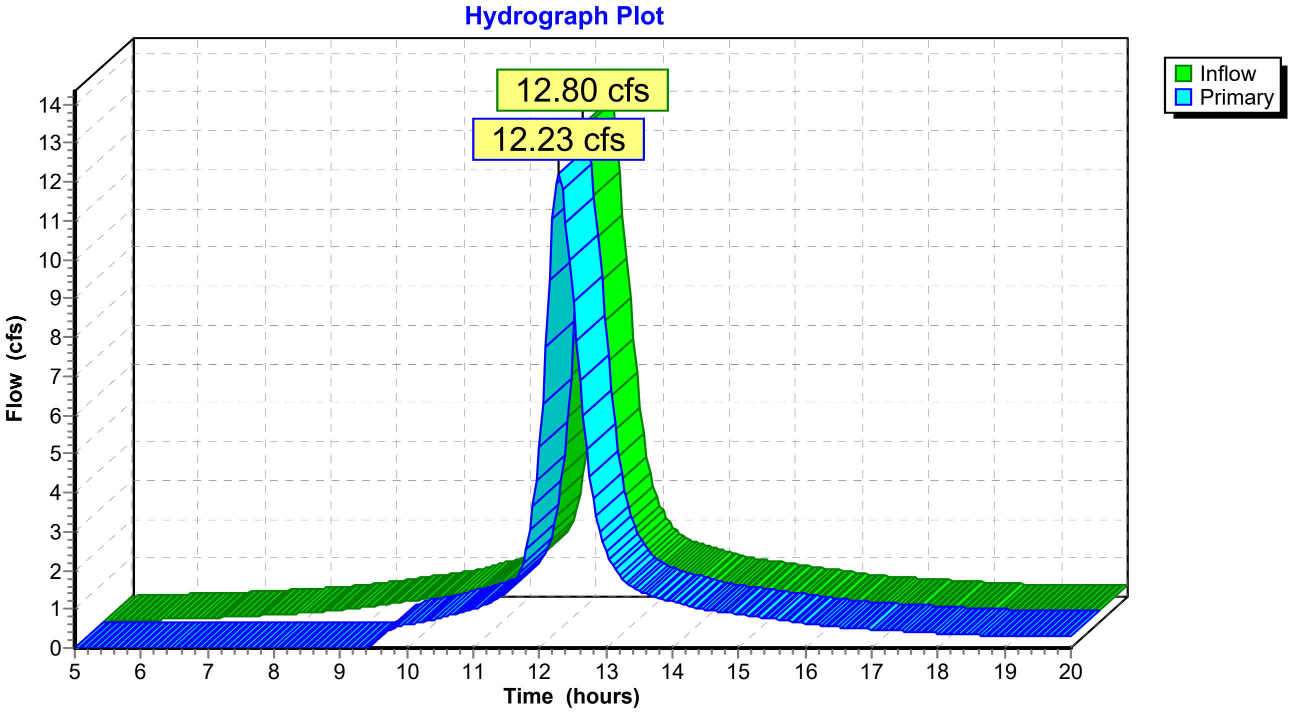
Peak Elev= 418.56' Storage= 6,231 cf
Plug-Flow detention time= 41.5 min calculated for 1.254 af (94% of inflow)
Storage and wetted areas determined by Prismatic sections

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
414.00	125	0	0
416.00	700	825	825
417.00	900	800	1,625
418.00	5,000	2,950	4,575

Primary OutFlow (Free Discharge)
└─1=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	417.50'	**5.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Pond PLUNGE 5: PLUNGE 5



APPENDIX D

Soils Mapping

Hydrologic Soil Group—Rensselaer County, New York
(Carver Court Soils Map)

Map Scale: 1:6,040 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Rensselaer County, New York
Survey Area Data: Version 17, Jun 11, 2020

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

Date(s) aerial images were photographed: Jul 1, 2014—Sep 22, 2017

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AnA	Alden silt loam, 0 to 3 percent slopes	C/D	9.9	10.2%
BeB	Bernardston gravelly silt loam, 3 to 8 percent slopes	C/D	1.9	2.0%
BeC	Bernardston gravelly silt loam, 8 to 15 percent slopes	C/D	2.9	3.0%
BeD	Bernardston gravelly silt loam, 15 to 25 percent slopes	C/D	0.6	0.6%
BnB	Bernardston-Nassau complex, undulating	C/D	26.8	27.6%
BnC	Bernardston-Nassau complex, rolling	C/D	26.4	27.1%
MbA	Madalin silt loam, 0 to 3 percent slopes	C/D	4.6	4.7%
NtA	Natchaug muck, 0 to 2 percent slopes	B/D	17.7	18.2%
PtB	Pittstown gravelly silt loam, 3 to 8 percent slopes	C	0.8	0.8%
RaA	Raynham silt loam, 0 to 5 percent slopes	C/D	4.2	4.3%
SrB	Scriba silt loam, 3 to 8 percent slopes	D	0.6	0.6%
W	Water		0.8	0.8%
Totals for Area of Interest			**97.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX E

GI Worksheets

NOI for coverage under Stormwater General Permit for Construction Activity

Alternate Identifier Carver Court Subdivision **Submission** HPA-HTSH-BYXQY **Revision** 1 **Form Version** 1.30

Review

This step allows you to review the form to confirm the form is populated completely and accurately, prior to certification and submission.

Please note: Any work you perform filling out a form will not be accessible by NYSDEC staff or the public until you actually submit the form in the 'Certify & Submit' step.

OWNER/OPERATOR INFORMATION

Owner/Operator Name (Company/Private Owner/Municipality/Agency/Institution, etc.)
CLDZ Devlopment LLC

Owner/Operator Contact Person Last Name (NOT CONSULTANT)
Laraway

Owner/Operator Contact Person First Name
Nick

Owner/Operator Mailing Address
494 Western Turnpike

City
Altamont

State
NY

Zip
12009

Phone
518-355-6034

Email
nlaraway@carvercompanies.com

Federal Tax ID
None Specified

PROJECT LOCATION

Project/Site Name
Carver Court Subdivision

Street Address (Not P.O. Box)
Upper Mannix Road

Side of Street
North

City/Town/Village (THAT ISSUES BUILDING PERMIT)
Town of East Greenbush

State
NY

Zip
12061

DEC Region
4

County
RENSSELAER

Name of Nearest Cross Street
Tech Valley Drive

Distance to Nearest Cross Street (Feet)
1100

Project In Relation to Cross Street
North

Tax Map Numbers Section-Block-Parcel
145-1-21, 155-5-4

Tax Map Numbers
None Specified

1. Coordinates

Provide the Geographic Coordinates for the project site. The two methods are:
- Navigate to the project location on the map (below) and click to place a marker and obtain the XY coordinates.
- The "Find Me" button will provide the lat/long for the person filling out this form. Then pan the map to the correct location and click the map to place a marker and obtain the XY coordinates.

Navigate to your location and click on the map to get the X,Y coordinates

Latitude	Longitude
42.63360085403593	-73.69282915560593

PROJECT DETAILS

2. What is the nature of this project?
New Construction

3. Select the predominant land use for both pre and post development conditions.

Pre-Development Existing Landuse
Forest

Post-Development Future Land Use
Single Family Subdivision (Please answer 3a)

3a. If Single Family Subdivision was selected in question 3, enter the number of subdivision lots.
110

4. In accordance with the larger common plan of development or sale, enter the total project site acreage, the acreage to be disturbed and the future impervious area (acreage)within the disturbed area.

*** ROUND TO THE NEAREST TENTH OF AN ACRE. ***

Total Site Area (acres)
91.0

Total Area to be Disturbed (acres)
40

Existing Impervious Area to be Disturbed (acres)
0.25

Future Impervious Area Within Disturbed Area (acres)
10.4

5. Do you plan to disturb more than 5 acres of soil at any one time?
No

6. Indicate the percentage (%) of each Hydrologic Soil Group(HSG) at the site.

A (%)
0

B (%)
0

C (%)
0

D (%)
100

7. Is this a phased project?
No

8. Enter the planned start and end dates of the disturbance activities.

Start Date
10/1/2021

End Date
9/30/2026

9. Identify the nearest surface waterbody(ies) to which construction site runoff will discharge.
Onsite Wetlands

9a. Type of waterbody identified in question 9?
Wetland/Federal Jurisdiction On Site (Answer 9b)

Other Waterbody Type Off Site Description
None Specified

9b. If "wetland" was selected in 9A, how was the wetland identified?
Delineated by Consultant

10. Has the surface waterbody(ies in question 9 been identified as a 303(d) segment in Appendix E of GP-0-20-001?
No

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-20-001?
No

12. Is the project located in one of the watershed areas associated with AA and AA-S classified waters?
No

If No, skip question 13.

13. Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey?
No

If Yes, what is the acreage to be disturbed?
None Specified

14. Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area?
No

15. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)?
Yes

16. What is the name of the municipality/entity that owns the separate storm sewer system?
Town of East Greenbush

17. Does any runoff from the site enter a sewer classified as a Combined Sewer?
No

18. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law?
No

19. Is this property owned by a state authority, state agency, federal government or local government?
No

20. Is this a remediation project being done under a Department approved work plan? (i.e. CERCLA, RCRA, Voluntary Cleanup Agreement, etc.)
No

REQUIRED SWPPP COMPONENTS

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book)?
Yes

22. Does this construction activity require the development of a SWPPP that includes the post-construction stormwater management practice component (i.e. Runoff Reduction, Water Quality and Quantity Control practices/techniques)?
Yes

If you answered No in question 22, skip question 23 and the Post-construction Criteria and Post-construction SMP Identification sections.

23. Has the post-construction stormwater management practice component of the SWPPP been developed in conformance with the current NYS Stormwater Management Design Manual?

Yes

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

Professional Engineer (P.E.)

SWPPP Preparer

Brett L Steenburgh PE PLLC

Contact Name (Last, Space, First)

Steenburgh Brett

Mailing Address

2832 ROSENDALE ROAD

City

NISKAYUNA

State

NY

Zip

12309

Phone

5183650675

Email

bsteenburghpe@gmail.com

Download SWPPP Preparer Certification Form

Please take the following steps to prepare and upload your preparer certification form:

1) Click on the link below to download a blank certification form
2) The certified SWPPP preparer should sign this form
3) Scan the signed form
4) Upload the scanned document

Download SWPPP Preparer Certification Form

Please upload the SWPPP Preparer Certification

SWPPP Preparer Certification Form Carver Court.pdf

Comment
None Specified

EROSION & SEDIMENT CONTROL CRITERIA

25. Has a construction sequence schedule for the planned management practices been prepared?
Yes

26. Select all of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural
Construction Road Stabilization
Dust Control
Sediment Basin
Silt Fence
Stabilized Construction Entrance
Storm Drain Inlet Protection

Biotechnical
None

Vegetative Measures
Mulching
Seeding
Sodding

Permanent Structural
Rock Outlet Protection

Other
None Specified

POST-CONSTRUCTION CRITERIA

*** IMPORTANT: Completion of Questions 27-39 is not required if response to Question 22 is No.**

27. Identify all site planning practices that were used to prepare the final site plan/layout for the project.

Preservation of Undisturbed Area
Reduction of Clearing and Grading
Preservation of Buffers
Locating Development in Less Sensitive Areas
Roadway Reduction
Sidewalk Reduction
Building Footprint Reduction

27a. Indicate which of the following soil restoration criteria was used to address the requirements in Section 5.1.6("Soil Restoration") of the Design Manual (2010 version).

All disturbed areas will be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).

28. Provide the total Water Quality Volume (WQv) required for this project (based on final site plan/layout). (Acre-feet)

1.005

29. Post-construction SMP Identification

Use the Post-construction SMP Identification section to identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity that were used to reduce the Total WQv Required (#28).

Identify the SMPs to be used by providing the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

Note: Redevelopment projects shall use the Post-Construction SMP Identification section to identify the SMPs used to treat and/or reduce the WQv required. If runoff reduction techniques will not be used to reduce the required WQv, skip to question 33a after identifying the SMPs.

30. Indicate the Total RRv provided by the RR techniques (Area/Volume Reduction) and Standard SMPs with RRv capacity identified in question 29. (acre-feet)

0.226

31. Is the Total RRv provided (#30) greater than or equal to the total WQv required (#28)?

No

If Yes, go to question 36. If No, go to question 32.

32. Provide the Minimum RRv required based on HSG. [Minimum RRv Required = (P) (0.95) (Ai) / 12, Ai=(s) (Aic)] (acre-feet)

0.19

32a. Is the Total RRv provided (#30) greater than or equal to the Minimum RRv Required (#32)?

Yes

If Yes, go to question 33.

Note: Use the space provided in question #39 to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). A detailed evaluation of the specific site limitations and justification for not reducing 100% of the WQv required (#28) must also be included in the SWPPP.

If No, sizing criteria has not been met; therefore, NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. SMPs

Use the Post-construction SMP Identification section to identify the Standard SMPs and, if applicable, the Alternative SMPs to be used to treat the remaining total WQv (=Total WQv Required in #28 - Total RRv Provided in #30).

Also, provide the total impervious area that contributes runoff to each practice selected.

NOTE: Use the Post-construction SMP Identification section to identify the SMPs used on Redevelopment projects.

33a. Indicate the Total WQv provided (i.e. WQv treated) by the SMPs identified in question #33 and Standard SMPs with RRv Capacity identified in question #29. (acre-feet)
1.005

Note: For the standard SMPs with RRv capacity, the WQv provided by each practice = the WQv calculated using the contributing drainage area to the practice - provided by the practice. (See Table 3.5 in Design Manual)

34. Provide the sum of the Total RRv provided (#30) and the WQv provided (#33a).
1.231

35. Is the sum of the RRv provided (#30) and the WQv provided (#33a) greater than or equal to the total WQv required (#28)?
Yes

If Yes, go to question 36.

If No, sizing criteria has not been met; therefore, NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

36. Provide the total Channel Protection Storage Volume (CPv required and provided or select waiver (#36a), if applicable.

CPv Required (acre-feet)
0.21

CPv Provided (acre-feet)
0.21

36a. The need to provide channel protection has been waived because:
None Specified

37. Provide the Overbank Flood (Qp) and Extreme Flood (Qf) control criteria or select waiver (#37a), if applicable.

Overbank Flood Control Criteria (Qp)

Pre-Development (CFS)
94.38

Post-Development (CFS)
78.83

Total Extreme Flood Control Criteria (Qf)

Pre-Development (CFS)
216.93

Post-Development (CFS)
198.54

37a. The need to meet the Qp and Qf criteria has been waived because:
None Specified

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed?
Yes

If Yes, Identify the entity responsible for the long term Operation and Maintenance
Town of East Greenbush

39. Use this space to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). (See question #32a) This space can also be used for other pertinent project information.
Due to the shallow depth of bedrock on the parcel approximately 40"
below grade throughout, many of the RRv practices cannot be employed
on the parcel.

POST-CONSTRUCTION SMP IDENTIFICATION

Runoff Reduction (RR) Techniques, Standard Stormwater Management Practices (SMPs) and Alternative SMPs

Identify the Post-construction SMPs to be used by providing the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

RR Techniques (Area Reduction)

Round to the nearest tenth

Total Contributing Acres for Conservation of Natural Area (RR-1)
0

Total Contributing Impervious Acres for Conservation of Natural Area (RR-1)
0

Total Contributing Acres for Sheetflow to Riparian Buffers/Filter Strips (RR-2)
0

Total Contributing Impervious Acres for Sheetflow to Riparian Buffers/Filter Strips (RR-2)
0

Total Contributing Acres for Tree Planting/Tree Pit (RR-3)
0

Total Contributing Impervious Acres for Tree Planting/Tree Pit (RR-3)
0

Total Contributing Acres for Disconnection of Rooftop Runoff (RR-4)
0

RR Techniques (Volume Reduction)

Total Contributing Impervious Acres for Disconnection of Rooftop Runoff (RR-4)
0

Total Contributing Impervious Acres for Vegetated Swale (RR-5)
0

Total Contributing Impervious Acres for Rain Garden (RR-6)
0

Total Contributing Impervious Acres for Stormwater Planter (RR-7)
0

Total Contributing Impervious Acres for Rain Barrel/Cistern (RR-8)
0

Total Contributing Impervious Acres for Porous Pavement (RR-9)
0

Total Contributing Impervious Acres for Green Roof (RR-10)
0

Standard SMPs with RRv Capacity

Total Contributing Impervious Acres for Infiltration Trench (I-1)
0

Total Contributing Impervious Acres for Infiltration Basin (I-2)
0

Total Contributing Impervious Acres for Dry Well (I-3)
0

Total Contributing Impervious Acres for Underground Infiltration System (I-4)
0

Total Contributing Impervious Acres for Bioretention (F-5)
4.22

Total Contributing Impervious Acres for Dry Swale (O-1)
6.14

Standard SMPs

Total Contributing Impervious Acres for Micropool Extended Detention (P-1)
0

Total Contributing Impervious Acres for Wet Pond (P-2)
0

Total Contributing Impervious Acres for Wet Extended Detention (P-3)
0

Total Contributing Impervious Acres for Multiple Pond System (P-4)
0

Total Contributing Impervious Acres for Pocket Pond (P-5)
0

Total Contributing Impervious Acres for Surface Sand Filter (F-1)
0

Total Contributing Impervious Acres for Underground Sand Filter (F-2)
0

Total Contributing Impervious Acres for Perimeter Sand Filter (F-3)
0

Total Contributing Impervious Acres for Organic Filter (F-4)
0

Total Contributing Impervious Acres for Shallow Wetland (W-1)
0

Total Contributing Impervious Acres for Extended Detention Wetland (W-2)
0

Total Contributing Impervious Acres for Pond/Wetland System (W-3)
0

Total Contributing Impervious Acres for Pocket Wetland (W-4)
0

Total Contributing Impervious Acres for Wet Swale (O-2)
0

Alternative SMPs (DO NOT INCLUDE PRACTICES BEING USED FOR PRETREATMENT ONLY)

Total Contributing Impervious Area for Hydrodynamic
0

Total Contributing Impervious Area for Wet Vault
0

Total Contributing Impervious Area for Media Filter
0

"Other" Alternative SMP?
0

Total Contributing Impervious Area for "Other"
0

Provide the name and manufaturer of the alternative SMPs (i.e. proprietary practice(s)) being used for WQv treatment.

Note: Redevelopment projects which do not use RR techniques, shall use questions 28, 29, 33 and 33a to provide SMPs used, total WQv required and total WQv provided for the project.

Manufacturer of Alternative SMP
None Specified

Name of Alternative SMP
None Specified

OTHER PERMITS

40. Identify other DEC permits, existing and new, that are required for this project/facility.
Water Quality Certificate

If SPDES Multi-Sector GP, then give permit ID
None Specified

If Other, then identify
None Specified

41. Does this project require a US Army Corps of Engineers Wetland Permit?
Yes

If "Yes," then indicate Size of Impact, in acres, to the nearest tenth
0.2

42. If this NOI is being submitted for the purpose of continuing or transferring coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned.
None Specified

MS4 SWPPP ACCEPTANCE

43. Is this project subject to the requirements of a regulated, traditional land use control MS4?
Yes - Please attach the MS4 Acceptance form below

If No, skip question 44

44. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI?
None Specified

MS4 SWPPP Acceptance Form Download

Download form from the link below. Complete, sign, and upload.

MS4 SWPPP Acceptance Form

MS4 Acceptance Form Upload

No files uploaded

Comment

None Specified

OWNER/OPERATOR CERTIFICATION

The owner/operator must download, sign, and upload the certification form in order to complete this application.

Owner/Operator Certification Form Download

Download the certification form by clicking the link below. Complete, sign, scan, and upload the form.

Owner/Operator Certification Form (PDF, 45KB)

Upload Owner/Operator Certification Form

No files uploaded

Comment

None Specified

At least one file is required.

Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?...	No

Design Point:	1	
P=	1.15	*inch*

Manually enter P, Total Area and Impervious Cover.

Breakdown of Subcatchments						
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Description**
1	0.58	0.58	100%	0.95	2,300	Dry Swale
2						
3						
4						
5						
6						
7						
8						
9						
10						
Subtotal (1-30)	0.58	0.58	100%	0.95	**2,300**	**Subtotal 1**
Total	0.58	0.58	100%	0.95	**2,300**	**Initial WQv**

Identify Runoff Reduction Techniques By Area			
Technique	**Total Contributing Area** *(Acre)*	**Contributing Impervious Area** *(Acre)*	**Notes**
Conservation of Natural Areas	0.00	0.00	*minimum 10,000 sf*
Riparian Buffers	0.00	0.00	*maximum contributing length 75 feet to 150 feet*
Filter Strips	0.00	0.00	
Tree Planting	0.00	0.00	*Up to 100 sf directly connected impervious area may be subtracted per tree*
Total	**0.00**	**0.00**	

Recalculate WQv after application of Area Reduction Techniques					
	Total Area *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Runoff Coefficient Rv**	**WQv** *(ft^3)*
"<<Initial WQv"	0.58	0.58	100%	0.95	2,300
Subtract Area	0.00	0.00			
WQv adjusted after Area Reductions	**0.58**	**0.58**	100%	0.95	2,300
Disconnection of Rooftops		0.00			
Adjusted WQv after Area Reduction and Rooftop Disconnect	0.58	0.58	100%	0.95	**2,300**
WQv reduced by Area Reduction techniques					0

Runoff Reduction Volume and Treated volumes						
	Runoff Reduction Techiques/Standard SMPs		**Total Contributing Area**	**Total Contributing Impervious Area**	**WQv Reduced (RRv)**	**WQv Treated**
			(acres)	**(acres)**	**cf**	**cf**
Area/Volume Reduction	Conservation of Natural Areas	RR-1	0.00	0.00		
	Sheetflow to Riparian Buffers/Filter Strips	RR-2	0.00	0.00		
	Tree Planting/Tree Pit	RR-3	0.00	0.00		
	Disconnection of Rooftop Runoff	RR-4		0.00		
	Vegetated Swale	RR-5	0.00	0.00	0	
	Rain Garden	RR-6	0.00	0.00	0	
	Stormwater Planter	RR-7	0.00	0.00	0	
	Rain Barrel/Cistern	RR-8	0.00	0.00	0	
	Porous Pavement	RR-9	0.00	0.00	0	
	Green Roof (Intensive & Extensive)	RR-10	0.00	0.00	0	
Standard SMPs w/RRv Capacity	Infiltration Trench	I-1	0.00	0.00	0	0
	Infiltration Basin	I-2	0.00	0.00	0	0
	Dry Well	I-3	0.00	0.00	0	0
	Underground Infiltration System	I-4				
	Bioretention & Infiltration Bioretention	F-5	0.00	0.00	0	0
	Dry swale	O-1	0.58	0.58	571	1729
Standard SMPs	Micropool Extended Detention (P-1)	P-1				
	Wet Pond (P-2)	P-2				
	Wet Extended Detention (P-3)	P-3				
	Multiple Pond system (P-4)	P-4				
	Pocket Pond (p-5)	P-5				
	Surface Sand filter (F-1)	F-1				
	Underground Sand filter (F-2)	F-2				
	Perimeter Sand Filter (F-3)	F-3				
	Organic Filter (F-4	F-4				
	Shallow Wetland (W-1)	W-1				
	Extended Detention Wetland (W-2	W-2				
	Pond/Wetland System (W-3)	W-3				
	Pocket Wetland (W-4)	W-4				
	Wet Swale (O-2)	O-2				
Totals by Area Reduction		→	0.00	0.00	0	
Totals by Volume Reduction		→	0.00	0.00	0	
Totals by Standard SMP w/RRV		→	0.58	0.58	571	1729
Totals by Standard SMP		→	0.00	0.00		0
Totals (Area + Volume + all SMPs)		→	0.58	0.58	571	1,729
	Impervious Cover √	okay				

Minimum RRv

Enter the Soils Data for the site		
Soil Group	Acres	S
A		55%
B		40%
C		30%
D	**100.00**	20%
Total Area	100	
Calculate the Minimum RRv		
S =	**0.20**	
Impervious =	0.58	*acre*
Precipitation	1.15	*in*
Rv	0.95	
Minimum RRv	**460**	***ft3***
	0.01	af

NOI QUESTIONS

#	NOI Question	Reported Value	
		cf	af
28	Total Water Quality Volume (WQv) Required	2300	*0.053*
30	Total RRV Provided	571	*0.013*
31	Is RRv Provided ≥WQv Required?	No	
32	Minimum RRv	460	*0.011*
32a	Is RRv Provided ≥ Minimum RRv Required?	Yes	
33a	Total WQv Treated	1729	*0.040*
34	Sum of Volume Reduced & Treated	2300	*0.053*
34	Sum of Volume Reduced and Treated	2300	*0.053*
35	Is Sum RRv Provided and WQv Provided ≥WQv Required?	Yes	

Apply Peak Flow Attenuation			
36	Channel Protection	*Cpv*	
37	Overbank	*Qp*	
37	Extreme Flood Control	*Qf*	
	Are Quantity Control requirements met?		

Dry Swale Worksheet

Design Point:	1

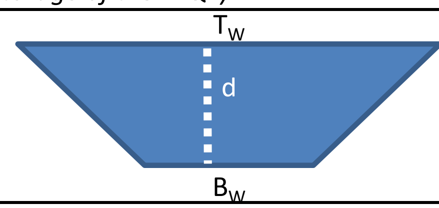
Enter Site Data For Drainage Area to be Treated by Practice

Catchment Number	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Rv	WQv *(ft^3)*	Precipitation *(in)*	Description
1	0.58	0.58	1.00	0.95	2300.15	1.15	Dry Swale
Enter Impervious Area Reduced by Disconnection of Rooftops		0.00	100%	0.95	2,300	<<WQv after adjusting for Disconnected Rooftops	

Pretreatment Provided			**Pretreatment Technique**
Pretreatment (10% of WQv)	230	*ft^3*	Plunge Pool

Calculate Available Storage Capacity

Bottom Width	8	*ft*	Design with a bottom width no greater than eight feet to avoid potential gullying and channel braiding, but no less than two feet
Side Slope (X:1)	4	*Okay*	Channels shall be designed with moderate side slopes (flatter than 3:1) for most conditions. 2:1 is the absolute maximum side slope
Longitudinal Slope	1%	*Okay*	*Maximum longitudinal slope shall be 4%*
Flow Depth	1.5	*ft*	*Maximum ponding depth of one foot at the mid-point of the channel, and a maximum depth of 18" at the end point of the channel (for storage of the WQv)*
Top Width	20	*ft*	
Area	21.00	*sf*	
Minimum Length	99	*ft*	
Actual Length	125	*ft*	
End Point Depth check	1.50	*Okay*	*A maximum depth of 18" at the end point of the channel (for storage of the WQv)*
Storage Capacity	2,855	*ft^3*	
Soil Group (HSG)		D	



Runoff Reduction

Is the Dry Swale contributing flow to another practice?		Select Practice	
RRv	**571**	***ft^3***	**Runnoff Reduction equals 40% in HSG A and B and 20% in HSG C and D up to the WQv**
Volume Treated	1,729	*ft^3*	This is the difference between the WQv calculated and the runoff reduction achieved in the swale
Volume Directed	0	*ft^3*	This volume is directed another practice
Volume √	*Okay*		Check to be sure that channel is long enough to store WQv

Design Point:	1

Total Water Quality Volume Calculation WQv(acre-feet) = [(P)(Rv)(A)] /12

Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?..			No
Design Point:	2A		*Manually enter P, Total Area and Impervious Cover.*
P=	1.15	*inch*	

Breakdown of Subcatchments						
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Description**
1	1.67	0.83	50%	0.50	3,467	Dry Swale
2						
3						
4						
5						
6						
7						
8						
9						
10						
Subtotal (1-30)	1.67	0.83	50%	0.50	**3,467**	**Subtotal 1**
Total	1.67	0.83	50%	0.50	**3,467**	**Initial WQv**

Identify Runoff Reduction Techniques By Area			
Technique	**Total Contributing Area** *(Acre)*	**Contributing Impervious Area** *(Acre)*	**Notes**
Conservation of Natural Areas	0.00	0.00	*minimum 10,000 sf*
Riparian Buffers	0.00	0.00	*maximum contributing length 75 feet to 150 feet*
Filter Strips	0.00	0.00	
Tree Planting	0.00	0.00	*Up to 100 sf directly connected impervious area may be subtracted per tree*
Total	**0.00**	**0.00**	

Recalculate WQv after application of Area Reduction Techniques					
	Total Area *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Runoff Coefficient Rv**	**WQv** *(ft^3)*
"<<Initial WQv"	1.67	0.83	50%	0.50	3,467
Subtract Area	0.00	0.00			
WQv adjusted after Area Reductions	**1.67**	**0.83**	50%	0.50	3,467
Disconnection of Rooftops		0.00			
Adjusted WQv after Area Reduction and Rooftop Disconnect	1.67	0.83	50%	0.50	**3,467**
WQv reduced by Area Reduction techniques					0

Runoff Reduction Volume and Treated volumes						
	Runoff Reduction Techiques/Standard SMPs		**Total Contributing Area**	**Total Contributing Impervious Area**	**WQv Reduced (RRv)**	**WQv Treated**
			(acres)	**(acres)**	**cf**	**cf**
Area/Volume Reduction	Conservation of Natural Areas	RR-1	0.00	0.00		
	Sheetflow to Riparian Buffers/Filter Strips	RR-2	0.00	0.00		
	Tree Planting/Tree Pit	RR-3	0.00	0.00		
	Disconnection of Rooftop Runoff	RR-4		0.00		
	Vegetated Swale	RR-5	0.00	0.00	0	
	Rain Garden	RR-6	0.00	0.00	0	
	Stormwater Planter	RR-7	0.00	0.00	0	
	Rain Barrel/Cistern	RR-8	0.00	0.00	0	
	Porous Pavement	RR-9	0.00	0.00	0	
	Green Roof (Intensive & Extensive)	RR-10	0.00	0.00	0	
Standard SMPs w/RRv Capacity	Infiltration Trench	I-1	0.00	0.00	0	0
	Infiltration Basin	I-2	0.00	0.00	0	0
	Dry Well	I-3	0.00	0.00	0	0
	Underground Infiltration System	I-4				
	Bioretention & Infiltration Bioretention	F-5	0.00	0.00	0	0
	Dry swale	O-1	1.67	0.83	699	2768
Standard SMPs	Micropool Extended Detention (P-1)	P-1				
	Wet Pond (P-2)	P-2				
	Wet Extended Detention (P-3)	P-3				
	Multiple Pond system (P-4)	P-4				
	Pocket Pond (p-5)	P-5				
	Surface Sand filter (F-1)	F-1				
	Underground Sand filter (F-2)	F-2				
	Perimeter Sand Filter (F-3)	F-3				
	Organic Filter (F-4	F-4				
	Shallow Wetland (W-1)	W-1				
	Extended Detention Wetland (W-2	W-2				
	Pond/Wetland System (W-3)	W-3				
	Pocket Wetland (W-4)	W-4				
	Wet Swale (O-2)	O-2				
	Totals by Area Reduction	→	0.00	0.00	0	
	Totals by Volume Reduction	→	0.00	0.00	0	
	Totals by Standard SMP w/RRV	→	1.67	0.83	699	2768
	Totals by Standard SMP	→	0.00	0.00		0
	Totals (Area + Volume + all SMPs)	→	1.67	0.83	699	2,768
	Impervious Cover √	okay				

Minimum RRv

Enter the Soils Data for the site		
Soil Group	Acres	S
A		55%
B		40%
C		30%
D	**100.00**	20%
Total Area	100	
Calculate the Minimum RRv		
S =	**0.20**	
Impervious =	0.83	*acre*
Precipitation	1.15	*in*
Rv	0.95	
Minimum RRv	**658**	***ft3***
	0.02	af

NOI QUESTIONS

#	NOI Question	Reported Value	
		cf	af
28	Total Water Quality Volume (WQv) Required	3467	*0.080*
30	Total RRV Provided	699	*0.016*
31	Is RRv Provided ≥WQv Required?	No	
32	Minimum RRv	658	*0.015*
32a	Is RRv Provided ≥ Minimum RRv Required?	Yes	
33a	Total WQv Treated	2768	*0.064*
34	Sum of Volume Reduced & Treated	3467	*0.080*
34	Sum of Volume Reduced and Treated	3467	*0.080*
35	Is Sum RRv Provided and WQv Provided ≥WQv Required?	Yes	

Apply Peak Flow Attenuation			
36	Channel Protection	*Cpv*	
37	Overbank	*Qp*	
37	Extreme Flood Control	*Qf*	
	Are Quantity Control requirements met?		

Dry Swale Worksheet

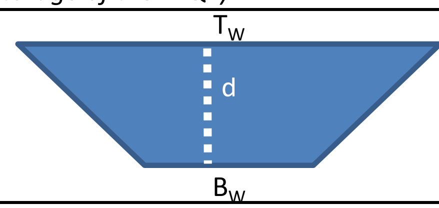
Design Point:	2A

Enter Site Data For Drainage Area to be Treated by Practice

Catchment Number	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Rv	WQv *(ft^3)*	Precipitation *(in)*	Description
1	1.67	0.83	0.50	0.50	3466.92	1.15	Dry Swale
Enter Impervious Area Reduced by Disconnection of Rooftops		0.00	50%	0.50	3,467	<<WQv after adjusting for Disconnected Rooftops	

Pretreatment Provided			Pretreatment Technique
Pretreatment (10% of WQv)	347	*ft^3*	Plunge Pool

Calculate Available Storage Capacity

Bottom Width	8	*ft*	Design with a bottom width no greater than eight feet to avoid potential gullying and channel braiding, but no less than two feet
Side Slope (X:1)	4	*Okay*	Channels shall be designed with moderate side slopes (flatter than 3:1) for most conditions. 2:1 is the absolute maximum side slope
Longitudinal Slope	1%	*Okay*	*Maximum longitudinal slope shall be 4%*
Flow Depth	1.5	*ft*	*Maximum ponding depth of one foot at the mid-point of the channel, and a maximum depth of 18" at the end point of the channel (for storage of the WQv)*
Top Width	20	*ft*	
Area	21.00	*sf*	
Minimum Length	149	*ft*	
Actual Length	150	*ft*	
End Point Depth check	1.50	*Okay*	*A maximum depth of 18" at the end point of the channel (for storage of the WQv)*
Storage Capacity	3,497	*ft^3*	
Soil Group (HSG)		D	

Runoff Reduction

Is the Dry Swale contributing flow to another practice?			Select Practice
RRv	**699**	***ft^3***	**Runnoff Reduction equals 40% in HSG A and B and 20% in HSG C and D up to the WQv**
Volume Treated	2,768	*ft^3*	This is the difference between the WQv calculated and the runoff reduction achieved in the swale
Volume Directed	0	*ft^3*	This volume is directed another practice
Volume √	*Okay*		Check to be sure that channel is long enough to store WQv

Design Point:	2A

Version 1.8 Last Updated: 11/09/2015 Total Water Quality Volume Calculation WQv(acre-feet) = [(P)(Rv)(A)] /12

Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?...						No
Design Point:	2B					
P=	1.15	*inch*	*Manually enter P, Total Area and Impervious Cover.*			

Breakdown of Subcatchments

Catchment Number	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Rv	WQv *(ft³)*	Description
1	5.79	2.70	47%	0.47	11,353	Bioretention
2						
3						
4						
5						
6						
7						
8						
9						
10						
Subtotal (1-30)	5.79	2.70	47%	0.47	**11,353**	**Subtotal 1**
Total	5.79	2.70	47%	0.47	**11,353**	**Initial WQv**

Identify Runoff Reduction Techniques By Area

Technique	Total Contributing Area *(Acre)*	Contributing Impervious Area *(Acre)*	Notes
Conservation of Natural Areas	0.00	0.00	*minimum 10,000 sf*
Riparian Buffers	0.00	0.00	*maximum contributing length 75 feet to 150 feet*
Filter Strips	0.00	0.00	
Tree Planting	0.00	0.00	*Up to 100 sf directly connected impervious area may be subtracted per tree*
Total	**0.00**	**0.00**	

Recalculate WQv after application of Area Reduction Techniques

	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Runoff Coefficient Rv	WQv *(ft³)*
"<<Initial WQv"	5.79	2.70	47%	0.47	11,353
Subtract Area	0.00	0.00			
WQv adjusted after Area Reductions	**5.79**	**2.70**	47%	0.47	11,353
Disconnection of Rooftops		0.00			
Adjusted WQv after Area Reduction and Rooftop Disconnect	5.79	2.70	47%	0.47	**11,353**
WQv reduced by Area Reduction techniques					0

Runoff Reduction Volume and Treated volumes						
	Runoff Reduction Techiques/Standard SMPs		**Total Contributing Area**	**Total Contributing Impervious Area**	**WQv Reduced (RRv)**	**WQv Treated**
			(acres)	**(acres)**	**cf**	**cf**
Area/Volume Reduction	Conservation of Natural Areas	RR-1	0.00	0.00		
	Sheetflow to Riparian Buffers/Filter Strips	RR-2	0.00	0.00		
	Tree Planting/Tree Pit	RR-3	0.00	0.00		
	Disconnection of Rooftop Runoff	RR-4		0.00		
	Vegetated Swale	RR-5	0.00	0.00	0	
	Rain Garden	RR-6	0.00	0.00	0	
	Stormwater Planter	RR-7	0.00	0.00	0	
	Rain Barrel/Cistern	RR-8	0.00	0.00	0	
	Porous Pavement	RR-9	0.00	0.00	0	
	Green Roof (Intensive & Extensive)	RR-10	0.00	0.00	0	
Standard SMPs w/RRv Capacity	Infiltration Trench	I-1	0.00	0.00	0	0
	Infiltration Basin	I-2	0.00	0.00	0	0
	Dry Well	I-3	0.00	0.00	0	0
	Underground Infiltration System	I-4				
	Bioretention & Infiltration Bioretention	F-5	5.79	2.70	2400	8953
	Dry swale	O-1	0.00	0.00	0	0
Standard SMPs	Micropool Extended Detention (P-1)	P-1				
	Wet Pond (P-2)	P-2				
	Wet Extended Detention (P-3)	P-3				
	Multiple Pond system (P-4)	P-4				
	Pocket Pond (p-5)	P-5				
	Surface Sand filter (F-1)	F-1				
	Underground Sand filter (F-2)	F-2				
	Perimeter Sand Filter (F-3)	F-3				
	Organic Filter (F-4	F-4				
	Shallow Wetland (W-1)	W-1				
	Extended Detention Wetland (W-2	W-2				
	Pond/Wetland System (W-3)	W-3				
	Pocket Wetland (W-4)	W-4				
	Wet Swale (O-2)	O-2				
Totals by Area Reduction		→	0.00	0.00	0	
Totals by Volume Reduction		→	0.00	0.00	0	
Totals by Standard SMP w/RRV		→	5.79	2.70	2400	8953
Totals by Standard SMP		→	0.00	0.00		0
Totals (Area + Volume + all SMPs)		→	5.79	2.70	2,400	8,953
	Impervious Cover √	okay				

Minimum RRv

Enter the Soils Data for the site		
Soil Group	Acres	S
A		55%
B		40%
C		30%
D	**100.00**	20%
Total Area	100	
Calculate the Minimum RRv		
S =	**0.20**	
Impervious =	2.70	*acre*
Precipitation	1.15	*in*
Rv	0.95	
Minimum RRv	**2,142**	***ft3***
	0.05	af

NOI QUESTIONS

#	NOI Question	Reported Value	
		cf	af
28	Total Water Quality Volume (WQv) Required	11353	*0.261*
30	Total RRV Provided	2400	*0.055*
31	Is RRv Provided ≥WQv Required?	No	
32	Minimum RRv	2142	*0.049*
32a	Is RRv Provided ≥ Minimum RRv Required?	Yes	
33a	Total WQv Treated	8953	*0.206*
34	Sum of Volume Reduced & Treated	11353	*0.261*
34	Sum of Volume Reduced and Treated	11353	*0.261*
35	Is Sum RRv Provided and WQv Provided ≥WQv Required?	Yes	

Apply Peak Flow Attenuation			
36	Channel Protection	*Cpv*	
37	Overbank	*Qp*	
37	Extreme Flood Control	*Qf*	
	Are Quantity Control requirements met?		

Bioretention Worksheet

(For use on HSG C or D Soils with underdrains)

Af=WQv*(df)/[k*(hf+df)(tf)]

Af	Required Surface Area (ft2)
WQv	Water Quality Volume (ft3)
df	Depth of the Soil Medium (feet)
hf	Average height of water above the planter bed
tf	Volume Through the Filter Media (days)

k The hydraulic conductivity [ft/day], can be varied depending on the properties of the soil media. Some reported conductivity values are: ***Sand*** - 3.5 ft/day (City of Austin 1988); ***Peat*** - 2.0 ft/day (Galli 1990); ***Leaf Compost*** - 8.7 ft/day (Claytor and Schueler, 1996); ***Bioretention Soil*** (0.5 ft/day (Claytor &

Design Point:	**2B**

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
1	5.79	2.70	0.47	0.47	11352.55	1.15	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops		0.00	47%	0.47	11,353	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						*ft^3*	
Soil Information							
Soil Group		D					
Soil Infiltration Rate		0.10	*in/hour*	*Okay*			
Using Underdrains?		Yes	*Okay*				
Calculate the Minimum Filter Area							
				Value		Units	Notes
WQv				11,353		*ft^3*	
Enter Depth of Soil Media			*df*	2.5		*ft*	*2.5-4 ft*
Enter Hydraulic Conductivity			*k*	0.5		*ft/day*	
Enter Average Height of Ponding			*hf*	0.5		*ft*	*6 inches max.*
Enter Filter Time			*tf*	2		*days*	
Required Filter Area			***Af***	**9460**		***ft^2***	
Determine Actual Bio-Retention Area							
Filter Width		50	*ft*				
Filter Length		100	*ft*				
Filter Area		5000	*ft^2*				
Actual Volume Provided		6000	*ft^3*				
Determine Runoff Reduction							
Is the Bioretention contributing flow to another practice?				Select Practice			
RRv		2,400					
RRv applied		**2,400**	***ft^3***	***This is 40% of the storage provided or WQv whichever is less.***			
Volume Treated		8,953	*ft^3*	*This is the portion of the WQv that is not reduced in the practice.*			
Volume Directed		0	*ft^3*	This volume is directed another practice			
Sizing √		Error		*Check to be sure Area provided ≥ Af*			

(For use on HSG C or D Soils with underdrains)

Total Water Quality Volume Calculation

$WQv(acre\text{-}feet) = [(P)(Rv)(A)] / 12$

Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?...	No

Design Point:	3	
P=	1.15	*inch*

Manually enter P, Total Area and Impervious Cover.

Breakdown of Subcatchments

Catchment Number	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Rv	WQv *(ft^3)*	Description
1	1.06	0.65	61%	0.60	2,663	Dry Swale
2						
3						
4						
5						
6						
7						
8						
9						
10						
Subtotal (1-30)	1.06	0.65	61%	0.60	**2,663**	**Subtotal 1**
Total	1.06	0.65	61%	0.60	**2,663**	**Initial WQv**

Identify Runoff Reduction Techniques By Area

Technique	Total Contributing Area *(Acre)*	Contributing Impervious Area *(Acre)*	Notes
Conservation of Natural Areas	0.00	0.00	*minimum 10,000 sf*
Riparian Buffers	0.00	0.00	*maximum contributing length 75 feet to 150 feet*
Filter Strips	0.00	0.00	
Tree Planting	0.00	0.00	*Up to 100 sf directly connected impervious area may be subtracted per tree*
Total	**0.00**	**0.00**	

Recalculate WQv after application of Area Reduction Techniques

	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Runoff Coefficient Rv	WQv *(ft^3)*
"<<Initial WQv"	1.06	0.65	61%	0.60	2,663
Subtract Area	0.00	0.00			
WQv adjusted after Area Reductions	**1.06**	**0.65**	61%	0.60	2,663
Disconnection of Rooftops		0.00			
Adjusted WQv after Area Reduction and Rooftop Disconnect	1.06	0.65	61%	0.60	**2,663**
WQv reduced by Area Reduction techniques					0

Runoff Reduction Volume and Treated volumes						
	Runoff Reduction Techiques/Standard SMPs		**Total Contributing Area**	**Total Contributing Impervious Area**	**WQv Reduced (RRv)**	**WQv Treated**
			(acres)	**(acres)**	**cf**	**cf**
Area/Volume Reduction	Conservation of Natural Areas	RR-1	0.00	0.00		
	Sheetflow to Riparian Buffers/Filter Strips	RR-2	0.00	0.00		
	Tree Planting/Tree Pit	RR-3	0.00	0.00		
	Disconnection of Rooftop Runoff	RR-4		0.00		
	Vegetated Swale	RR-5	0.00	0.00	0	
	Rain Garden	RR-6	0.00	0.00	0	
	Stormwater Planter	RR-7	0.00	0.00	0	
	Rain Barrel/Cistern	RR-8	0.00	0.00	0	
	Porous Pavement	RR-9	0.00	0.00	0	
	Green Roof (Intensive & Extensive)	RR-10	0.00	0.00	0	
Standard SMPs w/RRv Capacity	Infiltration Trench	I-1	0.00	0.00	0	0
	Infiltration Basin	I-2	0.00	0.00	0	0
	Dry Well	I-3	0.00	0.00	0	0
	Underground Infiltration System	I-4				
	Bioretention & Infiltration Bioretention	F-5	0.00	0.00	0	0
	Dry swale	O-1	1.06	0.65	977	1686
Standard SMPs	Micropool Extended Detention (P-1)	P-1				
	Wet Pond (P-2)	P-2				
	Wet Extended Detention (P-3)	P-3				
	Multiple Pond system (P-4)	P-4				
	Pocket Pond (p-5)	P-5				
	Surface Sand filter (F-1)	F-1				
	Underground Sand filter (F-2)	F-2				
	Perimeter Sand Filter (F-3)	F-3				
	Organic Filter (F-4	F-4				
	Shallow Wetland (W-1)	W-1				
	Extended Detention Wetland (W-2	W-2				
	Pond/Wetland System (W-3)	W-3				
	Pocket Wetland (W-4)	W-4				
	Wet Swale (O-2)	O-2				
	Totals by Area Reduction	→	0.00	0.00	0	
	Totals by Volume Reduction	→	0.00	0.00	0	
	Totals by Standard SMP w/RRV	→	1.06	0.65	977	1686
	Totals by Standard SMP	→	0.00	0.00		0
	Totals (Area + Volume + all SMPs)	→	1.06	0.65	977	1,686
	Impervious Cover √	okay				

Minimum RRv

Enter the Soils Data for the site		
Soil Group	Acres	S
A		55%
B		40%
C		30%
D	**100.00**	20%
Total Area	100	
Calculate the Minimum RRv		
S =	**0.20**	
Impervious =	0.65	*acre*
Precipitation	1.15	*in*
Rv	0.95	
Minimum RRv	**516**	***ft3***
	0.01	af

NOI QUESTIONS

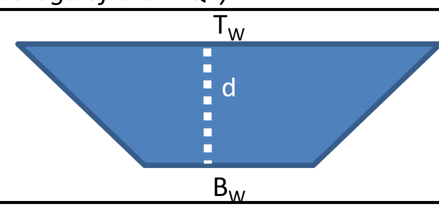
#	NOI Question	Reported Value	
		cf	af
28	Total Water Quality Volume (WQv) Required	2663	*0.061*
30	Total RRV Provided	977	*0.022*
31	Is RRv Provided ≥WQv Required?	No	
32	Minimum RRv	516	*0.012*
32a	Is RRv Provided ≥ Minimum RRv Required?	Yes	
33a	Total WQv Treated	1686	*0.039*
34	Sum of Volume Reduced & Treated	2663	*0.061*
34	Sum of Volume Reduced and Treated	2663	*0.061*
35	Is Sum RRv Provided and WQv Provided ≥WQv Required?	Yes	

Apply Peak Flow Attenuation			
36	Channel Protection	*Cpv*	
37	Overbank	*Qp*	
37	Extreme Flood Control	*Qf*	
	Are Quantity Control requirements met?		

