STORMWATER MANAGEMENT REPORT

PROJECT SITE:
THE CAPE CLUB OF SHARON
25 TIOT STREET
SHARON, MASSACHUSETTS 02067

PREPARED FOR:
CAPE CLUB BUILDERS, LLC
25 TIOT STREET
SHARON, MASSACHUSETTS 02067

PREPARED BY:

CONECO
Engineers & Scientists

4 First Street • Bridgewater, Massachusetts 02324

Phone: (508) 697-3191 • Fax: (508) 697-5996
E-mail: SOates@coneco.com

SEPTEMBER 15, 2017

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INTRODUCTION

Coneco Engineers & Scientists, Incorporated (Coneco) has completed a drainage analysis of the subject site, located at 25 Tiot Street in Sharon, Massachusetts, the results of which are contained herein. The purpose of this analysis is to quantitatively understand the impacts of the proposed redevelopment of the project site on the existing hydrologic conditions and to mitigate said impacts through the implementation of a stormwater management system that utilizes best management practices and is supported by an operations and maintenance plan as well as a long term pollution prevention plan.

DEVELOPMENT SUMMARY

The proposed project is a mix of new residential development and the redevelopment of an existing golf course. The areas that are considered redevelopment are only required to meet the stormwater standards to the maximum extent practicable, while the areas that are being developed will fully meet the stormwater standards. The overall project will consist of the construction of fifty two (52) two bedroom townhouses with permeable paver driveways, associated utilities, the relocation of an existing parking lot, and reconstruction of the existing access drive.

STORMWATER MANAGEMENT SYSTEM OVERVIEW

The proposed stormwater management system is primarily a “country drainage” system consisting of curb breaks in the roadway that direct stormwater flows through pea gravel diaphragms and grassed swales that convey the stormwater to vegetated infiltration basins. Where this option is not feasible on site, conventional pipe and gutter drainage conveyance was utilized which consisted of series of a deep sump hooded catch basins, manholes, and underground storage to collect, treat, and control the proposed flows that will match or improve the discharge to the sites existing subcatchment design points. In addition to the roadway drainage system, each of the proposed townhouses roof runoff is directed to an infiltration area to promote stormwater recharge. Each infiltration basin in the roadway system has been designed to contain the 10-year storm prior to discharging to the site through an overflow beehive structure. Above the 10-year storm elevation, the basins were designed to contain the 100-year storm elevation, at which an overflow spillway was placed. The berm will maintain one foot of freeboard above the 100-year storm elevation. The infiltration facilities for the roof runoff were sized to accommodate the one-inch (1”) storm event.

The stormwater analysis that was performed showed a reduction in rates and volumes without utilizing any of the proposed facilities for attenuation. Due to this, all of the proposed stormwater facilities were designed to treat stormwater and were not incorporated in the analysis because they were not needed for attenuation purposes. If the stormwater facilities were added into the post development analysis, they would aide in attenuation of both rates and volumes.

The majority of the roadway will be directed to curb breaks, pea gravel diaphragms, grassed swales, and infiltration basins. These measures area intended to remove TSS and promote the recharge of stormwater. Where the road is directed to a conventional drainage system, the catch basin will have 4 foot deep sumps and oil/gas hoods. The deep sumps are intended to remove sediment, and the hoods are intended to remove oil and gas from the stormwater prior to release. Stormwater will then travel though a system of pipes and drain manholes. All pipes within the closed conduit system have been designed for a 25-year storm.

Emergency spillways have been incorporated to facilitate the discharge of stormwater during a high magnitude storm event. The infiltration basins have been designed to accommodate and route the runoff from the 10-year storm event, while providing a foot of freeboard in the basin above the 100-year storm event.

All of the flared end inlets a depressed center and a level outer rim. The depressed center promotes the removal of any residual sediment while the level outer rim dissipates the energy of the effluent by diminishing the velocity and eliminating the point discharge.

From an environmentally sensitive perspective, the aforementioned measures result in a low impact design that enhances the introduction of surface water into the ground while preserving the natural hydrologic conditions.

METHODOLOGY

Drainage calculations are performed to demonstrate that there is no increase in the rate of runoff from the subject site due to the proposed project. The rate of runoff is compared at a common point, referred to as the design point, for both the pre and post development condition (or the existing and proposed condition in the case of a redevelopment project). The hydrologic and hydraulic model created to analyze the pre and post development condition was developed using the Soil Conservation Service (SCS) Technical Release No. 20 (TR 20, SCS unit hydrograph procedures), SCS Technical Release No. 55 (TR 55, Time of Concentration (T_c) and Curve Number (CN)), SCS Technical Paper No. 40 (TP 40, rainfall intensity) and the stormwater detention facilities were modeled using the SCS Storage Indication Method.

Time of Concentration (T_c) - is the time required for stormwater runoff to travel from the most hydraulically distant point in a drainage area or subcatchment to the design point. The T_c is calculated based upon slope, distance, surface cover and type of flow. A longer time of concentration will generally result in a smaller rate of runoff.

Curve Number (CN) - represents the amount of runoff expected from a particular segment of the drainage area. A higher curve number will be less permeable and therefore a larger rate of runoff. The CN is based upon three factors: soil type, soil cover, and cover condition. The soil type is graded A to D; A soil is the most permeable, D is the least. The soil cover (e.g. - vegetated, developed, farmland or impervious) ranges from 30-98, with more permeable soil covers having a lower value. The final factor is the condition of the vegetated soil cover (good, fair or poor), where vegetated cover in good condition is the most permeable and allows the least runoff.

The Hydrologic Soil Group (HSG) for the drainage areas was determined from the Soil Conservation Service Soil Survey of Norfolk County, Massachusetts. The soil survey contains maps which depict the extent of the various soil types. A soil type overlay plan is attached as Figure 6.

Design Software - To assist in the analysis, software entitled HydroCAD, Version 10.0 (developed by HydroCAD Software Solutions, L.L.C.) was utilized. The HydroCAD program calculates the runoff based on rainfall events and watershed characteristics, and produces a runoff hydrograph (a runoff rate versus time curve). If applicable, stage-storage-discharge curves for a specific detention facility are calculated.

Peak Attenuation - The peak rate of runoff at the design points was calculated for the existing and proposed conditions for the 2, 10, 25, and 100-year, 24-hour storm events. The peak rate of runoff was compared for each storm event to determine if there was an increase from the pre to post development condition.

Runoff Volume - The total volume of runoff for the entire site was calculated for the existing and proposed conditions for the 2, 10, 25, and 100-year, 24-hour storm events. The volume of runoff was compared for each storm event to determine if there was an increase from the pre to post development condition.

EXISTING CONDITIONS

Coneco compiled existing and proposed drainage areas from an onsite survey conducted by Coneco and an aerial survey performed by Col-East Inc. The site is located on the southeast side of Tiot Street near the intersection of the town lines between Sharon, Norwood, Walpole, and Canton. The site consists of a 200 acre golf course with a club building and parking lot in the center and a maintenance building on the southwest property line. The main roadway into the site is paved and branches off into several gravel paths that loop around the golf course. There are 55 acres of wetlands on the site, including two perennial streams that run from south to north and several ponds. The remainder of the site is primarily grass and wooded area with numerous sand traps, walkways, and cart paths throughout. Topography generally slopes from south to north at grades of less than 0.5%.

The Soil Conservation Service map for the area indicates that the site is made of fourteen soil types. Please refer to Table 1 for a summary of these soils.

Table 1

Existing Soil Classifications

SOIL MAP UNIT	*2012 NORFOLK SOIL SURVEY MAP UNIT NAME AND DESCRIPTION*	*HYDROLOGIC SOIL GROUP*
1	Water	Unclassified
10	Scarboro and Birdsall soils, 0 to percent slopes	D
30	Raynham silt loam, 0 to 3 percent slopes	C
31A	Walpole sandy loam, 0 to 3 percent slopes	D
51	Swansea muck, 0 to 1 percent slopes	D
52	Freetown muck, 0 to 1 percent slopes	D
254A	Merrimac fine sandy loam, 0 to 3 percent slopes	A
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A
255B	Windsor loamy sand, 3 to 8 percent slopes	A
256B	Deerfield loamy sand, 3 to 8 percent slopes	A
260B	Sudbury fine sandy loam, 2 to 8 percent slopes	B
420B	Canton fine sandy loam, 3 to 8 percent slopes	B
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	B
602	Urban land	Unclassified
655	Udorthents, wet substratum	D

PROPOSED CONDITIONS

The proposed project consists of the construction of 52 new townhouses (approximately 2,200 square feet each) with permeable paver driveways connecting to the reconstructed access drive. In addition, two new parking areas will be built to replace the current parking area that will be removed.

These changes increase the overall impervious area found at the site. However, the addition of deep sump catch basins with oil/gas hoods, infiltrations chambers, pea gravel diaphragms, grassed swales, and infiltration basins, the runoff from these impervious areas will be substantially cleaner than in the existing conditions.

STORMWATER MANAGEMENT STANDARDS REVIEW

As part of this drainage analysis, Coneco has performed an in-depth review of the subject site for conformance with the Massachusetts Department of Environmental Protection's Stormwater Management Standards. The project is considered a mix of development and redevelopment and areas that area considered redevelopment are therefore required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable and a redevelopment project shall comply with all other requirements of the Stormwater Management Standards and improve existing conditions. The following is a summary of our findings relative to our review of each of the standards. Please note that the actual text of each standard is italicized for clarity.

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

There are no new untreated discharges. A drainage system has been designed for the roadways and the townhouses. The stormwater shall be treated prior to release with grassed swales, infiltration basins, infiltration chambers, and deep sump catch basins with hoods. The deep sump will provide an area for sediment to settle out and the hood will provide oil and gas separation. Outlets have been designed to reduce erosion and eliminate scouring within the wetland areas. A level spreader shall be installed at each discharge point. The level spreader will spread out the runoff over a larger area which slows down the velocity and therefore reduces scour. The level spreader will be depressed to form a pool which will enhance sediment removal prior to discharge.

STANDARD 2: Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

The existing and proposed site conditions were analyzed for the 2, 10, 25, and 100-year 24-hour storm events using the aforementioned methodology (please refer to appendices A and B of this report for HydroCAD output support data). Based on these results, there is no increase in peak discharge rates or total volume for all storm events analyzed (refer to Table 2).

Table 2

Peak Rate of Runoff & Total Volume

West Perennial Stream

Storm Frequency (in years)	*Existing Conditions*		*Proposed Conditions*		*Percent Decrease From Existing*	
	Peak Runoff (CFS)	*Total Volume (CF)*	*Peak Runoff (CFS)*	*Total Volume (CF)*	*Peak Runoff*	*Total Volume (CF)*
2	*35.1*	*614,197*	*35.1*	*614,197*	*0.0%*	*0.0%*
10	*105.6*	*1,767,173*	*100.4*	*1,767,172*	*4.9%*	*0.0%*
25	*143.7*	*2,383,750*	*143.7*	*2,383,749*	*0.0%*	*0.0%*
100	*222.3*	*3,656,350*	*216.0*	*3,656,348*	*2.8%*	*0.0%*

East Perennial Stream

Storm Frequency (in years)	Existing Conditions		Proposed Conditions		Percent Decrease From Existing	
	Peak Runoff (CFS)	Total Volume (CF)	Peak Runoff (CFS)	Total Volume (CF)	Peak Runoff	Total Volume (CF)
2	28.6	508,125	28.6	508,105	0.0%	0.0%
10	96.0	1,622,998	90.9	1,622,937	5.3%	0.0%
25	134.0	2,237,794	134.0	2,237,709	0.0%	0.0%
100	213.3	3,527,370	213.3	3,527,236	3.1%	0.0%

CLOSED DRAINAGE SYSTEM CALCULATIONS

HydroCAD Pipe Sizing for the – 25-year storm

Drainage calculations were performed to size the on-site pipes to accommodate the flow from the 25-year storm for the contributing watersheds on-site and from surrounding neighborhoods.

HydroCAD ver. 10.00 was used to calculate the peak flow through the pipes, and the Manning equation was used to determine the minimum pipe size required to pass the flow from the 25-year storm.

The Manning's formula was utilized to calculate the capacity of the individual pipes in the closed drainage system. The Manning's formula is:

$Q = (Ap)\ (1.486/n)\ (s^{1/2})\ (h^{2/3})$
Q = Design flow, in CFS
Ap = Cross-sectional area of the pipe (square feet)
n = Roughness coefficient
s = slope of the pipe (ft/ft)
h = hydraulic radius = area/wetted perimeter (sf/ft)

The design flow, Q, was found in each pipe length by finding the sum of flows from each upstream catchment area contributing to that pipe. Individual flows were determined from the HydroCAD model during the 25-year storm. Please refer to Appendix C for the closed drainage system pipe sizing.

STANDARD 3: Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Standard 3 requires that a certain volume of water be recharged to the site depending on existing soil types and square feet of total impervious area over each soil type. Please refer to Table 3 for a summary of the required recharge.

Table 3

Recharge to Groundwater

Hydrologic Group	*Volume of Recharge (inches/SF)*	*Total Impervious Area (SF)*	*Required Recharge Volume (CF)*
A	0.60	268,052	13,403
B	0.35	23,883	697
C	0.25	8,047	168
D	0.10	89,238	744
		Total Volume to Recharge on Site:	**15,010 CF**

Therefore, the on-site infiltration system must be designed with a minimum infiltration capacity of 15,010 cubic feet. This is the required volume for all of the impervious areas that are on site, including areas that are not being modified. All new impervious areas and the reconstructed portion of the road area being directed to an infiltration facility. The proposed design directs 78.5% of the impervious to an infiltration system, which would require a minimum recharge volume of 19,126 cubic feet. The infiltration facilities proposed for the site will provide a total recharge volume of 44,287 cubic feet, which greatly exceeds the required volume.

Coneco has used the Simple Dynamic method for analyzing the infiltration BMPs. Please refer to Appendix C for this information as well as 72 hour drawdown calculations.

It should be noted that the proposed Infiltration BMPs do not adversely impact nearby wetland resource areas.

STANDARD 4: Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

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

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

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

The proposed stormwater management system will achieve the 80% TSS removal requirement for any surface water which happens to make its way into the underground system. Please refer to Table 4 for a TSS removal summary.

Please note that a long term pollution prevention plan has been developed as part of the analysis and can be found in Appendix D.

TREATMENT OF SUSPENDED SOLIDS:

Catch basins will be equipped with hoods and four-foot sumps to limit sediment, oils, and grease from being discharged to the drainage system. Infiltration basins will have pea gravel diaphragms and grassed swales as pretreatment. Please refer to Table 2 – Total Suspended Solids Removal worksheet attached herein for this information.

Runoff from roofs will be considered clean which require no treatment.

Table 4

Total Suspended Solids Removal

Conventional Drainage

BMP	*TSS Removal Rate*	*Starting TSS Load*	*TSS Removed*	*Remaining TSS Load*
Deep Sump Hooded Catch Basin	0.25	1.00	0.25	0.75
Stormceptor	0.52	0.75	0.39	0.36
Infiltration	0.80	0.36	0.29	0.07
		Total Suspended Solids Removed:		**93%**

Country Style Drainage

BMP	*TSS Removal Rate*	*Starting TSS Load*	*TSS Removed*	*Remaining TSS Load*
Pea Gravel Diaphragm	0.00	1.00	0.00	1.00
Grassed Swales	0.50	1.00	0.50	0.50
Infiltration	0.80	0.50	0.40	0.10
		Total Suspended Solids Removed:		**90%**

WATER QUALITY VOLUME

See Appendix C for required water quality volume calculations based on impervious area.

Water Quality Volume = 389,220 sf impervious area x1 inch/12 inches per foot = 32,435 cubic feet

STANDARD 5: For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

The project site is not a land use with higher potential pollutant loads, per the regulation.

STANDARD 6: Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

The project site discharges into an Interim Wellhead Protection Area of a public water supply and the discharge is located within the Fowl Meadow and Ponkapaog Bog Area of Critical Environmental Concern. This limits use of BMPs to those approved by MassDEP for stormwater discharges to an Interim Wellhead Protection Area and to Areas of Critical Environmental Concern and also requires the use of a treatment train that provides 80% TSS removal prior to discharge.

STANDARD 7: A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

While the project is a mix of development and redevelopment all standards are fully met.

STANDARD 8: A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

A Stormwater Pollution Prevention Plan (SWPPP) will be prepared before the disturbance of any earth commences on the project site. The SWPPP will be prepared by others per EPA NPDES NOI guidelines and submitted under a separate cover. The Sedimentation and Erosion Control Plan to be implemented during the construction phase of this project will be submitted with the SWPPP.

STANDARD 9: A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

Please refer to Appendix E for the Operation and Maintenance Plan for the proposed Stormwater Management System.

STANDARD 10: All illicit discharges to the stormwater management system are prohibited.

To our knowledge, no illicit discharges are made to the stormwater management system. See Appendix F for the Illicit Discharge Statement.

CONCLUSION/SUMMARY:

Based on the HydroCAD analysis for the 2, 10, 25, and 100-year storm events, the peak rate of runoff and the total volume have decreased from the existing to the proposed condition. Furthermore, effluent water quality has been enhanced and widespread infiltration has been introduced to previously uncontrolled areas thereby promoting/preserving the natural hydrologic conditions. In addition to these improvements, all 10 of the DEP Stormwater Standards have been met.

LIST OF FIGURES

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FIGURE 2 - USGS TOPOGRAPHIC MAP

FIGURE 3 - FLOOD INSURANCE RATE MAP

FIGURE 4 - NATURAL HERITAGE MAP

FIGURE 5 - CRITICAL AREAS

FIGURE 6 - SOIL SURVEY MAP

FIGURE 7 - EXISTING DRAINAGE AREAS

FIGURE 8 - PROPOSED DRAINAGE AREAS

APPENDIX A

EXISTING HYDROLOGICAL CONDITIONS

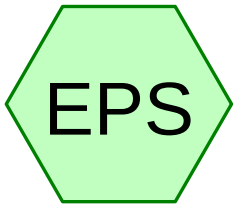
2-YEAR STORM EVENT

10-YEAR STORM EVENT

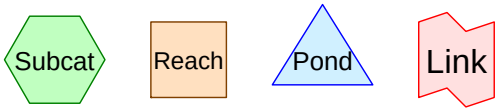
25-YEAR STORM EVENT

100-YEAR STORM EVENT

West Perennial Stream



East Perennial Stream



Routing Diagram for 9231.0 - Sharon - Spring Valley - Existing Conditions
Prepared by Microsoft, Printed 9/14/2017

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
3,437,793	61	1/4 acre lots, 38% imp, HSG A (EPS, WPS)
2,134,428	75	1/4 acre lots, 38% imp, HSG B (EPS, WPS)
1,733,033	83	1/4 acre lots, 38% imp, HSG C (EPS, WPS)
558,008	87	1/4 acre lots, 38% imp, HSG D (EPS, WPS)
2,729,853	39	>75% Grass cover, Good, HSG A (EPS, WPS)
1,385,679	61	>75% Grass cover, Good, HSG B (EPS, WPS)
15,686	74	>75% Grass cover, Good, HSG C (WPS)
2,007,105	80	>75% Grass cover, Good, HSG D (EPS, WPS)
631,054	30	Brush, Good, HSG A (EPS, WPS)
326,005	48	Brush, Good, HSG B (EPS, WPS)
93,787	65	Brush, Good, HSG C (WPS)
221,987	73	Brush, Good, HSG D (EPS, WPS)
52,144	72	Dirt roads, HSG A (EPS, WPS)
40,508	82	Dirt roads, HSG B (EPS, WPS)
31,297	89	Dirt roads, HSG D (EPS, WPS)
198,905	76	Gravel roads, HSG A (EPS, WPS)
496,610	85	Gravel roads, HSG B (EPS, WPS)
1,334	89	Gravel roads, HSG C (WPS)
100,894	91	Gravel roads, HSG D (EPS, WPS)
44,870	63	Natural western desert, HSG A (EPS, WPS)
9,541	77	Natural western desert, HSG B (WPS)
22,074	88	Natural western desert, HSG D (EPS, WPS)
520,282	98	Unconnected pavement, HSG A (EPS, WPS)
269,020	98	Unconnected pavement, HSG B (EPS, WPS)
245,791	98	Unconnected pavement, HSG C (EPS, WPS)
189,533	98	Unconnected pavement, HSG D (EPS, WPS)
2,114,775	98	Wetlands, Ponds, Basins, HSG D (EPS)
35,165	98	Wetlands, Ponds, and Basins, HSG B (EPS)
14,409	98	Wetlands, Ponds, and Basins, HSG C (EPS)
495,367	98	Wetlands, ponds, basins, HSG A (EPS, WPS)
195,210	98	Wetlands, ponds, basins, HSG B (WPS)
156,332	98	Wetlands, ponds, basins, HSG C (WPS)
883,549	98	Wetlands, ponds, basins, HSG D (WPS)
9,148,673	30	Woods, Good, HSG A (EPS, WPS)
4,528,066	55	Woods, Good, HSG B (EPS, WPS)
2,988,196	70	Woods, Good, HSG C (EPS, WPS)
4,527,347	77	Woods, Good, HSG D (EPS, WPS)
42,584,310	**62**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
17,258,941	HSG A	EPS, WPS
9,420,232	HSG B	EPS, WPS
5,248,568	HSG C	EPS, WPS
10,656,569	HSG D	EPS, WPS
0	Other	
42,584,310		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
3,437,793	2,134,428	1,733,033	558,008	0	7,863,262	1/4 acre lots, 38% imp
2,729,853	1,385,679	15,686	2,007,105	0	6,138,323	>75% Grass cover, Good
631,054	326,005	93,787	221,987	0	1,272,833	Brush, Good
52,144	40,508	0	31,297	0	123,949	Dirt roads
198,905	496,610	1,334	100,894	0	797,743	Gravel roads
44,870	9,541	0	22,074	0	76,485	Natural western desert
520,282	269,020	245,791	189,533	0	1,224,626	Unconnected pavement
0	0	0	2,114,775	0	2,114,775	Wetlands, Ponds, Basins
0	35,165	14,409	0	0	49,574	Wetlands, Ponds, and Basins
495,367	195,210	156,332	883,549	0	1,730,458	Wetlands, ponds, basins
9,148,673	4,528,066	2,988,196	4,527,347	0	21,192,282	Woods, Good
17,258,941	**9,420,232**	**5,248,568**	**10,656,569**	**0**	**42,584,310**	**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EPS: East Perennial Runoff Area=22,173,220 sf 19.34% Impervious Runoff Depth>0.27"
Flow Length=11,006' Tc=236.8 min CN=60 Runoff=28.6 cfs 508,125 cf

Subcatchment WPS: West Perennial Runoff Area=20,411,090 sf 18.71% Impervious Runoff Depth>0.36"
Flow Length=8,399' Tc=240.2 min CN=63 Runoff=35.1 cfs 614,197 cf

Total Runoff Area = 42,584,310 sf Runoff Volume = 1,122,322 cf Average Runoff Depth = 0.32"
80.96% Pervious = 34,476,837 sf 19.04% Impervious = 8,107,473 sf

Summary for Subcatchment EPS: East Perennial Stream

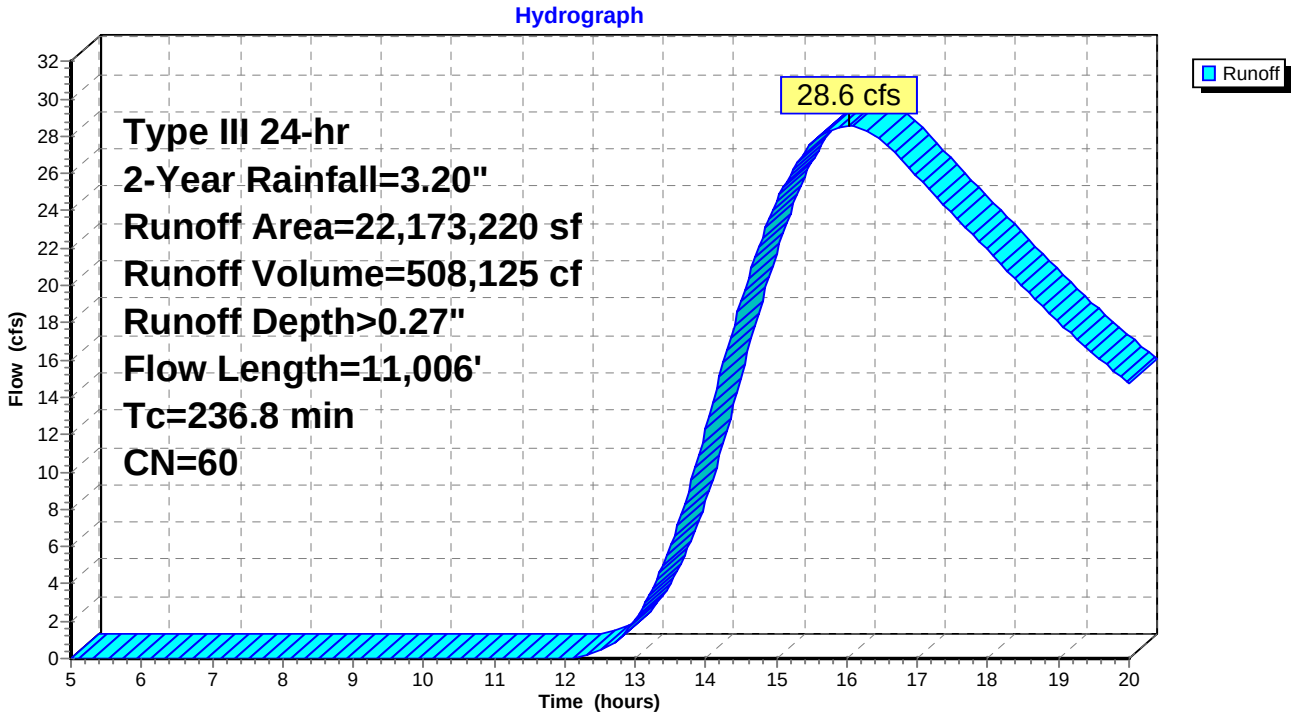
Runoff = 28.6 cfs @ 16.04 hrs, Volume= 508,125 cf, Depth> 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	115,988	30	Brush, Good, HSG A
	5,349,717	30	Woods, Good, HSG A
	2,002,331	39	>75% Grass cover, Good, HSG A
*	1,518,870	61	1/4 acre lots, 38% imp, HSG A
	36,932	63	Natural western desert, HSG A
	8,759	72	Dirt roads, HSG A
	155,481	76	Gravel roads, HSG A
	296,926	98	Unconnected pavement, HSG A
*	406,415	98	Wetlands, ponds, basins, HSG A
*	290,979	48	Brush, Good, HSG B
	2,538,361	55	Woods, Good, HSG B
	953,845	61	>75% Grass cover, Good, HSG B
	1,263,454	75	1/4 acre lots, 38% imp, HSG B
*	32,822	82	Dirt roads, HSG B
	472,190	85	Gravel roads, HSG B
	177,014	98	Unconnected pavement, HSG B
*	35,165	98	Wetlands, Ponds, and Basins, HSG B
	305,812	70	Woods, Good, HSG C
	43,863	83	1/4 acre lots, 38% imp, HSG C
	3,985	98	Unconnected pavement, HSG C
*	14,409	98	Wetlands, Ponds, and Basins, HSG C
*	100,945	73	Brush, Good, HSG D
*	2,384,670	77	Woods, Good, HSG D
	1,110,680	80	>75% Grass cover, Good, HSG D
*	312,159	87	1/4 acre lots, 38% imp, HSG D
	12,113	88	Natural western desert, HSG D
	6,715	89	Dirt roads, HSG D
	60,362	91	Gravel roads, HSG D
	47,483	98	Unconnected pavement, HSG D
*	2,114,775	98	Wetlands, Ponds, Basins, HSG D
	22,173,220	60	Weighted Average
	17,884,477		80.66% Pervious Area
	4,288,743		19.34% Impervious Area
	525,408		12.25% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
71.2	100	0.0010	0.02		**Sheet Flow, AB Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
20.2	384	0.0040	0.32		**Shallow Concentrated Flow, BC Woods** Woodland Kv= 5.0 fps
0.2	40	0.0190	2.80		**Shallow Concentrated Flow, CD Street** Paved Kv= 20.3 fps
5.6	176	0.0110	0.52		**Shallow Concentrated Flow, DE Woods** Woodland Kv= 5.0 fps
76.0	1,010	0.0010	0.22		**Shallow Concentrated Flow, EF Wetlands** Short Grass Pasture Kv= 7.0 fps
31.6	2,743	0.0005	1.44	56.35	**Channel Flow, FG East Stream 1** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
1.5	374	0.0040	4.09	159.39	**Channel Flow, GH East Stream 2** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.2	260		17.94		**Lake or Reservoir, HI East Stream Pond 1** Mean Depth= 10.00'
5.1	1,092	0.0030	3.54	138.04	**Channel Flow, IJ East Stream 3** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
4.0	854	0.0030	3.54	138.04	**Channel Flow, JK East Stream 4** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.2	177		17.94		**Lake or Reservoir, KL East Stream Pond 2** Mean Depth= 10.00'
17.5	3,038	0.0020	2.89	112.71	**Channel Flow, LM East Stream 5** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.3	367		17.94		**Lake or Reservoir, MN East Stream Pond 3** Mean Depth= 10.00'
3.2	391	0.0010	2.04	79.70	**Channel Flow, NO East Stream 6** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
236.8	11,006	Total			

Subcatchment EPS: East Perennial Stream



Summary for Subcatchment WPS: West Perennial Stream

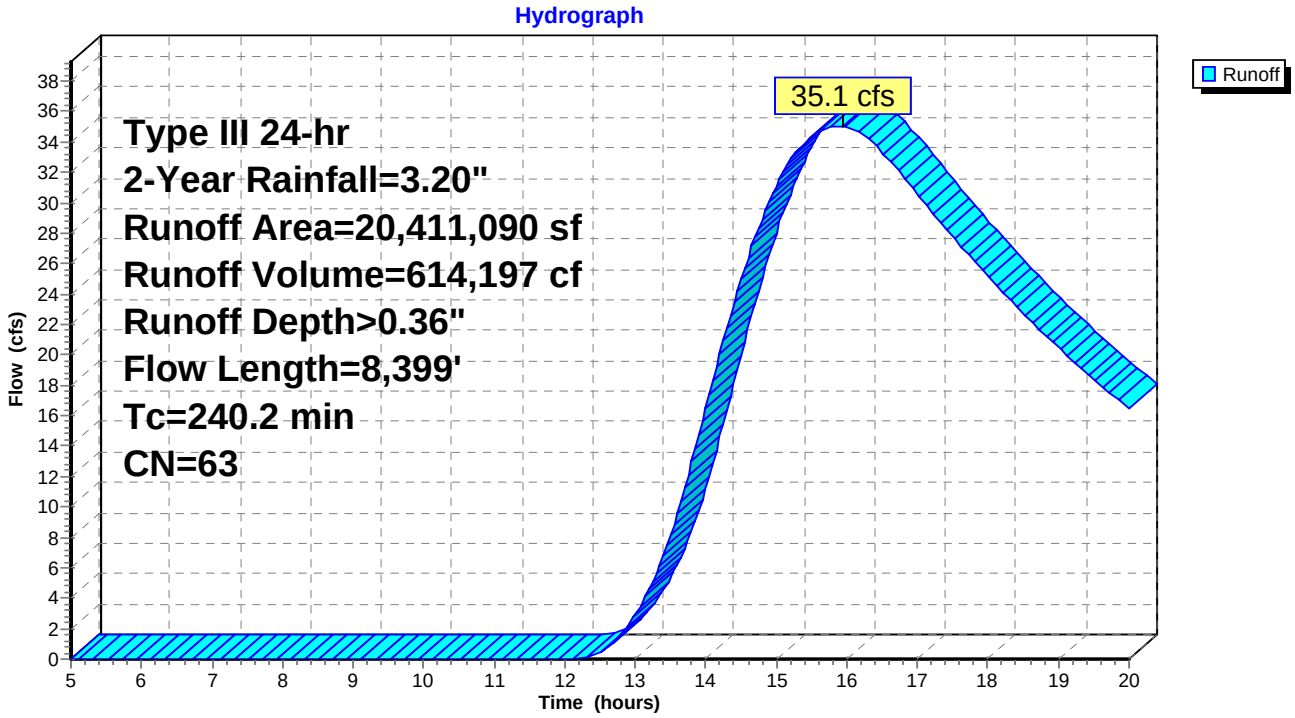
Runoff = 35.1 cfs @ 15.95 hrs, Volume= 614,197 cf, Depth> 0.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	515,066	30	Brush, Good, HSG A
	3,798,956	30	Woods, Good, HSG A
	727,522	39	>75% Grass cover, Good, HSG A
	1,918,923	61	1/4 acre lots, 38% imp, HSG A
	7,938	63	Natural western desert, HSG A
	43,385	72	Dirt roads, HSG A
	43,424	76	Gravel roads, HSG A
	223,356	98	Unconnected pavement, HSG A
*	88,952	98	Wetlands, ponds, basins, HSG A
*	35,026	48	Brush, Good, HSG B
	1,989,705	55	Woods, Good, HSG B
*	431,834	61	>75% Grass cover, Good, HSG B
*	870,974	75	1/4 acre lots, 38% imp, HSG B
	9,541	77	Natural western desert, HSG B
	7,686	82	Dirt roads, HSG B
	24,420	85	Gravel roads, HSG B
	92,006	98	Unconnected pavement, HSG B
*	195,210	98	Wetlands, ponds, basins, HSG B
*	93,787	65	Brush, Good, HSG C
	2,682,384	70	Woods, Good, HSG C
	15,686	74	>75% Grass cover, Good, HSG C
	1,689,170	83	1/4 acre lots, 38% imp, HSG C
	1,334	89	Gravel roads, HSG C
	241,806	98	Unconnected pavement, HSG C
*	156,332	98	Wetlands, ponds, basins, HSG C
*	121,042	73	Brush, Good, HSG D
	2,142,677	77	Woods, Good, HSG D
*	896,425	80	>75% Grass cover, Good, HSG D
*	245,849	87	1/4 acre lots, 38% imp, HSG D
	9,961	88	Natural western desert, HSG D
	24,582	89	Dirt roads, HSG D
	40,532	91	Gravel roads, HSG D
	142,050	98	Unconnected pavement, HSG D
*	883,549	98	Wetlands, ponds, basins, HSG D
	20,411,090	63	Weighted Average
	16,592,361		81.29% Pervious Area
	3,818,729		18.71% Impervious Area
	699,218		18.31% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	100	0.0150	0.07		**Sheet Flow, AB Wooded** Woods: Light underbrush n= 0.400 P2= 3.20"
18.1	454	0.0070	0.42		**Shallow Concentrated Flow, BC Wooded** Woodland Kv= 5.0 fps
8.7	491	0.0180	0.94		**Shallow Concentrated Flow, CD Grass** Short Grass Pasture Kv= 7.0 fps
34.7	466	0.0020	0.22		**Shallow Concentrated Flow, DE Wooded** Woodland Kv= 5.0 fps
17.0	319	0.0020	0.31		**Shallow Concentrated Flow, EF Wetland** Short Grass Pasture Kv= 7.0 fps
84.2	2,236	0.0040	0.44		**Shallow Concentrated Flow, FG Grass** Short Grass Pasture Kv= 7.0 fps
28.0	1,050	0.0080	0.63		**Shallow Concentrated Flow, GH Grass** Short Grass Pasture Kv= 7.0 fps
7.8	732	0.0010	1.57	26.70	**Channel Flow, HI West Stream 1** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.2	238		17.94		**Lake or Reservoir, IJ West Stream Pond 1** Mean Depth= 10.00'
16.7	1,571	0.0010	1.57	26.70	**Channel Flow, JK West Stream 2** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.7	742		17.94		**Lake or Reservoir, KL West Stream Pond 2** Mean Depth= 10.00'
240.2	8,399	Total			

Subcatchment WPS: West Perennial Stream



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EPS: East Perennial Runoff Area=22,173,220 sf 19.34% Impervious Runoff Depth>0.88"
Flow Length=11,006' Tc=236.8 min CN=60 Runoff=96.0 cfs 1,622,998 cf

Subcatchment WPS: West Perennial Runoff Area=20,411,090 sf 18.71% Impervious Runoff Depth>1.04"
Flow Length=8,399' Tc=240.2 min CN=63 Runoff=105.6 cfs 1,767,173 cf

Total Runoff Area = 42,584,310 sf Runoff Volume = 3,390,171 cf Average Runoff Depth = 0.96"
80.96% Pervious = 34,476,837 sf 19.04% Impervious = 8,107,473 sf

