Stormwater Report

For

39 Main Street

MEDWAY MA, 02053

Proposed Residential Development

March 26, 2019

PREPARED BY:
LEGACY ENGINEERING, LLC
Consulting Engineers
730 Main Street, Suite 2C
Millis, MA 02054

PREPARED FOR:
Strategic land ventures
257 Hillside Avenue
Needham, MA 02494

VOLUME 1 OF 1

COMMONWEALTH OF MASSACHUSETTS
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INTRODUCTION

This report presents a description along with supporting calculations for the stormwater runoff treatment and mitigation systems proposed for the residential development as presented on a plan set entitled "39 Main Street Site Plan of Land" prepared by Legacy Engineering LLC with an original date of March 26, 2019. The development consists of a 4.5 story, 190 unit apartment building and appurtenances.

EXISTING SITE

The proposed development lies on the southerly side of Main Street in Medway, totaling approximately 12.3 acres. The site predominately consists of woods and fields, with wetlands on the easterly side.

SOILS

A series of test pits have been conducted across the site, which have generally confirmed the soils conditions described in the soils conservation service on-line soils website maps (see Attachment H). The soils conservation service maps indicate that the site is comprised of various soils types as follows:

Westerly Portions:

- Canton (420B): A class B glacial till soil

Easterly Portions:

- Hinckley (245B): A class A glacial till soil
- Swansea Muck (51): A class D soil in wetland areas

GROUNDWATER CONDITIONS

On-site testing concluded that the site contains a groundwater table sloped eastward towards the wetlands. Groundwater elevations vary in depth 6 feet to 11 feet below grade, depending on the location on this sloping site.

SOIL PERMEABILITY

For the purposes of this report and based on the soils present at the proposed stormwater infiltration facilities, a Rawls rate for sand (8.27 inches per hour) is used for infiltration related calculations.

FLOOD PLAIN

The easterly wetland portions of the site lie within a FEMA Zone AE100-year flood plain, although no work is proposed within such areas.

WETLAND PROTECTION ACT

The easterly portions of the site include bordering vegetated wetlands along an unnamed tributary of the Great Black Swamp. A Notice of Intent will be filed for proposed work within wetland jurisdictional areas.

PROPOSED DEVELOPMENT

The proposed construction consists of a 4½ story, 190 unit apartment building, along with associated driveways, landscape areas, utility systems, and stormwater management systems.

MASSACHUSETTS STORMWATER MANAGEMENT STANDARDS

The stormwater management system design consists of a series of catch basins, manholes, and piping which collect runoff from the proposed development and the adjacent watersheds. These devices provide pretreatment prior to conveying stormwater into the various BMPs described herein. The stormwater management system is designed in accordance with the provisions of the DEP Stormwater Management Standards and Handbook, which are summarized below.

STANDARD 1 - New Stormwater Conveyances

No New Stormwater Conveyances (e.g. outfalls) May Discharge Untreated Stormwater Directly to or Cause Erosion in Wetlands or Waters of the Commonwealth. The proposed development complies with this standard.

The development includes two primary stormwater discharge points. Note the following:

- Design Point #1: Design point #1 represents the discharge to the easterly wetland system. All outlets from proposed stormwater facilities are equipped with level spreaders to prevent erosion to the wetlands.
- Design Point #2: Design Point #2 represents flow to the abutting property to the south of the development. There is no channelized discharge to this design point under either the existing or proposed condition.

STANDARD 2 – Peak Discharge Rates

Stormwater Management Systems shall be designed so that the Post-Development Peak Discharge Rates do not Exceed Pre-Development Peak Discharge Rates. The proposed development complies with this standard.

In order to model pre and post peak discharges, a program called Hydrocad was used, which employs the TR-20 modeling system. The DEP Stormwater Management regulations require that the 2 and 10 year storms should be considered for peak rates and the 100-year storm for flooding considerations. The following three theoretical storm events were used to model the site before and after the proposed activities occur[1]:

Design Storm	Rainfall
2-Year	3.2 inches
10-Year	4.7 inches
100-Year	6.7 inches

DESIGN POINT #1: Flow to Wetlands

Description of Existing Conditions: In the existing condition, Watershed E1 represents uncontrolled overland flow from the majority of the site. There are five existing houses with driveways within the watershed along main street. The remainder of the watershed consists of woods and minor field areas.

Description of Proposed Conditions: In the proposed condition, Watersheds P1a through P1i represent runoff captured and treated by infiltration field #1. This includes the northern and western portions of the site as well as the flow from off site in these directions. Watersheds P2a through P2f represent runoff captured and treated by infiltration field #2. This includes the southern and eastern portions of the site. Watershed P3 represents the uncontrolled runoff to the wetlands.

[1] Rainfall depths are as specified by MassDEP in Appendix F-1 of the Hydrology Handbook for Conservation Commissioners dated March 2002.

Summary of Peak Flow Rates to Design Point:

Design Storm (Year)	Peak Runoff Rate (cfs)	
	Existing	Proposed
2	0.22	0.03
10	2.88	2.87
100	10.33	10.11

DESIGN POINT #2: Overland flow to 43 Main St.

Description of Existing Conditions: In the existing condition, Watershed E-2 represents uncontrolled overland flow into 43 Main St. The watershed is mostly woods.

Description of Proposed Conditions: In the proposed condition, Watershed P4 represents uncontrolled flow to the abutter. The area contributing to this design point is greatly reduced in the proposed condition.

Summary of Peak Flow Rates to Design Point:

Design Storm (Year)	Peak Runoff Rate (cfs)	
	Existing	Proposed
2	0.02	0.00
10	0.33	0.00
100	1.41	0.07

STANDARD 3 - Loss of Annual Recharge

Loss of Annual Recharge to Groundwater shall be Eliminated or Minimized through the use of Environmentally Sensitive Site Design, Low Impact Development Techniques, Stormwater Best Management Practices, and Good Operation and Maintenance.

RECHARGE CALCULATIONS AND METHODS

The DEP Stormwater Management Standards requires that a minimum volume of runoff (Required Recharge Volume, Rv) be recharged on the site based on soils conditions in accordance with the following table:

	Class A Soils	Class B Soils	Class C Soils	Class D Soils
Runoff Depth (d) to be Recharged	d = 0.60 inches	d = 0.35 inches	d = 0.25 inches	d = 0.10 inches

The Required Recharge Volume is calculated by multiplying the runoff depth to be recharged (d) for each soils class by the amount of impervious coverage (on the site) under the proposed condition.

STORMWATER INFILTRATION FIELD #1

Recharge required (Rv)=(Impervious coverage)*(depth to be recharged)

	Class A Soils	Class B Soils	Class C Soils	Class D Soils
On-Site Impervious Area	86,800 s.f.	31,137 s.f.	0 s.f.	0 s.f.
Required Recharge Volume (Rv)	4,340 c.f.	908 c.f.	0 c.f.	0 c.f.
Total Rv	5,248 c.f.			

Standard 3 requires that infiltration facilities be provided and sized in accordance with three acceptable methods; 1) the Static Method, 2) The Simple Dynamic Method, and 3) the Dynamic Field Method. Each method is summarized below.

Static Method: The Static Method simply requires that the proposed recharge facility contain a total raw volume (adjusted for void space if stone is used within the storage volume) equal to or greater than the Required Recharge Volume.

Simple Dynamic Method: The Simple Dynamic method allows for a very conservative inclusion of some of the recharge which occurs within the infiltration facility during the design storm in accordance with the following formula:

$A' = Rv \div (D + kT)$

$V' = A \times Dn$

Where

A′ is the minimum required bottom area

V′ is the minimum required storage volume of the infiltration facility

Rv is the Required Recharge Volume

D is the depth of the infiltration facility (adjusted by the void space factor if the leaching facility is filled with stone)

K is the saturated hydraulic conductivity determined by the Rawls Rate (Table 2.3.3 of Volume 3, Chapter 1 of the Stormwater Handbook)

T is the allowable drawdown during the peak of the storm = 2 hours for this method
n is the stone void factor

This method allows the designer to include two hours of ongoing recharge during the design storm using a permeability rate (saturated hydraulic conductivity) selected based on the classification of the soil under the infiltration facility.

Dynamic Field Method: The Dynamic Field Method uses a more aggressive inclusion of on-going recharge from an infiltration facility during the design storm. This method is calculated using rainfall routing software (Hydrocad) and a truncated hydrograph which assumes that the Required Recharge Volume is loaded to the infiltration facility during a 12 hour period. For this method the design permeability rate must be based on in-situ permeability testing with a safety factor of 50% applied to the actual rate found.

For this infiltration facility, the Simple Dynamic Method has been utilized. This method allows for two hours or recharge during the storm event. The required WQV is larger than the Rv and is therefore used in this calculation. Using the following formula, the minimum leaching field area and volume was calculated:

A′ = Rv ÷ (D + kT)
WQV=9,828 c.f.
D=3.5 ft. x 40% voids = 1.4 ft.
K=8.27 in./hr. ÷ 12 in./ft. = 6.9 ft./hr.
T=2 hr.

The required area for this infiltration facility is 3,537 s.f. The proposed infiltration field has an area of 13,596 s.f. * 40% voids = 5,438 s.f. and therefore satisfies this requirement.

V′ = A x Dn
A= 3,537 s.f.
D= 3.5 ft.
n = 40%

The required storage for this infiltration facility is 4,952 c.f. The proposed infiltration field has a volume of 6,248 c.f. and therefore satisfies this requirement.

A secondary check is required to ensure that the Rv will recharge within at least 72 hours. The required Water Quality Volume (WQV) exceeds the Rv and is used for this calculation. A K value of 8.27 is used for drawdown design purposes since soils testing found sandy soils at this location. Using the following formula, the drawdown time is calculated:

$Time_{drawdown}$ = [Rv/(K x Bottom Area)]

Where:

WQV = 9,828 c.f.
K = 8.27 inches per hour = 0.69 feet per hour
Bottom Area = 13,596 s.f. x 40% voids = 5,438 s.f.

It is concluded that the drawdown time for the infiltrated volume is 2.6 hours, which satisfies this requirement.

STORMWATER INFILTRATION FIELD #2

Recharge required (Rv)=(Impervious coverage)*(depth to be recharged)

	Class A Soils	Class B Soils	Class C Soils	Class D Soils
On-Site Impervious Area	55,142 s.f.	17,019 s.f.	0 s.f.	0 s.f.
Required Recharge Volume (Rv)	2,757 c.f.	496 c.f.	0 c.f.	0 c.f.
Total Rv	3,253 c.f.			

For this infiltration facility, the Simple Dynamic Method has been utilized. This method allows for two hours or recharge during the storm event. The required WQV is larger than the Rv and is therefore used in this calculation. Using the following formula, the minimum leaching field area and volume was calculated:

A′ = Rv ÷ (D + kT)
WQV=6,013 c.f.
D=3.5 ft. x 40% voids = 1.4 ft.
K=8.27 in./hr. ÷ 12 in./ft. = 6.9 ft./hr.
T=2 hr.

The required area for this infiltration facility is 2,164 s.f. The proposed infiltration field has an area of 5,635 s.f. * 40% voids = 2,254 s.f. and therefore satisfies this requirement.

V′ = A x Dn
A= 2,164 s.f.
D= 3.5 ft.
n = 40%

The required storage for this infiltration facility is 3,030 c.f. The proposed infiltration field has a volume of 3,071 c.f. and therefore satisfies this requirement.

A secondary check is required to ensure that the Rv will recharge within at least 72 hours. The required Water Quality Volume (WQV) exceeds the Rv and is used for this calculation. A K value of 8.27 is used for drawdown design purposes since soils testing found sandy soils at this location. Using the following formula, the drawdown time is calculated:

$Time_{drawdown}$ = [Rv/(K x Bottom Area)]

Where:

WQV = 6,013 c.f.
K = 8.27 inches per hour = 0.69 feet per hour
Bottom Area = 5,635 s.f. x 40% voids = 2,254 s.f.

It is concluded that the drawdown time for the infiltrated volume is 3.9 hours, which satisfies this requirement.

Mounding Analysis:

A mounding analysis has been conducted and can be found in attachment L. The bottom of Infiltration Fields #1 is at elevation 158.0, with an average seasonal high groundwater elevation below the field at 153. The mound height is 2.5 feet and will not intercept the bottom of the field.

The bottom of Infiltration Field #3 is at elevation 158.0, with a seasonal high groundwater elevation below the basin at 152.4. The mound height is 2.2 feet and will not intercept the bottom of the field.

STANDARD 4 - TSS Removal

Stormwater Management Systems shall be Designed to Remove 80% of Average Annual Post-Construction Load of Total Suspended Solids (TSS). This standard is met when:

a) A long-term pollution prevention plan is provided and implemented as required (refer to Attachment A),
b) Structural stormwater BMP's are provided as required, and
c) Pretreatment is provided as required.

The proposed stormwater management system has been designed to provide a series of Best Management Practices in accordance with the Stormwater Management Policy to remove the pollutants found in runoff as described below for each drainage sub-system.

WATER QUALITY VOLUME (WQV)

The Water Quality Volume represents the volume of water which must receive TSS removal treatment in order to comply with Standard 4. The water quality volume is calculated based on either 0.5 inches of runoff or 1.0 inches of runoff from all non-roof impervious surfaces on the site. 0.5 inches is used except in sensitive locations as described in the Stormwater Handbook. Since this site discharges towards a Zone II for a public drinking water supply, the WQV is based on 1.0 inch of runoff. The total WQV for the site is split amongst the various BMP treatment trains as described below (or may not apply if the specific BMP's utilized do not use it as a sizing criteria). Using the following formula, the WQV is calculated:

WQV=(Impervious Area)*(1 in.)
WQV=(190,098 sq. ft.)*(1 in.)/(12 in/ft)=15,841 c.f.

Each infiltration facility was designed to treat the WQV using the Simple Dynamic Method as shown in Standard 3 of this report.

PROPOSED BMP DESIGN

Deep Sump Catch Basins/First Defense Units:

All proposed deep sump catch basins have 4' sumps with hoods designed in accordance with the DEP Stormwater Handbook. Each structure represents one of the pretreatment BMP's in each treatment train and provides a 25% TSS removal credit. First defense units provide 80% TSS removal, information for which can be found in attachment M.

Underground Infiltration Systems:

Infiltration Field #1 is sized to hold and infiltrate a volume of 6,248 c.f. of stormwater. Overflow from the system discharges to the wetlands via a level spreader. The impervious area treated by this facility is 117,937 s.f. The WQV required to be treated by this facility is calculated in Standard 3 of this report.

Infiltration field #3 is sized to infiltrate a volume of 3,071 c.f. of stormwater. Overflow from the system discharges to the wetlands via a level spreader. The impervious area treated by this facility is 72,161 s.f. The WQV required to be treated by this facility is calculated in Standard 3 of this report.

TSS REMOVAL CALCULATIONS

In accordance with the DEP Stormwater Management Handbook, each of the drainage treatment trains have been analyzed for TSS removal. The required TSS removal calculation sheets are included in Attachment E and the following sections provide a narrative discussion of each.

Underground Infiltration Fields:

Each infiltration field provides 80% TSS removal and is preceded by a First Defense Unit providing 80% TTS removal, which satisfied the 44% pretreatment requirement. The total TSS removal for these facilities is 85% where catch basins and First Defense units are used, and 80% where just First defense units are used.

STANDARD 5 - Land Uses with Higher Potential Pollutant Loads

For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If, through source control and/or pollution prevention, all land uses with higher potential pollutant load cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific structural stormwater BMP's determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

This development is not a Land Use with Higher Potential Pollutant Loads.

STANDARD 6 – Critical Areas

Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharge near or to any other critical area requires the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such area, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or *wetland and receive the highest and best practical method of treatment. A "stormwater discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone 1 or Zone A are prohibited unless essential to the operation of the public water supply.*

This site partially lies within a Zone II, which is considered a Critical Area. Stormwater infiltration BMPs are therefore preceded by pretreatment BMPs which achieve a minimum of 44% TSS removal.

STANDARD 7 - Redevelopment

A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structures stormwater best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

The site is largely undeveloped woodlands. A small portion of land is currently developed as a single-family dwelling along Main Street. The Stormwater Management Standards will be met to the maximum extent practicable for the developed location.

STANDARD 8 – Erosion Control

A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

A construction activity NPDES Stormwater Pollution Prevention Plan has been prepared and included as Attachment D.

STANDARD 9 – Long-Term Operations and Maintenance Plan

A Long-Term Operations and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

A Drainage System Operations and Maintenance Plan has been prepared and included as Attachment A.

STANDARD 10 – Illicit Discharge Compliance

All illicit discharges to the stormwater management system are prohibited.

See Attachment C for the Illicit Discharge Compliance Statement.

ATTACHMENT A: Operations and Maintenance Plan

OPERATIONS & MAINTENANCE PLAN

FOR

39 MAIN STREET

MEDWAY MA, 02053

PROPOSED RESIDENTIAL DEVELOPMENT

MARCH 26, 2019

PREPARED BY:
LEGACY ENGINEERING, LLC
CONSULTING ENGINEERS
730 MAIN STREET, SUITE 2C
MILLIS, MA 02054

PREPARED FOR:
STRATEGIC LAND VENTURES
257 HILLSIDE AVENUE
NEEDHAM, MA 02494

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INTRODUCTION

This Operations and Maintenance Plan (hereinafter referred to "O&M Plan") is provided to ensure the long-term monitoring and maintenance of various components of the development. This O&M Plan includes the following provisions:

1. Stormwater System Operations and Maintenance
2. Miscellaneous Provisions
3. Accidental Spill and Emergency Response Plan

The "Development" and the various components which are referenced in this O&M Plan are described on the site plan referenced below.

Project Name

39 Main Street

Project Location

39 Main Street
Medway MA, 02053

Operator Name and Address

Strategic Land Ventures
257 Hillside Avenue
Needham, MA 02494

References

This O&M Plan references other documents as follows:

Site Plan - Plans entitled "39 Main Street Site Plan of Land" with an original date of March 26, 2019 (as may be amended), and prepared by Legacy Engineering, LLC, hereinafter referred to as the "Site Plan".

Stormwater Report – Report entitled "Stormwater Report for 39 Main Street Medway, MA 02053" prepared by Legacy Engineering, LLC with an original date of March 26, 2019 (as may be amended).

Site Description

The proposed use consists of a 4.5 story, 190 unit apartment building located on 12.3 acres of land on Main Street in Medway and includes all appurtenant utility systems, landscape areas, and stormwater management systems. Those land areas are collectively referred to herein as the "Development."

Site Usage and Activities

Residential apartment and associated appurtenances.

PART 1: STORMWATER SYSTEM OPERATIONS AND MAINTENANCE

In order to maximize the continued effectiveness of the Stormwater Management BMP's for the development, the following Operation and Maintenance requirements apply to all stormwater facilities within the extents of the Development. The stormwater facilities are depicted on the Site Plan and are hereinafter referred to as the "Stormwater Facilities."

Operations and Maintenance Responsibilities

The Operator or its designee shall be responsible for implementing all Operations and Maintenance (O&M) responsibilities.

Commencement of Operations and Maintenance Responsibilities

Operations and Maintenance tasks shall be commenced once each respective Stormwater Facility is fully constructed and is receiving runoff from the Development.

Operations and Maintenance Tasks

Deep Sump Catch Basins:

1. Deep sump catch basins shall be inspected daily during construction activities and all sediments and debris shall be removed four times per year unless the owner can determine through recorded observations that sediment accumulation does not warrant such frequent cleanings. If deep sump catch basin cleaning occurs less than four times per year, cleaning shall occur when two feet of sediments have accumulated in the sump and at least once per year.
2. Silt sacks shall be installed on all catch basins throughout the time of construction.
3. All sediments and hydrocarbons shall be disposed of off-site in accordance with all applicable local, state, and federal regulations.

Stormwater Treatment Units (shown on the Site Plan as "First Defense Units"): (maintenance tasks and frequency from manufacturer published data)

1. Stormwater Treatment units shall be inspected twice per year. Sediments and floating debris and petroleum products shall be removed with a vacuum truck when either the sediment depth reaches 6-inches or the floating depth of petroleum products reaches 3-inches. Sediment and floating debris removal shall occur at least once per year unless the Operator can demonstrate that sediment/floating debris accumulation does not achieve the thresholds noted above within a typical year. The Operator shall submit an analysis by a Registered Professional Engineer to the Planning Board explaining the basis for more infrequent cleaning.
2. All sediments and hydrocarbons shall be disposed of off-site in accordance with all applicable local, state, and federal regulations.

Underground Infiltration Field:

1. Perform all pretreatment BMP maintenance, structural and non-structural, as required herein.
2. Inspect the infiltration field at least twice per year, approximately 2-4 days after a rainfall event to ensure that water is not still in the field (as it should have infiltrated into underlying soils by then). Should the infiltration field fail to infiltrate water sufficiently, the field system shall be excavated and replaced in accordance with the original design.
3. Clean out the Separator Row when sediment reaches 3".

Stormwater Pipes, Inlets and Outfalls:

1. All stormwater inlets and outfalls shall be inspected twice per year.
2. Trash, leaves, debris and sediment shall be removed from inlets and outfalls as needed to keep them free flowing.
3. If inspections indicate that stormwater pipelines have become partially obstructed with trash, leaves, debris or sediment, the pipelines shall be cleaned by water jet truck and the obstructions removed and disposed of.

The various operations and maintenance schedule requirements listed above may be reduced in frequency by approval from the Town. Should such permission be desired, the Operator shall provide documentation of actual on-site maintenance observations by a qualified source (engineer or other qualified person meeting the approval of the Town) demonstrating that the particular Stormwater BMP in question does not warrant the specified frequency of inspection or maintenance activities.

Reporting Requirements

The following documentation shall be submitted no later than December 31st of each calendar year to the Town:

1. A statement, signed by an authorized representative of the Operator indicating that the requirements of this O&M Plan were performed during the previous calendar year. Where requirements were not met, a schedule for their completion shall be provided and a follow-up statement submitted when complete.
2. A list of the maintenance activities performed along with the approximate date of the work.
3. A list of the inspections performed along with a statement by each inspector summarizing the results of the inspections performed in accordance with this O&M plan.
4. Copies of appurtenant documentation supporting the completion of the O&M responsibilities such as copies of contracts and/or receipts with parties engaged to perform maintenance and inspection services.
5. A notation regarding whether there has been any change in the name and or contact information for the Operator.

Public Safety Features

The stormwater system has been designed to safely collect surface runoff from developed areas (as described on the Site Plan and Stormwater Report) by providing collections systems at regular intervals to prevent surface flooding and to treat that runoff in accordance with the provisions of the Massachusetts Stormwater Management Standards and Handbook.

PART 2: MISCELLANEOUS PROVISIONS

Good Housekeeping Controls

The following good housekeeping measures will be implemented in the day-to-day operation of the Development:

1. The site will be maintained in a neat and orderly manner.
2. Fertilizers and pesticide application on the lots shall be in accordance with this plan.
3. All waste materials from the development will be collected in dumpsters and removed from the site by properly licensed disposal companies.

Management of Deicing Chemicals and Snow

Management of on-site snow will be as follows:

1. The site shall be plowed as needed to maintain safe driving conditions. Snow will be stored in windrows along pavement edges and shall be piled in landscape strips as needed.
2. Snow will not be plowed into piles which block or obstruct stormwater management facilities.
3. Snow will not be plowed into piles at roadway intersections such that it would obstruct visibility for entering or exiting vehicles.
4. Deicing chemicals application will be as little as possible while provide a safe environment for vehicular operation and function.

Operator Training

The Operator is responsible for providing training for the staff that will be responsible for the implementation of this O&M Plan. Such training shall occur at least once annually.

Illicit Discharges

The Operator shall not allow non-stormwater discharges into the development's stormwater system. Any discovered non-stormwater discharges into the development's stormwater system shall be immediately disconnected.

Estimated Operations and Maintenance Budget

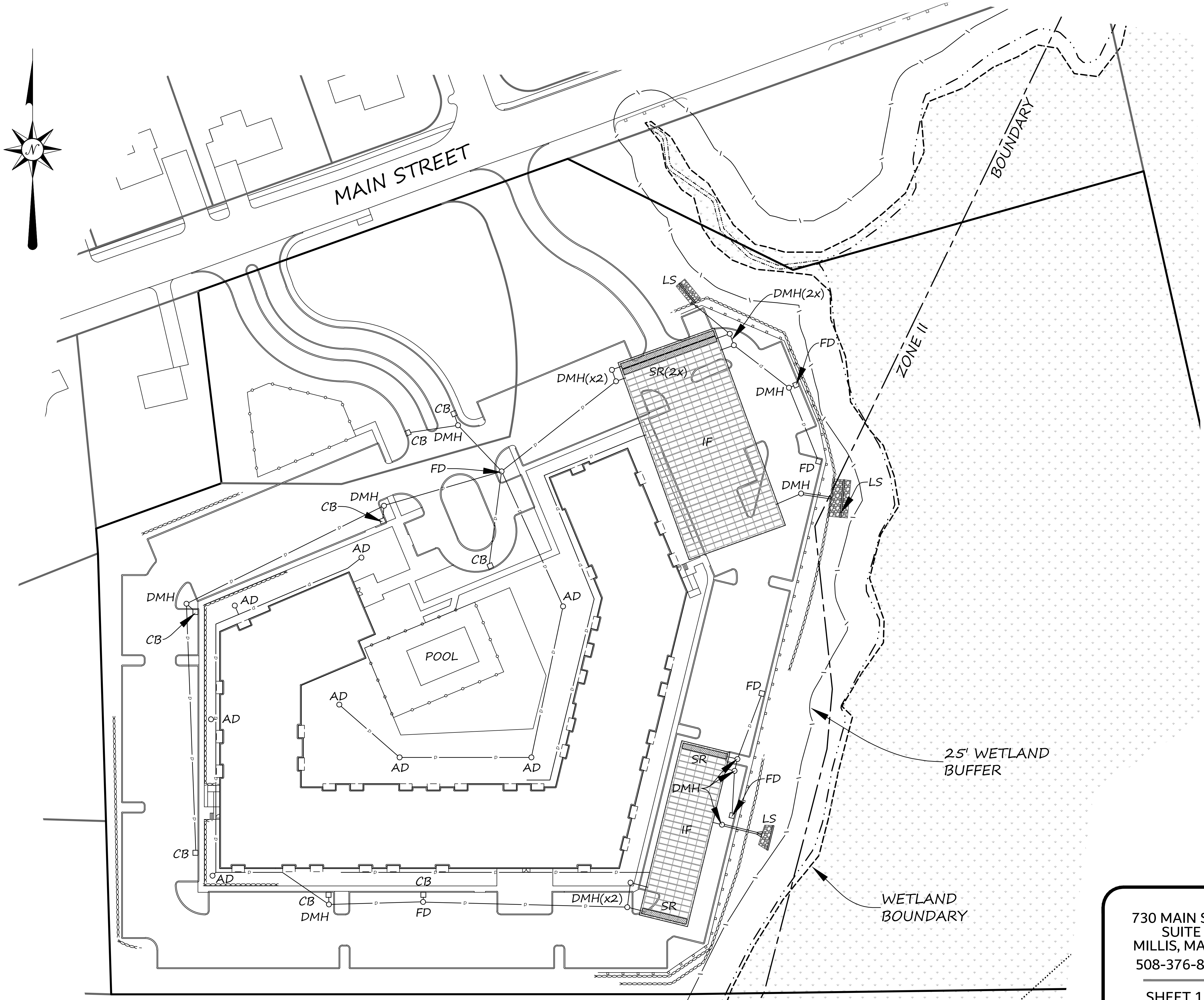
It is estimated that the regular annual maintenance tasks described herein will cost $5,000 per year (2019 value).

PART 3: ACCIDENTAL SPILL AND EMERGENCY RESPONSE PLAN

In the event of an accident within the boundaries of the Site, where significant gasoline or other petroleum products or other hazardous materials are released, the following procedure shall be followed in the order noted.

1. As quickly as possible, attempt to block the nearest stormwater catch basins if on a roadway, or if in proximity to wetlands, create a berm of soil downslope of the spill.
2. Immediately, and while the containment measures are implemented as described above, notify the following governmental entities and inform them of the type of spill that occurred:
   - Medway Fire Department at 911,
   - Medway Board of Health at 508-533-3206,
   - Medway Conservation Commission at 508-533-3292,
   - Mass. Department of Environmental Protection (DEP) Central Region at (508) 792-7650 (address is 8 New Bond Street, Worcester MA 01606), and
   - National Response Center (NRC) at (800) 424-8802 (for spills that require such notification pursuant to 40 CFR Part 110, 40 CFR Part 117, and 40 CR Part 302).
3. Once the various emergency response teams have arrived at the site and if the spill occurs on a lot, the owner shall follow the instructions of the various governmental entities, which may include the following:
   - A clean up firm may need to be immediately contacted.
   - If the hazardous materials have entered the stormwater system, portions of it may need to be cleaned and restored per the DEP. All such activities shall be as specified by the DEP.

EXHIBIT 1 STORMWATER FACILITIES SITE PLAN



LEGEND:

LS= LEVEL SPREADER
CB=CATCH BASIN
DMH= DRAIN MANHOLE
FD=FIRST DEFENSE UNIT
IF= INFILTRATION FIELD
SR=SEPARATOR ROW

PLAN SCALE: 1"=80"

0' 80' 160'

PLAN DATE: MARCH 26, 2019

REVISION	DATE	BY

39 MAIN STREET O&M PLAN OF LAND IN MEDWAY, MA

730 MAIN STREET
SUITE 2C
MILLIS, MA 02054
508-376-8883(o)

SHEET 1 OF 1

LEGACY ENGINEERING

EXHIBIT 2 STORMWATER SYSTEM OPERATIONS AND MAINTENANCE LOG FORM

Stormwater System Operations and Maintenance Log

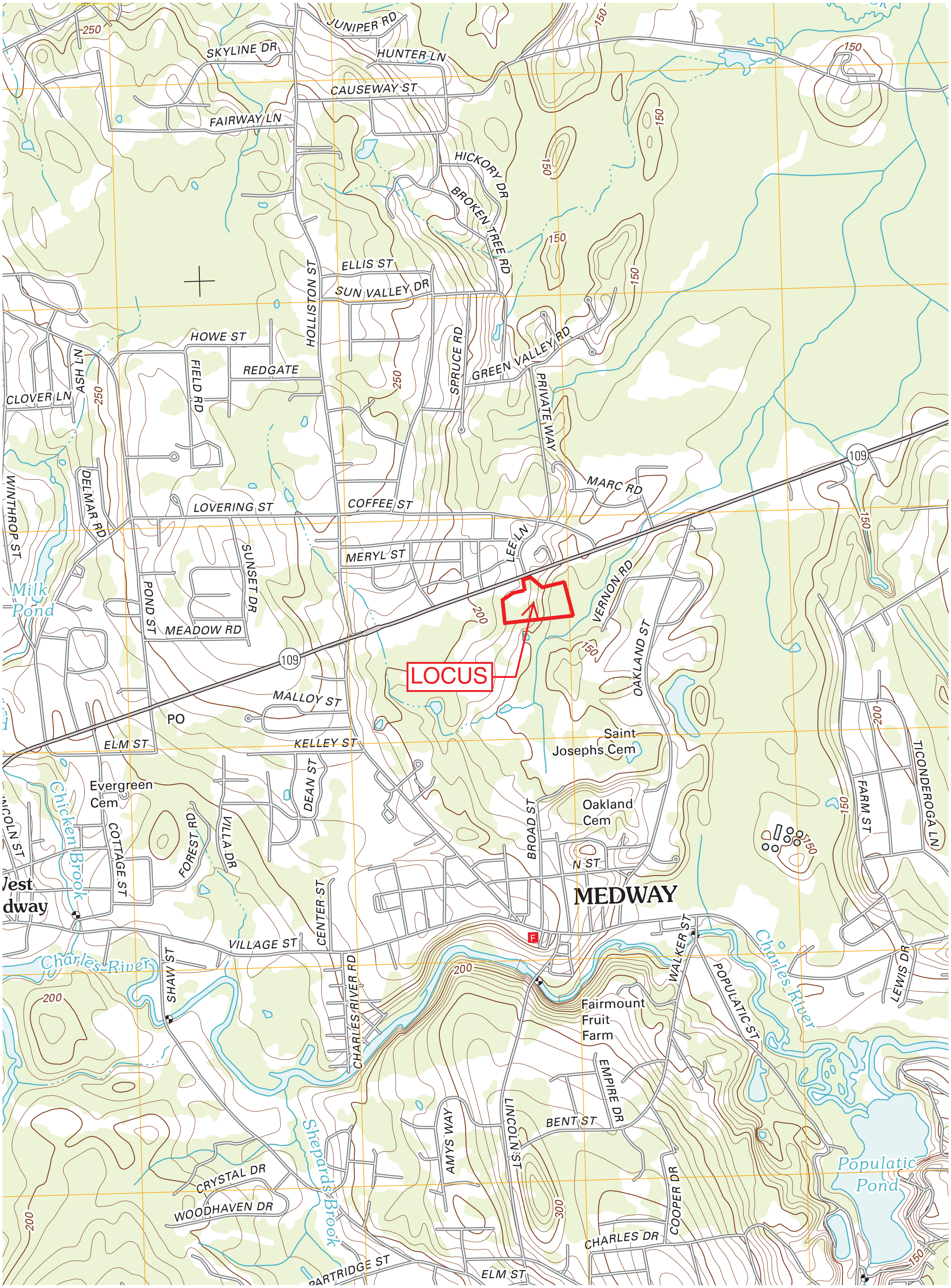
Year _______________

General Information	
Project Name	39 Main Street
Site Location	39 Main Street, Medway Ma, 02053
Inspector's Name	
Inspector's Title	
Inspector's Phone	
Signature of Operator at end of Year, Certifying that Work was Completed as Noted. Date:	

O&M Task Checklist

	O&M Activity	Date Completed	Notes/Comments
Deep Sump Catch Basins			
	1st Quarter Cleanout		
	2nd Quarter Cleanout		
	3rd Quarter Cleanout		
	4th Quarter Cleanout		
Underground infiltration Field			
	1st Annual Inspection		
	2nd Annual inspection		
	Sep. Row Cleaned?		
	System Repl. Req'd?		
First Defense Units			
	1st Inspection		
	2nd Inspection		
	Unit Cleaning		
Stormwater Pipes, Inlets and Outlets			
	1st Annual Inspection		
	2nd Annual inspection		

ATTACHMENT B: USGS Map



JUNIPER RD
SKYLINE DR
HUNTER LN
CAUSEWAY ST
FAIRWAY LN
HICKORY DR
BROKEN TREE RD
ELLIS ST
SUN VALLEY DR
HOLLISTON ST
HOWE ST
REDGATE
SPRUCE RD
GREEN VALLEY RD
PRIVATE WAY
CLOVER LN
ASH LN
FIELD RD
DELMAR RD
WINTHROP ST
LOVERING ST
COFFEE ST
MARC RD
109
MERYL ST
LEE LN
SUNSET DR
Milk Pond
POND ST
MEADOW RD
VERNON RD
OAKLAND ST
LOCUS
MALLOY ST
PO
ELM ST
KELLEY ST
Saint Josephs Cem
Evergreen Cem
Chicken Brook
DEAN ST
BROAD ST
Oakland Cem
FARM ST
TICONDEROGA LN
COTTAGE ST
FOREST RD
VILLA DR
N ST
West Medway
MEDWAY
CENTER ST
VILLAGE ST
WALKER ST
Charles River
SHAW ST
CHARLES RIVER RD
Fairmount Fruit Farm
POPULATIC ST
LEWIS DR
EMPIRE DR
AMYS WAY
BENT ST
LINCOLN ST
Shepards Brook
CRYSTAL DR
WOODHAVEN DR
COOPER DR
Populatic Pond
CHARLES DR
PARTRIDGE ST
ELM ST

ATTACHMENT C: Illicit Discharge Compliance Statement

ILLICIT DISCHARGE COMPLIANCE STATEMENT

39 Main Street
Medway, MA

This statement is provided in accordance with the provisions of the Massachusetts Stormwater Management Standard 10 and of the Massachusetts Stormwater Management Handbook.

Note the following:

- All stormwater management systems contain no connection to the site's wastewater sewer system or to any other non-stormwater collection system.
- Groundwater collection systems on the site are not connected to the site's wastewater sewer system or to any other non-stormwater collection system.
- The facility's Operations & Maintenance Plan is designed to prevent any discharge of non-stormwater to the drainage system.
- Any illicit discharges identified during or after construction will be immediately disconnected.

Date: March 26, 2019

ATTACHMENT D: Construction Activity NPDES Stormwater Pollution Prevention Plan

Stormwater Pollution Prevention Plan (SWPPP)

For a

Construction Activity

For

39 Main Street

MEDWAY MA, 02053

Proposed Residential Development

MARCH 26, 2019

PREPARED BY:
LEGACY ENGINEERING, LLC
Consulting Engineers
730 Main Street, Suite 2C
Millis, MA 02054

PREPARED FOR:
Strategic land ventures
257 Hillside Avenue
Needham, MA 02494

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CONTENTS

1.0 Project Description and Eligibility

This SWPPP is prepared in accordance with the requirements of the National Pollutant Discharge Elimination System (NPDES) 2017 Construction General Permit (CGP) for Discharges from Construction Activities, pursuant to the provisions of the Clean Water Act as amended by the Water Quality Act of 1987. The 2017 CGP became effective on February 16, 2017 and expires at midnight on February 16, 2022.

This SWPPP provides project-specific guidance and requirements for the proposed construction activity. Operators are, however, responsible to read, understand, and comply with all applicable requirements of the CGP, which is appended to this SWPPP.

1.1 Project Name

39 Main Street

1.2 Project Location

39 Main Street
Medway, MA 02053

1.3 Owner Name and Address

Strategic Land Ventures
257 Hillside Avenue
Needham, MA 02494

1.4 General Contractor/Operator Name and Address

Owner Operator:

Strategic Land Ventures
257 Hillside Avenue
Needham, MA 02494

Designation of Site Manager and Emergency Contact (person responsible for the day-to-day management of site operations): Geoff Engler, (or other individual as may be appointed by the Operator).

General Contractor/Operator:

(to be determined)

______________________ will have day-to-day operational control and responsibility of construction activities.

Designation of Site Manager (person responsible for the day-to-day management of site operations): <u>(to be determined)</u> or other individual as may be appointed by the Operator.

1.5 Stormwater Team

The stormwater team is identified in Appendix 10.5.

1.6 Associated Project Documents

This SWPPP references other documents as follows:

Site Plan - Plans entitled "39 Main Street Site Plan of Land" with an original date of March 26, 2019 (as may be amended), and prepared by Legacy Engineering, LLC, hereinafter referred to as the "Site Plan".

Stormwater Report – Report entitled "Stormwater Report for 39 Main Street Medway, MA 02053" prepared by Legacy Engineering, LLC with an original date of March 26, 2019 (as may be amended).

1.7 SWPPP Site Plan and Relation to Other Permits

Attached to this document is a SWPPP Site Plan which summarizes the various structural construction erosion control measures to be implemented during construction. Refer to the Site Plan for additional details and requirements. In the event that provisions of this SWPPP conflict with the requirements of the other permits obtained for the project, the requirements of the other permits will prevail unless such conformance will violate the provisions of the CGP. When such conflict is discovered, this SWPPP will be revised to reflect conformance with said permit.

1.8 Nature of Construction Activities

1. The project proposes the construction of a 4.5 story, 190 unit apartment building, including appurtenant parking lot, utility systems, stormwater management systems, and landscaping.
2. The total lot area of the development is approximately 12.3 acres.
3. The site is mostly wooded with a small grass field in the center of the site. The land in the easterly portion of the lot is wetlands along an unnamed tributary to Great Black Swamp.
4. The proposed construction activities will disturb approximately 6.7 acres in a single phase.
5. The only on-site construction support activities consist of minor areas of materials storage, which will vary in nature and location depending on the stage of construction.
6. Refer to Section 1.10 and Appendix 7.12 for a discussion of construction sequencing and schedule.
7. Refer to Attachment 10.10 for a list of pollutant generating activities, including materials inventories.
8. Construction activities are expected to occur Mondays through Saturday, 7:00 am through 6:00 pm.
9. This SWPPP is not for a public emergency.

1.9 Overall Phasing

The project will be constructed a single phase. Work is expected to commence in 2020 and to be completed by the end of 2021.

1.10 Major Activity Construction Sequence

1.10.1 Construction Sequence

- ✓ Install construction entrance and perimeter erosion controls;
- ✓ Locate existing utilities on and around the construction area;
- ✓ Demolish the existing dwelling and appurtenances;
- ✓ Clear and grub the development area;
- ✓ Grade the site;
- ✓ Install building foundation(s) and begin building construction;
- ✓ Install utilities including stormwater facilities;
- ✓ Complete stormwater facilities prior to paving the site
- ✓ Complete construction of new building(s), pave, and complete site landscaping;
- ✓ Temporary erosion controls will be installed as needed and as required by this Plan;
- ✓ Cleanout all catch basins in the portion of the site affected by construction activities after the site is fully stabilized.

1.11 Anticipated Discharges

The following discharges as authorized in the CGP are expected from the proposed construction and associated activities:

- ✓ Stormwater discharges associated with the proposed construction activity.
- ✓ Stormwater discharges from supporting activities such as equipment staging yards, material storage areas, excavated materials disposal areas, etc… directly related to the above noted construction activity.
- ✓ The following non-stormwater discharges, which are directly associated with the proposed large construction activity:
  - Fire hydrant flushing,
  - Waters used to wash vehicles when detergents are not used,
  - Water used to control dust in accordance with Part 3.1.B of the CGP,
  - Potable water including uncontaminated water line flushings,
  - Routine external building wash down that does not use detergents,
  - Pavement wash waters where detergents, spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed). Such wash waters may only be discharged to a surface water if it will first pass through a stormwater treatment BMP,
  - Uncontaminated air conditioning or compressor condensate,
  - Uncontaminated, non-turbid ground water or spring water,
  - Uncontaminated foundation or footing drains,
  - Treated dewatering water;
  - Landscape irrigation, and
  - Any other non-stormwater discharges otherwise allowed in the CGP

1.12 Anticipated Construction and Waste Materials

It is anticipated that the following materials will be present on the site during construction:

- ✓ Earthen materials such as dirt, gravel, crushed stone, loam, sand, fill, and other such substances.
- ✓ Asphalt and paving related materials.
- ✓ Utility piping, manholes, structures, and relative materials.

- ✓ Building materials typically involved in the construction of a residential building.
- ✓ Other typical construction materials.
- ✓ All such materials which are deemed potential pollutants shall be itemized in the log in Appendix 7.10. Potential pollutants include pesticides, fertilizers, plaster, cleaning solvents, glue/adhesives, curing compounds, wood preservatives, hydraulic oil/fluids, gasoline/diesel fuel, kerosene, antifreeze/coolant, sanitary facilities and other similar items.

Waste materials are expected to be limited to excess or discarded portions of the construction materials noted above.

1.13 Project Eligibility

The proposed construction activity is eligible to be permitted under the Construction General Permit for Massachusetts (CGP Permit No. MAR1200000) as the proposed activity will be completed in accordance with all requirements of the CGP.

The proposed construction activity is eligible to be permitted under the Construction General Permit for Massachusetts (CGP Permit No. MAR1200000) for the following reasons:

- ✓ The site will discharge construction-stage stormwater to be covered under the CGP.
- ✓ The parties listed are "operators" as defined in the CGP.
- ✓ The proposed work will disturb more than one acre of land.
- ✓ The EPA is the permitting authority for Massachusetts.
- ✓ As described in 1.9.1, the project meets one of the criteria related to the protection of species that are federally listed as endangered or threatened.
- ✓ The screening process related to the protection of historic properties has or will be completed.
- ✓ The site does not discharge to a Tier 2 water.
- ✓ No cationic treatment chemicals are proposed for use in sediment control.

1.13.1 Endangered Species

The proposed work is not likely to adversely affect ESA-listed species and/or designated critical habitats. Per the most recent NHESP data found on MassGIS, the site does not lie within, nor will it affect an area containing endangered species. Information from the U.S. Fish & Wildlife Service IPaC website indicates that the site may potentially affect one endangered species, the northern long-eared bat. We have therefore conducted a review and concluded the following:

- Per IPaC data, the site does not lie within a critical habitat for said species.
- NHESP mapping data indicates that this site is not a habitat area for said species.
- Stormwater discharges will be managed in accordance with applicable requirements and will therefore nor represent a hydrological or toxicity threat to the species of concern.

It is therefore concluded that the activity not likely to adversely affect an ESA-listed species and/or designated critical habitat.

1.13.2 Historic Properties

The proposed activity involves excavation for the installation of various stormwater management BMPs. To the best of our knowledge the site is not considered to be historically significant. There are no site features that suggest historical significance and the site is not listed on the National Register of Historic Places. Consequently, the proposed construction activity meets Appendix E of the CGP.

1.14 Coverage Dates

Coverage under the 2017 CGP terminates at the earliest of the following:

- ✓ The date a Notice of Termination is submitted to the EPA;
- ✓ Expiration of the 2017 CGP on February 16, 2022 (unless the CGP is temporarily extended or the subsequent replacement CGP automatically authorizes continuing coverage)
- ✓ In the event the construction activity extends beyond the termination date of the 2017 CGP, the Operator will be responsible for complying with the subsequent replacement CGP, including any applicability eligibility requirements.

1.15 Receiving Waters

Stormwater Runoff from the entire site will discharge to an unnamed tributary to the Great Black Swamp, which lies within the Charles River Watershed.

1.15.1 Impaired Waters

In accordance with Section 3.2 of the CGP, the following analysis is provided with respect to Impaired Waters:

- ➢ The unnamed tributary is not listed in the Massachusetts Year 2016 Integrated List of Waters.
- ➢ Section 3.2 of the CGP therefore does apply to this site. As such, inspection frequencies need not comply with section 4.3 of the CGP and stabilization completion deadlines comply with relevant portions of section 2.2.14 of the CGP.

1.15.2 Tier 2, 2,5 and 3 Waters

In accordance with Section 3.2 of the CGP, the following analysis is provided with respect to Tier 2, Tier 2,5, and Tier 3 waters.

- ➢ Tier 2 waters in Massachusetts are those waters designated as "High Quality Waters" on 314 CMR 4's associated watershed tables.
- ➢ Tier 2.5 waters in Massachusetts are those waters designated as Outstanding Resource Waters on the aforementioned watershed tables.
- ➢ To the best of our knowledge, there are no separate Tier 3 waters in Massachusetts.
- ➢ The unnamed tributary is not identified as a High Quality Water on the tables appended to 314 CMR 4.

1.15.3 TMDL Compliance

As of the date of this report, a review of the EPA's TMDL website (http://cfpub.epa.gov/npdes/stormwater/tmdl.cfm) concludes that there are TMDL's that apply to the town where this project is located. A summary of each and its relationship to the proposed construction activity are discussed below.

Northeast Regional Mercury Total Maximum Daily Load:

This TMDL is not exclusive to Massachusetts but rather applies to all of New England. It provides for a reduction in mercury concentrations within surface water bodies. The primary sources of mercury are wastewater (sewer) and atmospheric deposition. Page 27 of the October 24, 2007 "Northeast Regional Mercury Total Maximum Daily Load" report states "Because the majority of mercury in stormwater originates from atmospheric deposition, reductions of mercury loading in stormwater will be addressed through controls on atmospheric deposition." It is therefore concluded that this project is not required to implement any specific measure to comply with this TMDL.

Nutrient (Phosphorus) TMDL for the Upper/Middle Charles River:

This TMDL provides for a reduction in phosphorus discharges into the Charles River to reduce warm-weather eutrophication that regularly occurs. A review of the MassDEP implementation plan is available for this TMDL concludes that there are no specific numeric limitations or requirements for individual construction or development projects. Rather, the focus of the proposed implementation plan is in requiring additional regulation by local communities to control and reduce phosphorus generation. The primary impact of a project of this nature relative to phosphorus generation is stormwater generation. The Final TMDL recommends that local communities adopt stormwater management regulations/bylaws to ensure adequate treatment of stormwater runoff, thus reducing phosphorus loadings. The Town of Medway has implemented such regulations and this project is designed to be consistent with the local stormwater regulations, the DEP Stormwater Management Handbook, and the NPDES Construction General Permit. The Final TMDL also highly recommends a few specific BMP's for phosphorus reduction. One such approach is the use of infiltration facilities, which are highly effective at removing phosphorus as the phosphorus is almost eliminated through vegetation and soils contact as the water infiltrates downward. Data within the TMDL indicates that infiltration facilities designed to hold 1.0 inches of runoff from impervious surfaces, will remove more than 80% of the total annual phosphorus load from the site. Runoff from the site's impervious areas are routed to infiltration facilities designed to accommodate a minimum of 1-inches of runoff. Another focus of the Final TMDL is the elimination of illicit discharges, of which there are none within this project. It is therefore concluded that the proposed site design is consistent with the Nutrient TMDL for the Upper Charles River.

Nutrient (Phosphorus) TMDL for the Lower Charles River:

This TMDL is essentially the same as noted above for the Upper Charles River. For the same reasons as discussed above, it is therefore concluded that the proposed site design is consistent with the Nutrient TMDL for the Lower Charles River.

Pathogen TMDL for the Charles River Watershed:

This TMDL provides for reduction in pathogen concentrations in the Charles River watershed's impaired waterbody segments. A review of the EPA TMDL approval dated May 22, 2007 finds a reference to the requirement that projects of this nature implement stormwater BMP's consistent with the NPDES and other applicable regulations. The DEP has issued an implementation guide for this TMDL entitled "Mitigation Measures to Address Pathogen Pollution in Surface Water: A TMDL Implementation Guidance Manual for Massachusetts," which is the basis for the TMDL compliance assessment for this project. Pathogen sources within the Charles River watershed are numerous but many have no specific relation to this project such as combined-sewer overflows (CSO's), agricultural sources, and septic systems. For this project, the only significant potential source of pathogens is stormwater runoff. Stormwater runoff itself is not a source of pathogens. Rather, increases in the peak rate and volume of runoff from a site contribute to a potential increase in the amount of animal waste and other pathogen sources that can be washed into a waterbody. The DEP implementation guides reference the need for local communities to adopt local bylaws and regulations regulating stormwater runoff from both construction activities and post-construction site conditions. Medway has these regulations and the project has been designed accordingly. The DEP implementation guide also notes that infiltration facilities are perhaps the most effective pathogen removal BMP as the pathogens are removed through vegetation contact and by movement through the soil matrix. It is therefore concluded that the project is consistent with the TMDL for pathogens.

1.16 Site Notice & SWPPP Accessibility

A notice will be posted conspicuously near the main entrance of the site adjacent to a public road or right-of-way. It will denote the following:

1. That this site is permitted under the NPDES Construction General Permit No. MAR1200000 and shall include the NPDES Permit tracking number.
2. A contact name and phone number for obtaining additional site information.
3. A URL where the SWPPP is posted or the following statement "If you would like to obtain a copy of the Stormwater Pollution Prevention Plan (SWPPP) for this site, contact the EPA Regional Office at https://www.epa.gov/aboutepa/epa-region-1-new-england.
4. The following statement "If you observe indicators of stormwater pollutants in the discharge or in the receiving waterbody, contact the EPA through the following website: https://www.epa.gov/enforcement/report-environmental-violations.

The site notice must use fonts large enough to be readily viewed from the adjacent public right-of-way.

This Plan will be kept on-site at all times except where not practical. The Plan will be easily available to Approving Authority inspectors during normal working hours for the construction site.

2.0 Stormwater Controls

2.1 Project Limits and General Control Considerations

The site boundaries are shown on the Site Plan. Construction activities will be limited only to those areas necessary for site construction and no soil disturbance will occur downstream of the limits of erosion controls on the site. The proposed area of disturbance in Phase is 6.7 acres, and therefore does not the disturb more than 10 acres of land that drain to a single point. Furthermore, the limit of work along downstream wetlands buffer areas span some 800 linear feet with no concentration points. As such, there is no requirement for a construction sedimentation basin and none will be used unless construction conditions dictate otherwise. Stormwater runoff shall not be directed to the proposed stormwater infiltration basin until the sideslopes and bottom of the basin are vegetated. Perimeter erosion controls are provided to prevent eroded materials from leaving the site. The construction sequence has been proposed in such a way as to minimize the amount of time that disturbed soils will be exposed to weather. The soils on the disturbed area of the site are Class A and B, which will generate minimal amounts of runoff during construction. Temporary sediment basins will be implemented if needed during construction.

2.2 Natural Buffers or Equivalent Sediment Controls

The site is bounded to the east by bordering vegetated wetlands which flank an unnamed tributary. No work is proposed within 50 feet of a waterbody or waterway. Thus, a minimum 50' wide natural buffer will be maintained around the nearest of such features. Perimeter erosion controls will be provided as specified herein.

Site runoff through construction will be directed through vegetated buffer areas and perimeter erosion controls to maximize stormwater infiltration and filtering to reduce pollutant discharge.

2.3 Perimeter Erosion and Sediment Controls

Perimeter erosion and sediment control barriers will be provided, installed, and maintained downstream of all proposed construction activities in accordance with this Plan, the Site Plan, and all permits issued for the site development. Such controls must be installed before any earth-disturbing activities occur on the site in question. Erosion and sediment controls may be installed in phases so long as it precedes any earth-disturbing activities within the controls' upstream watershed.

The proposed single layer of perimeter erosion controls will provide adequate protection.

Sediment shall be removed along such controls on a regular basis. In no case, shall sediment be allowed to reach a depth equal to one half of the above ground height of the erosion control device.

2.4 Site Access Controls

Construction vehicles will use designated entry points for each site. Crushed stone or rip-rap entry apron(s) will be installed and properly maintained during construction until the site is paved. All construction access will be via Main Street. In the vicinity of the site, Main Street will be kept clean and swept as needed to minimize the tracking of soils and dust from the site.

2.5 Stockpiled Soils

Soil stockpiles to be left in place more than 24 hours shall be surrounded with a line of silt fence to prevent the piles from eroding into the site and to discourage on-site runoff from eroding the stockpiles. Soil stockpiles to be left in place more than 14 days shall be stabilized temporarily in accordance with this plan. Dust control measures shall be implemented to prevent wind erosion of the stockpiles.

2.6 Dust Control

Dust control measures will be implemented regularly to prevent the off-site deposition of wind-eroded soils. The principal form of dust control will be water application.

2.7 Disturbance of Steep Slopes

Contractors must pay careful attention to steep slopes and must implement additional temporary erosion and sediment control measures during work on steep slopes to prevent erosion.

2.8 Topsoil Preservation

Topsoil generated from the site construction activities must either be stockpiled for reuse on site in accordance with the practices noted above, or shall be removed from the site for reuse on other sites. Topsoil may not be mixed with general fill.

2.9 Soil Compaction

Areas designated for final vegetative surfaces or construction-stage or final stormwater infiltration practices shall be protected from excessive compaction by restricting vehicle access and the types of equipment that may be used in such areas. Prior to seeding/planting of such areas, exposed soil that has been compacted shall be loosened by tilling or other similar methods. Conditioning shall consist of deep tilling with a rotary tiller, disc harrowing, or manual loosening and re-grading with an excavator bucket. Conditioning shall extend to a depth of at least 12-inches.

2.10 Protection of Storm Drain Inlets

All storm drain system inlets inside of perimeter controls shall be protected with sediment control measures designed to remove sediment from stormwater prior to entering the inlet. Catch basins along the street frontage shall also be protected.

Such measures shall be periodically maintained and replaced as needed to ensure their proper functionality. Sediment shall be removed daily where found.

2.11 Protection of Channels and Discharge Points

Areas of concentrated stormwater discharge points such as swales, channels, and pipe outfalls shall incorporate velocity mitigation controls. Channels and swales shall implement temporary check dams constructed of straw bales of crushed stone berms. Discharge points shall be protected with temporary rip-rap aprons to dissipate the energy and velocity of stormwater flows.

2.12 Construction Stage Sediment Traps/Basins

Due to the size of this project and the decentralized nature of runoff patterns, sediment traps are not expected to be needed. Should construction conditions dictate otherwise, this SWPPP shall be updated to incorporate properly designed sediment trap(s).

2.13 Treatment Chemicals

There is no planned use of polymers, flocculants, or other erosion and sediment-control related treatment chemicals at this site.

2.14 Temporary Stabilization

Where construction activities have permanently ceased or where they have temporarily ceases for a period of more than 14 days, temporary soil stabilization measures will be employed in the affected areas in accordance with the following schedule:

- For disturbed areas less than 5 acres: as soon as practicable but no later than 14 calendar days after stabilization has been initiated.
- For disturbed areas larger than 5 acres and for site discharging to sediment- or nutrient-impaired waters: as soon as practicable but no later than 7 calendar days after stabilization has been initiated.

Such stabilization measures will consist of either erosion control mats or seeding. Where seeded for temporary erosion control purposes, a minimum of 6 pounds per 1,000 square feet of seed will be applied along with an appropriate fertilizer (based on the time of year applied) or as necessary to obtain a 70% vegetative cover. Additional seeding will be completed if needed and periodic watering will also be employed if necessary. Where stabilization by the 14th day is precluded by snow cover, frozen ground conditions, or other similar circumstances, stabilization measures will be initiated as soon as practicable.

Areas which are to ultimately be stabilized with pavement or other structural measures will be temporarily stabilized (when construction activities cease for more than 14 days), with crushed stone or a compacted gravel sub-base. Such temporary stabilization measures will be maintained in good condition.

2.15 Maintenance of Erosion & Sediment Control Measures

Erosion and sediment control measures will be maintained in good condition for the duration of the construction activity and until such time as the upstream areas achieve final stabilization as described herein. Sediment will be removed along haybales, silt fence, or filter socks when the depth exceeds four-inches. All control measures will be maintained in effective operating condition. If site inspections identify control measures that are not operating effectively or finds other problems, the Operator must:

- ✓ Initiate work to correct the problem immediately upon discovery and complete the work by the close of the next work day if the problem can be corrected through routine maintenance;
- ✓ For more significant repairs or where inspections determine that additional erosion and sediment controls are needed, such work must be completed and operation no later than 7 calendar days after discovery of the problem.

2.16 Pollution Prevention (Good Housekeeping Practices)

2.16.1 Construction Staging Areas

Construction staging areas will be limited in quantity and will be maintained in a neat and orderly fashion. Refer to the Site Plan for staging area location(s).

2.16.2 Vehicle Storage, Fueling and Maintenance Area

The Operator will designate a specific area of the site for fueling and overnight storage of vehicles on the site. Such area shall be located as far from wetlands areas and stormwater inlets as practicable and outside of the 100' buffer zone. Refer to the Site Plan for vehicle storage area location(s).

All equipment stored on-site will be monitored for leaks and will receive regular preventative maintenance to reduce the chance of leakage. Where vehicle leaks are identified, drip pans and absorbent pads shall be employed until the leak can be repaired, which shall be completed as soon as practicable. The Operator will maintain a bag of chemical sorbent, absorbent pads and an emergency spill kit on the site at all times within one of the designated Staging Areas. A sign shall be posted at the entrance to each Staging Area noting the location of the emergency spill kit. Spill kits shall include the following at a minimum.

- o Universal chemical sorbent capable of absorbing up to 15 gallons of liquid.
- o Gloves and safety glasses,
- o Four chemical socks,
- o Four chemical pads,
- o Four chemical pillows, and
- o Four plastic disposal bags.

2.16.3 Equipment Washing

Vehicle or equipment washing is not allowed on-site.

2.16.4 Building Products, Materials and Wastes

- ✓ The site will be maintained in a neat and orderly manner, with debris regularly disposed of.
- ✓ All products and materials stored on-site will be stored in a neat and orderly manner in appropriate containers. Building materials must be stored under cover (i.e. under a roof or under plastic sheeting) to prevent contact with rainwater.
- ✓ Manufacturer recommendations relative to the proper storage, use, and disposal of products and materials will be followed.

- ✓ An effort will be made to minimize the on-site storage of excess construction materials. In all cases, materials will be removed from the site if unused for more than three months.
- ✓ When use of products and materials have been completed, any excess products and materials will be promptly removed from the site and/or properly disposed of in accordance with all applicable state and federal regulations.
- ✓ All equipment to be stored on-site will be stored in a neat and orderly manner and such equipment will only be stored in the designated equipment Staging Areas on the site.

2.16.5 Fertilizer, Pesticide, Herbicide, or Insecticide Storage

Such materials may not be stored on-site and shall only be brought on-site in the quantities needed for application. Application shall be in accordance with manufacturer recommendation. Disposal of excess products shall follow local, state and federal law.

2.16.7 Petroleum and Other Chemical Products Storage

- ✓ Petroleum products may only be stored on-site in the limited quantities necessary for the ongoing work.
- ✓ All petroleum products will be stored in tightly sealed containers in one of the designated Staging Areas on the site and must be covered to prevent contact with rainwater.
- ✓ All paint and other hazardous materials containers will be stored in a tightly sealed container whenever not in use and stored under cover. Any waste and/or excess for these products will be disposed of off-site in accordance with all applicable state and federal regulations.

2.16.8 Hazardous Products and Hazardous Waste

- ✓ The use of hazardous products during construction will be in accordance with manufacturer recommendations and established construction practices.
- ✓ Hazardous materials must be stored in a separately designated area, under cover, and within secondary storage containers designed to hold at least 110% of the volume of the substance in question.
- ✓ Hazardous products will be kept in their original containers until they are used, and the container labels will be kept on-site within a designated Staging Area until use of the product is no longer needed.
- ✓ Unused quantities of hazardous products will be removed from the site in accordance with all applicable state and federal regulations.
- ✓ Hazardous waste materials generated by the construction (if any) will be disposed of off-site in accordance with all applicable state and federal regulations pertaining to such disposal. The Site Manager will be informed of these requirements and will ensure that this provision is adhered to.
- ✓ Any spills of hazardous materials found on the site will be cleaned up immediately using dry-cleanup procedures and reported in accordance with procedures established by local, state, and federal regulations. Washdowns of spill areas is prohibited.
- ✓ The Site Manager will be properly trained in hazardous materials spill prevention and clean-up.

2.16.9 Construction and Domestic Waste

- ✓ All waste materials from the site will be collected in dumpsters and disposed of off-site in accordance with all applicable state and federal regulations. The dumpster will be emptied as needed and the Operator will ensure that trash collection does not accumulate outside the dumpster. Trash and debris will be collected at least once per working day.
- ✓ The Operator will keep a portable toilet on the site for the use of work personnel and shall dispose of the waste materials in accordance with local, state, and federal regulations.

2.16.10 Materials/Tools Washing

- ✓ Any such wash water shall be directed into a leak-proof container and disposed of off-site in accordance with local, state and federal regulations.
- ✓ Concrete trucks will only wash out or dump surplus concrete within areas designated by the Operator on the site in designated depressions to prevent uncontrolled migration of such materials. All such surplus concrete will be cleaned-up by crushing the concrete and either re-using it in the construction activities or by removing it from the site.
- ✓ Wash waters from concrete or stucco applications, or from paint brushes or other similar activities must be directed into a leak-proof container or pit designed to prevent overflows due to precipitation. Accumulated wastewater must be disposed of in accordance with all local, state, and federal regulations to the extent it is deemed hazardous. Washwater generating activities must be conducted as far away from wetlands areas and storm drain inlets as possible.

2.16.11 Fertilizer Application

- ✓ Fertilizer shall be applied in accordance with the rates specified herein and in no case more than stipulated in the manufacturer's specifications.
- ✓ To the extent practicable, apply fertilizers in optimal seasons to maximize vegetation uptake and growth.
- ✓ Avoid applying fertilizers before heavy rains are expected and never apply to frozen ground or during winter conditions.
- ✓ Fertilizer may not be used in stormwater BMPs unless the BMP discharges to upland areas and unless the BMP is an infiltration practice.
- ✓ Fertilizers are not to be applied within buffer zones or within the Zone II for drinking water.

2.16.12 Spill Prevention and Response

(This portion of the document is written as if giving instructions to parties working on the property and/or the owner of the property)

In the event of an accident where significant gasoline or other petroleum products are released, the following procedure shall be followed in the order noted.

- ✓ Seek to contain the spill by constructing a berm of earthen or other materials around the spill site until the appropriate emergency response personnel has arrived. Seek to seal off any downstream stormwater facilities by earthen berms or the emergency spill kit materials.
- ✓ Immediately notify the following governmental entities and inform them of the type of spill that occurred:

- Medway Fire Department at 911,
- Medway Board of Health at 508-533-3206,
- Medway Conservation Commission at 508-533-3292,
- Mass. Department of Environmental Protection (DEP) Central Region at (508) 792-7650 (address is 20 Riverside Drive, Lakeville, MA 02347), and
- National Response Center (NRC) at (800) 424-8802 (for spills that require such notification pursuant to 40 CFR Part 110, 40 CFR Part 117, and 40 CR Part 302).

✓ Once the various emergency response teams have arrived at the site, the owner shall follow the instructions of the various governmental entities, which may include the following:
  - A clean up firm may need to be immediately contacted.
  - If the materials have remained trapped in the catch basins or proprietary stormwater treatment units, then these structures may be pumped out. All materials shall be removed by qualified personnel and disposed of in accordance with all applicable local, state, and federal regulations.

2.17 Dewatering Practices

This site is not expected to encounter significant quantities of groundwater during construction activities but if it does, the following practices will be implemented:

✓ Do not discharge any floating solids or foam;

✓ If dewatering water is found to contain oil, grease, etc… it must be filtered or passed through an oil/water separator prior to discharge;

✓ Wherever possible, discharge dewatering water to vegetated upland areas for infiltration. Where this is not possible, discharge dewatering water into a filtering pit consisting of a perimeter of double rows of haybales lined with three layers of filter fabric. Do not direct dewatering water into wetlands without prior treatment;

✓ Velocity dissipation measures must be included at all discharge points (rip-rap or crushed stone apron).

2.18 Infiltration Systems

The proposed construction-stage stormwater controls do not include any underground stormwater infiltration BMPs.

3.0 INSPECTIONS

3.1 Inspection Frequency

The Operator will designate an inspector or inspectors, who shall be a "qualified person" as defined in the CGP and will familiarize himself/herself with the design plans, with the CGP, and with the specifications of this SWPPP. The inspector will inspect the site for compliance with this Plan at least once every seven calendar days or once every fourteen calendar days and within 24 hours of the occurrence of a storm event of 0.25 inches or greater for the entire duration of construction, except as otherwise noted herein. The site does not discharge to a sediment or nutrient impaired water. Refer to CGP for additional inspection requirements.

Inspections may be reduced to twice per month in the first month, and thereafter once per month, in areas that have been temporarily stabilized or to areas that have achieved final stabilization. Wherever work within temporarily stabilized areas resumes, inspections shall be at the normal frequency specified above.

Should construction span a winter season, inspection may cease so long as the ground is frozen, all disturbed areas have been stabilized and construction is not continuing during the frozen conditions. In such case, inspections will resume one month before expected thaw of soil on the site. In areas where work will proceed through frozen ground conditions, inspections may be monthly until the area thaws or until rainfall is expected, whichever occurs earlier.

Once specific areas have received final stabilization, no further inspections are necessary for that area.

3.2 Inspection Areas

The Inspector will inspect all areas that have been cleared, graded, or excavated and which have not yet been stabilized; all stormwater controls including erosion and sediment controls; all equipment, materials, or waste storage areas; all areas where stormwater typically flows on the site; all areas where stormwater discharges from the site; and all areas where stabilization measures have been implemented.

3.2 Scope of Inspection

The inspection will review the following, at a minimum:

- ✓ Ensure that all snow fence lines (to be orange color) are vertical and strung securely between stakes;
- ✓ Ensure that all silt fence lines are vertical and strung securely between stakes and have no tears;
- ✓ Ensure that straw bales are not buried;
- ✓ Ensure that filter socks are not buried;
- ✓ Ensure that sediment accumulation along erosion controls does not exceed amounts specified above;
- ✓ Ensure that sediment accumulation within existing catch basins are not excessive and that sediment is removed when the depth of accumulation exceeds two feet or 50% of the sump depth, whichever is less;
- ✓ Ensure that un-stabilized areas during active construction activities are not eroding unduly;
- ✓ Ensure that slopes on the construction site are not eroding unduly;
- ✓ Ensure that drainage swales and drainage basins (once constructed) are functioning properly during construction;
- ✓ Ensure that areas where construction activities cease for more than 7 days are temporarily stabilized as specified herein;
- ✓ Ensure that temporary and permanent stabilization measures are thorough and complete and that there are no unprotected or deficient areas;
- ✓ Ensure that the point of vehicular entry into the site is not resulting in soils being tracked into the adjacent street;
- ✓ Care will be taken to determine if pollutants are leaving the site via either overland runoff or entrance into the municipal stormwater system;

- ✓ Determine if pollutants are passing erosion prevention measures and determine whether such issue will result in adverse downstream impacts, in which case additional measures shall be installed as required herein;
- ✓ Identify any areas where new or modified stormwater, sediment and erosion controls are needed;
- ✓ Check for the presence of conditions that could lead to leaks, spills or other accumulations of pollutants on the site;
- ✓ Identify and document all instances of non-compliance; and
- ✓ If a discharge from the property is identified: specify the location, document the visual quality of the discharge including color, odor, floating, settled, or suspended solids, foam, oil sheen or other obvious indicators of stormwater pollutants; and documents the effectiveness and any needed improvements to stormwater controls on the site.

All deficiencies will be remedied immediately and no later than seven days after discovery of the deficiency, and if possible, prior to the next anticipated rainfall event, if that event is anticipated to occur sooner than seven days. In addition, this Plan will be updated if needed, upon the documentation of a deficiency. The inspector will complete an inspection report after each site inspection and will provide a copy of this report to the Operator, who will keep the reports on-file. The inspection reports will at a minimum, contain the following information:

- ✓ The inspection date,
- ✓ Name, title, and qualifications of personnel conducting the inspection,
- ✓ Weather information for the period since the last inspection, including an estimate of the beginning time, duration, and rainfall quantity for any rainfall events since the last inspection,
- ✓ Weather information for the time of the inspection,
- ✓ Location of discharges of sediment or pollution from the site, if any are discovered during the inspection,
- ✓ Location of Controls (identified below) that need to be maintained,
- ✓ Location of Controls (identified below) that have failed to perform adequately, and which need redesign or improvement, and
- ✓ Location where additional Controls (not originally designed) need to be provided (if any).
- ✓ The report must identify any discovered incidents of non-compliance, and if none are found, a certification that the site is in compliance with this Plan. The report must be signed by the Inspector and the Operator as identified above.

4.0 Corrective Actions

Any corrective actions (spills, repairs of stormwater controls, replacement of stormwater controls, installation of new stormwater controls, etc…) must be completed within seven calendar days of the first deficiency observation. A log report must be prepared for each corrective action in accordance with the requirements of the CGP and appended to this SWPPP.

5.0 PERSONNEL TRAINING AND RECORDING KEEPING

5.1 Personnel Training

Inspectors and personnel who are responsible for taking corrective action or for designing, installing, maintaining or repairing stormwater controls, must be trained. Each such person must receive sufficient training such that they understand the requirements of the SWPPP and CGP and the scope of their responsibilities pursuant to these documents. Training will include a thorough description of the location of stormwater controls, the design function of stormwater controls, requirements for inspections and corrective action, and proper procedures to follow when implementing the requirements of the CGP and SWPPP.

5.2 Records

In addition to the inspection reports required herein, the Operator shall keep a record of:

- ✓ Dates when grading occurred,
- ✓ Dates when construction activities temporarily or permanently cease on any portion of the site, and
- ✓ Dates when stabilization measures are installed.

Inspection reports shall be copied to the Town's Conservation Agent.

5.3 Retention of Records

This SWPPP along with the NOI, acknowledgement letter from the EPA, all correspondence, inspection reports, records, and supporting data for this Notice of Intent will be kept for at least three years from the date of termination of coverage under the CGP.

5.4 Updating This SWPPP

This SWPPP will be updated as needed during the construction process to reflect changes in design, construction methodology, operation, maintenance, or other factors that may affect the discharge of stormwater and/or pollutants off the site during construction.

6.0 Certifications

I certify under the 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 contained therein. 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 have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed: ____
(Signature)

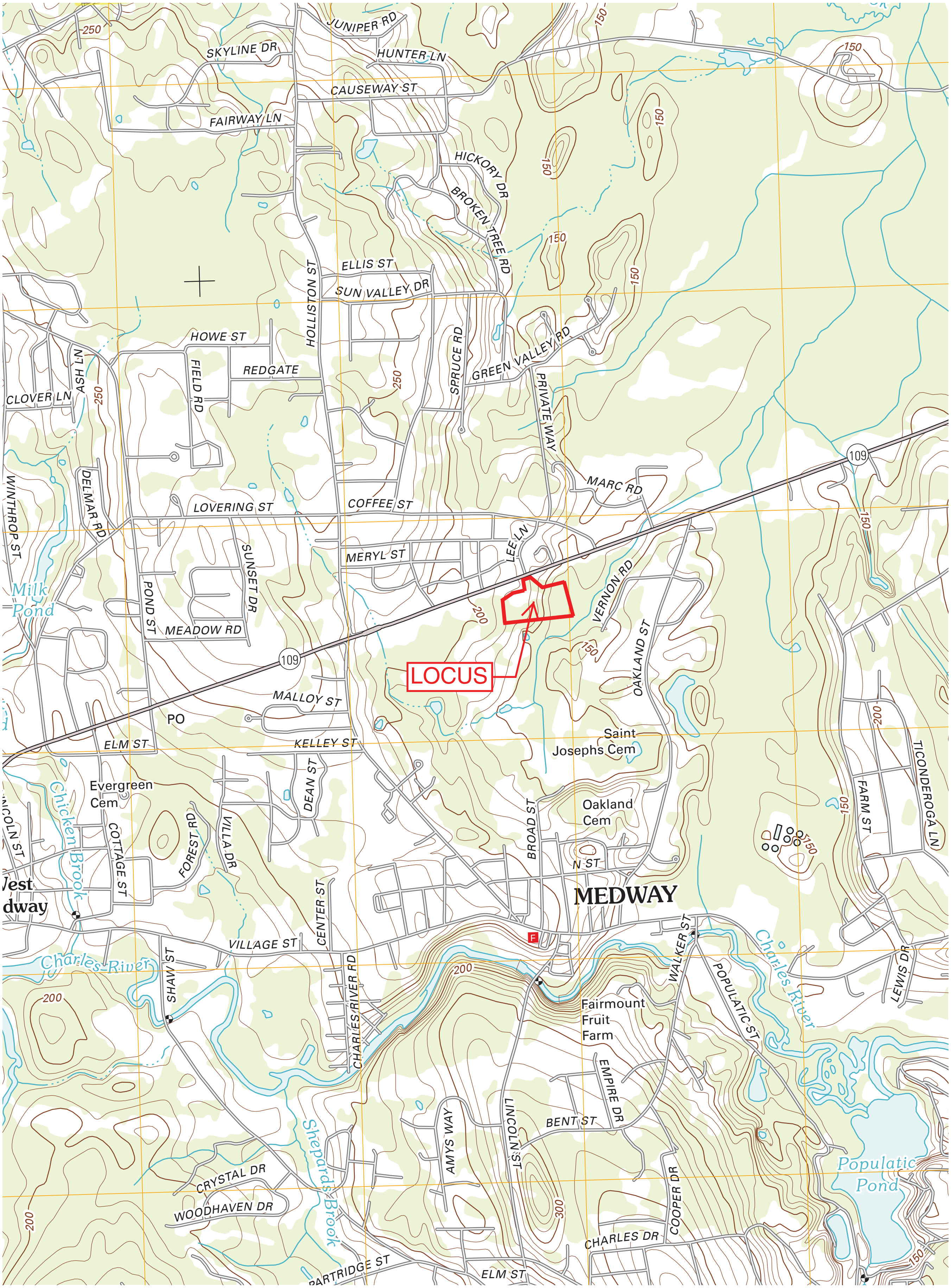
Date: ___________________________________

Signed: ____
(Signature)

Date: ___________________________________

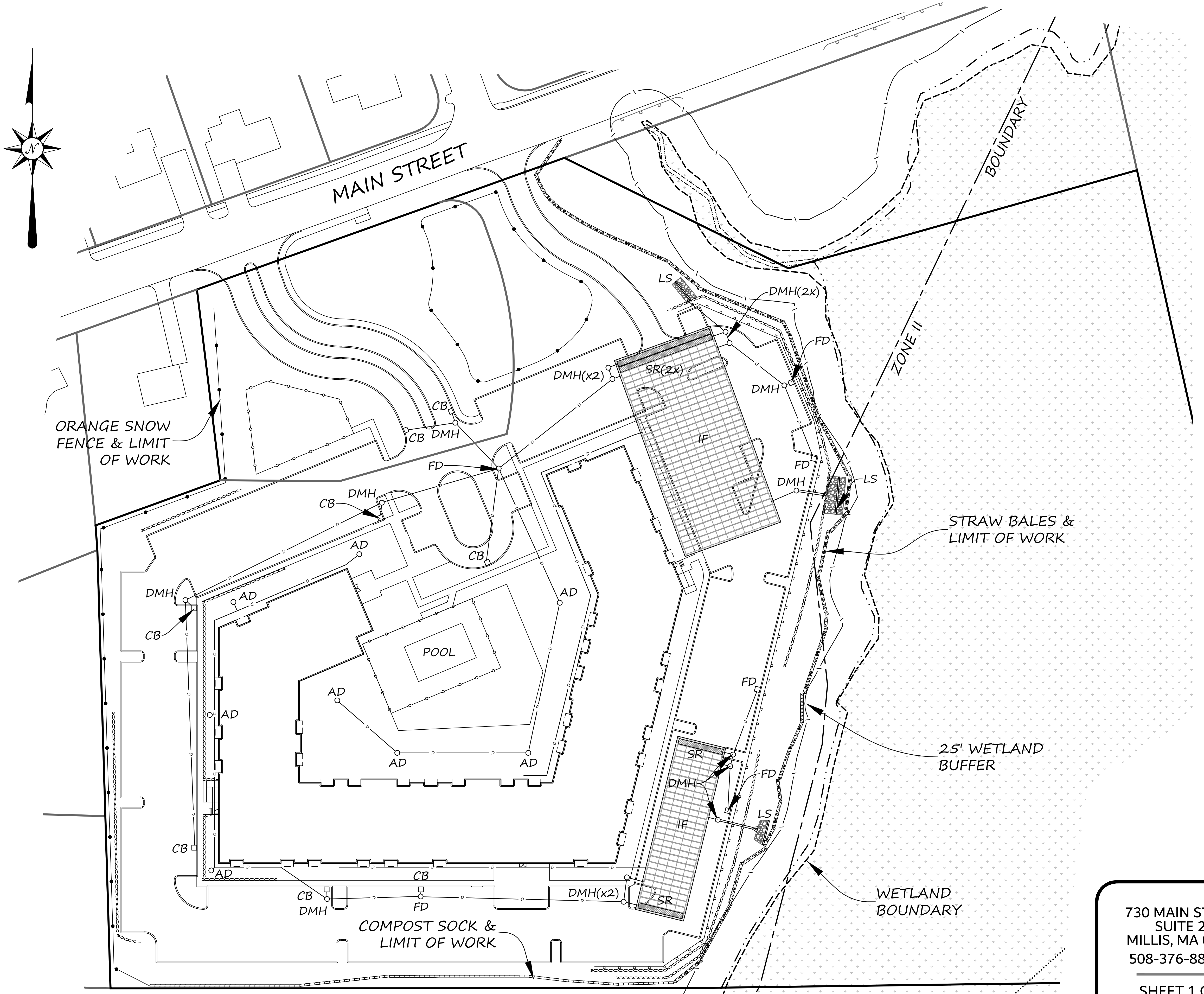
7.0 Appendices

Appendix 7.1
USGS MAP



LOCUS
MEDWAY
West Medway
JUNIPER RD
SKYLINE DR
HUNTER LN
CAUSEWAY ST
FAIRWAY LN
HICKORY DR
BROKEN TREE RD
ELLIS ST
SUN VALLEY DR
HOLLISTON ST
HOWE ST
REDGATE
FIELD RD
ASH LN
CLOVER LN
SPRUCE RD
GREEN VALLEY RD
PRIVATE WAY
MARC RD
DELMAR RD
WINTHROP ST
LOVERING ST
COFFEE ST
MERYL ST
LEE LN
SUNSET DR
POND ST
MEADOW RD
Milk Pond
VERNON RD
OAKLAND ST
MALLOY ST
KELLEY ST
ELM ST
PO
Saint Josephs Cem
Evergreen Cem
Chicken Brook
COTTAGE ST
FOREST RD
VILLA DR
DEAN ST
BROAD ST
Oakland Cem
N ST
CENTER ST
VILLAGE ST
Charles River
SHAW ST
CHARLES RIVER RD
WALKER ST
POPULATIC ST
Fairmount Fruit Farm
EMPIRE DR
BENT ST
LINCOLN ST
AMYS WAY
CRYSTAL DR
WOODHAVEN DR
Shepards Brook
COOPER DR
CHARLES DR
PARTRIDGE ST
ELM ST
Populatic Pond
FARM ST
TICONDEROGA LN
LEWIS DR
109
250
200
150
300

Appendix 7.2
SWPPP SITE PLAN



LEGEND:

LS= LEVEL SPREADER
CB=CATCH BASIN
DMH= DRAIN MANHOLE
FD=FIRST DEFENSE UNIT
IF= INFILTRATION FIELD
SR=SEPARATOR ROW

PLAN SCALE: 1"=80'

0' 80' 160'

PLAN DATE: MARCH 26, 2019

REVISION	DATE	BY

39 MAIN STREET SWPPP PLAN OF LAND IN MEDWAY, MA

730 MAIN STREET
SUITE 2C
MILLIS, MA 02054
508-376-8883(o)

SHEET 1 OF 1

LEGACY ENGINEERING

Appendix 7.3
CONSTRUCTION GENERAL PERMIT (CGP)

(TO BE ADDED AT TIME OF CONSTRUCTION)

Appendix 7.4
NOTICE OF INTENT
(TO BE ADDED AT TIME OF CONSTRUCTION)

Appendix 7.5
STORMWATER TEAM
(TO BE FINALIZED AT TIME OF CONSTRUCTION)

Stormwater Team

Operator #1 Stormwater Team

Owner/Operator Name: Strategic Land Ventures

Stormwater Team

	Team Member	Responsibility
1	SWPPP Preparer: Legacy Engineering, LLC	Preparing and modifying SWPPP
2	SWPPP Compliance & Oversight: Geoff Engler	General oversight of compliance with SWPPP & CGP
3	Qualified Inspector: Operator 2 to perform Inspections: T.B.D.	Performing Site Inspections
4	Construction Manager: Operator 2 to provide construction management: T.B.D.	Overseeing the installation & maintenance of all stormwater and erosion controls throughout construction. Day-to-day responsibility for compliance with the SWPPP and CGP

Operator #2 Stormwater Team

Construction Operator Name:

Stormwater Team

	Team Member	Responsibility
1	SWPPP Preparer: Legacy Engineering, LLC	Preparing and modifying SWPPP
2	SWPPP Compliance & Oversight: T.B.D.	General oversight of compliance with SWPPP & CGP
3	Qualified Inspector: T.B.D.	Performing Site Inspections
4	Construction Manager: T.B.D.	Overseeing the installation & maintenance of all stormwater and erosion controls throughout construction. Day-to-day responsibility for compliance with the SWPPP and CGP

Appendix 7.6
INSPECTION REPORTS
(To be added as they are generated)

Stormwater Construction Site Inspection Report

General Information			
Project Name	39 Main Street		
NPDES Tracking No.	MAR___________	Location	39 Main Street, Medway MA, 02053
Date of Site Inspection		Start/End Time	
Inspector's Name(s) and Qualifications			
Inspector's Title(s)			
Inspector's Contact Information			
Describe present phase of construction			
Type of Inspection ("Storm" = any rainfall event of 0.25 inches or more) ❑ Regular 14-day Inspection ❑ Pre-storm event ❑ During storm event ❑ Post-storm event			
Weather Information			
Has it rained since the last inspection? ❑Yes ❑No If yes, provide: Storm Start Date & Time: Storm Duration (hrs): Approximate Rainfall (in):			
Weather at time of this inspection?			
Do you suspect that discharges may have occurred since the last inspection? ❑Yes ❑No			
Is it safe to perform the required inspection? If no, indicate why and where these limitations apply ❑Yes ❑No			

Site-specific BMPs Inspection Checklist

	BMP Description	BMP Installed and Operating Properly?	Corrective Action Needed	Date for corrective action/responsible person
1	Entrance Aprons	❑Yes ❑No		
2	Erosion Barriers along perimeter of work area	❑Yes ❑No		
3	Catch Basin Inlet protection	❑Yes ❑No		
4	Other-	❑Yes ❑No		
5	Other-	❑Yes ❑No		

Overall Site Issues

	BMP/activity	Implemented?	Maintained?	Corrective Action	Date for corrective action/responsible person
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	n/a		
2	Are perimeter controls and sediment barriers adequately installed and maintained?	❑Yes ❑No	❑Yes ❑No		
3	Are stormwater discharges free of sediment deposits?	❑Yes ❑No	n/a		
4	Are storm drain inlets properly protected?	❑Yes ❑No	n/a		
5	Is there evidence of sediment being tracked into the street?	❑Yes ❑No	n/a		
6	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	n/a		
7	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	n/a		

	BMP/activity	Implemented?	Maintained?	Corrective Action	Date for corrective action/responsible person
8	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	n/a		
9	Are new or additional stormwater controls necessary to ensure compliance with the CGP?	❑Yes ❑No	n/a		
10	Do material storage areas present risk of spillage or leakage of potentially hazardous materials ?	❑Yes ❑No	n/a		
11	Other-	❑Yes ❑No	❑Yes ❑No		

Non-Compliance: Record any incidents of non-compliance with the Construction General Permit or the SWPPP since the last inspection in the table below.

Have any incidents of non-compliance occurred since the last inspection? ❑Yes ❑No

	Incident Description	Corrective Action Needed & Date of Initiation
1		
2		
3		
4		

Have any incidents of non-compliance occurred since the last inspection? ❑Yes ❑No

	Incident Description	Corrective Action Needed & Date of Initiation
5		

Discharges: Record any incidents of the discharge of sediment or eroded materials from the site

Have any discharges from the site occurred since the last inspection? ❑Yes ❑No

	Location of Discharge & Description of Water Quality (color, odor, floating, settled, or suspected solids, foam, sheen, etc...)	Corrective Action Needed & Date of Initiation (i.e. correction of existing stormwater controls or installation of new stormwater controls)
1		
2		
3		
4		
5		

Certification statement:
"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 there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name:
____

Signature:
____

Date: ____

Appendix 7.7
LOG OF CORRECTIVE ACTIONS

(To be added as incidents occur)

Log of Corrective Action

Corrective Action: "Any action taken to (1) repair, modify, or replace any stormwater control used at the site; (2) clean up and dispose of spills, releases, or other deposits found on the site; and (3) remedy a permit violation."

	Condition Type & Description	Date & Time Condition was Identified	Is SWPPP Modification Required?	Description of Corrective Action Taken (attach additional sheets as needed to describe). Specify type of materials disposed and the disposal location.
1			❑Yes ❑No	
2			❑Yes ❑No	
3			❑Yes ❑No	
4			❑Yes ❑No	
5			❑Yes ❑No	
6			❑Yes ❑No	
7			❑Yes ❑No	
8			❑Yes ❑No	
9			❑Yes ❑No	
10			❑Yes ❑No	

Appendix 7.8
LOG OF REDUCED INSPECTIONS

(To be added as incidents occur)

Log of Reduced Inspections

Log of reduced inspections permissible pursuant to section 4.4 of the Construction General Permit.

	Reason for Reduced Inspection	Portion of Site Applicable To	Beginning of Reduced Inspection Period	Conclusion of Reduced Inspection Period
1	❑ Stabilized Area (reduced to monthly) ❑ Frozen Conditions			
2	❑ Stabilized Area (reduced to monthly) ❑ Frozen Conditions			
3	❑ Stabilized Area (reduced to monthly) ❑ Frozen Conditions			
4	❑ Stabilized Area (reduced to monthly) ❑ Frozen Conditions			
5	❑ Stabilized Area (reduced to monthly) ❑ Frozen Conditions			
6	❑ Stabilized Area (reduced to monthly) ❑ Frozen Conditions			
7	❑ Stabilized Area (reduced to monthly) ❑ Frozen Conditions			
8	❑ Stabilized Area (reduced to monthly) ❑ Frozen Conditions			
9	❑ Stabilized Area (reduced to monthly) ❑ Frozen Conditions			
10	❑ Stabilized Area (reduced to monthly) ❑ Frozen Conditions			

Appendix 7.9
LOG OF SWPPP MODIFICATIONS

(To be added as modifications occur)

Log of SWPPP Modifications

	Date of Modification	Person Authorizing Modification	General Description of Modification
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			

Appendix 7.10
LOG OF POTENTIAL POLLUTANTS

List of Construction Materials which may be Considered a Potential Pollutant
(To be added as such information is determined)

Construction Materials Pollutant List No. _____

Description of Construction Activity:

____

____

____

____

	Construction Material	Solid/Liquid?	General Description of Storage and Use
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Appendix 7.11
SUB-CONTRACTOR LOG

List all sub-contractors and append a certification statement for each indicating their knowledge of and compliance with this SWPPP

(To be added as such information is determined)

Sub-Contractor Log

	Sub-Contractor Name	Address	Contact Name and Phone Number

Appendix 7.12
ESTIMATED SCHEDULE

(To be added as such information is determined)

Estimated Schedule

Task	Estimated Start Date	Estimated Duration
Earth Disturbing Activities		
Clearing and Grubbing		
Mass Grading (major cuts and fills)		
Final Grading		
Soil Stockpile Creation		
Removal of Temporary Stormwater Conveyances (if applicable)		
Removal of Other Temporary Stormwater Control Measures		
Removal of Construction Equipment and Vehicles		
Cessation of Any Pollutant-Generating Activities		

ATTACHMENT E: TSS Removal Calculation Sheets

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D
6. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table

Location: Infiltration Field Pretreatment

TSS Removal Calculation Worksheet

A BMP1	B TSS Removal Rate1	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
First Defense Unit	80%	1.00	80%	20%

Total TSS Removal = 80%

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

Project: 39 Main Street

Prepared By: Legacy Engineering, LLC

Date: March 26, 2019

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From Mass DEP Stormwater Handboook Vol. 1

Mass. Dept. of Environmental Protection

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D
6. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table

Location: Infiltration Field

TSS Removal Calculation Worksheet

A BMP 1	B TSS Removal Rate 1	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Infiltration Field w/ First Defense Unit	80%	1.00	80%	20%

Total TSS Removal = 80%

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

Project:	39 Main Street
Prepared By:	Legacy Engineering, LLC
Date:	March 26, 2019

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From Mass DEP Stormwater Handboook Vol. 1

Mass. Dept. of Environmental Protection

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D
6. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table

Location: Infiltration Field Pretreatment With Catch Basins

TSS Removal Calculation Worksheet

A BMP1	B TSS Removal Rate1	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Catch Basin	25%	1.00	25%	75%
First Defense Unit	80%	0.75	60%	15%

Total TSS Removal = 85%

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

Project:	39 Main Street
Prepared By:	Legacy Engineering, LLC
Date:	March 26, 2019

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From Mass DEP Stormwater Handboook Vol. 1

Mass. Dept. of Environmental Protection

INSTRUCTIONS: *Non-automated: Mar. 4, 2008*

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D
6. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table

Location: Infiltration Field With Catch Basins

TSS Removal Calculation Worksheet

A BMP 1	B TSS Removal Rate 1	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Catch Basin	25%	1.00	25%	75%
Infiltration Field w/ First Defense Unit	80%	0.75	60%	15%

Total TSS Removal = 85%

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

Project:	39 Main Street
Prepared By:	Legacy Engineering, LLC
Date:	March 26, 2019

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From Mass DEP Stormwater Handboook Vol. 1

Mass. Dept. of Environmental Protection

ATTACHMENT F: Stormwater Management Handbook Checklist

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

Checklist for Stormwater Report

A. Introduction

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

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

The Stormwater Report must include:

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

COMMONWEALTH OF MASSACHUSETTS
DANIEL J.
MERRIKIN
CIVIL
No. 43309
REGISTERED
PROFESSIONAL ENGINEER

Digitally signed by Daniel J. Merrikin, P.E.
Date: 2019.04.04 08:17:51 -04'00'

Signature and Date

Checklist

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

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of “country drainage” versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): ______________________________

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

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

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

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

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

  ☒ is within the Zone II or Interim Wellhead Protection Area

  ☐ is near or to other critical areas

  ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)

  ☐ involves runoff from land uses with higher potential pollutant loads.