Dry Swale Worksheet

Design Point:	3

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
1	1.06	0.65	0.61	0.60	2663.33	1.15	Dry Swale
Enter Impervious Area Reduced by Disconnection of Rooftops		0.00	61%	0.60	2,663	<<WQv after adjusting for Disconnected Rooftops	
Pretreatment Provided					**Pretreatment Technique**		
Pretreatment (10% of WQv)			266	ft^3	Plunge Pool		

Calculate Available Storage Capacity			
Bottom Width	8	*ft*	Design with a bottom width no greater than eight feet to avoid potential gullying and channel braiding, but no less than two feet
Side Slope (X:1)	4	*Okay*	Channels shall be designed with moderate side slopes (flatter than 3:1) for most conditions. 2:1 is the absolute maximum side slope
Longitudinal Slope	1%	*Okay*	*Maximum longitudinal slope shall be 4%*
Flow Depth	1.5	*ft*	*Maximum ponding depth of one foot at the mid-point of the channel, and a maximum depth of 18" at the end point of the channel (for storage of the WQv)*
Top Width	20	*ft*	
Area	21.00	*sf*	
Minimum Length	114	*ft*	
Actual Length	220	*ft*	
End Point Depth check	1.50	*Okay*	*A maximum depth of 18" at the end point of the channel (for storage of the WQv)*
Storage Capacity	4,886	ft^3	
Soil Group (HSG)			D

Runoff Reduction				
Is the Dry Swale contributing flow to another practice?			Select Practice	
RRv	**977**	ft^3	**Runnoff Reduction equals 40% in HSG A and B and 20% in HSG C and D up to the WQv**	
Volume Treated	1,686	ft^3	This is the difference between the WQv calculated and the runoff reduction achieved in the swale	
Volume Directed	0	ft^3	This volume is directed another practice	
Volume √	*Okay*		Check to be sure that channel is long enough to store WQv	

Design Point:	3

Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?..						No
Design Point:	5		*Manually enter P, Total Area and Impervious Cover.*			
P=	1.15	*inch*				

Breakdown of Subcatchments						
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Description**
1	9.80	3.61	37%	0.38	15,609	Dry Swale
2						DA-18B
3						DA-19
4						DA-19A
5						DA-20
6						DA-20A
7						DA-21
8						DA-21A
9						DA-21C
10						DA-22
Subtotal (1-30)	9.80	3.61	37%	0.38	**15,609**	**Subtotal 1**
Total	9.80	3.61	37%	0.38	**15,609**	**Initial WQv**

Identify Runoff Reduction Techniques By Area			
Technique	**Total Contributing Area** *(Acre)*	**Contributing Impervious Area** *(Acre)*	**Notes**
Conservation of Natural Areas	0.00	0.00	*minimum 10,000 sf*
Riparian Buffers	0.00	0.00	*maximum contributing length 75 feet to 150 feet*
Filter Strips	0.00	0.00	
Tree Planting	0.00	0.00	*Up to 100 sf directly connected impervious area may be subtracted per tree*
Total	**0.00**	**0.00**	

Recalculate WQv after application of Area Reduction Techniques					
	Total Area *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Runoff Coefficient Rv**	**WQv** *(ft^3)*
"<<Initial WQv"	9.80	3.61	37%	0.38	15,609
Subtract Area	0.00	0.00			
WQv adjusted after Area Reductions	**9.80**	**3.61**	37%	0.38	15,609
Disconnection of Rooftops		0.00			
Adjusted WQv after Area Reduction and Rooftop Disconnect	9.80	3.61	37%	0.38	**15,609**
WQv reduced by Area Reduction techniques					0

Total Water Quality Volume CalculationWQv(acre-feet) = [(P)(Rv)(A)] /12

Additional Subcatchments						
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Description**
11						DA-22A
12						DA-23
13						DA-23A
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
Subtotal	0.00	0.00			**0**	**Subtotal**

Runoff Reduction Volume and Treated volumes						
	Runoff Reduction Techiques/Standard SMPs		**Total Contributing Area**	**Total Contributing Impervious Area**	**WQv Reduced (RRv)**	**WQv Treated**
			(acres)	**(acres)**	**cf**	**cf**
Area/Volume Reduction	Conservation of Natural Areas	RR-1	0.00	0.00		
	Sheetflow to Riparian Buffers/Filter Strips	RR-2	0.00	0.00		
	Tree Planting/Tree Pit	RR-3	0.00	0.00		
	Disconnection of Rooftop Runoff	RR-4		0.00		
	Vegetated Swale	RR-5	0.00	0.00	0	
	Rain Garden	RR-6	0.00	0.00	0	
	Stormwater Planter	RR-7	0.00	0.00	0	
	Rain Barrel/Cistern	RR-8	0.00	0.00	0	
	Porous Pavement	RR-9	0.00	0.00	0	
	Green Roof (Intensive & Extensive)	RR-10	0.00	0.00	0	
Standard SMPs w/RRv Capacity	Infiltration Trench	I-1	0.00	0.00	0	0
	Infiltration Basin	I-2	0.00	0.00	0	0
	Dry Well	I-3	0.00	0.00	0	0
	Underground Infiltration System	I-4				
	Bioretention & Infiltration Bioretention	F-5	0.00	0.00	0	0
	Dry swale	O-1	9.80	3.61	3252	12356
Standard SMPs	Micropool Extended Detention (P-1)	P-1				
	Wet Pond (P-2)	P-2				
	Wet Extended Detention (P-3)	P-3				
	Multiple Pond system (P-4)	P-4				
	Pocket Pond (p-5)	P-5				
	Surface Sand filter (F-1)	F-1				
	Underground Sand filter (F-2)	F-2				
	Perimeter Sand Filter (F-3)	F-3				
	Organic Filter (F-4	F-4				
	Shallow Wetland (W-1)	W-1				
	Extended Detention Wetland (W-2	W-2				
	Pond/Wetland System (W-3)	W-3				
	Pocket Wetland (W-4)	W-4				
	Wet Swale (O-2)	O-2				
	Totals by Area Reduction	→	0.00	0.00	0	
	Totals by Volume Reduction	→	0.00	0.00	0	
	Totals by Standard SMP w/RRV	→	9.80	3.61	3252	12356
	Totals by Standard SMP	→	0.00	0.00		0
	Totals (Area + Volume + all SMPs)	→	9.80	3.61	3,252	12,356
	Impervious Cover √	okay				

Minimum RRv

Enter the Soils Data for the site		
Soil Group	Acres	S
A		55%
B		40%
C		30%
D	**100.00**	20%
Total Area	100	
Calculate the Minimum RRv		
S =	**0.20**	
Impervious =	3.61	*acre*
Precipitation	1.15	*in*
Rv	0.95	
Minimum RRv	**2,863**	***ft3***
	0.07	af

NOI QUESTIONS

#	NOI Question	Reported Value	
		cf	af
28	Total Water Quality Volume (WQv) Required	15609	*0.358*
30	Total RRV Provided	3252	*0.075*
31	Is RRv Provided ≥WQv Required?	No	
32	Minimum RRv	2863	*0.066*
32a	Is RRv Provided ≥ Minimum RRv Required?	Yes	
33a	Total WQv Treated	12356	*0.284*
34	Sum of Volume Reduced & Treated	15609	*0.358*
34	Sum of Volume Reduced and Treated	15609	*0.358*
35	Is Sum RRv Provided and WQv Provided ≥WQv Required?	Yes	

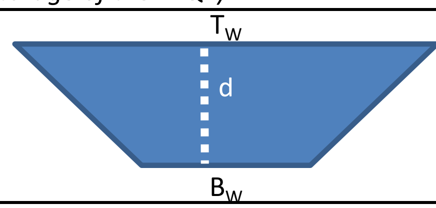
Apply Peak Flow Attenuation			
36	Channel Protection	*Cpv*	
37	Overbank	*Qp*	
37	Extreme Flood Control	*Qf*	
	Are Quantity Control requirements met?		

Dry Swale Worksheet

Design Point:	**5**

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
1	9.80	3.61	0.37	0.38	15608.66	1.15	Dry Swale
Enter Impervious Area Reduced by Disconnection of Rooftops		0.00	37%	0.38	15,609	<<WQv after adjusting for Disconnected Rooftops	

Pretreatment Provided			**Pretreatment Technique**
Pretreatment (10% of WQv)	1,561	*ft^3*	Plunge Pool

Calculate Available Storage Capacity			
Bottom Width	8	*ft*	Design with a bottom width no greater than eight feet to avoid potential gullying and channel braiding, but no less than two feet
Side Slope (X:1)	4	*Okay*	Channels shall be designed with moderate side slopes (flatter than 3:1) for most conditions. 2:1 is the absolute maximum side slope
Longitudinal Slope	1%	*Okay*	*Maximum longitudinal slope shall be 4%*
Flow Depth	1.5	*ft*	*Maximum ponding depth of one foot at the mid-point of the channel, and a maximum depth of 18" at the end point of the channel (for storage of the WQv)*
Top Width	20	*ft*	
Area	21.00	*sf*	
Minimum Length	669	*ft*	
Actual Length	700	*ft*	
End Point Depth check	1.50	*Okay*	*A maximum depth of 18" at the end point of the channel (for storage of the WQv)*
Storage Capacity	16,261	*ft^3*	
Soil Group (HSG)		D	

Runoff Reduction				
Is the Dry Swale contributing flow to another practice?			Select Practice	
RRv	**3,252**	***ft^3***	**Runnoff Reduction equals 40% in HSG A and B and 20% in HSG C and D up to the WQv**	
Volume Treated	12,356	*ft^3*	This is the difference between the WQv calculated and the runoff reduction achieved in the swale	
Volume Directed	0	*ft^3*	This volume is directed another practice	
Volume √	*Okay*		Check to be sure that channel is long enough to store WQv	

Design Point:	**5**

Version 1.8 Last Updated: 11/09/2015

Total Water Quality Volume Calculation

$WQv(acre\text{-}feet) = [(P)(Rv)(A)] / 12$

Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?...			No
Design Point:	6A		*Manually enter P, Total Area and Impervious Cover.*
P=	1.15	*inch*	

Breakdown of Subcatchments						
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Description**
1	0.90	0.47	52%	0.52	1,954	Dry Swale
2						
3						
4						
5						
6						
7						
8						
9						
10						
Subtotal (1-30)	0.90	0.47	52%	0.52	**1,954**	**Subtotal 1**
Total	0.90	0.47	52%	0.52	**1,954**	**Initial WQv**

Identify Runoff Reduction Techniques By Area			
Technique	**Total Contributing Area** *(Acre)*	**Contributing Impervious Area** *(Acre)*	**Notes**
Conservation of Natural Areas	0.00	0.00	*minimum 10,000 sf*
Riparian Buffers	0.00	0.00	*maximum contributing length 75 feet to 150 feet*
Filter Strips	0.00	0.00	
Tree Planting	0.00	0.00	*Up to 100 sf directly connected impervious area may be subtracted per tree*
Total	**0.00**	**0.00**	

Recalculate WQv after application of Area Reduction Techniques					
	Total Area *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Runoff Coefficient Rv**	**WQv** *(ft^3)*
"<<Initial WQv"	0.90	0.47	52%	0.52	1,954
Subtract Area	0.00	0.00			
WQv adjusted after Area Reductions	**0.90**	**0.47**	52%	0.52	1,954
Disconnection of Rooftops		0.00			
Adjusted WQv after Area Reduction and Rooftop Disconnect	0.90	0.47	52%	0.52	**1,954**
WQv reduced by Area Reduction techniques					0

Runoff Reduction Volume and Treated volumes						
	Runoff Reduction Techiques/Standard SMPs		**Total Contributing Area**	**Total Contributing Impervious Area**	**WQv Reduced (RRv)**	**WQv Treated**
			(acres)	**(acres)**	**cf**	**cf**
Area/Volume Reduction	Conservation of Natural Areas	RR-1	0.00	0.00		
	Sheetflow to Riparian Buffers/Filter Strips	RR-2	0.00	0.00		
	Tree Planting/Tree Pit	RR-3	0.00	0.00		
	Disconnection of Rooftop Runoff	RR-4		0.00		
	Vegetated Swale	RR-5	0.00	0.00	0	
	Rain Garden	RR-6	0.00	0.00	0	
	Stormwater Planter	RR-7	0.00	0.00	0	
	Rain Barrel/Cistern	RR-8	0.00	0.00	0	
	Porous Pavement	RR-9	0.00	0.00	0	
	Green Roof (Intensive & Extensive)	RR-10	0.00	0.00	0	
Standard SMPs w/RRv Capacity	Infiltration Trench	I-1	0.00	0.00	0	0
	Infiltration Basin	I-2	0.00	0.00	0	0
	Dry Well	I-3	0.00	0.00	0	0
	Underground Infiltration System	I-4				
	Bioretention & Infiltration Bioretention	F-5	0.00	0.00	0	0
	Dry swale	O-1	0.90	0.47	627	1327
Standard SMPs	Micropool Extended Detention (P-1)	P-1				
	Wet Pond (P-2)	P-2				
	Wet Extended Detention (P-3)	P-3				
	Multiple Pond system (P-4)	P-4				
	Pocket Pond (p-5)	P-5				
	Surface Sand filter (F-1)	F-1				
	Underground Sand filter (F-2)	F-2				
	Perimeter Sand Filter (F-3)	F-3				
	Organic Filter (F-4	F-4				
	Shallow Wetland (W-1)	W-1				
	Extended Detention Wetland (W-2	W-2				
	Pond/Wetland System (W-3)	W-3				
	Pocket Wetland (W-4)	W-4				
	Wet Swale (O-2)	O-2				
Totals by Area Reduction		→	0.00	0.00	0	
Totals by Volume Reduction		→	0.00	0.00	0	
Totals by Standard SMP w/RRV		→	0.90	0.47	627	1327
Totals by Standard SMP		→	0.00	0.00		0
Totals (Area + Volume + all SMPs)		→	0.90	0.47	627	1,327
	Impervious Cover √	okay				

Minimum RRv

Enter the Soils Data for the site		
Soil Group	Acres	S
A		55%
B		40%
C		30%
D	**100.00**	20%
Total Area	100	
Calculate the Minimum RRv		
S =	**0.20**	
Impervious =	0.47	*acre*
Precipitation	1.15	*in*
Rv	0.95	
Minimum RRv	**373**	***ft3***
	0.01	af

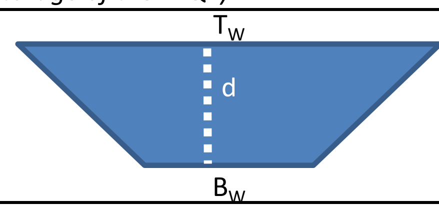
NOI QUESTIONS

#	NOI Question	Reported Value	
		cf	af
28	Total Water Quality Volume (WQv) Required	1954	*0.045*
30	Total RRV Provided	627	*0.014*
31	Is RRv Provided ≥WQv Required?	No	
32	Minimum RRv	373	*0.009*
32a	Is RRv Provided ≥ Minimum RRv Required?	Yes	
33a	Total WQv Treated	1327	*0.030*
34	Sum of Volume Reduced & Treated	1954	*0.045*
34	Sum of Volume Reduced and Treated	1954	*0.045*
35	Is Sum RRv Provided and WQv Provided ≥WQv Required?	Yes	

Apply Peak Flow Attenuation			
36	Channel Protection	*Cpv*	
37	Overbank	*Qp*	
37	Extreme Flood Control	*Qf*	
	Are Quantity Control requirements met?		

Dry Swale Worksheet

Design Point:	**6A**

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
1	0.90	0.47	0.52	0.52	1953.67	1.15	Dry Swale
Enter Impervious Area Reduced by Disconnection of Rooftops		0.00	52%	0.52	1,954	<<WQv after adjusting for Disconnected Rooftops	
Pretreatment Provided					**Pretreatment Technique**		
Pretreatment (10% of WQv)			195	*ft^3*	Plunge Pool		
Calculate Available Storage Capacity							
Bottom Width	8	*ft*	Design with a bottom width no greater than eight feet to avoid potential gullying and channel braiding, but no less than two feet				
Side Slope (X:1)	4	*Okay*	Channels shall be designed with moderate side slopes (flatter than 3:1) for most conditions. 2:1 is the absolute maximum side slope				
Longitudinal Slope	1%	*Okay*	*Maximum longitudinal slope shall be 4%*				
Flow Depth	1.5	*ft*	*Maximum ponding depth of one foot at the mid-point of the channel, and a maximum depth of 18" at the end point of the channel (for storage of the WQv)*				
Top Width	20	*ft*					
Area	21.00	*sf*					
Minimum Length	84	*ft*					
Actual Length	140	*ft*					
End Point Depth check	1.50	*Okay*	*A maximum depth of 18" at the end point of the channel (for storage of the WQv)*				
Storage Capacity	3,135	*ft^3*					
Soil Group (HSG)			D				
Runoff Reduction							
Is the Dry Swale contributing flow to another practice?				Select Practice			
RRv	**627**	***ft^3***	**Runnoff Reduction equals 40% in HSG A and B and 20% in HSG C and D up to the WQv**				
Volume Treated	1,327	*ft^3*	This is the difference between the WQv calculated and the runoff reduction achieved in the swale				
Volume Directed	0	*ft^3*	This volume is directed another practice				
Volume √	*Okay*		Check to be sure that channel is long enough to store WQv				

Design Point:	**6A**

Total Water Quality Volume Calculation WQv(acre-feet) = [(P)(Rv)(A)] /12

Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?...	No

Design Point:	6B	
P=	1.15	*inch*

Manually enter P, Total Area and Impervious Cover.

Breakdown of Subcatchments

Catchment Number	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Rv	WQv *(ft³)*	Description
1	3.23	1.52	47%	0.47	6,385	Bioretention
2						
3						
4						
5						
6						
7						
8						
9						
10						
Subtotal (1-30)	3.23	1.52	47%	0.47	**6,385**	**Subtotal 1**
Total	3.23	1.52	47%	0.47	**6,385**	**Initial WQv**

Identify Runoff Reduction Techniques By Area

Technique	Total Contributing Area *(Acre)*	Contributing Impervious Area *(Acre)*	Notes
Conservation of Natural Areas	0.00	0.00	*minimum 10,000 sf*
Riparian Buffers	0.00	0.00	*maximum contributing length 75 feet to 150 feet*
Filter Strips	0.00	0.00	
Tree Planting	0.00	0.00	*Up to 100 sf directly connected impervious area may be subtracted per tree*
Total	**0.00**	**0.00**	

Recalculate WQv after application of Area Reduction Techniques

	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Runoff Coefficient Rv	WQv *(ft³)*
"<<Initial WQv"	3.23	1.52	47%	0.47	6,385
Subtract Area	0.00	0.00			
WQv adjusted after Area Reductions	**3.23**	**1.52**	47%	0.47	6,385
Disconnection of Rooftops		0.00			
Adjusted WQv after Area Reduction and Rooftop Disconnect	3.23	1.52	47%	0.47	**6,385**
WQv reduced by Area Reduction techniques					0

Runoff Reduction Volume and Treated volumes						
	Runoff Reduction Techiques/Standard SMPs		**Total Contributing Area**	**Total Contributing Impervious Area**	**WQv Reduced (RRv)**	**WQv Treated**
			(acres)	**(acres)**	**cf**	**cf**
Area/Volume Reduction	Conservation of Natural Areas	RR-1	0.00	0.00		
	Sheetflow to Riparian Buffers/Filter Strips	RR-2	0.00	0.00		
	Tree Planting/Tree Pit	RR-3	0.00	0.00		
	Disconnection of Rooftop Runoff	RR-4		0.00		
	Vegetated Swale	RR-5	0.00	0.00	0	
	Rain Garden	RR-6	0.00	0.00	0	
	Stormwater Planter	RR-7	0.00	0.00	0	
	Rain Barrel/Cistern	RR-8	0.00	0.00	0	
	Porous Pavement	RR-9	0.00	0.00	0	
	Green Roof (Intensive & Extensive)	RR-10	0.00	0.00	0	
Standard SMPs w/RRv Capacity	Infiltration Trench	I-1	0.00	0.00	0	0
	Infiltration Basin	I-2	0.00	0.00	0	0
	Dry Well	I-3	0.00	0.00	0	0
	Underground Infiltration System	I-4				
	Bioretention & Infiltration Bioretention	F-5	3.23	1.52	1440	4945
	Dry swale	O-1	0.00	0.00	0	0
Standard SMPs	Micropool Extended Detention (P-1)	P-1				
	Wet Pond (P-2)	P-2				
	Wet Extended Detention (P-3)	P-3				
	Multiple Pond system (P-4)	P-4				
	Pocket Pond (p-5)	P-5				
	Surface Sand filter (F-1)	F-1				
	Underground Sand filter (F-2)	F-2				
	Perimeter Sand Filter (F-3)	F-3				
	Organic Filter (F-4	F-4				
	Shallow Wetland (W-1)	W-1				
	Extended Detention Wetland (W-2	W-2				
	Pond/Wetland System (W-3)	W-3				
	Pocket Wetland (W-4)	W-4				
	Wet Swale (O-2)	O-2				
	Totals by Area Reduction	→	0.00	0.00	0	
	Totals by Volume Reduction	→	0.00	0.00	0	
	Totals by Standard SMP w/RRV	→	3.23	1.52	1440	4945
	Totals by Standard SMP	→	0.00	0.00		0
	Totals (Area + Volume + all SMPs)	→	3.23	1.52	1,440	4,945
	Impervious Cover √	okay				

Minimum RRv

Enter the Soils Data for the site		
Soil Group	Acres	S
A		55%
B		40%
C		30%
D	**100.00**	20%
Total Area	100	
Calculate the Minimum RRv		
S =	**0.20**	
Impervious =	1.52	*acre*
Precipitation	1.15	*in*
Rv	0.95	
Minimum RRv	**1,206**	***ft3***
	0.03	af

NOI QUESTIONS

#	NOI Question	Reported Value	
		cf	af
28	Total Water Quality Volume (WQv) Required	6385	*0.147*
30	Total RRV Provided	1440	*0.033*
31	Is RRv Provided ≥WQv Required?	No	
32	Minimum RRv	1206	*0.028*
32a	Is RRv Provided ≥ Minimum RRv Required?	Yes	
33a	Total WQv Treated	4945	*0.114*
34	Sum of Volume Reduced & Treated	6385	*0.147*
34	Sum of Volume Reduced and Treated	6385	*0.147*
35	Is Sum RRv Provided and WQv Provided ≥WQv Required?	Yes	

Apply Peak Flow Attenuation			
36	Channel Protection	*Cpv*	
37	Overbank	*Qp*	
37	Extreme Flood Control	*Qf*	
	Are Quantity Control requirements met?		

Bioretention Worksheet

(For use on HSG C or D Soils with underdrains)

Af=WQv*(df)/[k*(hf+df)(tf)]

Af	Required Surface Area (ft2)
WQv	Water Quality Volume (ft3)
df	Depth of the Soil Medium (feet)
hf	Average height of water above the planter bed
tf	Volume Through the Filter Media (days)

k The hydraulic conductivity [ft/day], can be varied depending on the properties of the soil media. Some reported conductivity values are: ***Sand*** - 3.5 ft/day (City of Austin 1988); ***Peat*** - 2.0 ft/day (Galli 1990); ***Leaf Compost*** - 8.7 ft/day (Claytor and Schueler, 1996); ***Bioretention Soil*** (0.5 ft/day (Claytor &

Design Point:	**6B**						
Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
1	3.23	1.52	0.47	0.47	6384.90	1.15	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops		0.00	47%	0.47	6,385	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						*ft^3*	
Soil Information							
Soil Group		D					
Soil Infiltration Rate		0.10	*in/hour*	*Okay*			
Using Underdrains?		Yes	*Okay*				
Calculate the Minimum Filter Area							
				Value		Units	Notes
WQv				6,385		*ft^3*	
Enter Depth of Soil Media			*df*	2.5		*ft*	*2.5-4 ft*
Enter Hydraulic Conductivity			*k*	0.5		*ft/day*	
Enter Average Height of Ponding			*hf*	0.5		*ft*	*6 inches max.*
Enter Filter Time			*tf*	2		*days*	
Required Filter Area			***Af***	**5321**		***ft^2***	
Determine Actual Bio-Retention Area							
Filter Width		30	*ft*				
Filter Length		100	*ft*				
Filter Area		3000	*ft^2*				
Actual Volume Provided		3600	*ft^3*				
Determine Runoff Reduction							
Is the Bioretention contributing flow to another practice?				Select Practice			
RRv		1,440					
RRv applied		**1,440**	***ft^3***	***This is 40% of the storage provided or WQv whichever is less.***			
Volume Treated		4,945	*ft^3*	*This is the portion of the WQv that is not reduced in the practice.*			
Volume Directed		0	*ft^3*	This volume is directed another practice			
Sizing √		Error		*Check to be sure Area provided ≥ Af*			

(For use on HSG C or D Soils with underdrains)

APPENDIX F

NOI

0644089821

NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR ______ (for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-20-001

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required.

-IMPORTANT-

RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)

Owner/Operator Contact Person Last Name (NOT CONSULTANT)

Owner/Operator Contact Person First Name

Owner/Operator Mailing Address

City

State

Zip -

Phone (Owner/Operator) - -

Fax (Owner/Operator) - -

Email (Owner/Operator)

FED TAX ID
- (not required for individuals)

Project Site Information

Project/Site Name

Street Address (NOT P.O. BOX)

Side of Street
○ **North** ○ **South** ○ **East** ○ **West**

City/Town/Village (THAT ISSUES BUILDING PERMIT)

State: N Y
Zip: -
County
DEC Region

Name of Nearest Cross Street

Distance to Nearest Cross Street (Feet)

Project In Relation to Cross Street
○ **North** ○ **South** ○ **East** ○ **West**

Tax Map Numbers
Section-Block-Parcel

Tax Map Numbers

1. Provide the Geographic Coordinates for the project site. To do this, go to the NYSDEC Stormwater Interactive Map on the DEC website at:

https://gisservices.dec.ny.gov/gis/stormwater/

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located the centroid of your project site, go to the bottom right hand corner of the map for the X, Y coordinates. Enter the coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting)
-7
Ex. -73.749

Y Coordinates (Northing)
4
Ex. 42.652

2. What is the nature of this construction project?

○ **New Construction**

○ **Redevelopment with increase in impervious area**

○ **Redevelopment with no increase in impervious area**

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development Existing Land Use

- ○ FOREST
- ○ PASTURE/OPEN LAND
- ○ CULTIVATED LAND
- ○ SINGLE FAMILY HOME
- ○ SINGLE FAMILY SUBDIVISION
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ○ INDUSTRIAL
- ○ COMMERCIAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY
- ○ PARKING LOT
- ○ OTHER

Post-Development Future Land Use

- ○ SINGLE FAMILY HOME
- ○ SINGLE FAMILY SUBDIVISION
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ○ INDUSTRIAL
- ○ COMMERCIAL
- ○ MUNICIPAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY (water, sewer, gas, etc.)
- ○ PARKING LOT
- ○ CLEARING/GRADING ONLY
- ○ DEMOLITION, NO REDEVELOPMENT
- ○ WELL DRILLING ACTIVITY *(Oil, Gas, etc.)
- ○ OTHER

Number of Lots

***Note**: for gas well drilling, non-high volume hydraulic fractured wells only

4. In accordance with the larger common plan of development or sale, enter the total project site area; the total area to be disturbed; existing impervious area to be disturbed (for redevelopment activities); and the future impervious area constructed within the disturbed area. (Round to the nearest tenth of an acre.)

Total Site Area	**Total Area To Be Disturbed**	**Existing Impervious Area To Be Disturbed**	**Future Impervious Area Within Disturbed Area**
.	.	.	.

5. Do you plan to disturb more than 5 acres of soil at any one time? ○ **Yes** ○ **No**

6. Indicate the percentage of each Hydrologic Soil Group(HSG) at the site.

A	**B**	**C**	**D**
%	%	%	%

7. Is this a phased project? ○ **Yes** ○ **No**

8. Enter the planned start and end dates of the disturbance activities.

Start Date / / - **End Date** / /

9. Identify the nearest surface waterbody(ies) to which construction site runoff will discharge.

Name

9a. Type of waterbody identified in Question 9?

- ○ Wetland / State Jurisdiction On Site (Answer 9b)
- ○ Wetland / State Jurisdiction Off Site
- ○ Wetland / Federal Jurisdiction On Site (Answer 9b)
- ○ Wetland / Federal Jurisdiction Off Site
- ○ Stream / Creek On Site
- ○ Stream / Creek Off Site
- ○ River On Site
- ○ River Off Site
- ○ Lake On Site
- ○ Lake Off Site
- ○ Other Type On Site
- ○ Other Type Off Site

9b. How was the wetland identified?

- ○ Regulatory Map
- ○ Delineated by Consultant
- ○ Delineated by Army Corps of Engineers
- ○ Other (identify)

10. Has the surface waterbody(ies) in question 9 been identified as a 303(d) segment in Appendix E of GP-0-20-001? ○ **Yes** ○ **No**

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-20-001? ○ **Yes** ○ **No**

12. Is the project located in one of the watershed areas associated with AA and AA-S classified waters? **If no, skip question 13.** ○ **Yes** ○ **No**

13. Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey? **If Yes, what is the acreage to be disturbed?** ○ **Yes** ○ **No**

.

14. Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area? ○ **Yes** ○ **No**

15. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)? ○ **Yes** ○ **No** ○ **Unknown**

16. What is the name of the municipality/entity that owns the separate storm sewer system?

17. Does any runoff from the site enter a sewer classified as a Combined Sewer? ○ **Yes** ○ **No** ○ **Unknown**

18. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law? ○ **Yes** ○ **No**

19. Is this property owned by a state authority, state agency, federal government or local government? ○ **Yes** ○ **No**

20. Is this a remediation project being done under a Department approved work plan? (i.e. CERCLA, RCRA, Voluntary Cleanup Agreement, etc.) ○ **Yes** ○ **No**

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book)? ○ **Yes** ○ **No**

22. Does this construction activity require the development of a SWPPP that includes the post-construction stormwater management practice component (i.e. Runoff Reduction, Water Quality and Quantity Control practices/techniques)? ○ **Yes** ○ **No**
If No, skip questions 23 and 27-39.

23. Has the post-construction stormwater management practice component of the SWPPP been developed in conformance with the current NYS Stormwater Management Design Manual? ○ **Yes** ○ **No**

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

- ○ **Professional Engineer (P.E.)**
- ○ **Soil and Water Conservation District (SWCD)**
- ○ **Registered Landscape Architect (R.L.A)**
- ○ **Certified Professional in Erosion and Sediment Control (CPESC)**
- ○ **Owner/Operator**
- ○ **Other**

SWPPP Preparer

Contact Name (Last, Space, First)

Mailing Address

City

State Zip

-

Phone

- -

Fax

- -

Email

SWPPP Preparer Certification

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-20-001. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First Name **MI**

Last Name

Signature

Date

/ /

25. Has a construction sequence schedule for the planned management practices been prepared? ○ Yes ○ No

26. Select **all** of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural

- ○ Check Dams
- ○ Construction Road Stabilization
- ○ Dust Control
- ○ Earth Dike
- ○ Level Spreader
- ○ Perimeter Dike/Swale
- ○ Pipe Slope Drain
- ○ Portable Sediment Tank
- ○ Rock Dam
- ○ Sediment Basin
- ○ Sediment Traps
- ○ Silt Fence
- ○ Stabilized Construction Entrance
- ○ Storm Drain Inlet Protection
- ○ Straw/Hay Bale Dike
- ○ Temporary Access Waterway Crossing
- ○ Temporary Stormdrain Diversion
- ○ Temporary Swale
- ○ Turbidity Curtain
- ○ Water bars

Biotechnical

- ○ Brush Matting
- ○ Wattling

Vegetative Measures

- ○ Brush Matting
- ○ Dune Stabilization
- ○ Grassed Waterway
- ○ Mulching
- ○ Protecting Vegetation
- ○ Recreation Area Improvement
- ○ Seeding
- ○ Sodding
- ○ Straw/Hay Bale Dike
- ○ Streambank Protection
- ○ Temporary Swale
- ○ Topsoiling
- ○ Vegetating Waterways

Permanent Structural

- ○ Debris Basin
- ○ Diversion
- ○ Grade Stabilization Structure
- ○ Land Grading
- ○ Lined Waterway (Rock)
- ○ Paved Channel (Concrete)
- ○ Paved Flume
- ○ Retaining Wall
- ○ Riprap Slope Protection
- ○ Rock Outlet Protection
- ○ Streambank Protection

Other

Post-construction Stormwater Management Practice (SMP) Requirements

Important: Completion of Questions 27-39 is not required if response to Question 22 is No.

27. Identify all site planning practices that were used to prepare the final site plan/layout for the project.

- ○ **Preservation of Undisturbed Areas**
- ○ **Preservation of Buffers**
- ○ **Reduction of Clearing and Grading**
- ○ **Locating Development in Less Sensitive Areas**
- ○ **Roadway Reduction**
- ○ **Sidewalk Reduction**
- ○ **Driveway Reduction**
- ○ **Cul-de-sac Reduction**
- ○ **Building Footprint Reduction**
- ○ **Parking Reduction**

27a. Indicate which of the following soil restoration criteria was used to address the requirements in Section 5.1.6("Soil Restoration") of the Design Manual (2010 version).

- ○ All disturbed areas will be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).
- ○ Compacted areas were considered as impervious cover when calculating the **WQv Required**, and the compacted areas were assigned a post-construction Hydrologic Soil Group (HSG) designation that is one level less permeable than existing conditions for the hydrology analysis.

28. Provide the total Water Quality Volume (WQv) required for this project (based on final site plan/layout).

Total WQv Required

☐☐☐.☐☐☐ **acre-feet**

29. Identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity in Table 1 (See Page 9) that were used to reduce the Total WQv Required(#28).

Also, provide in Table 1 the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

Note: Redevelopment projects shall use Tables 1 and 2 to identify the SMPs used to treat and/or reduce the WQv required. If runoff reduction techniques will not be used to reduce the required WQv, skip to question 33a after identifying the SMPs.

Table 1 - Runoff Reduction (RR) Techniques and Standard Stormwater Management Practices (SMPs)

	Total Contributing Area (acres)		Total Contributing Impervious Area(acres)
RR Techniques (Area Reduction)			
○ Conservation of Natural Areas (RR-1) ...	.	and/or	.
○ Sheetflow to Riparian Buffers/Filters Strips (RR-2)	.	and/or	.
○ Tree Planting/Tree Pit (RR-3)	.	and/or	.
○ Disconnection of Rooftop Runoff (RR-4)..	.	and/or	.
RR Techniques (Volume Reduction)			
○ Vegetated Swale (RR-5)			.
○ Rain Garden (RR-6)			.
○ Stormwater Planter (RR-7)			.
○ Rain Barrel/Cistern (RR-8)			.
○ Porous Pavement (RR-9)			.
○ Green Roof (RR-10)			.
Standard SMPs with RRv Capacity			
○ Infiltration Trench (I-1)			.
○ Infiltration Basin (I-2)			.
○ Dry Well (I-3)			.
○ Underground Infiltration System (I-4)			.
○ Bioretention (F-5)			.
○ Dry Swale (O-1)			.
Standard SMPs			
○ Micropool Extended Detention (P-1)			.
○ Wet Pond (P-2)			.
○ Wet Extended Detention (P-3)			.
○ Multiple Pond System (P-4)			.
○ Pocket Pond (P-5)			.
○ Surface Sand Filter (F-1)			.
○ Underground Sand Filter (F-2)			.
○ Perimeter Sand Filter (F-3)			.
○ Organic Filter (F-4)			.
○ Shallow Wetland (W-1)			.
○ Extended Detention Wetland (W-2)			.
○ Pond/Wetland System (W-3)			.
○ Pocket Wetland (W-4)			.
○ Wet Swale (O-2)			.

Table 2 - Alternative SMPs (DO NOT INCLUDE PRACTICES BEING USED FOR PRETREATMENT ONLY)

Alternative SMP	Total Contributing Impervious Area(acres)
○ Hydrodynamic	___ . ___
○ Wet Vault	___ . ___
○ Media Filter	___ . ___
○ Other ______	___ . ___

Provide the name and manufacturer of the Alternative SMPs (i.e. proprietary practice(s)) being used for WQv treatment.

Name ______

Manufacturer ______

Note: Redevelopment projects which do not use RR techniques, shall use questions 28, 29, 33 and 33a to provide SMPs used, total WQv required and total WQv provided for the project.

30. Indicate the Total RRv provided by the RR techniques (Area/Volume Reduction) and Standard SMPs with RRv capacity identified in question 29.

Total RRv provided

___ . ___ **acre-feet**

31. Is the Total RRv provided (#30) greater than or equal to the total WQv required (#28).

○ **Yes** ○ **No**

If Yes, go to question 36.
If No, go to question 32.

32. Provide the Minimum RRv required based on HSG.
[Minimum RRv Required = (P)(0.95)(Ai)/12, Ai=(S)(Aic)]

Minimum RRv Required

___ . ___ **acre-feet**

32a. Is the Total RRv provided (#30) greater than or equal to the Minimum RRv Required (#32)?

○ **Yes** ○ **No**

If Yes, go to question 33.
Note: Use the space provided in question #39 to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). A detailed evaluation of the specific site limitations and justification for not reducing 100% of the WQv required (#28) must also be included in the SWPPP.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. Identify the Standard SMPs in Table 1 and, if applicable, the Alternative SMPs in Table 2 that were used to treat the remaining total WQv(=Total WQv Required in 28 - Total RRv Provided in 30).

Also, provide in Table 1 and 2 the total impervious area that contributes runoff to each practice selected.

Note: Use Tables 1 and 2 to identify the SMPs used on Redevelopment projects.

33a. Indicate the Total WQv provided (i.e. WQv treated) by the SMPs identified in question #33 and Standard SMPs with RRv Capacity identified in question 29.

WQv Provided

[ ][ ][ ].[ ][ ][ ] **acre-feet**

Note: For the standard SMPs with RRv capacity, the WQv provided by each practice = the WQv calculated using the contributing drainage area to the practice - RRv provided by the practice. (See Table 3.5 in Design Manual)

34. Provide the sum of the Total RRv provided (#30) and the WQv provided (#33a). [ ][ ][ ].[ ][ ][ ]

35. Is the sum of the RRv provided (#30) and the WQv provided (#33a) greater than or equal to the total WQv required (#28)? ○ **Yes** ○ **No**

If Yes, go to question 36.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

36. Provide the total Channel Protection Storage Volume (CPv) required and provided or select waiver (36a), if applicable.

CPv Required [ ][ ][ ].[ ][ ][ ] **acre-feet**

CPv Provided [ ][ ][ ].[ ][ ][ ] **acre-feet**

36a. The need to provide channel protection has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.

○ Reduction of the total CPv is achieved on site through runoff reduction techniques or infiltration systems.

37. Provide the Overbank Flood (Qp) and Extreme Flood (Qf) control criteria or select waiver (37a), if applicable.

Total Overbank Flood Control Criteria (Qp)

Pre-Development [ ][ ][ ].[ ][ ][ ] **CFS**

Post-development [ ][ ][ ].[ ][ ][ ] **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development [ ][ ][ ].[ ][ ][ ] **CFS**

Post-development [ ][ ][ ].[ ][ ][ ] **CFS**

37a. The need to meet the Qp and Qf criteria has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.

○ Downstream analysis reveals that the Qp and Qf controls are not required

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed? ○ **Yes** ○ **No**

If Yes, Identify the entity responsible for the long term Operation and Maintenance

39. Use this space to summarize the specific site limitations and justification for not reducing 100% of WQv required(#28). (See question 32a) This space can also be used for other pertinent project information.

40. Identify other DEC permits, existing and new, that are required for this project/facility.

- ○ Air Pollution Control
- ○ Coastal Erosion
- ○ Hazardous Waste
- ○ Long Island Wells
- ○ Mined Land Reclamation
- ○ Solid Waste
- ○ Navigable Waters Protection / Article 15
- ○ Water Quality Certificate
- ○ Dam Safety
- ○ Water Supply
- ○ Freshwater Wetlands/Article 24
- ○ Tidal Wetlands
- ○ Wild, Scenic and Recreational Rivers
- ○ Stream Bed or Bank Protection / Article 15
- ○ Endangered or Threatened Species(Incidental Take Permit)
- ○ Individual SPDES
- ○ SPDES Multi-Sector GP N Y R
- ○ Other
- ○ None

41. Does this project require a US Army Corps of Engineers Wetland Permit? ○ Yes ○ No
If Yes, Indicate Size of Impact. .

42. Is this project subject to the requirements of a regulated, traditional land use control MS4? ○ Yes ○ No
(If No, skip question 43)

43. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI? ○ Yes ○ No

44. If this NOI is being submitted for the purpose of continuing or transferring coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned. N Y R

Owner/Operator Certification

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Print First Name **MI**

Print Last Name

Owner/Operator Signature

Date

/ /

APPENDIX G

NOT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505
(NOTE: Submit completed form to address above)

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity

Please indicate your permit identification number: NYR ___ ___ ___ ___ ___ ___

I. Owner or Operator Information

1. Owner/Operator Name:

2. Street Address:

3. City/State/Zip:

4. Contact Person:	4a.Telephone:

4b. Contact Person E-Mail:

II. Project Site Information

5. Project/Site Name:

6. Street Address:

7. City/Zip:

8. County:

III. Reason for Termination

9a. □ All disturbed areas have achieved final stabilization in accordance with the general permit and SWPPP. ***Date final stabilization completed** (month/year): ______________________

9b. □ Permit coverage has been transferred to new owner/operator. Indicate new owner/operator's permit identification number: NYR ___ ___ ___ ___ ___ ___
(Note: Permit coverage can not be terminated by owner identified in I.1. above until new owner/operator obtains coverage under the general permit)

9c. □ Other (Explain on Page 2)

IV. Final Site Information:

10a. Did this construction activity require the development of a SWPPP that includes post-construction stormwater management practices? □ yes □ no (If no, go to question 10f.)

10b. Have all post-construction stormwater management practices included in the final SWPPP been constructed? □ yes □ no (If no, explain on Page 2)

10c. Identify the entity responsible for long-term operation and maintenance of practice(s)?

____

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

10d. Has the entity responsible for long-term operation and maintenance been given a copy of the operation and maintenance plan required by the general permit? □ yes □ no

10e. Indicate the method used to ensure long-term operation and maintenance of the post-construction stormwater management practice(s):

□ Post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain practice(s) have been deeded to the municipality.

□ Executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s).

□ For post-construction stormwater management practices that are privately owned, a mechanism is in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the owner or operator's deed of record.

□ For post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university or hospital), government agency or authority, or public utility; policy and procedures are in place that ensures operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

10f. Provide the total area of impervious surface (i.e. roof, pavement, concrete, gravel, etc.) constructed within the disturbance area? ______________________________ (acres)

11. Is this project subject to the requirements of a regulated, traditional land use control MS4? □ yes □ no

(If Yes, complete section VI - "MS4 Acceptance" statement

V. Additional Information/Explanation:

(Use this section to answer questions 9c. and 10b., if applicable)

VI. MS4 Acceptance - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative (Note: Not required when 9b. is checked -transfer of coverage)

I have determined that it is acceptable for the owner or operator of the construction project identified in question 5 to submit the Notice of Termination at this time.

Printed Name:

Title/Position:

Signature:	Date:

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

VII. Qualified Inspector Certification - Final Stabilization:

I hereby certify that all disturbed areas have achieved final stabilization as defined in the current version of the general permit, and that all temporary, structural erosion and sediment control measures have been removed. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

VIII. Qualified Inspector Certification - Post-construction Stormwater Management Practice(s):

I hereby certify that all post-construction stormwater management practices have been constructed in conformance with the SWPPP. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

IX. Owner or Operator Certification

I hereby certify that this document was prepared by me or under my direction or supervision. My determination, based upon my inquiry of the person(s) who managed the construction activity, or those persons directly responsible for gathering the information, is that the information provided in this document is true, accurate and complete. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

(NYS DEC Notice of Termination - January 2015)

APPENDIX H

MS4 Authorization Form

NYS Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form

for

Construction Activities Seeking Authorization Under SPDES General Permit

*(NOTE: Attach Completed Form to Notice Of Intent and Submit to Address Above)

I. Project Owner/Operator Information
1. Owner/Operator Name:
2. Contact Person:
3. Street Address:
4. City/State/Zip:
II. Project Site Information
5. Project/Site Name:
6. Street Address:
7. City/State/Zip:
III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information
8. SWPPP Reviewed by:
9. Title/Position:
10. Date Final SWPPP Reviewed and Accepted:
IV. Regulated MS4 Information
11. Name of MS4:
12. MS4 SPDES Permit Identification Number: NYR20A
13. Contact Person:
14. Street Address:
15. City/State/Zip:
16. Telephone Number:

MS4 SWPPP Acceptance Form - continued

V. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative

I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in question 5 has been reviewed and meets the substantive requirements in the SPDES General Permit For Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s). Note: The MS4, through the acceptance of the SWPPP, assumes no responsibility for the accuracy and adequacy of the design included in the SWPPP. In addition, review and acceptance of the SWPPP by the MS4 does not relieve the owner/operator or their SWPPP preparer of responsibility or liability for errors or omissions in the plan.

Printed Name:

Title/Position:

Signature:

Date:

VI. Additional Information

(NYS DEC - MS4 SWPPP Acceptance Form - January 2015)

APPENDIX I

GP-0-20-001

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SPDES GENERAL PERMIT
FOR STORMWATER DISCHARGES

From

CONSTRUCTION ACTIVITY

Permit No. GP- 0-20-001

Issued Pursuant to Article 17, Titles 7, 8 and Article 70

of the Environmental Conservation Law

Effective Date: January 29, 2020

Expiration Date: January 28, 2025

John J. Ferguson

Chief Permit Administrator

1-23-20

Authorized Signature

Date

Address: NYS DEC
Division of Environmental Permits
625 Broadway, 4th Floor
Albany, N.Y. 12233-1750

PREFACE

Pursuant to Section 402 of the Clean Water Act ("CWA"), stormwater *discharges* from certain *construction activities* are unlawful unless they are authorized by a *National Pollutant Discharge Elimination System ("NPDES")* permit or by a state permit program. New York administers the approved State Pollutant Discharge Elimination System (SPDES) program with permits issued in accordance with the New York State Environmental Conservation Law (ECL) Article 17, Titles 7, 8 and Article 70.

An *owner or operator* of a *construction activity* that is eligible for coverage under this permit must obtain coverage prior to the *commencement of construction activity*. Activities that fit the definition of "*construction activity*", as defined under 40 CFR 122.26(b)(14)(x), (15)(i), and (15)(ii), constitute construction of a *point source* and therefore, pursuant to ECL section 17-0505 and 17-0701, the *owner or operator* must have coverage under a SPDES permit prior to *commencing construction activity*. The *owner or operator* cannot wait until there is an actual *discharge* from the *construction site* to obtain permit coverage.

***Note: The italicized words/phrases within this permit are defined in Appendix A.**

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES

Table of Contents

Part 1. PERMIT COVERAGE AND LIMITATIONS

A. Permit Application

This permit authorizes stormwater *discharges* to *surface waters of the State* from the following *construction activities* identified within 40 CFR Parts 122.26(b)(14)(x), 122.26(b)(15)(i) and 122.26(b)(15)(ii), provided all of the eligibility provisions of this permit are met:

1. *Construction activities* involving soil disturbances of one (1) or more acres; including disturbances of less than one acre that are part of a *larger common plan of development or sale* that will ultimately disturb one or more acres of land; excluding *routine maintenance activity* that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility;

2. *Construction activities* involving soil disturbances of less than one (1) acre where the Department has determined that a *SPDES* permit is required for stormwater *discharges* based on the potential for contribution to a violation of a *water quality standard* or for significant contribution of *pollutants* to *surface waters of the State.*

3. *Construction activities* located in the watershed(s) identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

B. Effluent Limitations Applicable to Discharges from Construction Activities

*Discharge*s authorized by this permit must achieve, at a minimum, the effluent limitations in Part I.B.1. (a) – (f) of this permit. These limitations represent the degree of effluent reduction attainable by the application of best practicable technology currently available.

1. Erosion and Sediment Control Requirements - The *owner or operator* must select, design, install, implement and maintain control measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. The selection, design, installation, implementation, and maintenance of these control measures must meet the non-numeric effluent limitations in Part I.B.1.(a) – (f) of this permit and be in accordance with the New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, using sound engineering judgment. Where control measures are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must include in the *Stormwater Pollution Prevention Plan* ("SWPPP") the reason(s) for the

deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

a. **Erosion and Sediment Controls.** Design, install and maintain effective erosion and sediment controls to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such controls must be designed, installed and maintained to:

(i) *Minimize* soil erosion through application of runoff control and soil stabilization control measure to *minimize pollutant discharges*;

(ii) Control stormwater *discharge*s, including both peak flowrates and total stormwater volume, to *minimize* channel and *streambank* erosion and scour in the immediate vicinity of the *discharge* points;

(iii) *Minimize* the amount of soil exposed during *construction activity*;

(iv) *Minimize* the disturbance of *steep slopes*;

(v) *Minimize* sediment *discharge*s from the site;

(vi) Provide and maintain *natural buffer*s around surface waters, direct stormwater to vegetated areas and maximize stormwater infiltration to reduce *pollutant discharge*s, unless *infeasible*;

(vii) *Minimize* soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted;

(viii) Unless *infeasible*, preserve a sufficient amount of topsoil to complete soil restoration and establish a uniform, dense vegetative cover; and

(ix) *Minimize* dust. On areas of exposed soil, *minimize* dust through the appropriate application of water or other dust suppression techniques to control the generation of pollutants that could be discharged from the site.

b. **Soil Stabilization**. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within fourteen (14) days from the date the current soil disturbance activity ceased. For construction sites that *directly discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. See Appendix A for definition of *Temporarily Ceased*.

c. **Dewatering**. *Discharge*s from *dewatering* activities, including *discharge*s from *dewatering* of trenches and excavations, must be managed by appropriate control measures.

d. **Pollution Prevention Measures**. Design, install, implement, and maintain effective pollution prevention measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such measures must be designed, installed, implemented and maintained to:

(i) *Minimize* the *discharge* of *pollutants* from equipment and vehicle washing, wheel wash water, and other wash waters. This applies to washing operations that use clean water only. Soaps, detergents and solvents cannot be used;

(ii) *Minimize* the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, hazardous and toxic waste, and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a *discharge* of *pollutants*, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use) ; and

(iii) Prevent the *discharge* of *pollutants* from spills and leaks and implement chemical spill and leak prevention and response procedures.

e. **Prohibited *Discharge*s.** The following *discharge*s are prohibited:

(i) Wastewater from washout of concrete;

(ii) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;

(iii) Fuels, oils, or other *pollutants* used in vehicle and equipment operation and maintenance;

(iv) Soaps or solvents used in vehicle and equipment washing; and

(v) Toxic or hazardous substances from a spill or other release.

f. Surface Outlets. When discharging from basins and impoundments, the outlets shall be designed, constructed and maintained in such a manner that sediment does not leave the basin or impoundment and that erosion at or below the outlet does not occur.