Summary for Subcatchment EPS: East Perennial Stream

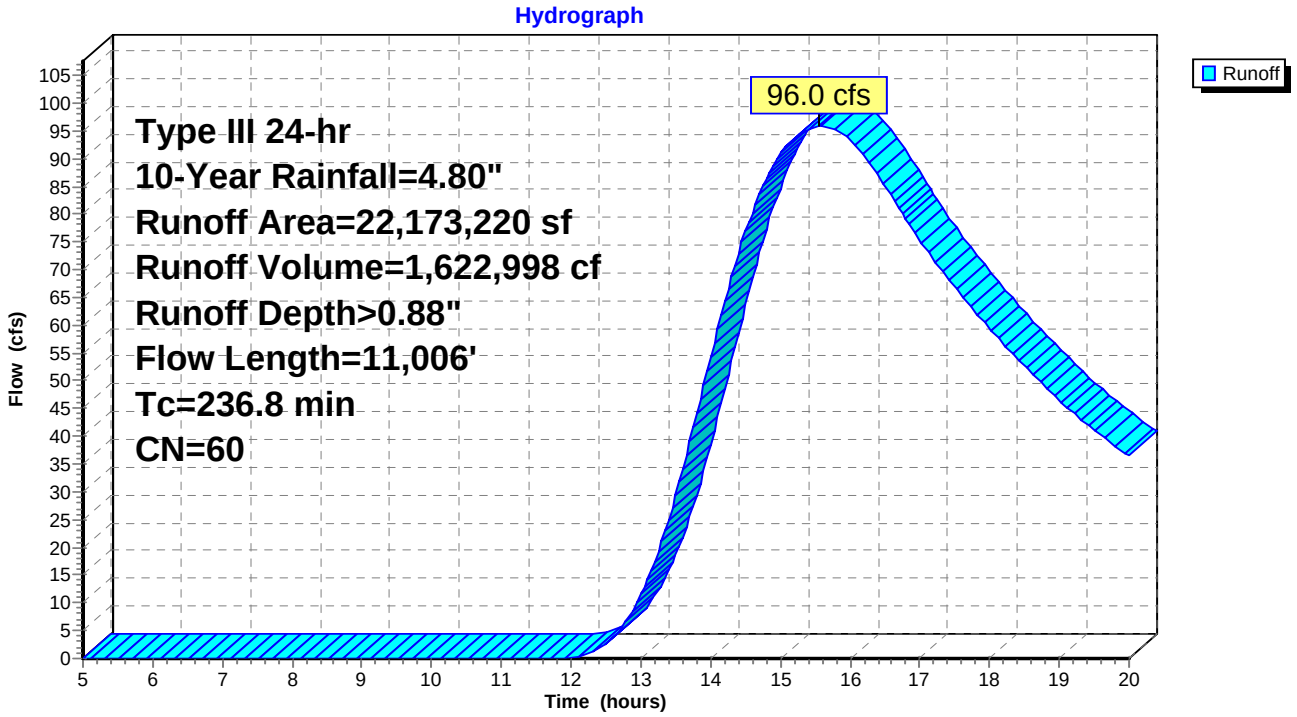
Runoff = 96.0 cfs @ 15.54 hrs, Volume= 1,622,998 cf, Depth> 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
*	115,988	30	Brush, Good, HSG A
	5,349,717	30	Woods, Good, HSG A
	2,002,331	39	>75% Grass cover, Good, HSG A
*	1,518,870	61	1/4 acre lots, 38% imp, HSG A
	36,932	63	Natural western desert, HSG A
	8,759	72	Dirt roads, HSG A
	155,481	76	Gravel roads, HSG A
	296,926	98	Unconnected pavement, HSG A
*	406,415	98	Wetlands, ponds, basins, HSG A
*	290,979	48	Brush, Good, HSG B
	2,538,361	55	Woods, Good, HSG B
	953,845	61	>75% Grass cover, Good, HSG B
	1,263,454	75	1/4 acre lots, 38% imp, HSG B
*	32,822	82	Dirt roads, HSG B
	472,190	85	Gravel roads, HSG B
	177,014	98	Unconnected pavement, HSG B
*	35,165	98	Wetlands, Ponds, and Basins, HSG B
	305,812	70	Woods, Good, HSG C
	43,863	83	1/4 acre lots, 38% imp, HSG C
	3,985	98	Unconnected pavement, HSG C
*	14,409	98	Wetlands, Ponds, and Basins, HSG C
*	100,945	73	Brush, Good, HSG D
*	2,384,670	77	Woods, Good, HSG D
	1,110,680	80	>75% Grass cover, Good, HSG D
*	312,159	87	1/4 acre lots, 38% imp, HSG D
	12,113	88	Natural western desert, HSG D
	6,715	89	Dirt roads, HSG D
	60,362	91	Gravel roads, HSG D
	47,483	98	Unconnected pavement, HSG D
*	2,114,775	98	Wetlands, Ponds, Basins, HSG D
	22,173,220	60	Weighted Average
	17,884,477		80.66% Pervious Area
	4,288,743		19.34% Impervious Area
	525,408		12.25% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
71.2	100	0.0010	0.02		**Sheet Flow, AB Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
20.2	384	0.0040	0.32		**Shallow Concentrated Flow, BC Woods** Woodland Kv= 5.0 fps
0.2	40	0.0190	2.80		**Shallow Concentrated Flow, CD Street** Paved Kv= 20.3 fps
5.6	176	0.0110	0.52		**Shallow Concentrated Flow, DE Woods** Woodland Kv= 5.0 fps
76.0	1,010	0.0010	0.22		**Shallow Concentrated Flow, EF Wetlands** Short Grass Pasture Kv= 7.0 fps
31.6	2,743	0.0005	1.44	56.35	**Channel Flow, FG East Stream 1** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
1.5	374	0.0040	4.09	159.39	**Channel Flow, GH East Stream 2** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.2	260		17.94		**Lake or Reservoir, HI East Stream Pond 1** Mean Depth= 10.00'
5.1	1,092	0.0030	3.54	138.04	**Channel Flow, IJ East Stream 3** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
4.0	854	0.0030	3.54	138.04	**Channel Flow, JK East Stream 4** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.2	177		17.94		**Lake or Reservoir, KL East Stream Pond 2** Mean Depth= 10.00'
17.5	3,038	0.0020	2.89	112.71	**Channel Flow, LM East Stream 5** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.3	367		17.94		**Lake or Reservoir, MN East Stream Pond 3** Mean Depth= 10.00'
3.2	391	0.0010	2.04	79.70	**Channel Flow, NO East Stream 6** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
236.8	11,006	Total			

Subcatchment EPS: East Perennial Stream



Summary for Subcatchment WPS: West Perennial Stream

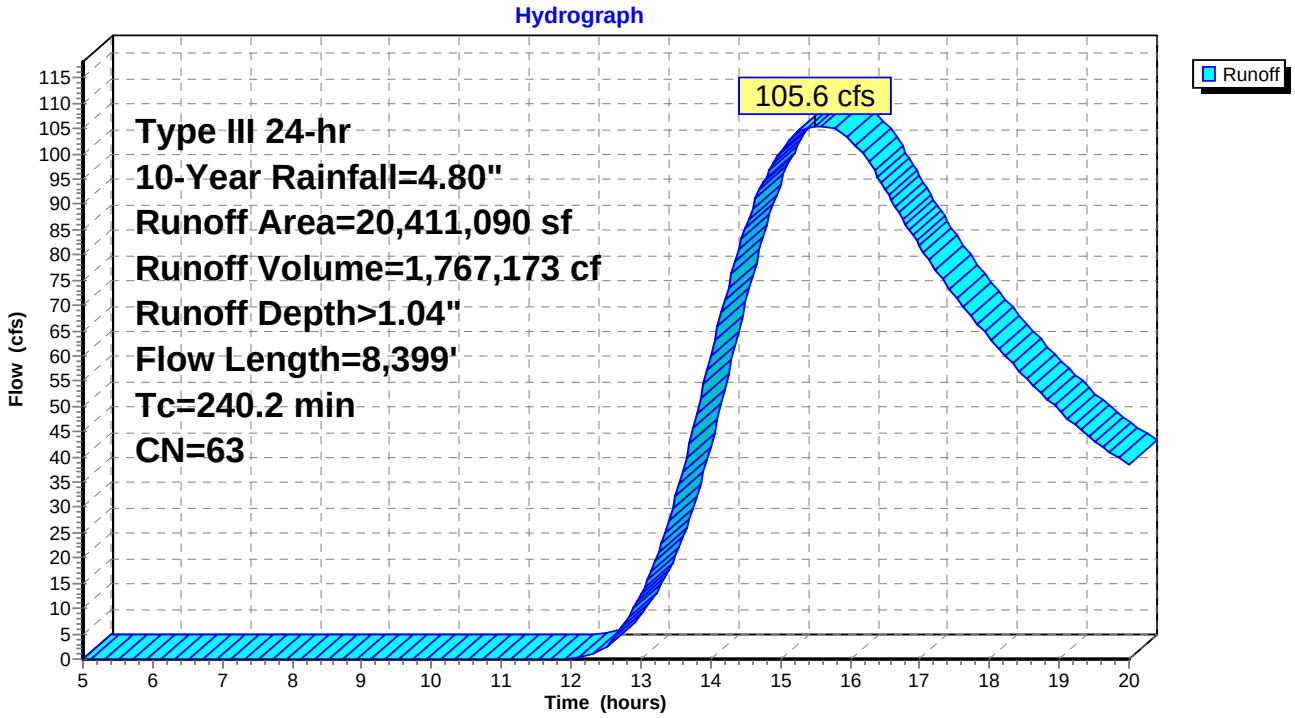
Runoff = 105.6 cfs @ 15.51 hrs, Volume= 1,767,173 cf, Depth> 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
*	515,066	30	Brush, Good, HSG A
	3,798,956	30	Woods, Good, HSG A
	727,522	39	>75% Grass cover, Good, HSG A
	1,918,923	61	1/4 acre lots, 38% imp, HSG A
	7,938	63	Natural western desert, HSG A
	43,385	72	Dirt roads, HSG A
	43,424	76	Gravel roads, HSG A
	223,356	98	Unconnected pavement, HSG A
*	88,952	98	Wetlands, ponds, basins, HSG A
*	35,026	48	Brush, Good, HSG B
	1,989,705	55	Woods, Good, HSG B
*	431,834	61	>75% Grass cover, Good, HSG B
*	870,974	75	1/4 acre lots, 38% imp, HSG B
	9,541	77	Natural western desert, HSG B
	7,686	82	Dirt roads, HSG B
	24,420	85	Gravel roads, HSG B
	92,006	98	Unconnected pavement, HSG B
*	195,210	98	Wetlands, ponds, basins, HSG B
*	93,787	65	Brush, Good, HSG C
	2,682,384	70	Woods, Good, HSG C
	15,686	74	>75% Grass cover, Good, HSG C
	1,689,170	83	1/4 acre lots, 38% imp, HSG C
	1,334	89	Gravel roads, HSG C
	241,806	98	Unconnected pavement, HSG C
*	156,332	98	Wetlands, ponds, basins, HSG C
*	121,042	73	Brush, Good, HSG D
	2,142,677	77	Woods, Good, HSG D
*	896,425	80	>75% Grass cover, Good, HSG D
*	245,849	87	1/4 acre lots, 38% imp, HSG D
	9,961	88	Natural western desert, HSG D
	24,582	89	Dirt roads, HSG D
	40,532	91	Gravel roads, HSG D
	142,050	98	Unconnected pavement, HSG D
*	883,549	98	Wetlands, ponds, basins, HSG D
	20,411,090	63	Weighted Average
	16,592,361		81.29% Pervious Area
	3,818,729		18.71% Impervious Area
	699,218		18.31% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	100	0.0150	0.07		**Sheet Flow, AB Wooded** Woods: Light underbrush n= 0.400 P2= 3.20"
18.1	454	0.0070	0.42		**Shallow Concentrated Flow, BC Wooded** Woodland Kv= 5.0 fps
8.7	491	0.0180	0.94		**Shallow Concentrated Flow, CD Grass** Short Grass Pasture Kv= 7.0 fps
34.7	466	0.0020	0.22		**Shallow Concentrated Flow, DE Wooded** Woodland Kv= 5.0 fps
17.0	319	0.0020	0.31		**Shallow Concentrated Flow, EF Wetland** Short Grass Pasture Kv= 7.0 fps
84.2	2,236	0.0040	0.44		**Shallow Concentrated Flow, FG Grass** Short Grass Pasture Kv= 7.0 fps
28.0	1,050	0.0080	0.63		**Shallow Concentrated Flow, GH Grass** Short Grass Pasture Kv= 7.0 fps
7.8	732	0.0010	1.57	26.70	**Channel Flow, HI West Stream 1** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.2	238		17.94		**Lake or Reservoir, IJ West Stream Pond 1** Mean Depth= 10.00'
16.7	1,571	0.0010	1.57	26.70	**Channel Flow, JK West Stream 2** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.7	742		17.94		**Lake or Reservoir, KL West Stream Pond 2** Mean Depth= 10.00'
240.2	8,399	Total			

Subcatchment WPS: West Perennial Stream



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EPS: East Perennial Runoff Area=22,173,220 sf 19.34% Impervious Runoff Depth>1.21"
Flow Length=11,006' Tc=236.8 min CN=60 Runoff=134.0 cfs 2,237,794 cf

Subcatchment WPS: West Perennial Runoff Area=20,411,090 sf 18.71% Impervious Runoff Depth>1.40"
Flow Length=8,399' Tc=240.2 min CN=63 Runoff=143.7 cfs 2,383,750 cf

Total Runoff Area = 42,584,310 sf Runoff Volume = 4,621,544 cf Average Runoff Depth = 1.30"
80.96% Pervious = 34,476,837 sf 19.04% Impervious = 8,107,473 sf

Summary for Subcatchment EPS: East Perennial Stream

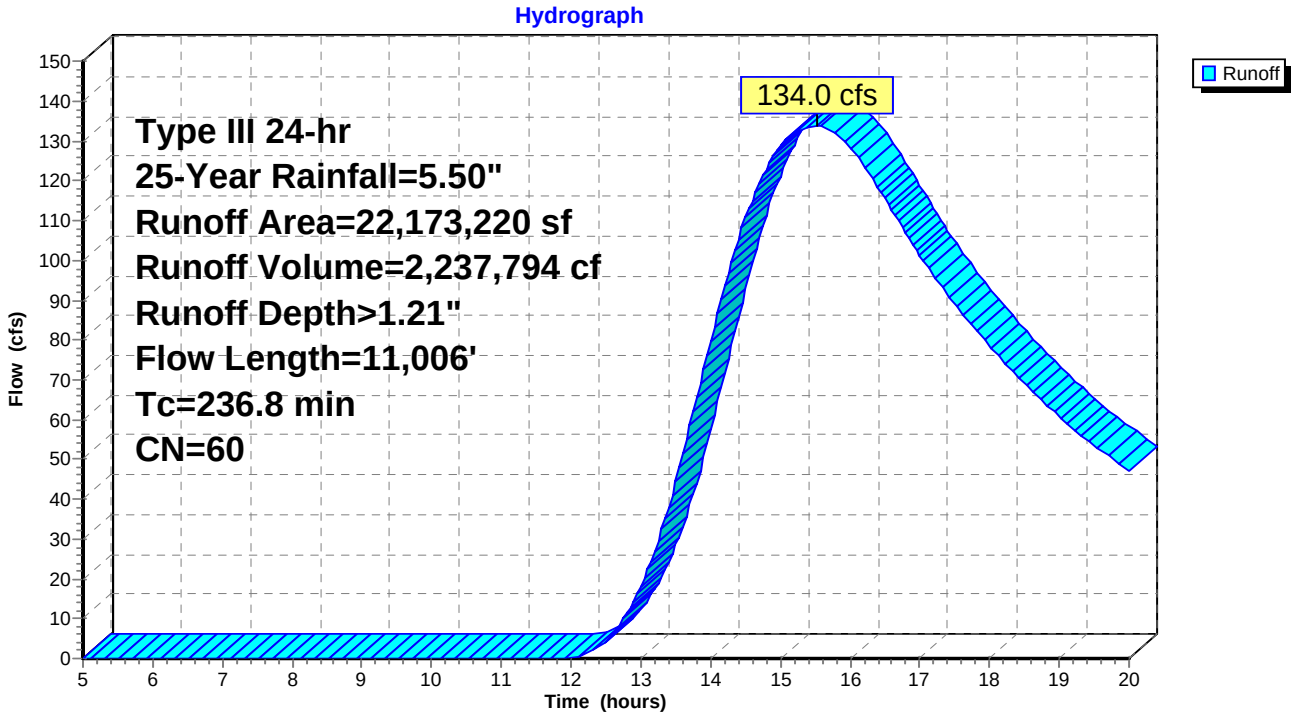
Runoff = 134.0 cfs @ 15.51 hrs, Volume= 2,237,794 cf, Depth> 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	115,988	30	Brush, Good, HSG A
	5,349,717	30	Woods, Good, HSG A
	2,002,331	39	>75% Grass cover, Good, HSG A
*	1,518,870	61	1/4 acre lots, 38% imp, HSG A
	36,932	63	Natural western desert, HSG A
	8,759	72	Dirt roads, HSG A
	155,481	76	Gravel roads, HSG A
	296,926	98	Unconnected pavement, HSG A
*	406,415	98	Wetlands, ponds, basins, HSG A
*	290,979	48	Brush, Good, HSG B
	2,538,361	55	Woods, Good, HSG B
	953,845	61	>75% Grass cover, Good, HSG B
	1,263,454	75	1/4 acre lots, 38% imp, HSG B
*	32,822	82	Dirt roads, HSG B
	472,190	85	Gravel roads, HSG B
	177,014	98	Unconnected pavement, HSG B
*	35,165	98	Wetlands, Ponds, and Basins, HSG B
	305,812	70	Woods, Good, HSG C
	43,863	83	1/4 acre lots, 38% imp, HSG C
	3,985	98	Unconnected pavement, HSG C
*	14,409	98	Wetlands, Ponds, and Basins, HSG C
*	100,945	73	Brush, Good, HSG D
*	2,384,670	77	Woods, Good, HSG D
	1,110,680	80	>75% Grass cover, Good, HSG D
*	312,159	87	1/4 acre lots, 38% imp, HSG D
	12,113	88	Natural western desert, HSG D
	6,715	89	Dirt roads, HSG D
	60,362	91	Gravel roads, HSG D
	47,483	98	Unconnected pavement, HSG D
*	2,114,775	98	Wetlands, Ponds, Basins, HSG D
	22,173,220	60	Weighted Average
	17,884,477		80.66% Pervious Area
	4,288,743		19.34% Impervious Area
	525,408		12.25% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
71.2	100	0.0010	0.02		**Sheet Flow, AB Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
20.2	384	0.0040	0.32		**Shallow Concentrated Flow, BC Woods** Woodland Kv= 5.0 fps
0.2	40	0.0190	2.80		**Shallow Concentrated Flow, CD Street** Paved Kv= 20.3 fps
5.6	176	0.0110	0.52		**Shallow Concentrated Flow, DE Woods** Woodland Kv= 5.0 fps
76.0	1,010	0.0010	0.22		**Shallow Concentrated Flow, EF Wetlands** Short Grass Pasture Kv= 7.0 fps
31.6	2,743	0.0005	1.44	56.35	**Channel Flow, FG East Stream 1** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
1.5	374	0.0040	4.09	159.39	**Channel Flow, GH East Stream 2** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.2	260		17.94		**Lake or Reservoir, HI East Stream Pond 1** Mean Depth= 10.00'
5.1	1,092	0.0030	3.54	138.04	**Channel Flow, IJ East Stream 3** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
4.0	854	0.0030	3.54	138.04	**Channel Flow, JK East Stream 4** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.2	177		17.94		**Lake or Reservoir, KL East Stream Pond 2** Mean Depth= 10.00'
17.5	3,038	0.0020	2.89	112.71	**Channel Flow, LM East Stream 5** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.3	367		17.94		**Lake or Reservoir, MN East Stream Pond 3** Mean Depth= 10.00'
3.2	391	0.0010	2.04	79.70	**Channel Flow, NO East Stream 6** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
236.8	11,006	Total			

Subcatchment EPS: East Perennial Stream



Summary for Subcatchment WPS: West Perennial Stream

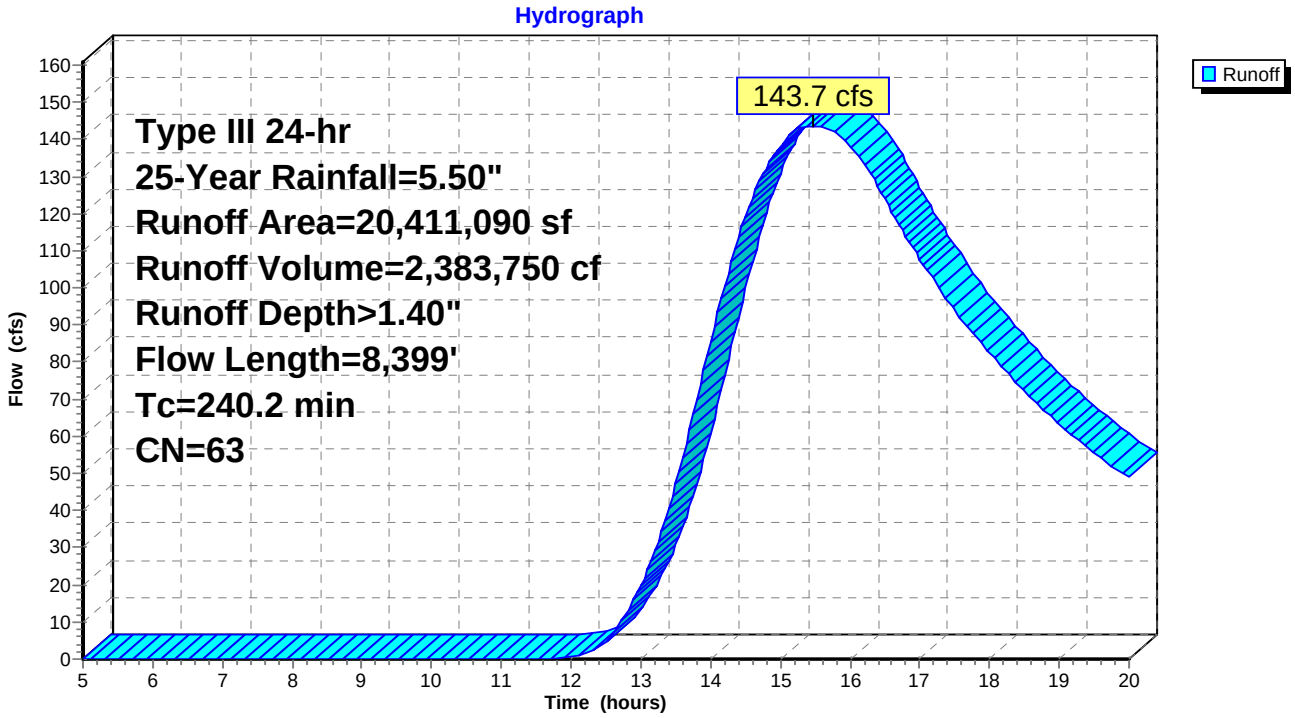
Runoff = 143.7 cfs @ 15.46 hrs, Volume= 2,383,750 cf, Depth> 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	515,066	30	Brush, Good, HSG A
	3,798,956	30	Woods, Good, HSG A
	727,522	39	>75% Grass cover, Good, HSG A
	1,918,923	61	1/4 acre lots, 38% imp, HSG A
	7,938	63	Natural western desert, HSG A
	43,385	72	Dirt roads, HSG A
	43,424	76	Gravel roads, HSG A
	223,356	98	Unconnected pavement, HSG A
*	88,952	98	Wetlands, ponds, basins, HSG A
*	35,026	48	Brush, Good, HSG B
	1,989,705	55	Woods, Good, HSG B
*	431,834	61	>75% Grass cover, Good, HSG B
*	870,974	75	1/4 acre lots, 38% imp, HSG B
	9,541	77	Natural western desert, HSG B
	7,686	82	Dirt roads, HSG B
	24,420	85	Gravel roads, HSG B
	92,006	98	Unconnected pavement, HSG B
*	195,210	98	Wetlands, ponds, basins, HSG B
*	93,787	65	Brush, Good, HSG C
	2,682,384	70	Woods, Good, HSG C
	15,686	74	>75% Grass cover, Good, HSG C
	1,689,170	83	1/4 acre lots, 38% imp, HSG C
	1,334	89	Gravel roads, HSG C
	241,806	98	Unconnected pavement, HSG C
*	156,332	98	Wetlands, ponds, basins, HSG C
*	121,042	73	Brush, Good, HSG D
	2,142,677	77	Woods, Good, HSG D
*	896,425	80	>75% Grass cover, Good, HSG D
*	245,849	87	1/4 acre lots, 38% imp, HSG D
	9,961	88	Natural western desert, HSG D
	24,582	89	Dirt roads, HSG D
	40,532	91	Gravel roads, HSG D
	142,050	98	Unconnected pavement, HSG D
*	883,549	98	Wetlands, ponds, basins, HSG D
	20,411,090	63	Weighted Average
	16,592,361		81.29% Pervious Area
	3,818,729		18.71% Impervious Area
	699,218		18.31% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	100	0.0150	0.07		**Sheet Flow, AB Wooded** Woods: Light underbrush n= 0.400 P2= 3.20"
18.1	454	0.0070	0.42		**Shallow Concentrated Flow, BC Wooded** Woodland Kv= 5.0 fps
8.7	491	0.0180	0.94		**Shallow Concentrated Flow, CD Grass** Short Grass Pasture Kv= 7.0 fps
34.7	466	0.0020	0.22		**Shallow Concentrated Flow, DE Wooded** Woodland Kv= 5.0 fps
17.0	319	0.0020	0.31		**Shallow Concentrated Flow, EF Wetland** Short Grass Pasture Kv= 7.0 fps
84.2	2,236	0.0040	0.44		**Shallow Concentrated Flow, FG Grass** Short Grass Pasture Kv= 7.0 fps
28.0	1,050	0.0080	0.63		**Shallow Concentrated Flow, GH Grass** Short Grass Pasture Kv= 7.0 fps
7.8	732	0.0010	1.57	26.70	**Channel Flow, HI West Stream 1** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.2	238		17.94		**Lake or Reservoir, IJ West Stream Pond 1** Mean Depth= 10.00'
16.7	1,571	0.0010	1.57	26.70	**Channel Flow, JK West Stream 2** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.7	742		17.94		**Lake or Reservoir, KL West Stream Pond 2** Mean Depth= 10.00'
240.2	8,399	Total			

Subcatchment WPS: West Perennial Stream



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EPS: East Perennial Runoff Area=22,173,220 sf 19.34% Impervious Runoff Depth>1.91"
Flow Length=11,006' Tc=236.8 min CN=60 Runoff=213.3 cfs 3,527,370 cf

Subcatchment WPS: West Perennial Runoff Area=20,411,090 sf 18.71% Impervious Runoff Depth>2.15"
Flow Length=8,399' Tc=240.2 min CN=63 Runoff=222.3 cfs 3,656,350 cf

Total Runoff Area = 42,584,310 sf Runoff Volume = 7,183,720 cf Average Runoff Depth = 2.02"
80.96% Pervious = 34,476,837 sf 19.04% Impervious = 8,107,473 sf

Summary for Subcatchment EPS: East Perennial Stream

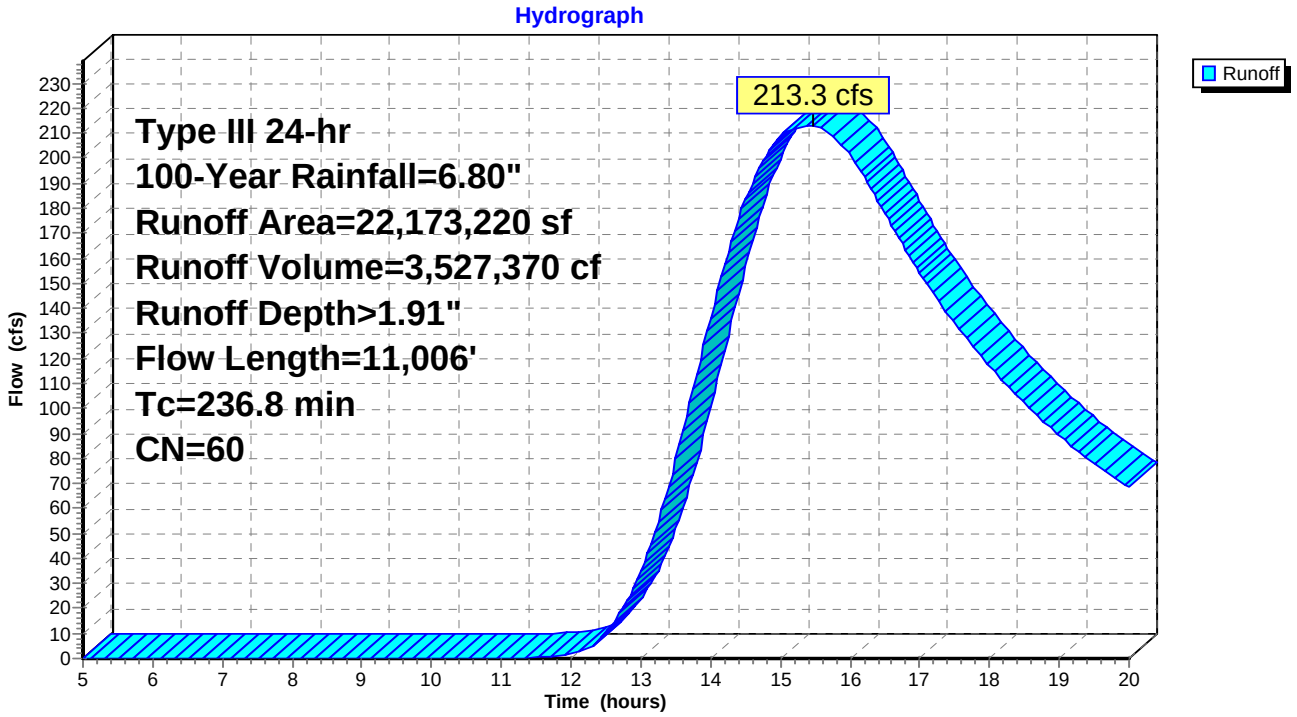
Runoff = 213.3 cfs @ 15.48 hrs, Volume= 3,527,370 cf, Depth> 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.80"

	Area (sf)	CN	Description
*	115,988	30	Brush, Good, HSG A
	5,349,717	30	Woods, Good, HSG A
	2,002,331	39	>75% Grass cover, Good, HSG A
*	1,518,870	61	1/4 acre lots, 38% imp, HSG A
	36,932	63	Natural western desert, HSG A
	8,759	72	Dirt roads, HSG A
	155,481	76	Gravel roads, HSG A
	296,926	98	Unconnected pavement, HSG A
*	406,415	98	Wetlands, ponds, basins, HSG A
*	290,979	48	Brush, Good, HSG B
	2,538,361	55	Woods, Good, HSG B
	953,845	61	>75% Grass cover, Good, HSG B
	1,263,454	75	1/4 acre lots, 38% imp, HSG B
*	32,822	82	Dirt roads, HSG B
	472,190	85	Gravel roads, HSG B
	177,014	98	Unconnected pavement, HSG B
*	35,165	98	Wetlands, Ponds, and Basins, HSG B
	305,812	70	Woods, Good, HSG C
	43,863	83	1/4 acre lots, 38% imp, HSG C
	3,985	98	Unconnected pavement, HSG C
*	14,409	98	Wetlands, Ponds, and Basins, HSG C
*	100,945	73	Brush, Good, HSG D
*	2,384,670	77	Woods, Good, HSG D
	1,110,680	80	>75% Grass cover, Good, HSG D
*	312,159	87	1/4 acre lots, 38% imp, HSG D
	12,113	88	Natural western desert, HSG D
	6,715	89	Dirt roads, HSG D
	60,362	91	Gravel roads, HSG D
	47,483	98	Unconnected pavement, HSG D
*	2,114,775	98	Wetlands, Ponds, Basins, HSG D
	22,173,220	60	Weighted Average
	17,884,477		80.66% Pervious Area
	4,288,743		19.34% Impervious Area
	525,408		12.25% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
71.2	100	0.0010	0.02		**Sheet Flow, AB Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
20.2	384	0.0040	0.32		**Shallow Concentrated Flow, BC Woods** Woodland Kv= 5.0 fps
0.2	40	0.0190	2.80		**Shallow Concentrated Flow, CD Street** Paved Kv= 20.3 fps
5.6	176	0.0110	0.52		**Shallow Concentrated Flow, DE Woods** Woodland Kv= 5.0 fps
76.0	1,010	0.0010	0.22		**Shallow Concentrated Flow, EF Wetlands** Short Grass Pasture Kv= 7.0 fps
31.6	2,743	0.0005	1.44	56.35	**Channel Flow, FG East Stream 1** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
1.5	374	0.0040	4.09	159.39	**Channel Flow, GH East Stream 2** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.2	260		17.94		**Lake or Reservoir, HI East Stream Pond 1** Mean Depth= 10.00'
5.1	1,092	0.0030	3.54	138.04	**Channel Flow, IJ East Stream 3** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
4.0	854	0.0030	3.54	138.04	**Channel Flow, JK East Stream 4** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.2	177		17.94		**Lake or Reservoir, KL East Stream Pond 2** Mean Depth= 10.00'
17.5	3,038	0.0020	2.89	112.71	**Channel Flow, LM East Stream 5** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.3	367		17.94		**Lake or Reservoir, MN East Stream Pond 3** Mean Depth= 10.00'
3.2	391	0.0010	2.04	79.70	**Channel Flow, NO East Stream 6** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
236.8	11,006	Total			

Subcatchment EPS: East Perennial Stream



Summary for Subcatchment WPS: West Perennial Stream

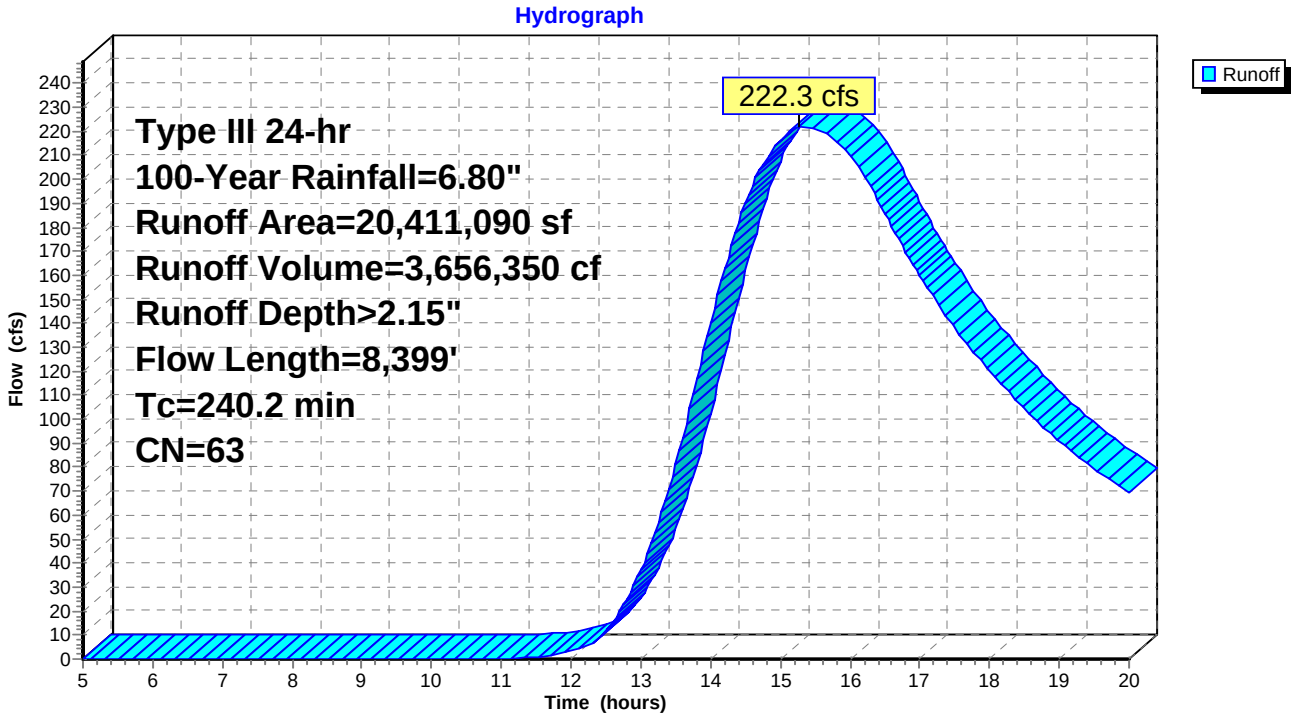
Runoff = 222.3 cfs @ 15.26 hrs, Volume= 3,656,350 cf, Depth> 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.80"

