APPLICATION FOR SITE PLAN REVIEW
PROPOSED BUILDING EXPANSION
75 PARKER STREET
NEWBURYPORT, MASSACHUSETTS

Volume 2 of 2

Prepared For:

Port City Realty, LLC
75 Parker Street
Newburyport, Massachusetts 01950

Prepared By:

CORNERSTONE

9F Presidential Way
Woburn, MA 01801

COMMONWEALTH OF MASSACHUSETTS
RICHARD BARTHELMES
NO. 33017
REGISTERED PROFESSIONAL ENGINEER

3/30/18

March 30, 2018

STORMWATER ANAYLYSIS AND CALCULATIONS
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TABLE OF CONTENTS

1.0 STORMWATER ANALYSIS AND CALCULATIONS

1.1 PROJECT NARRATIVE

The applicant, Port City Realty, LLC, proposes a new building addition constructed at 75 Parker Street, Parcel ID 78-1-A, in Newburyport, Massachusetts. The existing lot consists 98,281 square feet encompassing one commercial building with a loading dock, a single driveway entrance and parking lot, lawn and landscape area. Located in the rear of the building is grass and brush field that slopes south to a vegetated wetland.

The proposed addition will provide additional commercial industrial space. Each space will have a separate designated loading dock designed for a WB-67 type truck (AASHTO 2011). Two additional loading doors will be provided. The current loading dock for the existing structure will be extended to remain accessible. Additional parking spaces, wheelchair accessible ramps, concrete sidewalks and curbing will be constructed for access to the new and existing building entryways. The driveway aisles will be expanded for two-way traffic at the east driveway opening and single lane, exit-only traffic at the west opening. The proposed driveway configuration allows delivery trucks to provide pull-through service by entering through the east and exiting through the west driveway entrances. A new concrete dumpster pad will be provided south of the buildings. A retaining wall and guard rail will be constructed along the west side of driveway and lot line to support the proposed driveway grading.

A portion of the property is located within a vegetated wetland area. Proposed construction includes disturbance within 100 feet of the wetland but outside the 25 foot no disturbance zone. A portion of the property is located within the flood plain of elevation 10.0 feet. The proposed site improvements are located above the flood plain elevation.

Soils for the property are defined as Suffield silt loam (719B) in rear of the building and Udorthents (651 - loamy fill) in front of the building based on the NRCS Web Soil report. The NRCS Web Soil Survey Report is included as Attachment E. Six test pits were dug to verify the soil texture and seasonal high groundwater table. The parent material (C horizon) was a sandy silt loam over fine sand. The top, subsoil, and parent material C1 were classified as an HSG C for HydroCAD runoff calculations. Site test pit logs are included as Attachment F.

1.2 EXISTING CONDITIONS ANALYSIS

The existing lot is predominately grass and mowed brush. There is approximately 12,600 square feet of impervious bituminous concrete driveway and parking lot. The existing impervious roof and removable trailer consist of approximately 5,543 square feet.

There are three (3) subcatchments that flow to three (3) design points. Surface water from the front parking lot, driveway, front lawn, and west side lawn flow overland to Design Point 1, which is a culvert located northwest of the locus property. Design Point 2 is defined as the vegetated wetland to the south of the property. Surface water from the south and west of the building flow overland to Design Point 2 located at the end of an existing grassed swale and edge of the vegetated wetland. Surface water from east of the building flows overland to Design Point 3 which is defined as the lot east of the locus property. Roof runoff from the existing building was assumed to be dispersed to each of the three subcatchments based on locations of existing downspouts. The total existing impervious area on site is approximately 18,242 square feet. A plan showing the existing condition subcatchments is provided as Attachment A.

The following chart indicates the rainfall amounts based on the Northeast Regional Climate Center Extreme Precipitation Tables used for the existing and proposed calculations as listed in the Town of Newburyport Stormwater Rules and Regulations.

Storm Event	**Rainfall Amount (in)**
2-year 24 hour storm event	3.1 inches
10-year 24 hour storm event	4.7 inches
25-year 24 hour storm event	5.8 inches
50-year 24 hour storm event	7.1 inches
100-year 24 hour storm event	8.3 inches

The existing condition peak flow analysis to the three Design Points is summarized below.

Existing Peak Rate of Runoff (cfs)

Storm Event	**Design Point #1**	**Design Point #2**	**Design Point #3**
2 year 24 hour	0.63	1.24	0.55
10-year 24 hour	1.11	3.13	1.19
25-year 24 hour	1.45	4.60	1.66
50-year 24 hour	1.85	6.43	2.23
100-year 24 hour	2.21	8.17	2.76

1.3 PROPOSED CONDITIONS ANALYSIS

The proposed construction of additional tenant space, paved parking, driveways, walkways, and loading area will increase the impervious area on site to approximately 47,400 square feet. This equates to an increase of 29,157 square feet of impervious area from the existing condition. Two rain gardens of approximately 7,000 square feet and 1,200 square feet are proposed in the north and east of the existing structure, respectively. The remaining disturbed and non-disturbed areas of the site will consist of landscape plantings, grass and natural brush. Disturbance to areas within the 100-foot wetland buffer zone have been minimized while addressing stormwater mitigation best management practices and Massachusetts Stormwater Standards.

The Proposed Conditions Analysis utilizes the same three (3) design points as the Existing Conditions Analysis in order to compare the peak rate of runoff from existing to proposed conditions. The proposed stormwater management system designed mitigates the rate of runoff and increases the treatment of stormwater runoff compared to existing conditions. The site design and stormwater management system design reduces or maintains the peak rate of runoff to all three design points.

The existing building and a portion of the pavement and lawn area are designed to flow to proposed rain garden #1 located in the front of the lot. An outlet control structure within the rain garden has been designed to mitigate the rate of runoff overflow directed to Design Point #1. Runoff from portions of proposed building space A, the parking lot, and walkways are directed to rain garden #2. An outlet control structure within the rain garden has been designed to mitigate the runoff overflow directed to Design Point #2. Overflow from rain garden #2 is tied in with the drain system designed for the remaining subcatchments directed to Design Point #2. Runoff from portions of the parking lot, walkways, remainder of proposed building space A and proposed building space B are directed through drainage structures, water treatment units and to an underground chamber storage infiltration system. The overflow from the storage system is directed to Design Point #2. The runoff from an existing portion of lawn to the east of the building will flow to Design Point #3 as it does in the existing condition. A plan showing the proposed condition subcatchments is provided as Attachment A.

The proposed condition peak flow and volume analysis to Design Point #1 is summarized below.

Proposed Peak Rate of Runoff (cfs)

Storm Event	Design Point #1	Design Point #2	Design Point #3
2 year 24 hour	0.21	1.16	0.05
10-year 24 hour	0.59	3.08	0.11
25-year 24 hour	0.82	4.48	0.15
50-year 24 hour	1.19	6.26	0.21
100-year 24 hour	1.92	7.85	0.26

Summary of the net change in peak rate of runoff and volume of runoff from pre to post conditions are provided below.

Design Point #1 Peak Flow Comparison

Storm Event	Existing Conditions Peak Rate of Runoff (cfs)	Proposed Conditions Peak Rate of Runoff (cfs)	Net difference in Peak Rate of Runoff (cfs)
2-year 24 hour	0.63	0.21	-0.27
10-year 24 hour	1.11	0.59	-0.33
25-year 24 hour	1.45	0.82	-0.42
50-year 24 hour	1.85	1.19	-0.05
100- year 24 hour	2.21	1.92	-0.09

Design Point #2 Peak Flow Comparison

Storm Event	Existing Conditions Peak Rate of Runoff (cfs)	Proposed Conditions Peak Rate of Runoff (cfs)	Net difference in Peak Rate of Runoff (cfs)
2-year 24 hour	1.24	1.16	-0.08
10-year 24 hour	3.13	3.08	-0.05
25-year 24 hour	4.60	4.48	-0.12
50-year 24 hour	6.43	6.26	-0.17
100- year 24 hour	8.17	7.85	-0.32

Design Point #3 Peak Flow Comparison

Storm Event	Existing Conditions Peak Rate of Runoff (cfs)	Proposed Conditions Peak Rate of Runoff (cfs)	Net difference in Peak Rate of Runoff (cfs)
2-year 24 hour	0.55	0.05	-0.50
10-year 24 hour	1.19	0.11	-1.08
25-year 24 hour	1.66	0.15	-1.51
50-year 24 hour	2.23	0.21	-2.02
100- year 24 hour	2.76	0.26	-2.50

1.4 PIPE SIZING

The proposed pipes have been sized to convey a 50 year 24 hour storm event. In accordance with section B.1.b of the Newburyport Stormwater Management Standards, the following table summarizes the proposed pipe sizes and storm depth from a 10 year 24 hour storm event.

Culvert	Pipe size and type	Peak rate of runoff (cfs)	Peak depth (ft)
PCB 1	12” HDPE	0.22	0.27
PCB 2	12” HDPE	0.17	0.24
PCB 3	12” HDPE	0.51	0.63
PCB 4	12” HDPE	0.50	0.41
PCB 5	12” HDPE	0.36	0.42
PCB 6	12” HDPE	0.53	0.44
PCB 7	12” HDPE	0.28	0.42
PDMH 1	12” HDPE	0.39	0.38
PDMH 2	12” HDPE	1.01	0.62
PDMH 3	12” HDPE	1.01	0.65
PDMH 4	12” HDPE	1.84	0.79
PDMH 5	12” HDPE	1.84	0.89
PDMH 6	12” HDPE	0.75	0.53
PDMH 7	12” HDPE	1.02	0.56
PDMH 8	12” HDPE	1.46	0.80

1.5 MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION (MASSDEP) STORMWATER MANAGEMENT STANDARDS

Standard 1 - No untreated discharges or erosion to wetlands
The proposed site design and stormwater management system includes two discharge points of stormwater runoff. Stormwater runoff is treated through multiple best management practices prior to discharge at both locations, the existing 18” culvert (Design Point #1) and the bordering vegetated wetlands (Design Point #2),

Standard 2 - Peak Rate Attenuation
As detailed above, the stormwater management system has been designed to maintain or reduce the peak rate of runoff during the 2, 10, 25, 50, and 100-year 24-hour storm events.

Standard 3 - Stormwater Recharge. The site is located in a hydrologic soil group C, requiring 0.25" of recharge over impervious areas. The hydrologic soils group is based on NRCS online mapping tool and confirmed by on site observation and soil testing performed by a Massachusetts Title 5 soil evaluator. The test pits logs confirm the top parent material as a silt loam, consistent with a hydrologic soil group C. The proposed site development includes a total impervious area of 47,400 sf. The required recharge amount is 47,400 x .25/12 = 987 cf. Adjusted minimum storage volume: Because the entire impervious area is not directed through the infiltration basin, the MADEP Stormwater Handbook specifies that the minimum required recharge of the infiltration basin be adjusted by the ratio of total to contributing impervious area. The adjusted minimum required recharge volume for the infiltration basin is: 47,400/14,215 = 3.33 x 987 cf = 3,287 cf.

The simple dynamic storage method is utilized to demonstrate the minimum recharge volume is contained in the infiltration basin without any discharge though the primary outlet. As prescribed in the Massachusetts Stormwater Handbook, a subcatchment was defined as the impervious area, 47,400 sf, and a fictional storm event that generated the prescribed adjusted minimum recharge volume (3,287 cf) over the 11-13 hour time span was modeled. The modeled storm of 1.75" generates a runoff volume of 0.076 af (3,310 cf), and the peak elevation of the infiltration basin is 17.89, below the outlet elevation of 17.90, therefore the infiltration pond meets the required recharge volume of Standard 3. The groundwater recharge analysis is provided at the end of Attachment A.

A Mounding Analysis was performed utilizing the Hantush Method as required by the Massachusetts Stormwater Handbook for infiltration basins designed to attenuate peak rates and less than 4' separation to seasonal high groundwater. The infiltration basin is designed to be a minimum 2' above seasonal high groundwater as determined during the on site soil testing. The Mounding analysis demonstrates that the resulting groundwater mound beneath the infiltration system does not reduce the volume capacity of the infiltration basin, is drained out within 72 hours, and does not break out above the land surface. The Mounding Analysis Report is included as Attachment G.

Standard 4 - Water Quality

Total Suspended Solids (TSS) Removal
The stormwater management system is designed to improve the water quality of stormwater runoff leaving the site compared to existing conditions. The existing site development allows runoff to sheet flow off the paved parking lot and truck loading area to either the culvert along Parker Street (design point #1) or a swale discharging to the bordering vegetated wetland (design point #2). Minimal TSS removal occurs in the existing condition. The proposed site design incorporates several best management practices (BMP) including: deep sump catchbasins; water quality units; subsurface infiltration basin; grass swales; and rain gardens. Each BMP has been designed to both mitigate the peak rate of runoff and provide TSS removal. There is one treatment train corresponding to discharge design point 1 and two treatment trains corresponding to discharge design point #2.

Treatment train 1 – discharge to Design Point #1
The area of runoff directed to design point #1 is approximately 25,483 square feet which includes the existing building and the proposed paved area and rain garden. This portion of the site was previously disturbed for construction of the existing site features. Redevelopment of this area provides the opportunity for treatment of the

surface runoff prior to discharge to design point #1. In order to maintain the existing finish floor and loading dock elevations, additional pretreatment is not feasible. However, the proposed redevelopment of the front of the property will remove additional total suspended solids as well as meet or reduce the peak flow of runoff compared to the existing condition for design point 1.

Runoff from the front portion of the site sheet flows into the rain garden proposed in front of the building. Two (2) rip-rap swales are designed to reduce velocity of runoff from the driveway and loading area prior to discharge to the rain garden. The rain garden design incudes a twenty four inch (24") planting soil matrix below the rain garden and specifies a variety of shrubs and groundcovers suitable for planting in rain gardens. Runoff from the rain garden is conveyed through an outlet control structure designed to discharge runoff in a controlled manner to meet or reduce the peak rate of runoff at the design point. The outlet control structure conveys runoff through two 8" HDPE pipes to a grass swale which flows to the existing 18" culvert at Parker Street. The resulting TSS removal rate is 72% for treatment train 1. The redevelopment portion of the site meets standard 4 to the maximum extent practical. The MADEP TSS Removal Calculation Worksheet is attached as Attachment C.

Treatment train 2 – discharge to Design Point #2
Runoff from the rear portion of the paved area is collected by deep sump catchbasins and conveyed to a water quality pretreatment device (Contech Jellyfish Unit). The pretreatment device was sized for a 1" storm event. The runoff is then conveyed to an underground chamber infiltration system (Contech Chambermaxx). Overflow runoff from the infiltration system is allowed to discharge to stone rip-rap and existing grassed slope prior to reaching design point 2. The resulting TSS removal rate is greater than 90% for treatment train 2. The MADEP TSS Removal Calculation Worksheet is attached as Attachment C.

Treatment train 3 – discharge to Design Point #2
Runoff from the north portion of the proposed building tenant space A, and a portion of the parking lot and adjacent walkways flows to the proposed rain garden east of the existing building. The rain garden and outlet control structure have been designed to mitigate the peak flow of runoff prior to discharge to design point 2. Overflow from the rain garden discharges through a 12" HDPE pipe and joins additional runoff conveyance in proposed manhole #2. The runoff is combined with the runoff from the east and west portions of the parking lot collected by deep sump catchbasins and conveyed to a water quality pretreatment device (Contech Jellyfish Unit). The pretreatment device was sized for a 1" storm event. The runoff is then conveyed to an existing stone rip-rap swale and grass channel prior to reaching design point 2. The resulting TSS removal rate is greater than 90% for treatment train 3. The MADEP TSS Removal Calculation Worksheet is attached as Attachment C.

Proprietary Treatment Unit Review
The water quality pretreatment devices are manufactured by Contech Engineered Solutions. Given the site design criteria, Contech provided calculations to support a recommended pretreatment model, the Jellyfish 4-2-1 with offline routing configuration. The Jellyfish unit is a proprietary hydrodynamic separator, housing replaceable filter cartridges in a manhole structure. The offline configuration encompasses a diversion manhole, the treatment structure, and a collection manhole for further conveyance. The diversion manhole allows for bypass conveyance of

runoff to the collection manhole when the inflow of surface runoff has exceeded the flow capacity of the pretreatment unit. The pretreatment model is designed to remove at least 80% of the annual post-construction load of TSS. The design calculations provided by Contech are attached in Attachment D.

Water Quality Volume (WQV)

Design Point #1
WQV required = (impervious area) x (0.5" / 12" per ft.)
WQV required = 14,260 sf x (0.5"/12" per ft.) = 594 cf
WQV provided in rain garden = 934 cf between bottom elevation of rain garden and the lowest invert into the outlet control structure > 594 cf

Design Point #2
WQV required = 33,139 sf x (0.5"/12" per ft.) = 1,381 cf
WQV provided in chamber storage system = 741 cf + 793 cf = 1,534 cf
WQV provided in stone void storage = 670 cf + 601 cf = 1,271 cf
Total WQV provided = 2,805 cf > 1,381 cf required

Approximately 182 cf of additional storage is provided in the infiltration trench pipe and stone voids designed for conveyance to the infiltration chambers.

There is no impervious surface runoff directed to design point #3.

Drawdown within 72 Hours

Time (drawdown)	= Required Recharge Volume / (Rawl's Rate x Bottom Area)
Time drawdown	= (2,986 cf total storage) / [(8.27" per hour, sand infiltration rate) x (1'/12") x (1,100 sf bottom area) = 3.9 hrs < 72 hrs

Standard 5 - Land Uses with Higher Potential Pollutant Loads
The site is not considered a higher potential pollutant load

Standard 6 - Critical Areas
The site does not discharge to a critical area.

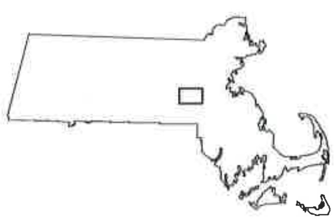
Standard 7 - Redevelopment
A portion of the site is previously developed. The existing development includes the building, parking area, and truck loading area. The site is designed to meet the MassDEP Stormwater Management Standards.

Standard 8 - Construction Period Pollution Prevention and Erosion Control Plan
A Stormwater Pollution Prevention Plan (SWPPP) is included in Appendix C of the Report to Accompany the Notice of Intent (NOI).

Standard 9 - Operation and Maintenance Plan
An Operation and Maintenance Plan is included. Refer to Attachment H.

Standard 10 - Prohibition of Illicit Discharges
An Illicit Discharge Statement will be provided by a Certifying Professional prior to the discharge of any stormwater to post-construction BMPs. Refer to Attachment B.

FIGURES



BASED ON U.S.G.S.
QUADRANGLE: MARLBOROUGH, MA
LATITUDE: 42° 47' 58.88"N
LONGITUDE: 70° 52' 52.53"W

Figure No. 1
LOCUS PLAN

HAWTAN LEATHERS
75 PARKER STREET
NEWBURYPORT, MASSACHUSETTS 01950

CORNERSTONE CONSTRUCTION SERVICES LLC
WOBURN, MASSACHUSETTS

FEBRUARY 2018

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CORNERSTONE CONSTRUCTION SERVICES LLC
9F PRESIDENTIAL WAY
WOBURN, MASSACHUSETTS 01801
(781) 937-3045

PROPOSED BUILDING EXPANSION
75 PARKER STREET
NEWBURYPORT, MASSACHUSETTS
PREPARED FOR

REVISIONS			
No.	DATE	DESCRIPTION	PROJECT	BY

EXISTING SUBCATCHMENT PLAN

DRAWN BY: BSM
CHECKED BY: KCK
SCALE: AS NOTED
DATE: FEBRUARY 2018

SHEET No. EX-1

PROJECT No. LE 627-10

CORNERSTONE CONSTRUCTION SERVICES LLC

9F PRESIDENTIAL WAY
WOBURN, MASSACHUSETTS 01801
(781) 937-3045

PROPOSED BUILDING EXPANSION
75 PARKER STREET
NEWBURYPORT, MASSACHUSETTS

REVISIONS

No.	DATE	DESCRIPTION	PROJECT	BY

PROPOSED SUBCATCHMENT PLAN

DRAWN BY: BSM
CHECKED BY: KCK
SCALE: AS NOTED
DATE: FEBRUARY 2018

SHEET No. EX-2

PROJECT No. LE 627-10

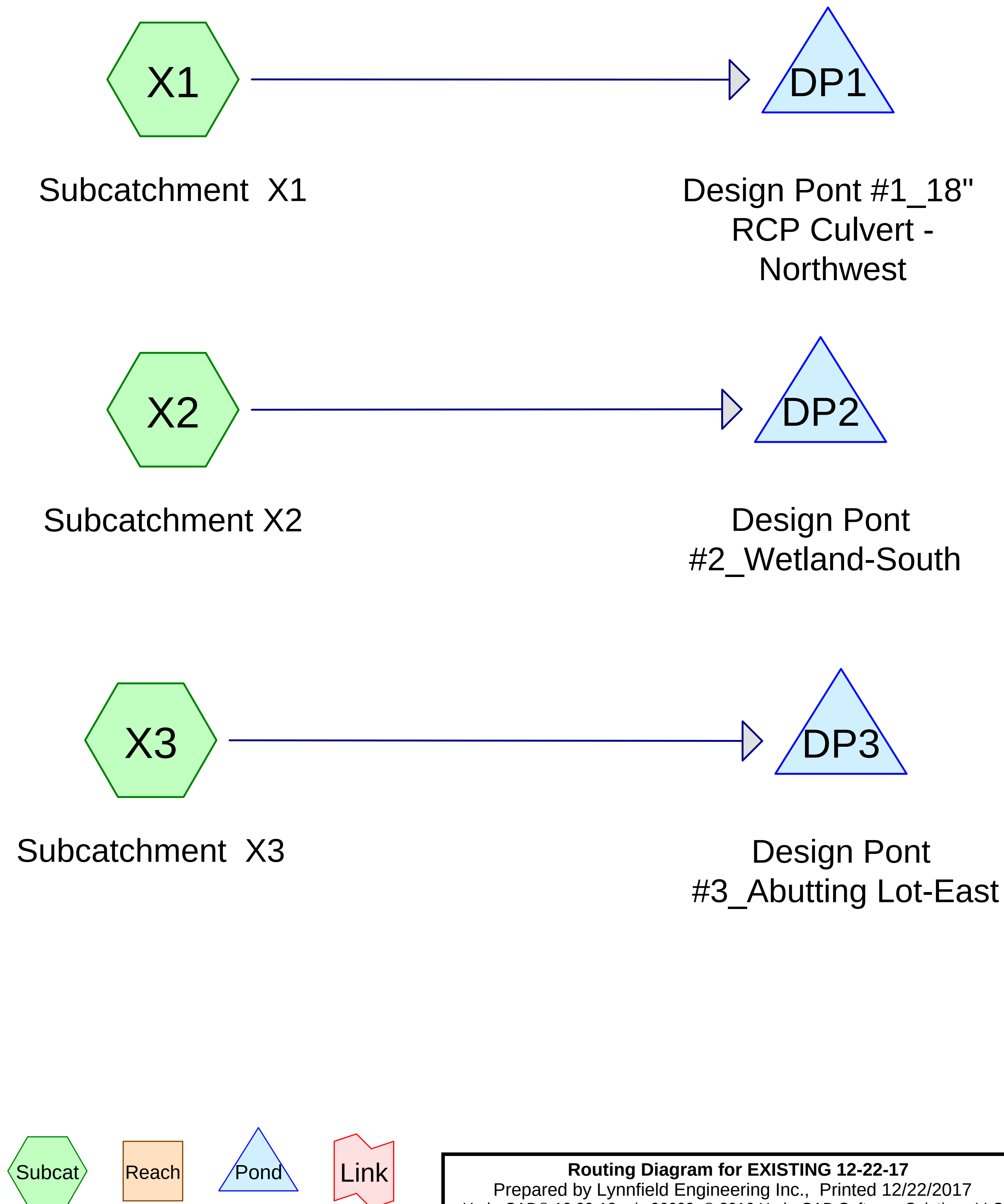
ATTACHMENT A

STORMWATER MODEL CALCULATIONS

ATTACHMENT A-1

Existing Conditions Analysis

Existing Conditions Analysis
2-Year 24-Hour Storm Event



Routing Diagram for EXISTING 12-22-17
Prepared by Lynnfield Engineering Inc., Printed 12/22/2017
HydroCAD® 10.00-18 s/n 06609 © 2016 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
44,459	74	>75% Grass cover, Good, HSG C (X1, X2, X3)
36,544	65	Brush, Good, HSG C (X2)
9,437	65	Brush, Good, HSG C, Wetland Brush (X2)
12,599	98	Paved parking, HSG C (X1, X2, X3)
5,174	98	Roofs, HSG C (X1, X2, X3)
469	98	Unconnected roofs, HSG C, Container (X2)
108,682	**74**	**TOTAL AREA**

Time span=5.00-40.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment X1: Subcatchment X1 Runoff Area=15,689 sf 52.60% Impervious Runoff Depth=1.83"
Flow Length=320' Tc=12.2 min CN=87 Runoff=0.63 cfs 2,388 cf

Subcatchment X2: Subcatchment X2 Runoff Area=72,692 sf 10.40% Impervious Runoff Depth=0.82"
Flow Length=386' Tc=10.0 min CN=71 Runoff=1.24 cfs 4,959 cf

Subcatchment X3: Subcatchment X3 Runoff Area=20,301 sf 11.97% Impervious Runoff Depth=1.14"
Flow Length=187' Tc=8.1 min CN=77 Runoff=0.55 cfs 1,930 cf

Pond DP1: Design Pont #1_18" RCP Culvert - Northwest Inflow=0.63 cfs 2,388 cf
Primary=0.63 cfs 2,388 cf

Pond DP2: Design Pont #2_Wetland-South Inflow=1.24 cfs 4,959 cf
Primary=1.24 cfs 4,959 cf

Pond DP3: Design Pont #3_Abutting Lot-East Inflow=0.55 cfs 1,930 cf
Primary=0.55 cfs 1,930 cf

Total Runoff Area = 108,682 sf Runoff Volume = 9,277 cf Average Runoff Depth = 1.02"
83.22% Pervious = 90,440 sf 16.78% Impervious = 18,242 sf

Summary for Subcatchment X1: Subcatchment X1

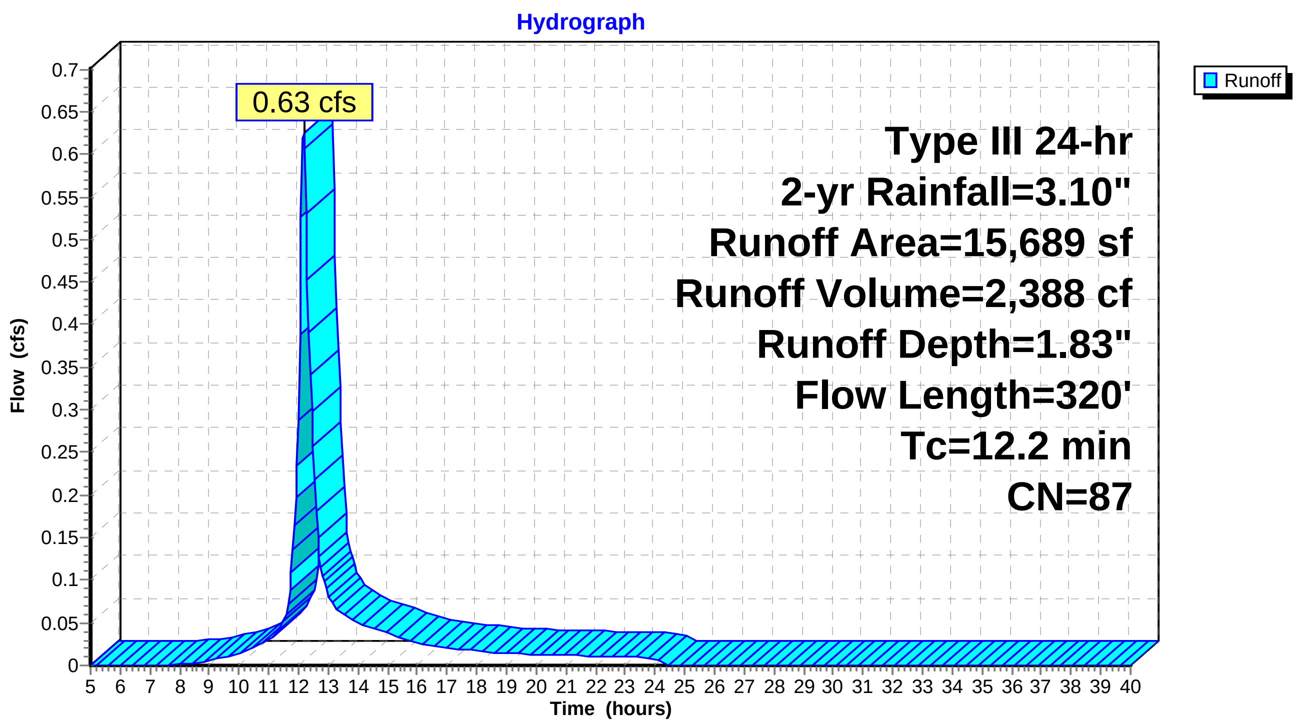
Runoff = 0.63 cfs @ 12.17 hrs, Volume= 2,388 cf, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
7,437	74	>75% Grass cover, Good, HSG C
6,684	98	Paved parking, HSG C
1,568	98	Roofs, HSG C
15,689	87	Weighted Average
7,437		47.40% Pervious Area
8,252		52.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0200	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
2.4	220	0.0472	1.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.2	320	Total			

Subcatchment X1: Subcatchment X1



Summary for Subcatchment X2: Subcatchment X2

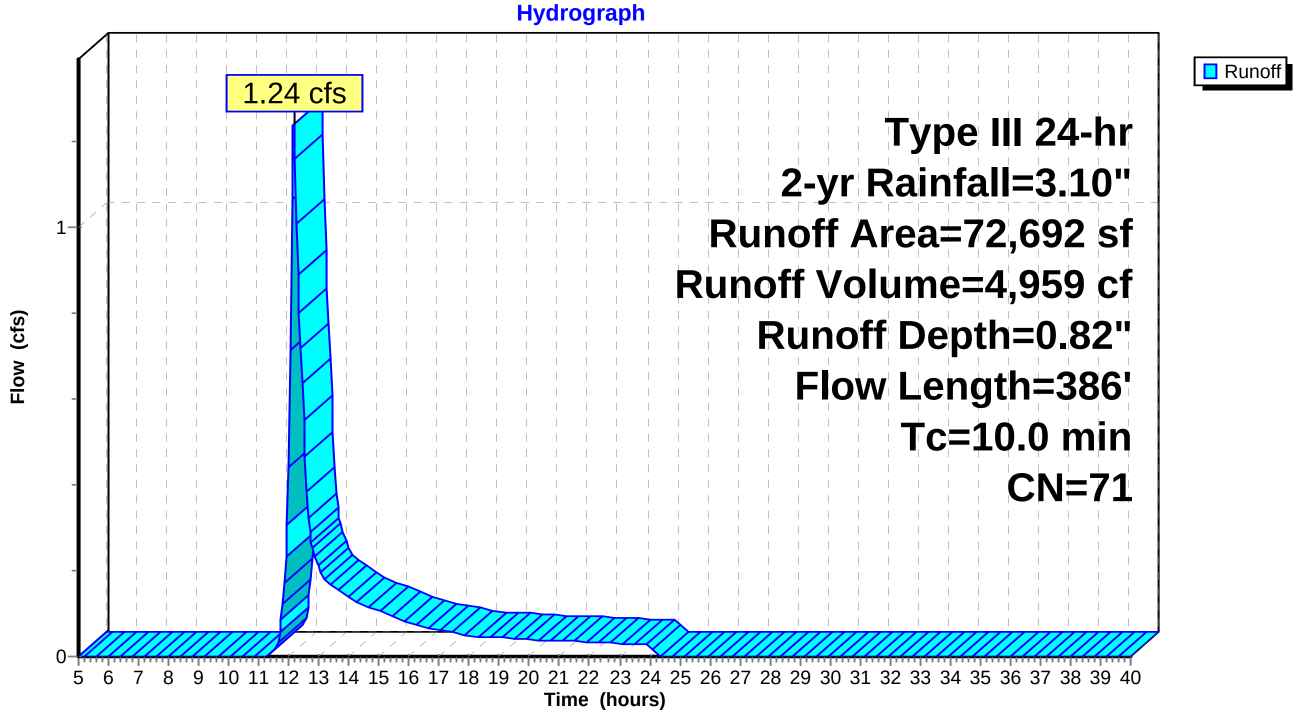
Runoff = 1.24 cfs @ 12.16 hrs, Volume= 4,959 cf, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

	Area (sf)	CN	Description
	1,427	98	Roofs, HSG C
*	469	98	Unconnected roofs, HSG C, Container
	5,663	98	Paved parking, HSG C
	19,152	74	>75% Grass cover, Good, HSG C
	36,544	65	Brush, Good, HSG C
*	9,437	65	Brush, Good, HSG C, Wetland Brush
	72,692	71	Weighted Average
	65,133		89.60% Pervious Area
	7,559		10.40% Impervious Area
	469		6.20% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0425	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
1.4	115	0.0370	1.35		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	171	0.0180	2.01		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.0	386	Total			

Subcatchment X2: Subcatchment X2



Summary for Subcatchment X3: Subcatchment X3

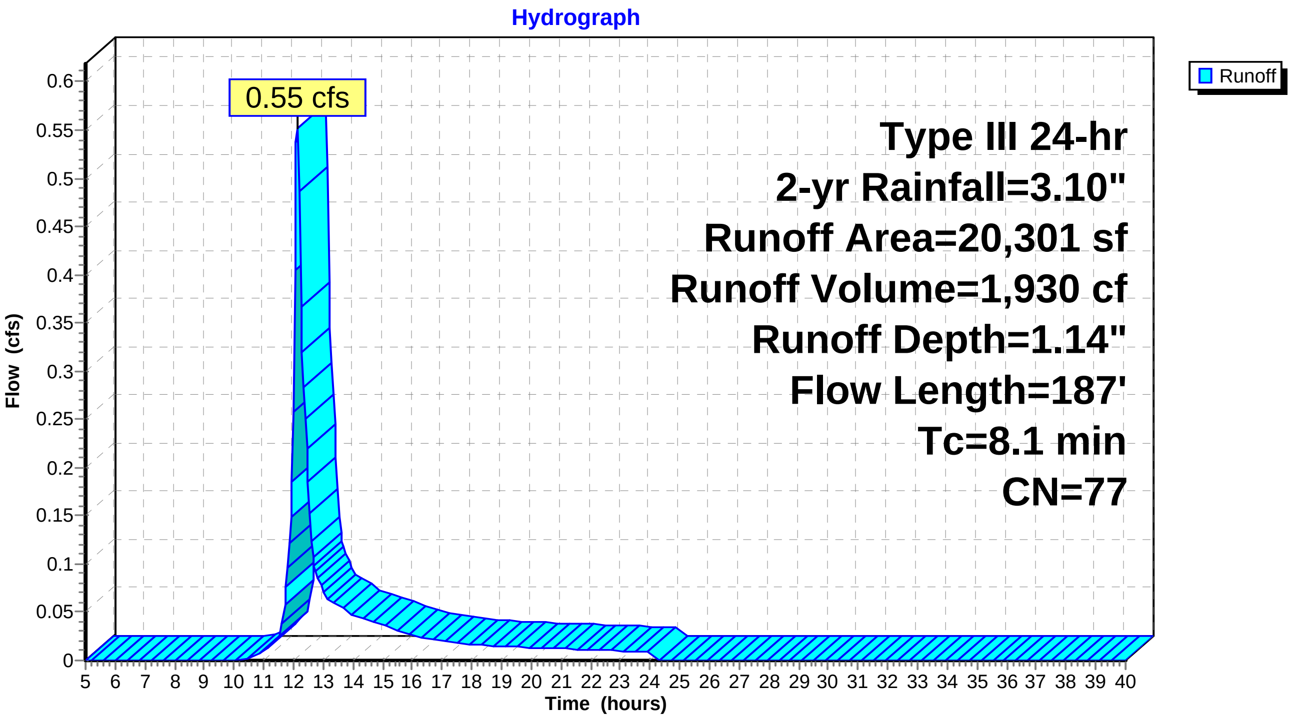
Runoff = 0.55 cfs @ 12.12 hrs, Volume= 1,930 cf, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
17,870	74	>75% Grass cover, Good, HSG C
252	98	Paved parking, HSG C
2,179	98	Roofs, HSG C
20,301	77	Weighted Average
17,870		88.03% Pervious Area
2,431		11.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0500	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
1.3	87	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.1	187	Total			

Subcatchment X3: Subcatchment X3

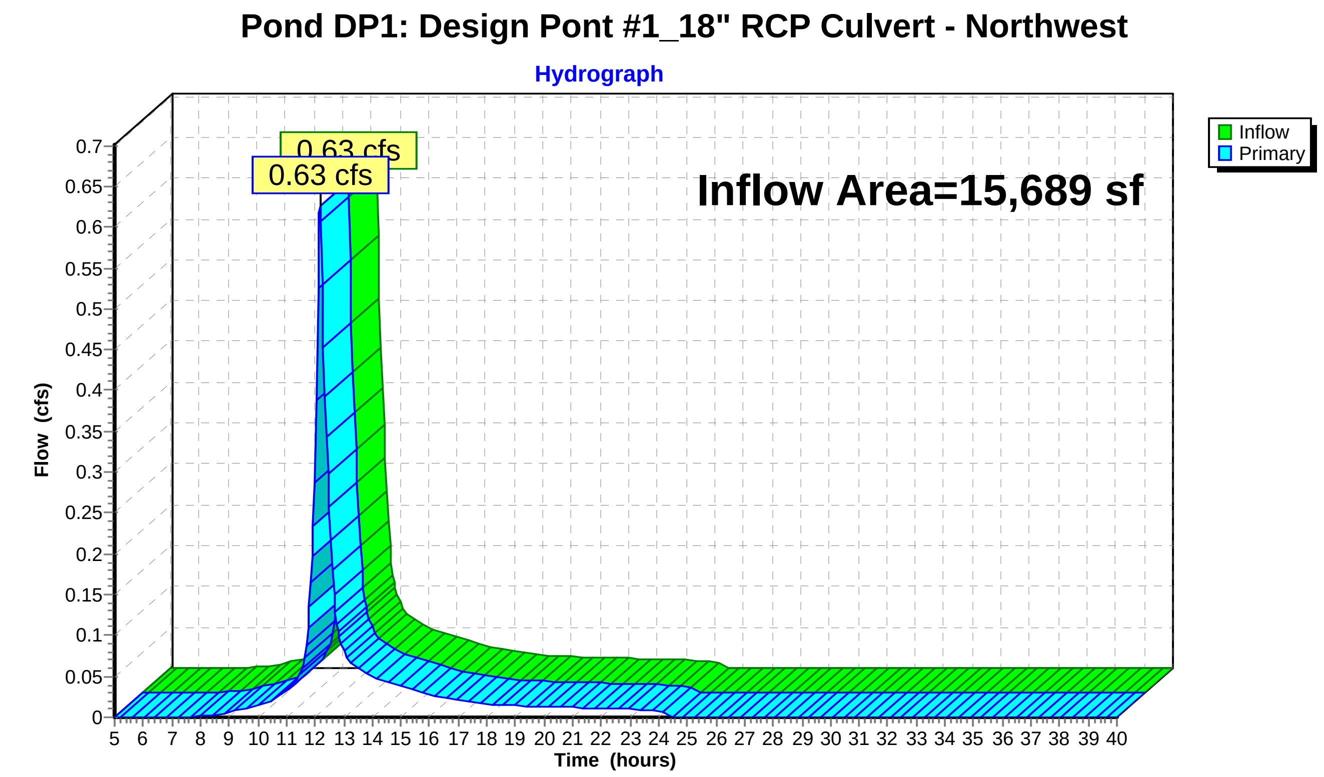


Summary for Pond DP1: Design Pont #1_18" RCP Culvert - Northwest

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 15,689 sf, 52.60% Impervious, Inflow Depth = 1.83" for 2-yr event
Inflow = 0.63 cfs @ 12.17 hrs, Volume= 2,388 cf
Primary = 0.63 cfs @ 12.17 hrs, Volume= 2,388 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs



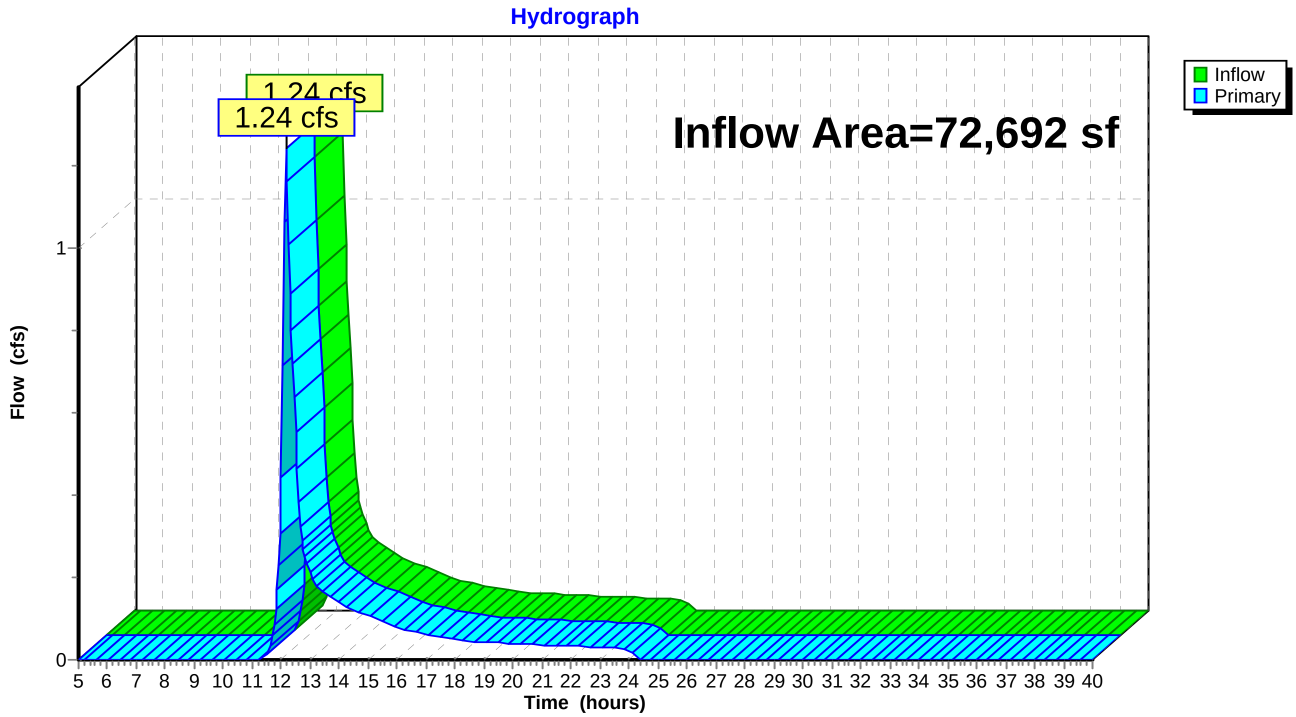
Summary for Pond DP2: Design Pont #2_Wetland-South

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	72,692 sf, 10.40% Impervious,	Inflow Depth = 0.82"	for 2-yr event
Inflow =	1.24 cfs @ 12.16 hrs, Volume=	4,959 cf	
Primary =	1.24 cfs @ 12.16 hrs, Volume=	4,959 cf, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs

Pond DP2: Design Pont #2_Wetland-South

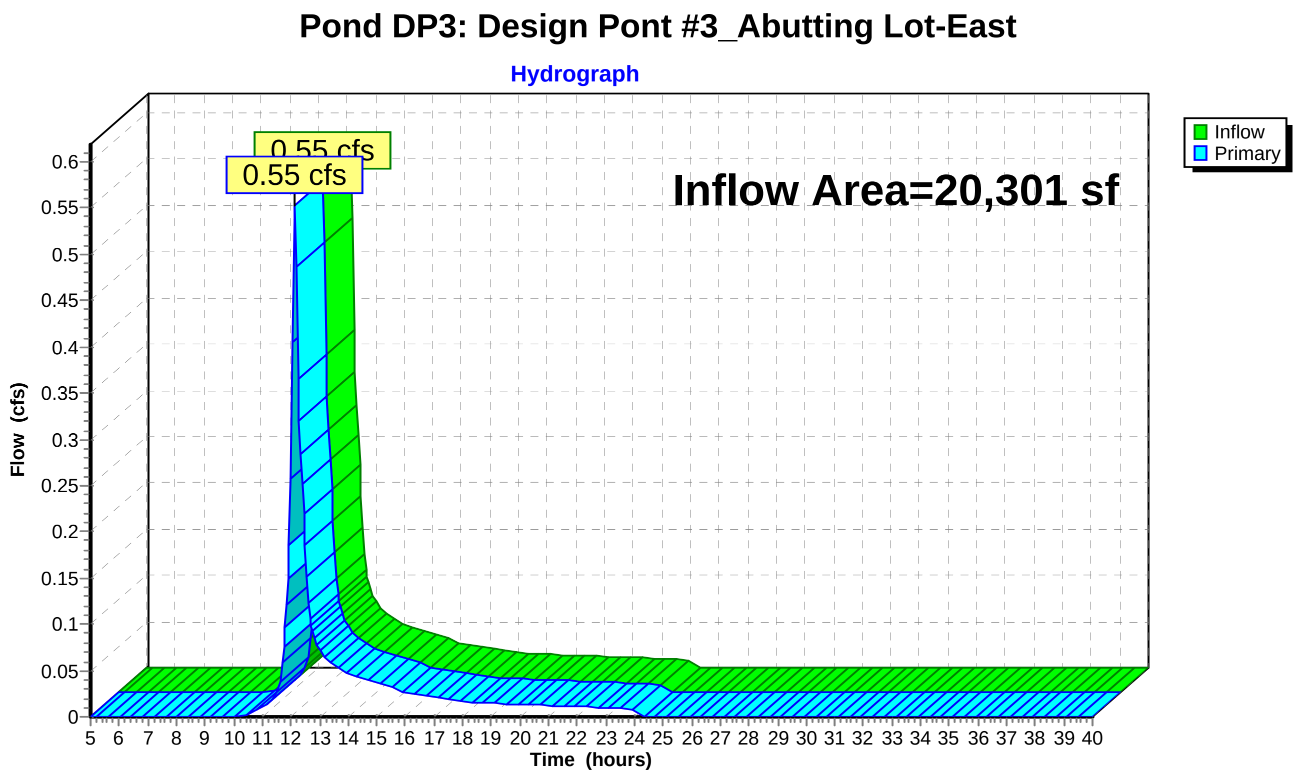


Summary for Pond DP3: Design Pont #3_Abutting Lot-East

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 20,301 sf, 11.97% Impervious, Inflow Depth = 1.14" for 2-yr event
Inflow = 0.55 cfs @ 12.12 hrs, Volume= 1,930 cf
Primary = 0.55 cfs @ 12.12 hrs, Volume= 1,930 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs



Existing Conditions Analysis
10-Year 24-Hour Storm Event

Time span=5.00-40.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment X1: Subcatchment X1 Runoff Area=15,689 sf 52.60% Impervious Runoff Depth=3.29"
Flow Length=320' Tc=12.2 min CN=87 Runoff=1.11 cfs 4,296 cf

Subcatchment X2: Subcatchment X2 Runoff Area=72,692 sf 10.40% Impervious Runoff Depth=1.89"
Flow Length=386' Tc=10.0 min CN=71 Runoff=3.13 cfs 11,464 cf

Subcatchment X3: Subcatchment X3 Runoff Area=20,301 sf 11.97% Impervious Runoff Depth=2.37"
Flow Length=187' Tc=8.1 min CN=77 Runoff=1.19 cfs 4,016 cf

Pond DP1: Design Pont #1_18" RCP Culvert - Northwest Inflow=1.11 cfs 4,296 cf
Primary=1.11 cfs 4,296 cf

Pond DP2: Design Pont #2_Wetland-South Inflow=3.13 cfs 11,464 cf
Primary=3.13 cfs 11,464 cf

Pond DP3: Design Pont #3_Abutting Lot-East Inflow=1.19 cfs 4,016 cf
Primary=1.19 cfs 4,016 cf

Total Runoff Area = 108,682 sf Runoff Volume = 19,776 cf Average Runoff Depth = 2.18"
83.22% Pervious = 90,440 sf 16.78% Impervious = 18,242 sf

Summary for Subcatchment X1: Subcatchment X1

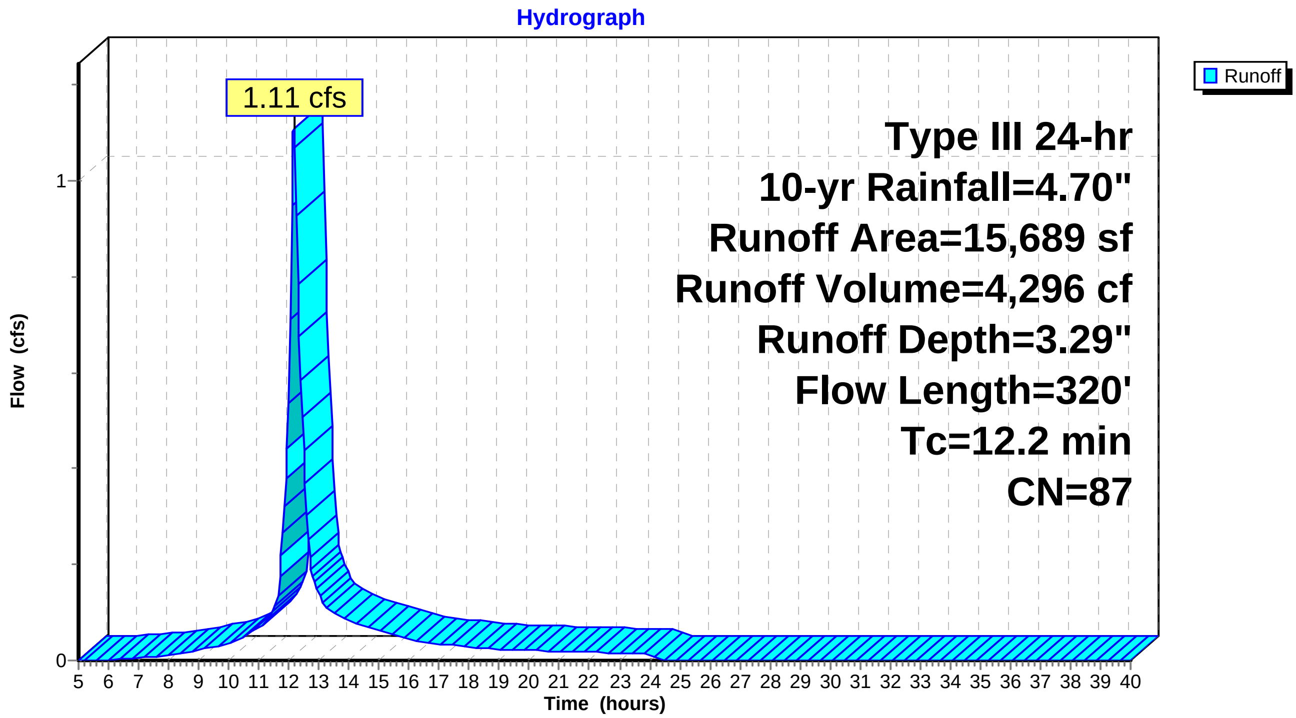
Runoff = 1.11 cfs @ 12.17 hrs, Volume= 4,296 cf, Depth= 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

Area (sf)	CN	Description
7,437	74	>75% Grass cover, Good, HSG C
6,684	98	Paved parking, HSG C
1,568	98	Roofs, HSG C
15,689	87	Weighted Average
7,437		47.40% Pervious Area
8,252		52.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0200	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
2.4	220	0.0472	1.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.2	320	Total			

Subcatchment X1: Subcatchment X1



Summary for Subcatchment X2: Subcatchment X2

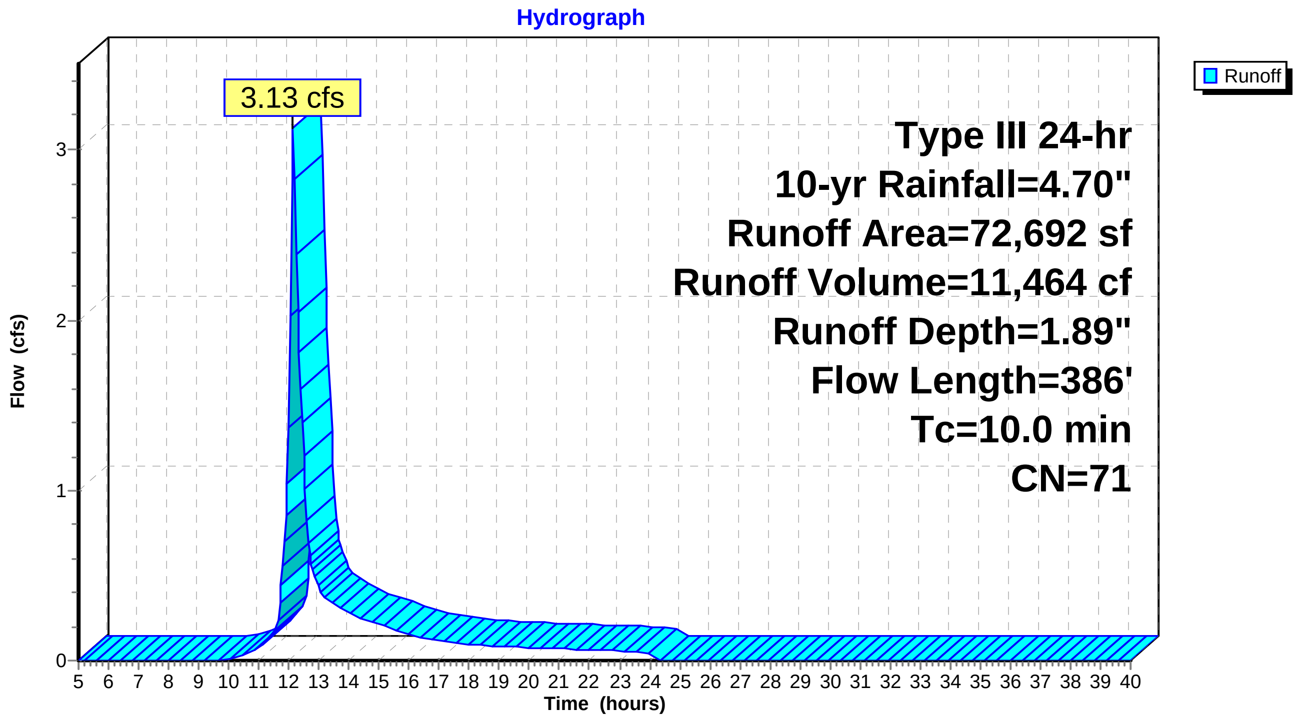
Runoff = 3.13 cfs @ 12.15 hrs, Volume= 11,464 cf, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

	Area (sf)	CN	Description
	1,427	98	Roofs, HSG C
*	469	98	Unconnected roofs, HSG C, Container
	5,663	98	Paved parking, HSG C
	19,152	74	>75% Grass cover, Good, HSG C
	36,544	65	Brush, Good, HSG C
*	9,437	65	Brush, Good, HSG C, Wetland Brush
	72,692	71	Weighted Average
	65,133		89.60% Pervious Area
	7,559		10.40% Impervious Area
	469		6.20% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0425	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
1.4	115	0.0370	1.35		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	171	0.0180	2.01		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.0	386	Total			

Subcatchment X2: Subcatchment X2



Summary for Subcatchment X3: Subcatchment X3

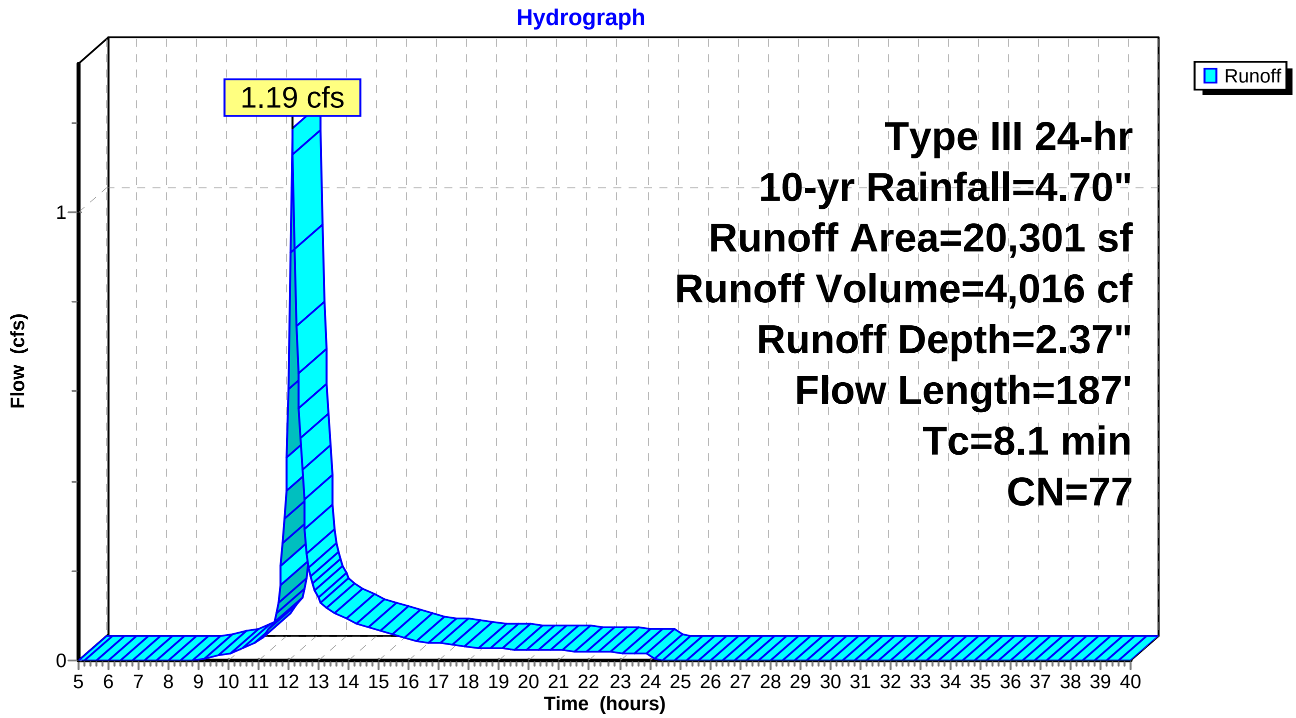
Runoff = 1.19 cfs @ 12.12 hrs, Volume= 4,016 cf, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

Area (sf)	CN	Description
17,870	74	>75% Grass cover, Good, HSG C
252	98	Paved parking, HSG C
2,179	98	Roofs, HSG C
20,301	77	Weighted Average
17,870		88.03% Pervious Area
2,431		11.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0500	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
1.3	87	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.1	187	Total			

Subcatchment X3: Subcatchment X3

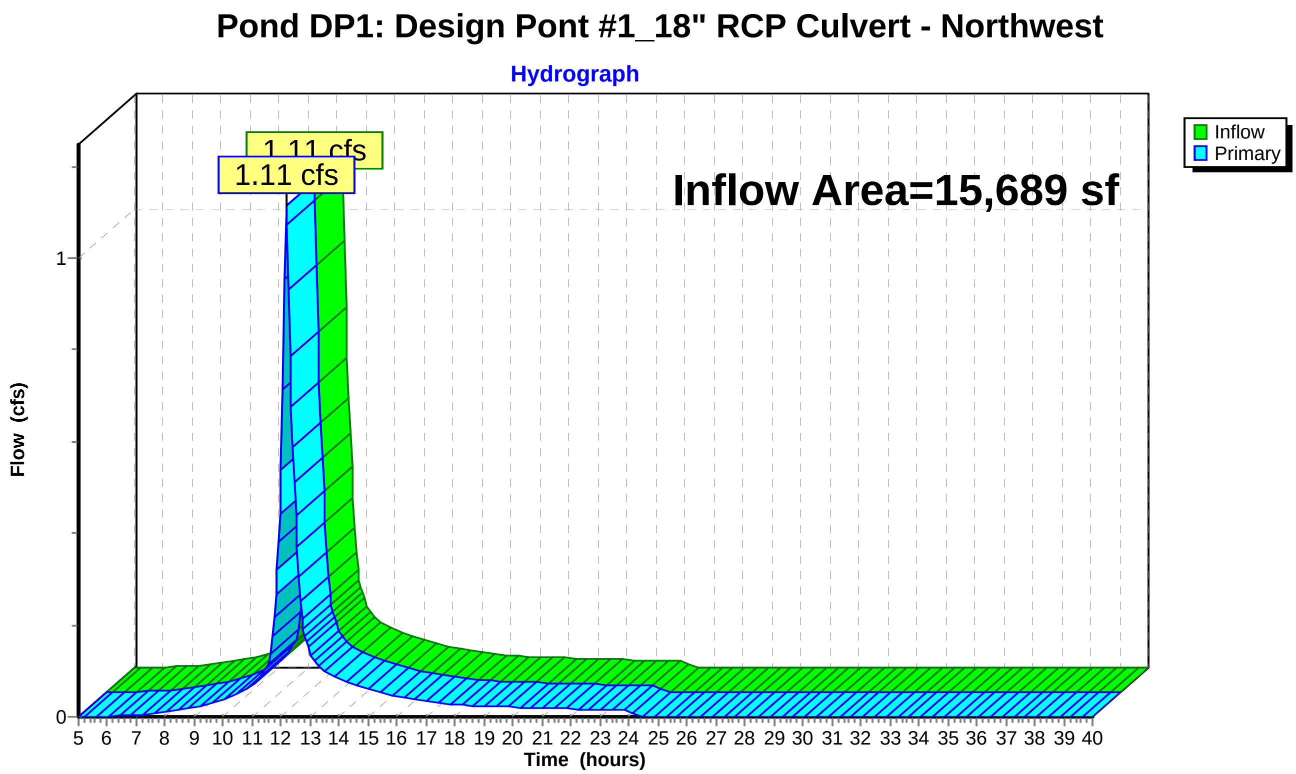


Summary for Pond DP1: Design Pont #1_18" RCP Culvert - Northwest

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	15,689 sf, 52.60% Impervious,	Inflow Depth = 3.29"	for 10-yr event
Inflow =	1.11 cfs @ 12.17 hrs, Volume=	4,296 cf	
Primary =	1.11 cfs @ 12.17 hrs, Volume=	4,296 cf, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs



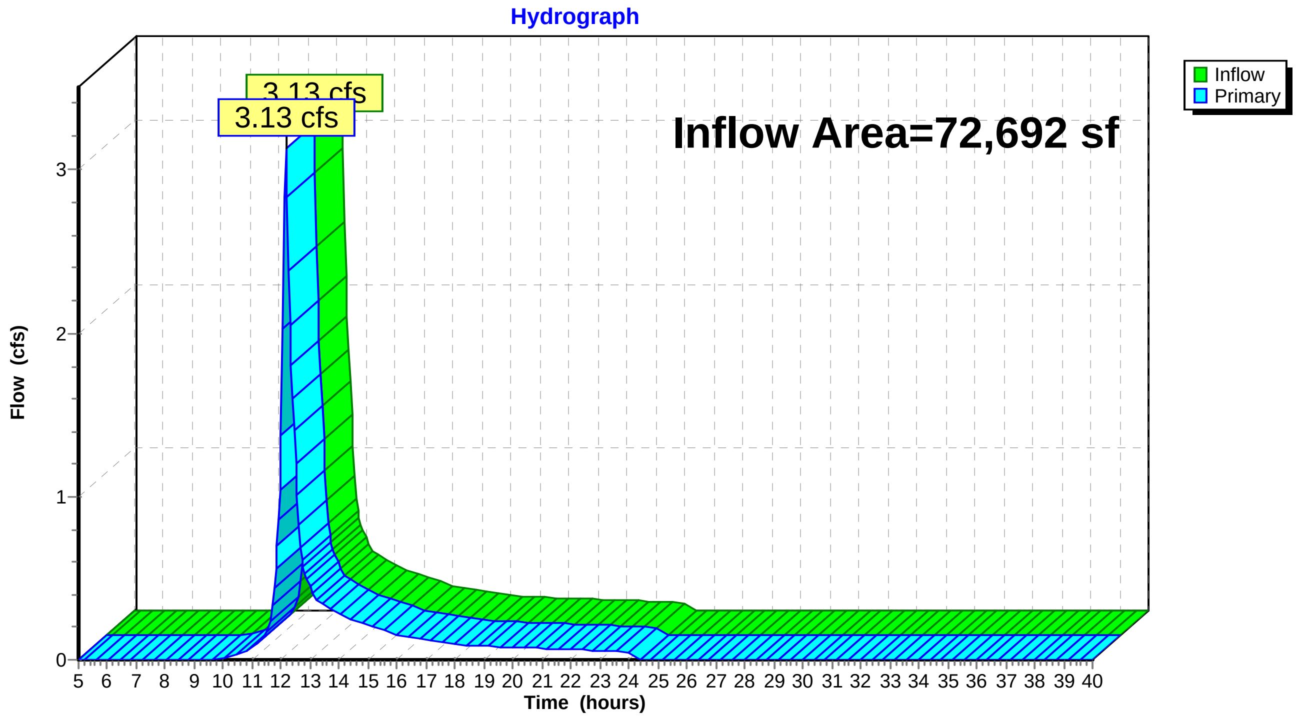
Summary for Pond DP2: Design Pont #2_Wetland-South

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	72,692 sf, 10.40% Impervious,	Inflow Depth = 1.89"	for 10-yr event
Inflow =	3.13 cfs @ 12.15 hrs, Volume=	11,464 cf	
Primary =	3.13 cfs @ 12.15 hrs, Volume=	11,464 cf, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs

Pond DP2: Design Pont #2_Wetland-South

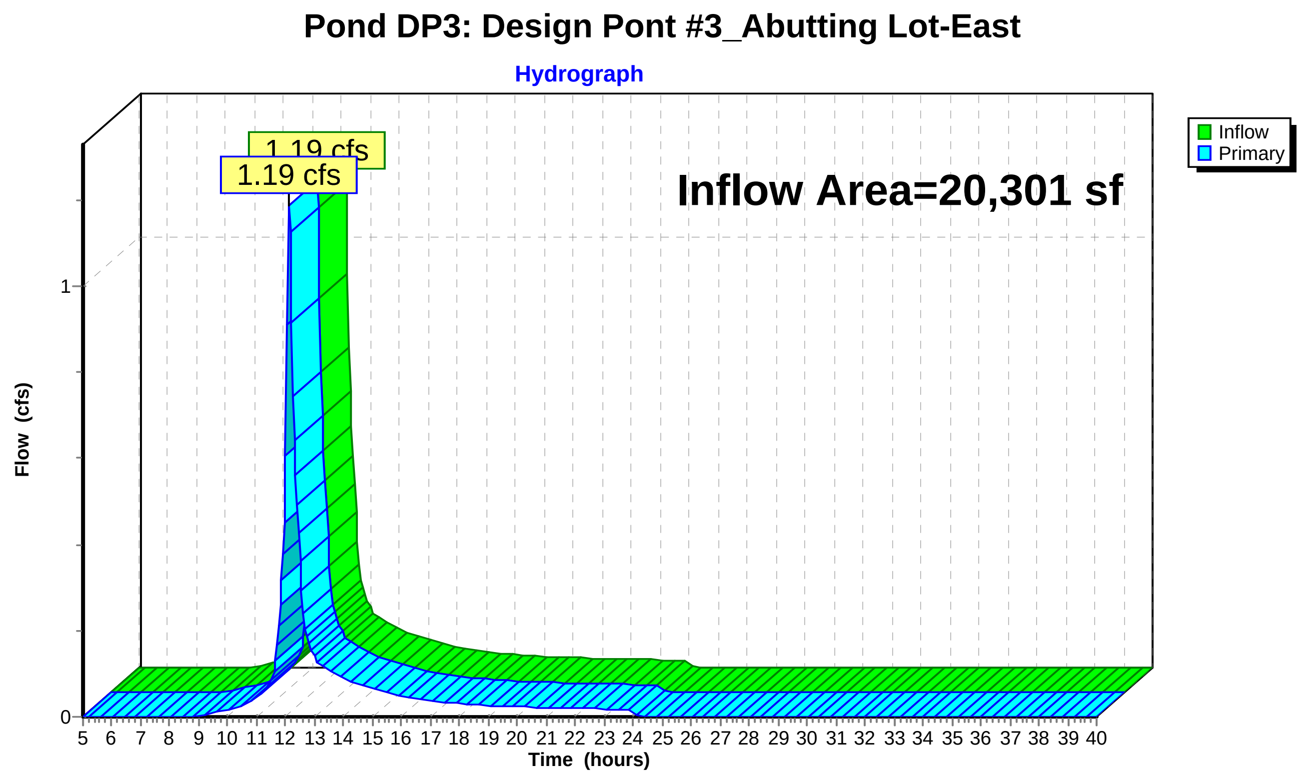


Summary for Pond DP3: Design Pont #3_Abutting Lot-East

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 20,301 sf, 11.97% Impervious, Inflow Depth = 2.37" for 10-yr event
Inflow = 1.19 cfs @ 12.12 hrs, Volume= 4,016 cf
Primary = 1.19 cfs @ 12.12 hrs, Volume= 4,016 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs



Existing Conditions Analysis
25-Year 24-Hour Storm Event

Time span=5.00-40.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment X1: Subcatchment X1 Runoff Area=15,689 sf 52.60% Impervious Runoff Depth>4.33"
Flow Length=320' Tc=12.2 min CN=87 Runoff=1.45 cfs 5,656 cf

Subcatchment X2: Subcatchment X2 Runoff Area=72,692 sf 10.40% Impervious Runoff Depth=2.74"
Flow Length=386' Tc=10.0 min CN=71 Runoff=4.60 cfs 16,589 cf

Subcatchment X3: Subcatchment X3 Runoff Area=20,301 sf 11.97% Impervious Runoff Depth=3.31"
Flow Length=187' Tc=8.1 min CN=77 Runoff=1.66 cfs 5,591 cf

Pond DP1: Design Pont #1_18" RCP Culvert - Northwest Inflow=1.45 cfs 5,656 cf
Primary=1.45 cfs 5,656 cf

Pond DP2: Design Pont #2_Wetland-South Inflow=4.60 cfs 16,589 cf
Primary=4.60 cfs 16,589 cf

Pond DP3: Design Pont #3_Abutting Lot-East Inflow=1.66 cfs 5,591 cf
Primary=1.66 cfs 5,591 cf

Total Runoff Area = 108,682 sf Runoff Volume = 27,836 cf Average Runoff Depth = 3.07"
83.22% Pervious = 90,440 sf 16.78% Impervious = 18,242 sf

Summary for Subcatchment X1: Subcatchment X1

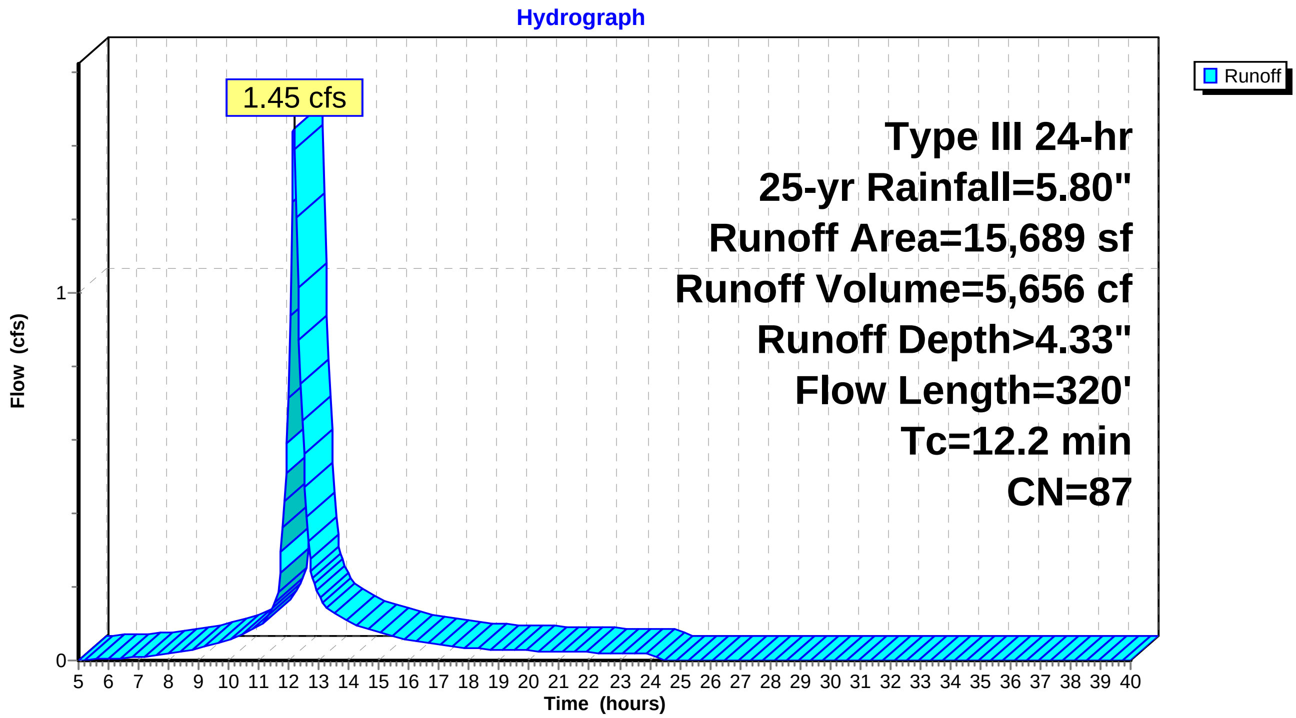
Runoff = 1.45 cfs @ 12.17 hrs, Volume= 5,656 cf, Depth> 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
7,437	74	>75% Grass cover, Good, HSG C
6,684	98	Paved parking, HSG C
1,568	98	Roofs, HSG C
15,689	87	Weighted Average
7,437		47.40% Pervious Area
8,252		52.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0200	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
2.4	220	0.0472	1.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.2	320	Total			

Subcatchment X1: Subcatchment X1



Summary for Subcatchment X2: Subcatchment X2

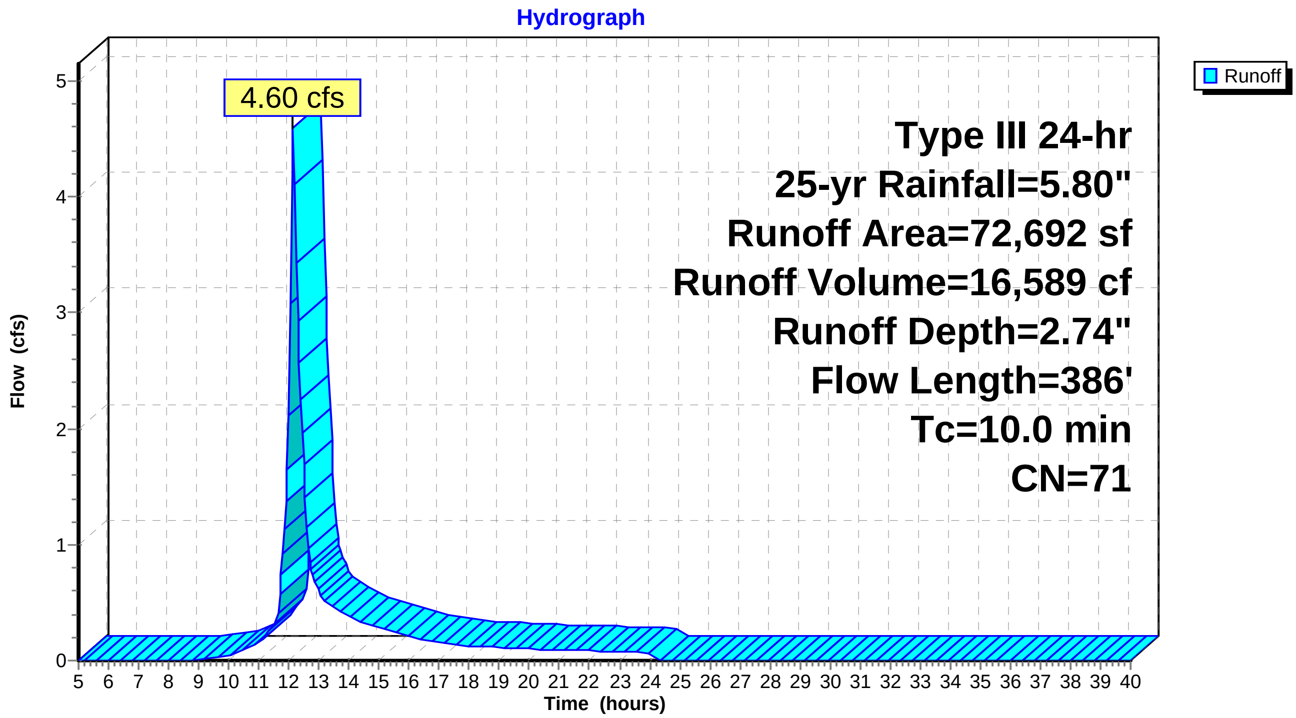
Runoff = 4.60 cfs @ 12.15 hrs, Volume= 16,589 cf, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

	Area (sf)	CN	Description
	1,427	98	Roofs, HSG C
*	469	98	Unconnected roofs, HSG C, Container
	5,663	98	Paved parking, HSG C
	19,152	74	>75% Grass cover, Good, HSG C
	36,544	65	Brush, Good, HSG C
*	9,437	65	Brush, Good, HSG C, Wetland Brush
	72,692	71	Weighted Average
	65,133		89.60% Pervious Area
	7,559		10.40% Impervious Area
	469		6.20% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0425	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
1.4	115	0.0370	1.35		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	171	0.0180	2.01		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.0	386	Total			

Subcatchment X2: Subcatchment X2



Summary for Subcatchment X3: Subcatchment X3

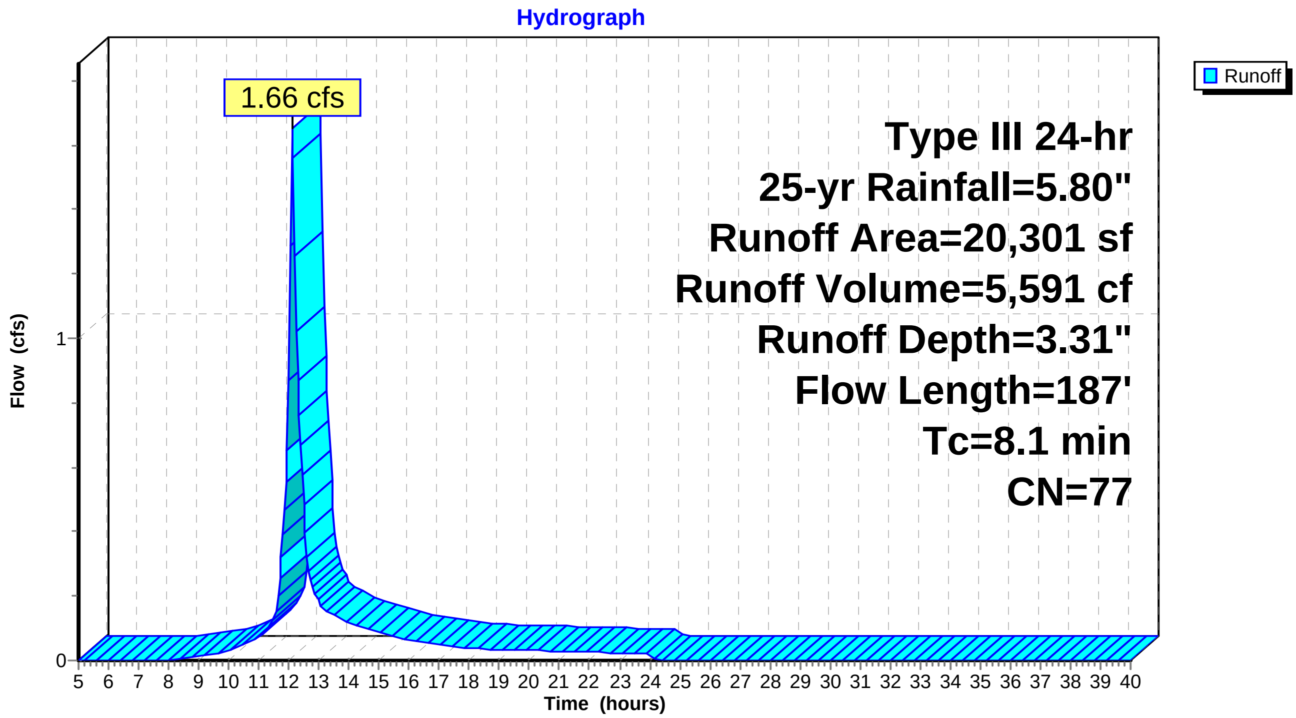
Runoff = 1.66 cfs @ 12.12 hrs, Volume= 5,591 cf, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
17,870	74	>75% Grass cover, Good, HSG C
252	98	Paved parking, HSG C
2,179	98	Roofs, HSG C
20,301	77	Weighted Average
17,870		88.03% Pervious Area
2,431		11.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0500	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
1.3	87	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.1	187	Total			

Subcatchment X3: Subcatchment X3

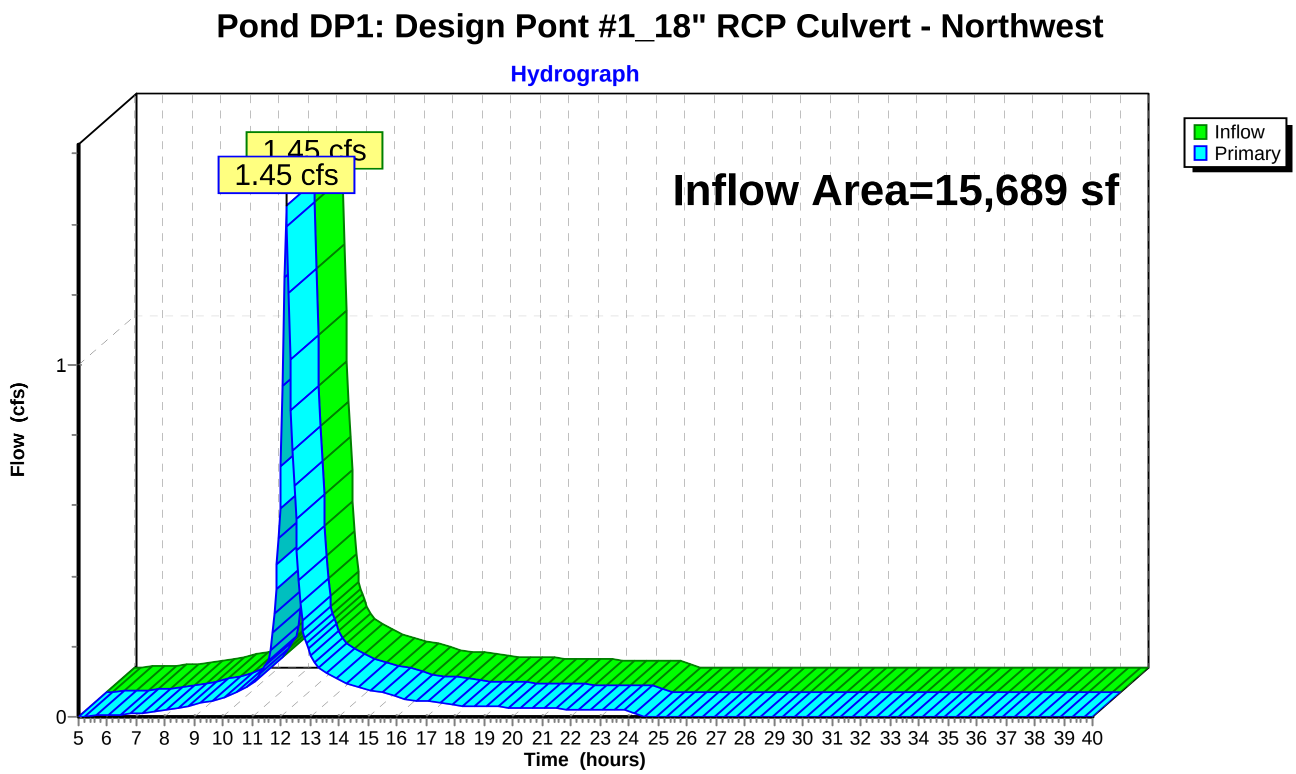


Summary for Pond DP1: Design Pont #1_18" RCP Culvert - Northwest

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	15,689 sf,	52.60% Impervious,	Inflow Depth > 4.33"	for 25-yr event
Inflow =	1.45 cfs @	12.17 hrs, Volume=	5,656 cf	
Primary =	1.45 cfs @	12.17 hrs, Volume=	5,656 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs

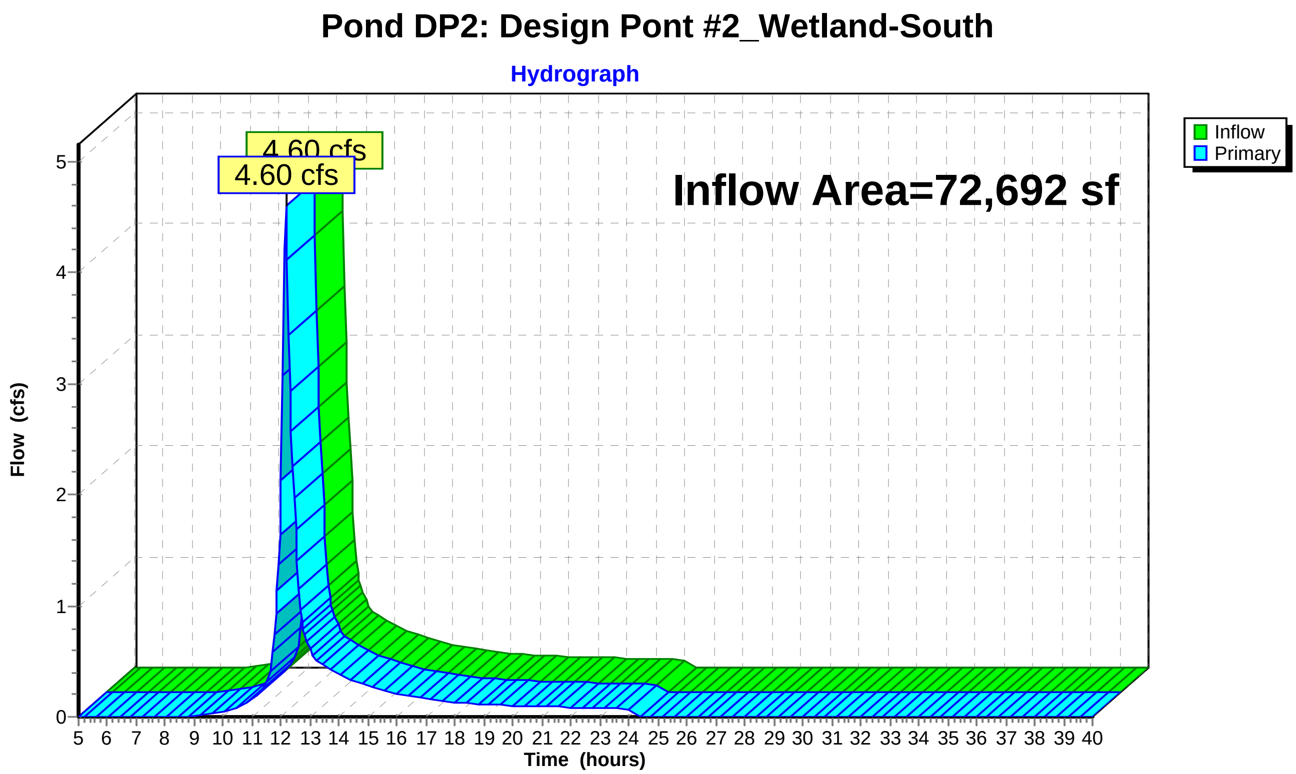


Summary for Pond DP2: Design Pont #2_Wetland-South

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	72,692 sf, 10.40% Impervious,	Inflow Depth = 2.74"	for 25-yr event
Inflow =	4.60 cfs @ 12.15 hrs, Volume=	16,589 cf	
Primary =	4.60 cfs @ 12.15 hrs, Volume=	16,589 cf, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs

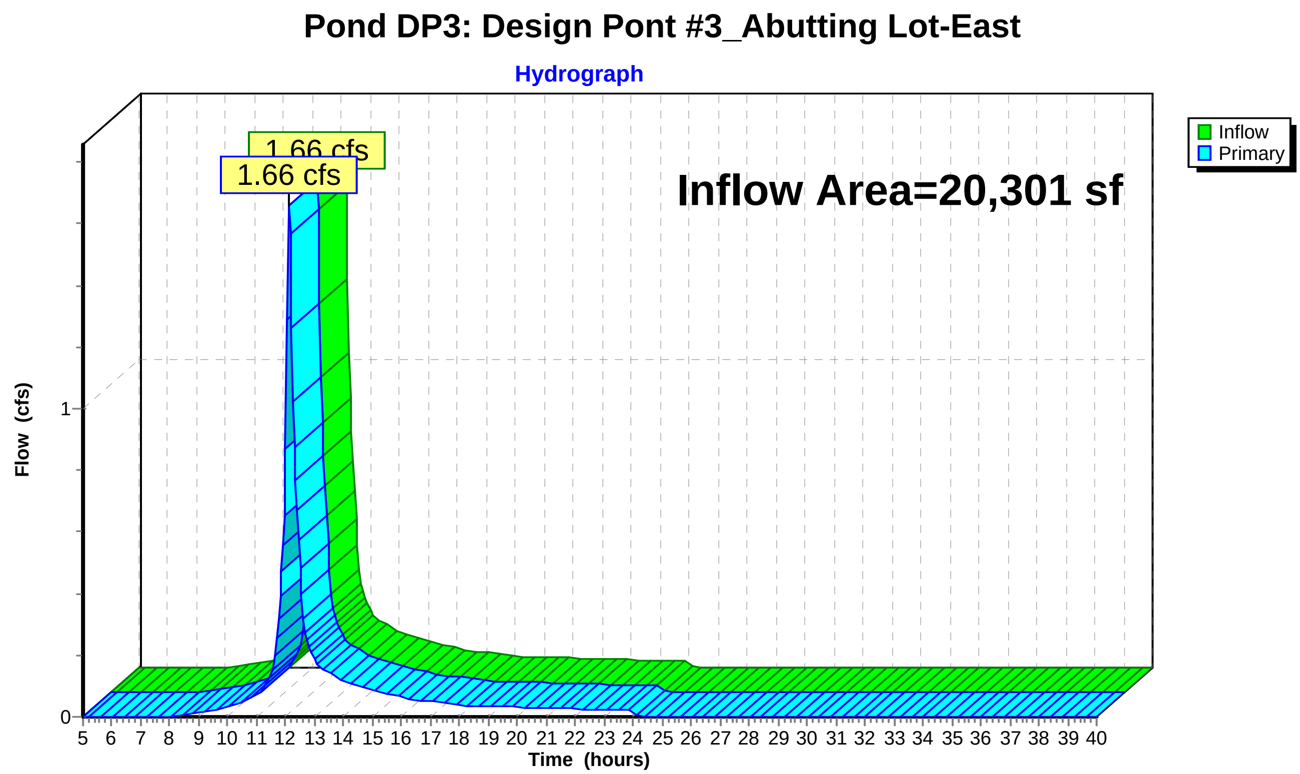


Summary for Pond DP3: Design Pont #3_Abutting Lot-East

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 20,301 sf, 11.97% Impervious, Inflow Depth = 3.31" for 25-yr event
Inflow = 1.66 cfs @ 12.12 hrs, Volume= 5,591 cf
Primary = 1.66 cfs @ 12.12 hrs, Volume= 5,591 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs



Existing Conditions Analysis
50-Year 24-Hour Storm Event

Time span=5.00-40.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment X1: Subcatchment X1 Runoff Area=15,689 sf 52.60% Impervious Runoff Depth>5.57"
Flow Length=320' Tc=12.2 min CN=87 Runoff=1.85 cfs 7,285 cf

Subcatchment X2: Subcatchment X2 Runoff Area=72,692 sf 10.40% Impervious Runoff Depth=3.81"
Flow Length=386' Tc=10.0 min CN=71 Runoff=6.43 cfs 23,066 cf

Subcatchment X3: Subcatchment X3 Runoff Area=20,301 sf 11.97% Impervious Runoff Depth=4.46"
Flow Length=187' Tc=8.1 min CN=77 Runoff=2.23 cfs 7,538 cf

Pond DP1: Design Pont #1_18" RCP Culvert - Northwest Inflow=1.85 cfs 7,285 cf
Primary=1.85 cfs 7,285 cf

Pond DP2: Design Pont #2_Wetland-South Inflow=6.43 cfs 23,066 cf
Primary=6.43 cfs 23,066 cf

Pond DP3: Design Pont #3_Abutting Lot-East Inflow=2.23 cfs 7,538 cf
Primary=2.23 cfs 7,538 cf

Total Runoff Area = 108,682 sf Runoff Volume = 37,889 cf Average Runoff Depth = 4.18"
83.22% Pervious = 90,440 sf 16.78% Impervious = 18,242 sf

Summary for Subcatchment X1: Subcatchment X1

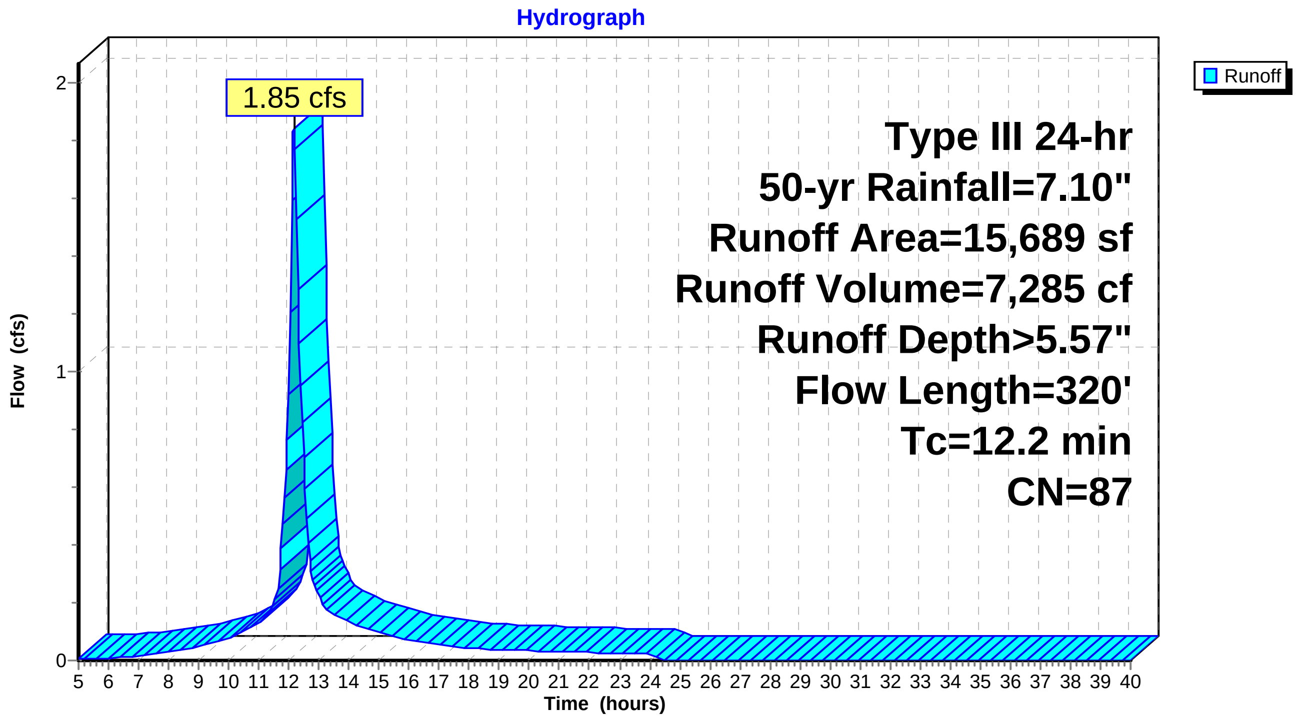
Runoff = 1.85 cfs @ 12.16 hrs, Volume= 7,285 cf, Depth> 5.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

Area (sf)	CN	Description
7,437	74	>75% Grass cover, Good, HSG C
6,684	98	Paved parking, HSG C
1,568	98	Roofs, HSG C
15,689	87	Weighted Average
7,437		47.40% Pervious Area
8,252		52.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0200	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
2.4	220	0.0472	1.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.2	320	Total			

Subcatchment X1: Subcatchment X1



Summary for Subcatchment X2: Subcatchment X2

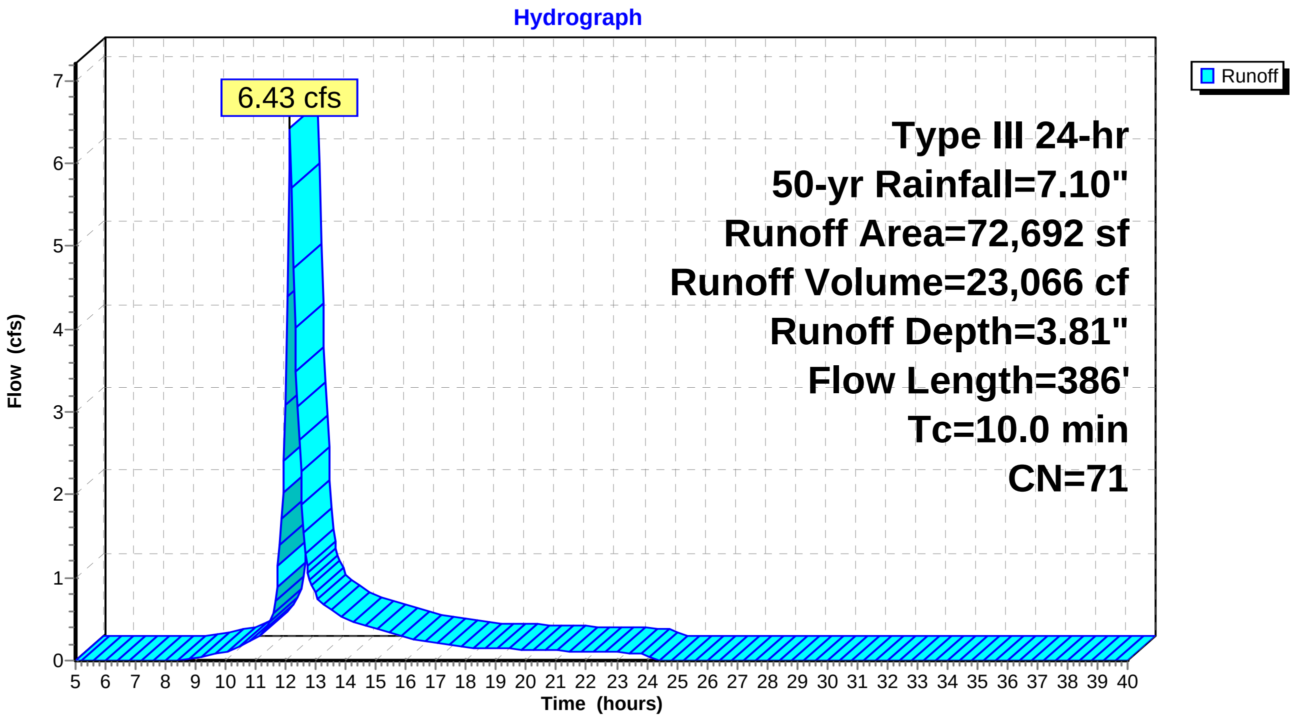
Runoff = 6.43 cfs @ 12.15 hrs, Volume= 23,066 cf, Depth= 3.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

	Area (sf)	CN	Description
	1,427	98	Roofs, HSG C
*	469	98	Unconnected roofs, HSG C, Container
	5,663	98	Paved parking, HSG C
	19,152	74	>75% Grass cover, Good, HSG C
	36,544	65	Brush, Good, HSG C
*	9,437	65	Brush, Good, HSG C, Wetland Brush
	72,692	71	Weighted Average
	65,133		89.60% Pervious Area
	7,559		10.40% Impervious Area
	469		6.20% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0425	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
1.4	115	0.0370	1.35		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	171	0.0180	2.01		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.0	386	Total			

Subcatchment X2: Subcatchment X2



Summary for Subcatchment X3: Subcatchment X3

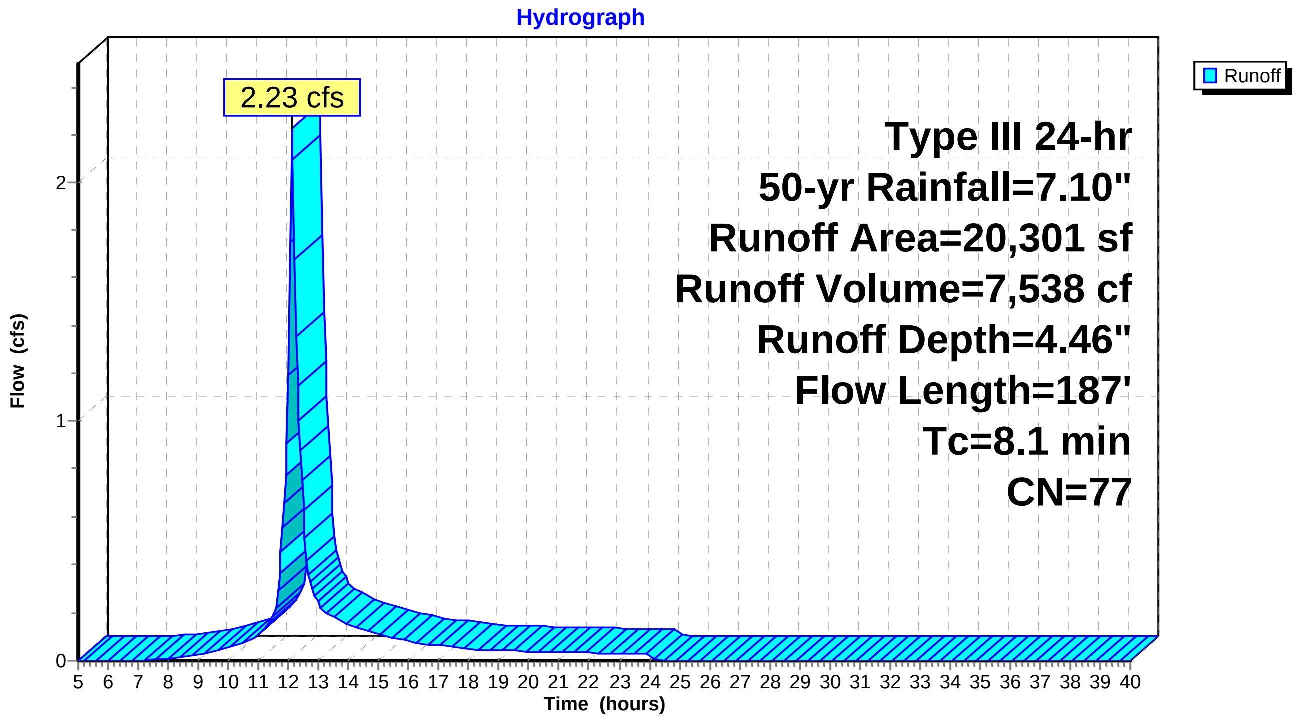
Runoff = 2.23 cfs @ 12.12 hrs, Volume= 7,538 cf, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

Area (sf)	CN	Description
17,870	74	>75% Grass cover, Good, HSG C
252	98	Paved parking, HSG C
2,179	98	Roofs, HSG C
20,301	77	Weighted Average
17,870		88.03% Pervious Area
2,431		11.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0500	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
1.3	87	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.1	187	Total			

Subcatchment X3: Subcatchment X3

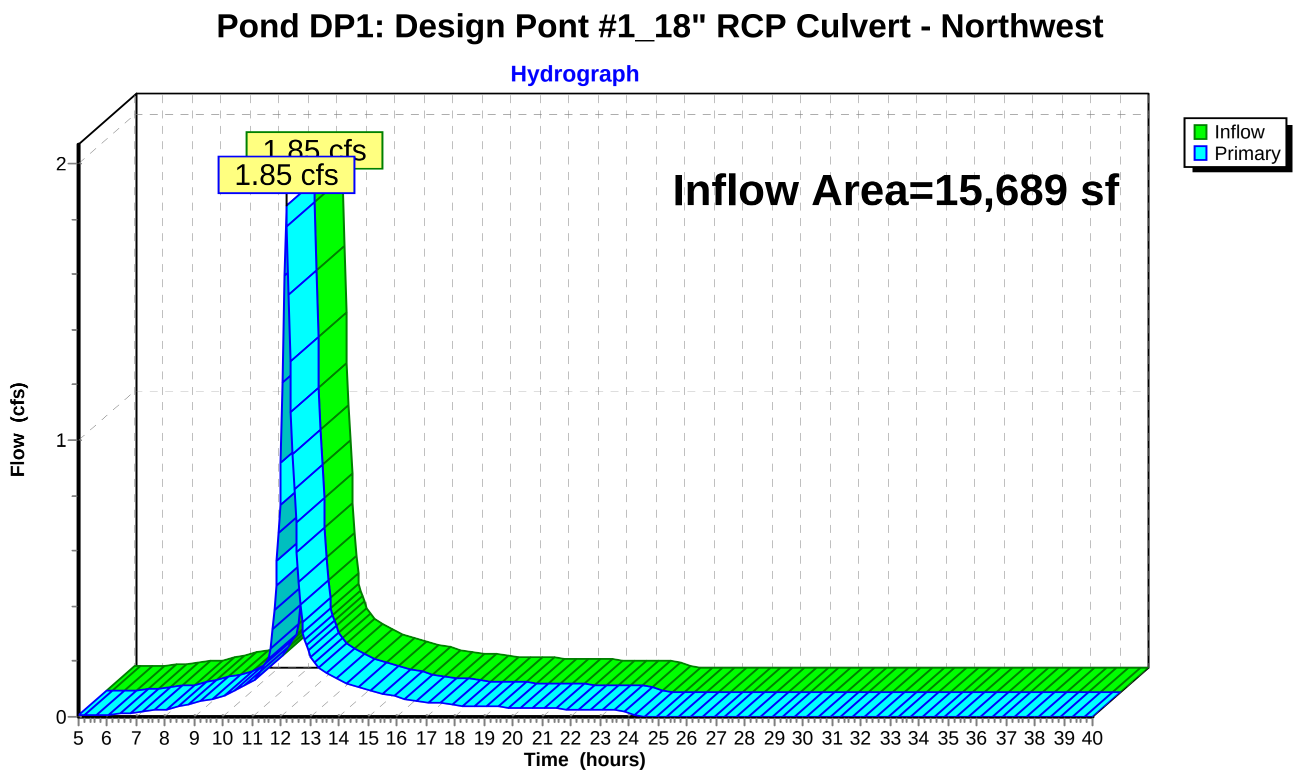


Summary for Pond DP1: Design Pont #1_18" RCP Culvert - Northwest

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	15,689 sf,	52.60% Impervious,	Inflow Depth > 5.57"	for 50-yr event
Inflow =	1.85 cfs @	12.16 hrs, Volume=	7,285 cf	
Primary =	1.85 cfs @	12.16 hrs, Volume=	7,285 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs



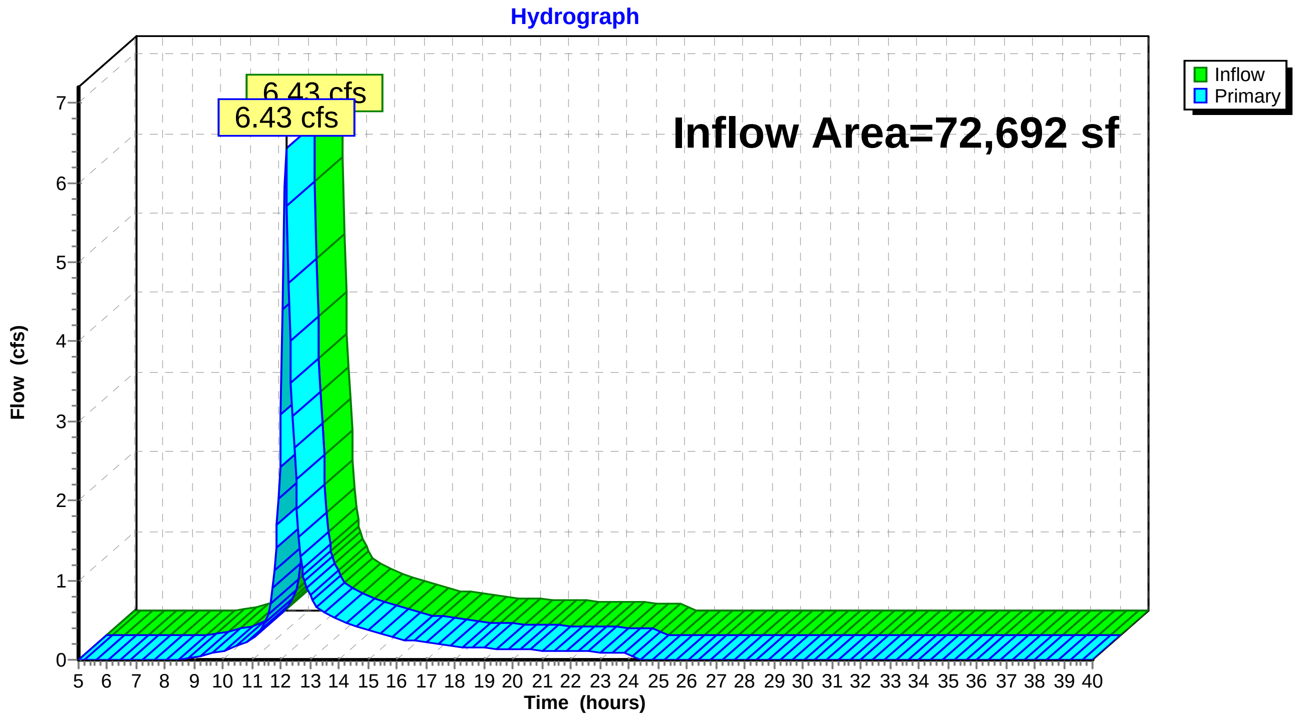
Summary for Pond DP2: Design Pont #2_Wetland-South

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	72,692 sf, 10.40% Impervious,	Inflow Depth = 3.81"	for 50-yr event
Inflow =	6.43 cfs @ 12.15 hrs, Volume=	23,066 cf	
Primary =	6.43 cfs @ 12.15 hrs, Volume=	23,066 cf, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs

Pond DP2: Design Pont #2_Wetland-South

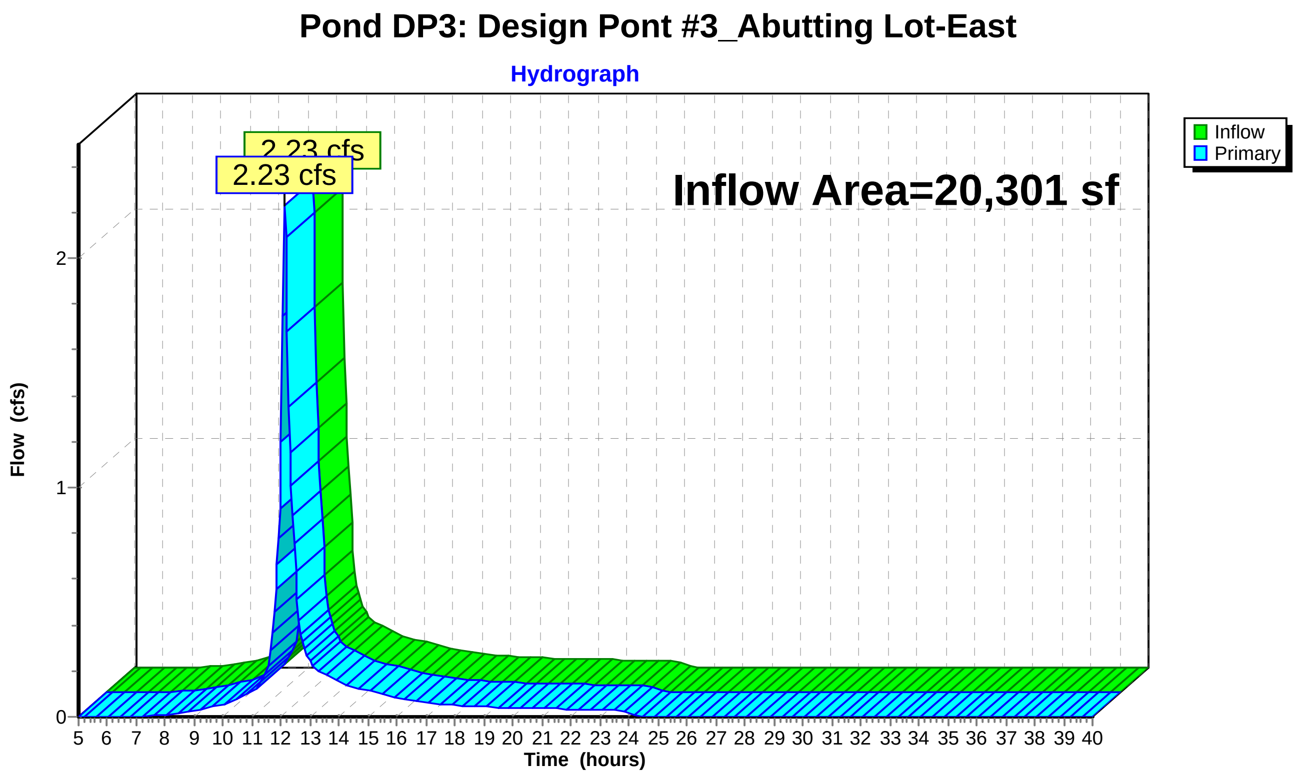


Summary for Pond DP3: Design Pont #3_Abutting Lot-East

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 20,301 sf, 11.97% Impervious, Inflow Depth = 4.46" for 50-yr event
Inflow = 2.23 cfs @ 12.12 hrs, Volume= 7,538 cf
Primary = 2.23 cfs @ 12.12 hrs, Volume= 7,538 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs



Existing Conditions Analysis
100-Year 24-Hour Storm Event

Time span=5.00-40.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment X1: Subcatchment X1 Runoff Area=15,689 sf 52.60% Impervious Runoff Depth>6.73"
Flow Length=320' Tc=12.2 min CN=87 Runoff=2.21 cfs 8,797 cf

Subcatchment X2: Subcatchment X2 Runoff Area=72,692 sf 10.40% Impervious Runoff Depth=4.84"
Flow Length=386' Tc=10.0 min CN=71 Runoff=8.17 cfs 29,324 cf

Subcatchment X3: Subcatchment X3 Runoff Area=20,301 sf 11.97% Impervious Runoff Depth=5.55"
Flow Length=187' Tc=8.1 min CN=77 Runoff=2.76 cfs 9,390 cf

Pond DP1: Design Pont #1_18" RCP Culvert - Northwest Inflow=2.21 cfs 8,797 cf
Primary=2.21 cfs 8,797 cf

Pond DP2: Design Pont #2_Wetland-South Inflow=8.17 cfs 29,324 cf
Primary=8.17 cfs 29,324 cf

Pond DP3: Design Pont #3_Abutting Lot-East Inflow=2.76 cfs 9,390 cf
Primary=2.76 cfs 9,390 cf

Total Runoff Area = 108,682 sf Runoff Volume = 47,511 cf Average Runoff Depth = 5.25"
83.22% Pervious = 90,440 sf 16.78% Impervious = 18,242 sf