C. Post-construction Stormwater Management Practice Requirements

1. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must select, design, install, and maintain the practices to meet the *performance criteria* in the New York State Stormwater Management Design Manual (“Design Manual”), dated January 2015, using sound engineering judgment. Where post-construction stormwater management practices (“SMPs”) are not designed in conformance with the *performance criteria* in the Design Manual, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must design the practices to meet the applicable *sizing criteria* in Part I.C.2.a., b., c. or d. of this permit.

a. Sizing Criteria for New Development

(i) Runoff Reduction Volume (“RRv”): Reduce the total Water Quality Volume (“WQv”) by application of RR techniques and standard SMPs with RRv capacity. The total WQv shall be calculated in accordance with the criteria in Section 4.2 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: Construction activities that cannot meet the criteria in Part I.C.2.a.(i) of this permit due to site limitations shall direct runoff from all newly constructed impervious areas to a RR technique or standard SMP with RRv capacity unless infeasible. The specific site limitations that prevent the reduction of 100% of the WQv shall be documented in the SWPPP.

For each impervious area that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered infeasible.

In no case shall the runoff reduction achieved from the newly constructed impervious areas be less than the Minimum RRv as calculated using the criteria in Section 4.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (“Cpv”): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
(2) The site discharges directly to tidal waters, or fifth order or larger streams.

(iv) *Overbank* Flood Control Criteria (“Qp”): Requires storage to attenuate the post-development 10-year, 24-hour peak discharge rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
(1) the site discharges directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

(v) Extreme Flood Control Criteria (“Qf”): Requires storage to attenuate the post-development 100-year, 24-hour peak discharge rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
(1) the site discharges directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

b. *Sizing Criteria* for *New Development* in Enhanced Phosphorus Removal Watershed

(i) Runoff Reduction Volume (RRv): Reduce the total Water Quality Volume (WQv) by application of RR techniques and standard SMPs with RRv capacity. The total WQv is the runoff volume from the 1-year, 24 hour design storm over the post-developed watershed and shall be calculated in accordance with the criteria in Section 10.3 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part I.C.2.b.(i) of this permit due to *site limitations* shall direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv shall be documented in the SWPPP. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible.*

In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 10.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (Cpv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
(2) The site *discharge*s directly to tidal waters, or fifth order or larger streams.

(iv) *Overbank* Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

(v) Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

c. Sizing Criteria for Redevelopment Activity

(i) Water Quality Volume (WQv): The WQv treatment objective for *redevelopment activity* shall be addressed by one of the following options. *Redevelopment activities* located in an Enhanced Phosphorus Removal Watershed (see Part III.B.3. and Appendix C of this permit) shall calculate the WQv in accordance with Section 10.3 of the Design Manual. All other *redevelopment activities* shall calculate the WQv in accordance with Section 4.2 of the Design Manual.

(1) Reduce the existing *impervious cover* by a minimum of 25% of the total disturbed, *impervious area*. The Soil Restoration criteria in Section 5.1.6 of the Design Manual must be applied to all newly created pervious areas, or

(2) Capture and treat a minimum of 25% of the WQv from the disturbed, *impervious area* by the application of standard SMPs; or reduce 25% of the WQv from the disturbed, *impervious area* by the application of RR techniques or standard SMPs with RRv capacity., or

(3) Capture and treat a minimum of 75% of the WQv from the disturbed, *impervious area* as well as any additional runoff from tributary areas by application of the alternative practices discussed in Sections 9.3 and 9.4 of the Design Manual., or

(4) Application of a combination of 1, 2 and 3 above that provide a weighted average of at least two of the above methods. Application of this method shall be in accordance with the criteria in Section 9.2.1(B) (IV) of the Design Manual.

If there is an existing post-construction stormwater management practice located on the site that captures and treats runoff from the *impervious area* that is being disturbed, the WQv treatment option selected must, at a minimum, provide treatment equal to the treatment that was being provided by the existing practice(s) if that treatment is greater than the treatment required by options 1 – 4 above.

(ii) Channel Protection Volume (Cpv): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iii) *Overbank* Flood Control Criteria (Qp): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iv) Extreme Flood Control Criteria (Qf): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site

d. Sizing Criteria for Combination of Redevelopment Activity and New Development

Construction projects that include both New Development and Redevelopment Activity shall provide post-construction stormwater management controls that meet the sizing criteria calculated as an aggregate of the Sizing Criteria in Part I.C.2.a. or b. of this permit for the New Development portion of the project and Part I.C.2.c of this permit for Redevelopment Activity portion of the project.

D. Maintaining Water Quality

The Department expects that compliance with the conditions of this permit will control *discharge*s necessary to meet applicable *water quality standards*. It shall be a violation of the *ECL* for any discharge to either cause or contribute to a violation of *water quality standards* as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, such as:

1. There shall be no increase in turbidity that will cause a substantial visible contrast to natural conditions;

2. There shall be no increase in suspended, colloidal or settleable solids that will cause deposition or impair the waters for their best usages; and

3. There shall be no residue from oil and floating substances, nor visible oil film, nor globules of grease.

If there is evidence indicating that the stormwater *discharge*s authorized by this permit are causing, have the reasonable potential to cause, or are contributing to a violation of the *water quality standards*; the *owner or operator* must take appropriate corrective action in accordance with Part IV.C.5. of this general permit and document in accordance with Part IV.C.4. of this general permit. To address the *water quality standard* violation the *owner or operator* may need to provide additional information, include and implement appropriate controls in the SWPPP to correct the problem, or obtain an individual SPDES permit.

If there is evidence indicating that despite compliance with the terms and conditions of this general permit it is demonstrated that the stormwater *discharge*s authorized by this permit are causing or contributing to a violation of *water quality standards*, or if the Department determines that a modification of the permit is necessary to prevent a violation of *water quality standards*, the authorized *discharge*s will no longer be eligible for coverage under this permit. The Department may require the *owner or operator* to obtain an individual SPDES permit to continue discharging.

E. Eligibility Under This General Permit

1. This permit may authorize all *discharges* of stormwater from *construction activity* to *surface waters of the State* and *groundwaters* except for ineligible *discharges* identified under subparagraph F. of this Part.

2. Except for non-stormwater *discharges* explicitly listed in the next paragraph, this permit only authorizes stormwater *discharge*s; including stormwater runoff, snowmelt runoff, and surface runoff and drainage, from *construction activities*.

3. Notwithstanding paragraphs E.1 and E.2 above, the following non-stormwater discharges are authorized by this permit: those listed in 6 NYCRR 750-1.2(a)(29)(vi), with the following exception: "Discharges from firefighting activities are authorized only when the firefighting activities are emergencies/unplanned"; waters to which other components have not been added that are used to control dust in accordance with the SWPPP; and uncontaminated *discharge*s from *construction site* de-watering operations. All non-stormwater discharges must be identified in the SWPPP. Under all circumstances, the *owner or operator* must still comply with *water quality standards* in Part I.D of this permit.

4. The *owner or operator* must maintain permit eligibility to *discharge* under this permit. Any *discharges* that are not compliant with the eligibility conditions of this permit are not authorized by the permit and the *owner or operator* must either apply for a separate permit to cover those ineligible *discharges* or take steps necessary to make the *discharge* eligible for coverage.

F. Activities Which Are Ineligible for Coverage Under This General Permit

All of the following are **not** authorized by this permit:

1. *Discharge*s after *construction activities* have been completed and the site has undergone *final stabilization*;

2. *Discharge*s that are mixed with sources of non-stormwater other than those expressly authorized under subsection E.3. of this Part and identified in the SWPPP required by this permit;

3. *Discharges* that are required to obtain an individual SPDES permit or another SPDES general permit pursuant to Part VII.K. of this permit;

4. *Construction activities* or *discharges* from *construction activities* that may adversely affect an *endangered or threatened species* unless the *owner or*

operator has obtained a permit issued pursuant to 6 NYCRR Part 182 for the project or the Department has issued a letter of non-jurisdiction for the project. All documentation necessary to demonstrate eligibility shall be maintained on site in accordance with Part II.D.2 of this permit;

5. *Discharges* which either cause or contribute to a violation of *water quality standards* adopted pursuant to the *ECL* and its accompanying regulations;

6. *Construction activities* for residential, commercial and institutional projects:

   a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

   b. Which are undertaken on land with no existing *impervious cover*; and

   c. Which disturb one (1) or more acres of land designated on the current United States Department of Agriculture ("USDA") Soil Survey as Soil Slope Phase "D", (provided the map unit name is inclusive of slopes greater than 25%), or Soil Slope Phase "E" or "F" (regardless of the map unit name), or a combination of the three designations.

7. *Construction activities* for linear transportation projects and linear utility projects:

   a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

   b. Which are undertaken on land with no existing *impervious cover*; and

   c. Which disturb two (2) or more acres of land designated on the current USDA Soil Survey as Soil Slope Phase "D" (provided the map unit name is inclusive of slopes greater than 25%), or Soil Slope Phase "E" or "F" (regardless of the map unit name), or a combination of the three designations.

8. *Construction activities* that have the potential to affect an *historic property*, unless there is documentation that such impacts have been resolved. The following documentation necessary to demonstrate eligibility with this requirement shall be maintained on site in accordance with Part II.D.2 of this permit and made available to the Department in accordance with Part VII.F of this permit:

   a. Documentation that the *construction activity* is not within an archeologically sensitive area indicated on the sensitivity map, and that the *construction activity* is not located on or immediately adjacent to a property listed or determined to be eligible for listing on the National or State Registers of Historic Places, and that there is no new permanent building on the *construction site* within the following distances from a building, structure, or object that is more than 50 years old, or if there is such a new permanent building on the *construction site* within those parameters that NYS Office of Parks, Recreation and Historic Preservation (OPRHP), a Historic Preservation Commission of a Certified Local Government, or a qualified preservation professional has determined that the building, structure, or object more than 50 years old is not historically/archeologically significant.

      - 1-5 acres of disturbance - 20 feet
      - 5-20 acres of disturbance - 50 feet
      - 20+ acres of disturbance - 100 feet, or

   b. DEC consultation form sent to OPRHP, and copied to the NYS DEC Agency Historic Preservation Officer (APO), and
      (i) the State Environmental Quality Review (SEQR) Environmental Assessment Form (EAF) with a negative declaration or the Findings Statement, with documentation of OPRHP’s agreement with the resolution; or
      (ii) documentation from OPRHP that the *construction activity* will result in No Impact; or
      (iii) documentation from OPRHP providing a determination of No Adverse Impact; or
      (iv) a Letter of Resolution signed by the owner/operator, OPRHP and the DEC APO which allows for this *construction activity* to be eligible for coverage under the general permit in terms of the State Historic Preservation Act (SHPA); or

   c. Documentation of satisfactory compliance with Section 106 of the National Historic Preservation Act for a coterminous project area:

(i) No Affect
(ii) No Adverse Affect
(iii) Executed Memorandum of Agreement, or

d. Documentation that:

(i) SHPA Section 14.09 has been completed by NYS DEC or another state agency.

9. *Discharge*s from *construction activities* that are subject to an existing SPDES individual or general permit where a SPDES permit for *construction activity* has been terminated or denied; or where the *owner or operator* has failed to renew an expired individual permit.

Part II. PERMIT COVERAGE

A. How to Obtain Coverage

1. An *owner or operator* of a *construction activity* that is not subject to the requirements of a regulated, traditional land use control MS4 must first prepare a SWPPP in accordance with all applicable requirements of this permit and then submit a completed Notice of Intent (NOI) to the Department to be authorized to discharge under this permit.

2. An *owner or operator* of a *construction activity* that is subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then have the SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department. The *owner or operator* shall have the “MS4 SWPPP Acceptance” form signed in accordance with Part VII.H., and then submit that form along with a completed NOI to the Department.

3. The requirement for an *owner or operator* to have its SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department does not apply to an *owner or operator* that is obtaining permit coverage in accordance with the requirements in Part II.F. (Change of *Owner or Operator*) or where the *owner or operator* of the *construction activity* is the *regulated, traditional land use control MS4* . This exemption does not apply to *construction activities* subject to the New York City Administrative Code.

B. Notice of Intent (NOI) Submittal

1. Prior to December 21, 2020, an owner or operator shall use either the electronic (eNOI) or paper version of the NOI that the Department prepared. Both versions of the NOI are located on the Department's website (http://www.dec.ny.gov/). The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the following address:

   NOTICE OF INTENT
   NYS DEC, Bureau of Water Permits
   625 Broadway, 4th Floor
   Albany, New York 12233-3505

2. Beginning December 21, 2020 and in accordance with EPA's 2015 NPDES Electronic Reporting Rule (40 CFR Part 127), the *owner or operator* must submit the NOI electronically using the *Department's* online NOI.

3. The *owner or operator* shall have the SWPPP preparer sign the "SWPPP Preparer Certification" statement on the NOI prior to submitting the form to the Department.

4. As of the date the NOI is submitted to the Department, the *owner or operator* shall make the NOI and SWPPP available for review and copying in accordance with the requirements in Part VII.F. of this permit.

C. Permit Authorization

1. An *owner or operator* shall not *commence construction activity* until their authorization to *discharge* under this permit goes into effect.

2. Authorization to *discharge* under this permit will be effective when the *owner or operator* has satisfied all of the following criteria:

   a. project review pursuant to the State Environmental Quality Review Act ("SEQRA") have been satisfied, when SEQRA is applicable. See the Department's website (http://www.dec.ny.gov/) for more information,

   b. where required, all necessary Department permits subject to the *Uniform Procedures Act ("UPA")* (see 6 NYCRR Part 621), or the equivalent from another New York State agency, have been obtained, unless otherwise notified by the Department pursuant to 6 NYCRR 621.3(a)(4). *Owners or operators* of *construction activities* that are required to obtain *UPA* permits must submit a preliminary SWPPP to the appropriate DEC Permit Administrator at the Regional Office listed in Appendix F at the time all other necessary *UPA* permit applications are submitted. The preliminary SWPPP must include sufficient information to demonstrate that the *construction activity* qualifies for authorization under this permit,

c. the final SWPPP has been prepared, and

d. a complete NOI has been submitted to the Department in accordance with the requirements of this permit.

3. An *owner or operator* that has satisfied the requirements of Part II.C.2 above will be authorized to *discharge* stormwater from their *construction activity* in accordance with the following schedule:

   a. For *construction activities* that are <u>not</u> subject to the requirements of a *regulated, traditional land use control MS4*:

      (i) Five (5) business days from the date the Department receives a complete electronic version of the NOI (eNOI) for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.; or

      (ii) Sixty (60) business days from the date the Department receives a complete NOI (electronic or paper version) for *construction activities* with a SWPPP that has <u>not</u> been prepared in conformance with the design criteria in technical standard referenced in Part III.B.1. or, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C., the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, or;

      (iii) Ten (10) business days from the date the Department receives a complete paper version of the NOI for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.

b. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*:

(i) Five (5) business days from the date the Department receives both a complete electronic version of the NOI (eNOI) and signed "*MS4* SWPPP Acceptance" form, or

(ii) Ten (10) business days from the date the Department receives both a complete paper version of the NOI and signed "MS4 SWPPP Acceptance" form.

4. Coverage under this permit authorizes stormwater *discharges* from only those areas of disturbance that are identified in the NOI. If an *owner or operator* wishes to have stormwater *discharges* from future or additional areas of disturbance authorized, they must submit a new NOI that addresses that phase of the development, unless otherwise notified by the Department. The *owner or operator* shall not *commence construction activity* on the future or additional areas until their authorization to *discharge* under this permit goes into effect in accordance with Part II.C. of this permit.

D. General Requirements For Owners or Operators With Permit Coverage

1. The *owner or operator* shall ensure that the provisions of the SWPPP are implemented from the *commencement of construction activity* until all areas of disturbance have achieved *final stabilization* and the Notice of Termination ("NOT") has been submitted to the Department in accordance with Part V. of this permit. This includes any changes made to the SWPPP pursuant to Part III.A.4. of this permit.

2. The *owner or operator* shall maintain a copy of the General Permit (GP-0-20-001), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form, inspection reports, responsible contractor's or subcontractor's certification statement (see Part III.A.6.), and all documentation necessary to demonstrate eligibility with this permit at the *construction site* until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department. The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

3. The *owner or operator* of a *construction activity* shall not disturb greater than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a *regulated, traditional land* *use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*). At a minimum, the *owner or operator* must comply with the following requirements in order to be authorized to disturb greater than five (5) acres of soil at any one time:

a. The *owner or operator* shall have a *qualified inspector* conduct **at least** two (2) site inspections in accordance with Part IV.C. of this permit every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

b. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016.

c. The *owner or operator* shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.

d. The *owner or operator* shall install any additional site-specific practices needed to protect water quality.

e. The *owner or operator* shall include the requirements above in their SWPPP.

4. In accordance with statute, regulations, and the terms and conditions of this permit, the Department may suspend or revoke an *owner's or operator's* coverage under this permit at any time if the Department determines that the SWPPP does not meet the permit requirements or consistent with Part VII.K..

5. Upon a finding of significant non-compliance with the practices described in the SWPPP or violation of this permit, the Department may order an immediate stop to all activity at the site until the non-compliance is remedied. The stop work order shall be in writing, describe the non-compliance in detail, and be sent to the *owner or operator*.

6. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*, the *owner or operator* shall notify the

regulated, traditional land use control MS4 in writing of any planned amendments or modifications to the post-construction stormwater management practice component of the SWPPP required by Part III.A. 4. and 5. of this permit. Unless otherwise notified by the *regulated, traditional land use control MS4*, the *owner or operator* shall have the SWPPP amendments or modifications reviewed and accepted by the *regulated, traditional land use control MS4* prior to commencing construction of the post-construction stormwater management practice.

E. Permit Coverage for Discharges Authorized Under GP-0-15-002

1. Upon renewal of SPDES General Permit for Stormwater Discharges from *Construction Activity* (Permit No. GP-0-15-002), an *owner or operator* of *a construction activity* with coverage under GP-0-15-002, as of the effective date of GP- 0-20-001, shall be authorized to *discharge* in accordance with GP- 0-20-001, unless otherwise notified by the Department.

   An *owner or operator* may continue to implement the technical/design components of the post-construction stormwater management controls provided that such design was done in conformance with the technical standards in place at the time of initial project authorization. However, they must comply with the other, non-design provisions of GP-0-20-001.

F. Change of Owner or Operator

1. When property ownership changes or when there is a change in operational control over the construction plans and specifications, the original *owner or operator* must notify the new *owner or operator*, in writing, of the requirement to obtain permit coverage by submitting a NOI with the Department. For *construction activities* subject to the requirements of a *regulated, traditional land use control MS4,* the original *owner or operator* must also notify the MS4, in writing, of the change in ownership at least 30 calendar days prior to the change in ownership.

2. Once the new *owner or operator* obtains permit coverage, the original *owner or operator* shall then submit a completed NOT with the name and permit identification number of the new *owner or operator* to the Department at the address in Part II.B.1. of this permit. If the original *owner or operator* maintains ownership of a portion of the *construction activity* and will disturb soil, they must maintain their coverage under the permit.

3. Permit coverage for the new *owner or operator* will be effective as of the date the Department receives a complete NOI, provided the original *owner or* *operator* was not subject to a sixty (60) business day authorization period that has not expired as of the date the Department receives the NOI from the new *owner or operator*.

Part III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. General SWPPP Requirements

1. A SWPPP shall be prepared and implemented by the *owner or operator* of each *construction activity* covered by this permit. The SWPPP must document the selection, design, installation, implementation and maintenance of the control measures and practices that will be used to meet the effluent limitations in Part I.B. of this permit and where applicable, the post-construction stormwater management practice requirements in Part I.C. of this permit. The SWPPP shall be prepared prior to the submittal of the NOI. The NOI shall be submitted to the Department prior to the *commencement of construction activity*. A copy of the completed, final NOI shall be included in the SWPPP.

2. The SWPPP shall describe the erosion and sediment control practices and where required, post-construction stormwater management practices that will be used and/or constructed to reduce the *pollutants* in stormwater *discharges* and to assure compliance with the terms and conditions of this permit. In addition, the SWPPP shall identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater *discharges*.

3. All SWPPPs that require the post-construction stormwater management practice component shall be prepared by a *qualified professional* that is knowledgeable in the principles and practices of stormwater management and treatment.

4. The *owner or operator* must keep the SWPPP current so that it at all times accurately documents the erosion and sediment controls practices that are being used or will be used during construction, and all post-construction stormwater management practices that will be constructed on the site. At a minimum, the *owner or operator* shall amend the SWPPP, including construction drawings:

    a. whenever the current provisions prove to be ineffective in minimizing *pollutants* in stormwater *discharges* from the site;

b. whenever there is a change in design, construction, or operation at the *construction site* that has or could have an effect on the *discharge* of *pollutants*;

c. to address issues or deficiencies identified during an inspection by the *qualified inspector,* the Department or other regulatory authority; and

d. to document the final construction conditions.

5. The Department may notify the *owner or operator* at any time that the SWPPP does not meet one or more of the minimum requirements of this permit. The notification shall be in writing and identify the provisions of the SWPPP that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by the Department, the *owner or operator* shall make the required changes to the SWPPP and submit written notification to the Department that the changes have been made. If the *owner or operator* does not respond to the Department's comments in the specified time frame, the Department may suspend the *owner's or operator's* coverage under this permit or require the *owner or operator* to obtain coverage under an individual SPDES permit in accordance with Part II.D.4. of this permit.

6. Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP. The *owner or operator* shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the *trained contractor.* The *owner or operator* shall ensure that at least one *trained contractor* is on site on a daily basis when soil disturbance activities are being performed.

   The *owner or operator* shall have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before they commence any *construction activity*:

   "I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater *discharge*s from *construction activities* and that it is unlawful for any person to cause or contribute to a violation of *water quality standards*. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations"

In addition to providing the certification statement above, the certification page must also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the *trained contractor* responsible for SWPPP implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The *owner or operator* shall attach the certification statement(s) to the copy of the SWPPP that is maintained at the *construction site*. If new or additional contractors are hired to implement measures identified in the SWPPP after construction has commenced, they must also sign the certification statement and provide the information listed above.

7. For projects where the Department requests a copy of the SWPPP or inspection reports, the *owner or operator* shall submit the documents in both electronic (PDF only) and paper format within five (5) business days, unless otherwise notified by the Department.

B. Required SWPPP Contents

1. Erosion and sediment control component - All SWPPPs prepared pursuant to this permit shall include erosion and sediment control practices designed in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Where erosion and sediment control practices are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must demonstrate *equivalence* to the technical standard. At a minimum, the erosion and sediment control component of the SWPPP shall include the following:

    a. Background information about the scope of the project, including the location, type and size of project

b. A site map/construction drawing(s) for the project, including a general location map. At a minimum, the site map shall show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s); floodplain/floodway boundaries; wetlands and drainage patterns that could be affected by the *construction activity*; existing and final contours ; locations of different soil types with boundaries; material, waste, borrow or equipment storage areas located on adjacent properties; and location(s) of the stormwater *discharge*(s);

c. A description of the soil(s) present at the site, including an identification of the Hydrologic Soil Group (HSG);

d. A construction phasing plan and sequence of operations describing the intended order of *construction activities*, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other activity at the site that results in soil disturbance;

e. A description of the minimum erosion and sediment control practices to be installed or implemented for each *construction activity* that will result in soil disturbance. Include a schedule that identifies the timing of initial placement or implementation of each erosion and sediment control practice and the minimum time frames that each practice should remain in place or be implemented;

f. A temporary and permanent soil stabilization plan that meets the requirements of this general permit and the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, for each stage of the project, including initial land clearing and grubbing to project completion and achievement of *final stabilization*;

g. A site map/construction drawing(s) showing the specific location(s), size(s), and length(s) of each erosion and sediment control practice;

h. The dimensions, material specifications, installation details, and operation and maintenance requirements for all erosion and sediment control practices. Include the location and sizing of any temporary sediment basins and structural practices that will be used to divert flows from exposed soils;

i. A maintenance inspection schedule for the contractor(s) identified in Part III.A.6. of this permit, to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection schedule shall be in accordance with the requirements in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016;

j. A description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a *pollutant* source in the stormwater *discharges*;

k. A description and location of any stormwater *discharges* associated with industrial activity other than construction at the site, including, but not limited to, stormwater *discharges* from asphalt plants and concrete plants located on the *construction site*; and

l. Identification of any elements of the design that are not in conformance with the design criteria in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. Post-construction stormwater management practice component – The *owner or operator* of any construction project identified in Table 2 of Appendix B as needing post-construction stormwater management practices shall prepare a SWPPP that includes practices designed in conformance with the applicable *sizing criteria* in Part I.C.2.a., c. or d. of this permit and the *performance criteria* in the technical standard, New York State Stormwater Management Design Manual dated January 2015

   Where post-construction stormwater management practices are not designed in conformance with the *performance criteria* in the technical standard, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

   The post-construction stormwater management practice component of the SWPPP shall include the following:

   a. Identification of all post-construction stormwater management practices to be constructed as part of the project. Include the dimensions, material specifications and installation details for each post-construction stormwater management practice;

b. A site map/construction drawing(s) showing the specific location and size of each post-construction stormwater management practice;

c. A Stormwater Modeling and Analysis Report that includes:

(i) Map(s) showing pre-development conditions, including watershed/subcatchments boundaries, flow paths/routing, and design points;

(ii) Map(s) showing post-development conditions, including watershed/subcatchments boundaries, flow paths/routing, design points and post-construction stormwater management practices;

(iii) Results of stormwater modeling (i.e. hydrology and hydraulic analysis) for the required storm events. Include supporting calculations (model runs), methodology, and a summary table that compares pre and post-development runoff rates and volumes for the different storm events;

(iv) Summary table, with supporting calculations, which demonstrates that each post-construction stormwater management practice has been designed in conformance with the *sizing criteria* included in the Design Manual;

(v) Identification of any *sizing criteria* that is not required based on the requirements included in Part I.C. of this permit; and

(vi) Identification of any elements of the design that are not in conformance with the *performance criteria* in the Design Manual. Include the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the Design Manual;

d. Soil testing results and locations (test pits, borings);

e. Infiltration test results, when required; and

f. An operations and maintenance plan that includes inspection and maintenance schedules and actions to ensure continuous and effective operation of each post-construction stormwater management practice. The plan shall identify the entity that will be responsible for the long term operation and maintenance of each practice.

3. Enhanced Phosphorus Removal Standards - All construction projects identified in Table 2 of Appendix B that are located in the watersheds identified in Appendix C shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the applicable *sizing criteria* in Part I.C.2. b., c. or d. of this permit and the *performance criteria,* Enhanced Phosphorus Removal Standards included in the Design Manual. At a minimum, the post-construction stormwater management practice component of the SWPPP shall include items 2.a - 2.f. above.

C. Required SWPPP Components by Project Type

Unless otherwise notified by the Department, *owners or operators* of *construction activities* identified in Table 1 of Appendix B are required to prepare a SWPPP that only includes erosion and sediment control practices designed in conformance with Part III.B.1 of this permit. *Owners or operators* of the *construction activities* identified in Table 2 of Appendix B shall prepare a SWPPP that also includes post-construction stormwater management practices designed in conformance with Part III.B.2 or 3 of this permit.

Part IV. INSPECTION AND MAINTENANCE REQUIREMENTS

A. General Construction Site Inspection and Maintenance Requirements

1. The *owner or operator* must ensure that all erosion and sediment control practices (including pollution prevention measures) and all post-construction stormwater management practices identified in the SWPPP are inspected and maintained in accordance with Part IV.B. and C. of this permit.

2. The terms of this permit shall not be construed to prohibit the State of New York from exercising any authority pursuant to the ECL, common law or federal law, or prohibit New York State from taking any measures, whether civil or criminal, to prevent violations of the laws of the State of New York or protect the public health and safety and/or the environment.

B. Contractor Maintenance Inspection Requirements

1. The *owner or operator* of each *construction activity* identified in Tables 1 and 2 of Appendix B shall have a *trained contractor* inspect the erosion and sediment control practices and pollution prevention measures being implemented within the active work area daily to ensure that they are being maintained in effective operating condition at all times. If deficiencies are identified, the contractor shall

begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.

2. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *trained contractor* can stop conducting the maintenance inspections. The *trained contractor* shall begin conducting the maintenance inspections in accordance with Part IV.B.1. of this permit as soon as soil disturbance activities resume.

3. For construction sites where soil disturbance activities have been shut down with partial project completion, the *trained contractor* can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* <u>and</u> all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

C. Qualified Inspector Inspection Requirements

The *owner or operator* shall have a *qualified inspector* conduct site inspections in conformance with the following requirements:

[Note: The *trained contractor* identified in Part III.A.6. and IV.B. of this permit **cannot** conduct the *qualified inspector* site inspections unless they meet the *qualified inspector* qualifications included in Appendix A. In order to perform these inspections, the *trained contractor* would have to be a:

- licensed Professional Engineer,
- Certified Professional in Erosion and Sediment Control (CPESC),
- New York State Erosion and Sediment Control Certificate Program holder
- Registered Landscape Architect, or
- someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity].

1. A *qualified inspector* shall conduct site inspections for all *construction activities* identified in Tables 1 and 2 of Appendix B, <u>with the exception of</u>:

    a. the construction of a single family residential subdivision with 25% or less *impervious cover* at total site build-out that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is <u>not</u> located in one of the watersheds listed in Appendix C and <u>not</u> directly discharging to one of the 303(d) segments listed in Appendix E;

b. the construction of a single family home that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is <u>not</u> located in one of the watersheds listed in Appendix C and <u>not</u> directly discharging to one of the 303(d) segments listed in Appendix E;

c. construction on agricultural property that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres; and

d. *construction activities* located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

2. Unless otherwise notified by the Department, the *qualified inspector* shall conduct site inspections in accordance with the following timetable:

a. For construction sites where soil disturbance activities are on-going, the *qualified inspector* shall conduct a site inspection at least once every seven (7) calendar days.

b. For construction sites where soil disturbance activities are on-going and the *owner or operator* has received authorization in accordance with Part II.D.3 to disturb greater than five (5) acres of soil at any one time, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

c. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *qualified inspector* shall conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to reducing the frequency of inspections.

d. For construction sites where soil disturbance activities have been shut down with partial project completion, the *qualified inspector* can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the *owner or operator* shall have the *qualified inspector* perform a final inspection and certify that all disturbed areas have achieved *final stabilization,* and all temporary, structural erosion and sediment control measures have been removed*;* and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice" certification statements on the NOT. The *owner or operator* shall then submit the completed NOT form to the address in Part II.B.1 of this permit.

e. For construction sites that directly *discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

3. At a minimum, the *qualified inspector* shall inspect all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved *final stabilization,* all points of *discharge* to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the *construction site*, and all points of *discharge* from the *construction site*.

4. The *qualified inspector* shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

a. Date and time of inspection;

b. Name and title of person(s) performing inspection;

c. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

d. A description of the condition of the runoff at all points of *discharge* from the *construction site*. This shall include identification of any *discharges* of sediment from the *construction site*. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the *construction site* which receive runoff from disturbed areas. This shall include identification of any *discharges* of sediment to the surface waterbody;

f. Identification of all erosion and sediment control practices and pollution prevention measures that need repair or maintenance;

g. Identification of all erosion and sediment control practices and pollution prevention measures that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

h. Description and sketch of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection;

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices and pollution prevention measures; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s);

k. Identification and status of all corrective actions that were required by previous inspection; and

l. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

5. Within one business day of the completion of an inspection, the *qualified inspector* shall notify the *owner or operator* and appropriate contractor or subcontractor identified in Part III.A.6. of this permit of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

6. All inspection reports shall be signed by the *qualified inspector.* Pursuant to Part II.D.2. of this permit, the inspection reports shall be maintained on site with the SWPPP.

Part V. TERMINATION OF PERMIT COVERAGE

A. Termination of Permit Coverage

1. An *owner or operator* that is eligible to terminate coverage under this permit must submit a completed NOT form to the address in Part II.B.1 of this permit. The NOT form shall be one which is associated with this permit, signed in accordance with Part VII.H of this permit.

2. An *owner or operator* may terminate coverage when one or more the following conditions have been met:

   a. Total project completion - All *construction activity* identified in the SWPPP has been completed; <u>and</u> all areas of disturbance have achieved *final stabilization*; <u>and</u> all temporary, structural erosion and sediment control measures have been removed; <u>and</u> all post-construction stormwater management practices have been constructed in conformance with the SWPPP and are operational;

b. Planned shutdown with partial project completion - All soil disturbance activities have ceased; and all areas disturbed as of the project shutdown date have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational;

c. A new *owner or operator* has obtained coverage under this permit in accordance with Part II.F. of this permit.

d. The *owner or operator* obtains coverage under an alternative SPDES general permit or an individual SPDES permit.

3. For *construction activities* meeting subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *qualified inspector* perform a final site inspection prior to submitting the NOT. The *qualified inspector* shall, by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice certification statements on the NOT, certify that all the requirements in Part V.A.2.a. or b. of this permit have been achieved.

4. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4* and meet subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *regulated, traditional land use control MS4* sign the "MS4 Acceptance" statement on the NOT in accordance with the requirements in Part VII.H. of this permit. The *regulated, traditional land use control MS4* official, by signing this statement, has determined that it is acceptable for the *owner or operator* to submit the NOT in accordance with the requirements of this Part. The *regulated, traditional land use control MS4* can make this determination by performing a final site inspection themselves or by accepting the *qualified inspector*'s final site inspection certification(s) required in Part V.A.3. of this permit.

5. For *construction activities* that require post-construction stormwater management practices and meet subdivision 2a. of this Part, the *owner or operator* must, prior to submitting the NOT, ensure one of the following:

a. the post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain such practice(s) have been deeded to the municipality in which the practice(s) is located,

b. an executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s),

c. for post-construction stormwater management practices that are privately owned, the *owner or operator* has a mechanism in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the *owner or operator's* deed of record,

d. for post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university, hospital), government agency or authority, or public utility; the *owner or operator* has policy and procedures in place that ensures operation and maintenance of the practices in accordance with the operation and maintenance plan.

Part VI. REPORTING AND RETENTION RECORDS

A. Record Retention

The *owner or operator* shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five (5) years from the date that the Department receives a complete NOT submitted in accordance with Part V. of this general permit.

B. Addresses

With the exception of the NOI, NOT, and MS4 SWPPP Acceptance form (which must be submitted to the address referenced in Part II.B.1 of this permit), all written correspondence requested by the Department, including individual permit applications, shall be sent to the address of the appropriate DOW Water (SPDES) Program contact at the Regional Office listed in Appendix F.

Part VII. STANDARD PERMIT CONDITIONS

A. Duty to Comply

The *owner or operator* must comply with all conditions of this permit. All contractors and subcontractors associated with the project must comply with the terms of the SWPPP. Any non-compliance with this permit constitutes a violation of the Clean Water

Act (CWA) and the ECL and is grounds for an enforcement action against the *owner or operator* and/or the contractor/subcontractor; permit revocation, suspension or modification; or denial of a permit renewal application. Upon a finding of significant non-compliance with this permit or the applicable SWPPP, the Department may order an immediate stop to all *construction activity* at the site until the non-compliance is remedied. The stop work order shall be in writing, shall describe the non-compliance in detail, and shall be sent to the *owner or operator*.

If any human remains or archaeological remains are encountered during excavation, the *owner or operator* must immediately cease, or cause to cease, all *construction activity* in the area of the remains and notify the appropriate Regional Water Engineer (RWE). *Construction activity* shall not resume until written permission to do so has been received from the RWE.

B. Continuation of the Expired General Permit

This permit expires five (5) years from the effective date. If a new general permit is not issued prior to the expiration of this general permit, an *owner or operator* with coverage under this permit may continue to operate and *discharge* in accordance with the terms and conditions of this general permit, if it is extended pursuant to the State Administrative Procedure Act and 6 NYCRR Part 621, until a new general permit is issued.

C. Enforcement

Failure of the *owner or operator,* its contractors, subcontractors, agents and/or assigns to strictly adhere to any of the permit requirements contained herein shall constitute a violation of this permit. There are substantial criminal, civil, and administrative penalties associated with violating the provisions of this permit. Fines of up to $37,500 per day for each violation and imprisonment for up to fifteen (15) years may be assessed depending upon the nature and degree of the offense.

D. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for an *owner or operator* in an enforcement action that it would have been necessary to halt or reduce the *construction activity* in order to maintain compliance with the conditions of this permit.

E. Duty to Mitigate

The *owner or operator* and its contractors and subcontractors shall take all reasonable steps to *minimize* or prevent any *discharge* in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

F. Duty to Provide Information

The *owner or operator* shall furnish to the Department, within a reasonable specified time period of a written request, all documentation necessary to demonstrate eligibility and any information to determine compliance with this permit or to determine whether cause exists for modifying or revoking this permit, or suspending or denying coverage under this permit, in accordance with the terms and conditions of this permit. The NOI, SWPPP and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five (5) business days of the *owner or operator* receiving a written request by any such person to review these documents. Copying of documents will be done at the requester's expense.

G. Other Information

When the *owner or operator* becomes aware that they failed to submit any relevant facts, or submitted incorrect information in the NOI or in any of the documents required by this permit , or have made substantive revisions to the SWPPP (e.g. the scope of the project changes significantly, the type of post-construction stormwater management practice(s) changes, there is a reduction in the sizing of the post-construction stormwater management practice, or there is an increase in the disturbance area or *impervious area*), which were not reflected in the original NOI submitted to the Department, they shall promptly submit such facts or information to the Department using the contact information in Part II.A. of this permit. Failure of the *owner or operator* to correct or supplement any relevant facts within five (5) business days of becoming aware of the deficiency shall constitute a violation of this permit.

H. Signatory Requirements

1. All NOIs and NOTs shall be signed as follows:

    a. For a corporation these forms shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

(i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

(ii) the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

b. For a partnership or sole proprietorship these forms shall be signed by a general partner or the proprietor, respectively; or

c. For a municipality, State, Federal, or other public agency these forms shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(i) the chief executive officer of the agency, or

(ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. The SWPPP and other information requested by the Department shall be signed by a person described in Part VII.H.1. of this permit or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Part VII.H.1. of this permit;

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of *equivalent* responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position) and,

c. The written authorization shall include the name, title and signature of the authorized representative and be attached to the SWPPP.

3. All inspection reports shall be signed by the *qualified inspector* that performs the inspection.

4. The MS4 SWPPP Acceptance form shall be signed by the principal executive officer or ranking elected official from the *regulated, traditional land use control MS4,* or by a duly authorized representative of that person.

   It shall constitute a permit violation if an incorrect and/or improper signatory authorizes any required forms, SWPPP and/or inspection reports.

I. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. *Owners or operators* must obtain any applicable conveyances, easements, licenses and/or access to real property prior to *commencing construction activity*.

J. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

K. Requirement to Obtain Coverage Under an Alternative Permit

1. The Department may require any owner or operator authorized by this permit to apply for and/or obtain either an individual SPDES permit or another SPDES general permit. When the Department requires any discharger authorized by a general permit to apply for an individual SPDES permit, it shall notify the discharger in writing that a permit application is required. This notice shall

include a brief statement of the reasons for this decision, an application form, a statement setting a time frame for the owner or operator to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from owner or operator receipt of the notification letter, whereby the authorization to discharge under this general permit shall be terminated. Applications must be submitted to the appropriate Permit Administrator at the Regional Office. The Department may grant additional time upon demonstration, to the satisfaction of the Department, that additional time to apply for an alternative authorization is necessary or where the Department has not provided a permit determination in accordance with Part 621 of this Title.

2. When an individual SPDES permit is issued to a discharger authorized to *discharge* under a general SPDES permit for the same *discharge*(s), the general permit authorization for outfalls authorized under the individual SPDES permit is automatically terminated on the effective date of the individual permit unless termination is earlier in accordance with 6 NYCRR Part 750.

L. Proper Operation and Maintenance

The *owner or operator* shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the *owner or operator* to achieve compliance with the conditions of this permit and with the requirements of the SWPPP.

M. Inspection and Entry

The *owner or operator* shall allow an authorized representative of the Department, EPA, applicable county health department, or, in the case of a *construction site* which *discharges* through an *MS4*, an authorized representative of the *MS4* receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the owner's or operator's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment), practices or operations regulated or required by this permit.

4. Sample or monitor at reasonable times, for purposes of assuring permit compliance or as otherwise authorized by the Act or ECL, any substances or parameters at any location.

N. Permit Actions

This permit may, at any time, be modified, suspended, revoked, or renewed by the Department in accordance with 6 NYCRR Part 621. The filing of a request by the *owner or operator* for a permit modification, revocation and reissuance, termination, a notification of planned changes or anticipated noncompliance does not limit, diminish and/or stay compliance with any terms of this permit.

O. Definitions

Definitions of key terms are included in Appendix A of this permit.

P. Re-Opener Clause

1. If there is evidence indicating potential or realized impacts on water quality due to any stormwater discharge associated with construction activity covered by this permit, the owner or operator of such discharge may be required to obtain an individual permit or alternative general permit in accordance with Part VII.K. of this permit or the permit may be modified to include different limitations and/or requirements.

2. Any Department initiated permit modification, suspension or revocation will be conducted in accordance with 6 NYCRR Part 621, 6 NYCRR 750-1.18, and 6 NYCRR 750-1.20.

Q. Penalties for Falsification of Forms and Reports

In accordance with 6NYCRR Part 750-2.4 and 750-2.5, any person who knowingly makes any false material statement, representation, or certification in any application, record, report or other document filed or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished in accordance with ECL §71-1933 and or Articles 175 and 210 of the New York State Penal Law.

R. Other Permits

Nothing in this permit relieves the *owner or operator* from a requirement to obtain any other permits required by law.

APPENDIX A – Acronyms and Definitions

Acronyms

APO – Agency Preservation Officer
BMP – Best Management Practice
CPESC – Certified Professional in Erosion and Sediment Control
Cpv – Channel Protection Volume
CWA – Clean Water Act (or the Federal Water Pollution Control Act, 33 U.S.C. §1251 et seq)
DOW – Division of Water
EAF – Environmental Assessment Form
ECL - Environmental Conservation Law
EPA – U. S. Environmental Protection Agency
HSG – Hydrologic Soil Group
MS4 – Municipal Separate Storm Sewer System
NOI – Notice of Intent
NOT – Notice of Termination
NPDES – National Pollutant Discharge Elimination System
OPRHP – Office of Parks, Recreation and Historic Places
Qf – Extreme Flood
Qp – Overbank Flood
RRv – Runoff Reduction Volume
RWE – Regional Water Engineer
SEQR – State Environmental Quality Review
SEQRA - State Environmental Quality Review Act
SHPA – State Historic Preservation Act
SPDES – State Pollutant Discharge Elimination System
SWPPP – Stormwater Pollution Prevention Plan
TMDL – Total Maximum Daily Load
UPA – Uniform Procedures Act
USDA – United States Department of Agriculture
WQv – Water Quality Volume

Definitions

<u>All definitions in this section are solely for the purposes of this permit.</u>

Agricultural Building – a structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products; excluding any structure designed, constructed or used, in whole or in part, for human habitation, as a place of employment where agricultural products are processed, treated or packaged, or as a place used by the public.

Agricultural Property –means the land for construction of a barn, *agricultural building*, silo, stockyard, pen or other structural practices identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State" prepared by the Department in cooperation with agencies of New York Nonpoint Source Coordinating Committee (dated June 2007).

Alter Hydrology from Pre to Post-Development Conditions - means the post-development peak flow rate(s) has increased by more than 5% of the pre-developed condition for the design storm of interest (e.g. 10 yr and 100 yr).

Combined Sewer - means a sewer that is designed to collect and convey both "sewage" and "stormwater".

Commence (Commencement of) Construction Activities - means the initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices required in the SWPPP. See definition for "*Construction Activity(ies)*" also.

Construction Activity(ies) - means any clearing, grading, excavation, filling, demolition or stockpiling activities that result in soil disturbance. Clearing activities can include, but are not limited to, logging equipment operation, the cutting and skidding of trees, stump removal and/or brush root removal. Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Construction Site – means the land area where *construction activity(ies)* will occur. See definition for "*Commence (Commencement of) Construction Activities"* and "*Larger Common Plan of Development or Sale" also.*

Dewatering – means the act of draining rainwater and/or groundwater from building foundations, vaults or excavations/trenches.

Direct Discharge (to a specific surface waterbody) - means that runoff flows from a *construction site* by overland flow and the first point of discharge is the specific surface waterbody, or runoff flows from a *construction site* to a separate storm sewer system and the first point of discharge from the separate storm sewer system is the specific surface waterbody.

Discharge(s) - means any addition of any pollutant to waters of the State through an outlet or *point source*.

Embankment –means an earthen or rock slope that supports a road/highway.

Endangered or Threatened Species – see 6 NYCRR Part 182 of the Department's rules and regulations for definition of terms and requirements.

Environmental Conservation Law (ECL) - means chapter 43-B of the Consolidated Laws of the State of New York, entitled the Environmental Conservation Law.

Equivalent (Equivalence) – means that the practice or measure meets all the performance, longevity, maintenance, and safety objectives of the technical standard and will provide an equal or greater degree of water quality protection.

Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

General SPDES permit - means a SPDES permit issued pursuant to 6 NYCRR Part 750-1.21 and Section 70-0117 of the ECL authorizing a category of discharges.

Groundwater(s) - means waters in the saturated zone. The saturated zone is a subsurface zone in which all the interstices are filled with water under pressure greater than that of the atmosphere. Although the zone may contain gas-filled interstices or interstices filled with fluids other than water, it is still considered saturated.

Historic Property – means any building, structure, site, object or district that is listed on the State or National Registers of Historic Places or is determined to be eligible for listing on the State or National Registers of Historic Places.

Impervious Area (Cover) - means all impermeable surfaces that cannot effectively infiltrate rainfall. This includes paved, concrete and gravel surfaces (i.e. parking lots, driveways, roads, runways and sidewalks); building rooftops and miscellaneous impermeable structures such as patios, pools, and sheds.

Infeasible – means not technologically possible, or not economically practicable and achievable in light of best industry practices.

Larger Common Plan of Development or Sale - means a contiguous area where multiple separate and distinct *construction activities* are occurring, or will occur, under one plan. The term “plan” in “larger common plan of development or sale” is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, marketing plan, advertisement, drawing, permit application, State Environmental Quality Review Act (SEQRA) environmental assessment form or other documents, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that *construction activities* may occur on a specific plot.

For discrete construction projects that are located within a larger common plan of development or sale that are at least 1/4 mile apart, each project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline or utility project that is part of the same “common plan” is not concurrently being disturbed.

Minimize – means reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practices.

Municipal Separate Storm Sewer (MS4) - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters of the State*;*
(ii) Designed or used for collecting or conveying stormwater;
(iii) Which is not a *combined sewer*; and
(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES) - means the national system for the issuance of wastewater and stormwater permits under the Federal Water Pollution Control Act (Clean Water Act).

Natural Buffer –means an undisturbed area with natural cover running along a surface water (e.g. wetland, stream, river, lake, etc.).

New Development – means any land disturbance that does not meet the definition of Redevelopment Activity included in this appendix.

New York State Erosion and Sediment Control Certificate Program – a certificate program that establishes and maintains a process to identify and recognize individuals who are capable of developing, designing, inspecting and maintaining erosion and sediment control plans on projects that disturb soils in New York State. The certificate program is administered by the New York State Conservation District Employees Association.

NOI Acknowledgment Letter - means the letter that the Department sends to an owner or operator to acknowledge the Department's receipt and acceptance of a complete Notice of Intent. This letter documents the owner's or operator's authorization to discharge in accordance with the general permit for stormwater discharges from *construction activity*.

Nonpoint Source - means any source of water pollution or pollutants which is not a discrete conveyance or *point source* permitted pursuant to Title 7 or 8 of Article 17 of the Environmental Conservation Law (see ECL Section 17-1403).

Overbank –means flow events that exceed the capacity of the stream channel and spill out into the adjacent floodplain.

Owner or Operator - means the person, persons or legal entity which owns or leases the property on which the *construction activity* is occurring; an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications; and/or an entity that has day-to-day operational control of those activities at a project that are necessary to ensure compliance with the permit conditions.