	Area (sf)	CN	Description
*	515,066	30	Brush, Good, HSG A
	3,798,956	30	Woods, Good, HSG A
	727,522	39	>75% Grass cover, Good, HSG A
	1,918,923	61	1/4 acre lots, 38% imp, HSG A
	7,938	63	Natural western desert, HSG A
	43,385	72	Dirt roads, HSG A
	43,424	76	Gravel roads, HSG A
	223,356	98	Unconnected pavement, HSG A
*	88,952	98	Wetlands, ponds, basins, HSG A
*	35,026	48	Brush, Good, HSG B
	1,989,705	55	Woods, Good, HSG B
*	431,834	61	>75% Grass cover, Good, HSG B
*	870,974	75	1/4 acre lots, 38% imp, HSG B
	9,541	77	Natural western desert, HSG B
	7,686	82	Dirt roads, HSG B
	24,420	85	Gravel roads, HSG B
	92,006	98	Unconnected pavement, HSG B
*	195,210	98	Wetlands, ponds, basins, HSG B
*	93,787	65	Brush, Good, HSG C
	2,682,384	70	Woods, Good, HSG C
	15,686	74	>75% Grass cover, Good, HSG C
	1,689,170	83	1/4 acre lots, 38% imp, HSG C
	1,334	89	Gravel roads, HSG C
	241,806	98	Unconnected pavement, HSG C
*	156,332	98	Wetlands, ponds, basins, HSG C
*	121,042	73	Brush, Good, HSG D
	2,142,677	77	Woods, Good, HSG D
*	896,425	80	>75% Grass cover, Good, HSG D
*	245,849	87	1/4 acre lots, 38% imp, HSG D
	9,961	88	Natural western desert, HSG D
	24,582	89	Dirt roads, HSG D
	40,532	91	Gravel roads, HSG D
	142,050	98	Unconnected pavement, HSG D
*	883,549	98	Wetlands, ponds, basins, HSG D
	20,411,090	63	Weighted Average
	16,592,361		81.29% Pervious Area
	3,818,729		18.71% Impervious Area
	699,218		18.31% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	100	0.0150	0.07		**Sheet Flow, AB Wooded** Woods: Light underbrush n= 0.400 P2= 3.20"
18.1	454	0.0070	0.42		**Shallow Concentrated Flow, BC Wooded** Woodland Kv= 5.0 fps
8.7	491	0.0180	0.94		**Shallow Concentrated Flow, CD Grass** Short Grass Pasture Kv= 7.0 fps
34.7	466	0.0020	0.22		**Shallow Concentrated Flow, DE Wooded** Woodland Kv= 5.0 fps
17.0	319	0.0020	0.31		**Shallow Concentrated Flow, EF Wetland** Short Grass Pasture Kv= 7.0 fps
84.2	2,236	0.0040	0.44		**Shallow Concentrated Flow, FG Grass** Short Grass Pasture Kv= 7.0 fps
28.0	1,050	0.0080	0.63		**Shallow Concentrated Flow, GH Grass** Short Grass Pasture Kv= 7.0 fps
7.8	732	0.0010	1.57	26.70	**Channel Flow, HI West Stream 1** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.2	238		17.94		**Lake or Reservoir, IJ West Stream Pond 1** Mean Depth= 10.00'
16.7	1,571	0.0010	1.57	26.70	**Channel Flow, JK West Stream 2** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.7	742		17.94		**Lake or Reservoir, KL West Stream Pond 2** Mean Depth= 10.00'
240.2	8,399	Total			

Subcatchment WPS: West Perennial Stream



APPENDIX B

PROPOSED HYDROLOGICAL CONDITIONS

2-YEAR STORM EVENT

10-YEAR STORM EVENT

25-YEAR STORM EVENT

100-YEAR STORM EVENT

West Perennial Stream

East Perennial Stream

Subcat Reach Pond Link

Routing Diagram for 9231.0 - Sharon - Spring Valley - Proposed Conditions
Prepared by Microsoft, Printed 9/14/2017

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
3,437,793	61	1/4 acre lots, 38% imp, HSG A (EPS, WPS)
2,134,428	75	1/4 acre lots, 38% imp, HSG B (EPS, WPS)
1,733,033	83	1/4 acre lots, 38% imp, HSG C (EPS, WPS)
558,008	87	1/4 acre lots, 38% imp, HSG D (EPS, WPS)
2,706,980	39	>75% Grass cover, Good, HSG A (EPS, WPS)
1,487,817	61	>75% Grass cover, Good, HSG B (EPS, WPS)
19,191	74	>75% Grass cover, Good, HSG C (WPS)
2,122,296	80	>75% Grass cover, Good, HSG D (EPS, WPS)
631,054	30	Brush, Good, HSG A (EPS, WPS)
326,005	48	Brush, Good, HSG B (EPS, WPS)
93,787	65	Brush, Good, HSG C (WPS)
221,987	73	Brush, Good, HSG D (EPS, WPS)
52,144	72	Dirt roads, HSG A (EPS, WPS)
40,508	82	Dirt roads, HSG B (EPS, WPS)
31,297	89	Dirt roads, HSG D (EPS, WPS)
192,891	76	Gravel roads, HSG A (EPS, WPS)
488,491	85	Gravel roads, HSG B (EPS, WPS)
4,732	89	Gravel roads, HSG C (WPS)
89,746	91	Gravel roads, HSG D (EPS, WPS)
13,217	77	Natural western desert, HSG B (WPS)
687	85	Natural western desert, HSG C (WPS)
23,923	88	Natural western desert, HSG D (EPS, WPS)
12,819	60	Porous Pavement, HSG A (EPS, WPS)
4,675	60	Porous Pavement, HSG B (WPS)
526	60	Porous Pavement, HSG C (WPS)
17,412	60	Porous Pavement, HSG D (WPS)
28,443	63	Sand, HSG A (EPS, WPS)
631,580	98	Unconnected pavement, HSG A (EPS, WPS)
281,667	98	Unconnected pavement, HSG B (EPS, WPS)
247,135	98	Unconnected pavement, HSG C (EPS, WPS)
172,402	98	Unconnected pavement, HSG D (EPS, WPS)
2,962,459	98	Wetlands, ponds, basins (EPS, WPS)
493,515	98	Wetlands, ponds, basins, HSG A (EPS, WPS)
201,019	98	Wetlands, ponds, basins, HSG B (EPS, WPS)
171,939	98	Wetlands, ponds, basins, HSG C (EPS, WPS)
9,078,038	30	Woods, Good, HSG A (EPS, WPS)
4,438,821	55	Woods, Good, HSG B (EPS, WPS)
2,977,538	70	Woods, Good, HSG C (EPS, WPS)
4,453,455	77	Woods, Good, HSG D (EPS, WPS)
42,583,458	**62**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
17,265,257	HSG A	EPS, WPS
9,416,648	HSG B	EPS, WPS
5,248,568	HSG C	EPS, WPS
7,690,526	HSG D	EPS, WPS
2,962,459	Other	EPS, WPS
42,583,458		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
3,437,793	2,134,428	1,733,033	558,008	0	7,863,262	1/4 acre lots, 38% imp	
2,706,980	1,487,817	19,191	2,122,296	0	6,336,284	>75% Grass cover, Good	
631,054	326,005	93,787	221,987	0	1,272,833	Brush, Good	
52,144	40,508	0	31,297	0	123,949	Dirt roads	
192,891	488,491	4,732	89,746	0	775,860	Gravel roads	
0	13,217	687	23,923	0	37,827	Natural western desert	
12,819	4,675	526	17,412	0	35,432	Porous Pavement	
28,443	0	0	0	0	28,443	Sand	
631,580	281,667	247,135	172,402	0	1,332,784	Unconnected pavement	
493,515	201,019	171,939	0	2,962,459	3,828,932	Wetlands, ponds, basins	
9,078,038	4,438,821	2,977,538	4,453,455	0	20,947,852	Woods, Good	
17,265,257	**9,416,648**	**5,248,568**	**7,690,526**	**2,962,459**	**42,583,458**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EPS: East Perennial Runoff Area=22,172,380 sf 19.54% Impervious Runoff Depth>0.27"
Flow Length=11,006' Tc=236.8 min UI Adjusted CN=60 Runoff=28.6 cfs 508,105 cf

Subcatchment WPS: West Perennial Runoff Area=20,411,078 sf 18.70% Impervious Runoff Depth>0.36"
Flow Length=8,399' Tc=240.2 min UI Adjusted CN=63 Runoff=35.1 cfs 614,197 cf

Total Runoff Area = 42,583,458 sf Runoff Volume = 1,122,302 cf Average Runoff Depth = 0.32"
80.86% Pervious = 34,433,702 sf 19.14% Impervious = 8,149,756 sf

Summary for Subcatchment EPS: East Perennial Stream

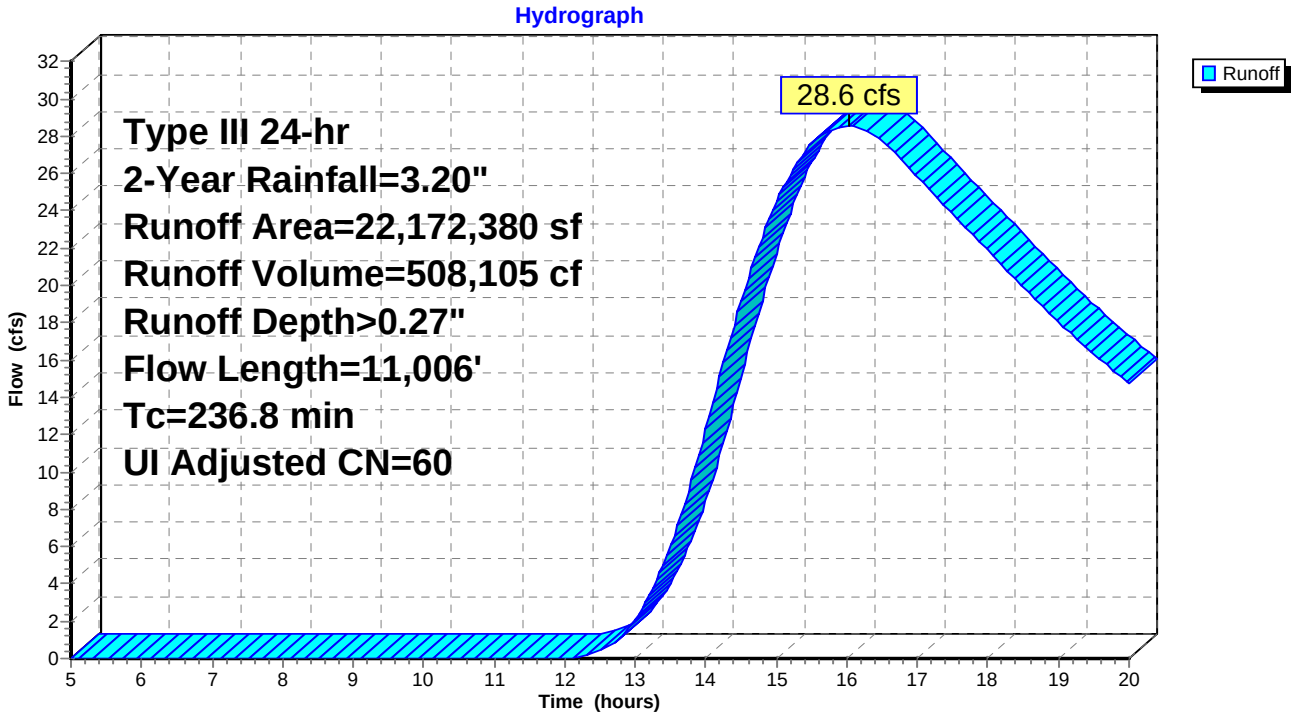
Runoff = 28.6 cfs @ 16.04 hrs, Volume= 508,105 cf, Depth> 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Adj	Description
*	115,988	30		Brush, Good, HSG A
*	5,308,192	30		Woods, Good, HSG A
	1,985,070	39		>75% Grass cover, Good, HSG A
*	5,568	60		Porous Pavement, HSG A
	1,518,870	61		1/4 acre lots, 38% imp, HSG A
*	23,750	63		Sand, HSG A
	8,759	72		Dirt roads, HSG A
	157,184	76		Gravel roads, HSG A
	371,717	98		Unconnected pavement, HSG A
*	403,422	98		Wetlands, ponds, basins, HSG A
*	290,979	48		Brush, Good, HSG B
	2,538,361	55		Woods, Good, HSG B
*	953,845	61		>75% Grass cover, Good, HSG B
*	1,263,454	75		1/4 acre lots, 38% imp, HSG B
*	32,822	82		Dirt roads, HSG B
*	472,190	85		Gravel roads, HSG B
	177,014	98		Unconnected pavement, HSG B
*	35,165	98		Wetlands, ponds, basins, HSG B
	307,013	70		Woods, Good, HSG C
	43,863	83		1/4 acre lots, 38% imp, HSG C
	3,985	98		Unconnected pavement, HSG C
*	14,409	98		Wetlands, ponds, basins, HSG C
*	100,945	73		Brush, Good, HSG D
	2,369,814	77		Woods, Good, HSG D
	1,143,356	80		>75% Grass cover, Good, HSG D
*	312,159	87		1/4 acre lots, 38% imp, HSG D
	13,626	88		Natural western desert, HSG D
	6,715	89		Dirt roads, HSG D
	59,660	91		Gravel roads, HSG D
	47,483	98		Unconnected pavement, HSG D
*	2,087,002	98		Wetlands, ponds, basins
	22,172,380	61	60	Weighted Average, UI Adjusted
	17,839,612			80.46% Pervious Area
	4,332,768			19.54% Impervious Area
	600,199			13.85% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
71.2	100	0.0010	0.02		**Sheet Flow, AB Wooded** Woods: Light underbrush n= 0.400 P2= 3.20"
20.2	384	0.0040	0.32		**Shallow Concentrated Flow, BC Wooded** Woodland Kv= 5.0 fps
0.2	40	0.0190	2.80		**Shallow Concentrated Flow, CD Street** Paved Kv= 20.3 fps
5.6	176	0.0110	0.52		**Shallow Concentrated Flow, DE Wooded** Woodland Kv= 5.0 fps
76.0	1,010	0.0010	0.22		**Shallow Concentrated Flow, EF Wetlands** Short Grass Pasture Kv= 7.0 fps
31.6	2,743	0.0005	1.44	56.35	**Channel Flow, FG, East Stream 1** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
1.5	374	0.0040	4.09	159.39	**Channel Flow, GH, East Stream 2** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
0.2	260		17.94		**Lake or Reservoir, HI East Stream Pond 1** Mean Depth= 10.00'
5.1	1,092	0.0030	3.54	138.04	**Channel Flow, IJ East Stream 3** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
4.0	854	0.0030	3.54	138.04	**Channel Flow, JK East Stream 4** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.2	177		17.94		**Lake or Reservoir, KL East Stream Pond 2** Mean Depth= 10.00'
17.5	3,038	0.0020	2.89	112.71	**Channel Flow, LM East Stream 5** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
0.3	367		17.94		**Lake or Reservoir, MN East Stream Pond 3** Mean Depth= 10.00'
3.2	391	0.0010	2.04	79.70	**Channel Flow, NO East Stream 6** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
236.8	11,006	Total			

Subcatchment EPS: East Perennial Stream



Summary for Subcatchment WPS: West Perennial Stream

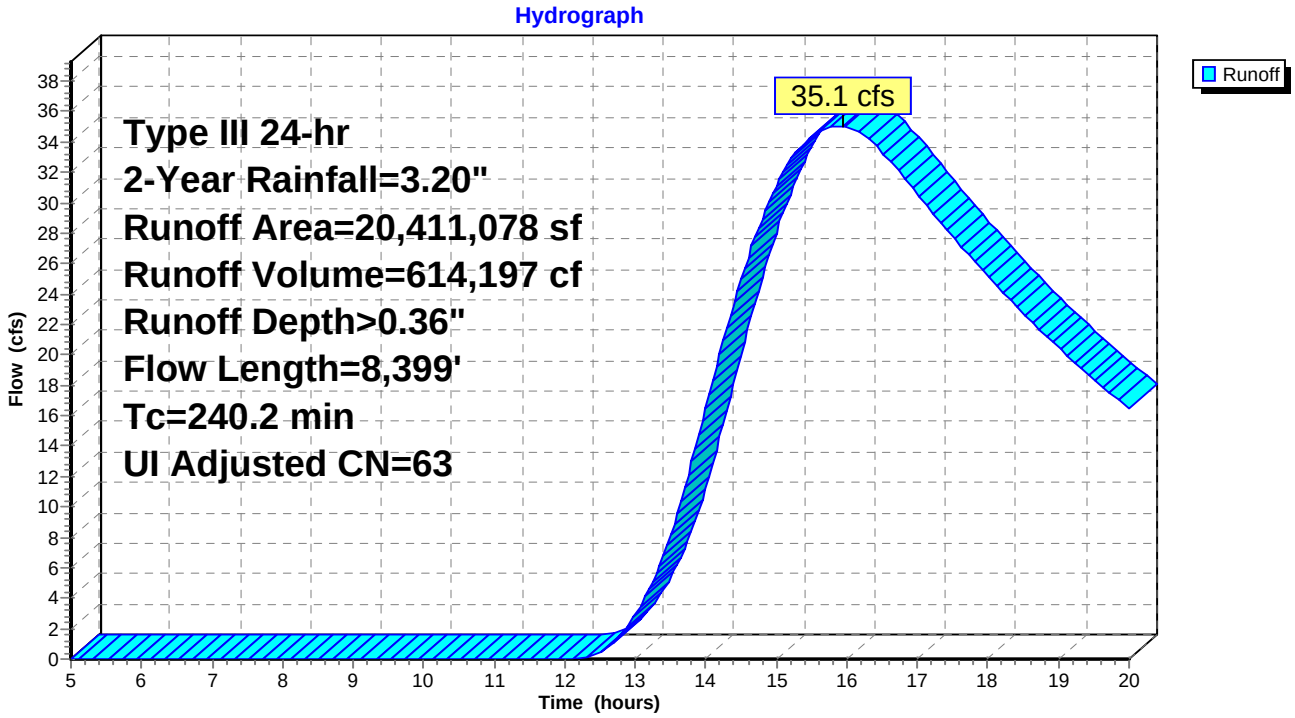
Runoff = 35.1 cfs @ 15.95 hrs, Volume= 614,197 cf, Depth> 0.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Adj	Description
*	515,066	30		Brush, Good, HSG A
*	3,769,846	30		Woods, Good, HSG A
	721,910	39		>75% Grass cover, Good, HSG A
*	7,251	60		Porous Pavement, HSG A
	1,918,923	61		1/4 acre lots, 38% imp, HSG A
*	4,693	63		Sand, HSG A
	43,385	72		Dirt roads, HSG A
	35,707	76		Gravel roads, HSG A
	259,863	98		Unconnected pavement, HSG A
*	90,093	98		Wetlands, ponds, basins, HSG A
*	35,026	48		Brush, Good, HSG B
	1,900,460	55		Woods, Good, HSG B
*	4,675	60		Porous Pavement, HSG B
*	533,972	61		>75% Grass cover, Good, HSG B
*	870,974	75		1/4 acre lots, 38% imp, HSG B
	13,217	77		Natural western desert, HSG B
*	7,686	82		Dirt roads, HSG B
*	16,301	85		Gravel roads, HSG B
	104,653	98		Unconnected pavement, HSG B
*	165,854	98		Wetlands, ponds, basins, HSG B
*	526	60		Porous Pavement, HSG C
	93,787	65		Brush, Good, HSG C
	2,670,525	70		Woods, Good, HSG C
	19,191	74		>75% Grass cover, Good, HSG C
	1,689,170	83		1/4 acre lots, 38% imp, HSG C
	687	85		Natural western desert, HSG C
	4,732	89		Gravel roads, HSG C
	243,150	98		Unconnected pavement, HSG C
*	157,530	98		Wetlands, ponds, basins, HSG C
*	17,412	60		Porous Pavement, HSG D
*	121,042	73		Brush, Good, HSG D
	2,083,641	77		Woods, Good, HSG D
	978,940	80		>75% Grass cover, Good, HSG D
*	245,849	87		1/4 acre lots, 38% imp, HSG D
	10,297	88		Natural western desert, HSG D
	24,582	89		Dirt roads, HSG D
	30,086	91		Gravel roads, HSG D
	124,919	98		Unconnected pavement, HSG D
*	875,457	98		Wetlands, ponds, basins
	20,411,078	64	63	Weighted Average, UI Adjusted
	16,594,091			81.30% Pervious Area
	3,816,987			18.70% Impervious Area
	732,585			19.19% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	100	0.0150	0.07		**Sheet Flow, AB Wooded** Woods: Light underbrush n= 0.400 P2= 3.20"
18.1	454	0.0070	0.42		**Shallow Concentrated Flow, BC Wooded** Woodland Kv= 5.0 fps
8.7	491	0.0180	0.94		**Shallow Concentrated Flow, CD Grass** Short Grass Pasture Kv= 7.0 fps
34.7	466	0.0020	0.22		**Shallow Concentrated Flow, DE Wooded** Woodland Kv= 5.0 fps
17.0	319	0.0020	0.31		**Shallow Concentrated Flow, EF Wetland** Short Grass Pasture Kv= 7.0 fps
84.2	2,236	0.0040	0.44		**Shallow Concentrated Flow, FG Grass** Short Grass Pasture Kv= 7.0 fps
28.0	1,050	0.0080	0.63		**Shallow Concentrated Flow, GH Grass** Short Grass Pasture Kv= 7.0 fps
7.8	732	0.0010	1.57	26.70	**Channel Flow, HI West Stream 1** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.2	238		17.94		**Lake or Reservoir, IJ West Stream Pond 1** Mean Depth= 10.00'
16.7	1,571	0.0010	1.57	26.70	**Channel Flow, JK West Stream 2** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.7	742		17.94		**Lake or Reservoir, KL West Stream Pond 2** Mean Depth= 10.00'
240.2	8,399	Total			

Subcatchment WPS: West Perennial Stream



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EPS: East Perennial Runoff Area=22,172,380 sf 19.54% Impervious Runoff Depth>0.88"
Flow Length=11,006' Tc=236.8 min UI Adjusted CN=60 Runoff=96.0 cfs 1,622,937 cf

Subcatchment WPS: West Perennial Runoff Area=20,411,078 sf 18.70% Impervious Runoff Depth>1.04"
Flow Length=8,399' Tc=240.2 min UI Adjusted CN=63 Runoff=105.6 cfs 1,767,172 cf

Total Runoff Area = 42,583,458 sf Runoff Volume = 3,390,109 cf Average Runoff Depth = 0.96"
80.86% Pervious = 34,433,702 sf 19.14% Impervious = 8,149,756 sf

Summary for Subcatchment EPS: East Perennial Stream

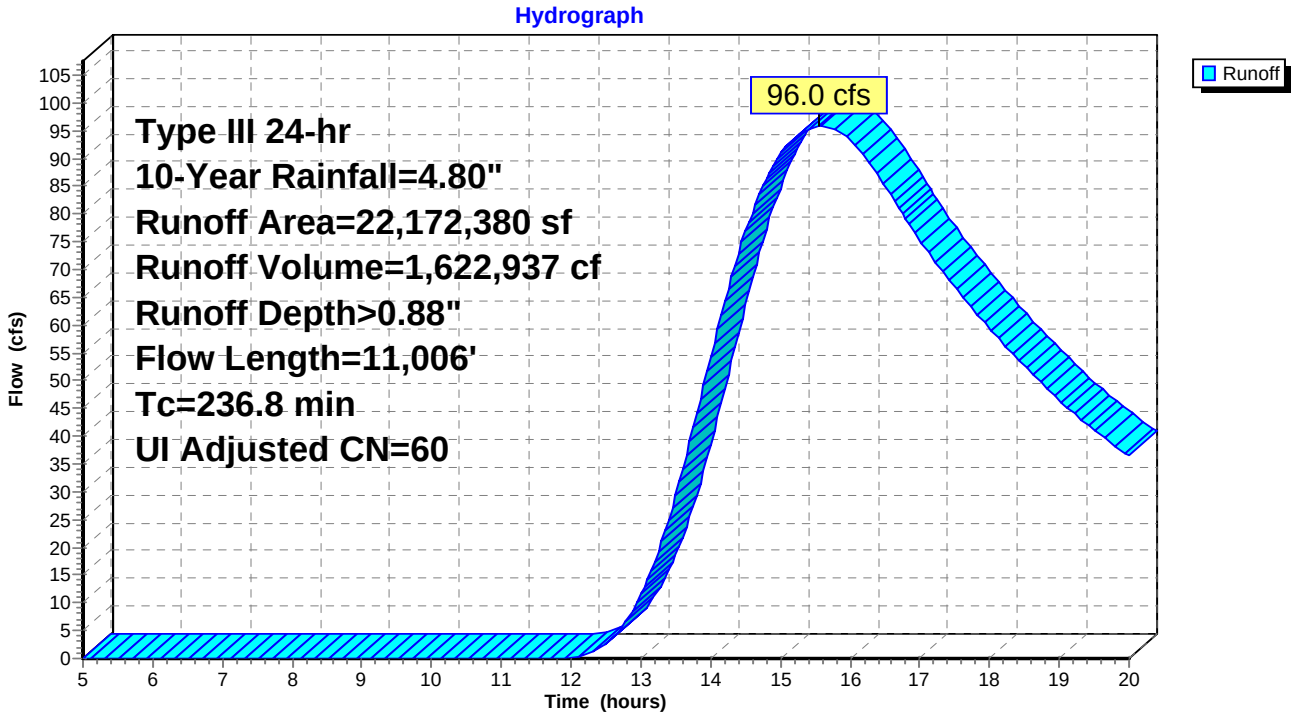
Runoff = 96.0 cfs @ 15.54 hrs, Volume= 1,622,937 cf, Depth> 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Adj	Description
*	115,988	30		Brush, Good, HSG A
*	5,308,192	30		Woods, Good, HSG A
	1,985,070	39		>75% Grass cover, Good, HSG A
*	5,568	60		Porous Pavement, HSG A
	1,518,870	61		1/4 acre lots, 38% imp, HSG A
*	23,750	63		Sand, HSG A
	8,759	72		Dirt roads, HSG A
	157,184	76		Gravel roads, HSG A
	371,717	98		Unconnected pavement, HSG A
*	403,422	98		Wetlands, ponds, basins, HSG A
*	290,979	48		Brush, Good, HSG B
	2,538,361	55		Woods, Good, HSG B
*	953,845	61		>75% Grass cover, Good, HSG B
*	1,263,454	75		1/4 acre lots, 38% imp, HSG B
*	32,822	82		Dirt roads, HSG B
*	472,190	85		Gravel roads, HSG B
	177,014	98		Unconnected pavement, HSG B
*	35,165	98		Wetlands, ponds, basins, HSG B
	307,013	70		Woods, Good, HSG C
	43,863	83		1/4 acre lots, 38% imp, HSG C
	3,985	98		Unconnected pavement, HSG C
*	14,409	98		Wetlands, ponds, basins, HSG C
*	100,945	73		Brush, Good, HSG D
	2,369,814	77		Woods, Good, HSG D
	1,143,356	80		>75% Grass cover, Good, HSG D
*	312,159	87		1/4 acre lots, 38% imp, HSG D
	13,626	88		Natural western desert, HSG D
	6,715	89		Dirt roads, HSG D
	59,660	91		Gravel roads, HSG D
	47,483	98		Unconnected pavement, HSG D
*	2,087,002	98		Wetlands, ponds, basins
	22,172,380	61	60	Weighted Average, UI Adjusted
	17,839,612			80.46% Pervious Area
	4,332,768			19.54% Impervious Area
	600,199			13.85% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
71.2	100	0.0010	0.02		**Sheet Flow, AB Wooded** Woods: Light underbrush n= 0.400 P2= 3.20"
20.2	384	0.0040	0.32		**Shallow Concentrated Flow, BC Wooded** Woodland Kv= 5.0 fps
0.2	40	0.0190	2.80		**Shallow Concentrated Flow, CD Street** Paved Kv= 20.3 fps
5.6	176	0.0110	0.52		**Shallow Concentrated Flow, DE Wooded** Woodland Kv= 5.0 fps
76.0	1,010	0.0010	0.22		**Shallow Concentrated Flow, EF Wetlands** Short Grass Pasture Kv= 7.0 fps
31.6	2,743	0.0005	1.44	56.35	**Channel Flow, FG, East Stream 1** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
1.5	374	0.0040	4.09	159.39	**Channel Flow, GH, East Stream 2** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
0.2	260		17.94		**Lake or Reservoir, HI East Stream Pond 1** Mean Depth= 10.00'
5.1	1,092	0.0030	3.54	138.04	**Channel Flow, IJ East Stream 3** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
4.0	854	0.0030	3.54	138.04	**Channel Flow, JK East Stream 4** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.2	177		17.94		**Lake or Reservoir, KL East Stream Pond 2** Mean Depth= 10.00'
17.5	3,038	0.0020	2.89	112.71	**Channel Flow, LM East Stream 5** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
0.3	367		17.94		**Lake or Reservoir, MN East Stream Pond 3** Mean Depth= 10.00'
3.2	391	0.0010	2.04	79.70	**Channel Flow, NO East Stream 6** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
236.8	11,006	Total			

Subcatchment EPS: East Perennial Stream



Summary for Subcatchment WPS: West Perennial Stream

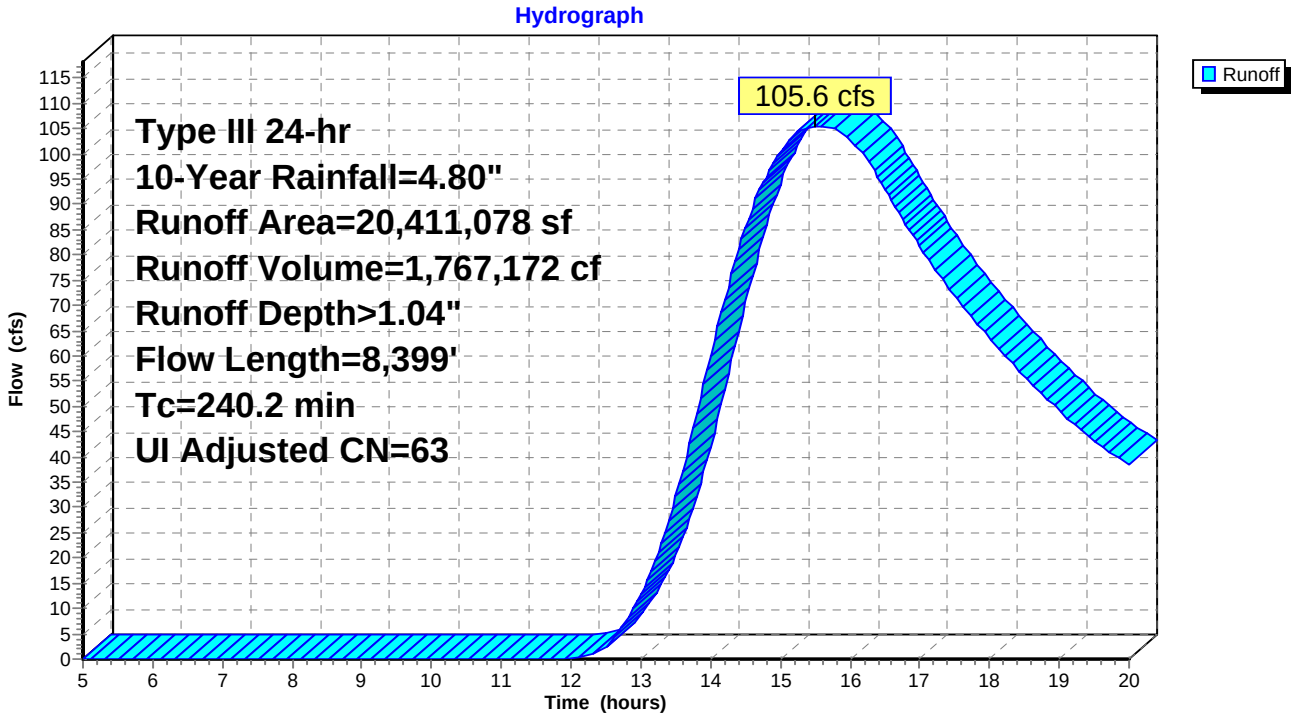
Runoff = 105.6 cfs @ 15.51 hrs, Volume= 1,767,172 cf, Depth> 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Adj	Description
*	515,066	30		Brush, Good, HSG A
*	3,769,846	30		Woods, Good, HSG A
	721,910	39		>75% Grass cover, Good, HSG A
*	7,251	60		Porous Pavement, HSG A
	1,918,923	61		1/4 acre lots, 38% imp, HSG A
*	4,693	63		Sand, HSG A
	43,385	72		Dirt roads, HSG A
	35,707	76		Gravel roads, HSG A
	259,863	98		Unconnected pavement, HSG A
*	90,093	98		Wetlands, ponds, basins, HSG A
*	35,026	48		Brush, Good, HSG B
	1,900,460	55		Woods, Good, HSG B
*	4,675	60		Porous Pavement, HSG B
*	533,972	61		>75% Grass cover, Good, HSG B
*	870,974	75		1/4 acre lots, 38% imp, HSG B
	13,217	77		Natural western desert, HSG B
*	7,686	82		Dirt roads, HSG B
*	16,301	85		Gravel roads, HSG B
	104,653	98		Unconnected pavement, HSG B
*	165,854	98		Wetlands, ponds, basins, HSG B
*	526	60		Porous Pavement, HSG C
	93,787	65		Brush, Good, HSG C
	2,670,525	70		Woods, Good, HSG C
	19,191	74		>75% Grass cover, Good, HSG C
	1,689,170	83		1/4 acre lots, 38% imp, HSG C
	687	85		Natural western desert, HSG C
	4,732	89		Gravel roads, HSG C
	243,150	98		Unconnected pavement, HSG C
*	157,530	98		Wetlands, ponds, basins, HSG C
*	17,412	60		Porous Pavement, HSG D
*	121,042	73		Brush, Good, HSG D
	2,083,641	77		Woods, Good, HSG D
	978,940	80		>75% Grass cover, Good, HSG D
*	245,849	87		1/4 acre lots, 38% imp, HSG D
	10,297	88		Natural western desert, HSG D
	24,582	89		Dirt roads, HSG D
	30,086	91		Gravel roads, HSG D
	124,919	98		Unconnected pavement, HSG D
*	875,457	98		Wetlands, ponds, basins
	20,411,078	64	63	Weighted Average, UI Adjusted
	16,594,091			81.30% Pervious Area
	3,816,987			18.70% Impervious Area
	732,585			19.19% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	100	0.0150	0.07		**Sheet Flow, AB Wooded** Woods: Light underbrush n= 0.400 P2= 3.20"
18.1	454	0.0070	0.42		**Shallow Concentrated Flow, BC Wooded** Woodland Kv= 5.0 fps
8.7	491	0.0180	0.94		**Shallow Concentrated Flow, CD Grass** Short Grass Pasture Kv= 7.0 fps
34.7	466	0.0020	0.22		**Shallow Concentrated Flow, DE Wooded** Woodland Kv= 5.0 fps
17.0	319	0.0020	0.31		**Shallow Concentrated Flow, EF Wetland** Short Grass Pasture Kv= 7.0 fps
84.2	2,236	0.0040	0.44		**Shallow Concentrated Flow, FG Grass** Short Grass Pasture Kv= 7.0 fps
28.0	1,050	0.0080	0.63		**Shallow Concentrated Flow, GH Grass** Short Grass Pasture Kv= 7.0 fps
7.8	732	0.0010	1.57	26.70	**Channel Flow, HI West Stream 1** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.2	238		17.94		**Lake or Reservoir, IJ West Stream Pond 1** Mean Depth= 10.00'
16.7	1,571	0.0010	1.57	26.70	**Channel Flow, JK West Stream 2** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.7	742		17.94		**Lake or Reservoir, KL West Stream Pond 2** Mean Depth= 10.00'
240.2	8,399	Total			

Subcatchment WPS: West Perennial Stream



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EPS: East Perennial Runoff Area=22,172,380 sf 19.54% Impervious Runoff Depth>1.21"
Flow Length=11,006' Tc=236.8 min UI Adjusted CN=60 Runoff=134.0 cfs 2,237,709 cf

Subcatchment WPS: West Perennial Runoff Area=20,411,078 sf 18.70% Impervious Runoff Depth>1.40"
Flow Length=8,399' Tc=240.2 min UI Adjusted CN=63 Runoff=143.7 cfs 2,383,749 cf

Total Runoff Area = 42,583,458 sf Runoff Volume = 4,621,458 cf Average Runoff Depth = 1.30"
80.86% Pervious = 34,433,702 sf 19.14% Impervious = 8,149,756 sf