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

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

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

ATTACHMENT G: FEMA Firmette

National Flood Hazard Layer FIRMette

FEMA

42°9'30.16"N

71°24'14.60"W

71°23'37.14"W

42°9'3.48"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

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

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) *Zone A, V, A99*
		With BFE or Depth *Zone AE, AO, AH, VE, AR*
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
		Future Conditions 1% Annual Chance Flood Hazard *Zone X*
		Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
		Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard *Zone X*
		Effective LOMRs
		Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES	B 20.2 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation
	8	Coastal Transect
	513	Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped

N

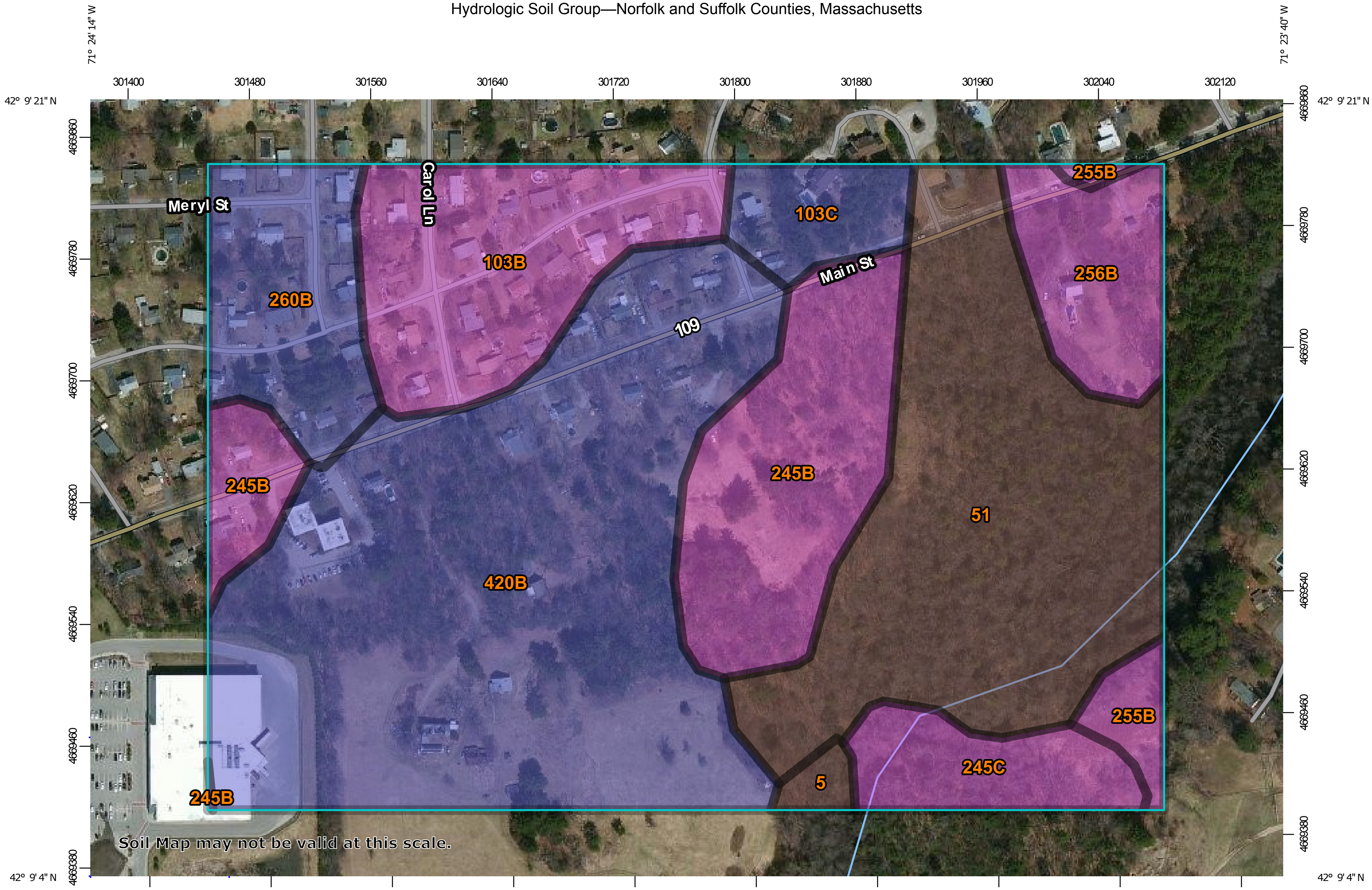
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/8/2019 at 11:19:34 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

ATTACHMENT H: Soils Data



Map Scale: 1:3,600 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 150, 300, 600, 900

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil 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 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 12, Sep 15, 2016

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

Date(s) aerial images were photographed: Apr 8, 2011—Apr 9, 2011

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

Hydrologic Soil Group— Summary by Map Unit — Norfolk and Suffolk Counties, Massachusetts (MA616)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
5	Saco silt loam, 0 to 3 percent slopes	B/D	0.4	0.6%
51	Swansea muck, 0 to 1 percent slopes	B/D	14.6	22.0%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	A	6.7	10.1%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	B	1.9	2.9%
245B	Hinckley loamy sand, 3 to 8 percent slopes	A	8.1	12.2%
245C	Hinckley loamy sand, 8 to 15 percent slopes	A	2.6	3.9%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	1.0	1.6%
256B	Deerfield loamy sand, 3 to 8 percent slopes	A	3.2	4.8%
260B	Sudbury fine sandy loam, 2 to 8 percent slopes	B	4.4	6.7%
420B	Canton fine sandy loam, 3 to 8 percent slopes	B	23.3	35.2%
Totals for Area of Interest			**66.4**	**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

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 1 **Date of Test Hole: April 27, 2016** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
7”	A_P	10YR4/3	None	LS	1%	<1%	Massive	Very Friable	
31”	B_W	10YR6/8	None	LS	1%	<1%	Massive	Very Friable	
56”	C1	2.5Y6/3	None	LS/ Lenses S (Med)	<1%	<1%	Massive	Very Friable	
144”	C2	2.5Y6/4	72”	S (Med)	5%	2%	Single Grain	Loose	
164”	C3	2.5Y6/3	Yes	LS/SL	3%	2%	Massive	Very Friable	

Reference Ground Elevation: 168.33
Additional Notes: None

<u>Groundwater Indicators Observed at Time of Testing:</u>

☒ Depth observed standing water in observation hole: 102”

☒ Depth weeping from side of observation hole: 102”

☒ Depth to soil redoximorphic features (mottles): 72”

☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 2 **Date of Test Hole: April 27, 2016** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
8”	Ap	10YR4/3	None	LS	1%	1%	Massive	Very Friable	
28”	B	10YR5/6	None	LS	3%	4%	Massive	Very Friable	
90”	C1	2.5Y6/4	72”	LS	4%	4%	Massive	Very Friable	Inconsistent Thickness
126”	C2	2.5Y6/3	Yes	SL/LS	2%	2%	Massive	Very Friable	Few boulders

Reference Ground Elevation: 167.53
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

☐ Depth observed standing water in observation hole: None

☒ Depth to soil redoximorphic features (mottles): 72”

☒ Depth weeping from side of observation hole: 87”

☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 3 **Date of Test Hole: April 27, 2016** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
12”	AP	10YR4/4	None	LS	1%	<1%	Massive	Very Friable	
28”	BW	10YR5/6	None	LS	1%	<1%	Massive	Very Friable	
70”	C1	2.5Y6/3	None	LS	<1%	<1%	Massive	Very Friable	
136”	C2	2.5Y6/4	72”	LS	6%	3%	Massive	Very Friable	

Reference Ground Elevation: 167.93
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

☐ Depth observed standing water in observation hole: None

☒ Depth to soil redoximorphic features (mottles): 72”

☒ Depth weeping from side of observation hole: 98”

☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 4 **Date of Test Hole: April 27, 2016** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
12"	Ap	10YR4/3	None	LS	1%	<1%	Massive	Very Friable	
26"	B	10YR5/6	None	LS	1%	<1%	Massive	Very Friable	
80"	C1	2.5Y6/4	None	LS/S	<1%	<1%	Massive/ Single Grain	Loose/ Very Friable	
128"	C2	2.5Y6/4	80"	LS/S	4%	3%	Massive/ Single Grain	Loose/ Very Friable	

Reference Ground Elevation: 169.43
Additional Notes: None

<u>Groundwater Indicators Observed at Time of Testing:</u>

☒ Depth observed standing water in observation hole: 88"

☒ Depth weeping from side of observation hole: 80"

☒ Depth to soil redoximorphic features (mottles): 80"

☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 5 **Date of Test Hole: April 27, 2016** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
6”	Ap	10YR4/3	None	LS	1%	<1%	Massive	Very Friable	
20”	Bw	10YR5/6	None	LS	1%	1%	Massive	Very Friable	
83”	C1	2.5Y6/4	None	LS	3%	1%	Massive	Very Friable	
120	C2	10YR5/4	91”	LS	3%	2%	Massive	Very Friable	Some Boulder/Fractured Ledge

Reference Ground Elevation: 165.53
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

☐ Depth observed standing water in observation hole: None

☒ Depth to soil redoximorphic features (mottles): 91”

☒ Depth weeping from side of observation hole: 98”

☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 6 **Date of Test Hole: April 27, 2016** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
77”	Fill								
120”	C	2.5Y6/4	80”	LS	5%	3%	Massive	Very Friable	

Reference Ground Elevation: 162.53
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

☐ Depth observed standing water in observation hole: None

☒ Depth to soil redoximorphic features (mottles): 80”

☒ Depth weeping from side of observation hole: 80”

☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 7 **Date of Test Hole: April 27, 2016** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
36”	Fill								
42”	A_B	10YR4/3	None	LS	1%	<1%	Massive	Very Friable	
66”	B_W	10YR5/6	None	LS	1%	<1%	Massive	Very Friable	
160”	C	2.5Y6/4	128”	LS	3%	1%	Massive	Very Friable	

Reference Ground Elevation: 162.13
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

☒ Depth observed standing water in observation hole: 142”

☒ Depth weeping from side of observation hole: 142”

☒ Depth to soil redoximorphic features (mottles): 128”

☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 8 **Date of Test Hole: April 27, 2016** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
4”	Ap	10YR4/3	None	LS	1%	<1%	Massive	Very Friable	
18”	Bw	10YR5/6	None	LS	3%	1%	Massive	Very Friable	
72”	C	2.5Y6/4	None	S (Med)	5%	4%	Single Grain	Loose	Refusal @72”

Reference Ground Elevation: 168.03
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

- ☐ Depth observed standing water in observation hole: None
- ☐ Depth to soil redoximorphic features (mottles): None
- ☐ Depth weeping from side of observation hole: None
- ☒ Depth to refusal: 72”

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 9 **Date of Test Hole: April 27, 2016** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
30”	Fill								
48”	B_W	10YR5/6	None	LS	3%	1%	Massive	Very Friable	
64”	C1	2.5Y6/3	None	LS	2%	1%	Massive	Very Friable	
144”	C2	2.5Y6/4	132”	S (Med)	5%	3%	Single Grain	Loose	Faint redox

Reference Ground Elevation: 165.13
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

☒ Depth observed standing water in observation hole:144”

☒ Depth to soil redoximorphic features (mottles): 132”

☐ Depth weeping from side of observation hole: None

☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 10 **Date of Test Hole: April 27, 2016** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
5”	A	10YR4/3	None	LS	1%	<1%	Massive	Very Friable	
28”	Bw	10YR6/8	None	LS	2%	1%	Massive	Very Friable	
68”	C1	2.5Y6/4	None	S(Med)	4%	2%	Single Grain	Loose	
150”	C2	2.5Y6/3	132”	LS	2%	1%	Massive	Very Friable	

Reference Ground Elevation: 167.03
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

☒ Depth observed standing water in observation hole: 144”

☒ Depth to soil redoximorphic features (mottles): 132”

☐ Depth weeping from side of observation hole: None

☐ Depth to refusal: None”

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 11 **Date of Test Hole: April 27, 2016** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
5”	A_P	10YR4/3	None	LS	1%	<1%	Massive	Very Friable	
19”	B_W	10YR6/8	None	LS	2%	1%	Massive	Very Friable	
72”	C1	2.5Y6/4	None	S (Med)	5%	2%	Single Grain	Loose	
102”	C2	2.5Y6/3	None	LS	2%	1%	Massive	Very Friable	Few boulders

Reference Ground Elevation: 166.43
Additional Notes: None

<u>Groundwater Indicators Observed at Time of Testing:</u>

☐ Depth observed standing water in observation hole: None ☐ Depth to soil redoximorphic features (mottles): None

☐ Depth weeping from side of observation hole: None ☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 12 **Date of Test Hole: January 10, 2019** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
4”	A	10YR4/3		LS	1%	2%	Massive	Very Friable	
20”	B_w	10YR6/8		LS	1%	<1%	Massive	Very Friable	
30”	B/C	2.5Y6/6		LS	1%	1%	Massive	Very Friable	
90”	C1	2.5Y6/4		S (Med)	6%	4%	Single Grain	Loose	
120”	C2	2.5Y6/2		LS	2%	4%	Massive	Very Friable	Boulders

Reference Ground Elevation: 168.8
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

- ☐ Depth observed standing water in observation hole: None
- ☐ Depth to soil redoximorphic features (mottles): None
- ☐ Depth weeping from side of observation hole: None
- ☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 13 **Date of Test Hole: January 10, 2019** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
2”	A	10YR4/3		LS	1%	<1%	Massive	Very Friable	
21”	B_W	10YR6/8		LS	2%	<1%	Massive	Very Friable	
50”	C1	2.5Y6/4		S (med)	3%	<1%	Single Grain	Loose	
110”	C2	2.5Y6/2		LS	2%	4%	Massive	Very Friable	Boulders

Reference Ground Elevation: 168.6
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

☐ Depth observed standing water in observation hole: None

☐ Depth to soil redoximorphic features (mottles): None

☐ Depth weeping from side of observation hole: None

☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 14 **Date of Test Hole: January 10, 2019** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
3”	A	10YR4/3		LS	1%	<1%	Massive	Very Friable	
15”	B	10YR6/7		LS	8%	2%	Massive	Very Friable	
90”	C	2.5Y6/4	80”	S (med)	8%	3%	Single Grain	Loose	

Reference Ground Elevation: 173.9
Additional Notes: None

<u>Groundwater Indicators Observed at Time of Testing:</u>

☒ Depth observed standing water in observation hole: 84” (166.9)

☒ Depth to soil redoximorphic features (mottles): 80” (167.2)

☐ Depth weeping from side of observation hole: None

☒ Depth to refusal: 90” (166.4)

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 15 **Date of Test Hole: January 10, 2019** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
6”	A	10YR4/3		LS	1%	<1%	Massive	Very Friable	
22”	Bw	10YR6/8		LS	2%	1%	Massive	Very Friable	
102”	C1	2.5Y6/4	77”	S (med)	6%	3%	Single Grain	Loose	

Reference Ground Elevation: 173.2
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

☒ Depth observed standing water in observation hole: 78” (166.7)

☐ Depth weeping from side of observation hole: None

☒ Depth to soil redoximorphic features (mottles): 77” (166.8)

☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 16 **Date of Test Hole: January 10, 2019** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
4”	A	10YR4/3		LS	1%	<1%	Massive	Very Friable	
23”	Bw	10YR6/8		LS	2%	1%	Massive	Very Friable	
108”	C	2.5Y6/4	90”	S (med)	6%	3%	Single Grain	Loose	

Reference Ground Elevation: 171.3
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

☒ Depth observed standing water in observation hole: 94” (163.5)

☐ Depth weeping from side of observation hole: None

☒ Depth to soil redoximorphic features (mottles): 90” (163.8)

☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 17 **Date of Test Hole: January 10, 2019** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
3”	A	10YR4/3		LS	1%	<1%	Massive	Very Friable	
24”	Bw	10YR6/8		LS	3%	1%	Massive	Very Friable	
40”	C1	2.5Y6/4		S (med)	8%	3%	Single Grain	Loose	
80”	C1	2.5Y6/2	78”	LS	2%	1%	Massive	Very Friable	

Reference Ground Elevation: 169.6
Additional Notes: None

<u>Groundwater Indicators Observed at Time of Testing:</u>

☐ Depth observed standing water in observation hole: None

☐ Depth weeping from side of observation hole: None

☒ Depth to soil redoximorphic features (mottles): 78” (163.1)

☒ Depth to refusal: 80” (162.9)

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 18 **Date of Test Hole: January 10, 2019** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
6”	A	10YR4/3		LS	1%	<1%	Massive	Very Friable	
16”	Bw	10YR6/8		LS	3%	1%	Massive	Very Friable	
60”	C1	2.5Y6/4	44”	S (med)	4%	2%	Single Grain	Loose	
80”	C1	2.5Y6/2		LS/SL	3%	1%	Massive	Very Friable	

Reference Ground Elevation: 166.3
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

☒ Depth observed standing water in observation hole: 60” (161.3)

☒ Depth weeping from side of observation hole: 44” (162.6)

☒ Depth to soil redoximorphic features (mottles): 44” (162.6)

☒ Depth to refusal: 80” (159.6)

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 19 **Date of Test Hole: January 10, 2019** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
9”	A	10YR4/3		LS	1%	<1%	Massive	Very Friable	
34”	Bw	10YR6/8		LS	1%	<1%	Massive	Very Friable	
60”	C1	2.5Y6/2		LS/S	1%	3%	Massive	Very Friable	Boulders
108”	C2	2.5Y6/4		S (Med)	8%	3%	Single Grain	Loose	

Reference Ground Elevation: 159.2
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

- ☐ Depth observed standing water in observation hole: None
- ☐ Depth weeping from side of observation hole: None
- ☐ Depth to soil redoximorphic features (mottles): None
- ☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 20 **Date of Test Hole: January 10, 2019** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
4”	A	10YR4/3		LS	1%	<1%	Massive	Very Friable	
23”	Bw	10YR6/8		LS	2%	1%	Massive	Very Friable	
72”	C1	2.5Y6/4		S (Med)	4%	2%	Single Grain	Loose	
115”	C2	2.5Y6/2		LS/S	2%	2%	Massive	Very Friable	Few Boulders

Reference Ground Elevation: 162.0
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

☐ Depth observed standing water in observation hole: None

☐ Depth to soil redoximorphic features (mottles): None

☐ Depth weeping from side of observation hole: None

☐ Depth to refusal: None

DEEP OBSERVATION TEST HOLE SOIL LOG
39 Main Street, Medway, MA

Deep Observation Hole: OTH 22 **Date of Test Hole: January 10, 2019** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

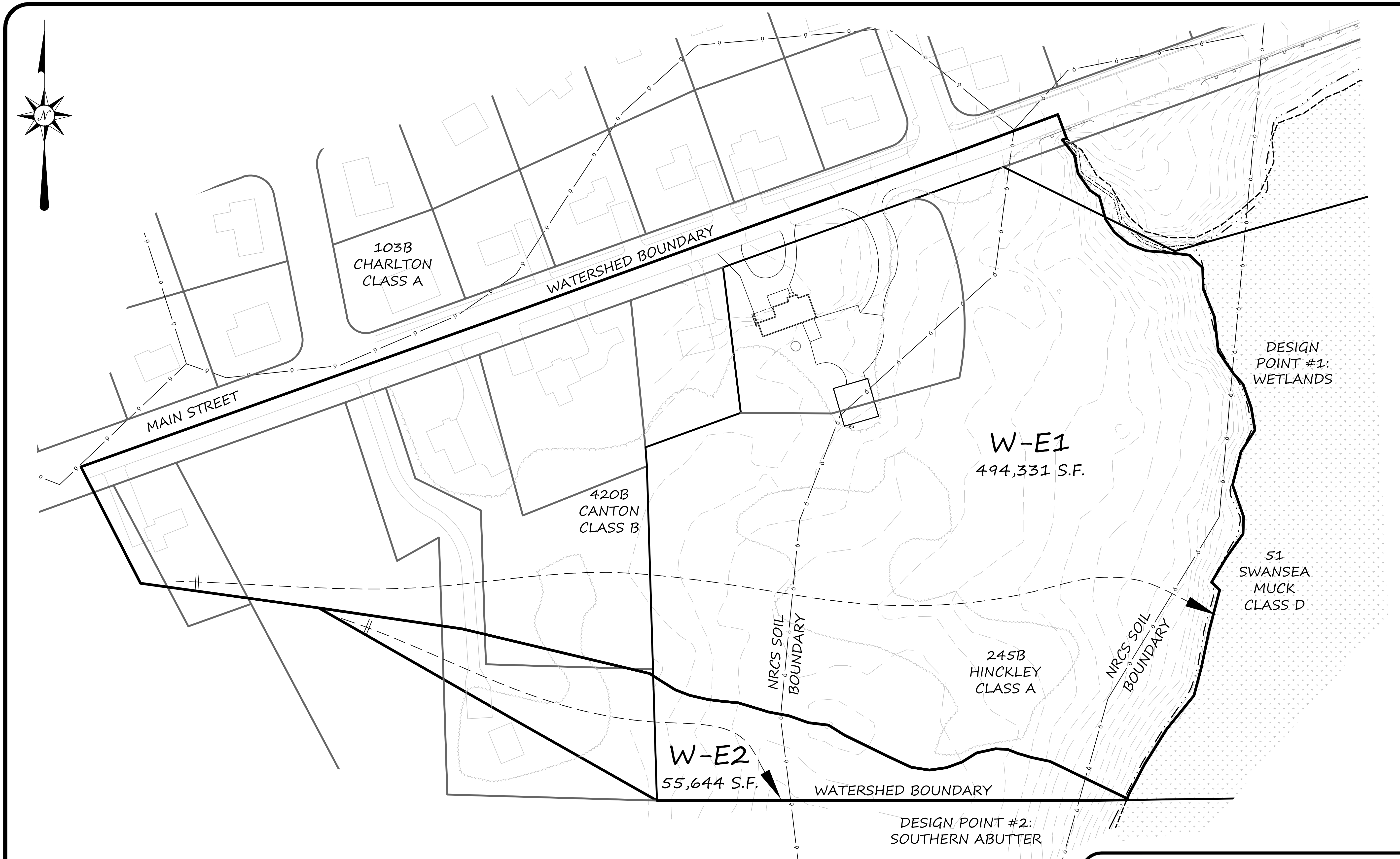
Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Depth of Redoximorphic Features	Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
					Gravel	Cobbles & Stones			
57”	Fill								
96”	C	2.5Y6/4		S (Med)	8%	4%	Single Grain	Loose	Boulders

Reference Ground Elevation: 162.5
Additional Notes: None

Groundwater Indicators Observed at Time of Testing:

- ☐ Depth observed standing water in observation hole: None
- ☐ Depth to soil redoximorphic features (mottles): None
- ☐ Depth weeping from side of observation hole: None
- ☐ Depth to refusal: None

ATTACHMENT I: Existing Watershed Plan



PLAN SCALE: 1"=100"

0' 100' 200'

PLAN DATE: MARCH 26, 2019

REVISION	DATE	BY

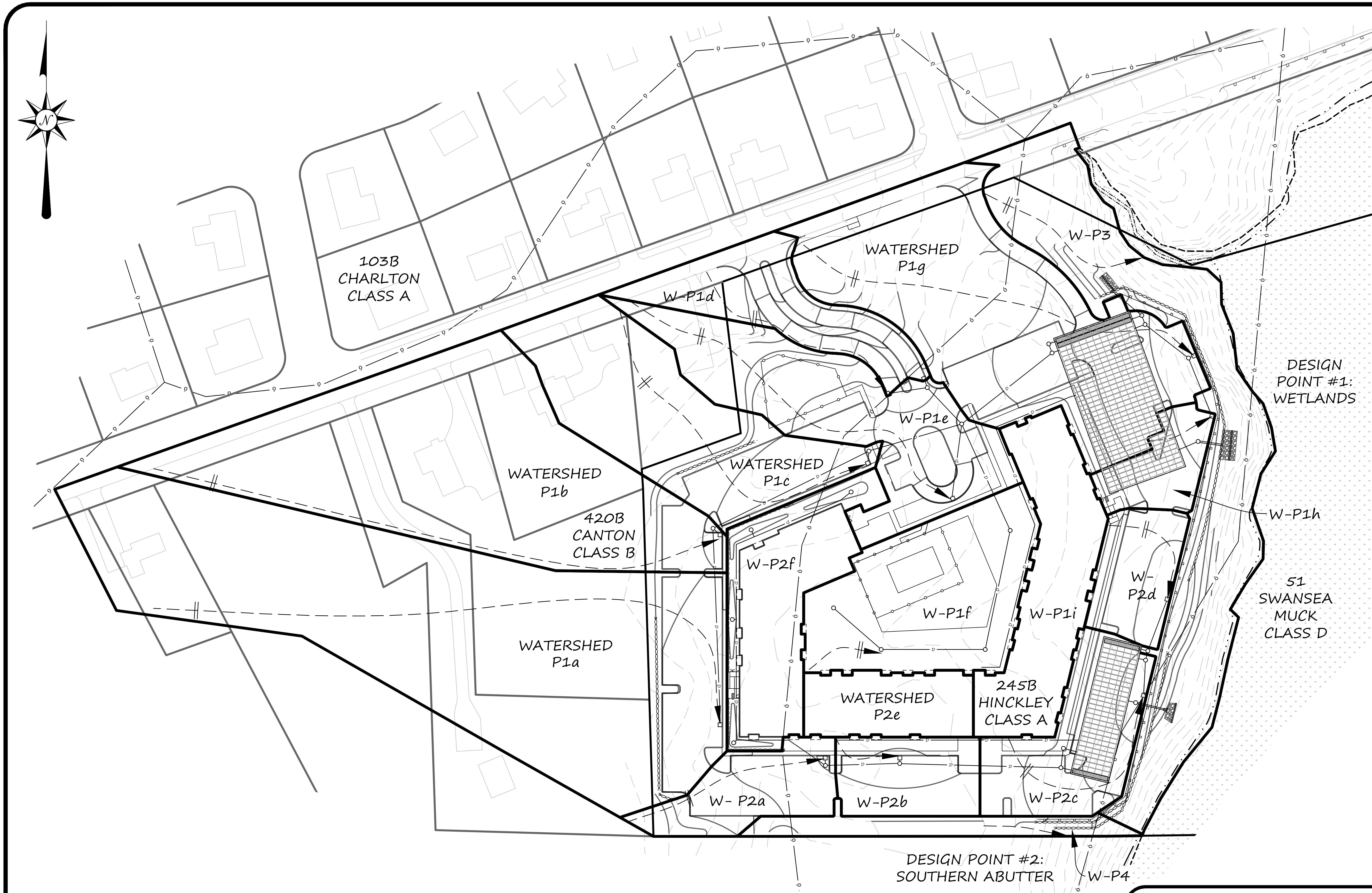
39 MAIN STREET EXISTING WATERSHED PLAN OF LAND IN MEDWAY, MA

730 MAIN STREET
SUITE 2C
MILLIS, MA 02054
508-376-8883(o)

SHEET 1 OF 1

LEGACY ENGINEERING

ATTACHMENT J: Proposed Watershed Plan



PLAN SCALE: 1"=100"

0' 100' 200'

PLAN DATE: MARCH 26, 2019

REVISION	DATE	BY

39 MAIN STREET
PROPOSED
WATERSHED PLAN
OF LAND IN
MEDWAY, MA

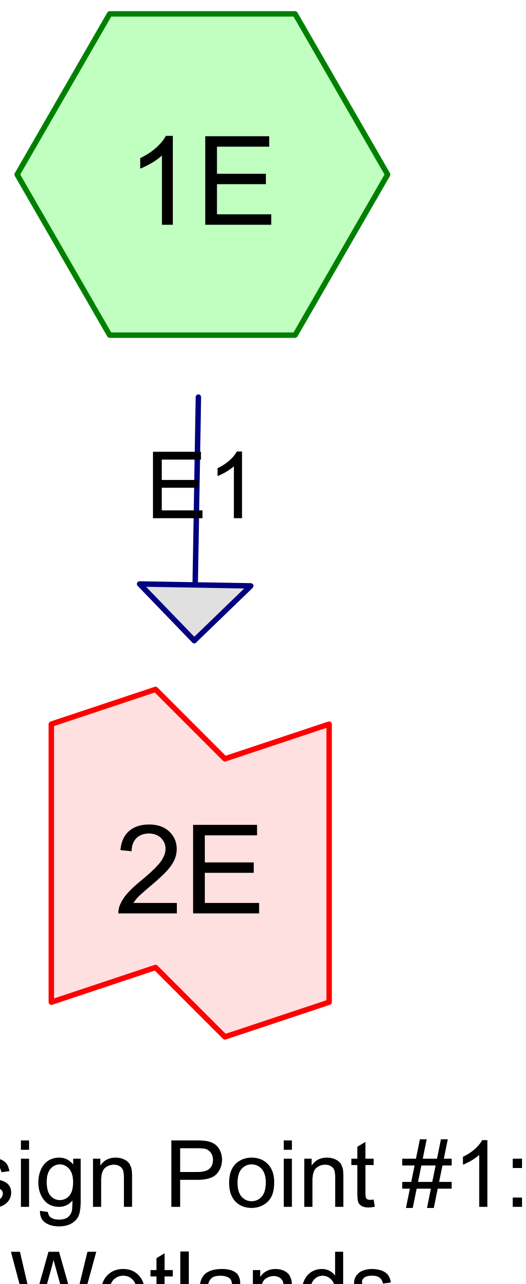
730 MAIN STREET
SUITE 2C
MILLIS, MA 02054
508-376-8883(o)

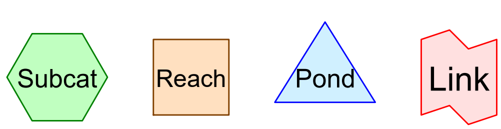
SHEET 1 OF 1

LEGACY ENGINEERING

ATTACHMENT K: Hydrocad Hydrology Calculations

DESIGN POINT #1: FLOW TO WETLANDS EXISTING CONDITIONS





Routing Diagram for HydroCAD2
Prepared by {enter your company name here}, Printed 4/2/2019

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.340	79	<50% Grass cover, Poor, HSG B (1E)
1.094	39	>75% Grass cover, Good, HSG A (1E)
1.271	61	>75% Grass cover, Good, HSG B (1E)
0.036	98	Paved parking, HSG A (1E)
0.997	98	Paved parking, HSG B (1E)
3.953	30	Woods, Good, HSG A (1E)
3.657	55	Woods, Good, HSG B (1E)
11.348	**50**	**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: E1 Runoff Area=494,331 sf 9.11% Impervious Runoff Depth=0.13"
Flow Length=1,112' Tc=25.7 min CN=50 Runoff=0.22 cfs 0.122 af

Link 2E: Design Point #1: Wetlands Inflow=0.22 cfs 0.122 af
Primary=0.22 cfs 0.122 af

Total Runoff Area = 11.348 ac Runoff Volume = 0.122 af Average Runoff Depth = 0.13"
90.89% Pervious = 10.315 ac 9.11% Impervious = 1.034 ac

Summary for Subcatchment 1E: E1

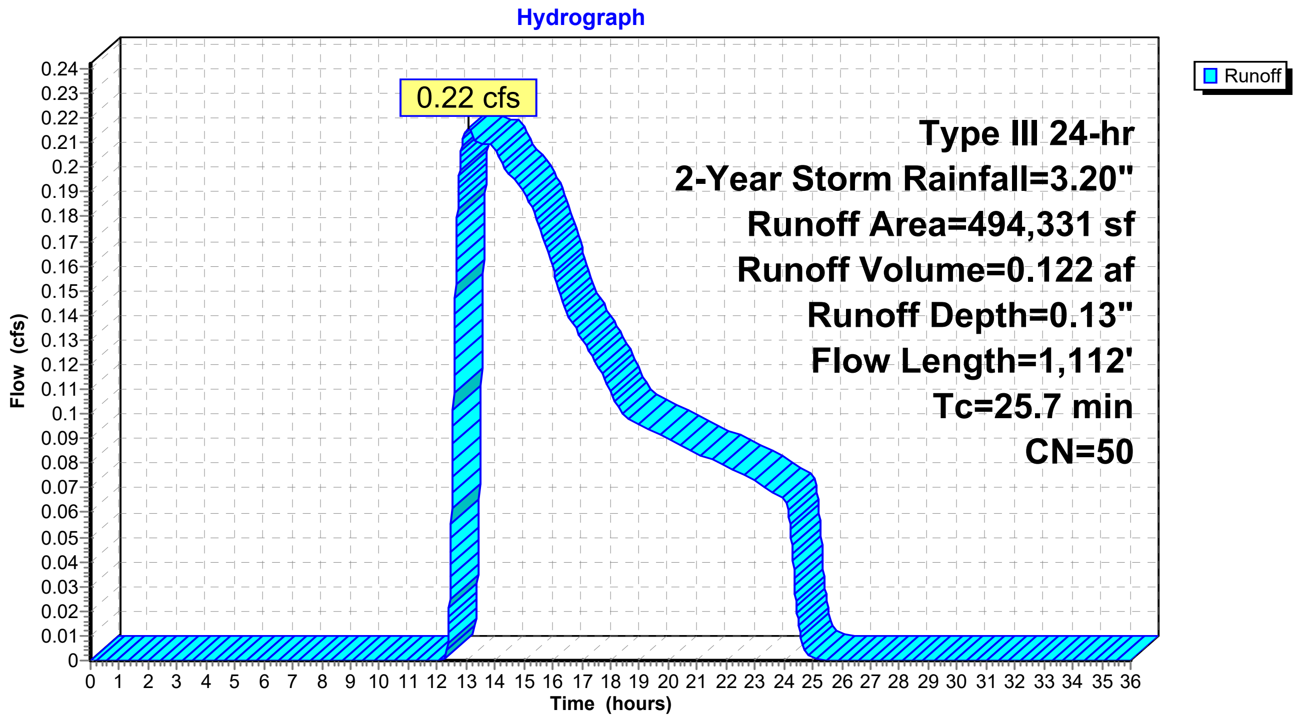
Runoff = 0.22 cfs @ 13.10 hrs, Volume= 0.122 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
1,576	98	Paved parking, HSG A
43,445	98	Paved parking, HSG B
172,178	30	Woods, Good, HSG A
159,284	55	Woods, Good, HSG B
55,377	61	>75% Grass cover, Good, HSG B
47,663	39	>75% Grass cover, Good, HSG A
14,808	79	<50% Grass cover, Poor, HSG B
494,331	50	Weighted Average
449,310		90.89% Pervious Area
45,021		9.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	43	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
12.2	816	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	12	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.1	241	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.7	1,112	Total			

Subcatchment 1E: E1

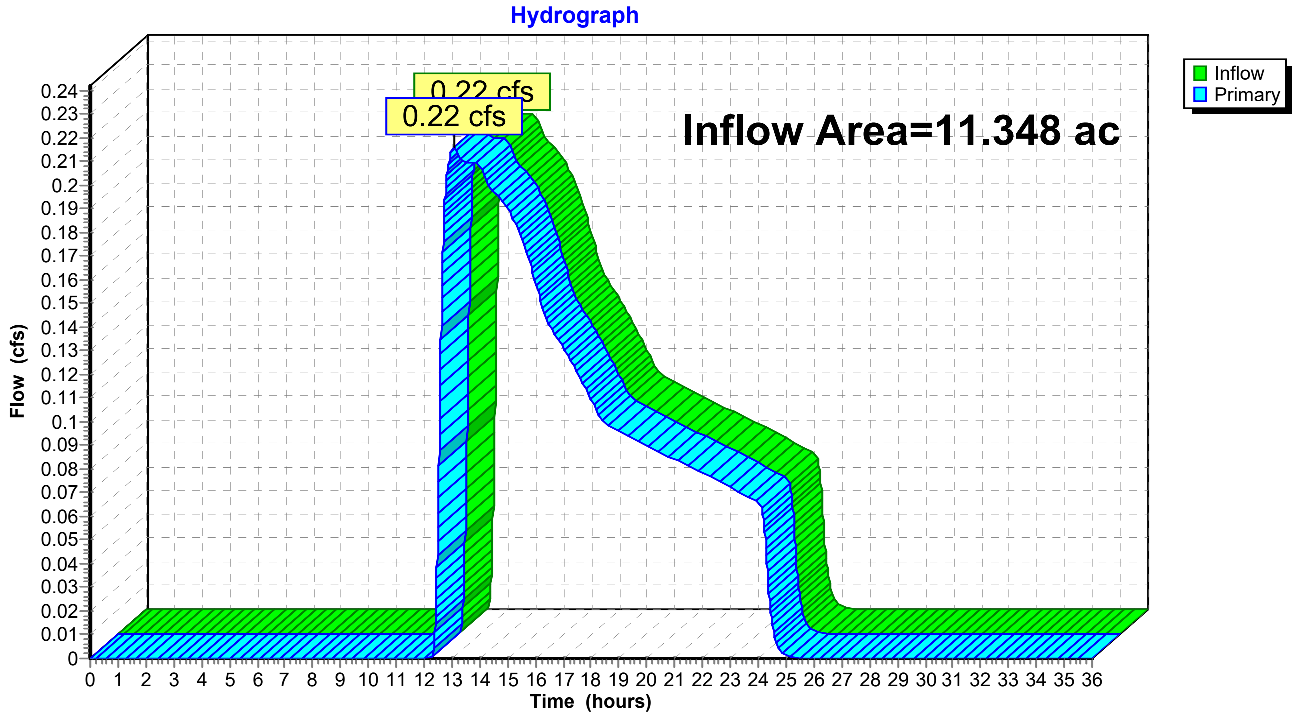


Summary for Link 2E: Design Point #1: Wetlands

Inflow Area =	11.348 ac,	9.11% Impervious, Inflow Depth =	0.13"	for 2-Year Storm event
Inflow =	0.22 cfs @	13.10 hrs, Volume=	0.122 af	
Primary =	0.22 cfs @	13.10 hrs, Volume=	0.122 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 2E: Design Point #1: Wetlands



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: E1 Runoff Area=494,331 sf 9.11% Impervious Runoff Depth=0.57"
Flow Length=1,112' Tc=25.7 min CN=50 Runoff=2.88 cfs 0.543 af

Link 2E: Design Point #1: Wetlands Inflow=2.88 cfs 0.543 af
Primary=2.88 cfs 0.543 af

Total Runoff Area = 11.348 ac Runoff Volume = 0.543 af Average Runoff Depth = 0.57"
90.89% Pervious = 10.315 ac 9.11% Impervious = 1.034 ac

Summary for Subcatchment 1E: E1

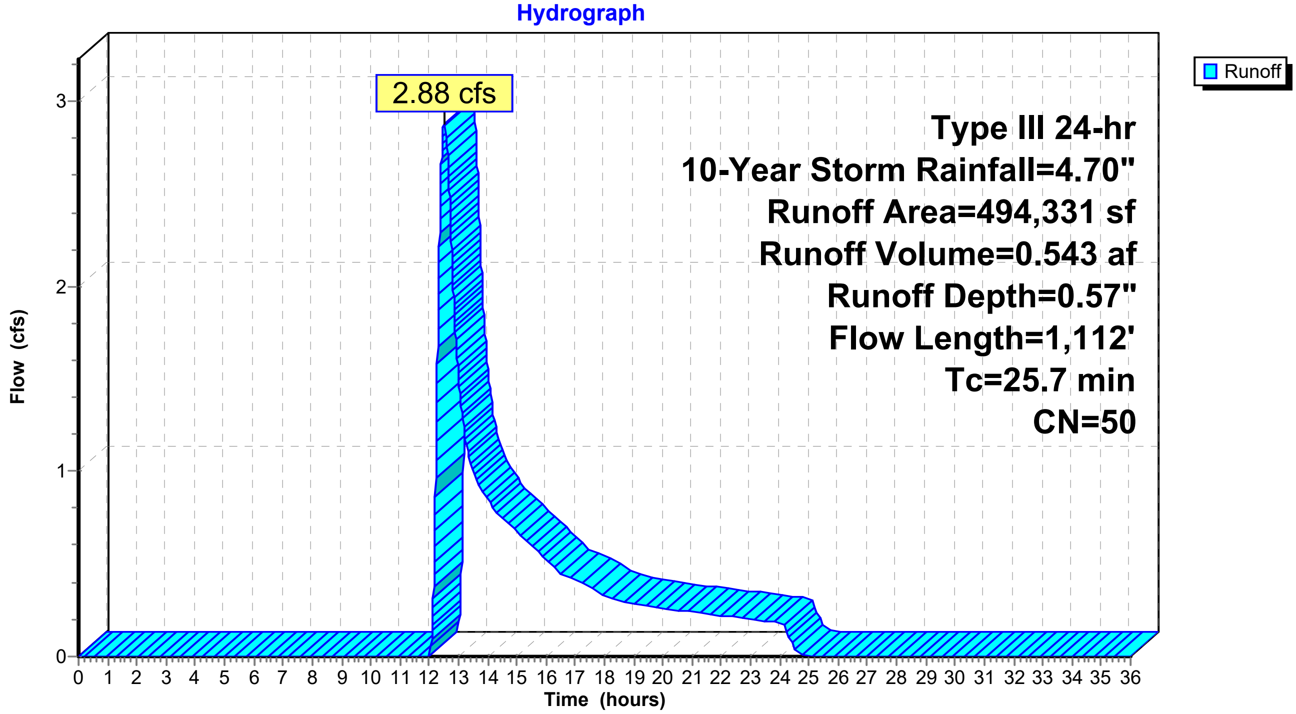
Runoff = 2.88 cfs @ 12.53 hrs, Volume= 0.543 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
1,576	98	Paved parking, HSG A
43,445	98	Paved parking, HSG B
172,178	30	Woods, Good, HSG A
159,284	55	Woods, Good, HSG B
55,377	61	>75% Grass cover, Good, HSG B
47,663	39	>75% Grass cover, Good, HSG A
14,808	79	<50% Grass cover, Poor, HSG B
494,331	50	Weighted Average
449,310		90.89% Pervious Area
45,021		9.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	43	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
12.2	816	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	12	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.1	241	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.7	1,112	Total			

Subcatchment 1E: E1

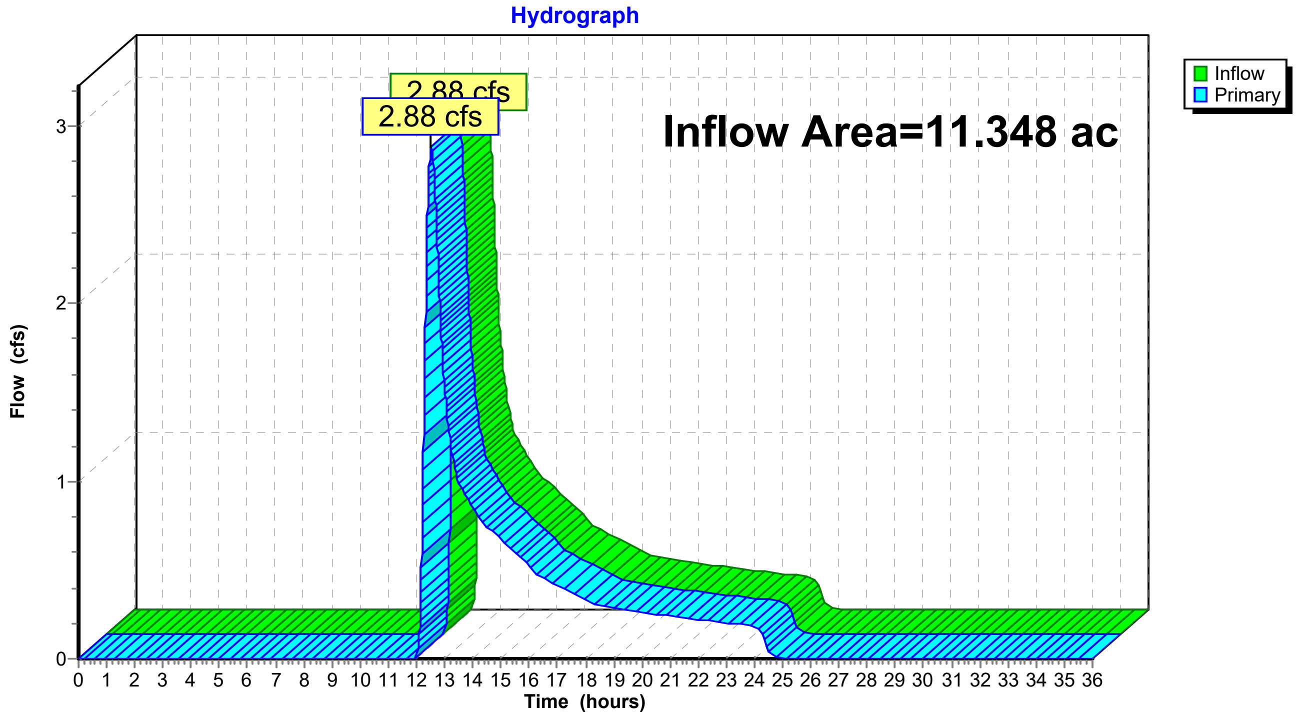


Summary for Link 2E: Design Point #1: Wetlands

Inflow Area =	11.348 ac,	9.11% Impervious,	Inflow Depth = 0.57"	for 10-Year Storm event	
Inflow =	2.88 cfs @	12.53 hrs,	Volume=	0.543 af	
Primary =	2.88 cfs @	12.53 hrs,	Volume=	0.543 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 2E: Design Point #1: Wetlands



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: E1 Runoff Area=494,331 sf 9.11% Impervious Runoff Depth=1.50"
Flow Length=1,112' Tc=25.7 min CN=50 Runoff=10.33 cfs 1.421 af

Link 2E: Design Point #1: Wetlands Inflow=10.33 cfs 1.421 af
Primary=10.33 cfs 1.421 af

Total Runoff Area = 11.348 ac Runoff Volume = 1.421 af Average Runoff Depth = 1.50"
90.89% Pervious = 10.315 ac 9.11% Impervious = 1.034 ac

Summary for Subcatchment 1E: E1

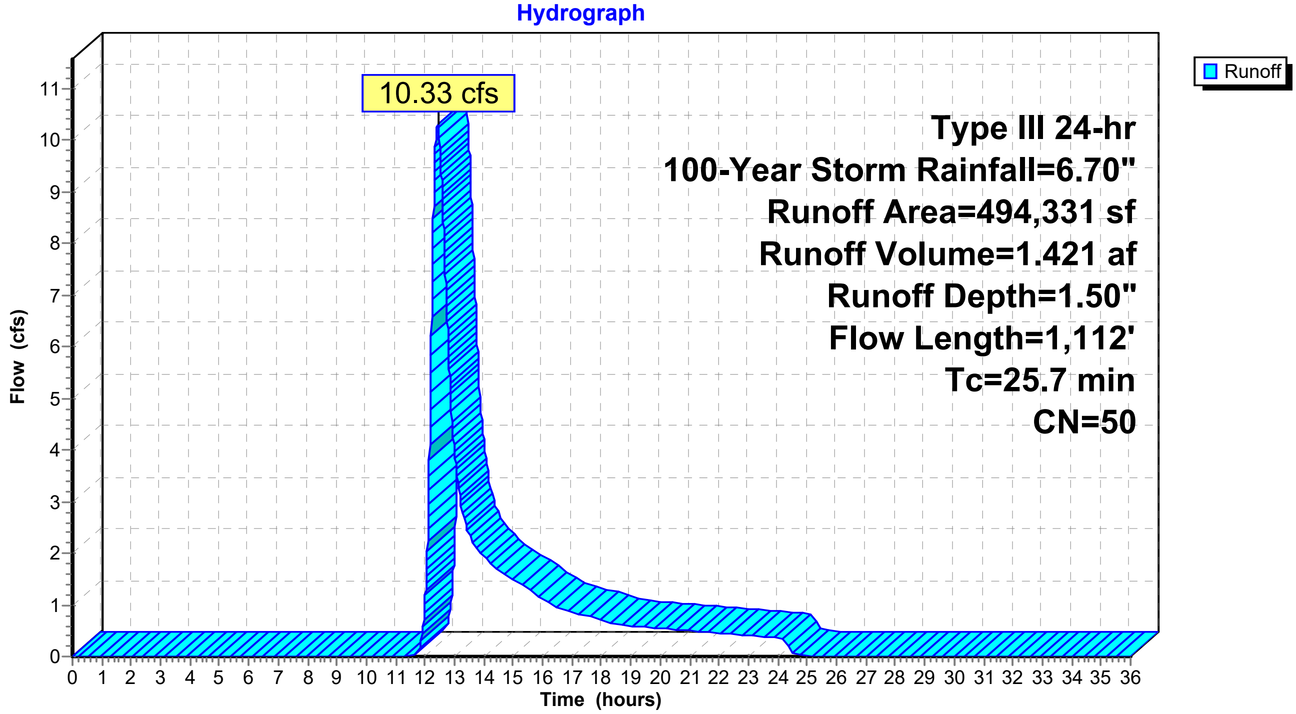
Runoff = 10.33 cfs @ 12.42 hrs, Volume= 1.421 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
1,576	98	Paved parking, HSG A
43,445	98	Paved parking, HSG B
172,178	30	Woods, Good, HSG A
159,284	55	Woods, Good, HSG B
55,377	61	>75% Grass cover, Good, HSG B
47,663	39	>75% Grass cover, Good, HSG A
14,808	79	<50% Grass cover, Poor, HSG B
494,331	50	Weighted Average
449,310		90.89% Pervious Area
45,021		9.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	43	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
12.2	816	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	12	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.1	241	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.7	1,112	Total			

Subcatchment 1E: E1

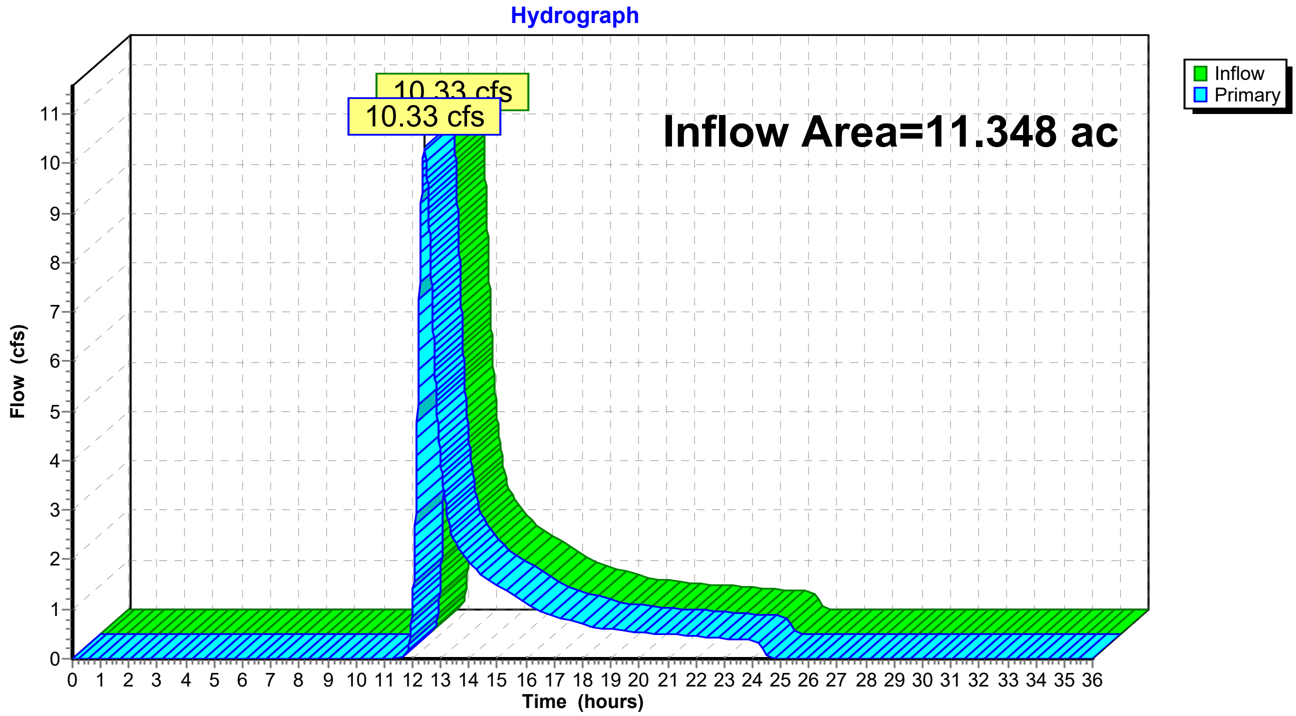


Summary for Link 2E: Design Point #1: Wetlands

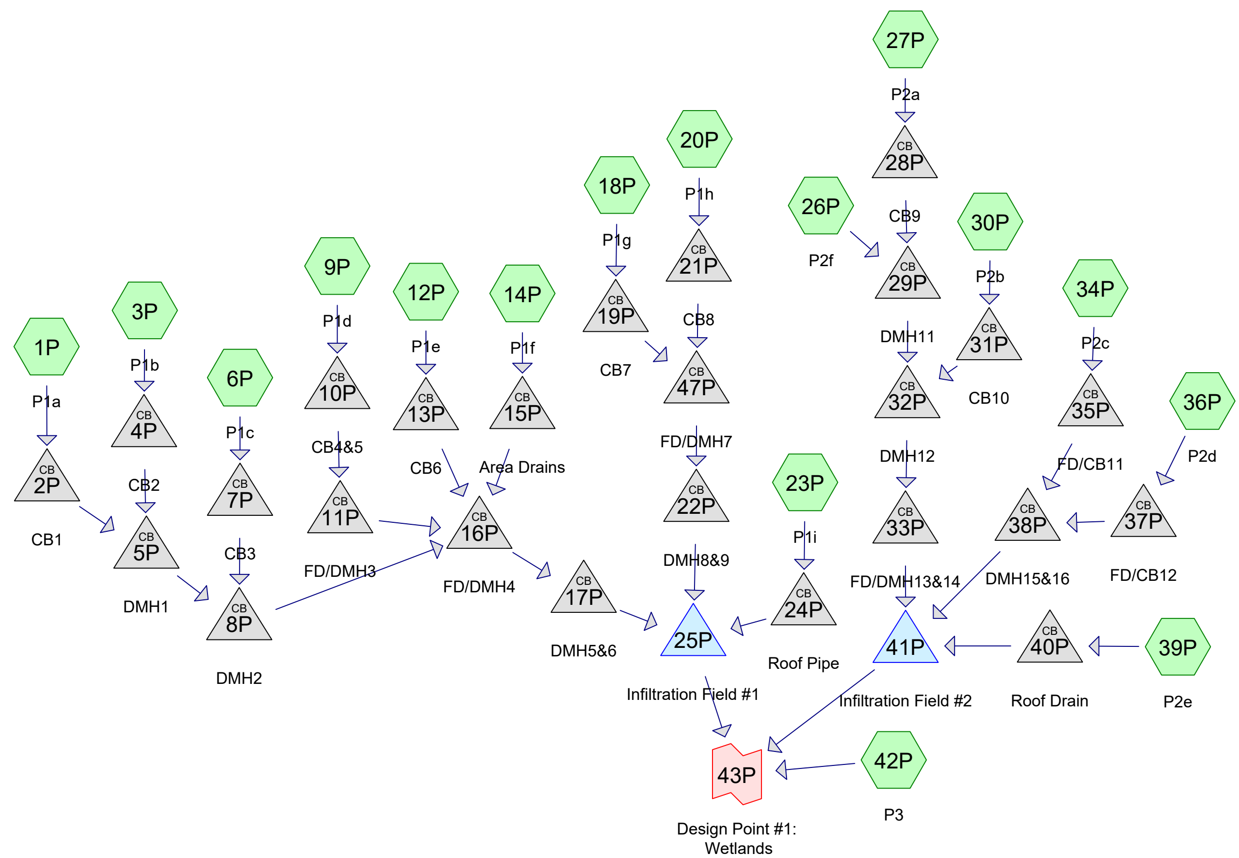
Inflow Area = 11.348 ac, 9.11% Impervious, Inflow Depth = 1.50" for 100-Year Storm event
Inflow = 10.33 cfs @ 12.42 hrs, Volume= 1.421 af
Primary = 10.33 cfs @ 12.42 hrs, Volume= 1.421 af, Atten= 0%, Lag= 0.0 min

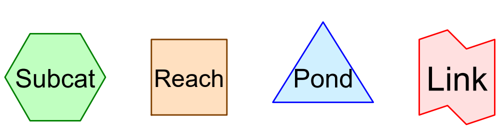
Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 2E: Design Point #1: Wetlands



DESIGN POINT #1: FLOW TO WETLANDS PROPOSED CONDITIONS





Routing Diagram for HydroCAD2
Prepared by {enter your company name here}, Printed 4/2/2019
HydroCAD® 10.00-24 s/n 02347 © 2018 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.132	79	<50% Grass cover, Poor, HSG B (9P, 12P)
1.356	39	>75% Grass cover, Good, HSG A (6P, 12P, 14P, 18P, 20P, 26P, 27P, 30P, 34P, 36P, 42P)
2.010	61	>75% Grass cover, Good, HSG B (1P, 3P, 6P, 9P, 12P, 18P, 26P, 27P, 42P)
2.184	98	Paved parking, HSG A (6P, 9P, 12P, 14P, 18P, 20P, 27P, 30P, 34P, 36P, 42P)
1.780	98	Paved parking, HSG B (1P, 3P, 6P, 9P, 12P, 18P, 26P, 27P, 42P)
0.383	98	Roofs, HSG A (26P, 39P)
0.254	98	Roofs, HSG B (26P)
0.535	98	Unconnected roofs, HSG A (23P)
0.847	30	Woods, Good, HSG A (18P, 42P)
2.964	55	Woods, Good, HSG B (1P, 3P, 6P, 12P, 18P, 42P)
12.445	**71**	**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1P: P1a Runoff Area=112,292 sf 17.77% Impervious Runoff Depth=0.56"
Flow Length=655' Tc=16.4 min CN=64 Runoff=0.92 cfs 0.120 af

Pond 2P: CB1 Peak Elev=167.38' Inflow=0.92 cfs 0.120 af
15.0" Round Culvert n=0.011 L=194.0' S=0.0052 '/' Outflow=0.92 cfs 0.120 af

Subcatchment 3P: P1b Runoff Area=72,500 sf 24.34% Impervious Runoff Depth=0.69"
Flow Length=562' Tc=16.0 min CN=67 Runoff=0.82 cfs 0.095 af

Pond 4P: CB2 Peak Elev=166.50' Inflow=0.82 cfs 0.095 af
12.0" Round Culvert n=0.011 L=3.0' S=0.0333 '/' Outflow=0.82 cfs 0.095 af

Pond 5P: DMH1 Peak Elev=166.42' Inflow=1.73 cfs 0.215 af
18.0" Round Culvert n=0.011 L=171.0' S=0.0053 '/' Outflow=1.73 cfs 0.215 af

Subcatchment 6P: P1c Runoff Area=36,460 sf 39.37% Impervious Runoff Depth=1.04"
Flow Length=372' Tc=16.1 min CN=74 Runoff=0.70 cfs 0.072 af

Pond 7P: CB3 Peak Elev=165.36' Inflow=0.70 cfs 0.072 af
12.0" Round Culvert n=0.011 L=3.0' S=0.0333 '/' Outflow=0.70 cfs 0.072 af

Pond 8P: DMH2 Peak Elev=165.52' Inflow=2.42 cfs 0.288 af
18.0" Round Culvert n=0.011 L=94.0' S=0.0287 '/' Outflow=2.42 cfs 0.288 af

Subcatchment 9P: P1d Runoff Area=17,792 sf 68.87% Impervious Runoff Depth=2.00"
Flow Length=233' Tc=9.9 min CN=88 Runoff=0.84 cfs 0.068 af

Pond 10P: CB4&5 Peak Elev=168.32' Inflow=0.84 cfs 0.068 af
Outflow=0.84 cfs 0.068 af

Pond 11P: FD/DMH3 Peak Elev=167.47' Inflow=0.84 cfs 0.068 af
12.0" Round Culvert n=0.011 L=47.0' S=0.1043 '/' Outflow=0.84 cfs 0.068 af

Subcatchment 12P: P1e Runoff Area=35,653 sf 39.20% Impervious Runoff Depth=1.04"
Flow Length=403' Tc=11.6 min CN=74 Runoff=0.78 cfs 0.071 af

Pond 13P: CB6 Peak Elev=164.95' Inflow=0.78 cfs 0.071 af
12.0" Round Culvert n=0.011 L=72.0' S=0.0333 '/' Outflow=0.78 cfs 0.071 af

Subcatchment 14P: P1f Runoff Area=31,721 sf 39.55% Impervious Runoff Depth=0.48"
Flow Length=81' Slope=0.0200 '/' Tc=9.8 min CN=62 Runoff=0.24 cfs 0.029 af

Pond 15P: Area Drains Peak Elev=163.09' Inflow=0.24 cfs 0.029 af
8.0" Round Culvert n=0.011 L=114.0' S=0.0061 '/' Outflow=0.24 cfs 0.029 af

Pond 16P: FD/DMH4 Peak Elev=162.85' Inflow=3.97 cfs 0.456 af
24.0" Round Culvert n=0.011 L=112.0' S=0.0286 '/' Outflow=3.97 cfs 0.456 af

Pond 17P: DMH5&6 Peak Elev=159.72' Inflow=3.97 cfs 0.456 af
Outflow=3.97 cfs 0.456 af

Subcatchment 18P: P1g Runoff Area=61,354 sf 47.91% Impervious Runoff Depth=0.98"
Flow Length=414' Tc=12.7 min CN=73 Runoff=1.21 cfs 0.115 af

Pond 19P: CB7 Peak Elev=160.54' Inflow=1.21 cfs 0.115 af
12.0" Round Culvert n=0.011 L=2.0' S=0.0500 '/' Outflow=1.21 cfs 0.115 af

Subcatchment 20P: P1h Runoff Area=8,054 sf 82.73% Impervious Runoff Depth=2.00"
Flow Length=68' Slope=0.0300 '/' Tc=5.0 min CN=88 Runoff=0.45 cfs 0.031 af

Pond 21P: CB8 Peak Elev=160.63' Inflow=0.45 cfs 0.031 af
12.0" Round Culvert n=0.011 L=59.0' S=0.0085 '/' Outflow=0.45 cfs 0.031 af

Pond 22P: DMH8&9 Peak Elev=159.34' Inflow=1.47 cfs 0.146 af
12.0" Round Culvert n=0.011 L=9.5' S=0.0105 '/' Outflow=1.47 cfs 0.146 af

Subcatchment 23P: P1i Runoff Area=23,312 sf 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=1.66 cfs 0.132 af

Pond 24P: Roof Pipe Peak Elev=164.22' Inflow=1.66 cfs 0.132 af
12.0" Round Culvert n=0.011 L=302.0' S=0.0100 '/' Outflow=1.66 cfs 0.132 af

Pond 25P: Infiltration Field #1 Peak Elev=158.69' Storage=5,001 cf Inflow=6.38 cfs 0.734 af
Discarded=2.61 cfs 0.734 af Primary=0.00 cfs 0.000 af Outflow=2.61 cfs 0.734 af

Subcatchment 26P: P2f Runoff Area=24,110 sf 71.37% Impervious Runoff Depth=1.84"
Tc=6.0 min CN=86 Runoff=1.19 cfs 0.085 af

Subcatchment 27P: P2a Runoff Area=12,798 sf 68.12% Impervious Runoff Depth=1.76"
Flow Length=211' Tc=6.9 min CN=85 Runoff=0.59 cfs 0.043 af

Pond 28P: CB9 Peak Elev=163.38' Inflow=0.59 cfs 0.043 af
12.0" Round Culvert n=0.011 L=122.0' S=0.0164 '/' Outflow=0.59 cfs 0.043 af

Pond 29P: DMH11 Peak Elev=165.73' Inflow=1.77 cfs 0.128 af
12.0" Round Culvert n=0.011 L=71.0' S=0.0141 '/' Outflow=1.77 cfs 0.128 af

Subcatchment 30P: P2b Runoff Area=11,558 sf 84.98% Impervious Runoff Depth=2.08"
Flow Length=74' Slope=0.0200 '/' Tc=5.0 min CN=89 Runoff=0.67 cfs 0.046 af

Pond 31P: CB10 Peak Elev=161.54' Inflow=0.67 cfs 0.046 af
12.0" Round Culvert n=0.011 L=3.0' S=0.0333 '/' Outflow=0.67 cfs 0.046 af

Pond 32P: DMH12 Peak Elev=164.68' Inflow=2.43 cfs 0.174 af
15.0" Round Culvert n=0.011 L=158.0' S=0.0323 '/' Outflow=2.43 cfs 0.174 af

Pond 33P: FD/DMH13&14 Peak Elev=159.43' Inflow=2.43 cfs 0.174 af
18.0" Round Culvert n=0.011 L=8.0' S=0.0125 '/' Outflow=2.43 cfs 0.174 af

Subcatchment 34P: P2c Runoff Area=19,803 sf 84.10% Impervious Runoff Depth=2.08"
Flow Length=225' Tc=5.0 min CN=89 Runoff=1.14 cfs 0.079 af

Pond 35P: FD/CB11 Peak Elev=160.36' Inflow=1.14 cfs 0.079 af
12.0" Round Culvert n=0.011 L=32.0' S=0.0313 '/' Outflow=1.14 cfs 0.079 af

Subcatchment 36P: P2d Runoff Area=10,490 sf 82.97% Impervious Runoff Depth=2.00"
Flow Length=124' Slope=0.0300 '/' Tc=5.0 min CN=88 Runoff=0.58 cfs 0.040 af

Pond 37P: FD/CB12 Peak Elev=160.38' Inflow=0.58 cfs 0.040 af
12.0" Round Culvert n=0.011 L=52.0' S=0.0231 '/' Outflow=0.58 cfs 0.040 af

Pond 38P: DMH15&16 Peak Elev=159.41' Inflow=1.73 cfs 0.119 af
12.0" Round Culvert n=0.011 L=6.5' S=0.0154 '/' Outflow=1.73 cfs 0.119 af

Subcatchment 39P: P2e Runoff Area=11,055 sf 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=0.79 cfs 0.063 af

Pond 40P: Roof Drain Peak Elev=165.56' Inflow=0.79 cfs 0.063 af
8.0" Round Culvert n=0.011 L=232.0' S=0.0280 '/' Outflow=0.79 cfs 0.063 af

Pond 41P: Infiltration Field #2 Peak Elev=159.02' Storage=3,577 cf Inflow=4.92 cfs 0.355 af
Discarded=1.08 cfs 0.355 af Primary=0.03 cfs 0.001 af Outflow=1.11 cfs 0.355 af

Subcatchment 42P: P3 Runoff Area=53,149 sf 2.73% Impervious Runoff Depth=0.00"
Flow Length=204' Tc=8.6 min CN=36 Runoff=0.00 cfs 0.000 af

Link 43P: Design Point #1: Wetlands Inflow=0.03 cfs 0.001 af
Primary=0.03 cfs 0.001 af

Pond 47P: FD/DMH7 Peak Elev=160.35' Inflow=1.47 cfs 0.146 af
12.0" Round Culvert n=0.011 L=51.0' S=0.0176 '/' Outflow=1.47 cfs 0.146 af

Total Runoff Area = 12.445 ac Runoff Volume = 1.090 af Average Runoff Depth = 1.05"
58.73% Pervious = 7.309 ac 41.27% Impervious = 5.136 ac

Summary for Subcatchment 1P: P1a

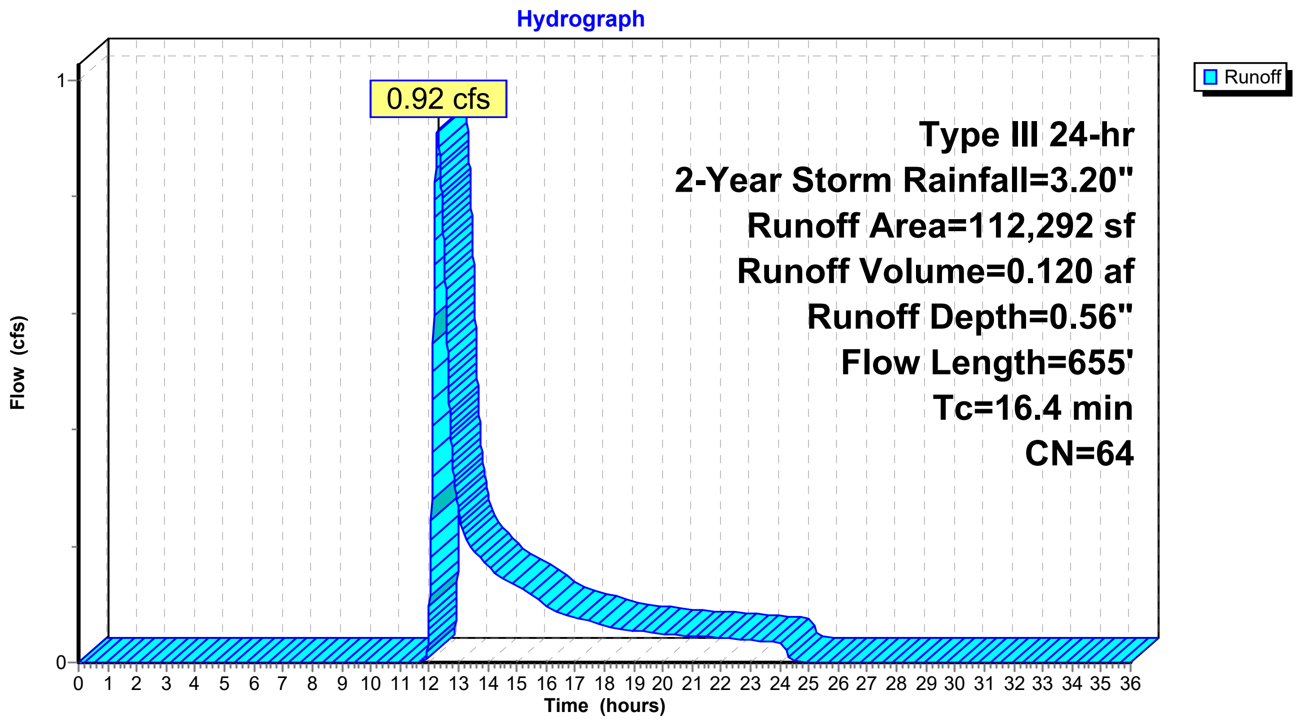
Runoff = 0.92 cfs @ 12.29 hrs, Volume= 0.120 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
19,951	98	Paved parking, HSG B
20,485	61	>75% Grass cover, Good, HSG B
71,856	55	Woods, Good, HSG B
112,292	64	Weighted Average
92,341		82.23% Pervious Area
19,951		17.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	43	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.8	410	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	47	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	155	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.4	655	Total			

Subcatchment 1P: P1a



Summary for Pond 2P: CB1

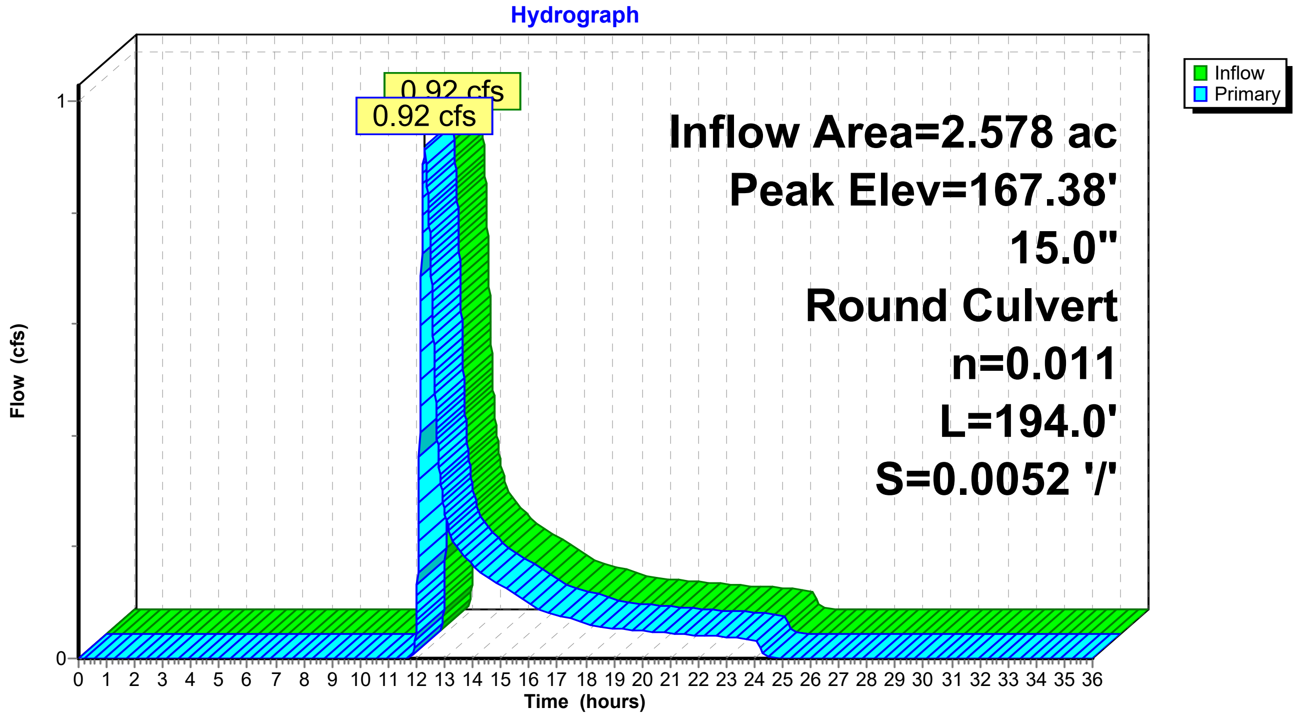
Inflow Area = 2.578 ac, 17.77% Impervious, Inflow Depth = 0.56" for 2-Year Storm event
Inflow = 0.92 cfs @ 12.29 hrs, Volume= 0.120 af
Outflow = 0.92 cfs @ 12.29 hrs, Volume= 0.120 af, Atten= 0%, Lag= 0.0 min
Primary = 0.92 cfs @ 12.29 hrs, Volume= 0.120 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 167.38' @ 12.29 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	166.90'	**15.0" Round Culvert** L= 194.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 166.90' / 165.90' S= 0.0052 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf

Primary OutFlow Max=0.92 cfs @ 12.29 hrs HW=167.38' (Free Discharge)
1=Culvert (Barrel Controls 0.92 cfs @ 3.17 fps)

Pond 2P: CB1



Summary for Subcatchment 3P: P1b

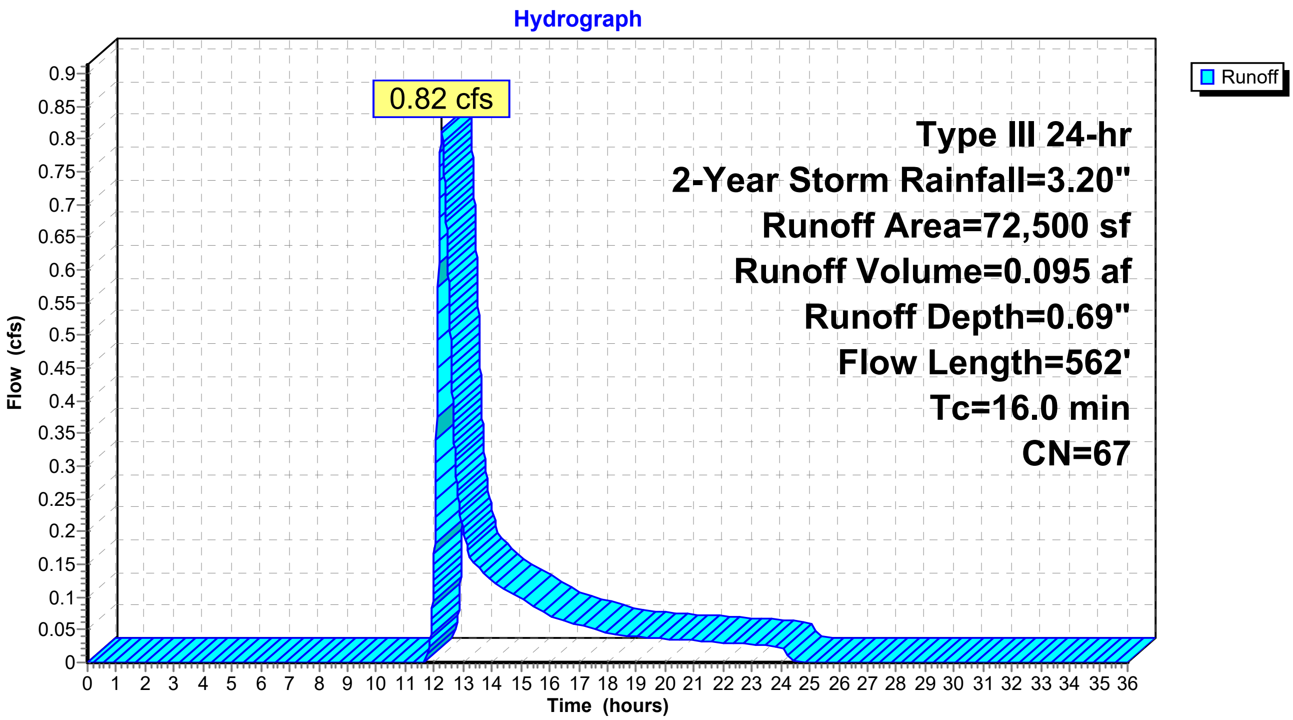
Runoff = 0.82 cfs @ 12.25 hrs, Volume= 0.095 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
17,650	98	Paved parking, HSG B
20,258	61	>75% Grass cover, Good, HSG B
34,592	55	Woods, Good, HSG B
72,500	67	Weighted Average
54,850		75.66% Pervious Area
17,650		24.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	43	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.0	405	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	17	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	97	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.0	562	Total			

Subcatchment 3P: P1b



Summary for Pond 4P: CB2

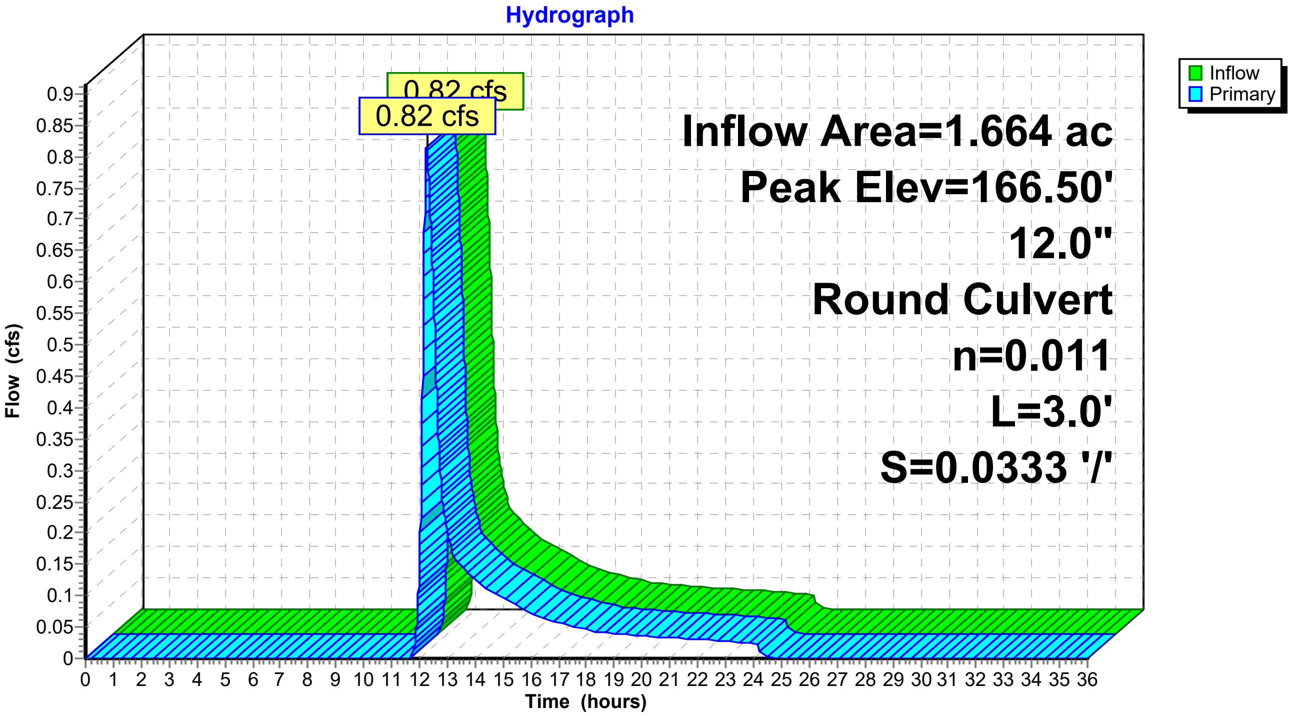
Inflow Area =	1.664 ac,	24.34% Impervious,	Inflow Depth = 0.69"	for 2-Year Storm event	
Inflow =	0.82 cfs @	12.25 hrs,	Volume=	0.095 af	
Outflow =	0.82 cfs @	12.25 hrs,	Volume=	0.095 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.82 cfs @	12.25 hrs,	Volume=	0.095 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 166.50' @ 12.25 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	166.00'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 166.00' / 165.90' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.82 cfs @ 12.25 hrs HW=166.50' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.82 cfs @ 3.02 fps)

Pond 4P: CB2



Summary for Pond 5P: DMH1

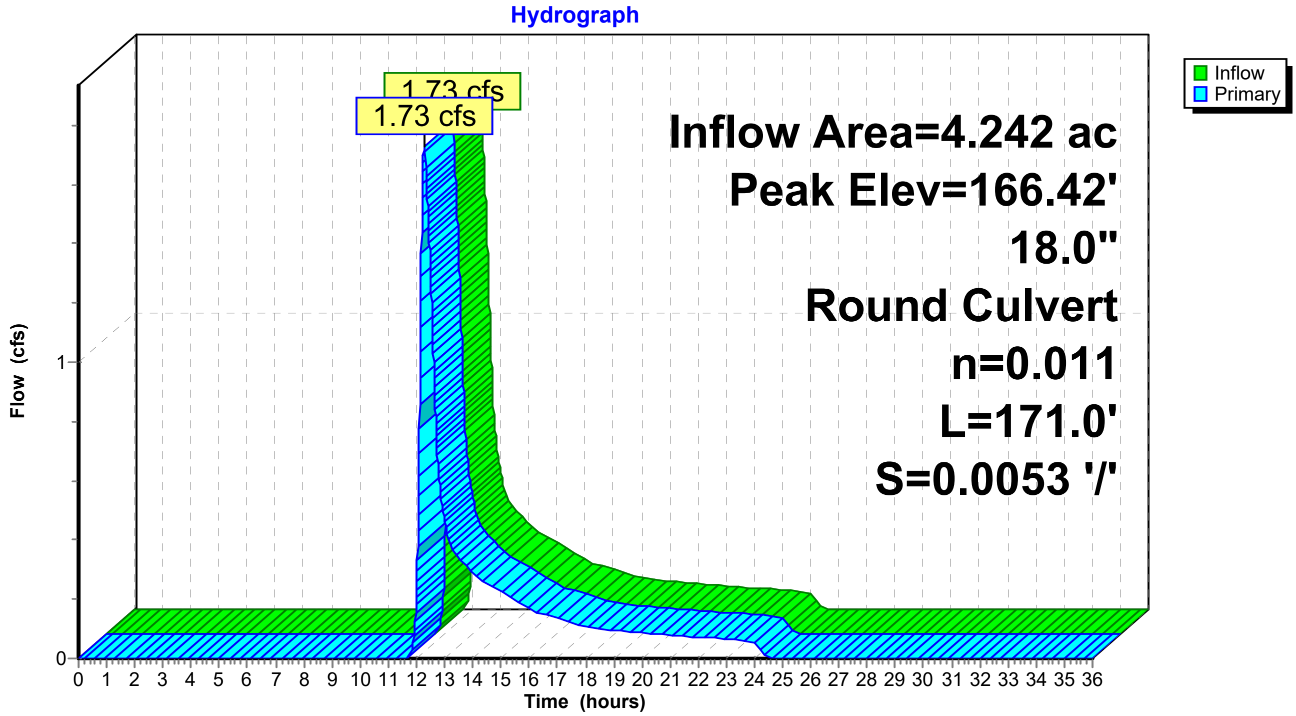
Inflow Area = 4.242 ac, 20.35% Impervious, Inflow Depth = 0.61" for 2-Year Storm event
Inflow = 1.73 cfs @ 12.27 hrs, Volume= 0.215 af
Outflow = 1.73 cfs @ 12.27 hrs, Volume= 0.215 af, Atten= 0%, Lag= 0.0 min
Primary = 1.73 cfs @ 12.27 hrs, Volume= 0.215 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 166.42' @ 12.27 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	165.80'	**18.0" Round Culvert** L= 171.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.80' / 164.90' S= 0.0053 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=1.73 cfs @ 12.27 hrs HW=166.42' (Free Discharge)
↑**1=Culvert** (Barrel Controls 1.73 cfs @ 3.67 fps)

Pond 5P: DMH1



Summary for Subcatchment 6P: P1c

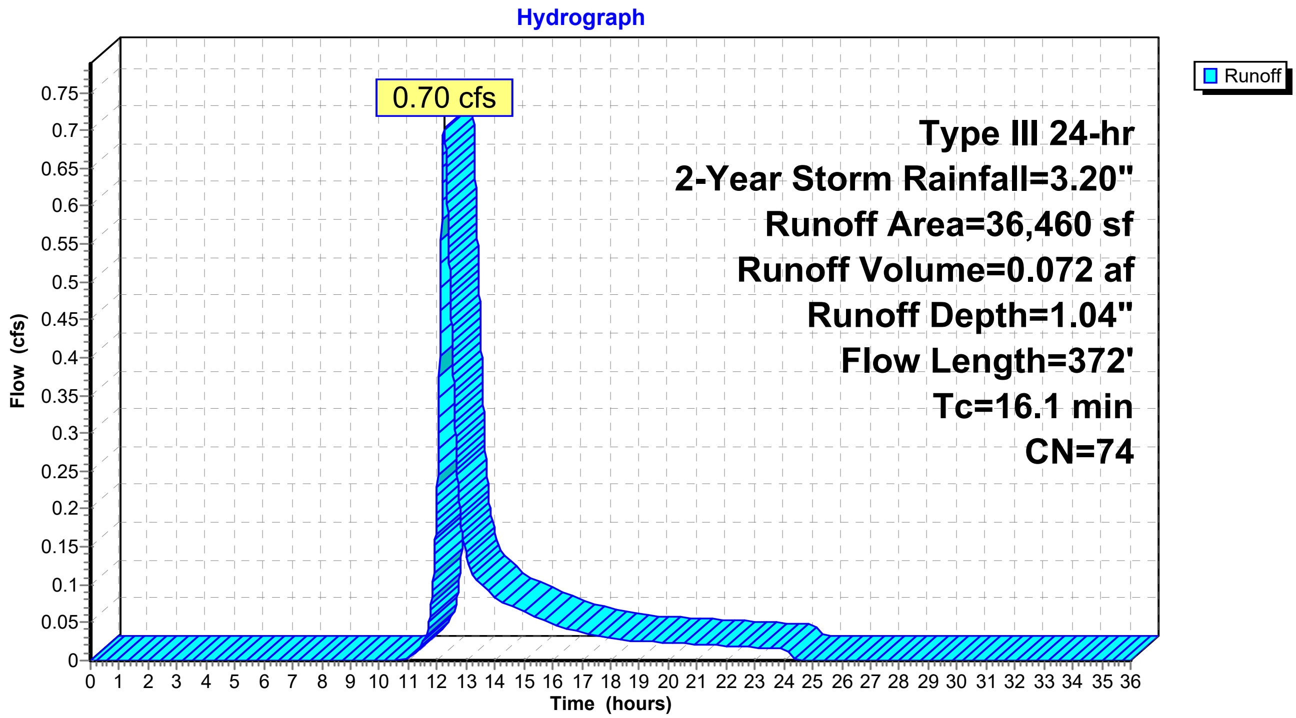
Runoff = 0.70 cfs @ 12.24 hrs, Volume= 0.072 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
1,313	98	Paved parking, HSG A
13,041	98	Paved parking, HSG B
160	39	>75% Grass cover, Good, HSG A
15,425	61	>75% Grass cover, Good, HSG B
6,521	55	Woods, Good, HSG B
36,460	74	Weighted Average
22,106		60.63% Pervious Area
14,354		39.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	47	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
4.8	36	0.0400	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.7	74	0.0700	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	40	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	175	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.1	372	Total			

Subcatchment 6P: P1c



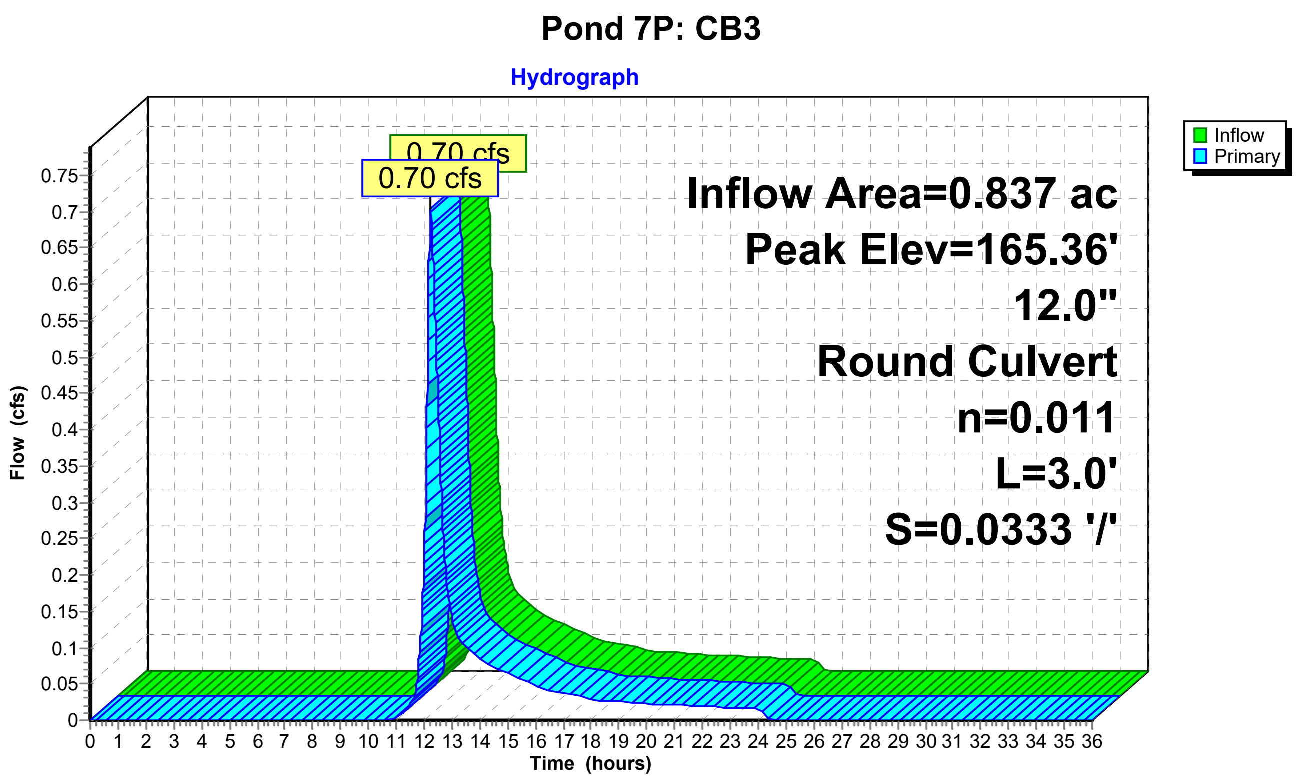
Summary for Pond 7P: CB3

Inflow Area =	0.837 ac,	39.37% Impervious,	Inflow Depth = 1.04"	for 2-Year Storm event	
Inflow =	0.70 cfs @	12.24 hrs,	Volume=	0.072 af	
Outflow =	0.70 cfs @	12.24 hrs,	Volume=	0.072 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.70 cfs @	12.24 hrs,	Volume=	0.072 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 165.36' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	164.90'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 164.90' / 164.80' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.70 cfs @ 12.24 hrs HW=165.36' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.70 cfs @ 2.94 fps)



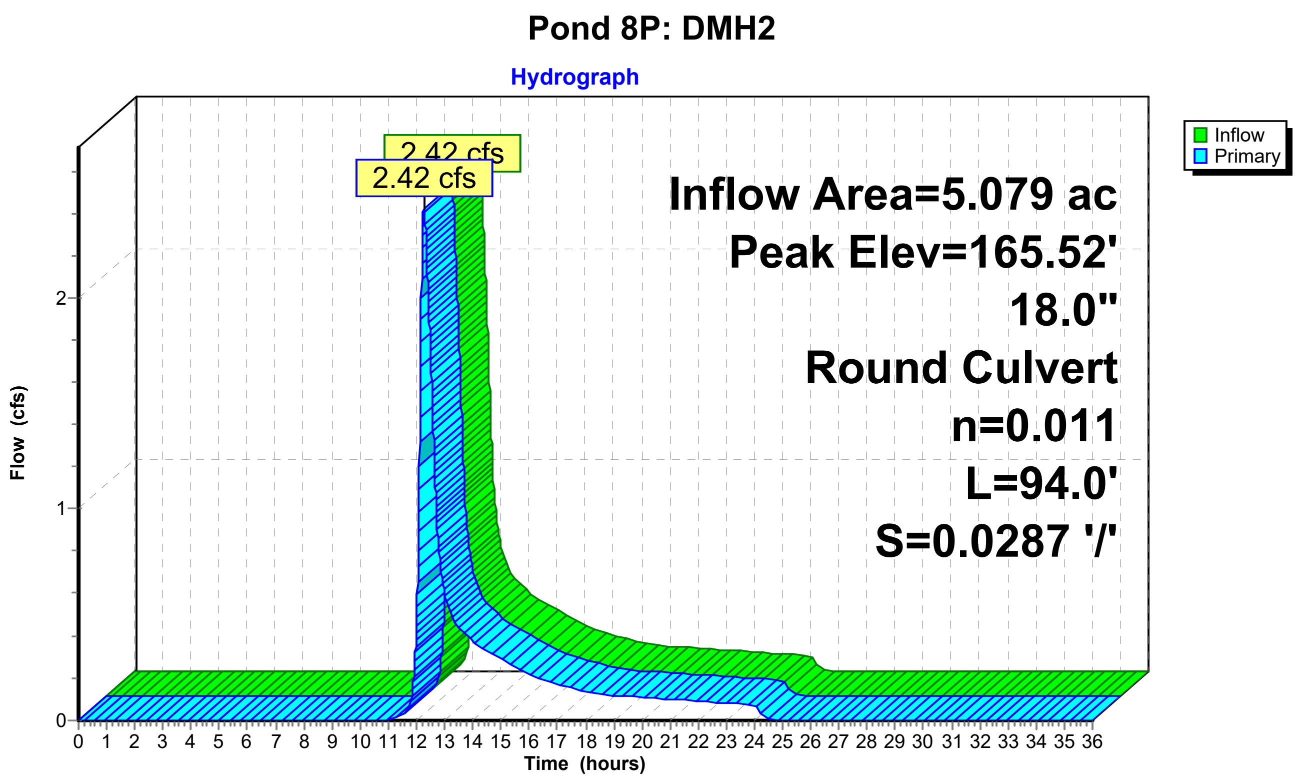
Summary for Pond 8P: DMH2

Inflow Area =	5.079 ac,	23.48% Impervious,	Inflow Depth = 0.68"	for 2-Year Storm event	
Inflow =	2.42 cfs @	12.26 hrs,	Volume=	0.288 af	
Outflow =	2.42 cfs @	12.26 hrs,	Volume=	0.288 af,	Atten= 0%, Lag= 0.0 min
Primary =	2.42 cfs @	12.26 hrs,	Volume=	0.288 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 165.52' @ 12.26 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	164.80'	**18.0" Round Culvert** L= 94.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 164.80' / 162.10' S= 0.0287 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=2.42 cfs @ 12.26 hrs HW=165.52' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.42 cfs @ 2.89 fps)



