

12. STORMWATER MANAGEMENT PLAN & CALCULATIONS

As previously described, the Site is currently entirely developed by the Waynflete School campus. The project will disturb more than one acre of area and will result in more than 1,000 Square-Feet of new impervious area. Applicable regulations that govern stormwater management on this site include Section 5 of the City of Portland Technical Manual, Chapter 32 of the City of Portland Code of Ordinances, and the Maine Stormwater Best Management Practices (BMP) Manual. Under Section 5 of the City Technical Manual, the project is subject to the Basic, General, and Flooding Standards of the Maine Department of Environmental Protection Chapter 500 Stormwater Regulations.

Adequate provisions have been made to collect, treat, and detain the required amount of stormwater runoff generated from the Site. The following sections describe the proposed compliance with these standards.

12.1 BASIC STANDARD (SOIL EROSION AND SEDIMENTATION CONTROL)

These standards address erosion and sedimentation control, inspection and maintenance, and good housekeeping practices. The application includes erosion and sediment control plans, details, and notes. These notes cover good housekeeping practices. The Erosion and Sedimentation Control Plan for the proposed project is provided below.

12.1.1 Erosion and Sedimentation Control Plan

The overall goal of the Soil Erosion and Sedimentation Plan is to restrict the potential for erosion and sedimentation at the site and down-gradient of the site. A variety of erosion control techniques will be implemented to achieve this goal. During construction, these include:

- Positive grades throughout the construction site to direct flow to sediment control barriers;
- Diversion barriers to keep upslope runoff from flowing through the construction site;
- Preserving and maintaining vegetated areas to the maximum extent possible;
- Installation and maintenance of sedimentation barriers adjacent to the project;
- Installation and maintenance of construction entrances at the travelled interface between stabilized and non-stabilized portions of the project site;
- Controls for fugitive dust, debris, and other materials;
- Permanent seeding and mulching applied as soon as areas are at final grades; and
- Inspection of all in-place measures after every significant rainfall until permanent measures are in place.

Structural measures will be installed where shown on the Soil Erosion and Sedimentation Control Plan, which is included in the drawings attached to Section 3 of this Report; details for the proposed measures are also included in the drawings. All measures will be implemented in accordance with the “Maine Erosion and Sedimentation Handbook for Construction: Best Management Practices”; they will be installed prior to any earth disturbing activities. All temporary measures will be removed after the areas are permanently stabilized.

Permanent erosion control measures will include vegetation and pavement. Areas of concentrated flow will be protected from erosion by establishing vegetation and riprap. All measures will be maintained in effective operating condition. The Contractor will be responsible for implementing and maintaining all erosion and sediment control measures and will use the attached inspection report form or equivalent.

12.2 GENERAL STANDARD (WATER QUALITY)

The DEP Chapter 500 Stormwater Regulations requires that at least 80% of the developed Site and 95% of impervious area be treated through the use of wetponds, filtration, infiltration, or buffers. An Underdrained Subsurface Sand Filter has been selected as the water quality treatment BMP for the Site, as there is limited available space on the Site for treatment measures that require surface area. Alternative methods were considered, such as space efficient Filterra

units, but were not selected because of the large areas required for treatment and because of the potential for snow plow damage on the Site.

Table 12-1 below outlines the treated areas and calculated percentages demonstrating conformance with the DEP Chapter 500 General Standard:

Table 12-1: Water Quality Treatment Percentages

	NET AREA INCREASE (SQUARE-FEET)	TREATED BY BMP* (SQUARE-FEET)	PERCENT TREATED
Impervious Area	4,776	40,833	>100%
Developed Area	0	47,429	>100%

*Note: Includes both new and existing areas

No new developed area will be created as the site is already entirely developed. The total new impervious area anticipated to result from the construction of the proposed development is approximately 4,776 Square-Feet. 100% of the new impervious area will be treated. This area, in addition to existing impervious and developed areas, will drain to an Underdrained Subsurface Sand Filter, which includes a bed of Stormtech chambers and will store and treat runoff before discharging from the Site.

12.2.1 Underdrained Subsurface Sand Filter

Adequate provisions have been made to collect stormwater runoff from the project area via a series of catch basins and inlets, which drain to an Underdrained Subsurface Sand Filter (USSF) designed to store and treat stormwater volumes generated from the 2-year, 10-year, and 25-year 24-hour storm events. The stormwater is directed through the initial subsurface chamber rows, which are identified as the pretreatment isolator rows of the system, before the remainder of the chambers are filled hydraulically via the porous stone bedding and water infiltrates down through the sand filter; stormwater that is not discarded via infiltration into the subsurface soils will be hydraulically collected by an underdrain system and then discharged to an outlet control structure. When larger storm events occur and the chambers are full, stormwater will be directed over the weir wall within a drainage manhole and bypass the chamber system via a manifold system to the outlet control structure.

The USSF has been designed based on Chapter 7.3 of Volume III of the DEP Stormwater BMP Manual; calculations demonstrating compliance with the BMP design requirements have been included at the end of this Section. Based on the results of the geotechnical evaluation conducted by SW Cole in 2015, separation between the proposed USSF and bedrock/groundwater is not anticipated to be an issue.

On-site soils testing was also completed by a research hydrologist from the sustainable Environments Branch of the National Risk Management Research Laboratory at the Environmental Protection Agency. A City-wide study is being completed to determine the potential for using infiltration systems in the City. Based on the data from this study, we anticipate that the proposed USSF will promote infiltration; however, infiltration has not been modeled so that a conservative outflow estimate can be made for the flooding standard, as described in the following section.

12.3 FLOODING STANDARD (WATER QUANTITY)

The MaineDEP Chapter 500 Stormwater Regulations indicate that the stormwater management system must detain, retain, or result in the infiltration of the stormwater flows from the 24-hour storm of the 2-, 10- and 25-year frequencies such that peak flows from the post-development design of the site do not exceed those from the pre-development design. The proposed USSF will provide both detention and infiltration of stormwater flows, in compliance with the Flooding Standard.

Stormwater modeling was completed using the HydroCAD 10.00 Stormwater Modeling System by Applied Microcomputer Systems, which uses TR-20 runoff calculation methodology. The HydroCAD output for both the pre- and post-development models are attached to this Section. The new Chapter 500 Stormwater regulations, adopted in August 2015, define new standard rainfall amounts for the 2-year, 10-year and 25-year, 24-hour storm events; a Type III rainfall distribution was applied to the storm events.

Subcatchment drainage areas were delineated based on topographical information. HydroCAD provides a lookup table for curve number (CN), which is a measure of the retention and runoff properties of various surfaces based on the Hydrological Soil Group (HSG) and land cover type using TR-55 methodology. The HSG for the Site was taken from the USDA Natural Resources Conservation Service Web Soil Survey; the Site consists entirely of HSG Type A. The area of each land cover type was delineated utilizing topographical information and HydroCAD computed the final CN for each subcatchment based on an area-weighted average.

The Time of Concentration (Tc) is the time required for runoff to travel from the most hydrologically distant point of a watershed to the point of discharge. The Tc for each subcatchment drainage area was computed within HydroCAD using TR-55 methodology as the sum of the travel times for each consecutive flow segment along the longest hydraulic flow path. The longest hydraulic flow path was delineated utilizing contour data and partitioned into segments based on flow types, land cover, and slopes. The primary types of flow consist of sheet flow, shallow concentrated flow, and channel flows. A minimum Tc of five minutes was utilized for all subcatchments.

12.3.1 Pre-Development Conditions

As previously described, the Site is currently entirely developed by the Waynflete School campus. The Site slopes generally in the south-easterly direction and discharges towards the combined sewer system in Danforth Street, which will serve as the study point for the Site. Currently, there are two stormwater pipes entering the combined sewer system in Danforth Street, one at the catch basin located at the intersection of Danforth and Fletcher Streets, and one direct connection mid-block between Fletcher and Storer Street. The Pre-Development stormwater model consists of seven subcatchments. Existing subcatchment boundaries, drainage patterns, and features are shown on Figure 12-1, Pre-Development Drainage Area Plan.

12.3.2 Post-Development Conditions

The proposed drainage structures and features are shown on Figure 12-2, Post-Development Drainage Area Plan. The Post-Development Site has been delineated based on topography as eight subcatchments, similar to those in the Pre-Development model, all of which ultimately discharge to the combined sewer system in Danforth Street. The proposed project will eliminate the mid-block connection to the combined sewer, and will upgrade the connection to the catch basin at the Danforth and Fletcher intersection.

Adequate provisions have been made to collect and dispose of stormwater generated from the developed area of the Site. An USSF, which includes a bed of StormTech storage chambers, has been designed to store and treat stormwater volumes generated on-site. The HydroCAD Reports for both the Pre- and Post-Development conditions are attached to this Section. Table 12-2 below provides a summary of the peak runoff rates for the 24-hour, 2-year, 10-year, and 25-year Type III storm events. As shown below, there is a net decrease in the post-development rate of runoff during all storms at the Site's study point.

Table 12-2: Summary of Peak Runoff Rates

STUDY POINT (EXISTING COMBINED SEWER SYSTEM IN DANFORTH STREET)	PEAK RUNOFF RATE (CFS)		
	2-YEAR STORM	10-YEAR STORM	25-YEAR STORM
Pre-Development	3.85	6.95	9.54

Post-Development	1.91	3.66	5.39
Difference	-1.94	-3.29	-4.15

The proposed stormwater management system has been designed to decrease peak flow rates and to improve water quality. As the Site’s peak runoff rate has been reduced, the proposed development is not anticipated to result in adverse effects, including flooding and erosion, to abutting and downstream properties.

12.4 INSPECTION AND MAINTENANCE OF STORMWATER SYSTEMS

General inspection and maintenance during and after construction must take place in accordance with the requirements outlined in Chapter 500, Stormwater Management, Appendix B, Inspection and Maintenance and Stormwater Management, Maine Department of Environmental Protection publication No. DEPLW0738. The Waynflete School will be responsible for implementing the maintenance and inspection requirements for the stormwater management system associated with the new development. The USSF and associated stormwater infrastructure will be inspected and maintained per the guidance outlined herein.

In accordance with Ordinance Section 27-1536(2)(b), the Waynflete School will enter into a Drainage Maintenance Agreement with the City in a form acceptable to Corporation Counsel. A third-party person from the list of approved inspectors maintained by the Water Resource Protection Department with knowledge of stormwater management and erosion and sediment control, including the standards and conditions in the permit, shall conduct the inspections and perform maintenance of the facilities. On or by July 15th of each year, Certification that the stormwater management system has been inspected, cleaned, and maintained shall be submitted to the Director of Water Resource Protection in a form provided by that Department.

The inspection and maintenance criteria outlined in Chapter 500 Stormwater Regulations will be followed. Monitoring and maintenance is critical for the proper operation of the USSF and StormTech chamber system. First year post-construction monitoring differs primarily by its increased frequency to assure proper system functioning. Post-construction routine monitoring is based on USEPA requirements for good housekeeping practices.

Post-Construction: Inspection frequency should be at least once every six months and after every major storm in the first year following construction.

- Ensure system drains within 24-36 hours; and
- Clean pre-treatment devices and remove debris and sediment buildup from Isolator Rows as needed (when the average depth of sediment throughout the length of the Isolator Row exceeds three inches).

Trash, debris, and sediment shall be removed from storm drain pipes as needed on a semi-annual basis. In addition to the inspection and maintenance of stormwater systems, paved areas will be inspected annually each spring. Periodic sweeping of pavement will reduce the amount of sediment available to enter the USSF, in turn reducing the need to clean the Stormwater system.

12.5 ATTACHMENTS

- Stormwater Erosion & Sedimentation Control Inspection Report Form
- USSF Design Calculations
- Figure 12.1 Pre-Development Drainage Area Plan
- Figure 12.2 Post-Development Drainage Area Plan
- Pre-Development HydroCAD Report
- Post-Development HydroCAD Report



**STORMWATER EROSION & SEDIMENTATION CONTROL
INSPECTION REPORT FORM**

Inspectors:

Date: ___ / ___ / ___

_____ of _____ (Project Owner)

_____ of _____ (Contractor)

_____ of _____

_____ of _____

Storm Event? Yes No Rainfall Amount _____ Storm Duration _____ hours

Visual Observations of Activity and Site Conditions:

Disturbed Soil Areas:

Storage Of Soils:

Sediment & Erosion Control Measures:

Construction Site Entrance:

Surface Stabilization:

Corrective Actions Taken

Attachments (if any):

Signature:

Representing:

Representing:



41 HUTCHINS DRIVE
 PORTLAND, MAINE 04102
 TEL. (207) 774-2112
 FAX (207) 774-6635

CLIENT Scott Simons Architects
 PROJECT Wynnflete School Campus Upgrades
 DESIGNED BY AEA DATE 2-1-16
 CHECKED BY _____ DATE _____
 PROJECT NO. 229423 SHEET NO. 1 OF 1

Underdrained Subsurface Sand Filter Design Calculations

Per Chapter 7.3 of Volume III of the Maine DEP Stormwater BMP Manual

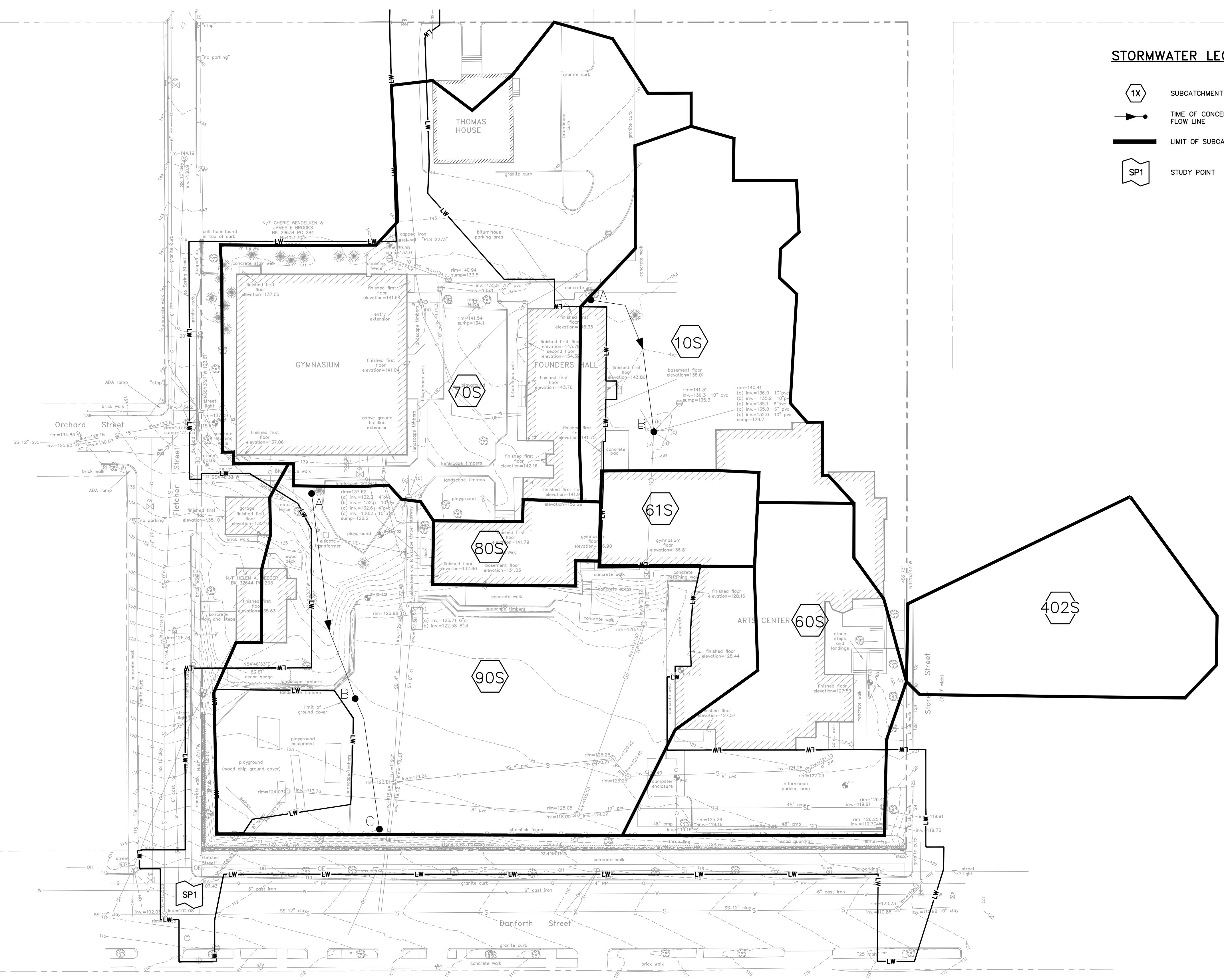
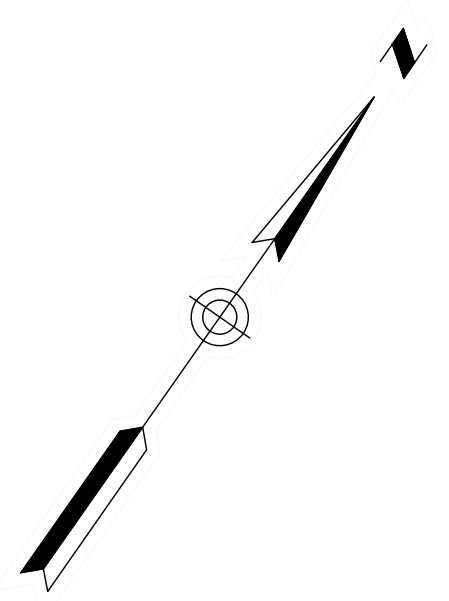
Treatment Volume: $(1" \times \text{Impervious Area}) + (0.4" \times \text{Pervious Area})$
 Impervious Area = 42,442 SF
 Pervious Area = 11,465 SF
 → Treatment Volume Req'd = 3,919 CF ✓OK
 Provided = 4,019 CF ✓

Impoundment Depth: Storage Provided @ Elevation ≤ 18"? Yes ✓OK


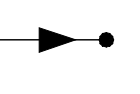


Surface Area: $5\% (\text{Impervious Area}) + 2\% (\text{Pervious Area})$
 → Surface Area Req'd = 2,351 SF
 Provided = 4,717 SF ✓OK

Isolator Row Sizing: Treatment Flow Rate (1-yr Storm) = $\frac{1.88 \text{ CFS}}{0.3 \text{ CFS}} \Rightarrow 6$
 MC-3500 Chambers = 0.3 CFS chambers Req'd
 # Chambers Provided = 12 ✓OK

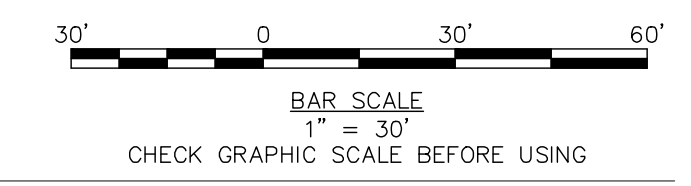
Release Time: System drains w/in 24-36 hours? 27 hours ✓OK



STORMWATER LEGEND

-  SUBCATCHMENT AREAS
-  TIME OF CONCENTRATION (Tc) FLOW LINE
-  LIMIT OF SUBCATCHMENT AREA
-  STUDY POINT

NOT FOR CONSTRUCTION

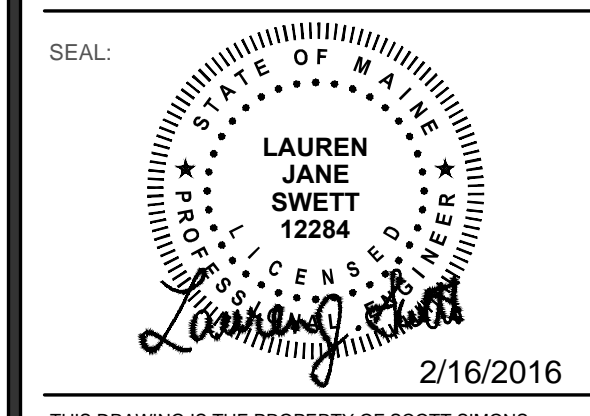


75 York Street
Portland, Maine 04101
simonsarchitects.com
207.772.4656



41 Hutchins Drive
Portland, Maine 04102
800.426.4262 | www.woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

PROJECT NAME:
**WAYNFLETE
GYM + LOWER SCHOOL**
NEW CONSTRUCTION
WAYNFLETE SCHOOL
360 SPRING STREET
PORTLAND, MAINE 04102



THIS DRAWING IS THE PROPERTY OF SCOTT SIMONS ARCHITECTS (SSA) AND IS NOT TO BE COPIED OR REPRODUCED IN PART OR WHOLE. © 2015 © SCOTT SIMONS ARCHITECTS, LLC

REVISION:

1	DATE
2	DATE
3	DATE
4	DATE
5	DATE
6	DATE

DATE OF ISSUE: FEBRUARY 2016
PROJECT NUMBER: 228423
STATUS: PLANNING BOARD SUBMISSION

**PRE
DEVELOPMENT
DRAINAGE AREA
PLAN**

PRE

PROJECT NAME:

**WAYNFLETE
GYM + LOWER SCHOOL**

NEW CONSTRUCTION

WAYNFLETE SCHOOL
360 SPRING STREET
PORTLAND, MAINE 04102

SEAL:



THIS DRAWING IS THE PROPERTY OF SCOTT SIMONS ARCHITECTS (SSA) AND IS NOT TO BE COPIED OR REPRODUCED IN PART OR WHOLE. © 2015 © SCOTT SIMONS ARCHITECTS, LLC

REVISION:





1	DATE
2	DATE
3	DATE
4	DATE
5	DATE
6	DATE

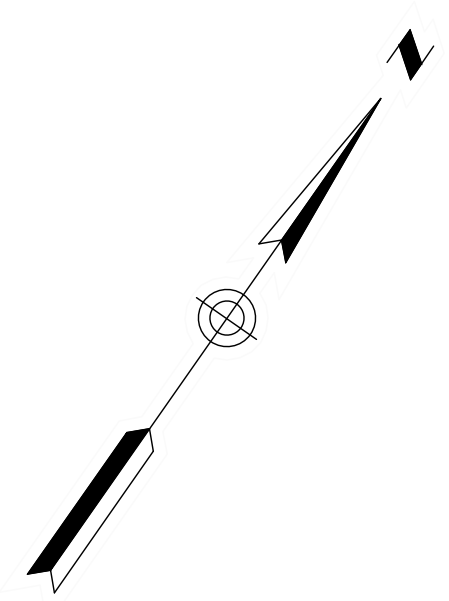
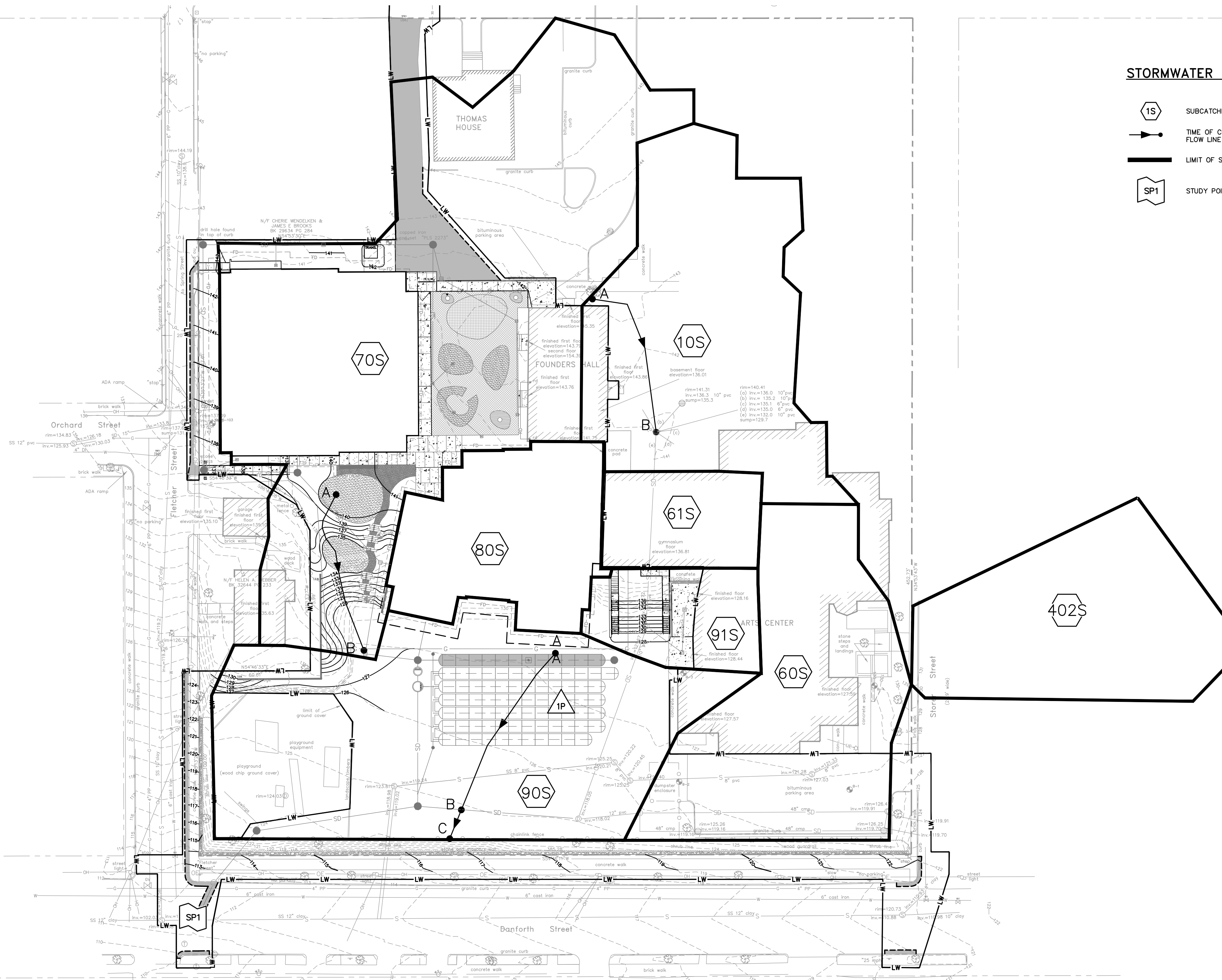
DATE OF ISSUE: FEBRUARY 2016
PROJECT NUMBER: 228423
STATUS: PLANNING BOARD SUBMISSION

**POST
DEVELOPMENT
DRAINAGE AREA
PLAN**

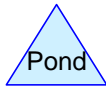
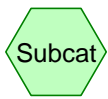
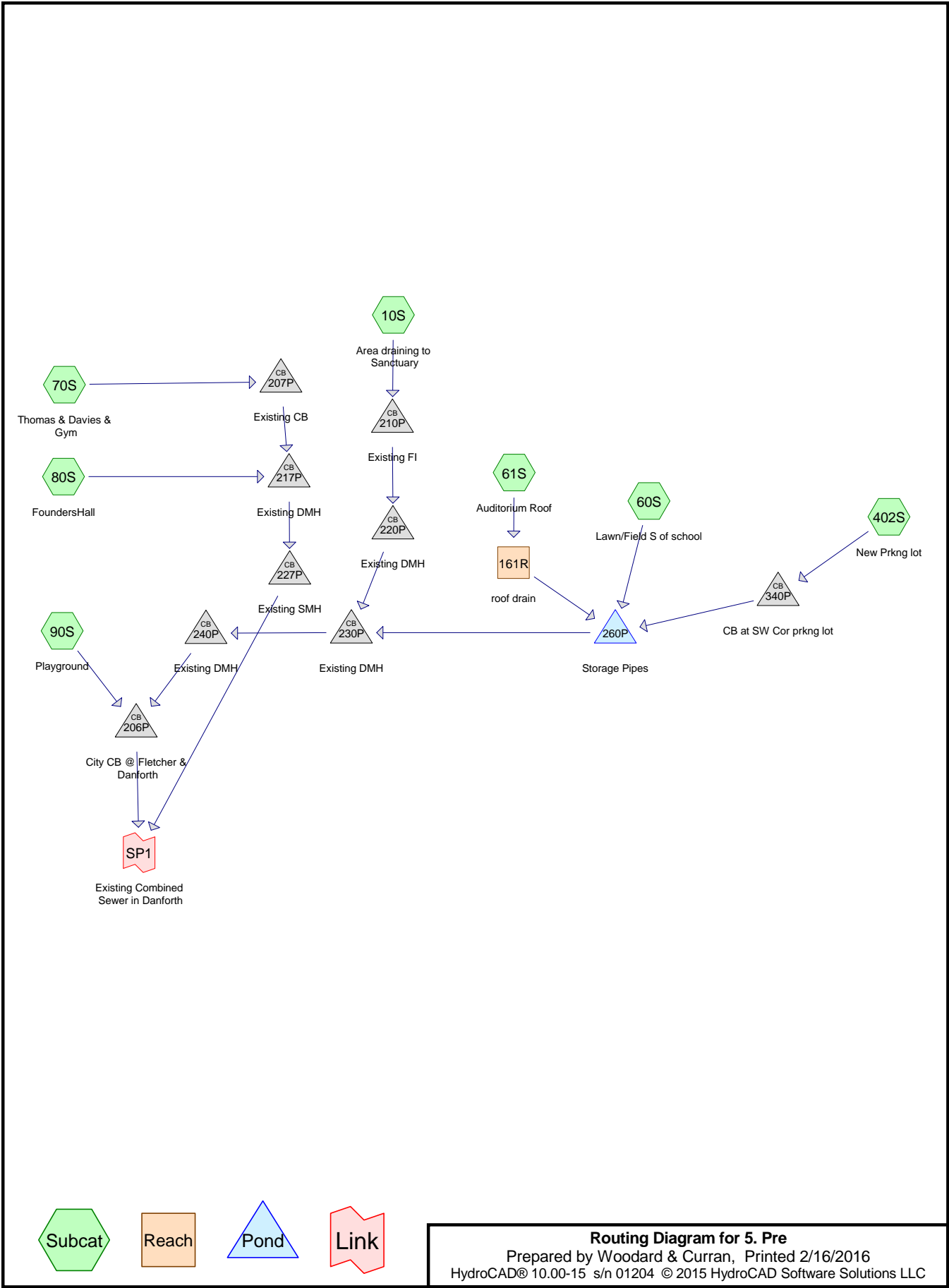
POST

STORMWATER LEGEND

-  SUBCATCHMENT AREAS
-  TIME OF CONCENTRATION (Tc)
FLOW LINE
-  LIMIT OF SUBCATCHMENT AREA
-  STUDY POINT



NOT FOR CONSTRUCTION



Routing Diagram for 5. Pre
 Prepared by Woodard & Curran, Printed 2/16/2016
 HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

5. Pre

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.14	98	Impervious (402S)
1.13	39	Lawn/field, HSG A (10S, 60S, 70S, 90S)
0.09	39	Pervious (402S)
0.18	98	Roof runoff (61S, 80S)
1.59	98	impervious (10S, 60S, 70S, 90S)
3.14	75	TOTAL AREA

5. Pre

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

PRE
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 3

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 10S: Area draining to	Runoff Area=19,633 sf	57.01% Impervious	Runoff Depth>0.92"
Flow Length=91'	Slope=0.0300 '/'	Tc=7.7 min	CN=73
	Runoff=0.42 cfs	0.034 af	
Subcatchment 60S: Lawn/Field S of school	Runoff Area=16,715 sf	84.98% Impervious	Runoff Depth>1.99"
	Tc=5.0 min	CN=89	Runoff=0.92 cfs
			0.064 af
Subcatchment 61S: Auditorium Roof	Runoff Area=4,485 sf	100.00% Impervious	Runoff Depth>2.87"
	Tc=5.0 min	CN=98	Runoff=0.32 cfs
			0.025 af
Subcatchment 70S: Thomas & Davies &	Runoff Area=41,034 sf	78.01% Impervious	Runoff Depth>1.67"
	Tc=5.0 min	CN=85	Runoff=1.92 cfs
			0.131 af
Subcatchment 80S: FoundersHall	Runoff Area=3,498 sf	100.00% Impervious	Runoff Depth>2.87"
	Tc=5.0 min	CN=98	Runoff=0.25 cfs
			0.019 af
Subcatchment 90S: Playground	Runoff Area=41,240 sf	29.19% Impervious	Runoff Depth>0.25"
Flow Length=188'	Tc=14.6 min	CN=56	Runoff=0.09 cfs
			0.020 af
Subcatchment 402S: New Prkng lot	Runoff Area=10,240 sf	60.94% Impervious	Runoff Depth>1.03"
	Tc=5.0 min	CN=75	Runoff=0.28 cfs
			0.020 af
Reach 161R: roof drain	Avg. Flow Depth=0.15'	Max Vel=6.63 fps	Inflow=0.32 cfs
6.0" Round Pipe	n=0.013	L=129.0'	S=0.0911 '/'
	Capacity=1.69 cfs	Outflow=0.32 cfs	0.025 af
Pond 206P: City CB @ Fletcher & Danforth	Peak Elev=109.59'	Inflow=1.79 cfs	0.162 af
8.0" Round Culvert	n=0.013	L=18.0'	S=0.2750 '/'
	Outflow=1.79 cfs	0.162 af	
Pond 207P: Existing CB	Peak Elev=131.47'	Inflow=1.92 cfs	0.131 af
10.0" Round Culvert	n=0.010	L=60.0'	S=0.1287 '/'
	Outflow=1.92 cfs	0.131 af	
Pond 210P: Existing FI	Peak Elev=132.39'	Inflow=0.42 cfs	0.034 af
10.0" Round Culvert	n=0.010	L=102.0'	S=0.1008 '/'
	Outflow=0.42 cfs	0.034 af	
Pond 217P: Existing DMH	Peak Elev=125.48'	Inflow=2.17 cfs	0.150 af
8.0" Round Culvert	n=0.013	L=89.0'	S=0.0367 '/'
	Outflow=2.17 cfs	0.150 af	
Pond 220P: Existing DMH	Peak Elev=122.06'	Inflow=0.42 cfs	0.034 af
10.0" Round Culvert	n=0.010	L=108.0'	S=0.0335 '/'
	Outflow=0.42 cfs	0.034 af	
Pond 227P: Existing SMH	Peak Elev=121.98'	Inflow=2.17 cfs	0.150 af
8.0" Round Culvert	n=0.013	L=71.0'	S=0.2025 '/'
	Outflow=2.17 cfs	0.150 af	
Pond 230P: Existing DMH	Peak Elev=120.15'	Inflow=1.79 cfs	0.143 af
8.0" Round Culvert	n=0.010	L=156.0'	S=0.0272 '/'
	Outflow=1.79 cfs	0.143 af	
Pond 240P: Existing DMH	Peak Elev=115.91'	Inflow=1.79 cfs	0.143 af
8.0" Round Culvert	n=0.010	L=58.0'	S=0.0833 '/'
	Outflow=1.79 cfs	0.143 af	

5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 4

Pond 260P: Storage Pipes

Peak Elev=119.87' Storage=164 cf Inflow=1.52 cfs 0.108 af
12.0" Round Culvert n=0.010 L=30.0' S=0.0380 '/ Outflow=1.37 cfs 0.108 af

Pond 340P: CB at SW Cor prkng lot

Peak Elev=129.34' Inflow=0.28 cfs 0.020 af
8.0" Round Culvert n=0.010 L=56.0' S=0.1000 '/ Outflow=0.28 cfs 0.020 af

Link SP1: Existing Combined Sewer in Danforth

Inflow=3.85 cfs 0.313 af
Primary=3.85 cfs 0.313 af

Total Runoff Area = 3.14 ac Runoff Volume = 0.313 af Average Runoff Depth = 1.19"
38.86% Pervious = 1.22 ac 61.14% Impervious = 1.92 ac

5. Pre

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

PRE
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 5

Summary for Subcatchment 10S: Area draining to Sanctuary

Runoff = 0.42 cfs @ 12.12 hrs, Volume= 0.034 af, Depth> 0.92"

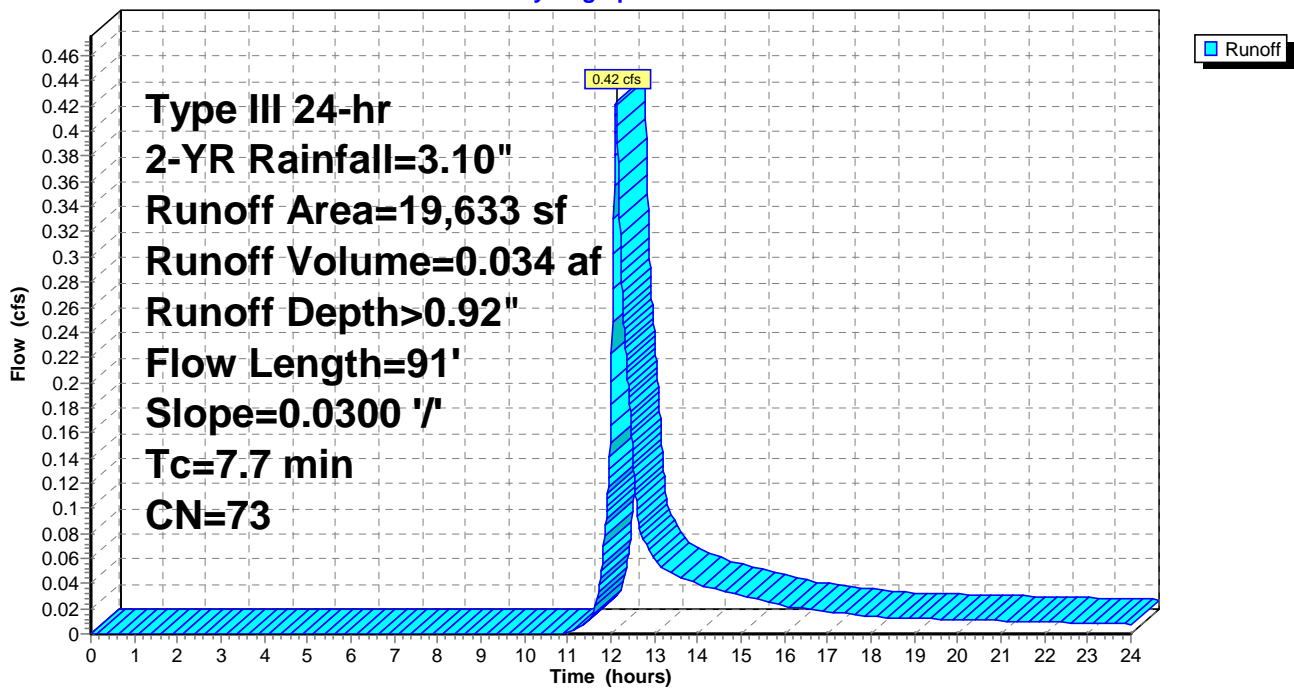
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	11,192	98	impervious
*	8,441	39	Lawn/field, HSG A
	19,633	73	Weighted Average
	8,441		42.99% Pervious Area
	11,192		57.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	91	0.0300	0.20		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.19"

Subcatchment 10S: Area draining to Sanctuary

Hydrograph



5. Pre

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

PRE
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 6

Summary for Subcatchment 60S: Lawn/Field S of school

Runoff = 0.92 cfs @ 12.07 hrs, Volume= 0.064 af, Depth> 1.99"

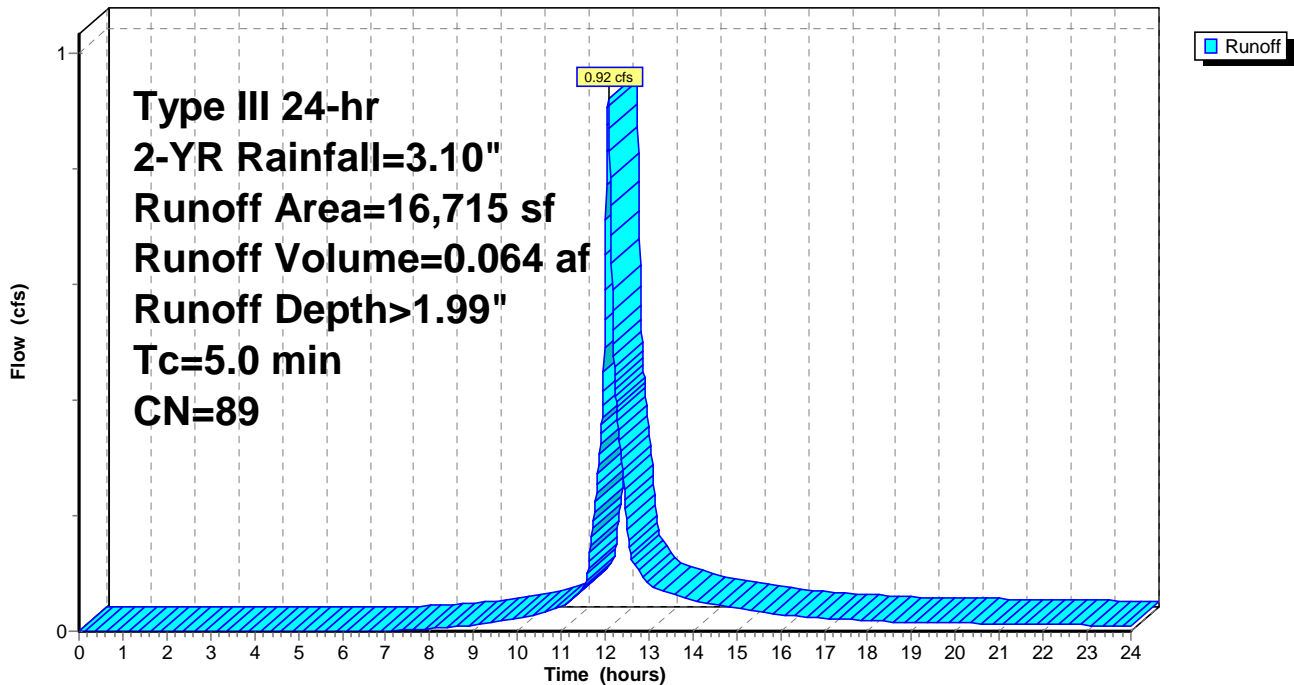
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	14,205	98	impervious
*	2,510	39	Lawn/field, HSG A
	16,715	89	Weighted Average
	2,510		15.02% Pervious Area
	14,205		84.98% Impervious Area

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

Subcatchment 60S: Lawn/Field S of school

Hydrograph



5. Pre

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

PRE
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 7

Summary for Subcatchment 61S: Auditorium Roof

Runoff = 0.32 cfs @ 12.07 hrs, Volume= 0.025 af, Depth> 2.87"

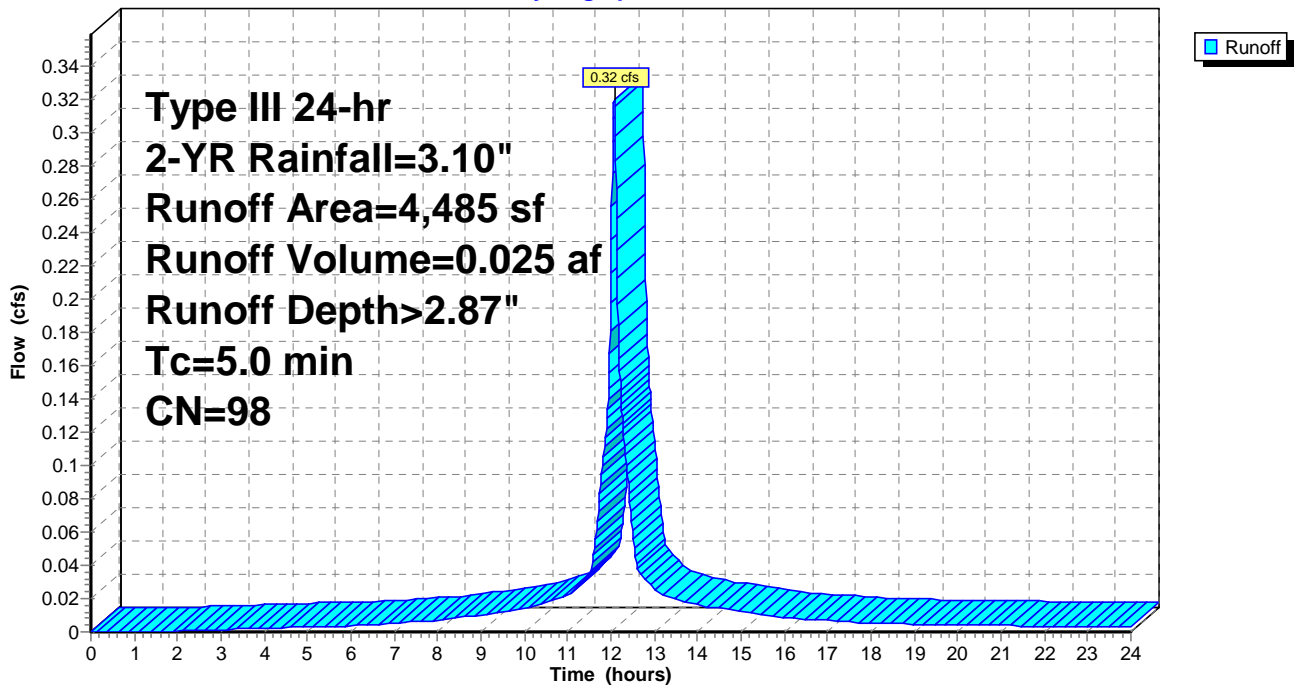
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
* 4,485	98	Roof runoff
4,485		100.00% Impervious Area

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

Subcatchment 61S: Auditorium Roof

Hydrograph



5. Pre

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

PRE
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 8

Summary for Subcatchment 70S: Thomas & Davies & Gym

Runoff = 1.92 cfs @ 12.08 hrs, Volume= 0.131 af, Depth> 1.67"

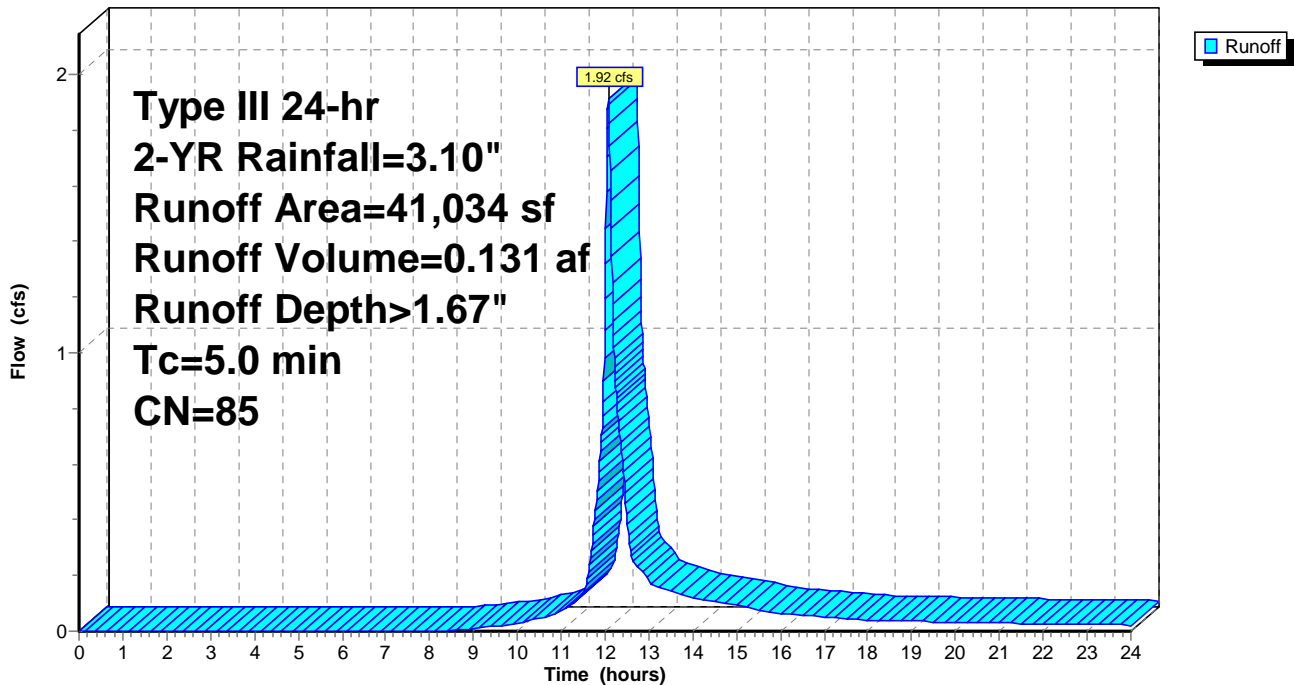
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	32,011	98	impervious
*	9,023	39	Lawn/field, HSG A
	41,034	85	Weighted Average
	9,023		21.99% Pervious Area
	32,011		78.01% Impervious Area

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

Subcatchment 70S: Thomas & Davies & Gym

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 9

Summary for Subcatchment 80S: FoundersHall

Runoff = 0.25 cfs @ 12.07 hrs, Volume= 0.019 af, Depth> 2.87"

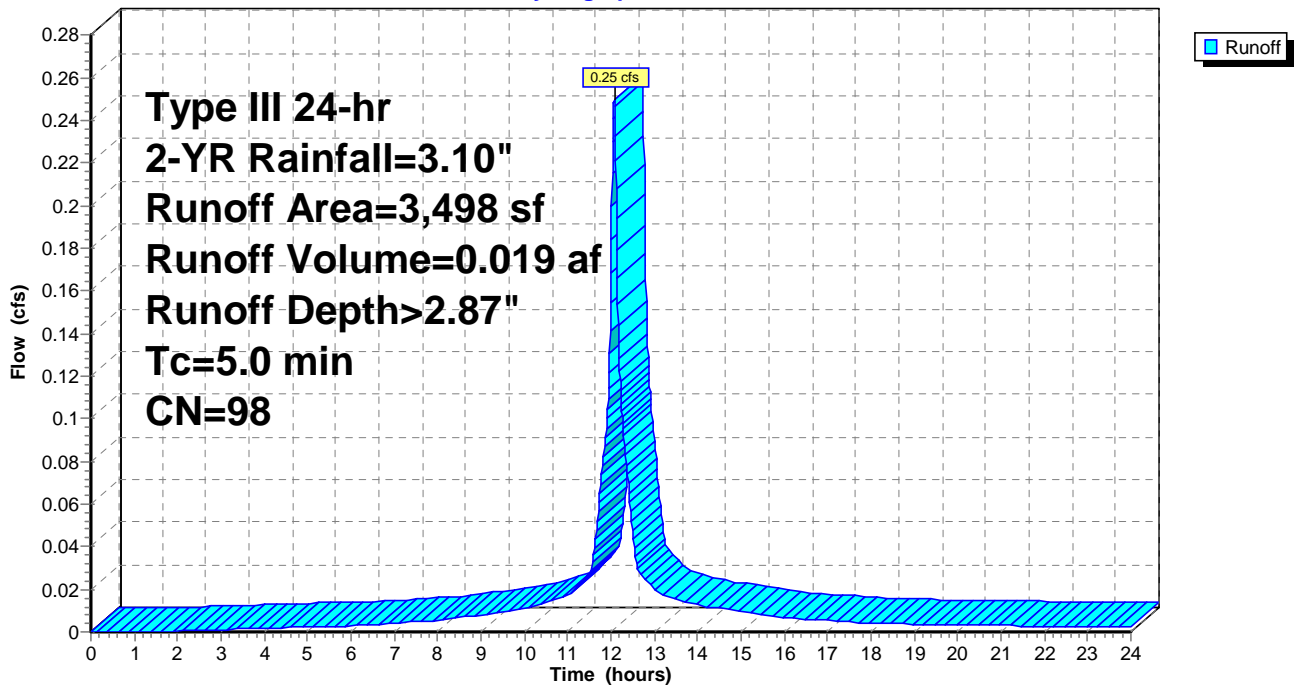
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	3,498	98	Roof runoff
	3,498		100.00% Impervious Area

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

Subcatchment 80S: FoundersHall

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 10

Summary for Subcatchment 90S: Playground

Runoff = 0.09 cfs @ 12.47 hrs, Volume= 0.020 af, Depth> 0.25"

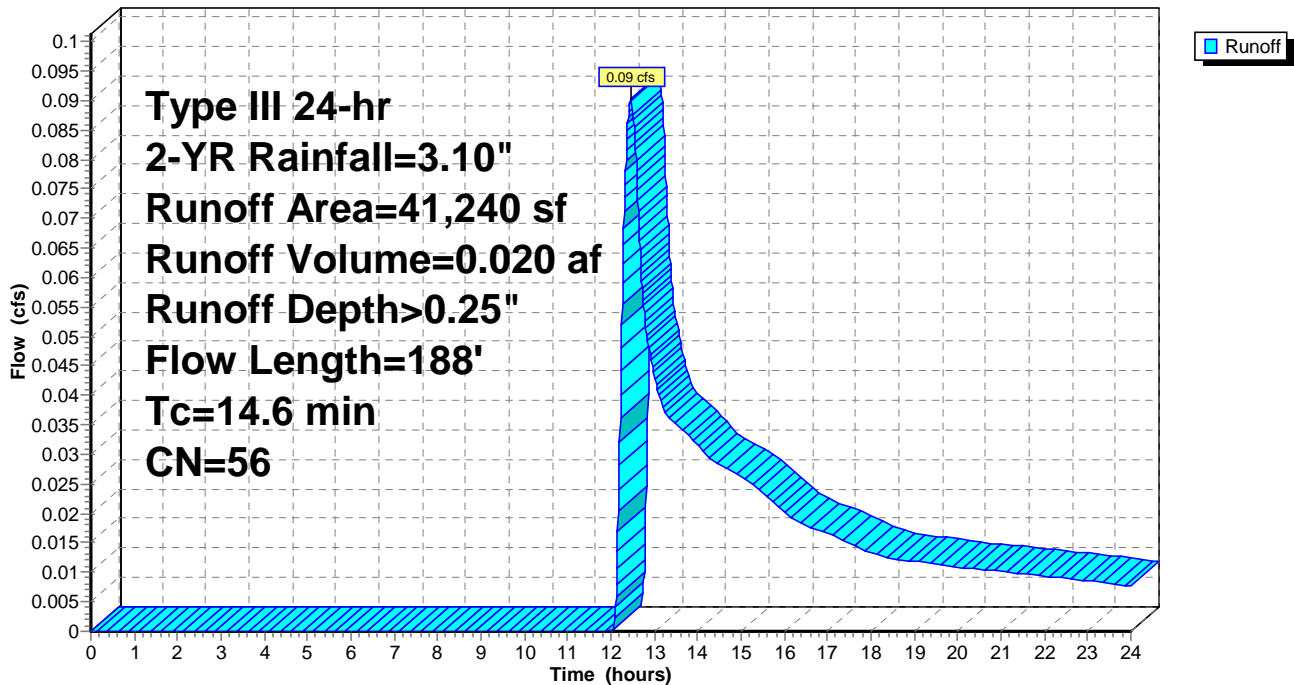
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	12,037	98	impervious
*	29,203	39	Lawn/field, HSG A
	41,240	56	Weighted Average
	29,203		70.81% Pervious Area
	12,037		29.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	100	0.0100	0.13		Sheet Flow, A-B
1.7	88	0.0154	0.87		Shallow Concentrated Flow, B-C
					Short Grass Pasture Kv= 7.0 fps
14.6	188	Total			

Subcatchment 90S: Playground

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 11

Summary for Subcatchment 402S: New Prkng lot

Runoff = 0.28 cfs @ 12.08 hrs, Volume= 0.020 af, Depth> 1.03"

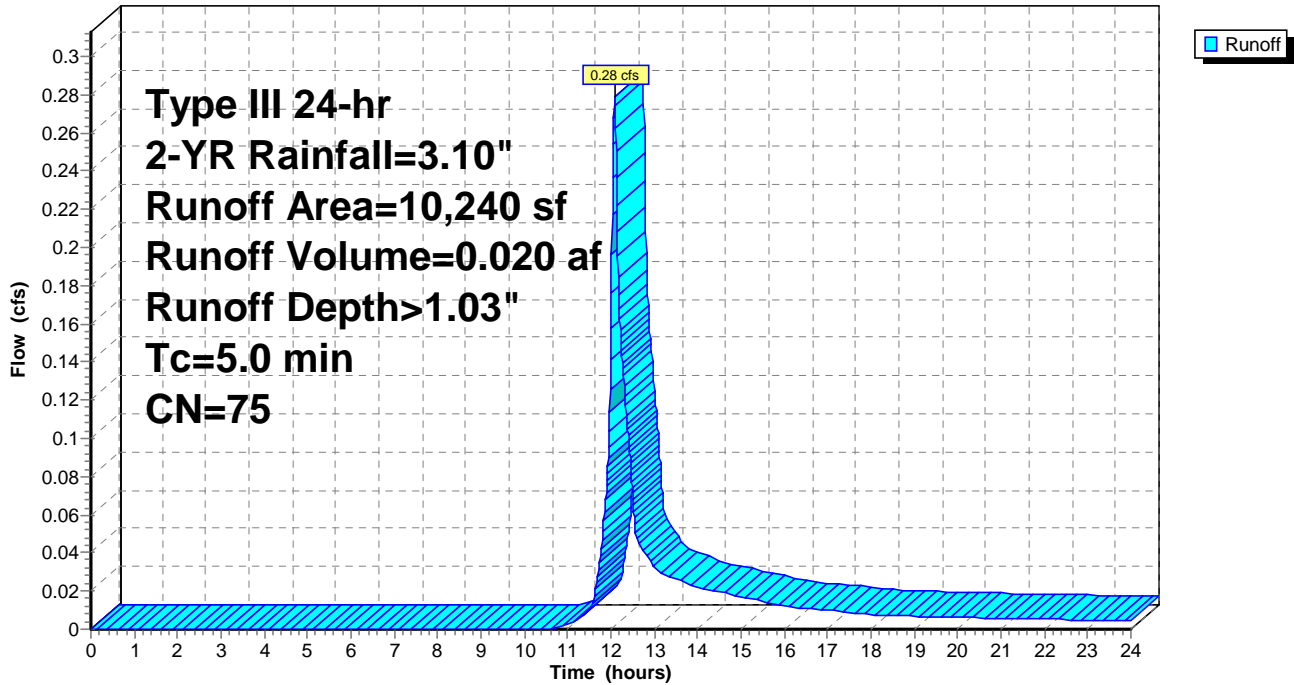
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	4,000	39	Pervious
*	6,240	98	Impervious
	10,240	75	Weighted Average
	4,000		39.06% Pervious Area
	6,240		60.94% Impervious Area

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

Subcatchment 402S: New Prkng lot

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 12

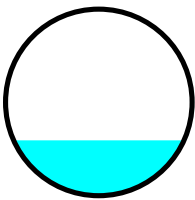
Summary for Reach 161R: roof drain

Inflow Area = 0.10 ac, 100.00% Impervious, Inflow Depth > 2.87" for 2-YR event
 Inflow = 0.32 cfs @ 12.07 hrs, Volume= 0.025 af
 Outflow = 0.32 cfs @ 12.08 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Max. Velocity= 6.63 fps, Min. Travel Time= 0.3 min
 Avg. Velocity = 2.17 fps, Avg. Travel Time= 1.0 min

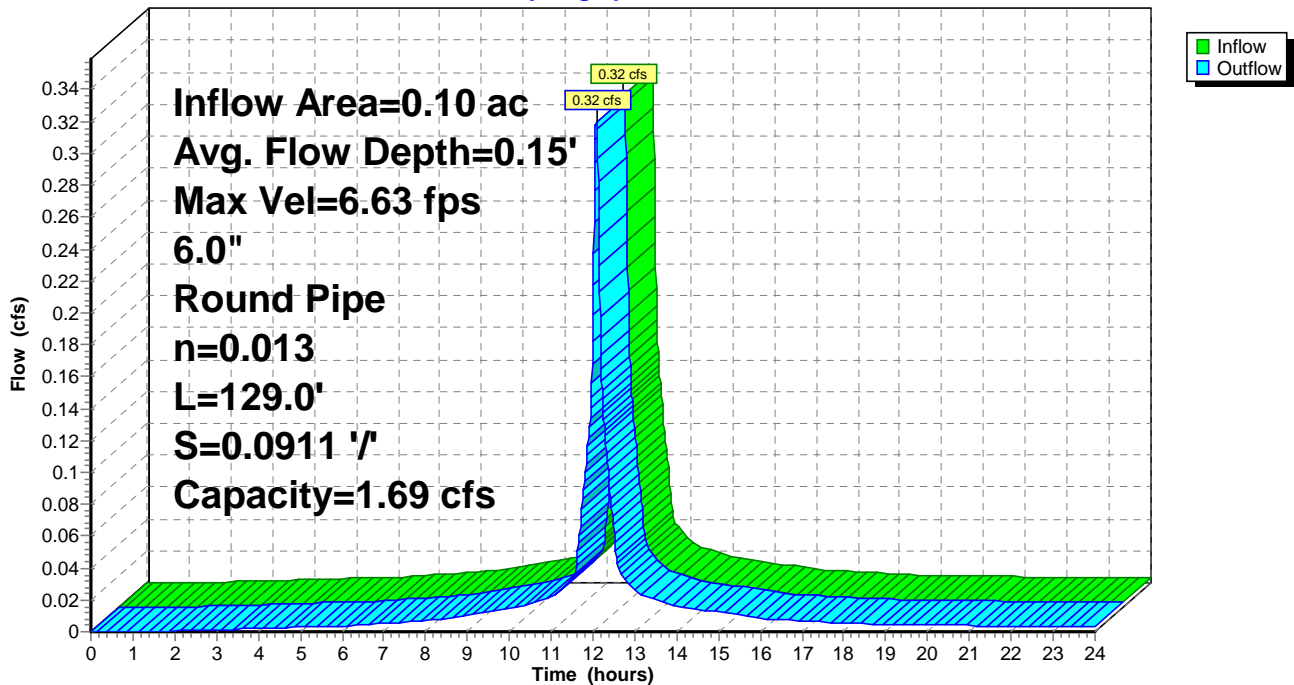
Peak Storage= 6 cf @ 12.07 hrs
 Average Depth at Peak Storage= 0.15'
 Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.69 cfs

6.0" Round Pipe
 n= 0.013 Corrugated PE, smooth interior
 Length= 129.0' Slope= 0.0911 '/'
 Inlet Invert= 130.00', Outlet Invert= 118.25'



Reach 161R: roof drain

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 13

Summary for Pond 206P: City CB @ Fletcher & Danforth

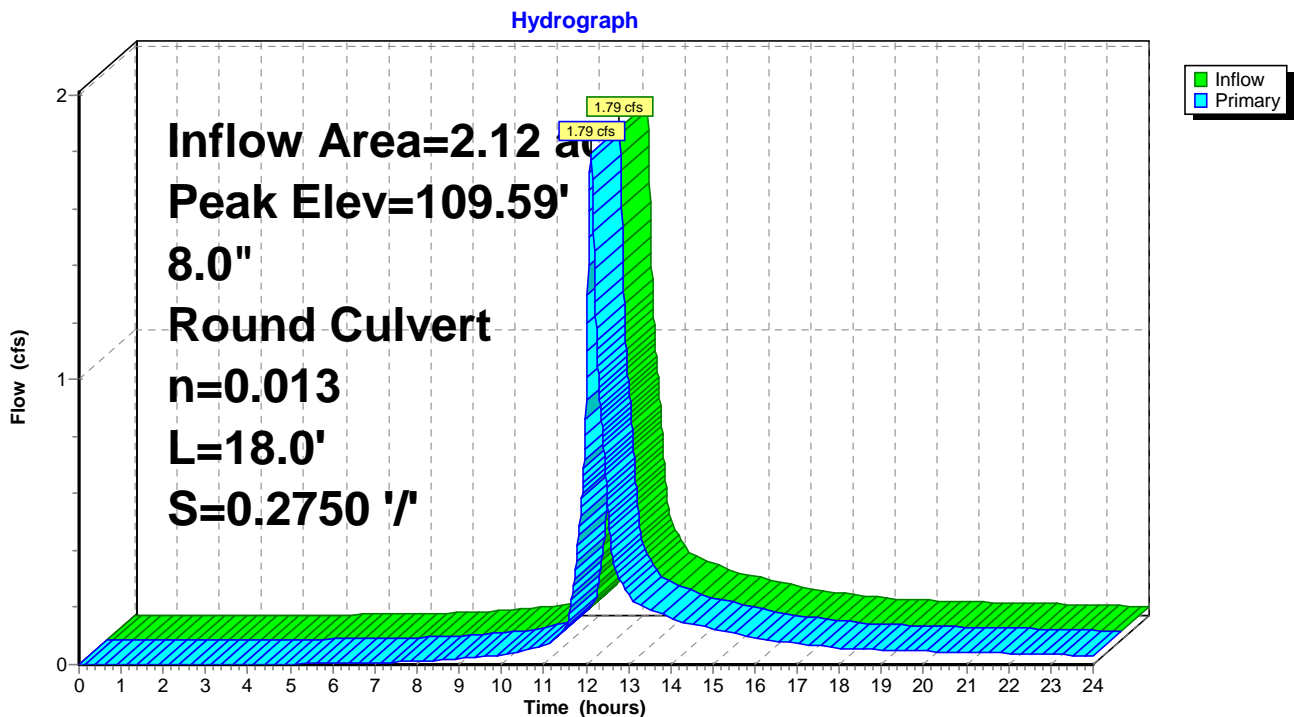
Inflow Area = 2.12 ac, 52.17% Impervious, Inflow Depth > 0.92" for 2-YR event
 Inflow = 1.79 cfs @ 12.12 hrs, Volume= 0.162 af
 Outflow = 1.79 cfs @ 12.12 hrs, Volume= 0.162 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.79 cfs @ 12.12 hrs, Volume= 0.162 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 109.59' @ 12.12 hrs
 Flood Elev= 111.26'

Device #	Routing	Invert	Outlet Devices
#1	Primary	107.43'	8.0" Round Culvert L= 18.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 107.43' / 102.48' S= 0.2750 '/ Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.35 sf

Primary OutFlow Max=1.79 cfs @ 12.12 hrs HW=109.59' (Free Discharge)
 ←1=Culvert (Inlet Controls 1.79 cfs @ 5.13 fps)

Pond 206P: City CB @ Fletcher & Danforth



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 14

Summary for Pond 207P: Existing CB

Inflow Area = 0.94 ac, 78.01% Impervious, Inflow Depth > 1.67" for 2-YR event
 Inflow = 1.92 cfs @ 12.08 hrs, Volume= 0.131 af
 Outflow = 1.92 cfs @ 12.08 hrs, Volume= 0.131 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.92 cfs @ 12.08 hrs, Volume= 0.131 af

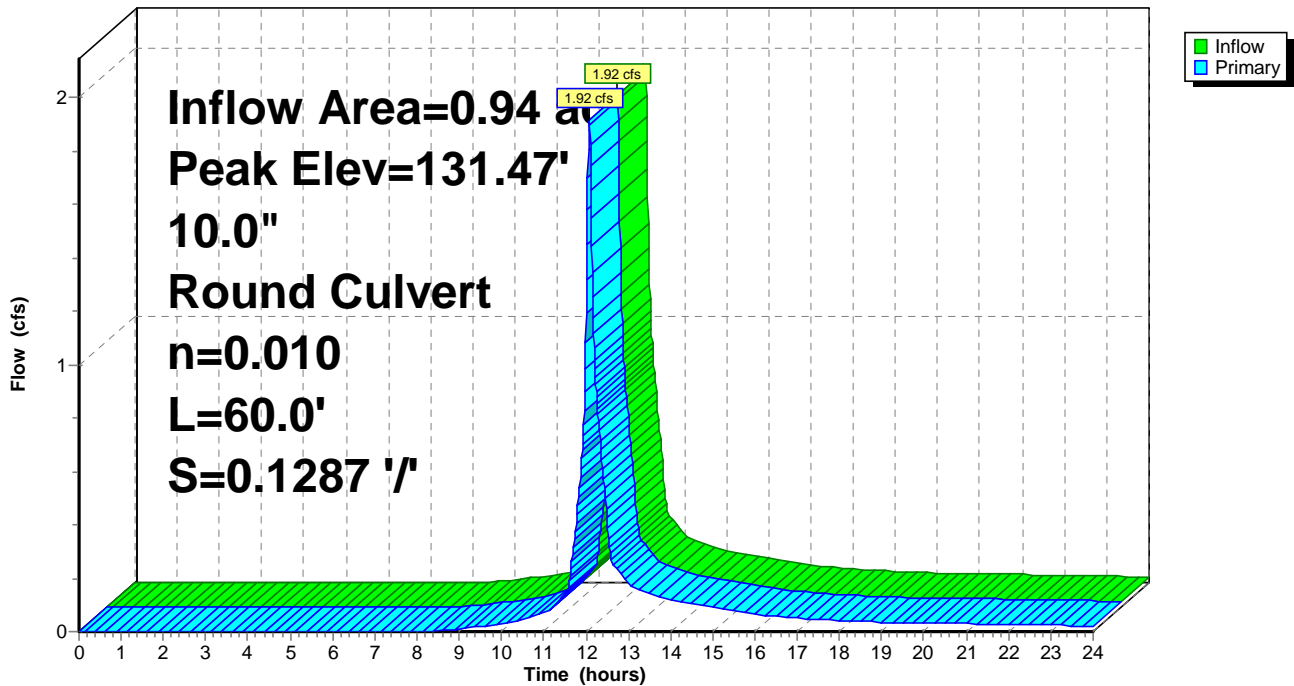
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 131.47' @ 12.08 hrs
 Flood Elev= 137.62'

Device #	Routing	Invert	Outlet Devices
1	Primary	130.20'	10.0" Round Culvert L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 130.20' / 122.48' S= 0.1287 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.91 cfs @ 12.08 hrs HW=131.47' (Free Discharge)
 ←1=Culvert (Inlet Controls 1.91 cfs @ 3.51 fps)

Pond 207P: Existing CB

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 15

Summary for Pond 210P: Existing FI

Inflow Area = 0.45 ac, 57.01% Impervious, Inflow Depth > 0.92" for 2-YR event
 Inflow = 0.42 cfs @ 12.12 hrs, Volume= 0.034 af
 Outflow = 0.42 cfs @ 12.12 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.42 cfs @ 12.12 hrs, Volume= 0.034 af

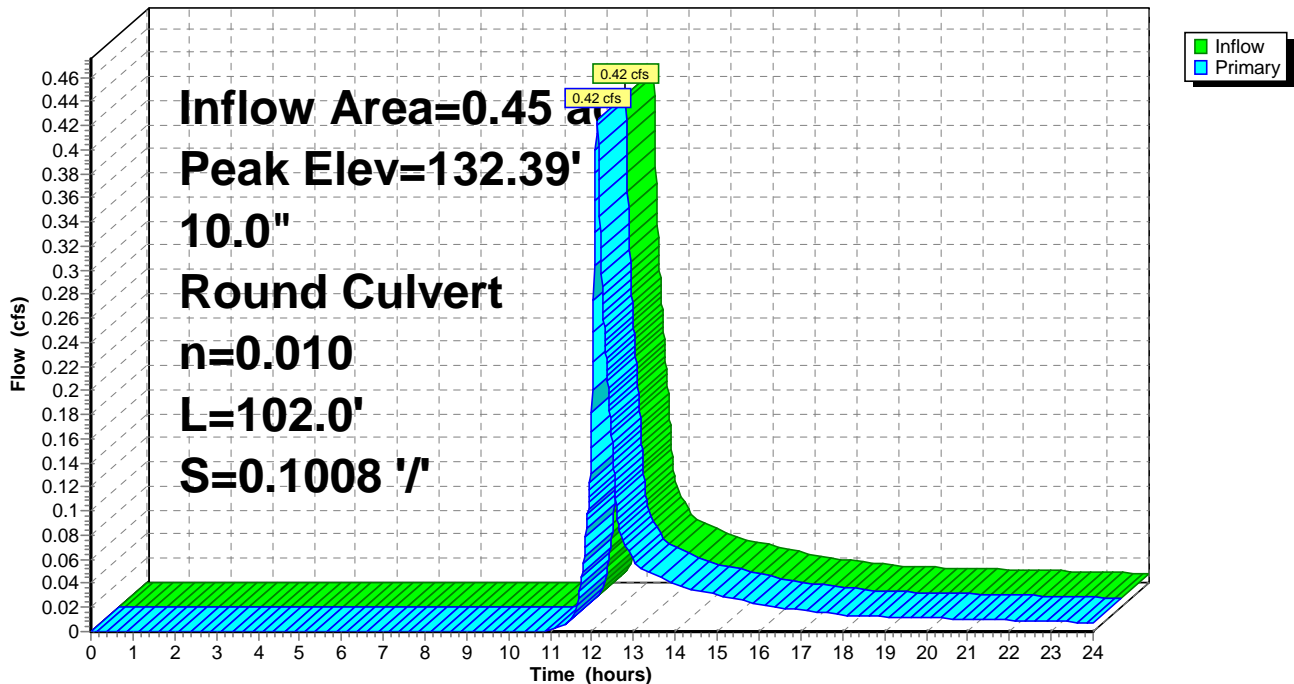
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 132.39' @ 12.12 hrs
 Flood Elev= 140.41'

Device #	Routing	Invert	Outlet Devices
#1	Primary	132.00'	10.0" Round Culvert L= 102.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 132.00' / 121.72' S= 0.1008 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=0.42 cfs @ 12.12 hrs HW=132.39' (Free Discharge)
 ↑1=Culvert (Inlet Controls 0.42 cfs @ 1.68 fps)