Summary for Subcatchment X1: Subcatchment X1

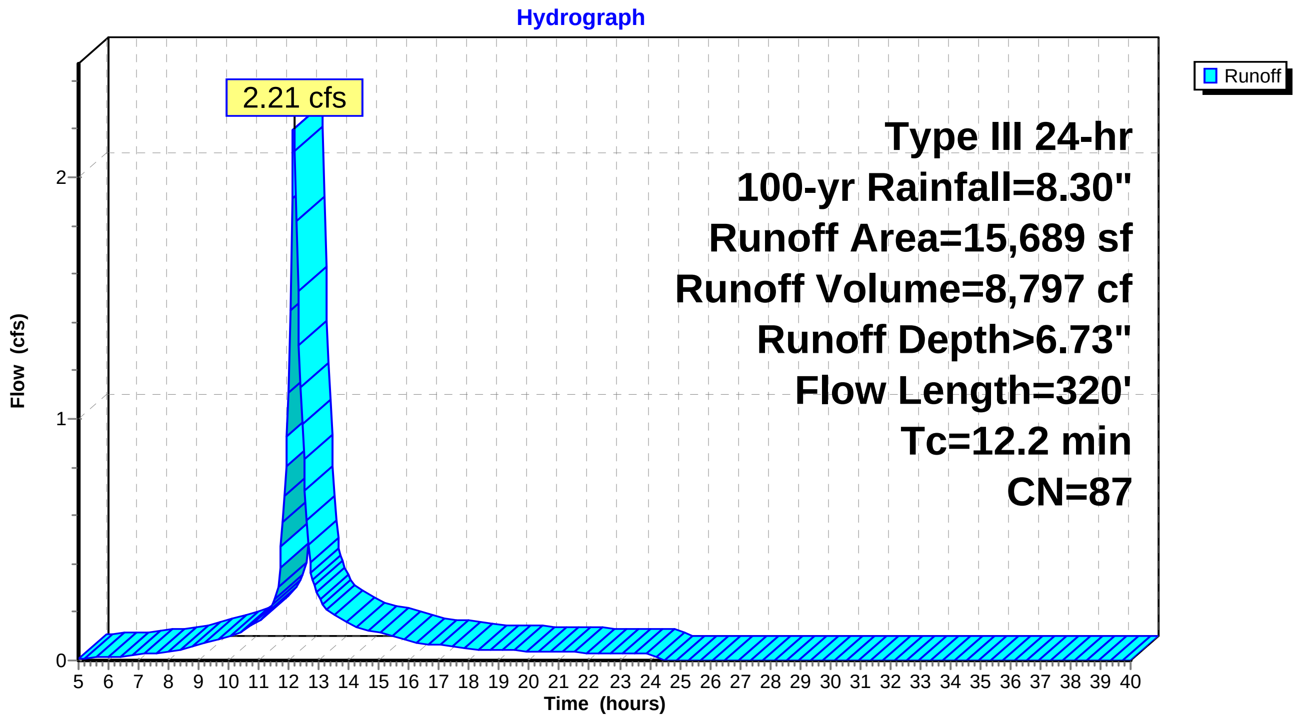
Runoff = 2.21 cfs @ 12.16 hrs, Volume= 8,797 cf, Depth> 6.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

Area (sf)	CN	Description
7,437	74	>75% Grass cover, Good, HSG C
6,684	98	Paved parking, HSG C
1,568	98	Roofs, HSG C
15,689	87	Weighted Average
7,437		47.40% Pervious Area
8,252		52.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0200	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
2.4	220	0.0472	1.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.2	320	Total			

Subcatchment X1: Subcatchment X1



Summary for Subcatchment X2: Subcatchment X2

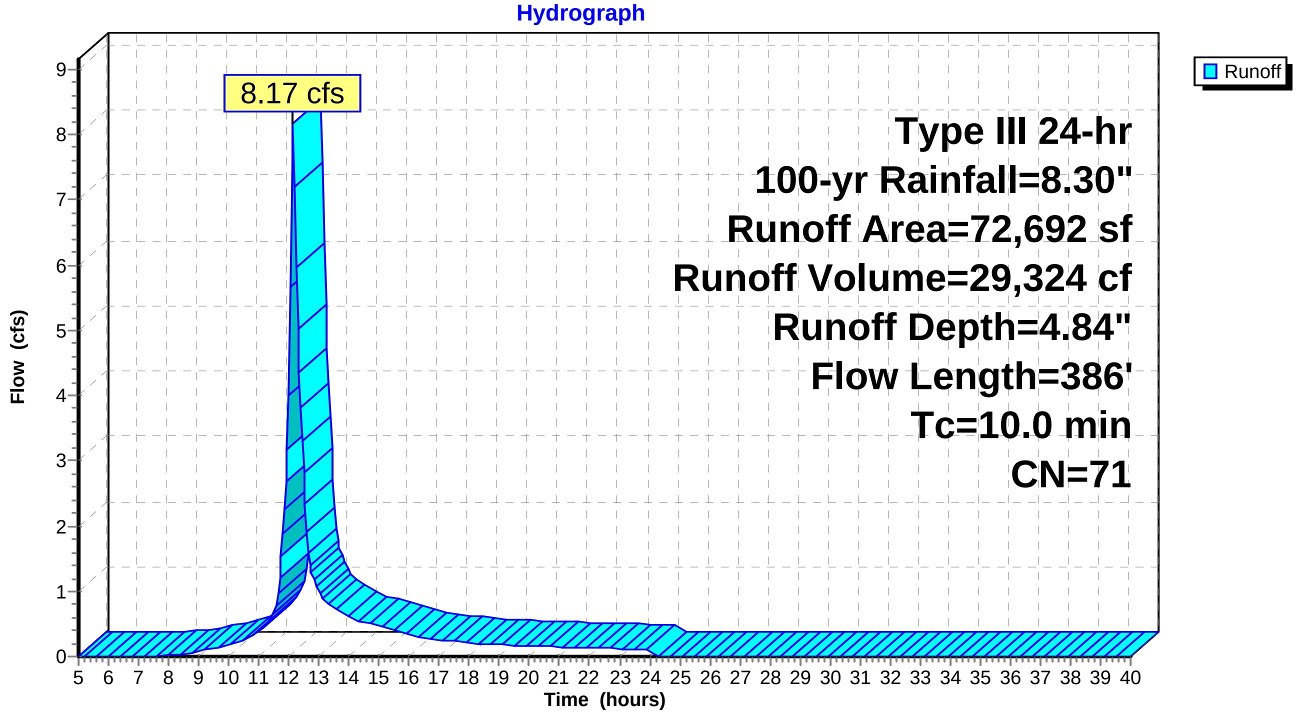
Runoff = 8.17 cfs @ 12.14 hrs, Volume= 29,324 cf, Depth= 4.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

	Area (sf)	CN	Description
	1,427	98	Roofs, HSG C
*	469	98	Unconnected roofs, HSG C, Container
	5,663	98	Paved parking, HSG C
	19,152	74	>75% Grass cover, Good, HSG C
	36,544	65	Brush, Good, HSG C
*	9,437	65	Brush, Good, HSG C, Wetland Brush
	72,692	71	Weighted Average
	65,133		89.60% Pervious Area
	7,559		10.40% Impervious Area
	469		6.20% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0425	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
1.4	115	0.0370	1.35		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	171	0.0180	2.01		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.0	386	Total			

Subcatchment X2: Subcatchment X2



Summary for Subcatchment X3: Subcatchment X3

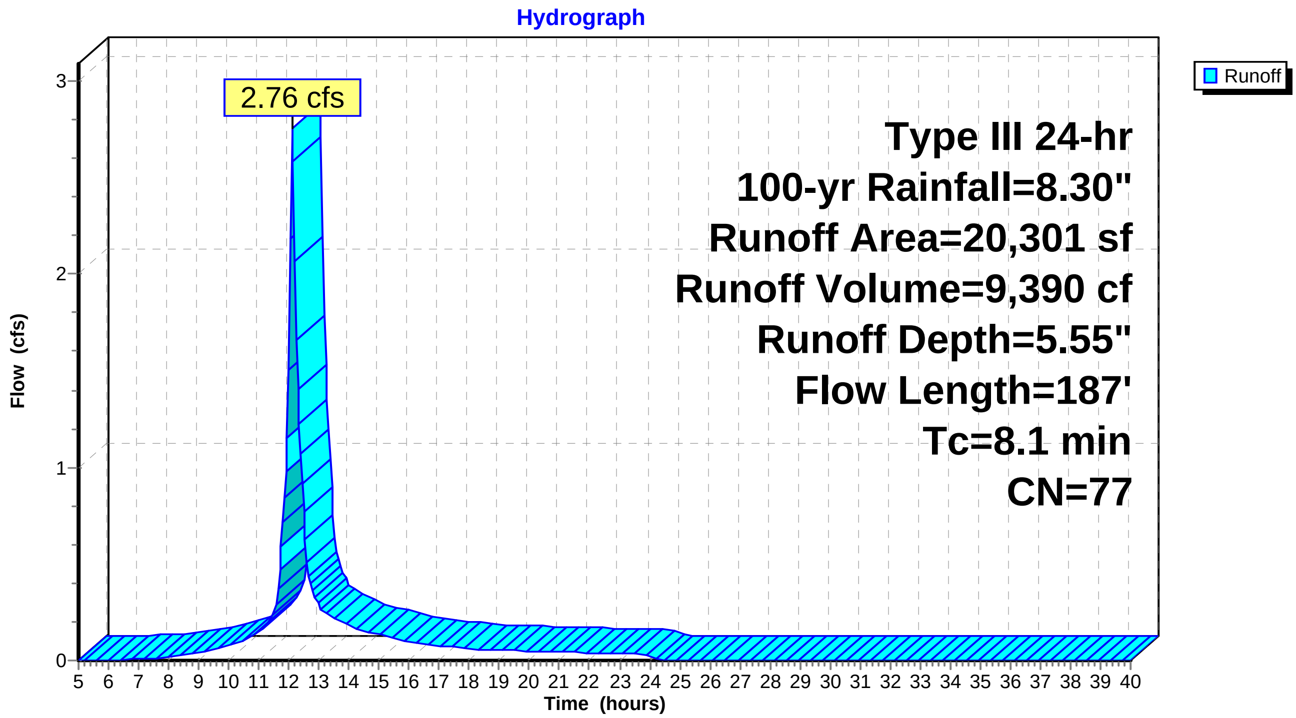
Runoff = 2.76 cfs @ 12.11 hrs, Volume= 9,390 cf, Depth= 5.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

Area (sf)	CN	Description
17,870	74	>75% Grass cover, Good, HSG C
252	98	Paved parking, HSG C
2,179	98	Roofs, HSG C
20,301	77	Weighted Average
17,870		88.03% Pervious Area
2,431		11.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0500	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.22"
1.3	87	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.1	187	Total			

Subcatchment X3: Subcatchment X3

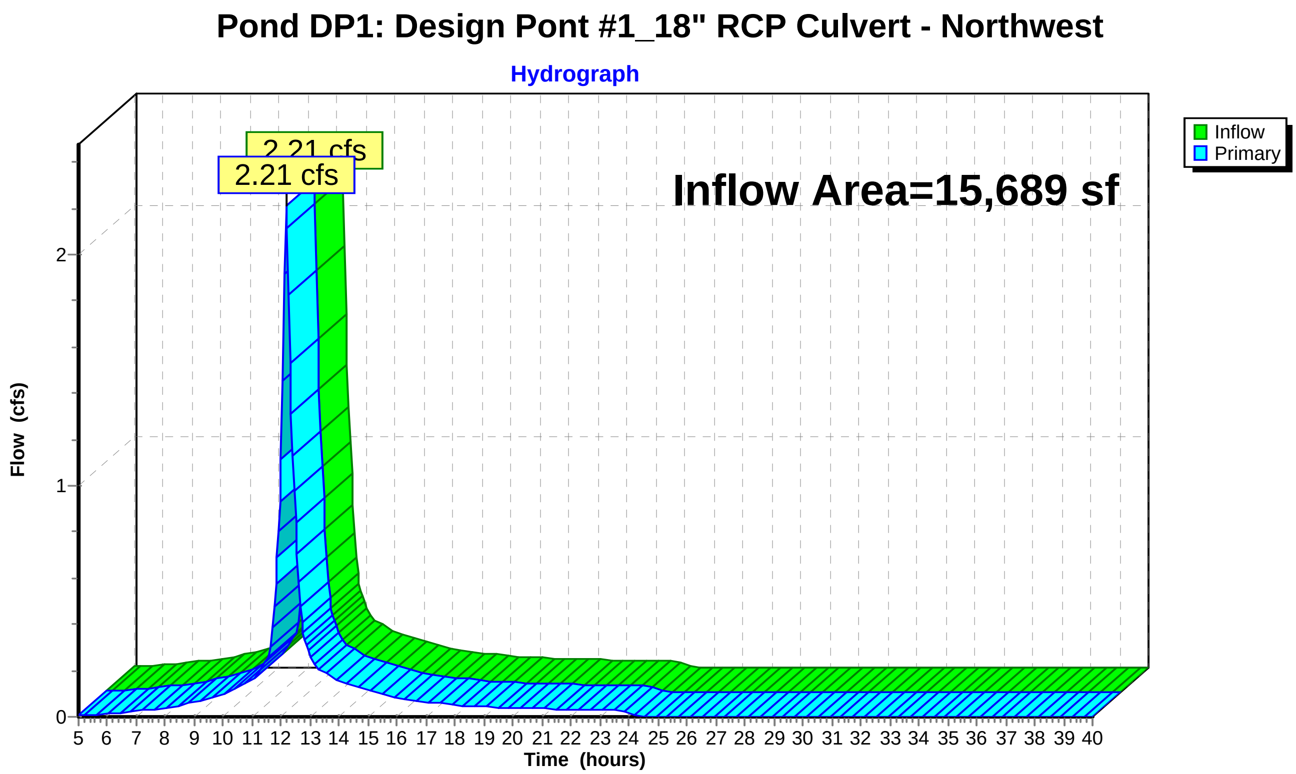


Summary for Pond DP1: Design Pont #1_18" RCP Culvert - Northwest

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	15,689 sf,	52.60% Impervious,	Inflow Depth > 6.73"	for 100-yr event
Inflow =	2.21 cfs @	12.16 hrs, Volume=	8,797 cf	
Primary =	2.21 cfs @	12.16 hrs, Volume=	8,797 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs



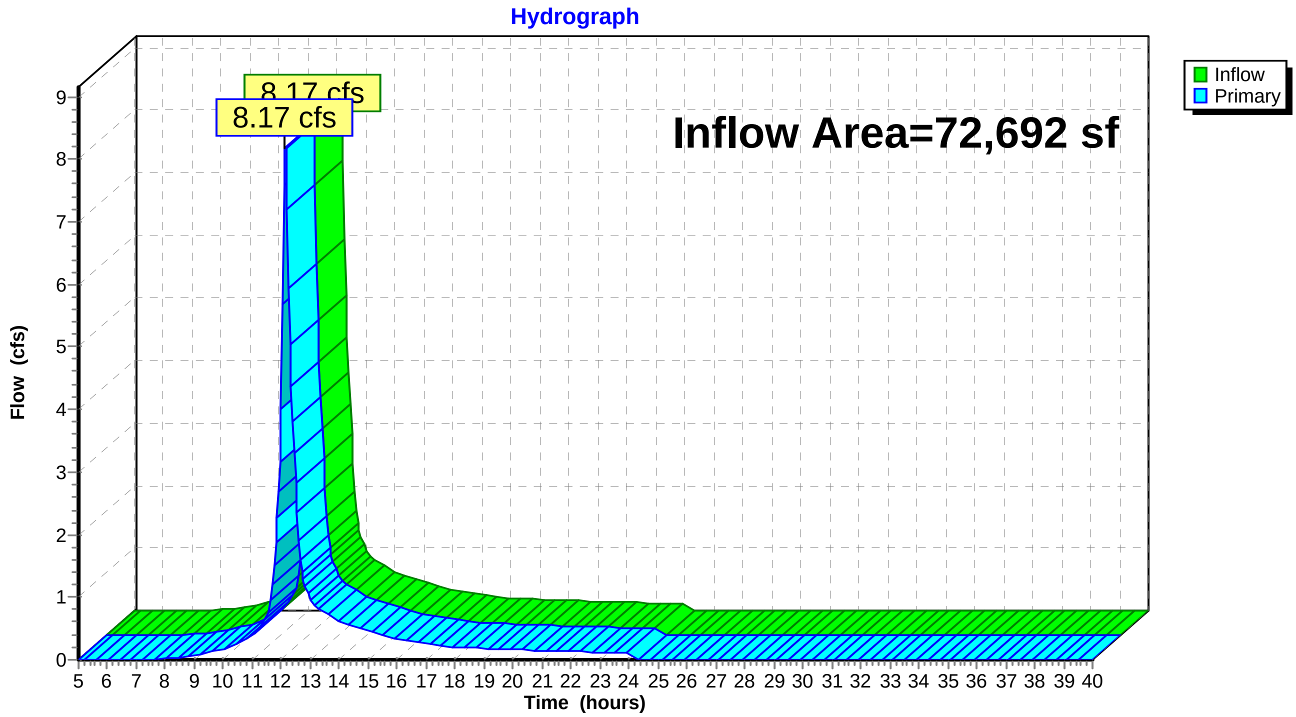
Summary for Pond DP2: Design Pont #2_Wetland-South

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 72,692 sf, 10.40% Impervious, Inflow Depth = 4.84" for 100-yr event
Inflow = 8.17 cfs @ 12.14 hrs, Volume= 29,324 cf
Primary = 8.17 cfs @ 12.14 hrs, Volume= 29,324 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs

Pond DP2: Design Pont #2_Wetland-South

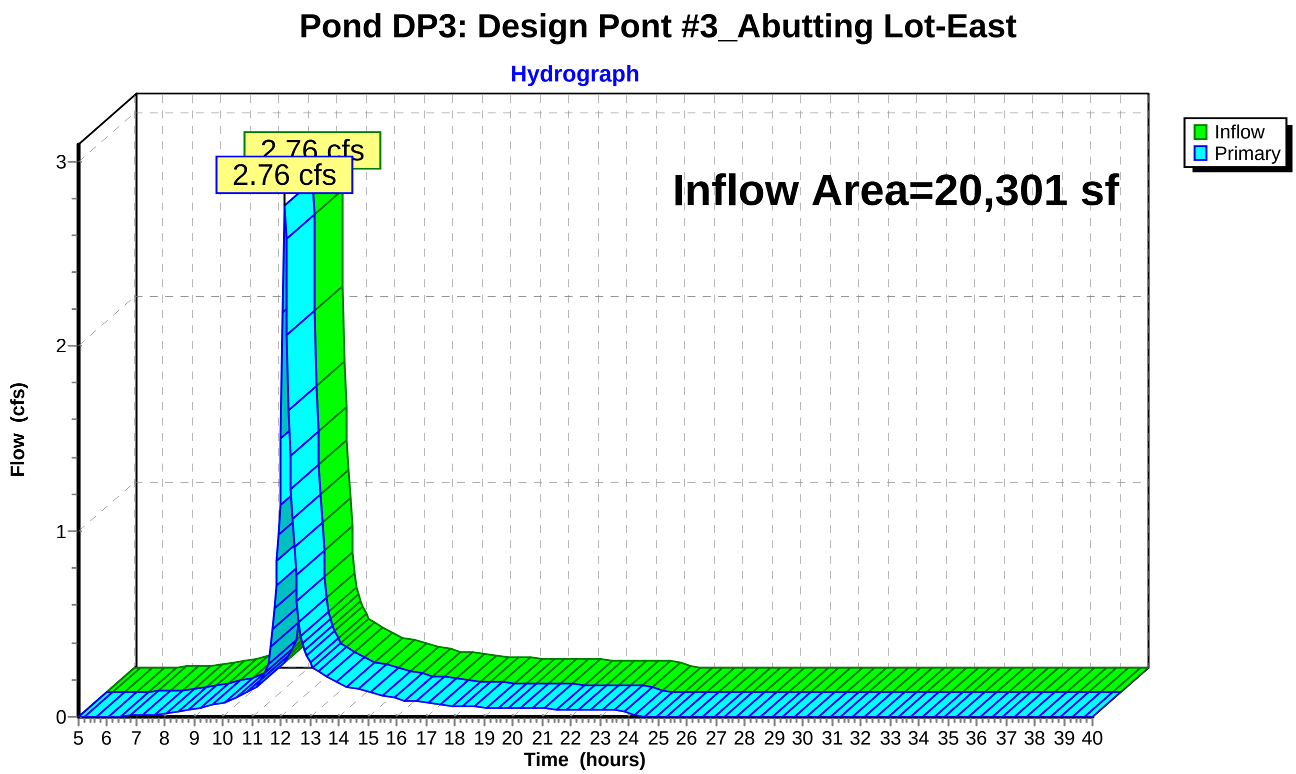


Summary for Pond DP3: Design Pont #3_Abutting Lot-East

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	20,301 sf,	11.97% Impervious,	Inflow Depth = 5.55"	for 100-yr event
Inflow =	2.76 cfs @	12.11 hrs, Volume=	9,390 cf	
Primary =	2.76 cfs @	12.11 hrs, Volume=	9,390 cf,	Atten= 0%, Lag= 0.0 min

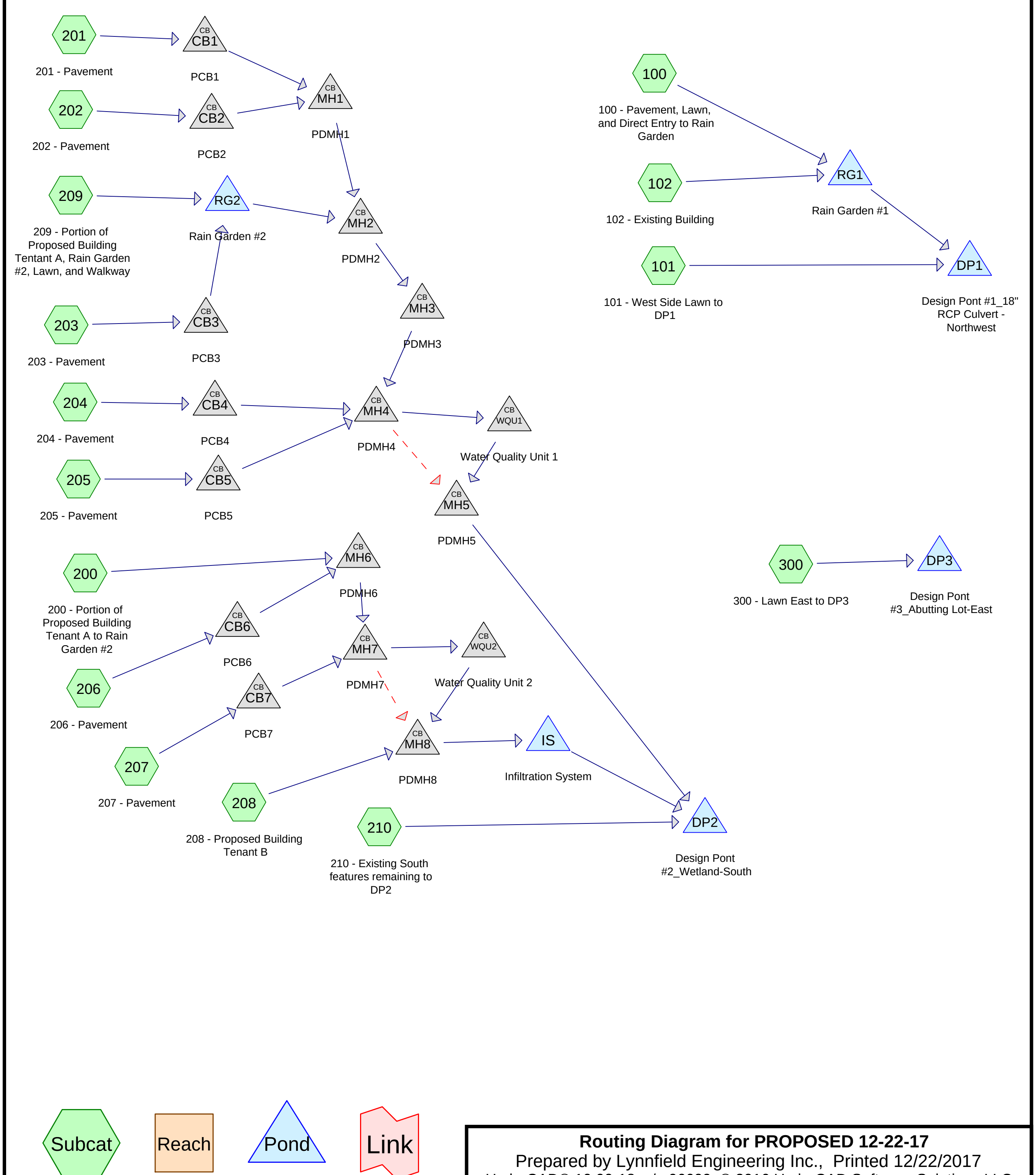
Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs



ATTACHMENT A-2

Proposed Conditions Analysis

Proposed Conditions Analysis
2-Year 24-Hour Storm Event



Routing Diagram for PROPOSED 12-22-17
Prepared by Lynnfield Engineering Inc., Printed 12/22/2017
HydroCAD® 10.00-18 s/n 06609 © 2016 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,078	79	50-75% Grass cover, Fair, HSG C (209)
7,225	74	>75% Grass cover, Good, HSG C (100, 101, 201, 203, 300)
35,498	65	Brush, Good, HSG C (210)
9,437	65	Brush, Good, HSG C, Wetland Brush (210)
33,796	98	Paved parking, HSG C (100, 201, 202, 203, 204, 205, 206, 207)
876	65	Rain Garden Surface Area (209)
6,173	65	Rain Garden surface area (100)
4,287	98	Roofs, HSG C (208)
5,175	98	Roofs, HSG C, Existing Building (102)
2,107	98	Roofs, HSG C, Half Prop. Building A (200)
84	98	Unconnected pavement, HSG C (209)
1,952	98	Unconnected roofs, HSG C (209)

Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100: 100 - Pavement, Lawn, Runoff Area=20,037 sf 45.35% Impervious Runoff Depth=1.46"
Tc=6.0 min CN=82 Runoff=0.77 cfs 2,435 cf

Subcatchment 101: 101 - West Side Lawn to Runoff Area=271 sf 0.00% Impervious Runoff Depth=0.97"
Tc=6.0 min CN=74 Runoff=0.01 cfs 22 cf

Subcatchment 102: 102 - Existing Building Runoff Area=5,175 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.35 cfs 1,237 cf

Subcatchment 200: 200 - Portion of Runoff Area=2,107 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.14 cfs 504 cf

Subcatchment 201: 201 - Pavement Runoff Area=2,187 sf 95.93% Impervious Runoff Depth=2.76"
Tc=6.0 min CN=97 Runoff=0.15 cfs 503 cf

Subcatchment 202: 202 - Pavement Runoff Area=1,651 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.11 cfs 395 cf

Subcatchment 203: 203 - Pavement Runoff Area=5,013 sf 96.69% Impervious Runoff Depth=2.76"
Tc=6.0 min CN=97 Runoff=0.33 cfs 1,152 cf

Subcatchment 204: 204 - Pavement Runoff Area=4,813 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.32 cfs 1,150 cf

Subcatchment 205: 205 - Pavement Runoff Area=3,480 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.23 cfs 832 cf

Subcatchment 206: 206 - Pavement Runoff Area=5,141 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.35 cfs 1,229 cf

Subcatchment 207: 207 - Pavement Runoff Area=2,680 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.18 cfs 640 cf

Subcatchment 208: 208 - Proposed Runoff Area=4,287 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.29 cfs 1,025 cf

Subcatchment 209: 209 - Portion of Runoff Area=4,990 sf 40.80% Impervious Runoff Depth=1.60"
Tc=6.0 min CN=84 Runoff=0.21 cfs 665 cf

Subcatchment 210: 210 - Existing South Runoff Area=44,935 sf 0.00% Impervious Runoff Depth=0.55"
Flow Length=210' Tc=10.6 min CN=65 Runoff=0.42 cfs 2,069 cf

Subcatchment 300: 300 - Lawn East to DP3 Runoff Area=1,921 sf 0.00% Impervious Runoff Depth=0.97"
Tc=6.0 min CN=74 Runoff=0.05 cfs 156 cf

Pond CB1: PCB1 Peak Elev=16.81' Inflow=0.15 cfs 503 cf
12.0" Round Culvert n=0.013 L=21.0' S=0.0095 '/' Outflow=0.15 cfs 503 cf

Pond CB2: PCB2 Peak Elev=16.78' Inflow=0.11 cfs 395 cf
12.0" Round Culvert n=0.013 L=21.0' S=0.0095 '/' Outflow=0.11 cfs 395 cf

Pond CB3: PCB3 Peak Elev=18.32' Inflow=0.33 cfs 1,152 cf
12.0" Round Culvert n=0.013 L=64.0' S=0.0063 '/' Outflow=0.33 cfs 1,152 cf

Pond CB4: PCB4 Peak Elev=15.42' Inflow=0.32 cfs 1,150 cf
12.0" Round Culvert n=0.013 L=94.0' S=0.0085 '/' Outflow=0.32 cfs 1,150 cf

Pond CB5: PCB5 Peak Elev=15.10' Inflow=0.23 cfs 832 cf
12.0" Round Culvert n=0.013 L=93.0' S=0.0054 '/' Outflow=0.23 cfs 832 cf

Pond CB6: PCB6 Peak Elev=20.25' Inflow=0.35 cfs 1,229 cf
12.0" Round Culvert n=0.013 L=78.0' S=0.0051 '/' Outflow=0.35 cfs 1,229 cf

Pond CB7: PCB7 Peak Elev=19.21' Inflow=0.18 cfs 640 cf
12.0" Round Culvert n=0.013 L=11.0' S=0.0091 '/' Outflow=0.18 cfs 640 cf

Pond DP1: Design Pont #1_18" RCP Culvert - Northwest Inflow=0.21 cfs 2,715 cf
Primary=0.21 cfs 2,715 cf

Pond DP2: Design Pont #2_Wetland-South Inflow=1.16 cfs 6,075 cf
Primary=1.16 cfs 6,075 cf

Pond DP3: Design Pont #3_Abutting Lot-East Inflow=0.05 cfs 156 cf
Primary=0.05 cfs 156 cf

Pond IS: Infiltration System Peak Elev=16.83' Storage=556 cf Inflow=0.96 cfs 3,397 cf
Discarded=0.28 cfs 3,397 cf Primary=0.00 cfs 0 cf Outflow=0.28 cfs 3,397 cf

Pond MH1: PDMH1 Peak Elev=16.58' Inflow=0.26 cfs 897 cf
12.0" Round Culvert n=0.013 L=85.0' S=0.0059 '/' Outflow=0.26 cfs 897 cf

Pond MH2: PDMH2 Peak Elev=16.04' Inflow=0.35 cfs 2,024 cf
12.0" Round Culvert n=0.013 L=115.0' S=0.0052 '/' Outflow=0.35 cfs 2,024 cf

Pond MH3: PDMH3 Peak Elev=15.36' Inflow=0.35 cfs 2,024 cf
12.0" Round Culvert n=0.013 L=138.0' S=0.0051 '/' Outflow=0.35 cfs 2,024 cf

Pond MH4: PDMH4 Peak Elev=14.71' Inflow=0.82 cfs 4,006 cf
Primary=0.72 cfs 3,924 cf Secondary=0.10 cfs 82 cf Outflow=0.82 cfs 4,006 cf

Pond MH5: PDMH5 Peak Elev=14.13' Inflow=0.82 cfs 4,006 cf
12.0" Round Culvert n=0.013 L=23.0' S=0.0087 '/' Outflow=0.82 cfs 4,006 cf

Pond MH6: PDMH6 Peak Elev=19.81' Inflow=0.49 cfs 1,732 cf
12.0" Round Culvert n=0.013 L=120.0' S=0.0050 '/' Outflow=0.49 cfs 1,732 cf

Pond MH7: PDMH7 Peak Elev=19.16' Inflow=0.67 cfs 2,373 cf
Primary=0.57 cfs 2,321 cf Secondary=0.09 cfs 52 cf Outflow=0.67 cfs 2,373 cf

Pond MH8: PDMH8 Peak Elev=18.71' Inflow=0.96 cfs 3,397 cf
12.0" Round Culvert n=0.013 L=9.0' S=0.0111 '/' Outflow=0.96 cfs 3,397 cf

Pond RG1: Rain Garden #1 Peak Elev=15.68' Storage=1,849 cf Inflow=1.12 cfs 3,671 cf
Outflow=0.21 cfs 2,693 cf

Pond RG2: Rain Garden #2 Peak Elev=18.29' Storage=850 cf Inflow=0.54 cfs 1,817 cf
Outflow=0.24 cfs 1,127 cf

Pond WQU1: Water Quality Unit 1 Peak Elev=14.33' Inflow=0.72 cfs 3,924 cf
12.0" Round Culvert n=0.013 L=9.0' S=0.0111 '/' Outflow=0.72 cfs 3,924 cf

Pond WQU2: Water Quality Unit 2 Peak Elev=18.82' Inflow=0.57 cfs 2,321 cf
12.0" Round Culvert n=0.013 L=6.0' S=0.0167 '/' Outflow=0.57 cfs 2,321 cf

Summary for Subcatchment 100: 100 - Pavement, Lawn, and Direct Entry to Rain Garden

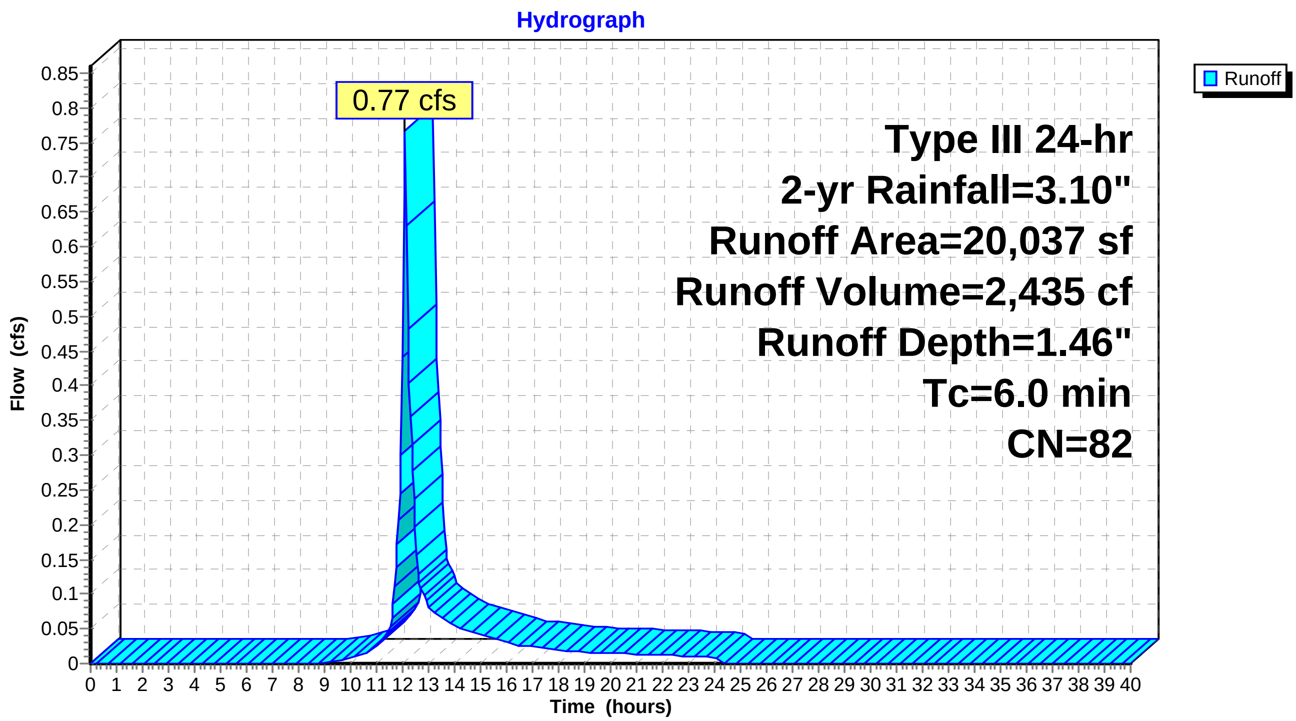
Runoff = 0.77 cfs @ 12.09 hrs, Volume= 2,435 cf, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

	Area (sf)	CN	Description
	4,778	74	>75% Grass cover, Good, HSG C
*	6,173	65	Rain Garden surface area
	9,086	98	Paved parking, HSG C
	20,037	82	Weighted Average
	10,951		54.65% Pervious Area
	9,086		45.35% Impervious Area

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

Subcatchment 100: 100 - Pavement, Lawn, and Direct Entry to Rain Garden



Summary for Subcatchment 101: 101 - West Side Lawn to DP1

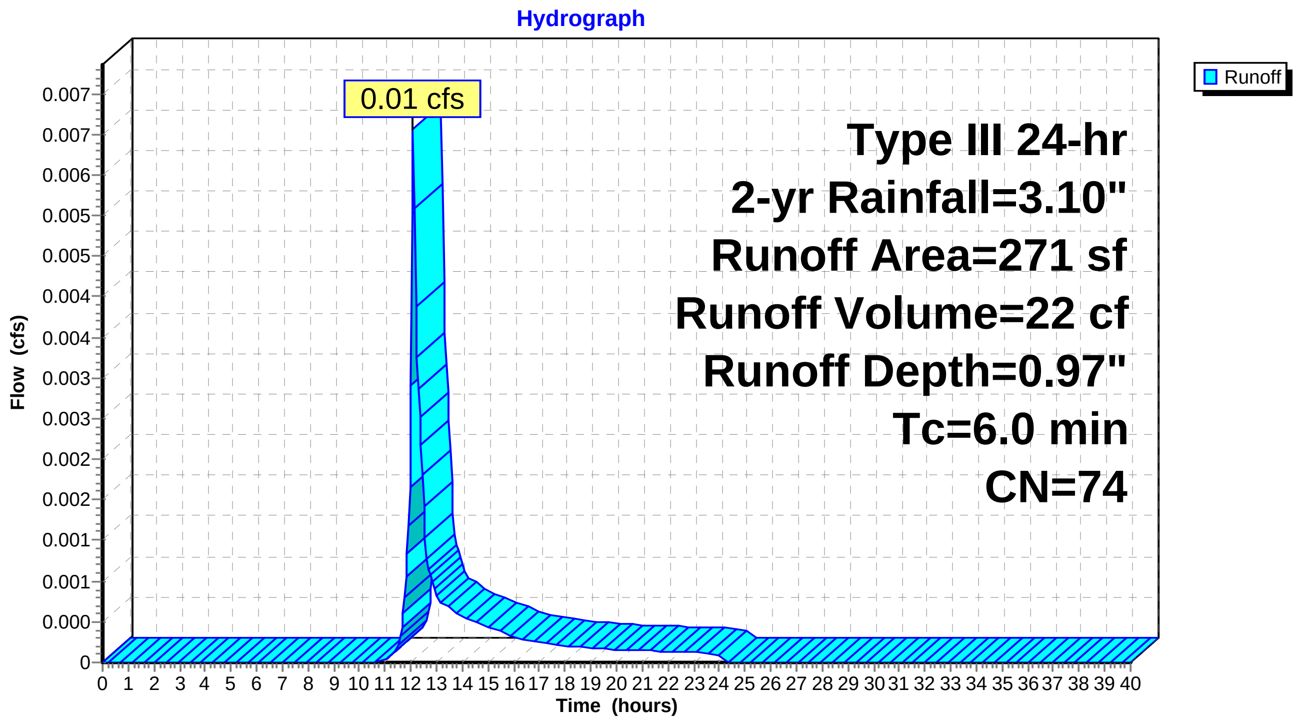
Runoff = 0.01 cfs @ 12.10 hrs, Volume= 22 cf, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
271	74	>75% Grass cover, Good, HSG C
271		100.00% Pervious Area

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

Subcatchment 101: 101 - West Side Lawn to DP1



Summary for Subcatchment 102: 102 - Existing Building

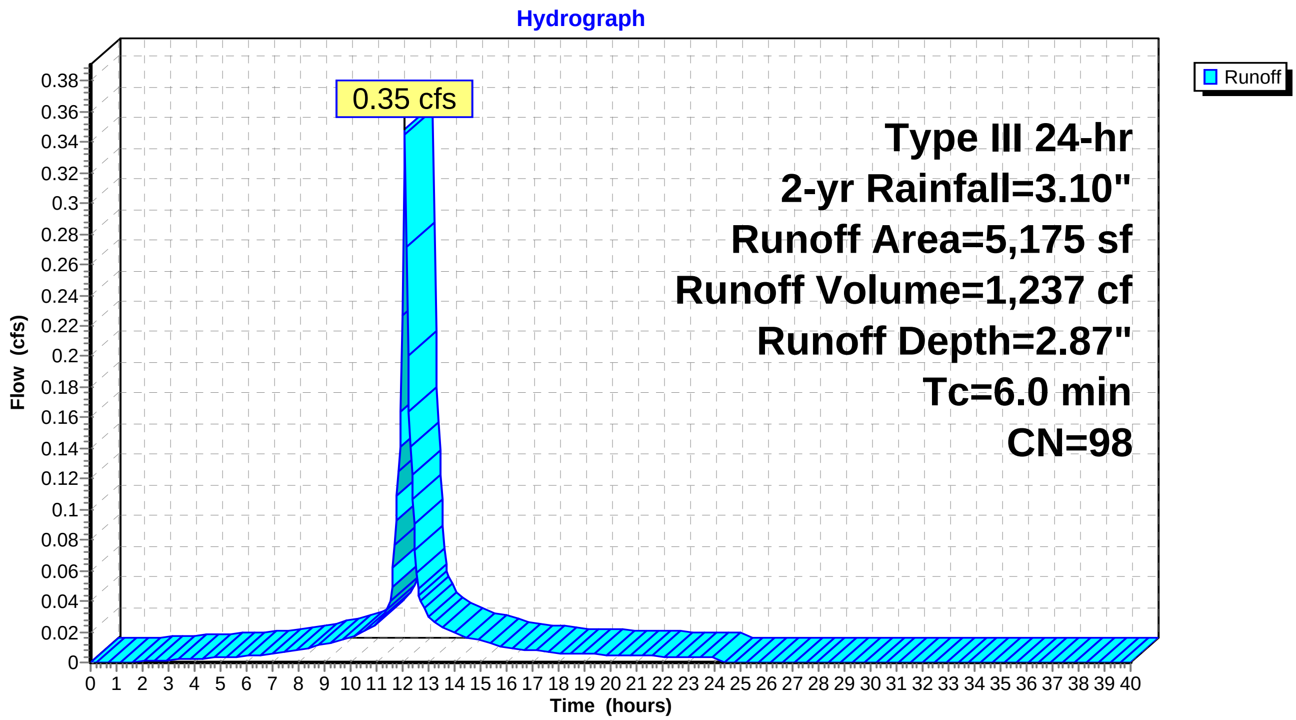
Runoff = 0.35 cfs @ 12.09 hrs, Volume= 1,237 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

	Area (sf)	CN	Description
*	5,175	98	Roofs, HSG C, Existing Building
	5,175		100.00% Impervious Area

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

Subcatchment 102: 102 - Existing Building



Summary for Subcatchment 200: 200 - Portion of Proposed Building Tenant A to Rain Garden #2

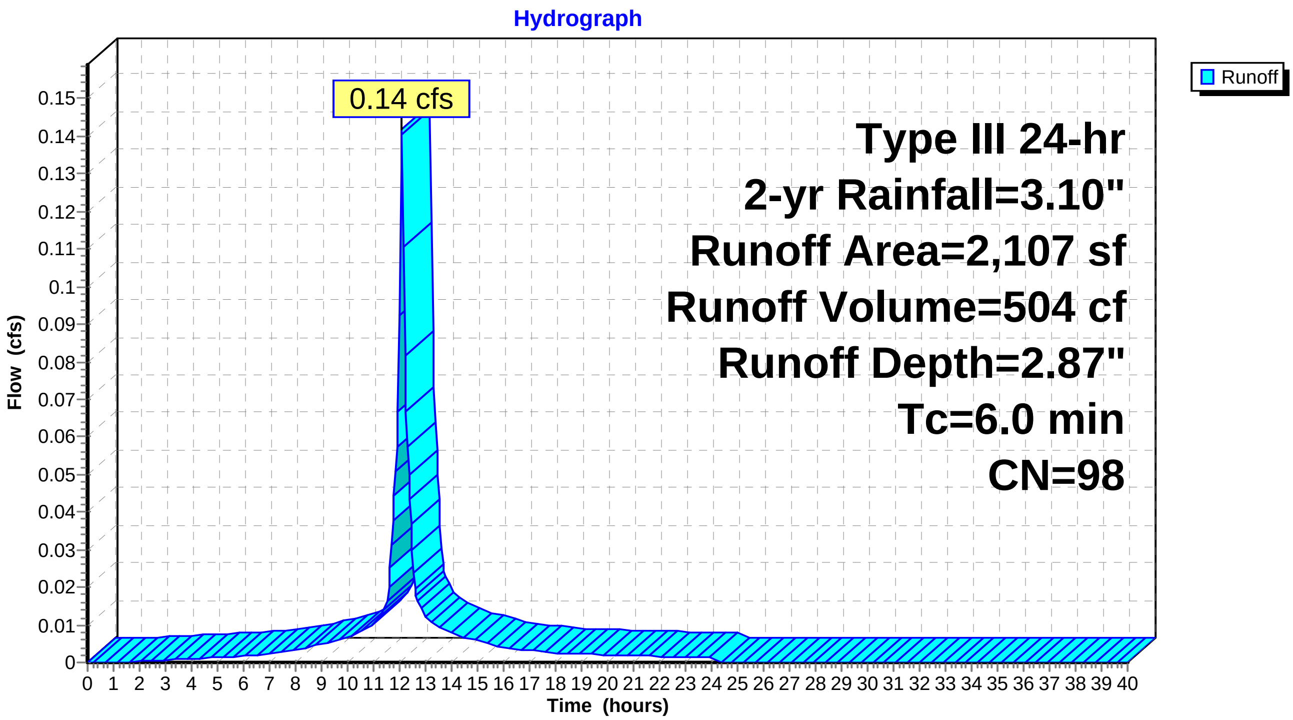
Runoff = 0.14 cfs @ 12.09 hrs, Volume= 504 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

	Area (sf)	CN	Description
*	2,107	98	Roofs, HSG C, Half Prop. Building A
	2,107		100.00% Impervious Area

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

Subcatchment 200: 200 - Portion of Proposed Building Tenant A to Rain Garden #2



Summary for Subcatchment 201: 201 - Pavement

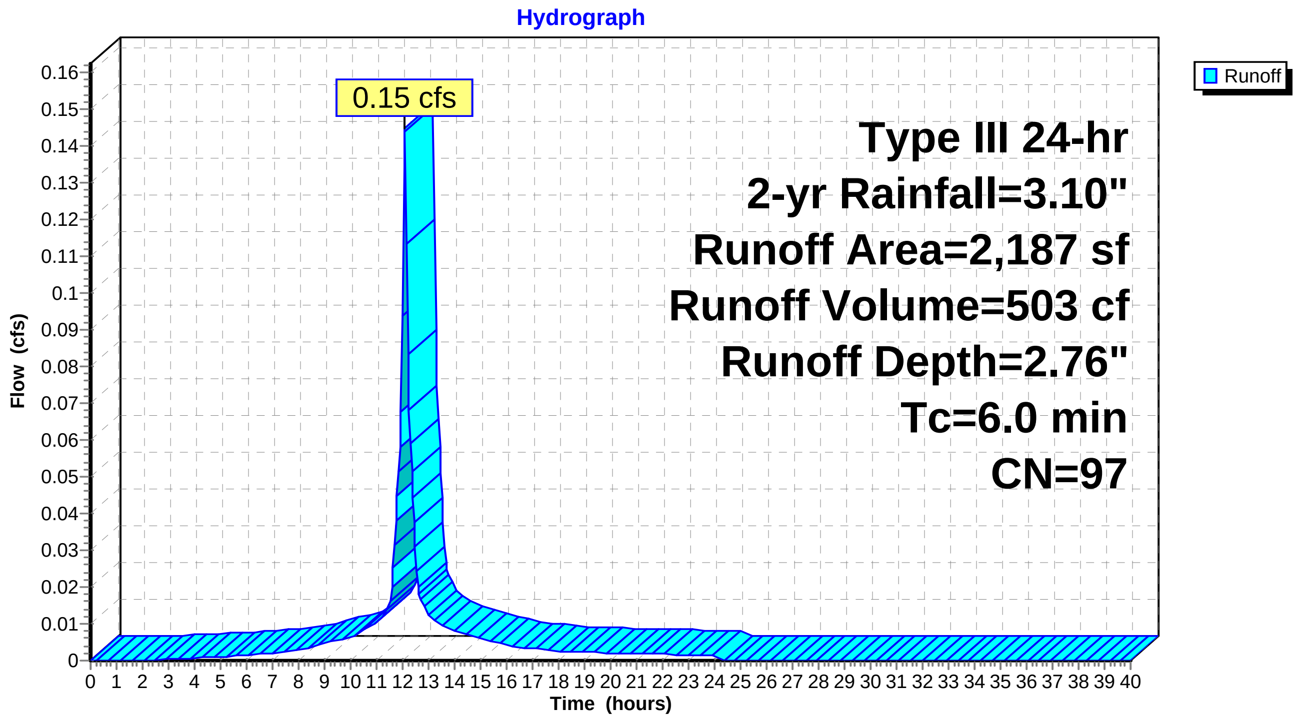
Runoff = 0.15 cfs @ 12.09 hrs, Volume= 503 cf, Depth= 2.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
2,098	98	Paved parking, HSG C
89	74	>75% Grass cover, Good, HSG C
2,187	97	Weighted Average
89		4.07% Pervious Area
2,098		95.93% Impervious Area

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

Subcatchment 201: 201 - Pavement



Summary for Subcatchment 202: 202 - Pavement

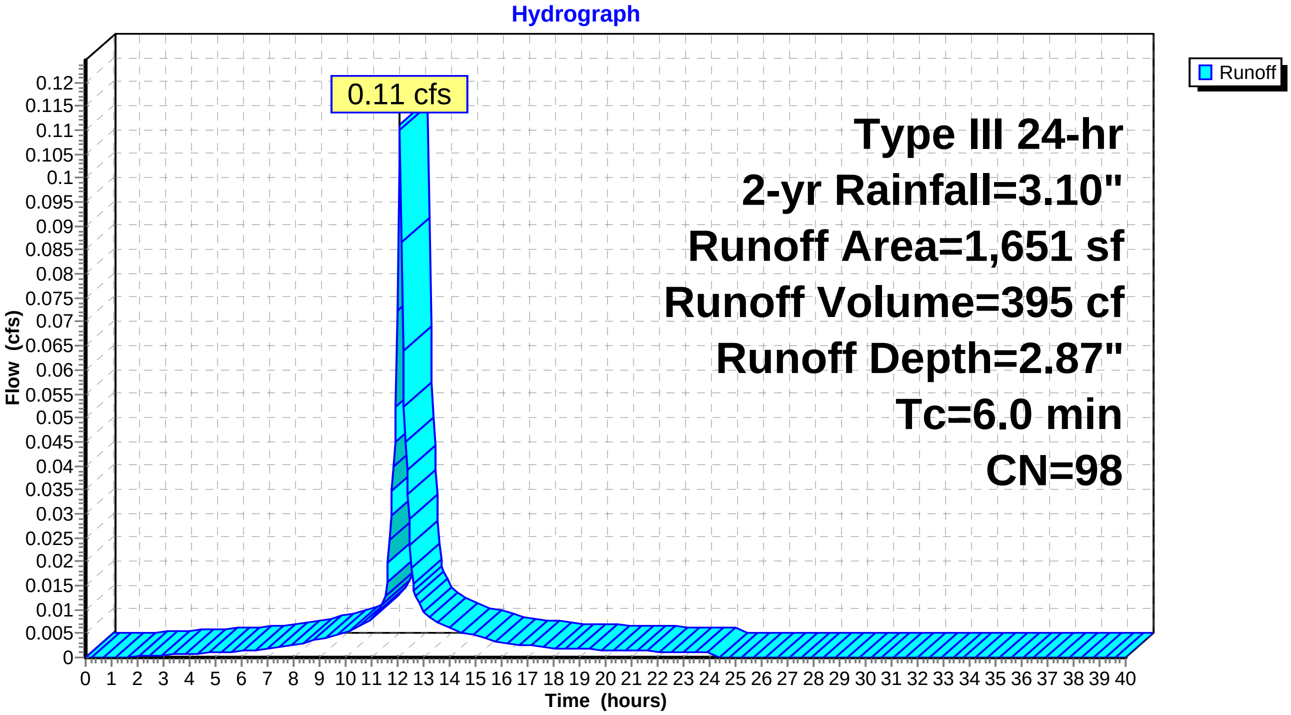
Runoff = 0.11 cfs @ 12.09 hrs, Volume= 395 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
1,651	98	Paved parking, HSG C
1,651		100.00% Impervious Area

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

Subcatchment 202: 202 - Pavement



Summary for Subcatchment 203: 203 - Pavement

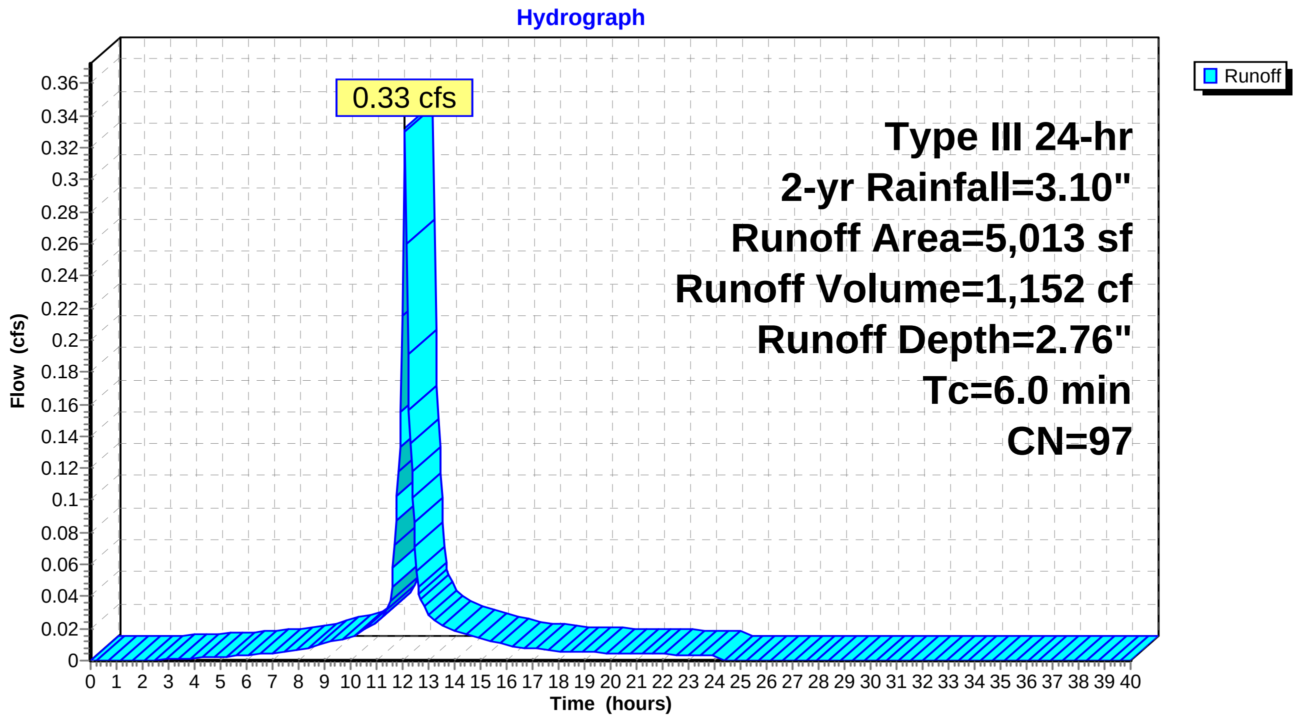
Runoff = 0.33 cfs @ 12.09 hrs, Volume= 1,152 cf, Depth= 2.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
4,847	98	Paved parking, HSG C
166	74	>75% Grass cover, Good, HSG C
5,013	97	Weighted Average
166		3.31% Pervious Area
4,847		96.69% Impervious Area

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

Subcatchment 203: 203 - Pavement



Summary for Subcatchment 204: 204 - Pavement

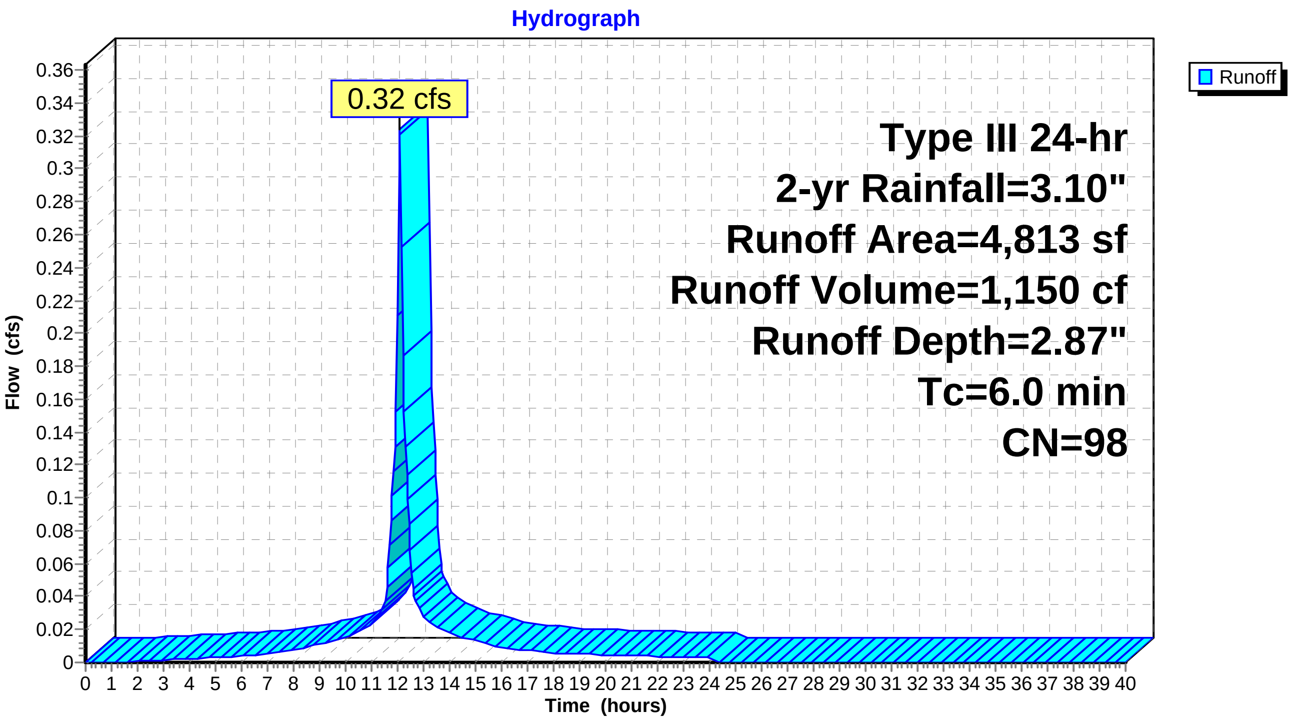
Runoff = 0.32 cfs @ 12.09 hrs, Volume= 1,150 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
4,813	98	Paved parking, HSG C
4,813		100.00% Impervious Area

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

Subcatchment 204: 204 - Pavement



Summary for Subcatchment 205: 205 - Pavement

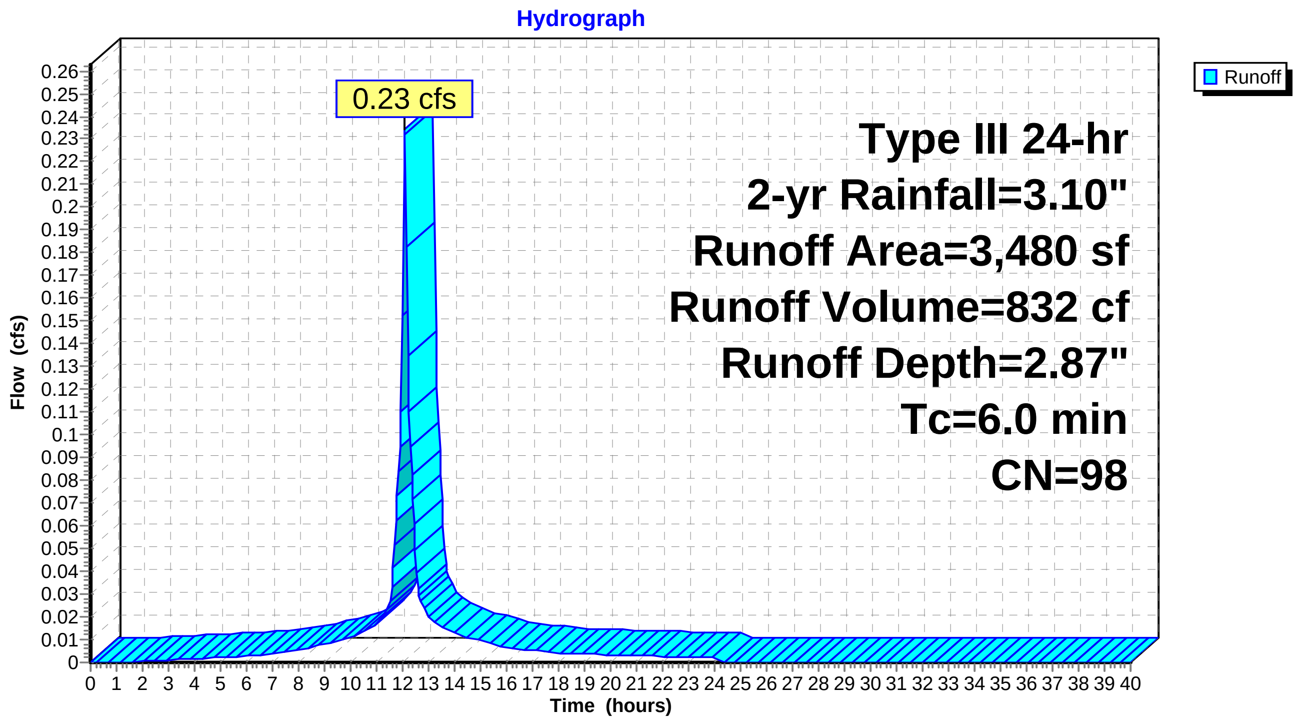
Runoff = 0.23 cfs @ 12.09 hrs, Volume= 832 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
3,480	98	Paved parking, HSG C
3,480		100.00% Impervious Area

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

Subcatchment 205: 205 - Pavement



Summary for Subcatchment 206: 206 - Pavement

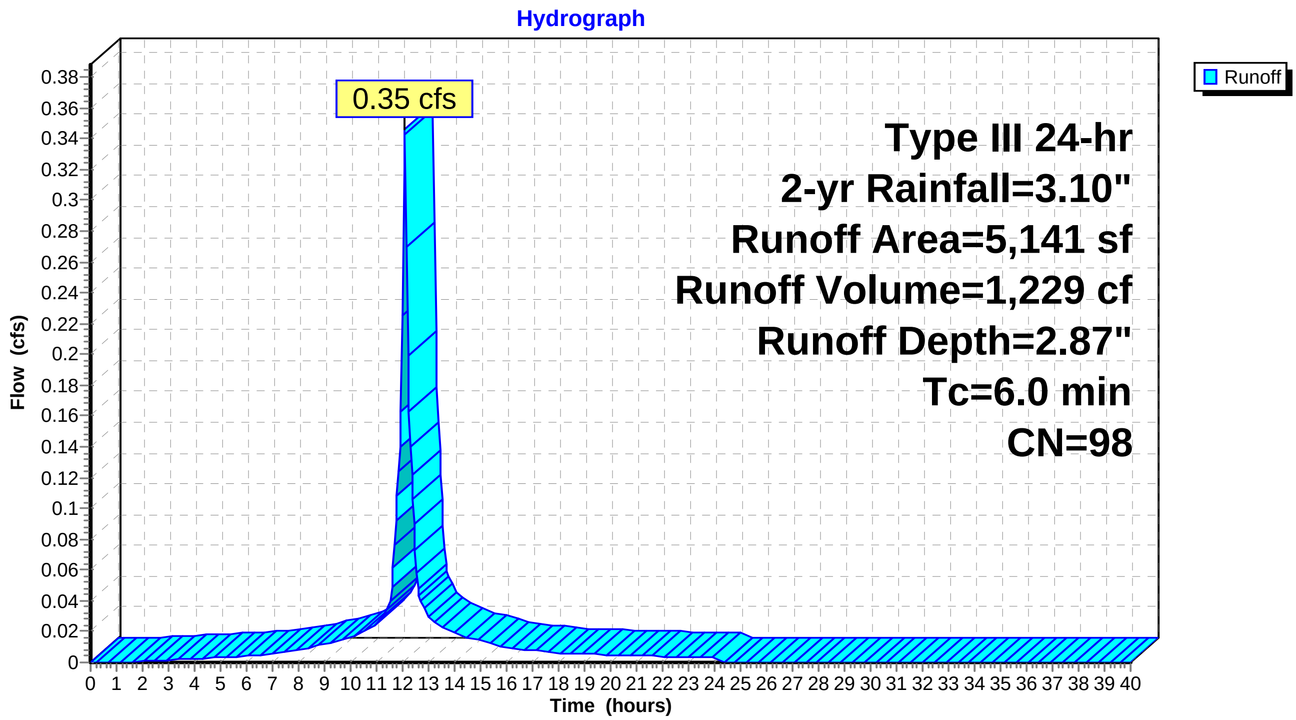
Runoff = 0.35 cfs @ 12.09 hrs, Volume= 1,229 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
5,141	98	Paved parking, HSG C
5,141		100.00% Impervious Area

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

Subcatchment 206: 206 - Pavement



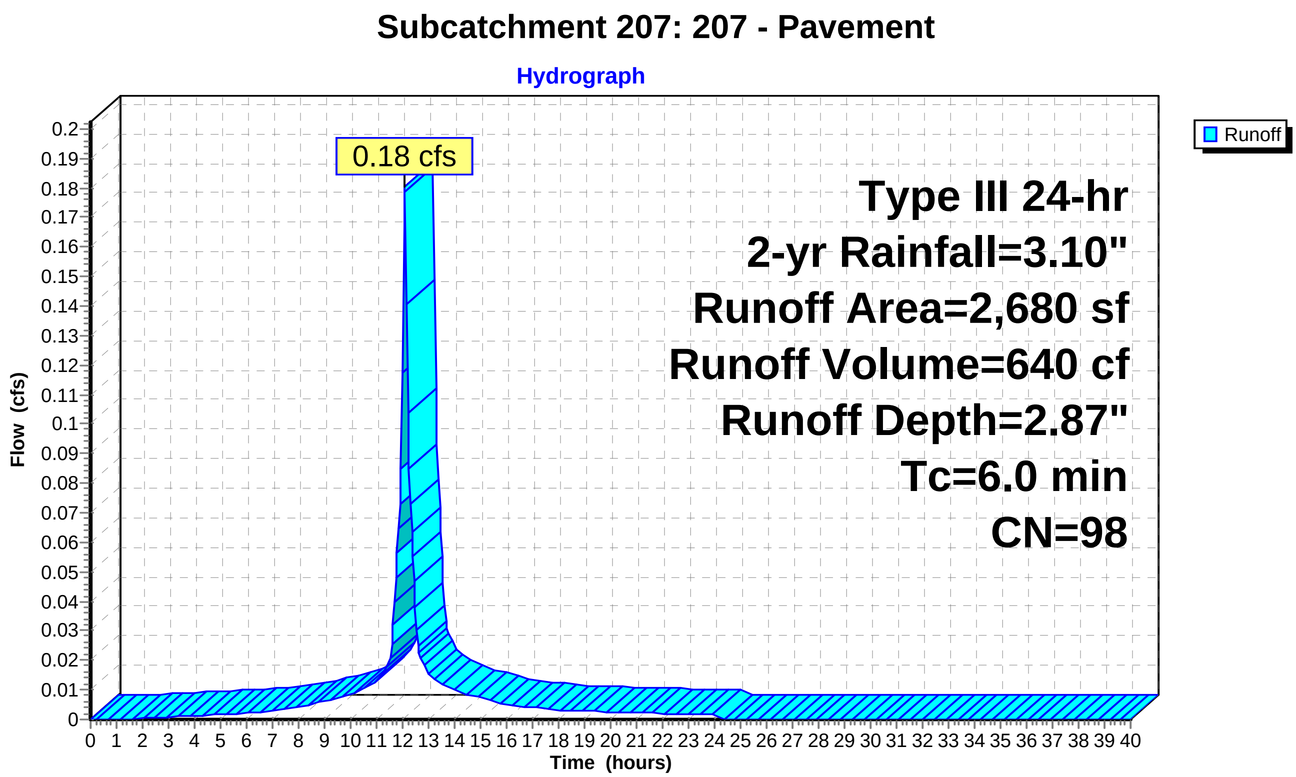
Summary for Subcatchment 207: 207 - Pavement

Runoff = 0.18 cfs @ 12.09 hrs, Volume= 640 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
2,680	98	Paved parking, HSG C
2,680		100.00% Impervious Area

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



Summary for Subcatchment 208: 208 - Proposed Building Tenant B

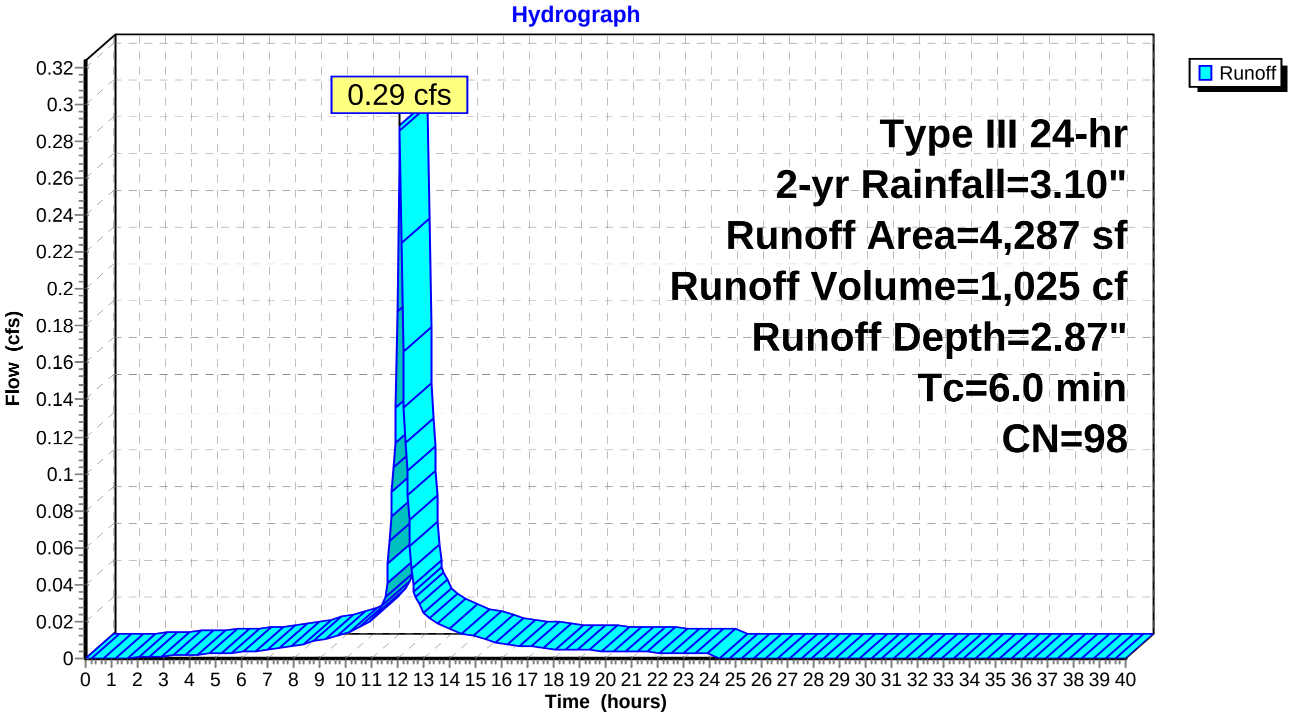
Runoff = 0.29 cfs @ 12.09 hrs, Volume= 1,025 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
4,287	98	Roofs, HSG C
0	98	Roofs, HSG C
4,287	98	Weighted Average
4,287		100.00% Impervious Area

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

Subcatchment 208: 208 - Proposed Building Tenant B



mary for Subcatchment 209: 209 - Portion of Proposed Building Tentant A, Rain Garden #2, Lawn, and W

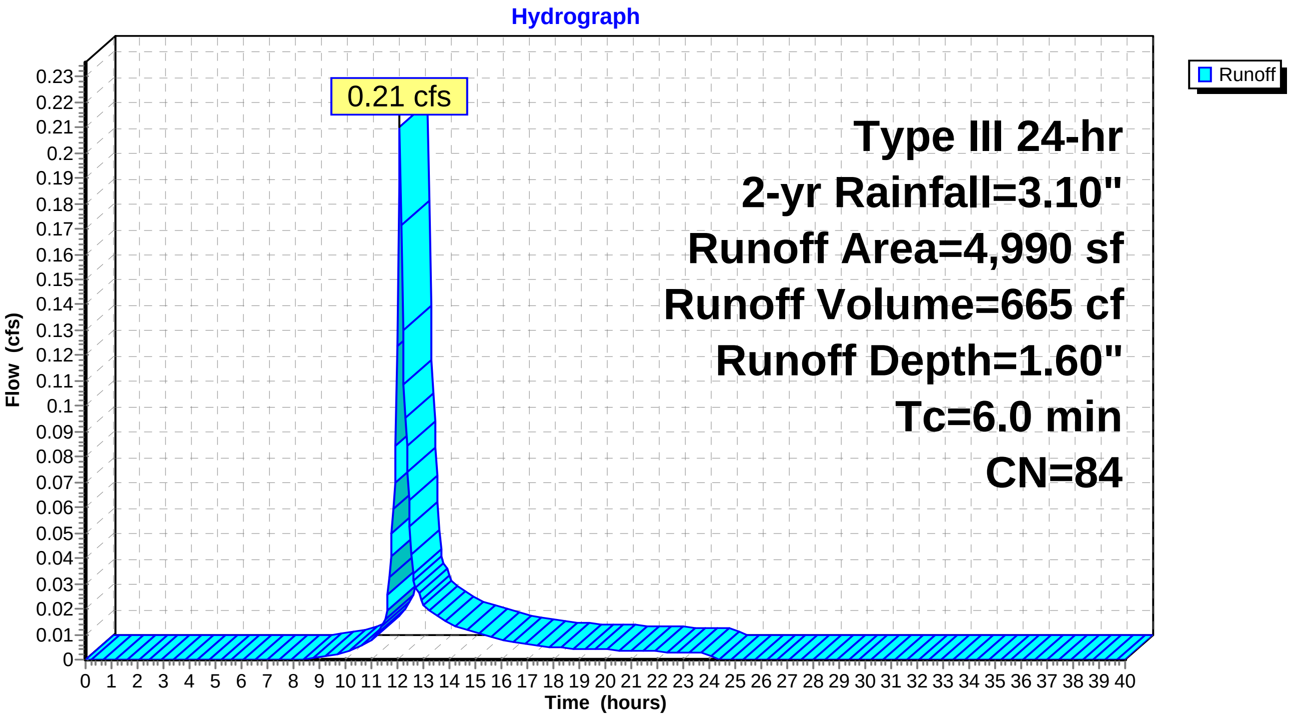
Runoff = 0.21 cfs @ 12.09 hrs, Volume= 665 cf, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

	Area (sf)	CN	Description
*	876	65	Rain Garden Surface Area
	2,078	79	50-75% Grass cover, Fair, HSG C
	84	98	Unconnected pavement, HSG C
	1,952	98	Unconnected roofs, HSG C
	4,990	84	Weighted Average
	2,954		59.20% Pervious Area
	2,036		40.80% Impervious Area
	2,036		100.00% Unconnected

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

Subcatchment 209: 209 - Portion of Proposed Building Tentant A, Rain Garden #2, Lawn, and Walkwa



Summary for Subcatchment 210: 210 - Existing South features remaining to DP2

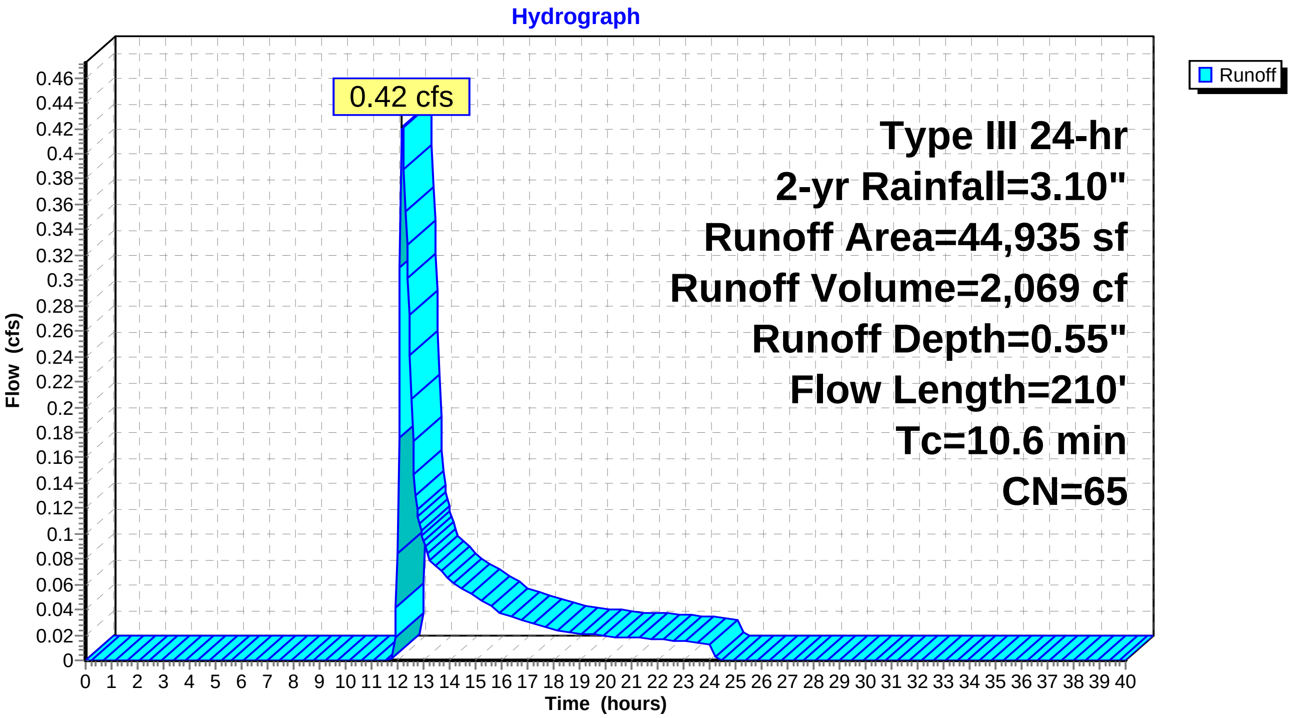
Runoff = 0.42 cfs @ 12.19 hrs, Volume= 2,069 cf, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

	Area (sf)	CN	Description
	35,498	65	Brush, Good, HSG C
*	9,437	65	Brush, Good, HSG C, Wetland Brush
	44,935	65	Weighted Average
	44,935		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	100	0.0600	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
1.4	110	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.6	210	Total			

Subcatchment 210: 210 - Existing South features remaining to DP2



Summary for Subcatchment 300: 300 - Lawn East to DP3

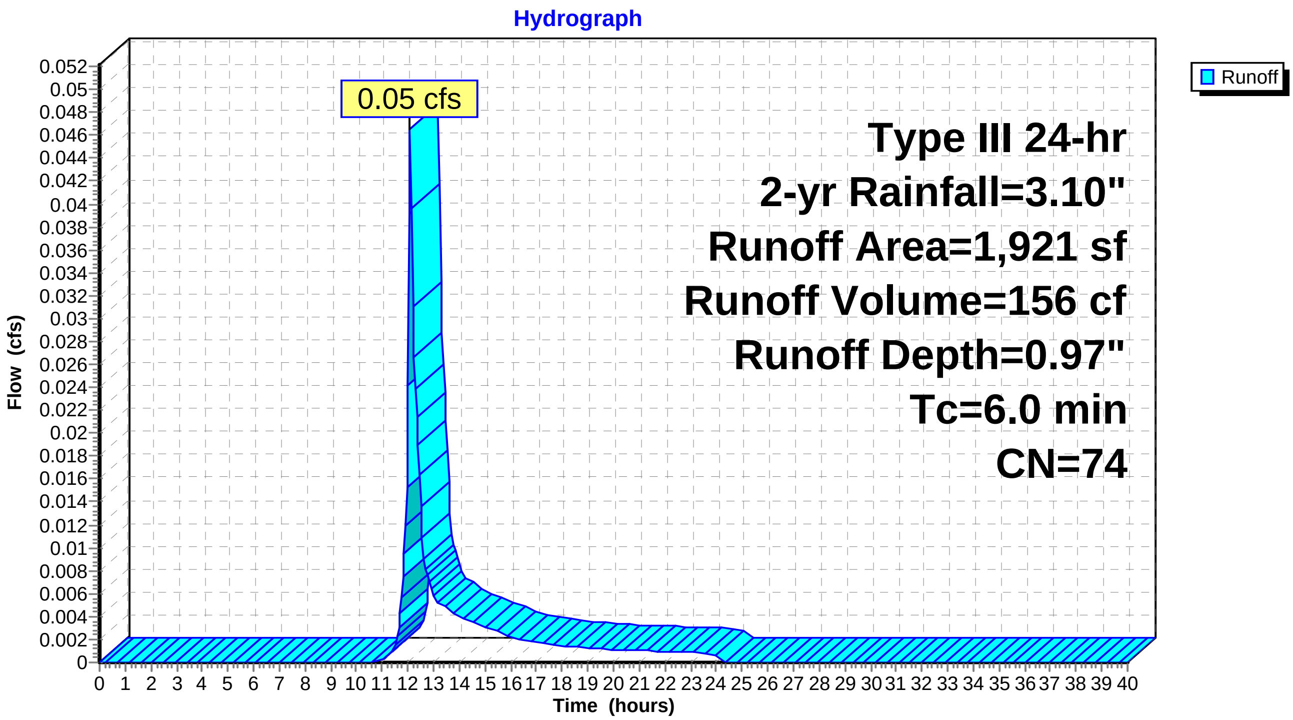
Runoff = 0.05 cfs @ 12.10 hrs, Volume= 156 cf, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
1,921	74	>75% Grass cover, Good, HSG C
1,921		100.00% Pervious Area

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

Subcatchment 300: 300 - Lawn East to DP3



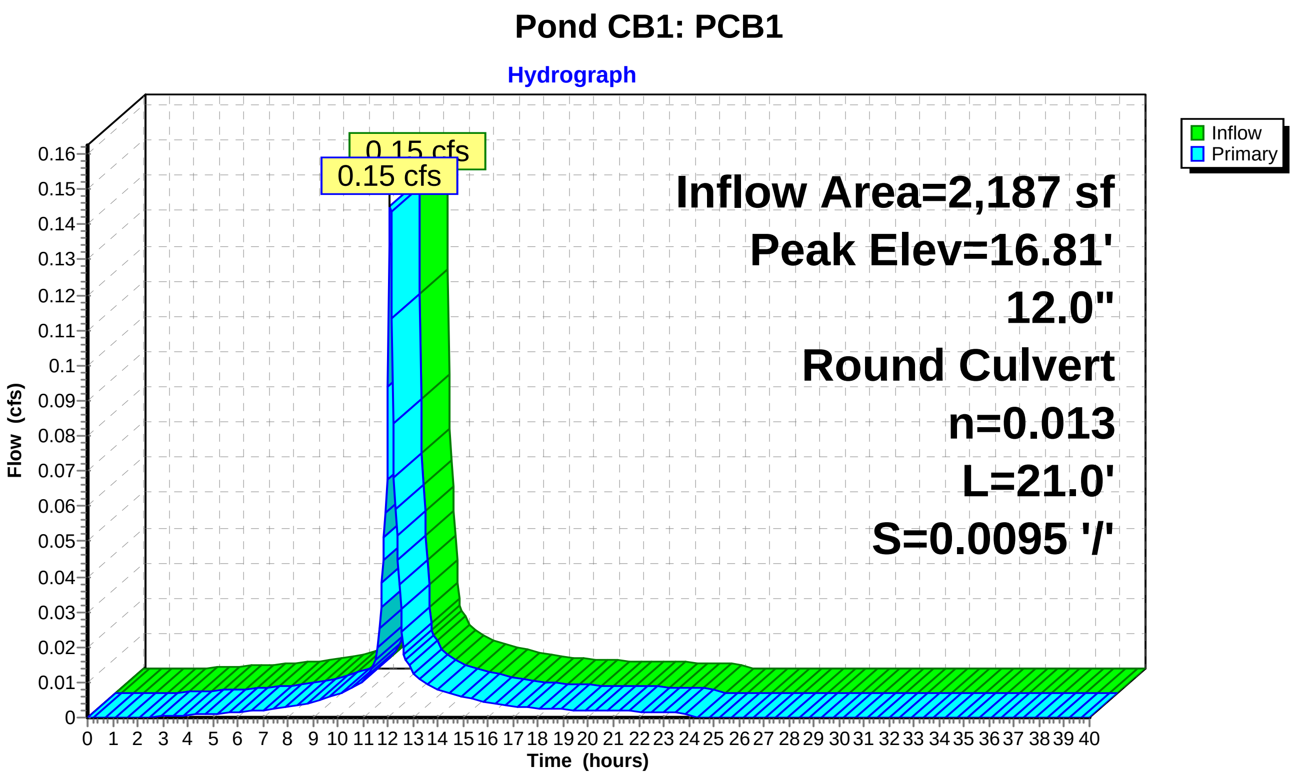
Summary for Pond CB1: PCB1

Inflow Area = 2,187 sf, 95.93% Impervious, Inflow Depth = 2.76" for 2-yr event
Inflow = 0.15 cfs @ 12.09 hrs, Volume= 503 cf
Outflow = 0.15 cfs @ 12.09 hrs, Volume= 503 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.15 cfs @ 12.09 hrs, Volume= 503 cf

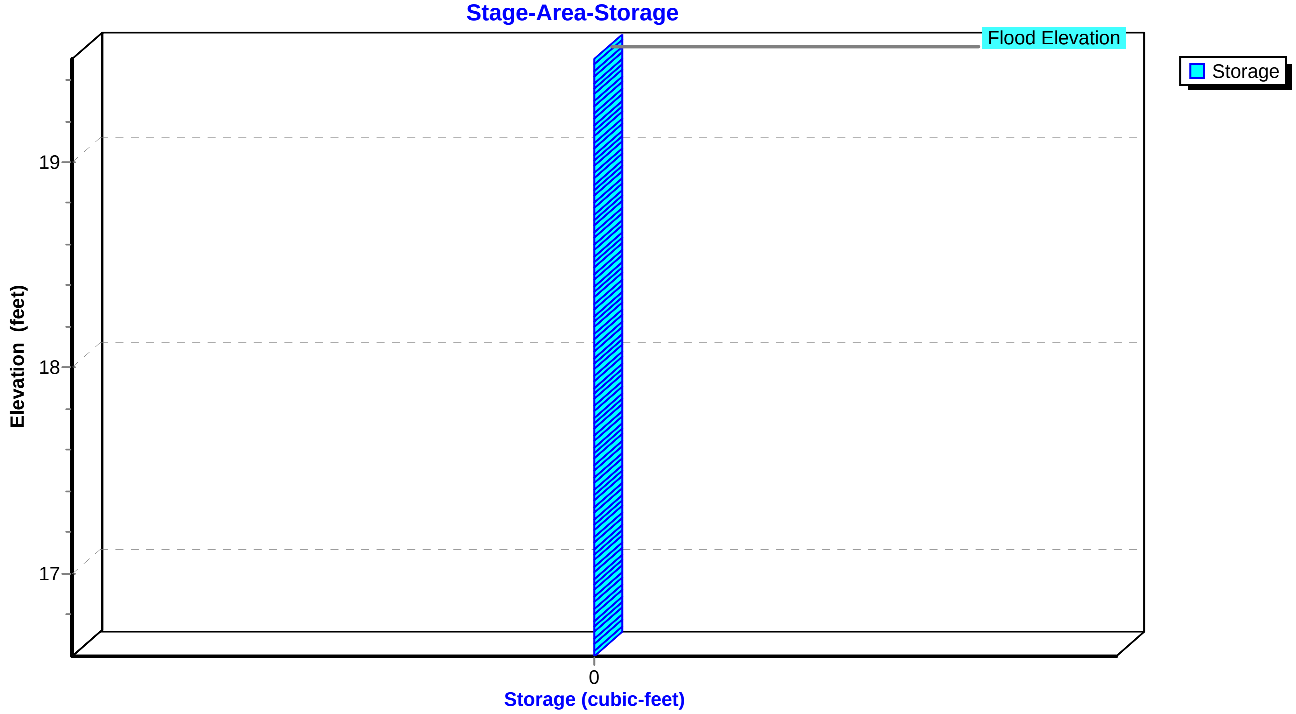
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.81' @ 12.09 hrs
Flood Elev= 19.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	16.60'	**12.0" Round Culvert** L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.60' / 16.40' S= 0.0095 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.14 cfs @ 12.09 hrs HW=16.81' TW=16.58' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.14 cfs @ 1.84 fps)



Pond CB1: PCB1



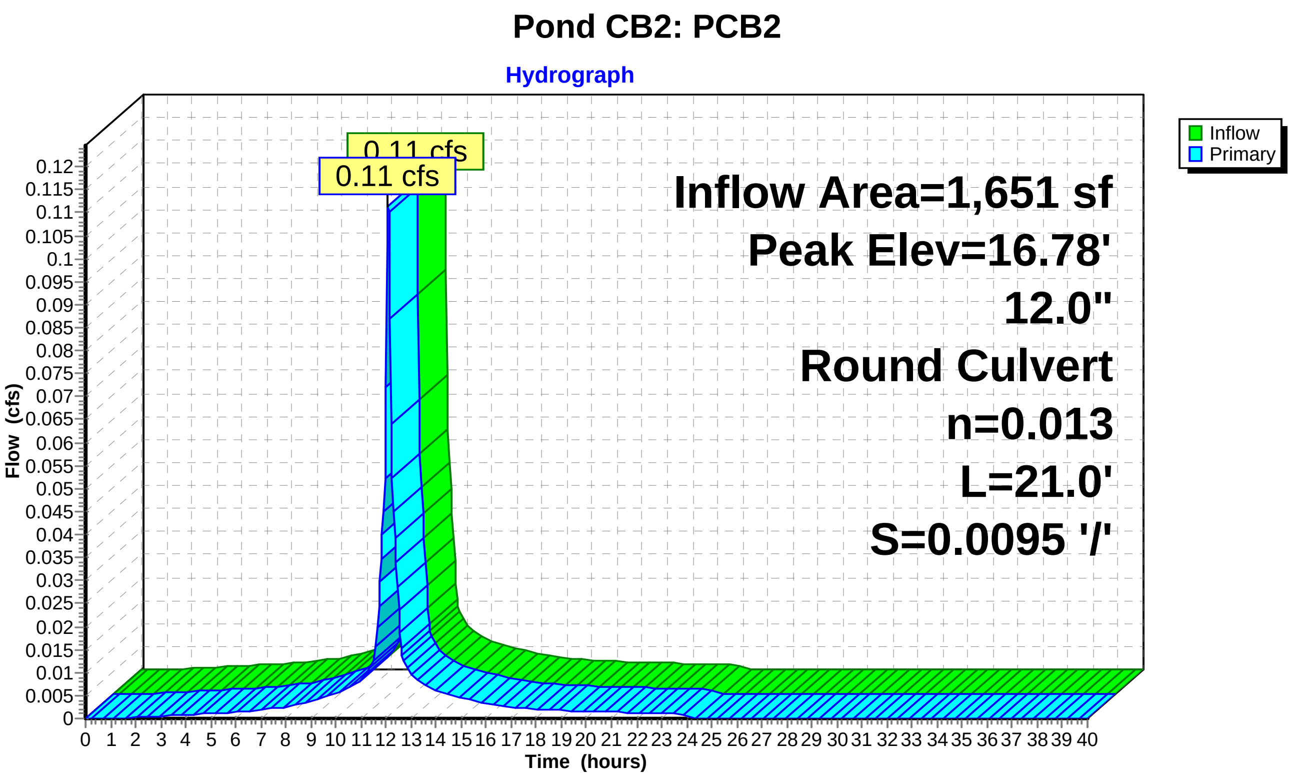
Summary for Pond CB2: PCB2

Inflow Area =	1,651 sf,100.00% Impervious,	Inflow Depth = 2.87"	for 2-yr event	
Inflow =	0.11 cfs @	12.09 hrs, Volume=	395 cf	
Outflow =	0.11 cfs @	12.09 hrs, Volume=	395 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.11 cfs @	12.09 hrs, Volume=	395 cf	

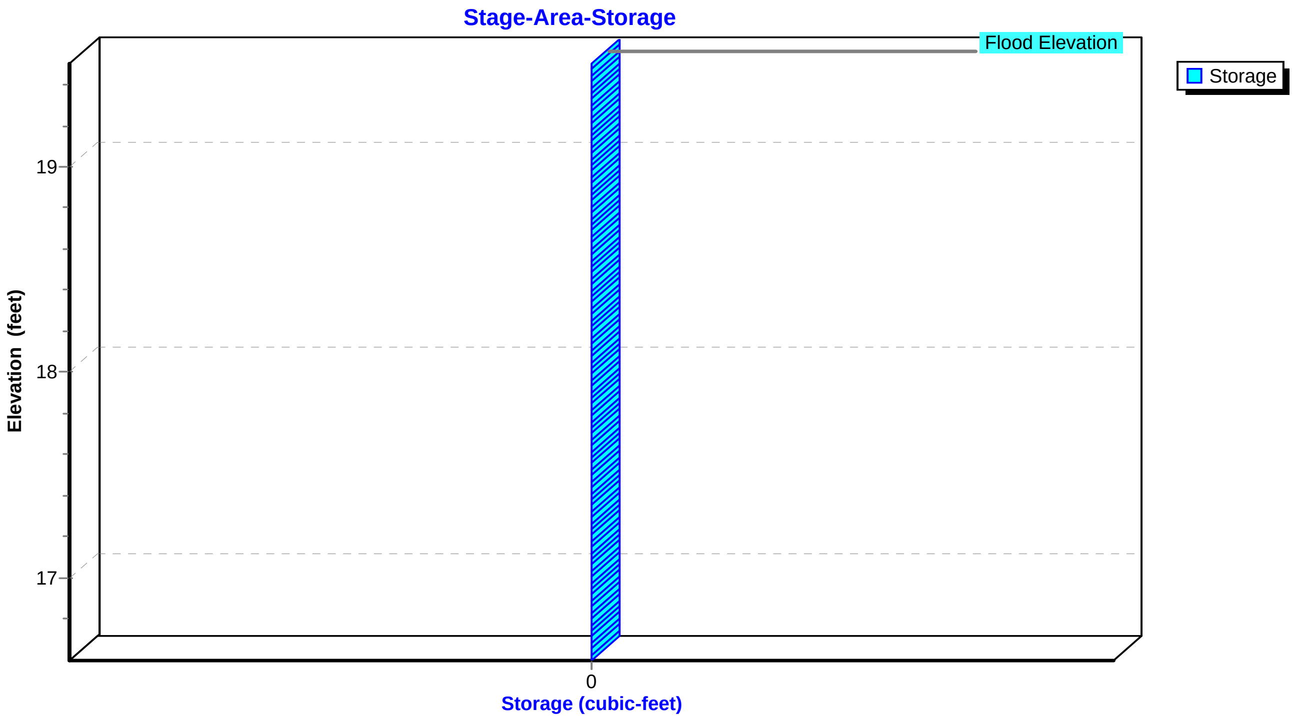
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.78' @ 12.09 hrs
Flood Elev= 19.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	16.60'	**12.0" Round Culvert** L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.60' / 16.40' S= 0.0095 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.11 cfs @ 12.09 hrs HW=16.78' TW=16.58' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.11 cfs @ 1.65 fps)



Pond CB2: PCB2



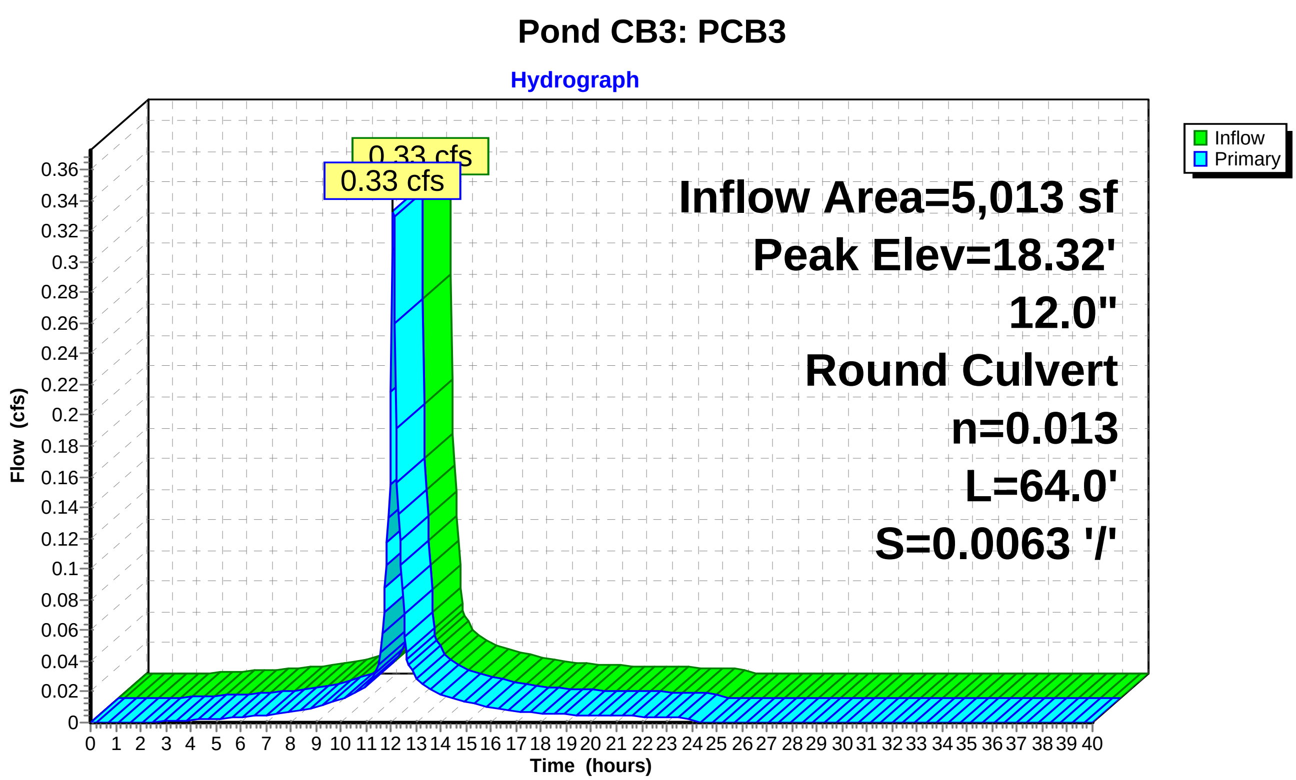
Summary for Pond CB3: PCB3

Inflow Area =		5,013 sf,	96.69% Impervious,	Inflow Depth = 2.76"	for 2-yr event
Inflow	=	0.33 cfs @	12.09 hrs, Volume=	1,152 cf	
Outflow	=	0.33 cfs @	12.09 hrs, Volume=	1,152 cf, Atten= 0%, Lag= 0.0 min	
Primary	=	0.33 cfs @	12.09 hrs, Volume=	1,152 cf	

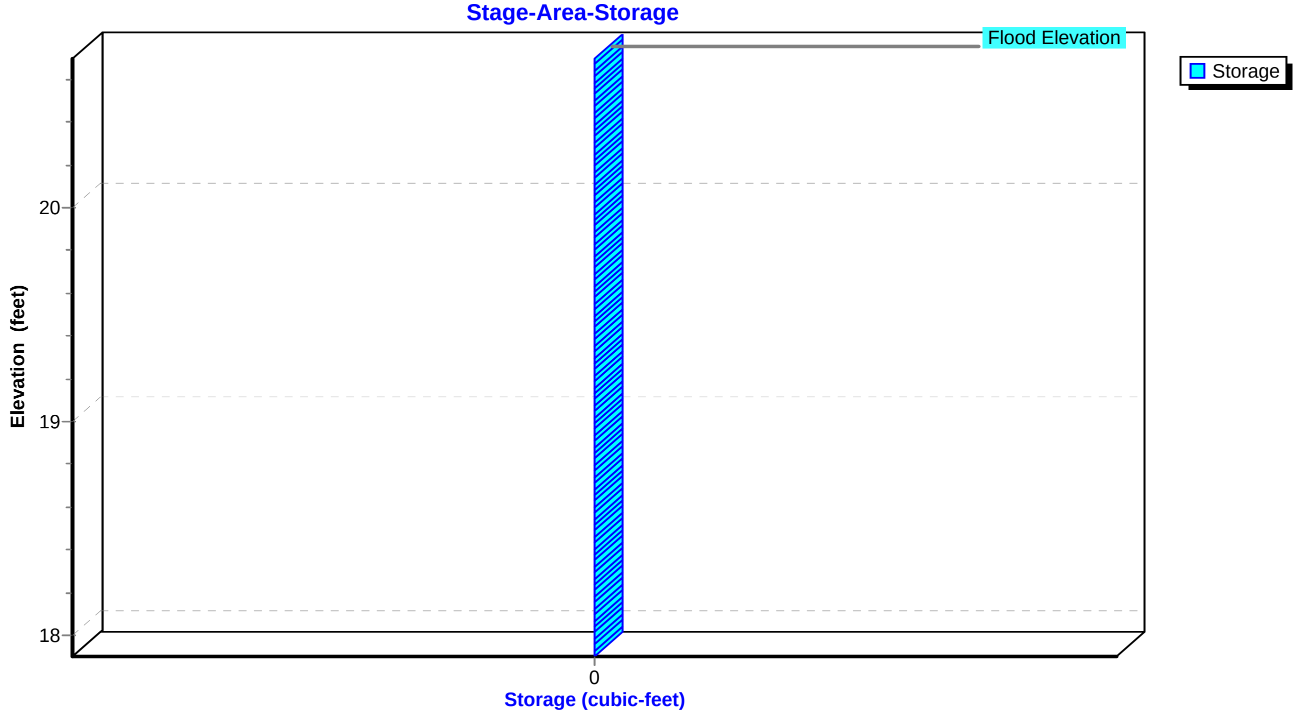
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.32' @ 12.30 hrs
Flood Elev= 20.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	17.90'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 17.90' / 17.50' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.25 cfs @ 12.09 hrs HW=18.27' TW=18.10' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.25 cfs @ 1.40 fps)



Pond CB3: PCB3



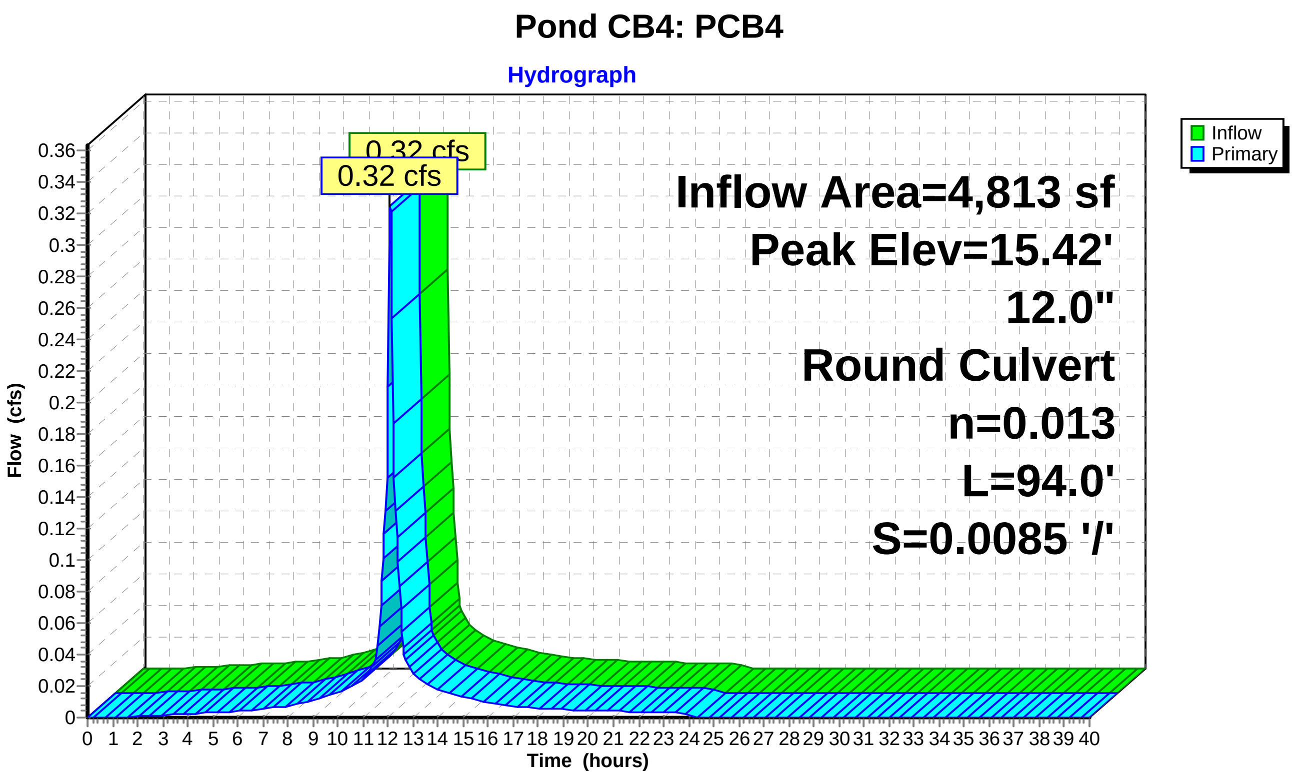
Summary for Pond CB4: PCB4

Inflow Area = 4,813 sf,100.00% Impervious, Inflow Depth = 2.87" for 2-yr event
Inflow = 0.32 cfs @ 12.09 hrs, Volume= 1,150 cf
Outflow = 0.32 cfs @ 12.09 hrs, Volume= 1,150 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.32 cfs @ 12.09 hrs, Volume= 1,150 cf

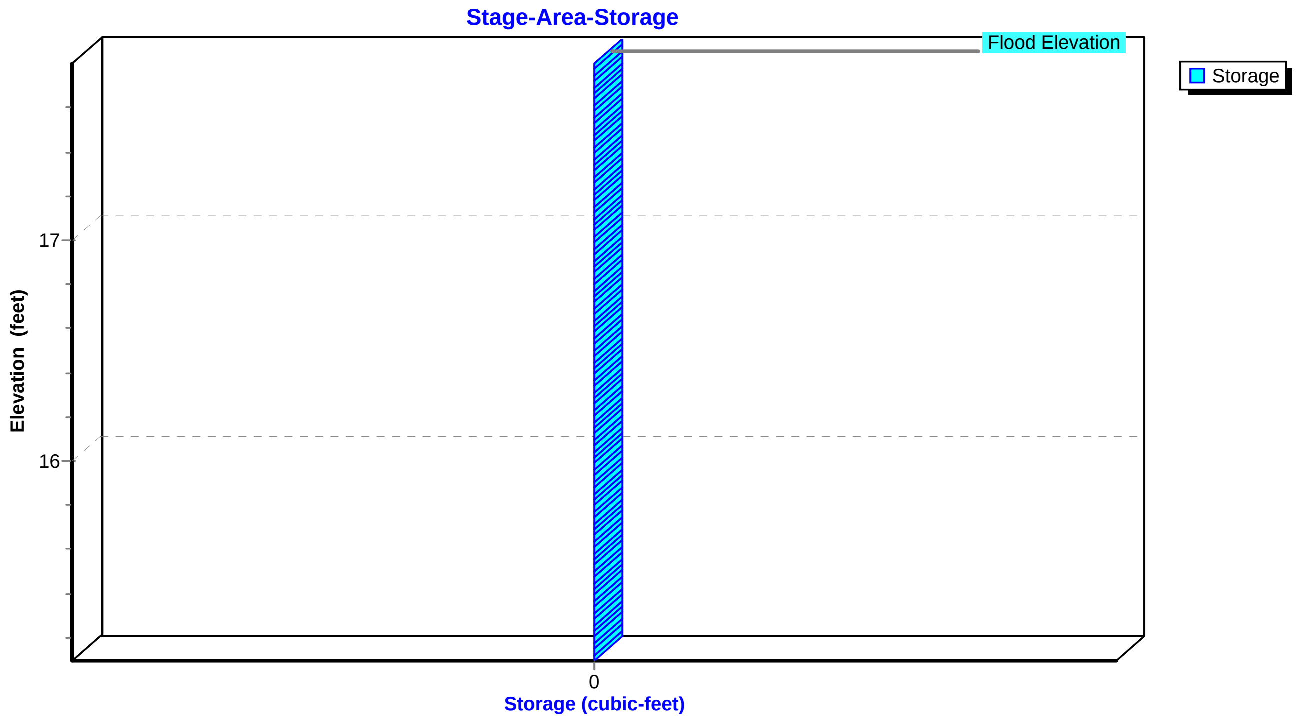
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.42' @ 12.09 hrs
Flood Elev= 17.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	15.10'	**12.0" Round Culvert** L= 94.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.10' / 14.30' S= 0.0085 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.32 cfs @ 12.09 hrs HW=15.41' TW=14.70' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.32 cfs @ 1.50 fps)



Pond CB4: PCB4



Summary for Pond CB5: PCB5

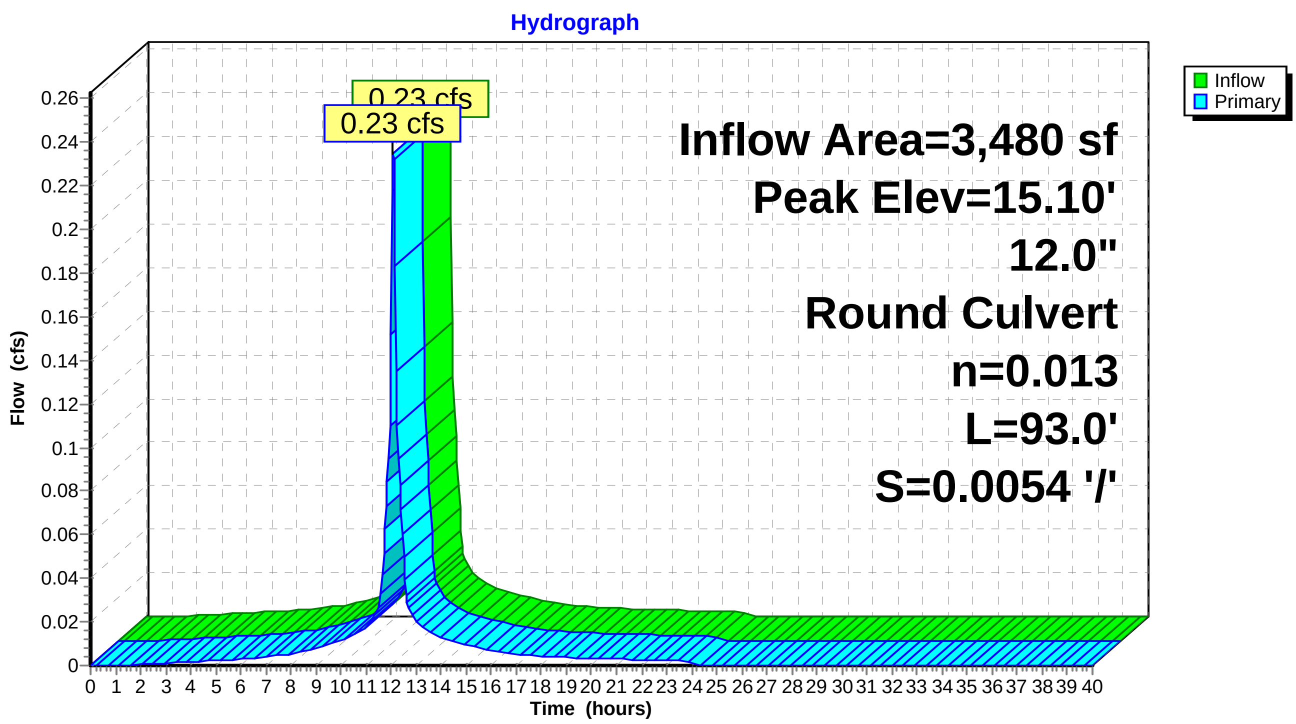
Inflow Area =	3,480 sf,100.00% Impervious,	Inflow Depth = 2.87"	for 2-yr event	
Inflow =	0.23 cfs @	12.09 hrs, Volume=	832 cf	
Outflow =	0.23 cfs @	12.09 hrs, Volume=	832 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.23 cfs @	12.09 hrs, Volume=	832 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.10' @ 12.10 hrs
Flood Elev= 17.60'

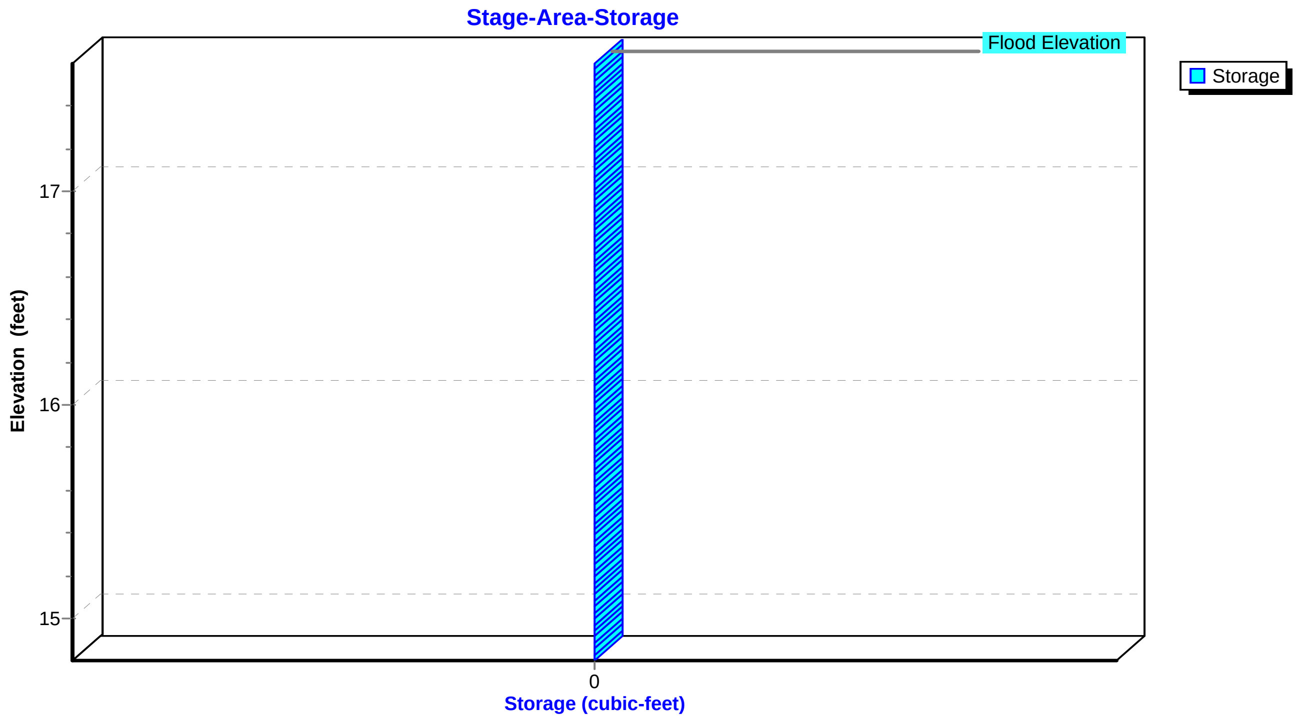
Device	Routing	Invert	Outlet Devices
#1	Primary	14.80'	**12.0" Round Culvert** L= 93.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.80' / 14.30' S= 0.0054 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.22 cfs @ 12.09 hrs HW=15.09' TW=14.70' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.22 cfs @ 1.70 fps)

