STORMWATER & EROSION CONTROL REPORT

April 6, 2023

Project Site:
34 High Street
Ashland, MA 01721

Prepared for:
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Charles River Homes Real Estate

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Robial™

Contents

Project Summary

This Stormwater and Erosion Control Report discusses the stormwater management system for the residential pool and tennis court development at 34 High in Ashland, Massachusetts. The property (Map #13, Block #163) is currently owned by Meredith & Daniel Huff.

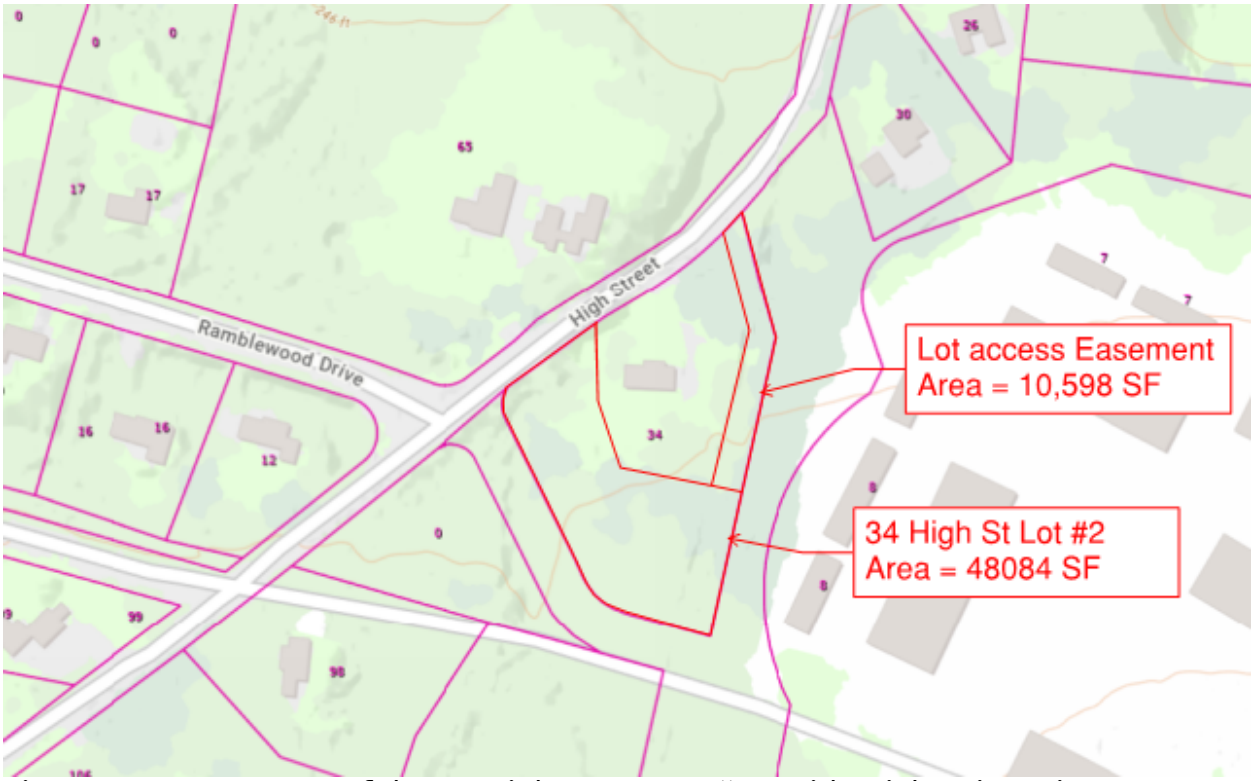


Figure 1.1 – Locus map of the 34 High Street Lot#2 residential project site.

Existing Conditions

The existing site is a recent subdivision of approximately 48,084 SF (1.1 acres) with a 10,598 SF access easement. Existing impervious area on the residential site includes a 2,823 SF pool and apron.

In general, the existing topography on the site runs downhill from the southern corner of the property to the northern property border adjacent to High Street. The average slope of the property is roughly 10%. The existing impervious area includes an abandoned pool area with concrete area that covers about 2,823 SF, or 5.9% of the property. The remainder of the site is about 11.8% wetland and 82.4% wooded area. The easement is undeveloped and wooded. Two design points were analyzed for the run-off from the project site: The easement connection to the High Street (Design Point #1) and the wetland boundary to the west (Design Point #2).

Proposed Conditions

The proposed development project proposes a total of 6,677 SF of added impervious area. Proposed impervious area on the property includes a 2,671 SF home, a 5,343 SF (3,708 SF on easement) driveway, a 1,284 SF pool and apron, and an additional 423 SF of impervious area including a porch and deck. The existing abandoned pool will be completely removed. The post-construction total impervious area will be 9,500 SF and cover 16.2% of the combined property and easement.

Stormwater Design/ Analysis

The stormwater management design for the 34 High Street project site includes Best Management Practices that address the existing versus the proposed site conditions including runoff volumes and peak flows, TSS removal and recharge to groundwater. A HydroCAD analysis was performed on the existing and proposed conditions for the entire site using the standard SCS TR-20 method.

The following Type III 24-hour design storms were analyzed in accordance with the MA DEP stormwater guidance and NOAA Storm frequency data for Ashland, MA:

- 1″ storm
- 2-year storm: 3.36″
- 10-year storm: 5.25″
- 25-year storm: 6.42″
- 100-year storm: 8.24″

Soil data was acquired from the NRCS web soil survey. The NRCS soil data is included in Appendix B of this report. The soil horizons where infiltration systems will be present all showed HSG Class B sandy loams at a minimum and all calculations were based on this criterion.

A total of 9,500 SF of impervious area is proposed for the 34 High Street project site. Stormwater runoff from the pool area will be collected through trench drains consisting of a perforated PVC pipe inside a bed of gravel wrapped in filter fabric and topped with 3″ of decorative river rock. These drainage trenches direct runoff to a drain basin that conveys stormwater to the bioretention area. Runoff from the top paved section of driveway is collected in a trench drain that feeds a drain basin that then conveys the runoff to the bioretention area. Roof drains are also conveyed to the bioretention area.

The runoff reaching the bottom of the proposed gravel driveway along the easement will be collected in a trench drain to drain basin and will then be directed to an infiltration basin which consists of 3 Cultec C4 HD chambers in a 14′ x 12′ x 20.5″ gravel bed below the gravel driveway.

A hydrologic sub- basin map is given in Appendix A for the existing and proposed conditions.

Compliance Standards

The proposed stormwater management system complies with the ten standards of the MassDEP Stormwater Management Policy and Stormwater Handbook.

This report was prepared under the direction of Jay Thrasher, a registered Professional Engineer (PE # 54434) licensed to do business in the Commonwealth of Massachusetts pursuant to MGL Chapter 112 Section 81R.

This section of the Stormwater Report includes the calculations required to document compliance with the following standards.

Standard 1

"No new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth."

There is a wetland on the property of the 34 High Street project site. Stormwater conveyances are designed to limit erosion to the wetland on site. The nearest conveyance is the bioretention area rip rap overflow that lies outside of the 75' wetland buffer.

Standard 2

"Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04."

The HydroCAD analysis performed on the development site pre and post-construction show that post-development peak discharges rates do not exceed pre-development discharge rates and runoff volumes for all design storm analyzed in this report. Table 5.1 below shows the estimated pre- and post-development peak discharge rates and runoff volumes for the five design storms.

Table 5.1 – Pre and post-development peak discharge rates for Design Point #1: Easement access @ High Street.

	Existing peak discharge rate (cfs)	Proposed peak discharge rate (cfs)	Existing runoff volume (CF)	Proposed runoff volume (CF)
2-yr storm: 3.36 in.	0.31	0.15	960	627
10-yr storm: 5.25 in.	0.74	0.44	2,189	1,650
25-yr storm: 6.42 in.	1.03	0.83	3,038	2,430
100-yr storm: 8.24 in.	1.50	1.24	4,436	3,734

Table 5.2 – Pre and post-development peak discharge rates for Design Point #2: Wetland.

	Existing peak discharge rate (cfs)	Proposed peak discharge rate (cfs)	Existing runoff volume (CF)	Proposed runoff volume (CF)
2-yr storm: 3.36 in.	0.77	0.22	2,907	2,456
10-yr storm: 5.25 in.	2.34	0.60	7,614	6,583
25-yr storm: 6.42 in.	3.47	0.78	11,042	9,750
100-yr storm: 8.24 in.	5.36	1.13	16,850	15,391

Standard 3

"Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook."

The calculation for required recharge volume provided by the Massachusetts Stormwater Handbook is given below:

$$Rv = F \times \text{impervious area}$$

- Rv is the required recharge volume.
- F is the target depth factor based on local regulation (F = 1-inch).
- Impervious area is the total cumulative impervious area on the site.

$$Rv = (1\text{-inch}) * (1\ ft/12\ inches) * (9{,}687\ SF)$$

$$Rv = 807.25\ CF$$

The proposed drainage and infiltration system design provides 1,862 CF of recharge volume storage capacity in the infiltration basins.

The HydroCAD analysis performed utilizes the "simple dynamic" method to ensure adequate sizing of the infiltration BMPs.

The calculation for ensuring the design meets the minimum 72-hour drawdown period associated with the "simple dynamic' method provided by the Massachusetts Stormwater handbook is given below:

$$\boldsymbol{Time_{drawdown}} = \frac{\boldsymbol{Rv}}{(\boldsymbol{K})(\boldsymbol{Bottom\ Area})}$$

Bottom Area is the bottom area of all infiltration BMPs combined, Rv is the calculated recharge volume, and K is the Rawl's Rate which is dependent on the soil classification according to Table 5.3 below.

Table 5.3 – 1982 Rawls Rates

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate Inches/Hour
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09

The soil at the project site was determined to be HSG Class B Sandy Loam and therefore a Rawl's Rate of 1.02 inches/hour was used for the calculation given below.

Bioretention Area Drawdown:

$$\boldsymbol{Time_{drawdown} = \frac{1,685\ CF}{(1.02\ in./hour)(1ft/12\ in.)(800\ SF)}}$$

$$\boldsymbol{Time_{drawdown} = 24.8\ hours}$$

Infiltration Basin Drawdown:

$$\boldsymbol{Time_{drawdown} = \frac{177\ CF}{(1.02\ in./hour)(1ft/12\ in.)(140\ SF)}}$$

$$\boldsymbol{Time_{drawdown} = 14.9\ hours}$$

The calculations ensure the entire infiltration volume will draw down within the maximum allowable 72 hours.

Standard 4

"Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;

b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and

c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook."

All stormwater drainage systems were designed to remove the required 80% of suspended solids from the stormwater runoff. Completed TSS removal worksheets (provided by MassDEP) can be found in Appendix C of this report.

Standard 5

"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 loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs 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."

The development project site does not qualify as land use with higher potential pollutant loads (LUHPPL) according to the Massachusetts Stormwater Handbook, 310 CMR 10.04 and 314 CMR 9.02.

Standard 6

"Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require 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 areas, 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 "storm water 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

3.00and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply."

The project site does not lie within a Zone II or Interim Wellhead Protection Area.

Standard 7

"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 structural 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."

All Stormwater Management standards are met for the 34 High Street project site.

Standard 8

"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."

The sediment and erosion control plan is given in the next section of this report.

Standard 9

"A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed."

A long-term Stormwater O&M Manual has been prepared and can be found in Appendix E of this report.

Standard 10

"All illicit discharges to the stormwater management system are prohibited."

No known illicit discharges exist at the project site and no illicit discharges will be added for this development project.

Sediment and Erosion Control

Site Disturbance

The total area of site disturbance both permanent and temporary (Limit of Work) is approximately 39,000 SF.

Estimated Construction Phasing

The estimated construction phasing for the 34 High Street project site is as follows:

- Installation of a temporary site access
- Installation of erosion controls and slope stabilization
- Installation of all temporary structures including portable toilets and trash receptacles
- Initial site clearing
- Demolition, razing, and removal of existing structures
- Septic system installation
- Drainage and recharge basin installation
- Utilities installation
- Pool, house and patio construction
- Site grading
- Final site landscaping and stabilization

Sediment and Erosion Control Plan

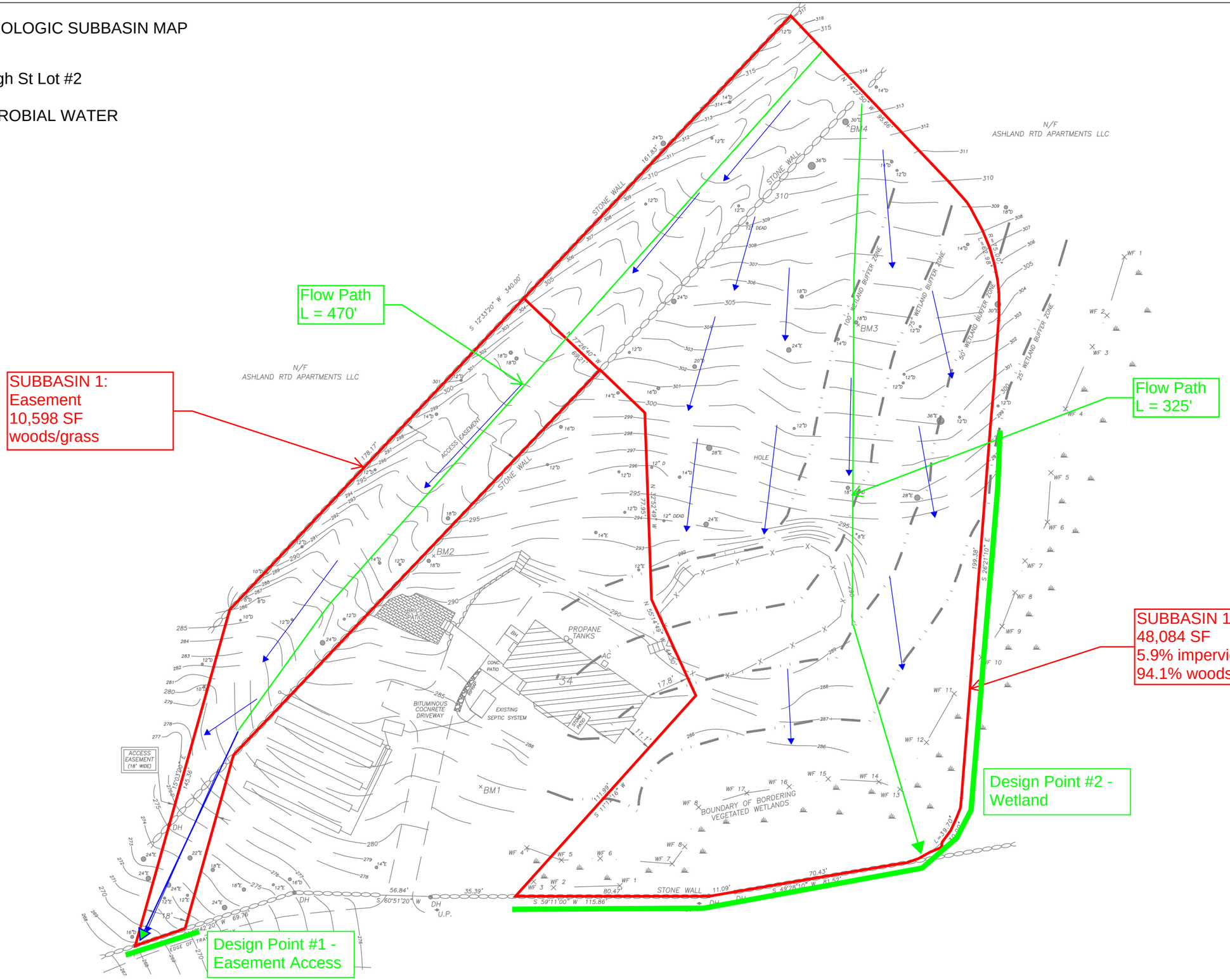
Multiple sediment and erosion control BMPs will be implemented for the 34 High Street project. The construction phase sediment and erosion control plans are detailed in the submitted drawings set. The following sediment and erosion control BMPs will be implemented:

- A temporary construction driveway tracking pad will be installed at the entrance to the site.
- All areas with slopes greater than 2:1 will be stabilized with jute matting slope stabilization blankets.
- A silt fence will be installed around the entire limit of work to prevent stormwater from entering the limit of work during the construction phase.
- A filter sock barrier will be placed around the limit of work on all slopes downhill of the limit of work area.
- All disturbed areas will be loamed and seeded at the completion of construction.

Appendix A: Hydrologic Sub-basin Maps

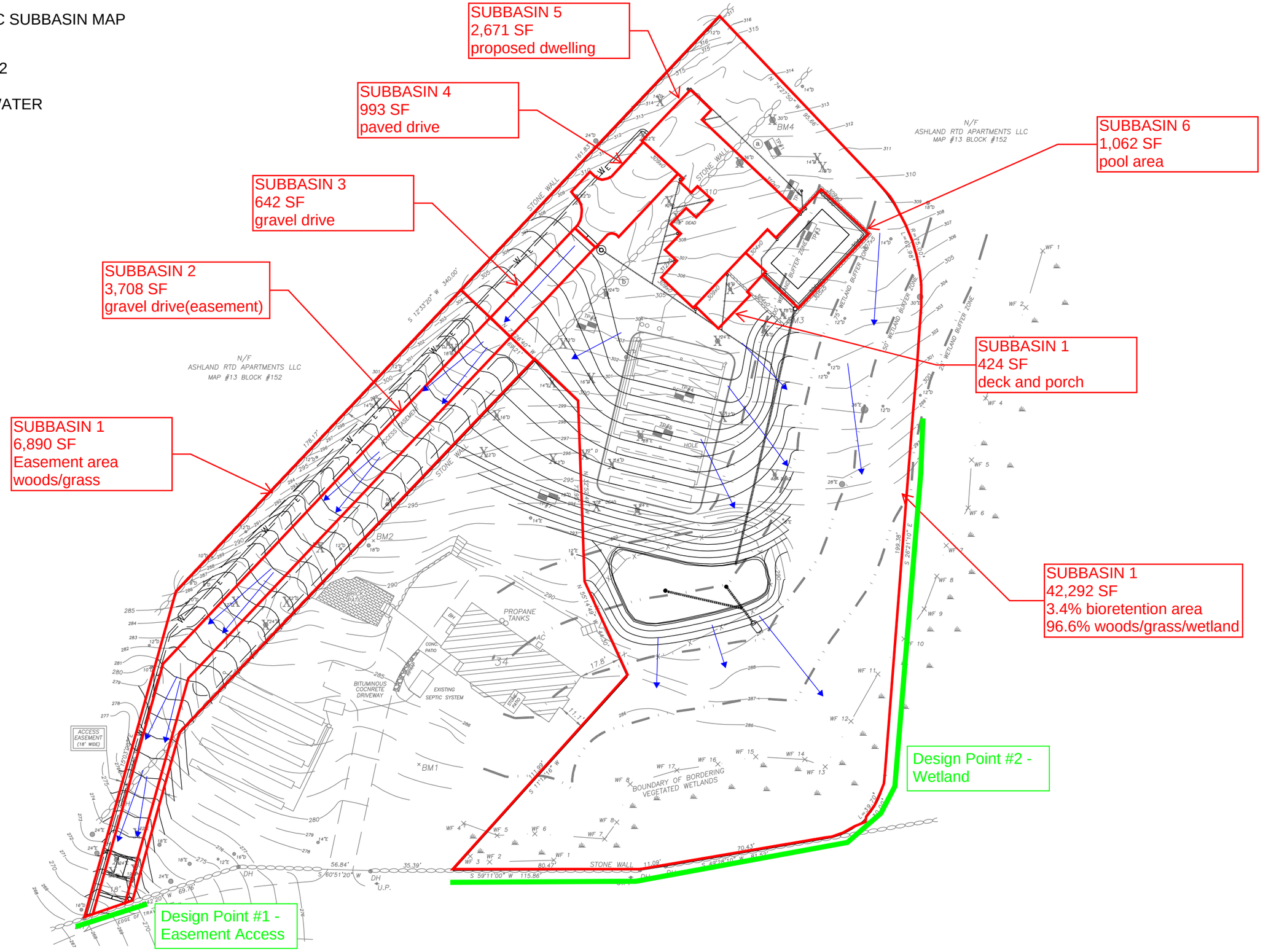
EXISTING HYDROLOGIC SUBBASIN MAP

PROJECT: 34 High St Lot #2
Ashland, MA
PREPARED BY: ROBIAL WATER
6 April 2022



PROPOSED HYDROLOGIC SUBBASIN MAP

PROJECT: 34 High St Lot #2
Ashland, MA
PREPARED BY: ROBIAL WATER
6 April 2022



Appendix B: Soil Data

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Middlesex County, Massachusetts

February 28, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:845 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 40 80 160 240

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 22, Sep 9, 2022

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
307D	Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony	1.1	69.2%
336B	Rainbow silt loam, 3 to 8 percent slopes, very stony	0.5	30.8%
Totals for Area of Interest		**1.6**	**100.0%**

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the

development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

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

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

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

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

Middlesex County, Massachusetts

307D—Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w67l
Elevation: 0 to 1,570 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Paxton, Extremely Stony

Setting

Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 10 inches: fine sandy loam
Bw1 - 10 to 17 inches: fine sandy loam
Bw2 - 17 to 28 inches: fine sandy loam
Cd - 28 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Charlton, extremely stony
Percent of map unit: 9 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge, extremely stony
Percent of map unit: 5 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ridgebury, extremely stony
Percent of map unit: 1 percent
Landform: Drumlins, depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

336B—Rainbow silt loam, 3 to 8 percent slopes, very stony

Map Unit Setting
National map unit symbol: 9932
Elevation: 110 to 520 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Rainbow and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rainbow

Setting
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, toeslope
Landform position (three-dimensional): Nose slope, base slope

Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Friable fine-loamy eolian deposits over dense loamy lodgment till derived from metamorphic rock

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 22 inches: silt loam
H3 - 22 to 32 inches: very fine sandy loam
H4 - 32 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 18 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Broadbrook

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Paxton

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder, toeslope
Landform position (three-dimensional): Head slope, nose slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave

Hydric soil rating: No

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Appendix C: TSS Removal Worksheets

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

Version 1, Automated: Mar. 4, 2008

Location: Infiltration Basin (Bottom of Driveway)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Subsurface Infiltration Structure	**0.80**	**0.75**	**0.60**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**

Total TSS Removal = **85%**

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

Project: **34 High St Lot #2**
Prepared By: **Robial Water, LTD**
Date: **4/6/2023**

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

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

Version 1, Automated: Mar. 4, 2008

Location: Bioretention Area

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Rain Garden	**0.90**	**0.75**	**0.68**	**0.08**
	0.00	**0.08**	**0.00**	**0.08**
	0.00	**0.08**	**0.00**	**0.08**
	0.00	**0.08**	**0.00**	**0.08**

Total TSS Removal = **93%**

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

Project: **34 High St Lot #2**
Prepared By: **Robial Water, LTD**
Date: **4/6/2023**

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Appendix D: Stormwater O&M Manual

STORMWATER OPERATION AND MAINTENANCE PLAN

34 High Street
Ashland, MA 01721

April 6, 2023

Stormwater Management System Owner: Name: Meredith and Daniel Huff
Or current Owner of 34 High St
Lot #2 Ashland, MA 01721

Engineer of record: Name: Jay Thrasher, P.E.
Robial Water, Ltd.
85 Courtland Street
Providence, RI 02909

Signature: _____

This Operation and Maintenance Plan has been prepared with reference to the MA Department of Environmental Protection stormwater standards and recommendations outlined in the stormwater handbook. This plan outlines the minimum efforts necessary to maintain the stormwater collection and treatment system and sedimentation and erosion control system for this site. This Plan includes O&M practices in accordance with the Massachusetts Department of Environmental Protection (DEP) stormwater management policy. Efforts in addition to the minimum listed herein may be required to ensure adequate stormwater management.

This Plan includes general site restrictions, routine/non-routine operation and maintenance, reporting and record keeping. A plan showing the location of the systems and facilities including easements, roadway drainage system, and stormwater devices is attached.

General Site Conditions

The following conditions are imposed as part of this Plan.

- The Stormwater Permitting Authority or its designee shall be able to enter the property, with notice to the property owner, at reasonable times and in a reasonable manner for the purpose of inspection.
- Illicit discharges into stormwater management system are perpetually prohibited.
- The use of fertilizers should be limited to slow-release fertilizers, except at establishment of vegetation.
- Uncovered and/or uncontained road de-icing materials shall not be stored on-site.

Operation and Maintenance:

Schedule: The entire stormwater management system should be inspected twice per year.

The stormwater system includes trench drains and drain basins at the top and bottom of the driveway, an infiltration basin at the end of the gravel driveway, and a bioretention area (rain garden). Specific inspection and maintenance practices are listed under each component below. Upon completion of inspection, the inspector should specify any necessary corrective actions to be taken by ownership of the facility. The items to be inspected and maintained are described in the following sections.

Based on the observed conditions, the Responsible Party shall immediately schedule the appropriate maintenance. Some minor maintenance, such as the removal of blockages, debris and saplings in the basins may be conducted at the time of the inspection. More difficult maintenance activities, requiring special equipment, will have to be scheduled, such as the removal of excessive sediment or the repair of eroded areas. All sediment must be removed at least once per year.

Drain Basins:

Location: DB1: Upper paved driveway area (48″)
DB2: bottom of gravel driveway (48″)
DB3: Adjacent to pool (48″)

The drain basins each consist of a sump that measures 2 feet deep from the bottom to the outlet pipe. The actual removal of sediments and associated pollutants and trash occurs only when sumps are cleaned out; therefore, regular maintenance is required. The more frequent the cleaning, the less likely sediments will be resuspended and subsequently discharged. Frequent cleaning also results in more volume available for future storms and enhances the overall performance.

At a minimum, the drain basins should be inspected twice annually (spring and fall) and cleaned whenever sediment accumulation comes within 12 inches of the top of the outlet tee, or at a minimum of once per year. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations. At each inspection, inspect outlet structure and repair as necessary.

If upon inspection mosquito breeding is found to be present, larvicide shall be introduced to the catch basins.

Infiltration Basin:
Location: Below end of gravel driveway.

The infiltration basin consists of 3 Cultec FD C4 HD chambers surrounded by a clean granular stone bed. The infiltration systems shall be inspected at least twice annually (spring and fall). Any debris found that can potentially clog the system shall be removed.

If upon inspection mosquito breeding is found to be present, larvicide shall be introduced to the infiltration system via the inspection port. The inspection port must be properly sealed between all inspections to ensure no mosquito colonies are introduced to the system.

Gravel Drainage Trenches:
Location: Along edges of concrete pool apron

The gravel trench drain shall be inspected after every major storm in the first few months after construction. After this initial period, the systems should be inspected at least twice annually (spring and fall) with on inspection performed after every major storm to see if the trench drain has developed any damage or debris.

If debris is found to be present at any point in time, the accumulated debris should be removed and disposed of in accordance with applicable local, state, and federal guidelines and regulations. If the trench drain is found to be damaged after the end of a storm or at any time, then immediate remediation is necessary.

If upon inspection mosquito breeding is found to be present, larvicide shall be introduced to the trench drain.

Bioretention Area:
Location: Lower lawn

The bioretention area is a normally dry planted area with 2.5′ of sandy bioretention soil media above a 6″ bed of gravel. The bioretention area shall be inspected after every storm in the first few months after construction to ensure proper stabilization and function. After this initial period, the systems should be inspected at least twice annually (spring and fall) with one inspection performed after every major storm. If accumulated water is found, a clearance rate should be calculated by dividing the drop in water levels (inches) by the elapsed time (hours). This clearance rate should be recording along with maintenance and repair records for the stormwater BMPs (see Reporting and record Keeping below).
The following shall be performed during each inspection:

- Check to ensure the surface remains well draining after storm events.
    - If filter bed is clogged, draining poorly, or standing water covers more than 50% of the surface 48 hours after a storm, then remove the top few inches of discolored material and till or rake the remaining material as needed.
- Check inlets, outlets and overflow grate for leaves and debris.
    - Rake in and around the system to clear it of debris. Clear the inlet and overflow structures if obstructed. Repair or replace any damage to structural components.
- Check for animal burrows and short-circuiting in the bioretention areas.
    - Soil erosion form short-circuiting or animal burrows should be repaired when they occur. The holes shall be filled and lightly compacted.

- Check for robust vegetation coverage throughout the system.
    - Remove any dead or dying plants. Trim existing plants as needed. Replace dead or removed plants with new vegetation from MA DEP list of acceptable wet condition species. Vegetation should cover roughly 75% of the bioretention areas.

Recommended Contractor:

The recommended contractor for disposal of accumulated sediment for the stormwater BMPs is Wayne's Drains. The contact info is given below. This O&M plan should be updated with new contact info for the current disposal company as required.

Wayne's Drains
36 Grant Avenue
Burlington, MA 01803
(781) 272-3100

Reporting and Record Keeping

The responsible party will be responsible for maintaining accurate Maintenance Logs for all maintenance, inspections, repairs, replacements, and disposal (for disposal, the log shall indicate the type of material and the disposal location). The logs shall be kept on site to be available for inspection by the Town municipal departments or other auditing authority. This will be a perpetual requirement of the Owners or their Designated Party.

The Site Maintenance Log will be completed as described above, and at a minimum will include:

a. The date of inspection or activity;
b. Name of inspector;
c. The condition of each stormwater management system, including components such as:
    i. Pretreatment devices
    ii. Vegetation
    iii. Inlets and outlets
    iv. Swales
    v. Underground drainage
    vi. Sediment and debris accumulation.
    vii. Any nonstructural practices
    viii. Pavement condition
    ix. Roof drains and gutter conditions
    ix. Any other item that could affect the proper function of the stormwater management system
d. Description of the need for maintenance; and
e. For disposal include type of material and the disposal location;

Drainage Easements:

A 10,598 SF access easement is included in this O&M Manual. No additional drainage easements are currently proposed or required.

Changes to Operation and Maintenance Plans

The owner(s) of the stormwater management system must notify the Stormwater Permitting Authority or its designated Reviewing Agent of changes in ownership or assignment of financial responsibility.

Emergency Response Plan / Spill Control Practices

On-site storage of hazardous materials shall not be allowed.

In the event of an accident where a significant amount of gasoline or other petroleum product is released, the following procedure should be followed:

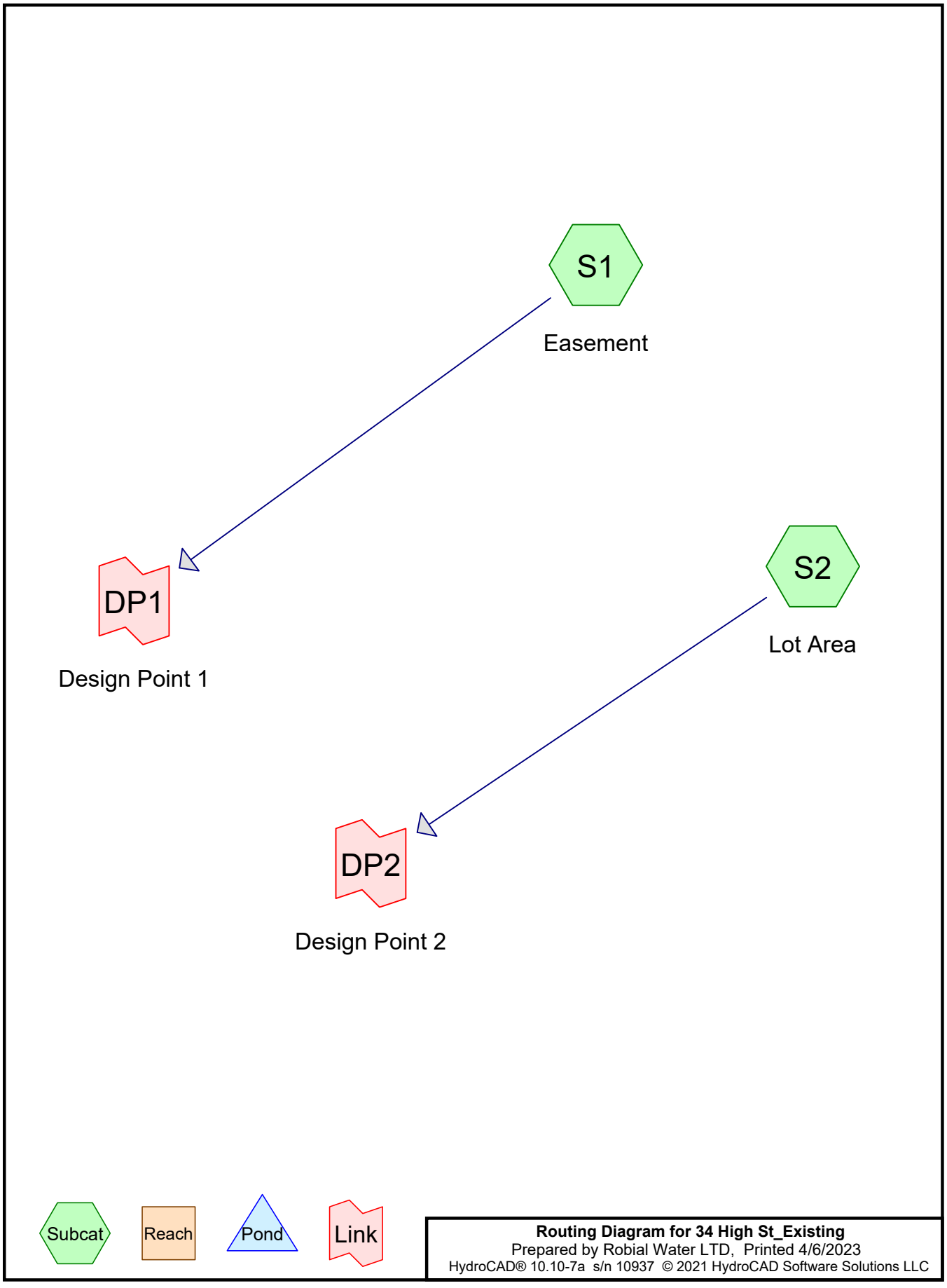
3. Immediately contact the following agencies:

Ashland Fire Department	(508) 881-2323
MassDEP Emergency response	(888) 304-1133

4. Provide support to agencies listed above, which may include contacting an outside contractor to provide clean-up or contacting a Licensed Site Professional (LSP) to lead the clean-up.

The outlet to the drainage system should be inspected. If there is evidence of discharge from the drainage system, additional corrective actions must be taken extending to the receiving water or beyond.

Appendix E: HydroCAD Printouts



Routing Diagram for 34 High St_Existing
Prepared by Robial Water LTD, Printed 4/6/2023

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 yr Storm	Type III 24-hr		Default	24.00	1	3.36	2
2	10 yr Storm	Type III 24-hr		Default	24.00	1	5.25	2
3	25 yr Storm	Type III 24-hr		Default	24.00	1	6.42	2
4	100 yr Storm	Type III 24-hr		Default	24.00	1	8.24	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,823	98	Unconnected pavement, HSG B (S2)
45,261	65	Woods/grass comb., Fair, HSG B (S2)
10,598	73	Woods/grass comb., Poor, HSG B (S1)
58,682	**68**	**TOTAL AREA**

Summary for Subcatchment S1: Easement

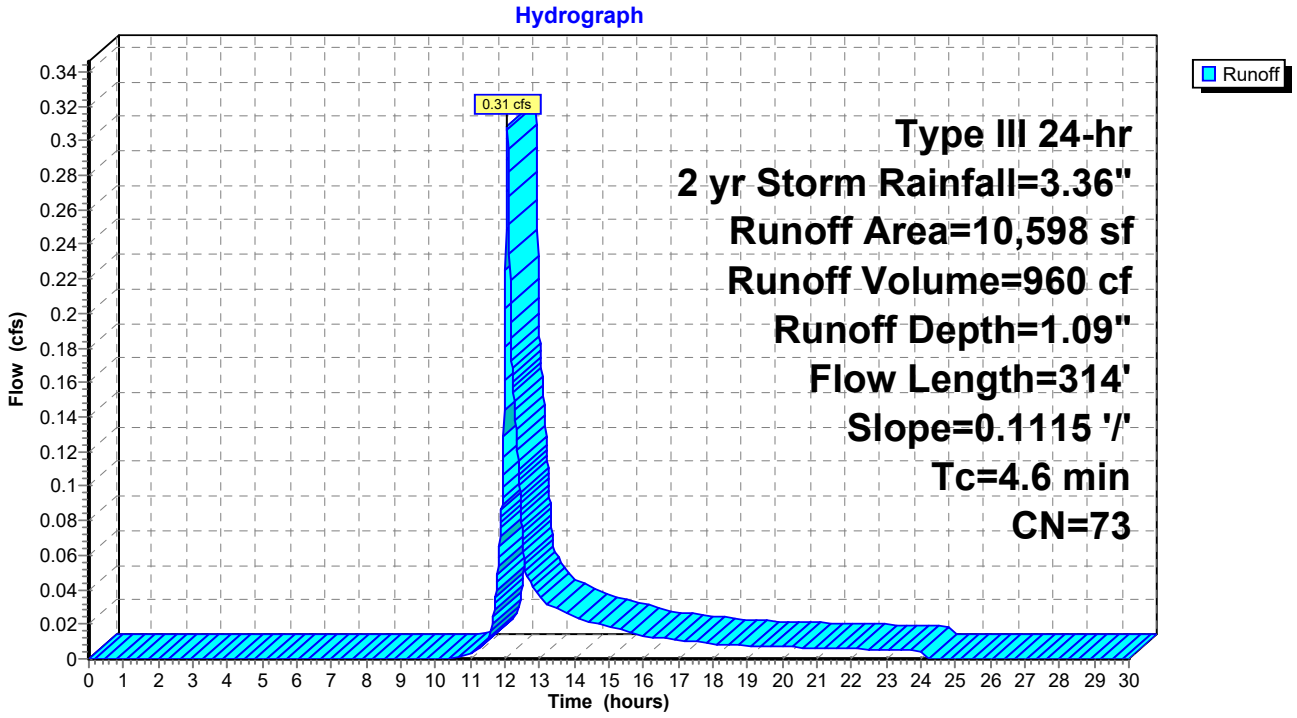
Runoff = 0.31 cfs @ 12.08 hrs, Volume= 960 cf, Depth= 1.09"
Routed to Link DP1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Storm Rainfall=3.36"

Area (sf)	CN	Description
10,598	73	Woods/grass comb., Poor, HSG B
10,598		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	314	0.1115	1.13		**Lag/CN Method,**

Subcatchment S1: Easement



Summary for Subcatchment S2: Lot Area

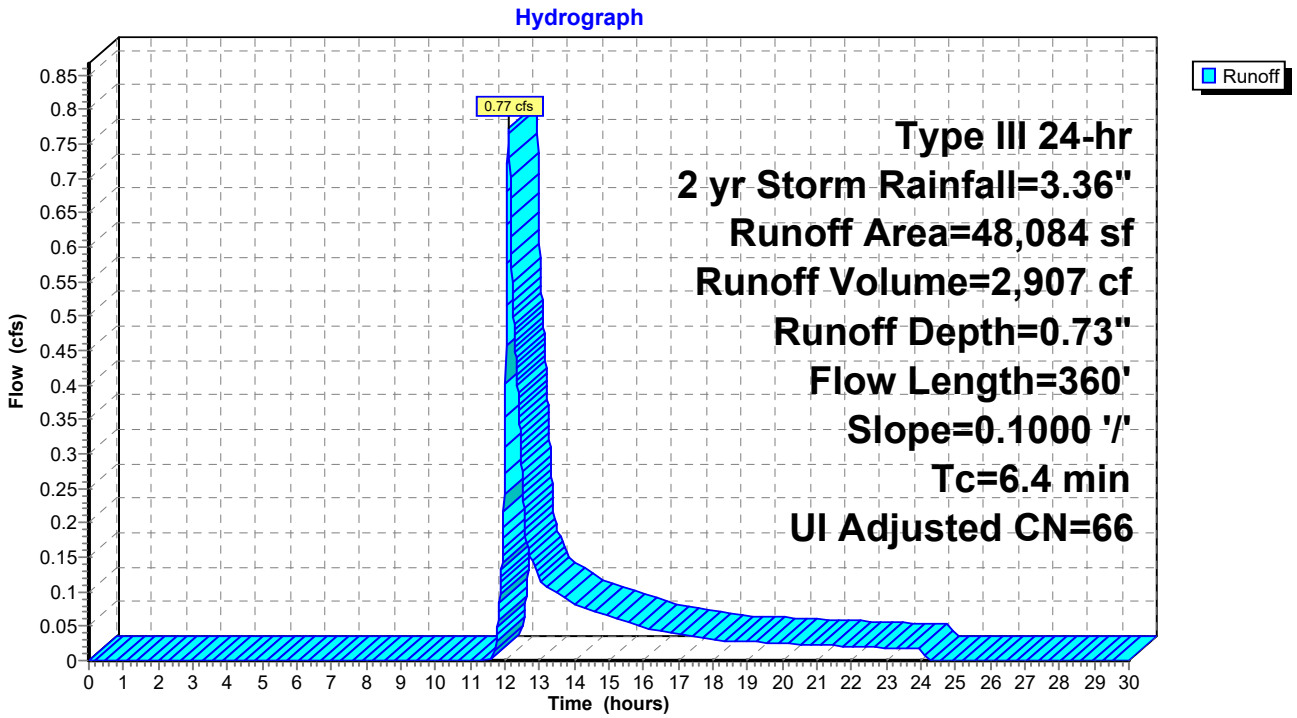
Runoff = 0.77 cfs @ 12.11 hrs, Volume= 2,907 cf, Depth= 0.73"
Routed to Link DP2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Storm Rainfall=3.36"

Area (sf)	CN	Adj	Description
45,261	65		Woods/grass comb., Fair, HSG B
2,823	98		Unconnected pavement, HSG B
48,084	67	66	Weighted Average, UI Adjusted
45,261			94.13% Pervious Area
2,823			5.87% Impervious Area
2,823			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	360	0.1000	0.94		**Lag/CN Method,**

Subcatchment S2: Lot Area

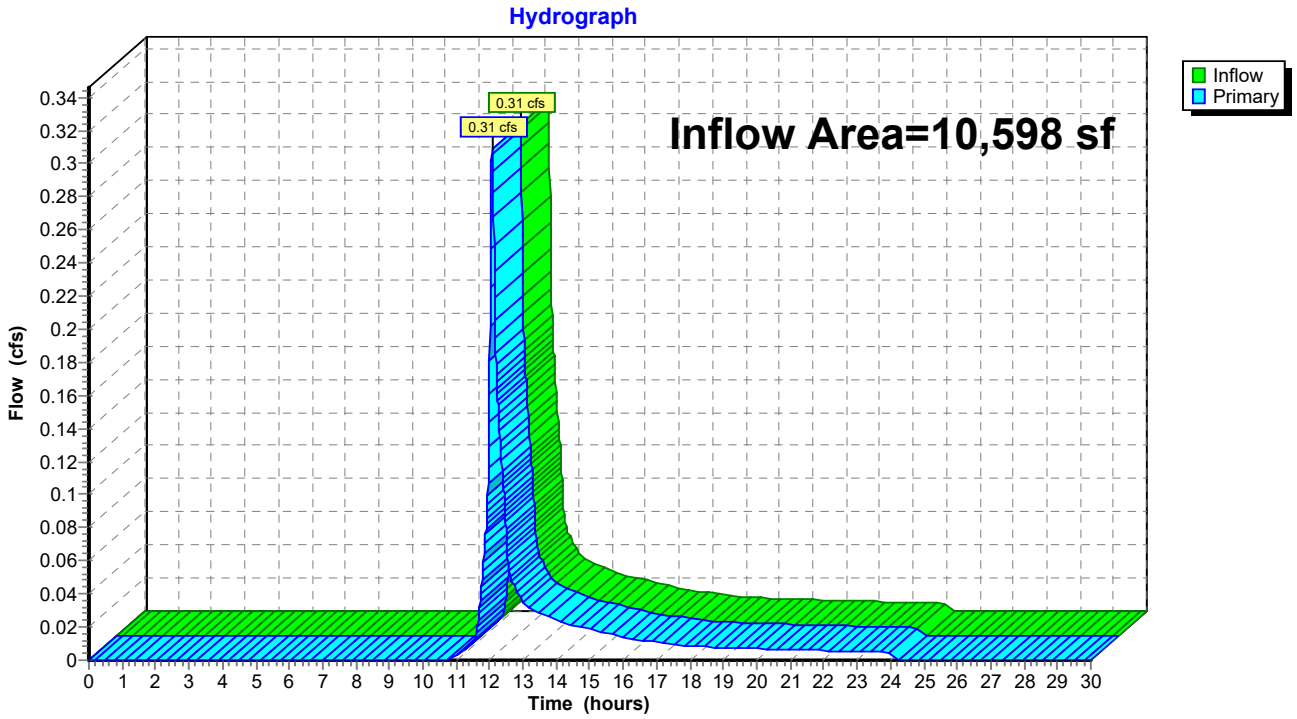


Summary for Link DP1: Design Point 1

Inflow Area = 10,598 sf, 0.00% Impervious, Inflow Depth = 1.09" for 2 yr Storm event
Inflow = 0.31 cfs @ 12.08 hrs, Volume= 960 cf
Primary = 0.31 cfs @ 12.08 hrs, Volume= 960 cf, Atten= 0%, Lag= 0.0 min

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

Link DP1: Design Point 1

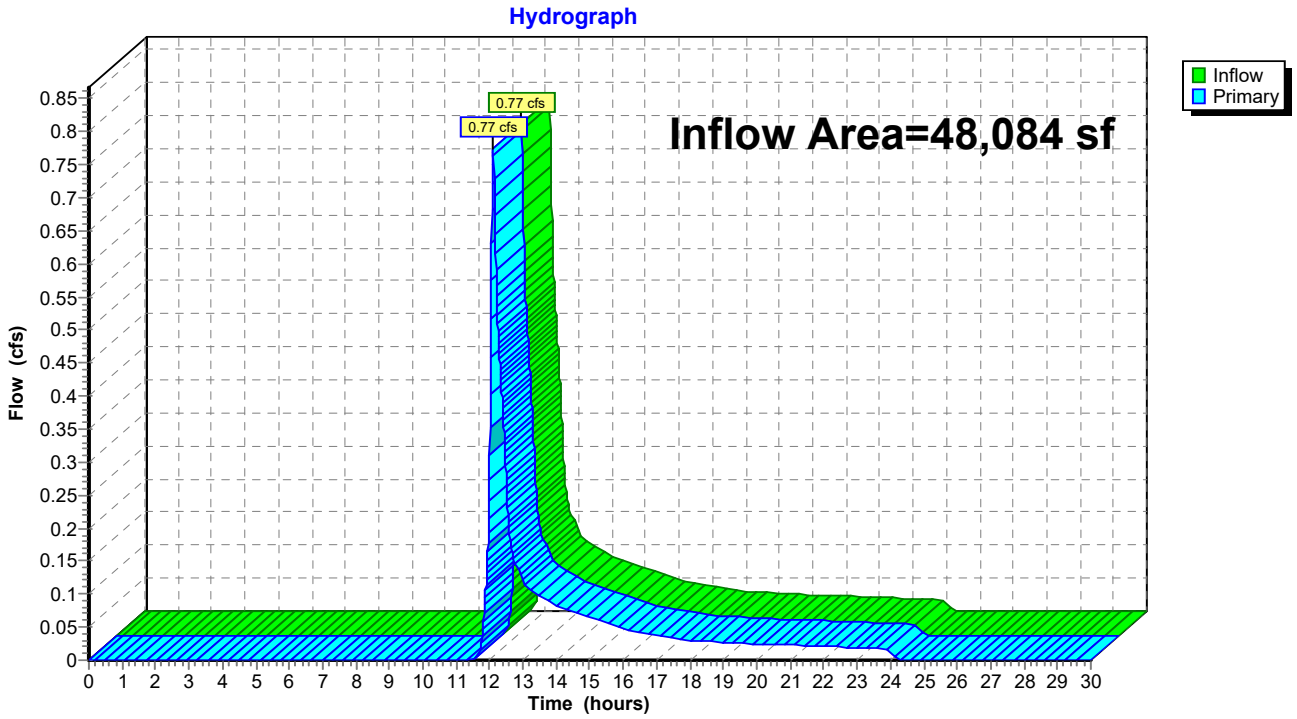


Summary for Link DP2: Design Point 2

Inflow Area = 48,084 sf, 5.87% Impervious, Inflow Depth = 0.73" for 2 yr Storm event
Inflow = 0.77 cfs @ 12.11 hrs, Volume= 2,907 cf
Primary = 0.77 cfs @ 12.11 hrs, Volume= 2,907 cf, Atten= 0%, Lag= 0.0 min

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

Link DP2: Design Point 2



Summary for Subcatchment S1: Easement

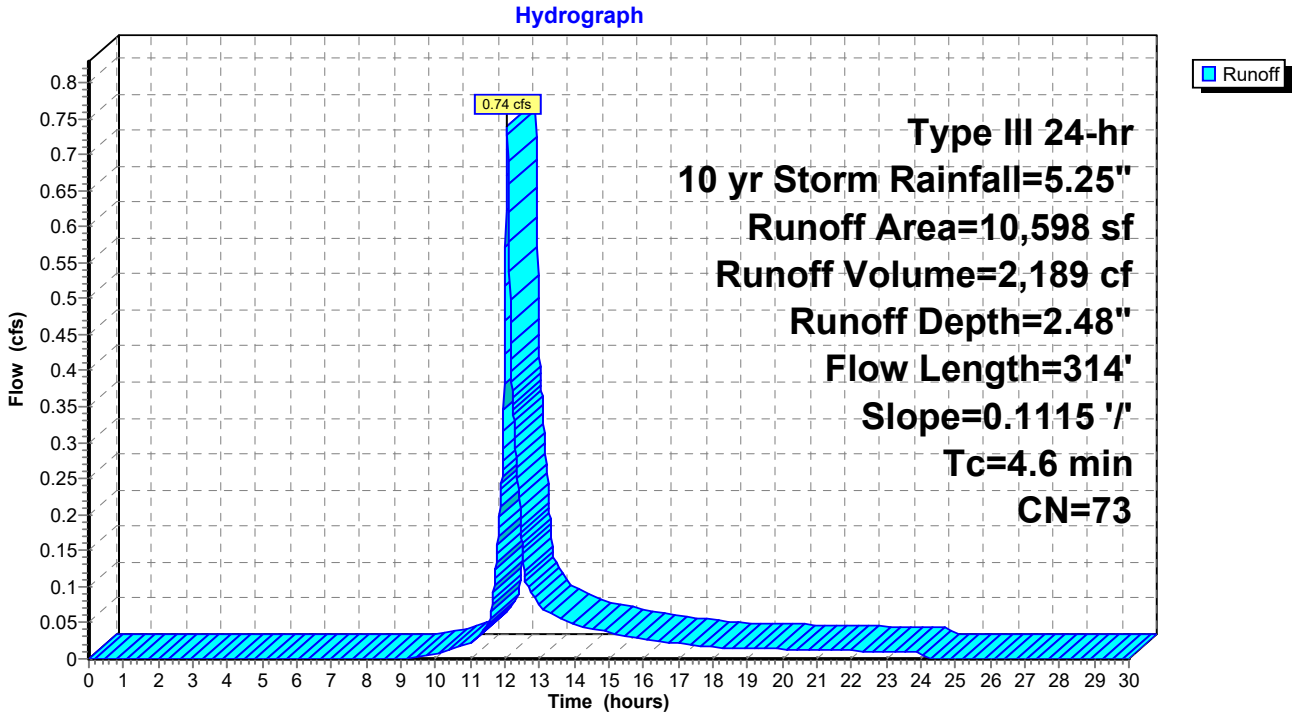
Runoff = 0.74 cfs @ 12.07 hrs, Volume= 2,189 cf, Depth= 2.48"
Routed to Link DP1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Storm Rainfall=5.25"