Pond 210P: Existing FI

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 16

Summary for Pond 217P: Existing DMH

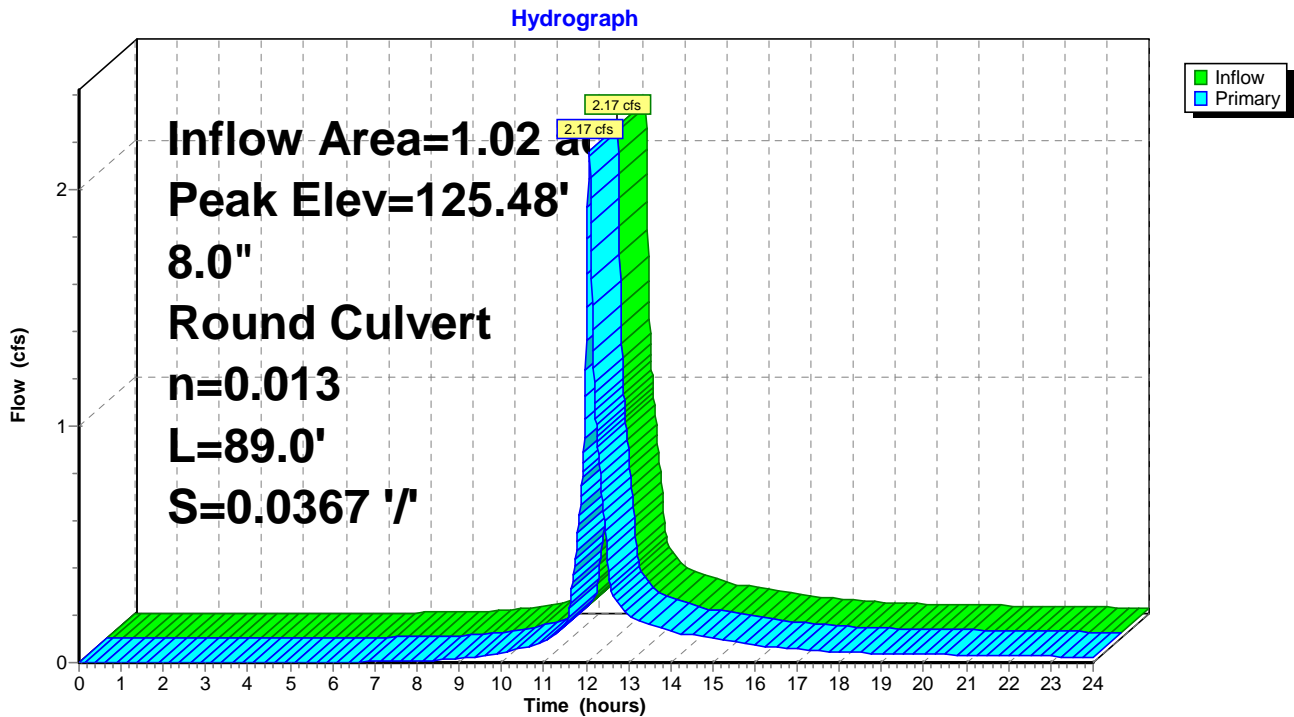
Inflow Area = 1.02 ac, 79.74% Impervious, Inflow Depth > 1.76" for 2-YR event
 Inflow = 2.17 cfs @ 12.07 hrs, Volume= 0.150 af
 Outflow = 2.17 cfs @ 12.07 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min
 Primary = 2.17 cfs @ 12.07 hrs, Volume= 0.150 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 125.48' @ 12.07 hrs
 Flood Elev= 126.98'

Device #	Routing	Invert	Outlet Devices
#1	Primary	122.48'	8.0" Round Culvert L= 89.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 122.48' / 119.21' S= 0.0367 '/ Cc= 0.900 n= 0.013 Cast iron, coated, Flow Area= 0.35 sf

Primary OutFlow Max=2.16 cfs @ 12.07 hrs HW=125.46' (Free Discharge)
 ↑1=Culvert (Inlet Controls 2.16 cfs @ 6.19 fps)

Pond 217P: Existing DMH



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 17

Summary for Pond 220P: Existing DMH

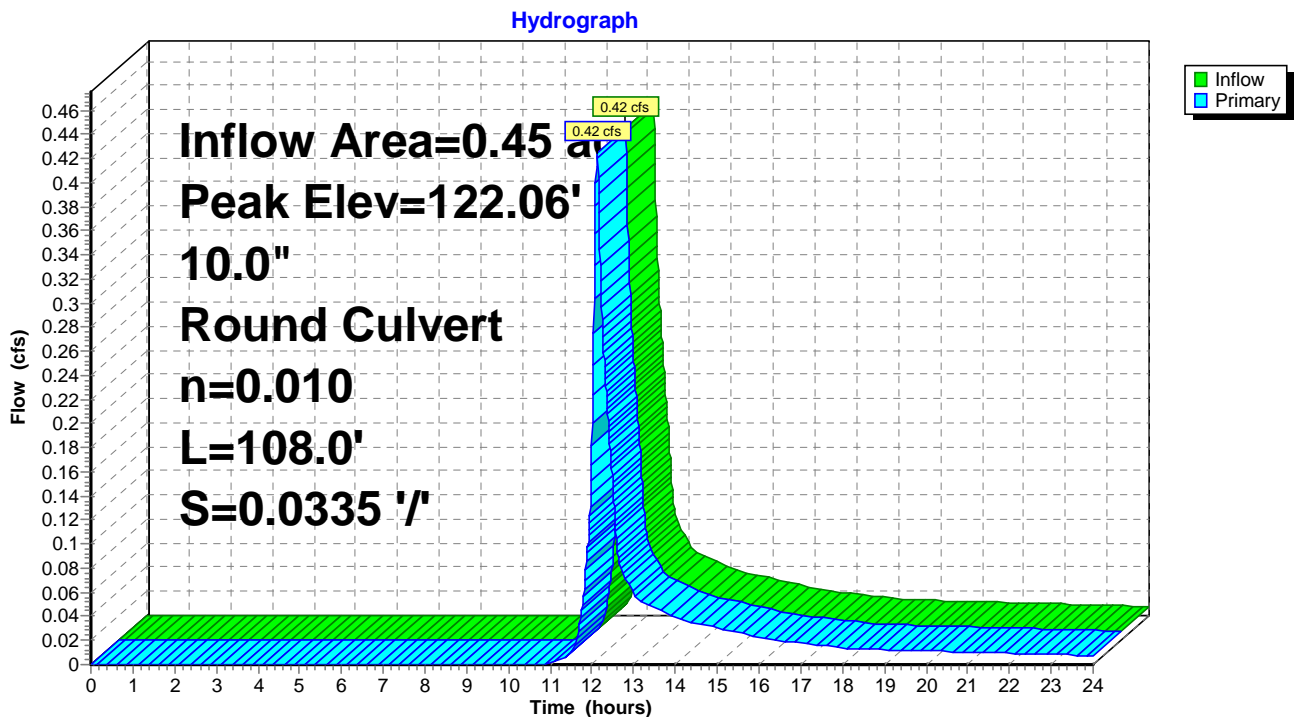
Inflow Area = 0.45 ac, 57.01% Impervious, Inflow Depth > 0.92" for 2-YR event
 Inflow = 0.42 cfs @ 12.12 hrs, Volume= 0.034 af
 Outflow = 0.42 cfs @ 12.12 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.42 cfs @ 12.12 hrs, Volume= 0.034 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 122.06' @ 12.12 hrs
 Flood Elev= 128.47'

Device #	Routing	Invert	Outlet Devices
#1	Primary	121.67'	10.0" Round Culvert L= 108.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 121.67' / 118.05' S= 0.0335 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=0.42 cfs @ 12.12 hrs HW=122.06' (Free Discharge)
 ←1=Culvert (Inlet Controls 0.42 cfs @ 1.68 fps)

Pond 220P: Existing DMH



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 18

Summary for Pond 227P: Existing SMH

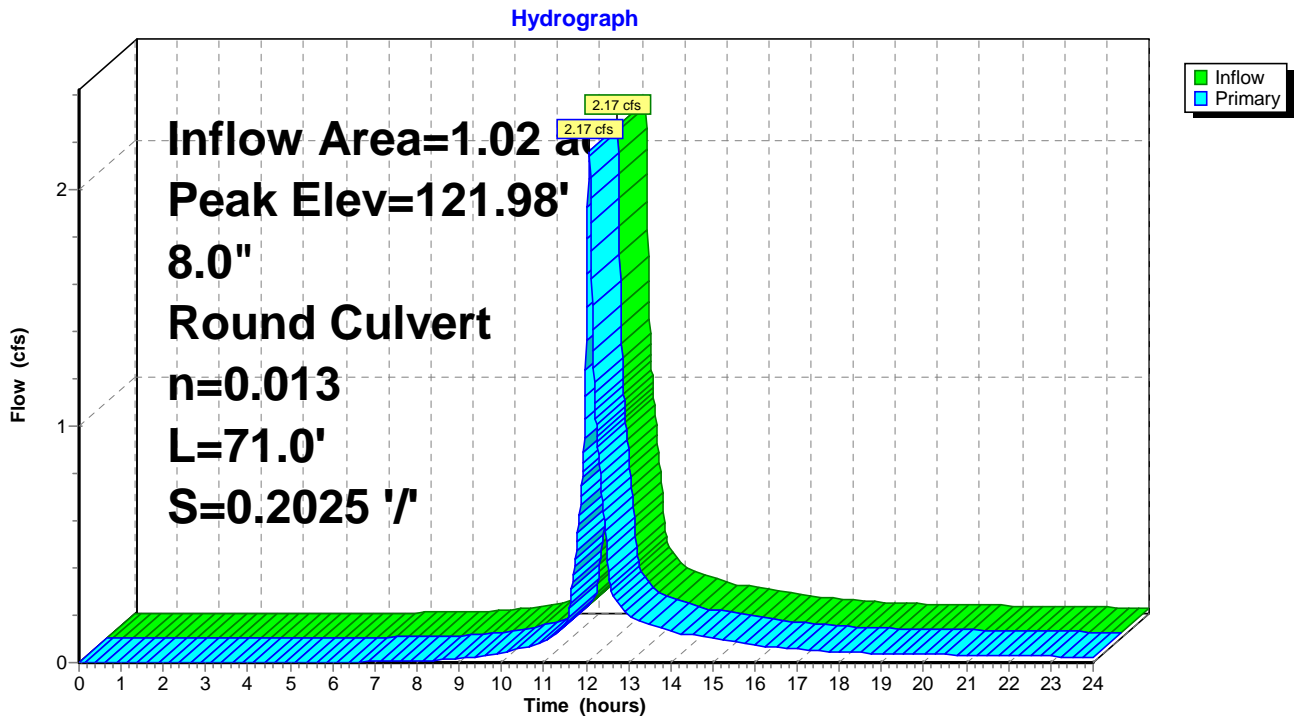
Inflow Area = 1.02 ac, 79.74% Impervious, Inflow Depth > 1.76" for 2-YR event
 Inflow = 2.17 cfs @ 12.07 hrs, Volume= 0.150 af
 Outflow = 2.17 cfs @ 12.07 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min
 Primary = 2.17 cfs @ 12.07 hrs, Volume= 0.150 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 121.98' @ 12.07 hrs
 Flood Elev= 123.81'

Device #	Routing	Invert	Outlet Devices
#1	Primary	118.98'	8.0" Round Culvert L= 71.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 118.98' / 104.60' S= 0.2025 '/ Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.35 sf

Primary OutFlow Max=2.16 cfs @ 12.07 hrs HW=121.96' (Free Discharge)
 ↑1=Culvert (Inlet Controls 2.16 cfs @ 6.19 fps)

Pond 227P: Existing SMH



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 19

Summary for Pond 230P: Existing DMH

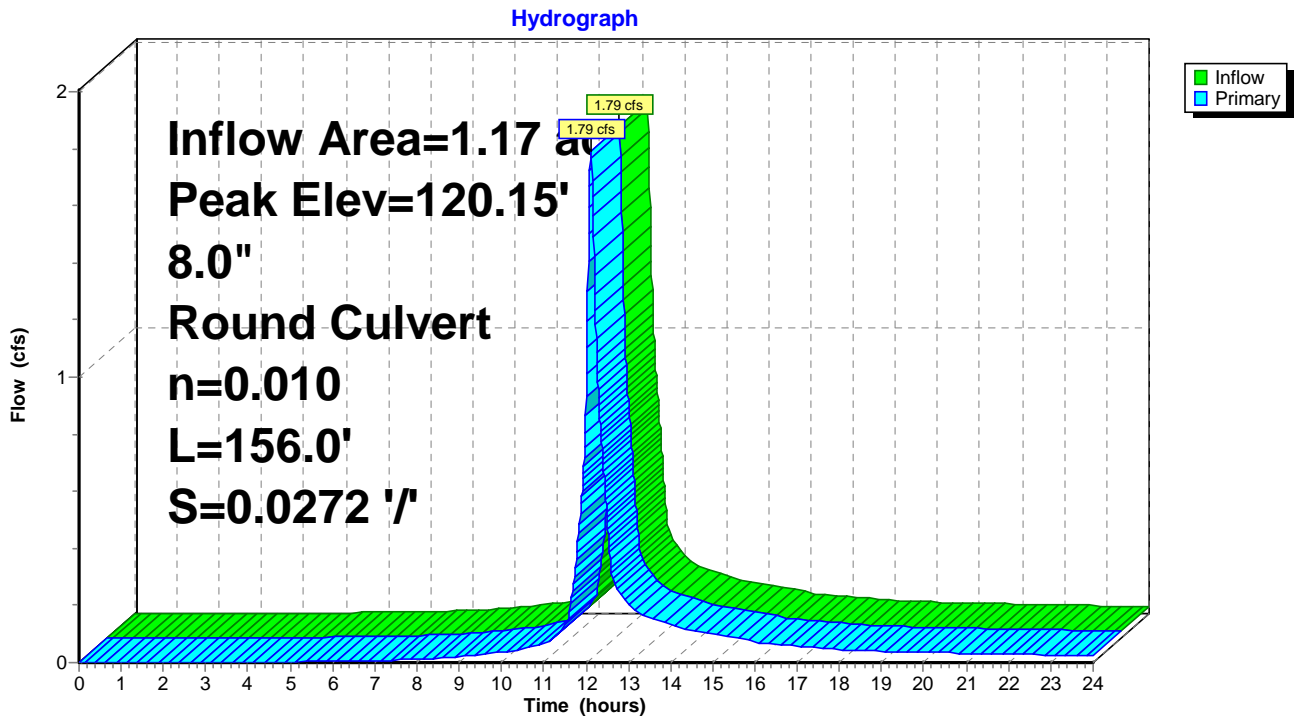
Inflow Area = 1.17 ac, 70.73% Impervious, Inflow Depth > 1.46" for 2-YR event
 Inflow = 1.79 cfs @ 12.12 hrs, Volume= 0.143 af
 Outflow = 1.79 cfs @ 12.12 hrs, Volume= 0.143 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.79 cfs @ 12.12 hrs, Volume= 0.143 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 120.15' @ 12.12 hrs
 Flood Elev= 125.05'

Device #	Routing	Invert	Outlet Devices
#1	Primary	118.00'	8.0" Round Culvert L= 156.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 118.00' / 113.76' S= 0.0272 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=1.79 cfs @ 12.12 hrs HW=120.15' (Free Discharge)
 ←1=Culvert (Inlet Controls 1.79 cfs @ 5.12 fps)

Pond 230P: Existing DMH



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 20

Summary for Pond 240P: Existing DMH

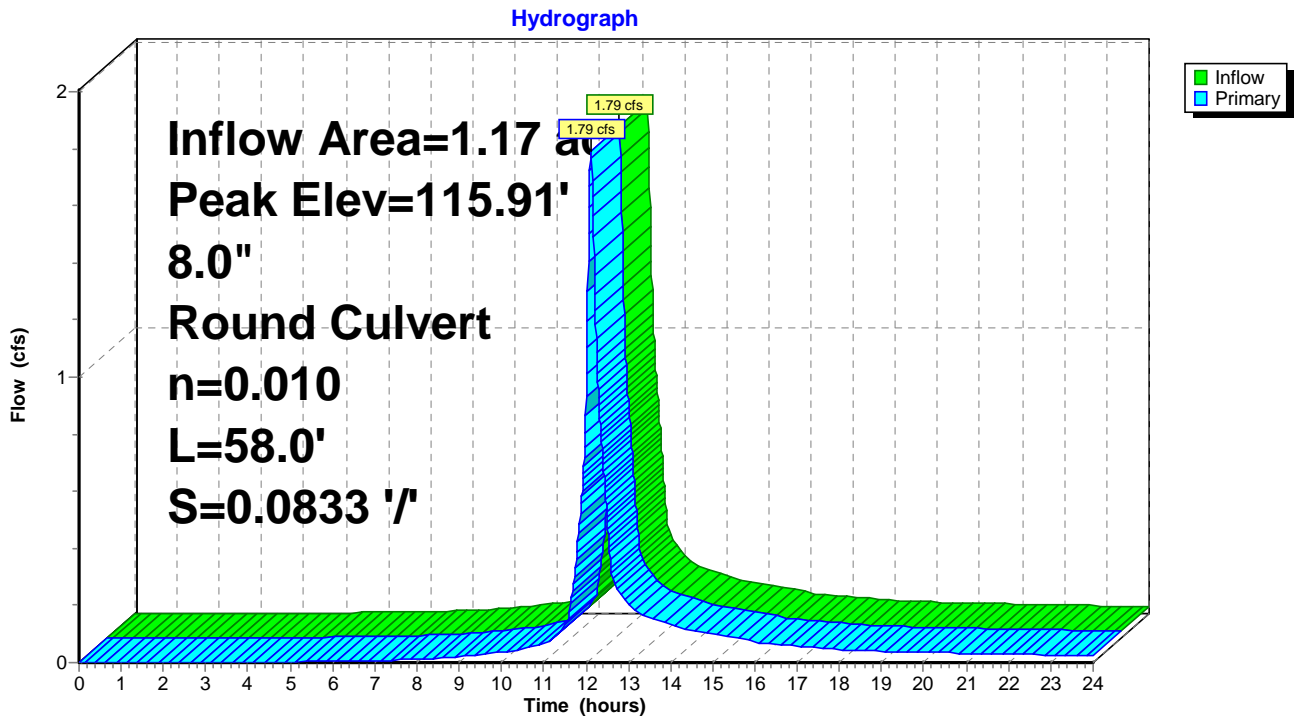
Inflow Area = 1.17 ac, 70.73% Impervious, Inflow Depth > 1.46" for 2-YR event
 Inflow = 1.79 cfs @ 12.12 hrs, Volume= 0.143 af
 Outflow = 1.79 cfs @ 12.12 hrs, Volume= 0.143 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.79 cfs @ 12.12 hrs, Volume= 0.143 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 115.91' @ 12.12 hrs
 Flood Elev= 124.03'

Device #	Routing	Invert	Outlet Devices
1	Primary	113.76'	8.0" Round Culvert L= 58.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 113.76' / 108.93' S= 0.0833 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=1.79 cfs @ 12.12 hrs HW=115.91' (Free Discharge)
 ←1=Culvert (Inlet Controls 1.79 cfs @ 5.12 fps)

Pond 240P: Existing DMH



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 21

Summary for Pond 260P: Storage Pipes

Inflow Area = 0.72 ac, 79.29% Impervious, Inflow Depth > 1.80" for 2-YR event
 Inflow = 1.52 cfs @ 12.08 hrs, Volume= 0.108 af
 Outflow = 1.37 cfs @ 12.11 hrs, Volume= 0.108 af, Atten= 10%, Lag= 2.3 min
 Primary = 1.37 cfs @ 12.11 hrs, Volume= 0.108 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 119.87' @ 12.11 hrs Surf.Area= 564 sf Storage= 164 cf
 Flood Elev= 125.26' Surf.Area= 0 sf Storage= 3,468 cf

Plug-Flow detention time= 1.1 min calculated for 0.108 af (100% of inflow)
 Center-of-Mass det. time= 1.0 min (808.5 - 807.5)

Volume	Invert	Avail.Storage	Storage Description
#1	119.16'	3,468 cf	48.0" Round Pipe Storage L= 276.0' S= 0.0027 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	119.16'	12.0" Round Culvert L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.16' / 118.02' S= 0.0380 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.36 cfs @ 12.11 hrs HW=119.87' (Free Discharge)
 ↑**1=Culvert** (Inlet Controls 1.36 cfs @ 2.27 fps)

5. Pre

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

PRE

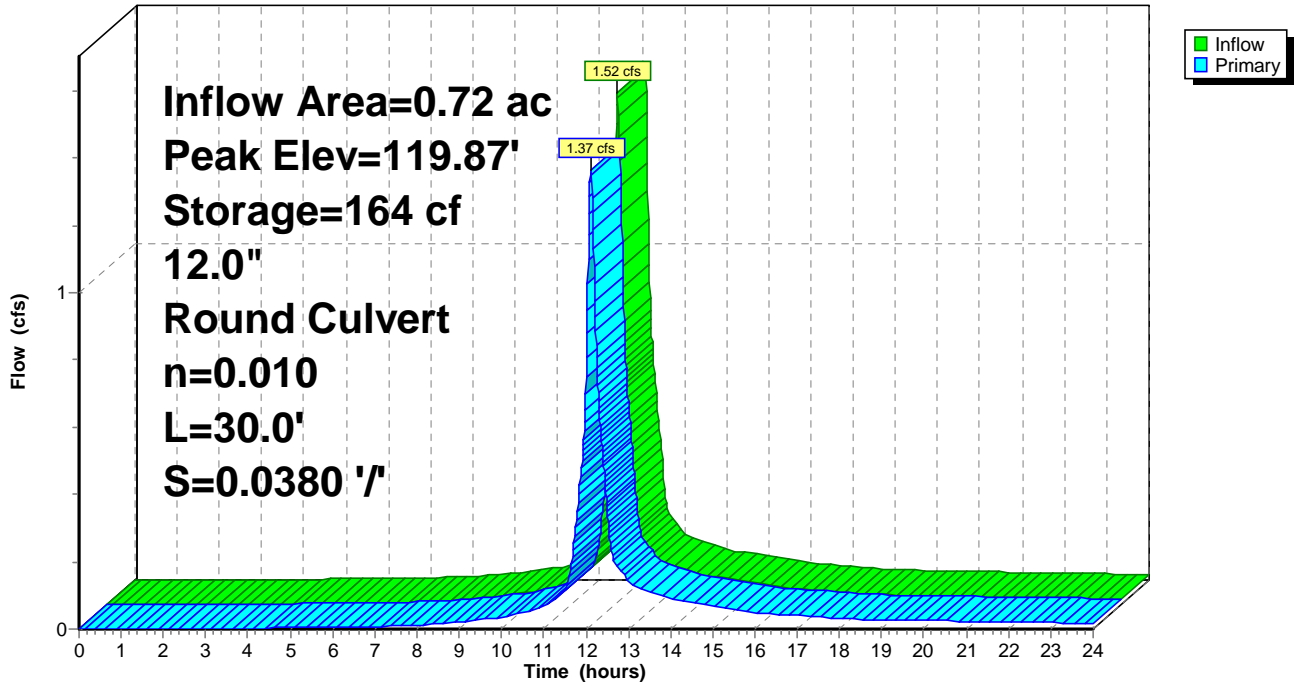
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 22

Pond 260P: Storage Pipes

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 23

Summary for Pond 340P: CB at SW Cor prkng lot

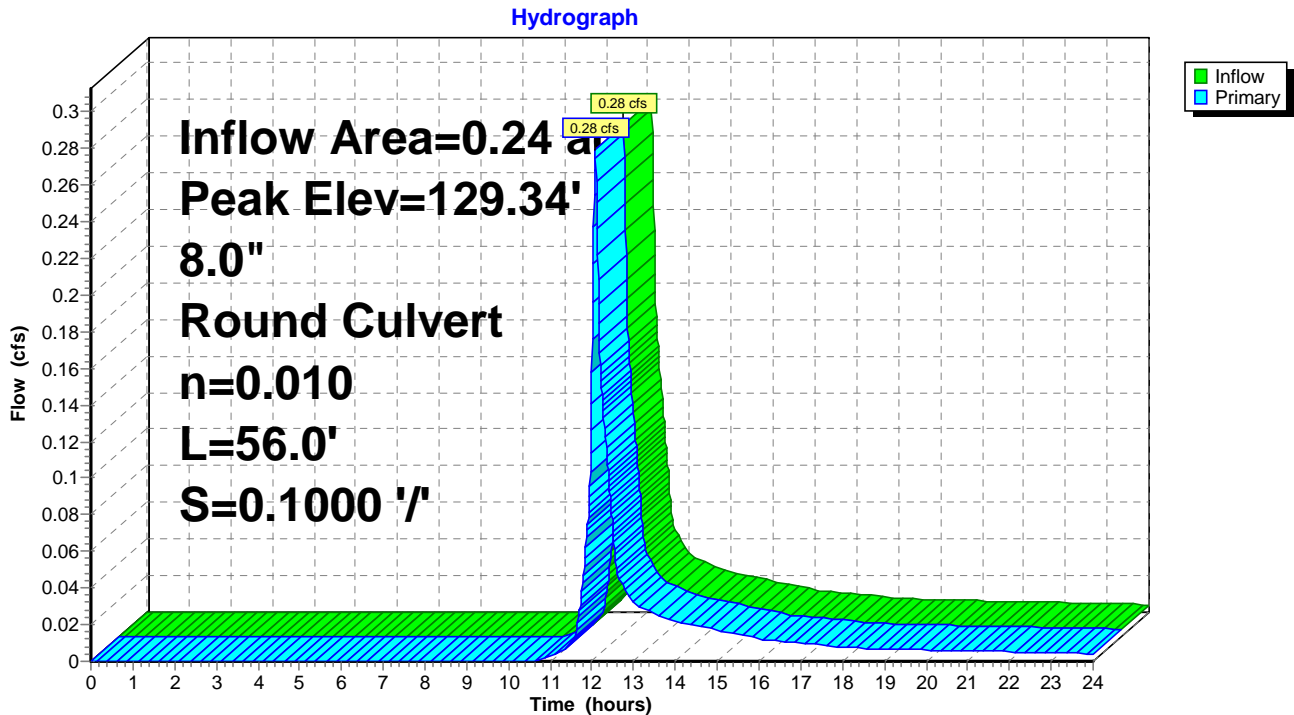
Inflow Area = 0.24 ac, 60.94% Impervious, Inflow Depth > 1.03" for 2-YR event
 Inflow = 0.28 cfs @ 12.08 hrs, Volume= 0.020 af
 Outflow = 0.28 cfs @ 12.08 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.28 cfs @ 12.08 hrs, Volume= 0.020 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 129.34' @ 12.08 hrs

Device #	Routing	Invert	Outlet Devices
1	Primary	129.00'	8.0" Round Culvert L= 56.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 129.00' / 123.40' S= 0.1000 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.28 cfs @ 12.08 hrs HW=129.34' (Free Discharge)
 1=Culvert (Inlet Controls 0.28 cfs @ 1.57 fps)

Pond 340P: CB at SW Cor prkng lot



5. Pre

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

PRE

Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

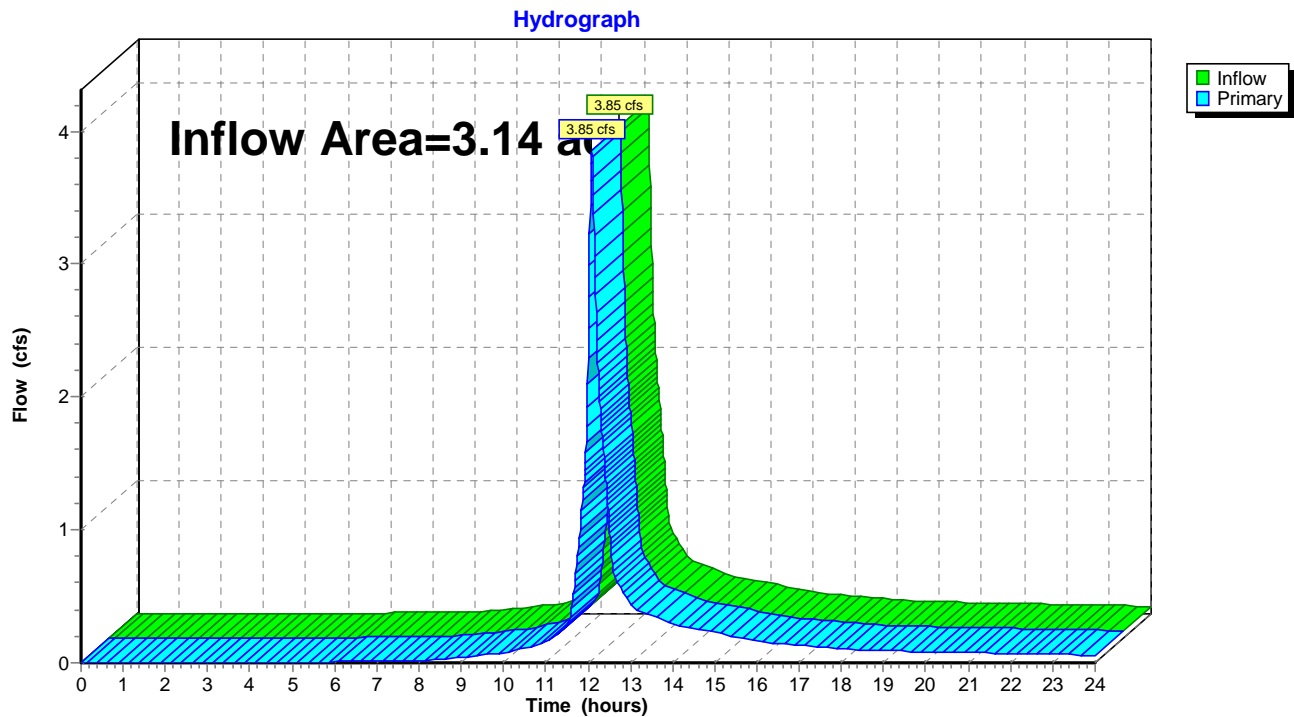
Page 24

Summary for Link SP1: Existing Combined Sewer in Danforth

Inflow Area = 3.14 ac, 61.14% Impervious, Inflow Depth > 1.19" for 2-YR event
Inflow = 3.85 cfs @ 12.09 hrs, Volume= 0.313 af
Primary = 3.85 cfs @ 12.09 hrs, Volume= 0.313 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link SP1: Existing Combined Sewer in Danforth



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 25

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 10S: Area draining to Runoff Area=19,633 sf 57.01% Impervious Runoff Depth>1.97"
Flow Length=91' Slope=0.0300 '/' Tc=7.7 min CN=73 Runoff=0.97 cfs 0.074 af

Subcatchment 60S: Lawn/Field S of school Runoff Area=16,715 sf 84.98% Impervious Runoff Depth>3.39"
Tc=5.0 min CN=89 Runoff=1.54 cfs 0.108 af

Subcatchment 61S: Auditorium Roof Runoff Area=4,485 sf 100.00% Impervious Runoff Depth>4.36"
Tc=5.0 min CN=98 Runoff=0.48 cfs 0.037 af

Subcatchment 70S: Thomas & Davies & Runoff Area=41,034 sf 78.01% Impervious Runoff Depth>3.00"
Tc=5.0 min CN=85 Runoff=3.41 cfs 0.235 af

Subcatchment 80S: FoundersHall Runoff Area=3,498 sf 100.00% Impervious Runoff Depth>4.36"
Tc=5.0 min CN=98 Runoff=0.37 cfs 0.029 af

Subcatchment 90S: Playground Runoff Area=41,240 sf 29.19% Impervious Runoff Depth>0.84"
Flow Length=188' Tc=14.6 min CN=56 Runoff=0.54 cfs 0.066 af

Subcatchment 402S: New Prkng lot Runoff Area=10,240 sf 60.94% Impervious Runoff Depth>2.13"
Tc=5.0 min CN=75 Runoff=0.60 cfs 0.042 af

Reach 161R: roof drain Avg. Flow Depth=0.18' Max Vel=7.42 fps Inflow=0.48 cfs 0.037 af
6.0" Round Pipe n=0.013 L=129.0' S=0.0911 '/' Capacity=1.69 cfs Outflow=0.48 cfs 0.037 af

Pond 206P: City CB @ Fletcher & Danforth Peak Elev=114.62' Inflow=3.48 cfs 0.327 af
8.0" Round Culvert n=0.013 L=18.0' S=0.2750 '/' Outflow=3.48 cfs 0.327 af

Pond 207P: Existing CB Peak Elev=133.32' Inflow=3.41 cfs 0.235 af
10.0" Round Culvert n=0.010 L=60.0' S=0.1287 '/' Outflow=3.41 cfs 0.235 af

Pond 210P: Existing FI Peak Elev=132.64' Inflow=0.97 cfs 0.074 af
10.0" Round Culvert n=0.010 L=102.0' S=0.1008 '/' Outflow=0.97 cfs 0.074 af

Pond 217P: Existing DMH Peak Elev=132.11' Inflow=3.79 cfs 0.265 af
8.0" Round Culvert n=0.013 L=89.0' S=0.0367 '/' Outflow=3.79 cfs 0.265 af

Pond 220P: Existing DMH Peak Elev=122.31' Inflow=0.97 cfs 0.074 af
10.0" Round Culvert n=0.010 L=108.0' S=0.0335 '/' Outflow=0.97 cfs 0.074 af

Pond 227P: Existing SMH Peak Elev=127.45' Inflow=3.79 cfs 0.265 af
8.0" Round Culvert n=0.013 L=71.0' S=0.2025 '/' Outflow=3.79 cfs 0.265 af

Pond 230P: Existing DMH Peak Elev=123.87' Inflow=3.12 cfs 0.261 af
8.0" Round Culvert n=0.010 L=156.0' S=0.0272 '/' Outflow=3.12 cfs 0.261 af

Pond 240P: Existing DMH Peak Elev=119.63' Inflow=3.12 cfs 0.261 af
8.0" Round Culvert n=0.010 L=58.0' S=0.0833 '/' Outflow=3.12 cfs 0.261 af

5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 26

Pond 260P: Storage Pipes

Peak Elev=120.18' Storage=377 cf Inflow=2.62 cfs 0.187 af
12.0" Round Culvert n=0.010 L=30.0' S=0.0380 '/ Outflow=2.16 cfs 0.187 af

Pond 340P: CB at SW Cor prkng lot

Peak Elev=129.54' Inflow=0.60 cfs 0.042 af
8.0" Round Culvert n=0.010 L=56.0' S=0.1000 '/ Outflow=0.60 cfs 0.042 af

Link SP1: Existing Combined Sewer in Danforth

Inflow=6.95 cfs 0.592 af
Primary=6.95 cfs 0.592 af

Total Runoff Area = 3.14 ac Runoff Volume = 0.592 af Average Runoff Depth = 2.26"
38.86% Pervious = 1.22 ac 61.14% Impervious = 1.92 ac

5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 27

Summary for Subcatchment 10S: Area draining to Sanctuary

Runoff = 0.97 cfs @ 12.11 hrs, Volume= 0.074 af, Depth> 1.97"

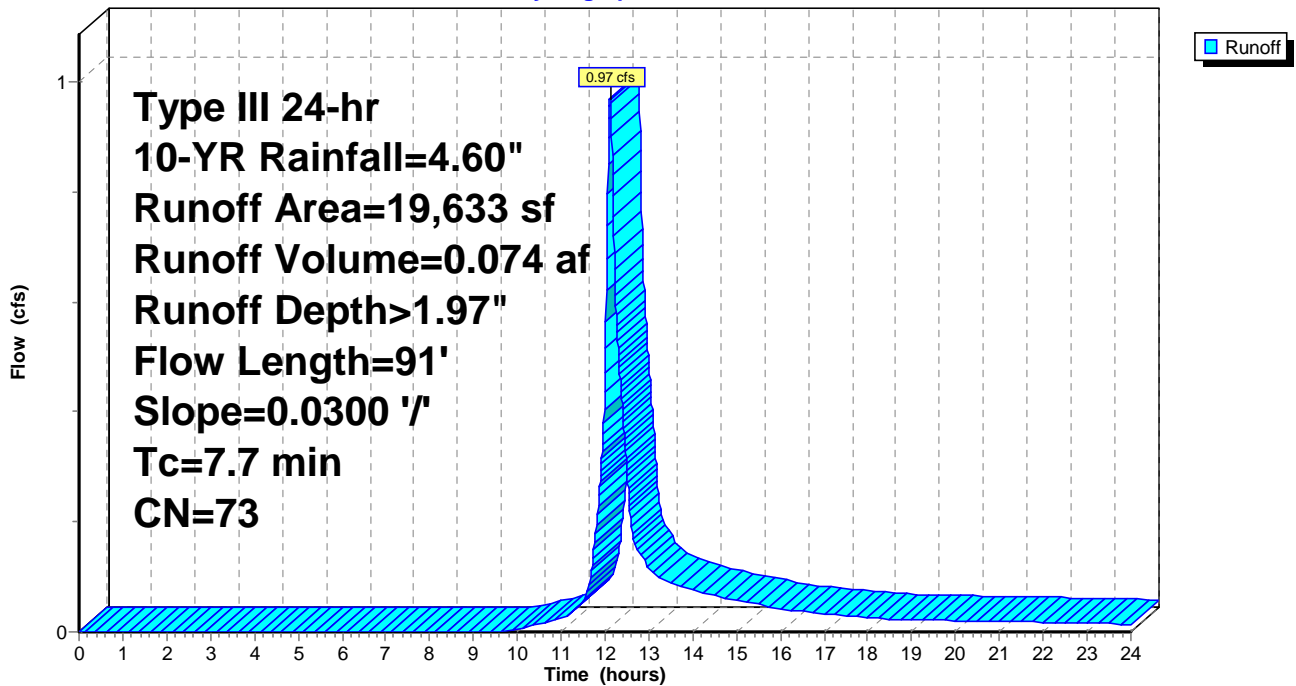
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	11,192	98	impervious
*	8,441	39	Lawn/field, HSG A
	19,633	73	Weighted Average
	8,441		42.99% Pervious Area
	11,192		57.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	91	0.0300	0.20		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.19"

Subcatchment 10S: Area draining to Sanctuary

Hydrograph



5. Pre

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

PRE
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 28

Summary for Subcatchment 60S: Lawn/Field S of school

Runoff = 1.54 cfs @ 12.07 hrs, Volume= 0.108 af, Depth> 3.39"

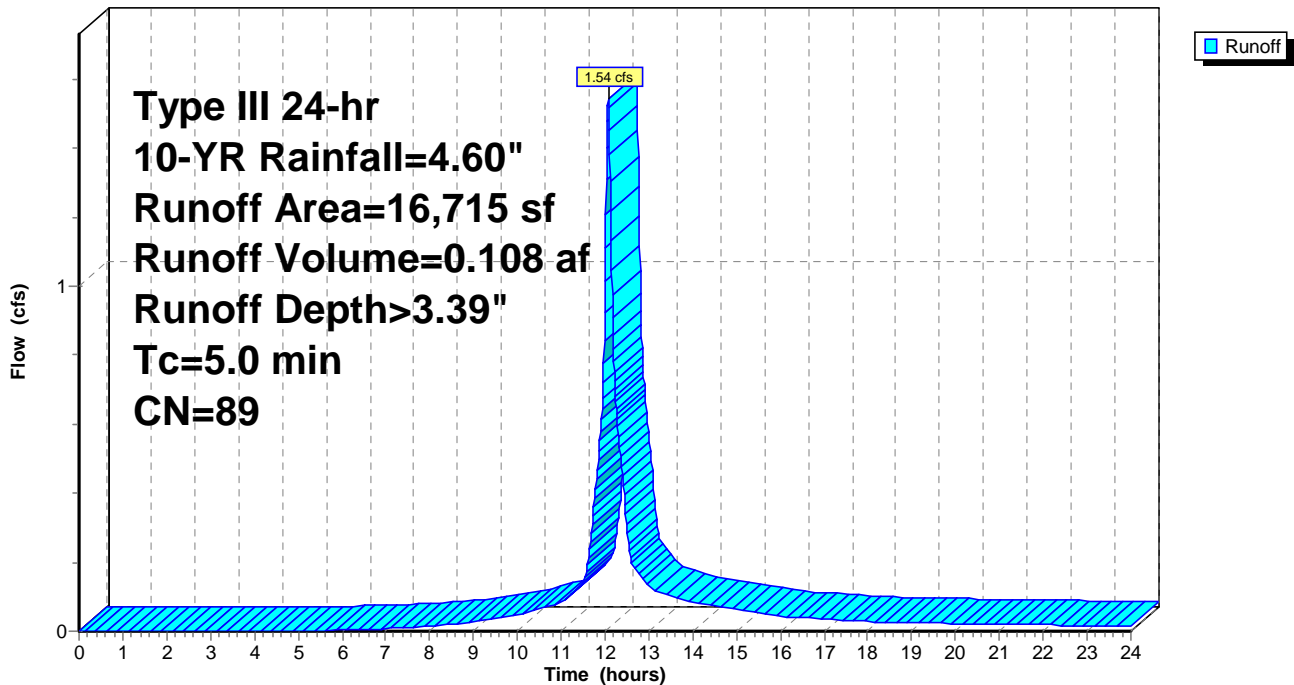
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	14,205	98	impervious
*	2,510	39	Lawn/field, HSG A
	16,715	89	Weighted Average
	2,510		15.02% Pervious Area
	14,205		84.98% Impervious Area

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

Subcatchment 60S: Lawn/Field S of school

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 29

Summary for Subcatchment 61S: Auditorium Roof

Runoff = 0.48 cfs @ 12.07 hrs, Volume= 0.037 af, Depth> 4.36"

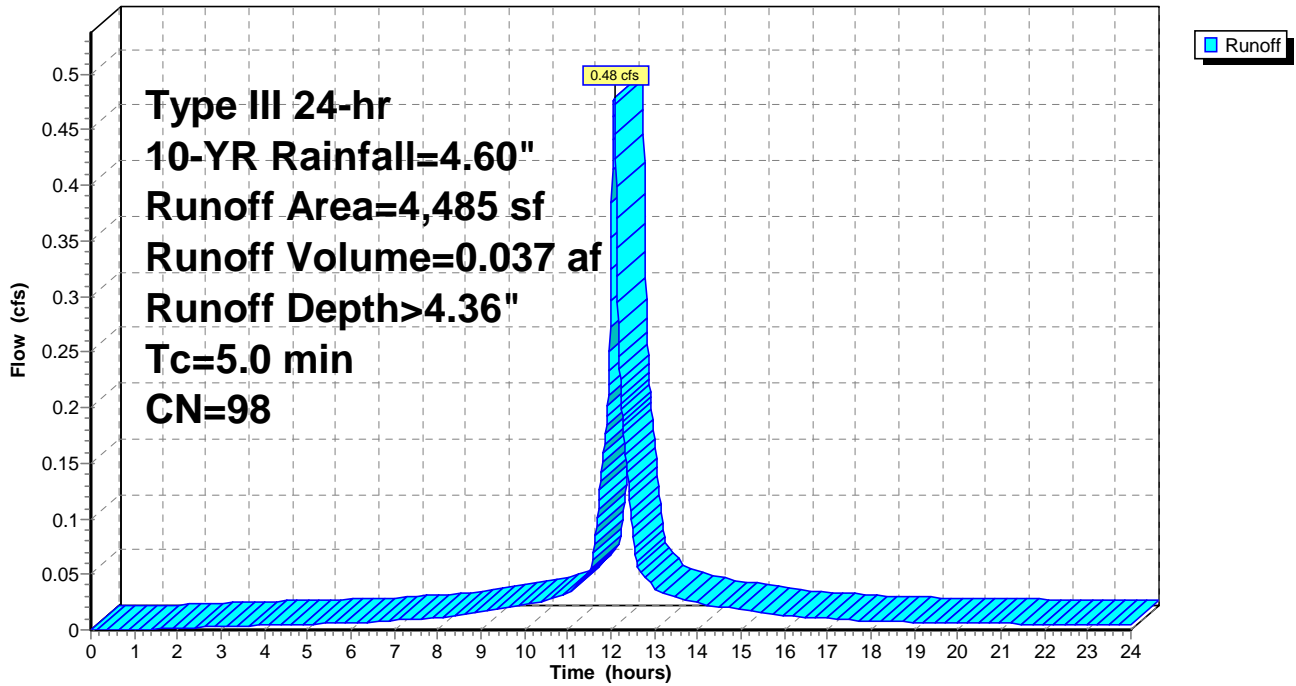
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
* 4,485	98	Roof runoff
4,485		100.00% Impervious Area

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

Subcatchment 61S: Auditorium Roof

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 30

Summary for Subcatchment 70S: Thomas & Davies & Gym

Runoff = 3.41 cfs @ 12.07 hrs, Volume= 0.235 af, Depth> 3.00"

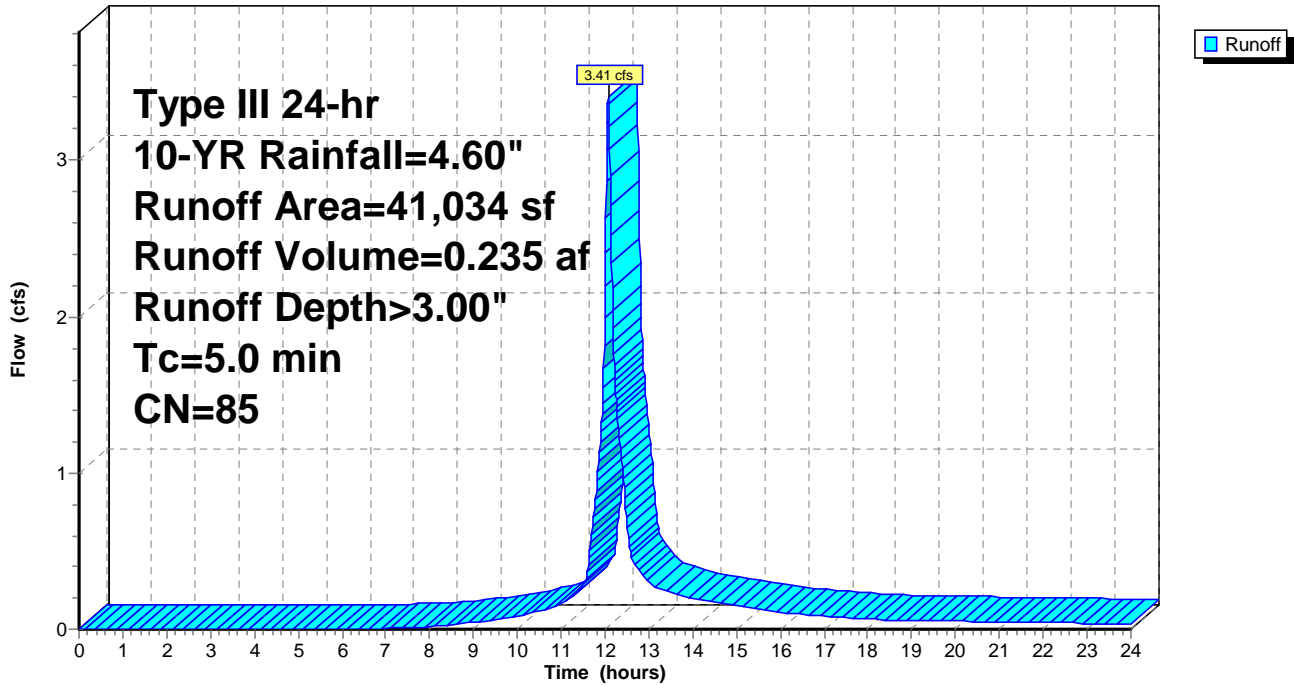
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	32,011	98	impervious
*	9,023	39	Lawn/field, HSG A
	41,034	85	Weighted Average
	9,023		21.99% Pervious Area
	32,011		78.01% Impervious Area

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

Subcatchment 70S: Thomas & Davies & Gym

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 31

Summary for Subcatchment 80S: FoundersHall

Runoff = 0.37 cfs @ 12.07 hrs, Volume= 0.029 af, Depth> 4.36"

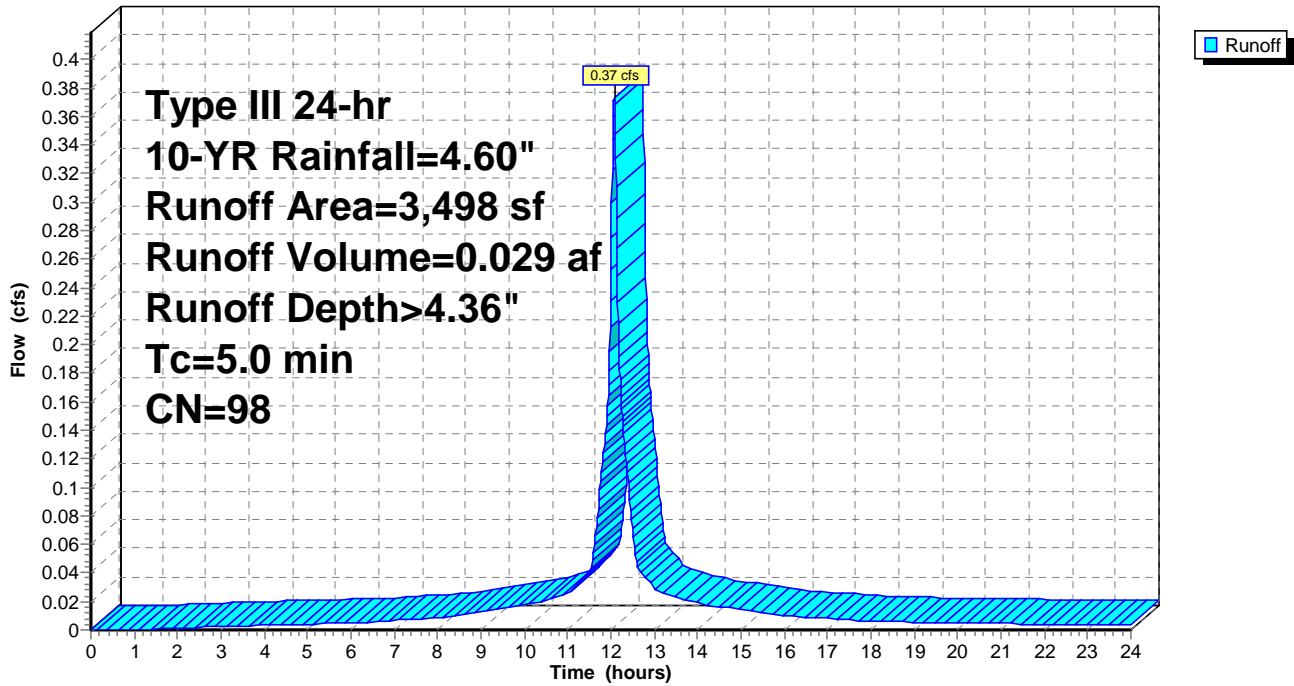
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	3,498	98	Roof runoff
	3,498		100.00% Impervious Area

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

Subcatchment 80S: FoundersHall

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 32

Summary for Subcatchment 90S: Playground

Runoff = 0.54 cfs @ 12.25 hrs, Volume= 0.066 af, Depth> 0.84"

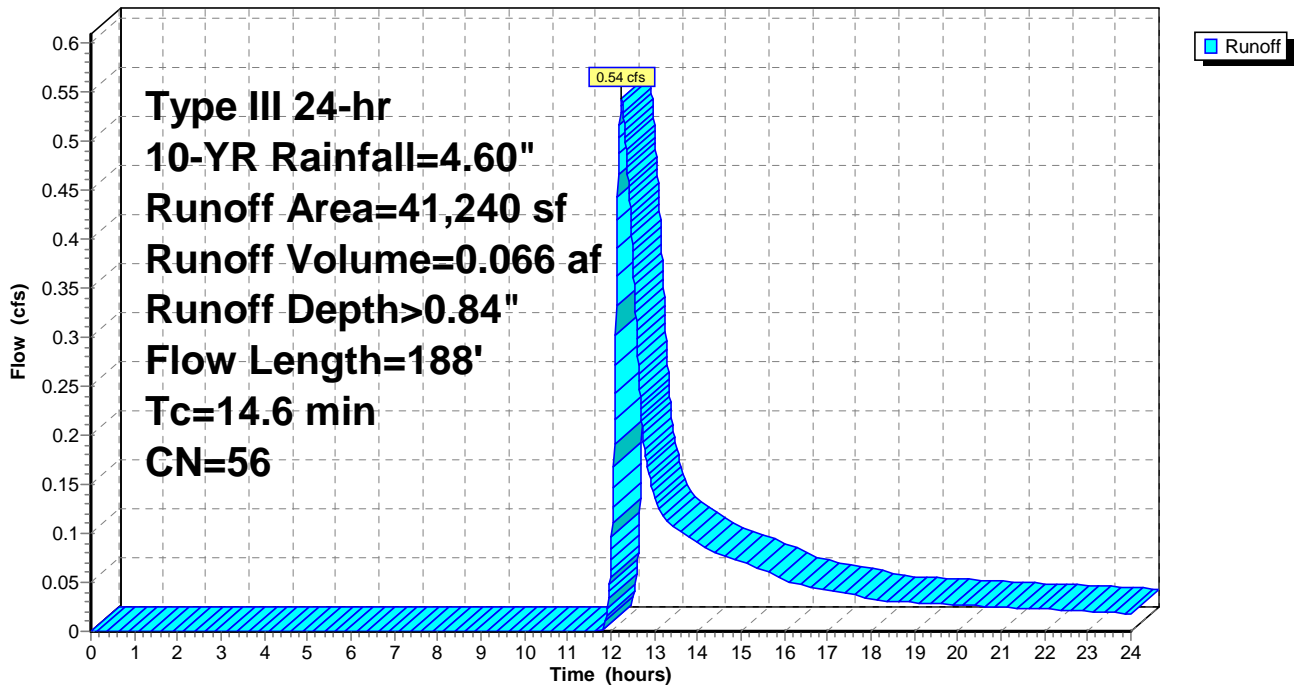
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	12,037	98	impervious
*	29,203	39	Lawn/field, HSG A
	41,240	56	Weighted Average
	29,203		70.81% Pervious Area
	12,037		29.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	100	0.0100	0.13		Sheet Flow, A-B
1.7	88	0.0154	0.87		Shallow Concentrated Flow, B-C
					Grass: Short n= 0.150 P2= 3.19"
					Short Grass Pasture Kv= 7.0 fps
14.6	188	Total			

Subcatchment 90S: Playground

Hydrograph



5. Pre

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

PRE
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 33

Summary for Subcatchment 402S: New Prkng lot

Runoff = 0.60 cfs @ 12.08 hrs, Volume= 0.042 af, Depth> 2.13"

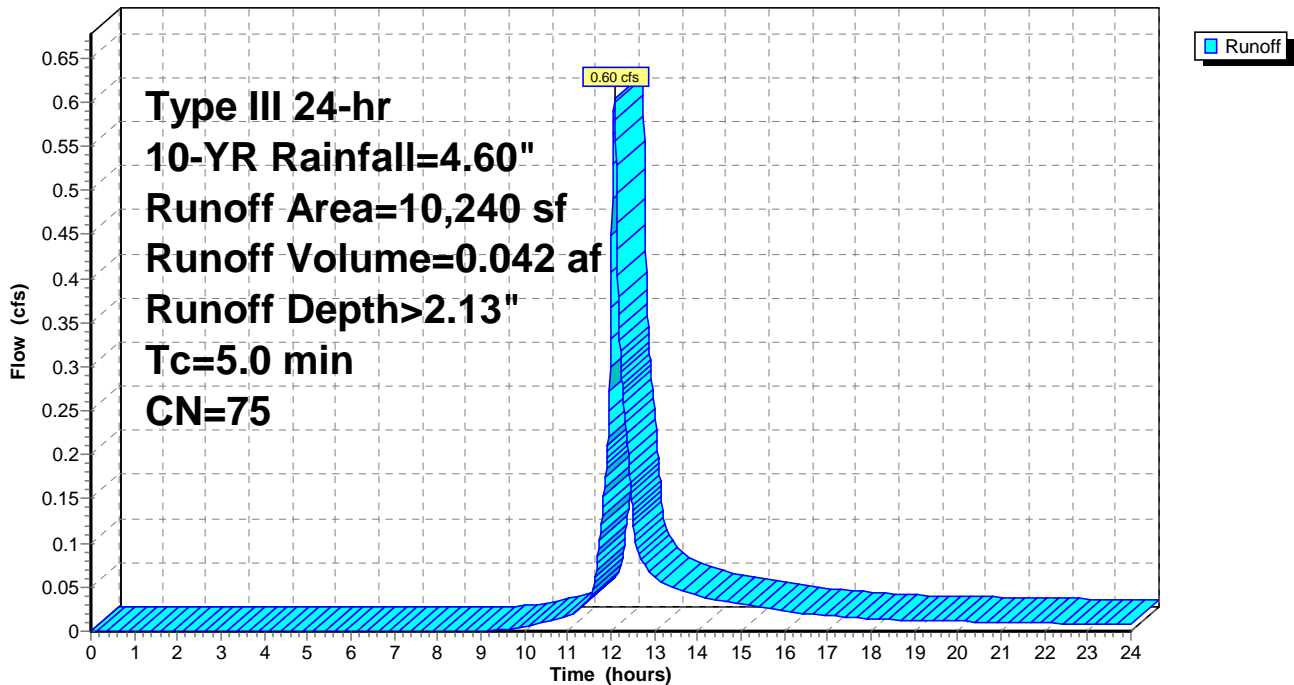
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	4,000	39	Pervious
*	6,240	98	Impervious
	10,240	75	Weighted Average
	4,000		39.06% Pervious Area
	6,240		60.94% Impervious Area

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

Subcatchment 402S: New Prkng lot

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 34

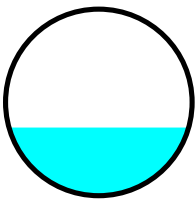
Summary for Reach 161R: roof drain

Inflow Area = 0.10 ac, 100.00% Impervious, Inflow Depth > 4.36" for 10-YR event
 Inflow = 0.48 cfs @ 12.07 hrs, Volume= 0.037 af
 Outflow = 0.48 cfs @ 12.08 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Max. Velocity= 7.42 fps, Min. Travel Time= 0.3 min
 Avg. Velocity = 2.45 fps, Avg. Travel Time= 0.9 min

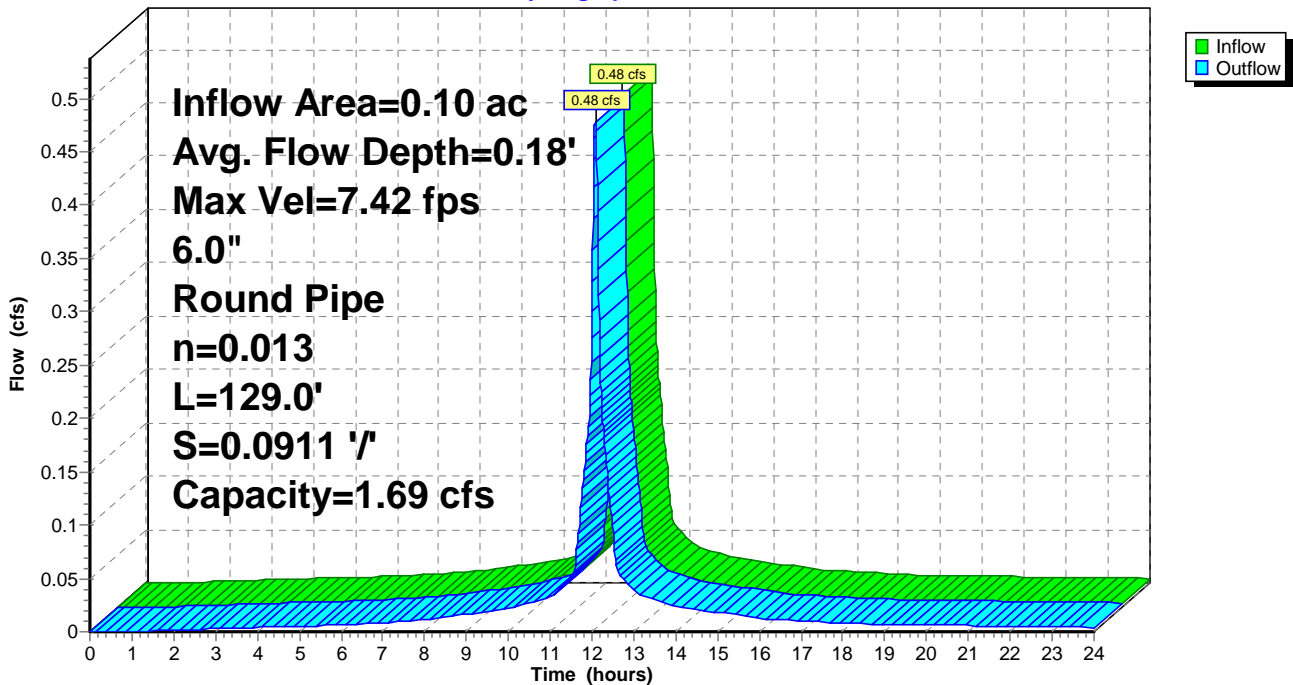
Peak Storage= 8 cf @ 12.07 hrs
 Average Depth at Peak Storage= 0.18'
 Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.69 cfs

6.0" Round Pipe
 n= 0.013 Corrugated PE, smooth interior
 Length= 129.0' Slope= 0.0911 '/'
 Inlet Invert= 130.00', Outlet Invert= 118.25'



Reach 161R: roof drain

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 35

Summary for Pond 206P: City CB @ Fletcher & Danforth

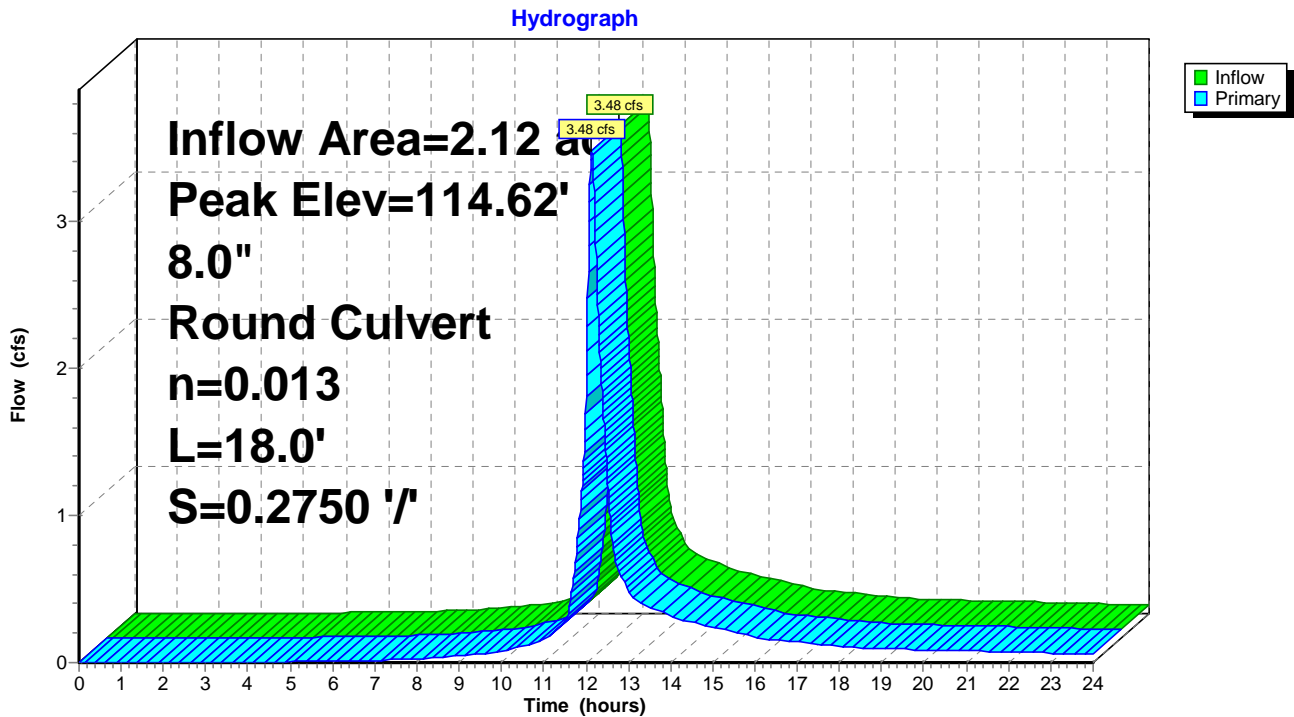
Inflow Area = 2.12 ac, 52.17% Impervious, Inflow Depth > 1.85" for 10-YR event
 Inflow = 3.48 cfs @ 12.13 hrs, Volume= 0.327 af
 Outflow = 3.48 cfs @ 12.13 hrs, Volume= 0.327 af, Atten= 0%, Lag= 0.0 min
 Primary = 3.48 cfs @ 12.13 hrs, Volume= 0.327 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 114.62' @ 12.13 hrs
 Flood Elev= 111.26'

Device #	Routing	Invert	Outlet Devices
1	Primary	107.43'	8.0" Round Culvert L= 18.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 107.43' / 102.48' S= 0.2750 '/ Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.35 sf

Primary OutFlow Max=3.47 cfs @ 12.13 hrs HW=114.61' (Free Discharge)
 ←1=Culvert (Inlet Controls 3.47 cfs @ 9.95 fps)

Pond 206P: City CB @ Fletcher & Danforth



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 36

Summary for Pond 207P: Existing CB

Inflow Area = 0.94 ac, 78.01% Impervious, Inflow Depth > 3.00" for 10-YR event
 Inflow = 3.41 cfs @ 12.07 hrs, Volume= 0.235 af
 Outflow = 3.41 cfs @ 12.07 hrs, Volume= 0.235 af, Atten= 0%, Lag= 0.0 min
 Primary = 3.41 cfs @ 12.07 hrs, Volume= 0.235 af

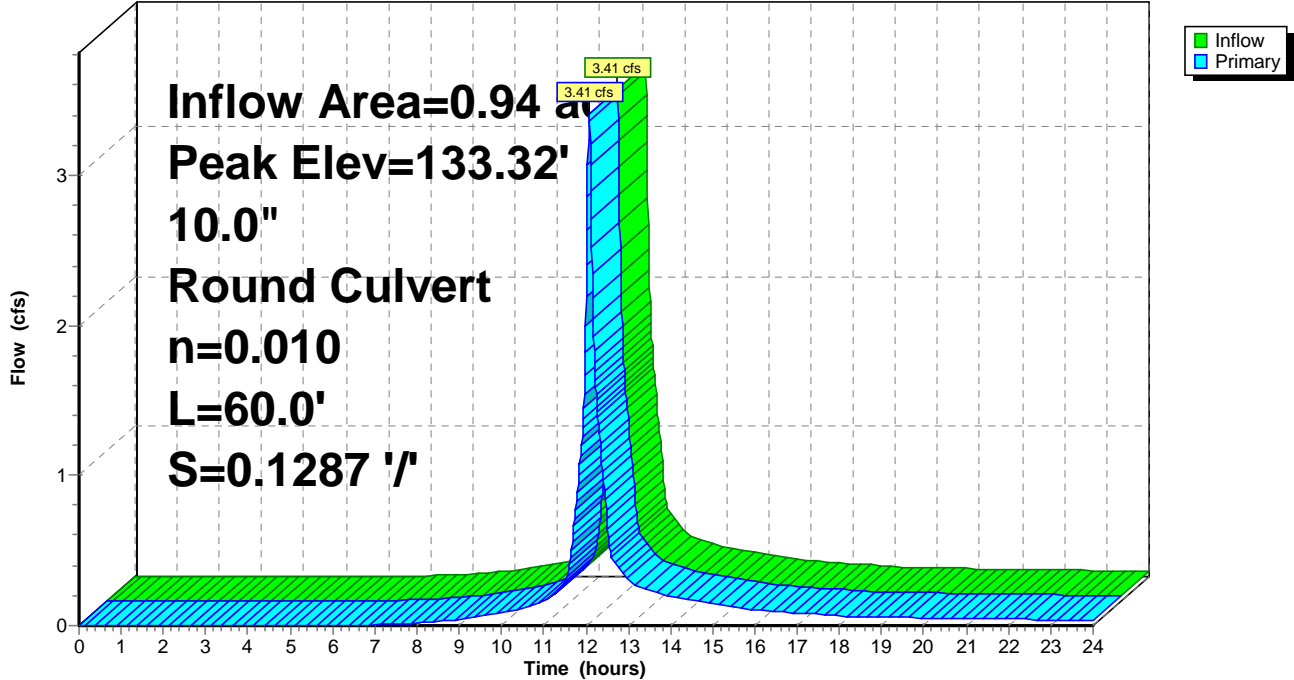
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 133.32' @ 12.07 hrs
 Flood Elev= 137.62'

Device #	Routing	Invert	Outlet Devices
1	Primary	130.20'	10.0" Round Culvert L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 130.20' / 122.48' S= 0.1287 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=3.40 cfs @ 12.07 hrs HW=133.31' (Free Discharge)
 ↑1=Culvert (Inlet Controls 3.40 cfs @ 6.24 fps)

Pond 207P: Existing CB

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 37

Summary for Pond 210P: Existing FI

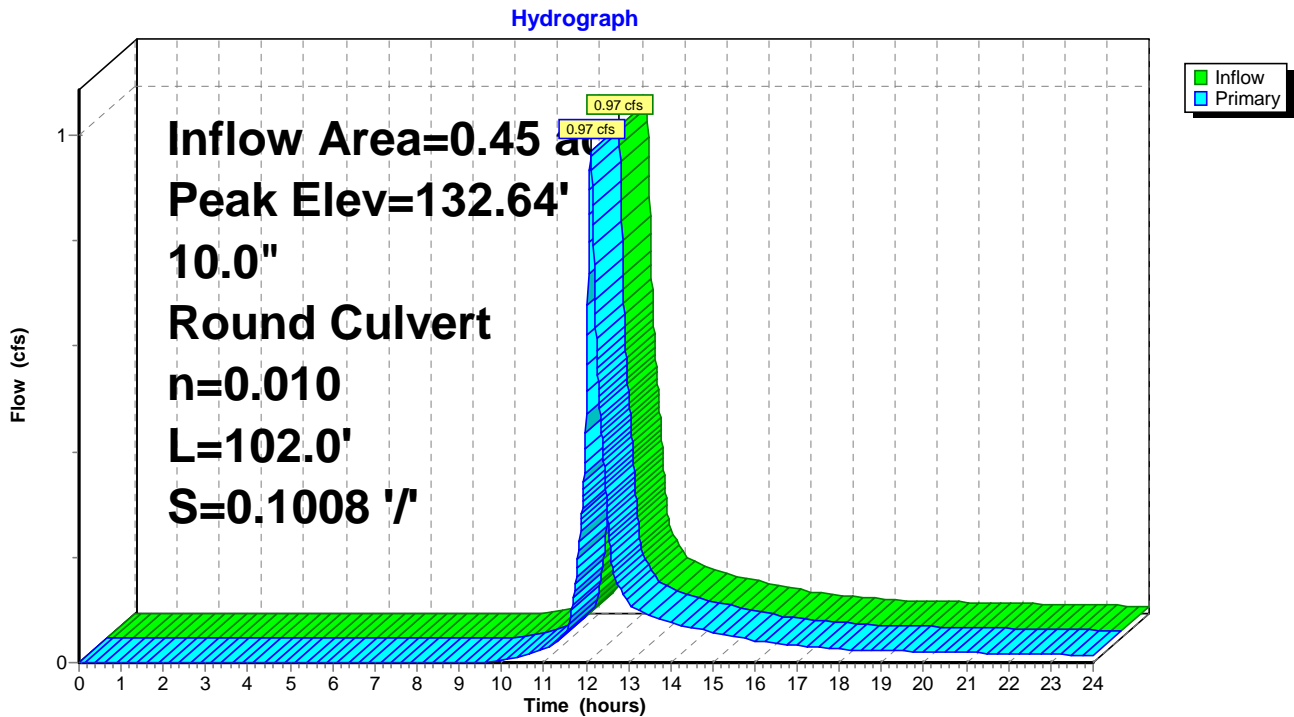
Inflow Area = 0.45 ac, 57.01% Impervious, Inflow Depth > 1.97" for 10-YR event
 Inflow = 0.97 cfs @ 12.11 hrs, Volume= 0.074 af
 Outflow = 0.97 cfs @ 12.11 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.97 cfs @ 12.11 hrs, Volume= 0.074 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 132.64' @ 12.11 hrs
 Flood Elev= 140.41'

Device #	Routing	Invert	Outlet Devices
#1	Primary	132.00'	10.0" Round Culvert L= 102.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 132.00' / 121.72' S= 0.1008 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=0.97 cfs @ 12.11 hrs HW=132.64' (Free Discharge)
 ↑1=Culvert (Inlet Controls 0.97 cfs @ 2.15 fps)

