Drainage Report
For
Hudson Valley Volkswagen
Amended Site Plan

Location:
1148-1152 Route 9
Town of Wappinger
County of Dutchess

Date: June 16, 2025
August 6, 2025
September 15, 2026

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1 Introduction

This Drainage Report has been prepared for The Premier Collection for the proposed Amended Hudson Valley Volkswagen Site. It has been developed in accordance with New York State Department of Environmental Conservation (NYSDEC) technical standards as presented in the New York Standards and Specifications for Sediment and Erosion Control Manual 2016, and the New York State Stormwater Management Design Manual 2024.

1.1 Project Background

The proposed project site is a 4.57± acre parcel located at 1148-1152 Route 9, in the Town of Wappinger, New York. The project is located within the Highway Business (H-B) zoning district. The site currently consists of two existing motor vehicle sales and service centers with vehicle displays/storage located at the rear of the parcel. The parcel received original site approval in September 1998. The site received an amended site plan approval special use permit approval in January of 2015 for the conversion of the existing stormwater pond to an underground chamber system such that the space can be utilized for additional storage of automobiles. This improvement was never installed, and the current site still utilizes the pond. A location map has been provided in figure A below, which shows an aerial view of the site and the surrounding area.

1.2 Proposed Project

Proposed improvements on this site include converting the existing stormwater retention pond into a parking area to be used as vehicle storage. An underground infiltration basin will be utilized to mitigate stormwater runoff. These improvements are originally approved in the 2015 site plan amendment.

It is also proposed to expand the existing showroom by 520sqft as well as the service center in the rear of the building by 3,401sqft. The existing service center drop off drive location on the north side of the building will be partially enclosed with a 1,328sqft drive through garage where cars arriving for service may be processed prior to being valeted to the expanded service shop in the rear. All proposed areas of expansion are currently paved and used for storage or otherwise improved.

No other physical modifications are being proposed to this site as part of this application.

According to the NYS Department of Environmental Conservation a SPDES General Permit for Stormwater Discharges for Construction Activity (GP-0-25-001) must be granted for any project greater than one (1) acre of disturbance. The total disturbance for this project shall be approximately 0.82 acres; therefore, a SPDES General Permit is not required. Disturbance to the

site during construction will be minimized to every extent possible. Temporary erosion and sediment control measures have been provided, and locations have been shown on the plan to indicate the limits of disturbance and to delineate the areas deemed necessary during construction.

Figure A - Location Map

2 Existing Site Features

The parcel consists of two existing motor vehicle sales and service centers approximately 10,500 and 11,050 square feet. Most of the site consists of impervious ground cover with landscaped and lawn areas. 28 Visitor parking/display spaces are in front of the existing buildings and 114 parking spaces are in the rear of the site and serve as service/employee/display parking. The site also consists of the usual appurtenances associated with a motor vehicle sales and service center such as landscaping, site lighting, etc.

2.1 Site Soils

The official soil type indicated by the USDA Soil Conservation Service for the Site is "Dutches-Cardigan Complex". The Refer to the following site soil descriptions and soils map in Figure B for the soil conditions presently found on the site.

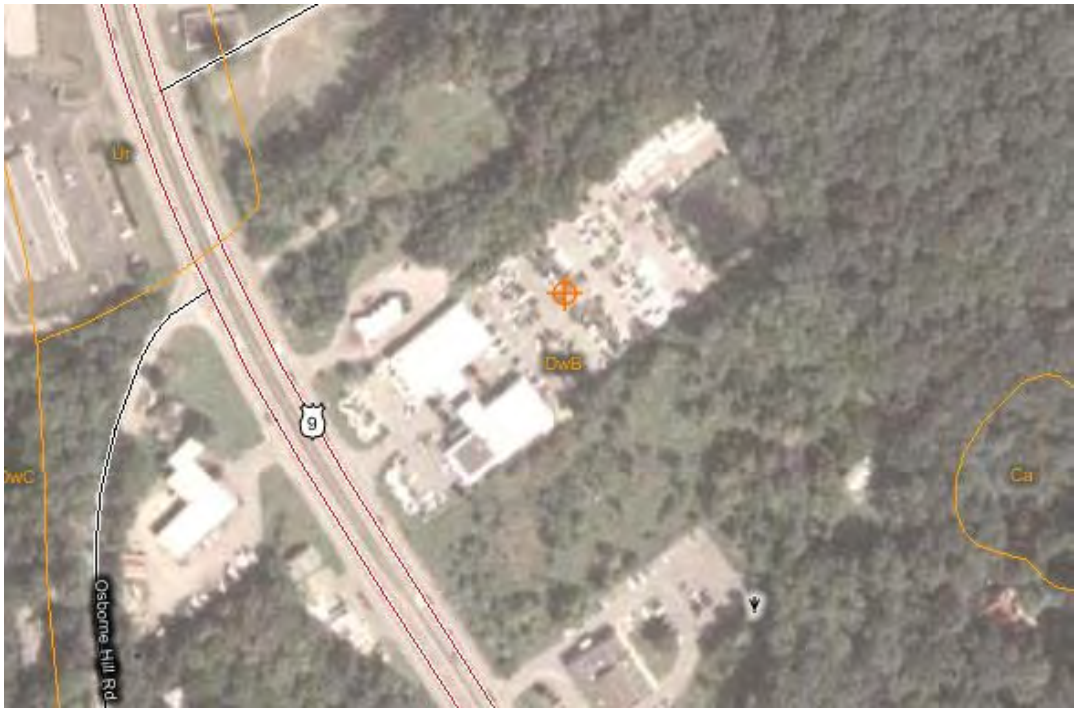
DwB – Dutchess –Cardigan Complex,
Hydrologic Soil Classification = B

Description: nearly level (1 to 6 percent slopes) – This complex is about 40 percent Dutchess soil, 30 percent Cardigan soils, and 30 percent other soils and rock outcrop. Folded shale rock outcrop covers 0.1 to 2 percent of the surface.

> Dutchess Soil – Very deep well drained loamy soils ion till. Permeability is moderate.
> Cardigan Soils – Moderately deep (20 to 40 inches), well drained loamy soils formed in till underlain by folded shale bedrock. Permeability is moderate.

The present site conditions consist of soils that have been extensively altered by human activities. The majority of the site has been previously disturbed and developed.

Figure B - Soils Map



3 Existing Site Hydrology

The site in the pre-development condition consists primarily of impervious ground cover. An existing storm sewer system is in place to collect the runoff from the site. Approximately 30 percent of the site runoff is captured by the existing curbing of the front parking area and directed to a 5,000-gallon grease and oil interceptor before being discharged into a swale along Route 9.

The remaining 70 percent of the site run off is captured by the existing curbing of the rear parking area and directed to the retention pond located at the rear of the site. An existing pipe acts as an overflow in larger storm events and allows stormwater in excess of the pond storage capacity to be conveyed to the swale in the front of the property.

Proposed improvements on this site include converting the existing stormwater retention pond into a parking area to be used as vehicle storage. The drainage area is broken down into two sub-areas to analyze the overall impacts. A single design point (DP1) at the out fall of the existing storm sewer within the swale along Route 9 was used to compare the runoff flow rates in Pre and Post Development conditions. Please refer to the Site Hydrology (SH.1) included in the back of this report, for graphical representations of the drainage flow path and area.

Refer to Appendix "A" for a detailed calculation of the Area, CN and T_c values. A summary of the predevelopment drainage input calculations can be found in Table 1 below.

Table 1: Pre Development Drainage Area Input Summary

Area	Total Area (sq.ft.)	CN	T_c (minutes)
Pre-Area 1	74,000	94	6.0*
Pre-Area 2	85,196	84	15.3

* The Minimum Tc used in TR-55 is 0.1 hours (6 minutes)

The predevelopment runoff rates were calculated using the Area, CN and T_c values as shown above. These values were then entered into HydroCAD, 1 and 2, 10, 25 & 100-year storm event flow rate values were obtained using local rainfall data (sourced from NRCC and NRCS joint collaborative website (http://precip.eas.cornell.edu)) to generate rainfall distribution curves. Refer to Appendix "A" for predevelopment hydrographs for DP#1.

The following table is a summary of the predevelopment design flows at DP#1:

Table 2: Pre Development Hydrograph Summary

Design Point	1-year Event	2-Year Event	10-Year Event	25-Year Event	100-Year Event
#1	0.84 c.f.s	1.26 c.f.s.	2.36 c.f.s.	3.02 c.f.s.	N/A

The existing pond, based on modeling, does not have the capacity to hold and convey the 100-year storm event without overtopping and discharging to the south, and the modeling software artificially creates a storage volume and skews the results. As such, it is not provided in the chart but the program results are in the appendix.

4 Developed Site Hydrology

Please refer to Drainage Sheet 2 of 2, "Post Development Hydrology", included in the back of this report, for graphical representations of drainage flow paths and areas.

Table 3: Post Development Drainage Input Summary

Sub-Area	Total Area (sq.ft)	CN	T_c (minutes)
Post-Area 1	74,000	94	6.0*
Post-Area 2	85,196	83	10.0

* The Minimum Tc used in TR-55 is 0.1 hours (6 minutes)

The following table is a summary of the predevelopment design flows at DP#1:

Table 4: Post Development Hydrograph Summary

Design Point	1-year Event	2-Year Event	10-Year Event	25-Year Event	100-Year Event
#1	0.76 c.f.s	1.21 c.f.s.	2.31 c.f.s.	2.92 c.f.s.	3.99 c.f.s.

4.1 Pre vs. Post Runoff Flow Rates

The following table is a summary of the Pre vs. Post development flow rates

Table 5: Pre vs. Post Summary

Storm	Pre	Post	Delta
1-year	0.84 c.f.s.	0.76 c.f.s.	-0.08 c.f.s.
2-year	1.26 c.f.s.	1.21 c.f.s.	-0.05 c.f.s.
10-year	2.36 c.f.s.	2.31 c.f.s.	-0.05 c.f.s.
25-year	3.02 c.f.s.	2.92 c.f.s.	-0.10 c.f.s.
100-year	---- c.f.s.	3.99 c.f.s.	--- c.f.s.

4.2 Mitigation Measures

For this project we are proposing a hydrodynamic separator to treat the runoff from the proposed site improvements and an underground detention basin system to mitigate the runoff from the site.

4.2.1 Hydrodynamic separator

The proposed unit is an advanced vortex separator which will remove sediment, oil and floatables from stormwater runoff. Contaminated stormwater runoff enters the inlet chute from a surface grate and/or inlet pipe. The inlet chute introduces flow into the chamber tangentially to create a low energy vortex flow regime that directs sediment into the sump while oils, floating trash and debris rise to the surface. Treated stormwater exits through a submerged outlet chute located opposite the direction of the rotating flow. Enhanced vortex separation is provided by forcing the rotating flow within the vessel to follow the longest path possible rather than directly from inlet to outlet. Higher flows bypass the treatment chamber to prevent turbulence and washout of captured pollutants. An internal bypass conveys infrequent peak flows directly to the outlet eliminating the need for and expense of external bypass control structures. A floatable draw off slot functions to convey floatables into the treatment chamber prior to bypass.

The system will be installed upstream of the proposed underground storage system and has been designed for provide for treatment of the “first flush” in small storm events while an internal bypass diverters higher flows of larger storm events.

Calculations are in the appendix for quality sizing, the 6 ft system can accommodate a total online flow rate of 32cfs and certified treatment flow of 3.38cfs

4.2.2 Underground Storage Basin

An underground system designed to capture, temporarily store, and discharge runoff at a controlled rate. A Stormtech® MC-3500 system is a 45”tall, high-capacity plastic stormwater management chamber. Typically, when using this model, fewer chambers are required resulting in less labor and a smaller installation area.

The system will be installed in the location of the current pond and provide the same functionality while allowing the parking of the required additional new vehicle stock The NYS Stormwater Maintenance Design Manual (SWMDM) classifies vehicle service and maintenance facility and/or fleet storage and a “hotspot” area. Hotspot land uses or activities must not be directed to a formal infiltration facility. To prevent stormwater from infiltrating into the surrounding soil a polyethylene liner around the top, sides and bottom of the proposed system.

The existing manhole will be utilized, and the new system discharge pipe will be relocated. Stormwater in excess of the system storage capacity will discharge in a controlled manner to the storm sewer system and ultimately discharge into the swale along Route 9.

5 Conclusions

All stormwater events have been mitigated to predevelopment level or less. Drainage will not be impacted by the improvements, and the proposed location is consistent with the previously approved design and intention. Furthermore, the system will convey the 100-year event where as the existing pond is inadequate to do so.

6 Temporary Erosion & Sediment Control Measures

STANDARDS AND SPECIFICATIONS FOR SILT FENCE

6.1 Silt Fence:

All silt fencing locations have been shown on the SWPPP insert in the back of this report and shall be installed in accordance with the detail shown in Figure F below:

Definition

A temporary barrier of geotextile fabric installed on the contours across a slope used to intercept sediment laden runoff from small drainage areas of disturbed soil.

Purpose

The purpose of a silt fence is to reduce runoff velocity and effect deposition of transported sediment load. Limits imposed by ultraviolet stability of the fabric will dictate the maximum period the silt fence may be used (approximately one year).

Conditions Where Practice Applies

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope lengths contributing runoff to a silt fence placed on a slope are:

Slope Maximum	Steepness Length (ft.)
2:1	25
3:1	50
4:1	75
5:1 or flatter	100

2. Maximum drainage area for overland flow to a silt fence shall not exceed ¼ acre per 100 feet of fence, with maximum ponding depth of 1.5 feet behind the fence.
3. Erosion would occur in the form of sheet erosion.
4. There is no concentration of water flowing to the barrier.

Design Criteria

Design computations are not required for installations of 1 month or less. Longer installation periods should be designed for expected runoff. All silt fences shall be placed as close to the areas as possible, but at least 10 feet from the toe of a slope to allow for maintenance and roll down. The area beyond the fence must be undisturbed or stabilized. Sensitive areas to be protected by silt fence may need to be reinforced by using heavy wire fencing for added support to prevent collapse. Where ends of filter cloth come together, they shall be overlapped, folded and stapled to prevent sediment bypass.
A detail of the silt fence shall be shown on the plan. See Figure below for details.

Criteria for Silt Fence Materials

1. Silt Fence Fabric: The fabric shall meet the following specifications unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance.

Table 6: Silt Fence Requirements

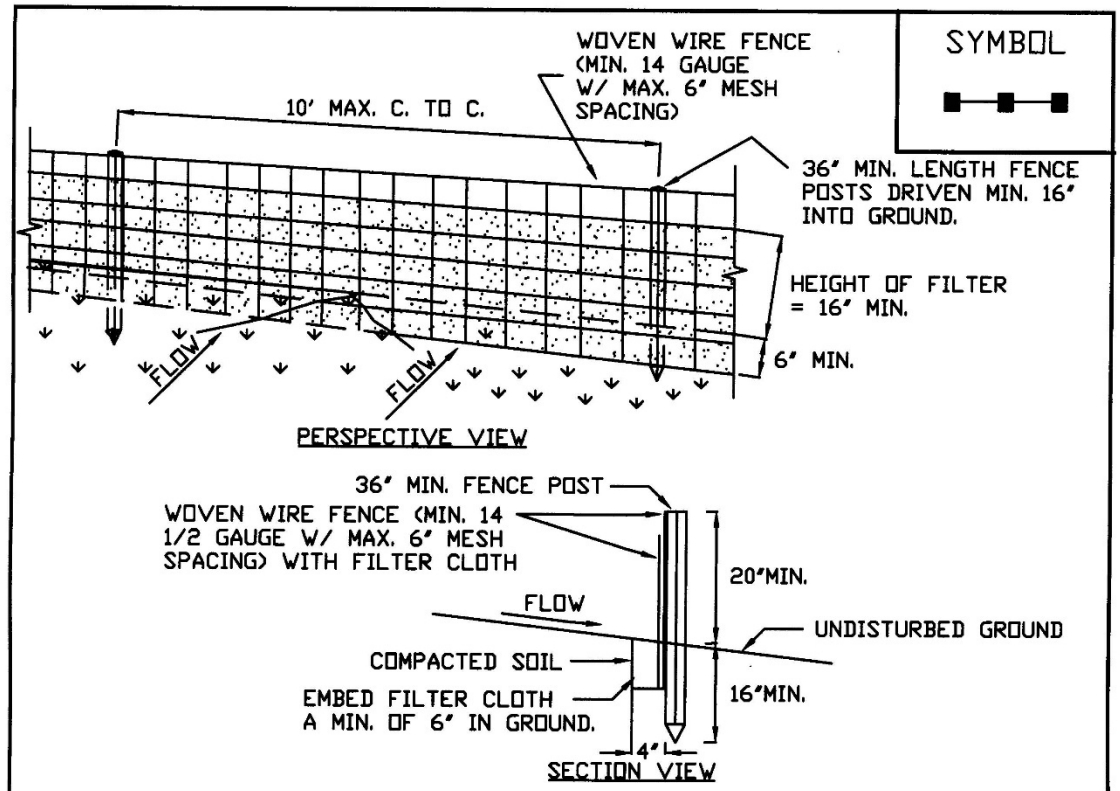
Fabric Properties	Acceptable Value	Test Method
Grab Tensile Strength (lbs)	90	ASTM D1682
Elongation at Failure (%)	50	ASTM D1682
Mullen Burst Strength (PSI)	190	ASTM D3786
Puncture Strength (lbs)	40	ASTM D751 (modified)
Slurry Flow Rate (gal/min/sf)	0.3	
Equivalent Opening Size	40-80	US Std Sieve CW-02215
Ultraviolet Radiation Stability (%)	90	ASTM G-26

2. Fence Posts (for fabricated units): The length shall be a minimum of 36 inches long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 2 square inches. Steel posts will be standard T and U section weighing not less than 1.00 pound

per linear foot.

3. Wire Fence (for fabricated units): Wire fencing shall be a minimum 14 gage with a maximum 6 in. mesh opening, or as approved.
4. Prefabricated Units: Envirofence, Geofab, or approved equal, may be used in lieu of the above method providing the unit is installed per the detail shown below

Figure E - Silt Fence Detail



CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	SILT FENCE

STANDARD AND SPECIFICATIONS FOR DUST CONTROL

6.2 Dust Control:

During the construction phase of the project, approximately 4.50 acres of soil will be disturbed to facilitate land regrading and general building construction. The time interval from initial excavation of the proposed disturbed area to the seeding and mulching stabilization phase shall be kept to a minimum. During this window of time during construction of bare soil exposure, dust control may be necessary. Refer to the following specifications regarding dust control.

Definition

The control of dust resulting from land-disturbing activities.

Purpose

To prevent surface and air movement of dust from disturbed soil surfaces that may cause off-site damage, health hazards, and traffic safety problems.

Conditions Where Practice Applies

On construction roads, access points, and other disturbed areas subject to surface dust movement and dust blowing where off-site damage may occur if dust is not controlled.

Design Criteria

Construction operations should be scheduled to minimize the amount of area disturbed at one time. Buffer areas of vegetation should be left where practical. Temporary or permanent stabilization measures shall be installed. No specific design criteria are given; see

construction specifications below for common methods of dust control. Water quality must be considered when materials are selected for dust control. Where there is a potential for the material to wash off to a stream, ingredient information must be provided to the local permitting authority.

Construction Specifications

A.

Non-driving Areas – These areas use products and materials applied or placed on soil surfaces to prevent airborne migration of soil particles.

Vegetative Cover – For disturbed areas not subject to traffic, vegetation provides the most practical method of dust control (see Section 3).

Mulch (including gravel mulch) – Mulch offers a fast effective means of controlling dust. This can also include rolled erosion control blankets.

Spray adhesives – These are products generally composed of polymers in a liquid or solid form that are mixed with water to form an emulsion that is sprayed on the soil surface with typical hydroseeding equipment. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations for the specific soils on the site. In no case should the application of these adhesives be made on wet soils or if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators and others working with the material.

B.

Driving Areas – These areas utilize water, polymer emulsions, and barriers to prevent dust movement from the traffic surface into the air.

Sprinkling – The site may be sprayed with water until the surface is wet. This is especially effective on haul roads and access routes.

Polymer Additives – These polymers are mixed with water and applied to the driving surface by a water truck with gravity feed drip bar, spray bar or automated distributor truck. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations. Incorporation of the emulsion into the soil will be done to the appropriate depth based on expected traffic. Compaction after incorporation will be by vibratory roller to a minimum of 95%. The prepared surface shall be moist and no application of the polymer will be made if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators working with the material.

Barriers – Woven geo-textiles can be placed on the driving surface to effectively reduce dust throw and particle migration on haul roads. Stone can also be used for construction roads for effective dust control.

Windbreak – A silt fence or similar barrier can control air currents at intervals equal to ten times the barrier height. Preserve existing wind barrier vegetation as much as practical.

August 2005 Page 5A.87 New York Standards and Specifications for Erosion and Sediment Control All Stormwater Pollution Prevention Plans must contain the NYS DEC issued "Conditions for Use" and "Application Instructions" for any polymers used on the site. This information can be obtained from the NYS DEC website.

Maintenance

Maintain dust control measures through dry weather periods until all disturbed areas are stabilized.

7 Construction waste management plan

Construction waste management practices are designed to maintain a clean and orderly work environment. This will reduce the potential for significant materials to come into contact with stormwater. A maintenance schedule shall be developed for these areas. The general contractor shall implement the following practices:

1. Material resulting from the clearing and grubbing operation will be stockpiled up slope from adequate sedimentation controls.

2. Equipment cleaning, maintenance, and repair areas shall be designated and protected by a temporary perimeter berm.

3. The use of detergents for large scale washing is prohibited (i.e., vehicles, buildings, pavement surfaces, etc.).

4. Spill Prevention and Response
   A Spill Prevention and Response Plan shall be developed for the site by the general contractor. The plan shall detail the steps needed to be followed in the event of an accidental spill and shall identify contact names and phone numbers of people and agencies that must be notified.

   The plan shall include Material Safety Data Sheets (MSDS) for all materials to be stored on-site. All workers on-site will be required to be trained on safe handling and spill prevention procedures for all materials used during construction. Regular tailgate safety meetings shall be held and all workers that are expected on the site during the week shall be required to attend.

5. Material Storage
   Construction materials shall be stored in a dedicated staging area. The staging area shall be located in an area that minimizes the impacts of the construction materials effecting stormwater quality.

   Chemicals, paints, solvents, fertilizers, and other toxic material must be stored in waterproof containers. Except during application, the contents must be kept in trucks or within storage facilities. Runoff containing such material must be collected, removed from the site, treated and disposed at an approved solid waste or chemical disposal facility.

6. Temporary Concrete Washout Facility

Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking. A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.

When temporary concrete washout facilities are no longer required for the work, the hardened concrete shall be removed and disposed of. Materials used to construct the temporary concrete washout facilities shall be removed from the site and disposed of. Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled and/or repaired and seeded and mulched for final stabilization.

7. Solid Waste Disposal
   No solid materials, including building materials, are allowed to be discharged from the site with stormwater. All solid waste, including disposable materials incidental to the major construction activities, must be collected and placed in containers. The containers will be emptied periodically by a contract trash disposal service and hauled away from the site.

   Substances that have the potential for polluting surface and/or groundwater must be controlled by whatever means necessary in order to ensure that they do not discharge from the site. As an example, special care must be exercised during equipment fueling and servicing operations. If a spill occurs, it must be contained and disposed so that it will not flow from the site or enter groundwater, even if this requires removal, treatment, and disposal of soil. In this regard, potentially polluting substances should be handled in a manner consistent with the impact they represent.

8. Water Source
   Non-stormwater components of site discharge must be clean water. Water used for construction, which discharges from the site, must originate from a public water supply or private well approved by the Health Department. Water used for construction that does not originate from an approved public supply must not discharge from the site. It can be retained in the ponds until it infiltrates and evaporates.

8 Conclusions

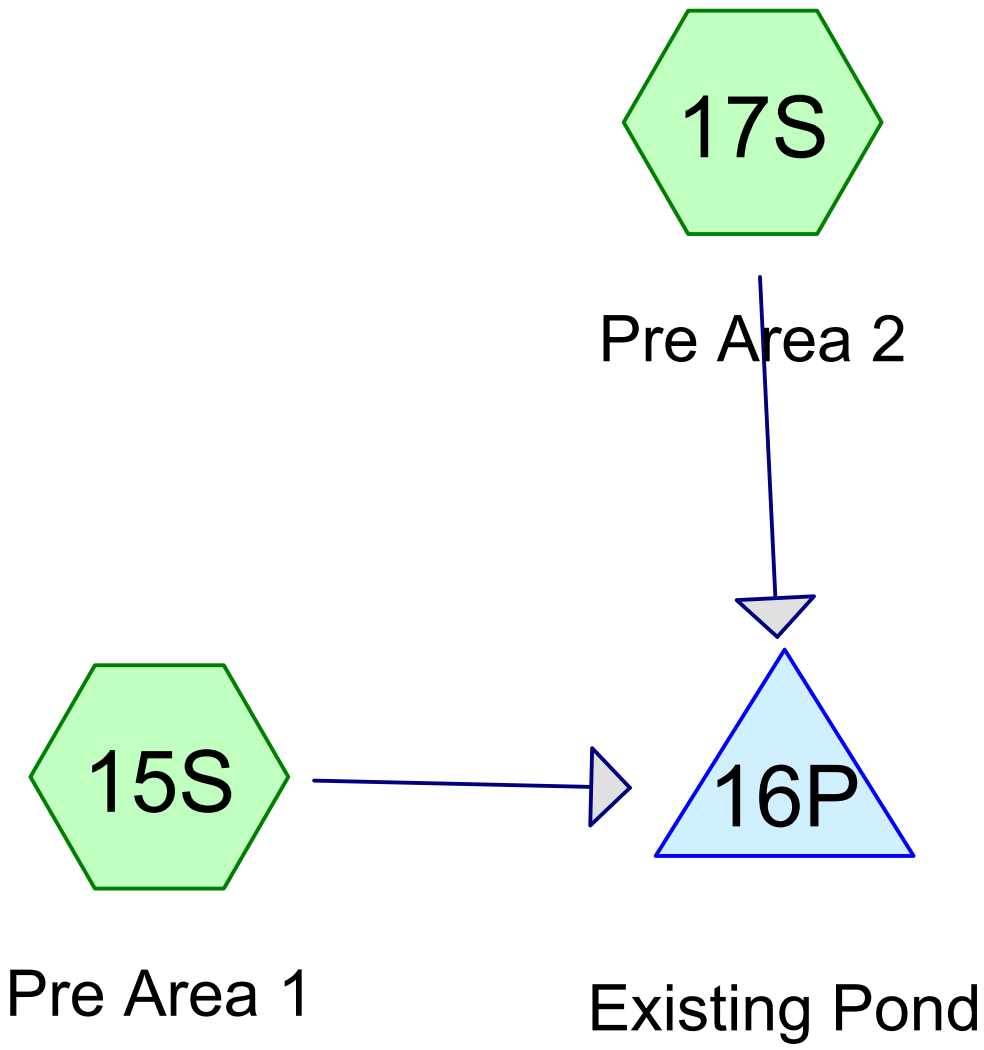
It can be seen from the information provided herein that the proposed Stormwater Management Practices shall reduce the post-development drainage impacts to less than pre-development conditions for the 2-year, 10-year & 25-year events at all design points in the build-out condition.

All BMP (Best Management Practices) have been applied to the site to ensure the proper control of any erosion and sediment created on site from disturbance activities. The Town of Wappinger Building Inspector and/or Town Engineer and have the authority to modify, add or eliminate any erosion control practice on the construction site.