Pond CB5: PCB5



Pond CB5: PCB5



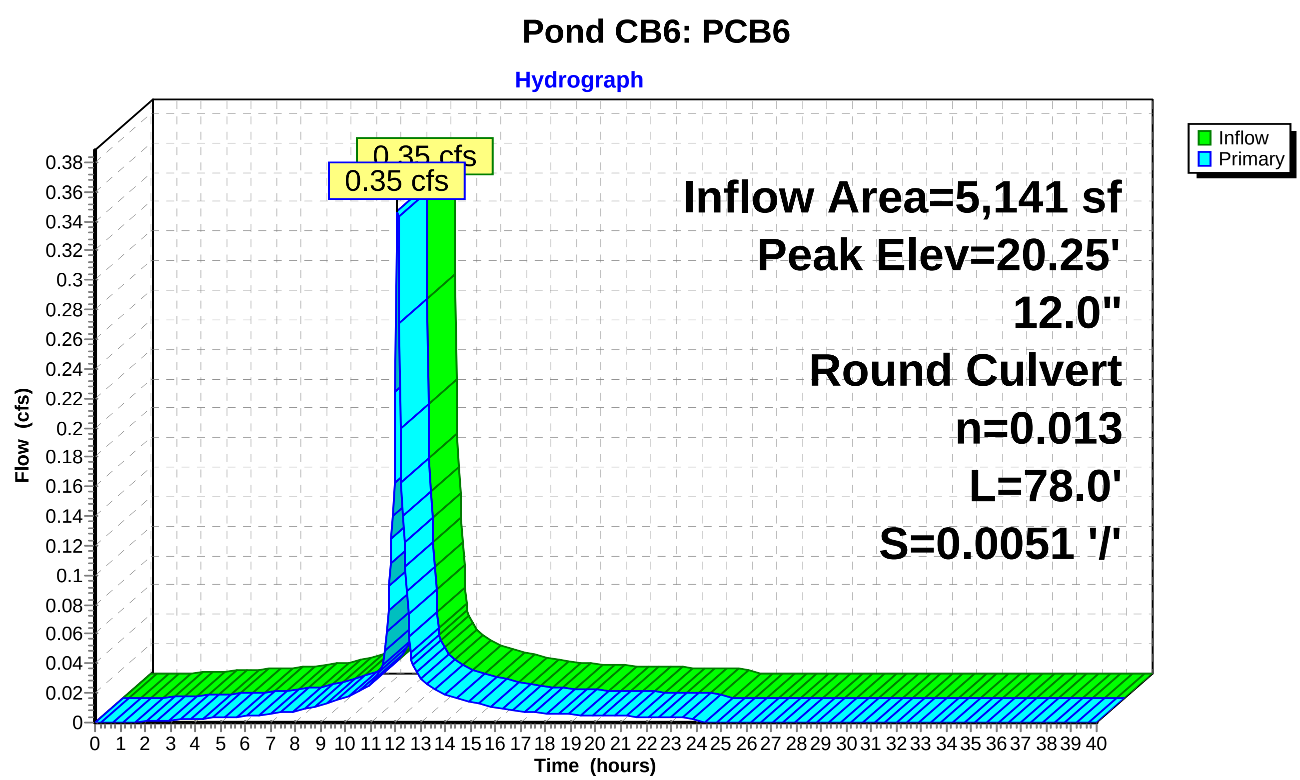
Summary for Pond CB6: PCB6

Inflow Area =		5,141 sf,100.00% Impervious,	Inflow Depth = 2.87" for 2-yr event			
Inflow	=	0.35 cfs @	12.09 hrs,	Volume=	1,229 cf	
Outflow	=	0.35 cfs @	12.09 hrs,	Volume=	1,229 cf,	Atten= 0%, Lag= 0.0 min
Primary	=	0.35 cfs @	12.09 hrs,	Volume=	1,229 cf	

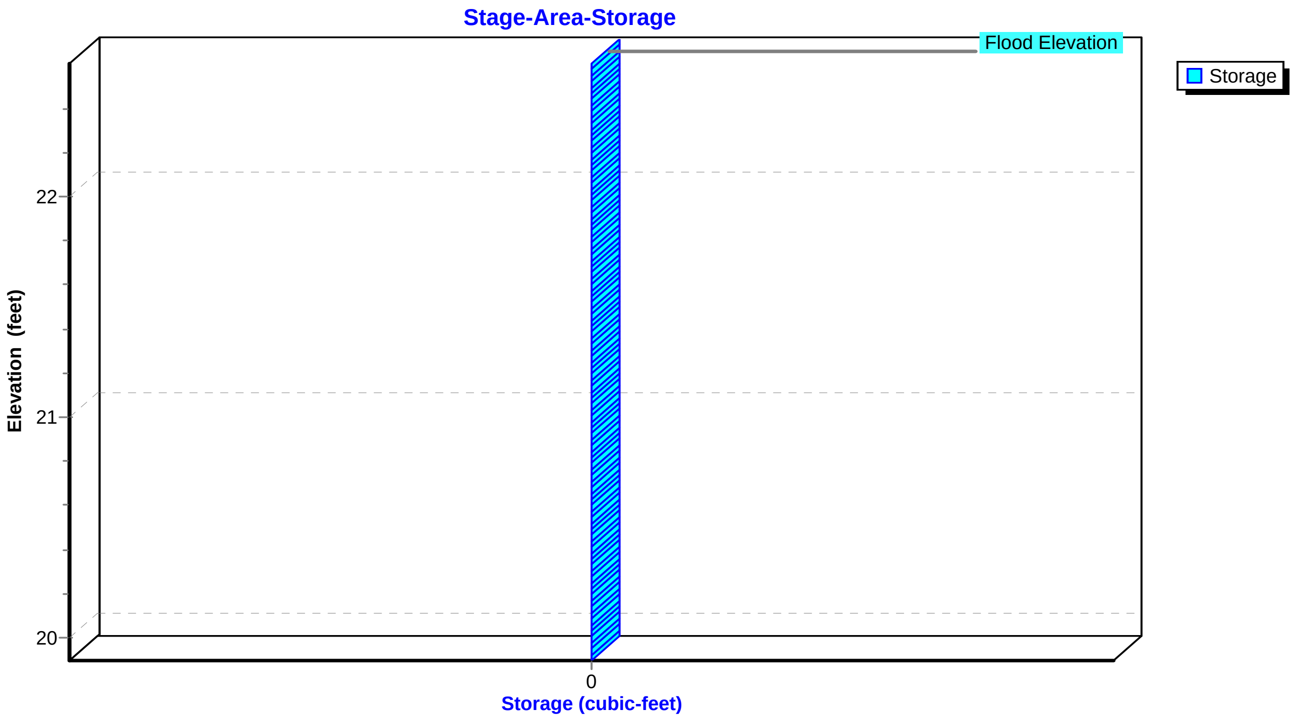
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 20.25' @ 12.09 hrs
Flood Elev= 22.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	19.90'	**12.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.90' / 19.50' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.33 cfs @ 12.09 hrs HW=20.24' TW=19.81' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.33 cfs @ 2.04 fps)



Pond CB6: PCB6



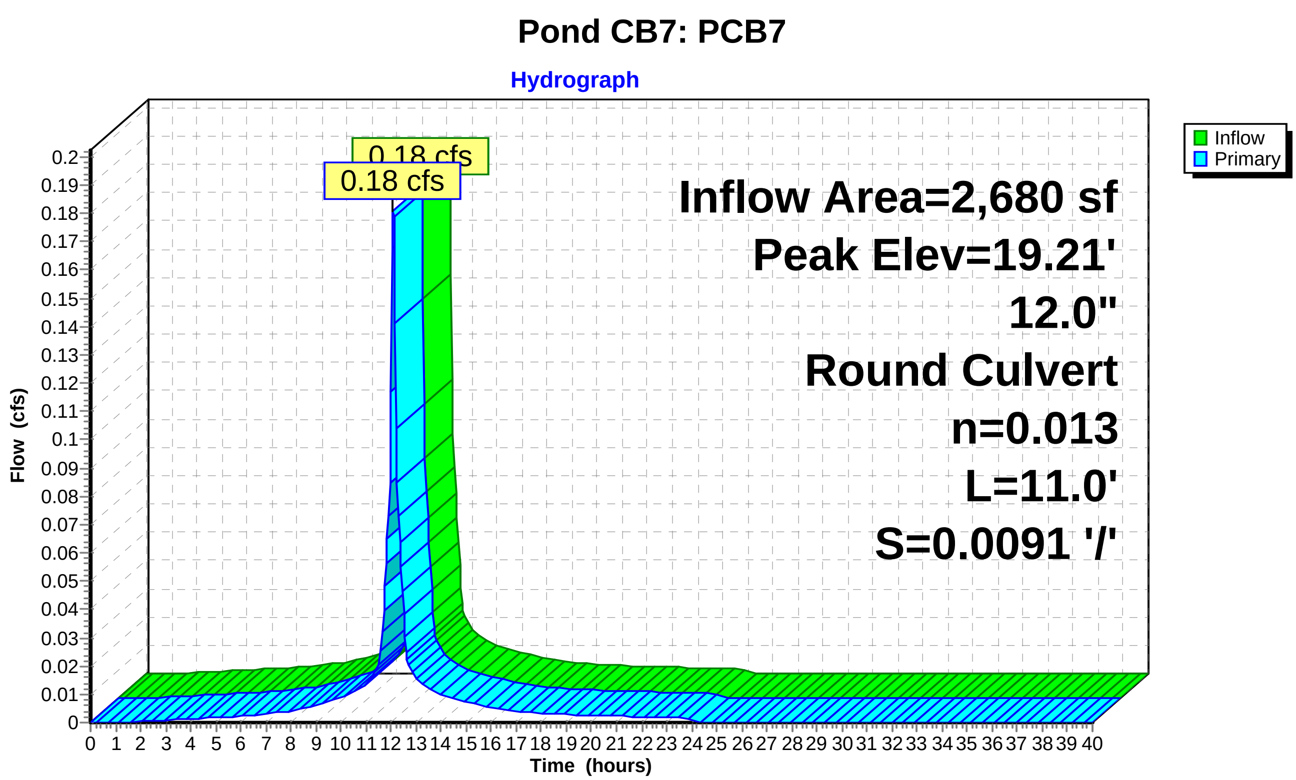
Summary for Pond CB7: PCB7

Inflow Area = 2,680 sf,100.00% Impervious, Inflow Depth = 2.87" for 2-yr event
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 640 cf
Outflow = 0.18 cfs @ 12.09 hrs, Volume= 640 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.18 cfs @ 12.09 hrs, Volume= 640 cf

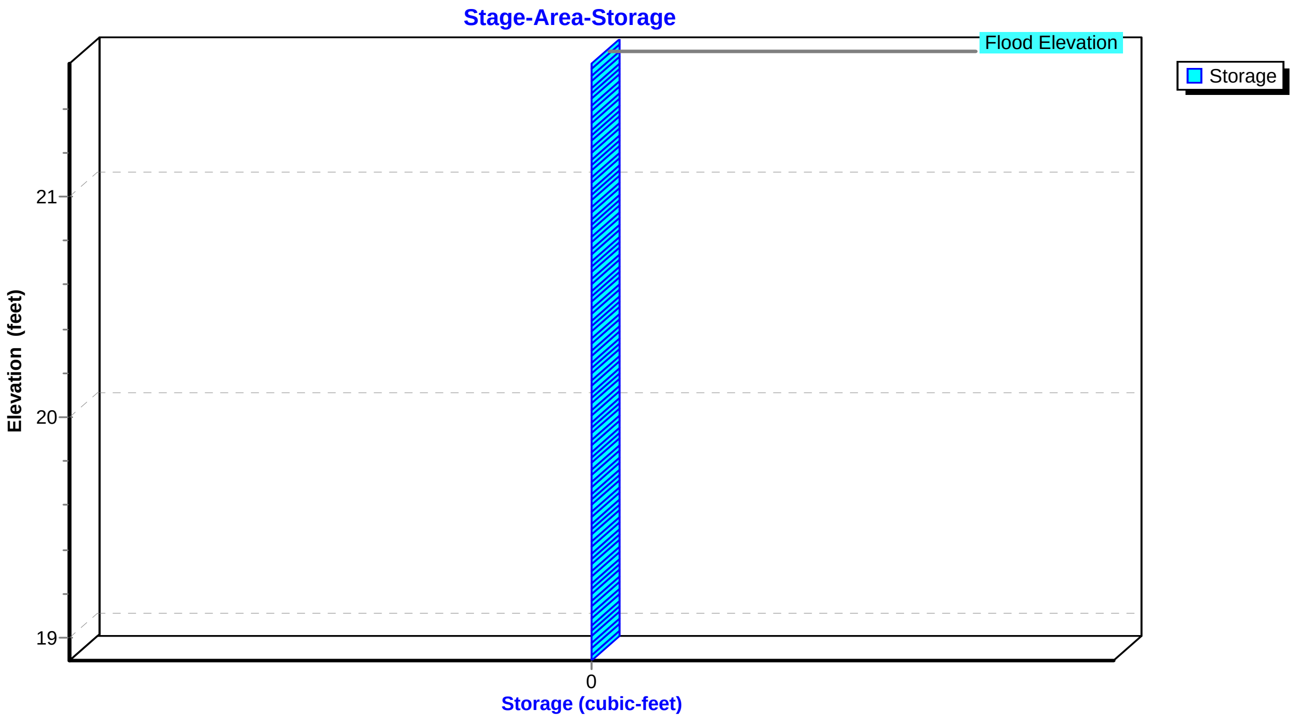
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.21' @ 12.12 hrs
Flood Elev= 21.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.90'	**12.0" Round Culvert** L= 11.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.90' / 18.80' S= 0.0091 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.14 cfs @ 12.09 hrs HW=19.20' TW=19.15' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.14 cfs @ 1.07 fps)



Pond CB7: PCB7

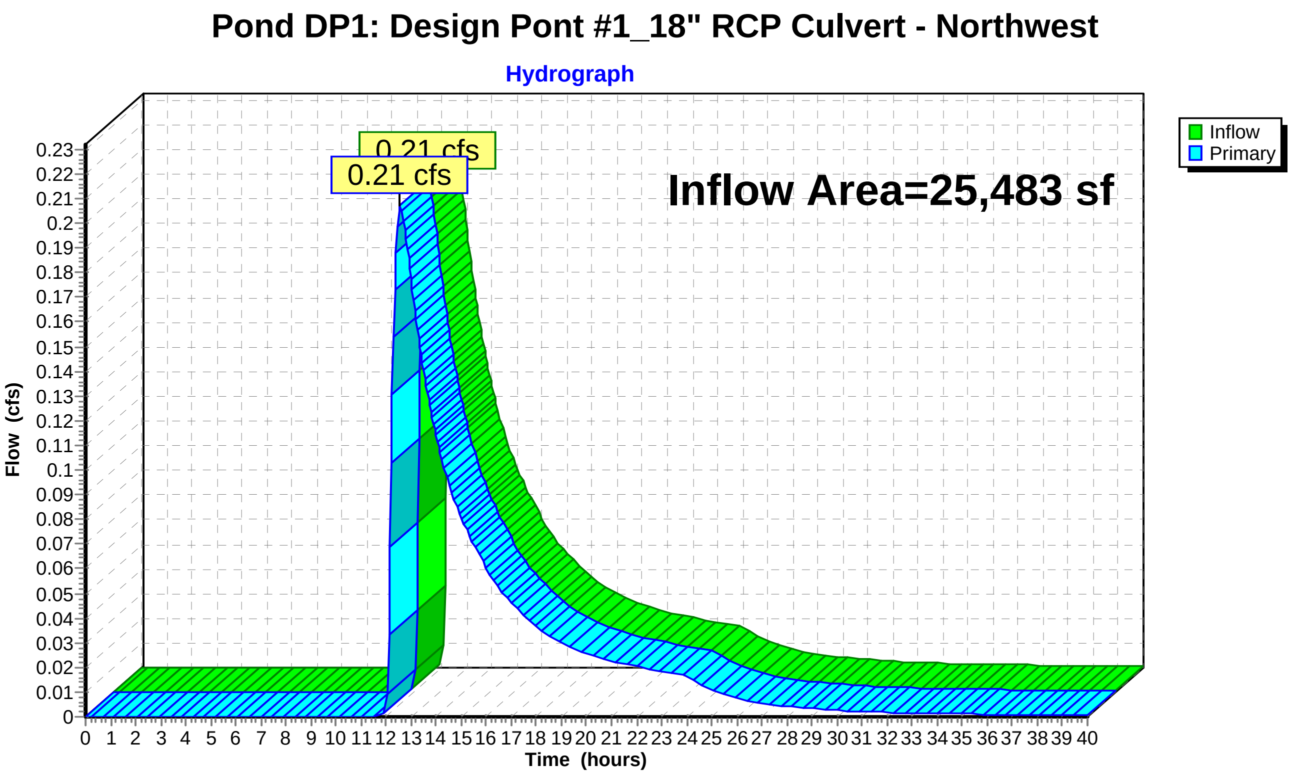


Summary for Pond DP1: Design Pont #1_18" RCP Culvert - Northwest

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	25,483 sf,	55.96% Impervious,	Inflow Depth > 1.28"	for 2-yr event
Inflow =	0.21 cfs @	12.56 hrs, Volume=	2,715 cf	
Primary =	0.21 cfs @	12.56 hrs, Volume=	2,715 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs



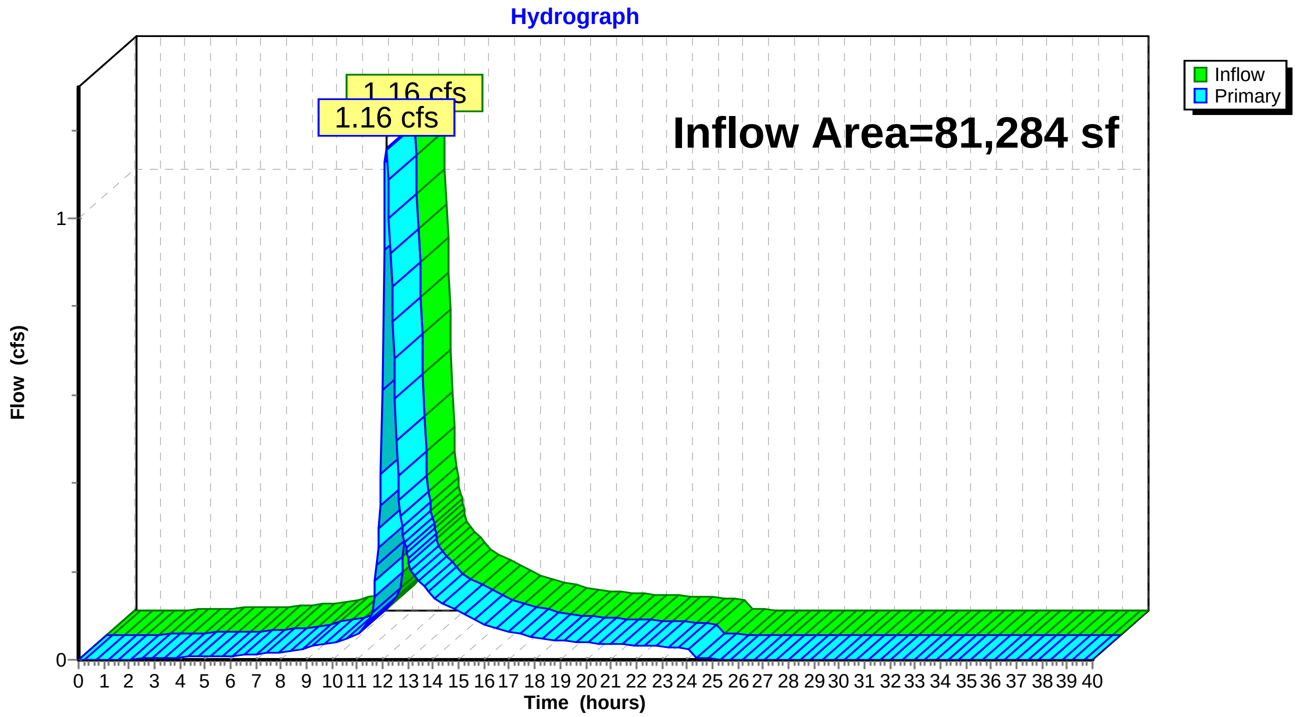
Summary for Pond DP2: Design Pont #2_Wetland-South

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 81,284 sf, 40.77% Impervious, Inflow Depth = 0.90" for 2-yr event
Inflow = 1.16 cfs @ 12.14 hrs, Volume= 6,075 cf
Primary = 1.16 cfs @ 12.14 hrs, Volume= 6,075 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Pond DP2: Design Pont #2_Wetland-South



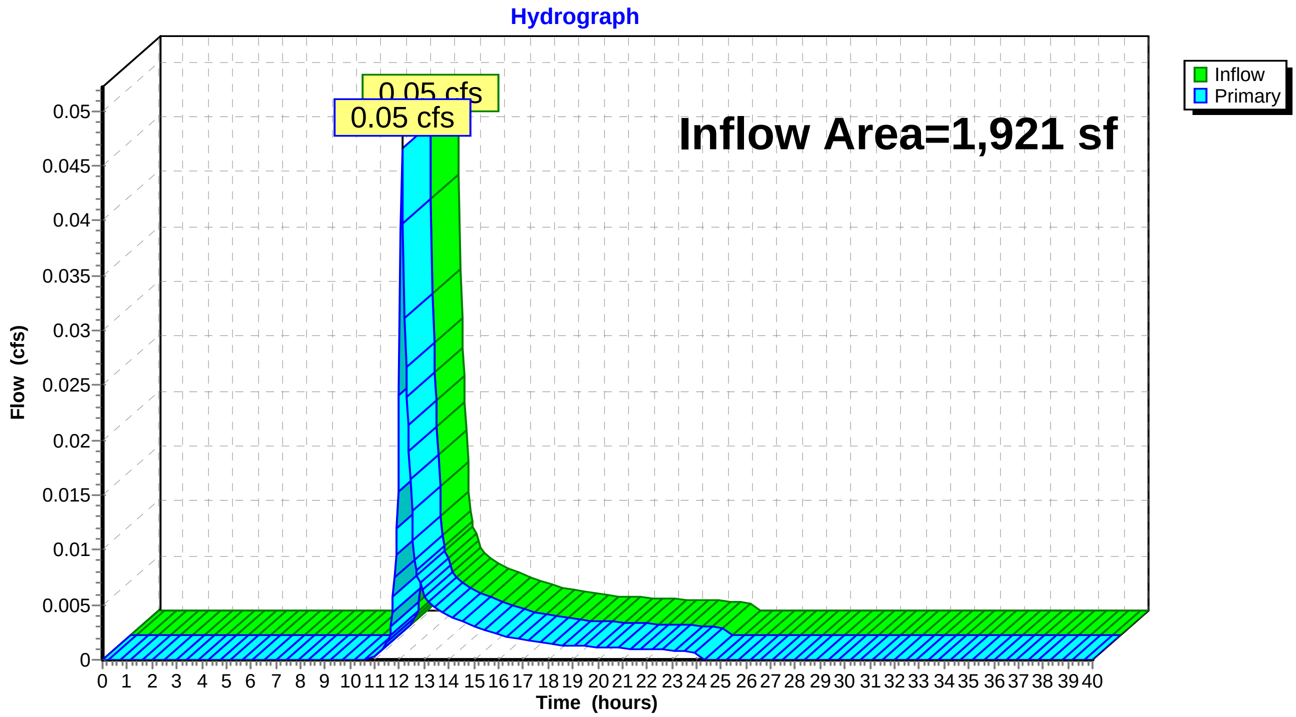
Summary for Pond DP3: Design Pont #3_Abutting Lot-East

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	1,921 sf,	0.00% Impervious,	Inflow Depth = 0.97"	for 2-yr event
Inflow =	0.05 cfs @	12.10 hrs, Volume=	156 cf	
Primary =	0.05 cfs @	12.10 hrs, Volume=	156 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Pond DP3: Design Pont #3_Abutting Lot-East



Summary for Pond IS: Infiltration System

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 14,215 sf,100.00% Impervious, Inflow Depth = 2.87" for 2-yr event
Inflow = 0.96 cfs @ 12.09 hrs, Volume= 3,397 cf
Outflow = 0.28 cfs @ 11.90 hrs, Volume= 3,397 cf, Atten= 71%, Lag= 0.0 min
Discarded = 0.28 cfs @ 11.90 hrs, Volume= 3,397 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.83' @ 12.41 hrs Surf.Area= 1,463 sf Storage= 556 cf

Plug-Flow detention time= 8.5 min calculated for 3,393 cf (100% of inflow)
Center-of-Mass det. time= 8.5 min (765.6 - 757.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	16.10'	670 cf	**6.28'W x 109.07'L x 3.52'H Field A** 2,416 cf Overall - 741 cf Embedded = 1,675 cf x 40.0% Voids
#2A	16.60'	741 cf	**Contech ChamberMaxx** x 15 Inside #1 Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap Row Length Adjustment= +0.32' x 6.92 sf x 1 rows
#3B	16.10'	601 cf	**10.98'W x 59.25'L x 3.52'H Field B** 2,294 cf Overall - 793 cf Embedded = 1,502 cf x 40.0% Voids
#4B	16.60'	793 cf	**Contech ChamberMaxx** x 16 Inside #3 Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap Row Length Adjustment= +0.32' x 6.92 sf x 2 rows
#5C	16.10'	143 cf	**2.54'W x 50.00'L x 3.21'H Field C** 408 cf Overall - 50 cf Embedded = 358 cf x 40.0% Voids
#6C	17.10'	39 cf	**ADS N-12 12** x 2 Inside #5 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf Row Length Adjustment= +8.00' x 0.81 sf x 1 rows
		2,986 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.10'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	17.90'	**12.0" Round Culvert** L= 66.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 17.90' / 16.50' S= 0.0212 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.28 cfs @ 11.90 hrs HW=16.15' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.10' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.00 cfs)

Pond IS: Infiltration System - Chamber Wizard Field A

Chamber Model = Contech ChamberMaxx (Contech® ChamberMaxx®)
Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
Row Length Adjustment= +0.32' x 6.92 sf x 1 rows

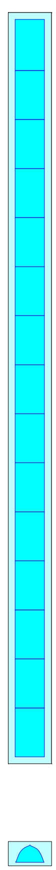
15 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 107.07' Row Length +12.0" End Stone x 2 = 109.07' Base Length
1 Rows x 51.4" Wide + 12.0" Side Stone x 2 = 6.28' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

15 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 1 Rows = 741.1 cf Chamber Storage

2,415.8 cf Field - 741.1 cf Chambers = 1,674.7 cf Stone x 40.0% Voids = 669.9 cf Stone Storage

Chamber Storage + Stone Storage = 1,411.0 cf = 0.032 af
Overall Storage Efficiency = 58.4%
Overall System Size = 109.07' x 6.28' x 3.52'

15 Chambers
89.5 cy Field
62.0 cy Stone



Pond IS: Infiltration System - Chamber Wizard Field B

Chamber Model = Contech ChamberMaxx (Contech® ChamberMaxx®)
Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
Row Length Adjustment= +0.32' x 6.92 sf x 2 rows

51.4" Wide + 5.0" Spacing = 56.4" C-C Row Spacing

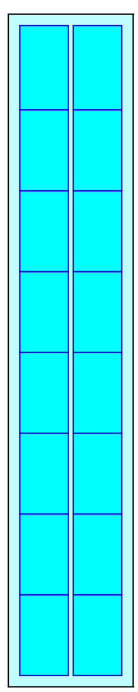
8 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 57.25' Row Length +12.0" End Stone x 2 = 59.25' Base Length
2 Rows x 51.4" Wide + 5.0" Spacing x 1 + 12.0" Side Stone x 2 = 10.98' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

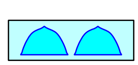
16 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 792.6 cf Chamber Storage

2,294.1 cf Field - 792.6 cf Chambers = 1,501.5 cf Stone x 40.0% Voids = 600.6 cf Stone Storage

Chamber Storage + Stone Storage = 1,393.2 cf = 0.032 af
Overall Storage Efficiency = 60.7%
Overall System Size = 59.25' x 10.98' x 3.52'

16 Chambers
85.0 cy Field
55.6 cy Stone





Pond IS: Infiltration System - Chamber Wizard Field C

Chamber Model = ADS N-12 12 (ADS N-12® Pipe)
Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
Row Length Adjustment= +8.00' x 0.81 sf x 1 rows

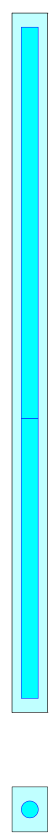
2 Chambers/Row x 20.00' Long +8.00' Row Adjustment = 48.00' Row Length +12.0" End Stone x 2 = 50.00' Base Length
1 Rows x 14.5" Wide + 8.0" Side Stone x 2 = 2.54' Base Width
12.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.21' Field Height

2 Chambers x 16.2 cf +8.00' Row Adjustment x 0.81 sf x 1 Rows = 38.9 cf Chamber Storage
2 Chambers x 20.9 cf +8.00' Row Adjustment x 1.05 sf x 1 Rows = 50.2 cf Displacement

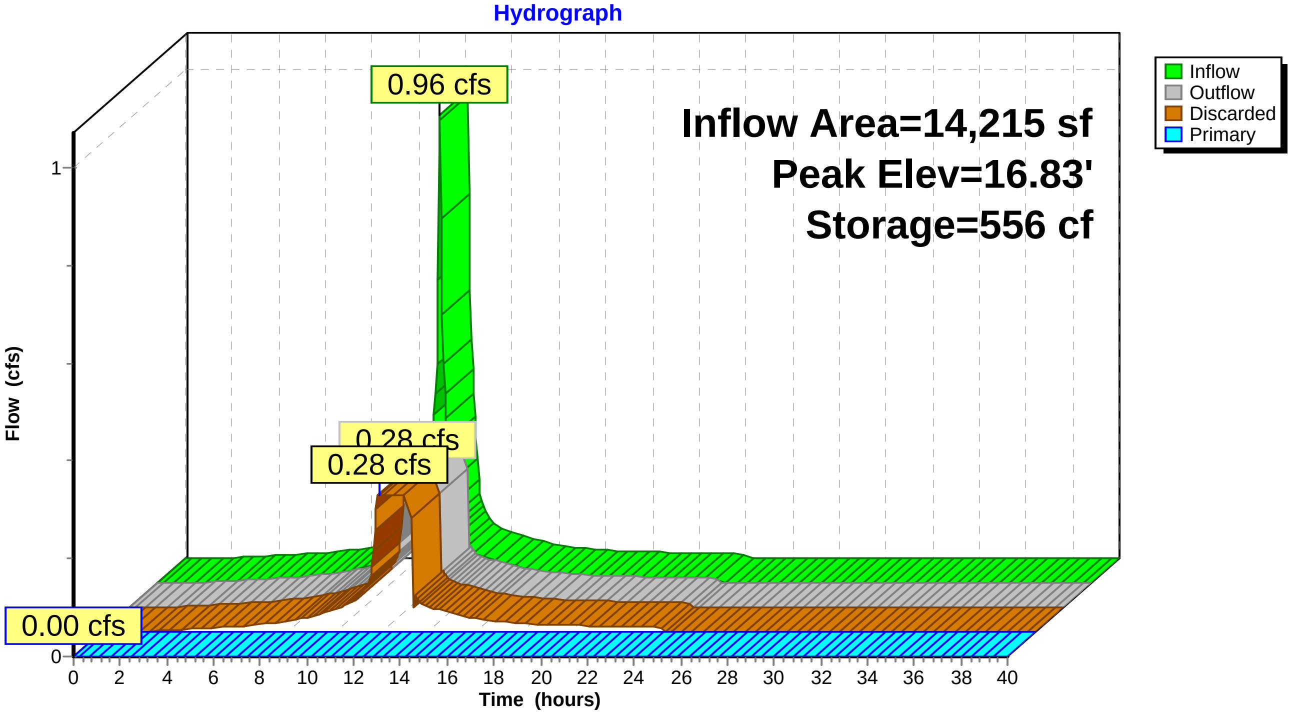
407.9 cf Field - 50.2 cf Chambers = 357.7 cf Stone x 40.0% Voids = 143.1 cf Stone Storage

Chamber Storage + Stone Storage = 181.9 cf = 0.004 af
Overall Storage Efficiency = 44.6%
Overall System Size = 50.00' x 2.54' x 3.21'

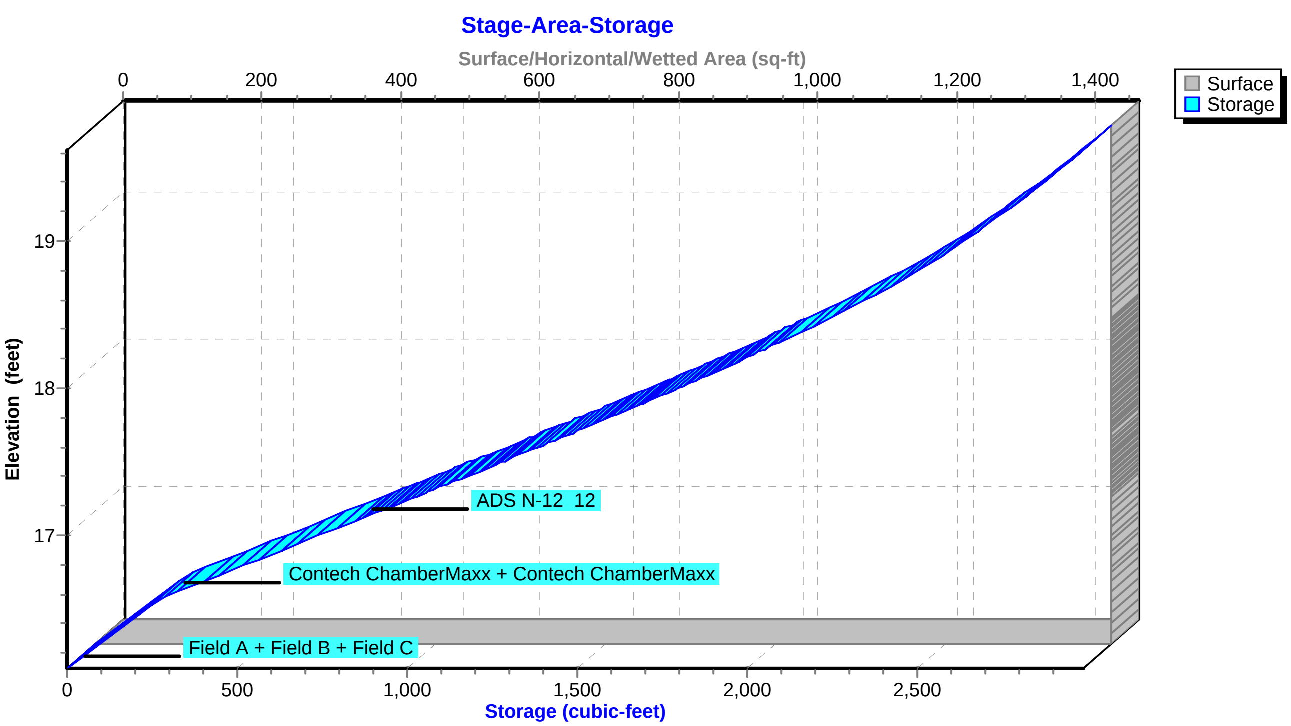
2 Chambers
15.1 cy Field
13.2 cy Stone



Pond IS: Infiltration System



Pond IS: Infiltration System



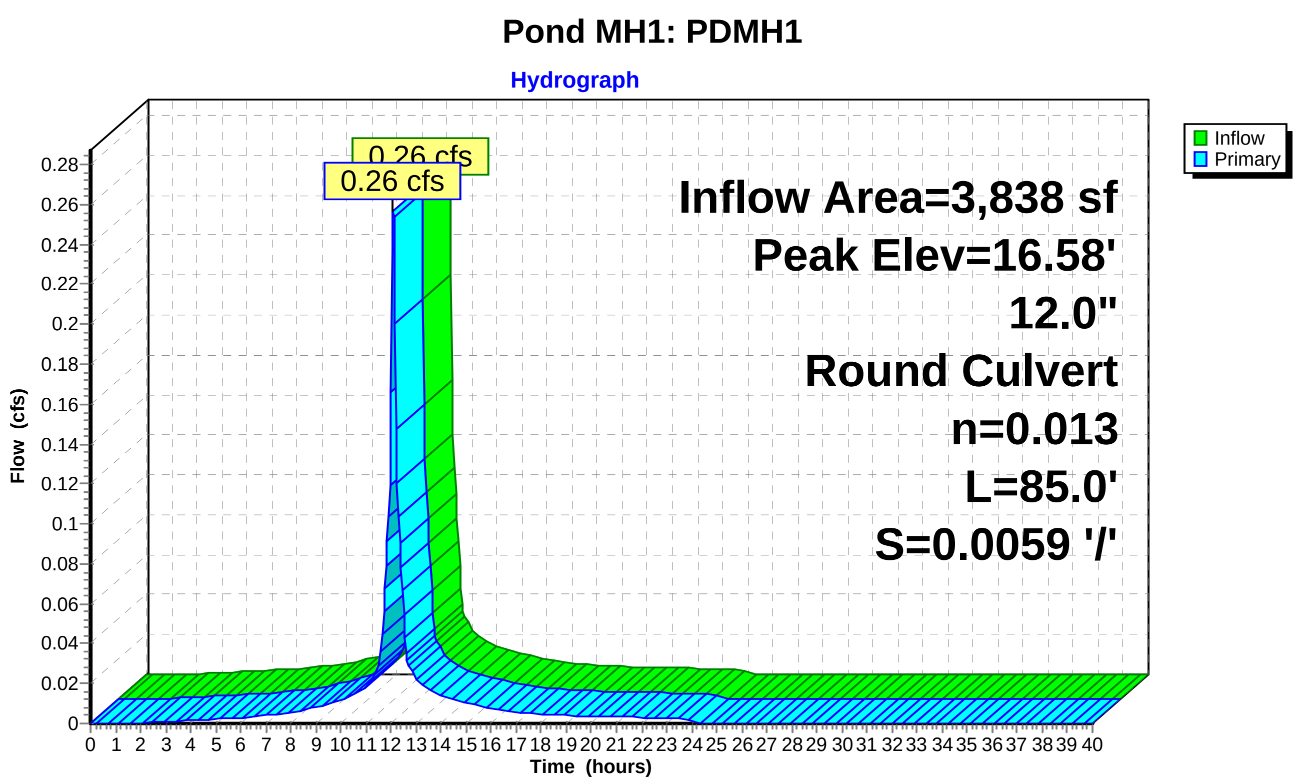
Summary for Pond MH1: PDMH1

Inflow Area =	3,838 sf,	97.68% Impervious,	Inflow Depth = 2.80"	for 2-yr event
Inflow =	0.26 cfs @	12.09 hrs, Volume=	897 cf	
Outflow =	0.26 cfs @	12.09 hrs, Volume=	897 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.26 cfs @	12.09 hrs, Volume=	897 cf	

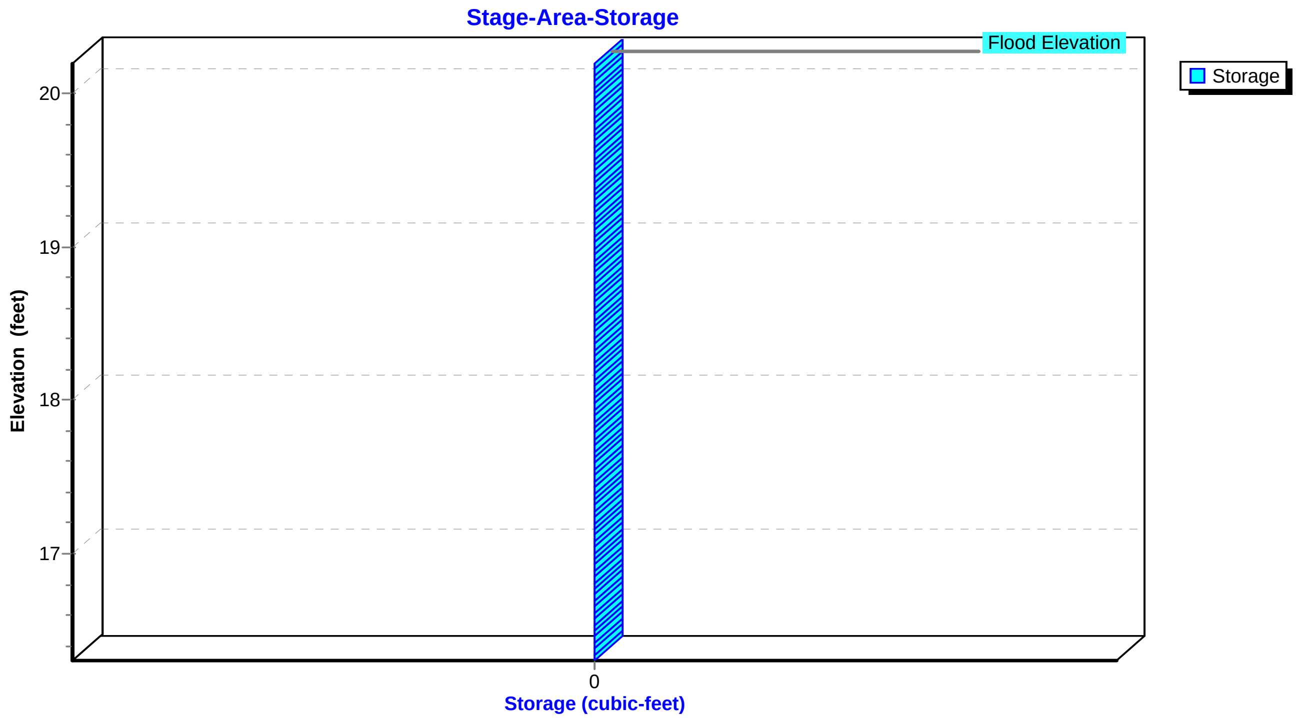
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.58' @ 12.09 hrs
Flood Elev= 20.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	16.30'	**12.0" Round Culvert** L= 85.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.30' / 15.80' S= 0.0059 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.25 cfs @ 12.09 hrs HW=16.58' TW=15.99' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.25 cfs @ 2.07 fps)



Pond MH1: PDMH1



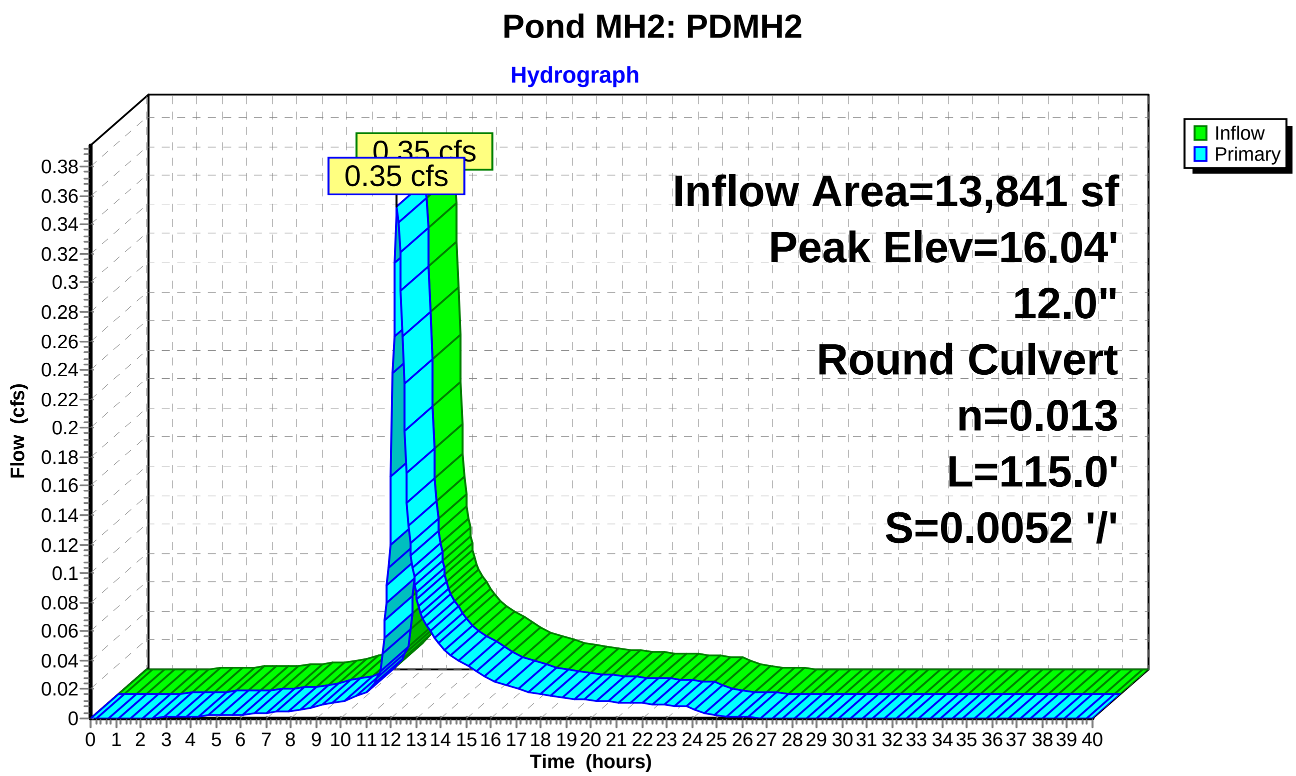
Summary for Pond MH2: PDMH2

Inflow Area = 13,841 sf, 76.82% Impervious, Inflow Depth = 1.75" for 2-yr event
Inflow = 0.35 cfs @ 12.24 hrs, Volume= 2,024 cf
Outflow = 0.35 cfs @ 12.24 hrs, Volume= 2,024 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.35 cfs @ 12.24 hrs, Volume= 2,024 cf

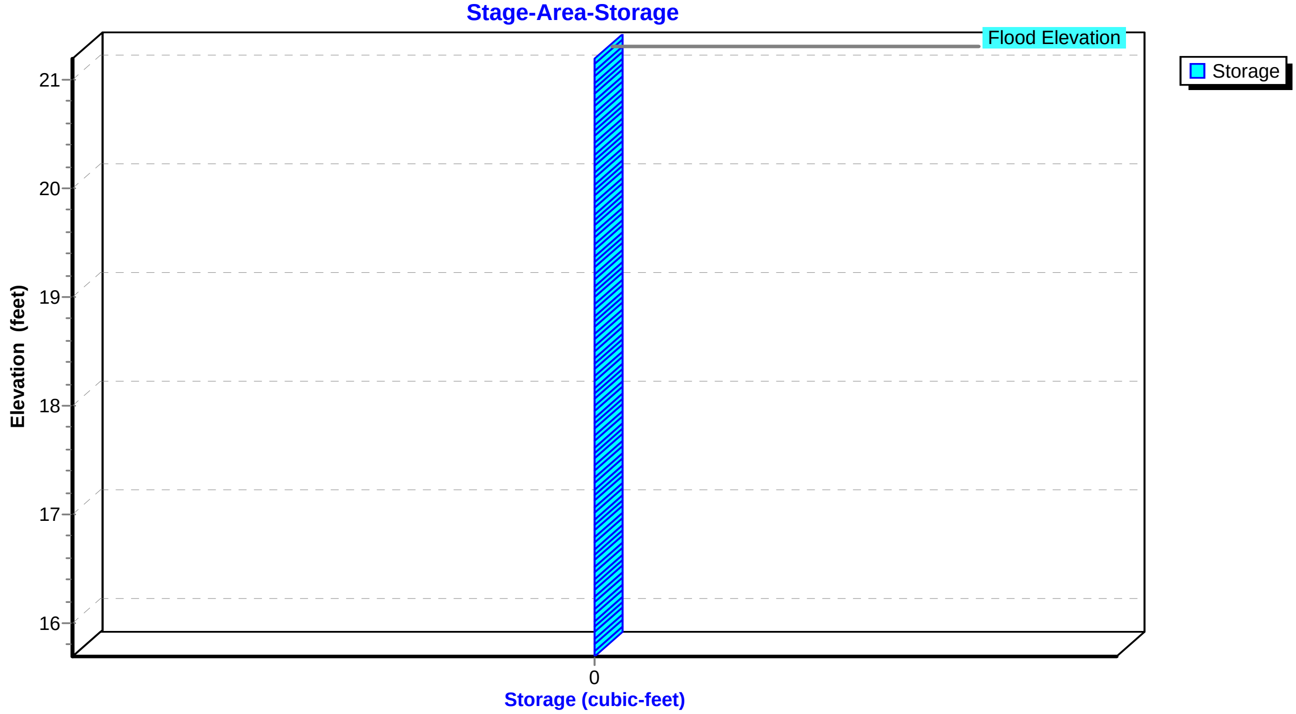
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.04' @ 12.24 hrs
Flood Elev= 21.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	15.70'	**12.0" Round Culvert** L= 115.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.70' / 15.10' S= 0.0052 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.35 cfs @ 12.24 hrs HW=16.04' TW=15.35' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.35 cfs @ 2.21 fps)



Pond MH2: PDMH2



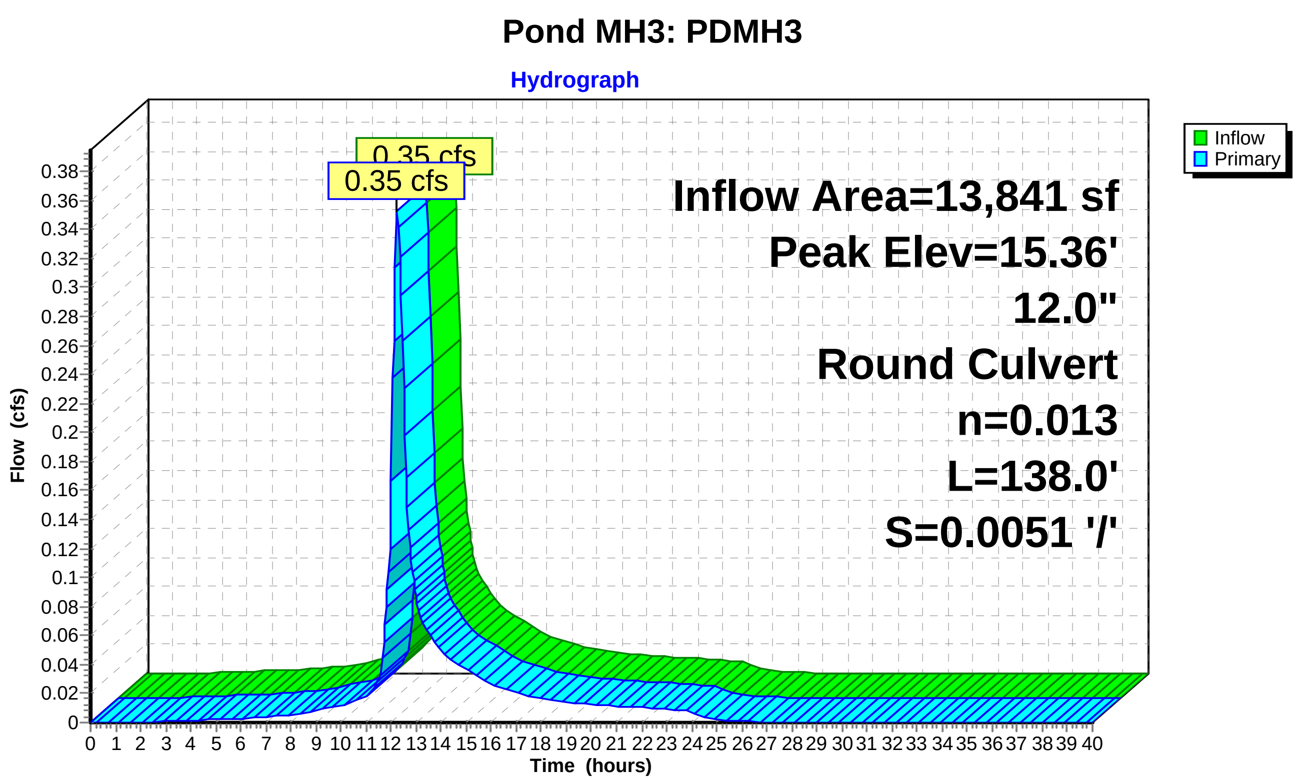
Summary for Pond MH3: PDMH3

Inflow Area =	13,841 sf,	76.82% Impervious,	Inflow Depth = 1.75"	for 2-yr event
Inflow =	0.35 cfs @	12.24 hrs, Volume=	2,024 cf	
Outflow =	0.35 cfs @	12.24 hrs, Volume=	2,024 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.35 cfs @	12.24 hrs, Volume=	2,024 cf	

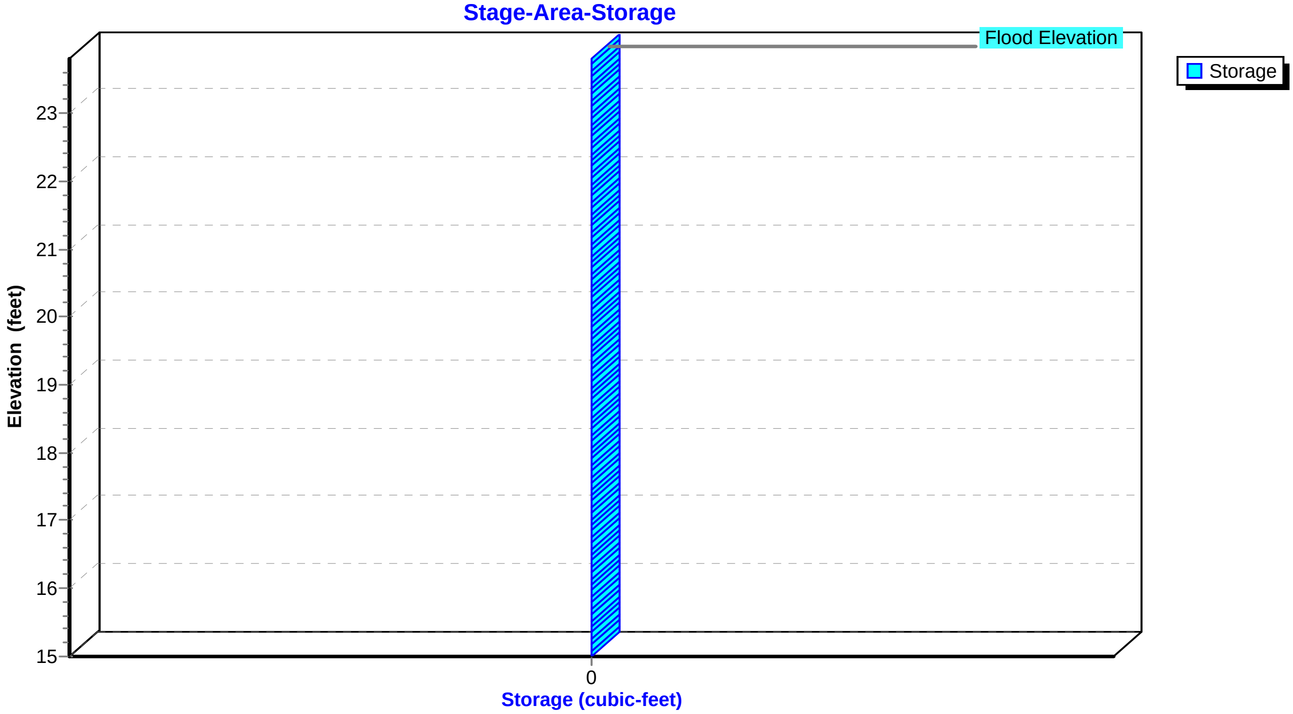
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.36' @ 12.22 hrs
Flood Elev= 23.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	**12.0" Round Culvert** L= 138.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.00' / 14.30' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.36 cfs @ 12.24 hrs HW=15.35' TW=14.65' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.36 cfs @ 2.12 fps)



Pond MH3: PDMH3



Summary for Pond MH4: PDMH4

Inflow Area =	22,134 sf,	85.50% Impervious,	Inflow Depth = 2.17"	for 2-yr event
Inflow =	0.82 cfs @	12.10 hrs, Volume=	4,006 cf	
Outflow =	0.82 cfs @	12.10 hrs, Volume=	4,006 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.72 cfs @	12.10 hrs, Volume=	3,924 cf	
Secondary =	0.10 cfs @	12.10 hrs, Volume=	82 cf	

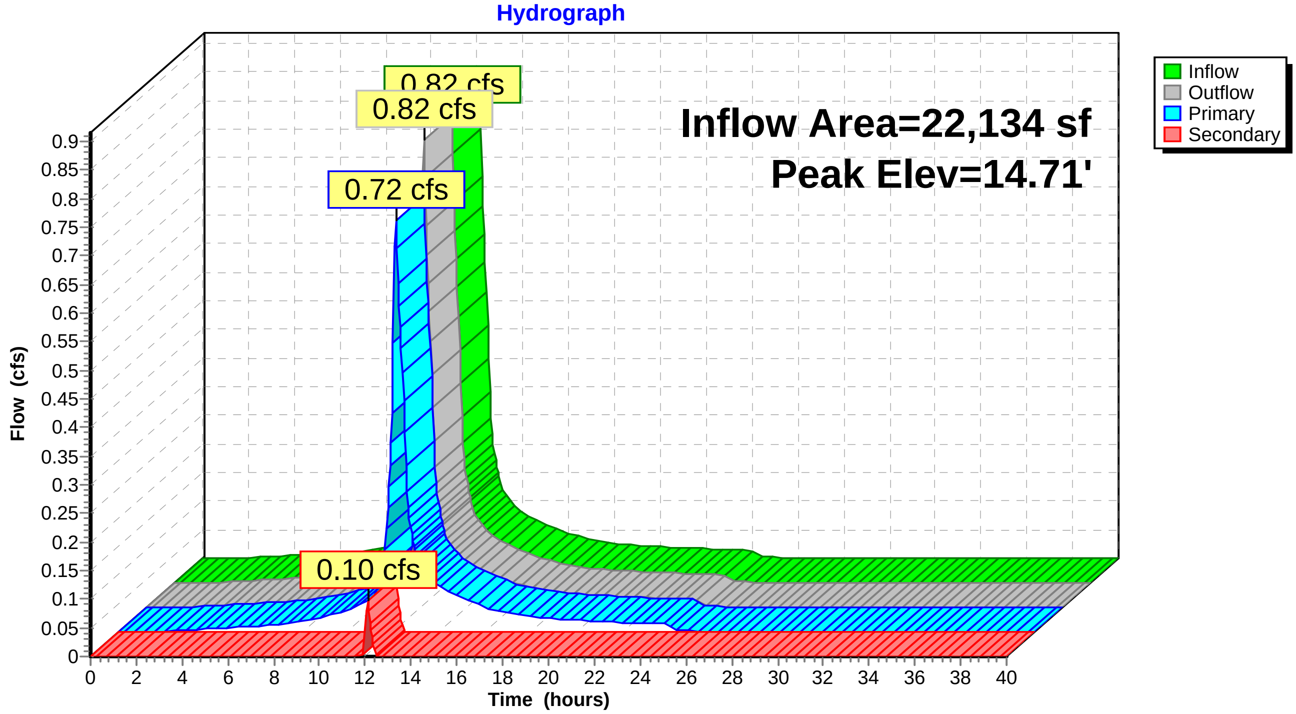
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 14.71' @ 12.10 hrs
Flood Elev= 21.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	14.20'	**12.0" Round Culvert** L= 6.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 14.10' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	14.20'	**12.0" Round Culvert** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 13.70' S= 0.0625 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	14.55'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

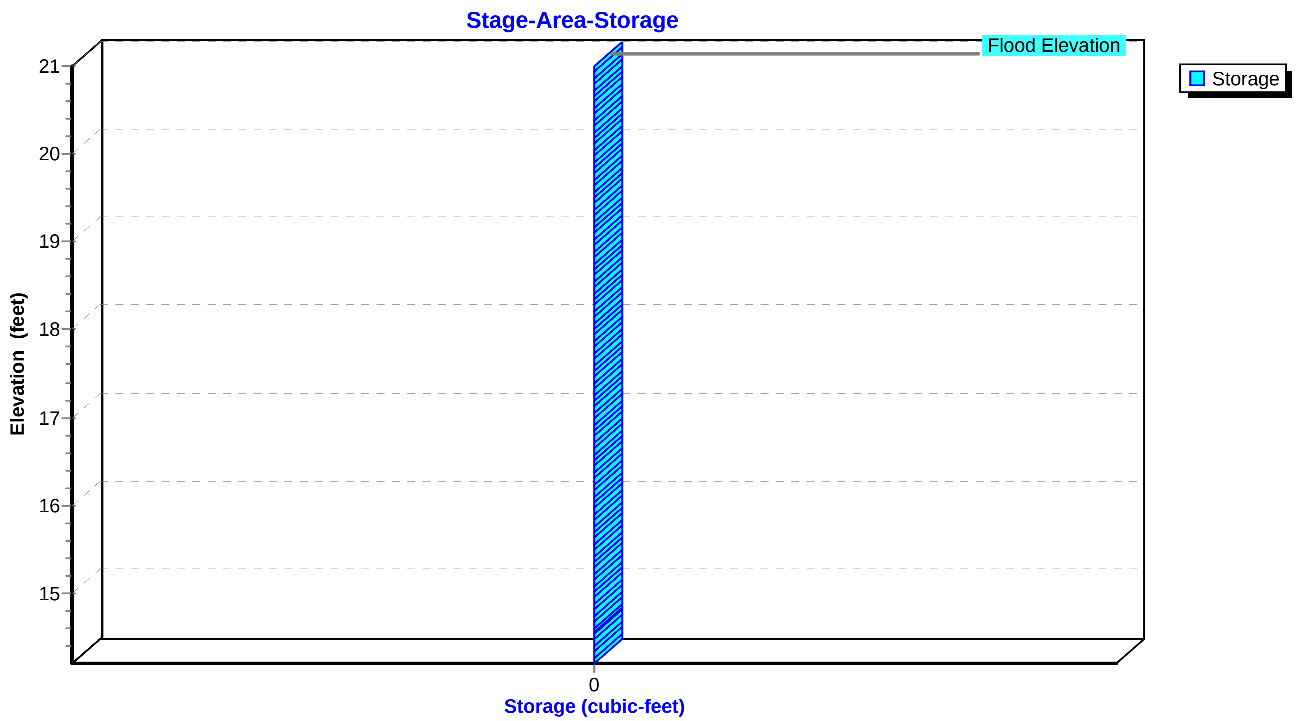
Primary OutFlow Max=0.72 cfs @ 12.10 hrs HW=14.71' TW=14.33' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.72 cfs @ 2.61 fps)

Secondary OutFlow Max=0.10 cfs @ 12.10 hrs HW=14.71' TW=14.13' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.10 cfs of 0.77 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.10 cfs @ 1.30 fps)

Pond MH4: PDMH4



Pond MH4: PDMH4



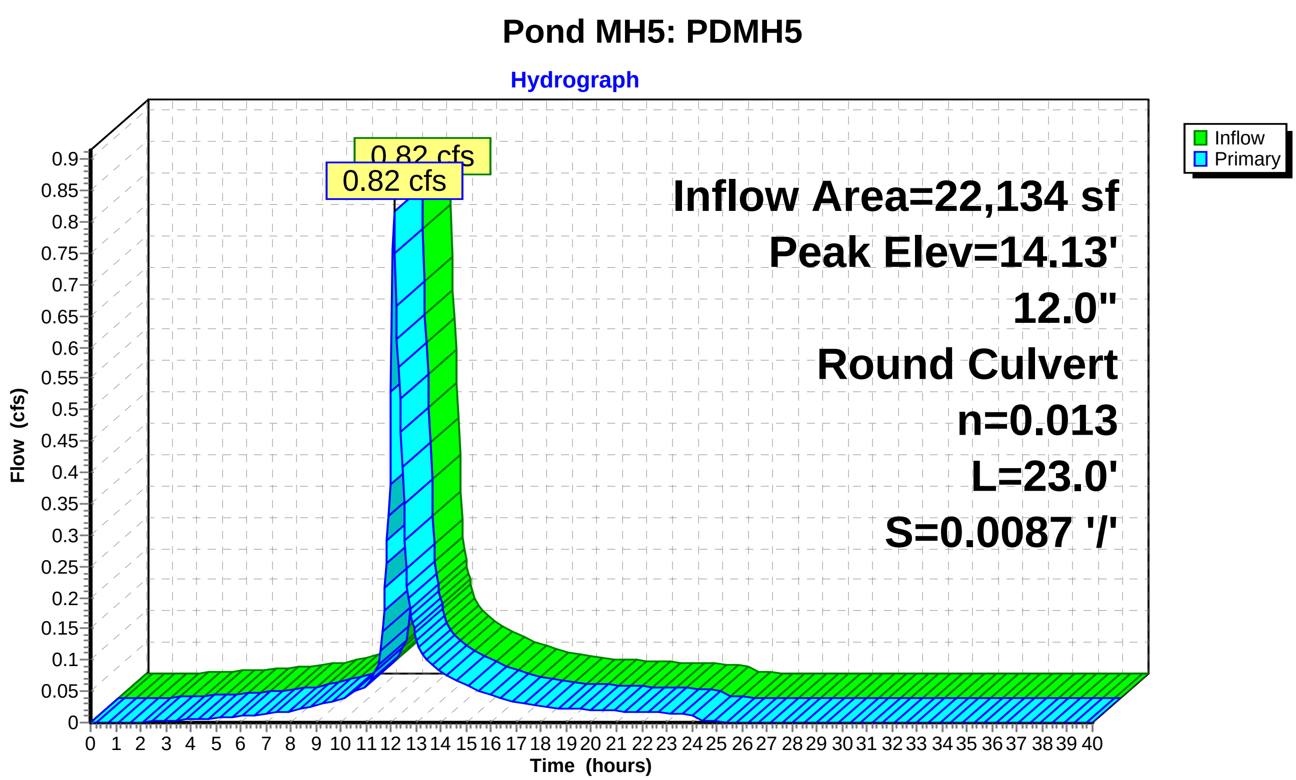
Summary for Pond MH5: PDMH5

Inflow Area =	22,134 sf,	85.50% Impervious,	Inflow Depth = 2.17"	for 2-yr event	
Inflow =	0.82 cfs @	12.10 hrs,	Volume=	4,006 cf	
Outflow =	0.82 cfs @	12.10 hrs,	Volume=	4,006 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.82 cfs @	12.10 hrs,	Volume=	4,006 cf	

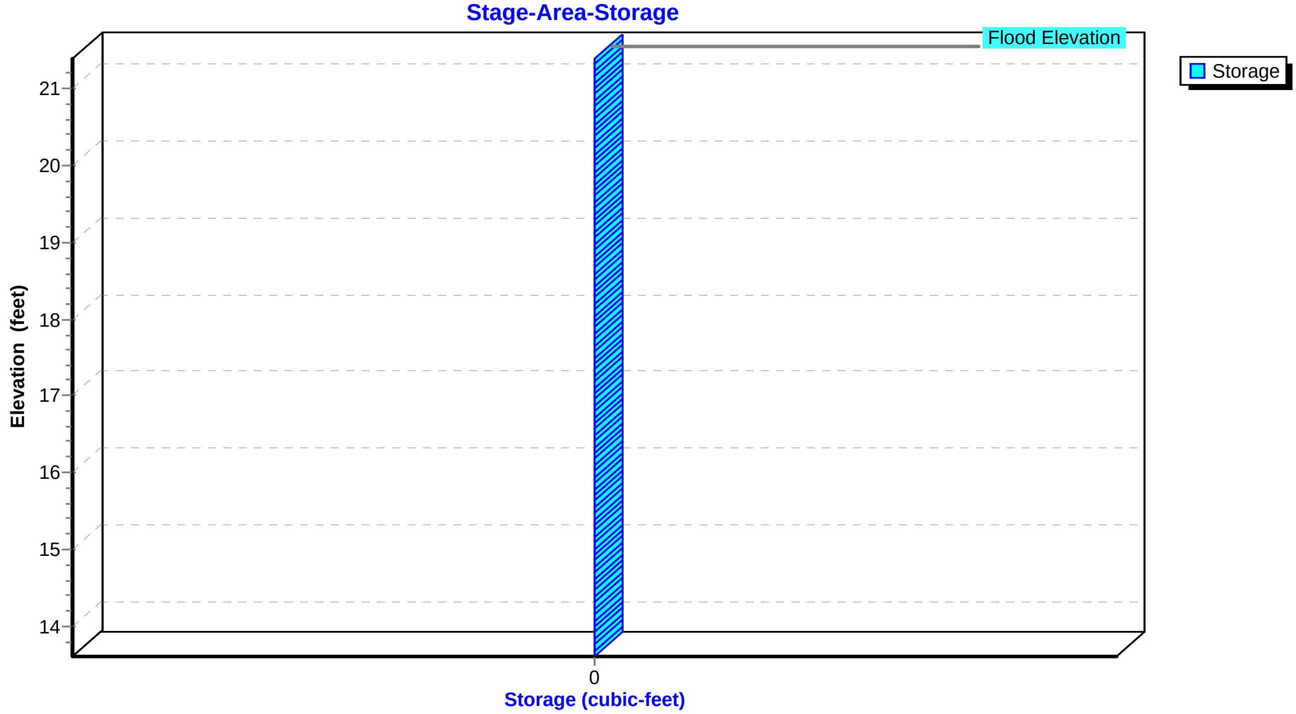
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 14.13' @ 12.10 hrs
Flood Elev= 21.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	13.60'	**12.0" Round Culvert** L= 23.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 13.60' / 13.40' S= 0.0087 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.82 cfs @ 12.10 hrs HW=14.13' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.82 cfs @ 2.78 fps)



Pond MH5: PDMH5



Summary for Pond MH6: PDMH6

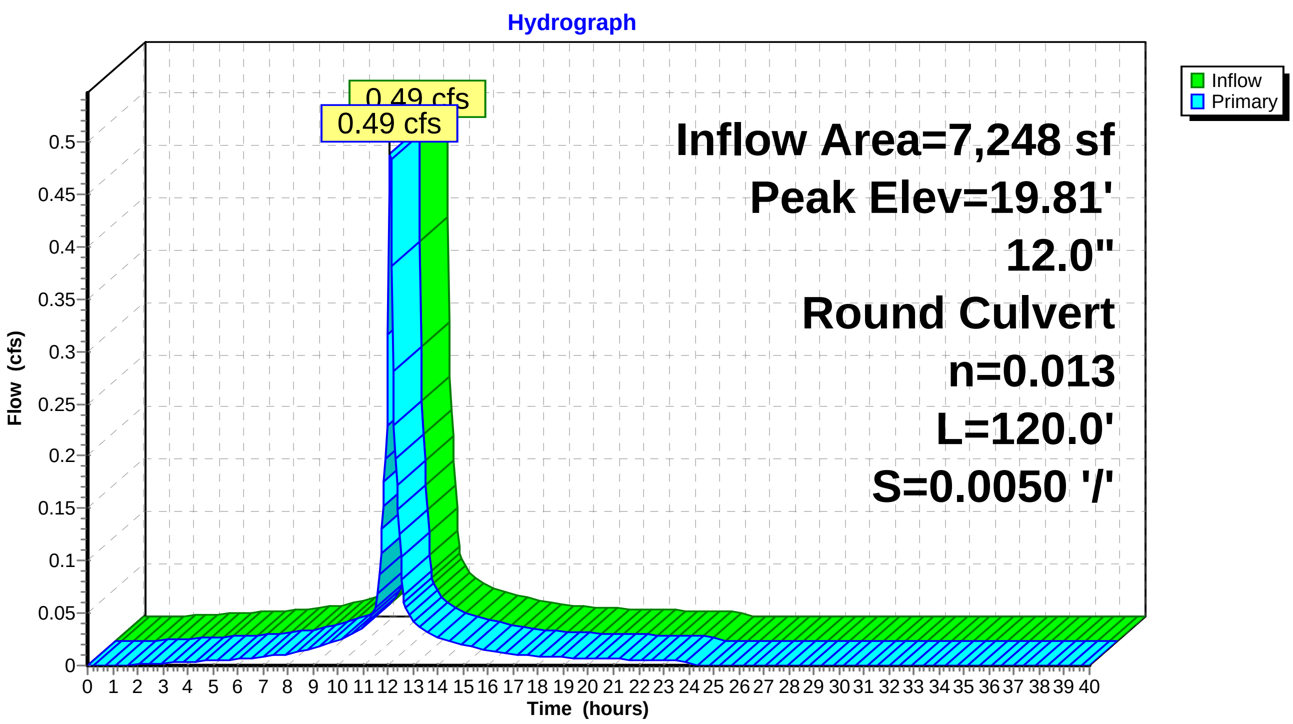
Inflow Area = 7,248 sf,100.00% Impervious, Inflow Depth = 2.87" for 2-yr event
Inflow = 0.49 cfs @ 12.09 hrs, Volume= 1,732 cf
Outflow = 0.49 cfs @ 12.09 hrs, Volume= 1,732 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.49 cfs @ 12.09 hrs, Volume= 1,732 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.81' @ 12.09 hrs
Flood Elev= 23.80'

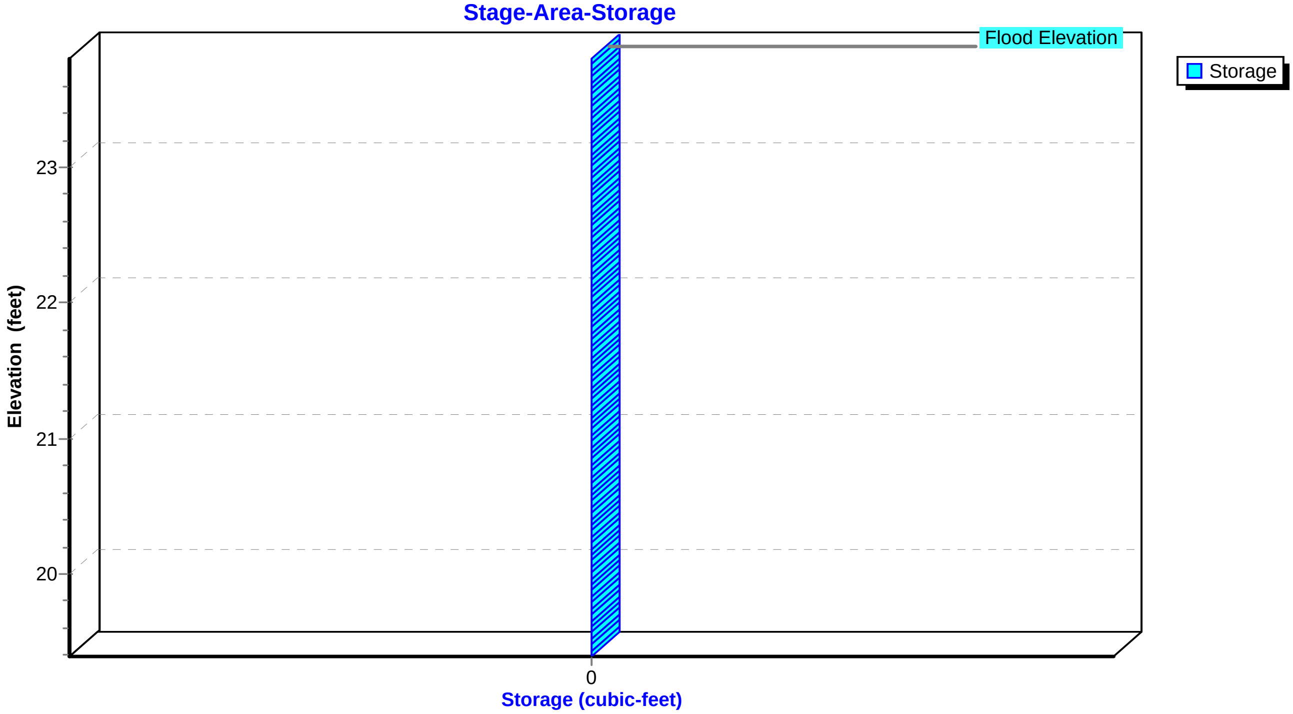
Device	Routing	Invert	Outlet Devices
#1	Primary	19.40'	**12.0" Round Culvert** L= 120.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.40' / 18.80' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.47 cfs @ 12.09 hrs HW=19.81' TW=19.15' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.47 cfs @ 2.30 fps)

Pond MH6: PDMH6



Pond MH6: PDMH6



Summary for Pond MH7: PDMH7

Inflow Area = 9,928 sf,100.00% Impervious, Inflow Depth = 2.87" for 2-yr event
Inflow = 0.67 cfs @ 12.09 hrs, Volume= 2,373 cf
Outflow = 0.67 cfs @ 12.09 hrs, Volume= 2,373 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.57 cfs @ 12.09 hrs, Volume= 2,321 cf
Secondary = 0.09 cfs @ 12.09 hrs, Volume= 52 cf

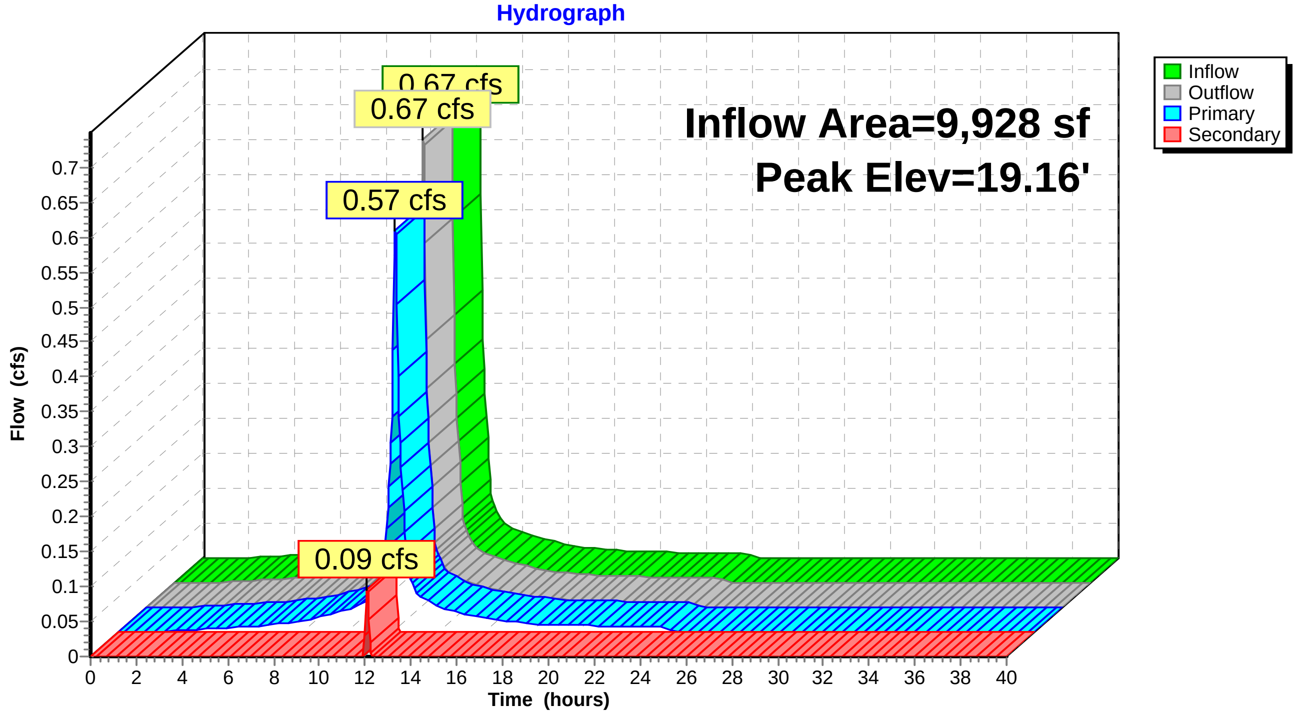
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.16' @ 12.09 hrs
Flood Elev= 21.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.70'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.70' / 18.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	18.70'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.70' / 18.20' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	19.00'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

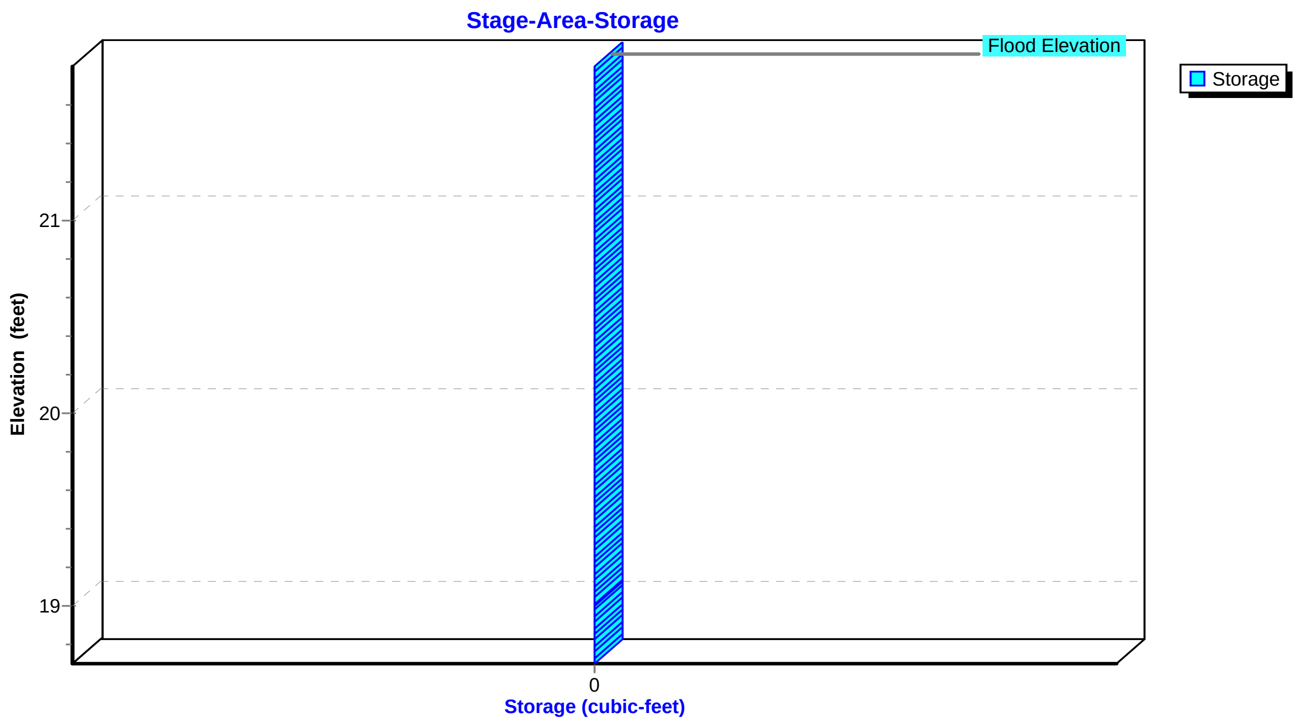
Primary OutFlow Max=0.56 cfs @ 12.09 hrs HW=19.15' TW=18.80' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.56 cfs @ 2.41 fps)

Secondary OutFlow Max=0.09 cfs @ 12.09 hrs HW=19.15' TW=18.70' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.09 cfs of 0.62 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.09 cfs @ 1.27 fps)

Pond MH7: PDMH7



Pond MH7: PDMH7



Summary for Pond MH8: PDMH8

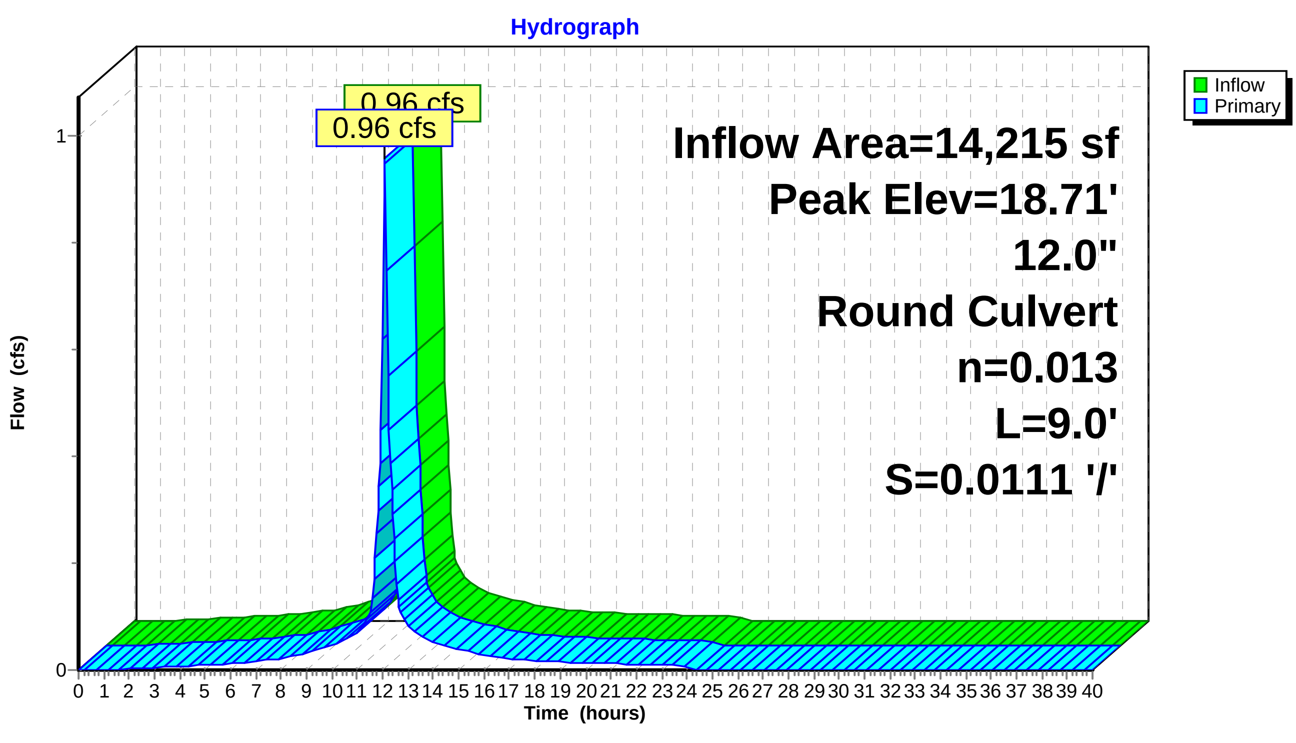
Inflow Area =	14,215 sf,100.00% Impervious,	Inflow Depth = 2.87" for 2-yr event		
Inflow =	0.96 cfs @	12.09 hrs, Volume=	3,397 cf	
Outflow =	0.96 cfs @	12.09 hrs, Volume=	3,397 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.96 cfs @	12.09 hrs, Volume=	3,397 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.71' @ 12.09 hrs
Flood Elev= 22.00'

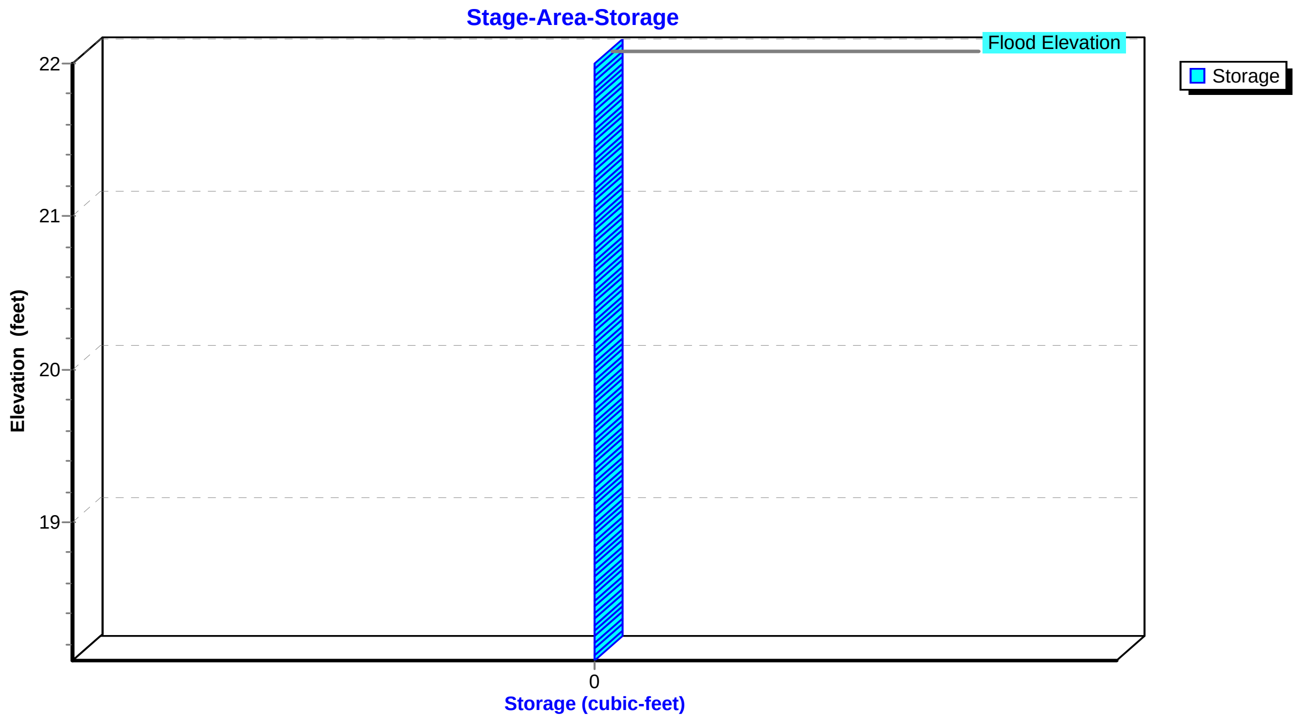
Device	Routing	Invert	Outlet Devices
#1	Primary	18.10'	**12.0" Round Culvert** L= 9.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.10' / 18.00' S= 0.0111 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.93 cfs @ 12.09 hrs HW=18.70' TW=16.56' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.93 cfs @ 2.70 fps)

Pond MH8: PDMH8



Pond MH8: PDMH8



Summary for Pond RG1: Rain Garden #1

Inflow Area = 25,212 sf, 56.56% Impervious, Inflow Depth = 1.75" for 2-yr event
Inflow = 1.12 cfs @ 12.09 hrs, Volume= 3,671 cf
Outflow = 0.21 cfs @ 12.56 hrs, Volume= 2,693 cf, Atten= 82%, Lag= 28.3 min
Primary = 0.21 cfs @ 12.56 hrs, Volume= 2,693 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.68' @ 12.56 hrs Surf.Area= 5,342 sf Storage= 1,849 cf
Flood Elev= 16.70' Surf.Area= 6,703 sf Storage= 6,272 cf

Plug-Flow detention time= 267.6 min calculated for 2,693 cf (73% of inflow)
Center-of-Mass det. time= 174.9 min (985.5 - 810.6)

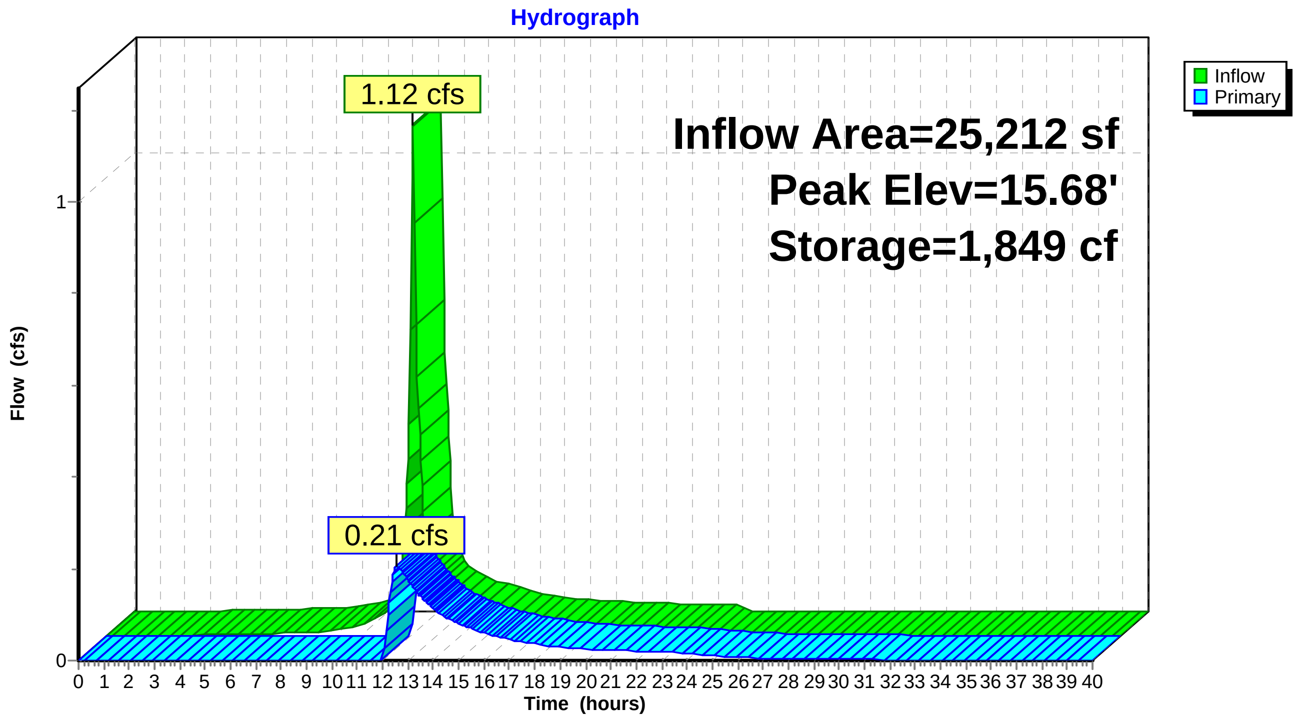
Volume	Invert	Avail.Storage	Storage Description
#1	15.30'	6,272 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
15.30	4,439	288.0	0	0	4,439
16.00	6,173	327.0	3,698	3,698	6,360
16.30	6,569	334.0	1,911	5,609	6,741
16.40	6,703	337.0	664	6,272	6,905

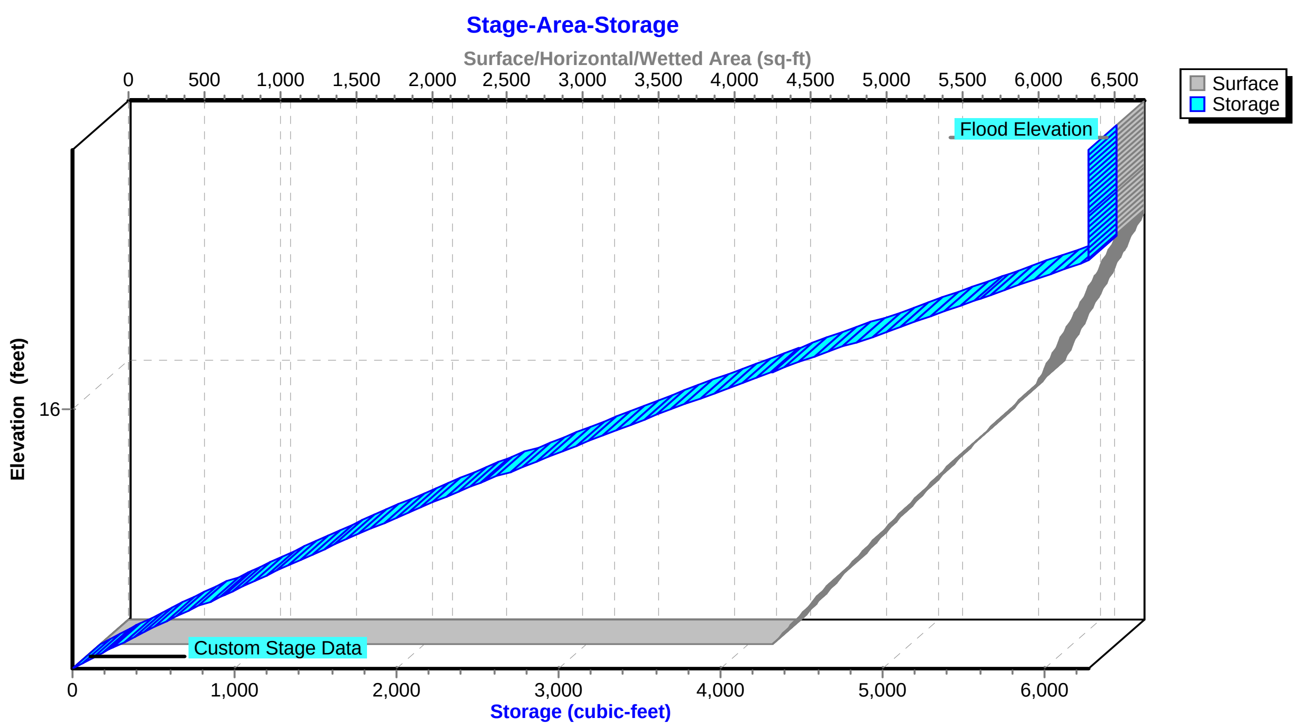
Device	Routing	Invert	Outlet Devices
#1	Primary	15.35'	**8.0" Round Culvert X 2.00** L= 65.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 15.35' / 15.00' S= 0.0054 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	15.50'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	15.80'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	16.10'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.21 cfs @ 12.56 hrs HW=15.68' TW=0.00' (Dynamic Tailwater)
1=Culvert (Passes 0.21 cfs of 0.49 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.21 cfs @ 1.44 fps)
3=Orifice/Grate (Controls 0.00 cfs)
4=Orifice/Grate (Controls 0.00 cfs)

Pond RG1: Rain Garden #1



Pond RG1: Rain Garden #1



Summary for Pond RG2: Rain Garden #2

[80] Warning: Exceeded Pond CB3 by 0.22' @ 24.35 hrs (0.11 cfs 1,125 cf)

Inflow Area = 10,003 sf, 68.81% Impervious, Inflow Depth = 2.18" for 2-yr event
Inflow = 0.54 cfs @ 12.09 hrs, Volume= 1,817 cf
Outflow = 0.24 cfs @ 12.30 hrs, Volume= 1,127 cf, Atten= 56%, Lag= 12.4 min
Primary = 0.24 cfs @ 12.30 hrs, Volume= 1,127 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.29' @ 12.30 hrs Surf.Area= 862 sf Storage= 850 cf
Flood Elev= 19.00' Surf.Area= 1,118 sf Storage= 1,546 cf

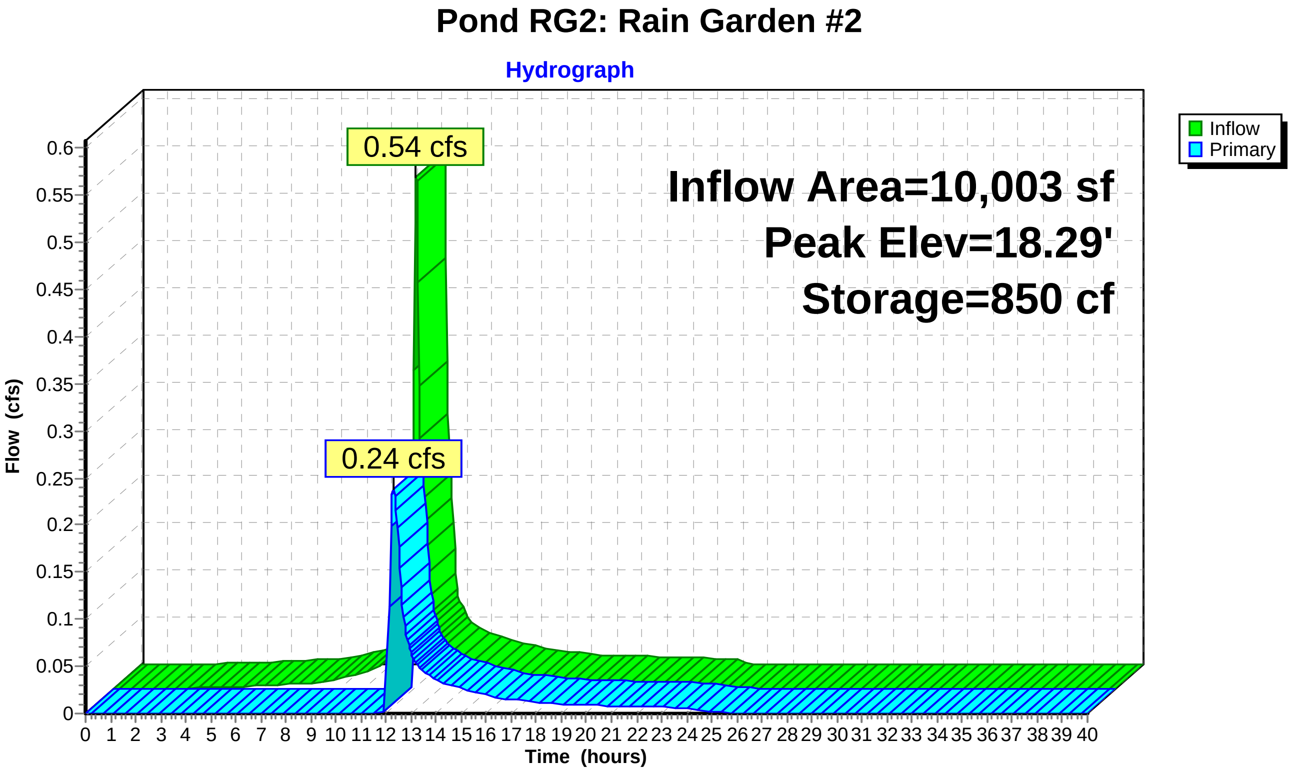
Plug-Flow detention time= 218.1 min calculated for 1,127 cf (62% of inflow)
Center-of-Mass det. time= 112.6 min (902.9 - 790.3)

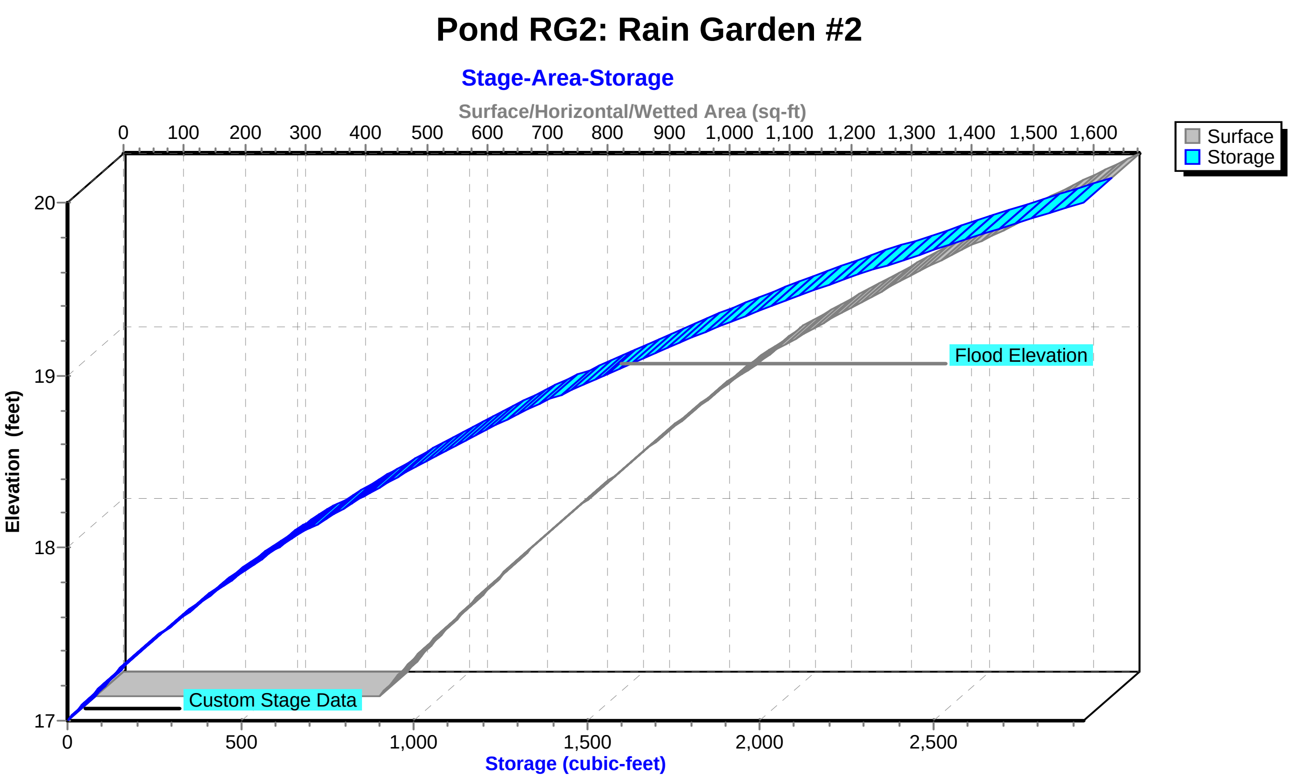
Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	2,934 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
17.00	468	89.0	0	0	468
18.00	765	108.0	610	610	782
19.00	1,118	127.0	936	1,546	1,156
20.00	1,676	152.0	1,388	2,934	1,728

Device	Routing	Invert	Outlet Devices
#1	Primary	16.50'	**12.0" Round Culvert X 2.00** L= 53.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 16.50' / 15.80' S= 0.0132 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	18.10'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	18.30'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	18.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.24 cfs @ 12.30 hrs HW=18.29' TW=16.04' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.24 cfs of 7.59 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.24 cfs @ 1.50 fps)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)


Pond RG2: Rain Garden #2
Hydrograph
0.54 cfs
0.24 cfs
Inflow Area=10,003 sf
Peak Elev=18.29'
Storage=850 cf
Inflow
Primary
Flow (cfs)
Time (hours)


Pond RG2: Rain Garden #2
Stage-Area-Storage
Surface/Horizontal/Wetted Area (sq-ft)
Surface
Storage
Flood Elevation
Custom Stage Data
Elevation (feet)
Storage (cubic-feet)

Summary for Pond WQU1: Water Quality Unit 1

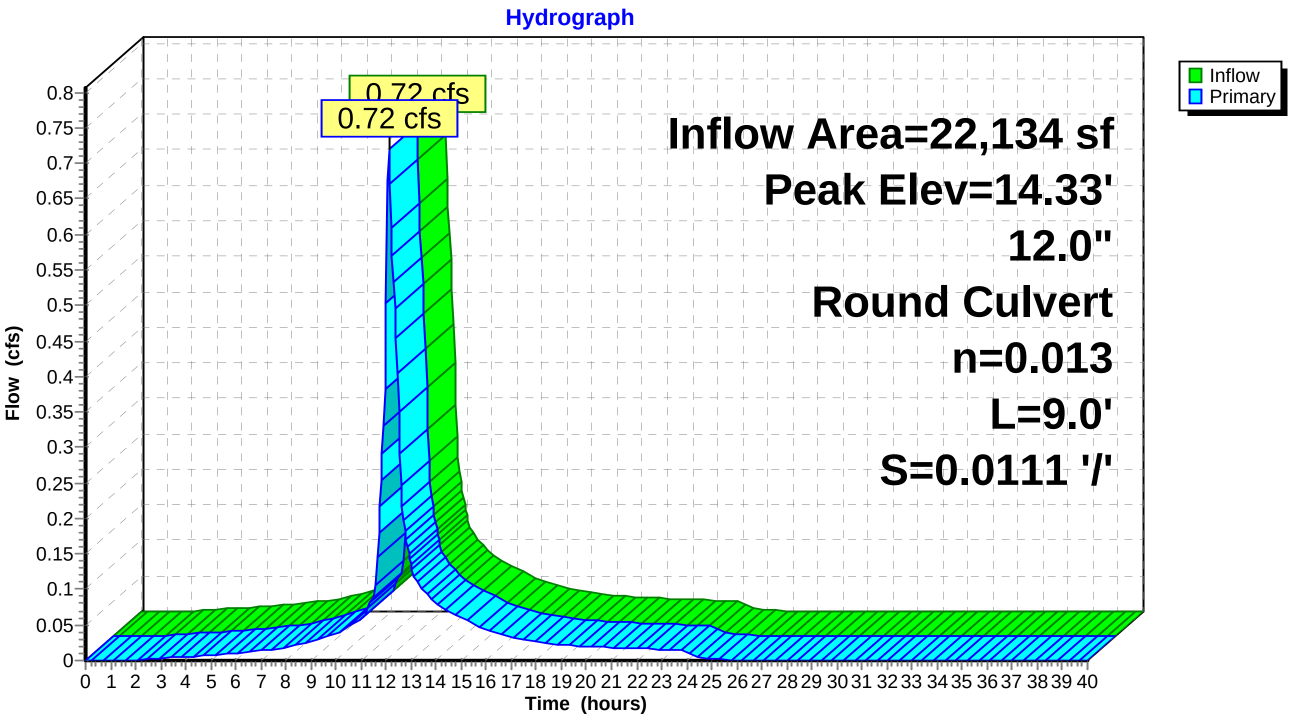
Inflow Area =	22,134 sf,	85.50% Impervious,	Inflow Depth = 2.13"	for 2-yr event
Inflow =	0.72 cfs @	12.10 hrs, Volume=	3,924 cf	
Outflow =	0.72 cfs @	12.10 hrs, Volume=	3,924 cf, Atten= 0%, Lag= 0.0 min	
Primary =	0.72 cfs @	12.10 hrs, Volume=	3,924 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 14.33' @ 12.12 hrs
Flood Elev= 21.00'

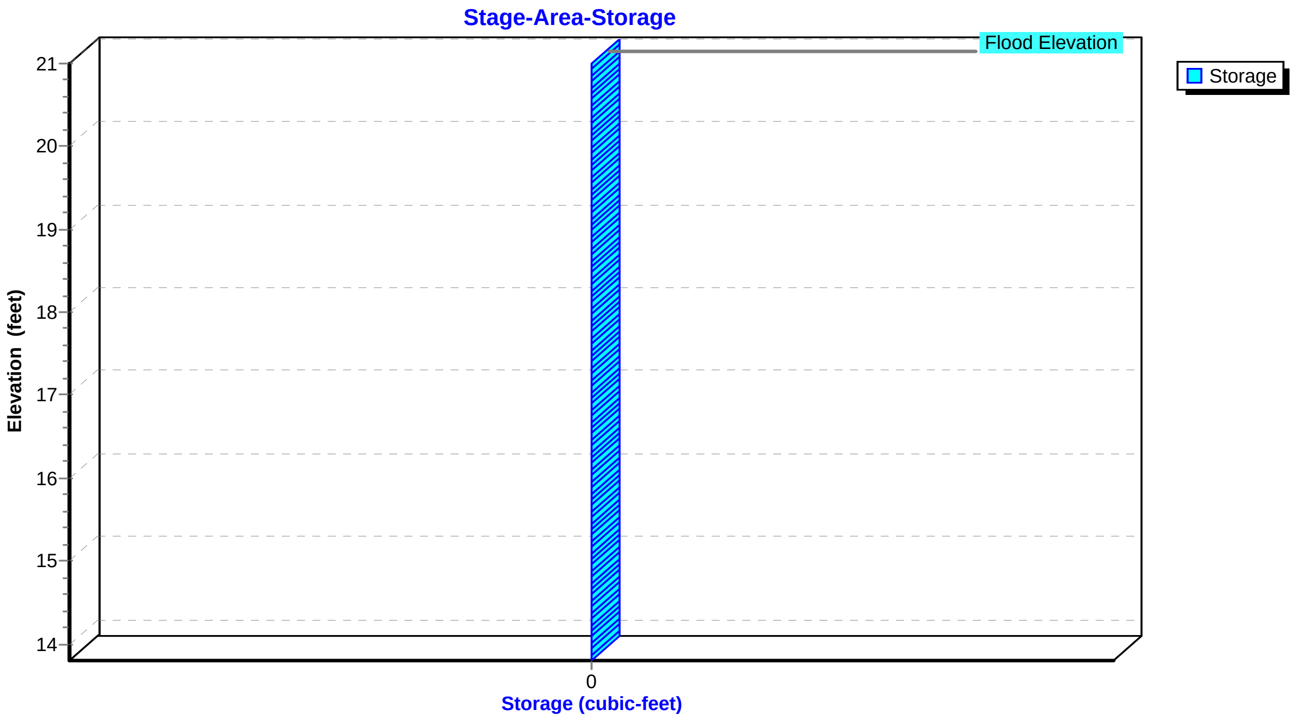
Device	Routing	Invert	Outlet Devices
#1	Primary	13.80'	**12.0" Round Culvert** L= 9.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 13.80' / 13.70' S= 0.0111 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.68 cfs @ 12.10 hrs HW=14.33' TW=14.13' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.68 cfs @ 2.35 fps)

Pond WQU1: Water Quality Unit 1



Pond WQU1: Water Quality Unit 1



Summary for Pond WQU2: Water Quality Unit 2

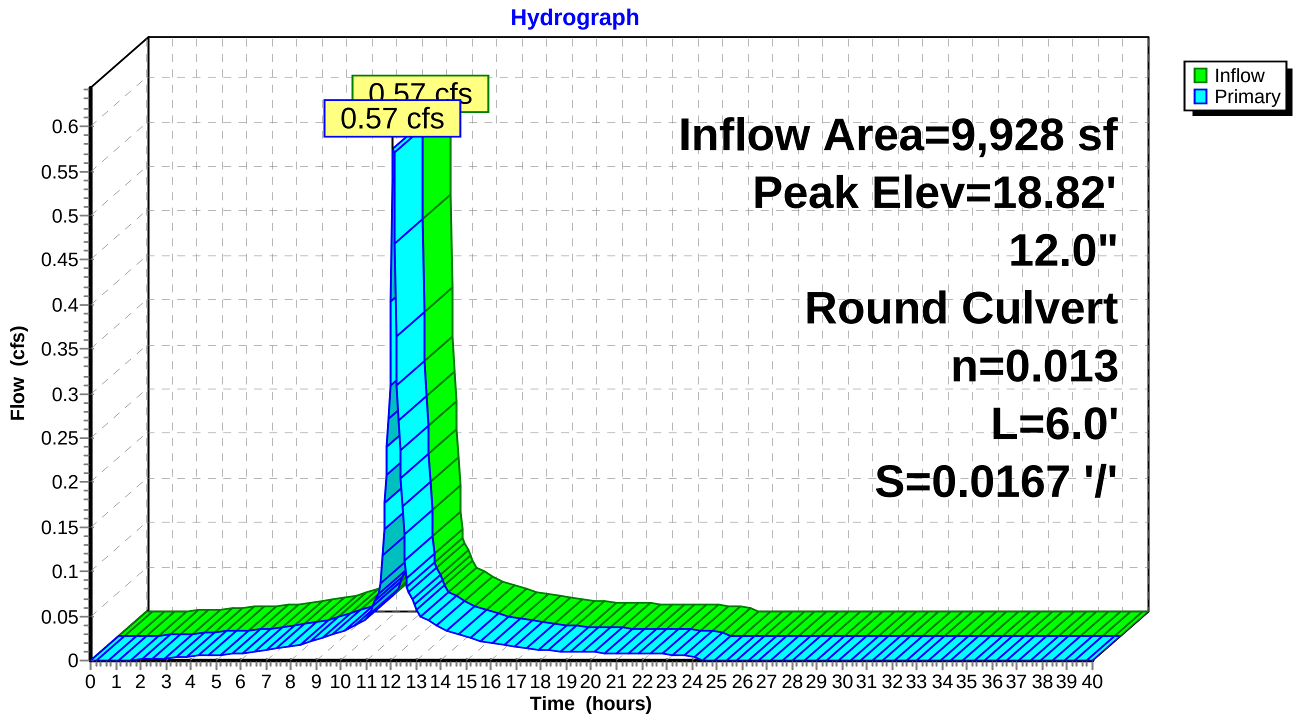
Inflow Area = 9,928 sf,100.00% Impervious, Inflow Depth = 2.81" for 2-yr event
Inflow = 0.57 cfs @ 12.09 hrs, Volume= 2,321 cf
Outflow = 0.57 cfs @ 12.09 hrs, Volume= 2,321 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.57 cfs @ 12.09 hrs, Volume= 2,321 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.82' @ 12.12 hrs
Flood Elev= 22.30'

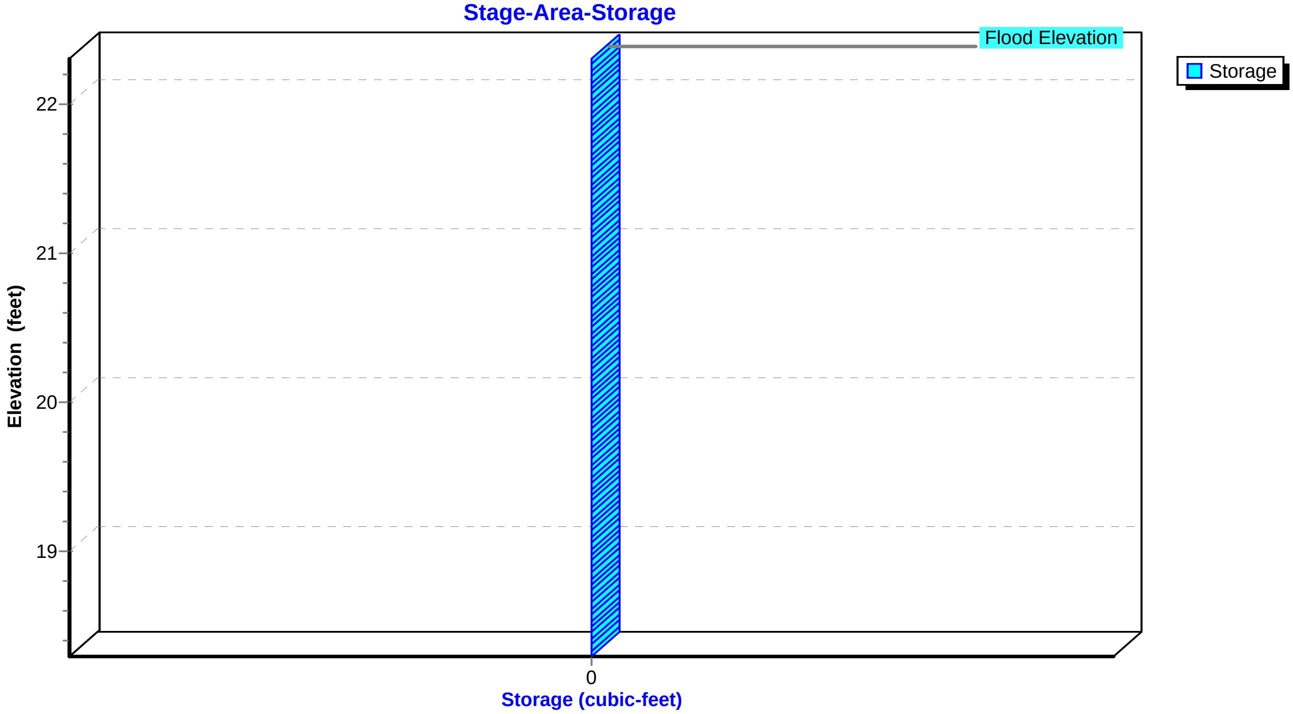
Device	Routing	Invert	Outlet Devices
#1	Primary	18.30'	**12.0" Round Culvert** L= 6.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.30' / 18.20' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.47 cfs @ 12.09 hrs HW=18.80' TW=18.70' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.47 cfs @ 1.72 fps)