Pond 210P: Existing FI



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 38

Summary for Pond 217P: Existing DMH

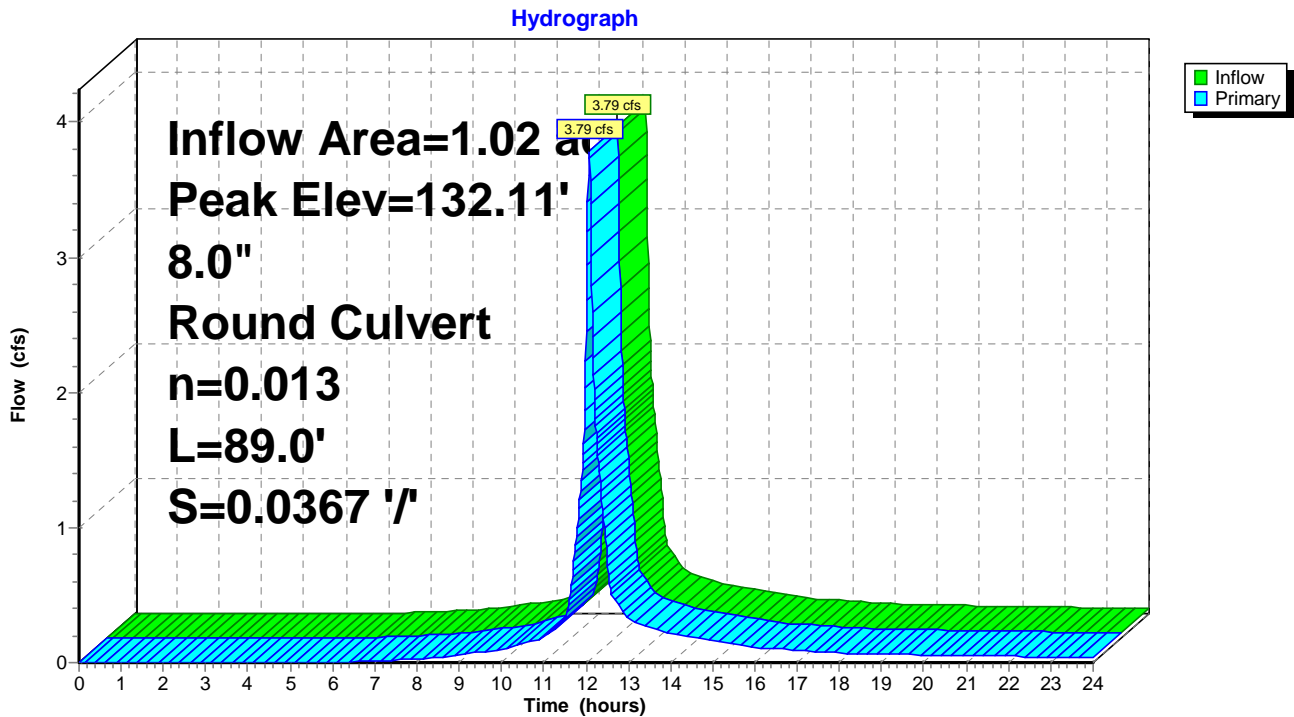
Inflow Area = 1.02 ac, 79.74% Impervious, Inflow Depth > 3.10" for 10-YR event
 Inflow = 3.79 cfs @ 12.07 hrs, Volume= 0.265 af
 Outflow = 3.79 cfs @ 12.07 hrs, Volume= 0.265 af, Atten= 0%, Lag= 0.0 min
 Primary = 3.79 cfs @ 12.07 hrs, Volume= 0.265 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 132.11' @ 12.07 hrs
 Flood Elev= 126.98'

Device #	Routing	Invert	Outlet Devices
1	Primary	122.48'	8.0" Round Culvert L= 89.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 122.48' / 119.21' S= 0.0367 '/ Cc= 0.900 n= 0.013 Cast iron, coated, Flow Area= 0.35 sf

Primary OutFlow Max=3.78 cfs @ 12.07 hrs HW=132.06' (Free Discharge)
 ←1=Culvert (Barrel Controls 3.78 cfs @ 10.82 fps)

Pond 217P: Existing DMH



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 39

Summary for Pond 220P: Existing DMH

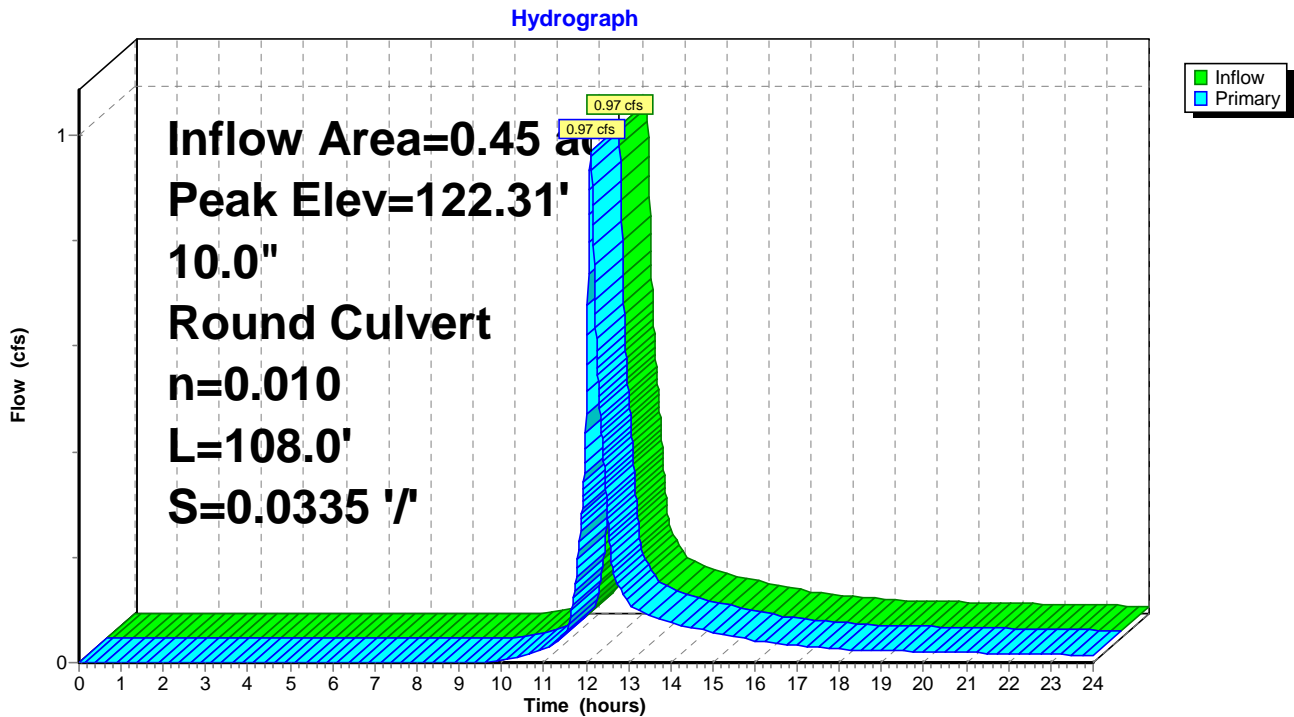
Inflow Area = 0.45 ac, 57.01% Impervious, Inflow Depth > 1.97" for 10-YR event
 Inflow = 0.97 cfs @ 12.11 hrs, Volume= 0.074 af
 Outflow = 0.97 cfs @ 12.11 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.97 cfs @ 12.11 hrs, Volume= 0.074 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 122.31' @ 12.11 hrs
 Flood Elev= 128.47'

Device #	Routing	Invert	Outlet Devices
#1	Primary	121.67'	10.0" Round Culvert L= 108.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 121.67' / 118.05' S= 0.0335 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=0.97 cfs @ 12.11 hrs HW=122.31' (Free Discharge)
 ↑1=Culvert (Inlet Controls 0.97 cfs @ 2.15 fps)

Pond 220P: Existing DMH



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 40

Summary for Pond 227P: Existing SMH

Inflow Area = 1.02 ac, 79.74% Impervious, Inflow Depth > 3.10" for 10-YR event
 Inflow = 3.79 cfs @ 12.07 hrs, Volume= 0.265 af
 Outflow = 3.79 cfs @ 12.07 hrs, Volume= 0.265 af, Atten= 0%, Lag= 0.0 min
 Primary = 3.79 cfs @ 12.07 hrs, Volume= 0.265 af

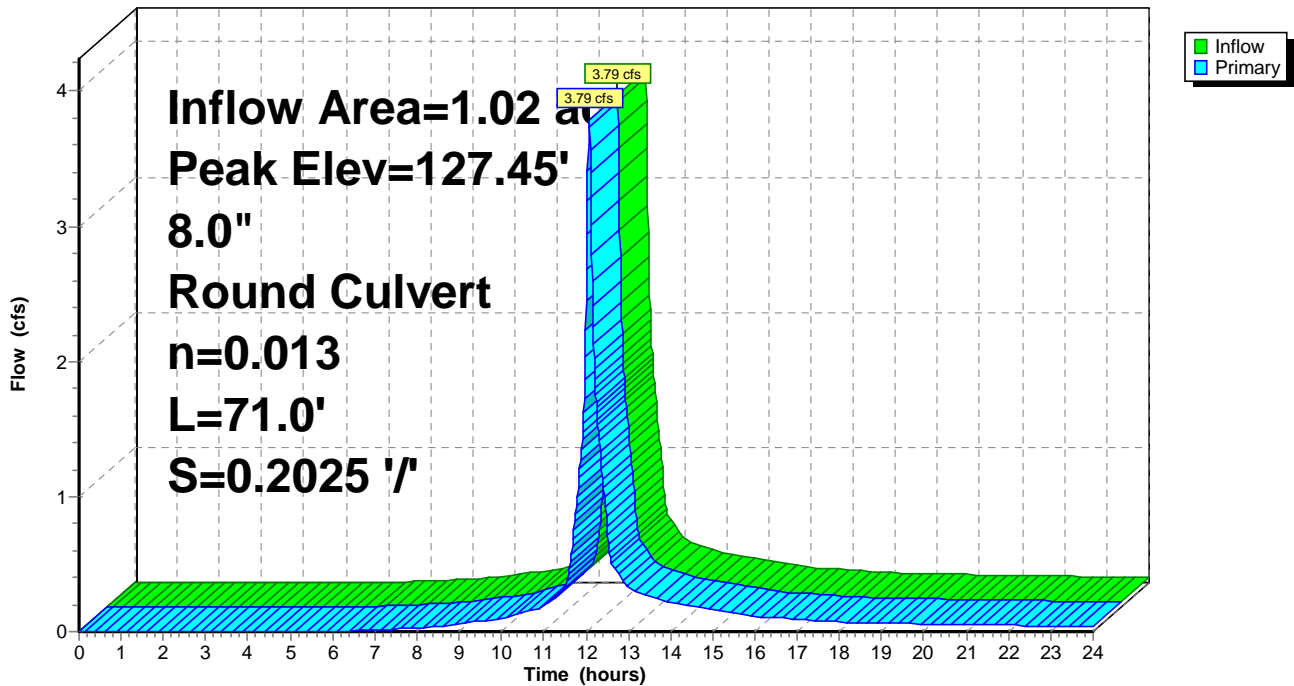
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 127.45' @ 12.07 hrs
 Flood Elev= 123.81'

Device #	Routing	Invert	Outlet Devices
1	Primary	118.98'	8.0" Round Culvert L= 71.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 118.98' / 104.60' S= 0.2025 '/ Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.35 sf

Primary OutFlow Max=3.78 cfs @ 12.07 hrs HW=127.42' (Free Discharge)
 ←1=Culvert (Inlet Controls 3.78 cfs @ 10.82 fps)

Pond 227P: Existing SMH

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 41

Summary for Pond 230P: Existing DMH

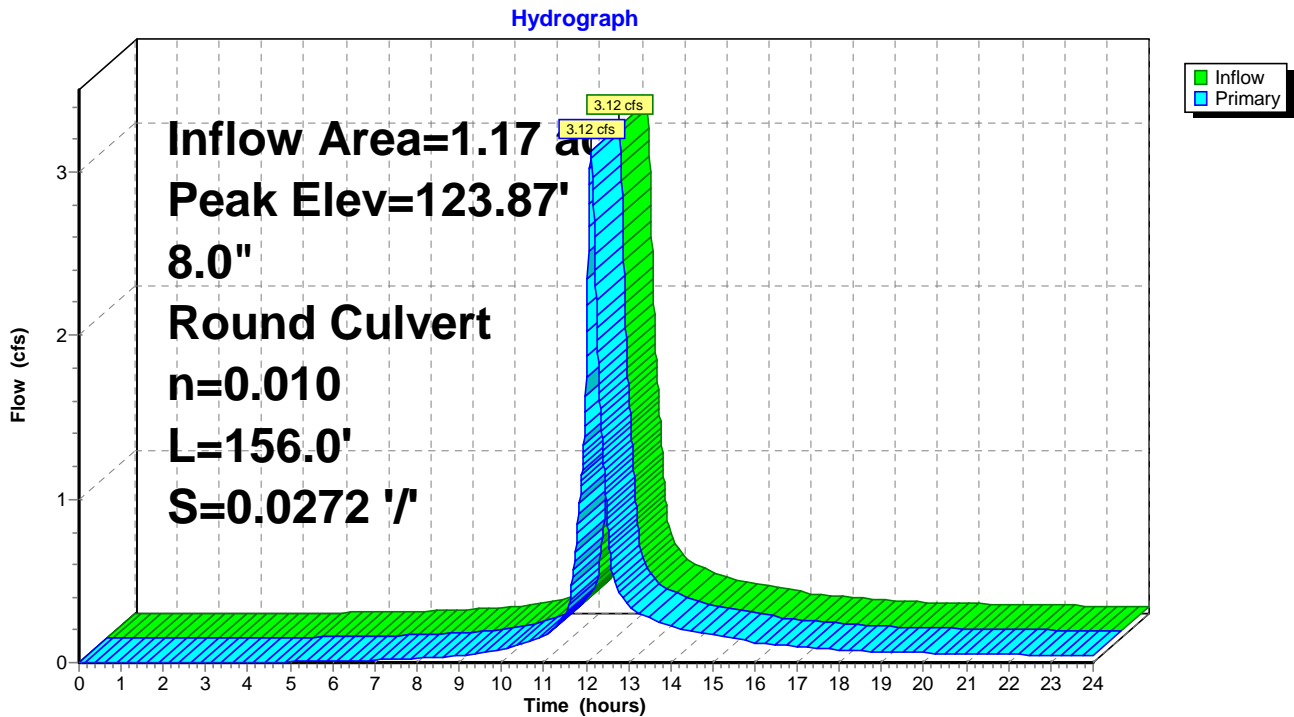
Inflow Area = 1.17 ac, 70.73% Impervious, Inflow Depth > 2.67" for 10-YR event
 Inflow = 3.12 cfs @ 12.12 hrs, Volume= 0.261 af
 Outflow = 3.12 cfs @ 12.12 hrs, Volume= 0.261 af, Atten= 0%, Lag= 0.0 min
 Primary = 3.12 cfs @ 12.12 hrs, Volume= 0.261 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 123.87' @ 12.12 hrs
 Flood Elev= 125.05'

Device #	Routing	Invert	Outlet Devices
#1	Primary	118.00'	8.0" Round Culvert L= 156.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 118.00' / 113.76' S= 0.0272 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=3.12 cfs @ 12.12 hrs HW=123.87' (Free Discharge)
 ←1=Culvert (Inlet Controls 3.12 cfs @ 8.95 fps)

Pond 230P: Existing DMH



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 42

Summary for Pond 240P: Existing DMH

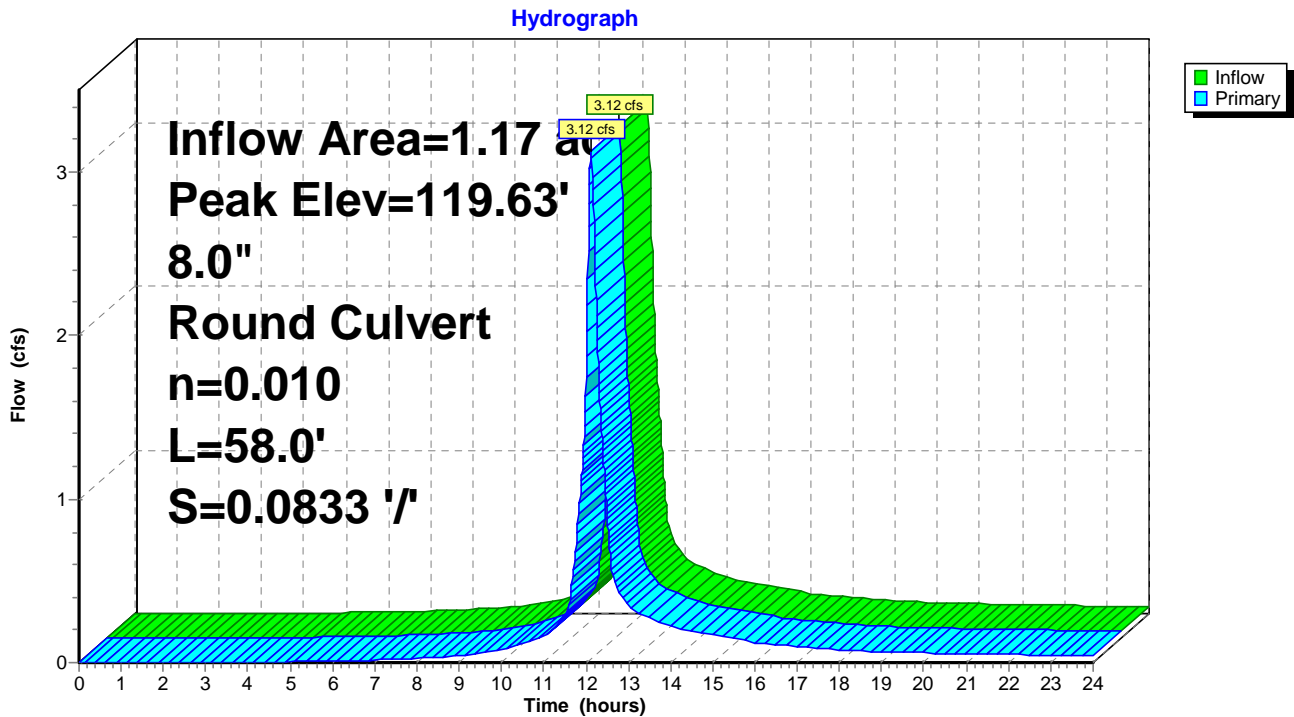
Inflow Area = 1.17 ac, 70.73% Impervious, Inflow Depth > 2.67" for 10-YR event
 Inflow = 3.12 cfs @ 12.12 hrs, Volume= 0.261 af
 Outflow = 3.12 cfs @ 12.12 hrs, Volume= 0.261 af, Atten= 0%, Lag= 0.0 min
 Primary = 3.12 cfs @ 12.12 hrs, Volume= 0.261 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 119.63' @ 12.12 hrs
 Flood Elev= 124.03'

Device #	Routing	Invert	Outlet Devices
#1	Primary	113.76'	8.0" Round Culvert L= 58.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 113.76' / 108.93' S= 0.0833 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=3.12 cfs @ 12.12 hrs HW=119.63' (Free Discharge)
 ←1=Culvert (Inlet Controls 3.12 cfs @ 8.95 fps)

Pond 240P: Existing DMH



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 43

Summary for Pond 260P: Storage Pipes

Inflow Area = 0.72 ac, 79.29% Impervious, Inflow Depth > 3.12" for 10-YR event
 Inflow = 2.62 cfs @ 12.07 hrs, Volume= 0.187 af
 Outflow = 2.16 cfs @ 12.13 hrs, Volume= 0.187 af, Atten= 18%, Lag= 3.1 min
 Primary = 2.16 cfs @ 12.13 hrs, Volume= 0.187 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 120.18' @ 12.13 hrs Surf.Area= 797 sf Storage= 377 cf
 Flood Elev= 125.26' Surf.Area= 0 sf Storage= 3,468 cf

Plug-Flow detention time= 1.4 min calculated for 0.187 af (100% of inflow)
 Center-of-Mass det. time= 1.3 min (797.0 - 795.7)

Volume	Invert	Avail.Storage	Storage Description
#1	119.16'	3,468 cf	48.0" Round Pipe Storage L= 276.0' S= 0.0027 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	119.16'	12.0" Round Culvert L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.16' / 118.02' S= 0.0380 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.15 cfs @ 12.13 hrs HW=120.18' (Free Discharge)
 ↑**1=Culvert** (Inlet Controls 2.15 cfs @ 2.74 fps)

5. Pre

Prepared by Woodard & Curran

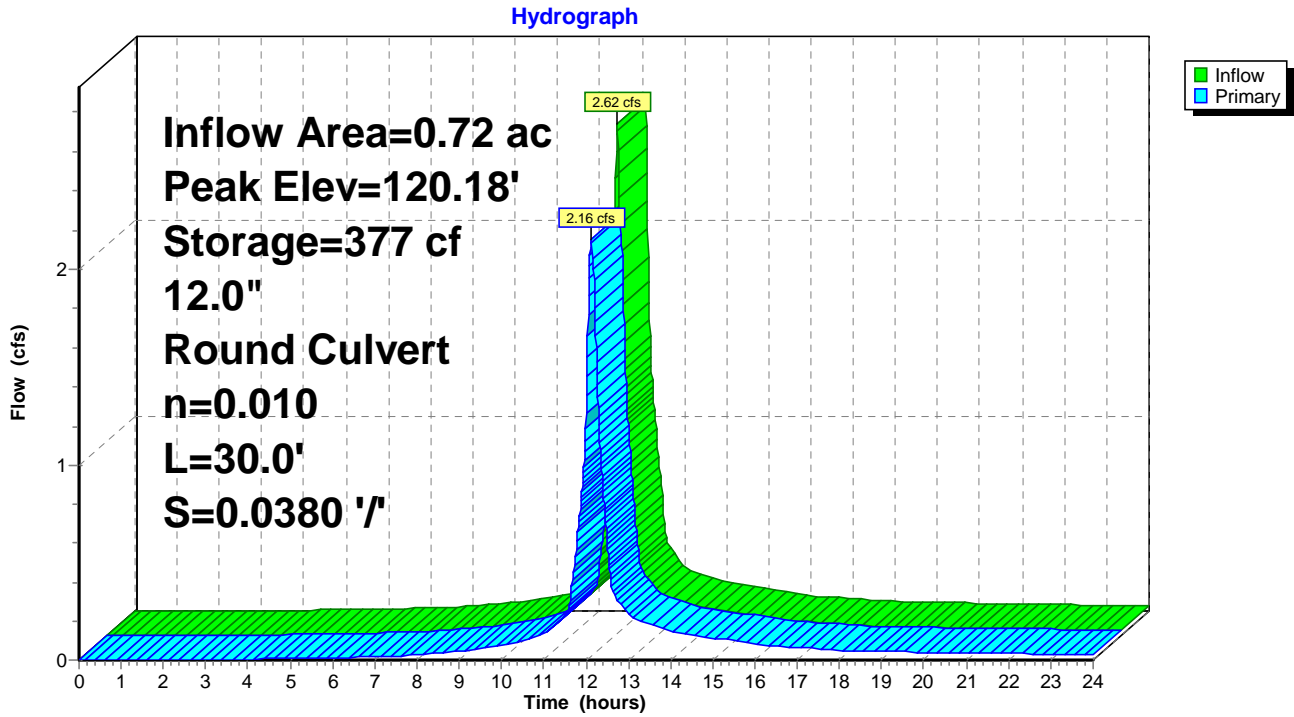
HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

PRE
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 44

Pond 260P: Storage Pipes



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 45

Summary for Pond 340P: CB at SW Cor prkng lot

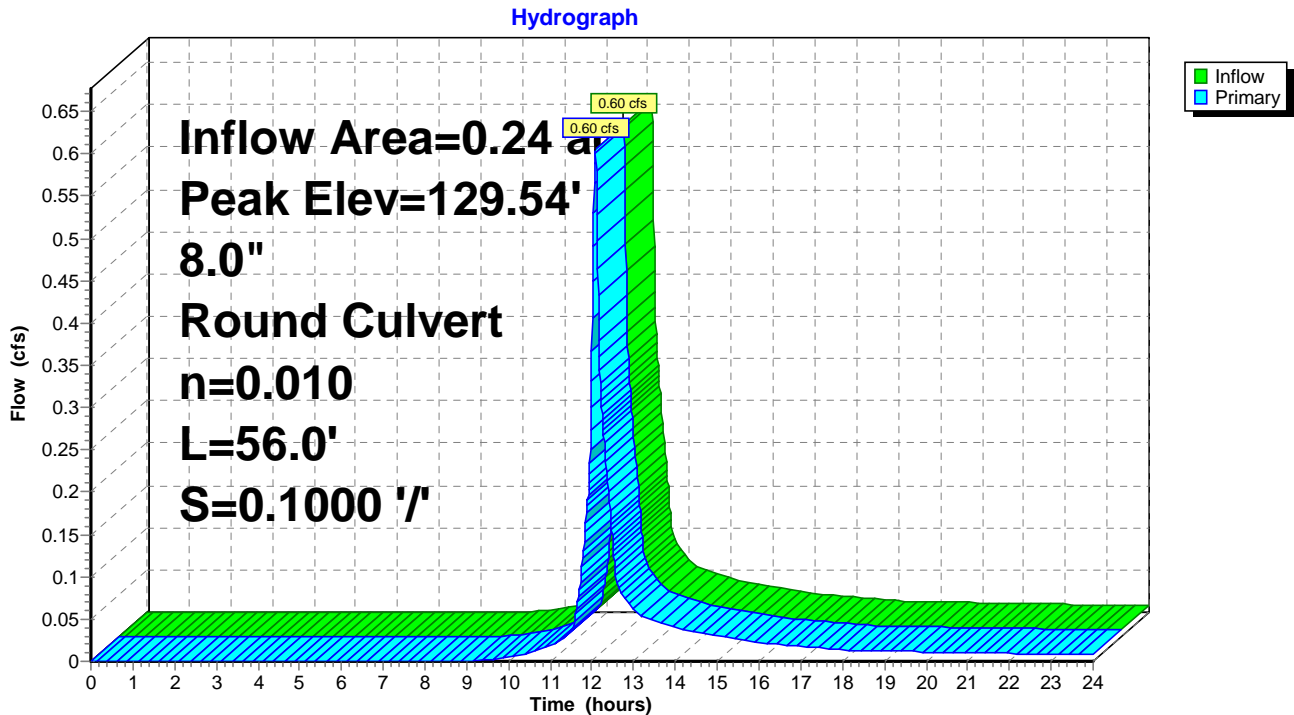
Inflow Area = 0.24 ac, 60.94% Impervious, Inflow Depth > 2.13" for 10-YR event
 Inflow = 0.60 cfs @ 12.08 hrs, Volume= 0.042 af
 Outflow = 0.60 cfs @ 12.08 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.60 cfs @ 12.08 hrs, Volume= 0.042 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 129.54' @ 12.08 hrs

Device #1	Routing Primary	Invert 129.00'	Outlet Devices
			8.0" Round Culvert L= 56.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 129.00' / 123.40' S= 0.1000 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.60 cfs @ 12.08 hrs HW=129.54' (Free Discharge)
 1=Culvert (Inlet Controls 0.60 cfs @ 1.98 fps)

Pond 340P: CB at SW Cor prkng lot



5. Pre

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

PRE
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

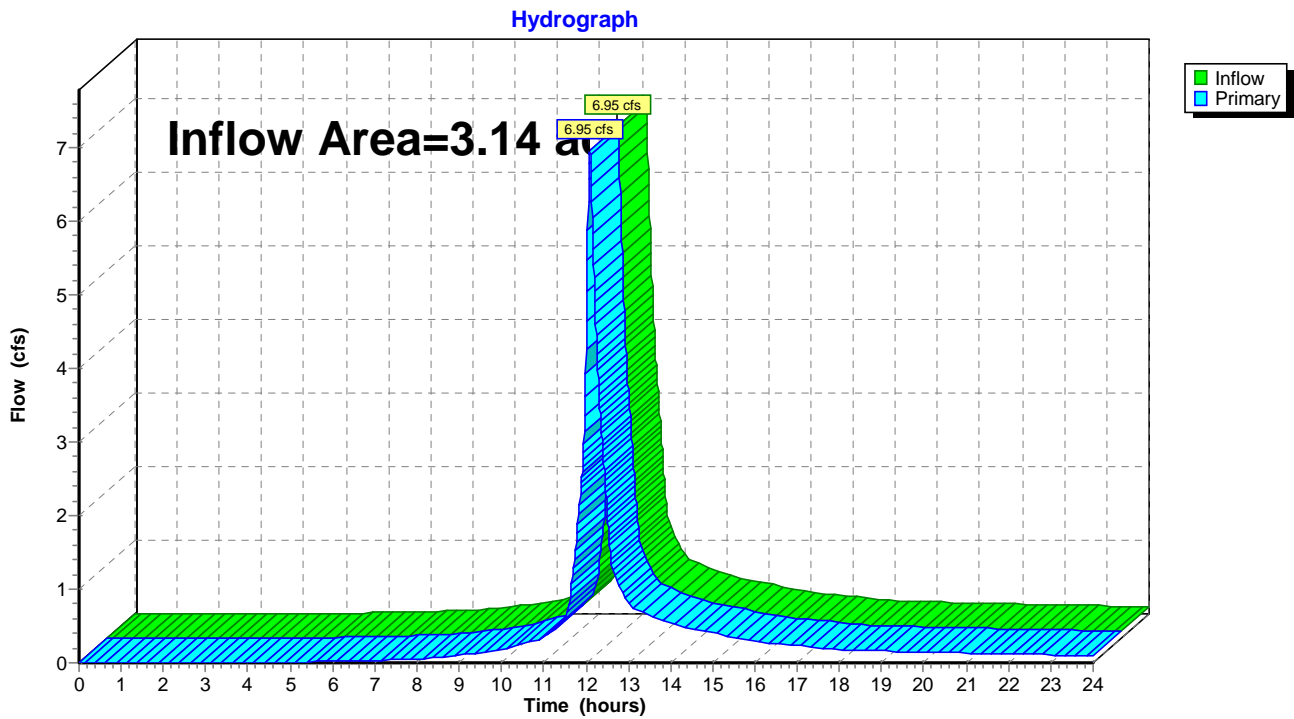
Page 46

Summary for Link SP1: Existing Combined Sewer in Danforth

Inflow Area = 3.14 ac, 61.14% Impervious, Inflow Depth > 2.26" for 10-YR event
Inflow = 6.95 cfs @ 12.09 hrs, Volume= 0.592 af
Primary = 6.95 cfs @ 12.09 hrs, Volume= 0.592 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link SP1: Existing Combined Sewer in Danforth



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 47

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 10S: Area draining to** Runoff Area=19,633 sf 57.01% Impervious Runoff Depth>2.92"
 Flow Length=91' Slope=0.0300 '/' Tc=7.7 min CN=73 Runoff=1.45 cfs 0.110 af
- Subcatchment 60S: Lawn/Field S of school** Runoff Area=16,715 sf 84.98% Impervious Runoff Depth>4.54"
 Tc=5.0 min CN=89 Runoff=2.04 cfs 0.145 af
- Subcatchment 61S: Auditorium Roof** Runoff Area=4,485 sf 100.00% Impervious Runoff Depth>5.56"
 Tc=5.0 min CN=98 Runoff=0.61 cfs 0.048 af
- Subcatchment 70S: Thomas & Davies &** Runoff Area=41,034 sf 78.01% Impervious Runoff Depth>4.11"
 Tc=5.0 min CN=85 Runoff=4.63 cfs 0.323 af
- Subcatchment 80S: FoundersHall** Runoff Area=3,498 sf 100.00% Impervious Runoff Depth>5.56"
 Tc=5.0 min CN=98 Runoff=0.47 cfs 0.037 af
- Subcatchment 90S: Playground** Runoff Area=41,240 sf 29.19% Impervious Runoff Depth>1.47"
 Flow Length=188' Tc=14.6 min CN=56 Runoff=1.11 cfs 0.116 af
- Subcatchment 402S: New Prkng lot** Runoff Area=10,240 sf 60.94% Impervious Runoff Depth>3.11"
 Tc=5.0 min CN=75 Runoff=0.89 cfs 0.061 af
- Reach 161R: roof drain** Avg. Flow Depth=0.21' Max Vel=7.90 fps Inflow=0.61 cfs 0.048 af
 6.0" Round Pipe n=0.013 L=129.0' S=0.0911 '/' Capacity=1.69 cfs Outflow=0.60 cfs 0.048 af
- Pond 206P: City CB @ Fletcher & Danforth** Peak Elev=121.80' Inflow=4.97 cfs 0.480 af
 8.0" Round Culvert n=0.013 L=18.0' S=0.2750 '/' Outflow=4.97 cfs 0.480 af
- Pond 207P: Existing CB** Peak Elev=135.60' Inflow=4.63 cfs 0.323 af
 10.0" Round Culvert n=0.010 L=60.0' S=0.1287 '/' Outflow=4.63 cfs 0.323 af
- Pond 210P: Existing FI** Peak Elev=132.91' Inflow=1.45 cfs 0.110 af
 10.0" Round Culvert n=0.010 L=102.0' S=0.1008 '/' Outflow=1.45 cfs 0.110 af
- Pond 217P: Existing DMH** Peak Elev=142.08' Inflow=5.10 cfs 0.360 af
 8.0" Round Culvert n=0.013 L=89.0' S=0.0367 '/' Outflow=5.10 cfs 0.360 af
- Pond 220P: Existing DMH** Peak Elev=122.58' Inflow=1.45 cfs 0.110 af
 10.0" Round Culvert n=0.010 L=108.0' S=0.0335 '/' Outflow=1.45 cfs 0.110 af
- Pond 227P: Existing SMH** Peak Elev=134.09' Inflow=5.10 cfs 0.360 af
 8.0" Round Culvert n=0.013 L=71.0' S=0.2025 '/' Outflow=5.10 cfs 0.360 af
- Pond 230P: Existing DMH** Peak Elev=129.28' Inflow=4.12 cfs 0.363 af
 8.0" Round Culvert n=0.010 L=156.0' S=0.0272 '/' Outflow=4.12 cfs 0.363 af
- Pond 240P: Existing DMH** Peak Elev=123.72' Inflow=4.12 cfs 0.363 af
 8.0" Round Culvert n=0.010 L=58.0' S=0.0833 '/' Outflow=4.12 cfs 0.363 af

5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 48

Pond 260P: Storage Pipes

Peak Elev=120.47' Storage=626 cf Inflow=3.53 cfs 0.254 af
12.0" Round Culvert n=0.010 L=30.0' S=0.0380 '/ Outflow=2.69 cfs 0.254 af

Pond 340P: CB at SW Cor prkng lot

Peak Elev=129.78' Inflow=0.89 cfs 0.061 af
8.0" Round Culvert n=0.010 L=56.0' S=0.1000 '/ Outflow=0.89 cfs 0.061 af

Link SP1: Existing Combined Sewer in Danforth

Inflow=9.54 cfs 0.839 af
Primary=9.54 cfs 0.839 af

Total Runoff Area = 3.14 ac Runoff Volume = 0.839 af Average Runoff Depth = 3.21"
38.86% Pervious = 1.22 ac 61.14% Impervious = 1.92 ac

5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 49

Summary for Subcatchment 10S: Area draining to Sanctuary

Runoff = 1.45 cfs @ 12.11 hrs, Volume= 0.110 af, Depth> 2.92"

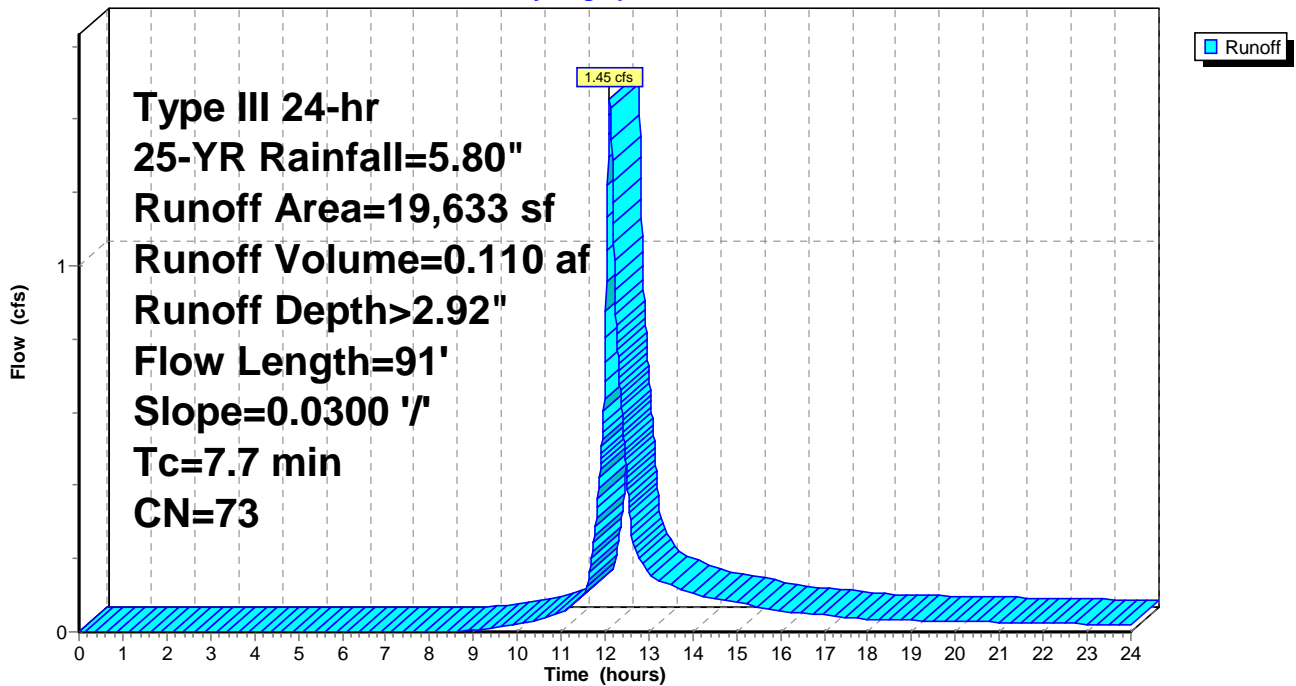
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	11,192	98	impervious
*	8,441	39	Lawn/field, HSG A
	19,633	73	Weighted Average
	8,441		42.99% Pervious Area
	11,192		57.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	91	0.0300	0.20		Sheet Flow, A-B
					Grass: Short n= 0.150 P2= 3.19"

Subcatchment 10S: Area draining to Sanctuary

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 50

Summary for Subcatchment 60S: Lawn/Field S of school

Runoff = 2.04 cfs @ 12.07 hrs, Volume= 0.145 af, Depth> 4.54"

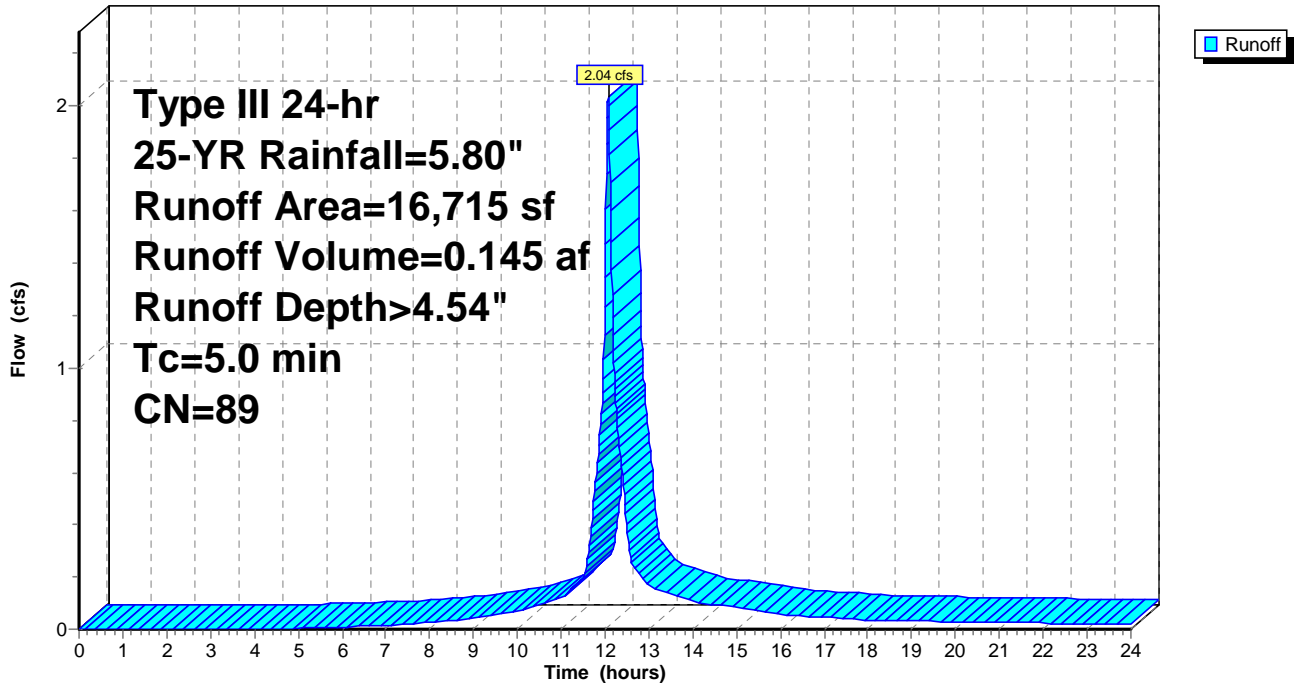
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	14,205	98	impervious
*	2,510	39	Lawn/field, HSG A
	16,715	89	Weighted Average
	2,510		15.02% Pervious Area
	14,205		84.98% Impervious Area

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

Subcatchment 60S: Lawn/Field S of school

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 51

Summary for Subcatchment 61S: Auditorium Roof

Runoff = 0.61 cfs @ 12.07 hrs, Volume= 0.048 af, Depth> 5.56"

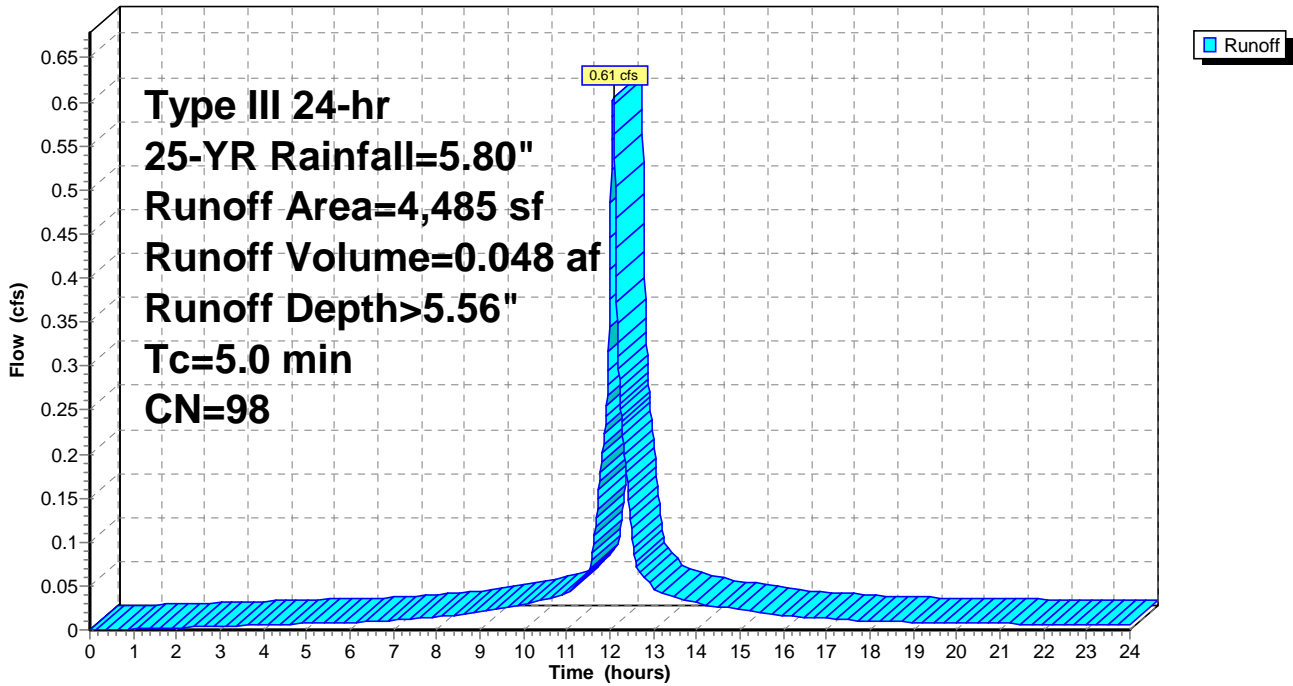
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
* 4,485	98	Roof runoff
4,485		100.00% Impervious Area

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

Subcatchment 61S: Auditorium Roof

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 52

Summary for Subcatchment 70S: Thomas & Davies & Gym

Runoff = 4.63 cfs @ 12.07 hrs, Volume= 0.323 af, Depth> 4.11"

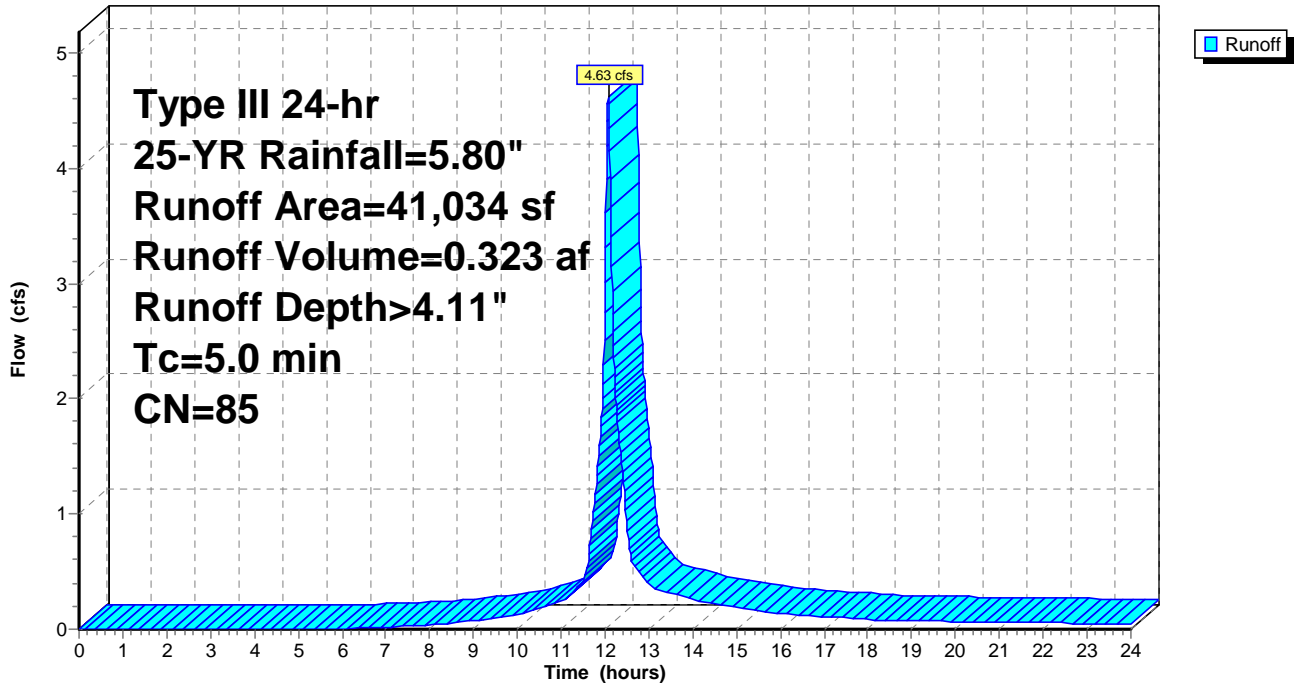
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	32,011	98	impervious
*	9,023	39	Lawn/field, HSG A
	41,034	85	Weighted Average
	9,023		21.99% Pervious Area
	32,011		78.01% Impervious Area

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

Subcatchment 70S: Thomas & Davies & Gym

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 53

Summary for Subcatchment 80S: FoundersHall

Runoff = 0.47 cfs @ 12.07 hrs, Volume= 0.037 af, Depth> 5.56"

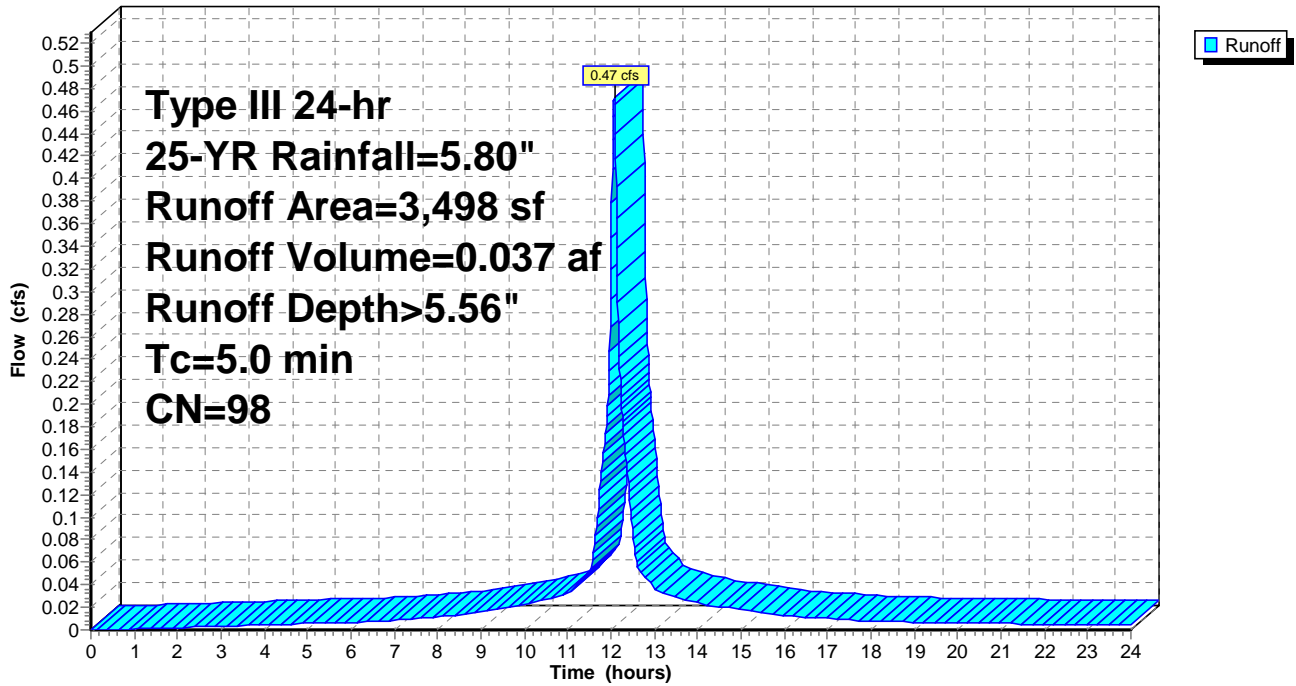
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	3,498	98	Roof runoff
	3,498		100.00% Impervious Area

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

Subcatchment 80S: FoundersHall

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 54

Summary for Subcatchment 90S: Playground

Runoff = 1.11 cfs @ 12.22 hrs, Volume= 0.116 af, Depth> 1.47"

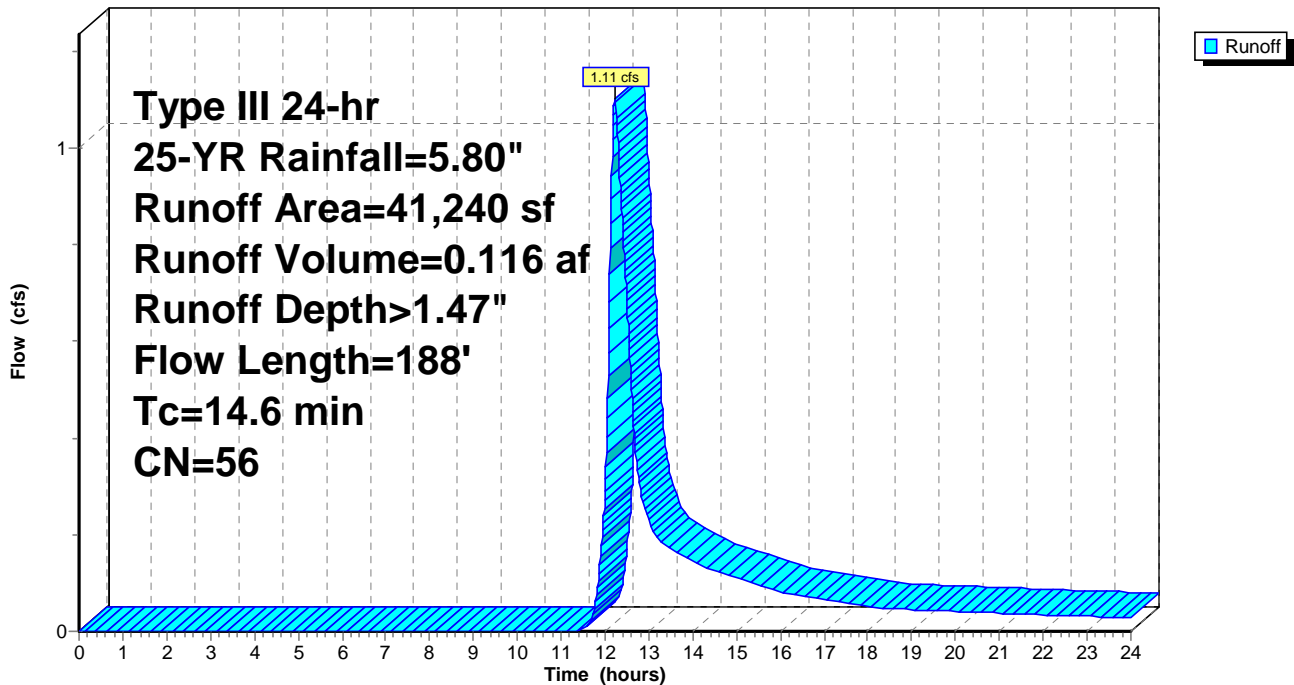
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	12,037	98	impervious
*	29,203	39	Lawn/field, HSG A
	41,240	56	Weighted Average
	29,203		70.81% Pervious Area
	12,037		29.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	100	0.0100	0.13		Sheet Flow, A-B
1.7	88	0.0154	0.87		Shallow Concentrated Flow, B-C
					Grass: Short n= 0.150 P2= 3.19"
					Short Grass Pasture Kv= 7.0 fps
14.6	188	Total			

Subcatchment 90S: Playground

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 55

Summary for Subcatchment 402S: New Prkng lot

Runoff = 0.89 cfs @ 12.08 hrs, Volume= 0.061 af, Depth> 3.11"

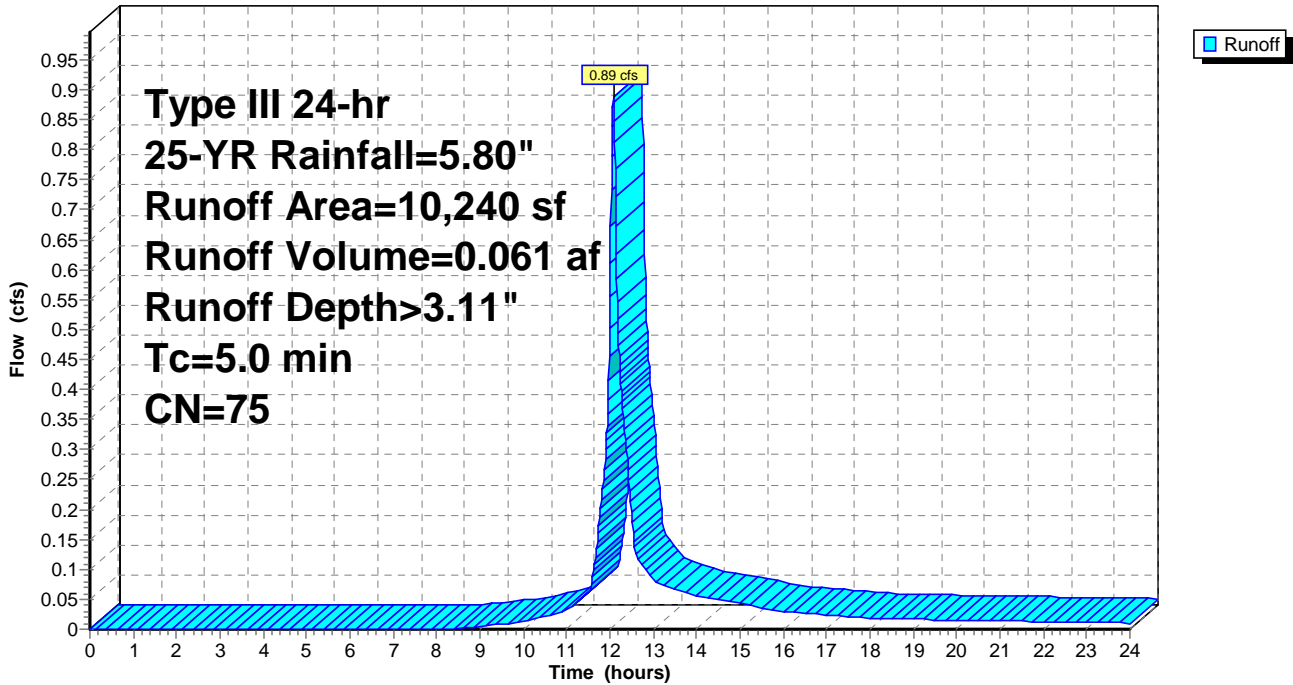
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	4,000	39	Pervious
*	6,240	98	Impervious
	10,240	75	Weighted Average
	4,000		39.06% Pervious Area
	6,240		60.94% Impervious Area

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

Subcatchment 402S: New Prkng lot

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 56

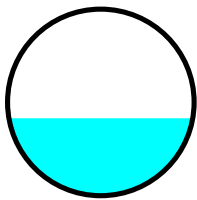
Summary for Reach 161R: roof drain

Inflow Area = 0.10 ac, 100.00% Impervious, Inflow Depth > 5.56" for 25-YR event
 Inflow = 0.61 cfs @ 12.07 hrs, Volume= 0.048 af
 Outflow = 0.60 cfs @ 12.08 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Max. Velocity= 7.90 fps, Min. Travel Time= 0.3 min
 Avg. Velocity = 2.64 fps, Avg. Travel Time= 0.8 min

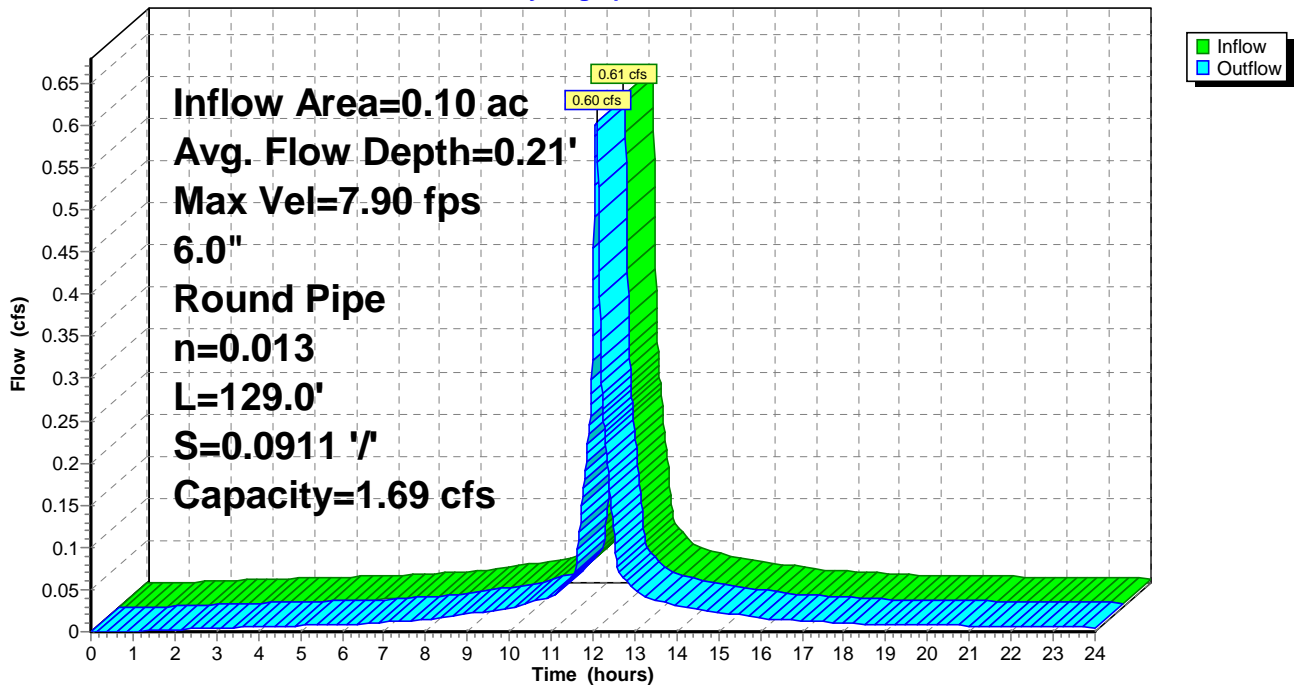
Peak Storage= 10 cf @ 12.07 hrs
 Average Depth at Peak Storage= 0.21'
 Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.69 cfs

6.0" Round Pipe
 n= 0.013 Corrugated PE, smooth interior
 Length= 129.0' Slope= 0.0911 '/'
 Inlet Invert= 130.00', Outlet Invert= 118.25'



Reach 161R: roof drain

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 57

Summary for Pond 206P: City CB @ Fletcher & Danforth

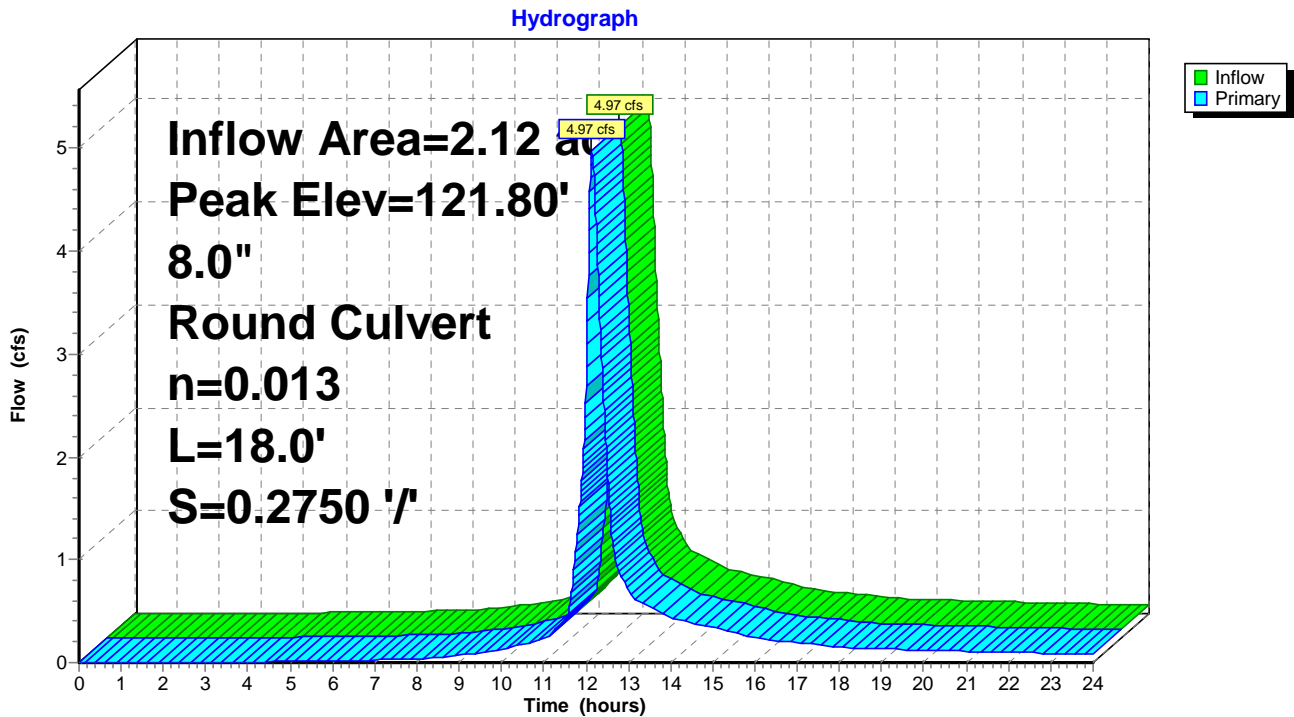
Inflow Area = 2.12 ac, 52.17% Impervious, Inflow Depth > 2.72" for 25-YR event
 Inflow = 4.97 cfs @ 12.14 hrs, Volume= 0.480 af
 Outflow = 4.97 cfs @ 12.14 hrs, Volume= 0.480 af, Atten= 0%, Lag= 0.0 min
 Primary = 4.97 cfs @ 12.14 hrs, Volume= 0.480 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 121.80' @ 12.14 hrs
 Flood Elev= 111.26'

Device #	Routing	Invert	Outlet Devices
1	Primary	107.43'	8.0" Round Culvert L= 18.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 107.43' / 102.48' S= 0.2750 '/ Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.35 sf

Primary OutFlow Max=4.97 cfs @ 12.14 hrs HW=121.79' (Free Discharge)
 1=Culvert (Inlet Controls 4.97 cfs @ 14.24 fps)

Pond 206P: City CB @ Fletcher & Danforth



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 58

Summary for Pond 207P: Existing CB

Inflow Area = 0.94 ac, 78.01% Impervious, Inflow Depth > 4.11" for 25-YR event
 Inflow = 4.63 cfs @ 12.07 hrs, Volume= 0.323 af
 Outflow = 4.63 cfs @ 12.07 hrs, Volume= 0.323 af, Atten= 0%, Lag= 0.0 min
 Primary = 4.63 cfs @ 12.07 hrs, Volume= 0.323 af

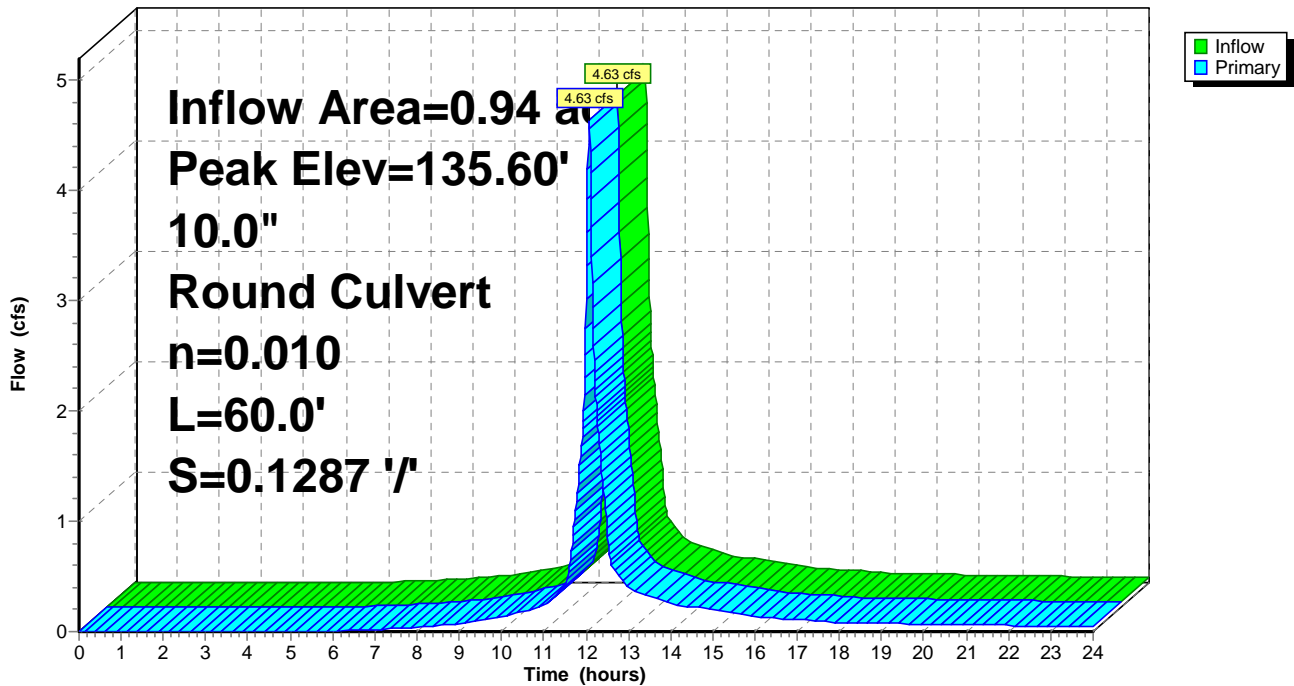
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 135.60' @ 12.07 hrs
 Flood Elev= 137.62'

Device #	Routing	Invert	Outlet Devices
1	Primary	130.20'	10.0" Round Culvert L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 130.20' / 122.48' S= 0.1287 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=4.62 cfs @ 12.07 hrs HW=135.58' (Free Discharge)
 ←1=Culvert (Inlet Controls 4.62 cfs @ 8.47 fps)

Pond 207P: Existing CB

Hydrograph



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 59

Summary for Pond 210P: Existing FI

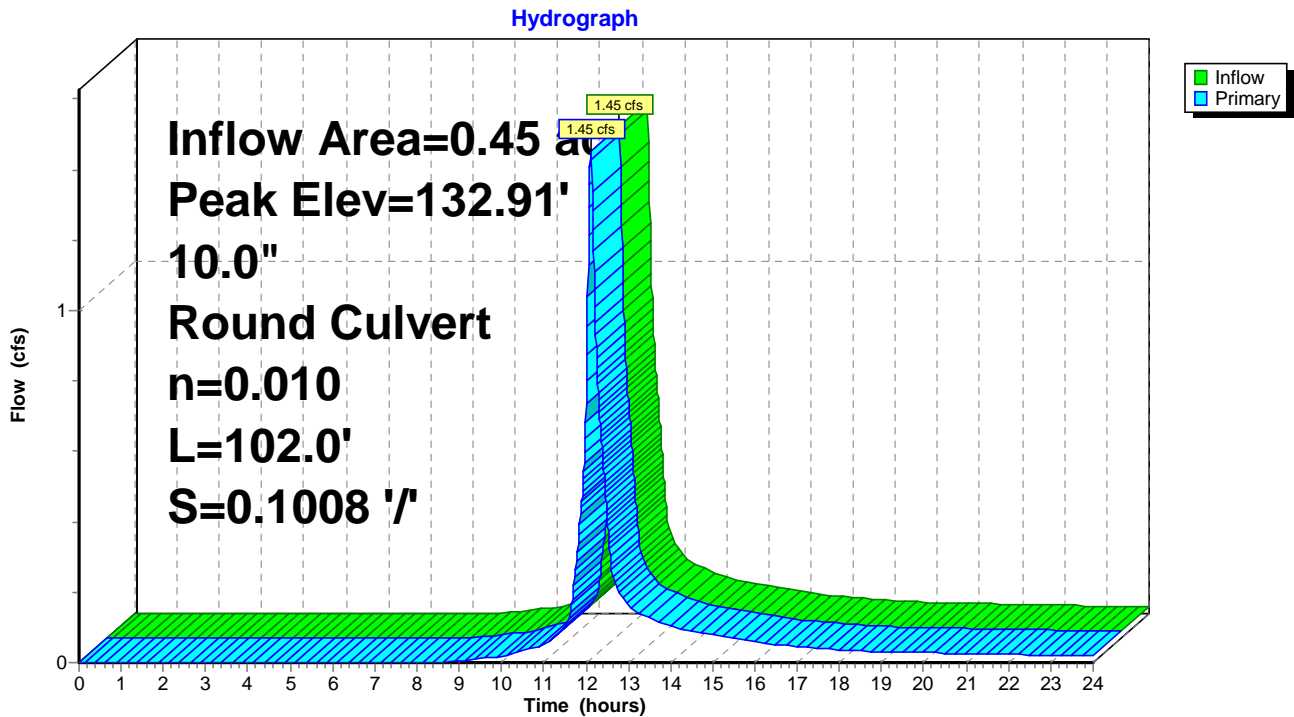
Inflow Area = 0.45 ac, 57.01% Impervious, Inflow Depth > 2.92" for 25-YR event
 Inflow = 1.45 cfs @ 12.11 hrs, Volume= 0.110 af
 Outflow = 1.45 cfs @ 12.11 hrs, Volume= 0.110 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.45 cfs @ 12.11 hrs, Volume= 0.110 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 132.91' @ 12.11 hrs
 Flood Elev= 140.41'

Device #	Routing	Invert	Outlet Devices
#1	Primary	132.00'	10.0" Round Culvert L= 102.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 132.00' / 121.72' S= 0.1008 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.45 cfs @ 12.11 hrs HW=132.91' (Free Discharge)
 ↑1=Culvert (Inlet Controls 1.45 cfs @ 2.66 fps)