Appendix

Appendix A

Pre-Development Cn, Tc Calculations & Pre-Development Hydrographs & Summary



Subcat Reach Pond Link

Routing Diagram for Hudson Valley Volkswagen - Drainage 11-13-13
Prepared by Day & Stokosa Engineering, PC, Printed 8/6/2025

Summary for Subcatchment 15S: Pre Area 1

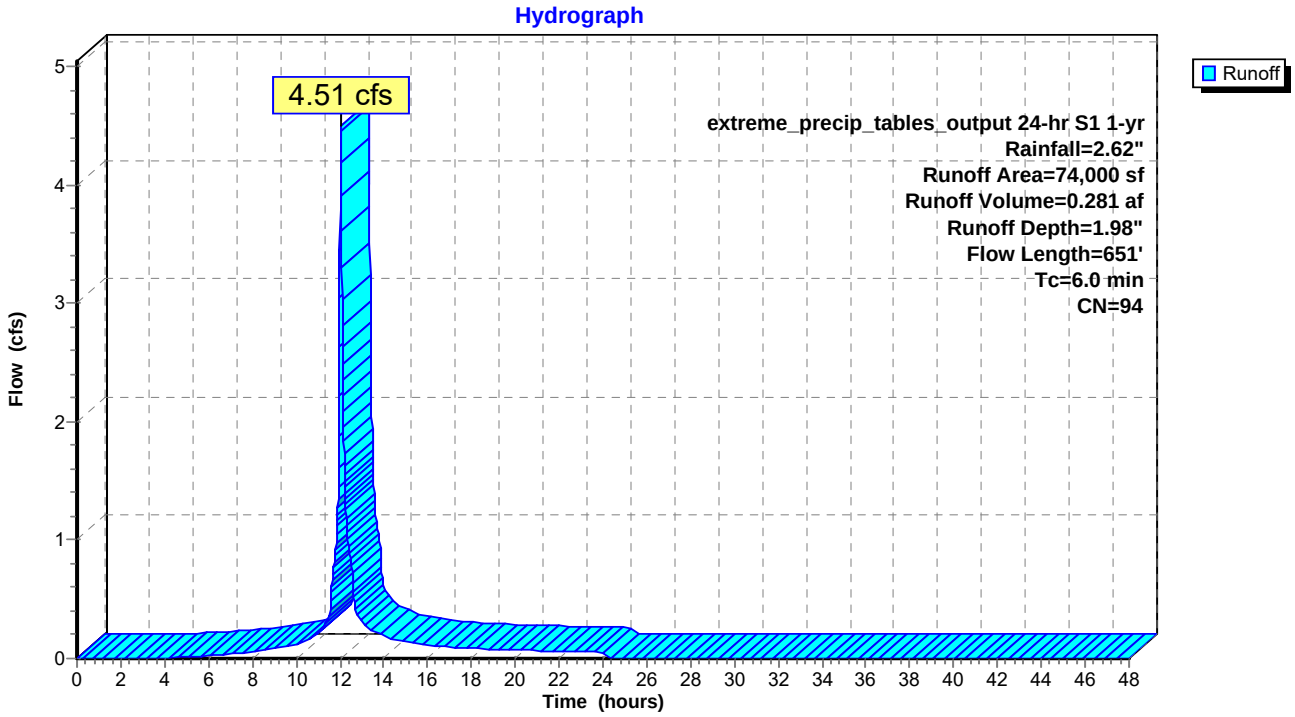
Runoff = 4.51 cfs @ 12.04 hrs, Volume= 0.281 af, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 1-yr Rainfall=2.62"

Area (sf)	CN	Description
55,000	98	Paved parking
10,800	98	roofs
8,200	61	>75% Grass cover, Good, HSG B
74,000	94	Weighted Average
8,200	61	11.08% Pervious Area
65,800	98	88.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0350	1.74		**Sheet Flow, Reach A-b** Smooth surfaces n= 0.011 P2= 3.50"
0.0	20	0.0350	7.31	7.31	**Channel Flow, Reach B-C** Area= 1.0 sf Perim= 5.0' r= 0.20' n= 0.013 Concrete, trowel finish
0.9	194	0.0350	3.80		**Shallow Concentrated Flow, Reach C-D** Paved Kv= 20.3 fps
1.0	352	0.0063	5.72	17.96	**Pipe Channel, Reach D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.1					**Direct Entry,**
5.8	651	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15S: Pre Area 1



Summary for Subcatchment 17S: Pre Area 2

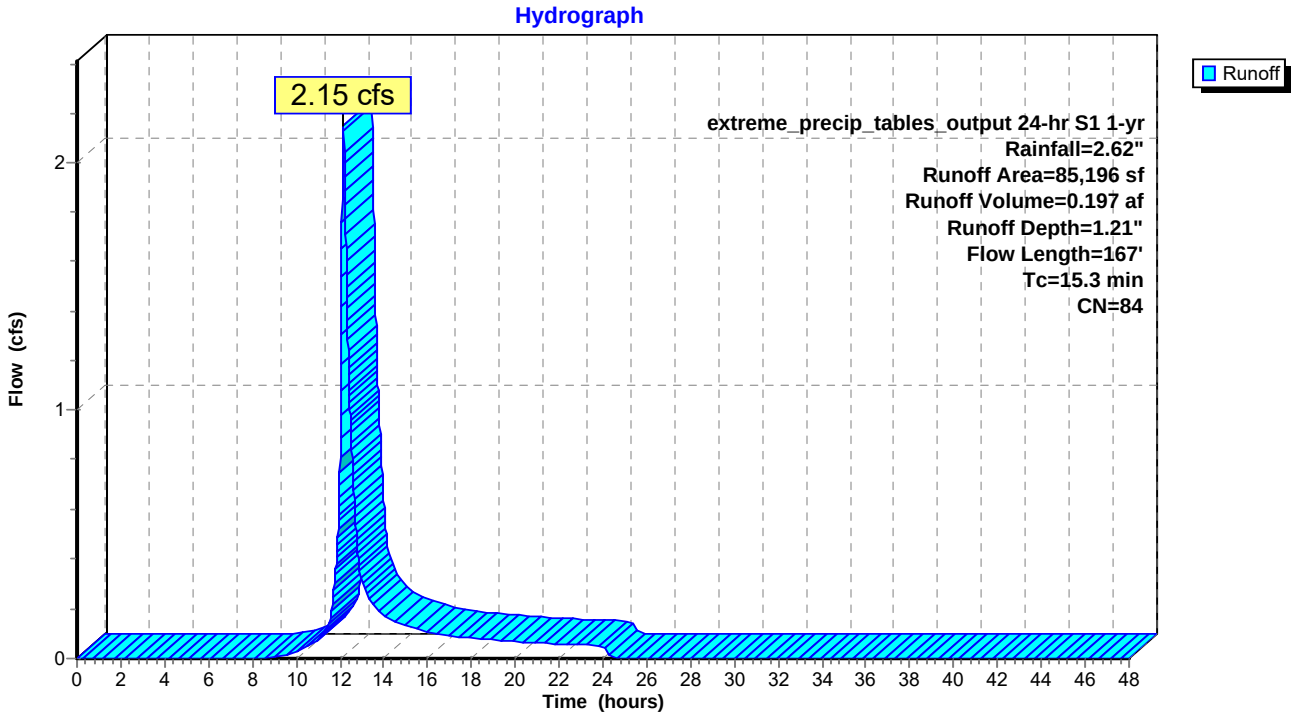
Runoff = 2.15 cfs @ 12.16 hrs, Volume= 0.197 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 1-yr Rainfall=2.62"

Area (sf)	CN	Description
13,520	98	Paved parking
14,500	96	Gravel surface, HSG B
1,200	61	>75% Grass cover, Good, HSG B
33,176	65	Woods/grass comb., Fair, HSG B
22,800	98	Water Surface, 0% imp, HSG B
85,196	84	Weighted Average
71,676	82	84.13% Pervious Area
13,520	98	15.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	60	0.0500	0.11		**Sheet Flow, Reach A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
5.3	40	0.0100	0.13		**Sheet Flow, Reach B-C** Range n= 0.130 P2= 3.50"
0.3	35	0.0200	2.28		**Shallow Concentrated Flow, Reach C-D** Unpaved Kv= 16.1 fps
0.2	32	0.1500	2.71		**Shallow Concentrated Flow, Reach** Short Grass Pasture Kv= 7.0 fps
15.3	167	Total			

Subcatchment 17S: Pre Area 2



Summary for Pond 16P: Existing Pond

Inflow Area = 3.655 ac, 49.83% Impervious, Inflow Depth = 1.57" for 1-yr event
Inflow = 5.71 cfs @ 12.05 hrs, Volume= 0.478 af
Outflow = 0.84 cfs @ 12.77 hrs, Volume= 0.456 af, Atten= 85%, Lag= 43.5 min
Primary = 0.84 cfs @ 12.77 hrs, Volume= 0.456 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Starting Elev= 249.10' Surf.Area= 15,970 sf Storage= 16,814 cf
Peak Elev= 249.72' @ 12.77 hrs Surf.Area= 16,741 sf Storage= 26,949 cf (10,135 cf above start)
Flood Elev= 252.50' Surf.Area= 22,800 sf Storage= 51,636 cf (34,822 cf above start)

Plug-Flow detention time= 1,234.4 min calculated for 0.070 af (15% of inflow)
Center-of-Mass det. time= 277.5 min (1,104.9 - 827.4)

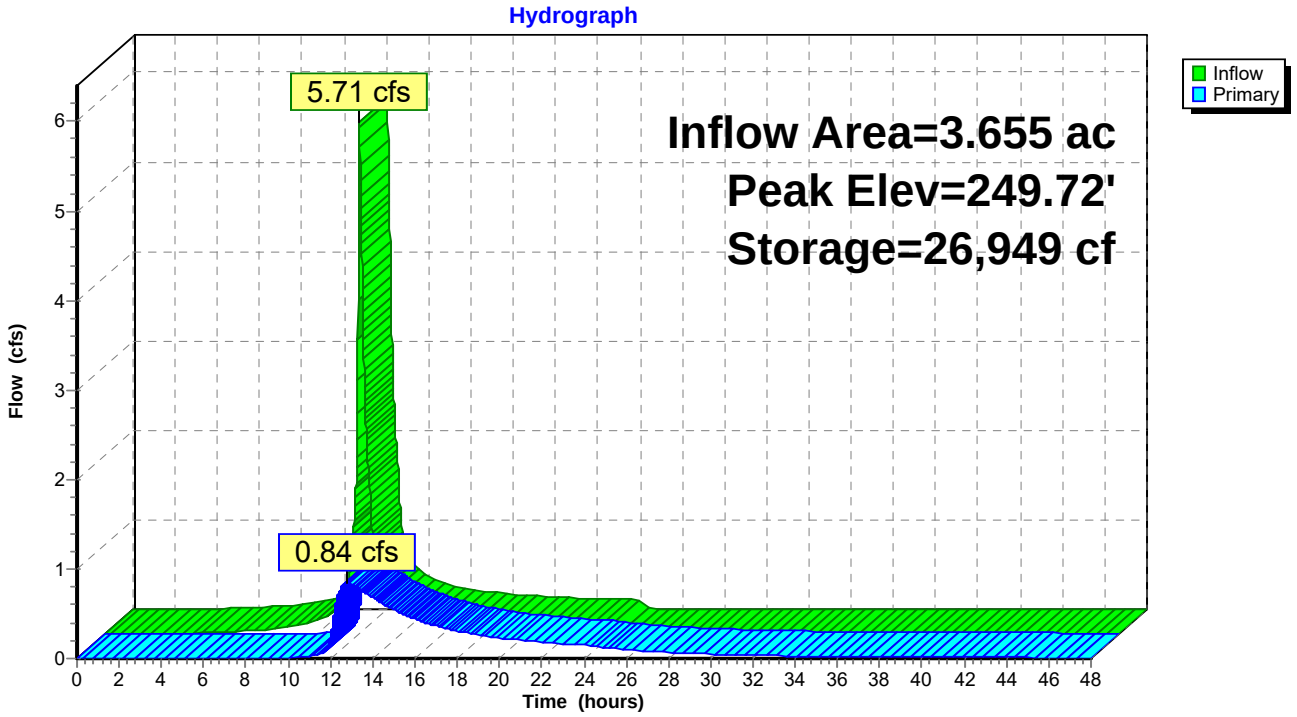
Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	51,636 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	14,601	0	0
250.00	17,090	31,691	31,691
251.00	22,800	19,945	51,636

Device	Routing	Invert	Outlet Devices
#1	Device 2	249.10'	**12.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 249.10' / 249.02' S= 0.0032 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Primary	249.02'	**15.0" Round Culvert** L= 594.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 249.02' / 247.20' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.84 cfs @ 12.77 hrs HW=249.72' (Free Discharge)
↑—**2=Culvert** (Passes 0.84 cfs of 1.30 cfs potential flow)
↑—**1=Culvert** (Barrel Controls 0.84 cfs @ 2.35 fps)

Pond 16P: Existing Pond



Summary for Subcatchment 15S: Pre Area 1

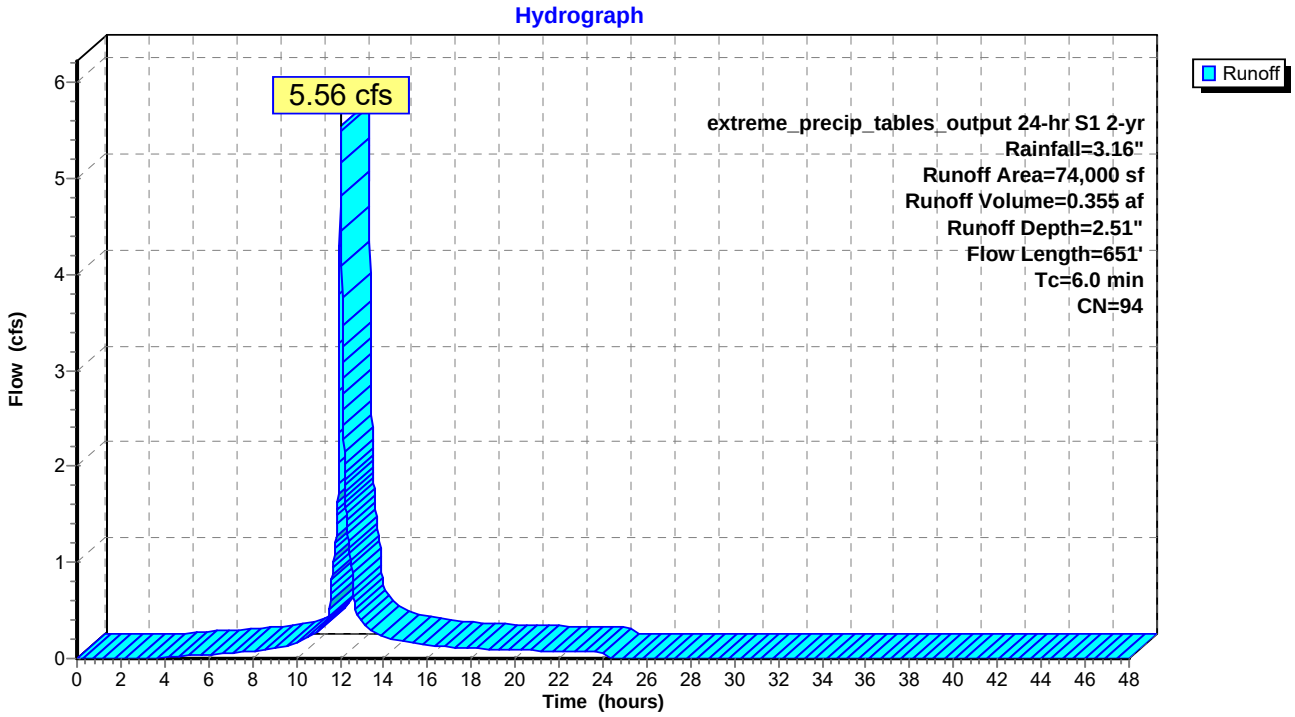
Runoff = 5.56 cfs @ 12.04 hrs, Volume= 0.355 af, Depth= 2.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 2-yr Rainfall=3.16"

Area (sf)	CN	Description
55,000	98	Paved parking
10,800	98	roofs
8,200	61	>75% Grass cover, Good, HSG B
74,000	94	Weighted Average
8,200	61	11.08% Pervious Area
65,800	98	88.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0350	1.74		**Sheet Flow, Reach A-b** Smooth surfaces n= 0.011 P2= 3.50"
0.0	20	0.0350	7.31	7.31	**Channel Flow, Reach B-C** Area= 1.0 sf Perim= 5.0' r= 0.20' n= 0.013 Concrete, trowel finish
0.9	194	0.0350	3.80		**Shallow Concentrated Flow, Reach C-D** Paved Kv= 20.3 fps
1.0	352	0.0063	5.72	17.96	**Pipe Channel, Reach D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.1					**Direct Entry,**
5.8	651	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15S: Pre Area 1



Summary for Subcatchment 17S: Pre Area 2

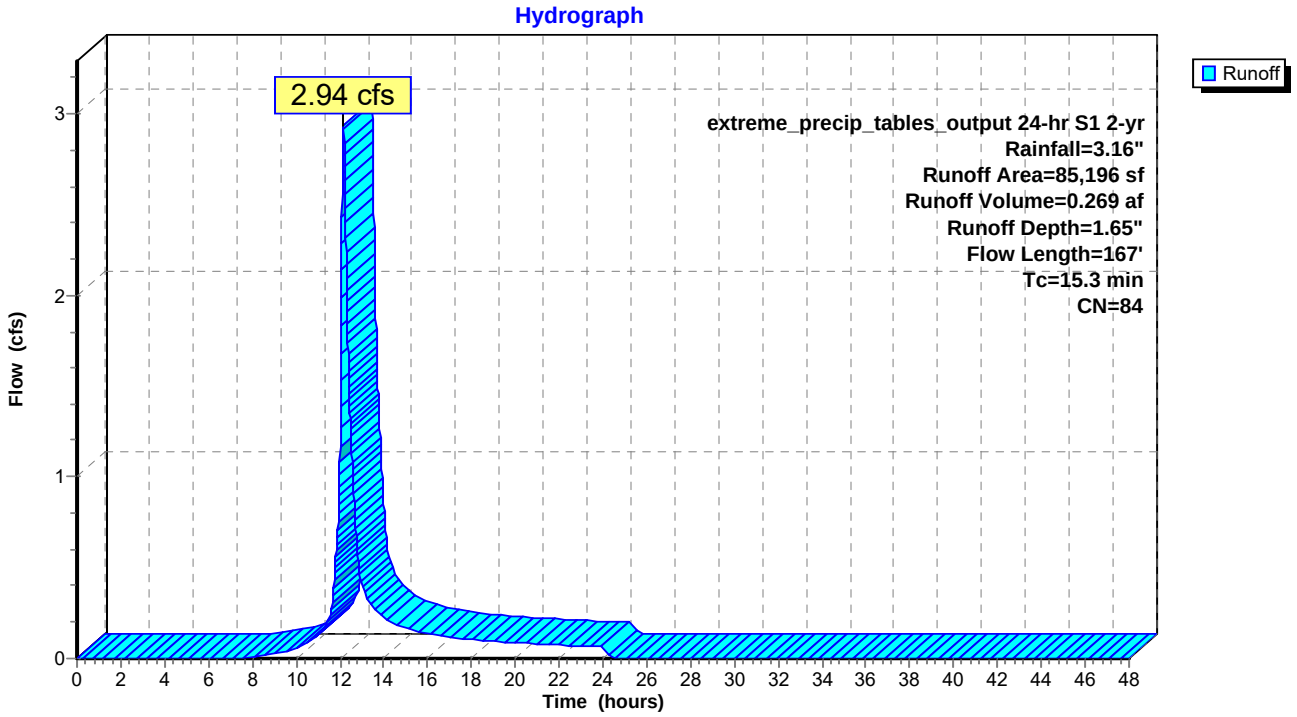
Runoff = 2.94 cfs @ 12.16 hrs, Volume= 0.269 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 2-yr Rainfall=3.16"

Area (sf)	CN	Description
13,520	98	Paved parking
14,500	96	Gravel surface, HSG B
1,200	61	>75% Grass cover, Good, HSG B
33,176	65	Woods/grass comb., Fair, HSG B
22,800	98	Water Surface, 0% imp, HSG B
85,196	84	Weighted Average
71,676	82	84.13% Pervious Area
13,520	98	15.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	60	0.0500	0.11		**Sheet Flow, Reach A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
5.3	40	0.0100	0.13		**Sheet Flow, Reach B-C** Range n= 0.130 P2= 3.50"
0.3	35	0.0200	2.28		**Shallow Concentrated Flow, Reach C-D** Unpaved Kv= 16.1 fps
0.2	32	0.1500	2.71		**Shallow Concentrated Flow, Reach** Short Grass Pasture Kv= 7.0 fps
15.3	167	Total			

Subcatchment 17S: Pre Area 2



Summary for Pond 16P: Existing Pond

Inflow Area = 3.655 ac, 49.83% Impervious, Inflow Depth = 2.05" for 2-yr event
Inflow = 7.26 cfs @ 12.05 hrs, Volume= 0.623 af
Outflow = 1.26 cfs @ 12.70 hrs, Volume= 0.600 af, Atten= 83%, Lag= 39.2 min
Primary = 1.26 cfs @ 12.70 hrs, Volume= 0.600 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Starting Elev= 249.10' Surf.Area= 15,970 sf Storage= 16,814 cf
Peak Elev= 249.89' @ 12.70 hrs Surf.Area= 16,948 sf Storage= 29,746 cf (12,932 cf above start)
Flood Elev= 252.50' Surf.Area= 22,800 sf Storage= 51,636 cf (34,822 cf above start)

Plug-Flow detention time= 790.4 min calculated for 0.214 af (34% of inflow)
Center-of-Mass det. time= 249.1 min (1,068.7 - 819.6)

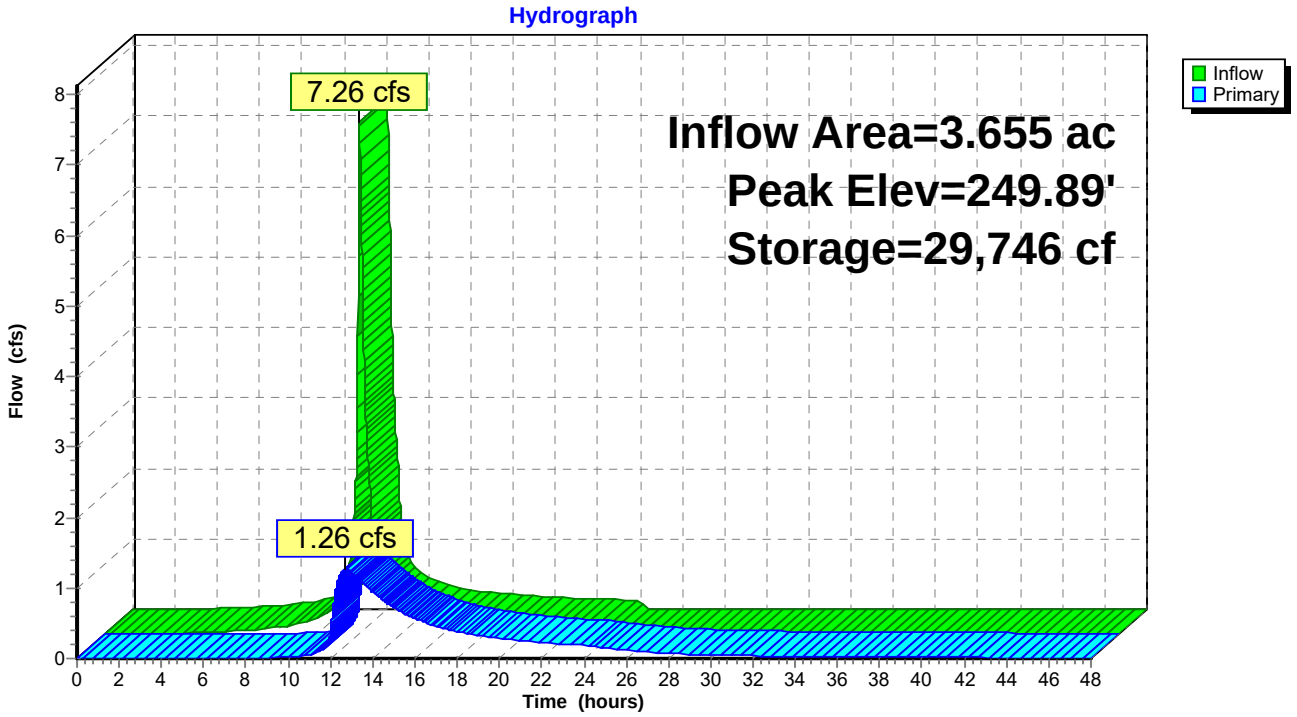
Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	51,636 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	14,601	0	0
250.00	17,090	31,691	31,691
251.00	22,800	19,945	51,636

Device	Routing	Invert	Outlet Devices
#1	Device 2	249.10'	**12.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 249.10' / 249.02' S= 0.0032 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Primary	249.02'	**15.0" Round Culvert** L= 594.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 249.02' / 247.20' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.26 cfs @ 12.70 hrs HW=249.89' (Free Discharge)
↑—**2=Culvert** (Passes 1.26 cfs of 1.88 cfs potential flow)
↑—**1=Culvert** (Barrel Controls 1.26 cfs @ 2.62 fps)

Pond 16P: Existing Pond



Summary for Subcatchment 15S: Pre Area 1

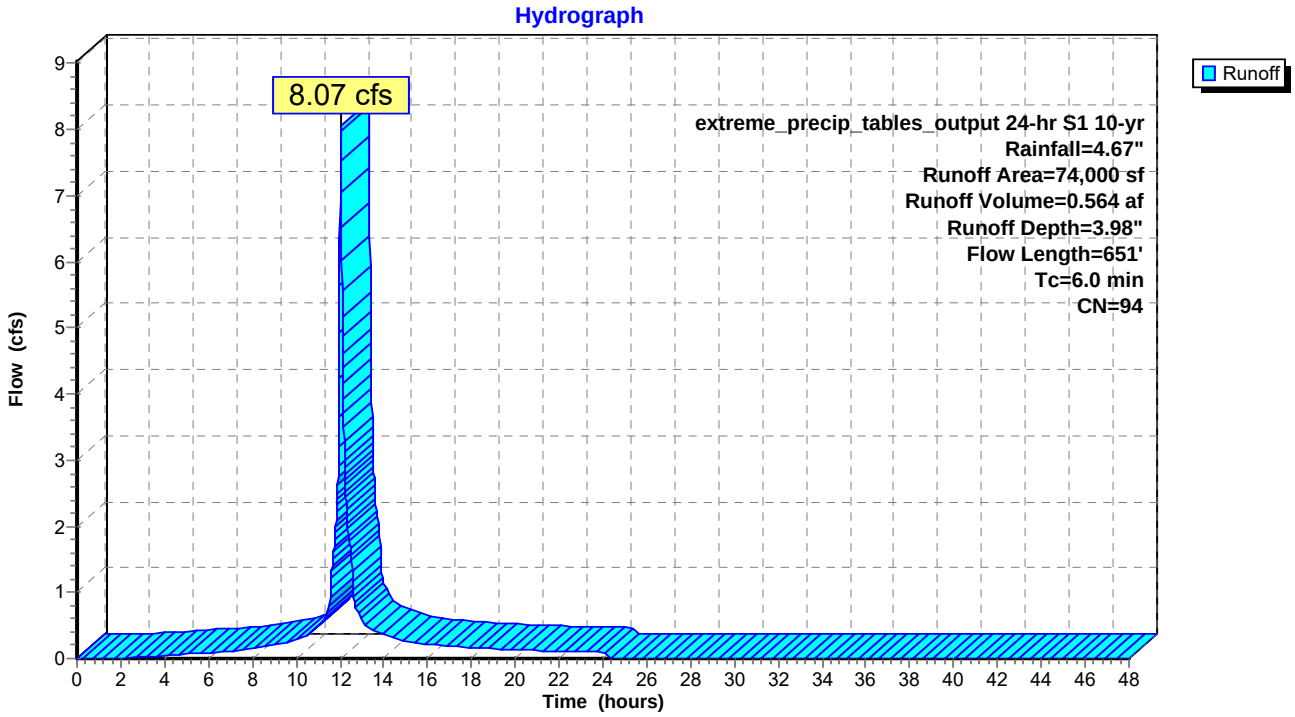
Runoff = 8.07 cfs @ 12.04 hrs, Volume= 0.564 af, Depth= 3.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 10-yr Rainfall=4.67"