Performance Criteria – means the design criteria listed under the "Required Elements" sections in Chapters 5, 6 and 10 of the technical standard, New York State Stormwater Management Design Manual, dated January 2015. It does not include the Sizing Criteria (i.e. WQv, RRv, Cpv, Qp and Qf) in Part I.C.2. of the permit.

Point Source - means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, or landfill leachate collection system from which *pollutants* are or may be discharged.

Pollutant - means dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast discharged into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in 6 NYCRR Parts 700 et seq .

Qualified Inspector - means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, New York State Erosion and Sediment Control Certificate Program holder or other Department endorsed individual(s).

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the *Qualified Professional* qualifications in addition to the *Qualified Inspector* qualifications.

Note: Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

Qualified Professional - means a person that is knowledgeable in the principles and practices of stormwater management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other Department endorsed individual(s). Individuals preparing SWPPPs that require the post-construction stormwater management practice component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics. All components of the SWPPP that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York.

Redevelopment Activity(ies) – means the disturbance and reconstruction of existing impervious area, including impervious areas that were removed from a project site within five (5) years of preliminary project plan submission to the local government (i.e. site plan, subdivision, etc.).

Regulated, Traditional Land Use Control MS4 - means a city, town or village with land use control authority that is authorized to discharge under New York State DEC’s

SPDES General Permit For Stormwater Discharges from Municipal Separate Stormwater Sewer Systems (MS4s) or the City of New York's Individual SPDES Permit for their Municipal Separate Storm Sewer Systems (NY-0287890).

Routine Maintenance Activity - means *construction activity* that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility, including, but not limited to:

- Re-grading of gravel roads or parking lots,
- Cleaning and shaping of existing roadside ditches and culverts that maintains the approximate original line and grade, and hydraulic capacity of the ditch,
- Cleaning and shaping of existing roadside ditches that does not maintain the approximate original grade, hydraulic capacity and purpose of the ditch if the changes to the line and grade, hydraulic capacity or purpose of the ditch are installed to improve water quality and quantity controls (e.g. installing grass lined ditch),
- Placement of aggregate shoulder backing that stabilizes the transition between the road shoulder and the ditch or *embankment*,
- Full depth milling and filling of existing asphalt pavements, replacement of concrete pavement slabs, and similar work that does not expose soil or disturb the bottom six (6) inches of subbase material,
- Long-term use of equipment storage areas at or near highway maintenance facilities,
- Removal of sediment from the edge of the highway to restore a previously existing sheet-flow drainage connection from the highway surface to the highway ditch or *embankment*,
- Existing use of Canal Corp owned upland disposal sites for the canal, and
- Replacement of curbs, gutters, sidewalks and guide rail posts.

Site limitations – means site conditions that prevent the use of an infiltration technique and or infiltration of the total WQv. Typical site limitations include: seasonal high groundwater, shallow depth to bedrock, and soils with an infiltration rate less than 0.5 inches/hour. The existence of site limitations shall be confirmed and documented using actual field testing (i.e. test pits, soil borings, and infiltration test) or using information from the most current United States Department of Agriculture (USDA) Soil Survey for the County where the project is located.

Sizing Criteria – means the criteria included in Part I.C.2 of the permit that are used to size post-construction stormwater management control practices. The criteria include; Water Quality Volume (WQv), Runoff Reduction Volume (RRv), Channel Protection Volume (Cpv), *Overbank* Flood (Qp), and Extreme Flood (Qf).

State Pollutant Discharge Elimination System (SPDES) - means the system established pursuant to Article 17 of the ECL and 6 NYCRR Part 750 for issuance of permits authorizing discharges to the waters of the state.

Steep Slope – means land area designated on the current United States Department of Agriculture ("USDA") Soil Survey as Soil Slope Phase "D", (provided the map unit name is inclusive of slopes greater than 25%) , or Soil Slope Phase E or F, (regardless of the map unit name), or a combination of the three designations.

Streambank – as used in this permit, means the terrain alongside the bed of a creek or stream. The bank consists of the sides of the channel, between which the flow is confined.

Stormwater Pollution Prevention Plan (SWPPP) – means a project specific report, including construction drawings, that among other things: describes the construction activity(ies), identifies the potential sources of pollution at the *construction site*; describes and shows the stormwater controls that will be used to control the pollutants (i.e. erosion and sediment controls; for many projects, includes post-construction stormwater management controls); and identifies procedures the *owner or operator* will implement to comply with the terms and conditions of the permit. See Part III of the permit for a complete description of the information that must be included in the SWPPP.

Surface Waters of the State - shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial seas of the state of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface waters), which are wholly or partially within or bordering the state or within its jurisdiction. Waters of the state are further defined in 6 NYCRR Parts 800 to 941.

Temporarily Ceased – means that an existing disturbed area will not be disturbed again within 14 calendar days of the previous soil disturbance.

Temporary Stabilization - means that exposed soil has been covered with material(s) as set forth in the technical standard, New York Standards and Specifications for Erosion and Sediment Control, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats (e.g. jute twisted yarn, excelsior wood fiber mats).

Total Maximum Daily Loads (TMDLs) - A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and *nonpoint source*s. It is a calculation of the maximum amount of a pollutant that a waterbody can receive on a daily basis and still meet *water quality standards*, and an allocation of that amount to the pollutant's sources. A TMDL stipulates wasteload allocations (WLAs) for *point source* discharges, load allocations (LAs) for *nonpoint source*s, and a margin of safety (MOS).

Trained Contractor - means an employee from the contracting (construction) company, identified in Part III.A.6., that has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

It can also mean an employee from the contracting (construction) company, identified in Part III.A.6., that meets the *qualified inspector* qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, New York State Erosion and Sediment Control Certificate Program holder, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity).

The *trained contractor* is responsible for the day to day implementation of the SWPPP.

Uniform Procedures Act (UPA) Permit - means a permit required under 6 NYCRR Part 621 of the Environmental Conservation Law (ECL), Article 70.

Water Quality Standard - means such measures of purity or quality for any waters in relation to their reasonable and necessary use as promulgated in 6 NYCRR Part 700 et seq.

APPENDIX B – Required SWPPP Components by Project Type

Table 1
Construction Activities that Require the Preparation of a SWPPP That Only Includes Erosion and Sediment Controls

The following construction activities that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres: • Single family home <u>not</u> located in one of the watersheds listed in Appendix C or <u>not</u> *directly discharging* to one of the 303(d) segments listed in Appendix E • Single family residential subdivisions with 25% or less impervious cover at total site build-out and <u>not</u> located in one of the watersheds listed in Appendix C and <u>not</u> directly discharging to one of the 303(d) segments listed in Appendix E • Construction of a barn or other *agricultural building*, silo, stock yard or pen.
The following construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land: All construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.
The following construction activities that involve soil disturbances of one (1) or more acres of land: • Installation of underground, linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains • Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects • Pond construction • Linear bike paths running through areas with vegetative cover, including bike paths surfaced with an impervious cover • Cross-country ski trails and walking/hiking trails • Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are not part of residential, commercial or institutional development; • Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that include incidental shoulder or curb work along an existing highway to support construction of the sidewalk, bike path or walking path. • Slope stabilization projects • Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics

Table 1 (Continued) Construction Activities that Require the Preparation of a SWPPP That Only Includes Erosion and Sediment Controls

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Spoil areas that will be covered with vegetation
- Vegetated open space projects (i.e. recreational parks, lawns, meadows, fields, downhill ski trails) excluding projects that *alter hydrology from pre to post development* conditions,
- Athletic fields (natural grass) that do not include the construction or reconstruction of *impervious area* <u>and</u> do not *alter hydrology from pre to post development* conditions
- Demolition project where vegetation will be established, and no redevelopment is planned
- Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with *impervious cover*
- Structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State”, excluding projects that involve soil disturbances of greater than five acres and construction activities that include the construction or reconstruction of impervious area
- Temporary access roads, median crossovers, detour roads, lanes, or other temporary impervious areas that will be restored to pre-construction conditions once the construction activity is complete

Table 2

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Single family home located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family home that disturbs five (5) or more acres of land
- Single family residential subdivisions located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions that involve soil disturbances of between one (1) and five (5) acres of land with greater than 25% impervious cover at total site build-out
- Single family residential subdivisions that involve soil disturbances of five (5) or more acres of land, and single family residential subdivisions that involve soil disturbances of less than five (5) acres that are part of a larger common plan of development or sale that will ultimately disturb five or more acres of land
- Multi-family residential developments; includes duplexes, townhomes, condominiums, senior housing complexes, apartment complexes, and mobile home parks
- Airports
- Amusement parks
- Breweries, cideries, and wineries, including establishments constructed on agricultural land
- Campgrounds
- Cemeteries that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Commercial developments
- Churches and other places of worship
- Construction of a barn or other *agricultural building* (e.g. silo) and structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State” that include the construction or reconstruction of *impervious area*, excluding projects that involve soil disturbances of less than five acres.
- Golf courses
- Institutional development; includes hospitals, prisons, schools and colleges
- Industrial facilities; includes industrial parks
- Landfills
- Municipal facilities; includes highway garages, transfer stations, office buildings, POTW’s, water treatment plants, and water storage tanks
- Office complexes
- Playgrounds that include the construction or reconstruction of impervious area
- Sports complexes
- Racetracks; includes racetracks with earthen (dirt) surface
- Road construction or reconstruction, including roads constructed as part of the construction activities listed in Table 1

Table 2 (Continued)

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Parking lot construction or reconstruction, including parking lots constructed as part of the construction activities listed in Table 1
- Athletic fields (natural grass) that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Athletic fields with artificial turf
- Permanent access roads, parking areas, substations, compressor stations and well drilling pads, surfaced with *impervious cover,* and constructed as part of an over-head electric transmission line project, wind-power project, cell tower project, oil or gas well drilling project, sewer or water main project or other linear utility project
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a residential, commercial or institutional development
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a highway construction or reconstruction project
- All other construction activities that include the construction or reconstruction of *impervious area* <u>or</u> *alter the hydrology from pre to post development* conditions, <u>and</u> are not listed in Table 1

APPENDIX C – Watersheds Requiring Enhanced Phosphorus Removal

Watersheds where *owners or operators* of construction activities identified in Table 2 of Appendix B must prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the technical standard, New York State Stormwater Management Design Manual ("Design Manual").

- Entire New York City Watershed located east of the Hudson River **-** Figure 1
- Onondaga Lake Watershed **-** Figure 2
- Greenwood Lake Watershed **-**Figure 3
- Oscawana Lake Watershed – Figure 4
- Kinderhook Lake Watershed – Figure 5

Figure 1 - New York City Watershed East of the Hudson

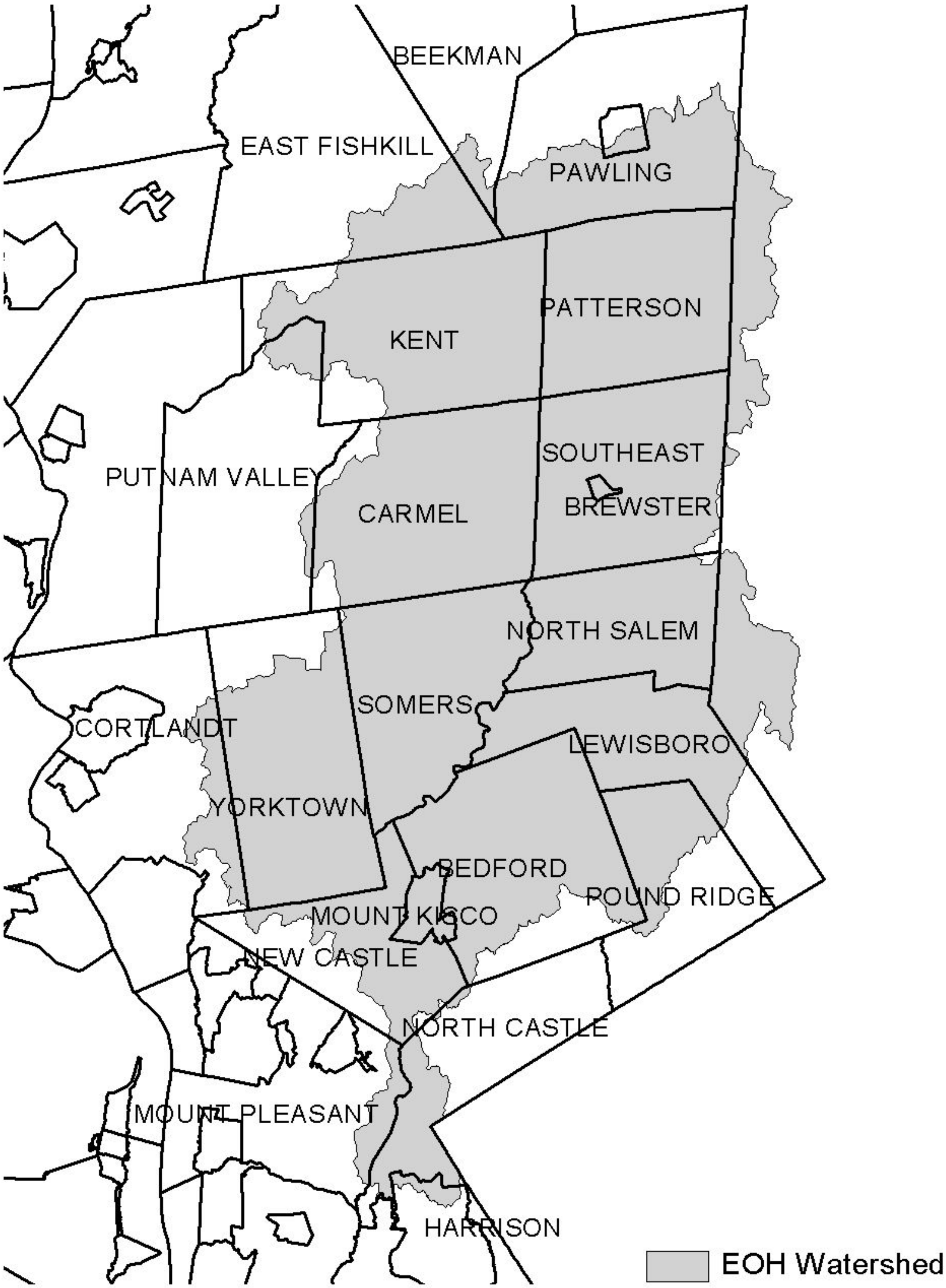


Figure 2 - Onondaga Lake Watershed

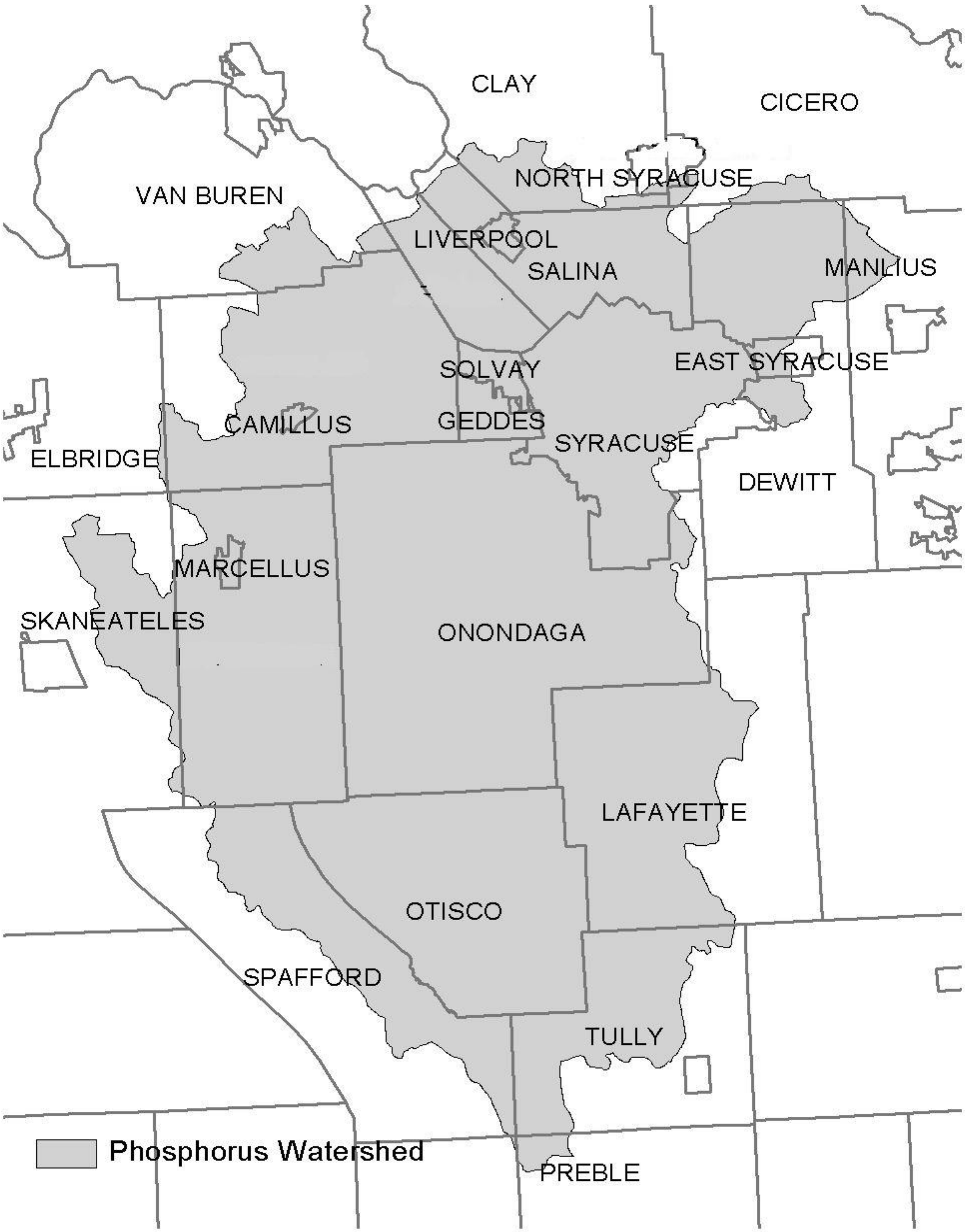


Figure 3 - Greenwood Lake Watershed

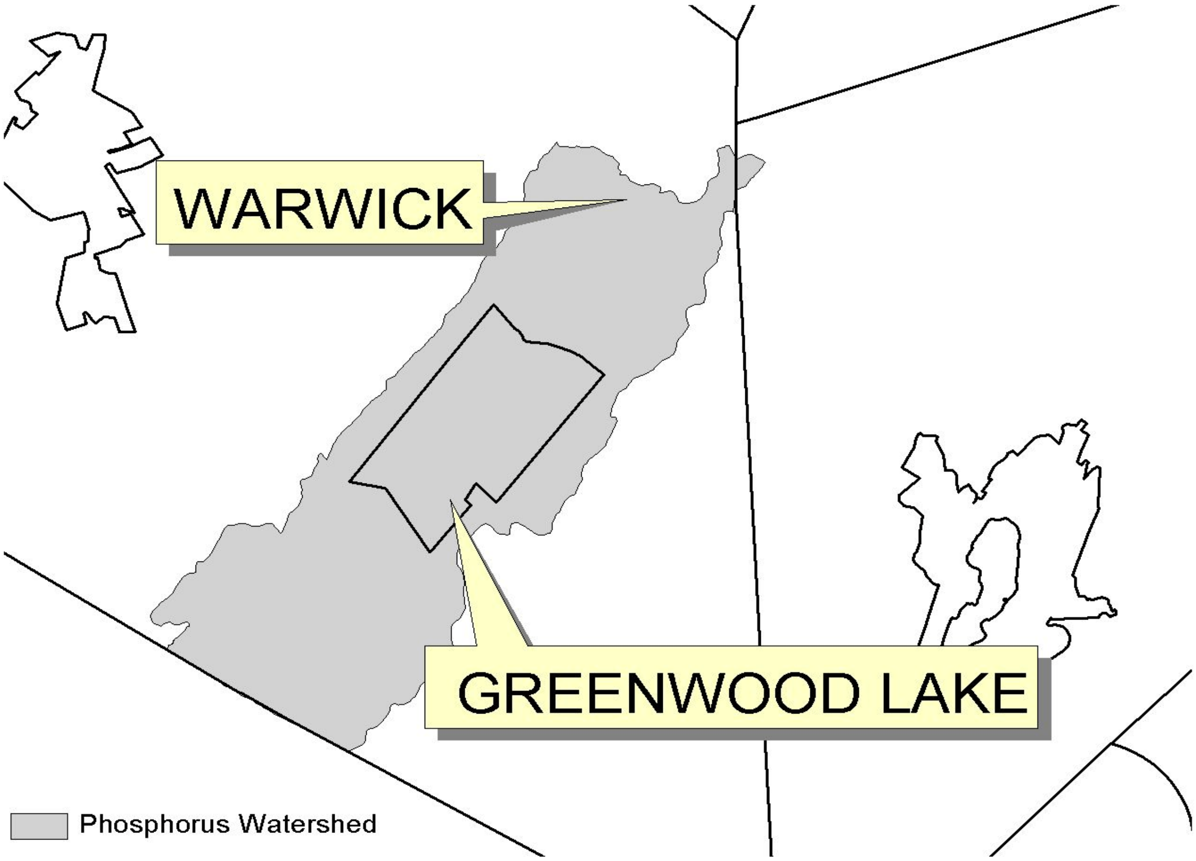


Figure 4 - Oscawana Lake Watershed

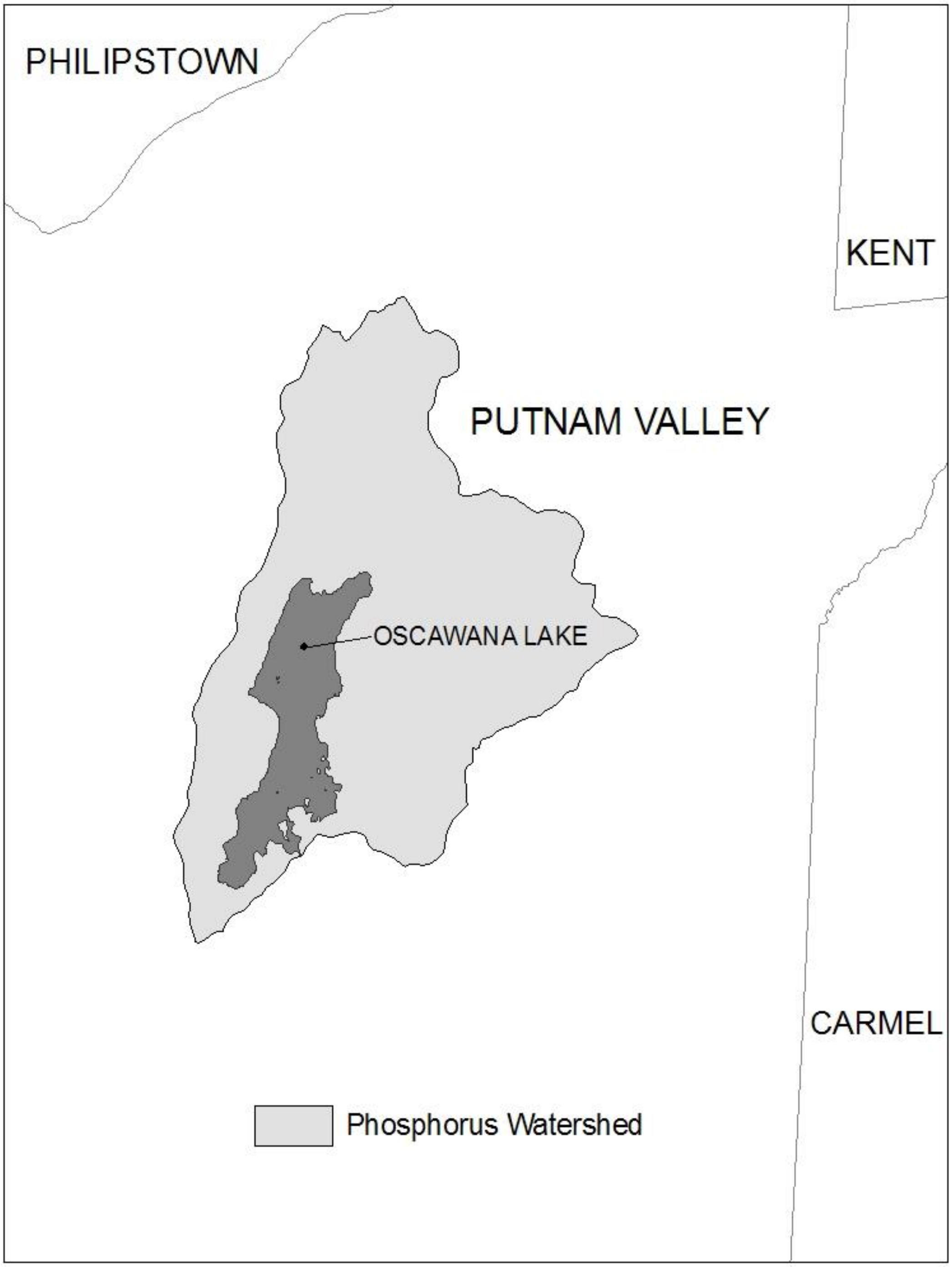
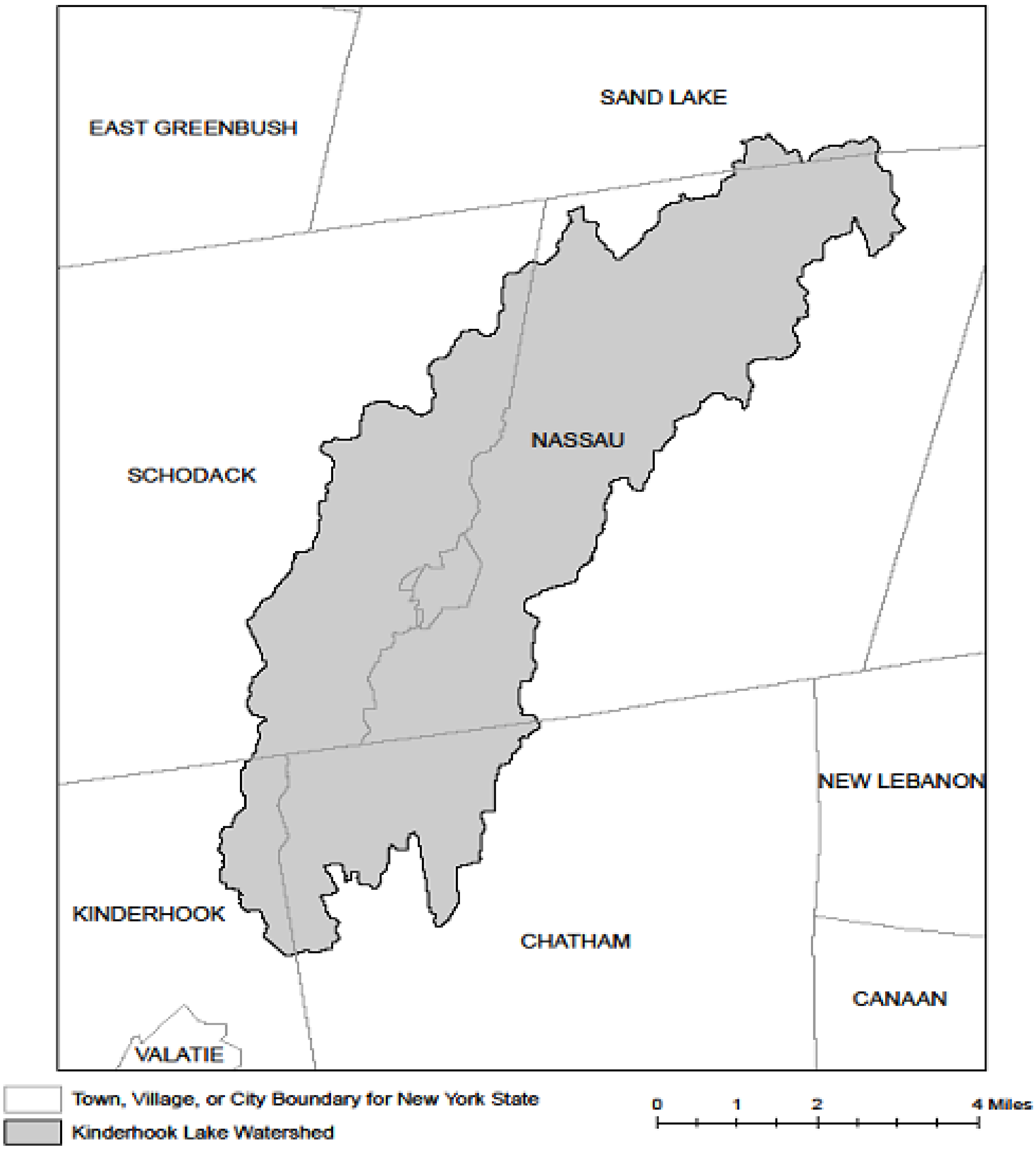


Figure 5 - Kinderhook Lake Watershed



APPENDIX D – Watersheds with Lower Disturbance Threshold

Watersheds where *owners or operators* of construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land must obtain coverage under this permit.

Entire New York City Watershed that is located east of the Hudson River **-** See Figure 1 in Appendix C

APPENDIX E – 303(d) Segments Impaired by Construction Related Pollutant(s)

List of 303(d) segments impaired by pollutants related to *construction activity* (e.g. silt, sediment or nutrients). The list was developed using "The Final New York State 2016 Section 303(d) List of Impaired Waters Requiring a TMDL/Other Strategy" dated November 2016. *Owners or operators* of single family home and single family residential subdivisions with 25% or less total impervious cover at total site build-out that involve soil disturbances of one or more acres of land, but less than 5 acres, and *directly discharge* to one of the listed segments below shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the New York State Stormwater Management Design Manual ("Design Manual"), dated January 2015.

COUNTY	WATERBODY	POLLUTANT
Albany	Ann Lee (Shakers) Pond, Stump Pond	Nutrients
Albany	Basic Creek Reservoir	Nutrients
Allegany	Amity Lake, Saunders Pond	Nutrients
Bronx	Long Island Sound, Bronx	Nutrients
Bronx	Van Cortlandt Lake	Nutrients
Broome	Fly Pond, Deer Lake, Sky Lake	Nutrients
Broome	Minor Tribs to Lower Susquehanna (north)	Nutrients
Broome	Whitney Point Lake/Reservoir	Nutrients
Cattaraugus	Allegheny River/Reservoir	Nutrients
Cattaraugus	Beaver (Alma) Lake	Nutrients
Cattaraugus	Case Lake	Nutrients
Cattaraugus	Linlyco/Club Pond	Nutrients
Cayuga	Duck Lake	Nutrients
Cayuga	Little Sodus Bay	Nutrients
Chautauqua	Bear Lake	Nutrients
Chautauqua	Chadakoin River and tribs	Nutrients
Chautauqua	Chautauqua Lake, North	Nutrients
Chautauqua	Chautauqua Lake, South	Nutrients
Chautauqua	Findley Lake	Nutrients
Chautauqua	Hulburt/Clymer Pond	Nutrients
Clinton	Great Chazy River, Lower, Main Stem	Silt/Sediment
Clinton	Lake Champlain, Main Lake, Middle	Nutrients
Clinton	Lake Champlain, Main Lake, North	Nutrients
Columbia	Kinderhook Lake	Nutrients
Columbia	Robinson Pond	Nutrients
Cortland	Dean Pond	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Dutchess	Fall Kill and tribs	Nutrients
Dutchess	Hillside Lake	Nutrients
Dutchess	Wappingers Lake	Nutrients
Dutchess	Wappingers Lake	Silt/Sediment
Erie	Beeman Creek and tribs	Nutrients
Erie	Ellicott Creek, Lower, and tribs	Silt/Sediment
Erie	Ellicott Creek, Lower, and tribs	Nutrients
Erie	Green Lake	Nutrients
Erie	Little Sister Creek, Lower, and tribs	Nutrients
Erie	Murder Creek, Lower, and tribs	Nutrients
Erie	Rush Creek and tribs	Nutrients
Erie	Scajaquada Creek, Lower, and tribs	Nutrients
Erie	Scajaquada Creek, Middle, and tribs	Nutrients
Erie	Scajaquada Creek, Upper, and tribs	Nutrients
Erie	South Branch Smoke Cr, Lower, and tribs	Silt/Sediment
Erie	South Branch Smoke Cr, Lower, and tribs	Nutrients
Essex	Lake Champlain, Main Lake, South	Nutrients
Essex	Lake Champlain, South Lake	Nutrients
Essex	Willsboro Bay	Nutrients
Genesee	Bigelow Creek and tribs	Nutrients
Genesee	Black Creek, Middle, and minor tribs	Nutrients
Genesee	Black Creek, Upper, and minor tribs	Nutrients
Genesee	Bowen Brook and tribs	Nutrients
Genesee	LeRoy Reservoir	Nutrients
Genesee	Oak Orchard Cr, Upper, and tribs	Nutrients
Genesee	Tonawanda Creek, Middle, Main Stem	Nutrients
Greene	Schoharie Reservoir	Silt/Sediment
Greene	Sleepy Hollow Lake	Silt/Sediment
Herkimer	Steele Creek tribs	Silt/Sediment
Herkimer	Steele Creek tribs	Nutrients
Jefferson	Moon Lake	Nutrients
Kings	Hendrix Creek	Nutrients
Kings	Prospect Park Lake	Nutrients
Lewis	Mill Creek/South Branch, and tribs	Nutrients
Livingston	Christie Creek and tribs	Nutrients
Livingston	Conesus Lake	Nutrients
Livingston	Mill Creek and minor tribs	Silt/Sediment
Monroe	Black Creek, Lower, and minor tribs	Nutrients
Monroe	Buck Pond	Nutrients
Monroe	Cranberry Pond	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Monroe	Lake Ontario Shoreline, Western	Nutrients
Monroe	Long Pond	Nutrients
Monroe	Mill Creek and tribs	Nutrients
Monroe	Mill Creek/Blue Pond Outlet and tribs	Nutrients
Monroe	Minor Tribs to Irondequoit Bay	Nutrients
Monroe	Rochester Embayment - East	Nutrients
Monroe	Rochester Embayment - West	Nutrients
Monroe	Shipbuilders Creek and tribs	Nutrients
Monroe	Thomas Creek/White Brook and tribs	Nutrients
Nassau	Beaver Lake	Nutrients
Nassau	Camaans Pond	Nutrients
Nassau	East Meadow Brook, Upper, and tribs	Silt/Sediment
Nassau	East Rockaway Channel	Nutrients
Nassau	Grant Park Pond	Nutrients
Nassau	Hempstead Bay	Nutrients
Nassau	Hempstead Lake	Nutrients
Nassau	Hewlett Bay	Nutrients
Nassau	Hog Island Channel	Nutrients
Nassau	Long Island Sound, Nassau County Waters	Nutrients
Nassau	Massapequa Creek and tribs	Nutrients
Nassau	Milburn/Parsonage Creeks, Upp, and tribs	Nutrients
Nassau	Reynolds Channel, west	Nutrients
Nassau	Tidal Tribs to Hempstead Bay	Nutrients
Nassau	Tribs (fresh) to East Bay	Nutrients
Nassau	Tribs (fresh) to East Bay	Silt/Sediment
Nassau	Tribs to Smith/Halls Ponds	Nutrients
Nassau	Woodmere Channel	Nutrients
New York	Harlem Meer	Nutrients
New York	The Lake in Central Park	Nutrients
Niagara	Bergholtz Creek and tribs	Nutrients
Niagara	Hyde Park Lake	Nutrients
Niagara	Lake Ontario Shoreline, Western	Nutrients
Niagara	Lake Ontario Shoreline, Western	Nutrients
Oneida	Ballou, Nail Creeks and tribs	Nutrients
Onondaga	Harbor Brook, Lower, and tribs	Nutrients
Onondaga	Ley Creek and tribs	Nutrients
Onondaga	Minor Tribs to Onondaga Lake	Nutrients
Onondaga	Ninemile Creek, Lower, and tribs	Nutrients
Onondaga	Onondaga Creek, Lower, and tribs	Nutrients
Onondaga	Onondaga Creek, Middle, and tribs	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Onondaga	Onondaga Lake, northern end	Nutrients
Onondaga	Onondaga Lake, southern end	Nutrients
Ontario	Great Brook and minor tribs	Silt/Sediment
Ontario	Great Brook and minor tribs	Nutrients
Ontario	Hemlock Lake Outlet and minor tribs	Nutrients
Ontario	Honeoye Lake	Nutrients
Orange	Greenwood Lake	Nutrients
Orange	Monhagen Brook and tribs	Nutrients
Orange	Orange Lake	Nutrients
Orleans	Lake Ontario Shoreline, Western	Nutrients
Orleans	Lake Ontario Shoreline, Western	Nutrients
Oswego	Lake Neatahwanta	Nutrients
Oswego	Pleasant Lake	Nutrients
Putnam	Bog Brook Reservoir	Nutrients
Putnam	Boyd Corners Reservoir	Nutrients
Putnam	Croton Falls Reservoir	Nutrients
Putnam	Diverting Reservoir	Nutrients
Putnam	East Branch Reservoir	Nutrients
Putnam	Lake Carmel	Nutrients
Putnam	Middle Branch Reservoir	Nutrients
Putnam	Oscawana Lake	Nutrients
Putnam	Palmer Lake	Nutrients
Putnam	West Branch Reservoir	Nutrients
Queens	Bergen Basin	Nutrients
Queens	Flushing Creek/Bay	Nutrients
Queens	Jamaica Bay, Eastern, and tribs (Queens)	Nutrients
Queens	Kissena Lake	Nutrients
Queens	Meadow Lake	Nutrients
Queens	Willow Lake	Nutrients
Rensselaer	Nassau Lake	Nutrients
Rensselaer	Snyders Lake	Nutrients
Richmond	Grasmere Lake/Bradys Pond	Nutrients
Rockland	Congers Lake, Swartout Lake	Nutrients
Rockland	Rockland Lake	Nutrients
Saratoga	Ballston Lake	Nutrients
Saratoga	Dwaas Kill and tribs	Silt/Sediment
Saratoga	Dwaas Kill and tribs	Nutrients
Saratoga	Lake Lonely	Nutrients
Saratoga	Round Lake	Nutrients
Saratoga	Tribs to Lake Lonely	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Schenectady	Collins Lake	Nutrients
Schenectady	Duane Lake	Nutrients
Schenectady	Mariaville Lake	Nutrients
Schoharie	Engleville Pond	Nutrients
Schoharie	Summit Lake	Nutrients
Seneca	Reeder Creek and tribs	Nutrients
St.Lawrence	Black Lake Outlet/Black Lake	Nutrients
St.Lawrence	Fish Creek and minor tribs	Nutrients
Steuben	Smith Pond	Nutrients
Suffolk	Agawam Lake	Nutrients
Suffolk	Big/Little Fresh Ponds	Nutrients
Suffolk	Canaan Lake	Silt/Sediment
Suffolk	Canaan Lake	Nutrients
Suffolk	Flanders Bay, West/Lower Sawmill Creek	Nutrients
Suffolk	Fresh Pond	Nutrients
Suffolk	Great South Bay, East	Nutrients
Suffolk	Great South Bay, Middle	Nutrients
Suffolk	Great South Bay, West	Nutrients
Suffolk	Lake Ronkonkoma	Nutrients
Suffolk	Long Island Sound, Suffolk County, West	Nutrients
Suffolk	Mattituck (Marratooka) Pond	Nutrients
Suffolk	Meetinghouse/Terrys Creeks and tribs	Nutrients
Suffolk	Mill and Seven Ponds	Nutrients
Suffolk	Millers Pond	Nutrients
Suffolk	Moriches Bay, East	Nutrients
Suffolk	Moriches Bay, West	Nutrients
Suffolk	Peconic River, Lower, and tidal tribs	Nutrients
Suffolk	Quantuck Bay	Nutrients
Suffolk	Shinnecock Bay and Inlet	Nutrients
Suffolk	Tidal tribs to West Moriches Bay	Nutrients
Sullivan	Bodine, Montgomery Lakes	Nutrients
Sullivan	Davies Lake	Nutrients
Sullivan	Evens Lake	Nutrients
Sullivan	Pleasure Lake	Nutrients
Tompkins	Cayuga Lake, Southern End	Nutrients
Tompkins	Cayuga Lake, Southern End	Silt/Sediment
Tompkins	Owasco Inlet, Upper, and tribs	Nutrients
Ulster	Ashokan Reservoir	Silt/Sediment
Ulster	Esopus Creek, Upper, and minor tribs	Silt/Sediment
Warren	Hague Brook and tribs	Silt/Sediment

303(d) Segments Impaired by Construction Related Pollutant(s)

Warren	Huddle/Finkle Brooks and tribs	Silt/Sediment
Warren	Indian Brook and tribs	Silt/Sediment
Warren	Lake George	Silt/Sediment
Warren	Tribs to L.George, Village of L George	Silt/Sediment
Washington	Cossayuna Lake	Nutrients
Washington	Lake Champlain, South Bay	Nutrients
Washington	Tribs to L.George, East Shore	Silt/Sediment
Washington	Wood Cr/Champlain Canal and minor tribs	Nutrients
Wayne	Port Bay	Nutrients
Westchester	Amawalk Reservoir	Nutrients
Westchester	Blind Brook, Upper, and tribs	Silt/Sediment
Westchester	Cross River Reservoir	Nutrients
Westchester	Lake Katonah	Nutrients
Westchester	Lake Lincolndale	Nutrients
Westchester	Lake Meahagh	Nutrients
Westchester	Lake Mohegan	Nutrients
Westchester	Lake Shenorock	Nutrients
Westchester	Long Island Sound, Westchester (East)	Nutrients
Westchester	Mamaroneck River, Lower	Silt/Sediment
Westchester	Mamaroneck River, Upper, and minor tribs	Silt/Sediment
Westchester	Muscoot/Upper New Croton Reservoir	Nutrients
Westchester	New Croton Reservoir	Nutrients
Westchester	Peach Lake	Nutrients
Westchester	Reservoir No.1 (Lake Isle)	Nutrients
Westchester	Saw Mill River, Lower, and tribs	Nutrients
Westchester	Saw Mill River, Middle, and tribs	Nutrients
Westchester	Sheldrake River and tribs	Silt/Sediment
Westchester	Sheldrake River and tribs	Nutrients
Westchester	Silver Lake	Nutrients
Westchester	Teatown Lake	Nutrients
Westchester	Titicus Reservoir	Nutrients
Westchester	Truesdale Lake	Nutrients
Westchester	Wallace Pond	Nutrients
Wyoming	Java Lake	Nutrients
Wyoming	Silver Lake	Nutrients

APPENDIX F – List of NYS DEC Regional Offices

Region	Covering the following counties:	DIVISION OF ENVIRONMENTAL PERMITS (DEP) Permit Administrators	DIVISION OF WATER (DOW) Water (SPDES) Program
1	Nassau and Suffolk	50 Circle Road Stony Brook, Ny 11790 Tel. (631) 444-0365	50 Circle Road Stony Brook, Ny 11790-3409 Tel. (631) 444-0405
2	Bronx, Kings, New York, Queens and Richmond	1 Hunters Point Plaza, 47-40 21st St. Long Island City, Ny 11101-5407 Tel. (718) 482-4997	1 Hunters Point Plaza, 47-40 21st St. Long Island City, Ny 11101-5407 Tel. (718) 482-4933
3	Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester	21 South Putt Corners Road New Paltz, Ny 12561-1696 Tel. (845) 256-3059	100 Hillside Avenue, Suite 1w White Plains, Ny 10603 Tel. (914) 428 - 2505
4	Albany, Columbia, Delaware, Greene, Montgomery, Otsego, Rensselaer, Schenectady and Schoharie	1150 North Westcott Road Schenectady, Ny 12306-2014 Tel. (518) 357-2069	1130 North Westcott Road Schenectady, Ny 12306-2014 Tel. (518) 357-2045
5	Clinton, Essex, Franklin, Fulton, Hamilton, Saratoga, Warren and Washington	1115 State Route 86, Po Box 296 Ray Brook, Ny 12977-0296 Tel. (518) 897-1234	232 Golf Course Road Warrensburg, Ny 12885-1172 Tel. (518) 623-1200
6	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
7	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7438	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7500
8	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROADAVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
9	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7165	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7070

APPENDIX J

CPv Calculations

Pond ATTENUATION BASIN 1: ATTENUATION BASIN 1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0	347.00	0.00
5.50	0.00	0	347.00	0.00
6.00	0.00	0	347.00	0.00
6.50	0.00	0	347.00	0.00
7.00	0.00	0	347.00	0.00
7.50	0.00	0	347.00	0.00
8.00	0.00	0	347.00	0.00
8.50	0.00	0	347.00	0.00
9.00	0.00	0	347.00	0.00
9.50	0.00	0	347.00	0.00
10.00	0.00	0	347.00	0.00
10.50	0.00	3	347.00	0.00
11.00	0.01	13	347.00	0.00
11.50	0.17	134	347.04	0.01
12.00	**0.87**	743	347.24	0.15
12.50	**0.58**	**2,003**	**347.64**	**0.59**
13.00	0.20	1,590	347.50	0.48
13.50	0.15	1,170	347.37	0.32
14.00	0.12	930	347.30	0.22
14.50	0.10	785	347.25	0.17
15.00	0.09	694	347.22	0.13
15.50	0.08	628	347.20	0.11
16.00	0.07	574	347.18	0.10
16.50	0.06	525	347.17	0.08
17.00	0.05	488	347.15	0.07
17.50	0.05	457	347.15	0.06
18.00	0.04	429	347.14	0.06
18.50	0.04	402	347.13	0.05
19.00	0.03	381	347.12	0.04
19.50	0.03	365	347.12	0.04
20.00	0.03	351	347.11	0.04
20.50	0.03	340	347.11	0.04
21.00	0.03	331	347.10	0.03
21.50	0.03	322	347.10	0.03
22.00	0.03	315	347.10	0.03
22.50	0.02	307	347.10	0.03
23.00	0.02	299	347.10	0.03
23.50	0.02	291	347.09	0.03
24.00	0.02	283	347.09	0.03
24.50	0.00	260	347.08	0.02
25.00	0.00	227	347.07	0.02
25.50	0.00	199	347.06	0.01
26.00	0.00	178	347.06	0.01
26.50	0.00	161	347.05	0.01
27.00	0.00	147	347.05	0.01
27.50	0.00	134	347.04	0.01
28.00	0.00	123	347.04	0.01
28.50	0.00	113	347.04	0.01
29.00	0.00	103	347.03	0.01
29.50	0.00	94	347.03	0.00
30.00	0.00	86	347.03	0.00

Pond ATTENUATION BASIN 2: ATTENUATION BASIN 2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0	358.00	0.00
5.50	0.00	0	358.00	0.00
6.00	0.00	0	358.00	0.00
6.50	0.00	0	358.00	0.00
7.00	0.00	0	358.00	0.00
7.50	0.00	0	358.00	0.00
8.00	0.00	0	358.00	0.00
8.50	0.00	0	358.00	0.00
9.00	0.00	0	358.00	0.00
9.50	0.00	0	358.00	0.00
10.00	0.00	0	358.00	0.00
10.50	0.01	8	358.00	0.00
11.00	0.03	37	358.01	0.00
11.50	0.14	120	358.02	0.01
12.00	**1.51**	1,094	358.23	0.20
12.50	**4.43**	**5,372**	**359.11**	**2.19**
13.00	2.41	**6,944**	**359.43**	**2.65**
13.50	1.45	5,753	359.19	2.31
14.00	1.06	4,277	358.88	1.79
14.50	0.85	3,208	358.66	1.29
15.00	0.72	2,635	358.54	0.95
15.50	0.62	2,314	358.48	0.76
16.00	0.53	2,091	358.43	0.64
16.50	0.45	1,911	358.39	0.55
17.00	0.40	1,764	358.36	0.47
17.50	0.36	1,647	358.34	0.42
18.00	0.32	1,544	358.32	0.37
18.50	0.28	1,453	358.30	0.33
19.00	0.26	1,375	358.28	0.30
19.50	0.24	1,311	358.27	0.28
20.00	0.23	1,260	358.26	0.26
20.50	0.22	1,217	358.25	0.24
21.00	0.21	1,183	358.24	0.23
21.50	0.20	1,153	358.24	0.21
22.00	0.19	1,125	358.23	0.21
22.50	0.18	1,096	358.23	0.20
23.00	0.17	1,068	358.22	0.19
23.50	0.16	1,039	358.21	0.18
24.00	0.15	1,011	358.21	0.17
24.50	0.10	948	358.20	0.15
25.00	0.06	843	358.17	0.12
25.50	0.04	737	358.15	0.09
26.00	0.03	649	358.13	0.07
26.50	0.02	581	358.12	0.06
27.00	0.02	522	358.11	0.05
27.50	0.01	470	358.10	0.04
28.00	0.01	424	358.09	0.03
28.50	0.01	384	358.08	0.03
29.00	0.01	351	358.07	0.02
29.50	0.00	322	358.07	0.02
30.00	0.00	298	358.06	0.02

Pond ATTENUATION POND 3: ATTENUATION POND 3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0	368.00	0.00
5.50	0.00	2	368.00	0.00
6.00	0.00	9	368.00	0.00
6.50	0.01	17	368.00	0.00
7.00	0.01	28	368.01	0.00
7.50	0.01	42	368.01	0.00
8.00	0.01	60	368.01	0.00
8.50	0.02	84	368.02	0.00
9.00	0.03	120	368.03	0.00
9.50	0.04	173	368.04	0.00
10.00	0.05	243	368.05	0.01
10.50	0.08	333	368.07	0.02
11.00	0.12	466	368.10	0.03
11.50	0.21	659	368.15	0.06
12.00	**1.23**	1,348	368.30	0.23
12.50	**1.24**	**3,794**	**368.84**	**0.73**
13.00	0.40	**3,683**	**368.82**	**0.71**
13.50	0.28	3,065	368.68	0.62
14.00	0.23	2,499	368.56	0.52
14.50	0.20	2,031	368.45	0.43
15.00	0.18	1,690	368.38	0.33
15.50	0.15	1,456	368.32	0.26
16.00	0.13	1,285	368.29	0.21
16.50	0.11	1,151	368.26	0.17
17.00	0.10	1,050	368.23	0.15
17.50	0.09	971	368.22	0.13
18.00	0.08	903	368.20	0.11
18.50	0.07	845	368.19	0.10
19.00	0.07	798	368.18	0.09
19.50	0.06	760	368.17	0.08
20.00	0.06	730	368.16	0.08
20.50	0.06	704	368.16	0.07
21.00	0.06	681	368.15	0.07
21.50	0.05	661	368.15	0.06
22.00	0.05	642	368.14	0.06
22.50	0.05	624	368.14	0.06
23.00	0.05	608	368.14	0.05
23.50	0.04	591	368.13	0.05
24.00	0.04	576	368.13	0.05
24.50	0.01	534	368.12	0.04
25.00	0.00	477	368.11	0.03
25.50	0.00	424	368.09	0.03
26.00	0.00	380	368.08	0.02
26.50	0.00	344	368.08	0.02
27.00	0.00	314	368.07	0.02
27.50	0.00	287	368.06	0.01
28.00	0.00	264	368.06	0.01
28.50	0.00	245	368.05	0.01
29.00	0.00	227	368.05	0.01
29.50	0.00	213	368.05	0.01
30.00	0.00	200	368.04	0.01

Pond ATTENUATION 1: ATTENUATION POND 1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0	372.33	0.00
5.50	0.00	0	372.33	0.00
6.00	0.00	0	372.33	0.00
6.50	0.00	1	372.33	0.00
7.00	0.00	2	372.33	0.00
7.50	0.00	5	372.33	0.00
8.00	0.01	13	372.33	0.00
8.50	0.03	32	372.33	0.01
9.00	0.07	79	372.34	0.03
9.50	0.14	182	372.36	0.07
10.00	0.24	352	372.38	0.13
10.50	0.40	594	372.42	0.25
11.00	0.63	887	372.47	0.45
11.50	1.12	1,303	372.53	0.80
12.00	**5.58**	3,447	372.87	1.93
12.50	**9.14**	**17,341**	**374.70**	**4.04**
13.00	2.80	**18,974**	**374.87**	**4.18**
13.50	1.81	15,605	374.52	3.88
14.00	1.49	11,892	374.13	3.52
14.50	1.25	8,417	373.65	3.01
15.00	1.10	5,618	373.21	2.46
15.50	0.96	3,515	372.88	1.95
16.00	0.81	2,030	372.65	1.48
16.50	0.69	1,376	372.55	0.86
17.00	0.62	1,183	372.51	0.69
17.50	0.55	1,082	372.50	0.60
18.00	0.49	1,001	372.49	0.53
18.50	0.44	925	372.47	0.48
19.00	0.42	873	372.47	0.44
19.50	0.40	837	372.46	0.42
20.00	0.38	805	372.46	0.39
20.50	0.36	775	372.45	0.37
21.00	0.34	750	372.45	0.36
21.50	0.33	726	372.44	0.34
22.00	0.31	704	372.44	0.33
22.50	0.30	681	372.44	0.31
23.00	0.28	658	372.43	0.30
23.50	0.27	635	372.43	0.28
24.00	0.25	612	372.43	0.26
24.50	0.04	466	372.40	0.17
25.00	0.01	262	372.37	0.10
25.50	0.00	141	372.35	0.05
26.00	0.00	76	372.34	0.03
26.50	0.00	41	372.34	0.02
27.00	0.00	22	372.33	0.01
27.50	0.00	12	372.33	0.00
28.00	0.00	7	372.33	0.00
28.50	0.00	4	372.33	0.00
29.00	0.00	2	372.33	0.00
29.50	0.00	1	372.33	0.00
30.00	0.00	1	372.33	0.00

Pond ATTENUATION BASIN 6: ATTENUATION BASIN 6

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
5.00	0.00	0	412.00	0.00
5.50	0.00	0	412.00	0.00
6.00	0.00	0	412.00	0.00
6.50	0.00	0	412.00	0.00
7.00	0.00	0	412.00	0.00
7.50	0.00	0	412.00	0.00
8.00	0.00	0	412.00	0.00
8.50	0.00	0	412.00	0.00
9.00	0.00	0	412.00	0.00
9.50	0.00	0	412.00	0.00
10.00	0.00	0	412.00	0.00
10.50	0.02	11	412.00	0.00
11.00	0.06	72	412.02	0.01
11.50	0.14	219	412.07	0.02
12.00	0.99	792	412.25	0.23
12.50	**4.52**	**3,676**	**413.15**	**2.25**
13.00	1.65	**4,218**	**413.32**	**2.50**
13.50	0.96	2,628	412.82	1.68
14.00	0.76	1,805	412.57	1.01
14.50	0.64	1,506	412.47	0.75
15.00	0.56	1,359	412.43	0.62
15.50	0.49	1,255	412.39	0.54
16.00	0.42	1,158	412.36	0.47
16.50	0.35	1,063	412.33	0.40
17.00	0.32	988	412.31	0.35
17.50	0.28	932	412.29	0.32
18.00	0.25	876	412.27	0.28
18.50	0.23	824	412.26	0.25
19.00	0.21	785	412.25	0.23
19.50	0.20	757	412.24	0.21
20.00	0.19	734	412.23	0.20
20.50	0.18	713	412.22	0.19
21.00	0.17	694	412.22	0.18
21.50	0.17	677	412.21	0.17
22.00	0.16	660	412.21	0.17
22.50	0.15	644	412.20	0.16
23.00	0.14	628	412.20	0.15
23.50	0.13	613	412.19	0.14
24.00	0.13	597	412.19	0.14
24.50	0.05	534	412.17	0.11
25.00	0.03	436	412.14	0.08
25.50	0.01	358	412.11	0.05
26.00	0.01	294	412.09	0.04
26.50	0.00	244	412.08	0.03
27.00	0.00	208	412.07	0.02
27.50	0.00	183	412.06	0.01
28.00	0.00	161	412.05	0.01
28.50	0.00	141	412.04	0.01
29.00	0.00	124	412.04	0.01
29.50	0.00	108	412.03	0.01
30.00	0.00	94	412.03	0.01

APPENDIX K

Weekly Inspection Form

Brett L. Steenburgh PE PLLC
2832 Rosendale Road
Niskayuna, NY 12309
(518) 365-0675 Phone
(518) 280-6520 Fax.