Pond 210P: Existing FI



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 60

Summary for Pond 217P: Existing DMH

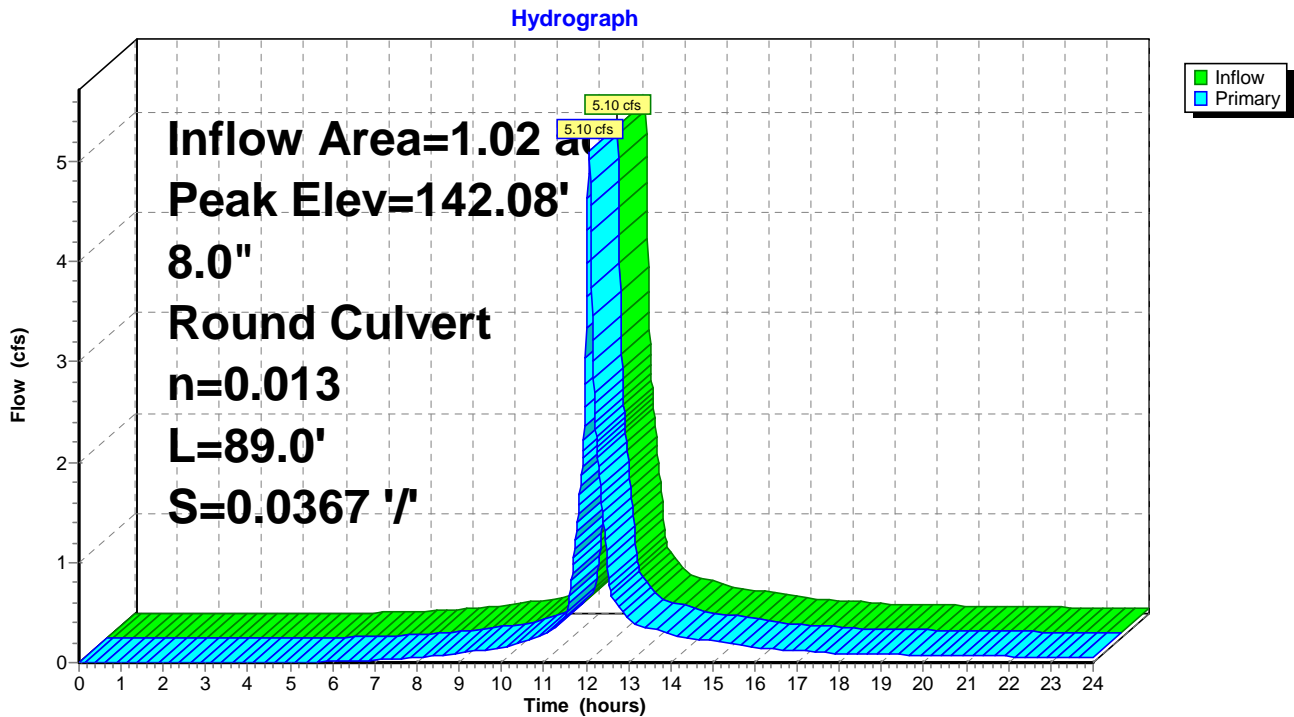
Inflow Area = 1.02 ac, 79.74% Impervious, Inflow Depth > 4.22" for 25-YR event
 Inflow = 5.10 cfs @ 12.07 hrs, Volume= 0.360 af
 Outflow = 5.10 cfs @ 12.07 hrs, Volume= 0.360 af, Atten= 0%, Lag= 0.0 min
 Primary = 5.10 cfs @ 12.07 hrs, Volume= 0.360 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 142.08' @ 12.07 hrs
 Flood Elev= 126.98'

Device #	Routing	Invert	Outlet Devices
1	Primary	122.48'	8.0" Round Culvert L= 89.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 122.48' / 119.21' S= 0.0367 '/ Cc= 0.900 n= 0.013 Cast iron, coated, Flow Area= 0.35 sf

Primary OutFlow Max=5.09 cfs @ 12.07 hrs HW=142.01' (Free Discharge)
 1=Culvert (Barrel Controls 5.09 cfs @ 14.59 fps)

Pond 217P: Existing DMH



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 61

Summary for Pond 220P: Existing DMH

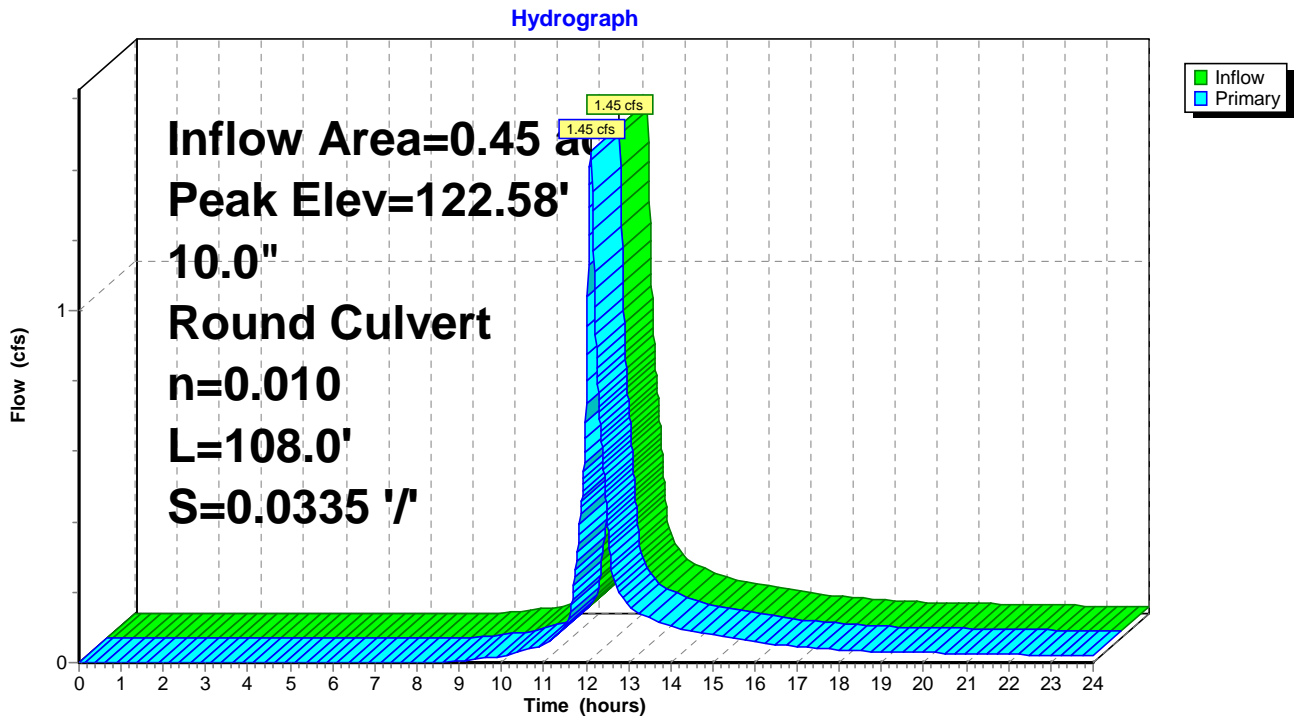
Inflow Area = 0.45 ac, 57.01% Impervious, Inflow Depth > 2.92" for 25-YR event
 Inflow = 1.45 cfs @ 12.11 hrs, Volume= 0.110 af
 Outflow = 1.45 cfs @ 12.11 hrs, Volume= 0.110 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.45 cfs @ 12.11 hrs, Volume= 0.110 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 122.58' @ 12.11 hrs
 Flood Elev= 128.47'

Device #	Routing	Invert	Outlet Devices
#1	Primary	121.67'	10.0" Round Culvert L= 108.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 121.67' / 118.05' S= 0.0335 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.45 cfs @ 12.11 hrs HW=122.58' (Free Discharge)
 ↑1=Culvert (Inlet Controls 1.45 cfs @ 2.66 fps)

Pond 220P: Existing DMH



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 62

Summary for Pond 227P: Existing SMH

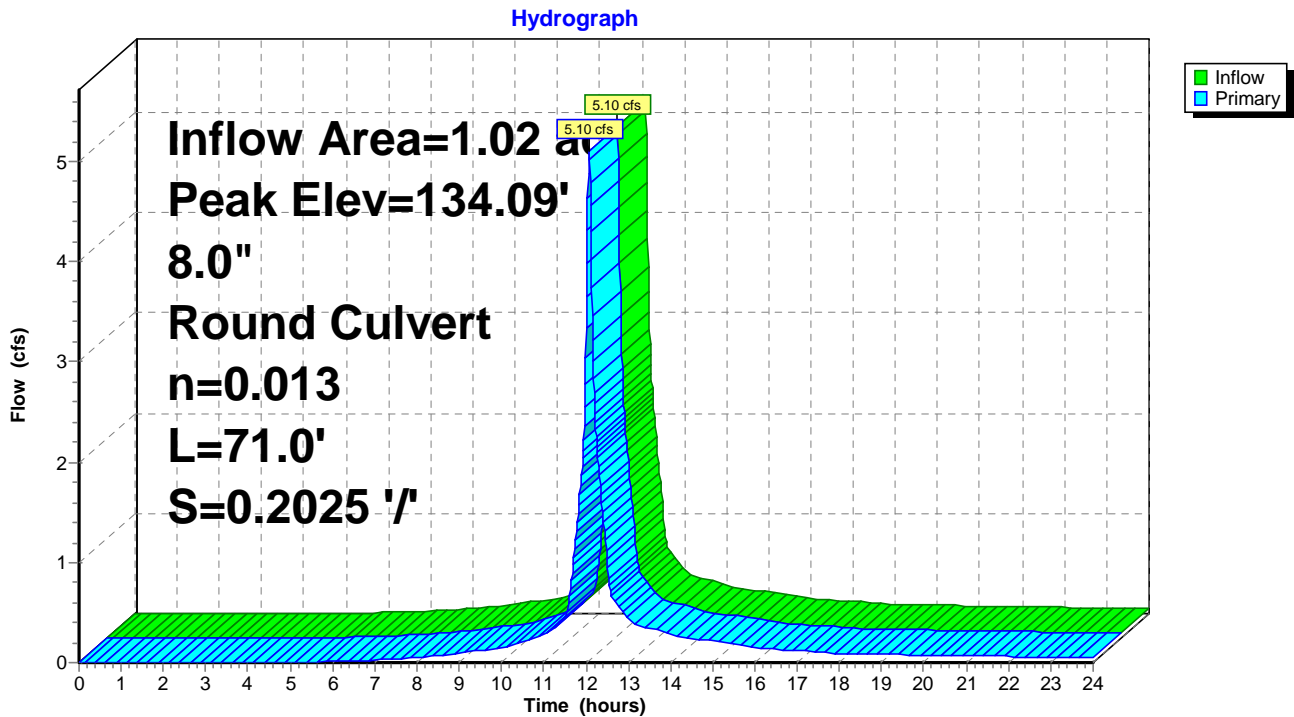
Inflow Area = 1.02 ac, 79.74% Impervious, Inflow Depth > 4.22" for 25-YR event
 Inflow = 5.10 cfs @ 12.07 hrs, Volume= 0.360 af
 Outflow = 5.10 cfs @ 12.07 hrs, Volume= 0.360 af, Atten= 0%, Lag= 0.0 min
 Primary = 5.10 cfs @ 12.07 hrs, Volume= 0.360 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 134.09' @ 12.07 hrs
 Flood Elev= 123.81'

Device #	Routing	Invert	Outlet Devices
1	Primary	118.98'	8.0" Round Culvert L= 71.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 118.98' / 104.60' S= 0.2025 '/ Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.35 sf

Primary OutFlow Max=5.09 cfs @ 12.07 hrs HW=134.04' (Free Discharge)
 ←1=Culvert (Inlet Controls 5.09 cfs @ 14.59 fps)

Pond 227P: Existing SMH



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 63

Summary for Pond 230P: Existing DMH

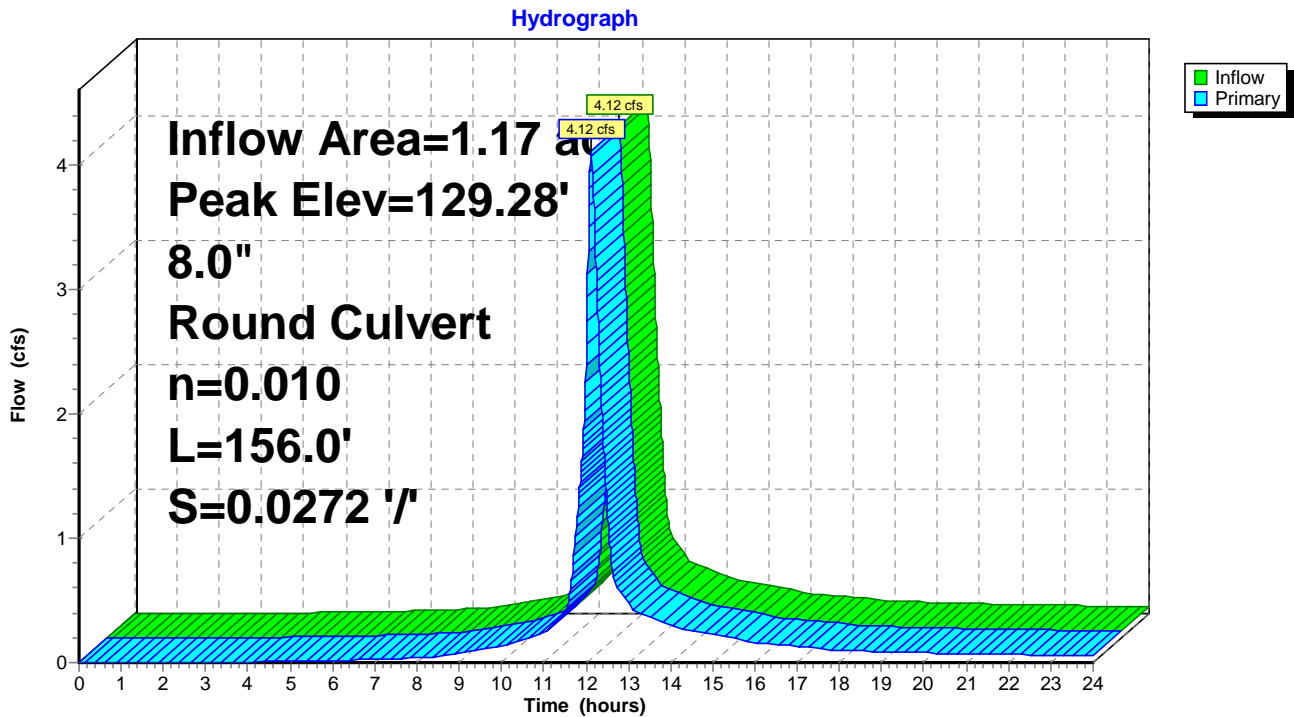
Inflow Area = 1.17 ac, 70.73% Impervious, Inflow Depth > 3.72" for 25-YR event
 Inflow = 4.12 cfs @ 12.12 hrs, Volume= 0.363 af
 Outflow = 4.12 cfs @ 12.12 hrs, Volume= 0.363 af, Atten= 0%, Lag= 0.0 min
 Primary = 4.12 cfs @ 12.12 hrs, Volume= 0.363 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 129.28' @ 12.12 hrs
 Flood Elev= 125.05'

Device #	Routing	Invert	Outlet Devices
1	Primary	118.00'	8.0" Round Culvert L= 156.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 118.00' / 113.76' S= 0.0272 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=4.11 cfs @ 12.12 hrs HW=129.26' (Free Discharge)
 1=Culvert (Barrel Controls 4.11 cfs @ 11.79 fps)

Pond 230P: Existing DMH



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 64

Summary for Pond 240P: Existing DMH

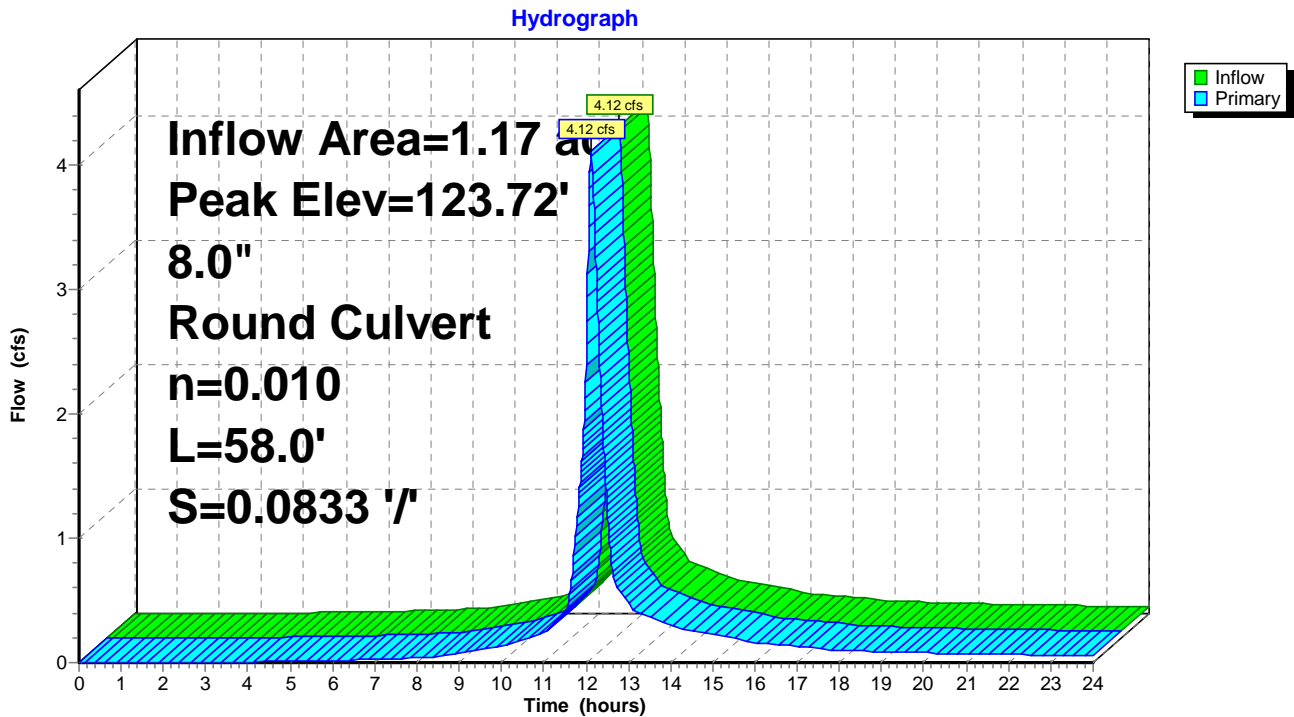
Inflow Area = 1.17 ac, 70.73% Impervious, Inflow Depth > 3.72" for 25-YR event
 Inflow = 4.12 cfs @ 12.12 hrs, Volume= 0.363 af
 Outflow = 4.12 cfs @ 12.12 hrs, Volume= 0.363 af, Atten= 0%, Lag= 0.0 min
 Primary = 4.12 cfs @ 12.12 hrs, Volume= 0.363 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 123.72' @ 12.12 hrs
 Flood Elev= 124.03'

Device #	Routing	Invert	Outlet Devices
1	Primary	113.76'	8.0" Round Culvert L= 58.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 113.76' / 108.93' S= 0.0833 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=4.11 cfs @ 12.12 hrs HW=123.71' (Free Discharge)
 ←1=Culvert (Inlet Controls 4.11 cfs @ 11.79 fps)

Pond 240P: Existing DMH



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 65

Summary for Pond 260P: Storage Pipes

Inflow Area = 0.72 ac, 79.29% Impervious, Inflow Depth > 4.22" for 25-YR event
 Inflow = 3.53 cfs @ 12.07 hrs, Volume= 0.254 af
 Outflow = 2.69 cfs @ 12.14 hrs, Volume= 0.254 af, Atten= 24%, Lag= 3.8 min
 Primary = 2.69 cfs @ 12.14 hrs, Volume= 0.254 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 120.47' @ 12.14 hrs Surf.Area= 924 sf Storage= 626 cf
 Flood Elev= 125.26' Surf.Area= 0 sf Storage= 3,468 cf

Plug-Flow detention time= 1.6 min calculated for 0.254 af (100% of inflow)
 Center-of-Mass det. time= 1.6 min (790.6 - 789.1)

Volume	Invert	Avail.Storage	Storage Description
#1	119.16'	3,468 cf	48.0" Round Pipe Storage L= 276.0' S= 0.0027 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	119.16'	12.0" Round Culvert L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.16' / 118.02' S= 0.0380 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.68 cfs @ 12.14 hrs HW=120.47' (Free Discharge)
 ↑**1=Culvert** (Inlet Controls 2.68 cfs @ 3.42 fps)

5. Pre

Prepared by Woodard & Curran

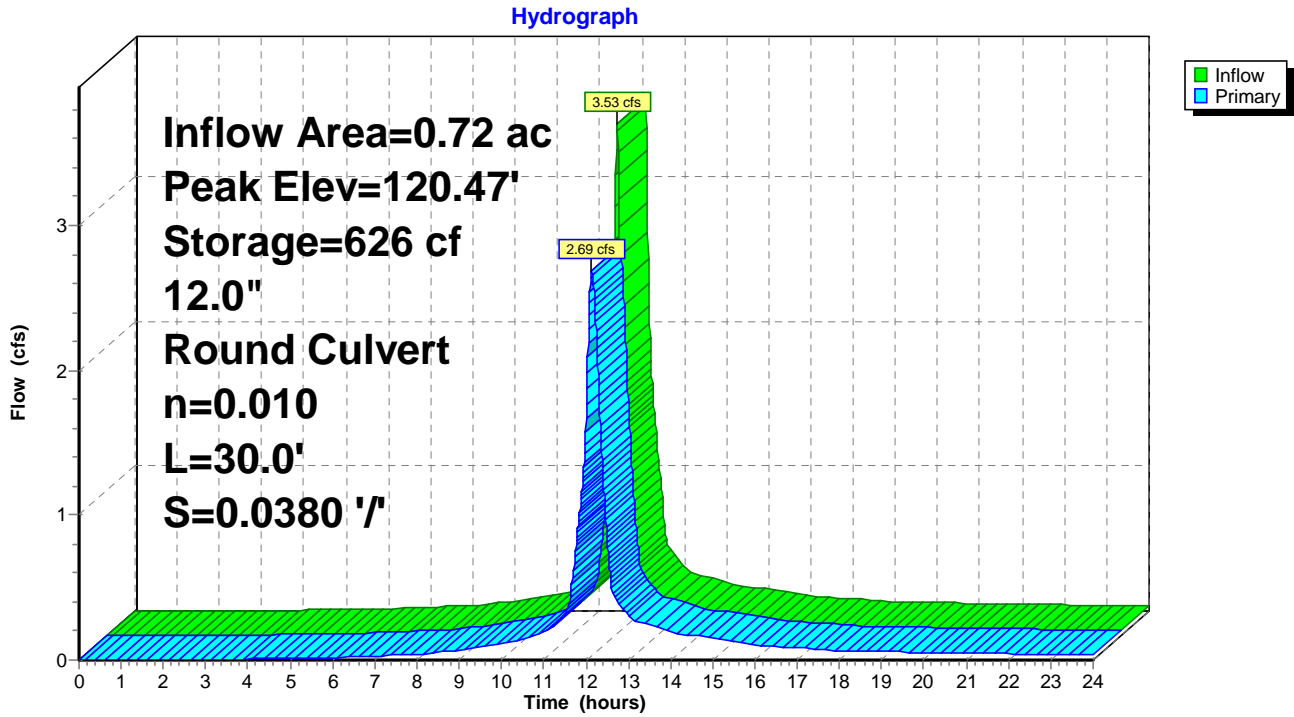
HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

PRE
Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 66

Pond 260P: Storage Pipes



5. Pre

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 67

Summary for Pond 340P: CB at SW Cor prkng lot

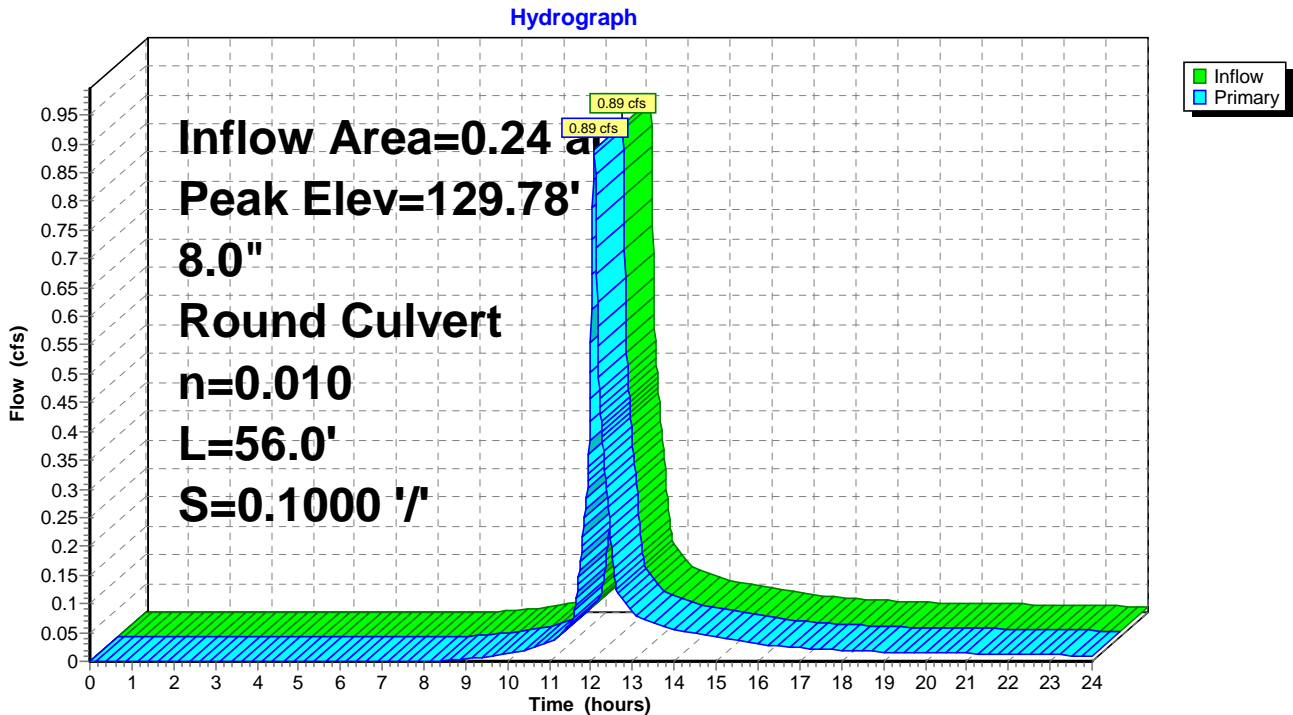
Inflow Area = 0.24 ac, 60.94% Impervious, Inflow Depth > 3.11" for 25-YR event
 Inflow = 0.89 cfs @ 12.08 hrs, Volume= 0.061 af
 Outflow = 0.89 cfs @ 12.08 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.89 cfs @ 12.08 hrs, Volume= 0.061 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 129.78' @ 12.08 hrs

Device #1	Routing Primary	Invert 129.00'	Outlet Devices
			8.0" Round Culvert L= 56.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 129.00' / 123.40' S= 0.1000 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.89 cfs @ 12.08 hrs HW=129.78' (Free Discharge)
 1=Culvert (Inlet Controls 0.89 cfs @ 2.54 fps)

Pond 340P: CB at SW Cor prkng lot



5. Pre

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

PRE
Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

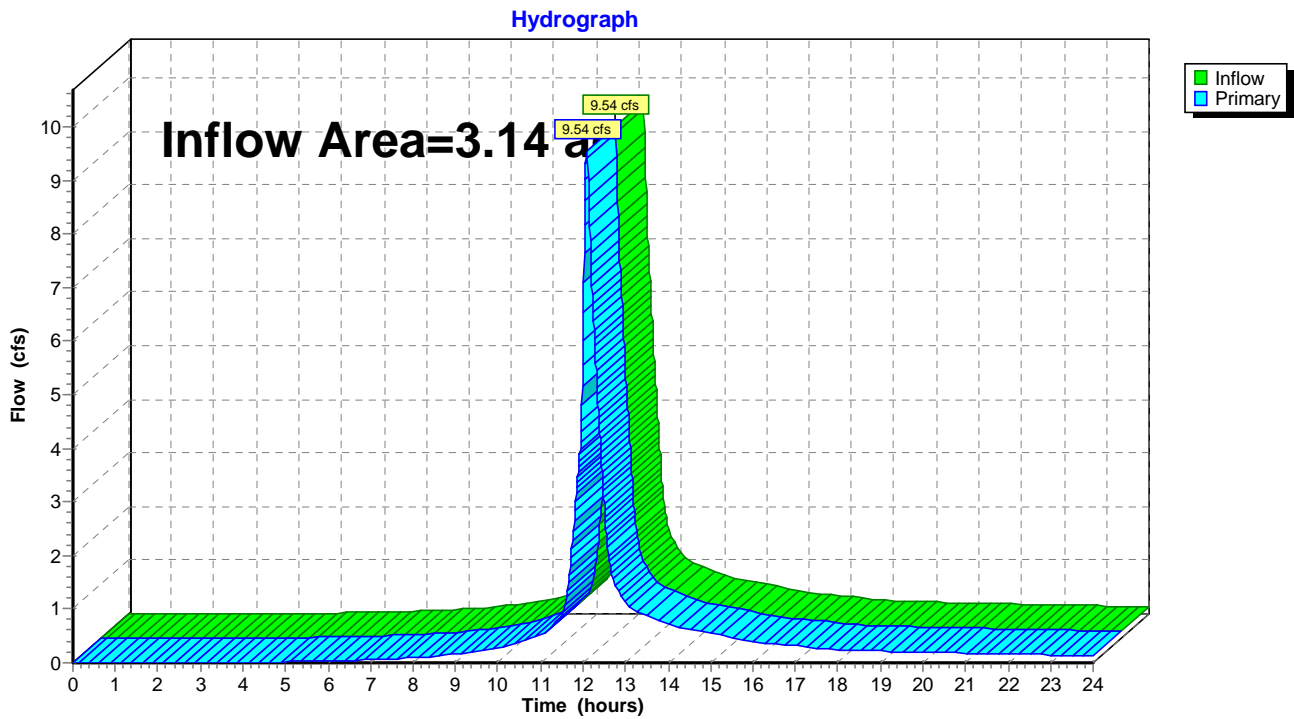
Page 68

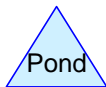
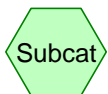
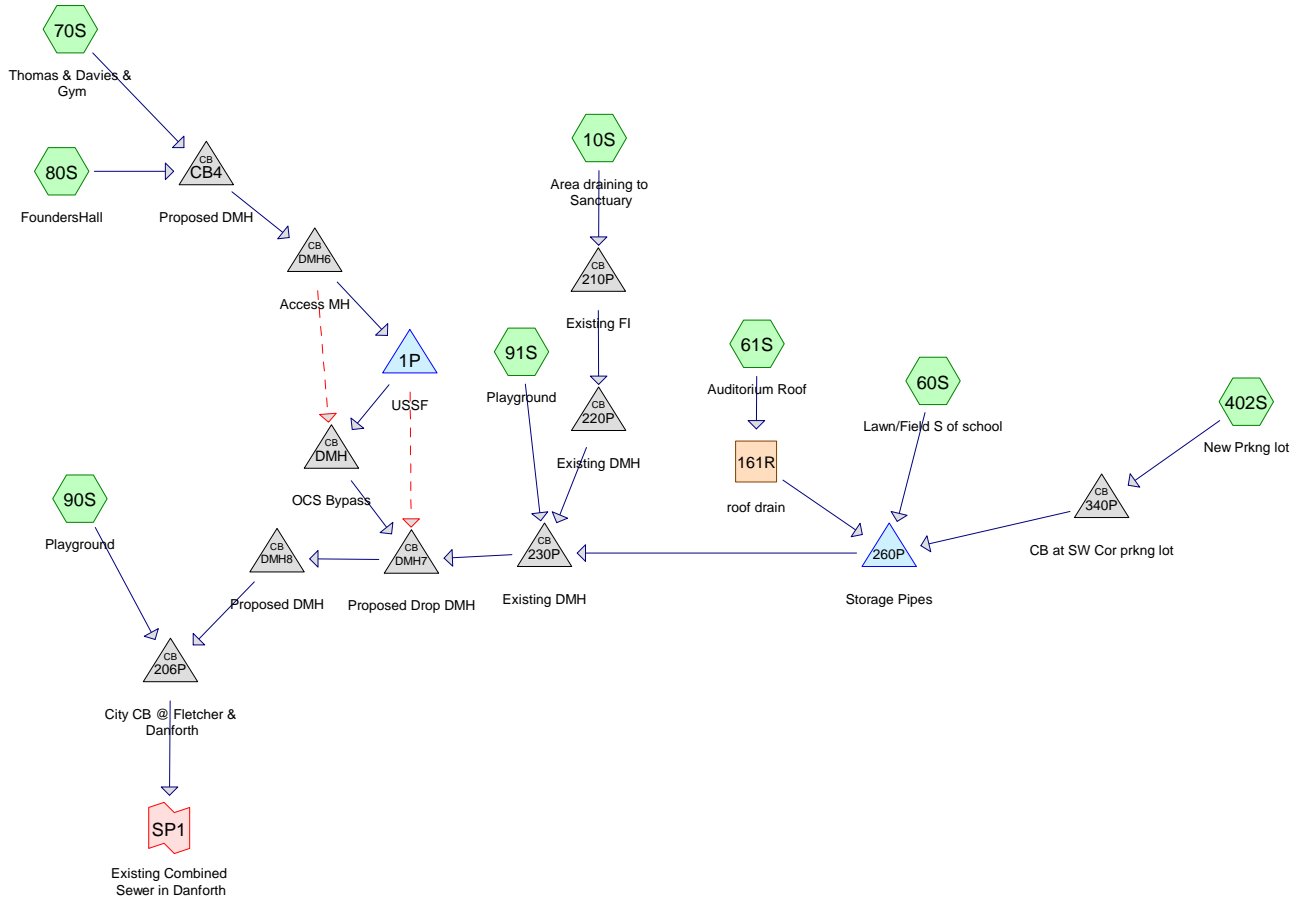
Summary for Link SP1: Existing Combined Sewer in Danforth

Inflow Area = 3.14 ac, 61.14% Impervious, Inflow Depth > 3.21" for 25-YR event
Inflow = 9.54 cfs @ 12.09 hrs, Volume= 0.839 af
Primary = 9.54 cfs @ 12.09 hrs, Volume= 0.839 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link SP1: Existing Combined Sewer in Danforth





Routing Diagram for 6. Post
 Prepared by Woodard & Curran, Printed 2/16/2016
 HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

6. Post

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.14	98	Impervious (402S)
1.02	39	Lawn/field, HSG A (10S, 60S, 70S, 90S, 91S)
0.09	39	Pervious (402S)
0.32	98	Roof runoff (61S, 80S)
1.57	98	impervious (10S, 60S, 70S, 90S, 91S)
3.14	77	TOTAL AREA

6. Post

Type III 24-hr 1-YR Rainfall=2.60"

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 3

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 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 10S: Area draining to Runoff Area=19,254 sf 56.16% Impervious Runoff Depth=0.58"
 Flow Length=91' Slope=0.0300 '/' Tc=7.7 min CN=72 Runoff=0.24 cfs 0.021 af

Subcatchment 60S: Lawn/Field S of school Runoff Area=16,715 sf 84.98% Impervious Runoff Depth=1.54"
 Tc=5.0 min CN=89 Runoff=0.72 cfs 0.049 af

Subcatchment 61S: Auditorium Roof Runoff Area=4,485 sf 100.00% Impervious Runoff Depth=2.37"
 Tc=5.0 min CN=98 Runoff=0.27 cfs 0.020 af

Subcatchment 70S: Thomas & Davies & Runoff Area=44,441 sf 74.20% Impervious Runoff Depth=1.13"
 Flow Length=91' Slope=0.1593 '/' Tc=5.0 min CN=83 Runoff=1.39 cfs 0.096 af

Subcatchment 80S: FoundersHall Runoff Area=9,466 sf 100.00% Impervious Runoff Depth=2.37"
 Tc=5.0 min CN=98 Runoff=0.56 cfs 0.043 af

Subcatchment 90S: Playground Runoff Area=27,554 sf 25.26% Impervious Runoff Depth=0.09"
 Flow Length=117' Tc=9.2 min CN=54 Runoff=0.01 cfs 0.004 af

Subcatchment 91S: Playground Runoff Area=4,688 sf 69.20% Impervious Runoff Depth=0.96"
 Tc=5.0 min CN=80 Runoff=0.12 cfs 0.009 af

Subcatchment 402S: New Prkng lot Runoff Area=10,240 sf 60.94% Impervious Runoff Depth=0.71"
 Tc=5.0 min CN=75 Runoff=0.18 cfs 0.014 af

Reach 161R: roof drain Avg. Flow Depth=0.13' Max Vel=6.29 fps Inflow=0.27 cfs 0.020 af
 6.0" Round Pipe n=0.013 L=129.0' S=0.0911 '/' Capacity=1.69 cfs Outflow=0.27 cfs 0.020 af

Pond 1P: USSF Peak Elev=120.77' Storage=6,062 cf Inflow=1.95 cfs 0.139 af
 Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 206P: City CB @ Fletcher & Danforth Peak Elev=108.16' Inflow=1.42 cfs 0.118 af
 12.0" Round Culvert n=0.010 L=20.0' S=0.2475 '/' Outflow=1.42 cfs 0.118 af

Pond 210P: Existing FI Peak Elev=132.28' Inflow=0.24 cfs 0.021 af
 10.0" Round Culvert n=0.010 L=102.0' S=0.1008 '/' Outflow=0.24 cfs 0.021 af

Pond 220P: Existing DMH Peak Elev=121.96' Inflow=0.24 cfs 0.021 af
 10.0" Round Culvert n=0.010 L=108.0' S=0.0335 '/' Outflow=0.24 cfs 0.021 af

Pond 230P: Existing DMH Peak Elev=118.89' Inflow=1.42 cfs 0.114 af
 10.0" Round Culvert n=0.010 L=83.0' S=0.0257 '/' Outflow=1.42 cfs 0.114 af

Pond 260P: Storage Pipes Peak Elev=119.78' Storage=114 cf Inflow=1.17 cfs 0.084 af
 12.0" Round Culvert n=0.010 L=30.0' S=0.0380 '/' Outflow=1.07 cfs 0.084 af

Pond 340P: CB at SW Cor prkng lot Peak Elev=129.27' Inflow=0.18 cfs 0.014 af
 8.0" Round Culvert n=0.010 L=56.0' S=0.1000 '/' Outflow=0.18 cfs 0.014 af

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 4

Pond CB4: Proposed DMH

Peak Elev=123.18' Inflow=1.95 cfs 0.139 af
12.0" Round Culvert n=0.010 L=24.0' S=0.0621 1/ Outflow=1.95 cfs 0.139 af

Pond DMH: OCS Bypass

Peak Elev=119.42' Inflow=0.00 cfs 0.000 af
10.0" Round Culvert n=0.010 L=60.0' S=0.0692 1/ Outflow=0.00 cfs 0.000 af

Pond DMH6: Access MH

Peak Elev=120.57' Inflow=1.95 cfs 0.139 af
Primary=1.95 cfs 0.139 af Secondary=0.00 cfs 0.000 af Outflow=1.95 cfs 0.139 af

Pond DMH7: Proposed Drop DMH

Peak Elev=116.06' Inflow=1.42 cfs 0.114 af
10.0" Round Culvert n=0.010 L=84.0' S=0.0175 1/ Outflow=1.42 cfs 0.114 af

Pond DMH8: Proposed DMH

Peak Elev=114.59' Inflow=1.42 cfs 0.114 af
10.0" Round Culvert n=0.010 L=33.0' S=0.1445 1/ Outflow=1.42 cfs 0.114 af

Link SP1: Existing Combined Sewer in Danforth

Inflow=1.42 cfs 0.118 af
Primary=1.42 cfs 0.118 af

Total Runoff Area = 3.14 ac Runoff Volume = 0.257 af Average Runoff Depth = 0.98"
35.41% Pervious = 1.11 ac 64.59% Impervious = 2.03 ac

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 5

Summary for Subcatchment 10S: Area draining to Sanctuary

Runoff = 0.24 cfs @ 12.13 hrs, Volume= 0.021 af, Depth= 0.58"

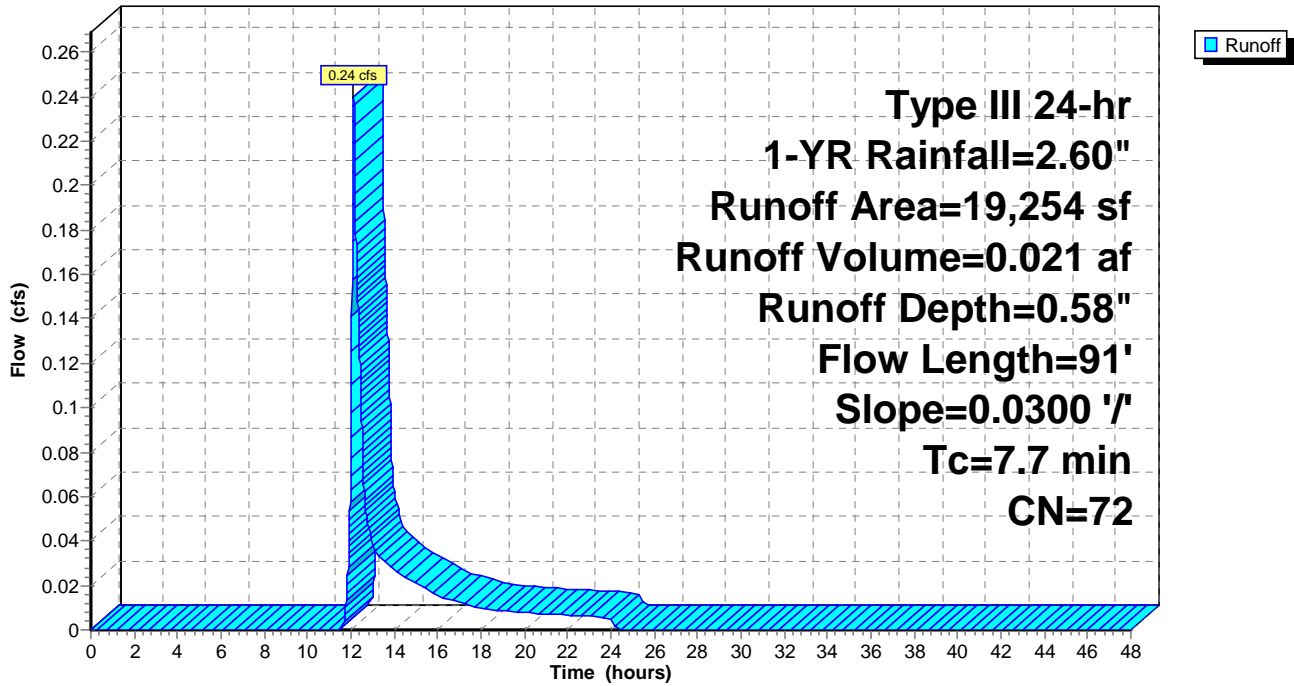
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.60"

	Area (sf)	CN	Description
*	10,813	98	impervious
*	8,441	39	Lawn/field, HSG A
	19,254	72	Weighted Average
	8,441		43.84% Pervious Area
	10,813		56.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	91	0.0300	0.20		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.19"

Subcatchment 10S: Area draining to Sanctuary

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 6

Summary for Subcatchment 60S: Lawn/Field S of school

Runoff = 0.72 cfs @ 12.07 hrs, Volume= 0.049 af, Depth= 1.54"

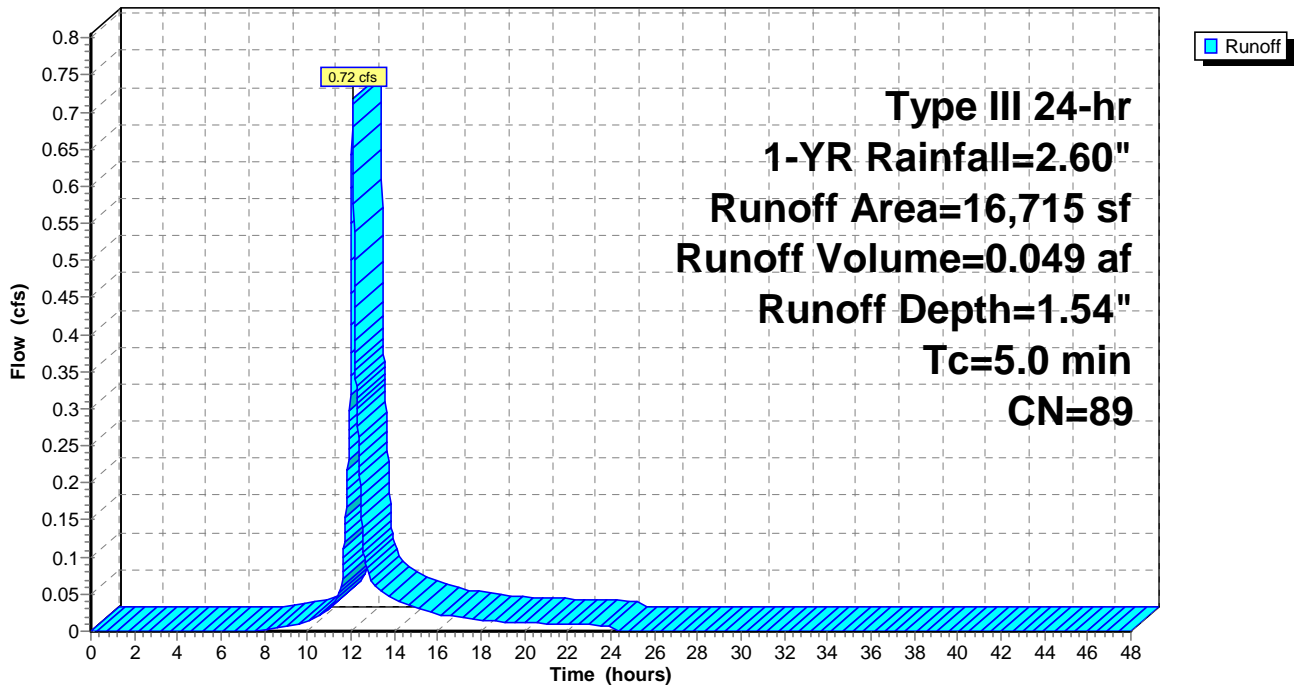
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.60"

	Area (sf)	CN	Description
*	14,205	98	impervious
*	2,510	39	Lawn/field, HSG A
	16,715	89	Weighted Average
	2,510		15.02% Pervious Area
	14,205		84.98% Impervious Area

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

Subcatchment 60S: Lawn/Field S of school

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 7

Summary for Subcatchment 61S: Auditorium Roof

Runoff = 0.27 cfs @ 12.07 hrs, Volume= 0.020 af, Depth= 2.37"

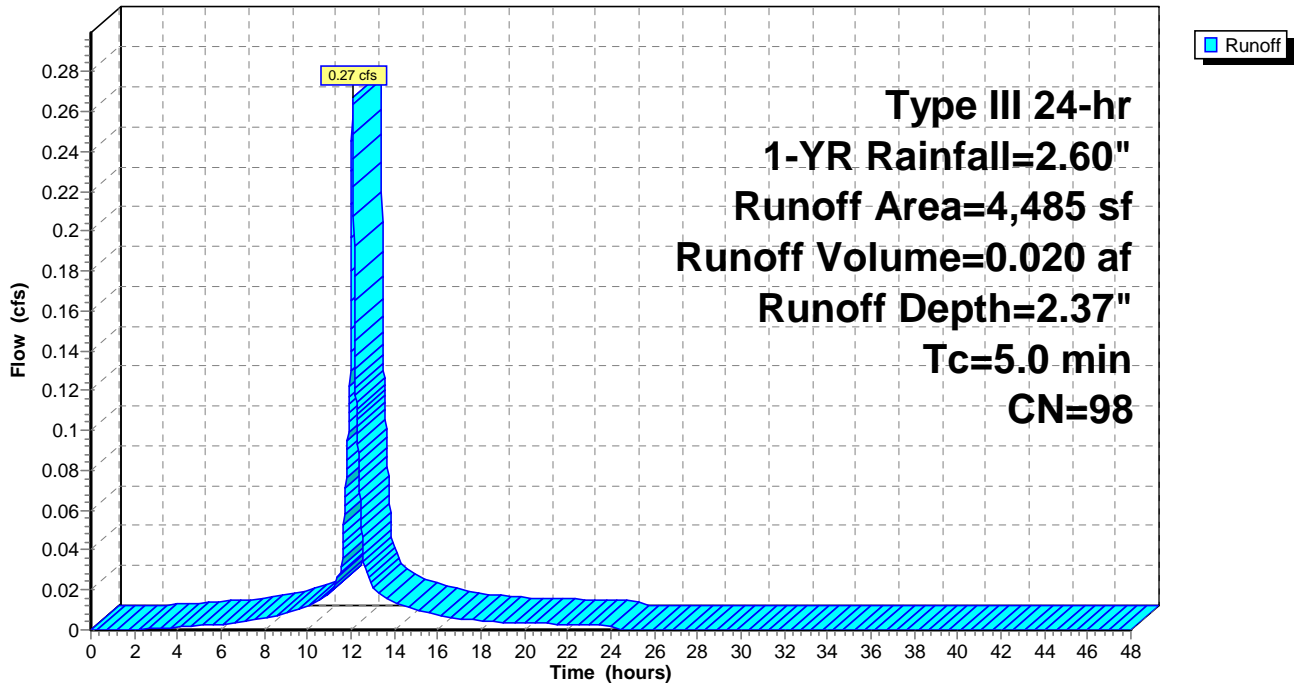
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.60"

Area (sf)	CN	Description
* 4,485	98	Roof runoff
4,485		100.00% Impervious Area

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

Subcatchment 61S: Auditorium Roof

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 8

Summary for Subcatchment 70S: Thomas & Davies & Gym

Runoff = 1.39 cfs @ 12.08 hrs, Volume= 0.096 af, Depth= 1.13"

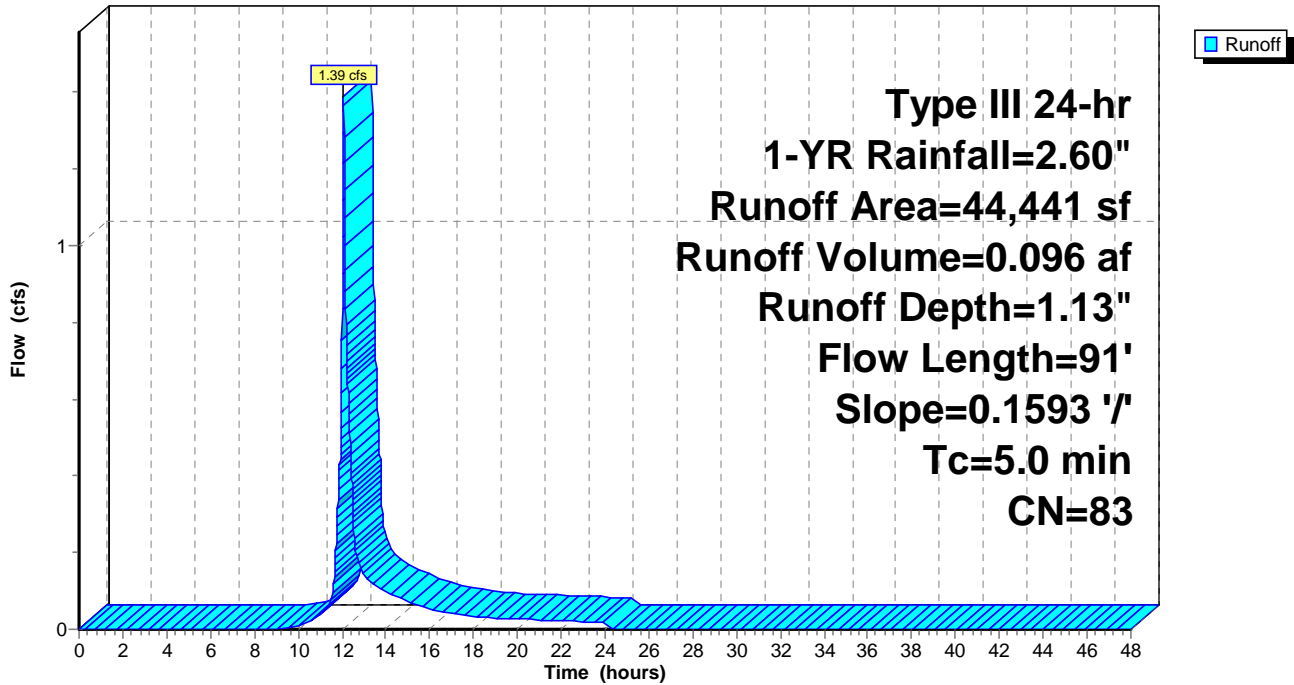
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.60"

	Area (sf)	CN	Description
*	32,976	98	impervious
*	11,465	39	Lawn/field, HSG A
	44,441	83	Weighted Average
	11,465		25.80% Pervious Area
	32,976		74.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	91	0.1593	0.38		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.19"
4.0	91	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 70S: Thomas & Davies & Gym

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 9

Summary for Subcatchment 80S: FoundersHall

Runoff = 0.56 cfs @ 12.07 hrs, Volume= 0.043 af, Depth= 2.37"

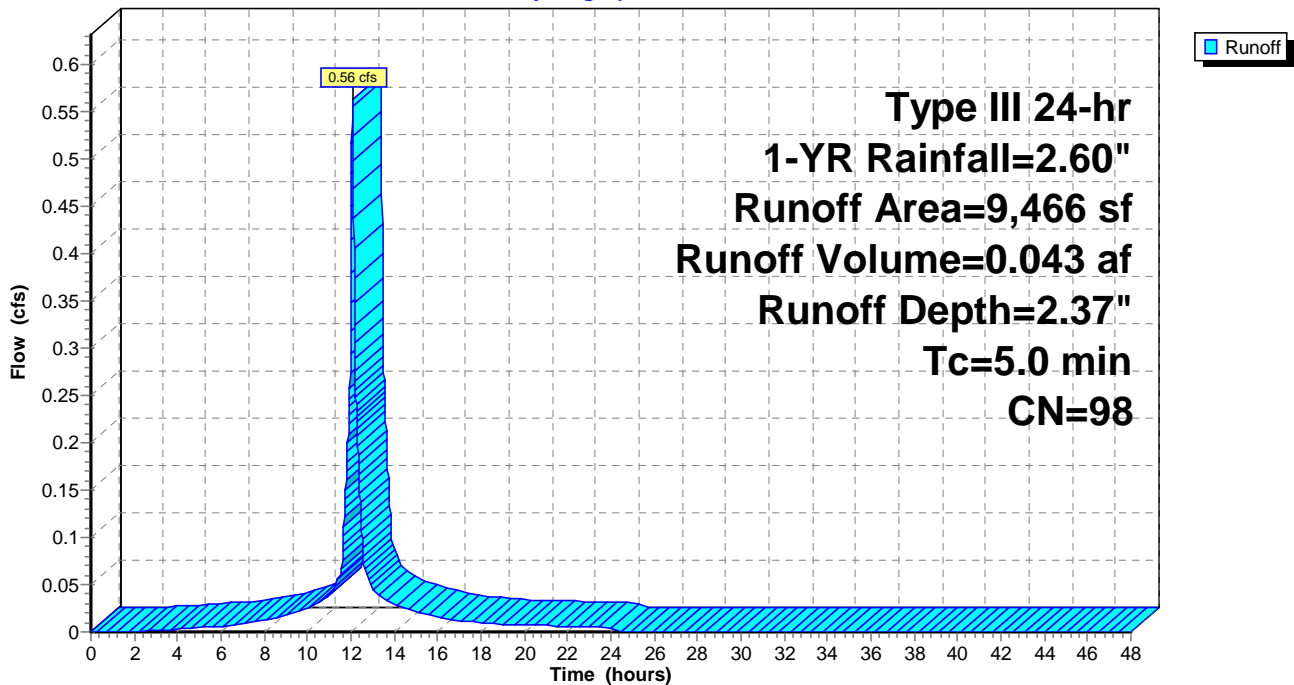
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.60"

	Area (sf)	CN	Description
*	9,466	98	Roof runoff
	9,466		100.00% Impervious Area

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

Subcatchment 80S: FoundersHall

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 10

Summary for Subcatchment 90S: Playground

Runoff = 0.01 cfs @ 13.75 hrs, Volume= 0.004 af, Depth= 0.09"

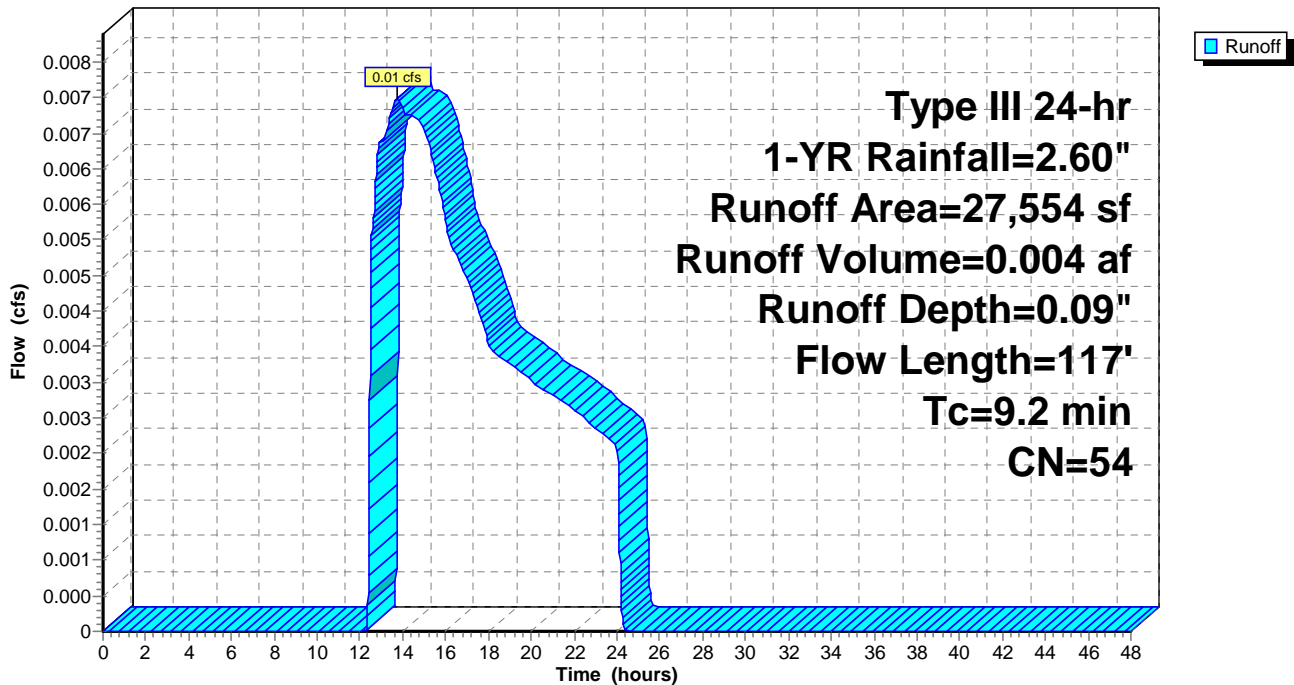
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.60"

	Area (sf)	CN	Description
*	6,960	98	impervious
*	20,594	39	Lawn/field, HSG A
	27,554	54	Weighted Average
	20,594		74.74% Pervious Area
	6,960		25.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.0250	0.19		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.19"
0.2	17	0.0588	1.70		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
9.2	117	Total			

Subcatchment 90S: Playground

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 11

Summary for Subcatchment 91S: Playground

Runoff = 0.12 cfs @ 12.08 hrs, Volume= 0.009 af, Depth= 0.96"

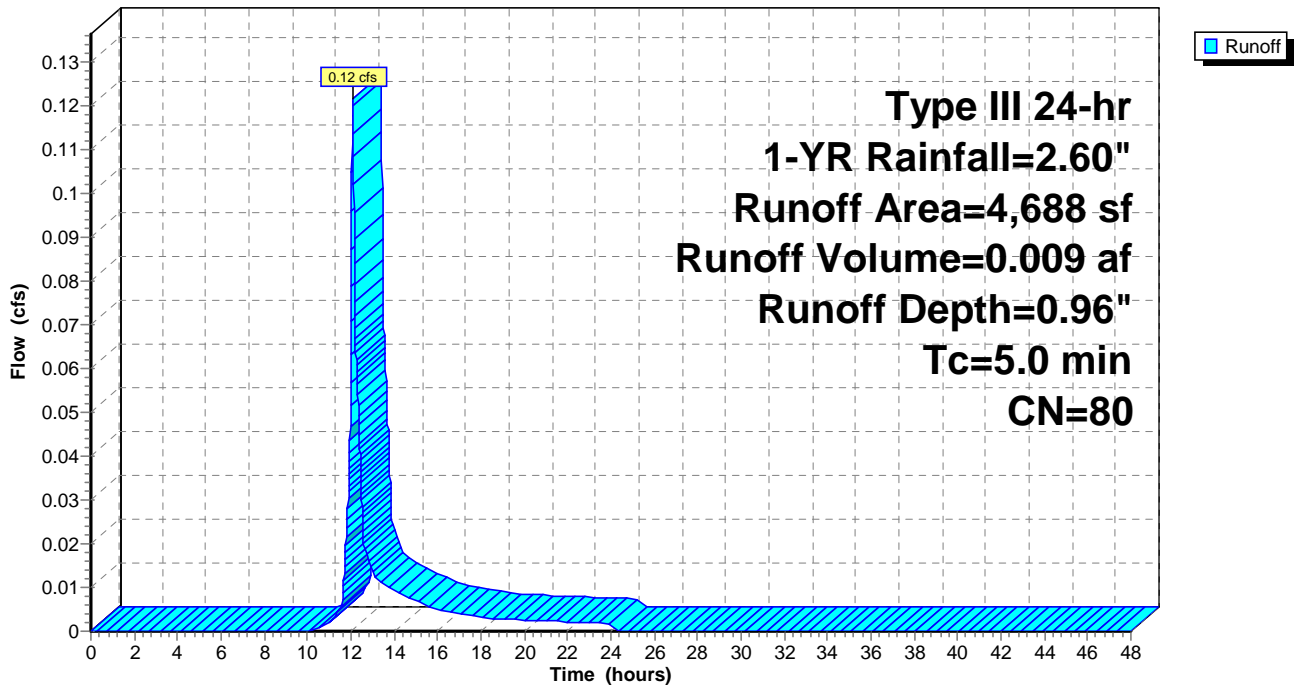
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.60"

	Area (sf)	CN	Description
*	3,244	98	impervious
*	1,444	39	Lawn/field, HSG A
	4,688	80	Weighted Average
	1,444		30.80% Pervious Area
	3,244		69.20% Impervious Area

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

Subcatchment 91S: Playground

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 12

Summary for Subcatchment 402S: New Prkng lot

Runoff = 0.18 cfs @ 12.08 hrs, Volume= 0.014 af, Depth= 0.71"

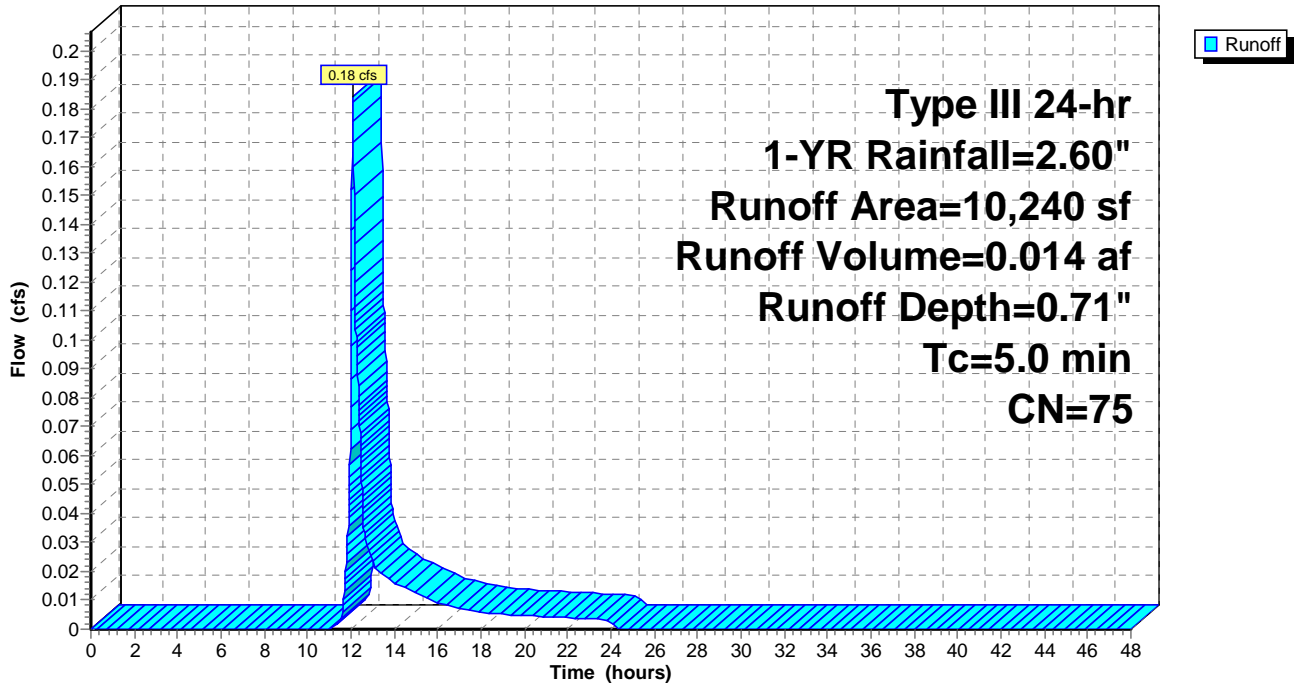
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.60"

	Area (sf)	CN	Description
*	4,000	39	Pervious
*	6,240	98	Impervious
	10,240	75	Weighted Average
	4,000		39.06% Pervious Area
	6,240		60.94% Impervious Area

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

Subcatchment 402S: New Prkng lot

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 13

Summary for Reach 161R: roof drain

Inflow Area = 0.10 ac, 100.00% Impervious, Inflow Depth = 2.37" for 1-YR event
Inflow = 0.27 cfs @ 12.07 hrs, Volume= 0.020 af
Outflow = 0.27 cfs @ 12.08 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Max. Velocity= 6.29 fps, Min. Travel Time= 0.3 min

Avg. Velocity = 2.04 fps, Avg. Travel Time= 1.1 min

Peak Storage= 5 cf @ 12.07 hrs

Average Depth at Peak Storage= 0.13'

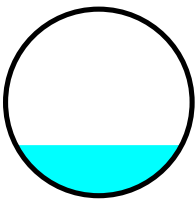
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.69 cfs

6.0" Round Pipe

n= 0.013 Corrugated PE, smooth interior

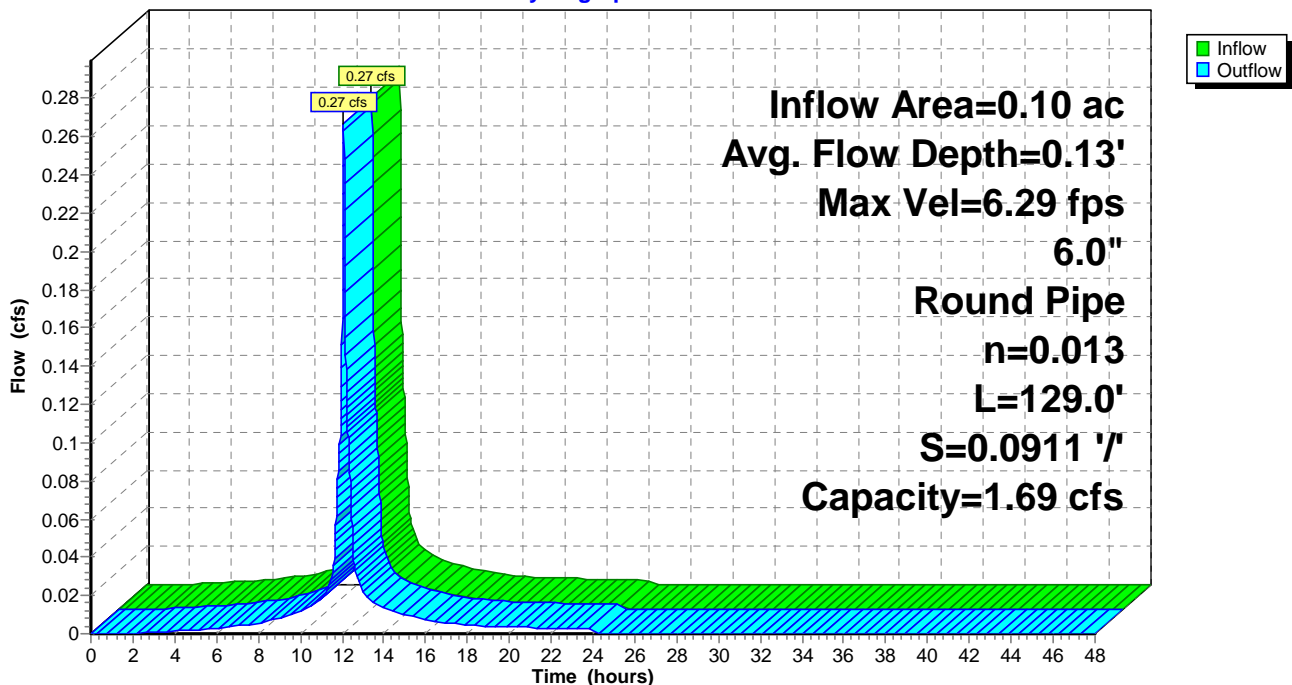
Length= 129.0' Slope= 0.0911 1/100'

Inlet Invert= 130.00', Outlet Invert= 118.25'



Reach 161R: roof drain

Hydrograph



6. Post

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 14

Summary for Pond 1P: USSF

Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth = 1.35" for 1-YR event
 Inflow = 1.95 cfs @ 12.08 hrs, Volume= 0.139 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 120.77' @ 24.29 hrs Surf.Area= 4,717 sf Storage= 6,062 cf
 Flood Elev= 126.48' Surf.Area= 4,717 sf Storage= 16,044 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	118.85'	6,599 cf	51.42'W x 91.74'L x 5.50'H Field A 25,943 cf Overall - 9,445 cf Embedded = 16,499 cf x 40.0% Voids
#2A	119.60'	9,445 cf	ADS_StormTech MC-3500 d +Cap x 84 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 7 Rows of 12 Chambers Cap Storage= +14.9 cf x 2 x 7 rows = 208.6 cf
		16,044 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	119.67'	8.0" Round Culvert L= 7.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.67' / 119.52' S= 0.0214 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#2	Device 1	123.35'	5.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	121.10'	8.0" Vert. Orifice/Grate C= 0.600
#4	Device 5	118.85'	2.410 in/hr Exfiltration over Surface area above 118.85' Conductivity to Groundwater Elevation = 113.00' Excluded Surface area = 4,717 sf
#5	Secondary	116.02'	6.0" Round Culvert L= 31.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 116.02' / 115.88' S= 0.0045 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 15

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=118.85' (Free Discharge)

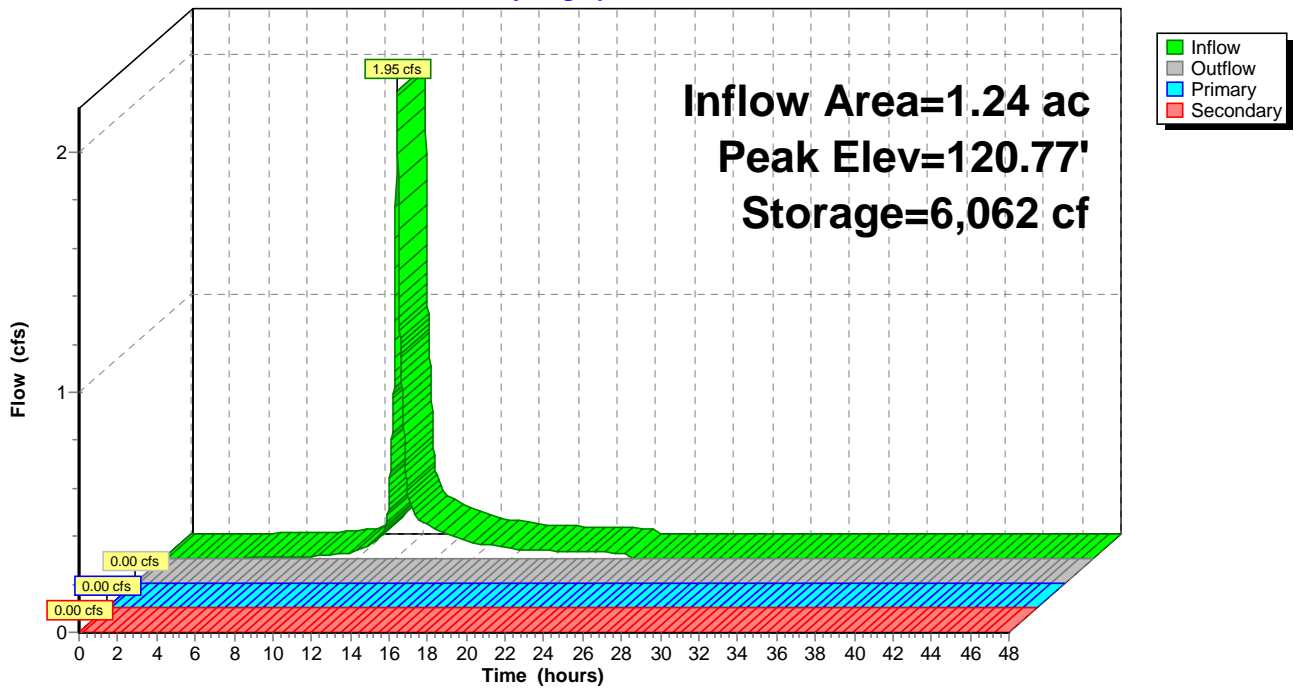
- 1=Culvert (Controls 0.00 cfs)
- 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
- 3=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=118.85' (Free Discharge)

- 5=Culvert (Passes 0.00 cfs of 1.20 cfs potential flow)
- 4=Exfiltration (Controls 0.00 cfs)

Pond 1P: USSF

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 16

Summary for Pond 206P: City CB @ Fletcher & Danforth

Inflow Area = 3.14 ac, 64.59% Impervious, Inflow Depth = 0.45" for 1-YR event
 Inflow = 1.42 cfs @ 12.11 hrs, Volume= 0.118 af
 Outflow = 1.42 cfs @ 12.11 hrs, Volume= 0.118 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.42 cfs @ 12.11 hrs, Volume= 0.118 af