Area (sf)	CN	Description
10,598	73	Woods/grass comb., Poor, HSG B
10,598		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	314	0.1115	1.13		**Lag/CN Method,**

Subcatchment S1: Easement



Summary for Subcatchment S2: Lot Area

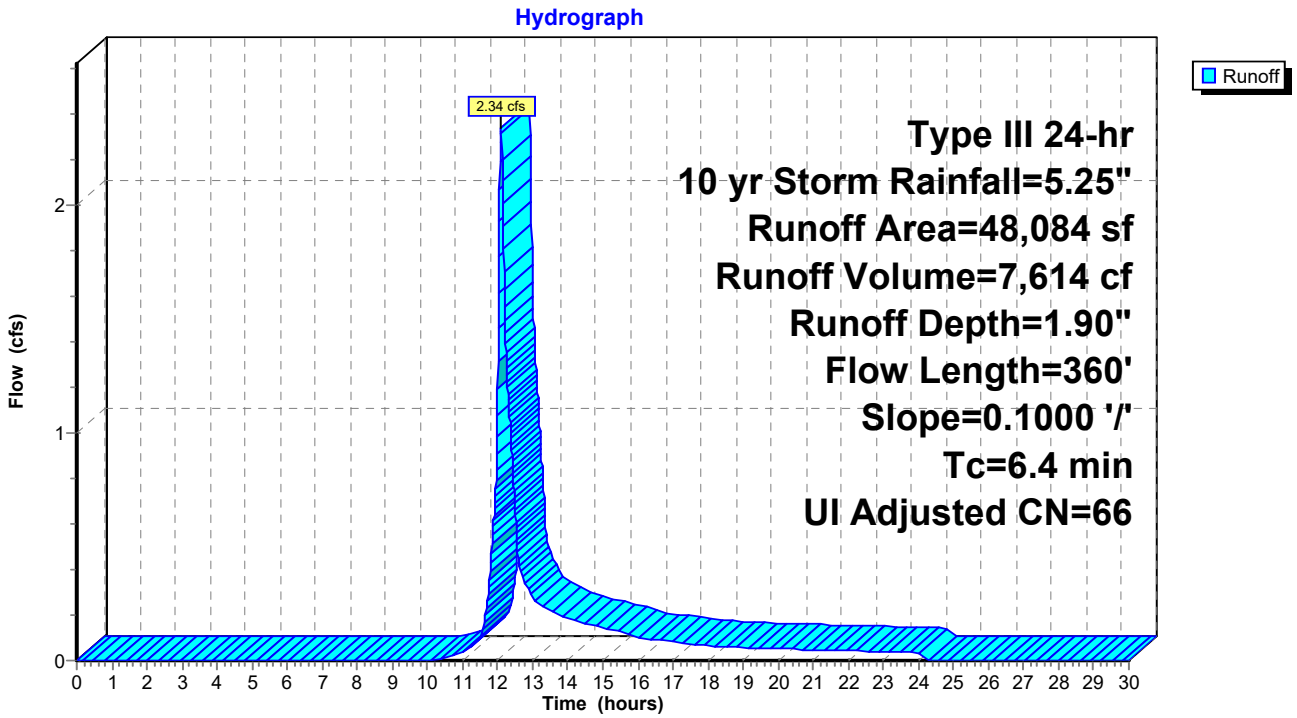
Runoff = 2.34 cfs @ 12.10 hrs, Volume= 7,614 cf, Depth= 1.90"
Routed to Link DP2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Storm Rainfall=5.25"

Area (sf)	CN	Adj	Description
45,261	65		Woods/grass comb., Fair, HSG B
2,823	98		Unconnected pavement, HSG B
48,084	67	66	Weighted Average, UI Adjusted
45,261			94.13% Pervious Area
2,823			5.87% Impervious Area
2,823			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	360	0.1000	0.94		**Lag/CN Method,**

Subcatchment S2: Lot Area

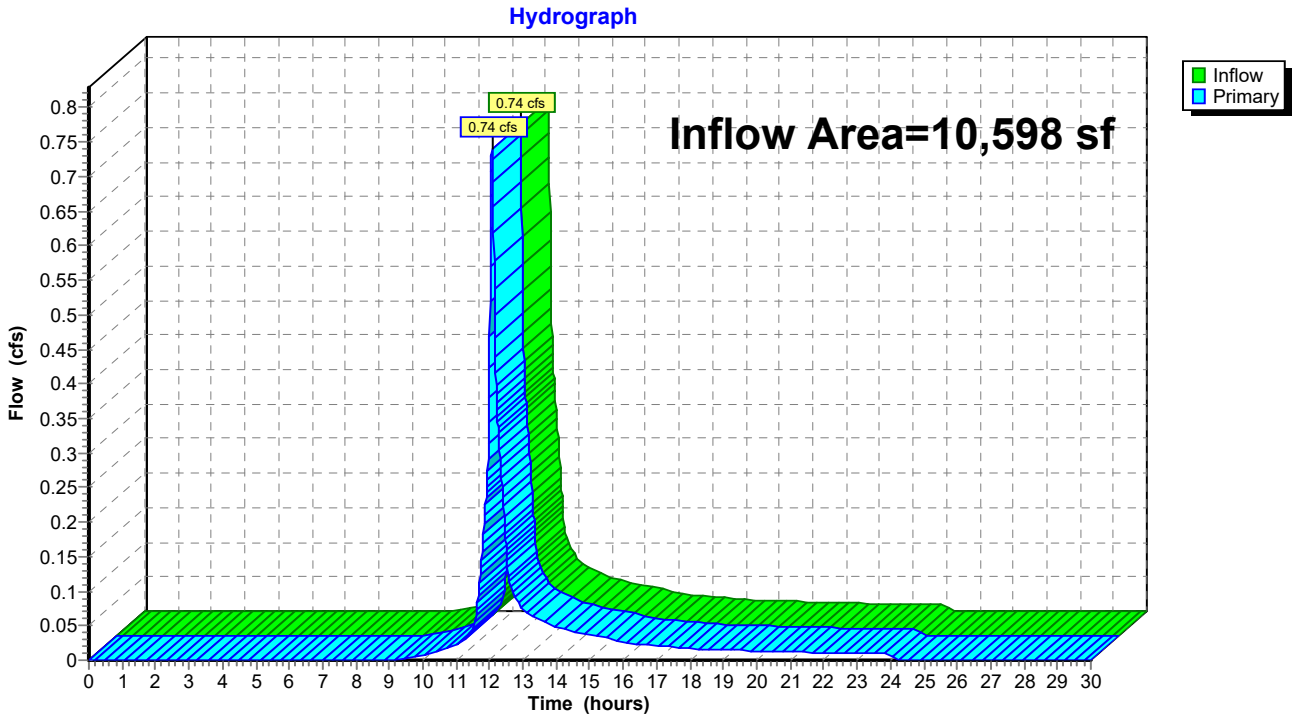


Summary for Link DP1: Design Point 1

Inflow Area = 10,598 sf, 0.00% Impervious, Inflow Depth = 2.48" for 10 yr Storm event
Inflow = 0.74 cfs @ 12.07 hrs, Volume= 2,189 cf
Primary = 0.74 cfs @ 12.07 hrs, Volume= 2,189 cf, Atten= 0%, Lag= 0.0 min

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

Link DP1: Design Point 1

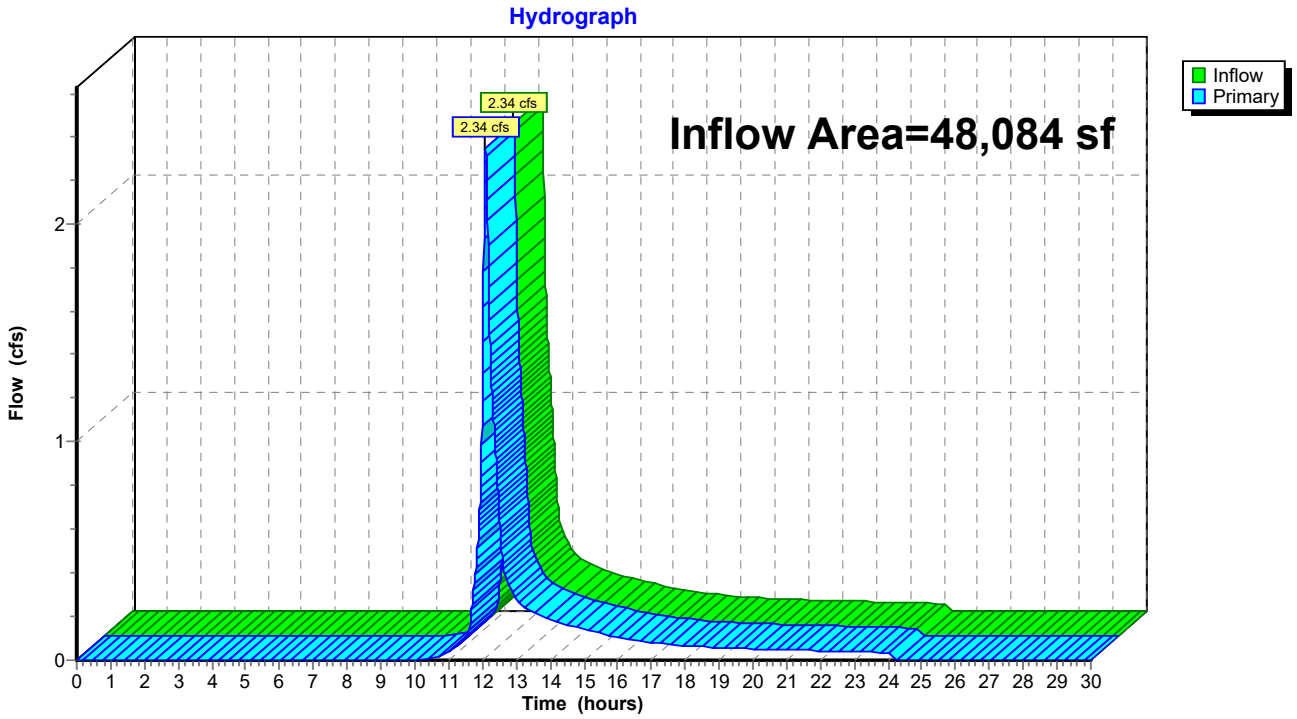


Summary for Link DP2: Design Point 2

Inflow Area = 48,084 sf, 5.87% Impervious, Inflow Depth = 1.90" for 10 yr Storm event
Inflow = 2.34 cfs @ 12.10 hrs, Volume= 7,614 cf
Primary = 2.34 cfs @ 12.10 hrs, Volume= 7,614 cf, Atten= 0%, Lag= 0.0 min

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

Link DP2: Design Point 2



Summary for Subcatchment S1: Easement

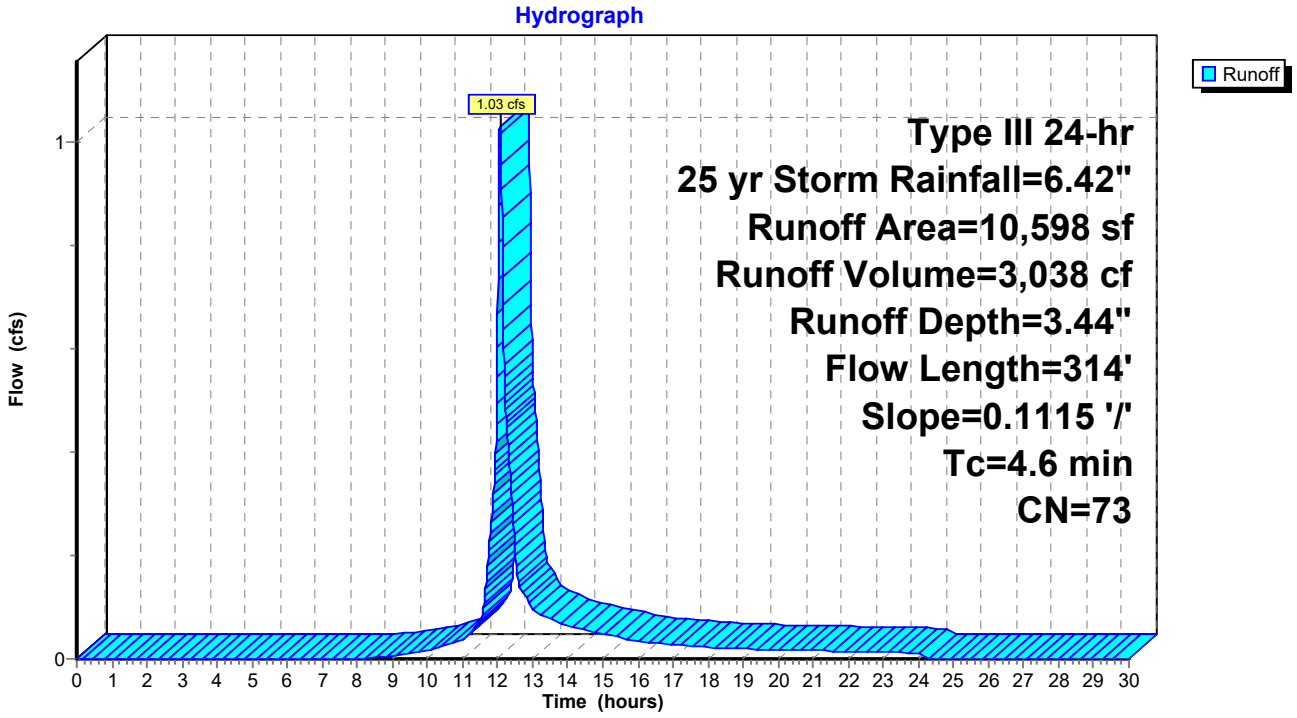
Runoff = 1.03 cfs @ 12.07 hrs, Volume= 3,038 cf, Depth= 3.44"
Routed to Link DP1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Storm Rainfall=6.42"

Area (sf)	CN	Description
10,598	73	Woods/grass comb., Poor, HSG B
10,598		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	314	0.1115	1.13		**Lag/CN Method,**

Subcatchment S1: Easement



Summary for Subcatchment S2: Lot Area

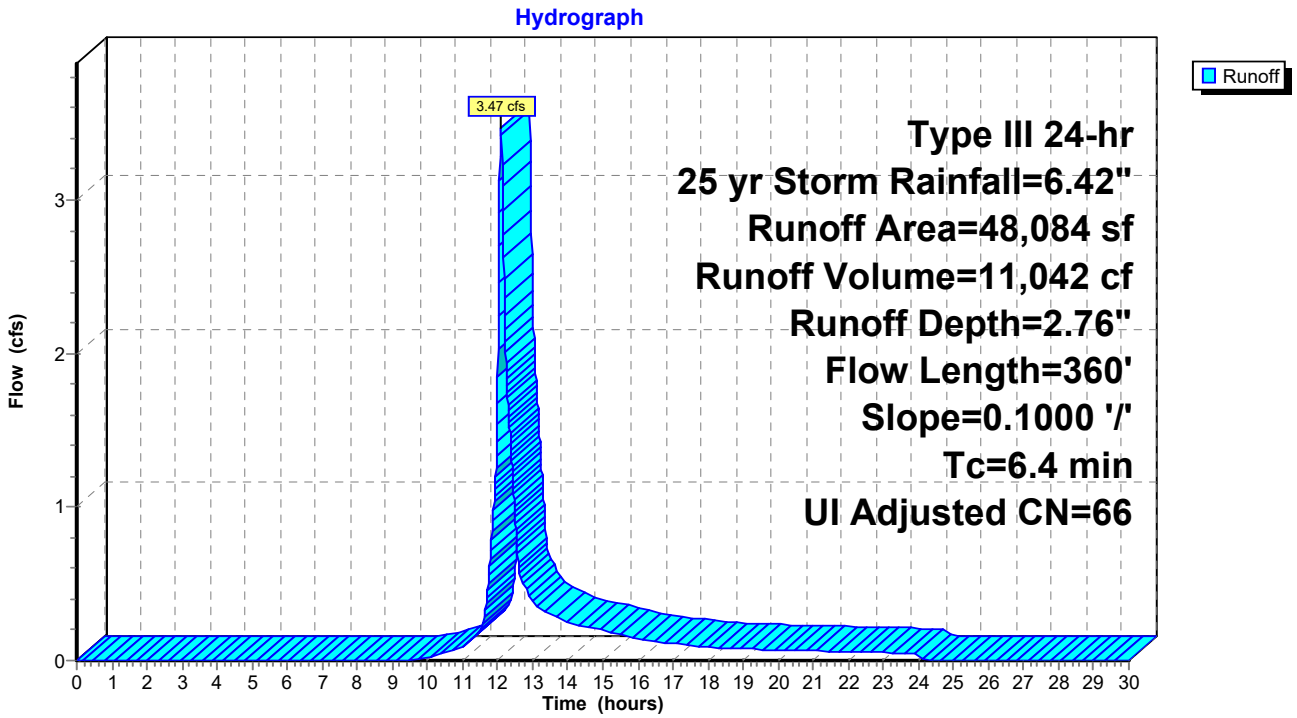
Runoff = 3.47 cfs @ 12.10 hrs, Volume= 11,042 cf, Depth= 2.76"
Routed to Link DP2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Storm Rainfall=6.42"

Area (sf)	CN	Adj	Description
45,261	65		Woods/grass comb., Fair, HSG B
2,823	98		Unconnected pavement, HSG B
48,084	67	66	Weighted Average, UI Adjusted
45,261			94.13% Pervious Area
2,823			5.87% Impervious Area
2,823			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	360	0.1000	0.94		**Lag/CN Method,**

Subcatchment S2: Lot Area

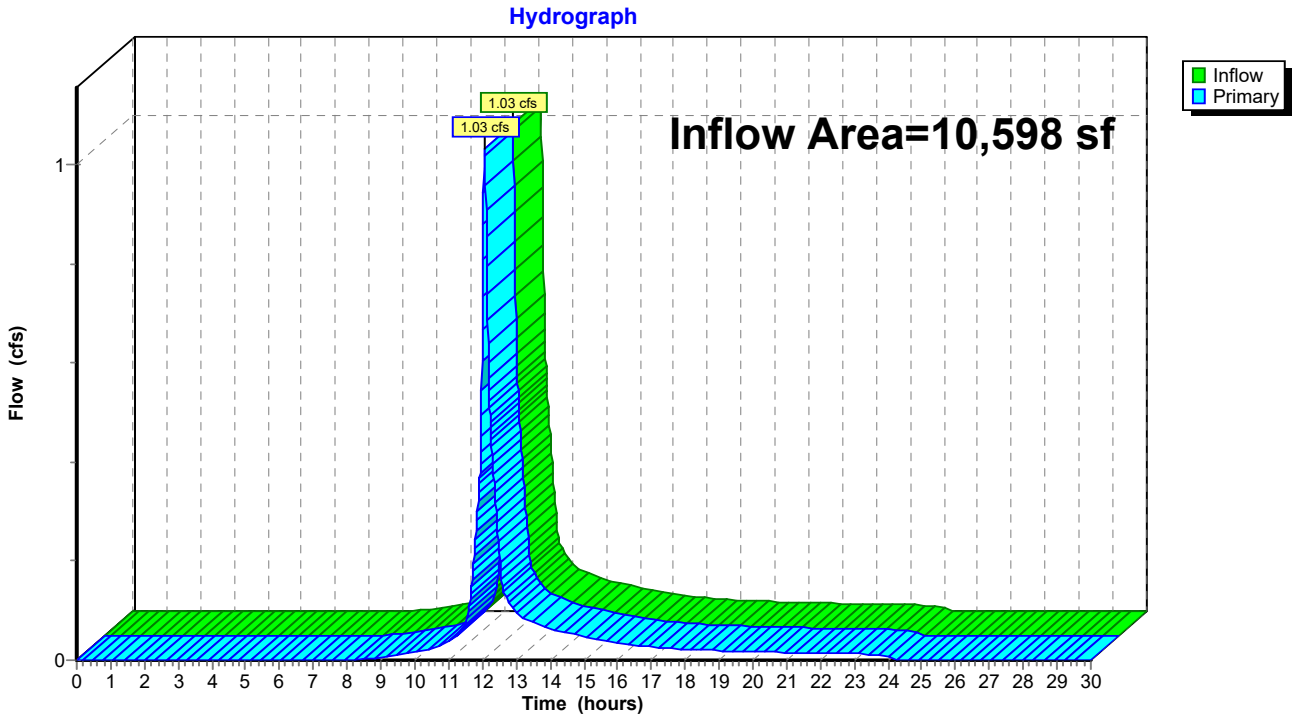


Summary for Link DP1: Design Point 1

Inflow Area = 10,598 sf, 0.00% Impervious, Inflow Depth = 3.44" for 25 yr Storm event
Inflow = 1.03 cfs @ 12.07 hrs, Volume= 3,038 cf
Primary = 1.03 cfs @ 12.07 hrs, Volume= 3,038 cf, Atten= 0%, Lag= 0.0 min

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

Link DP1: Design Point 1

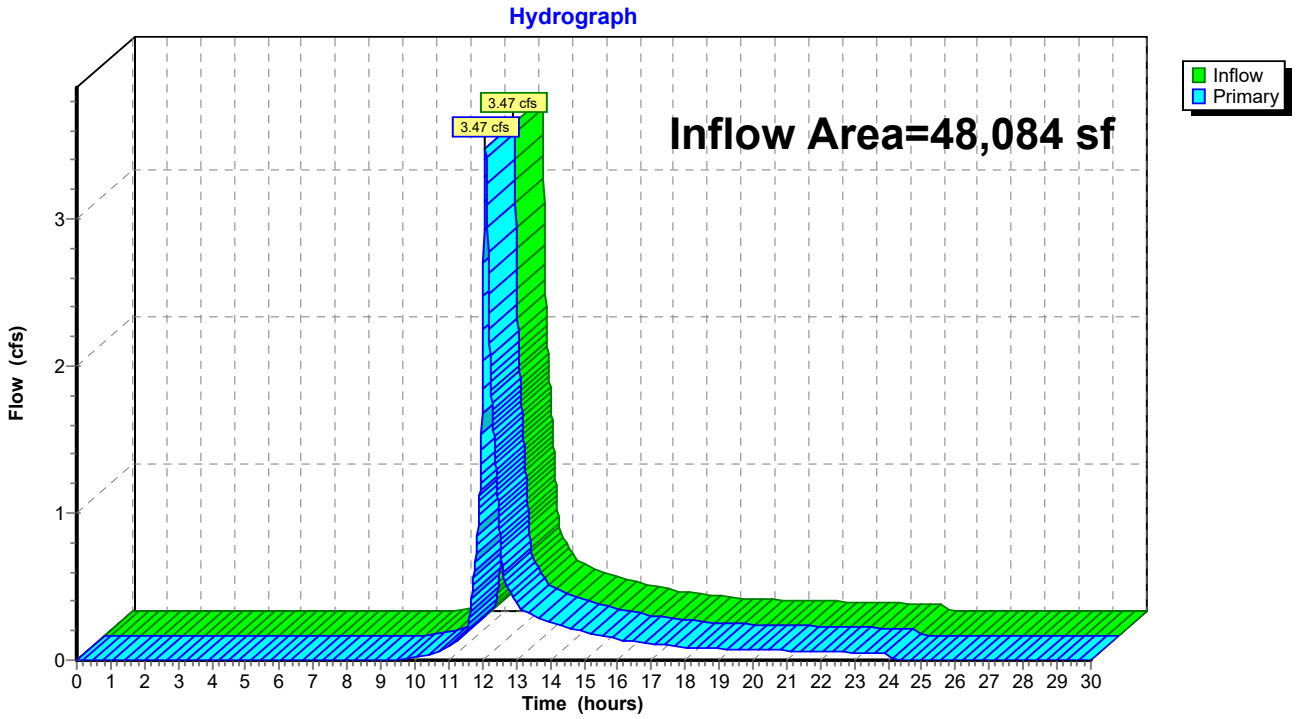


Summary for Link DP2: Design Point 2

Inflow Area = 48,084 sf, 5.87% Impervious, Inflow Depth = 2.76" for 25 yr Storm event
Inflow = 3.47 cfs @ 12.10 hrs, Volume= 11,042 cf
Primary = 3.47 cfs @ 12.10 hrs, Volume= 11,042 cf, Atten= 0%, Lag= 0.0 min

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

Link DP2: Design Point 2



Summary for Subcatchment S1: Easement

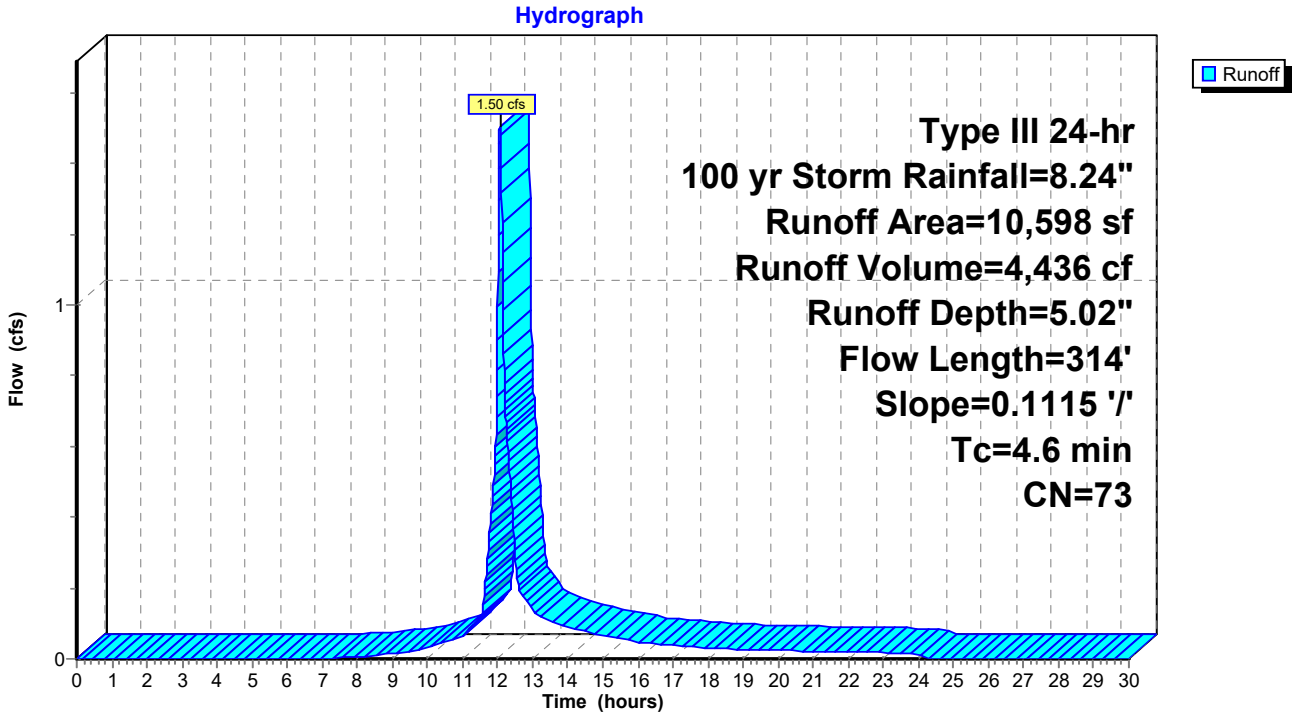
Runoff = 1.50 cfs @ 12.07 hrs, Volume= 4,436 cf, Depth= 5.02"
Routed to Link DP1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Storm Rainfall=8.24"

Area (sf)	CN	Description
10,598	73	Woods/grass comb., Poor, HSG B
10,598		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	314	0.1115	1.13		**Lag/CN Method,**

Subcatchment S1: Easement



Summary for Subcatchment S2: Lot Area

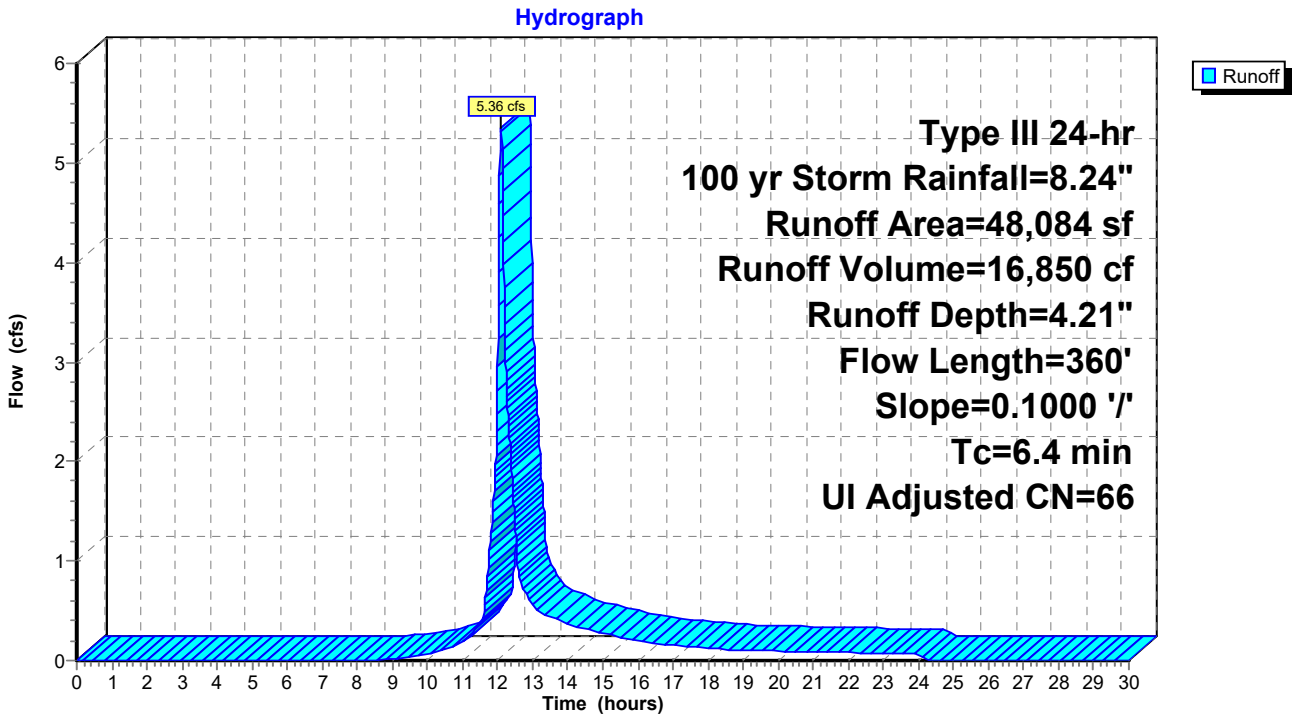
Runoff = 5.36 cfs @ 12.10 hrs, Volume= 16,850 cf, Depth= 4.21"
Routed to Link DP2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Storm Rainfall=8.24"

Area (sf)	CN	Adj	Description
45,261	65		Woods/grass comb., Fair, HSG B
2,823	98		Unconnected pavement, HSG B
48,084	67	66	Weighted Average, UI Adjusted
45,261			94.13% Pervious Area
2,823			5.87% Impervious Area
2,823			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	360	0.1000	0.94		**Lag/CN Method,**

Subcatchment S2: Lot Area

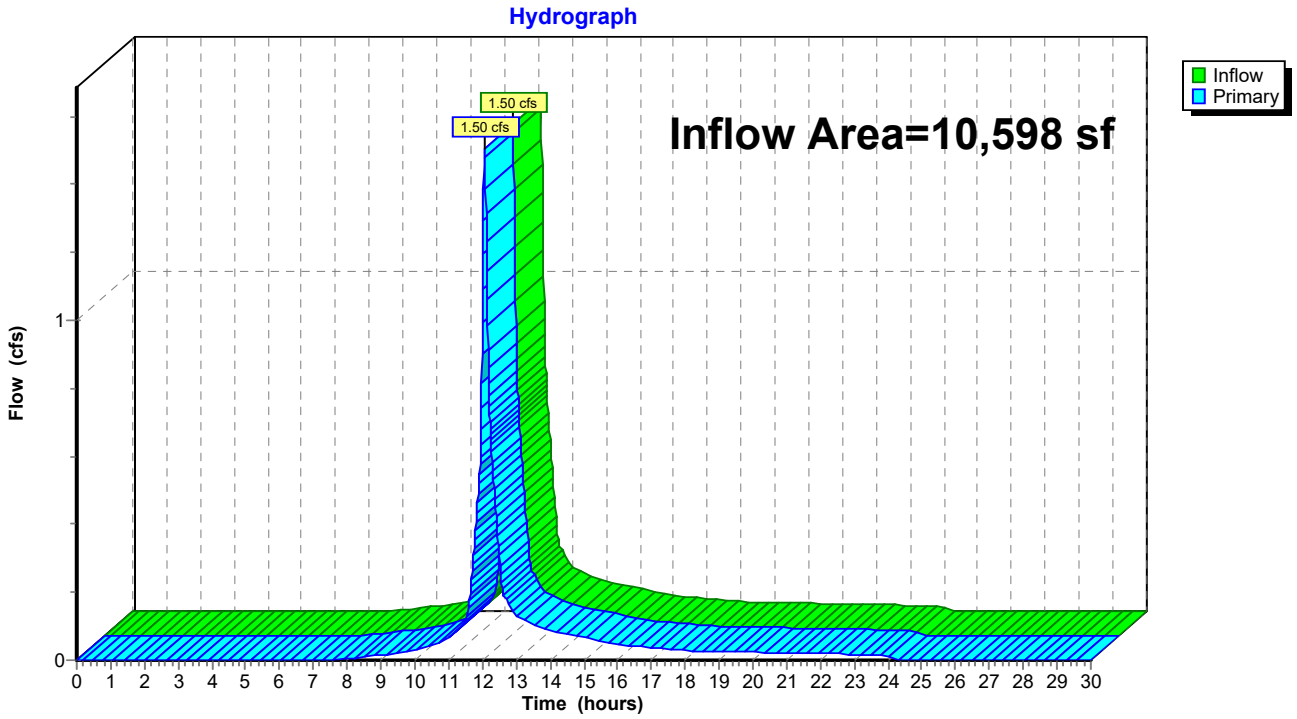


Summary for Link DP1: Design Point 1

Inflow Area = 10,598 sf, 0.00% Impervious, Inflow Depth = 5.02" for 100 yr Storm event
Inflow = 1.50 cfs @ 12.07 hrs, Volume= 4,436 cf
Primary = 1.50 cfs @ 12.07 hrs, Volume= 4,436 cf, Atten= 0%, Lag= 0.0 min

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

Link DP1: Design Point 1

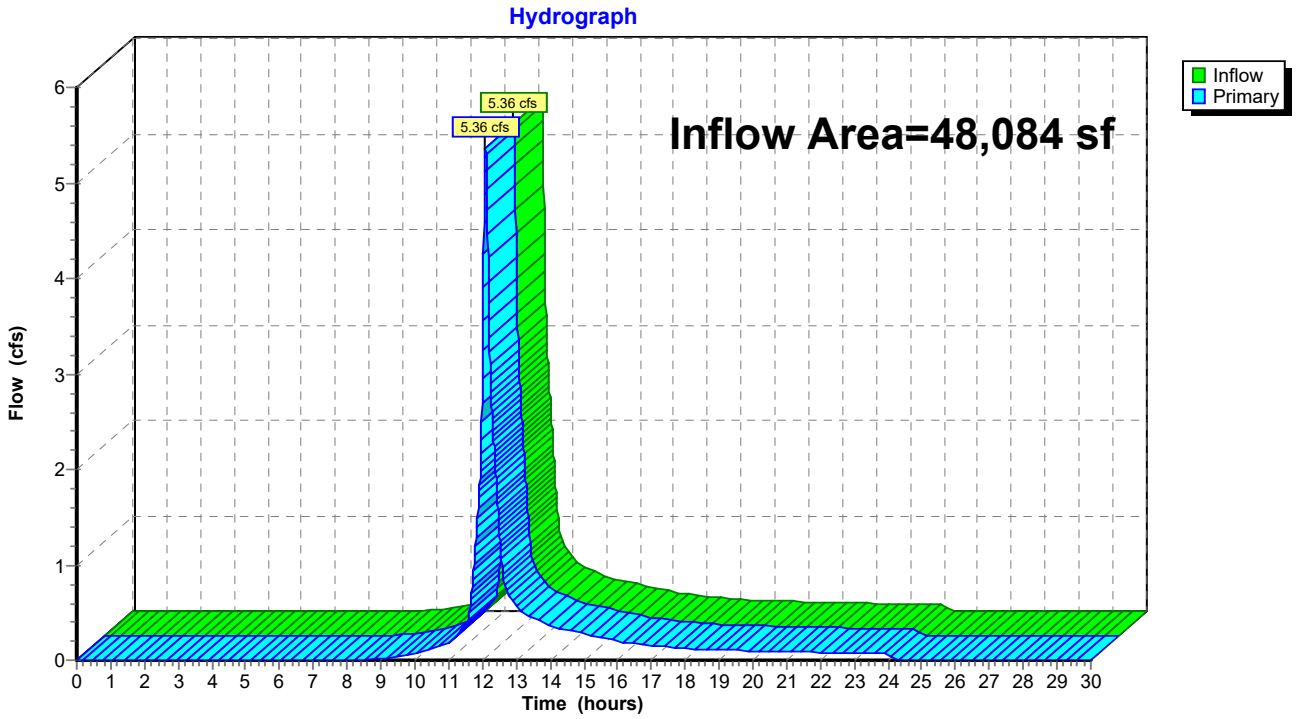


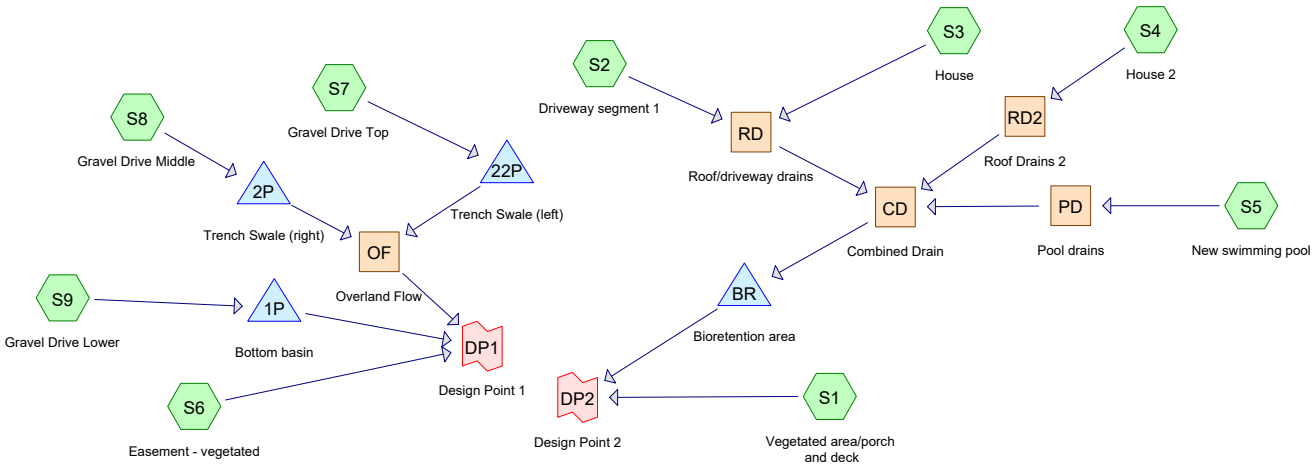
Summary for Link DP2: Design Point 2

Inflow Area = 48,084 sf, 5.87% Impervious, Inflow Depth = 4.21" for 100 yr Storm event
Inflow = 5.36 cfs @ 12.10 hrs, Volume= 16,850 cf
Primary = 5.36 cfs @ 12.10 hrs, Volume= 16,850 cf, Atten= 0%, Lag= 0.0 min

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

Link DP2: Design Point 2





Subcat Reach Pond Link

Routing Diagram for 34 High St_Proposed_2023.04.06
Prepared by Robial Water LTD, Printed 4/6/2023

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 yr Storm	Type III 24-hr		Default	24.00	1	3.36	2
2	10 yr Storm	Type III 24-hr		Default	24.00	1	5.25	2
3	25 yr Storm	Type III 24-hr		Default	24.00	1	6.42	2
4	100 yr Storm	Type III 24-hr		Default	24.00	1	8.24	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
4,350	85	Gravel roads, HSG B (S1, S7, S8, S9)
993	98	Paved parking, HSG B (S2)
1,293	98	Roofs, HSG B (S3)
1,486	98	Unconnected pavement, HSG B (S1, S5)
1,378	98	Unconnected roofs, HSG B (S4)
49,182	65	Woods/grass comb., Fair, HSG B (S1, S6)
58,682	**69**	**TOTAL AREA**

Summary for Subcatchment S1: Vegetated area/porch and deck

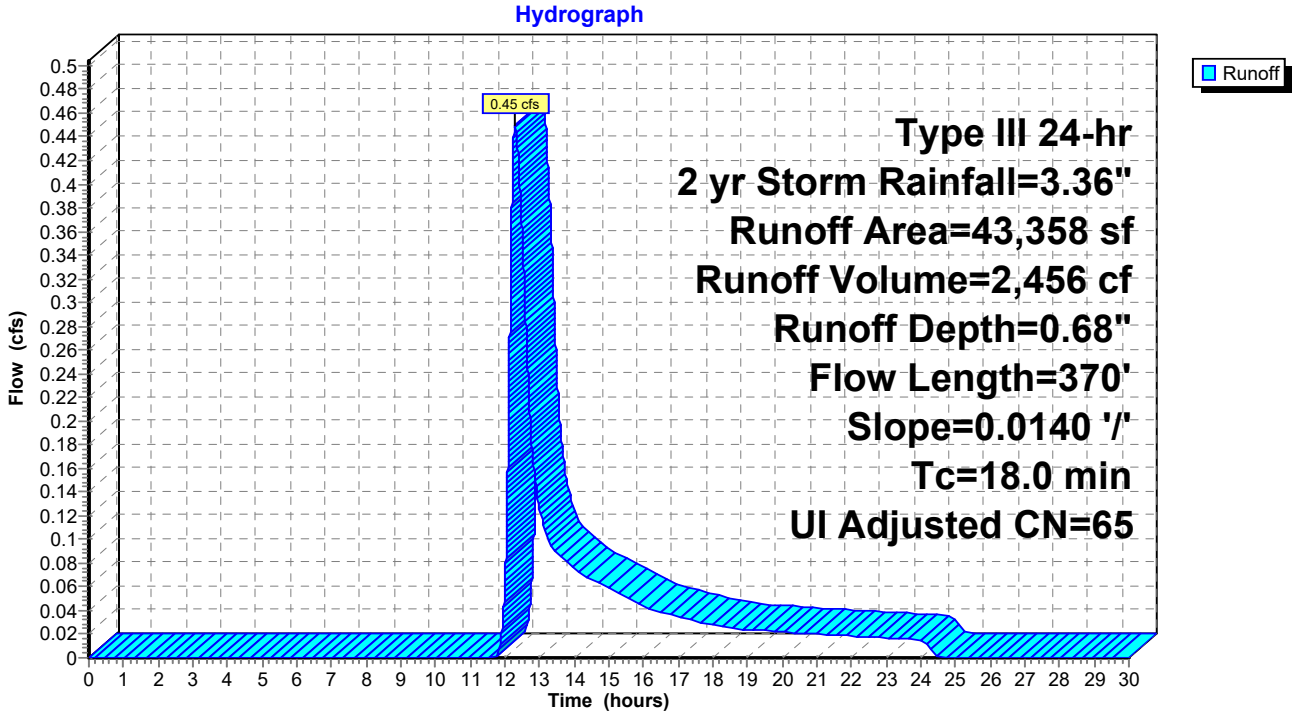
Runoff = 0.45 cfs @ 12.30 hrs, Volume= 2,456 cf, Depth= 0.68"
Routed to Link DP2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 2 yr Storm Rainfall=3.36"

Area (sf)	CN	Adj	Description
42,292	65		Woods/grass comb., Fair, HSG B
424	98		Unconnected pavement, HSG B
642	85		Gravel roads, HSG B
43,358	66	65	Weighted Average, UI Adjusted
42,934			99.02% Pervious Area
424			0.98% Impervious Area
424			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	370	0.0140	0.34		**Lag/CN Method,**

Subcatchment S1: Vegetated area/porch and deck



Summary for Subcatchment S2: Driveway segment 1

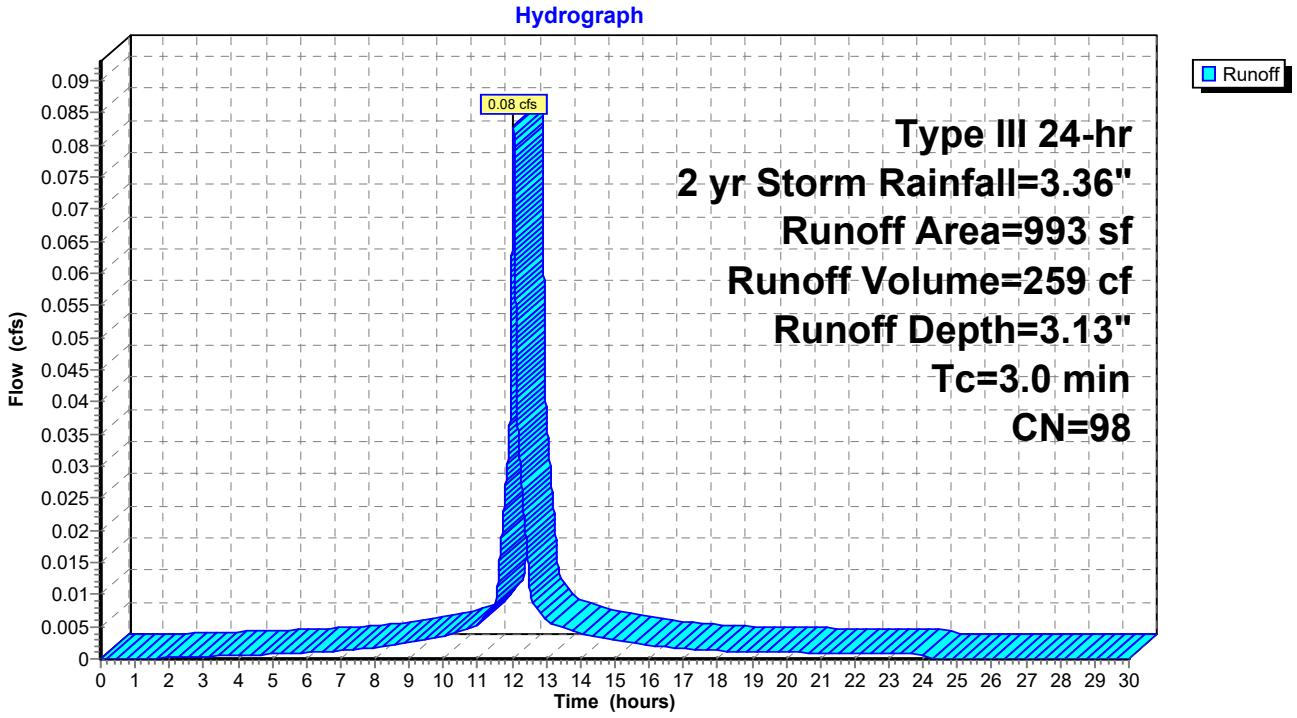
Runoff = 0.08 cfs @ 12.04 hrs, Volume= 259 cf, Depth= 3.13"
Routed to Reach RD : Roof/driveway drains

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 2 yr Storm Rainfall=3.36"

Area (sf)	CN	Description
993	98	Paved parking, HSG B
993		100.00% Impervious Area

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

Subcatchment S2: Driveway segment 1



Summary for Subcatchment S3: House

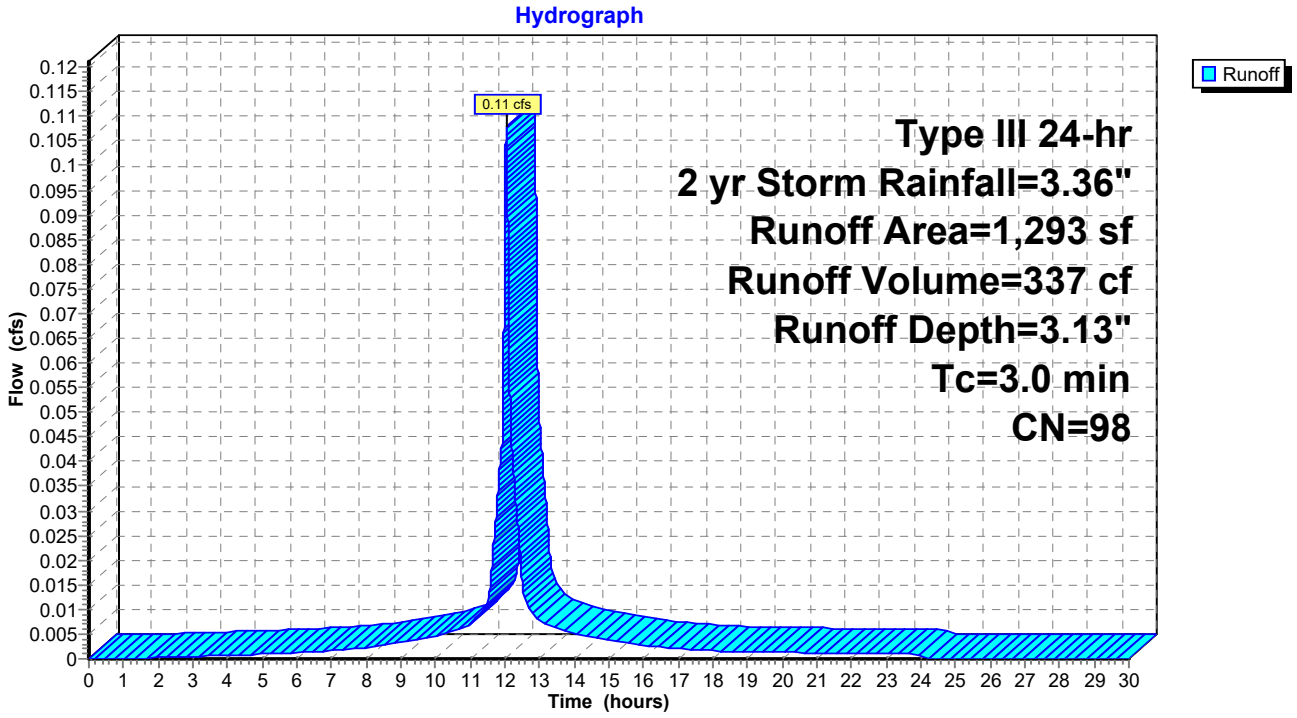
Runoff = 0.11 cfs @ 12.04 hrs, Volume= 337 cf, Depth= 3.13"
Routed to Reach RD : Roof/driveway drains