Construction Stormwater Compliance Inspection Report

Project Name:

Date

Permit Number:

Municipality

County:

Entry Time

Exit Time

On-site representative

Weather Conditions: Cloud 88 degrees s

Permittee:

Was the permittee contacted while on site

☐ Yes ☐ No

INSPECTION CHECKLIST

SPDES Authority

	Yes	No	N/A	
1.	☐	☐	☐	Is a copy of the NOI posted at the construction site for public viewing?
2.	☐	☐	☐	Is an up-to-date copy of the signed SWPPP retained at the construction site?
3.	☐	☐	☐	Is a copy of the SPDES General Permit retained at the construction site?

SWPPP Content

	Yes	No	N/A	
1.	☐	☐	☐	Does the SWPPP describe and identify the erosion & sediment control measures to be employed?
2.	☐	☐	☐	Does the SWPPP provide a maintenance schedule for the erosion & sediment control measures?
3.	☐	☐	☐	Does the SWPPP describe and identify the post-construction SW control measures to be employed?
4.	☐	☐	☐	Does the SWPPP identify the contractor(s) and subcontractor(s) responsible for each measure?
5.	☐	☐	☐	Does the SWPPP include all the necessary `CONTRACTOR CERTIFICATION' statements?
6.	☐	☐	☐	Is the SWPPP signed/certified by the permittee?

Record keeping

	Yes	No	N/A	
1.	☐	☐	☐	Are inspections performed as required by the permit (every 7 days)?
2.	☐	☐	☐	Are the site inspections performed by a qualified professional?
3.	☐	☐	☐	Are all required reports properly signed/certified?
4.	☐	☐	☐	Does the SWPPP include copies of the monthly/quarterly written summaries of compliance status?

Visual Observations

	Yes	No	N/A	
1.	☐	☐	☐	Are all erosion and sediment control measures installed/constructed?
2.	☐	☐	☐	Are all erosion and sediment control measures maintained properly?
3.	☐	☐	☐	Have all disturbances of 5 acres or more been approved prior to the disturbance?
4.	☐	☐	☐	Are stabilization measures initiated in inactive areas?
5.	☐	☐	☐	Are permanent stormwater control measures implemented?
6.	☐	☐	☐	Was there a discharge into the receiving water on the day of inspection?
6.	☐	☐	☐	Are receiving waters free of there evidence of turbidity, sedimentation, or oil ? (If no , complete Page 2)

Water Quality Observations

Describe the discharge(s) [source(s), impact on receiving water(s), etc.]

Describe the quality of the receiving water(s) both upstream and downstream of the discharge

Describe any other water quality violations

Additional Comments

Photos Attached ☐ Yes ☐ No

Photos will only be attached of deficiencies as required in the NYSDEC permit, unless requested by permittee

Overall Inspection Rating ☐ Satisfactory ☐ Marginal ☐ Unsatisfactory

Name/Agency of Lead Inspector:

Signature of Lead Inspector:

Name/Agencies of Other Inspectors:

APPENDIX L

SHPO Correspondence

February 26, 2020

David Moyer
Birchwood Archaeological Services, Inc.
131 Marion Avenue
PO Box 333
Gilbertsville, NY 13776

Re: DEC
Carver Court Residential Subdivision
Mannix Rd., East Greenbush, NY
19PR08310

Dear David Moyer:

Thank you for requesting the comments of the Division for Historic Preservation of the Office of Parks, Recreation and Historic Preservation (OPRHP). We have reviewed the submitted materials in accordance with the New York State Historic Preservation Act of 1980 (section 14.09 of the New York Parks, Recreation and Historic Preservation Law). These comments are those of the Division for Historic Preservation and relate only to Historic/Cultural resources. They do not include potential environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8) and its implementing regulations (5NYCRR Part 617).

We have reviewed your report entitled “Phase IA/IB Cultural Resources Survey, Carver Court Residential Development, Town of East Greenbush, Rensselaer County, New York” (20SR00096). OPRHP concurs with your recommendation that no additional archaeological work is necessary. We have no concerns regarding the project’s potential to impact historic architectural resources. Therefore, it is the opinion of OPRHP that no properties, including archaeological and/or historic resources, listed in or eligible for the New York State and National Registers of Historic Places will be impacted by this project.

If further correspondence is required regarding this project, please refer to the OPRHP Project Review (PR) number noted above. If you have any questions, I can be reached at 518-268-2186.

Sincerely,

Tim Lloyd, Ph.D., RPA
Scientist - Archaeology
timothy.lloyd@parks.ny.gov

via e-mail only

cc: B. Steenburgh

APPENDIX M

NYSDEC Maintenance Manual

NEW YORK STATE OF OPPORTUNITY.

Department of Environmental Conservation

MAINTENANCE GUIDANCE

Stormwater Management Practices

March 31, 2017

FINAL

Table of Contents

Section 1. Introduction

1.1. Stormwater Management Practice (SMP) Groups

Stormwater management has become an important function for municipalities to address the quality of local water resources and to adhere to state standards. Increasingly, stormwater management practices (SMPs) are constructed as part of new development or redevelopment projects as retrofits to existing infrastructure and/or as part of local watershed restoration plan efforts.

While SMPs are proliferating, municipalities are charged with a certain level of implementation and oversight. Whether this is a new function for a municipality or an expansion of existing programs, it is important for these local programs to have some degree of guidance to successfully meet the challenge. One important area where guidance has been lacking is how to properly operate and maintain the wide range of SMPs that are constructed. This chapter was developed to address this need. It is widely understood that SMPs will not function properly to protect water resources without attention to operation and maintenance (O&M), and that O&M tasks and responsibilities must be identified and assumed by various stakeholders.

The chapter is structured around a hierarchy concept where O&M responsibilities are addressed by SMP owners/property managers, municipal staff, landscape contractors and professionals with knowledge in stormwater management (Qualified Professional). The hierarchy approach, explained in more detail below in Section 1.2, strives for a cost-efficient way to ensure long-term performance of SMPs.

The maintenance procedures described in this chapter are applied to ten separate SMP groups (**Table 1.1**). These same ten groups are used to separate maintenance inspection guidance, costs, and other guidance in the chapter.

Table 1.1 Practices Discussed in this Chapter, by Group

SMP Group	Practices Included
Rainwater Harvesting	• Rain Barrel • Cistern
Disconnection and Sheetflow	• Rooftop Disconnection • Sheetflow to Filter Strip • Sheetflow to Riparian Buffers
Swales	• Vegetated Swale • Wet Swale
Tree Planting	• Tree Planting
Bioretention	• Bioretention Cell • Dry Swale • Rain Garden • Stormwater Planters • Tree Pits
Green Roofs	• Green Roofs
Permeable Pavements	• Permeable Pavers • Porous Asphalt/Concrete
Ponds and Wetlands	• Wet Pond Design Options • Stormwater Wetland Design Options
Infiltration	• Infiltration Trench • Infiltration Basin • Dry Well
Sand and Organic Filters	• Surface Sand Filters • Underground Sand Filters • Underground Organic Filters

1.2. Maintenance Hierarchy

SMPs require inspections and maintenance to identify small problems before they become more serious and expensive to repair. For example, removing a small amount of sediment from a filtering medium or permeable pavement surface is much less expensive than replacing a surface that has already become clogged. However, it can be cost prohibitive for most communities or SMP owners to hire highly trained staff or contractors to inspect these practices or to carry out the actual maintenance tasks. This can be especially true with the advent of "micro-scale" Green Infrastructure practices, which may be distributed across many individual public and private properties, and where the absolute number of SMPs within a municipality may exceed local government inspection and maintenance capabilities.

Many SMP maintenance problems start out as fairly small, easily rectified issues as long as they are detected early enough through an inspection. For these issues, property owners or managers can likely take care of the issue in an expedient and cost-effective manner.

However, at some point, property owners or managers will encounter an issue where diagnosing the problem and knowing the appropriate remedy will exceed their technical capabilities. At this point, an individual with training in SMP inspection, operation and maintenance, such as a municipal inspector or landscape contractor, may have to be called in for assistance.

Similarly, some problems escalate to the point where a Qualified Professional (i.e. professional engineer or landscape architect) is needed to bring the SMP back to a good functioning condition. The Qualified Professional may need to bring in other experts to assess problems with the SMP. For instance, they may call in a horticulturalist to assess problems with the planting plan.

Figure 1.1 The SMP Maintenance Hierarchy Pyramid

Acknowledging this step-wise approach to SMP inspection and maintenance, the SMP Maintenance Hierarchy concept was developed. The concept uses a combination of skill levels (**Figure 1.1**) as explained in more detail below.

Level 1: Property Owners and Managers, Interns, etc.

This category includes property owners, property managers, or HOA representatives, for privately owned SMPs. For municipally owned SMPS, this could include municipal maintenance staff or interns, and volunteers. These individuals would typically have no or only very limited training in stormwater maintenance and inspection but can use available guidance to quickly identify and rectify common and simple issues with SMP performance. This level completes routine inspections and maintenance activities. For most SMPs, the majority of inspection and maintenance activities can be conducted at this skill level, thus Level 1 forms the base of the Maintenance Hierarchy pyramid. Many well-functioning SMPs can be adequately maintained for long periods of time using Level 1 capabilities.

Although many issues can be addressed at Level 1, these inspectors and maintainers need a relief valve when the SMP problems become harder to diagnose and/or the remedies require a higher level of resources and expertise. Such issues are referred to in this chapter as "kick-outs to Level 2." For instance, an SMP may have a minor amount of sediment that has accumulated at inlets or on the practice bottom. A Level 1 person may be able to take care of this with a flat shovel and wheel barrow. However, a Level 2 inspection would be triggered if the sediment is deep, widespread, keeps recurring, and/or requires more sophisticated equipment to remove.

Level 2: Trained Municipal Staff

This level of inspection and maintenance is conducted primarily by municipal employees or landscape contractors who have completed training on SMP, inspection, operation and maintenance. Level 2 inspections can take place in response to two circumstances:

1. As part of an ongoing, routine municipal inspection program whereby SMPs are visited on a rotating basis at a frequency established by the local program, or

2. In response to a "kick-out" from a Level 1 inspector based on a specific problem or problems.

Circumstance #2 obviously will require coordination and communication between the Level 1 and Level 2 inspectors, with documentation and background provided by the Level 1 inspector. This is an essential part of making the hierarchy approach successful. In the example above, the Level 2 inspector can better diagnose the sources of the sediment, whether the sediment is affecting performance of the SMP, and the specific tasks needed to remove the sediment and abate the source.

As with kick-outs from Level 1 to Level 2, the same can exist from Level 2 to Level 3. It may be that the Level 2 inspector encounters a problem where a Qualified Professional is needed to re-design certain components of the SMP, and a qualified contractor is needed to undertake a more serious repair. This is when Level 3 is activated.

Level 3: Qualified Professionals

Qualified professionals include professional engineers and landscape architects, who can revisit design issues associated with chronic or serious problems. For repair and maintenance of the SMPs at this level, individuals with specific skills and certifications, such as a certified plumber who has experience working with rainwater harvesting practices or a horticulturalist with knowledge on proper plantings may need to be called in by the Qualified Professional. Level 3 inspection or maintenance is triggered in response to specific problems identified during a Level 2 inspection.

Continuing with the example above, the Level 2 inspector identifies that the sediment is accumulating in the SMP because of the lack of pre-treatment or that the practice is not sized properly for its drainage area. The Level 2 inspector at this point should consult a Qualified Professional (Level 3) who can go back to the original or as-built plan and develop workable solutions.

Table 1.2 further describes how maintenance and inspection activities differ among the three levels of the SMP Maintenance Hierarchy.

Table 1.2 Maintenance/Inspection Hierarchy Levels

	Level 1: Owners and Untrained Staff	**Level 2: Trained Municipal Staff**	**Level 3: Qualified Professionals**
Qualifications/ Training of Inspectors	No special training, but person is provided educational materials	On-the-job training and/or short workshops Define adequate training or provide examples	Professional License such as a PE or RLA
Frequency of Inspection	At least annually	Routine as determined by the local program OR as kick-out from Level 1 inspection	Only as needed from Level 2 inspection
Inspection Guidance	Checklists are included for each practice group in **Section 2** of this chapter and in **Appendix A**.	Guidance for the inspection is included in **Section 3**, and checklists are included in **Appendix B.**	**Section 4** includes guidance for diagnosing typical problems.
Typical Maintenance Activities	Routine mowing. Trash removal. Plant care and upkeep. Mulching as needed. Removal of small amounts of sediment from pretreatment areas of the practice.	Removal of larger amounts of sediment. Structural damage repair. Minor regrading and scarification of soil surface to restore permeability.	Redesign an improperly functioning practice. Includes re-grading of the contributing drainage area, replacing soil media and plantings (new planting plan), or modifying conveyance structures.
Triggers for Inspection or Maintenance by this Level	Regular inspection (no trigger)	Level 1 Inspection Sheets (**Section 2**) describe triggers that warrant a Level 2 Inspection.	Level 2 Inspection Guidance (**Section 3**) describes triggers that warrant a Level 3 Inspection.

1.3. Using the Remainder of this Chapter

This chapter provides guidance for maintaining SMPs, including inspection, maintenance activities, and maintenance planning. The chapter includes four sections as follows:

- **Section 2** outlines Level 1 inspection and maintenance procedures in the form of visual checklists. This includes guidance for inspection of each of the 10 SMP groups/categories included in this chapter, as well as specific kick-outs for Level 2.
- **Section 3** provides guidance for Level 2 inspections as to observed conditions, remedies, and triggers for Level 3.
- **Section 4** is most relevant to Level 3 and includes diagnostic measures for specific problems, as well as guidance for performing repair activities.
- **Section 5** provides an overview of planning for maintenance, including techniques for estimating maintenance costs and elements of a maintenance plan.

Section 2. Level 1 Inspections

2.1. How to Use this Section

Section 2 provides guidance for Level 1 inspections of 10 groups of stormwater management practices (SMPs). See Section 1 of this chapter for an explanation of Level 1 in the Maintenance Hierarchy.

- **Section 2.2** provides general guidance for Level 1 inspections.
- **Sections 2.3 through 2.12** provide detailed Level 1 inspection guidance and inspection forms for each of the 10 practice categories:
  - 2.3 Rainwater Harvesting
  - 2.4 Disconnection and Sheetflow
  - 2.5 Swales
  - 2.6 Tree Planting
  - 2.7 Bioretention
  - 2.8 Green Roofs
  - 2.9 Permeable Pavement
  - 2.10 Ponds and Wetlands
  - 2.11 Infiltration
  - 2.12 Sand and Organic Filters

2.2. General Guidance for Level 1 Inspections

Regardless of which practice you are inspecting, some key procedures and equipment are necessary. Read through this guidance before going on an inspection, and use the specific guidance in **Sections 2.3 through 2.12** for the particular practice type you are inspecting. The Level 1 Inspection can be completed with minimal previous training. Typical Level 1 inspectors may include a property owner or manager (for private SMPs) or perhaps an intern or maintenance or landscape crew members in the case of a publicly owned practice. Level 1 inspections are the most frequent inspections. They are designed to identify key maintenance issues before they become more serious and to help keep up with routine maintenance tasks.

When to Conduct a Level 1 Inspection

The Level 1 Inspection should be conducted at least annually for all practices and is often supplemented with additional visits after large storms, winter salting and sanding, or other seasonal changes. In addition, it is recommended that inspections take place more frequently during the first few years after installation of an SMP. Many issues can be identified and corrected during this early period so that they do not lead to larger problems in subsequent years. Plant establishment and health is one of these key issues. Once the SMP is stable and seems to be functioning properly, the inspections can become less frequent.

What to Take into the Field

The Level 1 Inspection is fairly simple, and it is assumed that very little measurement will be needed. However, the inspector should take pictures to document findings and should also keep a record of the inspections. The list of needs for the Level 1 Inspection includes the following:

1. Safety vest (if SMP is located in an area near traffic)
2. Notes or records from past inspections
3. Digital camera or phone
4. Clipboard and pencils (if using paper forms), or Tablet or smartphone if using digital forms
5. Bug spray (if needed)
6. Sun block (if needed)
7. Tape measure (optional, to measure pipe sizes and SMP dimensions)
8. Letter of permission to access property if the inspector is from an outside agency (e.g., summer intern working for the municipality)
9. Site Plan showing SMPs, Planting Plan (includes planting/seed mixes) and details
10. Engineers scale
11. Flagging/stakes and waterproof marker (to mark problem areas that need to be visited again)

Checklist and Follow-Up Actions

The Level 1 Inspection checklists included in **Sections 2.3 through 2.12** describe follow-up actions for each observed condition (See **Figure 2.2.1** for an example). A Level 1 Inspection Table is available for each component or key area of the particular SMP group. Use as follows:

- Check the box in the LEFT column if the problem is present at the site.
- Check the appropriate follow-up actions in the RIGHT column, or add your own as needed to fix the problem.
- DOCUMENT all your actions. Keep copies of the Level 1 inspection tables, plus notes, photos, or other documentation of corrective measures to fix problems. Record dates of actions and any follow-up inspections. This will be important for communicating with Level 2 inspectors and/or the local stormwater program.
- Activate a Level 2 Inspection (**Section 3**) as guided by the table (shown in blue cells): These blue cells identify conditions when a more detailed inspection will be needed to further diagnose problems. As the problem becomes more severe, it will be necessary to activate a Level 2 inspection. Consult the local stormwater program authority for the most appropriate Level 2 inspection option.

Permeable Pavement 1. Drainage Area	
Problem (Check if Present)	**Follow-Up Actions**
 ☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch areas of bare soil to get vegetation established. ☐ Fill in erosion areas with soil, compact, and seed straw to get vegetation established. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small bern or adding topsoil to area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.

Figure 2.2.1. Example of a Level 1 Inspection Checklist, with Follow-Up Actions. Note “Kick-Out to Level 2” highlighted in gray.

2.3. Rainwater Harvesting – Level 1 Inspections

Components of Rainwater Harvesting

Key components to inspect for Rainwater Harvesting systems include the following:

- RWH 1. Conveyance System (gutters, downspouts, other pipes) and Filter
- RWH 2. Storage Tank
- RWH 3. Outlets

Note: The category of Rainwater Harvesting includes:

- *Rain Barrel* – A small tank, usually between 50 and 100 gallons that can be installed directly next to a downspout. Multiple rain barrels can be connected in order to increase rainwater storage capacity. This is the most common form of rainwater harvesting on residential properties.
- *Cistern* – A larger tank that can be installed above ground or below ground, depending on the structural capacity of the material.

Figure 2.3.1 Key Areas for Level 1 Inspection of Rainwater Harvesting Systems

Rainwater Harvesting Level 1 Inspection

The Level 1 Inspection focuses on the Conveyance System and Filter (RWH 1), Storage Tank (RWH 2), and Outlet (RWH 3). It is recommended that this inspection be conducted two to four times per year, especially in spring and late fall. If possible, inspect the system during or immediately after a storm in order to better see any active blockages, leaks, or other problems.

RWH 1. Conveyance System and Filter

Description: The conveyance system is all the components that collect and convey runoff from the roof toward the storage tank. This typically consists of gutters and downspouts, and sometimes additional drainage pipes. These components need to be kept clear of debris in order to avoid blockages and spilling of runoff out of the gutters. Every proper rainwater harvesting system also has one or more ways of filtering the water coming into the tanks from the conveyance system. These may include screens, first-flush diverters, and vortex filters.

Instruction: Inspect any gutters, downspouts, drainage pipes, and filters connected to the Rainwater Harvesting System. Consult **Table 2.3.1** below:

Figure 2.3.2 Inspecting the Conveyance System and a Vortex-style Filter

Table 2.3.1 RWH Conveyance System and Filter

Problem (Check if Present)	Follow-Up Actions
☐ Leaves, sticks, or other debris in gutters and downspouts	☐ Remove all debris by hand. ☐ Other:
☐ Leaves, sticks, or other debris in filter(s)	☐ Clean out all debris and organic matter buildup by hand or by spraying with a hose. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Filter (first-flush diverter or vortex filter outside the tank) does not seem to be operating, is completely clogged, or does not appear to be trapping any debris.
☐ Loose or disconnected junctions between gutters, pipes, or filters	☐ Secure any loose junctions or parts and make sure they are properly sealed to prevent leaks, ☐ Other:

RWH 2. Storage Tank

Description: Many different types and sizes of tanks can be used for rainwater harvesting. They can be situated underground, above ground, or even partially buried. The tank body has an inlet (and/or cover) and one or more outlet points for water to leave the tank. Advanced rainwater harvesting systems usually also have a pump and a filter inside or outside the tank to further clean the stored water and pump it to the point of use.

Instruction: When the tank is full, carefully inspect for any leaks or blockages. Next, drain the tank to inspect interior. For safety reason, visually inspect the inside of the tank without breaking the plane of the opening with any body parts, as this is a confined space that should only be entered by those with special training. Consult **Table 2.3.2** below.

Figure 2.3.3 Inspecting the Storage Tank

Table 2.3.2 RWH Storage Tank

Problem (Check if Present)	Follow-Up Actions
☐ Tank is above ground and not freeze proof.	**Winterize the tank by performing the following steps:** ☐ Drain down water level in the tank before winter to avoid damage from freezing temperatures. ☐ Drain water from pipes and pumps. ☐ Disconnect conveyance pipes from the tank to enable roof runoff to bypass the tank during winter.
☐ Tank is full between rain events (harvested water is not being used).	☐ Drain down any remaining water in the tank before predicted rain events.
☐ Mosquito larvae or other insects present in the water	☐ Add mosquito dunks to water. ☐ Ensure that insect screens are installed on all openings and are properly sealed (inlet and outlets). ☐ Other:
☐ Debris, algae, or organic matter accumulated in tank	☐ Remove as much as possible, by hand. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: For large tanks that cannot easily be accessed for inspection and/or cleaning, defer to Level 2 Inspection.
☐ Tank does not appear to fill fully even during large rains, or water level drops quickly after filling.	☐ Kick-Out to Level 2 Inspection: Water is bypassing the tank and/or there are leaks in the tank wall. This will likely require special expertise to diagnose and fix.
☐ Problems with pumps, filters, or other mechanical components	☐ Kick-Out to Level 2 Inspection: This will likely require special expertise to diagnose and fix.

RWH 3. Outlets

Description: An above-ground rainwater harvesting tank usually has at least two outlets—one at the top of the tank where water overflows when the tank is full, and one near the bottom of the tank for delivering the stored water by gravity feed. Many filters also have an outlet pipe to divert the first flush of roof runoff away from the tank. Any overflow outlet that spills onto the ground should have sufficient erosion control (e.g., rock or stone pad) to prevent erosion of the ground.

Instruction: Examine the outlet pipe(s) and the point at which it overflows onto the ground. Consult **Table 2.3.3** below.

Table 2.3.3 RWH Outlets

Problem (Check if Present)	Follow-Up Actions
☐ Slow flow from outlet caused by faulty or clogged valve	☐ If clogging seems to be the problem, ream out sediment from valve if this can be done from exterior. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Valve needs to be replaced or cannot be cleaned out from outside of tank.
☐ Flow from outlet is backing up toward building foundation.	☐ Add flexible pipe to end of outlet pipe to divert flow further away and downhill from building.
☐ Erosion or drainage issues at outlet	☐ Add a gravel and/or stone pad to reduce the impact from the water flowing out of the outlet pipe during storms. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Rills have formed, erosion or drainage problems are more severe or cannot be resolved, or there is discoloration or other unusual conditions around the outlet.

2.4. Disconnection and Sheetflow

Components of Disconnection and Sheetflow

The intent of disconnection and sheetflow is for runoff from small areas of impervious cover to spread out evenly and dissipate in a grassy or vegetated area. It is a low-technology practice intended to reduce runoff at its source. Key components to inspect for Disconnection and Sheetflow include the following:

- D&S 1. Drainage Area
- D&S 2. Level Spreader/Energy Dissipator
- D&S 3. Treatment Area

Note: The category of Disconnection and Sheetflow includes:

Figure 2.4.1 Key Areas for Level 1 Inspection of Disconnection and Sheetflow with filter strip shown.

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- Rooftop Disconnection – Runoff from a small rooftop is directed to a relatively flat pervious area.
- Sheetflow to Filter Strip – Runoff from a small parking lot, sidewalk, or other small impervious surface is directed to a relatively flat, uniformly graded grassy area.
- Sheetflow to Riparian Buffers – Runoff from a small parking lot, sidewalk, or other small impervious surface is directed to a relatively flat, well-vegetated riparian area.

Disconnection and Sheetflow Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (D&S 1), Level Spreader/Energy Dissipater (D&S 2), and Treatment Area (D&S 3). This inspection should be conducted twice per year, preferably in the spring and fall. If possible, inspect the practice during a storm in order to better see any active blockages, bypassing, or other problems.

D&S 1. Drainage Area

Description: The drainage area consists of rooftops and/or impervious surfaces such as parking lots, driveways, or sidewalks. Pervious areas such as lawns or forests may also be part of the drainage area.

Instruction: Visually inspect any surfaces in the drainage area. Consult **Table 2.4.1** below.

Table 2.4.1 D&S Drainage Area

Problem (Check if Present)		Follow-Up Actions
	☐ Changes in flow; more runoff; runoff bypassing the practice	☐ For rooftop areas, make sure downspouts are still disconnected and conveying water into the treatment area. ☐ Look for and remove any “dams” of sediment and grass clippings that prevent water from entering the treatment area as sheet flow. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Changes to drainage area size or amount of runoff due to construction, tillage, etc.
	☐ For parking lots in the drainage area—sediment, grass clippings, or other debris has accumulated at pavement edge.	☐ For small, isolated amounts of debris, sweep up by hand and dispose properly so that it will not be exposed to runoff. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Sediment is widespread and cannot be removed by manual sweeping.
	☐ For parking lots in the drainage area—dips or damage at pavement edge caused flow to concentrate.	☐ Kick-Out to Level 2 Inspection: This will likely require special expertise to diagnose and fix pavement edge.

D&S 2. Level Spreader/Energy Dissipator

Description: Some disconnection and sheetflow practices have a structure in place to dissipate any concentrated runoff and turn it into sheet flow. This may consist of a stone or gravel spreader a concrete or wood level spreader, or other level and stable surface.

Instruction: Inspect the energy dissipator closely, during a rain event if possible. Consult the **Table 2.4.2** below.

Table 2.4.2 D&S Level Spreader/Energy Dissipator

Problem (Check if Present)		Follow-Up Actions
	☐ Debris and/or sediment accumulated behind or around the level spreader.	☐ Remove debris and sediment by hand and ensure that the area behind the level spreader is relatively flat. Too much debris and sediment can cause runoff to bypass the level spreader structure. ☐ Other:
	☐ Sinking, cracking, sloughing, or other structural problem makes the energy dissipator no longer level.	☐ For stone/gravel spreaders, add new material or rake out as needed to make it even. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Structural issues that cannot be easily fixed by hand

D&S 3. Treatment Area

Description: After runoff is dissipated as sheet flow, it enters the treatment area–a relatively flat grassy or vegetated area.

Instruction: Examine where flow enters the treatment area as well as the whole flow path. Look for signs of concentrated flow. Consult the table below.

Table 2.4.3 D&S Treatment Area

Problem (Check if Present)		Follow-Up Actions
☐ Trash and/or debris in the treatment area		☐ Collect trash/debris and dispose of properly.
	☐ Grass filter strip has grown very tall, to the point that runoff cannot easily enter or is getting concentrated.	☐ Mow filter strip twice a year or more frequently in a residential yard.
☐ Sparse vegetation or bare spots		☐ For grassy areas, add topsoil (as needed), grass seed mulch, and water during the growing season to re-establish consistent vegetation cover. ☐ Other:
	☐ Rills or gullies are forming in treatment area where flow has become concentrated	☐ For minor rills, fill in with soil, compact, and add seed and straw to establish vegetation. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Rills are more than 2" to 3" deep and require more than just hand raking and re-seeding.

2.5. Swales

Areas of Swales

- Key areas to inspect for swales include the following:
- SW 1. Drainage Area
- SW 2. Inlets
- SW 3. Swale Surface Area
- SW 4. Vegetation
- SW 5. Outlets

Note: The category of Swales includes:

- Vegetated Swale – shallow channel densely planted with variety of grasses, shrubs, and/or trees (also called bioswale or drainage swale)
- Wet Swale – a cross between a wetland and a swale, this linear system intercepts groundwater to maintain wetland vegetation

For the purposes of this chapter, the term "Swale" will be used to generally describe these practices.

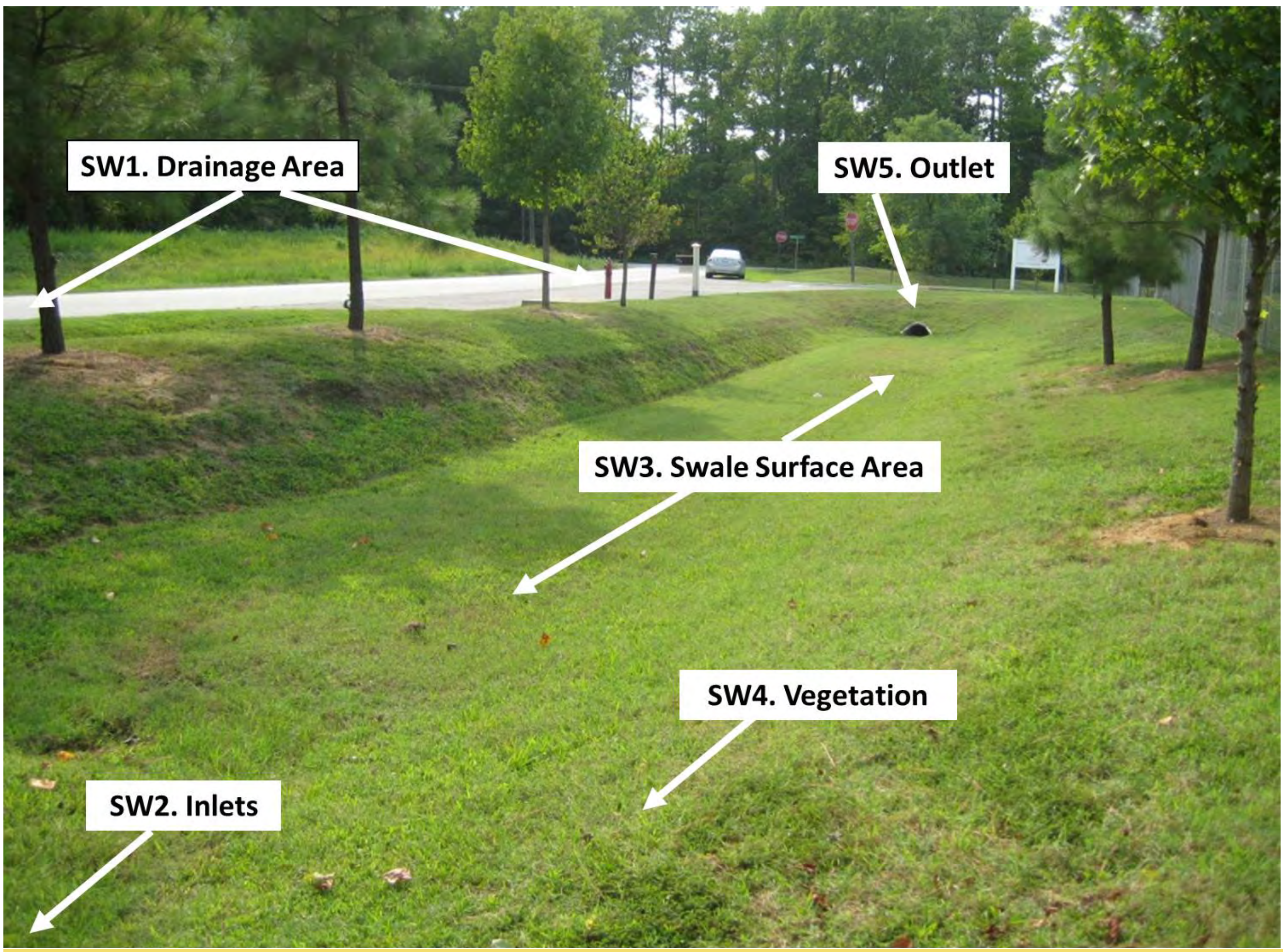


Figure 2.5.1 Key Areas for Level 1 Inspection of Swales Credit

Swale Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (SW1), Inlets (SW2), Swale Surface Area (SW3), Vegetation (SW4), and Outlets (SW5). This inspection should be conducted on a regular basis, with an early spring inspection to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow. An inspection during the growing season or in the early fall is also recommended to check on the health of vegetation.

SW 1. Drainage Area

Description: The drainage area sends runoff to and is uphill from the swale. When it rains, water runs off and flows to and along the swale.

Instruction: Look for areas that are uphill from the swale. Consult **Table 2.5.1** below.

Table 2.5.1 SW Drainage Area

Problem (Check if Present)	Follow-Up Actions
 ☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch or sod areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and add seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths
 ☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous.
	Kick-Out to Level 2 Inspection: Grass on edge of pavement continues to die off for unknown reasons. Swale edge may need to be replaced with other materials (e.g., stone diaphragm).
☐ Grass dying at edge of road	☐ Seed and mulch; add topsoil or compost if needed. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Grass on edge of pavement continues to die off for unknown reasons. Swale edge may need to be replaced with other materials (e.g., stone diaphragm).

SW 2. Inlets

Description: The inlets to a swale are where water flows in. Depending on the design, water can flow in through:

- Ditch, pipe, or curb opening at top of swale: This is the most common approach, where water enters the swale at the top.
- Along the entire edge of the swale: If the swale is along a roadway or parking lot, water may enter along the long side of the swale through defined curb openings or simply by water flowing into the swale from the pavement edge (known as “sheetflow”).

Instruction: Stand in the swale and look for all the places where water flows in. Consult **Table 2.5.2** below for possible problems.

Table 2.5.2 SW Inlets

Problem (Check if Present)	Follow-Up Actions
☐ Inlets or the swale edge are collecting grit, grass clippings, or debris or have grass/weeds growing. Some water may not be getting into the swale. The objective is to have a clear pathway for water to flow into the swale.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or opening). Parking lots will generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds, and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets or along the edge of the swale where water is supposed to enter. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the swale. ☐ Dispose of all material properly in an area where it will not re-enter the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the swale.
 ☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion are present, or there is bare dirt that is washing into the swale.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying an erosion control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
	☐ Level 2 Inspection: Erosion is occurring at most of the inlets or along much of the swale edge. The inlet design may have to be modified.

SW 3. Swale Surface Area

Description: The swale surface area is the vegetated area where water flows during a storm and also the side slopes that slope down into the swale bottom. Depending on the design, the swale may also contain “check dams,” which are small dams made out of earth, stone, wood, or other materials. The check dams slow down and temporarily pond water as it flows down the swale.

Instruction: Examine the entire swale surface and side slopes. Consult **Table 2.5.3** below for possible problems.

Table 2.5.3 SW Surface Area

Problem (Check if Present)	Follow-Up Actions
☐ Minor areas of sediment, grit, trash, or other debris are accumulating in the swale.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the swale. ☐ If removing the material creates a hole or low area, fill with good topsoil and add seed and straw to re-vegetate. ☐ Remove trash, vegetative debris, and other undesirable materials. ☐ If the swale is densely vegetated, it may be difficult to do the maintenance; check for excessive ponding or other issues described in this section to see if the accumulated material is causing a problem. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 3 inches deep and covers 25% or more of the swale surface. ☐ The source of sediment is unknown or cannot be controlled with simple measures.
 ☐ There is erosion in the bottom or on the side slopes. Water seems to be carving out rills as it flows through the swale or on the slopes.	☐ Try filling the eroded areas with clean topsoil, and then seed and mulch to establish vegetation. ☐ If the problem recurs, you may have to use some type of matting, stone (e.g., river cobble), or other material to fill in eroded areas. ☐ If the erosion is on a side slope, fill with soil and cover with erosion-control matting or at least straw mulch after re-seeding.
	☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3 inches deep and seems to be an issue with how water enters and moves through the swale. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water, but a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
☐ Water does not flow evenly down the length of the swale, but ponds in certain areas for long periods of time (e.g., 72 hours after a storm). The swale does not seem to have “positive drainage.” Check during or immediately after a rain storm.	☐ If the problem is minor (just small, isolated areas), try using a metal rake or other tools to create a more even flow path; remove excessive vegetative growth, sediment, or other debris that may be blocking the flow. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Water ponds in more than 25% of the swale for three days or more after a storm. The issue may be with the underlying soil or the grade of the swale. ☐ Water ponds behind check dams for three days or more after a storm. Check dams may be clogged or not functioning properly.

Table 2.5.3 SW Surface Area	
Problem (Check if Present)	**Follow-Up Actions**
	☐ If the problem is isolated to just a few check dams, try simple repairs. ☐ It is very important for the center of each check dam (where most of the water flows) to be lower (by at least several inches) than the edges of the check dams where they meet the side slopes. Also, the check dams should be keyed into side slopes so water does not flow between the check dam and side slope. ☐ Use a level to check the right check-dam configuration, as noted above. Repair by moving around stone, filling and compacting soil, or adding new material so that water will be directed to the center of the check dam instead of the edges. ☐ Other:
☐ Check dams (if present): water is flowing around the edges of check dams, creating erosion or sinkholes on the uphill or downhill side, or the check dams are breaking apart or breaching.	☐ Kick-Out to Level 2 Inspection: Many check dams are impacted and/or the problem seems to be a design issue with height, spacing, shape, or materials used to construct them.

SW 4. Vegetation

Description: The health of vegetation within the swale is perhaps the most critical maintenance item for the property owner or responsible party. Many vegetated swales become overgrown, and “desirable” vegetation becomes choked out by weeds and invasive plants. It is important to know what the swale is supposed to look like and what plants seem to be thriving or doing poorly. Periodic maintenance of vegetation will prevent larger problems that are more difficult and costly to manage.

Instruction: Examine the swale vegetation. Consult **Table 2.5.4** below for possible problems.

Table 2.5.4 SW Vegetation

Problem (Check if Present)	Follow-Up Actions
 ☐ Vegetation is too overgrown to access swale for maintenance activities	☐ Mow or bush-hog the path. ☐ Other:
 ☐ Vegetation requires regular maintenance: pulling weeds, removing dead and diseased plants, adding plants to fill in areas that are not well vegetated, etc.	☐ If you can identify which plants are weeds or not intended to be part of the planting plan, eliminate these, preferably by hand pulling. ☐ If weeds are widespread, check with the local stormwater authority and/or Extension Office about proper use of herbicides for areas connected with the flow of water. ☐ Even vegetation that is intended to be present can become large, overgrown, block flow, and/or crowd out surrounding plants. Prune and thin accordingly. ☐ If weeds or invasive plants have overtaken the whole swale, bush-hog the entire area before seed heads form in the spring. It will be necessary to remove the root mat manually or with appropriate herbicides, as noted above. ☐ Replant with species that are aesthetically pleasing and seem to be doing well in the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: You are unsure of the original planting design or the vegetation maintenance task is beyond your capabilities of time, expertise, or resources. If you are unsure of the health of the vegetation (e.g. salt damage, invasives, which plants are undesirable) or the appropriate season to conduct vegetation management, consult a landscape professional before undertaking any cutting, pruning, mowing, or brush hogging.
☐ Vegetation is too thin, is not healthy, and there are many spots that are not well vegetated.	☐ The original plants are likely not suited for the actual conditions within the swale. If you are knowledgeable about plants, select and plant more appropriate vegetation (preferably native plants) so that almost the entire surface area will be covered by the end of the second growing season. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: For all but small practices (e.g., in residential yards), this task will likely require a landscape design professional or horticulturalist.

SW 5. Outlets

Description: These are where water leaves the swale when it fills up or where water reaches the downstream end of the swale. There may be a small stone apron or rock dam here or even an outlet grate.

Instruction: Examine outlets that release water out of the swale. Consult **Table 2.5.5** below for possible problems.

Table 2.5.5 SW Outlets

Problem (Check if Present)	Follow-Up Actions
☐ Outlet is obstructed with mulch, sediment, debris, trash, etc.	☐ Remove the debris and dispose of it where it cannot re-enter the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Outlet is completely clogged or obstructed; there is too much material to remove by hand or with simple hand tools.

2.6. Tree Planting

Tree Planting Actions for Maintenance

Key actions to take for tree planting maintenance include the following:

- TP1. Watering
- TP2. Mulch
- TP3. Pruning
- TP4. Disease or pests

Note: This is a simple, “non-structural” practice and, as such, maintenance tasks are similar to any landscape maintenance. Tree planting can involve individual trees or more, such as reforesting a riparian buffer.

For this type of practice, inspection is part of maintenance to check on the health of the trees.

Figure 2.6.1. Key Areas for Inspection and Maintenance for Tree Planting

Tree Planting Level 1 Inspection

The Level 1 Inspection goes hand in hand with active maintenance and includes watering (TP1), mulching (TP2), and Pruning (TP3). Watering should occur during the growing season. Mulching and pruning occurs once a year in the spring and early spring, respectively.

TP 1. Watering

Description: Proper water management is perhaps the most crucial maintenance activity to ensure survival of newly planted trees. Watering is essential during periods of drought, while over watering can be fatal. Watering options include regular or soaker hoses, sprinklers, buckets, drip irrigation, or installation of larger capacity watering tanks for irrigation systems. Consult the maintenance plan for instructions on the timing, volume, and method of watering that is appropriate for the specific species of trees.

Instruction: Inspect the trees to determine whether they need watering. Consult **Table 2.6.1** below.

Table 2.6.1 TP Watering

Problem (Check if Present)	Follow-Up Actions
☐ Soil is not moist to the touch and/or it has not rained in a week, and leaves/needles are starting to appear wilted/dry.	☐ Water trees deeply and slowly near the base. Soaker hoses and drip irrigation work best for deep watering of trees and shrubs. ☐ Other:

TP 2. Mulch

Description: Mulching is a common method of weed control and moisture retention. Organic mulch should be spread over the soil surface and extend out to a radius of 5 feet or the tree drip line, whichever is less. Slowly decomposing organic mulches, such as shredded bark, compost, leaf mulch, or wood chips provide many added benefits for trees. Mulch that contains a combination of chips, leaves, bark and twigs is ideal for reforestation sites. Consult the maintenance plan for instructions on the timing, depth, and type of mulch application needed for the specific species of trees present.