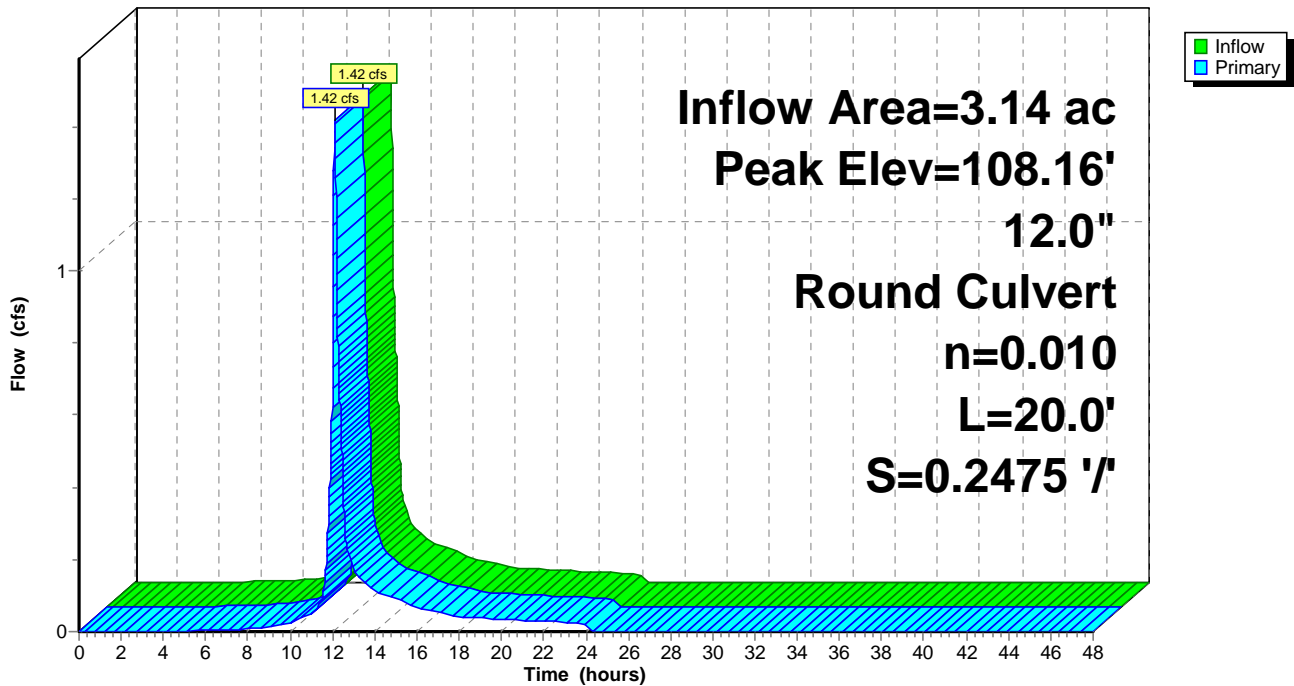
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 108.16' @ 12.11 hrs
 Flood Elev= 111.26'

Device	Routing	Invert	Outlet Devices
#1	Primary	107.43'	12.0" Round Culvert L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 107.43' / 102.48' S= 0.2475 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.42 cfs @ 12.11 hrs HW=108.16' (Free Discharge)
 ↑1=Culvert (Inlet Controls 1.42 cfs @ 2.30 fps)

Pond 206P: City CB @ Fletcher & Danforth

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 17

Summary for Pond 210P: Existing FI

Inflow Area = 0.44 ac, 56.16% Impervious, Inflow Depth = 0.58" for 1-YR event
Inflow = 0.24 cfs @ 12.13 hrs, Volume= 0.021 af
Outflow = 0.24 cfs @ 12.13 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 12.13 hrs, Volume= 0.021 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 132.28' @ 12.13 hrs

Flood Elev= 140.41'

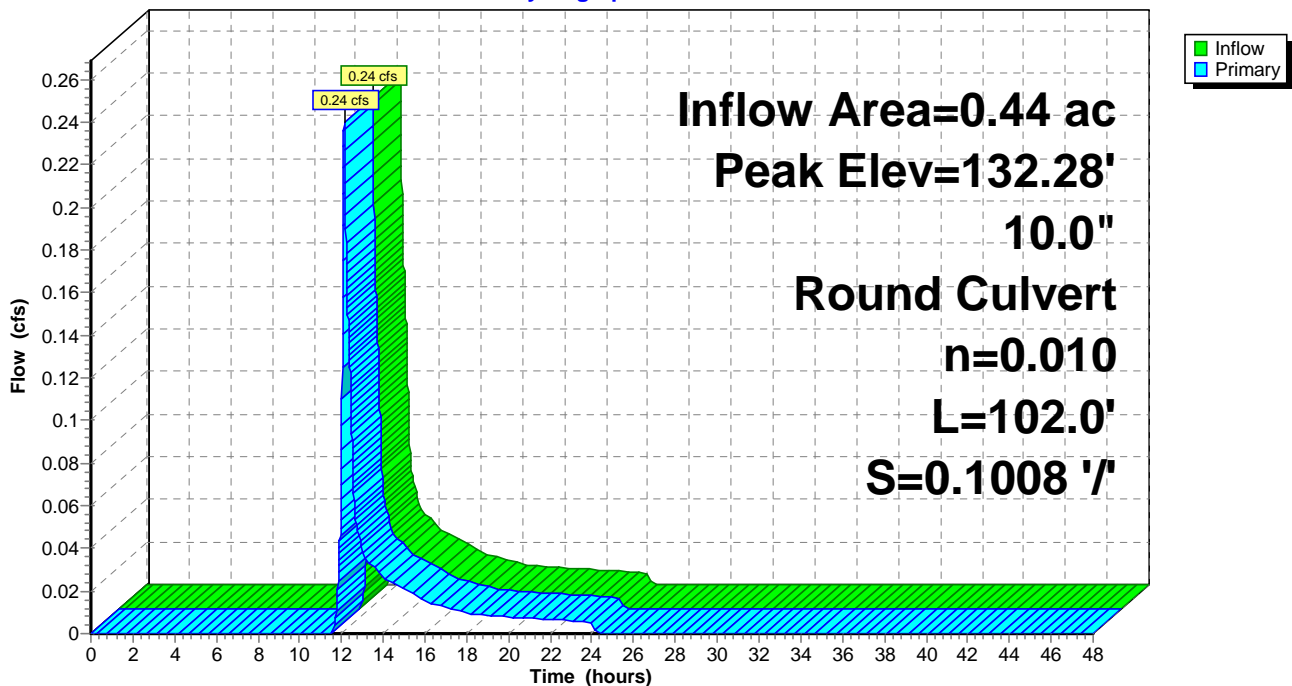
Device #	Routing	Invert	Outlet Devices
1	Primary	132.00'	10.0" Round Culvert L= 102.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 132.00' / 121.72' S= 0.1008 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=0.24 cfs @ 12.13 hrs HW=132.28' (Free Discharge)

↑1=Culvert (Inlet Controls 0.24 cfs @ 1.43 fps)

Pond 210P: Existing FI

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 18

Summary for Pond 220P: Existing DMH

Inflow Area = 0.44 ac, 56.16% Impervious, Inflow Depth = 0.58" for 1-YR event
Inflow = 0.24 cfs @ 12.13 hrs, Volume= 0.021 af
Outflow = 0.24 cfs @ 12.13 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 12.13 hrs, Volume= 0.021 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 121.96' @ 12.13 hrs

Flood Elev= 128.47'

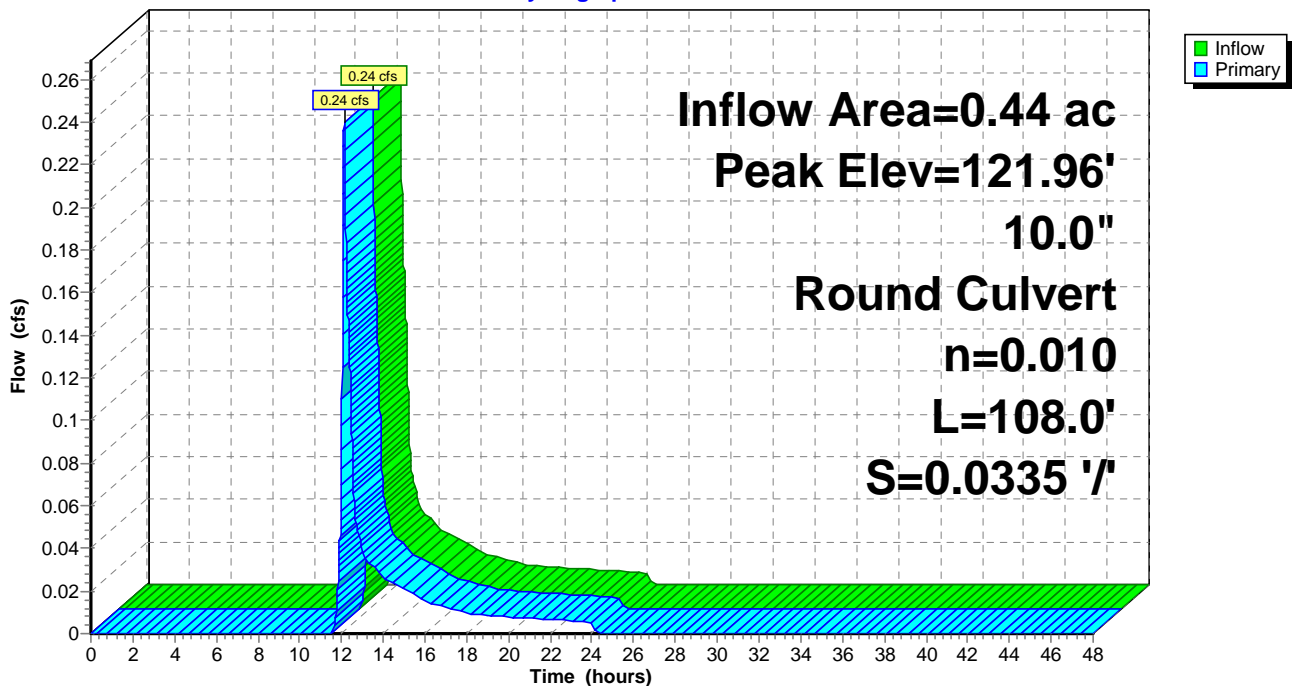
Device	Routing	Invert	Outlet Devices
#1	Primary	121.67'	10.0" Round Culvert L= 108.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 121.67' / 118.05' S= 0.0335 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=0.24 cfs @ 12.13 hrs HW=121.96' (Free Discharge)

↑1=Culvert (Inlet Controls 0.24 cfs @ 1.44 fps)

Pond 220P: Existing DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 19

Summary for Pond 230P: Existing DMH

Inflow Area = 1.27 ac, 70.40% Impervious, Inflow Depth = 1.07" for 1-YR event
Inflow = 1.42 cfs @ 12.11 hrs, Volume= 0.114 af
Outflow = 1.42 cfs @ 12.11 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min
Primary = 1.42 cfs @ 12.11 hrs, Volume= 0.114 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 118.89' @ 12.11 hrs

Flood Elev= 125.05'

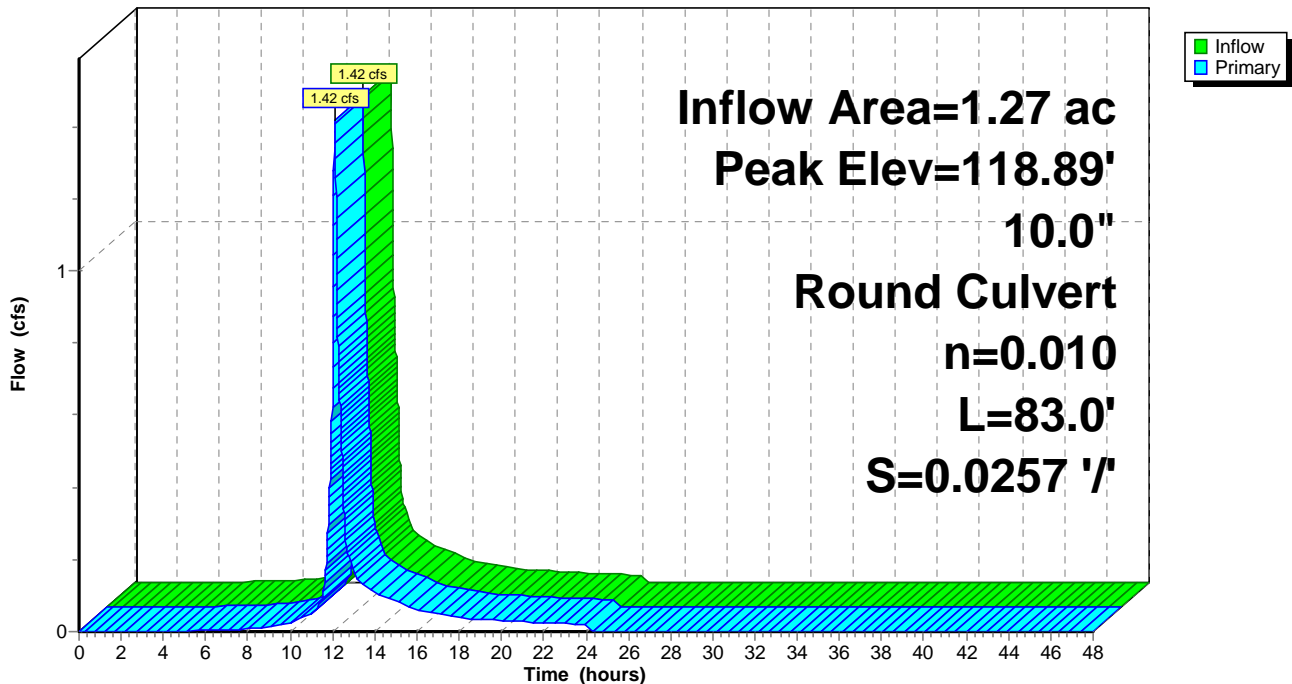
Device	Routing	Invert	Outlet Devices
#1	Primary	118.00'	10.0" Round Culvert L= 83.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 118.00' / 115.87' S= 0.0257 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.42 cfs @ 12.11 hrs HW=118.89' (Free Discharge)

↑1=Culvert (Inlet Controls 1.42 cfs @ 2.60 fps)

Pond 230P: Existing DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 20

Summary for Pond 260P: Storage Pipes

Inflow Area = 0.72 ac, 79.29% Impervious, Inflow Depth = 1.39" for 1-YR event
Inflow = 1.17 cfs @ 12.08 hrs, Volume= 0.084 af
Outflow = 1.07 cfs @ 12.11 hrs, Volume= 0.084 af, Atten= 8%, Lag= 2.0 min
Primary = 1.07 cfs @ 12.11 hrs, Volume= 0.084 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 119.78' @ 12.11 hrs Surf.Area= 454 sf Storage= 114 cf
Flood Elev= 125.26' Surf.Area= 0 sf Storage= 3,468 cf

Plug-Flow detention time= 1.0 min calculated for 0.084 af (100% of inflow)
Center-of-Mass det. time= 1.0 min (814.5 - 813.5)

Volume	Invert	Avail.Storage	Storage Description
#1	119.16'	3,468 cf	48.0" Round Pipe Storage L= 276.0' S= 0.0027 1/'

Device	Routing	Invert	Outlet Devices
#1	Primary	119.16'	12.0" Round Culvert L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.16' / 118.02' S= 0.0380 1/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.07 cfs @ 12.11 hrs HW=119.78' (Free Discharge)

↑**1=Culvert** (Inlet Controls 1.07 cfs @ 2.11 fps)

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

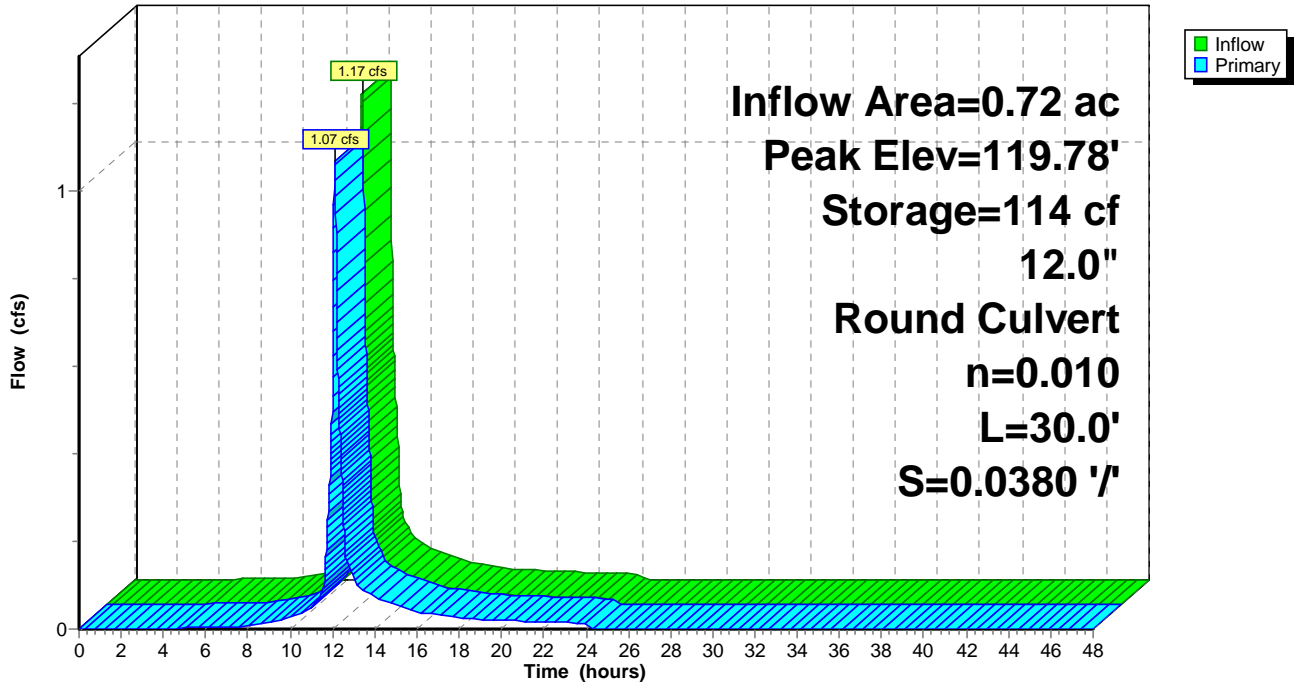
Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 21

Pond 260P: Storage Pipes

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 22

Summary for Pond 340P: CB at SW Cor prkng lot

Inflow Area = 0.24 ac, 60.94% Impervious, Inflow Depth = 0.71" for 1-YR event
Inflow = 0.18 cfs @ 12.08 hrs, Volume= 0.014 af
Outflow = 0.18 cfs @ 12.08 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min
Primary = 0.18 cfs @ 12.08 hrs, Volume= 0.014 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 129.27' @ 12.08 hrs

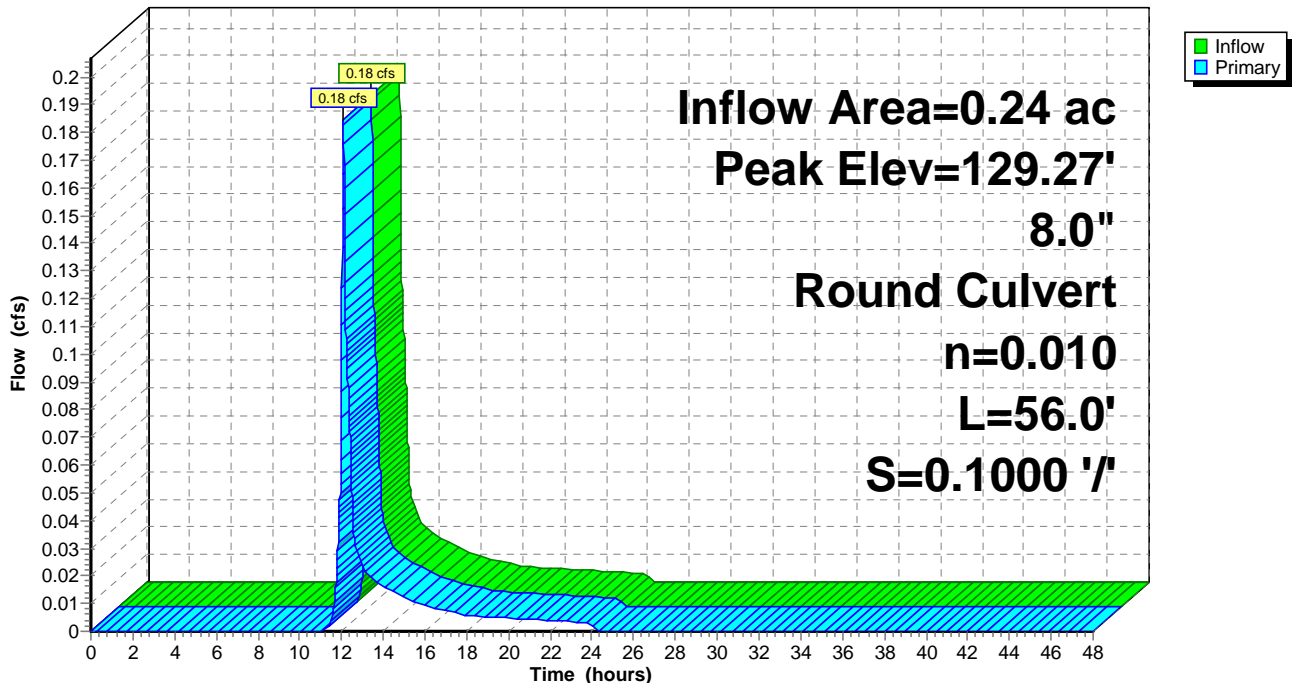
Device	Routing	Invert	Outlet Devices
#1	Primary	129.00'	8.0" Round Culvert L= 56.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 129.00' / 123.40' S= 0.1000 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.18 cfs @ 12.08 hrs HW=129.27' (Free Discharge)

↑1=Culvert (Inlet Controls 0.18 cfs @ 1.39 fps)

Pond 340P: CB at SW Cor prkng lot

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 23

Summary for Pond CB4: Proposed DMH

Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth = 1.35" for 1-YR event
Inflow = 1.95 cfs @ 12.08 hrs, Volume= 0.139 af
Outflow = 1.95 cfs @ 12.08 hrs, Volume= 0.139 af, Atten= 0%, Lag= 0.0 min
Primary = 1.95 cfs @ 12.08 hrs, Volume= 0.139 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 123.18' @ 12.08 hrs

Flood Elev= 127.50'

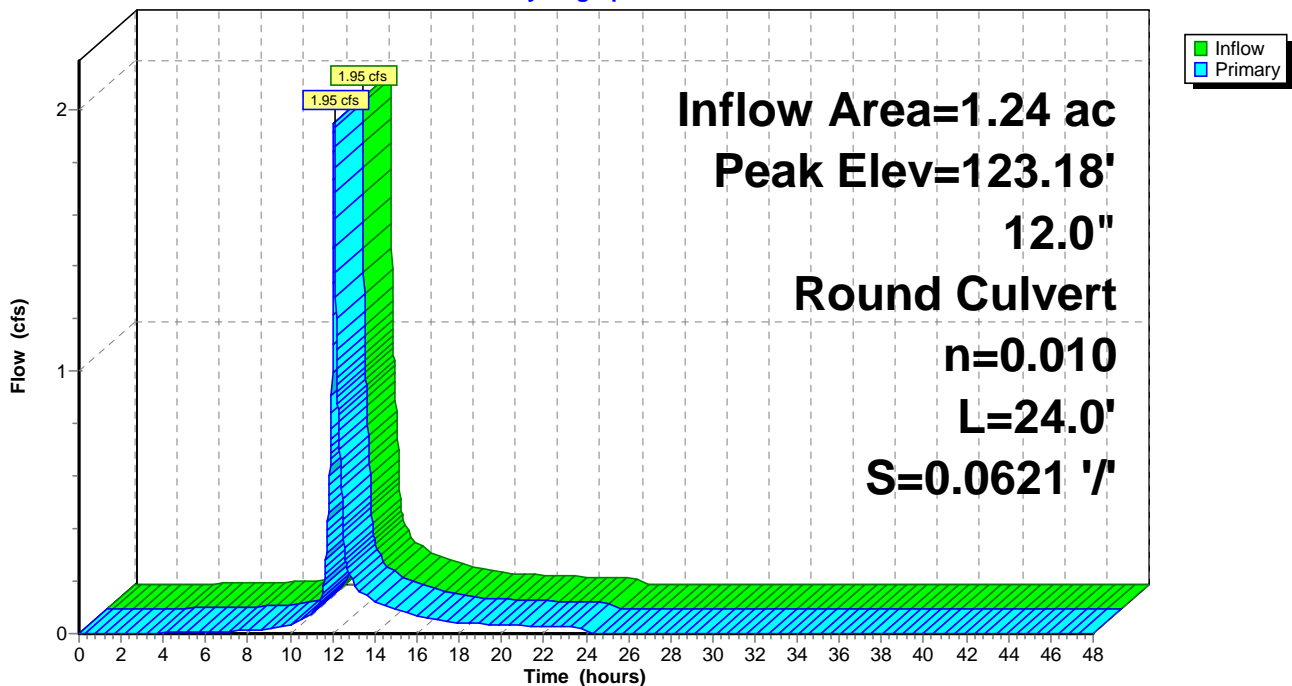
Device #1	Routing	Invert	Outlet Devices
	Primary	122.26'	12.0" Round Culvert L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 122.26' / 120.77' S= 0.0621 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.95 cfs @ 12.08 hrs HW=123.18' (Free Discharge)

↑1=Culvert (Inlet Controls 1.95 cfs @ 2.58 fps)

Pond CB4: Proposed DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 24

Summary for Pond DMH: OCS Bypass

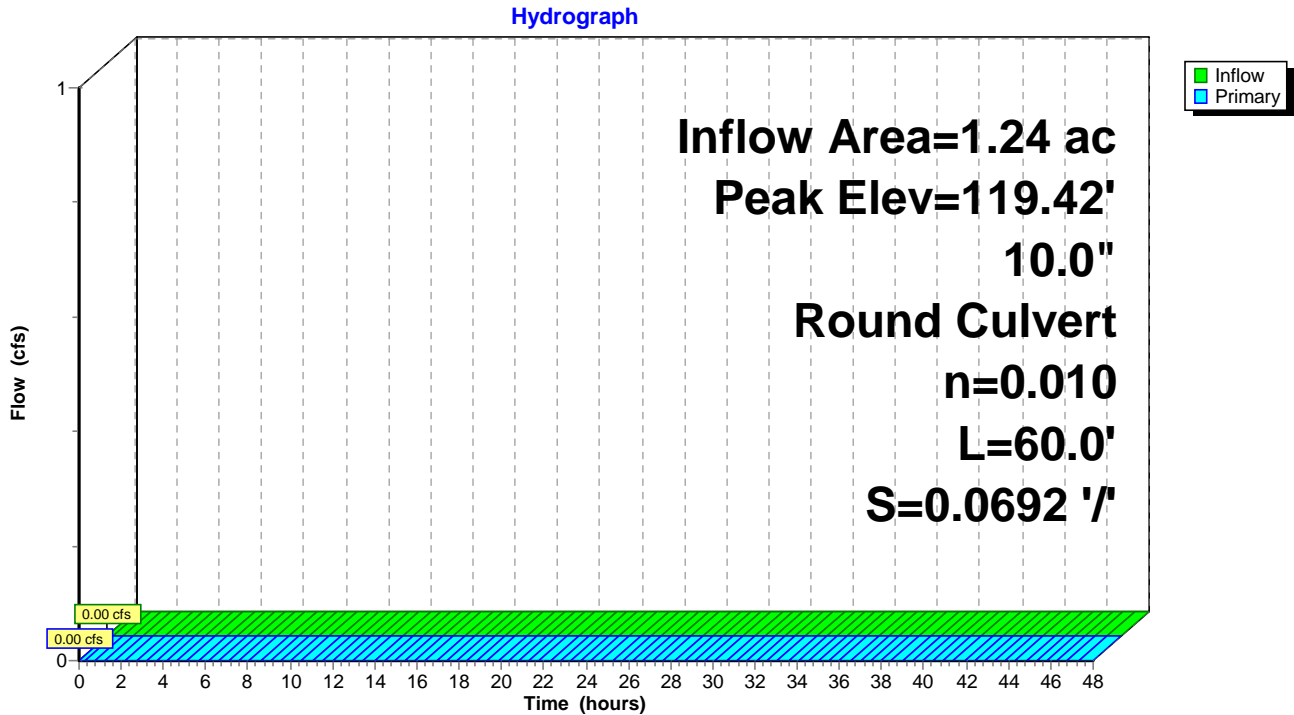
Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth = 0.00" for 1-YR event
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 119.42' @ 0.00 hrs
 Flood Elev= 126.48'

Device #	Routing	Invert	Outlet Devices
#1	Primary	119.42'	10.0" Round Culvert L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.42' / 115.27' S= 0.0692 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=119.42' (Free Discharge)
 ↑1=Culvert (Controls 0.00 cfs)

Pond DMH: OCS Bypass



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 25

Summary for Pond DMH6: Access MH

Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth = 1.35" for 1-YR event
Inflow = 1.95 cfs @ 12.08 hrs, Volume= 0.139 af
Outflow = 1.95 cfs @ 12.08 hrs, Volume= 0.139 af, Atten= 0%, Lag= 0.0 min
Primary = 1.95 cfs @ 12.08 hrs, Volume= 0.139 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 120.57' @ 12.08 hrs

Flood Elev= 126.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	119.77'	24.0" Round Culvert L= 9.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.77' / 119.77' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	119.77'	24.0" Round Culvert L= 2.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.77' / 119.77' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 2	123.35'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.94 cfs @ 12.08 hrs HW=120.56' (Free Discharge)

↑1=Culvert (Barrel Controls 1.94 cfs @ 2.48 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=119.77' (Free Discharge)

↑2=Culvert (Controls 0.00 cfs)

↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

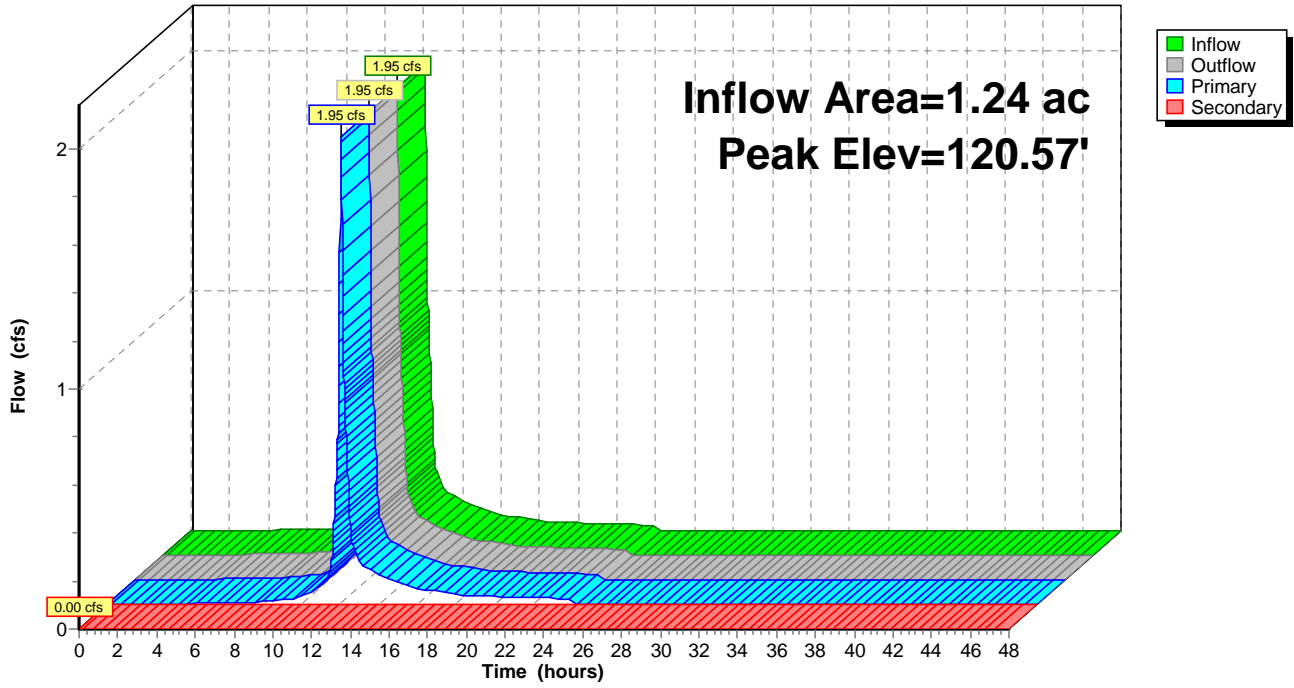
POST
Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 26

Pond DMH6: Access MH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 27

Summary for Pond DMH7: Proposed Drop DMH

Inflow Area = 2.51 ac, 74.51% Impervious, Inflow Depth = 0.54" for 1-YR event
Inflow = 1.42 cfs @ 12.11 hrs, Volume= 0.114 af
Outflow = 1.42 cfs @ 12.11 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min
Primary = 1.42 cfs @ 12.11 hrs, Volume= 0.114 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 116.06' @ 12.11 hrs

Flood Elev= 124.69'

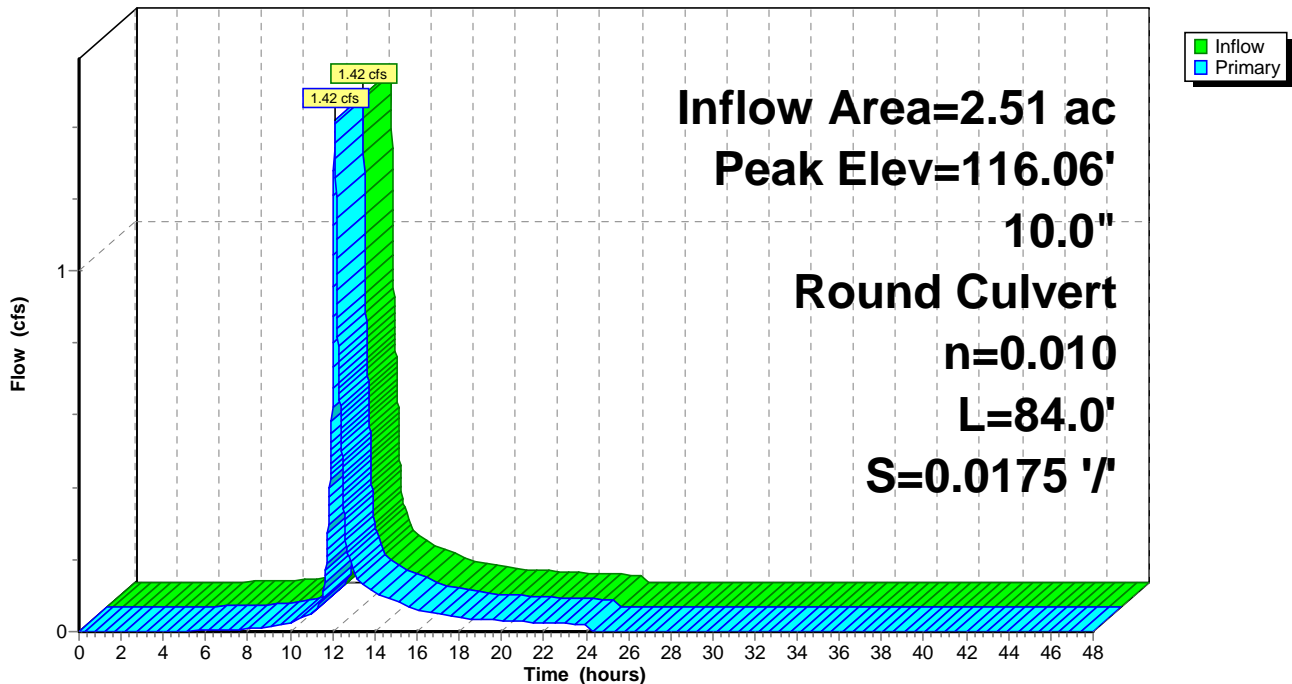
Device	Routing	Invert	Outlet Devices
#1	Primary	115.17'	10.0" Round Culvert L= 84.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 115.17' / 113.70' S= 0.0175 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.42 cfs @ 12.11 hrs HW=116.06' (Free Discharge)

↑1=Culvert (Inlet Controls 1.42 cfs @ 2.60 fps)

Pond DMH7: Proposed Drop DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

Page 28

Summary for Pond DMH8: Proposed DMH

Inflow Area = 2.51 ac, 74.51% Impervious, Inflow Depth = 0.54" for 1-YR event
 Inflow = 1.42 cfs @ 12.11 hrs, Volume= 0.114 af
 Outflow = 1.42 cfs @ 12.11 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.42 cfs @ 12.11 hrs, Volume= 0.114 af

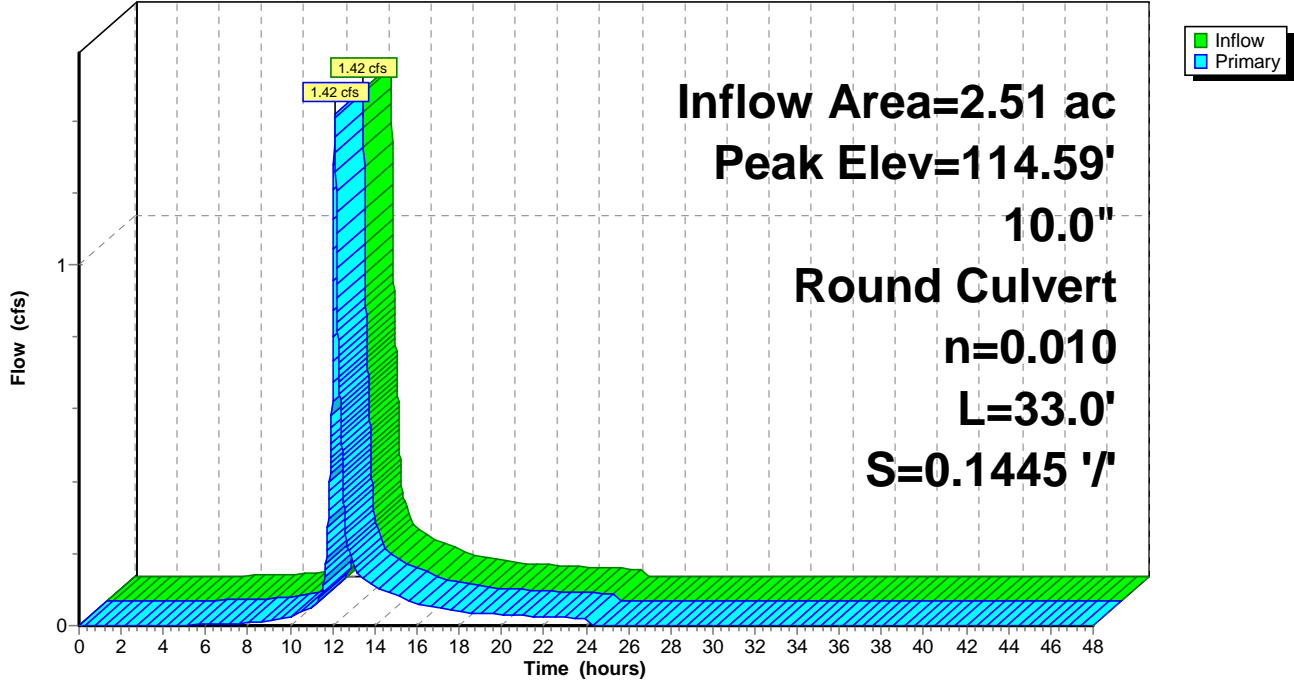
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 114.59' @ 12.11 hrs
 Flood Elev= 123.71'

Device #	Routing	Invert	Outlet Devices
1	Primary	113.70'	10.0" Round Culvert L= 33.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 113.70' / 108.93' S= 0.1445 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.42 cfs @ 12.11 hrs HW=114.58' (Free Discharge)
 ↑1=Culvert (Inlet Controls 1.42 cfs @ 2.60 fps)

Pond DMH8: Proposed DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 1-YR Rainfall=2.60"

Printed 2/16/2016

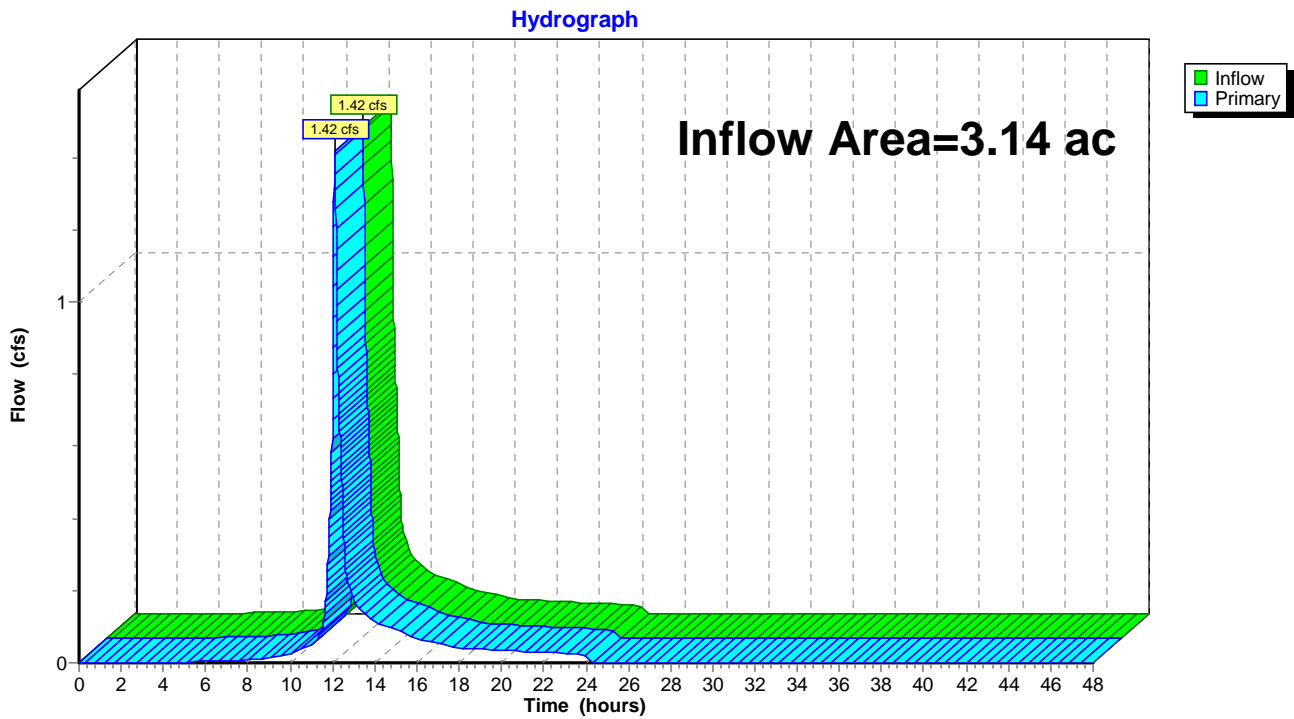
Page 29

Summary for Link SP1: Existing Combined Sewer in Danforth

Inflow Area = 3.14 ac, 64.59% Impervious, Inflow Depth = 0.45" for 1-YR event
Inflow = 1.42 cfs @ 12.11 hrs, Volume= 0.118 af
Primary = 1.42 cfs @ 12.11 hrs, Volume= 0.118 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link SP1: Existing Combined Sewer in Danforth



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 30

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 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 10S: Area draining to Runoff Area=19,254 sf 56.16% Impervious Runoff Depth=0.87"
Flow Length=91' Slope=0.0300 '/' Tc=7.7 min CN=72 Runoff=0.39 cfs 0.032 af

Subcatchment 60S: Lawn/Field S of school Runoff Area=16,715 sf 84.98% Impervious Runoff Depth=1.99"
Tc=5.0 min CN=89 Runoff=0.92 cfs 0.064 af

Subcatchment 61S: Auditorium Roof Runoff Area=4,485 sf 100.00% Impervious Runoff Depth=2.87"
Tc=5.0 min CN=98 Runoff=0.32 cfs 0.025 af

Subcatchment 70S: Thomas & Davies & Runoff Area=44,441 sf 74.20% Impervious Runoff Depth=1.53"
Flow Length=91' Slope=0.1593 '/' Tc=5.0 min CN=83 Runoff=1.89 cfs 0.130 af

Subcatchment 80S: FoundersHall Runoff Area=9,466 sf 100.00% Impervious Runoff Depth=2.87"
Tc=5.0 min CN=98 Runoff=0.68 cfs 0.052 af

Subcatchment 90S: Playground Runoff Area=27,554 sf 25.26% Impervious Runoff Depth=0.20"
Flow Length=117' Tc=9.2 min CN=54 Runoff=0.04 cfs 0.010 af

Subcatchment 91S: Playground Runoff Area=4,688 sf 69.20% Impervious Runoff Depth=1.33"
Tc=5.0 min CN=80 Runoff=0.17 cfs 0.012 af

Subcatchment 402S: New Prkng lot Runoff Area=10,240 sf 60.94% Impervious Runoff Depth=1.03"
Tc=5.0 min CN=75 Runoff=0.28 cfs 0.020 af

Reach 161R: roof drain Avg. Flow Depth=0.15' Max Vel=6.63 fps Inflow=0.32 cfs 0.025 af
6.0" Round Pipe n=0.013 L=129.0' S=0.0911 '/' Capacity=1.69 cfs Outflow=0.32 cfs 0.025 af

Pond 1P: USSF Peak Elev=121.19' Storage=7,622 cf Inflow=2.57 cfs 0.182 af
Primary=0.03 cfs 0.014 af Secondary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.014 af

Pond 206P: City CB @ Fletcher & Danforth Peak Elev=108.33' Inflow=1.91 cfs 0.177 af
12.0" Round Culvert n=0.010 L=20.0' S=0.2475 '/' Outflow=1.91 cfs 0.177 af

Pond 210P: Existing FI Peak Elev=132.37' Inflow=0.39 cfs 0.032 af
10.0" Round Culvert n=0.010 L=102.0' S=0.1008 '/' Outflow=0.39 cfs 0.032 af

Pond 220P: Existing DMH Peak Elev=122.04' Inflow=0.39 cfs 0.032 af
10.0" Round Culvert n=0.010 L=108.0' S=0.0335 '/' Outflow=0.39 cfs 0.032 af

Pond 230P: Existing DMH Peak Elev=119.26' Inflow=1.91 cfs 0.152 af
10.0" Round Culvert n=0.010 L=83.0' S=0.0257 '/' Outflow=1.91 cfs 0.152 af

Pond 260P: Storage Pipes Peak Elev=119.87' Storage=164 cf Inflow=1.52 cfs 0.108 af
12.0" Round Culvert n=0.010 L=30.0' S=0.0380 '/' Outflow=1.37 cfs 0.108 af

Pond 340P: CB at SW Cor prkng lot Peak Elev=129.34' Inflow=0.28 cfs 0.020 af
8.0" Round Culvert n=0.010 L=56.0' S=0.1000 '/' Outflow=0.28 cfs 0.020 af

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 31

Pond CB4: Proposed DMH

Peak Elev=123.50' Inflow=2.57 cfs 0.182 af
12.0" Round Culvert n=0.010 L=24.0' S=0.0621 '/ Outflow=2.57 cfs 0.182 af

Pond DMH: OCS Bypass

Peak Elev=119.51' Inflow=0.03 cfs 0.014 af
10.0" Round Culvert n=0.010 L=60.0' S=0.0692 '/ Outflow=0.03 cfs 0.014 af

Pond DMH6: Access MH

Peak Elev=120.69' Inflow=2.57 cfs 0.182 af
Primary=2.57 cfs 0.182 af Secondary=0.00 cfs 0.000 af Outflow=2.57 cfs 0.182 af

Pond DMH7: Proposed Drop DMH

Peak Elev=116.43' Inflow=1.91 cfs 0.166 af
10.0" Round Culvert n=0.010 L=84.0' S=0.0175 '/ Outflow=1.91 cfs 0.166 af

Pond DMH8: Proposed DMH

Peak Elev=114.96' Inflow=1.91 cfs 0.166 af
10.0" Round Culvert n=0.010 L=33.0' S=0.1445 '/ Outflow=1.91 cfs 0.166 af

Link SP1: Existing Combined Sewer in Danforth

Inflow=1.91 cfs 0.177 af
Primary=1.91 cfs 0.177 af

Total Runoff Area = 3.14 ac Runoff Volume = 0.344 af Average Runoff Depth = 1.32"
35.41% Pervious = 1.11 ac 64.59% Impervious = 2.03 ac

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 32

Summary for Subcatchment 10S: Area draining to Sanctuary

Runoff = 0.39 cfs @ 12.12 hrs, Volume= 0.032 af, Depth= 0.87"

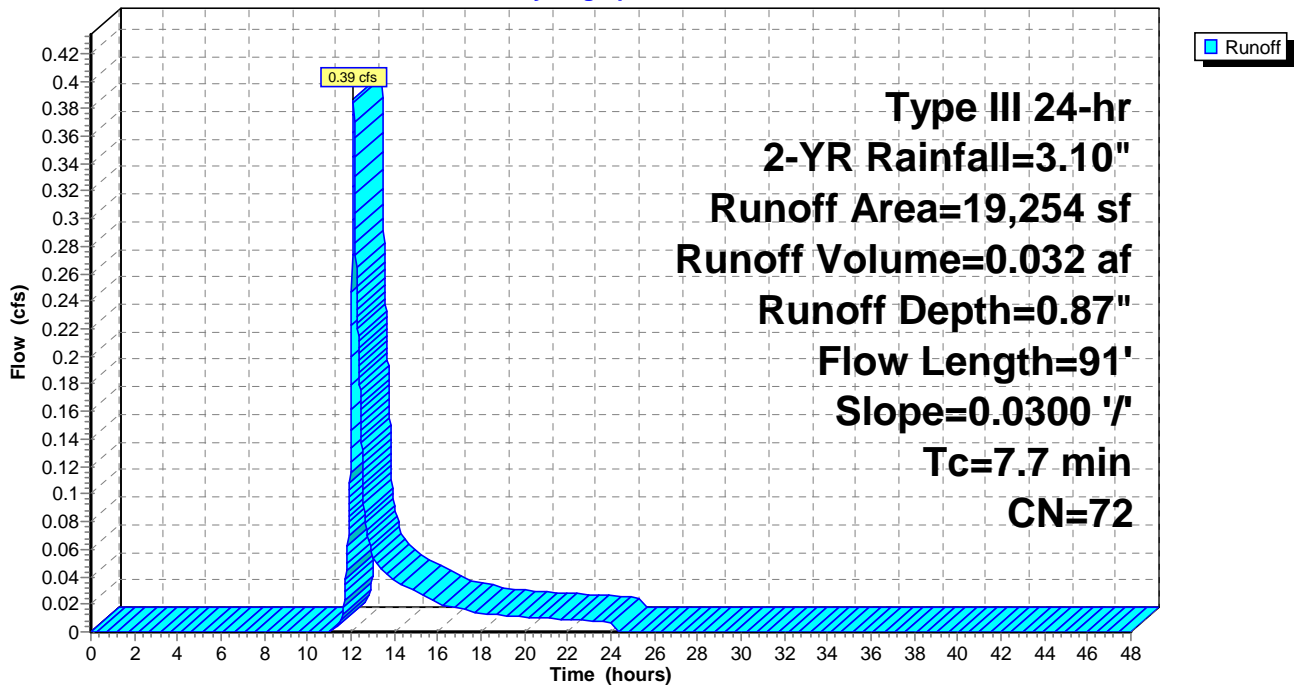
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	10,813	98	impervious
*	8,441	39	Lawn/field, HSG A
	19,254	72	Weighted Average
	8,441		43.84% Pervious Area
	10,813		56.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	91	0.0300	0.20		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.19"

Subcatchment 10S: Area draining to Sanctuary

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 33

Summary for Subcatchment 60S: Lawn/Field S of school

Runoff = 0.92 cfs @ 12.07 hrs, Volume= 0.064 af, Depth= 1.99"

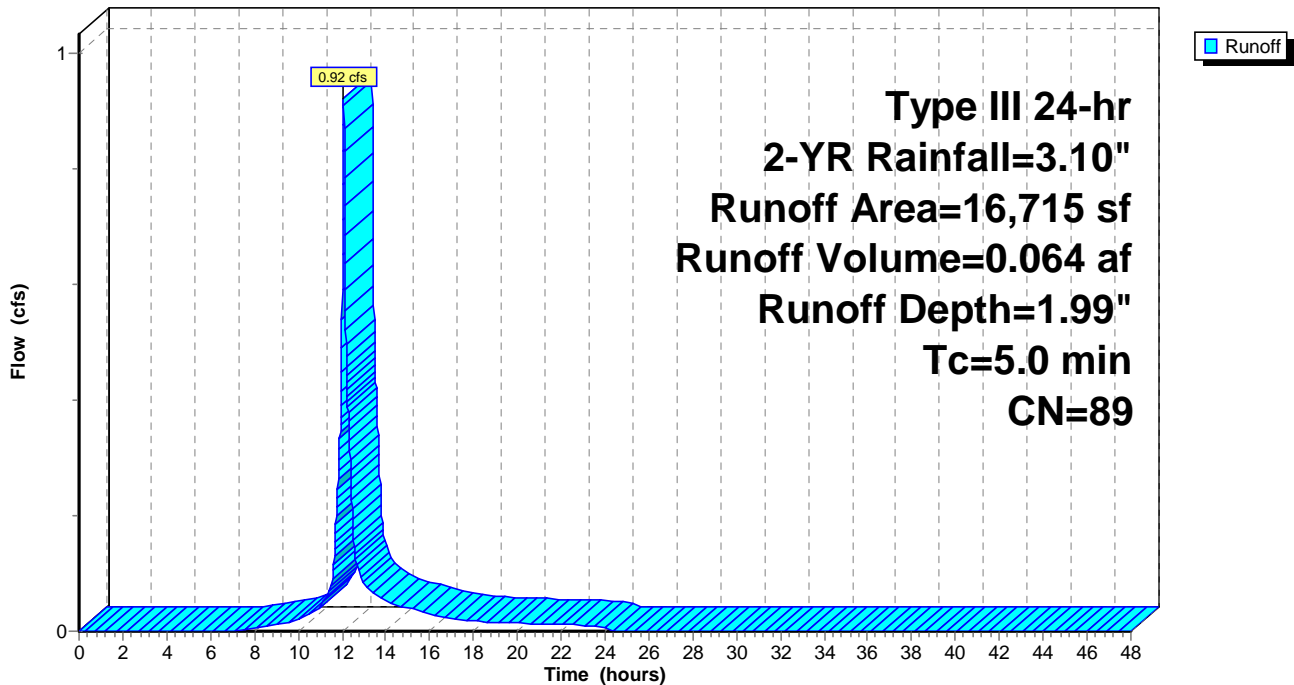
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	14,205	98	impervious
*	2,510	39	Lawn/field, HSG A
	16,715	89	Weighted Average
	2,510		15.02% Pervious Area
	14,205		84.98% Impervious Area

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

Subcatchment 60S: Lawn/Field S of school

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 34

Summary for Subcatchment 61S: Auditorium Roof

Runoff = 0.32 cfs @ 12.07 hrs, Volume= 0.025 af, Depth= 2.87"

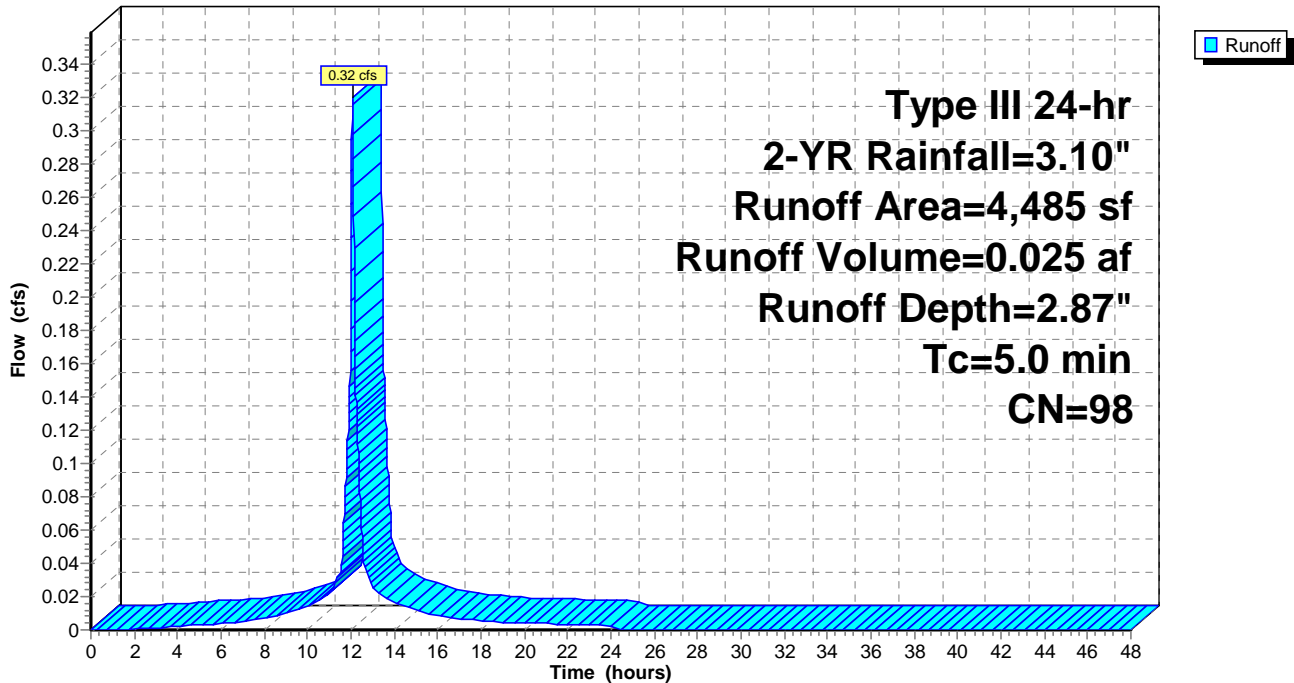
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	4,485	98	Roof runoff
	4,485		100.00% Impervious Area

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

Subcatchment 61S: Auditorium Roof

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 35

Summary for Subcatchment 70S: Thomas & Davies & Gym

Runoff = 1.89 cfs @ 12.08 hrs, Volume= 0.130 af, Depth= 1.53"

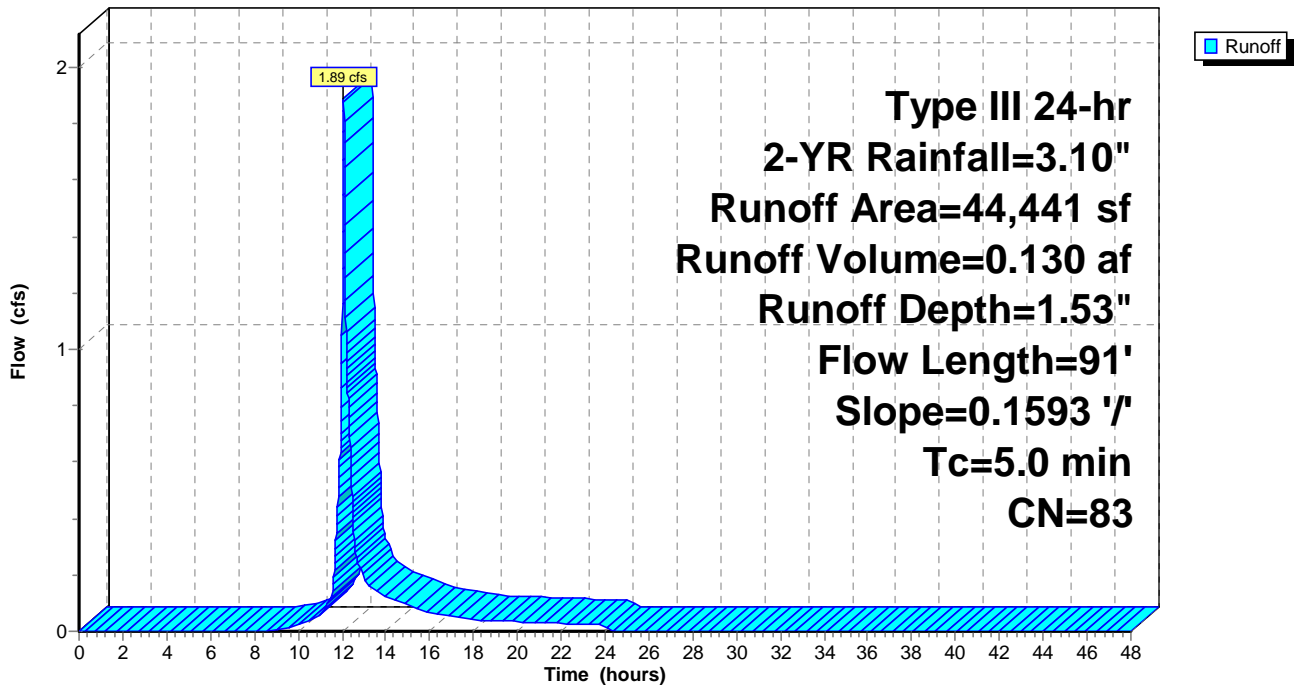
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	32,976	98	impervious
*	11,465	39	Lawn/field, HSG A
	44,441	83	Weighted Average
	11,465		25.80% Pervious Area
	32,976		74.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	91	0.1593	0.38		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.19"
4.0	91	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 70S: Thomas & Davies & Gym

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 36

Summary for Subcatchment 80S: FoundersHall

Runoff = 0.68 cfs @ 12.07 hrs, Volume= 0.052 af, Depth= 2.87"

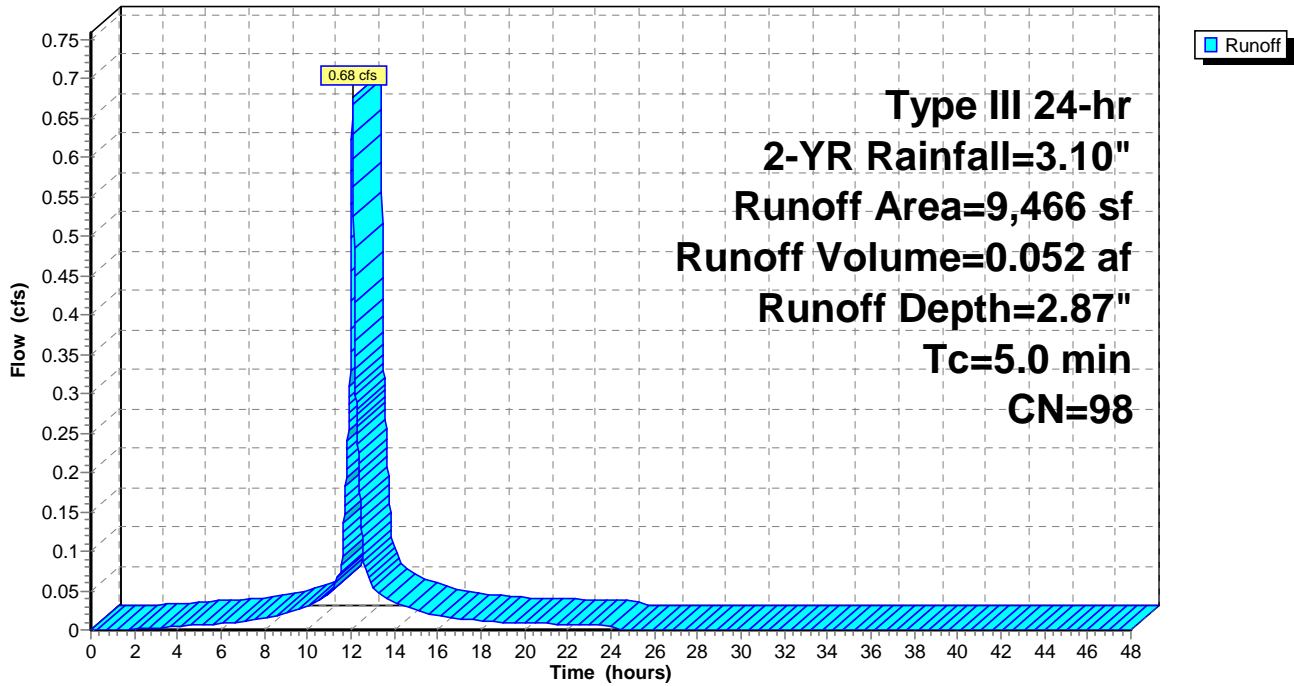
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	9,466	98	Roof runoff
	9,466		100.00% Impervious Area

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

Subcatchment 80S: FoundersHall

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 37

Summary for Subcatchment 90S: Playground

Runoff = 0.04 cfs @ 12.42 hrs, Volume= 0.010 af, Depth= 0.20"

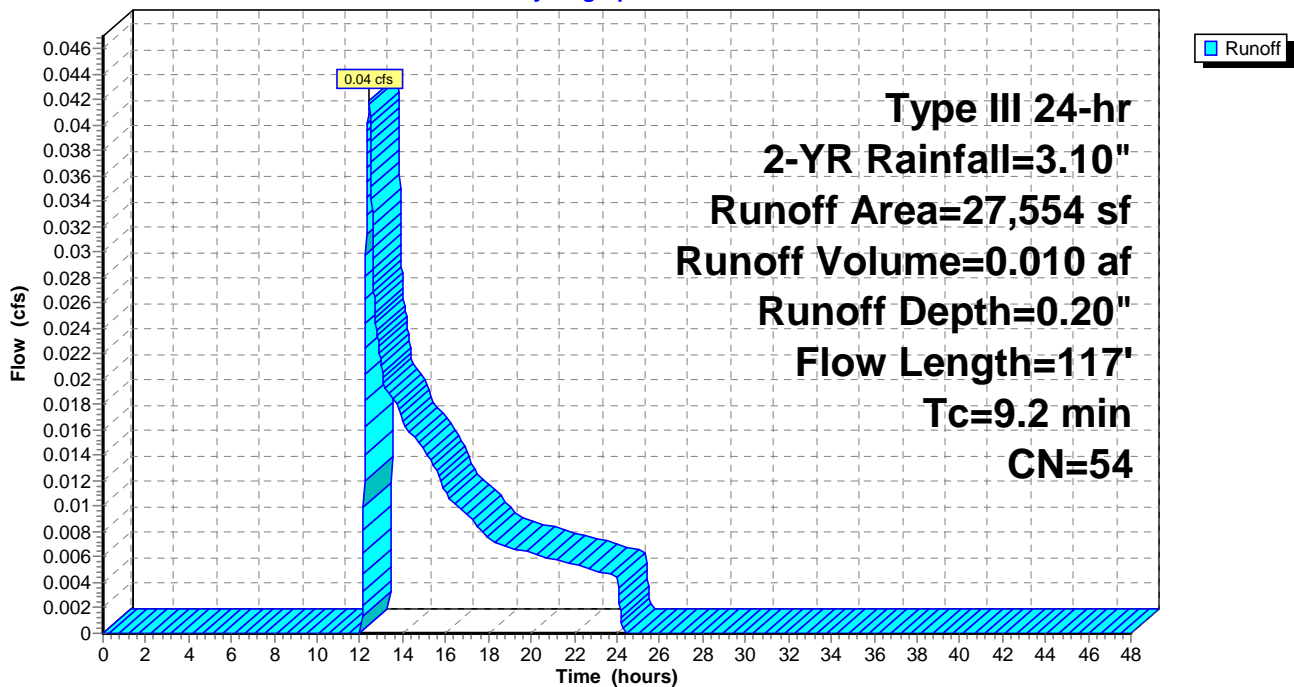
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	6,960	98	impervious
*	20,594	39	Lawn/field, HSG A
	27,554	54	Weighted Average
	20,594		74.74% Pervious Area
	6,960		25.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.0250	0.19		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.19"
0.2	17	0.0588	1.70		Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps
9.2	117	Total			

Subcatchment 90S: Playground

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 38

Summary for Subcatchment 91S: Playground

Runoff = 0.17 cfs @ 12.08 hrs, Volume= 0.012 af, Depth= 1.33"

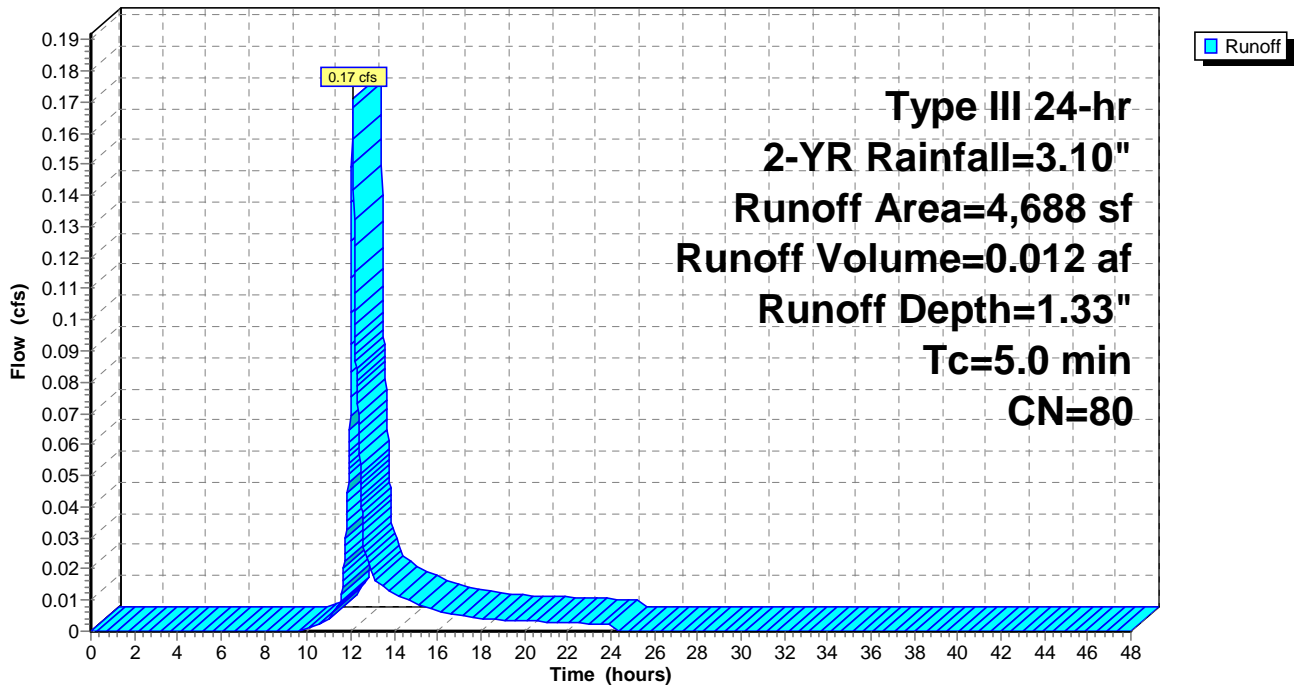
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	3,244	98	impervious
*	1,444	39	Lawn/field, HSG A
	4,688	80	Weighted Average
	1,444		30.80% Pervious Area
	3,244		69.20% Impervious Area

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

Subcatchment 91S: Playground

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 39

Summary for Subcatchment 402S: New Prkng lot

Runoff = 0.28 cfs @ 12.08 hrs, Volume= 0.020 af, Depth= 1.03"

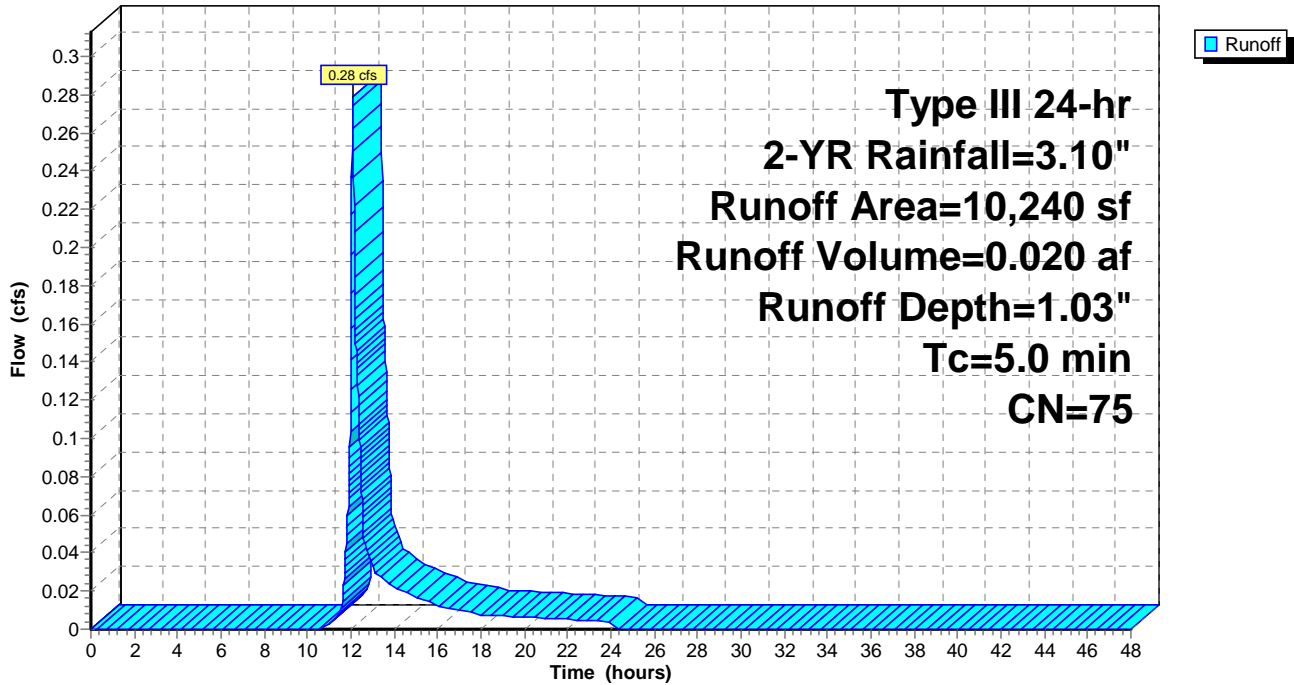
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	4,000	39	Pervious
*	6,240	98	Impervious
	10,240	75	Weighted Average
	4,000		39.06% Pervious Area
	6,240		60.94% Impervious Area