Pond WQU2: Water Quality Unit 2



Pond WQU2: Water Quality Unit 2



Proposed Conditions Analysis
10-Year 24-Hour Storm Event

Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100: 100 - Pavement, Lawn, Runoff Area=20,037 sf 45.35% Impervious Runoff Depth=2.81"
Tc=6.0 min CN=82 Runoff=1.48 cfs 4,696 cf

Subcatchment 101: 101 - West Side Lawn to Runoff Area=271 sf 0.00% Impervious Runoff Depth=2.13"
Tc=6.0 min CN=74 Runoff=0.02 cfs 48 cf

Subcatchment 102: 102 - Existing Building Runoff Area=5,175 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.53 cfs 1,925 cf

Subcatchment 200: 200 - Portion of Runoff Area=2,107 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.22 cfs 784 cf

Subcatchment 201: 201 - Pavement Runoff Area=2,187 sf 95.93% Impervious Runoff Depth=4.35"
Tc=6.0 min CN=97 Runoff=0.22 cfs 792 cf

Subcatchment 202: 202 - Pavement Runoff Area=1,651 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.17 cfs 614 cf

Subcatchment 203: 203 - Pavement Runoff Area=5,013 sf 96.69% Impervious Runoff Depth=4.35"
Tc=6.0 min CN=97 Runoff=0.51 cfs 1,816 cf

Subcatchment 204: 204 - Pavement Runoff Area=4,813 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.50 cfs 1,790 cf

Subcatchment 205: 205 - Pavement Runoff Area=3,480 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.36 cfs 1,294 cf

Subcatchment 206: 206 - Pavement Runoff Area=5,141 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.53 cfs 1,912 cf

Subcatchment 207: 207 - Pavement Runoff Area=2,680 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.28 cfs 997 cf

Subcatchment 208: 208 - Proposed Runoff Area=4,287 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.44 cfs 1,595 cf

Subcatchment 209: 209 - Portion of Runoff Area=4,990 sf 40.80% Impervious Runoff Depth=3.00"
Tc=6.0 min CN=84 Runoff=0.39 cfs 1,246 cf

Subcatchment 210: 210 - Existing South Runoff Area=44,935 sf 0.00% Impervious Runoff Depth=1.46"
Flow Length=210' Tc=10.6 min CN=65 Runoff=1.40 cfs 5,457 cf

Subcatchment 300: 300 - Lawn East to DP3 Runoff Area=1,921 sf 0.00% Impervious Runoff Depth=2.13"
Tc=6.0 min CN=74 Runoff=0.11 cfs 341 cf

Pond CB1: PCB1 Peak Elev=16.87' Inflow=0.22 cfs 792 cf
12.0" Round Culvert n=0.013 L=21.0' S=0.0095 '/' Outflow=0.22 cfs 792 cf

Pond CB2: PCB2 Peak Elev=16.84' Inflow=0.17 cfs 614 cf
12.0" Round Culvert n=0.013 L=21.0' S=0.0095 '/' Outflow=0.17 cfs 614 cf

Pond CB3: PCB3 Peak Elev=18.53' Inflow=0.51 cfs 1,816 cf
12.0" Round Culvert n=0.013 L=64.0' S=0.0063 '/' Outflow=0.51 cfs 1,816 cf

Pond CB4: PCB4 Peak Elev=15.51' Inflow=0.50 cfs 1,790 cf
12.0" Round Culvert n=0.013 L=94.0' S=0.0085 '/' Outflow=0.50 cfs 1,790 cf

Pond CB5: PCB5 Peak Elev=15.22' Inflow=0.36 cfs 1,294 cf
12.0" Round Culvert n=0.013 L=93.0' S=0.0054 '/' Outflow=0.36 cfs 1,294 cf

Pond CB6: PCB6 Peak Elev=20.34' Inflow=0.53 cfs 1,912 cf
12.0" Round Culvert n=0.013 L=78.0' S=0.0051 '/' Outflow=0.53 cfs 1,912 cf

Pond CB7: PCB7 Peak Elev=19.32' Inflow=0.28 cfs 997 cf
12.0" Round Culvert n=0.013 L=11.0' S=0.0091 '/' Outflow=0.28 cfs 997 cf

Pond DP1: Design Pont #1_18" RCP Culvert - Northwest Inflow=0.59 cfs 5,688 cf
Primary=0.59 cfs 5,688 cf

Pond DP2: Design Pont #2_Wetland-South Inflow=3.08 cfs 12,321 cf
Primary=3.08 cfs 12,321 cf

Pond DP3: Design Pont #3_Abutting Lot-East Inflow=0.11 cfs 341 cf
Primary=0.11 cfs 341 cf

Pond IS: Infiltration System Peak Elev=17.47' Storage=1,244 cf Inflow=1.46 cfs 5,288 cf
Discarded=0.28 cfs 5,288 cf Primary=0.00 cfs 0 cf Outflow=0.28 cfs 5,288 cf

Pond MH1: PDMH1 Peak Elev=16.68' Inflow=0.39 cfs 1,407 cf
12.0" Round Culvert n=0.013 L=85.0' S=0.0059 '/' Outflow=0.39 cfs 1,407 cf

Pond MH2: PDMH2 Peak Elev=16.32' Inflow=1.01 cfs 3,780 cf
12.0" Round Culvert n=0.013 L=115.0' S=0.0052 '/' Outflow=1.01 cfs 3,780 cf

Pond MH3: PDMH3 Peak Elev=15.65' Inflow=1.01 cfs 3,780 cf
12.0" Round Culvert n=0.013 L=138.0' S=0.0051 '/' Outflow=1.01 cfs 3,780 cf

Pond MH4: PDMH4 Peak Elev=14.99' Inflow=1.84 cfs 6,864 cf
Primary=1.46 cfs 6,424 cf Secondary=0.39 cfs 440 cf Outflow=1.84 cfs 6,864 cf

Pond MH5: PDMH5 Peak Elev=14.49' Inflow=1.84 cfs 6,864 cf
12.0" Round Culvert n=0.013 L=23.0' S=0.0087 '/' Outflow=1.84 cfs 6,864 cf

Pond MH6: PDMH6 Peak Elev=19.93' Inflow=0.75 cfs 2,696 cf
12.0" Round Culvert n=0.013 L=120.0' S=0.0050 '/' Outflow=0.75 cfs 2,696 cf

Pond MH7: PDMH7 Peak Elev=19.26' Inflow=1.02 cfs 3,693 cf
Primary=0.83 cfs 3,537 cf Secondary=0.20 cfs 156 cf Outflow=1.02 cfs 3,693 cf

Pond MH8: PDMH8 Peak Elev=18.90' Inflow=1.46 cfs 5,288 cf
12.0" Round Culvert n=0.013 L=9.0' S=0.0111 '/' Outflow=1.46 cfs 5,288 cf

Pond RG1: Rain Garden #1 Peak Elev=15.88' Storage=2,948 cf Inflow=2.02 cfs 6,621 cf
Outflow=0.59 cfs 5,640 cf

Pond RG2: Rain Garden #2 Peak Elev=18.49' Storage=1,028 cf Inflow=0.90 cfs 3,063 cf
Outflow=0.68 cfs 2,373 cf

Pond WQU1: Water Quality Unit 1 Peak Elev=14.71' Inflow=1.46 cfs 6,424 cf
12.0" Round Culvert n=0.013 L=9.0' S=0.0111 '/' Outflow=1.46 cfs 6,424 cf

Pond WQU2: Water Quality Unit 2 Peak Elev=19.00' Inflow=0.83 cfs 3,537 cf
12.0" Round Culvert n=0.013 L=6.0' S=0.0167 '/' Outflow=0.83 cfs 3,537 cf

Summary for Subcatchment 100: 100 - Pavement, Lawn, and Direct Entry to Rain Garden

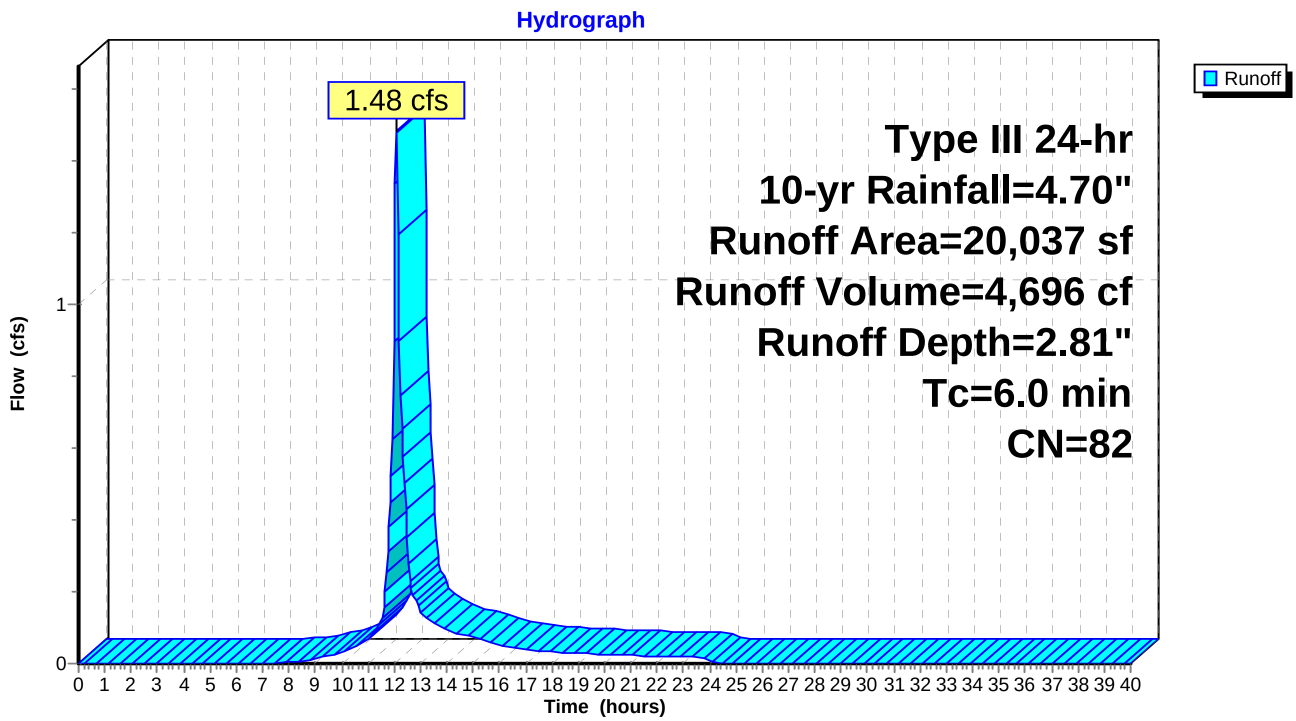
Runoff = 1.48 cfs @ 12.09 hrs, Volume= 4,696 cf, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

	Area (sf)	CN	Description
	4,778	74	>75% Grass cover, Good, HSG C
*	6,173	65	Rain Garden surface area
	9,086	98	Paved parking, HSG C
	20,037	82	Weighted Average
	10,951		54.65% Pervious Area
	9,086		45.35% Impervious Area

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

Subcatchment 100: 100 - Pavement, Lawn, and Direct Entry to Rain Garden



Summary for Subcatchment 101: 101 - West Side Lawn to DP1

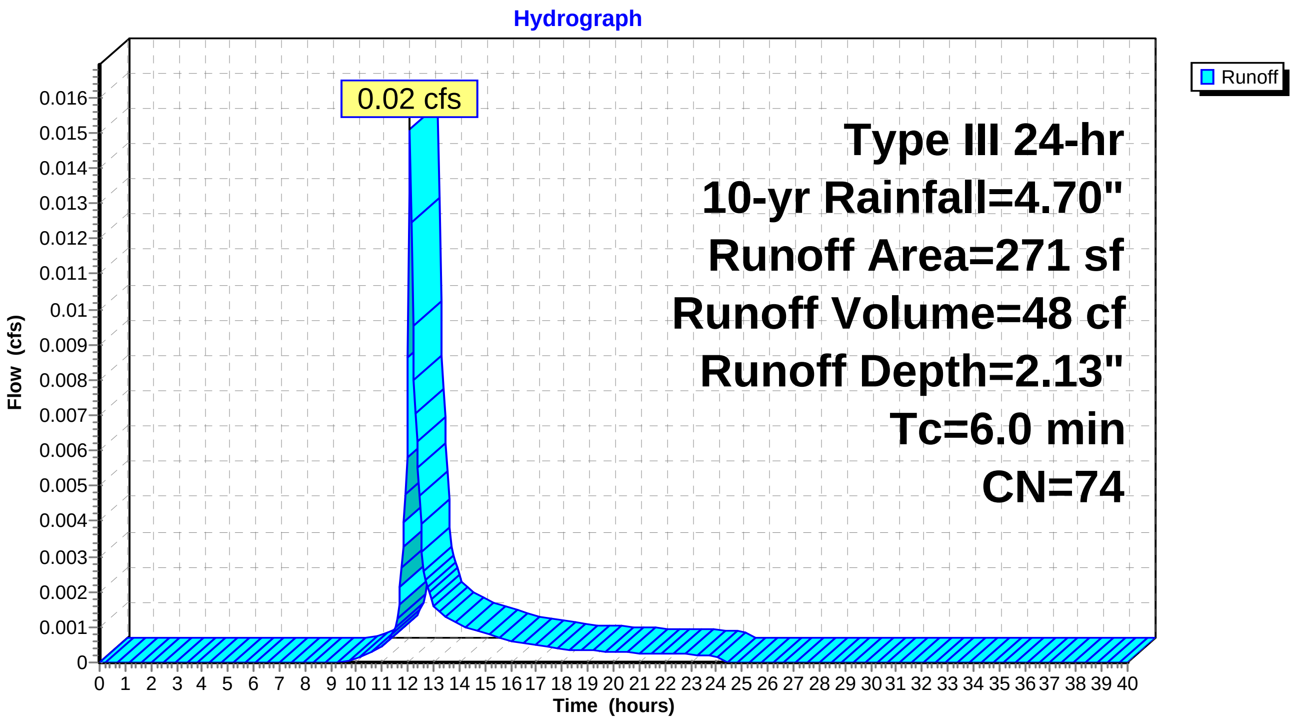
Runoff = 0.02 cfs @ 12.10 hrs, Volume= 48 cf, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

Area (sf)	CN	Description
271	74	>75% Grass cover, Good, HSG C
271		100.00% Pervious Area

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

Subcatchment 101: 101 - West Side Lawn to DP1



Summary for Subcatchment 102: 102 - Existing Building

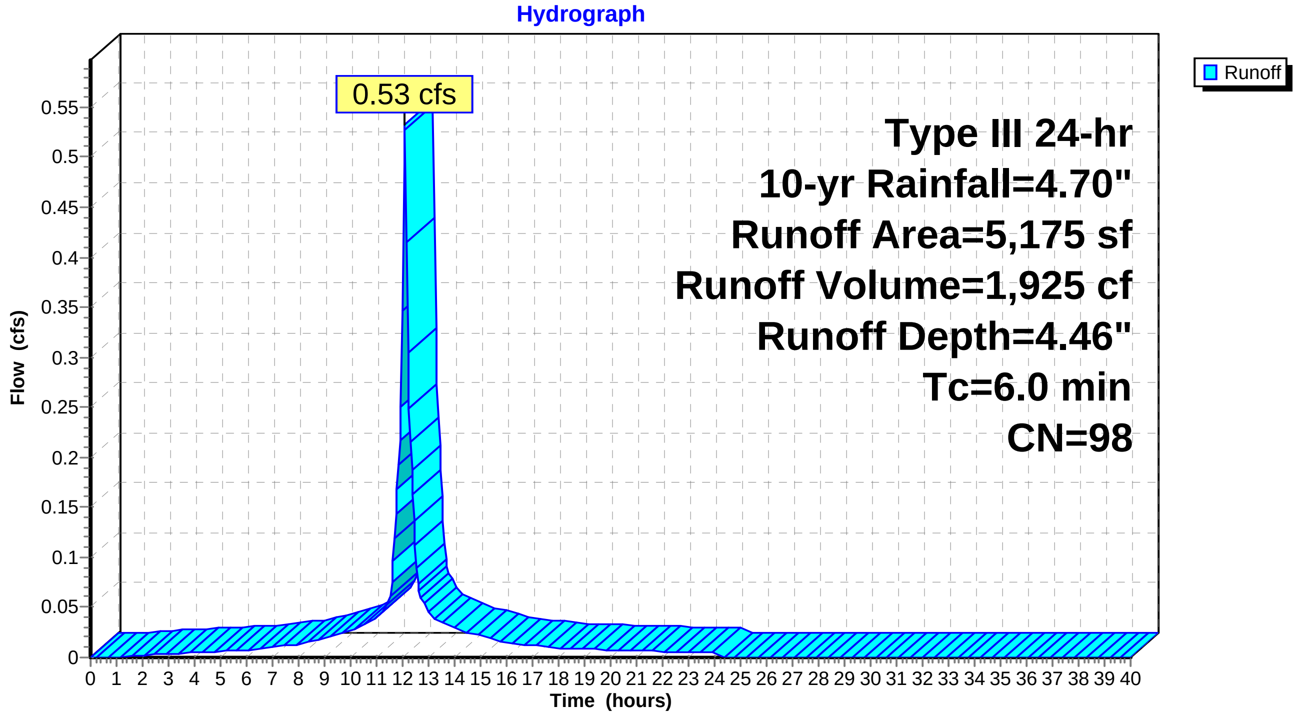
Runoff = 0.53 cfs @ 12.09 hrs, Volume= 1,925 cf, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

	Area (sf)	CN	Description
*	5,175	98	Roofs, HSG C, Existing Building
	5,175		100.00% Impervious Area

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

Subcatchment 102: 102 - Existing Building



Summary for Subcatchment 200: 200 - Portion of Proposed Building Tenant A to Rain Garden #2

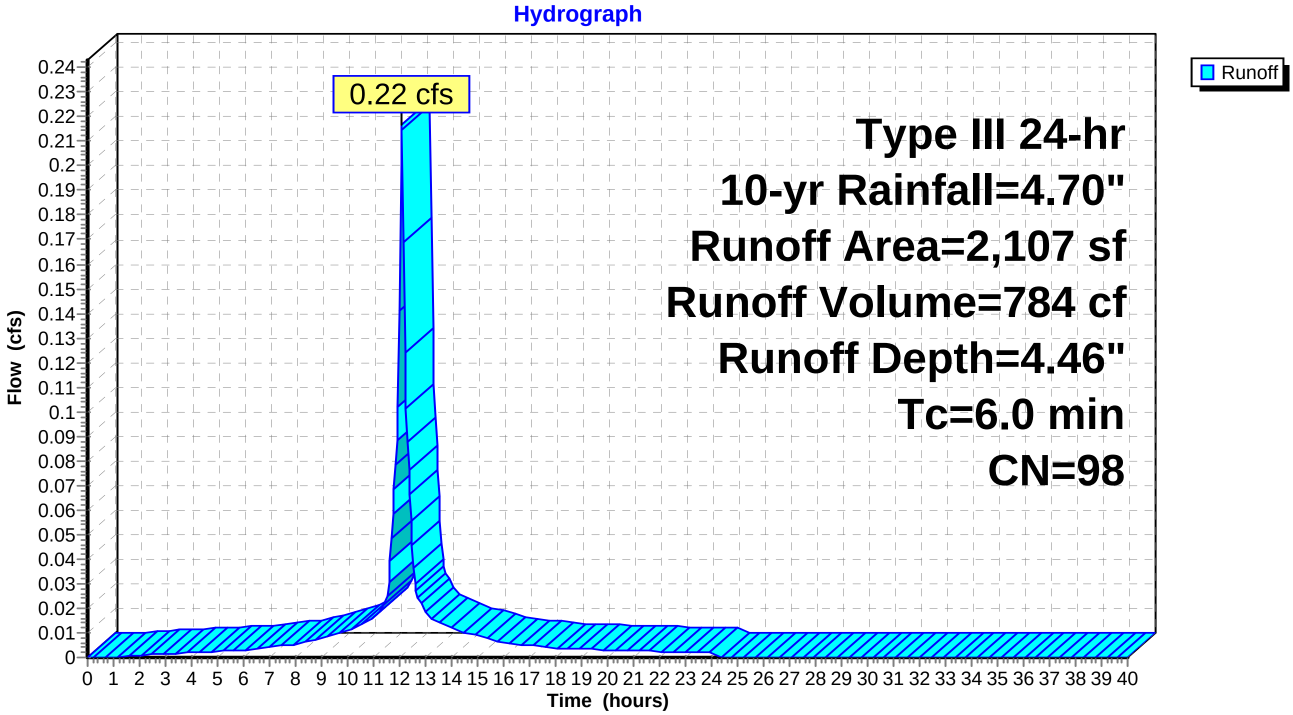
Runoff = 0.22 cfs @ 12.09 hrs, Volume= 784 cf, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

	Area (sf)	CN	Description
*	2,107	98	Roofs, HSG C, Half Prop. Building A
	2,107		100.00% Impervious Area

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

Subcatchment 200: 200 - Portion of Proposed Building Tenant A to Rain Garden #2



Summary for Subcatchment 201: 201 - Pavement

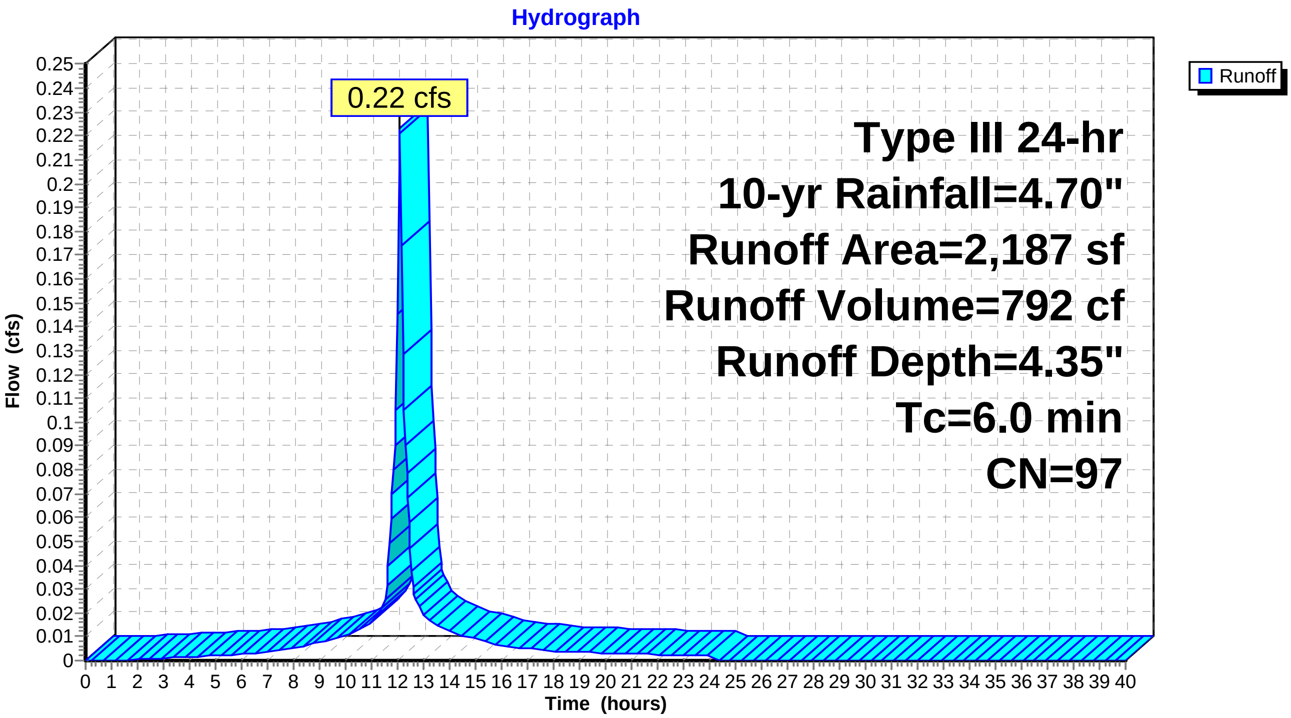
Runoff = 0.22 cfs @ 12.09 hrs, Volume= 792 cf, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

Area (sf)	CN	Description
2,098	98	Paved parking, HSG C
89	74	>75% Grass cover, Good, HSG C
2,187	97	Weighted Average
89		4.07% Pervious Area
2,098		95.93% Impervious Area

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

Subcatchment 201: 201 - Pavement



Summary for Subcatchment 202: 202 - Pavement

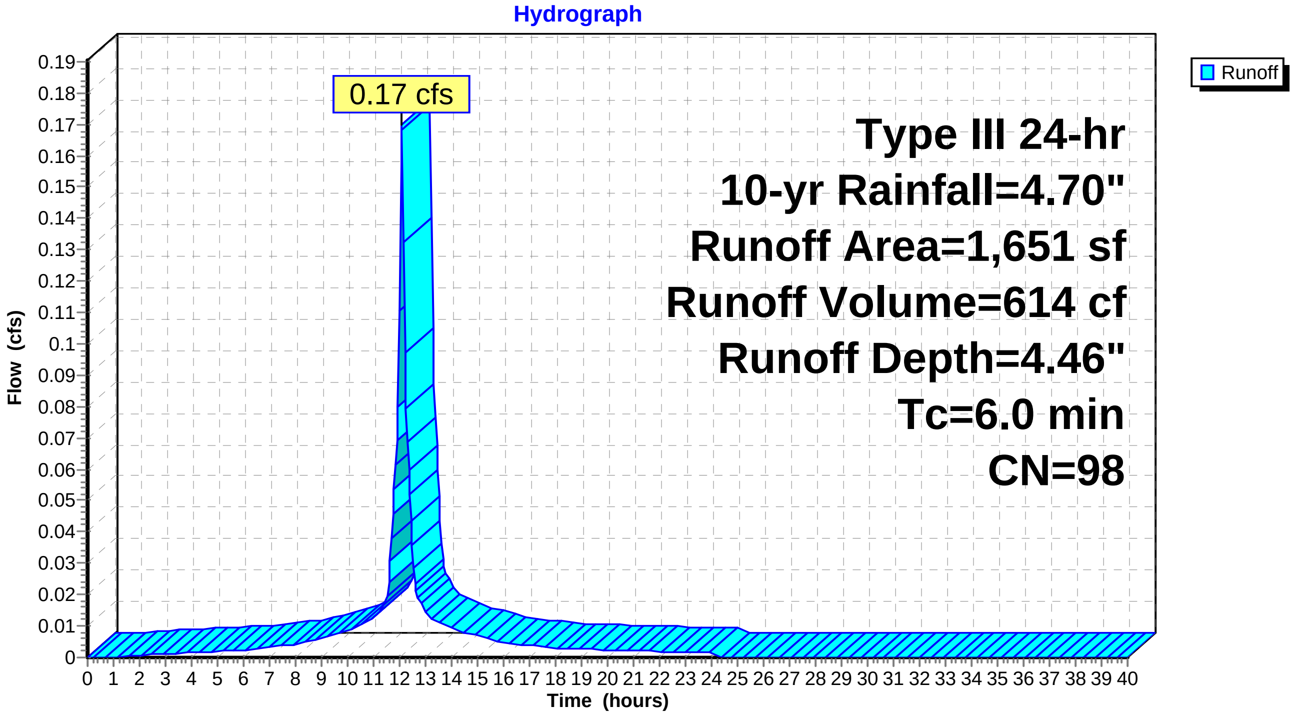
Runoff = 0.17 cfs @ 12.09 hrs, Volume= 614 cf, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

Area (sf)	CN	Description
1,651	98	Paved parking, HSG C
1,651		100.00% Impervious Area

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

Subcatchment 202: 202 - Pavement



Summary for Subcatchment 203: 203 - Pavement

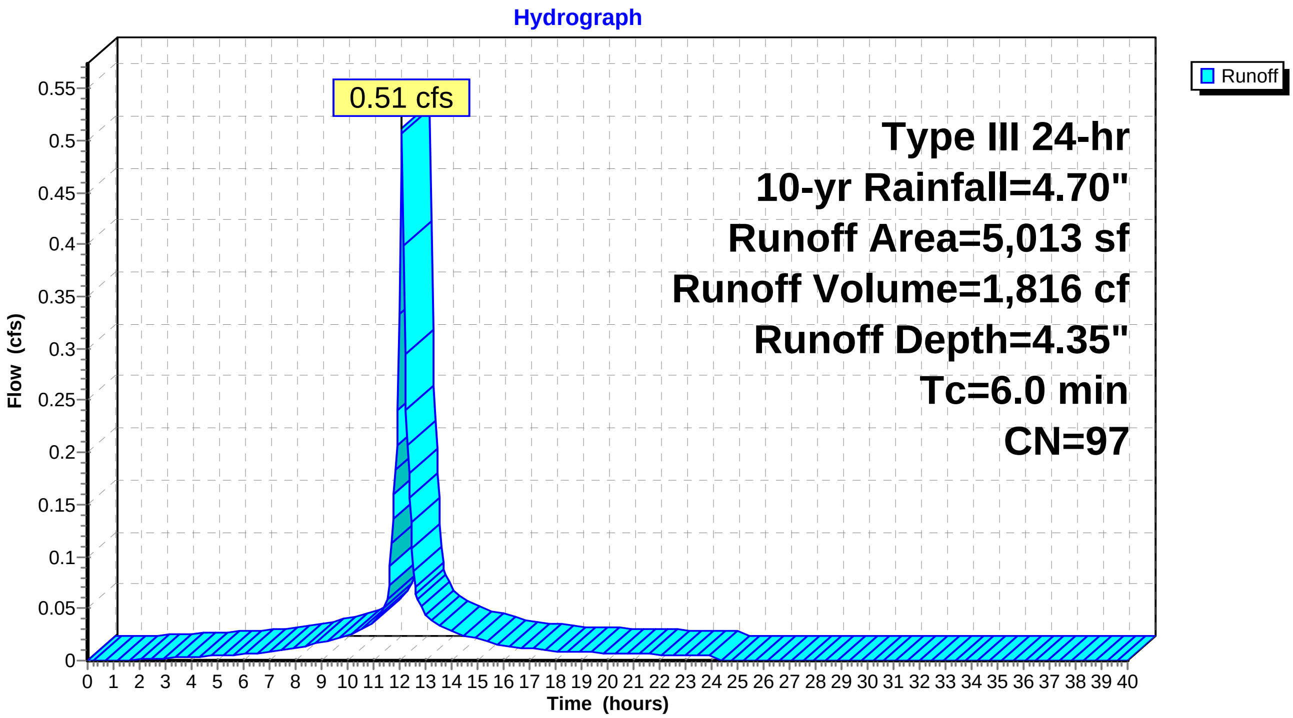
Runoff = 0.51 cfs @ 12.09 hrs, Volume= 1,816 cf, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

Area (sf)	CN	Description
4,847	98	Paved parking, HSG C
166	74	>75% Grass cover, Good, HSG C
5,013	97	Weighted Average
166		3.31% Pervious Area
4,847		96.69% Impervious Area

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

Subcatchment 203: 203 - Pavement



Summary for Subcatchment 204: 204 - Pavement

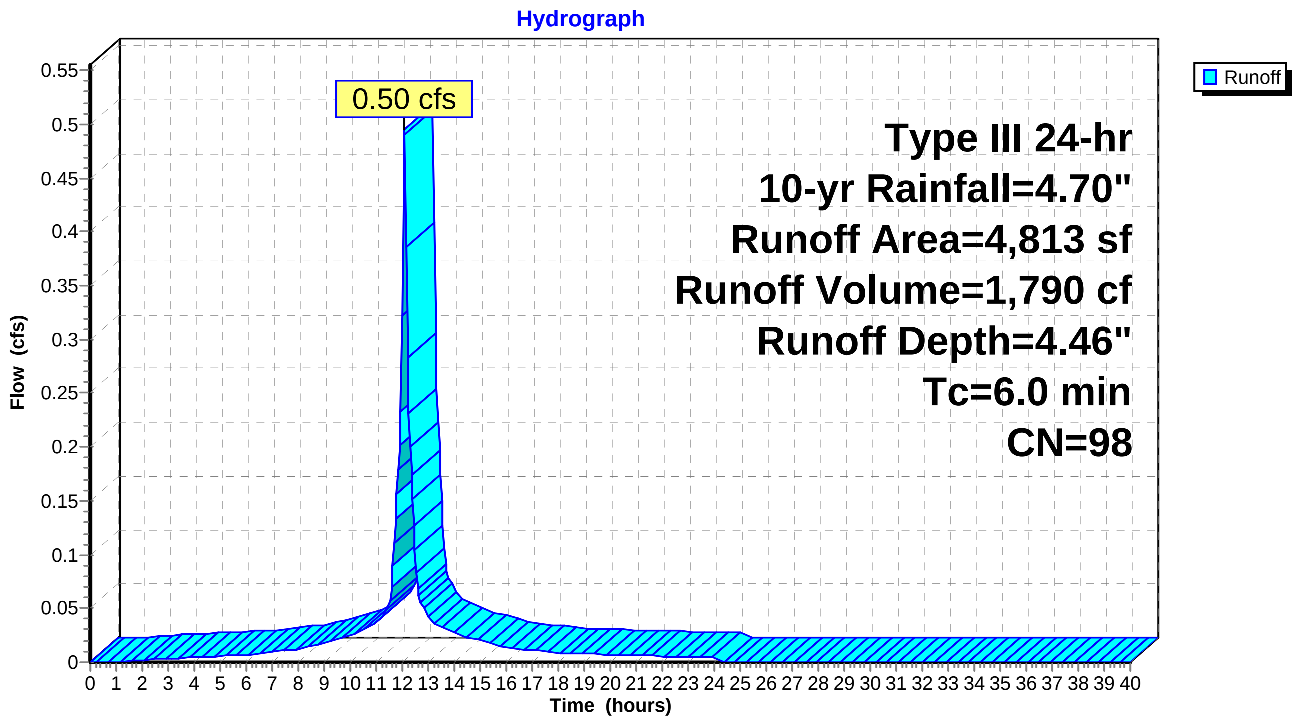
Runoff = 0.50 cfs @ 12.09 hrs, Volume= 1,790 cf, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

Area (sf)	CN	Description
4,813	98	Paved parking, HSG C
4,813		100.00% Impervious Area

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

Subcatchment 204: 204 - Pavement



Summary for Subcatchment 205: 205 - Pavement

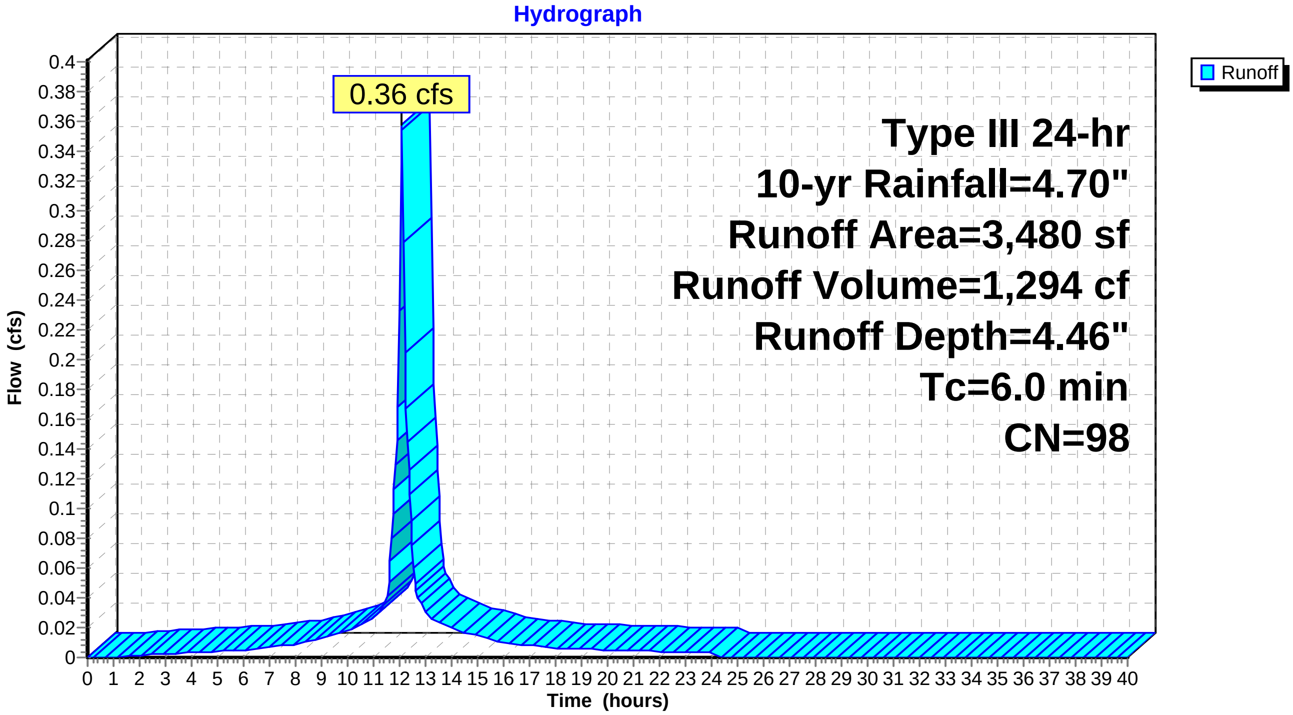
Runoff = 0.36 cfs @ 12.09 hrs, Volume= 1,294 cf, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

Area (sf)	CN	Description
3,480	98	Paved parking, HSG C
3,480		100.00% Impervious Area

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

Subcatchment 205: 205 - Pavement



Summary for Subcatchment 206: 206 - Pavement

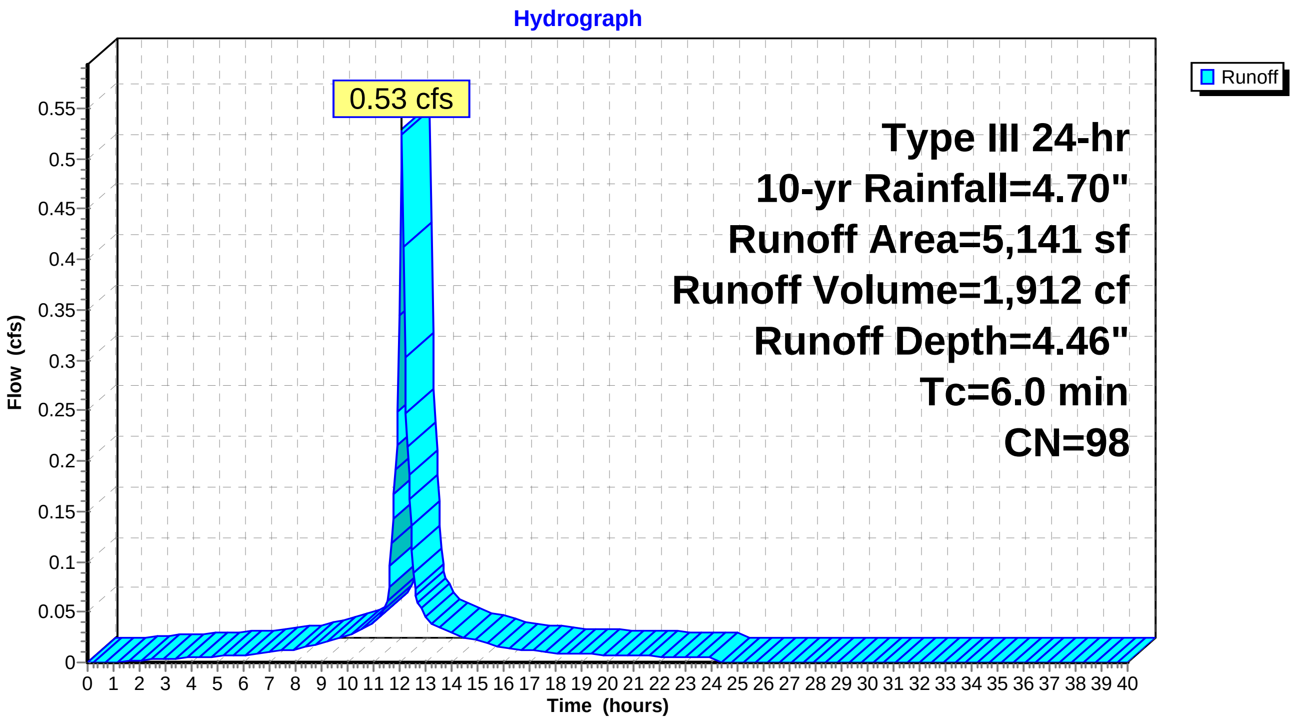
Runoff = 0.53 cfs @ 12.09 hrs, Volume= 1,912 cf, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

Area (sf)	CN	Description
5,141	98	Paved parking, HSG C
5,141		100.00% Impervious Area

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

Subcatchment 206: 206 - Pavement



Summary for Subcatchment 207: 207 - Pavement

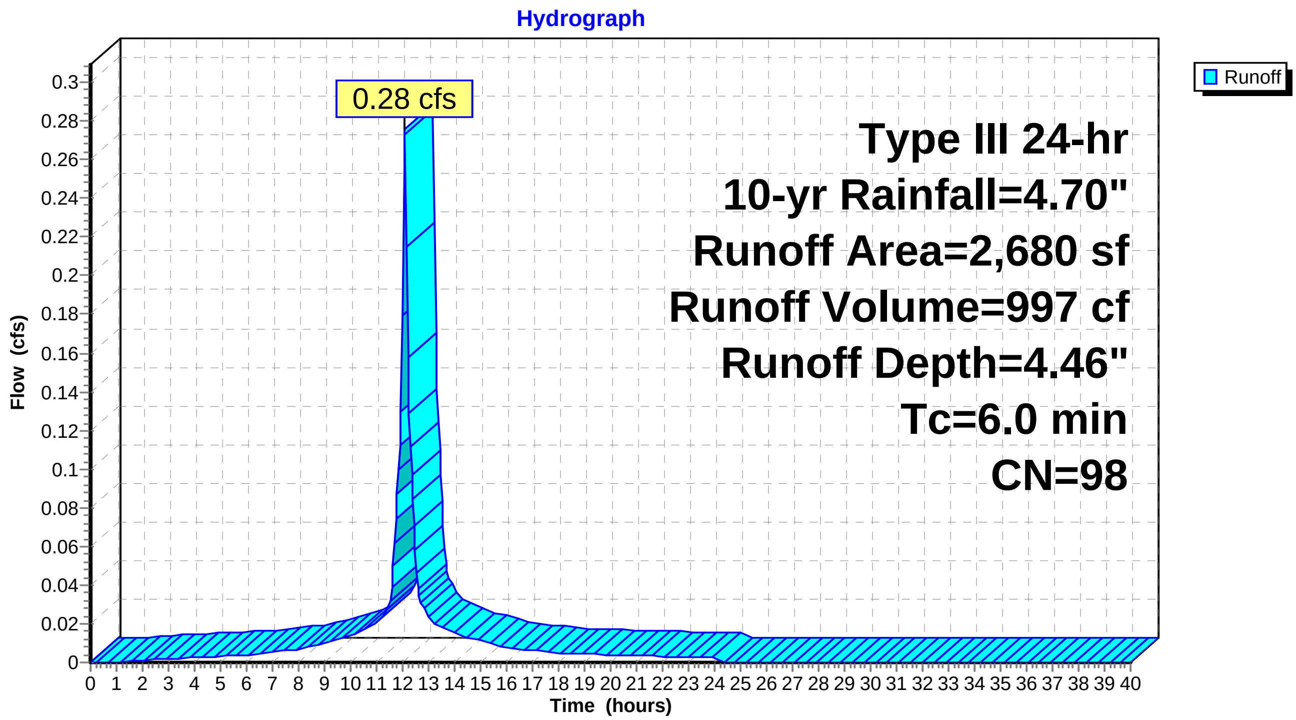
Runoff = 0.28 cfs @ 12.09 hrs, Volume= 997 cf, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

Area (sf)	CN	Description
2,680	98	Paved parking, HSG C
2,680		100.00% Impervious Area

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

Subcatchment 207: 207 - Pavement



Summary for Subcatchment 208: 208 - Proposed Building Tenant B

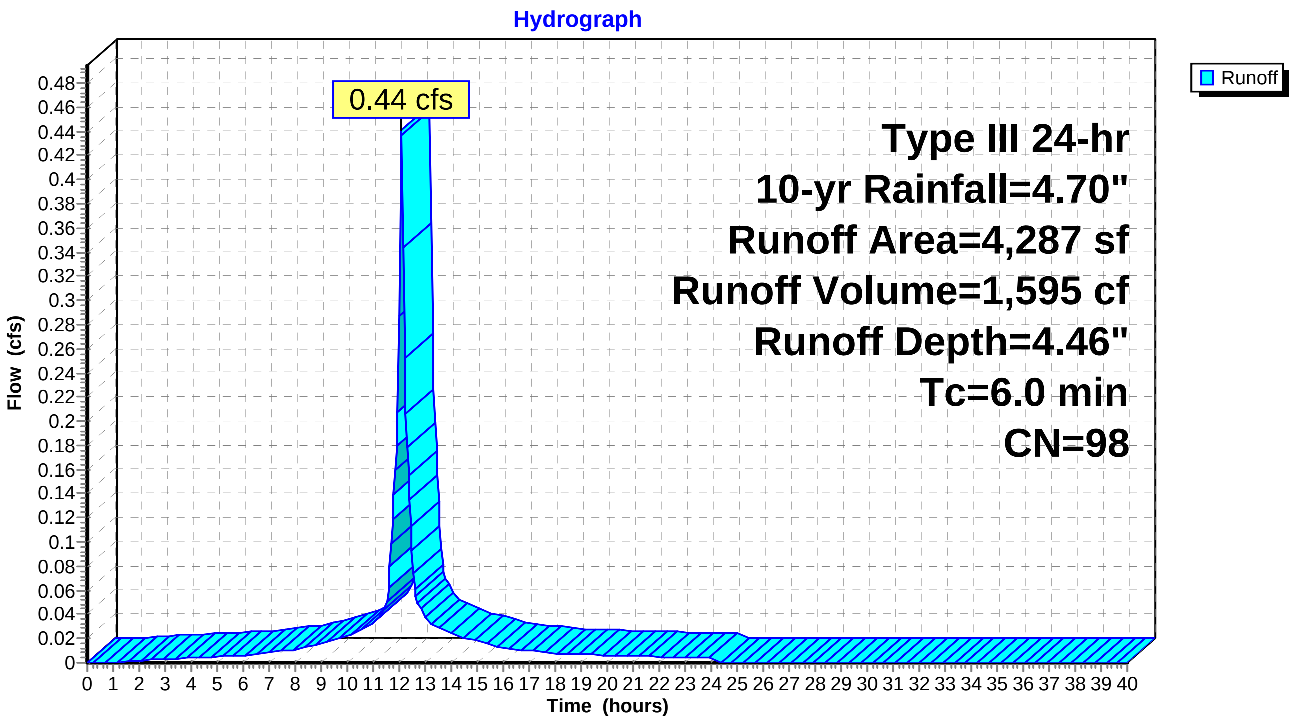
Runoff = 0.44 cfs @ 12.09 hrs, Volume= 1,595 cf, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

Area (sf)	CN	Description
4,287	98	Roofs, HSG C
0	98	Roofs, HSG C
4,287	98	Weighted Average
4,287		100.00% Impervious Area

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

Subcatchment 208: 208 - Proposed Building Tenant B



mary for Subcatchment 209: 209 - Portion of Proposed Building Tentant A, Rain Garden #2, Lawn, and W

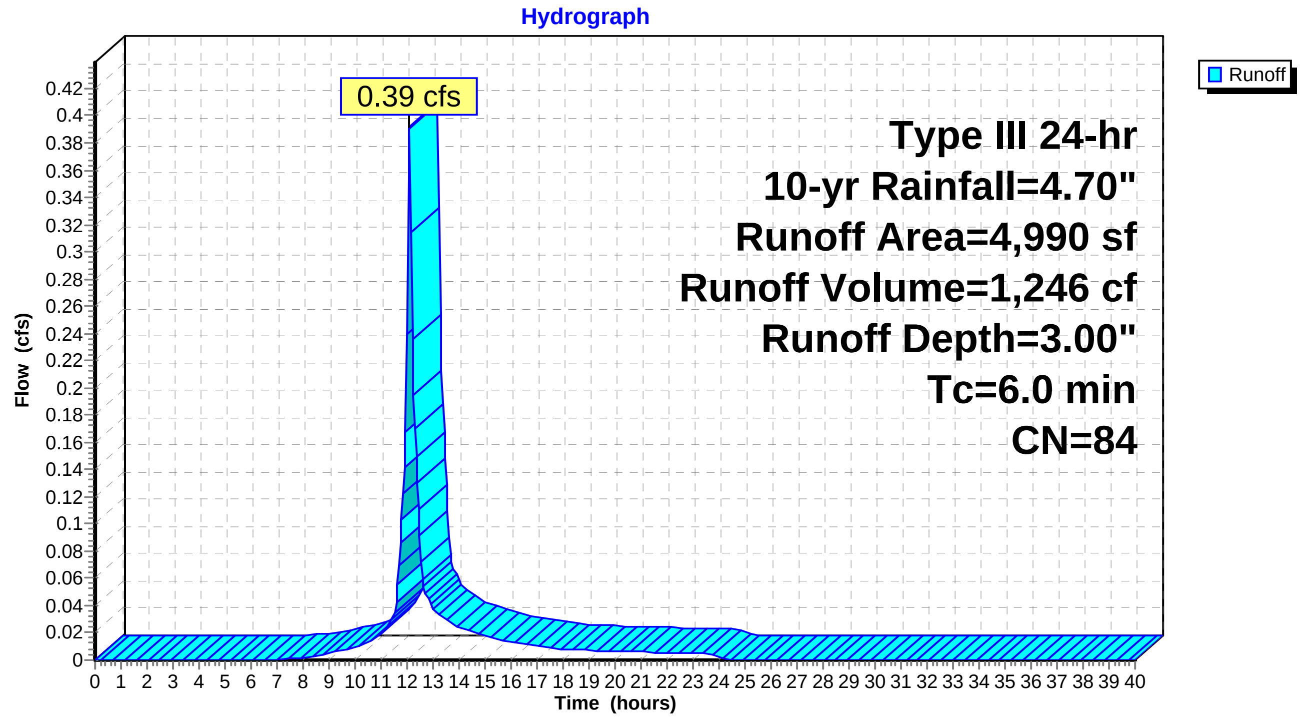
Runoff = 0.39 cfs @ 12.09 hrs, Volume= 1,246 cf, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

	Area (sf)	CN	Description
*	876	65	Rain Garden Surface Area
	2,078	79	50-75% Grass cover, Fair, HSG C
	84	98	Unconnected pavement, HSG C
	1,952	98	Unconnected roofs, HSG C
	4,990	84	Weighted Average
	2,954		59.20% Pervious Area
	2,036		40.80% Impervious Area
	2,036		100.00% Unconnected

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

Subcatchment 209: 209 - Portion of Proposed Building Tentant A, Rain Garden #2, Lawn, and Walkwa



Summary for Subcatchment 210: 210 - Existing South features remaining to DP2

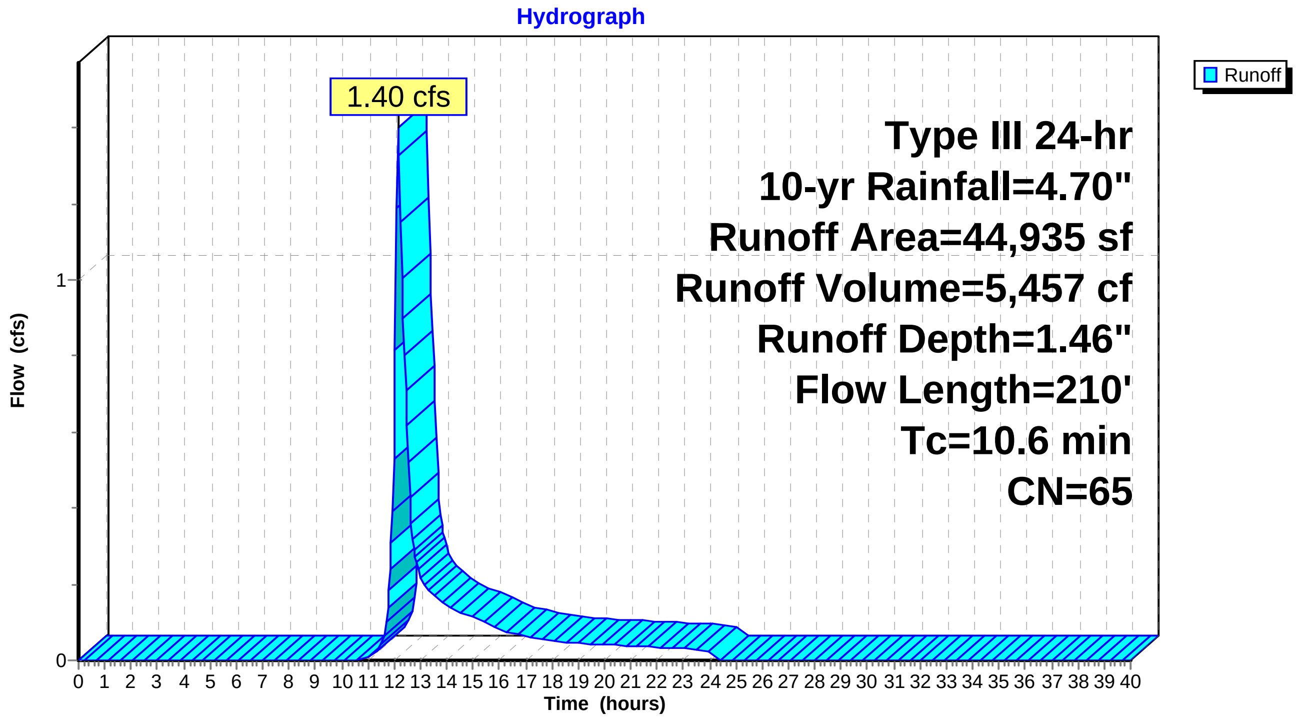
Runoff = 1.40 cfs @ 12.16 hrs, Volume= 5,457 cf, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

	Area (sf)	CN	Description
	35,498	65	Brush, Good, HSG C
*	9,437	65	Brush, Good, HSG C, Wetland Brush
	44,935	65	Weighted Average
	44,935		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	100	0.0600	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
1.4	110	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.6	210	Total			

Subcatchment 210: 210 - Existing South features remaining to DP2



Summary for Subcatchment 300: 300 - Lawn East to DP3

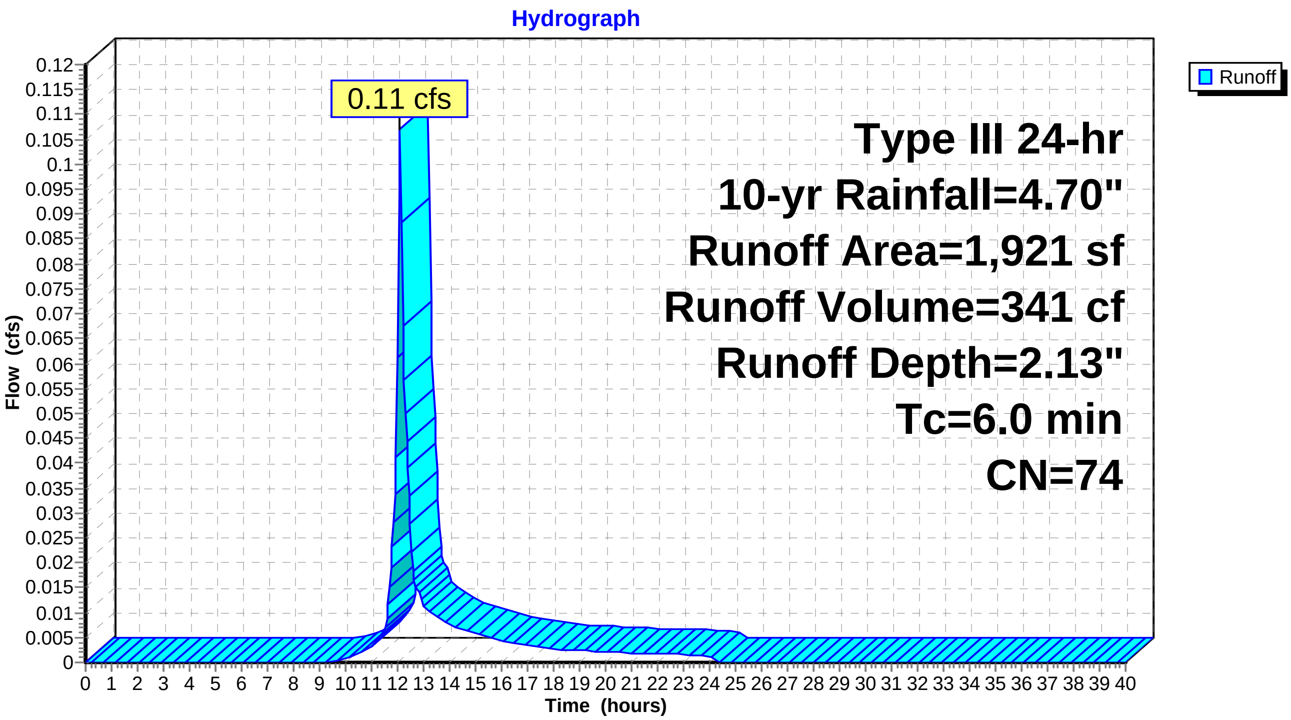
Runoff = 0.11 cfs @ 12.10 hrs, Volume= 341 cf, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.70"

Area (sf)	CN	Description
1,921	74	>75% Grass cover, Good, HSG C
1,921		100.00% Pervious Area

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

Subcatchment 300: 300 - Lawn East to DP3



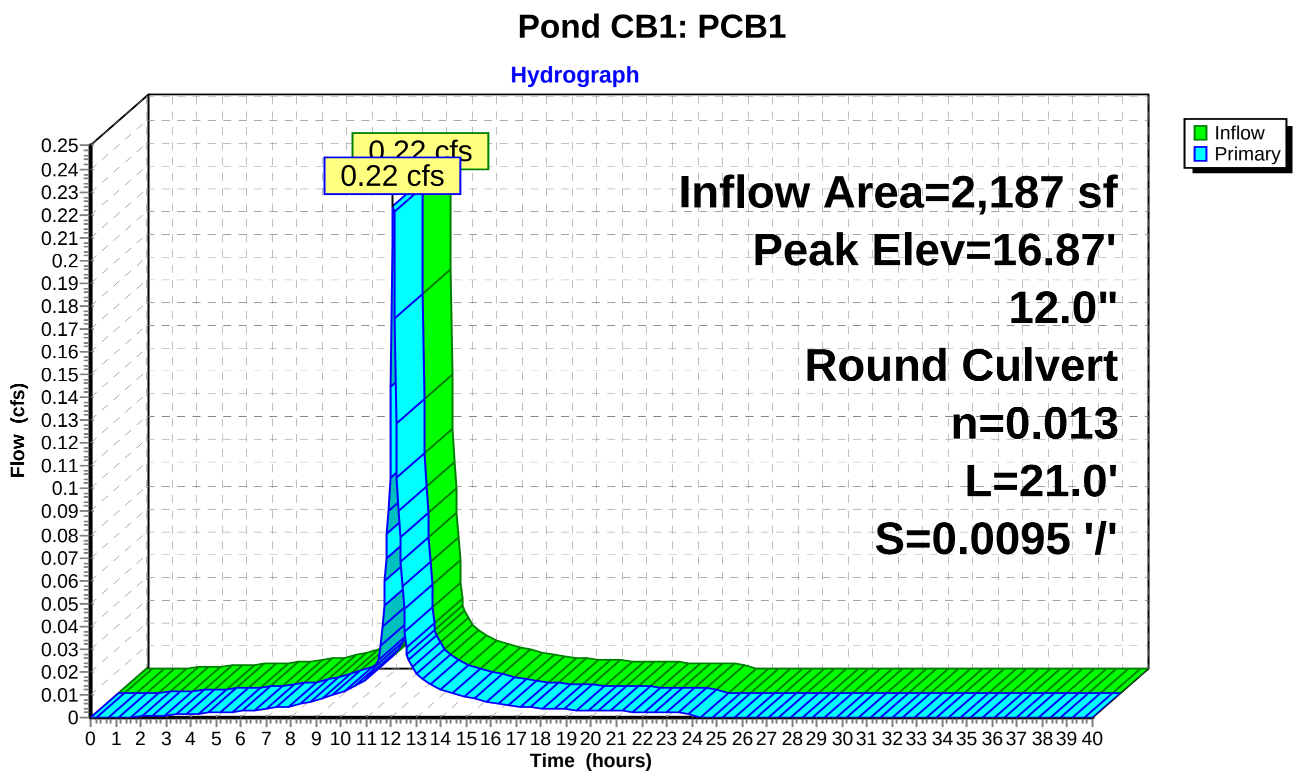
Summary for Pond CB1: PCB1

Inflow Area = 2,187 sf, 95.93% Impervious, Inflow Depth = 4.35" for 10-yr event
Inflow = 0.22 cfs @ 12.09 hrs, Volume= 792 cf
Outflow = 0.22 cfs @ 12.09 hrs, Volume= 792 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.22 cfs @ 12.09 hrs, Volume= 792 cf

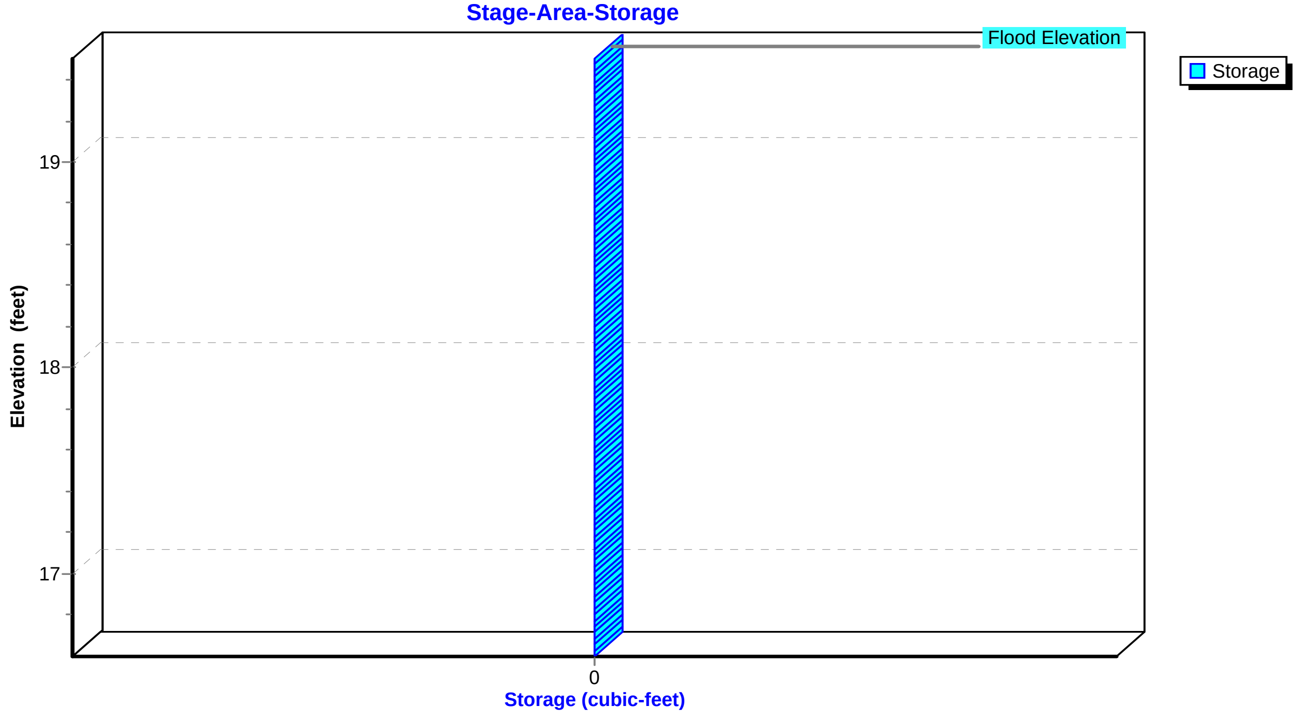
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.87' @ 12.10 hrs
Flood Elev= 19.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	16.60'	**12.0" Round Culvert** L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.60' / 16.40' S= 0.0095 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.20 cfs @ 12.09 hrs HW=16.86' TW=16.68' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.20 cfs @ 1.82 fps)



Pond CB1: PCB1



Summary for Pond CB2: PCB2

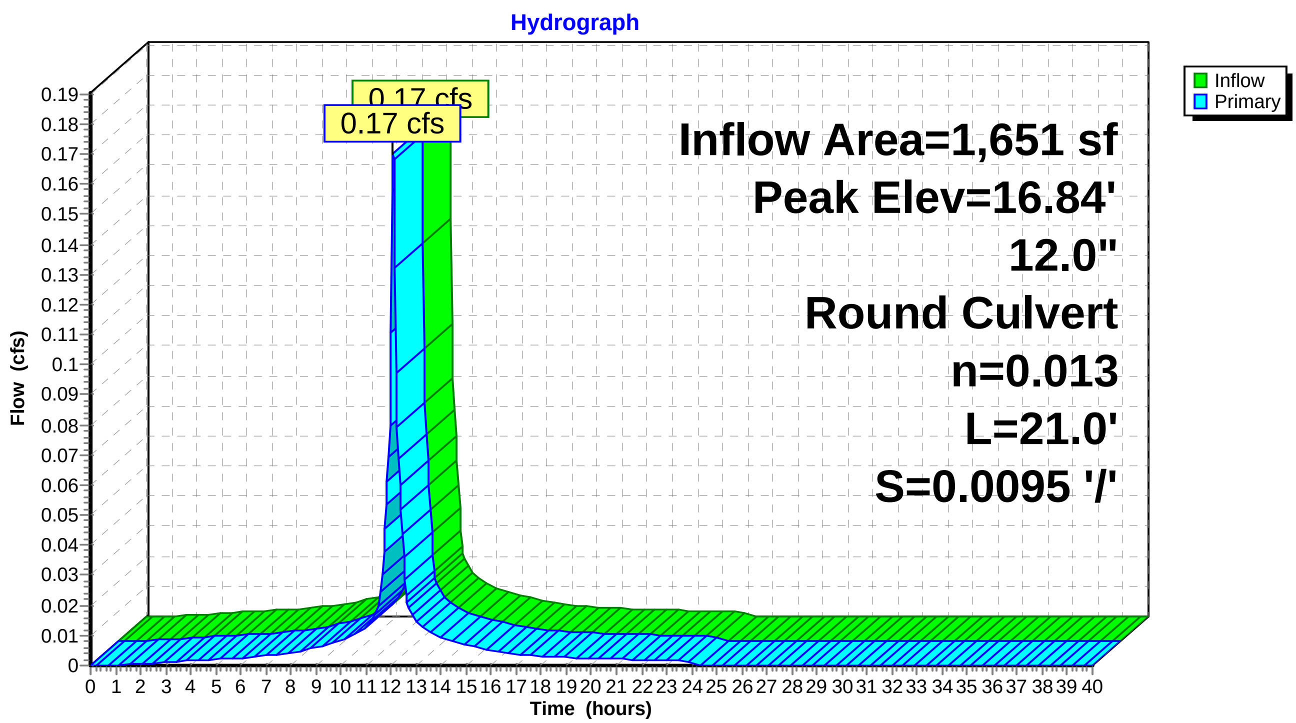
Inflow Area =	1,651 sf,100.00% Impervious,	Inflow Depth = 4.46" for 10-yr event			
Inflow =	0.17 cfs @	12.09 hrs,	Volume=	614 cf	
Outflow =	0.17 cfs @	12.09 hrs,	Volume=	614 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.17 cfs @	12.09 hrs,	Volume=	614 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.84' @ 12.11 hrs
Flood Elev= 19.50'

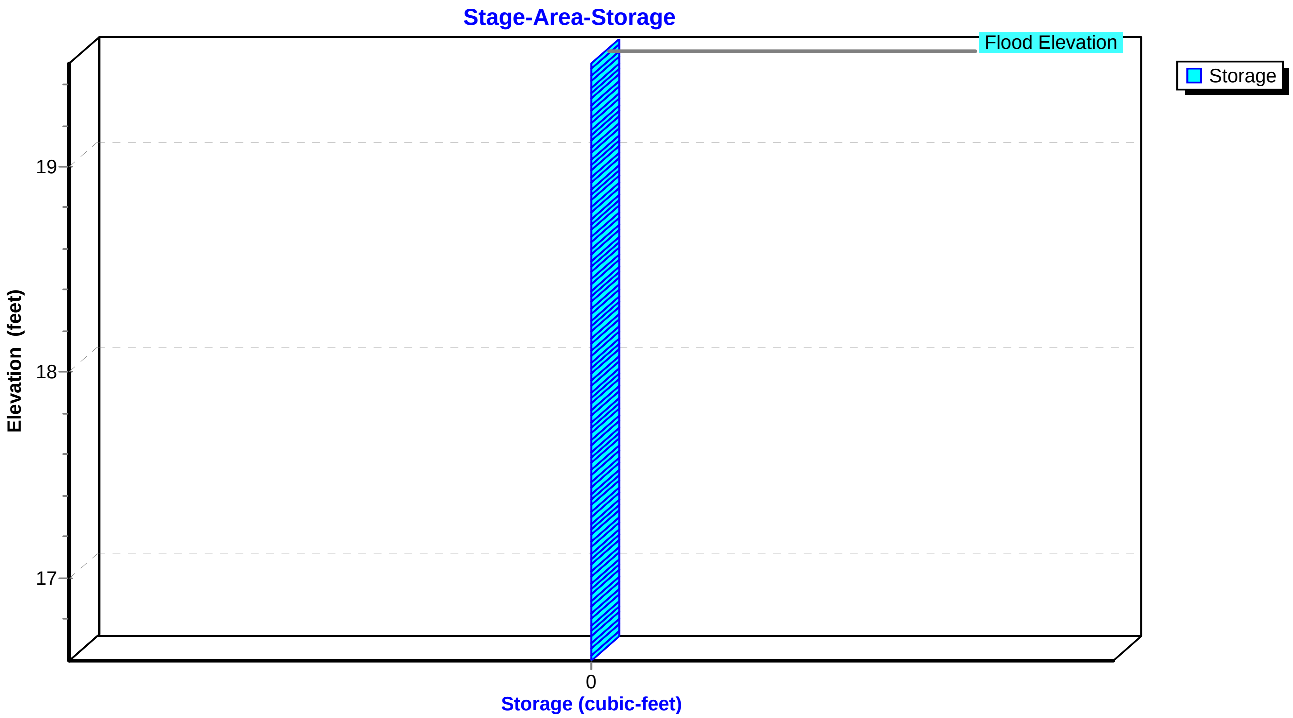
Device	Routing	Invert	Outlet Devices
#1	Primary	16.60'	**12.0" Round Culvert** L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.60' / 16.40' S= 0.0095 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.15 cfs @ 12.09 hrs HW=16.83' TW=16.68' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.15 cfs @ 1.60 fps)

Pond CB2: PCB2



Pond CB2: PCB2



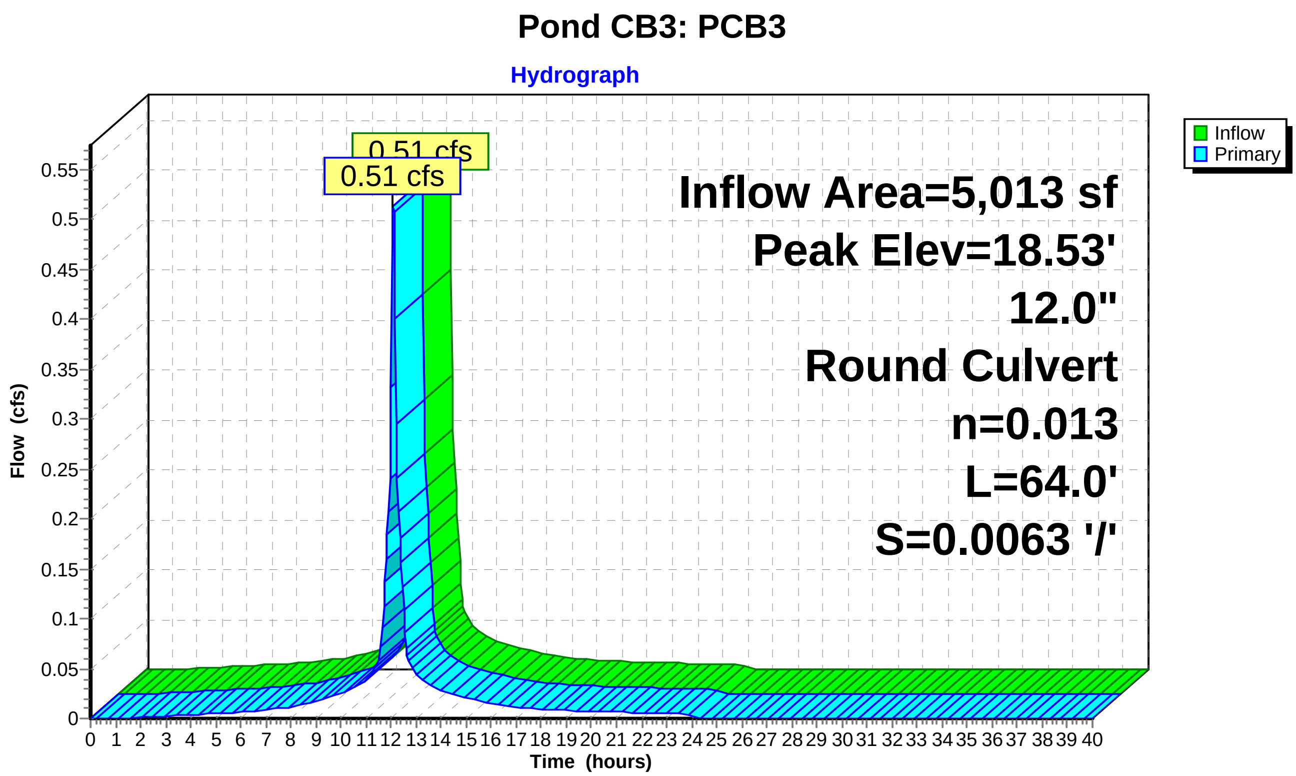
Summary for Pond CB3: PCB3

Inflow Area =	5,013 sf,	96.69% Impervious,	Inflow Depth = 4.35"	for 10-yr event
Inflow =	0.51 cfs @	12.09 hrs, Volume=	1,816 cf	
Outflow =	0.51 cfs @	12.09 hrs, Volume=	1,816 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.51 cfs @	12.09 hrs, Volume=	1,816 cf	

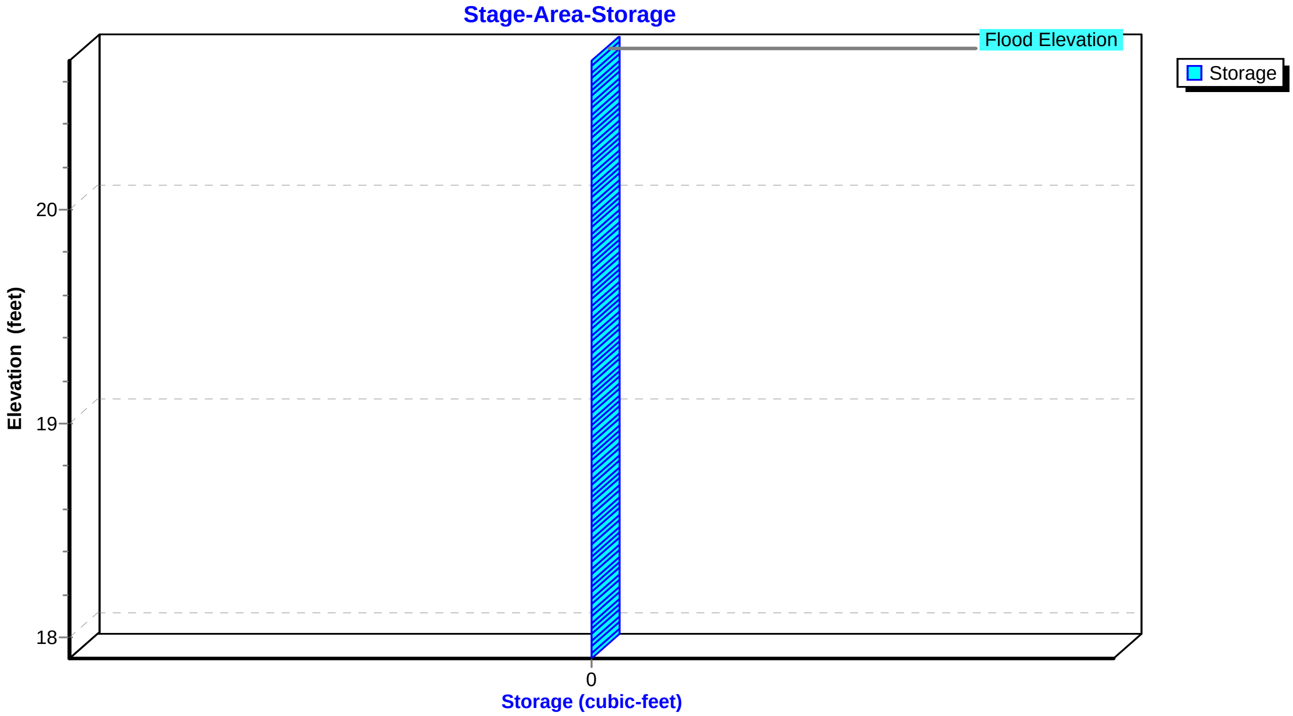
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.53' @ 12.17 hrs
Flood Elev= 20.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	17.90'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 17.90' / 17.50' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.36 cfs @ 12.09 hrs HW=18.51' TW=18.44' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.36 cfs @ 1.03 fps)



Pond CB3: PCB3



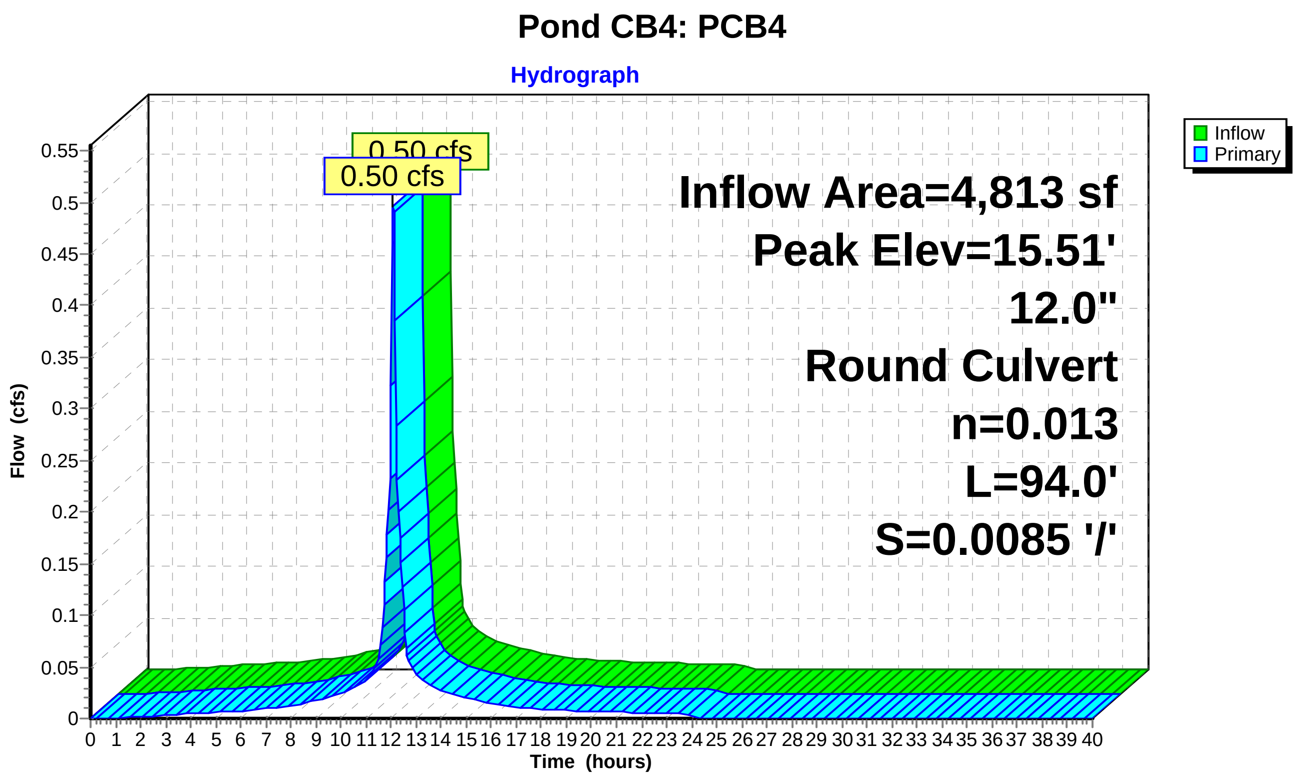
Summary for Pond CB4: PCB4

Inflow Area =	4,813 sf,100.00% Impervious,	Inflow Depth = 4.46"	for 10-yr event	
Inflow =	0.50 cfs @	12.09 hrs, Volume=	1,790 cf	
Outflow =	0.50 cfs @	12.09 hrs, Volume=	1,790 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.50 cfs @	12.09 hrs, Volume=	1,790 cf	

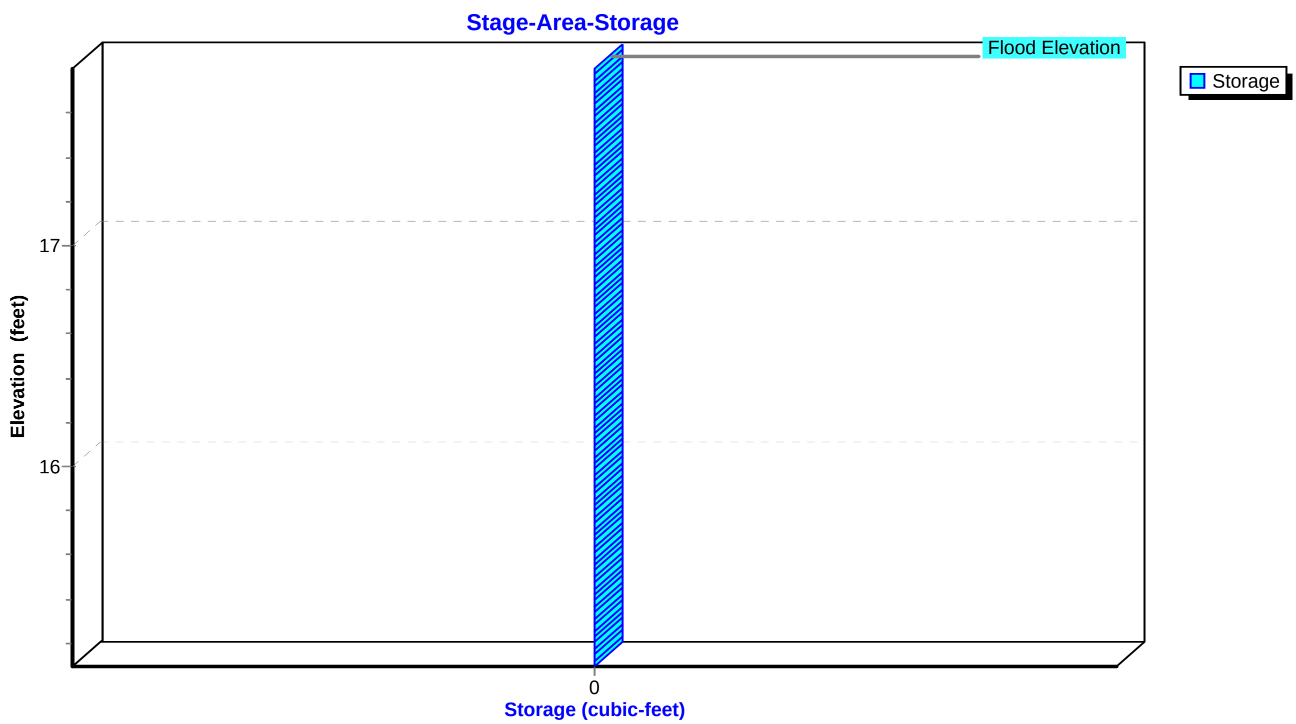
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.51' @ 12.10 hrs
Flood Elev= 17.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	15.10'	**12.0" Round Culvert** L= 94.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.10' / 14.30' S= 0.0085 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.45 cfs @ 12.09 hrs HW=15.50' TW=14.97' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.45 cfs @ 2.26 fps)



Pond CB4: PCB4



Summary for Pond CB5: PCB5

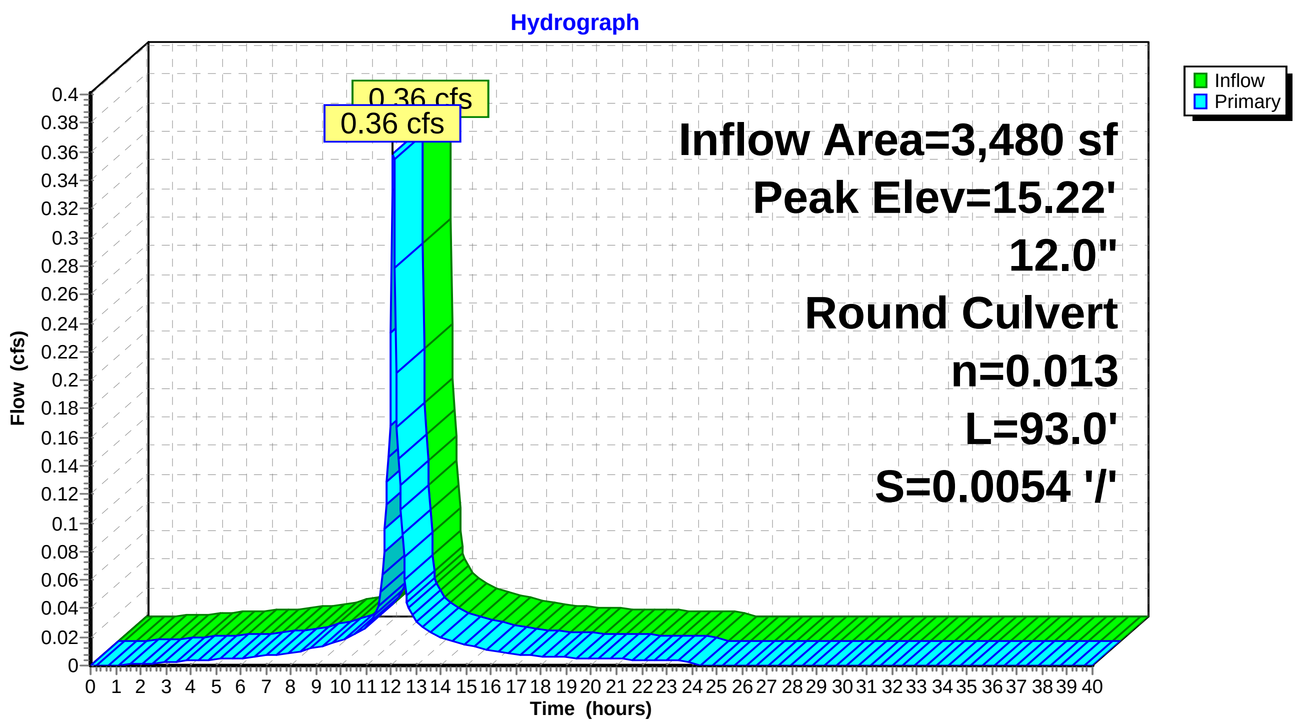
Inflow Area = 3,480 sf,100.00% Impervious, Inflow Depth = 4.46" for 10-yr event
Inflow = 0.36 cfs @ 12.09 hrs, Volume= 1,294 cf
Outflow = 0.36 cfs @ 12.09 hrs, Volume= 1,294 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.36 cfs @ 12.09 hrs, Volume= 1,294 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.22' @ 12.11 hrs
Flood Elev= 17.60'

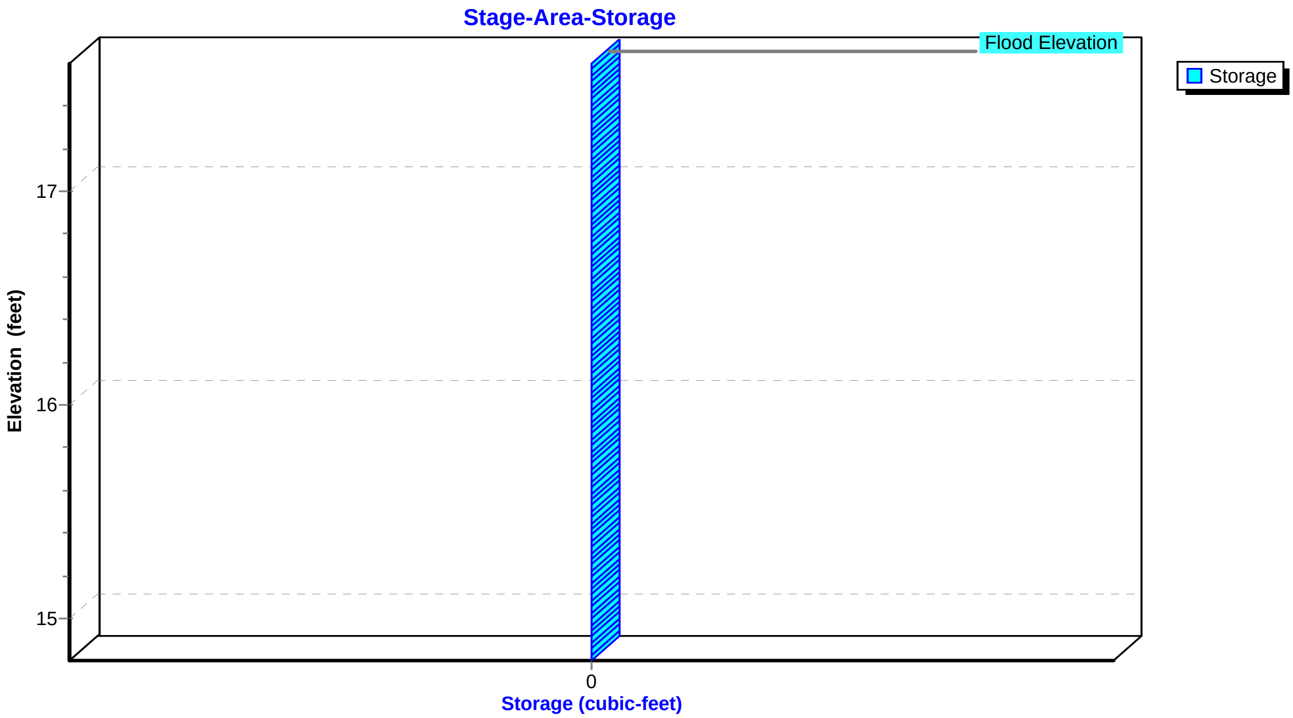
Device	Routing	Invert	Outlet Devices
#1	Primary	14.80'	**12.0" Round Culvert** L= 93.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.80' / 14.30' S= 0.0054 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.31 cfs @ 12.09 hrs HW=15.21' TW=14.97' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.31 cfs @ 1.51 fps)

Pond CB5: PCB5



Pond CB5: PCB5



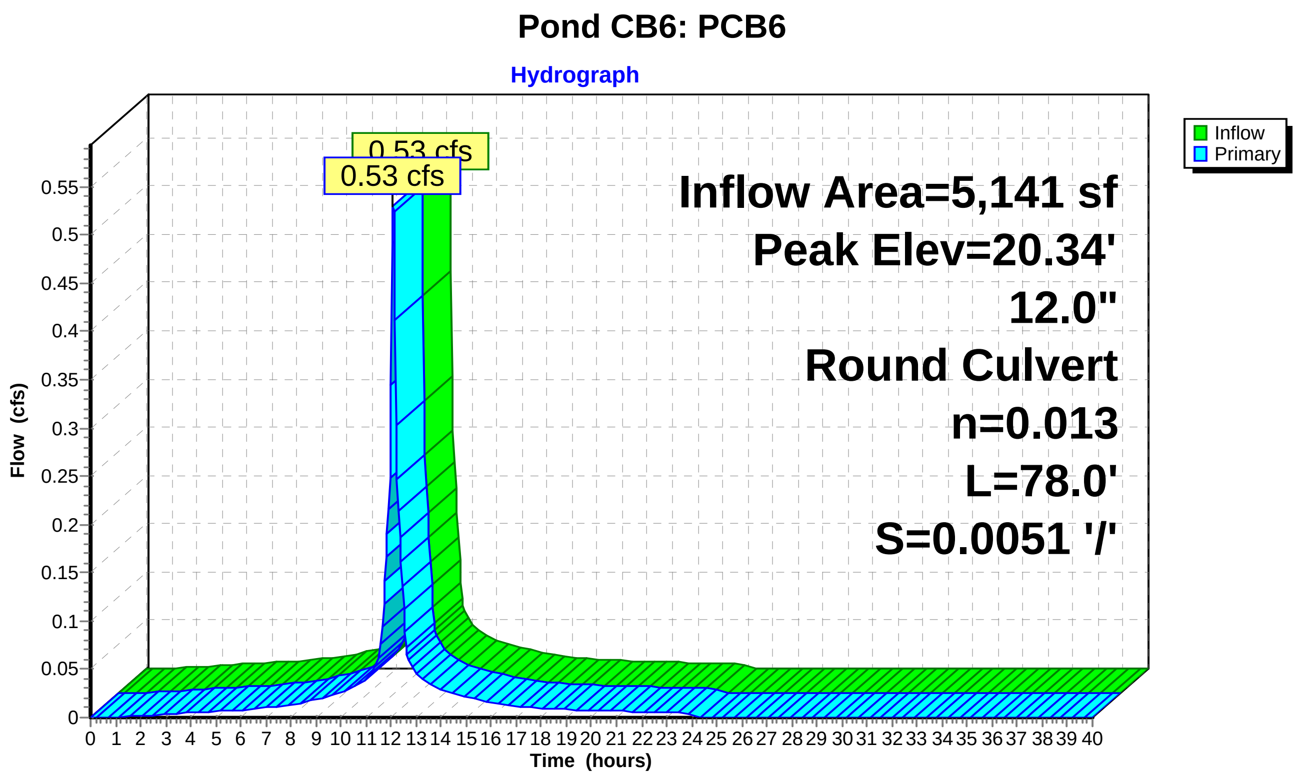
Summary for Pond CB6: PCB6

Inflow Area =	5,141 sf,100.00% Impervious,	Inflow Depth = 4.46"	for 10-yr event	
Inflow =	0.53 cfs @	12.09 hrs, Volume=	1,912 cf	
Outflow =	0.53 cfs @	12.09 hrs, Volume=	1,912 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.53 cfs @	12.09 hrs, Volume=	1,912 cf	

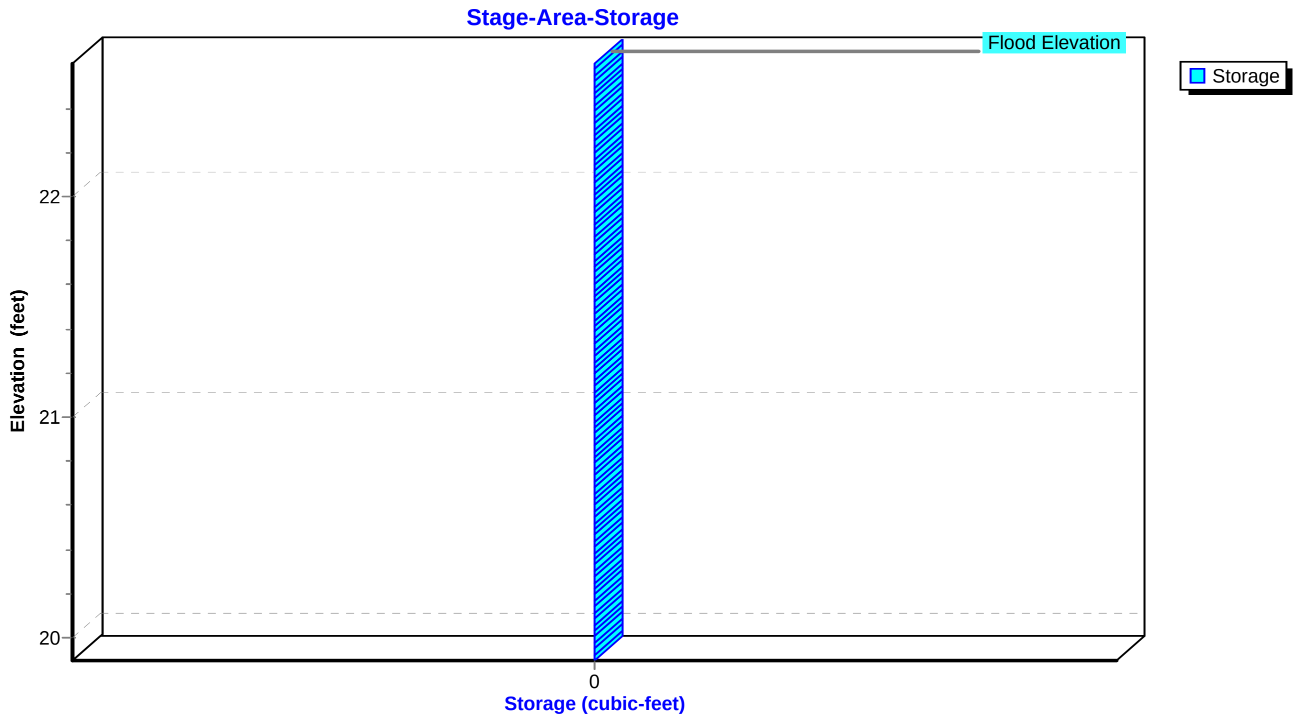
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 20.34' @ 12.10 hrs
Flood Elev= 22.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	19.90'	**12.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.90' / 19.50' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.49 cfs @ 12.09 hrs HW=20.34' TW=19.92' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.49 cfs @ 2.20 fps)



Pond CB6: PCB6



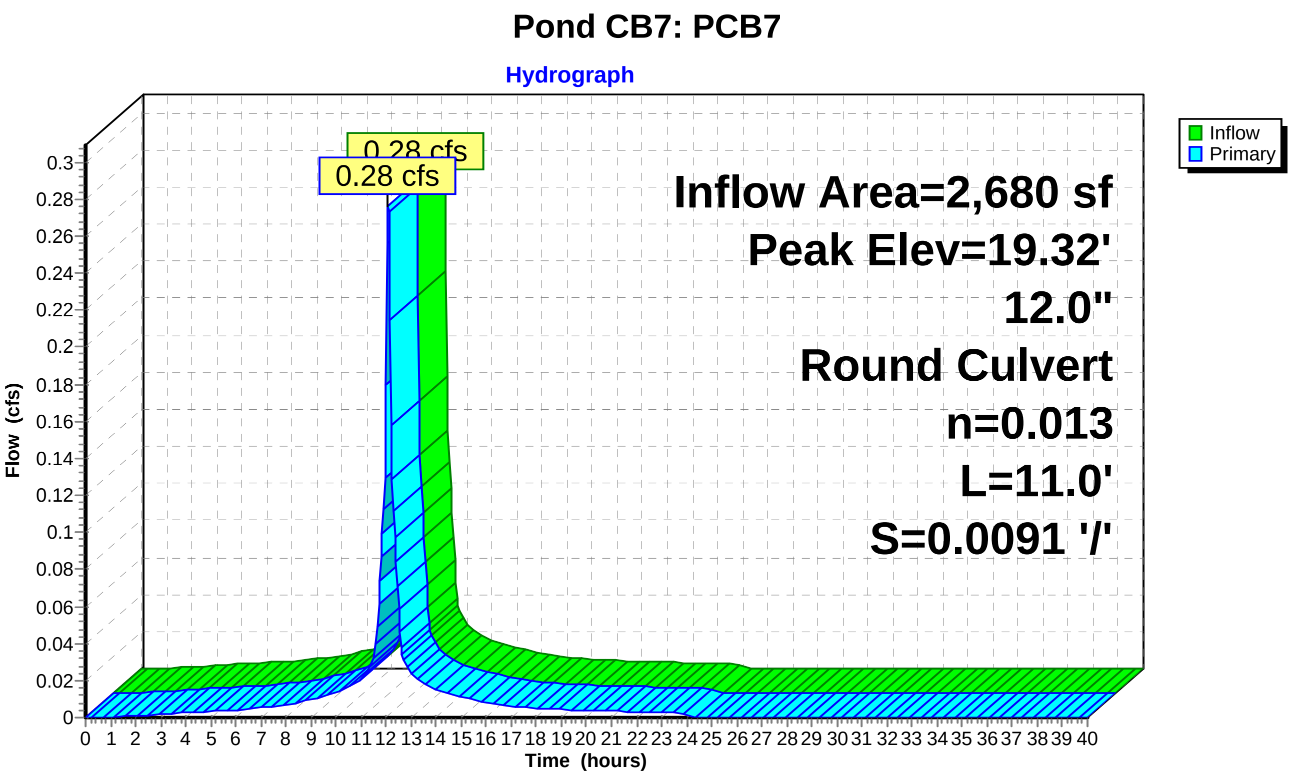
Summary for Pond CB7: PCB7

Inflow Area =	2,680 sf,100.00% Impervious,	Inflow Depth = 4.46" for 10-yr event			
Inflow =	0.28 cfs @	12.09 hrs,	Volume=	997 cf	
Outflow =	0.28 cfs @	12.09 hrs,	Volume=	997 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.28 cfs @	12.09 hrs,	Volume=	997 cf	

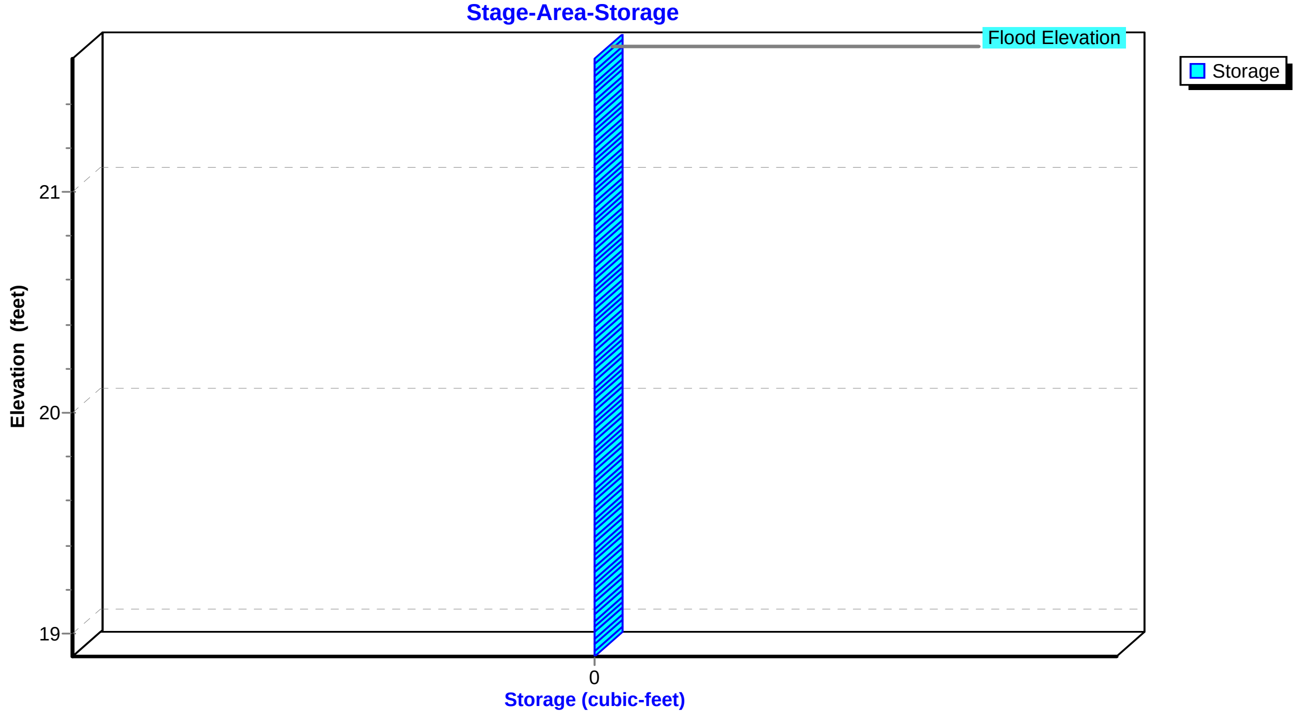
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.32' @ 12.12 hrs
Flood Elev= 21.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.90'	**12.0" Round Culvert** L= 11.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.90' / 18.80' S= 0.0091 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.19 cfs @ 12.09 hrs HW=19.29' TW=19.26' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.19 cfs @ 1.00 fps)



Pond CB7: PCB7



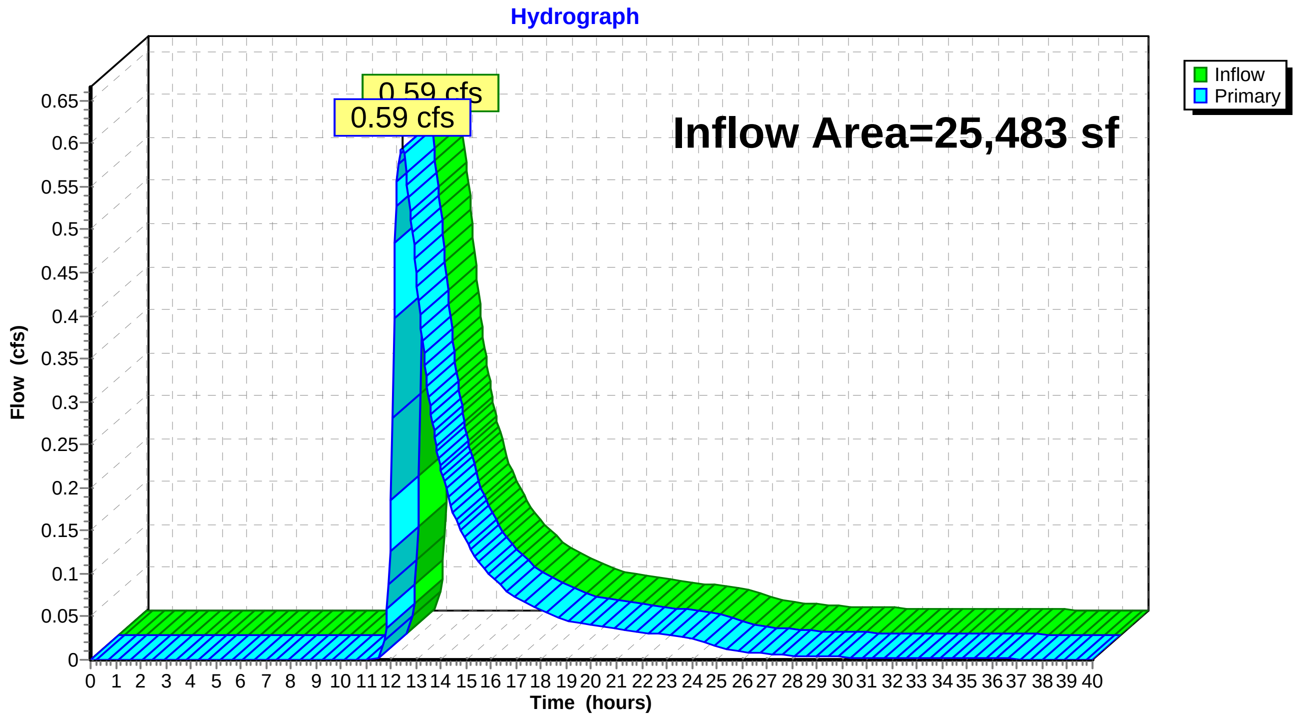
Summary for Pond DP1: Design Pont #1_18" RCP Culvert - Northwest

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	25,483 sf,	55.96% Impervious,	Inflow Depth > 2.68"	for 10-yr event
Inflow =	0.59 cfs @	12.43 hrs, Volume=	5,688 cf	
Primary =	0.59 cfs @	12.43 hrs, Volume=	5,688 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Pond DP1: Design Pont #1_18" RCP Culvert - Northwest



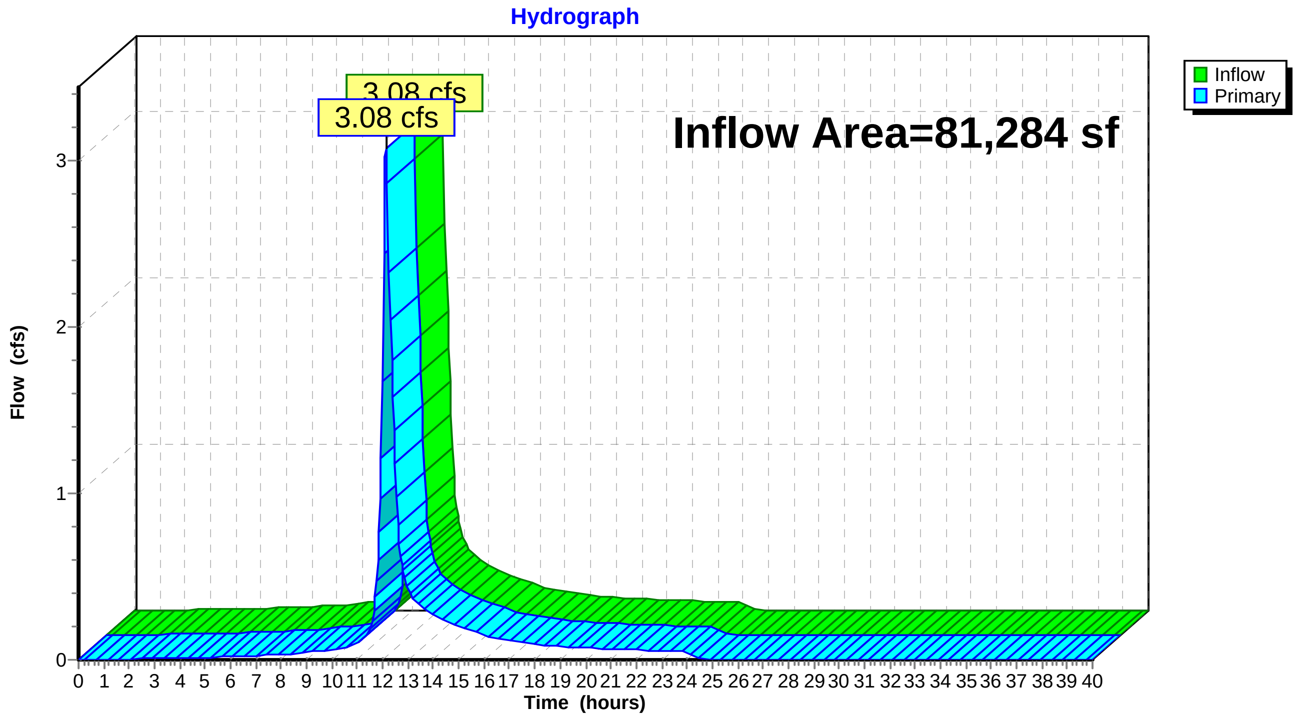
Summary for Pond DP2: Design Pont #2_Wetland-South

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	81,284 sf,	40.77% Impervious,	Inflow Depth = 1.82"	for 10-yr event
Inflow =	3.08 cfs @	12.13 hrs, Volume=	12,321 cf	
Primary =	3.08 cfs @	12.13 hrs, Volume=	12,321 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Pond DP2: Design Pont #2_Wetland-South



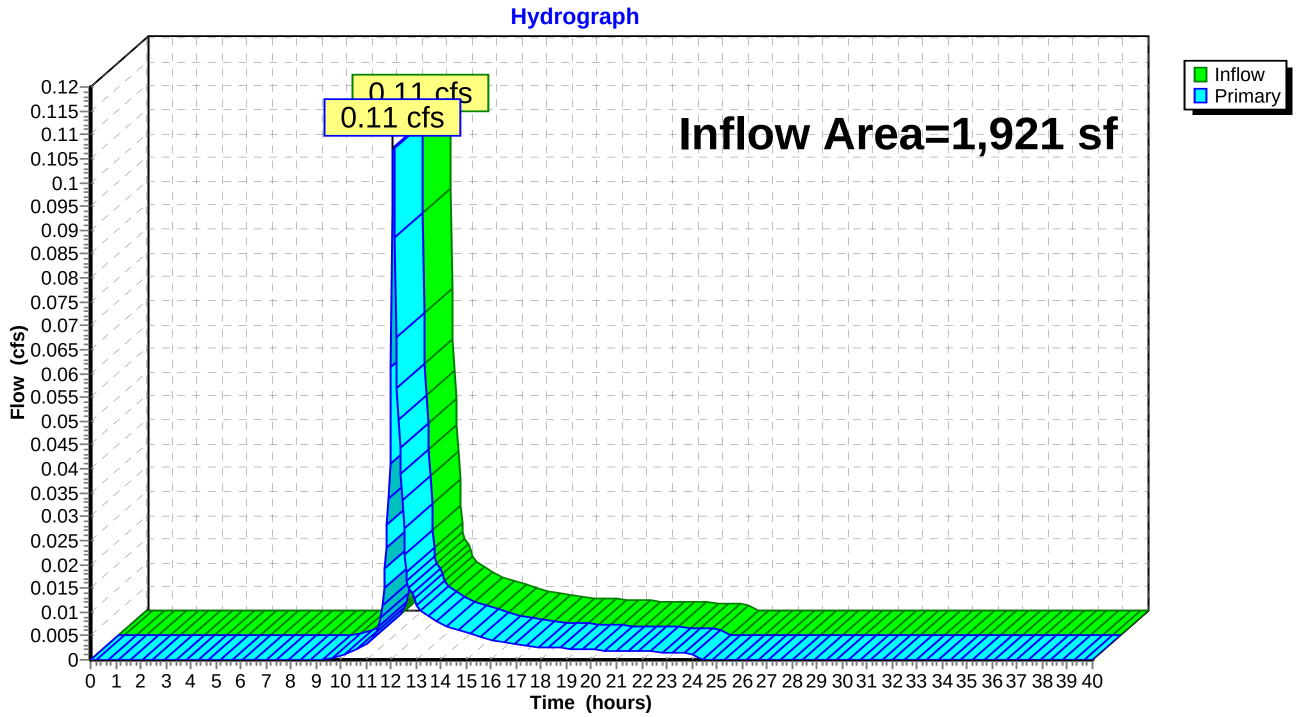
Summary for Pond DP3: Design Pont #3_Abutting Lot-East

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,921 sf, 0.00% Impervious, Inflow Depth = 2.13" for 10-yr event
Inflow = 0.11 cfs @ 12.10 hrs, Volume= 341 cf
Primary = 0.11 cfs @ 12.10 hrs, Volume= 341 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Pond DP3: Design Pont #3_Abutting Lot-East



Summary for Pond IS: Infiltration System

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=2)

Inflow Area =	14,215 sf,100.00% Impervious,	Inflow Depth = 4.46"	for 10-yr event	
Inflow =	1.46 cfs @	12.09 hrs, Volume=	5,288 cf	
Outflow =	0.28 cfs @	11.75 hrs, Volume=	5,288 cf,	Atten= 81%, Lag= 0.0 min
Discarded =	0.28 cfs @	11.75 hrs, Volume=	5,288 cf	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 17.47' @ 12.52 hrs Surf.Area= 1,463 sf Storage= 1,244 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 22.2 min (771.2 - 749.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	16.10'	670 cf	**6.28'W x 109.07'L x 3.52'H Field A** 2,416 cf Overall - 741 cf Embedded = 1,675 cf x 40.0% Voids
#2A	16.60'	741 cf	**Contech ChamberMaxx** x 15 Inside #1 Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap Row Length Adjustment= +0.32' x 6.92 sf x 1 rows
#3B	16.10'	601 cf	**10.98'W x 59.25'L x 3.52'H Field B** 2,294 cf Overall - 793 cf Embedded = 1,502 cf x 40.0% Voids
#4B	16.60'	793 cf	**Contech ChamberMaxx** x 16 Inside #3 Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap Row Length Adjustment= +0.32' x 6.92 sf x 2 rows
#5C	16.10'	143 cf	**2.54'W x 50.00'L x 3.21'H Field C** 408 cf Overall - 50 cf Embedded = 358 cf x 40.0% Voids
#6C	17.10'	39 cf	**ADS N-12 12** x 2 Inside #5 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf Row Length Adjustment= +8.00' x 0.81 sf x 1 rows
		2,986 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.10'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	17.90'	**12.0" Round Culvert** L= 66.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 17.90' / 16.50' S= 0.0212 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.28 cfs @ 11.75 hrs HW=16.14' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=16.10' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.00 cfs)