Summary for Subcatchment 9P: P1d

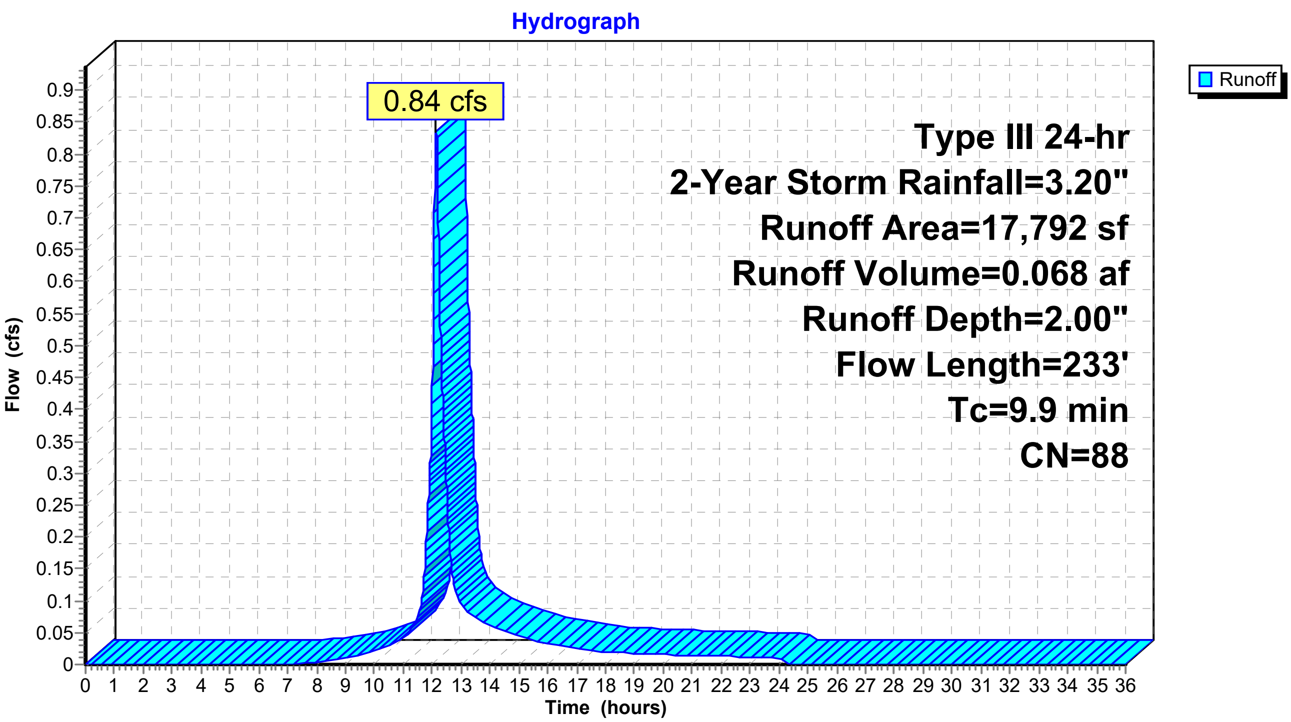
Runoff = 0.84 cfs @ 12.14 hrs, Volume= 0.068 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
220	98	Paved parking, HSG A
12,034	98	Paved parking, HSG B
4,299	61	>75% Grass cover, Good, HSG B
1,239	79	<50% Grass cover, Poor, HSG B
17,792	88	Weighted Average
5,538		31.13% Pervious Area
12,254		68.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	72	0.0300	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.1	17	0.1000	2.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	144	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.9	233	Total			

Subcatchment 9P: P1d



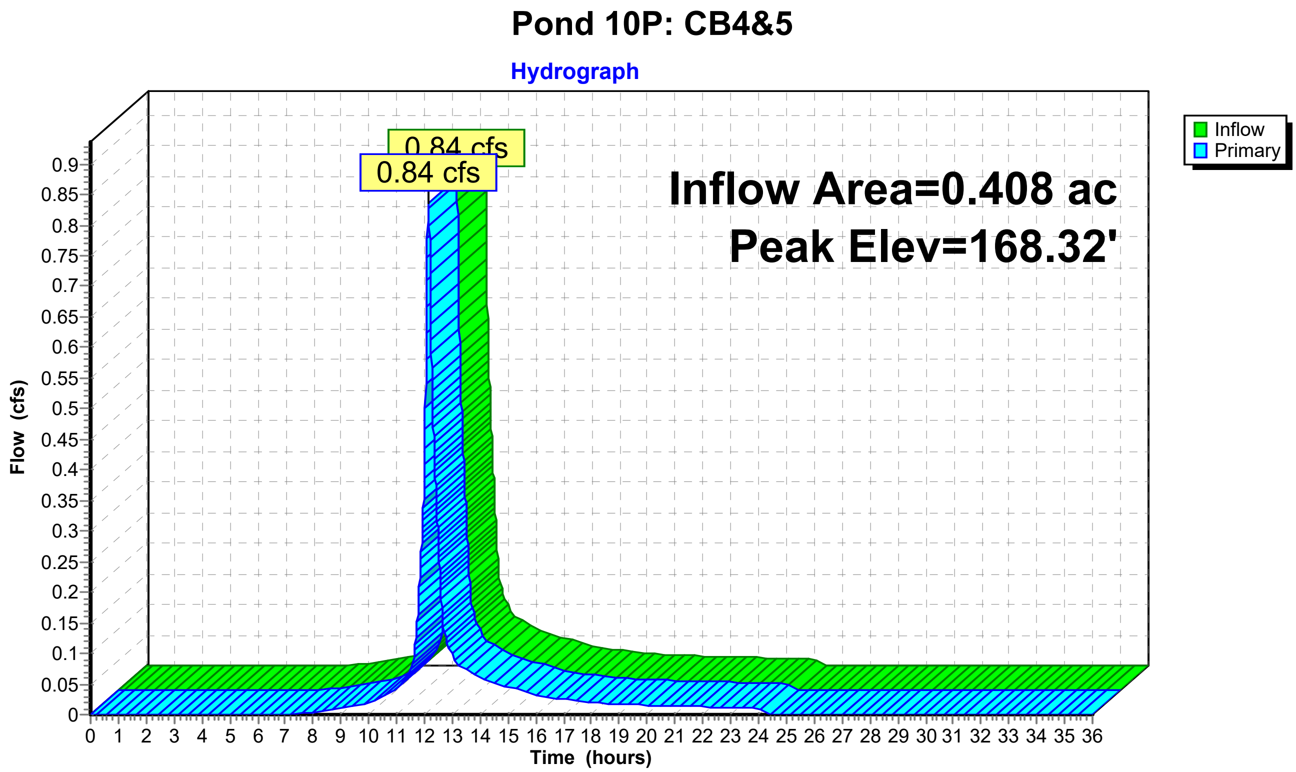
Summary for Pond 10P: CB4&5

Inflow Area = 0.408 ac, 68.87% Impervious, Inflow Depth = 2.00" for 2-Year Storm event
Inflow = 0.84 cfs @ 12.14 hrs, Volume= 0.068 af
Outflow = 0.84 cfs @ 12.14 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min
Primary = 0.84 cfs @ 12.14 hrs, Volume= 0.068 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 168.32' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	168.00'	**12.0" Round Culvert** L= 36.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 168.00' / 167.60' S= 0.0111 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#2	Primary	168.00'	**12.0" Round Culvert** L= 36.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 168.00' / 167.60' S= 0.0111 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.84 cfs @ 12.14 hrs HW=168.32' (Free Discharge)
1=Culvert (Inlet Controls 0.42 cfs @ 1.93 fps)
2=Culvert (Inlet Controls 0.42 cfs @ 1.93 fps)



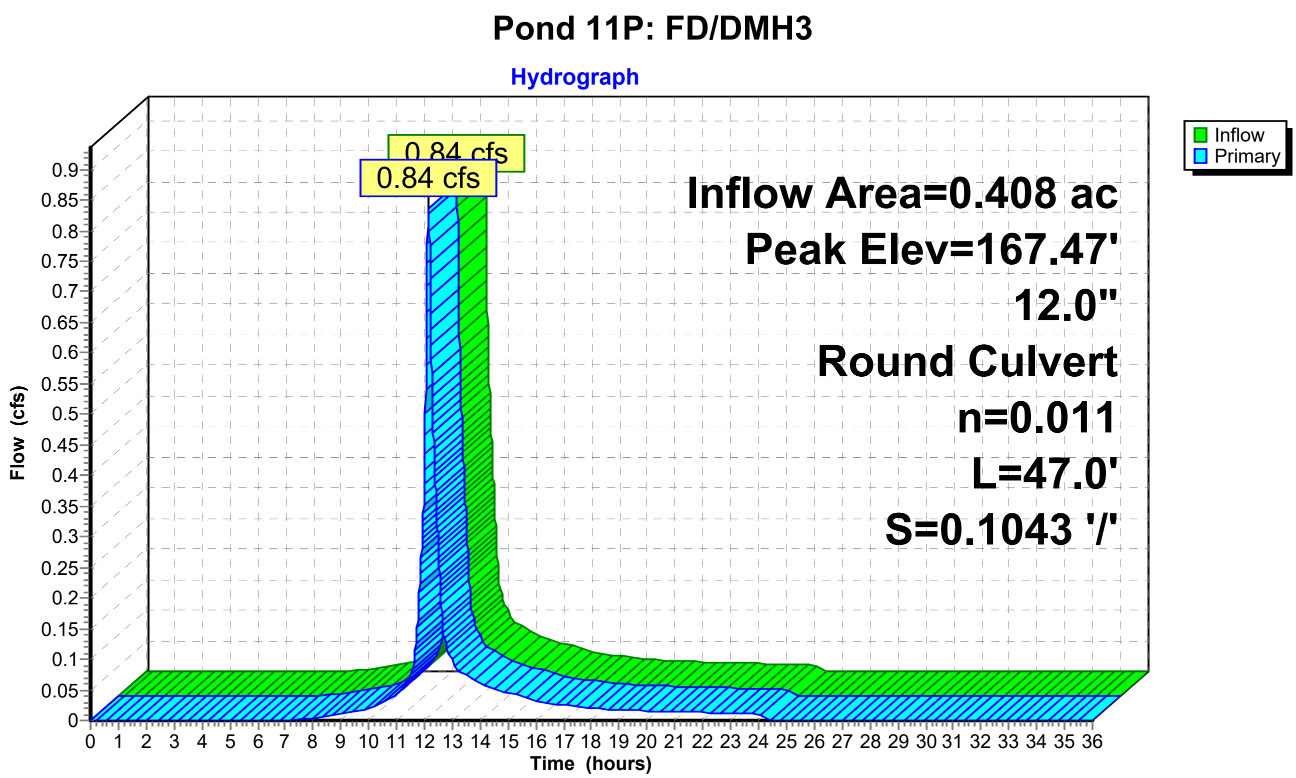
Summary for Pond 11P: FD/DMH3

Inflow Area = 0.408 ac, 68.87% Impervious, Inflow Depth = 2.00" for 2-Year Storm event
Inflow = 0.84 cfs @ 12.14 hrs, Volume= 0.068 af
Outflow = 0.84 cfs @ 12.14 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min
Primary = 0.84 cfs @ 12.14 hrs, Volume= 0.068 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 167.47' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	167.00'	**12.0" Round Culvert** L= 47.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 167.00' / 162.10' S= 0.1043 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.83 cfs @ 12.14 hrs HW=167.47' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.83 cfs @ 2.33 fps)



Summary for Subcatchment 12P: P1e

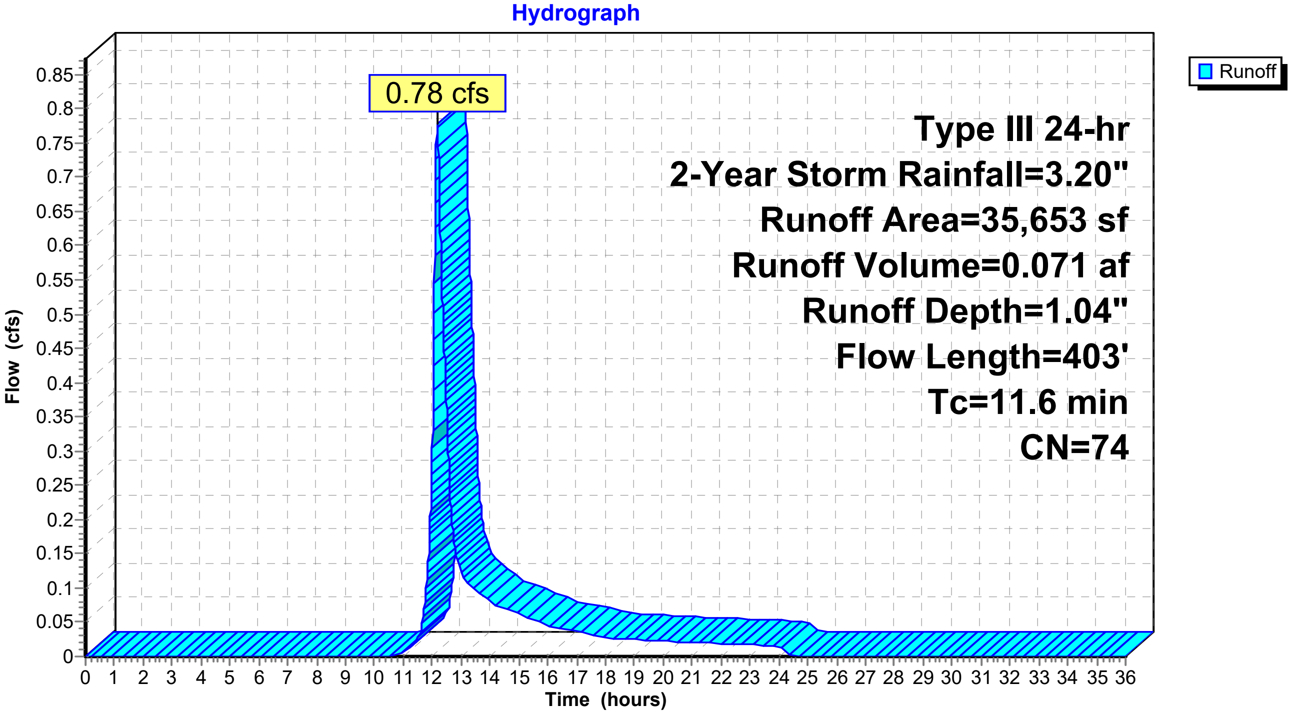
Runoff = 0.78 cfs @ 12.17 hrs, Volume= 0.071 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
10,926	98	Paved parking, HSG A
3,050	98	Paved parking, HSG B
6,148	39	>75% Grass cover, Good, HSG A
10,410	61	>75% Grass cover, Good, HSG B
4,510	79	<50% Grass cover, Poor, HSG B
609	55	Woods, Good, HSG B
35,653	74	Weighted Average
21,677		60.80% Pervious Area
13,976		39.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	83	0.0400	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.1	13	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	130	0.0700	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	177	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.6	403	Total			

Subcatchment 12P: P1e



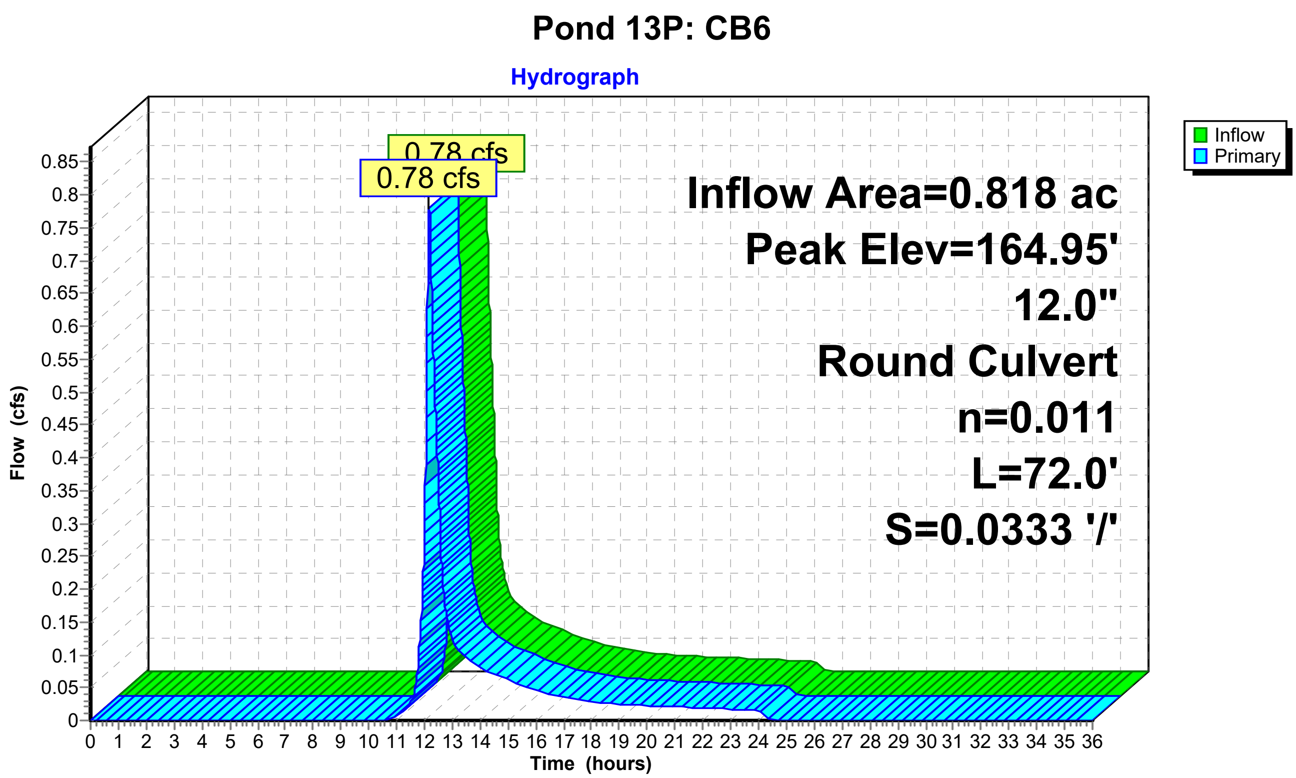
Summary for Pond 13P: CB6

Inflow Area =	0.818 ac,	39.20% Impervious,	Inflow Depth = 1.04"	for 2-Year Storm event
Inflow =	0.78 cfs @	12.17 hrs, Volume=	0.071 af	
Outflow =	0.78 cfs @	12.17 hrs, Volume=	0.071 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.78 cfs @	12.17 hrs, Volume=	0.071 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 164.95' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	164.50'	**12.0" Round Culvert** L= 72.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 164.50' / 162.10' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.78 cfs @ 12.17 hrs HW=164.95' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.78 cfs @ 2.28 fps)



Summary for Subcatchment 14P: P1f

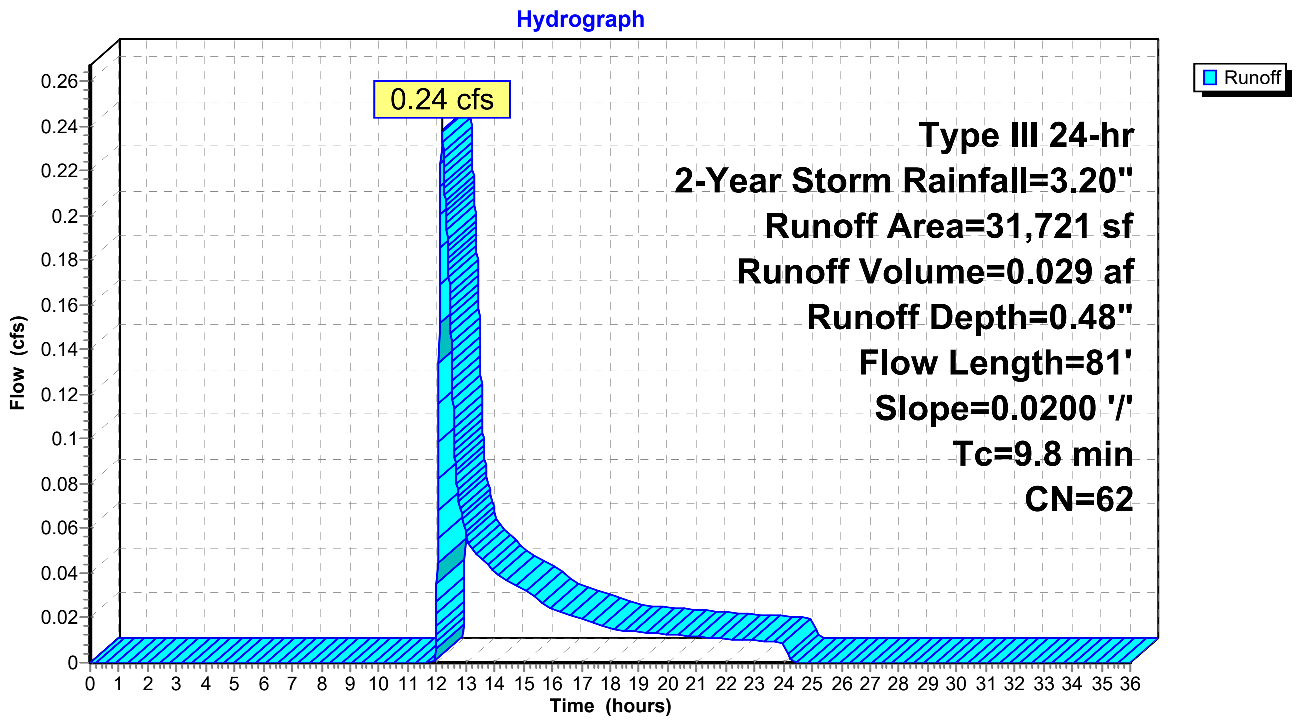
Runoff = 0.24 cfs @ 12.18 hrs, Volume= 0.029 af, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
12,547	98	Paved parking, HSG A
19,174	39	>75% Grass cover, Good, HSG A
31,721	62	Weighted Average
19,174		60.45% Pervious Area
12,547		39.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	59	0.0200	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.4	22	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	81	Total			

Subcatchment 14P: P1f



Summary for Pond 15P: Area Drains

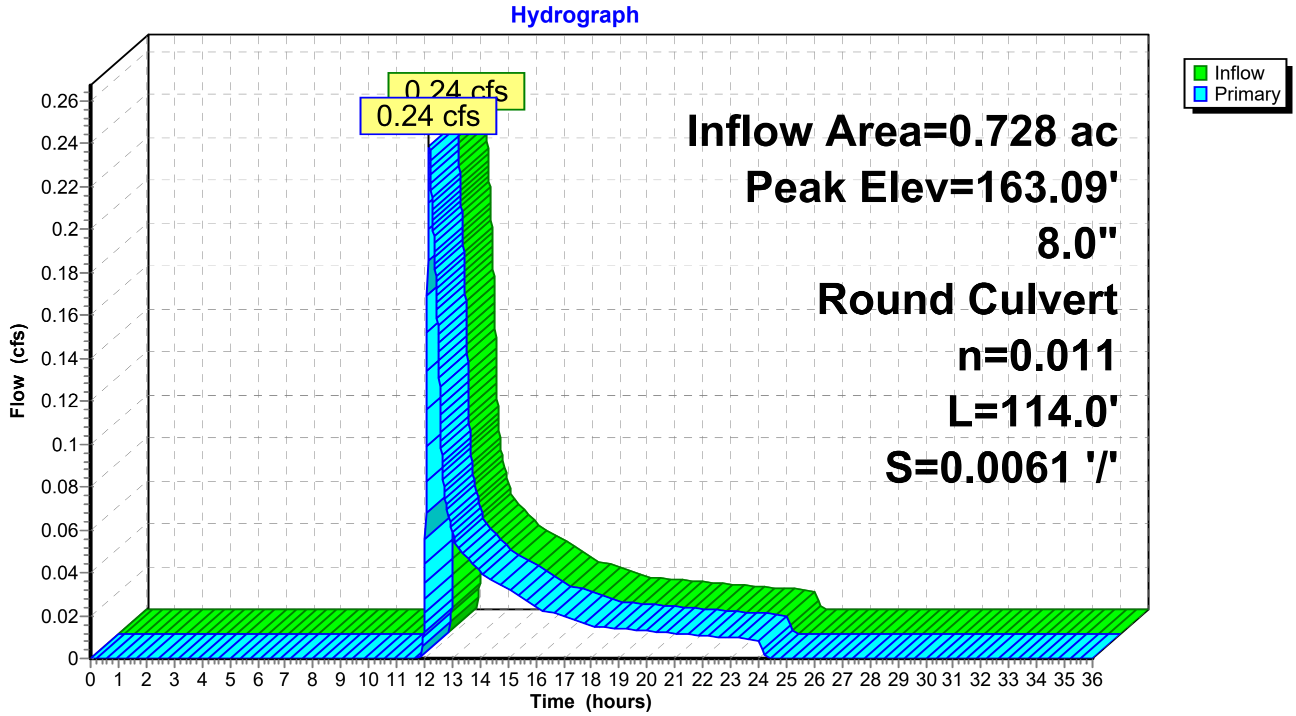
Inflow Area = 0.728 ac, 39.55% Impervious, Inflow Depth = 0.48" for 2-Year Storm event
Inflow = 0.24 cfs @ 12.18 hrs, Volume= 0.029 af
Outflow = 0.24 cfs @ 12.18 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 12.18 hrs, Volume= 0.029 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 163.09' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	162.80'	**8.0" Round Culvert** L= 114.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 162.80' / 162.10' S= 0.0061 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=0.24 cfs @ 12.18 hrs HW=163.09' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.24 cfs @ 2.45 fps)

Pond 15P: Area Drains



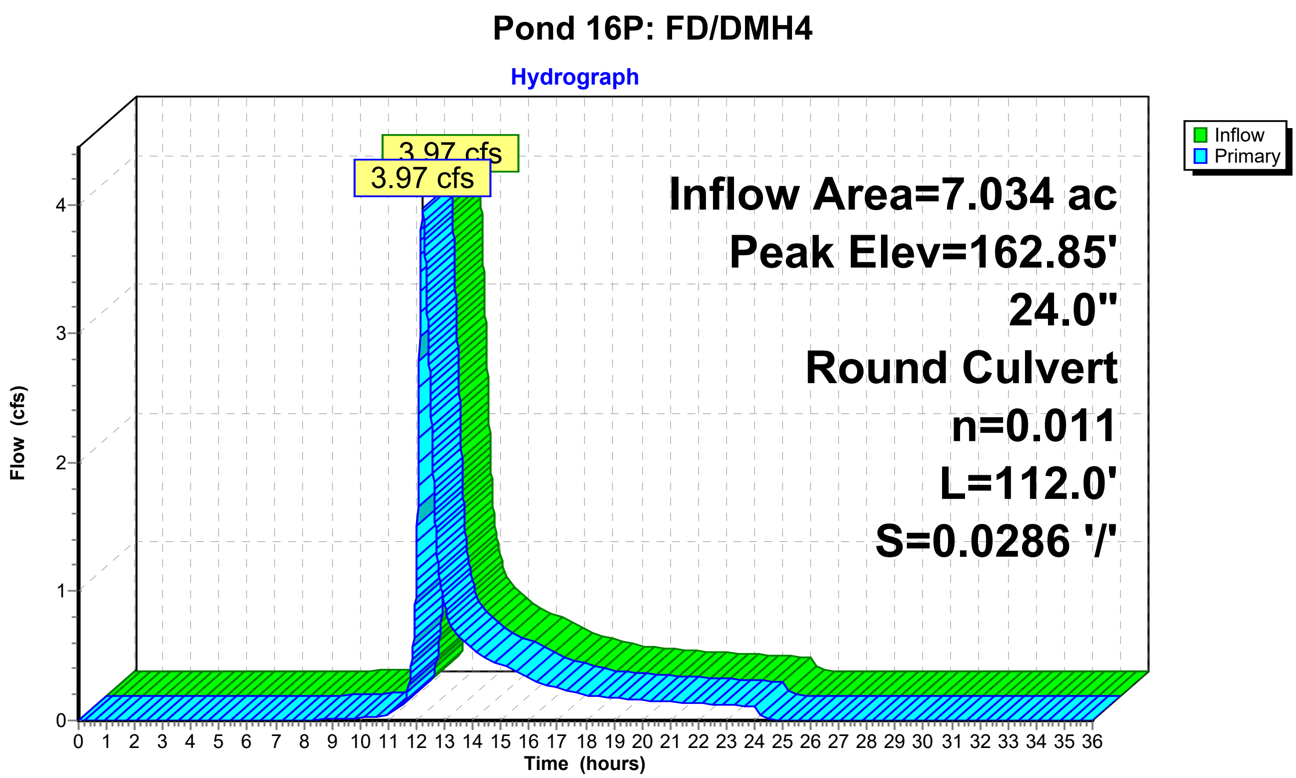
Summary for Pond 16P: FD/DMH4

Inflow Area = 7.034 ac, 29.61% Impervious, Inflow Depth = 0.78" for 2-Year Storm event
Inflow = 3.97 cfs @ 12.21 hrs, Volume= 0.456 af
Outflow = 3.97 cfs @ 12.21 hrs, Volume= 0.456 af, Atten= 0%, Lag= 0.0 min
Primary = 3.97 cfs @ 12.21 hrs, Volume= 0.456 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 162.85' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	162.00'	**24.0" Round Culvert** L= 112.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 162.00' / 158.80' S= 0.0286 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf

Primary OutFlow Max=3.96 cfs @ 12.21 hrs HW=162.85' (Free Discharge)
└─**1=Culvert** (Inlet Controls 3.96 cfs @ 3.13 fps)



Summary for Pond 17P: DMH5&6

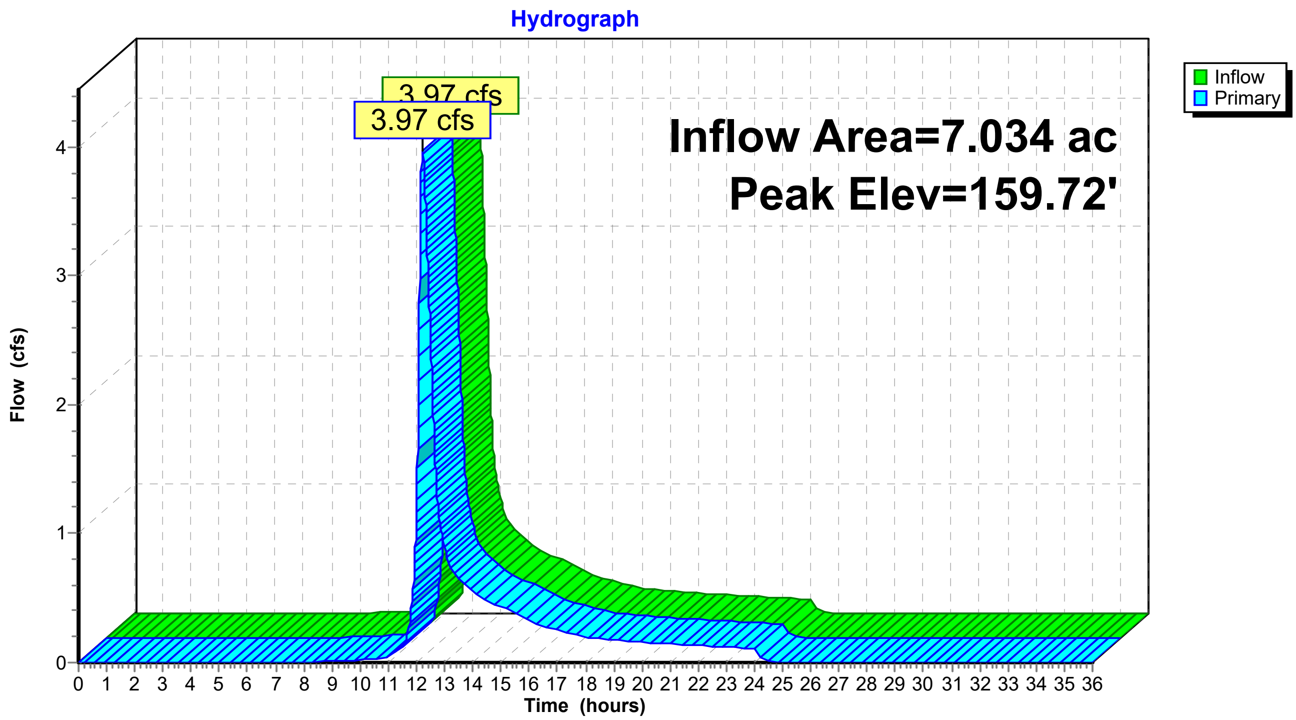
Inflow Area =	7.034 ac,	29.61% Impervious,	Inflow Depth = 0.78"	for 2-Year Storm event	
Inflow =	3.97 cfs @	12.21 hrs,	Volume=	0.456 af	
Outflow =	3.97 cfs @	12.21 hrs,	Volume=	0.456 af,	Atten= 0%, Lag= 0.0 min
Primary =	3.97 cfs @	12.21 hrs,	Volume=	0.456 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 159.72' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.60'	**18.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.60' / 158.50' S= 0.0125 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Primary	161.00'	**18.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.00' / 158.50' S= 0.4167 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=3.96 cfs @ 12.21 hrs HW=159.72' (Free Discharge)
1=Culvert (Barrel Controls 3.96 cfs @ 3.91 fps)
2=Culvert (Controls 0.00 cfs)

Pond 17P: DMH5&6



Summary for Subcatchment 18P: P1g

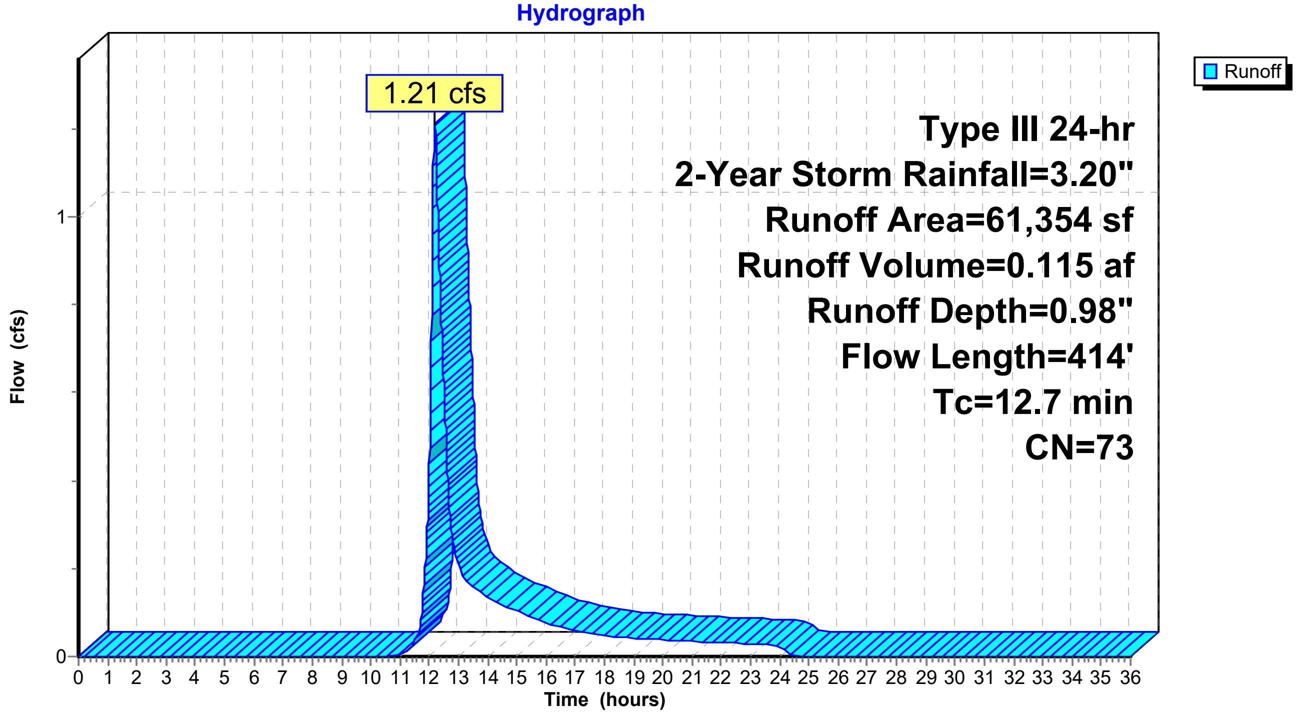
Runoff = 1.21 cfs @ 12.19 hrs, Volume= 0.115 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
24,200	98	Paved parking, HSG A
5,193	98	Paved parking, HSG B
6,461	39	>75% Grass cover, Good, HSG A
7,570	61	>75% Grass cover, Good, HSG B
3,461	30	Woods, Good, HSG A
14,469	55	Woods, Good, HSG B
61,354	73	Weighted Average
31,961		52.09% Pervious Area
29,393		47.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	61	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	180	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	44	0.0400	1.80		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
0.6	129	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.7	414	Total			

Subcatchment 18P: P1g



Summary for Pond 19P: CB7

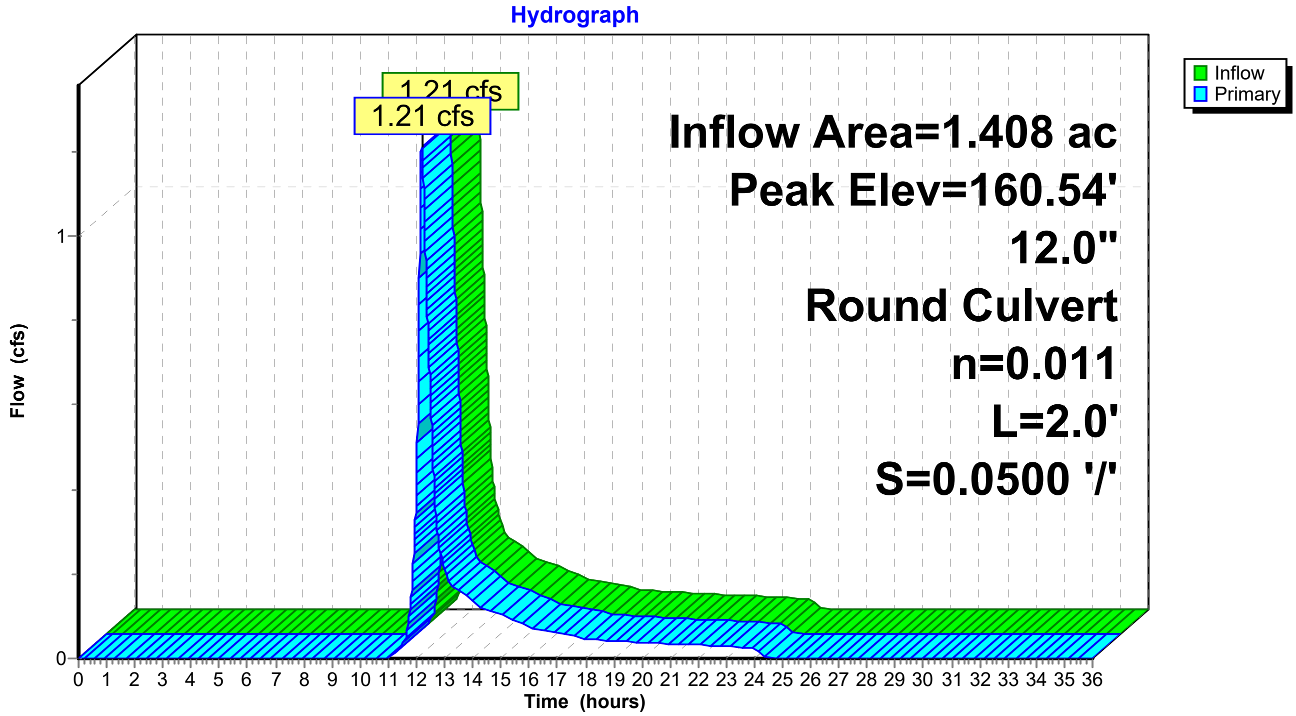
Inflow Area =	1.408 ac,	47.91% Impervious,	Inflow Depth = 0.98"	for 2-Year Storm event
Inflow =	1.21 cfs @	12.19 hrs,	Volume=	0.115 af
Outflow =	1.21 cfs @	12.19 hrs,	Volume=	0.115 af, Atten= 0%, Lag= 0.0 min
Primary =	1.21 cfs @	12.19 hrs,	Volume=	0.115 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.54' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	159.90'	**12.0" Round Culvert** L= 2.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.90' / 159.80' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.21 cfs @ 12.19 hrs HW=160.54' (Free Discharge)
└─**1=Culvert** (Barrel Controls 1.21 cfs @ 3.28 fps)

Pond 19P: CB7



Summary for Subcatchment 20P: P1h

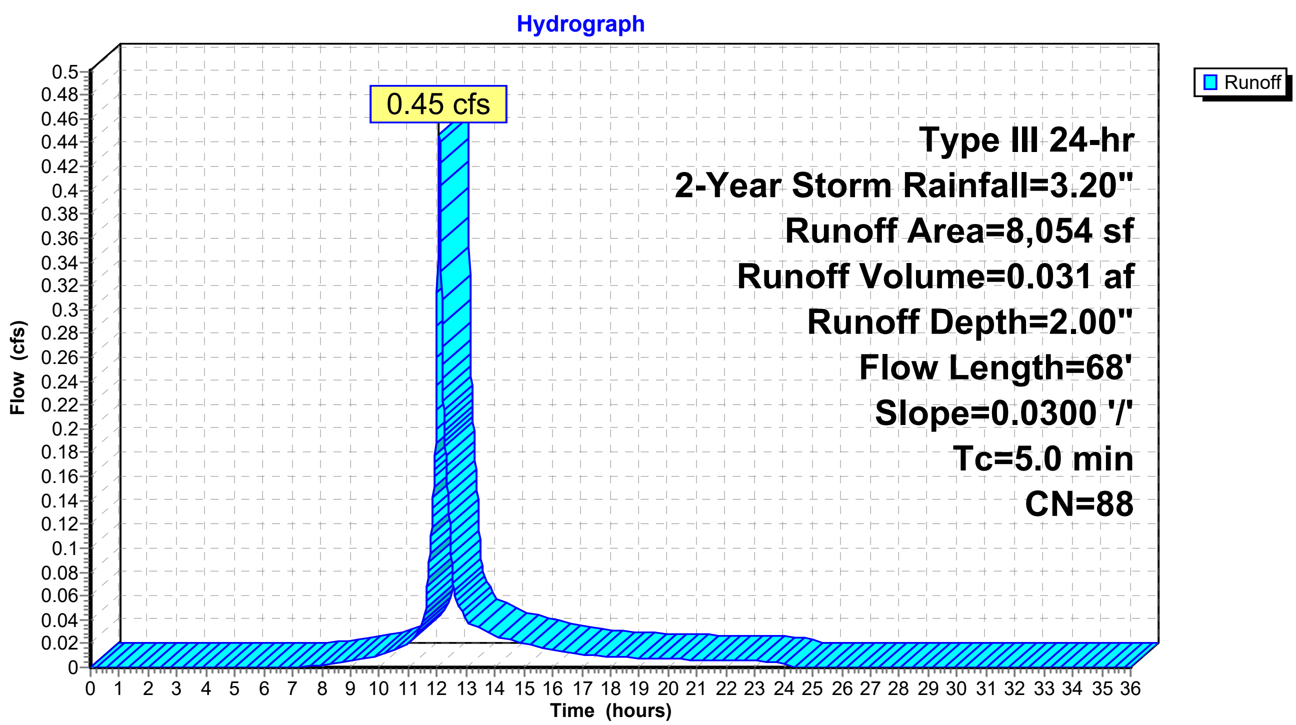
Runoff = 0.45 cfs @ 12.07 hrs, Volume= 0.031 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
6,663	98	Paved parking, HSG A
1,391	39	>75% Grass cover, Good, HSG A
8,054	88	Weighted Average
1,391		17.27% Pervious Area
6,663		82.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	14	0.0300	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.6	54	0.0300	1.43		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
3.1	68	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 20P: P1h



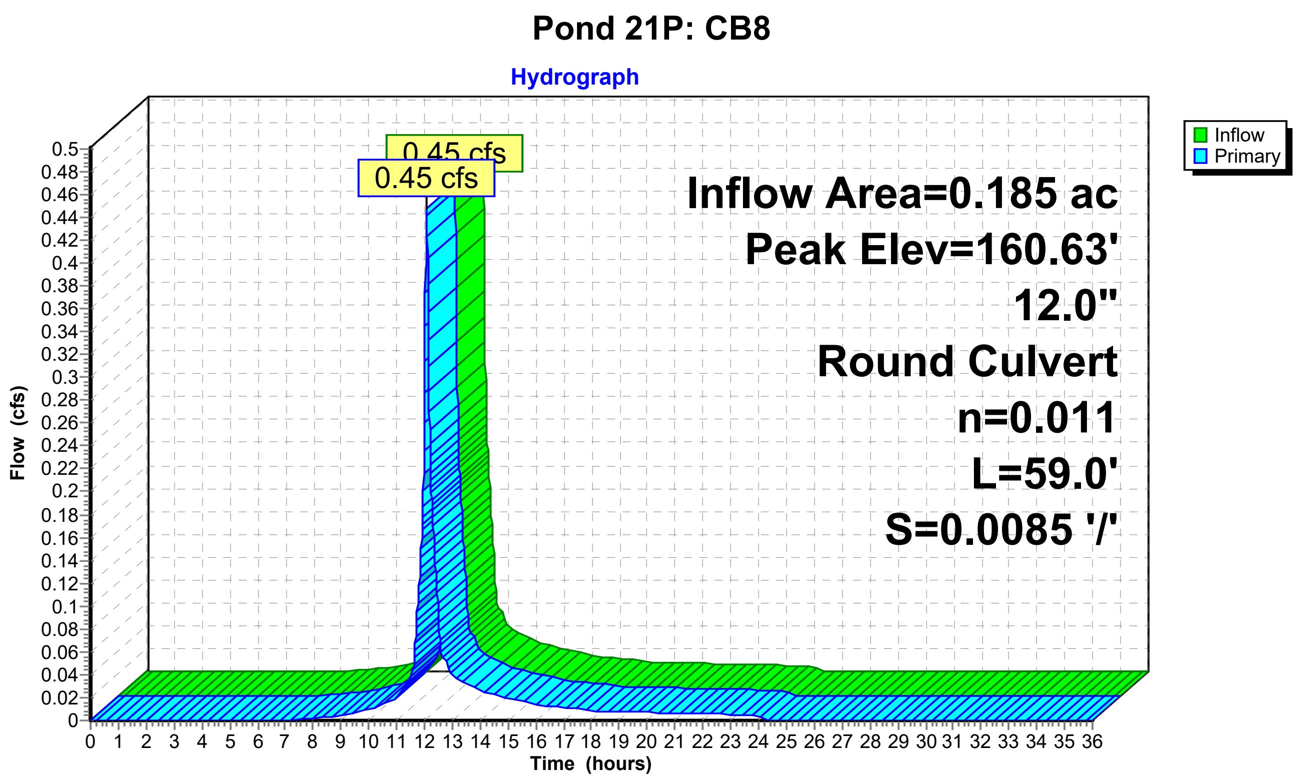
Summary for Pond 21P: CB8

Inflow Area = 0.185 ac, 82.73% Impervious, Inflow Depth = 2.00" for 2-Year Storm event
Inflow = 0.45 cfs @ 12.07 hrs, Volume= 0.031 af
Outflow = 0.45 cfs @ 12.07 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min
Primary = 0.45 cfs @ 12.07 hrs, Volume= 0.031 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.63' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	160.30'	**12.0" Round Culvert** L= 59.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 160.30' / 159.80' S= 0.0085 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.45 cfs @ 12.07 hrs HW=160.63' (Free Discharge)
↑**1=Culvert** (Inlet Controls 0.45 cfs @ 1.96 fps)



Summary for Pond 22P: DMH8&9

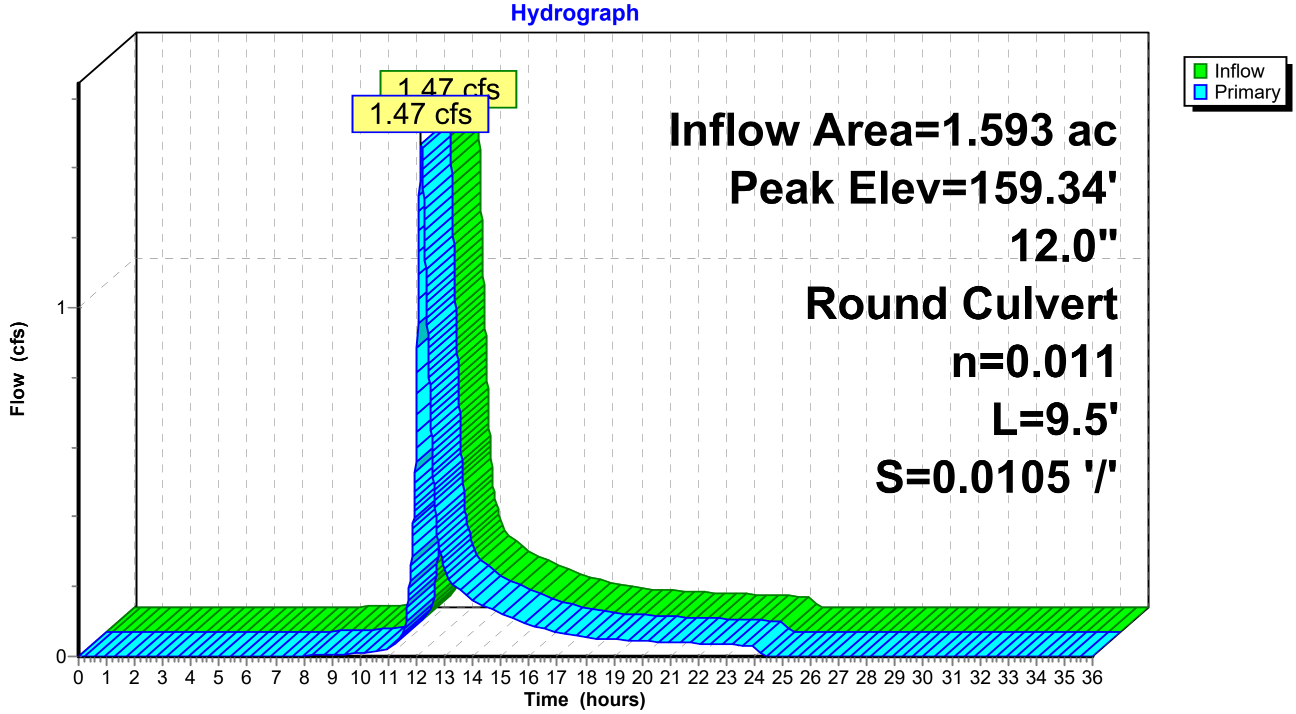
Inflow Area = 1.593 ac, 51.95% Impervious, Inflow Depth = 1.10" for 2-Year Storm event
Inflow = 1.47 cfs @ 12.17 hrs, Volume= 0.146 af
Outflow = 1.47 cfs @ 12.17 hrs, Volume= 0.146 af, Atten= 0%, Lag= 0.0 min
Primary = 1.47 cfs @ 12.17 hrs, Volume= 0.146 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 159.34' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.60'	**12.0" Round Culvert** L= 9.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.60' / 158.50' S= 0.0105 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.47 cfs @ 12.17 hrs HW=159.34' (Free Discharge)
└─**1=Culvert** (Barrel Controls 1.47 cfs @ 3.29 fps)

Pond 22P: DMH8&9



Summary for Subcatchment 23P: P1i

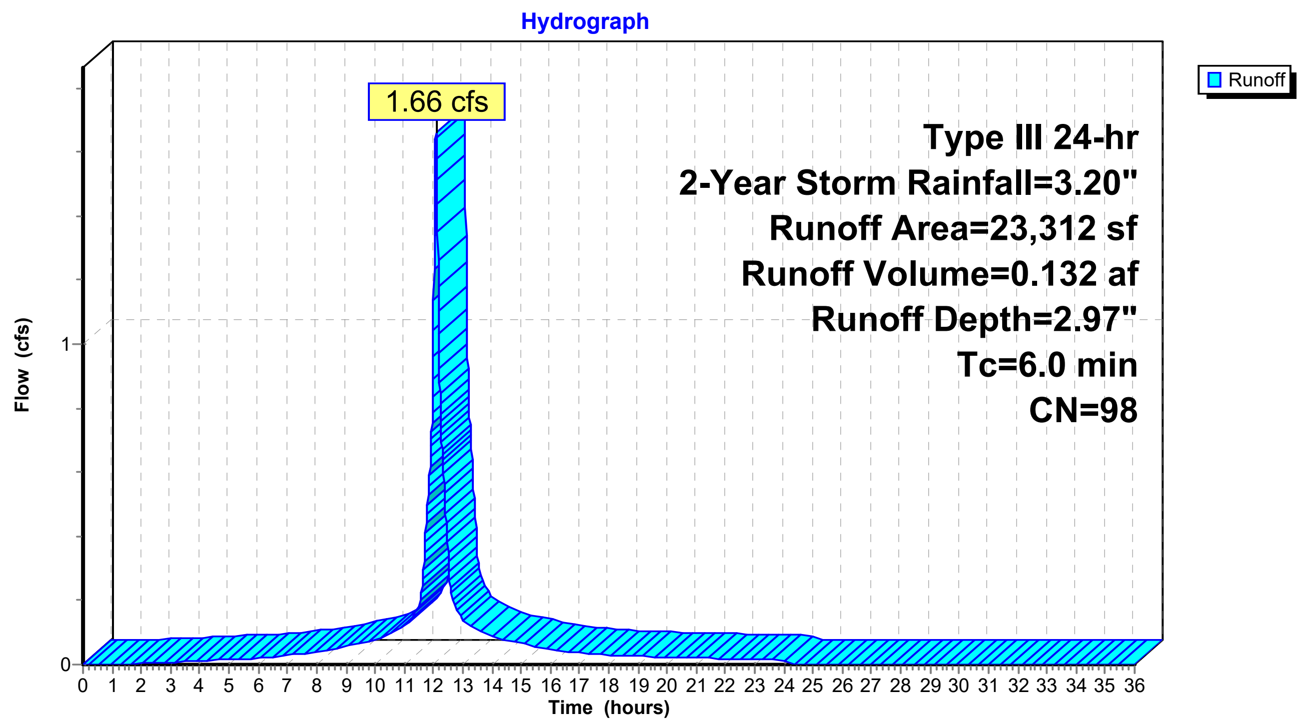
Runoff = 1.66 cfs @ 12.08 hrs, Volume= 0.132 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
23,312	98	Unconnected roofs, HSG A
23,312		100.00% Impervious Area
23,312		100.00% Unconnected

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

Subcatchment 23P: P1i



Summary for Pond 24P: Roof Pipe

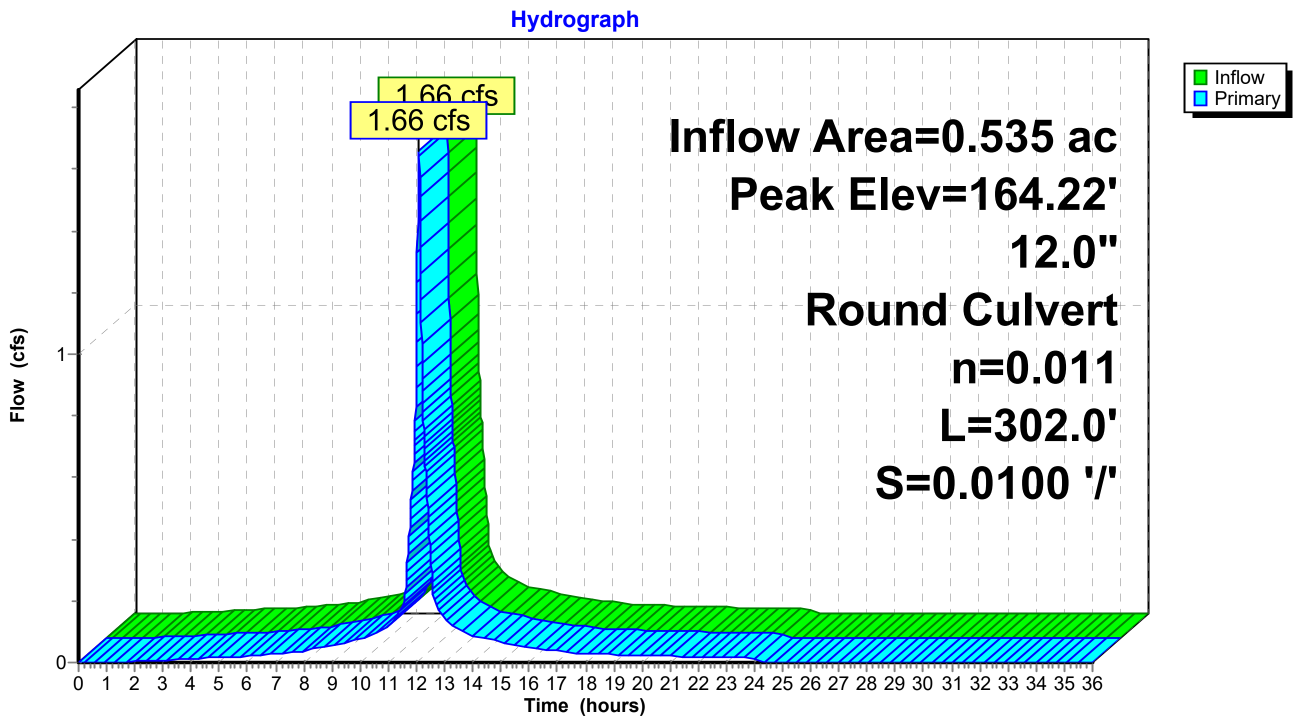
Inflow Area =	0.535 ac,100.00% Impervious,	Inflow Depth =	2.97"	for 2-Year Storm event	
Inflow =	1.66 cfs @	12.08 hrs,	Volume=	0.132 af	
Outflow =	1.66 cfs @	12.08 hrs,	Volume=	0.132 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.66 cfs @	12.08 hrs,	Volume=	0.132 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 164.22' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	163.52'	**12.0" Round Culvert** L= 302.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 163.52' / 160.50' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.66 cfs @ 12.08 hrs HW=164.22' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.66 cfs @ 2.84 fps)

Pond 24P: Roof Pipe



Summary for Pond 25P: Infiltration Field #1

Inflow Area =	9.163 ac, 37.61% Impervious,	Inflow Depth = 0.96"	for 2-Year Storm event	
Inflow =	6.38 cfs @	12.17 hrs, Volume=	0.734 af	
Outflow =	2.61 cfs @	12.02 hrs, Volume=	0.734 af,	Atten= 59%, Lag= 0.0 min
Discarded =	2.61 cfs @	12.02 hrs, Volume=	0.734 af	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 158.69' @ 12.60 hrs Surf.Area= 13,609 sf Storage= 5,001 cf

Plug-Flow detention time= 10.4 min calculated for 0.734 af (100% of inflow)
Center-of-Mass det. time= 10.4 min (864.5 - 854.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	158.00'	11,308 cf	**166.83'W x 81.50'L x 3.54'H Field A** 48,156 cf Overall - 19,887 cf Embedded = 28,269 cf x 40.0% Voids
#2A	158.50'	19,887 cf	**Cultec R-330XLHD** x 374 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 34 rows
#3	158.00'	75 cf	**4.00'D x 6.00'H Vertical Cone/Cylinder**
		31,270 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	158.80'	**12.0" Round Culvert** L= 22.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.80' / 156.00' S= 0.1273 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#3	Primary	159.50'	**8.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.50' / 156.00' S= 0.3500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf
#4	Primary	161.20'	**12.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.20' / 161.00' S= 0.0054 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=2.61 cfs @ 12.02 hrs HW=158.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 2.61 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=158.00' (Free Discharge)
├─**2=Culvert** (Controls 0.00 cfs)
├─**3=Culvert** (Controls 0.00 cfs)
└─**4=Culvert** (Controls 0.00 cfs)

Pond 25P: Infiltration Field #1 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 34 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

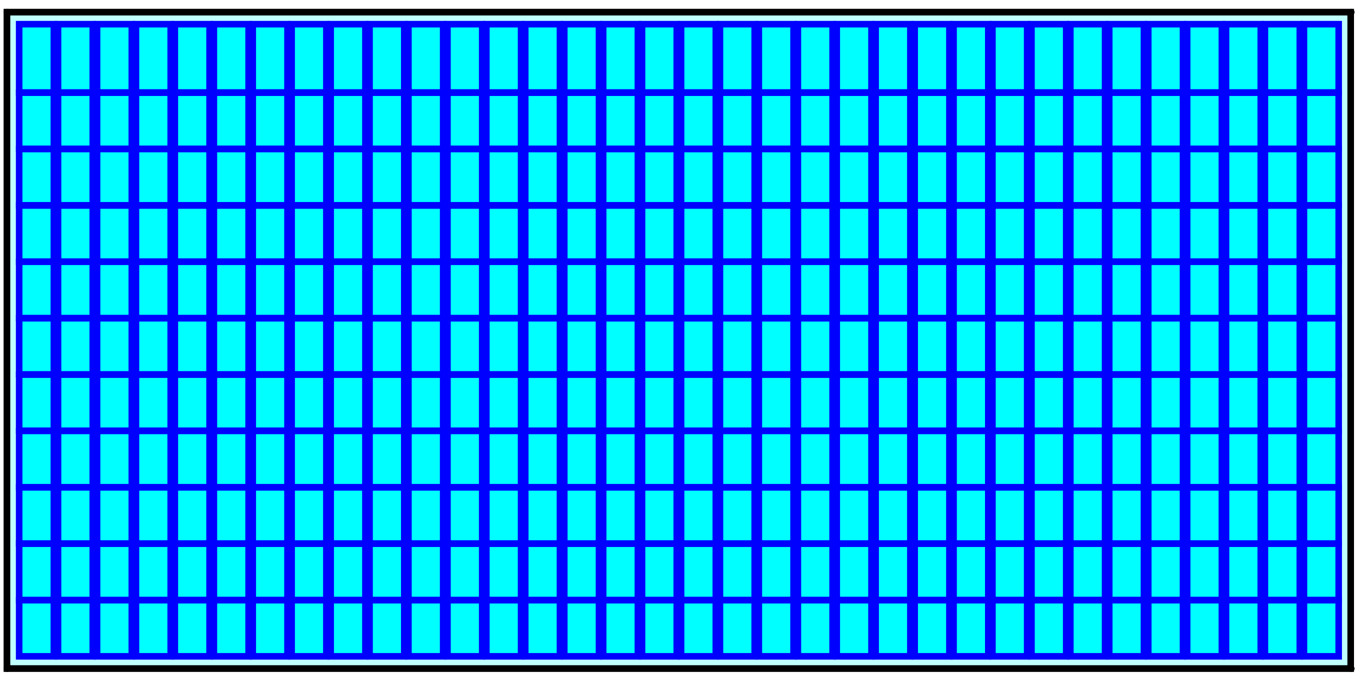
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +18.0" End Stone x 2 = 81.50' Base Length
34 Rows x 52.0" Wide + 6.0" Spacing x 33 + 18.0" Side Stone x 2 = 166.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

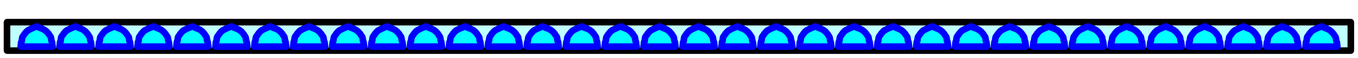
374 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 34 Rows = 19,886.7 cf Chamber Storage

48,155.7 cf Field - 19,886.7 cf Chambers = 28,269.0 cf Stone x 40.0% Voids = 11,307.6 cf Stone Storage

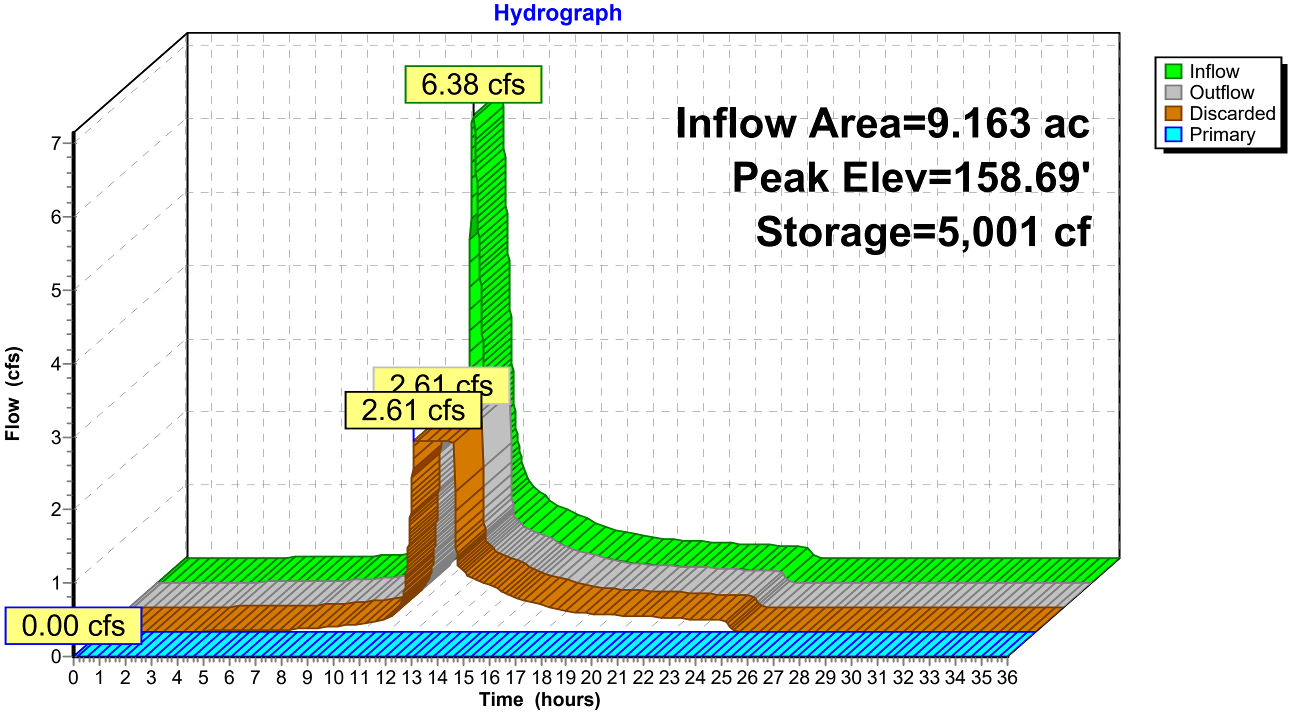
Chamber Storage + Stone Storage = 31,194.3 cf = 0.716 af
Overall Storage Efficiency = 64.8%
Overall System Size = 81.50' x 166.83' x 3.54'

374 Chambers
1,783.5 cy Field
1,047.0 cy Stone





Pond 25P: Infiltration Field #1



Summary for Subcatchment 26P: P2f

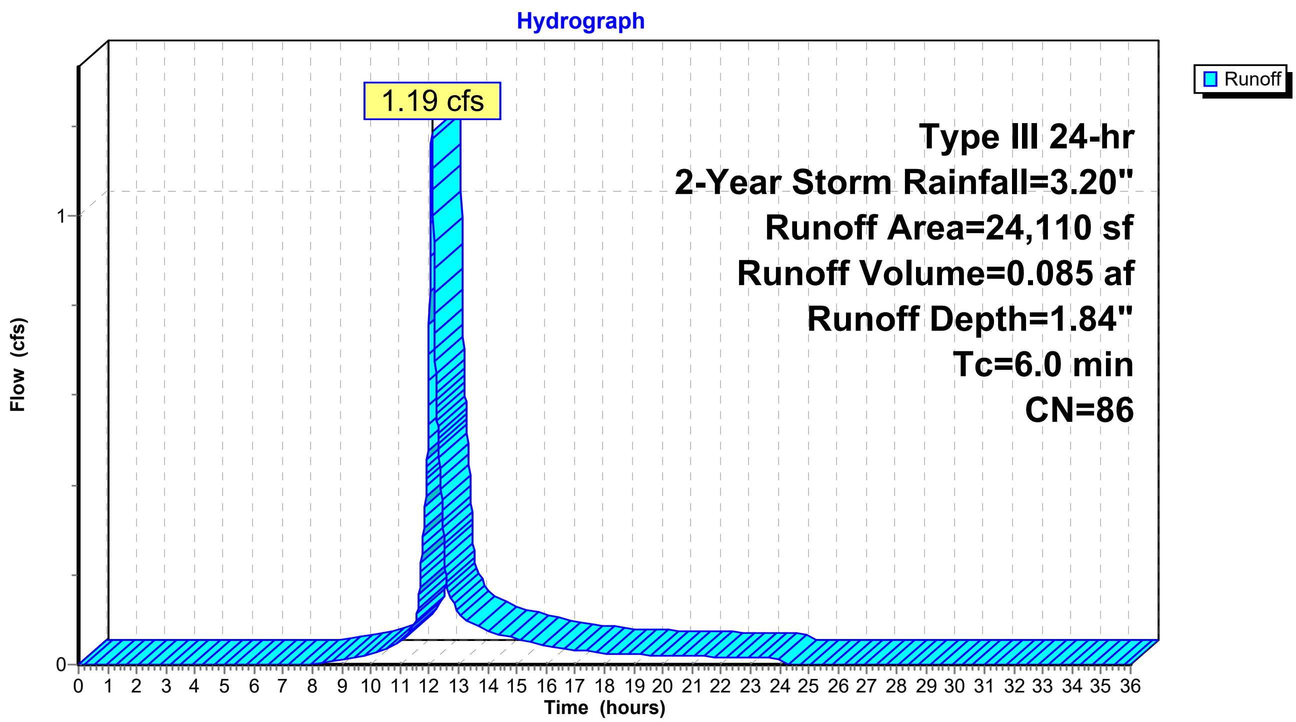
Runoff = 1.19 cfs @ 12.09 hrs, Volume= 0.085 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
5,626	98	Roofs, HSG A
11,048	98	Roofs, HSG B
534	98	Paved parking, HSG B
1,966	39	>75% Grass cover, Good, HSG A
4,936	61	>75% Grass cover, Good, HSG B
24,110	86	Weighted Average
6,902		28.63% Pervious Area
17,208		71.37% Impervious Area

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

Subcatchment 26P: P2f



Summary for Subcatchment 27P: P2a

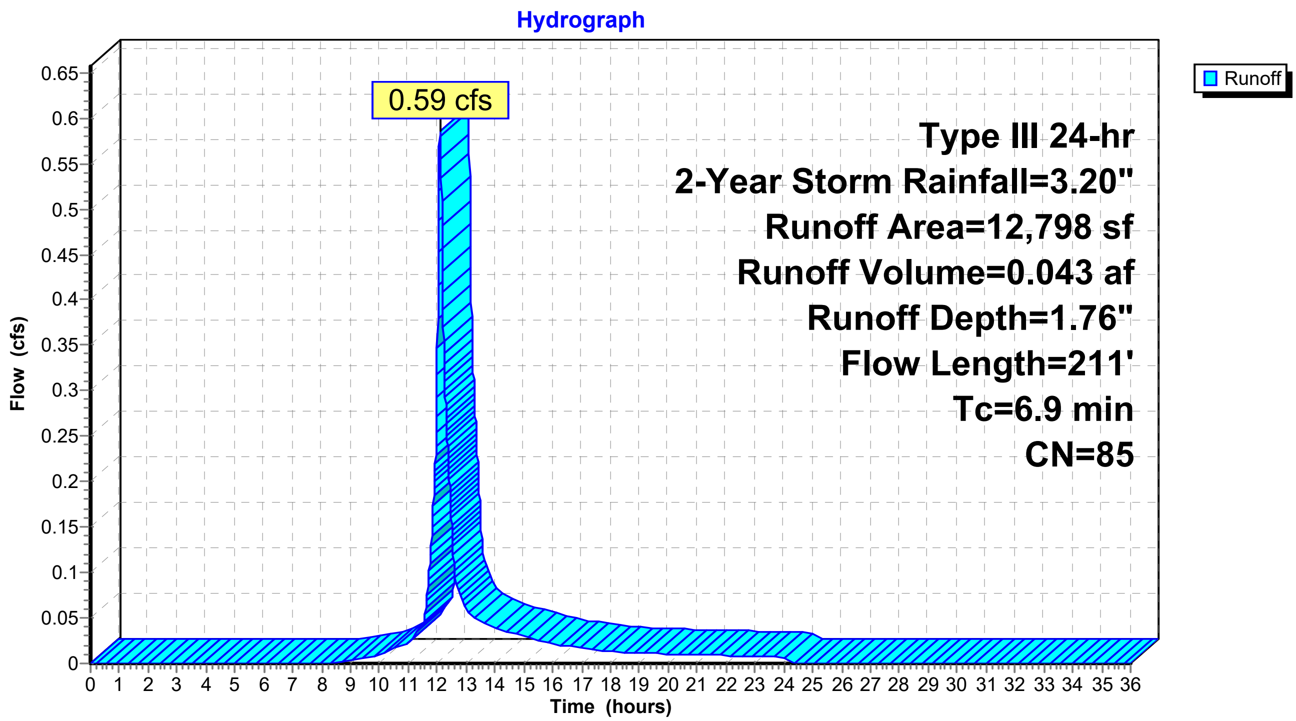
Runoff = 0.59 cfs @ 12.10 hrs, Volume= 0.043 af, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
3,281	98	Paved parking, HSG A
5,437	98	Paved parking, HSG B
790	39	>75% Grass cover, Good, HSG A
3,290	61	>75% Grass cover, Good, HSG B
12,798	85	Weighted Average
4,080		31.88% Pervious Area
8,718		68.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	66	0.0700	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.7	145	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.9	211	Total			

Subcatchment 27P: P2a



Summary for Pond 28P: CB9

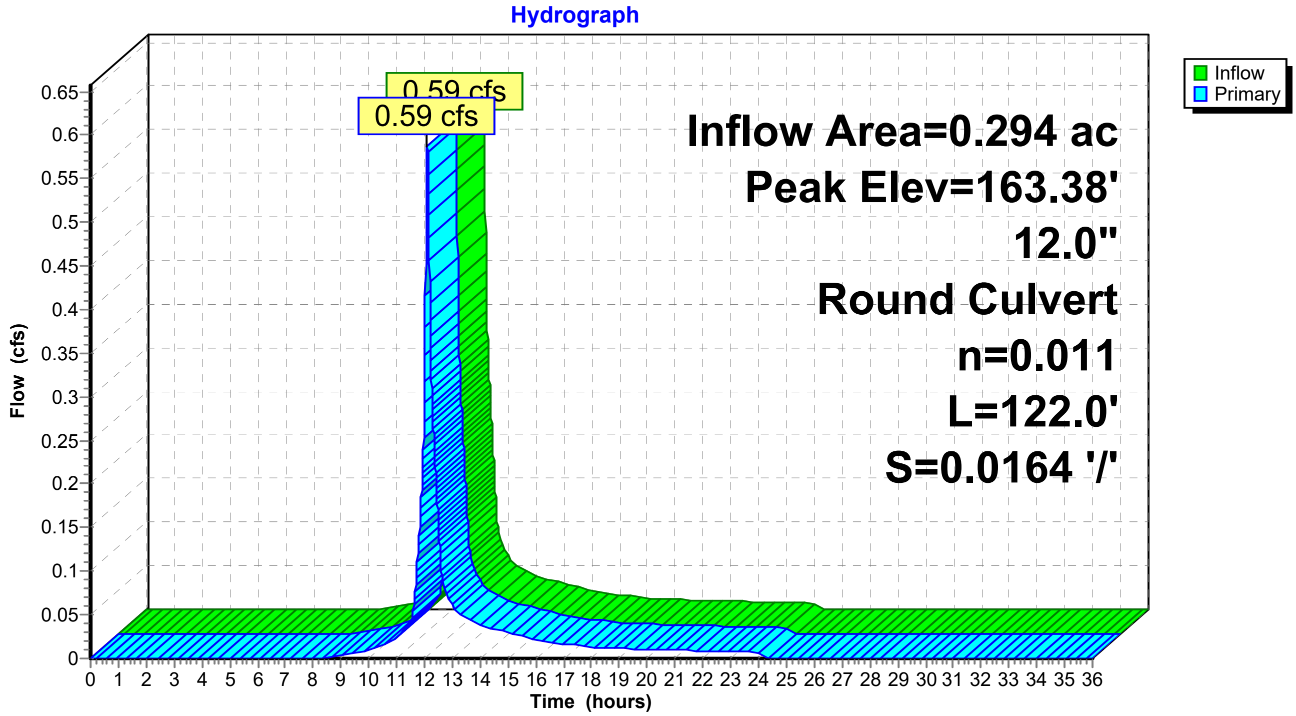
Inflow Area =	0.294 ac,	68.12% Impervious,	Inflow Depth = 1.76"	for 2-Year Storm event	
Inflow =	0.59 cfs @	12.10 hrs,	Volume=	0.043 af	
Outflow =	0.59 cfs @	12.10 hrs,	Volume=	0.043 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.59 cfs @	12.10 hrs,	Volume=	0.043 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 163.38' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	163.00'	**12.0" Round Culvert** L= 122.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 163.00' / 161.00' S= 0.0164 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.59 cfs @ 12.10 hrs HW=163.38' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.59 cfs @ 2.11 fps)

Pond 28P: CB9



Summary for Pond 29P: DMH11

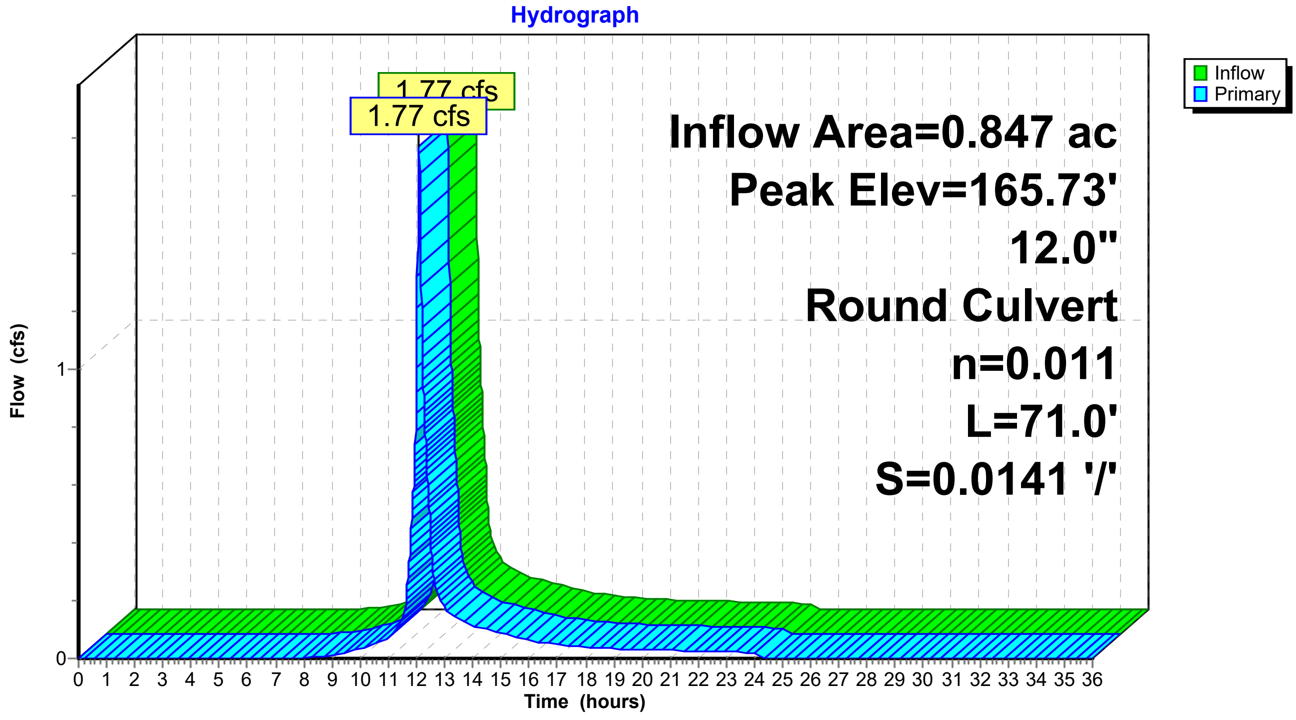
Inflow Area =	0.847 ac,	70.24% Impervious,	Inflow Depth = 1.81"	for 2-Year Storm event
Inflow =	1.77 cfs @	12.09 hrs, Volume=	0.128 af	
Outflow =	1.77 cfs @	12.09 hrs, Volume=	0.128 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.77 cfs @	12.09 hrs, Volume=	0.128 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 165.73' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	165.00'	**12.0" Round Culvert** L= 71.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.00' / 164.00' S= 0.0141 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.77 cfs @ 12.09 hrs HW=165.73' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.77 cfs @ 2.90 fps)

Pond 29P: DMH11



Summary for Subcatchment 30P: P2b

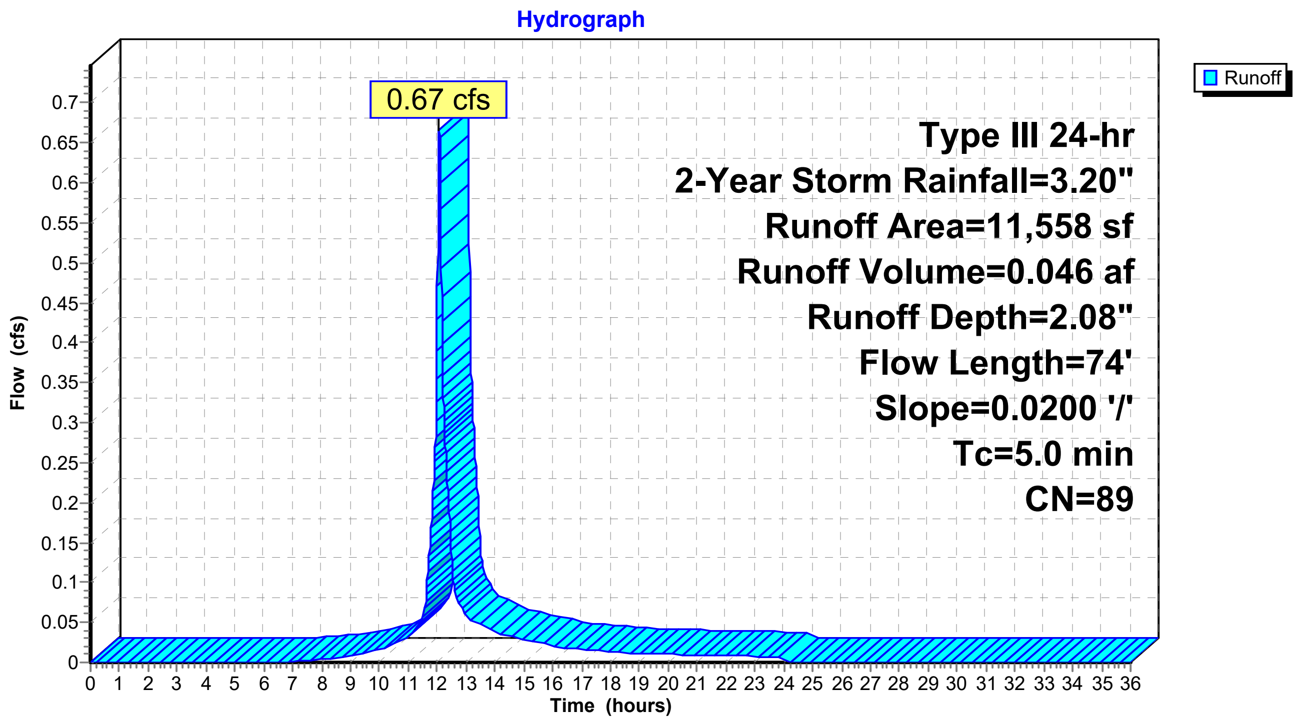
Runoff = 0.67 cfs @ 12.07 hrs, Volume= 0.046 af, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
9,822	98	Paved parking, HSG A
1,736	39	>75% Grass cover, Good, HSG A
11,558	89	Weighted Average
1,736		15.02% Pervious Area
9,822		84.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	14	0.0200	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.8	60	0.0200	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
3.8	74	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 30P: P2b



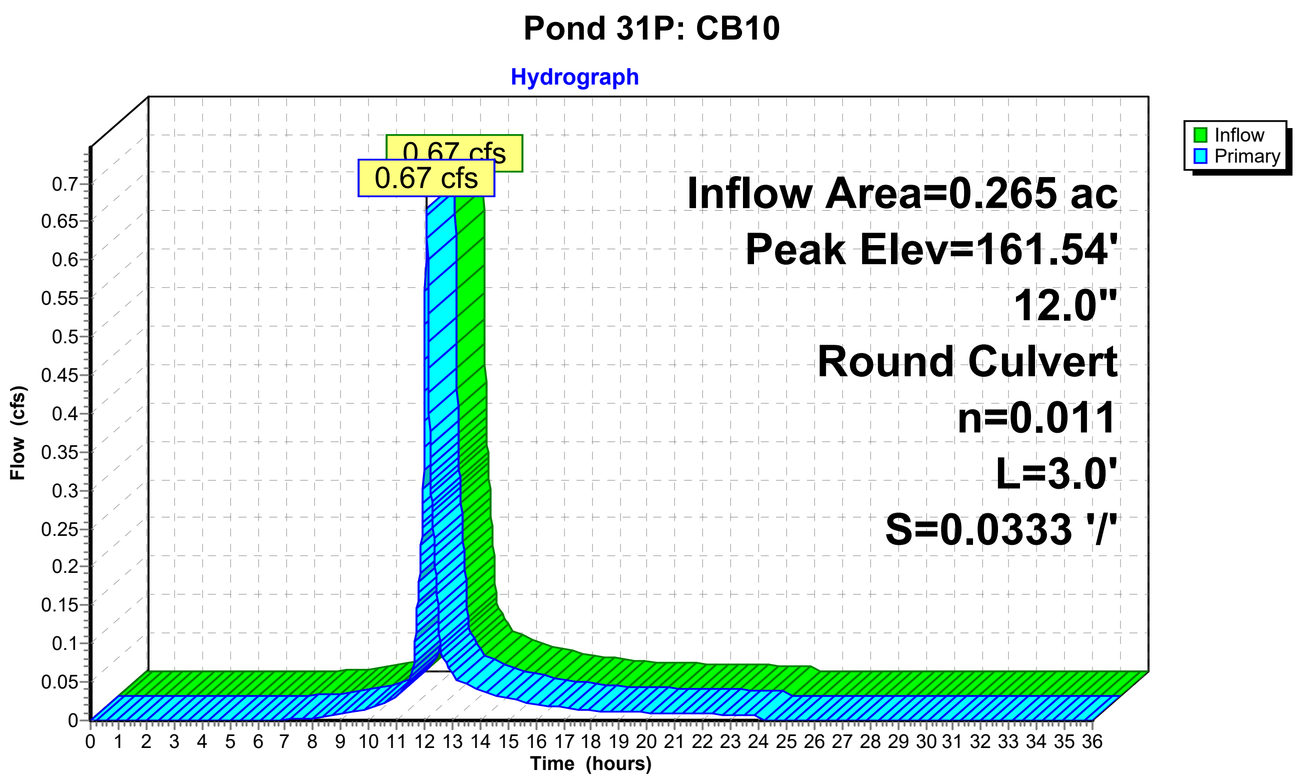
Summary for Pond 31P: CB10

Inflow Area =	0.265 ac, 84.98% Impervious,	Inflow Depth = 2.08"	for 2-Year Storm event	
Inflow =	0.67 cfs @	12.07 hrs, Volume=	0.046 af	
Outflow =	0.67 cfs @	12.07 hrs, Volume=	0.046 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.67 cfs @	12.07 hrs, Volume=	0.046 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 161.54' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	161.10'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.10' / 161.00' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.67 cfs @ 12.07 hrs HW=161.54' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.67 cfs @ 2.91 fps)



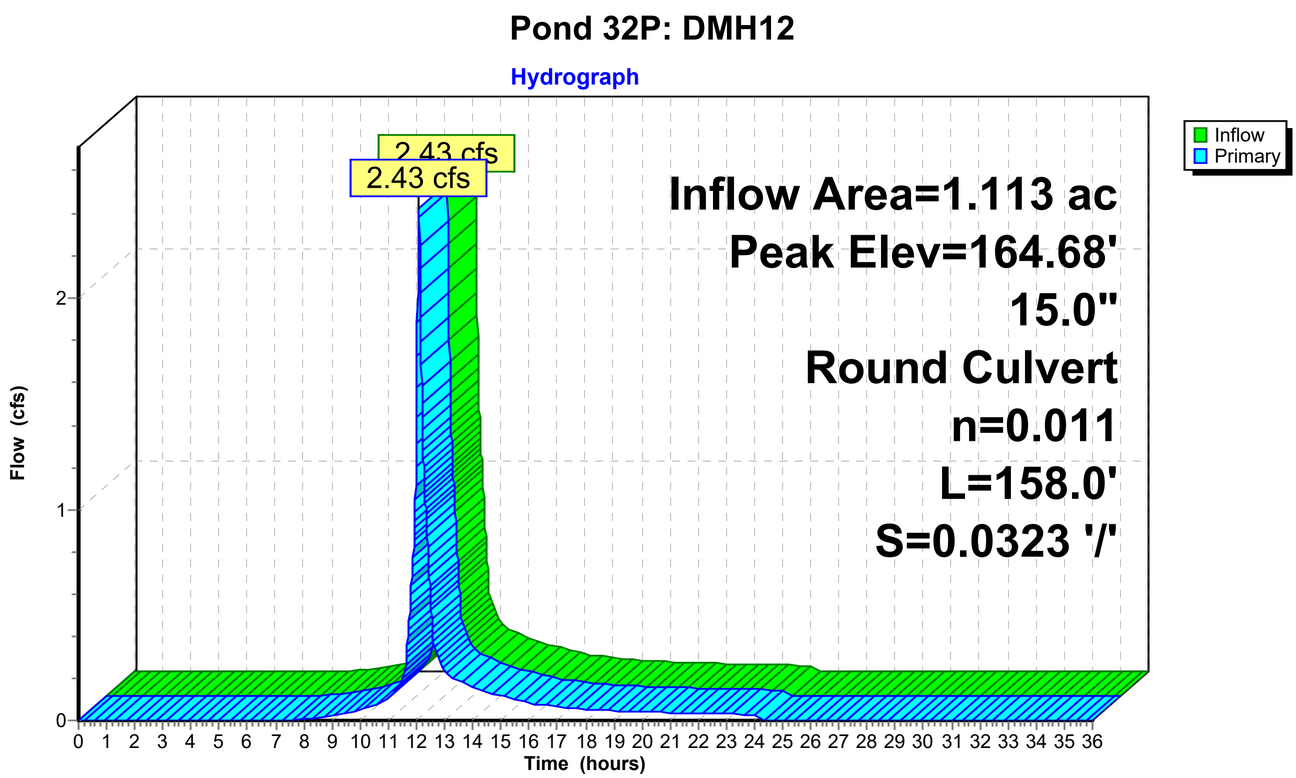
Summary for Pond 32P: DMH12

Inflow Area =	1.113 ac,	73.76% Impervious,	Inflow Depth = 1.87"	for 2-Year Storm event
Inflow =	2.43 cfs @	12.09 hrs, Volume=	0.174 af	
Outflow =	2.43 cfs @	12.09 hrs, Volume=	0.174 af, Atten= 0%, Lag= 0.0 min	
Primary =	2.43 cfs @	12.09 hrs, Volume=	0.174 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 164.68' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	163.90'	**15.0" Round Culvert** L= 158.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 163.90' / 158.80' S= 0.0323 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf

Primary OutFlow Max=2.42 cfs @ 12.09 hrs HW=164.68' (Free Discharge)
└─**1=Culvert** (Inlet Controls 2.42 cfs @ 3.01 fps)



Summary for Pond 33P: FD/DMH13&14

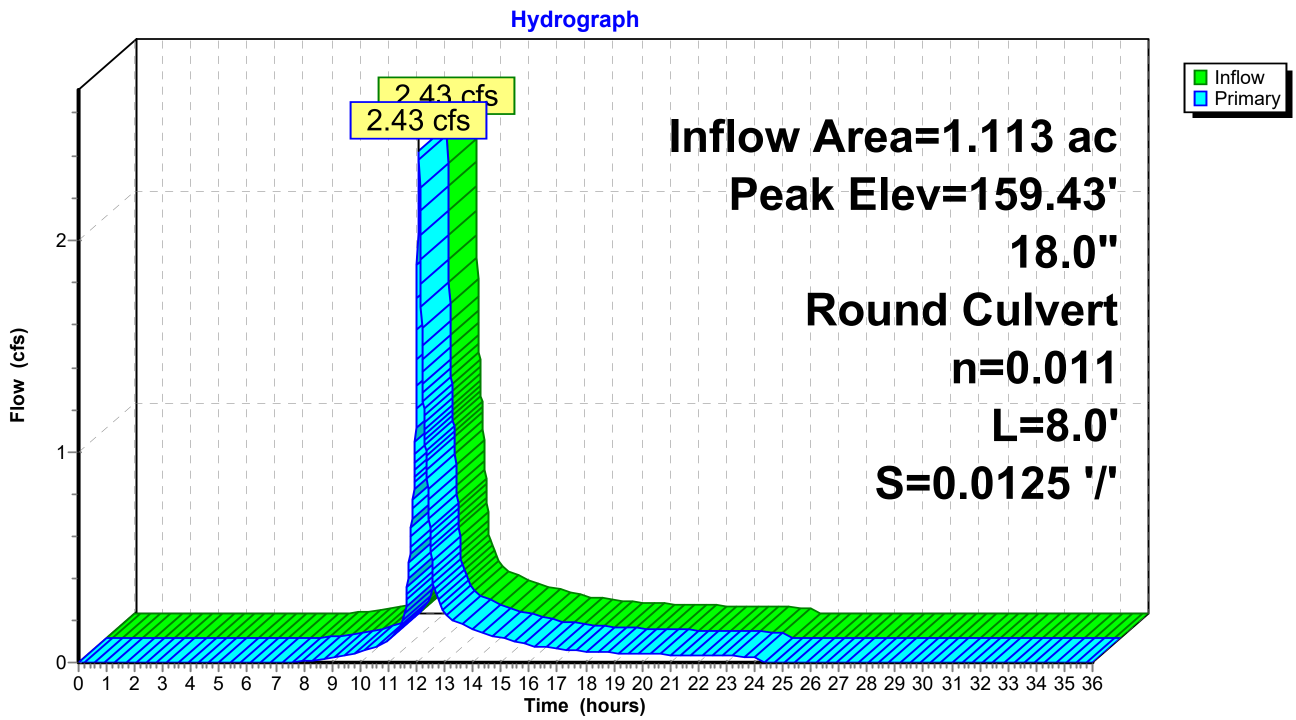
Inflow Area =	1.113 ac,	73.76% Impervious,	Inflow Depth = 1.87"	for 2-Year Storm event	
Inflow =	2.43 cfs @	12.09 hrs,	Volume=	0.174 af	
Outflow =	2.43 cfs @	12.09 hrs,	Volume=	0.174 af,	Atten= 0%, Lag= 0.0 min
Primary =	2.43 cfs @	12.09 hrs,	Volume=	0.174 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 159.43' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.60'	**18.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.60' / 158.50' S= 0.0125 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=2.42 cfs @ 12.09 hrs HW=159.43' (Free Discharge)
└─**1=Culvert** (Barrel Controls 2.42 cfs @ 3.49 fps)