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 2 yr Storm Rainfall=3.36"

Area (sf)	CN	Description
1,293	98	Roofs, HSG B
1,293		100.00% Impervious Area

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

Subcatchment S3: House



Summary for Subcatchment S4: House 2

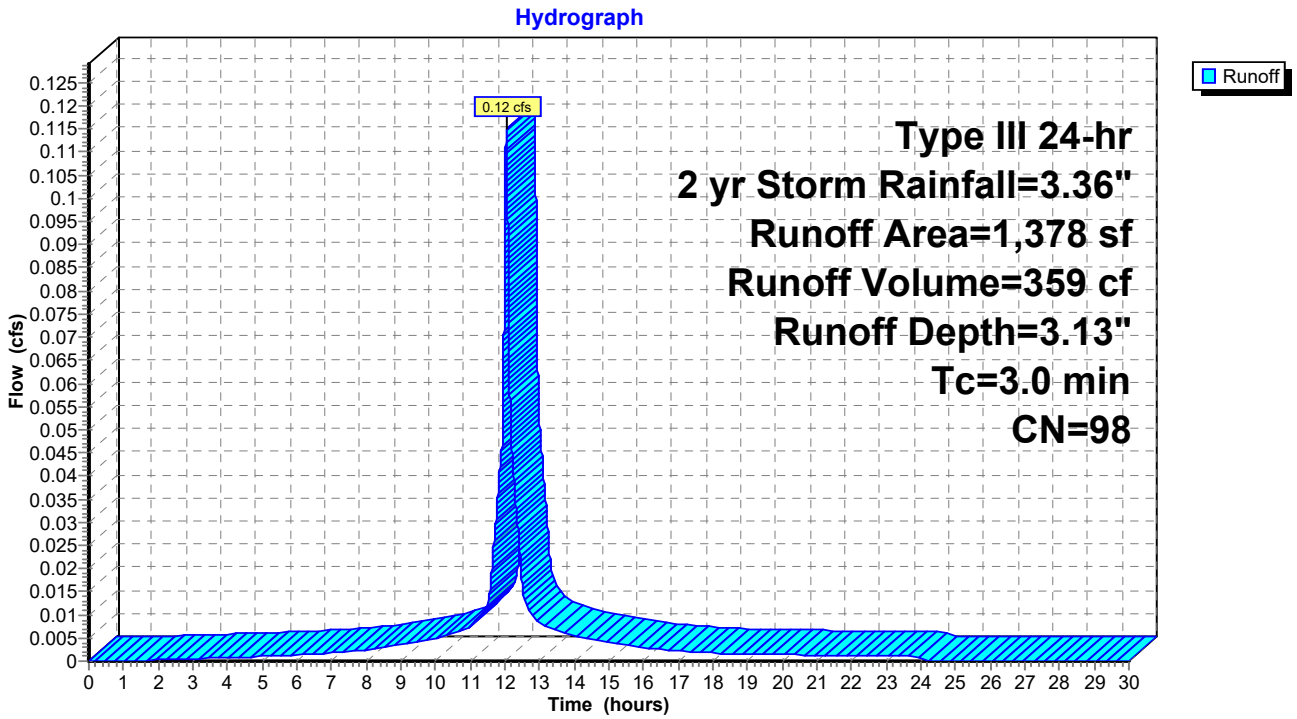
Runoff = 0.12 cfs @ 12.04 hrs, Volume= 359 cf, Depth= 3.13"
Routed to Reach RD2 : Roof Drains 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 2 yr Storm Rainfall=3.36"

Area (sf)	CN	Description
1,378	98	Unconnected roofs, HSG B
1,378		100.00% Impervious Area
1,378		100.00% Unconnected

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

Subcatchment S4: House 2



Summary for Subcatchment S5: New swimming pool

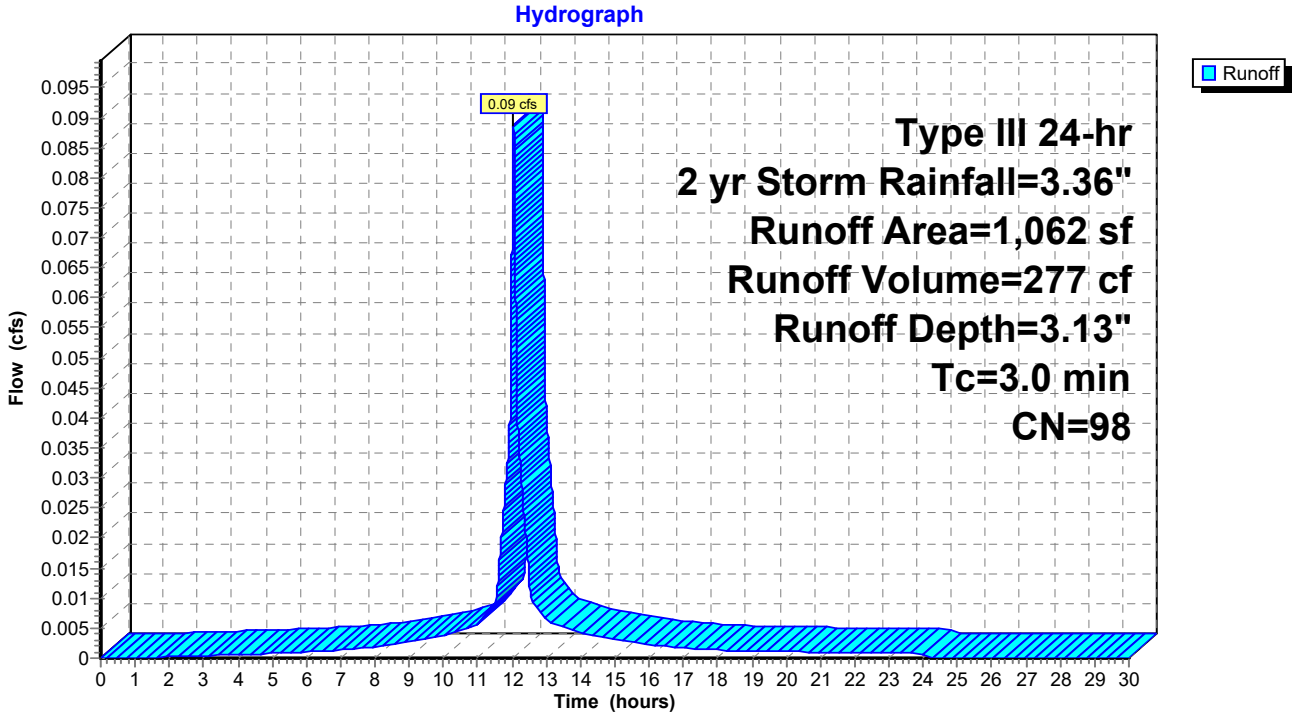
Runoff = 0.09 cfs @ 12.04 hrs, Volume= 277 cf, Depth= 3.13"
Routed to Reach PD : Pool drains

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 2 yr Storm Rainfall=3.36"

Area (sf)	CN	Description
1,062	98	Unconnected pavement, HSG B
1,062		100.00% Impervious Area
1,062		100.00% Unconnected

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

Subcatchment S5: New swimming pool



Summary for Subcatchment S6: Easement - vegetated

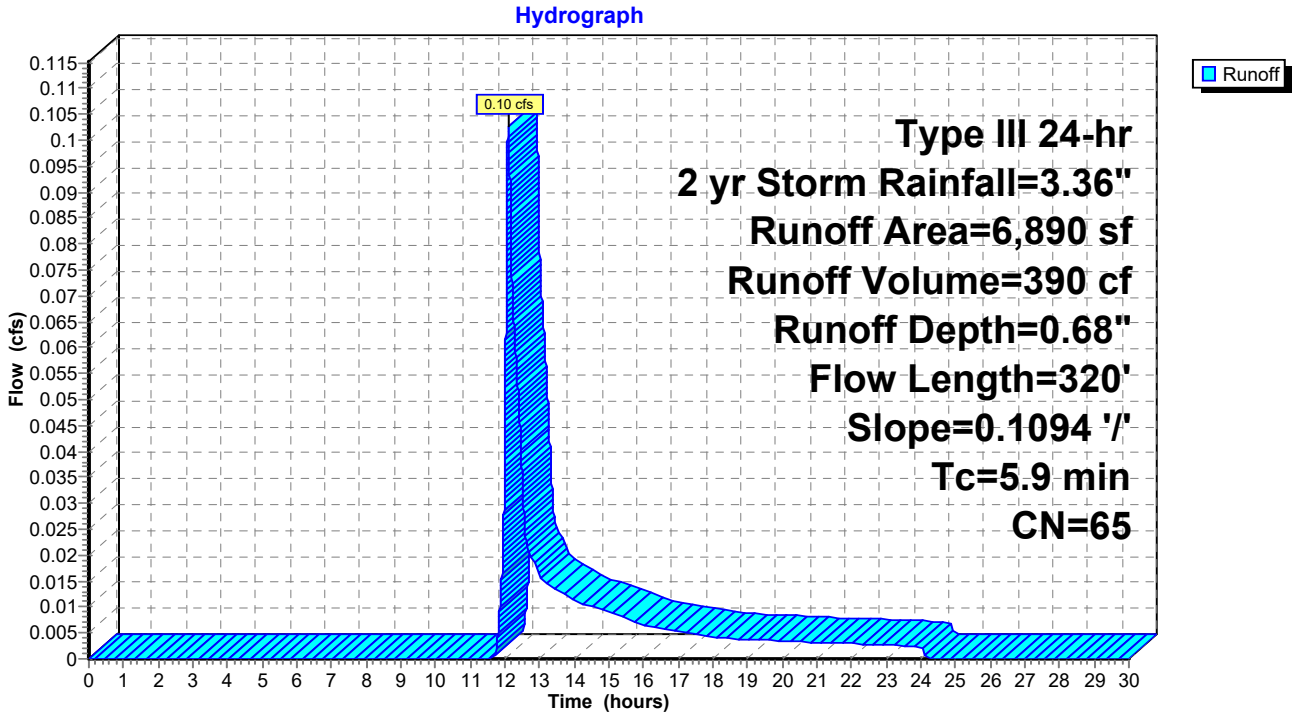
Runoff = 0.10 cfs @ 12.11 hrs, Volume= 390 cf, Depth= 0.68"
Routed to Link DP1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 2 yr Storm Rainfall=3.36"

Area (sf)	CN	Description
6,890	65	Woods/grass comb., Fair, HSG B
6,890		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	320	0.1094	0.91		**Lag/CN Method,**

Subcatchment S6: Easement - vegetated



Summary for Subcatchment S7: Gravel Drive Top

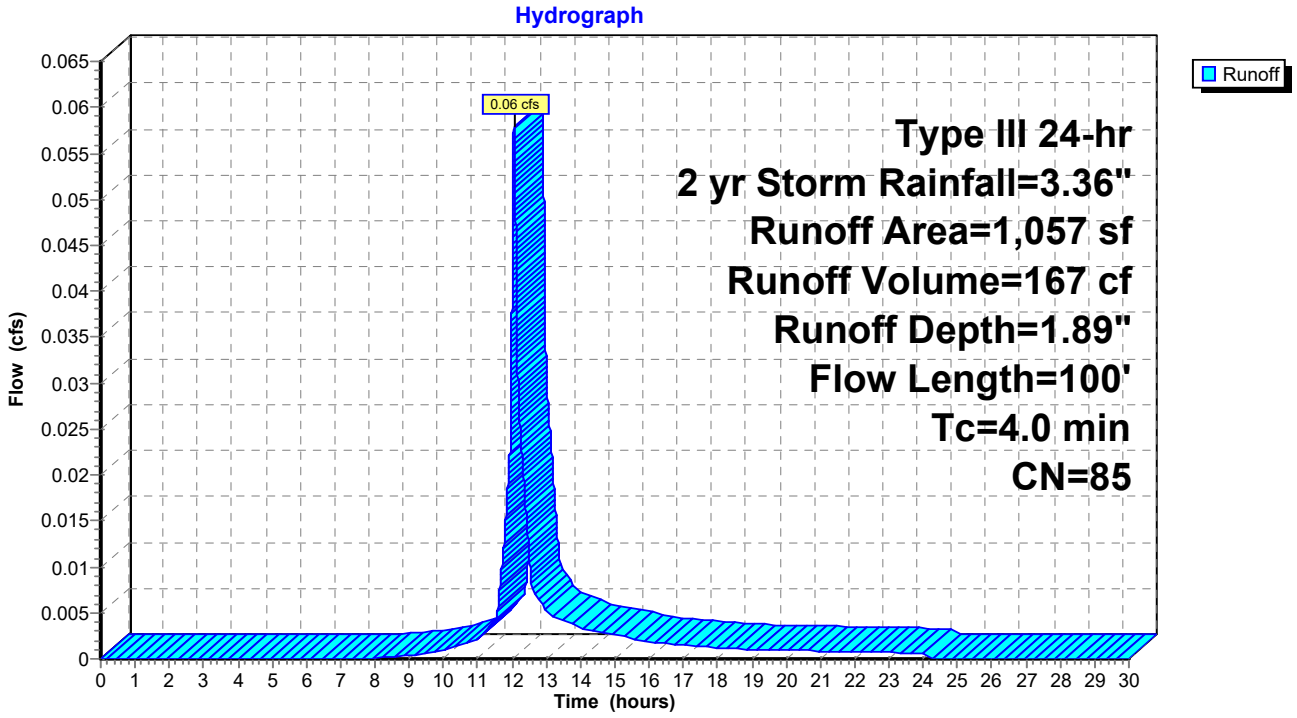
Runoff = 0.06 cfs @ 12.06 hrs, Volume= 167 cf, Depth= 1.89"
Routed to Pond 22P : Trench Swale (left)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 2 yr Storm Rainfall=3.36"

Area (sf)	CN	Description
1,057	85	Gravel roads, HSG B
1,057		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	100		0.42		**Direct Entry,**

Subcatchment S7: Gravel Drive Top



Summary for Subcatchment S8: Gravel Drive Middle

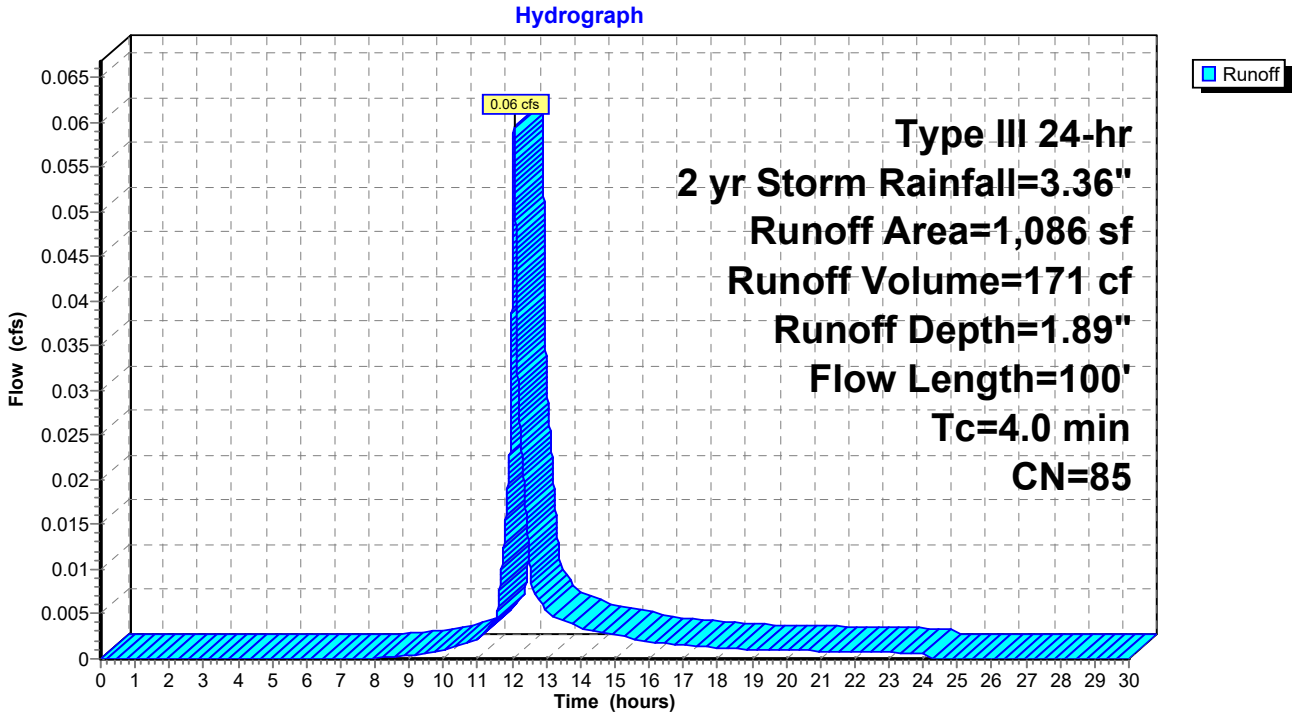
Runoff = 0.06 cfs @ 12.06 hrs, Volume= 171 cf, Depth= 1.89"
Routed to Pond 2P : Trench Swale (right)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 2 yr Storm Rainfall=3.36"

Area (sf)	CN	Description
1,086	85	Gravel roads, HSG B
1,086		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	100		0.42		**Direct Entry,**

Subcatchment S8: Gravel Drive Middle



Summary for Subcatchment S9: Gravel Drive Lower

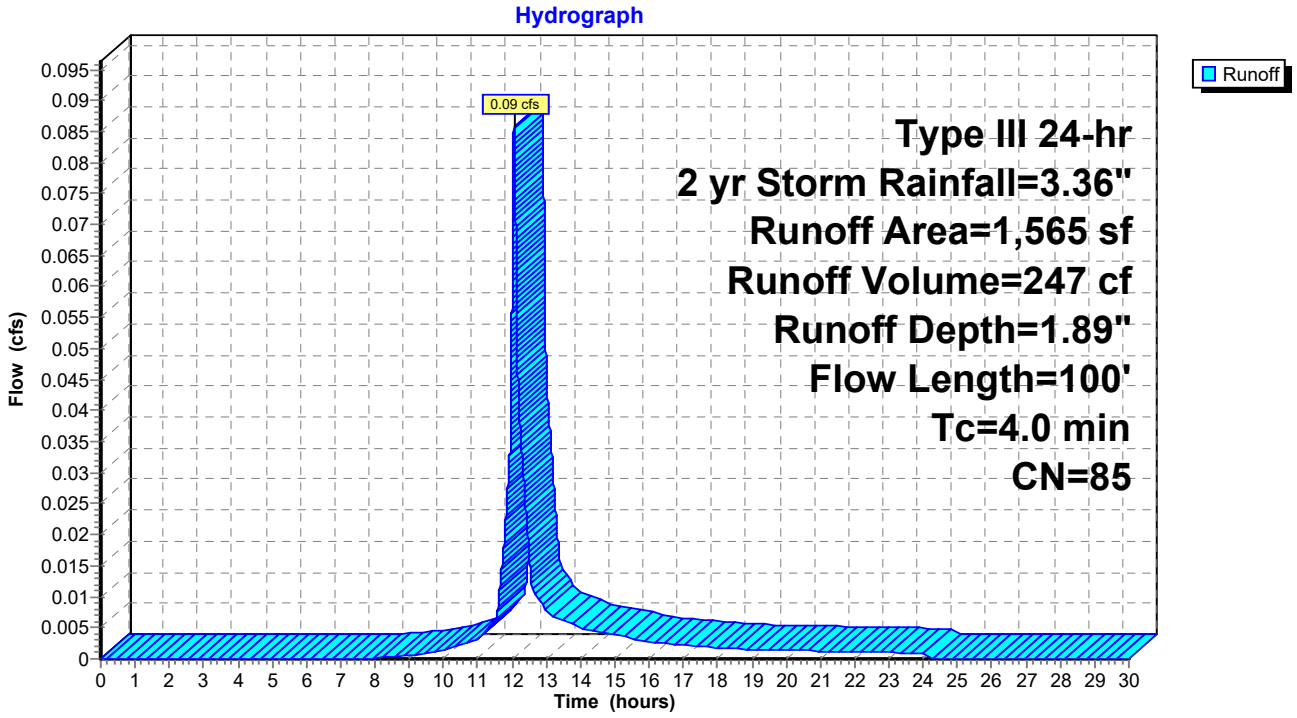
Runoff = 0.09 cfs @ 12.06 hrs, Volume= 247 cf, Depth= 1.89"
Routed to Pond 1P : Bottom basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 2 yr Storm Rainfall=3.36"

Area (sf)	CN	Description
1,565	85	Gravel roads, HSG B
1,565		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	100		0.42		**Direct Entry,**

Subcatchment S9: Gravel Drive Lower



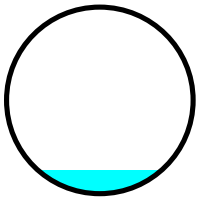
Summary for Reach CD: Combined Drain

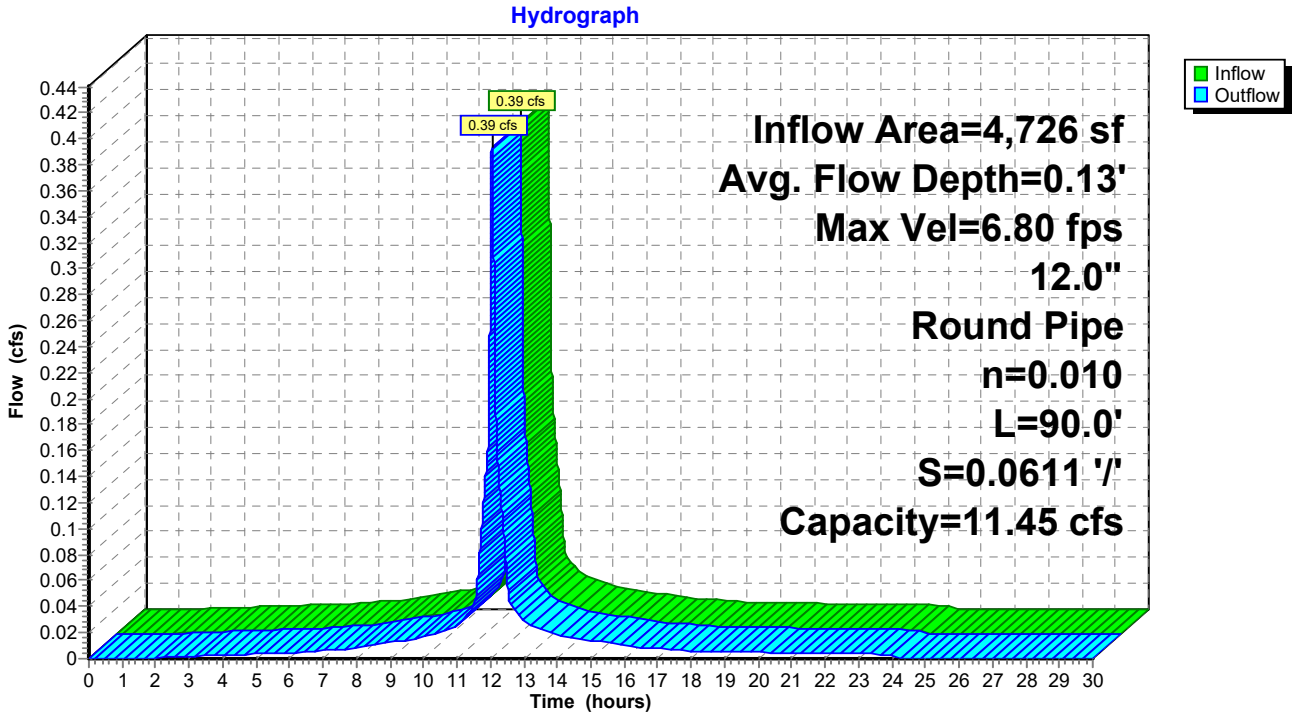
Inflow Area = 4,726 sf,100.00% Impervious, Inflow Depth = 3.13" for 2 yr Storm event
Inflow = 0.39 cfs @ 12.05 hrs, Volume= 1,231 cf
Outflow = 0.39 cfs @ 12.05 hrs, Volume= 1,231 cf, Atten= 0%, Lag= 0.2 min
Routed to Pond BR : Bioretention area

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 6.80 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.18 fps, Avg. Travel Time= 0.7 min

Peak Storage= 5 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 0.67'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 11.45 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 90.0' Slope= 0.0611 '/'
Inlet Invert= 298.00', Outlet Invert= 292.50'





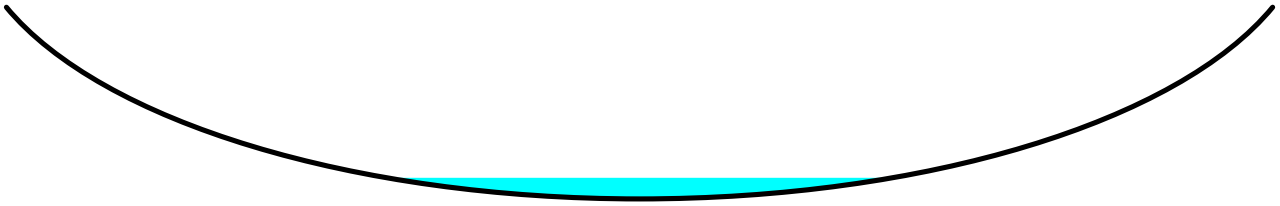
Summary for Reach OF: Overland Flow

Inflow Area = 2,143 sf, 0.00% Impervious, Inflow Depth = 1.32" for 2 yr Storm event
Inflow = 0.12 cfs @ 12.06 hrs, Volume= 236 cf
Outflow = 0.06 cfs @ 12.19 hrs, Volume= 236 cf, Atten= 51%, Lag= 7.5 min
Routed to Link DP1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 0.12 fps, Min. Travel Time= 19.8 min
Avg. Velocity = 0.04 fps, Avg. Travel Time= 60.8 min

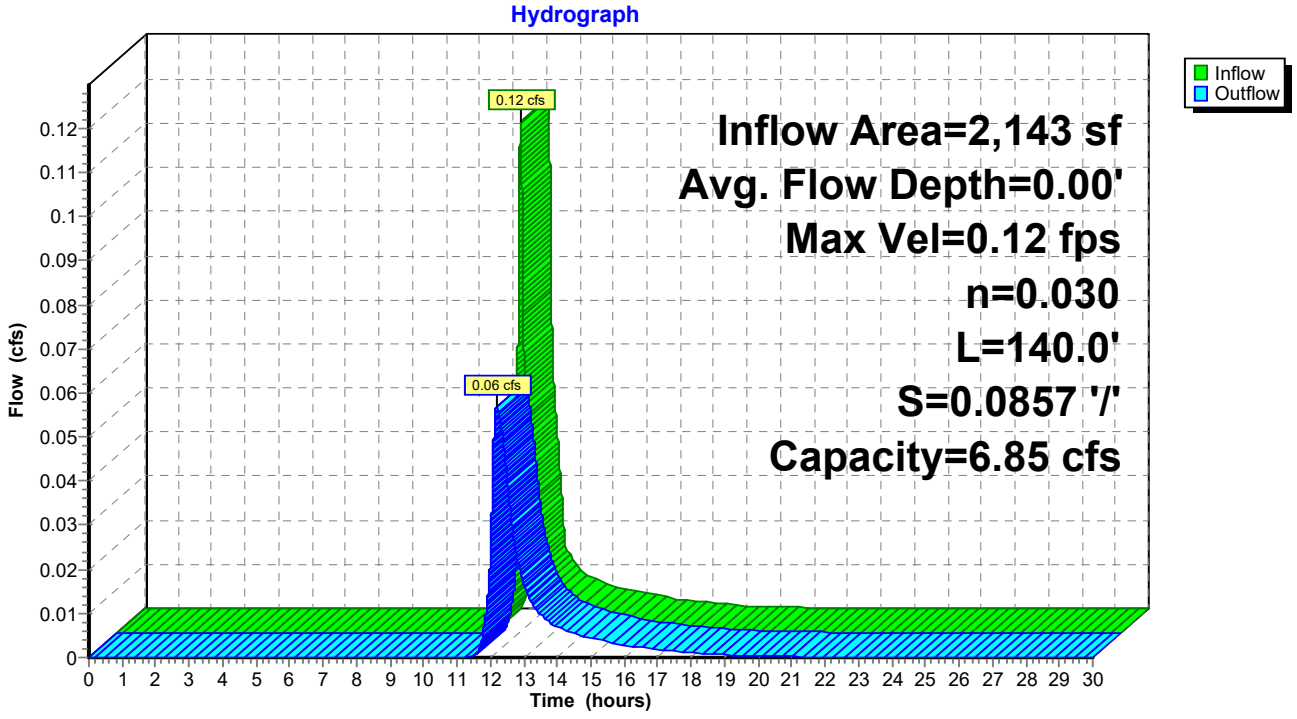
Peak Storage= 68 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 661.79'
Bank-Full Depth= 0.01' Flow Area= 13.3 sf, Capacity= 6.85 cfs

2,000.00' x 0.01' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 140.0' Slope= 0.0857 '/'
Inlet Invert= 283.00', Outlet Invert= 271.00'



‡

Reach OF: Overland Flow



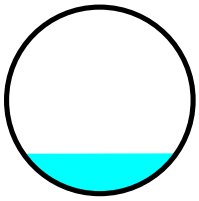
Summary for Reach PD: Pool drains

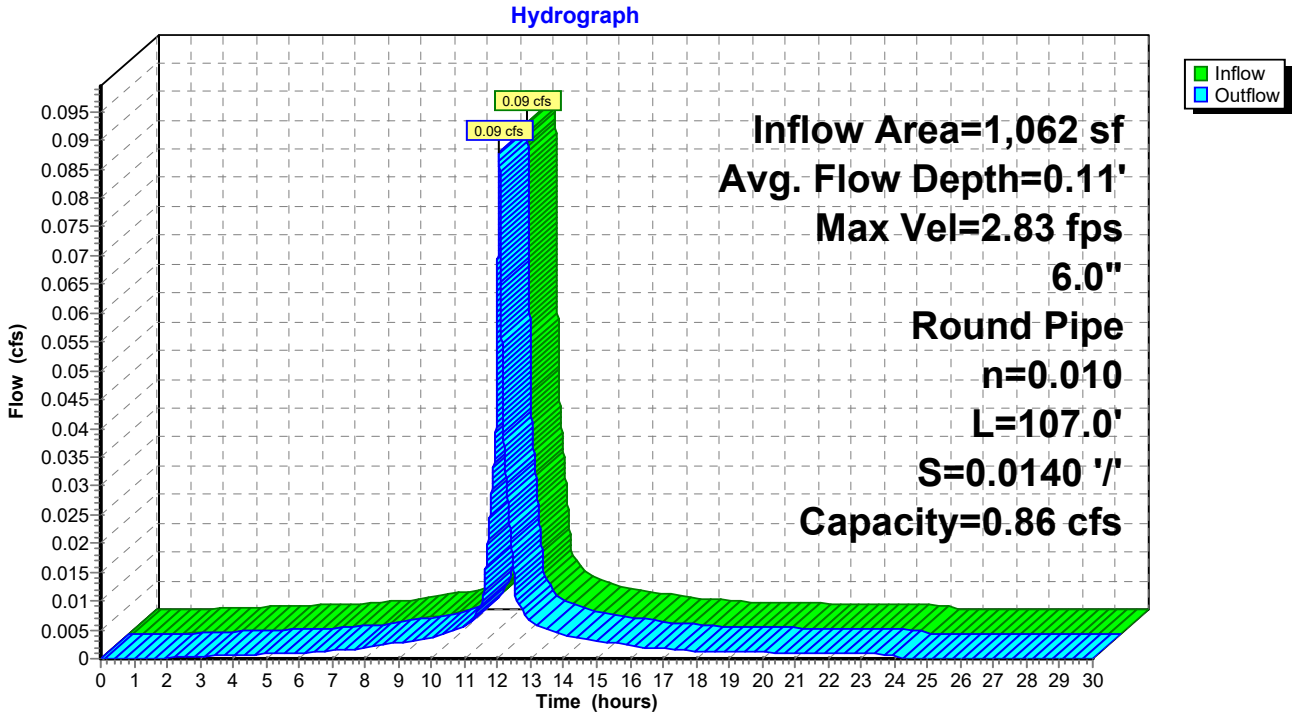
Inflow Area = 1,062 sf,100.00% Impervious, Inflow Depth = 3.13" for 2 yr Storm event
Inflow = 0.09 cfs @ 12.04 hrs, Volume= 277 cf
Outflow = 0.09 cfs @ 12.05 hrs, Volume= 277 cf, Atten= 1%, Lag= 0.4 min
Routed to Reach CD : Combined Drain

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 2.83 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 2.0 min

Peak Storage= 3 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.11' , Surface Width= 0.41'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.86 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 107.0' Slope= 0.0140 '/'
Inlet Invert= 299.50', Outlet Invert= 298.00'





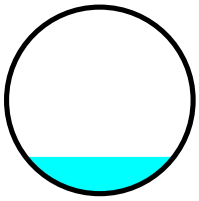
Summary for Reach RD: Roof/driveway drains

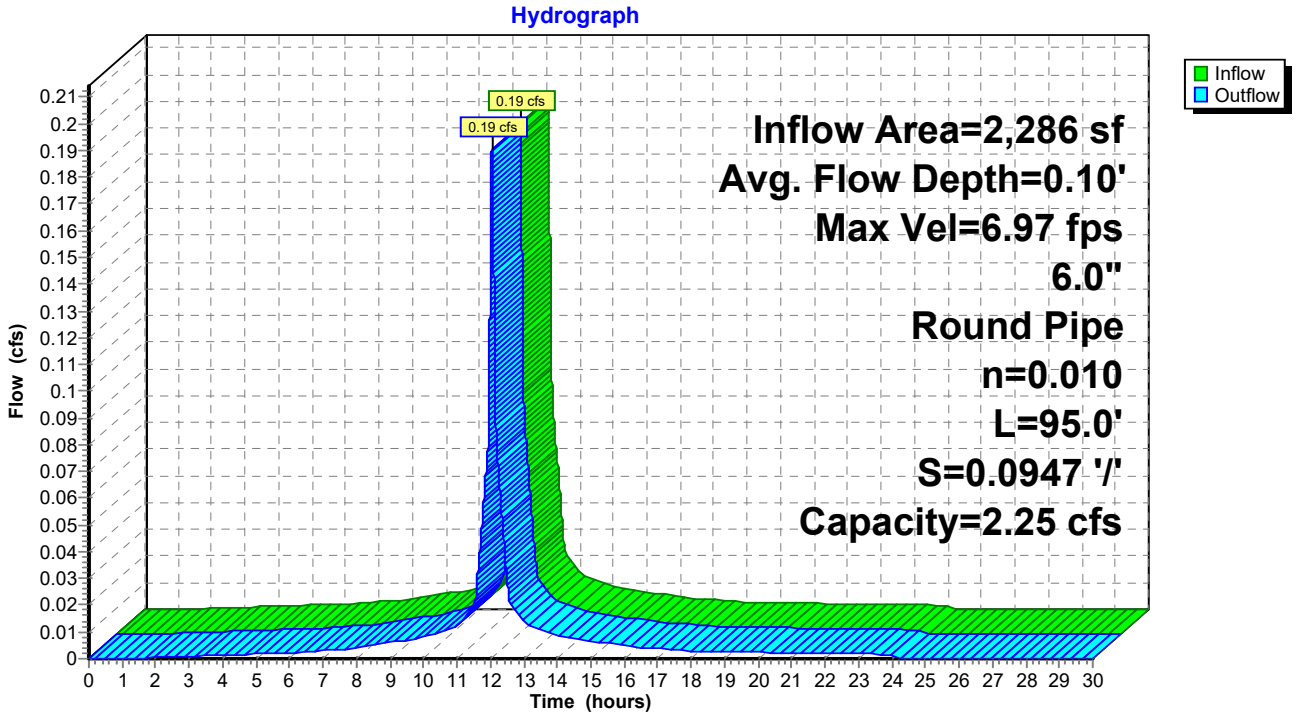
Inflow Area = 2,286 sf,100.00% Impervious, Inflow Depth = 3.13" for 2 yr Storm event
Inflow = 0.19 cfs @ 12.04 hrs, Volume= 596 cf
Outflow = 0.19 cfs @ 12.04 hrs, Volume= 596 cf, Atten= 0%, Lag= 0.1 min
Routed to Reach CD : Combined Drain

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 6.97 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.22 fps, Avg. Travel Time= 0.7 min

Peak Storage= 3 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.10' , Surface Width= 0.40'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 2.25 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 95.0' Slope= 0.0947 '/'
Inlet Invert= 307.00', Outlet Invert= 298.00'





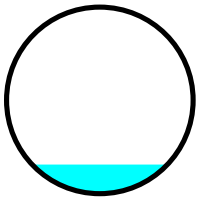
Summary for Reach RD2: Roof Drains 2

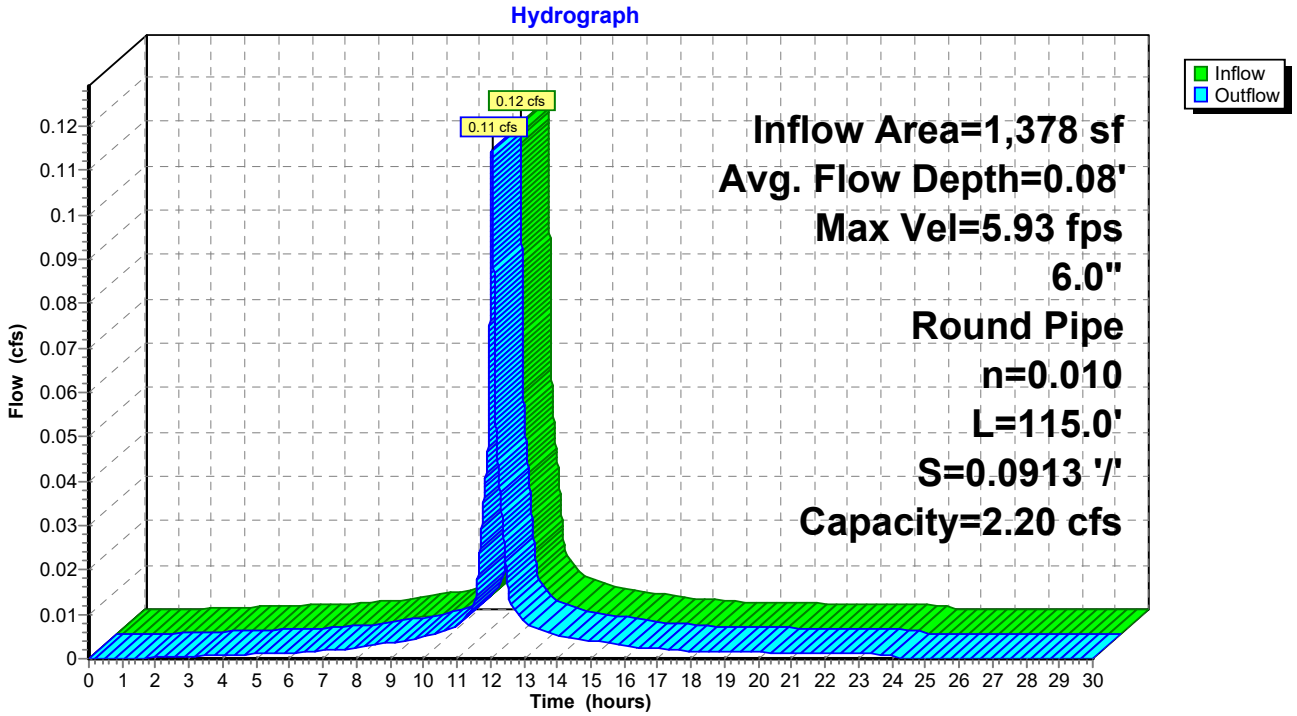
Inflow Area = 1,378 sf,100.00% Impervious, Inflow Depth = 3.13" for 2 yr Storm event
Inflow = 0.12 cfs @ 12.04 hrs, Volume= 359 cf
Outflow = 0.11 cfs @ 12.05 hrs, Volume= 359 cf, Atten= 0%, Lag= 0.2 min
Routed to Reach CD : Combined Drain

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 5.93 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.89 fps, Avg. Travel Time= 1.0 min

Peak Storage= 2 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.08' , Surface Width= 0.36'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 2.20 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 115.0' Slope= 0.0913 '/'
Inlet Invert= 308.50', Outlet Invert= 298.00'





Summary for Pond 1P: Bottom basin

Inflow Area = 1,565 sf, 0.00% Impervious, Inflow Depth = 1.89" for 2 yr Storm event
Inflow = 0.09 cfs @ 12.06 hrs, Volume= 247 cf
Outflow = 0.01 cfs @ 13.56 hrs, Volume= 247 cf, Atten= 93%, Lag= 90.2 min
Discarded = 0.01 cfs @ 13.56 hrs, Volume= 247 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 270.02' @ 13.56 hrs Surf.Area= 196 sf Storage= 108 cf

Plug-Flow detention time= 181.7 min calculated for 247 cf (100% of inflow)
Center-of-Mass det. time= 181.7 min (1,003.8 - 822.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	269.00'	106 cf	**18.00'W x 10.50'L x 1.71'H Field A** 323 cf Overall - 57 cf Embedded = 266 cf x 40.0% Voids
#2A	269.50'	57 cf	**Cultec FD C-4** x 4 Inside #1 Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.67 sf x 4 rows
#3	270.00'	14 cf	**3.00'D x 2.00'H Vertical Cone/Cylinder**
		177 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	271.00'	**4.0" x 2.0" Horiz. Orifice/Grate X 2.00 columns** X 50 rows C= 0.600 in 12.0" x 144.0" Grate (46% open area) Limited to weir flow at low heads
#2	Discarded	269.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 13.56 hrs HW=270.02' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=269.00' (Free Discharge)
1=Orifice/Grate (Controls 0.00 cfs)

Pond 1P: Bottom basin - Chamber Wizard Field A

Chamber Model = Cultec FD C-4 (Cultec Contactor® Field Drain C-4)
Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf
Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap
Row Length Adjustment= +0.50' x 1.67 sf x 4 rows

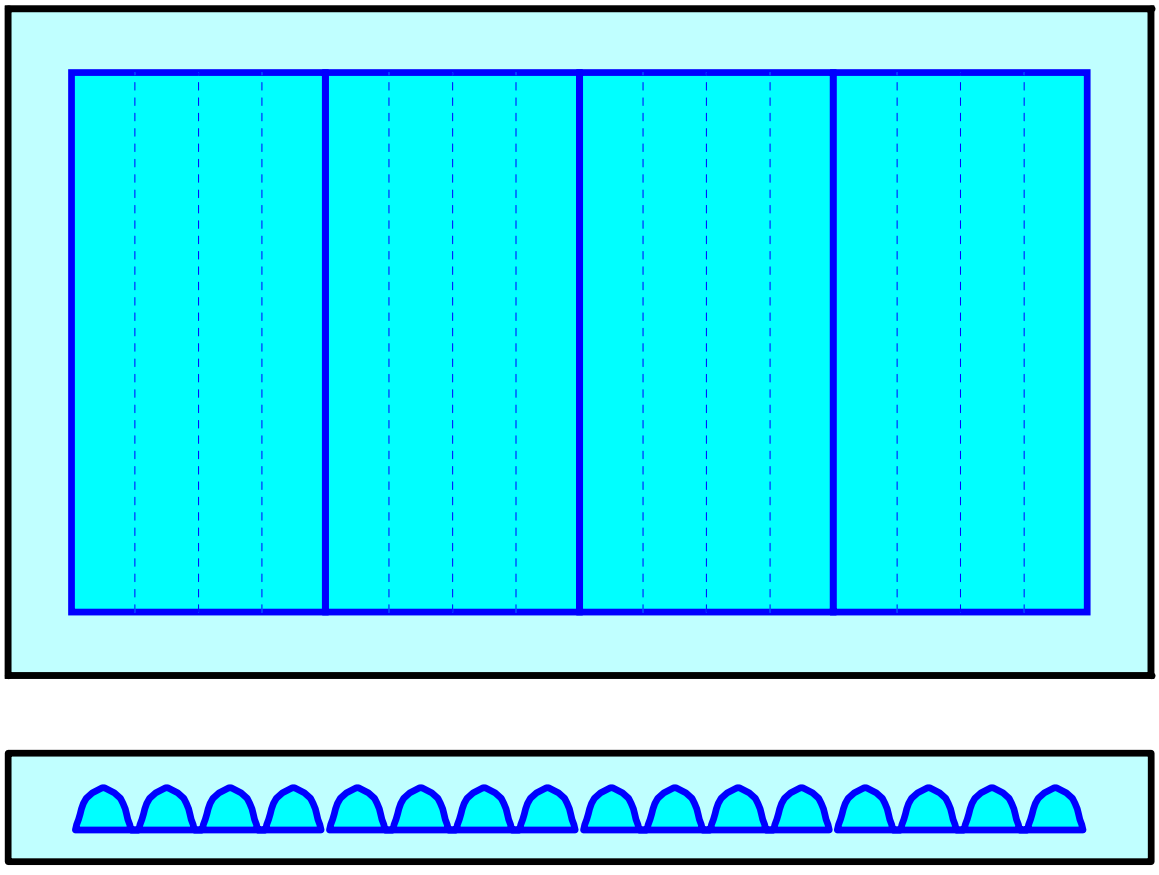
1 Chambers/Row x 8.00' Long +0.50' Row Adjustment = 8.50' Row Length +12.0" End Stone x 2 = 10.50' Base Length
4 Rows x 48.0" Wide + 12.0" Side Stone x 2 = 18.00' Base Width
6.0" Stone Base + 8.5" Chamber Height + 6.0" Stone Cover = 1.71' Field Height

4 Chambers x 13.3 cf +0.50' Row Adjustment x 1.67 sf x 4 Rows = 56.6 cf Chamber Storage

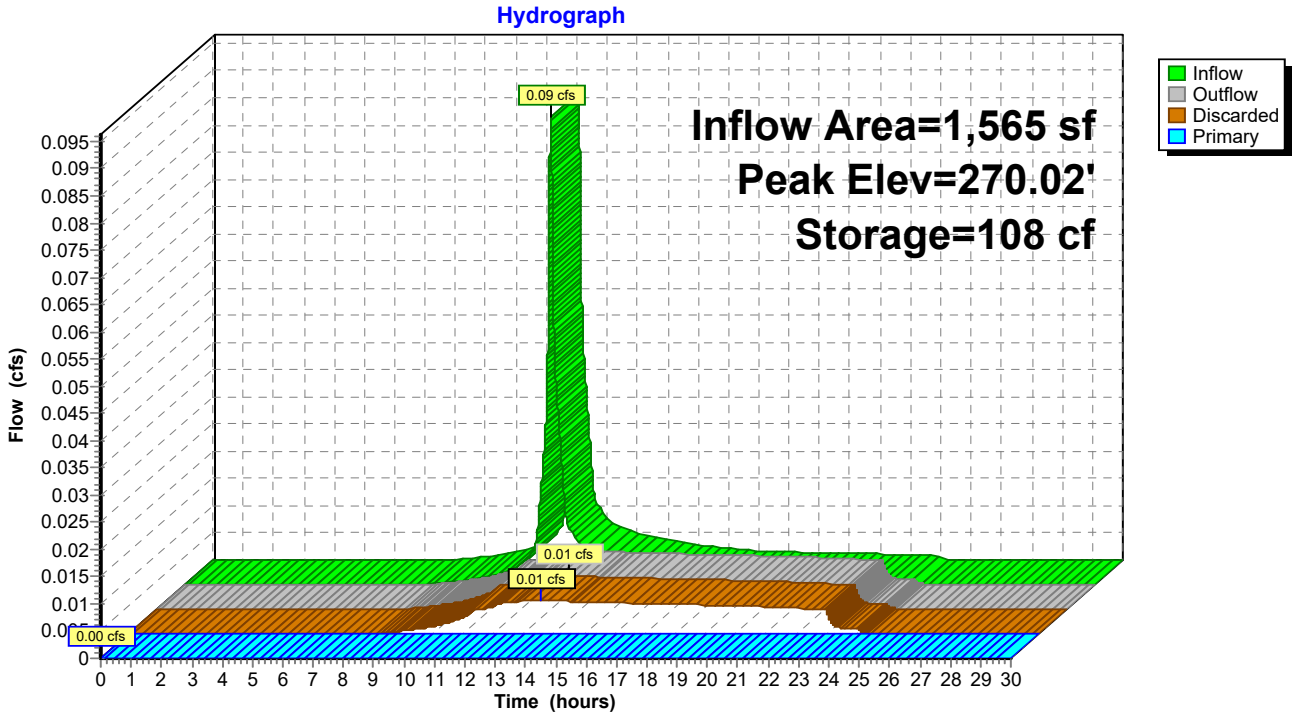
322.9 cf Field - 56.6 cf Chambers = 266.2 cf Stone x 40.0% Voids = 106.5 cf Stone Storage

Chamber Storage + Stone Storage = 163.1 cf = 0.004 af
Overall Storage Efficiency = 50.5%
Overall System Size = 10.50' x 18.00' x 1.71'

4 Chambers
12.0 cy Field
9.9 cy Stone



Pond 1P: Bottom basin



Summary for Pond 2P: Trench Swale (right)