Area (sf)	CN	Description
55,000	98	Paved parking
10,800	98	roofs
8,200	61	>75% Grass cover, Good, HSG B
74,000	94	Weighted Average
8,200	61	11.08% Pervious Area
65,800	98	88.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0350	1.74		**Sheet Flow, Reach A-b** Smooth surfaces n= 0.011 P2= 3.50"
0.0	20	0.0350	7.31	7.31	**Channel Flow, Reach B-C** Area= 1.0 sf Perim= 5.0' r= 0.20' n= 0.013 Concrete, trowel finish
0.9	194	0.0350	3.80		**Shallow Concentrated Flow, Reach C-D** Paved Kv= 20.3 fps
1.0	352	0.0063	5.72	17.96	**Pipe Channel, Reach D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.1					**Direct Entry,**
5.8	651	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15S: Pre Area 1



Summary for Subcatchment 17S: Pre Area 2

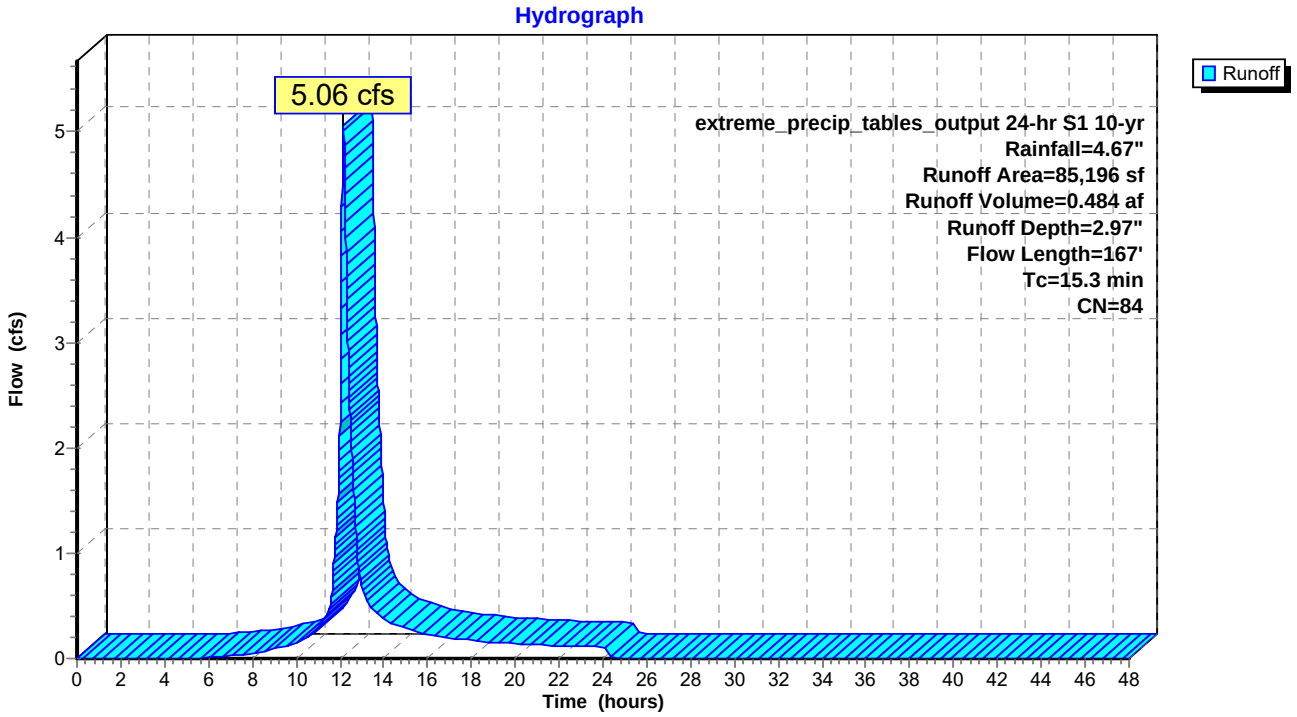
Runoff = 5.06 cfs @ 12.16 hrs, Volume= 0.484 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 10-yr Rainfall=4.67"

Area (sf)	CN	Description
13,520	98	Paved parking
14,500	96	Gravel surface, HSG B
1,200	61	>75% Grass cover, Good, HSG B
33,176	65	Woods/grass comb., Fair, HSG B
22,800	98	Water Surface, 0% imp, HSG B
85,196	84	Weighted Average
71,676	82	84.13% Pervious Area
13,520	98	15.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	60	0.0500	0.11		**Sheet Flow, Reach A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
5.3	40	0.0100	0.13		**Sheet Flow, Reach B-C** Range n= 0.130 P2= 3.50"
0.3	35	0.0200	2.28		**Shallow Concentrated Flow, Reach C-D** Unpaved Kv= 16.1 fps
0.2	32	0.1500	2.71		**Shallow Concentrated Flow, Reach** Short Grass Pasture Kv= 7.0 fps
15.3	167	Total			

Subcatchment 17S: Pre Area 2



Summary for Pond 16P: Existing Pond

Inflow Area = 3.655 ac, 49.83% Impervious, Inflow Depth = 3.44" for 10-yr event
Inflow = 11.20 cfs @ 12.05 hrs, Volume= 1.048 af
Outflow = 2.36 cfs @ 12.66 hrs, Volume= 1.024 af, Atten= 79%, Lag= 36.5 min
Primary = 2.36 cfs @ 12.66 hrs, Volume= 1.024 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Starting Elev= 249.10' Surf.Area= 15,970 sf Storage= 16,814 cf
Peak Elev= 250.32' @ 12.66 hrs Surf.Area= 18,929 sf Storage= 37,490 cf (20,676 cf above start)
Flood Elev= 252.50' Surf.Area= 22,800 sf Storage= 51,636 cf (34,822 cf above start)

Plug-Flow detention time= 481.5 min calculated for 0.638 af (61% of inflow)
Center-of-Mass det. time= 206.7 min (1,011.7 - 805.0)

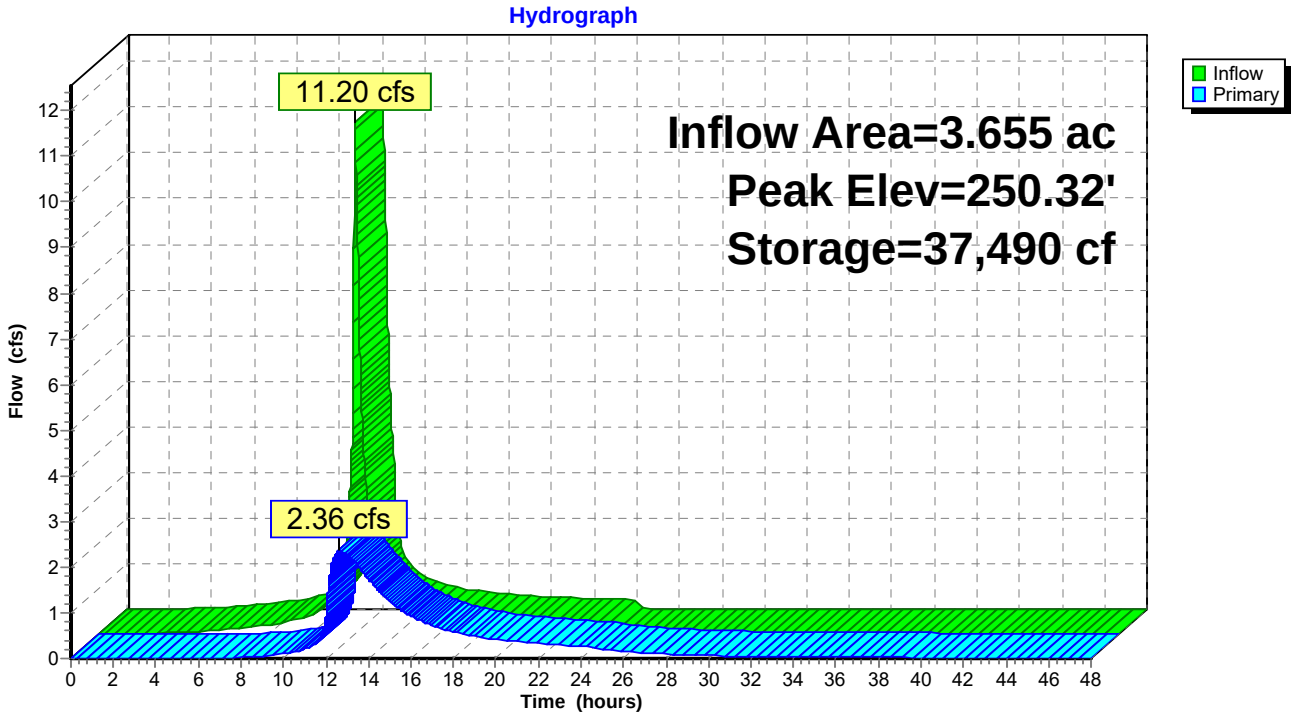
Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	51,636 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	14,601	0	0
250.00	17,090	31,691	31,691
251.00	22,800	19,945	51,636

Device	Routing	Invert	Outlet Devices
#1	Device 2	249.10'	**12.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 249.10' / 249.02' S= 0.0032 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Primary	249.02'	**15.0" Round Culvert** L= 594.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 249.02' / 247.20' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.36 cfs @ 12.66 hrs HW=250.32' (Free Discharge)
↑—**2=Culvert** (Passes 2.36 cfs of 3.41 cfs potential flow)
↑—**1=Culvert** (Barrel Controls 2.36 cfs @ 3.13 fps)

Pond 16P: Existing Pond



Summary for Subcatchment 15S: Pre Area 1

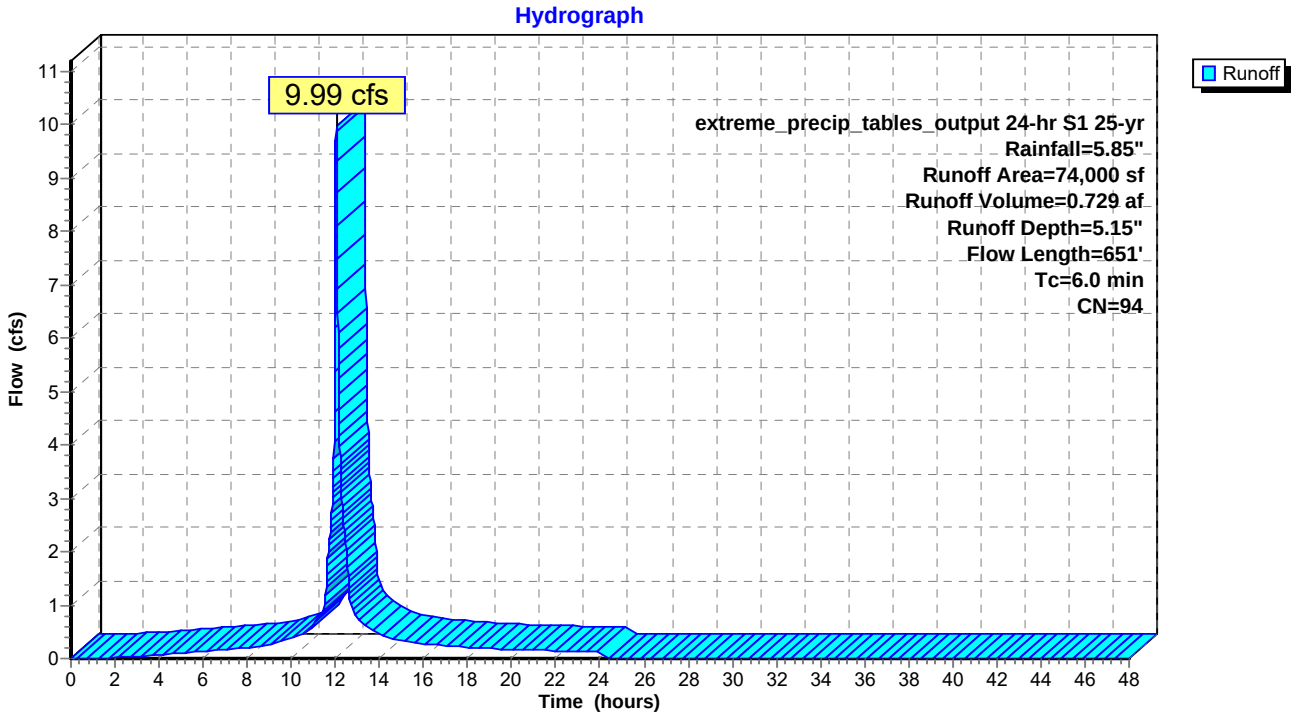
Runoff = 9.99 cfs @ 12.04 hrs, Volume= 0.729 af, Depth= 5.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 25-yr Rainfall=5.85"

Area (sf)	CN	Description
55,000	98	Paved parking
10,800	98	roofs
8,200	61	>75% Grass cover, Good, HSG B
74,000	94	Weighted Average
8,200	61	11.08% Pervious Area
65,800	98	88.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0350	1.74		**Sheet Flow, Reach A-b** Smooth surfaces n= 0.011 P2= 3.50"
0.0	20	0.0350	7.31	7.31	**Channel Flow, Reach B-C** Area= 1.0 sf Perim= 5.0' r= 0.20' n= 0.013 Concrete, trowel finish
0.9	194	0.0350	3.80		**Shallow Concentrated Flow, Reach C-D** Paved Kv= 20.3 fps
1.0	352	0.0063	5.72	17.96	**Pipe Channel, Reach D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.1					**Direct Entry,**
5.8	651	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15S: Pre Area 1



Summary for Subcatchment 17S: Pre Area 2

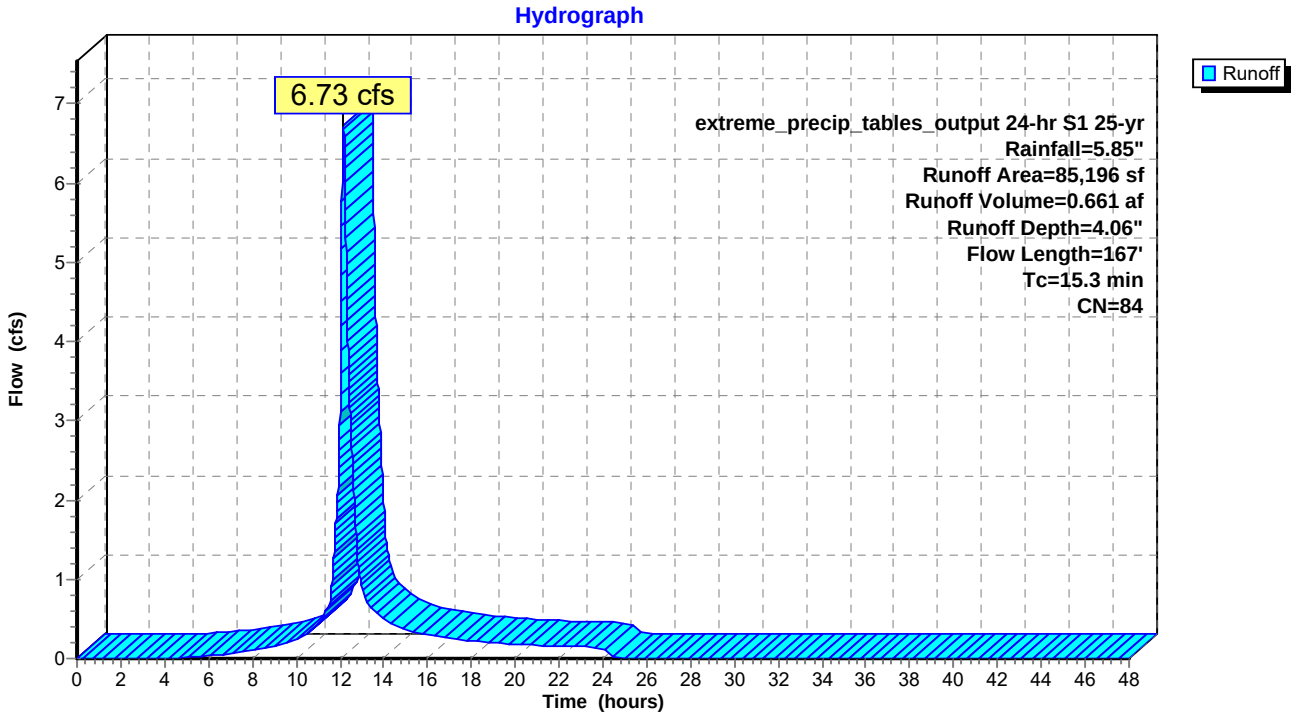
Runoff = 6.73 cfs @ 12.16 hrs, Volume= 0.661 af, Depth= 4.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 25-yr Rainfall=5.85"

Area (sf)	CN	Description
13,520	98	Paved parking
14,500	96	Gravel surface, HSG B
1,200	61	>75% Grass cover, Good, HSG B
33,176	65	Woods/grass comb., Fair, HSG B
22,800	98	Water Surface, 0% imp, HSG B
85,196	84	Weighted Average
71,676	82	84.13% Pervious Area
13,520	98	15.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	60	0.0500	0.11		**Sheet Flow, Reach A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
5.3	40	0.0100	0.13		**Sheet Flow, Reach B-C** Range n= 0.130 P2= 3.50"
0.3	35	0.0200	2.28		**Shallow Concentrated Flow, Reach C-D** Unpaved Kv= 16.1 fps
0.2	32	0.1500	2.71		**Shallow Concentrated Flow, Reach** Short Grass Pasture Kv= 7.0 fps
15.3	167	Total			

Subcatchment 17S: Pre Area 2



Summary for Pond 16P: Existing Pond

Inflow Area = 3.655 ac, 49.83% Impervious, Inflow Depth = 4.56" for 25-yr event
Inflow = 14.27 cfs @ 12.05 hrs, Volume= 1.390 af
Outflow = 3.02 cfs @ 12.66 hrs, Volume= 1.366 af, Atten= 79%, Lag= 36.9 min
Primary = 3.02 cfs @ 12.66 hrs, Volume= 1.366 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Starting Elev= 249.10' Surf.Area= 15,970 sf Storage= 16,814 cf
Peak Elev= 250.64' @ 12.66 hrs Surf.Area= 20,733 sf Storage= 43,758 cf (26,944 cf above start)
Flood Elev= 252.50' Surf.Area= 22,800 sf Storage= 51,636 cf (34,822 cf above start)

Plug-Flow detention time= 404.2 min calculated for 0.979 af (70% of inflow)
Center-of-Mass det. time= 192.6 min (989.7 - 797.1)

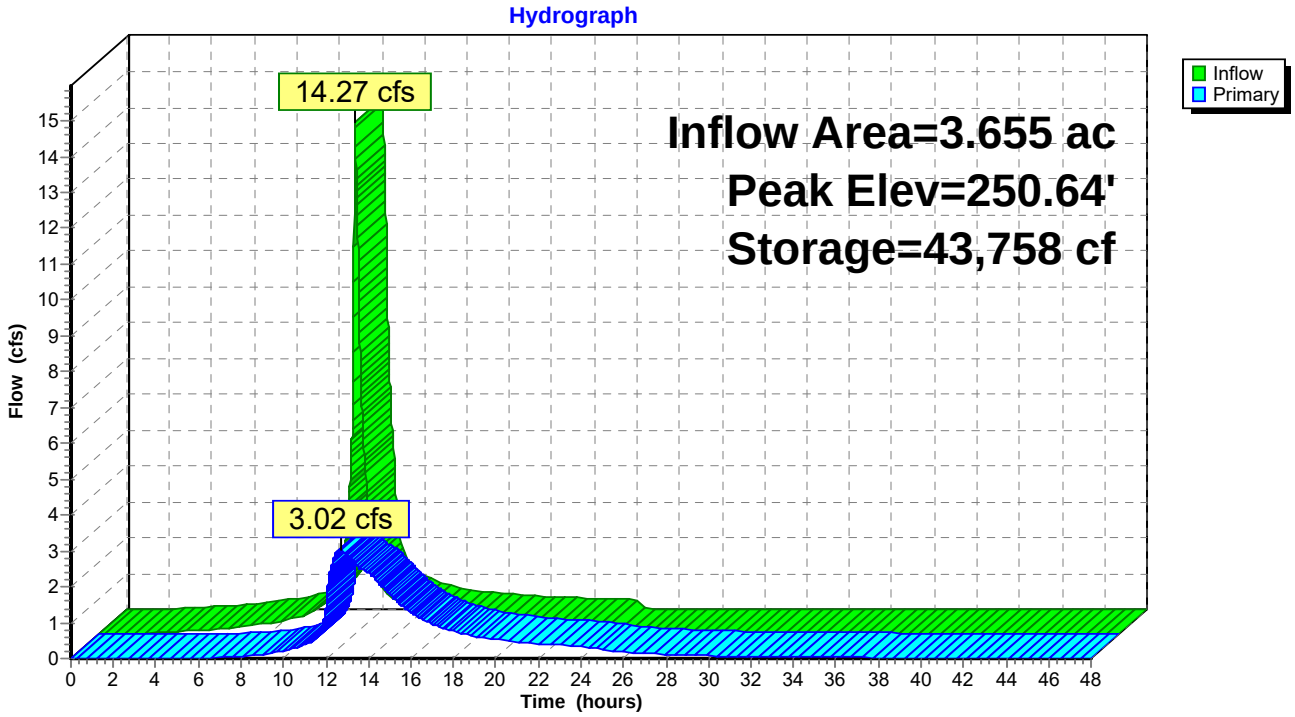
Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	51,636 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	14,601	0	0
250.00	17,090	31,691	31,691
251.00	22,800	19,945	51,636

Device	Routing	Invert	Outlet Devices
#1	Device 2	249.10'	**12.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 249.10' / 249.02' S= 0.0032 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Primary	249.02'	**15.0" Round Culvert** L= 594.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 249.02' / 247.20' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.02 cfs @ 12.66 hrs HW=250.64' (Free Discharge)
↑—**2=Culvert** (Passes 3.02 cfs of 3.90 cfs potential flow)
↑—**1=Culvert** (Barrel Controls 3.02 cfs @ 3.85 fps)

Pond 16P: Existing Pond



Summary for Subcatchment 15S: Pre Area 1

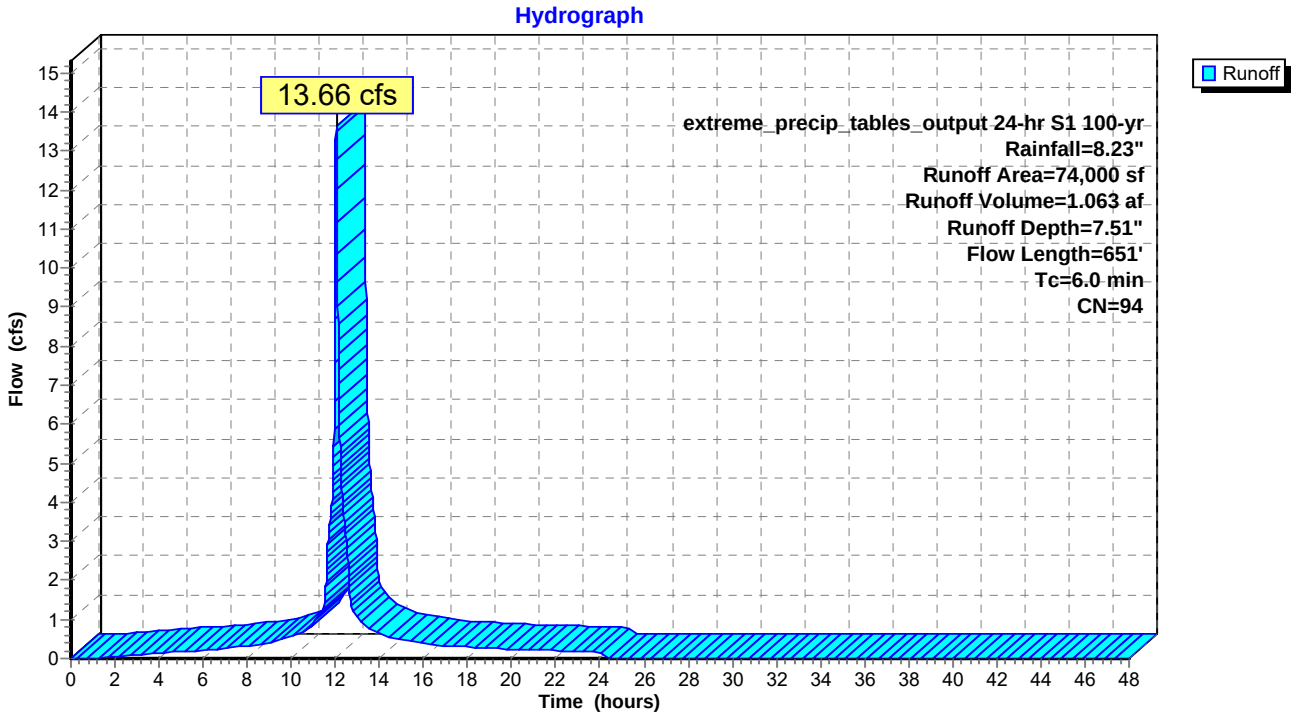
Runoff = 13.66 cfs @ 12.04 hrs, Volume= 1.063 af, Depth= 7.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 100-yr Rainfall=8.23"

Area (sf)	CN	Description
55,000	98	Paved parking
10,800	98	roofs
8,200	61	>75% Grass cover, Good, HSG B
74,000	94	Weighted Average
8,200	61	11.08% Pervious Area
65,800	98	88.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0350	1.74		**Sheet Flow, Reach A-b** Smooth surfaces n= 0.011 P2= 3.50"
0.0	20	0.0350	7.31	7.31	**Channel Flow, Reach B-C** Area= 1.0 sf Perim= 5.0' r= 0.20' n= 0.013 Concrete, trowel finish
0.9	194	0.0350	3.80		**Shallow Concentrated Flow, Reach C-D** Paved Kv= 20.3 fps
1.0	352	0.0063	5.72	17.96	**Pipe Channel, Reach D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.1					**Direct Entry,**
5.8	651	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15S: Pre Area 1