Pond IS: Infiltration System - Chamber Wizard Field A

Chamber Model = Contech ChamberMaxx (Contech® ChamberMaxx®)
Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
Row Length Adjustment= +0.32' x 6.92 sf x 1 rows

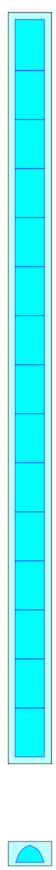
15 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 107.07' Row Length +12.0" End Stone x 2 = 109.07' Base Length
1 Rows x 51.4" Wide + 12.0" Side Stone x 2 = 6.28' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

15 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 1 Rows = 741.1 cf Chamber Storage

2,415.8 cf Field - 741.1 cf Chambers = 1,674.7 cf Stone x 40.0% Voids = 669.9 cf Stone Storage

Chamber Storage + Stone Storage = 1,411.0 cf = 0.032 af
Overall Storage Efficiency = 58.4%
Overall System Size = 109.07' x 6.28' x 3.52'

15 Chambers
89.5 cy Field
62.0 cy Stone



Pond IS: Infiltration System - Chamber Wizard Field B

Chamber Model = Contech ChamberMaxx (Contech® ChamberMaxx®)
Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
Row Length Adjustment= +0.32' x 6.92 sf x 2 rows

51.4" Wide + 5.0" Spacing = 56.4" C-C Row Spacing

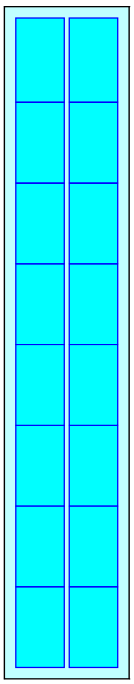
8 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 57.25' Row Length +12.0" End Stone x 2 = 59.25' Base Length
2 Rows x 51.4" Wide + 5.0" Spacing x 1 + 12.0" Side Stone x 2 = 10.98' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

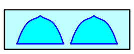
16 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 792.6 cf Chamber Storage

2,294.1 cf Field - 792.6 cf Chambers = 1,501.5 cf Stone x 40.0% Voids = 600.6 cf Stone Storage

Chamber Storage + Stone Storage = 1,393.2 cf = 0.032 af
Overall Storage Efficiency = 60.7%
Overall System Size = 59.25' x 10.98' x 3.52'

16 Chambers
85.0 cy Field
55.6 cy Stone





Pond IS: Infiltration System - Chamber Wizard Field C

Chamber Model = ADS N-12 12 (ADS N-12® Pipe)
Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
Row Length Adjustment= +8.00' x 0.81 sf x 1 rows

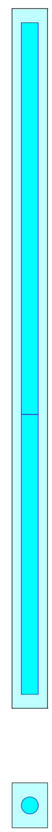
2 Chambers/Row x 20.00' Long +8.00' Row Adjustment = 48.00' Row Length +12.0" End Stone x 2 = 50.00' Base Length
1 Rows x 14.5" Wide + 8.0" Side Stone x 2 = 2.54' Base Width
12.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.21' Field Height

2 Chambers x 16.2 cf +8.00' Row Adjustment x 0.81 sf x 1 Rows = 38.9 cf Chamber Storage
2 Chambers x 20.9 cf +8.00' Row Adjustment x 1.05 sf x 1 Rows = 50.2 cf Displacement

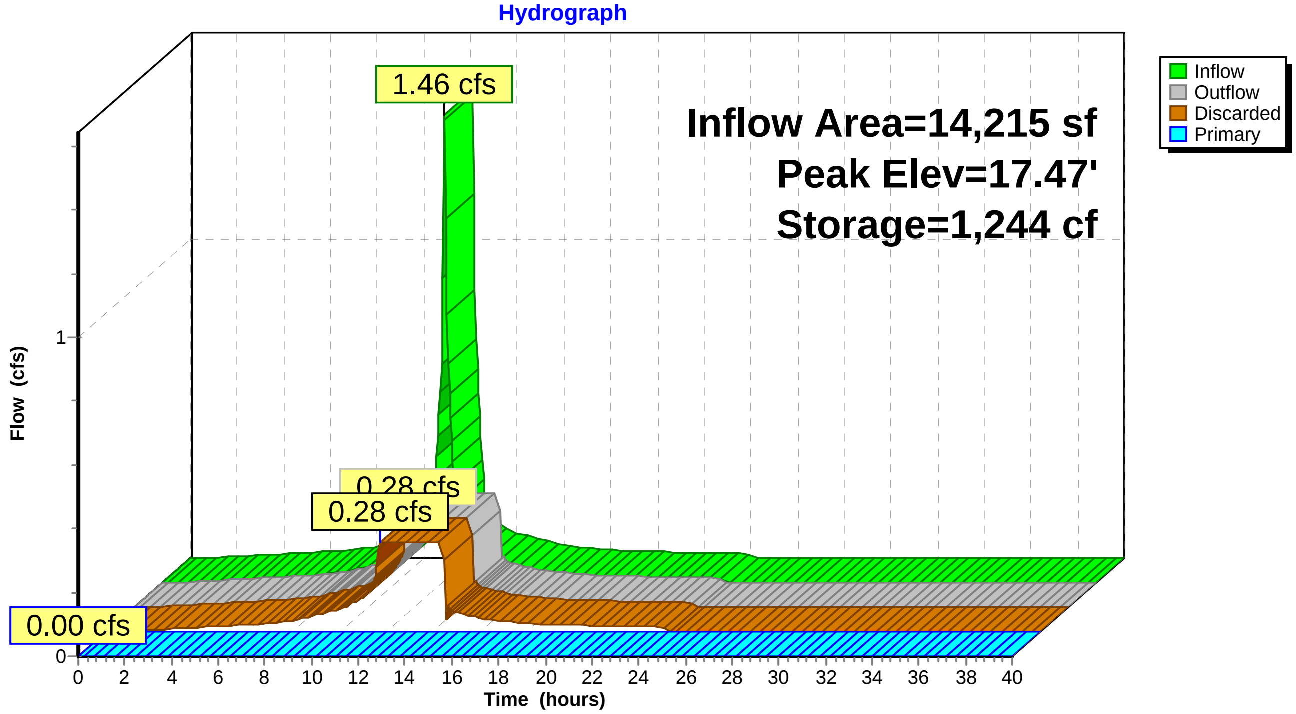
407.9 cf Field - 50.2 cf Chambers = 357.7 cf Stone x 40.0% Voids = 143.1 cf Stone Storage

Chamber Storage + Stone Storage = 181.9 cf = 0.004 af
Overall Storage Efficiency = 44.6%
Overall System Size = 50.00' x 2.54' x 3.21'

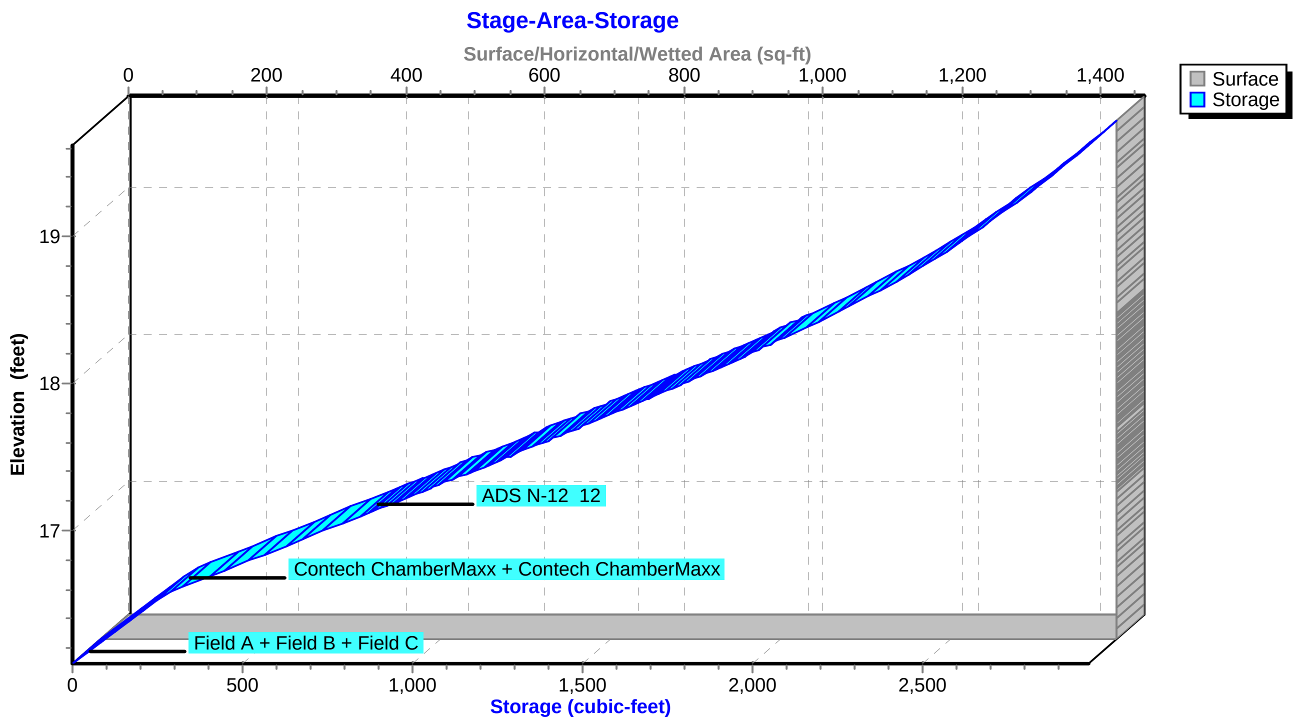
2 Chambers
15.1 cy Field
13.2 cy Stone



Pond IS: Infiltration System



Pond IS: Infiltration System



Summary for Pond MH1: PDMH1

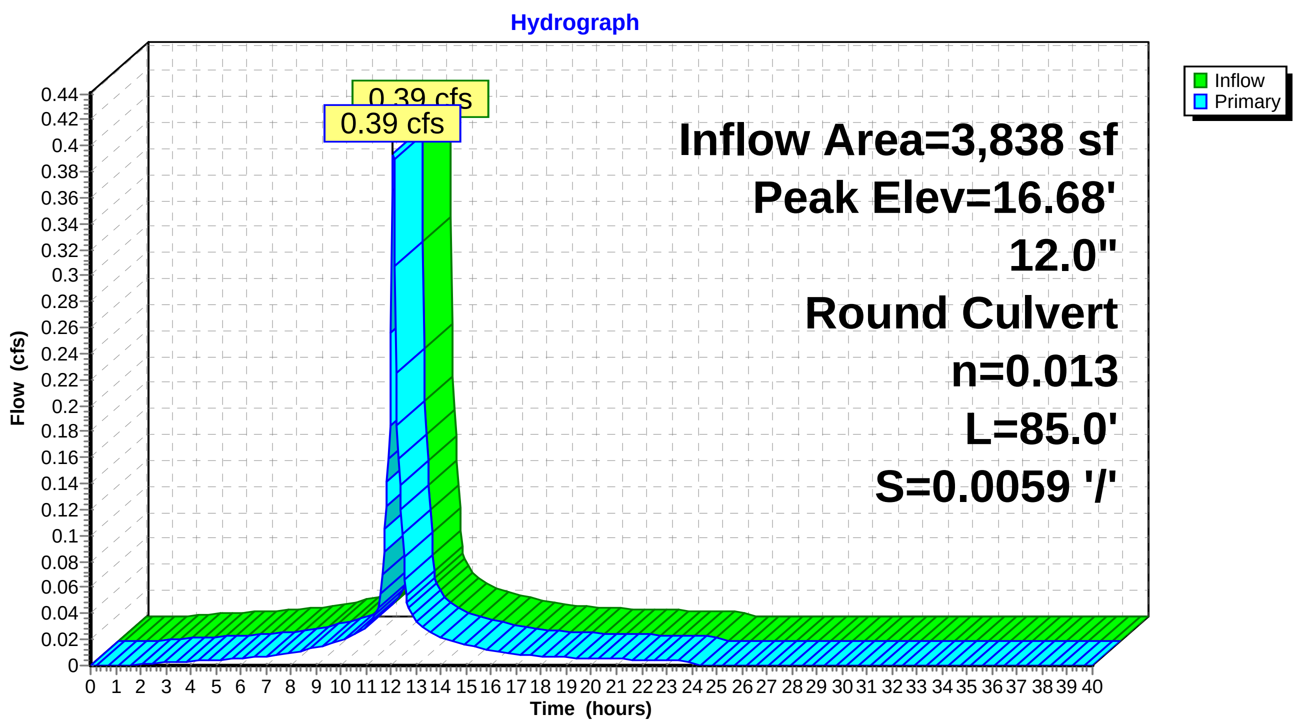
Inflow Area = 3,838 sf, 97.68% Impervious, Inflow Depth = 4.40" for 10-yr event
Inflow = 0.39 cfs @ 12.09 hrs, Volume= 1,407 cf
Outflow = 0.39 cfs @ 12.09 hrs, Volume= 1,407 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.39 cfs @ 12.09 hrs, Volume= 1,407 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.68' @ 12.10 hrs
Flood Elev= 20.20'

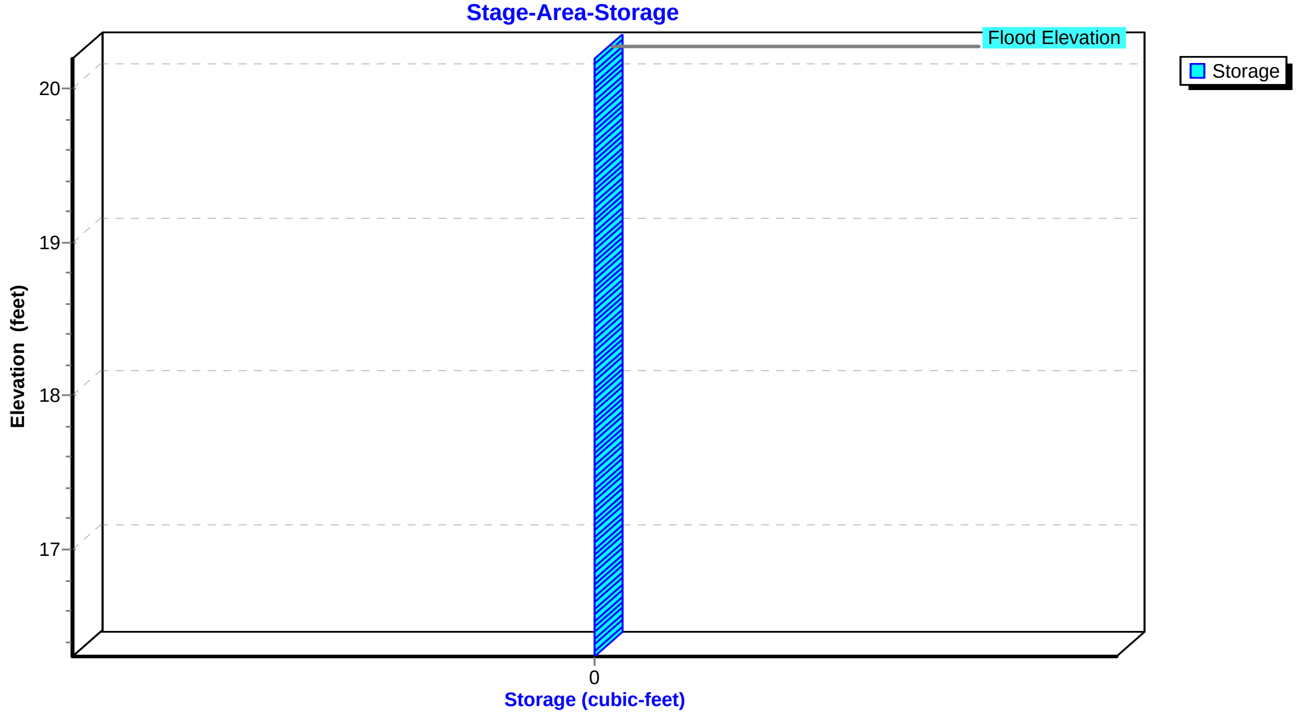
Device	Routing	Invert	Outlet Devices
#1	Primary	16.30'	**12.0" Round Culvert** L= 85.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.30' / 15.80' S= 0.0059 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.35 cfs @ 12.09 hrs HW=16.68' TW=16.29' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.35 cfs @ 1.93 fps)

Pond MH1: PDMH1



Pond MH1: PDMH1



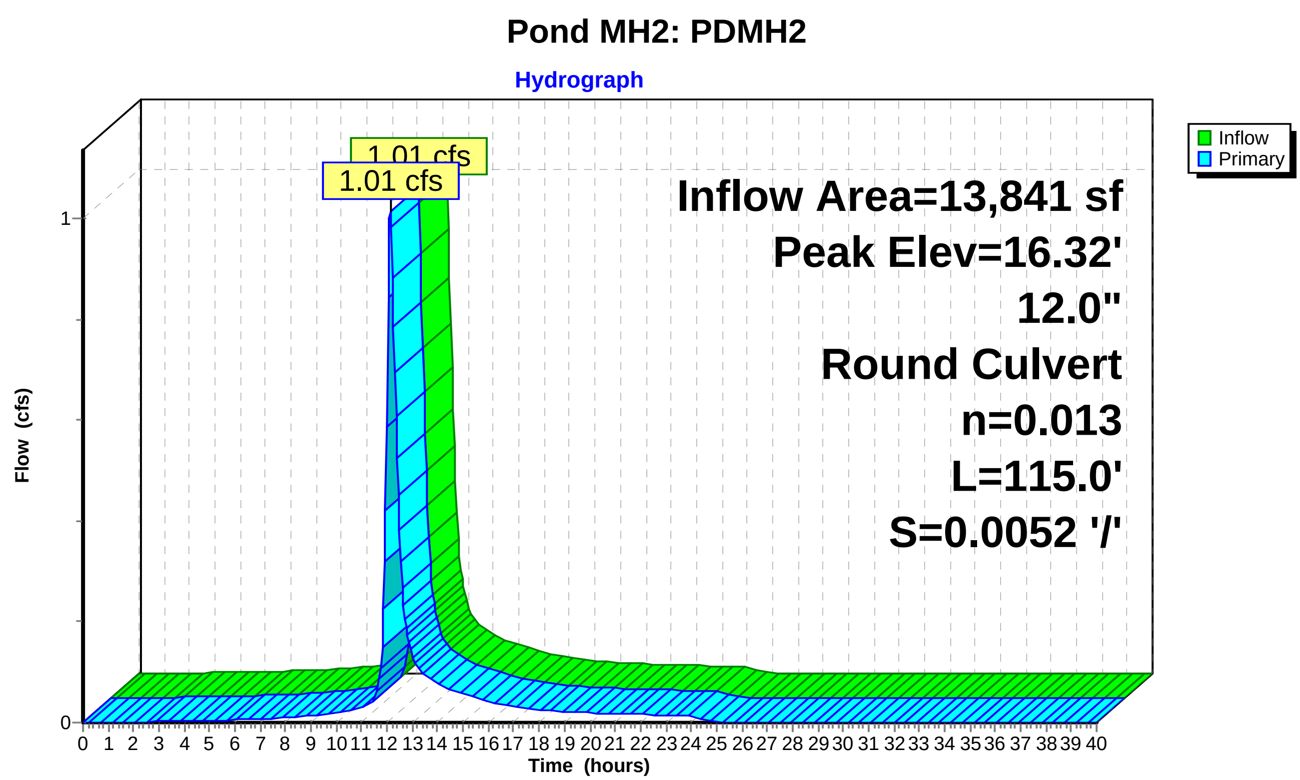
Summary for Pond MH2: PDMH2

Inflow Area =	13,841 sf,	76.82% Impervious,	Inflow Depth = 3.28"	for 10-yr event	
Inflow =	1.01 cfs @	12.12 hrs,	Volume=	3,780 cf	
Outflow =	1.01 cfs @	12.12 hrs,	Volume=	3,780 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.01 cfs @	12.12 hrs,	Volume=	3,780 cf	

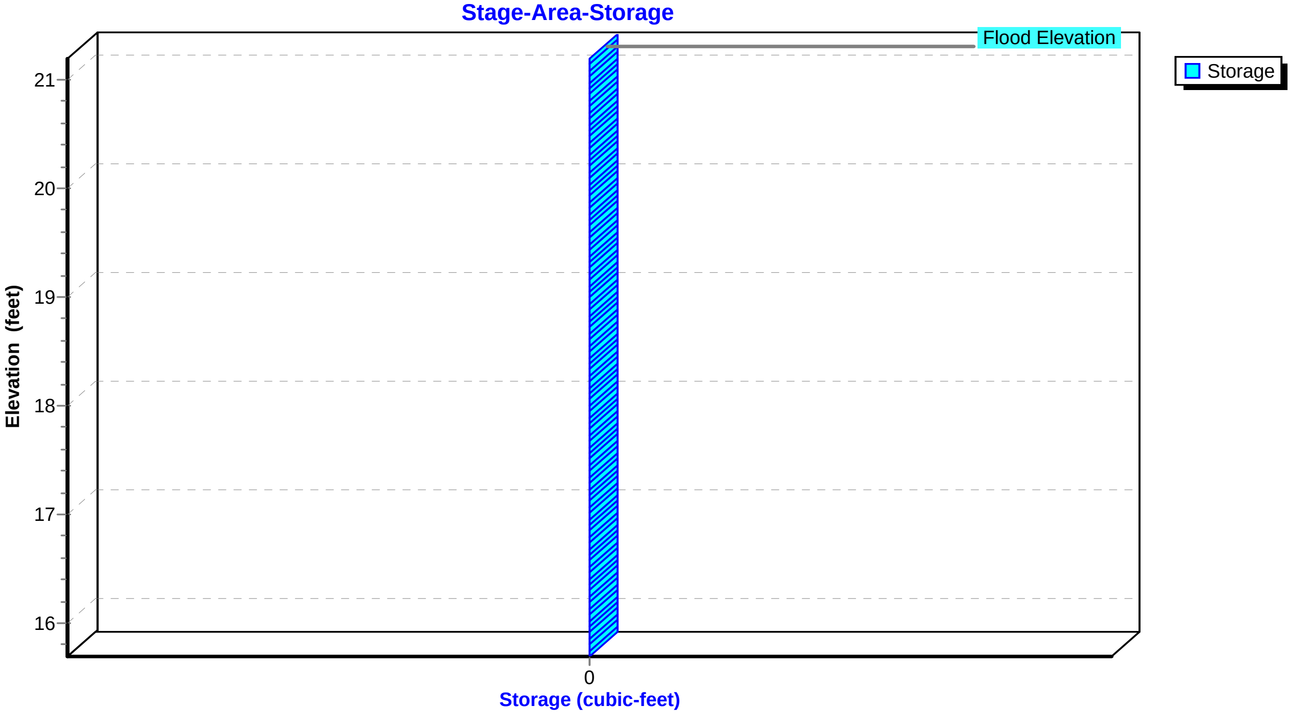
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.32' @ 12.14 hrs
Flood Elev= 21.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	15.70'	**12.0" Round Culvert** L= 115.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.70' / 15.10' S= 0.0052 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.96 cfs @ 12.12 hrs HW=16.31' TW=15.64' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.96 cfs @ 2.73 fps)



Pond MH2: PDMH2



Summary for Pond MH3: PDMH3

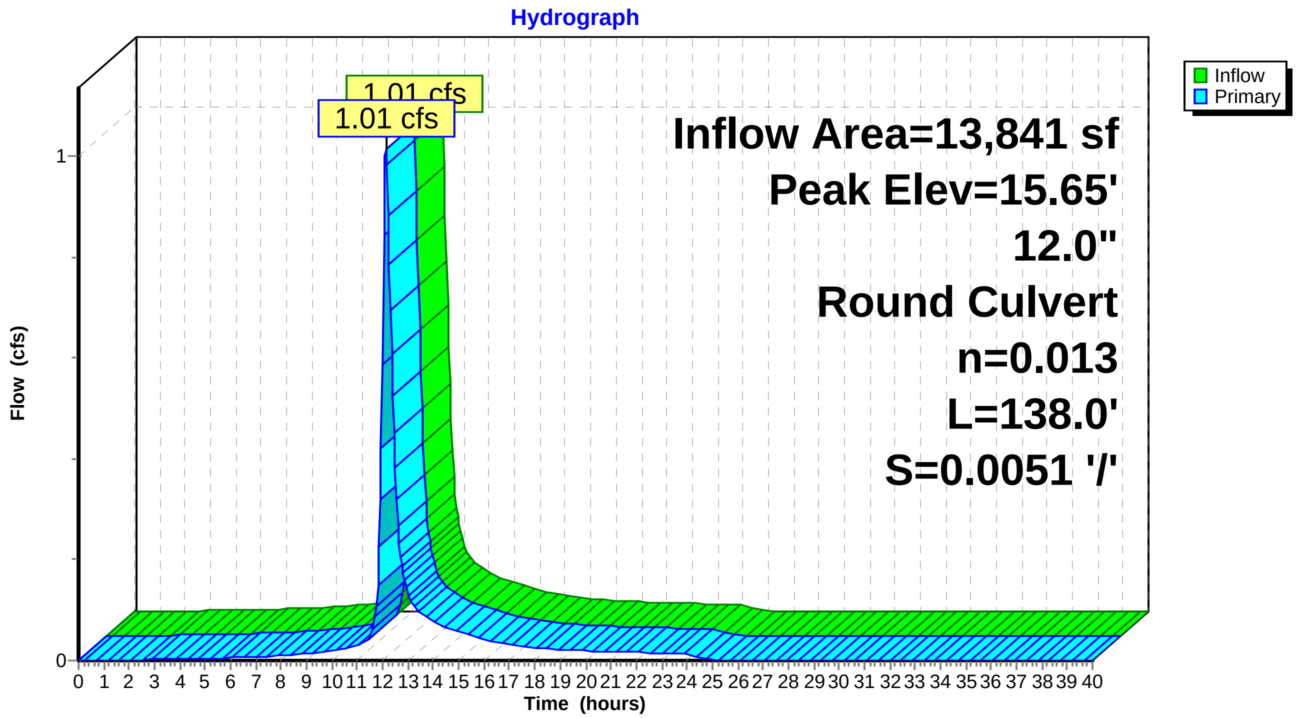
Inflow Area =	13,841 sf,	76.82% Impervious,	Inflow Depth = 3.28"	for 10-yr event		
Inflow =	1.01 cfs @	12.12 hrs,	Volume=	3,780 cf		
Outflow =	1.01 cfs @	12.12 hrs,	Volume=	3,780 cf,	Atten= 0%,	Lag= 0.0 min
Primary =	1.01 cfs @	12.12 hrs,	Volume=	3,780 cf		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.65' @ 12.13 hrs
Flood Elev= 23.80'

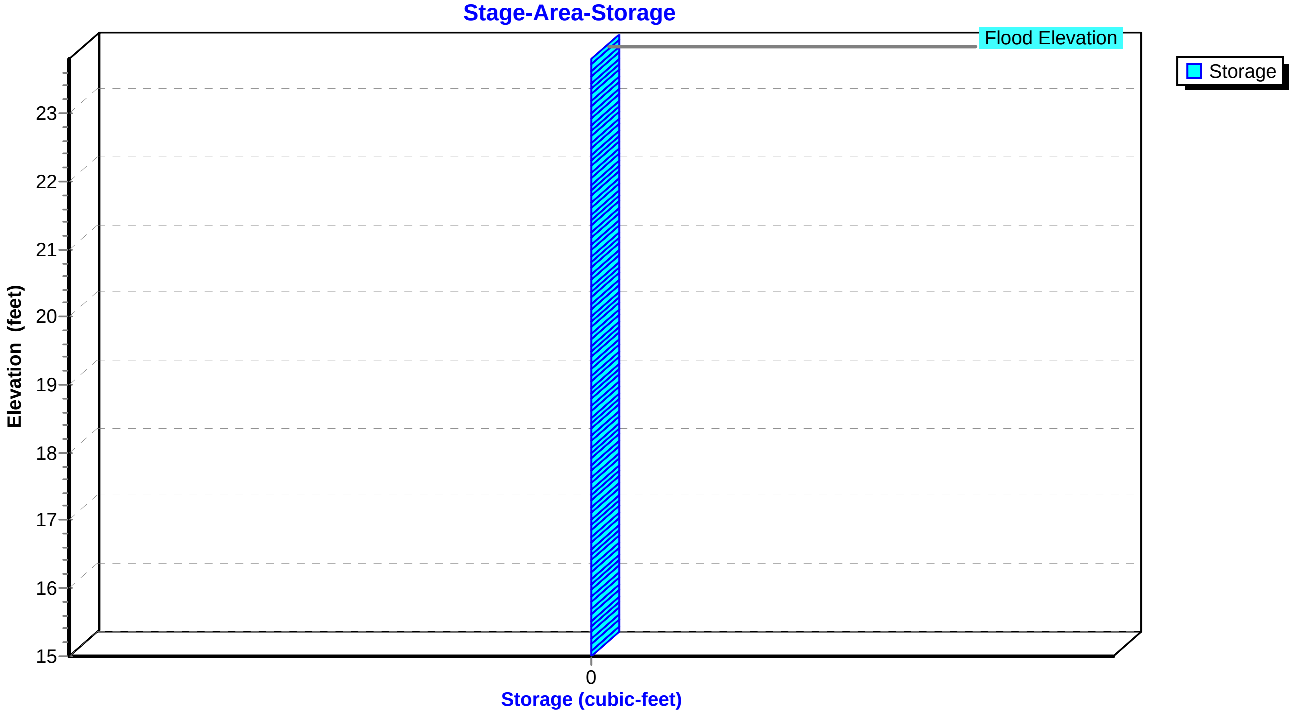
Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	**12.0" Round Culvert** L= 138.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.00' / 14.30' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.98 cfs @ 12.12 hrs HW=15.64' TW=14.98' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.98 cfs @ 2.60 fps)

Pond MH3: PDMH3



Pond MH3: PDMH3



Summary for Pond MH4: PDMH4

Inflow Area = 22,134 sf, 85.50% Impervious, Inflow Depth = 3.72" for 10-yr event
Inflow = 1.84 cfs @ 12.10 hrs, Volume= 6,864 cf
Outflow = 1.84 cfs @ 12.10 hrs, Volume= 6,864 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.46 cfs @ 12.10 hrs, Volume= 6,424 cf
Secondary = 0.39 cfs @ 12.11 hrs, Volume= 440 cf

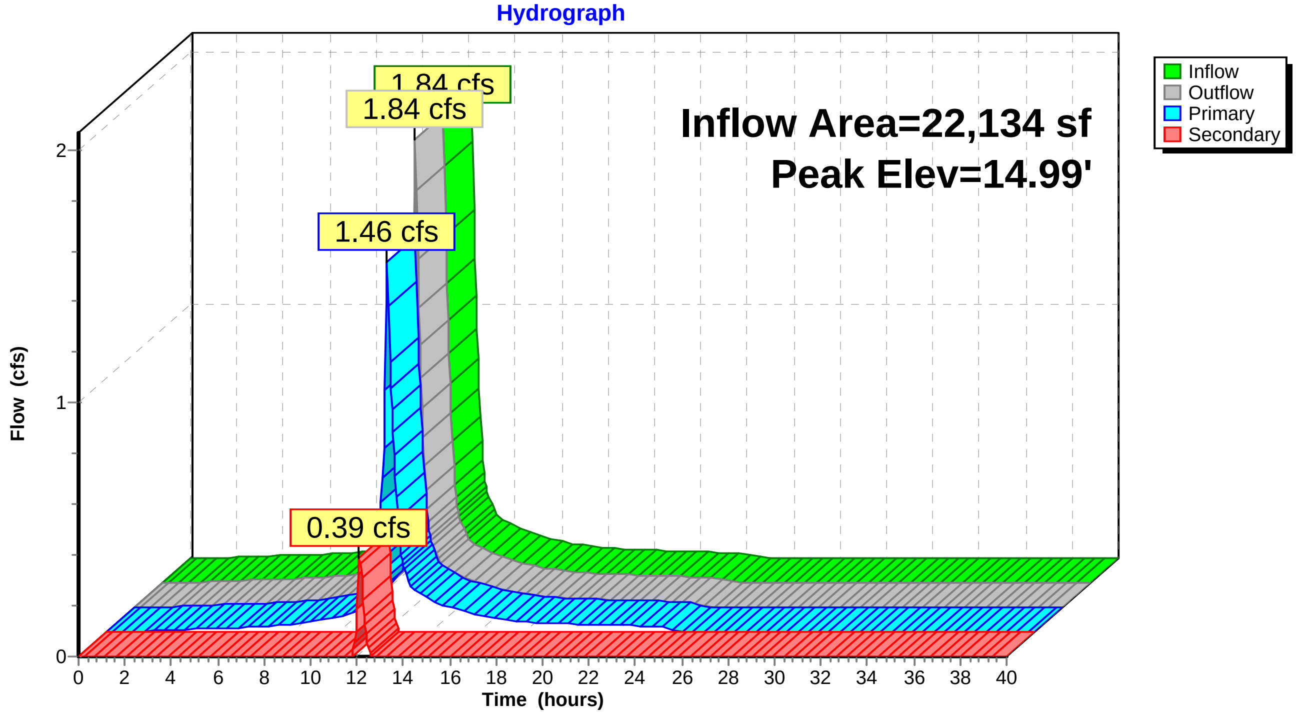
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 14.99' @ 12.11 hrs
Flood Elev= 21.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	14.20'	**12.0" Round Culvert** L= 6.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 14.10' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	14.20'	**12.0" Round Culvert** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 13.70' S= 0.0625 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	14.55'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

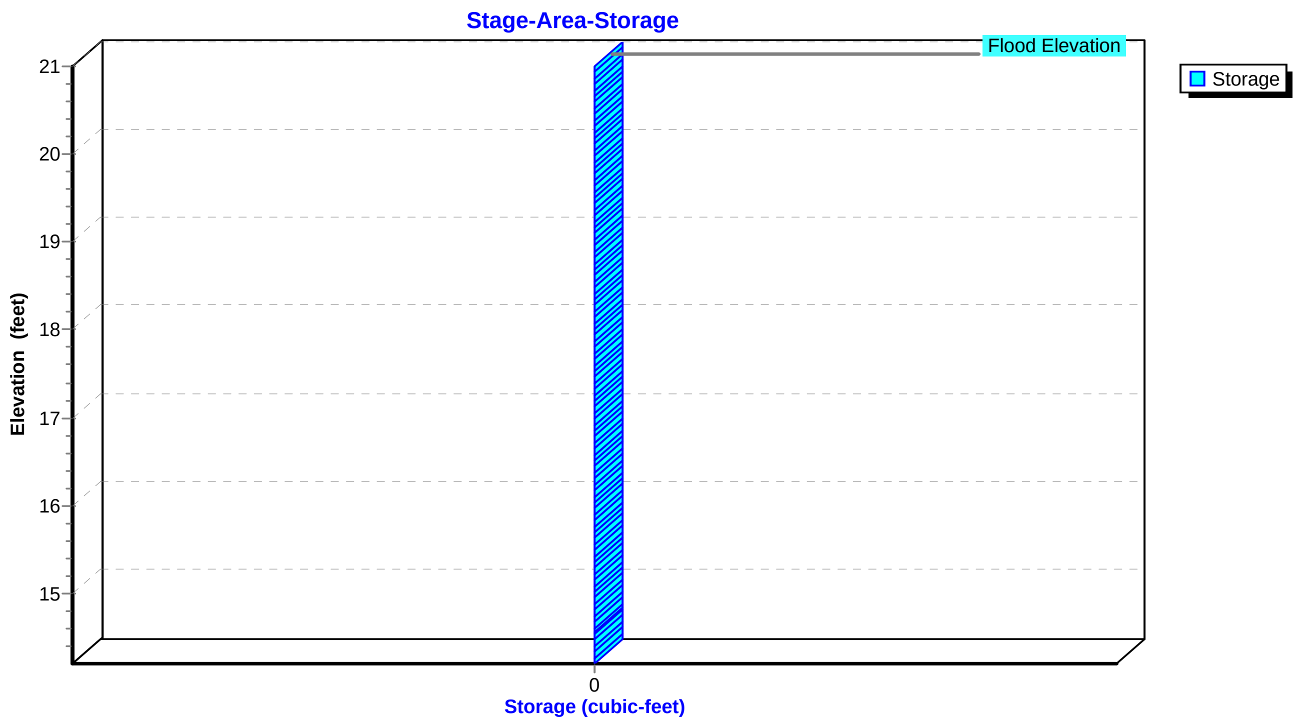
Primary OutFlow Max=1.36 cfs @ 12.10 hrs HW=14.98' TW=14.69' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.36 cfs @ 2.07 fps)

Secondary OutFlow Max=0.38 cfs @ 12.11 hrs HW=14.98' TW=14.48' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.38 cfs of 1.56 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.38 cfs @ 2.14 fps)

Pond MH4: PDMH4



Pond MH4: PDMH4



Summary for Pond MH5: PDMH5

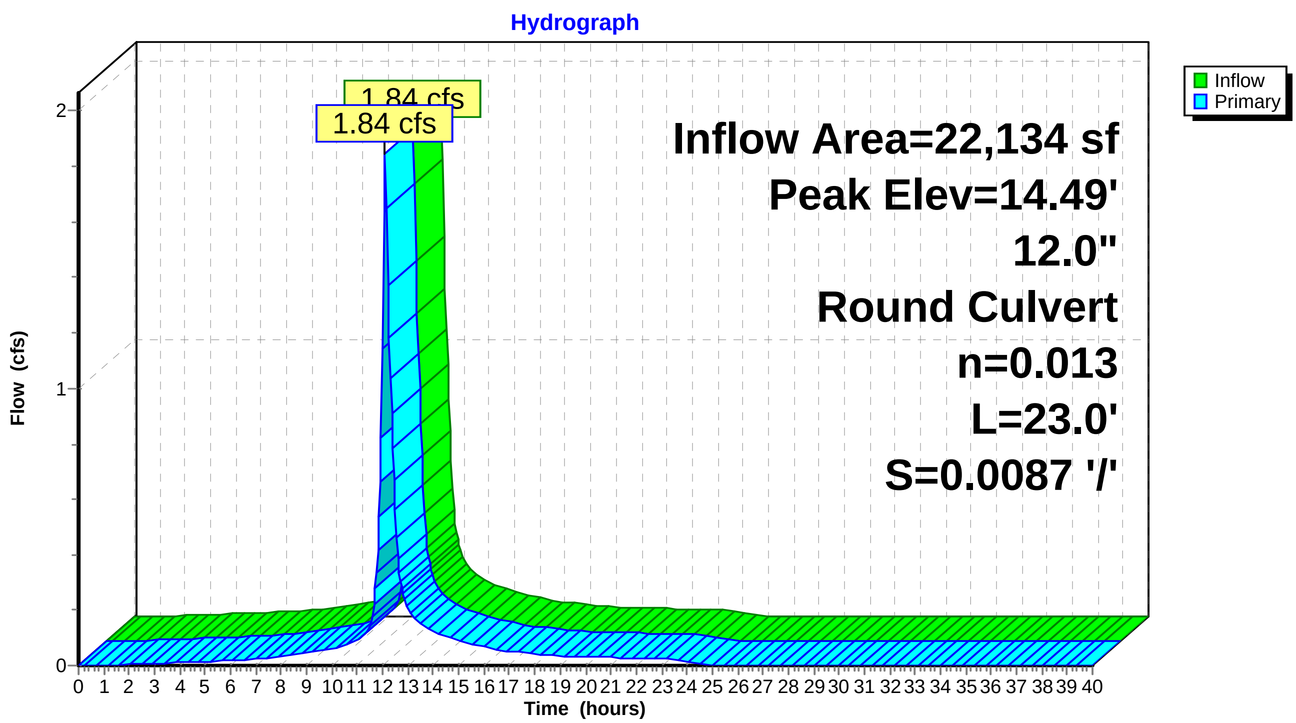
Inflow Area =	22,134 sf,	85.50% Impervious,	Inflow Depth = 3.72"	for 10-yr event
Inflow =	1.84 cfs @	12.10 hrs, Volume=	6,864 cf	
Outflow =	1.84 cfs @	12.10 hrs, Volume=	6,864 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.84 cfs @	12.10 hrs, Volume=	6,864 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 14.49' @ 12.10 hrs
Flood Elev= 21.40'

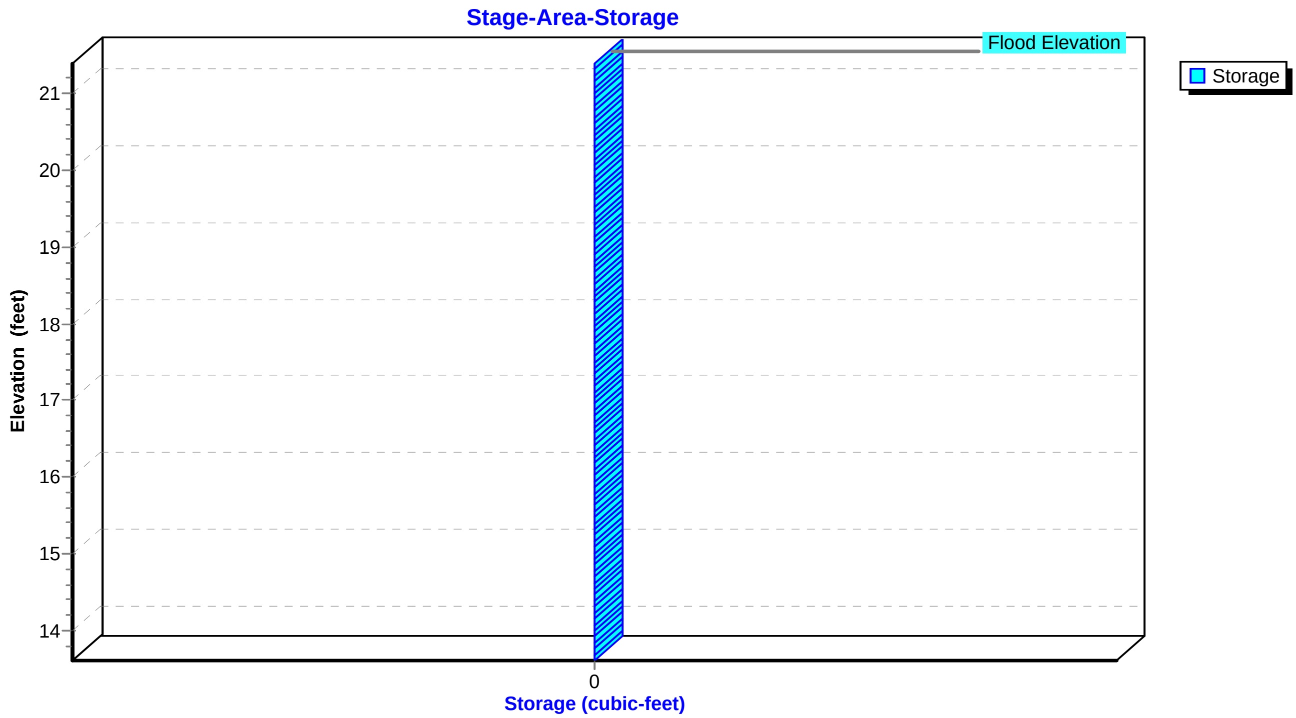
Device	Routing	Invert	Outlet Devices
#1	Primary	13.60'	**12.0" Round Culvert** L= 23.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 13.60' / 13.40' S= 0.0087 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.84 cfs @ 12.10 hrs HW=14.49' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.84 cfs @ 3.31 fps)

Pond MH5: PDMH5



Pond MH5: PDMH5



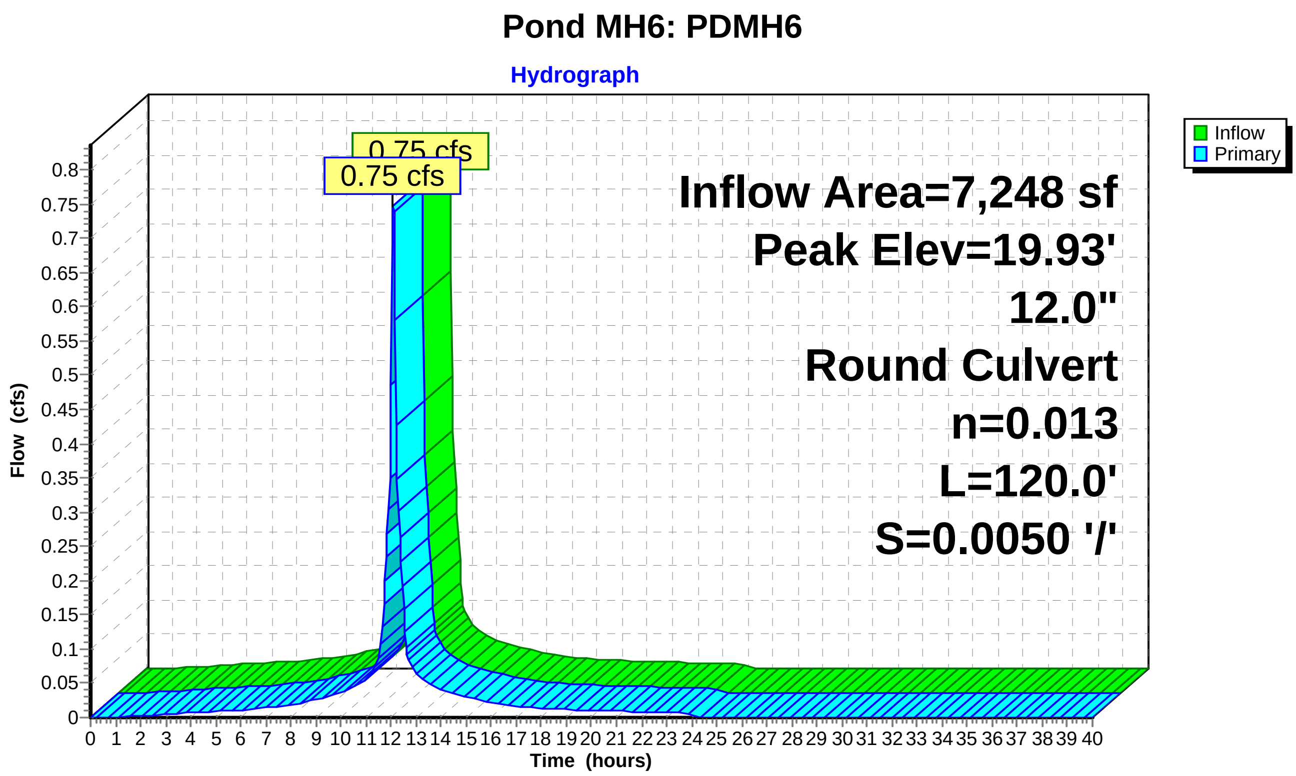
Summary for Pond MH6: PDMH6

Inflow Area =	7,248 sf,100.00% Impervious,	Inflow Depth = 4.46" for 10-yr event		
Inflow =	0.75 cfs @	12.09 hrs, Volume=	2,696 cf	
Outflow =	0.75 cfs @	12.09 hrs, Volume=	2,696 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.75 cfs @	12.09 hrs, Volume=	2,696 cf	

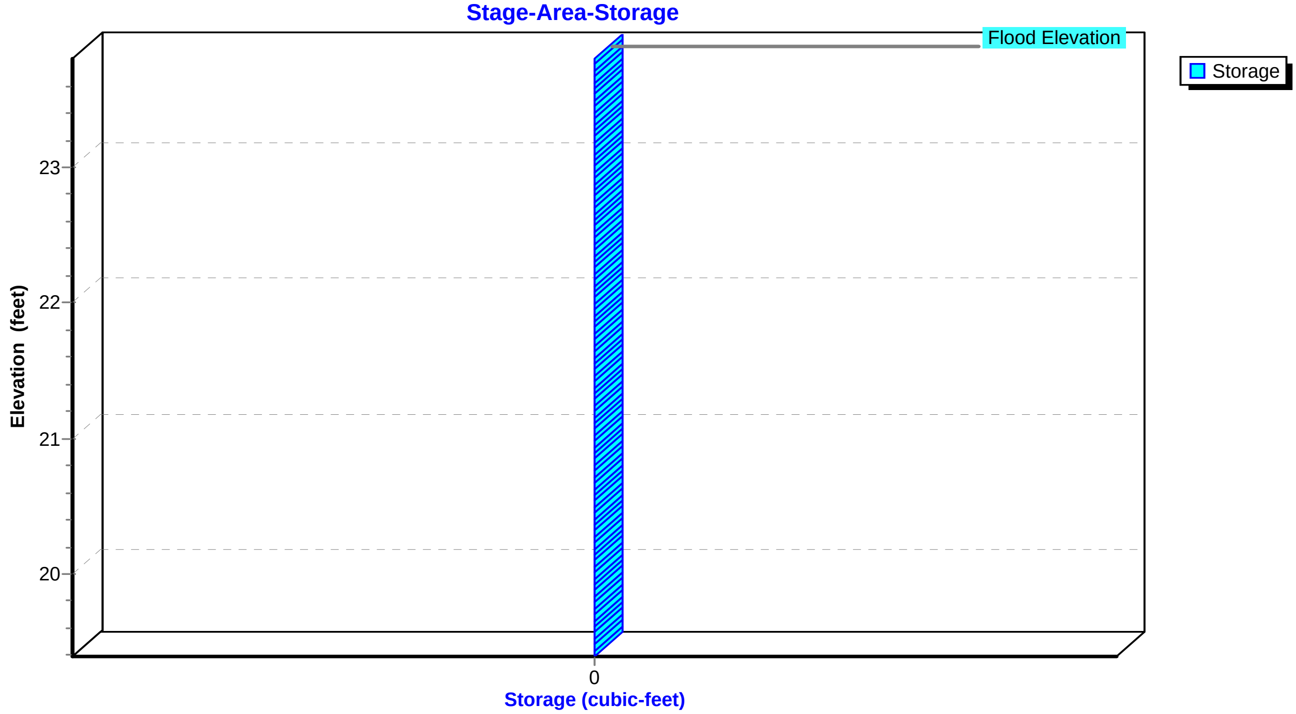
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.93' @ 12.09 hrs
Flood Elev= 23.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	19.40'	**12.0" Round Culvert** L= 120.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.40' / 18.80' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.71 cfs @ 12.09 hrs HW=19.92' TW=19.26' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.71 cfs @ 2.52 fps)



Pond MH6: PDMH6



Summary for Pond MH7: PDMH7

Inflow Area = 9,928 sf,100.00% Impervious, Inflow Depth = 4.46" for 10-yr event
Inflow = 1.02 cfs @ 12.09 hrs, Volume= 3,693 cf
Outflow = 1.02 cfs @ 12.09 hrs, Volume= 3,693 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.83 cfs @ 12.09 hrs, Volume= 3,537 cf
Secondary = 0.20 cfs @ 12.09 hrs, Volume= 156 cf

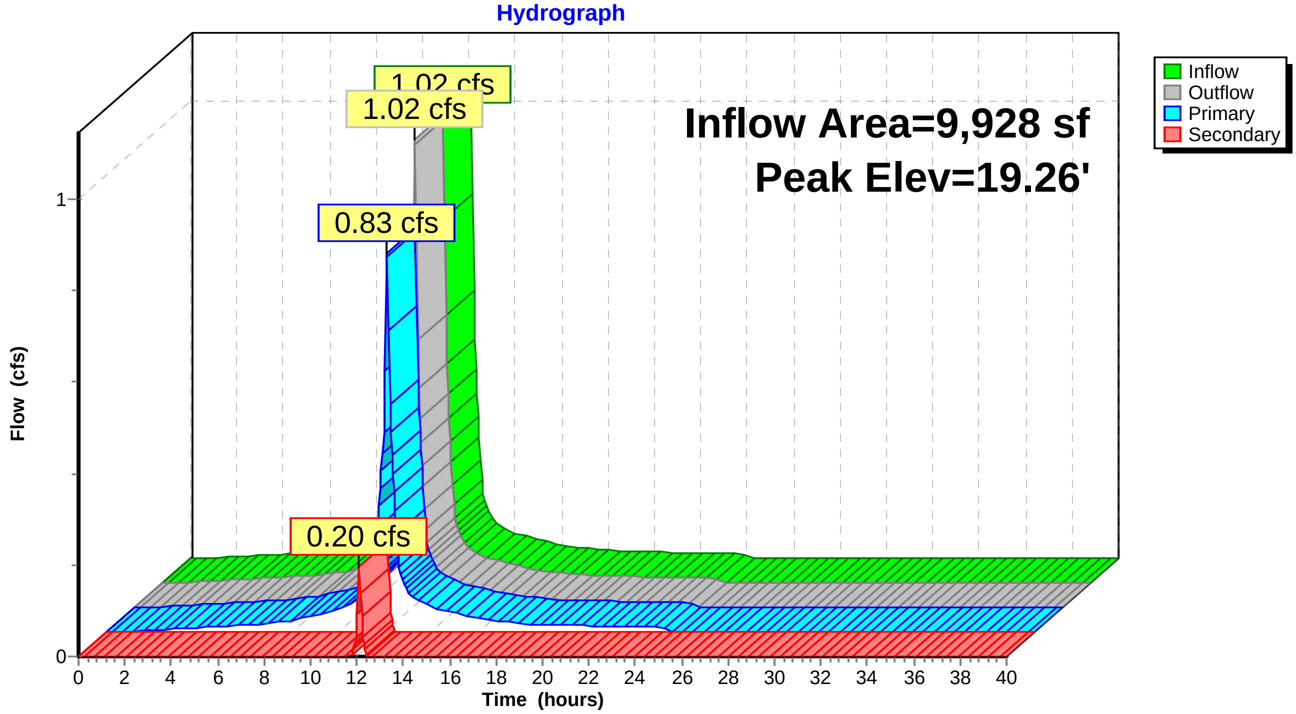
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.26' @ 12.09 hrs
Flood Elev= 21.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.70'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.70' / 18.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	18.70'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.70' / 18.20' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	19.00'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

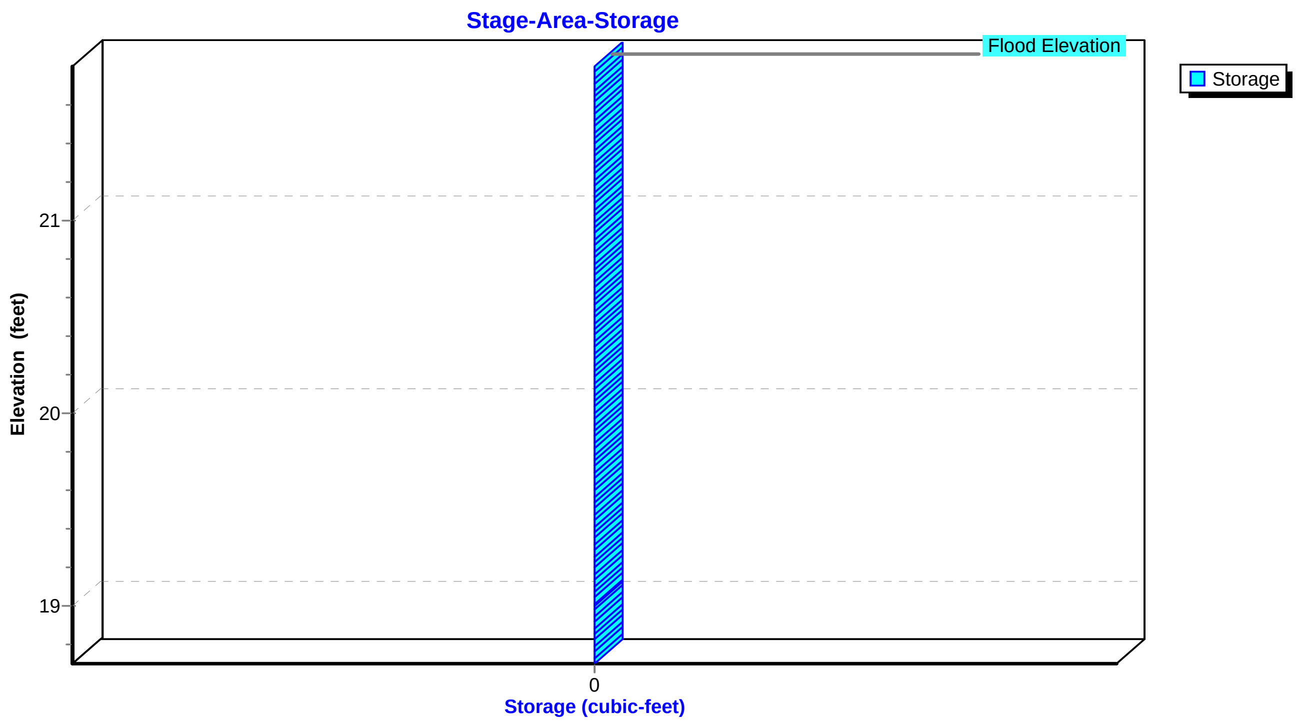
Primary OutFlow Max=0.81 cfs @ 12.09 hrs HW=19.26' TW=18.97' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.81 cfs @ 2.60 fps)

Secondary OutFlow Max=0.19 cfs @ 12.09 hrs HW=19.26' TW=18.88' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.19 cfs of 0.90 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.19 cfs @ 1.65 fps)

Pond MH7: PDMH7



Pond MH7: PDMH7



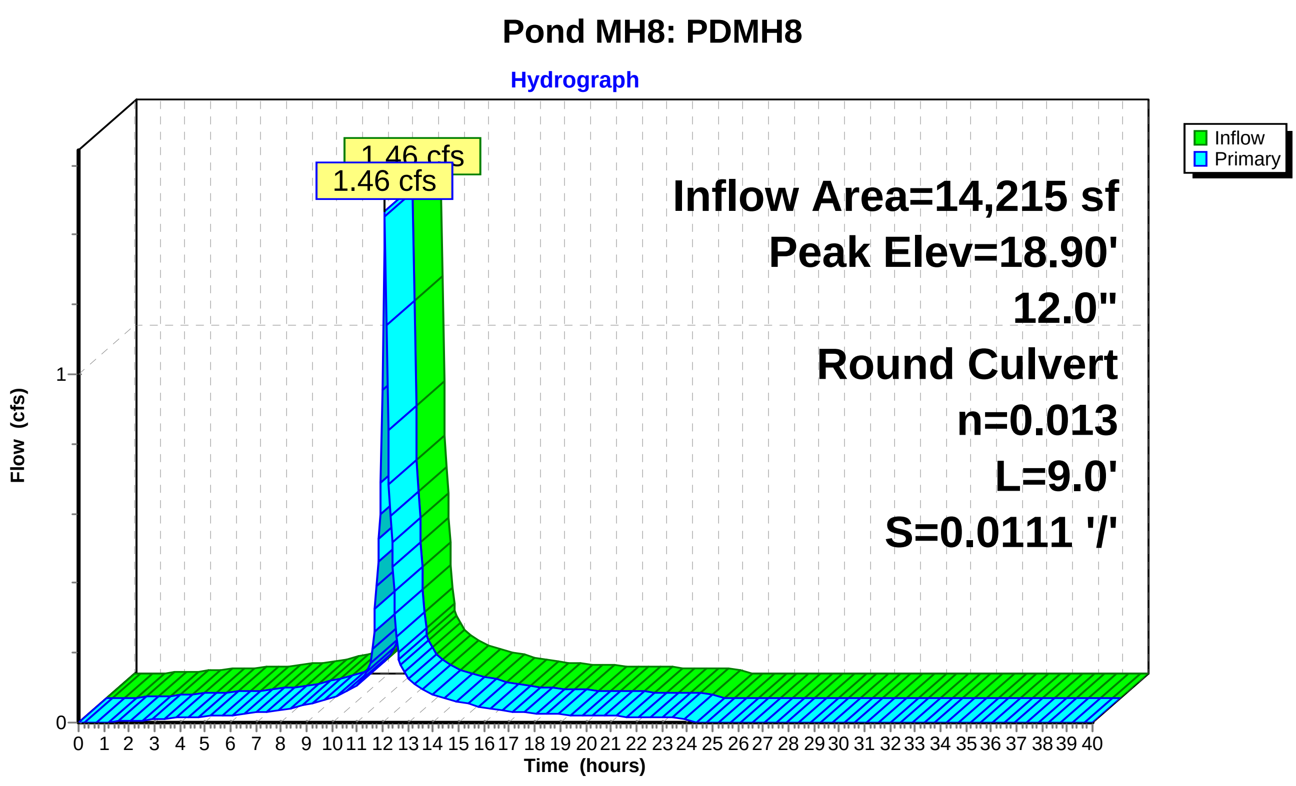
Summary for Pond MH8: PDMH8

Inflow Area = 14,215 sf,100.00% Impervious, Inflow Depth = 4.46" for 10-yr event
Inflow = 1.46 cfs @ 12.09 hrs, Volume= 5,288 cf
Outflow = 1.46 cfs @ 12.09 hrs, Volume= 5,288 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.46 cfs @ 12.09 hrs, Volume= 5,288 cf

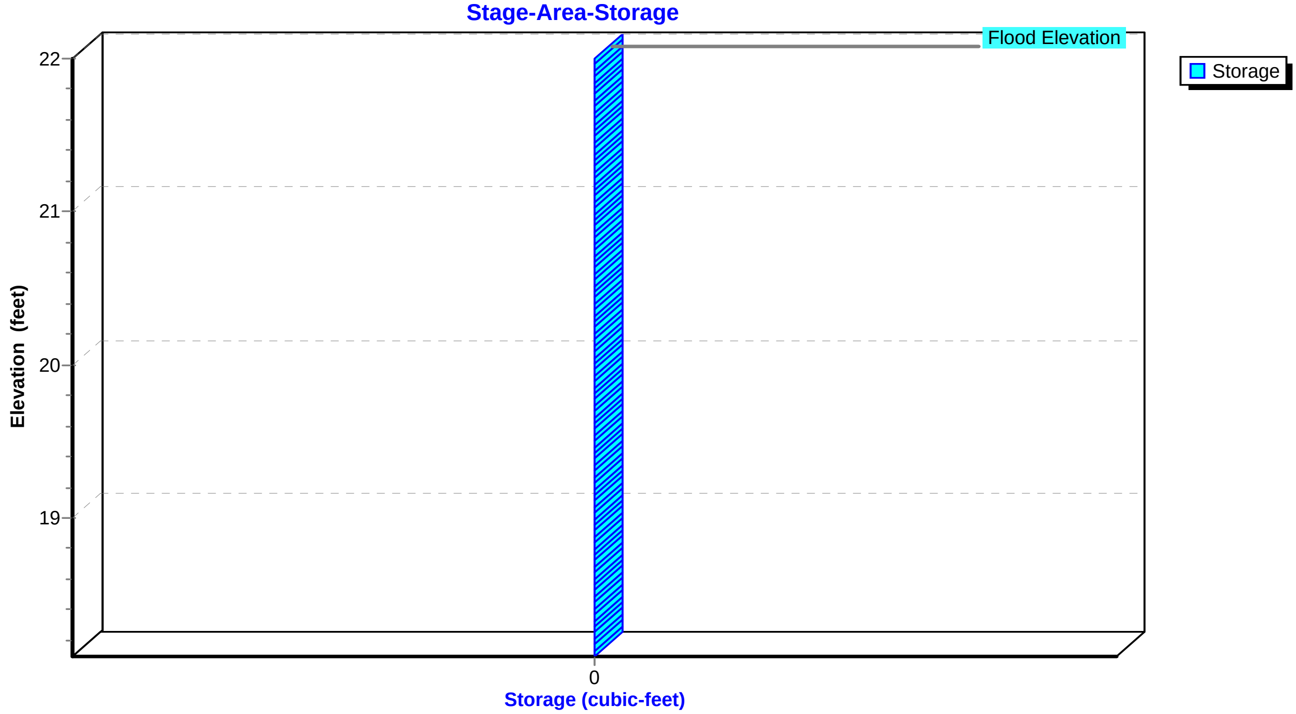
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.90' @ 12.09 hrs
Flood Elev= 22.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.10'	**12.0" Round Culvert** L= 9.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.10' / 18.00' S= 0.0111 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.42 cfs @ 12.09 hrs HW=18.88' TW=16.88' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.42 cfs @ 2.98 fps)



Pond MH8: PDMH8



Summary for Pond RG1: Rain Garden #1

Inflow Area = 25,212 sf, 56.56% Impervious, Inflow Depth = 3.15" for 10-yr event
Inflow = 2.02 cfs @ 12.09 hrs, Volume= 6,621 cf
Outflow = 0.59 cfs @ 12.44 hrs, Volume= 5,640 cf, Atten= 71%, Lag= 20.8 min
Primary = 0.59 cfs @ 12.44 hrs, Volume= 5,640 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.88' @ 12.44 hrs Surf.Area= 5,843 sf Storage= 2,948 cf
Flood Elev= 16.70' Surf.Area= 6,703 sf Storage= 6,272 cf

Plug-Flow detention time= 187.7 min calculated for 5,640 cf (85% of inflow)
Center-of-Mass det. time= 123.3 min (921.9 - 798.6)

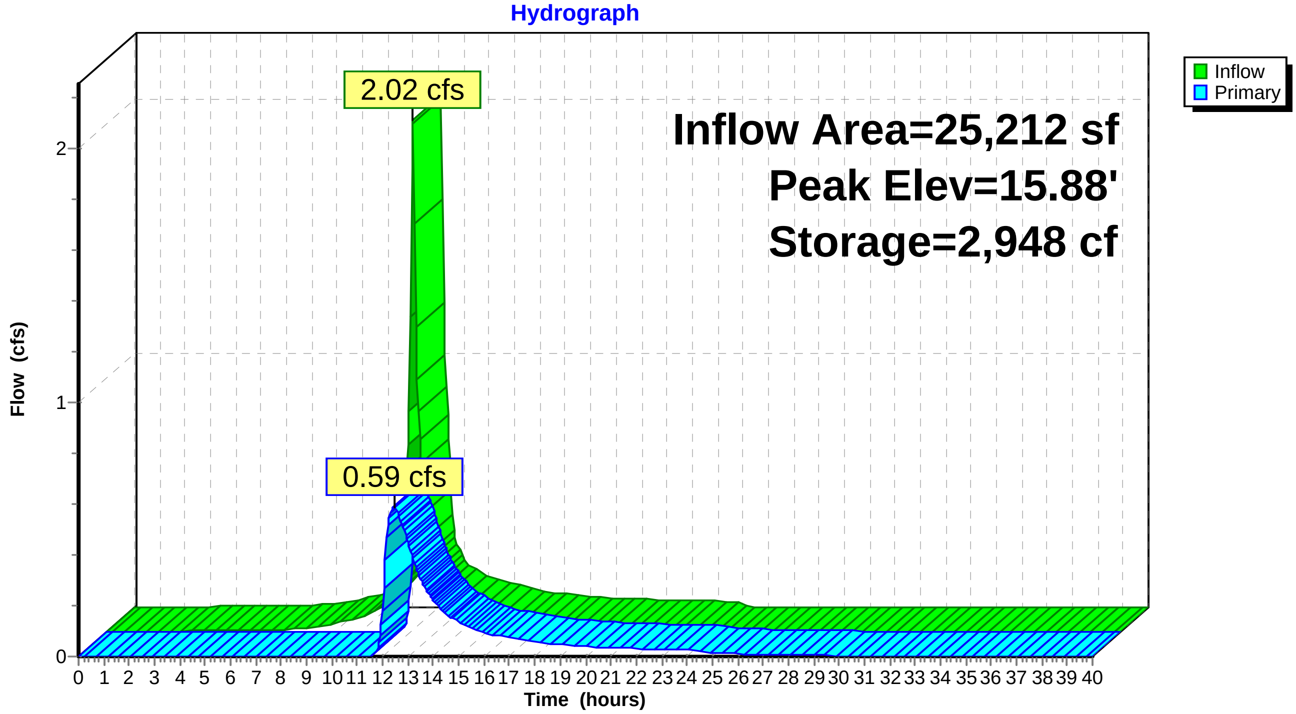
Volume	Invert	Avail.Storage	Storage Description
#1	15.30'	6,272 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
15.30	4,439	288.0	0	0	4,439
16.00	6,173	327.0	3,698	3,698	6,360
16.30	6,569	334.0	1,911	5,609	6,741
16.40	6,703	337.0	664	6,272	6,905

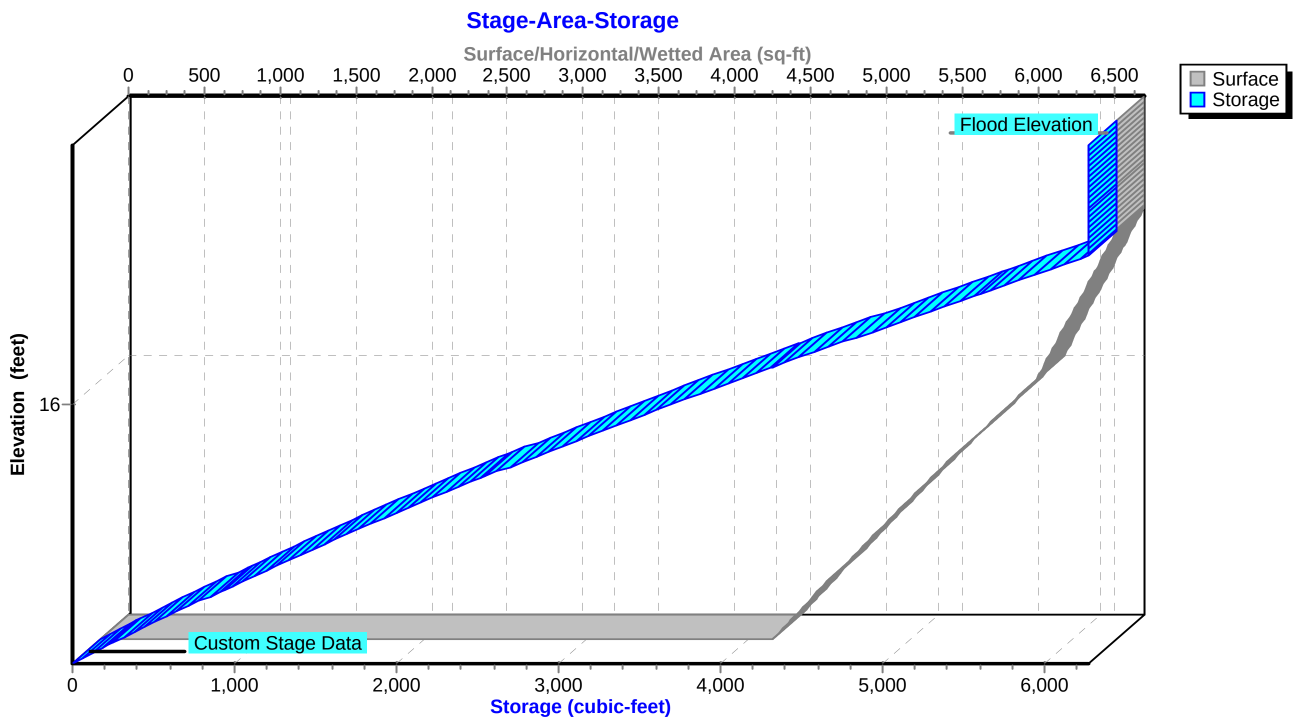
Device	Routing	Invert	Outlet Devices
#1	Primary	15.35'	**8.0" Round Culvert X 2.00** L= 65.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 15.35' / 15.00' S= 0.0054 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	15.50'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	15.80'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	16.10'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.59 cfs @ 12.44 hrs HW=15.88' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.59 cfs of 1.09 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.58 cfs @ 2.20 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.01 cfs @ 0.93 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond RG1: Rain Garden #1



Pond RG1: Rain Garden #1



Summary for Pond RG2: Rain Garden #2

[80] Warning: Exceeded Pond CB3 by 0.22' @ 24.45 hrs (0.11 cfs 1,130 cf)

Inflow Area = 10,003 sf, 68.81% Impervious, Inflow Depth = 3.67" for 10-yr event
Inflow = 0.90 cfs @ 12.09 hrs, Volume= 3,063 cf
Outflow = 0.68 cfs @ 12.16 hrs, Volume= 2,373 cf, Atten= 25%, Lag= 4.6 min
Primary = 0.68 cfs @ 12.16 hrs, Volume= 2,373 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.49' @ 12.16 hrs Surf.Area= 931 sf Storage= 1,028 cf
Flood Elev= 19.00' Surf.Area= 1,118 sf Storage= 1,546 cf

Plug-Flow detention time= 157.8 min calculated for 2,373 cf (77% of inflow)
Center-of-Mass det. time= 75.9 min (855.7 - 779.8)

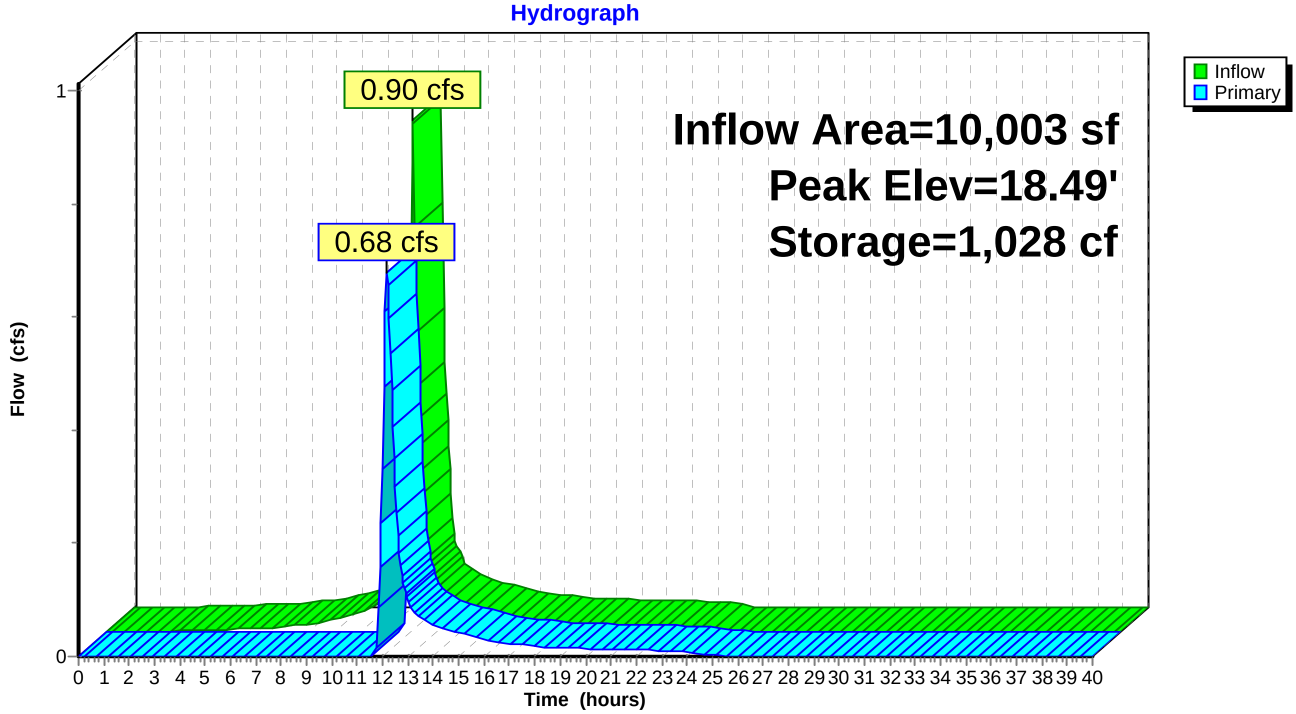
Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	2,934 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
17.00	468	89.0	0	0	468
18.00	765	108.0	610	610	782
19.00	1,118	127.0	936	1,546	1,156
20.00	1,676	152.0	1,388	2,934	1,728

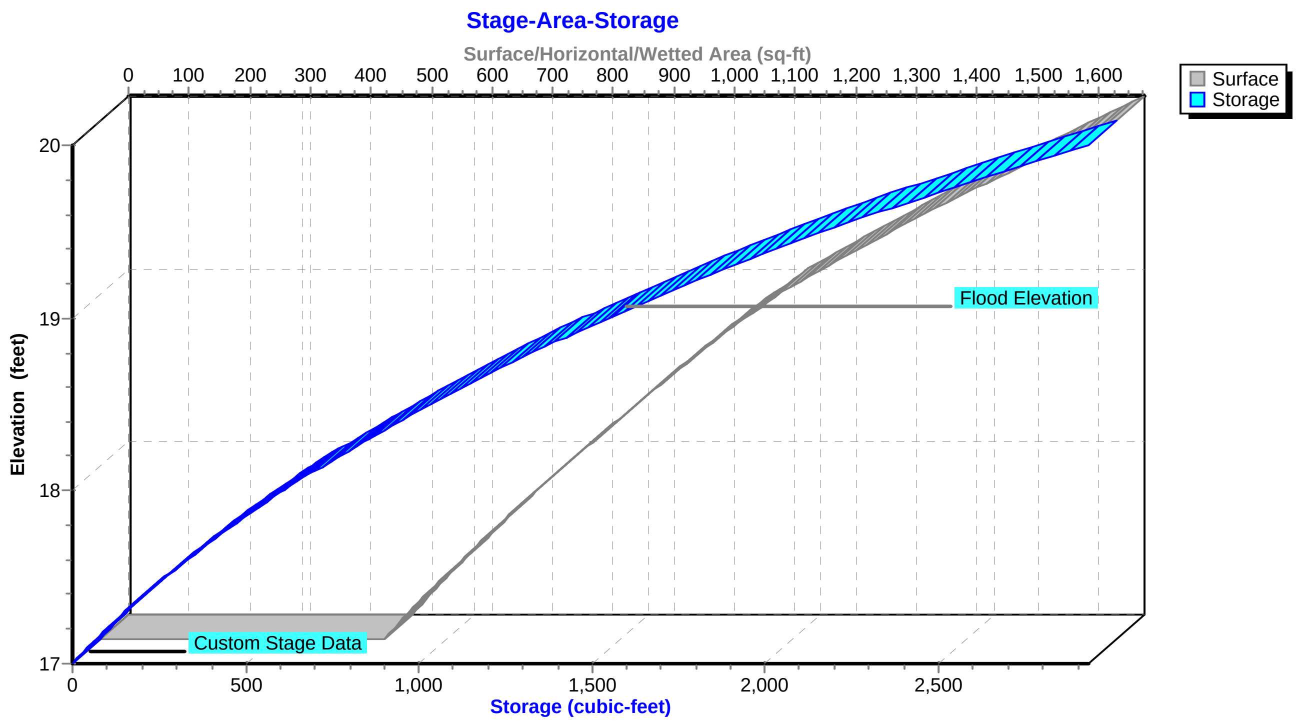
Device	Routing	Invert	Outlet Devices
#1	Primary	16.50'	**12.0" Round Culvert X 2.00** L= 53.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 16.50' / 15.80' S= 0.0132 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	18.10'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	18.30'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	18.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.67 cfs @ 12.16 hrs HW=18.49' TW=16.31' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.67 cfs of 8.14 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.59 cfs @ 2.27 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.08 cfs @ 1.48 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond RG2: Rain Garden #2



Pond RG2: Rain Garden #2



Summary for Pond WQU1: Water Quality Unit 1

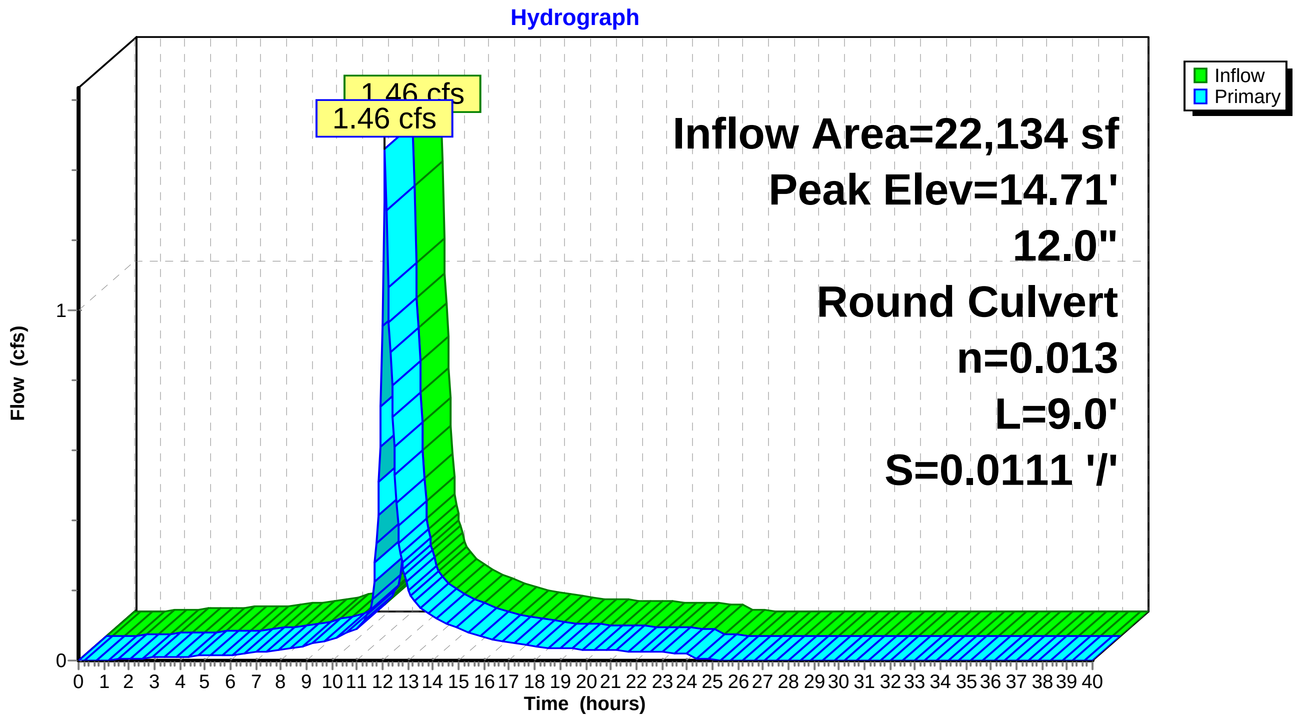
Inflow Area =	22,134 sf,	85.50% Impervious,	Inflow Depth = 3.48"	for 10-yr event
Inflow =	1.46 cfs @	12.10 hrs, Volume=	6,424 cf	
Outflow =	1.46 cfs @	12.10 hrs, Volume=	6,424 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.46 cfs @	12.10 hrs, Volume=	6,424 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 14.71' @ 12.13 hrs
Flood Elev= 21.00'

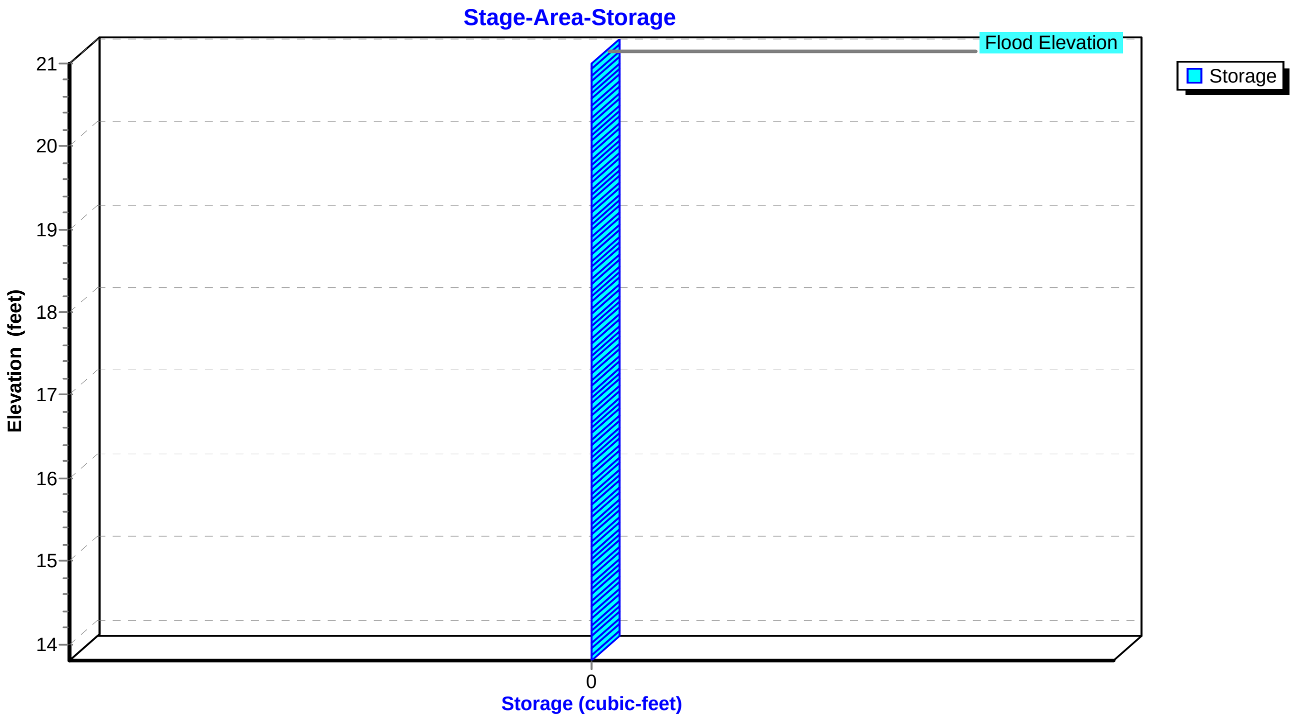
Device	Routing	Invert	Outlet Devices
#1	Primary	13.80'	**12.0" Round Culvert** L= 9.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 13.80' / 13.70' S= 0.0111 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.24 cfs @ 12.10 hrs HW=14.69' TW=14.49' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.24 cfs @ 1.69 fps)

Pond WQU1: Water Quality Unit 1



Pond WQU1: Water Quality Unit 1



Summary for Pond WQU2: Water Quality Unit 2

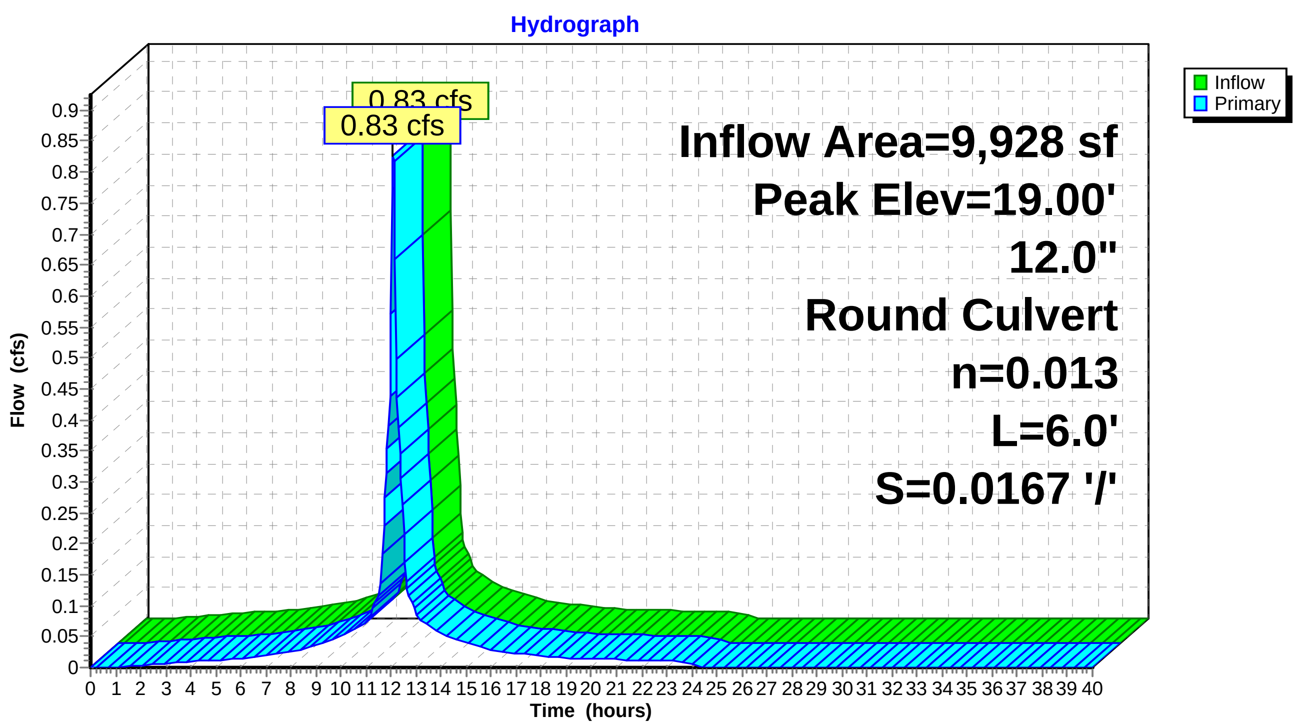
Inflow Area =	9,928 sf,100.00% Impervious,	Inflow Depth = 4.27"	for 10-yr event		
Inflow =	0.83 cfs @	12.09 hrs,	Volume=	3,537 cf	
Outflow =	0.83 cfs @	12.09 hrs,	Volume=	3,537 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.83 cfs @	12.09 hrs,	Volume=	3,537 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.00' @ 12.12 hrs
Flood Elev= 22.30'

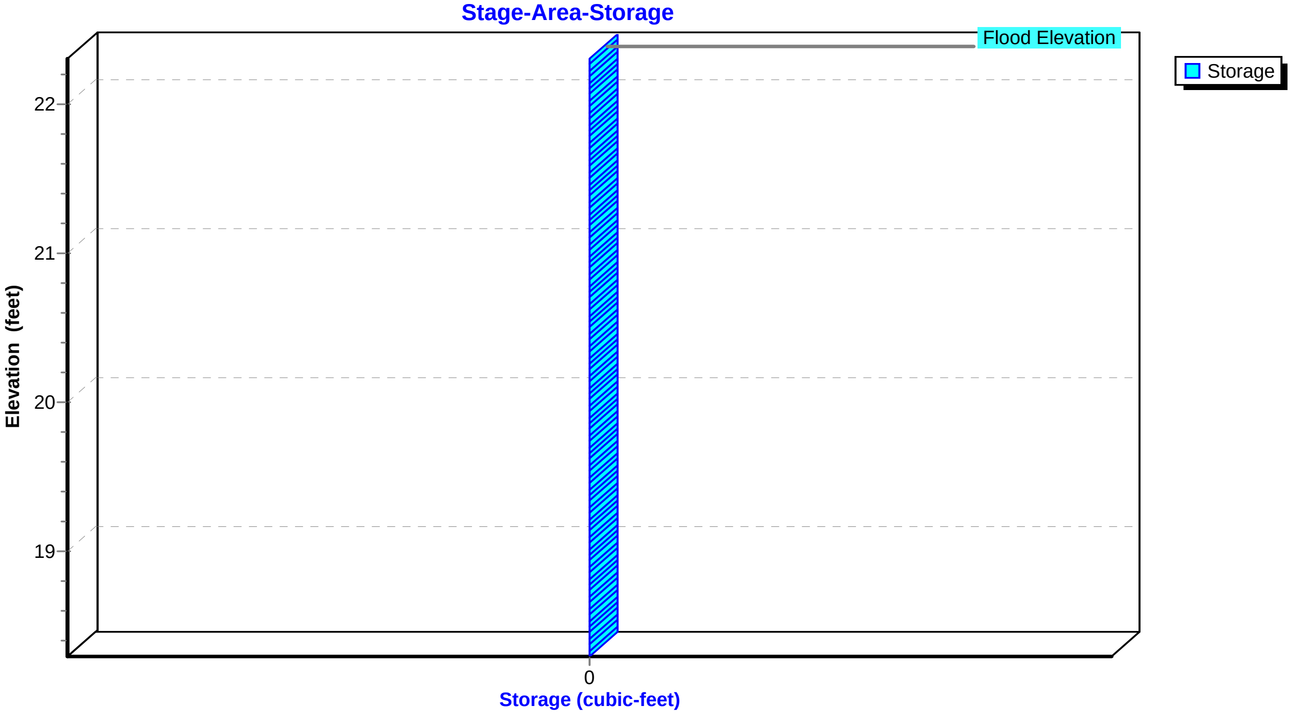
Device	Routing	Invert	Outlet Devices
#1	Primary	18.30'	**12.0" Round Culvert** L= 6.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.30' / 18.20' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.61 cfs @ 12.09 hrs HW=18.97' TW=18.88' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.61 cfs @ 1.10 fps)

Pond WQU2: Water Quality Unit 2



Pond WQU2: Water Quality Unit 2



Proposed Conditions Analysis
25-Year 24-Hour Storm Event

Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100: 100 - Pavement, Lawn, Runoff Area=20,037 sf 45.35% Impervious Runoff Depth=3.80"
Tc=6.0 min CN=82 Runoff=1.99 cfs 6,351 cf

Subcatchment 101: 101 - West Side Lawn to Runoff Area=271 sf 0.00% Impervious Runoff Depth=3.02"
Tc=6.0 min CN=74 Runoff=0.02 cfs 68 cf

Subcatchment 102: 102 - Existing Building Runoff Area=5,175 sf 100.00% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=98 Runoff=0.66 cfs 2,399 cf

Subcatchment 200: 200 - Portion of Runoff Area=2,107 sf 100.00% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=98 Runoff=0.27 cfs 977 cf

Subcatchment 201: 201 - Pavement Runoff Area=2,187 sf 95.93% Impervious Runoff Depth=5.44"
Tc=6.0 min CN=97 Runoff=0.28 cfs 992 cf

Subcatchment 202: 202 - Pavement Runoff Area=1,651 sf 100.00% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=98 Runoff=0.21 cfs 765 cf

Subcatchment 203: 203 - Pavement Runoff Area=5,013 sf 96.69% Impervious Runoff Depth=5.44"
Tc=6.0 min CN=97 Runoff=0.64 cfs 2,275 cf

Subcatchment 204: 204 - Pavement Runoff Area=4,813 sf 100.00% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=98 Runoff=0.61 cfs 2,231 cf

Subcatchment 205: 205 - Pavement Runoff Area=3,480 sf 100.00% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=98 Runoff=0.44 cfs 1,613 cf

Subcatchment 206: 206 - Pavement Runoff Area=5,141 sf 100.00% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=98 Runoff=0.65 cfs 2,383 cf

Subcatchment 207: 207 - Pavement Runoff Area=2,680 sf 100.00% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=98 Runoff=0.34 cfs 1,242 cf

Subcatchment 208: 208 - Proposed Runoff Area=4,287 sf 100.00% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=98 Runoff=0.55 cfs 1,987 cf

Subcatchment 209: 209 - Portion of Runoff Area=4,990 sf 40.80% Impervious Runoff Depth=4.01"
Tc=6.0 min CN=84 Runoff=0.52 cfs 1,667 cf

Subcatchment 210: 210 - Existing South Runoff Area=44,935 sf 0.00% Impervious Runoff Depth=2.21"
Flow Length=210' Tc=10.6 min CN=65 Runoff=2.20 cfs 8,264 cf

Subcatchment 300: 300 - Lawn East to DP3 Runoff Area=1,921 sf 0.00% Impervious Runoff Depth=3.02"
Tc=6.0 min CN=74 Runoff=0.15 cfs 483 cf

Pond CB1: PCB1 Peak Elev=16.91' Inflow=0.28 cfs 992 cf
12.0" Round Culvert n=0.013 L=21.0' S=0.0095 '/' Outflow=0.28 cfs 992 cf

Pond CB2: PCB2 Peak Elev=16.88' Inflow=0.21 cfs 765 cf
12.0" Round Culvert n=0.013 L=21.0' S=0.0095 '/' Outflow=0.21 cfs 765 cf

Pond CB3: PCB3 Peak Elev=18.61' Inflow=0.64 cfs 2,275 cf
12.0" Round Culvert n=0.013 L=64.0' S=0.0063 '/' Outflow=0.64 cfs 2,275 cf

Pond CB4: PCB4 Peak Elev=15.58' Inflow=0.61 cfs 2,231 cf
12.0" Round Culvert n=0.013 L=94.0' S=0.0085 '/' Outflow=0.61 cfs 2,231 cf

Pond CB5: PCB5 Peak Elev=15.32' Inflow=0.44 cfs 1,613 cf
12.0" Round Culvert n=0.013 L=93.0' S=0.0054 '/' Outflow=0.44 cfs 1,613 cf

Pond CB6: PCB6 Peak Elev=20.40' Inflow=0.65 cfs 2,383 cf
12.0" Round Culvert n=0.013 L=78.0' S=0.0051 '/' Outflow=0.65 cfs 2,383 cf

Pond CB7: PCB7 Peak Elev=19.38' Inflow=0.34 cfs 1,242 cf
12.0" Round Culvert n=0.013 L=11.0' S=0.0091 '/' Outflow=0.34 cfs 1,242 cf

Pond DP1: Design Pont #1_18" RCP Culvert - Northwest Inflow=0.82 cfs 7,837 cf
Primary=0.82 cfs 7,837 cf

Pond DP2: Design Pont #2_Wetland-South Inflow=4.48 cfs 17,126 cf
Primary=4.48 cfs 17,126 cf

Pond DP3: Design Pont #3_Abutting Lot-East Inflow=0.15 cfs 483 cf
Primary=0.15 cfs 483 cf

Pond IS: Infiltration System Peak Elev=17.96' Storage=1,750 cf Inflow=1.81 cfs 6,589 cf
Discarded=0.28 cfs 6,584 cf Primary=0.01 cfs 9 cf Outflow=0.29 cfs 6,592 cf

Pond MH1: PDMH1 Peak Elev=16.74' Inflow=0.49 cfs 1,758 cf
12.0" Round Culvert n=0.013 L=85.0' S=0.0059 '/' Outflow=0.49 cfs 1,758 cf

Pond MH2: PDMH2 Peak Elev=16.48' Inflow=1.44 cfs 5,010 cf
12.0" Round Culvert n=0.013 L=115.0' S=0.0052 '/' Outflow=1.44 cfs 5,010 cf

Pond MH3: PDMH3 Peak Elev=15.81' Inflow=1.44 cfs 5,010 cf
12.0" Round Culvert n=0.013 L=138.0' S=0.0051 '/' Outflow=1.44 cfs 5,010 cf

Pond MH4: PDMH4 Peak Elev=15.25' Inflow=2.45 cfs 8,853 cf
Primary=1.89 cfs 8,094 cf Secondary=0.64 cfs 759 cf Outflow=2.45 cfs 8,853 cf

Pond MH5: PDMH5 Peak Elev=14.77' Inflow=2.45 cfs 8,853 cf
12.0" Round Culvert n=0.013 L=23.0' S=0.0087 '/' Outflow=2.45 cfs 8,853 cf

Pond MH6: PDMH6 Peak Elev=19.99' Inflow=0.92 cfs 3,360 cf
12.0" Round Culvert n=0.013 L=120.0' S=0.0050 '/' Outflow=0.92 cfs 3,360 cf

Pond MH7: PDMH7 Peak Elev=19.33' Inflow=1.26 cfs 4,602 cf
Primary=1.00 cfs 4,346 cf Secondary=0.27 cfs 256 cf Outflow=1.26 cfs 4,602 cf

Pond MH8: PDMH8 Peak Elev=19.01' Inflow=1.81 cfs 6,589 cf
12.0" Round Culvert n=0.013 L=9.0' S=0.0111 '/' Outflow=1.81 cfs 6,589 cf

Pond RG1: Rain Garden #1 Peak Elev=16.00' Storage=3,714 cf Inflow=2.65 cfs 8,750 cf
Outflow=0.82 cfs 7,768 cf

Pond RG2: Rain Garden #2 Peak Elev=18.54' Storage=1,076 cf Inflow=1.15 cfs 3,942 cf
Outflow=1.03 cfs 3,252 cf

Pond WQU1: Water Quality Unit 1 Peak Elev=15.06' Inflow=1.89 cfs 8,094 cf
12.0" Round Culvert n=0.013 L=9.0' S=0.0111 '/' Outflow=1.89 cfs 8,094 cf

Pond WQU2: Water Quality Unit 2 Peak Elev=19.12' Inflow=1.00 cfs 4,346 cf
12.0" Round Culvert n=0.013 L=6.0' S=0.0167 '/' Outflow=1.00 cfs 4,346 cf

Summary for Subcatchment 100: 100 - Pavement, Lawn, and Direct Entry to Rain Garden

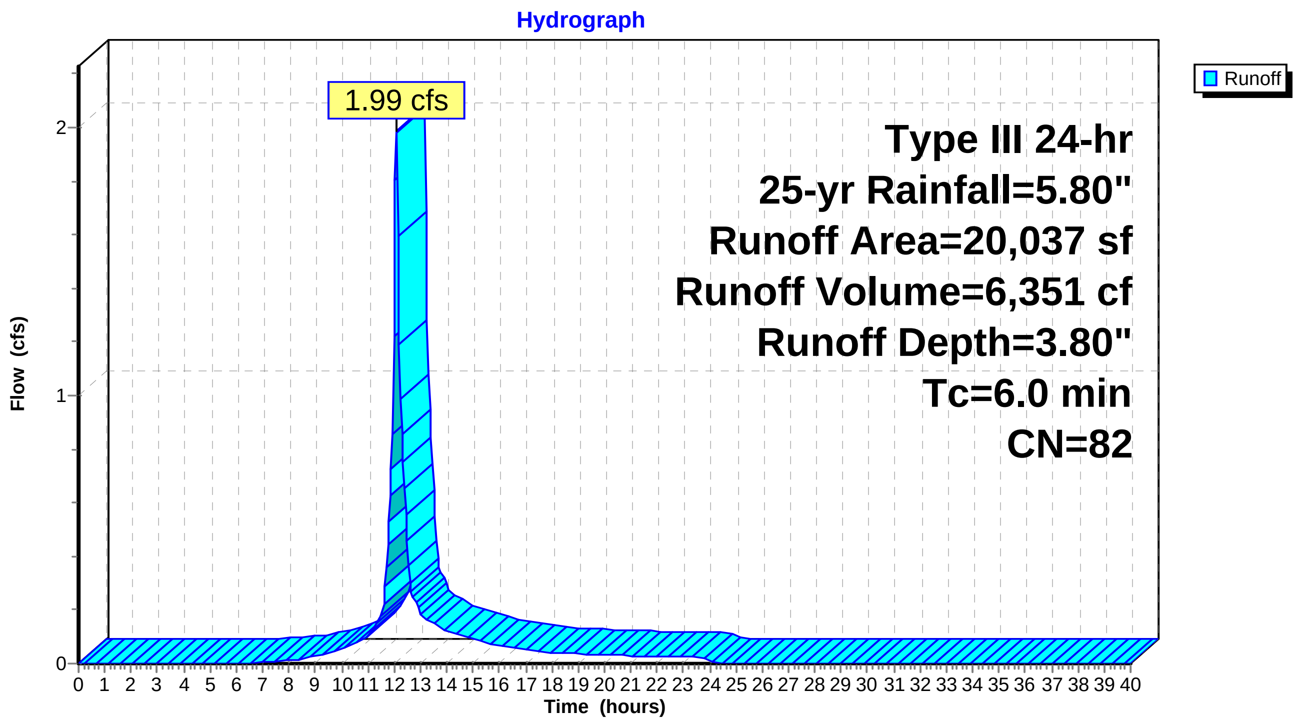
Runoff = 1.99 cfs @ 12.09 hrs, Volume= 6,351 cf, Depth= 3.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

	Area (sf)	CN	Description
	4,778	74	>75% Grass cover, Good, HSG C
*	6,173	65	Rain Garden surface area
	9,086	98	Paved parking, HSG C
	20,037	82	Weighted Average
	10,951		54.65% Pervious Area
	9,086		45.35% Impervious Area

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

Subcatchment 100: 100 - Pavement, Lawn, and Direct Entry to Rain Garden



Summary for Subcatchment 101: 101 - West Side Lawn to DP1

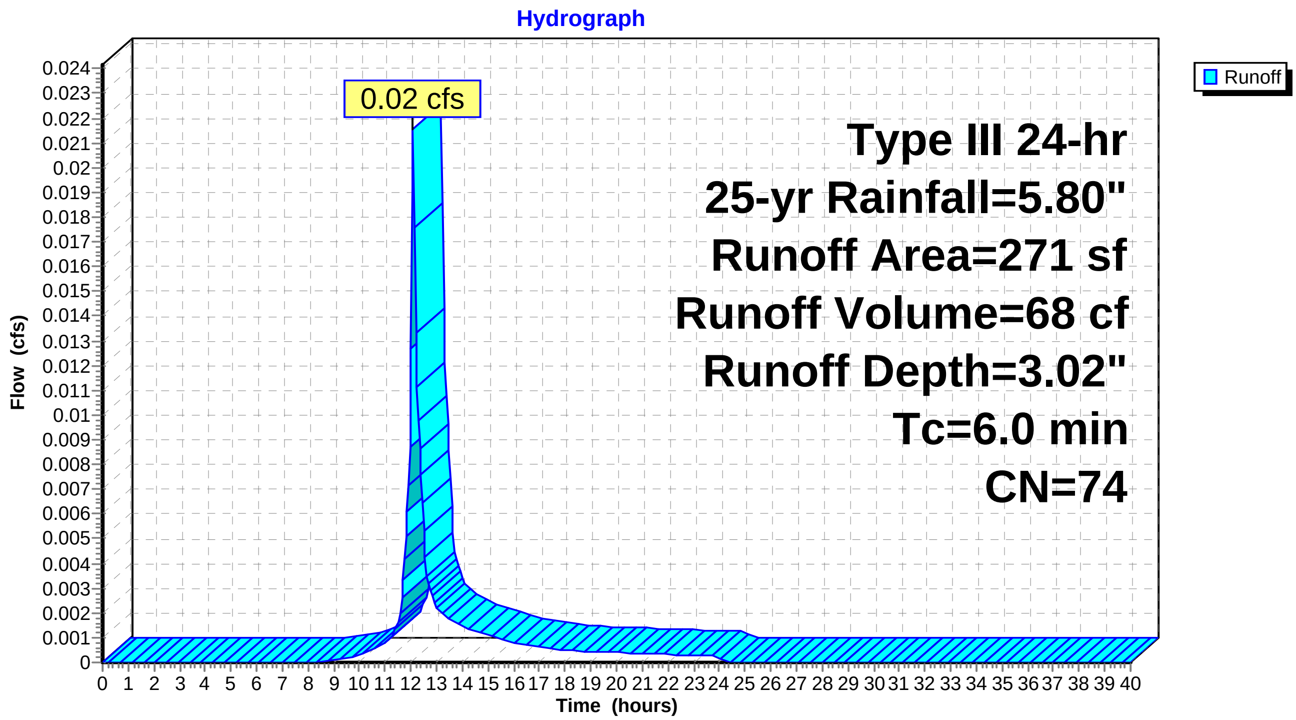
Runoff = 0.02 cfs @ 12.09 hrs, Volume= 68 cf, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
271	74	>75% Grass cover, Good, HSG C
271		100.00% Pervious Area

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

Subcatchment 101: 101 - West Side Lawn to DP1



Summary for Subcatchment 102: 102 - Existing Building

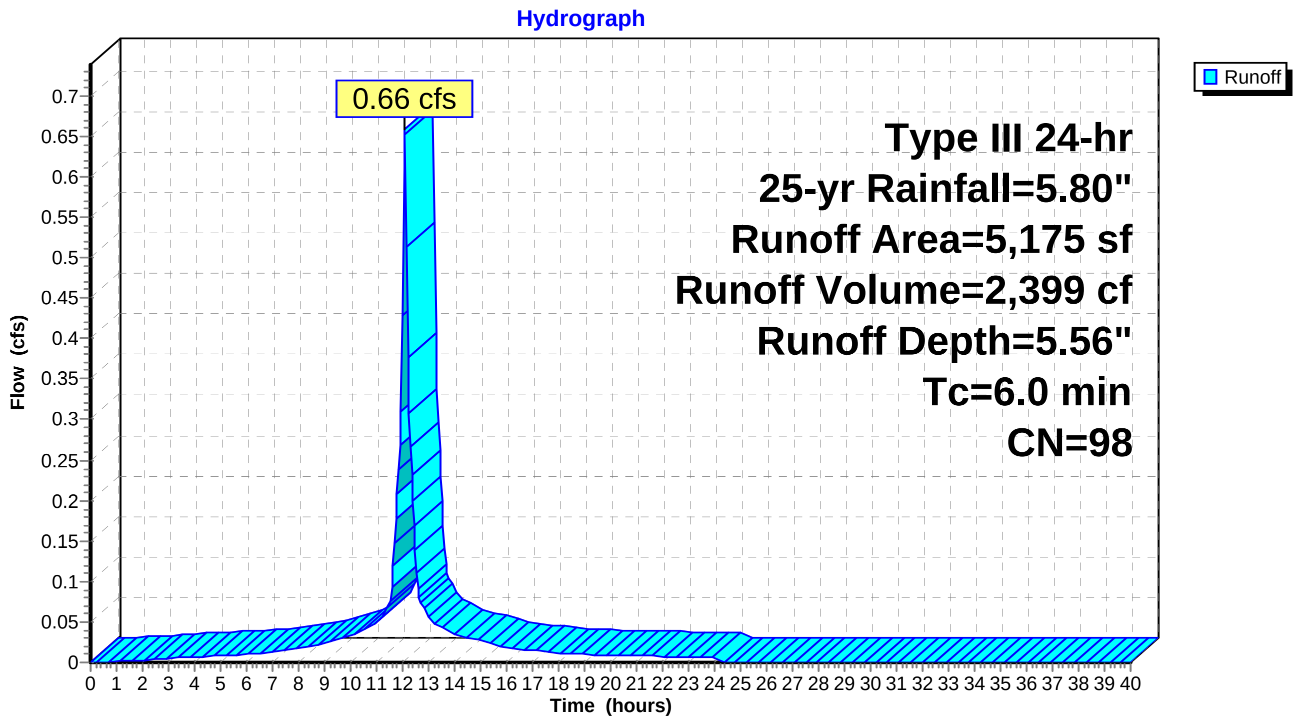
Runoff = 0.66 cfs @ 12.09 hrs, Volume= 2,399 cf, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

	Area (sf)	CN	Description
*	5,175	98	Roofs, HSG C, Existing Building
	5,175		100.00% Impervious Area

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

Subcatchment 102: 102 - Existing Building



Summary for Subcatchment 200: 200 - Portion of Proposed Building Tenant A to Rain Garden #2

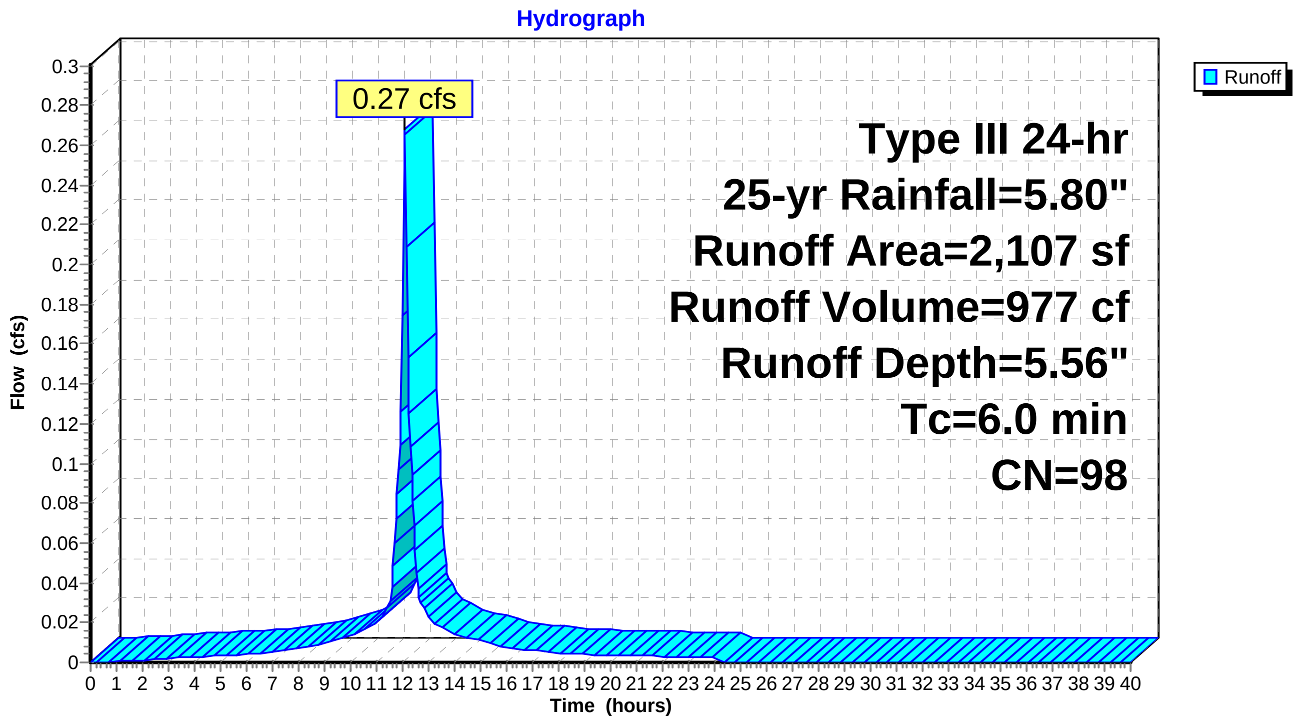
Runoff = 0.27 cfs @ 12.09 hrs, Volume= 977 cf, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

	Area (sf)	CN	Description
*	2,107	98	Roofs, HSG C, Half Prop. Building A
	2,107		100.00% Impervious Area

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

Subcatchment 200: 200 - Portion of Proposed Building Tenant A to Rain Garden #2



Summary for Subcatchment 201: 201 - Pavement

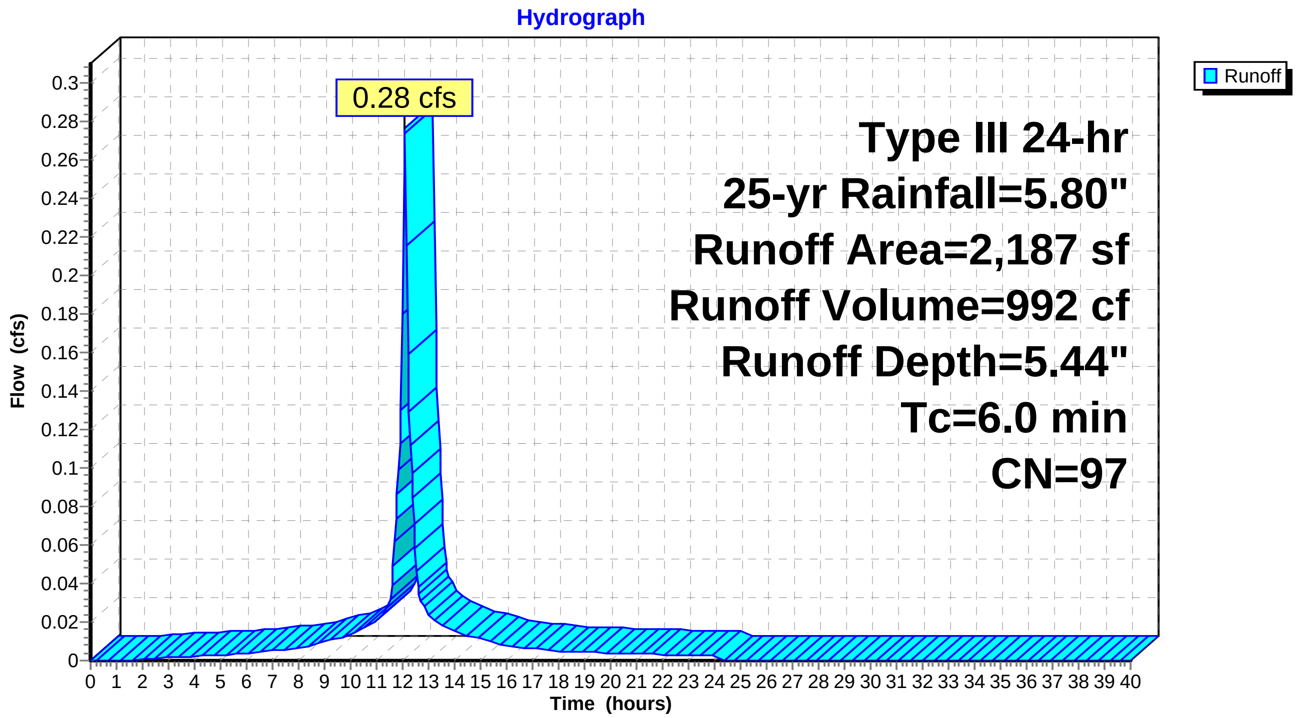
Runoff = 0.28 cfs @ 12.09 hrs, Volume= 992 cf, Depth= 5.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
2,098	98	Paved parking, HSG C
89	74	>75% Grass cover, Good, HSG C
2,187	97	Weighted Average
89		4.07% Pervious Area
2,098		95.93% Impervious Area