Inflow Area = 1,086 sf, 0.00% Impervious, Inflow Depth = 1.89" for 2 yr Storm event
Inflow = 0.06 cfs @ 12.06 hrs, Volume= 171 cf
Outflow = 0.06 cfs @ 12.06 hrs, Volume= 171 cf, Atten= 0%, Lag= 0.1 min
Discarded = 0.00 cfs @ 12.06 hrs, Volume= 54 cf
Primary = 0.06 cfs @ 12.06 hrs, Volume= 117 cf
Routed to Reach OF : Overland Flow

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 284.00' @ 12.06 hrs Surf.Area= 38 sf Storage= 11 cf

Plug-Flow detention time= 55.0 min calculated for 171 cf (100% of inflow)
Center-of-Mass det. time= 54.2 min (876.2 - 822.1)

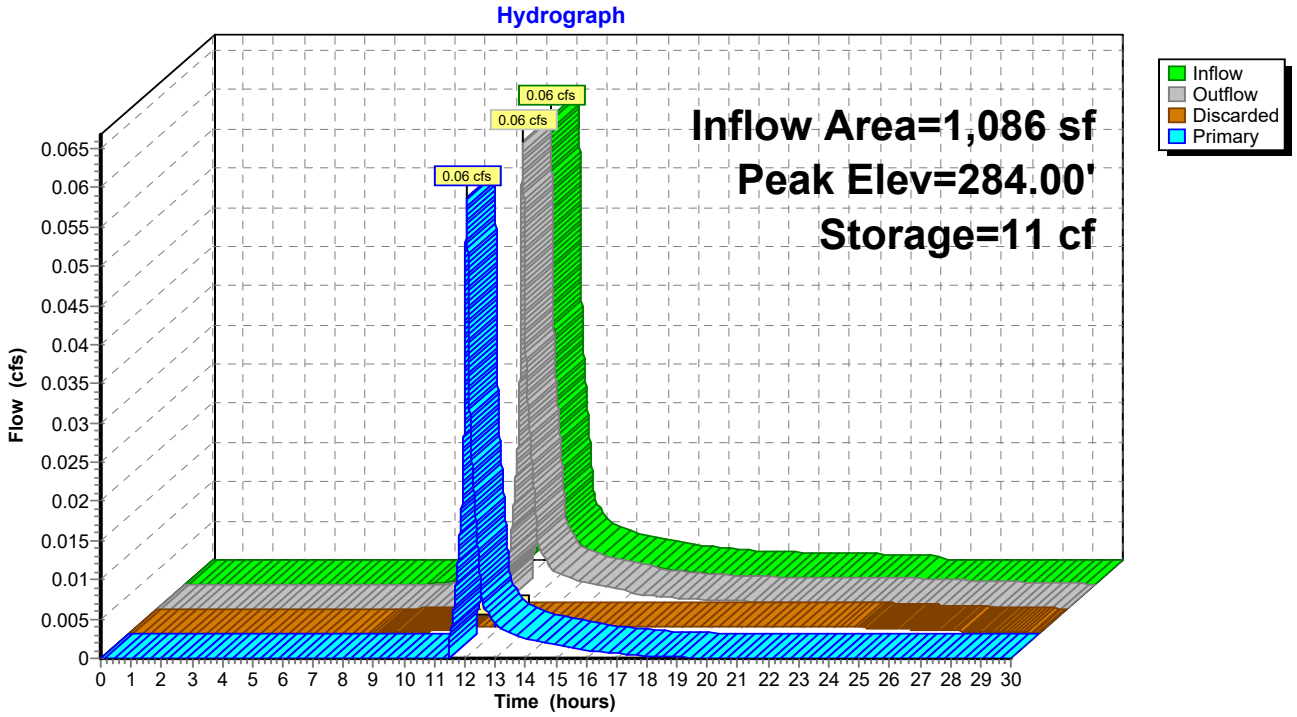
Volume	Invert	Avail.Storage	Storage Description
#1	283.00'	3,772 cf	**96.0" W x 60.0" H, R=55.0" Elliptical Pipe Storage** L= 185.0' S= 0.1050 '/' 5,388 cf Overall x 70.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	283.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	284.00'	**10.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.00 cfs @ 12.06 hrs HW=284.00' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.01 cfs @ 12.06 hrs HW=284.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.18 fps)

Pond 2P: Trench Swale (right)



Summary for Pond 22P: Trench Swale (left)

Inflow Area = 1,057 sf, 0.00% Impervious, Inflow Depth = 1.89" for 2 yr Storm event
Inflow = 0.06 cfs @ 12.06 hrs, Volume= 167 cf
Outflow = 0.06 cfs @ 12.06 hrs, Volume= 167 cf, Atten= 0%, Lag= 0.1 min
Discarded = 0.00 cfs @ 12.06 hrs, Volume= 48 cf
Primary = 0.06 cfs @ 12.06 hrs, Volume= 119 cf
Routed to Reach OF : Overland Flow

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 287.01' @ 12.06 hrs Surf.Area= 32 sf Storage= 9 cf

Plug-Flow detention time= 49.2 min calculated for 167 cf (100% of inflow)
Center-of-Mass det. time= 48.3 min (870.3 - 822.1)

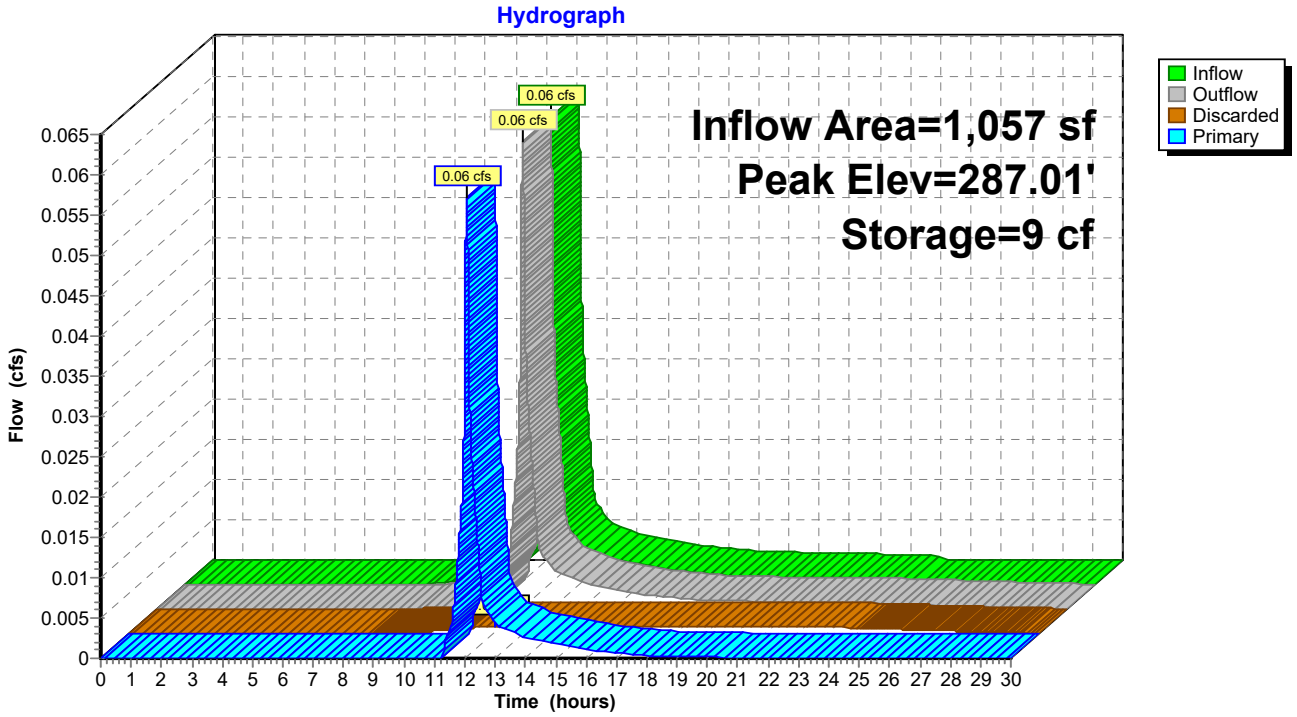
Volume	Invert	Avail.Storage	Storage Description
#1	286.00'	2,458 cf	**72.0" W x 60.0" H, R=40.0" Elliptical Pipe Storage** L= 150.0' S= 0.1050 '/' 3,511 cf Overall x 70.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	286.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	287.00'	**10.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.00 cfs @ 12.06 hrs HW=287.01' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.03 cfs @ 12.06 hrs HW=287.01' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.03 cfs @ 0.28 fps)

Pond 22P: Trench Swale (left)



Summary for Pond BR: Bioretention area

Inflow Area = 4,726 sf,100.00% Impervious, Inflow Depth = 3.13" for 2 yr Storm event
Inflow = 0.39 cfs @ 12.05 hrs, Volume= 1,231 cf
Outflow = 0.03 cfs @ 12.83 hrs, Volume= 1,231 cf, Atten= 91%, Lag= 47.0 min
Discarded = 0.03 cfs @ 12.83 hrs, Volume= 1,231 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP2 : Design Point 2

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 292.12' @ 12.83 hrs Surf.Area= 1,314 sf Storage= 477 cf

Plug-Flow detention time= 116.7 min calculated for 1,231 cf (100% of inflow)
Center-of-Mass det. time= 116.7 min (870.5 - 753.8)

Volume	Invert	Avail.Storage	Storage Description
#1	289.00'	1,685 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

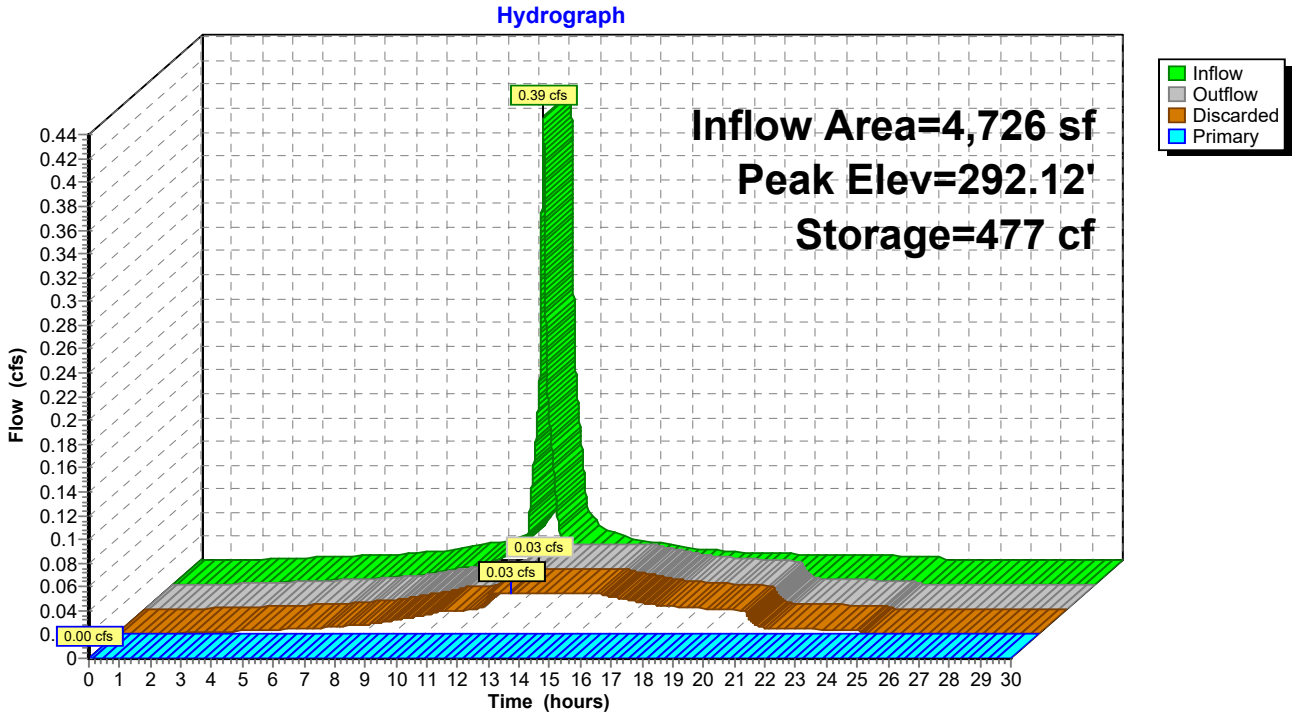
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
289.00	800	0.0	0	0	800
289.50	1,000	40.0	180	180	1,007
292.00	1,300	5.0	143	323	1,431
293.00	1,425	100.0	1,362	1,685	1,612

Device	Routing	Invert	Outlet Devices
#1	Discarded	289.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	292.50'	**12.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 292.50' / 289.00' S= 0.2333 '/' Cc= 0.500 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.03 cfs @ 12.83 hrs HW=292.12' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=289.00' (Free Discharge)
2=Culvert (Controls 0.00 cfs)

Pond BR: Bioretention area

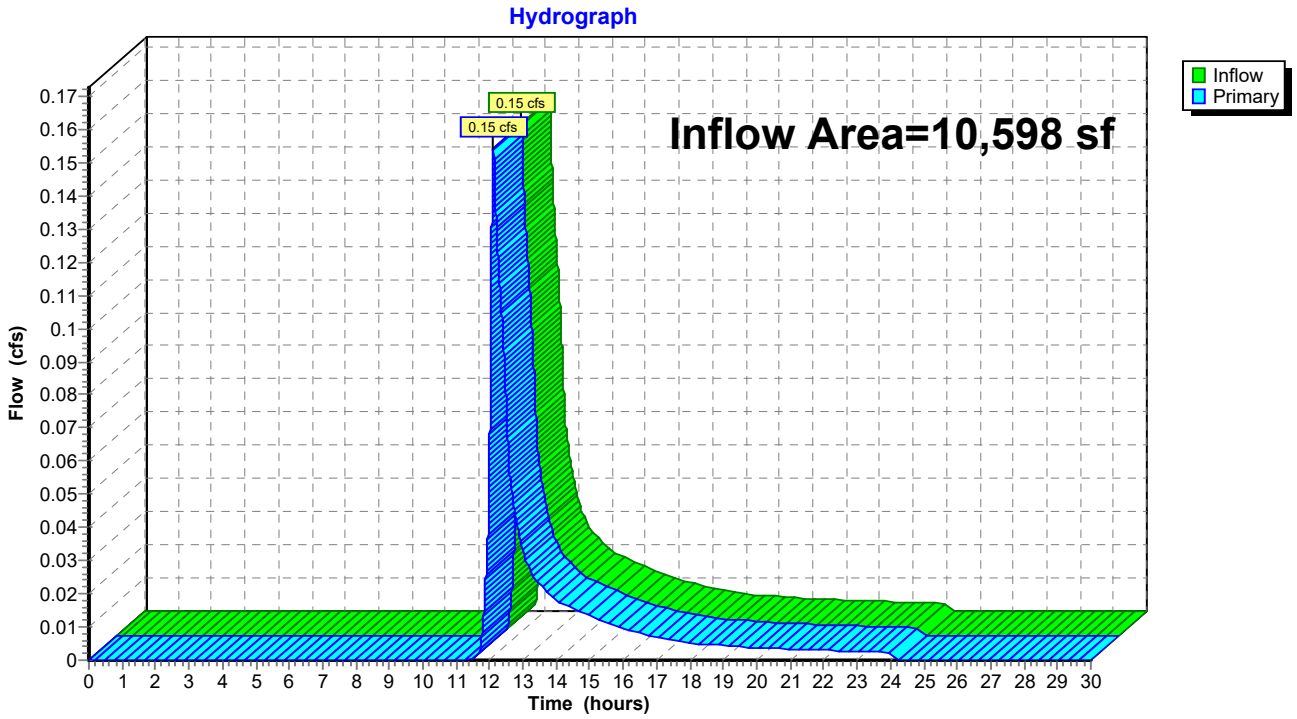


Summary for Link DP1: Design Point 1

Inflow Area = 10,598 sf, 0.00% Impervious, Inflow Depth = 0.71" for 2 yr Storm event
Inflow = 0.15 cfs @ 12.12 hrs, Volume= 627 cf
Primary = 0.15 cfs @ 12.12 hrs, Volume= 627 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs

Link DP1: Design Point 1

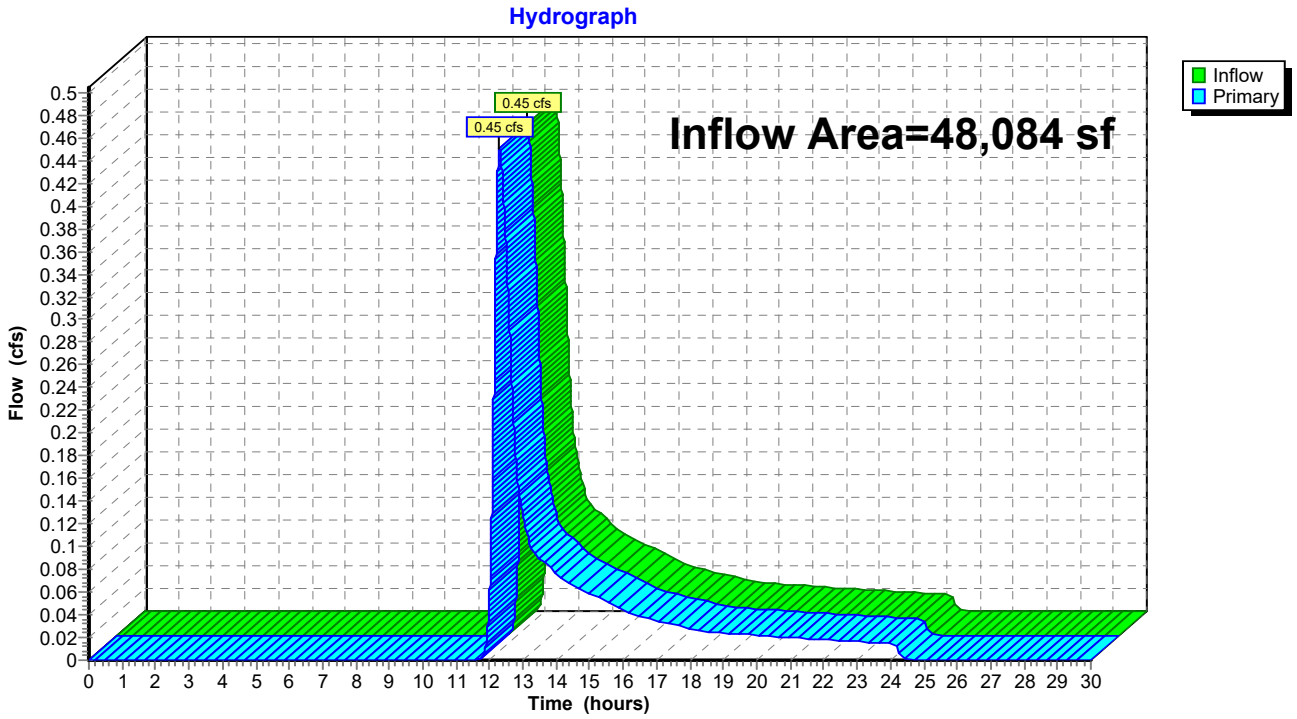


Summary for Link DP2: Design Point 2

Inflow Area = 48,084 sf, 10.71% Impervious, Inflow Depth = 0.61" for 2 yr Storm event
Inflow = 0.45 cfs @ 12.30 hrs, Volume= 2,456 cf
Primary = 0.45 cfs @ 12.30 hrs, Volume= 2,456 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs

Link DP2: Design Point 2



Summary for Subcatchment S1: Vegetated area/porch and deck

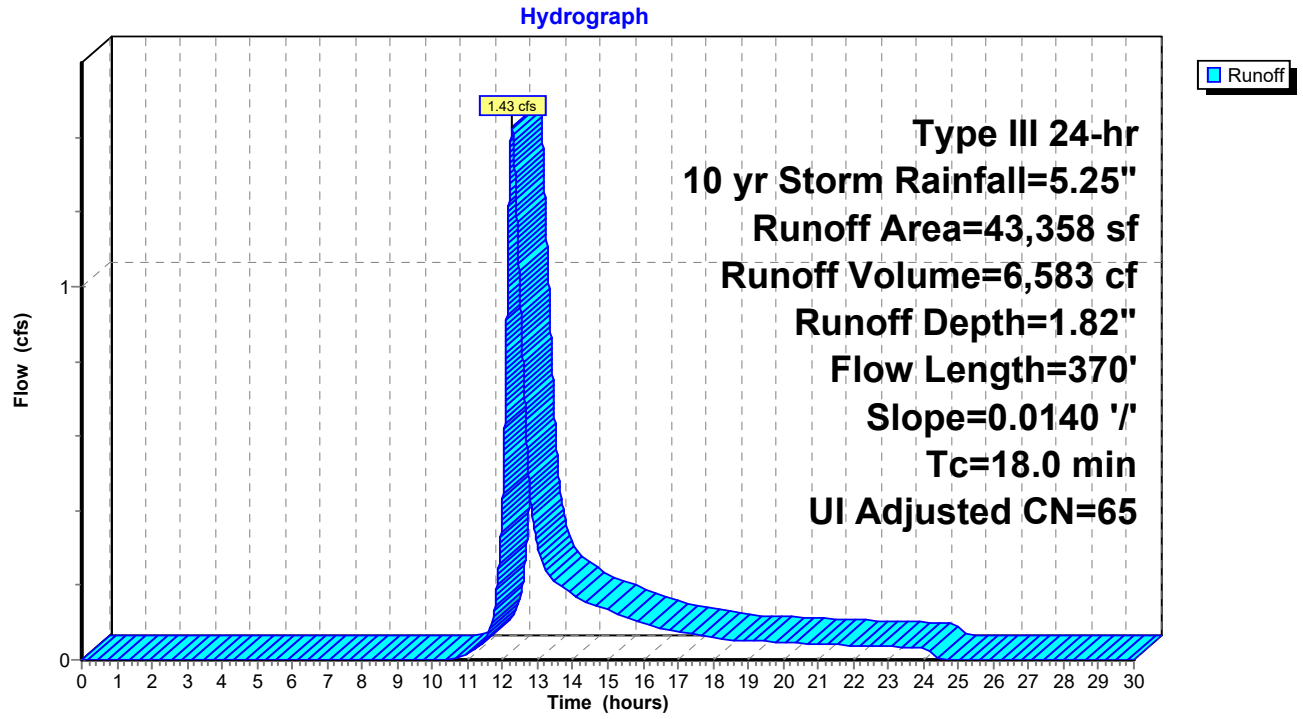
Runoff = 1.43 cfs @ 12.26 hrs, Volume= 6,583 cf, Depth= 1.82"
Routed to Link DP2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 10 yr Storm Rainfall=5.25"

Area (sf)	CN	Adj	Description
42,292	65		Woods/grass comb., Fair, HSG B
424	98		Unconnected pavement, HSG B
642	85		Gravel roads, HSG B
43,358	66	65	Weighted Average, UI Adjusted
42,934			99.02% Pervious Area
424			0.98% Impervious Area
424			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	370	0.0140	0.34		**Lag/CN Method,**

Subcatchment S1: Vegetated area/porch and deck



Summary for Subcatchment S2: Driveway segment 1

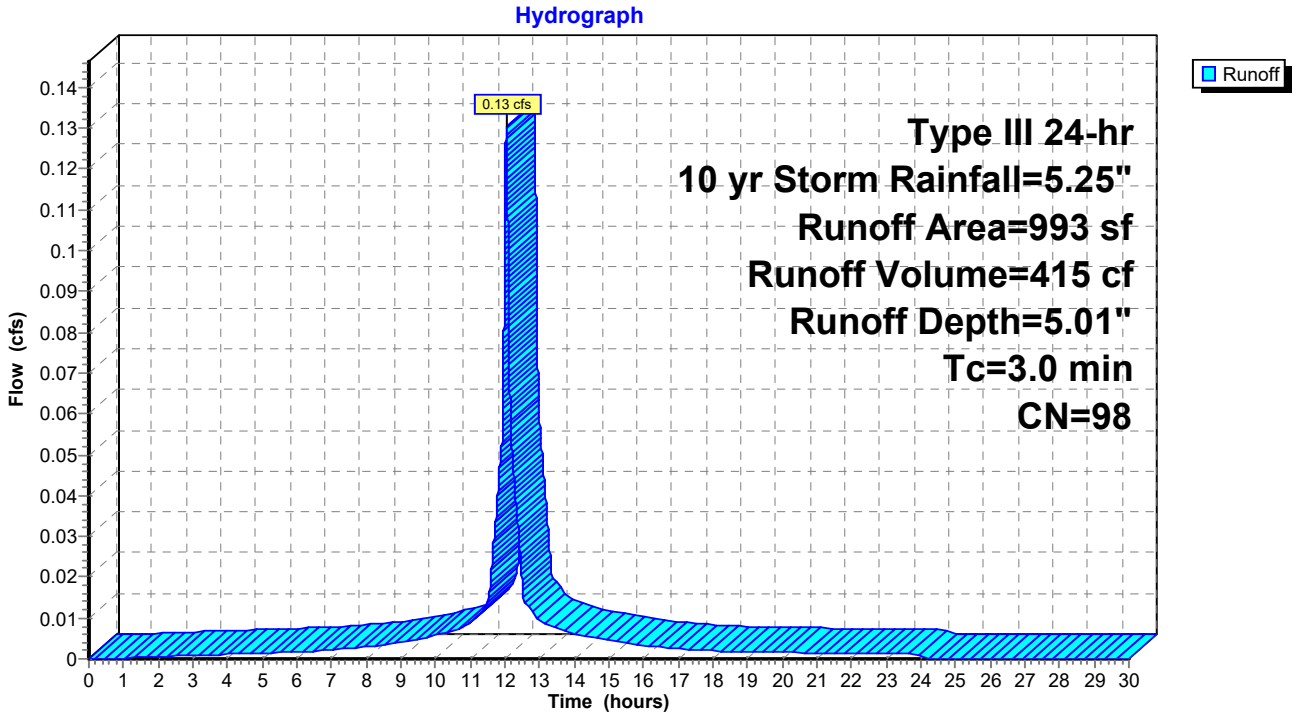
Runoff = 0.13 cfs @ 12.04 hrs, Volume= 415 cf, Depth= 5.01"
Routed to Reach RD : Roof/driveway drains

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 10 yr Storm Rainfall=5.25"

Area (sf)	CN	Description
993	98	Paved parking, HSG B
993		100.00% Impervious Area

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

Subcatchment S2: Driveway segment 1



Summary for Subcatchment S3: House

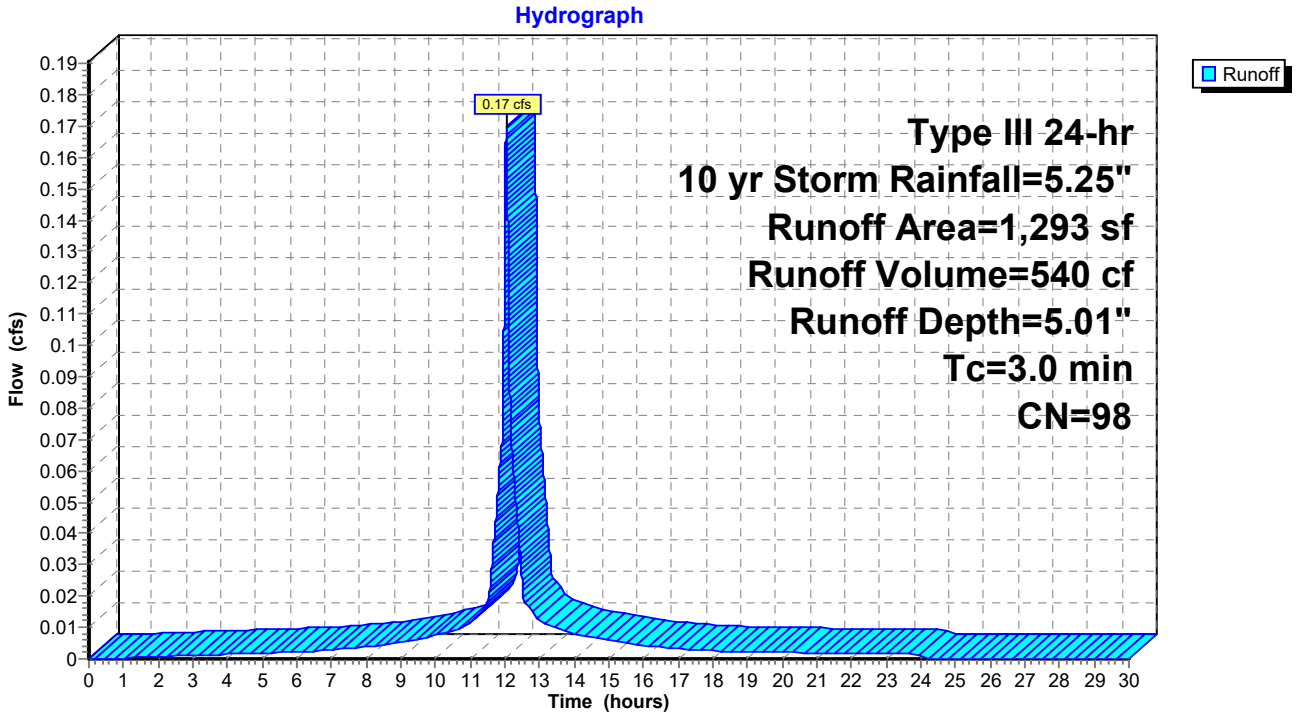
Runoff = 0.17 cfs @ 12.04 hrs, Volume= 540 cf, Depth= 5.01"
Routed to Reach RD : Roof/driveway drains

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 10 yr Storm Rainfall=5.25"

Area (sf)	CN	Description
1,293	98	Roofs, HSG B
1,293		100.00% Impervious Area

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

Subcatchment S3: House



Summary for Subcatchment S4: House 2

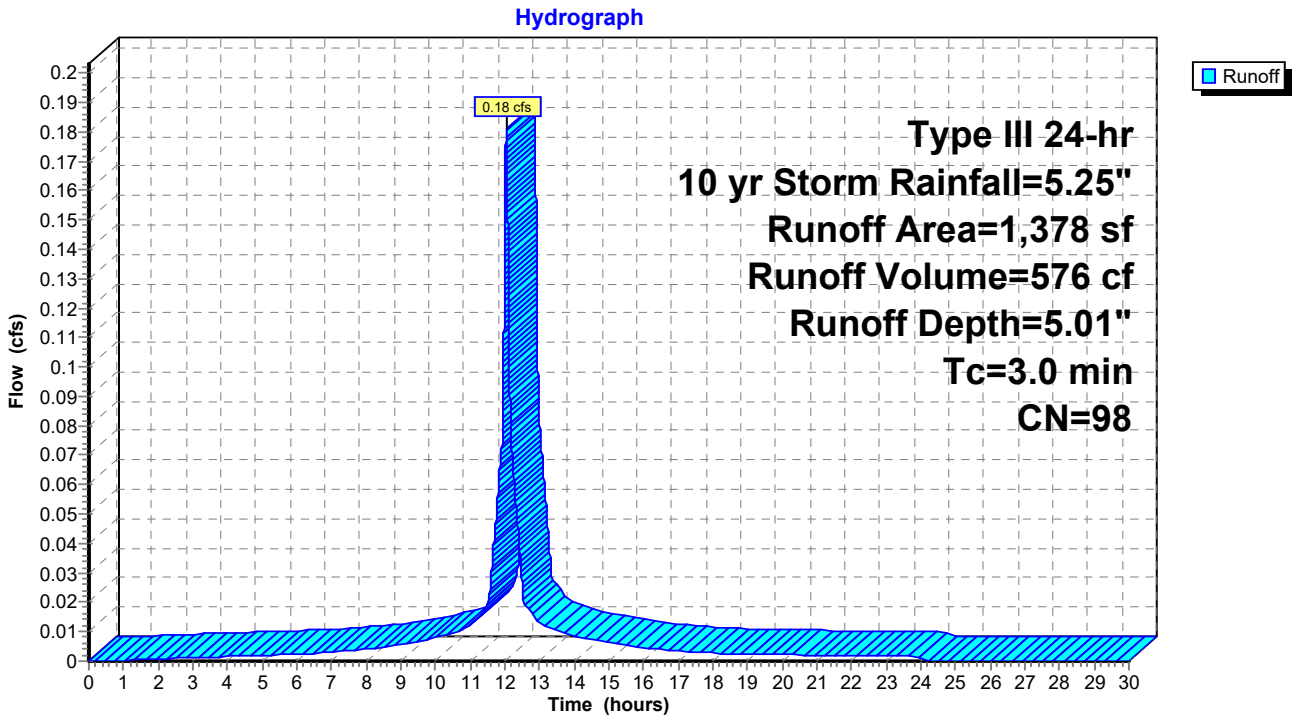
Runoff = 0.18 cfs @ 12.04 hrs, Volume= 576 cf, Depth= 5.01"
Routed to Reach RD2 : Roof Drains 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 10 yr Storm Rainfall=5.25"

Area (sf)	CN	Description
1,378	98	Unconnected roofs, HSG B
1,378		100.00% Impervious Area
1,378		100.00% Unconnected

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

Subcatchment S4: House 2



Summary for Subcatchment S5: New swimming pool

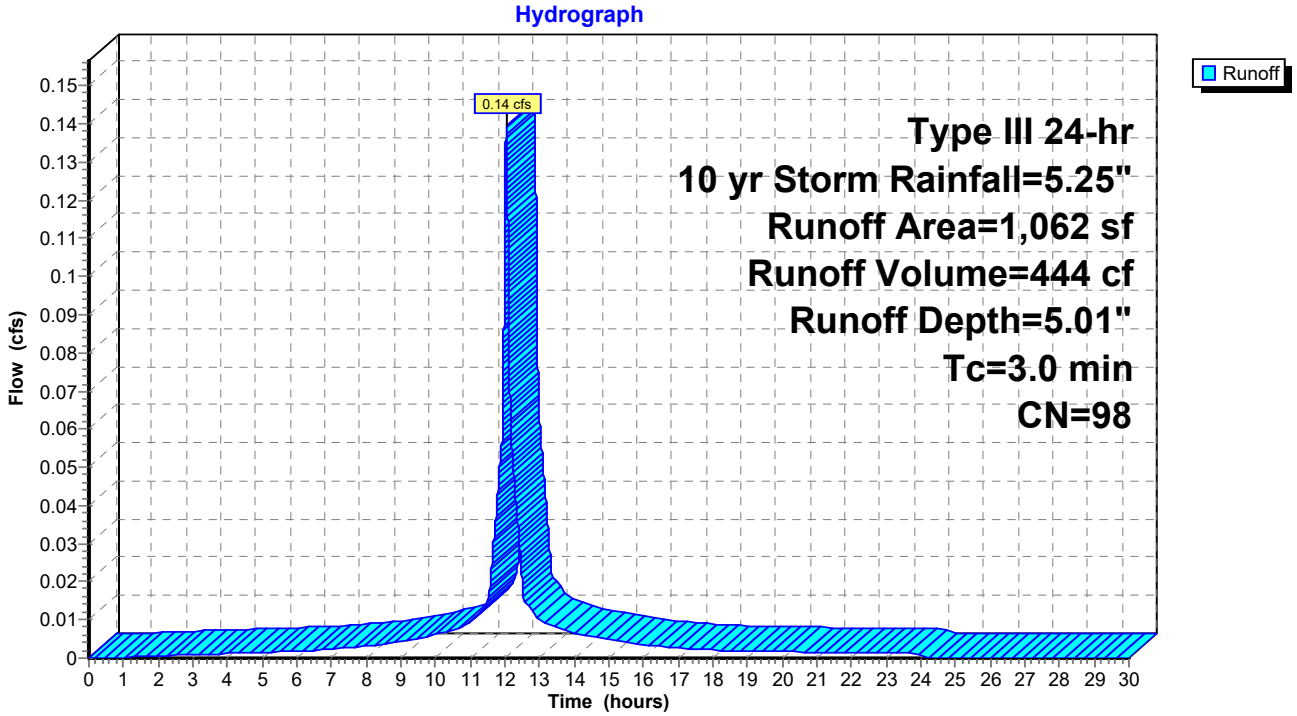
Runoff = 0.14 cfs @ 12.04 hrs, Volume= 444 cf, Depth= 5.01"
Routed to Reach PD : Pool drains

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 10 yr Storm Rainfall=5.25"

Area (sf)	CN	Description
1,062	98	Unconnected pavement, HSG B
1,062		100.00% Impervious Area
1,062		100.00% Unconnected

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

Subcatchment S5: New swimming pool



Summary for Subcatchment S6: Easement - vegetated

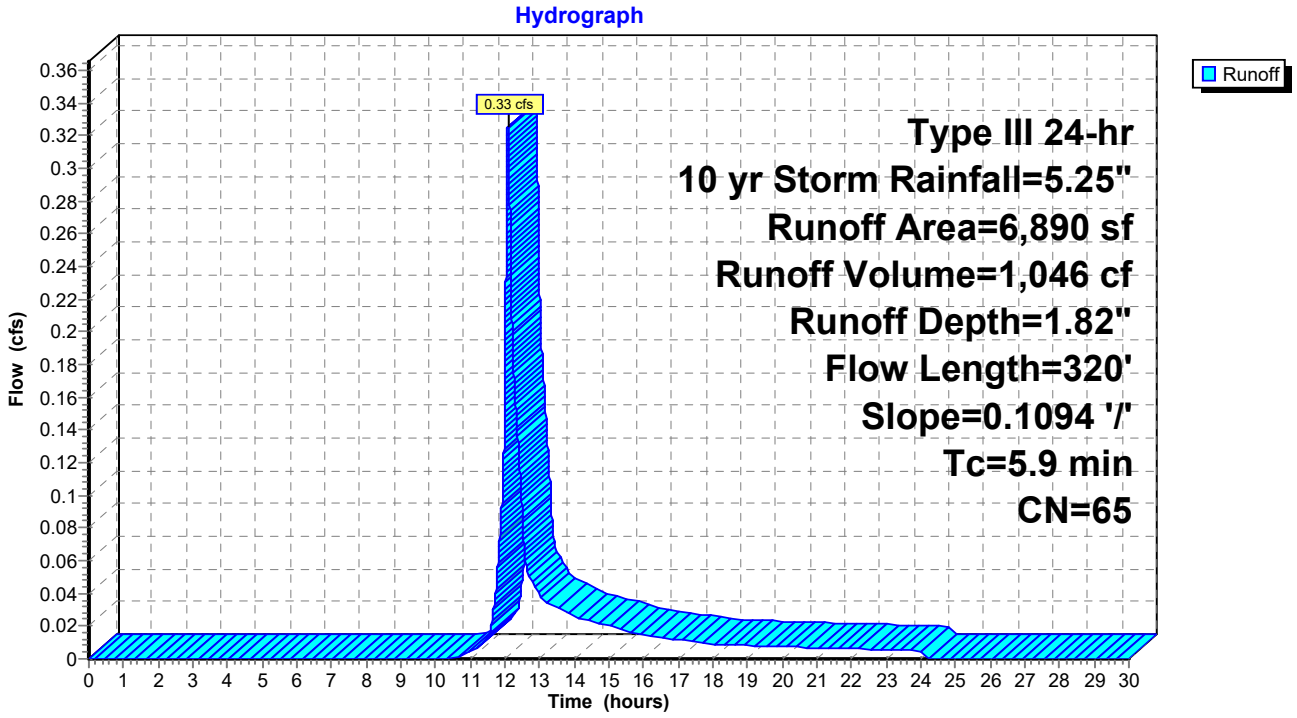
Runoff = 0.33 cfs @ 12.09 hrs, Volume= 1,046 cf, Depth= 1.82"
Routed to Link DP1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 10 yr Storm Rainfall=5.25"

Area (sf)	CN	Description
6,890	65	Woods/grass comb., Fair, HSG B
6,890		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	320	0.1094	0.91		**Lag/CN Method,**

Subcatchment S6: Easement - vegetated



Summary for Subcatchment S7: Gravel Drive Top

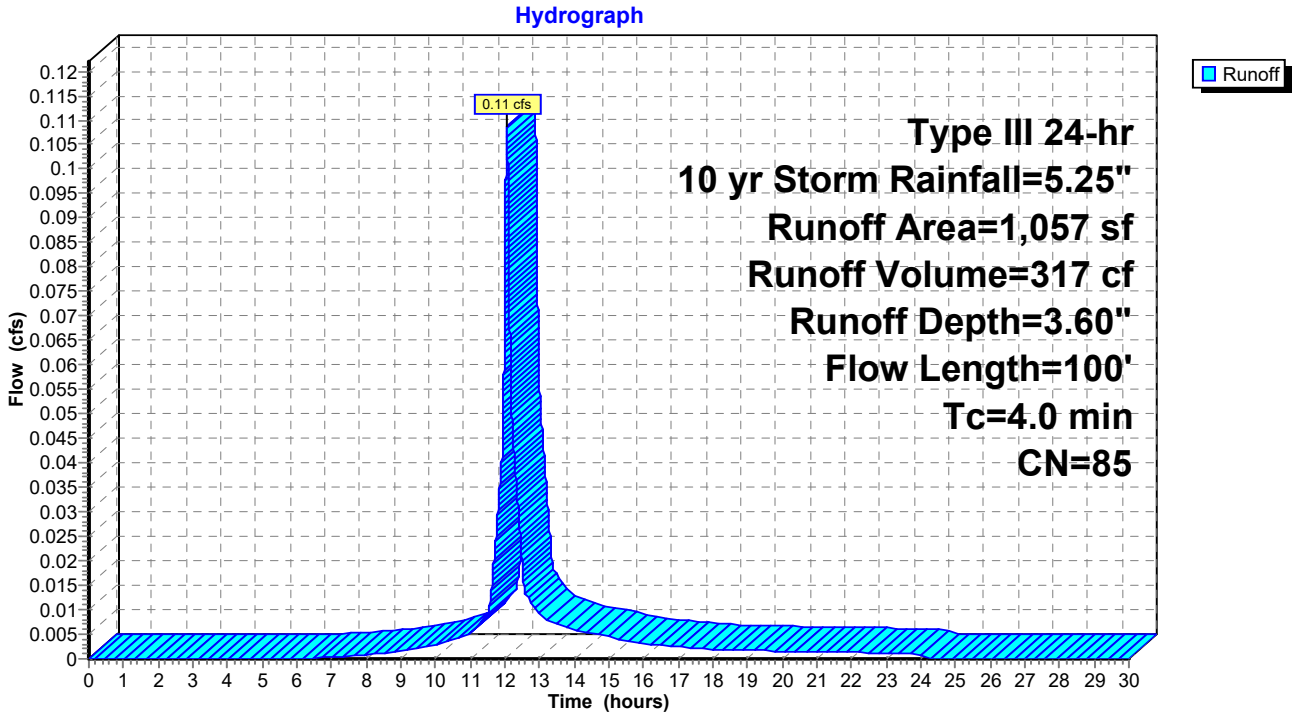
Runoff = 0.11 cfs @ 12.06 hrs, Volume= 317 cf, Depth= 3.60"
Routed to Pond 22P : Trench Swale (left)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 10 yr Storm Rainfall=5.25"

Area (sf)	CN	Description
1,057	85	Gravel roads, HSG B
1,057		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	100		0.42		**Direct Entry,**

Subcatchment S7: Gravel Drive Top



Summary for Subcatchment S8: Gravel Drive Middle

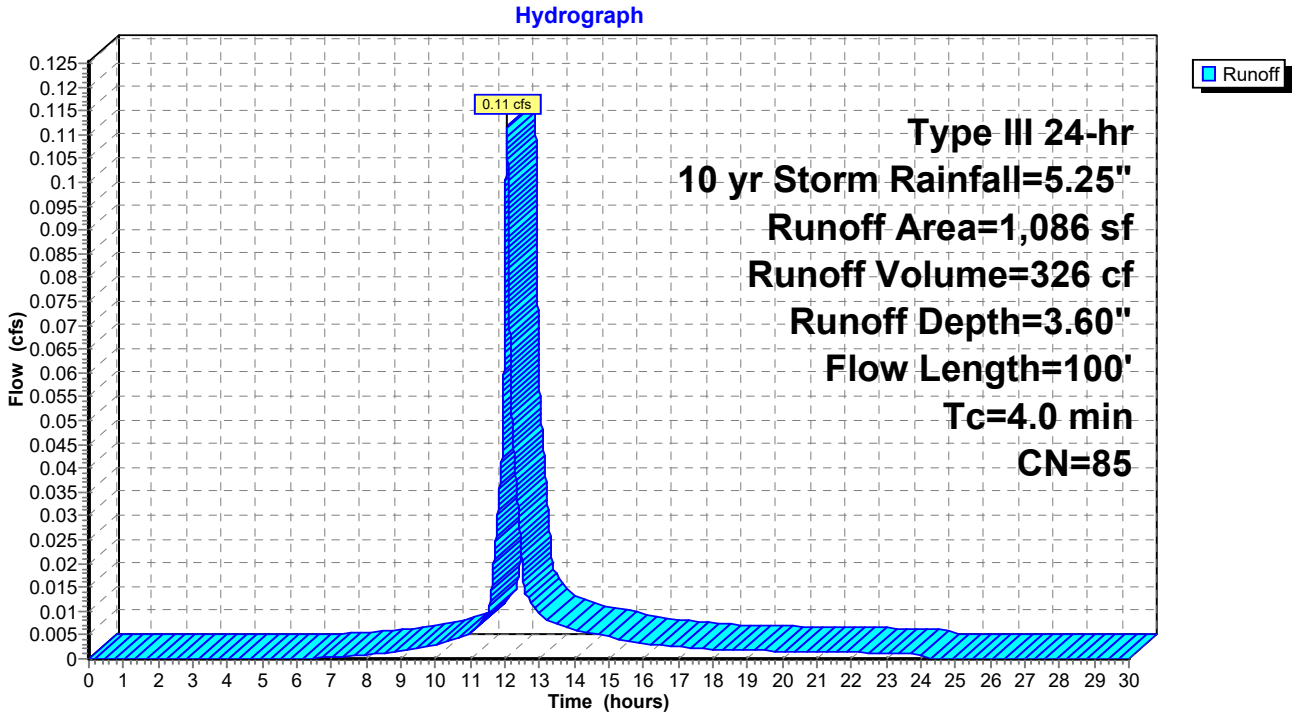
Runoff = 0.11 cfs @ 12.06 hrs, Volume= 326 cf, Depth= 3.60"
Routed to Pond 2P : Trench Swale (right)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 10 yr Storm Rainfall=5.25"

Area (sf)	CN	Description
1,086	85	Gravel roads, HSG B
1,086		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	100		0.42		**Direct Entry,**

Subcatchment S8: Gravel Drive Middle



Summary for Subcatchment S9: Gravel Drive Lower

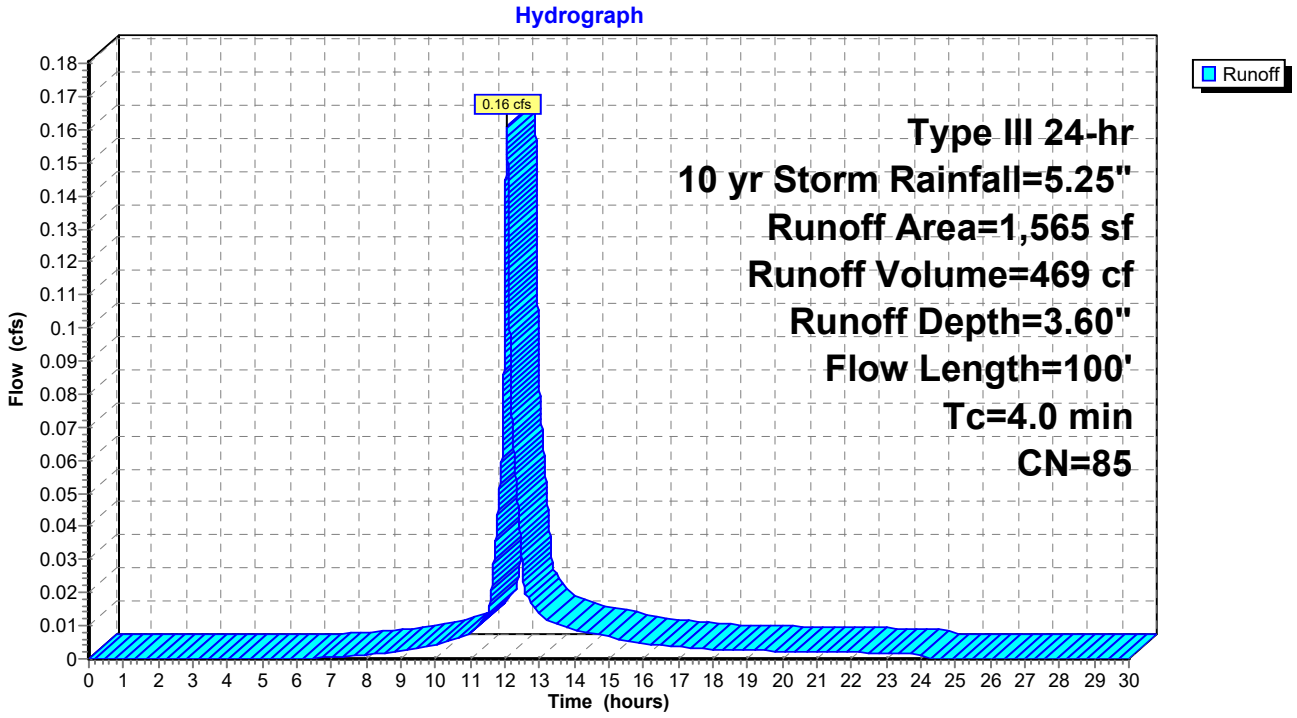
Runoff = 0.16 cfs @ 12.06 hrs, Volume= 469 cf, Depth= 3.60"
Routed to Pond 1P : Bottom basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 10 yr Storm Rainfall=5.25"

Area (sf)	CN	Description
1,565	85	Gravel roads, HSG B
1,565		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	100		0.42		**Direct Entry,**