Summary for Subcatchment 17S: Pre Area 2

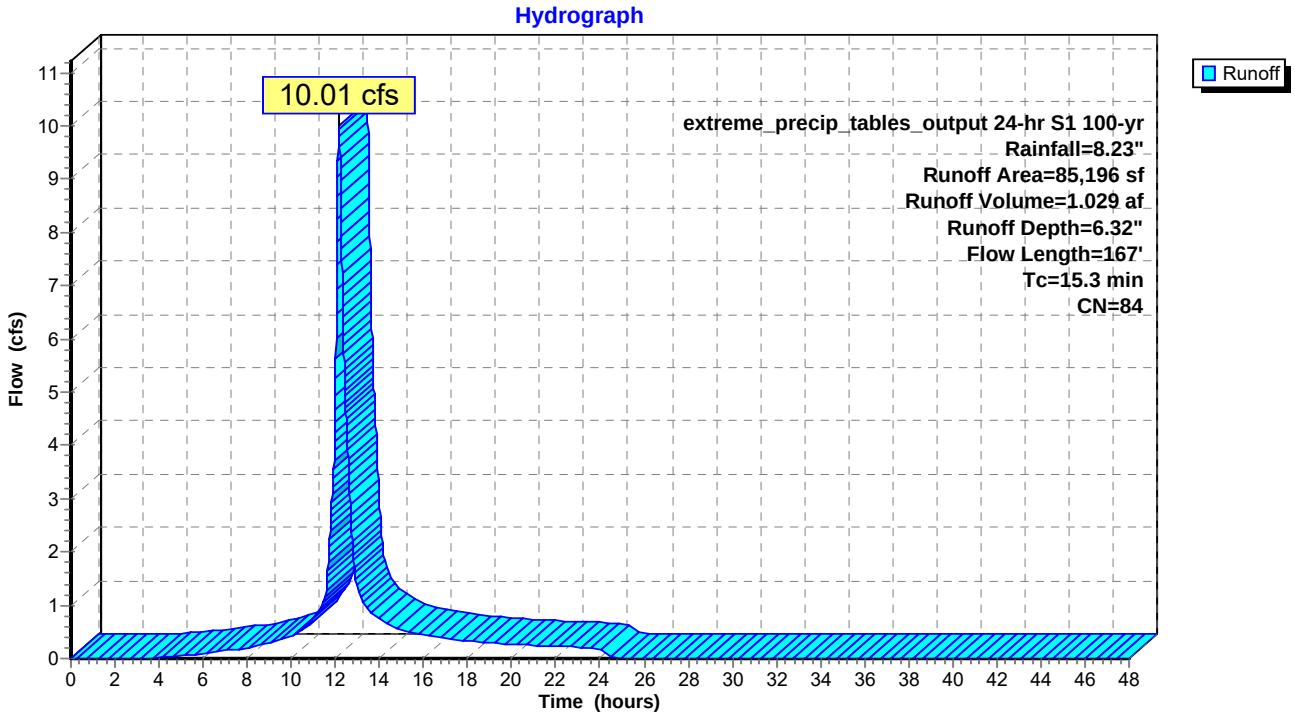
Runoff = 10.01 cfs @ 12.16 hrs, Volume= 1.029 af, Depth= 6.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 100-yr Rainfall=8.23"

Area (sf)	CN	Description
13,520	98	Paved parking
14,500	96	Gravel surface, HSG B
1,200	61	>75% Grass cover, Good, HSG B
33,176	65	Woods/grass comb., Fair, HSG B
22,800	98	Water Surface, 0% imp, HSG B
85,196	84	Weighted Average
71,676	82	84.13% Pervious Area
13,520	98	15.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	60	0.0500	0.11		**Sheet Flow, Reach A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
5.3	40	0.0100	0.13		**Sheet Flow, Reach B-C** Range n= 0.130 P2= 3.50"
0.3	35	0.0200	2.28		**Shallow Concentrated Flow, Reach C-D** Unpaved Kv= 16.1 fps
0.2	32	0.1500	2.71		**Shallow Concentrated Flow, Reach** Short Grass Pasture Kv= 7.0 fps
15.3	167	Total			

Subcatchment 17S: Pre Area 2



Summary for Pond 16P: Existing Pond

Inflow Area = 3.655 ac, 49.83% Impervious, Inflow Depth = 6.87" for 100-yr event
Inflow = 20.28 cfs @ 12.05 hrs, Volume= 2.093 af
Outflow = 13.97 cfs @ 12.30 hrs, Volume= 2.068 af, Atten= 31%, Lag= 15.1 min
Primary = 13.97 cfs @ 12.30 hrs, Volume= 2.068 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Starting Elev= 249.10' Surf.Area= 15,970 sf Storage= 16,814 cf
Peak Elev= 279.45' @ 12.30 hrs Surf.Area= 22,800 sf Storage= 51,636 cf (34,822 cf above start)
Flood Elev= 252.50' Surf.Area= 22,800 sf Storage= 51,636 cf (34,822 cf above start)

Plug-Flow detention time= 323.1 min calculated for 1.681 af (80% of inflow)
Center-of-Mass det. time= 170.5 min (956.2 - 785.6)

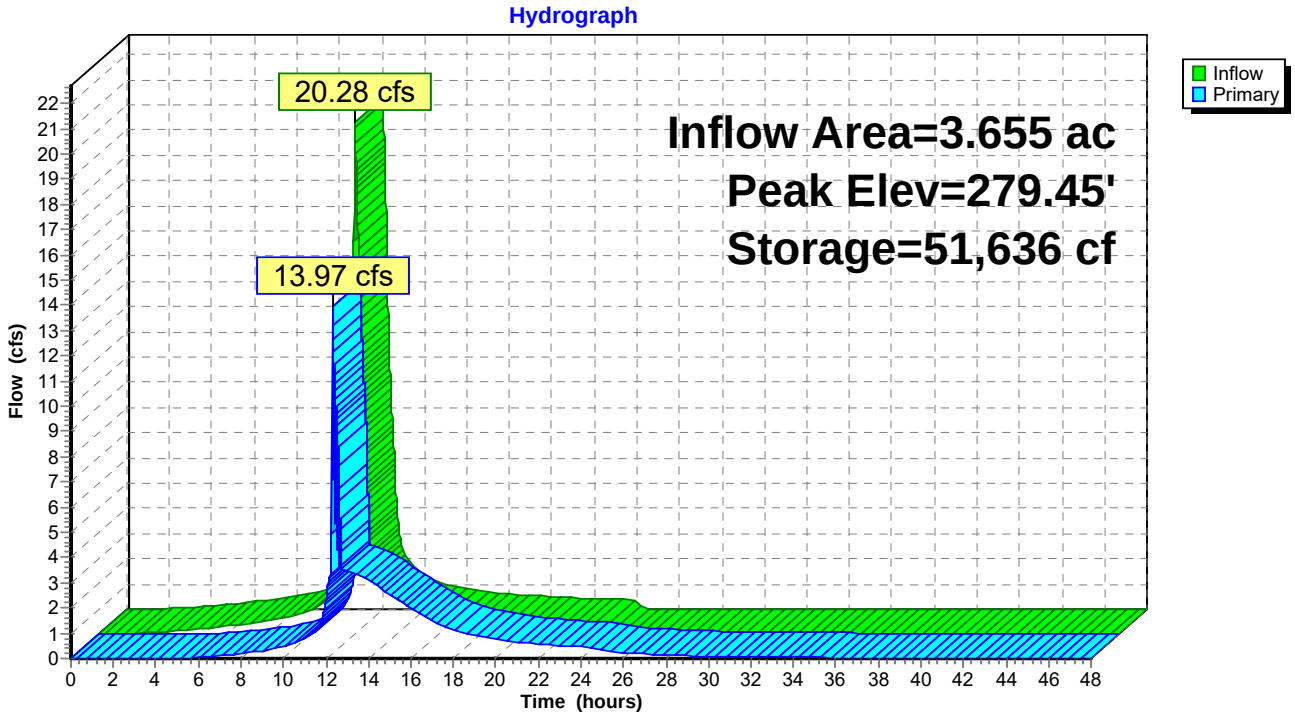
Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	51,636 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	14,601	0	0
250.00	17,090	31,691	31,691
251.00	22,800	19,945	51,636

Device	Routing	Invert	Outlet Devices
#1	Device 2	249.10'	**12.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 249.10' / 249.02' S= 0.0032 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Primary	249.02'	**15.0" Round Culvert** L= 594.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 249.02' / 247.20' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

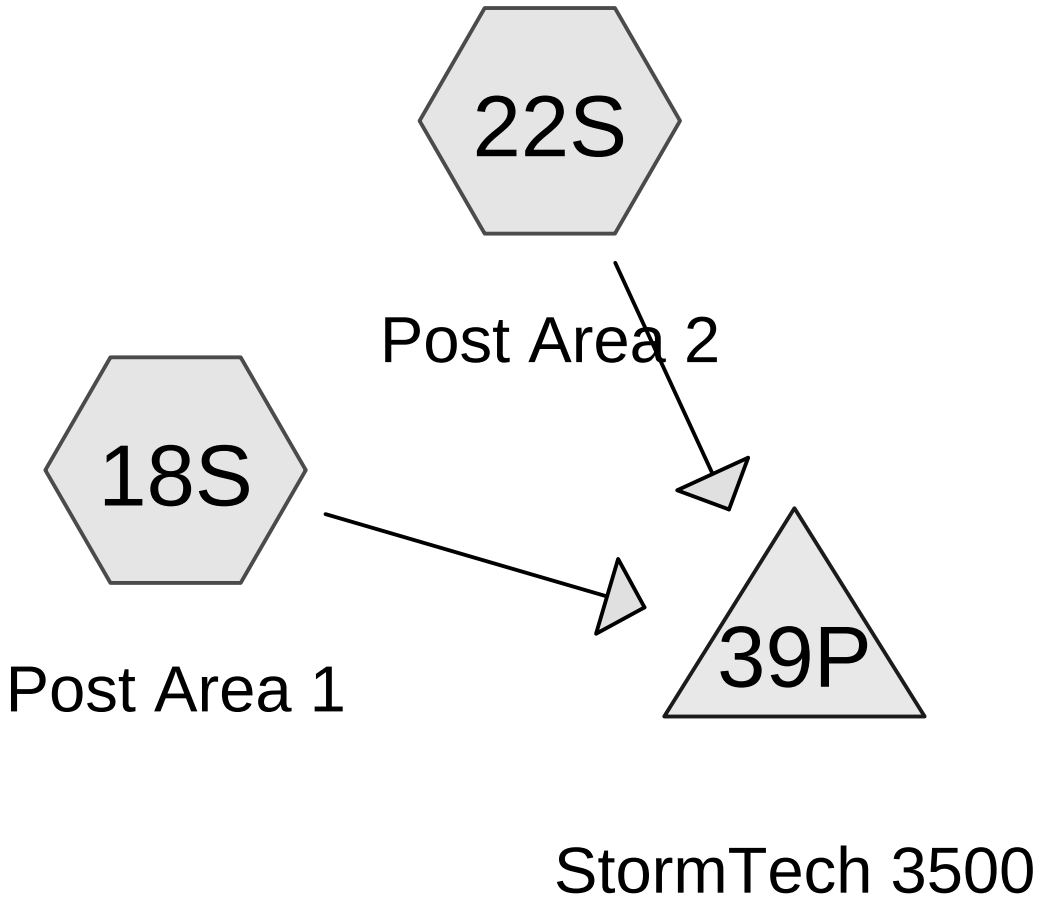
Primary OutFlow Max=13.04 cfs @ 12.30 hrs HW=276.09' (Free Discharge)
↑—**2=Culvert** (Barrel Controls 13.04 cfs @ 10.63 fps)
↑—**1=Culvert** (Passes 13.04 cfs of 15.37 cfs potential flow)

Pond 16P: Existing Pond



Appendix B

Post-Development Cn, Tc Calculations & Post-Development Hydrographs & Summary



Subcat Reach Pond Link

Routing Diagram for Hudson Valley Volkswagen - Drainage 11-13-13
Prepared by Day & Stokosa Engineering, PC, Printed 9/15/2026

Summary for Subcatchment 18S: Post Area 1

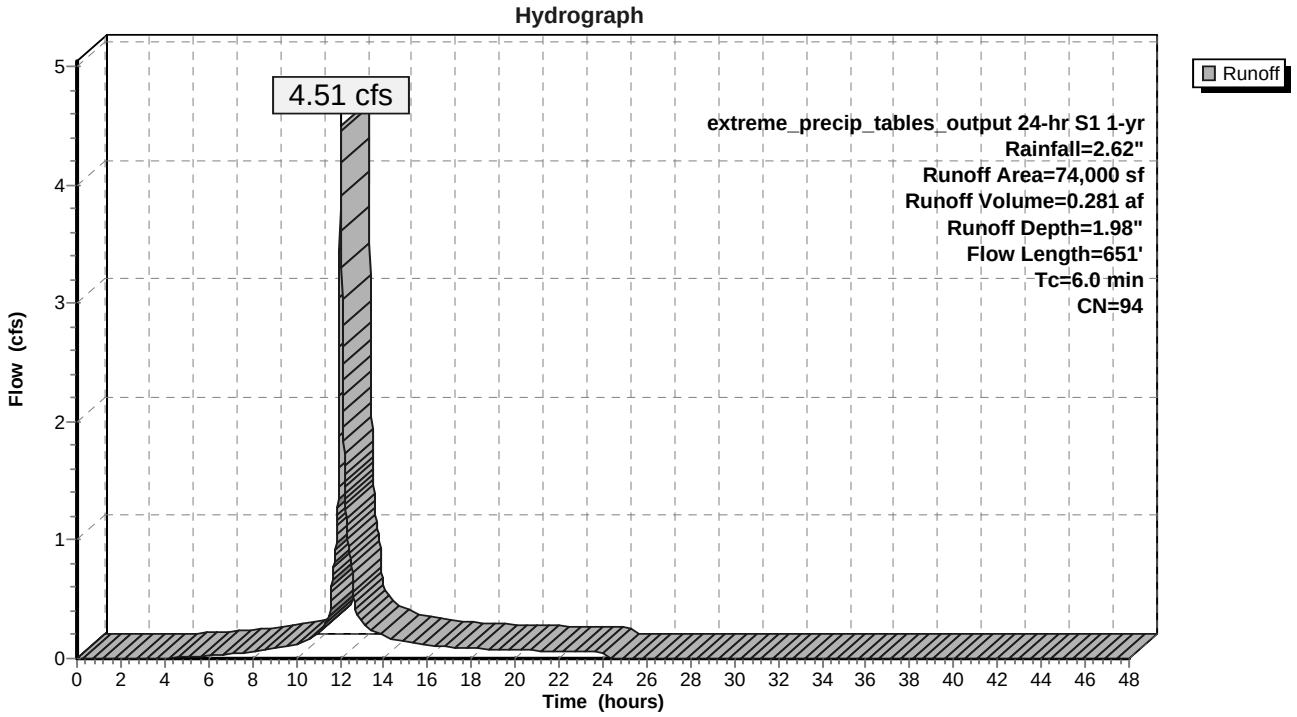
Runoff = 4.51 cfs @ 12.04 hrs, Volume= 0.281 af, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 1-yr Rainfall=2.62"

Area (sf)	CN	Description
55,016	98	Paved parking
10,803	98	roofs
8,181	61	>75% Grass cover, Good, HSG B
74,000	94	Weighted Average
8,181	61	11.06% Pervious Area
65,819	98	88.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0350	1.74		**Sheet Flow, Reach A-b** Smooth surfaces n= 0.011 P2= 3.50"
0.0	20	0.0350	7.31	7.31	**Channel Flow, Reach B-C** Area= 1.0 sf Perim= 5.0' r= 0.20' n= 0.013 Concrete, trowel finish
0.9	194	0.0350	3.80		**Shallow Concentrated Flow, Reach C-D** Paved Kv= 20.3 fps
1.0	352	0.0063	5.72	17.96	**Pipe Channel, Reach D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.1					**Direct Entry,**
5.8	651	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 18S: Post Area 1



Summary for Subcatchment 22S: Post Area 2

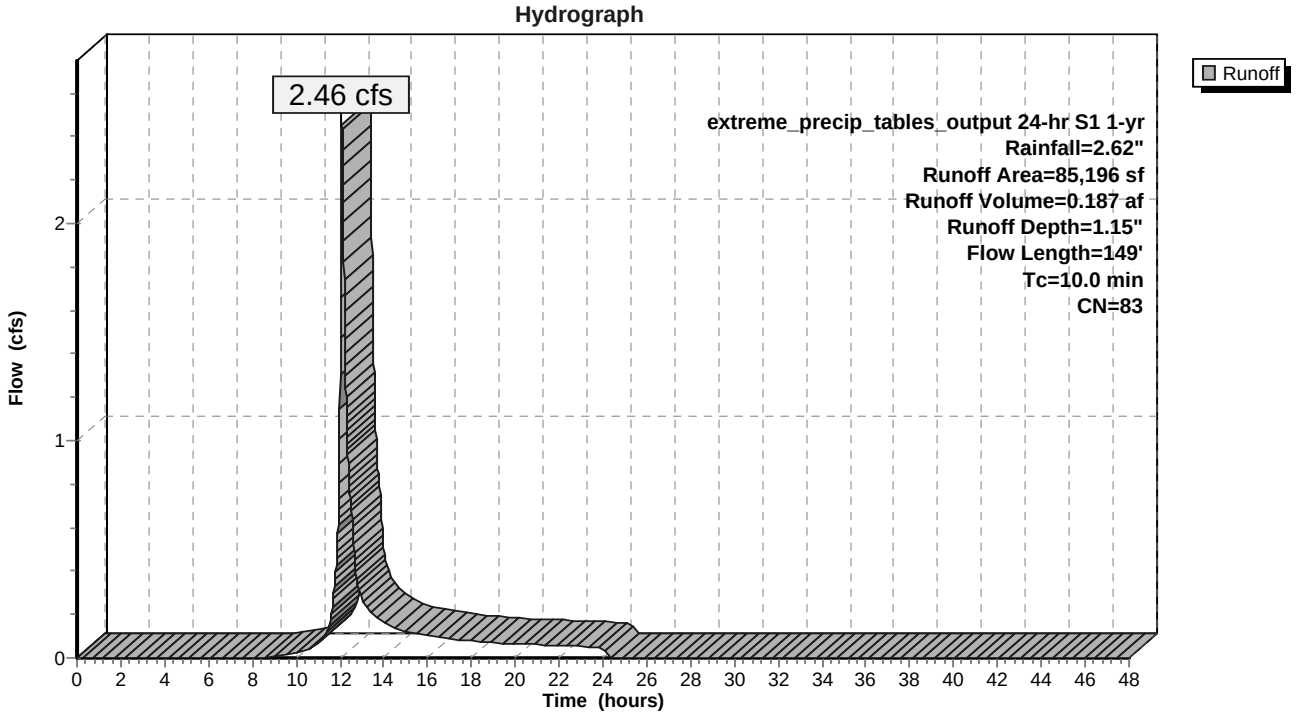
Runoff = 2.46 cfs @ 12.09 hrs, Volume= 0.187 af, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 1-yr Rainfall=2.62"

Area (sf)	CN	Description
13,520	98	Paved parking
37,300	96	Gravel surface, HSG B
7,000	61	>75% Grass cover, Good, HSG B
27,376	65	Woods/grass comb., Fair, HSG B
85,196	83	Weighted Average
71,676	81	84.13% Pervious Area
13,520	98	15.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	60	0.0500	0.11		**Sheet Flow, Reach A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.5	89	0.0220	3.01		**Shallow Concentrated Flow, Reach B-C** Paved Kv= 20.3 fps
10.0	149	Total			

Subcatchment 22S: Post Area 2



Summary for Pond 39P: StormTech 3500

Inflow Area = 3.655 ac, 49.84% Impervious, Inflow Depth = 1.54" for 1-yr event
Inflow = 6.57 cfs @ 12.05 hrs, Volume= 0.468 af
Outflow = 0.76 cfs @ 12.74 hrs, Volume= 0.438 af, Atten= 88%, Lag= 41.7 min
Primary = 0.76 cfs @ 12.74 hrs, Volume= 0.438 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Starting Elev= 249.02' Surf.Area= 23,445 sf Storage= 23,606 cf
Peak Elev= 249.54' @ 12.74 hrs Surf.Area= 23,445 sf Storage= 33,795 cf (10,189 cf above start)
Flood Elev= 253.75' Surf.Area= 23,445 sf Storage= 80,747 cf (57,142 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 305.3 min (1,131.6 - 826.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	247.45'	32,132 cf	**137.42'W x 170.61'L x 5.50'H Field A** 128,946 cf Overall - 48,615 cf Embedded = 80,330 cf x 40.0% Voids
#2A	248.20'	48,615 cf	**ADS_StormTech MC-3500 d +Cap** x 437 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 19 Rows of 23 Chambers Cap Storage= +14.9 cf x 2 x 19 rows = 566.2 cf
		80,747 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	249.02'	**15.0" Round Culvert** L= 594.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 249.02' / 247.20' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	249.02'	**12.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 248.33' / 249.02' S= -0.0276 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.76 cfs @ 12.74 hrs HW=249.54' (Free Discharge)
↑└**1=Culvert** (Barrel Controls 0.76 cfs @ 2.31 fps)
↑└**2=Culvert** (Passes 0.76 cfs of 0.81 cfs potential flow)

Pond 39P: StormTech 3500 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 19 rows = 566.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

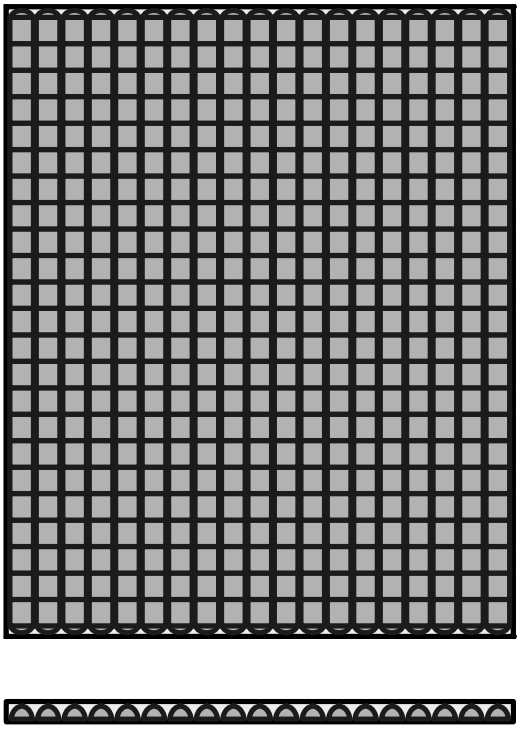
23 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 168.61' Row Length +12.0" End Stone x 2 = 170.61' Base Length
19 Rows x 77.0" Wide + 9.0" Spacing x 18 + 12.0" Side Stone x 2 = 137.42' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

437 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 19 Rows = 48,615.2 cf Chamber Storage

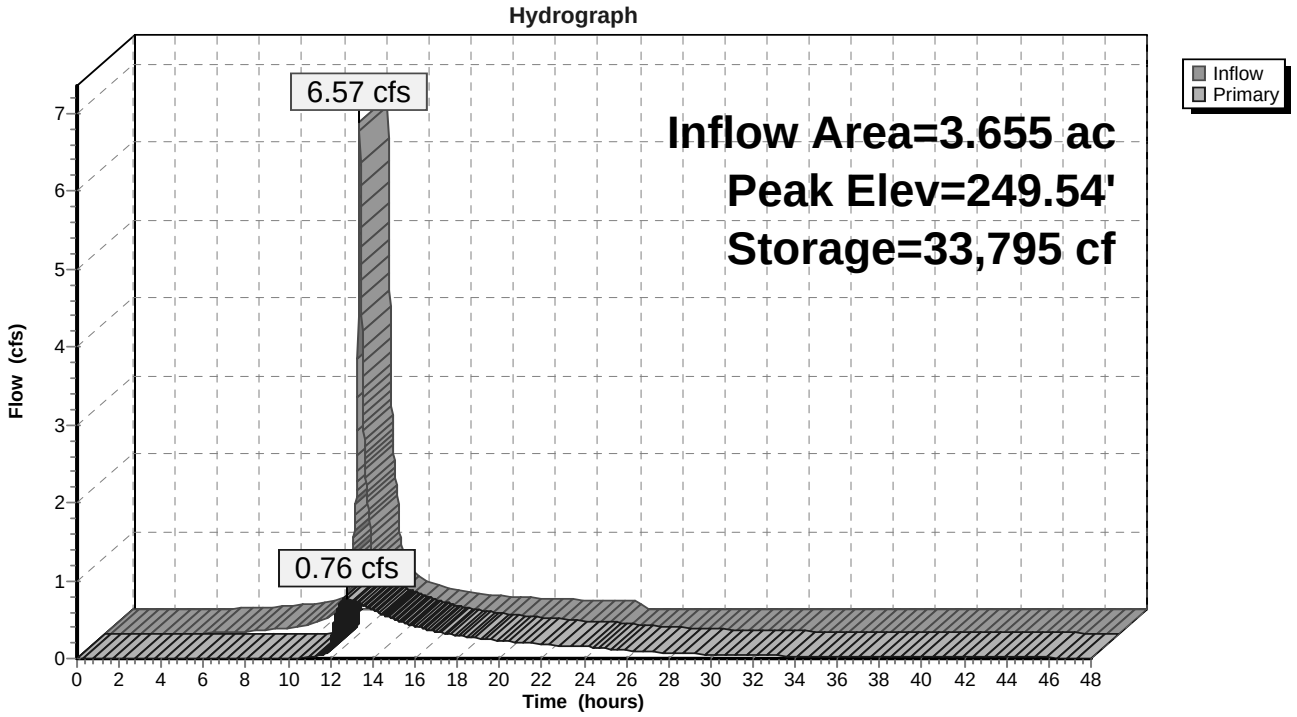
128,945.6 cf Field - 48,615.2 cf Chambers = 80,330.4 cf Stone x 40.0% Voids = 32,132.2 cf Stone Storage

Chamber Storage + Stone Storage = 80,747.4 cf = 1.854 af
Overall Storage Efficiency = 62.6%
Overall System Size = 170.61' x 137.42' x 5.50'

437 Chambers
4,775.8 cy Field
2,975.2 cy Stone



Pond 39P: StormTech 3500



Summary for Subcatchment 18S: Post Area 1

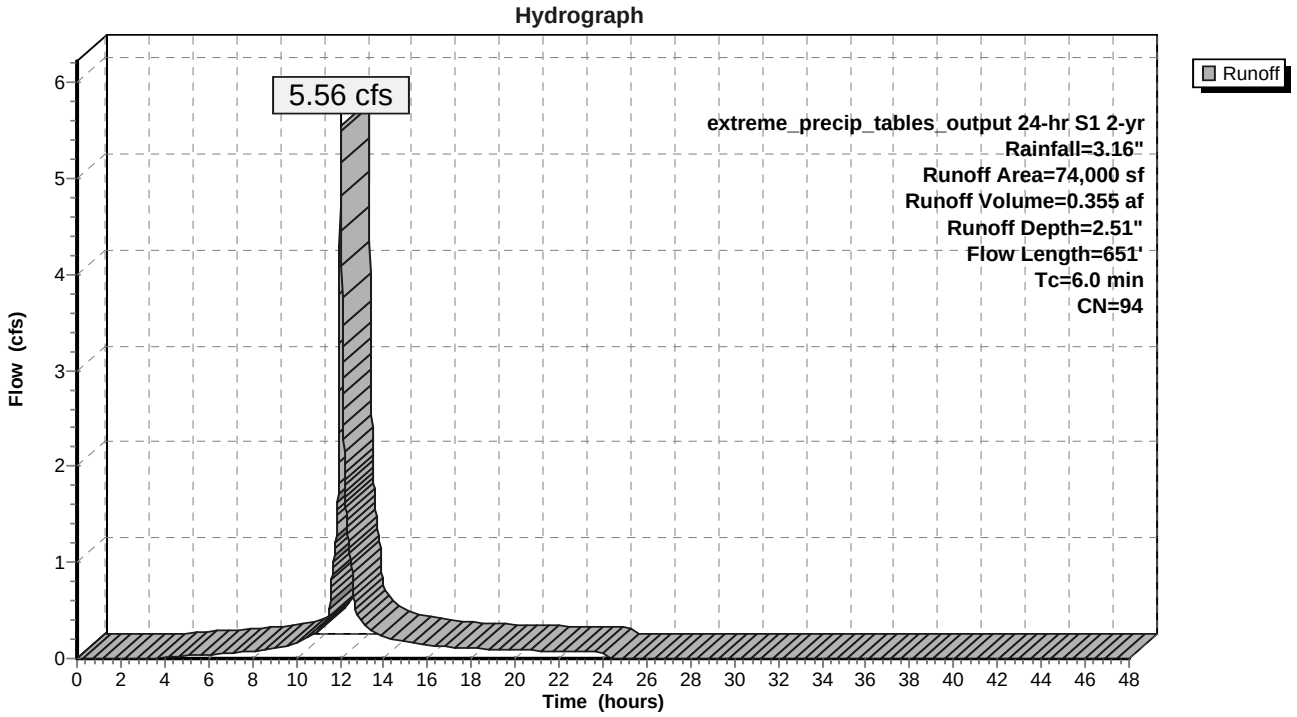
Runoff = 5.56 cfs @ 12.04 hrs, Volume= 0.355 af, Depth= 2.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 2-yr Rainfall=3.16"