Summary for Subcatchment EPS: East Perennial Stream

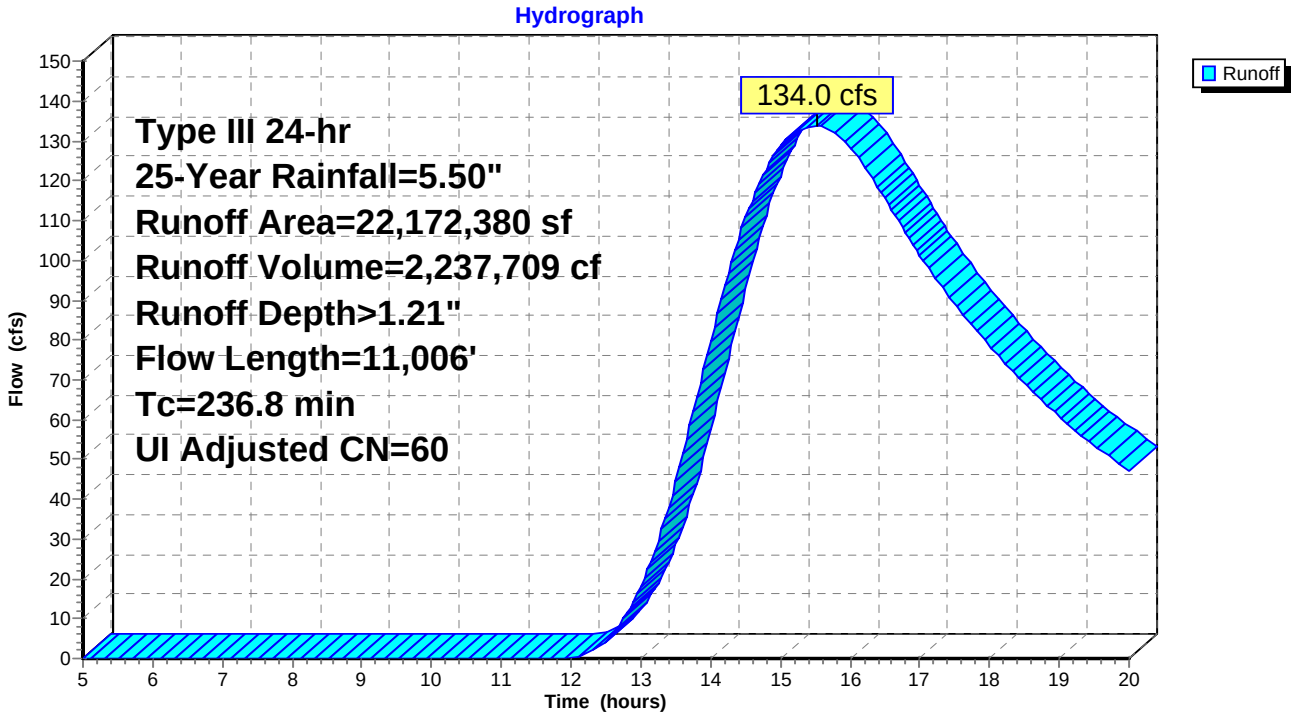
Runoff = 134.0 cfs @ 15.51 hrs, Volume= 2,237,709 cf, Depth> 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Adj	Description
*	115,988	30		Brush, Good, HSG A
*	5,308,192	30		Woods, Good, HSG A
	1,985,070	39		>75% Grass cover, Good, HSG A
*	5,568	60		Porous Pavement, HSG A
	1,518,870	61		1/4 acre lots, 38% imp, HSG A
*	23,750	63		Sand, HSG A
	8,759	72		Dirt roads, HSG A
	157,184	76		Gravel roads, HSG A
	371,717	98		Unconnected pavement, HSG A
*	403,422	98		Wetlands, ponds, basins, HSG A
*	290,979	48		Brush, Good, HSG B
	2,538,361	55		Woods, Good, HSG B
*	953,845	61		>75% Grass cover, Good, HSG B
*	1,263,454	75		1/4 acre lots, 38% imp, HSG B
*	32,822	82		Dirt roads, HSG B
*	472,190	85		Gravel roads, HSG B
	177,014	98		Unconnected pavement, HSG B
*	35,165	98		Wetlands, ponds, basins, HSG B
	307,013	70		Woods, Good, HSG C
	43,863	83		1/4 acre lots, 38% imp, HSG C
	3,985	98		Unconnected pavement, HSG C
*	14,409	98		Wetlands, ponds, basins, HSG C
*	100,945	73		Brush, Good, HSG D
	2,369,814	77		Woods, Good, HSG D
	1,143,356	80		>75% Grass cover, Good, HSG D
*	312,159	87		1/4 acre lots, 38% imp, HSG D
	13,626	88		Natural western desert, HSG D
	6,715	89		Dirt roads, HSG D
	59,660	91		Gravel roads, HSG D
	47,483	98		Unconnected pavement, HSG D
*	2,087,002	98		Wetlands, ponds, basins
	22,172,380	61	60	Weighted Average, UI Adjusted
	17,839,612			80.46% Pervious Area
	4,332,768			19.54% Impervious Area
	600,199			13.85% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
71.2	100	0.0010	0.02		**Sheet Flow, AB Wooded** Woods: Light underbrush n= 0.400 P2= 3.20"
20.2	384	0.0040	0.32		**Shallow Concentrated Flow, BC Wooded** Woodland Kv= 5.0 fps
0.2	40	0.0190	2.80		**Shallow Concentrated Flow, CD Street** Paved Kv= 20.3 fps
5.6	176	0.0110	0.52		**Shallow Concentrated Flow, DE Wooded** Woodland Kv= 5.0 fps
76.0	1,010	0.0010	0.22		**Shallow Concentrated Flow, EF Wetlands** Short Grass Pasture Kv= 7.0 fps
31.6	2,743	0.0005	1.44	56.35	**Channel Flow, FG, East Stream 1** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
1.5	374	0.0040	4.09	159.39	**Channel Flow, GH, East Stream 2** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
0.2	260		17.94		**Lake or Reservoir, HI East Stream Pond 1** Mean Depth= 10.00'
5.1	1,092	0.0030	3.54	138.04	**Channel Flow, IJ East Stream 3** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
4.0	854	0.0030	3.54	138.04	**Channel Flow, JK East Stream 4** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.2	177		17.94		**Lake or Reservoir, KL East Stream Pond 2** Mean Depth= 10.00'
17.5	3,038	0.0020	2.89	112.71	**Channel Flow, LM East Stream 5** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
0.3	367		17.94		**Lake or Reservoir, MN East Stream Pond 3** Mean Depth= 10.00'
3.2	391	0.0010	2.04	79.70	**Channel Flow, NO East Stream 6** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
236.8	11,006	Total			

Subcatchment EPS: East Perennial Stream



Summary for Subcatchment WPS: West Perennial Stream

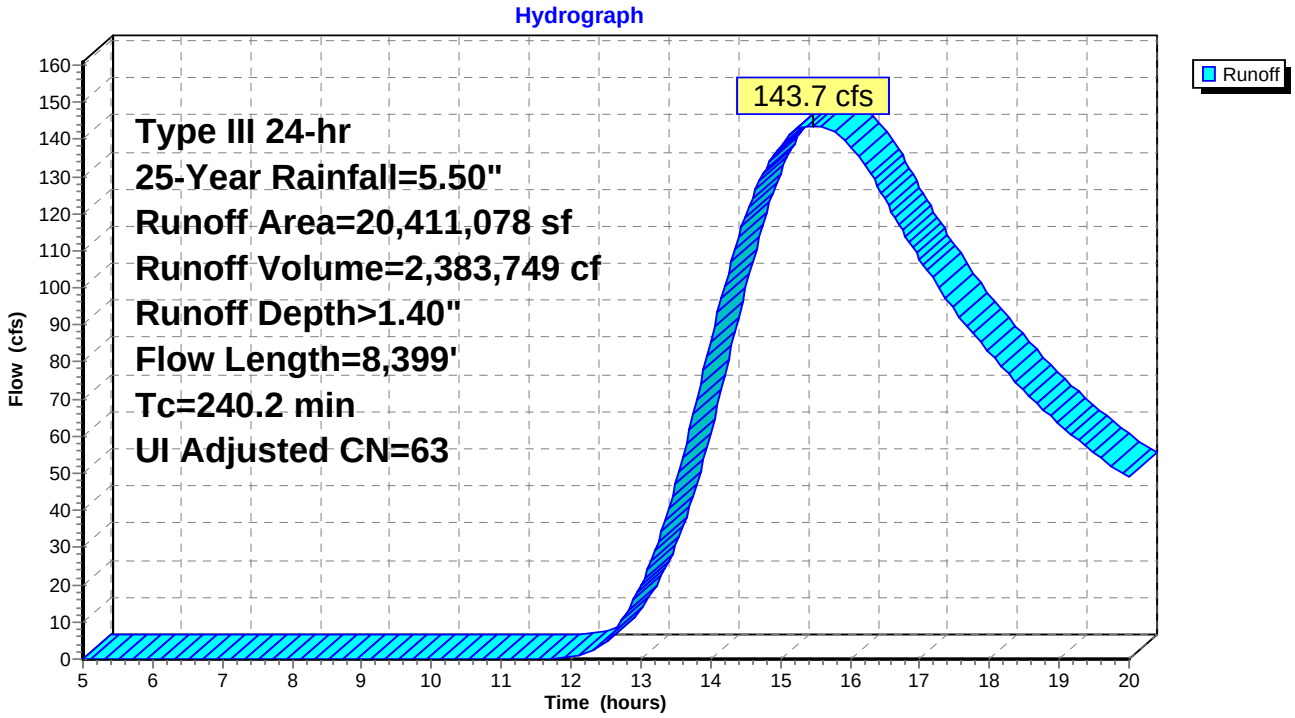
Runoff = 143.7 cfs @ 15.46 hrs, Volume= 2,383,749 cf, Depth> 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Adj	Description
*	515,066	30		Brush, Good, HSG A
*	3,769,846	30		Woods, Good, HSG A
	721,910	39		>75% Grass cover, Good, HSG A
*	7,251	60		Porous Pavement, HSG A
	1,918,923	61		1/4 acre lots, 38% imp, HSG A
*	4,693	63		Sand, HSG A
	43,385	72		Dirt roads, HSG A
	35,707	76		Gravel roads, HSG A
	259,863	98		Unconnected pavement, HSG A
*	90,093	98		Wetlands, ponds, basins, HSG A
*	35,026	48		Brush, Good, HSG B
	1,900,460	55		Woods, Good, HSG B
*	4,675	60		Porous Pavement, HSG B
*	533,972	61		>75% Grass cover, Good, HSG B
*	870,974	75		1/4 acre lots, 38% imp, HSG B
	13,217	77		Natural western desert, HSG B
*	7,686	82		Dirt roads, HSG B
*	16,301	85		Gravel roads, HSG B
	104,653	98		Unconnected pavement, HSG B
*	165,854	98		Wetlands, ponds, basins, HSG B
*	526	60		Porous Pavement, HSG C
	93,787	65		Brush, Good, HSG C
	2,670,525	70		Woods, Good, HSG C
	19,191	74		>75% Grass cover, Good, HSG C
	1,689,170	83		1/4 acre lots, 38% imp, HSG C
	687	85		Natural western desert, HSG C
	4,732	89		Gravel roads, HSG C
	243,150	98		Unconnected pavement, HSG C
*	157,530	98		Wetlands, ponds, basins, HSG C
*	17,412	60		Porous Pavement, HSG D
*	121,042	73		Brush, Good, HSG D
	2,083,641	77		Woods, Good, HSG D
	978,940	80		>75% Grass cover, Good, HSG D
*	245,849	87		1/4 acre lots, 38% imp, HSG D
	10,297	88		Natural western desert, HSG D
	24,582	89		Dirt roads, HSG D
	30,086	91		Gravel roads, HSG D
	124,919	98		Unconnected pavement, HSG D
*	875,457	98		Wetlands, ponds, basins
	20,411,078	64	63	Weighted Average, UI Adjusted
	16,594,091			81.30% Pervious Area
	3,816,987			18.70% Impervious Area
	732,585			19.19% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	100	0.0150	0.07		**Sheet Flow, AB Wooded** Woods: Light underbrush n= 0.400 P2= 3.20"
18.1	454	0.0070	0.42		**Shallow Concentrated Flow, BC Wooded** Woodland Kv= 5.0 fps
8.7	491	0.0180	0.94		**Shallow Concentrated Flow, CD Grass** Short Grass Pasture Kv= 7.0 fps
34.7	466	0.0020	0.22		**Shallow Concentrated Flow, DE Wooded** Woodland Kv= 5.0 fps
17.0	319	0.0020	0.31		**Shallow Concentrated Flow, EF Wetland** Short Grass Pasture Kv= 7.0 fps
84.2	2,236	0.0040	0.44		**Shallow Concentrated Flow, FG Grass** Short Grass Pasture Kv= 7.0 fps
28.0	1,050	0.0080	0.63		**Shallow Concentrated Flow, GH Grass** Short Grass Pasture Kv= 7.0 fps
7.8	732	0.0010	1.57	26.70	**Channel Flow, HI West Stream 1** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.2	238		17.94		**Lake or Reservoir, IJ West Stream Pond 1** Mean Depth= 10.00'
16.7	1,571	0.0010	1.57	26.70	**Channel Flow, JK West Stream 2** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.7	742		17.94		**Lake or Reservoir, KL West Stream Pond 2** Mean Depth= 10.00'
240.2	8,399	Total			

Subcatchment WPS: West Perennial Stream



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EPS: East Perennial Runoff Area=22,172,380 sf 19.54% Impervious Runoff Depth>1.91"
Flow Length=11,006' Tc=236.8 min UI Adjusted CN=60 Runoff=213.3 cfs 3,527,236 cf

Subcatchment WPS: West Perennial Runoff Area=20,411,078 sf 18.70% Impervious Runoff Depth>2.15"
Flow Length=8,399' Tc=240.2 min UI Adjusted CN=63 Runoff=222.3 cfs 3,656,348 cf

Total Runoff Area = 42,583,458 sf Runoff Volume = 7,183,584 cf Average Runoff Depth = 2.02"
80.86% Pervious = 34,433,702 sf 19.14% Impervious = 8,149,756 sf

Summary for Subcatchment EPS: East Perennial Stream

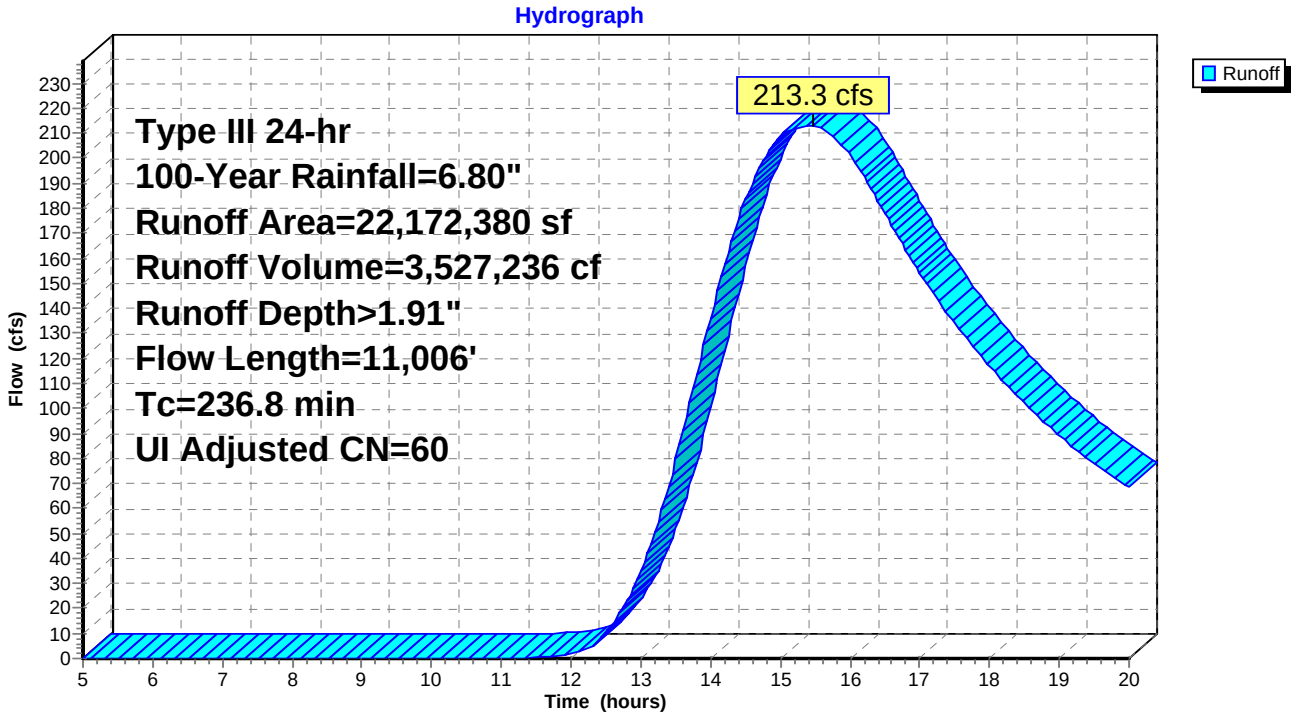
Runoff = 213.3 cfs @ 15.48 hrs, Volume= 3,527,236 cf, Depth> 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.80"

	Area (sf)	CN	Adj	Description
*	115,988	30		Brush, Good, HSG A
*	5,308,192	30		Woods, Good, HSG A
	1,985,070	39		>75% Grass cover, Good, HSG A
*	5,568	60		Porous Pavement, HSG A
	1,518,870	61		1/4 acre lots, 38% imp, HSG A
*	23,750	63		Sand, HSG A
	8,759	72		Dirt roads, HSG A
	157,184	76		Gravel roads, HSG A
	371,717	98		Unconnected pavement, HSG A
*	403,422	98		Wetlands, ponds, basins, HSG A
*	290,979	48		Brush, Good, HSG B
	2,538,361	55		Woods, Good, HSG B
*	953,845	61		>75% Grass cover, Good, HSG B
*	1,263,454	75		1/4 acre lots, 38% imp, HSG B
*	32,822	82		Dirt roads, HSG B
*	472,190	85		Gravel roads, HSG B
	177,014	98		Unconnected pavement, HSG B
*	35,165	98		Wetlands, ponds, basins, HSG B
	307,013	70		Woods, Good, HSG C
	43,863	83		1/4 acre lots, 38% imp, HSG C
	3,985	98		Unconnected pavement, HSG C
*	14,409	98		Wetlands, ponds, basins, HSG C
*	100,945	73		Brush, Good, HSG D
	2,369,814	77		Woods, Good, HSG D
	1,143,356	80		>75% Grass cover, Good, HSG D
*	312,159	87		1/4 acre lots, 38% imp, HSG D
	13,626	88		Natural western desert, HSG D
	6,715	89		Dirt roads, HSG D
	59,660	91		Gravel roads, HSG D
	47,483	98		Unconnected pavement, HSG D
*	2,087,002	98		Wetlands, ponds, basins
	22,172,380	61	60	Weighted Average, UI Adjusted
	17,839,612			80.46% Pervious Area
	4,332,768			19.54% Impervious Area
	600,199			13.85% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
71.2	100	0.0010	0.02		**Sheet Flow, AB Wooded** Woods: Light underbrush n= 0.400 P2= 3.20"
20.2	384	0.0040	0.32		**Shallow Concentrated Flow, BC Wooded** Woodland Kv= 5.0 fps
0.2	40	0.0190	2.80		**Shallow Concentrated Flow, CD Street** Paved Kv= 20.3 fps
5.6	176	0.0110	0.52		**Shallow Concentrated Flow, DE Wooded** Woodland Kv= 5.0 fps
76.0	1,010	0.0010	0.22		**Shallow Concentrated Flow, EF Wetlands** Short Grass Pasture Kv= 7.0 fps
31.6	2,743	0.0005	1.44	56.35	**Channel Flow, FG, East Stream 1** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
1.5	374	0.0040	4.09	159.39	**Channel Flow, GH, East Stream 2** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
0.2	260		17.94		**Lake or Reservoir, HI East Stream Pond 1** Mean Depth= 10.00'
5.1	1,092	0.0030	3.54	138.04	**Channel Flow, IJ East Stream 3** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
4.0	854	0.0030	3.54	138.04	**Channel Flow, JK East Stream 4** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040 Winding stream, pools & shoals
0.2	177		17.94		**Lake or Reservoir, KL East Stream Pond 2** Mean Depth= 10.00'
17.5	3,038	0.0020	2.89	112.71	**Channel Flow, LM East Stream 5** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
0.3	367		17.94		**Lake or Reservoir, MN East Stream Pond 3** Mean Depth= 10.00'
3.2	391	0.0010	2.04	79.70	**Channel Flow, NO East Stream 6** Area= 39.0 sf Perim= 17.0' r= 2.29' n= 0.040
236.8	11,006	Total			

Subcatchment EPS: East Perennial Stream



Summary for Subcatchment WPS: West Perennial Stream

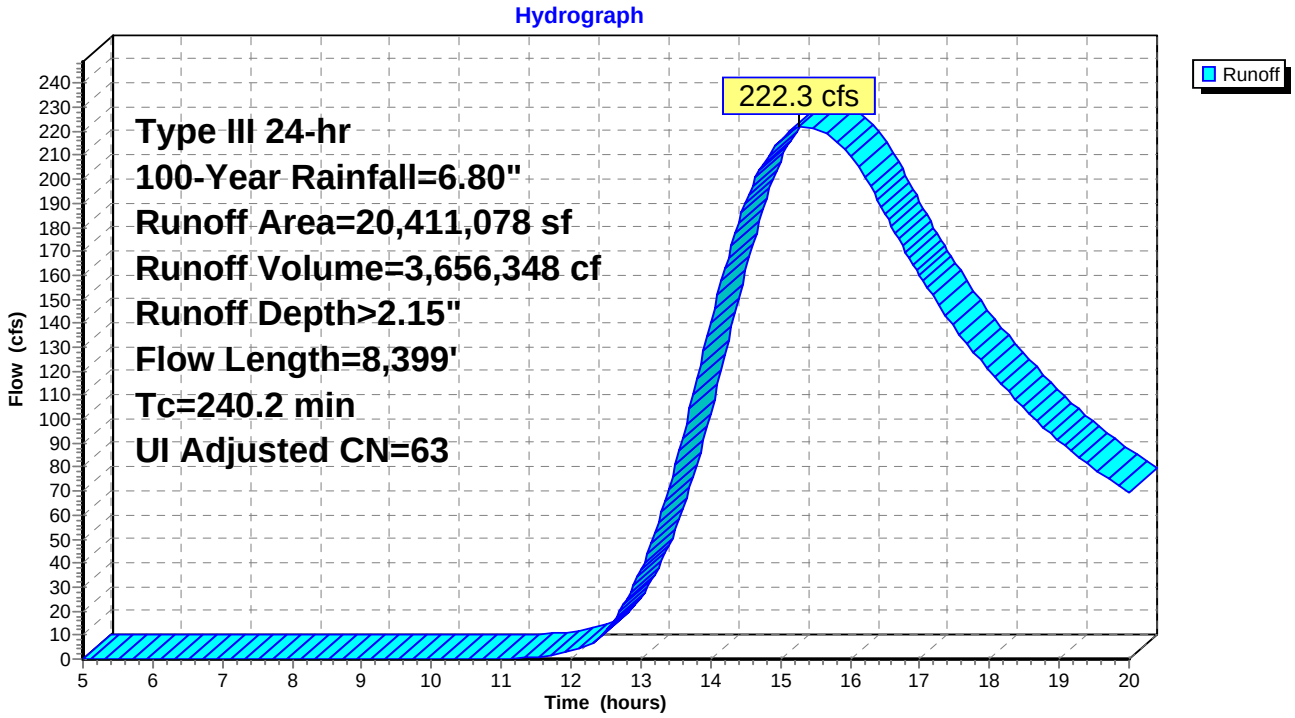
Runoff = 222.3 cfs @ 15.26 hrs, Volume= 3,656,348 cf, Depth> 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.80"

	Area (sf)	CN	Adj	Description
*	515,066	30		Brush, Good, HSG A
*	3,769,846	30		Woods, Good, HSG A
	721,910	39		>75% Grass cover, Good, HSG A
*	7,251	60		Porous Pavement, HSG A
	1,918,923	61		1/4 acre lots, 38% imp, HSG A
*	4,693	63		Sand, HSG A
	43,385	72		Dirt roads, HSG A
	35,707	76		Gravel roads, HSG A
	259,863	98		Unconnected pavement, HSG A
*	90,093	98		Wetlands, ponds, basins, HSG A
*	35,026	48		Brush, Good, HSG B
	1,900,460	55		Woods, Good, HSG B
*	4,675	60		Porous Pavement, HSG B
*	533,972	61		>75% Grass cover, Good, HSG B
*	870,974	75		1/4 acre lots, 38% imp, HSG B
	13,217	77		Natural western desert, HSG B
*	7,686	82		Dirt roads, HSG B
*	16,301	85		Gravel roads, HSG B
	104,653	98		Unconnected pavement, HSG B
*	165,854	98		Wetlands, ponds, basins, HSG B
*	526	60		Porous Pavement, HSG C
	93,787	65		Brush, Good, HSG C
	2,670,525	70		Woods, Good, HSG C
	19,191	74		>75% Grass cover, Good, HSG C
	1,689,170	83		1/4 acre lots, 38% imp, HSG C
	687	85		Natural western desert, HSG C
	4,732	89		Gravel roads, HSG C
	243,150	98		Unconnected pavement, HSG C
*	157,530	98		Wetlands, ponds, basins, HSG C
*	17,412	60		Porous Pavement, HSG D
*	121,042	73		Brush, Good, HSG D
	2,083,641	77		Woods, Good, HSG D
	978,940	80		>75% Grass cover, Good, HSG D
*	245,849	87		1/4 acre lots, 38% imp, HSG D
	10,297	88		Natural western desert, HSG D
	24,582	89		Dirt roads, HSG D
	30,086	91		Gravel roads, HSG D
	124,919	98		Unconnected pavement, HSG D
*	875,457	98		Wetlands, ponds, basins
	20,411,078	64	63	Weighted Average, UI Adjusted
	16,594,091			81.30% Pervious Area
	3,816,987			18.70% Impervious Area
	732,585			19.19% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	100	0.0150	0.07		**Sheet Flow, AB Wooded** Woods: Light underbrush n= 0.400 P2= 3.20"
18.1	454	0.0070	0.42		**Shallow Concentrated Flow, BC Wooded** Woodland Kv= 5.0 fps
8.7	491	0.0180	0.94		**Shallow Concentrated Flow, CD Grass** Short Grass Pasture Kv= 7.0 fps
34.7	466	0.0020	0.22		**Shallow Concentrated Flow, DE Wooded** Woodland Kv= 5.0 fps
17.0	319	0.0020	0.31		**Shallow Concentrated Flow, EF Wetland** Short Grass Pasture Kv= 7.0 fps
84.2	2,236	0.0040	0.44		**Shallow Concentrated Flow, FG Grass** Short Grass Pasture Kv= 7.0 fps
28.0	1,050	0.0080	0.63		**Shallow Concentrated Flow, GH Grass** Short Grass Pasture Kv= 7.0 fps
7.8	732	0.0010	1.57	26.70	**Channel Flow, HI West Stream 1** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.2	238		17.94		**Lake or Reservoir, IJ West Stream Pond 1** Mean Depth= 10.00'
16.7	1,571	0.0010	1.57	26.70	**Channel Flow, JK West Stream 2** Area= 17.0 sf Perim= 11.0' r= 1.55' n= 0.040 Winding stream, pools & shoals
0.7	742		17.94		**Lake or Reservoir, KL West Stream Pond 2** Mean Depth= 10.00'
240.2	8,399	Total			

Subcatchment WPS: West Perennial Stream



APPENDIX C

DRAINAGE SYSTEM CALCULATIONS

STANDARD 2 – PEAK RATE OF RUNOFF

STANDARD 3 – RECHARGE VOLUME

STANDARD 4 – WATER QUALITY VOLUME

PEAK VOLUME

WATER QUALITY VOLUME CONVERSION TO A DISCHARGE RATE

DRAWDOWN CALCULATIONS

CLOSED DRAINAGE SYSTEM/PIPE SIZING CALCULATIONS

SIMPLE DYNAMIC SIZING

FACILITY SIZING

CONECO
Engineers & Scientists

Project Number:	9232.0	**Date:**	September 14, 2017
Project Name:	Cape Club of Sharon	**Calculations by:**	Ben Rogers
Project Address:	25 Tiot Street	**Calculations date:**	September 14, 2017
Client:	Cape Club Builders, LLC	**Checked by:**	Jonathan Novak
Location:	Sharon MA	**Checked Date:**	September 14, 2017

STORMWATER MANAGEMENT STANDARD 2 - PEAK RATE OF RUNOFF

Western Stream

DESIGN STORM (YEAR)	EXISTING PEAK RUNOFF (CFS)	PROPOSED PEAK RUNOFF (CFS)	REDUCTION IN PEAK RUNOFF
2	35.1	35.1	0.0%
10	105.6	100.4	4.9%
25	143.7	143.7	0.0%
100	222.3	216.0	2.8%

Eastern Stream

DESIGN STORM (YEAR)	EXISTING PEAK RUNOFF (CFS)	PROPOSED PEAK RUNOFF (CFS)	REDUCTION IN PEAK RUNOFF
2	28.6	28.6	0.0%
10	96.0	90.9	5.3%
25	134.0	134.0	0.0%
100	213.3	213.3	0.0%

CONECO
Engineers & Scientists

Project Number:	9232.0	**Date:**	September 14, 2017
Project Name:	Cape Club of Sharon	**Calculations by:**	Ben Rogers
Project Address:	25 Tiot Street	**Calculations date:**	September 14, 2017
Client:	Cape Club Builders, LLC	**Checked by:**	Jonathan Novak
Location:	Sharon MA	**Checked Date:**	September 14, 2017

STORMWATER MANAGEMENT STANDARD 3 - RECHARGE VOLUME

	HYDROLOGIC SOIL GROUP				TOTAL
	A	B	C	D	
IMPERVIOUS AREA (S.F.)	268,052	23,883	8,047	89,238	389,220
INCHES OF RUNOFF TO BE RECHARGED	0.60	0.35	0.25	0.10	
REQUIRED RECHARGE VOLUME (FT^3)	13,403	697	168	744	**15,010**

CAPTURE AREA ADJUSTMENT - ADJUSTED MINIMUM REQUIRED RECHARGE VOLUME

MINIMUM OF 65% OF IMPERVIOUS AREA MUST BE DIRECTED TO THE RECHARGE BMP; 65 % IS =	252,993	SF		
IMPERVIOUS SITE AREA DRAINING TO BMP =	305,475	SF	78.5%	PERCENTAGE OF IMPERVIOUS AREA DIVERTED TO INFILTRATION FACILITY
RATIO OF TOTAL IMPERVIOUS AREA TO IMPERVIOUS AREA DRAINING TO RECHARGE BMP =	1.27		= TOTAL IMPERVIOUS AREA / IMPERVIOUS AREA DRAINING TO THE RECHARGE AREA	
ADJUSTED REQUIRED RECHARGE VOLUME=	**19,126**	CF	= RATIO OF IMPERVIOUS AREA x REQUIRED RECHARGE VOLUME	
PROPOSED RECHARGE VOLUME	**44,287**	CF	TAKEN FROM HYDROCAD CALCULATIONS BASED ON 1 INCH OF RAINFALL	

CONECO
Engineers & Scientists

Project Number:	9232.0	**Date:**	September 14, 2017
Project Name:	Cape Club of Sharon	**Calculations by:**	Ben Rogers
Project Address:	25 Tiot Street	**Calculations date:**	September 14, 2017
Client:	Cape Club Builders, LLC	**Checked by:**	Jonathan Novak
Location:	Sharon MA	**Checked Date:**	September 14, 2017

STORMWATER MANAGEMENT STANDARD 4 - WATER QUALITY VOLUME

	DEPTH TO TREAT (IN.)	IMPERVIOUS AREA (SF)	WATER VOLUME (CF)
WATER QUALITY VOLUME (if discharging to an area of high rate of infiltration, or sensitive area)	1	389,220	32,435
NET WATER QUALITY VOLUME			**32,435**

CONECO
Engineers & Scientists

Project Number:	9232.0	**Date:**	September 14, 2017
Project Name:	Cape Club of Sharon	**Calculations by:**	Ben Rogers
Project Address:	25 Tiot Street	**Calculations date:**	September 14, 2017
Client:	Cape Club Builders, LLC	**Checked by:**	Jonathan Novak
Location:	Sharon MA	**Checked Date:**	September 14, 2017

TOTAL VOLUME

Western Stream

DESIGN STORM (YEAR)	EXISTING TOTAL VOLUME (CF)	PROPOSED TOTAL VOLUME (CF)	REDUCTION IN TOTAL VOLUME
2	614,197	614,197	0.0%
10	1,767,173	1,767,172	0.0%
25	2,383,750	2,383,749	0.0%
100	3,656,350	3,656,348	0.0%

Eastern Stream

DESIGN STORM (YEAR)	EXISTING TOTAL VOLUME (CF)	PROPOSED TOTAL VOLUME (CF)	REDUCTION IN TOTAL VOLUME
2	508,125	508,105	0.0%
10	1,622,998	1,622,937	0.0%
25	2,237,794	2,237,709	0.0%
100	3,527,370	3,527,236	0.0%

CONECO
Engineers & Scientists

Project Number:	9231.0	**Date:**	September 14, 2017
Project Name:	Cape Club of Sharon	**Calculations by:**	Damien Dmitruk
Project Address:	25 Tiot Street	**Calculations date:**	September 14, 2017
Client:	Cape Club Builders, LLC	**Checked by:**	Jonathan Novak
Location:	Sharon MA	**Checked Date:**	September 14, 2017

CONVERSION OF WATER QUALITY VOLUME TO A DISCHARGE RATE FOR PROPRIETAY STORMWATER TREATMENT PRACTICES

$$Q = (qu)(A)(WQV)$$

Q= FLOW RATE
qu = UNIT PEAK DISCHARGE (csm/in)
A = IMPERVIOUS SURFACE DRAINAGE AREA (sq mi)
WQV = WATER QUALITY VOLUME

STC-1

Tc =	6	min
qu =	774	
A =	0.220	Acre
WQV =	1	inch
Q =	0.27	CFS

CONECO
Engineers & Scientists

Project Number:	9231.0	**Date:**	September 14, 2017
Project Name:	Cape Club of Sharon Townhouses	**Calculations by:**	Megan S. Dutra
Project Address:	25 Tiot Street	**Calculations date:**	September 14, 2017
Client:	Cape Club Builders, LLC	**Checked by:**	Jonathan E. Novak
Location:	Sharon, MA	**Checked Date:**	September 14, 2017

PROPOSED DRAWDOWN FOR RECHARGE STRUCTURES

BASIN 1

A = AREA OF PROPOSED LEACHING STRUCTURE	4,714	SQ. FT.
Rv = RECHARGE VOLUME =	4,611	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	0.27	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **43.5** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

BASIN 2

A = AREA OF PROPOSED LEACHING STRUCTURE	6,229	SQ. FT.
Rv = RECHARGE VOLUME =	5,046	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	0.27	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **36.0** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

BASIN 3

A = AREA OF PROPOSED LEACHING STRUCTURE	1,372	SQ. FT.
Rv = RECHARGE VOLUME =	1,613	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	0.52	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **27.1** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

BASIN 4

A = AREA OF PROPOSED LEACHING STRUCTURE	4,856	SQ. FT.
Rv = RECHARGE VOLUME =	3,189	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	0.52	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **15.2** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

BASIN 5

A = AREA OF PROPOSED LEACHING STRUCTURE	2,576	SQ. FT.
Rv = RECHARGE VOLUME =	2,165	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	0.27	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **37.4** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

CONECO Engineers & Scientists

Project Number:	9231.0	**Date:**	September 14, 2017
Project Name:	Cape Club of Sharon Townhouses	**Calculations by:**	Megan S. Dutra
Project Address:	25 Tiot Street	**Calculations date:**	September 14, 2017
Client:	Cape Club Builders, LLC	**Checked by:**	Jonathan E. Novak
Location:	Sharon, MA	**Checked Date:**	September 14, 2017

PROPOSED DRAWDOWN FOR RECHARGE STRUCTURES

BASIN 6

A = AREA OF PROPOSED LEACHING STRUCTURE	3,933	SQ. FT.
Rv = RECHARGE VOLUME =	3,312	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	0.52	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **19.4** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

BASIN 7

A = AREA OF PROPOSED LEACHING STRUCTURE	151	SQ. FT.
Rv = RECHARGE VOLUME =	117	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	0.52	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **17.9** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

BASIN 8

A = AREA OF PROPOSED LEACHING STRUCTURE	310	SQ. FT.
Rv = RECHARGE VOLUME =	348	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	0.52	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **25.9** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

BASIN 9

A = AREA OF PROPOSED LEACHING STRUCTURE	1,976	SQ. FT.
Rv = RECHARGE VOLUME =	1,676	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	0.52	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **19.6** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

BASIN 10

A = AREA OF PROPOSED LEACHING STRUCTURE	18,079	SQ. FT.
Rv = RECHARGE VOLUME =	12,861	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **3.5** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

CONECO
Engineers & Scientists

Project Number:	9231.0	**Date:**	September 14, 2017
Project Name:	Cape Club of Sharon Townhouses	**Calculations by:**	Megan S. Dutra
Project Address:	25 Tiot Street	**Calculations date:**	September 14, 2017
Client:	Cape Club Builders, LLC	**Checked by:**	Jonathan E. Novak
Location:	Sharon, MA	**Checked Date:**	September 14, 2017