Pond 33P: FD/DMH13&14



Summary for Subcatchment 34P: P2c

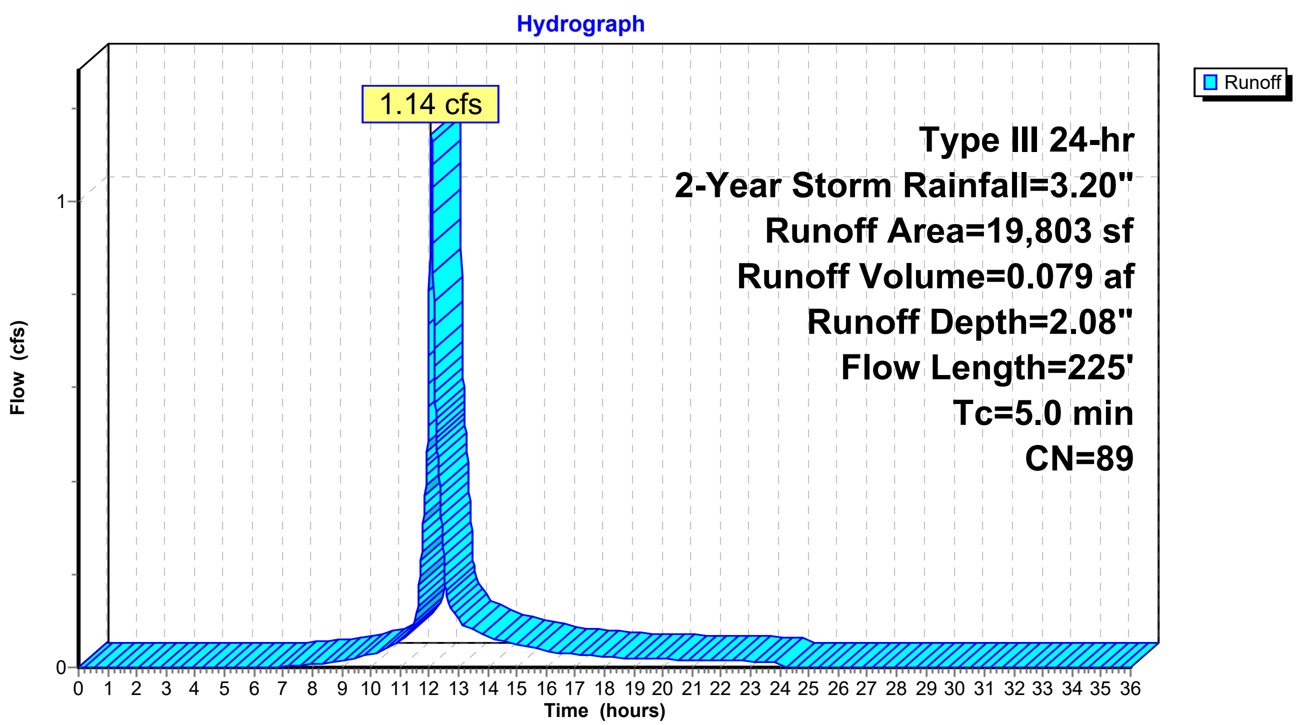
Runoff = 1.14 cfs @ 12.07 hrs, Volume= 0.079 af, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
16,654	98	Paved parking, HSG A
3,149	39	>75% Grass cover, Good, HSG A
19,803	89	Weighted Average
3,149		15.90% Pervious Area
16,654		84.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	15	0.0300	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
1.7	210	0.0400	2.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
4.4	225	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 34P: P2c



Summary for Pond 35P: FD/CB11

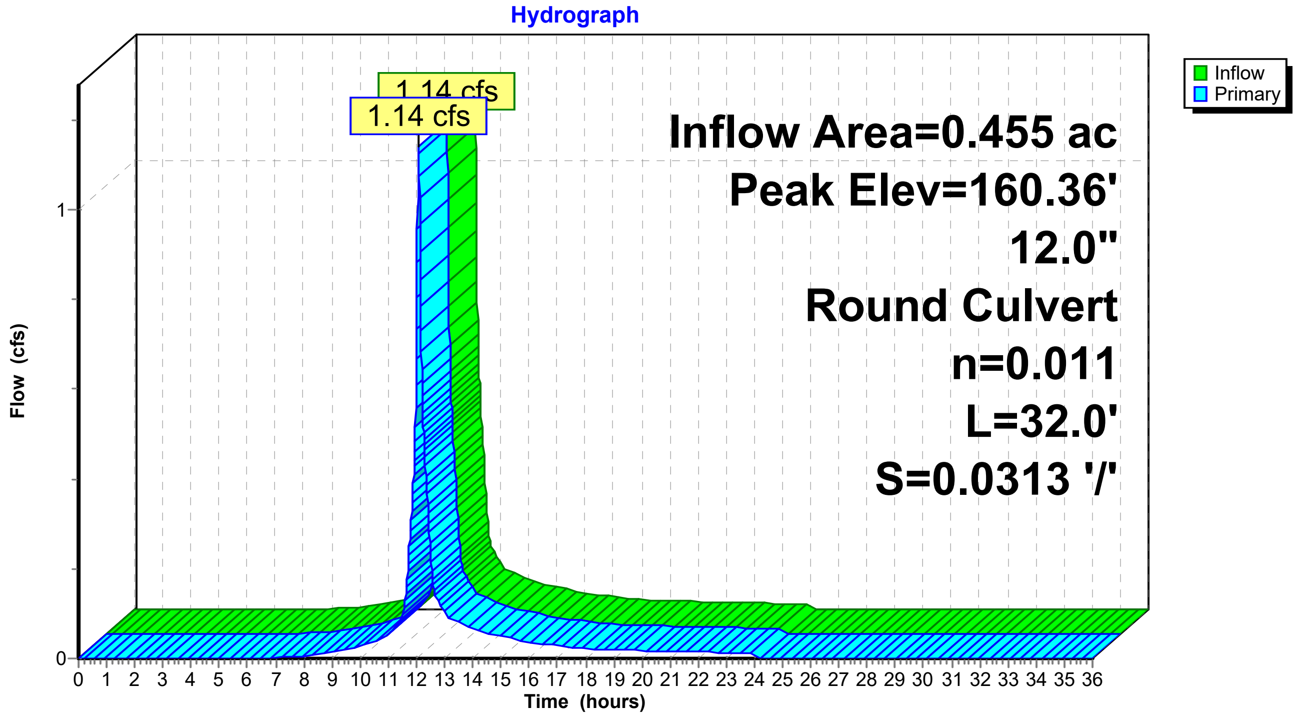
Inflow Area = 0.455 ac, 84.10% Impervious, Inflow Depth = 2.08" for 2-Year Storm event
Inflow = 1.14 cfs @ 12.07 hrs, Volume= 0.079 af
Outflow = 1.14 cfs @ 12.07 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.0 min
Primary = 1.14 cfs @ 12.07 hrs, Volume= 0.079 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.36' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	159.80'	**12.0" Round Culvert** L= 32.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.80' / 158.80' S= 0.0313 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.14 cfs @ 12.07 hrs HW=160.36' (Free Discharge)
1=Culvert (Inlet Controls 1.14 cfs @ 2.54 fps)

Pond 35P: FD/CB11



Summary for Subcatchment 36P: P2d

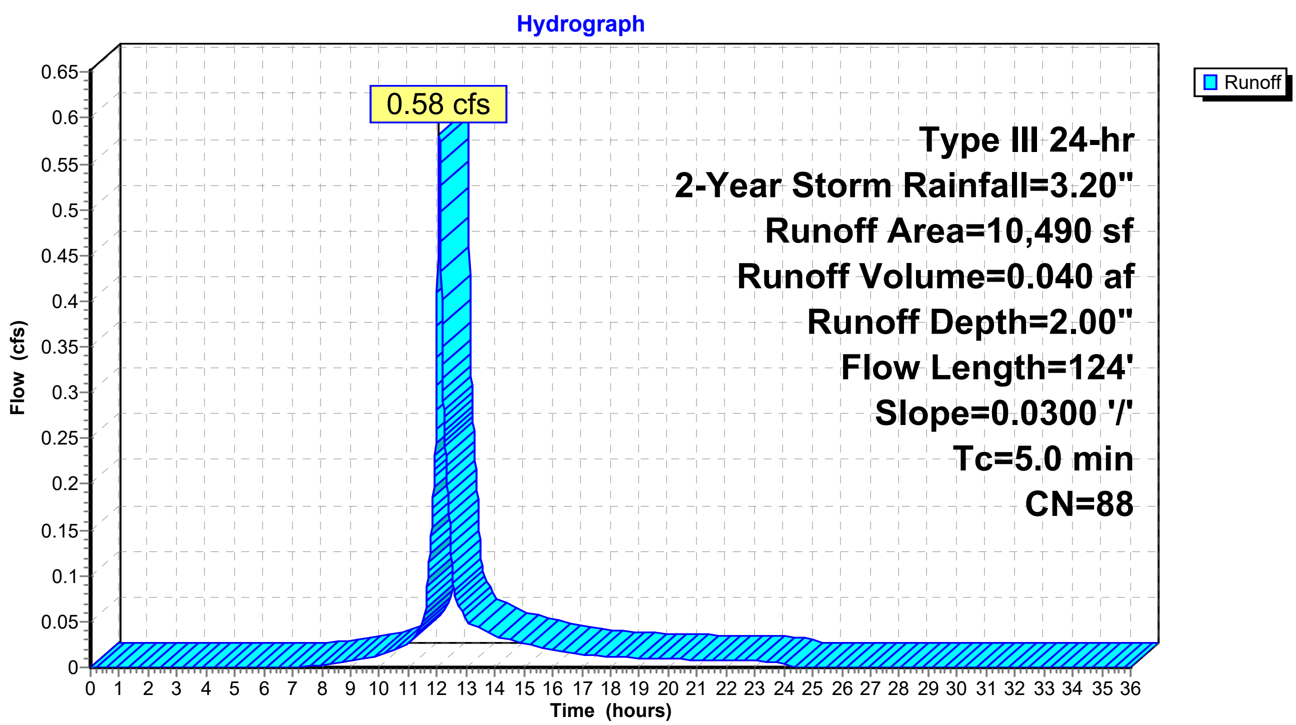
Runoff = 0.58 cfs @ 12.07 hrs, Volume= 0.040 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
8,704	98	Paved parking, HSG A
1,786	39	>75% Grass cover, Good, HSG A
10,490	88	Weighted Average
1,786		17.03% Pervious Area
8,704		82.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	14	0.0300	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
1.1	110	0.0300	1.65		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
3.6	124	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 36P: P2d



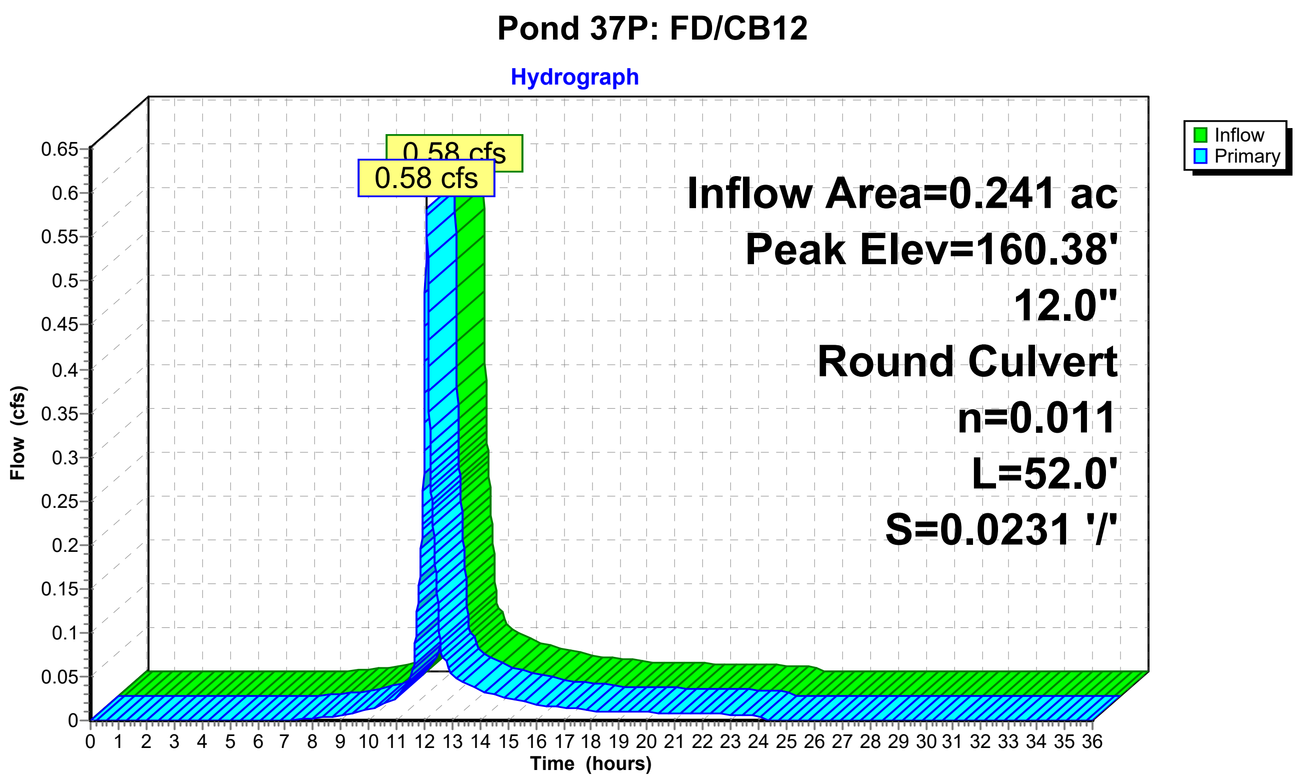
Summary for Pond 37P: FD/CB12

Inflow Area =	0.241 ac,	82.97% Impervious,	Inflow Depth = 2.00"	for 2-Year Storm event
Inflow =	0.58 cfs @	12.07 hrs, Volume=	0.040 af	
Outflow =	0.58 cfs @	12.07 hrs, Volume=	0.040 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.58 cfs @	12.07 hrs, Volume=	0.040 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.38' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	160.00'	**12.0" Round Culvert** L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 160.00' / 158.80' S= 0.0231 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.58 cfs @ 12.07 hrs HW=160.38' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.58 cfs @ 2.11 fps)



Summary for Pond 38P: DMH15&16

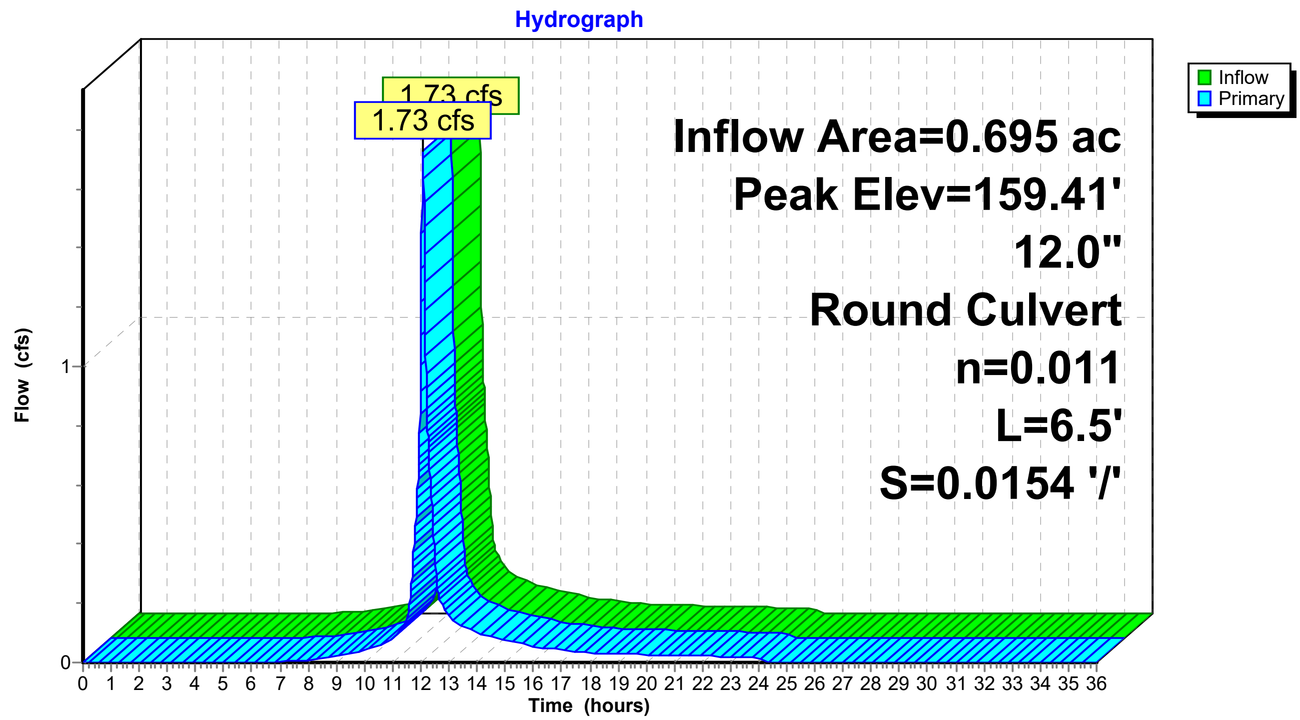
Inflow Area = 0.695 ac, 83.71% Impervious, Inflow Depth = 2.05" for 2-Year Storm event
Inflow = 1.73 cfs @ 12.07 hrs, Volume= 0.119 af
Outflow = 1.73 cfs @ 12.07 hrs, Volume= 0.119 af, Atten= 0%, Lag= 0.0 min
Primary = 1.73 cfs @ 12.07 hrs, Volume= 0.119 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 159.41' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.60'	**12.0" Round Culvert** L= 6.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.60' / 158.50' S= 0.0154 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.72 cfs @ 12.07 hrs HW=159.41' (Free Discharge)
└**1=Culvert** (Barrel Controls 1.72 cfs @ 3.46 fps)

Pond 38P: DMH15&16



Summary for Subcatchment 39P: P2e

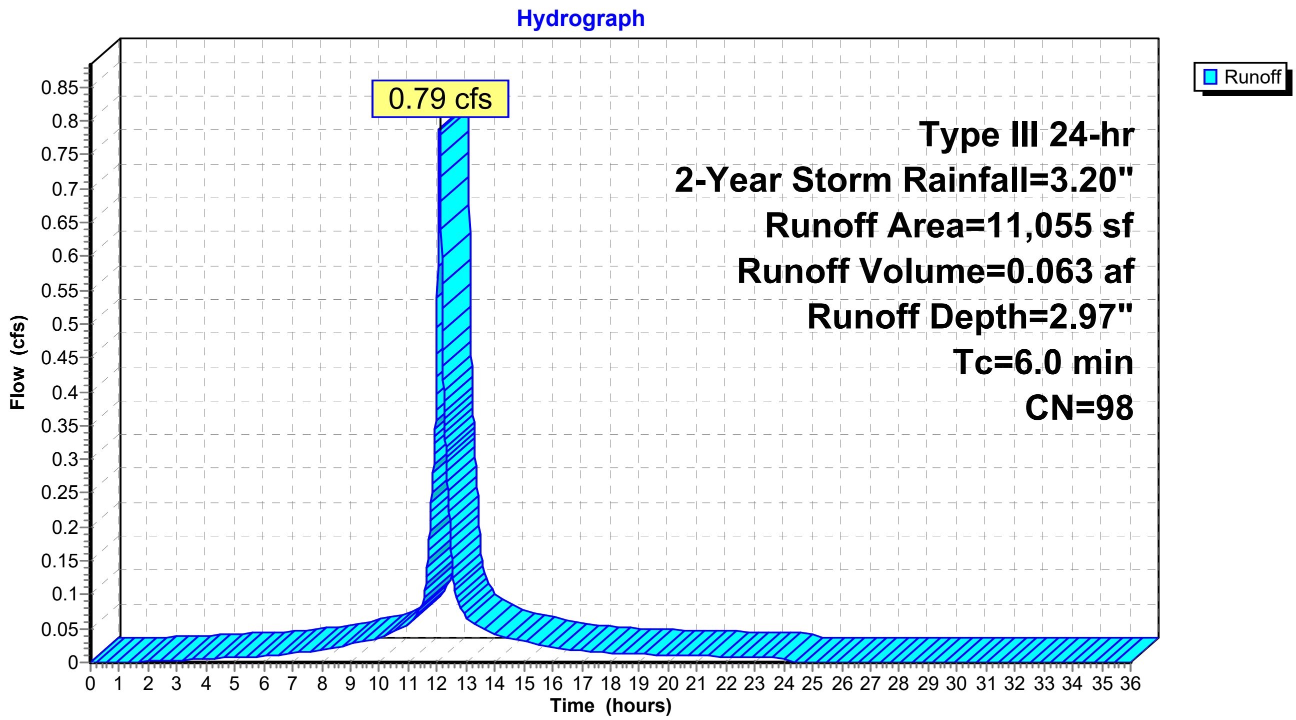
Runoff = 0.79 cfs @ 12.08 hrs, Volume= 0.063 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
11,055	98	Roofs, HSG A
11,055		100.00% Impervious Area

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

Subcatchment 39P: P2e



Summary for Pond 40P: Roof Drain

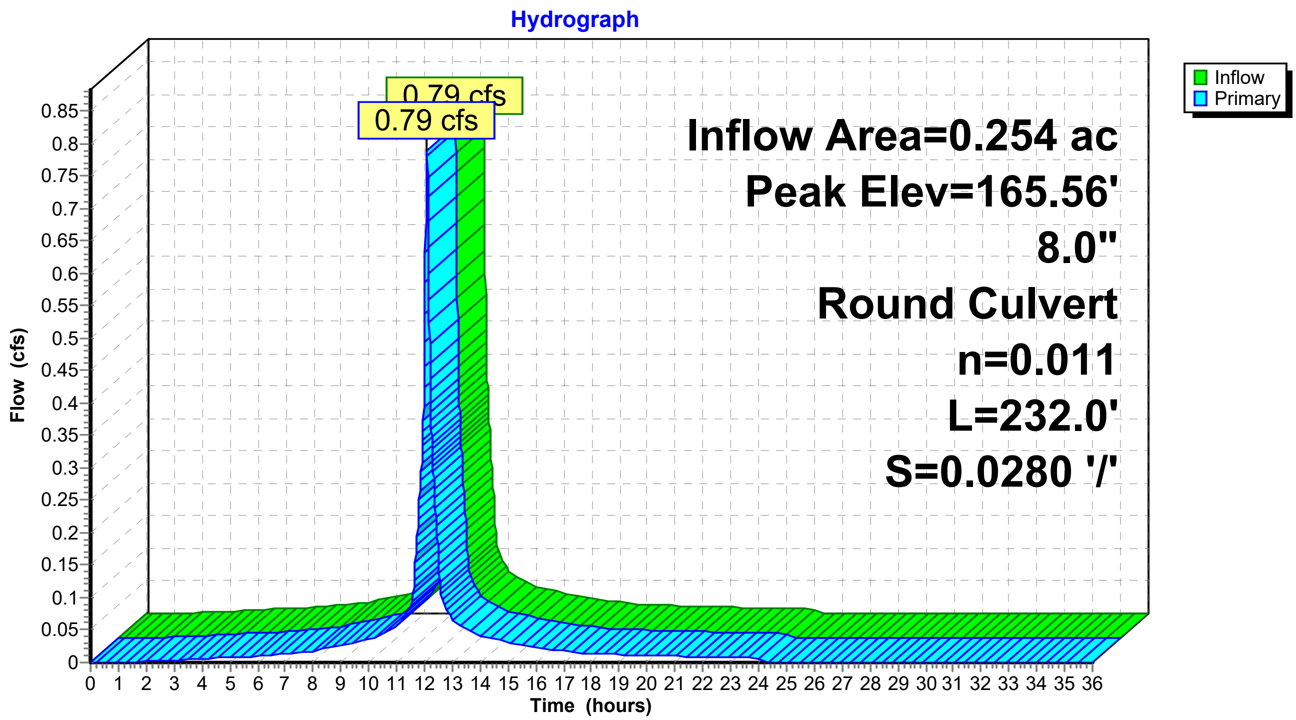
Inflow Area = 0.254 ac,100.00% Impervious, Inflow Depth = 2.97" for 2-Year Storm event
Inflow = 0.79 cfs @ 12.08 hrs, Volume= 0.063 af
Outflow = 0.79 cfs @ 12.08 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min
Primary = 0.79 cfs @ 12.08 hrs, Volume= 0.063 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 165.56' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	165.00'	**8.0" Round Culvert** L= 232.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.00' / 158.50' S= 0.0280 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=0.79 cfs @ 12.08 hrs HW=165.55' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.79 cfs @ 2.54 fps)

Pond 40P: Roof Drain



Summary for Pond 41P: Infiltration Field #2

Inflow Area = 2.062 ac, 80.34% Impervious, Inflow Depth = 2.07" for 2-Year Storm event
Inflow = 4.92 cfs @ 12.08 hrs, Volume= 0.355 af
Outflow = 1.11 cfs @ 12.50 hrs, Volume= 0.355 af, Atten= 78%, Lag= 24.9 min
Discarded = 1.08 cfs @ 11.78 hrs, Volume= 0.355 af
Primary = 0.03 cfs @ 12.50 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 159.02' @ 12.50 hrs Surf.Area= 5,635 sf Storage= 3,577 cf

Plug-Flow detention time= 18.1 min calculated for 0.355 af (100% of inflow)
Center-of-Mass det. time= 18.1 min (824.2 - 806.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	158.00'	4,829 cf	**142.67'W x 39.50'L x 3.54'H Field A** 19,958 cf Overall - 7,887 cf Embedded = 12,072 cf x 40.0% Voids
#2A	158.50'	7,887 cf	**Cultec R-330XLHD** x 145 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 29 rows
		12,716 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	158.91'	**4.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.91' / 157.00' S= 0.0455 '/' Cc= 0.900 n= 0.011, Flow Area= 0.09 sf
#3	Primary	160.90'	**12.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 160.90' / 157.00' S= 0.0929 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=1.08 cfs @ 11.78 hrs HW=158.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.08 cfs)

Primary OutFlow Max=0.03 cfs @ 12.50 hrs HW=159.02' (Free Discharge)
├─**2=Culvert** (Inlet Controls 0.03 cfs @ 1.12 fps)
└─**3=Culvert** (Controls 0.00 cfs)

Pond 41P: Infiltration Field #2 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 29 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

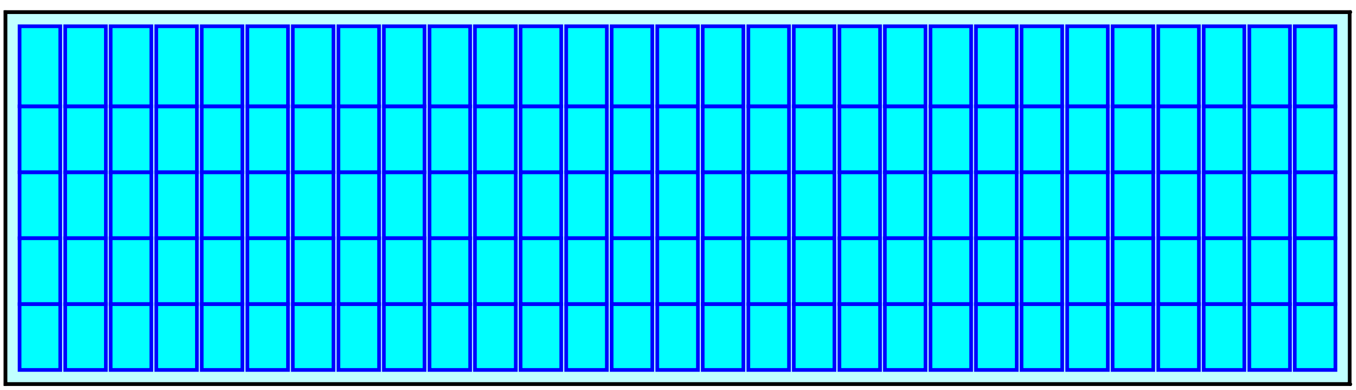
5 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 36.50' Row Length +18.0" End Stone x 2 = 39.50' Base Length
29 Rows x 52.0" Wide + 6.0" Spacing x 28 + 18.0" Side Stone x 2 = 142.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

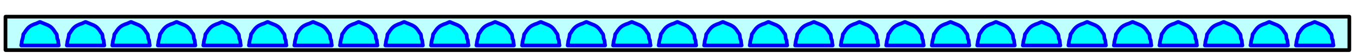
145 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 29 Rows = 7,886.9 cf Chamber Storage

19,958.5 cf Field - 7,886.9 cf Chambers = 12,071.6 cf Stone x 40.0% Voids = 4,828.6 cf Stone Storage

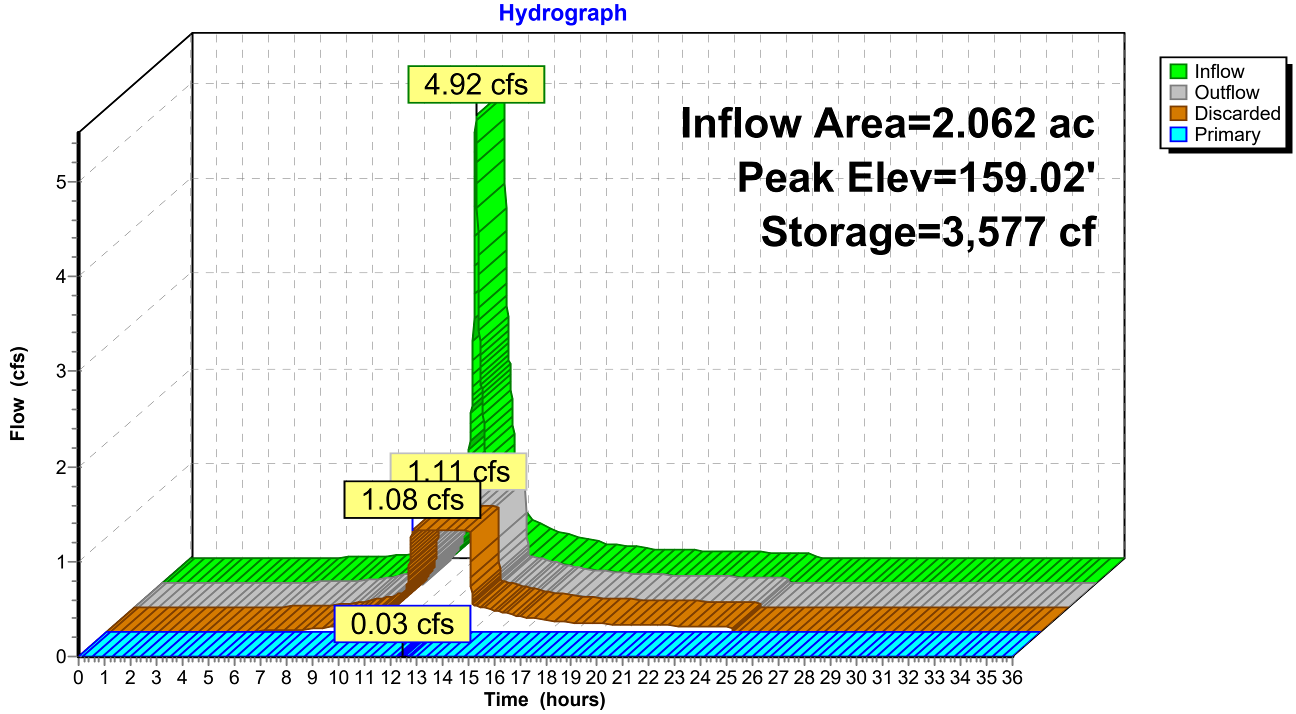
Chamber Storage + Stone Storage = 12,715.5 cf = 0.292 af
Overall Storage Efficiency = 63.7%
Overall System Size = 39.50' x 142.67' x 3.54'

145 Chambers
739.2 cy Field
447.1 cy Stone





Pond 41P: Infiltration Field #2



Summary for Subcatchment 42P: P3

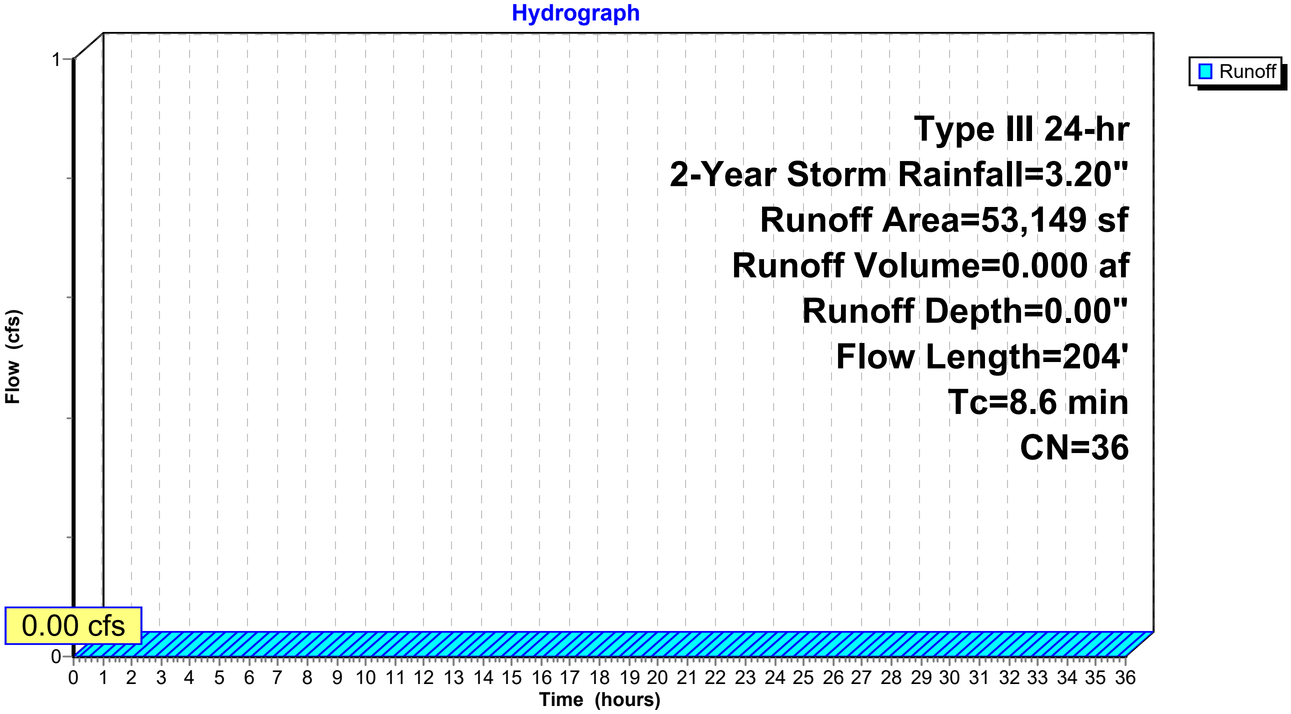
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

	Area (sf)	CN	Description
*	793	98	Paved parking, HSG A
	658	98	Paved parking, HSG B
	16,315	39	>75% Grass cover, Good, HSG A
	898	61	>75% Grass cover, Good, HSG B
	33,430	30	Woods, Good, HSG A
	1,055	55	Woods, Good, HSG B
	53,149	36	Weighted Average
	51,698		97.27% Pervious Area
	1,451		2.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	36	0.0400	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
2.2	8	0.0400	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	160	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.6	204	Total			

Subcatchment 42P: P3

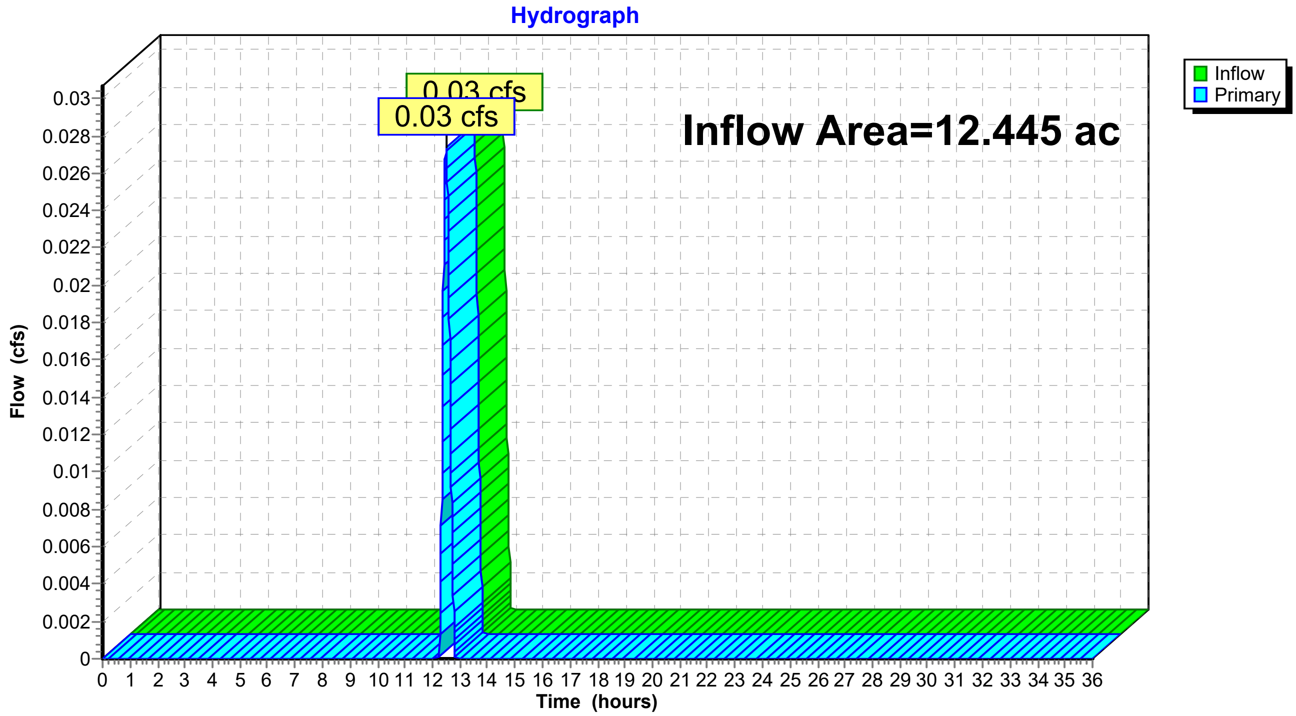


Summary for Link 43P: Design Point #1: Wetlands

Inflow Area =	12.445 ac, 41.27% Impervious, Inflow Depth = 0.00"	for 2-Year Storm event	
Inflow =	0.03 cfs @ 12.50 hrs, Volume=	0.001 af	
Primary =	0.03 cfs @ 12.50 hrs, Volume=	0.001 af, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 43P: Design Point #1: Wetlands



Summary for Pond 47P: FD/DMH7

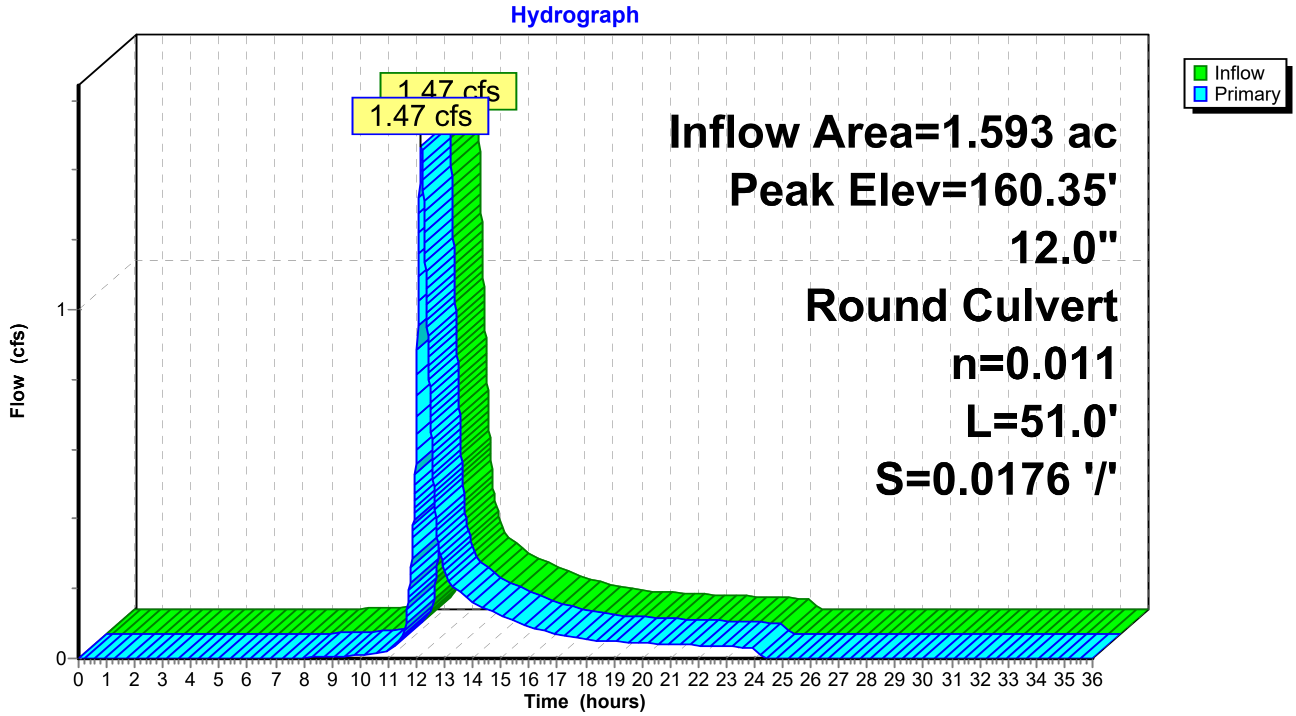
Inflow Area = 1.593 ac, 51.95% Impervious, Inflow Depth = 1.10" for 2-Year Storm event
Inflow = 1.47 cfs @ 12.17 hrs, Volume= 0.146 af
Outflow = 1.47 cfs @ 12.17 hrs, Volume= 0.146 af, Atten= 0%, Lag= 0.0 min
Primary = 1.47 cfs @ 12.17 hrs, Volume= 0.146 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.35' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	159.70'	**12.0" Round Culvert** L= 51.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.70' / 158.80' S= 0.0176 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.47 cfs @ 12.17 hrs HW=160.35' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.47 cfs @ 2.74 fps)

Pond 47P: FD/DMH7



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1P: P1a Runoff Area=112,292 sf 17.77% Impervious Runoff Depth=1.39"
Flow Length=655' Tc=16.4 min CN=64 Runoff=2.82 cfs 0.298 af

Pond 2P: CB1 Peak Elev=167.80' Inflow=2.82 cfs 0.298 af
15.0" Round Culvert n=0.011 L=194.0' S=0.0052 '/' Outflow=2.82 cfs 0.298 af

Subcatchment 3P: P1b Runoff Area=72,500 sf 24.34% Impervious Runoff Depth=1.60"
Flow Length=562' Tc=16.0 min CN=67 Runoff=2.18 cfs 0.222 af

Pond 4P: CB2 Peak Elev=166.93' Inflow=2.18 cfs 0.222 af
12.0" Round Culvert n=0.011 L=3.0' S=0.0333 '/' Outflow=2.18 cfs 0.222 af

Pond 5P: DMH1 Peak Elev=166.96' Inflow=5.00 cfs 0.520 af
18.0" Round Culvert n=0.011 L=171.0' S=0.0053 '/' Outflow=5.00 cfs 0.520 af

Subcatchment 6P: P1c Runoff Area=36,460 sf 39.37% Impervious Runoff Depth=2.13"
Flow Length=372' Tc=16.1 min CN=74 Runoff=1.52 cfs 0.148 af

Pond 7P: CB3 Peak Elev=165.64' Inflow=1.52 cfs 0.148 af
12.0" Round Culvert n=0.011 L=3.0' S=0.0333 '/' Outflow=1.52 cfs 0.148 af

Pond 8P: DMH2 Peak Elev=166.13' Inflow=6.51 cfs 0.668 af
18.0" Round Culvert n=0.011 L=94.0' S=0.0287 '/' Outflow=6.51 cfs 0.668 af

Subcatchment 9P: P1d Runoff Area=17,792 sf 68.87% Impervious Runoff Depth=3.38"
Flow Length=233' Tc=9.9 min CN=88 Runoff=1.40 cfs 0.115 af

Pond 10P: CB4&5 Peak Elev=168.42' Inflow=1.40 cfs 0.115 af
Outflow=1.40 cfs 0.115 af

Pond 11P: FD/DMH3 Peak Elev=167.63' Inflow=1.40 cfs 0.115 af
12.0" Round Culvert n=0.011 L=47.0' S=0.1043 '/' Outflow=1.40 cfs 0.115 af

Subcatchment 12P: P1e Runoff Area=35,653 sf 39.20% Impervious Runoff Depth=2.13"
Flow Length=403' Tc=11.6 min CN=74 Runoff=1.68 cfs 0.145 af

Pond 13P: CB6 Peak Elev=165.20' Inflow=1.68 cfs 0.145 af
12.0" Round Culvert n=0.011 L=72.0' S=0.0333 '/' Outflow=1.68 cfs 0.145 af

Subcatchment 14P: P1f Runoff Area=31,721 sf 39.55% Impervious Runoff Depth=1.26"
Flow Length=81' Slope=0.0200 '/' Tc=9.8 min CN=62 Runoff=0.85 cfs 0.076 af

Pond 15P: Area Drains Peak Elev=163.41' Inflow=0.85 cfs 0.076 af
8.0" Round Culvert n=0.011 L=114.0' S=0.0061 '/' Outflow=0.85 cfs 0.076 af

Pond 16P: FD/DMH4 Peak Elev=163.44' Inflow=9.89 cfs 1.005 af
24.0" Round Culvert n=0.011 L=112.0' S=0.0286 '/' Outflow=9.89 cfs 1.005 af

Pond 17P: DMH5&6 Peak Elev=160.78' Inflow=9.89 cfs 1.005 af
Outflow=9.89 cfs 1.005 af

Subcatchment 18P: P1g Runoff Area=61,354 sf 47.91% Impervious Runoff Depth=2.05"
Flow Length=414' Tc=12.7 min CN=73 Runoff=2.69 cfs 0.240 af

Pond 19P: CB7 Peak Elev=160.98' Inflow=2.69 cfs 0.240 af
12.0" Round Culvert n=0.011 L=2.0' S=0.0500 '/' Outflow=2.69 cfs 0.240 af

Subcatchment 20P: P1h Runoff Area=8,054 sf 82.73% Impervious Runoff Depth=3.38"
Flow Length=68' Slope=0.0300 '/' Tc=5.0 min CN=88 Runoff=0.75 cfs 0.052 af

Pond 21P: CB8 Peak Elev=160.74' Inflow=0.75 cfs 0.052 af
12.0" Round Culvert n=0.011 L=59.0' S=0.0085 '/' Outflow=0.75 cfs 0.052 af

Pond 22P: DMH8&9 Peak Elev=159.88' Inflow=3.12 cfs 0.293 af
12.0" Round Culvert n=0.011 L=9.5' S=0.0105 '/' Outflow=3.12 cfs 0.293 af

Subcatchment 23P: P1i Runoff Area=23,312 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=2.46 cfs 0.199 af

Pond 24P: Roof Pipe Peak Elev=164.44' Inflow=2.46 cfs 0.199 af
12.0" Round Culvert n=0.011 L=302.0' S=0.0100 '/' Outflow=2.46 cfs 0.199 af

Pond 25P: Infiltration Field #1 Peak Elev=159.69' Storage=16,389 cf Inflow=14.44 cfs 1.497 af
Discarded=2.61 cfs 1.299 af Primary=2.49 cfs 0.197 af Outflow=5.10 cfs 1.497 af

Subcatchment 26P: P2f Runoff Area=24,110 sf 71.37% Impervious Runoff Depth=3.19"
Tc=6.0 min CN=86 Runoff=2.05 cfs 0.147 af

Subcatchment 27P: P2a Runoff Area=12,798 sf 68.12% Impervious Runoff Depth=3.09"
Flow Length=211' Tc=6.9 min CN=85 Runoff=1.02 cfs 0.076 af

Pond 28P: CB9 Peak Elev=163.52' Inflow=1.02 cfs 0.076 af
12.0" Round Culvert n=0.011 L=122.0' S=0.0164 '/' Outflow=1.02 cfs 0.076 af

Pond 29P: DMH11 Peak Elev=166.16' Inflow=3.06 cfs 0.223 af
12.0" Round Culvert n=0.011 L=71.0' S=0.0141 '/' Outflow=3.06 cfs 0.223 af

Subcatchment 30P: P2b Runoff Area=11,558 sf 84.98% Impervious Runoff Depth=3.49"
Flow Length=74' Slope=0.0200 '/' Tc=5.0 min CN=89 Runoff=1.10 cfs 0.077 af

Pond 31P: CB10 Peak Elev=161.70' Inflow=1.10 cfs 0.077 af
12.0" Round Culvert n=0.011 L=3.0' S=0.0333 '/' Outflow=1.10 cfs 0.077 af

Pond 32P: DMH12 Peak Elev=165.01' Inflow=4.14 cfs 0.300 af
15.0" Round Culvert n=0.011 L=158.0' S=0.0323 '/' Outflow=4.14 cfs 0.300 af

Pond 33P: FD/DMH13&14 Peak Elev=159.75' Inflow=4.14 cfs 0.300 af
18.0" Round Culvert n=0.011 L=8.0' S=0.0125 '/' Outflow=4.14 cfs 0.300 af

Subcatchment 34P: P2c Runoff Area=19,803 sf 84.10% Impervious Runoff Depth=3.49"
Flow Length=225' Tc=5.0 min CN=89 Runoff=1.88 cfs 0.132 af

Pond 35P: FD/CB11 Peak Elev=160.55' Inflow=1.88 cfs 0.132 af
12.0" Round Culvert n=0.011 L=32.0' S=0.0313 '/' Outflow=1.88 cfs 0.132 af

Subcatchment 36P: P2d Runoff Area=10,490 sf 82.97% Impervious Runoff Depth=3.38"
Flow Length=124' Slope=0.0300 '/' Tc=5.0 min CN=88 Runoff=0.97 cfs 0.068 af

Pond 37P: FD/CB12 Peak Elev=160.51' Inflow=0.97 cfs 0.068 af
12.0" Round Culvert n=0.011 L=52.0' S=0.0231 '/' Outflow=0.97 cfs 0.068 af

Pond 38P: DMH15&16 Peak Elev=159.76' Inflow=2.85 cfs 0.200 af
12.0" Round Culvert n=0.011 L=6.5' S=0.0154 '/' Outflow=2.85 cfs 0.200 af

Subcatchment 39P: P2e Runoff Area=11,055 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=1.17 cfs 0.094 af

Pond 40P: Roof Drain Peak Elev=165.81' Inflow=1.17 cfs 0.094 af
8.0" Round Culvert n=0.011 L=232.0' S=0.0280 '/' Outflow=1.17 cfs 0.094 af

Pond 41P: Infiltration Field #2 Peak Elev=159.89' Storage=7,523 cf Inflow=8.13 cfs 0.594 af
Discarded=1.08 cfs 0.549 af Primary=0.38 cfs 0.045 af Outflow=1.46 cfs 0.594 af

Subcatchment 42P: P3 Runoff Area=53,149 sf 2.73% Impervious Runoff Depth=0.07"
Flow Length=204' Tc=8.6 min CN=36 Runoff=0.01 cfs 0.007 af

Link 43P: Design Point #1: Wetlands Inflow=2.87 cfs 0.250 af
Primary=2.87 cfs 0.250 af

Pond 47P: FD/DMH7 Peak Elev=160.88' Inflow=3.12 cfs 0.293 af
12.0" Round Culvert n=0.011 L=51.0' S=0.0176 '/' Outflow=3.12 cfs 0.293 af

Total Runoff Area = 12.445 ac Runoff Volume = 2.098 af Average Runoff Depth = 2.02"
58.73% Pervious = 7.309 ac 41.27% Impervious = 5.136 ac

Summary for Subcatchment 1P: P1a

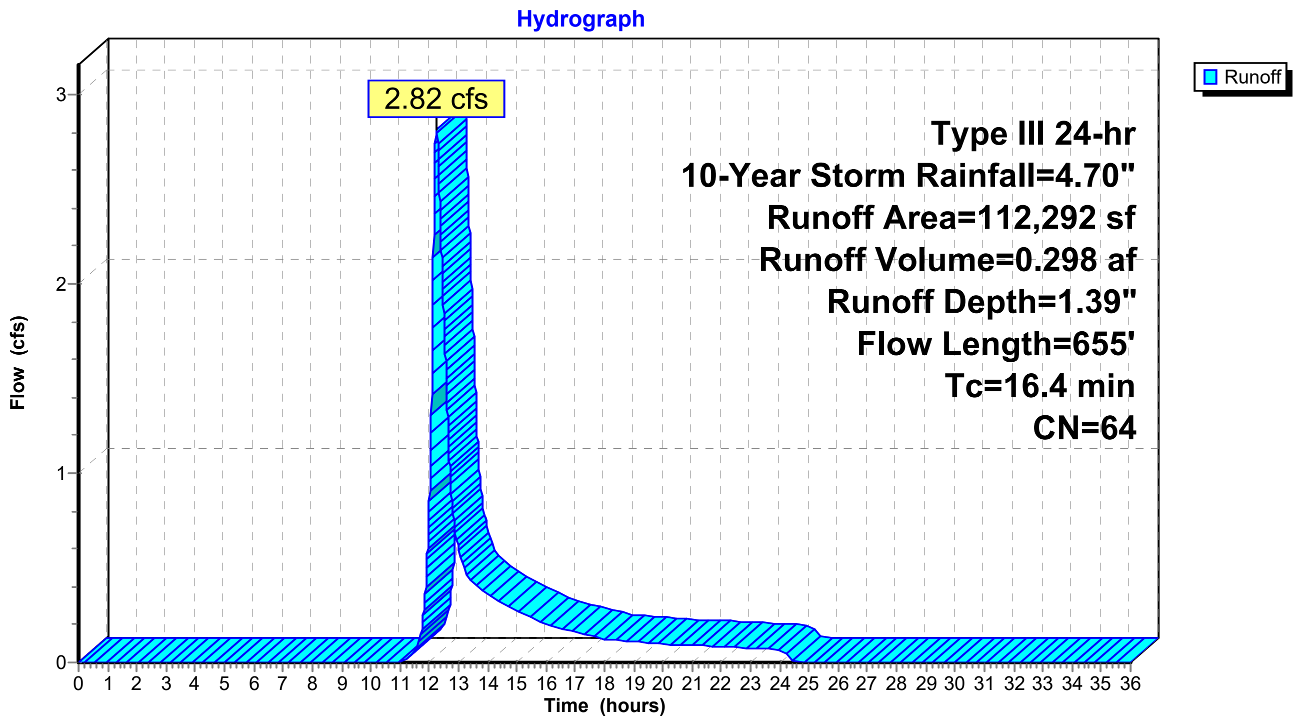
Runoff = 2.82 cfs @ 12.25 hrs, Volume= 0.298 af, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
19,951	98	Paved parking, HSG B
20,485	61	>75% Grass cover, Good, HSG B
71,856	55	Woods, Good, HSG B
112,292	64	Weighted Average
92,341		82.23% Pervious Area
19,951		17.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	43	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.8	410	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	47	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	155	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.4	655	Total			

Subcatchment 1P: P1a



Summary for Pond 2P: CB1

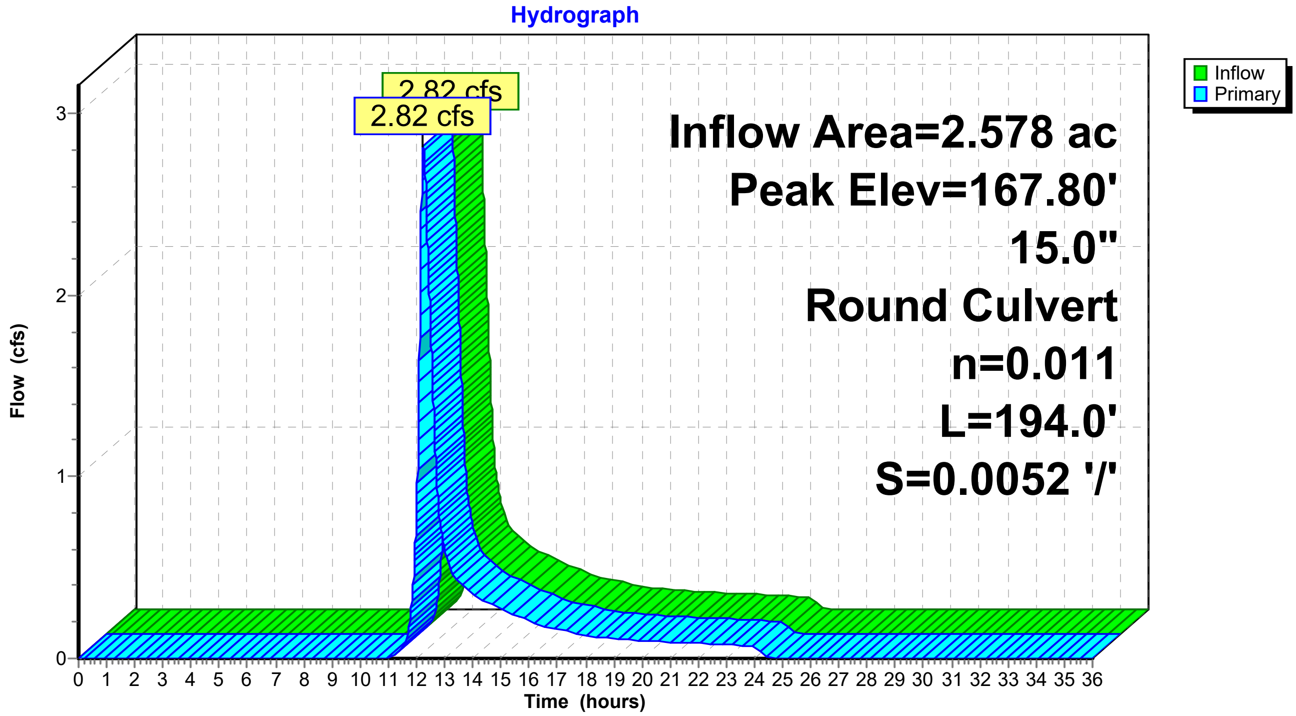
Inflow Area = 2.578 ac, 17.77% Impervious, Inflow Depth = 1.39" for 10-Year Storm event
Inflow = 2.82 cfs @ 12.25 hrs, Volume= 0.298 af
Outflow = 2.82 cfs @ 12.25 hrs, Volume= 0.298 af, Atten= 0%, Lag= 0.0 min
Primary = 2.82 cfs @ 12.25 hrs, Volume= 0.298 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 167.80' @ 12.25 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	166.90'	**15.0" Round Culvert** L= 194.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 166.90' / 165.90' S= 0.0052 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf

Primary OutFlow Max=2.82 cfs @ 12.25 hrs HW=167.80' (Free Discharge)
└─**1=Culvert** (Barrel Controls 2.82 cfs @ 4.17 fps)

Pond 2P: CB1



Summary for Subcatchment 3P: P1b

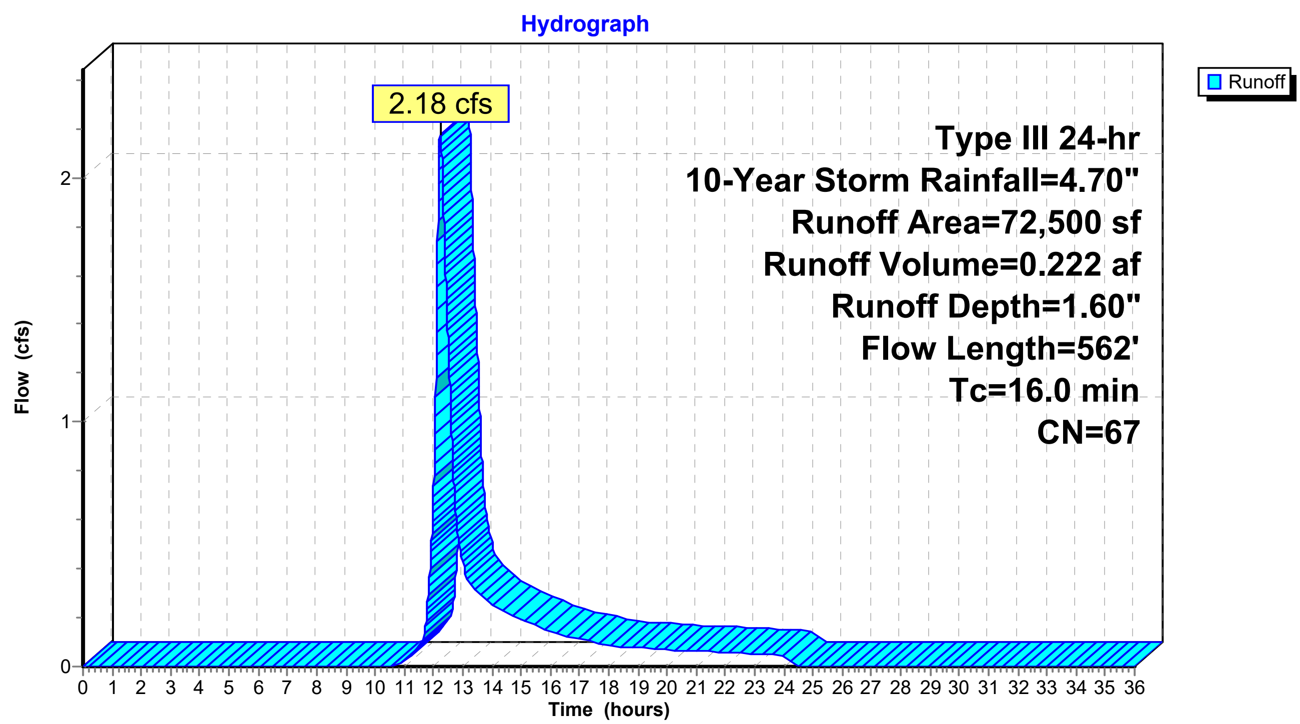
Runoff = 2.18 cfs @ 12.23 hrs, Volume= 0.222 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
17,650	98	Paved parking, HSG B
20,258	61	>75% Grass cover, Good, HSG B
34,592	55	Woods, Good, HSG B
72,500	67	Weighted Average
54,850		75.66% Pervious Area
17,650		24.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	43	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.0	405	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	17	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	97	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.0	562	Total			

Subcatchment 3P: P1b



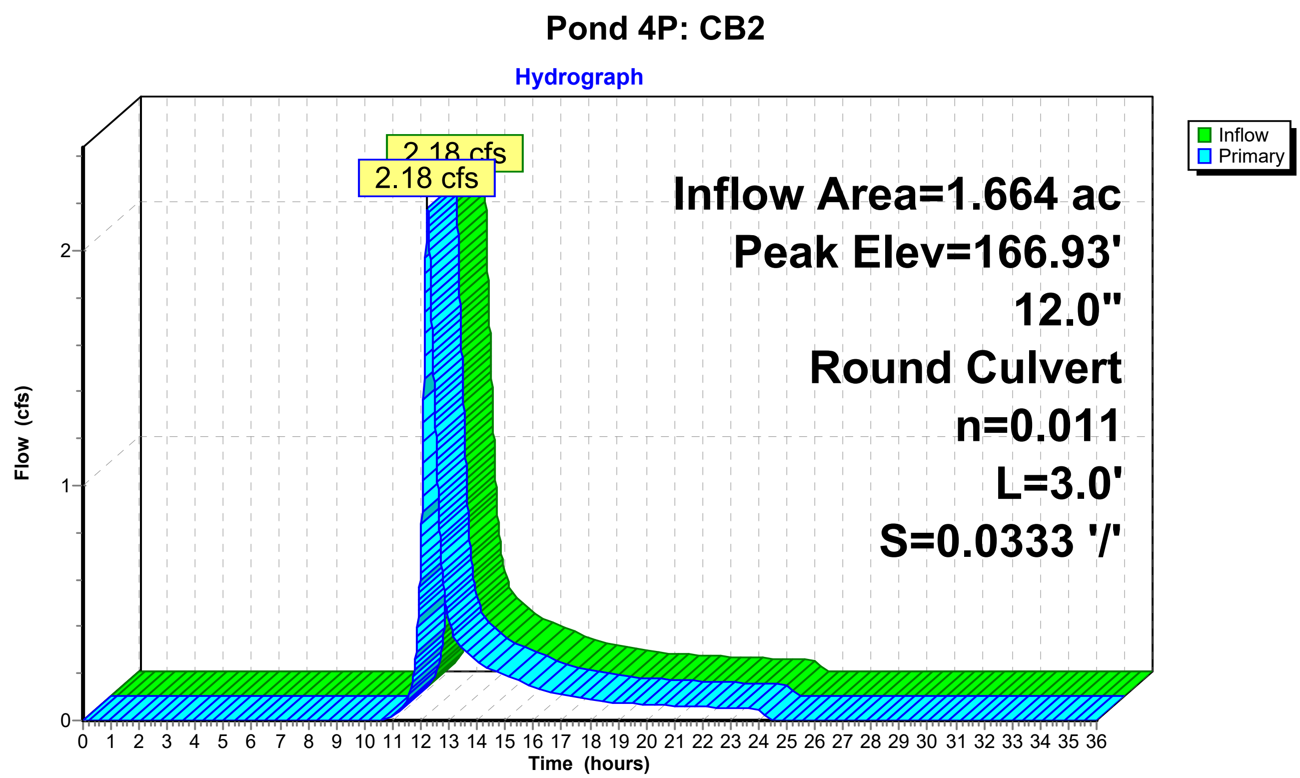
Summary for Pond 4P: CB2

Inflow Area = 1.664 ac, 24.34% Impervious, Inflow Depth = 1.60" for 10-Year Storm event
Inflow = 2.18 cfs @ 12.23 hrs, Volume= 0.222 af
Outflow = 2.18 cfs @ 12.23 hrs, Volume= 0.222 af, Atten= 0%, Lag= 0.0 min
Primary = 2.18 cfs @ 12.23 hrs, Volume= 0.222 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 166.93' @ 12.23 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	166.00'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 166.00' / 165.90' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=2.18 cfs @ 12.23 hrs HW=166.93' (Free Discharge)
└─**1=Culvert** (Barrel Controls 2.18 cfs @ 3.72 fps)



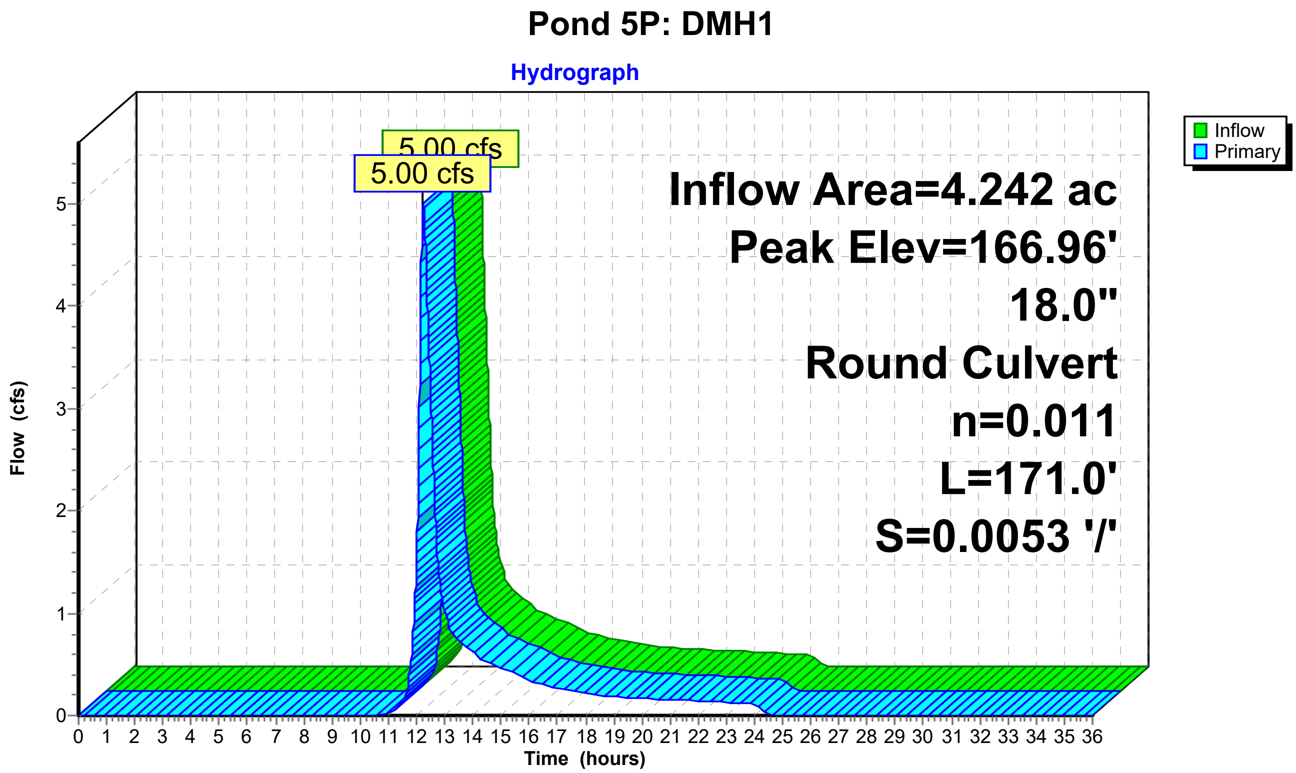
Summary for Pond 5P: DMH1

Inflow Area =	4.242 ac,	20.35% Impervious,	Inflow Depth = 1.47"	for 10-Year Storm event
Inflow =	5.00 cfs @	12.24 hrs,	Volume=	0.520 af
Outflow =	5.00 cfs @	12.24 hrs,	Volume=	0.520 af, Atten= 0%, Lag= 0.0 min
Primary =	5.00 cfs @	12.24 hrs,	Volume=	0.520 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 166.96' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	165.80'	**18.0" Round Culvert** L= 171.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.80' / 164.90' S= 0.0053 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=5.00 cfs @ 12.24 hrs HW=166.96' (Free Discharge)
└─**1=Culvert** (Barrel Controls 5.00 cfs @ 4.69 fps)



Summary for Subcatchment 6P: P1c

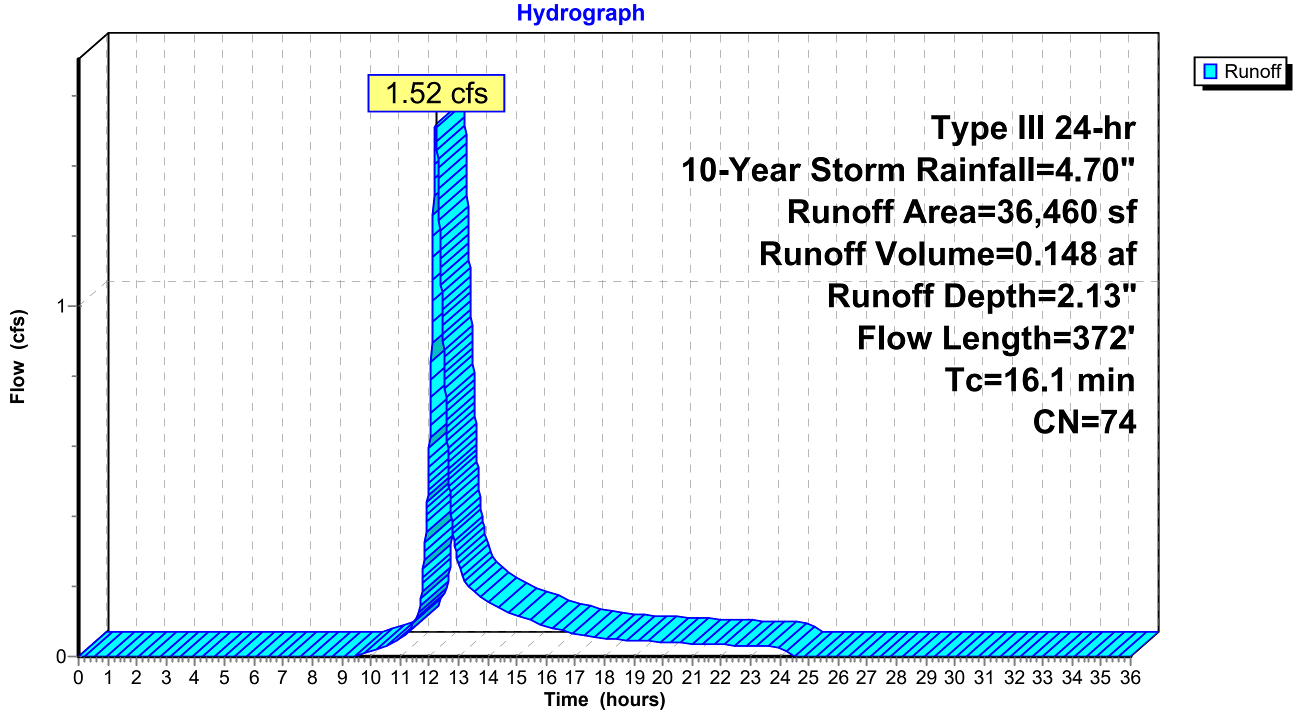
Runoff = 1.52 cfs @ 12.22 hrs, Volume= 0.148 af, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
1,313	98	Paved parking, HSG A
13,041	98	Paved parking, HSG B
160	39	>75% Grass cover, Good, HSG A
15,425	61	>75% Grass cover, Good, HSG B
6,521	55	Woods, Good, HSG B
36,460	74	Weighted Average
22,106		60.63% Pervious Area
14,354		39.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	47	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
4.8	36	0.0400	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.7	74	0.0700	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	40	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	175	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.1	372	Total			

Subcatchment 6P: P1c



Summary for Pond 7P: CB3

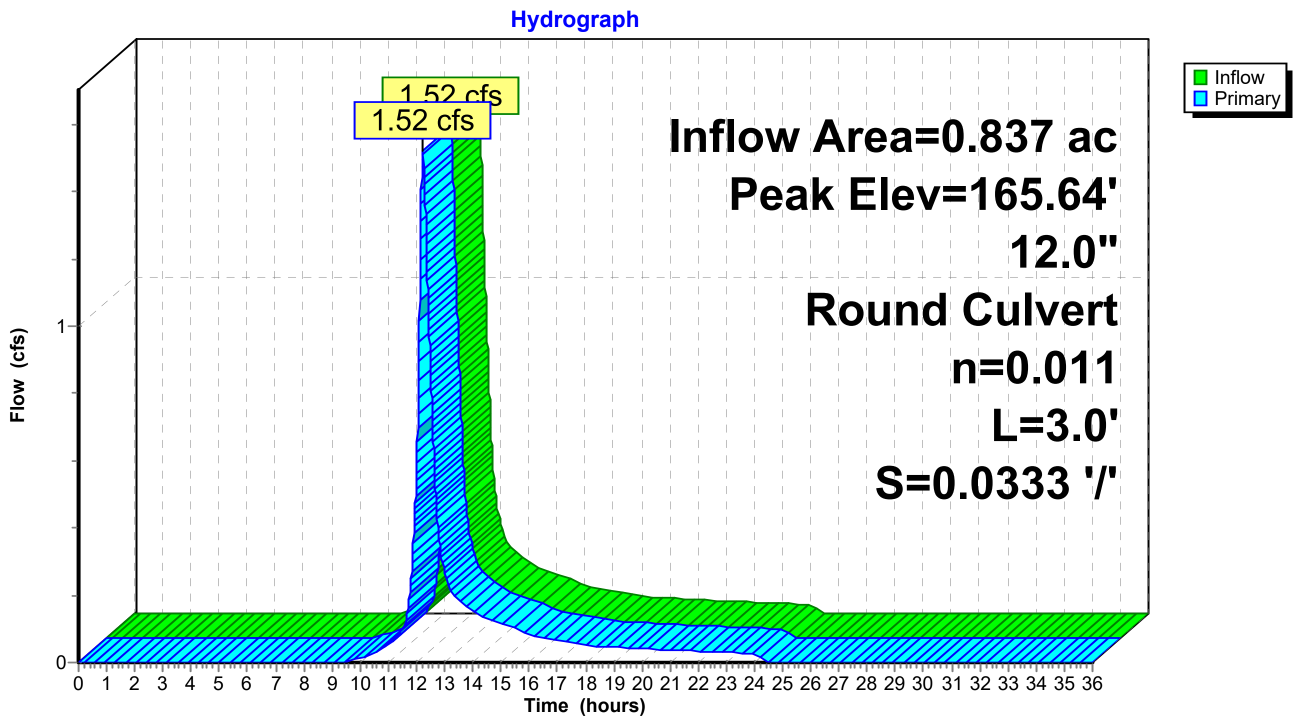
Inflow Area =	0.837 ac,	39.37% Impervious,	Inflow Depth = 2.13"	for 10-Year Storm event	
Inflow =	1.52 cfs @	12.22 hrs,	Volume=	0.148 af	
Outflow =	1.52 cfs @	12.22 hrs,	Volume=	0.148 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.52 cfs @	12.22 hrs,	Volume=	0.148 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 165.64' @ 12.22 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	164.90'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 164.90' / 164.80' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.52 cfs @ 12.22 hrs HW=165.64' (Free Discharge)
└─**1=Culvert** (Barrel Controls 1.52 cfs @ 3.42 fps)

Pond 7P: CB3



Summary for Pond 8P: DMH2

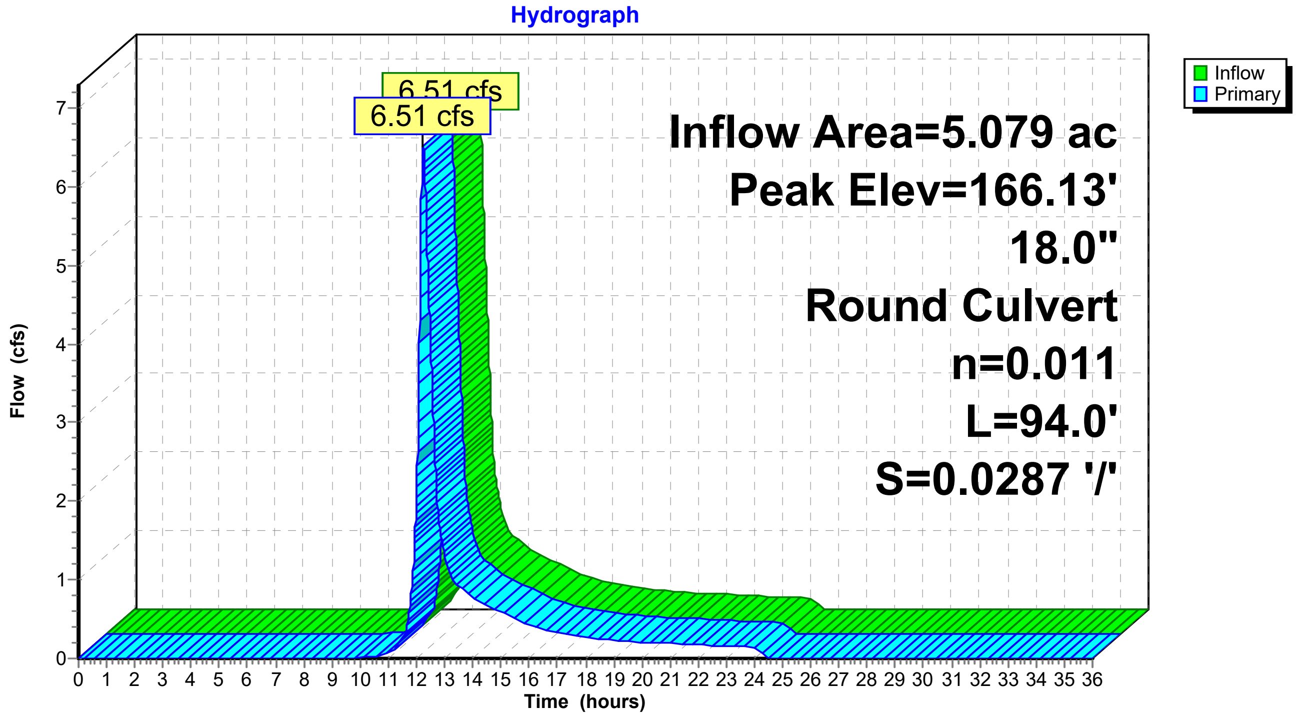
Inflow Area =	5.079 ac,	23.48% Impervious,	Inflow Depth = 1.58"	for 10-Year Storm event
Inflow =	6.51 cfs @	12.24 hrs,	Volume=	0.668 af
Outflow =	6.51 cfs @	12.24 hrs,	Volume=	0.668 af, Atten= 0%, Lag= 0.0 min
Primary =	6.51 cfs @	12.24 hrs,	Volume=	0.668 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 166.13' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	164.80'	**18.0" Round Culvert** L= 94.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 164.80' / 162.10' S= 0.0287 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=6.51 cfs @ 12.24 hrs HW=166.13' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 6.51 cfs @ 3.93 fps)

Pond 8P: DMH2



Summary for Subcatchment 9P: P1d

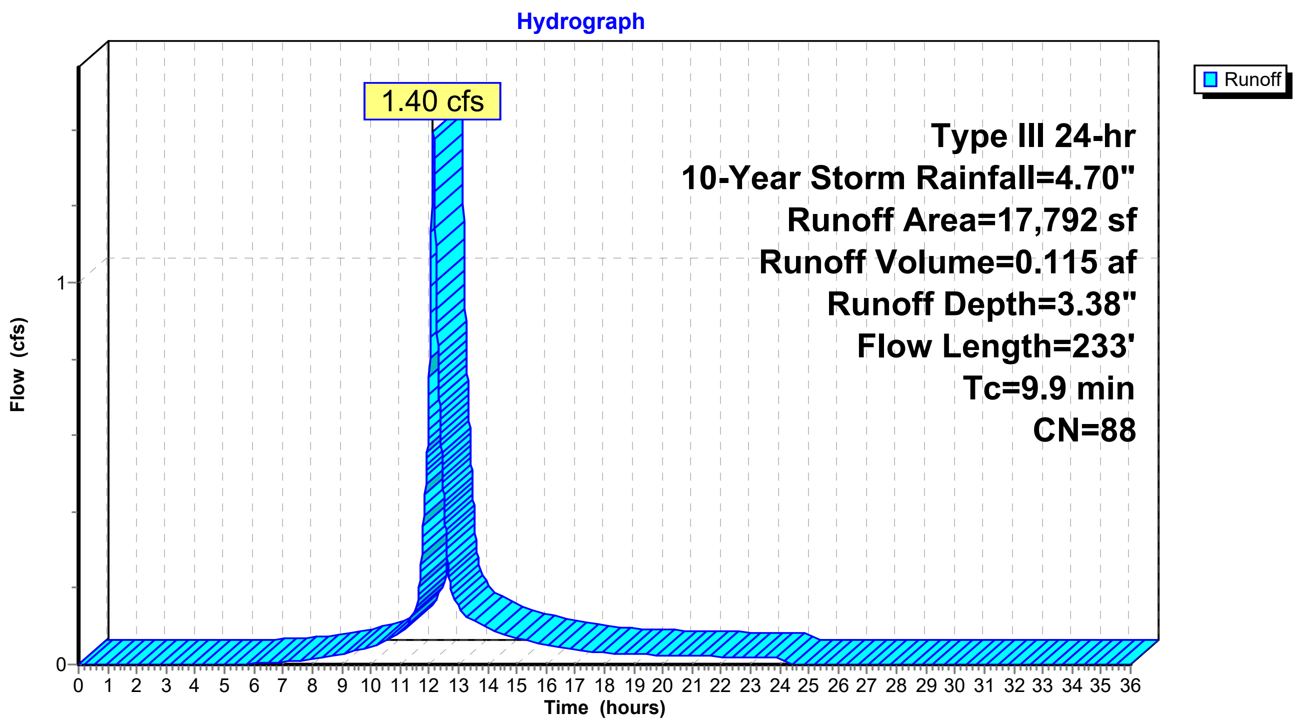
Runoff = 1.40 cfs @ 12.13 hrs, Volume= 0.115 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
220	98	Paved parking, HSG A
12,034	98	Paved parking, HSG B
4,299	61	>75% Grass cover, Good, HSG B
1,239	79	<50% Grass cover, Poor, HSG B
17,792	88	Weighted Average
5,538		31.13% Pervious Area
12,254		68.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	72	0.0300	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.1	17	0.1000	2.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	144	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.9	233	Total			

Subcatchment 9P: P1d



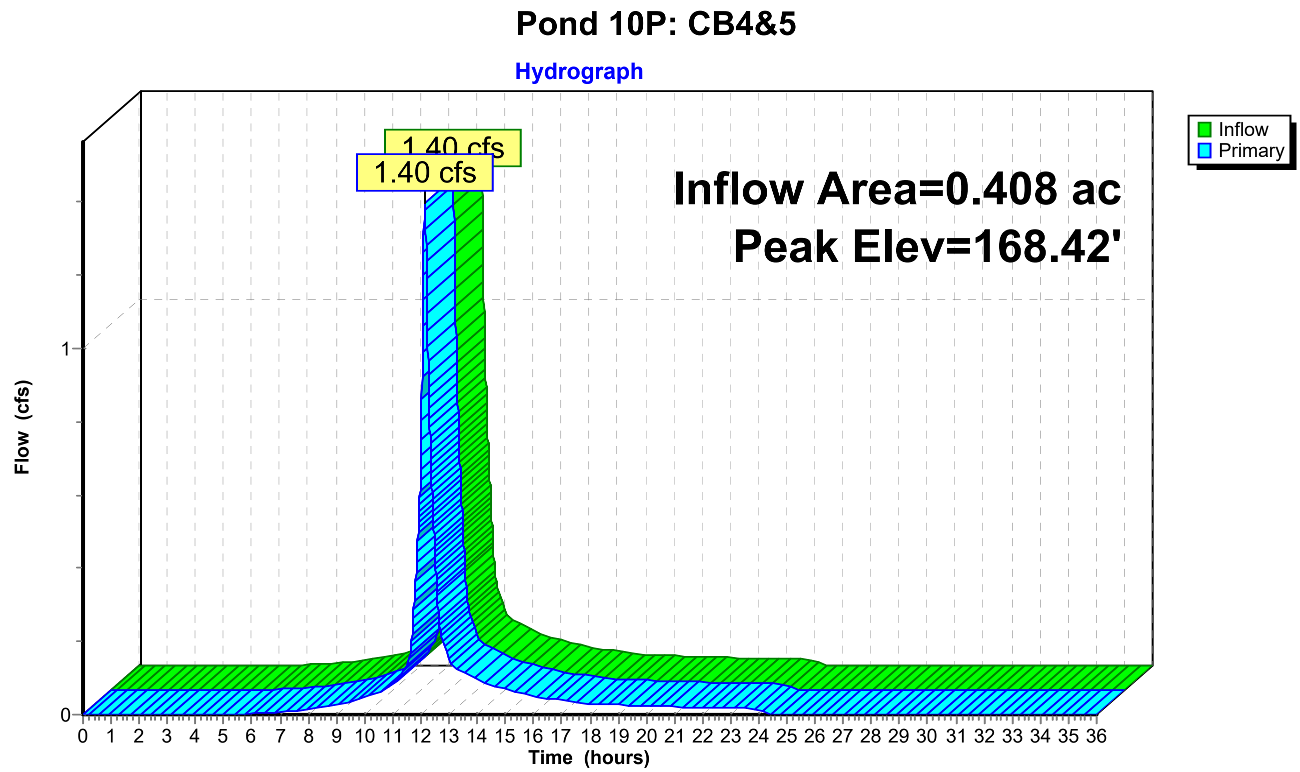
Summary for Pond 10P: CB4&5

Inflow Area = 0.408 ac, 68.87% Impervious, Inflow Depth = 3.38" for 10-Year Storm event
Inflow = 1.40 cfs @ 12.13 hrs, Volume= 0.115 af
Outflow = 1.40 cfs @ 12.13 hrs, Volume= 0.115 af, Atten= 0%, Lag= 0.0 min
Primary = 1.40 cfs @ 12.13 hrs, Volume= 0.115 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 168.42' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	168.00'	**12.0" Round Culvert** L= 36.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 168.00' / 167.60' S= 0.0111 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#2	Primary	168.00'	**12.0" Round Culvert** L= 36.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 168.00' / 167.60' S= 0.0111 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.39 cfs @ 12.13 hrs HW=168.42' (Free Discharge)
1=Culvert (Inlet Controls 0.70 cfs @ 2.21 fps)
2=Culvert (Inlet Controls 0.70 cfs @ 2.21 fps)



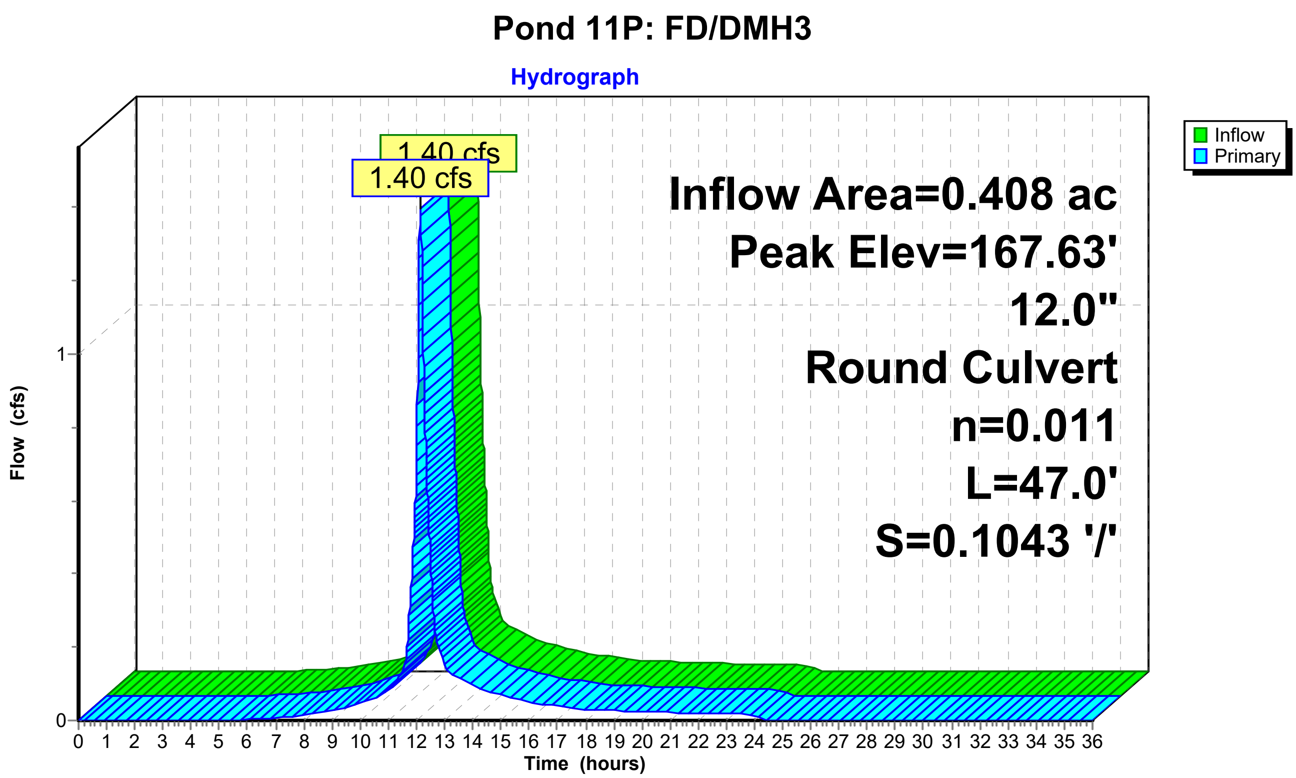
Summary for Pond 11P: FD/DMH3

Inflow Area =	0.408 ac,	68.87% Impervious,	Inflow Depth = 3.38"	for 10-Year Storm event
Inflow =	1.40 cfs @	12.13 hrs, Volume=	0.115 af	
Outflow =	1.40 cfs @	12.13 hrs, Volume=	0.115 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.40 cfs @	12.13 hrs, Volume=	0.115 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 167.63' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	167.00'	**12.0" Round Culvert** L= 47.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 167.00' / 162.10' S= 0.1043 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.39 cfs @ 12.13 hrs HW=167.63' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.39 cfs @ 2.69 fps)



Summary for Subcatchment 12P: P1e

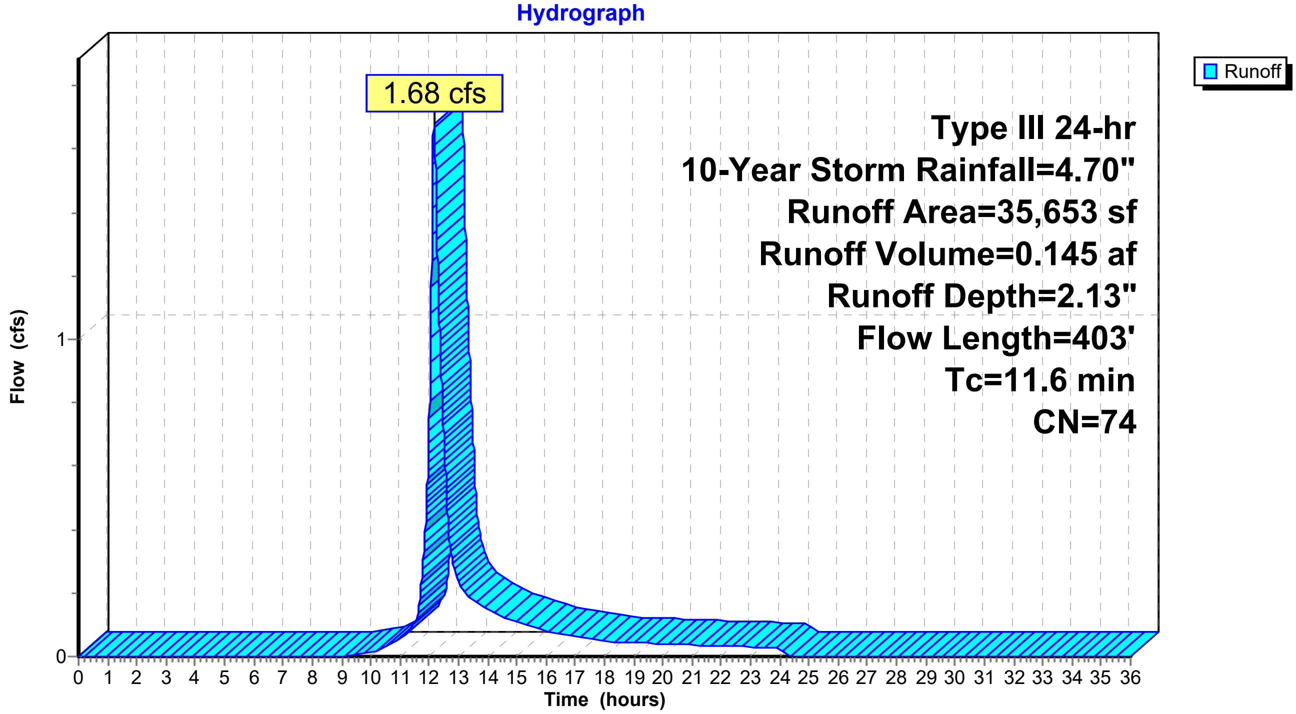
Runoff = 1.68 cfs @ 12.16 hrs, Volume= 0.145 af, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
10,926	98	Paved parking, HSG A
3,050	98	Paved parking, HSG B
6,148	39	>75% Grass cover, Good, HSG A
10,410	61	>75% Grass cover, Good, HSG B
4,510	79	<50% Grass cover, Poor, HSG B
609	55	Woods, Good, HSG B
35,653	74	Weighted Average
21,677		60.80% Pervious Area
13,976		39.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	83	0.0400	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.1	13	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	130	0.0700	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	177	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.6	403	Total			