Area (sf)	CN	Description
55,016	98	Paved parking
10,803	98	roofs
8,181	61	>75% Grass cover, Good, HSG B
74,000	94	Weighted Average
8,181	61	11.06% Pervious Area
65,819	98	88.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0350	1.74		**Sheet Flow, Reach A-b** Smooth surfaces n= 0.011 P2= 3.50"
0.0	20	0.0350	7.31	7.31	**Channel Flow, Reach B-C** Area= 1.0 sf Perim= 5.0' r= 0.20' n= 0.013 Concrete, trowel finish
0.9	194	0.0350	3.80		**Shallow Concentrated Flow, Reach C-D** Paved Kv= 20.3 fps
1.0	352	0.0063	5.72	17.96	**Pipe Channel, Reach D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.1					**Direct Entry,**
5.8	651	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 18S: Post Area 1



Summary for Subcatchment 22S: Post Area 2

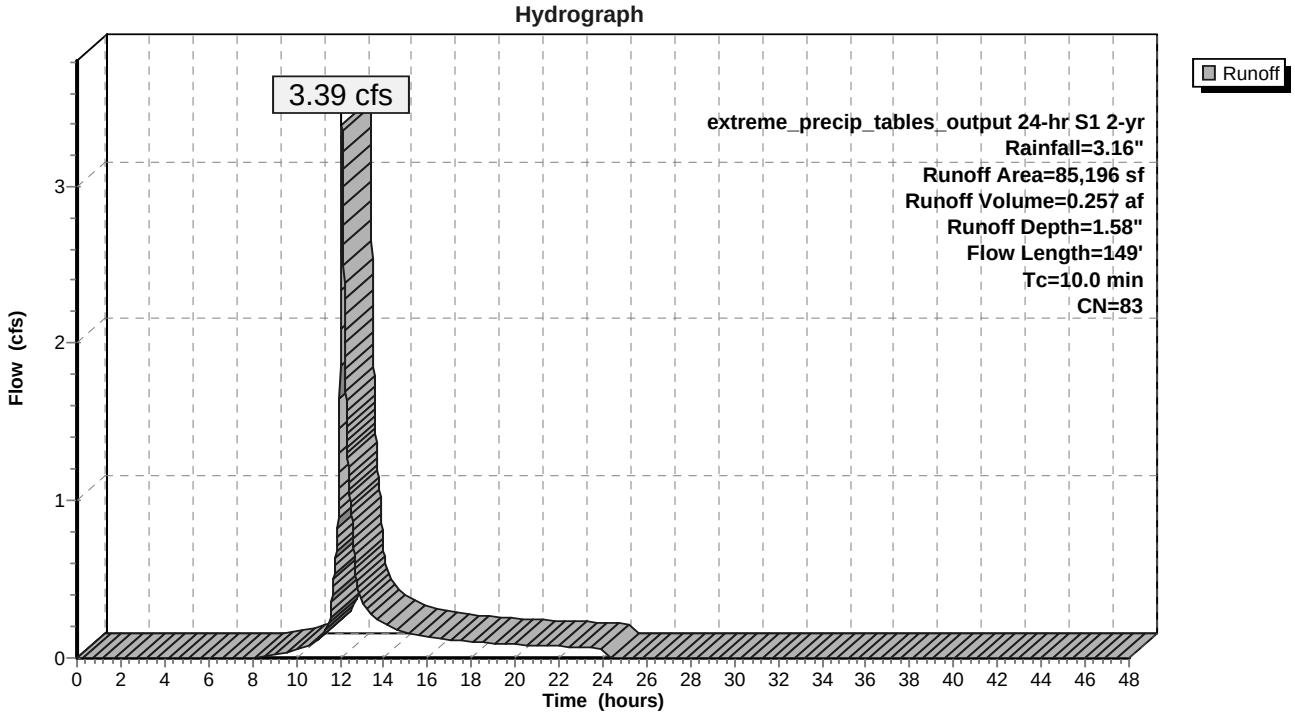
Runoff = 3.39 cfs @ 12.09 hrs, Volume= 0.257 af, Depth= 1.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 2-yr Rainfall=3.16"

Area (sf)	CN	Description
13,520	98	Paved parking
37,300	96	Gravel surface, HSG B
7,000	61	>75% Grass cover, Good, HSG B
27,376	65	Woods/grass comb., Fair, HSG B
85,196	83	Weighted Average
71,676	81	84.13% Pervious Area
13,520	98	15.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	60	0.0500	0.11		**Sheet Flow, Reach A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.5	89	0.0220	3.01		**Shallow Concentrated Flow, Reach B-C** Paved Kv= 20.3 fps
10.0	149	Total			

Subcatchment 22S: Post Area 2



Summary for Pond 39P: StormTech 3500

Inflow Area = 3.655 ac, 49.84% Impervious, Inflow Depth = 2.01" for 2-yr event
Inflow = 8.43 cfs @ 12.05 hrs, Volume= 0.612 af
Outflow = 1.21 cfs @ 12.65 hrs, Volume= 0.581 af, Atten= 86%, Lag= 36.0 min
Primary = 1.21 cfs @ 12.65 hrs, Volume= 0.581 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Starting Elev= 249.02' Surf.Area= 23,445 sf Storage= 23,606 cf
Peak Elev= 249.69' @ 12.65 hrs Surf.Area= 23,445 sf Storage= 36,600 cf (12,995 cf above start)
Flood Elev= 253.75' Surf.Area= 23,445 sf Storage= 80,747 cf (57,142 cf above start)

Plug-Flow detention time= 1,662.2 min calculated for 0.040 af (6% of inflow)
Center-of-Mass det. time= 269.8 min (1,088.4 - 818.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	247.45'	32,132 cf	**137.42'W x 170.61'L x 5.50'H Field A** 128,946 cf Overall - 48,615 cf Embedded = 80,330 cf x 40.0% Voids
#2A	248.20'	48,615 cf	**ADS_StormTech MC-3500 d +Cap** x 437 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 19 Rows of 23 Chambers Cap Storage= +14.9 cf x 2 x 19 rows = 566.2 cf
		80,747 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	249.02'	**15.0" Round Culvert** L= 594.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 249.02' / 247.20' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	249.02'	**12.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 248.33' / 249.02' S= -0.0276 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.21 cfs @ 12.65 hrs HW=249.69' (Free Discharge)
└**1=Culvert** (Barrel Controls 1.21 cfs @ 2.63 fps)
└**2=Culvert** (Passes 1.21 cfs of 1.23 cfs potential flow)

Pond 39P: StormTech 3500 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 19 rows = 566.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

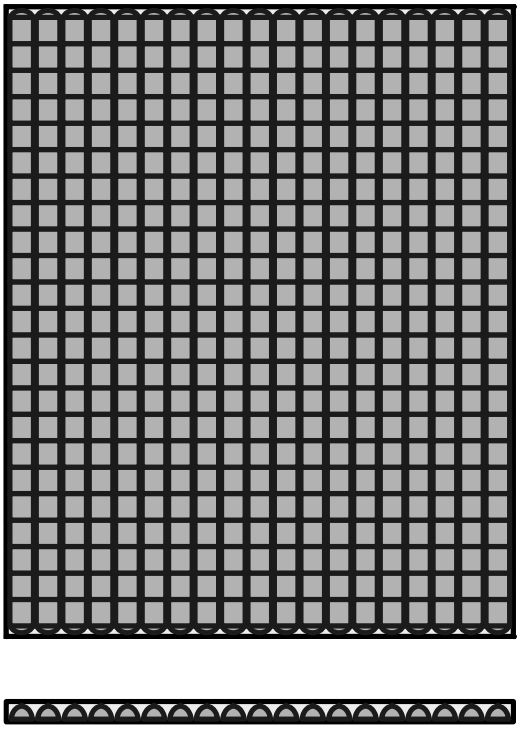
23 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 168.61' Row Length +12.0" End Stone x 2 = 170.61' Base Length
19 Rows x 77.0" Wide + 9.0" Spacing x 18 + 12.0" Side Stone x 2 = 137.42' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

437 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 19 Rows = 48,615.2 cf Chamber Storage

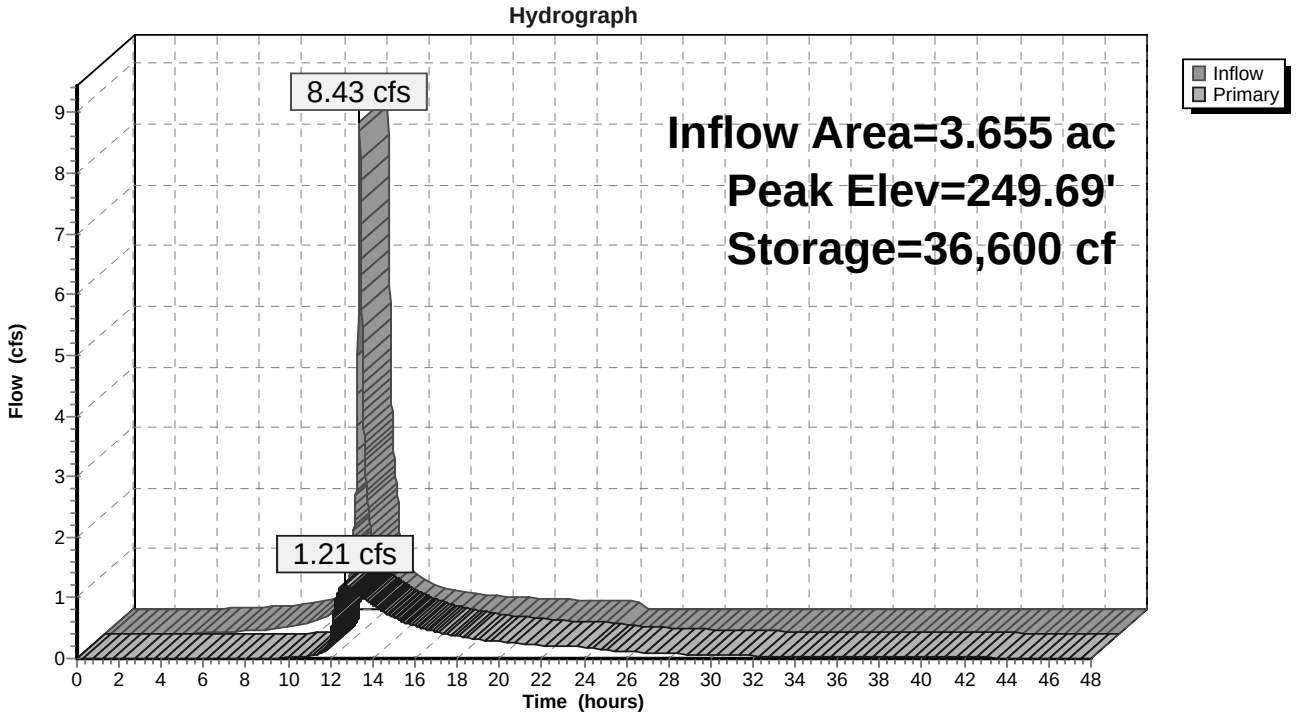
128,945.6 cf Field - 48,615.2 cf Chambers = 80,330.4 cf Stone x 40.0% Voids = 32,132.2 cf Stone Storage

Chamber Storage + Stone Storage = 80,747.4 cf = 1.854 af
Overall Storage Efficiency = 62.6%
Overall System Size = 170.61' x 137.42' x 5.50'

437 Chambers
4,775.8 cy Field
2,975.2 cy Stone



Pond 39P: StormTech 3500



Summary for Subcatchment 18S: Post Area 1

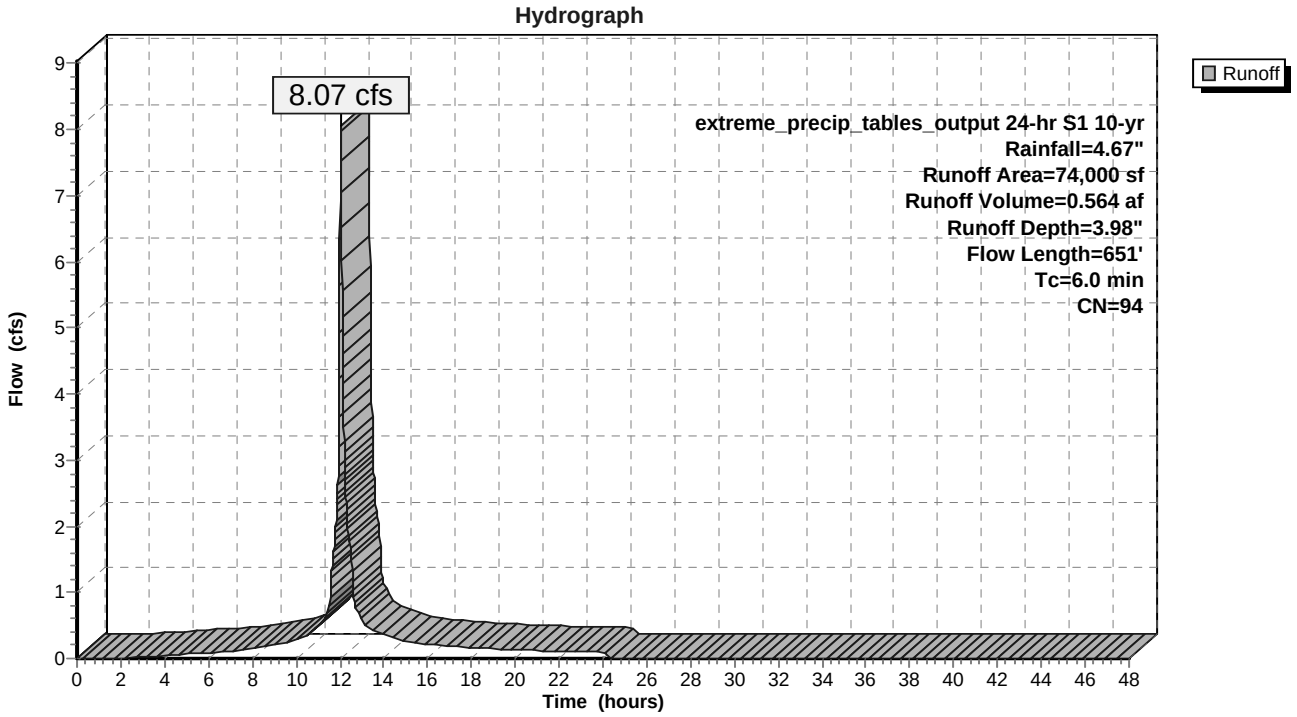
Runoff = 8.07 cfs @ 12.04 hrs, Volume= 0.564 af, Depth= 3.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 10-yr Rainfall=4.67"

Area (sf)	CN	Description
55,016	98	Paved parking
10,803	98	roofs
8,181	61	>75% Grass cover, Good, HSG B
74,000	94	Weighted Average
8,181	61	11.06% Pervious Area
65,819	98	88.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0350	1.74		**Sheet Flow, Reach A-b** Smooth surfaces n= 0.011 P2= 3.50"
0.0	20	0.0350	7.31	7.31	**Channel Flow, Reach B-C** Area= 1.0 sf Perim= 5.0' r= 0.20' n= 0.013 Concrete, trowel finish
0.9	194	0.0350	3.80		**Shallow Concentrated Flow, Reach C-D** Paved Kv= 20.3 fps
1.0	352	0.0063	5.72	17.96	**Pipe Channel, Reach D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.1					**Direct Entry,**
5.8	651	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 18S: Post Area 1



Summary for Subcatchment 22S: Post Area 2

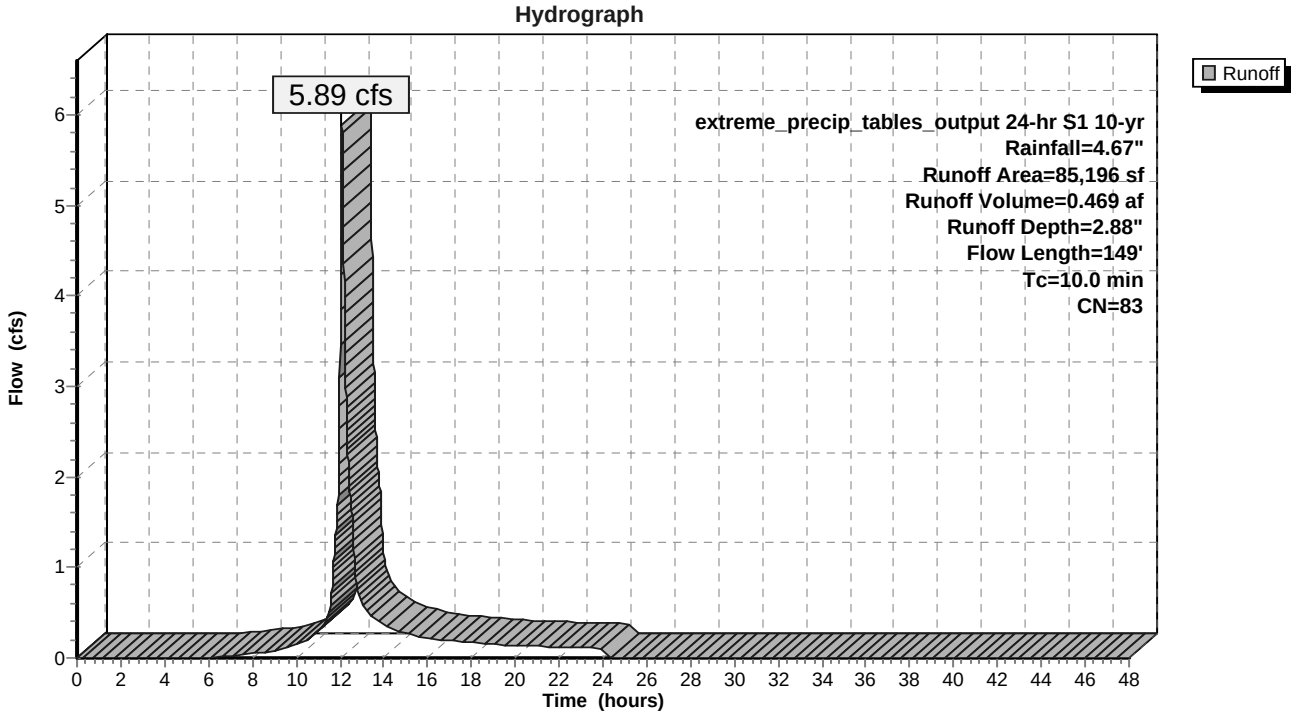
Runoff = 5.89 cfs @ 12.09 hrs, Volume= 0.469 af, Depth= 2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 10-yr Rainfall=4.67"

Area (sf)	CN	Description
13,520	98	Paved parking
37,300	96	Gravel surface, HSG B
7,000	61	>75% Grass cover, Good, HSG B
27,376	65	Woods/grass comb., Fair, HSG B
85,196	83	Weighted Average
71,676	81	84.13% Pervious Area
13,520	98	15.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	60	0.0500	0.11		**Sheet Flow, Reach A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.5	89	0.0220	3.01		**Shallow Concentrated Flow, Reach B-C** Paved Kv= 20.3 fps
10.0	149	Total			

Subcatchment 22S: Post Area 2



Summary for Pond 39P: StormTech 3500

Inflow Area = 3.655 ac, 49.84% Impervious, Inflow Depth = 3.39" for 10-yr event
Inflow = 13.19 cfs @ 12.05 hrs, Volume= 1.033 af
Outflow = 2.31 cfs @ 12.61 hrs, Volume= 1.001 af, Atten= 83%, Lag= 33.8 min
Primary = 2.31 cfs @ 12.61 hrs, Volume= 1.001 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Starting Elev= 249.02' Surf.Area= 23,445 sf Storage= 23,606 cf
Peak Elev= 250.12' @ 12.61 hrs Surf.Area= 23,445 sf Storage= 44,523 cf (20,917 cf above start)
Flood Elev= 253.75' Surf.Area= 23,445 sf Storage= 80,747 cf (57,142 cf above start)

Plug-Flow detention time= 628.0 min calculated for 0.459 af (44% of inflow)
Center-of-Mass det. time= 218.8 min (1,022.7 - 803.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	247.45'	32,132 cf	**137.42'W x 170.61'L x 5.50'H Field A** 128,946 cf Overall - 48,615 cf Embedded = 80,330 cf x 40.0% Voids
#2A	248.20'	48,615 cf	**ADS_StormTech MC-3500 d +Cap** x 437 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 19 Rows of 23 Chambers Cap Storage= +14.9 cf x 2 x 19 rows = 566.2 cf
		80,747 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	249.02'	**15.0" Round Culvert** L= 594.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 249.02' / 247.20' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	249.02'	**12.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 248.33' / 249.02' S= -0.0276 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.31 cfs @ 12.61 hrs HW=250.12' (Free Discharge)
↑**1=Culvert** (Passes 2.31 cfs of 2.77 cfs potential flow)
↑**2=Culvert** (Inlet Controls 2.31 cfs @ 2.94 fps)

Pond 39P: StormTech 3500 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 19 rows = 566.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

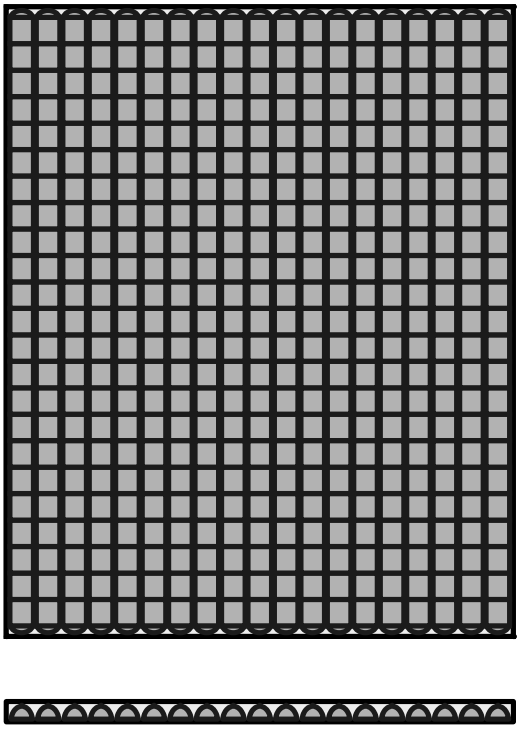
23 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 168.61' Row Length +12.0" End Stone x 2 = 170.61' Base Length
19 Rows x 77.0" Wide + 9.0" Spacing x 18 + 12.0" Side Stone x 2 = 137.42' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

437 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 19 Rows = 48,615.2 cf Chamber Storage

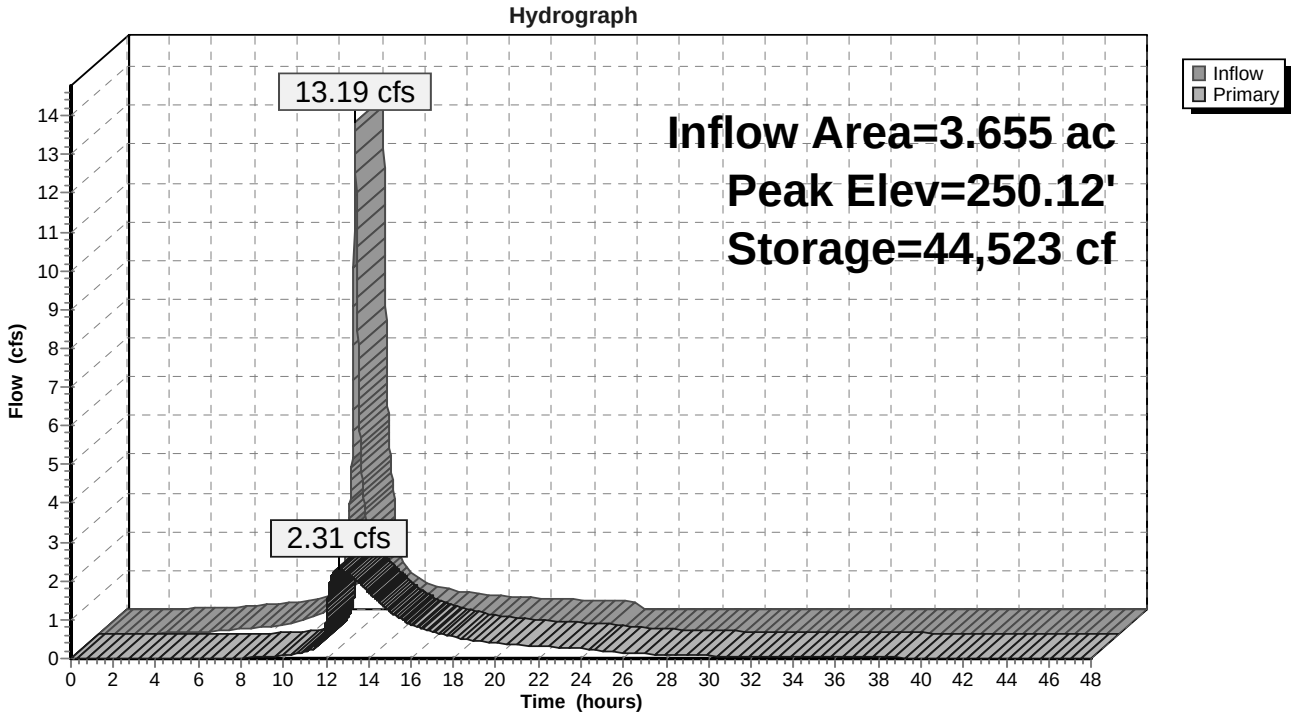
128,945.6 cf Field - 48,615.2 cf Chambers = 80,330.4 cf Stone x 40.0% Voids = 32,132.2 cf Stone Storage

Chamber Storage + Stone Storage = 80,747.4 cf = 1.854 af
Overall Storage Efficiency = 62.6%
Overall System Size = 170.61' x 137.42' x 5.50'