PROPOSED DRAWDOWN FOR RECHARGE STRUCTURES

BASIN 11

A = AREA OF PROPOSED LEACHING STRUCTURE	1,108	SQ. FT.
Rv = RECHARGE VOLUME =	449	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **2.0** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

BASIN 12

A = AREA OF PROPOSED LEACHING STRUCTURE	14,366	SQ. FT.
Rv = RECHARGE VOLUME =	5,843	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **2.0** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

BASIN 13

A = AREA OF PROPOSED LEACHING STRUCTURE	364	SQ. FT.
Rv = RECHARGE VOLUME =	158	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	8.27	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **0.6** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

BASIN 14

A = AREA OF PROPOSED LEACHING STRUCTURE	378	SQ. FT.
Rv = RECHARGE VOLUME =	335	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	0.27	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **39.4** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

CONECO
Engineers & Scientists

Project Number:	9231.0	**Date:**	September 14, 2017
Project Name:	Cape Club of Sharon Townhouses	**Calculations by:**	Megan S. Dutra
Project Address:	25 Tiot Street	**Calculations date:**	September 14, 2017
Client:	Cape Club Builders, LLC	**Checked by:**	Jonathan E. Novak
Location:	Sharon, MA	**Checked Date:**	September 14, 2017

PROPOSED DRAWDOWN FOR RECHARGE STRUCTURES

INFILTRATION TRENCHES 1 - 3

A = AREA OF PROPOSED LEACHING STRUCTURE	117	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	122	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON AHYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **5.2** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCHES 4 & 7

A = AREA OF PROPOSED LEACHING STRUCTURE	66	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	63	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **4.8** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCHES 5, 6, & 8-10

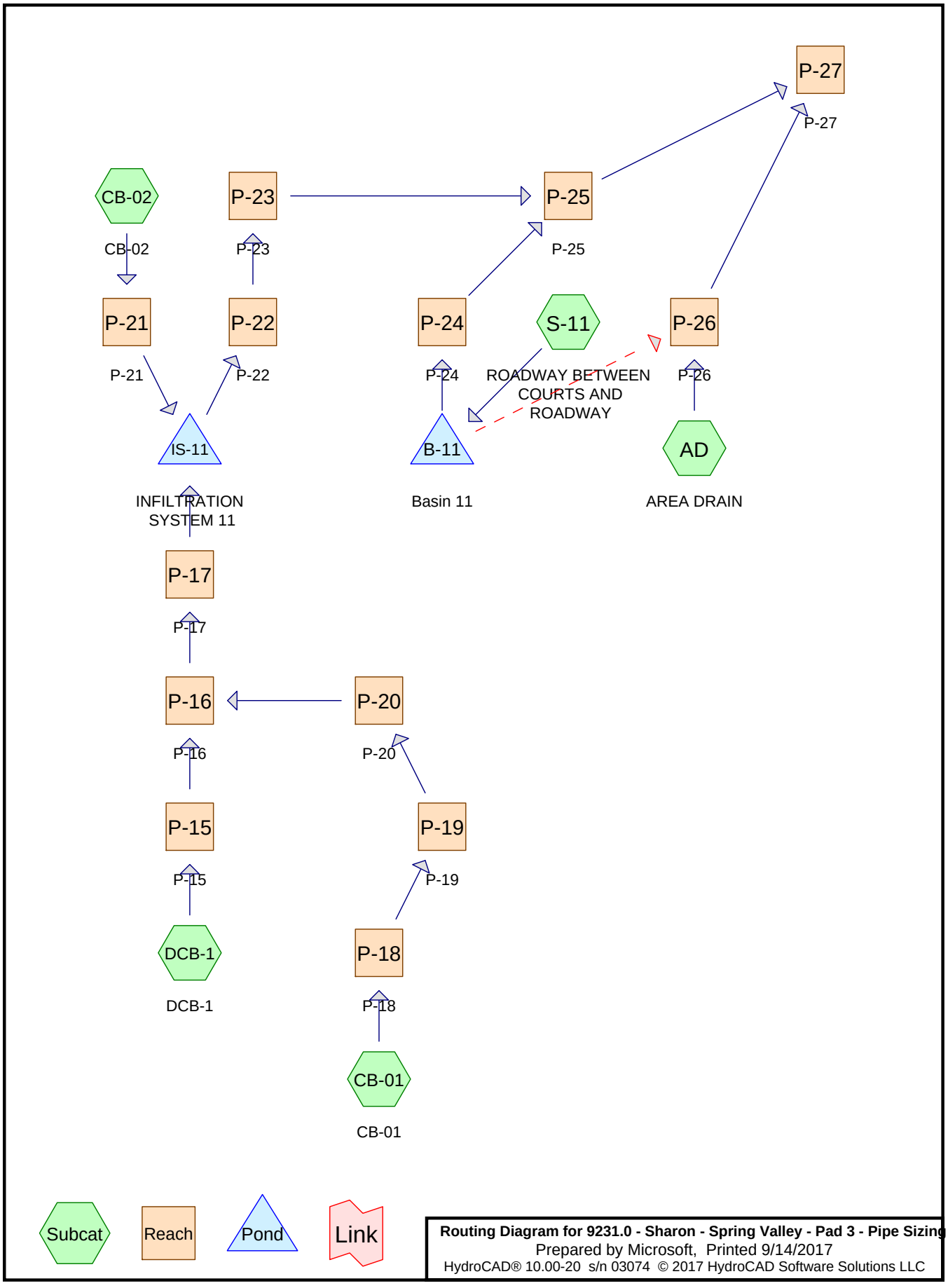
A = AREA OF PROPOSED LEACHING STRUCTURE	125	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	128	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **5.1** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 11

A = AREA OF PROPOSED LEACHING STRUCTURE	1,771	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	1,987	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	8.27	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **1.6** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK


P-27
P-27
CB-02
P-23
P-25
CB-02
P-23
P-25
P-21
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P-24
S-11
P-26
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ROADWAY BETWEEN COURTS AND ROADWAY
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DCB-1
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CB-01
CB-01
Subcat
Reach
Pond
Link
Routing Diagram for 9231.0 - Sharon - Spring Valley - Pad 3 - Pipe Sizing
Prepared by Microsoft, Printed 9/14/2017
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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
37,462	HSG A	AD, CB-01, CB-02, DCB-1, S-11
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
37,462		**TOTAL AREA**

Summary for Subcatchment AD: AREA DRAIN

Runoff = 0.82 cfs @ 12.10 hrs, Volume= 2,418 cf, Depth> 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
6,177	39	>75% Grass cover, Good, HSG A
6,832	98	Unconnected pavement, HSG A
13,009	70	Weighted Average
6,177		47.48% Pervious Area
6,832		52.52% Impervious Area
6,832		100.00% Unconnected

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

Summary for Subcatchment CB-01: CB-01

Runoff = 0.61 cfs @ 12.09 hrs, Volume= 2,046 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
5,036	98	Paved parking, HSG A
5,036		100.00% Impervious Area

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

Summary for Subcatchment CB-02: CB-02

Runoff = 0.99 cfs @ 12.09 hrs, Volume= 3,321 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
8,176	98	Paved parking, HSG A
8,176		100.00% Impervious Area

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

Summary for Subcatchment DCB-1: DCB-1

Runoff = 0.57 cfs @ 12.09 hrs, Volume= 1,928 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
4,747	98	Paved roads w/curbs & sewers, HSG A
4,747		100.00% Impervious Area

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

Summary for Subcatchment S-11: ROADWAY BETWEEN COURTS AND ROADWAY

Runoff = 0.49 cfs @ 12.09 hrs, Volume= 1,440 cf, Depth> 2.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
2,527	39	>75% Grass cover, Good, HSG A
3,967	98	Paved parking, HSG A
6,494	75	Weighted Average
2,527		38.91% Pervious Area
3,967		61.09% Impervious Area

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

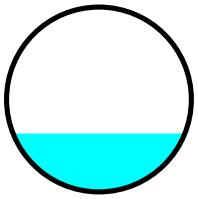
Summary for Reach P-15: P-15

Inflow Area = 4,747 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.57 cfs @ 12.09 hrs, Volume= 1,928 cf
Outflow = 0.57 cfs @ 12.09 hrs, Volume= 1,927 cf, Atten= 1%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.71 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.05 fps, Avg. Travel Time= 0.7 min

Peak Storage= 10 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.68 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 46.0' Slope= 0.0057 '/'
Inlet Invert= 56.34', Outlet Invert= 56.08'



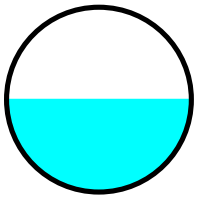
Summary for Reach P-16: P-16

Inflow Area = 9,783 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 1.14 cfs @ 12.10 hrs, Volume= 3,969 cf
Outflow = 1.14 cfs @ 12.10 hrs, Volume= 3,969 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.88 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.15 fps, Avg. Travel Time= 0.1 min

Peak Storage= 2 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.25 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 5.0' Slope= 0.0040 '/'
Inlet Invert= 56.08', Outlet Invert= 56.06'



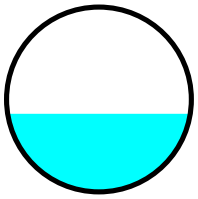
Summary for Reach P-17: P-17

Inflow Area = 9,783 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 1.14 cfs @ 12.10 hrs, Volume= 3,969 cf
Outflow = 1.14 cfs @ 12.10 hrs, Volume= 3,969 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.63 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.44 fps, Avg. Travel Time= 0.0 min

Peak Storage= 1 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.09 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 4.0' Slope= 0.0075 '/'
Inlet Invert= 56.03', Outlet Invert= 56.00'



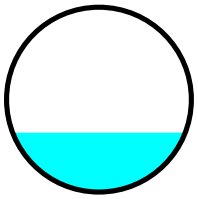
Summary for Reach P-18: P-18

Inflow Area = 5,036 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.61 cfs @ 12.09 hrs, Volume= 2,046 cf
Outflow = 0.61 cfs @ 12.09 hrs, Volume= 2,044 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.80 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.08 fps, Avg. Travel Time= 0.4 min

Peak Storage= 6 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.74 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 27.0' Slope= 0.0059 '/'
Inlet Invert= 56.95', Outlet Invert= 56.79'



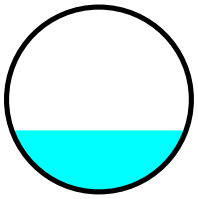
Summary for Reach P-19: P-19

Inflow Area = 5,036 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.61 cfs @ 12.09 hrs, Volume= 2,044 cf
Outflow = 0.59 cfs @ 12.11 hrs, Volume= 2,043 cf, Atten= 3%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.66 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 1.7 min

Peak Storage= 23 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.56 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 103.0' Slope= 0.0051 '/'
Inlet Invert= 56.79', Outlet Invert= 56.26'



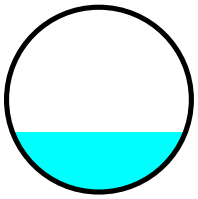
Summary for Reach P-20: P-20

Inflow Area = 5,036 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.59 cfs @ 12.11 hrs, Volume= 2,043 cf
Outflow = 0.58 cfs @ 12.11 hrs, Volume= 2,042 cf, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.67 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.04 fps, Avg. Travel Time= 0.5 min

Peak Storage= 7 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.59 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 34.0' Slope= 0.0053 '/'
Inlet Invert= 56.26', Outlet Invert= 56.08'



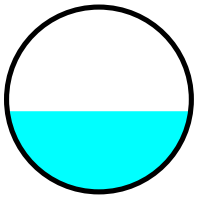
Summary for Reach P-21: P-21

Inflow Area = 8,176 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.99 cfs @ 12.09 hrs, Volume= 3,321 cf
Outflow = 0.98 cfs @ 12.09 hrs, Volume= 3,319 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.01 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.18 fps, Avg. Travel Time= 0.3 min

Peak Storage= 8 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.52 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 24.0' Slope= 0.0050 '/'
Inlet Invert= 56.12', Outlet Invert= 56.00'



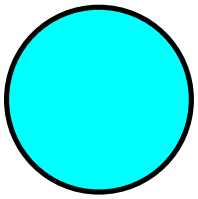
Summary for Reach P-22: P-22

Inflow Area = 17,959 sf,100.00% Impervious, Inflow Depth = 1.01" for 25-Year event
Inflow = 1.07 cfs @ 12.20 hrs, Volume= 1,516 cf
Outflow = 0.48 cfs @ 12.20 hrs, Volume= 1,516 cf, Atten= 56%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.69 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.30 fps, Avg. Travel Time= 3.1 min

Peak Storage= 44 cf @ 12.15 hrs
Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 0.48 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 56.0' Slope= 0.0002 '/'
Inlet Invert= 56.00', Outlet Invert= 55.99'



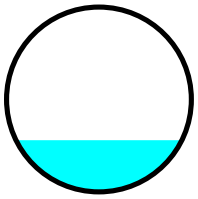
Summary for Reach P-23: P-23

Inflow Area = 17,959 sf,100.00% Impervious, Inflow Depth = 1.01" for 25-Year event
Inflow = 0.48 cfs @ 12.20 hrs, Volume= 1,516 cf
Outflow = 0.48 cfs @ 12.25 hrs, Volume= 1,516 cf, Atten= 0%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.67 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.57 fps, Avg. Travel Time= 0.2 min

Peak Storage= 3 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.82 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 16.0' Slope= 0.0062 '/'
Inlet Invert= 56.33', Outlet Invert= 56.23'



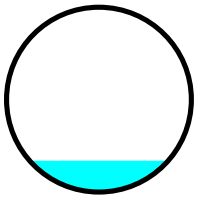
Summary for Reach P-24: P-24

Inflow Area = 6,494 sf, 61.09% Impervious, Inflow Depth = 0.09" for 25-Year event
Inflow = 0.02 cfs @ 12.57 hrs, Volume= 50 cf
Outflow = 0.02 cfs @ 12.59 hrs, Volume= 50 cf, Atten= 1%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.10 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 0.81 fps, Avg. Travel Time= 0.5 min

Peak Storage= 1 cf @ 12.58 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.39 cfs

6.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 23.0' Slope= 0.0048 '/'
Inlet Invert= 56.34', Outlet Invert= 56.23'



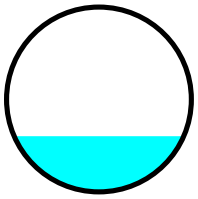
Summary for Reach P-25: P-25

Inflow Area = 24,453 sf, 89.67% Impervious, Inflow Depth = 0.77" for 25-Year event
Inflow = 0.50 cfs @ 12.57 hrs, Volume= 1,566 cf
Outflow = 0.50 cfs @ 12.61 hrs, Volume= 1,566 cf, Atten= 0%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.52 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.41 fps, Avg. Travel Time= 1.3 min

Peak Storage= 22 cf @ 12.60 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.55 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 113.0' Slope= 0.0051 '/'
Inlet Invert= 56.23', Outlet Invert= 55.65'



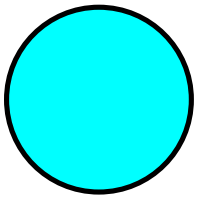
Summary for Reach P-26: P-26

Inflow Area = 13,009 sf, 52.52% Impervious, Inflow Depth > 2.23" for 25-Year event
Inflow = 0.82 cfs @ 12.10 hrs, Volume= 2,418 cf
Outflow = 0.47 cfs @ 12.58 hrs, Volume= 2,417 cf, Atten= 43%, Lag= 29.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.38 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.29 fps, Avg. Travel Time= 0.4 min

Peak Storage= 6 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.42 cfs

6.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 29.0' Slope= 0.0055 '/'
Inlet Invert= 55.81', Outlet Invert= 55.65'



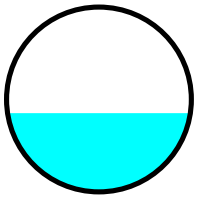
Summary for Reach P-27: P-27

Inflow Area = 37,462 sf, 76.77% Impervious, Inflow Depth > 1.28" for 25-Year event
Inflow = 0.97 cfs @ 12.58 hrs, Volume= 3,983 cf
Outflow = 0.94 cfs @ 12.58 hrs, Volume= 3,980 cf, Atten= 2%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.98 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.24 fps, Avg. Travel Time= 1.7 min

Peak Storage= 41 cf @ 12.58 hrs
Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.53 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 129.0' Slope= 0.0050 '/'
Inlet Invert= 55.65', Outlet Invert= 55.00'



Summary for Pond B-11: Basin 11

Inflow Area = 6,494 sf, 61.09% Impervious, Inflow Depth > 2.66" for 25-Year event
Inflow = 0.49 cfs @ 12.09 hrs, Volume= 1,440 cf
Outflow = 0.09 cfs @ 12.57 hrs, Volume= 1,437 cf, Atten= 82%, Lag= 28.9 min
Discarded = 0.06 cfs @ 12.57 hrs, Volume= 1,387 cf
Primary = 0.02 cfs @ 12.57 hrs, Volume= 50 cf
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 56.52' @ 12.57 hrs Surf.Area= 1,151 sf Storage= 520 cf

Plug-Flow detention time= 68.4 min calculated for 1,433 cf (100% of inflow)
Center-of-Mass det. time= 67.5 min (861.5 - 794.0)

Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	1,934 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
56.00	845	0	0
57.00	1,433	1,139	1,139
57.50	1,748	795	1,934

Device	Routing	Invert	Outlet Devices
#1	Primary	56.46'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Secondary	57.25'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	56.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.06 cfs @ 12.57 hrs HW=56.52' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.02 cfs @ 12.57 hrs HW=56.52' (Free Discharge)
└**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.02 cfs @ 0.80 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=56.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond IS-11: INFILTRATION SYSTEM 11

Inflow Area = 17,959 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 2.12 cfs @ 12.10 hrs, Volume= 7,289 cf
Outflow = 1.41 cfs @ 12.20 hrs, Volume= 7,287 cf, Atten= 34%, Lag= 6.4 min
Discarded = 0.34 cfs @ 11.65 hrs, Volume= 5,771 cf
Primary = 1.07 cfs @ 12.20 hrs, Volume= 1,516 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 56.54' @ 12.20 hrs Surf.Area= 1,771 sf Storage= 1,107 cf

Plug-Flow detention time= 8.3 min calculated for 7,287 cf (100% of inflow)
Center-of-Mass det. time= 8.3 min (744.1 - 735.8)

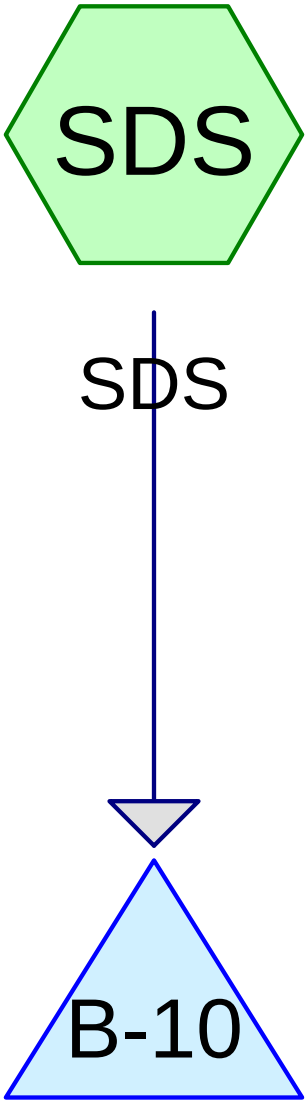
Volume	Invert	Avail.Storage	Storage Description
#1A	55.50'	1,086 cf	**28.33'W x 62.50'L x 2.04'H Field A** 3,615 cf Overall - 901 cf Embedded = 2,714 cf x 40.0% Voids
#2A	56.00'	901 cf	**Cultec C-100HD** x 64 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 8 rows
		1,987 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	56.00'	**12.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.34 cfs @ 11.65 hrs HW=55.52' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=1.06 cfs @ 12.20 hrs HW=56.53' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 1.06 cfs @ 2.49 fps)



Basin 10

Subcat Reach Pond Link

Routing Diagram for 9231.0 - Sharon - Spring Valley - SDS
Prepared by Microsoft, Printed 9/14/2017

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
389,220	98	Paved parking, HSG A (SDS)
389,220	**98**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
389,220	HSG A	SDS
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
389,220		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
389,220	0	0	0	0	389,220	Paved parking	S D S
389,220	**0**	**0**	**0**	**0**	**389,220**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment SDS: SDS Runoff Area=389,220 sf 100.00% Impervious Runoff Depth>0.47"
Tc=6.0 min CN=98 Runoff=4.97 cfs 15,096 cf

Pond B-10: Basin 10 Peak Elev=52.27' Storage=4,472 cf Inflow=4.97 cfs 15,096 cf
Outflow=0.94 cfs 15,069 cf

Total Runoff Area = 389,220 sf Runoff Volume = 15,096 cf Average Runoff Depth = 0.47"
0.00% Pervious = 0 sf 100.00% Impervious = 389,220 sf

Summary for Subcatchment SDS: SDS

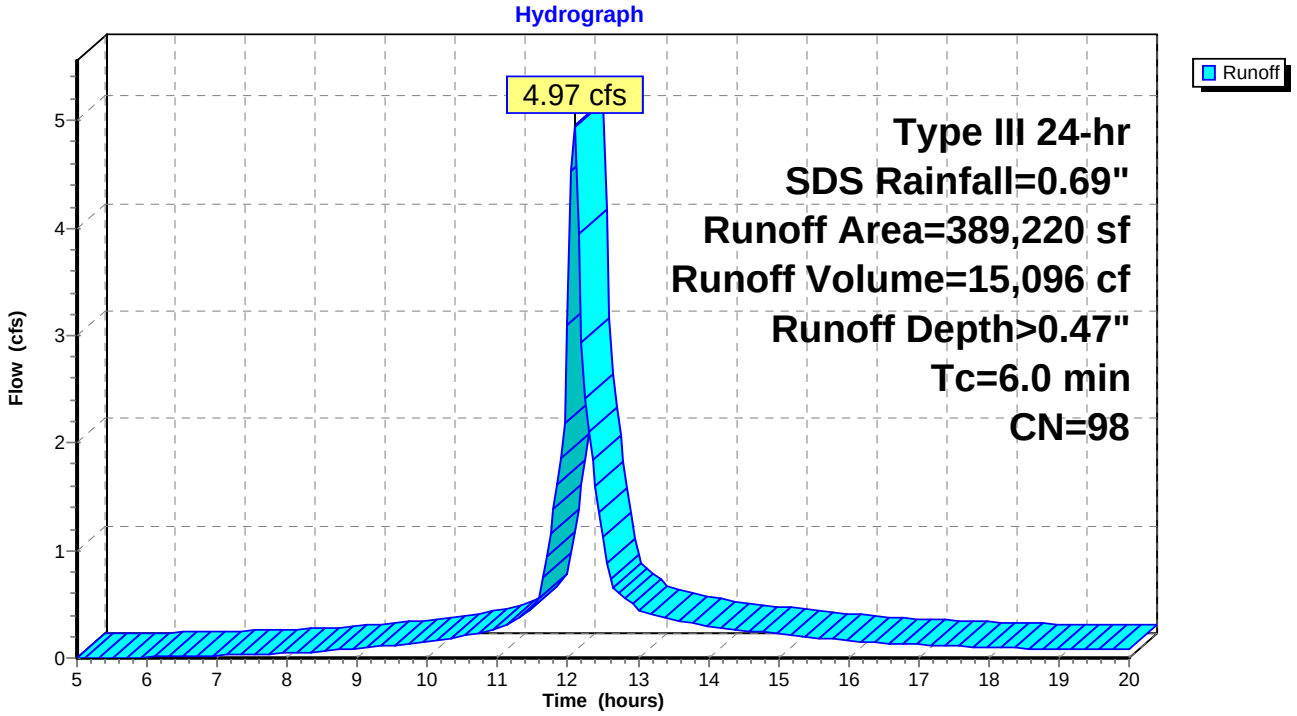
Runoff = 4.97 cfs @ 12.09 hrs, Volume= 15,096 cf, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr SDS Rainfall=0.69"

Area (sf)	CN	Description
389,220	98	Paved parking, HSG A
389,220		100.00% Impervious Area

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

Subcatchment SDS: SDS



Summary for Pond B-10: Basin 10

Inflow Area = 389,220 sf,100.00% Impervious, Inflow Depth > 0.47" for SDS event
Inflow = 4.97 cfs @ 12.09 hrs, Volume= 15,096 cf
Outflow = 0.94 cfs @ 12.54 hrs, Volume= 15,069 cf, Atten= 81%, Lag= 27.1 min
Discarded = 0.94 cfs @ 12.54 hrs, Volume= 15,069 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 52.27' @ 12.54 hrs Surf.Area= 16,887 sf Storage= 4,472 cf

Plug-Flow detention time= 32.5 min calculated for 15,069 cf (100% of inflow)
Center-of-Mass det. time= 31.7 min (801.1 - 769.4)

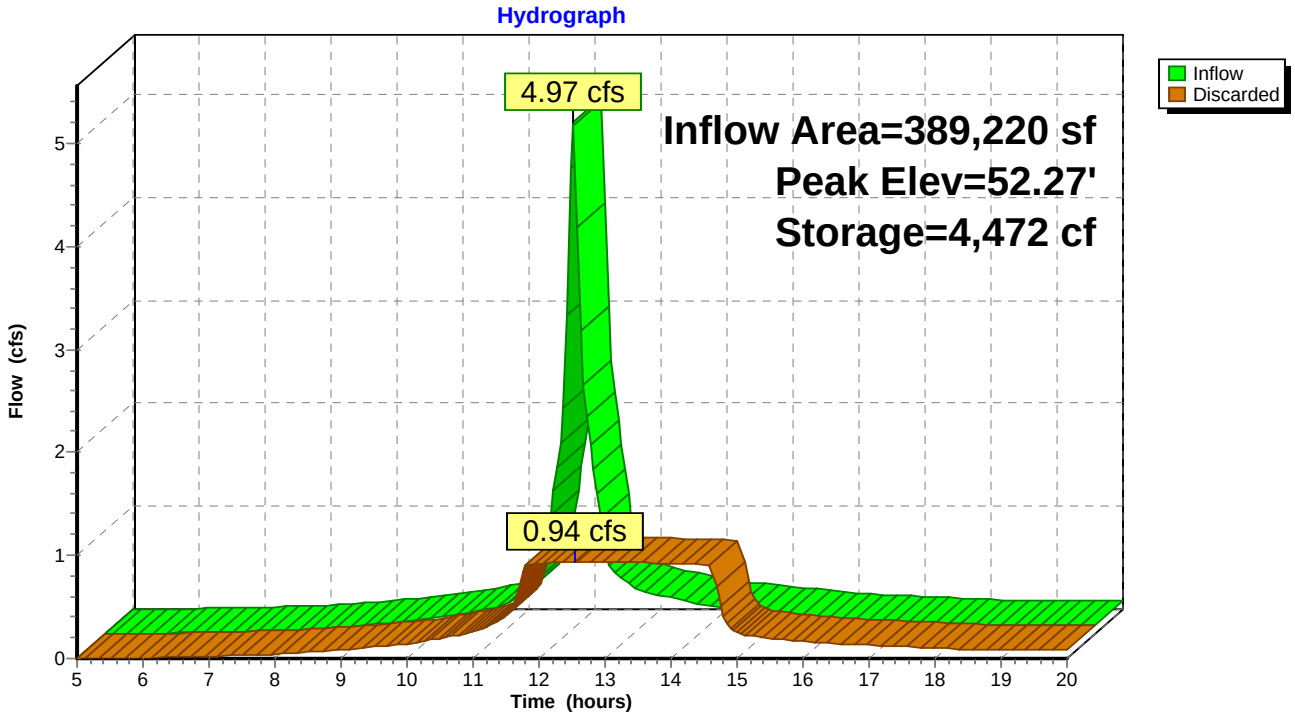
Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	37,624 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

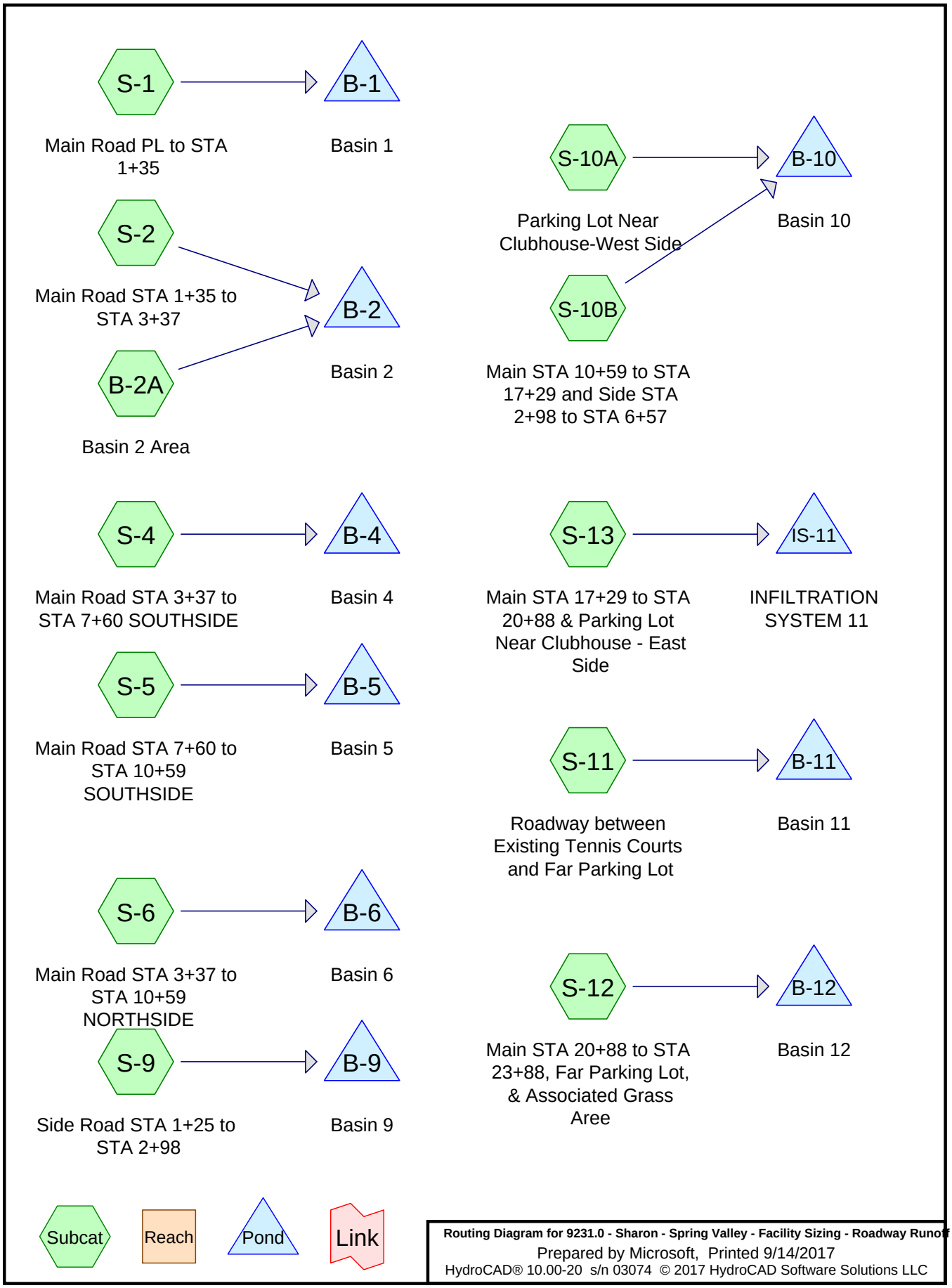
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.00	16,216	0	0
53.00	18,701	17,459	17,459
54.00	21,629	20,165	37,624

Device	Routing	Invert	Outlet Devices
#1	Discarded	52.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.94 cfs @ 12.54 hrs HW=52.27' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.94 cfs)

Pond B-10: Basin 10




S-1
B-1
Main Road PL to STA 1+35
Basin 1
S-2
Main Road STA 1+35 to STA 3+37
B-2
B-2A
Basin 2
Basin 2 Area
S-10A
B-10
Parking Lot Near Clubhouse-West Side
Basin 10
S-10B
Main STA 10+59 to STA 17+29 and Side STA 2+98 to STA 6+57
S-4
B-4
Main Road STA 3+37 to STA 7+60 SOUTHSIDE
Basin 4
S-13
IS-11
Main STA 17+29 to STA 20+88 & Parking Lot Near Clubhouse - East Side
INFILTRATION SYSTEM 11
S-5
B-5
Main Road STA 7+60 to STA 10+59 SOUTHSIDE
Basin 5
S-11
B-11
Roadway between Existing Tennis Courts and Far Parking Lot
Basin 11
S-6
B-6
Main Road STA 3+37 to STA 10+59 NORTHSIDE
Basin 6
S-12
B-12
Main STA 20+88 to STA 23+88, Far Parking Lot, & Associated Grass Aree
Basin 12
S-9
B-9
Side Road STA 1+25 to STA 2+98
Basin 9
Subcat
Reach
Pond
Link

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
5,443	60	(S-1)
45,633	39	>75% Grass cover, Good, HSG A (S-10A, S-10B, S-11, S-12, S-13)
1,101	61	>75% Grass cover, Good, HSG B (S-6, S-9)
35,575	74	>75% Grass cover, Good, HSG C (B-2A, S-1, S-2, S-4, S-5)
344	89	Gravel roads, HSG C (S-1)
61,667	98	Paved parking, HSG A (S-10A, S-10B, S-11, S-13)
13,493	98	Paved parking, HSG B (S-6, S-9)
21,138	98	Paved parking, HSG C (S-1, S-2, S-4, S-5)
51,953	98	Paved roads w/curbs & sewers, HSG A (S-12)
86	60	Permeable Pavement (S-2)
20,254	60	Permeable Pavement (TH) (S-10B)
21,250	98	Water Surface, HSG A (S-10B)
8,106	98	Water Surface, HSG B (S-6, S-9)
8,274	98	Water Surface, HSG C (S-4, S-5)
294,317	**82**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
180,503	HSG A	S-10A, S-10B, S-11, S-12, S-13
22,700	HSG B	S-6, S-9
65,331	HSG C	B-2A, S-1, S-2, S-4, S-5
0	HSG D	
25,783	Other	S-1, S-10B, S-2
294,317		**TOTAL AREA**

Summary for Subcatchment B-2A: Basin 2 Area

Runoff = 0.44 cfs @ 12.10 hrs, Volume= 1,284 cf, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
7,547	74	>75% Grass cover, Good, HSG C
7,547		100.00% Pervious Area

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

Summary for Subcatchment S-1: Main Road PL to STA 1+35

Runoff = 2.22 cfs @ 12.01 hrs, Volume= 5,582 cf, Depth> 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
	4,835	98	Paved parking, HSG C
	344	89	Gravel roads, HSG C
	20,896	74	>75% Grass cover, Good, HSG C
*	5,443	60	
	31,518	75	Weighted Average
	26,683		84.66% Pervious Area
	4,835		15.34% Impervious Area

Summary for Subcatchment S-10A: Parking Lot Near Clubhouse-West Side

Runoff = 1.38 cfs @ 12.00 hrs, Volume= 3,672 cf, Depth> 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
10,936	98	Paved parking, HSG A
1,356	39	>75% Grass cover, Good, HSG A
12,292	91	Weighted Average
1,356		11.03% Pervious Area
10,936		88.97% Impervious Area

Summary for Subcatchment S-10B: Main STA 10+59 to STA 17+29 and Side STA 2+98 to STA 6+57

Runoff = 6.64 cfs @ 12.00 hrs, Volume= 16,664 cf, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
	28,037	98	Paved parking, HSG A
	17,461	39	>75% Grass cover, Good, HSG A
	21,250	98	Water Surface, HSG A
	128	39	>75% Grass cover, Good, HSG A
*	20,254	60	Permeable Pavement (TH)
	265	39	>75% Grass cover, Good, HSG A
	87,395	77	Weighted Average
	38,108		43.60% Pervious Area
	49,287		56.40% Impervious Area

Summary for Subcatchment S-11: Roadway between Existing Tennis Courts and Far Parking Lot

Runoff = 0.39 cfs @ 12.09 hrs, Volume= 1,148 cf, Depth> 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
2,527	39	>75% Grass cover, Good, HSG A
3,967	98	Paved parking, HSG A
6,494	75	Weighted Average
2,527		38.91% Pervious Area
3,967		61.09% Impervious Area

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

Summary for Subcatchment S-12: Main STA 20+88 to STA 23+88, Far Parking Lot, & Associated Grass A

Runoff = 5.41 cfs @ 12.09 hrs, Volume= 15,954 cf, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
51,953	98	Paved roads w/curbs & sewers, HSG A
6,742	39	>75% Grass cover, Good, HSG A
16,742	39	>75% Grass cover, Good, HSG A
75,437	80	Weighted Average
23,484		31.13% Pervious Area
51,953		68.87% Impervious Area