Instruction: Mulch should be applied twice per year—in the late spring and during leaf fall. Consult the table below for possible problems. Check the depth of mulch regularly. Rake the old mulch to break up any matted layers and to refresh the appearance. Consult **Table 2.6.2** below.

Table 2.6.2 TP Mulch

Problem (Check if Present)	Follow-Up Actions
☐ Mulch is too thin or thick (should be approximately 3" deep) or does not extend to tree canopy (or 5' radius if tree has a larger than 10' canopy reach).	☐ Add or remove mulch around tree canopy to maximum 5' radius but not within 3" of the bark. ☐ If mulch is against the stems or tree trunks, pull it back several inches to expose the base of the trunk and root crown. ☐ Other:

TP 3. Pruning

Description: Pruning is usually not needed for newly planted trees but may be beneficial for tree structure in older trees. If necessary, prune only dead, diseased, broken or crossing branches at planting. As the tree grows, lower branches may be pruned to provide clearance above the ground or to remove dead or damaged limbs that sprout from the trunk.

- Instruction: Examine the branches and tree shape. Consult Table 2.6.3 below for possible problems.

Table 2.6.3 TP Pruning

Problem (Check if Present)	Follow-Up Actions
☐ Presence of suckers, dead or diseased branches, branches that interfere with pedestrian traffic	☐ Selective cutting ☐ Prune to make the tree more aesthetically pleasing and remove disease. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Use an arborist or landscaper for more extensive pruning jobs.

2.7. Bioretention

Areas of Bioretention

Key areas to inspect for Bioretention include the following:

- BR 1. Drainage Area
- BR 2. Inlets
- BR 3. Bioretention Ponding Area
- BR 4. Vegetation
- BR 5. Outlets

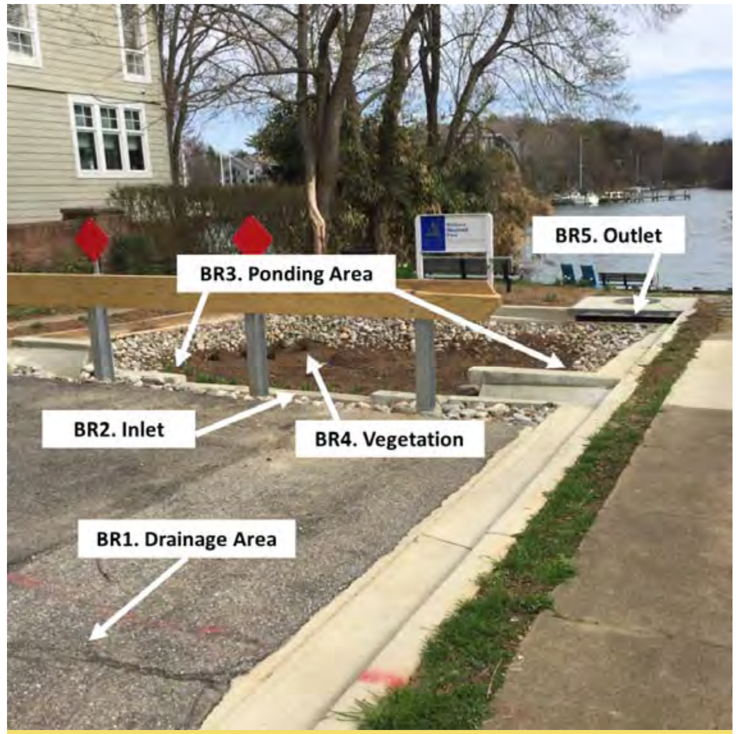


Figure 2.7.1. Key Areas for Level 1 Inspection of Bioretention

Note: The category of Bioretention includes:

- Bioretention cells – areas of soil, mulch, and vegetation that treat runoff
- Dry swales – long, linear bioretention cells, sometimes with check dams along a mildly sloping swale
- Rain gardens – usually small-scale bioretention practices on residential or small commercial properties
- Stormwater planters – usually in more urban settings, with soil and plants in a concrete box that receives roof runoff or perhaps other water from the site
- Tree pits – also a more urban practice where the bioretention is confined within some sort of box (e.g., concrete) and places along road curbs or other areas to treat runoff

For the purposes of this chapter, the term “Bioretention cell” will be used to generally describe these practices.

Bioretention Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (BR1), Inlets (BR2), Bioretention Ponding Area (BR3), Vegetation (BR4), and Outlets (BR5). This inspection should be conducted on a regular basis, with an early spring inspection to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow. An inspection during the growing season or in the early fall is also recommended to check on the health of vegetation.

BR 1. Drainage Area

Description: The drainage area sends runoff to and is uphill from the Bioretention cell. When it rains, water runs off and flows to the Bioretention cell and ponds within the cell temporarily (usually for no more than 48 hours). Sometimes, the runoff will contain dirt, grit, grass clippings, oil, or other substances that SHOULD NOT be directed to the Bioretention area.

Instruction: Look for areas that are uphill from the Bioretention cell. Consult **Table 2.7.1** below.

Table 2.7.1 BR Drainage Area

Problem (Check if Present)		Follow-Up Actions
	☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.
	☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
	☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

BR 2. Inlets

Description: The inlets to a Bioretention cell are where water flows into the cell. Depending on the design, water can flow in through:

- Curb cuts or openings in a parking lot or roadway
- Pipes or ditches that carry water into the Bioretention cell from the drainage area
- Flow directly over the land surface (known as "sheetflow"), sometimes across a strip of rock or stone

Curb cut – flow enter through defined place in curb

Curb cut

Gravel diaphragm – flow enters as sheetflow and is evenly distributed across length of practice

Grass filter strip: accepts sheet flow from the parking lot

Figure 2.7.2 Bioretention Cell Inlets

CSN, 2013

Instruction: Stand in the Bioretention cell itself and look for all the places where water flows in. Often there will be multiple points of inflow to the practice. Consult **Table 2.7.2** below for possible problems.

Table 2.7.2 BR Inlets

Problem (Check if Present)	Follow-Up Actions
 ☐ Inlets collect grit and debris or grass/weeds. Some water may not be getting into the Bioretention cell. The objective is to have a clear pathway for water to flow into the cell.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or openings). Parking lots generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the Bioretention cell. ☐ Dispose of all material properly where it will not re-enter the Bioretention cell. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the Bioretention cell.
 ☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion is present, or there is bare dirt that is washing into the Bioretention cell.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying erosion-control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Erosion is occurring at most of the inlets, and it looks like there is too much water that is concentrating at these points. The inlet design may have to be modified.

BR 3. Bioretention Ponding Area

Description: The ponding area fills up with water during a rainstorm. If you picture the Bioretention cell as a bathtub, there is the *bottom* (usually flat surface), *side slopes* (areas that slope down to the bottom from the surrounding ground), and *berms or structures that control the depth to which water ponds.*

Instruction: Examine the entire Bioretention surface and side slopes. Consult the table below for possible problems.

Table 2.7.3 BR Ponding Area

Problem (Check if Present)	**Follow-Up Actions**
 ☐ Mulch (if used) needs to be replaced or replenished. The mulch layer had decomposed or is less than 1-inch thick.	☐ Add new mulch to a total depth (including any existing mulch that is left) of 2 to 3 inches. The mulch should be shredded hardwood mulch that is less likely to float away during rainstorms. ☐ Avoid adding too much mulch so that inlets are obstructed or certain areas become higher than the rest of the Bioretention surface. ☐ Other:
 ☐ Minor areas of sediment, grit, trash, or other debris are accumulating on the bottom.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the Bioretention cell. ☐ If removing the material creates a hole or low area, fill with soil mix that matches original mix and cover with mulch so that the Bioretention surface area is as flat as possible. ☐ Remove trash, vegetative debris, and other undesirable materials. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 2-inches deep and covers 25% or more of the Bioretention surface. ☐ Kick-Out to Level 2 Inspection: The Bioretention cell is too densely vegetated to assess sediment accumulation or ponding; see BR-4, Vegetation.

 ☐ There is erosion in the bottom or on the side slopes. Water seems to be carving out rills as it flows across the Bioretention surface or on the slopes, or sinkholes are forming in certain areas. ☐ Source: Stormwater Maintenance, LLC.	☐ Try filling the eroded areas with clean topsoil or sand, and cover with mulch. ☐ If the problem recurs, you may have to use stone (e.g., river cobble) to fill in problem areas. ☐ If the erosion is on a side slope, fill with clay that can be compacted and seed and mulch the area. ☐ Other: ☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3-inches deep and seems to be an issue with how water enters and moves through the Bioretention cell. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water, but a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
 ☐ The bottom of the Bioretention cell is not flat, and the water pools at one end, along an edge, or in certain pockets. The whole bottom is not uniformly covered with water. See design plan to verify that Bioretention surface is intended to be flat. Check during or immediately after a rainstorm.	☐ If the problem is minor (just small, isolated areas are not covered with water), try raking the surface OR adding mulch to low spots to create a more level surface. You may need to remove and replace plantings in order to properly even off the surface. ☐ Check the surface with a string and bubble level to get the surface as flat as possible. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Ponding water is isolated to less than half of the Bioretention surface area, and there seem to be elevation differences of more than a couple of inches across the surface.
 ☐ Water stands on the surface more than 72 hours after a rainstorm and /or wetland-type vegetation is present. The Bioretention cell does not appear to be draining properly.	☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

BR 4. Vegetation

Description: The health of vegetation within the Bioretention cell is perhaps the most critical maintenance item for the property owner or responsible party. Many Bioretention cells become overgrown, and “desirable” vegetation becomes choked out by weeds and invasive plants. It is important to know what the Bioretention cell is supposed to look like and what plants seem to be thriving or doing poorly. Periodic maintenance of vegetation will prevent larger problems that are more difficult and costly to manage.

Instruction: Examine all Bioretention cell vegetation. Consult the table below for possible problems.

Table 2.7.4 BR Vegetation

Problem (Check if Present)	Follow-Up Actions
 ☐ Vegetation requires regular maintenance—pulling weeds, removing dead and diseased plants, replacing mulch around plants, adding plants to fill in areas that are not well vegetated, etc.	☐ If you can identify which plants are weeds or not intended to be part of the planting plan, eliminate these, preferably by hand pulling. ☐ If weeds are widespread, check with the local stormwater authority and/or Extension Office about proper use of herbicides for areas connected with the flow of water. ☐ Even vegetation that is intended to be present can become large, overgrown, and/or crowd out surrounding plants. Prune and thin accordingly. ☐ If weeds or invasive plants have overtaken the whole Bioretention cell, bush-hog the entire area before seedheads form in the spring. It will be necessary to remove the root mat manually or with appropriate herbicides, as noted above. ☐ Re-plant with species that are aesthetically pleasing and seem to be doing well in the Bioretention cell. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: You are unsure of the original planting design, or the vegetation maintenance task is beyond your capabilities of time, expertise, or resources. If you are unsure of the health of the vegetation (e.g. salt damage, invasives, which plants are undesirable) or the appropriate season to conduct vegetation management, consult a landscape professional before undertaking any cutting, pruning, mowing, or brush hogging.
 ☐ Vegetation is too thin, is not healthy, and there are many spots that are not well vegetated.	☐ The original plants are likely not suited for the actual conditions within the Bioretention cell. If you are knowledgeable about plants, select and plant more appropriate vegetation (preferably native plants) so that almost the entire surface area will be covered by the end of the second growing season. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: For all but small practices (e.g., rain gardens), this task will likely require a landscape design professional or horticulturalist.

BR 5. Outlets

Description: Outlets are where water leaves the Bioretention cell when there is too much ponded water. There are various ways that outlets are configured. They can be a yard drain type of structure in the Bioretention cell itself or a rock weir where water flows during large storms. Many Bioretention practices have an underdrain, which is like a French drain, that helps the Bioretention cell drain properly after storms. The underdrain pipe may “daylight” (come to the ground surface) at some point downhill from the Bioretention cell.

Instruction: Examine outlets that release water out of the Bioretention cell. Consult the table below for possible problems.

Table 2.7.5 BR Outlets

Problem (Check if Present)	Follow-Up Actions
☐ Erosion at outlet	☐ Add stone to reduce the impact from the water flowing out of the outlet pipe or weir during storms. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Rills have formed and erosion problem becomes more severe.
 ☐ Outlet obstructed with mulch, sediment, debris, trash, etc.	☐ Remove the debris and dispose of it where it cannot re-enter the Bioretention cell. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Outlet is completely clogged or obstructed; there is too much material to remove by hand or with simple hand tools.

2.8. Green Roof

Areas of the Green Roof

Key areas to inspect for green roofs include the following:

GR 1. Vegetation and Surface
GR 2. Overflows and Drains

Note: Green Roofs consist of green infrastructure practices applied on rooftops, wherein stormwater is filtered through a vegetated planting bed. Green Roofs are a unique practice in that they are often covered by a professional ongoing maintenance contract, and their design is highly variable depending on the specific product. This section highlights some key inspection items.

Figure 2.8.1. Key Areas for Level 1 Inspection of Green Roof

Green Roof Level 1 Inspection

The Level 1 Inspection focuses on the Vegetation (GR1), Overflows and Drains (GR2), and the Surface and Soil Medium (GR3). This inspection should be conducted on a regular basis, with an early spring inspection to ensure that the practice has survived the winter, particularly if there has been a cold year.

On a routine basis, the Level 1 Inspector should also ensure that the vegetation is surviving any harsh roof conditions, particularly during dry periods.

GR 1. Vegetation and Surface

Description: The green roof vegetation usually consists of succulent plants, such as sedums, and should form a dense cover over the course of several growing seasons.

Instruction: Visually inspect the surface and vegetation of the practice. Consult **Table 2.8.1** below:

Table 2.8.1 GR Vegetation and Surface

Problem (Check if Present)	Follow-Up Actions
☐ Wilting or nutrient-deprived vegetation; bare areas developing on the roof	☐ Water or irrigate. ☐ Prune or remove dead or dying vegetation. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Greater than 20% plant dieoff or wilting, even after rainy periods. May require new vegetation or indicate a problem with the soil medium. ☐ Kick-Out to Level 2 Inspection: Yellowing vegetation may indicate a need for fertilizer, but do not fertilize unless explicitly included in the management plan or with a Level 2 Inspection. ☐ Kick-Out to Level 2 Inspection: Bare areas with no vegetation growing. These may become weed problems in the future.
 ☐ Weeds or moss	☐ Remove weeds by hand. ☐ Apply lime to kill moss. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Weeds cover more than 25% of the surface, or the original planting plan has been compromised.
☐ Ponding between storm events	☐ Kick-Out to Level 2 Inspection: Surface ponding more than 24 hours after a storm event presents a hazard and needs to be addressed immediately.

GR 2. Overflows and Drains

Description: Green roofs typically drain through a network of underdrains to outlet at roof drainage infrastructure. These drainage structures need to be inspected and cleaned periodically to ensure that the medium drains properly.

Instruction: Review the specific maintenance plan for this practice to determine where inspection ports are. Remove the cover and inspect the port.

Table 2.8.2 GR Overflows and Drains

Problem (Check if Present)	Follow-Up Actions
☐ Inspection port for roof drainage (can be clogged with debris)	☐ Remove debris by hand or flush through with a hose. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Debris cannot be removed, or it appears that debris has accumulated in the underdrains.
☐ Damage to other roof drainage structures (e.g., roof scuppers)	☐ Call contractor or individual in charge of regular building maintenance. This is a building maintenance issue. ☐ Other:

2.9. Permeable Pavement

Areas of Permeable Pavement

Key areas to inspect for permeable pavement include the following:

- PP1. Drainage Area
- PP2. Pavement Surface

Note: Permeable pavements include several materials, including porous asphalt materials, which appear similar to an asphalt parking lot, permeable concrete, and "interlocking concrete pavers," which are individual paving blocks. References to removing and replacing individual blocks of pavement refer only to this last category.

Figure 2.9.1. Key Areas for Level 1 Inspection of Permeable Pavement

Permeable Pavement Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (PP1) and the Pavement Surface (PP2). This inspection should be conducted on a regular basis, with an early spring inspection to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow.

On a routine basis, the Level 1 Inspector should also ensure that the pavement area and its drainage are properly managed. Some key activities to avoid include:

1. Applying sand during winter months
2. Certain types of permeable pavement should not be plowed with steel-bladed plows.
3. Poor management of dumpsters
4. Storing or placing dirt, grit, mulch, sand, or other similar materials on or near the pavement surface

PP 1. Drainage Area

Description: The drainage area sends runoff to the Permeable pavement area and is uphill from the Permeable pavement. When it rains, water runs off and flows to the Permeable pavement area, and it may pond there temporarily.

Instruction: Look for areas that are uphill from the Permeable pavement. Consult **Table 2.9.1** below:

Table 2.9.1 PP Drainage Area

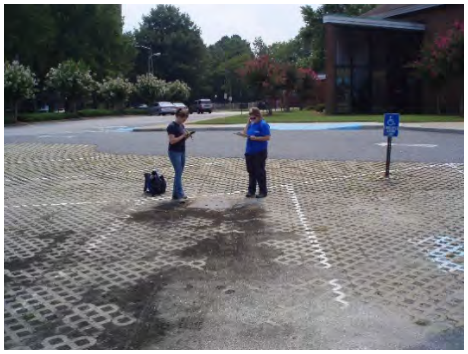
Problem (Check if Present)		Follow-Up Actions
	☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.
	☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
	☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

PP 2. Permeable Pavement Surface

Description: The surface of the Permeable pavement should be relatively clean (not a lot of dirt and grit on the surface), free of cracks and broken pavement, and should NOT hold water after a rainstorm for more than a few hours.

Instruction: Examine the entire permeable pavement surface. Consult **Table 2.9.2** below for possible problems.

Table 2.9.2 PP Surface

Problem (Check if Present)		Follow-Up Actions
	☐ Dirt and grit accumulating on pavement surface	☐ For small areas (e.g., driveways, patios), try a leaf blower or sweep the area to remove the dirt/grit from the Permeable pavement and properly dispose of the material. ☐ If dirt/grit remain in the joint areas between paver blocks, agitate with a rough brush and vacuum the surface with a wet/dry vac. ☐ Remove and replace clogged blocks in segmented pavers. ☐ For larger areas (e.g., parking lots, courtyards), hire a vacuum sweeper to restore the surface to a cleaner condition. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Grit is widespread and cannot be removed by manual sweeping.
	☐ Grass and weeds are growing on the permeable pavement surface (applies only to pavement types that are not intended to be covered in vegetation).	☐ If paver type is not intended to be covered in vegetation, remove the grass/weeds either mechanically (pulling, by hand or with a flame weeder) or with a herbicide approved for use in or near water (consult your local Extension Office for suggestions). ☐ Follow the actions listed above for removing dirt/grit from the pavement surface. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Grass/weeds cover more than 25% of surface area.
	☐ Slumping, sinking, cracking, or breaking of the pavement surface *(Source: CSN, 2013)*	☐ For small areas (e.g., patios, small driveway), it may be possible to remove the damaged pavers, check and fill in the underlying gravel, and replace with new materials. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Problem affects more than a small, isolated area. Will typically require a qualified contractor to fix it. ☐ Problem recurs or occurs in multiple small locations.
	☐ Water stands on Permeable pavement for days after a rainstorm; the Permeable pavement is clogged and doesn't let water through. *(Source: CSN, 2013)*	☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

2.10. Ponds and Wetlands

Areas of Ponds and Wetlands

Key areas to inspect for ponds and wetlands include the following:

- PO 1. Drainage area
- PO 2. Inlet pipes and swales
- PO 3. Pond area and embankments
- PO 4. Pond outlet

Note: This category includes the following practices:

- *Wet ponds* – have a permanent pool of water and may be divided into various "cells"
- *Stormwater wetlands* – have a variety of depth zones ranging from deep pools to shallow wetlands and are characterized by wetland vegetation

It is recommended strongly to have as-built drawings and copies of previous inspections at hand, if available. Aerial photos may be needed to help direct the inspector to the pond or wetland location if it is obscured by vegetation.

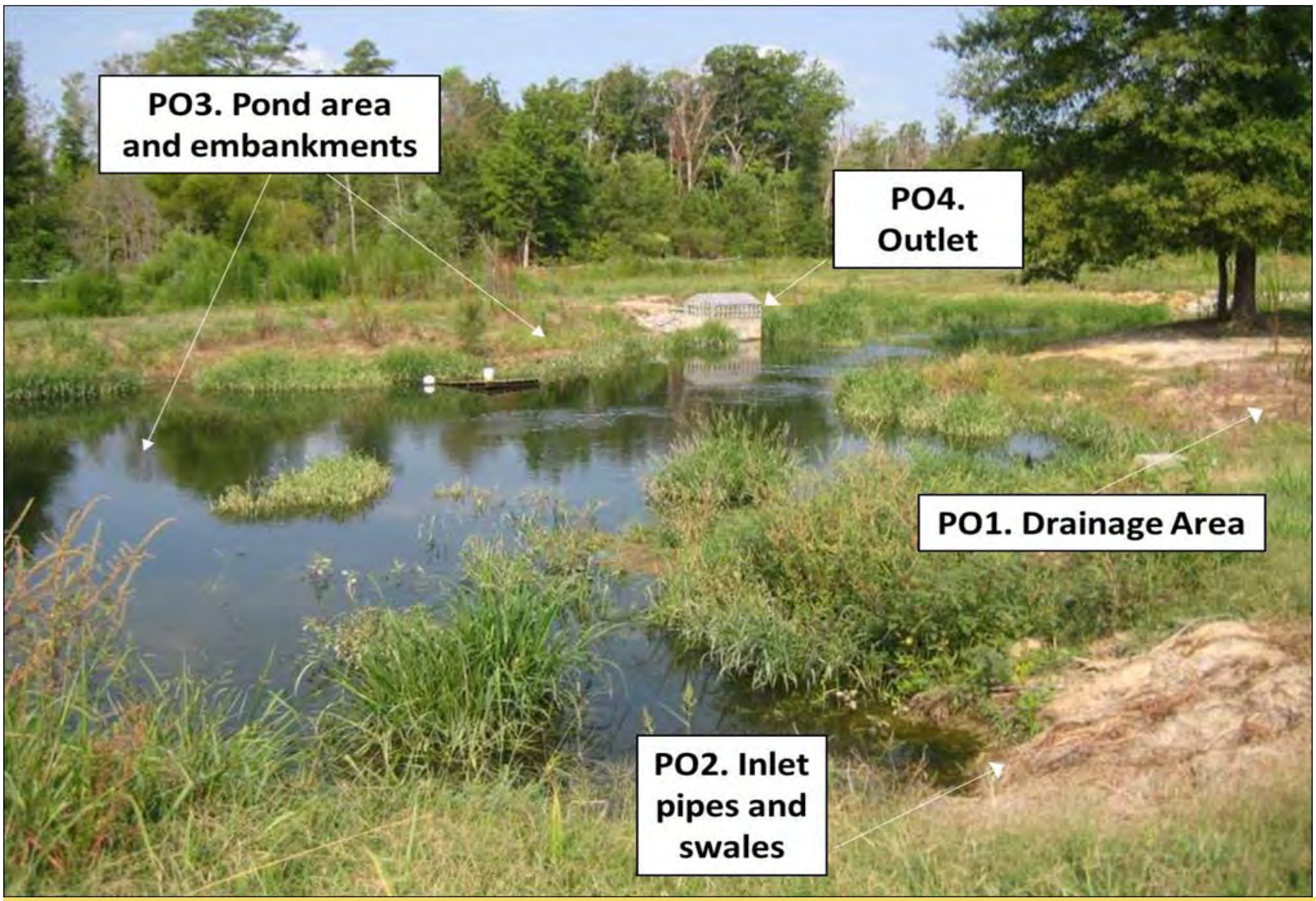


Figure 2.10.1. Key Areas for Level 1 Inspection of a Pond/Wetland

Pond and Wetland Level 1 Inspection

The Level 1 Inspection focuses on the drainage area (PW 1), inlet pipes or swales (PW 2), pond area and embankments (PW 3) and pond outlet structures and outfall (PW 4). This inspection should be conducted on a regular basis to ensure that a buildup of trash, vegetation, or sediment does not interfere with the pre-treatment, pond or wetland, and the outfall's normal flow or function. Pond embankments and dams should be regularly inspected for evidence of erosion, burrowing or tunneling animals, and large woody vegetation growing on the dam.

PW 1. Drainage Area

Description: The drainage area conveys runoff to and is uphill from the pond inlet. When it rains, water runs off through roof drains, yard drains, parking lots, roadways and underdrains to the ponds. Flow is through underground piping systems, overland via swales, or across the ground as sheetflow. Sometimes, the runoff will contain dirt, grit, grass clippings, leaves and woody debris that can collect in the drainage system. If left alone, blockages can occur and increase the chance of shallow flooding or standing water. Standing water in drainage systems foster mosquitos, pipe corrosion, and possible nuisance and odor conditions.

Instruction: Look for areas that are uphill from the pond. Consult **Table 2.10.1** below:

Table 2.10.1 PW Drainage Area

Problem (Check if Present)	Follow-Up Actions
☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to establish vegetation. ☐ Fill in eroded areas with soil, compact, seed and mulch with straw to establish vegetation. ☐ Other: ☐ Kick-Out to Level 2 Inspection: If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ If large areas of soil have been eroded or larger channels are forming, this may require rerouting of flow paths or use of an erosion-control seed mat or blanket to reestablish acceptable ground cover or anchor sod where it is practical.
 ☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Remove excessive vegetation or woody debris that can block drainage systems. ☐ Other:
 ☐ Open containers of oil, grease, paint, or other substances exposed to rain in the drainage area	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

PW 2. Pond Inlets

Description: Free, unobstructed flow from the drainage area to stormwater ponds is necessary to prevent shallow flooding and even structural damage from flooding. Pond inlets can consist of pipes, ditches, swales, or other means to convey stormwater to the pond or wetland.

Instruction: Look for all areas where water flows into the pond during storms. Note that there may be multiple points of inflow and types of structures (e.g., pipes, open ditches, etc.). Consult **Table 2.10.2** below:

Table 2.10.2 Pond Inlets

Problem (Check if Present)		Follow-Up Actions
 	☐ Inlets are buried, covered or filled with silt, debris, or trash, or blocked by excessive vegetation.	☐ If the problem can be remedied with hand tools and done in a safe manner, remove vegetation, trash, woody debris, etc. from blocking inlet structures. ☐ Other:
		☐ Kick-Out to Level 2 or 3 Inspection: If the amount of material is too large to handle OR there are ANY safety concerns about working in standing water, soft sediment, etc., the work will likely have to be performed by a qualified contractor.
	☐ Inlets are broken, and, with pieces of pipe or concrete falling into the pond, there is erosion around the inlet, there is open space under the pipe, or there is erosion where the inlet meets the pond	☐ Kick-Out to Level 2 Inspection: These types of structural or erosion problems are more serious and will require a qualified contractor to repair.

PW 3. Pond Area and Embankments

Description: The pond area and embankment can consist of the following elements:

- Pre-treatment cell or small holding area where water first flows into the pond from the various inlets. These are commonly referred to as “forebays” and will be demarcated from the main pond area by small dams made of earth or rock. The purpose of forebays is to capture some of the sediment and pollutants before they reach the deep pool, making maintenance easier over time. Not all ponds will have forebays.
- The pond surface can be open water or a combination of open water and areas with wetland vegetation. Sometimes there is a shallow bench around the perimeter of a pond, known as an “aquatic bench.”
- The “side slopes” are areas around the perimeter of the pond where the surrounding land slopes down to the pond surface.
- Most ponds will have a “riser structure,” where the water exits a pond during storms. This can be a concrete or metal pipe that is open at the top, often with some type of trash rack. Some ponds also have an “emergency spillway,” which is an open, rock-lined channel that carries water from large storms safely across the embankment.
- The dam or embankment holds water in the pond and is constructed of compacted soil, such as clay. There is often a pipe through the embankment that carries water from the riser structure safely through the embankment to the downstream channel.

The pond’s pre-treatment areas or forebays should not be choked with vegetation or full of sediment. Removal of excessive vegetation and sediment and selective replanting are often annual maintenance activities.

Likewise, the pond’s deep pool should not to be choked with vegetation or filled with sediment. Vegetation and sediment bars can restrict flow and cause short circuiting that reduces capture of sediment. Pond volume is to be maintained at the original design capacity and free of sediment bars or debris piles. Sometimes ponds are over-maintained and have no vegetation. Algae and turbidity (muddy water) are common problems in many ponds.

Instruction: Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Table 2.10.3 PW Pond Area and Embankments

Problem (Check if Present)		**Follow-Up Actions**
	☐ The pretreatment area(s) or forebay(s) are filled with sediment, trash, vegetation, or other debris.	☐ If the problem can be remedied with hand tools and done in a safe manner, use a flat shovel or other equipment to remove small amounts of sediment. ☐ Remove trash and excessive vegetation from forebays if this can be done in a safe manner. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Large amounts of sediment or debris will have to be removed by a qualified contractor. ANY condition that poses a safety concern for working in standing water or soft sediments should be referred to a Level 2 Inspection or qualified contractor.

Table 2.10.3 PW Pond Area and Embankments

Problem (Check if Present)		Follow-Up Actions
	☐ The pond area itself has accumulated sediment, trash, debris, or excessive vegetation that is choking the flow of the water, OR the pond area is covered with algae or aquatic plants.	☐ Level 1 includes handling only small amounts of material that can be removed by hand, or with rakes or other hand tools. Do not attempt any repair that poses a safety issue. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Most cases will call for a Level 2 Inspection and/or a qualified contractor. ☐ You are not sure what type and amount of vegetation is supposed to be in the pond. ☐ The algae or aquatic plants should be identified so that proper control techniques can be applied.
	☐ The side slopes of the pond are unstable, eroding, and have areas of bare dirt.	☐ If there are only minor areas, try filling in small rills or gullies with topsoil, compacting, and seeding and mulching all bare dirt areas with an appropriate seed. Alternatively, try using herbaceous plugs to get vegetation established in tricky areas, such as steep slopes. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Erosion and many bare dirt areas on steep side slopes will require a Level 2 Inspection and repair by a qualified contractor.
 	☐ The riser structure is clogged with trash, debris, sediment, vegetation, etc., OR is open, unlocked, or has a steep drop and poses a safety concern. The pond level may have dropped below its "normal" level.	☐ If you can safely access the riser on foot or with a small boat, clear minor amounts of debris and remove it from the pond area for safe disposal. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: The riser cannot be accessed safely, the amount of debris is substantial, or the riser seems to be completely clogged and the water level has risen too high. ☐ There are safety issues with the riser and concern about access to pipes, drops, or any other life safety concern. ☐ The riser is leaning, broken, settling or slumping, corroded, eroded or any other structural problem.

Table 2.10.3 PW Pond Area and Embankments		
Problem (Check if Present)		**Follow-Up Actions**
	☐ The dam/embankment is slumping, sinking, settling, eroding, or has medium or large trees growing on it.	☐ If there are small isolated areas, try to fix them by adding clean material (clay and topsoil) and seeding and mulching. ☐ Periodically mow embankments to enable inspection of the banks and to minimize establishment of woody vegetation. ☐ Remove any woody vegetation that has already established on embankments. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Most of these situations will require a Level 2 Inspection or evaluation and repair by a qualified contractor. Seepage through the dam or problems with the pipe through the dam can be a serious issue that should be addressed to avoid possible dam failure.
	☐ The emergency spillway or outfall (if it exists) has ☐ erosion, settlement, or loss of material. Rock-lined spillways have excessive debris or vegetation.	☐ Clear light debris and vegetation. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Displacement of rock lining, excessive vegetation and erosion/settlement may warrant review and decision by Level 2 Inspector to check against original plan. ☐ Any uncertainty about the integrity of the emergency spillway should be referred to a Level 2 Inspector. ☐ Erosion or settlement such that design has been compromised should be reviewed by an engineer.

PW 4. Pond Outlet

Description: The pond's outlet enables the ponded water to discharge to downstream drainage systems or stream channels. The outlet is often at the base of the dam/embankment on the downstream side. Inspection of this point can help prevent flooding of the pond and upstream drainage systems and prevent pond failure at a weak point of a pond's containment system.

Instruction: Examine the outlet of the pipe on the downstream side of the dam/embankment where it empties into a stream, channel, or drainage system. Consult the table below for possible problems.

Table 2.10.4 PW Pond Outlet	
Problem (Check if Present)	**Follow-Up Actions**
 ☐ The pond outlet is clogged with sediment, trash, debris, vegetation, or is eroding, caving in, slumping, or falling apart.	☐ If there is a minor blockage, remove the debris or vegetation to allow free flow of water. ☐ Remove any accumulated trash at the outlet. ☐ Outlet: ☐ Kick-Out to Level 2 Inspection: ☐ If the area at the outlet cannot be easily accessed or if the blockage is substantial, a Level 2 Inspection is warranted. ☐ Erosion at and downstream of the outfall should be evaluated by a qualified professional. ☐ Any structural problems, such as broken pipes, structures falling into the stream, or holes or tunnels around the outfall pipe, should be evaluated by a Level 2 Inspector and will require repair by a qualified contractor. ☐ The pool of water at the outlet pipe is discolored, has an odor, or has excessive algae or vegetative growth.

2.11. Infiltration

Areas of Infiltration

Key areas to inspect for Infiltration include the following:

- IN 1. Drainage Area
- IN 2. Inlets
- IN 3. Infiltration Area
- IN 4. Outlets

Note: The category of Infiltration includes:

- Infiltration Trench – Long, narrow infiltration practice, usually with small gravel at the surface and a reservoir of larger gravel or stone beneath
- Infiltration Basin – Larger practice, usually covered with grass and highly permeable soil beneath
- Dry Well – Small pit filled with stone or gravel, or precast concrete chamber surrounded by stone that receives and stores runoff to enable it to infiltrate into the underlying ground.

Figure 2.11.1 Key Areas for Level 1 Inspection of Infiltration Practice

Infiltration Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (IN1), Inlets (IN2), Infiltration Area (IN3), and Outlets (IN4). The purpose of an infiltration practice is to temporarily store collected runoff so that it can percolate into the underlying soil. Using this practice is dependent on having a good on-site soil that is capable of infiltrating the amount of runoff generated by the drainage area. The Level 1 Inspection should be conducted at least twice a year, especially in early spring, to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow.

IN 1. Drainage Area

Description: The drainage area conveys runoff to and is uphill from the Infiltration cell. When it rains, water runs off and flows to the Infiltration cell and soaks into its underlying layers.

Instruction: Look for both pervious and impervious areas that are uphill from the Infiltration cell. Consult **Table 11.1.1** below.

<table>
<tr><th colspan="3">Table 11.1.1 IN Drainage Area</th></tr>
<tr><th colspan="2">Problem (Check if Present)</th><th>Follow-Up Actions</th></tr>
<tr><td rowspan="2"></td><td rowspan="2">☐ Bare soil, erosion of the ground (rills washing out the dirt)</td><td>☐ Seed and straw areas of bare soil to establish vegetation.
☐ Fill in erosion areas with soil, compact, and seed and straw to get vegetation established.
☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted.
☐ Other:</td></tr>
<tr><td>☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.</td></tr>
<tr><td colspan="2">☐ For Dry Wells: Leaves, sticks, or other debris in gutters and downspouts</td><td>☐ Remove all debris by hand.
☐ Other:</td></tr>
<tr><td></td><td>☐ Piles of grass clippings, mulch, dirt, salt, or other materials</td><td>☐ Remove or cover piles of grass clippings, mulch, dirt, etc.
☐ Other:</td></tr>
<tr><td></td><td>☐ Open containers of oil, grease, paint, or other substances</td><td>☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous.
☐ Other:</td></tr>
</table>

IN 2. Inlets

Description: The inlets to an Infiltration practice are where water flows into the cell. Depending on the design, inlets can be:

- *Curb cuts or openings* in a parking lot or roadway
- *Downspouts* that deliver runoff directly from a rooftop to the Infiltration practice
- *Pipes or ditches* that carry water into the Infiltration practice from the drainage area
- *Flow directly over the land surface* (known as “sheetflow”), sometimes across a strip of rock or stone

Instruction: Look for all the places where water flows into the Infiltration practice. Consult **Table 11.1.2** below for possible problems.

Table 11.1.2 IN Inlets

Problem (Check if Present)	Follow-Up Actions
 ☐ Inlets are collecting grit and debris or grass/weeds are growing. Some water may not be getting into the Infiltration practice.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or openings). Parking lots generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the Infiltration practice. ☐ Dispose of all material properly in an area where it will not re-enter the practice. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the Infiltration practice.
☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion is present, or there is bare dirt that is washing into the Infiltration practice.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying erosion-control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Erosion is occurring at most of the inlets and it looks like there is too much water that is concentrating at these points. The inlet design may have to be modified.

IN 3. Infiltration Area

Description: The infiltration area is the area that collects water and allows it to seep into the underlying soil. Some infiltration areas also have a vertical perforated pipe called an *observation well,* which is used to view the water level in the infiltration practice after a storm. If the infiltration practice is working properly, the water in the observation well should be completely drained down within 2 to 3 days of a storm. Depending on the design, the infiltration area can be covered with grass, gravel, or stone.

Instruction: Examine the surface of the infiltration area and the observation well. Consult **Table 11.1.3** below for possible problems. Note: The following Problem and Follow-Up Actions apply to infiltration practice pretreatment areas also.

Table 11.1.3 IN Infiltration Area

Problem (Check if Present)	Follow-Up Actions
 ☐ For grass-covered Infiltration practices: grass has grown very tall, *(Photo credit: Stormwater Maintenance, LLC)*	☐ Mow infiltration area at least twice per year. ☐ Other:
 ☐ For grass-covered Infiltration practices: sparse vegetation cover or bare spots	☐ Add topsoil (as needed), grass seed, straw, and water during the growing season to re-establish consistent grass coverage. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sparse vegetation cover can be a sign that the infiltration area is not infiltrating at the proper rate and water is standing too long after a storm. The surface may be saturated or squishy, and the conditions do not enable grass to grow. This situation should be evaluated by a Level 2 Inspection and likely corrected by a qualified contractor.
☐ Minor areas of sediment, grit, trash, or other debris are accumulating on the surface.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the Infiltration practice. ☐ If removing the material creates a hole or low area, rake the surface smooth and level. ☐ Remove trash, debris, and other undesirable materials. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 2-inches deep and covers 25% or more of the surface of the Infiltration area.

Table 11.1.3 IN Infiltration Area	
Problem (Check if Present)	**Follow-Up Actions**
 ☐ There is erosion on the surface; water seems to be carving out rills as it flows across the surface of the Infiltration area or sinkholes are forming in certain areas.	☐ For minor areas of erosion, try filling the eroded areas with clean topsoil, sand, or stone (whatever the existing cover is). ☐ If the problem recurs, you may have to use larger stone (e.g., river cobble) to fill in problem areas. ☐ Other: ☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3-inches deep and seems to be an issue with how water enters and moves through the infiltration area. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water but a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
 ☐ Observation well is damaged or cap is missing	☐ Kick-Out to Level 2 Inspection: Requires replacing pipes or caps.
 ☐ Water still visible in the observation well more than 72 hours after a rain storm. The Infiltration practice does not appear to be draining properly.	☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

IN 4. Outlets

Description: Outlets are where water exits the surface of the infiltration area during larger storms when the underground infiltration reservoir fills up and the excess water needs somewhere to go. Note that not all infiltration practices will have an identifiable outlet if the design is for all the water to infiltrate into the ground. Outlets may be a berm, stone weir, or pipe.

Instruction: Locate and inspect all outlets. Consult **Table 2.11.4** below for possible problems.

Table 2.11.4 IN Outlets

Problem (Check if Present)	Follow-Up Actions
 ☐ Outlet obstructed with sediment, debris, trash, etc.	☐ Remove the debris and dispose of it where it cannot re-enter the infiltration area. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Outlet is completely obstructed; there is too much material to remove by hand or with simple hand tools.
☐ Rills or gullies are forming at outlet.	☐ For minor rills, fill in with soil, compact, and seed and straw to establish vegetation. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Rills are more than 2" to 3" deep and require more than just hand raking and re-seeding.

2.12. Sand and Organic Filters

Components of Sand and Organic Filters

Key areas to inspect for these types of practices include the following:

- SF 1. Drainage Area
- SF 2. Inlets and Pre-treatment
- SF 3. Filter Area

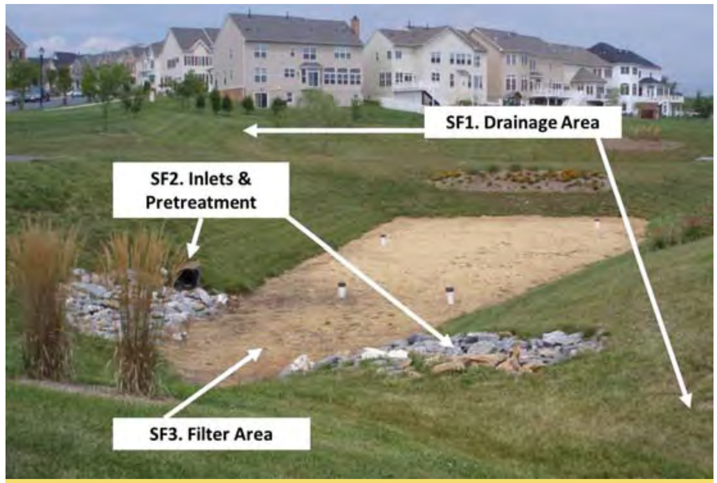


Figure 2.12.1. Key Areas for Level 1 Inspection of Sand and Organic Filters

Note: The category of Sand and Organic Filters includes:

- Surface Sand Filters – Surface sand filters (Figure 2.12.1) have a sand layer and often an underdrain layer beneath. Water comes in on the surface.
- Underground Sand Filters – Sand filters can also be in an underground vault or concrete trench in a parking lot or near a building. These are typically accessed through manholes or heavy grates.
- Underground Organic Filters – These are similar to underground sand filters but may also contain canisters of peat or other organic media that helps filter pollutants from runoff. These types of underground structures will be difficult for Level 1 Inspectors to inspect because they involve pulling off heavy manhole covers or grates. The Level 1 Inspection will focus on any evidence of clogging as observed from the surface.

Figure 2.12.2. Examples of underground filters: Left –Perimeter sand filter in a concrete box (photo shows the filter with the grate top off as the filter is being maintained). The right-hand side is a sedimentation chamber filled with water and the left-hand side is the sand filter chamber. Right –Underground vault filter with special organic filter media inside cartridges.

Sand and Organic Filter Level 1 Inspection

The Level 1 Inspection for Sand and Organic Filters focuses on the Drainage Area (SF1), Inlets (SF2), and Filter Area (SF3). The purpose of a filter practice is to temporarily store collected runoff and have it percolate through a filter media, such as sand, that filters pollutants before the water continues downstream. Most filters have an underdrain system (perforated pipe in a gravel layer) to let the water out of the filter once the filtration takes place. The Level 1 Inspection should be conducted at least annually, especially in early spring, to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow.

SF 1. Drainage Area

Description: The drainage area conveys runoff to and is uphill from the filter.

Instruction: Look for both pervious and impervious areas that are uphill from the filter. Consult **Table 2.12.1** below.

Table 2.12.1 SF Drainage Area

Problem (Check if Present)	Follow-Up Actions
 ☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to get vegetation established. ☐ Fill in erosion areas with soil, compact, and seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.
 ☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
 ☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

SF 2. Inlets

Figure 2.12.3. Key Areas for Level 1 Inspection of Sand and Organic Filters

Description: The inlets to a filter are where water flows into the filter. Depending on the design, inlets can be:

- Curb cuts or inlets in a parking lot or roadway
- Downspouts that deliver runoff directly from a rooftop to the filter
- Pipes or ditches that carry water into the filter from the drainage area
- Flow directly over the land surface (known as "sheetflow")

Above-ground filters can have any of the above. Underground filters most likely have curb inlets or flow directly into a grate that is part of the filter itself (see left-hand side of perimeter sand filter shown in **Figure 2.12.3**).

Instruction: Look for all the places where water flows into the filter practice. Consult **Table 2.12.2** below for possible problems.

Table 2.12.2 SF Inlets

Problem (Check if Present)		Follow-Up Actions
	☐ Inlets are collecting grit and debris or grass/weeds growing. Some water may not be getting into the filter practice.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or openings). Parking lots generate fine grit that accumulates at these spots. ☐ Pull out clumps of growing grass or weeds and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the Filter practice. ☐ Dispose of all material properly in an area where it will not re-enter the practice. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the filter practice.
	☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion are present, or there is dirt washing into the filter practice.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying erosion-control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Erosion is occurring at most of the inlets and it looks like there is too much water concentrating at these points. The inlet design may have to be modified.

Table 2.12.2 SF Inlets		
Problem (Check if Present)		**Follow-Up Actions**
	☐ For an underground filter, water is ponding and doesn't seem to be getting through the filter.	☐ Kick-Out to Level 2 Inspection: This is generally a more serious problem and should be referred for a Level 2 Inspection because it will require opening up the filter vault to check for clogging.

SF 3. Filter Area (for Surface Sand Filters)

Description: The Filter Area is the area that collects water and allows it to seep into the filter media. Some filters also have a vertical perforated pipe that is the cleanout for the underdrain pipe.

Instruction: Examine the surface of the filter and the observation well, if present. Consult **Table 2.12.3** below for possible problems.

Table 2.12.3 SF Filter Area (for Surface Sand Filters)	
Problem (Check if Present)	**Follow-Up Actions**
 ☐ Filter has grass and vegetation growing on more than 25% of the filter bed, threatening to clog the filter.	☐ Vegetation growing in the filter bed should be removed either manually or with a water-safe herbicide (e.g., glysophate without surfactants). ☐ Other:
	☐ Kick-Out to Level 2 Inspection: The filter seems clogged, or vegetation and weeds have proliferated past the point where the Level 1 person can manage it.
☐ Minor amounts of sediment, grit, trash, or other debris are accumulating on the surface.	☐ Use a shovel to scoop out minor amounts of sediment or grit, especially in the spring after winter sanding materials wash in and accumulate. Dispose of the material where it cannot re-enter the filter. ☐ If removing the material creates a hole or low area, rake the surface smooth and level. ☐ Remove trash, debris, and other undesirable materials. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment (other than sand) has accumulated more than 2-inches deep and covers 25% or more of the surface of the filter area.

Table 2.12.3 SF Filter Area (for Surface Sand Filters)

Problem (Check if Present)	Follow-Up Actions
 ☐ There is erosion on the surface; water seems to be carving out rills as it flows across the filter surface, or sinkholes are forming in certain areas.	☐ For minor areas of erosion, try filling the eroded areas with clean, coarse construction sand. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3-inches deep and seems to be an issue with how water enters and moves through the filter area. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water but by a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
 ☐ Water is still visible on the surface and/or the standpipe (if present) more than 72 hours after a rainstorm. The filter practice drains very slowly or is completely clogged.	☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

Section 3. Level 2 and 3 Inspections

3.1. How to Use this Section

This section provides guidance for Level 2 and 3 inspections for 10 groups of stormwater management practices (SMPs). See Section 1 of this chapter for an explanation of the Maintenance Hierarchy approach.

- Section 3.2 provides general guidance for Level 2 and 3 inspections.
- Sections 3.3 through 3.12 provide detailed Level 2 and 3 inspection guidance for each of the 10 practice categories:
    - 3.3 Rainwater Harvesting
    - 3.4 Disconnection and Sheetflow
    - 3.5 Swales
    - 3.6 Tree Planting
    - 3.7 Bioretention
    - 3.8 Green Roofs
    - 3.9 Permeable Pavement
    - 3.10 Ponds and Wetlands
    - 3.11 Infiltration
    - 3.12 Sand and Organic Filters
- Each section has **tables** containing guidance for Level 2 inspectors on specific SMP conditions and possible repairs for those problems (in left column), as well as lists of conditions that would likely trigger a Level 3 evaluation or maintenance action (right column). In addition, **Appendix B** contains detailed checklists for Level 2 inspectors to use in the field during their inspections.
- **Section 3.13** provides a brief overview for Level 3 inspections and how these fit into the overall hierarchy. However, most of the content for Level 3 maintenance actions is contained in **Section 4.**

3.2. General Guidance for Level 2 and 3 Inspections

The Level 2 inspection will typically be performed by a municipal employee or landscape contractor with some training in stormwater operations and maintenance. Regardless of which type of practice is being inspected, some key procedures and equipment are necessary. Read through this guidance before going on an inspection, and use the specific guidance in **Sections 3.3 through 3.12** for the practice you are inspecting. While much of the equipment and general procedures are somewhat similar to Level 1 inspections, additional information is provided for Level 2 inspectors below.

When to Conduct a Level 2 Inspection

The Level 2 Inspection is needed for two reasons. First, routine inspections to comply with local stormwater regulations typically require a Level 2 inspector. In addition, a Level 2 inspection may be triggered to address or diagnose problems identified during a Level 1 inspection. In this situation, the Level 2 inspector should confer with the Level 1 inspector about problems they have identified and then conduct a follow-up inspection that focuses more on diagnosing the causes of the problems and possible solutions. The checklists in **Appendix B** and other resources cited in **Sections 3.3 through 3.12** can be used as tools.