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

Subcatchment 402S: New Prkng lot

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 40

Summary for Reach 161R: roof drain

Inflow Area = 0.10 ac, 100.00% Impervious, Inflow Depth = 2.87" for 2-YR event
Inflow = 0.32 cfs @ 12.07 hrs, Volume= 0.025 af
Outflow = 0.32 cfs @ 12.08 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Max. Velocity= 6.63 fps, Min. Travel Time= 0.3 min

Avg. Velocity = 2.15 fps, Avg. Travel Time= 1.0 min

Peak Storage= 6 cf @ 12.07 hrs

Average Depth at Peak Storage= 0.15'

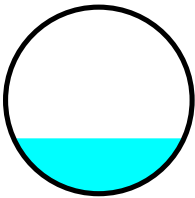
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.69 cfs

6.0" Round Pipe

n= 0.013 Corrugated PE, smooth interior

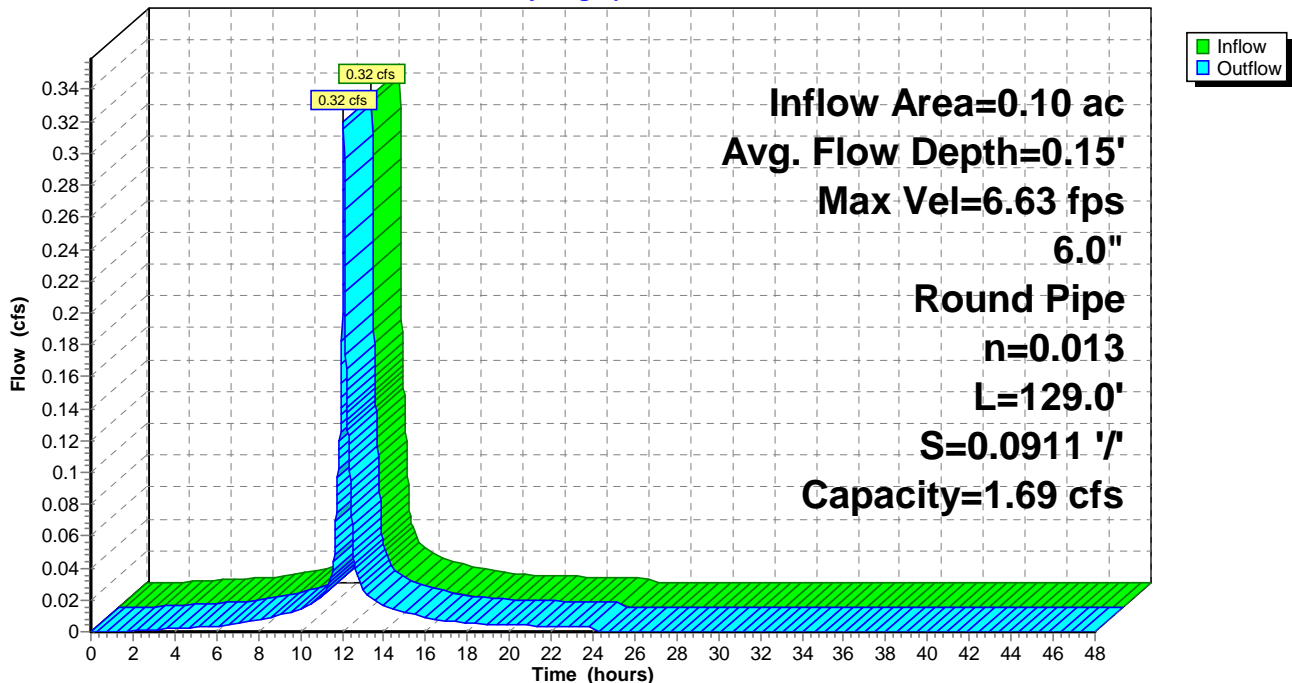
Length= 129.0' Slope= 0.0911 1/100'

Inlet Invert= 130.00', Outlet Invert= 118.25'



Reach 161R: roof drain

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 41

Summary for Pond 1P: USSF

Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth = 1.76" for 2-YR event
Inflow = 2.57 cfs @ 12.07 hrs, Volume= 0.182 af
Outflow = 0.03 cfs @ 24.01 hrs, Volume= 0.014 af, Atten= 99%, Lag= 715.9 min
Primary = 0.03 cfs @ 24.01 hrs, Volume= 0.014 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 121.19' @ 24.01 hrs Surf.Area= 4,717 sf Storage= 7,622 cf
Flood Elev= 126.48' Surf.Area= 4,717 sf Storage= 16,044 cf

Plug-Flow detention time= 1,009.8 min calculated for 0.014 af (8% of inflow)
Center-of-Mass det. time= 739.1 min (1,550.5 - 811.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	118.85'	6,599 cf	51.42'W x 91.74'L x 5.50'H Field A 25,943 cf Overall - 9,445 cf Embedded = 16,499 cf x 40.0% Voids
#2A	119.60'	9,445 cf	ADS_StormTech MC-3500 d +Cap x 84 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 7 Rows of 12 Chambers Cap Storage= +14.9 cf x 2 x 7 rows = 208.6 cf
		16,044 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	119.67'	8.0" Round Culvert L= 7.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.67' / 119.52' S= 0.0214 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#2	Device 1	123.35'	5.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	121.10'	8.0" Vert. Orifice/Grate C= 0.600
#4	Device 5	118.85'	2.410 in/hr Exfiltration over Surface area above 118.85' Conductivity to Groundwater Elevation = 113.00' Excluded Surface area = 4,717 sf
#5	Secondary	116.02'	6.0" Round Culvert L= 31.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 116.02' / 115.88' S= 0.0045 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 42

Primary OutFlow Max=0.03 cfs @ 24.01 hrs HW=121.19' (Free Discharge)

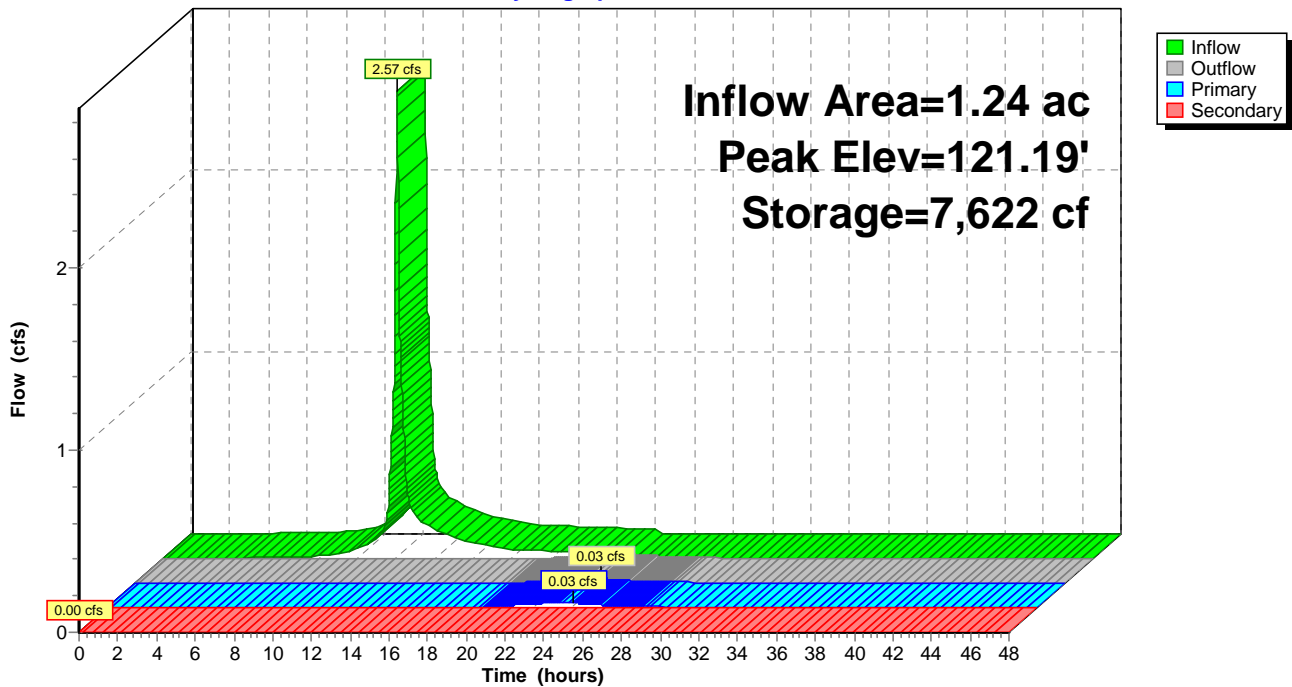
- 1=Culvert (Passes 0.03 cfs of 1.44 cfs potential flow)
- 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
- 3=Orifice/Grate (Orifice Controls 0.03 cfs @ 1.01 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=118.85' (Free Discharge)

- 5=Culvert (Passes 0.00 cfs of 1.20 cfs potential flow)
- 4=Exfiltration (Controls 0.00 cfs)

Pond 1P: USSF

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 43

Summary for Pond 206P: City CB @ Fletcher & Danforth

Inflow Area = 3.14 ac, 64.59% Impervious, Inflow Depth > 0.68" for 2-YR event
Inflow = 1.91 cfs @ 12.11 hrs, Volume= 0.177 af
Outflow = 1.91 cfs @ 12.11 hrs, Volume= 0.177 af, Atten= 0%, Lag= 0.0 min
Primary = 1.91 cfs @ 12.11 hrs, Volume= 0.177 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 108.33' @ 12.11 hrs

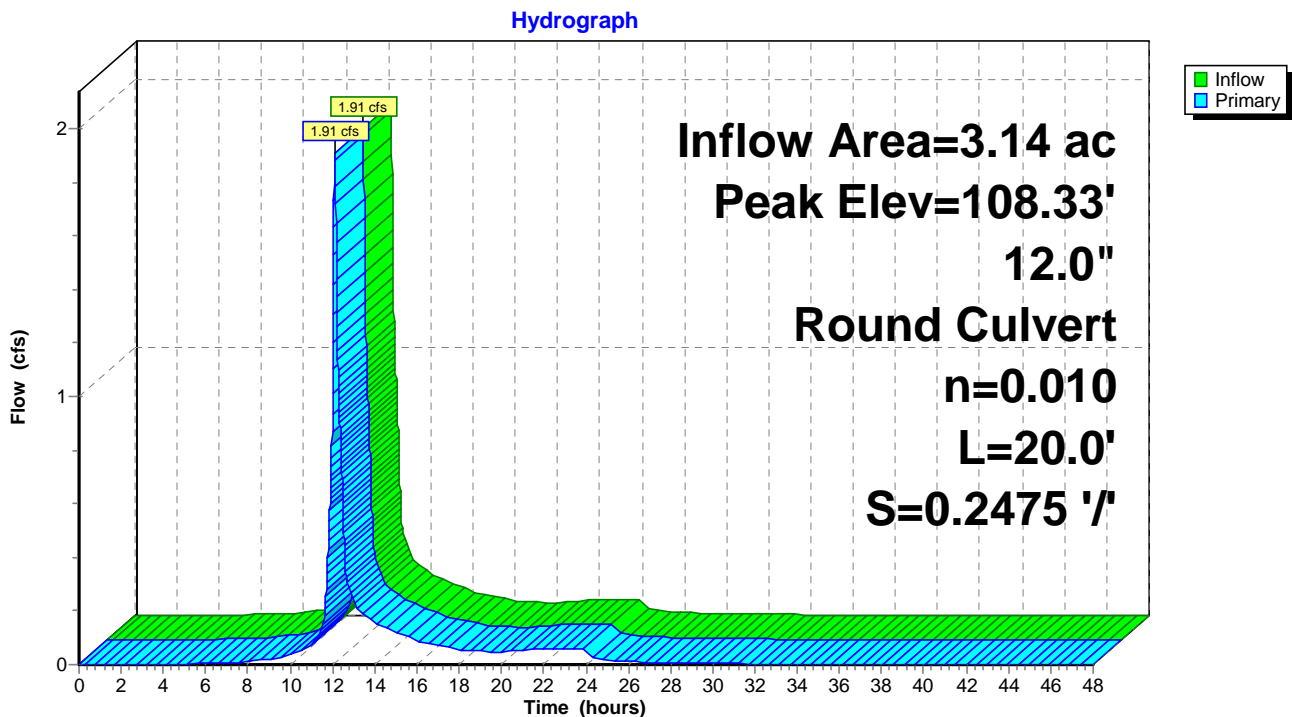
Flood Elev= 111.26'

Device #	Routing	Invert	Outlet Devices
1	Primary	107.43'	12.0" Round Culvert L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 107.43' / 102.48' S= 0.2475 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.91 cfs @ 12.11 hrs HW=108.33' (Free Discharge)

↑1=Culvert (Inlet Controls 1.91 cfs @ 2.55 fps)

Pond 206P: City CB @ Fletcher & Danforth



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 44

Summary for Pond 210P: Existing FI

Inflow Area = 0.44 ac, 56.16% Impervious, Inflow Depth = 0.87" for 2-YR event
Inflow = 0.39 cfs @ 12.12 hrs, Volume= 0.032 af
Outflow = 0.39 cfs @ 12.12 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min
Primary = 0.39 cfs @ 12.12 hrs, Volume= 0.032 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 132.37' @ 12.12 hrs

Flood Elev= 140.41'

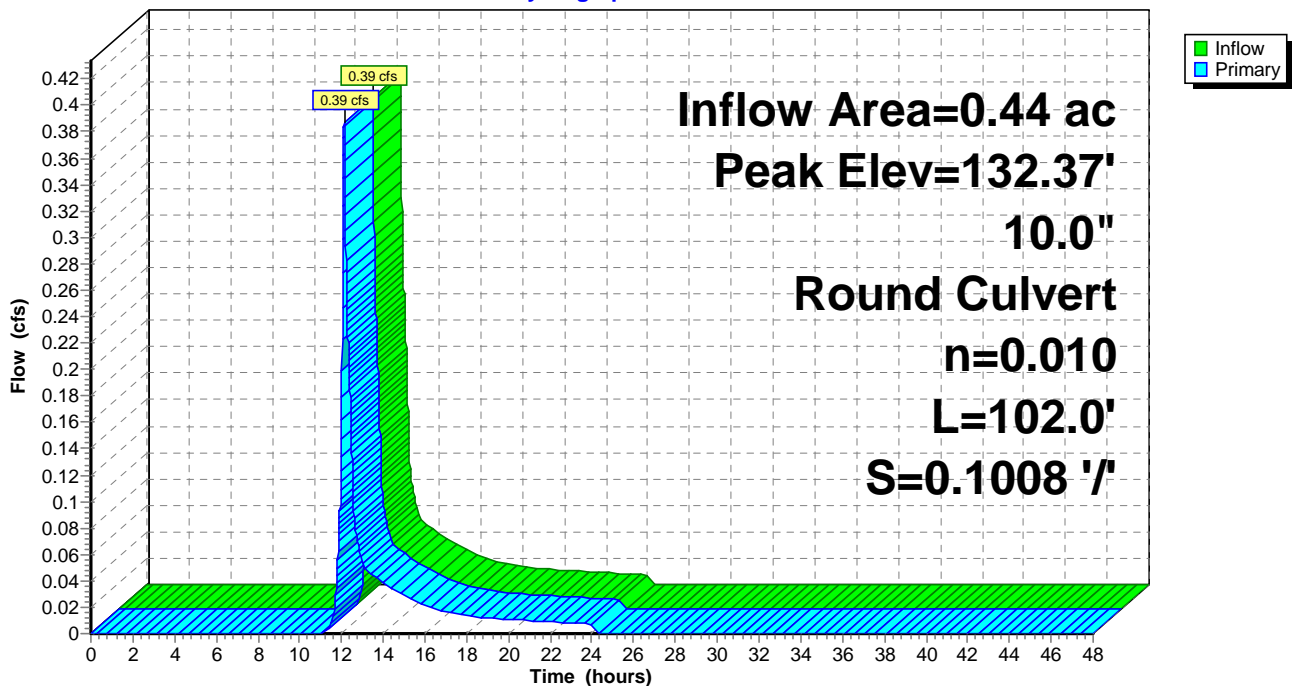
Device #	Routing	Invert	Outlet Devices
#1	Primary	132.00'	10.0" Round Culvert L= 102.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 132.00' / 121.72' S= 0.1008 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=0.38 cfs @ 12.12 hrs HW=132.37' (Free Discharge)

↑1=Culvert (Inlet Controls 0.38 cfs @ 1.64 fps)

Pond 210P: Existing FI

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 45

Summary for Pond 220P: Existing DMH

Inflow Area = 0.44 ac, 56.16% Impervious, Inflow Depth = 0.87" for 2-YR event
Inflow = 0.39 cfs @ 12.12 hrs, Volume= 0.032 af
Outflow = 0.39 cfs @ 12.12 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min
Primary = 0.39 cfs @ 12.12 hrs, Volume= 0.032 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 122.04' @ 12.12 hrs

Flood Elev= 128.47'

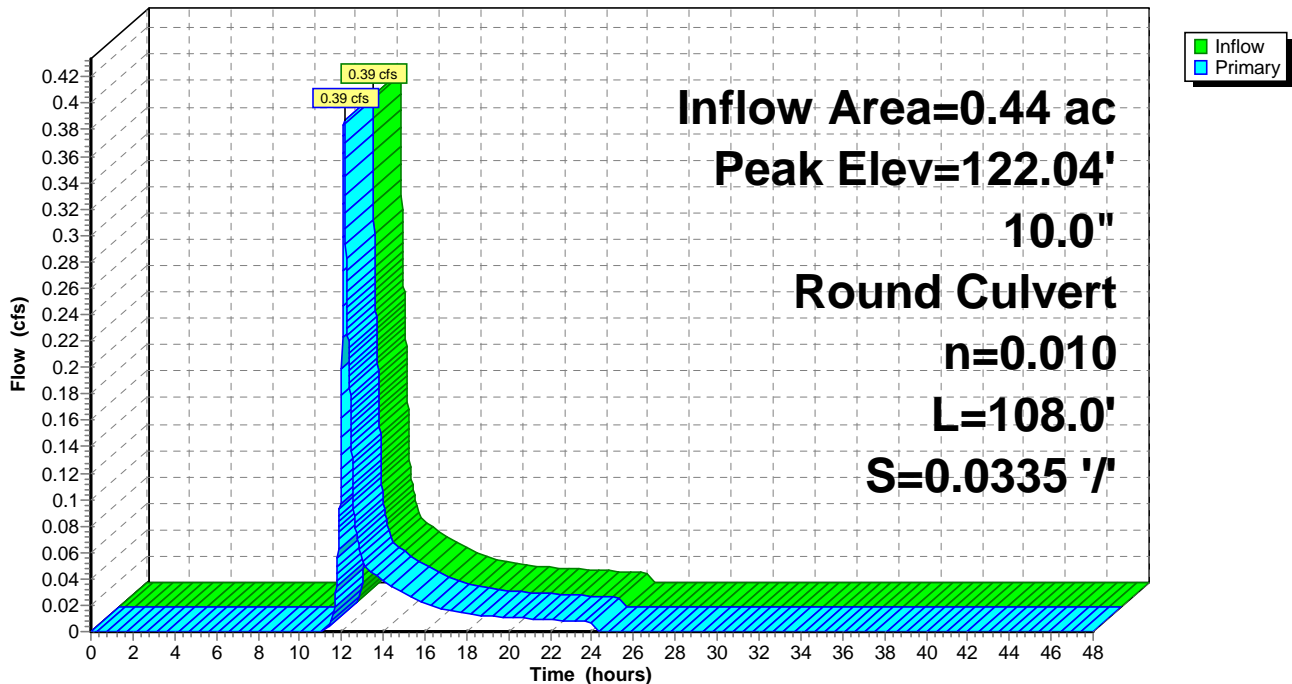
Device #	Routing	Invert	Outlet Devices
#1	Primary	121.67'	10.0" Round Culvert L= 108.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 121.67' / 118.05' S= 0.0335 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=0.39 cfs @ 12.12 hrs HW=122.04' (Free Discharge)

↑1=Culvert (Inlet Controls 0.39 cfs @ 1.64 fps)

Pond 220P: Existing DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 46

Summary for Pond 230P: Existing DMH

Inflow Area = 1.27 ac, 70.40% Impervious, Inflow Depth = 1.44" for 2-YR event
Inflow = 1.91 cfs @ 12.11 hrs, Volume= 0.152 af
Outflow = 1.91 cfs @ 12.11 hrs, Volume= 0.152 af, Atten= 0%, Lag= 0.0 min
Primary = 1.91 cfs @ 12.11 hrs, Volume= 0.152 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 119.26' @ 12.11 hrs

Flood Elev= 125.05'

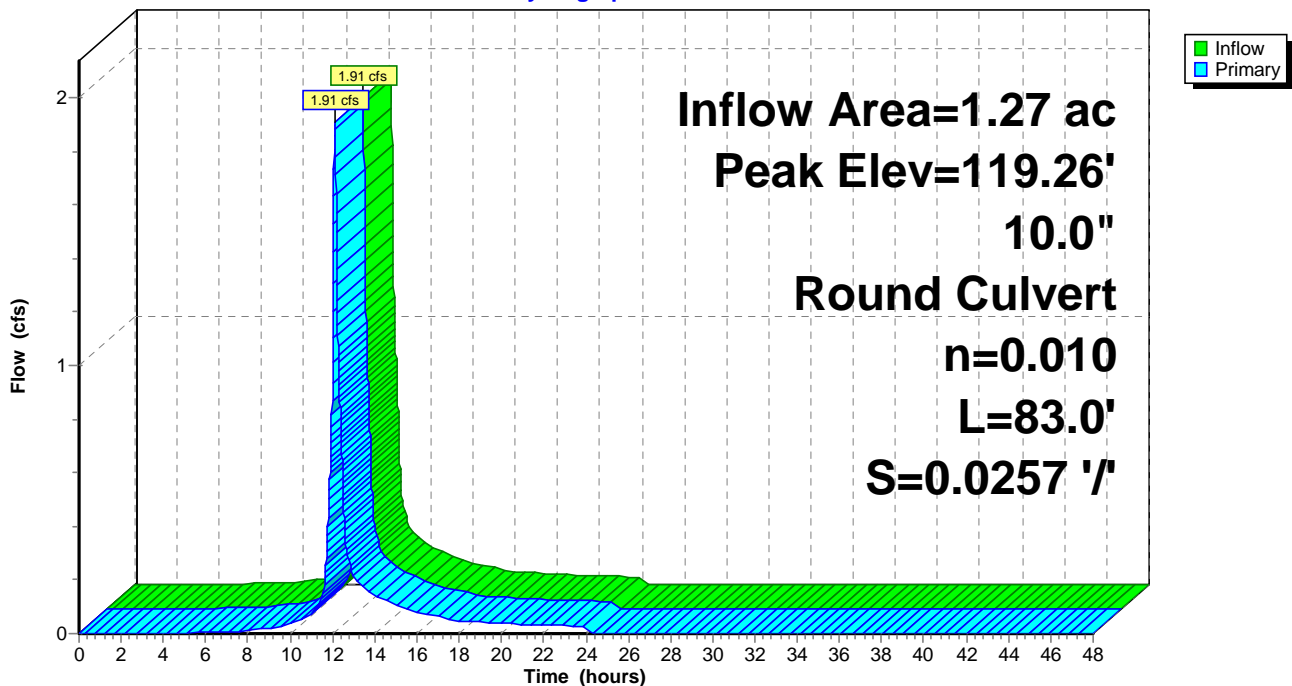
Device #1	Routing	Invert	Outlet Devices
	Primary	118.00'	10.0" Round Culvert L= 83.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 118.00' / 115.87' S= 0.0257 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.91 cfs @ 12.11 hrs HW=119.26' (Free Discharge)

↑1=Culvert (Inlet Controls 1.91 cfs @ 3.49 fps)

Pond 230P: Existing DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 47

Summary for Pond 260P: Storage Pipes

Inflow Area = 0.72 ac, 79.29% Impervious, Inflow Depth = 1.80" for 2-YR event
Inflow = 1.52 cfs @ 12.08 hrs, Volume= 0.108 af
Outflow = 1.37 cfs @ 12.11 hrs, Volume= 0.108 af, Atten= 10%, Lag= 2.3 min
Primary = 1.37 cfs @ 12.11 hrs, Volume= 0.108 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 119.87' @ 12.11 hrs Surf.Area= 564 sf Storage= 164 cf
Flood Elev= 125.26' Surf.Area= 0 sf Storage= 3,468 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.1 min (809.2 - 808.1)

Volume	Invert	Avail.Storage	Storage Description
#1	119.16'	3,468 cf	48.0" Round Pipe Storage L= 276.0' S= 0.0027 '/

Device	Routing	Invert	Outlet Devices
#1	Primary	119.16'	12.0" Round Culvert L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.16' / 118.02' S= 0.0380 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.36 cfs @ 12.11 hrs HW=119.87' (Free Discharge)

↑**1=Culvert** (Inlet Controls 1.36 cfs @ 2.27 fps)

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

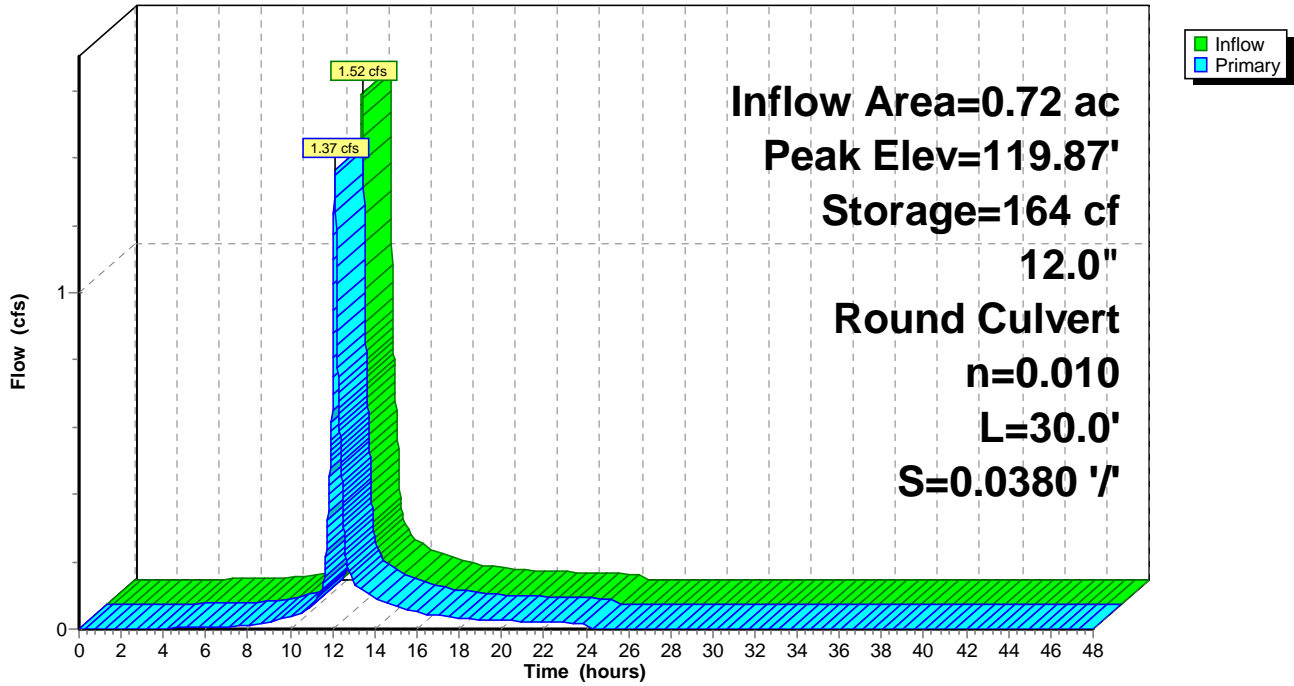
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 48

Pond 260P: Storage Pipes

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 49

Summary for Pond 340P: CB at SW Cor prkng lot

Inflow Area = 0.24 ac, 60.94% Impervious, Inflow Depth = 1.03" for 2-YR event
Inflow = 0.28 cfs @ 12.08 hrs, Volume= 0.020 af
Outflow = 0.28 cfs @ 12.08 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min
Primary = 0.28 cfs @ 12.08 hrs, Volume= 0.020 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 129.34' @ 12.08 hrs

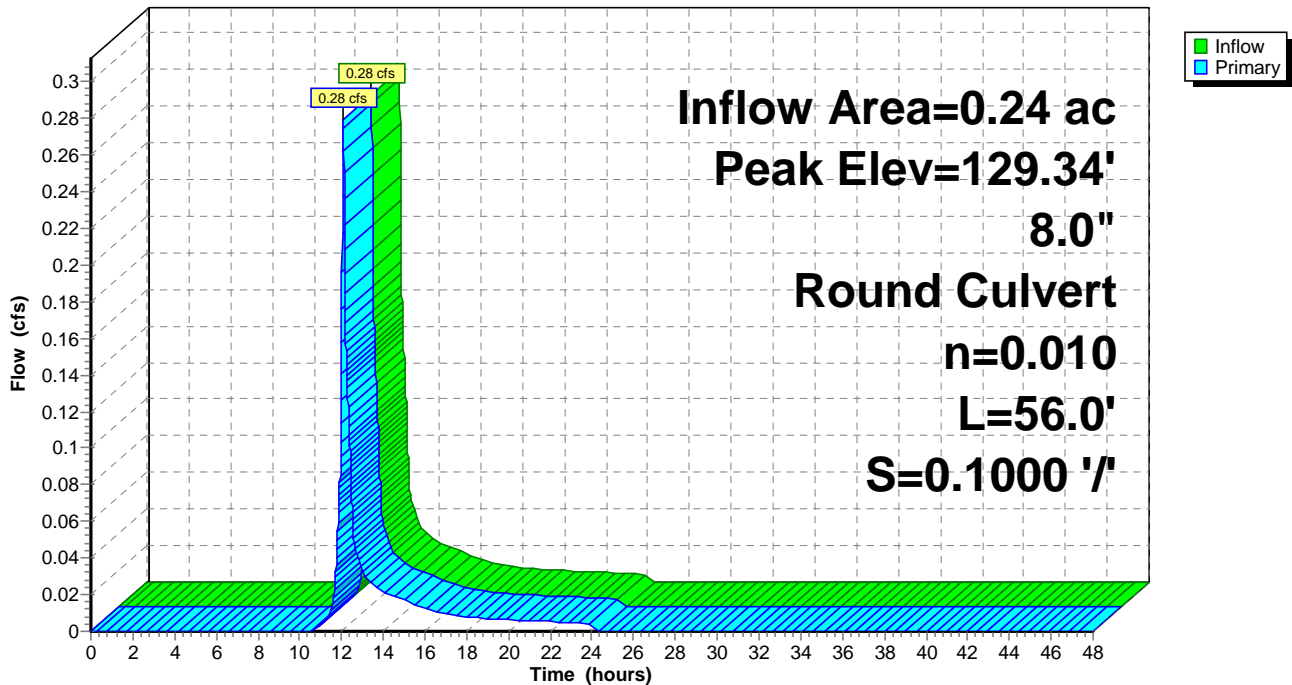
Device #	Routing	Invert	Outlet Devices
#1	Primary	129.00'	8.0" Round Culvert L= 56.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 129.00' / 123.40' S= 0.1000 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.28 cfs @ 12.08 hrs HW=129.34' (Free Discharge)

↑1=Culvert (Inlet Controls 0.28 cfs @ 1.57 fps)

Pond 340P: CB at SW Cor prkng lot

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 50

Summary for Pond CB4: Proposed DMH

Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth = 1.76" for 2-YR event
Inflow = 2.57 cfs @ 12.07 hrs, Volume= 0.182 af
Outflow = 2.57 cfs @ 12.07 hrs, Volume= 0.182 af, Atten= 0%, Lag= 0.0 min
Primary = 2.57 cfs @ 12.07 hrs, Volume= 0.182 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 123.50' @ 12.07 hrs

Flood Elev= 127.50'

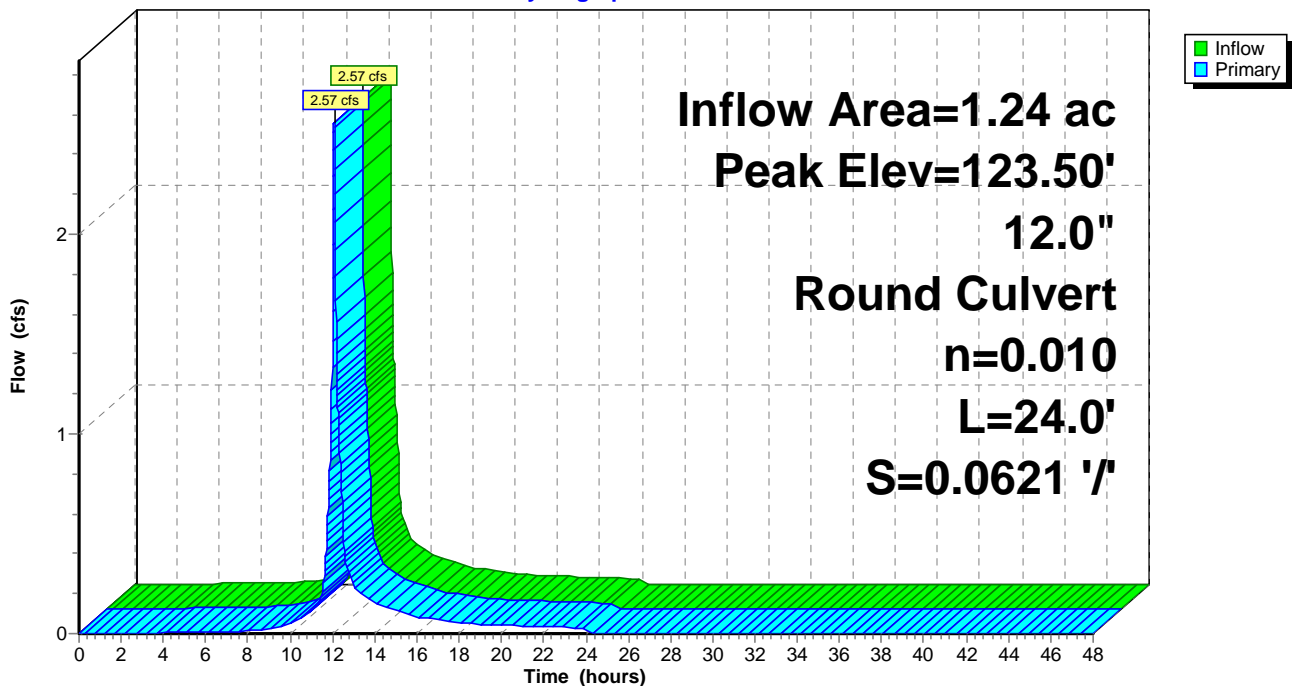
Device	Routing	Invert	Outlet Devices
#1	Primary	122.26'	12.0" Round Culvert L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 122.26' / 120.77' S= 0.0621 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.56 cfs @ 12.07 hrs HW=123.50' (Free Discharge)

↑1=Culvert (Inlet Controls 2.56 cfs @ 3.26 fps)

Pond CB4: Proposed DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 51

Summary for Pond DMH: OCS Bypass

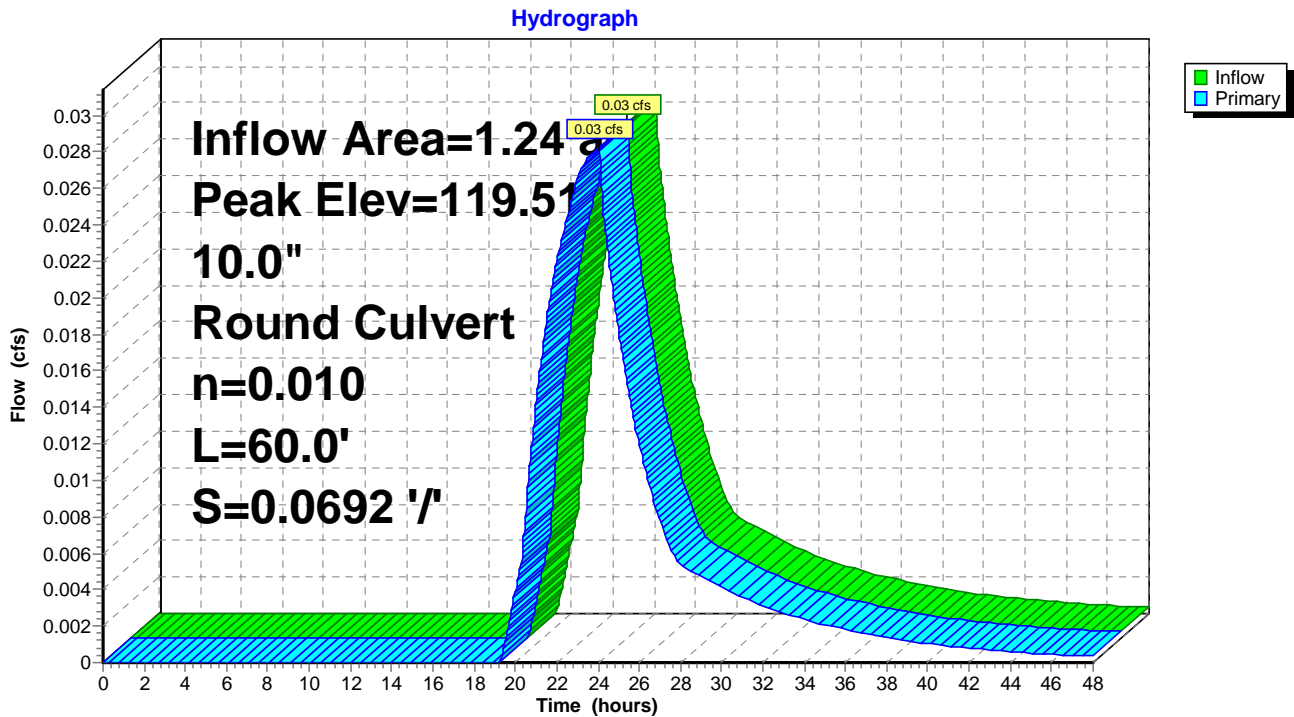
Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth > 0.14" for 2-YR event
 Inflow = 0.03 cfs @ 24.01 hrs, Volume= 0.014 af
 Outflow = 0.03 cfs @ 24.01 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.03 cfs @ 24.01 hrs, Volume= 0.014 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 119.51' @ 24.01 hrs
 Flood Elev= 126.48'

Device #	Routing	Invert	Outlet Devices
#1	Primary	119.42'	10.0" Round Culvert L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.42' / 115.27' S= 0.0692 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=0.03 cfs @ 24.01 hrs HW=119.51' (Free Discharge)
 ↑1=Culvert (Inlet Controls 0.03 cfs @ 0.80 fps)

Pond DMH: OCS Bypass



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 52

Summary for Pond DMH6: Access MH

Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth = 1.76" for 2-YR event
Inflow = 2.57 cfs @ 12.07 hrs, Volume= 0.182 af
Outflow = 2.57 cfs @ 12.07 hrs, Volume= 0.182 af, Atten= 0%, Lag= 0.0 min
Primary = 2.57 cfs @ 12.07 hrs, Volume= 0.182 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 120.69' @ 12.07 hrs

Flood Elev= 126.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	119.77'	24.0" Round Culvert L= 9.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.77' / 119.77' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	119.77'	24.0" Round Culvert L= 2.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.77' / 119.77' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 2	123.35'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=2.56 cfs @ 12.07 hrs HW=120.69' (Free Discharge)

↑1=Culvert (Barrel Controls 2.56 cfs @ 2.68 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=119.77' (Free Discharge)

↑2=Culvert (Controls 0.00 cfs)

↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

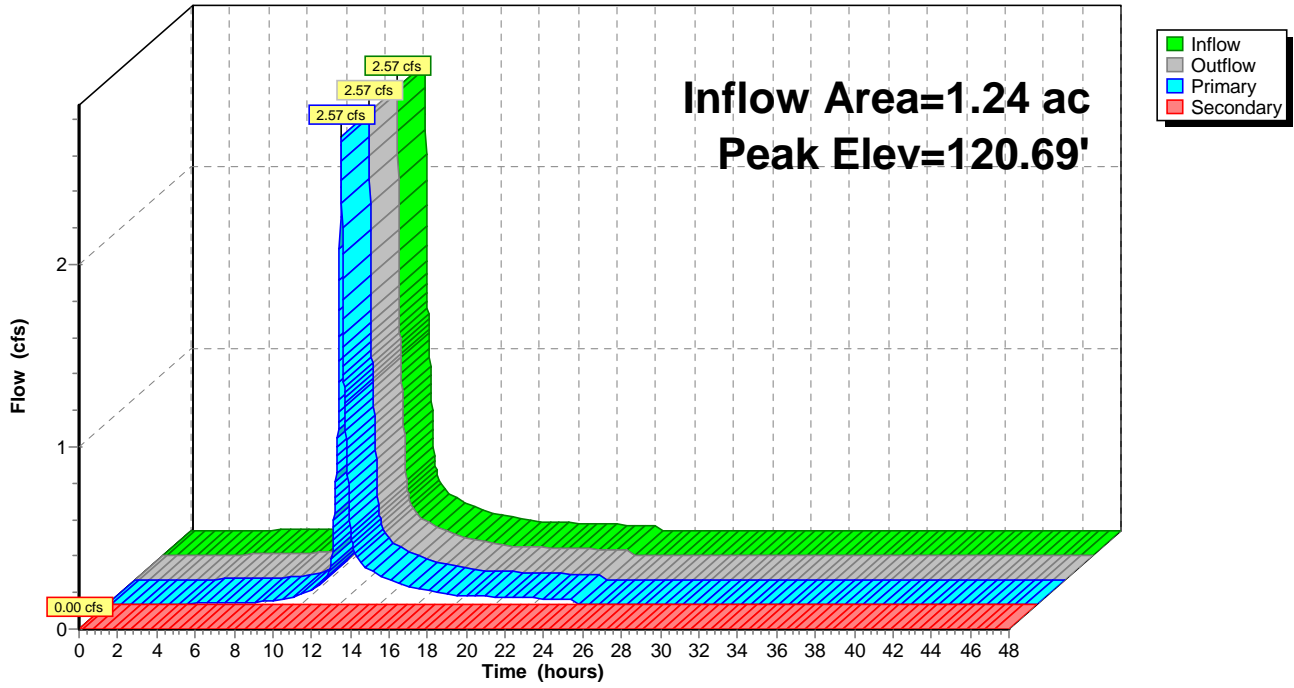
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 53

Pond DMH6: Access MH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 54

Summary for Pond DMH7: Proposed Drop DMH

Inflow Area = 2.51 ac, 74.51% Impervious, Inflow Depth > 0.80" for 2-YR event
 Inflow = 1.91 cfs @ 12.11 hrs, Volume= 0.166 af
 Outflow = 1.91 cfs @ 12.11 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.91 cfs @ 12.11 hrs, Volume= 0.166 af

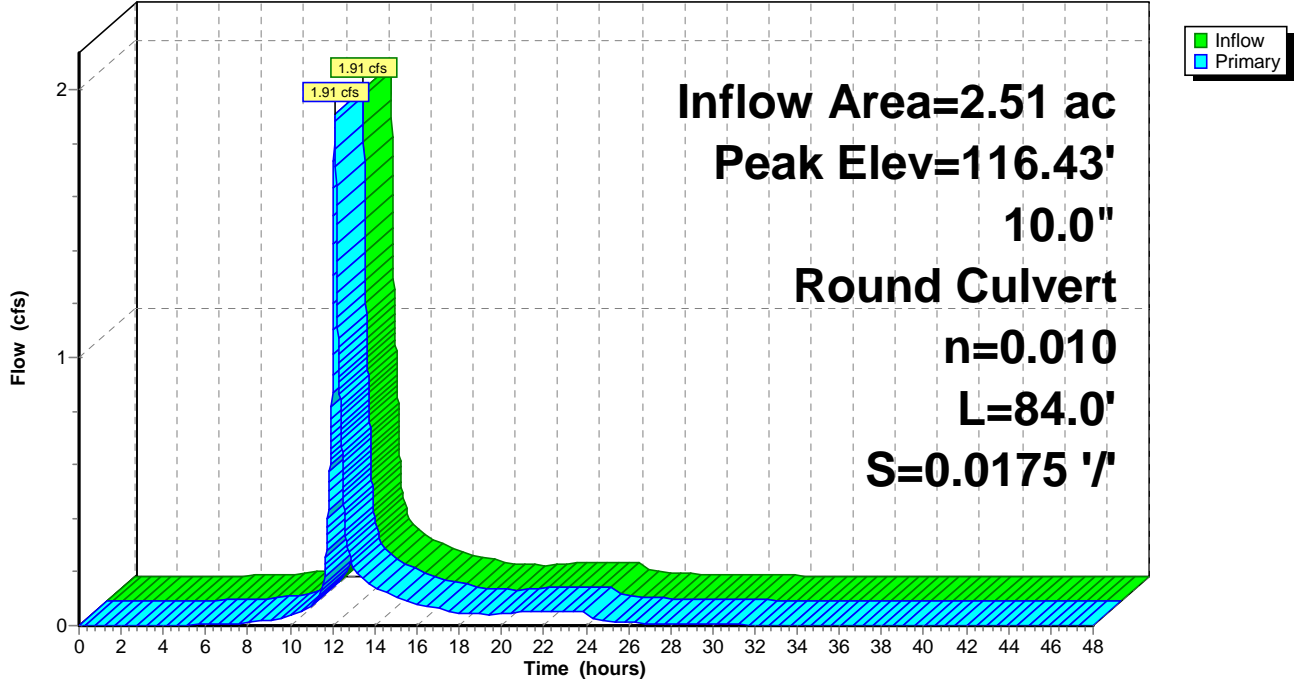
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 116.43' @ 12.11 hrs
 Flood Elev= 124.69'

Device #	Routing	Invert	Outlet Devices
1	Primary	115.17'	10.0" Round Culvert L= 84.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 115.17' / 113.70' S= 0.0175 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.91 cfs @ 12.11 hrs HW=116.43' (Free Discharge)
 ↑1=Culvert (Inlet Controls 1.91 cfs @ 3.49 fps)

Pond DMH7: Proposed Drop DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

Page 55

Summary for Pond DMH8: Proposed DMH

Inflow Area = 2.51 ac, 74.51% Impervious, Inflow Depth > 0.80" for 2-YR event
Inflow = 1.91 cfs @ 12.11 hrs, Volume= 0.166 af
Outflow = 1.91 cfs @ 12.11 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min
Primary = 1.91 cfs @ 12.11 hrs, Volume= 0.166 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 114.96' @ 12.11 hrs

Flood Elev= 123.71'

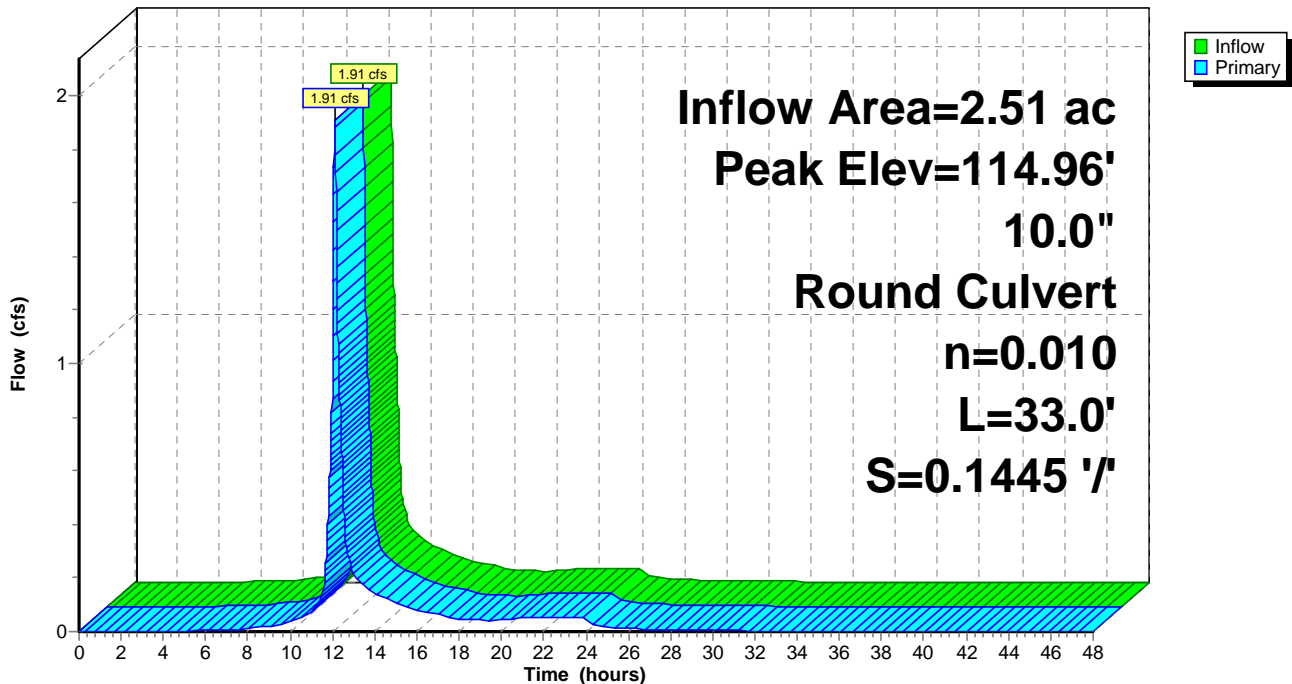
Device #	Routing	Invert	Outlet Devices
1	Primary	113.70'	10.0" Round Culvert L= 33.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 113.70' / 108.93' S= 0.1445 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.91 cfs @ 12.11 hrs HW=114.96' (Free Discharge)

↑1=Culvert (Inlet Controls 1.91 cfs @ 3.50 fps)

Pond DMH8: Proposed DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 2-YR Rainfall=3.10"

Printed 2/16/2016

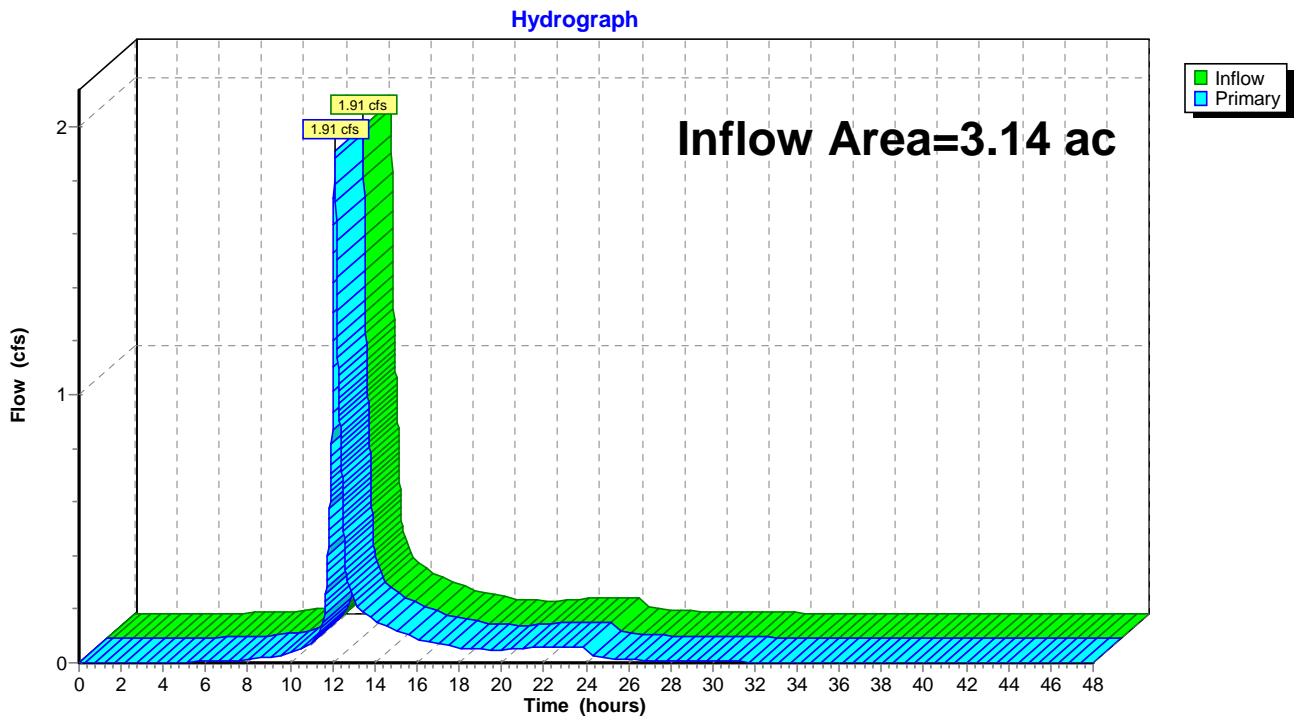
Page 56

Summary for Link SP1: Existing Combined Sewer in Danforth

Inflow Area = 3.14 ac, 64.59% Impervious, Inflow Depth > 0.68" for 2-YR event
Inflow = 1.91 cfs @ 12.11 hrs, Volume= 0.177 af
Primary = 1.91 cfs @ 12.11 hrs, Volume= 0.177 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link SP1: Existing Combined Sewer in Danforth



6. Post

Type III 24-hr 10-YR Rainfall=4.60"

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 57

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 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 10S: Area draining to Runoff Area=19,254 sf 56.16% Impervious Runoff Depth=1.89"
 Flow Length=91' Slope=0.0300 '/' Tc=7.7 min CN=72 Runoff=0.91 cfs 0.070 af

Subcatchment 60S: Lawn/Field S of school Runoff Area=16,715 sf 84.98% Impervious Runoff Depth=3.39"
 Tc=5.0 min CN=89 Runoff=1.54 cfs 0.108 af

Subcatchment 61S: Auditorium Roof Runoff Area=4,485 sf 100.00% Impervious Runoff Depth=4.36"
 Tc=5.0 min CN=98 Runoff=0.48 cfs 0.037 af

Subcatchment 70S: Thomas & Davies & Runoff Area=44,441 sf 74.20% Impervious Runoff Depth=2.81"
 Flow Length=91' Slope=0.1593 '/' Tc=5.0 min CN=83 Runoff=3.48 cfs 0.239 af

Subcatchment 80S: FoundersHall Runoff Area=9,466 sf 100.00% Impervious Runoff Depth=4.36"
 Tc=5.0 min CN=98 Runoff=1.01 cfs 0.079 af

Subcatchment 90S: Playground Runoff Area=27,554 sf 25.26% Impervious Runoff Depth=0.73"
 Flow Length=117' Tc=9.2 min CN=54 Runoff=0.34 cfs 0.039 af

Subcatchment 91S: Playground Runoff Area=4,688 sf 69.20% Impervious Runoff Depth=2.55"
 Tc=5.0 min CN=80 Runoff=0.33 cfs 0.023 af

Subcatchment 402S: New Prkng lot Runoff Area=10,240 sf 60.94% Impervious Runoff Depth=2.13"
 Tc=5.0 min CN=75 Runoff=0.60 cfs 0.042 af

Reach 161R: roof drain Avg. Flow Depth=0.18' Max Vel=7.42 fps Inflow=0.48 cfs 0.037 af
 6.0" Round Pipe n=0.013 L=129.0' S=0.0911 '/' Capacity=1.69 cfs Outflow=0.48 cfs 0.037 af

Pond 1P: USSF Peak Elev=121.45' Storage=8,567 cf Inflow=4.49 cfs 0.318 af
 Primary=0.37 cfs 0.151 af Secondary=0.00 cfs 0.000 af Outflow=0.37 cfs 0.151 af

Pond 206P: City CB @ Fletcher & Danforth Peak Elev=109.43' Inflow=3.66 cfs 0.470 af
 12.0" Round Culvert n=0.010 L=20.0' S=0.2475 '/' Outflow=3.66 cfs 0.470 af

Pond 210P: Existing FI Peak Elev=132.62' Inflow=0.91 cfs 0.070 af
 10.0" Round Culvert n=0.010 L=102.0' S=0.1008 '/' Outflow=0.91 cfs 0.070 af

Pond 220P: Existing DMH Peak Elev=122.28' Inflow=0.91 cfs 0.070 af
 10.0" Round Culvert n=0.010 L=108.0' S=0.0335 '/' Outflow=0.91 cfs 0.070 af

Pond 230P: Existing DMH Peak Elev=121.04' Inflow=3.36 cfs 0.280 af
 10.0" Round Culvert n=0.010 L=83.0' S=0.0257 '/' Outflow=3.36 cfs 0.280 af

Pond 260P: Storage Pipes Peak Elev=120.18' Storage=377 cf Inflow=2.62 cfs 0.188 af
 12.0" Round Culvert n=0.010 L=30.0' S=0.0380 '/' Outflow=2.16 cfs 0.188 af

Pond 340P: CB at SW Cor prkng lot Peak Elev=129.54' Inflow=0.60 cfs 0.042 af
 8.0" Round Culvert n=0.010 L=56.0' S=0.1000 '/' Outflow=0.60 cfs 0.042 af

6. Post

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 58

Pond CB4: Proposed DMH

Peak Elev=125.03' Inflow=4.49 cfs 0.318 af
 12.0" Round Culvert n=0.010 L=24.0' S=0.0621 '/ Outflow=4.49 cfs 0.318 af

Pond DMH: OCS Bypass

Peak Elev=119.78' Inflow=0.37 cfs 0.151 af
 10.0" Round Culvert n=0.010 L=60.0' S=0.0692 '/ Outflow=0.37 cfs 0.151 af

Pond DMH6: Access MH

Peak Elev=121.01' Inflow=4.49 cfs 0.318 af
 Primary=4.49 cfs 0.318 af Secondary=0.00 cfs 0.000 af Outflow=4.49 cfs 0.318 af

Pond DMH7: Proposed Drop DMH

Peak Elev=118.21' Inflow=3.36 cfs 0.431 af
 10.0" Round Culvert n=0.010 L=84.0' S=0.0175 '/ Outflow=3.36 cfs 0.431 af

Pond DMH8: Proposed DMH

Peak Elev=116.74' Inflow=3.36 cfs 0.431 af
 10.0" Round Culvert n=0.010 L=33.0' S=0.1445 '/ Outflow=3.36 cfs 0.431 af

Link SP1: Existing Combined Sewer in Danforth

Inflow=3.66 cfs 0.470 af
 Primary=3.66 cfs 0.470 af

Total Runoff Area = 3.14 ac Runoff Volume = 0.637 af Average Runoff Depth = 2.43"
35.41% Pervious = 1.11 ac 64.59% Impervious = 2.03 ac

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 59

Summary for Subcatchment 10S: Area draining to Sanctuary

Runoff = 0.91 cfs @ 12.11 hrs, Volume= 0.070 af, Depth= 1.89"

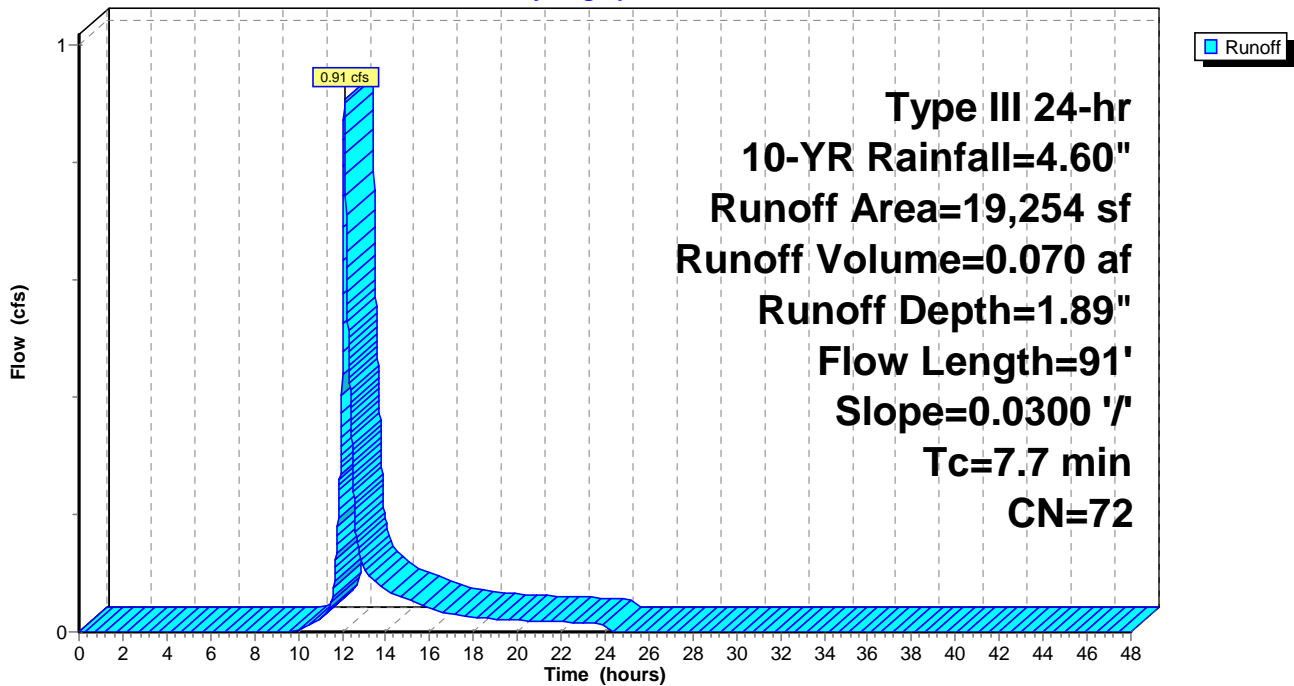
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	10,813	98	impervious
*	8,441	39	Lawn/field, HSG A
	19,254	72	Weighted Average
	8,441		43.84% Pervious Area
	10,813		56.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	91	0.0300	0.20		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.19"

Subcatchment 10S: Area draining to Sanctuary

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 60

Summary for Subcatchment 60S: Lawn/Field S of school

Runoff = 1.54 cfs @ 12.07 hrs, Volume= 0.108 af, Depth= 3.39"

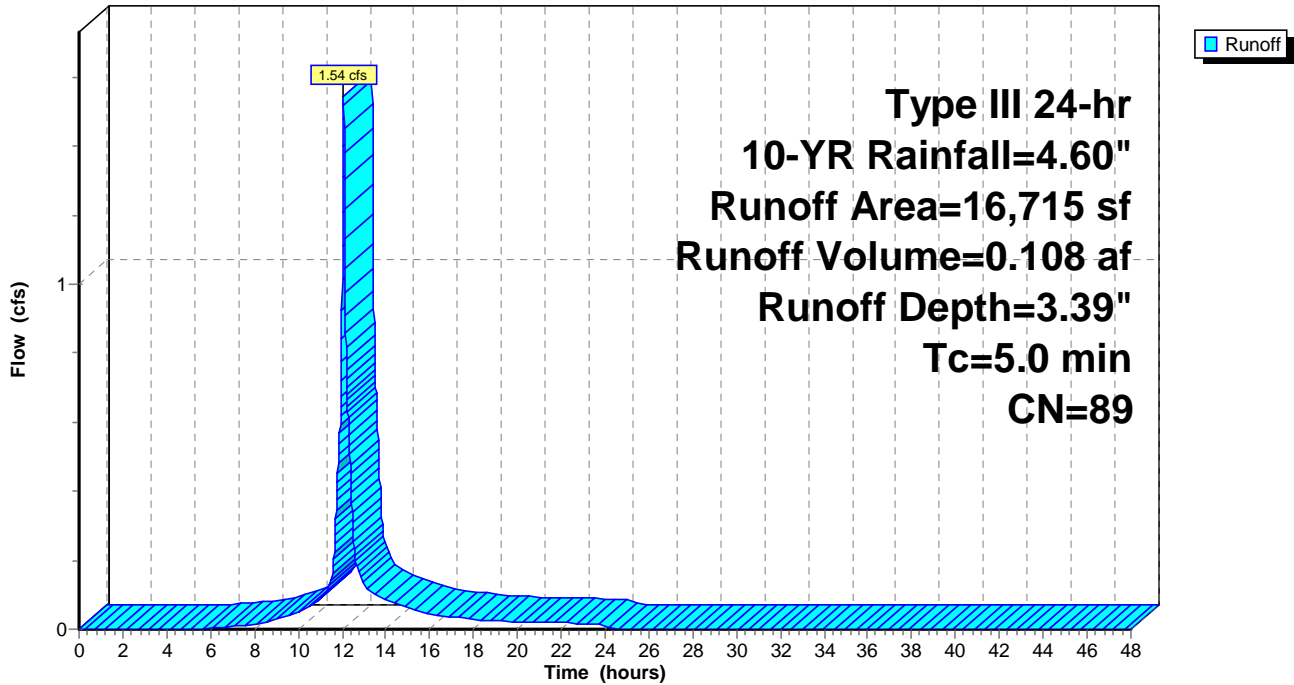
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	14,205	98	impervious
*	2,510	39	Lawn/field, HSG A
	16,715	89	Weighted Average
	2,510		15.02% Pervious Area
	14,205		84.98% Impervious Area

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

Subcatchment 60S: Lawn/Field S of school

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 61

Summary for Subcatchment 61S: Auditorium Roof

Runoff = 0.48 cfs @ 12.07 hrs, Volume= 0.037 af, Depth= 4.36"

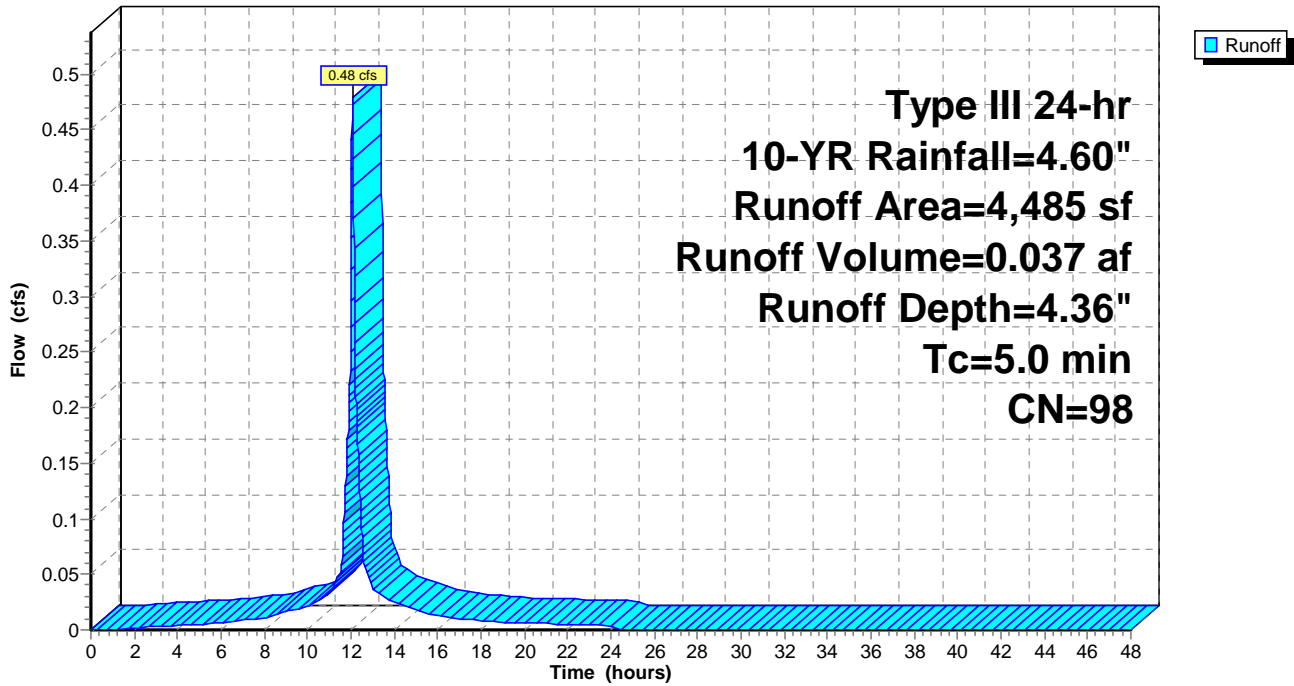
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
* 4,485	98	Roof runoff
4,485		100.00% Impervious Area

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

Subcatchment 61S: Auditorium Roof

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 62

Summary for Subcatchment 70S: Thomas & Davies & Gym

Runoff = 3.48 cfs @ 12.07 hrs, Volume= 0.239 af, Depth= 2.81"

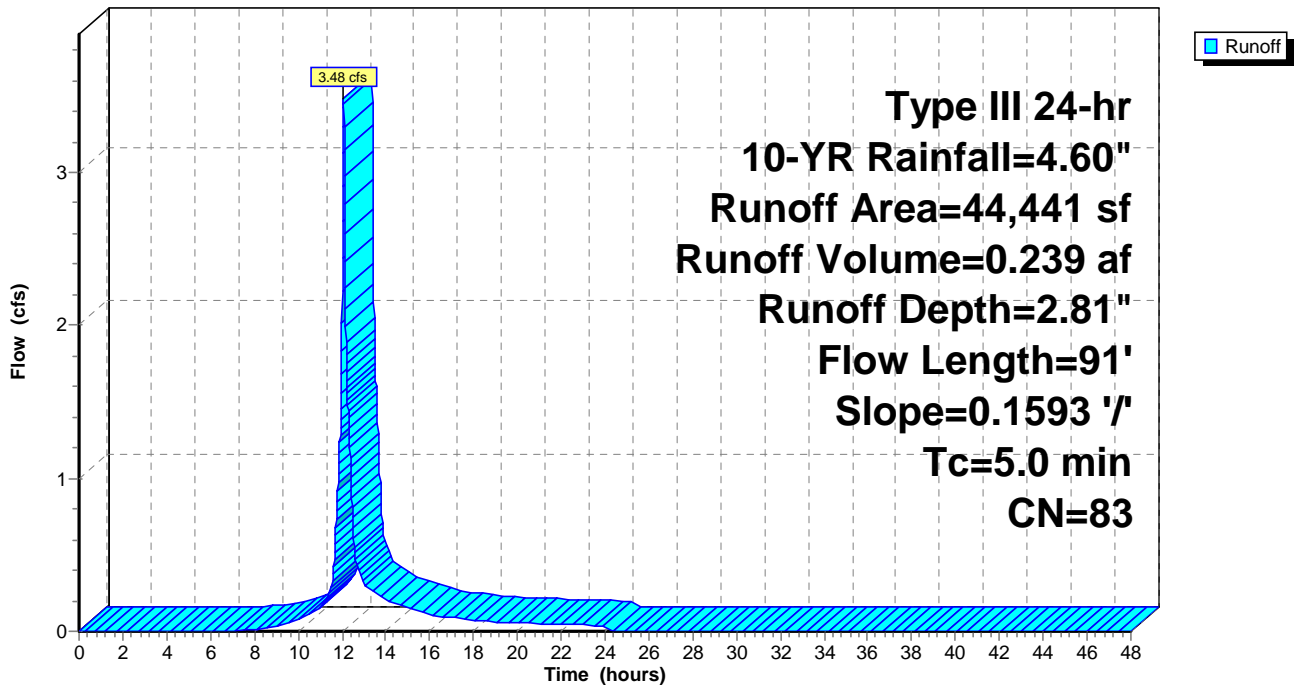
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	32,976	98	impervious
*	11,465	39	Lawn/field, HSG A
	44,441	83	Weighted Average
	11,465		25.80% Pervious Area
	32,976		74.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	91	0.1593	0.38		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.19"
4.0	91	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 70S: Thomas & Davies & Gym

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 63

Summary for Subcatchment 80S: FoundersHall

Runoff = 1.01 cfs @ 12.07 hrs, Volume= 0.079 af, Depth= 4.36"

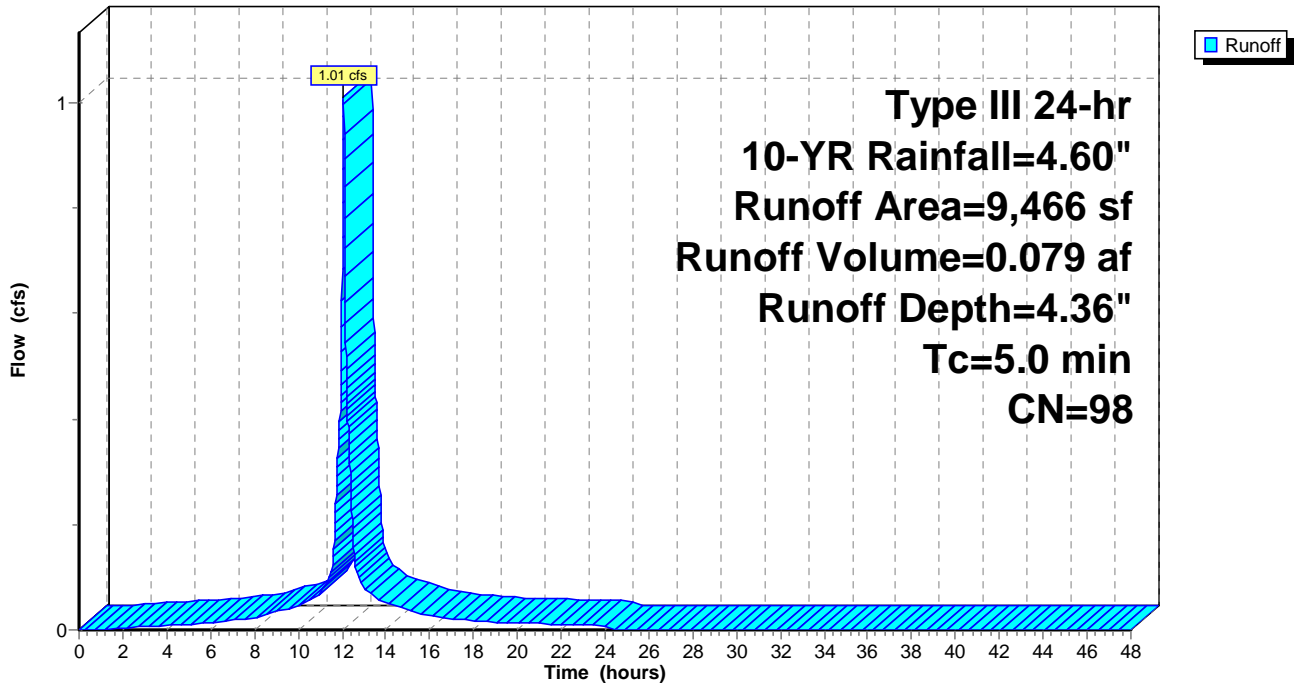
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
* 9,466	98	Roof runoff
9,466		100.00% Impervious Area