Subcatchment S9: Gravel Drive Lower



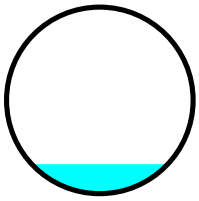
Summary for Reach CD: Combined Drain

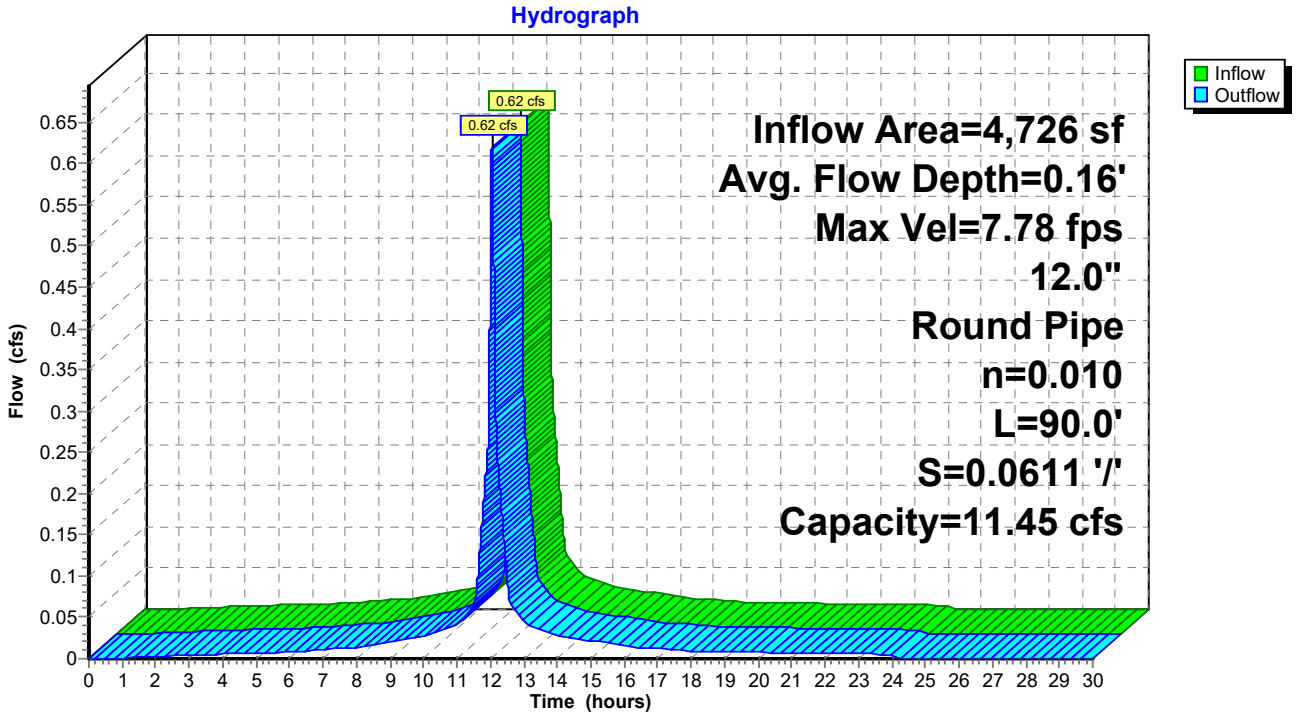
Inflow Area = 4,726 sf,100.00% Impervious, Inflow Depth = 5.01" for 10 yr Storm event
Inflow = 0.62 cfs @ 12.05 hrs, Volume= 1,974 cf
Outflow = 0.62 cfs @ 12.05 hrs, Volume= 1,974 cf, Atten= 0%, Lag= 0.2 min
Routed to Pond BR : Bioretention area

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 7.78 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.48 fps, Avg. Travel Time= 0.6 min

Peak Storage= 7 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 0.73'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 11.45 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 90.0' Slope= 0.0611 '/'
Inlet Invert= 298.00', Outlet Invert= 292.50'





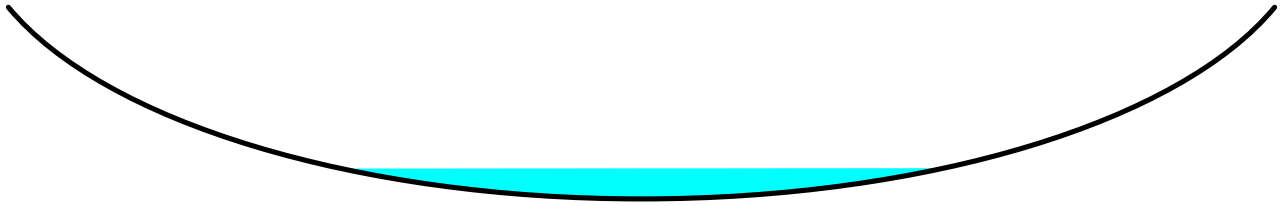
Summary for Reach OF: Overland Flow

Inflow Area = 2,143 sf, 0.00% Impervious, Inflow Depth = 2.95" for 10 yr Storm event
Inflow = 0.22 cfs @ 12.06 hrs, Volume= 527 cf
Outflow = 0.13 cfs @ 12.15 hrs, Volume= 527 cf, Atten= 42%, Lag= 5.5 min
Routed to Link DP1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 0.15 fps, Min. Travel Time= 15.5 min
Avg. Velocity = 0.05 fps, Avg. Travel Time= 49.8 min

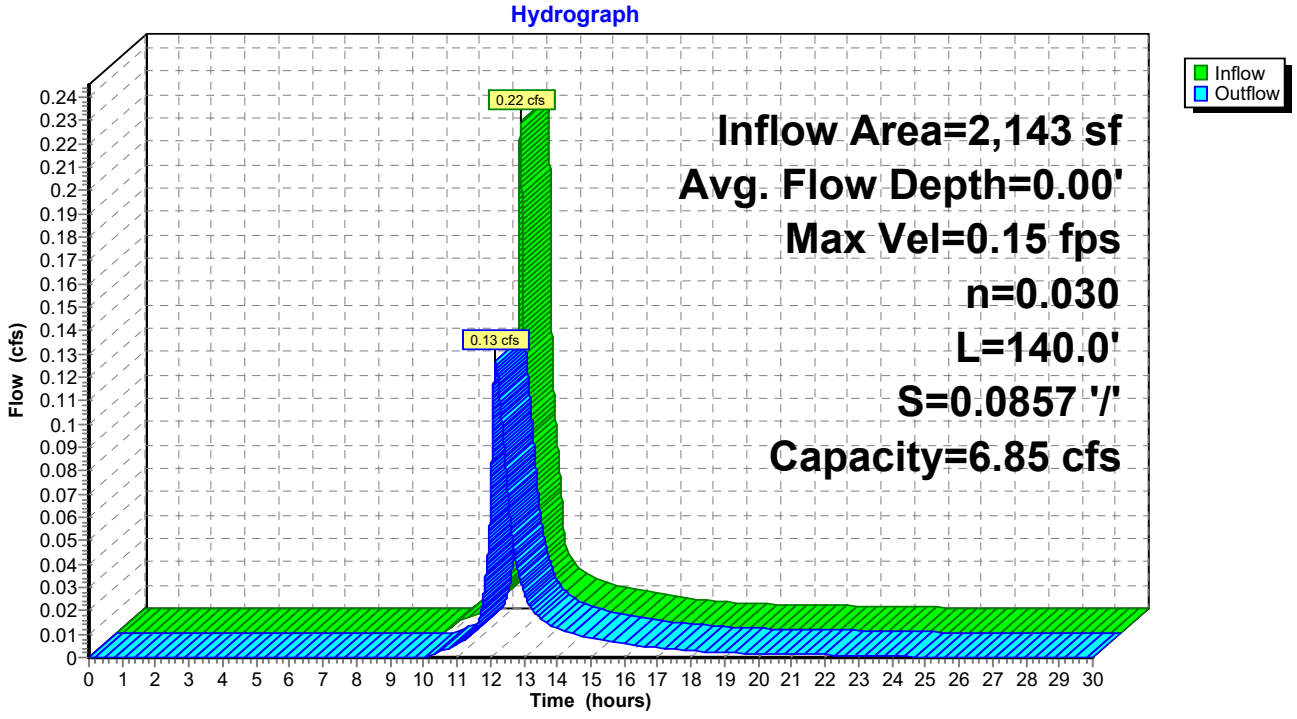
Peak Storage= 118 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 796.66'
Bank-Full Depth= 0.01' Flow Area= 13.3 sf, Capacity= 6.85 cfs

2,000.00' x 0.01' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 140.0' Slope= 0.0857 '/'
Inlet Invert= 283.00', Outlet Invert= 271.00'



‡

Reach OF: Overland Flow



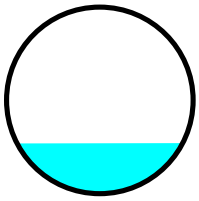
Summary for Reach PD: Pool drains

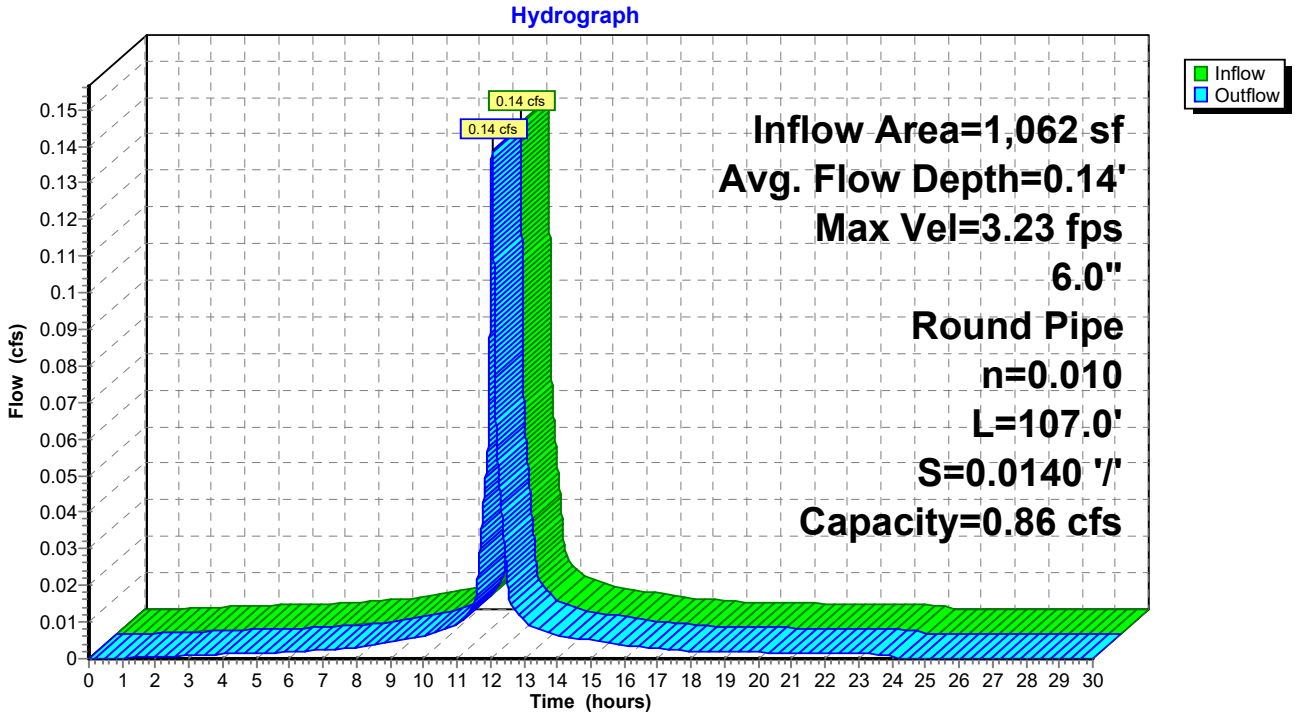
Inflow Area = 1,062 sf,100.00% Impervious, Inflow Depth = 5.01" for 10 yr Storm event
Inflow = 0.14 cfs @ 12.04 hrs, Volume= 444 cf
Outflow = 0.14 cfs @ 12.05 hrs, Volume= 444 cf, Atten= 1%, Lag= 0.4 min
Routed to Reach CD : Combined Drain

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 3.23 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 1.7 min

Peak Storage= 5 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 0.44'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.86 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 107.0' Slope= 0.0140 '/'
Inlet Invert= 299.50', Outlet Invert= 298.00'





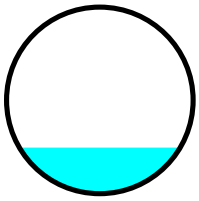
Summary for Reach RD: Roof/driveway drains

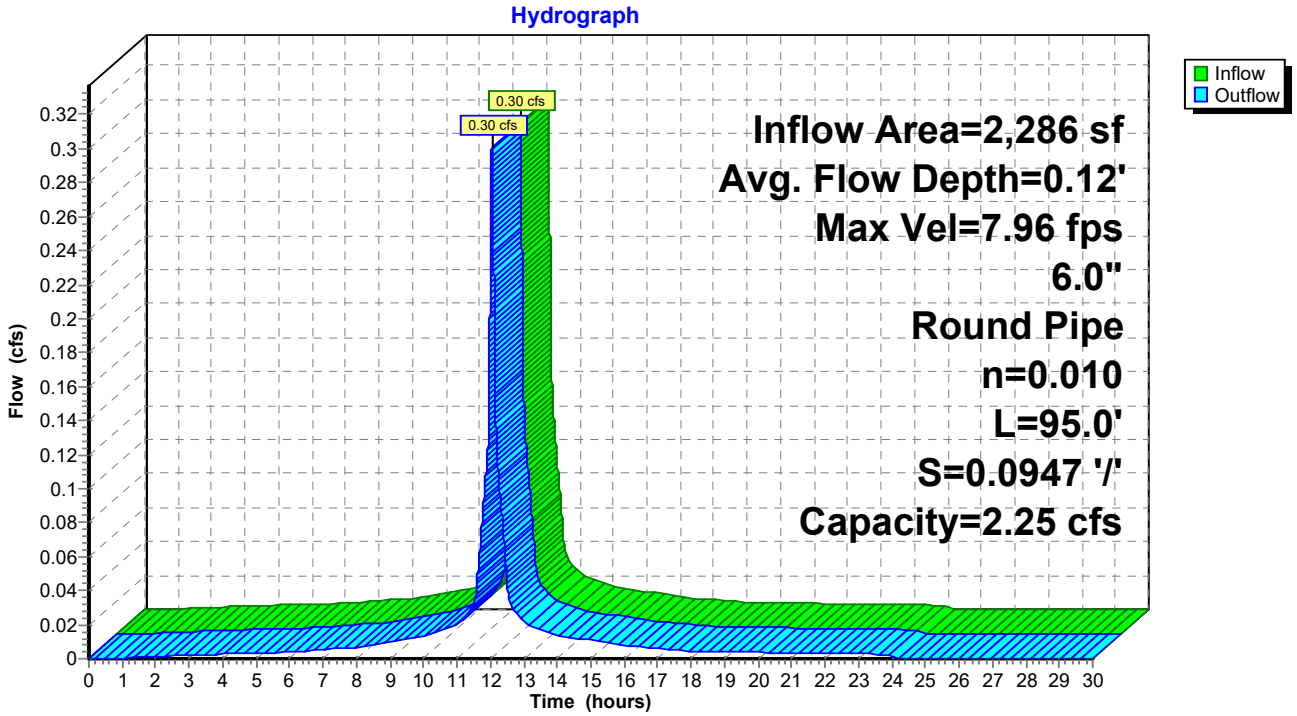
Inflow Area = 2,286 sf,100.00% Impervious, Inflow Depth = 5.01" for 10 yr Storm event
Inflow = 0.30 cfs @ 12.04 hrs, Volume= 955 cf
Outflow = 0.30 cfs @ 12.04 hrs, Volume= 955 cf, Atten= 0%, Lag= 0.1 min
Routed to Reach CD : Combined Drain

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 7.96 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.54 fps, Avg. Travel Time= 0.6 min

Peak Storage= 4 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.12' , Surface Width= 0.43'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 2.25 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 95.0' Slope= 0.0947 '/'
Inlet Invert= 307.00', Outlet Invert= 298.00'





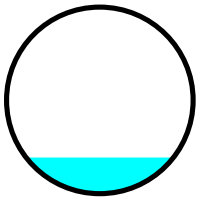
Summary for Reach RD2: Roof Drains 2

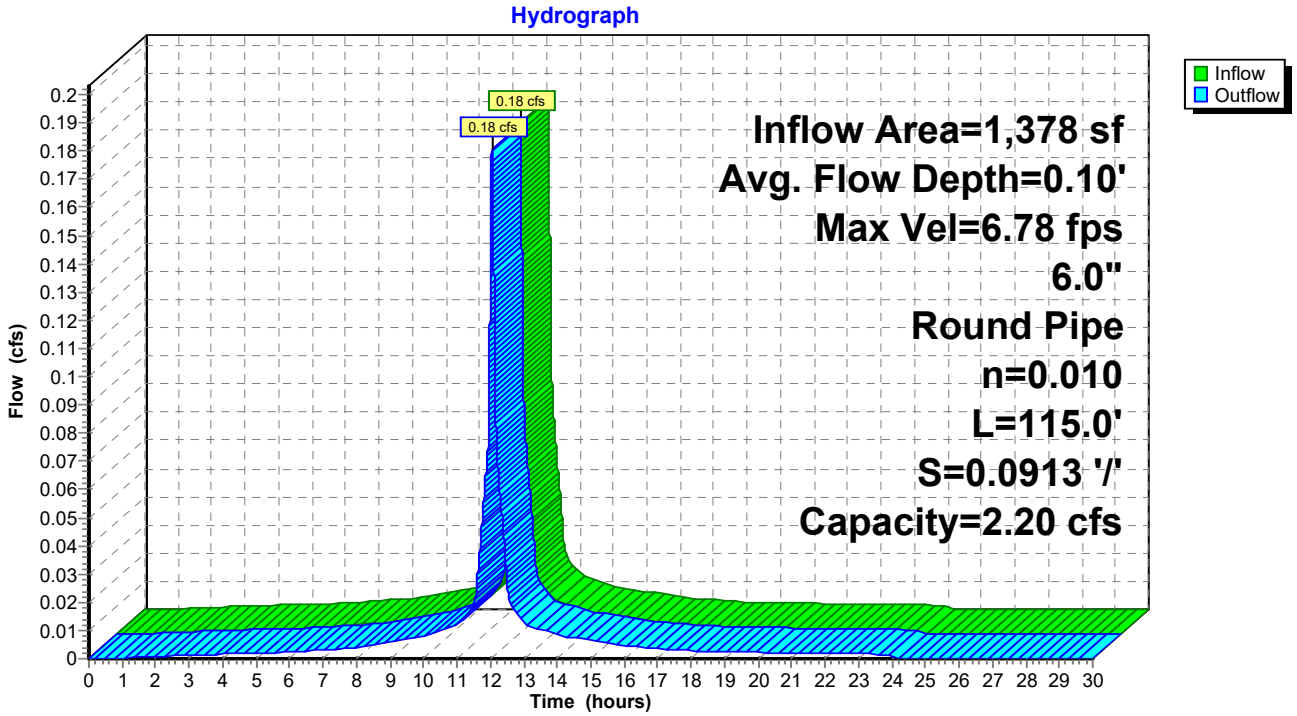
Inflow Area = 1,378 sf,100.00% Impervious, Inflow Depth = 5.01" for 10 yr Storm event
Inflow = 0.18 cfs @ 12.04 hrs, Volume= 576 cf
Outflow = 0.18 cfs @ 12.05 hrs, Volume= 576 cf, Atten= 0%, Lag= 0.1 min
Routed to Reach CD : Combined Drain

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 6.78 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.16 fps, Avg. Travel Time= 0.9 min

Peak Storage= 3 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.10' , Surface Width= 0.40'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 2.20 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 115.0' Slope= 0.0913 '/'
Inlet Invert= 308.50', Outlet Invert= 298.00'





Summary for Pond 1P: Bottom basin

Inflow Area = 1,565 sf, 0.00% Impervious, Inflow Depth = 3.60" for 10 yr Storm event
Inflow = 0.16 cfs @ 12.06 hrs, Volume= 469 cf
Outflow = 0.07 cfs @ 12.22 hrs, Volume= 469 cf, Atten= 57%, Lag= 9.6 min
Discarded = 0.01 cfs @ 12.22 hrs, Volume= 393 cf
Primary = 0.06 cfs @ 12.22 hrs, Volume= 77 cf
Routed to Link DP1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 271.01' @ 12.22 hrs Surf.Area= 196 sf Storage= 170 cf

Plug-Flow detention time= 220.2 min calculated for 469 cf (100% of inflow)
Center-of-Mass det. time= 220.2 min (1,024.0 - 803.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	269.00'	106 cf	**18.00'W x 10.50'L x 1.71'H Field A** 323 cf Overall - 57 cf Embedded = 266 cf x 40.0% Voids
#2A	269.50'	57 cf	**Cultec FD C-4** x 4 Inside #1 Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.67 sf x 4 rows
#3	270.00'	14 cf	**3.00'D x 2.00'H Vertical Cone/Cylinder**
		177 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	271.00'	**4.0" x 2.0" Horiz. Orifice/Grate X 2.00 columns** X 50 rows C= 0.600 in 12.0" x 144.0" Grate (46% open area) Limited to weir flow at low heads
#2	Discarded	269.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 12.22 hrs HW=271.01' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.05 cfs @ 12.22 hrs HW=271.01' (Free Discharge)
1=Orifice/Grate (Weir Controls 0.05 cfs @ 0.28 fps)

Pond 1P: Bottom basin - Chamber Wizard Field A

Chamber Model = Cultec FD C-4 (Cultec Contactor® Field Drain C-4)
Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf
Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap
Row Length Adjustment= +0.50' x 1.67 sf x 4 rows

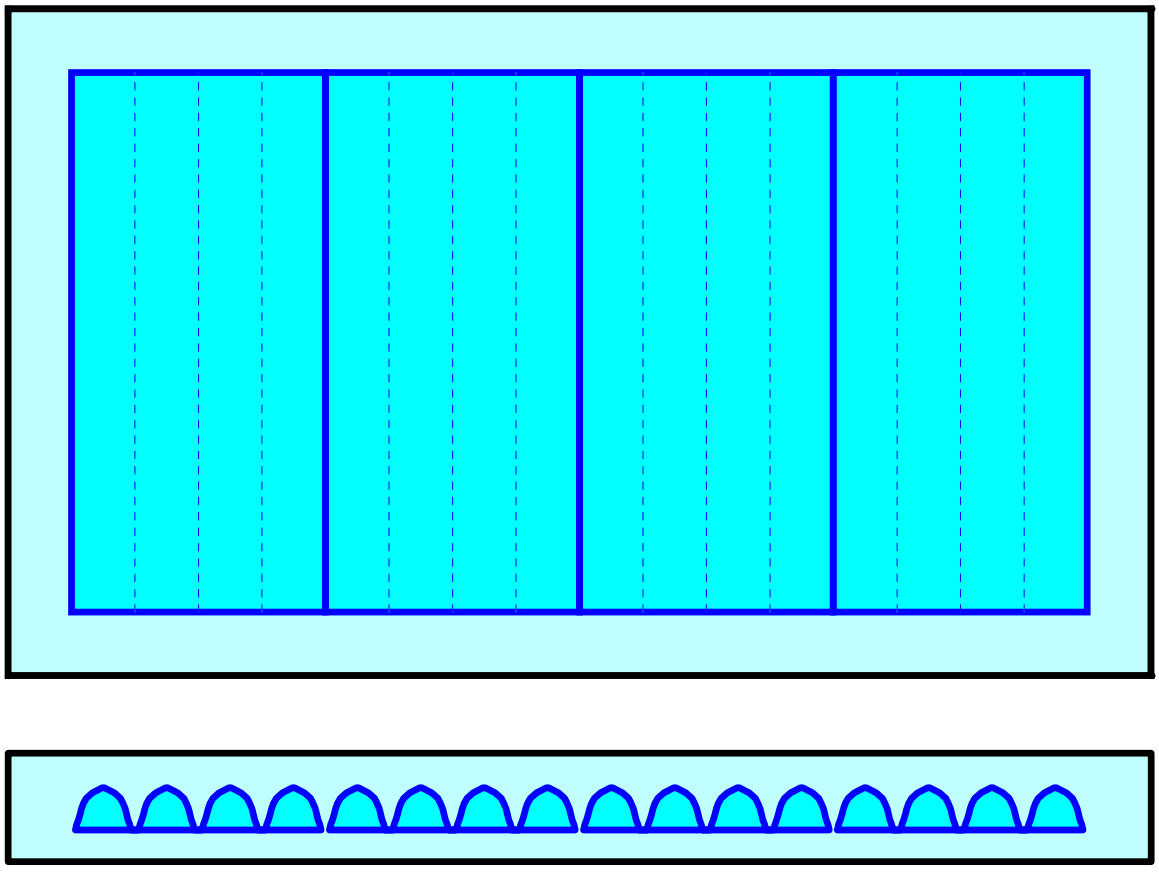
1 Chambers/Row x 8.00' Long +0.50' Row Adjustment = 8.50' Row Length +12.0" End Stone x 2 = 10.50' Base Length
4 Rows x 48.0" Wide + 12.0" Side Stone x 2 = 18.00' Base Width
6.0" Stone Base + 8.5" Chamber Height + 6.0" Stone Cover = 1.71' Field Height

4 Chambers x 13.3 cf +0.50' Row Adjustment x 1.67 sf x 4 Rows = 56.6 cf Chamber Storage

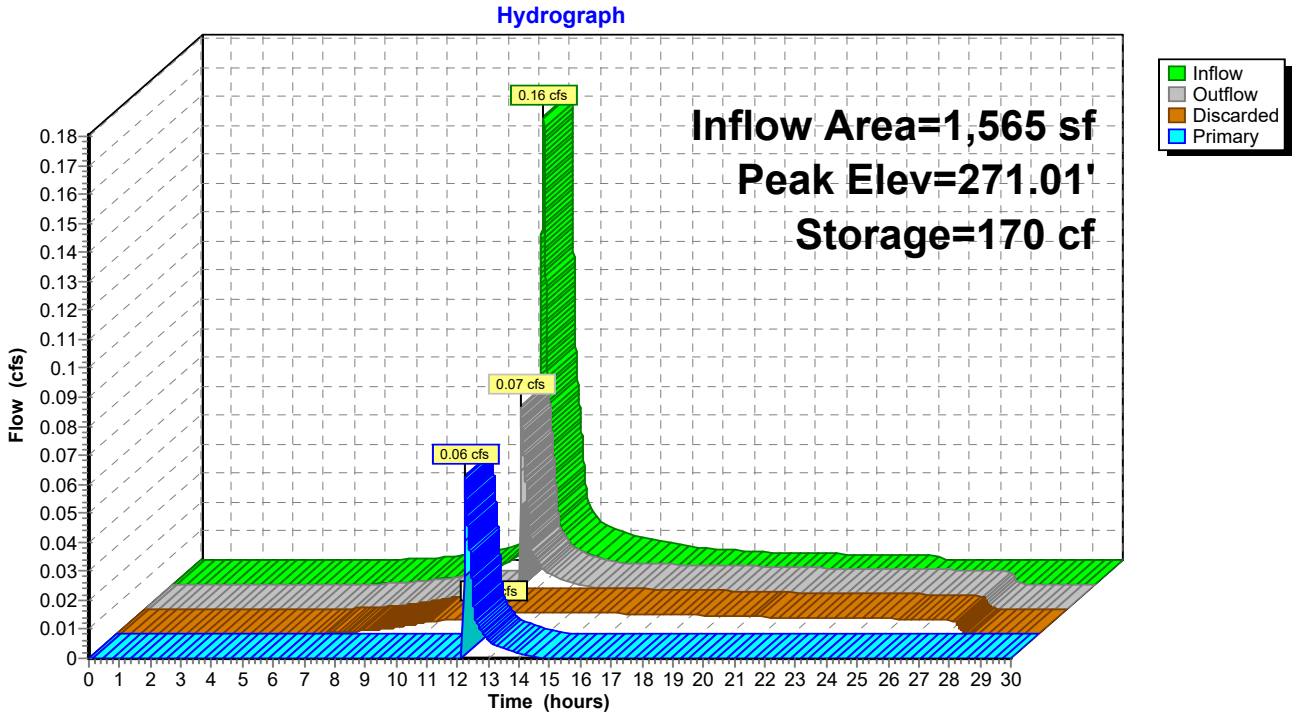
322.9 cf Field - 56.6 cf Chambers = 266.2 cf Stone x 40.0% Voids = 106.5 cf Stone Storage

Chamber Storage + Stone Storage = 163.1 cf = 0.004 af
Overall Storage Efficiency = 50.5%
Overall System Size = 10.50' x 18.00' x 1.71'

4 Chambers
12.0 cy Field
9.9 cy Stone



Pond 1P: Bottom basin



Summary for Pond 2P: Trench Swale (right)

Inflow Area = 1,086 sf, 0.00% Impervious, Inflow Depth = 3.60" for 10 yr Storm event
Inflow = 0.11 cfs @ 12.06 hrs, Volume= 326 cf
Outflow = 0.11 cfs @ 12.06 hrs, Volume= 325 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 12.06 hrs, Volume= 62 cf
Primary = 0.11 cfs @ 12.06 hrs, Volume= 264 cf
Routed to Reach OF : Overland Flow

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 284.01' @ 12.06 hrs Surf.Area= 38 sf Storage= 11 cf

Plug-Flow detention time= 33.2 min calculated for 325 cf (100% of inflow)
Center-of-Mass det. time= 32.3 min (836.1 - 803.8)

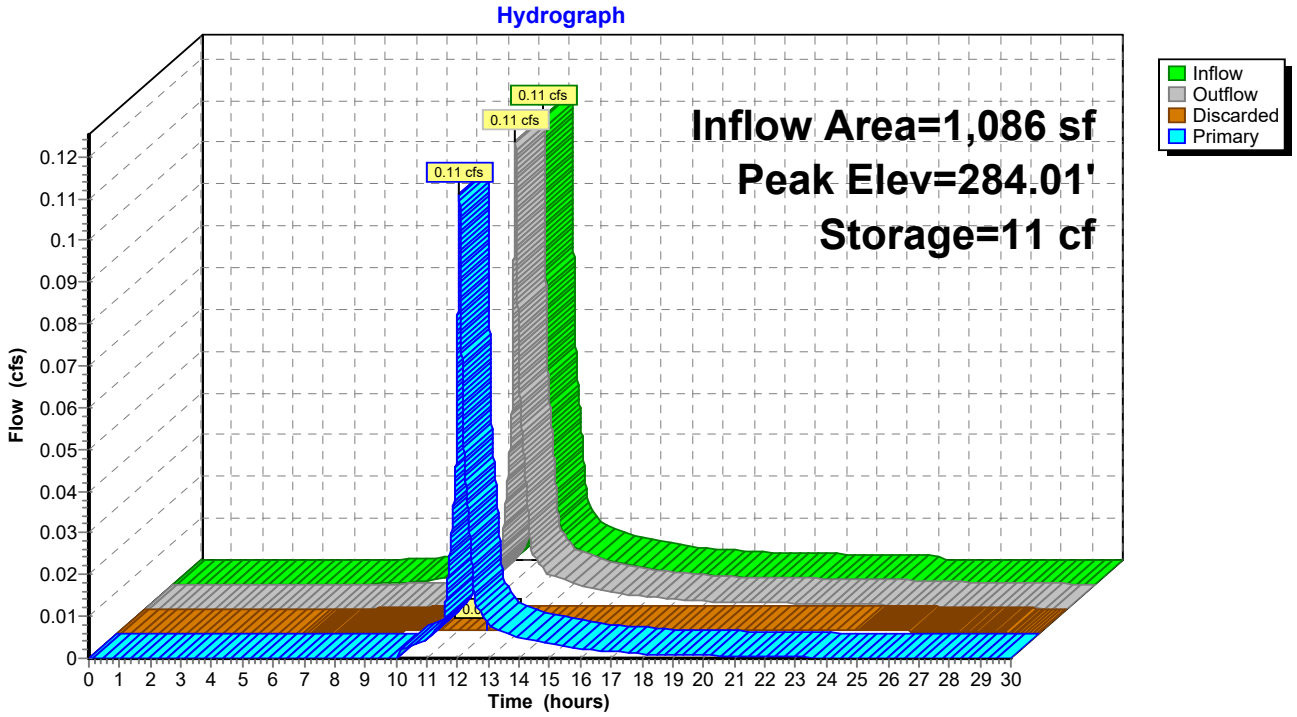
Volume	Invert	Avail.Storage	Storage Description
#1	283.00'	3,772 cf	**96.0" W x 60.0" H, R=55.0" Elliptical Pipe Storage** L= 185.0' S= 0.1050 '/' 5,388 cf Overall x 70.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	283.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	284.00'	**10.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.00 cfs @ 12.06 hrs HW=284.01' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.02 cfs @ 12.06 hrs HW=284.01' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.02 cfs @ 0.25 fps)

Pond 2P: Trench Swale (right)



Summary for Pond 22P: Trench Swale (left)

Inflow Area = 1,057 sf, 0.00% Impervious, Inflow Depth = 3.60" for 10 yr Storm event
Inflow = 0.11 cfs @ 12.06 hrs, Volume= 317 cf
Outflow = 0.11 cfs @ 12.06 hrs, Volume= 317 cf, Atten= 0%, Lag= 0.1 min
Discarded = 0.00 cfs @ 12.06 hrs, Volume= 53 cf
Primary = 0.11 cfs @ 12.06 hrs, Volume= 264 cf
Routed to Reach OF : Overland Flow

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 287.02' @ 12.06 hrs Surf.Area= 32 sf Storage= 9 cf

Plug-Flow detention time= 29.1 min calculated for 317 cf (100% of inflow)
Center-of-Mass det. time= 28.4 min (832.2 - 803.8)

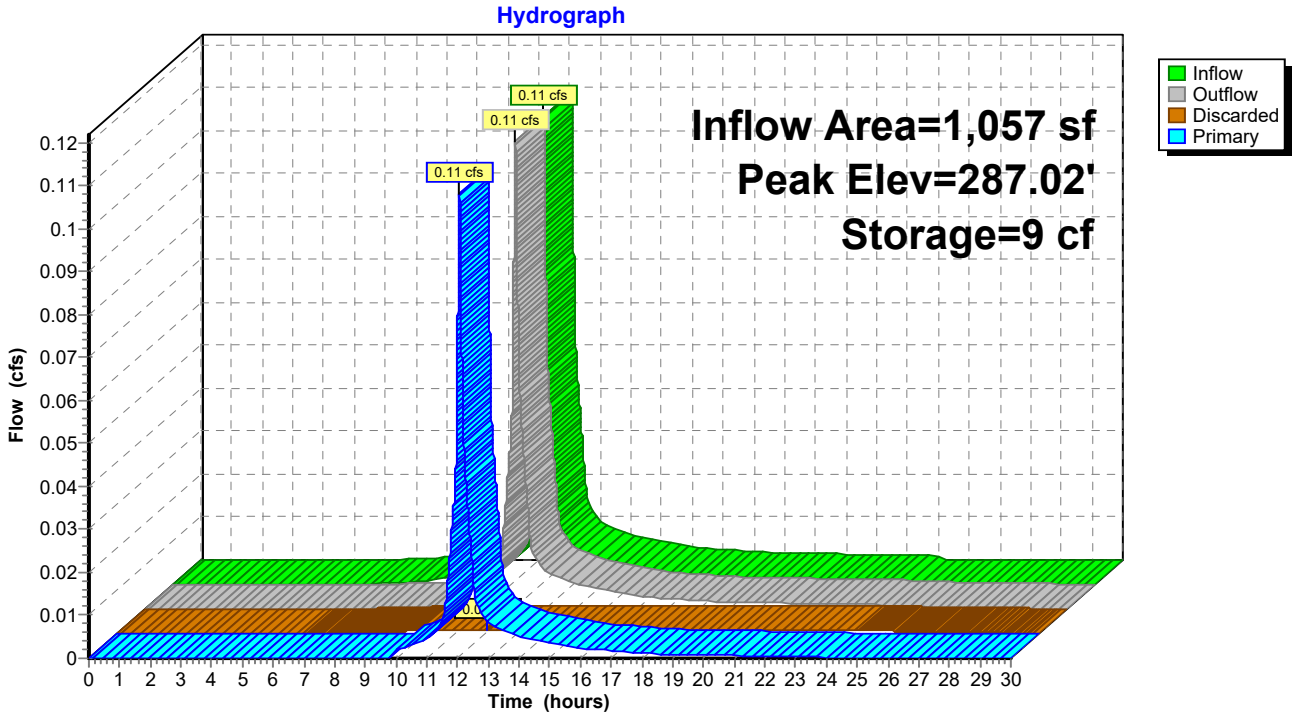
Volume	Invert	Avail.Storage	Storage Description
#1	286.00'	2,458 cf	**72.0" W x 60.0" H, R=40.0" Elliptical Pipe Storage** L= 150.0' S= 0.1050 '/' 3,511 cf Overall x 70.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	286.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	287.00'	**10.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.00 cfs @ 12.06 hrs HW=287.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.08 cfs @ 12.06 hrs HW=287.02' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.08 cfs @ 0.39 fps)

Pond 22P: Trench Swale (left)



Summary for Pond BR: Bioretention area

Inflow Area = 4,726 sf,100.00% Impervious, Inflow Depth = 5.01" for 10 yr Storm event
Inflow = 0.62 cfs @ 12.05 hrs, Volume= 1,974 cf
Outflow = 0.04 cfs @ 13.51 hrs, Volume= 1,974 cf, Atten= 94%, Lag= 87.9 min
Discarded = 0.04 cfs @ 13.51 hrs, Volume= 1,974 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP2 : Design Point 2

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 292.43' @ 13.51 hrs Surf.Area= 1,353 sf Storage= 894 cf

Plug-Flow detention time= 220.9 min calculated for 1,974 cf (100% of inflow)
Center-of-Mass det. time= 220.9 min (966.4 - 745.5)

Volume	Invert	Avail.Storage	Storage Description
#1	289.00'	1,685 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

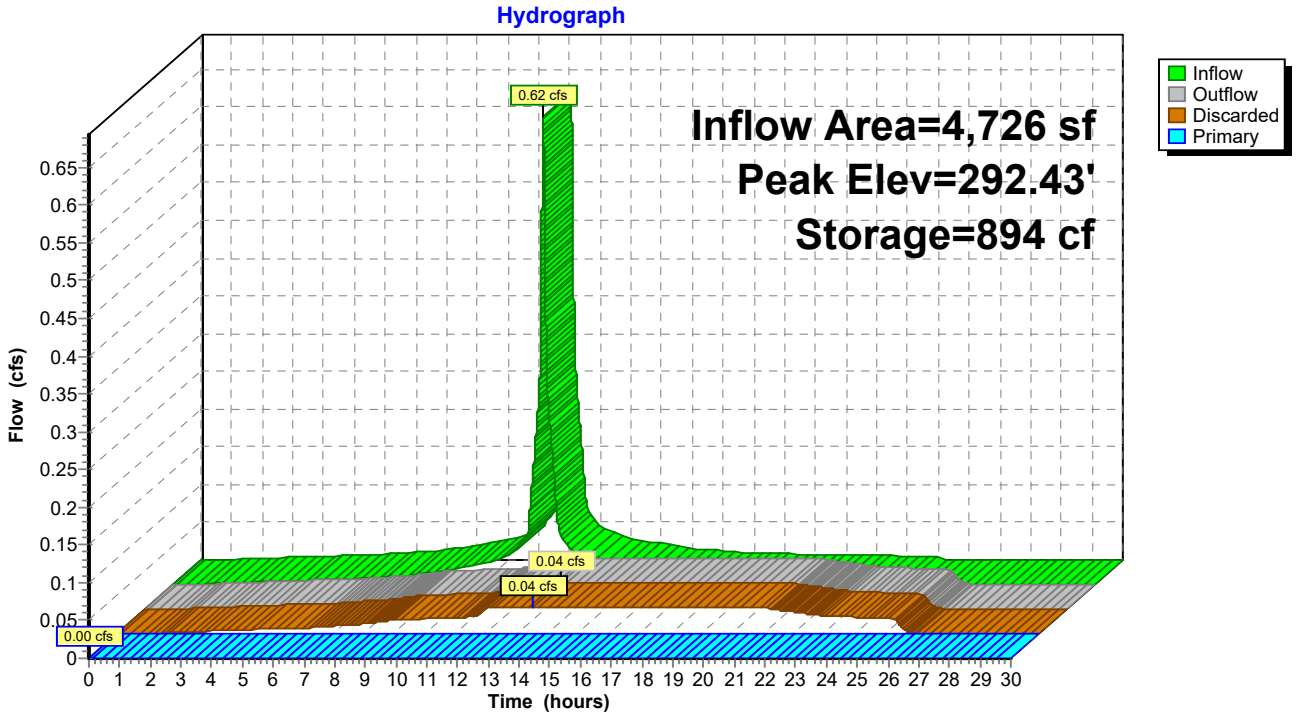
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
289.00	800	0.0	0	0	800
289.50	1,000	40.0	180	180	1,007
292.00	1,300	5.0	143	323	1,431
293.00	1,425	100.0	1,362	1,685	1,612

Device	Routing	Invert	Outlet Devices
#1	Discarded	289.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	292.50'	**12.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 292.50' / 289.00' S= 0.2333 '/' Cc= 0.500 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.04 cfs @ 13.51 hrs HW=292.43' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=289.00' (Free Discharge)
↑—**2=Culvert** (Controls 0.00 cfs)

Pond BR: Bioretention area

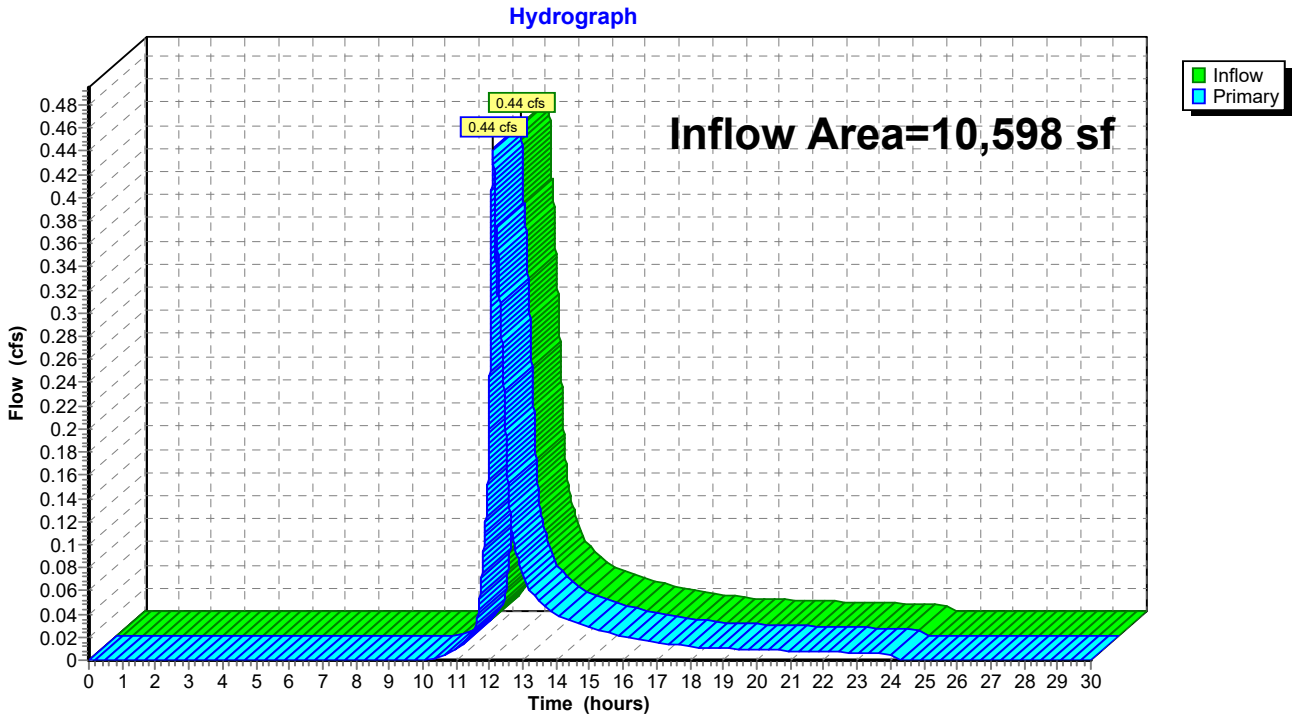


Summary for Link DP1: Design Point 1

Inflow Area = 10,598 sf, 0.00% Impervious, Inflow Depth = 1.87" for 10 yr Storm event
Inflow = 0.44 cfs @ 12.10 hrs, Volume= 1,650 cf
Primary = 0.44 cfs @ 12.10 hrs, Volume= 1,650 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs

Link DP1: Design Point 1

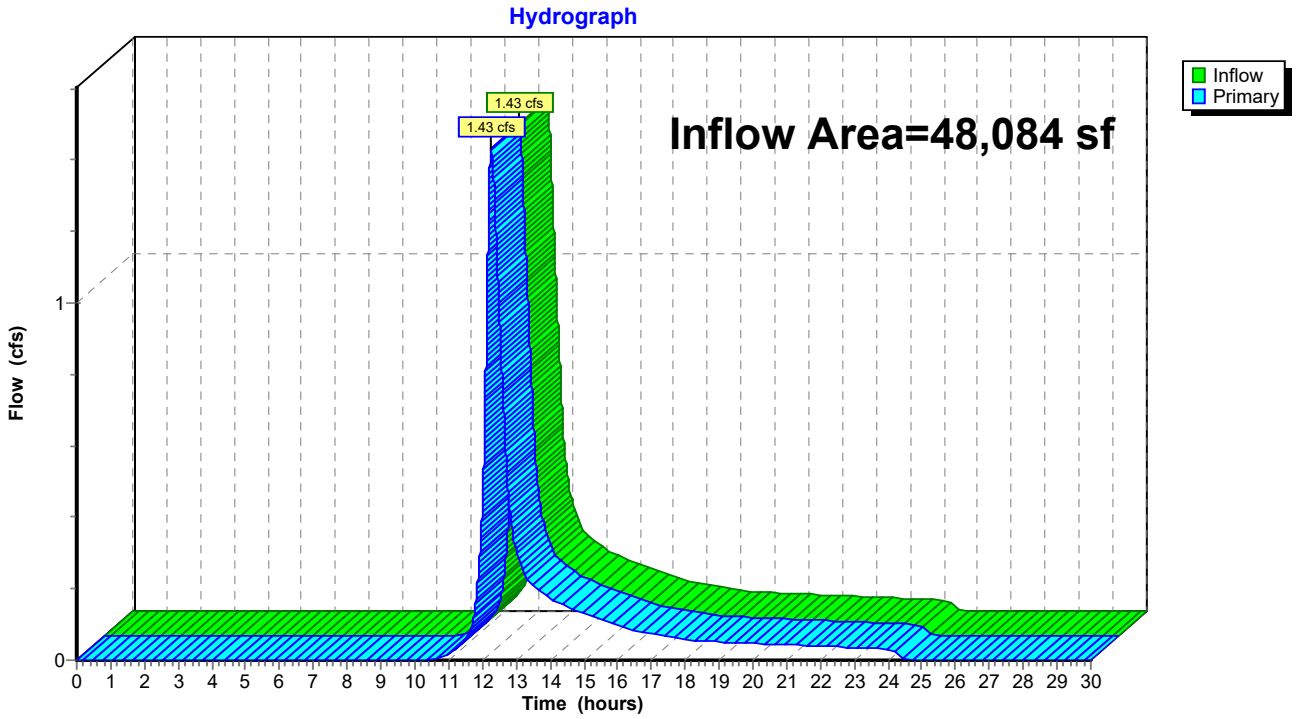


Summary for Link DP2: Design Point 2

Inflow Area = 48,084 sf, 10.71% Impervious, Inflow Depth = 1.64" for 10 yr Storm event
Inflow = 1.43 cfs @ 12.26 hrs, Volume= 6,583 cf
Primary = 1.43 cfs @ 12.26 hrs, Volume= 6,583 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs

Link DP2: Design Point 2



Summary for Subcatchment S1: Vegetated area/porch and deck

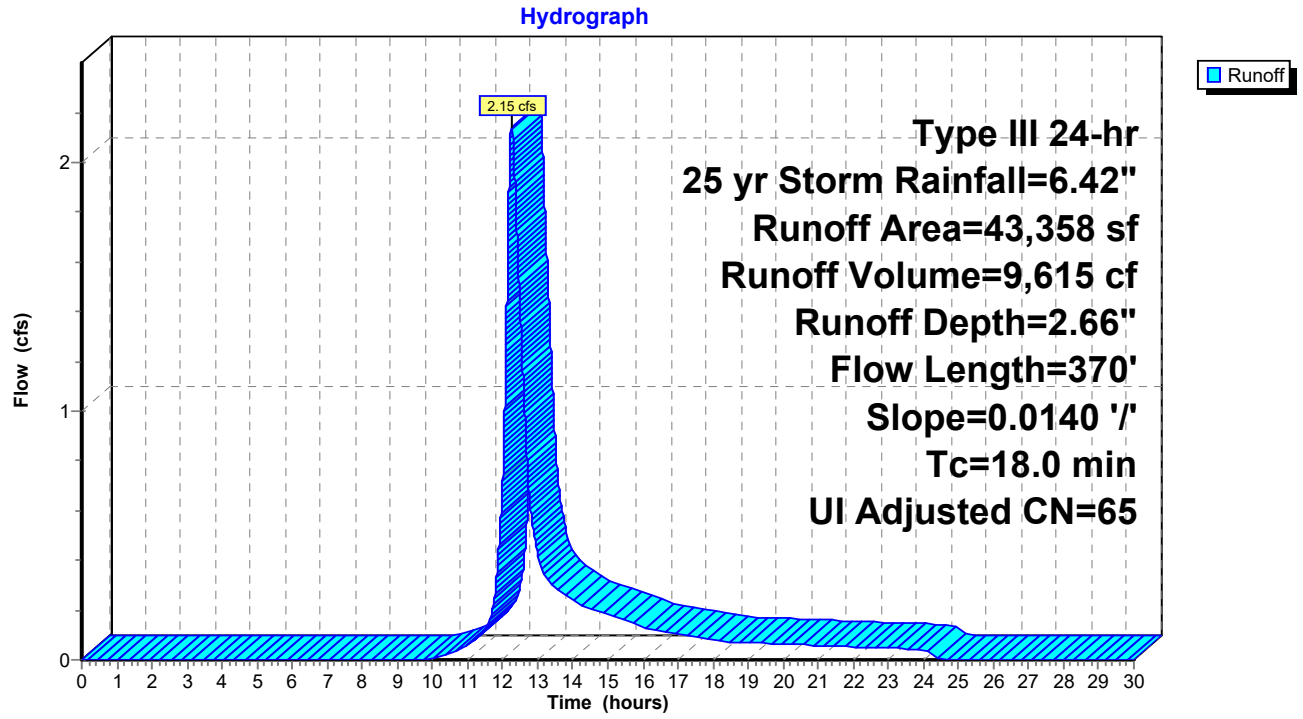
Runoff = 2.15 cfs @ 12.26 hrs, Volume= 9,615 cf, Depth= 2.66"
Routed to Link DP2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 25 yr Storm Rainfall=6.42"