Subcatchment 12P: P1e



Summary for Pond 13P: CB6

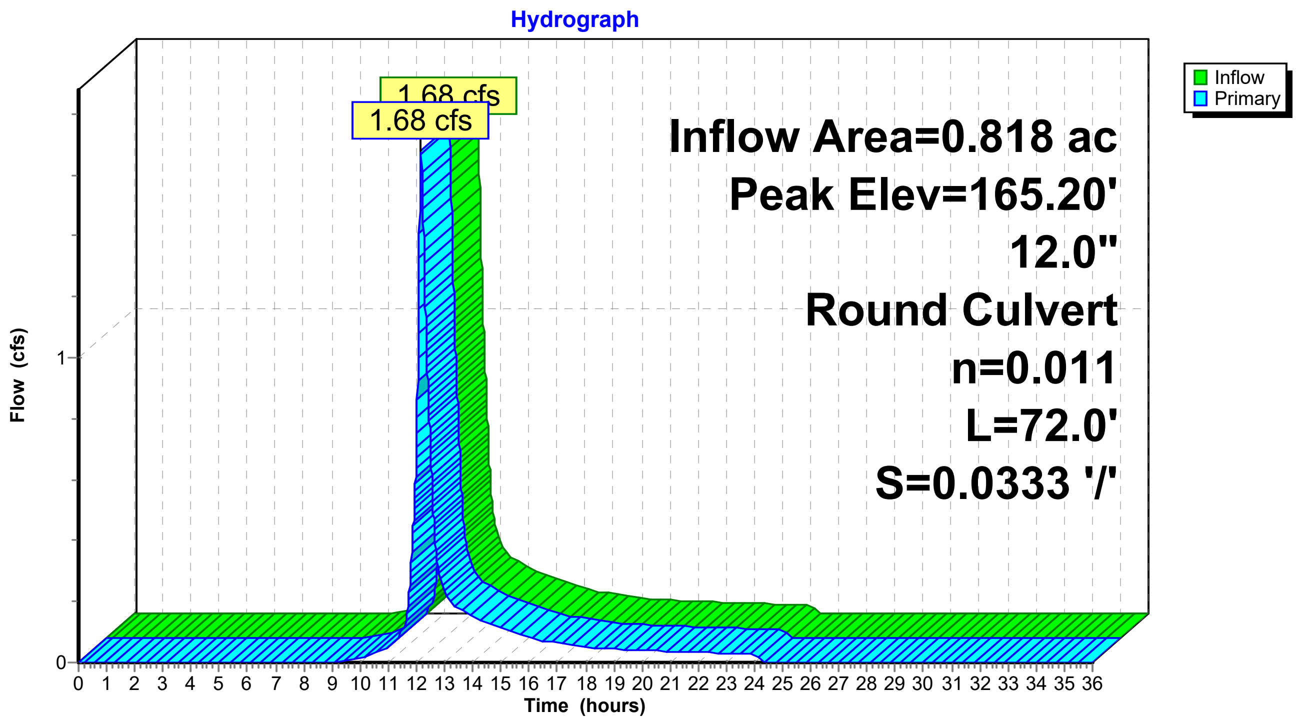
Inflow Area = 0.818 ac, 39.20% Impervious, Inflow Depth = 2.13" for 10-Year Storm event
Inflow = 1.68 cfs @ 12.16 hrs, Volume= 0.145 af
Outflow = 1.68 cfs @ 12.16 hrs, Volume= 0.145 af, Atten= 0%, Lag= 0.0 min
Primary = 1.68 cfs @ 12.16 hrs, Volume= 0.145 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 165.20' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	164.50'	**12.0" Round Culvert** L= 72.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 164.50' / 162.10' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.68 cfs @ 12.16 hrs HW=165.20' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.68 cfs @ 2.85 fps)

Pond 13P: CB6



Summary for Subcatchment 14P: P1f

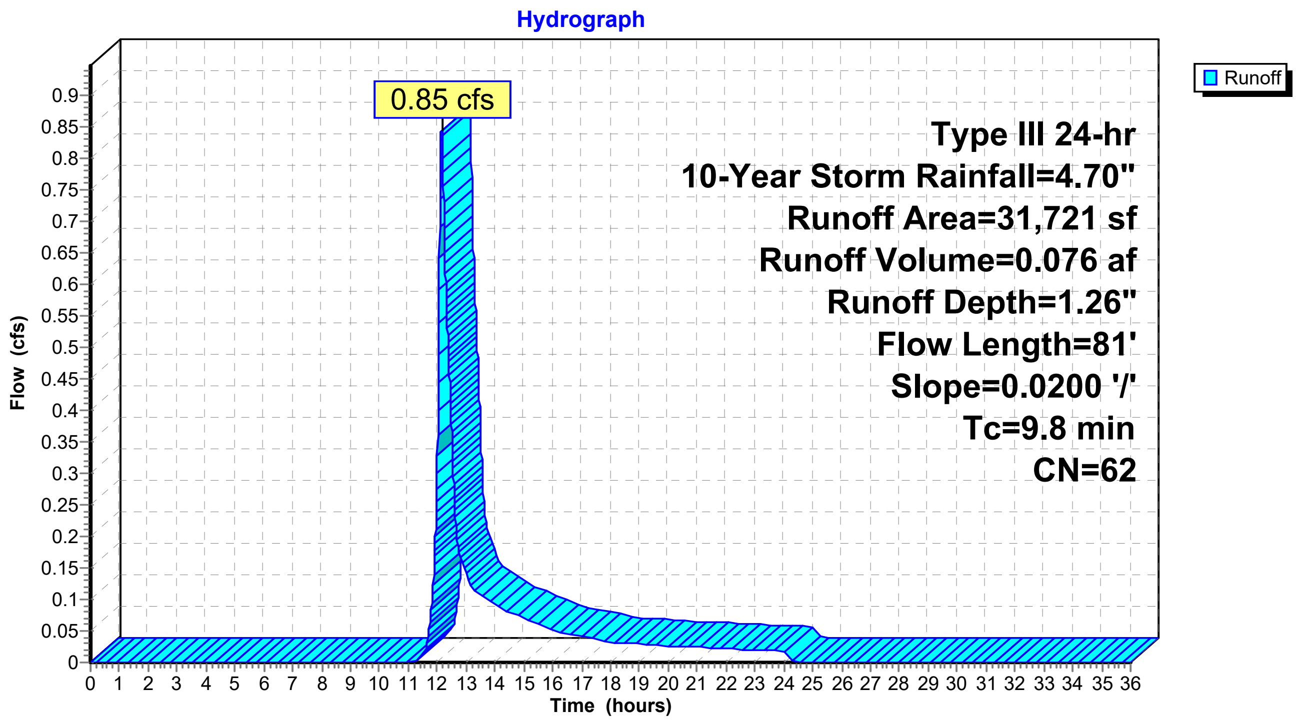
Runoff = 0.85 cfs @ 12.15 hrs, Volume= 0.076 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
12,547	98	Paved parking, HSG A
19,174	39	>75% Grass cover, Good, HSG A
31,721	62	Weighted Average
19,174		60.45% Pervious Area
12,547		39.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	59	0.0200	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.4	22	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	81	Total			

Subcatchment 14P: P1f



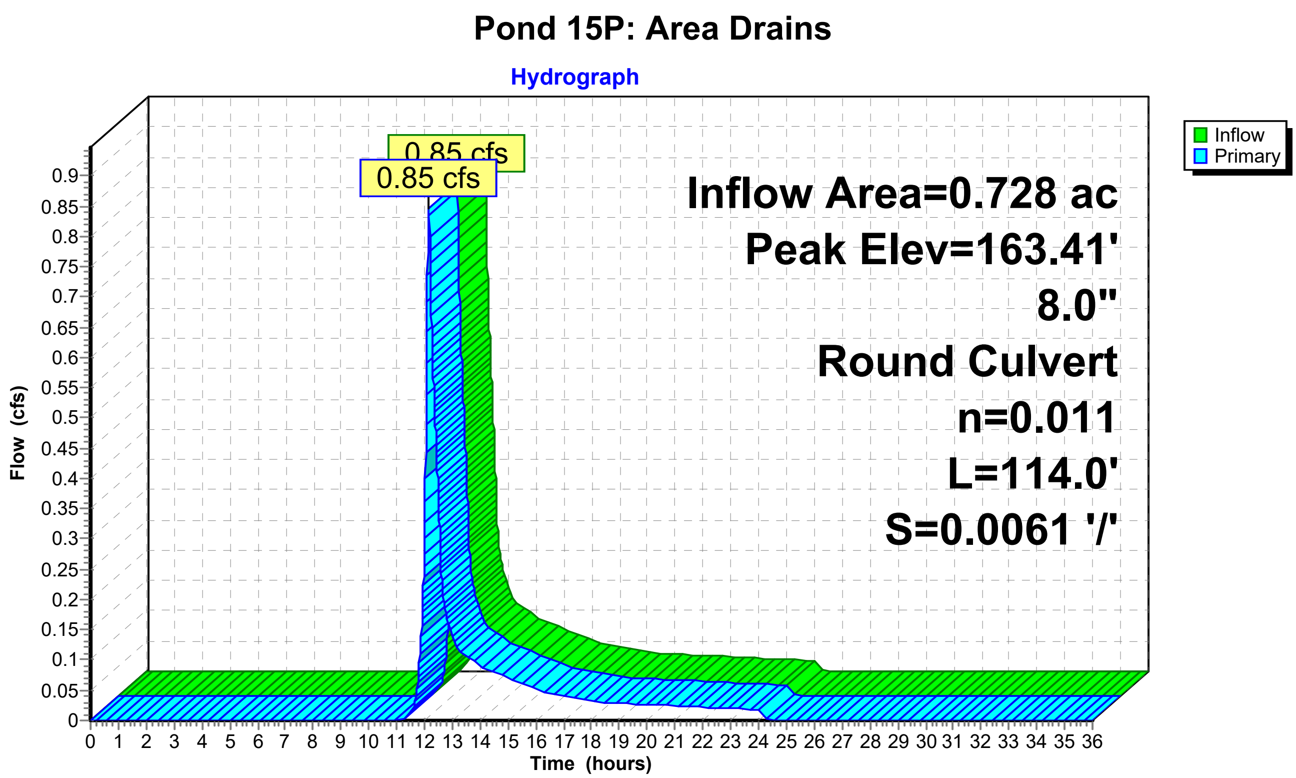
Summary for Pond 15P: Area Drains

Inflow Area =	0.728 ac,	39.55% Impervious,	Inflow Depth = 1.26"	for 10-Year Storm event
Inflow =	0.85 cfs @	12.15 hrs, Volume=	0.076 af	
Outflow =	0.85 cfs @	12.15 hrs, Volume=	0.076 af, Atten= 0%, Lag= 0.0 min	
Primary =	0.85 cfs @	12.15 hrs, Volume=	0.076 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 163.41' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	162.80'	**8.0" Round Culvert** L= 114.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 162.80' / 162.10' S= 0.0061 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=0.85 cfs @ 12.15 hrs HW=163.41' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.85 cfs @ 3.30 fps)



Summary for Pond 16P: FD/DMH4

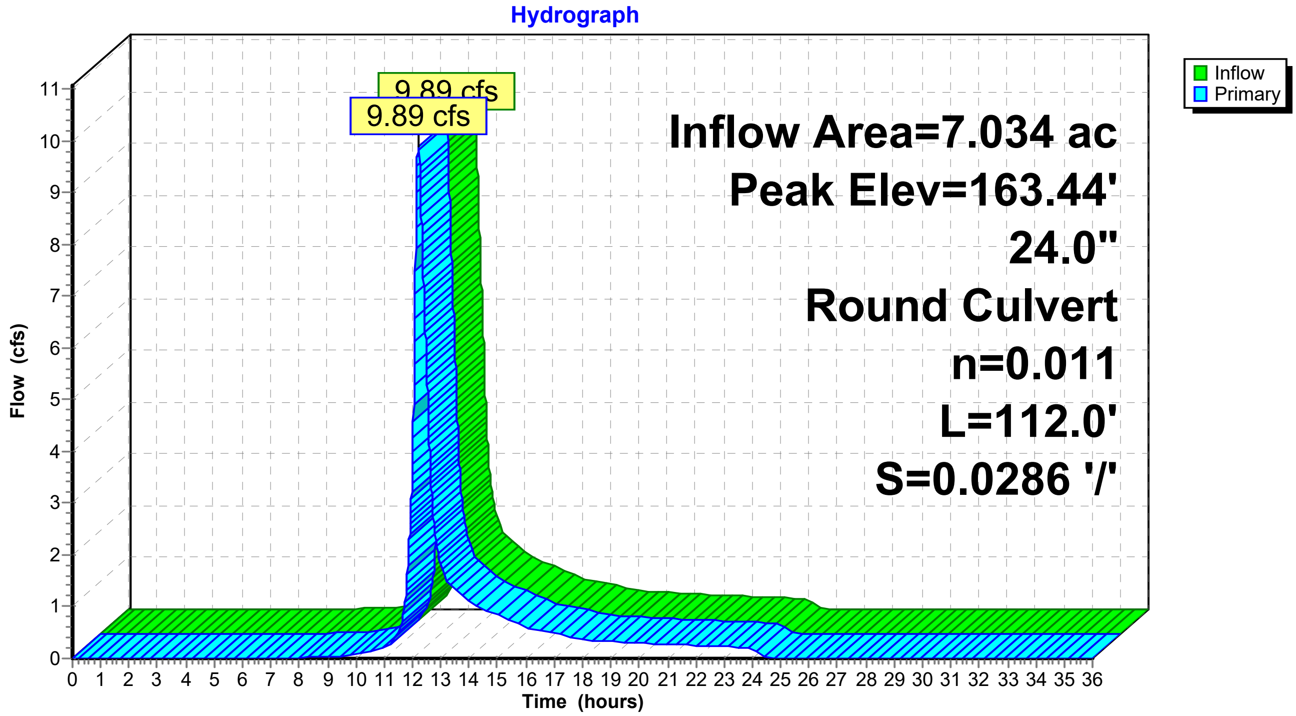
Inflow Area =	7.034 ac,	29.61% Impervious,	Inflow Depth =	1.71"	for 10-Year Storm event	
Inflow =	9.89 cfs @	12.20 hrs,	Volume=	1.005 af		
Outflow =	9.89 cfs @	12.20 hrs,	Volume=	1.005 af,	Atten= 0%,	Lag= 0.0 min
Primary =	9.89 cfs @	12.20 hrs,	Volume=	1.005 af		

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 163.44' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	162.00'	**24.0" Round Culvert** L= 112.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 162.00' / 158.80' S= 0.0286 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf

Primary OutFlow Max=9.89 cfs @ 12.20 hrs HW=163.44' (Free Discharge)
└**1=Culvert** (Inlet Controls 9.89 cfs @ 4.09 fps)

Pond 16P: FD/DMH4



Summary for Pond 17P: DMH5&6

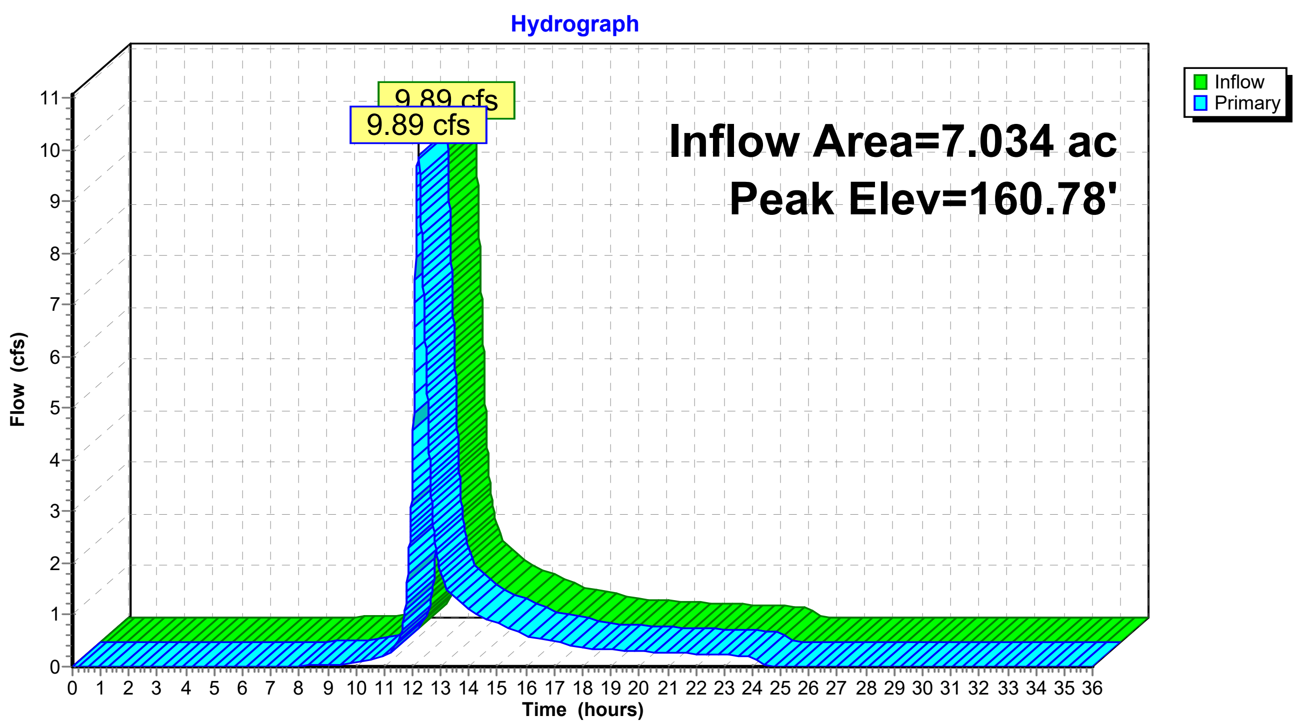
Inflow Area =	7.034 ac, 29.61% Impervious,	Inflow Depth = 1.71"	for 10-Year Storm event	
Inflow =	9.89 cfs @	12.20 hrs, Volume=	1.005 af	
Outflow =	9.89 cfs @	12.20 hrs, Volume=	1.005 af,	Atten= 0%, Lag= 0.0 min
Primary =	9.89 cfs @	12.20 hrs, Volume=	1.005 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.78' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.60'	**18.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.60' / 158.50' S= 0.0125 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Primary	161.00'	**18.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.00' / 158.50' S= 0.4167 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=9.89 cfs @ 12.20 hrs HW=160.78' (Free Discharge)
1=Culvert (Barrel Controls 9.89 cfs @ 5.60 fps)
2=Culvert (Controls 0.00 cfs)

Pond 17P: DMH5&6



Summary for Subcatchment 18P: P1g

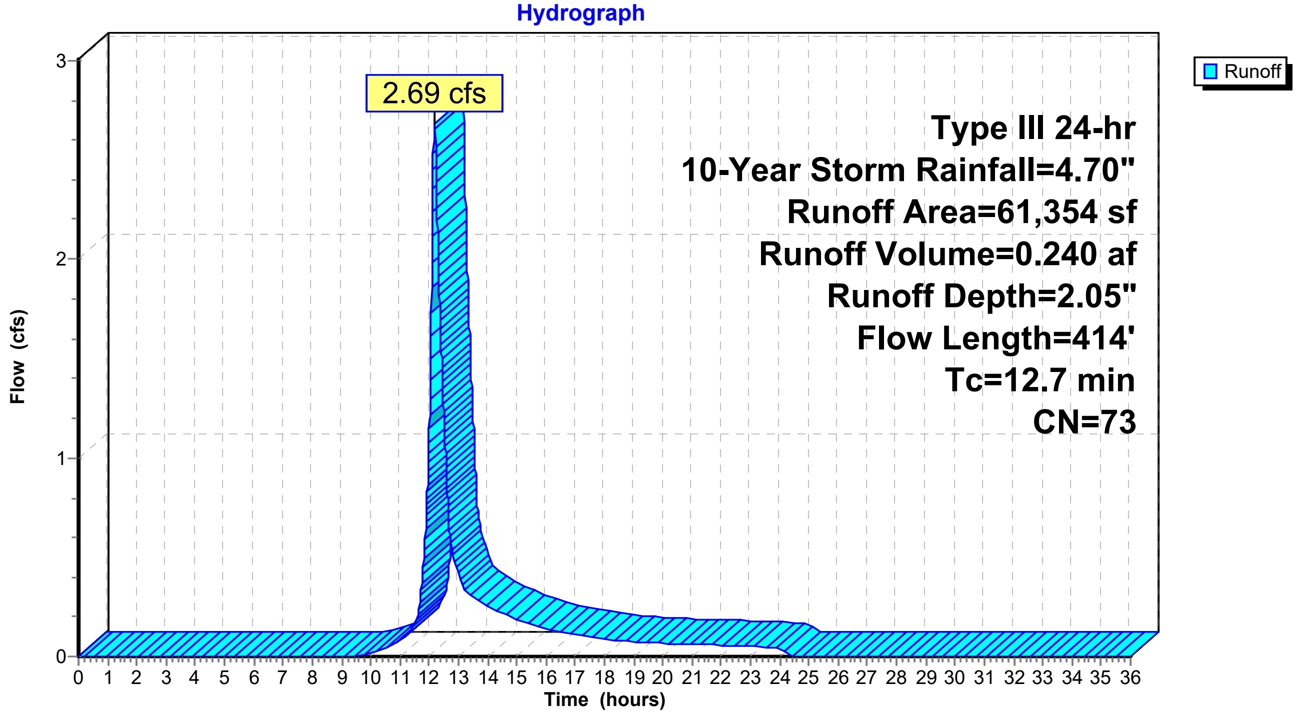
Runoff = 2.69 cfs @ 12.18 hrs, Volume= 0.240 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
24,200	98	Paved parking, HSG A
5,193	98	Paved parking, HSG B
6,461	39	>75% Grass cover, Good, HSG A
7,570	61	>75% Grass cover, Good, HSG B
3,461	30	Woods, Good, HSG A
14,469	55	Woods, Good, HSG B
61,354	73	Weighted Average
31,961		52.09% Pervious Area
29,393		47.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	61	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	180	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	44	0.0400	1.80		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
0.6	129	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.7	414	Total			

Subcatchment 18P: P1g



Summary for Pond 19P: CB7

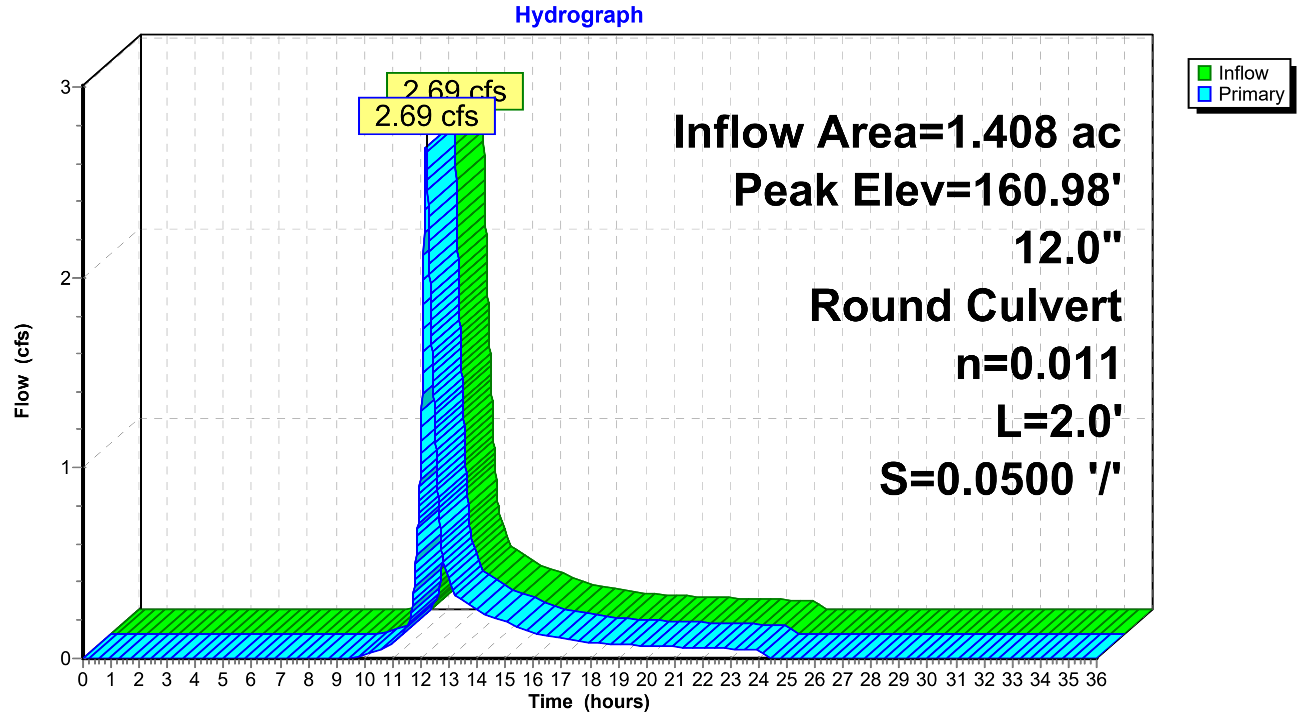
Inflow Area = 1.408 ac, 47.91% Impervious, Inflow Depth = 2.05" for 10-Year Storm event
Inflow = 2.69 cfs @ 12.18 hrs, Volume= 0.240 af
Outflow = 2.69 cfs @ 12.18 hrs, Volume= 0.240 af, Atten= 0%, Lag= 0.0 min
Primary = 2.69 cfs @ 12.18 hrs, Volume= 0.240 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.98' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	159.90'	**12.0" Round Culvert** L= 2.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.90' / 159.80' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=2.69 cfs @ 12.18 hrs HW=160.98' (Free Discharge)
└**1=Culvert** (Barrel Controls 2.69 cfs @ 3.94 fps)

Pond 19P: CB7



Summary for Subcatchment 20P: P1h

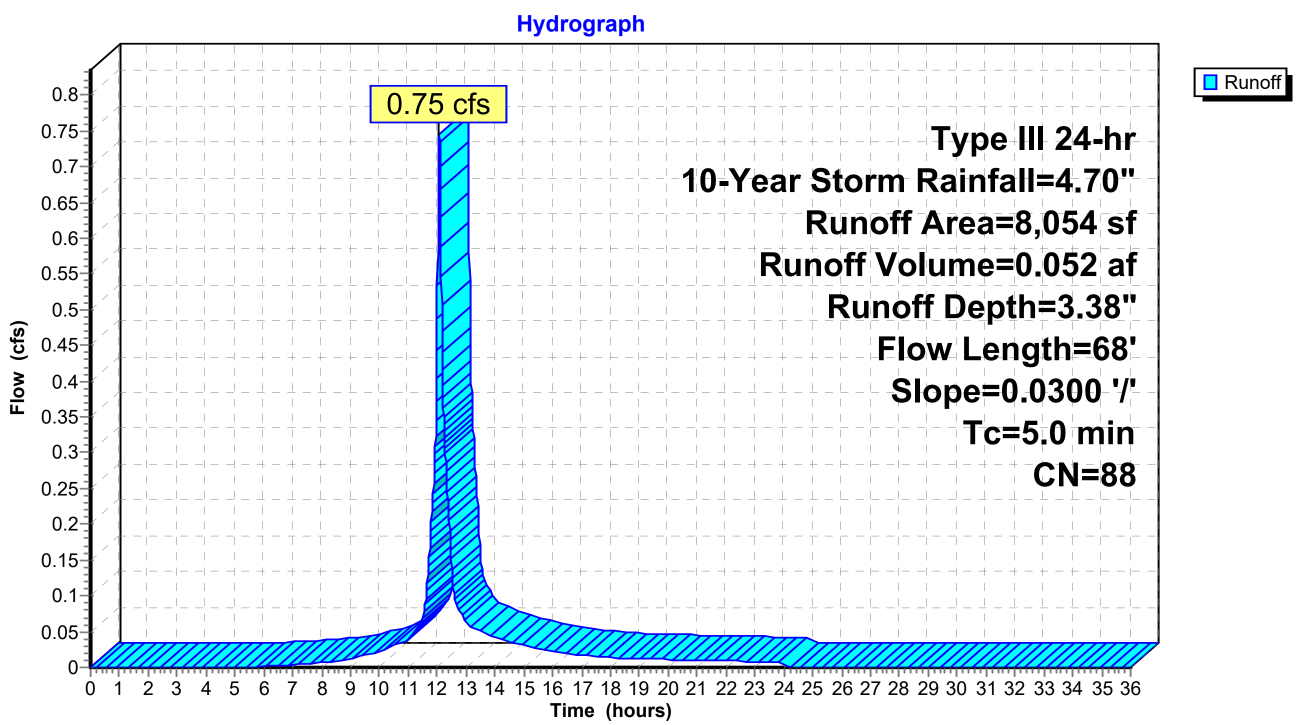
Runoff = 0.75 cfs @ 12.07 hrs, Volume= 0.052 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
6,663	98	Paved parking, HSG A
1,391	39	>75% Grass cover, Good, HSG A
8,054	88	Weighted Average
1,391		17.27% Pervious Area
6,663		82.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	14	0.0300	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.6	54	0.0300	1.43		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
3.1	68	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 20P: P1h



Summary for Pond 21P: CB8

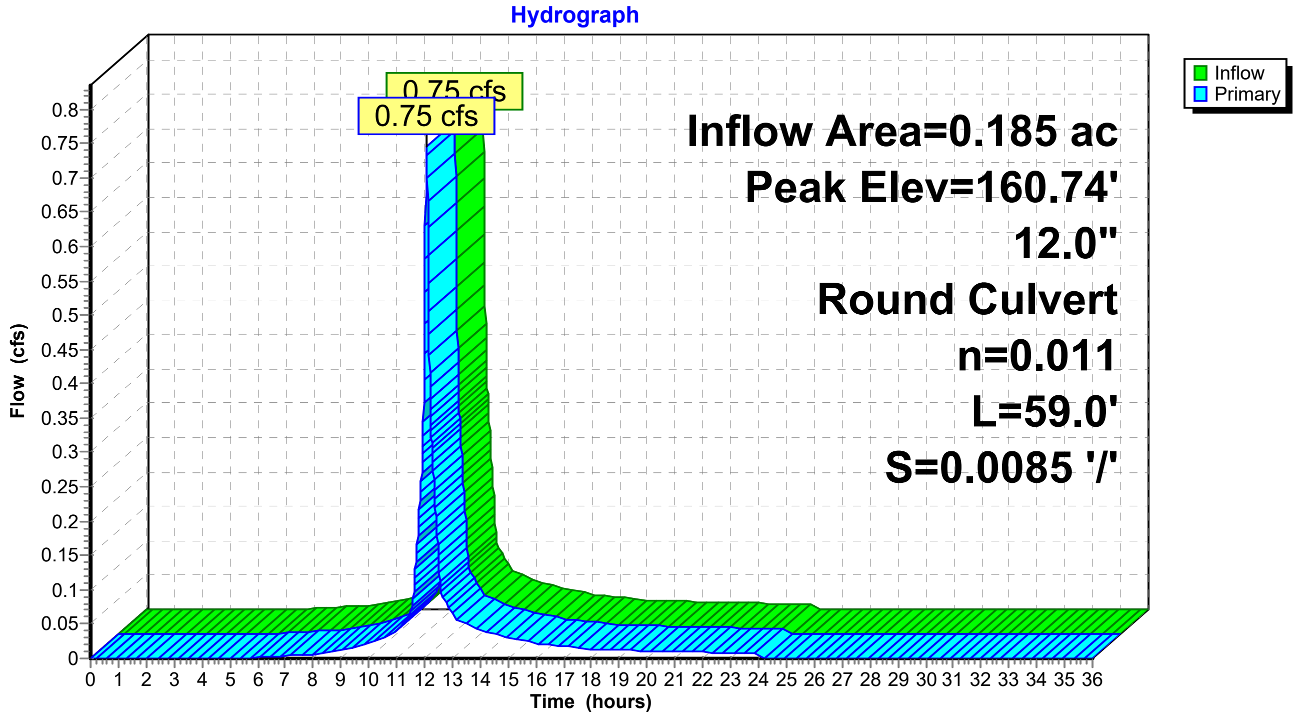
Inflow Area = 0.185 ac, 82.73% Impervious, Inflow Depth = 3.38" for 10-Year Storm event
Inflow = 0.75 cfs @ 12.07 hrs, Volume= 0.052 af
Outflow = 0.75 cfs @ 12.07 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.0 min
Primary = 0.75 cfs @ 12.07 hrs, Volume= 0.052 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.74' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	160.30'	**12.0" Round Culvert** L= 59.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 160.30' / 159.80' S= 0.0085 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.74 cfs @ 12.07 hrs HW=160.74' (Free Discharge)
↑**1=Culvert** (Inlet Controls 0.74 cfs @ 2.25 fps)

Pond 21P: CB8



Summary for Pond 22P: DMH8&9

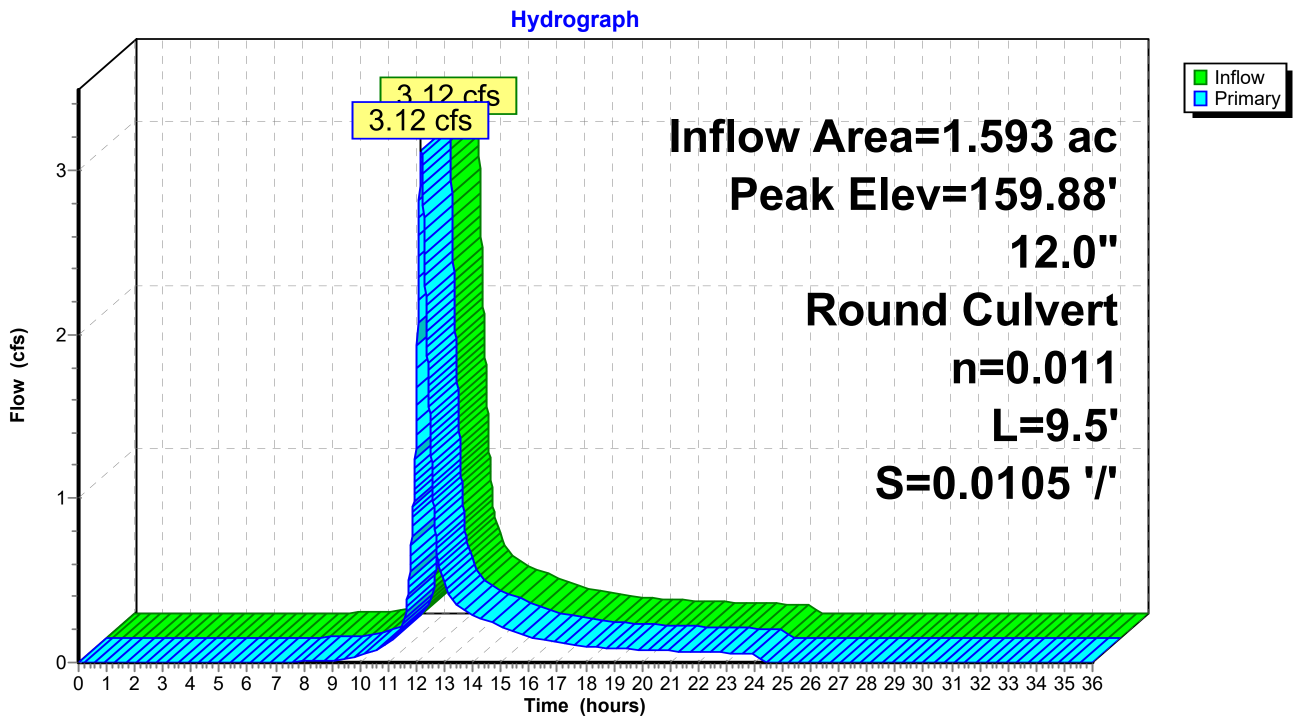
Inflow Area =	1.593 ac,	51.95% Impervious,	Inflow Depth =	2.20"	for 10-Year Storm event
Inflow =	3.12 cfs @	12.16 hrs,	Volume=	0.293 af	
Outflow =	3.12 cfs @	12.16 hrs,	Volume=	0.293 af,	Atten= 0%, Lag= 0.0 min
Primary =	3.12 cfs @	12.16 hrs,	Volume=	0.293 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 159.88' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.60'	**12.0" Round Culvert** L= 9.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.60' / 158.50' S= 0.0105 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=3.12 cfs @ 12.16 hrs HW=159.88' (Free Discharge)
└─**1=Culvert** (Barrel Controls 3.12 cfs @ 4.01 fps)

Pond 22P: DMH8&9



Summary for Subcatchment 23P: P1i

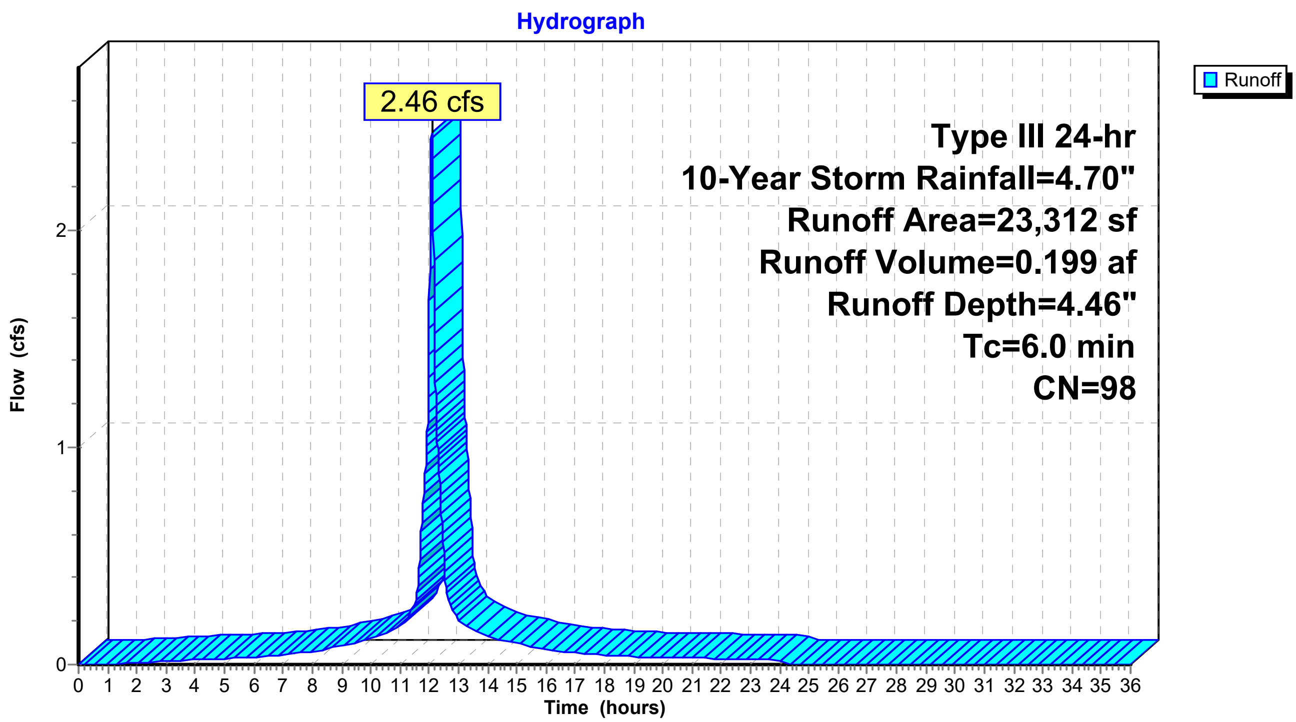
Runoff = 2.46 cfs @ 12.08 hrs, Volume= 0.199 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
23,312	98	Unconnected roofs, HSG A
23,312		100.00% Impervious Area
23,312		100.00% Unconnected

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

Subcatchment 23P: P1i



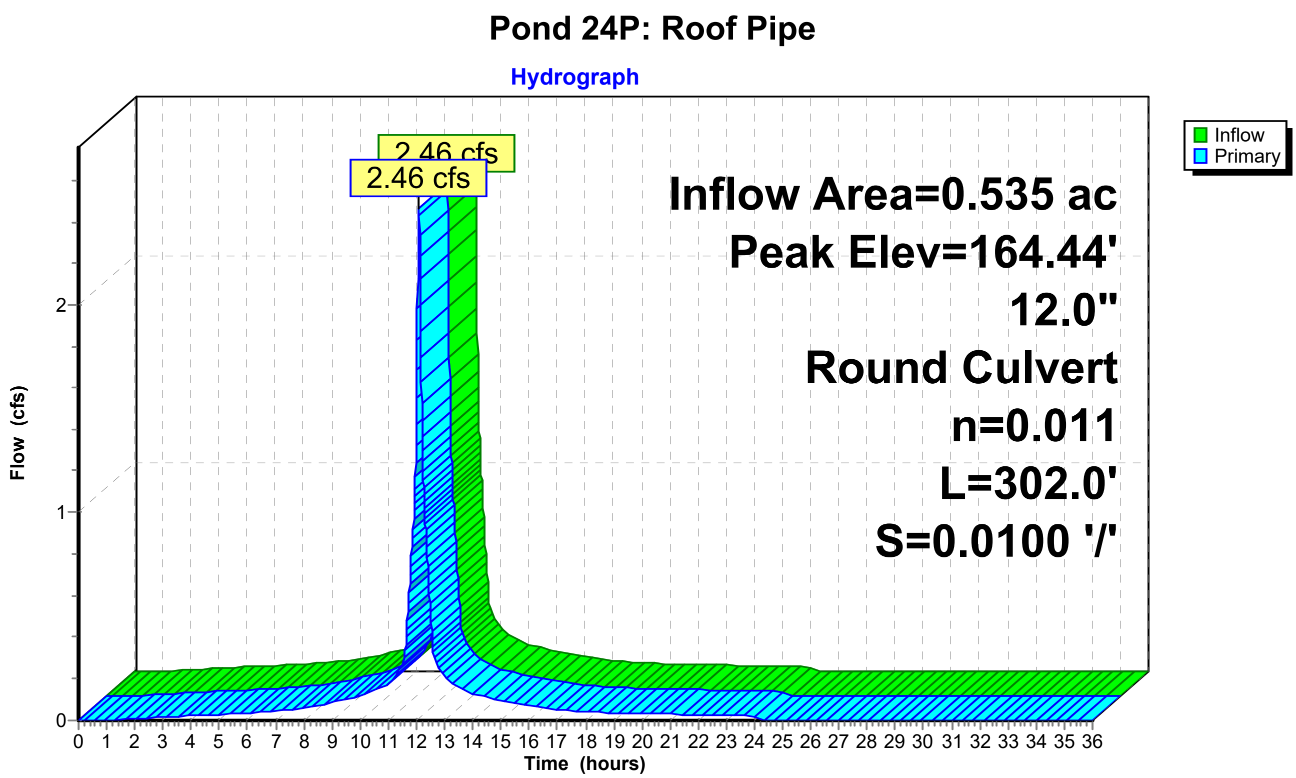
Summary for Pond 24P: Roof Pipe

Inflow Area =	0.535 ac,100.00% Impervious,	Inflow Depth = 4.46"	for 10-Year Storm event	
Inflow =	2.46 cfs @	12.08 hrs, Volume=	0.199 af	
Outflow =	2.46 cfs @	12.08 hrs, Volume=	0.199 af,	Atten= 0%, Lag= 0.0 min
Primary =	2.46 cfs @	12.08 hrs, Volume=	0.199 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 164.44' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	163.52'	**12.0" Round Culvert** L= 302.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 163.52' / 160.50' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=2.45 cfs @ 12.08 hrs HW=164.44' (Free Discharge)
└─**1=Culvert** (Inlet Controls 2.45 cfs @ 3.26 fps)



Summary for Pond 25P: Infiltration Field #1

Inflow Area = 9.163 ac, 37.61% Impervious, Inflow Depth = 1.96" for 10-Year Storm event
Inflow = 14.44 cfs @ 12.18 hrs, Volume= 1.497 af
Outflow = 5.10 cfs @ 12.62 hrs, Volume= 1.497 af, Atten= 65%, Lag= 26.6 min
Discarded = 2.61 cfs @ 11.81 hrs, Volume= 1.299 af
Primary = 2.49 cfs @ 12.62 hrs, Volume= 0.197 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 159.69' @ 12.62 hrs Surf.Area= 13,609 sf Storage= 16,389 cf

Plug-Flow detention time= 30.4 min calculated for 1.496 af (100% of inflow)
Center-of-Mass det. time= 30.4 min (870.6 - 840.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	158.00'	11,308 cf	**166.83'W x 81.50'L x 3.54'H Field A**
			48,156 cf Overall - 19,887 cf Embedded = 28,269 cf x 40.0% Voids
#2A	158.50'	19,887 cf	**Cultec R-330XLHD** x 374 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 34 rows
#3	158.00'	75 cf	**4.00'D x 6.00'H Vertical Cone/Cylinder**
		31,270 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	158.80'	**12.0" Round Culvert**
			L= 22.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 158.80' / 156.00' S= 0.1273 '/' Cc= 0.900
			n= 0.011, Flow Area= 0.79 sf
#3	Primary	159.50'	**8.0" Round Culvert**
			L= 10.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 159.50' / 156.00' S= 0.3500 '/' Cc= 0.900
			n= 0.011, Flow Area= 0.35 sf
#4	Primary	161.20'	**12.0" Round Culvert**
			L= 37.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 161.20' / 161.00' S= 0.0054 '/' Cc= 0.900
			n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=2.61 cfs @ 11.81 hrs HW=158.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 2.61 cfs)

Primary OutFlow Max=2.50 cfs @ 12.62 hrs HW=159.69' (Free Discharge)
├─**2=Culvert** (Inlet Controls 2.37 cfs @ 3.21 fps)
├─**3=Culvert** (Inlet Controls 0.12 cfs @ 1.49 fps)
└─**4=Culvert** (Controls 0.00 cfs)

Pond 25P: Infiltration Field #1 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 34 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

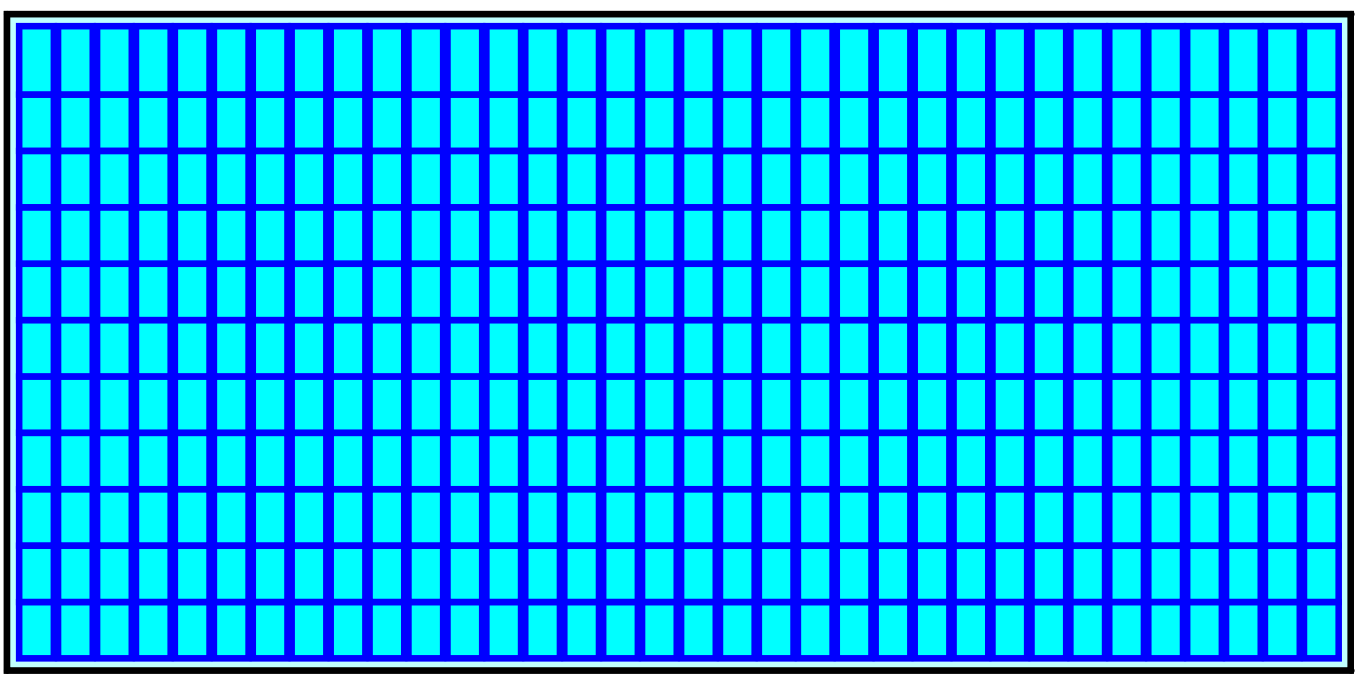
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +18.0" End Stone x 2 = 81.50' Base Length
34 Rows x 52.0" Wide + 6.0" Spacing x 33 + 18.0" Side Stone x 2 = 166.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

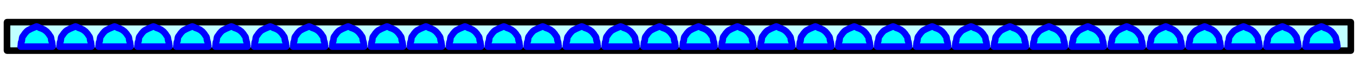
374 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 34 Rows = 19,886.7 cf Chamber Storage

48,155.7 cf Field - 19,886.7 cf Chambers = 28,269.0 cf Stone x 40.0% Voids = 11,307.6 cf Stone Storage

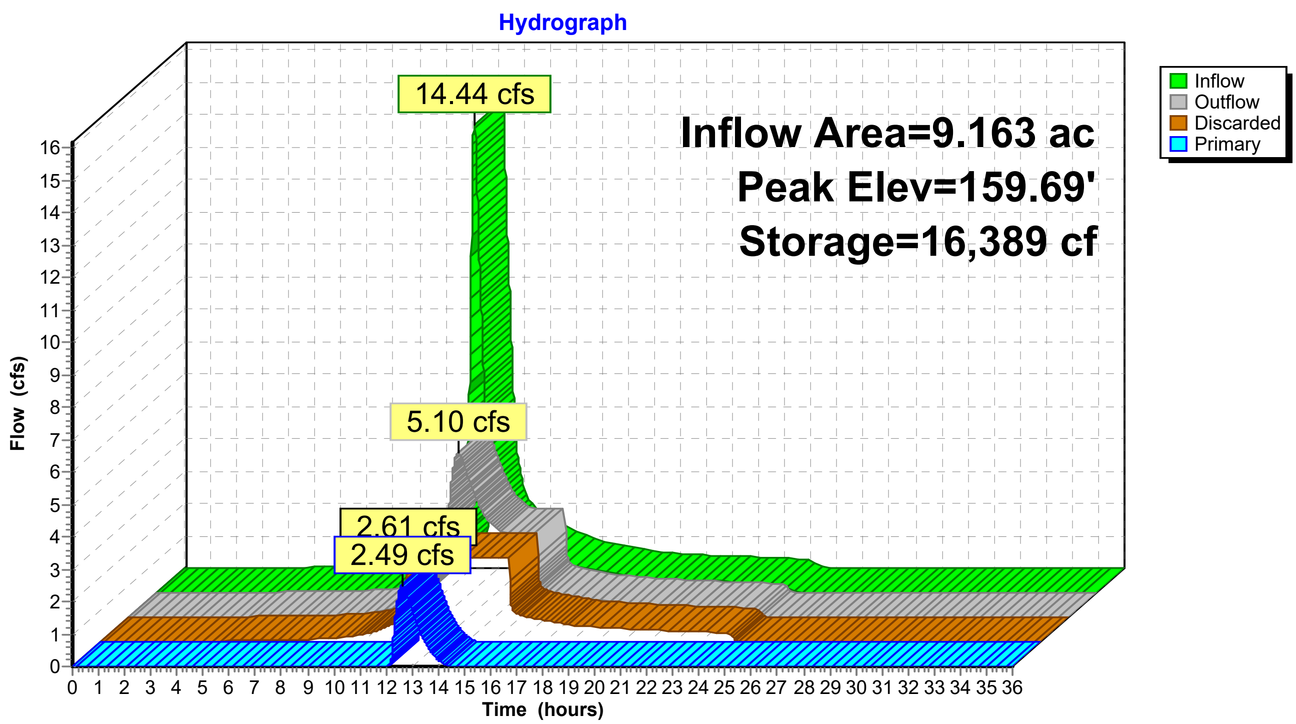
Chamber Storage + Stone Storage = 31,194.3 cf = 0.716 af
Overall Storage Efficiency = 64.8%
Overall System Size = 81.50' x 166.83' x 3.54'

374 Chambers
1,783.5 cy Field
1,047.0 cy Stone





Pond 25P: Infiltration Field #1



Summary for Subcatchment 26P: P2f

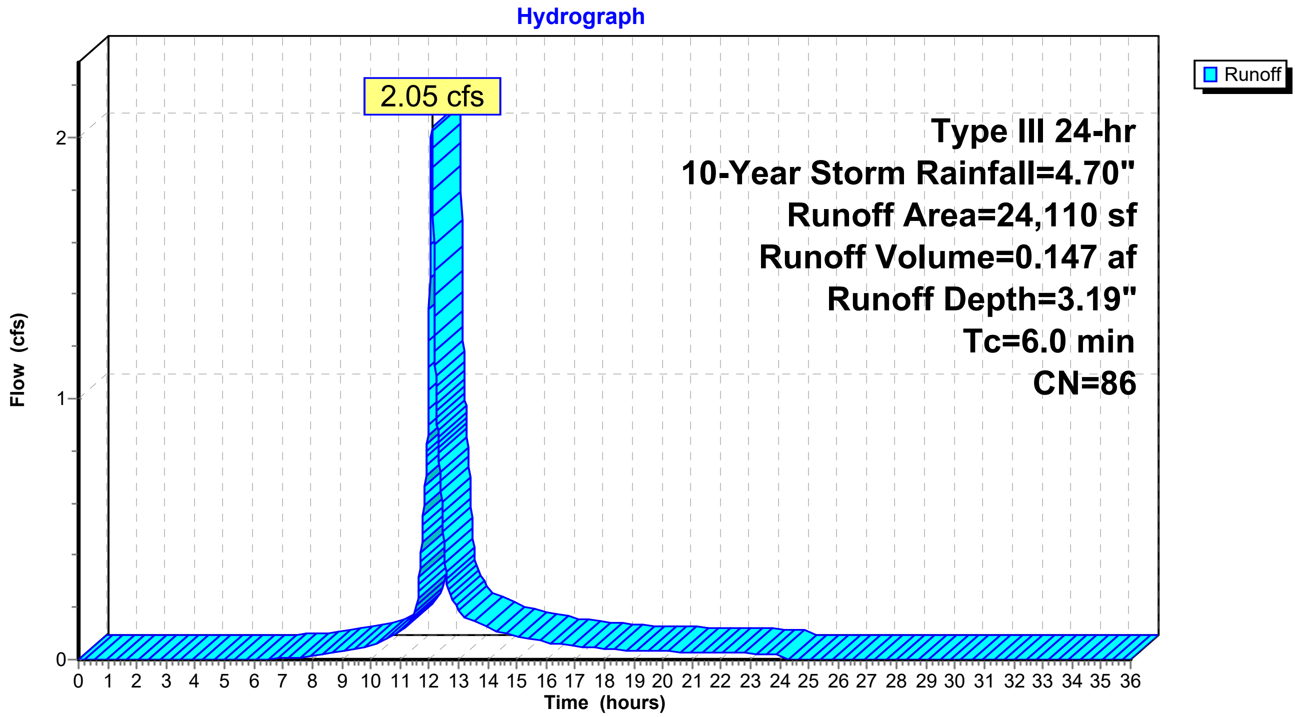
Runoff = 2.05 cfs @ 12.09 hrs, Volume= 0.147 af, Depth= 3.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
5,626	98	Roofs, HSG A
11,048	98	Roofs, HSG B
534	98	Paved parking, HSG B
1,966	39	>75% Grass cover, Good, HSG A
4,936	61	>75% Grass cover, Good, HSG B
24,110	86	Weighted Average
6,902		28.63% Pervious Area
17,208		71.37% Impervious Area

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

Subcatchment 26P: P2f



Summary for Subcatchment 27P: P2a

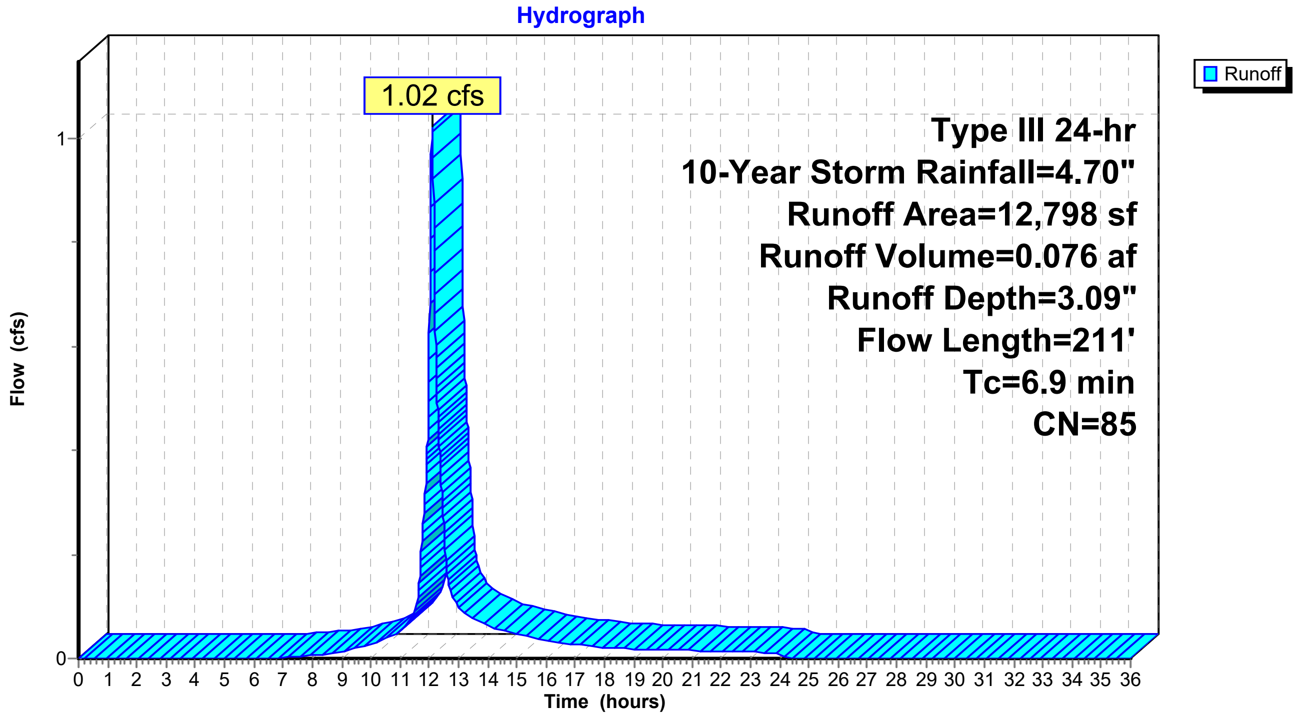
Runoff = 1.02 cfs @ 12.10 hrs, Volume= 0.076 af, Depth= 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
3,281	98	Paved parking, HSG A
5,437	98	Paved parking, HSG B
790	39	>75% Grass cover, Good, HSG A
3,290	61	>75% Grass cover, Good, HSG B
12,798	85	Weighted Average
4,080		31.88% Pervious Area
8,718		68.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	66	0.0700	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.7	145	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.9	211	Total			

Subcatchment 27P: P2a



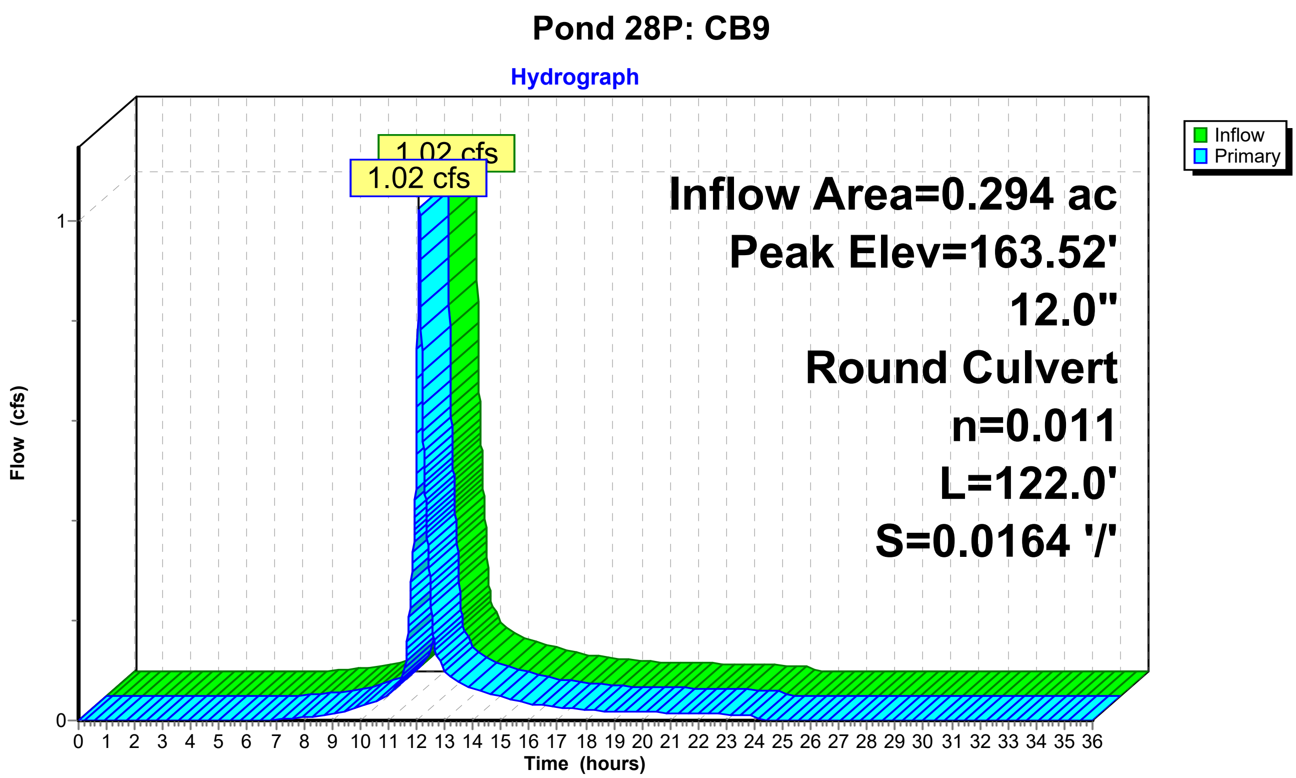
Summary for Pond 28P: CB9

Inflow Area =	0.294 ac,	68.12% Impervious,	Inflow Depth = 3.09"	for 10-Year Storm event	
Inflow =	1.02 cfs @	12.10 hrs,	Volume=	0.076 af	
Outflow =	1.02 cfs @	12.10 hrs,	Volume=	0.076 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.02 cfs @	12.10 hrs,	Volume=	0.076 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 163.52' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	163.00'	**12.0" Round Culvert** L= 122.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 163.00' / 161.00' S= 0.0164 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.02 cfs @ 12.10 hrs HW=163.52' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.02 cfs @ 2.46 fps)



Summary for Pond 29P: DMH11

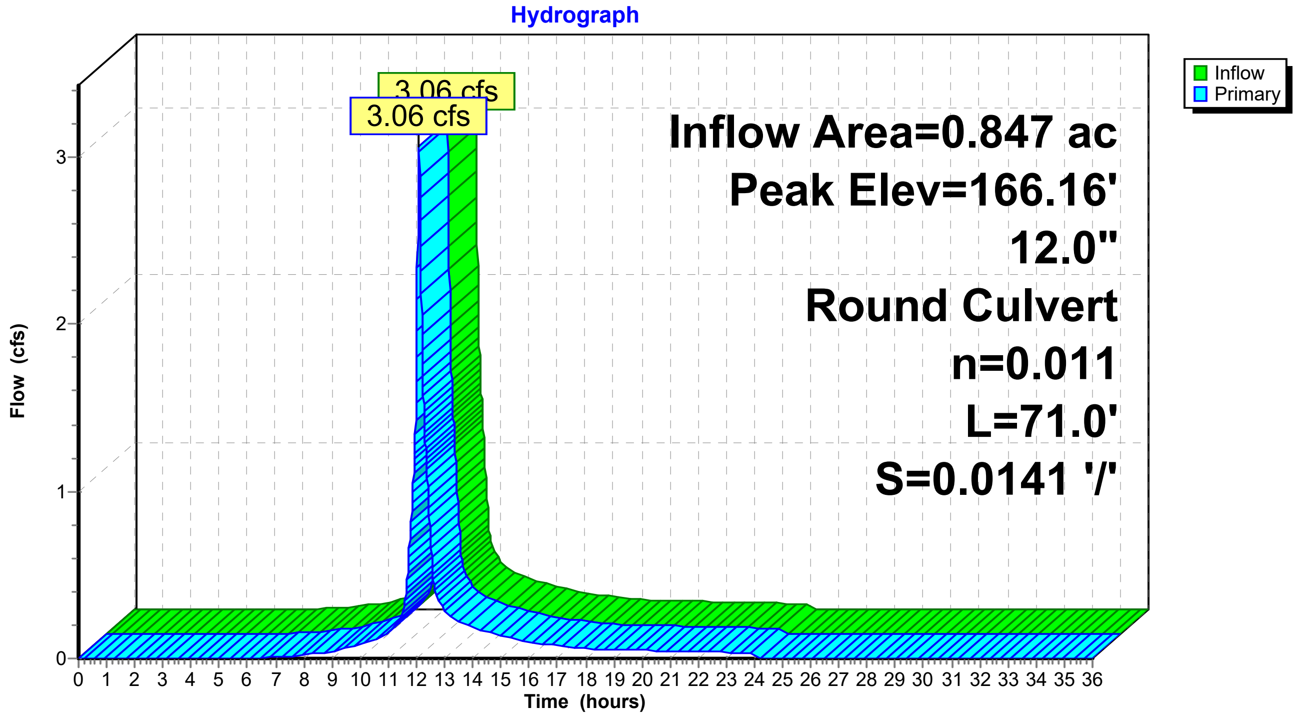
Inflow Area = 0.847 ac, 70.24% Impervious, Inflow Depth = 3.15" for 10-Year Storm event
Inflow = 3.06 cfs @ 12.09 hrs, Volume= 0.223 af
Outflow = 3.06 cfs @ 12.09 hrs, Volume= 0.223 af, Atten= 0%, Lag= 0.0 min
Primary = 3.06 cfs @ 12.09 hrs, Volume= 0.223 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 166.16' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	165.00'	**12.0" Round Culvert** L= 71.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.00' / 164.00' S= 0.0141 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=3.06 cfs @ 12.09 hrs HW=166.16' (Free Discharge)
└─**1=Culvert** (Inlet Controls 3.06 cfs @ 3.90 fps)

Pond 29P: DMH11



Summary for Subcatchment 30P: P2b

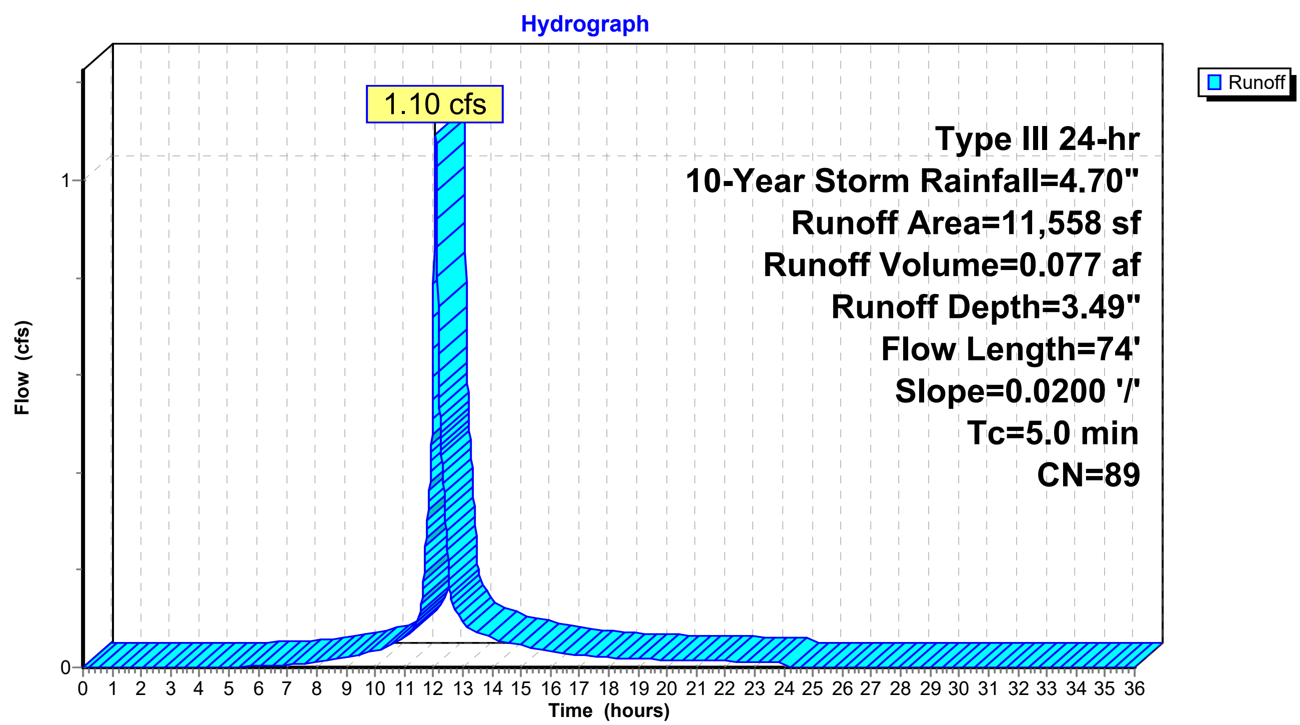
Runoff = 1.10 cfs @ 12.07 hrs, Volume= 0.077 af, Depth= 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
9,822	98	Paved parking, HSG A
1,736	39	>75% Grass cover, Good, HSG A
11,558	89	Weighted Average
1,736		15.02% Pervious Area
9,822		84.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	14	0.0200	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.8	60	0.0200	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
3.8	74	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 30P: P2b



Summary for Pond 31P: CB10

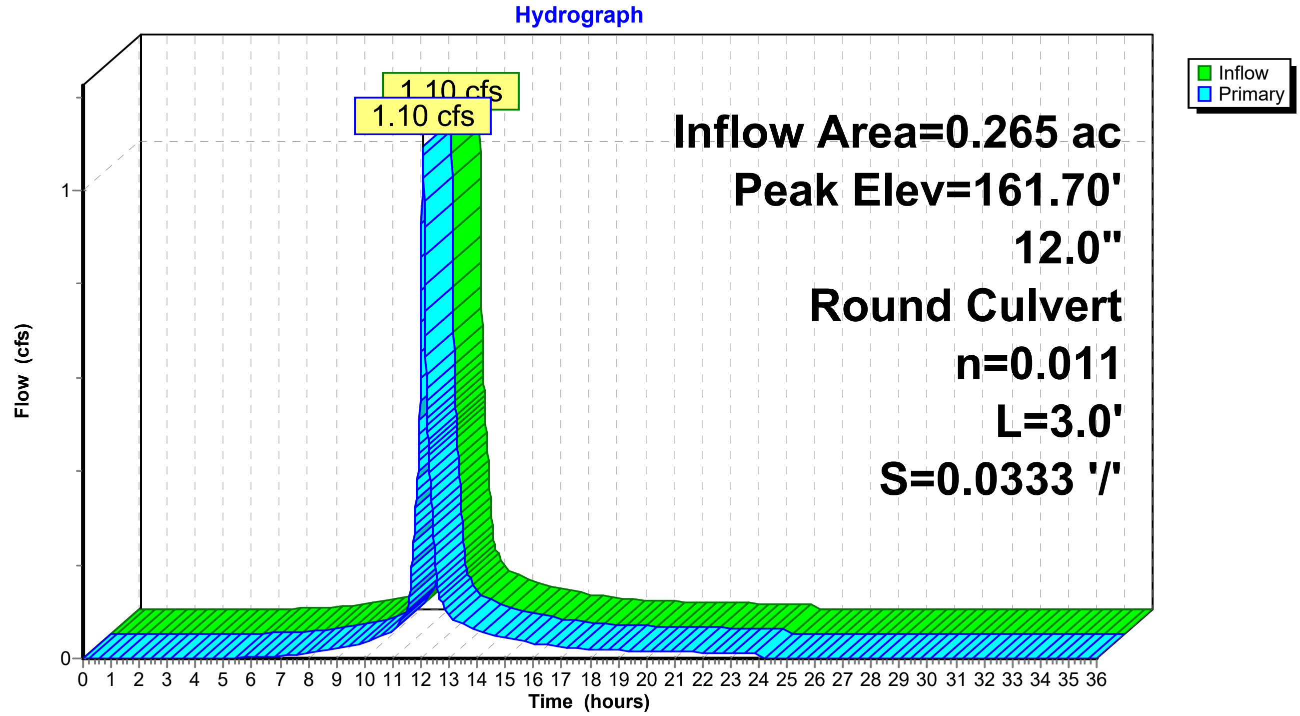
Inflow Area = 0.265 ac, 84.98% Impervious, Inflow Depth = 3.49" for 10-Year Storm event
Inflow = 1.10 cfs @ 12.07 hrs, Volume= 0.077 af
Outflow = 1.10 cfs @ 12.07 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min
Primary = 1.10 cfs @ 12.07 hrs, Volume= 0.077 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 161.70' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	161.10'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.10' / 161.00' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.09 cfs @ 12.07 hrs HW=161.70' (Free Discharge)
└─**1=Culvert** (Barrel Controls 1.09 cfs @ 3.20 fps)

Pond 31P: CB10



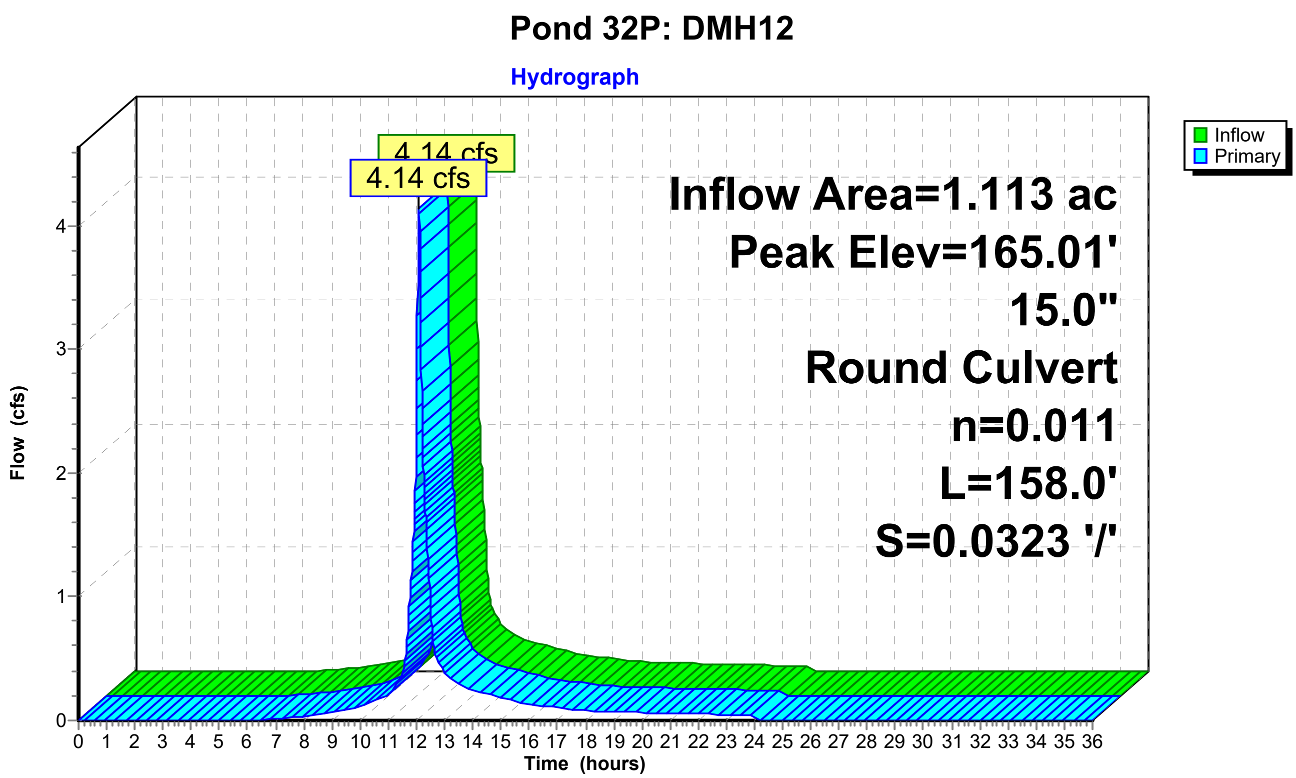
Summary for Pond 32P: DMH12

Inflow Area = 1.113 ac, 73.76% Impervious, Inflow Depth = 3.23" for 10-Year Storm event
Inflow = 4.14 cfs @ 12.09 hrs, Volume= 0.300 af
Outflow = 4.14 cfs @ 12.09 hrs, Volume= 0.300 af, Atten= 0%, Lag= 0.0 min
Primary = 4.14 cfs @ 12.09 hrs, Volume= 0.300 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 165.01' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	163.90'	**15.0" Round Culvert** L= 158.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 163.90' / 158.80' S= 0.0323 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf

Primary OutFlow Max=4.13 cfs @ 12.09 hrs HW=165.01' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 4.13 cfs @ 3.59 fps)



Summary for Pond 33P: FD/DMH13&14

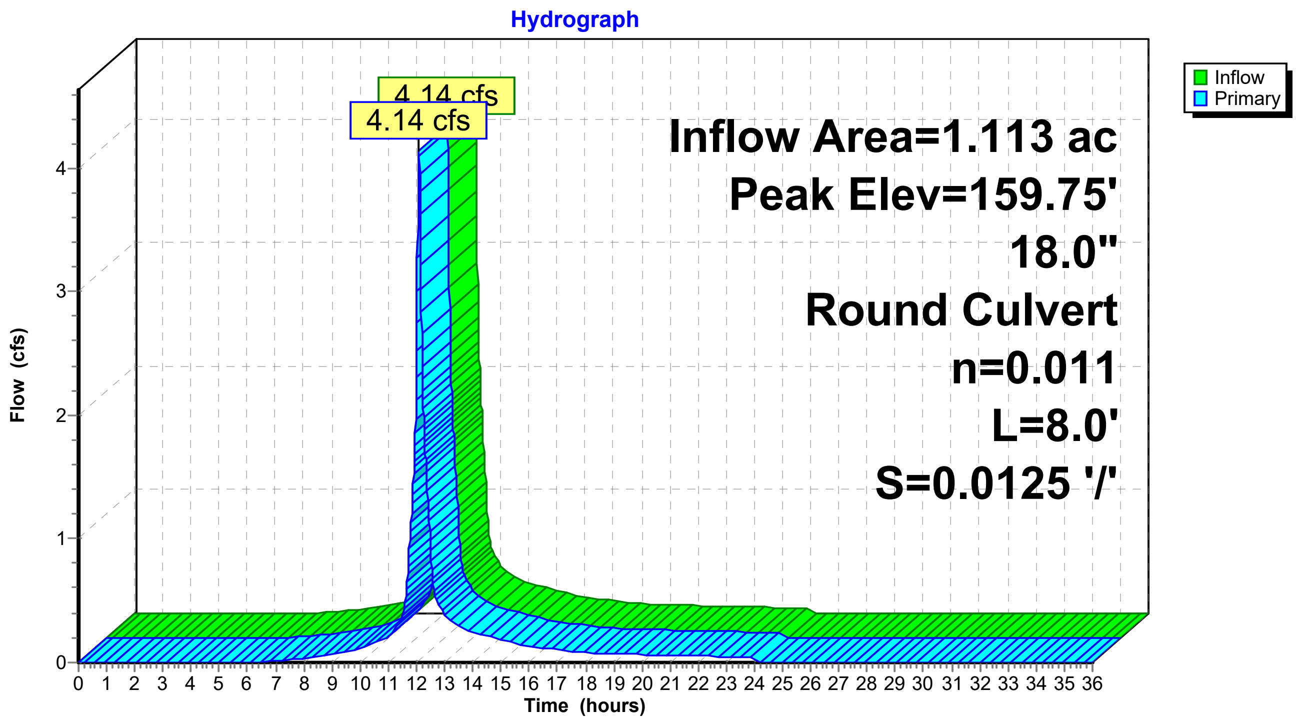
Inflow Area =	1.113 ac,	73.76% Impervious,	Inflow Depth = 3.23"	for 10-Year Storm event	
Inflow =	4.14 cfs @	12.09 hrs,	Volume=	0.300 af	
Outflow =	4.14 cfs @	12.09 hrs,	Volume=	0.300 af,	Atten= 0%, Lag= 0.0 min
Primary =	4.14 cfs @	12.09 hrs,	Volume=	0.300 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 159.75' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.60'	**18.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.60' / 158.50' S= 0.0125 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=4.13 cfs @ 12.09 hrs HW=159.74' (Free Discharge)
└─**1=Culvert** (Barrel Controls 4.13 cfs @ 3.95 fps)

Pond 33P: FD/DMH13&14



Summary for Subcatchment 34P: P2c

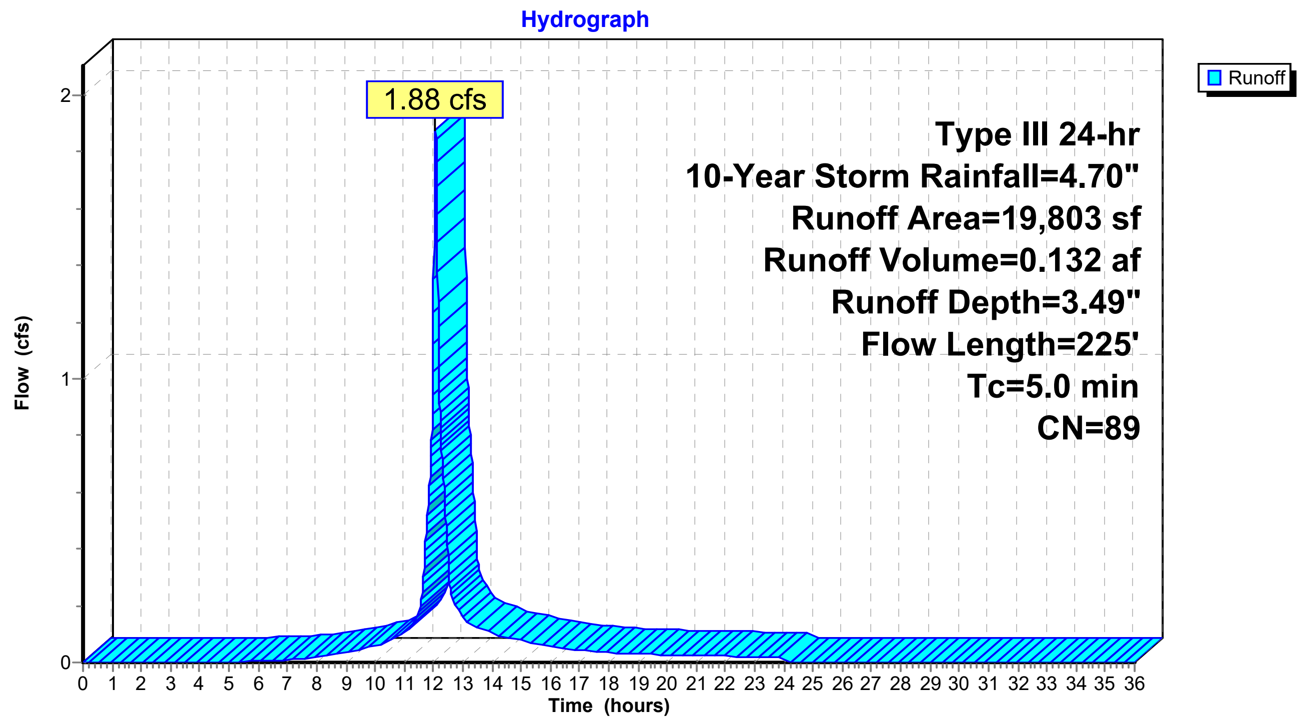
Runoff = 1.88 cfs @ 12.07 hrs, Volume= 0.132 af, Depth= 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
16,654	98	Paved parking, HSG A
3,149	39	>75% Grass cover, Good, HSG A
19,803	89	Weighted Average
3,149		15.90% Pervious Area
16,654		84.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	15	0.0300	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
1.7	210	0.0400	2.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
4.4	225	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 34P: P2c



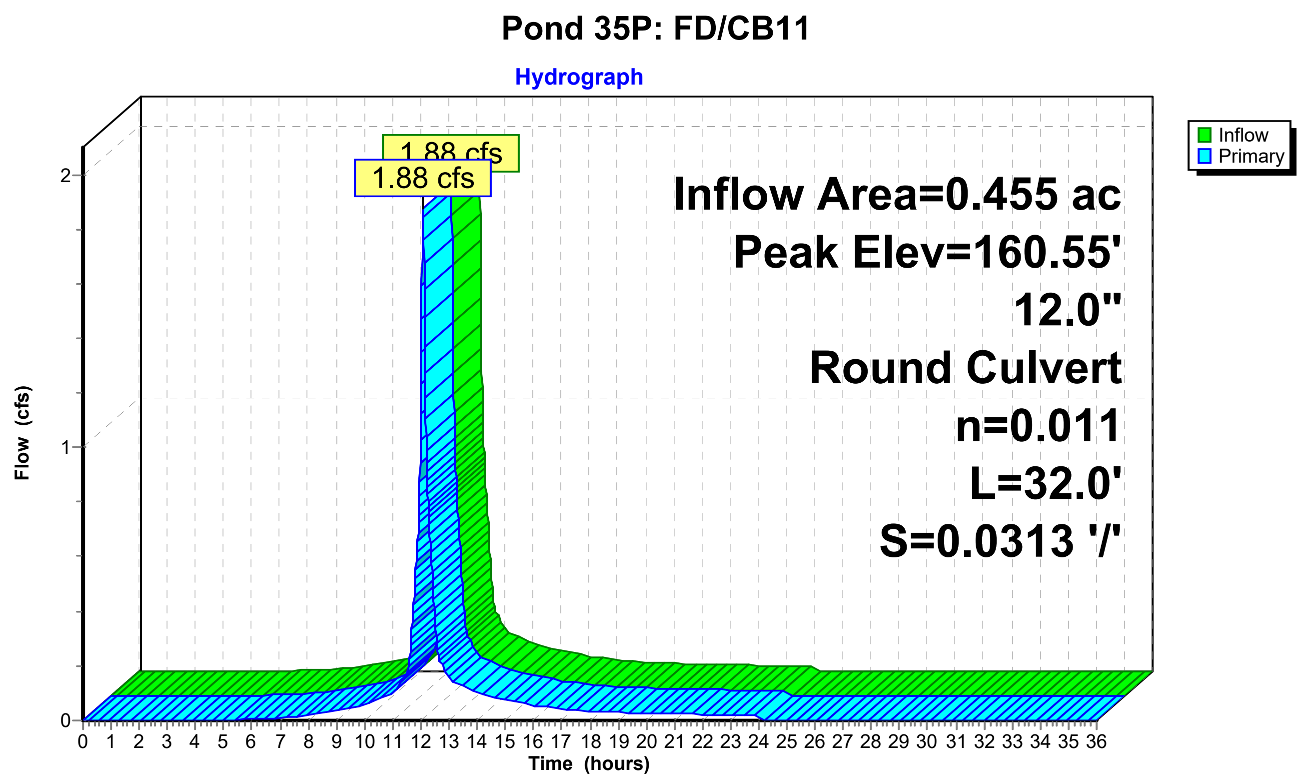
Summary for Pond 35P: FD/CB11

Inflow Area =	0.455 ac, 84.10% Impervious,	Inflow Depth = 3.49"	for 10-Year Storm event
Inflow =	1.88 cfs @ 12.07 hrs,	Volume=	0.132 af
Outflow =	1.88 cfs @ 12.07 hrs,	Volume=	0.132 af, Atten= 0%, Lag= 0.0 min
Primary =	1.88 cfs @ 12.07 hrs,	Volume=	0.132 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.55' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	159.80'	**12.0" Round Culvert** L= 32.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.80' / 158.80' S= 0.0313 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.87 cfs @ 12.07 hrs HW=160.55' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.87 cfs @ 2.95 fps)



Summary for Subcatchment 36P: P2d

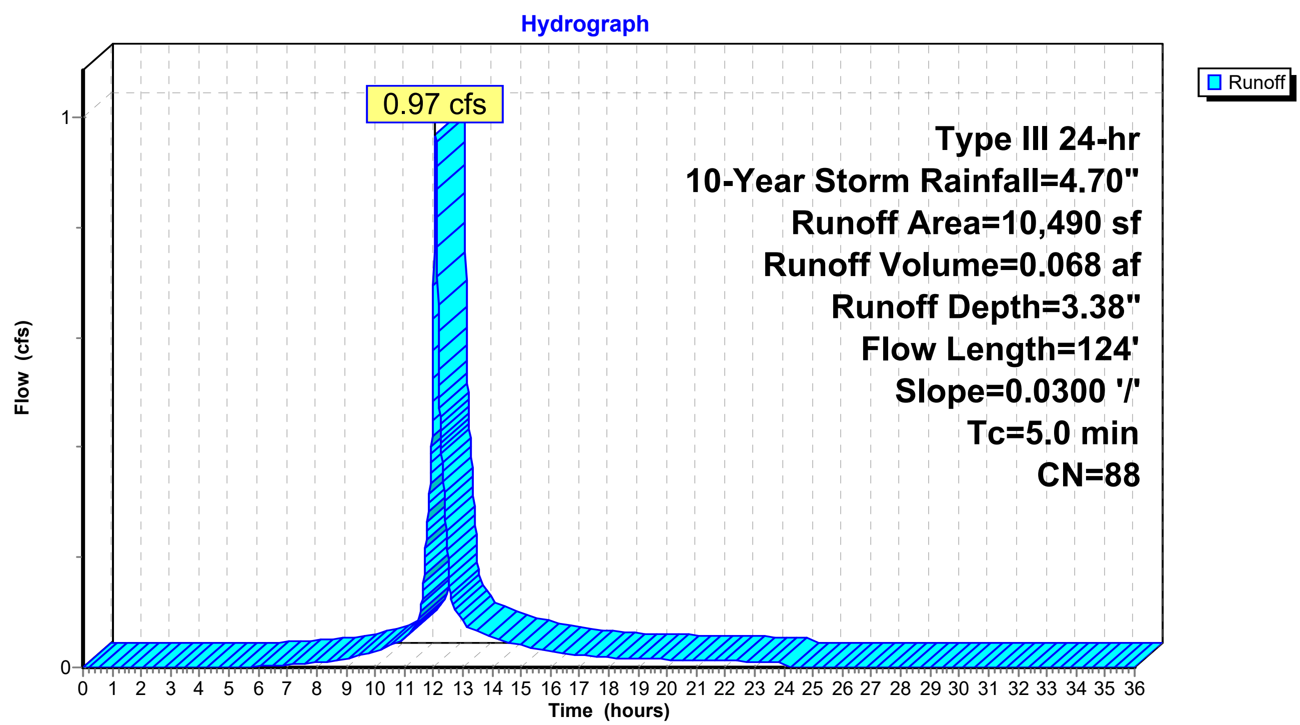
Runoff = 0.97 cfs @ 12.07 hrs, Volume= 0.068 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
8,704	98	Paved parking, HSG A
1,786	39	>75% Grass cover, Good, HSG A
10,490	88	Weighted Average
1,786		17.03% Pervious Area
8,704		82.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	14	0.0300	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
1.1	110	0.0300	1.65		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
3.6	124	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 36P: P2d