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

Summary for Subcatchment S-13: Main STA 17+29 to STA 20+88 & Parking Lot Near Clubhouse - East S

Runoff = 2.00 cfs @ 12.09 hrs, Volume= 6,632 cf, Depth> 4.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
18,727	98	Paved parking, HSG A
412	39	>75% Grass cover, Good, HSG A
19,139	97	Weighted Average
412		2.15% Pervious Area
18,727		97.85% Impervious Area

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

Summary for Subcatchment S-2: Main Road STA 1+35 to STA 3+37

Runoff = 1.12 cfs @ 12.00 hrs, Volume= 2,884 cf, Depth> 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
	5,443	98	Paved parking, HSG C
	5,669	74	>75% Grass cover, Good, HSG C
*	86	60	Permeable Pavement
	11,198	86	Weighted Average
	5,755		51.39% Pervious Area
	5,443		48.61% Impervious Area

Summary for Subcatchment S-4: Main Road STA 3+37 to STA 7+60 SOUTHSIDE

Runoff = 1.49 cfs @ 12.00 hrs, Volume= 4,166 cf, Depth> 4.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
6,267	98	Paved parking, HSG C
1,154	74	>75% Grass cover, Good, HSG C
4,856	98	Water Surface, HSG C
12,277	96	Weighted Average
1,154		9.40% Pervious Area
11,123		90.60% Impervious Area

Summary for Subcatchment S-5: Main Road STA 7+60 to STA 10+59 SOUTHSIDE

Runoff = 1.02 cfs @ 12.00 hrs, Volume= 2,884 cf, Depth> 4.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
4,593	98	Paved parking, HSG C
309	74	>75% Grass cover, Good, HSG C
3,418	98	Water Surface, HSG C
8,320	97	Weighted Average
309		3.71% Pervious Area
8,011		96.29% Impervious Area

Summary for Subcatchment S-6: Main Road STA 3+37 to STA 10+59 NORTHSIDE

Runoff = 1.85 cfs @ 12.00 hrs, Volume= 5,190 cf, Depth> 4.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
8,859	98	Paved parking, HSG B
946	61	>75% Grass cover, Good, HSG B
5,490	98	Water Surface, HSG B
15,295	96	Weighted Average
946		6.19% Pervious Area
14,349		93.81% Impervious Area

Summary for Subcatchment S-9: Side Road STA 1+25 to STA 2+98

Runoff = 0.91 cfs @ 12.00 hrs, Volume= 2,567 cf, Depth> 4.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
4,634	98	Paved parking, HSG B
155	61	>75% Grass cover, Good, HSG B
2,616	98	Water Surface, HSG B
7,405	97	Weighted Average
155		2.09% Pervious Area
7,250		97.91% Impervious Area

Summary for Pond B-1: Basin 1

Inflow Area = 31,518 sf, 15.34% Impervious, Inflow Depth > 2.13" for 10-Year event
Inflow = 2.22 cfs @ 12.01 hrs, Volume= 5,582 cf
Outflow = 0.03 cfs @ 20.00 hrs, Volume= 978 cf, Atten= 99%, Lag= 479.7 min
Discarded = 0.03 cfs @ 20.00 hrs, Volume= 977 cf
Primary = 0.00 cfs @ 20.00 hrs, Volume= 2 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 66.14' @ 20.00 hrs Surf.Area= 4,745 sf Storage= 4,603 cf

Plug-Flow detention time= 238.4 min calculated for 978 cf (18% of inflow)
Center-of-Mass det. time= 127.4 min (921.8 - 794.4)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	16,992 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
65.00	3,350	0	0	3,350
66.00	4,572	3,945	3,945	4,592
67.00	5,866	5,206	9,151	5,911
68.00	10,000	7,842	16,992	10,057

Device	Routing	Invert	Outlet Devices
#1	Primary	62.75'	**6.0" Round Culvert** L= 30.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 62.75' / 62.25' S= 0.0167 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	66.14'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	66.28'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	65.00'	**0.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 20.00 hrs HW=66.14' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 20.00 hrs HW=66.14' (Free Discharge)
└**1=Culvert** (Passes 0.00 cfs of 1.07 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.00 cfs @ 0.12 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-10: Basin 10

Inflow Area = 99,687 sf, 60.41% Impervious, Inflow Depth > 2.45" for 10-Year event
Inflow = 8.02 cfs @ 12.00 hrs, Volume= 20,336 cf
Outflow = 0.96 cfs @ 12.56 hrs, Volume= 20,293 cf, Atten= 88%, Lag= 33.2 min
Discarded = 0.96 cfs @ 12.56 hrs, Volume= 20,293 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 52.43' @ 12.56 hrs Surf.Area= 17,252 sf Storage= 7,120 cf

Plug-Flow detention time= 59.9 min calculated for 20,293 cf (100% of inflow)
Center-of-Mass det. time= 59.0 min (842.7 - 783.7)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	37,591 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
52.00	16,216	0	0	16,216
53.00	18,701	17,444	17,444	18,745
54.00	21,629	20,147	37,591	21,716

Device	Routing	Invert	Outlet Devices
#1	Primary	51.50'	**6.0" Round Culvert** L= 15.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 51.50' / 51.00' S= 0.0333 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	52.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	53.00'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	52.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.96 cfs @ 12.56 hrs HW=52.43' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.96 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=52.00' (Free Discharge)
├**1=Culvert** (Passes 0.00 cfs of 0.42 cfs potential flow)
│ └**2=Orifice/Grate** (Controls 0.00 cfs)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-11: Basin 11

Inflow Area = 6,494 sf, 61.09% Impervious, Inflow Depth > 2.12" for 10-Year event
Inflow = 0.39 cfs @ 12.09 hrs, Volume= 1,148 cf
Outflow = 0.06 cfs @ 12.65 hrs, Volume= 1,146 cf, Atten= 85%, Lag= 33.1 min
Discarded = 0.06 cfs @ 12.65 hrs, Volume= 1,146 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

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

Peak Elev= 56.42' @ 12.65 hrs Surf.Area= 1,071 sf Storage= 398 cf

Plug-Flow detention time= 57.1 min calculated for 1,142 cf (99% of inflow)
Center-of-Mass det. time= 56.2 min (855.3 - 799.1)

Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	1,920 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
56.00	845	0	0	845
57.00	1,433	1,126	1,126	1,445
57.50	1,748	794	1,920	1,768

Device	Routing	Invert	Outlet Devices
#1	Primary	56.34'	**6.0" Round Culvert** L= 23.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 56.34' / 56.23' S= 0.0048 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	56.46'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	57.25'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#4	Discarded	56.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.06 cfs @ 12.65 hrs HW=56.42' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=56.00' (Free Discharge)
├**1=Culvert** (Controls 0.00 cfs)
│ └**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-12: Basin 12

Inflow Area = 75,437 sf, 68.87% Impervious, Inflow Depth > 2.54" for 10-Year event
Inflow = 5.41 cfs @ 12.09 hrs, Volume= 15,954 cf
Outflow = 0.80 cfs @ 12.64 hrs, Volume= 15,929 cf, Atten= 85%, Lag= 32.6 min
Discarded = 0.80 cfs @ 12.64 hrs, Volume= 15,929 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 56.39' @ 12.64 hrs Surf.Area= 14,295 sf Storage= 5,456 cf

Plug-Flow detention time= 53.6 min calculated for 15,929 cf (100% of inflow)
Center-of-Mass det. time= 53.0 min (841.4 - 788.5)

Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	22,810 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
56.00	13,460	0	0	13,460
57.00	15,634	14,533	14,533	15,676
57.50	17,489	8,276	22,810	17,545

Device	Routing	Invert	Outlet Devices
#1	Primary	55.50'	**6.0" Round Culvert** L= 17.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 55.50' / 55.00' S= 0.0294 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	56.42'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	56.66'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	56.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.80 cfs @ 12.64 hrs HW=56.39' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.80 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=56.00' (Free Discharge)
└**1=Culvert** (Passes 0.00 cfs of 0.42 cfs potential flow)
└**2=Orifice/Grate** (Controls 0.00 cfs)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-2: Basin 2

Inflow Area = 18,745 sf, 29.04% Impervious, Inflow Depth > 2.67" for 10-Year event
Inflow = 1.39 cfs @ 12.01 hrs, Volume= 4,168 cf
Outflow = 0.04 cfs @ 17.13 hrs, Volume= 1,352 cf, Atten= 97%, Lag= 307.0 min
Discarded = 0.04 cfs @ 17.13 hrs, Volume= 1,352 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 63.02' @ 17.13 hrs Surf.Area= 5,825 sf Storage= 2,904 cf

Plug-Flow detention time= 208.6 min calculated for 1,348 cf (32% of inflow)
Center-of-Mass det. time= 108.1 min (887.0 - 778.9)

Volume	Invert	Avail.Storage	Storage Description
#1	62.50'	12,965 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
62.50	5,244	0	0	5,244
63.00	5,798	2,759	2,759	5,813
64.00	6,950	6,365	9,125	7,000
64.53	7,547	3,841	12,965	7,618

Device	Routing	Invert	Outlet Devices
#1	Primary	61.50'	**6.0" Round Culvert** L= 25.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 61.50' / 61.00' S= 0.0200 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	63.38'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	63.52'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	62.50'	**0.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 17.13 hrs HW=63.02' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=62.50' (Free Discharge)
├**1=Culvert** (Passes 0.00 cfs of 0.62 cfs potential flow)
│└**2=Orifice/Grate** (Controls 0.00 cfs)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-4: Basin 4

Inflow Area = 12,277 sf, 90.60% Impervious, Inflow Depth > 4.07" for 10-Year event
Inflow = 1.49 cfs @ 12.00 hrs, Volume= 4,166 cf
Outflow = 0.04 cfs @ 15.45 hrs, Volume= 1,810 cf, Atten= 97%, Lag= 207.3 min
Discarded = 0.04 cfs @ 15.45 hrs, Volume= 1,808 cf
Primary = 0.00 cfs @ 15.45 hrs, Volume= 2 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 57.87' @ 15.45 hrs Surf.Area= 3,512 sf Storage= 2,624 cf

Plug-Flow detention time= 194.1 min calculated for 1,809 cf (43% of inflow)
Center-of-Mass det. time= 89.7 min (827.2 - 737.6)

Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	7,335 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
57.00	2,538	0	0	2,538
58.00	3,669	3,086	3,086	3,686
59.00	4,856	4,249	7,335	4,895

Device	Routing	Invert	Outlet Devices
#1	Primary	55.50'	**6.0" Round Culvert** L= 25.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 55.50' / 55.00' S= 0.0200 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	57.87'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	58.02'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir**

			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	57.00'	**0.520 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 15.45 hrs HW=57.87' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 15.45 hrs HW=57.87' (Free Discharge)
├**1=Culvert** (Passes 0.00 cfs of 0.96 cfs potential flow)
│ └**2=Orifice/Grate** (Weir Controls 0.00 cfs @ 0.11 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-5: Basin 5

Inflow Area = 8,320 sf, 96.29% Impervious, Inflow Depth > 4.16" for 10-Year event
Inflow = 1.02 cfs @ 12.00 hrs, Volume= 2,884 cf
Outflow = 0.02 cfs @ 17.67 hrs, Volume= 750 cf, Atten= 98%, Lag= 340.1 min
Discarded = 0.02 cfs @ 17.67 hrs, Volume= 750 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 59.93' @ 17.67 hrs Surf.Area= 2,575 sf Storage= 2,156 cf

Plug-Flow detention time= 228.9 min calculated for 749 cf (26% of inflow)
Center-of-Mass det. time= 67.7 min (801.9 - 734.2)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	5,250 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
59.00	2,080	0	0	2,080
60.00	2,616	2,343	2,343	2,643
61.00	3,208	2,907	5,250	3,265

Device	Routing	Invert	Outlet Devices
#1	Primary	55.50'	**6.0" Round Culvert**
			L= 25.0' CMP, mitered to conform to fill, Ke= 0.700
			Inlet / Outlet Invert= 55.50' / 55.00' S= 0.0200 '/' Cc= 0.900
			n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	59.93'	**12.0" Horiz. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads
#3	Primary	60.02'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	59.00'	**0.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.02 cfs @ 17.67 hrs HW=59.93' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=59.00' (Free Discharge)
└**1=Culvert** (Passes 0.00 cfs of 1.17 cfs potential flow)
└**2=Orifice/Grate** (Controls 0.00 cfs)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-6: Basin 6

Inflow Area = 15,295 sf, 93.81% Impervious, Inflow Depth > 4.07" for 10-Year event
Inflow = 1.85 cfs @ 12.00 hrs, Volume= 5,190 cf
Outflow = 0.06 cfs @ 15.37 hrs, Volume= 2,121 cf, Atten= 97%, Lag= 202.2 min
Discarded = 0.05 cfs @ 15.37 hrs, Volume= 2,082 cf
Primary = 0.01 cfs @ 15.37 hrs, Volume= 39 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 56.46' @ 15.37 hrs Surf.Area= 3,933 sf Storage= 3,338 cf

Plug-Flow detention time= 193.6 min calculated for 2,113 cf (41% of inflow)
Center-of-Mass det. time= 84.8 min (822.3 - 737.6)

Volume	Invert	Avail.Storage	Storage Description
#1	55.50'	8,426 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
55.50	3,046	0	0	3,046
56.00	3,506	1,637	1,637	3,517
57.00	4,470	3,978	5,615	4,507
57.59	5,065	2,811	8,426	5,119

Device	Routing	Invert	Outlet Devices
#1	Primary	55.50'	**6.0" Round Culvert** L= 21.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 55.50' / 55.00' S= 0.0238 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	56.45'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	56.59'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	55.50'	**0.520 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.05 cfs @ 15.37 hrs HW=56.46' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.01 cfs @ 15.37 hrs HW=56.46' (Free Discharge)
└**1=Culvert** (Passes 0.01 cfs of 0.65 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.01 cfs @ 0.29 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-9: Basin 9

Inflow Area = 7,405 sf, 97.91% Impervious, Inflow Depth > 4.16" for 10-Year event
Inflow = 0.91 cfs @ 12.00 hrs, Volume= 2,567 cf
Outflow = 0.02 cfs @ 15.71 hrs, Volume= 1,042 cf, Atten= 97%, Lag= 222.8 min
Discarded = 0.02 cfs @ 15.71 hrs, Volume= 1,042 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 59.99' @ 15.71 hrs Surf.Area= 1,974 sf Storage= 1,660 cf

Plug-Flow detention time= 197.7 min calculated for 1,041 cf (41% of inflow)
Center-of-Mass det. time= 84.7 min (818.9 - 734.2)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	3,980 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
59.00	1,409	0	0	1,409
60.00	1,983	1,688	1,688	2,001
61.00	2,616	2,292	3,980	2,656

Device	Routing	Invert	Outlet Devices
#1	Primary	55.50'	**6.0" Round Culvert** L= 30.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 55.50' / 55.00' S= 0.0167 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	59.99'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	60.09'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	59.00'	**0.520 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.02 cfs @ 15.71 hrs HW=59.99' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=59.00' (Free Discharge)
├**1=Culvert** (Passes 0.00 cfs of 1.09 cfs potential flow)
│ └**2=Orifice/Grate** (Controls 0.00 cfs)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond IS-11: INFILTRATION SYSTEM 11

Inflow Area = 19,139 sf, 97.85% Impervious, Inflow Depth > 4.16" for 10-Year event
Inflow = 2.00 cfs @ 12.09 hrs, Volume= 6,632 cf
Outflow = 0.96 cfs @ 12.25 hrs, Volume= 6,630 cf, Atten= 52%, Lag= 10.1 min
Discarded = 0.38 cfs @ 12.26 hrs, Volume= 5,857 cf
Primary = 0.58 cfs @ 12.25 hrs, Volume= 774 cf

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

Peak Elev= 56.67' @ 12.26 hrs Surf.Area= 1,771 sf Storage= 1,278 cf

Plug-Flow detention time= 13.3 min calculated for 6,630 cf (100% of inflow)
Center-of-Mass det. time= 13.1 min (751.8 - 738.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	55.50'	1,086 cf	**28.33'W x 62.50'L x 2.04'H Field A** 3,615 cf Overall - 901 cf Embedded = 2,714 cf x 40.0% Voids
#2A	56.00'	901 cf	**Cultec C-100HD** x 64 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 8 rows
		1,987 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.50'	**8.270 in/hr Exfiltration over Wetted area**
#2	Primary	56.29'	**12.0" Round Culvert** L= 56.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 56.00' / 56.29' S= -0.0052 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.38 cfs @ 12.26 hrs HW=56.67' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.38 cfs)

Primary OutFlow Max=0.57 cfs @ 12.25 hrs HW=56.67' (Free Discharge)
└**2=Culvert** (Inlet Controls 0.57 cfs @ 2.10 fps)

Summary for Subcatchment B-2A: Basin 2 Area

Runoff = 0.75 cfs @ 12.09 hrs, Volume= 2,220 cf, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
7,547	74	>75% Grass cover, Good, HSG C
7,547		100.00% Pervious Area

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

Summary for Subcatchment S-1: Main Road PL to STA 1+35

Runoff = 3.79 cfs @ 12.00 hrs, Volume= 9,554 cf, Depth> 3.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
	4,835	98	Paved parking, HSG C
	344	89	Gravel roads, HSG C
	20,896	74	>75% Grass cover, Good, HSG C
*	5,443	60	
	31,518	75	Weighted Average
	26,683		84.66% Pervious Area
	4,835		15.34% Impervious Area

Summary for Subcatchment S-10A: Parking Lot Near Clubhouse-West Side

Runoff = 2.01 cfs @ 12.00 hrs, Volume= 5,465 cf, Depth> 5.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
10,936	98	Paved parking, HSG A
1,356	39	>75% Grass cover, Good, HSG A
12,292	91	Weighted Average
1,356		11.03% Pervious Area
10,936		88.97% Impervious Area

Summary for Subcatchment S-10B: Main STA 10+59 to STA 17+29 and Side STA 2+98 to STA 6+57

Runoff = 11.04 cfs @ 12.00 hrs, Volume= 27,989 cf, Depth> 3.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
	28,037	98	Paved parking, HSG A
	17,461	39	>75% Grass cover, Good, HSG A
	21,250	98	Water Surface, HSG A
	128	39	>75% Grass cover, Good, HSG A
*	20,254	60	Permeable Pavement (TH)
	265	39	>75% Grass cover, Good, HSG A
	87,395	77	Weighted Average
	38,108		43.60% Pervious Area
	49,287		56.40% Impervious Area

Summary for Subcatchment S-11: Roadway between Existing Tennis Courts and Far Parking Lot

Runoff = 0.67 cfs @ 12.09 hrs, Volume= 1,965 cf, Depth> 3.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
2,527	39	>75% Grass cover, Good, HSG A
3,967	98	Paved parking, HSG A
6,494	75	Weighted Average
2,527		38.91% Pervious Area
3,967		61.09% Impervious Area

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

Summary for Subcatchment S-12: Main STA 20+88 to STA 23+88, Far Parking Lot, & Associated Grass A

Runoff = 8.71 cfs @ 12.09 hrs, Volume= 26,085 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
51,953	98	Paved roads w/curbs & sewers, HSG A
6,742	39	>75% Grass cover, Good, HSG A
16,742	39	>75% Grass cover, Good, HSG A
75,437	80	Weighted Average
23,484		31.13% Pervious Area
51,953		68.87% Impervious Area

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

Summary for Subcatchment S-13: Main STA 17+29 to STA 20+88 & Parking Lot Near Clubhouse - East S

Runoff = 2.81 cfs @ 12.09 hrs, Volume= 9,404 cf, Depth> 5.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
18,727	98	Paved parking, HSG A
412	39	>75% Grass cover, Good, HSG A
19,139	97	Weighted Average
412		2.15% Pervious Area
18,727		97.85% Impervious Area

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

Summary for Subcatchment S-2: Main Road STA 1+35 to STA 3+37

Runoff = 1.70 cfs @ 12.00 hrs, Volume= 4,481 cf, Depth> 4.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
	5,443	98	Paved parking, HSG C
	5,669	74	>75% Grass cover, Good, HSG C
*	86	60	Permeable Pavement
	11,198	86	Weighted Average
	5,755		51.39% Pervious Area
	5,443		48.61% Impervious Area

Summary for Subcatchment S-4: Main Road STA 3+37 to STA 7+60 SOUTHSIDE

Runoff = 2.10 cfs @ 12.00 hrs, Volume= 5,952 cf, Depth> 5.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
6,267	98	Paved parking, HSG C
1,154	74	>75% Grass cover, Good, HSG C
4,856	98	Water Surface, HSG C
12,277	96	Weighted Average
1,154		9.40% Pervious Area
11,123		90.60% Impervious Area

Summary for Subcatchment S-5: Main Road STA 7+60 to STA 10+59 SOUTHSIDE

Runoff = 1.43 cfs @ 12.00 hrs, Volume= 4,089 cf, Depth> 5.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
4,593	98	Paved parking, HSG C
309	74	>75% Grass cover, Good, HSG C
3,418	98	Water Surface, HSG C
8,320	97	Weighted Average
309		3.71% Pervious Area
8,011		96.29% Impervious Area

Summary for Subcatchment S-6: Main Road STA 3+37 to STA 10+59 NORTHSIDE

Runoff = 2.62 cfs @ 12.00 hrs, Volume= 7,415 cf, Depth> 5.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
8,859	98	Paved parking, HSG B
946	61	>75% Grass cover, Good, HSG B
5,490	98	Water Surface, HSG B
15,295	96	Weighted Average
946		6.19% Pervious Area
14,349		93.81% Impervious Area

Summary for Subcatchment S-9: Side Road STA 1+25 to STA 2+98

Runoff = 1.27 cfs @ 12.00 hrs, Volume= 3,639 cf, Depth> 5.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
4,634	98	Paved parking, HSG B
155	61	>75% Grass cover, Good, HSG B
2,616	98	Water Surface, HSG B
7,405	97	Weighted Average
155		2.09% Pervious Area
7,250		97.91% Impervious Area

Summary for Pond B-1: Basin 1

Inflow Area = 31,518 sf, 15.34% Impervious, Inflow Depth > 3.64" for 100-Year event
Inflow = 3.79 cfs @ 12.00 hrs, Volume= 9,554 cf
Outflow = 0.50 cfs @ 12.51 hrs, Volume= 4,877 cf, Atten= 87%, Lag= 30.3 min
Discarded = 0.03 cfs @ 12.51 hrs, Volume= 1,115 cf
Primary = 0.47 cfs @ 12.51 hrs, Volume= 3,762 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 66.27' @ 12.51 hrs Surf.Area= 4,902 sf Storage= 5,211 cf

Plug-Flow detention time= 172.1 min calculated for 4,861 cf (51% of inflow)
Center-of-Mass det. time= 90.6 min (872.7 - 782.1)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	16,992 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
65.00	3,350	0	0	3,350
66.00	4,572	3,945	3,945	4,592
67.00	5,866	5,206	9,151	5,911
68.00	10,000	7,842	16,992	10,057

Device	Routing	Invert	Outlet Devices
#1	Primary	62.75'	**6.0" Round Culvert** L= 30.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 62.75' / 62.25' S= 0.0167 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	66.14'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	66.28'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	65.00'	**0.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 12.51 hrs HW=66.27' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.47 cfs @ 12.51 hrs HW=66.27' (Free Discharge)
└**1=Culvert** (Passes 0.47 cfs of 1.09 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.47 cfs @ 1.17 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-10: Basin 10

Inflow Area = 99,687 sf, 60.41% Impervious, Inflow Depth > 4.03" for 100-Year event
Inflow = 13.05 cfs @ 12.00 hrs, Volume= 33,454 cf
Outflow = 1.14 cfs @ 12.85 hrs, Volume= 33,386 cf, Atten= 91%, Lag= 50.8 min
Discarded = 1.02 cfs @ 12.85 hrs, Volume= 32,967 cf
Primary = 0.13 cfs @ 12.85 hrs, Volume= 419 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 52.80' @ 12.85 hrs Surf.Area= 18,197 sf Storage= 13,806 cf

Plug-Flow detention time= 121.8 min calculated for 33,275 cf (99% of inflow)
Center-of-Mass det. time= 120.6 min (893.6 - 773.0)

Volume	Invert	Avail.Storage	Storage Description
#1	52.00'	37,591 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
52.00	16,216	0	0	16,216
53.00	18,701	17,444	17,444	18,745
54.00	21,629	20,147	37,591	21,716

Device	Routing	Invert	Outlet Devices
#1	Primary	51.50'	**6.0" Round Culvert** L= 15.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 51.50' / 51.00' S= 0.0333 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	52.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	53.00'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	52.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=1.02 cfs @ 12.85 hrs HW=52.80' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 1.02 cfs)

Primary OutFlow Max=0.12 cfs @ 12.85 hrs HW=52.80' (Free Discharge)
├**1=Culvert** (Passes 0.12 cfs of 0.85 cfs potential flow)
│ └**2=Orifice/Grate** (Weir Controls 0.12 cfs @ 0.75 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-11: Basin 11

Inflow Area = 6,494 sf, 61.09% Impervious, Inflow Depth > 3.63" for 100-Year event
Inflow = 0.67 cfs @ 12.09 hrs, Volume= 1,965 cf
Outflow = 0.19 cfs @ 12.46 hrs, Volume= 1,962 cf, Atten= 72%, Lag= 22.0 min
Discarded = 0.07 cfs @ 12.46 hrs, Volume= 1,635 cf
Primary = 0.12 cfs @ 12.46 hrs, Volume= 326 cf

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

Peak Elev= 56.65' @ 12.46 hrs Surf.Area= 1,208 sf Storage= 660 cf

Plug-Flow detention time= 65.7 min calculated for 1,955 cf (100% of inflow)
Center-of-Mass det. time= 64.8 min (851.7 - 786.8)

Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	1,920 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
56.00	845	0	0	845
57.00	1,433	1,126	1,126	1,445
57.50	1,748	794	1,920	1,768

Device	Routing	Invert	Outlet Devices
#1	Primary	56.34'	**6.0" Round Culvert** L= 23.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 56.34' / 56.23' S= 0.0048 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	56.46'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	57.25'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#4	Discarded	56.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.07 cfs @ 12.46 hrs HW=56.65' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.12 cfs @ 12.46 hrs HW=56.65' (Free Discharge)
├**1=Culvert** (Barrel Controls 0.12 cfs @ 1.38 fps)
│ └**2=Sharp-Crested Rectangular Weir** (Passes 0.12 cfs of 0.12 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-12: Basin 12

Inflow Area = 75,437 sf, 68.87% Impervious, Inflow Depth > 4.15" for 100-Year event
Inflow = 8.71 cfs @ 12.09 hrs, Volume= 26,085 cf
Outflow = 1.60 cfs @ 12.55 hrs, Volume= 26,048 cf, Atten= 82%, Lag= 27.6 min
Discarded = 0.83 cfs @ 12.55 hrs, Volume= 22,424 cf
Primary = 0.77 cfs @ 12.55 hrs, Volume= 3,623 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 56.66' @ 12.55 hrs Surf.Area= 14,877 sf Storage= 9,352 cf

Plug-Flow detention time= 69.5 min calculated for 26,048 cf (100% of inflow)
Center-of-Mass det. time= 68.9 min (845.9 - 777.0)

Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	22,810 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
56.00	13,460	0	0	13,460
57.00	15,634	14,533	14,533	15,676
57.50	17,489	8,276	22,810	17,545

Device	Routing	Invert	Outlet Devices
#1	Primary	55.50'	**6.0" Round Culvert** L= 17.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 55.50' / 55.00' S= 0.0294 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	56.42'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	56.66'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	56.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.83 cfs @ 12.55 hrs HW=56.66' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.83 cfs)

Primary OutFlow Max=0.77 cfs @ 12.55 hrs HW=56.66' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.77 cfs @ 3.91 fps)
└**2=Orifice/Grate** (Passes 0.77 cfs of 1.21 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 0.00 cfs @ 0.04 fps)

Summary for Pond B-2: Basin 2

Inflow Area = 18,745 sf, 29.04% Impervious, Inflow Depth > 4.29" for 100-Year event
Inflow = 2.18 cfs @ 12.01 hrs, Volume= 6,701 cf
Outflow = 0.05 cfs @ 17.58 hrs, Volume= 1,652 cf, Atten= 98%, Lag= 334.0 min
Discarded = 0.04 cfs @ 17.58 hrs, Volume= 1,575 cf
Primary = 0.01 cfs @ 17.58 hrs, Volume= 77 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 63.39' @ 17.58 hrs Surf.Area= 6,232 sf Storage= 5,092 cf

Plug-Flow detention time= 221.3 min calculated for 1,647 cf (25% of inflow)
Center-of-Mass det. time= 98.0 min (866.5 - 768.5)

Volume	Invert	Avail.Storage	Storage Description
#1	62.50'	12,965 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
62.50	5,244	0	0	5,244
63.00	5,798	2,759	2,759	5,813
64.00	6,950	6,365	9,125	7,000
64.53	7,547	3,841	12,965	7,618

Device	Routing	Invert	Outlet Devices
#1	Primary	61.50'	**6.0" Round Culvert** L= 25.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 61.50' / 61.00' S= 0.0200 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	63.38'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	63.52'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	62.50'	**0.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 17.58 hrs HW=63.39' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.01 cfs @ 17.58 hrs HW=63.39' (Free Discharge)
└**1=Culvert** (Passes 0.01 cfs of 0.86 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.01 cfs @ 0.29 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-4: Basin 4

Inflow Area = 12,277 sf, 90.60% Impervious, Inflow Depth > 5.82" for 100-Year event
Inflow = 2.10 cfs @ 12.00 hrs, Volume= 5,952 cf
Outflow = 0.44 cfs @ 12.37 hrs, Volume= 3,454 cf, Atten= 79%, Lag= 22.3 min
Discarded = 0.04 cfs @ 12.37 hrs, Volume= 1,939 cf
Primary = 0.40 cfs @ 12.37 hrs, Volume= 1,515 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 57.98' @ 12.37 hrs Surf.Area= 3,650 sf Storage= 3,029 cf

Plug-Flow detention time= 149.5 min calculated for 3,441 cf (58% of inflow)
Center-of-Mass det. time= 67.5 min (801.4 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	7,335 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
57.00	2,538	0	0	2,538
58.00	3,669	3,086	3,086	3,686
59.00	4,856	4,249	7,335	4,895

Device	Routing	Invert	Outlet Devices
#1	Primary	55.50'	**6.0" Round Culvert** L= 25.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 55.50' / 55.00' S= 0.0200 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	57.87'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	58.02'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir**

			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	57.00'	**0.520 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 12.37 hrs HW=57.98' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.39 cfs @ 12.37 hrs HW=57.98' (Free Discharge)
├**1=Culvert** (Passes 0.39 cfs of 0.98 cfs potential flow)
│ └**2=Orifice/Grate** (Weir Controls 0.39 cfs @ 1.10 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-5: Basin 5

Inflow Area = 8,320 sf, 96.29% Impervious, Inflow Depth > 5.90" for 100-Year event
Inflow = 1.43 cfs @ 12.00 hrs, Volume= 4,089 cf
Outflow = 0.25 cfs @ 12.41 hrs, Volume= 1,923 cf, Atten= 82%, Lag= 24.9 min
Discarded = 0.02 cfs @ 12.41 hrs, Volume= 784 cf
Primary = 0.24 cfs @ 12.41 hrs, Volume= 1,139 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 60.01' @ 12.41 hrs Surf.Area= 2,622 sf Storage= 2,371 cf

Plug-Flow detention time= 183.7 min calculated for 1,922 cf (47% of inflow)
Center-of-Mass det. time= 82.4 min (813.8 - 731.5)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	5,250 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
59.00	2,080	0	0	2,080
60.00	2,616	2,343	2,343	2,643
61.00	3,208	2,907	5,250	3,265

Device	Routing	Invert	Outlet Devices
#1	Primary	55.50'	**6.0" Round Culvert**
			L= 25.0' CMP, mitered to conform to fill, Ke= 0.700
			Inlet / Outlet Invert= 55.50' / 55.00' S= 0.0200 '/' Cc= 0.900
			n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	59.93'	**12.0" Horiz. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads
#3	Primary	60.02'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	59.00'	**0.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.02 cfs @ 12.41 hrs HW=60.01' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.23 cfs @ 12.41 hrs HW=60.01' (Free Discharge)
└**1=Culvert** (Passes 0.23 cfs of 1.32 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.23 cfs @ 0.93 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-6: Basin 6

Inflow Area = 15,295 sf, 93.81% Impervious, Inflow Depth > 5.82" for 100-Year event
Inflow = 2.62 cfs @ 12.00 hrs, Volume= 7,415 cf
Outflow = 0.54 cfs @ 12.38 hrs, Volume= 4,201 cf, Atten= 80%, Lag= 22.7 min
Discarded = 0.05 cfs @ 12.38 hrs, Volume= 2,226 cf
Primary = 0.49 cfs @ 12.38 hrs, Volume= 1,976 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 56.58' @ 12.38 hrs Surf.Area= 4,052 sf Storage= 3,829 cf

Plug-Flow detention time= 150.2 min calculated for 4,185 cf (56% of inflow)
Center-of-Mass det. time= 66.4 min (800.2 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	55.50'	8,426 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
55.50	3,046	0	0	3,046
56.00	3,506	1,637	1,637	3,517
57.00	4,470	3,978	5,615	4,507
57.59	5,065	2,811	8,426	5,119

Device	Routing	Invert	Outlet Devices
#1	Primary	55.50'	**6.0" Round Culvert** L= 21.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 55.50' / 55.00' S= 0.0238 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	56.45'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	56.59'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	55.50'	**0.520 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.05 cfs @ 12.38 hrs HW=56.58' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.48 cfs @ 12.38 hrs HW=56.58' (Free Discharge)
└**1=Culvert** (Passes 0.48 cfs of 0.69 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.48 cfs @ 1.18 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B-9: Basin 9

Inflow Area = 7,405 sf, 97.91% Impervious, Inflow Depth > 5.90" for 100-Year event
Inflow = 1.27 cfs @ 12.00 hrs, Volume= 3,639 cf
Outflow = 0.31 cfs @ 12.33 hrs, Volume= 2,032 cf, Atten= 75%, Lag= 19.6 min
Discarded = 0.02 cfs @ 12.33 hrs, Volume= 1,106 cf
Primary = 0.29 cfs @ 12.33 hrs, Volume= 925 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 60.08' @ 12.33 hrs Surf.Area= 2,032 sf Storage= 1,853 cf

Plug-Flow detention time= 152.7 min calculated for 2,030 cf (56% of inflow)
Center-of-Mass det. time= 65.9 min (797.3 - 731.5)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	3,980 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
59.00	1,409	0	0	1,409
60.00	1,983	1,688	1,688	2,001
61.00	2,616	2,292	3,980	2,656

Device	Routing	Invert	Outlet Devices
#1	Primary	55.50'	**6.0" Round Culvert** L= 30.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 55.50' / 55.00' S= 0.0167 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.20 sf
#2	Device 1	59.99'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	60.09'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#4	Discarded	59.00'	**0.520 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.02 cfs @ 12.33 hrs HW=60.08' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.29 cfs @ 12.33 hrs HW=60.08' (Free Discharge)
├**1=Culvert** (Passes 0.29 cfs of 1.25 cfs potential flow)
│ └**2=Orifice/Grate** (Weir Controls 0.29 cfs @ 0.99 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond IS-11: INFILTRATION SYSTEM 11

Inflow Area = 19,139 sf, 97.85% Impervious, Inflow Depth > 5.90" for 100-Year event
Inflow = 2.81 cfs @ 12.09 hrs, Volume= 9,404 cf
Outflow = 1.89 cfs @ 12.18 hrs, Volume= 9,402 cf, Atten= 33%, Lag= 5.6 min
Discarded = 0.39 cfs @ 12.18 hrs, Volume= 7,413 cf
Primary = 1.50 cfs @ 12.18 hrs, Volume= 1,989 cf

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

Peak Elev= 57.00' @ 12.18 hrs Surf.Area= 1,771 sf Storage= 1,603 cf

Plug-Flow detention time= 12.7 min calculated for 9,401 cf (100% of inflow)
Center-of-Mass det. time= 12.5 min (748.4 - 735.9)