Area (sf)	CN	Adj	Description
42,292	65		Woods/grass comb., Fair, HSG B
424	98		Unconnected pavement, HSG B
642	85		Gravel roads, HSG B
43,358	66	65	Weighted Average, UI Adjusted
42,934			99.02% Pervious Area
424			0.98% Impervious Area
424			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	370	0.0140	0.34		**Lag/CN Method,**

Subcatchment S1: Vegetated area/porch and deck



Summary for Subcatchment S2: Driveway segment 1

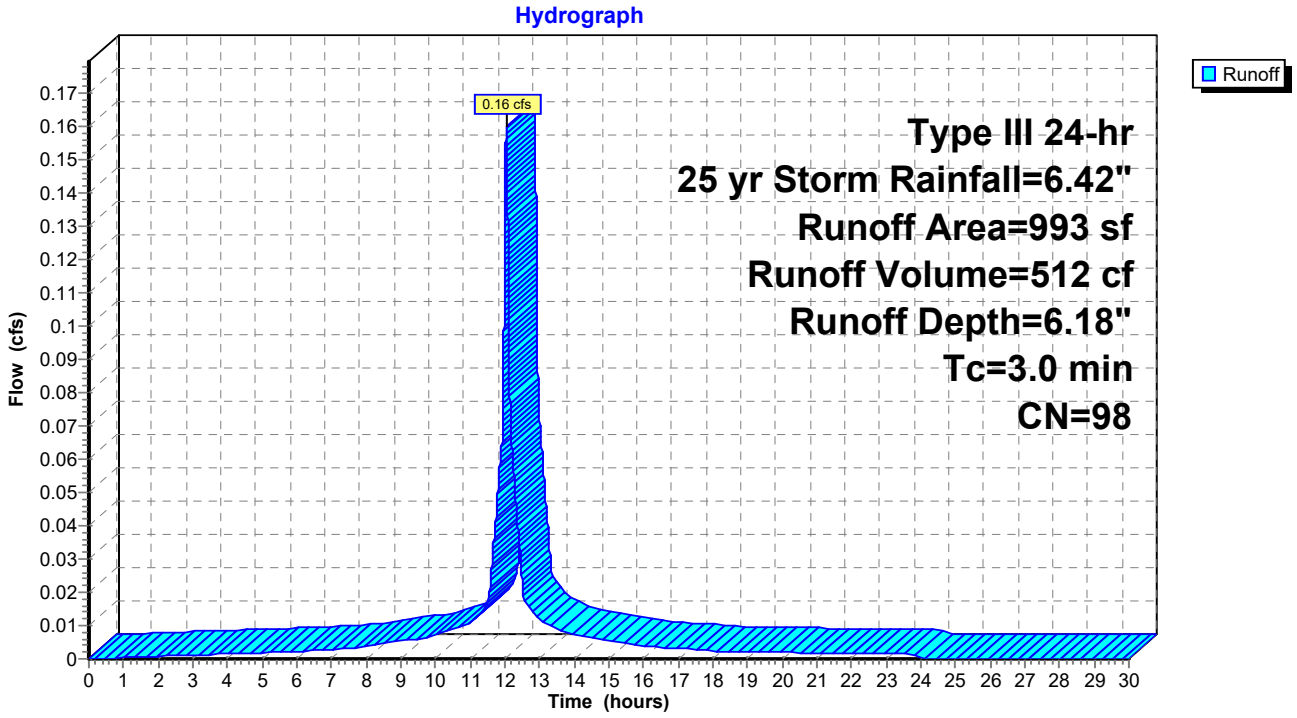
Runoff = 0.16 cfs @ 12.04 hrs, Volume= 512 cf, Depth= 6.18"
Routed to Reach RD : Roof/driveway drains

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 25 yr Storm Rainfall=6.42"

Area (sf)	CN	Description
993	98	Paved parking, HSG B
993		100.00% Impervious Area

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

Subcatchment S2: Driveway segment 1



Summary for Subcatchment S3: House

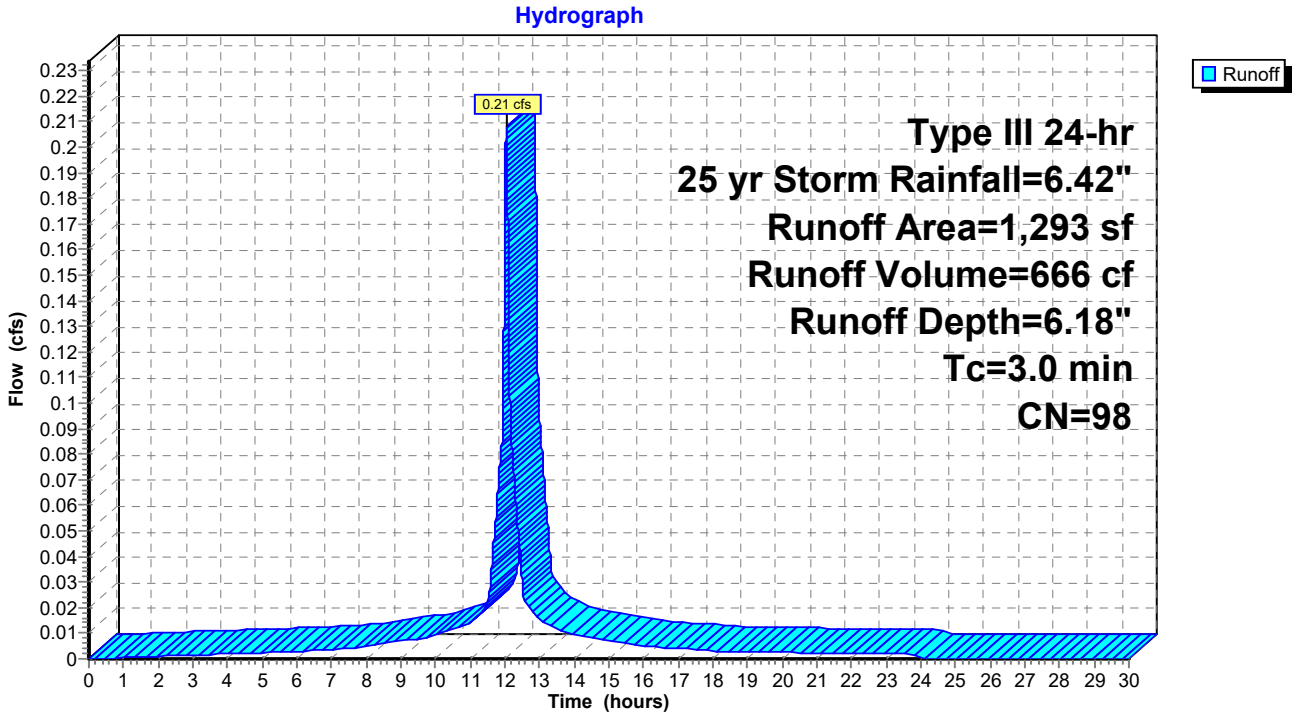
Runoff = 0.21 cfs @ 12.04 hrs, Volume= 666 cf, Depth= 6.18"
Routed to Reach RD : Roof/driveway drains

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 25 yr Storm Rainfall=6.42"

Area (sf)	CN	Description
1,293	98	Roofs, HSG B
1,293		100.00% Impervious Area

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

Subcatchment S3: House



Summary for Subcatchment S4: House 2

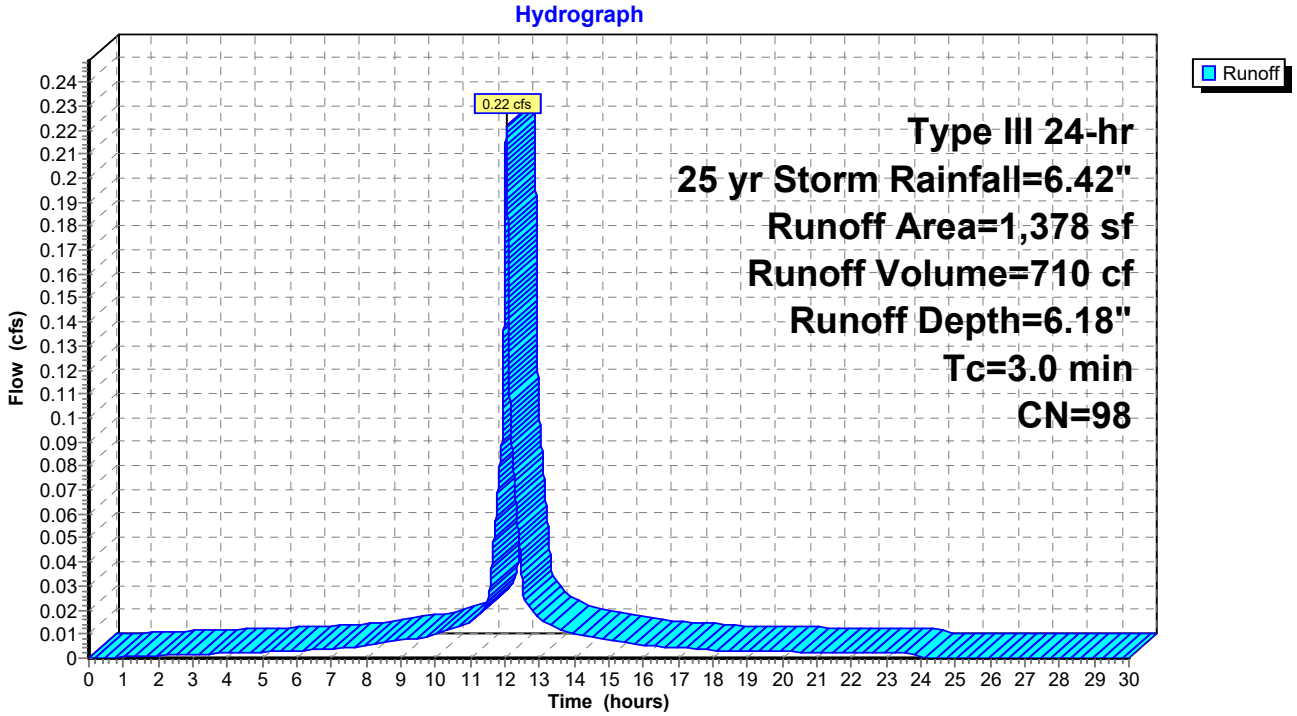
Runoff = 0.22 cfs @ 12.04 hrs, Volume= 710 cf, Depth= 6.18"
Routed to Reach RD2 : Roof Drains 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 25 yr Storm Rainfall=6.42"

Area (sf)	CN	Description
1,378	98	Unconnected roofs, HSG B
1,378		100.00% Impervious Area
1,378		100.00% Unconnected

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

Subcatchment S4: House 2



Summary for Subcatchment S5: New swimming pool

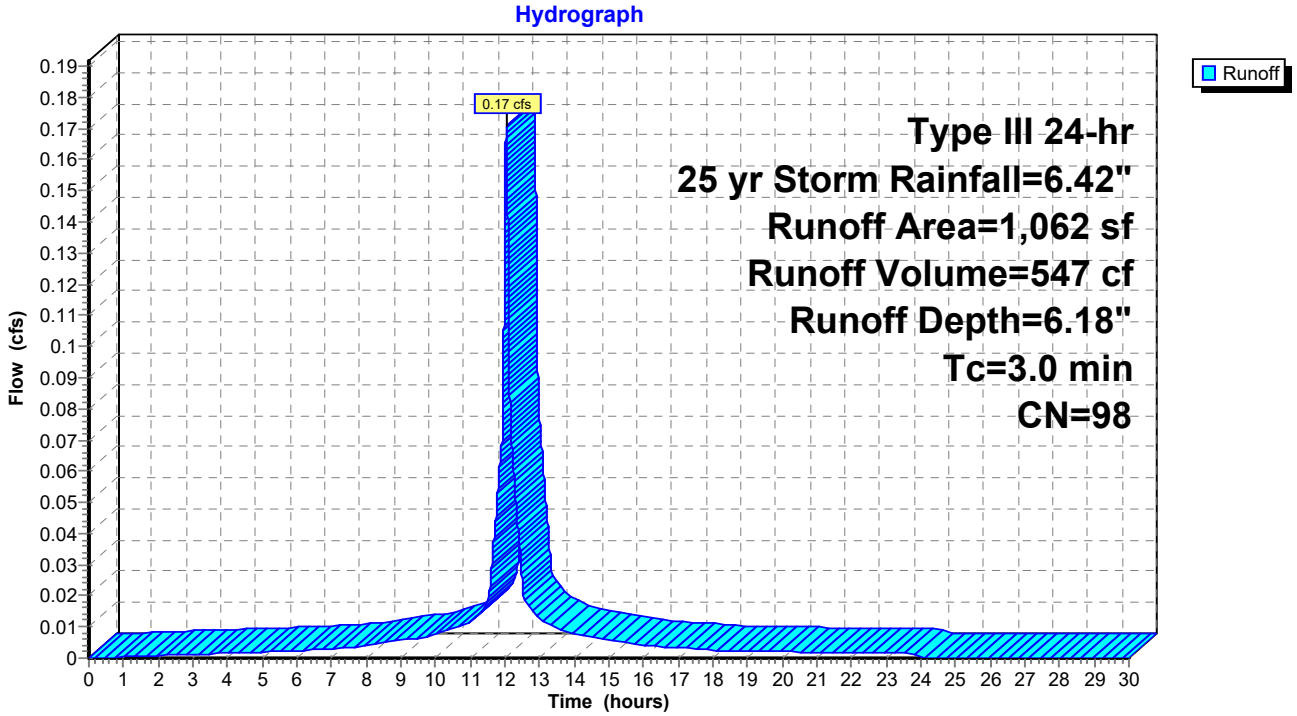
Runoff = 0.17 cfs @ 12.04 hrs, Volume= 547 cf, Depth= 6.18"
Routed to Reach PD : Pool drains

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 25 yr Storm Rainfall=6.42"

Area (sf)	CN	Description
1,062	98	Unconnected pavement, HSG B
1,062		100.00% Impervious Area
1,062		100.00% Unconnected

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

Subcatchment S5: New swimming pool



Summary for Subcatchment S6: Easement - vegetated

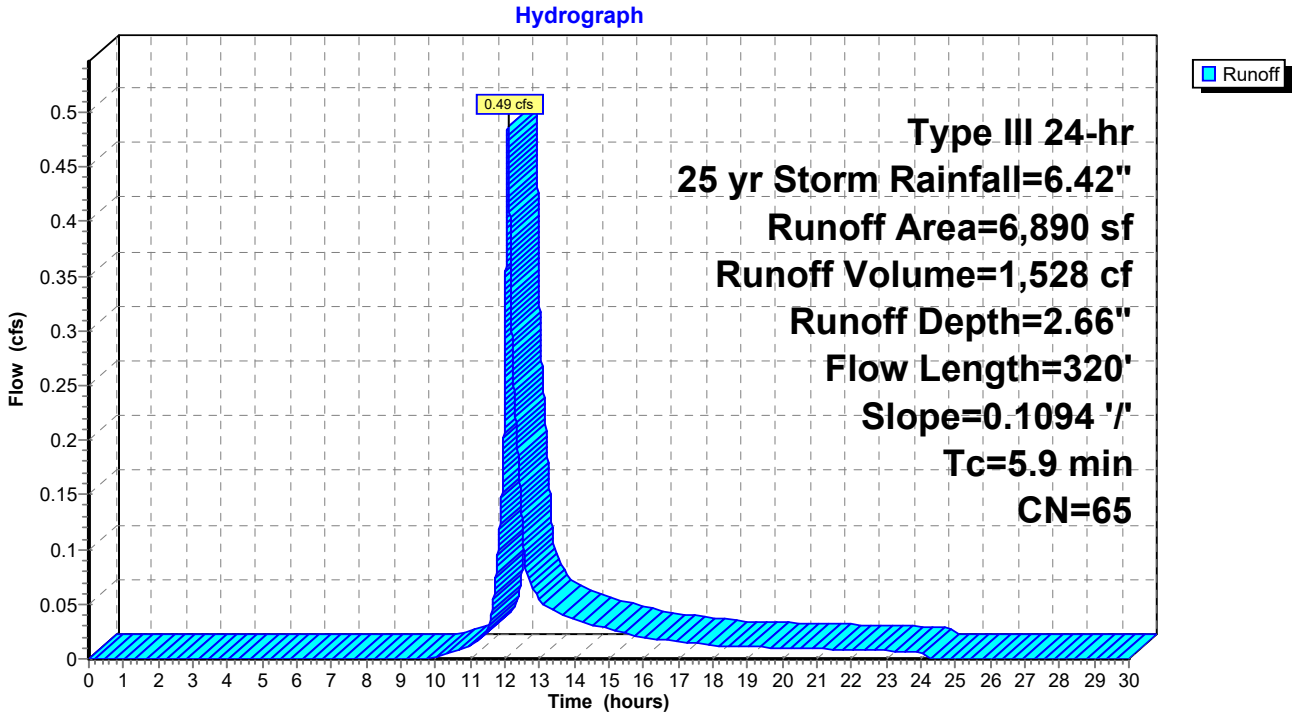
Runoff = 0.49 cfs @ 12.09 hrs, Volume= 1,528 cf, Depth= 2.66"
Routed to Link DP1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 25 yr Storm Rainfall=6.42"

Area (sf)	CN	Description
6,890	65	Woods/grass comb., Fair, HSG B
6,890		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	320	0.1094	0.91		**Lag/CN Method,**

Subcatchment S6: Easement - vegetated



Summary for Subcatchment S7: Gravel Drive Top

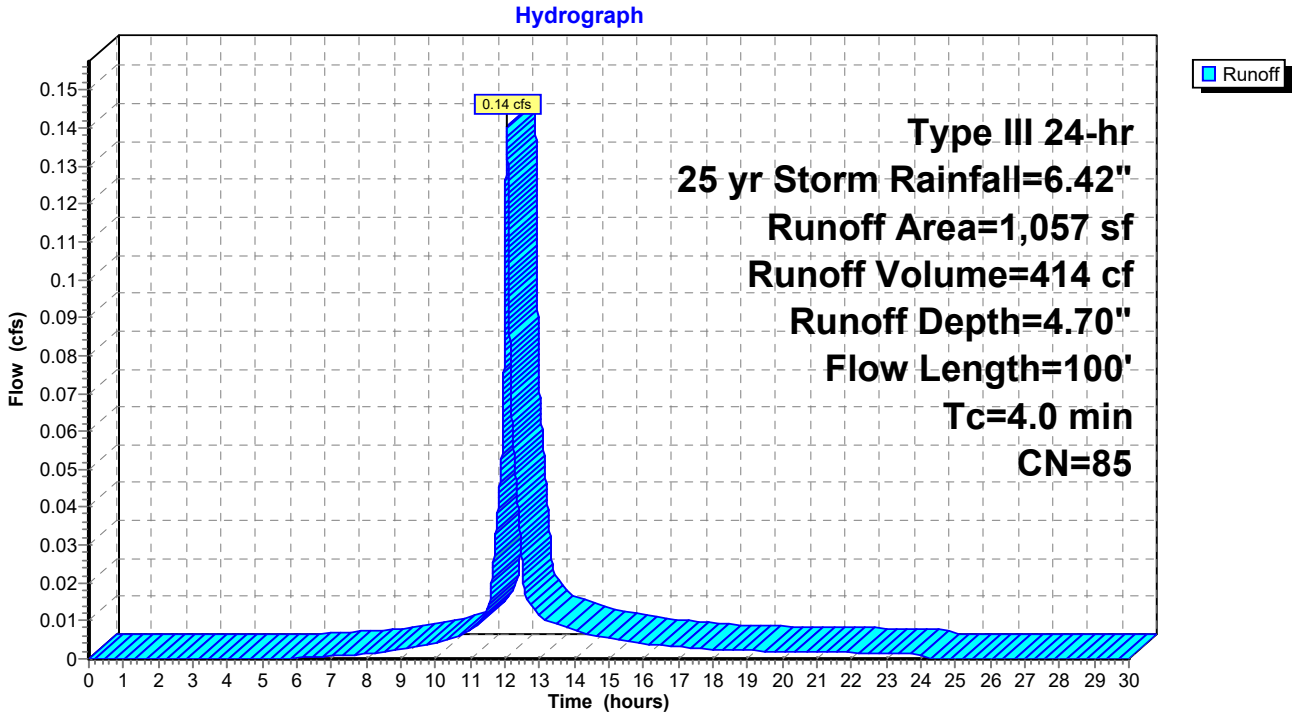
Runoff = 0.14 cfs @ 12.06 hrs, Volume= 414 cf, Depth= 4.70"
Routed to Pond 22P : Trench Swale (left)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 25 yr Storm Rainfall=6.42"

Area (sf)	CN	Description
1,057	85	Gravel roads, HSG B
1,057		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	100		0.42		**Direct Entry,**

Subcatchment S7: Gravel Drive Top



Summary for Subcatchment S8: Gravel Drive Middle

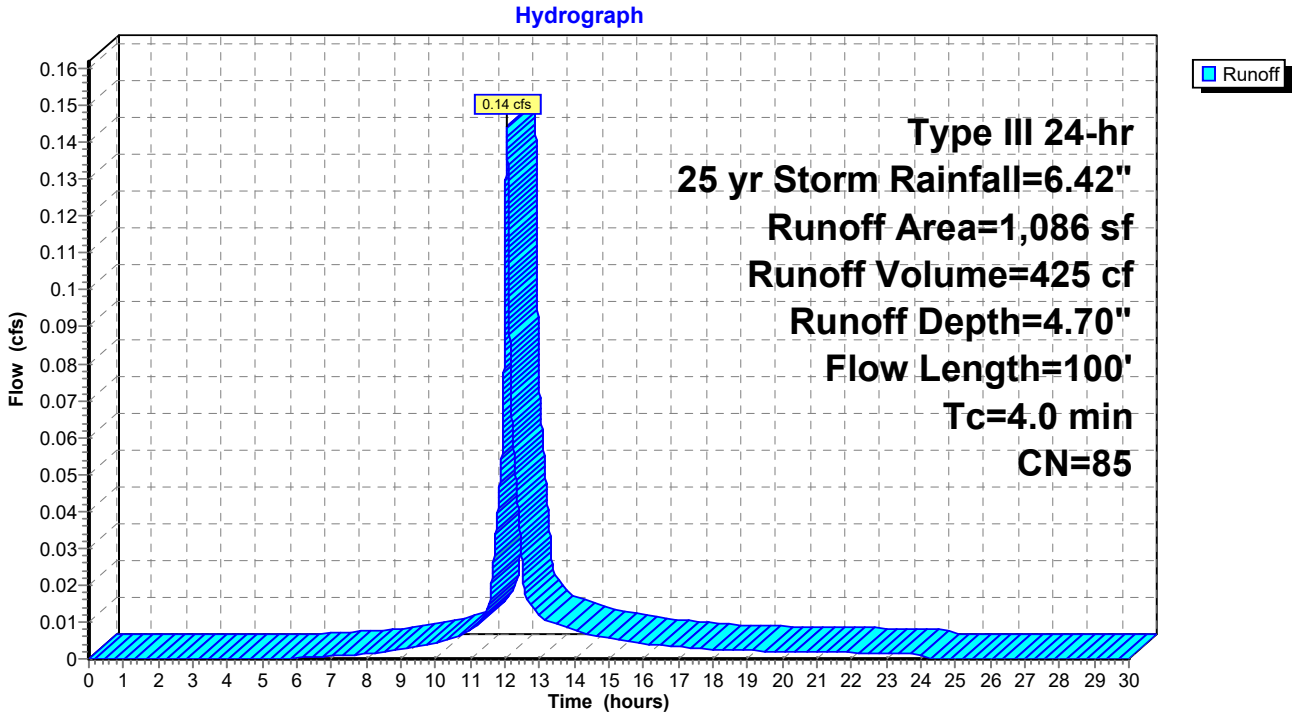
Runoff = 0.14 cfs @ 12.06 hrs, Volume= 425 cf, Depth= 4.70"
Routed to Pond 2P : Trench Swale (right)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 25 yr Storm Rainfall=6.42"

Area (sf)	CN	Description
1,086	85	Gravel roads, HSG B
1,086		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	100		0.42		**Direct Entry,**

Subcatchment S8: Gravel Drive Middle



Summary for Subcatchment S9: Gravel Drive Lower

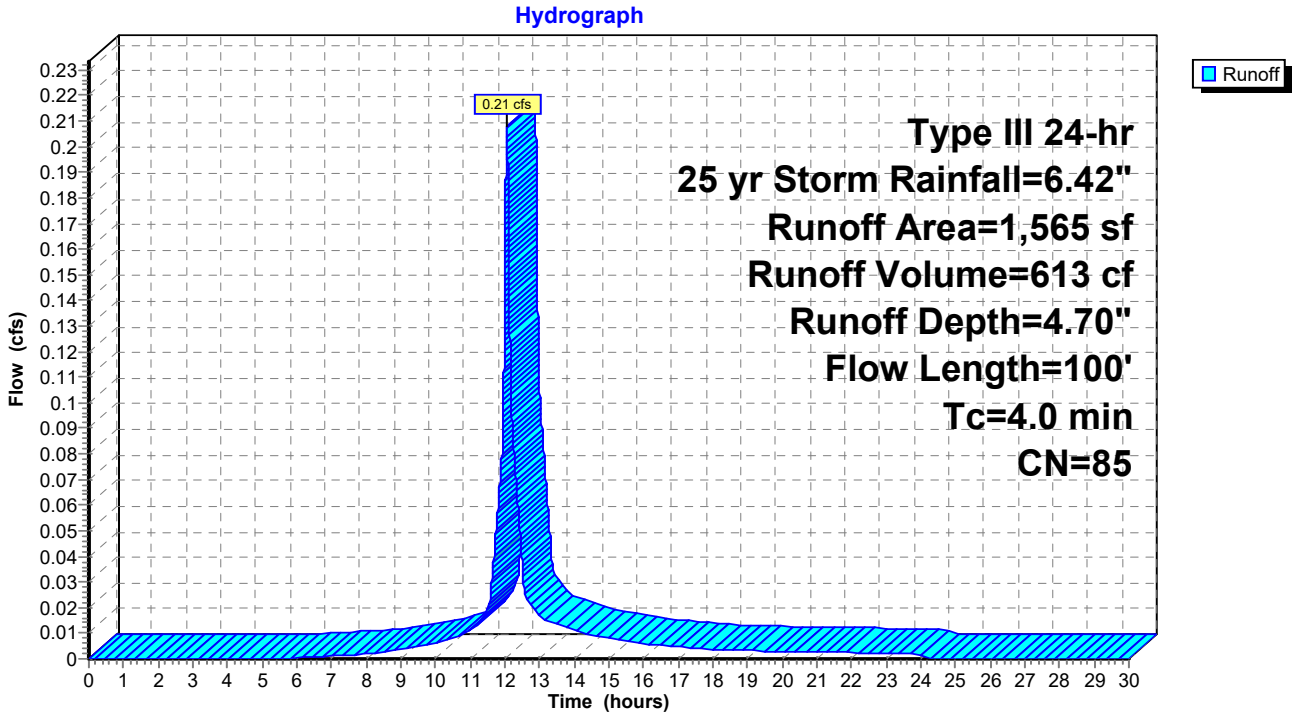
Runoff = 0.21 cfs @ 12.06 hrs, Volume= 613 cf, Depth= 4.70"
Routed to Pond 1P : Bottom basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 25 yr Storm Rainfall=6.42"

Area (sf)	CN	Description
1,565	85	Gravel roads, HSG B
1,565		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	100		0.42		**Direct Entry,**

Subcatchment S9: Gravel Drive Lower



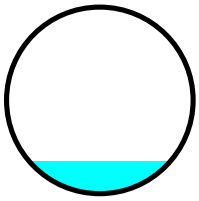
Summary for Reach CD: Combined Drain

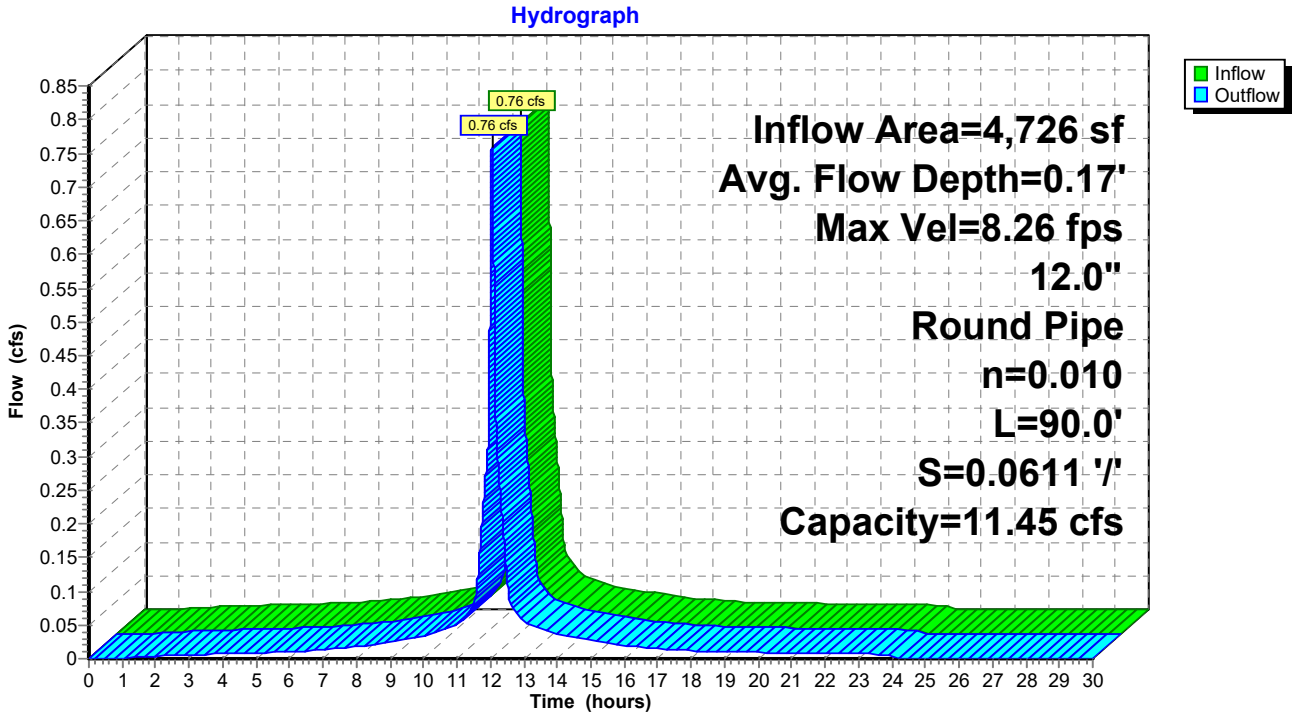
Inflow Area = 4,726 sf,100.00% Impervious, Inflow Depth = 6.18" for 25 yr Storm event
Inflow = 0.76 cfs @ 12.05 hrs, Volume= 2,434 cf
Outflow = 0.76 cfs @ 12.05 hrs, Volume= 2,434 cf, Atten= 0%, Lag= 0.1 min
Routed to Pond BR : Bioretention area

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 8.26 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.64 fps, Avg. Travel Time= 0.6 min

Peak Storage= 8 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.17' , Surface Width= 0.76'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 11.45 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 90.0' Slope= 0.0611 '/'
Inlet Invert= 298.00', Outlet Invert= 292.50'





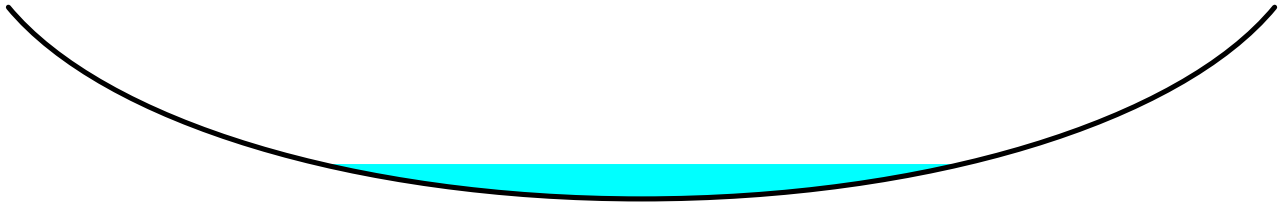
Summary for Reach OF: Overland Flow

Inflow Area = 2,143 sf, 0.00% Impervious, Inflow Depth = 4.02" for 25 yr Storm event
Inflow = 0.28 cfs @ 12.06 hrs, Volume= 719 cf
Outflow = 0.17 cfs @ 12.14 hrs, Volume= 719 cf, Atten= 39%, Lag= 5.1 min
Routed to Link DP1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 0.17 fps, Min. Travel Time= 14.1 min
Avg. Velocity = 0.05 fps, Avg. Travel Time= 45.4 min

Peak Storage= 146 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 854.88'
Bank-Full Depth= 0.01' Flow Area= 13.3 sf, Capacity= 6.85 cfs

2,000.00' x 0.01' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 140.0' Slope= 0.0857 '/'
Inlet Invert= 283.00', Outlet Invert= 271.00'



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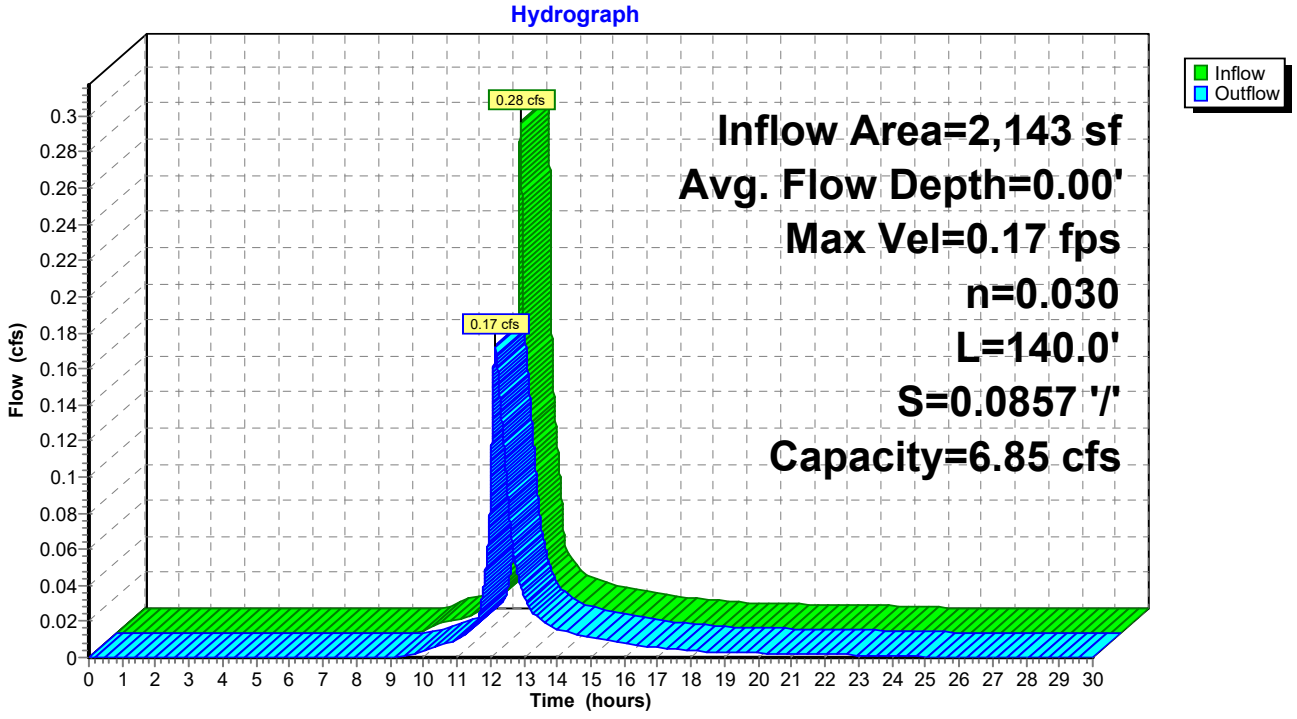
Reach OF: Overland Flow



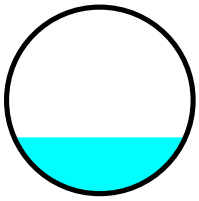
Summary for Reach PD: Pool drains

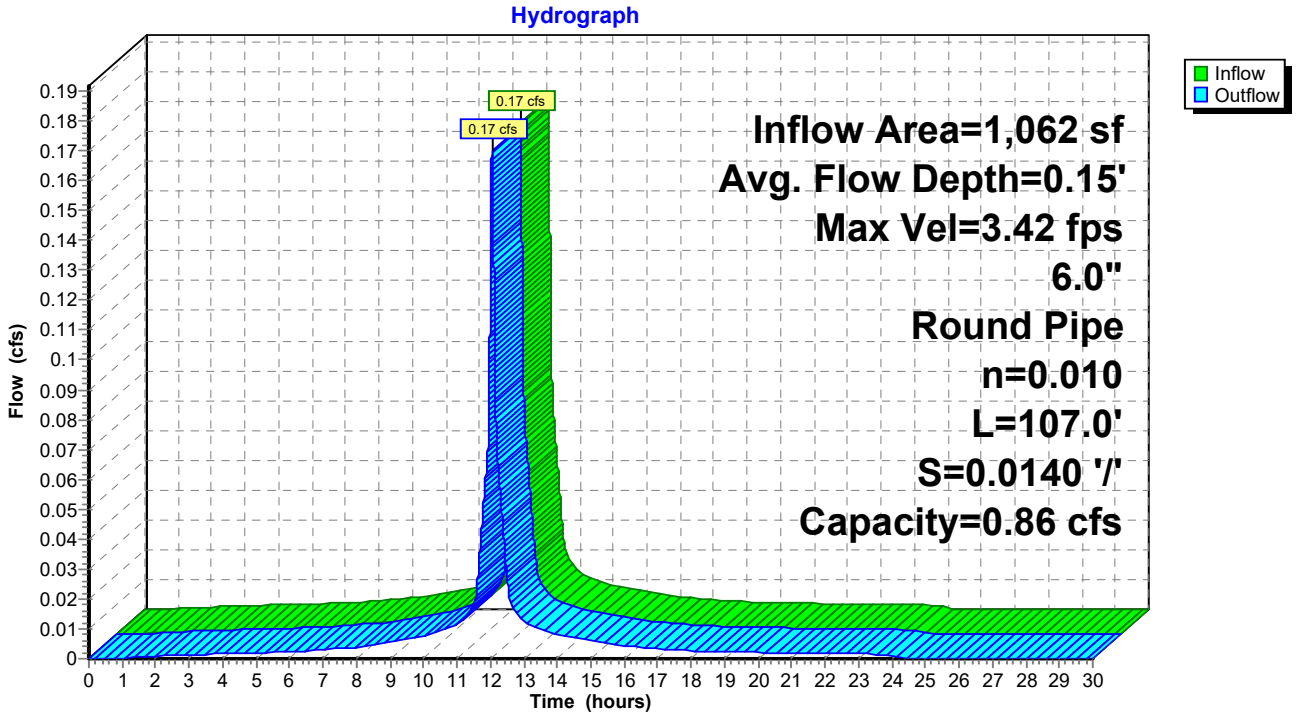
Inflow Area = 1,062 sf,100.00% Impervious, Inflow Depth = 6.18" for 25 yr Storm event
Inflow = 0.17 cfs @ 12.04 hrs, Volume= 547 cf
Outflow = 0.17 cfs @ 12.05 hrs, Volume= 547 cf, Atten= 1%, Lag= 0.3 min
Routed to Reach CD : Combined Drain

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 3.42 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 1.6 min

Peak Storage= 5 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.15' , Surface Width= 0.46'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.86 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 107.0' Slope= 0.0140 '/'
Inlet Invert= 299.50', Outlet Invert= 298.00'





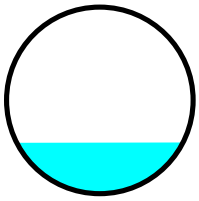
Summary for Reach RD: Roof/driveway drains

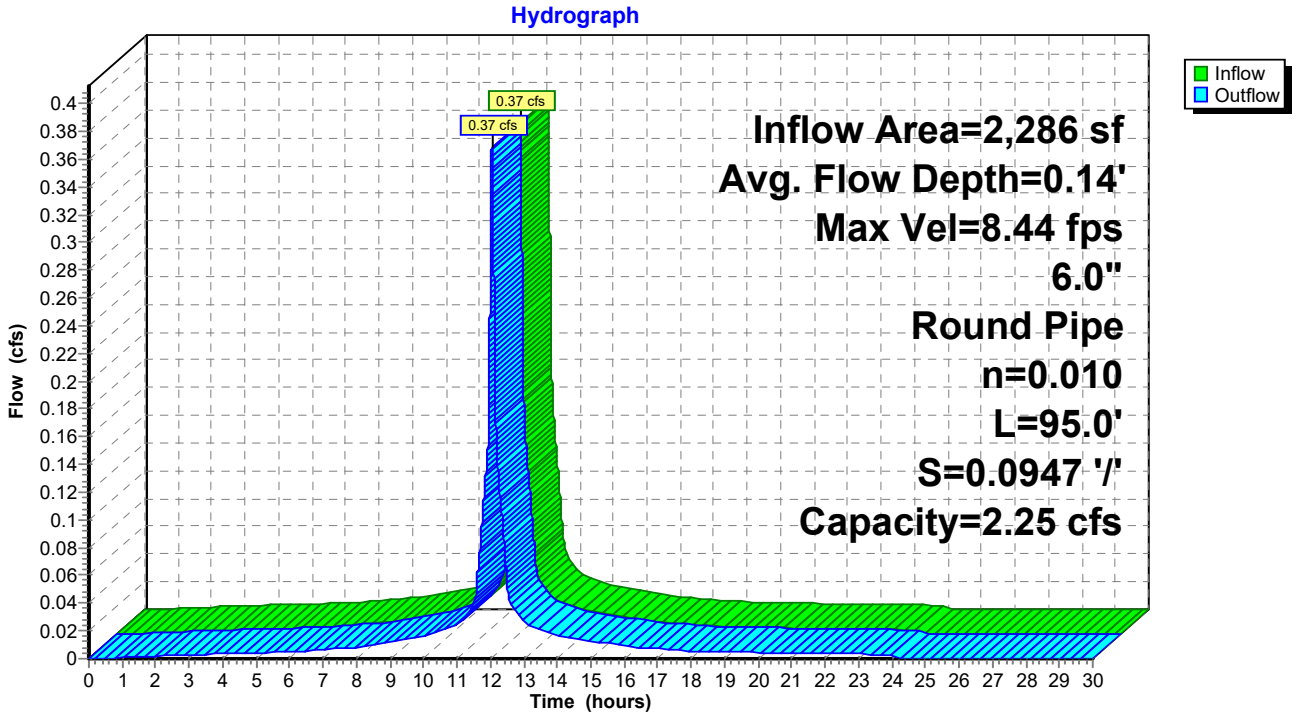
Inflow Area = 2,286 sf,100.00% Impervious, Inflow Depth = 6.18" for 25 yr Storm event
Inflow = 0.37 cfs @ 12.04 hrs, Volume= 1,178 cf
Outflow = 0.37 cfs @ 12.04 hrs, Volume= 1,178 cf, Atten= 0%, Lag= 0.1 min
Routed to Reach CD : Combined Drain

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 8.44 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.71 fps, Avg. Travel Time= 0.6 min

Peak Storage= 4 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 0.45'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 2.25 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 95.0' Slope= 0.0947 '/'
Inlet Invert= 307.00', Outlet Invert= 298.00'





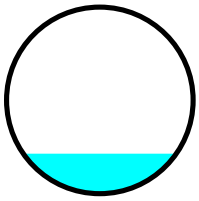
Summary for Reach RD2: Roof Drains 2

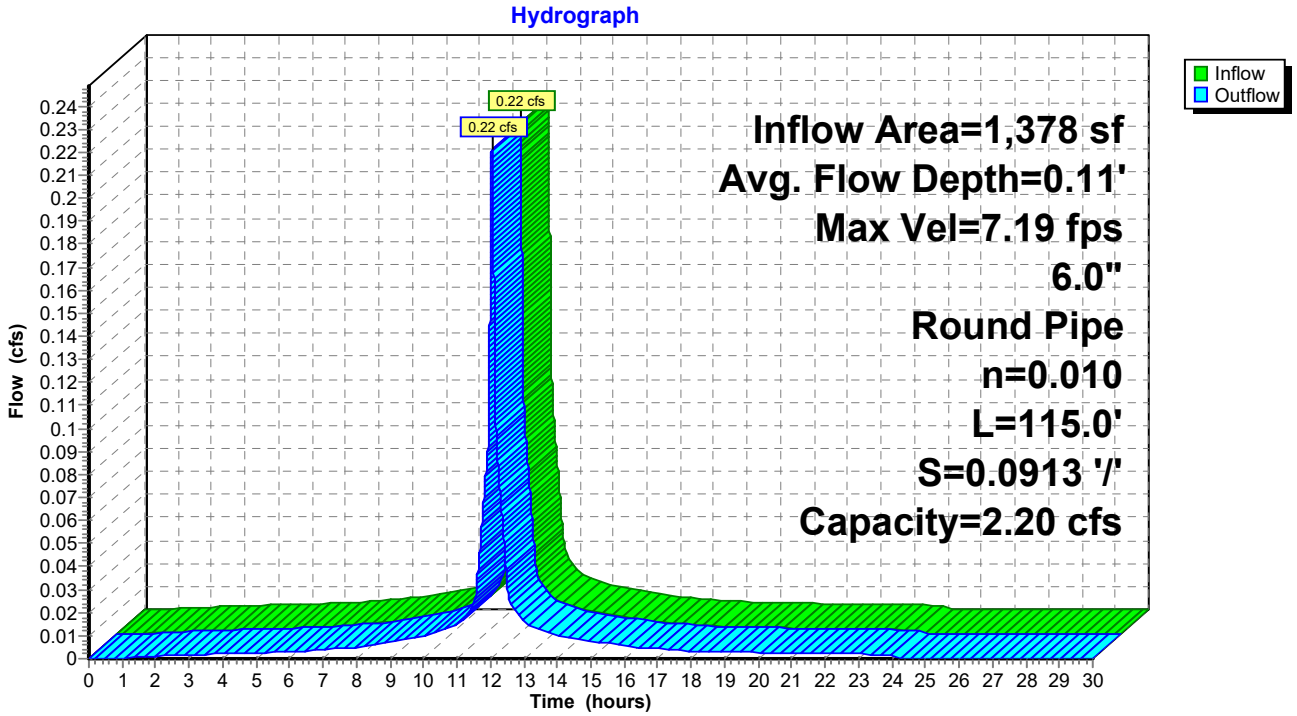
Inflow Area = 1,378 sf,100.00% Impervious, Inflow Depth = 6.18" for 25 yr Storm event
Inflow = 0.22 cfs @ 12.04 hrs, Volume= 710 cf
Outflow = 0.22 cfs @ 12.05 hrs, Volume= 710 cf, Atten= 0%, Lag= 0.1 min
Routed to Reach CD : Combined Drain

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 7.19 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.30 fps, Avg. Travel Time= 0.8 min

Peak Storage= 4 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.11' , Surface Width= 0.41'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 2.20 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 115.0' Slope= 0.0913 '/'
Inlet Invert= 308.50', Outlet Invert= 298.00'





Summary for Pond 1P: Bottom basin

Inflow Area = 1,565 sf, 0.00% Impervious, Inflow Depth = 4.70" for 25 yr Storm event
Inflow = 0.21 cfs @ 12.06 hrs, Volume= 613 cf
Outflow = 0.20 cfs @ 12.07 hrs, Volume= 613 cf, Atten= 2%, Lag= 0.9 min
Discarded = 0.01 cfs @ 12.07 hrs, Volume= 430 cf
Primary = 0.20 cfs @ 12.07 hrs, Volume= 183 cf
Routed to Link DP1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 271.02' @ 12.07 hrs Surf.Area= 196 sf Storage= 170 cf

Plug-Flow detention time= 187.6 min calculated for 613 cf (100% of inflow)
Center-of-Mass det. time= 187.6 min (983.9 - 796.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	269.00'	106 cf	**18.00'W x 10.50'L x 1.71'H Field A** 323 cf Overall - 57 cf Embedded = 266 cf x 40.0% Voids
#2A	269.50'	57 cf	**Cultec FD C-4** x 4 Inside #1 Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.67 sf x 4 rows
#3	270.00'	14 cf	**3.00'D x 2.00'H Vertical Cone/Cylinder**
		177 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	271.00'	**4.0" x 2.0" Horiz. Orifice/Grate X 2.00 columns** X 50 rows C= 0.600 in 12.0" x 144.0" Grate (46% open area) Limited to weir flow at low heads
#2	Discarded	269.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 12.07 hrs HW=271.02' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.17 cfs @ 12.07 hrs HW=271.02' (Free Discharge)
1=Orifice/Grate (Weir Controls 0.17 cfs @ 0.41 fps)

Pond 1P: Bottom basin - Chamber Wizard Field A

Chamber Model = Cultec FD C-4 (Cultec Contactor® Field Drain C-4)
Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf
Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap
Row Length Adjustment= +0.50' x 1.67 sf x 4 rows