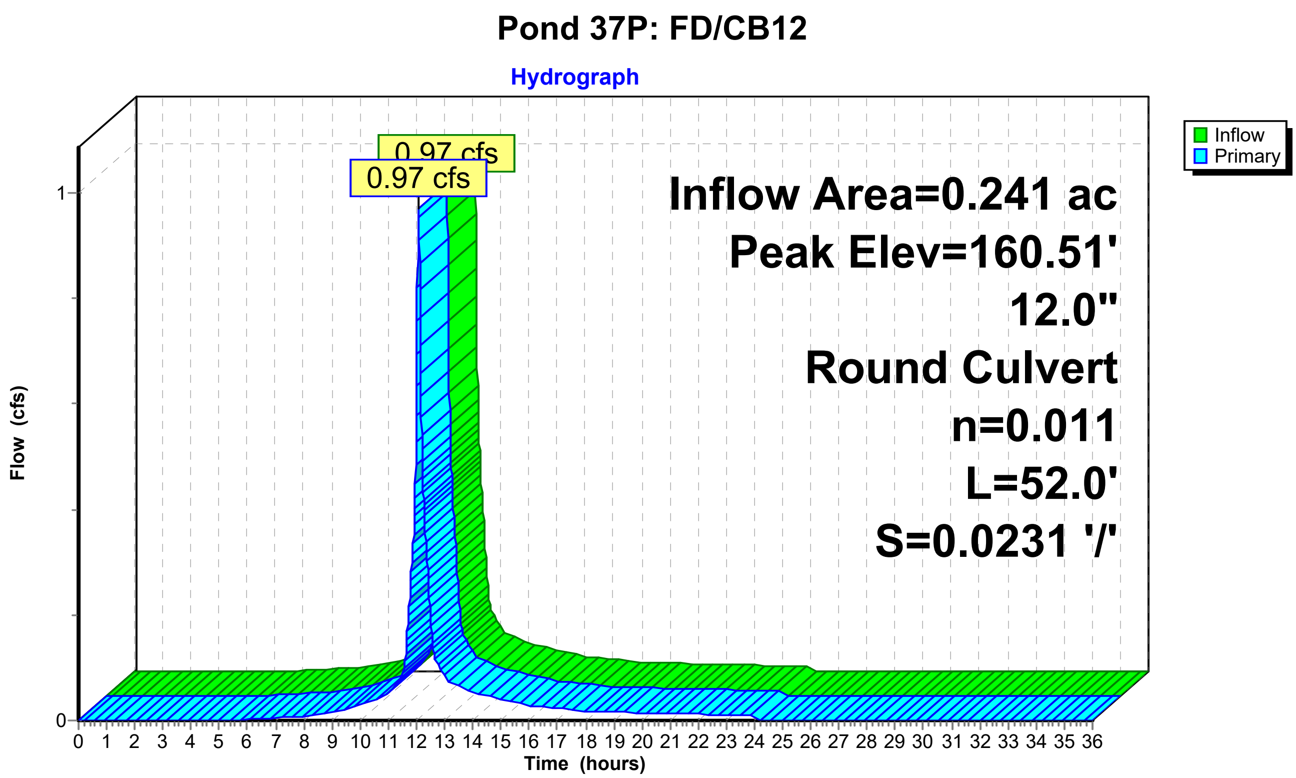
Summary for Pond 37P: FD/CB12

Inflow Area = 0.241 ac, 82.97% Impervious, Inflow Depth = 3.38" for 10-Year Storm event
Inflow = 0.97 cfs @ 12.07 hrs, Volume= 0.068 af
Outflow = 0.97 cfs @ 12.07 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min
Primary = 0.97 cfs @ 12.07 hrs, Volume= 0.068 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.51' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	160.00'	**12.0" Round Culvert** L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 160.00' / 158.80' S= 0.0231 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.97 cfs @ 12.07 hrs HW=160.51' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.97 cfs @ 2.42 fps)



Summary for Pond 38P: DMH15&16

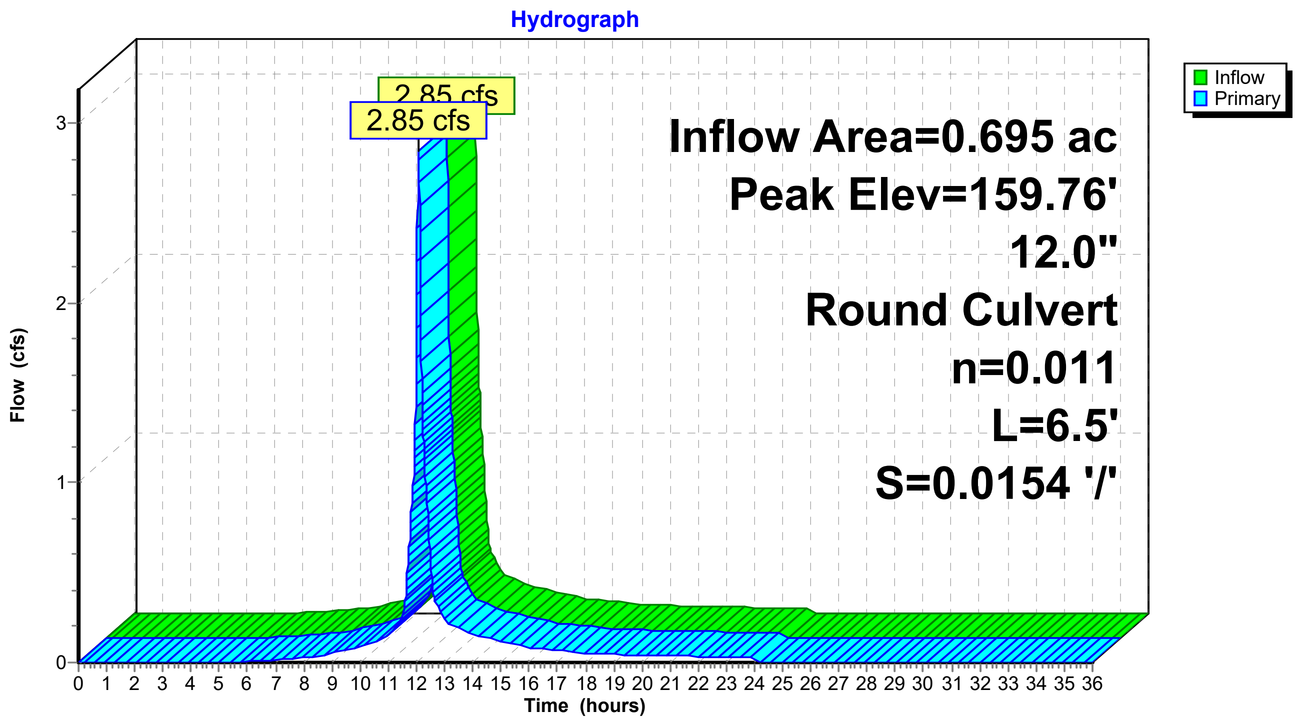
Inflow Area = 0.695 ac, 83.71% Impervious, Inflow Depth = 3.45" for 10-Year Storm event
Inflow = 2.85 cfs @ 12.07 hrs, Volume= 0.200 af
Outflow = 2.85 cfs @ 12.07 hrs, Volume= 0.200 af, Atten= 0%, Lag= 0.0 min
Primary = 2.85 cfs @ 12.07 hrs, Volume= 0.200 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 159.76' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.60'	**12.0" Round Culvert** L= 6.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.60' / 158.50' S= 0.0154 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=2.84 cfs @ 12.07 hrs HW=159.75' (Free Discharge)
└**1=Culvert** (Barrel Controls 2.84 cfs @ 3.94 fps)

Pond 38P: DMH15&16



Summary for Subcatchment 39P: P2e

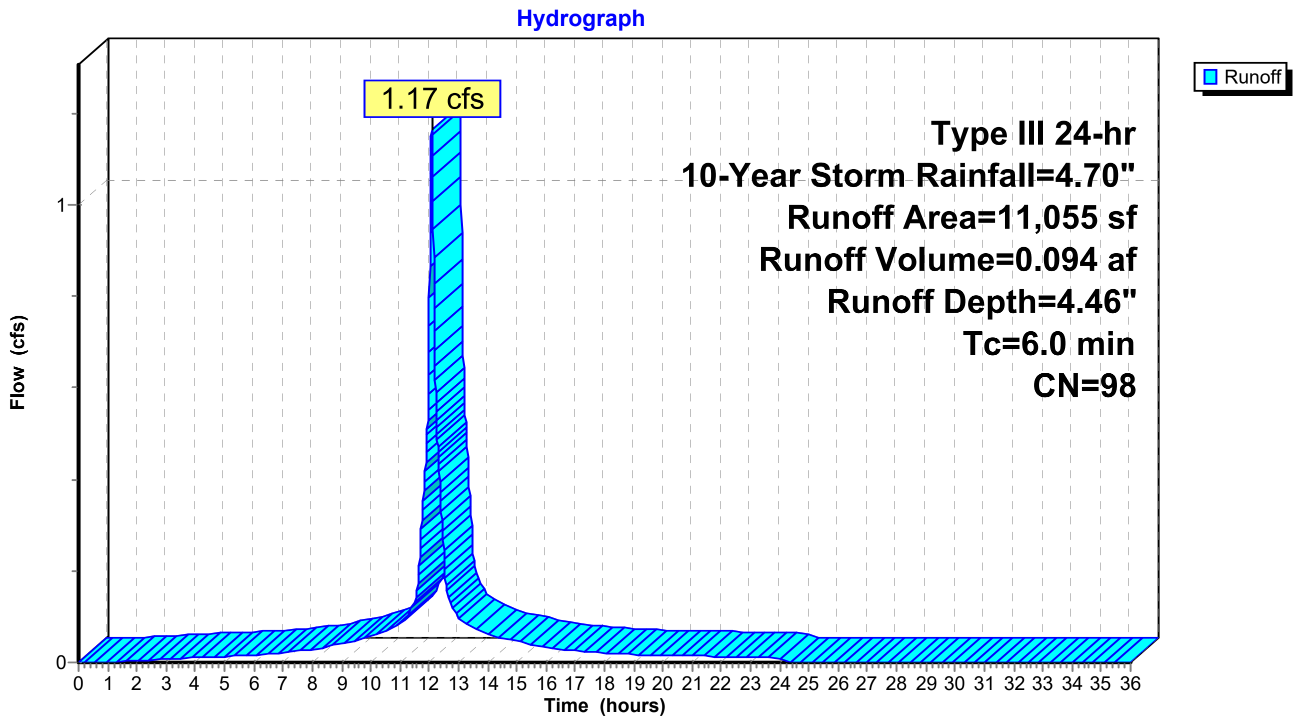
Runoff = 1.17 cfs @ 12.08 hrs, Volume= 0.094 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
11,055	98	Roofs, HSG A
11,055		100.00% Impervious Area

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

Subcatchment 39P: P2e



Summary for Pond 40P: Roof Drain

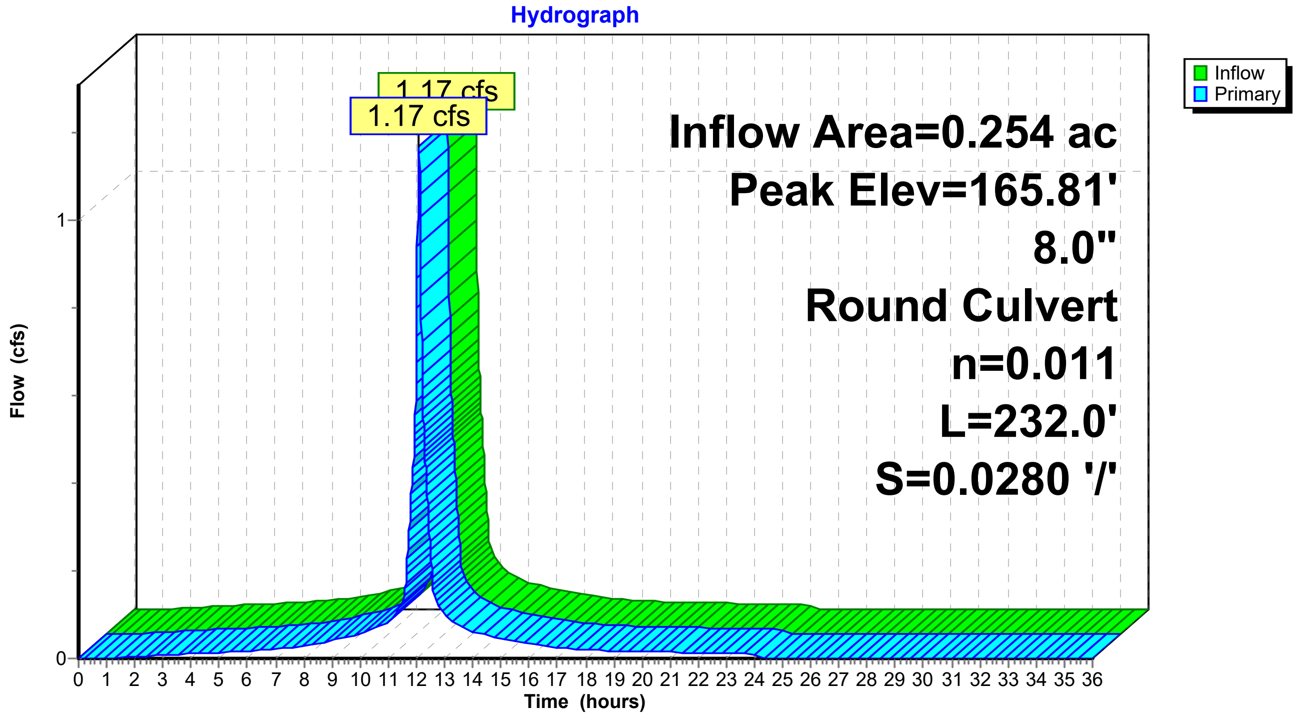
Inflow Area = 0.254 ac,100.00% Impervious, Inflow Depth = 4.46" for 10-Year Storm event
Inflow = 1.17 cfs @ 12.08 hrs, Volume= 0.094 af
Outflow = 1.17 cfs @ 12.08 hrs, Volume= 0.094 af, Atten= 0%, Lag= 0.0 min
Primary = 1.17 cfs @ 12.08 hrs, Volume= 0.094 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 165.81' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	165.00'	**8.0" Round Culvert** L= 232.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.00' / 158.50' S= 0.0280 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=1.16 cfs @ 12.08 hrs HW=165.81' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 1.16 cfs @ 3.34 fps)

Pond 40P: Roof Drain



Summary for Pond 41P: Infiltration Field #2

Inflow Area = 2.062 ac, 80.34% Impervious, Inflow Depth = 3.46" for 10-Year Storm event
Inflow = 8.13 cfs @ 12.08 hrs, Volume= 0.594 af
Outflow = 1.46 cfs @ 12.54 hrs, Volume= 0.594 af, Atten= 82%, Lag= 27.3 min
Discarded = 1.08 cfs @ 11.65 hrs, Volume= 0.549 af
Primary = 0.38 cfs @ 12.54 hrs, Volume= 0.045 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 159.89' @ 12.54 hrs Surf.Area= 5,635 sf Storage= 7,523 cf

Plug-Flow detention time= 36.0 min calculated for 0.594 af (100% of inflow)
Center-of-Mass det. time= 36.0 min (829.4 - 793.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	158.00'	4,829 cf	**142.67'W x 39.50'L x 3.54'H Field A** 19,958 cf Overall - 7,887 cf Embedded = 12,072 cf x 40.0% Voids
#2A	158.50'	7,887 cf	**Cultec R-330XLHD** x 145 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 29 rows
		12,716 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	158.91'	**4.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.91' / 157.00' S= 0.0455 '/' Cc= 0.900 n= 0.011, Flow Area= 0.09 sf
#3	Primary	160.90'	**12.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 160.90' / 157.00' S= 0.0929 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=1.08 cfs @ 11.65 hrs HW=158.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.08 cfs)

Primary OutFlow Max=0.38 cfs @ 12.54 hrs HW=159.89' (Free Discharge)
├─**2=Culvert** (Inlet Controls 0.38 cfs @ 4.33 fps)
└─**3=Culvert** (Controls 0.00 cfs)

Pond 41P: Infiltration Field #2 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 29 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

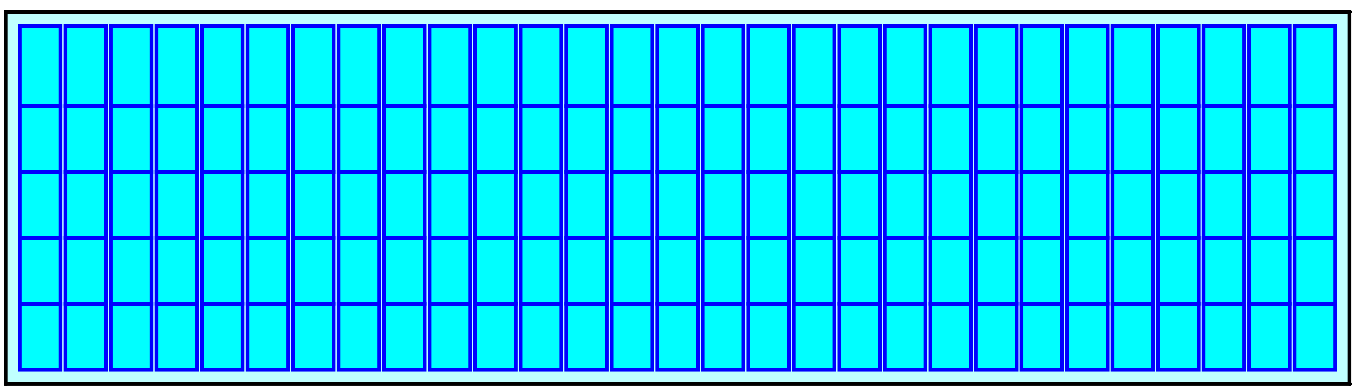
5 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 36.50' Row Length +18.0" End Stone x 2 = 39.50' Base Length
29 Rows x 52.0" Wide + 6.0" Spacing x 28 + 18.0" Side Stone x 2 = 142.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

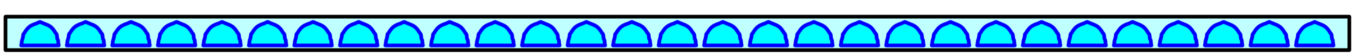
145 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 29 Rows = 7,886.9 cf Chamber Storage

19,958.5 cf Field - 7,886.9 cf Chambers = 12,071.6 cf Stone x 40.0% Voids = 4,828.6 cf Stone Storage

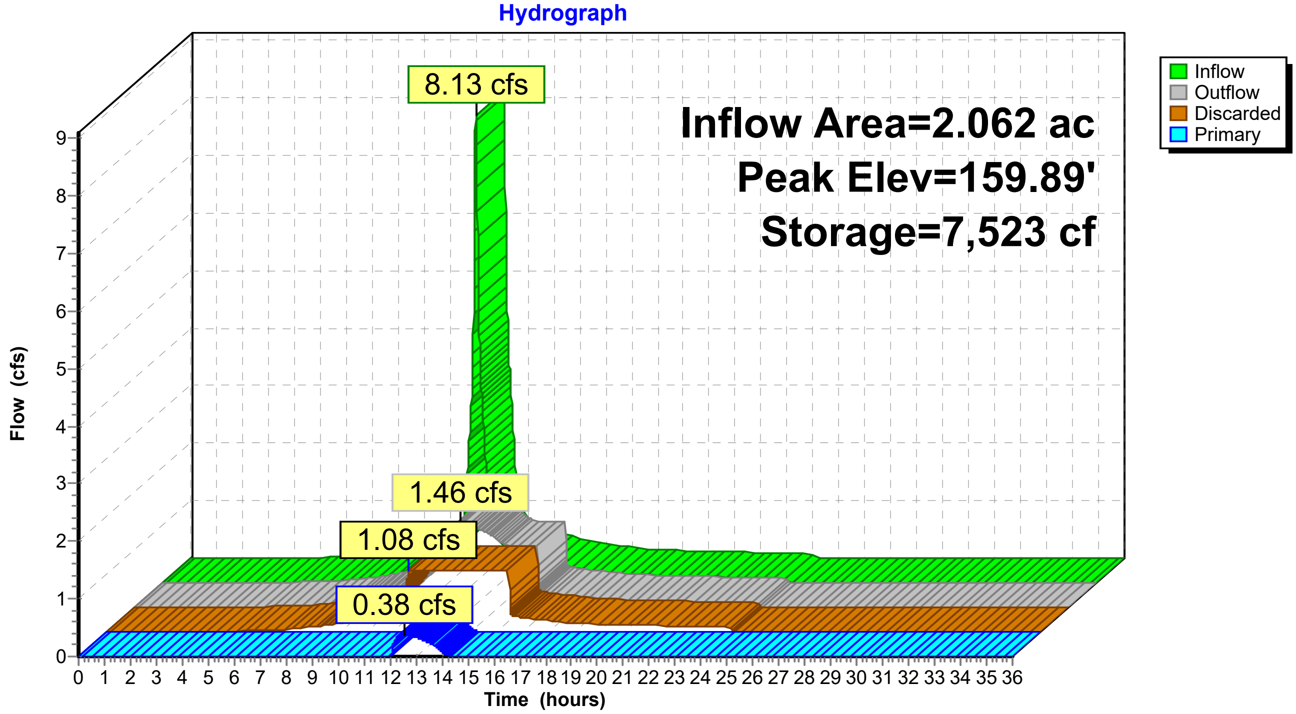
Chamber Storage + Stone Storage = 12,715.5 cf = 0.292 af
Overall Storage Efficiency = 63.7%
Overall System Size = 39.50' x 142.67' x 3.54'

145 Chambers
739.2 cy Field
447.1 cy Stone





Pond 41P: Infiltration Field #2



Summary for Subcatchment 42P: P3

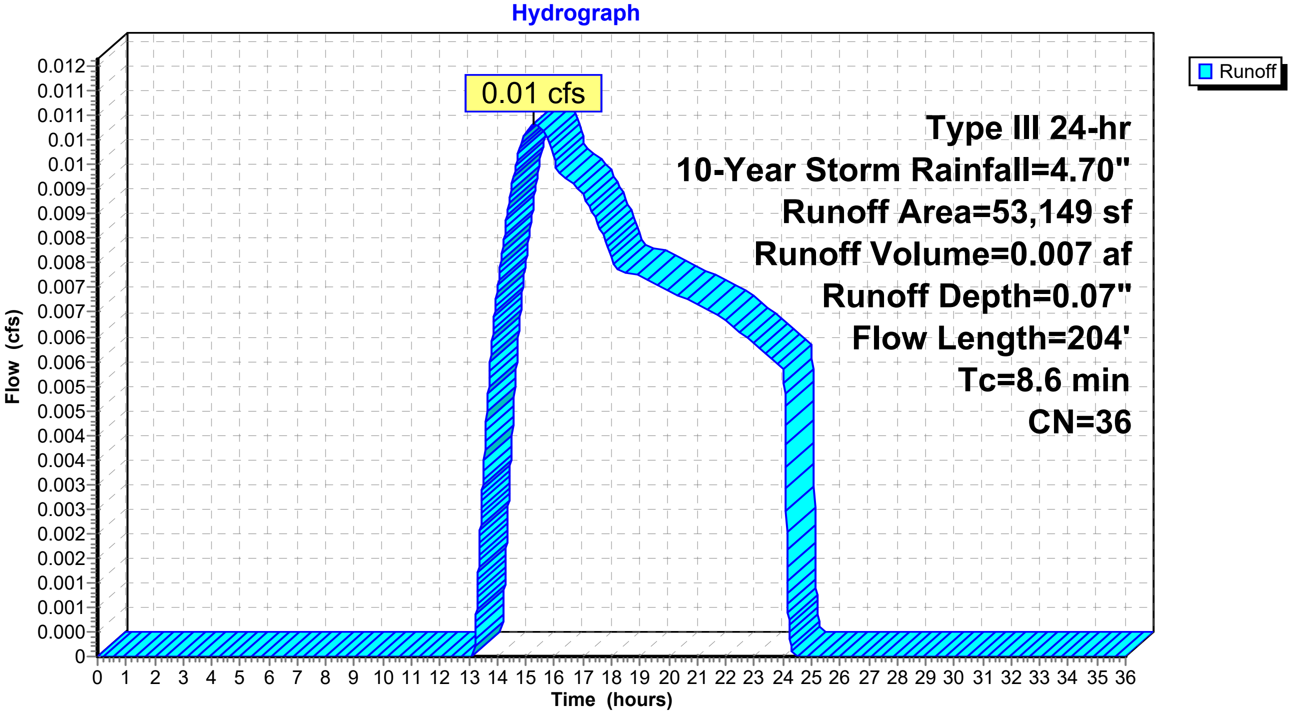
Runoff = 0.01 cfs @ 15.30 hrs, Volume= 0.007 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

	Area (sf)	CN	Description
*	793	98	Paved parking, HSG A
	658	98	Paved parking, HSG B
	16,315	39	>75% Grass cover, Good, HSG A
	898	61	>75% Grass cover, Good, HSG B
	33,430	30	Woods, Good, HSG A
	1,055	55	Woods, Good, HSG B
	53,149	36	Weighted Average
	51,698		97.27% Pervious Area
	1,451		2.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	36	0.0400	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
2.2	8	0.0400	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	160	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.6	204	Total			

Subcatchment 42P: P3

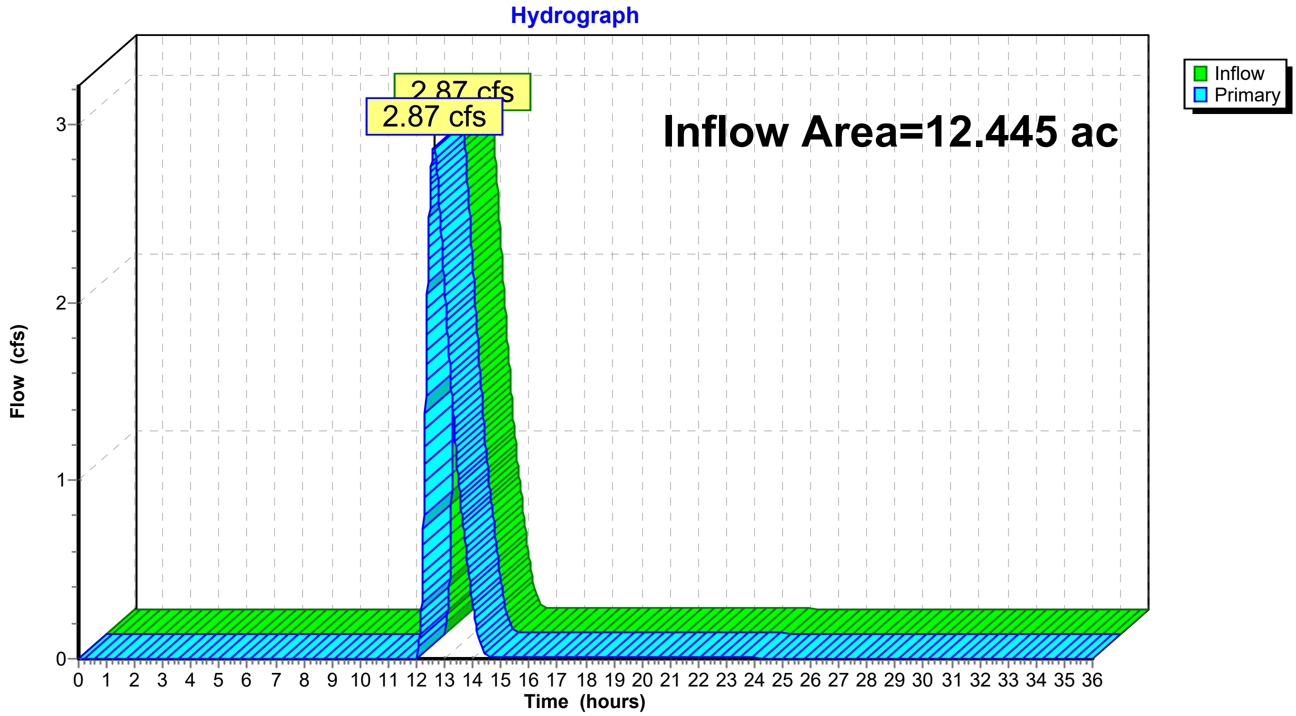


Summary for Link 43P: Design Point #1: Wetlands

Inflow Area =	12.445 ac,	41.27% Impervious,	Inflow Depth = 0.24"	for 10-Year Storm event
Inflow =	2.87 cfs @	12.62 hrs,	Volume=	0.250 af
Primary =	2.87 cfs @	12.62 hrs,	Volume=	0.250 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 43P: Design Point #1: Wetlands



Summary for Pond 47P: FD/DMH7

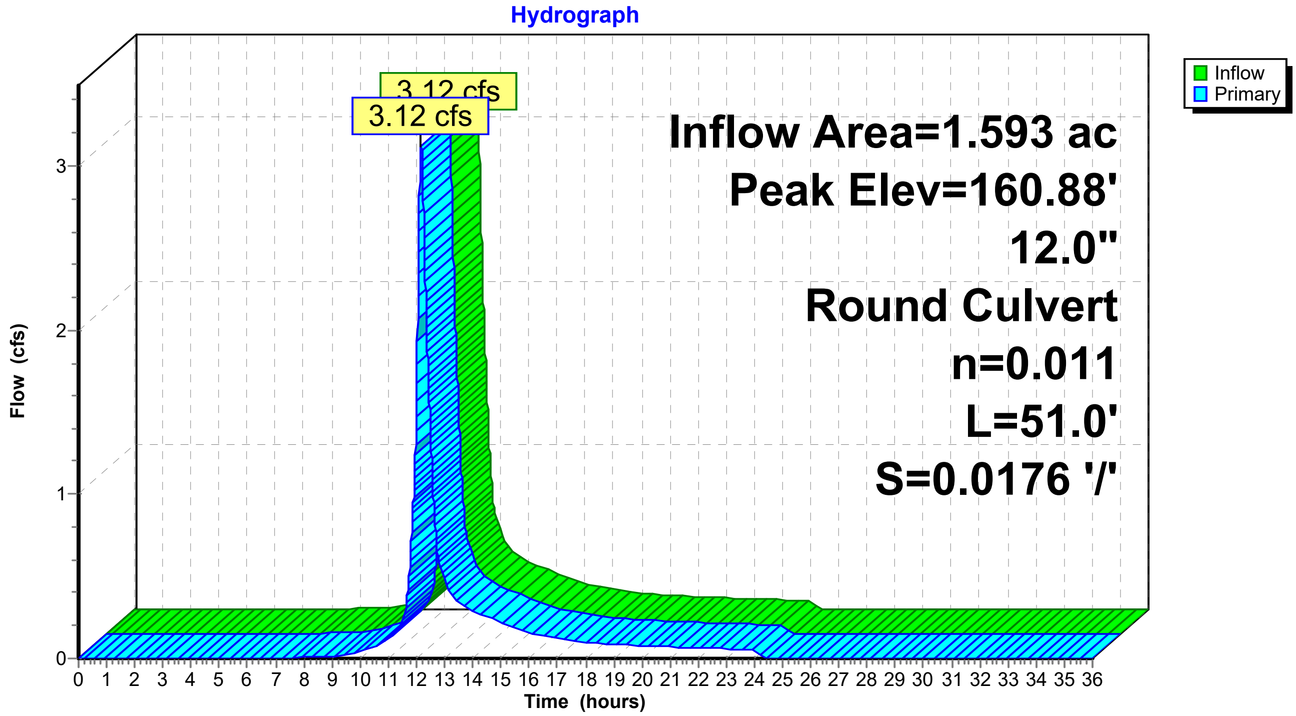
Inflow Area = 1.593 ac, 51.95% Impervious, Inflow Depth = 2.20" for 10-Year Storm event
Inflow = 3.12 cfs @ 12.16 hrs, Volume= 0.293 af
Outflow = 3.12 cfs @ 12.16 hrs, Volume= 0.293 af, Atten= 0%, Lag= 0.0 min
Primary = 3.12 cfs @ 12.16 hrs, Volume= 0.293 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.88' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	159.70'	**12.0" Round Culvert** L= 51.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.70' / 158.80' S= 0.0176 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=3.12 cfs @ 12.16 hrs HW=160.88' (Free Discharge)
└─**1=Culvert** (Inlet Controls 3.12 cfs @ 3.97 fps)

Pond 47P: FD/DMH7



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1P: P1a Runoff Area=112,292 sf 17.77% Impervious Runoff Depth=2.78"
Flow Length=655' Tc=16.4 min CN=64 Runoff=6.01 cfs 0.596 af

Pond 2P: CB1 Peak Elev=168.91' Inflow=6.01 cfs 0.596 af
15.0" Round Culvert n=0.011 L=194.0' S=0.0052 '/' Outflow=6.01 cfs 0.596 af

Subcatchment 3P: P1b Runoff Area=72,500 sf 24.34% Impervious Runoff Depth=3.07"
Flow Length=562' Tc=16.0 min CN=67 Runoff=4.38 cfs 0.426 af

Pond 4P: CB2 Peak Elev=167.84' Inflow=4.38 cfs 0.426 af
12.0" Round Culvert n=0.011 L=3.0' S=0.0333 '/' Outflow=4.38 cfs 0.426 af

Pond 5P: DMH1 Peak Elev=168.40' Inflow=10.38 cfs 1.022 af
18.0" Round Culvert n=0.011 L=171.0' S=0.0053 '/' Outflow=10.38 cfs 1.022 af

Subcatchment 6P: P1c Runoff Area=36,460 sf 39.37% Impervious Runoff Depth=3.78"
Flow Length=372' Tc=16.1 min CN=74 Runoff=2.74 cfs 0.264 af

Pond 7P: CB3 Peak Elev=166.00' Inflow=2.74 cfs 0.264 af
12.0" Round Culvert n=0.011 L=3.0' S=0.0333 '/' Outflow=2.74 cfs 0.264 af

Pond 8P: DMH2 Peak Elev=167.92' Inflow=13.11 cfs 1.286 af
18.0" Round Culvert n=0.011 L=94.0' S=0.0287 '/' Outflow=13.11 cfs 1.286 af

Subcatchment 9P: P1d Runoff Area=17,792 sf 68.87% Impervious Runoff Depth=5.30"
Flow Length=233' Tc=9.9 min CN=88 Runoff=2.14 cfs 0.180 af

Pond 10P: CB4&5 Peak Elev=168.54' Inflow=2.14 cfs 0.180 af
Outflow=2.14 cfs 0.180 af

Pond 11P: FD/DMH3 Peak Elev=167.82' Inflow=2.14 cfs 0.180 af
12.0" Round Culvert n=0.011 L=47.0' S=0.1043 '/' Outflow=2.14 cfs 0.180 af

Subcatchment 12P: P1e Runoff Area=35,653 sf 39.20% Impervious Runoff Depth=3.78"
Flow Length=403' Tc=11.6 min CN=74 Runoff=3.02 cfs 0.258 af

Pond 13P: CB6 Peak Elev=165.64' Inflow=3.02 cfs 0.258 af
12.0" Round Culvert n=0.011 L=72.0' S=0.0333 '/' Outflow=3.02 cfs 0.258 af

Subcatchment 14P: P1f Runoff Area=31,721 sf 39.55% Impervious Runoff Depth=2.58"
Flow Length=81' Slope=0.0200 '/' Tc=9.8 min CN=62 Runoff=1.89 cfs 0.157 af

Pond 15P: Area Drains Peak Elev=165.44' Inflow=1.89 cfs 0.157 af
8.0" Round Culvert n=0.011 L=114.0' S=0.0061 '/' Outflow=1.89 cfs 0.157 af

Pond 16P: FD/DMH4 Peak Elev=164.62' Inflow=19.24 cfs 1.881 af
24.0" Round Culvert n=0.011 L=112.0' S=0.0286 '/' Outflow=19.24 cfs 1.881 af

Pond 17P: DMH5&6 Peak Elev=162.12' Inflow=19.24 cfs 1.881 af
Outflow=19.24 cfs 1.881 af

Subcatchment 18P: P1g Runoff Area=61,354 sf 47.91% Impervious Runoff Depth=3.68"
Flow Length=414' Tc=12.7 min CN=73 Runoff=4.89 cfs 0.432 af

Pond 19P: CB7 Peak Elev=162.07' Inflow=4.89 cfs 0.432 af
12.0" Round Culvert n=0.011 L=2.0' S=0.0500 '/' Outflow=4.89 cfs 0.432 af

Subcatchment 20P: P1h Runoff Area=8,054 sf 82.73% Impervious Runoff Depth=5.30"
Flow Length=68' Slope=0.0300 '/' Tc=5.0 min CN=88 Runoff=1.14 cfs 0.082 af

Pond 21P: CB8 Peak Elev=160.86' Inflow=1.14 cfs 0.082 af
12.0" Round Culvert n=0.011 L=59.0' S=0.0085 '/' Outflow=1.14 cfs 0.082 af

Pond 22P: DMH8&9 Peak Elev=161.26' Inflow=5.56 cfs 0.513 af
12.0" Round Culvert n=0.011 L=9.5' S=0.0105 '/' Outflow=5.56 cfs 0.513 af

Subcatchment 23P: P1i Runoff Area=23,312 sf 100.00% Impervious Runoff Depth=6.46"
Tc=6.0 min CN=98 Runoff=3.52 cfs 0.288 af

Pond 24P: Roof Pipe Peak Elev=164.88' Inflow=3.52 cfs 0.288 af
12.0" Round Culvert n=0.011 L=302.0' S=0.0100 '/' Outflow=3.52 cfs 0.288 af

Pond 25P: Infiltration Field #1 Peak Elev=161.54' Storage=31,235 cf Inflow=26.86 cfs 2.682 af
Discarded=2.61 cfs 1.814 af Primary=8.24 cfs 0.868 af Outflow=10.85 cfs 2.682 af

Subcatchment 26P: P2f Runoff Area=24,110 sf 71.37% Impervious Runoff Depth=5.08"
Tc=6.0 min CN=86 Runoff=3.20 cfs 0.234 af

Subcatchment 27P: P2a Runoff Area=12,798 sf 68.12% Impervious Runoff Depth=4.97"
Flow Length=211' Tc=6.9 min CN=85 Runoff=1.62 cfs 0.122 af

Pond 28P: CB9 Peak Elev=163.69' Inflow=1.62 cfs 0.122 af
12.0" Round Culvert n=0.011 L=122.0' S=0.0164 '/' Outflow=1.62 cfs 0.122 af

Pond 29P: DMH11 Peak Elev=167.11' Inflow=4.80 cfs 0.356 af
12.0" Round Culvert n=0.011 L=71.0' S=0.0141 '/' Outflow=4.80 cfs 0.356 af

Subcatchment 30P: P2b Runoff Area=11,558 sf 84.98% Impervious Runoff Depth=5.42"
Flow Length=74' Slope=0.0200 '/' Tc=5.0 min CN=89 Runoff=1.66 cfs 0.120 af

Pond 31P: CB10 Peak Elev=161.88' Inflow=1.66 cfs 0.120 af
12.0" Round Culvert n=0.011 L=3.0' S=0.0333 '/' Outflow=1.66 cfs 0.120 af

Pond 32P: DMH12 Peak Elev=165.71' Inflow=6.43 cfs 0.476 af
15.0" Round Culvert n=0.011 L=158.0' S=0.0323 '/' Outflow=6.43 cfs 0.476 af

Pond 33P: FD/DMH13&14 Peak Elev=160.13' Inflow=6.43 cfs 0.476 af
18.0" Round Culvert n=0.011 L=8.0' S=0.0125 '/' Outflow=6.43 cfs 0.476 af

Subcatchment 34P: P2c Runoff Area=19,803 sf 84.10% Impervious Runoff Depth=5.42"
Flow Length=225' Tc=5.0 min CN=89 Runoff=2.85 cfs 0.205 af

Pond 35P: FD/CB11 Peak Elev=160.87' Inflow=2.85 cfs 0.205 af
12.0" Round Culvert n=0.011 L=32.0' S=0.0313 '/' Outflow=2.85 cfs 0.205 af

Subcatchment 36P: P2d Runoff Area=10,490 sf 82.97% Impervious Runoff Depth=5.30"
Flow Length=124' Slope=0.0300 '/' Tc=5.0 min CN=88 Runoff=1.49 cfs 0.106 af

Pond 37P: FD/CB12 Peak Elev=160.65' Inflow=1.49 cfs 0.106 af
12.0" Round Culvert n=0.011 L=52.0' S=0.0231 '/' Outflow=1.49 cfs 0.106 af

Pond 38P: DMH15&16 Peak Elev=160.42' Inflow=4.34 cfs 0.312 af
12.0" Round Culvert n=0.011 L=6.5' S=0.0154 '/' Outflow=4.34 cfs 0.312 af

Subcatchment 39P: P2e Runoff Area=11,055 sf 100.00% Impervious Runoff Depth=6.46"
Tc=6.0 min CN=98 Runoff=1.67 cfs 0.137 af

Pond 40P: Roof Drain Peak Elev=166.32' Inflow=1.67 cfs 0.137 af
8.0" Round Culvert n=0.011 L=232.0' S=0.0280 '/' Outflow=1.67 cfs 0.137 af

Pond 41P: Infiltration Field #2 Peak Elev=161.49' Storage=12,596 cf Inflow=12.40 cfs 0.924 af
Discarded=1.08 cfs 0.763 af Primary=1.86 cfs 0.161 af Outflow=2.94 cfs 0.924 af

Subcatchment 42P: P3 Runoff Area=53,149 sf 2.73% Impervious Runoff Depth=0.47"
Flow Length=204' Tc=8.6 min CN=36 Runoff=0.22 cfs 0.048 af

Link 43P: Design Point #1: Wetlands Inflow=10.11 cfs 1.077 af
Primary=10.11 cfs 1.077 af

Pond 47P: FD/DMH7 Peak Elev=162.36' Inflow=5.56 cfs 0.513 af
12.0" Round Culvert n=0.011 L=51.0' S=0.0176 '/' Outflow=5.56 cfs 0.513 af

Total Runoff Area = 12.445 ac Runoff Volume = 3.654 af Average Runoff Depth = 3.52"
58.73% Pervious = 7.309 ac 41.27% Impervious = 5.136 ac

Summary for Subcatchment 1P: P1a

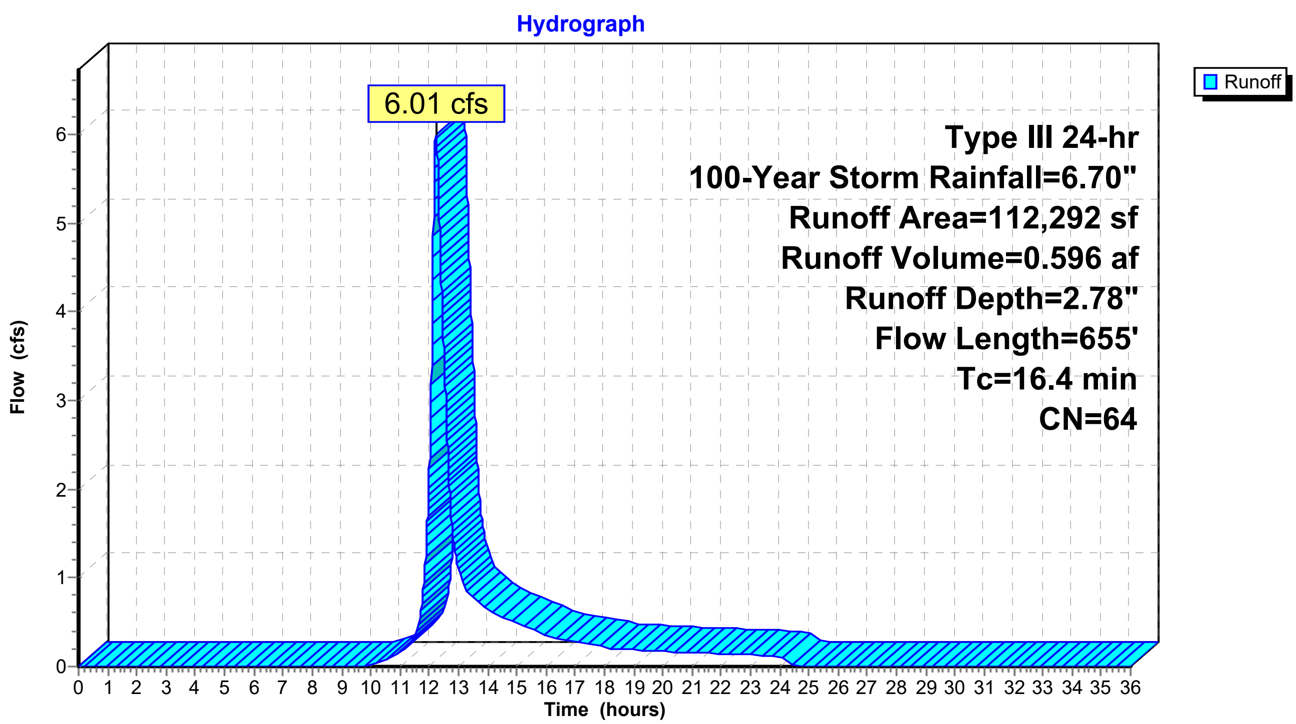
Runoff = 6.01 cfs @ 12.23 hrs, Volume= 0.596 af, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
19,951	98	Paved parking, HSG B
20,485	61	>75% Grass cover, Good, HSG B
71,856	55	Woods, Good, HSG B
112,292	64	Weighted Average
92,341		82.23% Pervious Area
19,951		17.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	43	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.8	410	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	47	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	155	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.4	655	Total			

Subcatchment 1P: P1a



Summary for Pond 2P: CB1

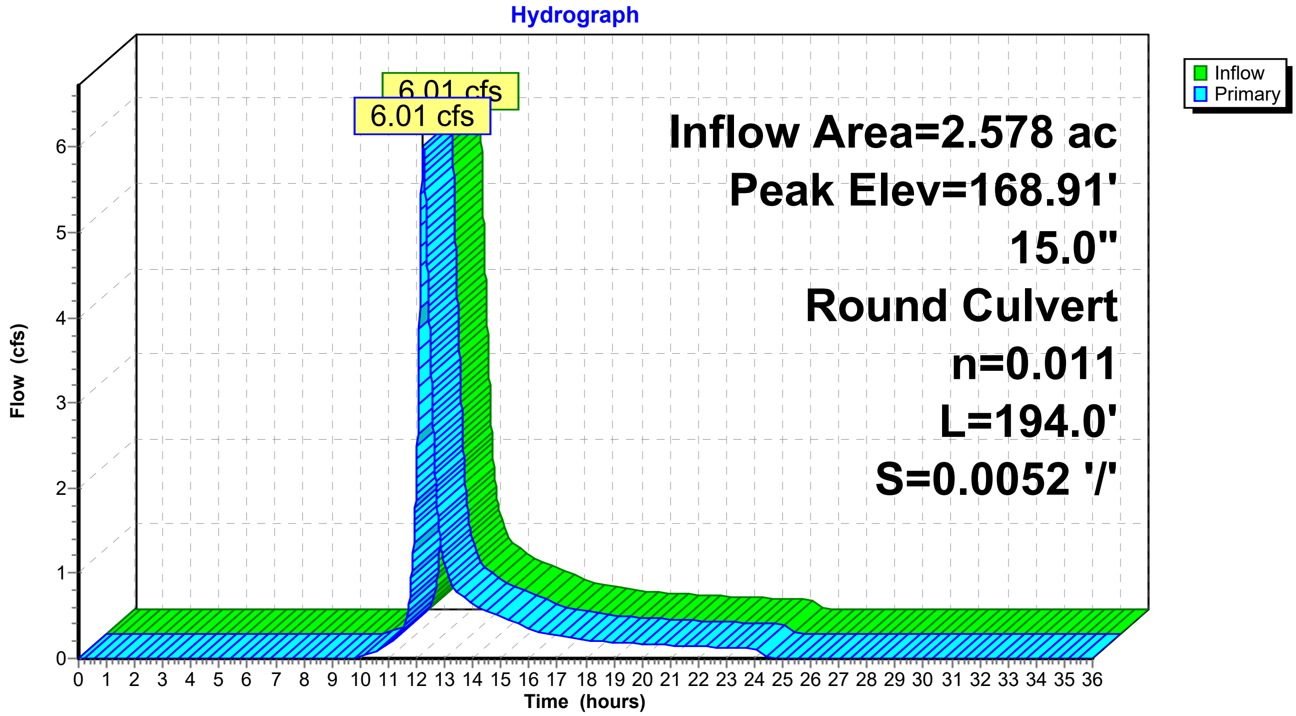
Inflow Area = 2.578 ac, 17.77% Impervious, Inflow Depth = 2.78" for 100-Year Storm event
Inflow = 6.01 cfs @ 12.23 hrs, Volume= 0.596 af
Outflow = 6.01 cfs @ 12.23 hrs, Volume= 0.596 af, Atten= 0%, Lag= 0.0 min
Primary = 6.01 cfs @ 12.23 hrs, Volume= 0.596 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 168.91' @ 12.23 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	166.90'	**15.0" Round Culvert** L= 194.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 166.90' / 165.90' S= 0.0052 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf

Primary OutFlow Max=6.01 cfs @ 12.23 hrs HW=168.91' (Free Discharge)
└─**1=Culvert** (Barrel Controls 6.01 cfs @ 4.89 fps)

Pond 2P: CB1



Summary for Subcatchment 3P: P1b

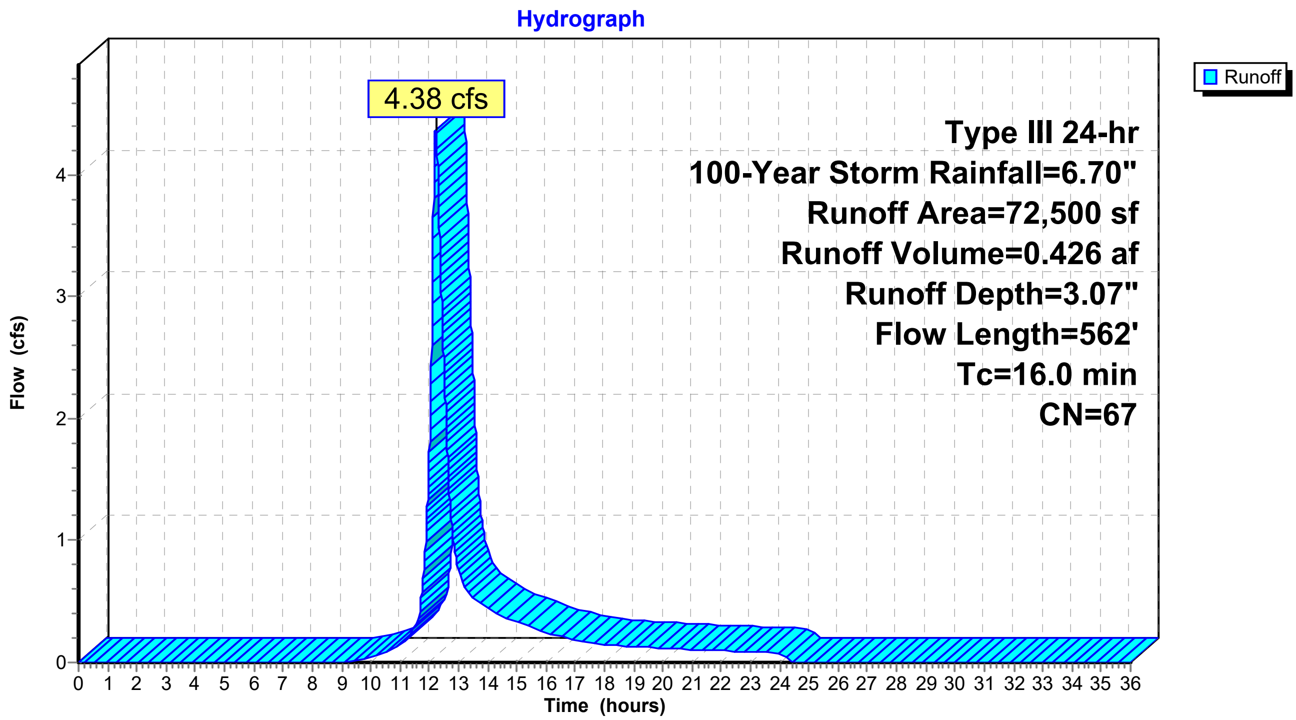
Runoff = 4.38 cfs @ 12.22 hrs, Volume= 0.426 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
17,650	98	Paved parking, HSG B
20,258	61	>75% Grass cover, Good, HSG B
34,592	55	Woods, Good, HSG B
72,500	67	Weighted Average
54,850		75.66% Pervious Area
17,650		24.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	43	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.0	405	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	17	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	97	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.0	562	Total			

Subcatchment 3P: P1b



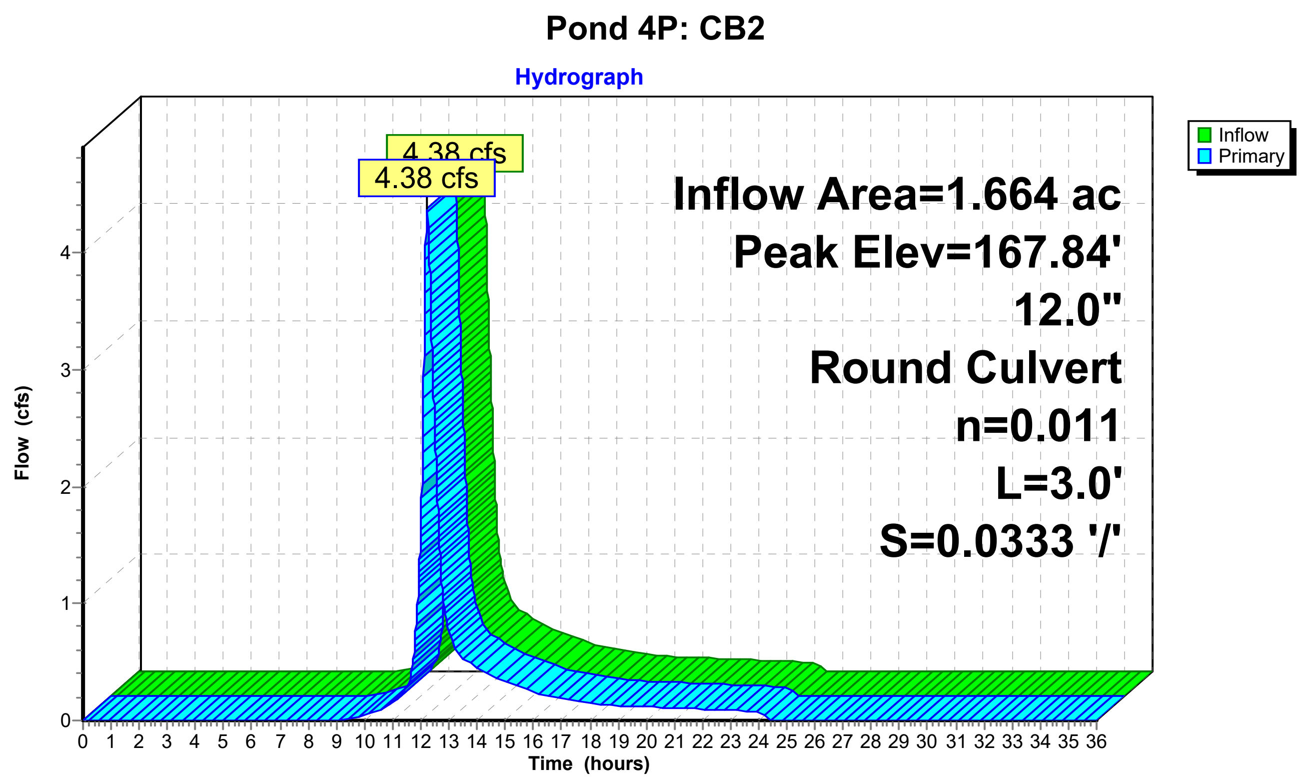
Summary for Pond 4P: CB2

Inflow Area =	1.664 ac,	24.34% Impervious,	Inflow Depth = 3.07"	for 100-Year Storm event
Inflow =	4.38 cfs @	12.22 hrs, Volume=	0.426 af	
Outflow =	4.38 cfs @	12.22 hrs, Volume=	0.426 af,	Atten= 0%, Lag= 0.0 min
Primary =	4.38 cfs @	12.22 hrs, Volume=	0.426 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 167.84' @ 12.22 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	166.00'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 166.00' / 165.90' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=4.37 cfs @ 12.22 hrs HW=167.84' (Free Discharge)
└─**1=Culvert** (Inlet Controls 4.37 cfs @ 5.57 fps)



Summary for Pond 5P: DMH1

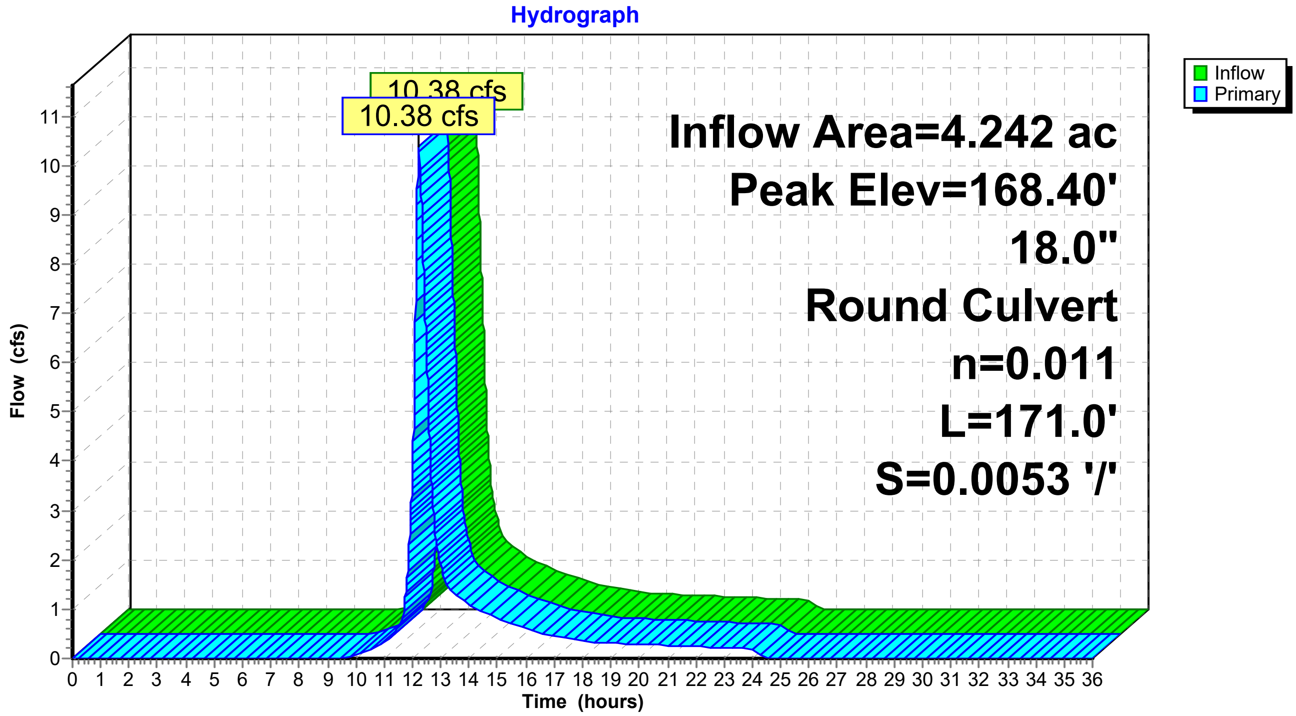
Inflow Area =	4.242 ac,	20.35% Impervious,	Inflow Depth = 2.89"		for 100-Year Storm event
Inflow =	10.38 cfs @	12.23 hrs,	Volume=	1.022 af	
Outflow =	10.38 cfs @	12.23 hrs,	Volume=	1.022 af,	Atten= 0%, Lag= 0.0 min
Primary =	10.38 cfs @	12.23 hrs,	Volume=	1.022 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 168.40' @ 12.23 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	165.80'	**18.0" Round Culvert** L= 171.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.80' / 164.90' S= 0.0053 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=10.38 cfs @ 12.23 hrs HW=168.40' (Free Discharge)
└─**1=Culvert** (Barrel Controls 10.38 cfs @ 5.87 fps)

Pond 5P: DMH1



Summary for Subcatchment 6P: P1c

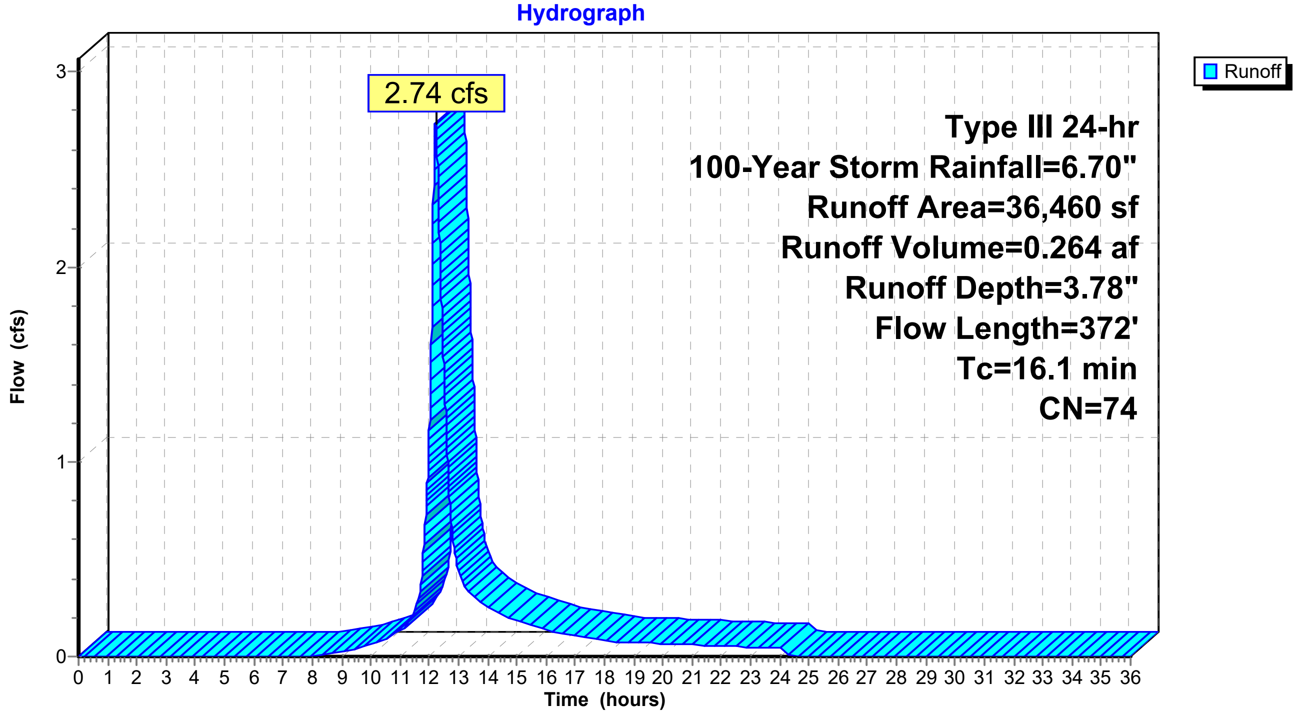
Runoff = 2.74 cfs @ 12.22 hrs, Volume= 0.264 af, Depth= 3.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
1,313	98	Paved parking, HSG A
13,041	98	Paved parking, HSG B
160	39	>75% Grass cover, Good, HSG A
15,425	61	>75% Grass cover, Good, HSG B
6,521	55	Woods, Good, HSG B
36,460	74	Weighted Average
22,106		60.63% Pervious Area
14,354		39.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	47	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
4.8	36	0.0400	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.7	74	0.0700	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	40	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	175	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.1	372	Total			

Subcatchment 6P: P1c



Summary for Pond 7P: CB3

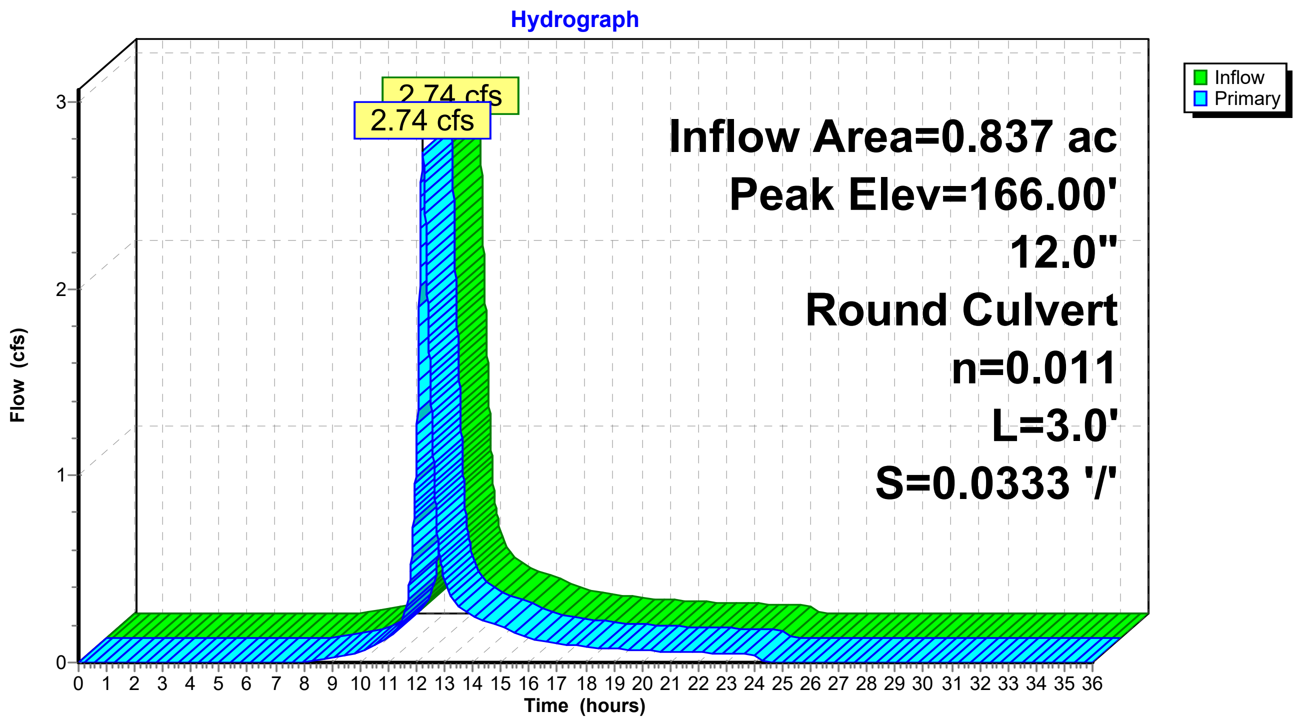
Inflow Area =	0.837 ac, 39.37% Impervious,	Inflow Depth = 3.78"	for 100-Year Storm event	
Inflow =	2.74 cfs @	12.22 hrs, Volume=	0.264 af	
Outflow =	2.74 cfs @	12.22 hrs, Volume=	0.264 af,	Atten= 0%, Lag= 0.0 min
Primary =	2.74 cfs @	12.22 hrs, Volume=	0.264 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 166.00' @ 12.22 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	164.90'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 164.90' / 164.80' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=2.74 cfs @ 12.22 hrs HW=166.00' (Free Discharge)
1=Culvert (Barrel Controls 2.74 cfs @ 3.95 fps)

Pond 7P: CB3



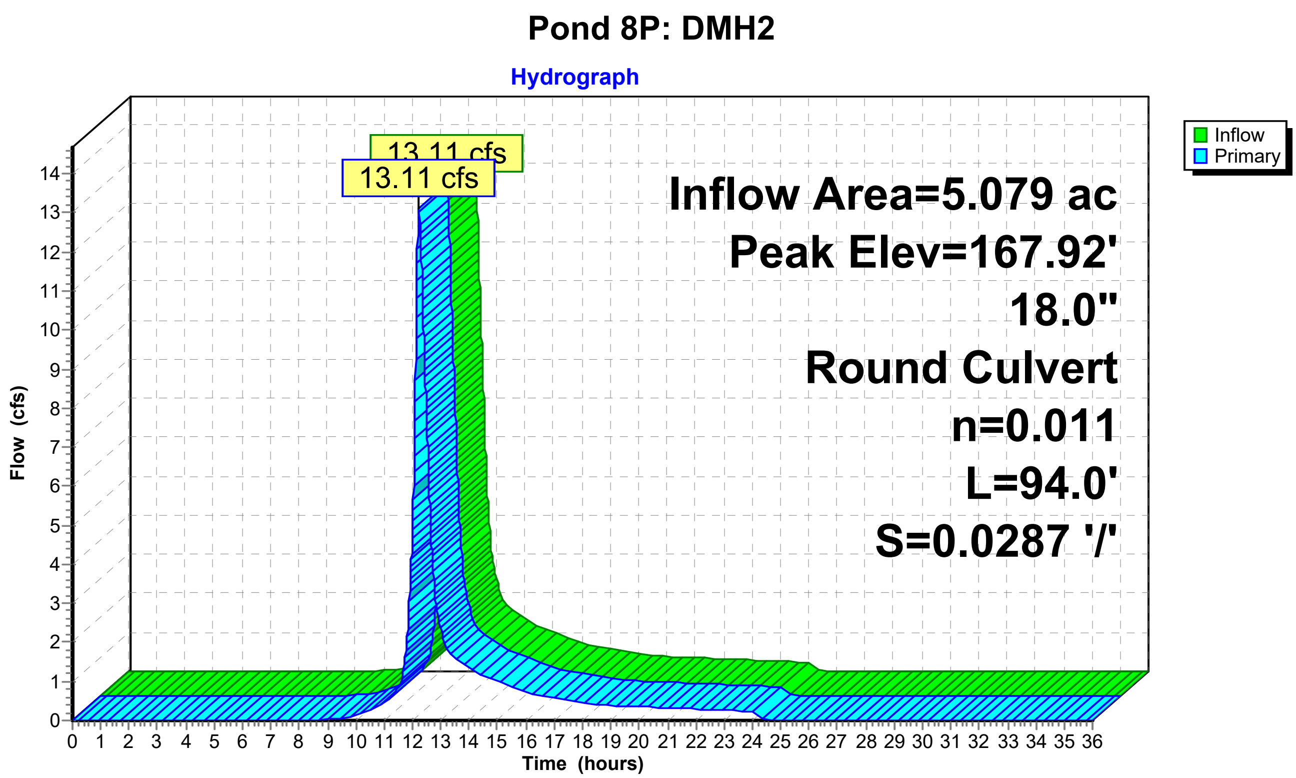
Summary for Pond 8P: DMH2

Inflow Area =	5.079 ac,	23.48% Impervious,	Inflow Depth = 3.04"	for 100-Year Storm event	
Inflow =	13.11 cfs @	12.23 hrs,	Volume=	1.286 af	
Outflow =	13.11 cfs @	12.23 hrs,	Volume=	1.286 af,	Atten= 0%, Lag= 0.0 min
Primary =	13.11 cfs @	12.23 hrs,	Volume=	1.286 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 167.92' @ 12.23 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	164.80'	**18.0" Round Culvert** L= 94.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 164.80' / 162.10' S= 0.0287 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=13.10 cfs @ 12.23 hrs HW=167.92' (Free Discharge)
└─**1=Culvert** (Inlet Controls 13.10 cfs @ 7.41 fps)



Summary for Subcatchment 9P: P1d

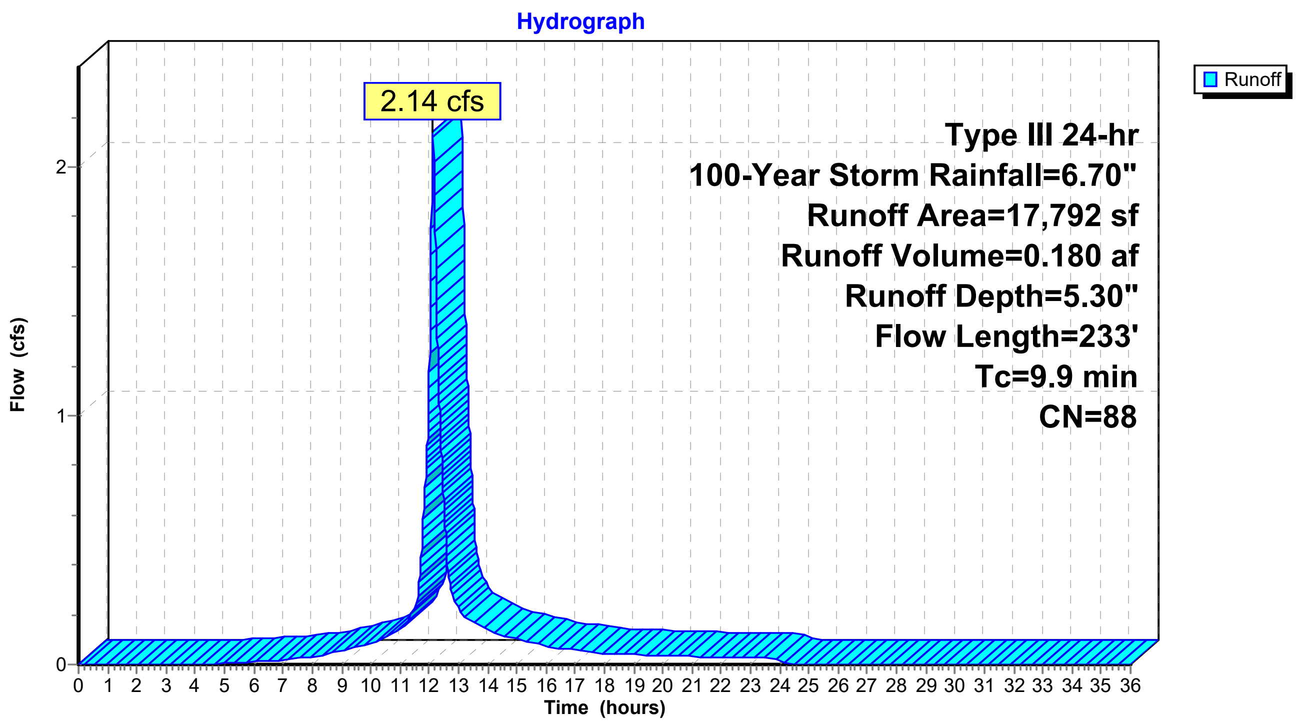
Runoff = 2.14 cfs @ 12.13 hrs, Volume= 0.180 af, Depth= 5.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
220	98	Paved parking, HSG A
12,034	98	Paved parking, HSG B
4,299	61	>75% Grass cover, Good, HSG B
1,239	79	<50% Grass cover, Poor, HSG B
17,792	88	Weighted Average
5,538		31.13% Pervious Area
12,254		68.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	72	0.0300	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.1	17	0.1000	2.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	144	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.9	233	Total			

Subcatchment 9P: P1d



Summary for Pond 10P: CB4&5

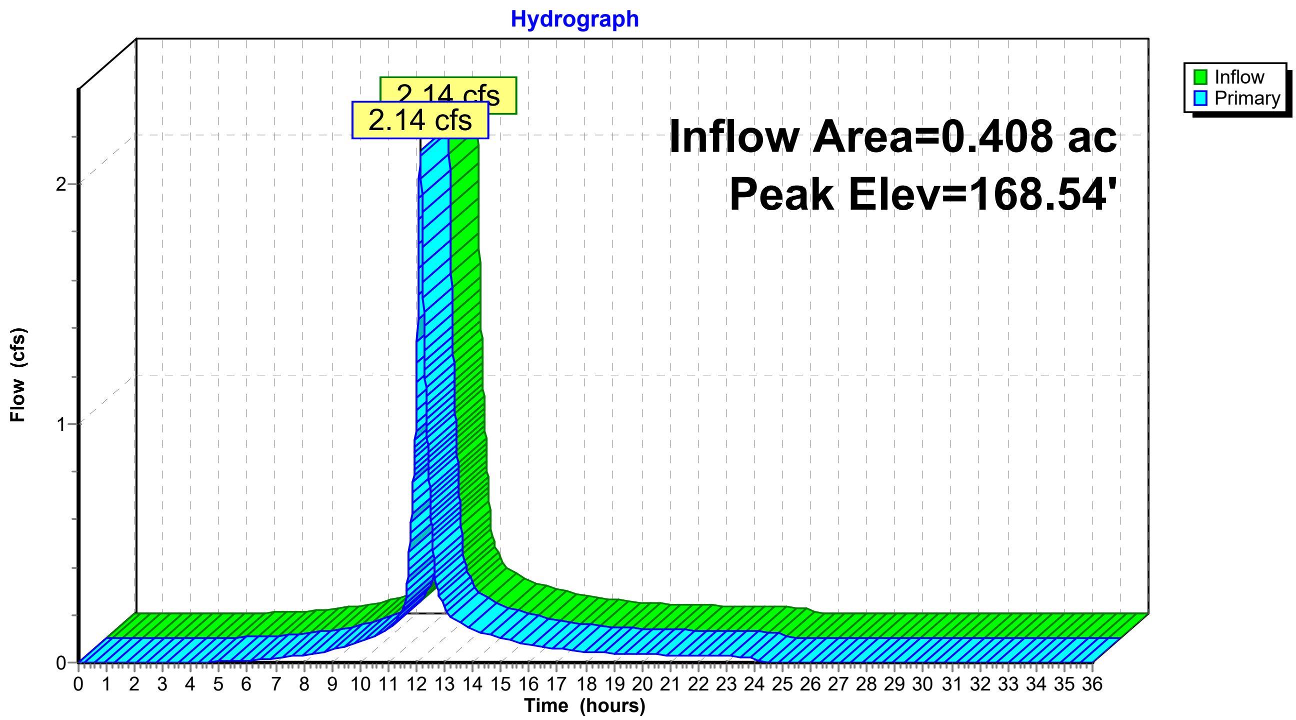
Inflow Area = 0.408 ac, 68.87% Impervious, Inflow Depth = 5.30" for 100-Year Storm event
Inflow = 2.14 cfs @ 12.13 hrs, Volume= 0.180 af
Outflow = 2.14 cfs @ 12.13 hrs, Volume= 0.180 af, Atten= 0%, Lag= 0.0 min
Primary = 2.14 cfs @ 12.13 hrs, Volume= 0.180 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 168.54' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	168.00'	**12.0" Round Culvert** L= 36.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 168.00' / 167.60' S= 0.0111 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#2	Primary	168.00'	**12.0" Round Culvert** L= 36.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 168.00' / 167.60' S= 0.0111 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=2.14 cfs @ 12.13 hrs HW=168.54' (Free Discharge)
1=Culvert (Inlet Controls 1.07 cfs @ 2.49 fps)
2=Culvert (Inlet Controls 1.07 cfs @ 2.49 fps)

Pond 10P: CB4&5



Summary for Pond 11P: FD/DMH3

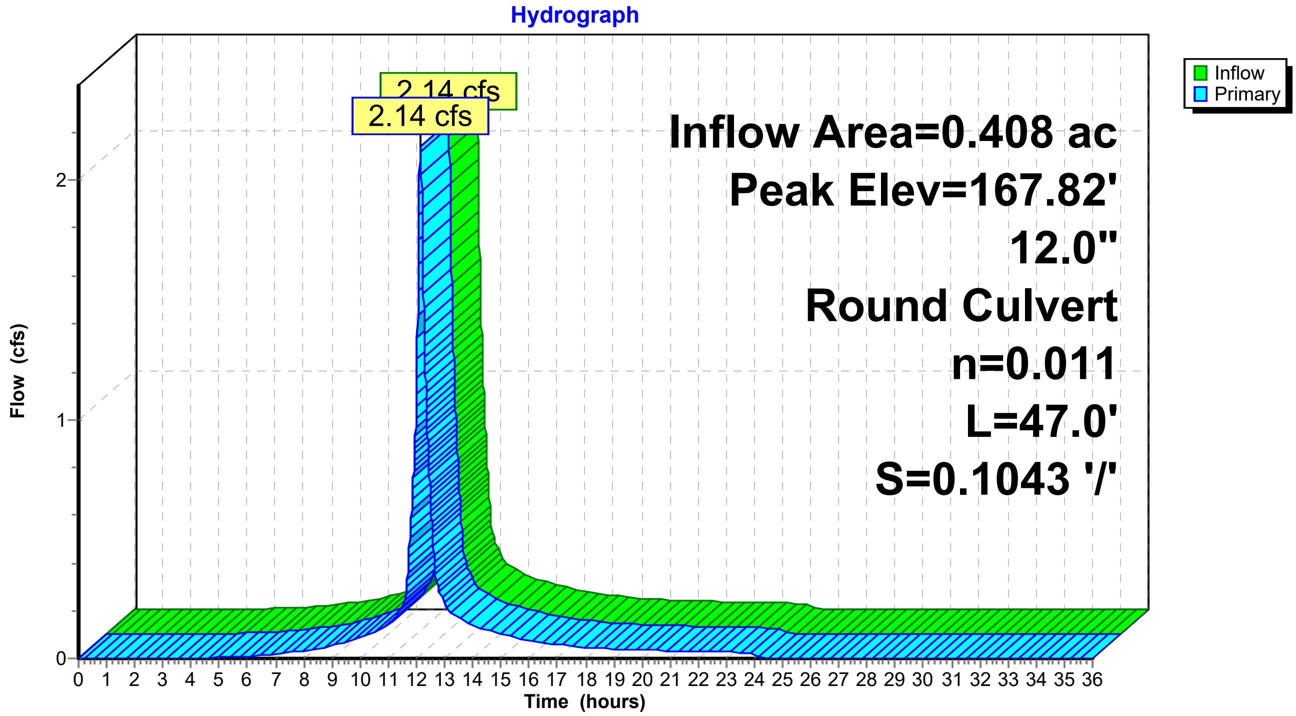
Inflow Area = 0.408 ac, 68.87% Impervious, Inflow Depth = 5.30" for 100-Year Storm event
Inflow = 2.14 cfs @ 12.13 hrs, Volume= 0.180 af
Outflow = 2.14 cfs @ 12.13 hrs, Volume= 0.180 af, Atten= 0%, Lag= 0.0 min
Primary = 2.14 cfs @ 12.13 hrs, Volume= 0.180 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 167.82' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	167.00'	**12.0" Round Culvert** L= 47.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 167.00' / 162.10' S= 0.1043 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=2.14 cfs @ 12.13 hrs HW=167.82' (Free Discharge)
1=Culvert (Inlet Controls 2.14 cfs @ 3.09 fps)

Pond 11P: FD/DMH3



Summary for Subcatchment 12P: P1e

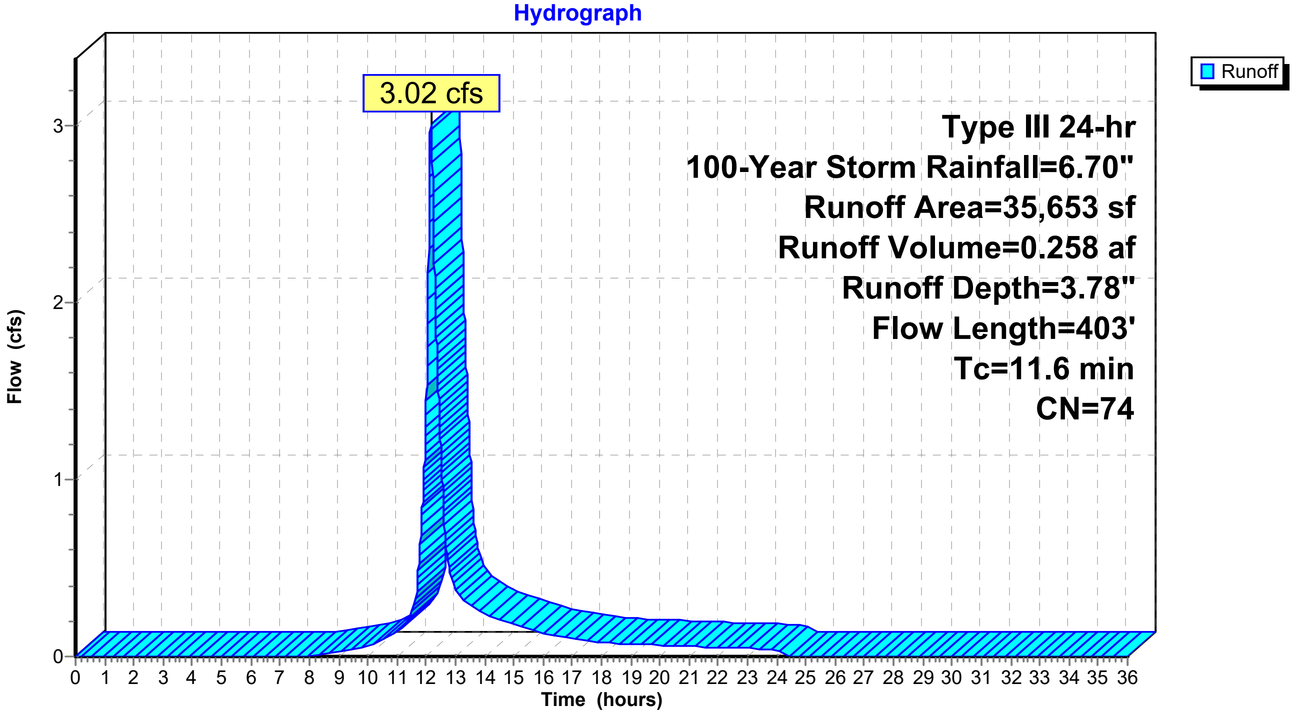
Runoff = 3.02 cfs @ 12.16 hrs, Volume= 0.258 af, Depth= 3.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
10,926	98	Paved parking, HSG A
3,050	98	Paved parking, HSG B
6,148	39	>75% Grass cover, Good, HSG A
10,410	61	>75% Grass cover, Good, HSG B
4,510	79	<50% Grass cover, Poor, HSG B
609	55	Woods, Good, HSG B
35,653	74	Weighted Average
21,677		60.80% Pervious Area
13,976		39.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	83	0.0400	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.1	13	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	130	0.0700	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	177	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.6	403	Total			

Subcatchment 12P: P1e



Summary for Pond 13P: CB6

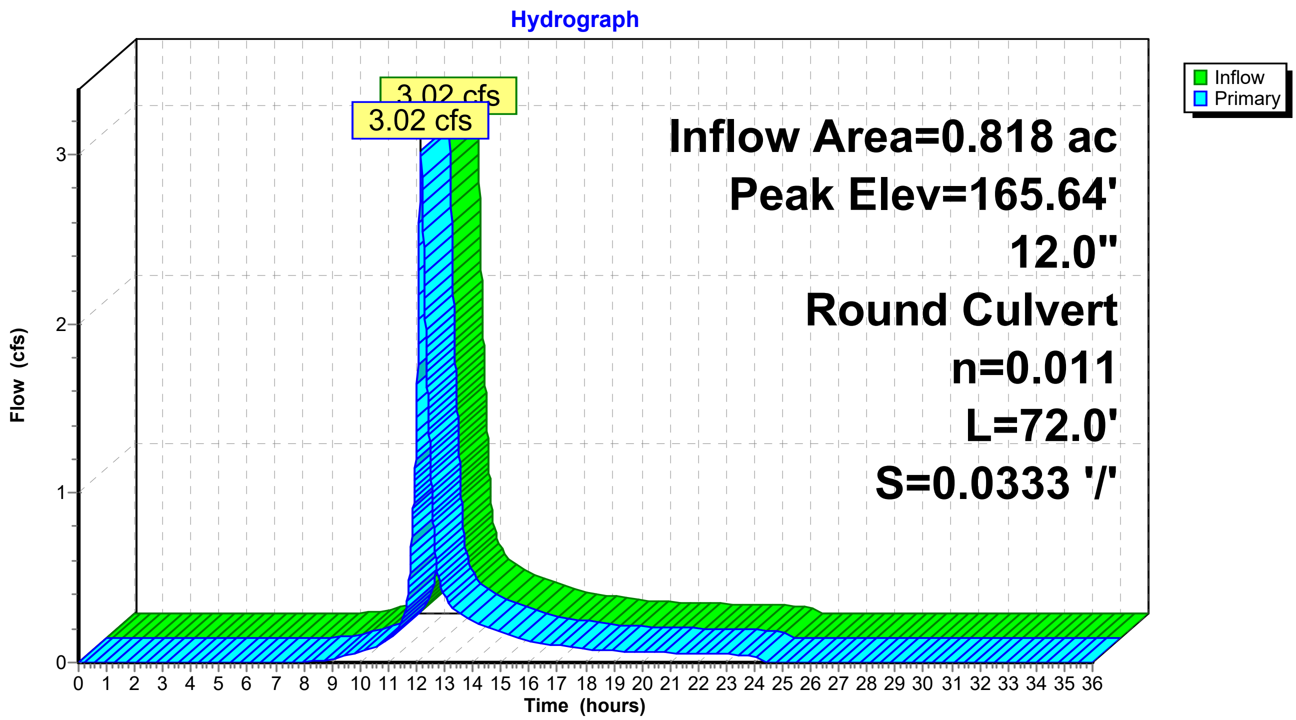
Inflow Area = 0.818 ac, 39.20% Impervious, Inflow Depth = 3.78" for 100-Year Storm event
Inflow = 3.02 cfs @ 12.16 hrs, Volume= 0.258 af
Outflow = 3.02 cfs @ 12.16 hrs, Volume= 0.258 af, Atten= 0%, Lag= 0.0 min
Primary = 3.02 cfs @ 12.16 hrs, Volume= 0.258 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 165.64' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	164.50'	**12.0" Round Culvert** L= 72.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 164.50' / 162.10' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=3.02 cfs @ 12.16 hrs HW=165.64' (Free Discharge)
└─**1=Culvert** (Inlet Controls 3.02 cfs @ 3.84 fps)

Pond 13P: CB6



Summary for Subcatchment 14P: P1f

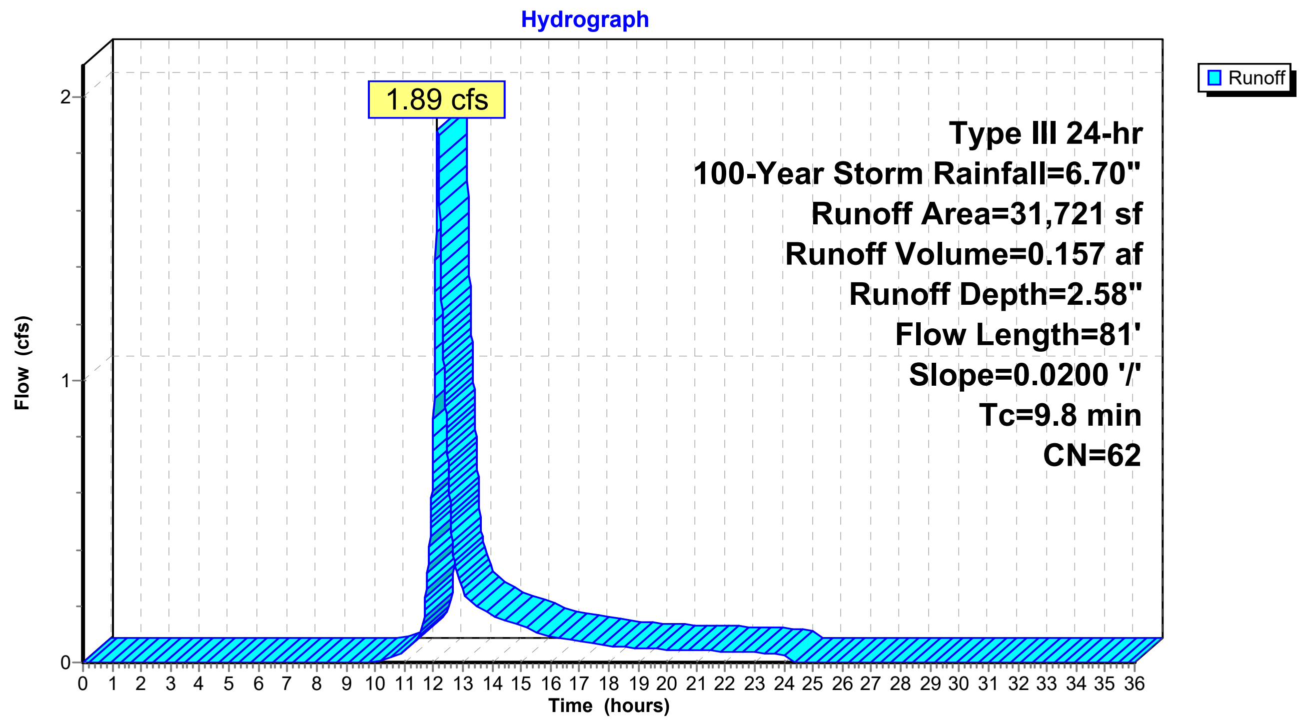
Runoff = 1.89 cfs @ 12.14 hrs, Volume= 0.157 af, Depth= 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
12,547	98	Paved parking, HSG A
19,174	39	>75% Grass cover, Good, HSG A
31,721	62	Weighted Average
19,174		60.45% Pervious Area
12,547		39.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	59	0.0200	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.4	22	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	81	Total			

Subcatchment 14P: P1f



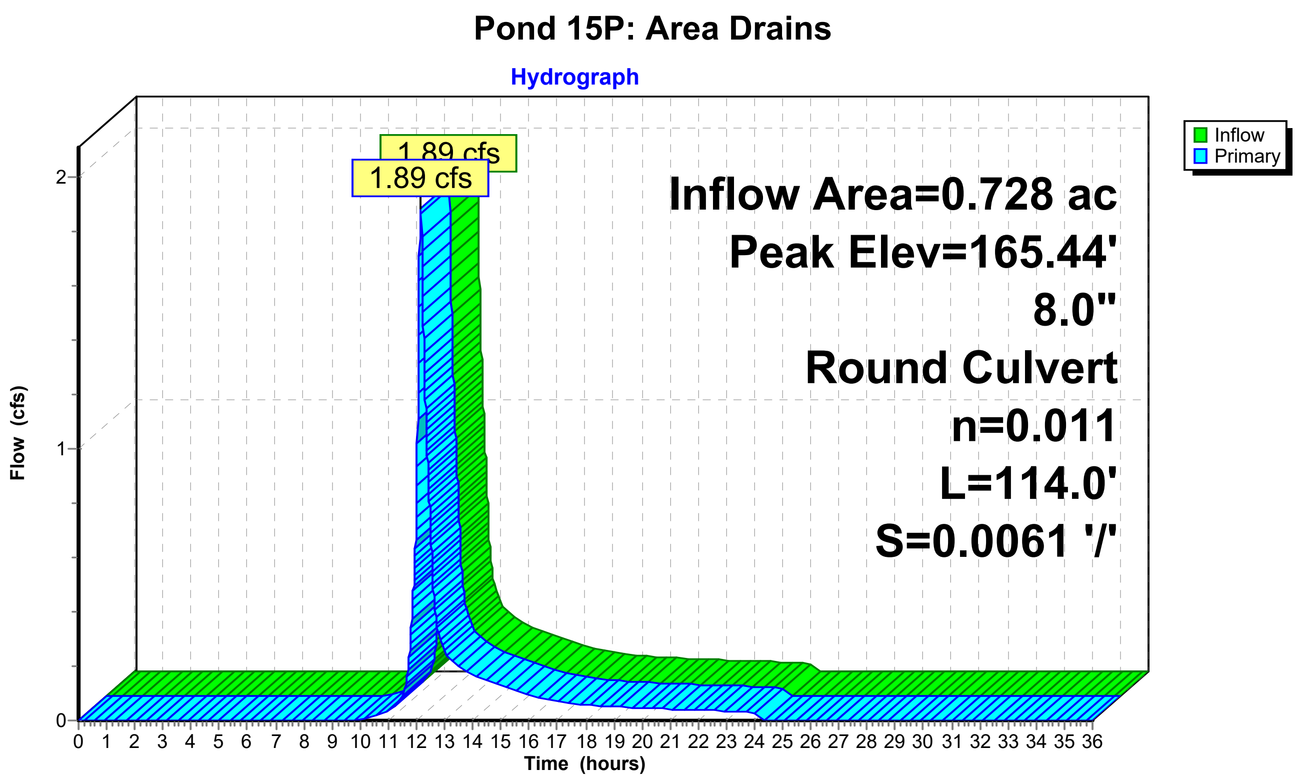
Summary for Pond 15P: Area Drains

Inflow Area =	0.728 ac,	39.55% Impervious,	Inflow Depth =	2.58"	for 100-Year Storm event
Inflow =	1.89 cfs @	12.14 hrs,	Volume=	0.157 af	
Outflow =	1.89 cfs @	12.14 hrs,	Volume=	0.157 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.89 cfs @	12.14 hrs,	Volume=	0.157 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 165.44' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	162.80'	**8.0" Round Culvert** L= 114.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 162.80' / 162.10' S= 0.0061 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=1.88 cfs @ 12.14 hrs HW=165.43' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 1.88 cfs @ 5.40 fps)