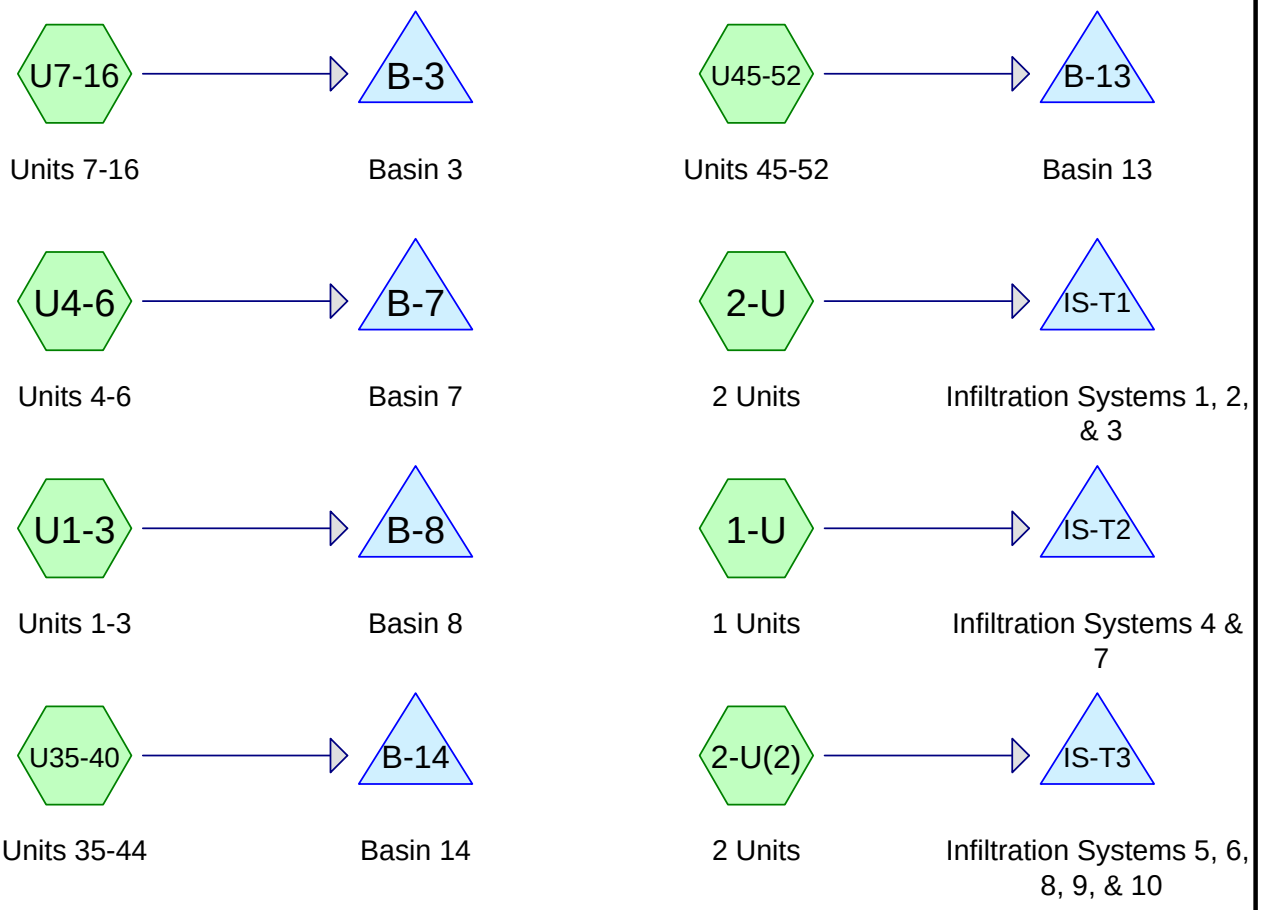
Volume	Invert	Avail.Storage	Storage Description
#1A	55.50'	1,086 cf	**28.33'W x 62.50'L x 2.04'H Field A** 3,615 cf Overall - 901 cf Embedded = 2,714 cf x 40.0% Voids
#2A	56.00'	901 cf	**Cultec C-100HD** x 64 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 8 rows
		1,987 cf	Total Available Storage

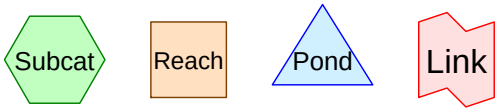
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.50'	**8.270 in/hr Exfiltration over Wetted area**
#2	Primary	56.29'	**12.0" Round Culvert** L= 56.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 56.00' / 56.29' S= -0.0052 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.39 cfs @ 12.18 hrs HW=56.99' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=1.47 cfs @ 12.18 hrs HW=56.99' (Free Discharge)
└**2=Culvert** (Barrel Controls 1.47 cfs @ 2.36 fps)





Routing Diagram for 9231.0 - Sharon - Spring Valley - Facility Sizing
Prepared by Microsoft, Printed 9/14/2017

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
34,015	61	>75% Grass cover, Good, HSG B (U1-3, U35-40, U4-6)
10,148	74	>75% Grass cover, Good, HSG C (U35-40)
47,798	98	Paved parking, HSG B (U1-3, U4-6, U7-16)
22,937	98	Paved parking, HSG B or C (U35-40)
11,592	60	Permeable Pavement (U1-3, U35-40, U4-6)
4,555	60	Porous Pavement, HSG A (U45-52)
29,690	98	Unconnected roofs, HSG A (1-U, 2-U, 2-U(2), U45-52)
160,735	**85**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
34,245	HSG A	1-U, 2-U, 2-U(2), U45-52
104,750	HSG B	U1-3, U35-40, U4-6, U7-16
10,148	HSG C	U35-40
0	HSG D	
11,592	Other	U1-3, U35-40, U4-6
160,735		**TOTAL AREA**

Summary for Subcatchment 1-U: 1 Units

Runoff = 0.04 cfs @ 12.09 hrs, Volume= 139 cf, Depth> 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr One Inch Rainfall=1.00"

Area (sf)	CN	Description
2,232	98	Unconnected roofs, HSG A
2,232		100.00% Impervious Area
2,232		100.00% Unconnected

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

Summary for Subcatchment 2-U: 2 Units

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 278 cf, Depth> 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr One Inch Rainfall=1.00"

Area (sf)	CN	Description
4,464	98	Unconnected roofs, HSG A
4,464		100.00% Impervious Area
4,464		100.00% Unconnected

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

Summary for Subcatchment 2-U(2): 2 Units

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 278 cf, Depth> 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr One Inch Rainfall=1.00"

Area (sf)	CN	Description
4,464	98	Unconnected roofs, HSG A
4,464		100.00% Impervious Area
4,464		100.00% Unconnected

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

Summary for Subcatchment U1-3: Units 1-3

Runoff = 0.00 cfs @ 12.44 hrs, Volume= 49 cf, Depth> 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr One Inch Rainfall=1.00"

	Area (sf)	CN	Description
	6,812	98	Paved parking, HSG B
	6,902	61	>75% Grass cover, Good, HSG B
*	1,494	60	Permeable Pavement
	15,208	77	Weighted Average
	8,396		55.21% Pervious Area
	6,812		44.79% Impervious Area

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

Summary for Subcatchment U35-40: Units 35-44

Runoff = 0.02 cfs @ 12.44 hrs, Volume= 193 cf, Depth> 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr One Inch Rainfall=1.00"

	Area (sf)	CN	Description
*	22,937	98	Paved parking, HSG B or C
	9,682	61	>75% Grass cover, Good, HSG B
	3,712	74	>75% Grass cover, Good, HSG C
*	7,222	60	Permeable Pavement
	10,366	61	>75% Grass cover, Good, HSG B
	6,436	74	>75% Grass cover, Good, HSG C
	60,355	77	Weighted Average
	37,418		62.00% Pervious Area
	22,937		38.00% Impervious Area

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

Summary for Subcatchment U4-6: Units 4-6

Runoff = 0.00 cfs @ 12.49 hrs, Volume= 42 cf, Depth> 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr One Inch Rainfall=1.00"

	Area (sf)	CN	Description
	6,831	98	Paved parking, HSG B
	7,065	61	>75% Grass cover, Good, HSG B
*	2,876	60	Permeable Pavement
	16,772	76	Weighted Average
	9,941		59.27% Pervious Area
	6,831		40.73% Impervious Area

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

Summary for Subcatchment U45-52: Units 45-52

Runoff = 0.21 cfs @ 12.10 hrs, Volume= 633 cf, Depth> 0.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr One Inch Rainfall=1.00"

	Area (sf)	CN	Description
	18,530	98	Unconnected roofs, HSG A
*	4,555	60	Porous Pavement, HSG A
	23,085	91	Weighted Average
	4,555		19.73% Pervious Area
	18,530		80.27% Impervious Area
	18,530		100.00% Unconnected

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

Summary for Subcatchment U7-16: Units 7-16

Runoff = 0.68 cfs @ 12.09 hrs, Volume= 2,128 cf, Depth> 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr One Inch Rainfall=1.00"

	Area (sf)	CN	Description
	34,155	98	Paved parking, HSG B
	34,155		100.00% Impervious Area

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

Summary for Pond B-13: Basin 13

Inflow Area = 23,085 sf, 80.27% Impervious, Inflow Depth > 0.33" for One Inch event
Inflow = 0.21 cfs @ 12.10 hrs, Volume= 633 cf
Outflow = 0.07 cfs @ 12.47 hrs, Volume= 633 cf, Atten= 68%, Lag= 22.1 min
Discarded = 0.07 cfs @ 12.47 hrs, Volume= 633 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 57.42' @ 12.47 hrs Surf.Area= 346 sf Storage= 129 cf

Plug-Flow detention time= 12.0 min calculated for 631 cf (100% of inflow)
Center-of-Mass det. time= 11.8 min (825.4 - 813.6)

Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	364 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
57.00	267	0	0	267
58.00	470	364	364	481

Device	Routing	Invert	Outlet Devices
#1	Discarded	57.00'	**8.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.07 cfs @ 12.47 hrs HW=57.42' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Summary for Pond B-14: Basin 14

Inflow Area = 60,355 sf, 38.00% Impervious, Inflow Depth > 0.04" for One Inch event
Inflow = 0.02 cfs @ 12.44 hrs, Volume= 193 cf
Outflow = 0.00 cfs @ 20.00 hrs, Volume= 35 cf, Atten= 91%, Lag= 453.8 min
Discarded = 0.00 cfs @ 20.00 hrs, Volume= 35 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 59.92' @ 20.00 hrs Surf.Area= 229 sf Storage= 159 cf

Plug-Flow detention time= 232.5 min calculated for 35 cf (18% of inflow)
Center-of-Mass det. time= 72.3 min (989.1 - 916.8)

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	177 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
59.00	120	0	0	120
60.00	240	177	177	249

Device	Routing	Invert	Outlet Devices
#1	Discarded	59.00'	**0.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.00 cfs @ 20.00 hrs HW=59.92' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Summary for Pond B-3: Basin 3

Inflow Area = 34,155 sf,100.00% Impervious, Inflow Depth > 0.75" for One Inch event
Inflow = 0.68 cfs @ 12.09 hrs, Volume= 2,128 cf
Outflow = 0.02 cfs @ 16.96 hrs, Volume= 646 cf, Atten= 98%, Lag= 292.4 min
Discarded = 0.02 cfs @ 16.96 hrs, Volume= 646 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 58.44' @ 16.96 hrs Surf.Area= 1,346 sf Storage= 1,527 cf

Plug-Flow detention time= 215.0 min calculated for 644 cf (30% of inflow)
Center-of-Mass det. time= 95.2 min (853.7 - 758.5)

Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	2,346 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
57.00	792	0	0	792
58.00	1,165	973	973	1,181
59.00	1,594	1,374	2,346	1,630

Device	Routing	Invert	Outlet Devices
#1	Discarded	57.00'	**0.520 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.02 cfs @ 16.96 hrs HW=58.44' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Summary for Pond B-7: Basin 7

Inflow Area = 16,772 sf, 40.73% Impervious, Inflow Depth > 0.03" for One Inch event
Inflow = 0.00 cfs @ 12.49 hrs, Volume= 42 cf
Outflow = 0.00 cfs @ 20.00 hrs, Volume= 17 cf, Atten= 70%, Lag= 450.7 min
Discarded = 0.00 cfs @ 20.00 hrs, Volume= 17 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 56.67' @ 20.00 hrs Surf.Area= 62 sf Storage= 25 cf

Plug-Flow detention time= 195.2 min calculated for 17 cf (40% of inflow)
Center-of-Mass det. time= 70.7 min (1,001.7 - 931.0)

Volume	Invert	Avail.Storage	Storage Description
#1	56.00'	204 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
56.00	18	0	0	18
57.00	93	51	51	97
58.00	224	154	204	235

Device	Routing	Invert	Outlet Devices
#1	Discarded	56.00'	**0.520 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.00 cfs @ 20.00 hrs HW=56.67' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.00 cfs)

Summary for Pond B-8: Basin 8

Inflow Area = 15,208 sf, 44.79% Impervious, Inflow Depth > 0.04" for One Inch event
Inflow = 0.00 cfs @ 12.44 hrs, Volume= 49 cf
Outflow = 0.00 cfs @ 20.00 hrs, Volume= 19 cf, Atten= 80%, Lag= 453.8 min
Discarded = 0.00 cfs @ 20.00 hrs, Volume= 19 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 61.73' @ 20.00 hrs Surf.Area= 67 sf Storage= 29 cf

Plug-Flow detention time= 207.0 min calculated for 19 cf (40% of inflow)
Center-of-Mass det. time= 80.6 min (997.3 - 916.8)

Volume	Invert	Avail.Storage	Storage Description
#1	61.00'	517 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
61.00	18	0	0	18
62.00	93	51	51	97
63.00	224	154	204	235
64.00	411	313	517	432

Device	Routing	Invert	Outlet Devices
#1	Discarded	61.00'	**0.520 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.00 cfs @ 20.00 hrs HW=61.73' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.00 cfs)

Summary for Pond IS-T1: Infiltration Systems 1, 2, & 3

Inflow Area = 4,464 sf,100.00% Impervious, Inflow Depth > 0.75" for One Inch event
Inflow = 0.09 cfs @ 12.09 hrs, Volume= 278 cf
Outflow = 0.01 cfs @ 12.71 hrs, Volume= 278 cf, Atten= 88%, Lag= 37.5 min
Discarded = 0.01 cfs @ 12.71 hrs, Volume= 278 cf

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

Peak Elev= 58.71' @ 12.71 hrs Surf.Area= 117 sf Storage= 107 cf

Plug-Flow detention time= 88.5 min calculated for 278 cf (100% of inflow)
Center-of-Mass det. time= 88.2 min (846.7 - 758.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	57.00'	77 cf	**11.67'W x 10.00'L x 2.04'H Field A** 238 cf Overall - 45 cf Embedded = 194 cf x 40.0% Voids
#2A	57.50'	45 cf	**Cultec C-100HD** x 3 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 3 rows
		122 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	57.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 12.71 hrs HW=58.71' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.01 cfs)

Summary for Pond IS-T2: Infiltration Systems 4 & 7

Inflow Area = 2,232 sf,100.00% Impervious, Inflow Depth > 0.75" for One Inch event
Inflow = 0.04 cfs @ 12.09 hrs, Volume= 139 cf
Outflow = 0.01 cfs @ 12.60 hrs, Volume= 139 cf, Atten= 85%, Lag= 30.5 min
Discarded = 0.01 cfs @ 12.60 hrs, Volume= 139 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 58.53' @ 12.60 hrs Surf.Area= 66 sf Storage= 49 cf

Plug-Flow detention time= 62.9 min calculated for 139 cf (100% of inflow)
Center-of-Mass det. time= 62.6 min (821.1 - 758.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	57.00'	48 cf	**6.00'W x 11.00'L x 2.04'H Field A** 135 cf Overall - 15 cf Embedded = 120 cf x 40.0% Voids
#2A	57.50'	15 cf	**Cultec C-100HD** Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 1 rows
		63 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	57.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 12.60 hrs HW=58.53' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.01 cfs)

Summary for Pond IS-T3: Infiltration Systems 5, 6, 8, 9, & 10

Inflow Area = 4,464 sf,100.00% Impervious, Inflow Depth > 0.75" for One Inch event
Inflow = 0.09 cfs @ 12.09 hrs, Volume= 278 cf
Outflow = 0.01 cfs @ 12.62 hrs, Volume= 278 cf, Atten= 86%, Lag= 32.2 min
Discarded = 0.01 cfs @ 12.62 hrs, Volume= 278 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 58.53' @ 12.62 hrs Surf.Area= 125 sf Storage= 102 cf

Plug-Flow detention time= 72.1 min calculated for 278 cf (100% of inflow)
Center-of-Mass det. time= 71.8 min (830.3 - 758.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	57.00'	85 cf	**5.00'W x 25.00'L x 2.04'H Field A** 255 cf Overall - 43 cf Embedded = 212 cf x 40.0% Voids
#2A	57.50'	43 cf	**Cultec C-100HD** x 3 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 1 rows
		128 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	57.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 12.62 hrs HW=58.53' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.01 cfs)

APPENDIX D

LONG TERM POLLUTION PREVENTION PLAN – REQUIRED BY STANDARDS 4-6

LONG TERM POLLUTION PREVENTION PLAN

To keep the Stormwater Management System (SMS) functioning properly and to ensure that the stormwater Total Suspended Solids (TSS) are reduced, a long term pollution prevention is required. The Cape Club of Sharon, the owner/operator of the facility, is responsible for the adherence to this long term plan. The following is a guideline of the specific requirements of the plan to maintain the long term viability of the stormwater management system.

The Stormwater Pollution Prevention Plan for the site addresses many of the items in the Long Term Pollution Prevention Plan.

Good Housekeeping Practices

Employees shall be instructed in the importance of not spilling fluids and chemicals such as oil, antifreeze, etc. onto the bare ground. All areas exposed to the weather shall be kept clean

Maintenance of the Grounds

The Cape Club of Sharon has an existing maintenance schedule for the grounds and will continue utilizing this existing schedule. Maintenance of lawns, gardens and other landscaped areas is to be performed by appropriate maintenance staff, as approved by the Owner.

Requirements for routine inspections and maintenance of stormwater BMPs;

BMPs shall be inspected on a monthly basis. BMPs shall be maintained per the Operations and Maintenance Plan.

Spill prevention and response plans;

First responders	Phone Numbers
• Sharon Fire Department	911 if emergency or (781) 784-1522
• Sharon Police Department	911 if emergency or (781) 784-1587
• Mass Department of Environmental Protection	
Emergency Response	1-888-304-1133

Provisions for solid waste management;

Solid waste shall be collected at a minimum of once per week and disposed of in an appropriate dumpster or garbage truck. Waste shall be disposed of in a legal manner, at a state licensed recycling center or landfill.

Provisions for prevention of illicit discharges to the stormwater management system;

Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;

Per the SWPPP , annual SWPPP training shall be conducted. Training records shall be kept on file

Routine Inspections and Maintenance of SMS BMP's

Routine inspections and maintenance shall be performed in accordance with the Operations and Maintenance Plan

APPENDIX E

OPERATION AND MAINTENANCE PLAN - REQUIRED BY STANDARD 9

OPERATION AND MAINTENANCE PLAN

To keep the Stormwater Management System (SMS) functioning properly and to ensure that the Total Suspended Solids (TSS) are reduced, periodic maintenance is required. The owner/operator of the facility is responsible for the periodic maintenance requirements of the SMS. The Cape Club of Sharon is the owner and will be the party responsible for the maintenance of the SMS. The following is a guideline of the specific maintenance schedules and tasks required to keep the SMS functioning properly.

Unscheduled Maintenance

The following inspections and maintenance activities must be completed after each rain event in excess of two-inches (2"), or after any snow or rain event accompanied by high winds:

1. Inspect the infiltration basins for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of the inlet or outlet of the basins.

General Maintenance

The following inspections and maintenance activities must be completed on a regular basis as conditions warrant:

1. Maintain the grassy side slopes of the infiltration basins and grassed swales through regular mowing. Keep the grass between three and six inches (3"-6") in length. Remove the grass clippings to prevent them from impeding the flow of stormwater from the inlets or outlets.

2. During the fall and the spring remove any accumulated leaves from the catch basin and inlet control structure grates, grassed swales, inlet and outlet aprons including flared end sections, infiltration basin(s), and level spreaders.

Quarterly Maintenance

The following inspections and maintenance activities must be completed quarterly (January 15, April 15, July 15, October 15 or other acceptable quarterly dates):

1. Sweep, vacuum, or clean the roadway area to reduce the amount of sediment entering the SMS.

2. Inspect the catch basin sumps for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of the outlet of the catch basin. Remove accumulated sediment, by use of a clamshell bucket or vacuum truck, when it reaches a height of 18-inches but not less than annually.

3. Inspect the infiltration basins, vegetated swales, inlet structures, flared ends, and level spreaders for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of the inlet or outlet of the basin. Remove any accumulated sediment, by the use of hand tools (shovels, rakes, wheelbarrows, etc.) when it exceeds three-inches (3") but not less than annually.

Annual Maintenance

The following inspections and maintenance activities must be completed annually (April 15 or another acceptable date):

1. Sweep, vacuum or clean the roadway area to reduce the amount of sediment entering the SMS.

2. Remove accumulated sediment from the catch basin sumps by use of a clamshell bucket or vacuum truck. Inspect the hood to ensure that it is properly secured. If excessive sediment is encountered in the catch basin sump and or the inlet to the catch basin, spot inspect the under drain system. If more than ½" of sediment is encountered in under drain system, jet wash system and then remove any additional sediment from catch basin sumps.

3. Remove any accumulated sediment from grassed swales, infiltration basins, level spreaders and/or plunge pools by the use of a clamshell bucket or by the use of hand tools (shovels, rakes, wheelbarrows, etc.). Reset any displaced rip-rap.

4. Remove any accumulated sediment from the infiltration basins, by the use of hand tools (shovels, rakes, wheelbarrows, etc.).

Water Quality Unit Maintenance

Refer to Stormceptor® Owner's Manual found on the following pages for operational and maintenance information on the water quality units found on site.

Cape Club Builders, LLC

The Cape Club of Sharon

25 Tiot Street, Sharon, MA

Stormwater Management System Operation & Maintenance Checklist

Unscheduled Maintenance

The following inspections and maintenance activities must be completed after each rain event in excess of two-inches (2"), or after any snow or rain event accompanied by high winds

- Inspect the infiltration basins for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of the inlets or outlets of the basins.

General Maintenance

- Mow the grass side slopes of the infiltration basins and grassed channels through regular mowing. Keep the grass between three and six inches (3"-6") in length. Remove the grass clippings to prevent them from impeding the flow of stormwater from the inlets or outlets. Repair areas of erosion and revegetate.
- During the fall and the spring remove leaves from the catch basin and inlet control structure grates, grassed swales, inlet and outlet aprons including flared end sections, infiltration basin(s), and level spreaders.

Quarterly Maintenance

- Sweep, vacuum, or clean the roadway area.
- Inspect the catch basin sumps for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of the outlet of the catch basin. Remove accumulated sediment, by use of a clamshell bucket or vacuum truck, when it reaches a height of 18-inches but not less than annually.
- Inspect the infiltration basins, inlet structures, flared ends, and level spreaders for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of the inlet or outlet of the basin. Remove any accumulated sediment, by the use of hand tools (shovels, rakes, wheelbarrows, etc.) when it exceeds three-inches (3") but not less than annually.

Annual Maintenance

- Sweep, vacuum, or clean the roadway area.
- Remove sediment from the catch basin sumps by use of a clamshell bucket or vacuum truck. Inspect the hood to ensure that it is properly secured.
- Remove sediment from grassed channels infiltration basins, inlet structures, flared ends, and level spreaders by the use of a clamshell bucket or by the use of hand tools (shovels, rakes, wheelbarrows, etc.). Reset any displaced rip-rap.
- Remove sediment from the infiltration basins with the use of hand tools (shovels, rakes, wheelbarrows, etc.).

Water Quality Unit Maintenance

- Refer to the Stormceptor® Owner's Manual for operational and maintenance information on the water quality units found on site.

Cape Club Builders, LLC			
The Cape Club of Sharon			
25 Tiot Street, Sharon, MA			
STORMWATER MANAGEMENT SYSTEM OPERATION & MAINTENANCE LOG			
DATE	**TIME**	**MAINTENANCE ACTIVITY**	**MAINTENANCE PERFORMED, OBSERVATIONS**

APPENDIX F

ILLICIT DISCHARGE COMPLIANCE STATEMENT- REQUIRED BY STANDARD 10

Illicit Discharge Compliance Statement

Responsibility:

The Owner is responsible for ultimate compliance with all provisions of the Massachusetts Stormwater Management Policy, the USEPA NPDES Construction General Permit and responsible for identifying and eliminating illicit discharges (as defined by the USEPA).

OWNER NAME:	The Cape Club of Sharon
ADDRESS:	25 Tiot Street
	Sharon, MA 02067
TEL. NUMBER:	(781) 784-5991

Engineer's Compliance Statement:

To the best of my knowledge, the attached plans, computations and specifications meet the requirements of Standard 10 of the Massachusetts Stormwater Handbook regarding illicit discharges to the stormwater management system and that no detectable illicit discharges exist on the site. All documents and attachments were prepared under my direction and qualified personnel properly gathered and evaluated the information submitted, to the best of my knowledge.

Included with this statement are site plans, drawn to scale, that identify the location of systems for conveying stormwater on the site and show that these systems do not allow the entry of any illicit discharges into the stormwater management system. The plans also show any systems for conveying wastewater and/or groundwater on the site and show that there are no connections between the stormwater and wastewater systems.

For a redevelopment project (if applicable), all actions taken to identify and remove illicit discharges, including without limitation, visual screening, dye or smoke testing, and the removal of any sources of illicit discharges to the stormwater management system are documented and included with this st

Tracy L. Duarte

Tracy L. Duarte, P.E.
Civil Engineer

APPENDIX G

SOIL LOGS

Job No.:	9231.0	Soil Evaluator:	Tracy Duarte
Client:	Spring Valley, LLC	BOH Witness:	N/A
Site Location:	25 Tiot St, Sharon MA	Excavator:	Joe (MJD Exc.)
Land Use:	Lawn	Date:	August 8, 2017
Parent Material:	Compact Till	Weather:	Cloudy 64°F

Check One: New: X Repair: ____ Upgrade: ____

Water Resource Conditions: Normal: X Above: ____ Below: ____

TP # D-1 (Near Building #1)

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-16	Fill	N/A	N/A		Depth	30"	Mottling	16"
16-22	A	Sandy Loam	10YR 3/2		0-15 Min.	1/4"		
22-40	B	Very Fine Sandy Loam	10YR 4/4	Tight. 10% Gravel & Cobbles	15-30 Min.	1/4"	Weeping	106"
					30-45 Min.	1/4"		
40-108	C	Very Fine Sandy Loam	2.5Y 5/6	Tight. 10% Gravel & Cobbles, 5% Stones. Heavy mottling throughout.	45-60 Min.	1/4"	Standing	108"
					60-75 Min.	-		
					Rate	1"/hr		

TP # D-2

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	Sandy Loam	10YR 3/2		Depth	N/A	Mottling	20"
12-17	B	Loamy Sand	10YR 5/3		0-15 Min.	N/A		
17-90	C	Loamy Sand	2.5Y 6/3	10% Gravel & Cobbles, 5% Stones. Heavy mottling throughout (fill in one corner)	15-30 Min.	N/A	Weeping	70"
					30-45 Min.	N/A		
					45-60 Min.	N/A	Standing	84"
					60-75 Min.	N/A		
					Rate			

TP # D-3

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	Fill				Depth	N/A	Mottling	22"
12-22	A	Sandy Loam	10YR 3/2		0-15 Min.	N/A		
22-38	B	Loamy Sand	10YR 5/4		15-30 Min.	N/A	Weeping	72"
38-90	C	Loamy Sand	2.5Y 6/3	15% Gravel & Cobbles. 5% Stones. Heavy mottling throughout.	30-45 Min.	N/A		
					45-60 Min.	N/A	Standing	88"
					60-75 Min.	N/A		
					Rate			

TP # D-4 (On slope near unit 8&9, depths measured at top of slope)

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-42	Fill	N/A	N/A		Depth	N/A	Mottling	34"
42-54	A	Loam	10YR 3/2		0-15 Min.	N/A		
54-60	B	Sandy Loam	10YR 5/4		15-30 Min.	N/A	Weeping	N/A
60-118	C	Silt Loam	2.5Y 6/3	Smearing, heavy mottling. Platey.	30-45 Min.	N/A		
					45-60 Min.	N/A	Standing	N/A
					60-75 Min.	N/A		
					Rate			

TP # D-5

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	Loam	10YR 3/2		Depth	30"	Mottling	14"
12-22	B	Sandy Loam	10YR 5/4		0-15 Min.	1/16"		
22-94	C	Loam	2.5Y 5/3	5% Stones. Heavy mottling throughout.	15-30 Min.	0	Weeping	72"
					30-45 Min.	0		
					45-60 Min.	0	Standing	90"
					60-75 Min.			

Rate 0"/hr

TP # D-6

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-18	Fill				Depth	N/A	Mottling	14"
18-26	A	Sandy Loam	10YR 3/2	Roots	0-15 Min.	N/A		
26-34	B	Sandy Loam	10YR 5/4		15-30 Min.	N/A	Weeping	83"
34-94	C	Sandy Loam	2.5YR 5/4	Tight, 5% Gravel & Cobbles. Heavy mottling throughout.	30-45 Min.	N/A		
					45-60 Min.	N/A	Standing	92"
					60-75 Min.	N/A		

Rate

TP # D-7

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-20	Fill				Depth	N/A	Mottling	17"
20-25	A	Loam	10YR 2/2		0-15 Min.	N/A		
25-33	B	Sandy Loam	10YR 5/4		15-30 Min.	N/A	Weeping	N/A
33-58	C1	Silt Loam	2.5Y 5/3	Smearing, platey.	30-45 Min.	N/A		
58-93	C2	Sandy Loam	2.5Y 5/4	Heavy mottling throughout.	45-60 Min.	N/A	Standing	N/A
					60-75 Min.	N/A		

Rate

TP # D-8 (Near unit 40+41)

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-9	A	Sandy Loam	10YR 4/2	Roots	Depth	N/A	Mottling	88"
9-18	B	Loamy Sand	10YR 5/3		0-15 Min.	N/A		
18-92	C	Sand	2.5Y 5/3	5% Gravel & Cobbles, Very friable, Peastone Pocket found at edge of pit	15-30 Min.	N/A	Weeping	N/A
					30-45 Min.	N/A		
					45-60 Min.	N/A	Standing	N/A
					60-75 Min.	N/A		

Rate

TP # D-9 (Near unit 44+45)

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-24	Fill	N/A	N/A		Depth	N/A	Mottling	50"
24-32	A	Sandy Loam	10YR 3/2		0-15 Min.	N/A		
32-44	B	Loamy Sand	10YR 4/6		15-30 Min.	N/A	Weeping	N/A
44-54	C1	Loamy Sand	2.5Y 5/3		30-45 Min.	N/A		
54-98	C2	Sand	2.5Y 5/3	5% Gravel & Cobbles. Very friable	45-60 Min.	N/A	Standing	N/A
					60-75 Min.	N/A		

Rate

TP # D-10 (Near pond)

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-24	Fill				Depth	N/A	Mottling	36"
24-36	OA			Roots, organics	0-15 Min.	N/A		
36-96	C	Fine Sand	2.5Y 5/2	Saturated	15-30 Min.	N/A	Weeping	60"
					30-45 Min.	N/A		
					45-60 Min.	N/A	Standing	90"
					60-75 Min.	N/A		

Rate

TP # D-11

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-22	Fill				Depth	32"	Mottling	14"
22-28	A	Loam	10YR 2/2		0-15 Min.	1/4"		
28-34	B	Loamy Sand	10YR 5/4		15-30 Min.	1/4"	Weeping	44"
34-82	C	Fine Loamy Sand	2.5Y 5/3	Heavy weeping and mottling. 5% Gravel & Cobbles	30-45 Min.	1/4"		
					45-60 Min.	1/4"	Standing	80"
					60-75 Min.			

Rate 1"/hr

TP # D-12

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-64	Fill				Depth	N/A	Mottling	68"
64-68	A				0-15 Min.	N/A		
68-78	B				15-30 Min.	N/A	Weeping	N/A
78-108	C	Loamy Sand	2.5Y 5/3		30-45 Min.	N/A		
					45-60 Min.	N/A	Standing	N/A
					60-75 Min.	N/A		

Rate

TP # D-13 (Parking Lot)

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-26	Fill				Depth	N/A	Mottling	42"
26-86	C	Fine Sand	2.5Y 5/3	Platey, Very friable.	0-15 Min.	N/A		
					15-30 Min.	N/A	Weeping	60"
					30-45 Min.	N/A		
					45-60 Min.	N/A	Standing	84"
					60-75 Min.	N/A		

Rate

TP # D-14 (Near units 48+49)

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-16	Fill				Depth	N/A	Mottling	N/A
16-24	A	Loamy Sand	10YR 3/2	Roots	0-15 Min.	N/A		
24-38	B	Loamy Sand	10YR 4/6		15-30 Min.	N/A	Weeping	N/A
38-114	C	Sand	2.5Y 5/3	Very friable.	30-45 Min.	N/A		
					45-60 Min.	N/A	Standing	N/A
					60-75 Min.	N/A		

Rate

APPENDIX H

STORMCEPTOR SIZING DETAILED REPORT AND OWNER'S MANUAL

Detailed Stormceptor Sizing Report – Cape Club of Sharon

Project Information & Location			
Project Name	Cape Club of Sharon	**Project Number**	9231.0
City	92	**State/ Province**	Massachusetts
Country	United States of America	**Date**	9/14/2017
Designer Information		**EOR Information (optional)**	
Name	Coneco Coneco	**Name**	
Company	Coneco Engineers & Scientists	**Company**	
Phone #	508-697-3191	**Phone #**	
Email	Stormceptor@coneco.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Cape Club of Sharon
Recommended Stormceptor Model	STC 450i
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	90
PSD	Fine Distribution
Rainfall Station	BLUE HILL

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	90
STC 900	94
STC 1200	94
STC 1800	94
STC 2400	96
STC 3600	96
STC 4800	97
STC 6000	97
STC 7200	98
STC 11000	99
STC 13000	99
STC 16000	99
StormceptorMAX	Custom

Stormceptor
The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology
Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:
• Site parameters
• Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
• Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
• TSS load
• Detention time of the system

Hydrology Analysis
PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour). Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station			
State/Province	Massachusetts	**Total Number of Rainfall Events**	10784
Rainfall Station Name	BLUE HILL	**Total Rainfall (in)**	2849.7
Station ID #	0736	**Average Annual Rainfall (in)**	49.1
Coordinates	42°12'44"N, 71°6'53"W	**Total Evaporation (in)**	242.9
Elevation (ft)	630	**Total Infiltration (in)**	0.0
Years of Rainfall Data	58	**Total Rainfall that is Runoff (in)**	2606.8

Notes
• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules. • Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed. • For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (acres)	0.22
Imperviousness %	100.0

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

Design Details	
Stormceptor Inlet Invert Elev (ft)	
Stormceptor Outlet Invert Elev (ft)	
Stormceptor Rim Elev (ft)	
Normal Water Level Elevation (ft)	
Pipe Diameter (in)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	Cape Club of Sharon

Site Details

Drainage Area

Total Area (acres)	0.22
Imperviousness %	100.0

Surface Characteristics

Width (ft)	196.00
Slope %	2
Impervious Depression Storage (in)	0.02
Pervious Depression Storage (in)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (in/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

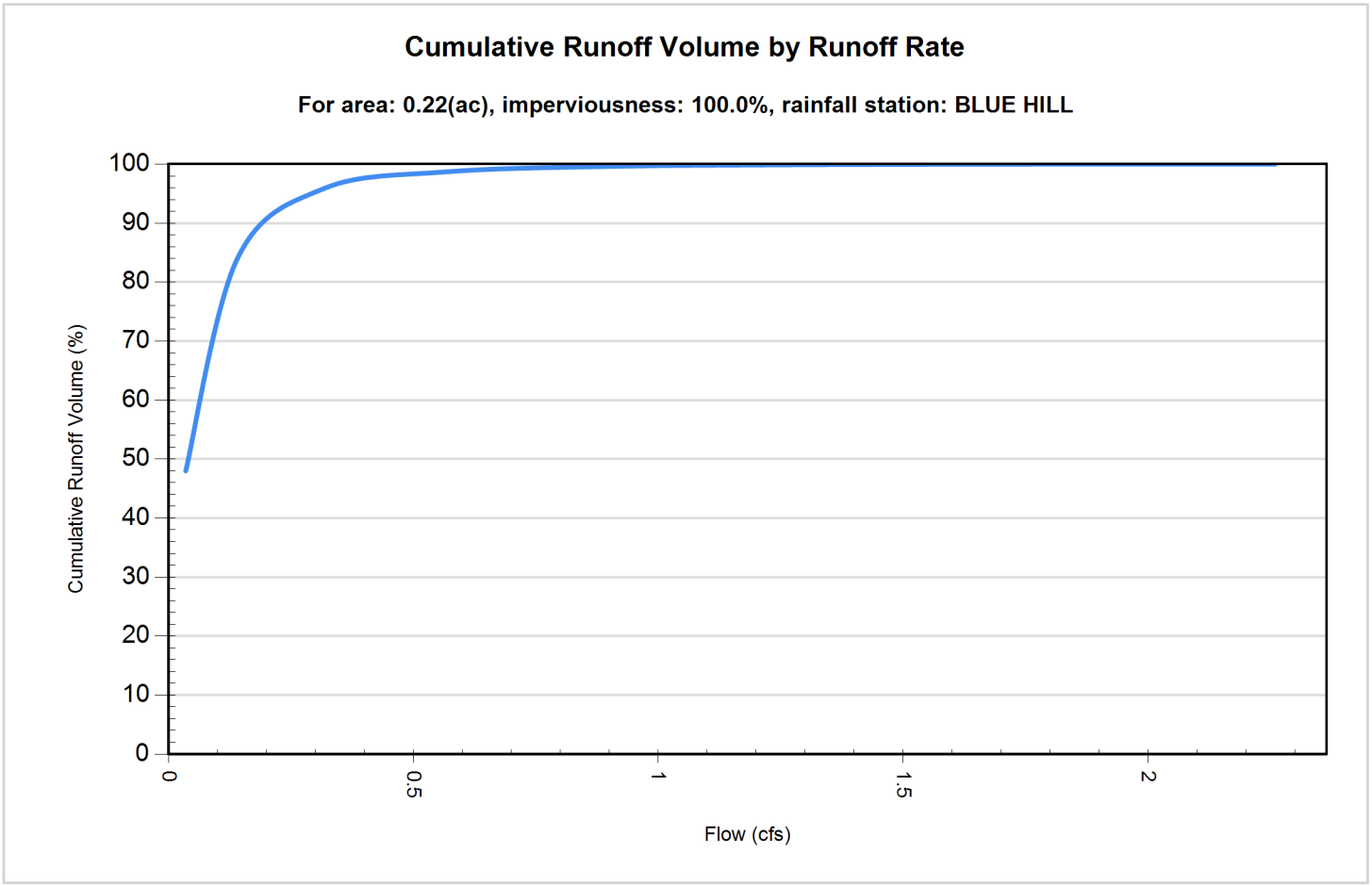
Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