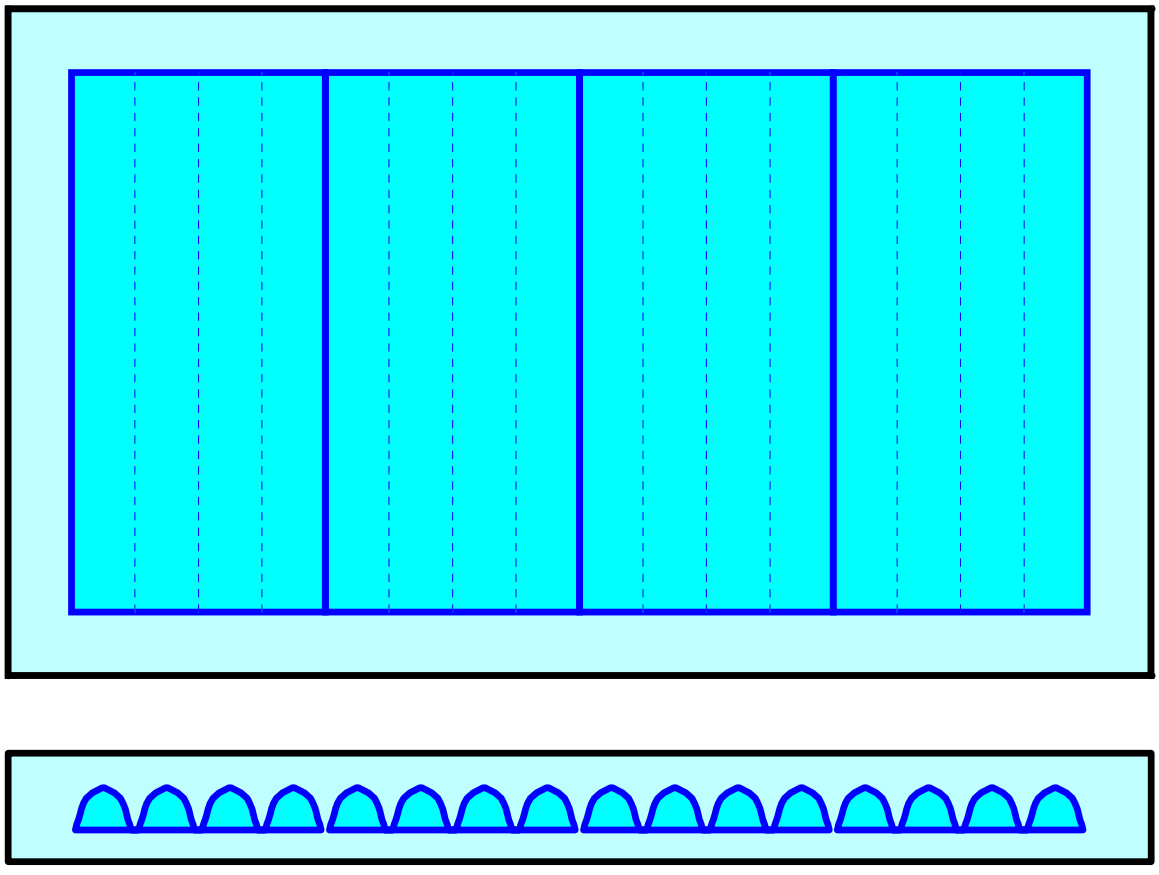
1 Chambers/Row x 8.00' Long +0.50' Row Adjustment = 8.50' Row Length +12.0" End Stone x 2 = 10.50' Base Length
4 Rows x 48.0" Wide + 12.0" Side Stone x 2 = 18.00' Base Width
6.0" Stone Base + 8.5" Chamber Height + 6.0" Stone Cover = 1.71' Field Height

4 Chambers x 13.3 cf +0.50' Row Adjustment x 1.67 sf x 4 Rows = 56.6 cf Chamber Storage

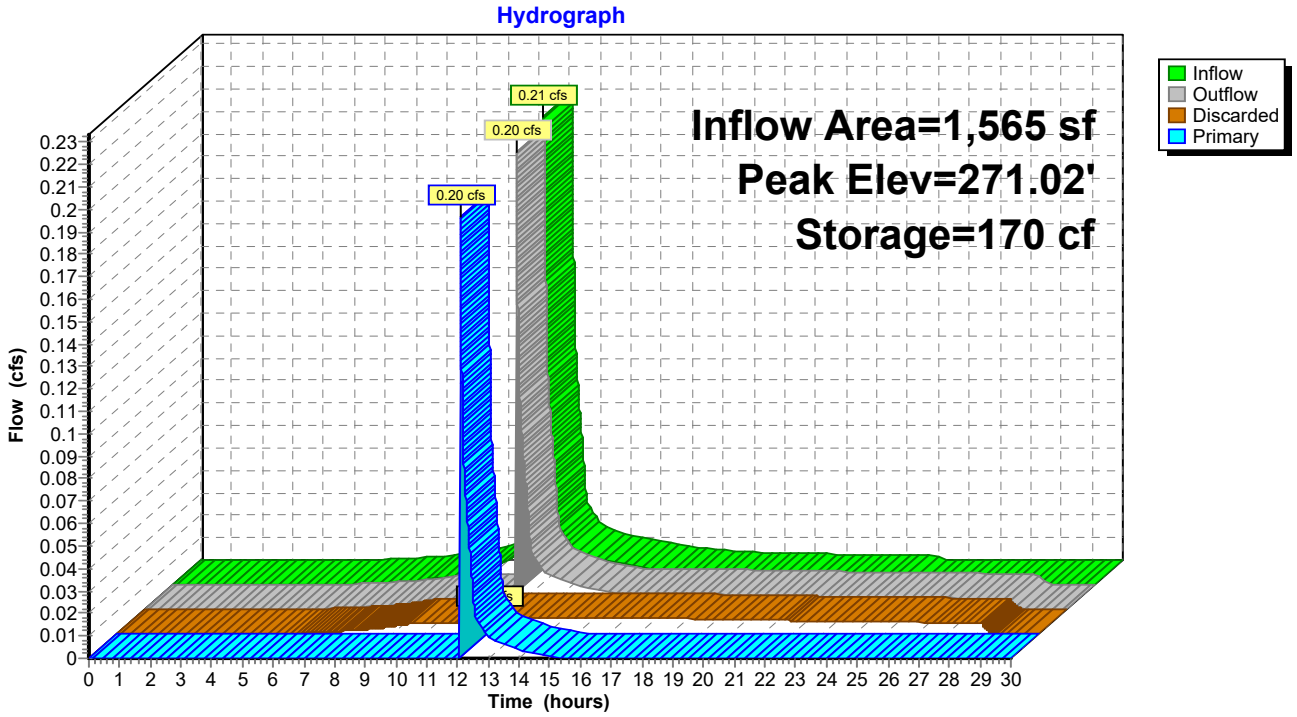
322.9 cf Field - 56.6 cf Chambers = 266.2 cf Stone x 40.0% Voids = 106.5 cf Stone Storage

Chamber Storage + Stone Storage = 163.1 cf = 0.004 af
Overall Storage Efficiency = 50.5%
Overall System Size = 10.50' x 18.00' x 1.71'

4 Chambers
12.0 cy Field
9.9 cy Stone



Pond 1P: Bottom basin



Summary for Pond 2P: Trench Swale (right)

Inflow Area = 1,086 sf, 0.00% Impervious, Inflow Depth = 4.70" for 25 yr Storm event
Inflow = 0.14 cfs @ 12.06 hrs, Volume= 425 cf
Outflow = 0.14 cfs @ 12.06 hrs, Volume= 425 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 12.06 hrs, Volume= 64 cf
Primary = 0.14 cfs @ 12.06 hrs, Volume= 361 cf
Routed to Reach OF : Overland Flow

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 284.01' @ 12.06 hrs Surf.Area= 38 sf Storage= 11 cf

Plug-Flow detention time= 26.6 min calculated for 425 cf (100% of inflow)
Center-of-Mass det. time= 25.9 min (822.3 - 796.3)

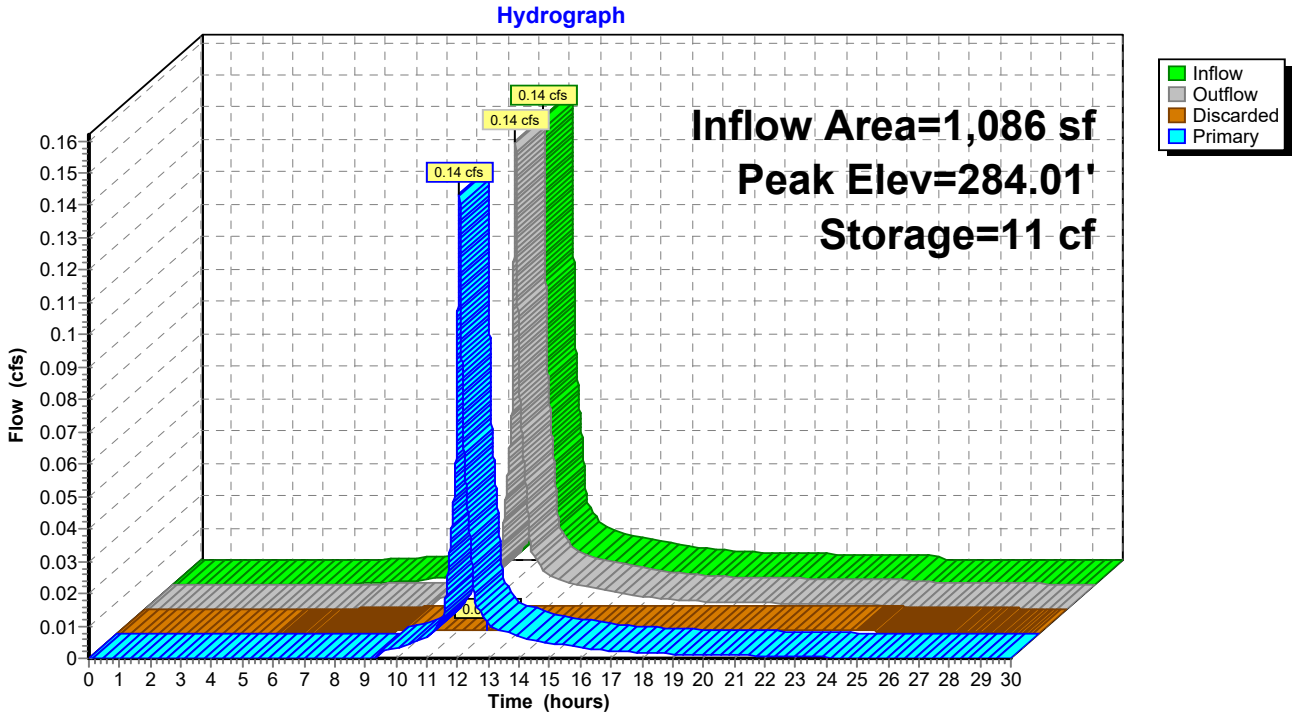
Volume	Invert	Avail.Storage	Storage Description
#1	283.00'	3,772 cf	**96.0" W x 60.0" H, R=55.0" Elliptical Pipe Storage** L= 185.0' S= 0.1050 '/' 5,388 cf Overall x 70.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	283.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	284.00'	**10.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.00 cfs @ 12.06 hrs HW=284.01' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.03 cfs @ 12.06 hrs HW=284.01' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.03 cfs @ 0.28 fps)

Pond 2P: Trench Swale (right)



Summary for Pond 22P: Trench Swale (left)

Inflow Area = 1,057 sf, 0.00% Impervious, Inflow Depth = 4.70" for 25 yr Storm event
Inflow = 0.14 cfs @ 12.06 hrs, Volume= 414 cf
Outflow = 0.14 cfs @ 12.06 hrs, Volume= 414 cf, Atten= 0%, Lag= 0.1 min
Discarded = 0.00 cfs @ 12.06 hrs, Volume= 56 cf
Primary = 0.14 cfs @ 12.06 hrs, Volume= 358 cf
Routed to Reach OF : Overland Flow

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 287.03' @ 12.06 hrs Surf.Area= 33 sf Storage= 9 cf

Plug-Flow detention time= 23.3 min calculated for 414 cf (100% of inflow)
Center-of-Mass det. time= 22.8 min (819.1 - 796.3)

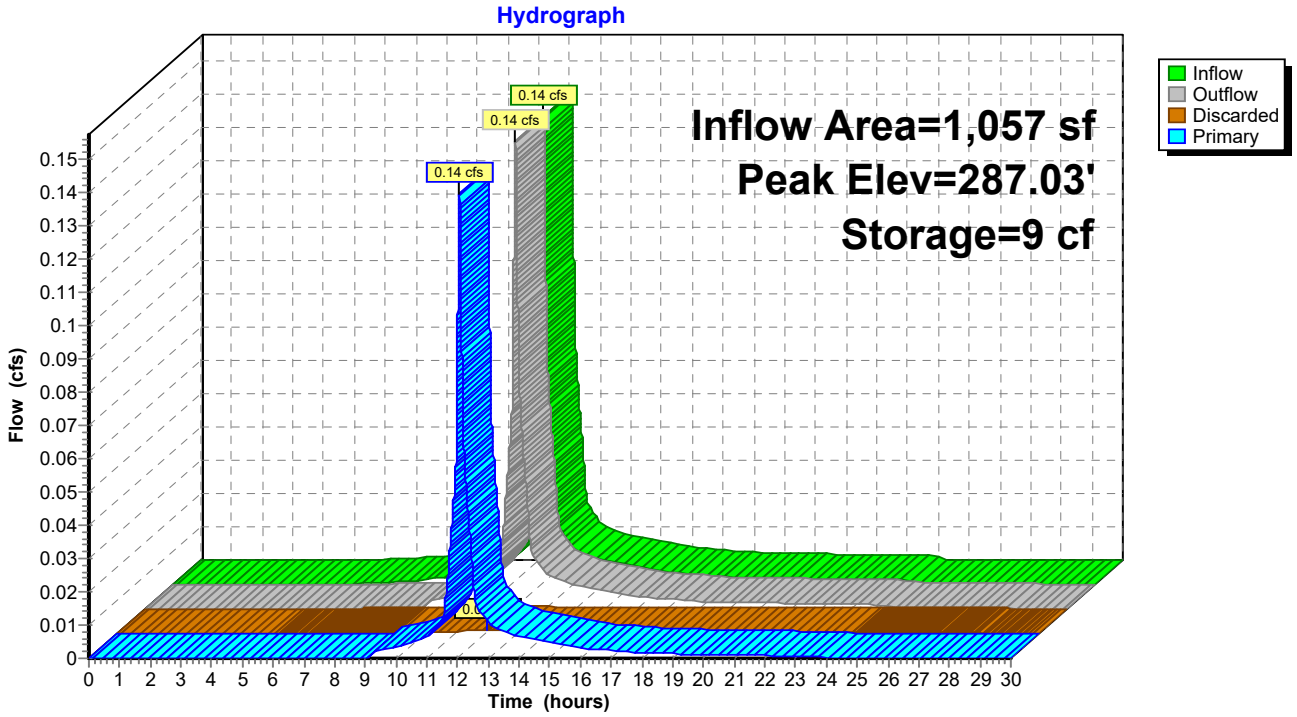
Volume	Invert	Avail.Storage	Storage Description
#1	286.00'	2,458 cf	**72.0" W x 60.0" H, R=40.0" Elliptical Pipe Storage** L= 150.0' S= 0.1050 '/' 3,511 cf Overall x 70.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	286.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	287.00'	**10.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.00 cfs @ 12.06 hrs HW=287.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.12 cfs @ 12.06 hrs HW=287.03' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.12 cfs @ 0.44 fps)

Pond 22P: Trench Swale (left)



Summary for Pond BR: Bioretention area

Inflow Area = 4,726 sf,100.00% Impervious, Inflow Depth = 6.18" for 25 yr Storm event
Inflow = 0.76 cfs @ 12.05 hrs, Volume= 2,434 cf
Outflow = 0.06 cfs @ 12.95 hrs, Volume= 2,434 cf, Atten= 92%, Lag= 53.9 min
Discarded = 0.04 cfs @ 12.95 hrs, Volume= 2,299 cf
Primary = 0.02 cfs @ 12.95 hrs, Volume= 135 cf
Routed to Link DP2 : Design Point 2

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 292.59' @ 12.95 hrs Surf.Area= 1,374 sf Storage= 1,116 cf

Plug-Flow detention time= 250.9 min calculated for 2,434 cf (100% of inflow)
Center-of-Mass det. time= 250.9 min (993.3 - 742.4)

Volume	Invert	Avail.Storage	Storage Description
#1	289.00'	1,685 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

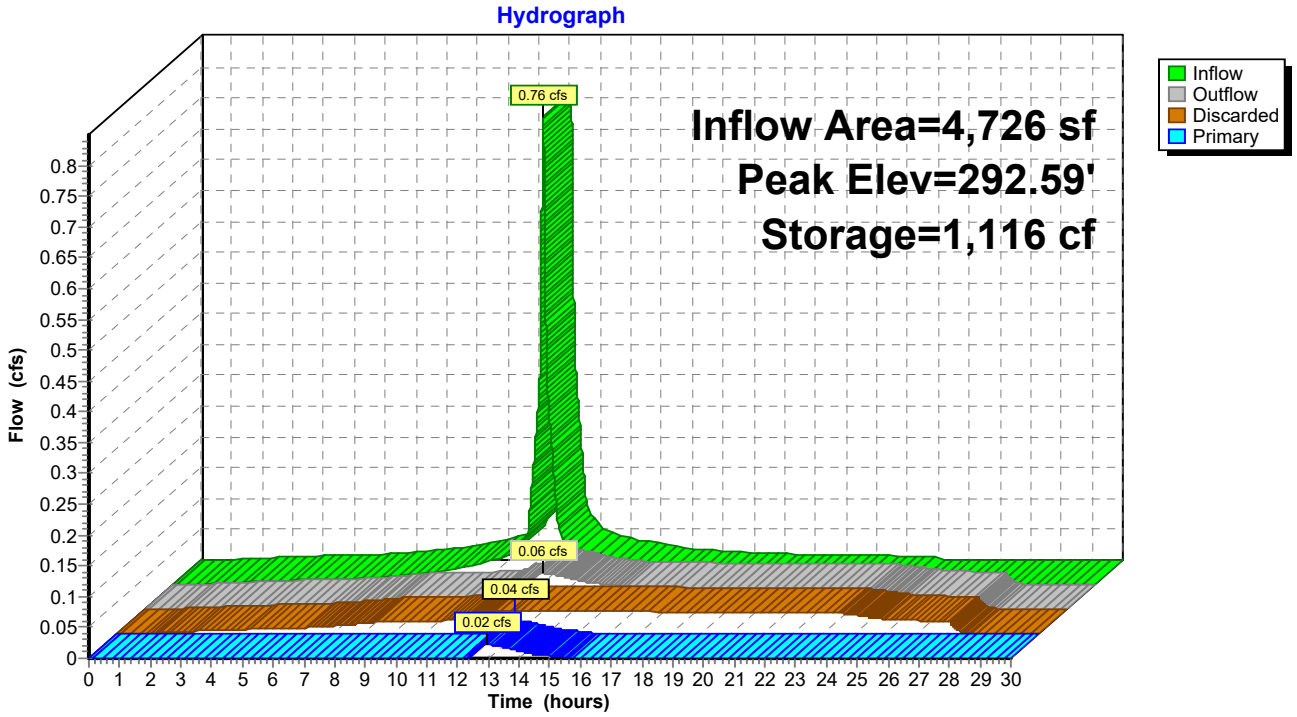
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
289.00	800	0.0	0	0	800
289.50	1,000	40.0	180	180	1,007
292.00	1,300	5.0	143	323	1,431
293.00	1,425	100.0	1,362	1,685	1,612

Device	Routing	Invert	Outlet Devices
#1	Discarded	289.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	292.50'	**12.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 292.50' / 289.00' S= 0.2333 '/' Cc= 0.500 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.04 cfs @ 12.95 hrs HW=292.59' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.02 cfs @ 12.95 hrs HW=292.59' (Free Discharge)
↑**2=Culvert** (Inlet Controls 0.02 cfs @ 0.58 fps)

Pond BR: Bioretention area

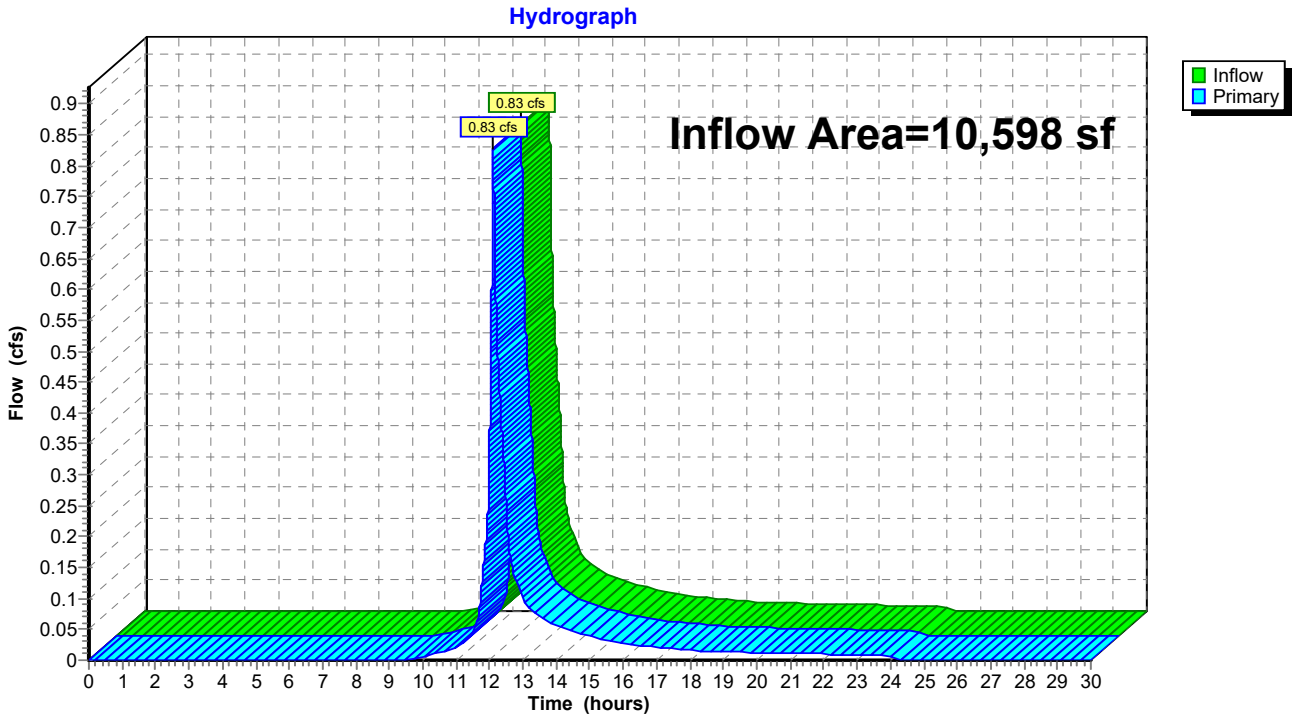


Summary for Link DP1: Design Point 1

Inflow Area = 10,598 sf, 0.00% Impervious, Inflow Depth = 2.75" for 25 yr Storm event
Inflow = 0.83 cfs @ 12.08 hrs, Volume= 2,430 cf
Primary = 0.83 cfs @ 12.08 hrs, Volume= 2,430 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs

Link DP1: Design Point 1

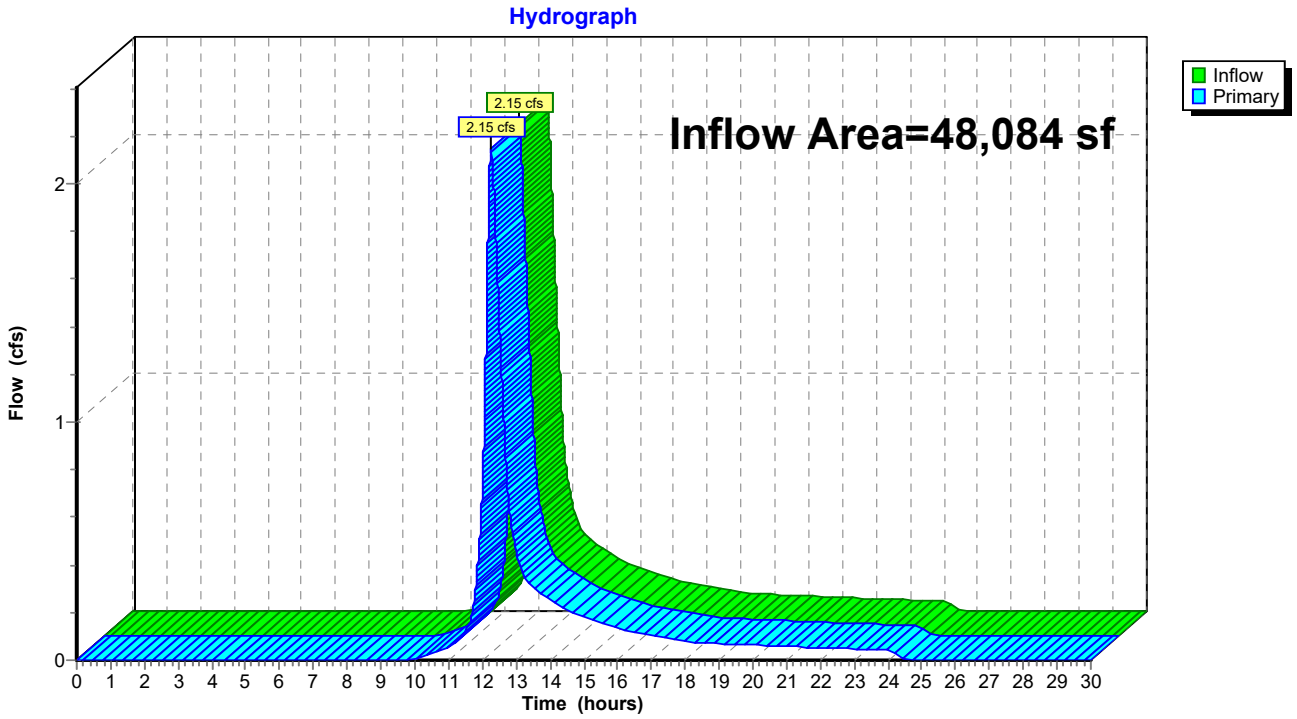


Summary for Link DP2: Design Point 2

Inflow Area = 48,084 sf, 10.71% Impervious, Inflow Depth = 2.43" for 25 yr Storm event
Inflow = 2.15 cfs @ 12.26 hrs, Volume= 9,750 cf
Primary = 2.15 cfs @ 12.26 hrs, Volume= 9,750 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs

Link DP2: Design Point 2



Summary for Subcatchment S1: Vegetated area/porch and deck

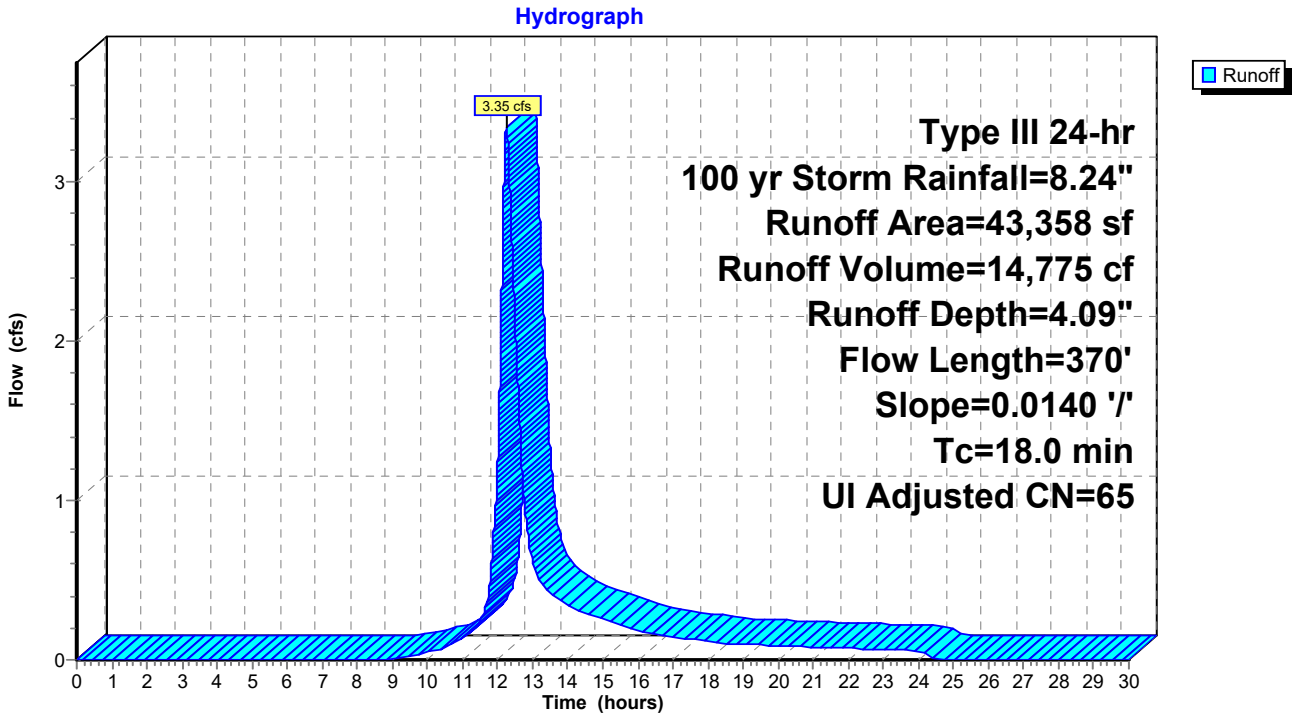
Runoff = 3.35 cfs @ 12.26 hrs, Volume= 14,775 cf, Depth= 4.09"
Routed to Link DP2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 100 yr Storm Rainfall=8.24"

Area (sf)	CN	Adj	Description
42,292	65		Woods/grass comb., Fair, HSG B
424	98		Unconnected pavement, HSG B
642	85		Gravel roads, HSG B
43,358	66	65	Weighted Average, UI Adjusted
42,934			99.02% Pervious Area
424			0.98% Impervious Area
424			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	370	0.0140	0.34		**Lag/CN Method,**

Subcatchment S1: Vegetated area/porch and deck



Summary for Subcatchment S2: Driveway segment 1

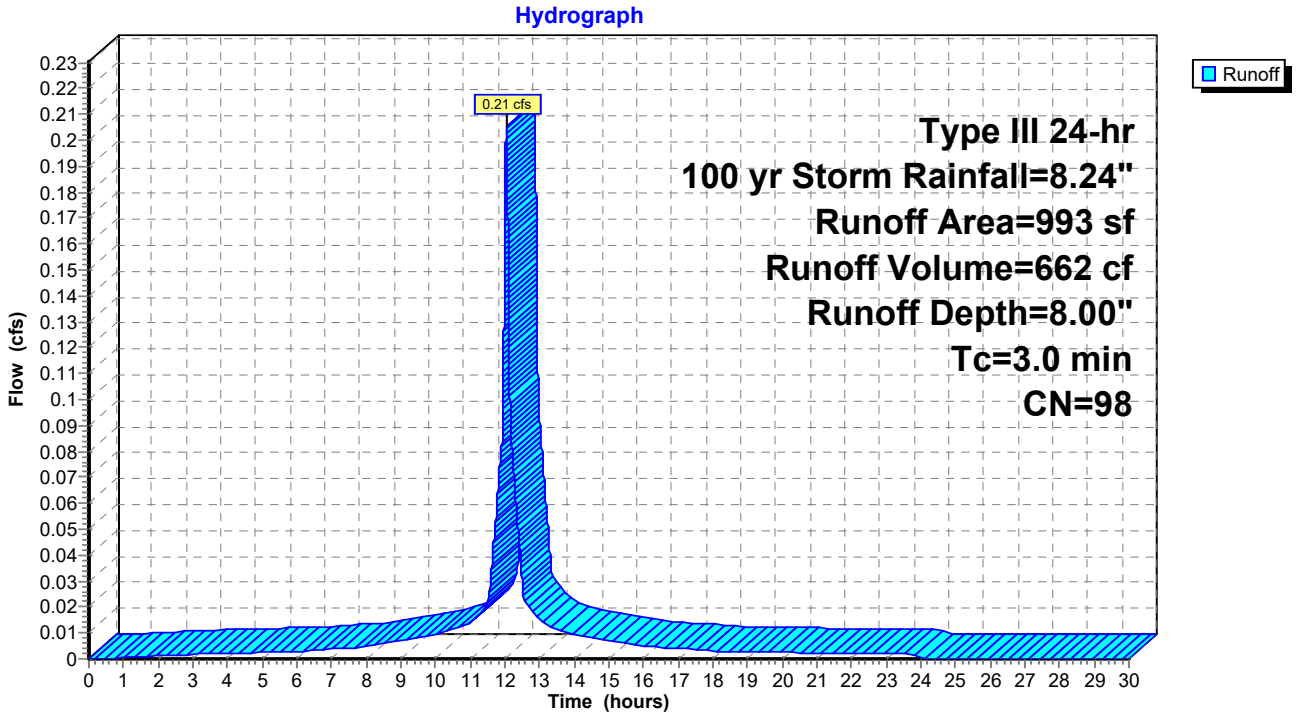
Runoff = 0.21 cfs @ 12.04 hrs, Volume= 662 cf, Depth= 8.00"
Routed to Reach RD : Roof/driveway drains

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 100 yr Storm Rainfall=8.24"

Area (sf)	CN	Description
993	98	Paved parking, HSG B
993		100.00% Impervious Area

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

Subcatchment S2: Driveway segment 1



Summary for Subcatchment S3: House

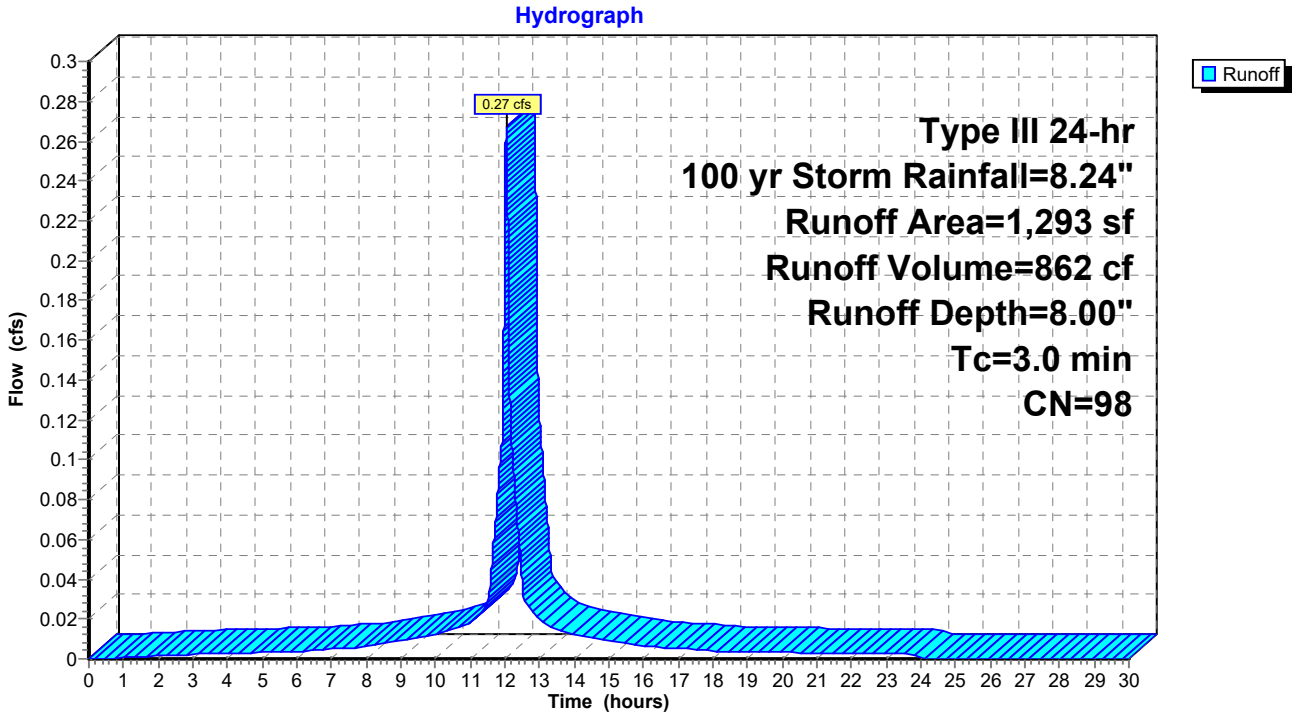
Runoff = 0.27 cfs @ 12.04 hrs, Volume= 862 cf, Depth= 8.00"
Routed to Reach RD : Roof/driveway drains

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 100 yr Storm Rainfall=8.24"

Area (sf)	CN	Description
1,293	98	Roofs, HSG B
1,293		100.00% Impervious Area

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

Subcatchment S3: House



Summary for Subcatchment S4: House 2

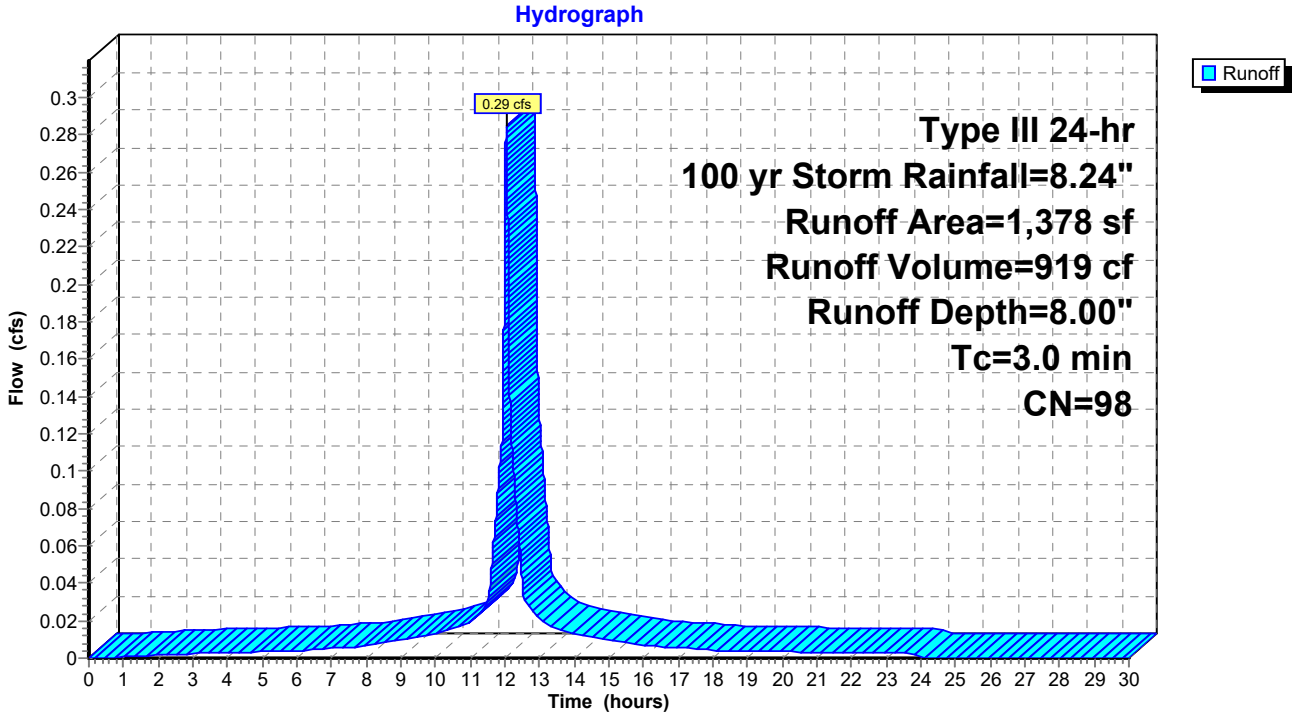
Runoff = 0.29 cfs @ 12.04 hrs, Volume= 919 cf, Depth= 8.00"
Routed to Reach RD2 : Roof Drains 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 100 yr Storm Rainfall=8.24"

Area (sf)	CN	Description
1,378	98	Unconnected roofs, HSG B
1,378		100.00% Impervious Area
1,378		100.00% Unconnected

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

Subcatchment S4: House 2



Summary for Subcatchment S5: New swimming pool

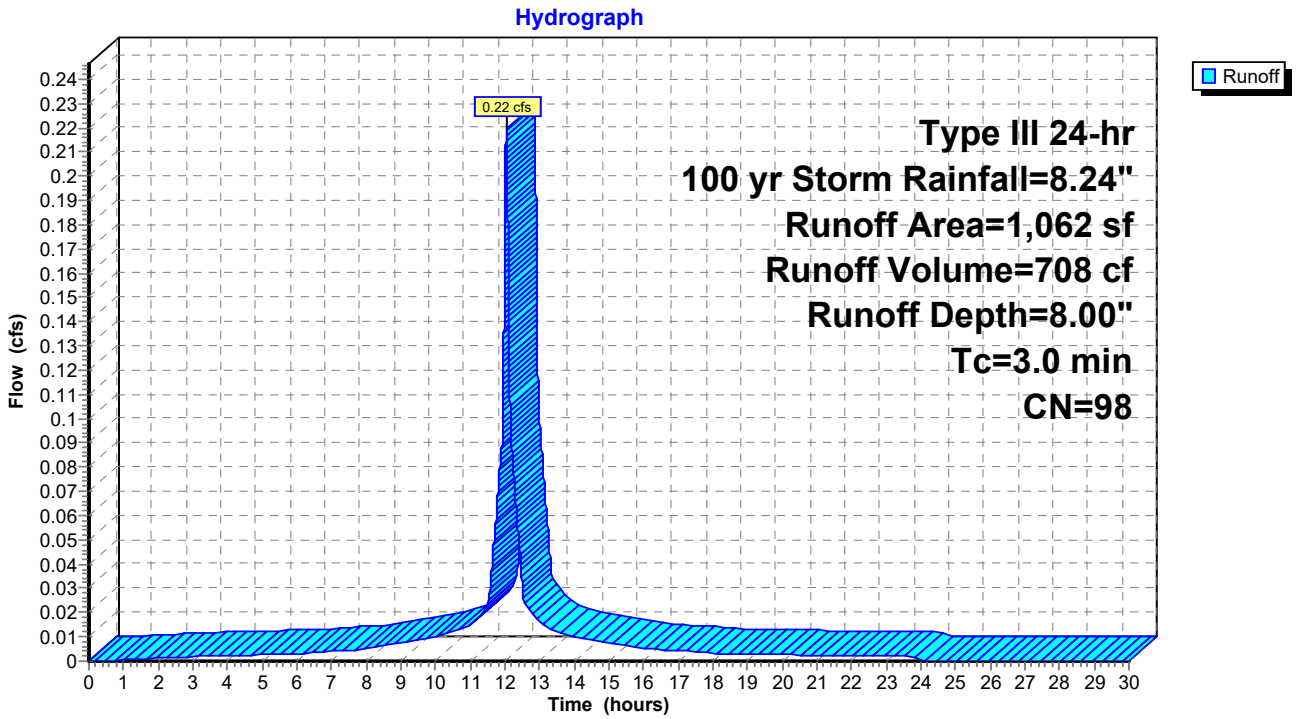
Runoff = 0.22 cfs @ 12.04 hrs, Volume= 708 cf, Depth= 8.00"
Routed to Reach PD : Pool drains

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 100 yr Storm Rainfall=8.24"

Area (sf)	CN	Description
1,062	98	Unconnected pavement, HSG B
1,062		100.00% Impervious Area
1,062		100.00% Unconnected

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

Subcatchment S5: New swimming pool



Summary for Subcatchment S6: Easement - vegetated

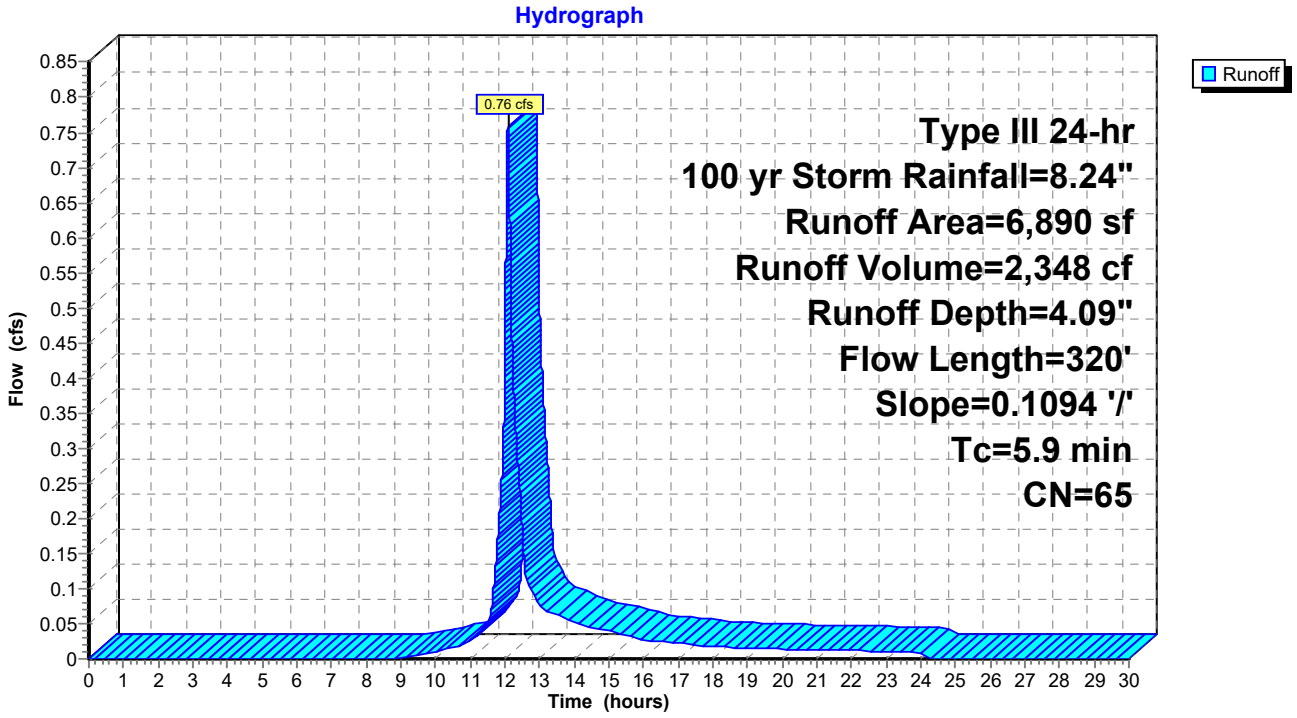
Runoff = 0.76 cfs @ 12.09 hrs, Volume= 2,348 cf, Depth= 4.09"
Routed to Link DP1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 100 yr Storm Rainfall=8.24"

Area (sf)	CN	Description
6,890	65	Woods/grass comb., Fair, HSG B
6,890		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	320	0.1094	0.91		**Lag/CN Method,**

Subcatchment S6: Easement - vegetated



Summary for Subcatchment S7: Gravel Drive Top

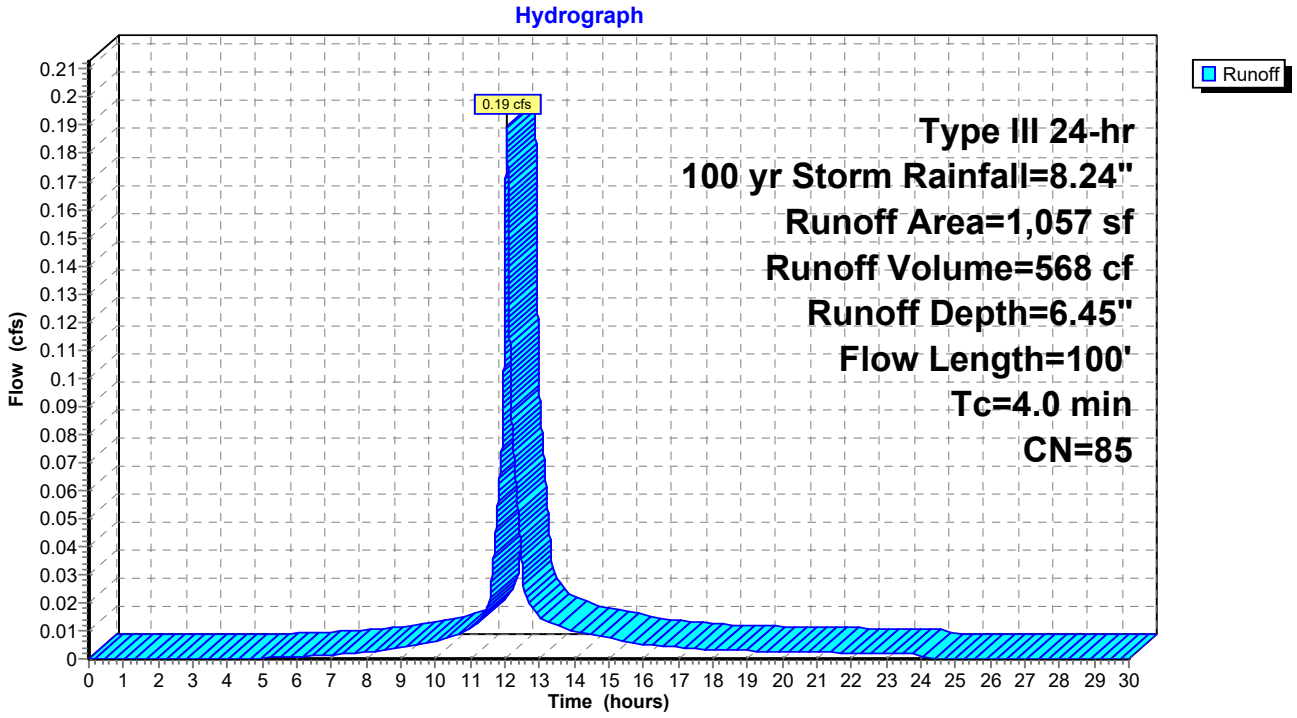
Runoff = 0.19 cfs @ 12.06 hrs, Volume= 568 cf, Depth= 6.45"
Routed to Pond 22P : Trench Swale (left)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 100 yr Storm Rainfall=8.24"

Area (sf)	CN	Description
1,057	85	Gravel roads, HSG B
1,057		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	100		0.42		**Direct Entry,**