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

Subcatchment 201: 201 - Pavement



Summary for Subcatchment 202: 202 - Pavement

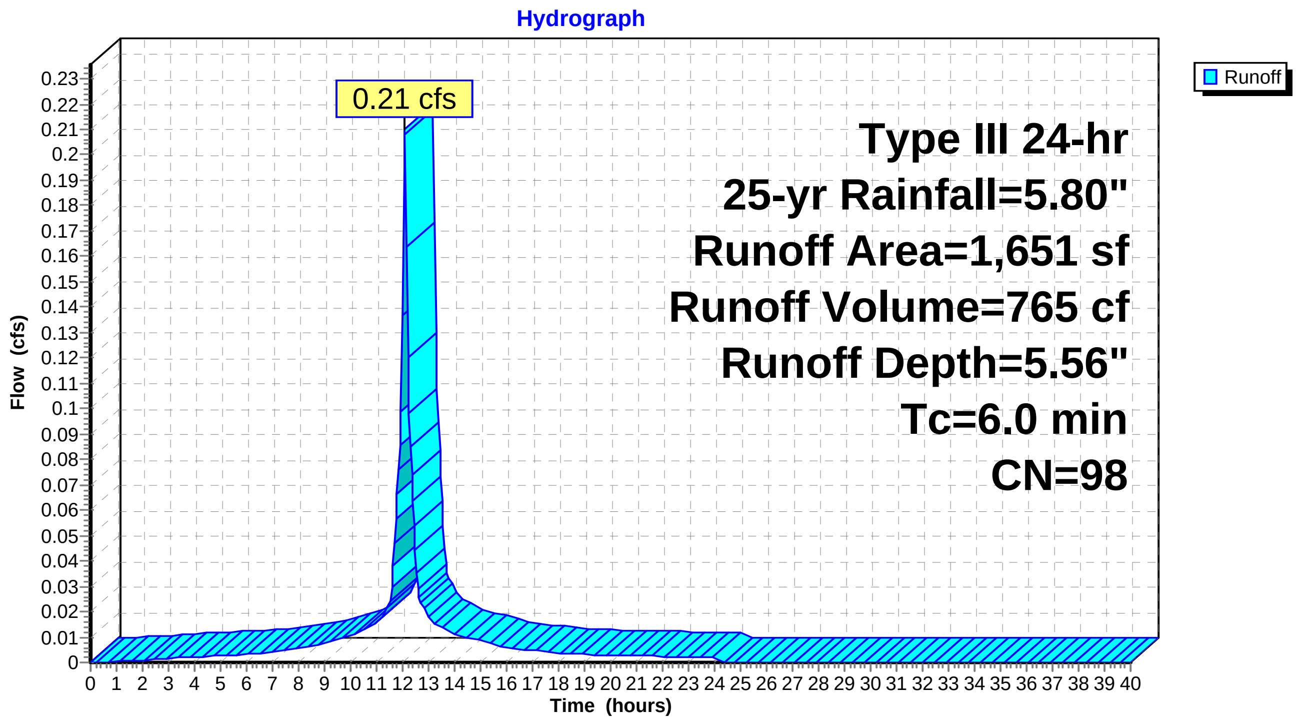
Runoff = 0.21 cfs @ 12.09 hrs, Volume= 765 cf, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
1,651	98	Paved parking, HSG C
1,651		100.00% Impervious Area

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

Subcatchment 202: 202 - Pavement



Summary for Subcatchment 203: 203 - Pavement

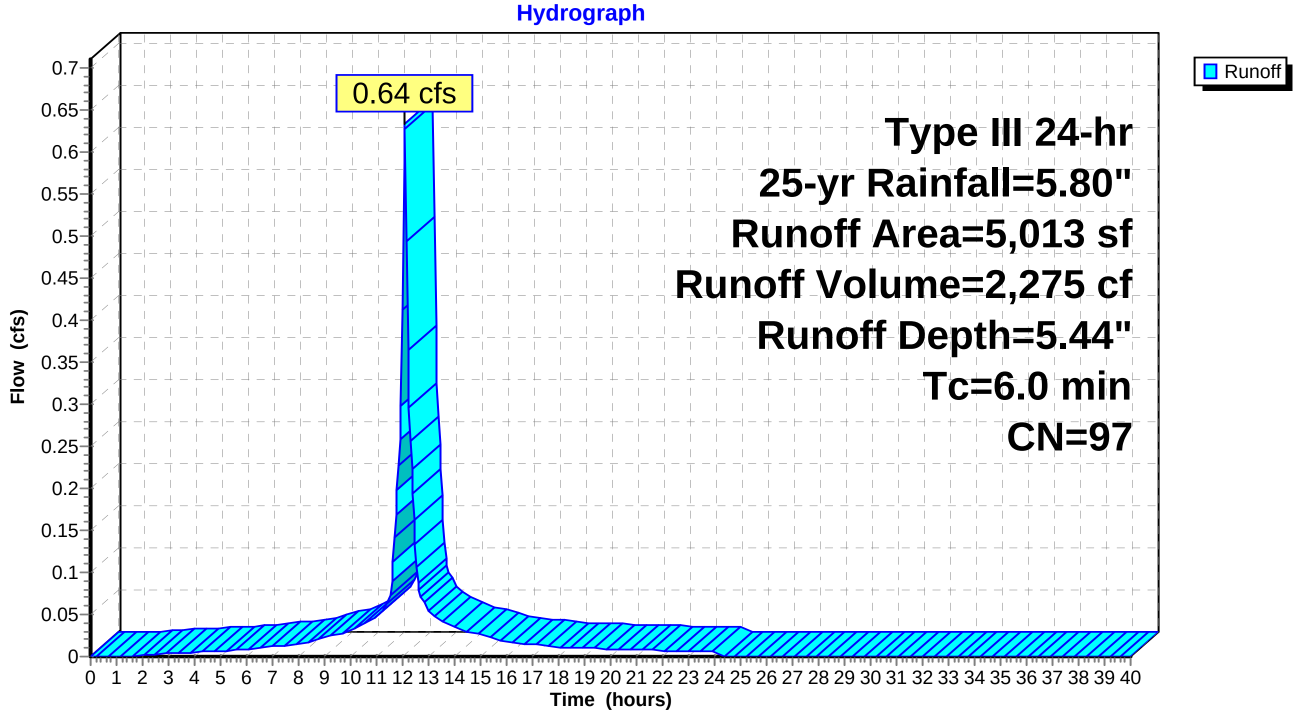
Runoff = 0.64 cfs @ 12.09 hrs, Volume= 2,275 cf, Depth= 5.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
4,847	98	Paved parking, HSG C
166	74	>75% Grass cover, Good, HSG C
5,013	97	Weighted Average
166		3.31% Pervious Area
4,847		96.69% Impervious Area

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

Subcatchment 203: 203 - Pavement



Summary for Subcatchment 204: 204 - Pavement

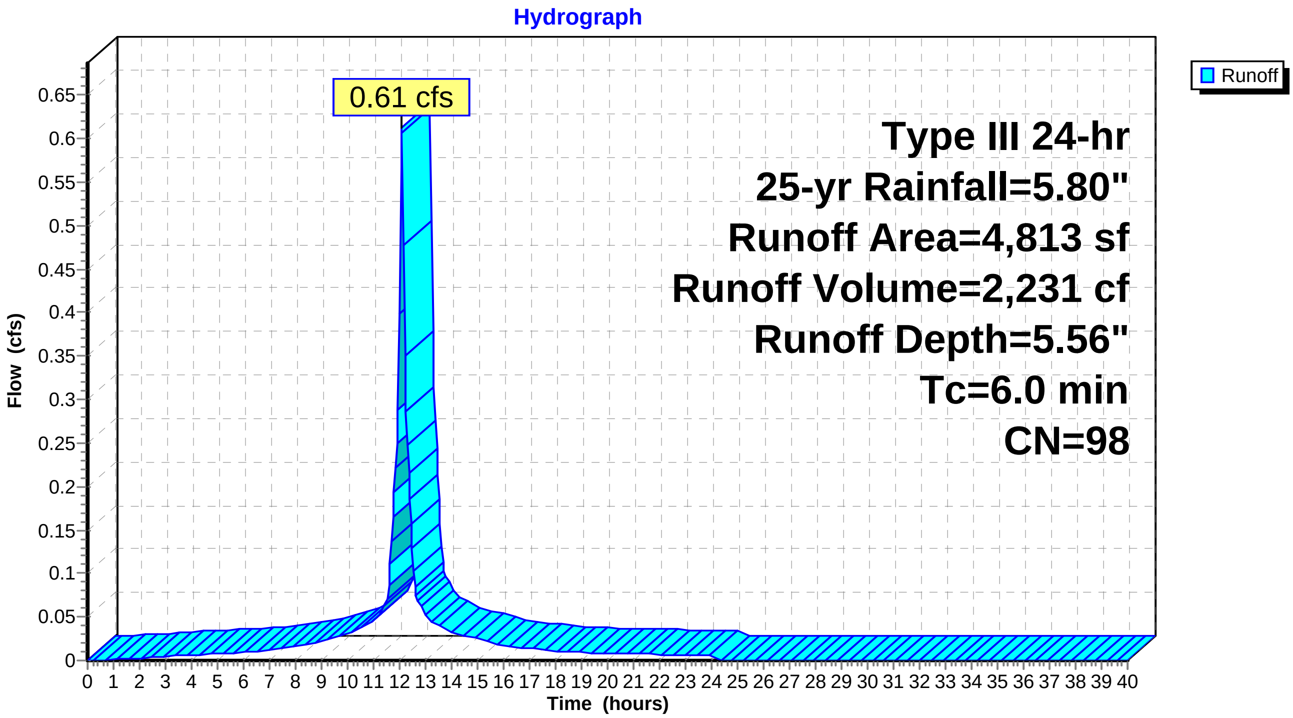
Runoff = 0.61 cfs @ 12.09 hrs, Volume= 2,231 cf, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
4,813	98	Paved parking, HSG C
4,813		100.00% Impervious Area

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

Subcatchment 204: 204 - Pavement



Summary for Subcatchment 205: 205 - Pavement

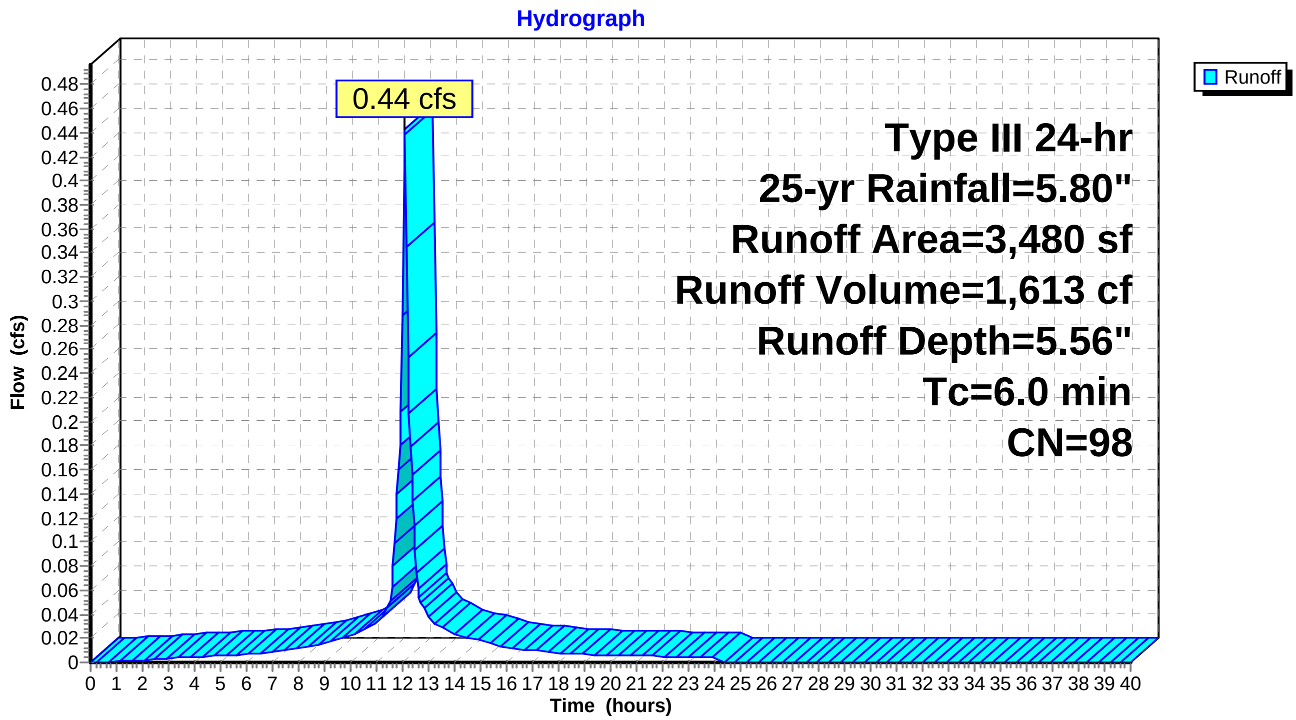
Runoff = 0.44 cfs @ 12.09 hrs, Volume= 1,613 cf, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
3,480	98	Paved parking, HSG C
3,480		100.00% Impervious Area

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

Subcatchment 205: 205 - Pavement



Summary for Subcatchment 206: 206 - Pavement

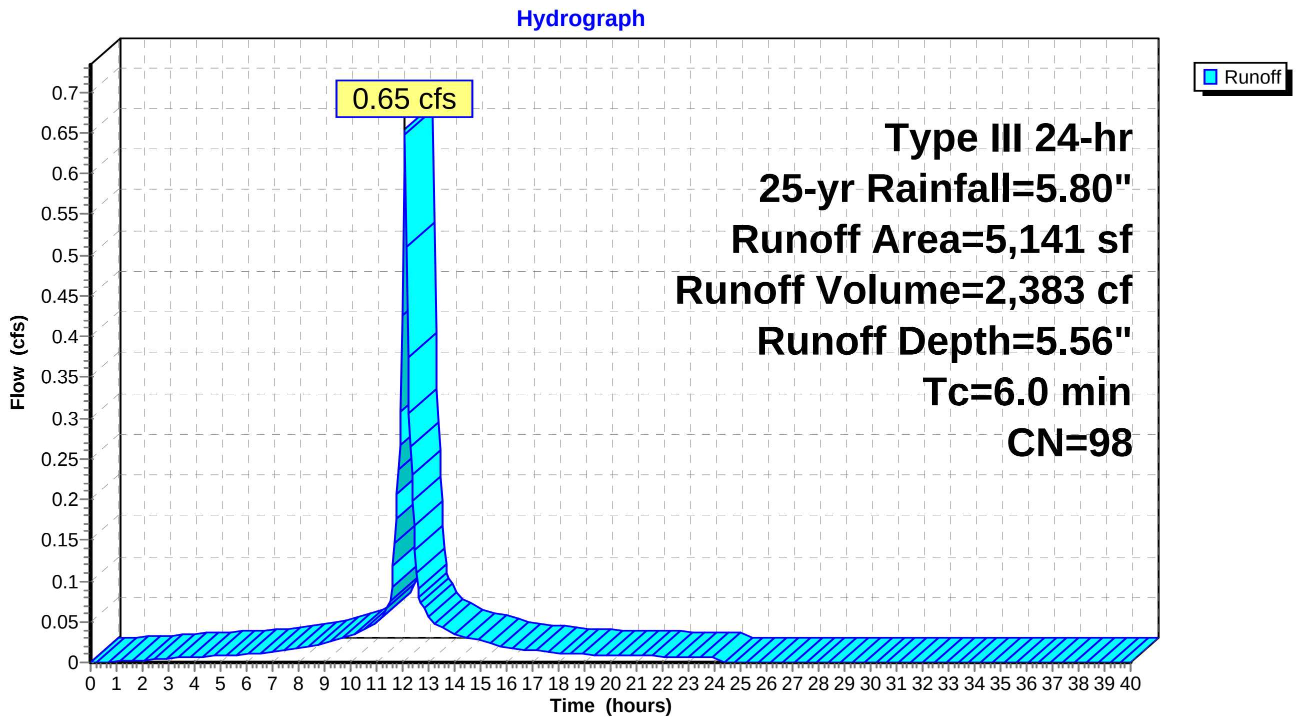
Runoff = 0.65 cfs @ 12.09 hrs, Volume= 2,383 cf, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
5,141	98	Paved parking, HSG C
5,141		100.00% Impervious Area

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

Subcatchment 206: 206 - Pavement



Summary for Subcatchment 207: 207 - Pavement

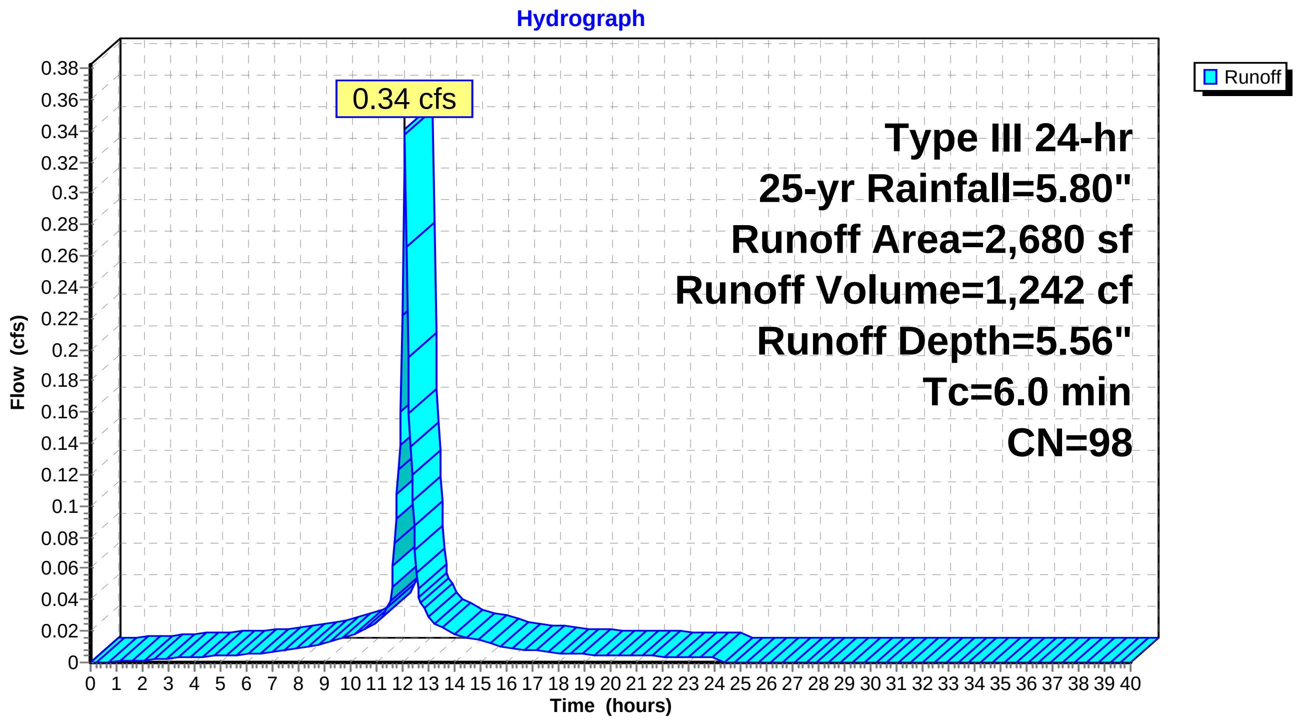
Runoff = 0.34 cfs @ 12.09 hrs, Volume= 1,242 cf, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
2,680	98	Paved parking, HSG C
2,680		100.00% Impervious Area

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

Subcatchment 207: 207 - Pavement



Summary for Subcatchment 208: 208 - Proposed Building Tenant B

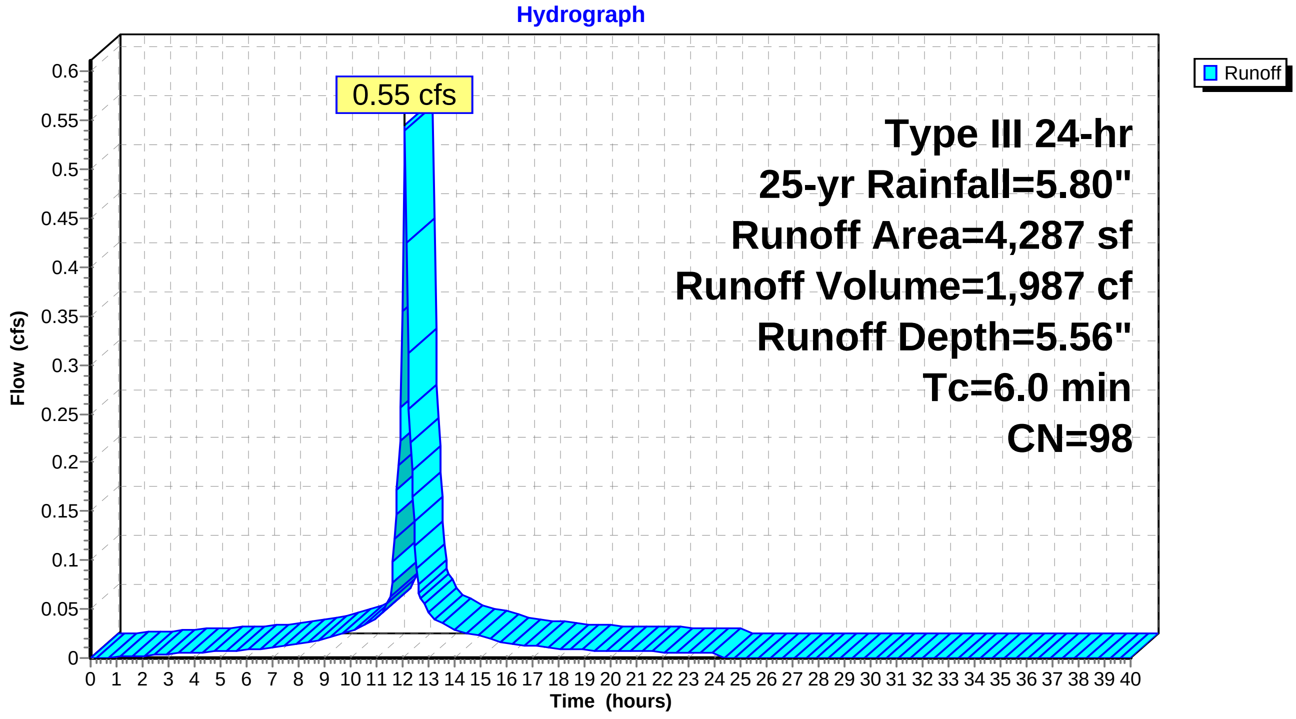
Runoff = 0.55 cfs @ 12.09 hrs, Volume= 1,987 cf, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
4,287	98	Roofs, HSG C
0	98	Roofs, HSG C
4,287	98	Weighted Average
4,287		100.00% Impervious Area

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

Subcatchment 208: 208 - Proposed Building Tenant B



mary for Subcatchment 209: 209 - Portion of Proposed Building Tentant A, Rain Garden #2, Lawn, and W

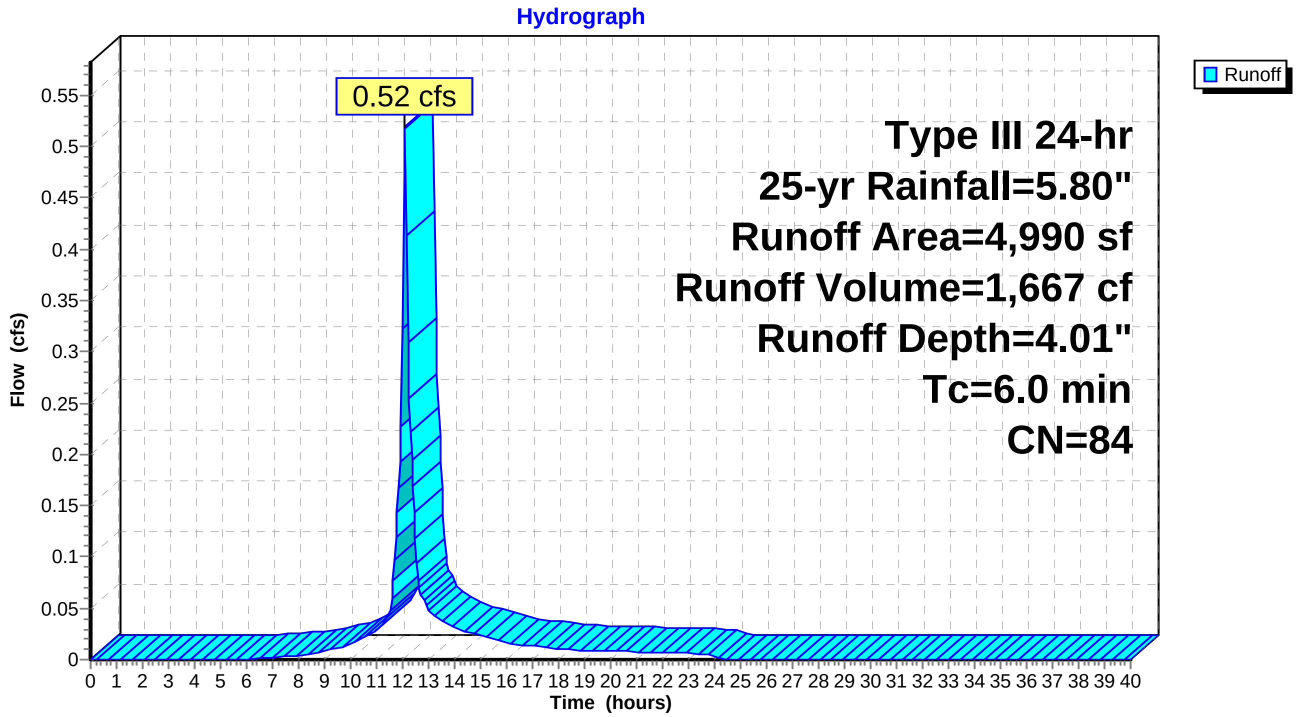
Runoff = 0.52 cfs @ 12.09 hrs, Volume= 1,667 cf, Depth= 4.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

	Area (sf)	CN	Description
*	876	65	Rain Garden Surface Area
	2,078	79	50-75% Grass cover, Fair, HSG C
	84	98	Unconnected pavement, HSG C
	1,952	98	Unconnected roofs, HSG C
	4,990	84	Weighted Average
	2,954		59.20% Pervious Area
	2,036		40.80% Impervious Area
	2,036		100.00% Unconnected

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

Subcatchment 209: 209 - Portion of Proposed Building Tentant A, Rain Garden #2, Lawn, and Walkwa



Summary for Subcatchment 210: 210 - Existing South features remaining to DP2

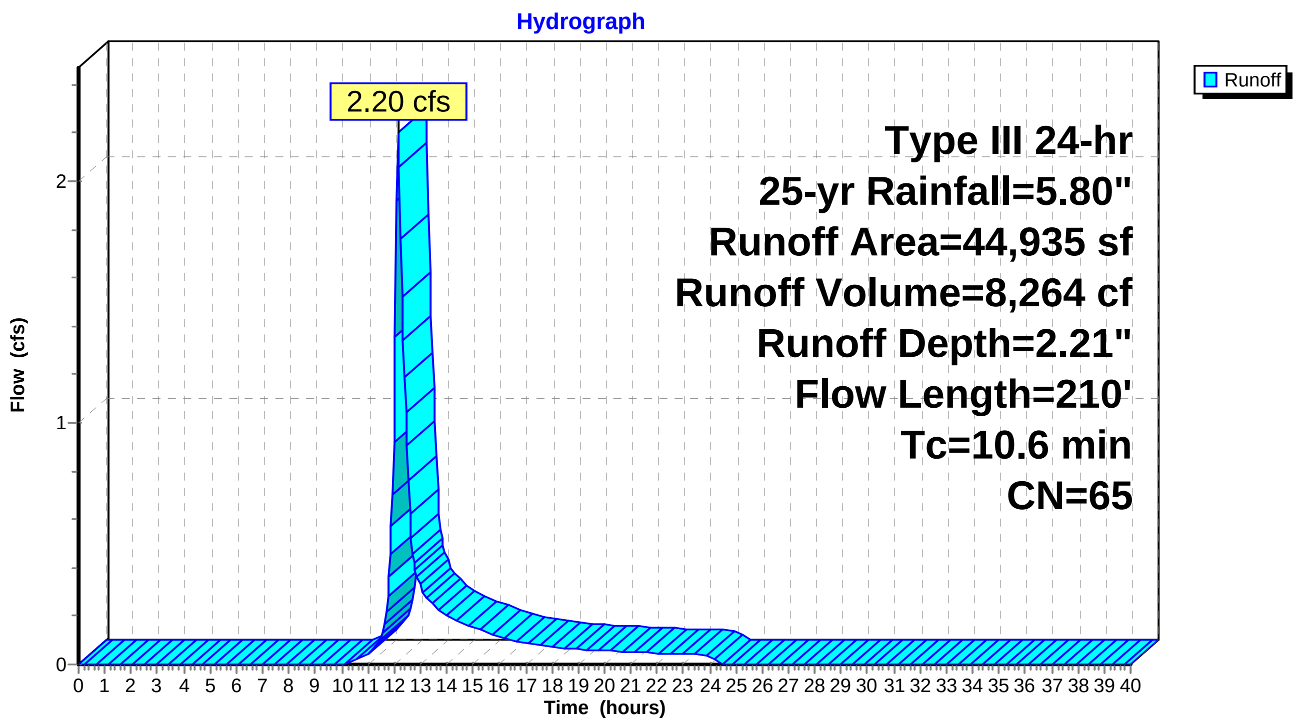
Runoff = 2.20 cfs @ 12.16 hrs, Volume= 8,264 cf, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

	Area (sf)	CN	Description
	35,498	65	Brush, Good, HSG C
*	9,437	65	Brush, Good, HSG C, Wetland Brush
	44,935	65	Weighted Average
	44,935		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	100	0.0600	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
1.4	110	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.6	210	Total			

Subcatchment 210: 210 - Existing South features remaining to DP2



Summary for Subcatchment 300: 300 - Lawn East to DP3

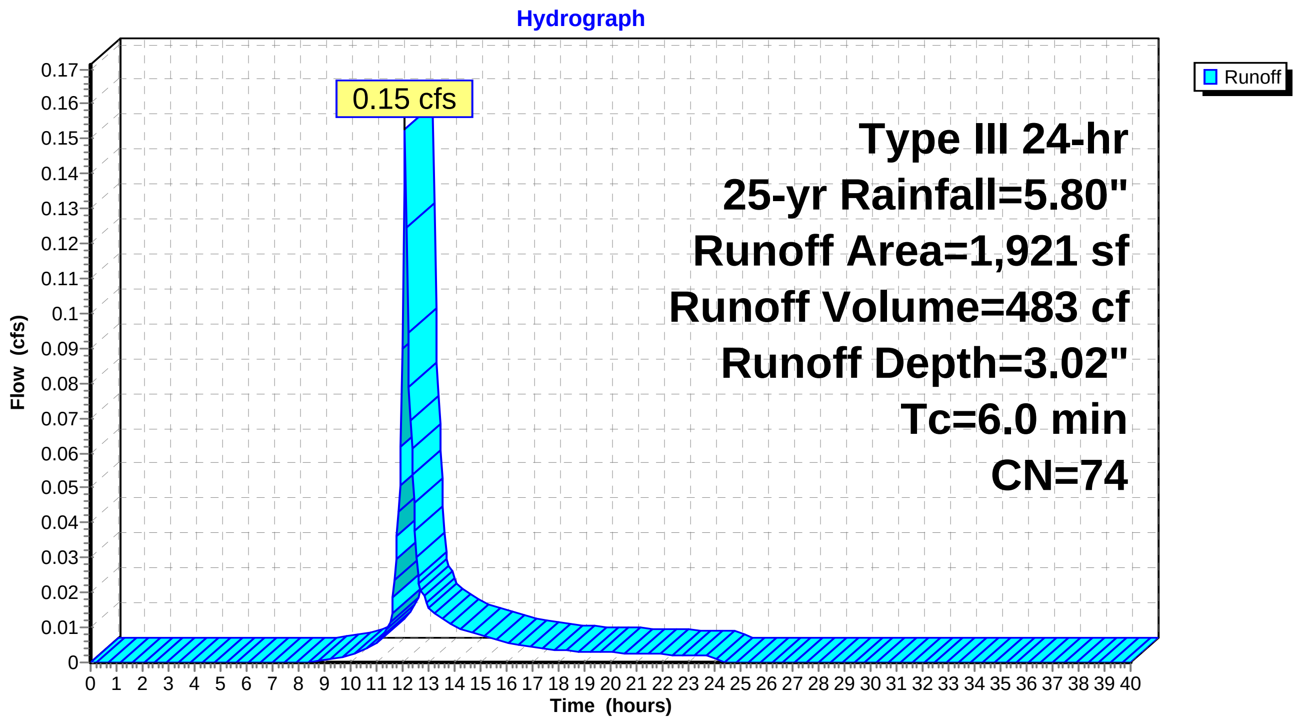
Runoff = 0.15 cfs @ 12.09 hrs, Volume= 483 cf, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
1,921	74	>75% Grass cover, Good, HSG C
1,921		100.00% Pervious Area

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

Subcatchment 300: 300 - Lawn East to DP3



Summary for Pond CB1: PCB1

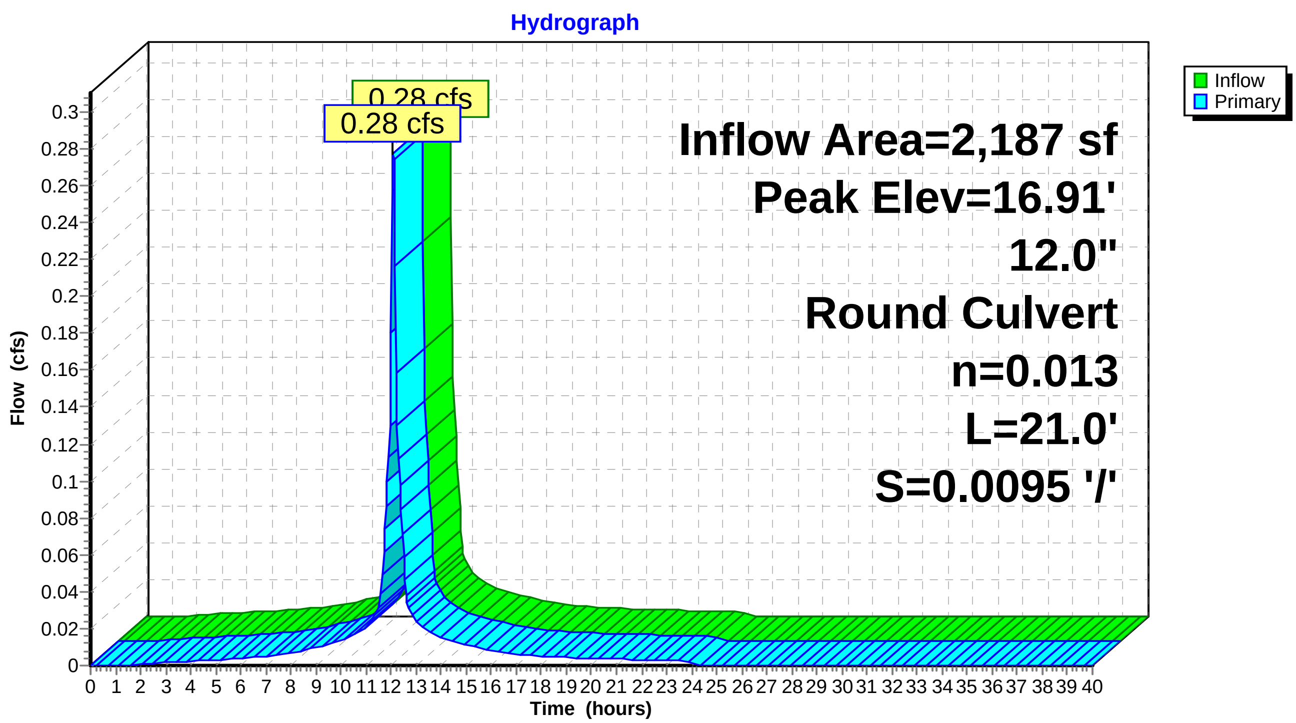
Inflow Area = 2,187 sf, 95.93% Impervious, Inflow Depth = 5.44" for 25-yr event
Inflow = 0.28 cfs @ 12.09 hrs, Volume= 992 cf
Outflow = 0.28 cfs @ 12.09 hrs, Volume= 992 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.28 cfs @ 12.09 hrs, Volume= 992 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.91' @ 12.11 hrs
Flood Elev= 19.50'

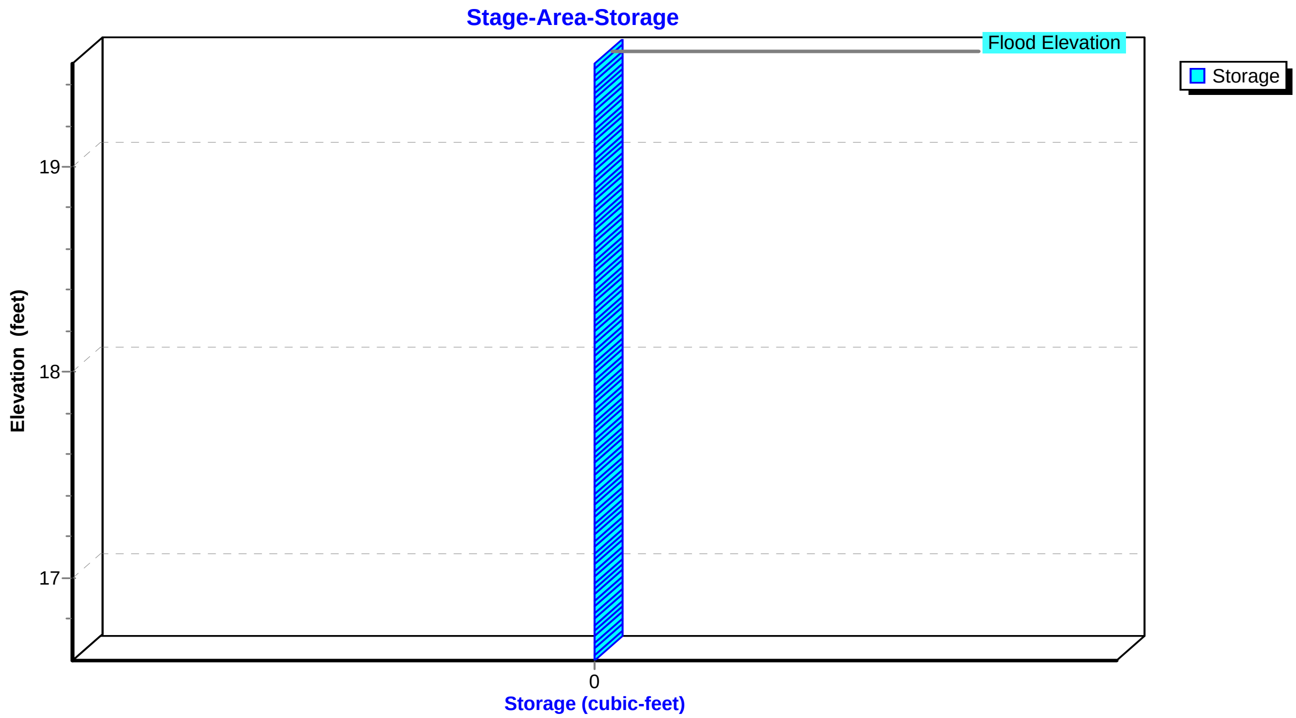
Device	Routing	Invert	Outlet Devices
#1	Primary	16.60'	**12.0" Round Culvert** L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.60' / 16.40' S= 0.0095 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.24 cfs @ 12.09 hrs HW=16.90' TW=16.73' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.24 cfs @ 1.79 fps)

Pond CB1: PCB1



Pond CB1: PCB1



Summary for Pond CB2: PCB2

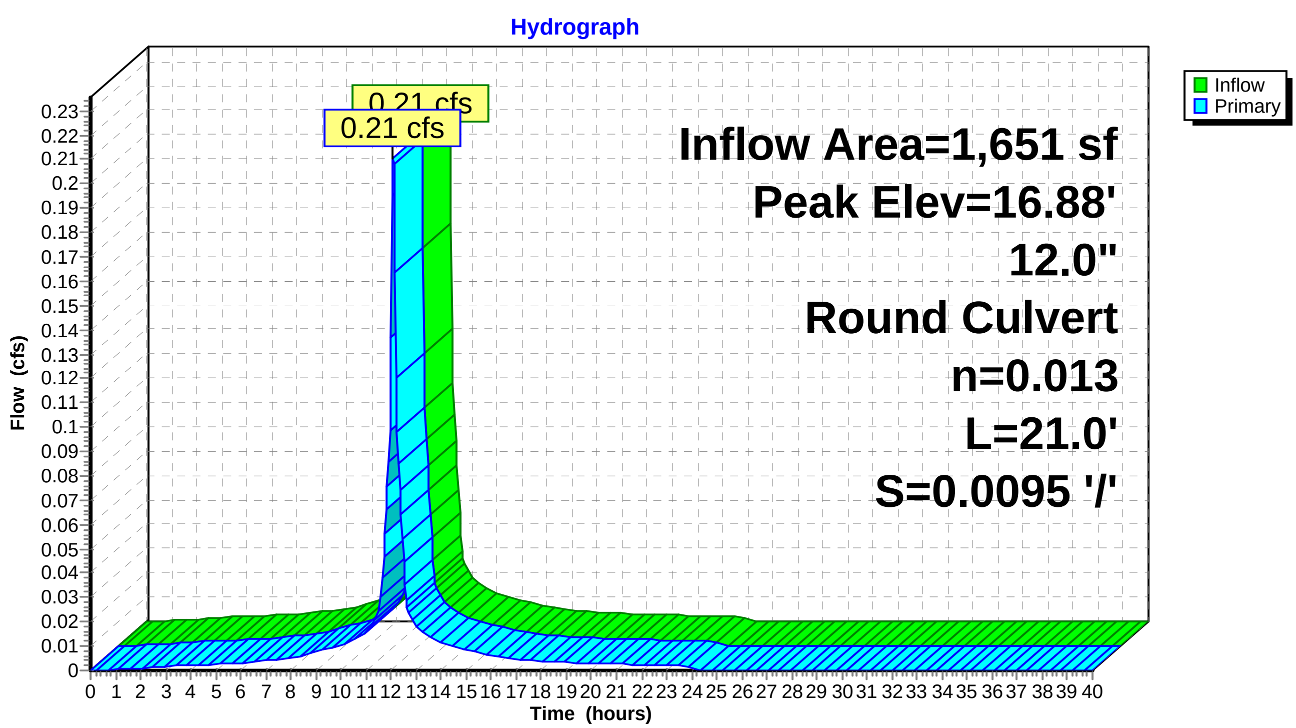
Inflow Area = 1,651 sf,100.00% Impervious, Inflow Depth = 5.56" for 25-yr event
Inflow = 0.21 cfs @ 12.09 hrs, Volume= 765 cf
Outflow = 0.21 cfs @ 12.09 hrs, Volume= 765 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.21 cfs @ 12.09 hrs, Volume= 765 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.88' @ 12.11 hrs
Flood Elev= 19.50'

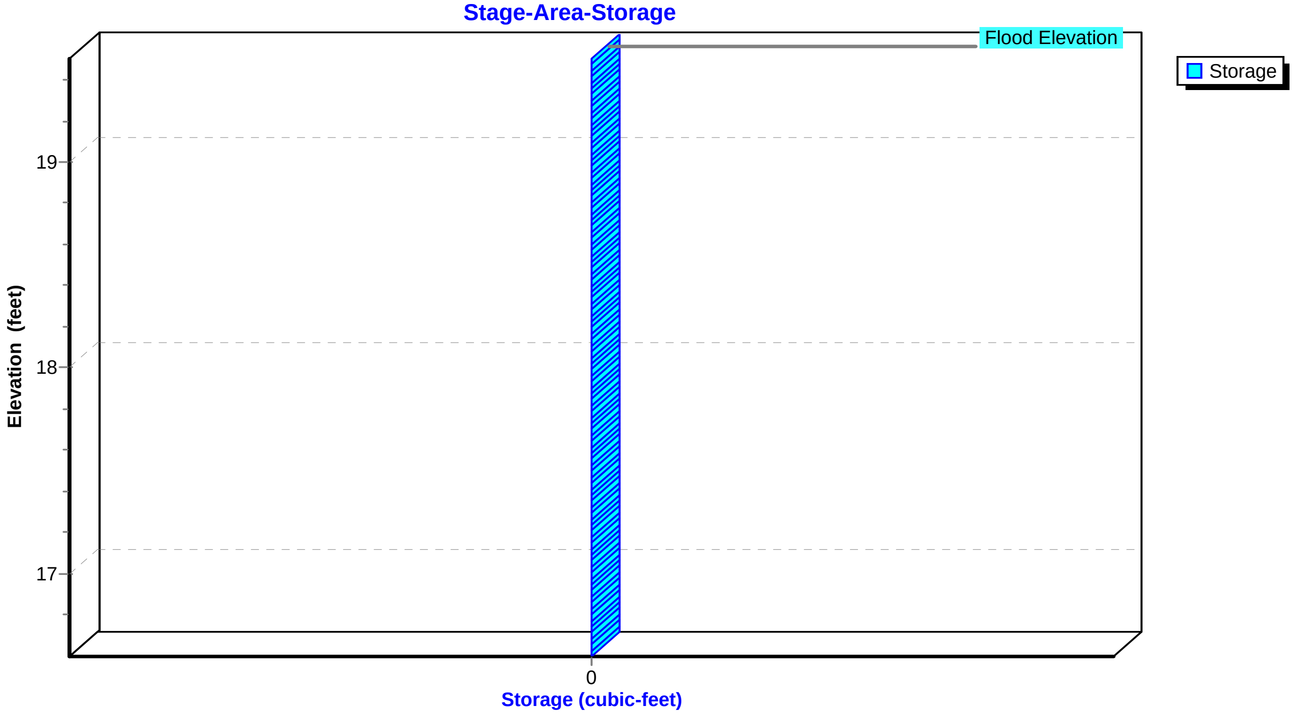
Device	Routing	Invert	Outlet Devices
#1	Primary	16.60'	**12.0" Round Culvert** L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.60' / 16.40' S= 0.0095 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.18 cfs @ 12.09 hrs HW=16.87' TW=16.73' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.18 cfs @ 1.56 fps)

Pond CB2: PCB2



Pond CB2: PCB2



Summary for Pond CB3: PCB3

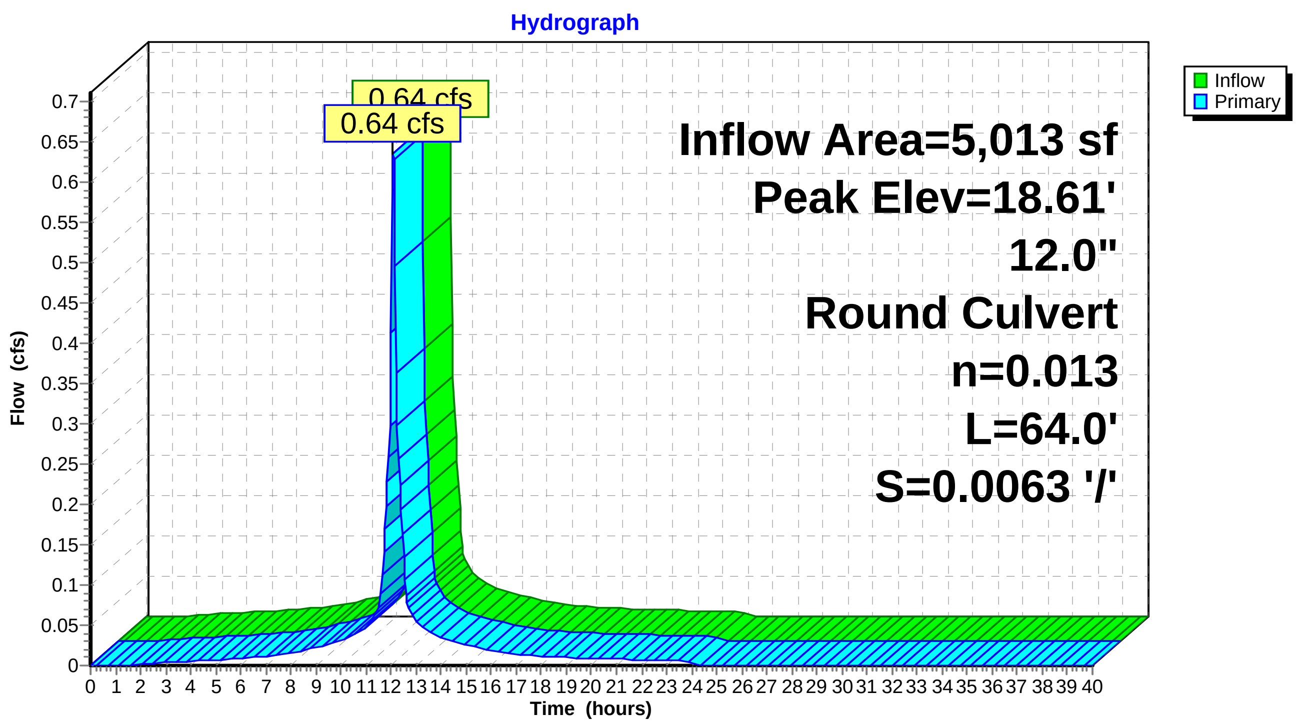
Inflow Area =	5,013 sf,	96.69% Impervious,	Inflow Depth = 5.44"	for 25-yr event
Inflow =	0.64 cfs @	12.09 hrs, Volume=	2,275 cf	
Outflow =	0.64 cfs @	12.09 hrs, Volume=	2,275 cf, Atten= 0%, Lag= 0.0 min	
Primary =	0.64 cfs @	12.09 hrs, Volume=	2,275 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.61' @ 12.14 hrs
Flood Elev= 20.70'

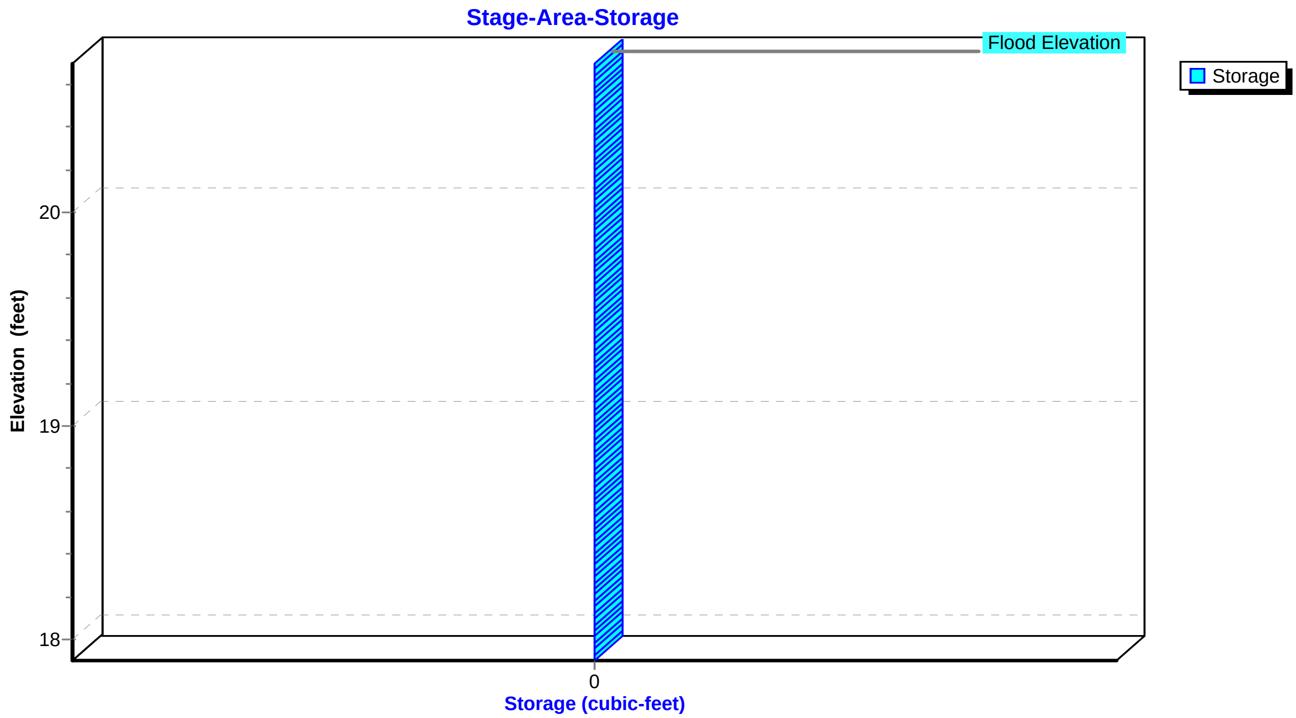
Device	Routing	Invert	Outlet Devices
#1	Primary	17.90'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 17.90' / 17.50' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.45 cfs @ 12.09 hrs HW=18.59' TW=18.52' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.45 cfs @ 1.10 fps)

Pond CB3: PCB3



Pond CB3: PCB3



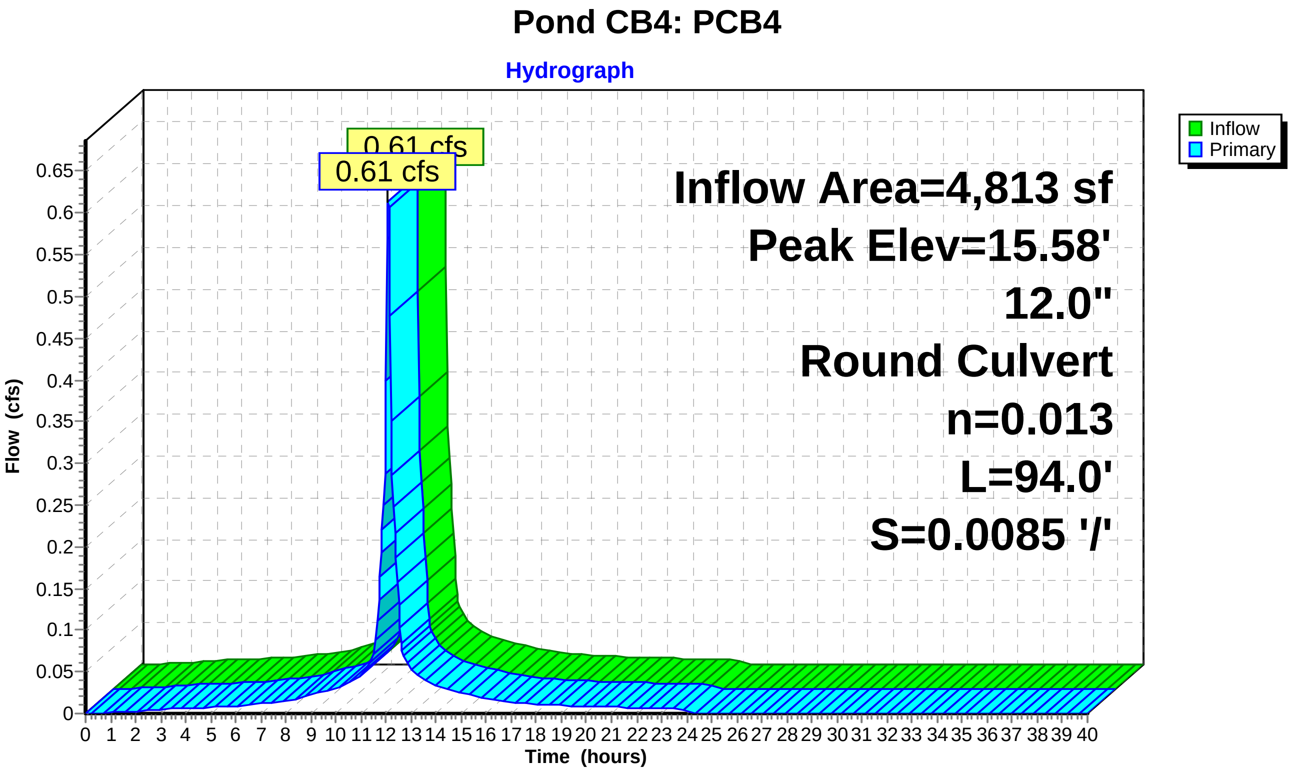
Summary for Pond CB4: PCB4

Inflow Area =	4,813 sf,100.00% Impervious,	Inflow Depth = 5.56"	for 25-yr event	
Inflow =	0.61 cfs @	12.09 hrs, Volume=	2,231 cf	
Outflow =	0.61 cfs @	12.09 hrs, Volume=	2,231 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.61 cfs @	12.09 hrs, Volume=	2,231 cf	

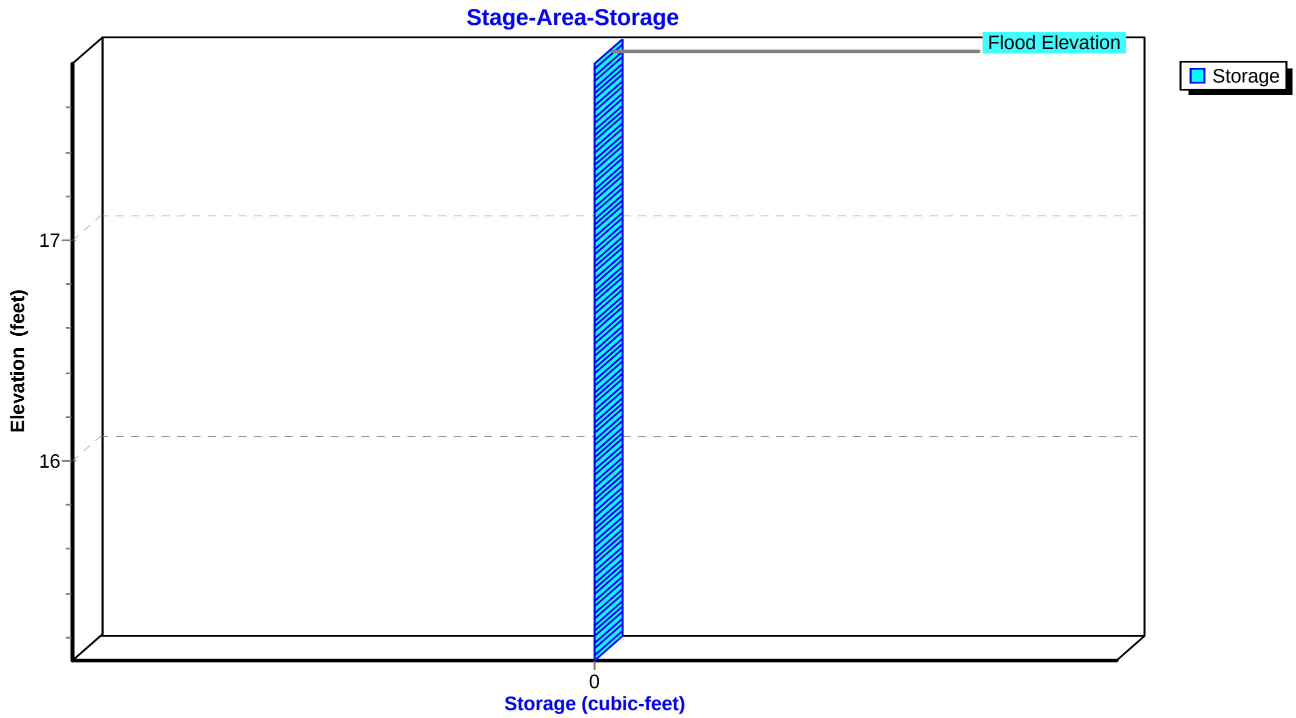
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.58' @ 12.10 hrs
Flood Elev= 17.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	15.10'	**12.0" Round Culvert** L= 94.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.10' / 14.30' S= 0.0085 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.54 cfs @ 12.09 hrs HW=15.57' TW=15.10' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.54 cfs @ 2.21 fps)



Pond CB4: PCB4



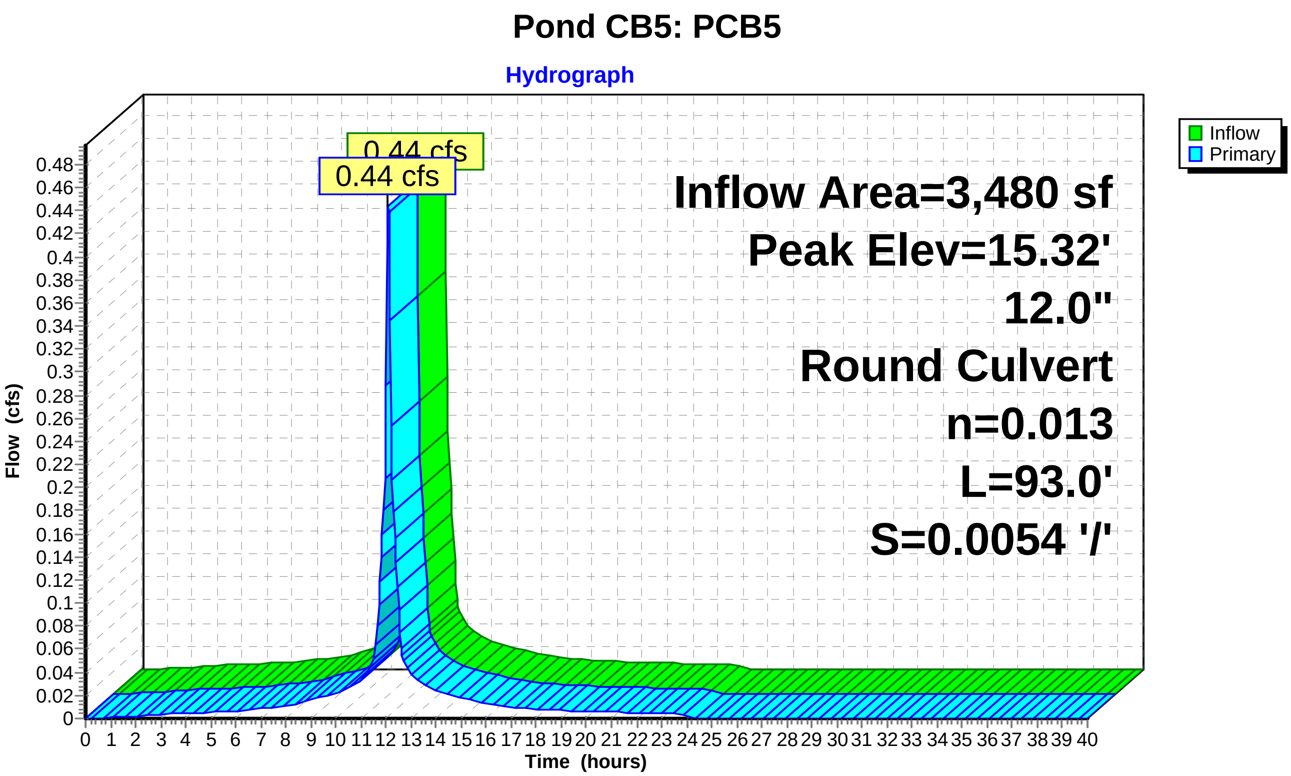
Summary for Pond CB5: PCB5

Inflow Area = 3,480 sf,100.00% Impervious, Inflow Depth = 5.56" for 25-yr event
Inflow = 0.44 cfs @ 12.09 hrs, Volume= 1,613 cf
Outflow = 0.44 cfs @ 12.09 hrs, Volume= 1,613 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.44 cfs @ 12.09 hrs, Volume= 1,613 cf

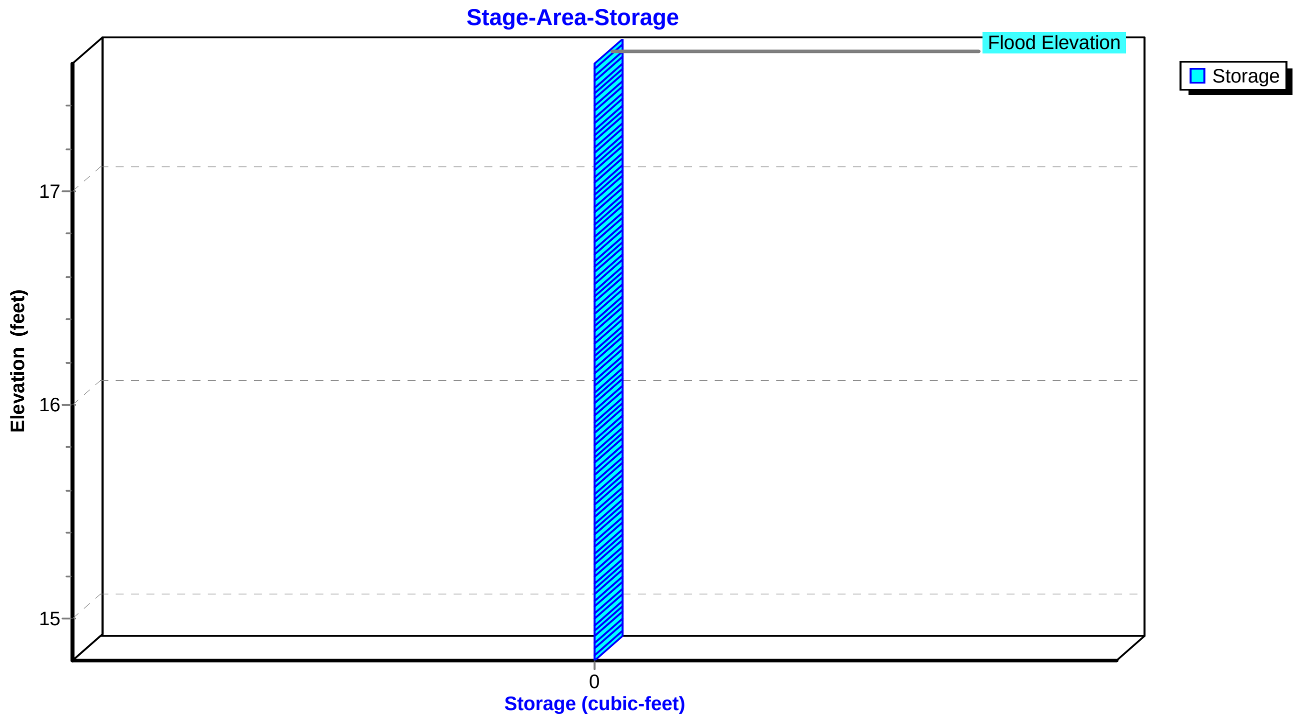
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.32' @ 12.19 hrs
Flood Elev= 17.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	14.80'	**12.0" Round Culvert** L= 93.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.80' / 14.30' S= 0.0054 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.34 cfs @ 12.09 hrs HW=15.27' TW=15.10' (Dynamic Tailwater)
└—**1=Culvert** (Outlet Controls 0.34 cfs @ 1.36 fps)



Pond CB5: PCB5



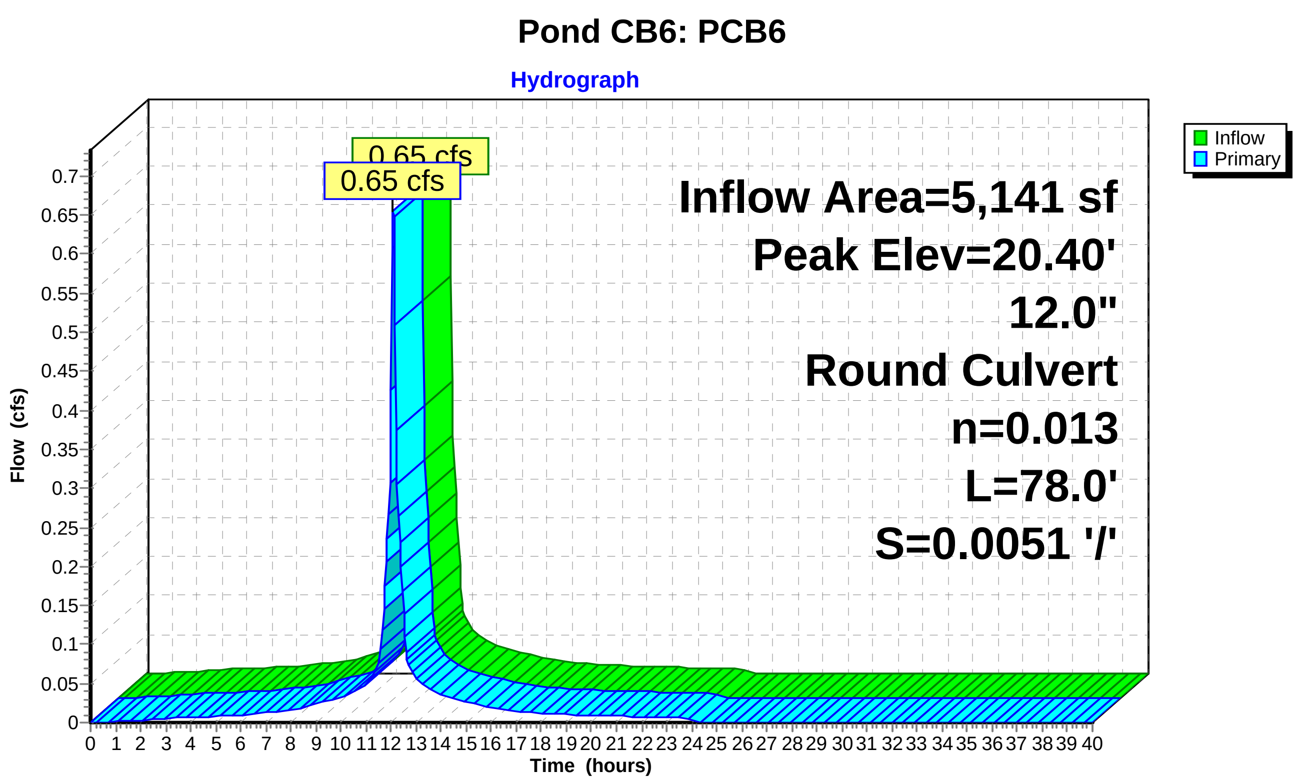
Summary for Pond CB6: PCB6

Inflow Area =		5,141 sf,100.00% Impervious,	Inflow Depth = 5.56"	for 25-yr event
Inflow	=	0.65 cfs @ 12.09 hrs, Volume=	2,383 cf	
Outflow	=	0.65 cfs @ 12.09 hrs, Volume=	2,383 cf, Atten= 0%, Lag= 0.0 min	
Primary	=	0.65 cfs @ 12.09 hrs, Volume=	2,383 cf	

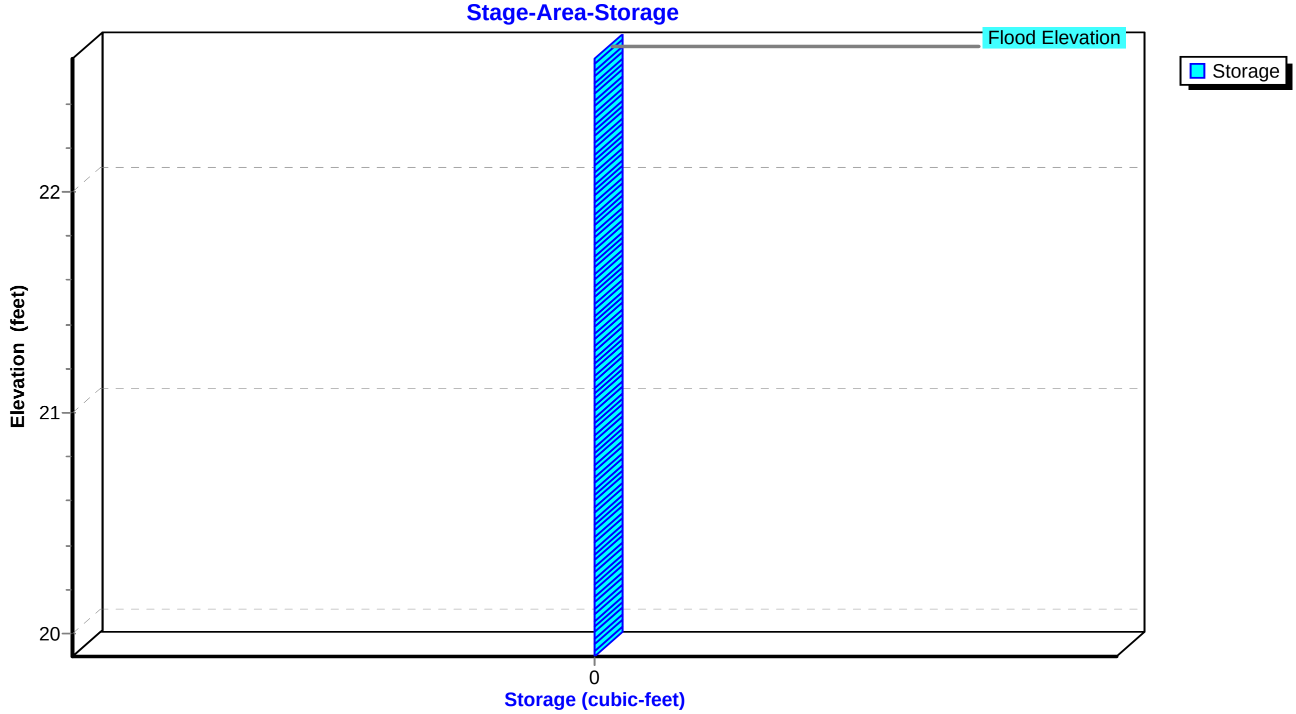
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 20.40' @ 12.10 hrs
Flood Elev= 22.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	19.90'	**12.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.90' / 19.50' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.60 cfs @ 12.09 hrs HW=20.39' TW=19.98' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.60 cfs @ 2.27 fps)



Pond CB6: PCB6



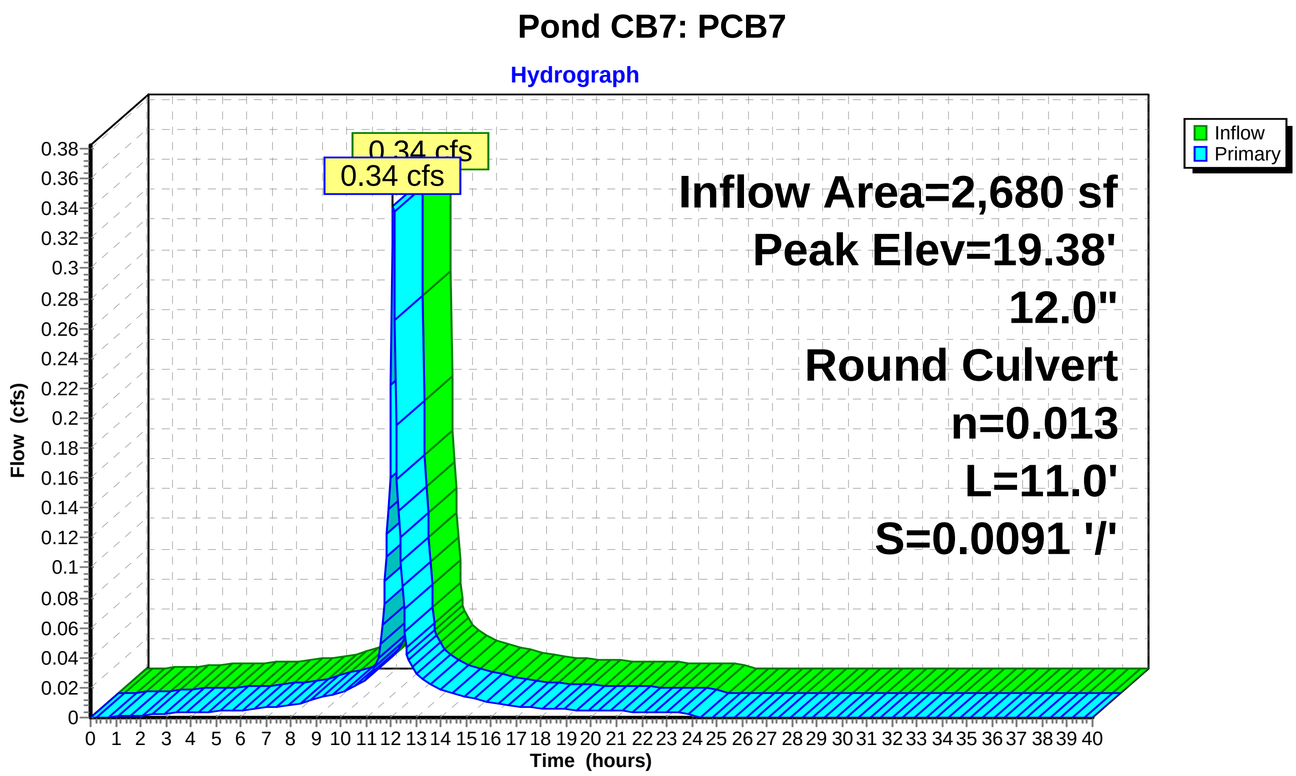
Summary for Pond CB7: PCB7

Inflow Area = 2,680 sf,100.00% Impervious, Inflow Depth = 5.56" for 25-yr event
Inflow = 0.34 cfs @ 12.09 hrs, Volume= 1,242 cf
Outflow = 0.34 cfs @ 12.09 hrs, Volume= 1,242 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.34 cfs @ 12.09 hrs, Volume= 1,242 cf

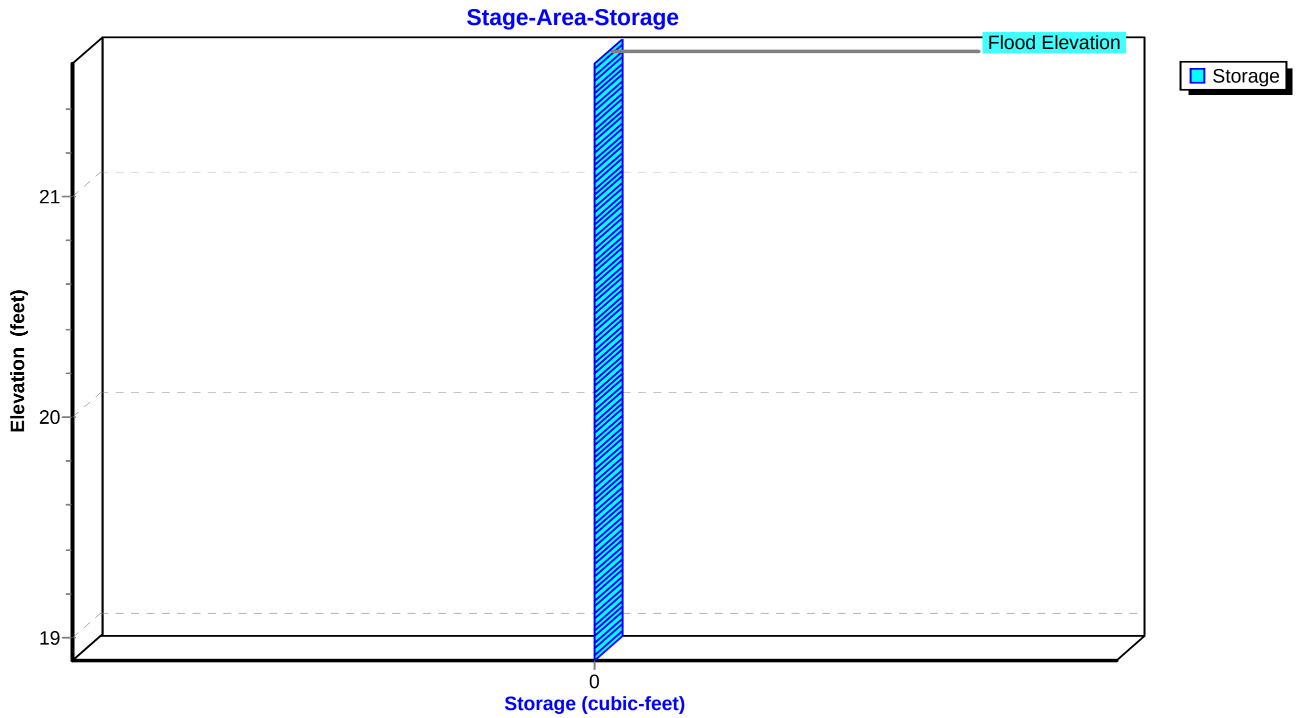
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.38' @ 12.12 hrs
Flood Elev= 21.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.90'	**12.0" Round Culvert** L= 11.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.90' / 18.80' S= 0.0091 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.22 cfs @ 12.09 hrs HW=19.35' TW=19.32' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.22 cfs @ 0.94 fps)



Pond CB7: PCB7

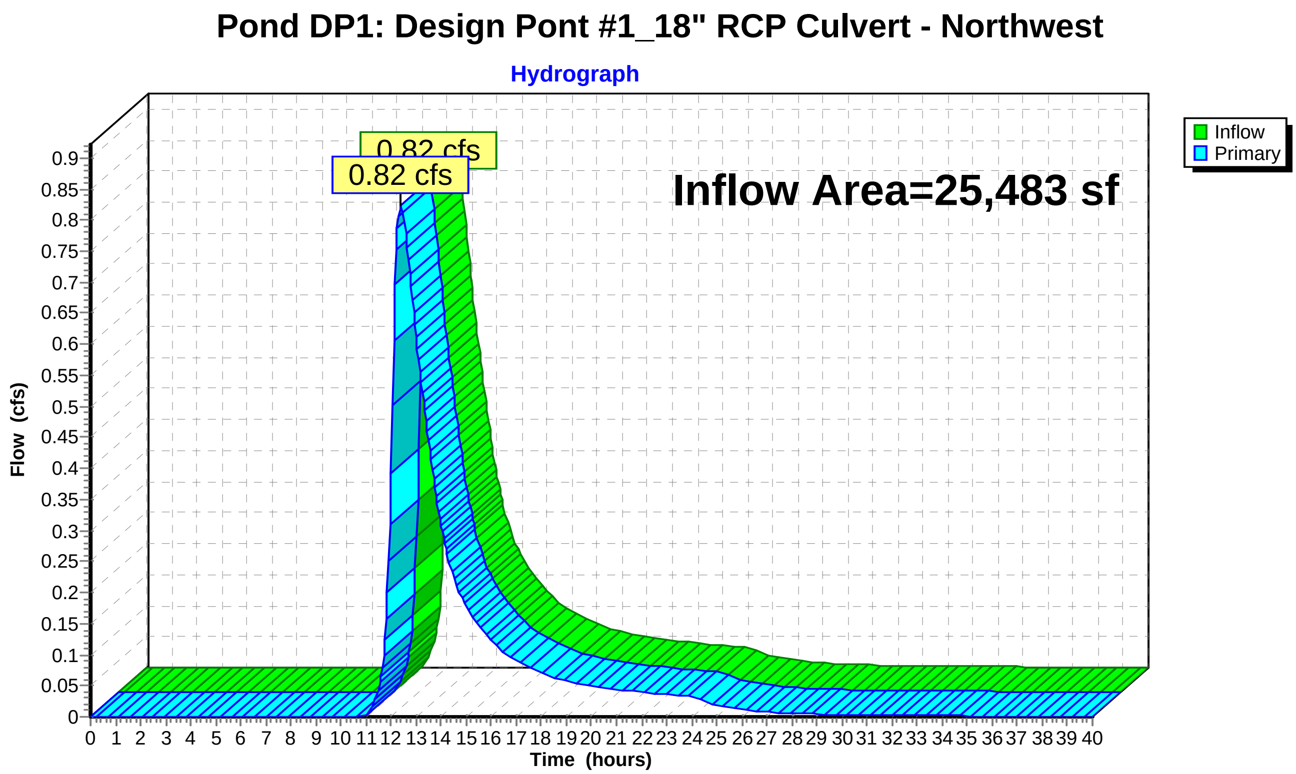


Summary for Pond DP1: Design Pont #1_18" RCP Culvert - Northwest

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	25,483 sf,	55.96% Impervious,	Inflow Depth > 3.69"	for 25-yr event
Inflow =	0.82 cfs @	12.41 hrs, Volume=	7,837 cf	
Primary =	0.82 cfs @	12.41 hrs, Volume=	7,837 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

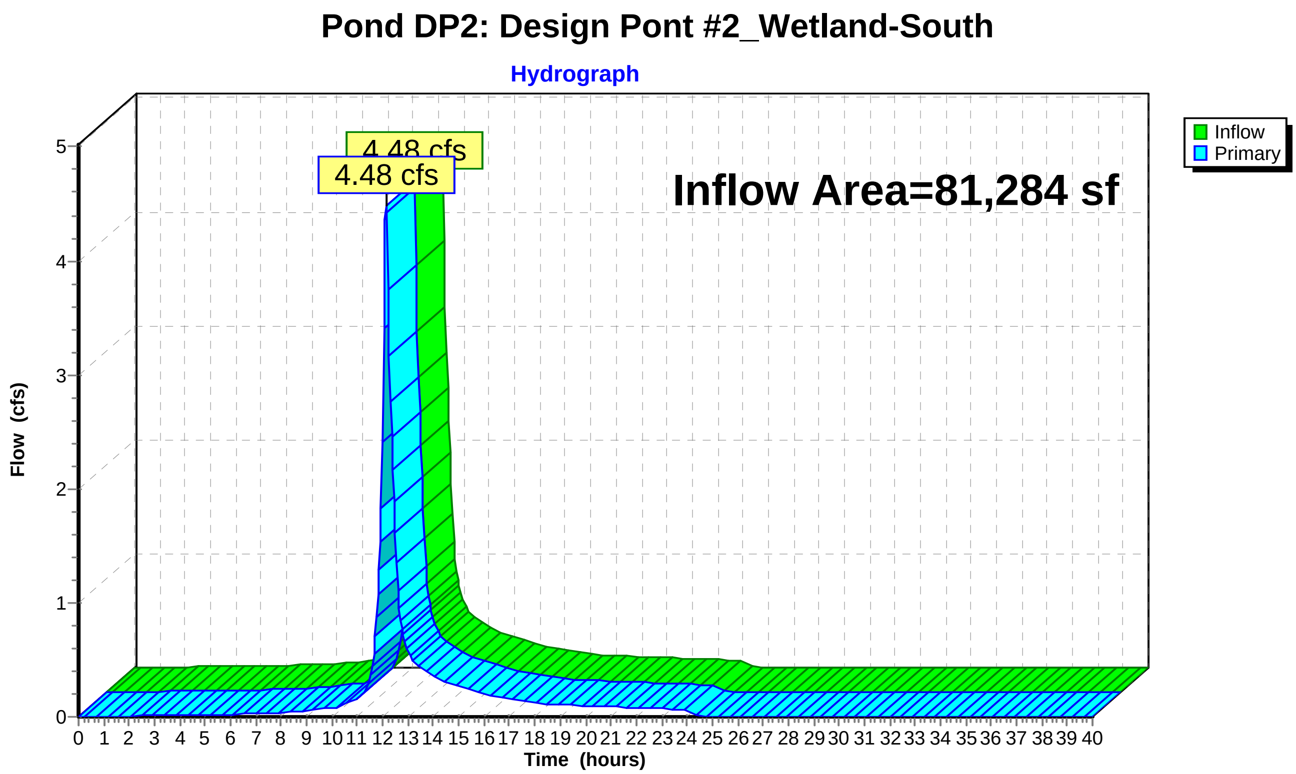


Summary for Pond DP2: Design Pont #2_Wetland-South

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 81,284 sf, 40.77% Impervious, Inflow Depth = 2.53" for 25-yr event
Inflow = 4.48 cfs @ 12.13 hrs, Volume= 17,126 cf
Primary = 4.48 cfs @ 12.13 hrs, Volume= 17,126 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

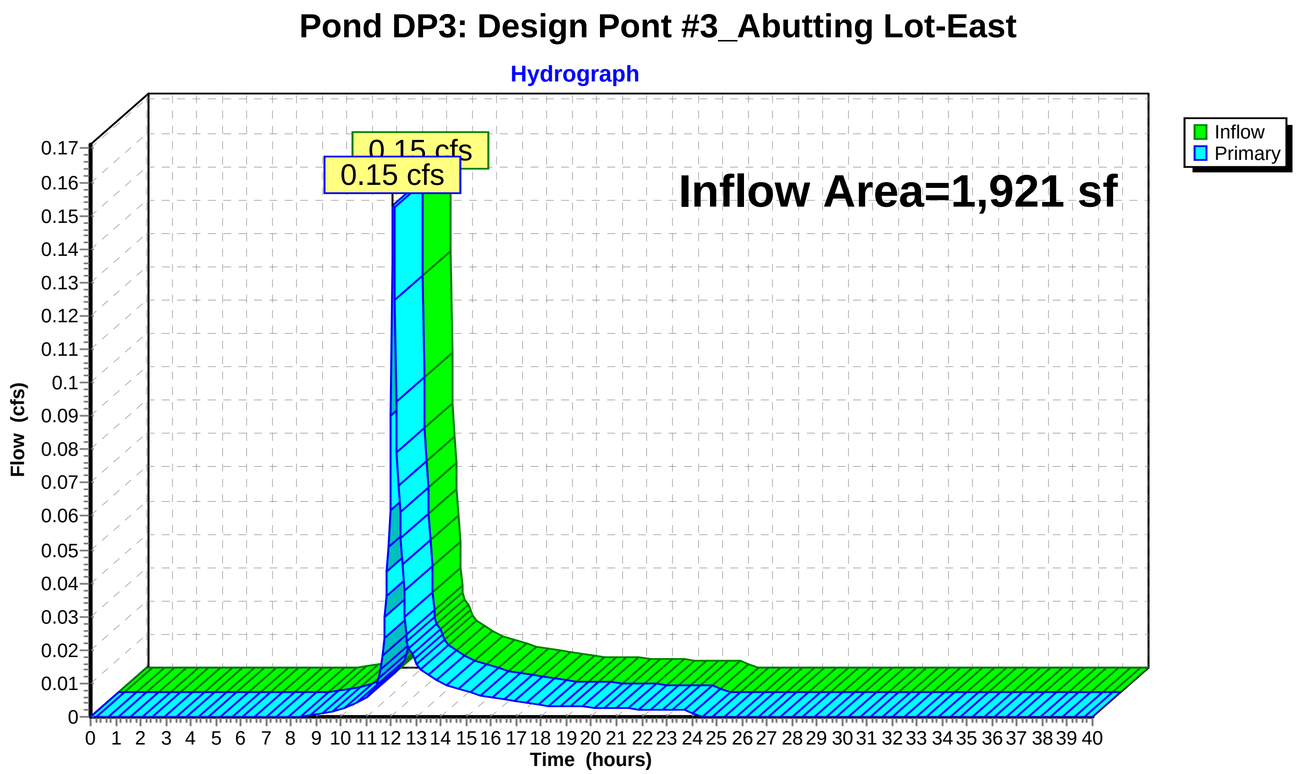


Summary for Pond DP3: Design Pont #3_Abutting Lot-East

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	1,921 sf, 0.00% Impervious,	Inflow Depth = 3.02" for 25-yr event	
Inflow =	0.15 cfs @ 12.09 hrs,	Volume=	483 cf
Primary =	0.15 cfs @ 12.09 hrs,	Volume=	483 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs



Summary for Pond IS: Infiltration System

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=2)

Inflow Area =	14,215 sf,100.00% Impervious,	Inflow Depth = 5.56" for 25-yr event			
Inflow =	1.81 cfs @	12.09 hrs,	Volume=	6,589 cf	
Outflow =	0.29 cfs @	12.56 hrs,	Volume=	6,592 cf,	Atten= 84%, Lag= 28.5 min
Discarded =	0.28 cfs @	11.70 hrs,	Volume=	6,584 cf	
Primary =	0.01 cfs @	12.56 hrs,	Volume=	9 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 17.96' @ 12.56 hrs Surf.Area= 1,463 sf Storage= 1,750 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 33.8 min (779.5 - 745.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	16.10'	670 cf	**6.28'W x 109.07'L x 3.52'H Field A**
			2,416 cf Overall - 741 cf Embedded = 1,675 cf x 40.0% Voids
#2A	16.60'	741 cf	**Contech ChamberMaxx** x 15 Inside #1
			Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
			Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
			Row Length Adjustment= +0.32' x 6.92 sf x 1 rows
#3B	16.10'	601 cf	**10.98'W x 59.25'L x 3.52'H Field B**
			2,294 cf Overall - 793 cf Embedded = 1,502 cf x 40.0% Voids
#4B	16.60'	793 cf	**Contech ChamberMaxx** x 16 Inside #3
			Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
			Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
			Row Length Adjustment= +0.32' x 6.92 sf x 2 rows
#5C	16.10'	143 cf	**2.54'W x 50.00'L x 3.21'H Field C**
			408 cf Overall - 50 cf Embedded = 358 cf x 40.0% Voids
#6C	17.10'	39 cf	**ADS N-12 12** x 2 Inside #5
			Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
			Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
			Row Length Adjustment= +8.00' x 0.81 sf x 1 rows
		2,986 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.10'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	17.90'	**12.0" Round Culvert**
			L= 66.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 17.90' / 16.50' S= 0.0212 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.28 cfs @ 11.70 hrs HW=16.14' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.01 cfs @ 12.56 hrs HW=17.96' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 0.01 cfs @ 0.65 fps)

Pond IS: Infiltration System - Chamber Wizard Field A

Chamber Model = Contech ChamberMaxx (Contech® ChamberMaxx®)
Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
Row Length Adjustment= +0.32' x 6.92 sf x 1 rows

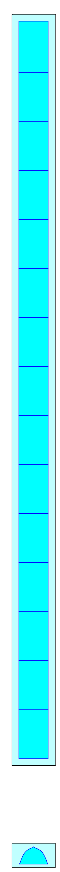
15 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 107.07' Row Length +12.0" End Stone x 2 = 109.07' Base Length
1 Rows x 51.4" Wide + 12.0" Side Stone x 2 = 6.28' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

15 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 1 Rows = 741.1 cf Chamber Storage

2,415.8 cf Field - 741.1 cf Chambers = 1,674.7 cf Stone x 40.0% Voids = 669.9 cf Stone Storage

Chamber Storage + Stone Storage = 1,411.0 cf = 0.032 af
Overall Storage Efficiency = 58.4%
Overall System Size = 109.07' x 6.28' x 3.52'

15 Chambers
89.5 cy Field
62.0 cy Stone



Pond IS: Infiltration System - Chamber Wizard Field B

Chamber Model = Contech ChamberMaxx (Contech® ChamberMaxx®)
Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
Row Length Adjustment= +0.32' x 6.92 sf x 2 rows

51.4" Wide + 5.0" Spacing = 56.4" C-C Row Spacing

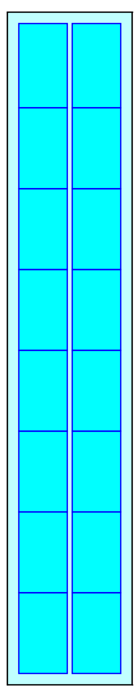
8 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 57.25' Row Length +12.0" End Stone x 2 = 59.25' Base Length
2 Rows x 51.4" Wide + 5.0" Spacing x 1 + 12.0" Side Stone x 2 = 10.98' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

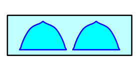
16 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 792.6 cf Chamber Storage

2,294.1 cf Field - 792.6 cf Chambers = 1,501.5 cf Stone x 40.0% Voids = 600.6 cf Stone Storage

Chamber Storage + Stone Storage = 1,393.2 cf = 0.032 af
Overall Storage Efficiency = 60.7%
Overall System Size = 59.25' x 10.98' x 3.52'

16 Chambers
85.0 cy Field
55.6 cy Stone





Pond IS: Infiltration System - Chamber Wizard Field C

Chamber Model = ADS N-12 12 (ADS N-12® Pipe)
Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
Row Length Adjustment= +8.00' x 0.81 sf x 1 rows

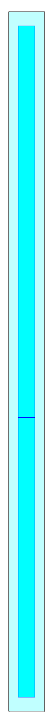
2 Chambers/Row x 20.00' Long +8.00' Row Adjustment = 48.00' Row Length +12.0" End Stone x 2 = 50.00' Base Length
1 Rows x 14.5" Wide + 8.0" Side Stone x 2 = 2.54' Base Width
12.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.21' Field Height

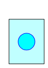
2 Chambers x 16.2 cf +8.00' Row Adjustment x 0.81 sf x 1 Rows = 38.9 cf Chamber Storage
2 Chambers x 20.9 cf +8.00' Row Adjustment x 1.05 sf x 1 Rows = 50.2 cf Displacement

407.9 cf Field - 50.2 cf Chambers = 357.7 cf Stone x 40.0% Voids = 143.1 cf Stone Storage

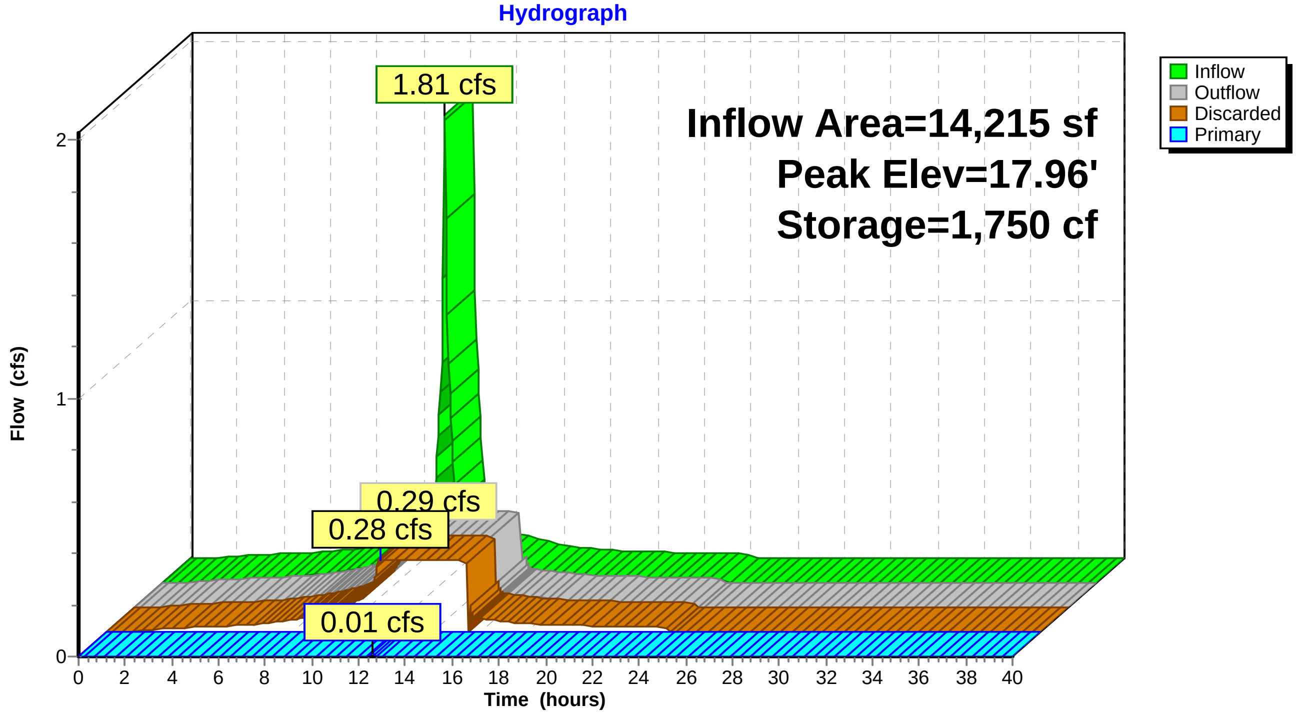
Chamber Storage + Stone Storage = 181.9 cf = 0.004 af
Overall Storage Efficiency = 44.6%
Overall System Size = 50.00' x 2.54' x 3.21'

2 Chambers
15.1 cy Field
13.2 cy Stone

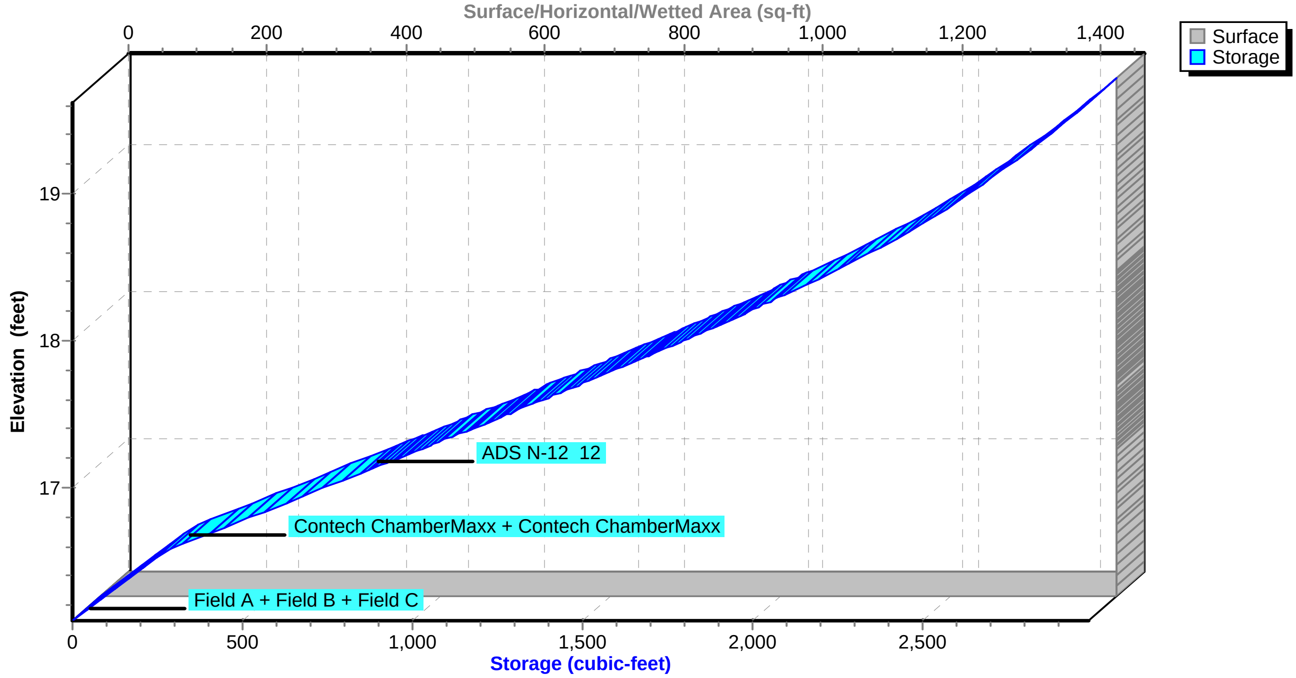




Pond IS: Infiltration System



Pond IS: Infiltration System



Summary for Pond MH1: PDMH1

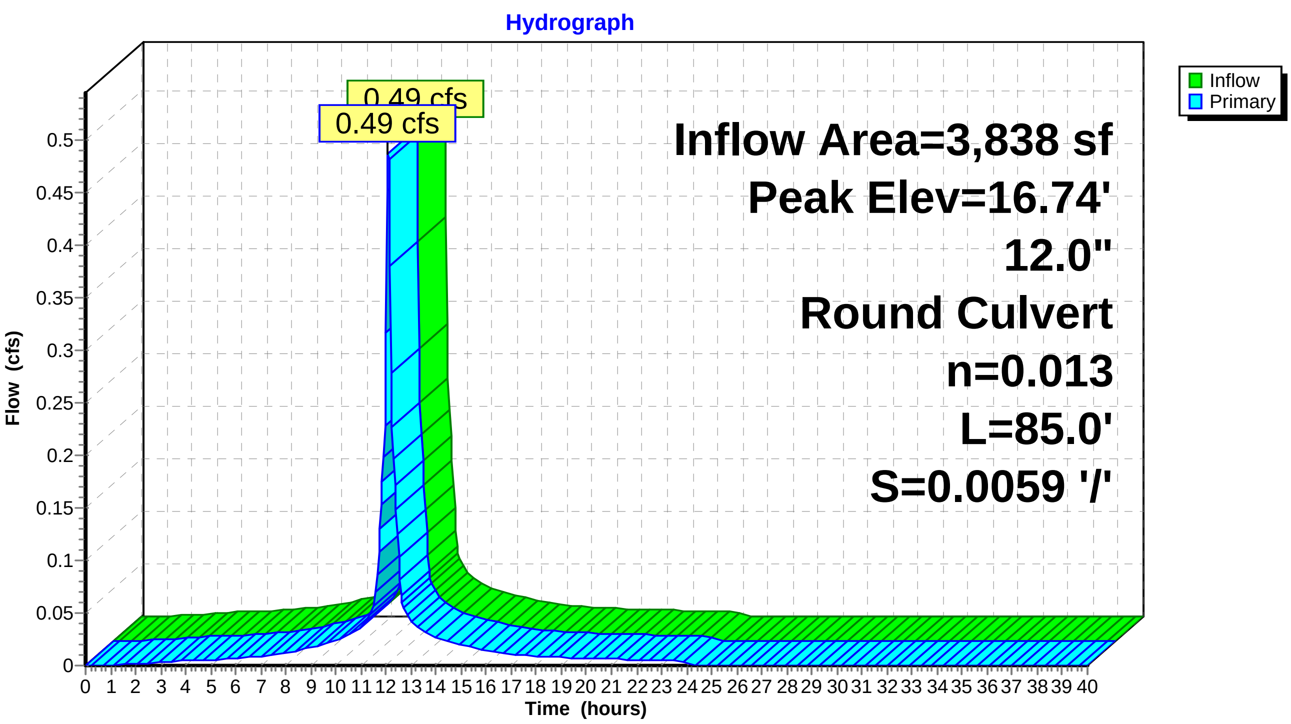
Inflow Area = 3,838 sf, 97.68% Impervious, Inflow Depth = 5.50" for 25-yr event
Inflow = 0.49 cfs @ 12.09 hrs, Volume= 1,758 cf
Outflow = 0.49 cfs @ 12.09 hrs, Volume= 1,758 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.49 cfs @ 12.09 hrs, Volume= 1,758 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.74' @ 12.11 hrs
Flood Elev= 20.20'

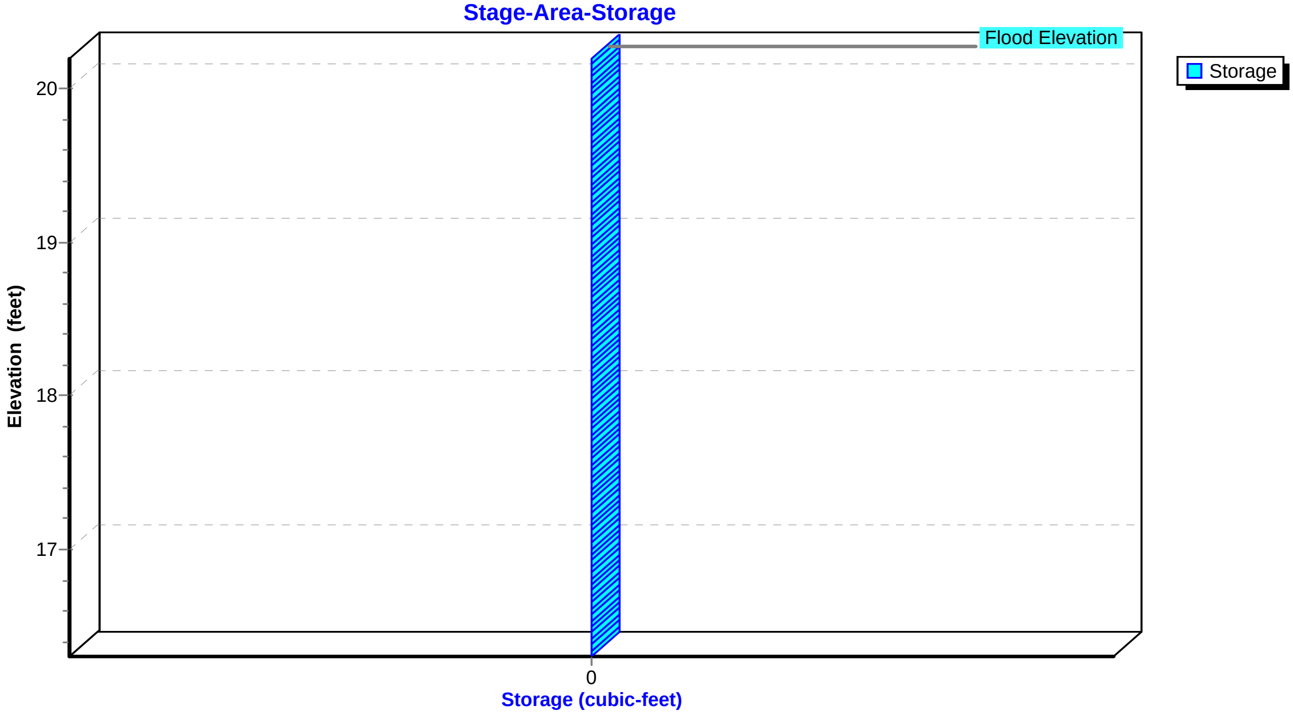
Device	Routing	Invert	Outlet Devices
#1	Primary	16.30'	**12.0" Round Culvert** L= 85.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.30' / 15.80' S= 0.0059 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.41 cfs @ 12.09 hrs HW=16.73' TW=16.41' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.41 cfs @ 1.86 fps)

Pond MH1: PDMH1



Pond MH1: PDMH1



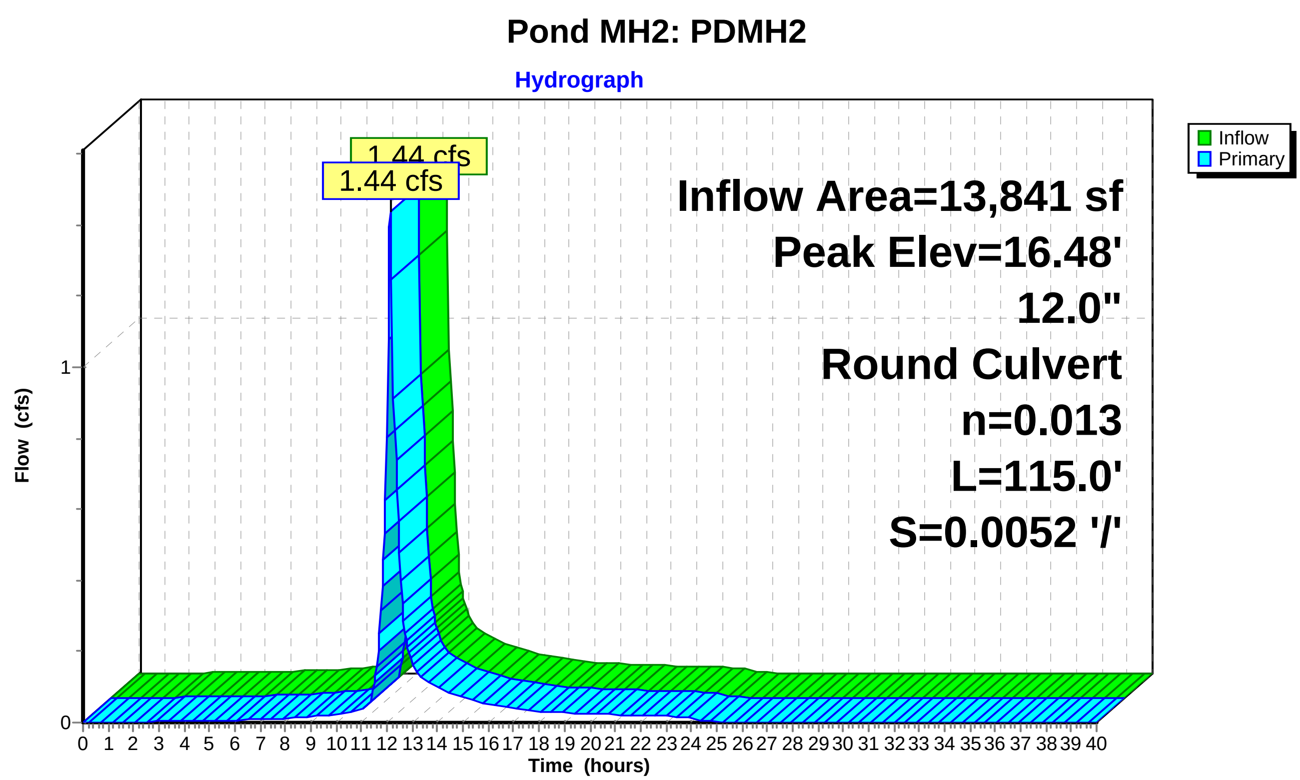
Summary for Pond MH2: PDMH2

Inflow Area = 13,841 sf, 76.82% Impervious, Inflow Depth = 4.34" for 25-yr event
Inflow = 1.44 cfs @ 12.13 hrs, Volume= 5,010 cf
Outflow = 1.44 cfs @ 12.13 hrs, Volume= 5,010 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.44 cfs @ 12.13 hrs, Volume= 5,010 cf

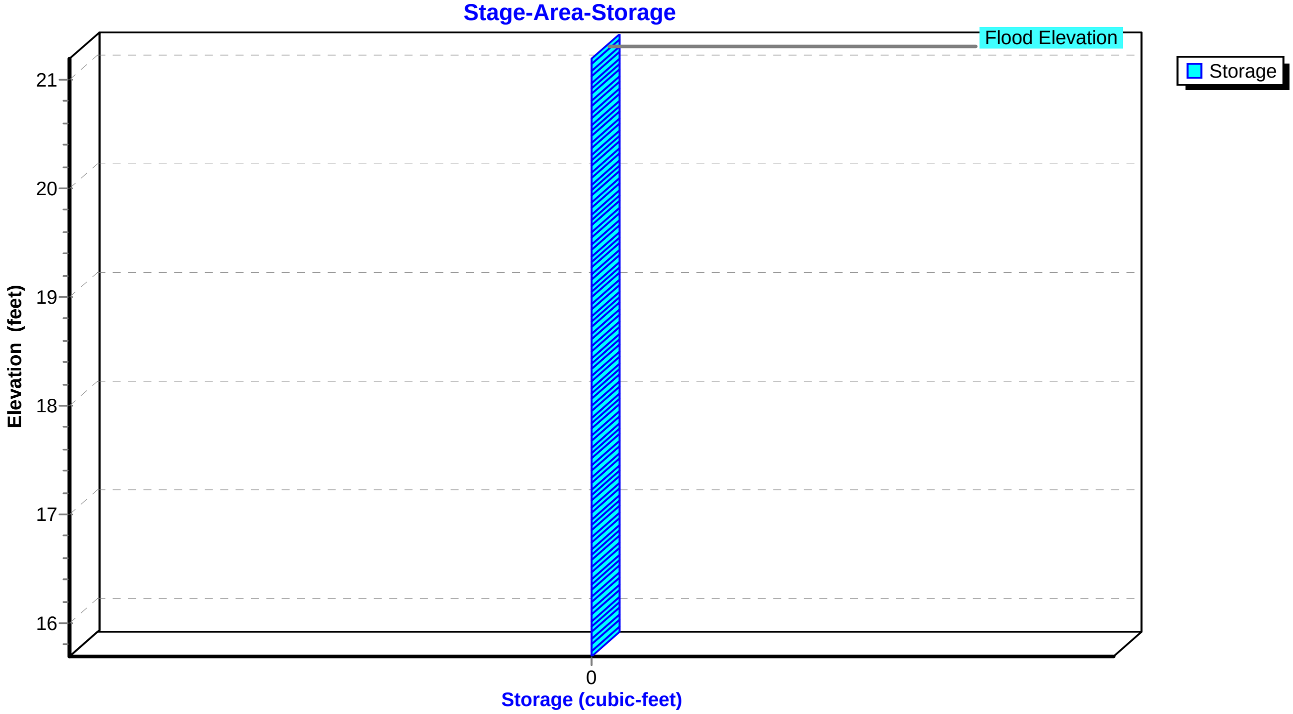
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.48' @ 12.14 hrs
Flood Elev= 21.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	15.70'	**12.0" Round Culvert** L= 115.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.70' / 15.10' S= 0.0052 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.33 cfs @ 12.13 hrs HW=16.46' TW=15.80' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.33 cfs @ 2.87 fps)