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

Subcatchment 80S: FoundersHall

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 64

Summary for Subcatchment 90S: Playground

Runoff = 0.34 cfs @ 12.16 hrs, Volume= 0.039 af, Depth= 0.73"

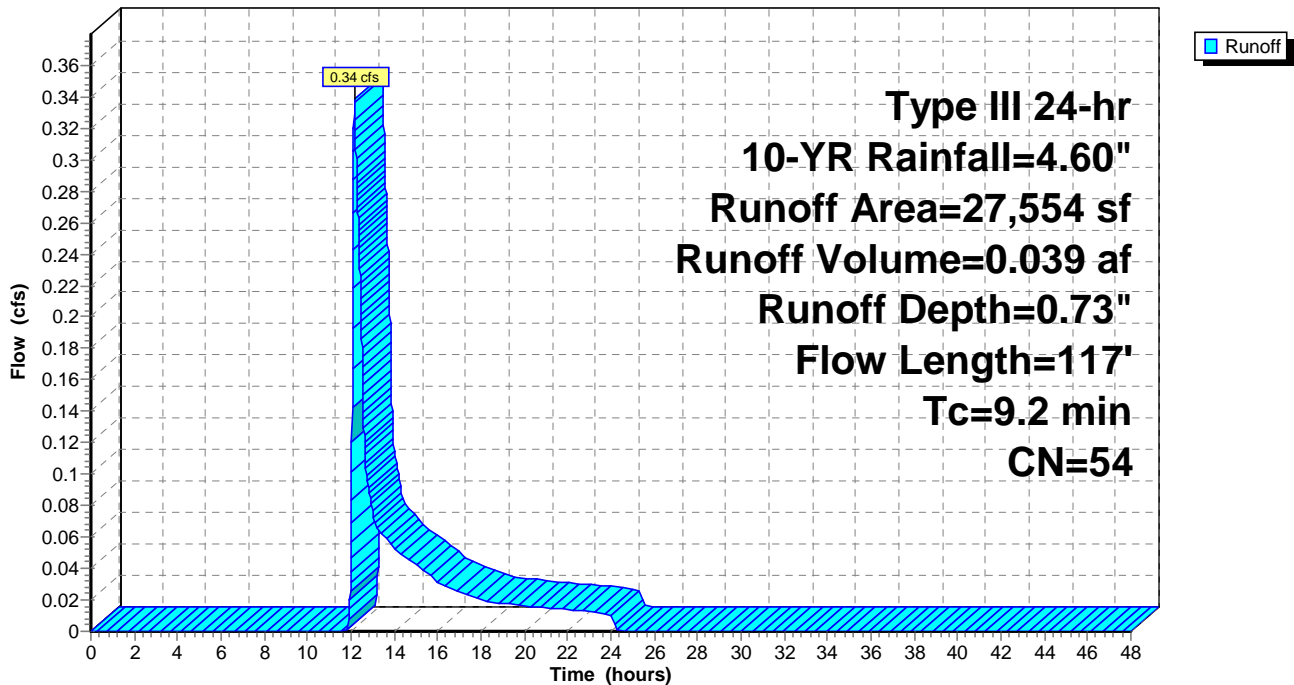
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	6,960	98	impervious
*	20,594	39	Lawn/field, HSG A
	27,554	54	Weighted Average
	20,594		74.74% Pervious Area
	6,960		25.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.0250	0.19		Sheet Flow, A-B
					Grass: Short n= 0.150 P2= 3.19"
0.2	17	0.0588	1.70		Shallow Concentrated Flow, B-C
					Short Grass Pasture Kv= 7.0 fps
9.2	117	Total			

Subcatchment 90S: Playground

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 65

Summary for Subcatchment 91S: Playground

Runoff = 0.33 cfs @ 12.07 hrs, Volume= 0.023 af, Depth= 2.55"

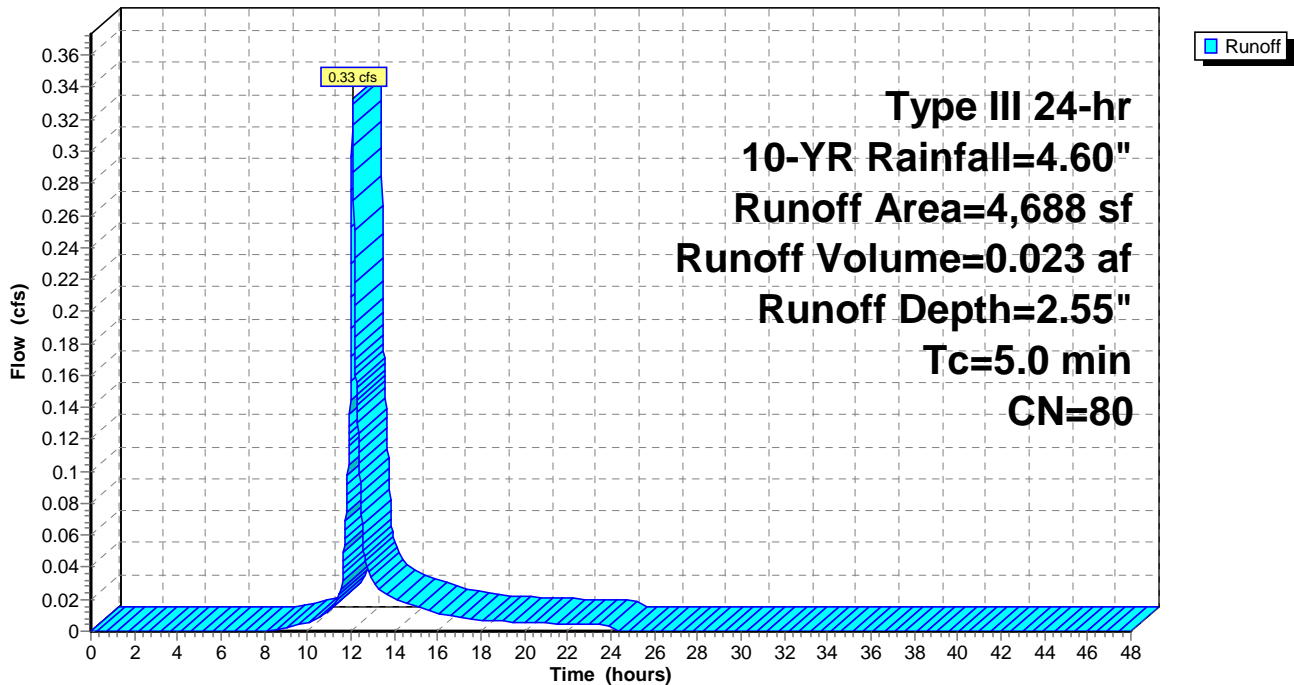
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	3,244	98	impervious
*	1,444	39	Lawn/field, HSG A
	4,688	80	Weighted Average
	1,444		30.80% Pervious Area
	3,244		69.20% Impervious Area

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

Subcatchment 91S: Playground

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 66

Summary for Subcatchment 402S: New Prkng lot

Runoff = 0.60 cfs @ 12.08 hrs, Volume= 0.042 af, Depth= 2.13"

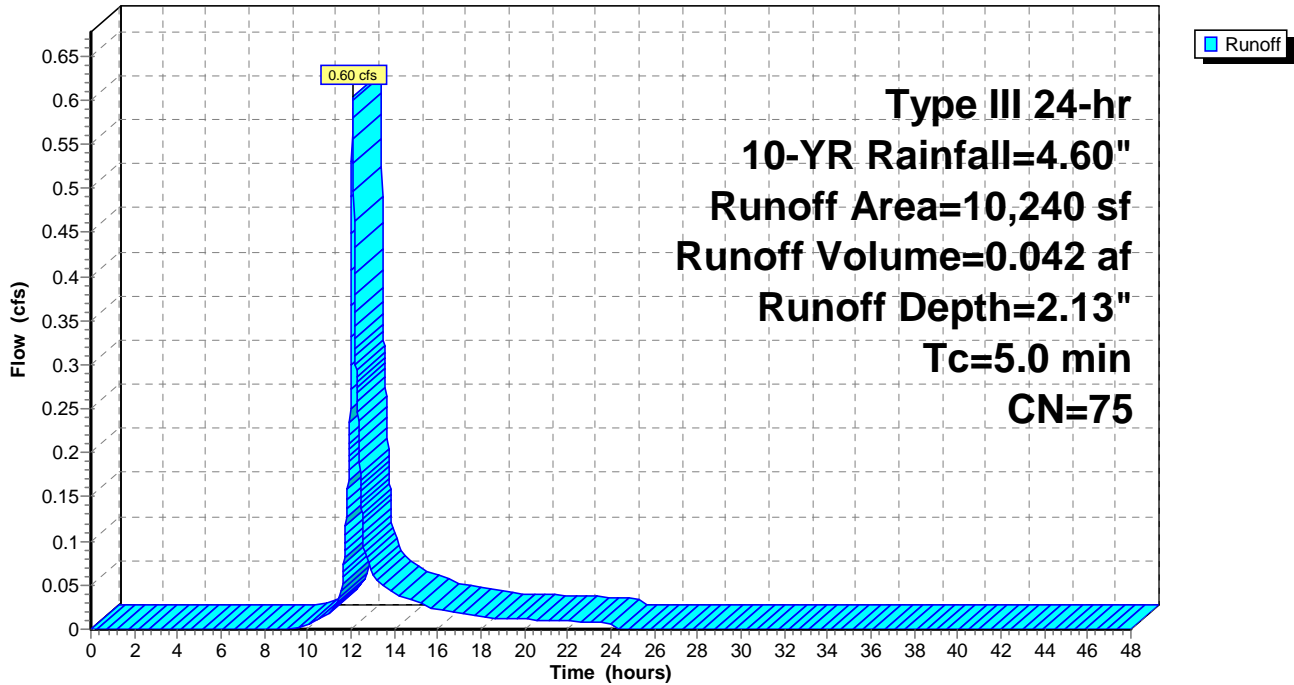
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	4,000	39	Pervious
*	6,240	98	Impervious
	10,240	75	Weighted Average
	4,000		39.06% Pervious Area
	6,240		60.94% Impervious Area

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

Subcatchment 402S: New Prkng lot

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 67

Summary for Reach 161R: roof drain

Inflow Area = 0.10 ac, 100.00% Impervious, Inflow Depth = 4.36" for 10-YR event
Inflow = 0.48 cfs @ 12.07 hrs, Volume= 0.037 af
Outflow = 0.48 cfs @ 12.08 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Max. Velocity= 7.42 fps, Min. Travel Time= 0.3 min

Avg. Velocity = 2.44 fps, Avg. Travel Time= 0.9 min

Peak Storage= 8 cf @ 12.07 hrs

Average Depth at Peak Storage= 0.18'

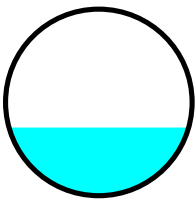
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.69 cfs

6.0" Round Pipe

n= 0.013 Corrugated PE, smooth interior

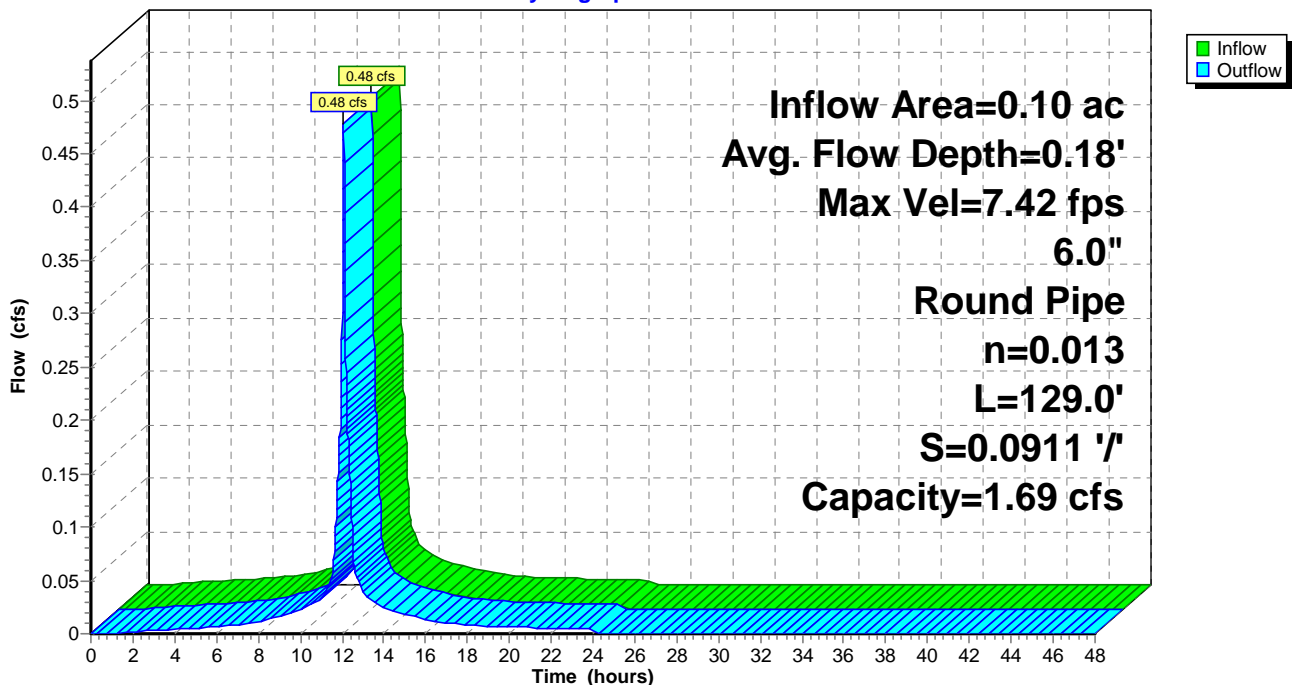
Length= 129.0' Slope= 0.0911 1/100'

Inlet Invert= 130.00', Outlet Invert= 118.25'



Reach 161R: roof drain

Hydrograph



6. Post

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 68

Summary for Pond 1P: USSF

Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth = 3.09" for 10-YR event
 Inflow = 4.49 cfs @ 12.07 hrs, Volume= 0.318 af
 Outflow = 0.37 cfs @ 13.08 hrs, Volume= 0.151 af, Atten= 92%, Lag= 60.5 min
 Primary = 0.37 cfs @ 13.08 hrs, Volume= 0.151 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 121.45' @ 13.08 hrs Surf.Area= 4,717 sf Storage= 8,567 cf
 Flood Elev= 126.48' Surf.Area= 4,717 sf Storage= 16,044 cf

Plug-Flow detention time= 343.2 min calculated for 0.151 af (47% of inflow)
 Center-of-Mass det. time= 222.8 min (1,022.0 - 799.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	118.85'	6,599 cf	51.42'W x 91.74'L x 5.50'H Field A 25,943 cf Overall - 9,445 cf Embedded = 16,499 cf x 40.0% Voids
#2A	119.60'	9,445 cf	ADS_StormTech MC-3500 d +Cap x 84 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 7 Rows of 12 Chambers Cap Storage= +14.9 cf x 2 x 7 rows = 208.6 cf
		16,044 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	119.67'	8.0" Round Culvert L= 7.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.67' / 119.52' S= 0.0214 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#2	Device 1	123.35'	5.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	121.10'	8.0" Vert. Orifice/Grate C= 0.600
#4	Device 5	118.85'	2.410 in/hr Exfiltration over Surface area above 118.85' Conductivity to Groundwater Elevation = 113.00' Excluded Surface area = 4,717 sf
#5	Secondary	116.02'	6.0" Round Culvert L= 31.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 116.02' / 115.88' S= 0.0045 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 69

Primary OutFlow Max=0.37 cfs @ 13.08 hrs HW=121.45' (Free Discharge)

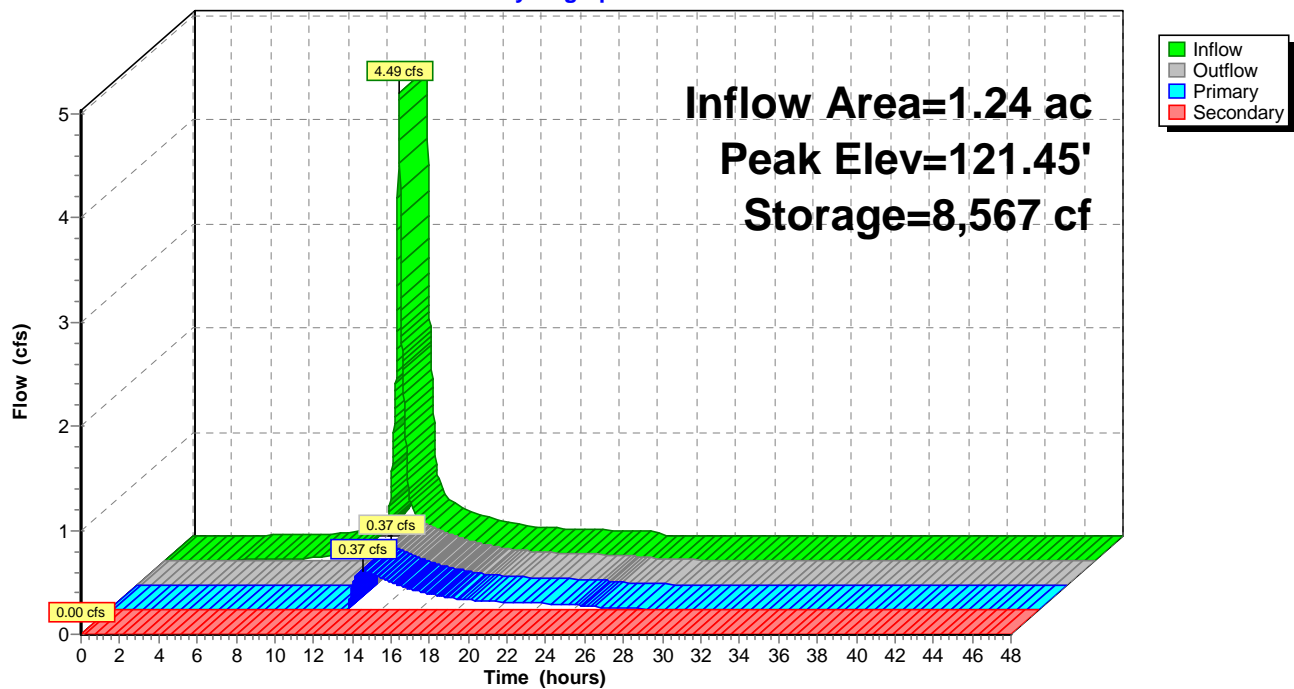
- 1=Culvert (Passes 0.37 cfs of 1.59 cfs potential flow)
- 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
- 3=Orifice/Grate (Orifice Controls 0.37 cfs @ 2.00 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=118.85' (Free Discharge)

- 5=Culvert (Passes 0.00 cfs of 1.20 cfs potential flow)
- 4=Exfiltration (Controls 0.00 cfs)

Pond 1P: USSF

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 70

Summary for Pond 206P: City CB @ Fletcher & Danforth

Inflow Area = 3.14 ac, 64.59% Impervious, Inflow Depth > 1.79" for 10-YR event
Inflow = 3.66 cfs @ 12.12 hrs, Volume= 0.470 af
Outflow = 3.66 cfs @ 12.12 hrs, Volume= 0.470 af, Atten= 0%, Lag= 0.0 min
Primary = 3.66 cfs @ 12.12 hrs, Volume= 0.470 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 109.43' @ 12.12 hrs

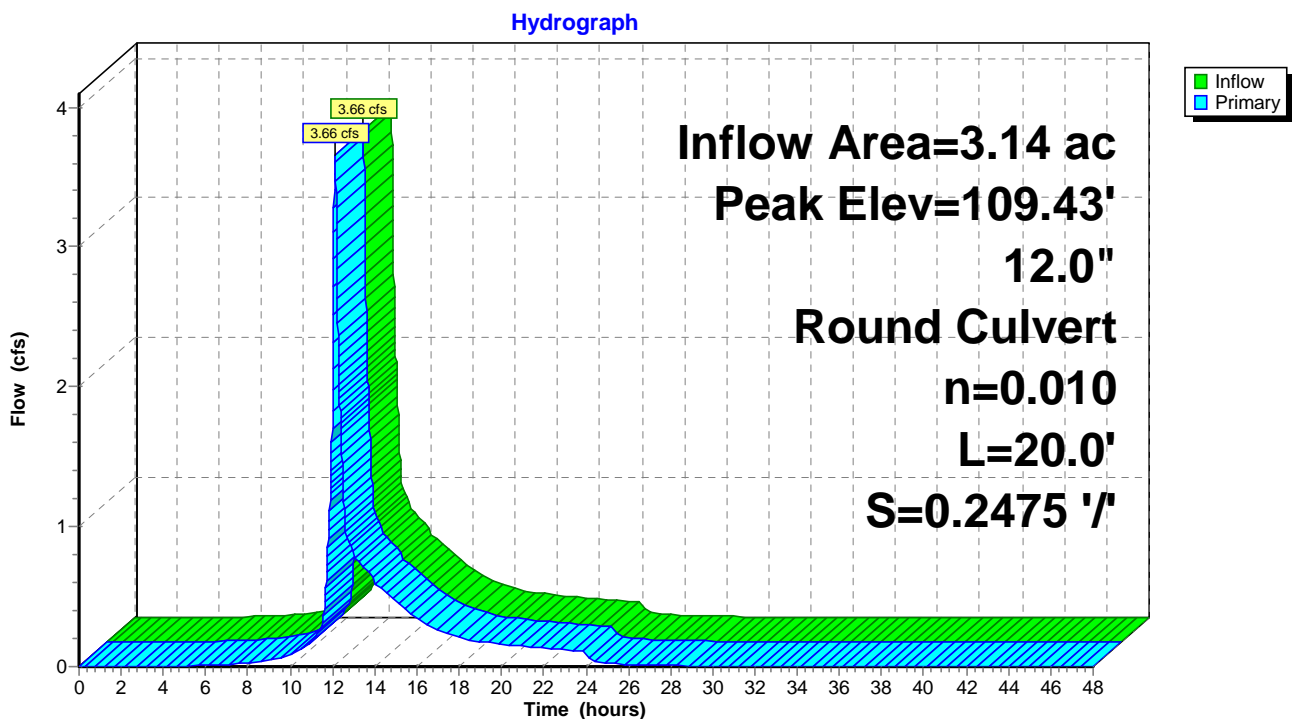
Flood Elev= 111.26'

Device	Routing	Invert	Outlet Devices
#1	Primary	107.43'	12.0" Round Culvert L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 107.43' / 102.48' S= 0.2475 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.66 cfs @ 12.12 hrs HW=109.43' (Free Discharge)

↑1=Culvert (Inlet Controls 3.66 cfs @ 4.65 fps)

Pond 206P: City CB @ Fletcher & Danforth



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 71

Summary for Pond 210P: Existing FI

Inflow Area = 0.44 ac, 56.16% Impervious, Inflow Depth = 1.89" for 10-YR event
Inflow = 0.91 cfs @ 12.11 hrs, Volume= 0.070 af
Outflow = 0.91 cfs @ 12.11 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min
Primary = 0.91 cfs @ 12.11 hrs, Volume= 0.070 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 132.62' @ 12.11 hrs

Flood Elev= 140.41'

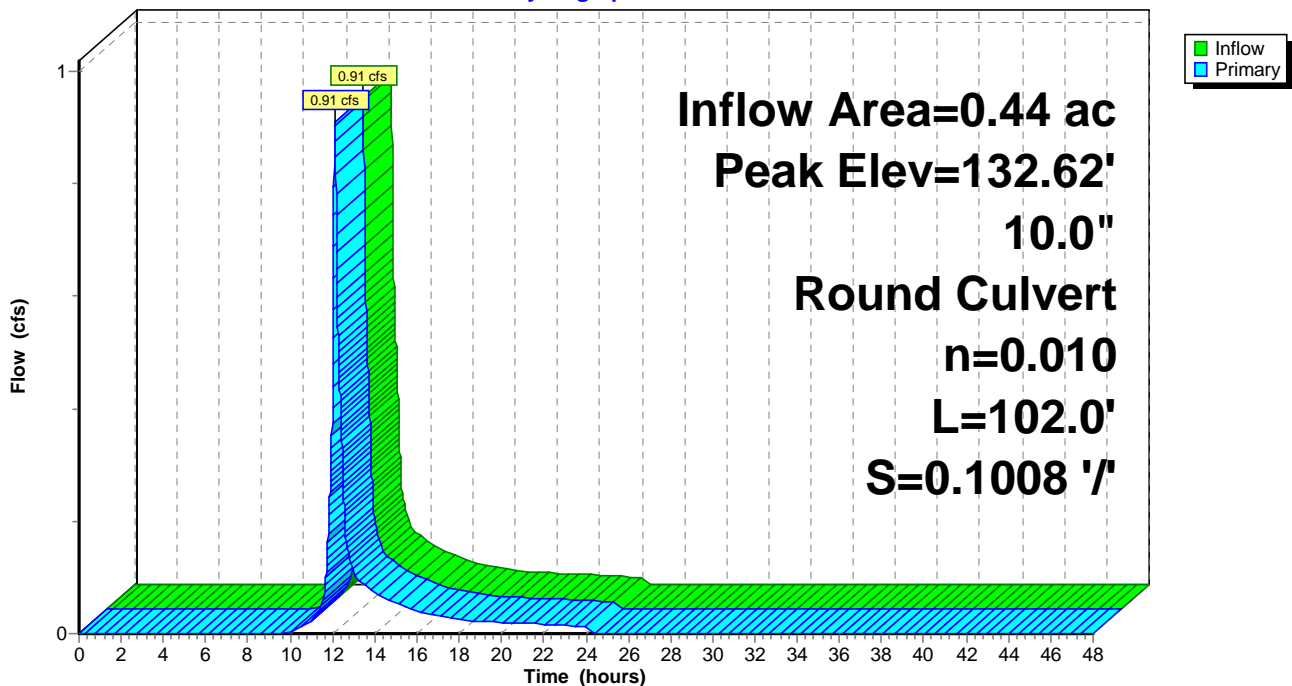
Device	Routing	Invert	Outlet Devices
#1	Primary	132.00'	10.0" Round Culvert L= 102.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 132.00' / 121.72' S= 0.1008 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=0.91 cfs @ 12.11 hrs HW=132.61' (Free Discharge)

↑1=Culvert (Inlet Controls 0.91 cfs @ 2.11 fps)

Pond 210P: Existing FI

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 72

Summary for Pond 220P: Existing DMH

Inflow Area = 0.44 ac, 56.16% Impervious, Inflow Depth = 1.89" for 10-YR event
Inflow = 0.91 cfs @ 12.11 hrs, Volume= 0.070 af
Outflow = 0.91 cfs @ 12.11 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min
Primary = 0.91 cfs @ 12.11 hrs, Volume= 0.070 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 122.28' @ 12.11 hrs

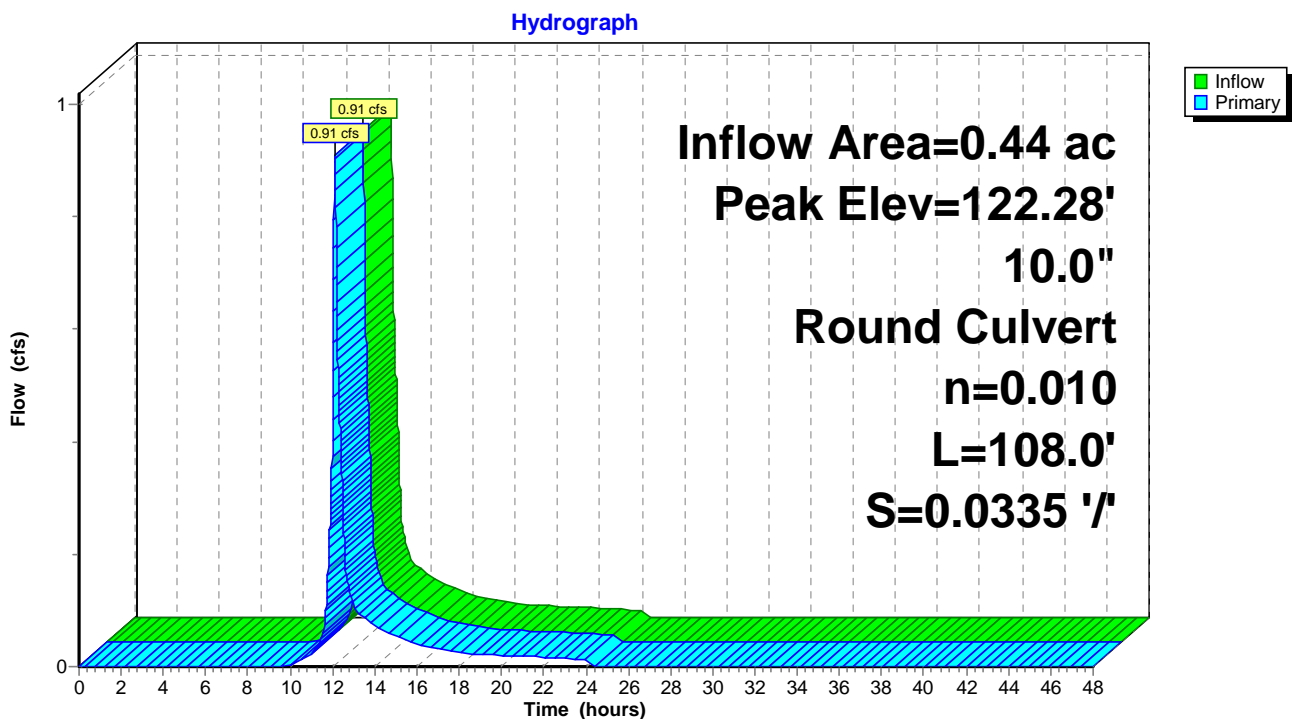
Flood Elev= 128.47'

Device	Routing	Invert	Outlet Devices
#1	Primary	121.67'	10.0" Round Culvert L= 108.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 121.67' / 118.05' S= 0.0335 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=0.91 cfs @ 12.11 hrs HW=122.28' (Free Discharge)

↑1=Culvert (Inlet Controls 0.91 cfs @ 2.11 fps)

Pond 220P: Existing DMH



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 73

Summary for Pond 230P: Existing DMH

Inflow Area = 1.27 ac, 70.40% Impervious, Inflow Depth = 2.64" for 10-YR event
Inflow = 3.36 cfs @ 12.11 hrs, Volume= 0.280 af
Outflow = 3.36 cfs @ 12.11 hrs, Volume= 0.280 af, Atten= 0%, Lag= 0.0 min
Primary = 3.36 cfs @ 12.11 hrs, Volume= 0.280 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 121.04' @ 12.11 hrs

Flood Elev= 125.05'

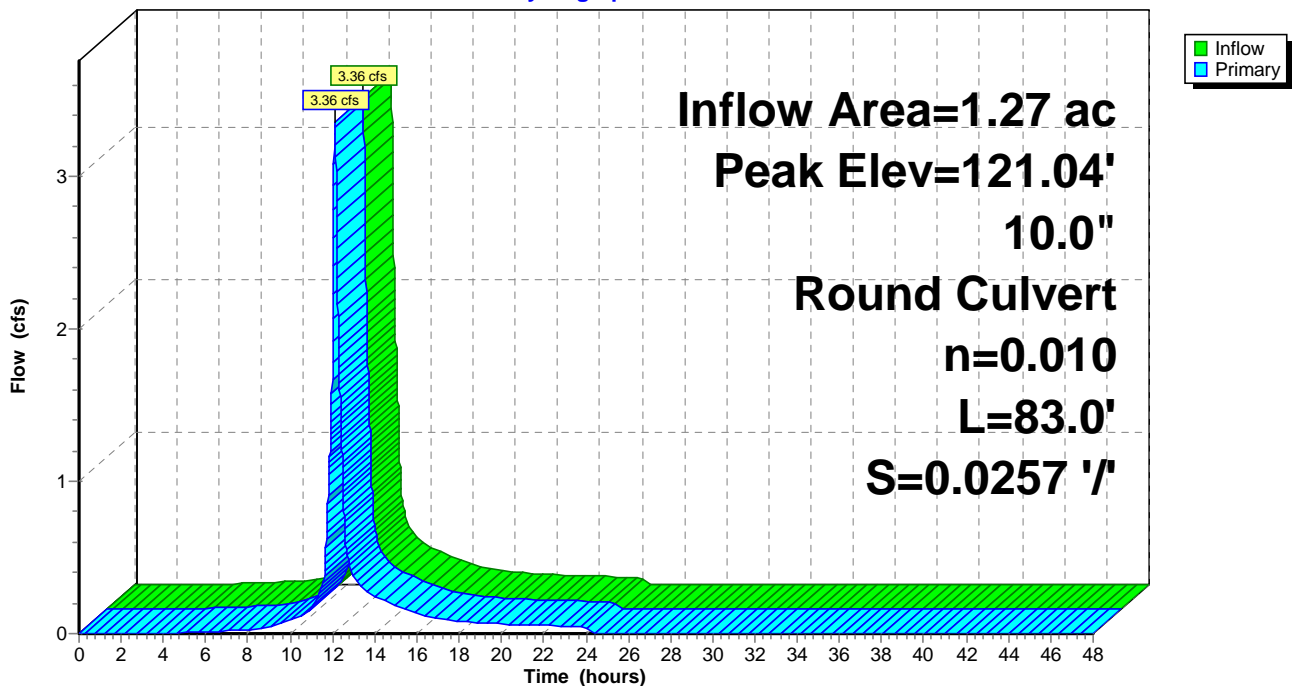
Device #	Routing	Invert	Outlet Devices
1	Primary	118.00'	10.0" Round Culvert L= 83.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 118.00' / 115.87' S= 0.0257 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=3.35 cfs @ 12.11 hrs HW=121.03' (Free Discharge)

↑1=Culvert (Inlet Controls 3.35 cfs @ 6.15 fps)

Pond 230P: Existing DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 74

Summary for Pond 260P: Storage Pipes

Inflow Area = 0.72 ac, 79.29% Impervious, Inflow Depth = 3.12" for 10-YR event
Inflow = 2.62 cfs @ 12.07 hrs, Volume= 0.188 af
Outflow = 2.16 cfs @ 12.13 hrs, Volume= 0.188 af, Atten= 18%, Lag= 3.1 min
Primary = 2.16 cfs @ 12.13 hrs, Volume= 0.188 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 120.18' @ 12.13 hrs Surf.Area= 797 sf Storage= 377 cf
Flood Elev= 125.26' Surf.Area= 0 sf Storage= 3,468 cf

Plug-Flow detention time= 1.4 min calculated for 0.188 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (797.7 - 796.3)

Volume	Invert	Avail.Storage	Storage Description
#1	119.16'	3,468 cf	48.0" Round Pipe Storage L= 276.0' S= 0.0027 1/'

Device	Routing	Invert	Outlet Devices
#1	Primary	119.16'	12.0" Round Culvert L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.16' / 118.02' S= 0.0380 1/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.15 cfs @ 12.13 hrs HW=120.18' (Free Discharge)

↑**1=Culvert** (Inlet Controls 2.15 cfs @ 2.74 fps)

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

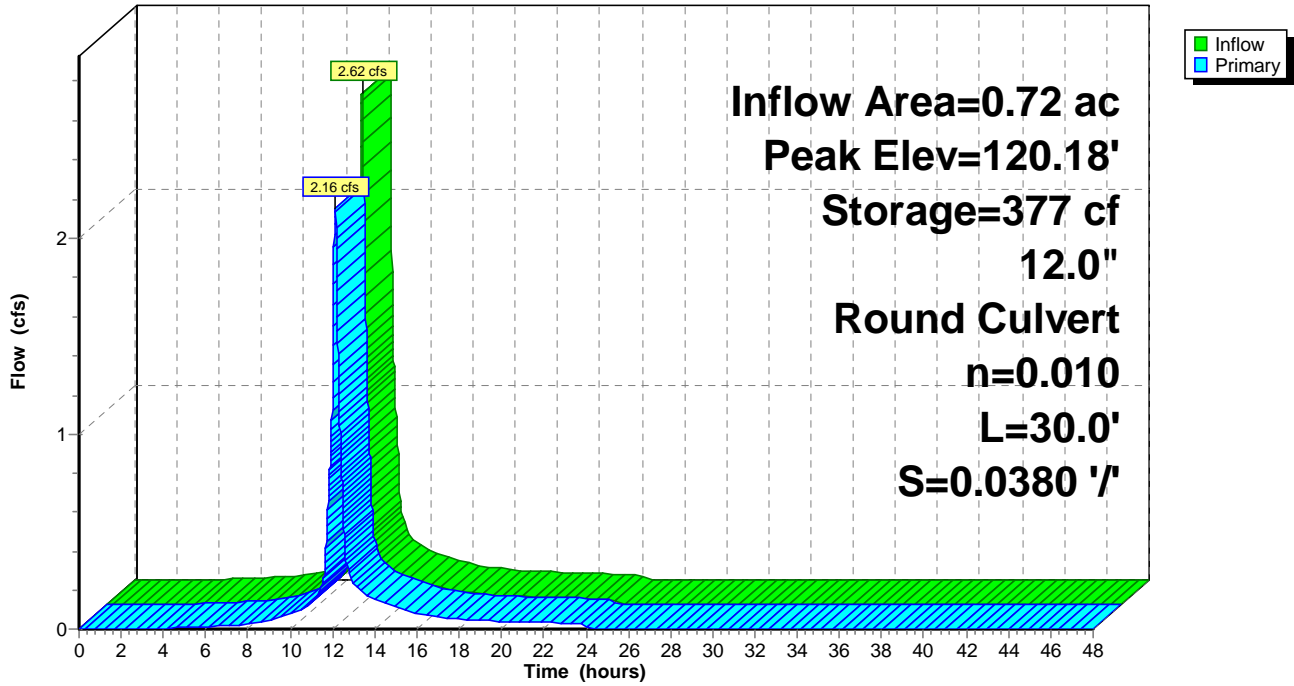
POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 75

Pond 260P: Storage Pipes

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 76

Summary for Pond 340P: CB at SW Cor prkng lot

Inflow Area = 0.24 ac, 60.94% Impervious, Inflow Depth = 2.13" for 10-YR event
Inflow = 0.60 cfs @ 12.08 hrs, Volume= 0.042 af
Outflow = 0.60 cfs @ 12.08 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min
Primary = 0.60 cfs @ 12.08 hrs, Volume= 0.042 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 129.54' @ 12.08 hrs

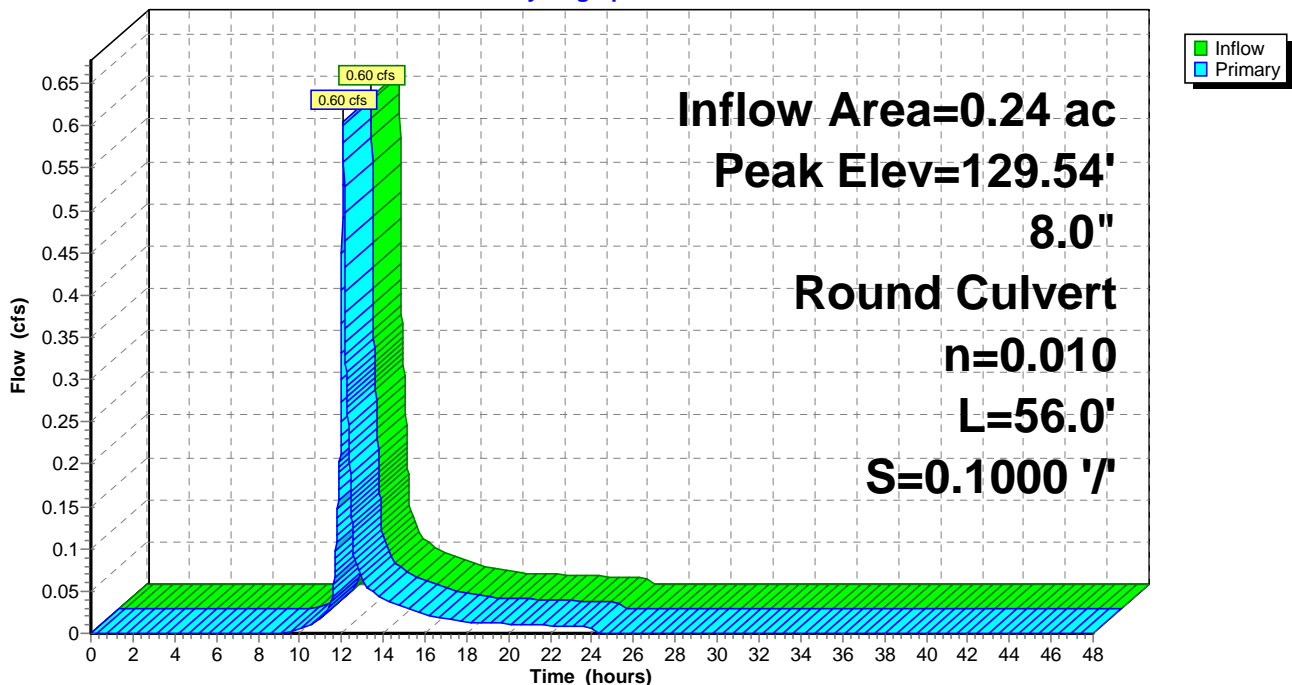
Device	Routing	Invert	Outlet Devices
#1	Primary	129.00'	8.0" Round Culvert L= 56.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 129.00' / 123.40' S= 0.1000 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.60 cfs @ 12.08 hrs HW=129.54' (Free Discharge)

↑1=Culvert (Inlet Controls 0.60 cfs @ 1.98 fps)

Pond 340P: CB at SW Cor prkng lot

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 77

Summary for Pond CB4: Proposed DMH

Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth = 3.09" for 10-YR event
Inflow = 4.49 cfs @ 12.07 hrs, Volume= 0.318 af
Outflow = 4.49 cfs @ 12.07 hrs, Volume= 0.318 af, Atten= 0%, Lag= 0.0 min
Primary = 4.49 cfs @ 12.07 hrs, Volume= 0.318 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 125.03' @ 12.07 hrs

Flood Elev= 127.50'

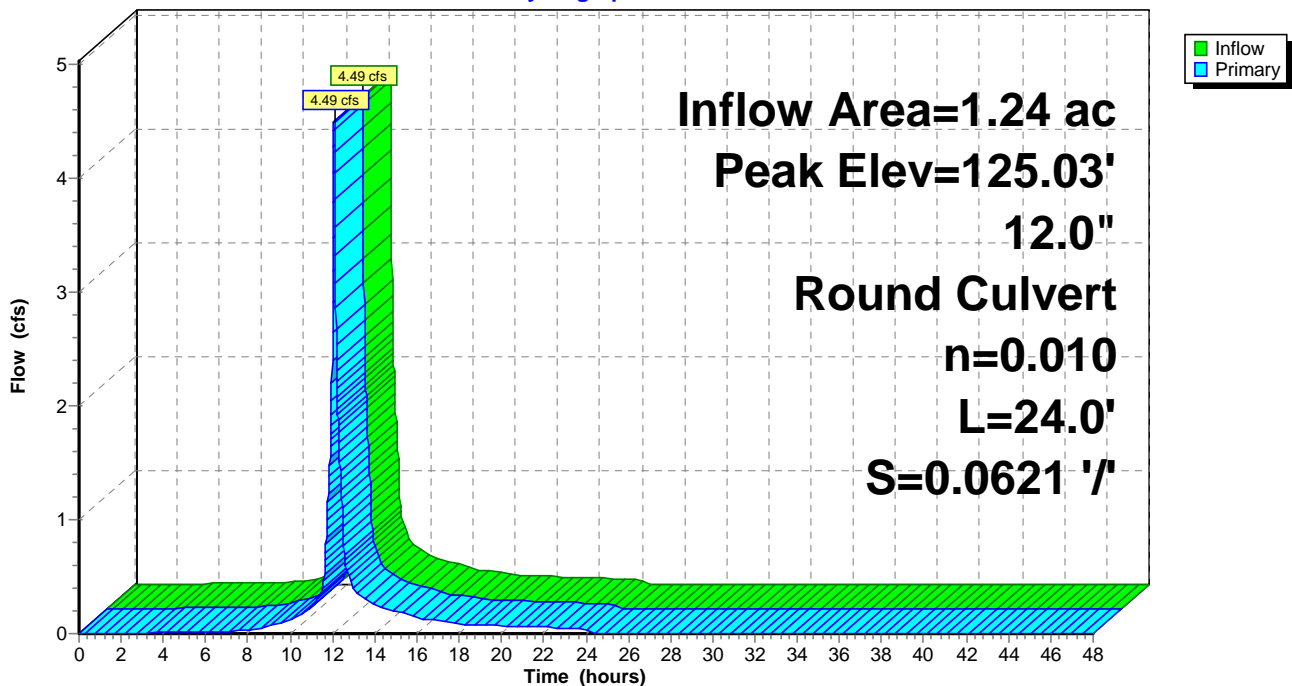
Device	Routing	Invert	Outlet Devices
#1	Primary	122.26'	12.0" Round Culvert L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 122.26' / 120.77' S= 0.0621 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=4.48 cfs @ 12.07 hrs HW=125.02' (Free Discharge)

↑1=Culvert (Inlet Controls 4.48 cfs @ 5.71 fps)

Pond CB4: Proposed DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 78

Summary for Pond DMH: OCS Bypass

Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth > 1.46" for 10-YR event
Inflow = 0.37 cfs @ 13.08 hrs, Volume= 0.151 af
Outflow = 0.37 cfs @ 13.08 hrs, Volume= 0.151 af, Atten= 0%, Lag= 0.0 min
Primary = 0.37 cfs @ 13.08 hrs, Volume= 0.151 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 119.78' @ 13.08 hrs

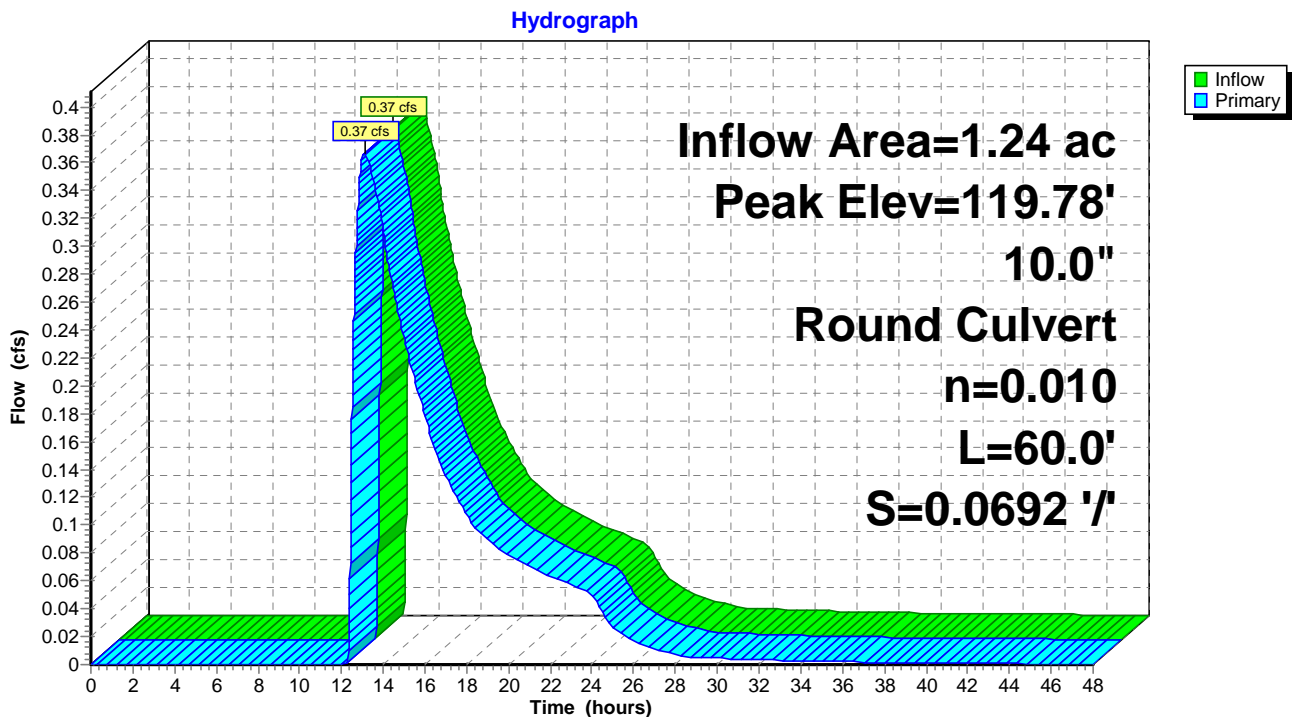
Flood Elev= 126.48'

Device #	Routing	Invert	Outlet Devices
#1	Primary	119.42'	10.0" Round Culvert L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.42' / 115.27' S= 0.0692 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=0.37 cfs @ 13.08 hrs HW=119.78' (Free Discharge)

↑1=Culvert (Inlet Controls 0.37 cfs @ 1.62 fps)

Pond DMH: OCS Bypass



6. Post

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 79

Summary for Pond DMH6: Access MH

Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth = 3.09" for 10-YR event
 Inflow = 4.49 cfs @ 12.07 hrs, Volume= 0.318 af
 Outflow = 4.49 cfs @ 12.07 hrs, Volume= 0.318 af, Atten= 0%, Lag= 0.0 min
 Primary = 4.49 cfs @ 12.07 hrs, Volume= 0.318 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 121.01' @ 12.07 hrs
 Flood Elev= 126.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	119.77'	24.0" Round Culvert L= 9.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.77' / 119.77' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	119.77'	24.0" Round Culvert L= 2.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.77' / 119.77' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 2	123.35'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=4.48 cfs @ 12.07 hrs HW=121.01' (Free Discharge)
 ↑1=Culvert (Barrel Controls 4.48 cfs @ 3.14 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=119.77' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

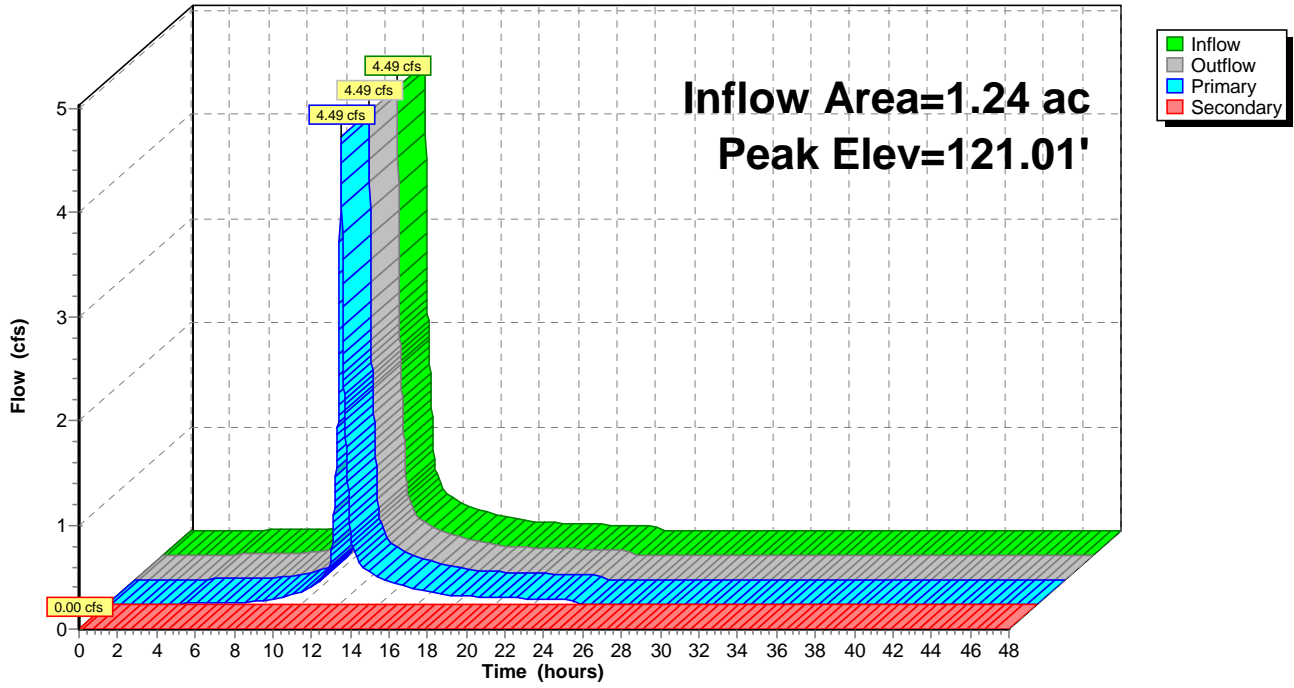
POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 80

Pond DMH6: Access MH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 81

Summary for Pond DMH7: Proposed Drop DMH

Inflow Area = 2.51 ac, 74.51% Impervious, Inflow Depth > 2.06" for 10-YR event
Inflow = 3.36 cfs @ 12.11 hrs, Volume= 0.431 af
Outflow = 3.36 cfs @ 12.11 hrs, Volume= 0.431 af, Atten= 0%, Lag= 0.0 min
Primary = 3.36 cfs @ 12.11 hrs, Volume= 0.431 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 118.21' @ 12.11 hrs

Flood Elev= 124.69'

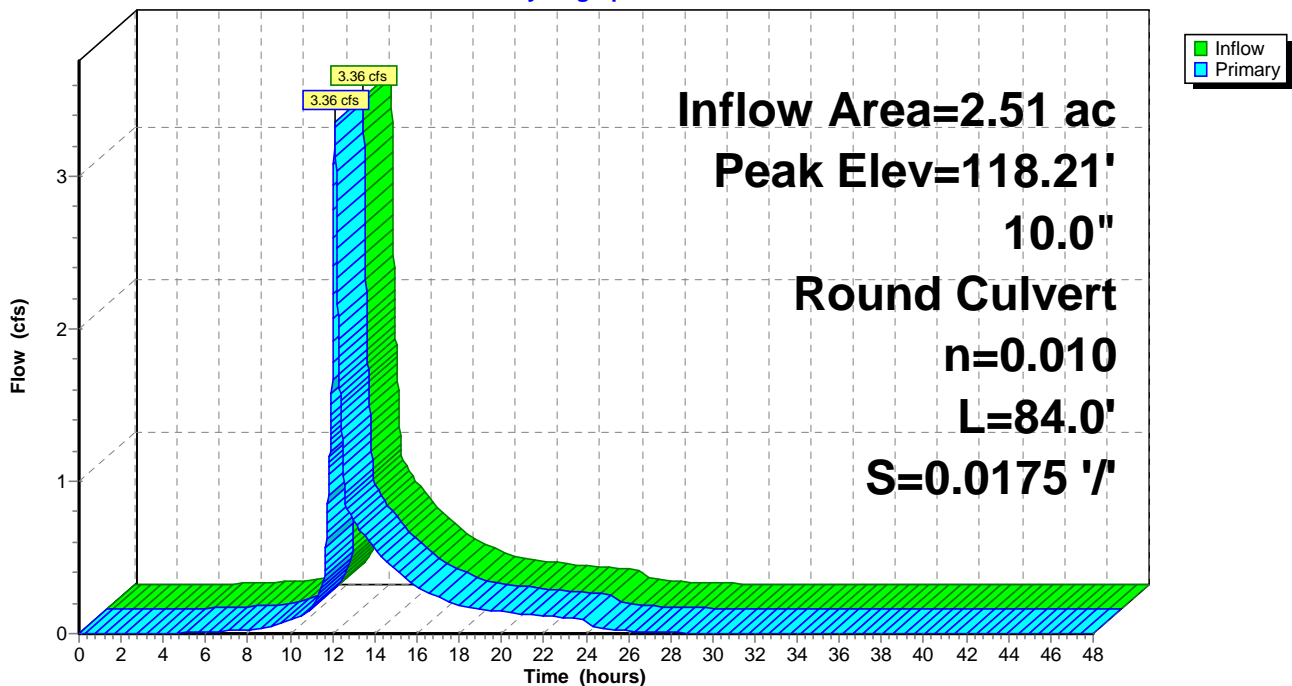
Device #	Routing	Invert	Outlet Devices
1	Primary	115.17'	10.0" Round Culvert L= 84.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 115.17' / 113.70' S= 0.0175 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=3.35 cfs @ 12.11 hrs HW=118.20' (Free Discharge)

↑1=Culvert (Inlet Controls 3.35 cfs @ 6.15 fps)

Pond DMH7: Proposed Drop DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 82

Summary for Pond DMH8: Proposed DMH

Inflow Area = 2.51 ac, 74.51% Impervious, Inflow Depth > 2.06" for 10-YR event
Inflow = 3.36 cfs @ 12.11 hrs, Volume= 0.431 af
Outflow = 3.36 cfs @ 12.11 hrs, Volume= 0.431 af, Atten= 0%, Lag= 0.0 min
Primary = 3.36 cfs @ 12.11 hrs, Volume= 0.431 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 116.74' @ 12.11 hrs

Flood Elev= 123.71'

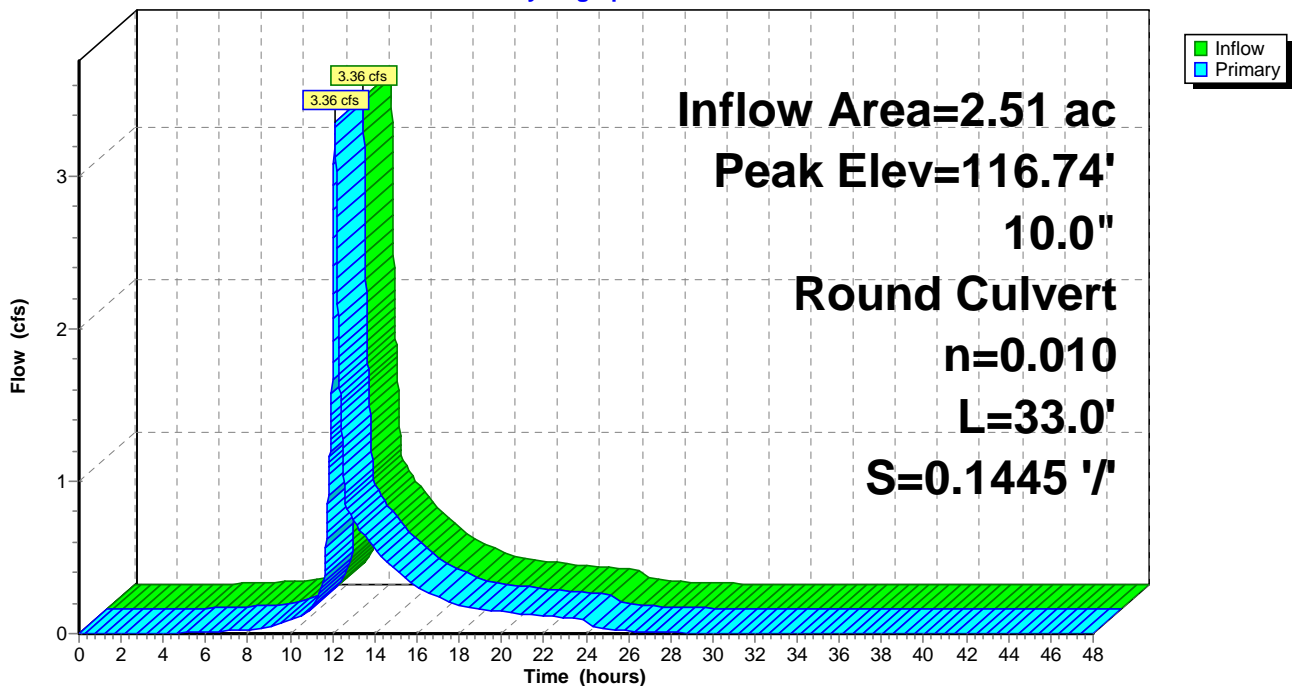
Device #	Routing	Invert	Outlet Devices
1	Primary	113.70'	10.0" Round Culvert L= 33.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 113.70' / 108.93' S= 0.1445 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=3.35 cfs @ 12.11 hrs HW=116.73' (Free Discharge)

↑1=Culvert (Inlet Controls 3.35 cfs @ 6.15 fps)

Pond DMH8: Proposed DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 10-YR Rainfall=4.60"

Printed 2/16/2016

Page 83

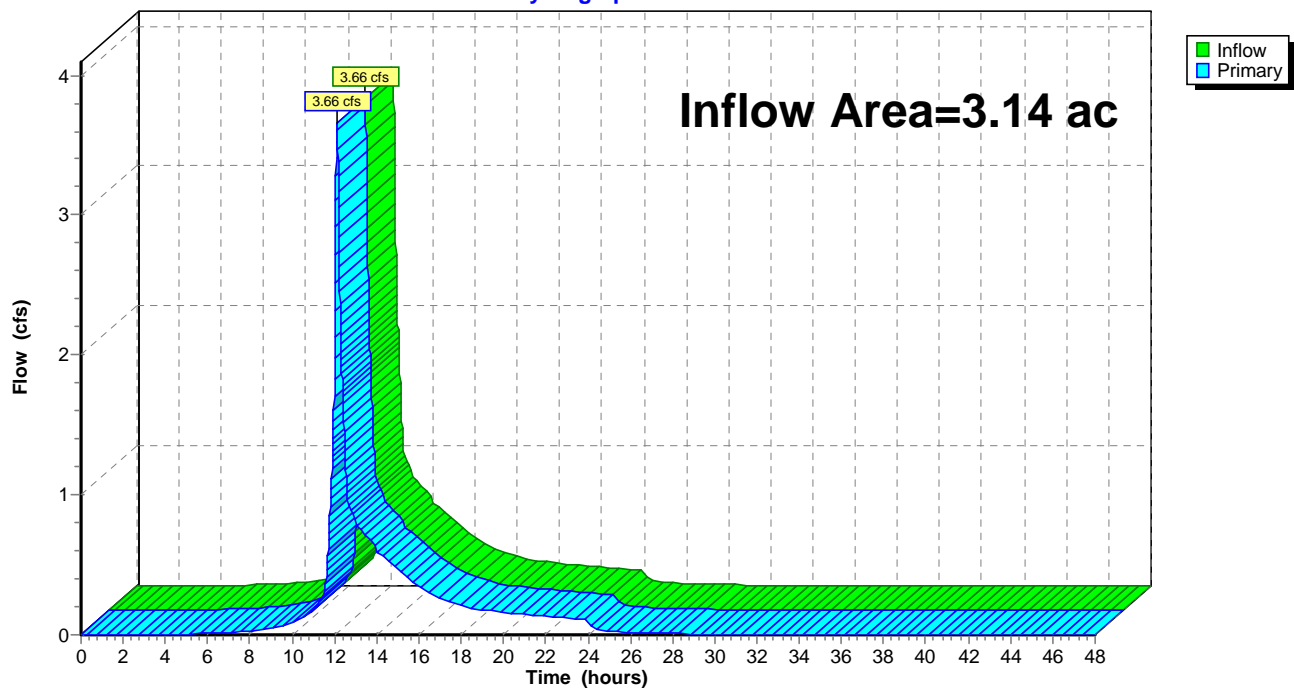
Summary for Link SP1: Existing Combined Sewer in Danforth

Inflow Area = 3.14 ac, 64.59% Impervious, Inflow Depth > 1.79" for 10-YR event
Inflow = 3.66 cfs @ 12.12 hrs, Volume= 0.470 af
Primary = 3.66 cfs @ 12.12 hrs, Volume= 0.470 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link SP1: Existing Combined Sewer in Danforth

Hydrograph



6. Post

Type III 24-hr 25-YR Rainfall=5.80"

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 84

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 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 10S: Area draining to	Runoff Area=19,254 sf	56.16% Impervious	Runoff Depth=2.83"
Flow Length=91'	Slope=0.0300 '/'	Tc=7.7 min	CN=72
		Runoff=1.38 cfs	0.104 af
Subcatchment 60S: Lawn/Field S of school	Runoff Area=16,715 sf	84.98% Impervious	Runoff Depth=4.54"
		Tc=5.0 min	CN=89
		Runoff=2.04 cfs	0.145 af
Subcatchment 61S: Auditorium Roof	Runoff Area=4,485 sf	100.00% Impervious	Runoff Depth=5.56"
		Tc=5.0 min	CN=98
		Runoff=0.61 cfs	0.048 af
Subcatchment 70S: Thomas & Davies &	Runoff Area=44,441 sf	74.20% Impervious	Runoff Depth=3.91"
Flow Length=91'	Slope=0.1593 '/'	Tc=5.0 min	CN=83
		Runoff=4.79 cfs	0.332 af
Subcatchment 80S: FoundersHall	Runoff Area=9,466 sf	100.00% Impervious	Runoff Depth=5.56"
		Tc=5.0 min	CN=98
		Runoff=1.28 cfs	0.101 af
Subcatchment 90S: Playground	Runoff Area=27,554 sf	25.26% Impervious	Runoff Depth=1.33"
Flow Length=117'		Tc=9.2 min	CN=54
		Runoff=0.75 cfs	0.070 af
Subcatchment 91S: Playground	Runoff Area=4,688 sf	69.20% Impervious	Runoff Depth=3.60"
		Tc=5.0 min	CN=80
		Runoff=0.47 cfs	0.032 af
Subcatchment 402S: New Prkng lot	Runoff Area=10,240 sf	60.94% Impervious	Runoff Depth=3.11"
		Tc=5.0 min	CN=75
		Runoff=0.89 cfs	0.061 af
Reach 161R: roof drain	Avg. Flow Depth=0.21'	Max Vel=7.90 fps	Inflow=0.61 cfs
6.0" Round Pipe	n=0.013	L=129.0'	S=0.0911 '/'
		Capacity=1.69 cfs	Outflow=0.60 cfs
			0.048 af
Pond 1P: USSF	Peak Elev=121.91'	Storage=10,207 cf	Inflow=6.07 cfs
	Primary=1.16 cfs	0.265 af	Secondary=0.00 cfs
		0.000 af	Outflow=1.16 cfs
			0.265 af
Pond 206P: City CB @ Fletcher & Danforth	Peak Elev=111.19'	Inflow=5.39 cfs	0.726 af
	12.0" Round Culvert	n=0.010	L=20.0'
		S=0.2475 '/'	Outflow=5.39 cfs
			0.726 af
Pond 210P: Existing FI	Peak Elev=132.86'	Inflow=1.38 cfs	0.104 af
	10.0" Round Culvert	n=0.010	L=102.0'
		S=0.1008 '/'	Outflow=1.38 cfs
			0.104 af
Pond 220P: Existing DMH	Peak Elev=122.53'	Inflow=1.38 cfs	0.104 af
	10.0" Round Culvert	n=0.010	L=108.0'
		S=0.0335 '/'	Outflow=1.38 cfs
			0.104 af
Pond 230P: Existing DMH	Peak Elev=123.02'	Inflow=4.45 cfs	0.390 af
	10.0" Round Culvert	n=0.010	L=83.0'
		S=0.0257 '/'	Outflow=4.45 cfs
			0.390 af
Pond 260P: Storage Pipes	Peak Elev=120.47'	Storage=626 cf	Inflow=3.53 cfs
	12.0" Round Culvert	n=0.010	L=30.0'
		S=0.0380 '/'	Outflow=2.69 cfs
			0.254 af
Pond 340P: CB at SW Cor prkng lot	Peak Elev=129.78'	Inflow=0.89 cfs	0.061 af
	8.0" Round Culvert	n=0.010	L=56.0'
		S=0.1000 '/'	Outflow=0.89 cfs
			0.061 af

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 85

Pond CB4: Proposed DMH

Peak Elev=126.90' Inflow=6.07 cfs 0.433 af
12.0" Round Culvert n=0.010 L=24.0' S=0.0621 '/ Outflow=6.07 cfs 0.433 af

Pond DMH: OCS Bypass

Peak Elev=120.15' Inflow=1.16 cfs 0.265 af
10.0" Round Culvert n=0.010 L=60.0' S=0.0692 '/ Outflow=1.16 cfs 0.265 af

Pond DMH6: Access MH

Peak Elev=121.24' Inflow=6.07 cfs 0.433 af
Primary=6.07 cfs 0.433 af Secondary=0.00 cfs 0.000 af Outflow=6.07 cfs 0.433 af

Pond DMH7: Proposed Drop DMH

Peak Elev=120.60' Inflow=4.64 cfs 0.656 af
10.0" Round Culvert n=0.010 L=84.0' S=0.0175 '/ Outflow=4.64 cfs 0.656 af

Pond DMH8: Proposed DMH

Peak Elev=119.13' Inflow=4.64 cfs 0.656 af
10.0" Round Culvert n=0.010 L=33.0' S=0.1445 '/ Outflow=4.64 cfs 0.656 af

Link SP1: Existing Combined Sewer in Danforth

Inflow=5.39 cfs 0.726 af
Primary=5.39 cfs 0.726 af

Total Runoff Area = 3.14 ac Runoff Volume = 0.893 af Average Runoff Depth = 3.41"
35.41% Pervious = 1.11 ac 64.59% Impervious = 2.03 ac

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 86

Summary for Subcatchment 10S: Area draining to Sanctuary

Runoff = 1.38 cfs @ 12.11 hrs, Volume= 0.104 af, Depth= 2.83"

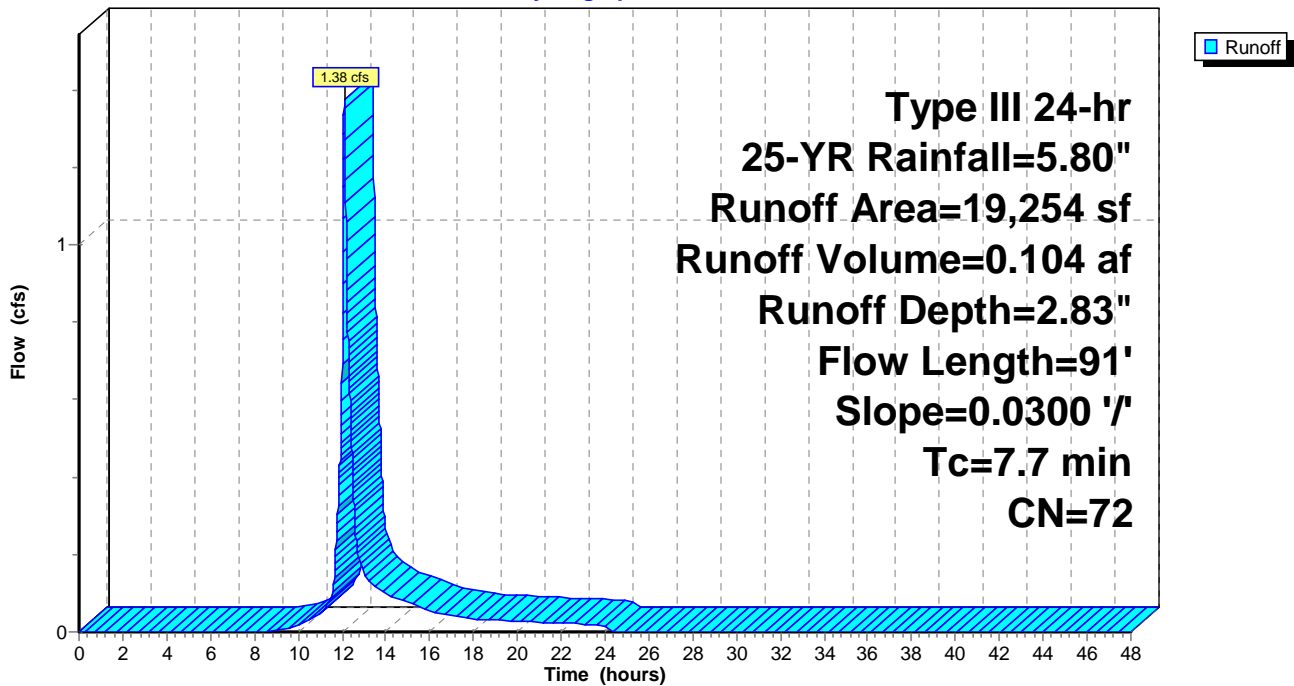
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	10,813	98	impervious
*	8,441	39	Lawn/field, HSG A
	19,254	72	Weighted Average
	8,441		43.84% Pervious Area
	10,813		56.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	91	0.0300	0.20		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.19"

Subcatchment 10S: Area draining to Sanctuary

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 87

Summary for Subcatchment 60S: Lawn/Field S of school

Runoff = 2.04 cfs @ 12.07 hrs, Volume= 0.145 af, Depth= 4.54"