Summary for Pond 16P: FD/DMH4

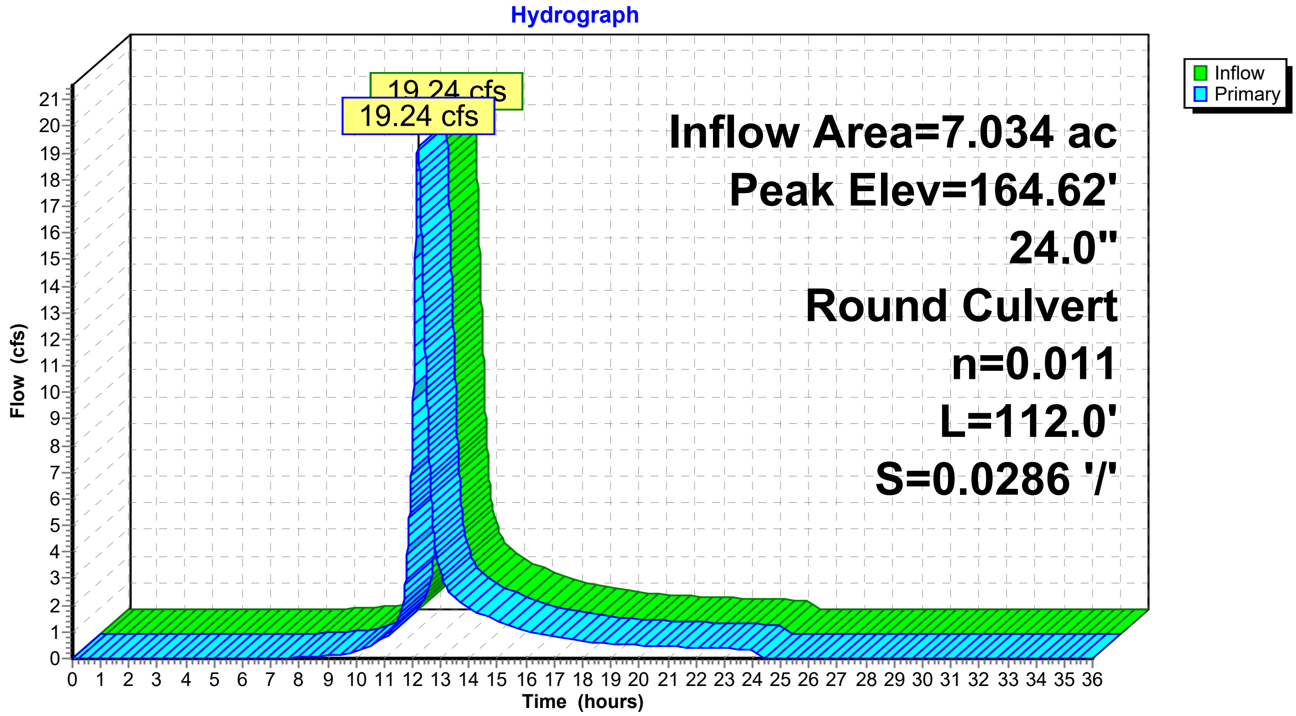
Inflow Area = 7.034 ac, 29.61% Impervious, Inflow Depth = 3.21" for 100-Year Storm event
Inflow = 19.24 cfs @ 12.19 hrs, Volume= 1.881 af
Outflow = 19.24 cfs @ 12.19 hrs, Volume= 1.881 af, Atten= 0%, Lag= 0.0 min
Primary = 19.24 cfs @ 12.19 hrs, Volume= 1.881 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 164.62' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	162.00'	**24.0" Round Culvert** L= 112.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 162.00' / 158.80' S= 0.0286 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf

Primary OutFlow Max=19.22 cfs @ 12.19 hrs HW=164.62' (Free Discharge)
└─**1=Culvert** (Inlet Controls 19.22 cfs @ 6.12 fps)

Pond 16P: FD/DMH4



Summary for Pond 17P: DMH5&6

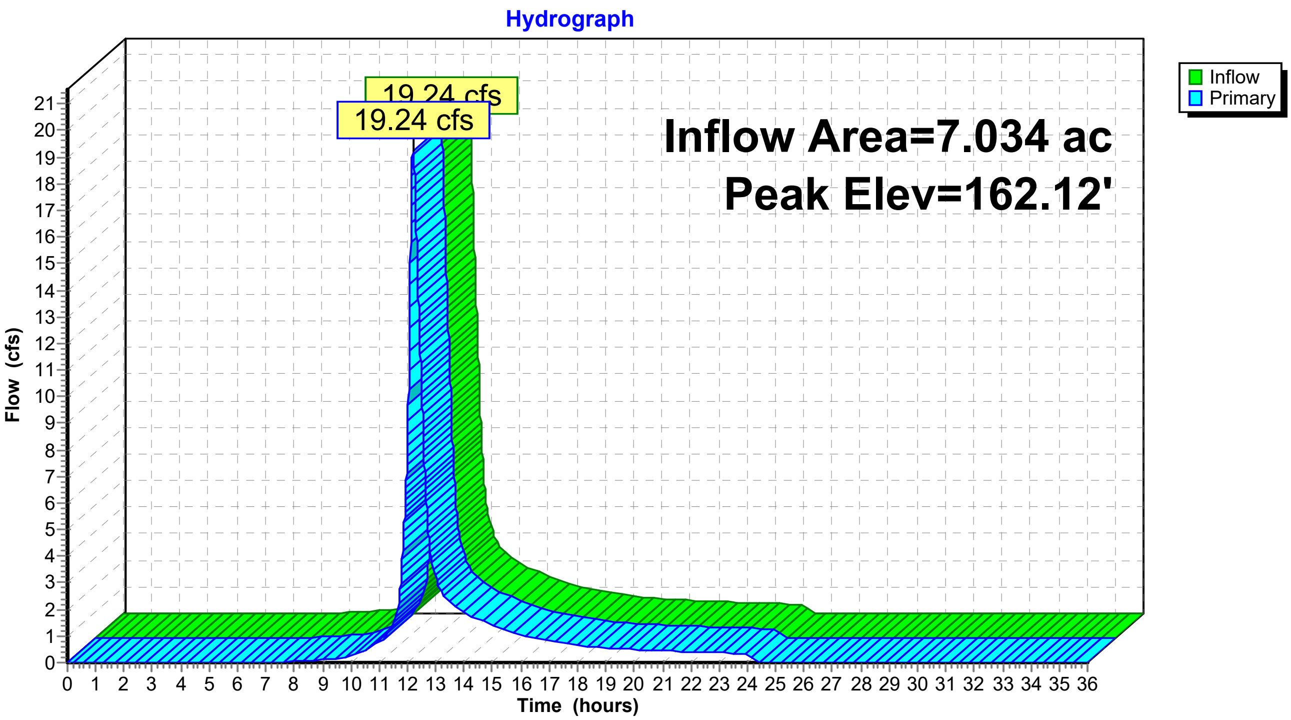
Inflow Area =	7.034 ac, 29.61% Impervious,	Inflow Depth = 3.21"	for 100-Year Storm event	
Inflow =	19.24 cfs @	12.19 hrs, Volume=	1.881 af	
Outflow =	19.24 cfs @	12.19 hrs, Volume=	1.881 af,	Atten= 0%, Lag= 0.0 min
Primary =	19.24 cfs @	12.19 hrs, Volume=	1.881 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 162.12' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.60'	**18.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.60' / 158.50' S= 0.0125 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Primary	161.00'	**18.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.00' / 158.50' S= 0.4167 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=19.22 cfs @ 12.19 hrs HW=162.12' (Free Discharge)
1=Culvert (Inlet Controls 14.15 cfs @ 8.01 fps)
2=Culvert (Inlet Controls 5.07 cfs @ 3.60 fps)

Pond 17P: DMH5&6



Summary for Subcatchment 18P: P1g

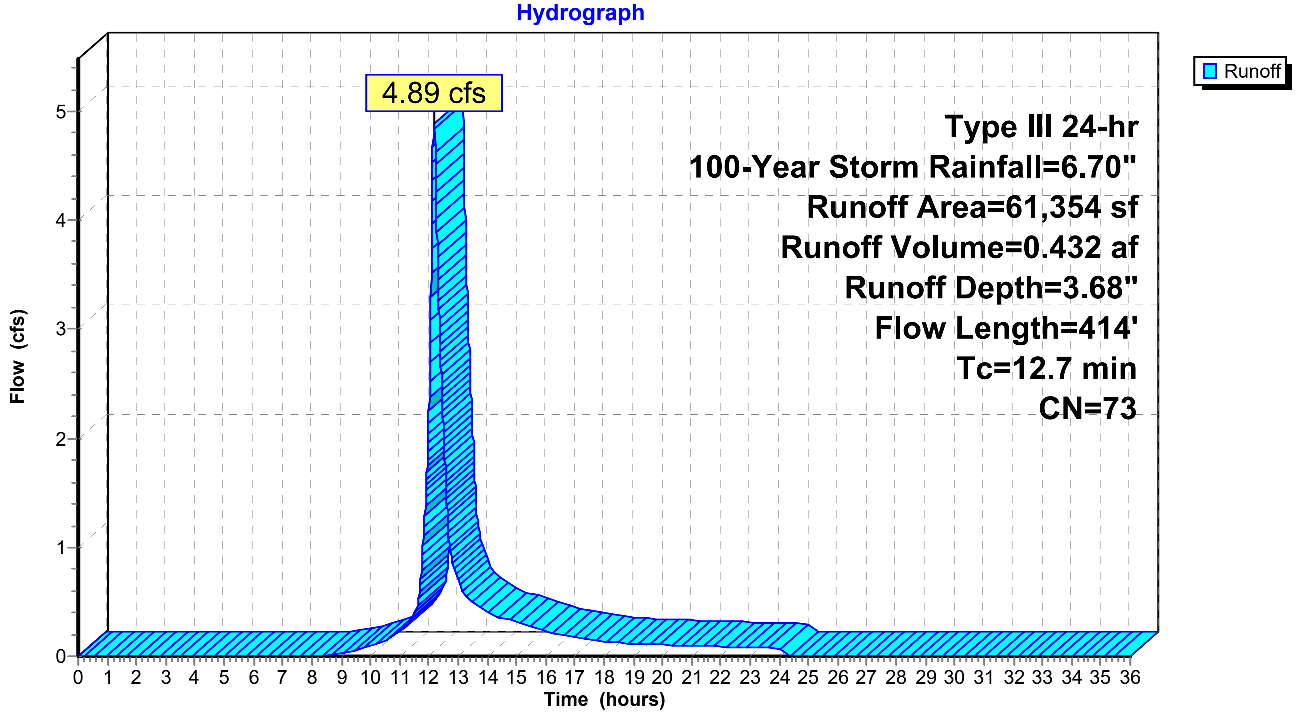
Runoff = 4.89 cfs @ 12.18 hrs, Volume= 0.432 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
24,200	98	Paved parking, HSG A
5,193	98	Paved parking, HSG B
6,461	39	>75% Grass cover, Good, HSG A
7,570	61	>75% Grass cover, Good, HSG B
3,461	30	Woods, Good, HSG A
14,469	55	Woods, Good, HSG B
61,354	73	Weighted Average
31,961		52.09% Pervious Area
29,393		47.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	61	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	180	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	44	0.0400	1.80		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
0.6	129	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.7	414	Total			

Subcatchment 18P: P1g



Summary for Pond 19P: CB7

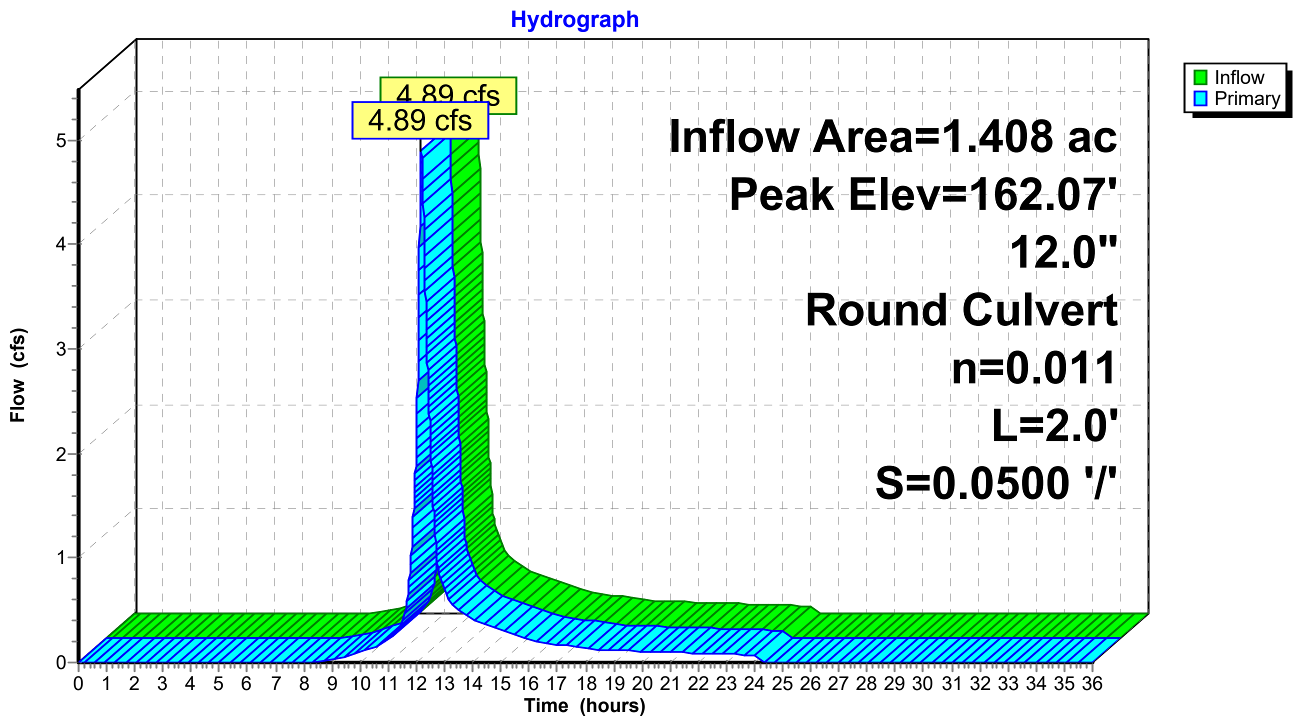
Inflow Area =	1.408 ac,	47.91% Impervious,	Inflow Depth = 3.68"	for 100-Year Storm event	
Inflow =	4.89 cfs @	12.18 hrs,	Volume=	0.432 af	
Outflow =	4.89 cfs @	12.18 hrs,	Volume=	0.432 af,	Atten= 0%, Lag= 0.0 min
Primary =	4.89 cfs @	12.18 hrs,	Volume=	0.432 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 162.07' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	159.90'	**12.0" Round Culvert** L= 2.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.90' / 159.80' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=4.89 cfs @ 12.18 hrs HW=162.07' (Free Discharge)
└─**1=Culvert** (Inlet Controls 4.89 cfs @ 6.23 fps)

Pond 19P: CB7



Summary for Subcatchment 20P: P1h

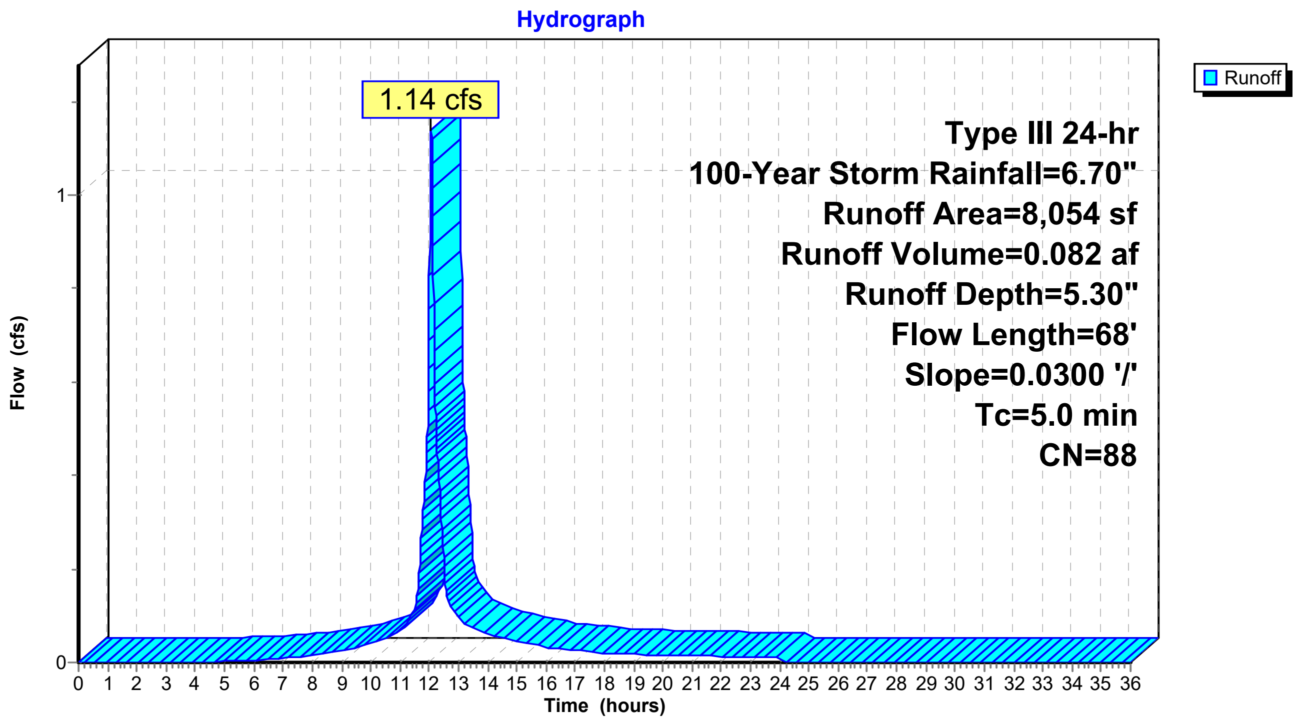
Runoff = 1.14 cfs @ 12.07 hrs, Volume= 0.082 af, Depth= 5.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
6,663	98	Paved parking, HSG A
1,391	39	>75% Grass cover, Good, HSG A
8,054	88	Weighted Average
1,391		17.27% Pervious Area
6,663		82.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	14	0.0300	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.6	54	0.0300	1.43		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
3.1	68	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 20P: P1h



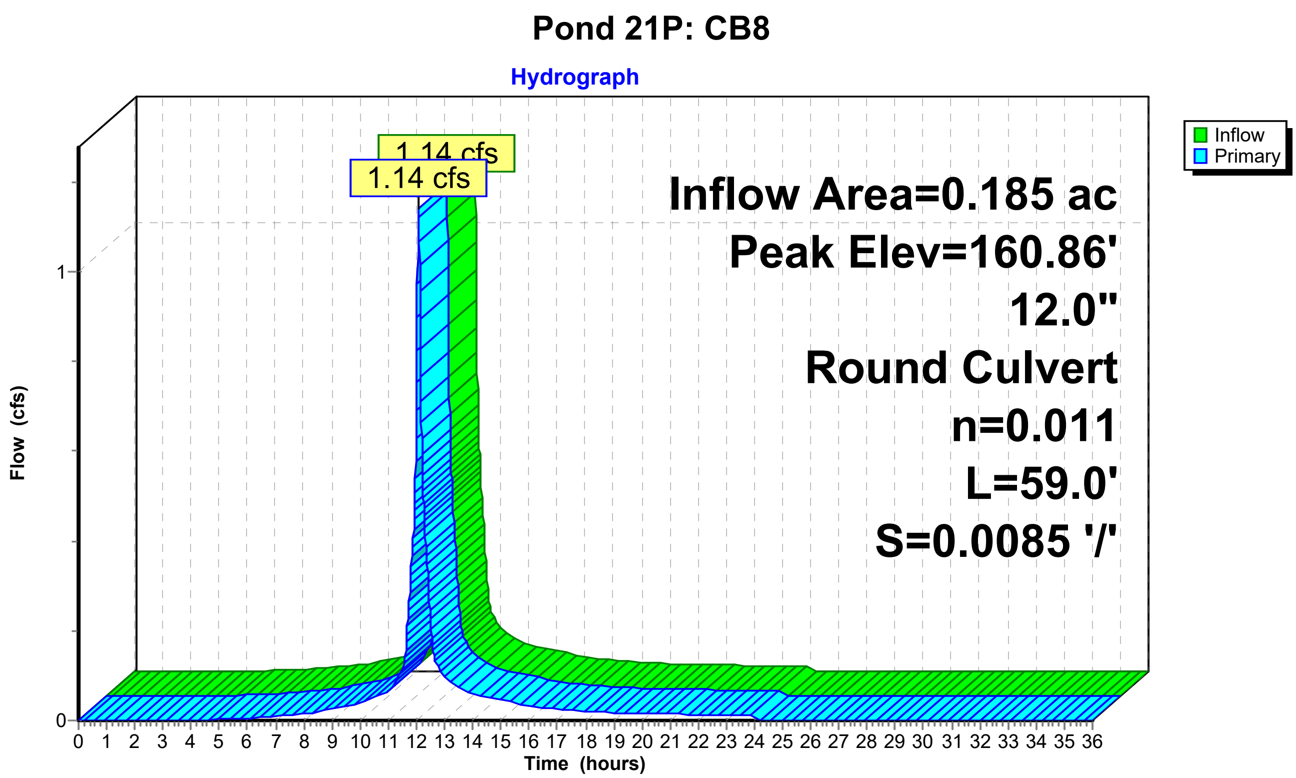
Summary for Pond 21P: CB8

Inflow Area =	0.185 ac, 82.73% Impervious,	Inflow Depth = 5.30"	for 100-Year Storm event	
Inflow =	1.14 cfs @	12.07 hrs, Volume=	0.082 af	
Outflow =	1.14 cfs @	12.07 hrs, Volume=	0.082 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.14 cfs @	12.07 hrs, Volume=	0.082 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.86' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	160.30'	**12.0" Round Culvert** L= 59.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 160.30' / 159.80' S= 0.0085 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.14 cfs @ 12.07 hrs HW=160.86' (Free Discharge)
└─**1=Culvert** (Barrel Controls 1.14 cfs @ 3.67 fps)



Summary for Pond 22P: DMH8&9

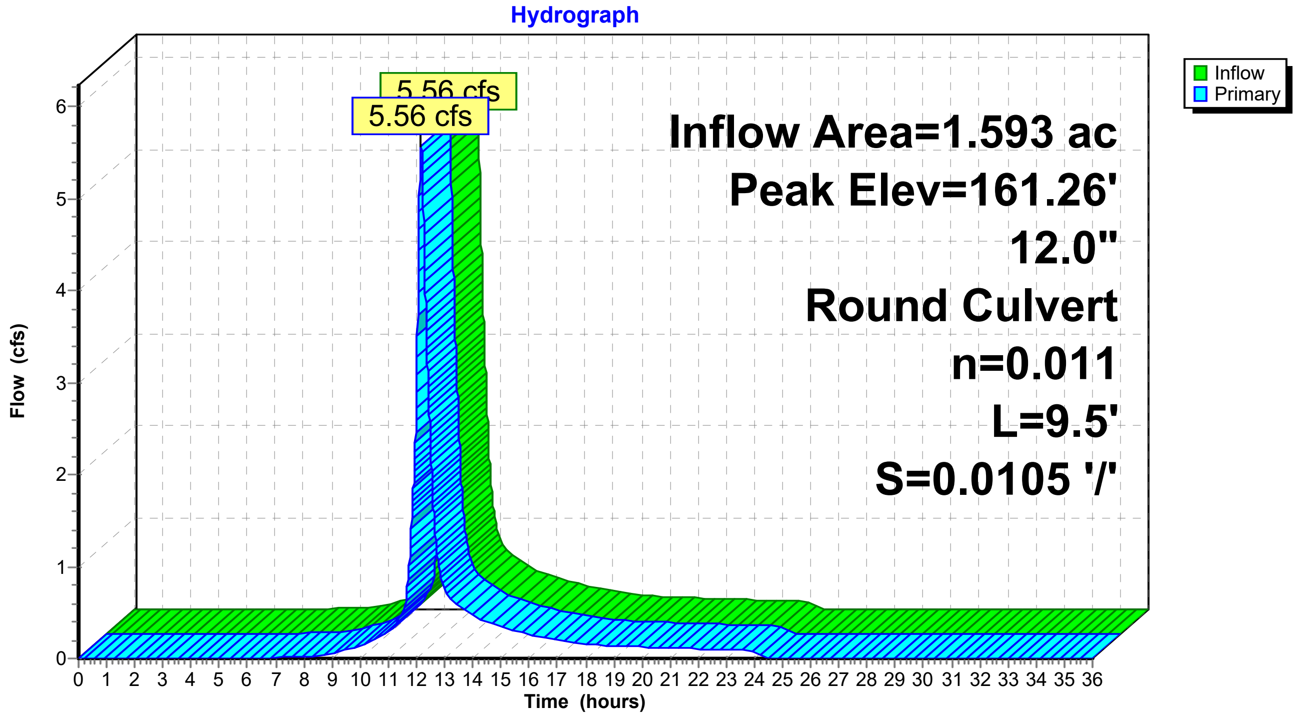
Inflow Area = 1.593 ac, 51.95% Impervious, Inflow Depth = 3.87" for 100-Year Storm event
Inflow = 5.56 cfs @ 12.16 hrs, Volume= 0.513 af
Outflow = 5.56 cfs @ 12.16 hrs, Volume= 0.513 af, Atten= 0%, Lag= 0.0 min
Primary = 5.56 cfs @ 12.16 hrs, Volume= 0.513 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 161.26' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.60'	**12.0" Round Culvert** L= 9.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.60' / 158.50' S= 0.0105 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=5.56 cfs @ 12.16 hrs HW=161.26' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 5.56 cfs @ 7.08 fps)

Pond 22P: DMH8&9



Summary for Subcatchment 23P: P1i

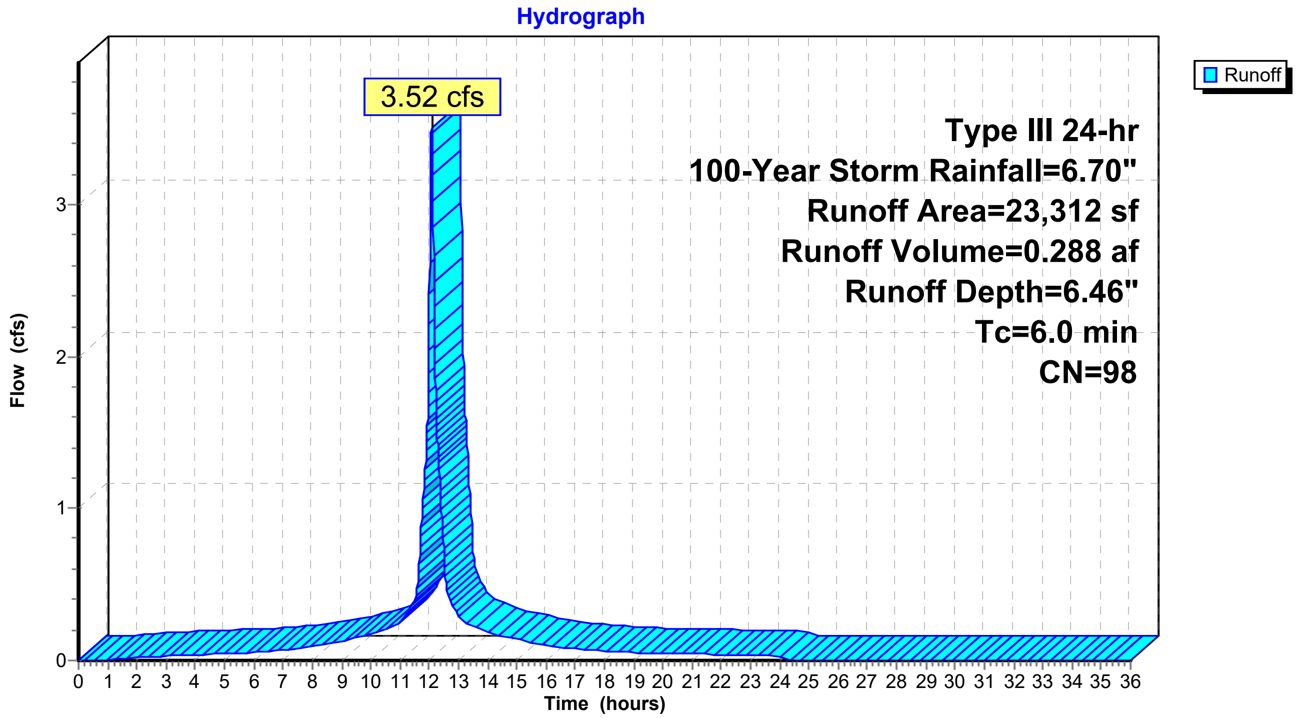
Runoff = 3.52 cfs @ 12.08 hrs, Volume= 0.288 af, Depth= 6.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
23,312	98	Unconnected roofs, HSG A
23,312		100.00% Impervious Area
23,312		100.00% Unconnected

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

Subcatchment 23P: P1i



Summary for Pond 24P: Roof Pipe

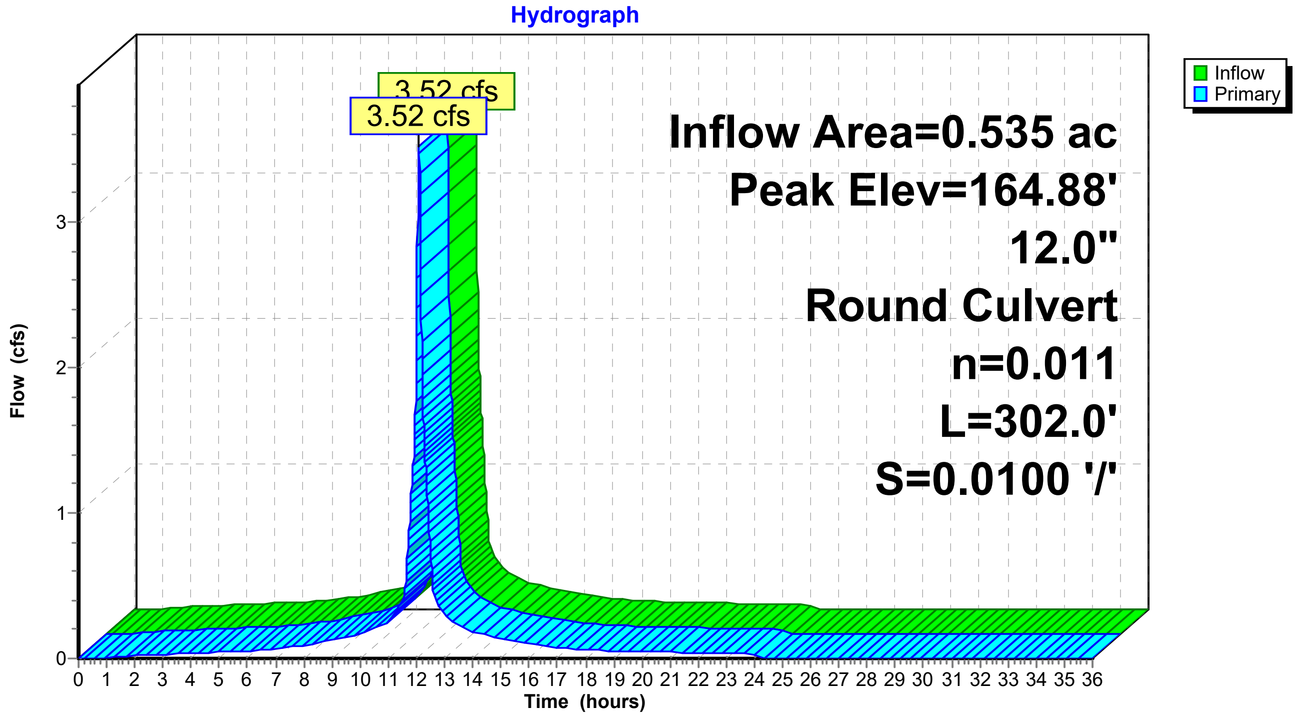
Inflow Area =	0.535 ac,100.00% Impervious,	Inflow Depth = 6.46"	for 100-Year Storm event	
Inflow =	3.52 cfs @	12.08 hrs, Volume=	0.288 af	
Outflow =	3.52 cfs @	12.08 hrs, Volume=	0.288 af,	Atten= 0%, Lag= 0.0 min
Primary =	3.52 cfs @	12.08 hrs, Volume=	0.288 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 164.88' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	163.52'	**12.0" Round Culvert** L= 302.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 163.52' / 160.50' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=3.51 cfs @ 12.08 hrs HW=164.88' (Free Discharge)
└─**1=Culvert** (Inlet Controls 3.51 cfs @ 4.47 fps)

Pond 24P: Roof Pipe



Summary for Pond 25P: Infiltration Field #1

Inflow Area =	9.163 ac,	37.61% Impervious,	Inflow Depth = 3.51"	for 100-Year Storm event
Inflow =	26.86 cfs @	12.18 hrs, Volume=	2.682 af	
Outflow =	10.85 cfs @	12.56 hrs, Volume=	2.682 af,	Atten= 60%, Lag= 23.2 min
Discarded =	2.61 cfs @	11.61 hrs, Volume=	1.814 af	
Primary =	8.24 cfs @	12.56 hrs, Volume=	0.868 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 161.54' @ 12.56 hrs Surf.Area= 13,609 sf Storage= 31,235 cf

Plug-Flow detention time= 35.8 min calculated for 2.682 af (100% of inflow)
Center-of-Mass det. time= 35.7 min (863.4 - 827.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	158.00'	11,308 cf	**166.83'W x 81.50'L x 3.54'H Field A** 48,156 cf Overall - 19,887 cf Embedded = 28,269 cf x 40.0% Voids
#2A	158.50'	19,887 cf	**Cultec R-330XLHD** x 374 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 34 rows
#3	158.00'	75 cf	**4.00'D x 6.00'H Vertical Cone/Cylinder**
		31,270 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	158.80'	**12.0" Round Culvert** L= 22.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.80' / 156.00' S= 0.1273 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#3	Primary	159.50'	**8.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.50' / 156.00' S= 0.3500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf
#4	Primary	161.20'	**12.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.20' / 161.00' S= 0.0054 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=2.61 cfs @ 11.61 hrs HW=158.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 2.61 cfs)

Primary OutFlow Max=8.24 cfs @ 12.56 hrs HW=161.54' (Free Discharge)
├─**2=Culvert** (Inlet Controls 5.66 cfs @ 7.21 fps)
├─**3=Culvert** (Inlet Controls 2.20 cfs @ 6.29 fps)
└─**4=Culvert** (Barrel Controls 0.38 cfs @ 2.41 fps)

Pond 25P: Infiltration Field #1 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 34 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

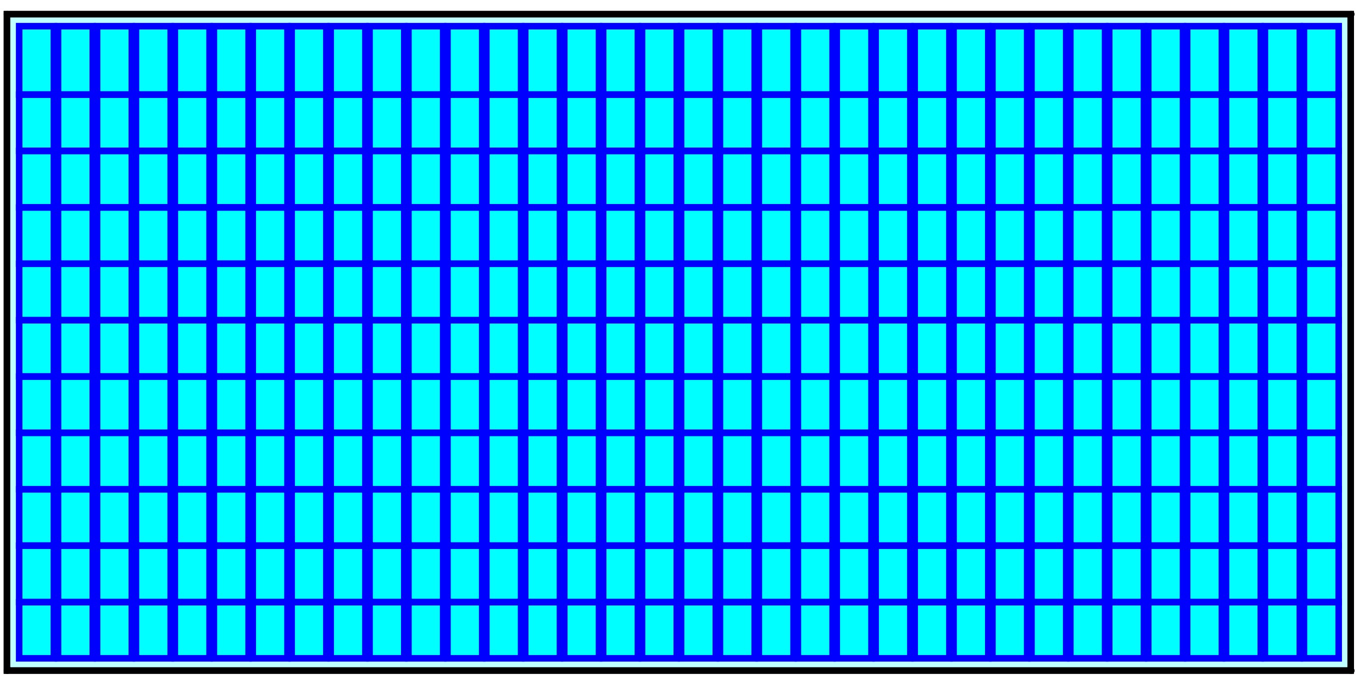
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +18.0" End Stone x 2 = 81.50' Base Length
34 Rows x 52.0" Wide + 6.0" Spacing x 33 + 18.0" Side Stone x 2 = 166.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

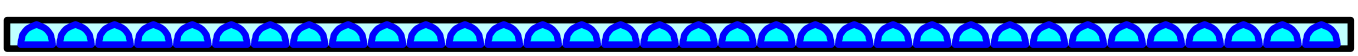
374 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 34 Rows = 19,886.7 cf Chamber Storage

48,155.7 cf Field - 19,886.7 cf Chambers = 28,269.0 cf Stone x 40.0% Voids = 11,307.6 cf Stone Storage

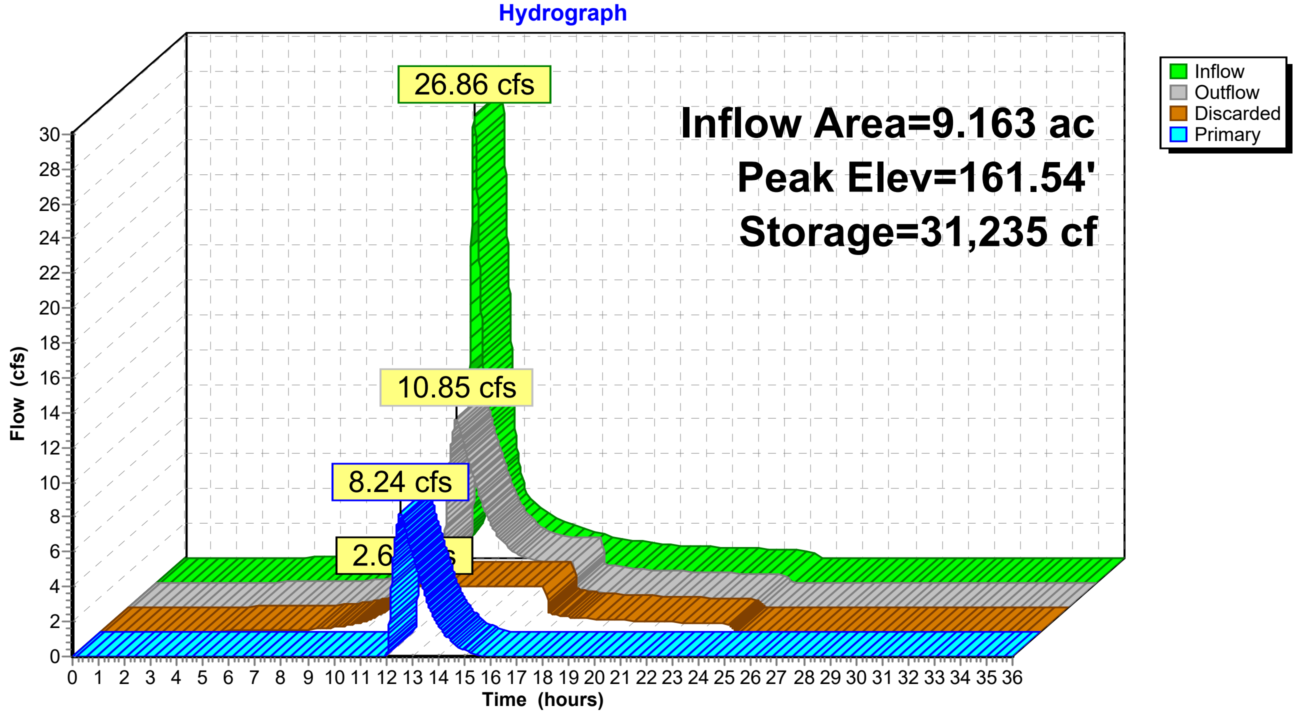
Chamber Storage + Stone Storage = 31,194.3 cf = 0.716 af
Overall Storage Efficiency = 64.8%
Overall System Size = 81.50' x 166.83' x 3.54'

374 Chambers
1,783.5 cy Field
1,047.0 cy Stone





Pond 25P: Infiltration Field #1



Summary for Subcatchment 26P: P2f

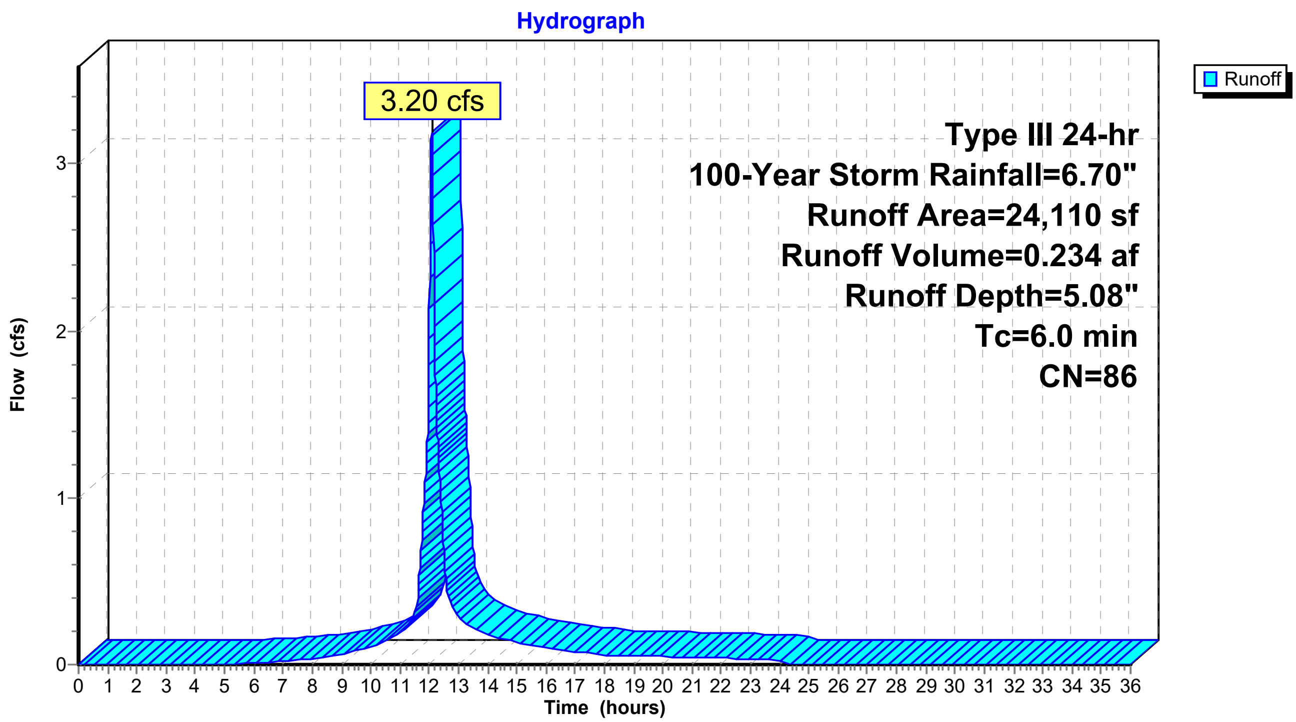
Runoff = 3.20 cfs @ 12.09 hrs, Volume= 0.234 af, Depth= 5.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
5,626	98	Roofs, HSG A
11,048	98	Roofs, HSG B
534	98	Paved parking, HSG B
1,966	39	>75% Grass cover, Good, HSG A
4,936	61	>75% Grass cover, Good, HSG B
24,110	86	Weighted Average
6,902		28.63% Pervious Area
17,208		71.37% Impervious Area

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

Subcatchment 26P: P2f



Summary for Subcatchment 27P: P2a

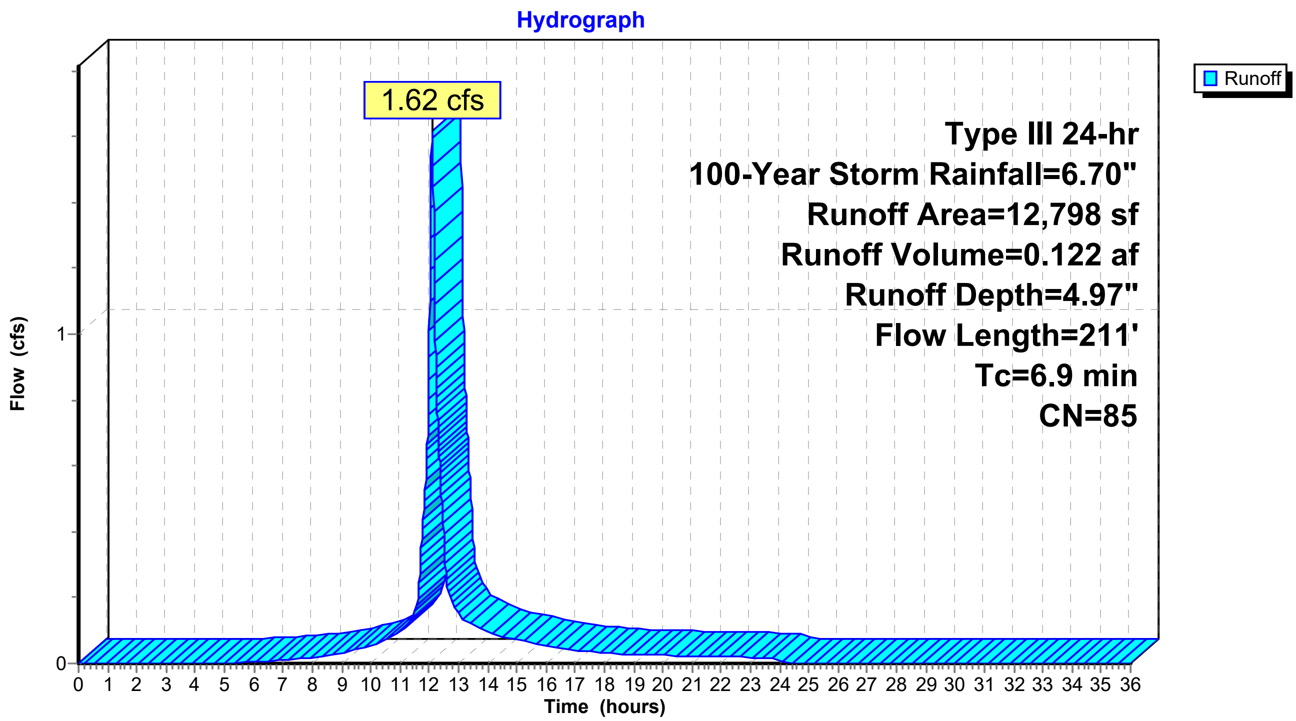
Runoff = 1.62 cfs @ 12.10 hrs, Volume= 0.122 af, Depth= 4.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
3,281	98	Paved parking, HSG A
5,437	98	Paved parking, HSG B
790	39	>75% Grass cover, Good, HSG A
3,290	61	>75% Grass cover, Good, HSG B
12,798	85	Weighted Average
4,080		31.88% Pervious Area
8,718		68.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	66	0.0700	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.7	145	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
6.9	211	Total			

Subcatchment 27P: P2a



Summary for Pond 28P: CB9

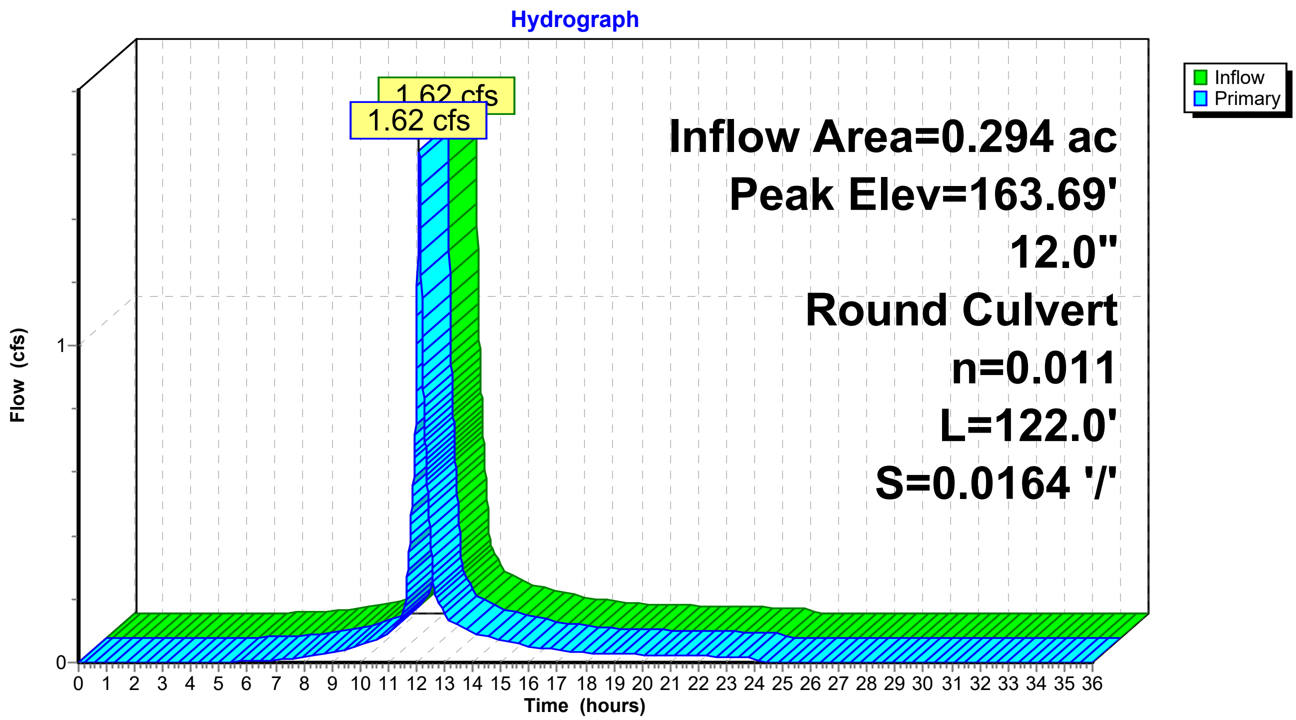
Inflow Area =		0.294 ac,	68.12% Impervious,	Inflow Depth = 4.97"	for 100-Year Storm event	
Inflow	=	1.62 cfs @	12.10 hrs,	Volume=	0.122 af	
Outflow	=	1.62 cfs @	12.10 hrs,	Volume=	0.122 af,	Atten= 0%, Lag= 0.0 min
Primary	=	1.62 cfs @	12.10 hrs,	Volume=	0.122 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 163.69' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	163.00'	**12.0" Round Culvert** L= 122.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 163.00' / 161.00' S= 0.0164 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.61 cfs @ 12.10 hrs HW=163.68' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 1.61 cfs @ 2.82 fps)

Pond 28P: CB9



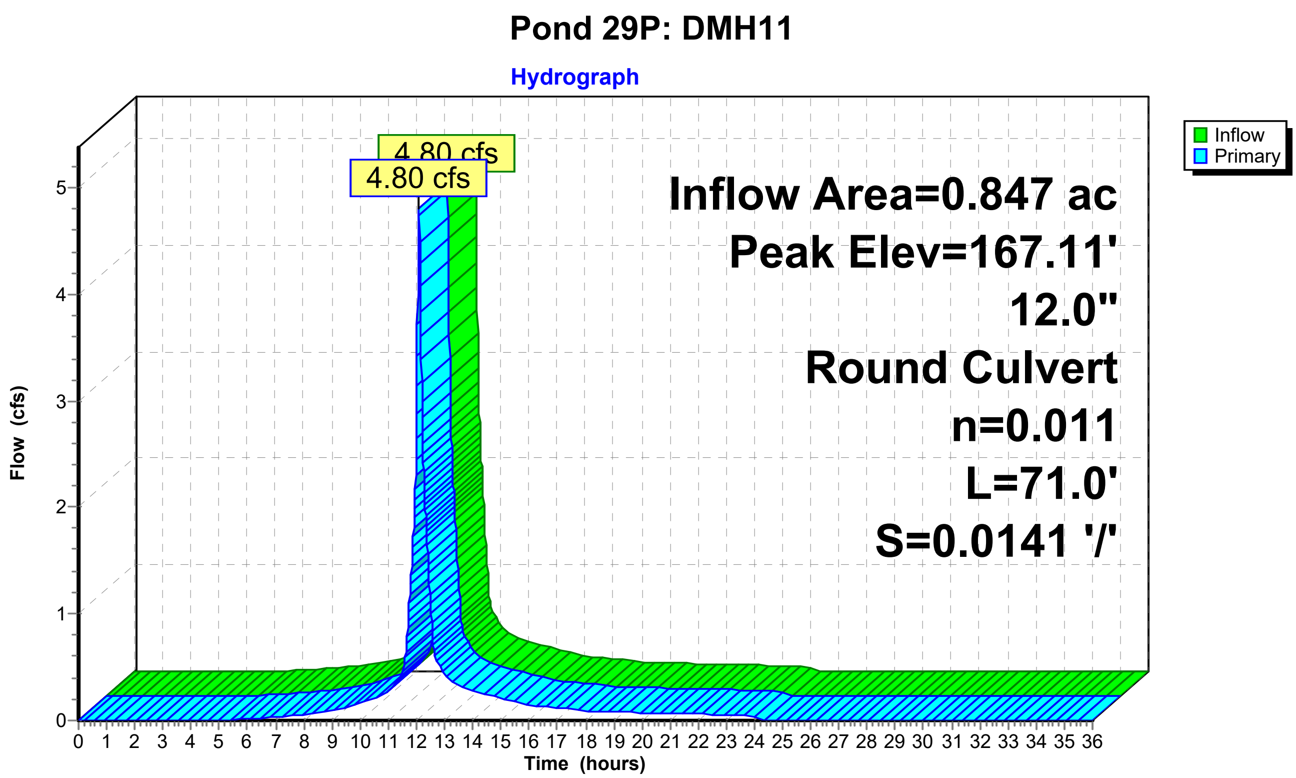
Summary for Pond 29P: DMH11

Inflow Area =	0.847 ac,	70.24% Impervious,	Inflow Depth =	5.04"	for 100-Year Storm event
Inflow =	4.80 cfs @	12.09 hrs,	Volume=	0.356 af	
Outflow =	4.80 cfs @	12.09 hrs,	Volume=	0.356 af,	Atten= 0%, Lag= 0.0 min
Primary =	4.80 cfs @	12.09 hrs,	Volume=	0.356 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 167.11' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	165.00'	**12.0" Round Culvert** L= 71.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.00' / 164.00' S= 0.0141 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=4.80 cfs @ 12.09 hrs HW=167.11' (Free Discharge)
└─**1=Culvert** (Inlet Controls 4.80 cfs @ 6.11 fps)



Summary for Subcatchment 30P: P2b

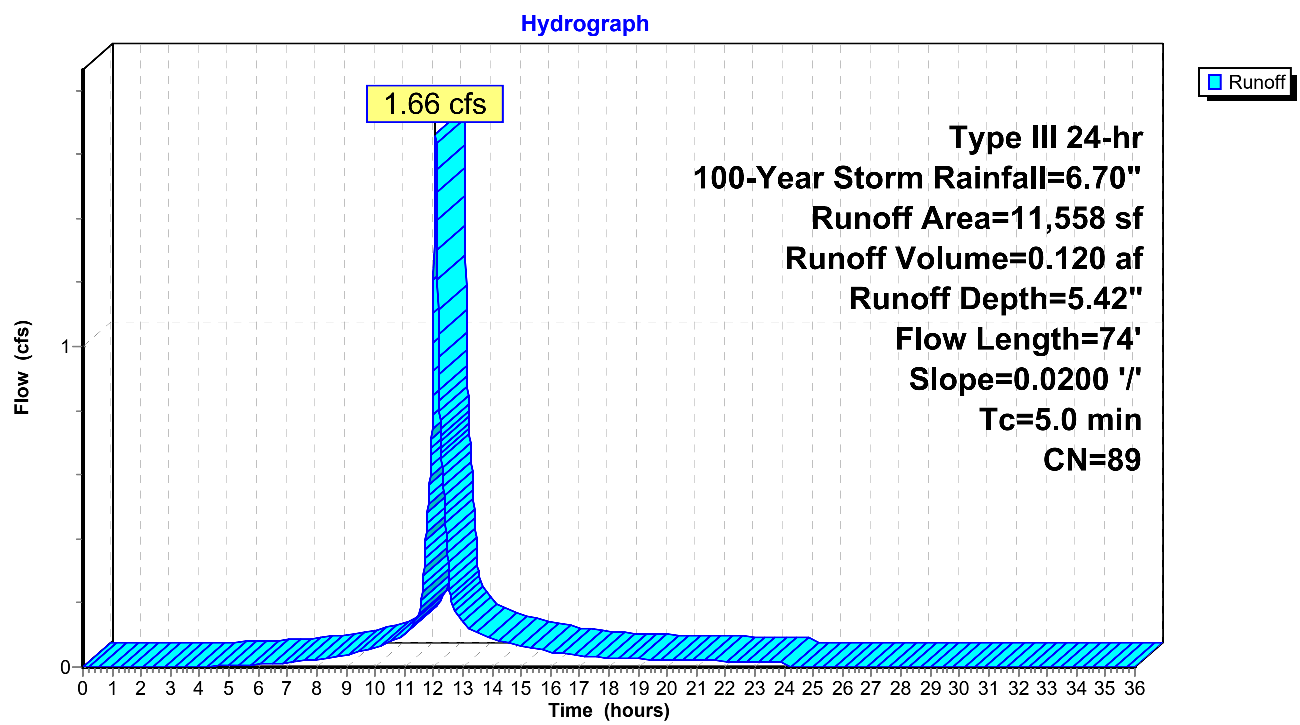
Runoff = 1.66 cfs @ 12.07 hrs, Volume= 0.120 af, Depth= 5.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
9,822	98	Paved parking, HSG A
1,736	39	>75% Grass cover, Good, HSG A
11,558	89	Weighted Average
1,736		15.02% Pervious Area
9,822		84.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	14	0.0200	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.8	60	0.0200	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
3.8	74	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 30P: P2b



Summary for Pond 31P: CB10

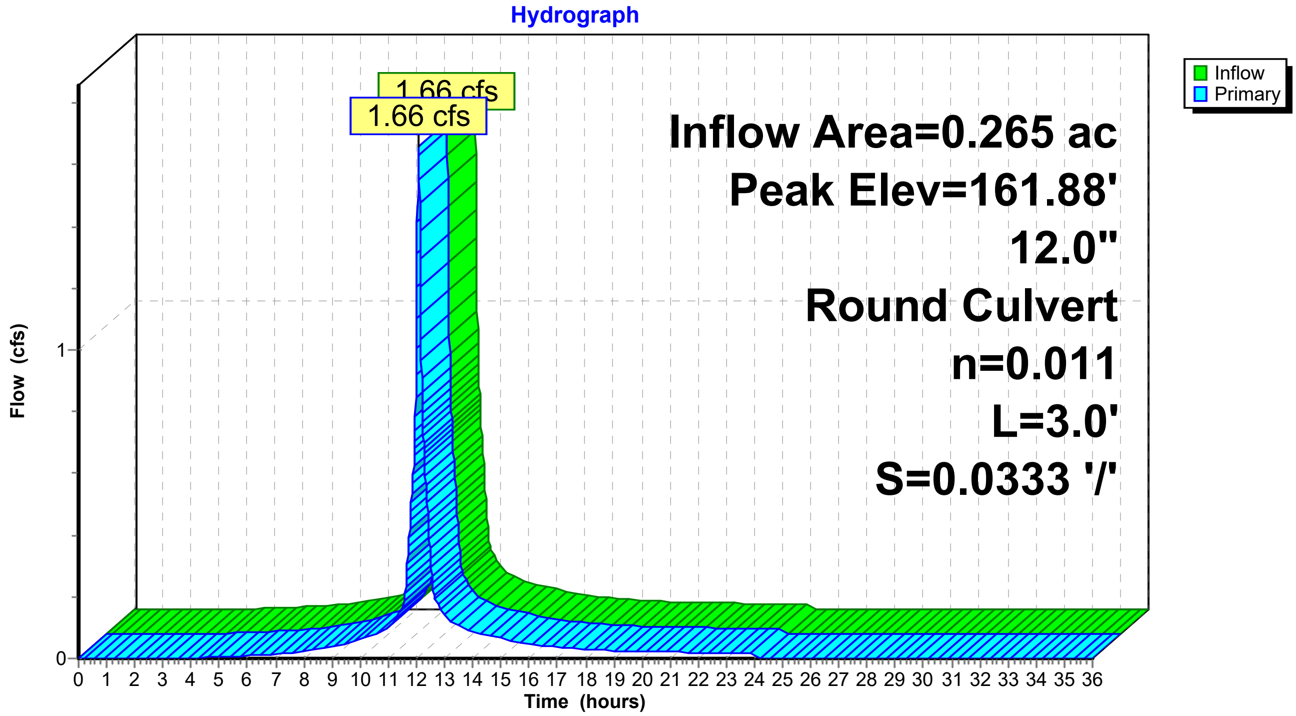
Inflow Area =	0.265 ac,	84.98% Impervious,	Inflow Depth = 5.42"	for 100-Year Storm event
Inflow =	1.66 cfs @	12.07 hrs, Volume=	0.120 af	
Outflow =	1.66 cfs @	12.07 hrs, Volume=	0.120 af, Atten= 0%, Lag= 0.0 min	
Primary =	1.66 cfs @	12.07 hrs, Volume=	0.120 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 161.88' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	161.10'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.10' / 161.00' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.66 cfs @ 12.07 hrs HW=161.88' (Free Discharge)
└─**1=Culvert** (Barrel Controls 1.66 cfs @ 3.49 fps)

Pond 31P: CB10



Summary for Pond 32P: DMH12

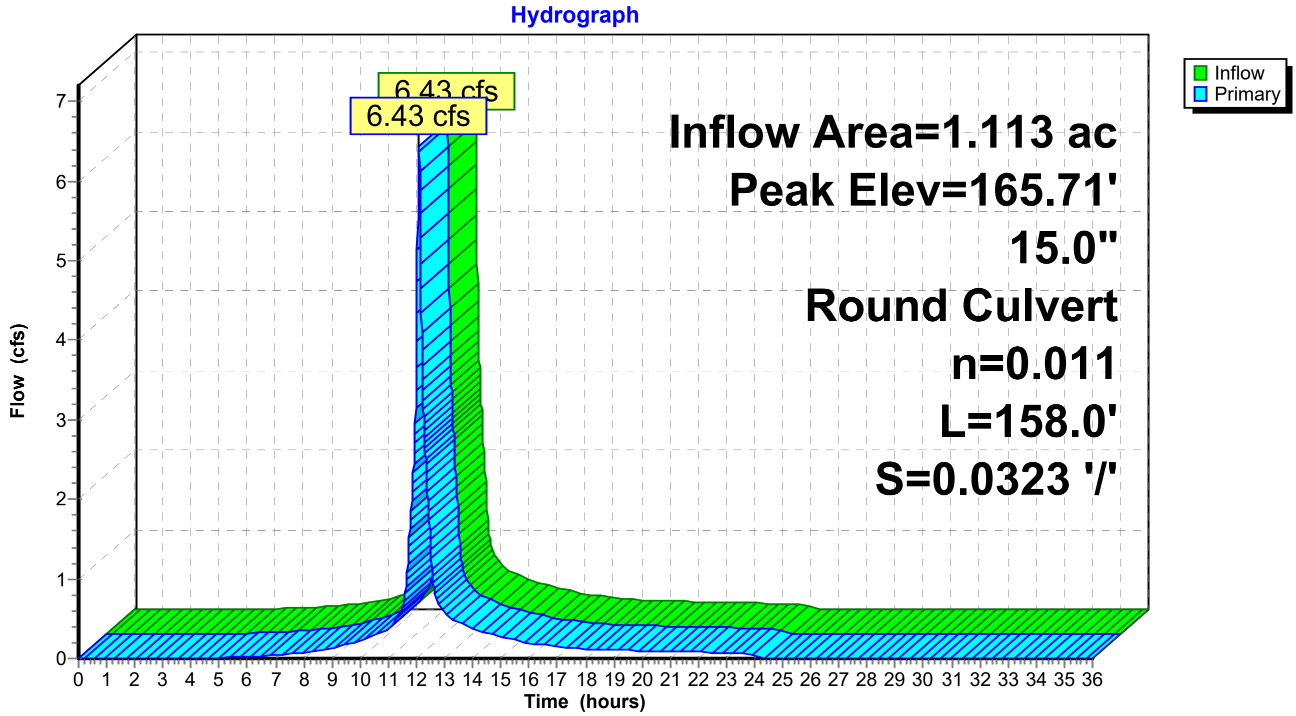
Inflow Area = 1.113 ac, 73.76% Impervious, Inflow Depth = 5.13" for 100-Year Storm event
Inflow = 6.43 cfs @ 12.08 hrs, Volume= 0.476 af
Outflow = 6.43 cfs @ 12.08 hrs, Volume= 0.476 af, Atten= 0%, Lag= 0.0 min
Primary = 6.43 cfs @ 12.08 hrs, Volume= 0.476 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 165.71' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	163.90'	**15.0" Round Culvert** L= 158.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 163.90' / 158.80' S= 0.0323 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf

Primary OutFlow Max=6.42 cfs @ 12.08 hrs HW=165.71' (Free Discharge)
└─**1=Culvert** (Inlet Controls 6.42 cfs @ 5.23 fps)

Pond 32P: DMH12



Summary for Pond 33P: FD/DMH13&14

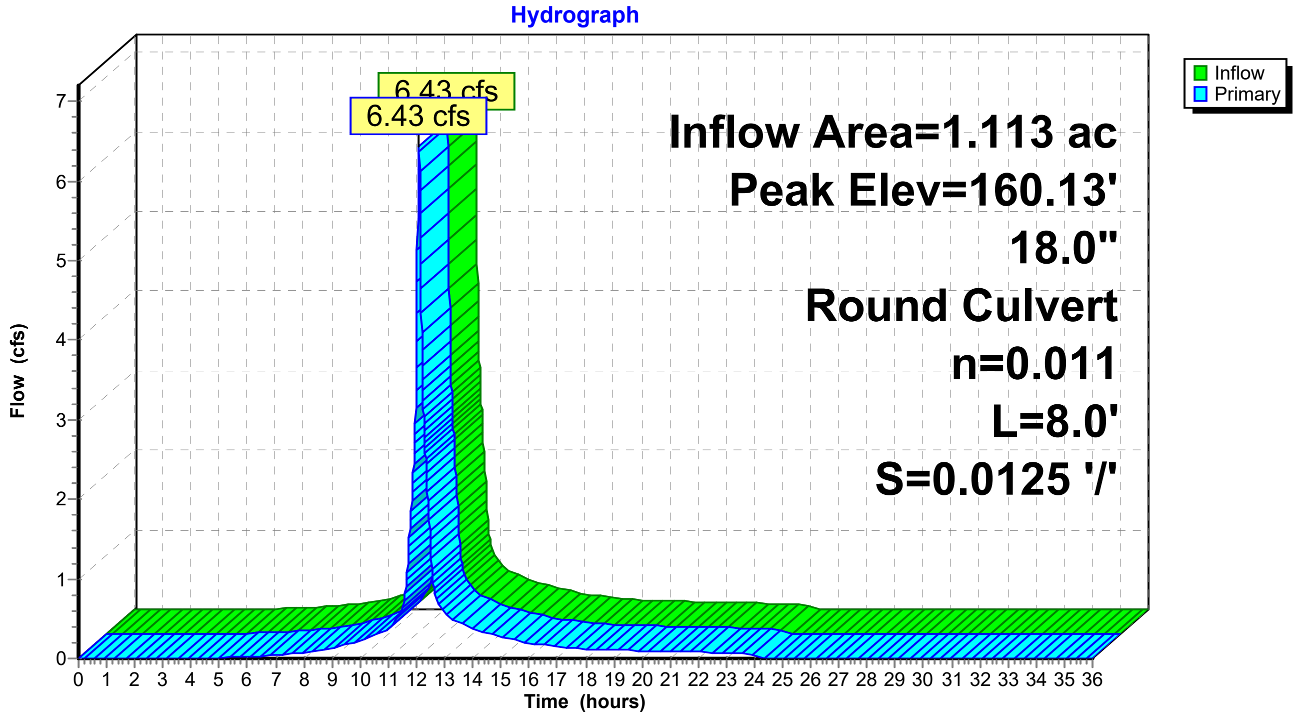
Inflow Area =	1.113 ac,	73.76% Impervious,	Inflow Depth = 5.13"	for 100-Year Storm event
Inflow =	6.43 cfs @	12.08 hrs, Volume=	0.476 af	
Outflow =	6.43 cfs @	12.08 hrs, Volume=	0.476 af,	Atten= 0%, Lag= 0.0 min
Primary =	6.43 cfs @	12.08 hrs, Volume=	0.476 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.13' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.60'	**18.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.60' / 158.50' S= 0.0125 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=6.42 cfs @ 12.08 hrs HW=160.13' (Free Discharge)
↑**1=Culvert** (Barrel Controls 6.42 cfs @ 4.43 fps)

Pond 33P: FD/DMH13&14



Summary for Subcatchment 34P: P2c

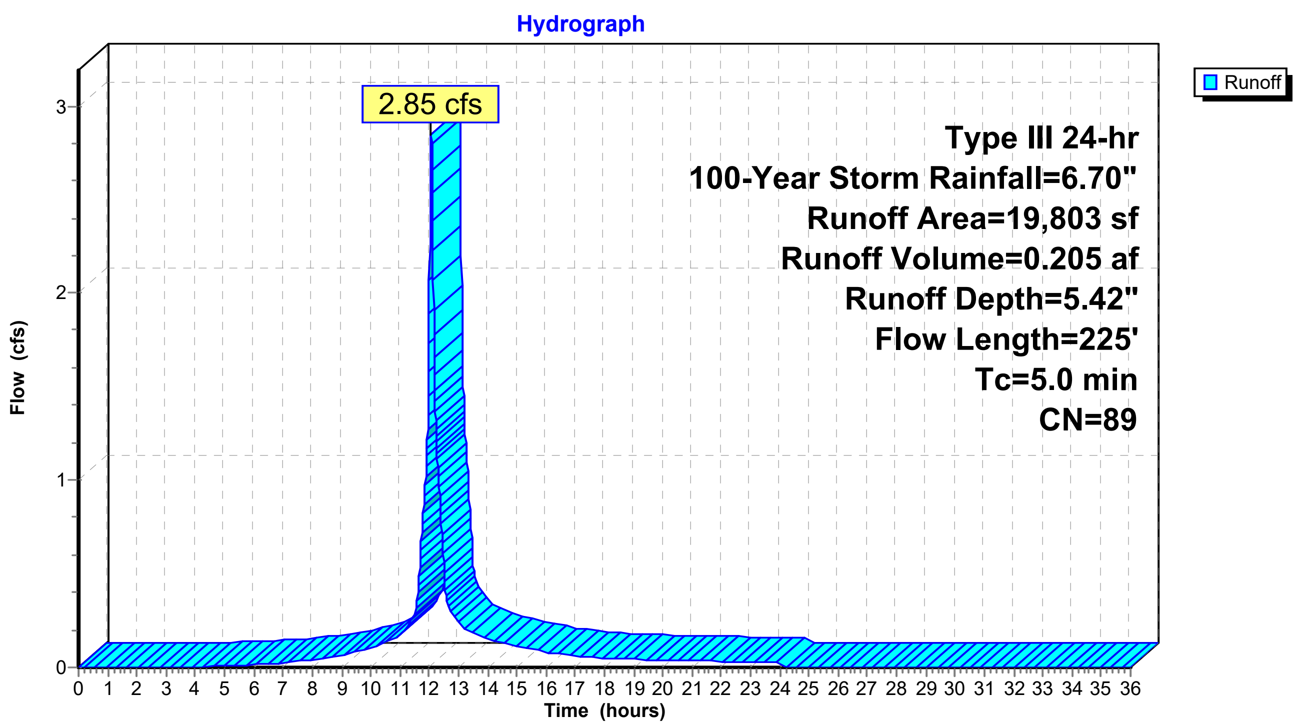
Runoff = 2.85 cfs @ 12.07 hrs, Volume= 0.205 af, Depth= 5.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
16,654	98	Paved parking, HSG A
3,149	39	>75% Grass cover, Good, HSG A
19,803	89	Weighted Average
3,149		15.90% Pervious Area
16,654		84.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	15	0.0300	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
1.7	210	0.0400	2.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
4.4	225	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 34P: P2c



Summary for Pond 35P: FD/CB11

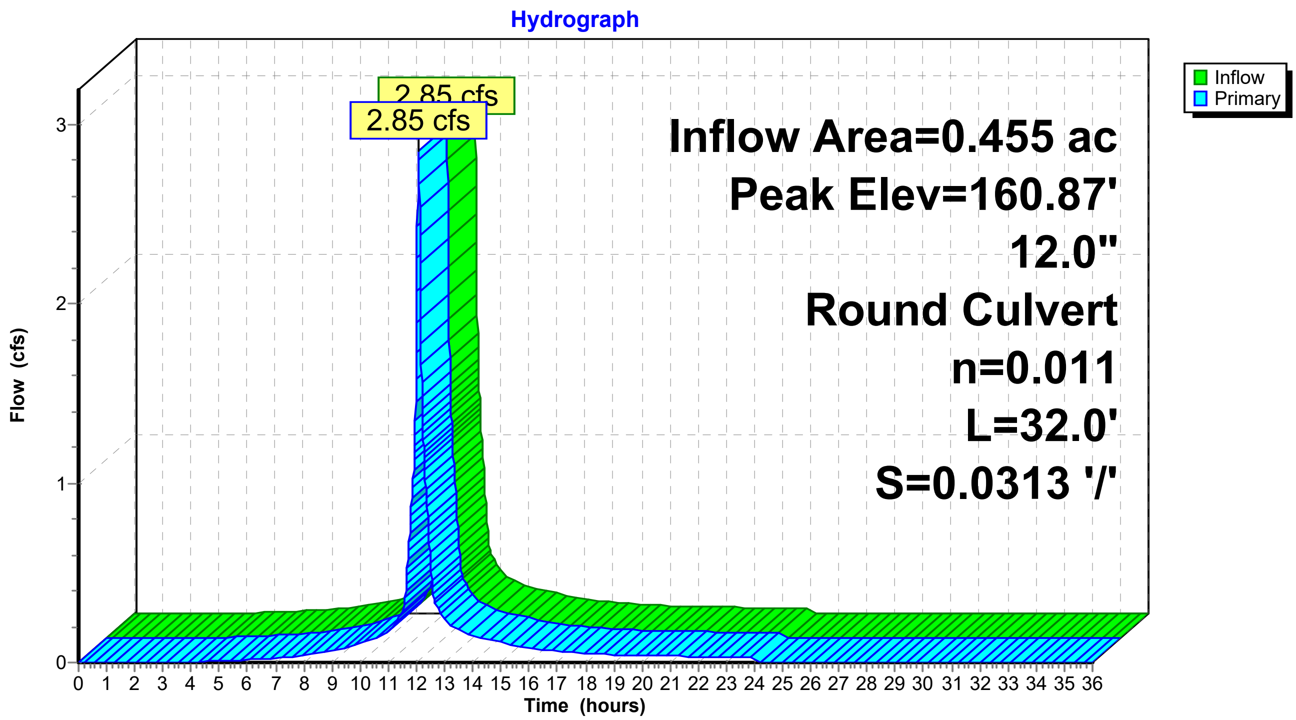
Inflow Area =	0.455 ac,	84.10% Impervious,	Inflow Depth = 5.42"	for 100-Year Storm event
Inflow =	2.85 cfs @	12.07 hrs, Volume=	0.205 af	
Outflow =	2.85 cfs @	12.07 hrs, Volume=	0.205 af,	Atten= 0%, Lag= 0.0 min
Primary =	2.85 cfs @	12.07 hrs, Volume=	0.205 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.87' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	159.80'	**12.0" Round Culvert** L= 32.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.80' / 158.80' S= 0.0313 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=2.85 cfs @ 12.07 hrs HW=160.87' (Free Discharge)
└─**1=Culvert** (Inlet Controls 2.85 cfs @ 3.63 fps)

Pond 35P: FD/CB11



Summary for Subcatchment 36P: P2d

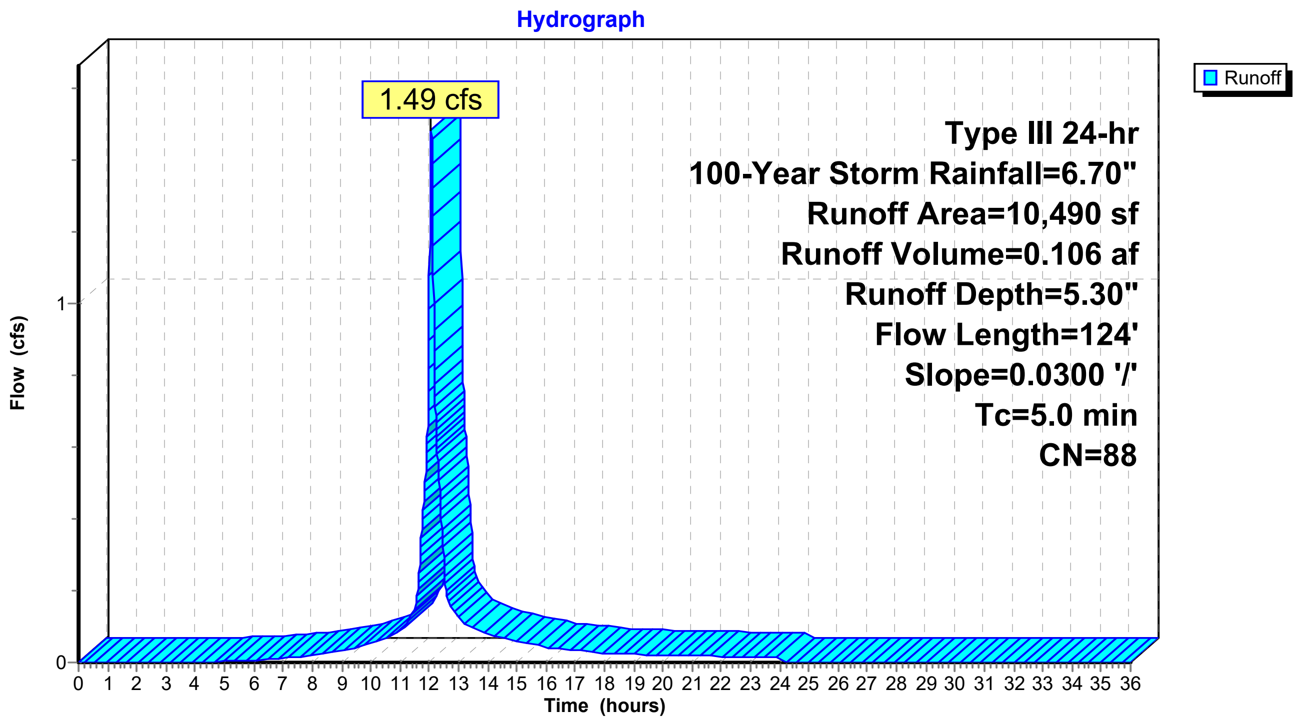
Runoff = 1.49 cfs @ 12.07 hrs, Volume= 0.106 af, Depth= 5.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
8,704	98	Paved parking, HSG A
1,786	39	>75% Grass cover, Good, HSG A
10,490	88	Weighted Average
1,786		17.03% Pervious Area
8,704		82.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	14	0.0300	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
1.1	110	0.0300	1.65		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
3.6	124	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 36P: P2d



Summary for Pond 37P: FD/CB12

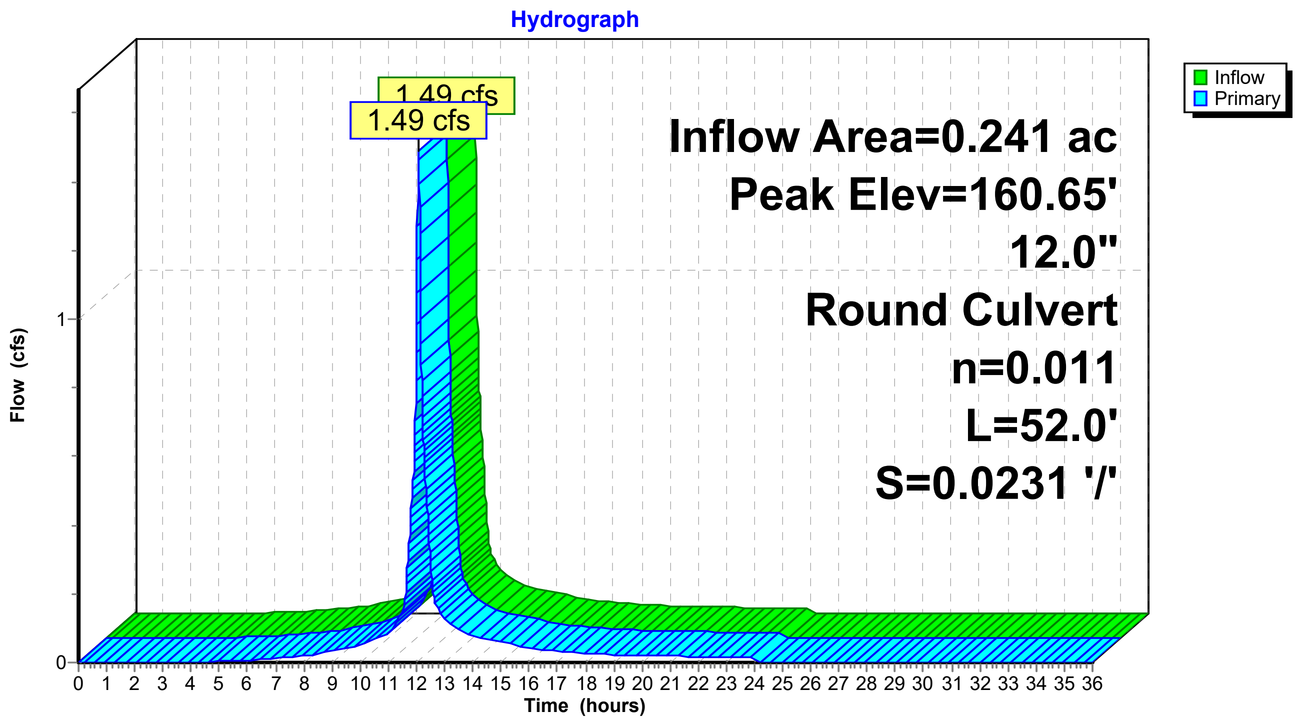
Inflow Area = 0.241 ac, 82.97% Impervious, Inflow Depth = 5.30" for 100-Year Storm event
Inflow = 1.49 cfs @ 12.07 hrs, Volume= 0.106 af
Outflow = 1.49 cfs @ 12.07 hrs, Volume= 0.106 af, Atten= 0%, Lag= 0.0 min
Primary = 1.49 cfs @ 12.07 hrs, Volume= 0.106 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.65' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	160.00'	**12.0" Round Culvert** L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 160.00' / 158.80' S= 0.0231 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.49 cfs @ 12.07 hrs HW=160.65' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.49 cfs @ 2.75 fps)

Pond 37P: FD/CB12



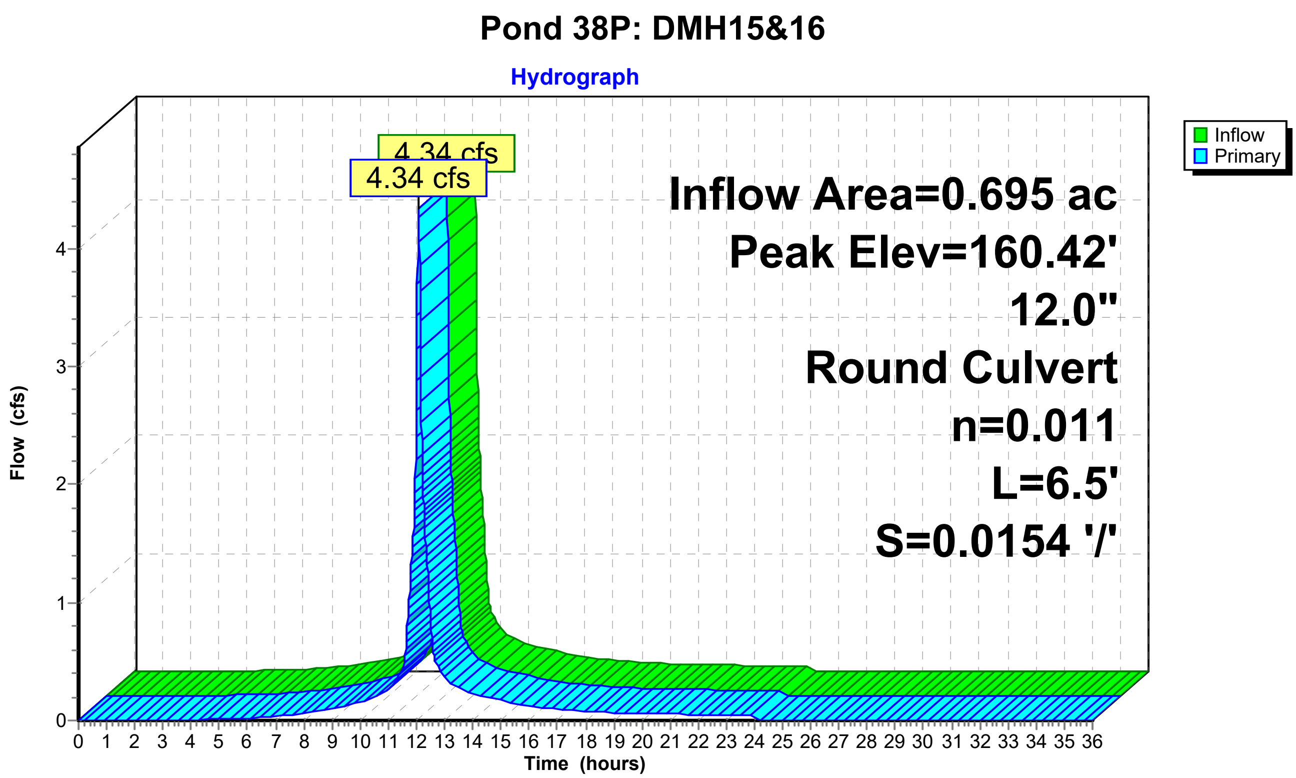
Summary for Pond 38P: DMH15&16

Inflow Area = 0.695 ac, 83.71% Impervious, Inflow Depth = 5.38" for 100-Year Storm event
Inflow = 4.34 cfs @ 12.07 hrs, Volume= 0.312 af
Outflow = 4.34 cfs @ 12.07 hrs, Volume= 0.312 af, Atten= 0%, Lag= 0.0 min
Primary = 4.34 cfs @ 12.07 hrs, Volume= 0.312 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.42' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	158.60'	**12.0" Round Culvert** L= 6.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.60' / 158.50' S= 0.0154 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=4.33 cfs @ 12.07 hrs HW=160.41' (Free Discharge)
└─**1=Culvert** (Inlet Controls 4.33 cfs @ 5.52 fps)



Summary for Subcatchment 39P: P2e

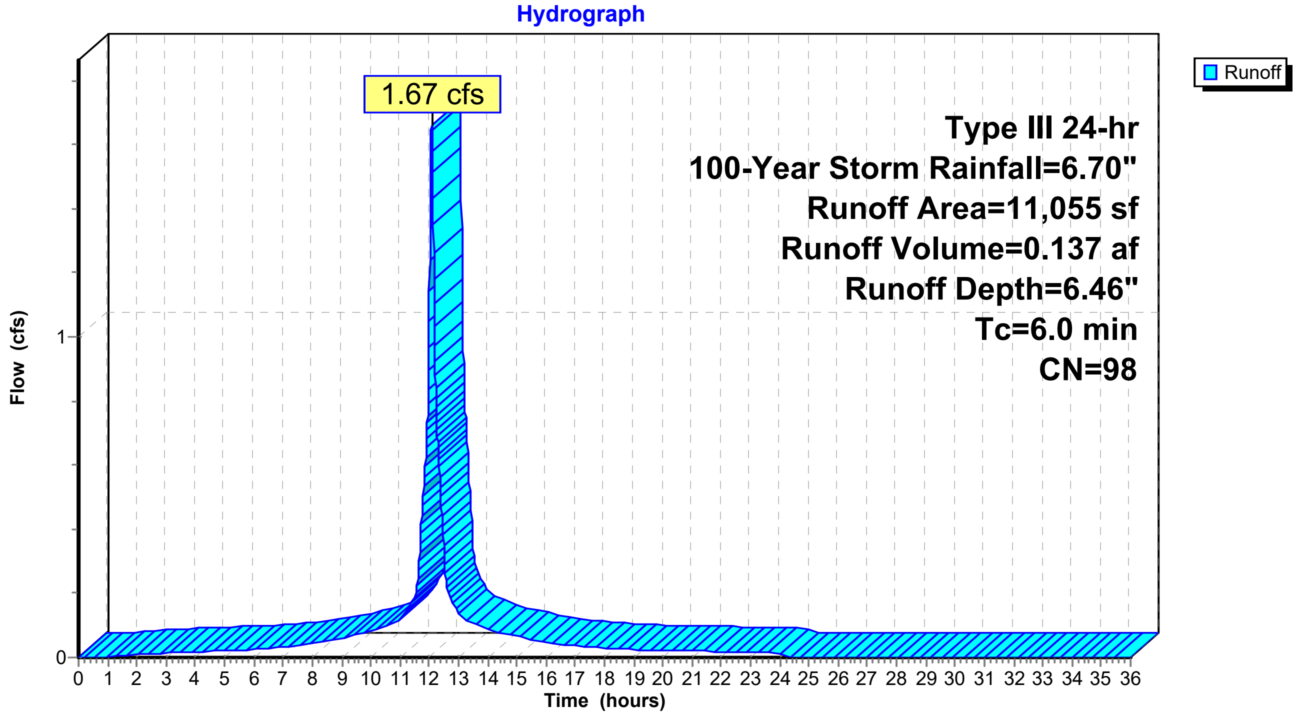
Runoff = 1.67 cfs @ 12.08 hrs, Volume= 0.137 af, Depth= 6.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
11,055	98	Roofs, HSG A
11,055		100.00% Impervious Area