Pond MH2: PDMH2



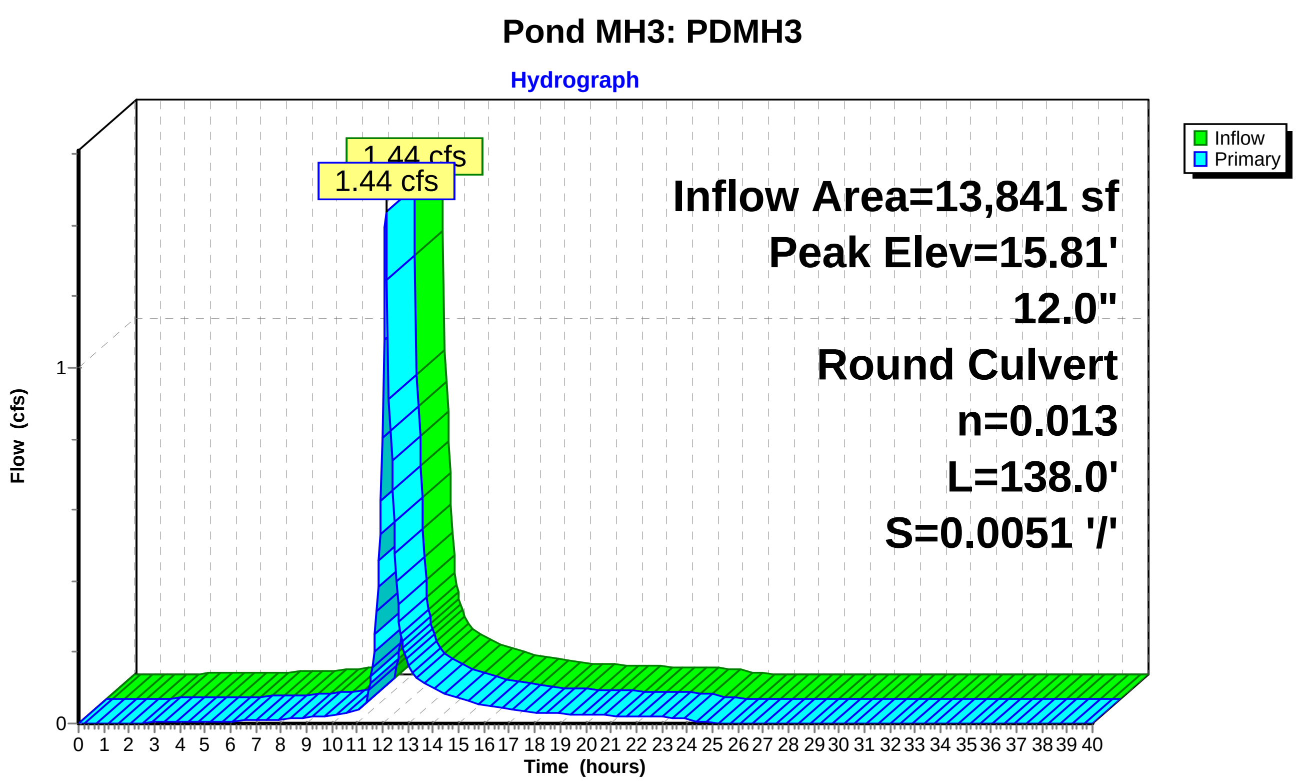
Summary for Pond MH3: PDMH3

Inflow Area =	13,841 sf,	76.82% Impervious,	Inflow Depth = 4.34"	for 25-yr event
Inflow =	1.44 cfs @	12.13 hrs, Volume=	5,010 cf	
Outflow =	1.44 cfs @	12.13 hrs, Volume=	5,010 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.44 cfs @	12.13 hrs, Volume=	5,010 cf	

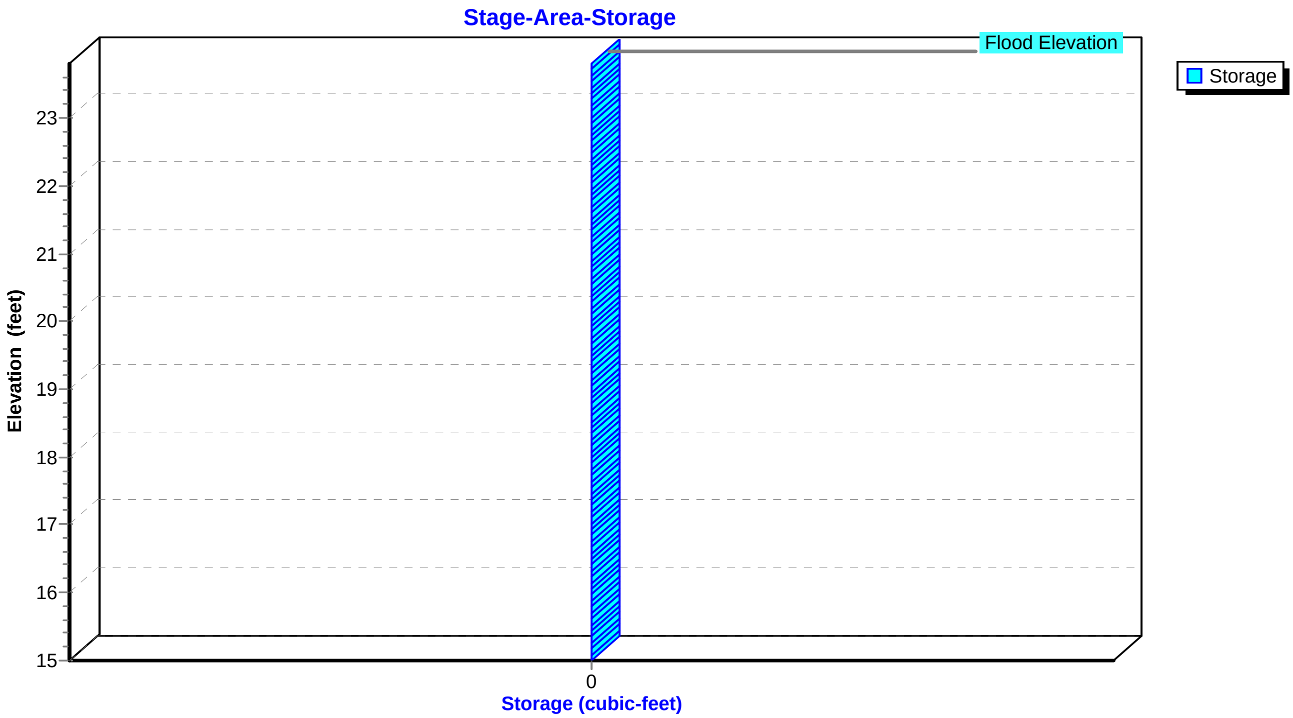
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.81' @ 12.14 hrs
Flood Elev= 23.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	**12.0" Round Culvert** L= 138.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.00' / 14.30' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.29 cfs @ 12.13 hrs HW=15.80' TW=15.19' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.29 cfs @ 2.62 fps)



Pond MH3: PDMH3



Summary for Pond MH4: PDMH4

Inflow Area =	22,134 sf,	85.50% Impervious,	Inflow Depth = 4.80"	for 25-yr event
Inflow =	2.45 cfs @	12.11 hrs, Volume=	8,853 cf	
Outflow =	2.45 cfs @	12.11 hrs, Volume=	8,853 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.89 cfs @	12.10 hrs, Volume=	8,094 cf	
Secondary =	0.64 cfs @	12.16 hrs, Volume=	759 cf	

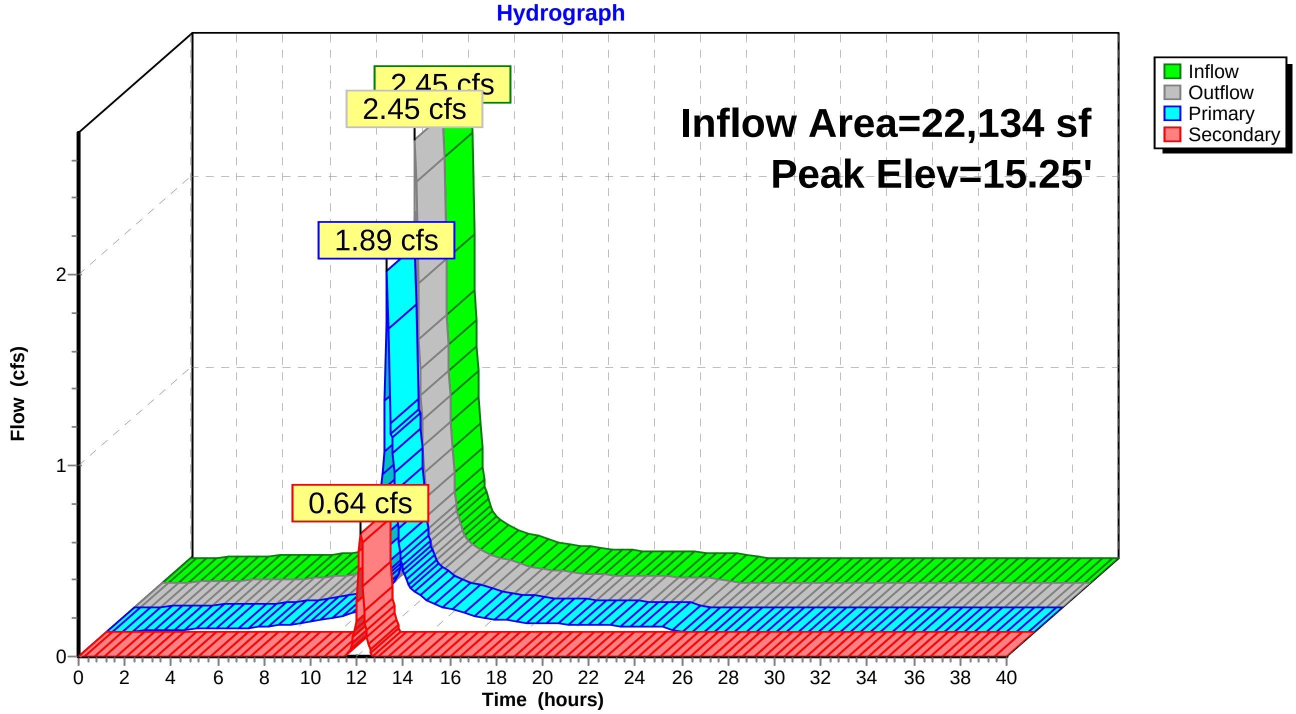
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.25' @ 12.16 hrs
Flood Elev= 21.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	14.20'	**12.0" Round Culvert** L= 6.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 14.10' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	14.20'	**12.0" Round Culvert** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 13.70' S= 0.0625 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	14.55'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

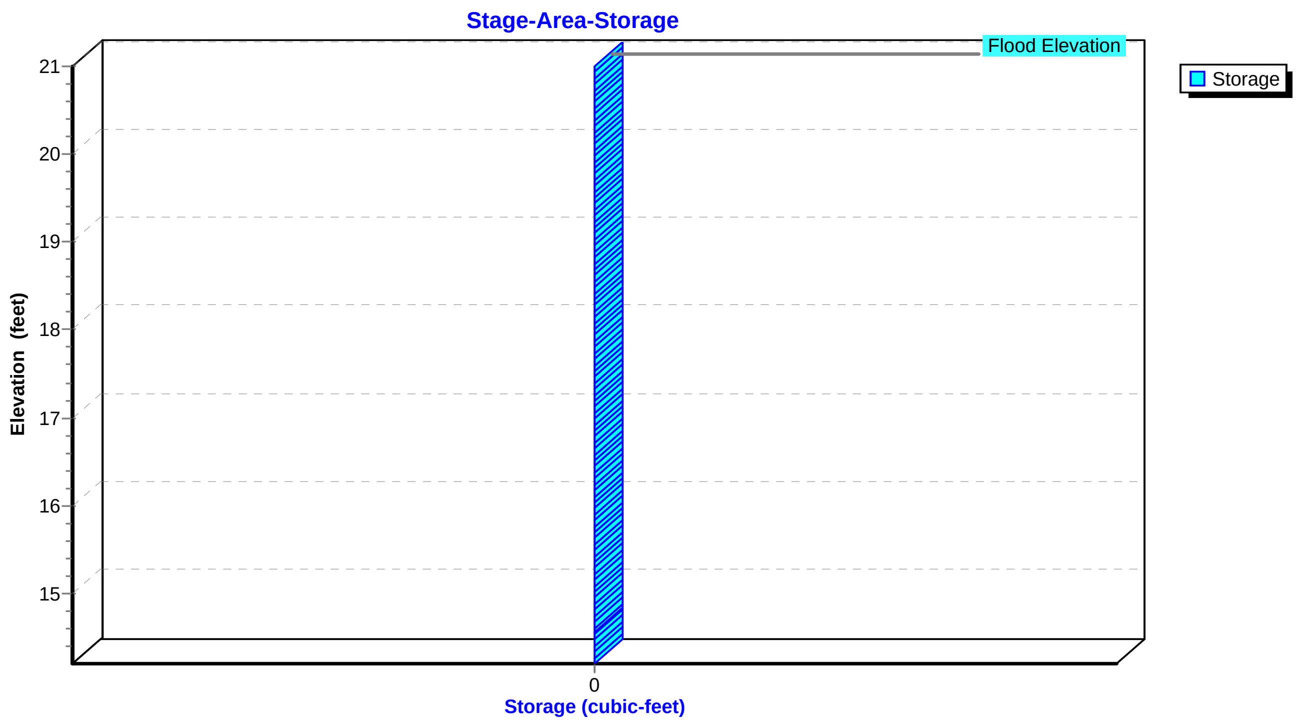
Primary OutFlow Max=1.17 cfs @ 12.10 hrs HW=15.13' TW=14.96' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.17 cfs @ 1.54 fps)

Secondary OutFlow Max=0.67 cfs @ 12.16 hrs HW=15.24' TW=14.62' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.67 cfs of 2.19 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.67 cfs @ 2.68 fps)

Pond MH4: PDMH4



Pond MH4: PDMH4



Summary for Pond MH5: PDMH5

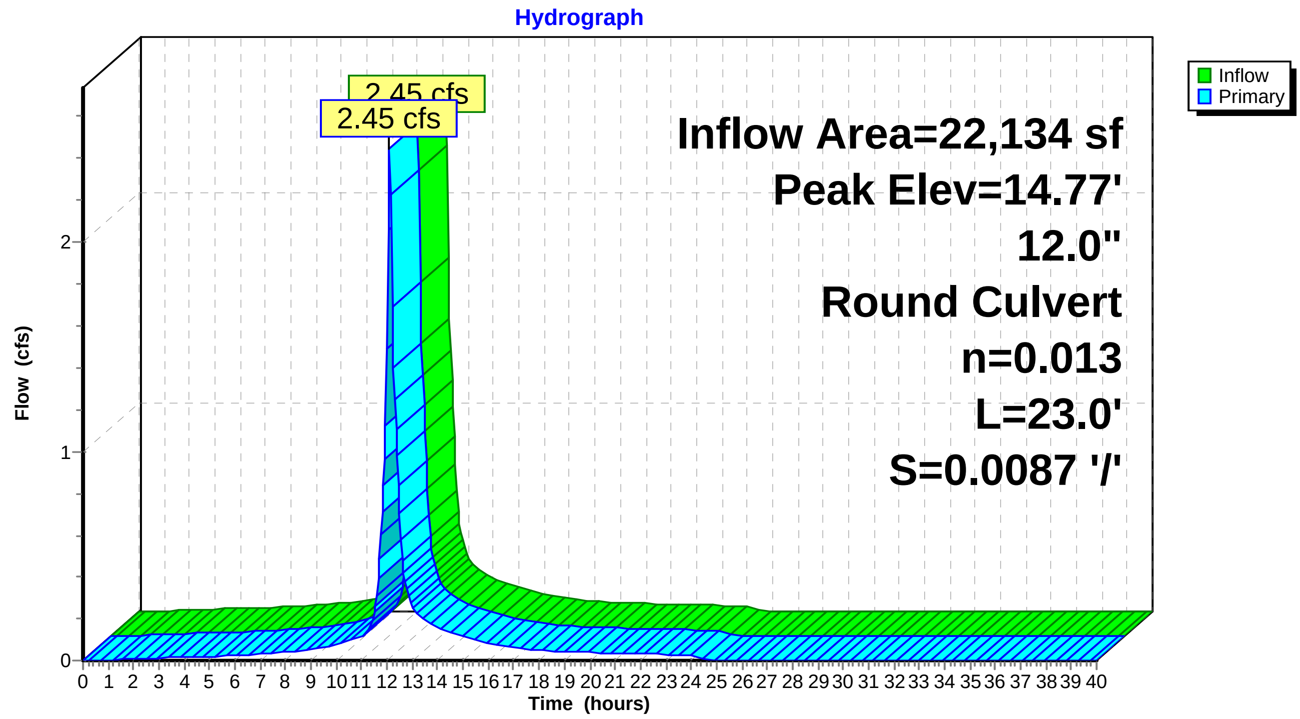
Inflow Area = 22,134 sf, 85.50% Impervious, Inflow Depth = 4.80" for 25-yr event
Inflow = 2.45 cfs @ 12.11 hrs, Volume= 8,853 cf
Outflow = 2.45 cfs @ 12.11 hrs, Volume= 8,853 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.45 cfs @ 12.11 hrs, Volume= 8,853 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 14.77' @ 12.11 hrs
Flood Elev= 21.40'

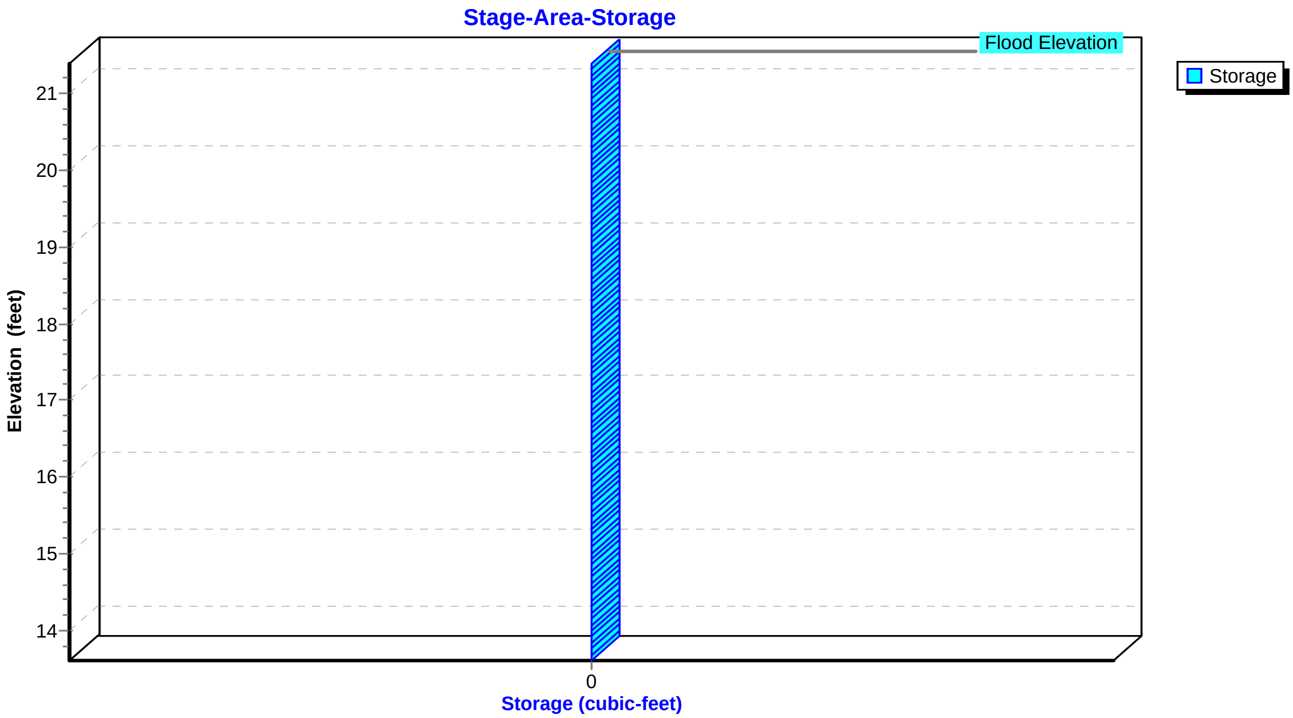
Device	Routing	Invert	Outlet Devices
#1	Primary	13.60'	**12.0" Round Culvert** L= 23.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 13.60' / 13.40' S= 0.0087 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.41 cfs @ 12.11 hrs HW=14.75' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.41 cfs @ 3.07 fps)

Pond MH5: PDMH5



Pond MH5: PDMH5



Summary for Pond MH6: PDMH6

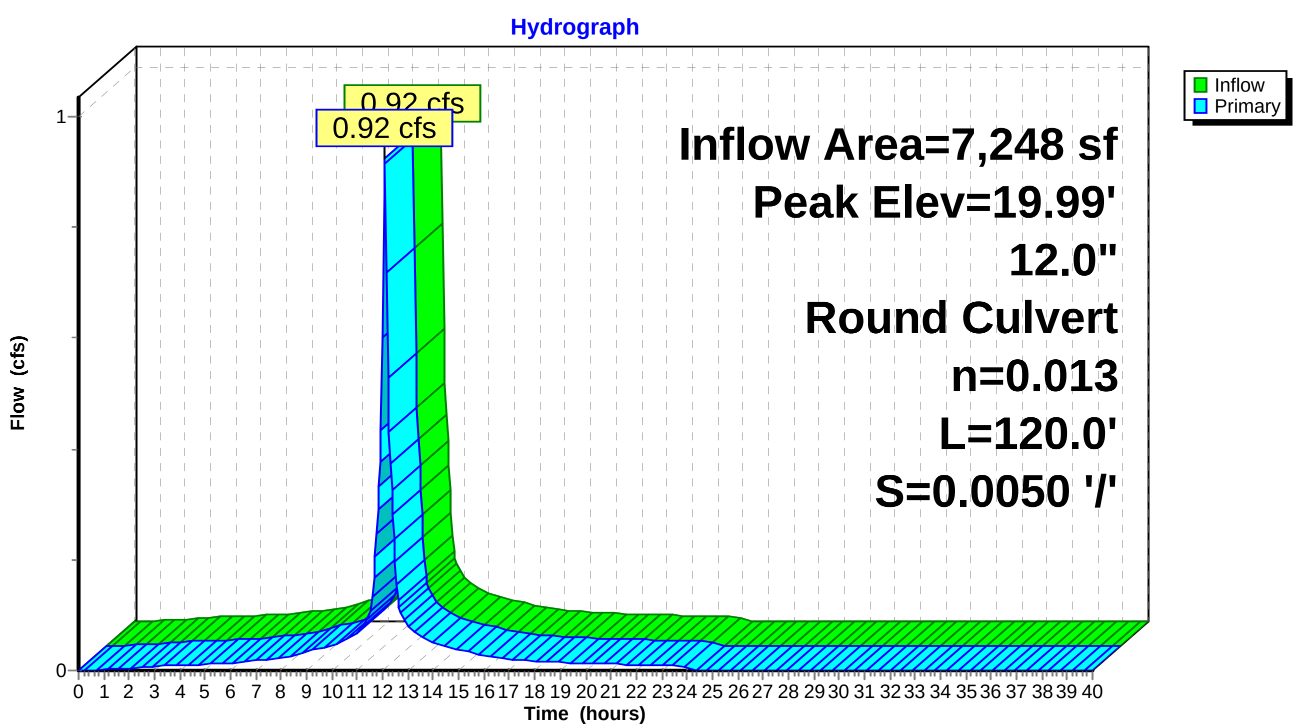
Inflow Area = 7,248 sf,100.00% Impervious, Inflow Depth = 5.56" for 25-yr event
Inflow = 0.92 cfs @ 12.09 hrs, Volume= 3,360 cf
Outflow = 0.92 cfs @ 12.09 hrs, Volume= 3,360 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.92 cfs @ 12.09 hrs, Volume= 3,360 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.99' @ 12.09 hrs
Flood Elev= 23.80'

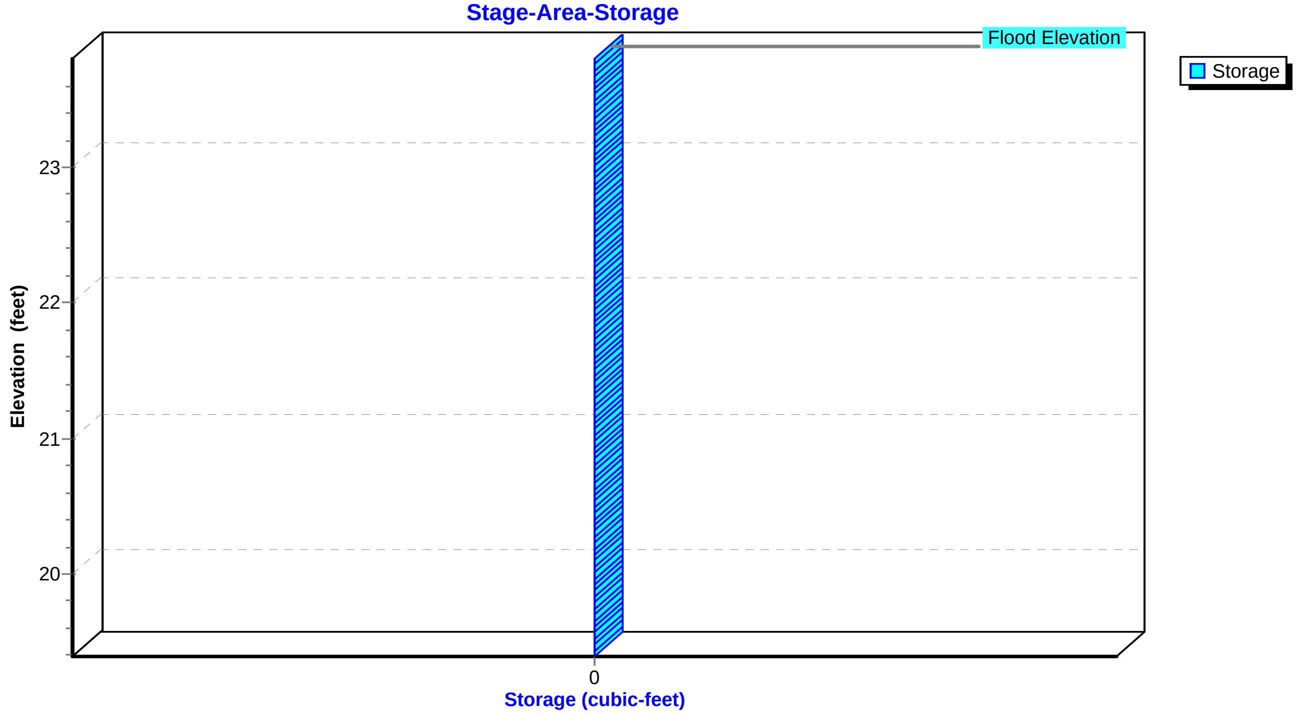
Device	Routing	Invert	Outlet Devices
#1	Primary	19.40'	**12.0" Round Culvert** L= 120.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.40' / 18.80' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.87 cfs @ 12.09 hrs HW=19.98' TW=19.32' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.87 cfs @ 2.64 fps)

Pond MH6: PDMH6



Pond MH6: PDMH6



Summary for Pond MH7: PDMH7

Inflow Area = 9,928 sf,100.00% Impervious, Inflow Depth = 5.56" for 25-yr event
Inflow = 1.26 cfs @ 12.09 hrs, Volume= 4,602 cf
Outflow = 1.26 cfs @ 12.09 hrs, Volume= 4,602 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.00 cfs @ 12.08 hrs, Volume= 4,346 cf
Secondary = 0.27 cfs @ 12.09 hrs, Volume= 256 cf

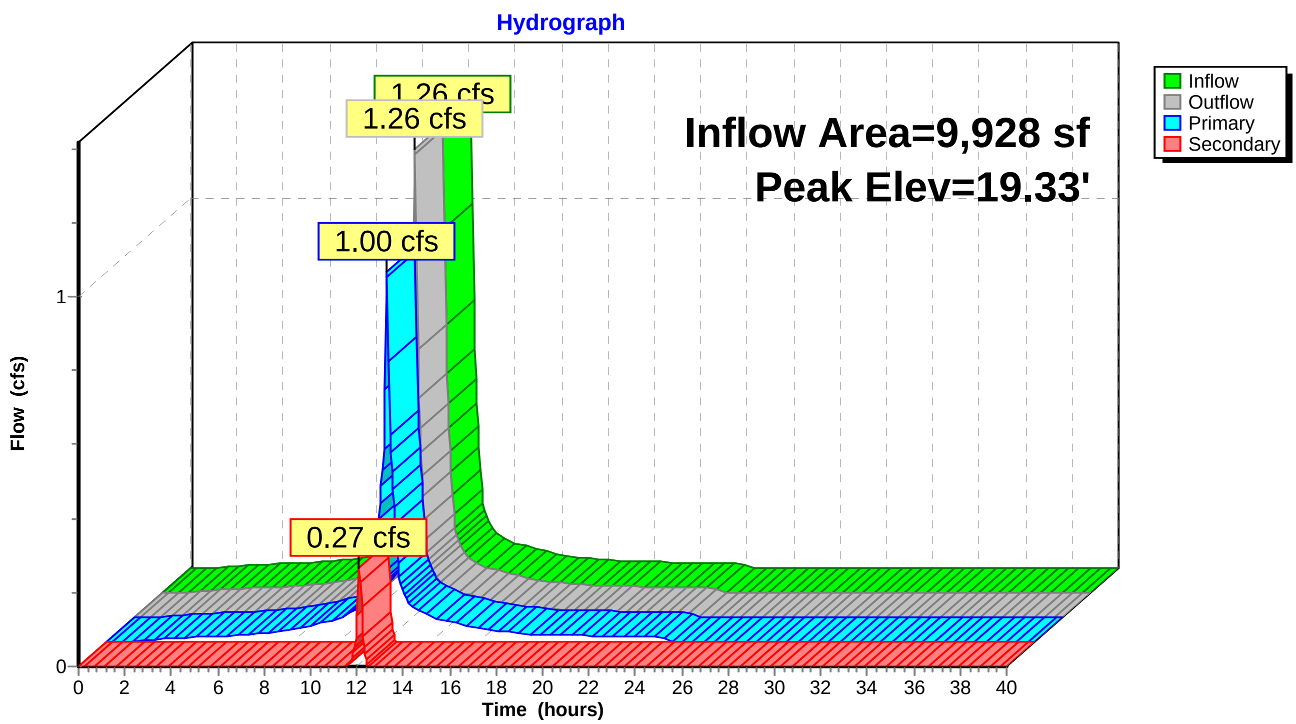
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.33' @ 12.09 hrs
Flood Elev= 21.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.70'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.70' / 18.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	18.70'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.70' / 18.20' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	19.00'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

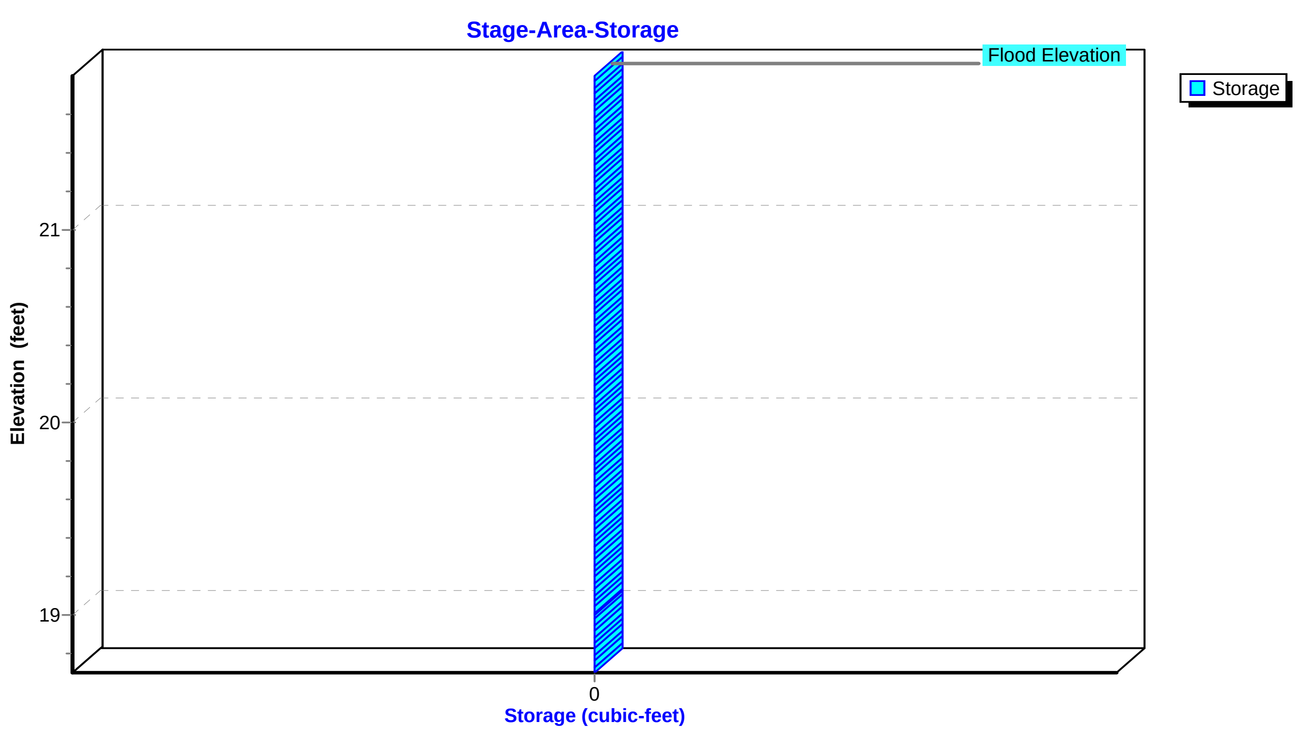
Primary OutFlow Max=0.95 cfs @ 12.08 hrs HW=19.32' TW=19.07' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.95 cfs @ 2.67 fps)

Secondary OutFlow Max=0.26 cfs @ 12.09 hrs HW=19.32' TW=19.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 0.26 cfs of 1.09 cfs potential flow)
  ↑—**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.26 cfs @ 1.86 fps)

Pond MH7: PDMH7



Pond MH7: PDMH7



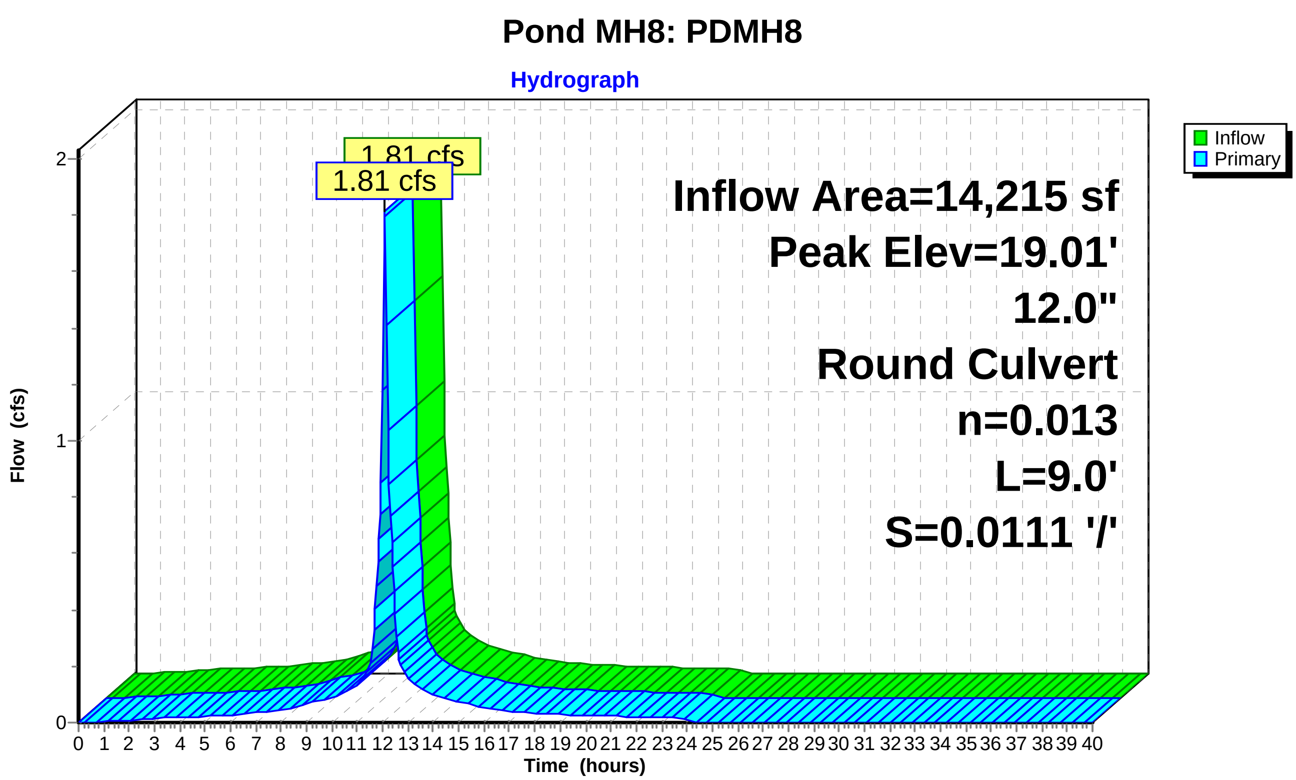
Summary for Pond MH8: PDMH8

Inflow Area =	14,215 sf,100.00% Impervious,	Inflow Depth = 5.56"	for 25-yr event
Inflow =	1.81 cfs @ 12.09 hrs,	Volume=	6,589 cf
Outflow =	1.81 cfs @ 12.09 hrs,	Volume=	6,589 cf, Atten= 0%, Lag= 0.0 min
Primary =	1.81 cfs @ 12.09 hrs,	Volume=	6,589 cf

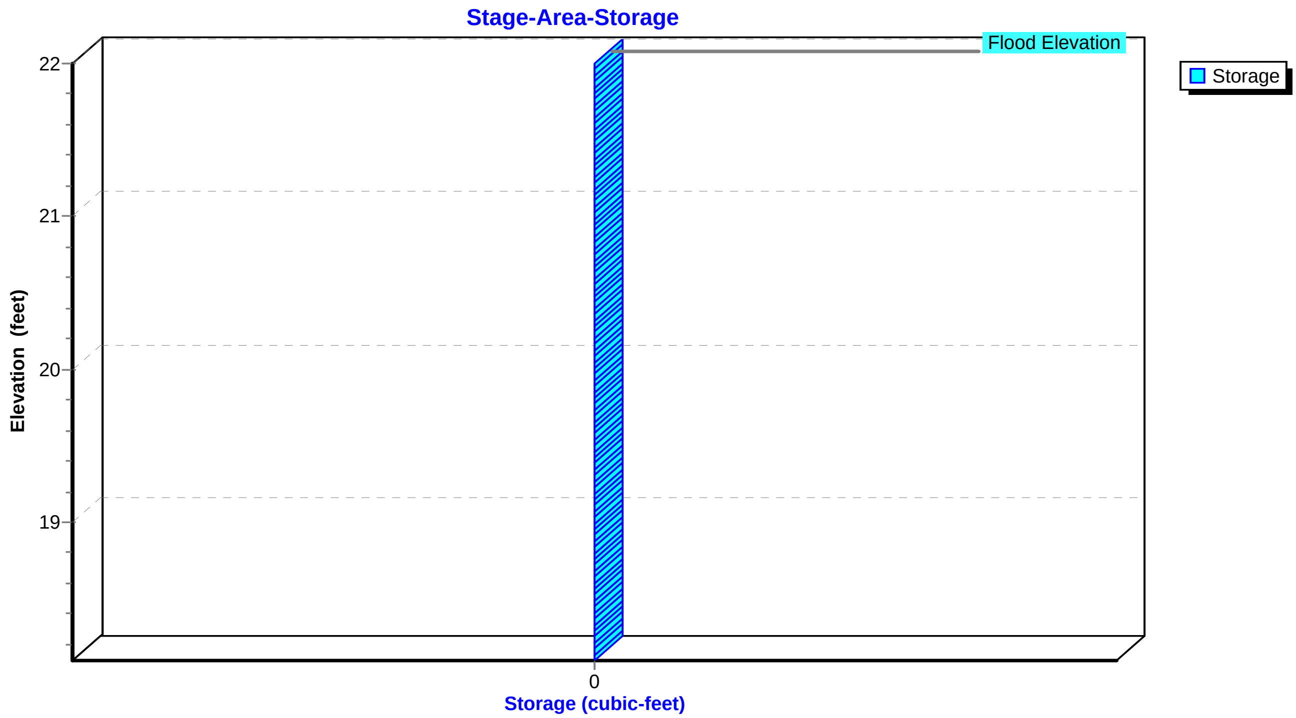
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.01' @ 12.09 hrs
Flood Elev= 22.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.10'	**12.0" Round Culvert** L= 9.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.10' / 18.00' S= 0.0111 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.76 cfs @ 12.09 hrs HW=19.00' TW=17.11' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.76 cfs @ 3.13 fps)



Pond MH8: PDMH8



Summary for Pond RG1: Rain Garden #1

Inflow Area = 25,212 sf, 56.56% Impervious, Inflow Depth = 4.16" for 25-yr event
Inflow = 2.65 cfs @ 12.09 hrs, Volume= 8,750 cf
Outflow = 0.82 cfs @ 12.42 hrs, Volume= 7,768 cf, Atten= 69%, Lag= 19.6 min
Primary = 0.82 cfs @ 12.42 hrs, Volume= 7,768 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.00' @ 12.42 hrs Surf.Area= 6,177 sf Storage= 3,714 cf
Flood Elev= 16.70' Surf.Area= 6,703 sf Storage= 6,272 cf

Plug-Flow detention time= 163.7 min calculated for 7,768 cf (89% of inflow)
Center-of-Mass det. time= 110.6 min (903.1 - 792.6)

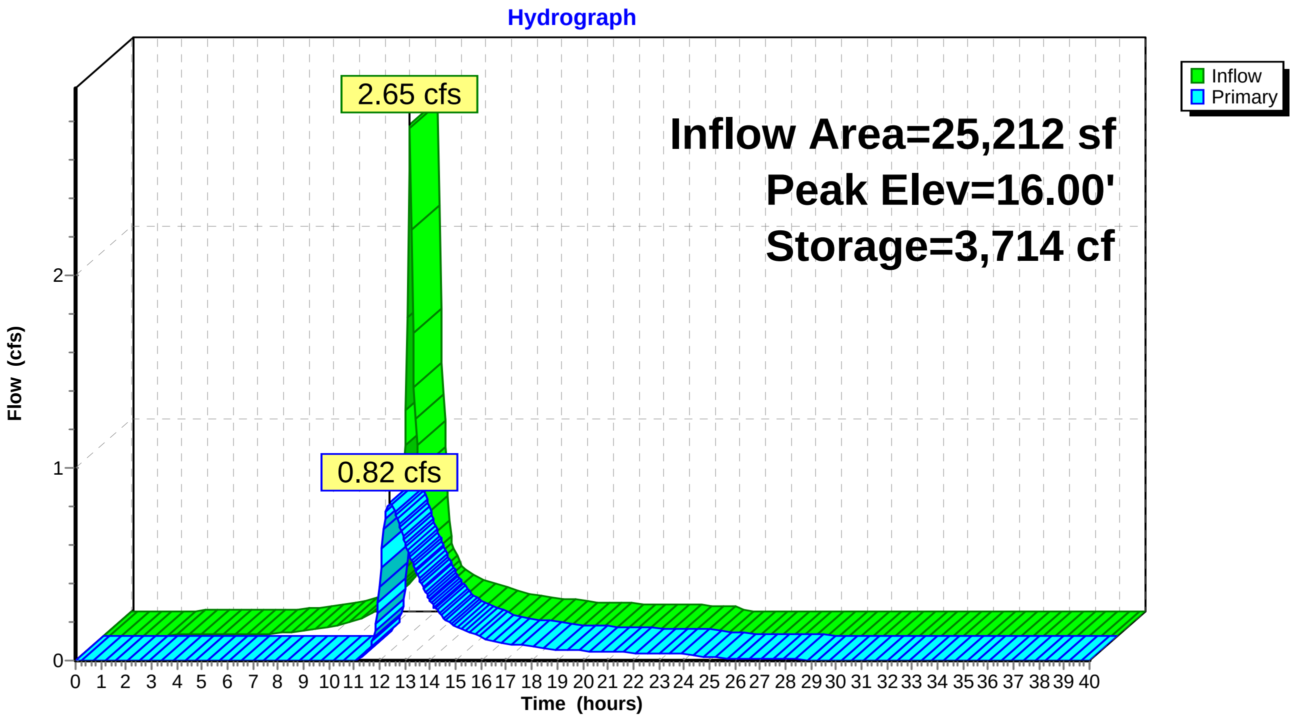
Volume	Invert	Avail.Storage	Storage Description
#1	15.30'	6,272 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
15.30	4,439	288.0	0	0	4,439
16.00	6,173	327.0	3,698	3,698	6,360
16.30	6,569	334.0	1,911	5,609	6,741
16.40	6,703	337.0	664	6,272	6,905

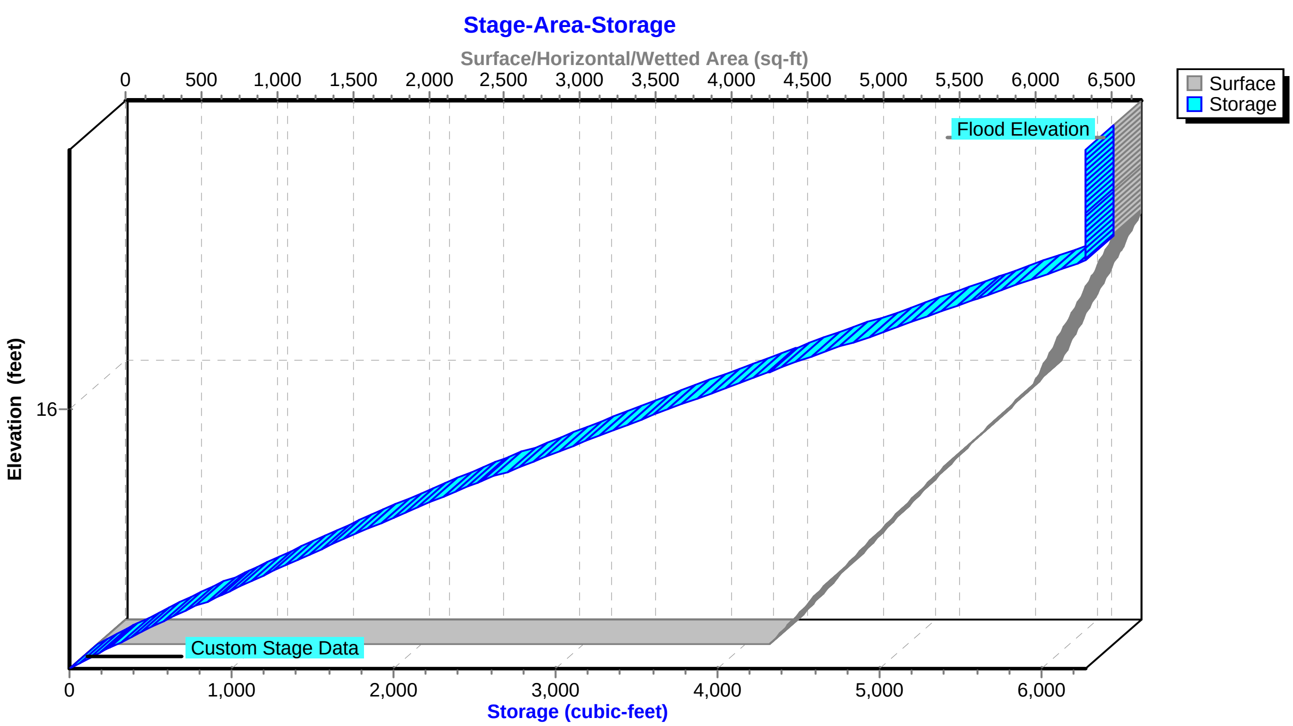
Device	Routing	Invert	Outlet Devices
#1	Primary	15.35'	**8.0" Round Culvert X 2.00** L= 65.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 15.35' / 15.00' S= 0.0054 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	15.50'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	15.80'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	16.10'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.82 cfs @ 12.42 hrs HW=16.00' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.82 cfs of 1.50 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.73 cfs @ 2.79 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.08 cfs @ 1.53 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond RG1: Rain Garden #1



Pond RG1: Rain Garden #1



Summary for Pond RG2: Rain Garden #2

[80] Warning: Exceeded Pond CB3 by 0.23' @ 24.45 hrs (0.12 cfs 1,144 cf)

Inflow Area = 10,003 sf, 68.81% Impervious, Inflow Depth = 4.73" for 25-yr event
Inflow = 1.15 cfs @ 12.09 hrs, Volume= 3,942 cf
Outflow = 1.03 cfs @ 12.14 hrs, Volume= 3,252 cf, Atten= 11%, Lag= 3.2 min
Primary = 1.03 cfs @ 12.14 hrs, Volume= 3,252 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.54' @ 12.14 hrs Surf.Area= 949 sf Storage= 1,076 cf
Flood Elev= 19.00' Surf.Area= 1,118 sf Storage= 1,546 cf

Plug-Flow detention time= 136.4 min calculated for 3,248 cf (82% of inflow)
Center-of-Mass det. time= 66.6 min (841.4 - 774.8)

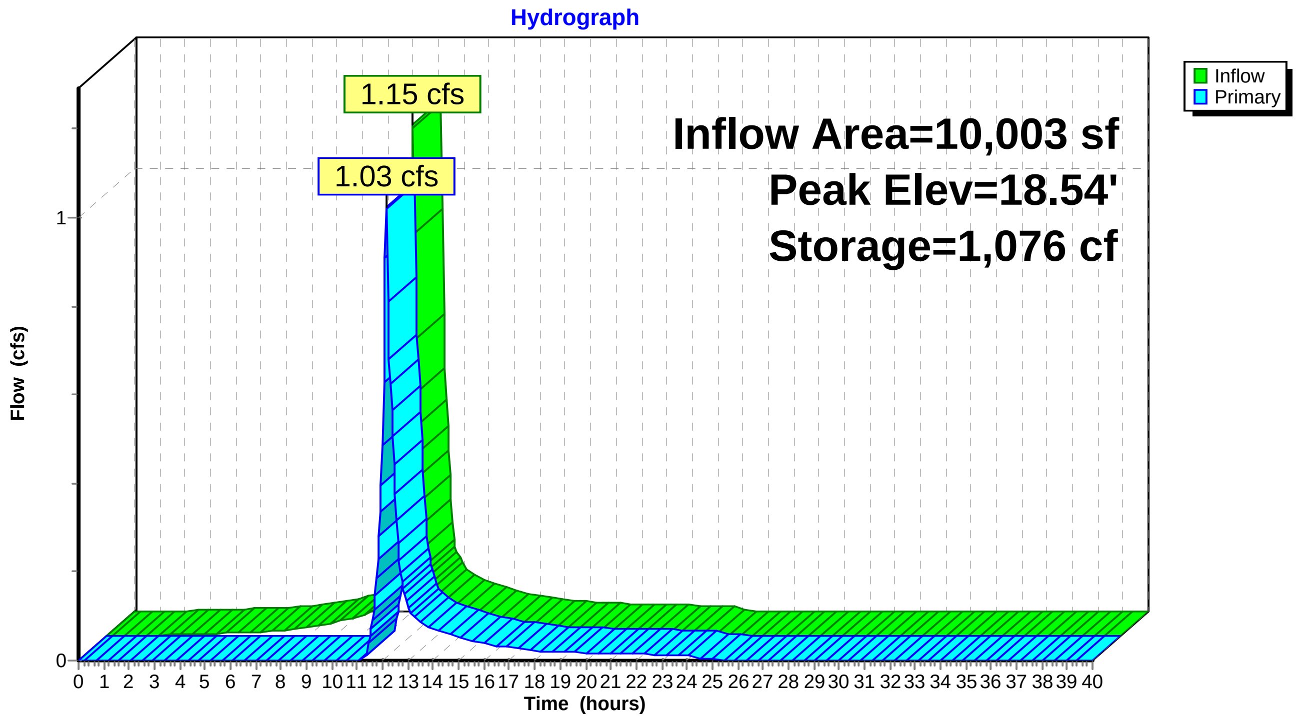
Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	2,934 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
17.00	468	89.0	0	0	468
18.00	765	108.0	610	610	782
19.00	1,118	127.0	936	1,546	1,156
20.00	1,676	152.0	1,388	2,934	1,728

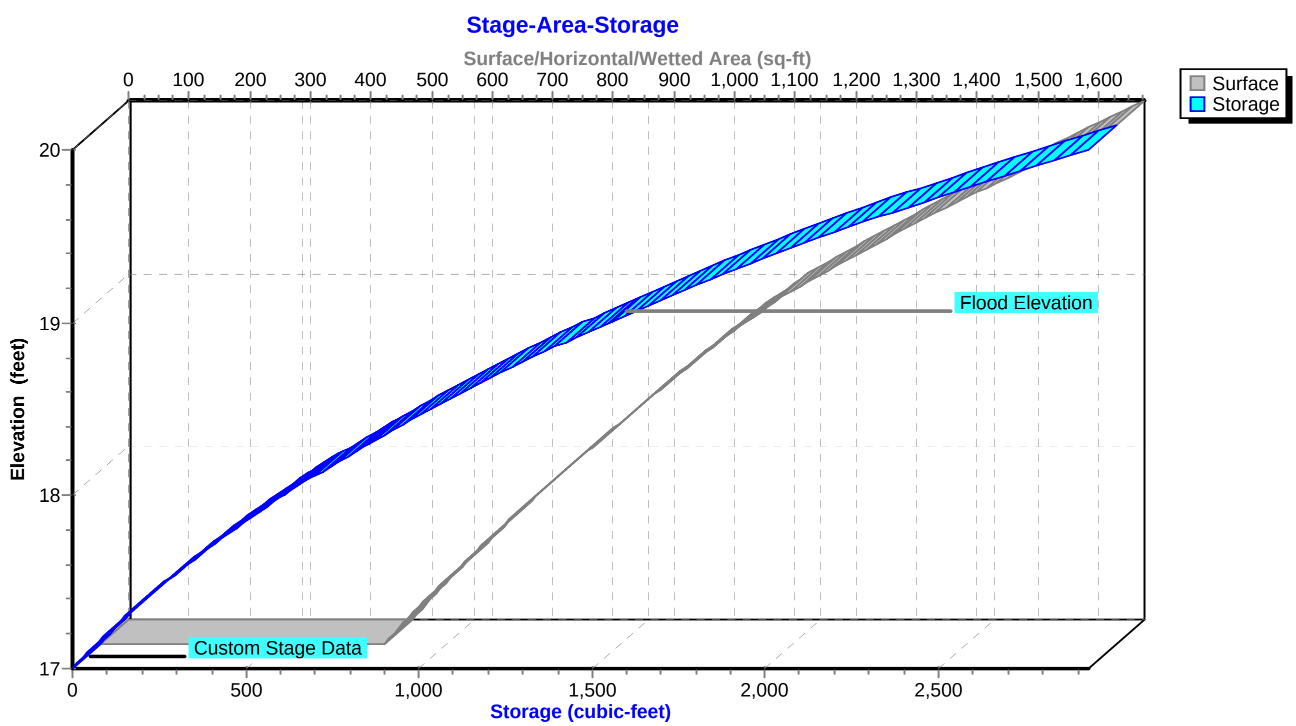
Device	Routing	Invert	Outlet Devices
#1	Primary	16.50'	**12.0" Round Culvert X 2.00** L= 53.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 16.50' / 15.80' S= 0.0132 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	18.10'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	18.30'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	18.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.00 cfs @ 12.14 hrs HW=18.54' TW=16.47' (Dynamic Tailwater)
1=Culvert (Passes 1.00 cfs of 8.29 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.66 cfs @ 2.53 fps)
3=Orifice/Grate (Orifice Controls 0.11 cfs @ 1.68 fps)
4=Orifice/Grate (Weir Controls 0.23 cfs @ 0.67 fps)

Pond RG2: Rain Garden #2



Pond RG2: Rain Garden #2



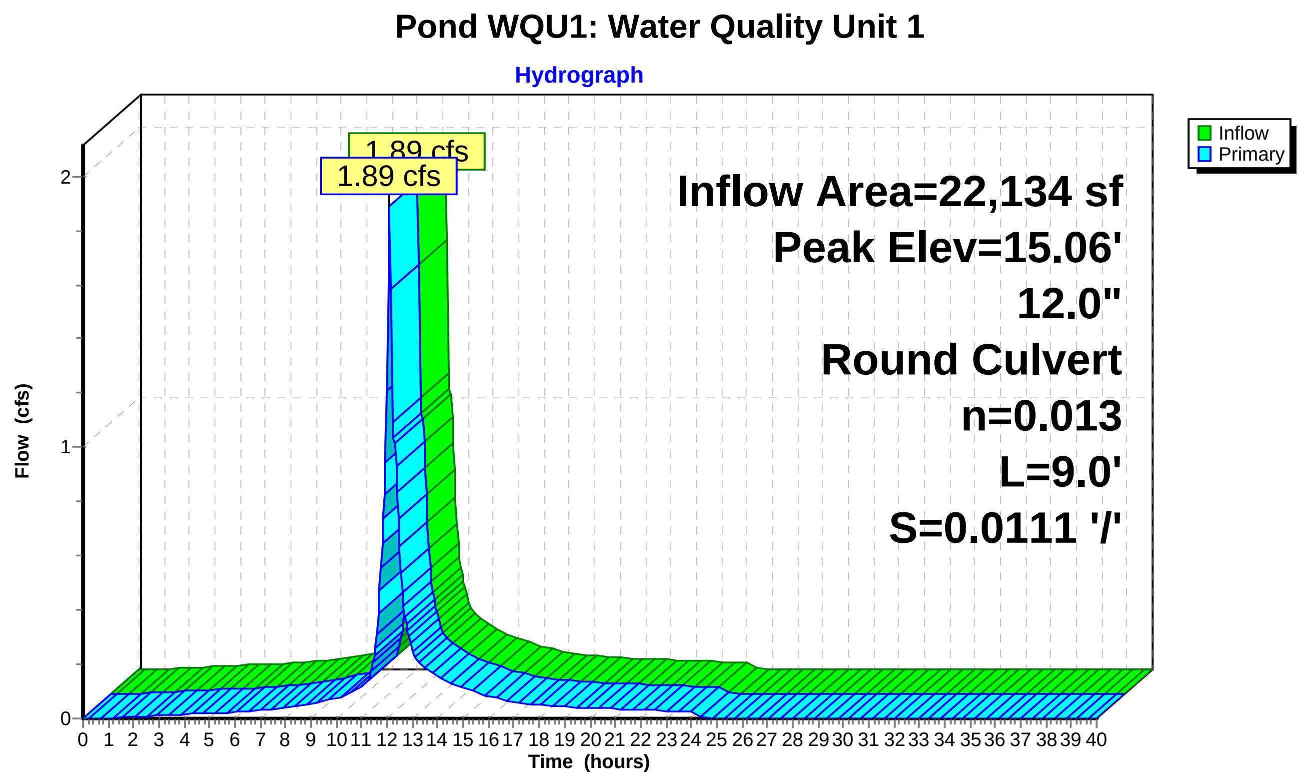
Summary for Pond WQU1: Water Quality Unit 1

Inflow Area = 22,134 sf, 85.50% Impervious, Inflow Depth = 4.39" for 25-yr event
Inflow = 1.89 cfs @ 12.10 hrs, Volume= 8,094 cf
Outflow = 1.89 cfs @ 12.10 hrs, Volume= 8,094 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.89 cfs @ 12.10 hrs, Volume= 8,094 cf

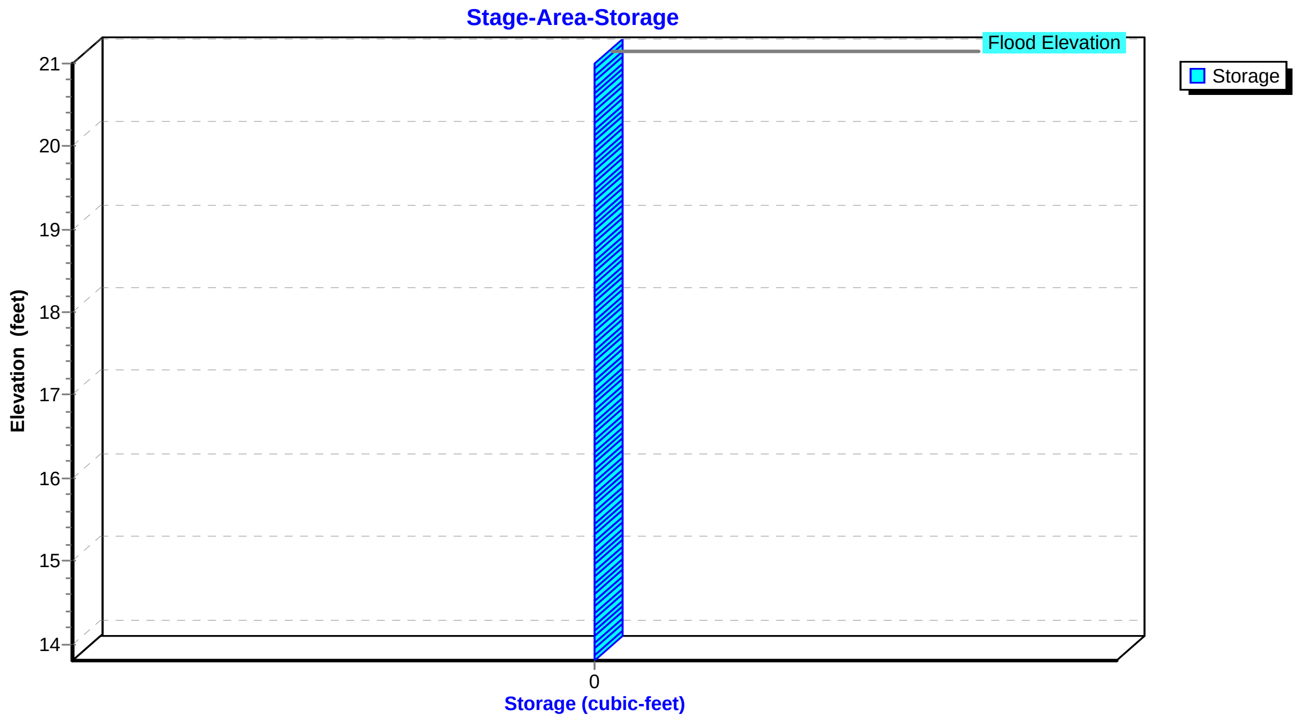
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.06' @ 12.14 hrs
Flood Elev= 21.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	13.80'	**12.0" Round Culvert** L= 9.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 13.80' / 13.70' S= 0.0111 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.33 cfs @ 12.10 hrs HW=14.96' TW=14.76' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 1.33 cfs @ 1.70 fps)



Pond WQU1: Water Quality Unit 1



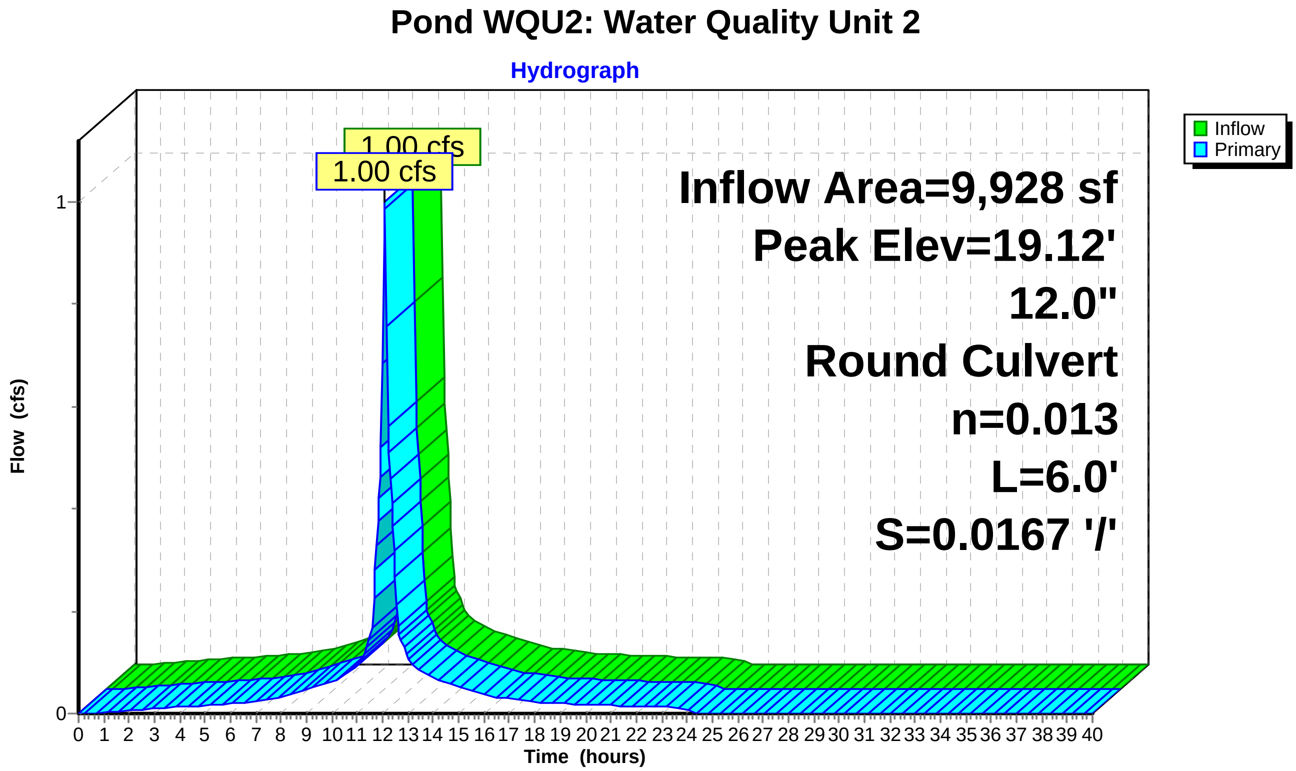
Summary for Pond WQU2: Water Quality Unit 2

Inflow Area =	9,928 sf,100.00% Impervious,	Inflow Depth = 5.25" for 25-yr event		
Inflow =	1.00 cfs @	12.08 hrs, Volume=	4,346 cf	
Outflow =	1.00 cfs @	12.08 hrs, Volume=	4,346 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.00 cfs @	12.08 hrs, Volume=	4,346 cf	

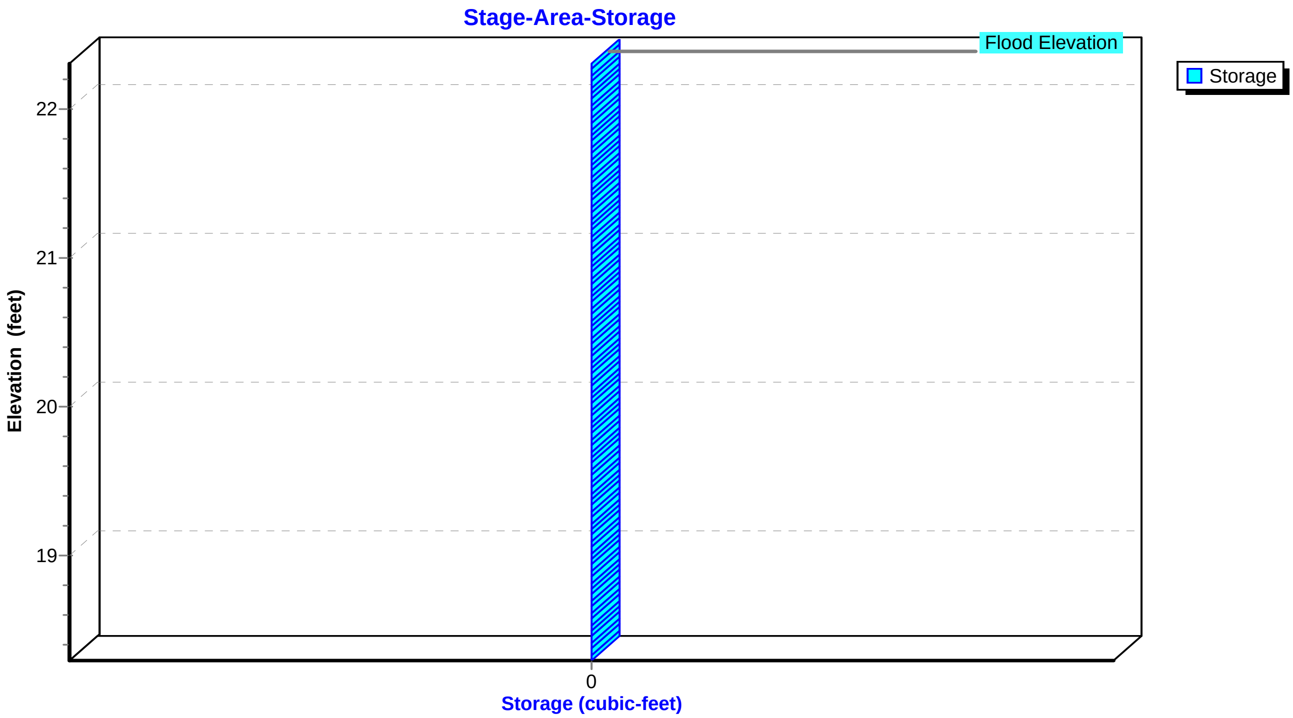
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.12' @ 12.12 hrs
Flood Elev= 22.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.30'	**12.0" Round Culvert** L= 6.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.30' / 18.20' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.69 cfs @ 12.08 hrs HW=19.07' TW=19.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.69 cfs @ 1.05 fps)



Pond WQU2: Water Quality Unit 2



Proposed Conditions Analysis
50-Year 24-Hour Storm Event

Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100: 100 - Pavement, Lawn, Runoff Area=20,037 sf 45.35% Impervious Runoff Depth=5.01"
Tc=6.0 min CN=82 Runoff=2.60 cfs 8,365 cf

Subcatchment 101: 101 - West Side Lawn to Runoff Area=271 sf 0.00% Impervious Runoff Depth=4.13"
Tc=6.0 min CN=74 Runoff=0.03 cfs 93 cf

Subcatchment 102: 102 - Existing Building Runoff Area=5,175 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=0.81 cfs 2,959 cf

Subcatchment 200: 200 - Portion of Runoff Area=2,107 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=0.33 cfs 1,205 cf

Subcatchment 201: 201 - Pavement Runoff Area=2,187 sf 95.93% Impervious Runoff Depth=6.74"
Tc=6.0 min CN=97 Runoff=0.34 cfs 1,229 cf

Subcatchment 202: 202 - Pavement Runoff Area=1,651 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=0.26 cfs 944 cf

Subcatchment 203: 203 - Pavement Runoff Area=5,013 sf 96.69% Impervious Runoff Depth=6.74"
Tc=6.0 min CN=97 Runoff=0.78 cfs 2,816 cf

Subcatchment 204: 204 - Pavement Runoff Area=4,813 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=0.75 cfs 2,752 cf

Subcatchment 205: 205 - Pavement Runoff Area=3,480 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=0.54 cfs 1,990 cf

Subcatchment 206: 206 - Pavement Runoff Area=5,141 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=0.80 cfs 2,939 cf

Subcatchment 207: 207 - Pavement Runoff Area=2,680 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=0.42 cfs 1,532 cf

Subcatchment 208: 208 - Proposed Runoff Area=4,287 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=0.67 cfs 2,451 cf

Subcatchment 209: 209 - Portion of Runoff Area=4,990 sf 40.80% Impervious Runoff Depth=5.23"
Tc=6.0 min CN=84 Runoff=0.67 cfs 2,177 cf

Subcatchment 210: 210 - Existing South Runoff Area=44,935 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=210' Tc=10.6 min CN=65 Runoff=3.24 cfs 11,908 cf

Subcatchment 300: 300 - Lawn East to DP3 Runoff Area=1,921 sf 0.00% Impervious Runoff Depth=4.13"
Tc=6.0 min CN=74 Runoff=0.21 cfs 661 cf

Pond CB1: PCB1 Peak Elev=16.96' Inflow=0.34 cfs 1,229 cf
12.0" Round Culvert n=0.013 L=21.0' S=0.0095 '/' Outflow=0.34 cfs 1,229 cf

Pond CB2: PCB2 Peak Elev=16.92' Inflow=0.26 cfs 944 cf
12.0" Round Culvert n=0.013 L=21.0' S=0.0095 '/' Outflow=0.26 cfs 944 cf

Pond CB3: PCB3 Peak Elev=18.69' Inflow=0.78 cfs 2,816 cf
12.0" Round Culvert n=0.013 L=64.0' S=0.0063 '/' Outflow=0.78 cfs 2,816 cf

Pond CB4: PCB4 Peak Elev=15.91' Inflow=0.75 cfs 2,752 cf
12.0" Round Culvert n=0.013 L=94.0' S=0.0085 '/' Outflow=0.75 cfs 2,752 cf

Pond CB5: PCB5 Peak Elev=15.88' Inflow=0.54 cfs 1,990 cf
12.0" Round Culvert n=0.013 L=93.0' S=0.0054 '/' Outflow=0.54 cfs 1,990 cf

Pond CB6: PCB6 Peak Elev=20.47' Inflow=0.80 cfs 2,939 cf
12.0" Round Culvert n=0.013 L=78.0' S=0.0051 '/' Outflow=0.80 cfs 2,939 cf

Pond CB7: PCB7 Peak Elev=19.45' Inflow=0.42 cfs 1,532 cf
12.0" Round Culvert n=0.013 L=11.0' S=0.0091 '/' Outflow=0.42 cfs 1,532 cf

Pond DP1: Design Pont #1_18" RCP Culvert - Northwest Inflow=1.19 cfs 10,435 cf
Primary=1.19 cfs 10,435 cf

Pond DP2: Design Pont #2_Wetland-South Inflow=6.26 cfs 23,686 cf
Primary=6.26 cfs 23,686 cf

Pond DP3: Design Pont #3_Abutting Lot-East Inflow=0.21 cfs 661 cf
Primary=0.21 cfs 661 cf

Pond IS: Infiltration System Peak Elev=18.26' Storage=2,039 cf Inflow=2.22 cfs 8,127 cf
Discarded=0.28 cfs 7,567 cf Primary=0.41 cfs 560 cf Outflow=0.69 cfs 8,127 cf

Pond MH1: PDMH1 Peak Elev=16.84' Inflow=0.60 cfs 2,173 cf
12.0" Round Culvert n=0.013 L=85.0' S=0.0059 '/' Outflow=0.60 cfs 2,173 cf

Pond MH2: PDMH2 Peak Elev=16.65' Inflow=2.00 cfs 6,476 cf
12.0" Round Culvert n=0.013 L=115.0' S=0.0052 '/' Outflow=2.00 cfs 6,476 cf

Pond MH3: PDMH3 Peak Elev=16.15' Inflow=2.00 cfs 6,476 cf
12.0" Round Culvert n=0.013 L=138.0' S=0.0051 '/' Outflow=2.00 cfs 6,476 cf

Pond MH4: PDMH4 Peak Elev=15.87' Inflow=3.27 cfs 11,217 cf
Primary=2.36 cfs 10,018 cf Secondary=1.07 cfs 1,200 cf Outflow=3.27 cfs 11,217 cf

Pond MH5: PDMH5 Peak Elev=15.30' Inflow=3.27 cfs 11,218 cf
12.0" Round Culvert n=0.013 L=23.0' S=0.0087 '/' Outflow=3.27 cfs 11,218 cf

Pond MH6: PDMH6 Peak Elev=20.07' Inflow=1.13 cfs 4,144 cf
12.0" Round Culvert n=0.013 L=120.0' S=0.0050 '/' Outflow=1.13 cfs 4,144 cf

Pond MH7: PDMH7 Peak Elev=19.42' Inflow=1.55 cfs 5,676 cf
Primary=1.22 cfs 5,289 cf Secondary=0.34 cfs 387 cf Outflow=1.55 cfs 5,676 cf

Pond MH8: PDMH8 Peak Elev=19.16' Inflow=2.22 cfs 8,127 cf
12.0" Round Culvert n=0.013 L=9.0' S=0.0111 '/' Outflow=2.22 cfs 8,127 cf

Pond RG1: Rain Garden #1 Peak Elev=16.13' Storage=4,522 cf Inflow=3.41 cfs 11,324 cf
Outflow=1.18 cfs 10,342 cf

Pond RG2: Rain Garden #2 Peak Elev=18.58' Storage=1,110 cf Inflow=1.45 cfs 4,993 cf
Outflow=1.43 cfs 4,303 cf

Pond WQU1: Water Quality Unit 1 Peak Elev=15.68' Inflow=2.36 cfs 10,018 cf
12.0" Round Culvert n=0.013 L=9.0' S=0.0111 '/' Outflow=2.36 cfs 10,018 cf

Pond WQU2: Water Quality Unit 2 Peak Elev=19.28' Inflow=1.22 cfs 5,289 cf
12.0" Round Culvert n=0.013 L=6.0' S=0.0167 '/' Outflow=1.22 cfs 5,289 cf

Summary for Subcatchment 100: 100 - Pavement, Lawn, and Direct Entry to Rain Garden

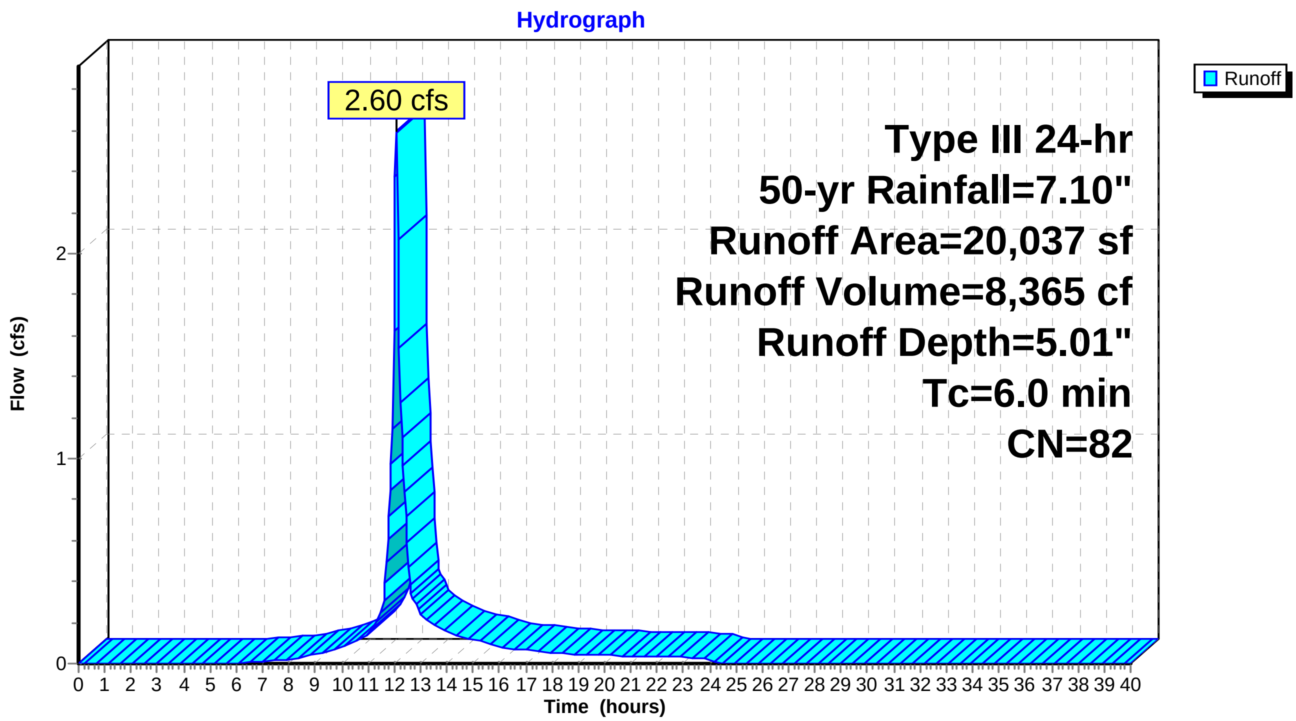
Runoff = 2.60 cfs @ 12.09 hrs, Volume= 8,365 cf, Depth= 5.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

	Area (sf)	CN	Description
	4,778	74	>75% Grass cover, Good, HSG C
*	6,173	65	Rain Garden surface area
	9,086	98	Paved parking, HSG C
	20,037	82	Weighted Average
	10,951		54.65% Pervious Area
	9,086		45.35% Impervious Area

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

Subcatchment 100: 100 - Pavement, Lawn, and Direct Entry to Rain Garden



Summary for Subcatchment 101: 101 - West Side Lawn to DP1

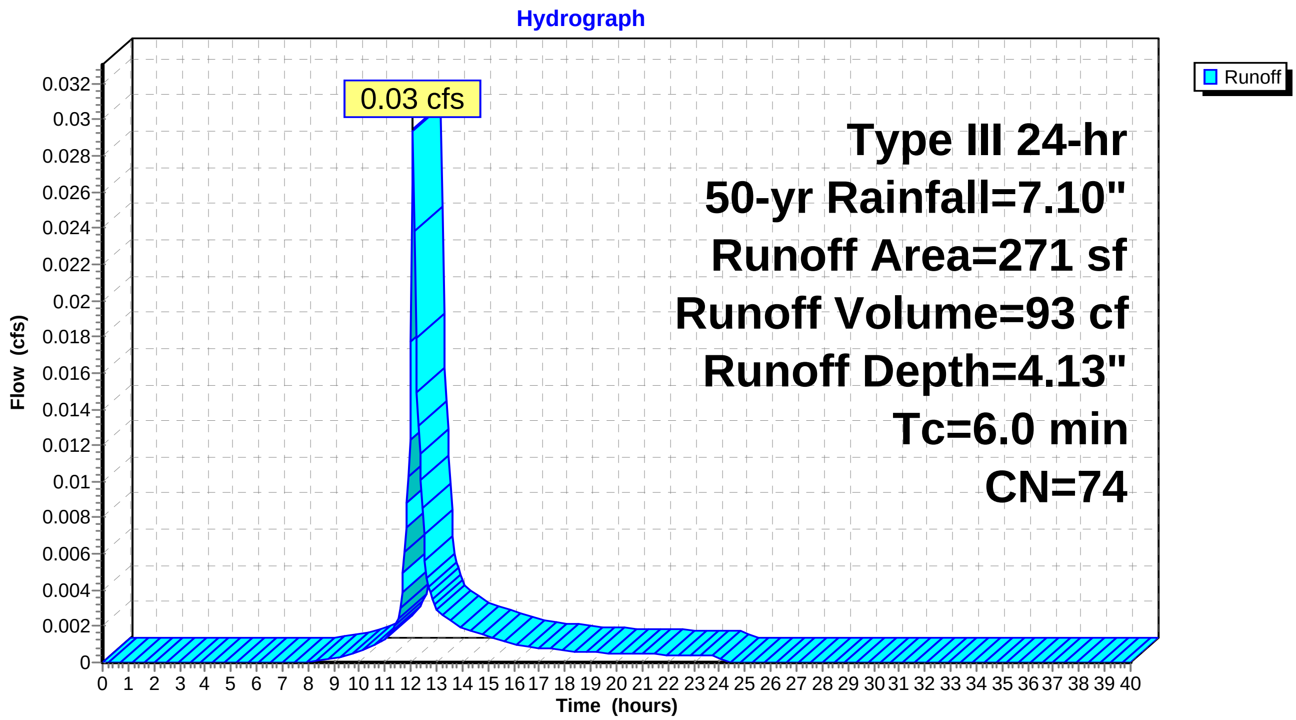
Runoff = 0.03 cfs @ 12.09 hrs, Volume= 93 cf, Depth= 4.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

Area (sf)	CN	Description
271	74	>75% Grass cover, Good, HSG C
271		100.00% Pervious Area

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

Subcatchment 101: 101 - West Side Lawn to DP1



Summary for Subcatchment 102: 102 - Existing Building

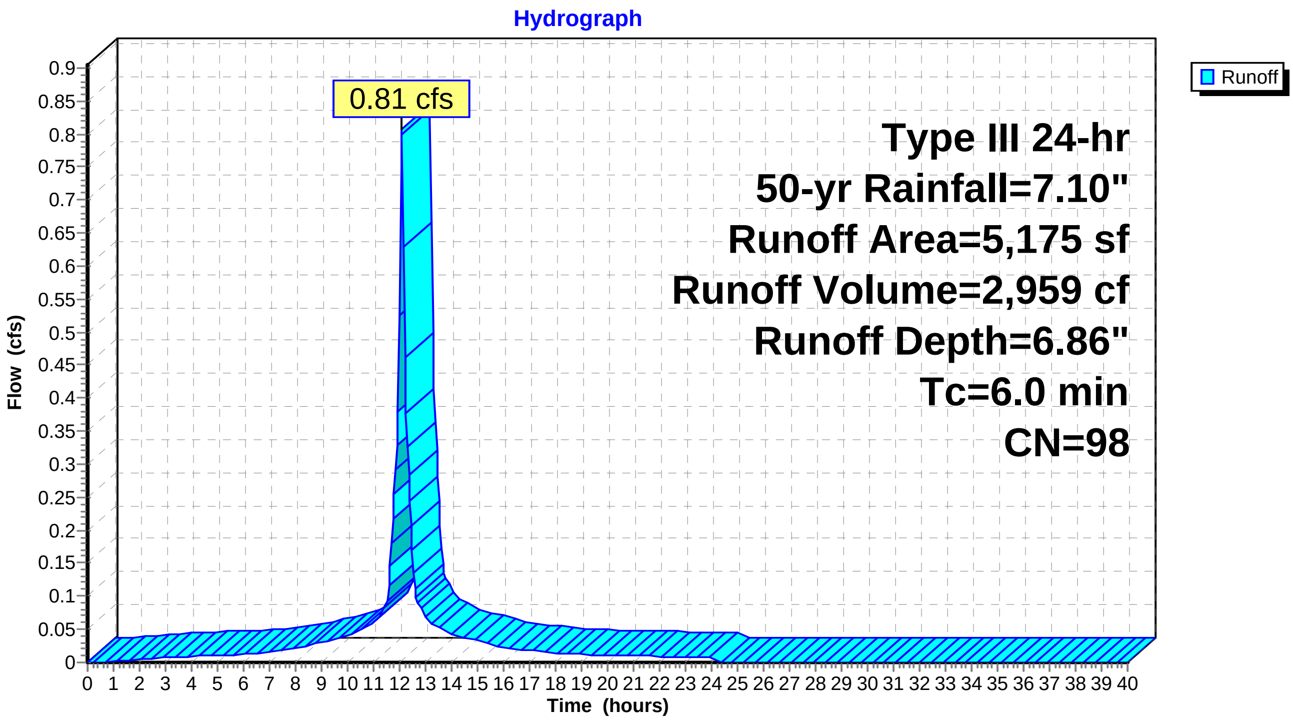
Runoff = 0.81 cfs @ 12.09 hrs, Volume= 2,959 cf, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

	Area (sf)	CN	Description
*	5,175	98	Roofs, HSG C, Existing Building
	5,175		100.00% Impervious Area

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

Subcatchment 102: 102 - Existing Building



Summary for Subcatchment 200: 200 - Portion of Proposed Building Tenant A to Rain Garden #2

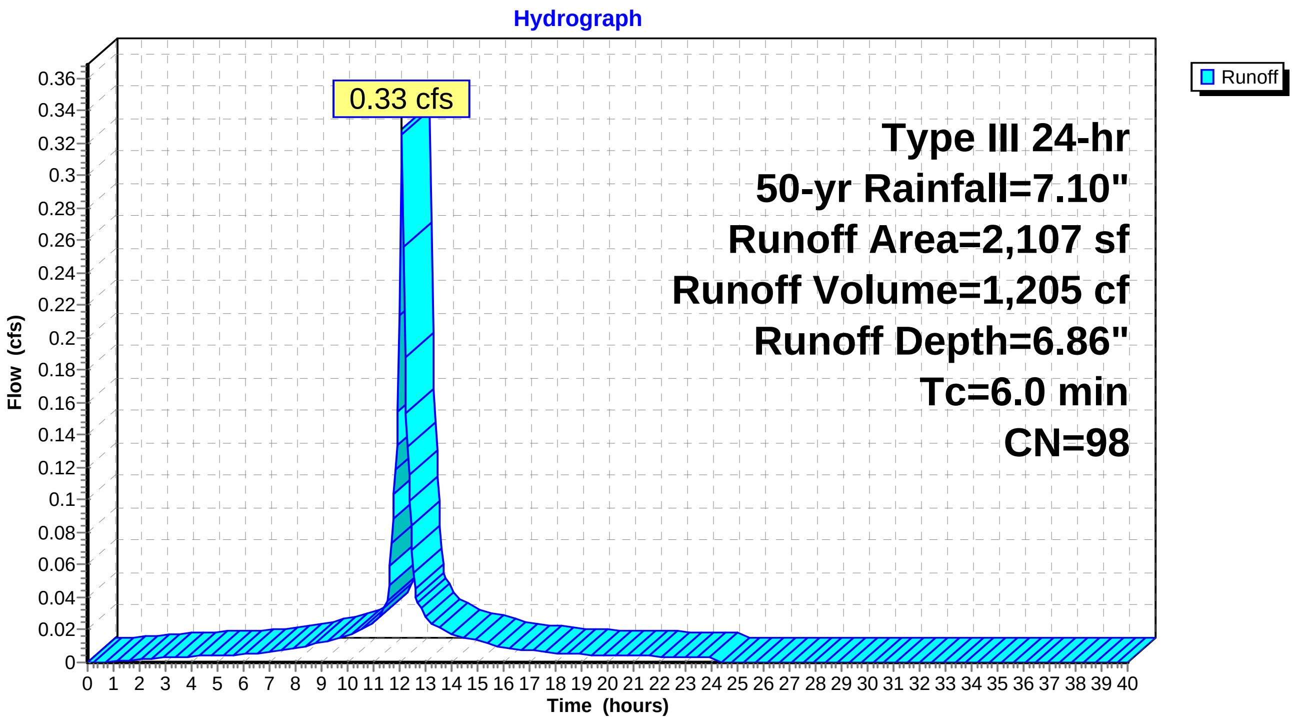
Runoff = 0.33 cfs @ 12.09 hrs, Volume= 1,205 cf, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

	Area (sf)	CN	Description
*	2,107	98	Roofs, HSG C, Half Prop. Building A
	2,107		100.00% Impervious Area

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

Subcatchment 200: 200 - Portion of Proposed Building Tenant A to Rain Garden #2



Summary for Subcatchment 201: 201 - Pavement

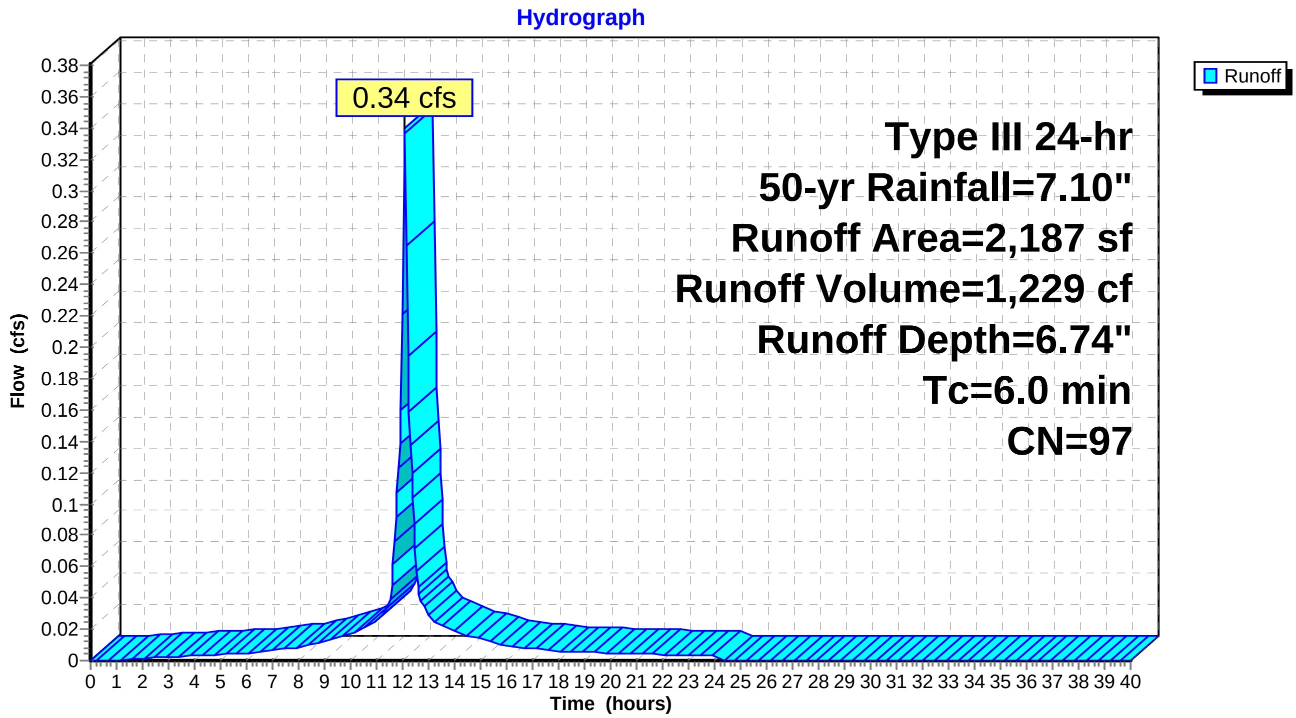
Runoff = 0.34 cfs @ 12.09 hrs, Volume= 1,229 cf, Depth= 6.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

Area (sf)	CN	Description
2,098	98	Paved parking, HSG C
89	74	>75% Grass cover, Good, HSG C
2,187	97	Weighted Average
89		4.07% Pervious Area
2,098		95.93% Impervious Area

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

Subcatchment 201: 201 - Pavement



Summary for Subcatchment 202: 202 - Pavement

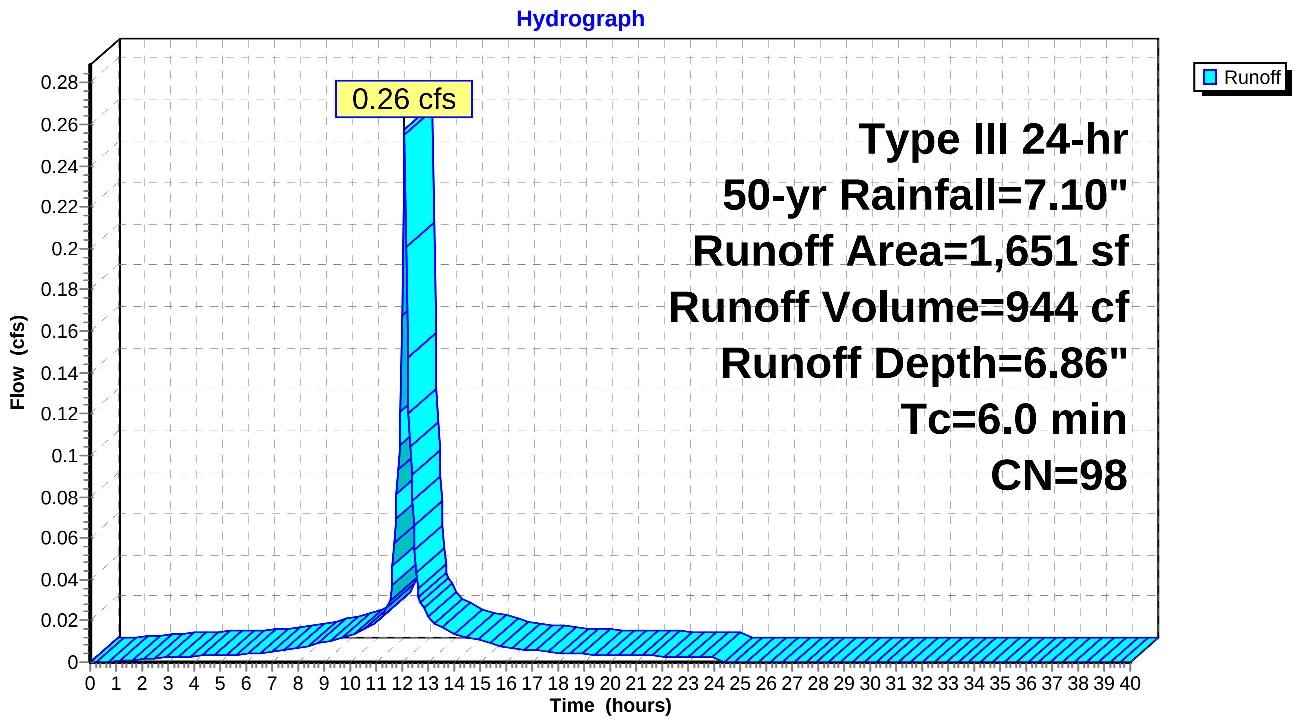
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 944 cf, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

Area (sf)	CN	Description
1,651	98	Paved parking, HSG C
1,651		100.00% Impervious Area

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

Subcatchment 202: 202 - Pavement



Summary for Subcatchment 203: 203 - Pavement

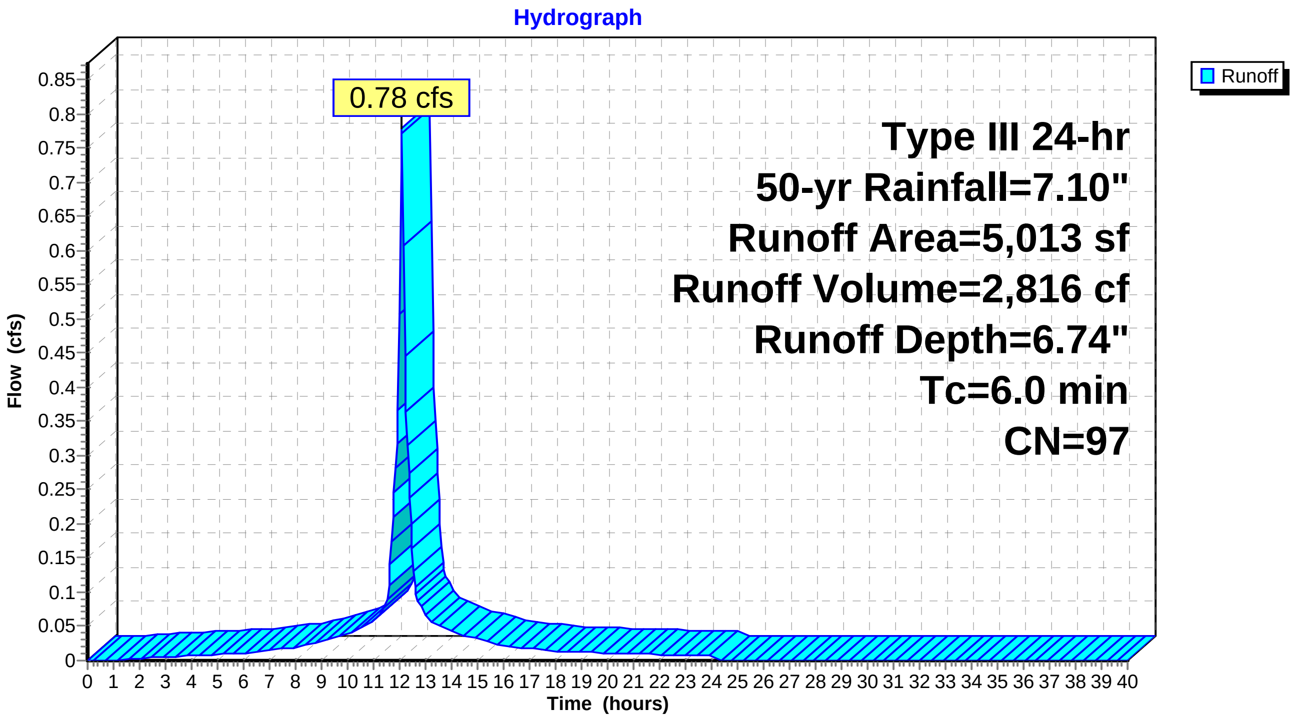
Runoff = 0.78 cfs @ 12.09 hrs, Volume= 2,816 cf, Depth= 6.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

Area (sf)	CN	Description
4,847	98	Paved parking, HSG C
166	74	>75% Grass cover, Good, HSG C
5,013	97	Weighted Average
166		3.31% Pervious Area
4,847		96.69% Impervious Area

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

Subcatchment 203: 203 - Pavement



Summary for Subcatchment 204: 204 - Pavement

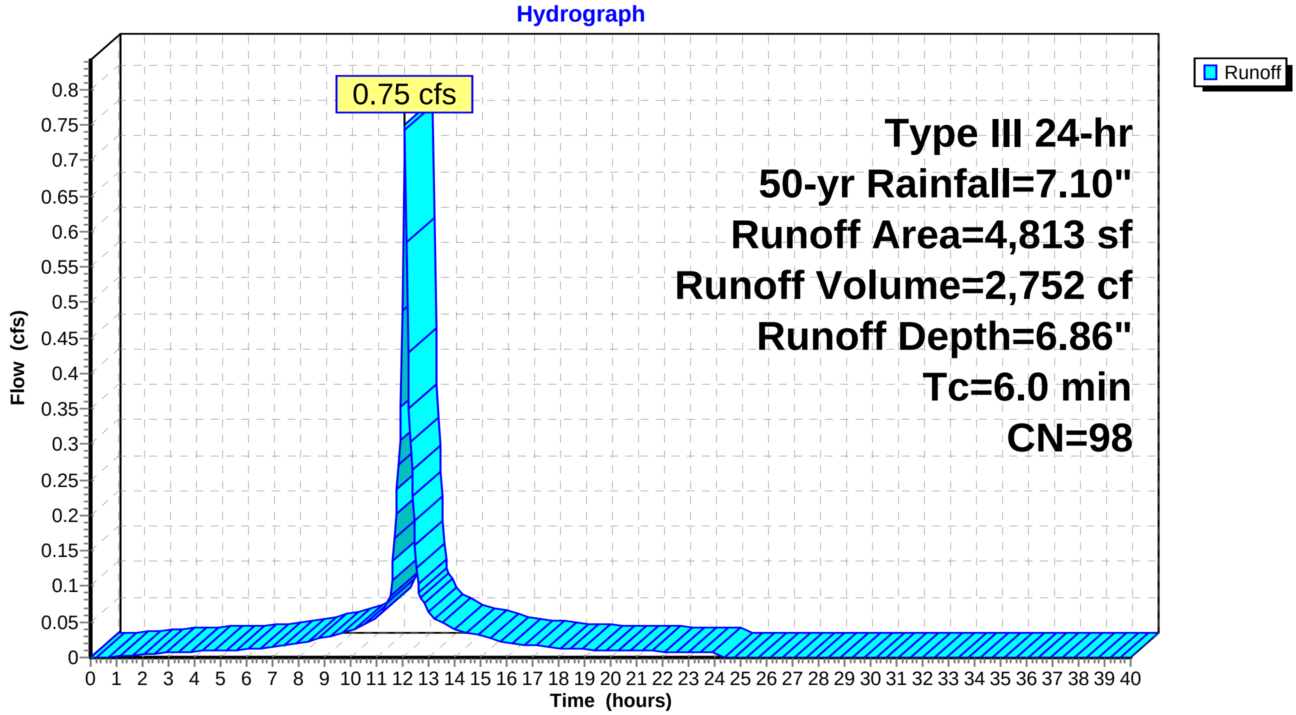
Runoff = 0.75 cfs @ 12.09 hrs, Volume= 2,752 cf, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

Area (sf)	CN	Description
4,813	98	Paved parking, HSG C
4,813		100.00% Impervious Area

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

Subcatchment 204: 204 - Pavement



Summary for Subcatchment 205: 205 - Pavement

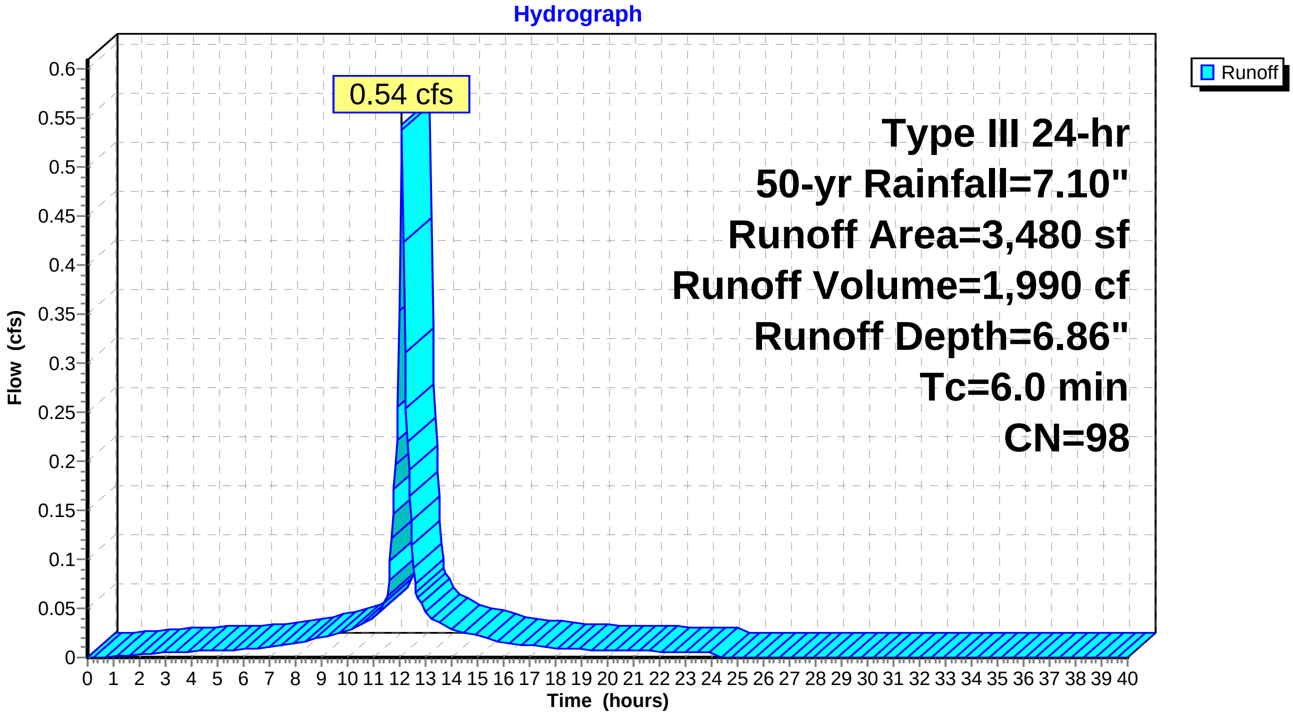
Runoff = 0.54 cfs @ 12.09 hrs, Volume= 1,990 cf, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

Area (sf)	CN	Description
3,480	98	Paved parking, HSG C
3,480		100.00% Impervious Area

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

Subcatchment 205: 205 - Pavement



Summary for Subcatchment 206: 206 - Pavement

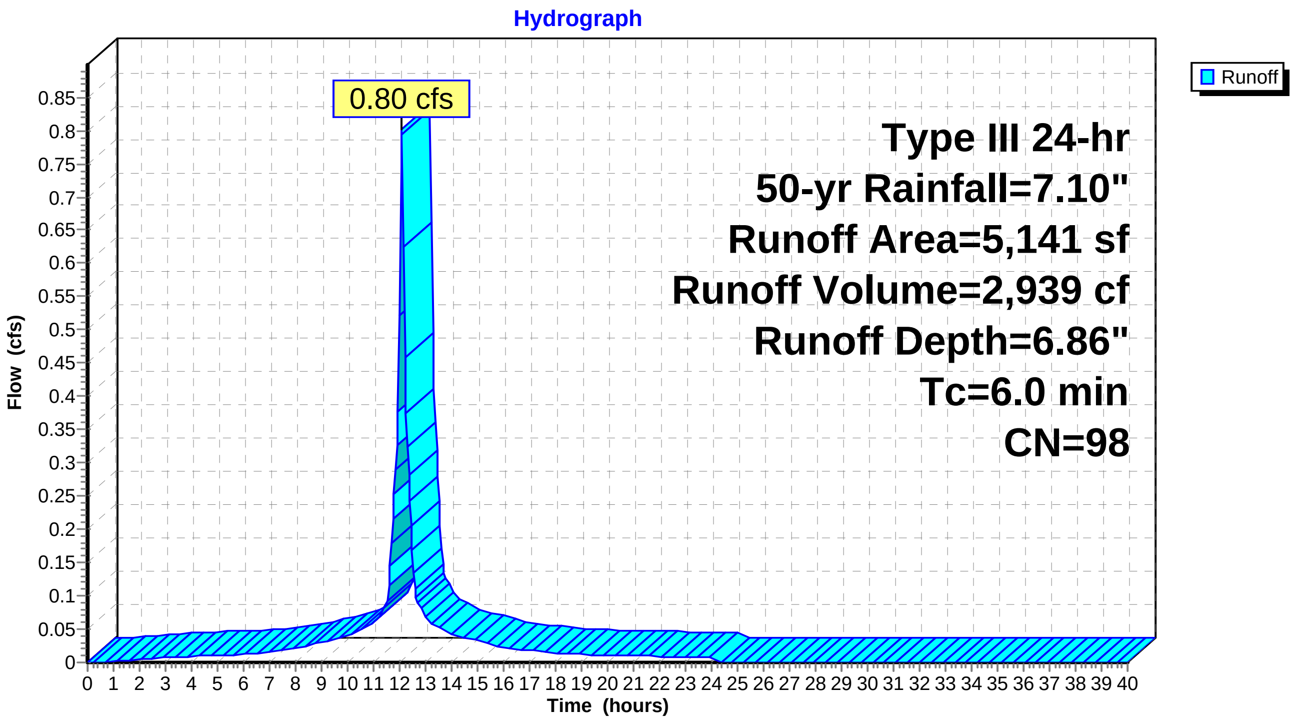
Runoff = 0.80 cfs @ 12.09 hrs, Volume= 2,939 cf, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

Area (sf)	CN	Description
5,141	98	Paved parking, HSG C
5,141		100.00% Impervious Area

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

Subcatchment 206: 206 - Pavement



Summary for Subcatchment 207: 207 - Pavement

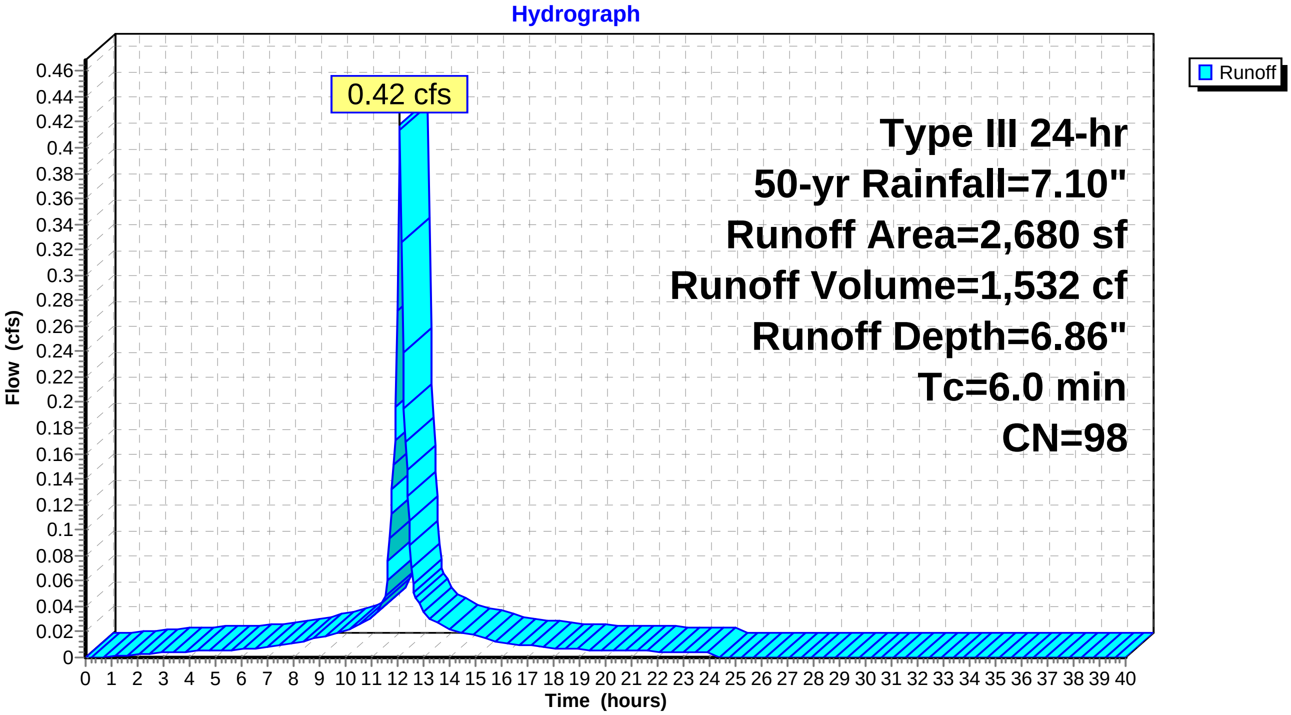
Runoff = 0.42 cfs @ 12.09 hrs, Volume= 1,532 cf, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

Area (sf)	CN	Description
2,680	98	Paved parking, HSG C
2,680		100.00% Impervious Area

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

Subcatchment 207: 207 - Pavement



Summary for Subcatchment 208: 208 - Proposed Building Tenant B

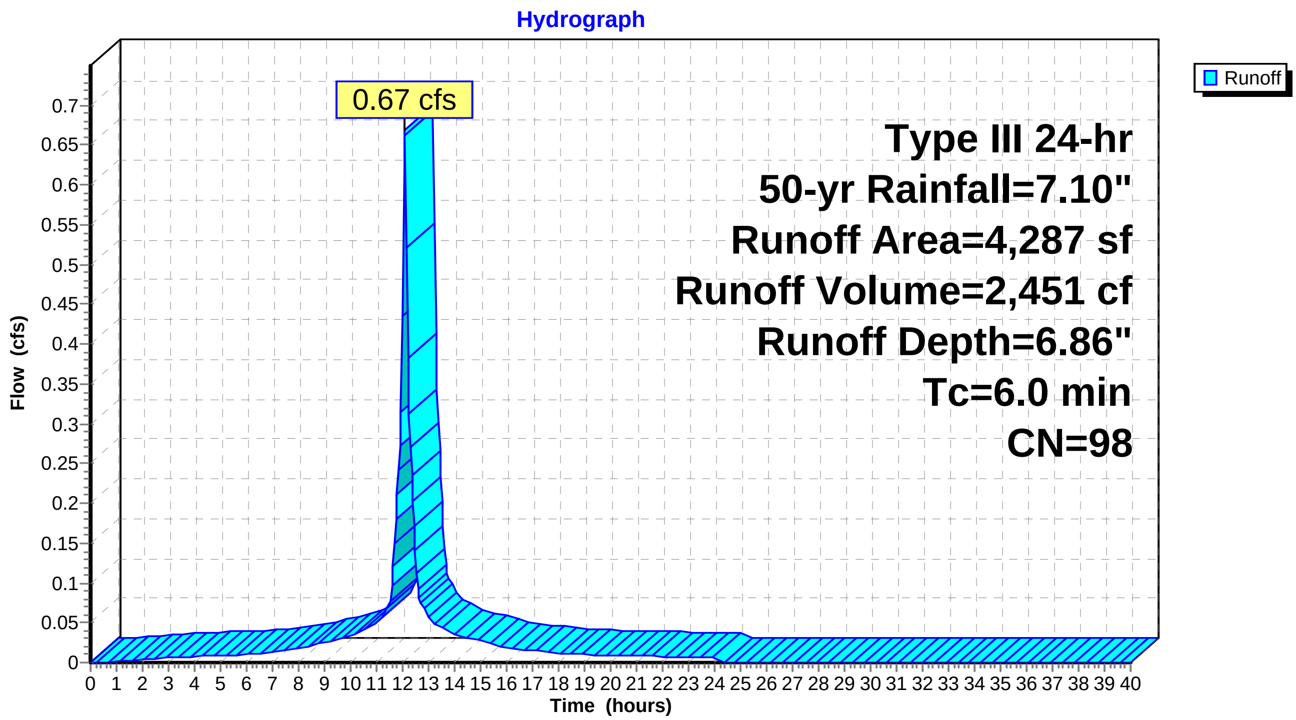
Runoff = 0.67 cfs @ 12.09 hrs, Volume= 2,451 cf, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

Area (sf)	CN	Description
4,287	98	Roofs, HSG C
0	98	Roofs, HSG C
4,287	98	Weighted Average
4,287		100.00% Impervious Area

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

Subcatchment 208: 208 - Proposed Building Tenant B



mary for Subcatchment 209: 209 - Portion of Proposed Building Tentant A, Rain Garden #2, Lawn, and W

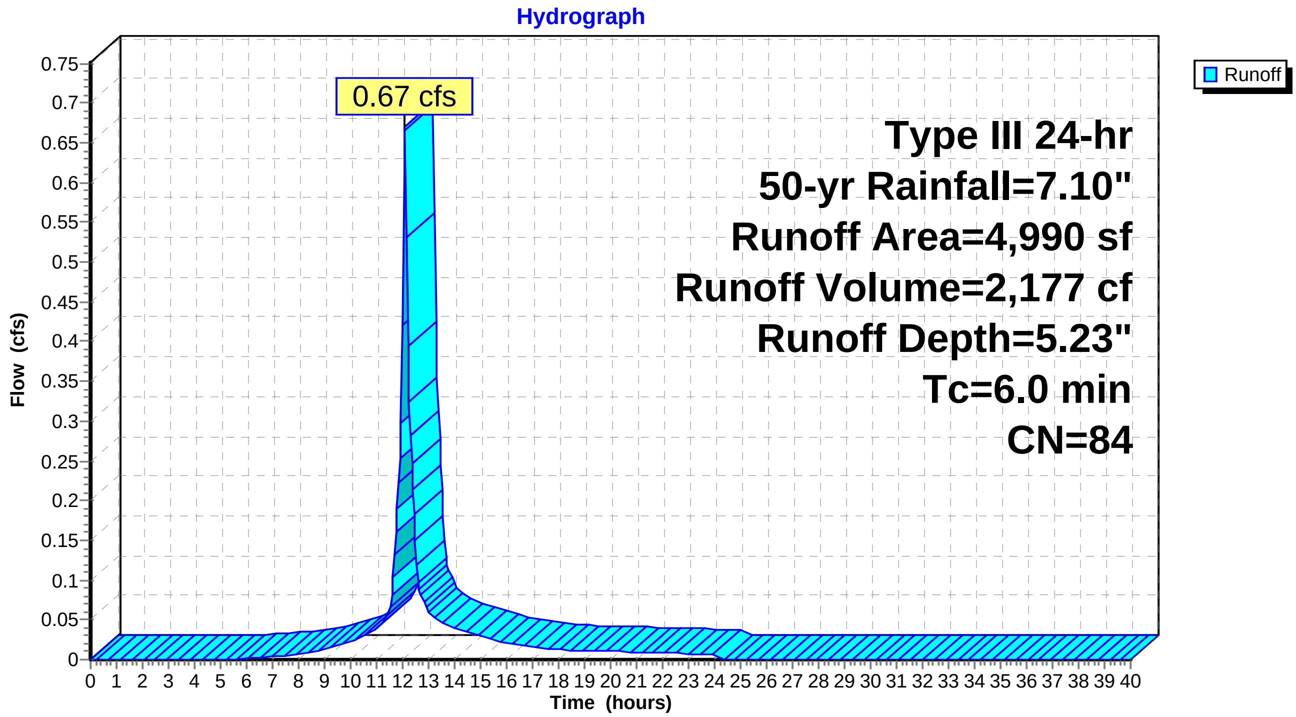
Runoff = 0.67 cfs @ 12.09 hrs, Volume= 2,177 cf, Depth= 5.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