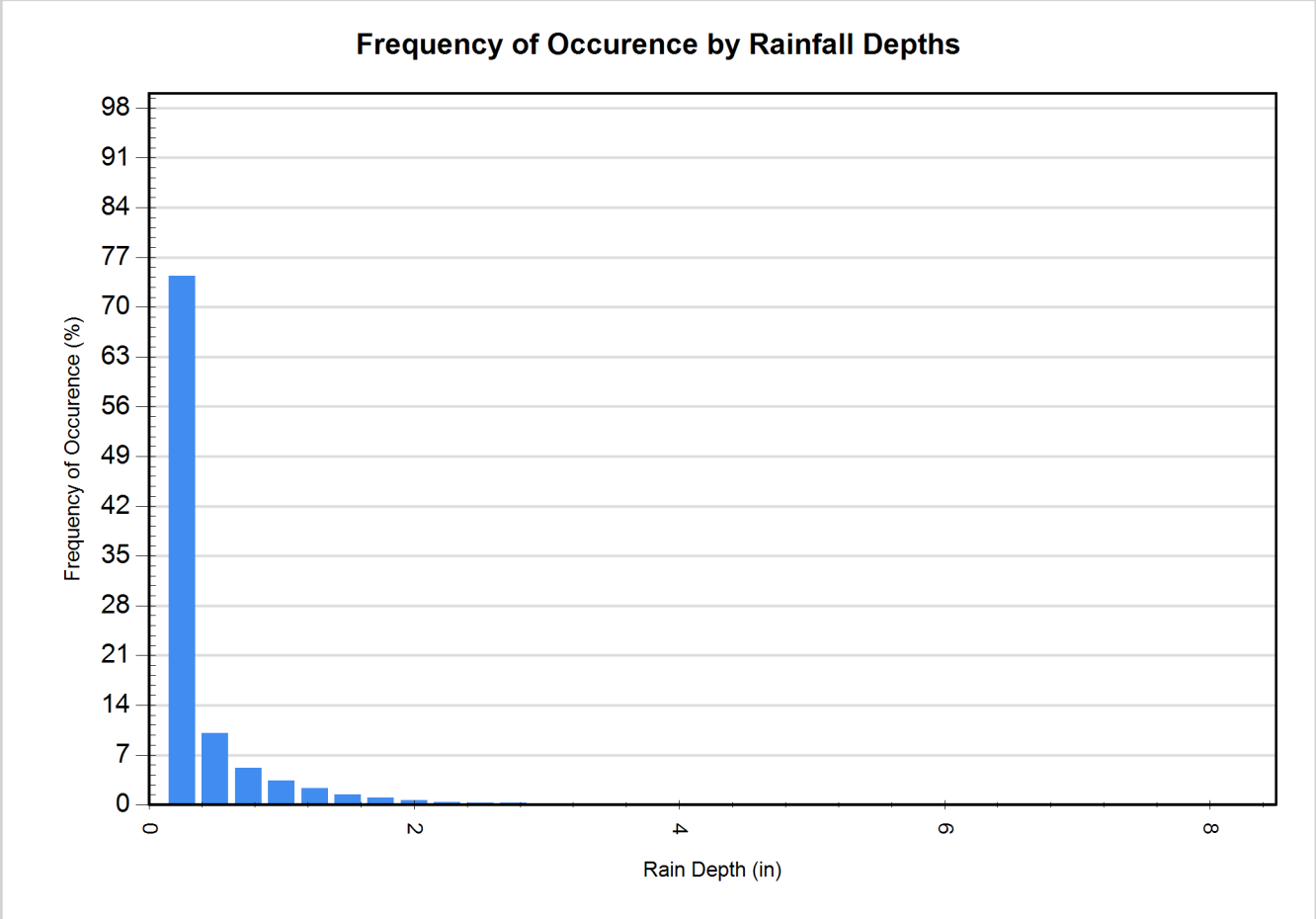
TSS Availability Parameters

Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (cfs)	Runoff Volume (ft³)	Volume Over (ft³)	Cumulative Runoff Volume (%)
0.035	1036847	1125403	48.0
0.141	1817566	344431	84.1
0.318	2072772	89103	95.9
0.565	2134705	27155	98.7
0.883	2152452	9400	99.6
1.271	2158772	3079	99.9
1.730	2160921	930	100.0
2.260	2161491	360	100.0



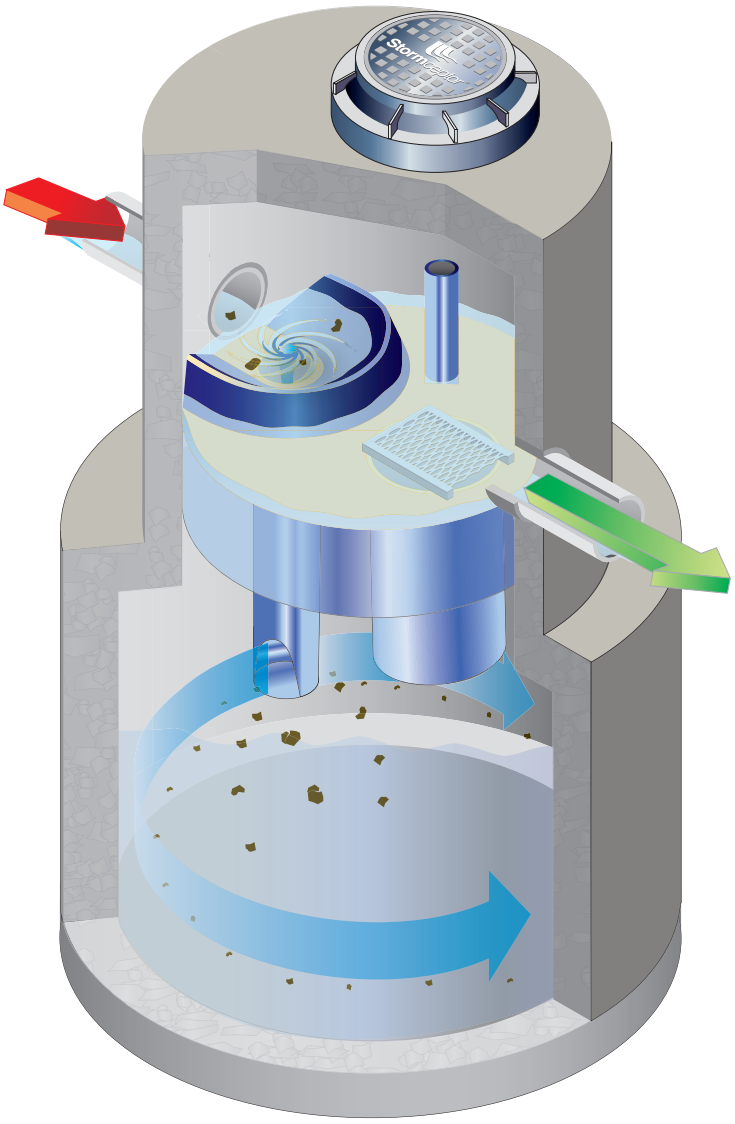
Rainfall Event Analysis				
Rainfall Depth (in)	No. of Events	Percentage of Total Events (%)	Total Volume (in)	Percentage of Annual Volume (%)
0.25	8022	74.4	470	16.5
0.50	1094	10.1	398	14.0
0.75	557	5.2	345	12.1
1.00	368	3.4	318	11.1
1.25	243	2.3	272	9.5
1.50	148	1.4	202	7.1
1.75	107	1.0	174	6.1
2.00	66	0.6	123	4.3
2.25	42	0.4	89	3.1
2.50	33	0.3	79	2.8
2.75	28	0.3	74	2.6
3.00	21	0.2	60	2.1
3.25	12	0.1	37	1.3
3.50	10	0.1	34	1.2
3.75	5	0.0	18	0.6
4.00	2	0.0	8	0.3
4.25	1	0.0	4	0.1
4.50	4	0.0	18	0.6
4.75	3	0.0	14	0.5
5.00	0	0.0	0	0.0
5.25	1	0.0	5	0.2
5.50	3	0.0	16	0.6
5.75	2	0.0	11	0.4
6.00	5	0.0	29	1.0
6.25	0	0.0	0	0.0
6.50	1	0.0	6	0.2
6.75	0	0.0	0	0.0
7.00	1	0.0	7	0.2
7.25	1	0.0	7	0.2
7.50	0	0.0	0	0.0
7.75	2	0.0	15	0.5
8.00	0	0.0	0	0.0
8.25	0	0.0	0	0.0
8.25	2	0.0	17	0.6



For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

Stormceptor®

Owner's Manual



Stormceptor is protected by one or more of the following patents:

Canadian Patent No. 2,137,942
Canadian Patent No. 2,175,277
Canadian Patent No. 2,180,305
Canadian Patent No. 2,180,338
Canadian Patent No. 2,206,338
Canadian Patent No. 2,327,768
U.S. Patent No. 5,753,115
U.S. Patent No. 5,849,181
U.S. Patent No. 6,068,765
U.S. Patent No. 6,371,690
U.S. Patent No. 7,582,216
U.S. Patent No. 7,666,303
Australia Patent No. 693.164
Australia Patent No. 707,133
Australia Patent No. 729,096
Australia Patent No. 779,401
Australia Patent No. 2008,279,378
Australia Patent No. 2008,288,900
Indonesia Patent No. 0007058
Japan Patent No. 3581233
Japan Patent No. 9-11476
Korean Patent No. 0519212
Malaysia Patent No. 118987
New Zealand Patent No. 314,646
New Zealand Patent No. 583,008
New Zealand Patent No. 583,583
South African Patent No. 2010/00682
South African Patent No. 2010/01796
Other Patents Pending

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2 – Stormceptor Operation & Components

3 – Stormceptor Identification

4 – Stormceptor Inspection & Maintenance
    Recommended Stormceptor Inspection Procedure
    Recommended Stormceptor Maintenance Procedure

5 – Contact Information (Stormceptor Licensees)

Congratulations!

Your selection of a Stormceptor® means that you have chosen the most recognized and efficient stormwater oil/sediment separator available for protecting the environment. Stormceptor is a pollution control device often referred to as a “Hydrodynamic Separator (HDS)” or an “Oil Grit Separator (OGS)”, engineered to remove and retain pollutants from stormwater runoff to protect our lakes, rivers and streams from the harmful effects of non-point source pollution.

1 – Stormceptor Overview

Stormceptor is a patented stormwater quality structure most often utilized as a treatment component of the underground storm drain network for stormwater pollution prevention. Stormceptor is designed to remove sediment, total suspended solids (TSS), other pollutants attached to sediment, hydrocarbons and free oil from stormwater runoff. Collectively the Stormceptor provides spill protection and prevents non-point source pollution from entering downstream waterways.

Key benefits of Stormceptor include:

- Removes sediment, suspended solids, debris, nutrients, heavy metals, and hydrocarbons (oil and grease) from runoff and snowmelt.
- Will not scour or re-suspend trapped pollutants.
- Provides sediment and oil storage.
- Provides spill control for accidents, commercial and industrial developments.
- Easy to inspect and maintain (vacuum truck).
- “STORMCEPTOR” is *clearly* marked on the access cover (excluding inlet designs).
- Relatively small footprint.
- 3rd Party tested and independently verified.
- Dedicated team of experts available to provide support.

Model Types:

- STC (Standard)
- STF (Fiberglass)
- EOS (Extended Oil Storage)
- OSR (Oil and Sand Removal)
- MAX (Custom designed unit, specific to site)

Configuration Types:

- Inlet unit (accommodates inlet flow entry, and multi-pipe entry)
- In-Line (accommodates multi-pipe entry)
- Submerged Unit (accommodates the site’s tailwater conditions)
- Series Unit (combines treatment in two systems)

Please Maintain Your Stormceptor

To ensure long-term environmental protection through continued performance as originally designed for your site, **Stormceptor must be maintained**, as any stormwater treatment practice does. The need for maintenance is determined through inspection of the Stormceptor. Procedures for inspection are provided within this document. Maintenance of the Stormceptor is performed from the surface via vacuum truck.

If you require information about Stormceptor, or assistance in finding resources to facilitate inspections or maintenance of your Stormceptor please call your local Stormceptor Licensee or Imbrium® Systems.

2 – Stormceptor Operation & Components

Stormceptor is a flexibly designed underground stormwater quality treatment device that is unparalleled in its effectiveness for pollutant capture and retention using patented flow separation technology.

Stormceptor creates a non-turbulent treatment environment below the insert platform within the system. The insert diverts water into the lower chamber, allowing free oils and debris to rise, and sediment to settle under relatively low velocity conditions. These pollutants are trapped and stored below the insert and protected from large runoff events for later removal during the maintenance procedure.

With thousands of units operating worldwide, Stormceptor delivers reliable protection every day, in every storm. The patented Stormceptor design prohibits the scour and release of captured pollutants, ensuring superior water quality treatment and protection during even the most extreme storm events. Stormceptor's proven performance is backed by the longest record of lab and field verification in the industry.

Stormceptor Schematic and Component Functions

Below are schematics of two common Stormceptor configurations with key components identified and their functions briefly described.

Figure 1.

Inline Stormceptor

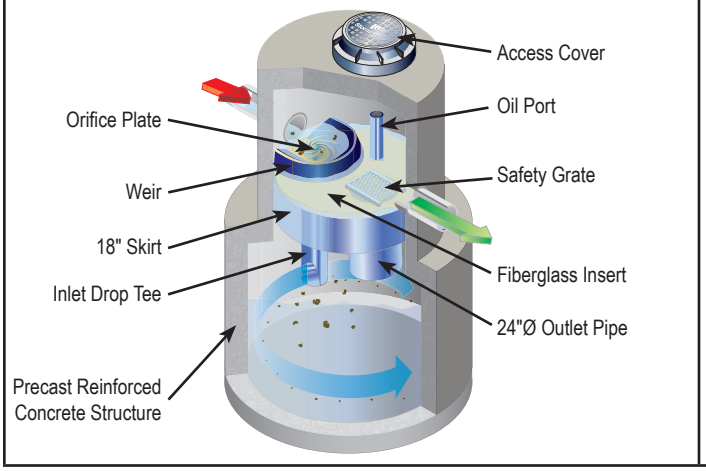
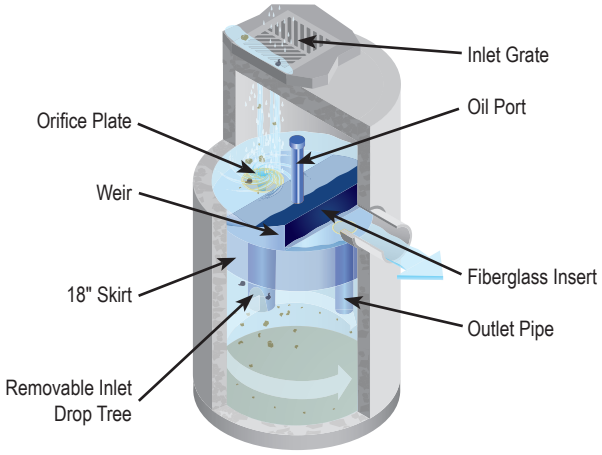


Figure 2.

Inlet Stormceptor



- **Manhole access cover** – provides access to the subsurface components
- **Precast reinforced concrete structure** – provides the vessel's watertight structural support
- **Fiberglass insert** – separates vessel into upper and lower chambers
- **Weir** – directs incoming stormwater and oil spills into the lower chamber
- **Orifice plate** – prevents scour of accumulated pollutants
- **Inlet drop tee** – conveys stormwater into the lower chamber
- **Fiberglass skirt** – provides double-wall containment of hydrocarbons
- **Outlet riser pipe** – conveys treated water to the upper chamber; primary vacuum line access port for sediment removal
- **Oil inspection port** – primary access for measuring oil depth and oil removal
- **Safety grate** – safety measure to cover riser pipe in the event of manned entry into vessel

3 – Stormceptor Identification

Stormceptor is available in both precast concrete and fiberglass vessels, with precast concrete often being the dominant material of construction.

In the Stormceptor, a patented, engineered fiberglass insert separates the structure into an upper chamber and lower chamber. The lower chamber will remain full of water, as this is where the pollutants are sequestered for later removal. Multiple Stormceptor model (STC, OSR, EOS, MAX and STF) configurations exist, each to be inspected and maintained in a similar fashion.

Each unit is easily identifiable as a Stormceptor by the trade name "Stormceptor" embossed on each access cover at the surface. To determine the location of "inlet" Stormceptor units with horizontal catch basin inlet, look down into the grate as the Stormceptor insert will be visible. The name "Stormceptor" is not embossed on inlet models due to the variability of inlet grates used/ approved across North America.

Once the location of the Stormceptor is determined, the model number may be identified by comparing the measured depth from the fiberglass insert level at the outlet pipe's invert (water level) to the bottom of the tank using **Table 1**.

In addition, starting in 1996 a metal serial number tag containing the model number has been affixed to the inside of the unit, on the fiberglass insert. If the unit does not have a serial number, or if there is any uncertainty regarding the size of the unit using depth measurements, please contact your local Stormceptor Representative for assistance.

Sizes/Models

Typical general dimensions and capacities of the standard precast STC, EOS & OSR Stormceptor models in both USA and Canada/International (excluding South East Asia and Australia) are provided in **Tables 1 and 2**. Typical rim to invert measurements are provided later in this document. The total depth for cleaning will be the sum of the depth from outlet pipe invert (generally the water level) to rim (grade) and the depth from outlet pipe invert to the precast bottom of the unit. Note that depths and capacities may vary slightly between regions.

Table 1A. (US) Stormceptor Dimensions – Insert to Base of Structure

STC Model	Insert to Base (in.)
450	60
900	55
1200	71
1800	105
2400	94
3600	134
4800	128
6000	150
7200	134
11000*	128
13000*	150
16000*	134

EOS Model	Insert to Base (in.)
4-175	60
9-365	55
12-590	71
18-1000	105
24-1400	94
36-1700	134
48-2000	128
60-2500	150
72-3400	134
110-5000*	128
130-6000*	150
160-7800*	134

OSR Model	Insert to Base (in.)
65	60
140	55
250	94
390	128
560	134
780*	128
1125*	134

Typical STF m (in.)
1.5 (60)
1.5 (61)
1.8 (73)
2.9 (115)
2.3 (89)
3.2 (127)
2.9 (113)
3.5 (138)
3.3 (128)

Notes:

1. *Depth Below Pipe Inlet Invert to the Bottom of Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.*

**Consist of two chamber structures in series.*

Table 1B. (CA & Int'l) Stormceptor Dimensions – Insert to Base of Structure

STC Model	Insert to Base (m)
300	1.5
750	1.5
1000	1.8
1500	2.8
2000	2.8
3000	3.7
4000	3.4
5000	4.0
6000	3.7
9000*	3.4
11000*	4.0
14000*	3.7

EOS Model	Insert to Base (m)
300	1.5
750	1.5
1000	1.8
2000	2.8
3000	3.7
4000	3.4
5000	4.0
6000	3.7
9000*	3.4
10000*	4.0
14000*	3.7

OSR Model	Insert to Base (m)
300	1.7
750	1.6
2000	2.6
4000	3.6
6000	3.7
9000*	3.6
14000*	3.7

Typical STF m (in.)
1.5 (60)
1.5 (61)
1.8 (73)
2.9 (115)
2.3 (89)
3.2 (127)
2.9 (113)
3.5 (138)
3.3 (128)

Notes:

1. *Depth Below Pipe Inlet Invert to the Bottom of Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.*

**Consist of two chamber structures in series.*

Table 2A. (US) Storage Capacities

STC Model	Hydrocarbon Storage Capacity gal	Sediment Capacity ft^3	**EOS Model**	Hydrocarbon Storage Capacity gal	**OSR Model**	Hydrocarbon Storage Capacity gal	Sediment Capacity ft^3
450	86	46	**4-175**	175	**065**	115	46
900	251	89	**9-365**	365	**140**	233	58
1200	251	127	**12-590**	591			
1800	251	207	**18-1000**	1198			
2400	840	205	**24-1400**	1457	**250**	792	156
3600	840	373	**36-1700**	1773			
4800	909	543	**48-2000**	2005	**390**	1233	465
6000	909	687	**60-2500**	2514			
7200	1059	839	**72-3400**	3418	**560**	1384	690
11000*	2797	1089	**110-5000***	5023	**780***	2430	930
13000*	2797	1374	**130-6000***	6041			
16000*	3055	1677	**160-7800***	7850	**1125***	2689	1378

Notes:

1. *Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.*

**Consist of two chamber structures in series.*

Table 2B. (CA & Int'l) Storage Capacities

STC Model	Hydrocarbon Storage Capacity L	Sediment Capacity L	EOS Model	Hydrocarbon Storage Capacity L	OSR Model	Hydrocarbon Storage Capacity L	Sediment Capacity L
300	300	1450	**300**	662	**300**	300	1500
750	915	3000	**750**	1380	**750**	900	3000
1000	915	3800	**1000**	2235			
1500	915	6205					
2000	2890	7700	**2000**	5515	**2000**	2790	7700
3000	2890	11965	**3000**	6710			
4000	3360	16490	**4000**	7585	**4000**	4700	22200
5000	3360	20940	**5000**	9515			
6000	3930	26945	**6000**	12940	**6000**	5200	26900
9000*	10555	32980	**9000***	19010	**9000***	9300	33000
11000*	10555	37415	**10000***	22865			
14000*	11700	53890	**14000***	29715	**14000***	10500	53900

Notes:

1. *Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.*

**Consist of two chamber structures in series.*

4 – Stormceptor Inspection & Maintenance

Regular inspection and maintenance is a proven, cost-effective way to maximize water resource protection for all stormwater pollution control practices, and is required to insure proper functioning of the Stormceptor. Both inspection and maintenance of the Stormceptor is easily performed from the surface. Stormceptor's patented technology has no moving parts, simplifying the inspection and maintenance process.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess the sediment accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

When is maintenance cleaning needed?

- For optimum performance, the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, which is approximately 15% of the unit's total storage capacity (see **Table 2**). The frequency should be adjusted based on historical inspection results due to variable site pollutant loading.

- Sediment removal is easier when removed on a regular basis at or prior to the recommended maintenance sediment depths, as sediment build-up can compact making removal more difficult.
- The unit should be cleaned out immediately after an oil, fuel or chemical spill.

What conditions can compromise Stormceptor performance?

- If construction sediment and debris is not removed prior to activating the Stormceptor unit, maintenance frequency may be reduced.
- If the system is not maintained regularly and fills with sediment and debris beyond the capacity as indicated in **Table 2**, pollutant removal efficiency may be reduced.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured.
- If debris clogs the inlet of the system, removal efficiency of sediment and hydrocarbons may be reduced.
- If a downstream blockage occurs, a backwater condition may occur for the Stormceptor and removal efficiency of sediment and hydrocarbons may be reduced.

What training is required?

The Stormceptor is to be inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins. For typical inspection and maintenance activities, no specific supplemental training is required for the Stormceptor. Information provided within this Manual (provided to the site owner) contains sufficient guidance to maintain the system properly.

In unusual circumstances, such as if a damaged component needs replacement or some other condition requires manned entry into the vessel, confined space entry procedures must be followed. Only professional maintenance service providers trained in these procedures should enter the vessel. Service provider companies typically have personnel who are trained and certified in confined space entry procedures according to local, state, and federal standards.

What equipment is typically required for inspection?

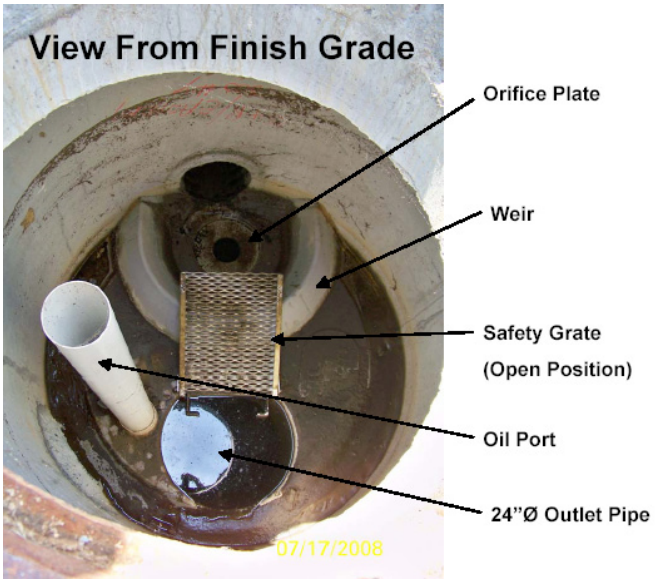
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

Recommended Stormceptor Inspection Procedure:

- Stormceptor is to be inspected from grade through a standard surface manhole access cover.
- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick.
- Oil depth is measured through the oil inspection port, either a 4-inch (100 mm) or 6-inch (150 mm) diameter port.
- Sediment depth can be measured through the oil inspection port or the 24-inch (610 mm) diameter outlet riser pipe.
- Inspections also involve a visual inspection of the internal components of the system.

Figure 3.

Figure 4.



What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required

Recommended Stormceptor Maintenance Procedure

Maintenance of Stormceptor is performed using a vacuum truck.

No entry into the unit is required for maintenance. ***DO NOT ENTER THE STORMCEPTOR CHAMBER*** unless you have the proper personal safety equipment, have been trained and are qualified to enter a confined space, as identified by local Occupational Safety and Health Regulations (e.g. 29 CFR 1910.146 or Canada Occupational Safety and Health Regulations – SOR/86-304). Without the proper equipment, training and permit, entry into confined spaces can result in serious bodily harm and potentially death. Consult local, provincial, and/or state regulations to determine the requirements for confined space entry. Be aware, and take precaution that the Stormceptor fiberglass insert may be slippery. In addition, be aware that some units do not have a safety grate to cover the outlet riser pipe that leads to the submerged, lower chamber.

- Ideally maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is to be maintained through a standard surface manhole access cover.
- Insert the oil dipstick into the oil inspection port. If oil is present, pump off the oil layer into separate containment using a small pump and tubing.
- Maintenance cleaning of accumulated sediment is performed with a vacuum truck.
    - For 6-ft (1800 mm) diameter models and larger, the vacuum hose is inserted into the lower chamber via the 24-inch (610 mm) outlet riser pipe.
    - For 4-ft (1200 mm) diameter model, the removable drop tee is lifted out, and the vacuum hose is inserted into the lower chamber via the 12-inch (305 mm) drop tee hole.

Figure 5.

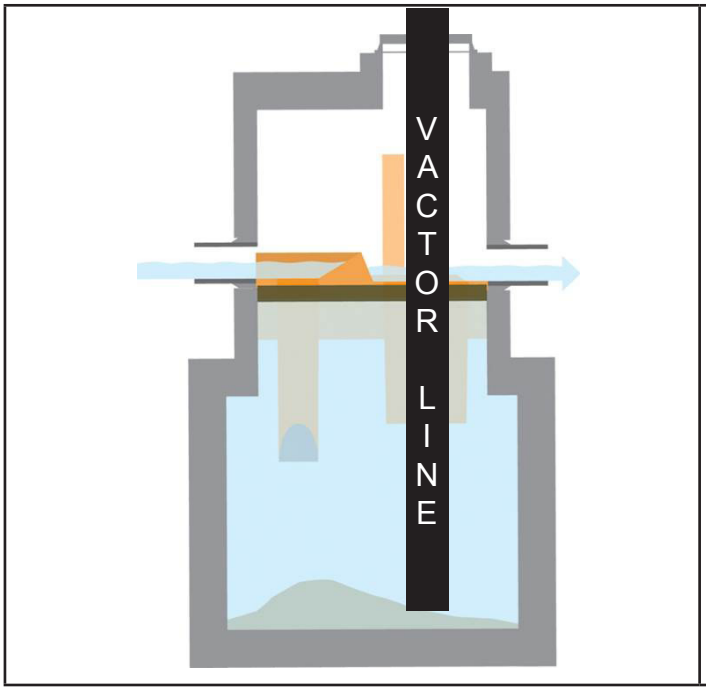
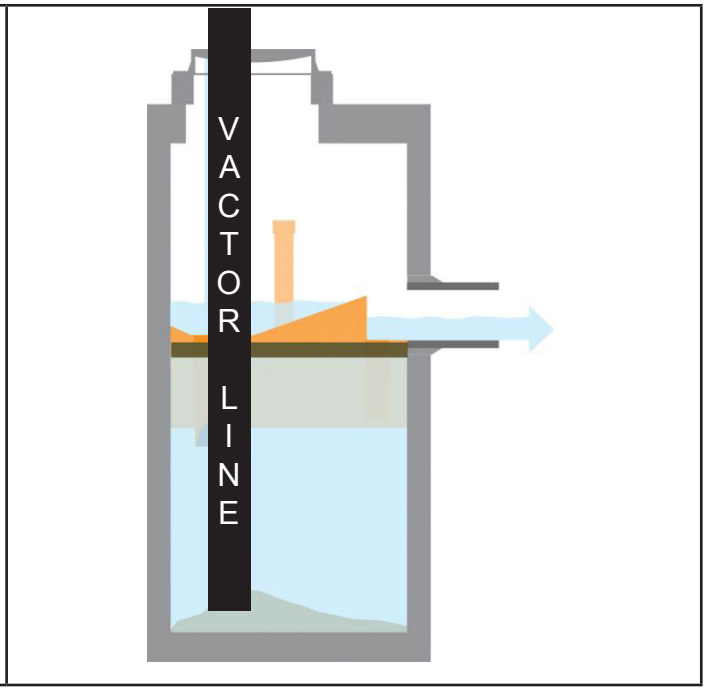


Figure 6.



- Using the vacuum hose, decant the water from the lower chamber into a separate containment tank or to the sanitary sewer, if permitted by the local regulating authority.
- Remove the sediment sludge from the bottom of the unit using the vacuum hose. For large Stormceptor units, a flexible hose is often connected to the primary vacuum line for ease of movement in the lower chamber.
- Units that have not been maintained regularly, have surpassed the maximum recommended sediment capacity, or contain damaged components may require manned entry by trained personnel using safe and proper confined space entry procedures.

Figure 7.

Figure 8.

A maintenance worker stationed at the above ground surface uses a vacuum hose to evacuate water, sediment, and debris from the system.

What is required for proper disposal?

The requirements for the disposal of material removed from Stormceptor units are similar to that of any other stormwater treatment Best Management Practices (BMP). Local guidelines should be consulted prior to disposal of the separator contents. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste. This could be site and pollutant dependent. In some cases, approval from the disposal facility operator/agency may be required.

What about oil spills?

Stormceptor is often implemented in areas where there is high potential for oil, fuel or other hydrocarbon or chemical spills. Stormceptor units should be cleaned immediately after a spill occurs by a licensed liquid waste hauler. You should also notify the appropriate regulatory agencies as required in the event of a spill.

What if I see an oil rainbow or sheen at the Stormceptor outlet?

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a hydrocarbon rainbow or sheen can be seen at

very small oil concentrations (< 10 ppm). Stormceptor is effective at removing 95% of free oil, and the appearance of a sheen at the outlet with high influent oil concentrations does not mean that the unit is not working to this level of removal. In addition, if the influent oil is emulsified, the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified or dissolved oil conditions.

What factors affect the costs involved with inspection/maintenance?
The Vacuum Service Industry for stormwater drainage and sewer systems is a well-established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean Stormceptor units will vary. Inspection and maintenance costs are most often based on unit size, the number of units on a site, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations.

What factors predict maintenance frequency?
Maintenance frequency will vary with the amount of pollution on your site (number of hydrocarbon spills, amount of sediment, site activity and use, etc.). It is recommended that the frequency of maintenance be increased or reduced based on local conditions. If the sediment load is high from an unstable site or sediment loads transported from upstream catchments, maintenance may be required semi-annually. Conversely once a site has stabilized, maintenance may be required less frequently (for example: two to seven year, site and situation dependent). Maintenance should be performed immediately after an oil spill or once the sediment depth in Stormceptor reaches the value specified in **Table 3** based on the unit size.

Table 3A. (US) Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment depth (in)	EOS Model	Maintenance Sediment depth (in)	Oil Storage Depth (in)	OSR Model	Maintenance Sediment depth (in)
450	8	**4-175**	9	24	**065**	8
900	8	**9-365**	9	24	**140**	8
1200	10	**12-590**	11	39		
1800	15					
2400	12	**24-1400**	14	68	**250**	12
3600	17	**36-1700**	19	79		
4800	15	**48-2000**	16	68	**390**	17
6000	18	**60-2500**	20	79		
7200	15	**72-3400**	17	79	**560**	17
11000*	17	**110-5000***	16	68	**780***	17
13000*	20	**130-6000***	20	79		
16000*	17	**160-7800***	17	79	**1125***	17

Note:

1. *The values above are for typical standard units.*

**Per structure.*

Table 3B. (CA & Int'l) Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment depth (mm)	EOS Model	Maintenance Sediment depth (mm)	Oil Storage Depth (mm)	OSR Model	Maintenance Sediment depth (mm)
300	225	**300**	225	610	**300**	200
750	230	**750**	230	610	**750**	200
1000	275	**1000**	275	990		
1500	400					
2000	350	**2000**	350	1727	**2000**	300
3000	475	**3000**	475	2006		
4000	400	**4000**	400	1727	**4000**	375
5000	500	**5000**	500	2006		
6000	425	**6000**	425	2006	**6000**	375
9000*	400	**9000***	400	1727	**9000***	425
11000*	500	**10000***	500	2006		
14000*	425	**14000***	425	2006	**14000***	425

Note:

1. *The values above are for typical standard units.*

   **Per structure.*

Replacement parts

Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. Therefore, inspection and maintenance activities are generally focused on pollutant removal. However, if replacements parts are necessary, they may be purchased by contacting your local Stormceptor Representative, or Imbrium Systems.

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Stormceptor's long and effective service life.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: _____

Allowable Sediment Depth: _____

Serial Number: _____

Installation Date: _____

Location Description of Unit: _____

Other Comments: _____

Contact Information

Questions regarding the Stormceptor can be addressed by contacting your area Stormceptor Licensee, Imbrium Systems, or visit our website at www.stormceptor.com.

Stormceptor Licensees:

CANADA

Lafarge Canada Inc.
www.lafargepipe.com

403-292-9502 / 1-888-422-4022	Calgary, AB
780-468-5910	Edmonton, AB
204-958-6348	Winnipeg, MB, NW. ON, SK

Langley Concrete Group
www.langleyconcretegroup.com

604-502-5236	BC

Hanson Pipe & Precast Inc.
www.hansonpipeandprecast.com

519-622-7574 / 1-888-888-3222	ON

Lécuyer et Fils Ltée.
www.lecuyerbeton.com

450-454-3928 / 1-800-561-0970	QC

Strescon Limited
www.strescon.com

902-494-7400	NS, NF
506-633-8877	NB, PE

UNITED STATES

Rinker Materials
www.rinkerstormceptor.com
1-800-909-7763

AUSTRALIA & SOUTHEAST ASIA, including New Zealand & Japan

Humes Water Solutions
www.humes.com.au
+61 7 3364 2894

Imbrium Systems Inc. & Imbrium Systems LLC

Canada	1-416-960-9900 / 1-800-565-4801
United States	1-301-279-8827 / 1-888-279-8826
International	+1-416-960-9900 / +1-301-279-8827
Email	info@imbriumsystems.com

www.imbriumsystems.com
www.stormceptor.com