437 Chambers
4,775.8 cy Field
2,975.2 cy Stone



Pond 39P: StormTech 3500



Summary for Subcatchment 18S: Post Area 1

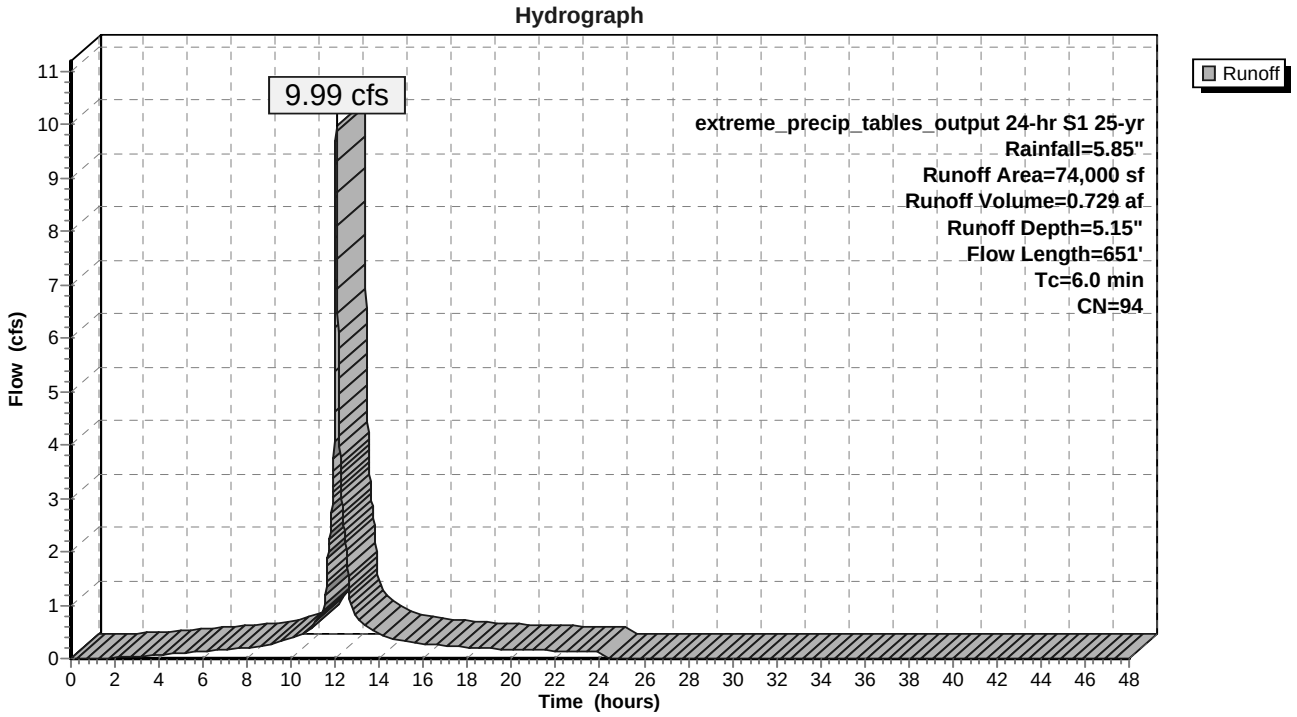
Runoff = 9.99 cfs @ 12.04 hrs, Volume= 0.729 af, Depth= 5.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 25-yr Rainfall=5.85"

Area (sf)	CN	Description
55,016	98	Paved parking
10,803	98	roofs
8,181	61	>75% Grass cover, Good, HSG B
74,000	94	Weighted Average
8,181	61	11.06% Pervious Area
65,819	98	88.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0350	1.74		**Sheet Flow, Reach A-b** Smooth surfaces n= 0.011 P2= 3.50"
0.0	20	0.0350	7.31	7.31	**Channel Flow, Reach B-C** Area= 1.0 sf Perim= 5.0' r= 0.20' n= 0.013 Concrete, trowel finish
0.9	194	0.0350	3.80		**Shallow Concentrated Flow, Reach C-D** Paved Kv= 20.3 fps
1.0	352	0.0063	5.72	17.96	**Pipe Channel, Reach D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.1					**Direct Entry,**
5.8	651	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 18S: Post Area 1



Summary for Subcatchment 22S: Post Area 2

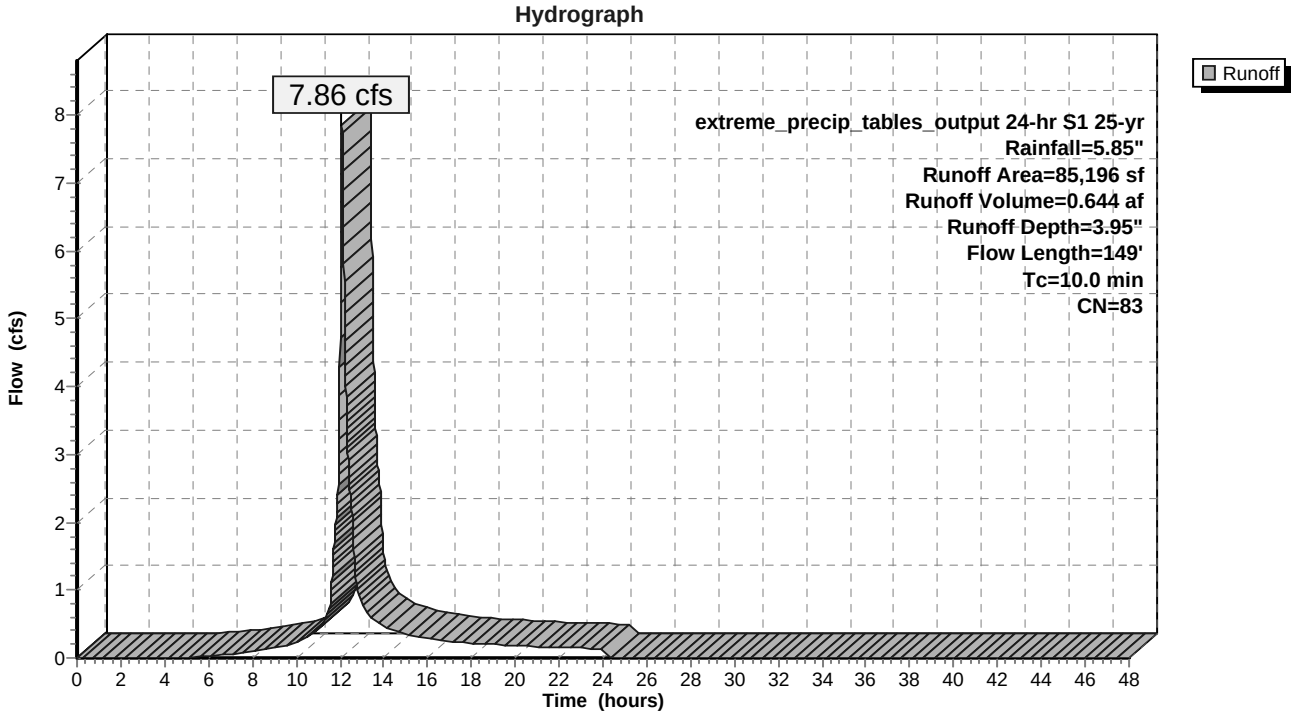
Runoff = 7.86 cfs @ 12.09 hrs, Volume= 0.644 af, Depth= 3.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 25-yr Rainfall=5.85"

Area (sf)	CN	Description
13,520	98	Paved parking
37,300	96	Gravel surface, HSG B
7,000	61	>75% Grass cover, Good, HSG B
27,376	65	Woods/grass comb., Fair, HSG B
85,196	83	Weighted Average
71,676	81	84.13% Pervious Area
13,520	98	15.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	60	0.0500	0.11		**Sheet Flow, Reach A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.5	89	0.0220	3.01		**Shallow Concentrated Flow, Reach B-C** Paved Kv= 20.3 fps
10.0	149	Total			

Subcatchment 22S: Post Area 2



Summary for Pond 39P: StormTech 3500

Inflow Area = 3.655 ac, 49.84% Impervious, Inflow Depth = 4.51" for 25-yr event
Inflow = 16.89 cfs @ 12.05 hrs, Volume= 1.373 af
Outflow = 2.92 cfs @ 12.62 hrs, Volume= 1.341 af, Atten= 83%, Lag= 34.2 min
Primary = 2.92 cfs @ 12.62 hrs, Volume= 1.341 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Starting Elev= 249.02' Surf.Area= 23,445 sf Storage= 23,606 cf
Peak Elev= 250.48' @ 12.62 hrs Surf.Area= 23,445 sf Storage= 50,939 cf (27,333 cf above start)
Flood Elev= 253.75' Surf.Area= 23,445 sf Storage= 80,747 cf (57,142 cf above start)

Plug-Flow detention time= 490.9 min calculated for 0.799 af (58% of inflow)
Center-of-Mass det. time= 202.1 min (998.1 - 796.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	247.45'	32,132 cf	**137.42'W x 170.61'L x 5.50'H Field A** 128,946 cf Overall - 48,615 cf Embedded = 80,330 cf x 40.0% Voids
#2A	248.20'	48,615 cf	**ADS_StormTech MC-3500 d +Cap** x 437 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 19 Rows of 23 Chambers Cap Storage= +14.9 cf x 2 x 19 rows = 566.2 cf
		80,747 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	249.02'	**15.0" Round Culvert** L= 594.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 249.02' / 247.20' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	249.02'	**12.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 248.33' / 249.02' S= -0.0276 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.92 cfs @ 12.62 hrs HW=250.48' (Free Discharge)
↑—**1=Culvert** (Passes 2.92 cfs of 3.85 cfs potential flow)
↑—**2=Culvert** (Inlet Controls 2.92 cfs @ 3.72 fps)

Pond 39P: StormTech 3500 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 19 rows = 566.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

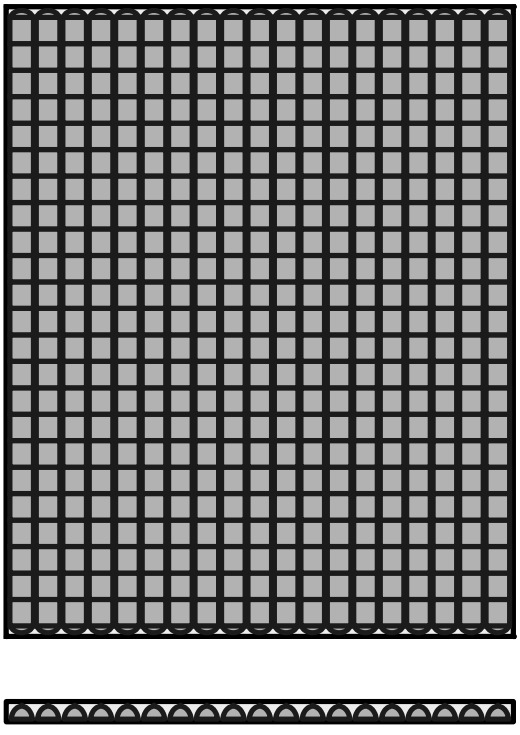
23 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 168.61' Row Length +12.0" End Stone x 2 = 170.61' Base Length
19 Rows x 77.0" Wide + 9.0" Spacing x 18 + 12.0" Side Stone x 2 = 137.42' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

437 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 19 Rows = 48,615.2 cf Chamber Storage

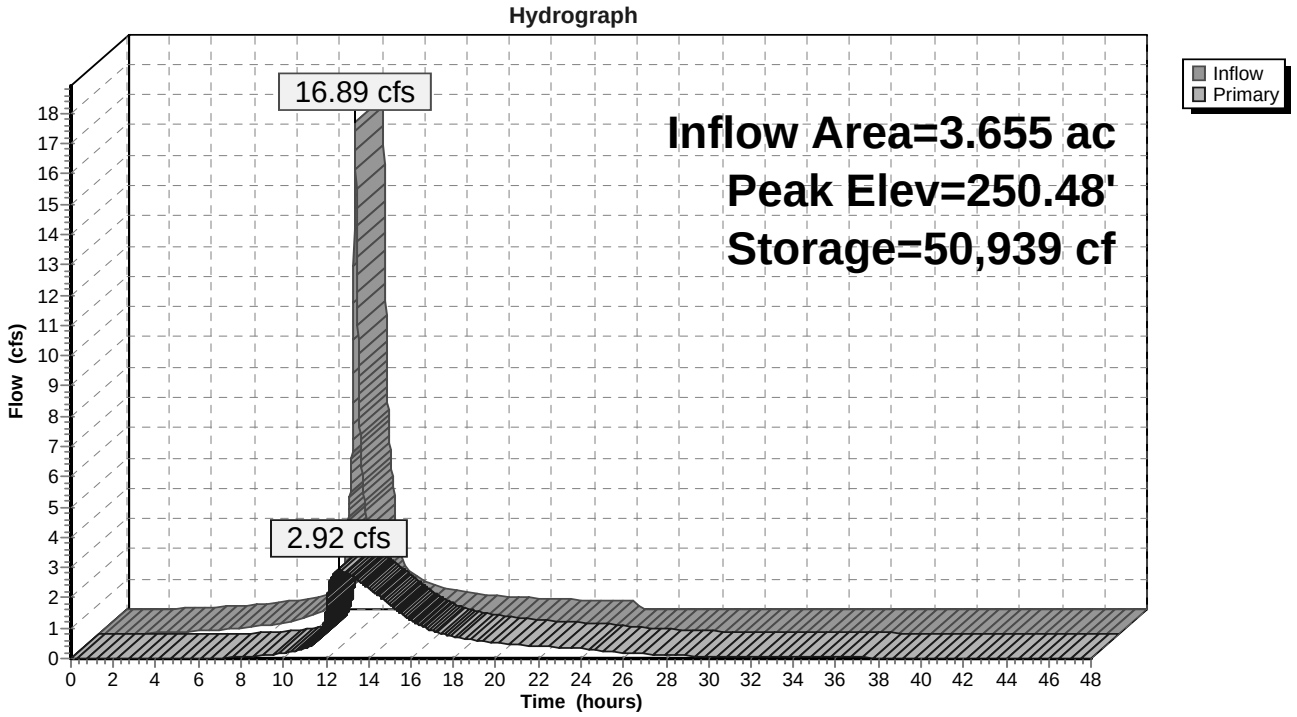
128,945.6 cf Field - 48,615.2 cf Chambers = 80,330.4 cf Stone x 40.0% Voids = 32,132.2 cf Stone Storage

Chamber Storage + Stone Storage = 80,747.4 cf = 1.854 af
Overall Storage Efficiency = 62.6%
Overall System Size = 170.61' x 137.42' x 5.50'

437 Chambers
4,775.8 cy Field
2,975.2 cy Stone



Pond 39P: StormTech 3500



Summary for Subcatchment 18S: Post Area 1

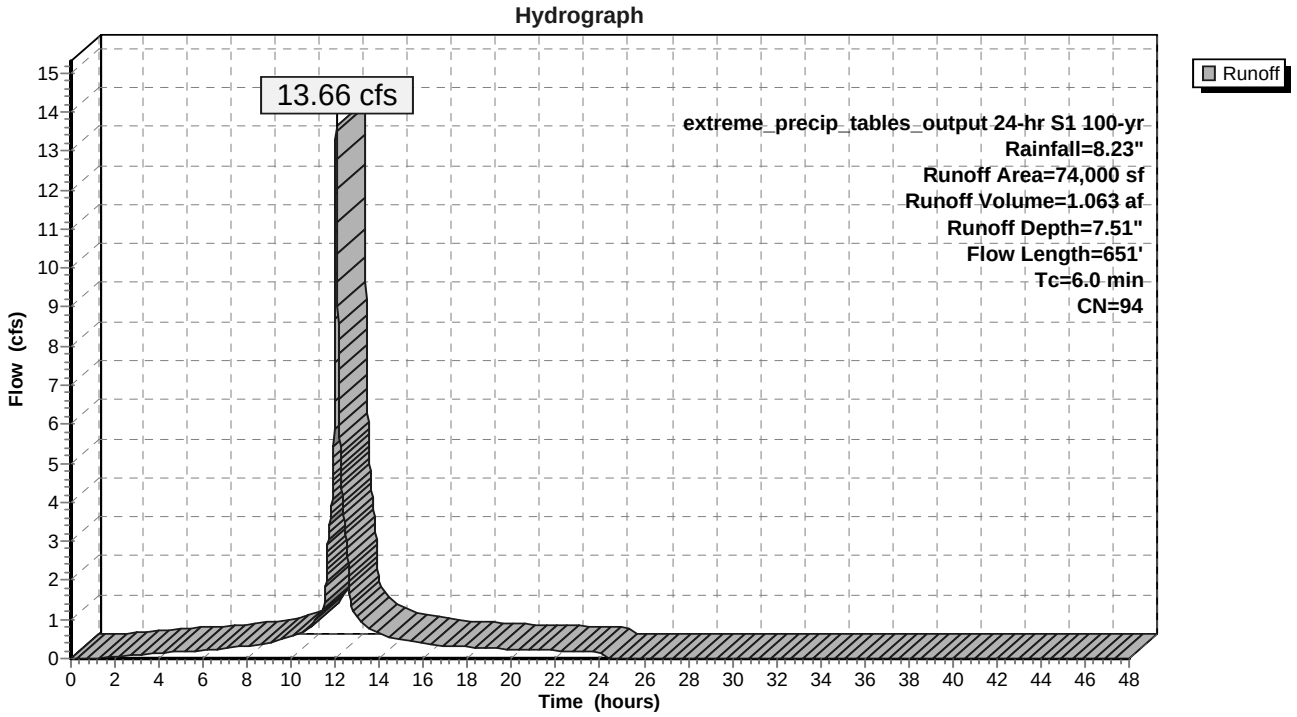
Runoff = 13.66 cfs @ 12.04 hrs, Volume= 1.063 af, Depth= 7.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 100-yr Rainfall=8.23"

Area (sf)	CN	Description
55,016	98	Paved parking
10,803	98	roofs
8,181	61	>75% Grass cover, Good, HSG B
74,000	94	Weighted Average
8,181	61	11.06% Pervious Area
65,819	98	88.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0350	1.74		**Sheet Flow, Reach A-b** Smooth surfaces n= 0.011 P2= 3.50"
0.0	20	0.0350	7.31	7.31	**Channel Flow, Reach B-C** Area= 1.0 sf Perim= 5.0' r= 0.20' n= 0.013 Concrete, trowel finish
0.9	194	0.0350	3.80		**Shallow Concentrated Flow, Reach C-D** Paved Kv= 20.3 fps
1.0	352	0.0063	5.72	17.96	**Pipe Channel, Reach D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.1					**Direct Entry,**
5.8	651	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 18S: Post Area 1



Summary for Subcatchment 22S: Post Area 2

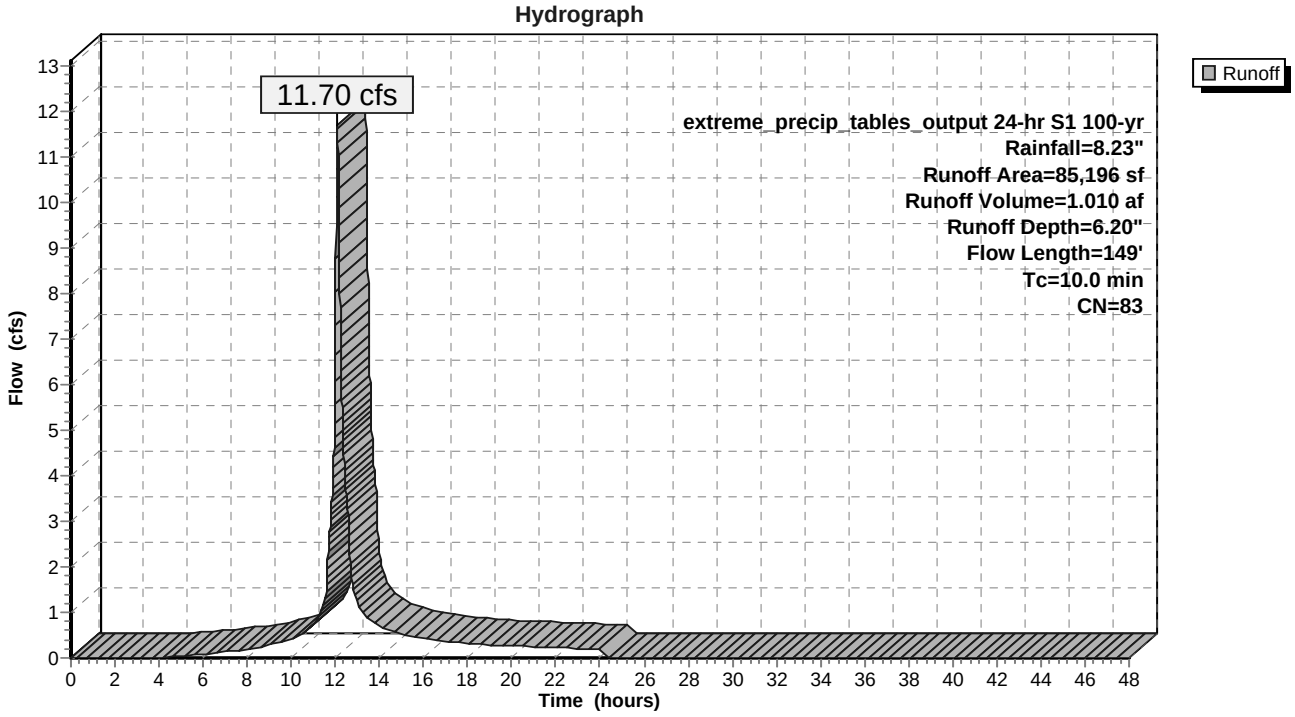
Runoff = 11.70 cfs @ 12.08 hrs, Volume= 1.010 af, Depth= 6.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
extreme_precip_tables_output 24-hr S1 100-yr Rainfall=8.23"

Area (sf)	CN	Description
13,520	98	Paved parking
37,300	96	Gravel surface, HSG B
7,000	61	>75% Grass cover, Good, HSG B
27,376	65	Woods/grass comb., Fair, HSG B
85,196	83	Weighted Average
71,676	81	84.13% Pervious Area
13,520	98	15.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	60	0.0500	0.11		**Sheet Flow, Reach A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.5	89	0.0220	3.01		**Shallow Concentrated Flow, Reach B-C** Paved Kv= 20.3 fps
10.0	149	Total			

Subcatchment 22S: Post Area 2



Summary for Pond 39P: StormTech 3500

Inflow Area = 3.655 ac, 49.84% Impervious, Inflow Depth = 6.81" for 100-yr event
Inflow = 24.07 cfs @ 12.05 hrs, Volume= 2.073 af
Outflow = 3.99 cfs @ 12.64 hrs, Volume= 2.041 af, Atten= 83%, Lag= 35.5 min
Primary = 3.99 cfs @ 12.64 hrs, Volume= 2.041 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Starting Elev= 249.02' Surf.Area= 23,445 sf Storage= 23,606 cf
Peak Elev= 251.31' @ 12.64 hrs Surf.Area= 23,445 sf Storage= 64,076 cf (40,470 cf above start)
Flood Elev= 253.75' Surf.Area= 23,445 sf Storage= 80,747 cf (57,142 cf above start)

Plug-Flow detention time= 389.1 min calculated for 1.499 af (72% of inflow)
Center-of-Mass det. time= 187.5 min (972.0 - 784.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	247.45'	32,132 cf	**137.42'W x 170.61'L x 5.50'H Field A** 128,946 cf Overall - 48,615 cf Embedded = 80,330 cf x 40.0% Voids
#2A	248.20'	48,615 cf	**ADS_StormTech MC-3500 d +Cap** x 437 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 19 Rows of 23 Chambers Cap Storage= +14.9 cf x 2 x 19 rows = 566.2 cf
		80,747 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	249.02'	**15.0" Round Culvert** L= 594.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 249.02' / 247.20' S= 0.0031 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	249.02'	**12.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 248.33' / 249.02' S= -0.0276 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.99 cfs @ 12.64 hrs HW=251.31' (Free Discharge)
↑—**1=Culvert** (Passes 3.99 cfs of 4.25 cfs potential flow)
↑—**2=Culvert** (Inlet Controls 3.99 cfs @ 5.09 fps)

Pond 39P: StormTech 3500 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 19 rows = 566.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

23 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 168.61' Row Length +12.0" End Stone x 2 = 170.61' Base Length
19 Rows x 77.0" Wide + 9.0" Spacing x 18 + 12.0" Side Stone x 2 = 137.42' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

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128,945.6 cf Field - 48,615.2 cf Chambers = 80,330.4 cf Stone x 40.0% Voids = 32,132.2 cf Stone Storage

Chamber Storage + Stone Storage = 80,747.4 cf = 1.854 af
Overall Storage Efficiency = 62.6%
Overall System Size = 170.61' x 137.42' x 5.50'

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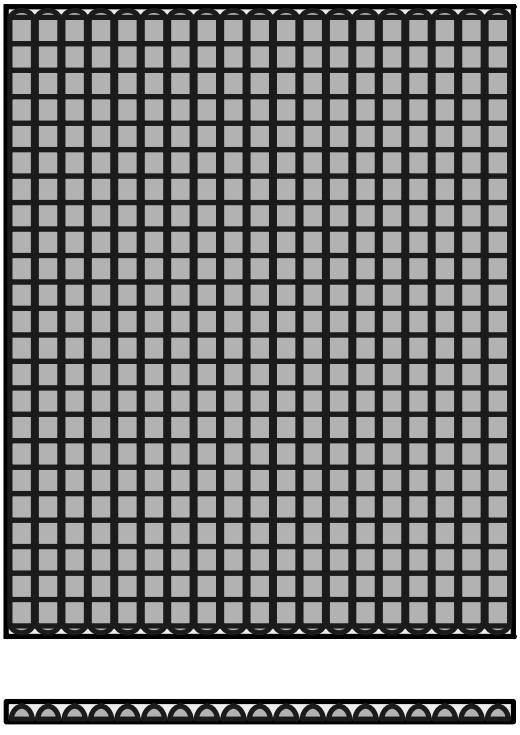
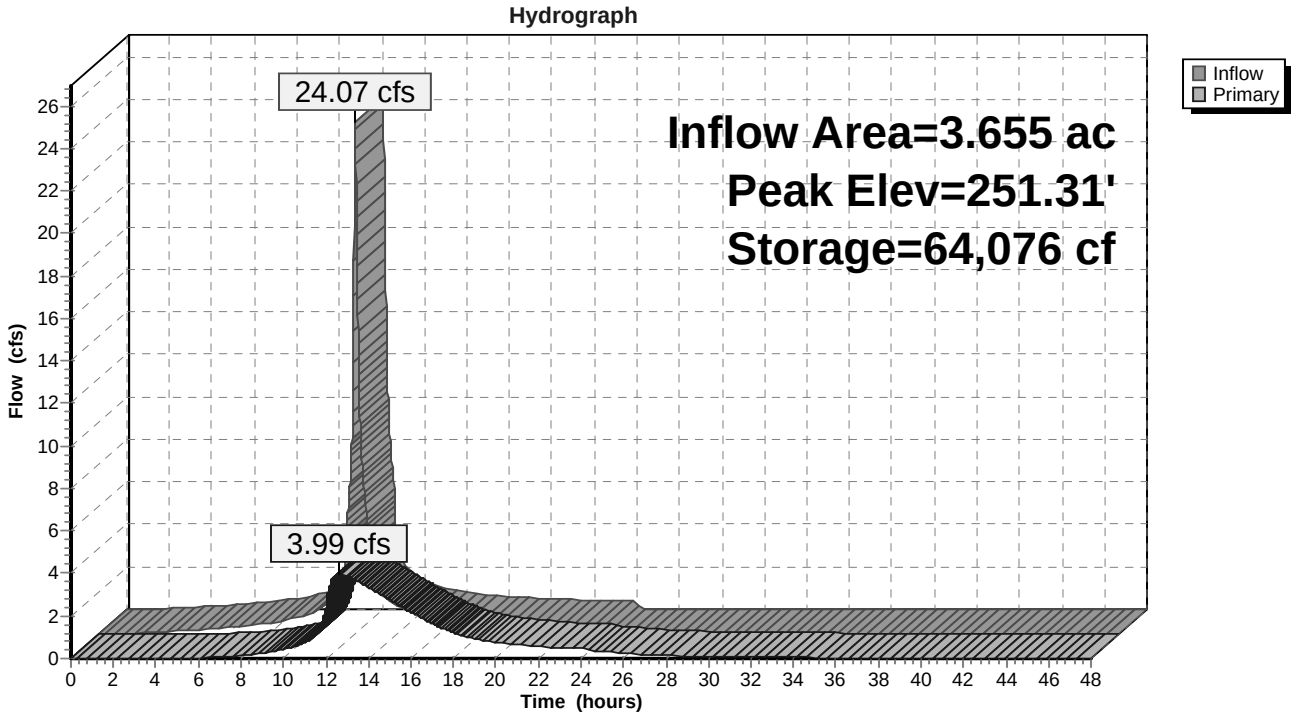
4,775.8 cy Field
2,975.2 cy Stone



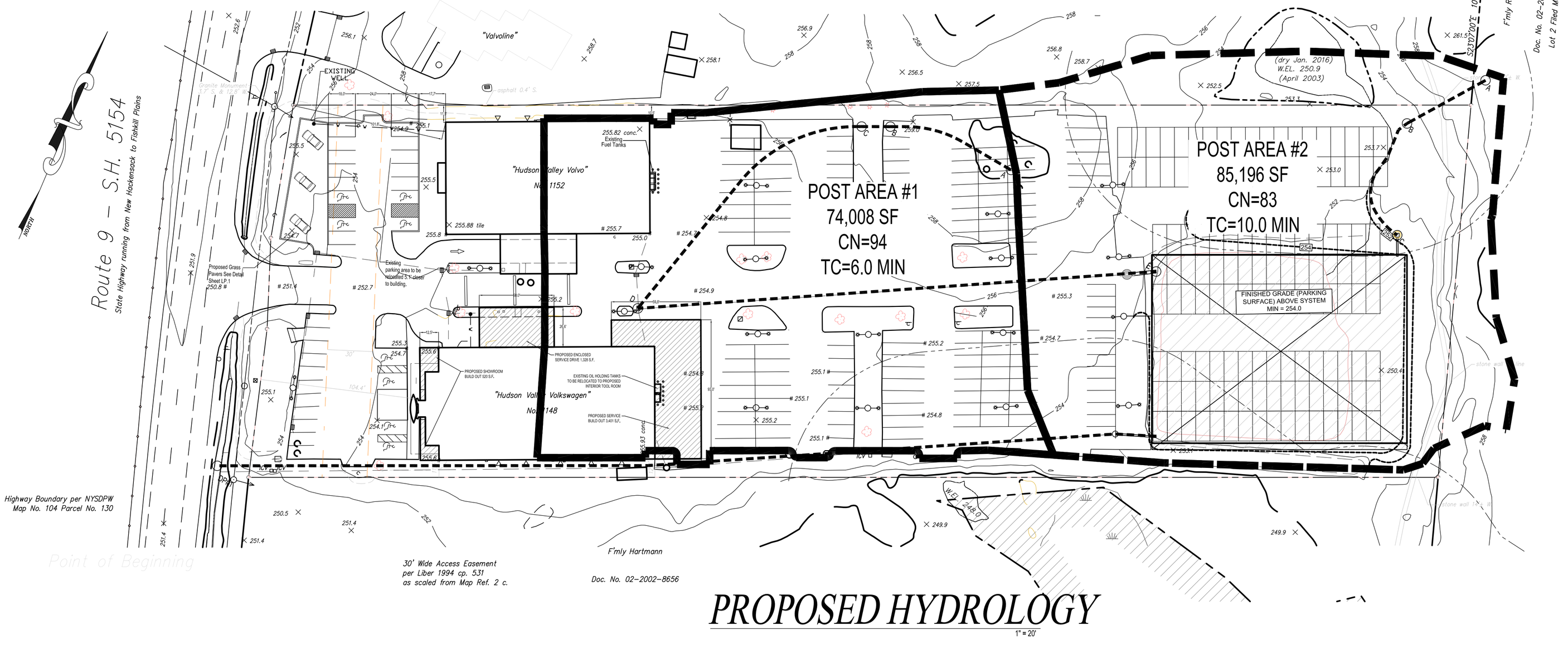
Pond 39P: StormTech 3500



Appendix C
Pre & Post Hydrology

EXISTING HYDROLOGY

1" = 40'



PROPOSED HYDROLOGY

1" = 20'

	Mark A Day, PE
09-14-26	
05-06-26	
10-15-25	
09-08-25	
08-06-25	
Revisions 07-23-25	
Project No. 2024.401	License No. 069646

DAY | STOKOSA
ENGINEERING P.C.