The frequency of this type of inspection may be defined by the municipality. As with Level 1 inspections, the frequency may change with the age of the SMP, with higher frequencies the first couple of years after installation. Well-established and well-maintained practices may only need to be inspected every few years.

Notifying the Responsible Party

Consult the plan file and maintenance agreement to ascertain the responsible party. Confirm that there is right of access through the local code, signed maintenance agreement, or other means. Contact the responsible party at least three business days in advance of the proposed inspection. If the responsible party cannot be found or contacted, make a reasonable effort through file research to contact a property representative, and document these efforts in writing. If the inspection is in response to a Level 1 inspection and referral to your agency, try to speak with the person who conducted the Level 1 inspection and get any documentation they may have. For publicly owned and managed SMPs, the responsible party will likely be the municipality or other regulated MS4.

What to Take in the Field

Level 2 inspections may require more measurement and, as a result, need some additional materials. In addition, the Level 2 inspection may involve gaining access to private property. Consequently, additional identification is needed for these inspections. A list of recommended items to take in the field is provided in **Table 2.2.1**.

Table 3.2.1 What to Take in the Field for a Level 2 Inspection

- Safety equipment: safety vest, steel-toe shoes, traffic cones if working near traffic, etc.
- Approved plan and as-built (record drawing) if available
- Records of previous inspections if available
- Engineering scale
- Hand level and pocket rod if needed to measure relative elevations
- Digital camera
- Several copies of SMP checklist if paper forms are used (**Appendix B**)
- Clipboard and pencils if paper forms are used
- Dry erase white board and marker (optional) to include in photos to keep track of SMP tracking # in municipal database (see **Figure 3.2** as example)
- Letter on municipal letterhead granting access and/or agency photo badge
- Pipe wrench to open underdrain clean-out caps
- Flashlight to look into underdrain cleanouts and/or manholes
- Manhole puller
- Soil probe or auger
- 100' measuring tape
- Shovel
- Bug spray

Conducting the Inspection

In general, the inspection should follow a consistent, logical approach, such as outlined below.

- Conduct a quick tour of the practice to identify any obvious issues and important components: inlets (number, location), surface area, overflow structures, berms or impoundments, outfalls, downstream conveyance channels or receiving waters. Check these components against the design plan or as-built drawing (if available).
- Starting at the outlet or low point, use the checklists provided in Appendix B to evaluate the practice. The inspection will proceed from the outlet or outfall to the stormwater treatment area, berms, side slopes, inlets, and drainage area. Make sure to fill in key information on the inspection form, such as SMP identifier number, site name, inspector name, date, and weather conditions.

Figure 3.2. A white board and digital camera can be handy to note SMP tracking #, date of inspection, and other forms of documentation. Note that an inspector may alternatively tag photographs, particularly if they are recorded on a smartphone or Tablet.

- Take photos of important components or maintenance concerns, and mark photo locations and direction on a sketch.
- Review the inspection form before leaving the site to make sure that all necessary information has been collected.

Follow-Up Actions

Immediate follow-up actions include entering the inspection information in the appropriate database or hard copy file, downloading and labeling photos, and providing other necessary documentation.

Another possible follow-up action would be to activate a Level 3 inspection in certain situations. The Level 2 inspector will have to make a judgement call as to whether observed problems warrant a Level 3 investigation, and will also have to coordinate with the responsible party to pursue such an investigation. The Level 2 guidance in this chapter summarizes follow-up actions associated with various observations of SMP condition. Note that these tables are divided into "Level 2" and "Triggers for Level 3" follow-up actions, with Level 2 actions in *blue* cells and Level 3 in *green* cells. Consult **Section 4** of this chapter for more guidance on how to diagnose and correct some of the maintenance items included in these tables.

Another follow-up action involves communicating problems and corrective measures to the responsible party (private or public). This may involve instructing the responsible party to undertake a Level 3 inspection or to provide a timeframe for correcting simpler issues that do not require Level 3 involvement. Many local programs have existing procedures for sending letters or activating a compliance procedure. These procedures include verifying that repairs and corrections are completed by the responsible party.

Level 3 Inspection Guidance

The Level 3 inspection is typically conducted by a Qualified Professional such as a professional engineer or Landscape Architect. It is assumed that the Level 3 inspector is knowledgeable in stormwater management, as well as engineering and construction practices. The Level 3 inspector will not typically be completing a full practice inspection. This inspection is conducted only in response to problems identified during the Level 2 inspection, is more diagnostic in nature, assumes a greater degree of initial knowledge, and may require more extensive intervention.

The Level 3 inspection is also more results based in that it will lead to a specific repair to address the issue that triggered the inspection. **Section 4** identifies 12 problems typically addressed in a Level 3 inspection and discusses measures to diagnose the cause of the problem, as well as repairs needed to address it. It should be noted that the problems addressed in each **Section 4** subsection can occur in a variety of SMPs (e.g., erosion is a common issue in almost every type of SMP). As a result, each subsection identifies the SMPs where the problem most commonly occurs and, in some cases, an SMP-specific diagnosis procedure.

3.3. Rainwater Harvesting – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Rainwater Harvesting practices are:

- Structural or mechanical problems (e.g., malfunction of the first-flush diverter or vortex filter)
- Accumulation of debris in the tank that cannot be easily removed by hand
- Severe erosion at the outlet

Table 3.3.1 Level 2 Inspection – RAINWATER HARVESTING

Recommended Repairs	Triggers for Level 3 Inspection
Observed Condition: Tank is not filling properly or water level drops quickly	
Condition 1: Tank is not filling properly Look for signs of water bypassing the tank. Inspect the conveyance system and filters to make sure that all parts are properly connected and not leaking. Observe the system during a rainstorm to make sure that water is not backing up and spilling out of the gutters or getting excessively diverted by the filter. Adjust angles and placement of filter as needed. Condition 2: Water level drops quickly after filling Requires diagnosis and resolution of problem: • Leaking valve or spigot? • Crack in tank wall? • Pump turning on unnecessarily?	• Gutters, pipes, and/or filter appear to be undersized or not properly designed. • Structural or mechanical problem requires special expertise in rainwater harvesting systems.
Observed Condition: Tank is sinking, leaning, or at risk of collapse	
Condition 1: Foundation is not stable This repair may need specialized equipment and skill, depending on the size and type of tank. For smaller tanks (like rain barrels), drain and disconnect the tank to move it aside. Compact the underlying soil and create a solid, level base for the tank with concrete blocks or gravel. Seek professional help for larger tanks. Condition 2: Other structural problem Seek professional help.	• Tanks cannot be easily adjusted or fixed by hand.
Observed Condition: Severe erosion at outlet	
Condition 1: Erosion gets worse even after re-seeding or adding stone There are several potential solutions to this continued erosion. Add geotextile fabric below the stone to protect the soil. Dig out a pit at the outfall and fill with gravel or stone to absorb the velocity of the water spilling out the tank. If the outlet flows onto a steep slope, consider extending the pipe length to a flatter area. Some of these actions may require help from a contractor.	• Erosion control cannot easily be installed by hand. • Erosion recurs after previous repairs. • Downstream drainage concerns

3.4. Disconnection & Sheet Flow – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Disconnection and Sheetflow practices are:

- Significant damage to level spreader/energy dissipator
- Major erosion

Table 3.4.1 Level 2 Inspection – DISCONNECTION AND SHEETFLOW

Recommended Repairs	Triggers for Level 3 Inspection
Observed Condition: Significant sediment on pavement that drains to disconnection area (e.g., grass strip)	
Condition 1: Sediment on parking lot is widespread Enlist a mechanical sweeper or vacuum sweeper to remove sediment across entire pavement surface. Pay special attention to downhill edges of pavement where more sediment may have accumulated.	• Sediment accumulation is so serious that it cannot be sufficiently removed with mechanical sweeper. May indicate a high sediment load from uphill in the drainage area that needs to be mitigated.
Observed Condition: Pavement edge deteriorating	
Condition 1: Dips or damage at pavement edge causing runoff to concentrate Determine whether the damaged edge is causing significant enough concentration of runoff to warrant repair or regrading of the pavement.	• Edge must be patched or re-paved to make secure and level. • Parking lot not draining properly to the energy dissipator and treatment area.
Observed Condition: Level spreader/energy dissipator	
Condition 1: Level spreader sinking or uneven If basic equipment can be used, prop up and secure any section of level spreader that is sinking. Regrade soil all around level spreader and add stone as necessary to prevent erosion and bypassing. Condition 2: Level spreader is broken These repairs can be simple for small, residential-scale practices, such as at a downspout. Ensure the level spreader is level across, keyed in to soil at the edges, and made of durable material that can withstand the flow of water running across it. Larger or more complicated level spreaders (e.g., concrete) will likely require specialized skill and equipment.	• Level spreader requires specialized equipment, regrading, or large amount of material to make level again. • Level spreader needs to be re-designed and replaced.
Observed Condition: Erosion in treatment area	
Condition 1: Rills from concentrated flow Inspect energy dissipator to see whether it needs to be improved to better spread out incoming flow. Regrade flow path to ensure that it is relatively flat (if minor). If major re-grading is needed, the treatment area may need to be redesigned and fixed with specialized equipment.	• Major rills and gullies • Treatment area needs to be re-designed and major grading needed.

3.5. Swales – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Swales are:

- Standing water, swale not draining properly (not applicable to wet swales)
- Severe erosion around or under check dams
- Large area of vegetation overrun with weeds and/or invasive species
- Severe erosion at outlet that requires redesign

Table 3.5.1 Level 2 Inspection: SWALE

Recommended Repairs	Triggers for Level 3 Inspection
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
Condition 1: Small pockets of standing water Use a soil probe or auger to examine the soil profile. If isolated areas have accumulated grit, fines, or vegetative debris or have compacted soil, try scraping off top 3 to 6 inches of soil and replacing with clean material. Also check to see that surface is level and water is not ponding selectively in certain areas. Condition 2: Standing water is widespread or covers entire surface Requires diagnosis and resolution of problem: Bad or compacted soil Filter fabric on the swale bottom Too much sediment/grit washing in from drainage area? Too much ponding depth? Longitudinal slope is too flat?	• Soil is overly compacted or clogged and problem is not evident from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or is associated with the original design of the practice (e.g., not enough slope down through the swale).
Observed Condition: Vegetation is predominantly weeds and invasive species	
For a small area, weed and dig up invasive plants. Replant with natives or plants from original planting plan. If longer than 100 feet, develop a new planting plan and have it professionally reviewed.	• Vegetation deviates significantly from original planting plan; swale has been neglected and suffered from deferred maintenance. • Owner/responsible party does not know how to maintain the practice. • For large area, hire a professional to develop a grading plan and develop a planting plan.

Observed Condition: Severe erosion of check dams, inlets, swale bottom, or side slopes

	• Erosion (rills, gullies) is more than 12-inches deep at inlets or the swale bottom or more than 3-inches deep on side slopes. • Flow paths from the drainage area are higher than expected, such that the swale needs to be redesigned to handle higher flow rates and velocities.

Observed Condition: Significant sediment accumulation, indicating an uncontrolled source of sediment

Condition 1: Isolated areas of sediment accumulation, generally less than 3-inches deep Sediment source may be from a one-time or isolated event. Remove accumulated sediment and top 2 to 3 inches of swale soil media; replace with clean material. Check drainage area for any ongoing sources of sediment. Condition 2: Majority of the surface is caked with “hard pan” (thin layer of clogging material) or accumulated sediment that is 3-inches deep or more This can be caused by improper construction sequence (drainage area not fully stabilized prior to installation of the swale) or another chronic source of sediment in the drainage area. Augering several holes down along the swale can indicate how severe the problem is; often the damage is confined to the first several inches of soil. Removing and replacing this top layer (or to the depth where sediment incursion is seen in auger holes) can be adequate, as long the problem does not recur.	• More than 2 inches of accumulated sediment cover 25% or more of the swale surface area. • “Hard pan” of thin, crusty layer covers majority of swale surface area and seems to be impeding flow of water along the swale. • New sources of sediment seem to be accumulating with each significant rainfall event.

3.6. Tree Planting – Level 2 Inspections and Triggers for Level 3

A Level 2 Tree Planting inspection should be conducted periodically during the growing season by the Cooperative Extension or an arborist.

Table 3.6.1 Level 2 Inspection: TREE PLANTING	
Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Appearance of fungus or pest damage	
Condition 1: Fungus, discoloration, browning leaves or holes in leaves Check with arborist or other tree professional about the best way to proceed. This requires a Level 3 inspection. Condition 2: Burrowing insects, holes Check with arborist or other tree professional about the best way to proceed. This requires a Level 3 inspection.	• Any concerns about how to address infestation or disease

3.7. Bioretention – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Bioretention are:

- Standing water, clogged media
- Vegetation management
- Bioretention does not conform to original design plan in surface area or storage.
- Severe erosion of filter bed, inlets, or around outlets
- Significant sediment accumulation, indicating an uncontrolled source of sediment

Table 3.7.1 Level 2 Inspection: BIORETENTION NOTE: Key Source for this Information *(CSN, 2013)*	
Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
Condition 1: Small pockets of standing water Use a soil probe or auger to examine the soil profile. If isolated areas have accumulated grit, fines, or vegetative debris or have bad soil media, try scraping off top 3 inches of media and replacing with clean material. Also check to see that surface is level and water is not ponding selectively in certain areas. Condition 2: Standing water is widespread or covers entire surface Requires diagnosis and resolution of problem: • Clogged underdrain? • Filter fabric between soil media and underdrain stone? • Need to install underdrain if not present? • Too much sediment/grit washing in from drainage area? • Too much ponding depth? • Improper soil media?	• Soil media is clogged and problem is not evident from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or is associated with the original design of the practice.

Observed Condition: Vegetation is sparse or out of control	
Condition 1: Original design planting plan seems good but has not been maintained, so there are many invasives and/or dead plants Will require some horticultural experience to restore vegetation to intended condition by weeding, pruning, removing plants, and adding new plants. Condition 2: Original design planting plan is unknown or cannot be actualized A landscape architect or horticulturalist will be needed to redo the planting plan. Will likely require analysis of soil pH, moisture, organic content, sun/shade, and other conditions to make sure plants match conditions. Plan should include invasive plant management and maintenance plan to include mulching, watering, disease intervention, periodic thinning/pruning, etc.	• Vegetation deviates significantly from original planting plan; Bioretention has been neglected and suffered from deferred maintenance. • Owner/responsible party does not know how to maintain the practice.
Observed Condition: Bioretention does not conform to original design plan in surface area or storage	
Condition 1: Level 2 Inspection reveals that practice is too small based on design dimension, does not have adequate storage (e.g., ponding depth) based on the plan, and/or does not treat the drainage area runoff as indicated on the plan Small areas of deviation can be corrected by the property owner or responsible party, but it is likely that a Qualified Professional will have to revisit the design and attempt a redesign that meets original objectives or that can be resubmitted to the municipality for approval.	• More than a 25% departure from the approved plan in surface area, storage, or drainage area; sometimes less than this threshold at the discretion of the Level 2 inspector.
Observed Condition: Severe erosion of filter bed, inlets, or around outlets	
Condition 1: Erosion at inlets The lining (e.g., grass, matting, stone, rock) may not be adequate for the actual flow velocities coming through the inlets. First line of defense is to try a more non-erosive lining and/or to extend the lining further down to where inlet slopes meet the Bioretention surface. If problem persists, analysis by a Qualified Professional is warranted. Condition 2: Erosion of Bioretention filter bed This is often caused by “preferential flow paths” through and along the Bioretention surface. The source of flow should be analyzed and methods employed to dissipate energy and disperse the flow (e.g., check dams, rock splash pads). Condition 3: Erosion on side slopes Again, the issue is likely linked with unanticipated flow paths down the side slopes (probably overland flow that concentrates as it hits the edge of the slope). For small or isolated areas, try filling, compacting, and re-establishing healthy ground cover vegetation. If the problem is more widespread, further analysis is required to determine how to redirect the flow.	• Erosion (rills, gullies) is more than 12 inches deep at inlets or the filter bed or more than 3 inches deep on side slopes. • If the issue is not caused by moving water but some sort of subsurface defect. This may manifest as a sinkhole or linear depression and be associated with problems with the underdrain stone or pipe or underlying soil.
Observed Condition: Significant sediment accumulation, indicating an uncontrolled source of sediment	
Condition 1: Isolated areas of sediment accumulation, generally less than 3-inches deep Sediment source may be from a one-time or isolated event. Remove accumulated sediment and top 2 to 3 inches of Bioretention soil media; replace with clean material. Check drainage area for any ongoing sources of sediment. Condition 2: Majority of the surface is caked with “hard pan” (thin layer of clogging material) or accumulated sediment that is 3-inches deep or more This can be caused by an improper construction sequence (drainage area not fully stabilized prior to installation of Bioretention soil media) or another chronic source of sediment in the drainage area. Augering several holes down through the media can indicate how severe the problem is; often the damage is confined to the first several inches of soil media. Removing and replacing this top layer (or to the depth where sediment incursion is seen in auger holes) can be adequate, as long as the problem does not recur.	• More than 2 inches of accumulated sediment cover 25% or more of the Bioretention surface area. • “Hard pan” of thin, crusty layer covers majority of Bioretention surface area and seems to be impeding flow of water down through the soil media. • New sources of sediment seem to be accumulating with each significant rainfall event.

3.8. Green Roof – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Green Roofs are:

- Standing water
- Vegetation management
- Structural damage

Table 3.8.1 Level 2 Inspection: GREEN ROOF	
Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Unhealthy or Dying Vegetation	
	• More than 25% die off • Plants are unhealthy for a prolonged period of time or need to be replanted repeatedly, indicating that a new planting plan may be necessary, or the planting medium is not functioning properly. • pH or other media constituents are not conducive to plant growth, and the media needs to be amended (e.g., lime, fertilizer). This should be handled by a green roof vendor or green roof plant specialist.
Observed Condition: Ponding Between Storm Events or Debris Accumulation	
Condition 1: Further inspection shows debris is clogging the outflow drainpipe Remove debris by hand and revisit within 24 hours to see whether this action fixed the problem. Condition 2: Debris has backed up to include the underdrain Attempt to remove by hand or flush out with a hose.	• Ponding continues even after debris has been removed. This may indicate a problem with either the media or the underdrain system.
Observed Condition: Structural Damage to Overflows	
Condition: If the damage is minor, repair damage directly, per original design drawings	• Most instances of structural damage will need to be referred to the designer or a qualified green roof vendor.
Observed Condition: Roof is Leaking or indication that the membrane has a leak	
Condition: Roof is leaking	• Any leaks in the membrane trigger a Level 3 inspection or an inspection by the original installer or designer.

3.9. Permeable Pavement – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Permeable Pavement are:

- Ponding or
- Highly clogged pavement

Table 3.9.1 Level 2 Inspection: PERMEABLE PAVEMENT	
Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Bare Soil or Erosion in the Drainage Area	
	• Large rills or gullies are forming in the drainage area. • An attempt to regrade the drainage area has been unsuccessful • Fixing the problem would require major regrading (i.e., redirecting more than a 100-square-foot area. • It is not clear why the problem is occurring.
Observed Condition: Dirt or Grit Accumulating, or Grass Growing on Pavement Surface	
Condition 1: Grit beginning to form but is isolated to a small area or does not fill the joints between paver blocks Try to agitate and sweep by hand, or hire a contractor with a vacuum sweeper. Also investigate the drainage area for potential sediment sources. If no obvious sources are found, discuss winter sanding and salting operations with the property owner to identify whether this could be the source. Condition 2: Grit is forming and cannot be removed with agitation and hand sweeping Hire a vendor with a regenerative air vacuum sweeper, maximum power 2,500 rpm; avoid sweepers that use water.	• More than 2 inches of sand/dirt/grit are on some of the pavement surface. • More than 25% of the pavement surface is covered with sand/dirt/grit to the extent that joints between paver blocks are filled. • Regenerative air sweeper cannot remove grit.
Observed Condition: Structural Damage	
Condition 1: Portions of porous asphalt or permeable pavers are damaged, and the cause is known to be at the surface. If the damage is from a single event such as heavy equipment or heavy fallen objects, or the surface has been damaged by wear over time, hire a contractor experienced in permeable pavement installation to repair the damaged areas. Condition 2: Damage to other structures, such as drainage infrastructure If possible, repair or replace damaged items, or hire a contractor with permeable pavement experience if the damaged infrastructure is within the pavement surface.	• More than 25% of the surface needs to be repaired or replaced. • It appears that the underlying material has “caved in,” indicating an underlying water conveyance or soil stabilization issue. • Problem is repaired but recurs within less than five years.

Table 3.9.1 Level 2 Inspection: PERMEABLE PAVEMENT	
Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Ponding on the Pavement Surface	
Condition 1: Underdrains (if present) may be clogged Check to see whether underdrains are clogged by inspecting cleanouts (if present) or catch basins and looking for debris. If underdrains appear clogged, it may be necessary to hire a router service to ream out the underdrains. Condition 2: At time of Level 2 inspection, water is not ponded, and there is no obvious clogging of the surface. Conduct a flood test to determine whether the ponding is an ongoing problem.	• Water stands on the pavement surface more than 72 hours after a storm, and the problem cannot be resolved by unclogging underdrains. • More than 25% of the pavement surface is covered with sand/dirt/grit to the extent that joints between paver blocks are filled.

Figure 3.9.1. Winter salting, sanding, plowing, and snow storage can cause problems for permeable pavement surfaces, which will trigger a Level 3 investigation.

Figure 3.9.2. A Level 3 investigation is warranted if more than 25% of the permeable pavement surface appears to be clogged, or joints are filled in, or, as shown in the photo, vegetation is growing.

3.10. Ponds & Wetlands – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Ponds and Wetlands are:

- Severe erosion
- Excessive algae or aquatic plants
- Settlement and pipe corrosion
- Major sediment buildup

Table 3.10.1 Level Inspection: PONDS and WETLANDS	
Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Bare Soil or Erosion in the Drainage Area	
Condition 1: Extensive problem spots, but no channels or rills forming Reseed problem areas. If problem persists or grass does not take, consider hiring a landscape contractor. Condition 2: Problem is extensive, and rills/channels are beginning to form May be necessary to divert or redirect water that is causing the erosion problem. If it appears that simple regrading—such as installing a berm or leveling a low spot–will fix the problem, make repairs and ensure that the problem is repaired after the next storm.	• Large rills or gullies are forming in the drainage area. • An attempt to regrade the drainage area has been unsuccessful. • Fixing the problem would require major regrading (i.e., redirecting more than a 100-square-foot area. • It is not clear why the problem is occurring.
Observed Condition: Manholes or Inlet Pipe Buried or Covered with Vegetation	
Condition 1: Nearest manhole and inlet pipe not found Consult as-built drawings to get to closest suspected location and use metal detector to search for metal manhole cover. If unsuccessful, identify nearest drain inlets and approximate pipe direction to locate next manhole. Condition 2: Manhole located and inspected Never enter a manhole, except by following confined-space entry protocols. If outlet pipe is not visible or greater than 25% full of sediment/debris or trash, it will typically require a qualified contractor to flush, clean and clear blockages. Condition 3: Inlet pipe not found at pond Clear vegetation and brush that may be covering the inlet pipe. Buried inlet pipes may be found through use of a metal probe. Condition 4: Inlet pipe buried in sediment or blocked by vegetation Once located, the pipe path can be cleared of vegetation with brush hook or other brush tools. Light digging may clear sediment from the end of the pipe.	• To locate buried manholes and lost storm lines, it is sometimes necessary to hire a pipeline inspection contractor with televising equipment or ground-penetrating radar and enter at the closest upstream access point. • Locating a buried inlet pipe may require wading in the edge of the pond and using a metal probe and brush axe to find and expose the pipe. • If other than light digging is necessary to remove accumulated sediment, a contractor with heavy equipment may be required.

Table 3.10.1 Level Inspection: PONDS and WETLANDS	
Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Pipe or Headwall Settlement, Erosion, Corrosion or Failure	
Condition 1: Pipe or headwall settlement or failure Severe sinkholes, settlement or corrosion should be kicked out to Level 3 Inspection. Condition 2: Flow not confined to pipe and visible outside pipe wall With flashlight, observe the inside of the pipe and note its condition. Take photographs. Look for sinkholes developing that indicate pipe failure beneath the surface. Kick out to Level 3 inspection.	• Where blockages are visible, a decision is needed on whether to clear them or leave in place. If a third of the pipe is full of sediment, it should be removed by a contractor with pipe-cleaning equipment. • Corrosion of inlet pipes that allows flow around the pipe exterior is a structural concern because it can lead to settlement, sinkholes and undermining pond embankment. Evidence of this type of failure may require specialized pipe-inspection equipment and investigation by an engineer.
Observed Condition: Pond Conditions	
Condition 1: Pond pre-treatment zone is full of sediment or not constructed as shown on as-built drawings. Condition 2: Excessive buildup of sediment or overgrowth If the pre-treatment area or pond pool is overgrown or filled with sediment so that the original design is compromised, corrective measures are required. If plants have died, then replanting is necessary. If none of the original design exists due to alteration or sediment, kick out to Level 3 inspection.	• It may require inspection by an engineer to determine next steps for clearing, replanting or reconstruction. • Erosion or settlement such that design has been compromised should be reviewed by an engineer. Recurring erosion may require redesign and/or regrading to direct flow away from eroding area. • If sediment has filled more than 50% of the pond's capacity, dredging is likely needed and should be evaluated by a qualified contractor. • Removal or control of excessive algae or aquatic plants can be assessed by a qualified pond maintenance company.

3.11. Infiltration – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Infiltration practices are:

- Standing water, clogged media
- Severe erosion of infiltration area, inlets, or around outlets
- Significant sediment accumulation, indicating an uncontrolled source of sediment

<table>
<tr><th colspan="2">Table 3.11.1 Level Inspection: INFILTRATION</th></tr>
<tr><th>Recommended Repairs</th><th>Triggers for Level 3 Inspection</th></tr>
<tr><td colspan="2">Observed Condition: Water Stands on Surface for More than 72 Hours after Storm</td></tr>
<tr><td>Condition 1: Small pockets of standing water

For infiltration basins with soil, use a soil probe or auger to examine the soil profile. For gravel infiltration trenches or basins, use a shovel to dig into the gravel layer where the problem is occurring. If isolated areas have accumulated grit, fine silt, or vegetative debris or have bad soil or clogged gravel, try removing and replacing with clean material. If the practice is supposed to have grass cover, it will likely be necessary to replant once the problem is resolved.

Condition 2: Standing water is widespread or covers entire surface

Look in the observation well (if it exists) and use a tape measure to estimate the depth of water standing in the soil or gravel. Requires diagnosis and resolution of problem:
• Too much sediment/grit washing in from drainage area?
• Too much ponding depth?
• Improper infiltration media?
• Underlying soil not suitable for infiltration?
As above, the resolution will likely require replanting and re-establishment of good grass cover if this is part of the design.</td><td>• Infiltration media is clogged and problem cannot be diagnosed from Level 2 inspection.
• Level 2 inspection identifies problem, but it cannot be resolved easily or it is associated with the original design of the practice.</td></tr>
<tr><td colspan="2">Observed Condition: Severe erosion of infiltration bed, inlets, or around outlets</td></tr>
<tr><td>Condition 1: Erosion at inlets

The lining (e.g., grass, matting, stone, rock) may not be adequate for the actual flow velocities coming through the inlets. First line of defense is to try a less erosive lining and/or extending the lining further down to where inlet slopes meet the infiltration surface. If problem persists, analysis by a Qualified Professional is warranted.

Condition 2: Erosion of infiltration bed

This is often caused by “preferential flow paths” along the surface. The source of flow should be analyzed and methods employed to dissipate energy and disperse the flow (e.g., check dams, rock splash pads).</td><td>• Erosion (rills, gullies) is more than 12 inches deep
• The issue is not caused by moving water but some sort of subsurface defect, which may manifest as a sinkhole or linear depression and be associated with problems with the underlying stone or soil.</td></tr>
</table>

Observed Condition: Significant sediment accumulation, indicating an uncontrolled source of sediment	
Condition 1: Isolated areas of sediment accumulation, generally less than 3-inches deep Sediment source may be from a one-time or isolated event. For practices with soil cover, remove accumulated sediment and top 2 to 3 inches of soil; replace with clean material. Check drainage area for any ongoing sources of sediment. Condition 2: Majority of the surface is caked with “hard pan” (thin layer of clogging material) or accumulated sediment that is 3-inches deep or more This can be caused by an improper construction sequence (drainage area not fully stabilized prior to installation of infiltration practice) or another chronic source of sediment in the drainage area. For infiltration basins with soil, augering several holes down through the media can indicate how severe the problem is; often the damage is confined to the first several inches of soil media. Removing and replacing this top layer (or to the depth where sediment incursion is seen in auger holes) can be adequate, as long the problem does not recur.	• Trenches or dry wells with stone or gravel at surface may need to be cleaned out with a vacuum truck because the process of removing the top layer of stone may cause fine silt to drop further down. • More than 2 inches of accumulated sediment cover 25% or more of the infiltration surface area. • “Hard pan” of thin, crusty layer covers majority of Infiltration surface area and seems to be impeding flow of water down through the soil media. • New sources of sediment seem to be accumulating with each significant rainfall event.

3.12. Sand and Organic Filters – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Sand and Organic Filters are:

- Standing water, clogged filter media
- Need to pump out sedimentation chamber
- Response to fuel or other spills that make it into the filter

Table 3.12.1 Level 2 Inspection: SAND AND ORGANIC FILTERS

Recommended Repairs	Triggers for Level 3 Inspection
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
Condition 1: Small pockets of standing water Use a soil probe or auger to examine the sand or filter profile. If isolated areas have accumulated grit, fine silt, vegetative debris, oily sludge or bad sand media, try scraping off top 3 inches of media and replacing with clean, coarse construction sand. Condition 2: Standing water is widespread or covers entire surface Look in the underdrain cleanout (if present) and use a tape measure to estimate the depth of water standing in the sand layer. Requires diagnosis and resolution of problem: • Clogged underdrain • Filter fabric between the sand layer and underdrain gravel OR on top of the sand filter layer (usually held in place by a thin layer of gravel) • Too much sediment/grit/vegetative debris/oily sludge washing in from drainage area • Too much ponding depth • Improper sand media	• Sand or organic media is clogged, but problem was not evident from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or is associated with the original design of the practice. • The problem seems to be filter fabric placement, but this is specified in the original design. • The entire filter media layer or filter cartridges need to be replaced. • The problem is associated with improper configuration of underdrain pipes or outlet structures.

Observed Condition: Severe erosion of filter bed, inlets, or around outlets	
	• Erosion (rills, gullies) is more than 12 inches deep. • The issue is not caused by moving water but some sort of subsurface defect, which may manifest as a sinkhole or linear depression and be associated with problems with the underlying stone or soil.

Observed Condition: Significant sediment accumulation, indicating an uncontrolled source of sediment	
Condition 1: Isolated areas of sediment accumulation, generally less than 3-inches deep Sediment source may be from a one-time or isolated event. Remove accumulated sediment and top 2 to 3 inches of sand or filter media; replace with clean material. Check drainage area for any ongoing sources of sediment. Condition 2: Majority of the surface is caked with “hard pan” (thin layer of clogging material) or accumulated sediment that is 3-inches deep or more This can be caused by an improper construction sequence (drainage area not fully stabilized prior to installation of filter practice) or another chronic source of sediment in the drainage area. Augering several holes down through the sand media can indicate how severe the problem is; often the damage is confined to the first several inches of media. Removing and replacing this top layer (or to the depth where sediment incursion is seen in auger holes) can be adequate, as long the problem does not recur.	• More than 2 inches of accumulated sediment cover 25% or more of the filter surface area. • “Hard pan” of thin, crusty layer covers majority of filter surface area that seems to be impeding flow of water down through the filter media. • New sources of sediment seem to be accumulating with each significant rainfall event.

Observed Condition: Underground vault system has standing water and oily sludge floating on top, or other issues that indicate clogging, malfunction, or need for maintenance	
Condition: Compare observation to the design or as-built plans to see whether existing conditions match the plan details.	• This condition will almost always warrant conferring with the manufacturer or vendor and/or using the Level 3 inspection process to further diagnose the problem.

Section 4. Diagnostics and Maintenance Measures

4.1. About this Section

Section 4 summarizes the most common problems found in SMPs, as well as typical maintenance or repair solutions. The guidance provided in this section has some similarities to **Section 3** but differs in the following ways:

1. The primary audience for Section 4 is the Level 3 inspector, often a professional engineer, or landscape architect tasked with diagnosing and repairing SMPs that are not working properly. However, the information in Section 4 may also be quite useful for a Level 2 inspector seeking to diagnose a particular problem.
2. The maintenance measures described in this section are more detailed and focus on repairs to specific problems rather than on routine maintenance such as weeding or minor sediment removal.
3. Because the problems described in this section can be applied to several different practices, this section is organized by the type of problem rather than the practice type.

Problems addressed during Level 3 inspection/maintenance are summarized in **Table 4.1**. This list is not exhaustive but does address the most common issues in the SMPs that require some advanced knowledge and skill to inspect and fix. Each problem category is discussed in a separate sub-section.

Table 4.1: Common Inspection/Maintenance Issues for Level 3

Sub-Section/Category	Description
4.2 Contributing Drainage Area – Pollutant Sources	Sediment or pollution sources in the Drainage Area
4.3 Physical Obstructions	Physical obstructions to maintenance access, overflow, or emergency spillway
4.4 Erosion	Erosion on side slopes, practice bottom, at inlet or outlets. Rills and gullies forming where there should be sheetflow
4.5 Departures from Design Dimensions	Practice dimensions have been altered, either due to filling with sediment, redesign or filling in, or improper implementation.
4.6 Improper Flow Pathways	Flow is shortcircuiting the practice, or drainage pathways have been otherwise modified.
4.7 Sediment Buildup	Sediment has accumulated in a pool, practice bottom, pre-treatment area, or vault.
4.8 Clogging	The soil media or other components are clogged, and there may be standing water for longer than intended.
4.9 Vegetation	Excessive, inadequate, and/or unhealthy vegetation to support a practice
4.10 Embankment and Overflow Condition	Issues with an embankment or overflow weir or channel
4.11 Structural Damage	SMP infrastructure, such as concrete or metal elements, have been damaged.
4.12 Pool Stability	Permanent pool of water is at the improper elevation.
4.13 Pool Quality	Permanent pool of water suffers from poor quality due to algal growth or other issues.

4.2. Contributing Drainage Area – Pollutant Sources

Issue applies most commonly to: Sheetflow/Disconnection, Swales, Bioretention, Permeable Pavement, Ponds/Wetlands, Infiltration, and Sand/Organic Filters.

Problem #1: Bare soil washing into SMP from drainage area

General Approach for All Practices:

- Identify the specific source(s) of sediment in the drainage area by tracking sediment flow during a rainfall or looking for a track of sediment staining during dry weather.
- For an active sedimentation event, attempt to filter incoming runoff if conditions allow (e.g., enough space upstream of the practice for temporary ponding). Consider installing a silt fence, silt socks (at curb inlets), staked straw bales, or other filtering material at the inlets of the SMP. This will keep at least some of the sediment from getting into the practice.
- Runoff from active construction should not enter the SMP; divert to a temporary and approved sediment control practice.
- For areas of bare soil *not* due to active construction **(bottom photo)**, prep the soil and re-seed/plant with grass species or other thick ground cover appropriate for the region. May also need starter fertilizer, topsoil, and/or compost.
- For steep slopes with bare soil, consider also installing erosion-control matting to hold soil, seed, and straw in place until the vegetation becomes well established.
- For fill and topsoil stockpiles in the drainage area, provide temporary or permanent cover as soon as possible. Alternatively, surround the base of the stockpile with silt fence, or equivalent, to prevent the transport of sediment-laden runoff.

Helpful Skills:

- Erosion and sediment control knowledge and skills
- Landscaping knowledge to understand appropriate ground cover species for re-vegetating bare areas

Equipment Typically Used for Fixing Sediment Sources:

- Silt fencing and other sediment barriers
- Erosion-control matting and/or straw
- Rakes and shovels
- Light excavation or grading equipment for larger jobs
- Equipment to deliver topsoil or compost as needed
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out
- Starter fertilizer, topsoil, and/or compost

Problem #2: Other pollution sources in the drainage area

General Approach for All Practices:

- Pollutants may include: road salt, oils, fuels, food grease, wash water, paints and solvents, trash, and many others.
- Identify the source(s) of pollution.
- For pollutants spilled on the ground, remove by hand or use absorbents to soak up wet material. Absorbents and other waste materials shall be disposed of properly.
- For materials stored outside, move them to a covered area or build/add cover over the materials. Provide secondary containment, if possible.
- Make sure all waste containers have lids and fix any leaks (**see poor practices in photo at right**).
- For sites prone to frequent oil leaks and staining (e.g., vehicle maintenance yards), consider installing an oil/water separator to pre-treat runoff that enters the SMP.
- For routine dumping of wash water, grease, paints, or other pollutants, enforce behavior change and explain good housekeeping practices.
- Develop a pollution prevention plan for the site to ensure that hazardous materials and other potential pollutants are not stored where they are exposed to rainfall.
- For areas that receive a heavy salt and/or sand load during the winter, consider diverting upslope runoff, especially for practices such as permeable pavement. Some monitoring of winter road or parking lot clearing activities may also be warranted.

Helpful Skills:

- Knowledge of good housekeeping and pollution prevention practices
- Good communication with employees and managers at site (e.g., for correcting bad site operations)

Equipment Typically Used for Correcting Other Pollutant Sources:

- Tarps to cover stockpiles
- Absorbents to soak up spills
- Secondary containment barriers that will hold back any liquids or solids that may leak out of their primary container
- Storage barns, sheds, pole barns and other permanent cover for potential pollutants

4.3. Physical Obstructions

Issue Applies Most Commonly To: Rainwater Harvesting, Sheetflow/Disconnection, Swales, Bioretention, Green Roofs, Ponds/Wetlands, Infiltration, and Sand/Organic Filters

Problem #1: Maintenance access is obstructed

Ground-Level SMPs:

- Where a path for vehicles and construction equipment to access the practice was established during construction but is now overgrown, remove woody vegetation and any other tall vegetation. This path should be bush hogged once or twice a year.
- If the SMP needs a large quantity of trash and/or sediment removed in areas where access is limited due to steep grades, overgrown vegetation, etc., it will be necessary to establish safe vehicular access by clearing and possibly re-grading the area. It is advisable to have a maintained, all-weather surface to critical parts of the SMP.
- It is most important to provide access nearest to parts of the practice where sediment and trash tend to accumulate the most: forebay and riser structure.
- For an SMP blocked by fences **(photo at right)**, install a gate that is wide enough for vehicles to enter for any current or future maintenance.
- Sometimes access is blocked by unauthorized structures, such as sheds, property fences, retaining walls, etc. Confer with the local stormwater authority on the presence of any maintenance easements and means to gain access to the practice.
- The solutions above should also provide for safe foot access for routine inspection and maintenance.

Rainwater Harvesting:

- Ensure that no structures are covering the filter or the tank's access/inspection port.

Green Roofs

- Ensure that individuals can safely reach the roof with tools in hand (e.g., buckets, pruners, hoses). If the roof cannot be accessed via a walk-through door, this may require installing a wide ladder or fire escape-style stairs on the inside or outside of the building.
- If there is a concern of getting too close to the roof's edge while doing maintenance, install a railing around the edge for safety. Alternatively, for sloped roofs, workers may need to use harnesses during maintenance activities.

Helpful Skills:

- Use of motorized landscaping equipment
- Chainsaw skills
- Use of grading equipment for larger jobs
- *Note*: OSHA safety requirements and certifications may apply to green roof maintenance.

Equipment Typically Used to Regain Proper Access:

- Mower, trimmer
- For very overgrown areas, chainsaw and/or bush hog
- For areas that need to be regraded, excavator, skid steer, or other grading equipment

Problem #2: Flow is obstructed in or out of the practice

General Approach for All Practices:

- Flow can bypass an SMP when there is too much sediment/debris buildup near the inlets or due to grading changes in the drainage area (e.g., repaving of parking lot). If the cause of blockage or bypass is not obvious, inspect the practice during rainfall to watch the flow paths. (See **Section 4.6 – Improper Flow Pathways** for additional guidance.)

- Obstruction of overflow or emergency spillway structures is most often due to buildup of debris, such as trees, sticks, trash. It is *very* important to keep these structures clear of such blockages in order to avoid flooding or a dam breach (**avoid conditions caused by beaver activity - top photo**).

- Where debris cannot easily be cleared by hand, special equipment and skills may be needed. An obstructed riser structure in a wet pond may need to be accessed by boat **(bottom photo)**. In cases where large sticks, tree branches, trash, or other debris obstruct the overflow or spillway, they may need to be cut up by chainsaw. Large debris will usually need to be hauled away with a truck.

Helpful Skills:

- Chainsaw skills
- Muscle strength to haul large debris
- Boating capabilities

Equipment Typically Used to Clear Obstructions:

- Gloves, shovels, pruners, rakes, and other hand tools
- Waders for wetlands
- Chainsaw for large sticks and branches
- Cable puller (come-along) to remove large branches that cannot be pulled out by hand
- Boat and personal floatation device for riser structures in wet ponds
- Truck to haul away debris

4.4. Erosion

Issue Applies Most Commonly To: Sheetflow/Disconnection, Swales, Bioretention, and Ponds/Wetlands

Problem: Erosion on practice surface, inlets, and/or outlets

General Approach for All Practices:

- See **Section 4.10 – Embankment and Overflow Condition** for how to repair erosion on side-slope embankments.
- Rill and gully erosion occurs when runoff flow is concentrated. Deep rills and gully erosion on the practice surface **(top photo)** will require the surface to be regraded to make uniform again. Use the lightest equipment possible in order to minimize soil compaction during excavation.
- After excavation, reseed/plant the area with ground cover that is appropriate for the moisture conditions of the practice. Amend or enhance soil as needed according to a soil test; soil may need more organic material to support plants.
- To prevent further erosion on the surface of the practice, ensure that flow from the inlets can spread out adequately and has enhanced energy dissipation features. This may require installing or enhancing a stone apron outlet protection that flares out and down to the level of the practice to slow and spread out the flow. Other options include check dams, energy dissipation devices, or an armored low-flow channel. A stilling basin **(bottom photo)** can also dissipate flow as it comes out of an inlet or outlet pipe. Apply similar treatments to any outlets that are experiencing erosion.
- Any sloped soils that are disturbed during excavation will likely need erosion-control matting to hold it in place while vegetation becomes established.

Helpful Skills:

- Landscaping/Gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing
- Skills with excavation equipment
- Knowledge of sediment and erosion control practices and resources appropriate for the area

Equipment Typically Used for Fixing Erosion:

- Rakes, shovels, wheelbarrows, and other “landscaping” equipment
- Light excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move stone and other materials around
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out

4.5. Departure from Design Dimensions

Issue Applies Most Commonly To: Swales, Bioretention, Ponds/Wetlands, Infiltration, and Sand/Organic Filters

Problem: Practice dimensions have been altered

General Approach for All Practices:

- Once constructed, the dimensions of an SMP may become altered from the original design for a variety of reasons. These reasons can include:
- The SMP was not constructed to the proper dimensions at initial installation.
- Sediment accumulation in the SMP reduces the intended storage volume of the practice **(top photo).**
- Redevelopment or regrading of the site encroaches into the footprint of the SMP.
- Dumping of leaves, trash, or other debris into the SMP reduces the intended storage volume of the practice.
- If it appears that the dimensions of an SMP have been altered, proceed as follows:
- Consult the original design or as-built plans and sizing computations for the SMP to identify the intended dimensions and storage volume of the practice. Measure the length, width, and depth of the practice to estimate the current storage volume. Calculate the difference in volume to determine whether it is significant enough to warrant restoring the practice to its original dimensions. If the loss in volume is greater than about 10%, this likely warrants action.
- If the SMP's original storage volume cannot practically be restored because of current site conditions, an additional SMP may need to be built elsewhere on the site in order to regain adequate storage and treatment volume for the site.
- For problems of dumping by individuals on or near the site, install "No Dumping" or similar signage to inform people that this is not an appropriate place to dispose of debris. Any debris that has already been dumped should be removed from the practice either by hand or with equipment.

Helpful Skills:

- Basic surveying
- Understanding stormwater design plans and sizing computations
- Stormwater management design
- Skills with excavation equipment and erosion and sediment control

Equipment Typically Used to Investigate and Fix Dimensions:

- Simple level or survey equipment, tape measure, and other tools to measure SMP dimensions
- Light excavation or grading equipment for larger jobs
- Rakes, shovels, wheelbarrows, and other "landscaping" equipment for small jobs
- Soil stabilization materials

4.6. Improper Flow Paths

Issue Applies Most Commonly To: Rainwater Harvesting, Sheetflow/Disconnection, Swales, Bioretention, Infiltration, and Sand/Organic Filters

Problem #1: Flow intended to go into a practice is diverted by debris or grit buildup or capacity issues at inlets

Bioretention, Swales, Infiltration, Sand/Organic Filters:

- Grit, sediment, leaves, and other debris builds up at curb inlets or other inlets, sometimes to the point where flow is diverted completely around the practice (photos above). This is a common issue for practices that rely on curb cuts or other small inlet structures to get water into the practice for treatment. A minor amount of debris may be OK and not affect the ability of water to enter the practice. However, be aware of conditions where flow *that is supposed to be treated* is diverted to a downgradient storm drain or other structures in such a way that the stormwater treatment is entirely or partially bypassed.

- In many cases, correcting the problem may simply involve removing debris or unclogging the inlet.
- However, this problem can be chronic if the inlet design is susceptible to clogging. This can occur if the slope from the inlet into the practice is flat and/or there are controllable sources of sediment and debris in the drainage area.
- For chronic problems, consider redesigning inlets to be more clog proof. One solution is to build in a 2 to 3-inch drop from the curb inlet onto a gravel or stone diaphragm along the edge of the practice (see example in photo are right).
- Inlets that are undersized for the flow coming to them should be enlarged and armored with an appropriate erosion-resistant lining.

Rainwater Harvesting:

- Water intended to be collected in rainwater harvesting systems is sometimes not delivered to the tank or cistern if the system of gutters, downspouts, pipes, etc. is not sized properly or if the first-flush diverter or vortex filter is not functioning correctly and diverting too much water away from the tank.
- As with inlets, this may simply be a matter of routine cleaning of gutters, downspouts, vortex filters, etc.
- It may also be a design or capacity issue, in which case, installing larger gutters or a more robust piping system may be in order.

Source: Rainwater Management Solutions 1

Example of enhancing the gutter and piping system leading to a rainwater harvesting system

Helpful Skills:

- Basic surveying
- Typical landscaping skills using materials such as soil, rock/stone, edging material, mulch, etc.
- Light construction of gutters, downspouts, piping
- Some knowledge of first-flush diverter and vortex filter products

Problem #2: Flow is not uniformly accessing the entire treatment area

Bioretention, Swales, Infiltration, Disconnection and Sheetflow, Sand/Organic Filters:

Improper flow path issues in this category include:

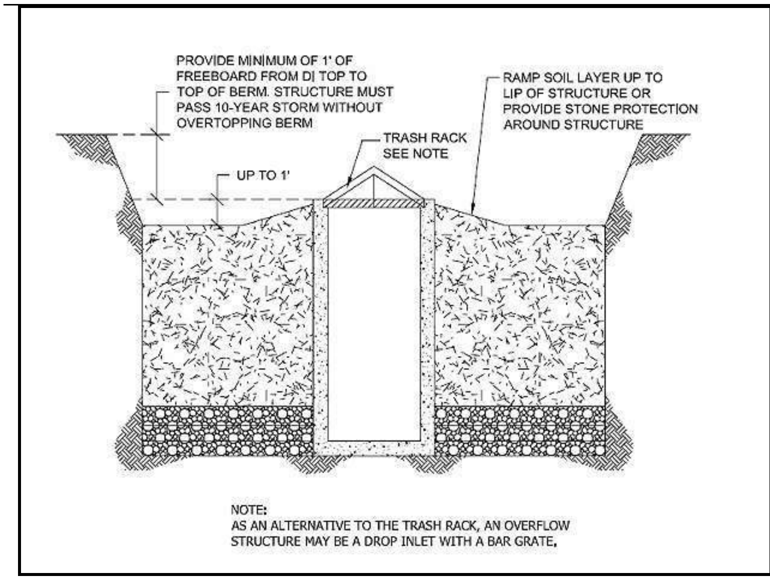
- Water forming channels or rills through the treatment bed of bioretention, swales, infiltration, or surface sand filters, and thus not spreading out across the treatment area surface
- Water ponding only at one end of the treatment area because the surface is not level
- Water piping through weak spots to an outlet or underdrain, such as where soil media meets a concrete structure
- See Section 4.4, Erosion for issues of channeling or erosion on the treatment surface.
- For uneven treatment area and preferential ponding, assess the severity of the problem. Compare the relative elevations of the "high" part of the treatment area (the area where water does NOT seem to pond) and any overflow structure or weir where high water flows will leave the practice. If there is still some freeboard (such that the overflow structure is higher than ALL of the treatment bed surface), then there will still be some ponding for larger rainfall events. Try some minor raking or moving soil media and mulch around to even out the filter bed.
- However, the problem is more serious if parts of the treatment area are higher than the overflow structure. These areas will never be valuable for treatment purposes. The treatment area is supposed to fill up like a bathtub, so some regrading is needed to level out the treatment area.
- If water is piping or shortcircuiting through the soil or sand media, forming sinkholes or otherwise bypassing the intended treatment mechanism, it will be necessary to repair these spots. Around concrete or metal overflow structures, use soil material right around the structure that can be compacted (bioretention soil media tends to be light, sandy, and fluffy and won't compact very well). Another option is to "ramp up" the soil layer to the lip of the structure so that there won't be a hydraulic jump at this potentially weak point. See the figure below.