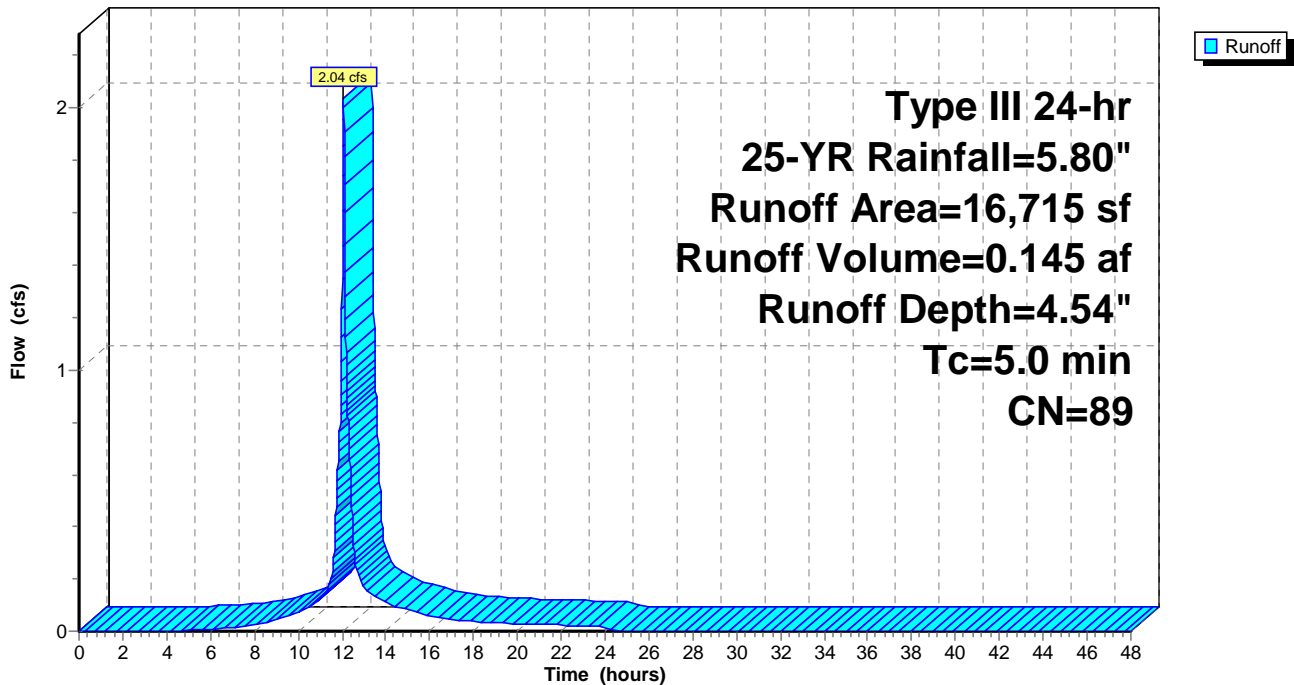
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	14,205	98	impervious
*	2,510	39	Lawn/field, HSG A
	16,715	89	Weighted Average
	2,510		15.02% Pervious Area
	14,205		84.98% Impervious Area

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

Subcatchment 60S: Lawn/Field S of school

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 88

Summary for Subcatchment 61S: Auditorium Roof

Runoff = 0.61 cfs @ 12.07 hrs, Volume= 0.048 af, Depth= 5.56"

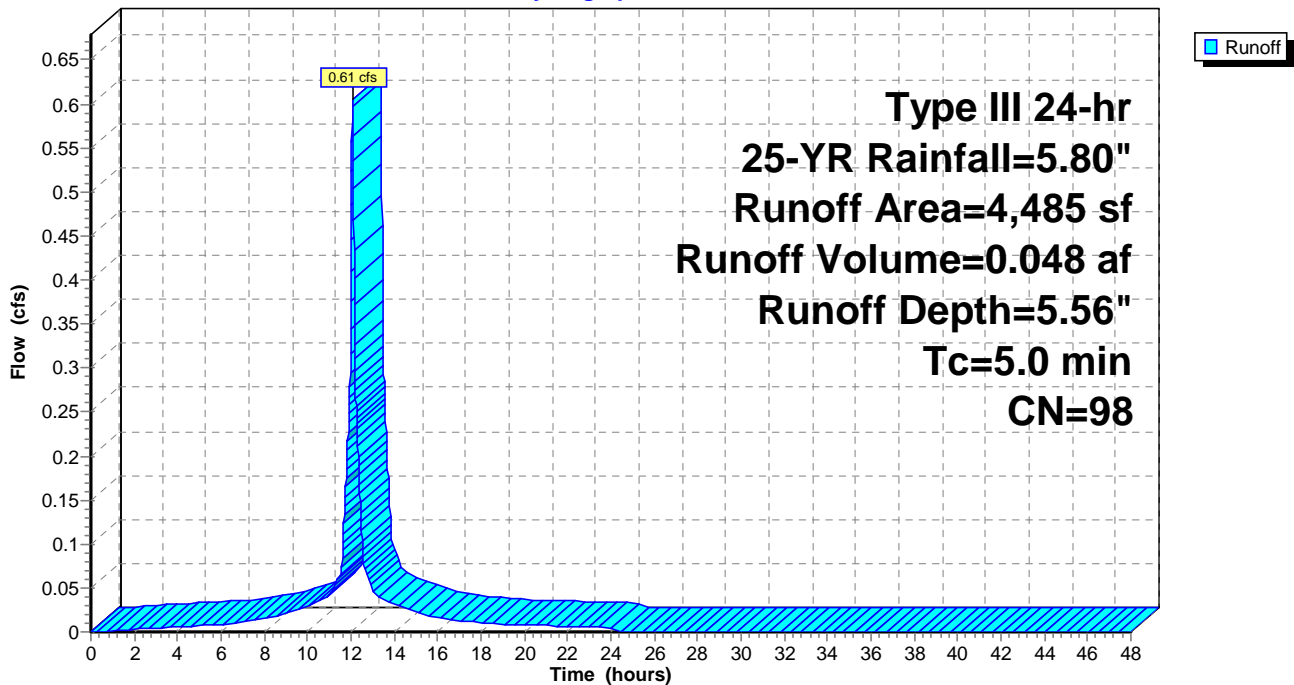
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	4,485	98	Roof runoff
	4,485		100.00% Impervious Area

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

Subcatchment 61S: Auditorium Roof

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 89

Summary for Subcatchment 70S: Thomas & Davies & Gym

Runoff = 4.79 cfs @ 12.07 hrs, Volume= 0.332 af, Depth= 3.91"

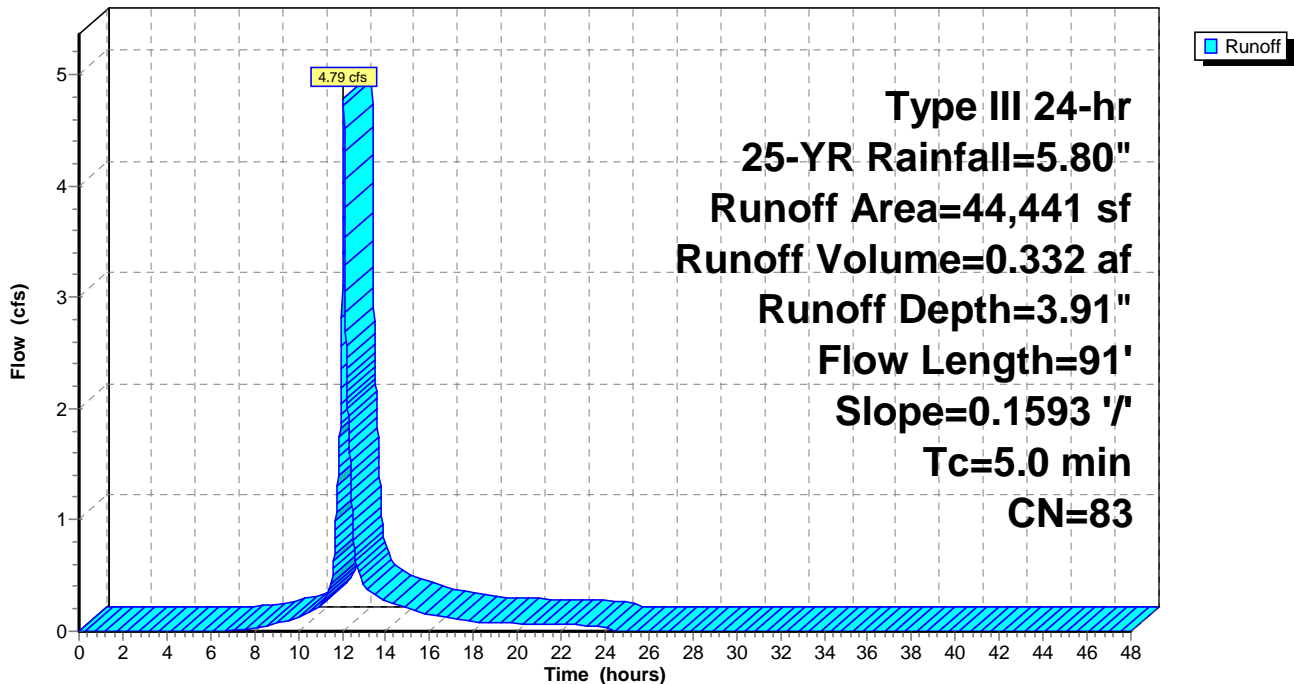
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	32,976	98	impervious
*	11,465	39	Lawn/field, HSG A
	44,441	83	Weighted Average
	11,465		25.80% Pervious Area
	32,976		74.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	91	0.1593	0.38		Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.19"
4.0	91	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 70S: Thomas & Davies & Gym

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 90

Summary for Subcatchment 80S: FoundersHall

Runoff = 1.28 cfs @ 12.07 hrs, Volume= 0.101 af, Depth= 5.56"

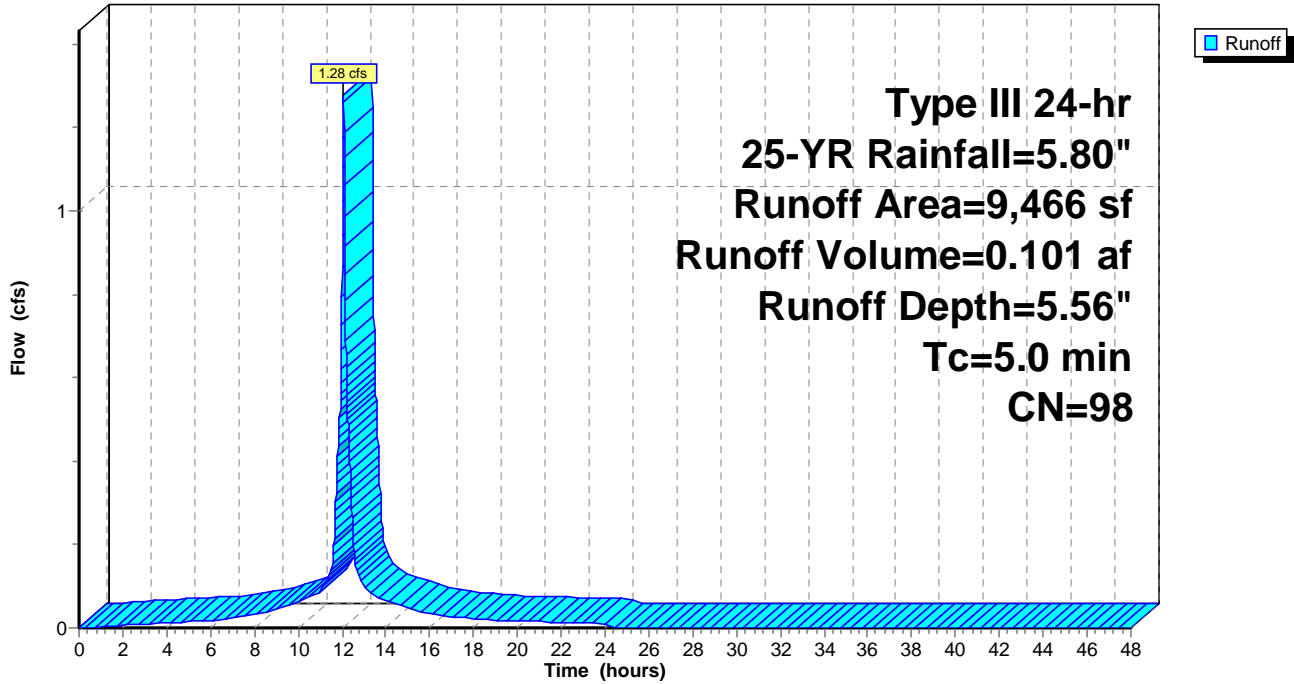
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
* 9,466	98	Roof runoff
9,466		100.00% Impervious Area

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

Subcatchment 80S: FoundersHall

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 91

Summary for Subcatchment 90S: Playground

Runoff = 0.75 cfs @ 12.15 hrs, Volume= 0.070 af, Depth= 1.33"

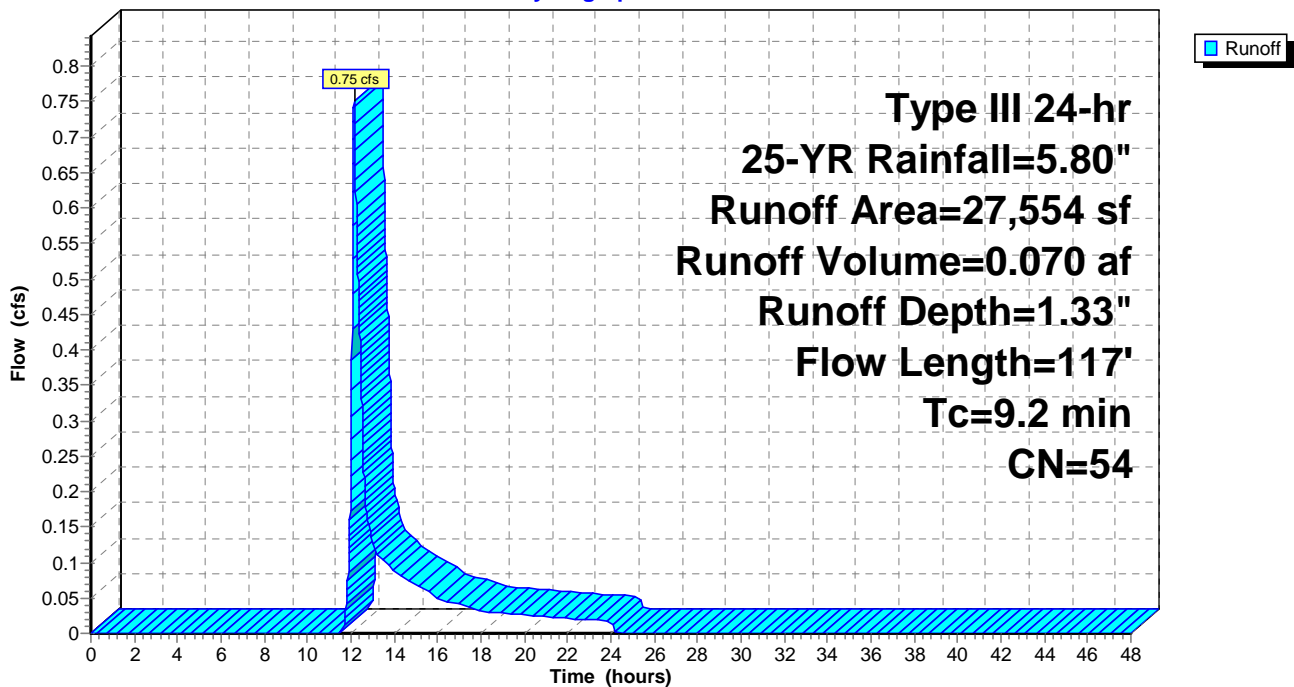
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	6,960	98	impervious
*	20,594	39	Lawn/field, HSG A
	27,554	54	Weighted Average
	20,594		74.74% Pervious Area
	6,960		25.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.0250	0.19		Sheet Flow, A-B
					Grass: Short n= 0.150 P2= 3.19"
0.2	17	0.0588	1.70		Shallow Concentrated Flow, B-C
					Short Grass Pasture Kv= 7.0 fps
9.2	117	Total			

Subcatchment 90S: Playground

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 92

Summary for Subcatchment 91S: Playground

Runoff = 0.47 cfs @ 12.07 hrs, Volume= 0.032 af, Depth= 3.60"

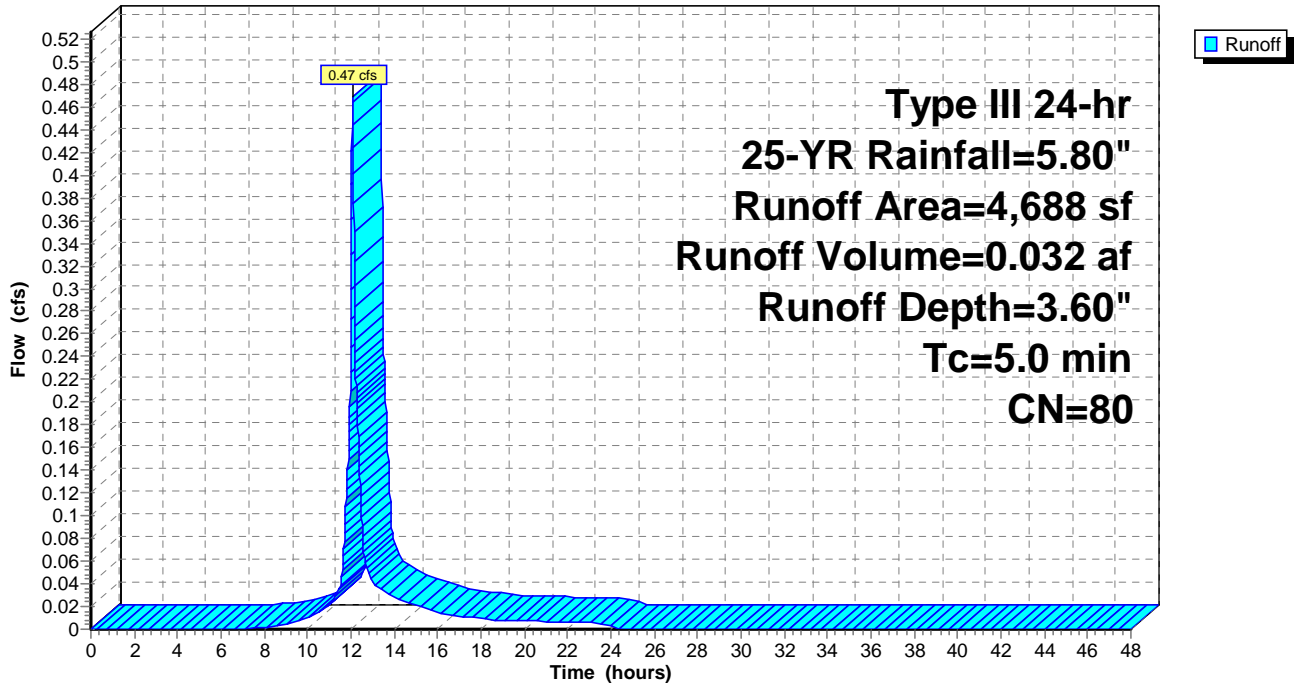
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	3,244	98	impervious
*	1,444	39	Lawn/field, HSG A
	4,688	80	Weighted Average
	1,444		30.80% Pervious Area
	3,244		69.20% Impervious Area

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

Subcatchment 91S: Playground

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 93

Summary for Subcatchment 402S: New Prkng lot

Runoff = 0.89 cfs @ 12.08 hrs, Volume= 0.061 af, Depth= 3.11"

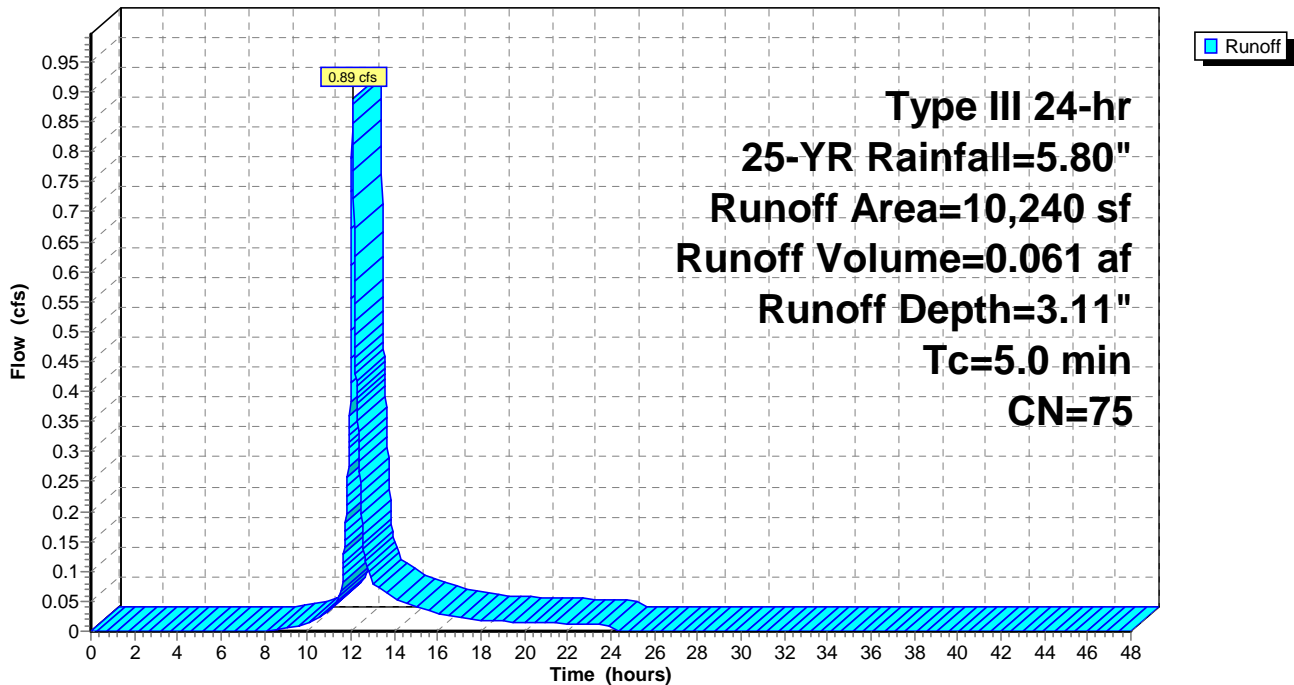
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	4,000	39	Pervious
*	6,240	98	Impervious
	10,240	75	Weighted Average
	4,000		39.06% Pervious Area
	6,240		60.94% Impervious Area

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

Subcatchment 402S: New Prkng lot

Hydrograph



6. Post

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 94

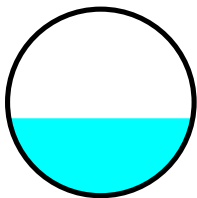
Summary for Reach 161R: roof drain

Inflow Area = 0.10 ac, 100.00% Impervious, Inflow Depth = 5.56" for 25-YR event
 Inflow = 0.61 cfs @ 12.07 hrs, Volume= 0.048 af
 Outflow = 0.60 cfs @ 12.08 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Max. Velocity= 7.90 fps, Min. Travel Time= 0.3 min
 Avg. Velocity = 2.62 fps, Avg. Travel Time= 0.8 min

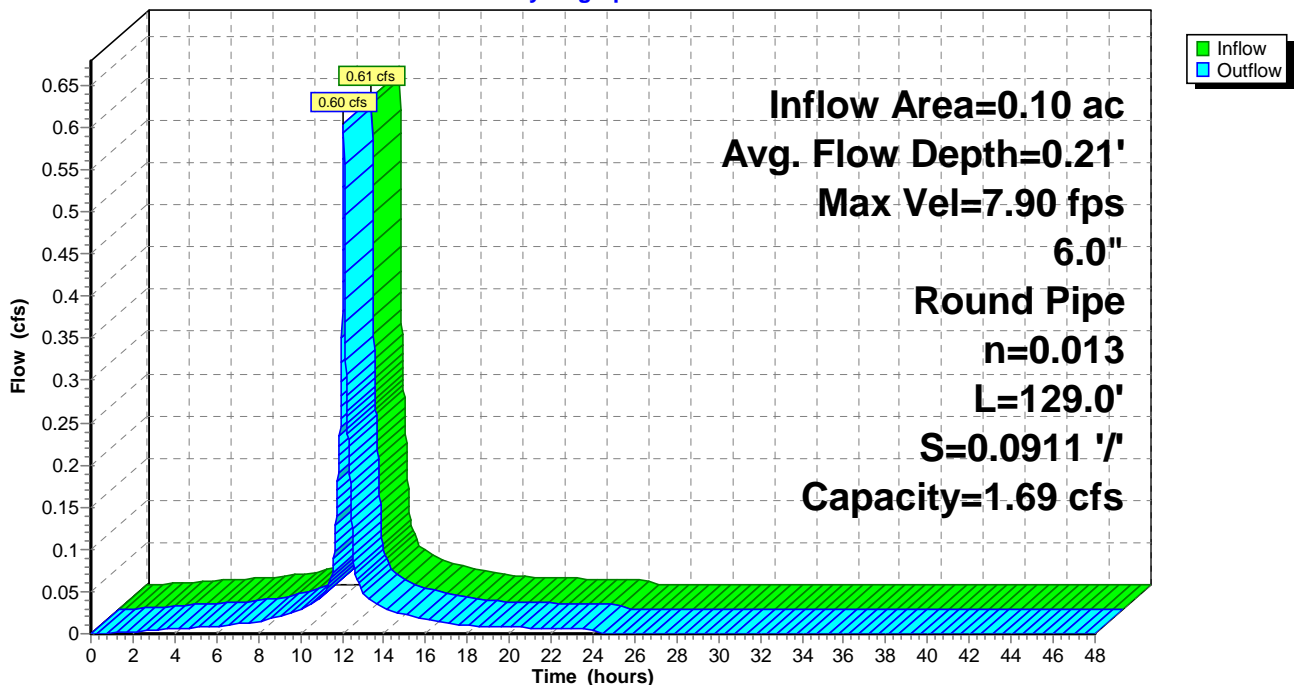
Peak Storage= 10 cf @ 12.07 hrs
 Average Depth at Peak Storage= 0.21'
 Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.69 cfs

6.0" Round Pipe
 n= 0.013 Corrugated PE, smooth interior
 Length= 129.0' Slope= 0.0911 '/'
 Inlet Invert= 130.00', Outlet Invert= 118.25'



Reach 161R: roof drain

Hydrograph



6. Post

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 95

Summary for Pond 1P: USSF

Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth = 4.20" for 25-YR event
 Inflow = 6.07 cfs @ 12.07 hrs, Volume= 0.433 af
 Outflow = 1.16 cfs @ 12.51 hrs, Volume= 0.265 af, Atten= 81%, Lag= 26.1 min
 Primary = 1.16 cfs @ 12.51 hrs, Volume= 0.265 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 121.91' @ 12.51 hrs Surf.Area= 4,717 sf Storage= 10,207 cf
 Flood Elev= 126.48' Surf.Area= 4,717 sf Storage= 16,044 cf

Plug-Flow detention time= 259.1 min calculated for 0.265 af (61% of inflow)
 Center-of-Mass det. time= 154.4 min (946.7 - 792.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	118.85'	6,599 cf	51.42'W x 91.74'L x 5.50'H Field A 25,943 cf Overall - 9,445 cf Embedded = 16,499 cf x 40.0% Voids
#2A	119.60'	9,445 cf	ADS_StormTech MC-3500 d +Cap x 84 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 7 Rows of 12 Chambers Cap Storage= +14.9 cf x 2 x 7 rows = 208.6 cf
		16,044 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	119.67'	8.0" Round Culvert L= 7.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.67' / 119.52' S= 0.0214 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#2	Device 1	123.35'	5.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	121.10'	8.0" Vert. Orifice/Grate C= 0.600
#4	Device 5	118.85'	2.410 in/hr Exfiltration over Surface area above 118.85' Conductivity to Groundwater Elevation = 113.00' Excluded Surface area = 4,717 sf
#5	Secondary	116.02'	6.0" Round Culvert L= 31.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 116.02' / 115.88' S= 0.0045 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 96

Primary OutFlow Max=1.16 cfs @ 12.51 hrs HW=121.91' (Free Discharge)

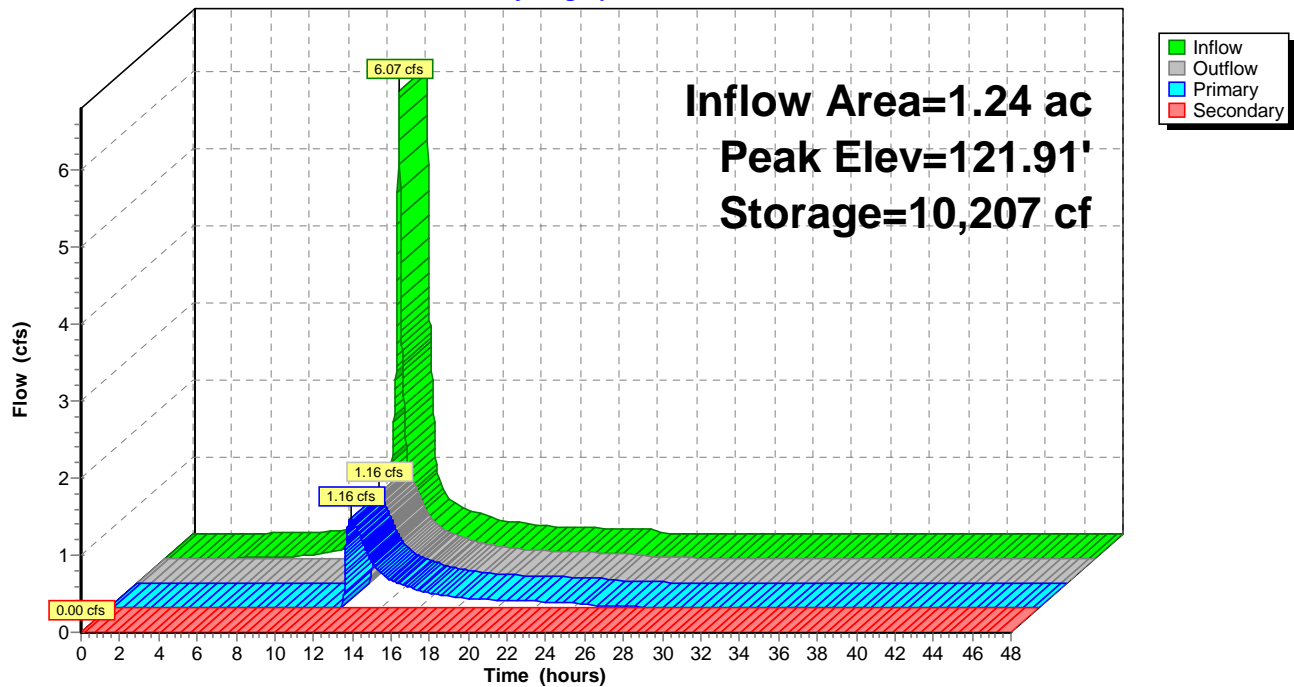
- 1=Culvert (Passes 1.16 cfs of 1.83 cfs potential flow)
- 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
- 3=Orifice/Grate (Orifice Controls 1.16 cfs @ 3.34 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=118.85' (Free Discharge)

- 5=Culvert (Passes 0.00 cfs of 1.20 cfs potential flow)
- 4=Exfiltration (Controls 0.00 cfs)

Pond 1P: USSF

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 97

Summary for Pond 206P: City CB @ Fletcher & Danforth

Inflow Area = 3.14 ac, 64.59% Impervious, Inflow Depth = 2.77" for 25-YR event
Inflow = 5.39 cfs @ 12.14 hrs, Volume= 0.726 af
Outflow = 5.39 cfs @ 12.14 hrs, Volume= 0.726 af, Atten= 0%, Lag= 0.0 min
Primary = 5.39 cfs @ 12.14 hrs, Volume= 0.726 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 111.19' @ 12.14 hrs

Flood Elev= 111.26'

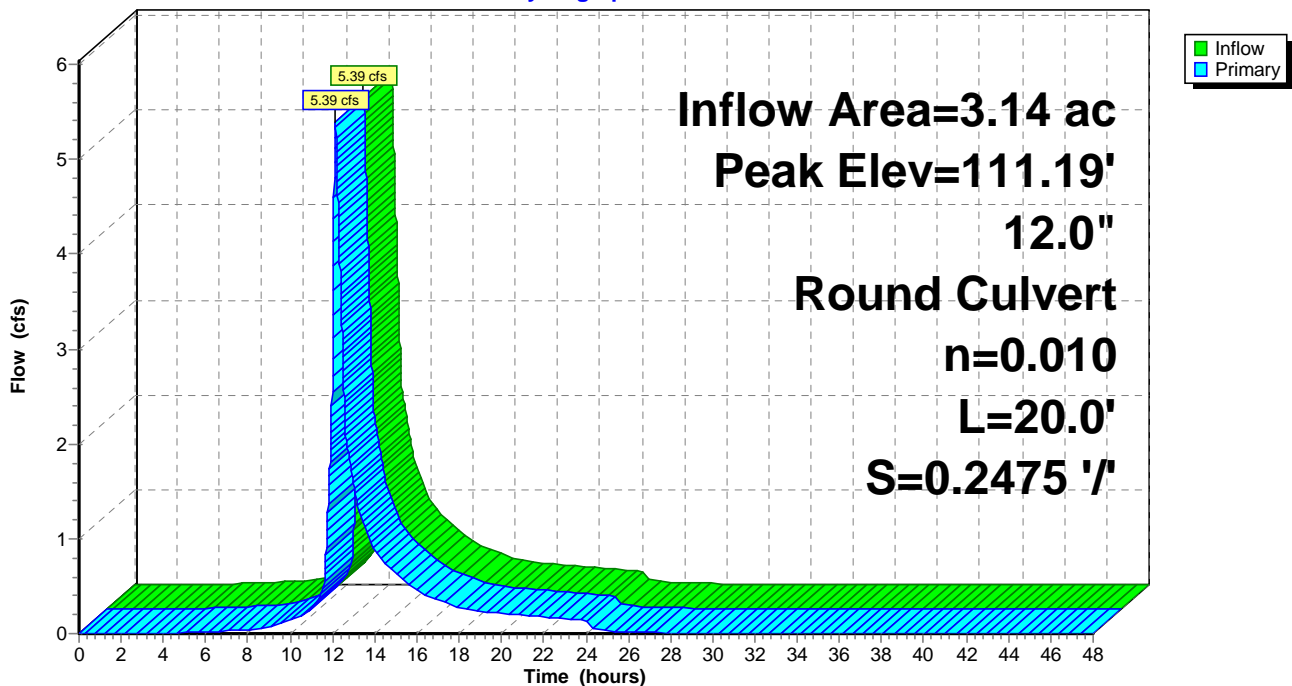
Device	Routing	Invert	Outlet Devices
#1	Primary	107.43'	12.0" Round Culvert L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 107.43' / 102.48' S= 0.2475 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=5.39 cfs @ 12.14 hrs HW=111.19' (Free Discharge)

↑1=Culvert (Inlet Controls 5.39 cfs @ 6.86 fps)

Pond 206P: City CB @ Fletcher & Danforth

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 98

Summary for Pond 210P: Existing FI

Inflow Area = 0.44 ac, 56.16% Impervious, Inflow Depth = 2.83" for 25-YR event
Inflow = 1.38 cfs @ 12.11 hrs, Volume= 0.104 af
Outflow = 1.38 cfs @ 12.11 hrs, Volume= 0.104 af, Atten= 0%, Lag= 0.0 min
Primary = 1.38 cfs @ 12.11 hrs, Volume= 0.104 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 132.86' @ 12.11 hrs

Flood Elev= 140.41'

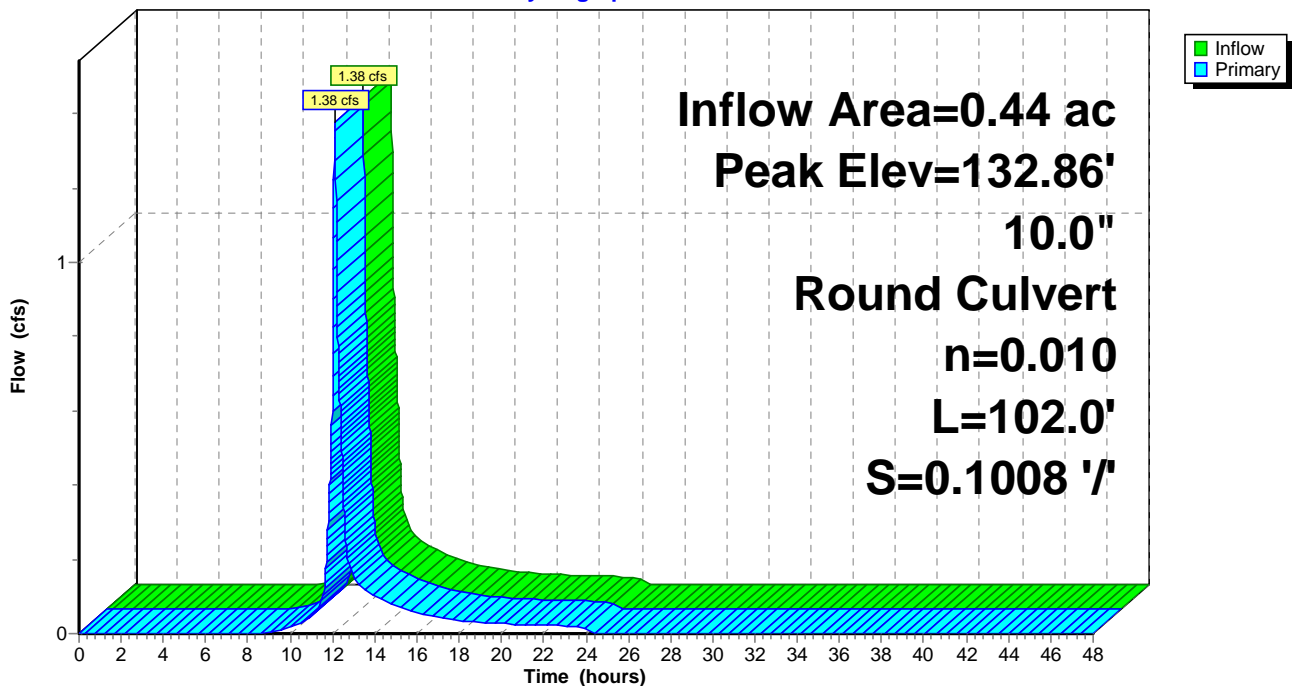
Device	Routing	Invert	Outlet Devices
#1	Primary	132.00'	10.0" Round Culvert L= 102.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 132.00' / 121.72' S= 0.1008 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.38 cfs @ 12.11 hrs HW=132.86' (Free Discharge)

↑1=Culvert (Inlet Controls 1.38 cfs @ 2.53 fps)

Pond 210P: Existing FI

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 99

Summary for Pond 220P: Existing DMH

Inflow Area = 0.44 ac, 56.16% Impervious, Inflow Depth = 2.83" for 25-YR event
Inflow = 1.38 cfs @ 12.11 hrs, Volume= 0.104 af
Outflow = 1.38 cfs @ 12.11 hrs, Volume= 0.104 af, Atten= 0%, Lag= 0.0 min
Primary = 1.38 cfs @ 12.11 hrs, Volume= 0.104 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 122.53' @ 12.11 hrs

Flood Elev= 128.47'

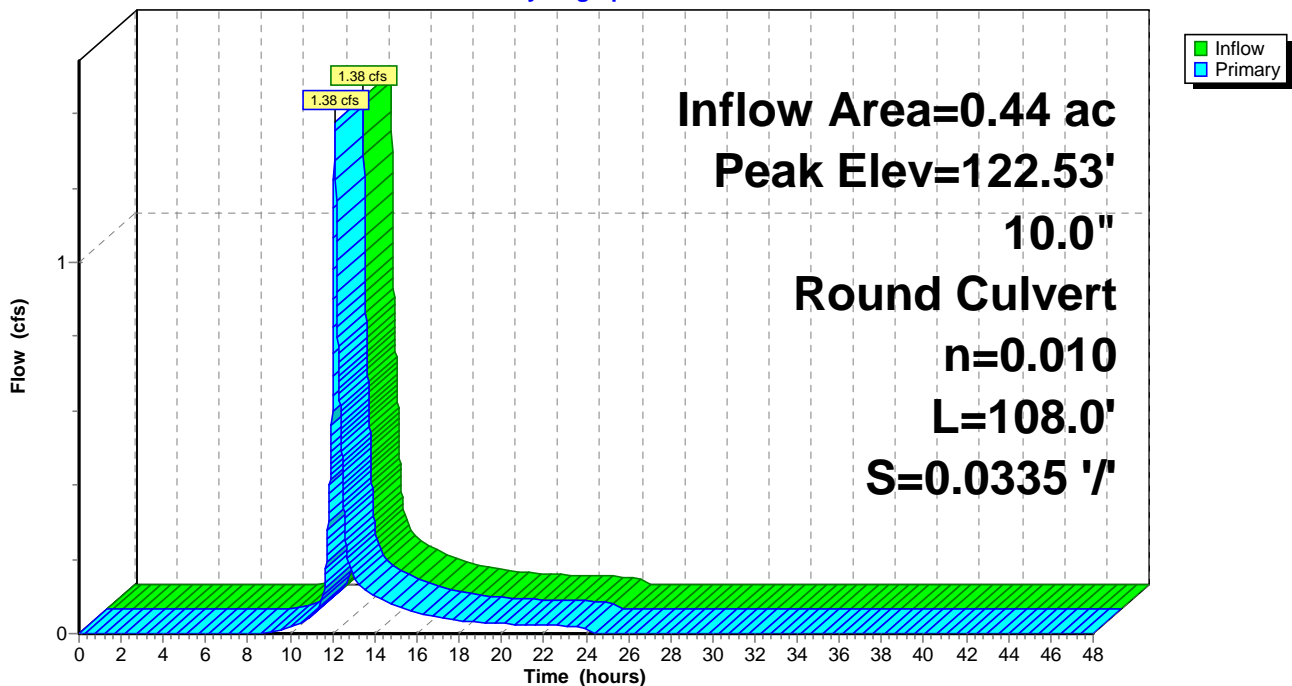
Device	Routing	Invert	Outlet Devices
#1	Primary	121.67'	10.0" Round Culvert L= 108.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 121.67' / 118.05' S= 0.0335 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.37 cfs @ 12.11 hrs HW=122.53' (Free Discharge)

↑1=Culvert (Inlet Controls 1.37 cfs @ 2.52 fps)

Pond 220P: Existing DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 100

Summary for Pond 230P: Existing DMH

Inflow Area = 1.27 ac, 70.40% Impervious, Inflow Depth = 3.69" for 25-YR event
Inflow = 4.45 cfs @ 12.12 hrs, Volume= 0.390 af
Outflow = 4.45 cfs @ 12.12 hrs, Volume= 0.390 af, Atten= 0%, Lag= 0.0 min
Primary = 4.45 cfs @ 12.12 hrs, Volume= 0.390 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 123.02' @ 12.12 hrs

Flood Elev= 125.05'

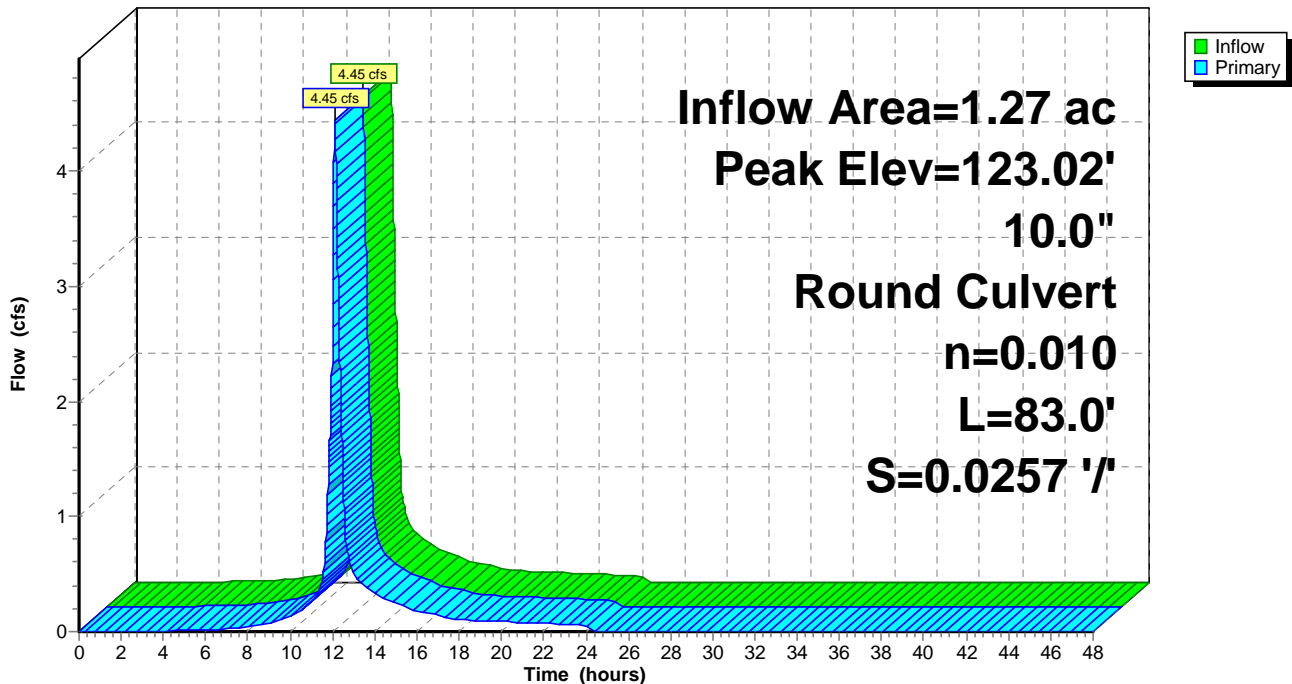
Device #	Routing	Invert	Outlet Devices
#1	Primary	118.00'	10.0" Round Culvert L= 83.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 118.00' / 115.87' S= 0.0257 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=4.44 cfs @ 12.12 hrs HW=123.01' (Free Discharge)

↑1=Culvert (Inlet Controls 4.44 cfs @ 8.14 fps)

Pond 230P: Existing DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 101

Summary for Pond 260P: Storage Pipes

Inflow Area = 0.72 ac, 79.29% Impervious, Inflow Depth = 4.22" for 25-YR event
Inflow = 3.53 cfs @ 12.07 hrs, Volume= 0.254 af
Outflow = 2.69 cfs @ 12.14 hrs, Volume= 0.254 af, Atten= 24%, Lag= 3.8 min
Primary = 2.69 cfs @ 12.14 hrs, Volume= 0.254 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 120.47' @ 12.14 hrs Surf.Area= 924 sf Storage= 626 cf
Flood Elev= 125.26' Surf.Area= 0 sf Storage= 3,468 cf

Plug-Flow detention time= 1.6 min calculated for 0.254 af (100% of inflow)
Center-of-Mass det. time= 1.6 min (791.3 - 789.6)

Volume	Invert	Avail.Storage	Storage Description
#1	119.16'	3,468 cf	48.0" Round Pipe Storage L= 276.0' S= 0.0027 '/

Device	Routing	Invert	Outlet Devices
#1	Primary	119.16'	12.0" Round Culvert L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.16' / 118.02' S= 0.0380 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.68 cfs @ 12.14 hrs HW=120.47' (Free Discharge)

↑**1=Culvert** (Inlet Controls 2.68 cfs @ 3.42 fps)

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

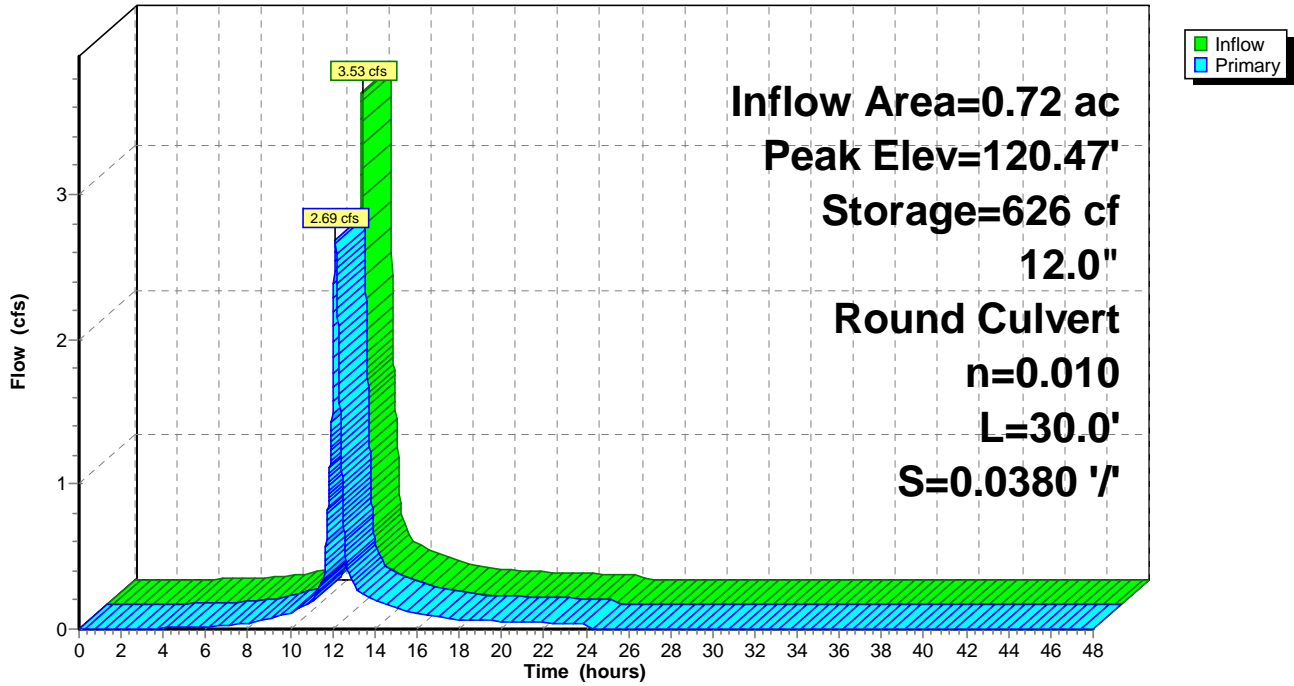
POST
Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 102

Pond 260P: Storage Pipes

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 103

Summary for Pond 340P: CB at SW Cor prkng lot

Inflow Area = 0.24 ac, 60.94% Impervious, Inflow Depth = 3.11" for 25-YR event
Inflow = 0.89 cfs @ 12.08 hrs, Volume= 0.061 af
Outflow = 0.89 cfs @ 12.08 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min
Primary = 0.89 cfs @ 12.08 hrs, Volume= 0.061 af

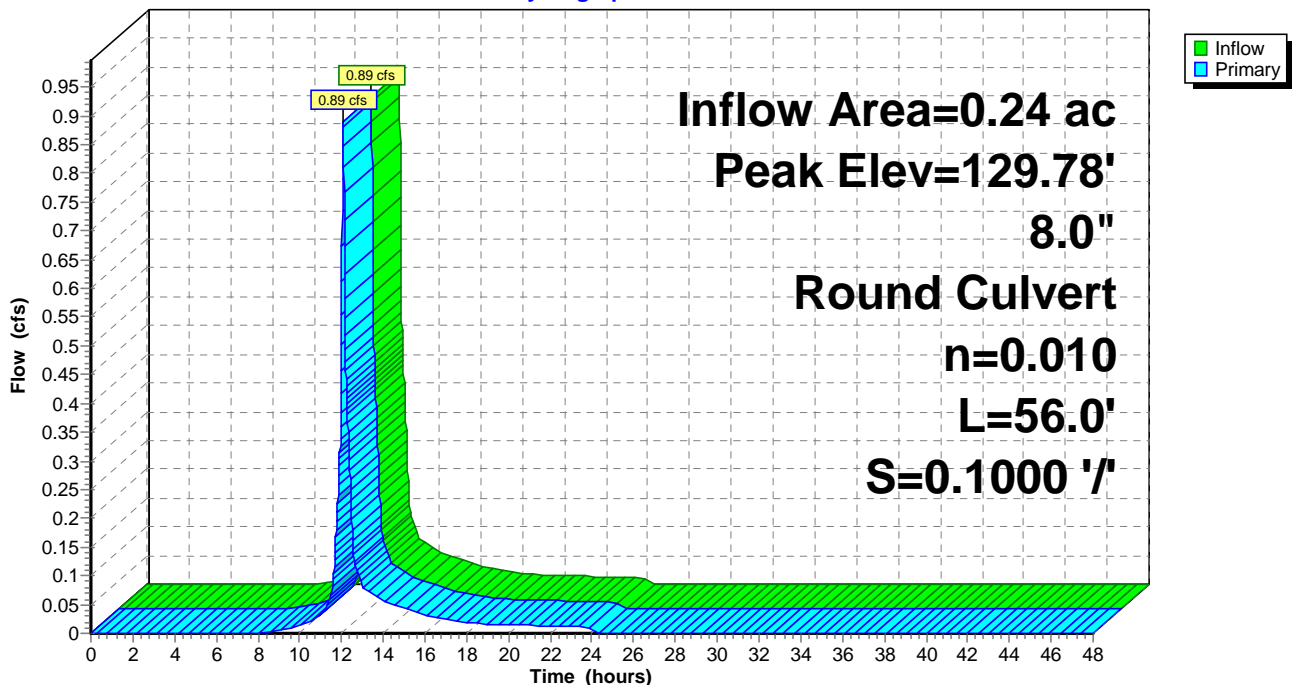
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 129.78' @ 12.08 hrs

Device #	Routing	Invert	Outlet Devices
1	Primary	129.00'	8.0" Round Culvert L= 56.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 129.00' / 123.40' S= 0.1000 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.89 cfs @ 12.08 hrs HW=129.78' (Free Discharge)
↑1=Culvert (Inlet Controls 0.89 cfs @ 2.54 fps)

Pond 340P: CB at SW Cor prkng lot

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 104

Summary for Pond CB4: Proposed DMH

Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth = 4.20" for 25-YR event
Inflow = 6.07 cfs @ 12.07 hrs, Volume= 0.433 af
Outflow = 6.07 cfs @ 12.07 hrs, Volume= 0.433 af, Atten= 0%, Lag= 0.0 min
Primary = 6.07 cfs @ 12.07 hrs, Volume= 0.433 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 126.90' @ 12.07 hrs

Flood Elev= 127.50'

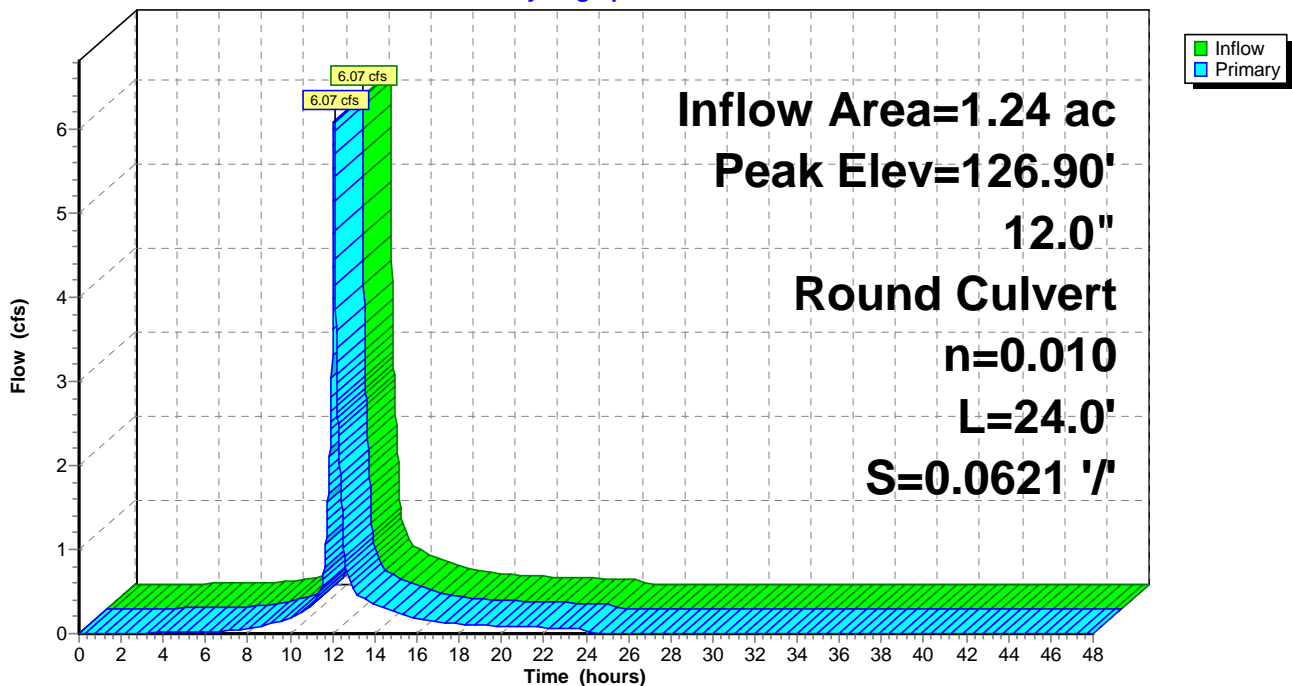
Device	Routing	Invert	Outlet Devices
#1	Primary	122.26'	12.0" Round Culvert L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 122.26' / 120.77' S= 0.0621 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=6.06 cfs @ 12.07 hrs HW=126.88' (Free Discharge)

↑1=Culvert (Inlet Controls 6.06 cfs @ 7.72 fps)

Pond CB4: Proposed DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 105

Summary for Pond DMH: OCS Bypass

Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth > 2.57" for 25-YR event
Inflow = 1.16 cfs @ 12.51 hrs, Volume= 0.265 af
Outflow = 1.16 cfs @ 12.51 hrs, Volume= 0.265 af, Atten= 0%, Lag= 0.0 min
Primary = 1.16 cfs @ 12.51 hrs, Volume= 0.265 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 120.15' @ 12.51 hrs

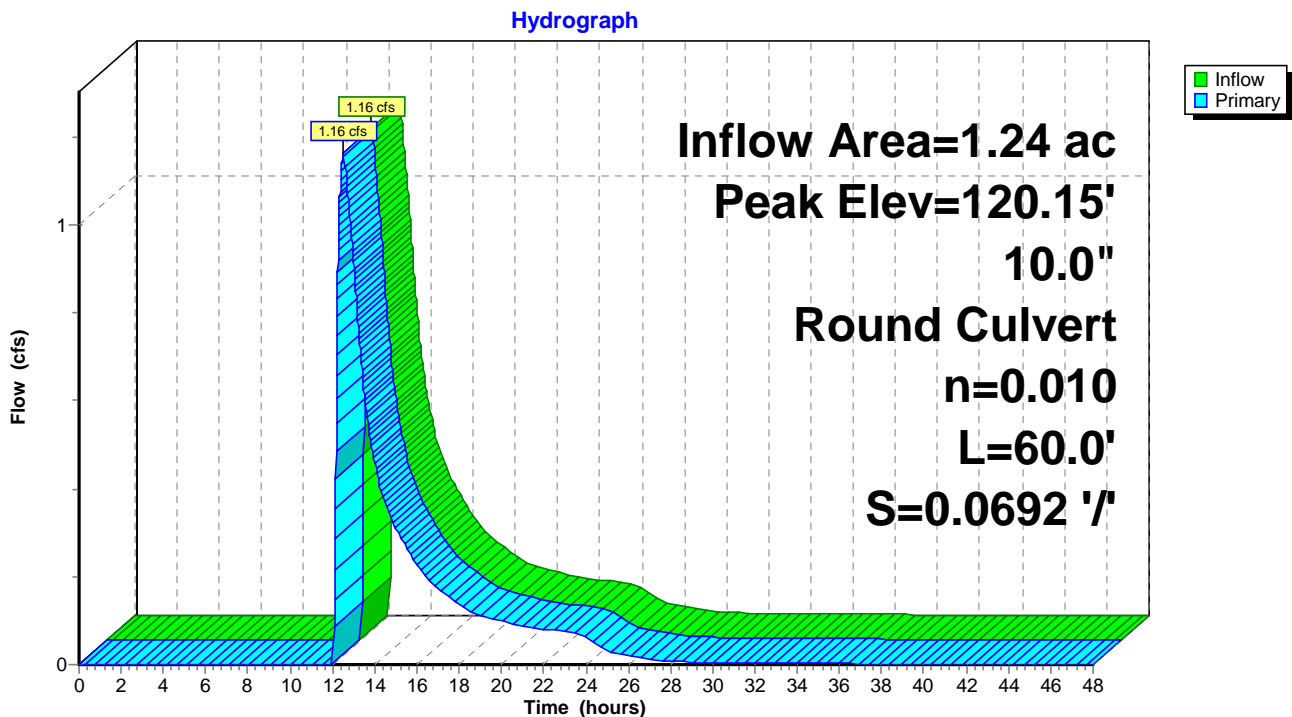
Flood Elev= 126.48'

Device	Routing	Invert	Outlet Devices
#1	Primary	119.42'	10.0" Round Culvert L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.42' / 115.27' S= 0.0692 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=1.17 cfs @ 12.51 hrs HW=120.15' (Free Discharge)

↑1=Culvert (Inlet Controls 1.17 cfs @ 2.30 fps)

Pond DMH: OCS Bypass



6. Post

Prepared by Woodard & Curran

Printed 2/16/2016

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

Page 106

Summary for Pond DMH6: Access MH

Inflow Area = 1.24 ac, 78.73% Impervious, Inflow Depth = 4.20" for 25-YR event
 Inflow = 6.07 cfs @ 12.07 hrs, Volume= 0.433 af
 Outflow = 6.07 cfs @ 12.07 hrs, Volume= 0.433 af, Atten= 0%, Lag= 0.0 min
 Primary = 6.07 cfs @ 12.07 hrs, Volume= 0.433 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 121.24' @ 12.07 hrs
 Flood Elev= 126.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	119.77'	24.0" Round Culvert L= 9.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.77' / 119.77' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	119.77'	24.0" Round Culvert L= 2.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 119.77' / 119.77' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 2	123.35'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=6.06 cfs @ 12.07 hrs HW=121.23' (Free Discharge)
 ↑1=Culvert (Barrel Controls 6.06 cfs @ 3.43 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=119.77' (Free Discharge)
 ↑2=Culvert (Controls 0.00 cfs)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

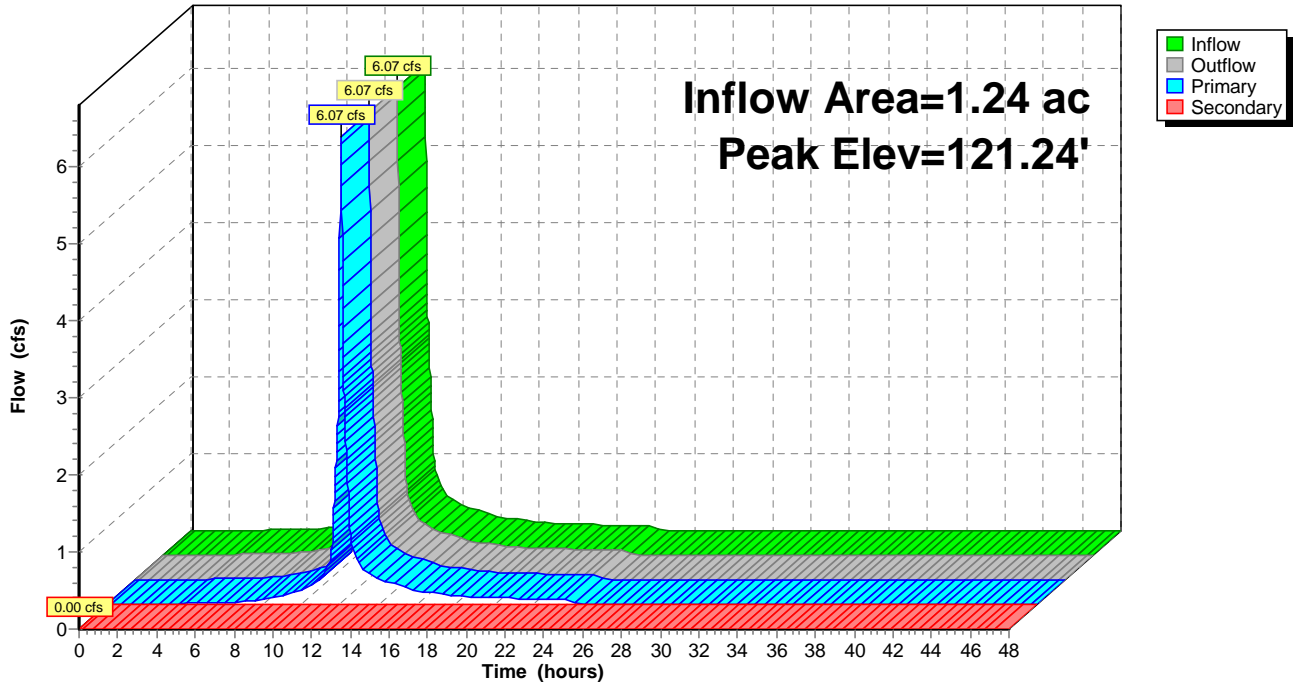
POST
Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 107

Pond DMH6: Access MH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 108

Summary for Pond DMH7: Proposed Drop DMH

Inflow Area = 2.51 ac, 74.51% Impervious, Inflow Depth = 3.14" for 25-YR event
Inflow = 4.64 cfs @ 12.14 hrs, Volume= 0.656 af
Outflow = 4.64 cfs @ 12.14 hrs, Volume= 0.656 af, Atten= 0%, Lag= 0.0 min
Primary = 4.64 cfs @ 12.14 hrs, Volume= 0.656 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 120.60' @ 12.14 hrs

Flood Elev= 124.69'

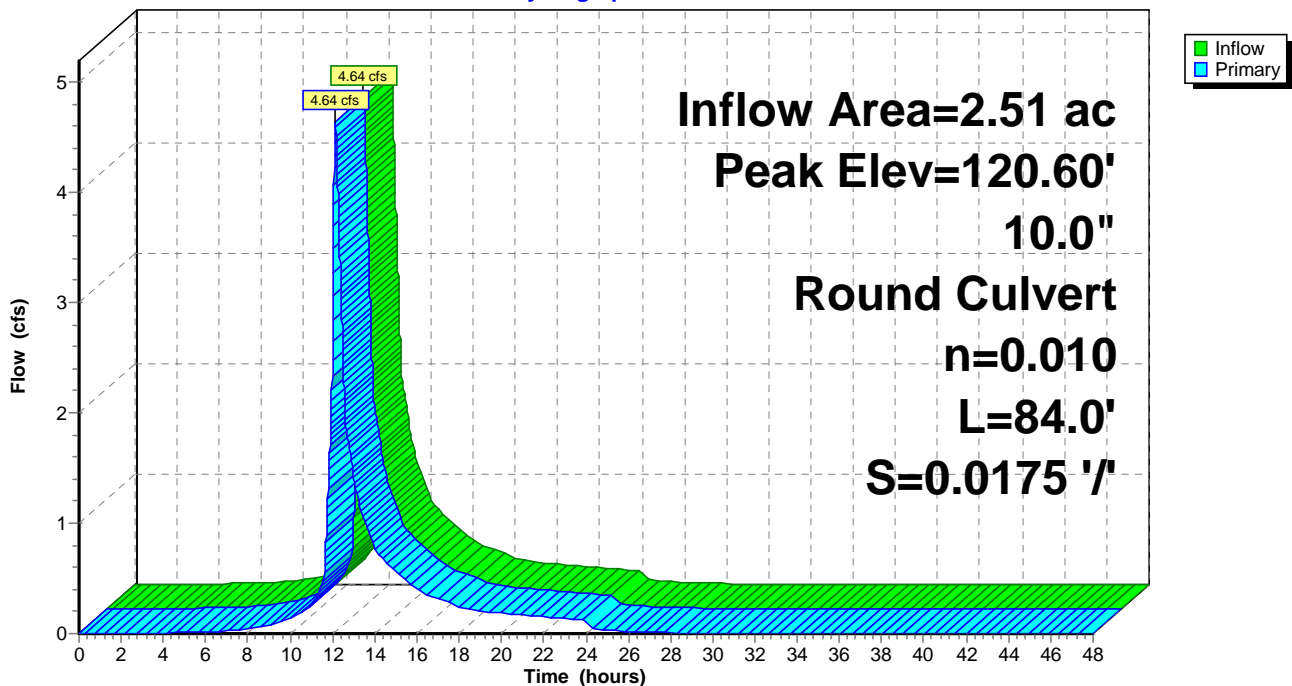
Device #	Routing	Invert	Outlet Devices
#1	Primary	115.17'	10.0" Round Culvert L= 84.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 115.17' / 113.70' S= 0.0175 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=4.64 cfs @ 12.14 hrs HW=120.60' (Free Discharge)

↑1=Culvert (Inlet Controls 4.64 cfs @ 8.51 fps)

Pond DMH7: Proposed Drop DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST
Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 109

Summary for Pond DMH8: Proposed DMH

Inflow Area = 2.51 ac, 74.51% Impervious, Inflow Depth = 3.14" for 25-YR event
 Inflow = 4.64 cfs @ 12.14 hrs, Volume= 0.656 af
 Outflow = 4.64 cfs @ 12.14 hrs, Volume= 0.656 af, Atten= 0%, Lag= 0.0 min
 Primary = 4.64 cfs @ 12.14 hrs, Volume= 0.656 af

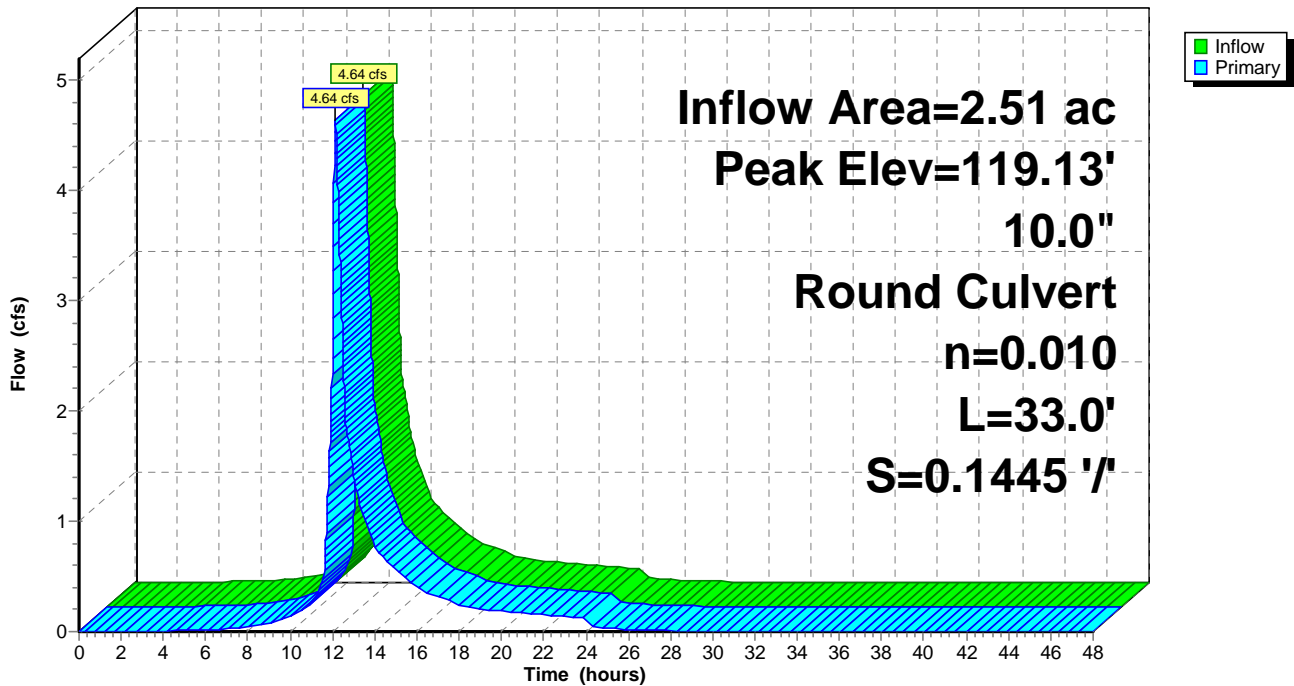
Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 119.13' @ 12.14 hrs
 Flood Elev= 123.71'

Device #	Routing	Invert	Outlet Devices
#1	Primary	113.70'	10.0" Round Culvert L= 33.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 113.70' / 108.93' S= 0.1445 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=4.64 cfs @ 12.14 hrs HW=119.13' (Free Discharge)
 ↑1=Culvert (Inlet Controls 4.64 cfs @ 8.51 fps)

Pond DMH8: Proposed DMH

Hydrograph



6. Post

Prepared by Woodard & Curran

HydroCAD® 10.00-15 s/n 01204 © 2015 HydroCAD Software Solutions LLC

POST

Type III 24-hr 25-YR Rainfall=5.80"

Printed 2/16/2016

Page 110

Summary for Link SP1: Existing Combined Sewer in Danforth

Inflow Area = 3.14 ac, 64.59% Impervious, Inflow Depth = 2.77" for 25-YR event
Inflow = 5.39 cfs @ 12.14 hrs, Volume= 0.726 af
Primary = 5.39 cfs @ 12.14 hrs, Volume= 0.726 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link SP1: Existing Combined Sewer in Danforth

Hydrograph