3 Van Wyck Lane
Wappingers Falls, New York
(845)-223-3202

PROJECT
AMENDED SITE PLAN FOR HUDSON VALLEY VOLKSWAGEN
Town of Wappinger — Dutchess County, New York

DRAWING
Amended Site Plan

SCALE	DRAWN BY	DRAWING No.
As Noted	MAD	SP.1
DATE 6-4-25	CHECKED BY MAD	3 of 7

Appendix D

Stormwater O&M

First Defense®

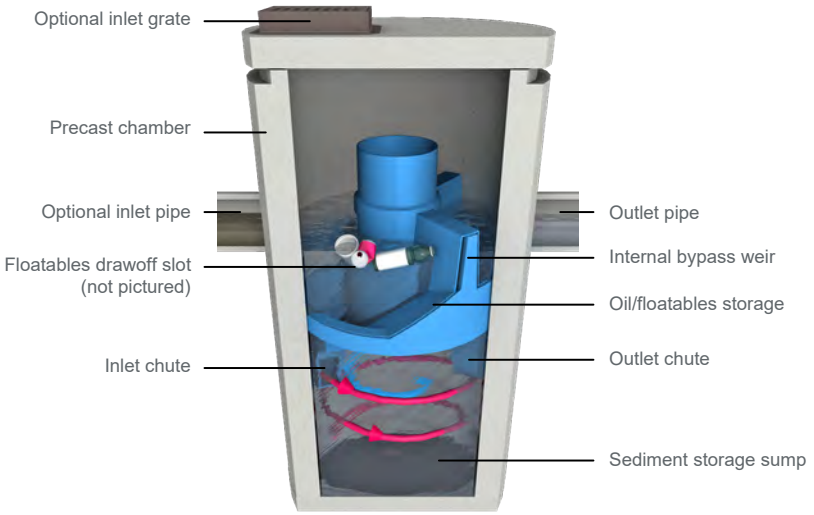
Advanced Hydrodynamic Separator

Product Summary

A Simple Solution for the Trickiest Sites

First Defense is a versatile stormwater separator with some of the highest approved flow rates in the United States. Engineers and contractors can save site space and reduce project costs by using the smallest possible footprint. It works with single or multiple inlet pipes and inlet grates. An internal bypass conveys infrequent peak flows directly to the outlet, efficiently capturing pollutants and preventing washouts.

Features



Contaminated stormwater runoff enters the inlet chute from a surface grate and/or inlet pipe. The inlet chute introduces flow into the chamber tangentially to create a low energy vortex flow regime (magenta arrow) that directs sediment into the sump while oils, floating trash and debris rise to the surface.

Treated stormwater exits through a submerged outlet chute located opposite to the direction of the rotating flow (blue arrow). Enhanced vortex separation is provided by forcing the rotating flow within the vessel to follow the longest path possible rather than directly from inlet to outlet.

Higher flows bypass the treatment chamber to prevent turbulence and washout of captured pollutants. An internal bypass conveys infrequent peak flows directly to the outlet eliminating the need for, and expense of, external bypass control structures. A floatables draw off slot functions to convey floatables into the treatment chamber prior to bypass.

Applications

- Areas requiring a minimum of 50% TSS removal
- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Highways, parking lots, industrial areas and urban developments
- Pre-treatment to ponds, storage systems, green infrastructure

Benefits

Highest Flow Through the Smallest Footprint

- **Smaller Footprint, Lower Costs**
  First Defense provides space-saving, easy-to-install surface water treatment in standard size chambers/manholes.
- **Adapt to Site Limitations**
  Variable configurations will help you effectively slip First Defense into a tight spot. It also works well with large pipes, multiple inlet pipes and inlet grates.
- **Reduce Installation Time & Costs**
  Every First Defense unit is delivered to site pre-assembled and ready for install.
- **Online System Configuration**
  First Defense eliminates the need for separate structures with its integrated internal bypass.
- **Designed with Maintenance in Mind**
  Easy vactor hose access through the center shaft of the system makes for quick sump cleanout, saving time and reducing long-term operational cost.

Sizing & Specifications

First Defense units are available in **six diameters** to fit standard chamber and manhole sizes. The dimensions below are common across all model numbers.

Diameter	Peak Online Flow Rate	Maximum Pipe Diameter[1]	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Standard Distance from Outlet Invert to Sump Floor
(ft / m)	(cfs / L/s)	(in / mm)	(yd^3 / m^3)	(ft / m)	(ft / m)
3 / 0.9	15 / 424	18 / 450	0.4 / 0.3	2.0 - 2.5 / 0.61 - 0.76	3.71 / 1.13
4 / 1.2	18 / 510	24 / 600	0.7 / 0.5	2.0 - 3.0 / 0.61 - 0.91	4.97 / 1.5
5 / 1.5	20 / 566	24 / 600	1.1 / .84	2.0 - 3.7 / 0.61 - 1.13	5.83 / 1.5
6 / 1.8	32 / 906	30 / 750	1.6 / 1.2	2.0 - 4.1 / 0.61 - 1.25	5.97 / 1.8
8 / 2.4	50 / 1415	48 / 1200	2.8 / 2.1	2.4 - 5.4 / 0.73 -1.65	7.40 / 2.2
10 / 3.0	50 / 1415	48 / 1200	4.4 / 3.3	2.4 - 6.8 / 0.73 - 2.07	10.25 / 3.12

Hydro International offers First Defense units in **two versions** that conform to the performance requirements of different states' water quality regulations.[4]

First Defense High Capacity Model Number	Typical TSS Treatment Flow Rates	
	NJDEP Certified[4]	110µm
	(cfs / L/s)	(cfs / L/s)
FDHC-3	0.84 / 23.7	1.06 / 30.0
FDHC-4	1.50 / 42.4	1.88 / 53.2
FDHC-5	2.35 / 66.2	2.94 / 83.2
FDHC-6	3.38 / 95.7	4.23 / 119.8
FDHC-8	6.00 / 169.9	7.52 / 212.9
FDHC-10	9.38 / 265.6	11.75 / 332.7

First Defense Optimum Model Number	NJDEP Certified Treatment Flow Rates[4]
	(cfs / L/s)
FDO-3	1.02 / 28.9
FDO-4	1.81 / 51.3
FDO-5	2.83 / 80.0
FDO-6	4.07 / 115.2
FDO-8	7.23 / 204.7
FDO-10	11.33 / 320.6

[1]Contact Hydro International when larger pipe sizes are required.
[2]Contact Hydro International when custom sediment storage capacity is required.
[3]These are guidlines only. Minimum distance is based on pipe diameter and headloss at assumed flow rates, contact Hydro for detailed design.
[4]NJDEP Certified / NJCAT Verified, based on one inlet pipe and no inlet grate.

Also available in a screened configuration for Full Trash Capture!

Free Online Design Tool

This free online sizing tool will recommend the best separator, model size and online or offline configuration based on site-specific data entered by the user.

Upon completion, users have the option to submit the design to Hydro International for a free review by our engineering team.

Go to hydro-int.com/sizing to access the tool.

Hydro International

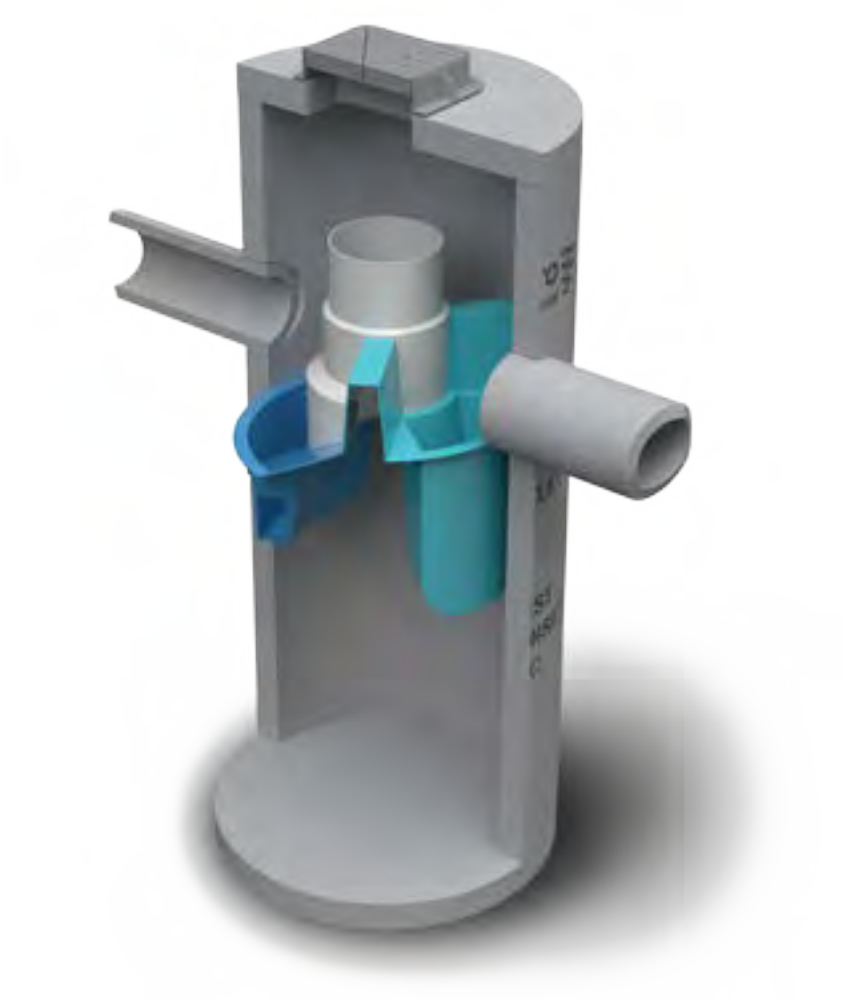
Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200
Email: stormwaterinquiry@hydro-int.com
Web: www.hydro-int.com/firstdefense

FD_SS_B_2203

Download Drawings:
→ hydro-int.com/fddrawings

Operation & Maintenance Manual:
→ hydro-int.com/fd-om

Hydro International



Operation and Maintenance Manual

First Defense® and First Defense® High Capacity

Vortex Separator for Stormwater Treatment

Table of Contents

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Hydro Maintenance Ser vices

Hydro International has been engineering stormwater treatment systems for over 30 years. We understand the mechanics of removing pollutants from stormwater and how to keep systems running at an optimal level.

Nobody Knows our Systems Better than we do

Avoid Ser vice Negligence

Sanitation services providers not intimately familiar with stormwater treatment systems are at risk of the following:

- Inadvertently breaking parts or failing to clean/replace system components appropriately.
- Charging you for more frequent maintenance because they lacked the tools to service your system properly in the first place.
- Billing you for replacement parts that might have been covered under your Hydro warranty plan
- Charging for maintenance that may not yet have been required.

Leave the Dir ty Work t o us

Trash, sediment and polluted water is stored inside treatment systems until they are removed by our team with a vactor truck. Sometimes teams must physically enter the system chambers in order to prepare the system for maintenance and install any replacement parts. Services include but are not limited to:

- Solids removal
- Removal of liquid pollutants
- Replacement media installation (when applicable)

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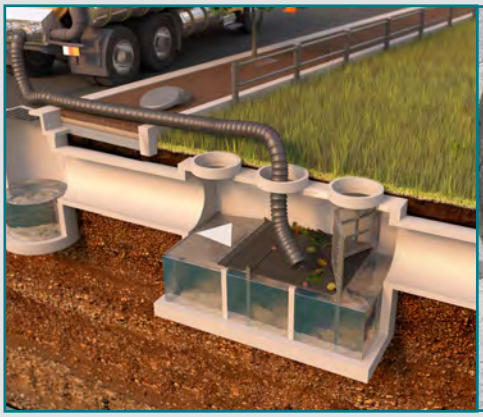
Better Tools, Better Results

Not all vactor trucks are created equal. Appropriate tools and suction power are needed to service stormwater systems appropriately. Companies who don't specialize in stormwater treatment won't have the tools to properly clean systems or install new parts.



Service Warranty

Make sure you're not paying for service that is covered under your warranty plan. Only Hydro International's service teams can identify tune-ups that should be on us, not you.

Treatment Systems Serviced by Hydro:

- Stormwwater filters
- Stormwater separators
- Baffle boxes
- Biofilters/biorention systems
- Storage structures
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I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations (refer to *Section II. Model Sizes & Configurations*, page 4) to accommodate a wide range of pipe sizes, peak flows and depth constraints.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig.1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for “offline” arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 500% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

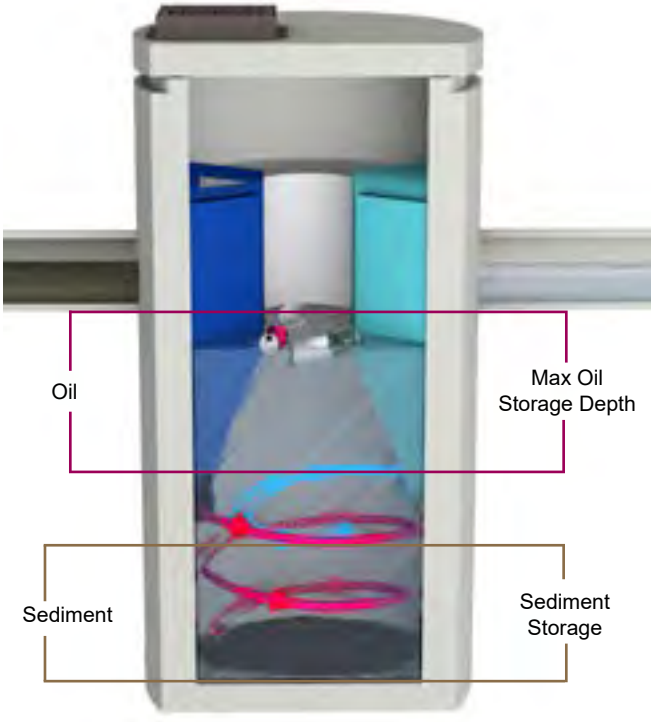

Fig.1 Pollutant storage volumes in the First Defense®.

II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components of the First Defense®-4HC and First Defense®-6HC have modified geometries as to allow greater design flexibility needed to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2a - 2b). First Defense® model parameters and design criteria are shown in Table 1.

First Defense® Components

1. **Built-In Bypass**
2. **Inlet Pipe**
3. **Inlet Chute**
4. **Floatables Draw-off Port**
5. **Outlet Pipe**
6. **Floatables Storage**
7. **Sediment Storage**
8. **Inlet Grate or Cover**

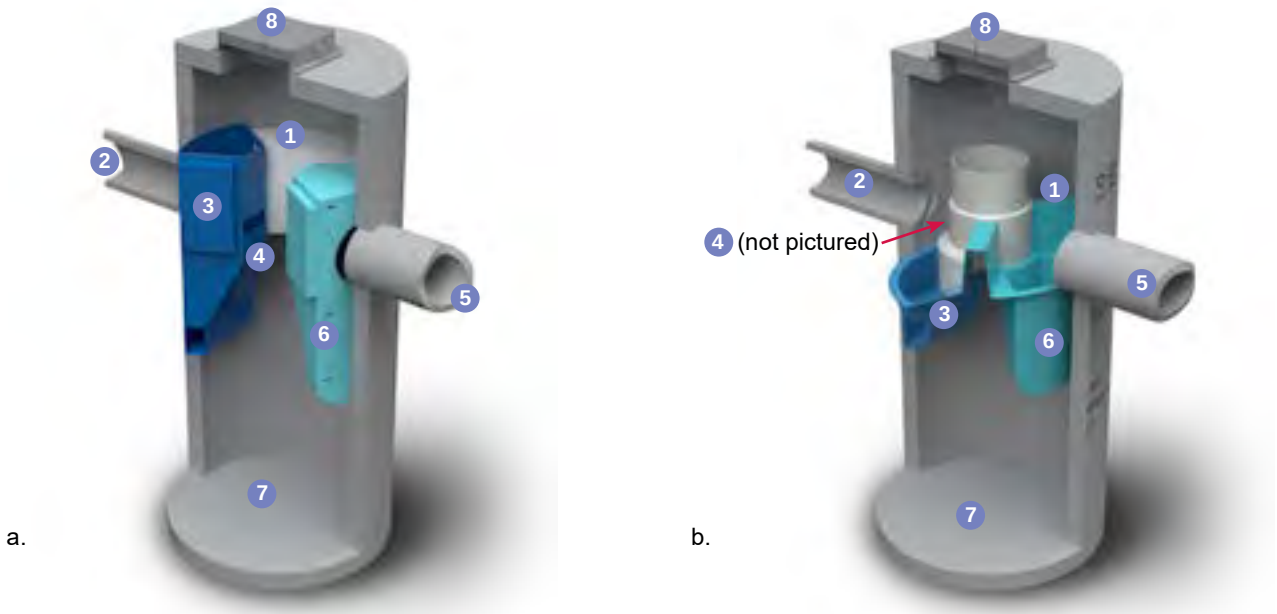

Fig.2a) First Defense®-4 and First Defense®-6; b) First Defense®-4HC and First Defense®-6HC, with higher capacity dual internal bypass and larger maximum pipe diameter.

First Defense® High Capacity Model Number	Diameter	Typical TSS Treatment Flow Rates		Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Standard Distance from Outlet Invert to Sump Floor
		NJDEP Certified	106µm						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd^3 / m^3)	(ft / m)	(ft / m)
FD-3HC	3 / 0.9	0.84 / 23.7	1.60 / 45.3	15 / 424	18 / 457	125 / 473	0.4 / 0.3	2.0 - 3.5 / 0.6 - 1.0	3.71 / 1.13
FD-4HC	4 / 1.2	1.50 / 42.4	1.88 / 50.9	18 / 510	24 / 600	191 / 723	0.7 / 0.5	2.3 - 3.9 / 0.7 - 1.2	4.97 / 1.5
FD-5HC	5 / 1.5	2.34 / 66.2	2.94 / 82.1	20 / 566	24 / 609	300 / 1135	1.1 / .84	2.5 - 4.5 / 0.7 - 1.3	5.19 / 1.5
FD-6HC	6 / 1.8	3.38 / 95.7	4.73 / 133.9	32 / 906	30 / 750	496 / 1,878	1.6 / 1.2	3.0 - 5.1 / 0.9 - 1.6	5.97 / 1.8
FD-8HC	8 / 2.4	6.00 / 169.9	7.52 / 212.9	50 / 1,415	48 / 1219	1120 / 4239	2.8 / 2.1	3.0 - 6.0 / 0.9 -1.8	7.40 / 2.2

[1]Contact Hydro International when larger pipe sizes are required.
[2]Contact Hydro International when custom sediment storage capacity is required.
[3]Minimum distance for models depends on pipe diameter.

III. Maintenance

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil. Maximum pollutant storage capacities are provided in Table 1.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense®-HC have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vactor hose used for maintenance should be less than 15 inches in diameter.

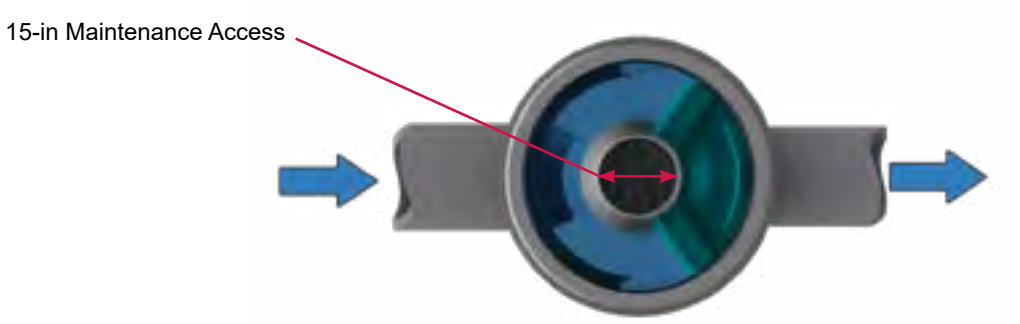

Fig.3 The central opening to the sump of the First Defense®-HC is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil / flotables removal, for a 6-ft First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.

4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.

6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.

8. Take down safety equipment.

9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.5).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump.

Scheduling

- Floatables and sump clean out are typically conducted once a year during any season.

- Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.

Fig.4 Floatables are removed with a vactor hose (First Defense model FD-4, shown).

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe (such as a Sludge Judge®)
- Vactor truck (flexible hose recommended)
- First Defense® Maintenance Log

Floatables and sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.

4. Remove oil and floatables stored on the surface of the water with the vactor hose (Fig.5) or with the skimmer or net (not pictured).

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).

6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor (Fig.5).

7. Retract the vactor hose from the vessel.

8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.

9. Securely replace the grate or lid.

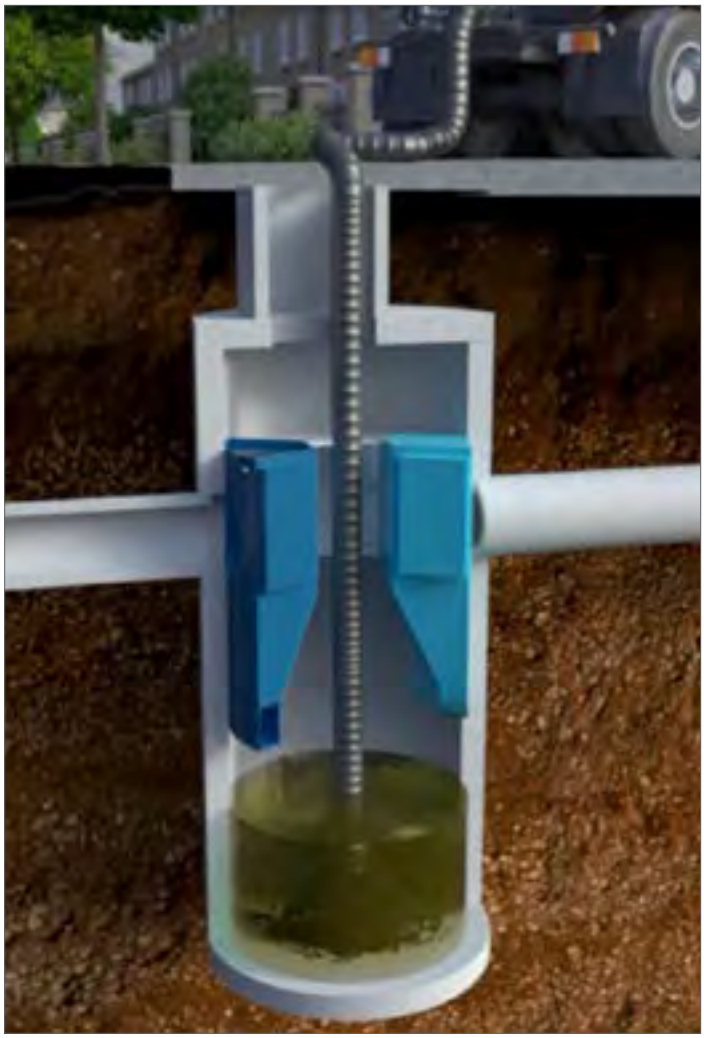

Fig.5 Sediment is removed with a vactor hose (First Defense model FD-4, shown).

Maintenance at a Glance

Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.	