These three issues are illustrated below:

Water from the inlet at top of photo is channeling through the bioretention area.

Water is preferentially ponding only at one end of the bioretention because the surface is not flat.

Water is "piping" down to the underdrain at the weak spot where the soil media meets the concrete overflow structure.



Ramp up soil layer to the lip of the structure to address this being a weak interface where water can work down and create bypassing. (Source: Virginia 2013 Stormwater BMP Specifications, Specification #9, Bioretention, Figure 9.13.)

Impervious Disconnection:

The most likely flow path issues with Impervious Disconnection are: (1) owners intentionally diverting downspouts away from pervious area and onto impervious area **(left photo below),** and (2) slight grading issues diverting the water away from the intended pervious receiving area **(right photo below).**


Both issues are fairly straightforward to address but involve communicating and working with property owners to explain the purpose of disconnection and how to properly maintain it. The second issue may involve some minor regrading or building low-profile berms to get water to flow to the intended disconnection area.

Helpful Skills:

- Rudimentary surveying
- Typical landscaping skills—using materials such as soil, rock/stone, edging material, mulch, etc.

Equipment Typically Used for Inspecting and Fixing Flow Paths

- Surveying equipment (i.e. Site level or total station) to get relative elevations among different parts of treatment area, inlets, overflow structures, etc.
- Small, simple tools—flat shovels, wheelbarrows, rakes, other common landscape/gardening tools
- Large, more complicated equipment—small excavators to move material around or do regrading. Always work from the side of the practice and NOT within the practice itself.

4.7. Sediment Buildup

Issue Applies Most Commonly To: Swales, Bioretention, Permeable Pavement, Ponds/Wetlands, Infiltration, and Sand/Organic Filters

Problem: Sediment accumulation more than 2 inches thick covering 25% or more of the practice surface area

Bioretention, Swales:

- Determine the source(s) of sediment. The most likely sources are: (1) premature installation of the practice during the construction process and discharge of construction site sediment loads; (2) erosion in the contributing drainage area *after* construction is complete; and (3) erosion along the practice side slope or within the practice itself. If it is an ongoing source, it must be abated (see **Sections 4.2, Contributing Drainage Area, and 4.4, Erosion).**
- Use a soil auger to auger holes in various places across the Bioretention or Swale surface area, especially in areas where sediment is accumulating. Determine how deep the sediment is penetrating into the soil media layer. Usually, it will be the top 2 to 3 inches that are most affected. Note that for swales *without* an engineered soil media, the sediment layer will likely be confined to the surface.
- Remove the "fouled" soil media to the affected depth (using flat shovels or small excavators and working from the side) and replace with clean material from an approved vendor (bioretention soil media or equivalent). If no vendors are available in your area, use the soil media specifications from the **Design Manual** to replicate the right mix of sand, topsoil, and composted organic material.
- Check to ensure that the practice is filtering at the proper rate after the next several storm events.

Infiltration:

- For infiltration practices excavated to a suitable infiltrating soil layer (e.g., not stone reservoir layer), use the same procedures as for Bioretention/Swales above.
- For infiltration trenches and basins that have a stone reservoir layer, use similar procedures, but use a shovel to dig into the stone layer to ascertain how deep the sediment incursion is into the stone. Remove down to this layer and replace with clean material.
- If the infiltration practice is clogged, see **Section 4.8: Clogging.**
- As with Bioretention, check for controllable sources of sediment in the Drainage Area (**Section 4.2**).

Permeable Pavement:

- NOTE: Routine sweeping with a regenerative air vacuum (maximum power 2,500 rpm) is important to avoid more costly repairs that result from deferred maintenance. It is best to sweep the pavement surface in the early spring after winter sanding/salting materials or snow piles have led to sediment or winter slag accumulation. Also, if the area is surrounded by tree canopy, fall cleanup is essential, as vegetative debris tends to get pulverized by vehicle traffic and ground into the pavement surface.
- Observe the pavement surface during a storm event to see whether the sediment is clogging the pavement (i.e., standing water on the surface after the storm stops). If so, see **Section 4.8: Clogging.**
- Remove several of the paver blocks in different parts of the structure to ascertain how deep the sediment is penetrating into the bedding and reservoir layers. Most of the time, sediment incursion will be limited to the top 1 or 2 inches of the pavement bedding layer (for permeable interlocking concrete pavers and concrete grid pavers).
- Based on the above observations, it may be worthwhile to quantify the infiltration rate using ASTM C-1701/1701M. This is most useful in conducting the test in the *same place within the pavement surface through the course of several years* to document reduction in infiltration rates. Repair or restorative sweeping is warranted when infiltration rates drop below around 10 inches per hour. NOTE: As stated above, this can likely be avoided if routine annual sweeping is conducted.
- If sediment covers more than 25% of the surface, is deeper than 2 inches, or vegetation is starting to grow where sediment has accumulated, consult a street-sweeping vendor about *restorative* sweeping. In this case, it will be necessary to use a higher RPM sweeper or vacuum sweeper to suck out more of the bedding pea gravel that has been fouled, then replace with clean material.

Infiltration test using ASTM C-1701

Pulling grass and weeds from the joints can damage parking surface if roots are firmly established in the bedding layer.

- Vegetation growing in the pavement joints should be removed either manually or with a water-safe herbicide (e.g., glysophate without surfactants). It is important to not let weeds proliferate in the pavement surface because pulling them out by the roots may damage the pavement structure. (Note: The application of herbicides to control invasive or undesirable vegetation within wetlands or other waters of the U.S. may require an Aquatic Pesticide Permit from the NYS DEC)
- Check the pavement surface after a storm event to ensure that it is draining properly.

The North Carolina State University (NCSU) Stormwater Engineering Group has an informative Urban Waterways publication, *Maintaining Permeable Pavements (2011):*
http://www.bae.ncsu.edu/stormwater/pubs.htm

Routine, air-vacuum sweeping in the early spring and fall is the best approach for permeable pavement maintenance (Photo source: Toronto and Region Conservation)

Ponds and Wetlands:

- Sedimentation is an inevitable process in ponds and wetlands. NOTE that upstream erosion, especially along stream channels or ditches leading to the practice will accelerate the sedimentation process and lead to more frequent and costly sediment removal operations. Whenever possible, it is important to mitigate any upstream erosion issues.
- Forebays and/or pre-treatment areas should be cleaned out when they reach 50% of their design capacity. Once cleanout is complete, it will be worthwhile to install a graduated rod into the forebay with a clear marking of future sediment clean-out levels.
- The main body of a pond or wetland may need to be dredged on an infrequent basis or when sediment has replaced 50% of the design capacity. There are many dredging methods available. Excavators with long arms can handle most small or moderate-sized ponds. Other methods may be necessary for larger facilities. Dredging can be a complicated operation involving dewatering, storage of wet sediment, and possibly hauling to on-site or off-site disposal or reuse areas. Consult a qualified contractor to explore available methods and costs for the particular application. Once again, installation of a graduated rod can help mark future clean-out levels. Note: The dredging of accumulated sediment within regulated wetlands, ponds or at outlet structure may require permits from NYS DEC and/or USACE. In addition, removed sediment should be properly disposed of in a regulated solid waste management facility or in an upland area that is at least 100 feet from regulated wetlands or streams. Sediment managed in upland disposal areas shall be graded, seeded and mulched.

Sand/Organic Filters:

- See the section above on Bioretention/Swales as some of the procedures will be similar, especially for above-ground filters. It is important to determine whether the drainage area is generating a controllable source of sediment that can be abated.
- Underground trench or vault filters will require routine maintenance to: (1) remove accumulated sediment, trash, and floatables from the sedimentation chamber, usually with a vac truck; and (2) remove sediment, grit, and sludge from the top layer of the filter media and replace with clean material. NOTE: Depending on the configuration of the underground filter, confined-space procedures may apply. For a normally operating practice, these maintenance tasks should be conducted every two to three years. If the filter is treating a stormwater hotspot or a particularly dirty drainage area (e.g., vehicle maintenance, washing, repair), the frequency may increase to annually or more often, as dictated by Level 2 inspections. Also, in these cases, it may be warranted to test the material to ensure proper disposal.
- Some proprietary filters require replacement of special cartridges or filter material. Consult the vendor or manufacturer for special maintenance procedures.

Routine cleaning of a perimeter or "Delaware" sand filter. This can be done from the surface, but deeper, vault-type filters will require confined-space entry procedures.

Helpful Skills:

- Most common contracting skills
- Excavation, dewatering, and sediment disposal in some cases
- Knowledge of maintenance equipment, such as vac trucks, street sweepers, etc.
- Knowledge of preferred conditions for bioretention soil media
- Soil testing in some cases where sediment is being removed from stormwater hotspots

Equipment Typically Used for Sediment Removal Activities:

- Small, simple tools—flat shovels, wheelbarrows, rakes, other common tools
- Larger jobs—small or large excavators, loaders, dewatering equipment (pumps, dirt bags, etc.), trucks to haul material to on-site or off-site disposal or reuse areas, erosion and sediment-control supplies.

4.8. Clogging

Issue Applies Most Commonly To: Bioretention, Permeable Pavement, Infiltration, and Sand/Organic Filters

Problem: Filter media clogged; water standing on practice surface for 48 to 72 hours or longer after a storm

Bioretention:

Standing water on the bioretention surface 48 to 72 hours after a storm event is a sure indication of clogging (top photo). Clogging of bioretention practices can be tricky to diagnose as there are several probable causes:

a. Clogged underdrain
b. Filter fabric between soil media and underdrain stone
c. Too much sediment/grit washing in from drainage area
d. Too much ponding depth
e. Improper soil media

The following procedure can be used to work through diagnosing the most common causes, beginning with the simplest and easiest to fix and progressing through more complex remedies:

1. Look for a thin, crusty layer of sediment that covers some or all of the soil media. It is often grayish in color. This thin layer can sometimes be enough to cause slow drainage. Scrape this crust off and ascertain sources of sediment in the drainage area (see Section 4.2, Contributing Drainage Area). Often, this problem can be caused by the bioretention soil media being installed too early in the construction process, but other chronic sediment sources should also be checked.
2. Open the underdrain cleanout and pour water in to verify that the underdrains are functioning and not clogged or otherwise in need of repair. The purpose of this check is to see whether there is standing water all the way down through the soil. If there is standing water on the surface, *but not in the underdrain*, then there is clogging somewhere in the soil layer. If the underdrain and cleanout have standing water and there is not water coming out the other end (outlet) of the underdrain pipe, then the underdrain is clogged and will need to be rooted out.
3. Use a soil auger to auger several holes down through the soil media to the underdrain layer (if present) or underlying soil. Check to see whether there is a layer of filter fabric at the bottom of the soil layer. The auger will pierce through any filter fabric that is present, and pieces of fabric in the auger bucket should be removed. Notice if the fabric is "blinded" or clogged with sediment. This is a common issue with older bioretention practices. If the practice has a clogged the filter fabric layer, go to step #6, install wick drain.

Filter fabric, where present, is a likely source of clogging.

4. While checking for filter fabric in auger holes, also note whether there is a layer of saturated soil media or bad soil media (e.g., too much clay content) that may be on top of a good media layer. This will be fairly obvious as the top 3 or 4 inches will be mucky and saturated, with dry and sandy media below. If this is the case, it will be necessary to remove the bad material and replace with good, clean bioretention soil media in accordance with the design specifications. Till or incorporate the good material into the underlying existing soil media to establish a good contact.

5. If the entire profile of soil media is bad, has too much clay content, or does not appear to meet the specifications for soil media, it will be worthwhile to test the soil and compare against the recommended specifications (e.g., clay content, particle sizes, etc.). If the soil does NOT meet specifications, see steps #6 and #9 below.
6. If the problem appears to be filter fabric or bad soil media (steps #3 or #5 above), there is a critical decision to be made. It is an expensive proposition to dig up the entire facility to either remove the filter fabric or replace the entire soil layer. If the clogging problem is not severe in nature, an intermediate (and much cheaper) option may be to install wick drains. Using a 6-inch auger bucket, auger numerous vertical holes around the practice surface area, making sure to auger all the way down to the underdrain stone or underlying soil (if there is no underdrain). Hammer 6-inch perforated PVC or other type of pipe into these holes. Perforations should be about 3/8-inch diameter. Fill the pipes with clean underdrain gravel (#57 stone) mixed in with coarse construction sand. These drains will serve to wick fines from the surrounding soil media and will provide alternative drainage. Check after the next several storm events to see whether the wick drains improve drainage.

Adding sand to a wick drain. The vertical perforated PVC pipe has already been placed in the auger hole.

7. Sometimes the cause of saturated soil media is springs or some type of baseflow coming into the practice. This is a more difficult problem as bioretention is not supposed to receive this type of constant flow. It will be necessary to identify and reroute springs or baseflow or perhaps replace the bioretention practice with a different type of practice.
8. Another possible source of poor drainage or clogging is that there can be too much water on top of the soil media when the bioretention practice fills up. Most specifications call for a maximum ponding depth of 12 inches, but sometimes the ponding depth can be 18 or even 24 inches. While this increases the amount of head pushing water down through the soil media, it can also lead to compaction or too much sediment building up. If the bioretention practice has a ponding depth greater than 12 inches, consider configuring the outlet or large storm overflow to reduce the ponding depth to 12 inches or less. Check with the local stormwater authority to ensure that doing this will not compromise the required treatment volume of the practice.
9. If clogging is too severe to be fixed with wick drains or other remedies listed above, it may be necessary to rebuild the bioretention practice by digging up the existing soil, taking out any filter fabric that is between the soil media and underdrain stone, and rebuilding and replanting according to the design specifications.
10. Whatever the chosen remedy, check to ensure that the practice is filtering at the proper rate after the next several storm events.

The Chesapeake Stormwater Network (CSN) has produced an excellent reference guide for inspecting and diagnosing Bioretention issues, *Technical Bulletin #10, Bioretention Illustrated.* This tool can be used as an additional reference and can be downloaded using this link: http://chesapeakestormwater.net/category/publications/

Infiltration:

- Clogging of infiltration practices can be simple to resolve or fatal:
- On the *simple* side, clogging (or poor drainage) may arise from sediment, vegetative debris, parking lot grit, or other debris clogging the top few inches of soil or stone.
- With luck, the practice will have an observation well (vertical perforated PVC pipe with cap that extends through the stone reservoir in an infiltration trench or basin). Check the observation well three days after a storm event of ½-inch or more. If water is standing in the observation well to the surface, then the whole profile may be clogged (see below under *fatal*). If the observation well has only a few inches or no water and there is still water standing on the surface, then surface clogging is a likely culprit.
- For infiltration practices in soil (no stone reservoir), auger several holes around the infiltration surface area. If saturated soil seems to be on top of good, clean, dry soil, then surface clogging seems likely.
- For infiltration trenches and basins with a gravel reservoir, dig several holes around the surface to determine, again, whether there seems to be a layer of gravel clogged with sediment, leaves, vegetative debris, parking lot grit, etc. If possible, dig down to where the gravel meets the underlying soil to see whether a layer of filter fabric is present (which may be common with older practices). If this is the case, blinding of the filter fabric may be a cause of the clogging.
- For surface clogging, remove the affected material down to the level where the soil or gravel seems clean, and replace with clean material. If filter fabric seems to be a problem, it will be necessary to dig up the gravel, remove the filter fabric, and rebuild the reservoir layer in accordance with the current design specifications. In either case, check after a storm event to ensure that this has resolved the issue.
- On the *fatal* side, the underlying soil may not be suitable for infiltration, either due to soil characteristics, compaction during construction, or other causes. Check the original design package to see whether any soil testing was done at the time. It may be worthwhile to auger down to the infiltration interface layer (e.g., where stone reservoir meets the underlying soil and then another several inches below this interface), and take several soil samples for lab analysis to compare to current soil specifications (see information below about infiltration soil analysis).

- It may be that a geotechnical analysis would reveal that there is a good infiltration soil layer, but it is lower than the existing interface. This would still require a complete rebuild and excavation down to the suitable soil layer. Restoring porosity at the designed elevation would require replacing soil above this suitable layer and avoiding compaction.
- Another option would be to convert the practice to a bioretention practice with an underdrain. Check with the local stormwater authority to see whether this would require any site plan or stormwater plan amendments or other permits.
- Many updated state stormwater manuals and specifications include protocols for infiltration soil testing and analysis that reference various ASTM standards. For example, see: *Virginia 2013 BMP Standards & Specifications, Specification #8: Infiltration, Appendix 8-A, Infiltration and Soil Testing* at: **http://www.deq.virginia.gov/fileshare/wps/2013_DRAFT_BMP_Specs/**

Permeable Pavement:

- AS NOTED IN SECTION 4.7 – sediment buildup, routine sweeping with a regenerative air vacuum (maximum power 2,500 rpm) is important to avoid more costly repairs that result from deferred maintenance. Preventative maintenance is the best and most cost-effective way to prevent clogging in the first place.
- If there is standing water on the pavement surface 48 to 72 hours after a storm event of ½-inch or more, then the pavement surface is clogged.
- Check the design plan or as-built plan to see whether the permeable pavement design includes an underdrain. There may also be underdrain cleanouts at the edge of the permeable pavement.
- If there is an underdrain, the first thing to check is whether the underdrain is clogged, crushed, or broken. Check to see whether there is standing water in the underdrain cleanout 48 to 72 hours after a storm event. If the underdrain is dry, pour water into the underdrain with a hose and see whether it comes out the other end. If the underdrain is clogged, snake it out, as this is the first and easiest thing to try.
- If the underdrain is working, then clogging may be due to: (1) clogged surface or bedding layer; or (2) underlying soil is not suitable for infiltration for designs with no underdrain. First, refer to the guidance in Section 4.7 – Sediment Buildup, and then proceed as follows:
- IF THERE IS NO UNDERDRAIN AND THE DESIGN IS BASED ON SOIL INFILTRATION UNDER THE PAVEMENT, it will be worthwhile to check the soil because unclogging the surface layer will likely not fix the problem. Check the original design package for any soil infiltration testing. It is likely worthwhile to remove the entire pavement section in several places down to the soil layer and to do a geotechnical investigation of the soil profile. See: ASTM C-1701/1701M and/or *Virginia 2013 BMP Standards & Specifications, Specification #8: Infiltration, Appendix 8-A, Infiltration and Soil Testing* for examples of soil infiltration protocols (URL above).
- If the soil is not suitable for an infiltration design, it will probably be necessary to rebuild the pavement using an underdrain design or possibly adding subsurface drainage along the perimeter of the parking area.
- IF THERE IS AN UNDERDRAIN OR THE SOIL IS SUITABLE FOR INFILTRATION, the best approach to try to unclog the pavement is restorative sweeping with a vacuum sweeper. Regenerative air sweepers may not have enough suction to relieve the clogging.
- If vacuum sweeping is not successful, it may be necessary to rebuild any layers fouled with sediment and fines. It is likely that this will be confined to the bedding layer and gravel used in the paver stone joints, but some clogging can possibly move down into the underlying stone reservoir layer.
- The North Carolina State University (NCSU) Stormwater Engineering Group has an informative Urban Waterways publication, *Maintaining Permeable Pavements (2011):* **http://www.bae.ncsu.edu/stormwater/pubs.htm**

Water standing on the parking surface 48 to 72 hours after a storm is an indication of clogging. Snow piles at the edge of the photo point to possible clogging from winter sanding or plowing.

Sand/Organic Filters:

- See the section above on Bioretention/Swales as some of the procedures will be similar, especially for above-ground filters.
- Also see Section 4.7 – Sediment Buildup for guidance on routine maintenance of the sedimentation and filter chambers.
- As with Bioretention, there can be various causes for clogged filters:
- Filter fabric layer under the filter media that has blinded or clogged
- Clogging of the surface of the filter layer or filter cartridges
- Bad filter media (e.g., sand or organic media)
- "Plumbing" issues with configuration of overflow and underdrain pipes
- Fortunately, filters are usually confined within concrete vaults or manholes, so diagnosing and rectifying clogging problems should be more straightforward. Check the original design or as-built plans. Some of the following guidance may also be helpful:
- For proprietary cartridge or special filter media structures, consult the vendor or manufacturer for recommended solutions.
- See Section 4.7 for guidance on removing the top layer of filter media and replacing with clean material, as well as vacuuming out any sedimentation chambers.
- If it is suspected that overflow or outlet pipes are not configured correctly, check against the design plans and also standard drawings from the manufacturer.
- Chronic clogging problems are likely due to excessively dirty drainage areas, including uncontrolled sources of sediment, oil and grease washoff, vegetative debris from surrounding trees or shrubs, or other sources. It will be important to check and resolve any controllable sources of clogging in the drainage area (see **Section 4.2 – Contributing Drainage Area**).

Standing water on the parking lot is evidence that this perimeter sand filter (under the sidewalk) is clogged.

Helpful Skills:

- Soil infiltration analysis techniques as per ASTM and/or current BMP design specifications
- Excavation, dewatering, and sediment disposal in some cases
- Knowledge of maintenance equipment, such as vac trucks, street sweepers, etc.
- Knowledge of preferred conditions for bioretention, sand/organic filter media, or standard permeable pavement types and bedding layers
- General practice of trying easier or less expensive strategies before jumping right to wholesale reconstruction of a practice

Equipment Typically Used for Unclogging Activities:

- Soil infiltration testing or geotechnical equipment
- Small or large excavators, loaders, dewatering equipment (pumps, dirt bags, etc.), trucks to haul material to on-site or off-site disposal or reuse areas, erosion and sediment control supplies
- Pavement demolition and repair equipment
- Mulch, plants, filter media, and other materials needed to rebuild practices

4.9. Vegetation

Issue Applies Most Commonly To: Swales, Tree Planting, Bioretention, Green Roofs, and Ponds/Wetlands

Problem #1: Not enough vegetation; vegetation *is unhealthy*

Bioretention, Swales, Tree Planting:

- Test soil/media to ensure proper conditions exist for plant survival.
- Check water drawdown after a storm to make sure that wet/saturated conditions are not the cause of plant failure. If this IS an issue, see **Section 4.8 – Clogging.**
- Amend or enhance soil as needed; soil may need more organic material to support plants, but do NOT use uncomposted organic material or animal waste, as it will likely export undesirable nutrients to the stormwater system.
- If plants have continued to die, consider a different species or entire planting palette or revised planting plan **(photo to right shows the need for a whole new planting plan)**. Also consider using an appropriate bioretention or swale native seed mix to supplement use of plugs or other nursery stock.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.
- Replant and add mulch or ground cover as needed.

Ponds and Wetlands:

- See **Section 4.13 – Pool Quality** for general guidance on pond and wetland vegetation maintenance, as well as the following.
- For emergent vegetation, determine whether water depths are too deep or shallow for survival (i.e., depths are different from design depths, or original design included improper vegetation).
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- For large-scale plantings, drain the permanent pool and plant during the early spring.

Green Roof:

- Consult with a green roof plant vendor about possible causes of plant failure. Lack of watering during initial establishment could be the main culprit.
- Work with a qualified vendor to develop and install a new planting plan.
- Speak with building facilities maintenance personnel to ensure they understand need for watering and caring for new plants after they are installed.

Helpful Skills:

- Landscaping/gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of native plant and/or wetland plant nurseries in general region

Problem #2: Too much vegetation, overgrown (with invasive species), not maintained

General Approach for All Practices:

- Determine which invasive plants are present. For a list of regulated and prohibited invasive plants in New York State, see *New York State Prohibited and Regulated Plants* (NYS DEC, NYS Agriculture and Markets, 2014) at: http://www.dec.ny.gov/docs/lands_forests_pdf/isprohibitedplants2.pdf . Invasive plants shall be properly disposed of in a manner that renders them non-living and non-viable to prevent the establishment, introduction or spread of disposed species.
- Review whether the original planting plan relied on these plants; for example, some wetland plans may rely on "aggressive colonizers" such as cat tails.
- For more detailed information regarding appropriate control measures for each species, consult the Cornell Cooperative Extension Invasive Species Program at the following link: http://ccetompkins.org/environment/invasive-nuisance-species/invasive-plants. If invasives have taken over the facility, wholesale removal and replanting with desirable species may be necessary.
- If (non-invasive) plants are overgrown, (**example in photo to right**), remove, thin, or trim back excessive vegetation.
- If an entire new planting plan is deemed necessary, use SMP-Specific Guidance in the remainder of this manual, along with landscaping goals for the site location, to devise a plan that allows for adequate growth over a long period of time. A simple, clear planting design (**example in photo below**) with a long-term plan has the best chance of being maintained through time. Maintenance crews need to know which plants are part of the design versus weeds and how the practice should look from year to year.
- Develop a plan to ensure proper weeding, pruning, trimming, and replanting to maintain the plan over time.
- See **Section 4.13 – Pool Quality** for general guidance on pond and wetland vegetation maintenance, as well as the following.

Helpful Skills:

- Knowledge of exotic and invasive species is needed. Consult a local Cooperative Extension Office.
- Specific measures may include mechanical hand pulling, regrading (requires construction equipment), or herbicide/pesticide application *safe for aquatic environments*.
- Landscape architect
- Knowledge of wetland plants (for ponds/wetlands)
- Knowledge of SMP design (to understand hydrologic regime for plant selection)

Equipment Typically Used for Vegetation Maintenance Activities

- Soil auger to diagnose issues of soil drainage that may affect vegetation health
- Rakes, shovels, wheelbarrows, and other "landscaping" equipment
- Light excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move soil media, mulch, and other materials
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out
- Planting bars, soil drills, etc.
- For planting in standing water (e.g., ponds, wetlands), pumps or pump-around systems and dirt bags or other ways to temporarily dewater planting area

4.10. Embankment and Overflow Condition

Issue Applies Most Commonly To: Swales, Bioretention, and especially Ponds/Wetlands

Problem #1: Rill and channel erosion and bare dirt areas of embankments

Bioretention, Swales:

- Erosion and areas of bare dirt indicate two basic issues: 1) soils and moisture levels are not suitable for the plants or turf used; and 2) vegetation cannot take hold because of concentrated flow, physical wear, or poor soil conditions. Address these issues first with a soil/media test to ensure proper conditions exist for plant survival.
- High salt content from winter deicing of pavement is a common culprit of poor soil conditions for roadside plants. If this is the case, restore area with plant species that can tolerate salt levels, or replace edge plants with a stone diaphragm to intercept runoff from road.
- Amend or enhance soil as needed; soil may need more organic material to support dense ground cover.
- For concentrated flow and physical wear, redirect concentrated flow so that it disperses in mulched and vegetated areas. Stake in mulch and replant with vigorous plants recommended through the soils test.
- If plants have continued to die, consider a different species or entire planting palette or a revised planting plan (see **Section 4.9 – Vegetation and photo to right)**. Also consider using an appropriate bioretention or swale native seed mix to supplement use of plugs or other nursery stock.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.
- Replant and add mulch or ground cover as needed.

Ponds and Wetlands:

- Where erosion has deposited soil within the pond or wetland water line, remove this material and reshape the slope.
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- To address rill and channel erosion, first obtain a soil sample test to get soil amendment recommendations. Undercut the eroded sections and replace with clean amended soil, based on the soil test, and reseed as appropriate for the season.
- It may be necessary to stake in seed blankets or erosion-resistant lining (e.g., erosion-control matting or even rock in extreme situations) to stabilize eroded areas. Again, choose seed types appropriate for the season.
- Based on soil test guidance, reseed bare areas to prevent further erosion.
- For persistent problems, reroute the flow to more stable receiving areas using berms, diversions, etc.

Helpful Skills:

- Landscaping/gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing.
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of sediment and erosion control practices and resources appropriate for the area

Problem #2: Settlement, loss of armoring material, erosion of emergency overflow

General Approach for All Practices:

- Settlement, loss of armoring material, erosion and accumulated debris can affect the dimension, water velocity or capacity of the emergency overflow such that embankment failure could occur in flood events (**photos below**).
- Inspect for exposure of soil or geotextile base material in the overflow and rearmor areas of exposure.
- In cases of settlement, a qualified engineer should be sought to assess its capacity and impact on pond capacity.
- Erosion of spillways should be repaired and revegetated as described for embankments.

Helpful Skills:

- Knowledge of sediment and erosion control practices for the area
- Completion of self-guided training on dam safety through Association of State Dam Safety Officials: http://www.damsafety.org

Problem #3: Impounding structure (embankment or dam) integrity issues due to tunneling or digging animals, woody vegetation or seepage

Ponds/Wetlands:

- Impounding structure stability is a serious concern, especially where trees have become established on the slopes, or there's evidence of animal burrows or seepage.
- The best approach for trees on the crest, slopes, and adjacent to an impounding structure or embankment is to cut them down before they reach significant size. If large trees have been cut down but their root systems not removed, carefully monitor the area around the remaining stumps for signs of seepage.
- Exercise judgement for trees on the surrounding side slopes that are NOT impounding structures (not designed to hold back water in the pool). Sometimes a forested edge can enhance the appeal of a pond, but access for maintenance must also be available, and some trees can drop debris into ponds, leading to quality issues.
- Animal burrows can be dangerous to the structural integrity of the embankment because they weaken it and can create pathways for seepage. Professional exterminators may be needed to trap and remove animal pests.
- Seepage as water flow or boiling sand on the lower portion of the exterior slope or toe area of an impounding structure should be brought to the attention of a qualified engineer.
- Leakage around conveyance structures such as barrel pipes or spillways should be monitored for increase since the last inspection. A qualified engineer is needed to resolve issues of piping or seepage along the barrel pipe through a dam.
- Turbidity or cloudiness in seepage should also be brought to the attention of a qualified engineer.

Helpful Skills:

- Completion of self-guided training on dam safety through the Association of State Dam Safety Officials: http://www.damsafety.org

Equipment Typically Used for Embankment and Overflow Maintenance Activities

- Excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move soil media, mulch, and other materials
- Plants and/or seed mix, seed blanket and erosion control materials
- Rod and level for settlement measurements
- Clear glass bottle for seepage visual test

4.11. Structural Damage

Issue Applies Most Commonly To: Any Practice

Problem: Structural damage to pipes, headwalls, standpipes, inlet/outlet structures, grates, curbs, and other structural components

- Structural components are necessary for water to flow into and out of stormwater practices as intended. This is a broad category that involves components composed of concrete, metal, plastic, and other materials. Some common examples include:
- Deteriorated or broken curbs that allow water to bypass a practice
- Slumping or sinkholes where soil meets a concrete drop inlet or outlet structure
- Broken or collapsed inlets
- Connections in an inlet or manhole structure that are not parged and are leaky
- Collapsed or crushed pipes (especially corrugated metal)
- Missing or broken steps or other safety features in a manhole or riser structure
- Root penetration and clogging of underdrain or other pipes
- Broken check dams
- There are too many particular instances to mention here, but the general idea is to inspect and repair any structural components that are affecting the performance of a practice or leading to a potential health or safety issue.

Helpful Skills:

- General contracting skills—concrete work, metal, proper joint sealing
- Routing out clogged pipes
- Perhaps CCTV experience to look for broken or clogged pipes

Equipment Typically Used for Fixing Erosion:

- General contracting
- CCTV

4.12. Pool Stability

Issue Applies Most Commonly To: Ponds/Wetlands

Problem: Flooded or dry pond – outlet issues

General Approach for Ponds and Wetlands:

- Note high-water marks on structures or pond banks and compare with outlet structure weir.
- If the outlet weir is submerged, investigate downstream for plugs such as beaver dams, woody debris or sediment bars. Refer to **Section 4.3 – Physical Obstructions** for removal of obstructions.
- If the pond is retaining more water than it is supposed to and there is no flow from the outlet with no visible blockages in the outlet pipe, look for obstructions above the weir or outlet pipe. Woody debris, vegetation and silt can plug outfall weirs or blind rock outfall protection. Removal of such blockages tends to be a hand exercise. A jet/vacuum truck or other heavy equipment may be needed to clear excessive or precarious blockages (**photo on right**).
- If the pond is too low and not holding water in the designated pool, the outlet structure should be closely inspected to see whether it has settled from the original construction or there is leakage through joints or cracks. Finding no deficiencies with the structure, investigate the pond embankment as described in **Section 4.10** for evidence of seepage.
- If there is no evidence of seepage and the outlet structure has no apparent structural defects, an engineer should be consulted to review the pond design and determine the proper outlet elevation.

Helpful Skills:

- The ability to navigate uneven surfaces, to follow ditch banks and to sight drainage obstructions is implicit with this task.
- Ability to use a level to sight adequate elevation fall is helpful.

Equipment Typically Used for Pool Stability Evaluations

- Bright flashlight for pipe inspection
- Manhole hook for manhole cover access
- Brush hook to clear debris and walking surfaces
- Rod and level to check elevation differentials

4.13. Pool Quality

Issue Applies Most Commonly To: Ponds/Wetlands

Problem #1: Littoral shelves and pond edge: not enough vegetation; vegetation *is unhealthy;* invasive plants have taken over

Ponds and Wetlands:

- If there is not enough vegetation or no vegetation, determine whether maintenance practices have killed the plants. If so, work with the owner to educate those responsible for pond maintenance on correct methods. Consult plans for original planting and replant.
- For emergent vegetation, determine whether water depths are too deep or shallow for survival (i.e., depths are different from design depths, or original design included improper vegetation).
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- For large-scale plantings, drain the permanent pool and plant during the early spring.If ponds are overgrown so that less than 25% of the surface area is visible, the pond water level should be lowered to enable selective plant removal.
- Invasive plants, such as phragmites or common reed, should be removed with their roots. Be sure to restore areas that have been disturbed with replacement vegetation because root removal exposes soil to erosion. Invasive plants shall be properly disposed of in a manner that renders them non-living and non-viable to prevent the establishment, introduction or spread of disposed species.
- Native plants selected based on environmental conditions have the greatest chance for survival.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.

Helpful Skills:

- Landscaping/gardening
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of native plants and/or wetland plant nurseries in general region
- Familiarity with New York invasive terrestrial and wetland plants and their control: http://nyis.info/

Problem #2: Pond color, scum, odor, algae and plant overgrowth

- Ponds that have algae covering more than 20% of the surface should have maintenance to remove it. Raking or mechanical harvesting of filamentous algae offers short-term control, but feasible long-term strategies should be considered.
- Pond maintenance companies should be relied on to identify the algae and appropriately control them. Pond specialists can control the algae growth in ponds, but its growth and reproduction are dependent on nutrients. When nutrients are in abundance, so will be the algae or vegetation.
- Plants can be used in shallow shelfs at inlets to take up nutrients, but they must be maintained and cuttings removed to take nutrients out of the pond system.
- If (non-invasive) plants are overgrown, remove or trim back excessive vegetation. Remove cuttings and trimmings. Do not allow vegetative debris to remain in the pond.
- Pond clarity and color can be impacted by excessive sediment discharge or flow shortcircuiting. For issues of clarity and color, follow the recommendations in **Section 4.7 – Sediment Buildup**.
- If invasive aquatic plants are identified, follow DEC guidelines for reporting and controlling invasives (see **Section 4.9 – Vegetation**).
- Some color, odor, and pond quality issues can be caused by leaks, spills, and other releases in the drainage area. Any petroleum odor or oily sheen (aside from natural rainbow sheen associated with decomposition of organic matter) should be reported to the appropriate state or local response agency. Other peculiar colors or odors can be investigated in collaboration with relevant agencies. Common issues are grease, paint, or other substances poured into storm drains, dumpster management, and stockpiles of various materials exposed to rainfall.

Helpful Skills:
• Ability to recognize invasive aquatic plants • Specific measures may include mechanical hand pulling, regrading (requires construction equipment), or herbicide/pesticide application *safe for aquatic environments*. • Knowledge of wetland plants and common types of algae and aquatic weeds • Knowledge of types of pond maintenance practices
Equipment Typically Used for Pool Quality Investigations
• High-top rubber boots • Canoes or small boats • Brush hook to clear vegetation and access pond bank • Secchi disk to check and compare pond color and clarity • Large-mouth bottle to collect algae and water quality samples • Various materials to control aquatic weeds and algae

Section 5. Planning for Stormwater Maintenance

Often, stormwater practices fall into disrepair because there is no plan in place for ensuring that they are maintained over time. As a result, maintenance can become reactive in nature, resulting in high costs for repairing damaged practices or practices becoming ineffective over time. This section outlines some key elements of stormwater maintenance planning, including:

1. Program models for stormwater maintenance
2. Inspection and maintenance checklists
3. Planning for the costs of stormwater maintenance
4. Identifying the need for infrequent maintenance items

5.1. Program Models for Stormwater Maintenance

The Maintenance Hierarchy concept (See Section 1) is discussed throughout this chapter, but the individuals who will conduct the Level 1, Level 2 and Level 3 inspections and maintenance will vary depending on how the local program is administered. While this chapter does not focus on program elements, it is important to note that the local program requirements will influence who performs ongoing maintenance. This will play an important role in how to develop a comprehensive maintenance plan.

Although there are many options for implementing a stormwater plan, they can be described by three broad categories, including: 1) Private Maintenance; 2) Local Program; and 3) Hybrid Approach. Understanding the program in the local community will influence the best techniques for developing the maintenance plan (**Table 5.1**).

Option 1: Private Maintenance

In this option, maintenance is the responsibility of the private land owner. In regulated MS4s, however, the land owner will periodically report to the local government. In this model, it is important to ensure that the maintenance plan is very easy to understand and includes pictures of key practice elements. If possible, include a list of contractors who will be able to perform maintenance items and how much these will cost. Finally, materials should point homeowners to resources so that they can learn more about the practices on their property. DEC's Maintenance Photo Library and Training Materials webpage (link) can be useful tools for this purpose.

Option 2: Local Government Maintenance

In this option, the local government takes over maintenance responsibility for all stormwater practices. While it is still important to develop a clear and simple plan, the designer can assume some level of training or supervision for the individuals conducting inspections and maintenance. For publicly maintained practices, it is helpful to find out what resources the local government has in place for developing the plan. These resources may be in the form of existing reporting and tracking procedures, which can be modified for the specific practice, or equipment such as vacuum sweepers. Maintenance access should be made available to local government staff through official easements.

Option 3: Hybrid Approach

In the hybrid approach to stormwater maintenance, larger practices or practices on public land are maintained by the local government, and smaller practices on private property are maintained by the owner. There are other hybrid models, however. For example, the local government may take responsibility for inspections but leave the owner responsible for maintenance items identified during the inspection.

Table 5.1 Maintenance Considerations for Three Program Options

Program Option	Inspection/Maintenance Performed By:	Key Considerations for the Designer
Option 1: Private	Level 1: Property owner or HOA Level 2: Private Contractor Level 3: Certified Contractor	Make the plan very simple and graphic intensive. Include a list of contractors if applicable. Provide links to educational materials.
Option 2: Local Program	Level 1: Interns or Untrained Staff Level 2: Trained Local Staff Level 3: City/Town Engineer or other individual hired by the city or town	Learn about the resources the local program has at its disposal. If government staff are being trained, develop a maintenance plan that is consistent with their knowledge and understanding. Be aware of equipment and materials on hand in this community.
Option 3: Hybrid Approach	Inspection is typically divided, where larger practices or those on private property are maintained by the public entity.	Understand how this maintenance is divided, and develop a plan that is consistent with this arrangement.

Special Considerations for Green Infrastructure Practices

Because many of the Green Infrastructure practices included in this manual, such as Tree Planting, Rain Gardens and Sheetflow and Level Spreaders, are implemented at a very small scale, they present a unique challenge in terms of stormwater maintenance. These practices are more likely to be located on private property. As a result, the designer needs to consider the *Private Maintenance* model. Maintenance plans for these small practices should be as simple as possible, and the designer should ensure that maintenance can be completed with readily available materials.

5.2. Inspection and Maintenance Checklists and Documentation

The checklists included in this chapter are specific to the maintenance hierarchy. The maintenance plan should include inspection checklists for all three hierarchies. In addition, these checklists should be modified to identify the specific practice elements included in each design. The materials developed as a part of the maintenance plan should be provided to the practice owner and local government. (See **Table 5.2**)

Table 5.2. Customizing Checklists and Guidance

Hierarchy	Checklist/Checklist Guidance	Tips for Customizing
Level 1	**Section 2** includes both the checklists and guidance.	Add photographs of the practice (once installed), and include a simple aerial photograph of the site to locate the practice. Include key local government contacts and contractors along with the checklist.
Level 2	**Section 3** includes guidance on how to respond to the Level 1 Inspection and/or activate a Level 3 investigation. **Appendix B** includes routine inspection checklists for the Level 2 Inspector.	Modify to remove elements that are not in this particular practice.
Level 3	Guidance is included in **Sections 3 and 4**.	Typically, this will not need to be modified.

5.3. Budgeting for Maintenance

A maintenance plan should include a budget for annual maintenance. In the Public Maintenance model, a single entity (the local government) will be responsible for maintenance of many practices, so the cost of maintenance for an individual practice may not be as important as estimating the average cost of maintenance across all practices. For privately maintained practices, on the other hand, it is very helpful to develop a cost estimate that is as accurate as possible for the specific location. As a result, two options for estimating costs are presented here, including:

- **Option 1**: Average or Unit Costs
  Generalized cost data are used to estimate an annual cost. This option may be used for a municipality or other institution that manages a large number of practices.
- **Option 2:** Detailed Individual Practice Budget
  Annual costs are estimated using more detailed practice information, as well as more detailed estimates of labor and materials costs.

Option 1: Average or Unit Costs

In this option, annual maintenance costs are estimated on a per-acre basis or based on a percentage of the construction costs. These prices typically range from about 1% to 4% of the construction costs (King and Hagan, 2011; **Table 5.3**).

Table 5.3 Typical Maintenance Costs (Source: King and Hagan, 2011; Adjusted to 2015 Costs)

Practice	Annual Maintenance Cost (% of Construction)	Annual Maintenance Cost ($/cubic foot of the water quality volume–WQV—treated)
Buffers	4%	$0.25-$0.35
Tree Planting	4%	$0.35
Ponds and Wetlands	4%	$0.22-$0.35
Infiltration Trench/ Basin	2%	$0.25
Filtering Practices	4%	$0.41-$0.47
Bioretention	4%	$0.44
Swales	3%	$0.18-$0.26
Permeable Pavement	1%	$0.64-$0.89

While the costs in **Table 5.3** may be a reasonable starting point, it is important to note that the actual data will vary greatly, depending on labor rates and materials costs. For example, the hourly “Open Shop” labor rate for rough grading is approximately $27/hour in Elmira and $38/hour in New York City (Means, 2015). In addition, costs for labor, materials and equipment will vary depending on the maintenance arrangement (**Table 5.4**).

Table 5.4 Variability in Maintenance Costs Based on Maintenance Arrangement			
Maintenance Arrangement	**Labor**	**Materials**	**Equipment**
Public Maintenance (Municipality)	Level 1: Intern Wage Level 2: Staff Salary Level 3: Professional Staff or Contractor	Low: Materials bought in bulk.	Low: Typically owned by Public Works or similar department.
Private Maintenance (Homeowner)	Level 1: Homeowner (Free) or Contractor Level 2: Private Landscaper or Contractor Level 3: Professional Contractor	High: Materials purchased in small quantities.	High: Specialized equipment needs to be rented if needed.
Private Maintenance (Commercial or HOA)	Level 1: Free (with HOA volunteers) or Contracted Labor Rate Level 2: Private Landscaper or Contractor Level 3: Professional Contractor	Varies: Materials may be bought in bulk or on a small scale, depending on the size of the private entity.	High: Specialized equipment needs to be rented if needed.

Option 2: Site-Based Costs

Because both the unit costs of labor and materials and the average annual costs of maintenance can be so highly variable, more detailed data will be needed to estimate costs at a particular site. One approach for estimating these costs is to generate a list of routine maintenance items, along with associated unit costs for labor, materials and equipment. This approach requires the user to enter basic design data for the practice, as well as information regarding local labor rates and other general costs. In the bioretention example below, unit costs are used to estimate routine maintenance costs, including inspections and regular maintenance.

Example Annual Cost Estimation: Bioretention

An example cost estimation for a bioretention cell follows below. The cost estimation tool used in the Maintenance Chapter will be automated. This example demonstrates how the unit cost and typical frequency data will be used to estimate average annual maintenance costs. In it, we are estimating annual maintenance costs for a bioretention practice with characteristics summarized in **Table 5.5**. **Table 5.6** then summarizes activities, their frequency and extent, and associated labor costs.

Using the assumptions for this practice, the annual costs for routine maintenance would be $1,828 ($1.15/cubic foot of Water Quality Volume) in the first year and $1,468 ($0.90/cf WQv) in subsequent years. This value is much higher than the $0.44/cf estimated using general cost data (**Table 5.3**). However, significant cost savings could be realized by using volunteer or intern-level labor for Level 1 inspections and routine maintenance.

Table 5.5. Assumptions for Bioretention Cost Example

Practice Design		**Unit Costs**	
Water Quality Volume (cf)	1,600	Level 1 Labor ($/hr)	$15
Forebay Volume (cf)	400	Level 2 Labor ($/hr)	$35
Total Practice Area (sf)	2,000	Mulch ($/cy)	$10
Filter Area (sf)	1,000	Plants ($/plant)	$1
Ponding Area (sf)	1,500	Trash Tipping Fee	$25
Slope Area (sf)	500	Seed/Mulch for a small area	$10
Turf Area (sf)	No Turf	Average Cost for a PVC Replacement Part (Planning Level)	$100
Inlets (#)	1		

Table 5.6. Bioretention Example - Routine Maintenance Costs

Task	Frequency (x/year, Decimal)	Typical Extent	Extent	Hours (Unit)	Hours/yr	Level	Materials and Equipment	Annual Costs		
								Labor	Materials and Equipment	Total
Level 1 Inspection - 1 to 5-acre drainage	1	Practice	1	1 per inspection	1	1		$15		$15
Level 2 Inspection - 1 to 5-acre drainage	0.2	Practice	1	2 per inspection	0.4	2		$14		$14
Watering - grass and plants: Year 1	16	Weekly for first growing season, over filter surface area	1,000	0.5 per 400 sf area	24	1	Assume minimal cost for water	$360		$360
Trash and Debris Removal	4	Ponding area	1,500	1 per 400 sf practice surface area	15	1	Assume $25 Tipping Fee for Each Trip	$225	$100	$325
Weeding	2	Assume 50% of practice area	1,000	4 per 400 sf practice surface area	20	1		$300		$300
Mulching	1	Ponding area	1,500	4 per 400 sf area	15	1	Bark mulch; assume 15 cy/application	$225	$150	$375
Sediment Removal (minor)	1	Assume one small area per inlet	1	1 per small area	1	1		$15		$15
Erosion Repair (minor)	1	Inlets; assume 25 sf/practice	25	1 per 25 sf	1	1	Seed, mulch and topsoil	$15	$10	$25
Erosion Repair (minor)	1	10% of slope area	50	1 per 25 sf	2	1	Seed, mulch and topsoil	$30	$20	$40
Minor Regrading	0.5	1 spot per 400 sf of practice area	5	1 per repair	2.5	2	Assume done by hand	$88		$88
Planting (plants)	0.2	Assume 50% of practice area	1,000	8 per200 sf	8	1	Assume 500 plants/planting	$120	$100	$220
Minor PVC or Metal Repairs (observation well cap, PVC riser, grates)	0.2	1 per practice	1	1 per repair	0.2	2	Assume about a $100 piece of equipment	$7	$20	$27
Sediment Removal (small forebay)	0.2	per forebay	1	2 per forebay	0.4	2	Assume removal by hand	$14		$14
							Total Costs - Year 1	**$1,428**	**$400**	**$1,828**
							Total Costs - Subsequent Years	**$1,068**	**$400**	**$1,468**

5.4. Planning for “Non-Routine” Maintenance

If the guidance provided in this chapter is followed and practices are designed properly, the routine maintenance (and budget guidance in **Section 5.3**) should be sufficient to keep a practice functioning indefinitely, but planning is needed for infrequent maintenance items. In the initial maintenance plan, identify a few of the most likely infrequent items. If initial routine inspections start to identify a more serious problem, develop a plan and budget for performing the repairs. To be more conservative, another option is to provide a contingency budget to plan for non-routine repairs over the life of the practice.

Note: Maintenance and repairs that rise to a Level 3 inspection may require permits from the NYS DEC and/or US Army Corps of Engineers if they are undertaken within or adjacent to regulated wetlands or other waters of the U.S.