Subcatchment S7: Gravel Drive Top



Summary for Subcatchment S8: Gravel Drive Middle

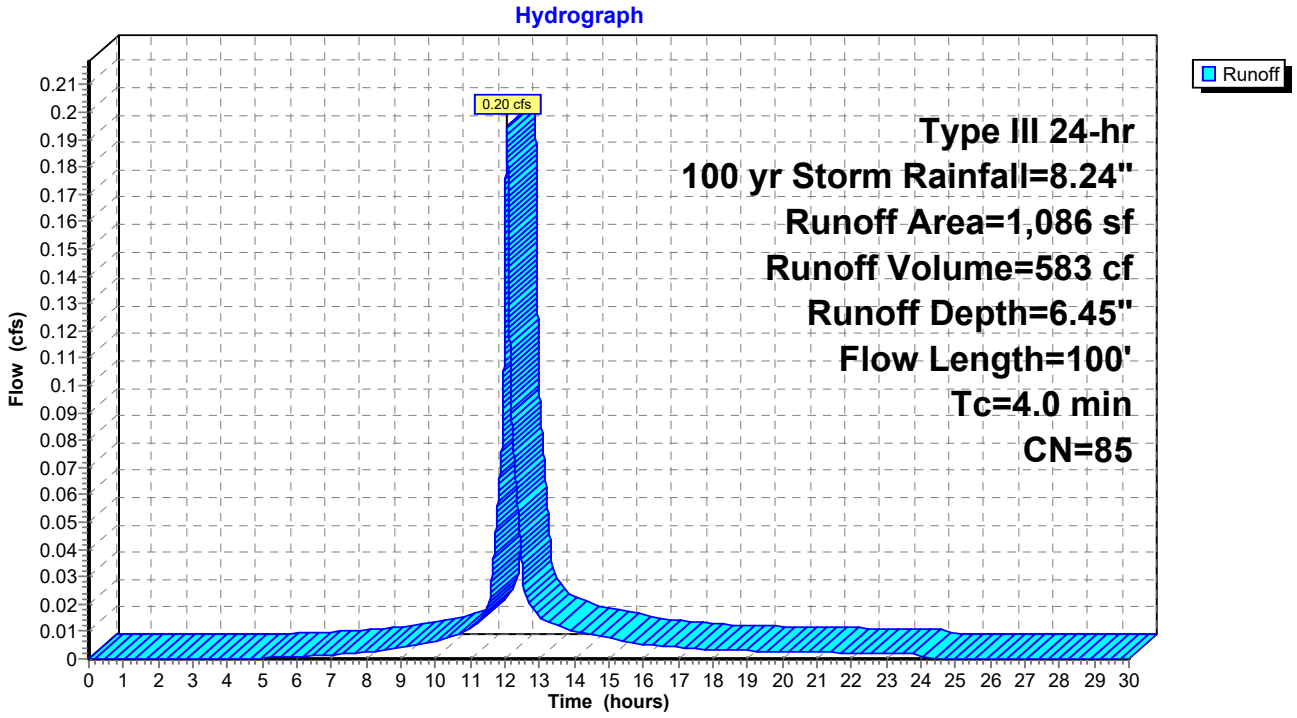
Runoff = 0.20 cfs @ 12.06 hrs, Volume= 583 cf, Depth= 6.45"
Routed to Pond 2P : Trench Swale (right)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 100 yr Storm Rainfall=8.24"

Area (sf)	CN	Description
1,086	85	Gravel roads, HSG B
1,086		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	100		0.42		**Direct Entry,**

Subcatchment S8: Gravel Drive Middle



Summary for Subcatchment S9: Gravel Drive Lower

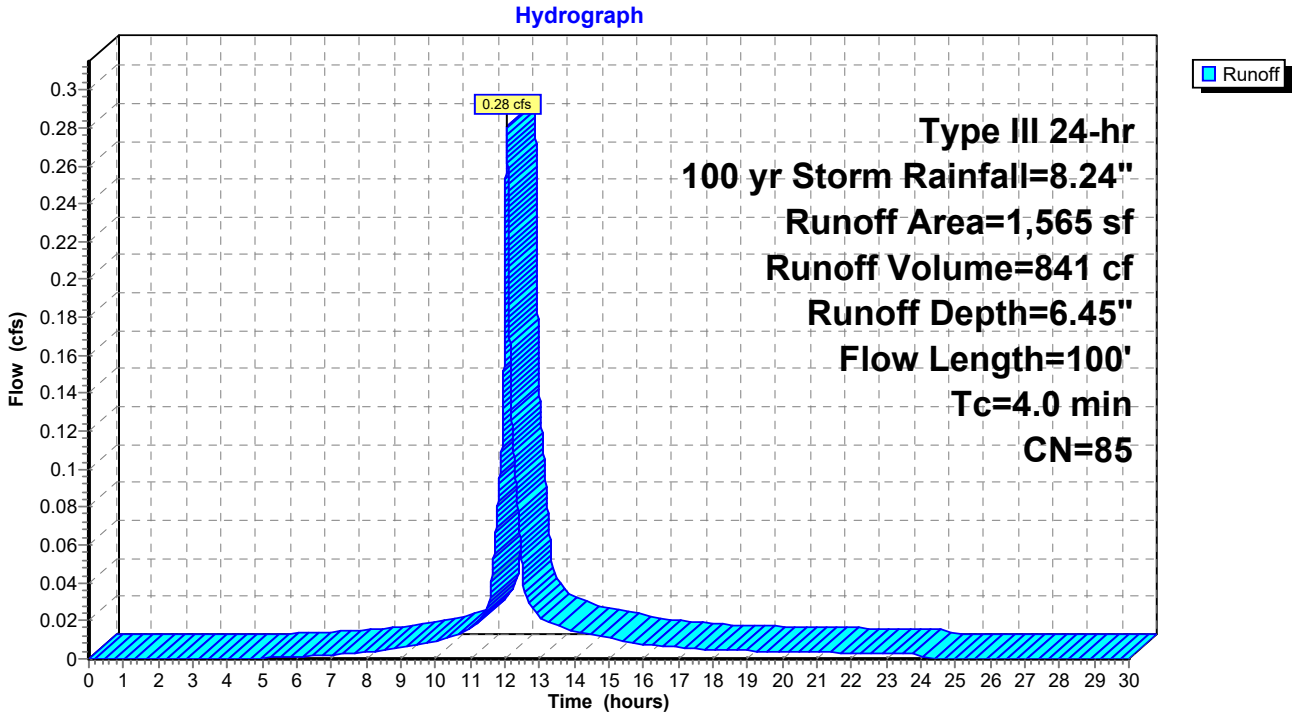
Runoff = 0.28 cfs @ 12.06 hrs, Volume= 841 cf, Depth= 6.45"
Routed to Pond 1P : Bottom basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Type III 24-hr 100 yr Storm Rainfall=8.24"

Area (sf)	CN	Description
1,565	85	Gravel roads, HSG B
1,565		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	100		0.42		**Direct Entry,**

Subcatchment S9: Gravel Drive Lower



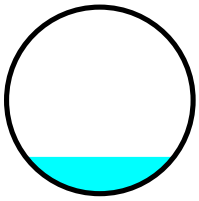
Summary for Reach CD: Combined Drain

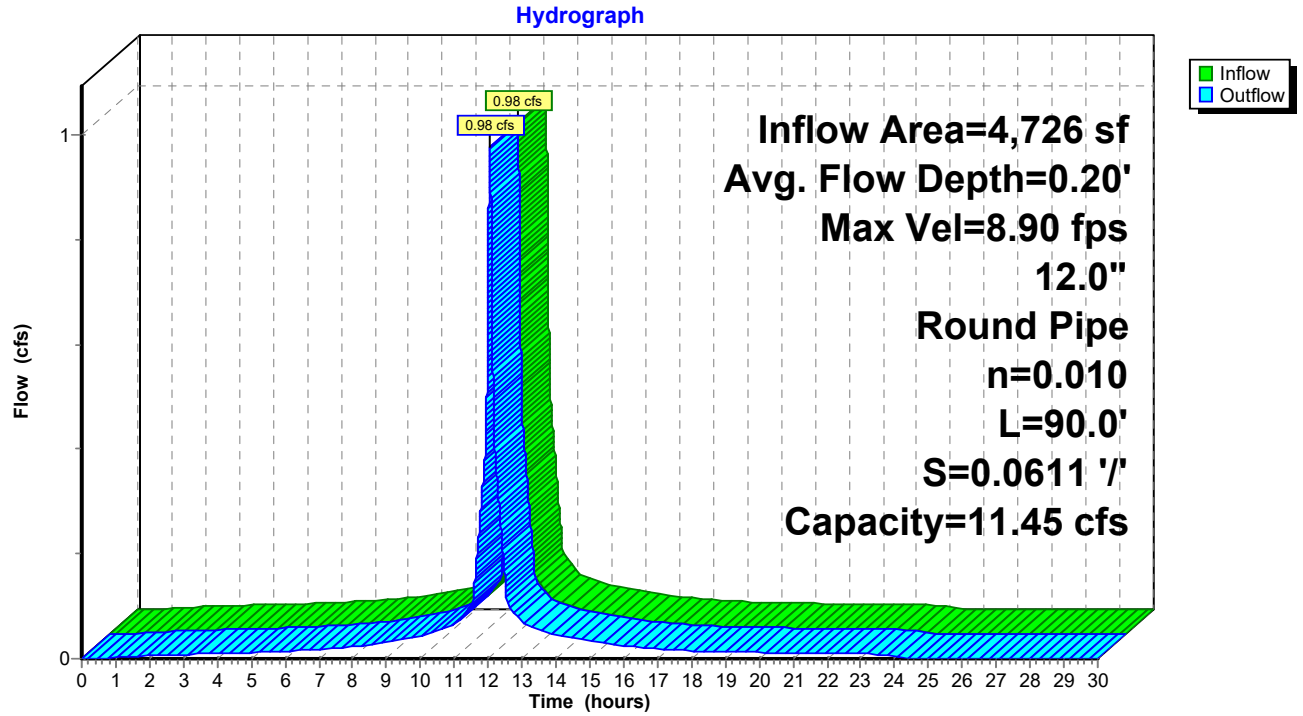
Inflow Area = 4,726 sf,100.00% Impervious, Inflow Depth = 8.00" for 100 yr Storm event
Inflow = 0.98 cfs @ 12.05 hrs, Volume= 3,151 cf
Outflow = 0.98 cfs @ 12.05 hrs, Volume= 3,151 cf, Atten= 0%, Lag= 0.1 min
Routed to Pond BR : Bioretention area

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 8.90 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.85 fps, Avg. Travel Time= 0.5 min

Peak Storage= 10 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 0.80'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 11.45 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 90.0' Slope= 0.0611 '/'
Inlet Invert= 298.00', Outlet Invert= 292.50'





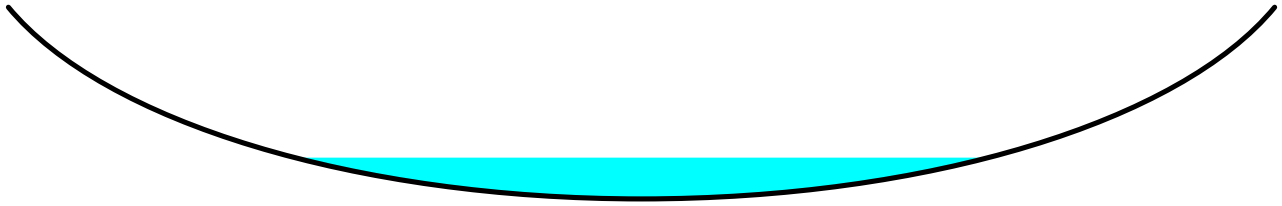
Summary for Reach OF: Overland Flow

Inflow Area = 2,143 sf, 0.00% Impervious, Inflow Depth = 5.73" for 100 yr Storm event
Inflow = 0.38 cfs @ 12.06 hrs, Volume= 1,024 cf
Outflow = 0.24 cfs @ 12.14 hrs, Volume= 1,024 cf, Atten= 36%, Lag= 4.7 min
Routed to Link DP1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 0.18 fps, Min. Travel Time= 12.7 min
Avg. Velocity = 0.06 fps, Avg. Travel Time= 41.1 min

Peak Storage= 186 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 927.13'
Bank-Full Depth= 0.01' Flow Area= 13.3 sf, Capacity= 6.85 cfs

2,000.00' x 0.01' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 140.0' Slope= 0.0857 '/'
Inlet Invert= 283.00', Outlet Invert= 271.00'



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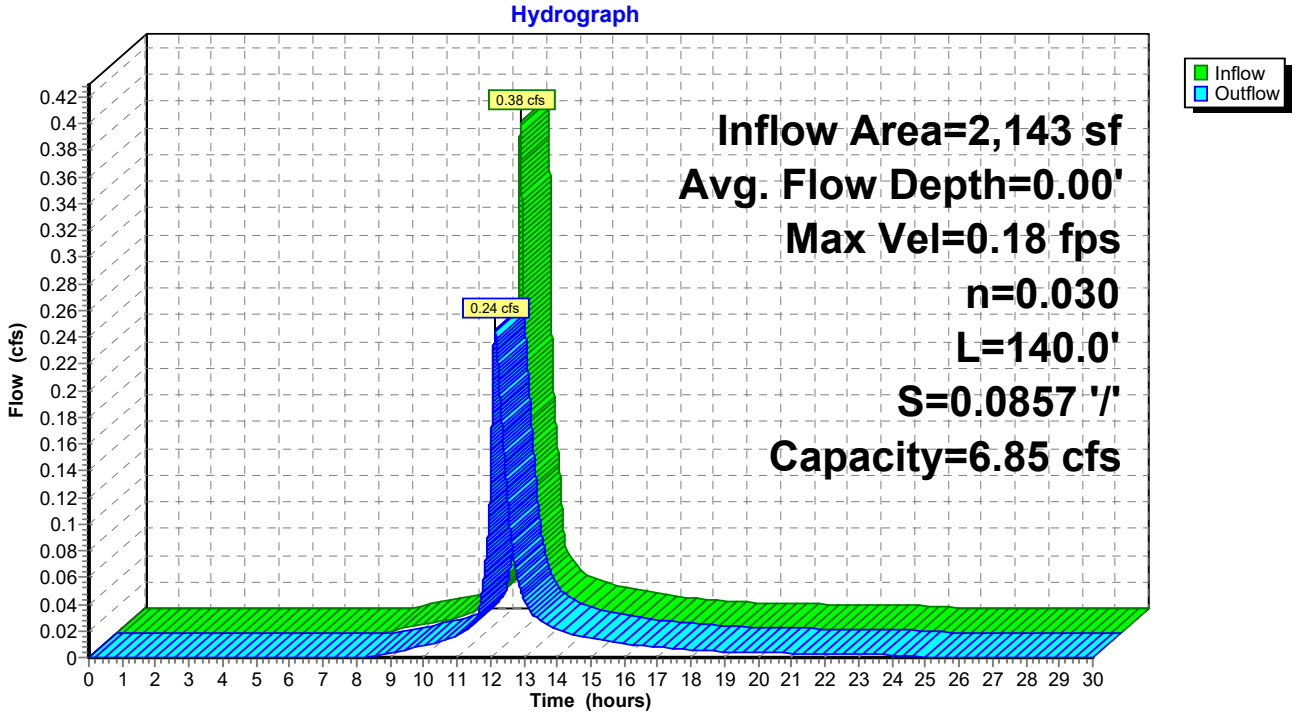
Reach OF: Overland Flow



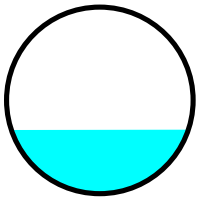
Summary for Reach PD: Pool drains

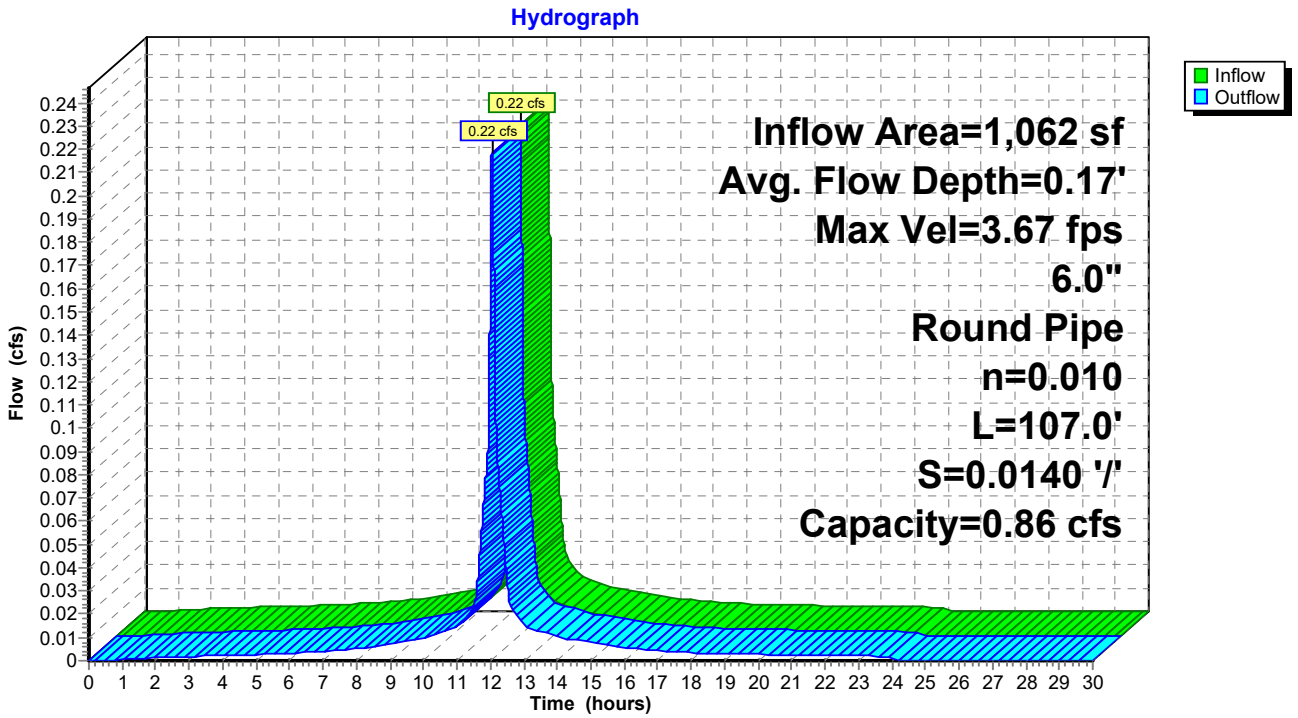
Inflow Area = 1,062 sf,100.00% Impervious, Inflow Depth = 8.00" for 100 yr Storm event
Inflow = 0.22 cfs @ 12.04 hrs, Volume= 708 cf
Outflow = 0.22 cfs @ 12.05 hrs, Volume= 708 cf, Atten= 1%, Lag= 0.3 min
Routed to Reach CD : Combined Drain

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 3.67 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.19 fps, Avg. Travel Time= 1.5 min

Peak Storage= 6 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.17' , Surface Width= 0.47'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.86 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 107.0' Slope= 0.0140 '/'
Inlet Invert= 299.50', Outlet Invert= 298.00'





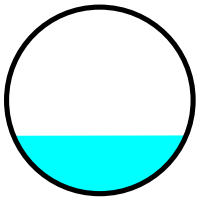
Summary for Reach RD: Roof/driveway drains

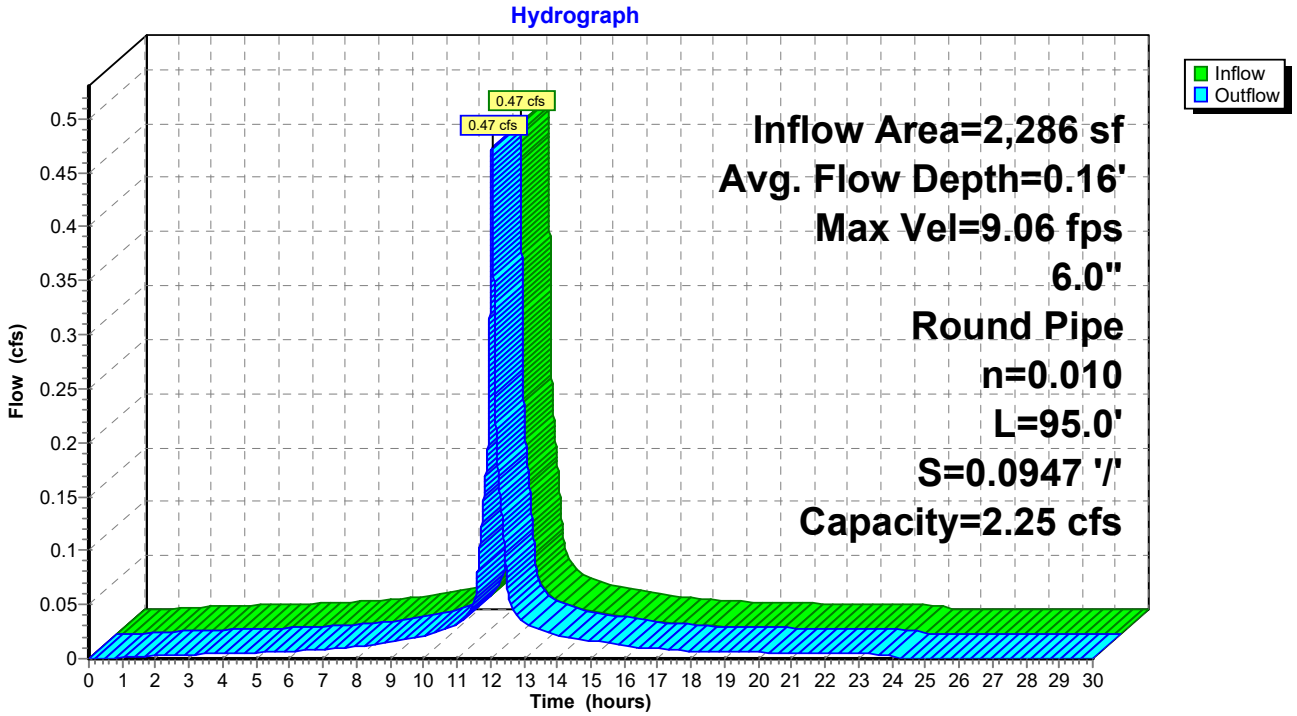
Inflow Area = 2,286 sf,100.00% Impervious, Inflow Depth = 8.00" for 100 yr Storm event
Inflow = 0.47 cfs @ 12.04 hrs, Volume= 1,524 cf
Outflow = 0.47 cfs @ 12.04 hrs, Volume= 1,524 cf, Atten= 0%, Lag= 0.1 min
Routed to Reach CD : Combined Drain

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 9.06 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.93 fps, Avg. Travel Time= 0.5 min

Peak Storage= 5 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 0.46'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 2.25 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 95.0' Slope= 0.0947 '/'
Inlet Invert= 307.00', Outlet Invert= 298.00'





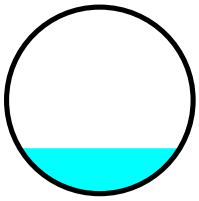
Summary for Reach RD2: Roof Drains 2

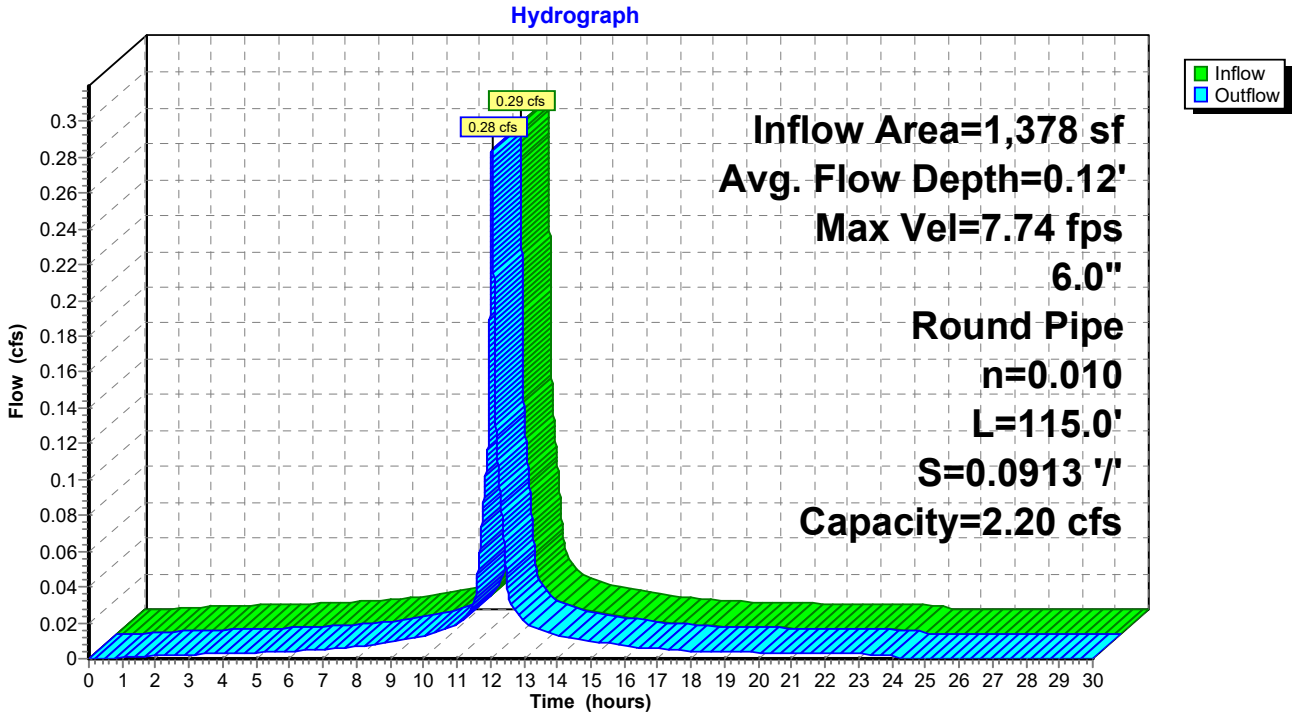
Inflow Area = 1,378 sf,100.00% Impervious, Inflow Depth = 8.00" for 100 yr Storm event
Inflow = 0.29 cfs @ 12.04 hrs, Volume= 919 cf
Outflow = 0.28 cfs @ 12.04 hrs, Volume= 919 cf, Atten= 0%, Lag= 0.1 min
Routed to Reach CD : Combined Drain

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Max. Velocity= 7.74 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.49 fps, Avg. Travel Time= 0.8 min

Peak Storage= 4 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.12' , Surface Width= 0.43'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 2.20 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 115.0' Slope= 0.0913 '/'
Inlet Invert= 308.50', Outlet Invert= 298.00'





Summary for Pond 1P: Bottom basin

Inflow Area = 1,565 sf, 0.00% Impervious, Inflow Depth = 6.45" for 100 yr Storm event
Inflow = 0.28 cfs @ 12.06 hrs, Volume= 841 cf
Outflow = 0.28 cfs @ 12.06 hrs, Volume= 841 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.01 cfs @ 12.06 hrs, Volume= 478 cf
Primary = 0.27 cfs @ 12.06 hrs, Volume= 362 cf
Routed to Link DP1 : Design Point 1

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 271.02' @ 12.06 hrs Surf.Area= 196 sf Storage= 170 cf

Plug-Flow detention time= 156.3 min calculated for 841 cf (100% of inflow)
Center-of-Mass det. time= 156.3 min (944.0 - 787.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	269.00'	106 cf	**18.00'W x 10.50'L x 1.71'H Field A** 323 cf Overall - 57 cf Embedded = 266 cf x 40.0% Voids
#2A	269.50'	57 cf	**Cultec FD C-4** x 4 Inside #1 Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.67 sf x 4 rows
#3	270.00'	14 cf	**3.00'D x 2.00'H Vertical Cone/Cylinder**
		177 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	271.00'	**4.0" x 2.0" Horiz. Orifice/Grate X 2.00 columns** X 50 rows C= 0.600 in 12.0" x 144.0" Grate (46% open area) Limited to weir flow at low heads
#2	Discarded	269.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 12.06 hrs HW=271.02' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.23 cfs @ 12.06 hrs HW=271.02' (Free Discharge)
1=Orifice/Grate (Weir Controls 0.23 cfs @ 0.46 fps)

Pond 1P: Bottom basin - Chamber Wizard Field A

Chamber Model = Cultec FD C-4 (Cultec Contactor® Field Drain C-4)
Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf
Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap
Row Length Adjustment= +0.50' x 1.67 sf x 4 rows

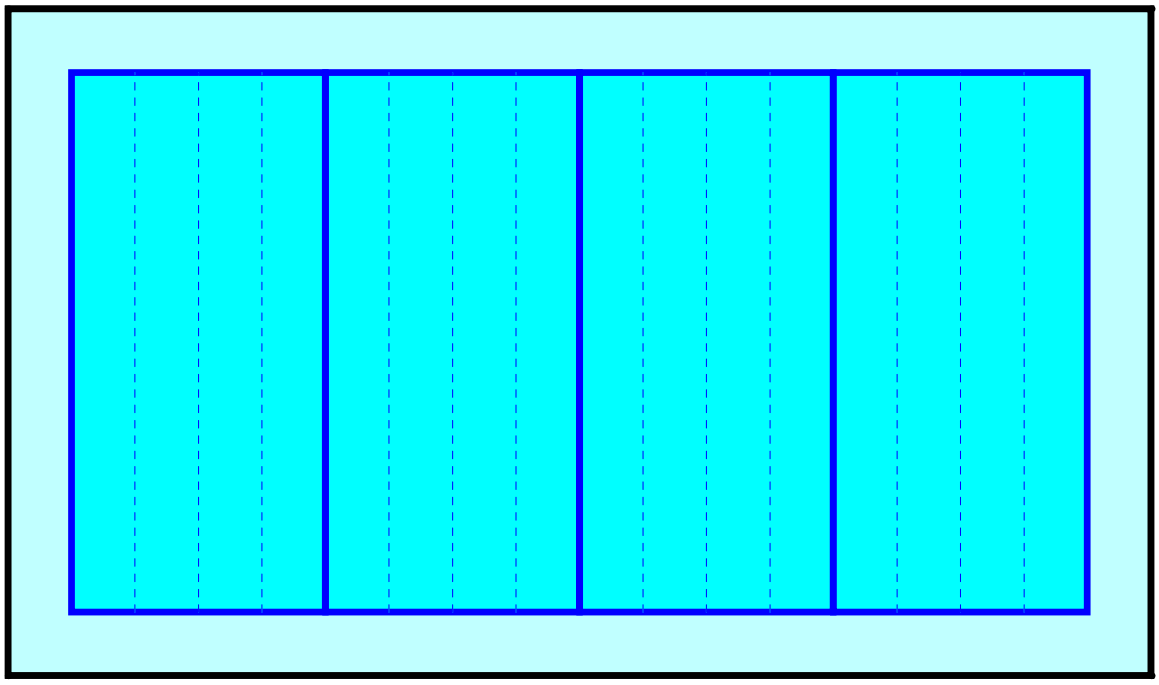
1 Chambers/Row x 8.00' Long +0.50' Row Adjustment = 8.50' Row Length +12.0" End Stone x 2 = 10.50' Base Length
4 Rows x 48.0" Wide + 12.0" Side Stone x 2 = 18.00' Base Width
6.0" Stone Base + 8.5" Chamber Height + 6.0" Stone Cover = 1.71' Field Height

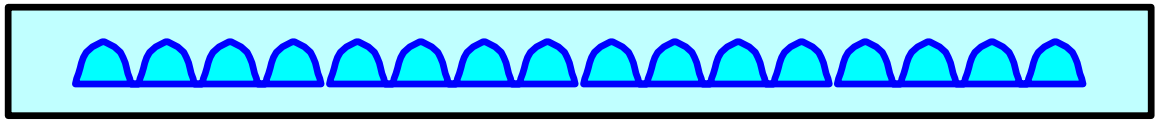
4 Chambers x 13.3 cf +0.50' Row Adjustment x 1.67 sf x 4 Rows = 56.6 cf Chamber Storage

322.9 cf Field - 56.6 cf Chambers = 266.2 cf Stone x 40.0% Voids = 106.5 cf Stone Storage

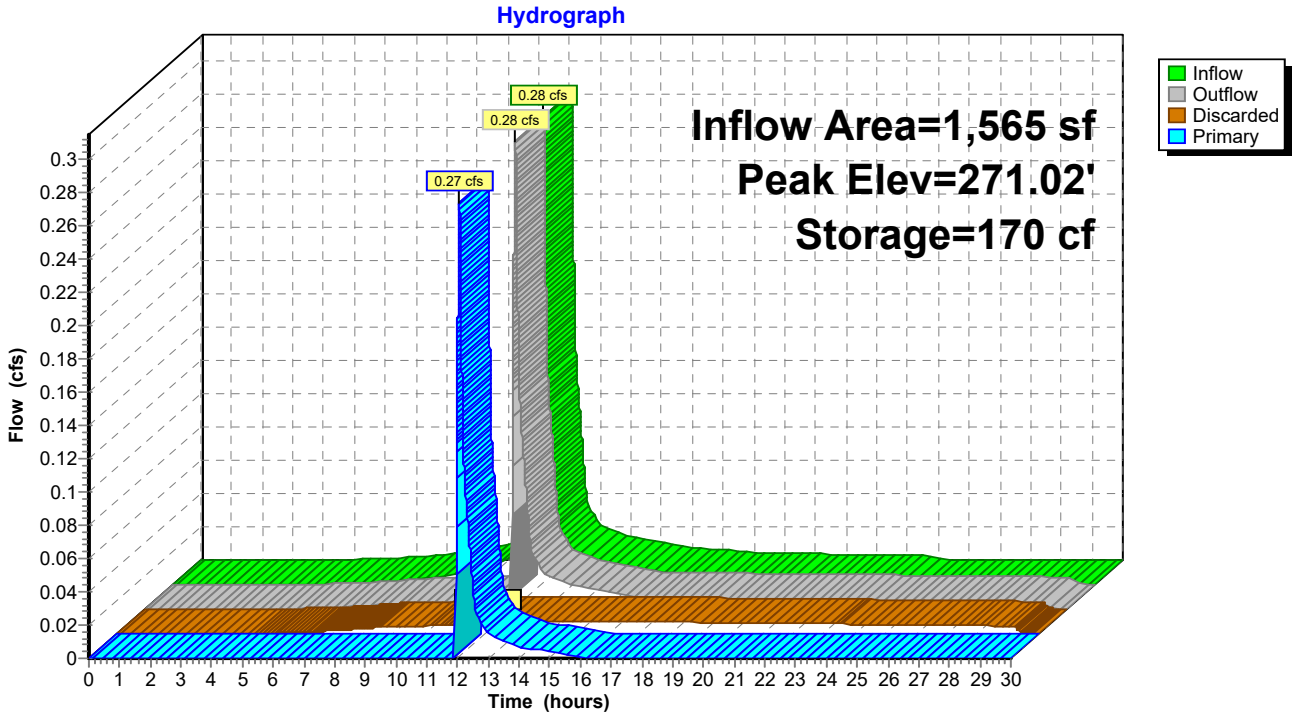
Chamber Storage + Stone Storage = 163.1 cf = 0.004 af
Overall Storage Efficiency = 50.5%
Overall System Size = 10.50' x 18.00' x 1.71'

4 Chambers
12.0 cy Field
9.9 cy Stone





Pond 1P: Bottom basin



Summary for Pond 2P: Trench Swale (right)

Inflow Area = 1,086 sf, 0.00% Impervious, Inflow Depth = 6.45" for 100 yr Storm event
Inflow = 0.20 cfs @ 12.06 hrs, Volume= 583 cf
Outflow = 0.20 cfs @ 12.06 hrs, Volume= 583 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 12.06 hrs, Volume= 68 cf
Primary = 0.19 cfs @ 12.06 hrs, Volume= 515 cf
Routed to Reach OF : Overland Flow

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 284.01' @ 12.06 hrs Surf.Area= 38 sf Storage= 11 cf

Plug-Flow detention time= 20.5 min calculated for 583 cf (100% of inflow)
Center-of-Mass det. time= 20.1 min (807.7 - 787.6)

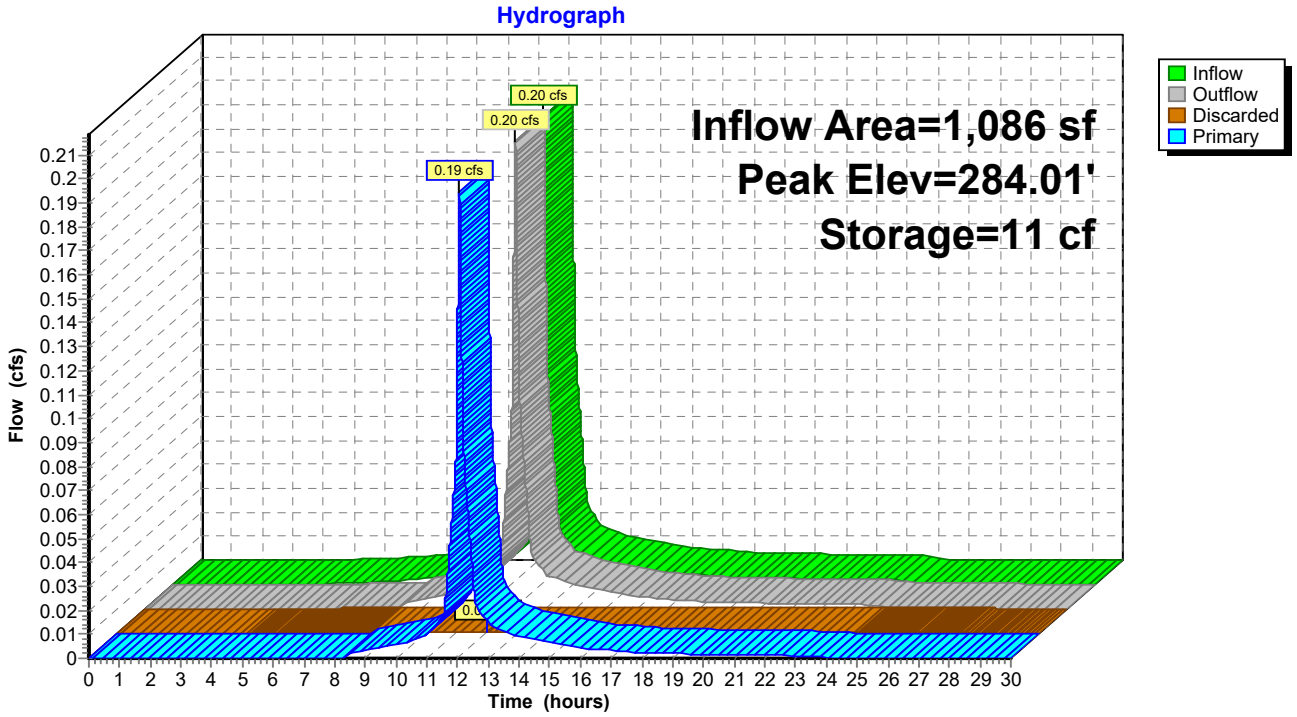
Volume	Invert	Avail.Storage	Storage Description
#1	283.00'	3,772 cf	**96.0" W x 60.0" H, R=55.0" Elliptical Pipe Storage** L= 185.0' S= 0.1050 '/' 5,388 cf Overall x 70.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	283.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	284.00'	**10.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.00 cfs @ 12.06 hrs HW=284.01' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.05 cfs @ 12.06 hrs HW=284.01' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.05 cfs @ 0.32 fps)

Pond 2P: Trench Swale (right)



Summary for Pond 22P: Trench Swale (left)

Inflow Area = 1,057 sf, 0.00% Impervious, Inflow Depth = 6.45" for 100 yr Storm event
Inflow = 0.19 cfs @ 12.06 hrs, Volume= 568 cf
Outflow = 0.19 cfs @ 12.06 hrs, Volume= 567 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 12.06 hrs, Volume= 59 cf
Primary = 0.19 cfs @ 12.06 hrs, Volume= 509 cf
Routed to Reach OF : Overland Flow

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 287.04' @ 12.06 hrs Surf.Area= 33 sf Storage= 10 cf

Plug-Flow detention time= 18.0 min calculated for 567 cf (100% of inflow)
Center-of-Mass det. time= 17.7 min (805.3 - 787.6)

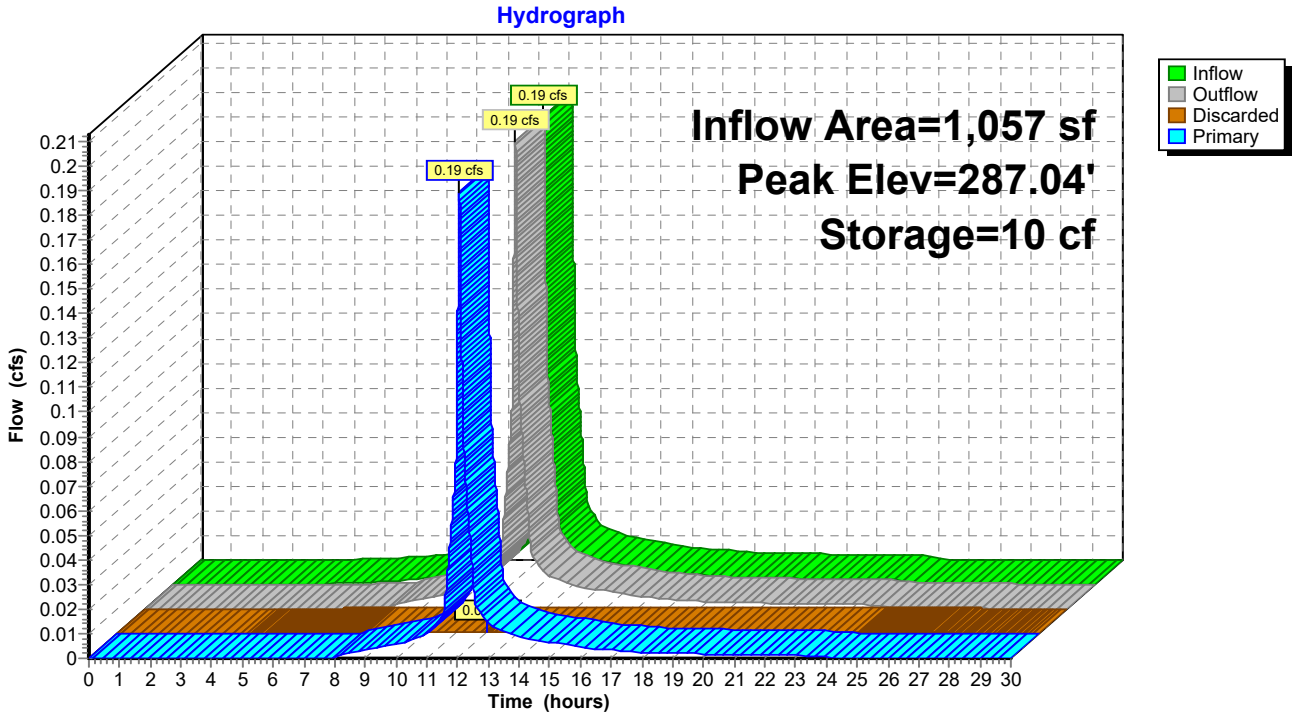
Volume	Invert	Avail.Storage	Storage Description
#1	286.00'	2,458 cf	**72.0" W x 60.0" H, R=40.0" Elliptical Pipe Storage** L= 150.0' S= 0.1050 '/' 3,511 cf Overall x 70.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	286.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	287.00'	**10.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.00 cfs @ 12.06 hrs HW=287.04' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.18 cfs @ 12.06 hrs HW=287.04' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.18 cfs @ 0.51 fps)

Pond 22P: Trench Swale (left)



Summary for Pond BR: Bioretention area

Inflow Area = 4,726 sf,100.00% Impervious, Inflow Depth = 8.00" for 100 yr Storm event
Inflow = 0.98 cfs @ 12.05 hrs, Volume= 3,151 cf
Outflow = 0.19 cfs @ 12.46 hrs, Volume= 3,151 cf, Atten= 81%, Lag= 24.5 min
Discarded = 0.04 cfs @ 12.46 hrs, Volume= 2,534 cf
Primary = 0.15 cfs @ 12.46 hrs, Volume= 616 cf
Routed to Link DP2 : Design Point 2

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs
Peak Elev= 292.75' @ 12.46 hrs Surf.Area= 1,393 sf Storage= 1,335 cf

Plug-Flow detention time= 226.0 min calculated for 3,151 cf (100% of inflow)
Center-of-Mass det. time= 226.0 min (965.0 - 739.0)

Volume	Invert	Avail.Storage	Storage Description
#1	289.00'	1,685 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

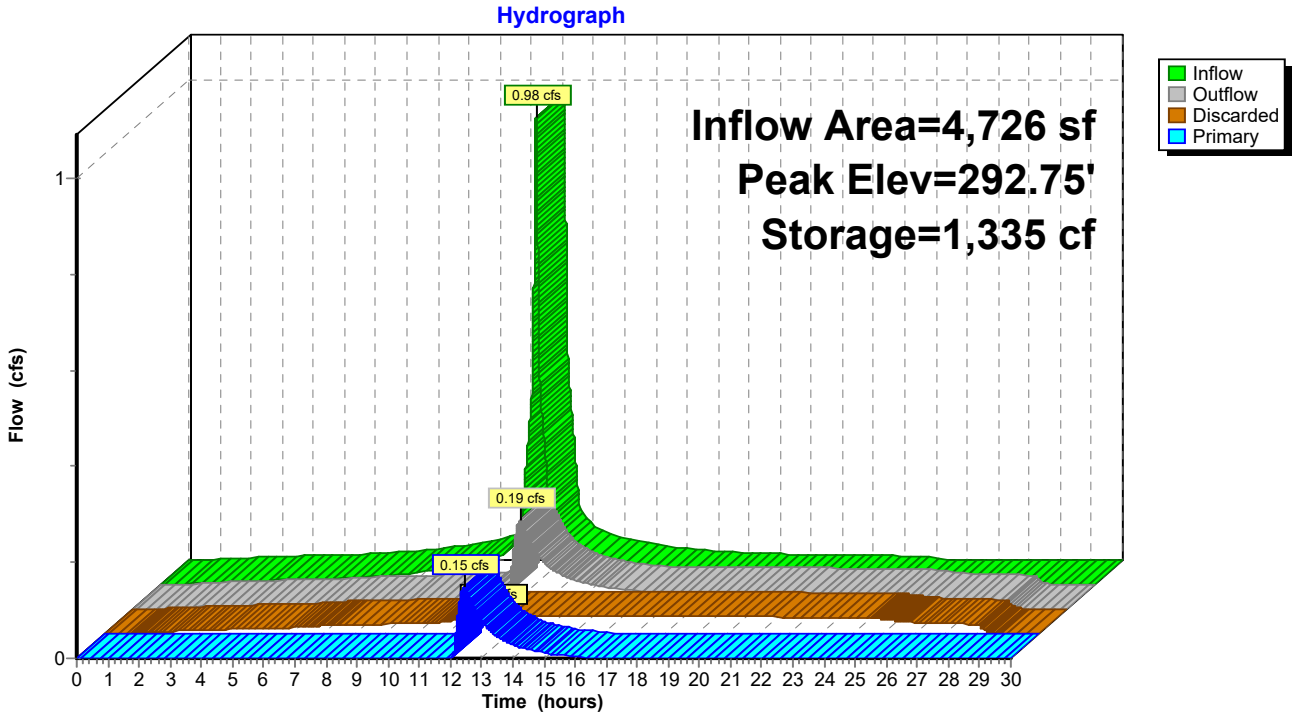
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
289.00	800	0.0	0	0	800
289.50	1,000	40.0	180	180	1,007
292.00	1,300	5.0	143	323	1,431
293.00	1,425	100.0	1,362	1,685	1,612

Device	Routing	Invert	Outlet Devices
#1	Discarded	289.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	292.50'	**12.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 292.50' / 289.00' S= 0.2333 '/' Cc= 0.500 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.04 cfs @ 12.46 hrs HW=292.75' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.15 cfs @ 12.46 hrs HW=292.75' (Free Discharge)
↑**2=Culvert** (Inlet Controls 0.15 cfs @ 0.95 fps)

Pond BR: Bioretention area

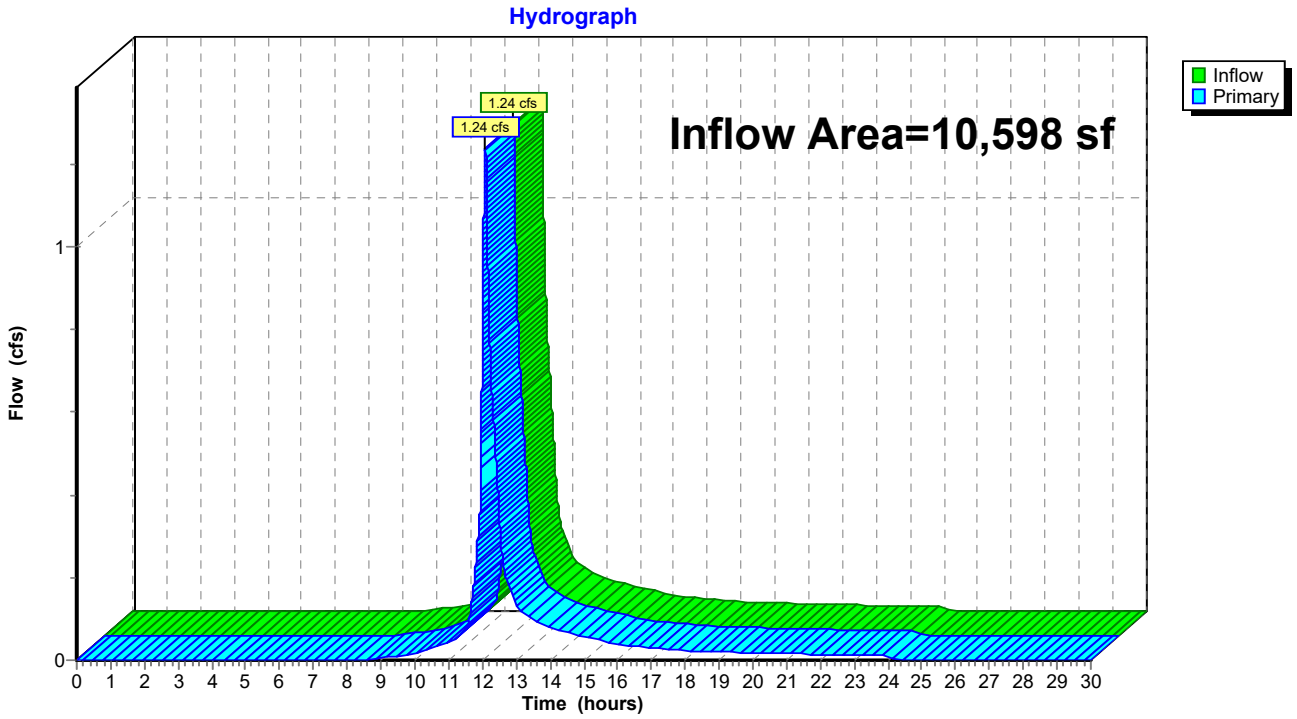


Summary for Link DP1: Design Point 1

Inflow Area = 10,598 sf, 0.00% Impervious, Inflow Depth = 4.23" for 100 yr Storm event
Inflow = 1.24 cfs @ 12.08 hrs, Volume= 3,734 cf
Primary = 1.24 cfs @ 12.08 hrs, Volume= 3,734 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs

Link DP1: Design Point 1



Summary for Link DP2: Design Point 2

Inflow Area = 48,084 sf, 10.71% Impervious, Inflow Depth = 3.84" for 100 yr Storm event
Inflow = 3.45 cfs @ 12.26 hrs, Volume= 15,391 cf
Primary = 3.45 cfs @ 12.26 hrs, Volume= 15,391 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.00010 hrs

Link DP2: Design Point 2