First Defense® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL SIZE (CIRCLE ONE): **FD-4** **FD-4HC** **FD-6** **FD-6HC**

INLET (CIRCLE ALL THAT APPLY): **GRATED INLET (CATCH BASIN)** **INLET PIPE (FLOW THROUGH)**

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First Defense® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment Depth Measured	Volume of Sediment Removed	Site Activity and Comments

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stormwaterinquiry@hydro-int.com

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Turning Water Around...®

StormTech® MC-3500 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

Nominal Chamber Specifications
(not to scale)

Size (L x W x H)
90” x 77” x 45”
2286 mm x 1956 mm x 1143 mm

Chamber Storage
109.9 ft³ (3.11 m³)

Min. Installed Storage*
175.0 ft³ (4.96 m³)

Weight
134 lbs (60.8 kg)

Shipping
15 chambers/pallet
7 end caps/pallet
7 pallets/truck

*Assumes a minimum of 12” (300 mm) of stone above, 9” (230 mm) of stone below chambers, 6” (150 mm) of stone between chambers/ end caps and 40% stone porosity.

Nominal End Cap Specifications
(not to scale)

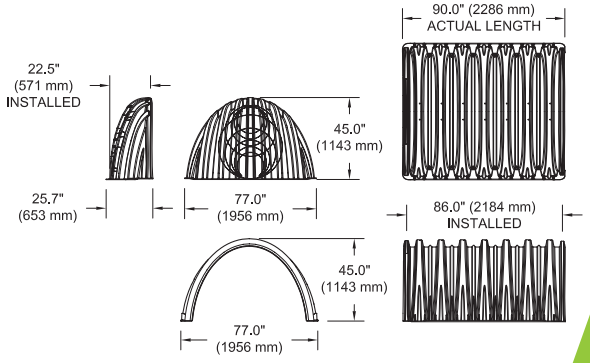
Size (L x W x H)
26.5” x 71” x 45.1”
673 mm x 1803 mm x 1145 mm

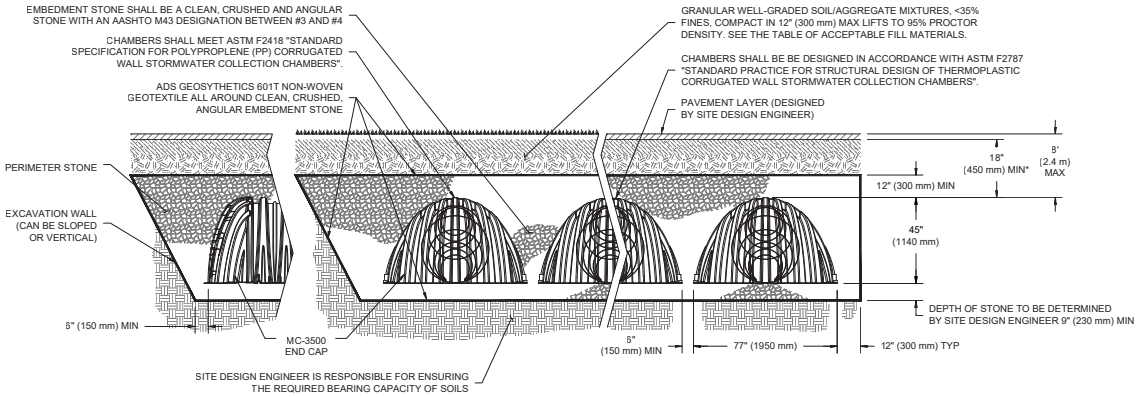
End Cap Storage
14.9 ft³ (0.42 m³)

Min. Installed Storage*
45.1 ft³ (1.28 m³)

Weight
49 lbs (22.2 kg)

*Assumes a minimum of 12” (300 mm) of stone above, 9” (230 mm) of stone below, 6” (150 mm) of stone perimeter, 6” (150 mm) of stone between chambers/ end caps and 40% stone porosity.





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

ADS StormTech™

StormTech MC-3500 Specifications

Storage Volume Per Chamber

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)			
		9 in (230 mm)	12 in (300 mm)	15 in (375 mm)	18 in (450 mm)
Chamber	109.9 (3.11)	175.0 (4.96)	179.9 (5.09)	184.9 (5.24)	189.9 (5.38)
End Cap	14.9 (0.42)	45.1 (1.28)	46.6 (1.32)	48.3 (1.37)	49.9 (1.41)

Note: Assumes 6" (150 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume.

Amount of Stone Per Chamber

English Tons (yds³)	Stone Foundation Depth			
	9 in	12 in	15 in	18 in
Chamber	8.5 (6.0)	9.1 (6.5)	9.7 (6.9)	10.4 (7.4)
End Cap	3.9 (2.8)	4.1 (2.9)	4.3 (3.1)	4.5 (3.2)
Metric Kilograms (m³)	**230 mm**	**300 mm**	**375 mm**	**450 mm**
Chamber	7711 (4.6)	8255 (5.0)	8800 (5.3)	9435 (5.7)
End Cap	3538 (2.1)	3719 (2.2)	3901 (2.4)	4082 (2.5)

Note: Assumes 12" (300 mm) of stone above and 6" (150 mm) row spacing and 6" (150 mm) of perimeter stone in front of end caps.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth			
	9 in (230 mm)	12 in (300 mm)	15 in (375mm)	18 in (450 mm)
Chamber	11.9 (9.1)	12.4 (9.5)	12.8 (9.8)	13.3 (10.2)
End Cap	4.0 (3.1)	4.1 (3.3)	4.3 (3.3)	4.4 (3.4)

Note: Assumes 6" (150 mm) of separation between chamber rows and 24" (600 mm) of cover. The volume of excavation will vary as depth of cover increases.

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StormTech® Installation Guide

MC-3500 & MC-4500 Chamber

StormTech SiteAssist

Required Materials and Equipment List

- Acceptable fill materials per Table 1
- ADS Plus and non-woven geotextile fabrics
- StormTech solid end caps, pre-cored and pre-fabricated end caps
- StormTech chambers, manifolds and fittings

Note: MC-3500 chamber pallets are 77" x 90" (2.0 m x 2.3 m) and weigh about 2010 lbs. (912 kg) and MC-4500 pallets are 100" x 52" (2.5 m x 1.3 m) and weigh about 840 lbs. (381 kg). Unloading chambers requires 72" (1.8 m) (min.) forks and/or tie downs (straps, chains, etc).

Important Notes:

A. This installation guide provides the minimum requirements for proper installation of chambers. Nonadherence to this guide may result in damage to chambers during installation. Replacement of damaged chambers during or after backfilling is costly and very time consuming. It is recommended that all installers are familiar with this guide, and that the contractor inspects the chambers for distortion, damage and joint integrity as work progresses.

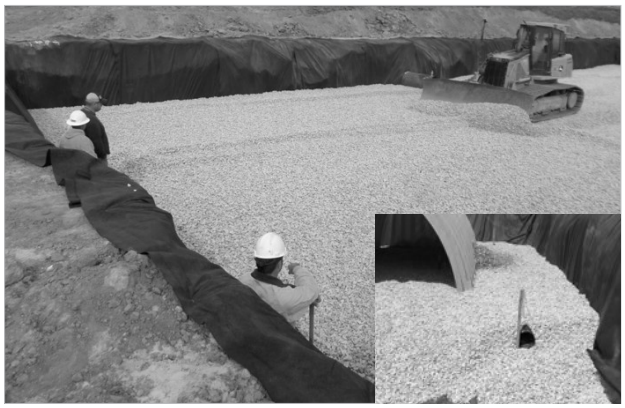
B. Use of a dozer to push embedment stone between the rows of chambers may cause damage to chambers and is not an acceptable backfill method. Any chambers damaged by using the "dump and push" method are not covered under the StormTech standard warranty.

C. Care should be taken in the handling of chambers and end caps. End caps must be stored standing upright. Avoid dropping, prying or excessive force on chambers during removal from pallet and initial placement.

Requirements for System Installation

Excavate bed and prepare subgrade per engineer's plans. Plans and specifications should include Best Management Practices (BMPs) to deter contamination of open pits during construction.

Place non-woven geotextile over prepared soils and up excavation walls.



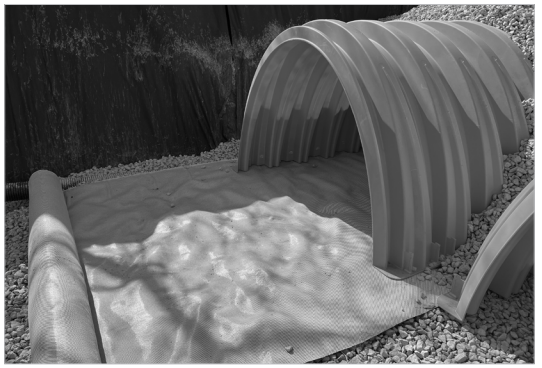
Place clean, crushed, angular stone foundation 9" (230 mm) min. Install underdrains if required. Compact to achieve a flat surface.

Manifold, Scour Fabric and Chamber Assembly

Install manifolds and lay out ADS Plus Fabric at inlet rows. Place ADS Plus Fabric at each inlet end cap parallel to the row (min. 17.5 ft (5.33 m)). Place a continuous piece entire length of Isolator® Plus Row(s).

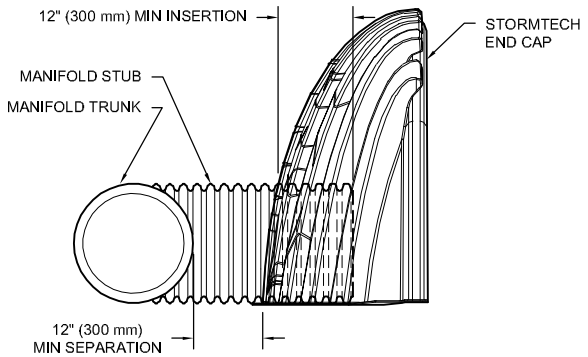
Align the first chamber and end cap of each row with inlet pipes. Contractor may choose to postpone stone placement around end chambers and leave ends of rows open for easy inspection of chambers during the backfill process.

Continue installing chambers by overlapping chamber end corrugations. Chamber joints are labeled “Lower Joint – Overlap Here” and “Build this direction – Upper Joint” Be sure that the chamber placement does not exceed the reach of the construction equipment used to place the stone. Maintain minimum 6” (150 mm) spacing between MC-3500 rows and 9” (230 mm) spacing between MC-4500 rows.



Place a continuous layer of ADS PLUS fabric between the foundation stone and the Isolator Row PLUS chambers, making sure the fabric lays flat and extends the entire width of the chamber feet.
When used on an Isolator Row PLUS, a 24” FLAMP (flared end ramp) is attached to the inside of the inlet pipe with a provided threaded rod and bolt. The FLAMP then lays on top of the ADS PLUS fabric.

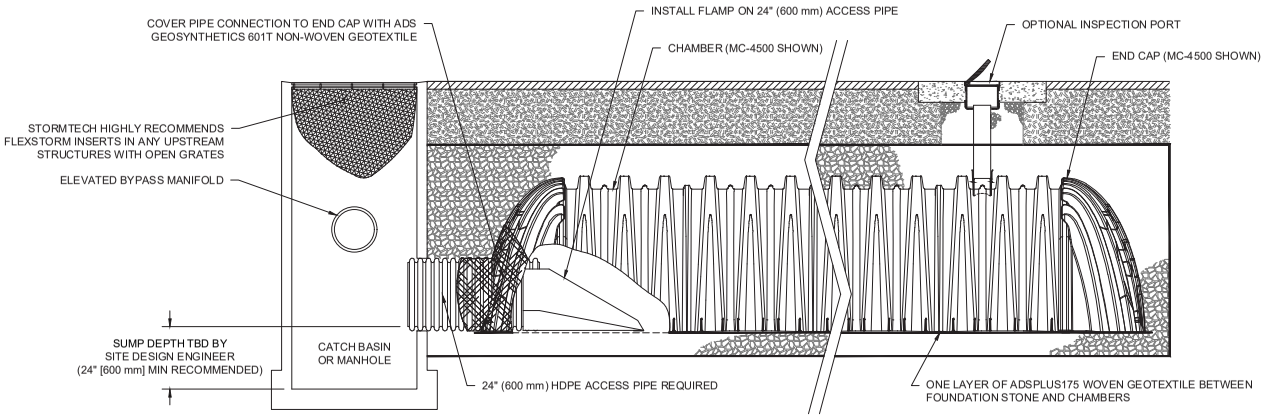
Manifold Insertion



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

Insert inlet and outlet manifolds a minimum 12” (300 mm) into chamber end caps. Manifold header should be a minimum 12” (300 mm) from base of end cap.

StormTech Isolator Row Plus Detail

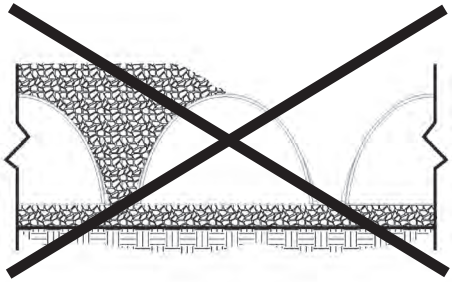


Initial Anchoring of Chambers – Embedment Stone

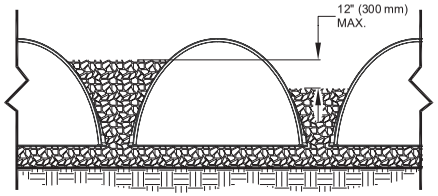
Initial embedment shall be spotted along the centerline of the chamber evenly anchoring the lower portion of the chamber. This is best accomplished with a stone conveyor or excavator reaching along the row.

No equipment shall be operated on the bed at this stage of the installation. Excavators must be located off the bed. Dump trucks shall not dump stone directly on to the bed. Dozers or loaders are not allowed on the bed at this time.

Backfill of Chambers – Embedment Stone

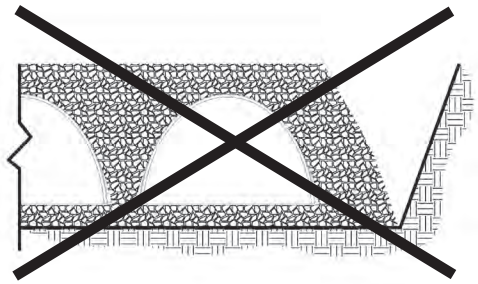


Uneven Backfill

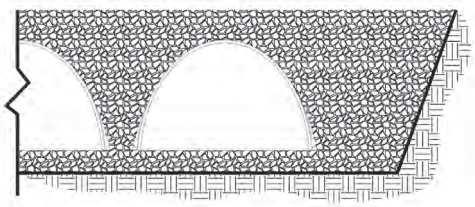


Even Backfill

Backfill chambers evenly. Stone column height should never differ by more than 12” (300 mm) between adjacent chamber rows or between chamber rows and perimeter.



Perimeter Not Backfilled



Perimeter Fully Backfilled

Perimeter stone must be brought up evenly with chamber rows. Perimeter must be fully backfilled, with stone extended horizontally to the excavation wall.

Backfill of Chambers – Embedment Stone and Cover Stone

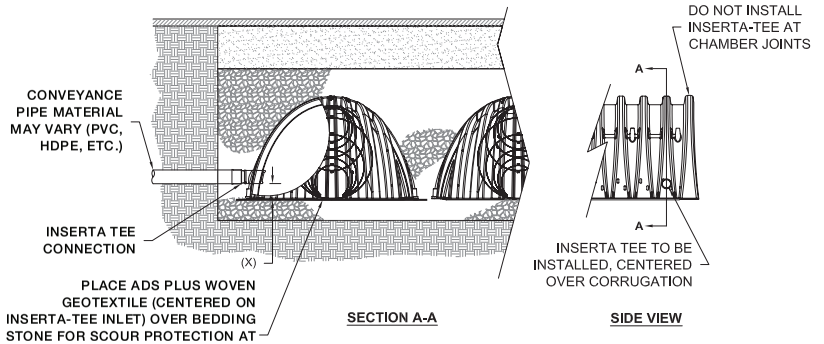
Continue evenly backfilling between rows and around perimeter until embedment stone reaches tops of chambers and a minimum 12” (300 mm) of cover stone is in place. Perimeter stone must extend horizontally to the excavation wall for both straight or sloped sidewalls. The recommended backfill methods are with a stone conveyor outside of the bed or build as you go with an excavator inside the bed reaching along the rows. Backfilling while assembling chambers rows as shown in the picture will help to ensure that equipment reach is not exceeded.

Only after chambers have been backfilled to top of chamber and with a minimum 12” (300 mm) of cover stone on top of chambers can skid loaders and small LGP dozers be used to final grade cover stone and backfill material in accordance with ground pressure limits in Table 2. Equipment must push material parallel to rows only. Never push perpendicular to rows. StormTech recommends the contractor inspect chamber rows before placing final backfill. Any chambers damaged by construction equipment shall be removed and replaced.

Final Backfill of Chambers – Fill Material

Install non-woven geotextile over stone. Geotextile must overlap 24” (600 mm) where edges meet. Compact at 18” (450 mm) of fill for MC-3500 and 24” (600 mm) of fill for MC-4500. Roller travel parallel with rows.

Inserta Tee Detail



CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
MC-3500	12” (250 mm)	6” (150 mm)
MC-4500	12” (250 mm)	8” (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

Table 1- Acceptable Fill Materials

Material Location	Description	AASHTO M43 Designation[1]	Compaction/Density Requirement
(D) **Final Fill:** Fill Material for layer 'D' starts from the top of the 'C' layer to the bottom of flexible pavement or unpaved finished grade above. Note that the pavement subbase may be part of the 'D' layer.	Any soil/rock materials, native soils or per engineer's plans. Check plans for pavement subgrade requirements.	N/A	Prepare per site design engineer's plans. Paved installations may have stringent material and preparation requirements.
(C) **Initial Fill:** Fill Material for layer 'C' starts from the top of the embedment stone ('B' layer) to 18" (450 mm) for MC-3500 and 24" (600 mm) for MC-4500 above the top of the chamber. Note that pavement subbase may be part of the 'C' layer.	Granular well-graded soil/aggregate mixtures, <35% fines or processed aggregate. Most pavement subbase materials can be used in lieu of this layer.	AASHTO M145[1] A-1, A-2-4, A-3 or AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	Begin compaction after min. 18" (450 mm) for MC-3500 and 24" (600 mm) for MC-4500 of material over the chambers is reached. Compact additional layers in 12" (300 mm) max. lifts to a min. 95% Proctor density for well-graded material and 95% relative density for processed aggregate materials.
(B) **Embedment Stone:** Embedment Stone surrounding chambers from the foundation stone to the 'C' layer above.	Clean, crushed, angular stone or Recycled Concrete[4]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	No compaction required.
(A) **Foundation Stone:** Foundation Stone below the chambers from the subgrade up to the foot (bottom) of the chamber.	Clean, crushed, angular stone or Recycled Concrete[4]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	Place and compact in 9" (225 mm) lifts using two full coverages with a vibratory compactor.[2,3]

Please Note:

1. The listed AASHTO designations are for gradations only. The stone must also be clean, crushed, angular. For example, a specification for #4 stone would state: "clean, crushed, angular no. 4 (AASHTO M43) stone".
2. StormTech compaction requirements are met for 'A' location materials when placed and compacted in 9" (230 mm) (max) lifts using two full coverages with a vibratory compactor.
3. Where infiltration surfaces may be comprised by compaction, for standard installations and standard design load conditions, a flat surface may be achieved by raking or dragging without compaction equipment. For special load designs, contact StormTech for compaction requirements.
4. Where recycled concrete aggregate is used in layers 'A' or 'B' the material should also meet the acceptable criteria outlined in ADS Technical Note 6.20 "Recycled Concrete Structural Backfill".

Figure 1- Inspection Port Detail

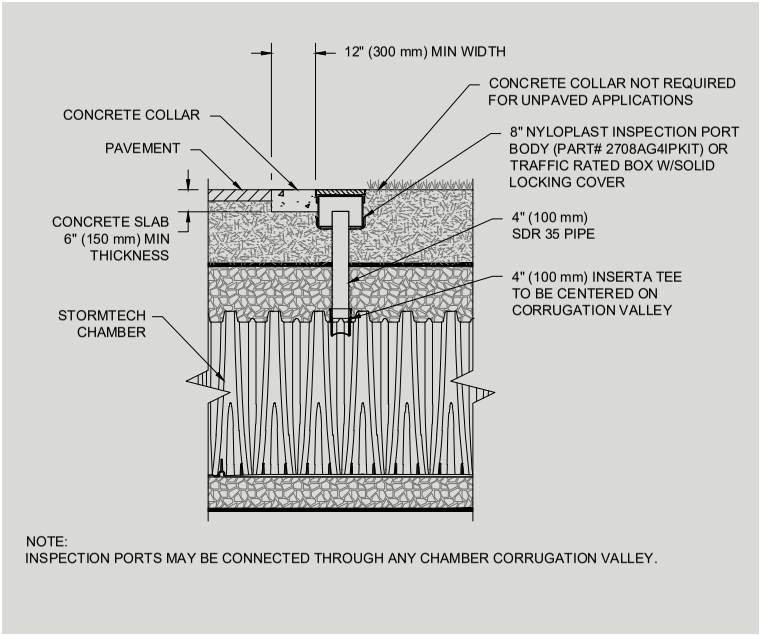
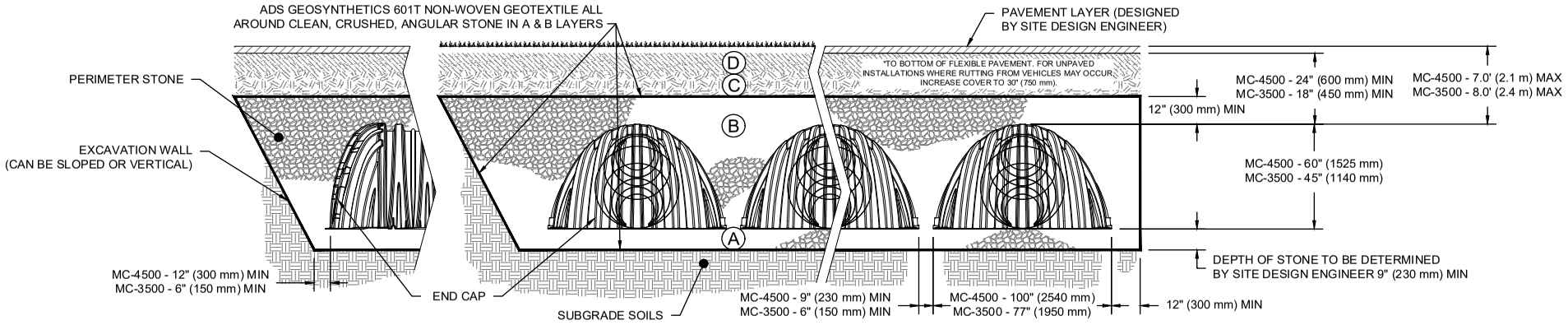


Figure 2 - Fill Material Locations



Notes:

1. 36” (900 mm) of stabilized cover materials over the chambers is recommended during the construction phase if general construction activities, such as full dump truck travel and dumping, are to occur over the bed.
2. During paving operations, dump truck axle loads on 18” (450mm) of cover for MC-3500s may be necessary. Precautions should be taken to avoid rutting of the road base layer, to ensure that compaction requirements have been met, and that a minimum of 18” (450mm) of cover for MC-3500s exists over the chambers. Contact StormTech for additional guidance on allowable axle loads during paving.
3. Ground pressure for track dozers is the vehicle operating weight divided by total ground contact area for both tracks. Excavators will exert higher ground pressures based on loaded bucket weight and boom extension.
4. Mini-excavators (<8,000lbs/3,628 kg) can be used with at least 12” (300 mm) of stone over the chambers and are limited by the maximum ground pressures in Table 2 based on a full bucket at maximum boom extension.
5. StormTech does not require compaction of initial fill at 18” (450 mm) of cover. However, requirements by others for 6” (150 mm) lifts may necessitate the use of small compactors at 18” (450 mm) of cover.
6. Storage of materials such as construction materials, equipment, spoils, etc. should not be located over the StormTech system. The use of equipment over the StormTech system not covered in Table 2 (ex. soil mixing equipment, cranes, etc) is limited. Please contact StormTech for more information.
7. Allowable track loads based on vehicle travel only. Excavators shall not operate on chamber beds until the total backfill reaches 3 feet (900 mm) over the entire bed.

Call StormTech at **888.892.2694** for technical and product information or visit www.stormtech.com

Table 2 - Maximum Allowable Construction Vehicle Loads[6]

Material Location	Fill Depth over Chambers in. (mm)	Maximum Allowable Wheel Loads		Maximum Allowable Track Loads[6]		Maximum Allowable Roller Loads
		Max Axle Load for Trucks lbs (kN)	Max Wheel Load for Loaders lbs (kN)	Track Width in. (mm)	Max Ground Pressure psf (kPa)	Max Drum Weight or Dynamic Force lbs (kN)
Ⓓ Final Fill Material	36” (900) Compacted	32,000 (142)	16,000 (71)	12” (305) 18” (457) 24” (610) 30” (762) 36” (914)	4050 (194) 2760 (132) 2130 (102) 1770 (84) 1530 (73)	38,000 (169)
Ⓒ Initial Fill Material	24” (600) Compacted	32,000 (142)	16,000 (71)	12” (305) 18” (457) 24” (610) 30” (762) 36” (914)	2750 (131) 1920 (92) 1520 (73) 1310 (63) 1180 (56)	20,000 (89)
	24” (600) Loose/Dumped	MC-3500		12” (305) 18” (457) 24” (610) 30” (762) 36” (914)	2430 (116) 1730 (82) 1390 (66) 1210 (58) 1100 (52)	16,000 (71)
		32,000 (142)	16,000 (71)			
		MC-4500				
		24,000 (107)	12,000 (53)			
	18” (450)	MC-3500		12” (305) 18” (457) 24” (610) 30” (762) 36” (914)	2140 (102) 1530 (73) 1260 (60) 1120 (53) 1030 (49)	5,000 (22) (static loads only)[5]
		32,000 (142)	16,000 (71)			
		MC-4500				
		24,000 (107)	12,000 (53)			
Ⓑ Embedment Stone	12” (300)	Not Allowed	Not Allowed	12” (305) 18” (457) 24” (610) 30” (762)	1100 (53) 710 (34) 660 (32) 580 (28)	Not Allowed
	6” (150)	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed

Table 3 - Placement Methods and Descriptions

Material Location	Placement Methods/ Restrictions	Wheel Load Restrictions	Track Load Restrictions	Roller Load Restrictions
		See Table 2 for Maximum Construction Loads		
Ⓓ Final Fill Material	A variety of placement methods may be used. All construction loads must not exceed the maximum limits in Table 2.	36” (900 mm) minimum cover required for dump trucks to dump over chambers.	Dozers to push parallel to rows.[4]	Roller travel parallel to rows only until 36” (900 mm) compacted cover is reached.
Ⓒ Initial Fill Material	Excavator positioned off bed recommended. Small excavator allowed over chambers. Small dozer allowed.	Asphalt can be dumped into paver when compacted pavement subbase reaches 18” (450 mm) for MC-3500 and 24” (600 mm) for MC-4500 above top of chambers.	Small LGP track dozers & skid loaders allowed to grade cover stone with at least 12” (300 mm) stone under tracks at all times. Equipment must push parallel to rows at all times.	Use dynamic force of roller only after compacted fill depth reaches 18” (450 mm) for MC-3500 and 24” (600 mm) for MC-4500 over chambers. Roller travel parallel to chamber rows only.
Ⓑ Embedment Stone	No equipment allowed on bare chambers. Use excavator or stone conveyor positioned off bed or on foundation stone to evenly fill around all chambers to at least the top of chambers.	No wheel loads allowed. Material must be placed outside the limits of the chamber bed.	No tracked equipment is allowed on chambers until a min. 12” (300 mm) cover stone is in place.	No rollers allowed.
Ⓐ Foundation Stone	No StormTech restrictions. Contractor responsible for any conditions or requirements by others relative to subgrade bearing capacity, dewatering or protection of subgrade.			