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

Subcatchment 39P: P2e



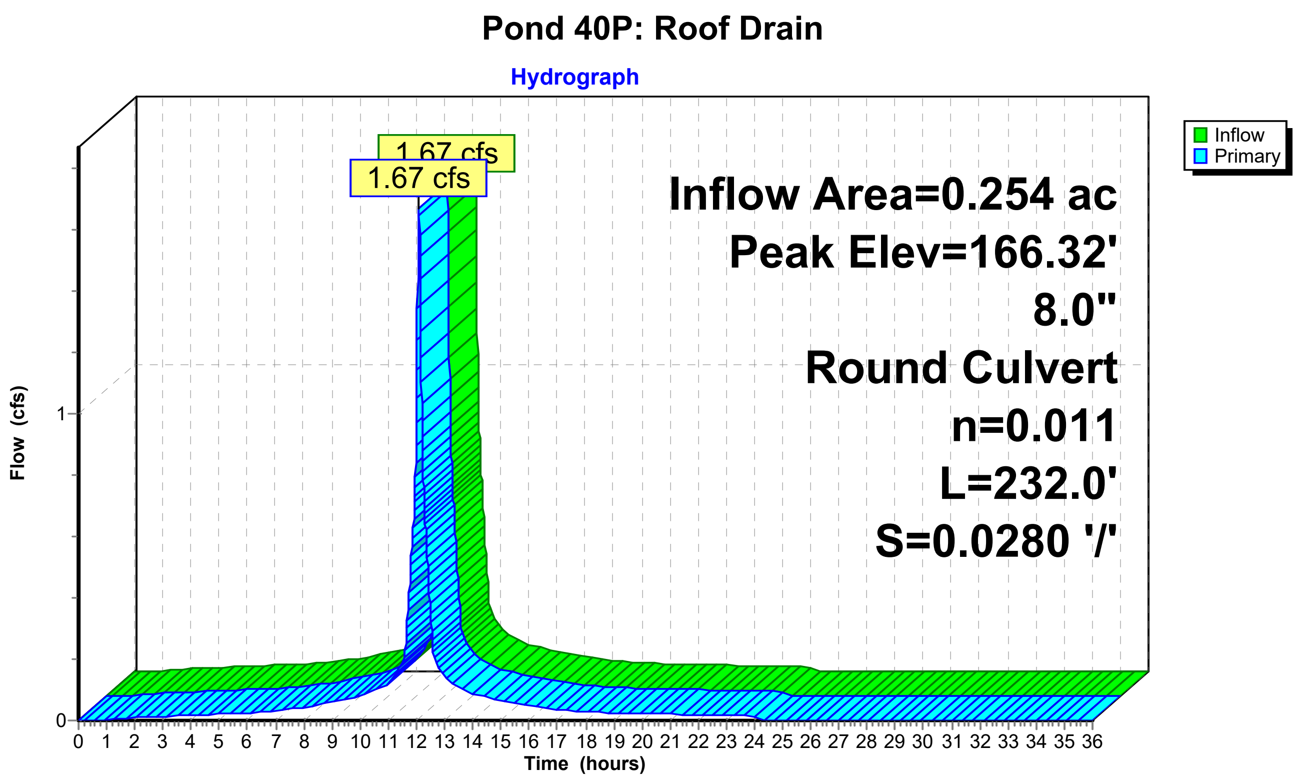
Summary for Pond 40P: Roof Drain

Inflow Area = 0.254 ac,100.00% Impervious, Inflow Depth = 6.46" for 100-Year Storm event
Inflow = 1.67 cfs @ 12.08 hrs, Volume= 0.137 af
Outflow = 1.67 cfs @ 12.08 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.0 min
Primary = 1.67 cfs @ 12.08 hrs, Volume= 0.137 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 166.32' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	165.00'	**8.0" Round Culvert** L= 232.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.00' / 158.50' S= 0.0280 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=1.67 cfs @ 12.08 hrs HW=166.31' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 1.67 cfs @ 4.77 fps)



Summary for Pond 41P: Infiltration Field #2

Inflow Area = 2.062 ac, 80.34% Impervious, Inflow Depth = 5.38" for 100-Year Storm event
Inflow = 12.40 cfs @ 12.08 hrs, Volume= 0.924 af
Outflow = 2.94 cfs @ 12.47 hrs, Volume= 0.924 af, Atten= 76%, Lag= 23.4 min
Discarded = 1.08 cfs @ 11.38 hrs, Volume= 0.763 af
Primary = 1.86 cfs @ 12.47 hrs, Volume= 0.161 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 161.49' @ 12.47 hrs Surf.Area= 5,635 sf Storage= 12,596 cf

Plug-Flow detention time= 52.4 min calculated for 0.924 af (100% of inflow)
Center-of-Mass det. time= 52.4 min (834.9 - 782.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	158.00'	4,829 cf	**142.67'W x 39.50'L x 3.54'H Field A** 19,958 cf Overall - 7,887 cf Embedded = 12,072 cf x 40.0% Voids
#2A	158.50'	7,887 cf	**Cultec R-330XLHD** x 145 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 29 rows
		12,716 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	158.91'	**4.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.91' / 157.00' S= 0.0455 '/' Cc= 0.900 n= 0.011, Flow Area= 0.09 sf
#3	Primary	160.90'	**12.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 160.90' / 157.00' S= 0.0929 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=1.08 cfs @ 11.38 hrs HW=158.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.08 cfs)

Primary OutFlow Max=1.86 cfs @ 12.47 hrs HW=161.49' (Free Discharge)
├─**2=Culvert** (Barrel Controls 0.60 cfs @ 6.92 fps)
└─**3=Culvert** (Inlet Controls 1.26 cfs @ 2.61 fps)

Pond 41P: Infiltration Field #2 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 29 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

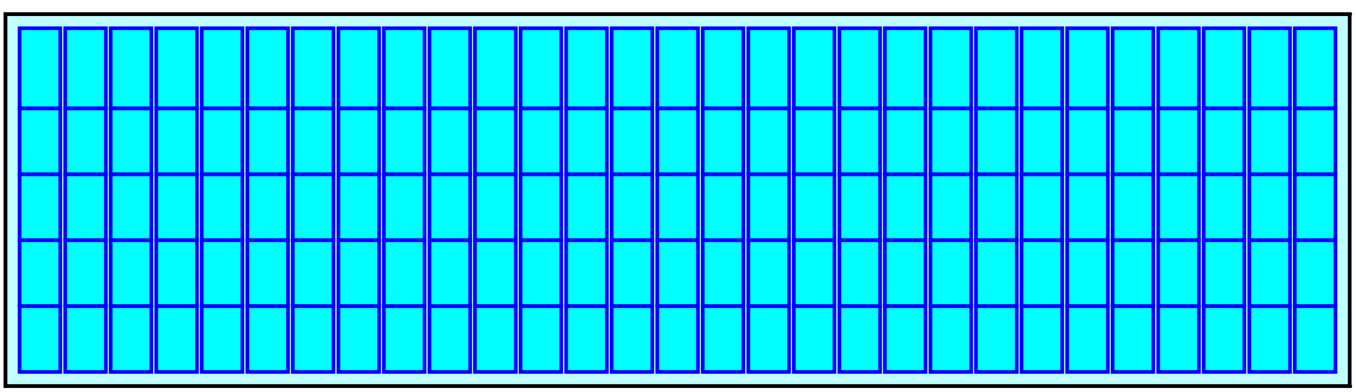
5 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 36.50' Row Length +18.0" End Stone x 2 = 39.50' Base Length
29 Rows x 52.0" Wide + 6.0" Spacing x 28 + 18.0" Side Stone x 2 = 142.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

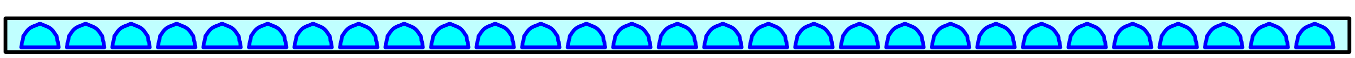
145 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 29 Rows = 7,886.9 cf Chamber Storage

19,958.5 cf Field - 7,886.9 cf Chambers = 12,071.6 cf Stone x 40.0% Voids = 4,828.6 cf Stone Storage

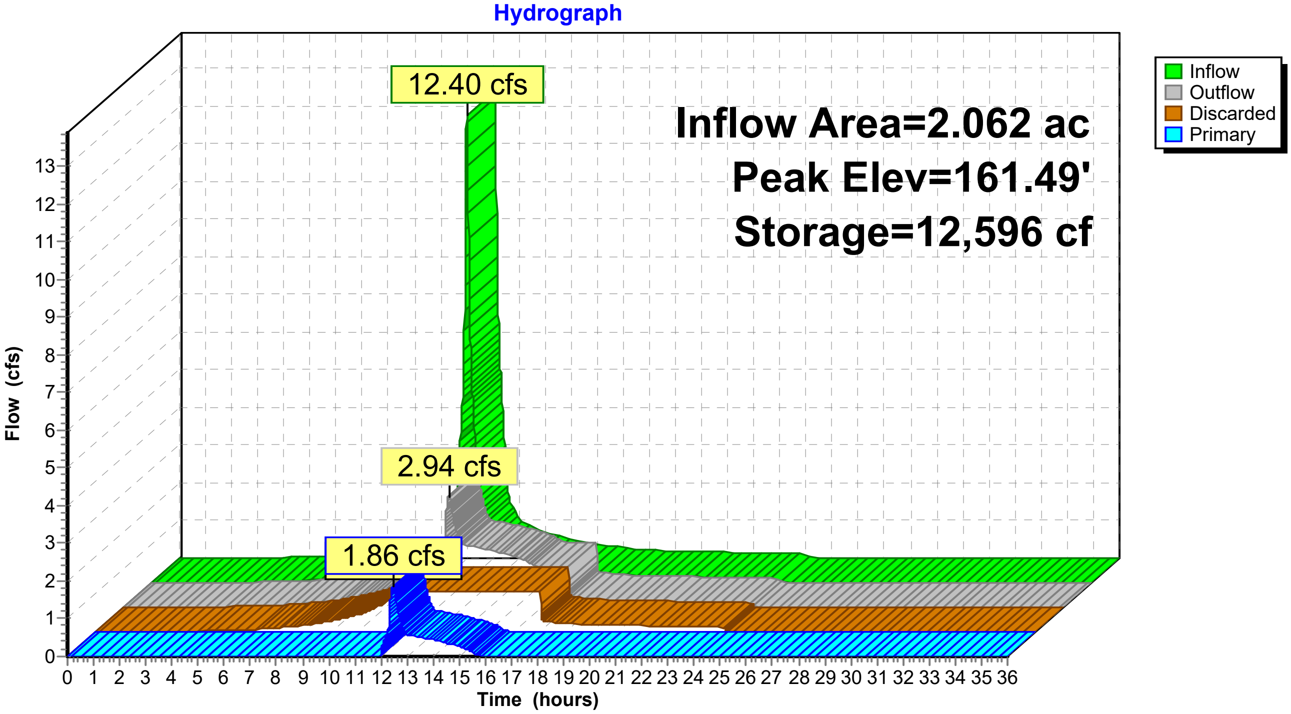
Chamber Storage + Stone Storage = 12,715.5 cf = 0.292 af
Overall Storage Efficiency = 63.7%
Overall System Size = 39.50' x 142.67' x 3.54'

145 Chambers
739.2 cy Field
447.1 cy Stone





Pond 41P: Infiltration Field #2



Summary for Subcatchment 42P: P3

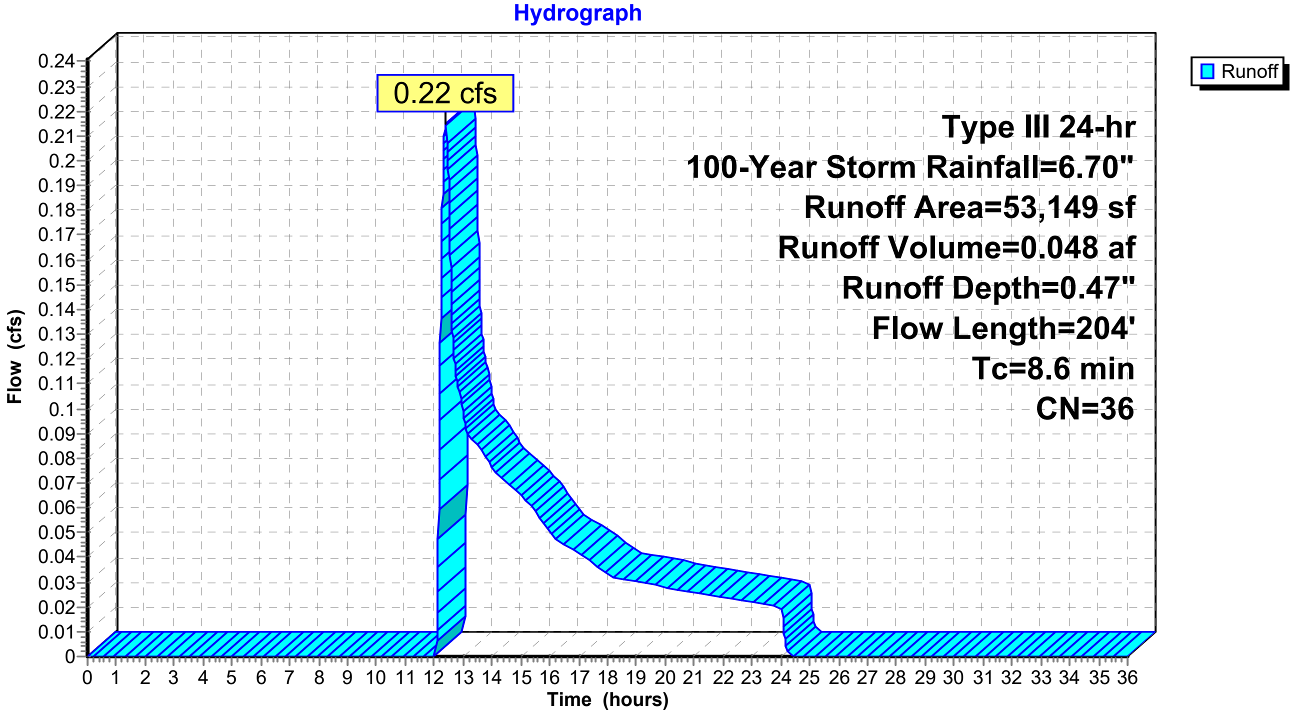
Runoff = 0.22 cfs @ 12.39 hrs, Volume= 0.048 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

	Area (sf)	CN	Description
*	793	98	Paved parking, HSG A
	658	98	Paved parking, HSG B
	16,315	39	>75% Grass cover, Good, HSG A
	898	61	>75% Grass cover, Good, HSG B
	33,430	30	Woods, Good, HSG A
	1,055	55	Woods, Good, HSG B
	53,149	36	Weighted Average
	51,698		97.27% Pervious Area
	1,451		2.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	36	0.0400	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
2.2	8	0.0400	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	160	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.6	204	Total			

Subcatchment 42P: P3

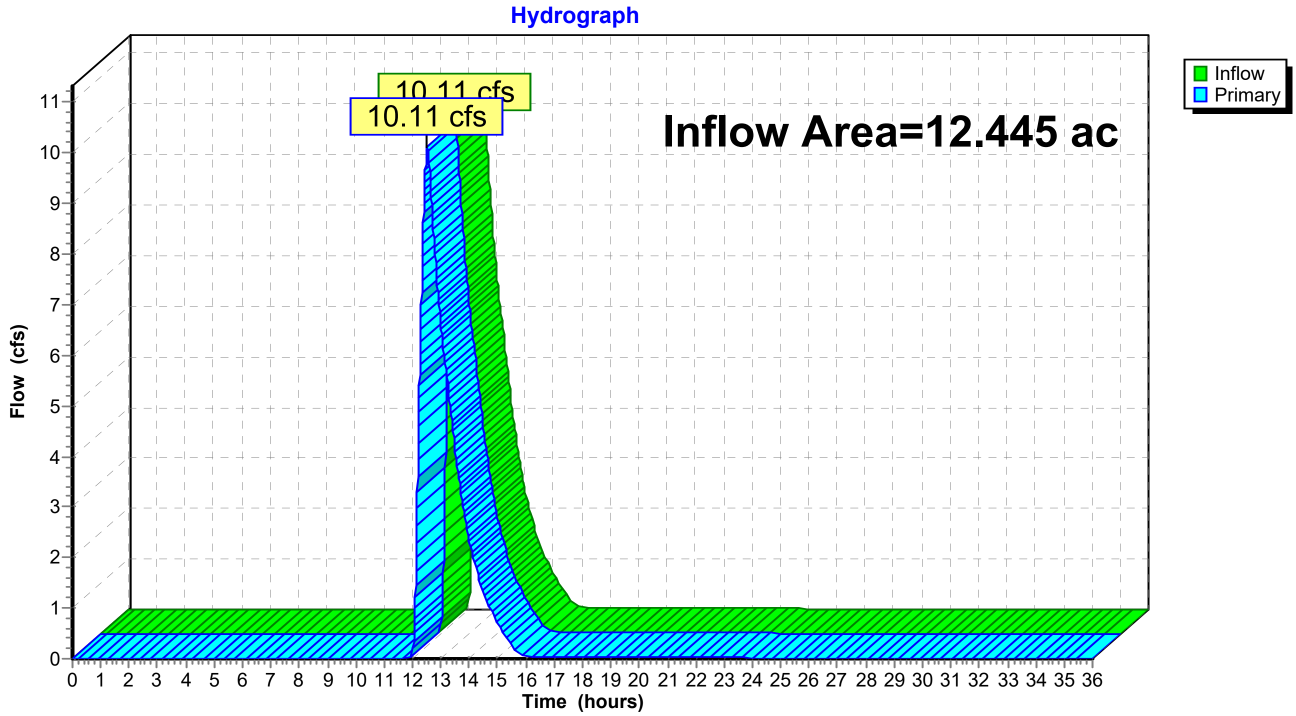


Summary for Link 43P: Design Point #1: Wetlands

Inflow Area = 12.445 ac, 41.27% Impervious, Inflow Depth = 1.04" for 100-Year Storm event
Inflow = 10.11 cfs @ 12.53 hrs, Volume= 1.077 af
Primary = 10.11 cfs @ 12.53 hrs, Volume= 1.077 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 43P: Design Point #1: Wetlands



Summary for Pond 47P: FD/DMH7

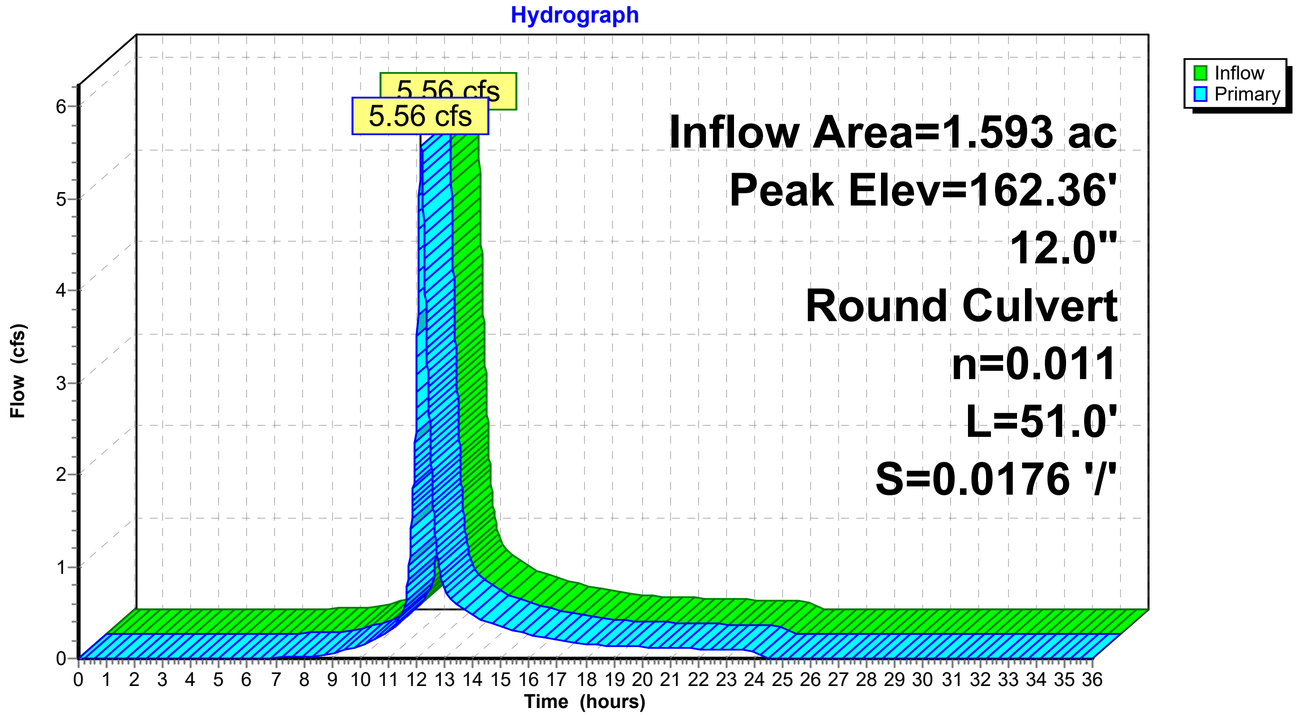
Inflow Area = 1.593 ac, 51.95% Impervious, Inflow Depth = 3.87" for 100-Year Storm event
Inflow = 5.56 cfs @ 12.16 hrs, Volume= 0.513 af
Outflow = 5.56 cfs @ 12.16 hrs, Volume= 0.513 af, Atten= 0%, Lag= 0.0 min
Primary = 5.56 cfs @ 12.16 hrs, Volume= 0.513 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 162.36' @ 12.16 hrs

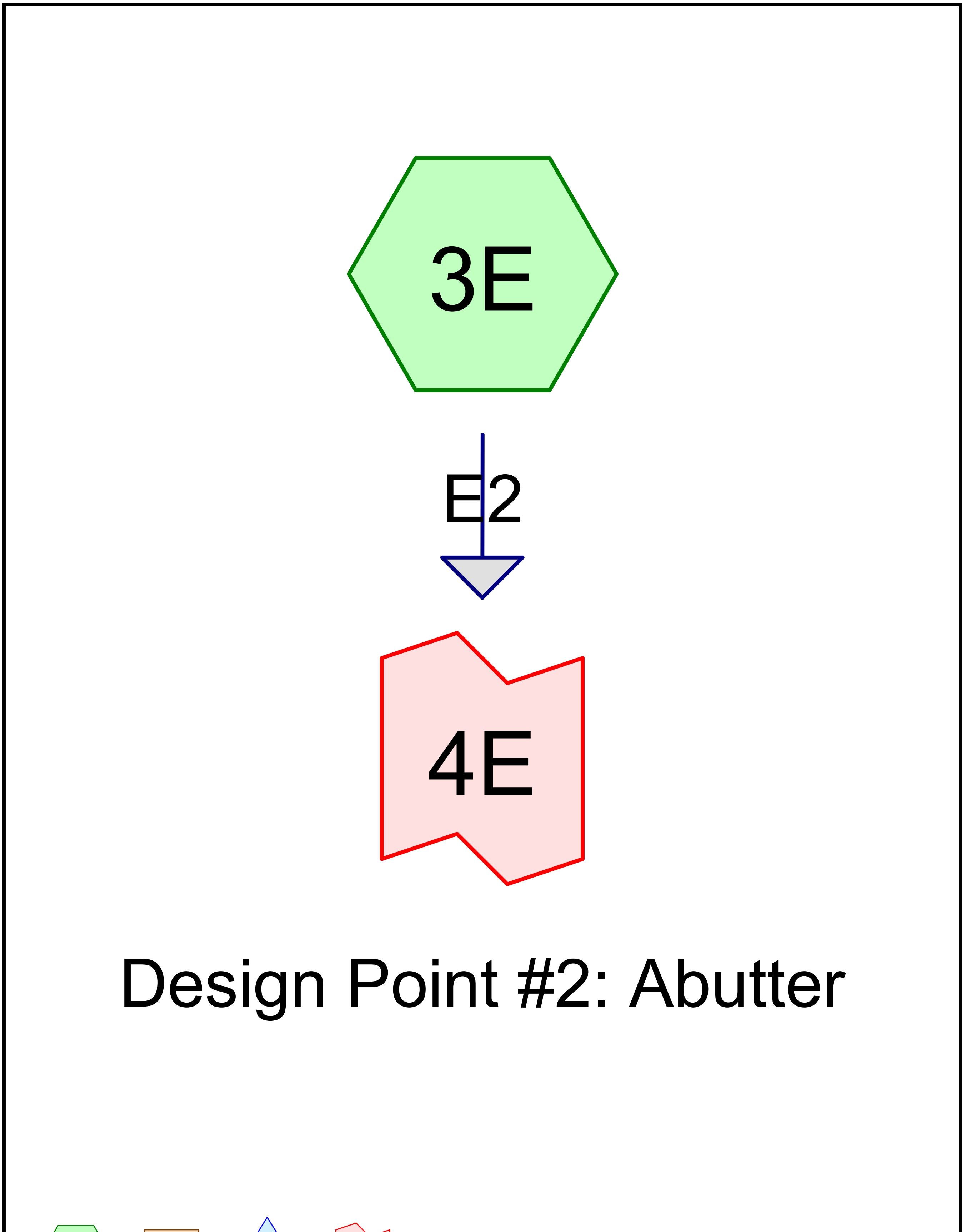
Device	Routing	Invert	Outlet Devices
#1	Primary	159.70'	**12.0" Round Culvert** L= 51.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.70' / 158.80' S= 0.0176 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=5.56 cfs @ 12.16 hrs HW=162.36' (Free Discharge)
└─**1=Culvert** (Inlet Controls 5.56 cfs @ 7.08 fps)

Pond 47P: FD/DMH7



DESIGN POINT #2: FLOW TO 43 MAIN ST. EXISTING CONDITIONS



Routing Diagram for HydroCAD2
Prepared by {enter your company name here}, Printed 4/2/2019

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.153	61	>75% Grass cover, Good, HSG B (3E)
0.027	98	Paved parking, HSG B (3E)
0.383	30	Woods, Good, HSG A (3E)
0.715	55	Woods, Good, HSG B (3E)
1.277	**49**	**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3E: E2 Runoff Area=55,645 sf 2.15% Impervious Runoff Depth=0.11"
Flow Length=515' Tc=12.5 min CN=49 Runoff=0.02 cfs 0.012 af

Link 4E: Design Point #2: Abutter Inflow=0.02 cfs 0.012 af
Primary=0.02 cfs 0.012 af

Total Runoff Area = 1.277 ac Runoff Volume = 0.012 af Average Runoff Depth = 0.11"
97.85% Pervious = 1.250 ac 2.15% Impervious = 0.027 ac

Summary for Subcatchment 3E: E2

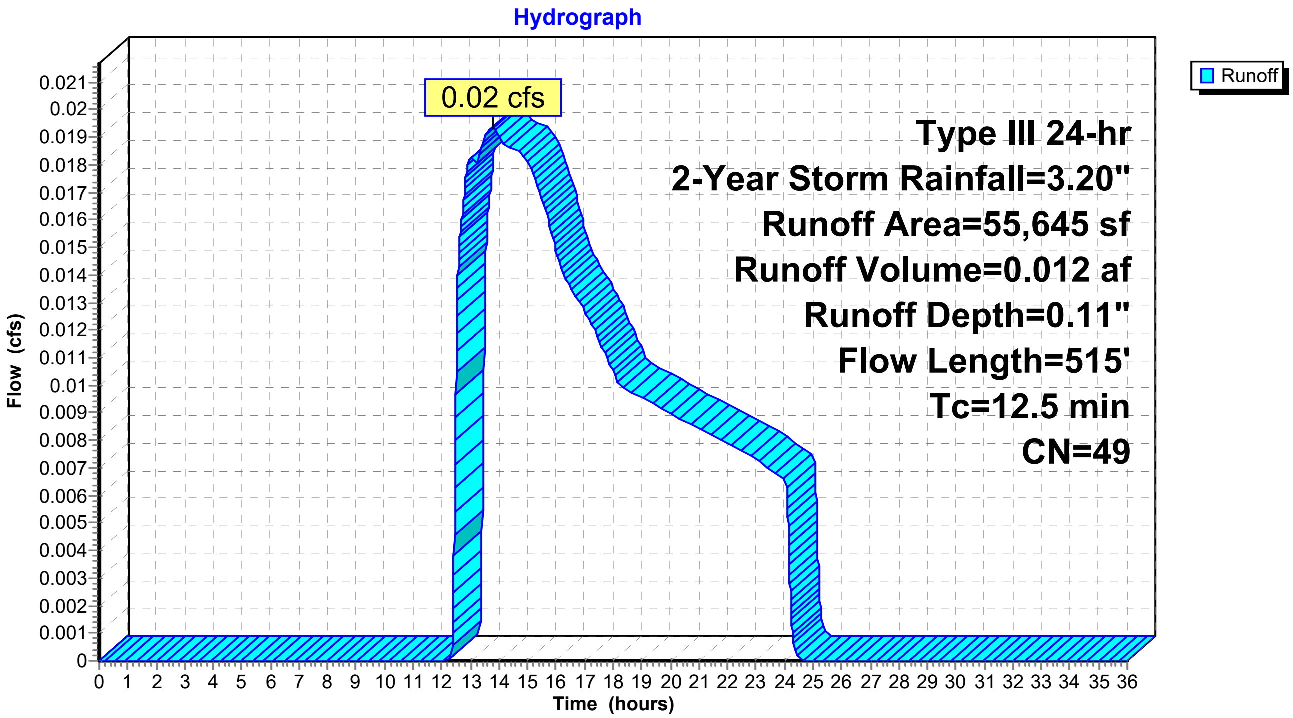
Runoff = 0.02 cfs @ 13.79 hrs, Volume= 0.012 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
1,194	98	Paved parking, HSG B
16,665	30	Woods, Good, HSG A
31,132	55	Woods, Good, HSG B
6,654	61	>75% Grass cover, Good, HSG B
55,645	49	Weighted Average
54,451		97.85% Pervious Area
1,194		2.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	28	0.0500	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	108	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	12	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	95	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	47	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.4	225	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.5	515	Total			

Subcatchment 3E: E2

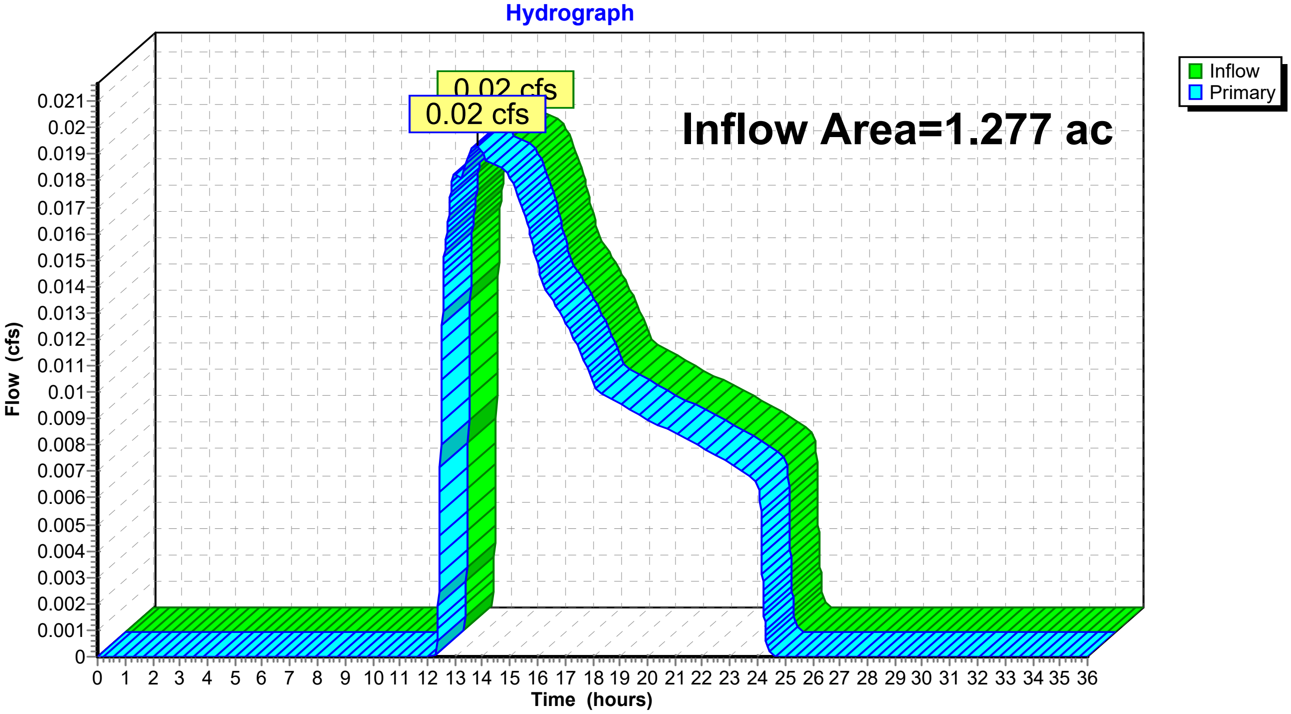


Summary for Link 4E: Design Point #2: Abutter

Inflow Area =	1.277 ac,	2.15% Impervious,	Inflow Depth = 0.11"	for 2-Year Storm event	
Inflow =	0.02 cfs @	13.79 hrs,	Volume=	0.012 af	
Primary =	0.02 cfs @	13.79 hrs,	Volume=	0.012 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 4E: Design Point #2: Abutter



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3E: E2 Runoff Area=55,645 sf 2.15% Impervious Runoff Depth=0.53"
Flow Length=515' Tc=12.5 min CN=49 Runoff=0.33 cfs 0.056 af

Link 4E: Design Point #2: Abutter Inflow=0.33 cfs 0.056 af
Primary=0.33 cfs 0.056 af

Total Runoff Area = 1.277 ac Runoff Volume = 0.056 af Average Runoff Depth = 0.53"
97.85% Pervious = 1.250 ac 2.15% Impervious = 0.027 ac

Summary for Subcatchment 3E: E2

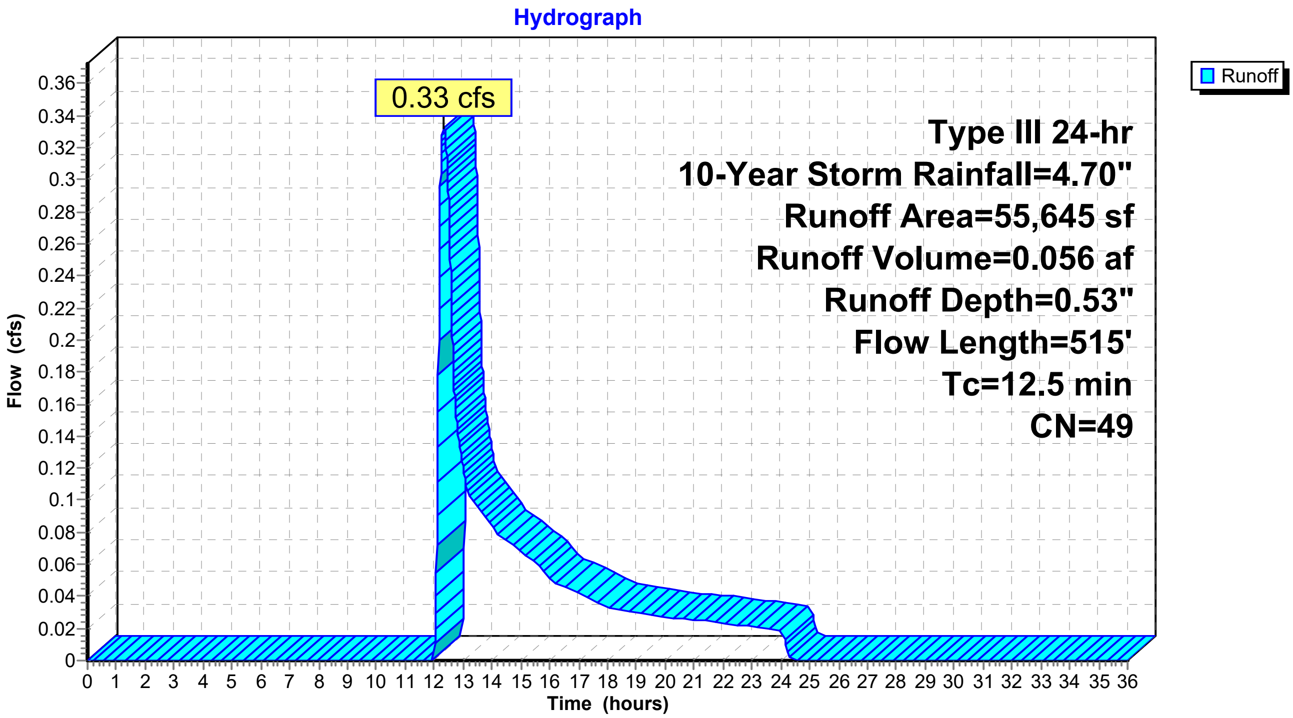
Runoff = 0.33 cfs @ 12.34 hrs, Volume= 0.056 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
1,194	98	Paved parking, HSG B
16,665	30	Woods, Good, HSG A
31,132	55	Woods, Good, HSG B
6,654	61	>75% Grass cover, Good, HSG B
55,645	49	Weighted Average
54,451		97.85% Pervious Area
1,194		2.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	28	0.0500	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	108	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	12	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	95	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	47	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.4	225	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.5	515	Total			

Subcatchment 3E: E2

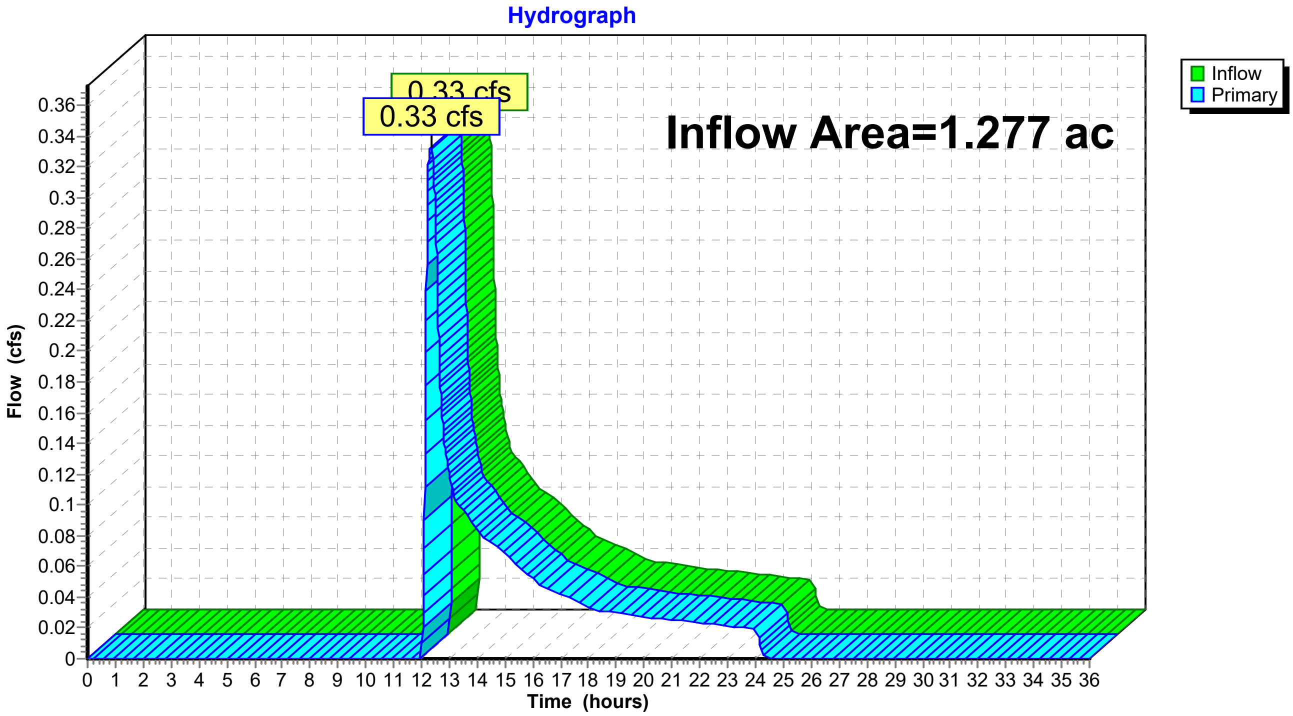


Summary for Link 4E: Design Point #2: Abutter

Inflow Area =	1.277 ac,	2.15% Impervious,	Inflow Depth = 0.53"	for 10-Year Storm event	
Inflow =	0.33 cfs @	12.34 hrs,	Volume=	0.056 af	
Primary =	0.33 cfs @	12.34 hrs,	Volume=	0.056 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 4E: Design Point #2: Abutter



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3E: E2 Runoff Area=55,645 sf 2.15% Impervious Runoff Depth=1.42"
Flow Length=515' Tc=12.5 min CN=49 Runoff=1.41 cfs 0.151 af

Link 4E: Design Point #2: Abutter Inflow=1.41 cfs 0.151 af
Primary=1.41 cfs 0.151 af

Total Runoff Area = 1.277 ac Runoff Volume = 0.151 af Average Runoff Depth = 1.42"
97.85% Pervious = 1.250 ac 2.15% Impervious = 0.027 ac

Summary for Subcatchment 3E: E2

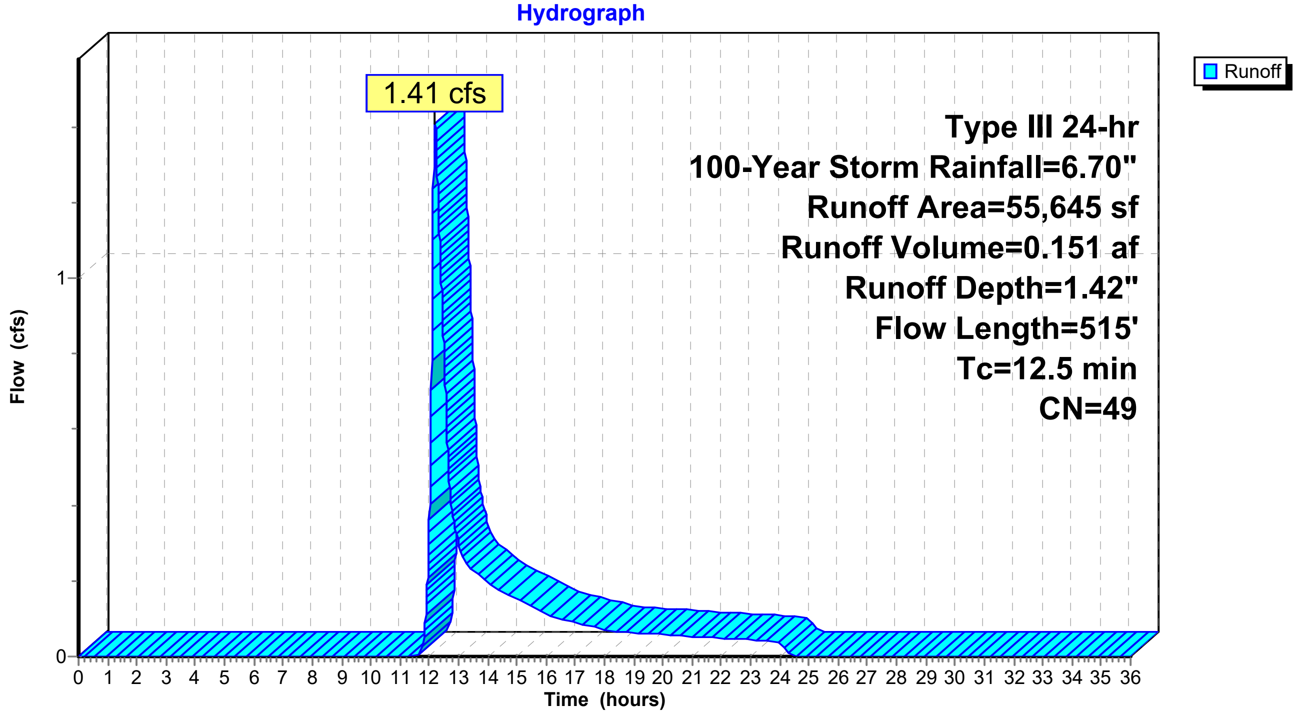
Runoff = 1.41 cfs @ 12.20 hrs, Volume= 0.151 af, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
1,194	98	Paved parking, HSG B
16,665	30	Woods, Good, HSG A
31,132	55	Woods, Good, HSG B
6,654	61	>75% Grass cover, Good, HSG B
55,645	49	Weighted Average
54,451		97.85% Pervious Area
1,194		2.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	28	0.0500	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.6	108	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	12	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	95	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	47	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.4	225	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.5	515	Total			

Subcatchment 3E: E2

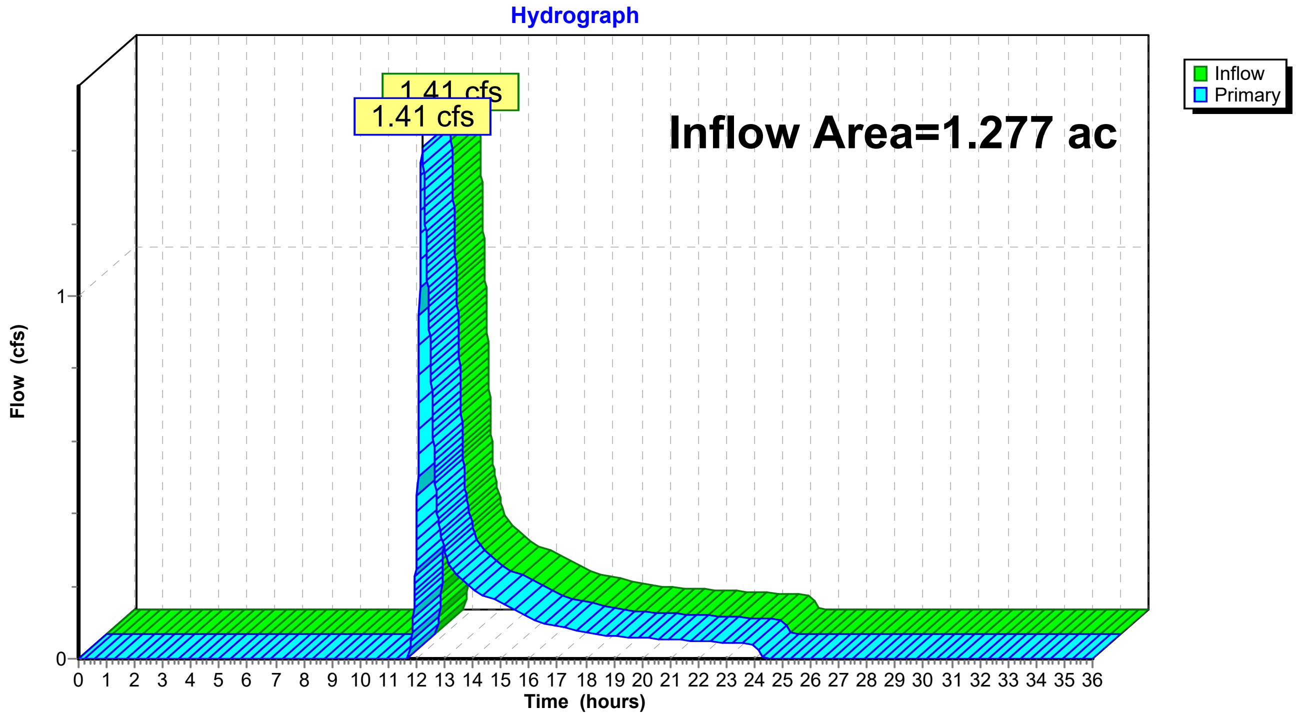


Summary for Link 4E: Design Point #2: Abutter

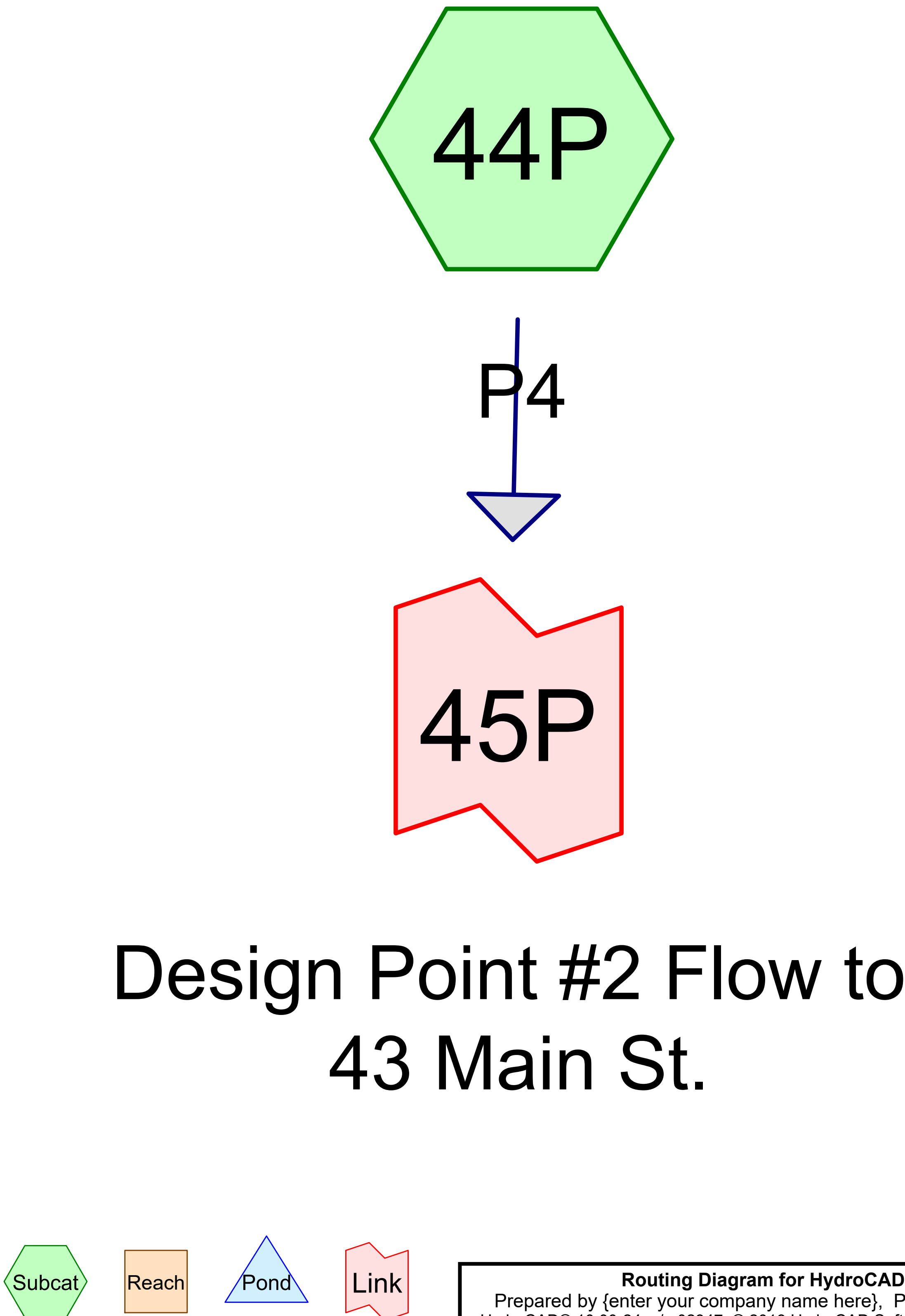
Inflow Area = 1.277 ac, 2.15% Impervious, Inflow Depth = 1.42" for 100-Year Storm event
Inflow = 1.41 cfs @ 12.20 hrs, Volume= 0.151 af
Primary = 1.41 cfs @ 12.20 hrs, Volume= 0.151 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 4E: Design Point #2: Abutter



DESIGN POINT #2: FLOW TO 43 MAIN ST. PROPOSED CONDITIONS



Routing Diagram for HydroCAD2
Prepared by {enter your company name here}, Printed 4/2/2019

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.181	39	>75% Grass cover, Good, HSG A (44P)
0.181	**39**	**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 44P: P4 Runoff Area=7,866 sf 0.00% Impervious Runoff Depth=0.00"
Tc=0.0 min CN=39 Runoff=0.00 cfs 0.000 af

Link 45P: Design Point #2 Flow to 43 Main St. Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 0.181 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
100.00% Pervious = 0.181 ac 0.00% Impervious = 0.000 ac

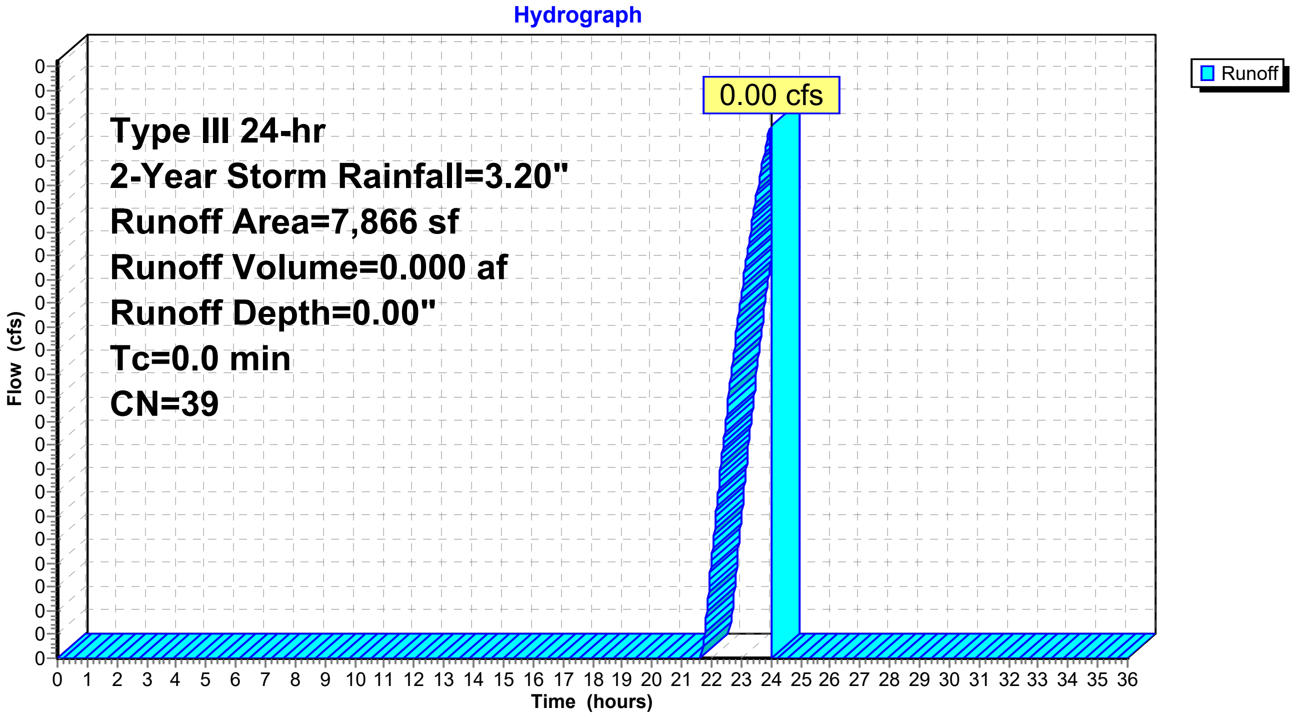
Summary for Subcatchment 44P: P4

Runoff = 0.00 cfs @ 23.99 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
7,866	39	>75% Grass cover, Good, HSG A
7,866		100.00% Pervious Area

Subcatchment 44P: P4

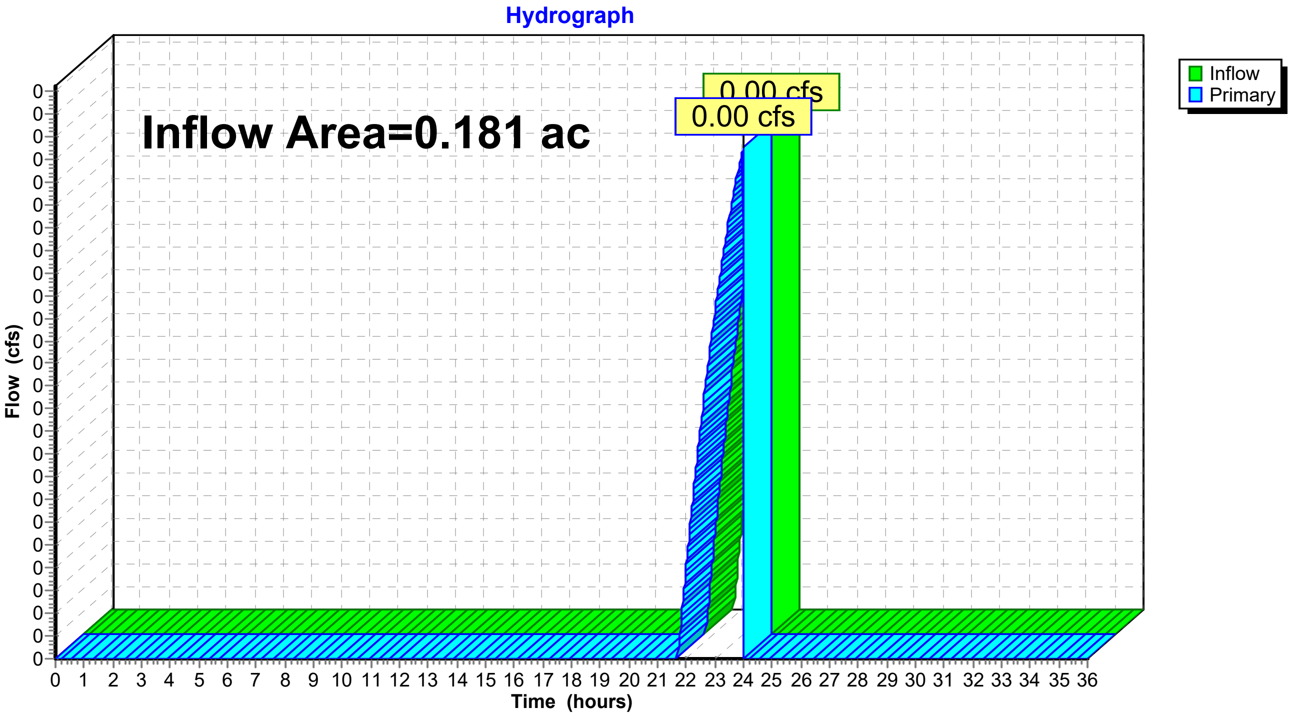


Summary for Link 45P: Design Point #2 Flow to 43 Main St.

Inflow Area =	0.181 ac,	0.00% Impervious, Inflow Depth =	0.00"	for 2-Year Storm event
Inflow =	0.00 cfs @	23.99 hrs, Volume=	0.000 af	
Primary =	0.00 cfs @	23.99 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 45P: Design Point #2 Flow to 43 Main St.



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 44P: P4 Runoff Area=7,866 sf 0.00% Impervious Runoff Depth=0.14"
Tc=0.0 min CN=39 Runoff=0.00 cfs 0.002 af

Link 45P: Design Point #2 Flow to 43 Main St. Inflow=0.00 cfs 0.002 af
Primary=0.00 cfs 0.002 af

Total Runoff Area = 0.181 ac Runoff Volume = 0.002 af Average Runoff Depth = 0.14"
100.00% Pervious = 0.181 ac 0.00% Impervious = 0.000 ac

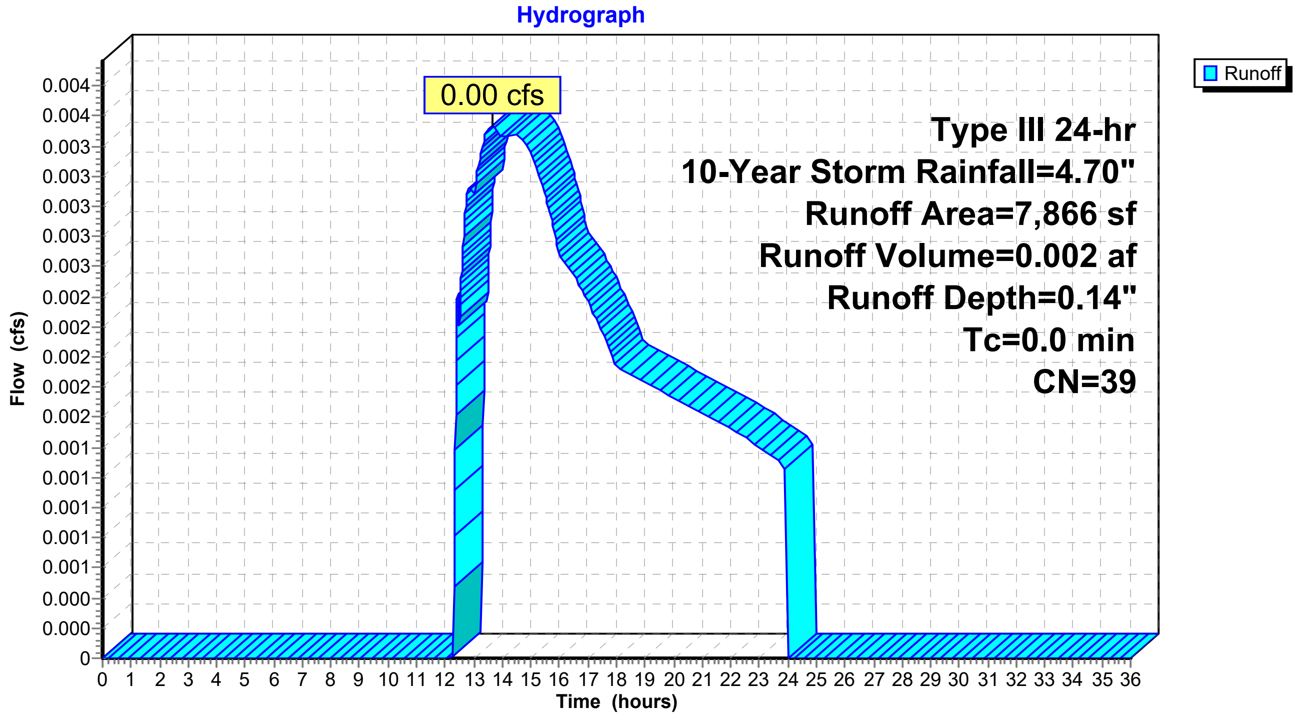
Summary for Subcatchment 44P: P4

Runoff = 0.00 cfs @ 13.67 hrs, Volume= 0.002 af, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Storm Rainfall=4.70"

Area (sf)	CN	Description
7,866	39	>75% Grass cover, Good, HSG A
7,866		100.00% Pervious Area

Subcatchment 44P: P4

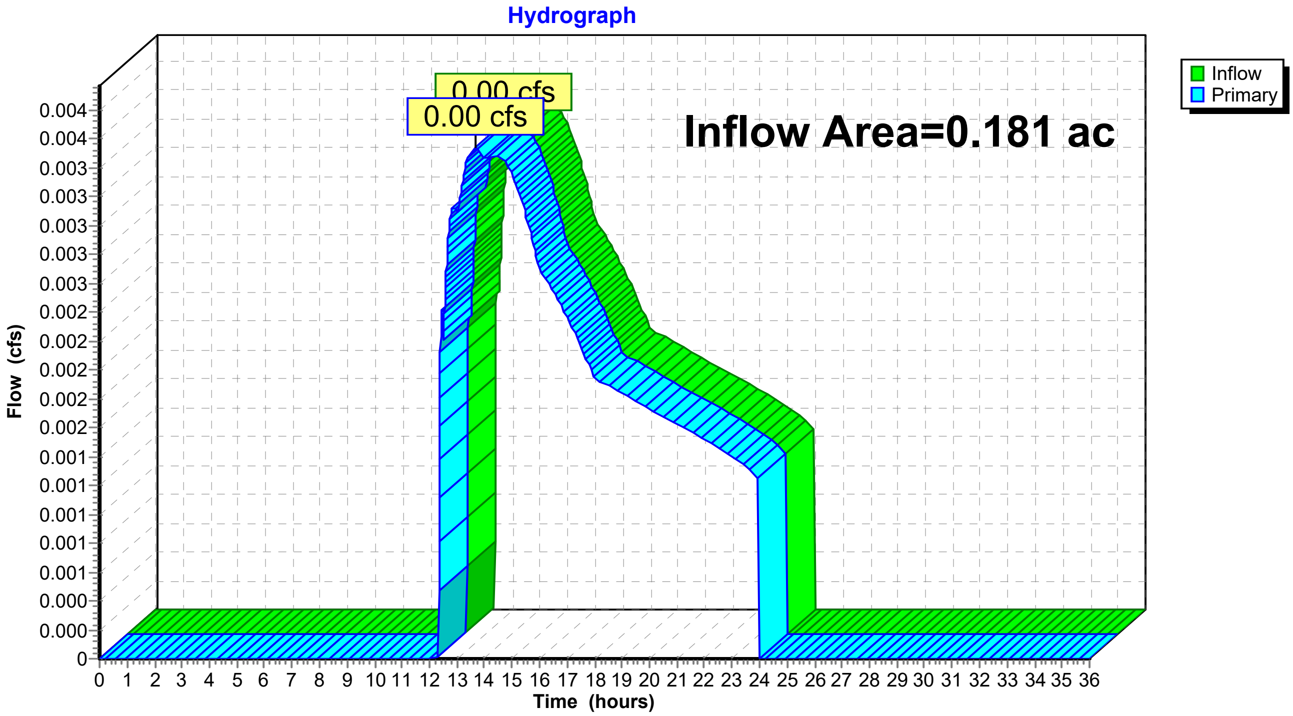


Summary for Link 45P: Design Point #2 Flow to 43 Main St.

Inflow Area =	0.181 ac,	0.00% Impervious,	Inflow Depth = 0.14"	for 10-Year Storm event	
Inflow =	0.00 cfs @	13.67 hrs,	Volume=	0.002 af	
Primary =	0.00 cfs @	13.67 hrs,	Volume=	0.002 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 45P: Design Point #2 Flow to 43 Main St.



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 44P: P4 Runoff Area=7,866 sf 0.00% Impervious Runoff Depth=0.66"
Tc=0.0 min CN=39 Runoff=0.07 cfs 0.010 af

Link 45P: Design Point #2 Flow to 43 Main St. Inflow=0.07 cfs 0.010 af
Primary=0.07 cfs 0.010 af

Total Runoff Area = 0.181 ac Runoff Volume = 0.010 af Average Runoff Depth = 0.66"
100.00% Pervious = 0.181 ac 0.00% Impervious = 0.000 ac

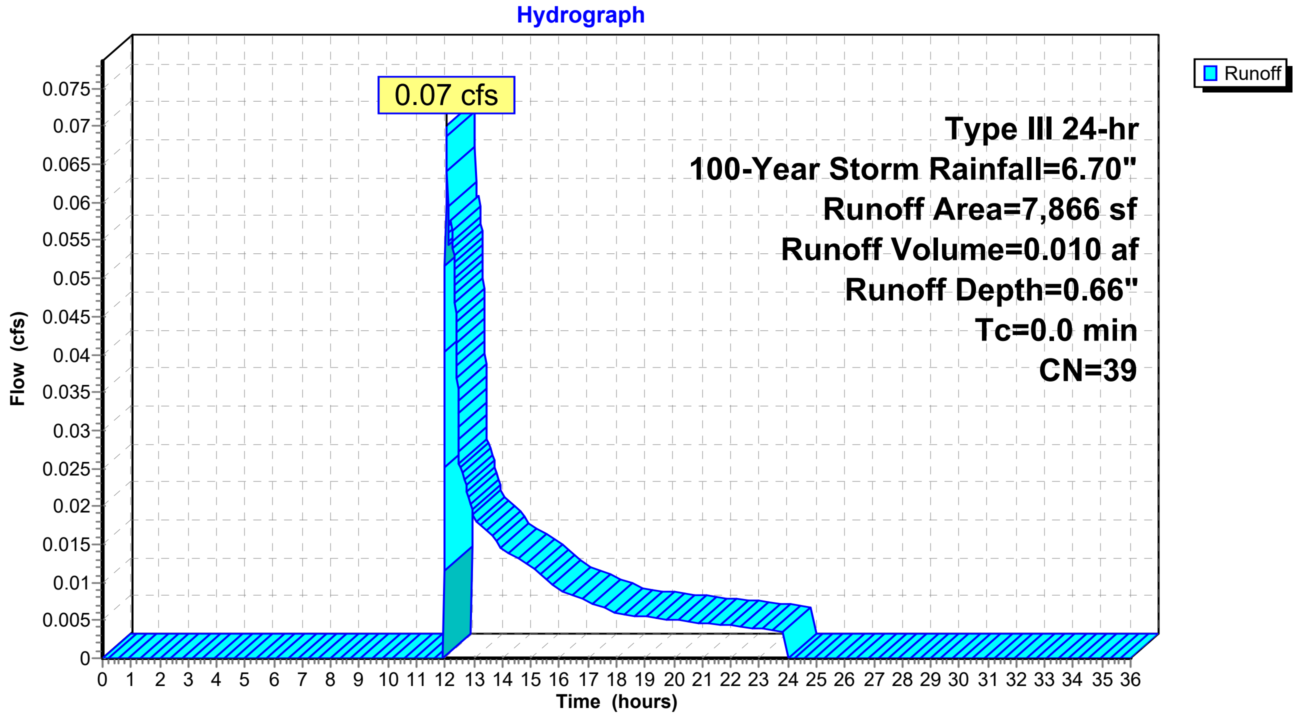
Summary for Subcatchment 44P: P4

Runoff = 0.07 cfs @ 12.05 hrs, Volume= 0.010 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Storm Rainfall=6.70"

Area (sf)	CN	Description
7,866	39	>75% Grass cover, Good, HSG A
7,866		100.00% Pervious Area

Subcatchment 44P: P4

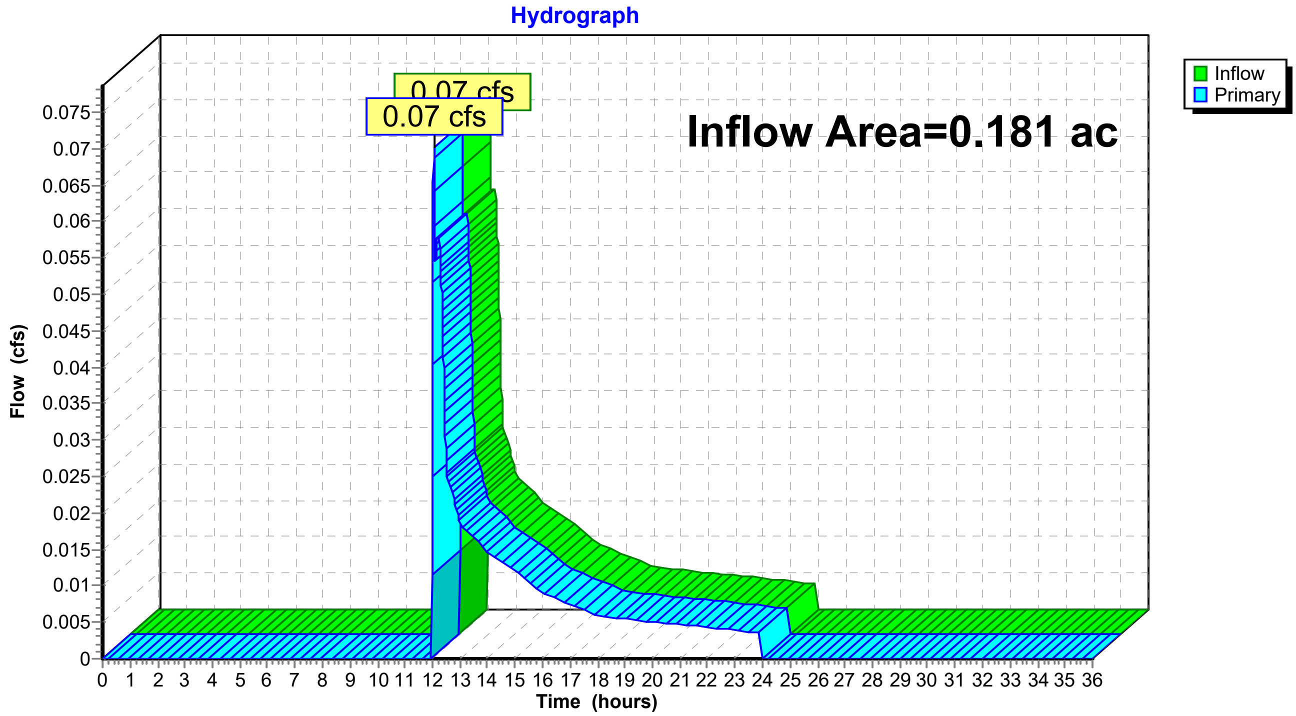


Summary for Link 45P: Design Point #2 Flow to 43 Main St.

Inflow Area = 0.181 ac, 0.00% Impervious, Inflow Depth = 0.66" for 100-Year Storm event
Inflow = 0.07 cfs @ 12.05 hrs, Volume= 0.010 af
Primary = 0.07 cfs @ 12.05 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

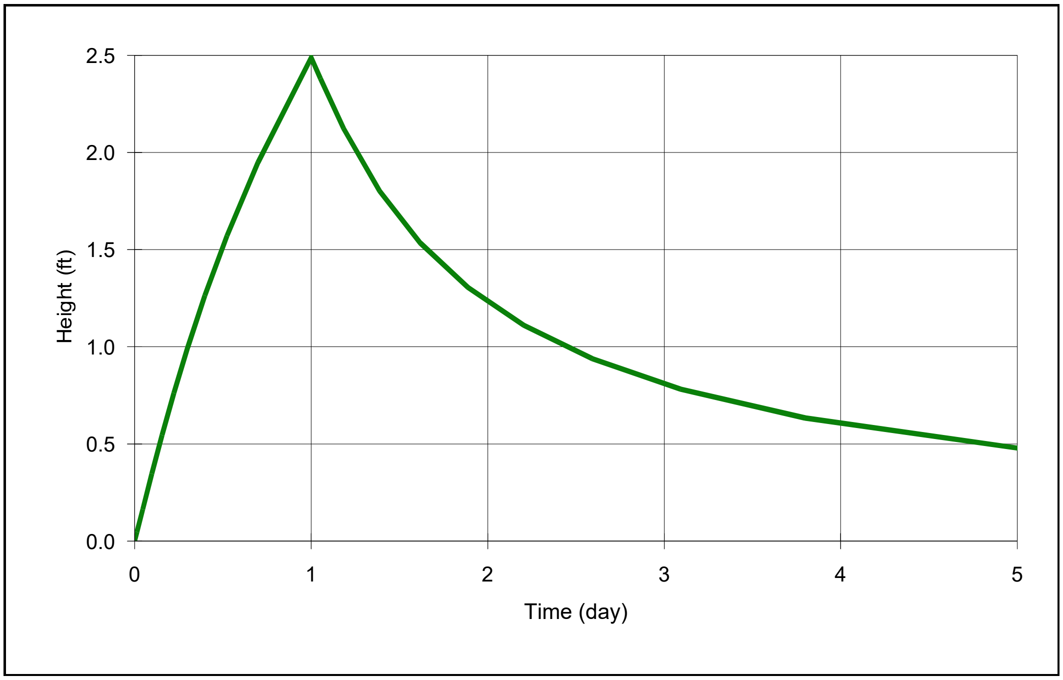
Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link 45P: Design Point #2 Flow to 43 Main St.



ATTACHMENT L: Mounding Calculations

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Legacy Engineering LLC

PROJECT: Infiltration Field 1

ANALYST: Daniel J. Merrikin, P.E.

DATE: 4/2/2019 TIME: 2:38:51 PM

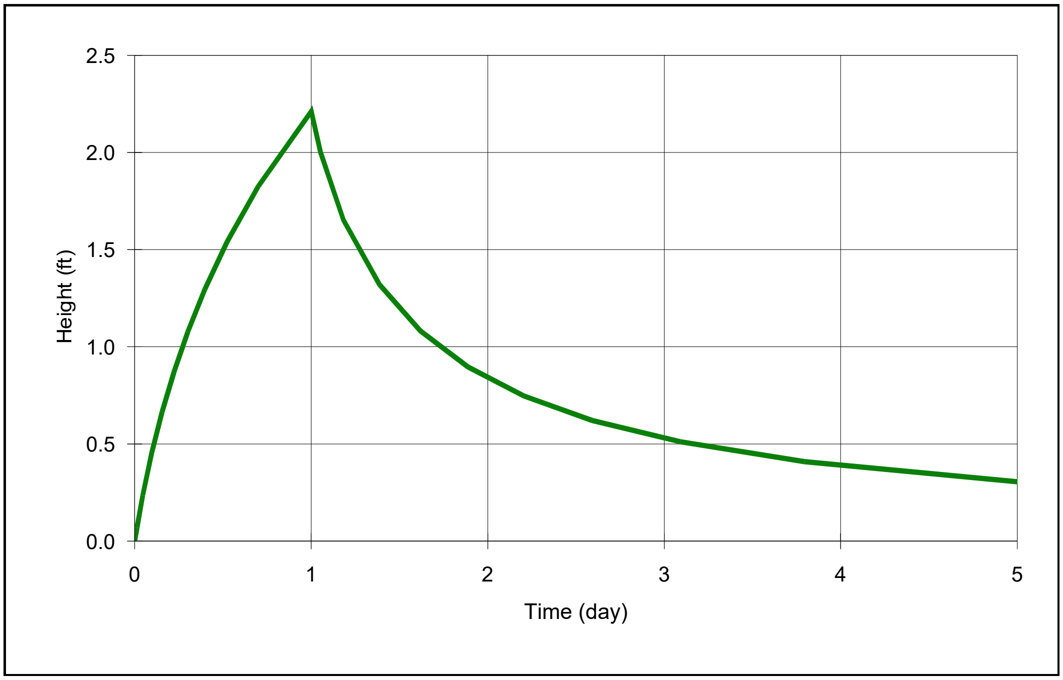
INPUT PARAMETERS

Application rate: 0.72 c.ft/day/sq. ft
Duration of application: 1 day
Total simulation time: 5 day
Fillable porosity: 0.2
Hydraulic conductivity: 16.5 ft/day
Initial saturated thickness: 20 ft
Length of application area: 166.83 ft
Width of application area: 81.5 ft
No constant head boundary used
Groundwater mounding @
X coordinate: 0 ft
Y coordinate: 0 ft
Total volume applied: 9789.584 cft

MODEL RESULTS

Time (day)	Mound Height (ft)
0	0
0	0.05
0	0.16
0.1	0.35
0.2	0.55
0.2	0.76
0.3	1
0.4	1.26
0.5	1.57
0.7	1.95
1	2.49
1.1	2.38
1.2	2.12
1.4	1.8
1.6	1.53
1.9	1.31
2.2	1.11
2.6	0.94
3.1	0.78
3.8	0.63
5	0.48

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Legacy Engineering LLC

PROJECT: Infiltration Field 2

ANALYST: Daniel J. Merrikin, P.E.

DATE: 4/2/2019 TIME: 2:39:24 PM

INPUT PARAMETERS

Application rate: 1.07 c.ft/day/sq. ft
Duration of application: 1 day
Total simulation time: 5 day
Fillable porosity: 0.2
Hydraulic conductivity: 16.5 ft/day
Initial saturated thickness: 20 ft
Length of application area: 142.67 ft
Width of application area: 39.5 ft
No constant head boundary used
Groundwater mounding @
X coordinate: 0 ft
Y coordinate: 0 ft
Total volume applied: 6029.948 cft

MODEL RESULTS

Time (day)	Mound Height (ft)
0	0
0	0.07
0	0.24
0.1	0.46
0.2	0.66
0.2	0.87
0.3	1.08
0.4	1.3
0.5	1.54
0.7	1.82
1	2.21
1.1	2
1.2	1.65
1.4	1.32
1.6	1.08
1.9	0.9
2.2	0.75
2.6	0.62
3.1	0.51
3.8	0.41
5	0.3

ATTACHMENT M: First Defense Proprietary Treatment Units

First Defense® High Capacity

A Simple Solution for your Trickiest Sites

Product Profile

The First Defense® High Capacity is an enhanced vortex separator that combines an effective stormwater treatment chamber with an integral peak flow bypass. It efficiently removes sediment total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® High Capacity is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints (**Table 1**, next page).

Applications

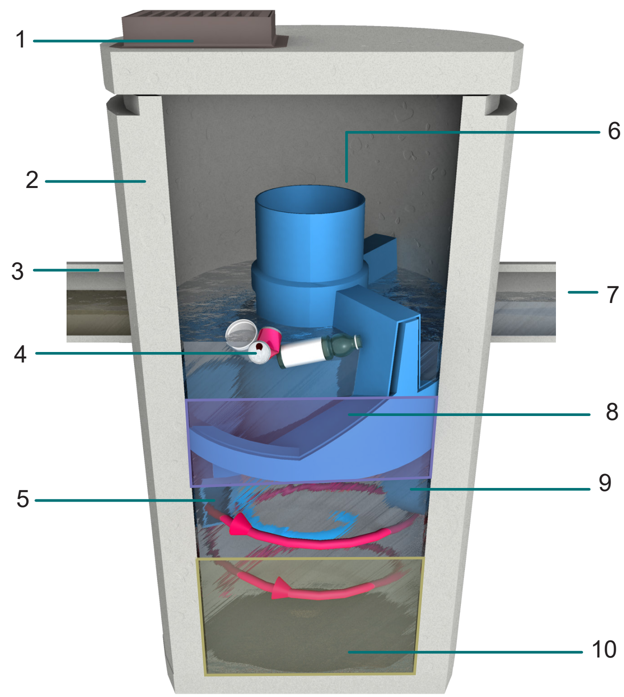
- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for “offline” arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 450% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

Verified by NJCAT and NJDEP

Fig.1 The First Defense® High Capacity has internal components designed to efficiently capture pollutants and prevent washout at peak flows.



Components

1. Inlet Grate (optional)
2. Precast chamber
3. Inlet Pipe (optional)
4. Floatables Draw Off Slot (not pictured)
5. Inlet Chute
6. Internal Bypass
7. Outlet pipe
8. Oil and Floatables Storage
9. Outlet chute
10. Sediment Storage Sump

How it Works

The First Defense® High Capacity has internal components designed to remove and retain gross debris, total suspended solids (TSS) and hydrocarbons (**Fig.1**).

Contaminated stormwater runoff enters the inlet chute from a surface grate and/or inlet pipe. The inlet chute introduces flow into the chamber tangentially to create a low energy vortex flow regime (magenta arrow) that directs sediment into the sump while oils, floating trash and debris rise to the surface.

Treated stormwater exits through a submerged outlet chute located opposite to the direction of the rotating flow (blue arrow). Enhanced vortex separation is provided by forcing the rotating flow within the vessel to follow the longest path possible rather than directly from inlet to outlet.

Higher flows bypass the treatment chamber to prevent turbulence and washout of captured pollutants. An internal bypass conveys infrequent peak flows directly to the outlet eliminating the need for, and expense of, external bypass control structures. A floatables draw off slot functions to convey floatables into the treatment chamber prior to bypass.

Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212
Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com

First Defense® High Capacity

Sizing & Design

This adaptable online treatment system works easily with large pipes, multiple inlet pipes, inlet grates and now, contains a high capacity bypass for the conveyance of large peak flows. Designed with site flexibility in mind, the First Defense® High Capacity allows engineers to maximize available site space without compromising treatment level.

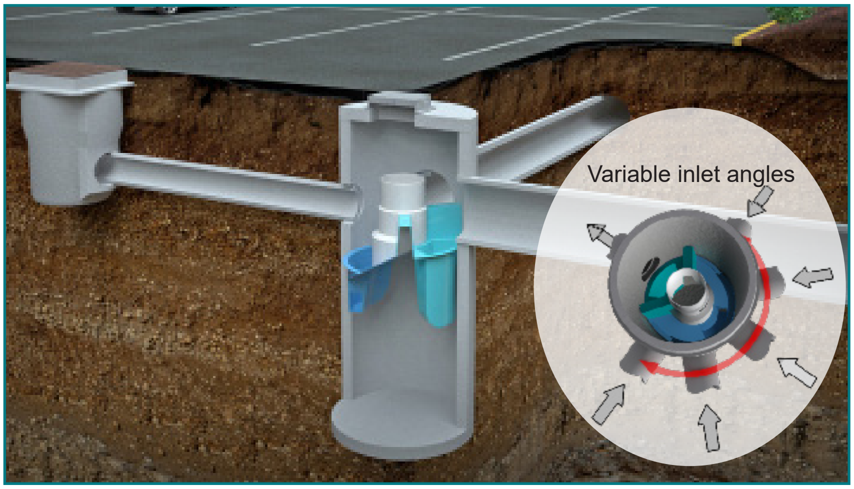


Fig 2. Works with multiple inlet pipes and grates

Inspection and Maintenance

Nobody maintains our systems better than we do. To ensure optimal, ongoing device performance, be sure to recommend Hydro International as a preferred service and maintenance provider to your clients.

Call **1 (800) 848-2706** to schedule an inspection and cleanout or learn more at **hydro-int.com/service**

Sizing Calculator for Engineers

This simple online tool will recommend the best separatror, model size and online/offline arrangement based on site-specific data entered by the user.

Go to hydro-int.com/sizing to access the tool.

Fig 3. Maintenance is done with a vactor truck

Table 1. First Defense® High Capacity Design Criteria.

First Defense® High Capacity Model Number	Diameter	Typical TSS Treatment Flow Rates		Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Standard Distance from Outlet Invert to Sump Floor
		NJDEP Certified	110µm						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd^3 / m^3)	(ft / m)	(ft / m)
FD-3HC	3 / 0.9	0.84 / 23.7	1.06 / 45.3	15 / 424	18 / 457	125 / 473	0.4 / 0.3	2.0 - 3.5 / 0.6 - 1.0	3.71 / 1.13
FD-4HC	4 / 1.2	1.50 / 42.4	1.88 / 50.9	18 / 510	24 / 600	191 / 723	0.7 / 0.5	2.3 - 3.9 / 0.7 - 1.2	4.97 / 1.5
FD-5HC	5 / 1.5	2.34 / 66.2	2.94 / 82.1	20 / 566	24 / 600	300 / 1135	1.1 / .84	2.5 - 4.5 / 0.7 - 1.3	5.19 / 1.5
FD-6HC	6 / 1.8	3.38 / 95.7	4.23 / 133.9	32 / 906	30 / 750	496 / 1,878	1.6 / 1.2	3.0 - 5.1 / 0.9 - 1.6	5.97 / 1.8
FD-8HC	8 / 2.4	6.00 / 169.9	7.52 / 212.9	50 / 1,415	48 / 1219	1120 / 4239	2.8 / 2.1	3.0 - 6.0 / 0.9 -1.8	7.40 / 2.2

[1]Contact Hydro International when larger pipe sizes are required.
[2]Contact Hydro International when custom sediment storage capacity is required.
[3]Minimum distance for models depends on pipe diameter.

Hydro International®

Performance Verification of TSS Removal with OK-110 Silica Sand

The First Defense® is a cost competitive device used to capture oil, debris and sediment from stormwater runoff. Commonly used as a pre-treatment device, the First Defense® effectively captures the bulk of the pollutant load when used upstream of more sensitive treatment devices such as infiltration systems.

The First Defense® is equally well suited as a stand alone treatment device for use on space constrained sites. Whereas pretreatment devices are used to capture gross solids, stand alone treatment devices must remove gross solids and finer particles. Stand alone treatment units must also prevent pollutant washout during intense storm events, as there is no additional treatment system downstream to capture pollutants scoured from the upstream system before runoff is discharged to the environment.

The First Defense® uses the principles of rotational flow to provide greater capture efficiency of fine suspended solids as compared to that of conventional gravity separation chambers. Furthermore, its unique internal bypass prevents washout of captured pollutants during intense storm flows. Flows exceeding the design treatment flow rate are diverted away from the pollutant storage sump through an enclosed bypass chute. This arrangement protects captured pollutants from high scour velocities during high-intensity rainfall without requiring the use of an additional bypass junction manhole (Fig.1).

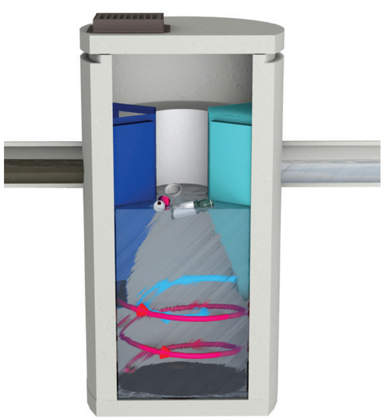


Fig.1 The First Defense® captures fine sediments as well as gross pollutants, making it an effective stand-alone treatment device for space constrained sites.

Performance Test Objectives and Protocols

To evaluate the treatment performance of the First Defense®, a 4-ft diameter unit was tested at Hydro International's hydraulics laboratory in Portland, ME. The primary objectives were to: 1) independently verify the removal efficiency of Total Suspended Solids (TSS) with a fine particle size gradation, and 2) verify that the First Defense® protects previously captured pollutants from washout during high-flow bypass mode.

TSS removal tests were conducted according to the Maine Department of Environmental Protection (MEDEP) Test Protocols, which specify OK-110 sediment as the test pollutant (Fig.2).

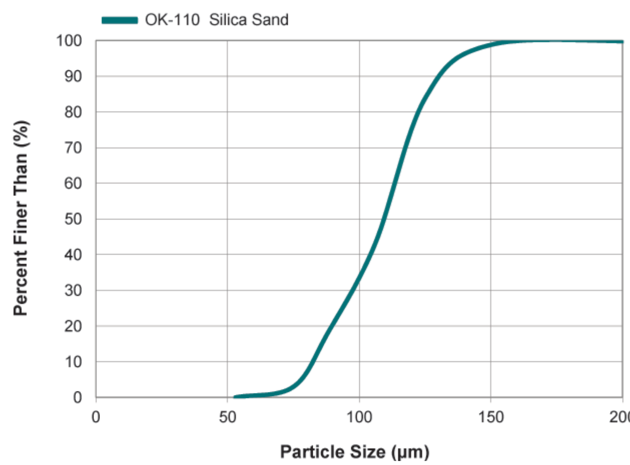


Fig.2 Particle size distribution of the OK-110 silica blend, which contains a large fraction of fine particle sizes that are targeted by stand-alone stormwater treatment devices.

Washout tests were conducted in conformance with the 2009 New Jersey DEP protocols for Hydrodynamic Separators, which require pre-loading the sump of the test unit to 50% capacity with OK-110 (Fig.3).

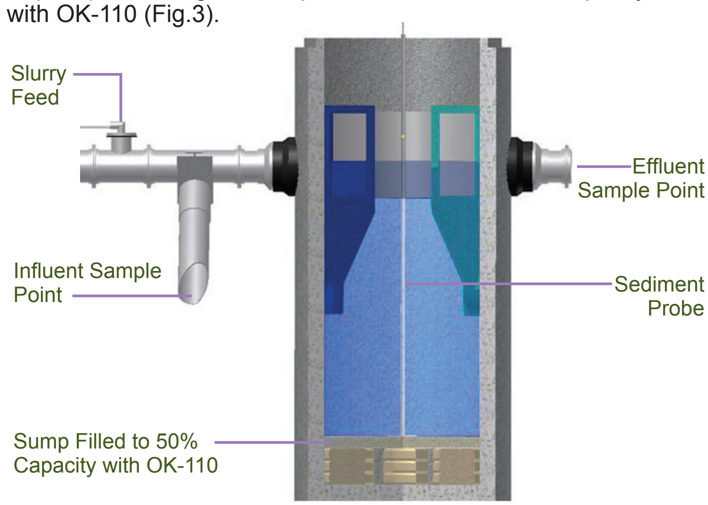


Fig.3 The 4-ft First Defense® was tested with its sump pre-loaded to 50% capacity with OK-110 sediment.

First Defense®

Washout Test Procedures
Washout tests were conducted at multiple flow rates ranging from 0.88 to 3.8 cfs. At each tested flow rate, clean water from a 23,000 gallon reservoir was pumped to the First Defense® for 15 minutes (Fig.4).

At the conclusion of the test run, the sediment depth was measured and compared to the initial depth. Results showed no measureable decrease in the depth of sediment pre-loaded in the sump.

The first round of retention results were confirmed by retesting at the same flow rates while measuring changes in effluent concentrations. While pumping clean water from the reservoir through the pre-loaded sump for 25 minutes at each flow rate, influent and effluent samples were collected at 5-minute intervals. The samples were analyzed for TSS by an independent, state-certified laboratory utilizing APHA SM2540D.

The analytical results for all test runs showed non-detectable levels of TSS.

A representative from the University of New Hampshire Stormwater Center observed all of the washout tests as an independent witness. This witness reviewed data analysis and quality control procedures of the external laboratory used for sample analysis, and provided a written report to independently verify the observations.

TSS Removal Efficiency Test Procedures
TSS removal efficiency tests were run at 0.7 cfs, the targeted Design Treatment Flow Rate of the 4-ft First Defense®. A slurry mixture of F-60 was pumped into the clean water pipeline conveying water from a 23,000 gal reservoir to the First Defense® (Fig.4).

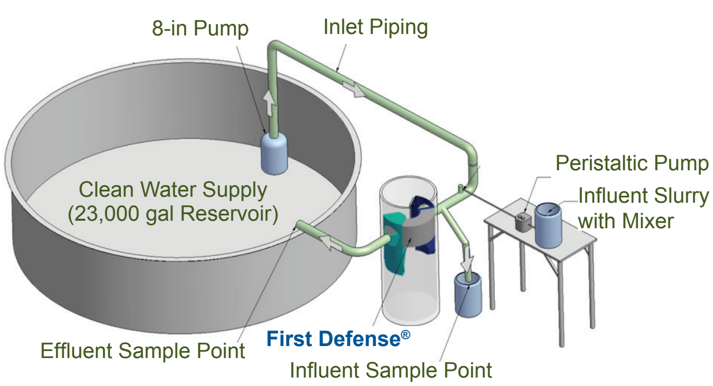


Fig.4 The First Defense® was tested at Hydro International's Portland, Maine test facility.

Influent and effluent samples were taken at pre-determined intervals spaced by residence time. All samples had a minimum volume of 500 mL. Background influent and effluent samples were collected and analyzed to ensure clean water supplied from the reservoir did not exceed non-detectable concentrations of 4 mg/L TSS.

Samples were independently analyzed for TSS using APHA SM2540D by an accredited third party laboratory.

Test Results
Overall, the First Defense® met and exceeded the scour test requirements of the NJDEP protocol, showing no measurable effluent TSS concentration and no measurable decrease in depth of the pre-loaded sediment at flows up to 500% of the model's Design Treatment Flow Rate.

Overall, the test results show that the First Defense® exceeds 94% removal for the mean flow rate of 0.65 cfs (293 gpm), and would be expected to exceed 90% removal at the target flow rate of 0.71 cfs (Table 1). These tests were independently witnessed and reported by Jeff Dennis of the Maine DEP. As stated in his written assessment:

"All paired sample removal efficiencies exceeded 80%, as did their mean whether or not they were adjusted for background concentrations, so it is very clear that at 290 gpm, a 4-ft diameter First Defense® unit can remove at least 80% of OK-110 grade silica sand, and seems to be able to remove more than 90% at this flow."

Table 1. OK-110 Sediment Removal Efficiency.

Test Run	Flow Rate	Influent TSS Concentration	Effluent TSS Concentration	Removal Efficiency
	(cfs)	(mg/L)	(mg/L)	(%)
1	0.61	299.8	13.7	95.4
2	0.73	268.6	16.8	93.7
3	0.67	189.1	12.6	93.3
4	0.66	279.1	15.8	94.3
5	0.58	291.1	17.3	94.1
6	0.63	267.2	15.8	94.1
Mean	0.65	265.5	15.2	94.2

Conclusions
The results confirm that the First Defense® effectively captures fine sediment at its treatment flow rate, and that fine sediments captured in the pollutant storage sump are protected from washout during intense storm events. This confirms that the First Defense® is a suitable stand-alone stormwater treatment device for sites where larger treatment systems are not practical solutions.

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