	Area (sf)	CN	Description
*	876	65	Rain Garden Surface Area
	2,078	79	50-75% Grass cover, Fair, HSG C
	84	98	Unconnected pavement, HSG C
	1,952	98	Unconnected roofs, HSG C
	4,990	84	Weighted Average
	2,954		59.20% Pervious Area
	2,036		40.80% Impervious Area
	2,036		100.00% Unconnected

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

Subcatchment 209: 209 - Portion of Proposed Building Tentant A, Rain Garden #2, Lawn, and Walkwa



Summary for Subcatchment 210: 210 - Existing South features remaining to DP2

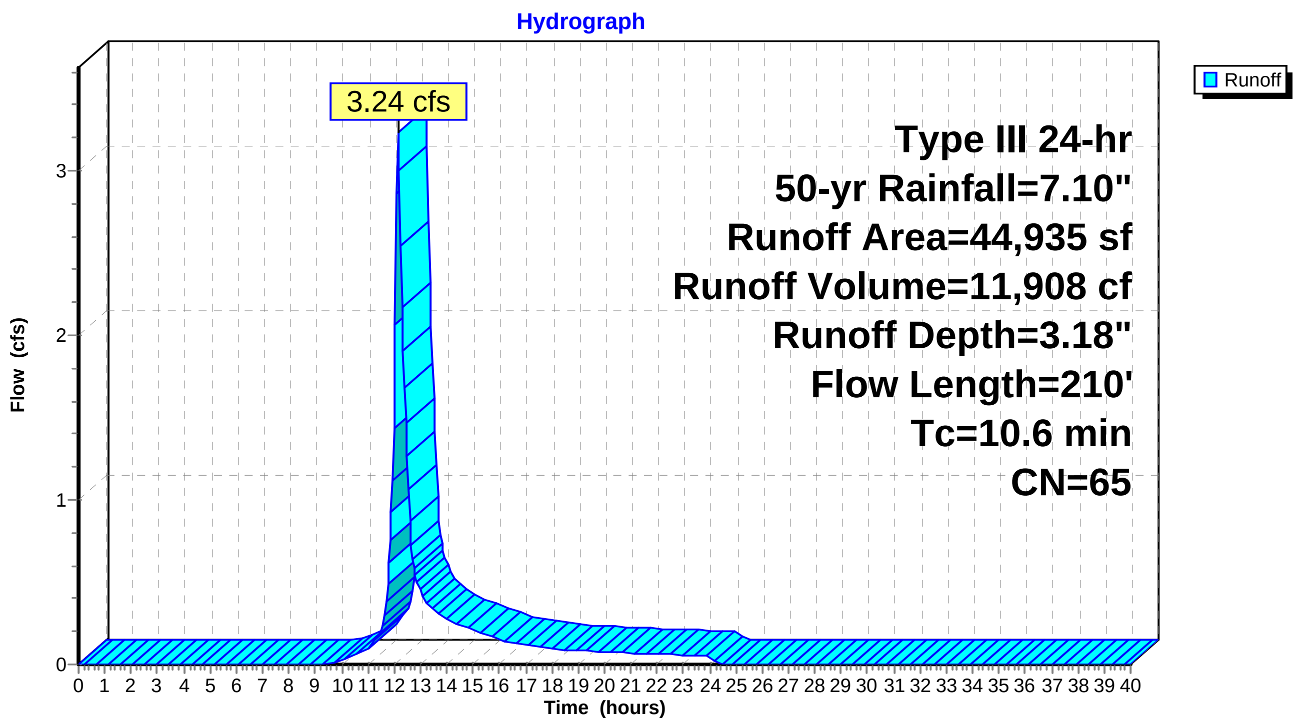
Runoff = 3.24 cfs @ 12.16 hrs, Volume= 11,908 cf, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

	Area (sf)	CN	Description
	35,498	65	Brush, Good, HSG C
*	9,437	65	Brush, Good, HSG C, Wetland Brush
	44,935	65	Weighted Average
	44,935		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	100	0.0600	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
1.4	110	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.6	210	Total			

Subcatchment 210: 210 - Existing South features remaining to DP2



Summary for Subcatchment 300: 300 - Lawn East to DP3

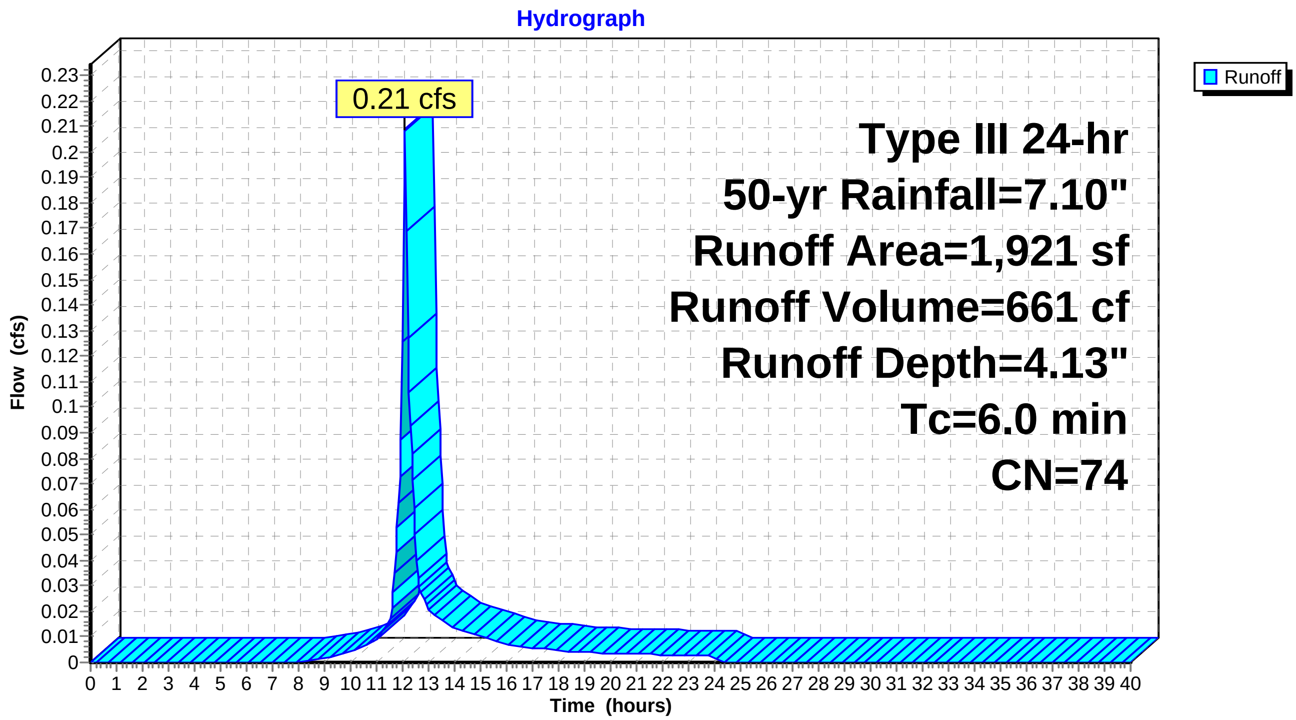
Runoff = 0.21 cfs @ 12.09 hrs, Volume= 661 cf, Depth= 4.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=7.10"

Area (sf)	CN	Description
1,921	74	>75% Grass cover, Good, HSG C
1,921		100.00% Pervious Area

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

Subcatchment 300: 300 - Lawn East to DP3



Summary for Pond CB1: PCB1

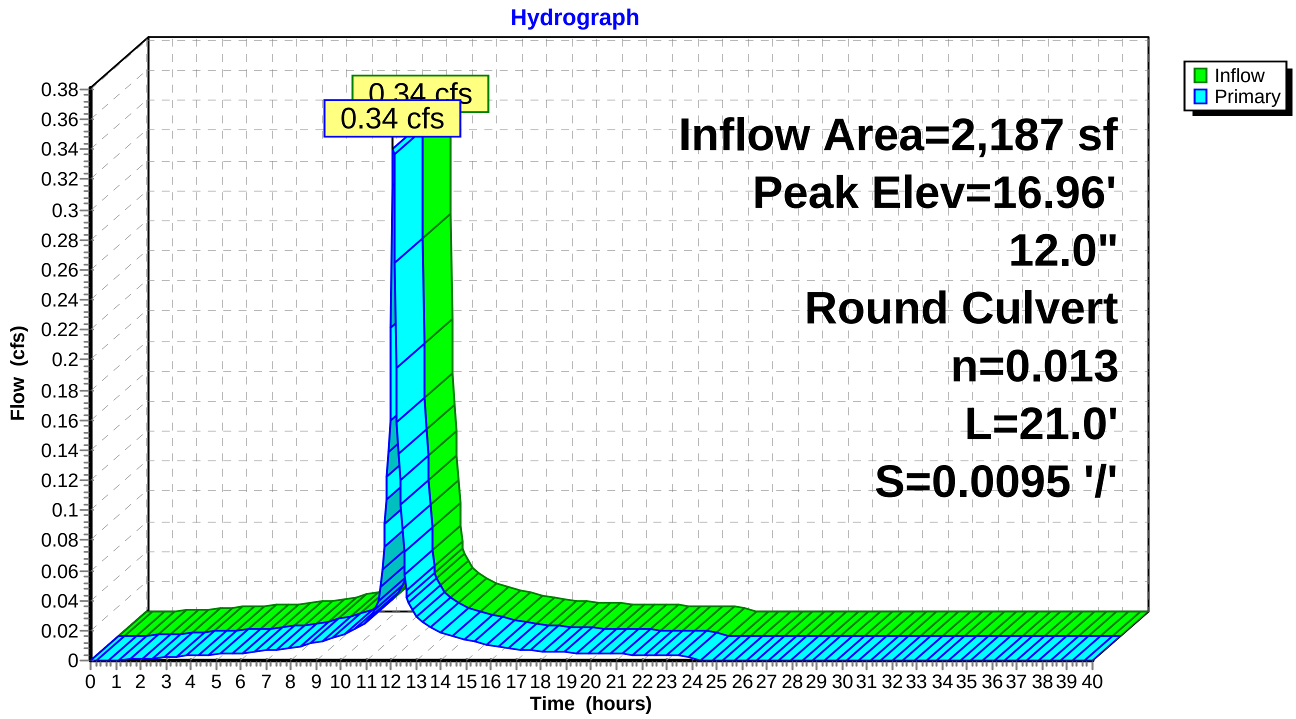
Inflow Area = 2,187 sf, 95.93% Impervious, Inflow Depth = 6.74" for 50-yr event
Inflow = 0.34 cfs @ 12.09 hrs, Volume= 1,229 cf
Outflow = 0.34 cfs @ 12.09 hrs, Volume= 1,229 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.34 cfs @ 12.09 hrs, Volume= 1,229 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.96' @ 12.12 hrs
Flood Elev= 19.50'

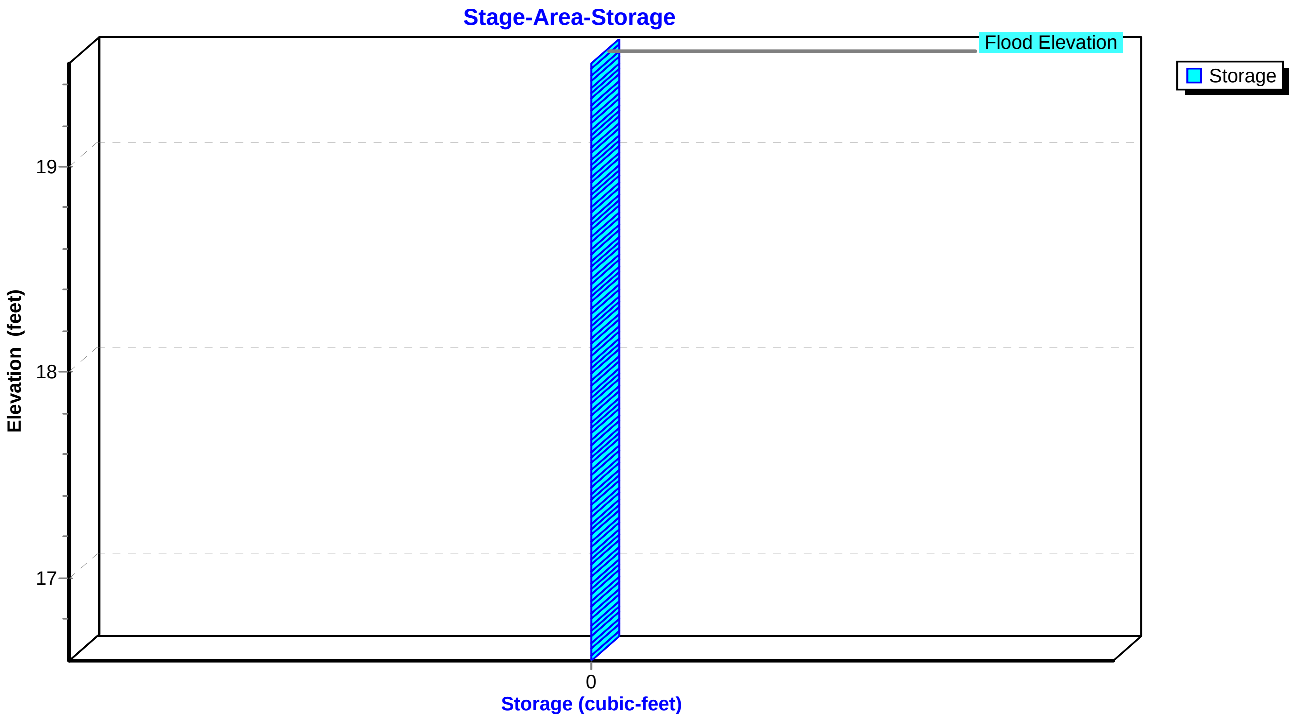
Device	Routing	Invert	Outlet Devices
#1	Primary	16.60'	**12.0" Round Culvert** L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.60' / 16.40' S= 0.0095 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.28 cfs @ 12.09 hrs HW=16.95' TW=16.80' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.28 cfs @ 1.71 fps)

Pond CB1: PCB1



Pond CB1: PCB1



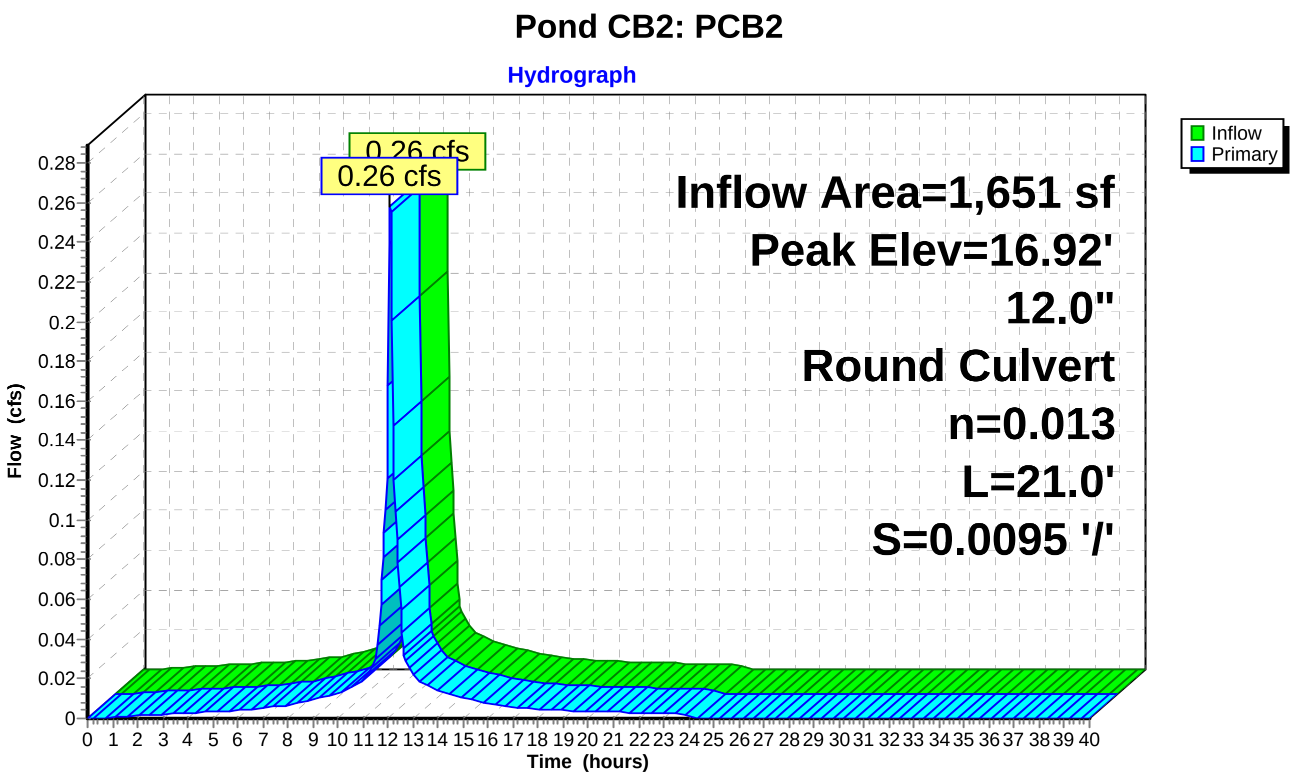
Summary for Pond CB2: PCB2

Inflow Area =	1,651 sf,100.00% Impervious,	Inflow Depth = 6.86" for 50-yr event		
Inflow =	0.26 cfs @	12.09 hrs, Volume=	944 cf	
Outflow =	0.26 cfs @	12.09 hrs, Volume=	944 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.26 cfs @	12.09 hrs, Volume=	944 cf	

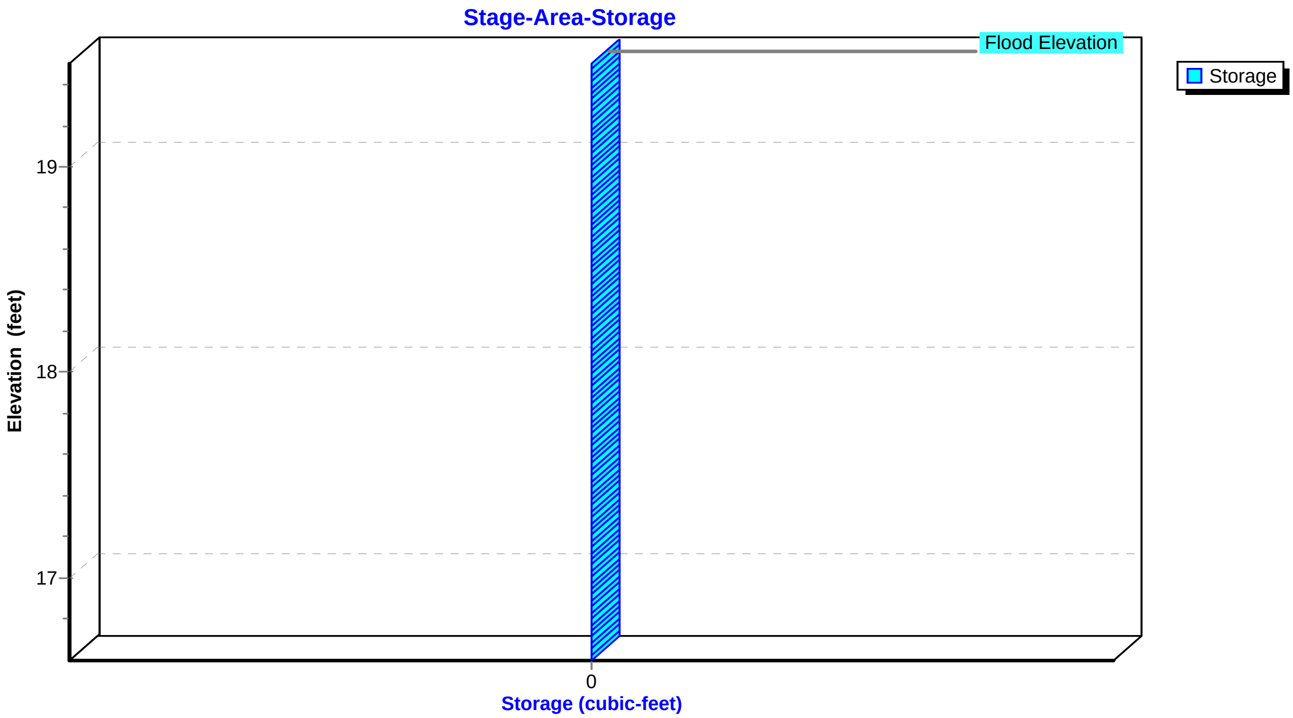
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.92' @ 12.12 hrs
Flood Elev= 19.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	16.60'	**12.0" Round Culvert** L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.60' / 16.40' S= 0.0095 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.20 cfs @ 12.09 hrs HW=16.91' TW=16.80' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.20 cfs @ 1.44 fps)



Pond CB2: PCB2



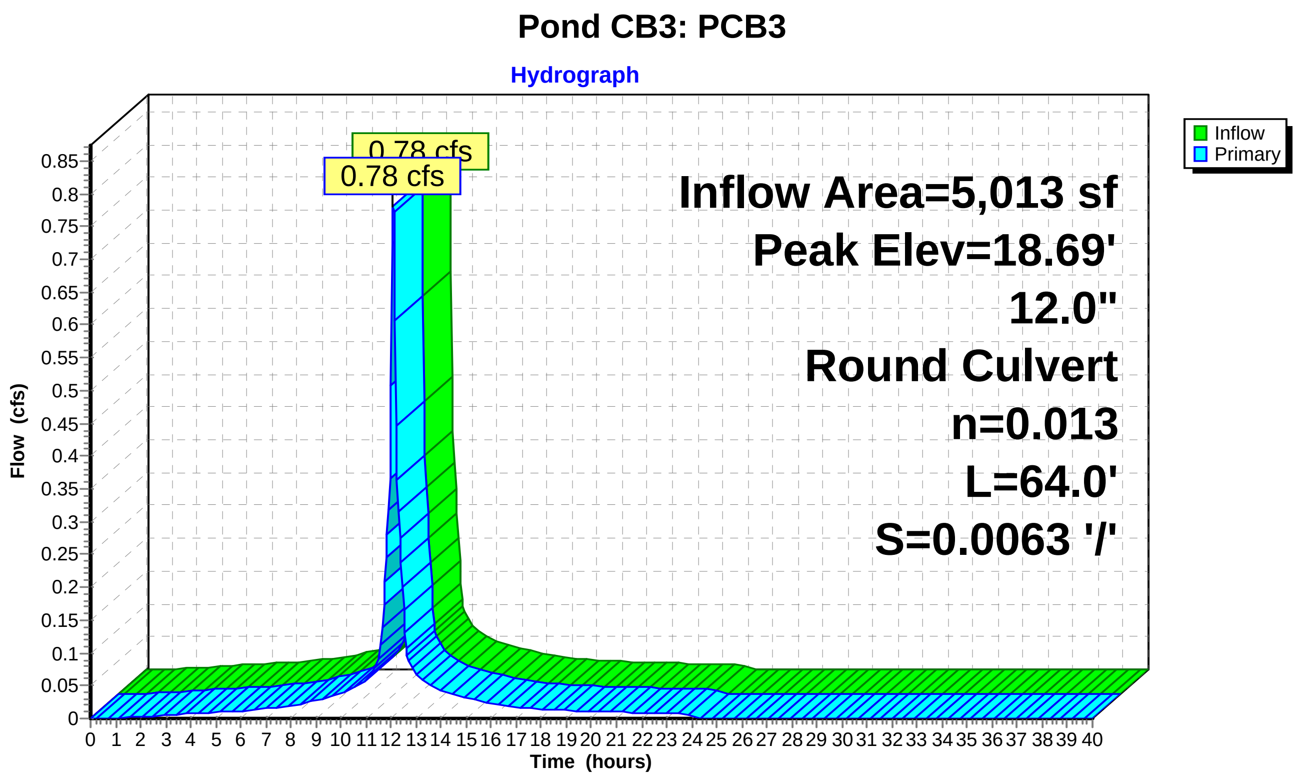
Summary for Pond CB3: PCB3

Inflow Area =	5,013 sf, 96.69% Impervious,	Inflow Depth = 6.74"	for 50-yr event
Inflow =	0.78 cfs @ 12.09 hrs, Volume=	2,816 cf	
Outflow =	0.78 cfs @ 12.09 hrs, Volume=	2,816 cf, Atten= 0%, Lag= 0.0 min	
Primary =	0.78 cfs @ 12.09 hrs, Volume=	2,816 cf	

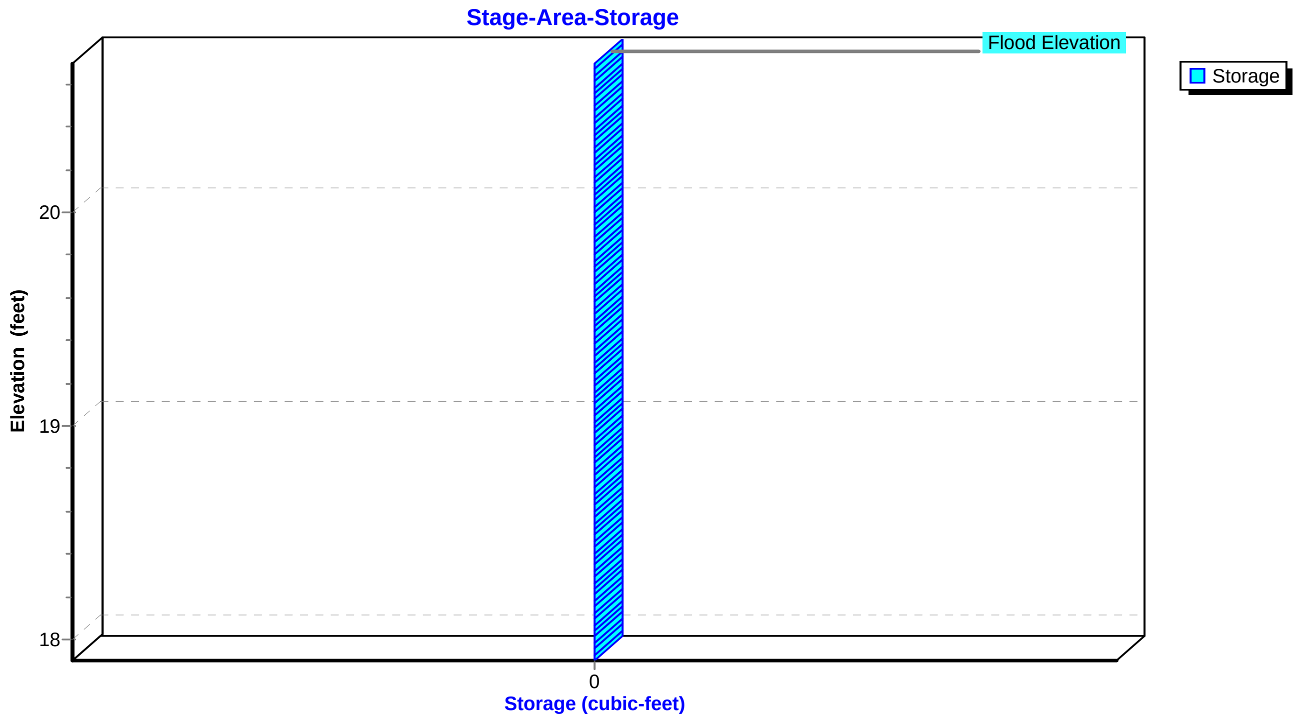
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.69' @ 12.12 hrs
Flood Elev= 20.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	17.90'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 17.90' / 17.50' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.61 cfs @ 12.09 hrs HW=18.66' TW=18.56' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.61 cfs @ 1.32 fps)



Pond CB3: PCB3



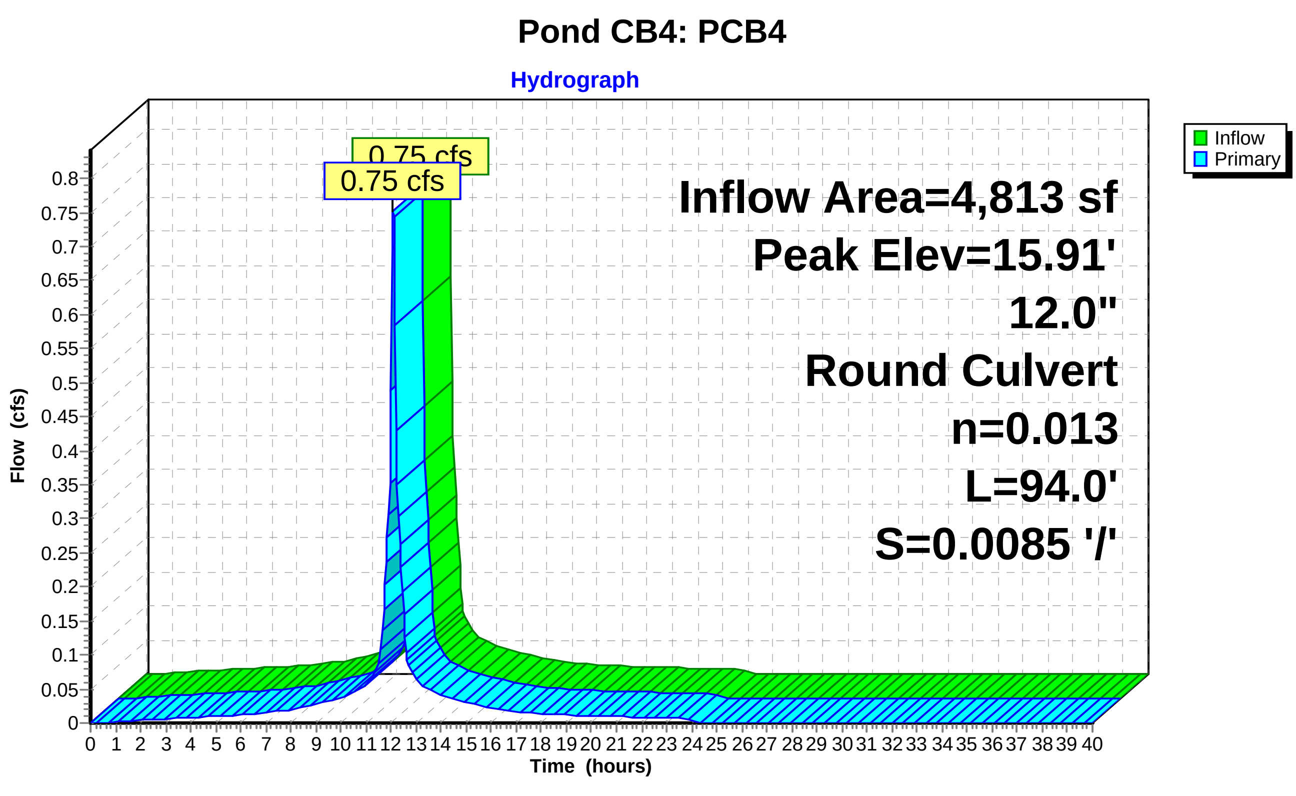
Summary for Pond CB4: PCB4

Inflow Area =	4,813 sf,100.00% Impervious,	Inflow Depth = 6.86"	for 50-yr event	
Inflow =	0.75 cfs @	12.09 hrs, Volume=	2,752 cf	
Outflow =	0.75 cfs @	12.09 hrs, Volume=	2,752 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.75 cfs @	12.09 hrs, Volume=	2,752 cf	

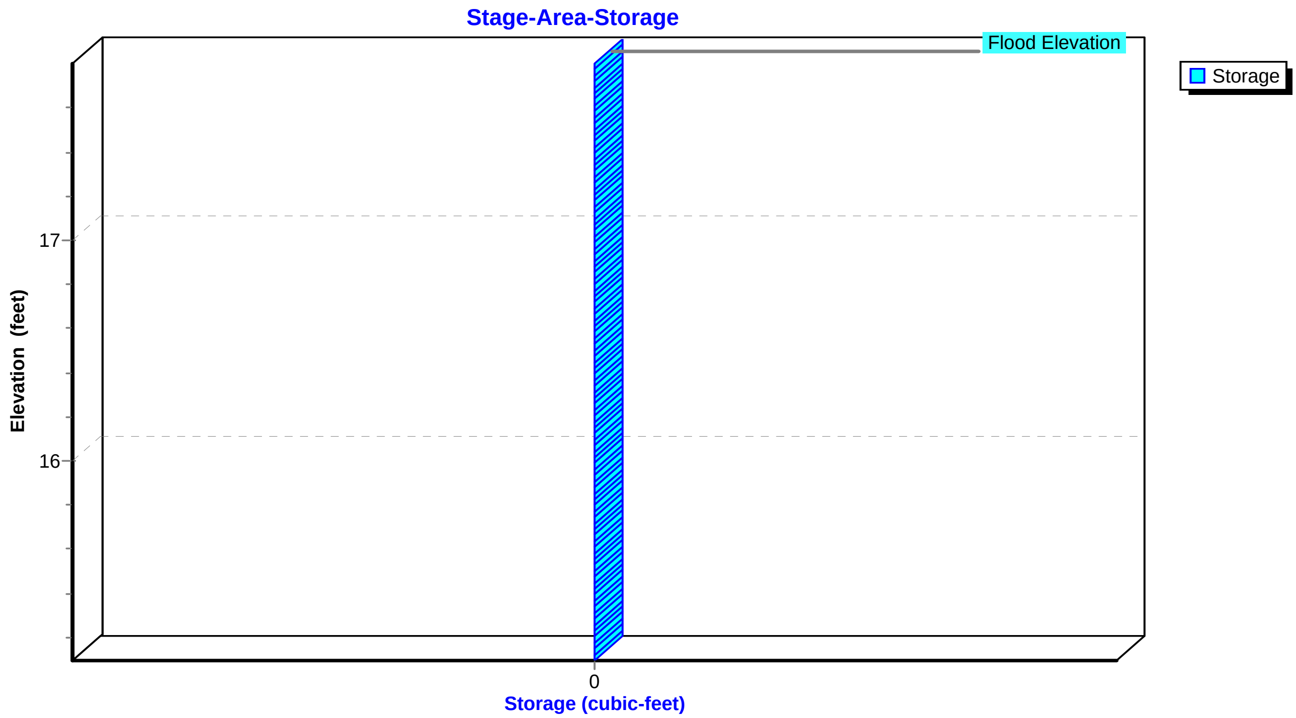
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.91' @ 12.21 hrs
Flood Elev= 17.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	15.10'	**12.0" Round Culvert** L= 94.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.10' / 14.30' S= 0.0085 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.43 cfs @ 12.09 hrs HW=15.64' TW=15.47' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.43 cfs @ 1.43 fps)



Pond CB4: PCB4



Summary for Pond CB5: PCB5

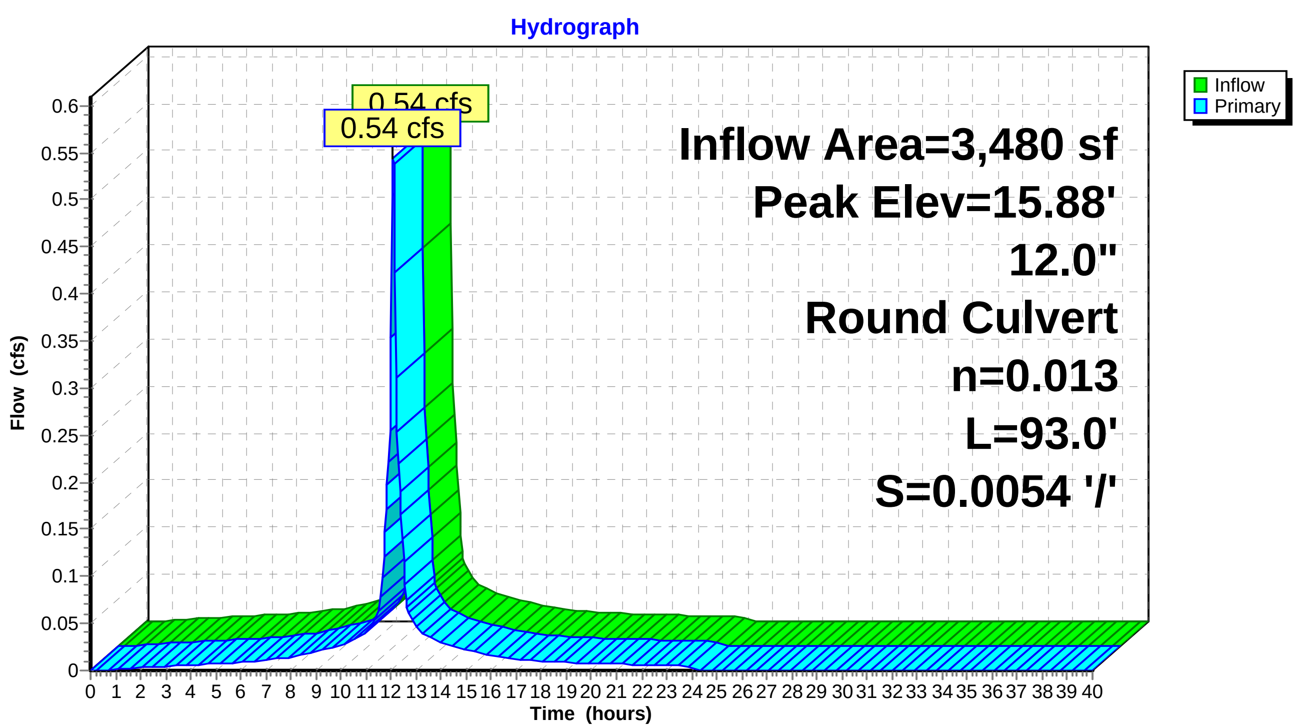
Inflow Area =	3,480 sf,100.00% Impervious,	Inflow Depth = 6.86"	for 50-yr event	
Inflow =	0.54 cfs @	12.09 hrs, Volume=	1,990 cf	
Outflow =	0.54 cfs @	12.09 hrs, Volume=	1,990 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.54 cfs @	12.09 hrs, Volume=	1,990 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.88' @ 12.21 hrs
Flood Elev= 17.60'

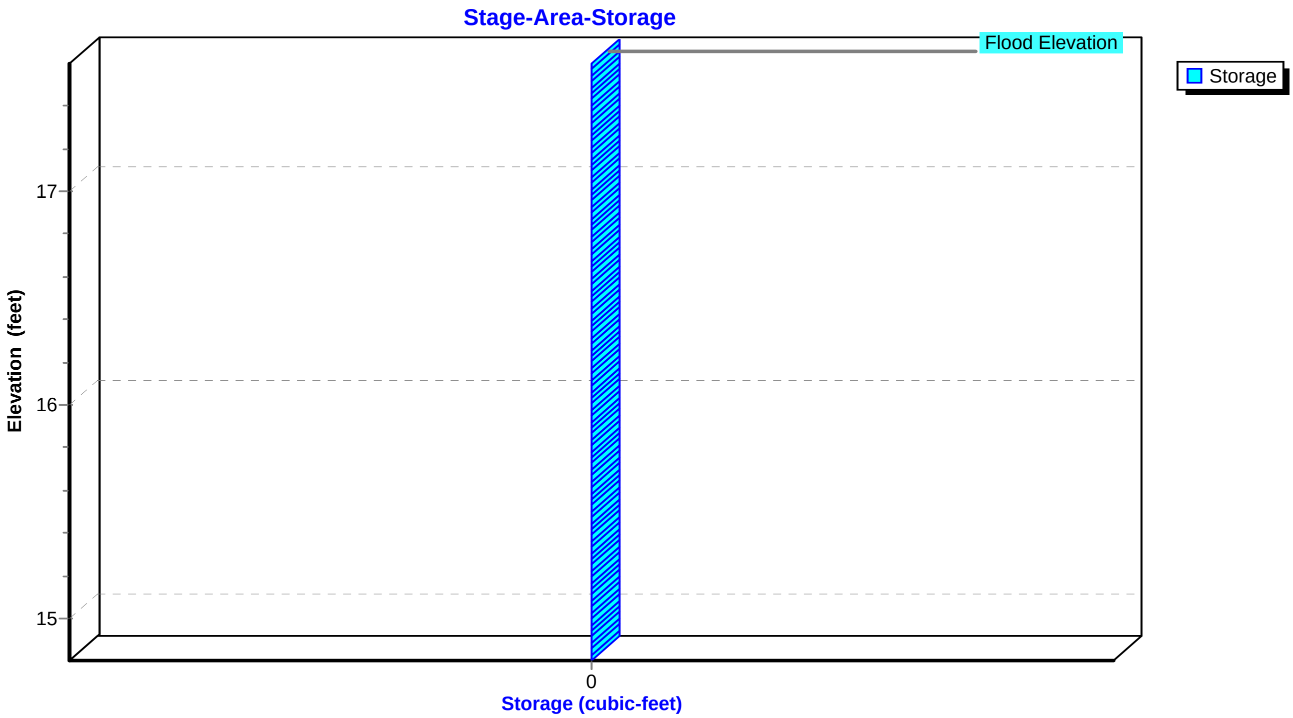
Device	Routing	Invert	Outlet Devices
#1	Primary	14.80'	**12.0" Round Culvert** L= 93.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.80' / 14.30' S= 0.0054 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=15.36' TW=15.47' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)

Pond CB5: PCB5



Pond CB5: PCB5



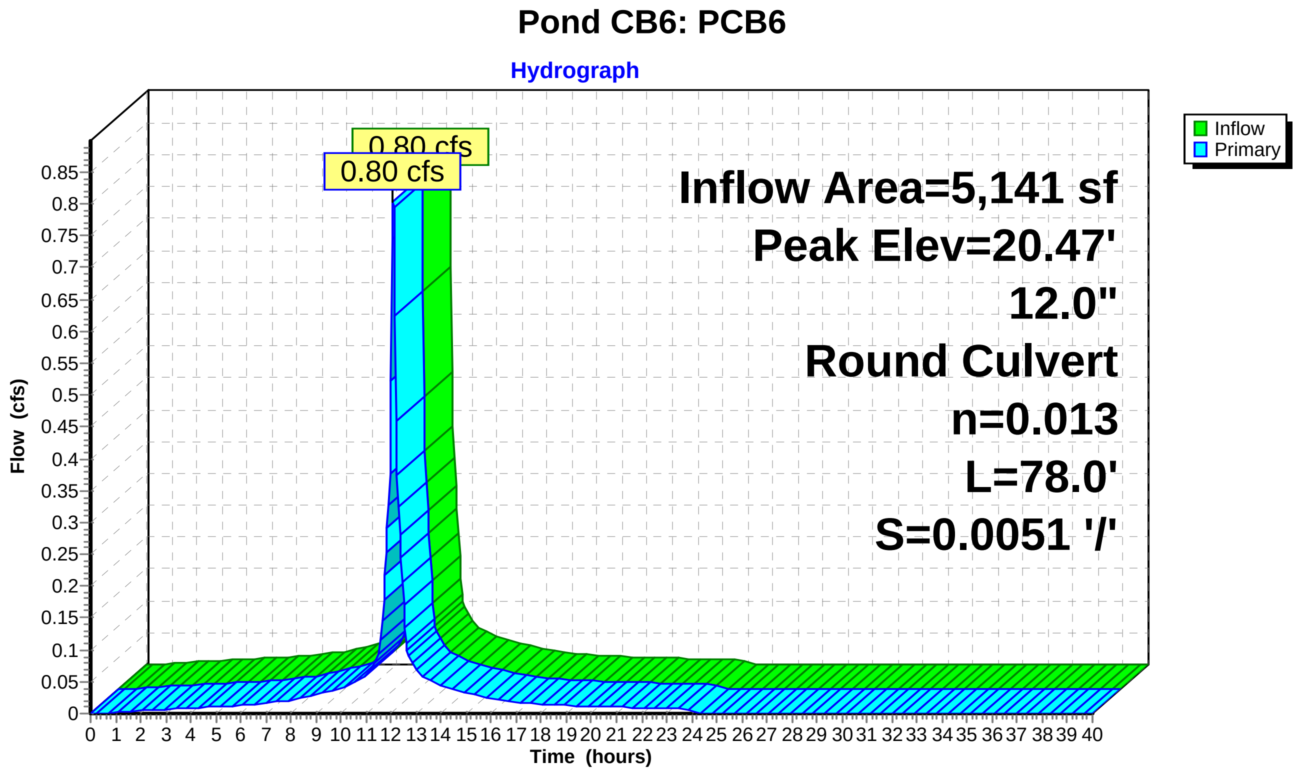
Summary for Pond CB6: PCB6

Inflow Area = 5,141 sf,100.00% Impervious, Inflow Depth = 6.86" for 50-yr event
Inflow = 0.80 cfs @ 12.09 hrs, Volume= 2,939 cf
Outflow = 0.80 cfs @ 12.09 hrs, Volume= 2,939 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.80 cfs @ 12.09 hrs, Volume= 2,939 cf

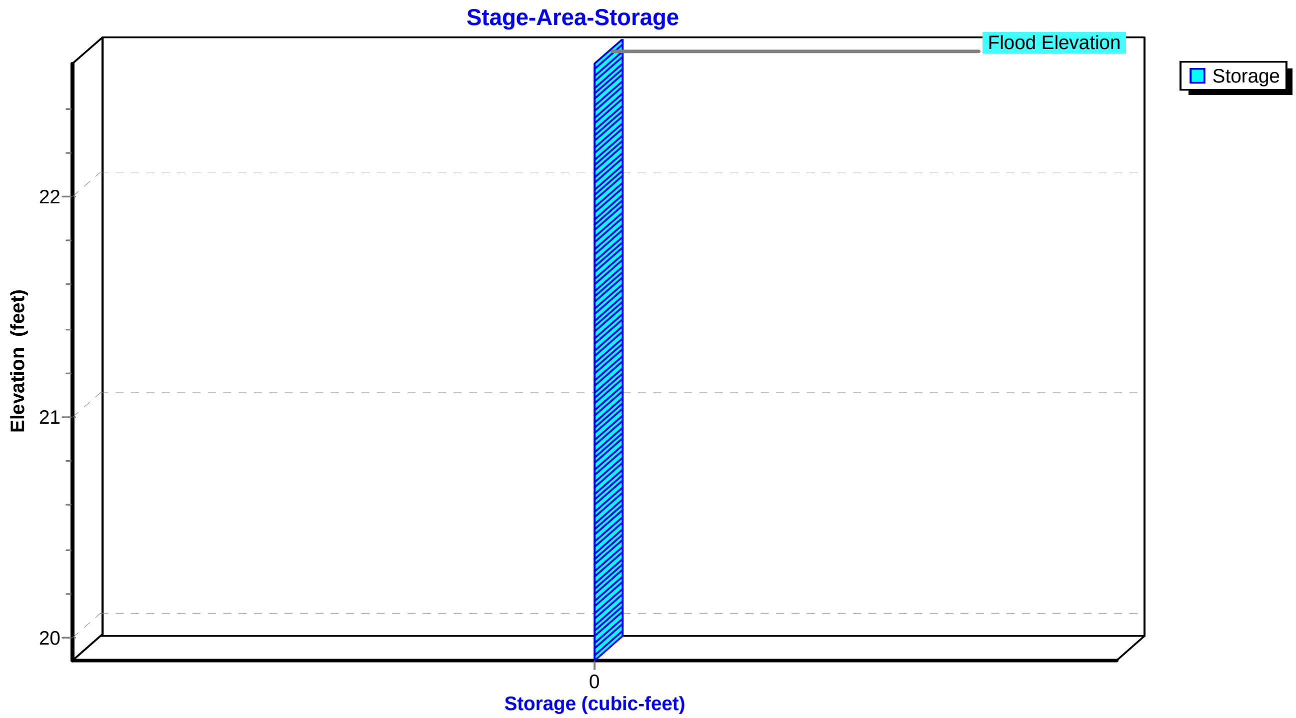
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 20.47' @ 12.10 hrs
Flood Elev= 22.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	19.90'	**12.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.90' / 19.50' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.73 cfs @ 12.09 hrs HW=20.46' TW=20.06' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.73 cfs @ 2.32 fps)



Pond CB6: PCB6



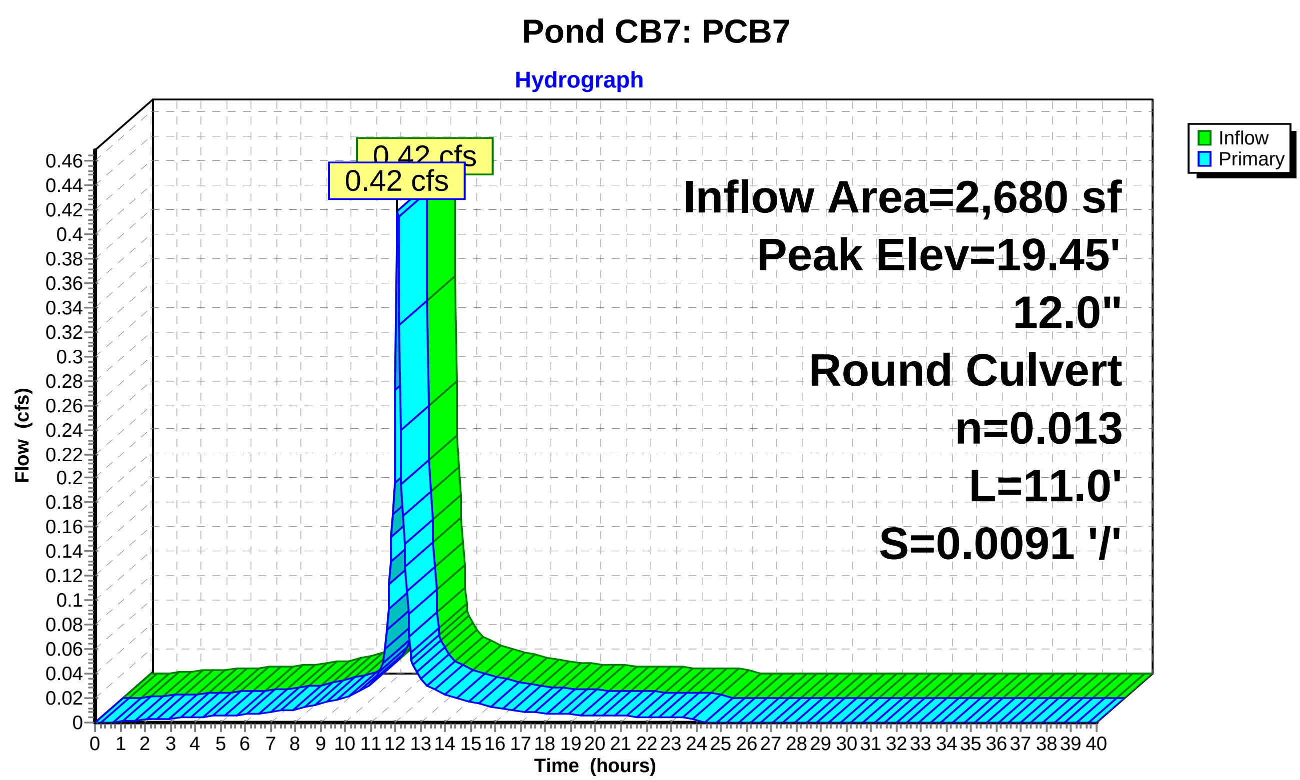
Summary for Pond CB7: PCB7

Inflow Area = 2,680 sf,100.00% Impervious, Inflow Depth = 6.86" for 50-yr event
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 1,532 cf
Outflow = 0.42 cfs @ 12.09 hrs, Volume= 1,532 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.42 cfs @ 12.09 hrs, Volume= 1,532 cf

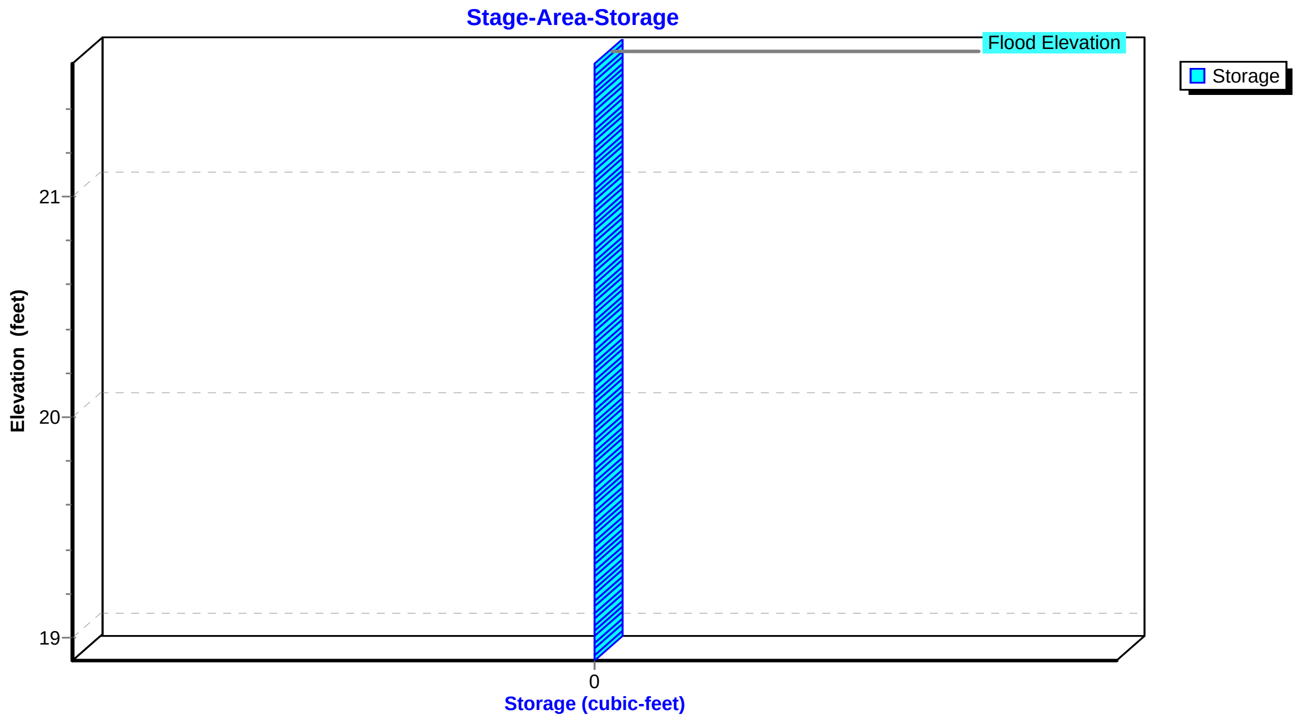
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.45' @ 12.14 hrs
Flood Elev= 21.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.90'	**12.0" Round Culvert** L= 11.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.90' / 18.80' S= 0.0091 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.23 cfs @ 12.09 hrs HW=19.42' TW=19.40' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.23 cfs @ 0.80 fps)



Pond CB7: PCB7

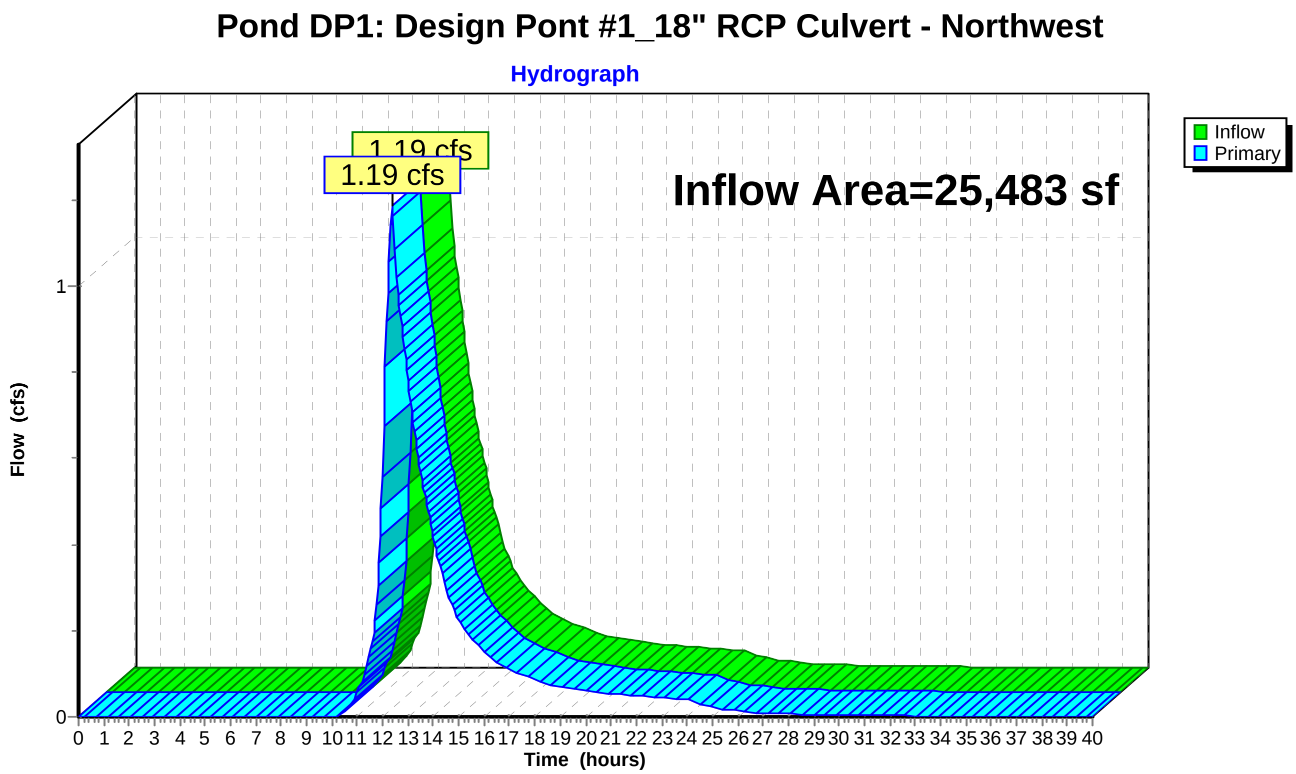


Summary for Pond DP1: Design Pont #1_18" RCP Culvert - Northwest

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	25,483 sf,	55.96% Impervious,	Inflow Depth > 4.91"	for 50-yr event
Inflow =	1.19 cfs @	12.37 hrs, Volume=	10,435 cf	
Primary =	1.19 cfs @	12.37 hrs, Volume=	10,435 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

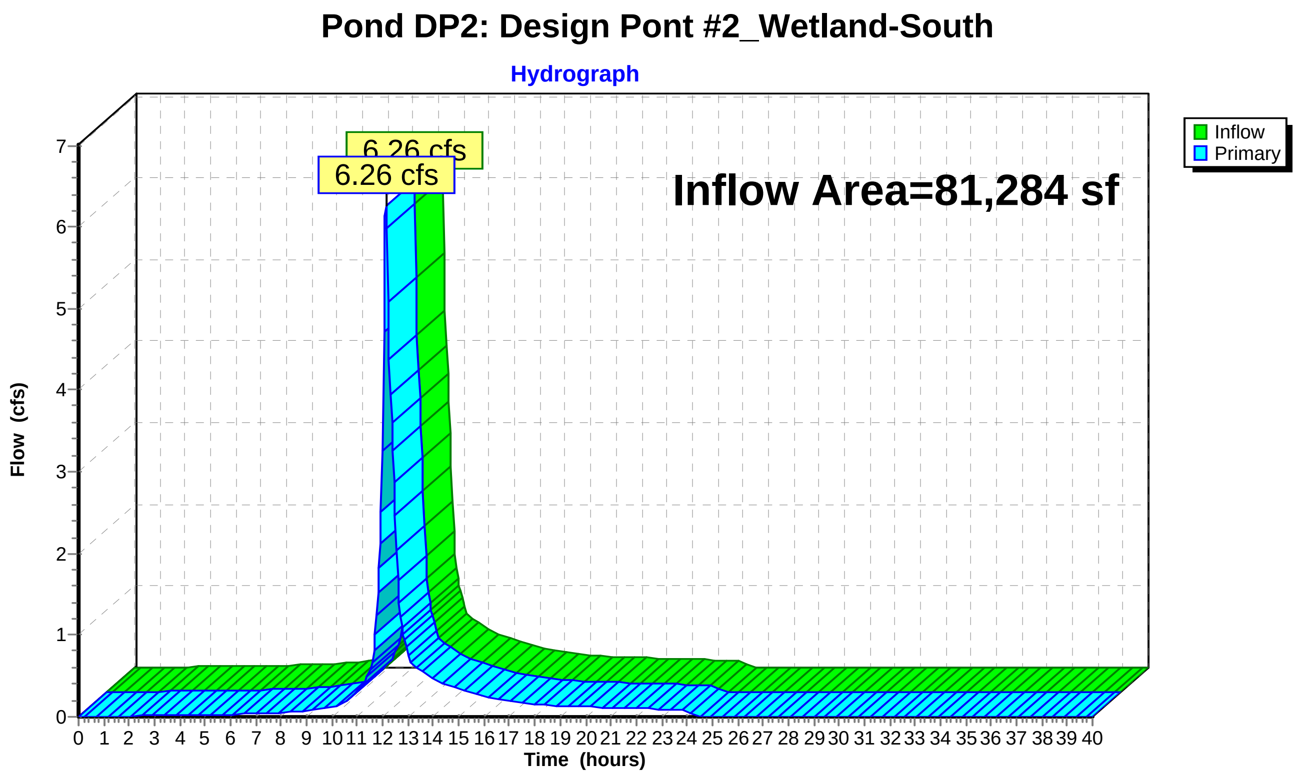


Summary for Pond DP2: Design Pont #2_Wetland-South

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 81,284 sf, 40.77% Impervious, Inflow Depth = 3.50" for 50-yr event
Inflow = 6.26 cfs @ 12.12 hrs, Volume= 23,686 cf
Primary = 6.26 cfs @ 12.12 hrs, Volume= 23,686 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs



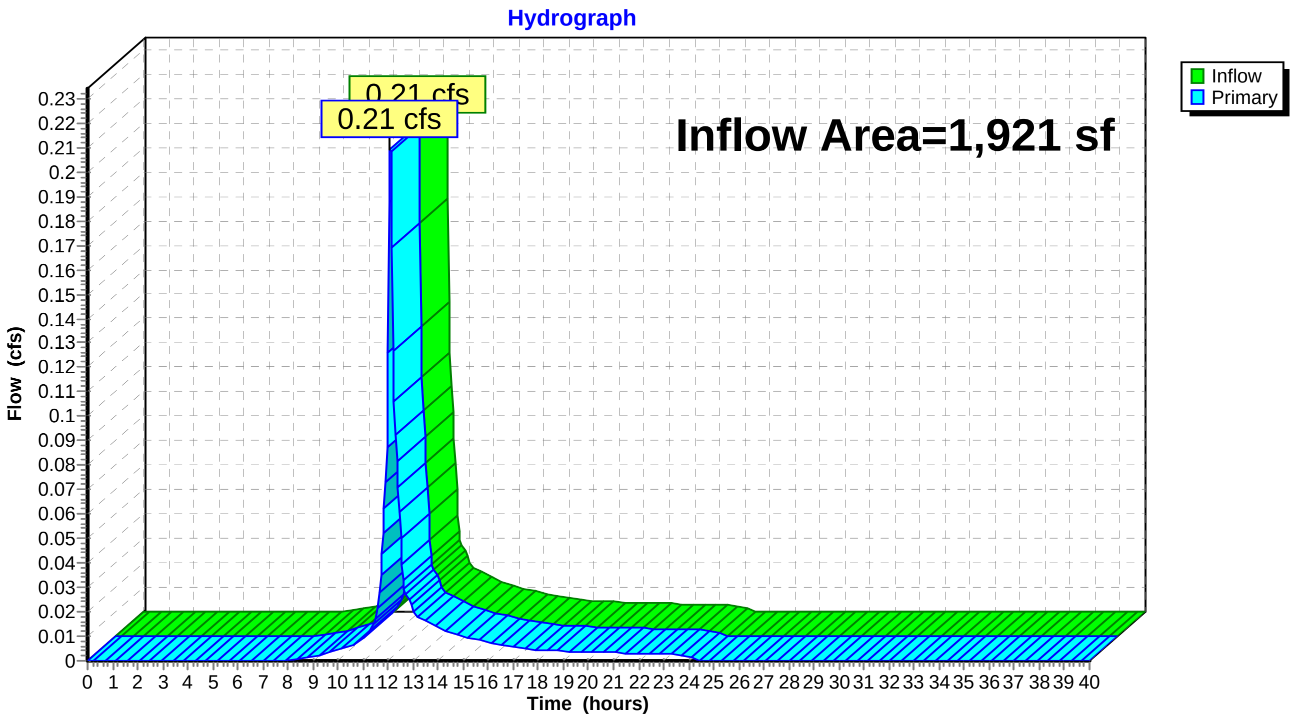
Summary for Pond DP3: Design Pont #3_Abutting Lot-East

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,921 sf, 0.00% Impervious, Inflow Depth = 4.13" for 50-yr event
Inflow = 0.21 cfs @ 12.09 hrs, Volume= 661 cf
Primary = 0.21 cfs @ 12.09 hrs, Volume= 661 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Pond DP3: Design Pont #3_Abutting Lot-East



Summary for Pond IS: Infiltration System

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 14,215 sf,100.00% Impervious, Inflow Depth = 6.86" for 50-yr event
Inflow = 2.22 cfs @ 12.09 hrs, Volume= 8,127 cf
Outflow = 0.69 cfs @ 12.40 hrs, Volume= 8,127 cf, Atten= 69%, Lag= 18.7 min
Discarded = 0.28 cfs @ 11.65 hrs, Volume= 7,567 cf
Primary = 0.41 cfs @ 12.40 hrs, Volume= 560 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.26' @ 12.40 hrs Surf.Area= 1,463 sf Storage= 2,039 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 34.5 min (777.3 - 742.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	16.10'	670 cf	**6.28'W x 109.07'L x 3.52'H Field A** 2,416 cf Overall - 741 cf Embedded = 1,675 cf x 40.0% Voids
#2A	16.60'	741 cf	**Contech ChamberMaxx** x 15 Inside #1 Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap Row Length Adjustment= +0.32' x 6.92 sf x 1 rows
#3B	16.10'	601 cf	**10.98'W x 59.25'L x 3.52'H Field B** 2,294 cf Overall - 793 cf Embedded = 1,502 cf x 40.0% Voids
#4B	16.60'	793 cf	**Contech ChamberMaxx** x 16 Inside #3 Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap Row Length Adjustment= +0.32' x 6.92 sf x 2 rows
#5C	16.10'	143 cf	**2.54'W x 50.00'L x 3.21'H Field C** 408 cf Overall - 50 cf Embedded = 358 cf x 40.0% Voids
#6C	17.10'	39 cf	**ADS N-12 12** x 2 Inside #5 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf Row Length Adjustment= +8.00' x 0.81 sf x 1 rows
		2,986 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.10'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	17.90'	**12.0" Round Culvert** L= 66.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 17.90' / 16.50' S= 0.0212 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.28 cfs @ 11.65 hrs HW=16.14' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.41 cfs @ 12.40 hrs HW=18.26' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 0.41 cfs @ 1.61 fps)

Pond IS: Infiltration System - Chamber Wizard Field A

Chamber Model = Contech ChamberMaxx (Contech® ChamberMaxx®)
Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
Row Length Adjustment= +0.32' x 6.92 sf x 1 rows

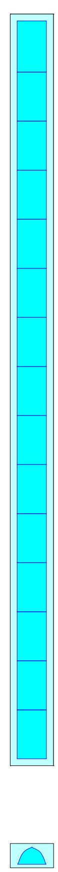
15 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 107.07' Row Length +12.0" End Stone x 2 = 109.07' Base Length
1 Rows x 51.4" Wide + 12.0" Side Stone x 2 = 6.28' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

15 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 1 Rows = 741.1 cf Chamber Storage

2,415.8 cf Field - 741.1 cf Chambers = 1,674.7 cf Stone x 40.0% Voids = 669.9 cf Stone Storage

Chamber Storage + Stone Storage = 1,411.0 cf = 0.032 af
Overall Storage Efficiency = 58.4%
Overall System Size = 109.07' x 6.28' x 3.52'

15 Chambers
89.5 cy Field
62.0 cy Stone



Pond IS: Infiltration System - Chamber Wizard Field B

Chamber Model = Contech ChamberMaxx (Contech® ChamberMaxx®)
Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
Row Length Adjustment= +0.32' x 6.92 sf x 2 rows

51.4" Wide + 5.0" Spacing = 56.4" C-C Row Spacing

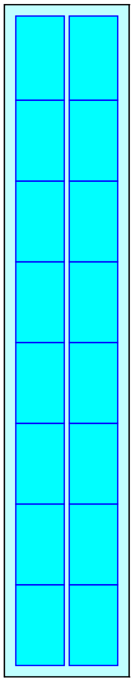
8 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 57.25' Row Length +12.0" End Stone x 2 = 59.25' Base Length
2 Rows x 51.4" Wide + 5.0" Spacing x 1 + 12.0" Side Stone x 2 = 10.98' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

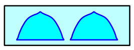
16 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 792.6 cf Chamber Storage

2,294.1 cf Field - 792.6 cf Chambers = 1,501.5 cf Stone x 40.0% Voids = 600.6 cf Stone Storage

Chamber Storage + Stone Storage = 1,393.2 cf = 0.032 af
Overall Storage Efficiency = 60.7%
Overall System Size = 59.25' x 10.98' x 3.52'

16 Chambers
85.0 cy Field
55.6 cy Stone





Pond IS: Infiltration System - Chamber Wizard Field C

Chamber Model = ADS N-12 12 (ADS N-12® Pipe)
Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
Row Length Adjustment= +8.00' x 0.81 sf x 1 rows

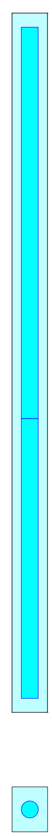
2 Chambers/Row x 20.00' Long +8.00' Row Adjustment = 48.00' Row Length +12.0" End Stone x 2 = 50.00' Base Length
1 Rows x 14.5" Wide + 8.0" Side Stone x 2 = 2.54' Base Width
12.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.21' Field Height

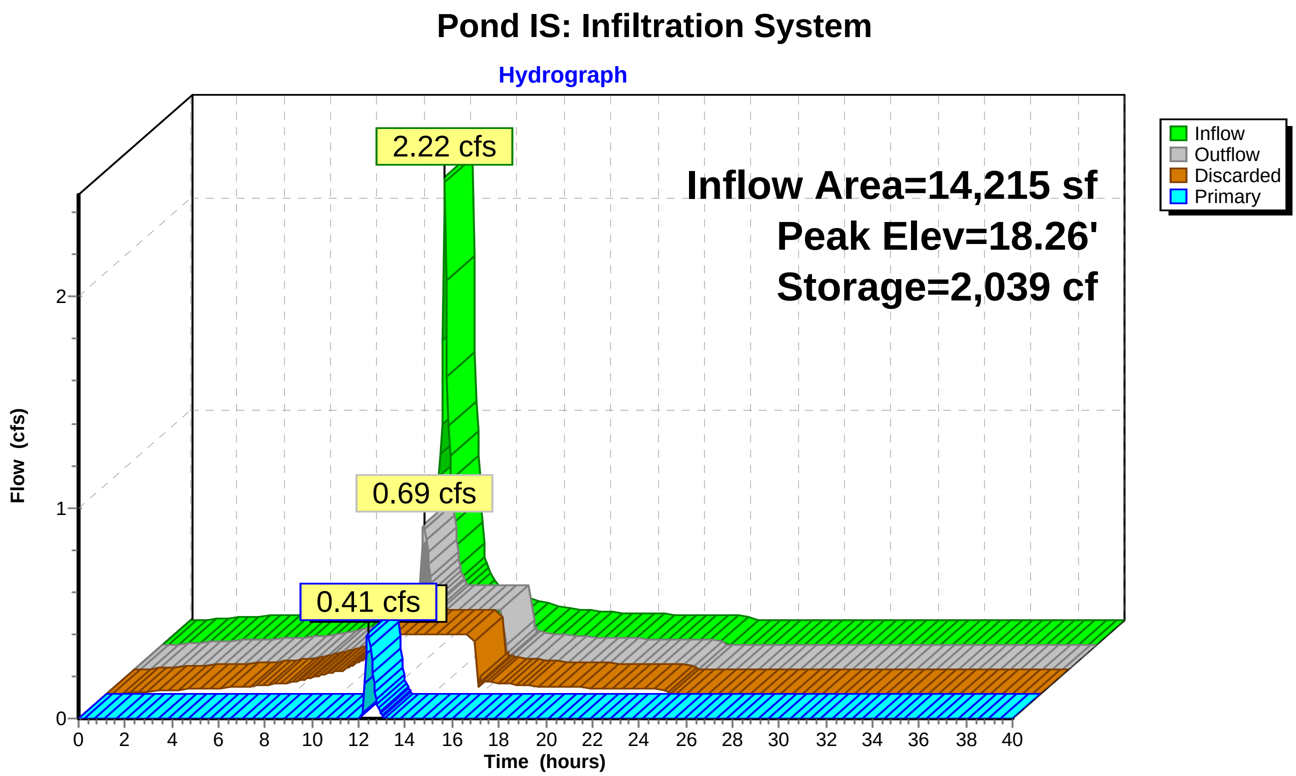
2 Chambers x 16.2 cf +8.00' Row Adjustment x 0.81 sf x 1 Rows = 38.9 cf Chamber Storage
2 Chambers x 20.9 cf +8.00' Row Adjustment x 1.05 sf x 1 Rows = 50.2 cf Displacement

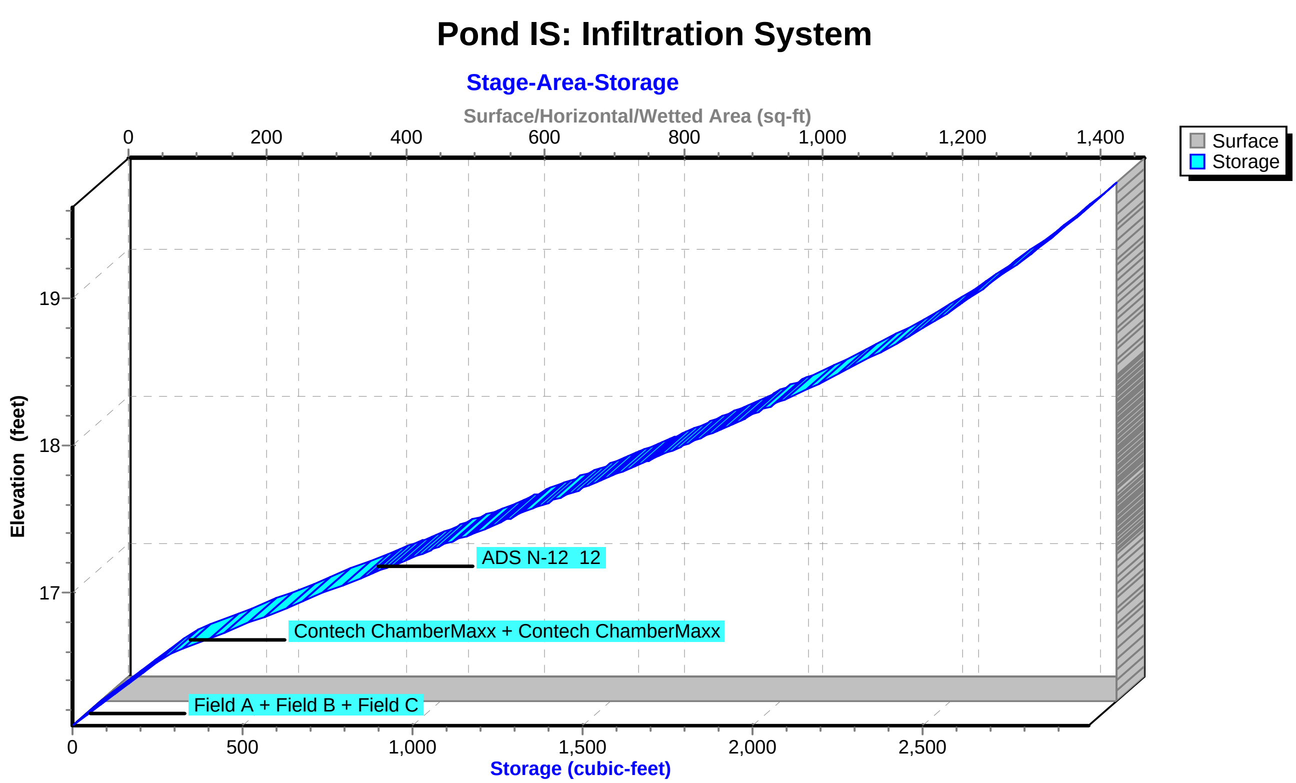
407.9 cf Field - 50.2 cf Chambers = 357.7 cf Stone x 40.0% Voids = 143.1 cf Stone Storage

Chamber Storage + Stone Storage = 181.9 cf = 0.004 af
Overall Storage Efficiency = 44.6%
Overall System Size = 50.00' x 2.54' x 3.21'

2 Chambers
15.1 cy Field
13.2 cy Stone




Pond IS: Infiltration System
Hydrograph
2.22 cfs
0.69 cfs
0.41 cfs
Inflow Area=14,215 sf
Peak Elev=18.26'
Storage=2,039 cf
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0
1
2
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
Time (hours)


Pond IS: Infiltration System
Stage-Area-Storage
Surface/Horizontal/Wetted Area (sq-ft)
0 200 400 600 800 1,000 1,200 1,400
Surface
Storage
Elevation (feet)
17
18
19
ADS N-12 12
Contech ChamberMaxx + Contech ChamberMaxx
Field A + Field B + Field C
0 500 1,000 1,500 2,000 2,500
Storage (cubic-feet)

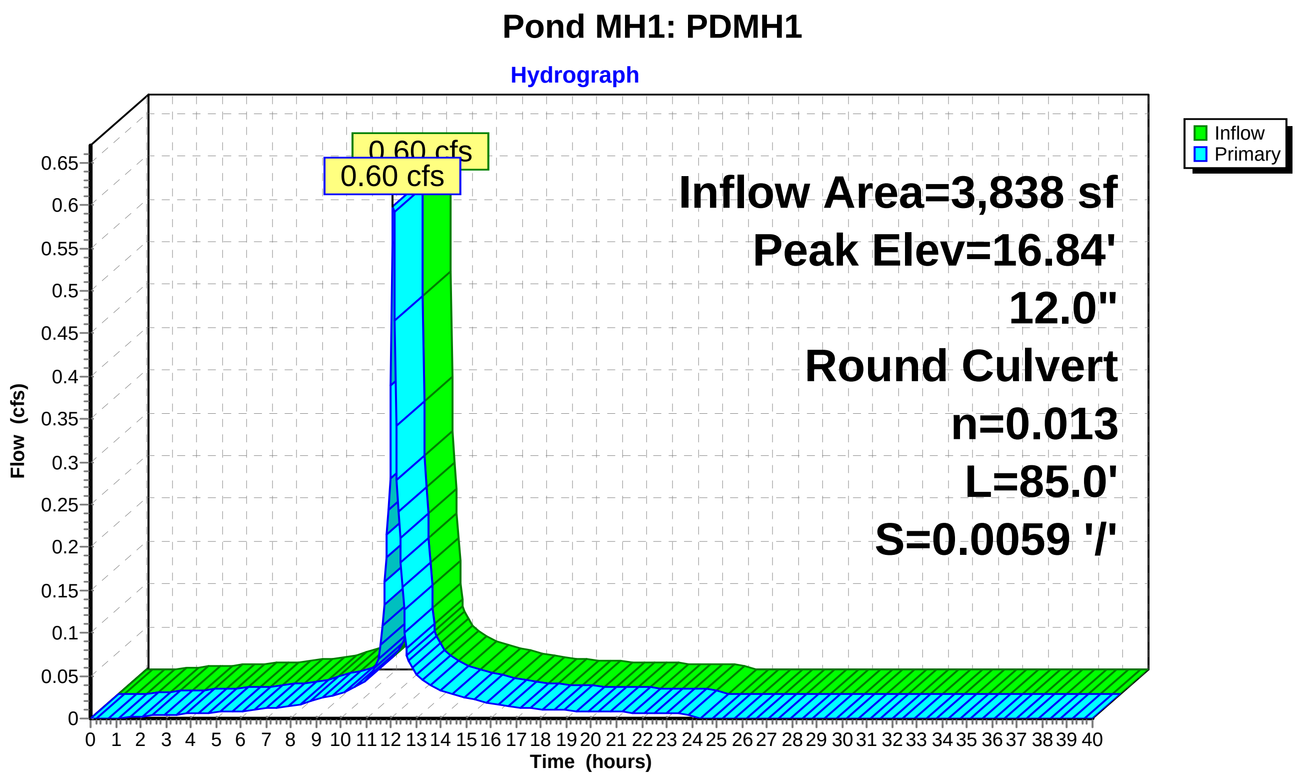
Summary for Pond MH1: PDMH1

Inflow Area =	3,838 sf,	97.68% Impervious,	Inflow Depth = 6.79"	for 50-yr event
Inflow =	0.60 cfs @	12.09 hrs, Volume=	2,173 cf	
Outflow =	0.60 cfs @	12.09 hrs, Volume=	2,173 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.60 cfs @	12.09 hrs, Volume=	2,173 cf	

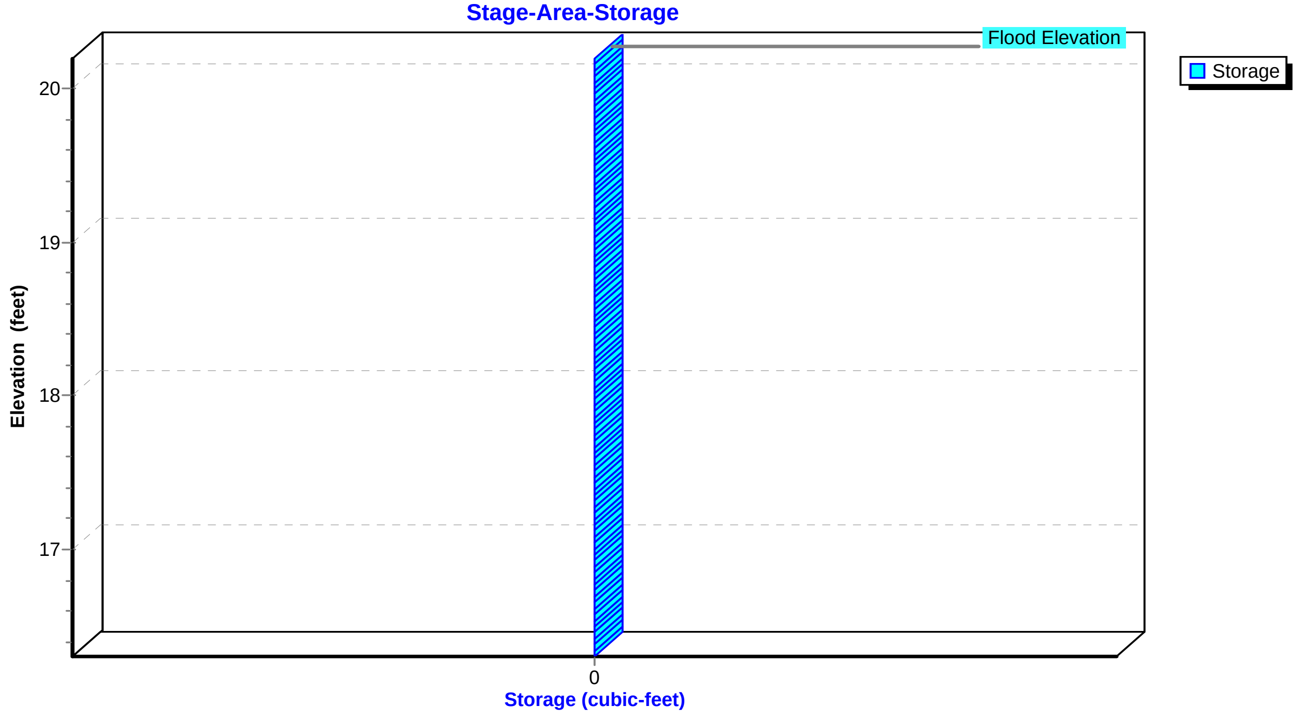
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.84' @ 12.14 hrs
Flood Elev= 20.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	16.30'	**12.0" Round Culvert** L= 85.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.30' / 15.80' S= 0.0059 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.43 cfs @ 12.09 hrs HW=16.80' TW=16.59' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.43 cfs @ 1.60 fps)



Pond MH1: PDMH1



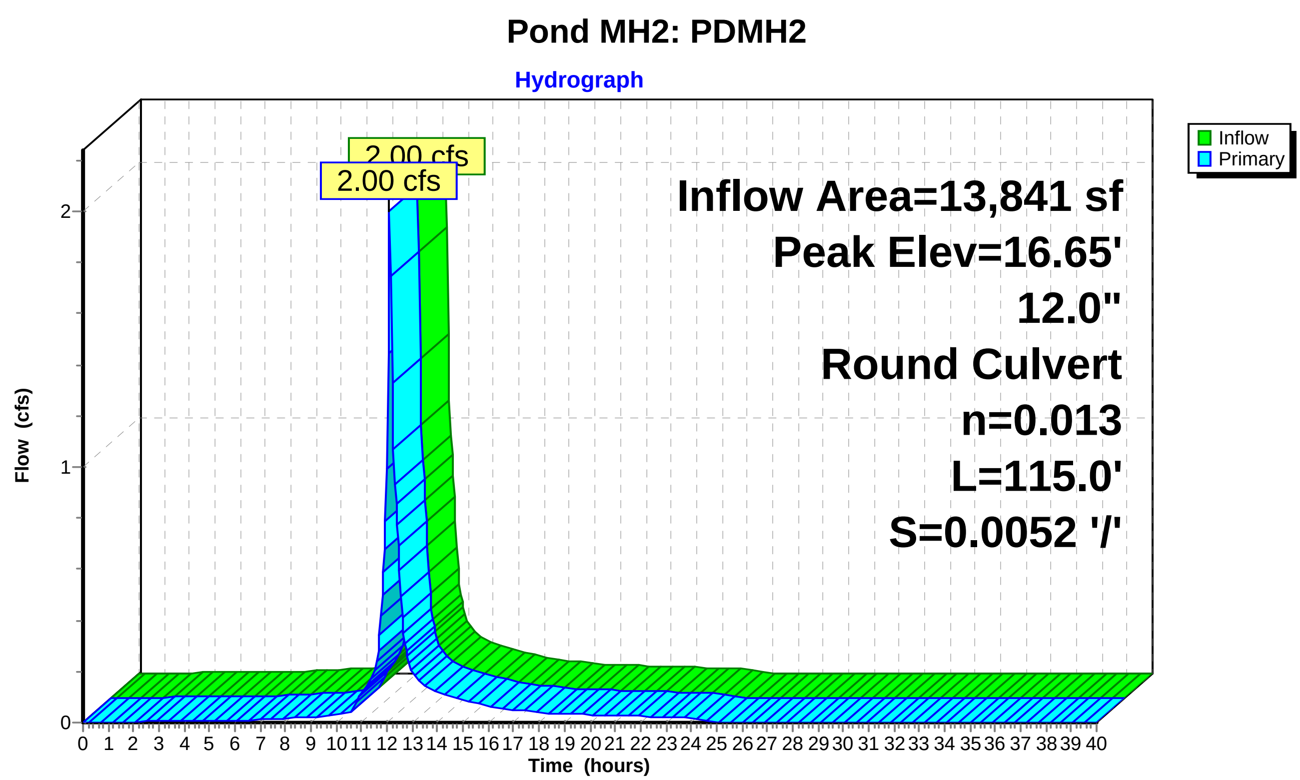
Summary for Pond MH2: PDMH2

Inflow Area =	13,841 sf,	76.82% Impervious,	Inflow Depth = 5.61"	for 50-yr event
Inflow =	2.00 cfs @	12.11 hrs, Volume=	6,476 cf	
Outflow =	2.00 cfs @	12.11 hrs, Volume=	6,476 cf, Atten= 0%, Lag= 0.0 min	
Primary =	2.00 cfs @	12.11 hrs, Volume=	6,476 cf	

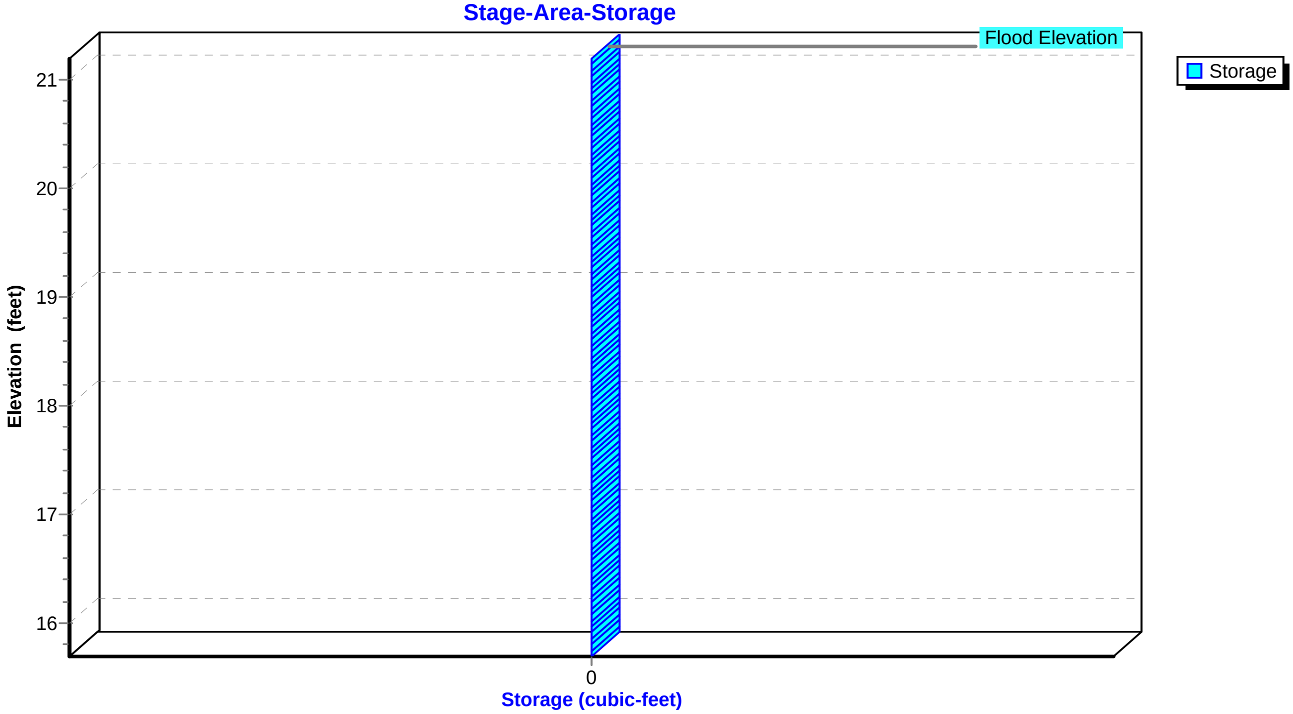
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.65' @ 12.13 hrs
Flood Elev= 21.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	15.70'	**12.0" Round Culvert** L= 115.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.70' / 15.10' S= 0.0052 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.72 cfs @ 12.11 hrs HW=16.64' TW=16.02' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 1.72 cfs @ 2.90 fps)



Pond MH2: PDMH2



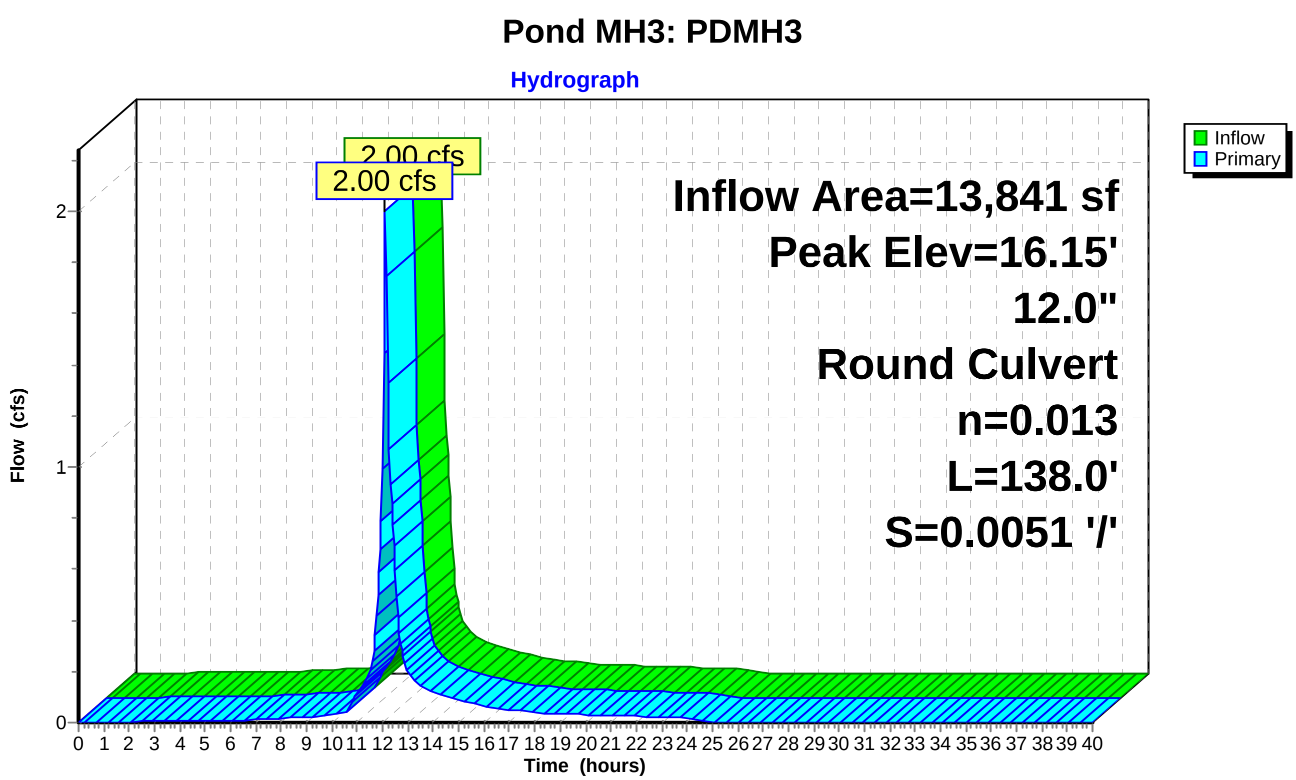
Summary for Pond MH3: PDMH3

Inflow Area =	13,841 sf, 76.82% Impervious,	Inflow Depth = 5.61"	for 50-yr event
Inflow =	2.00 cfs @ 12.11 hrs, Volume=	6,476 cf	
Outflow =	2.00 cfs @ 12.11 hrs, Volume=	6,476 cf, Atten= 0%, Lag= 0.0 min	
Primary =	2.00 cfs @ 12.11 hrs, Volume=	6,476 cf	

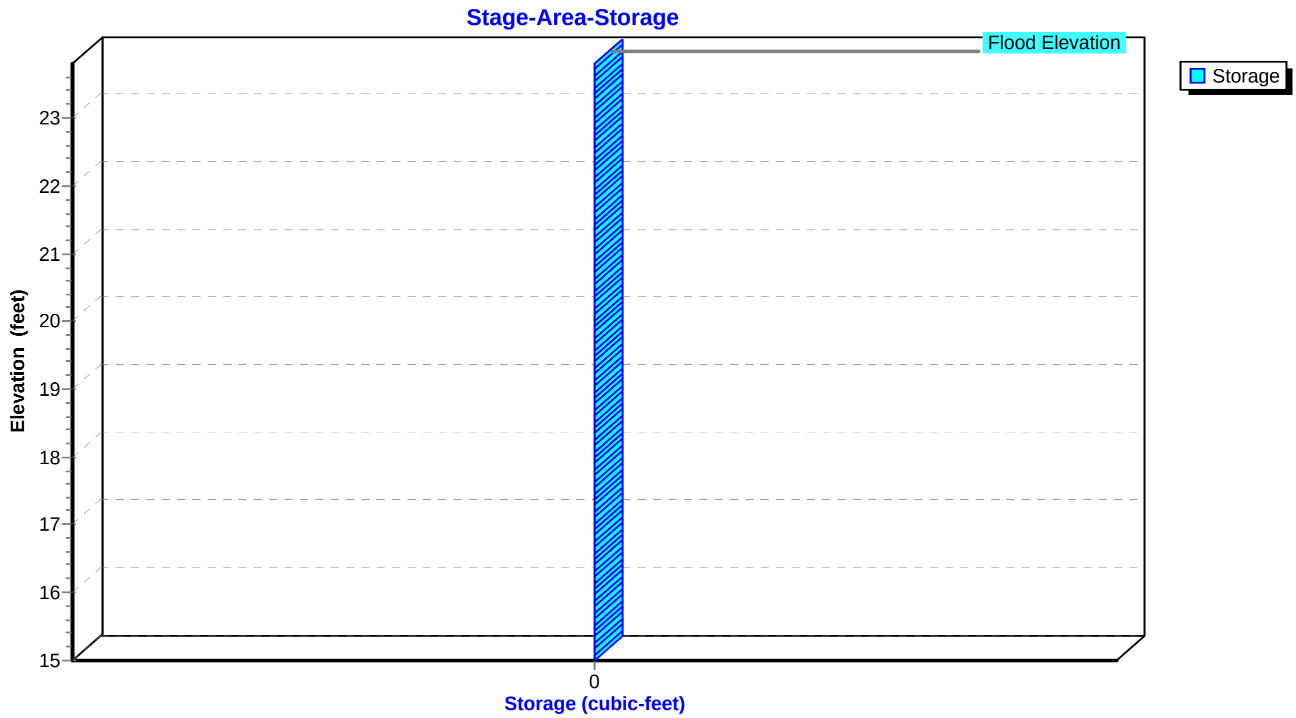
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.15' @ 12.19 hrs
Flood Elev= 23.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	**12.0" Round Culvert** L= 138.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.00' / 14.30' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.40 cfs @ 12.11 hrs HW=16.02' TW=15.63' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 1.40 cfs @ 2.18 fps)



Pond MH3: PDMH3



Summary for Pond MH4: PDMH4

[80] Warning: Exceeded Pond CB4 by 0.11' @ 12.15 hrs (0.57 cfs 102 cf)
[80] Warning: Exceeded Pond CB5 by 0.24' @ 12.15 hrs (1.29 cfs 370 cf)

Inflow Area = 22,134 sf, 85.50% Impervious, Inflow Depth = 6.08" for 50-yr event
Inflow = 3.27 cfs @ 12.10 hrs, Volume= 11,217 cf
Outflow = 3.27 cfs @ 12.10 hrs, Volume= 11,217 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.36 cfs @ 12.09 hrs, Volume= 10,018 cf
Secondary = 1.07 cfs @ 12.18 hrs, Volume= 1,200 cf

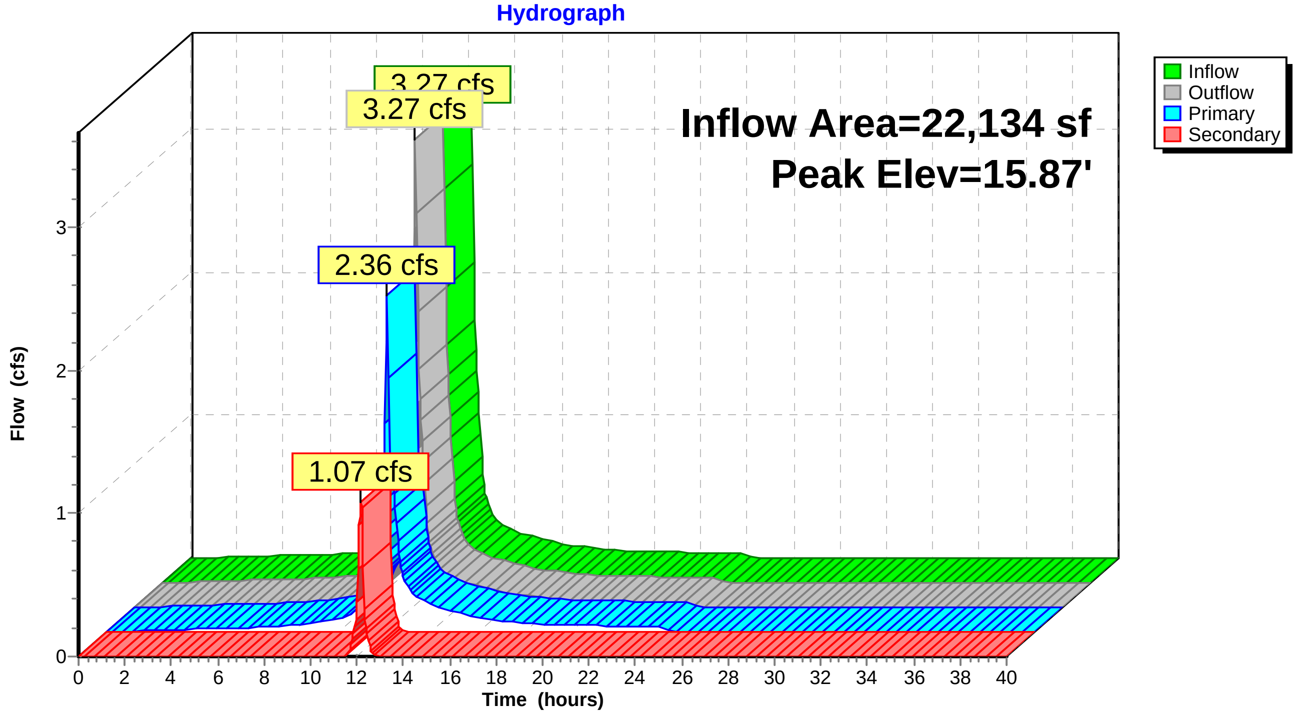
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.87' @ 12.16 hrs
Flood Elev= 21.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	14.20'	**12.0" Round Culvert** L= 6.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 14.10' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	14.20'	**12.0" Round Culvert** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 13.70' S= 0.0625 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	14.55'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

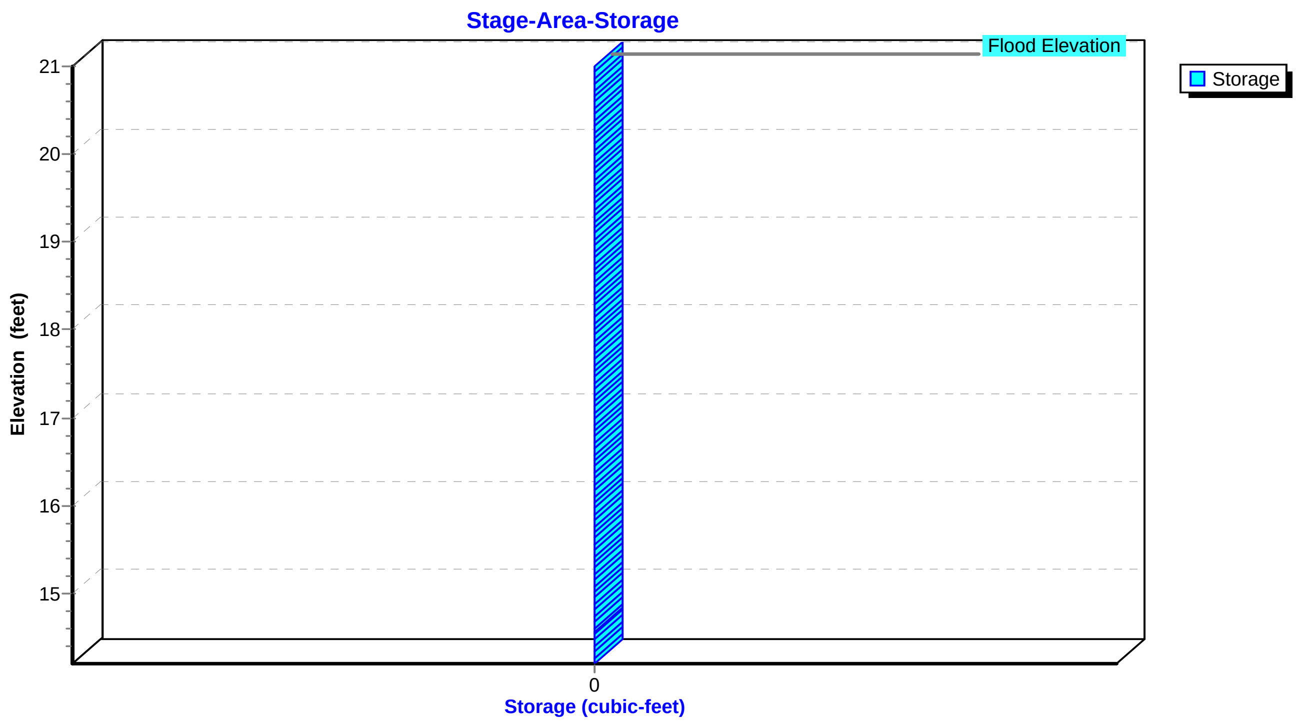
Primary OutFlow Max=0.90 cfs @ 12.09 hrs HW=15.51' TW=15.42' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.90 cfs @ 1.14 fps)

Secondary OutFlow Max=1.13 cfs @ 12.18 hrs HW=15.80' TW=14.72' (Dynamic Tailwater)
└─**2=Culvert** (Passes 1.13 cfs of 3.11 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 1.13 cfs @ 3.59 fps)

Pond MH4: PDMH4



Pond MH4: PDMH4



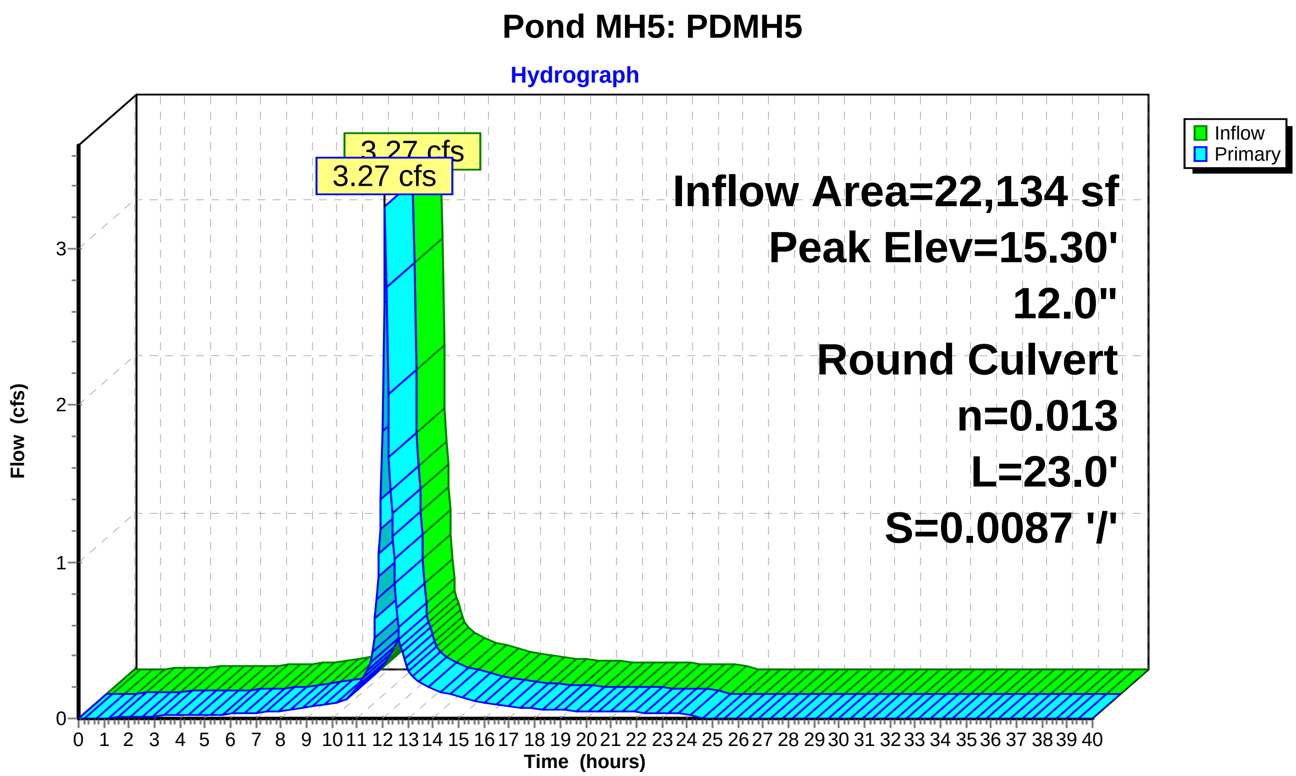
Summary for Pond MH5: PDMH5

Inflow Area =	22,134 sf,	85.50% Impervious,	Inflow Depth = 6.08"	for 50-yr event
Inflow =	3.27 cfs @	12.10 hrs, Volume=	11,218 cf	
Outflow =	3.27 cfs @	12.10 hrs, Volume=	11,218 cf, Atten= 0%, Lag= 0.0 min	
Primary =	3.27 cfs @	12.10 hrs, Volume=	11,218 cf	

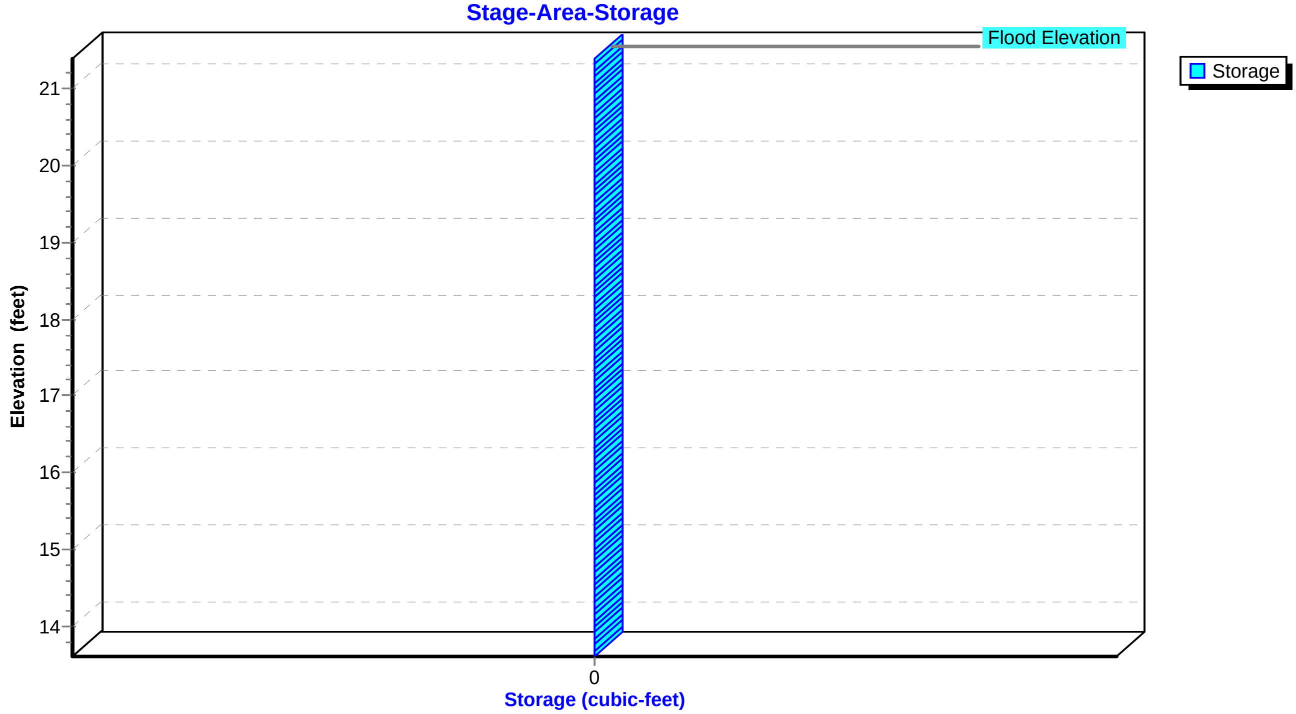
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.30' @ 12.10 hrs
Flood Elev= 21.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	13.60'	**12.0" Round Culvert** L= 23.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 13.60' / 13.40' S= 0.0087 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.25 cfs @ 12.10 hrs HW=15.28' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 3.25 cfs @ 4.14 fps)



Pond MH5: PDMH5



Summary for Pond MH6: PDMH6

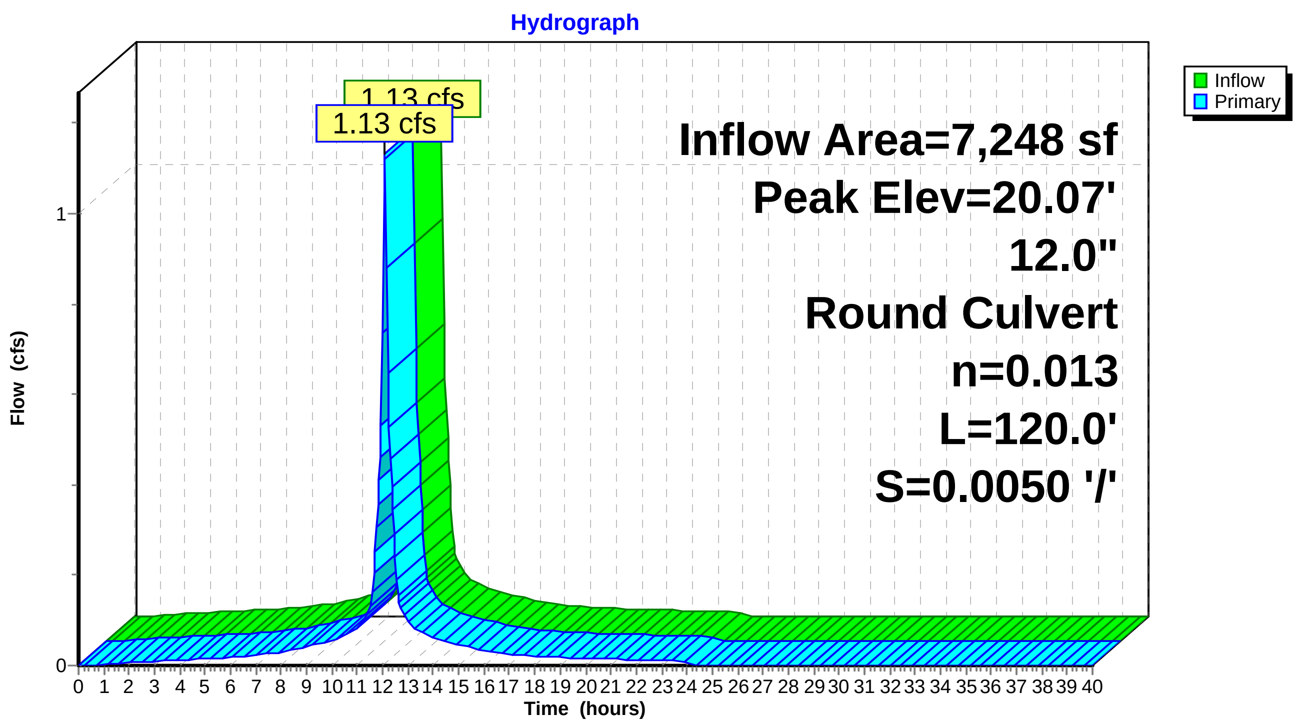
Inflow Area = 7,248 sf,100.00% Impervious, Inflow Depth = 6.86" for 50-yr event
Inflow = 1.13 cfs @ 12.09 hrs, Volume= 4,144 cf
Outflow = 1.13 cfs @ 12.09 hrs, Volume= 4,144 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.13 cfs @ 12.09 hrs, Volume= 4,144 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 20.07' @ 12.09 hrs
Flood Elev= 23.80'

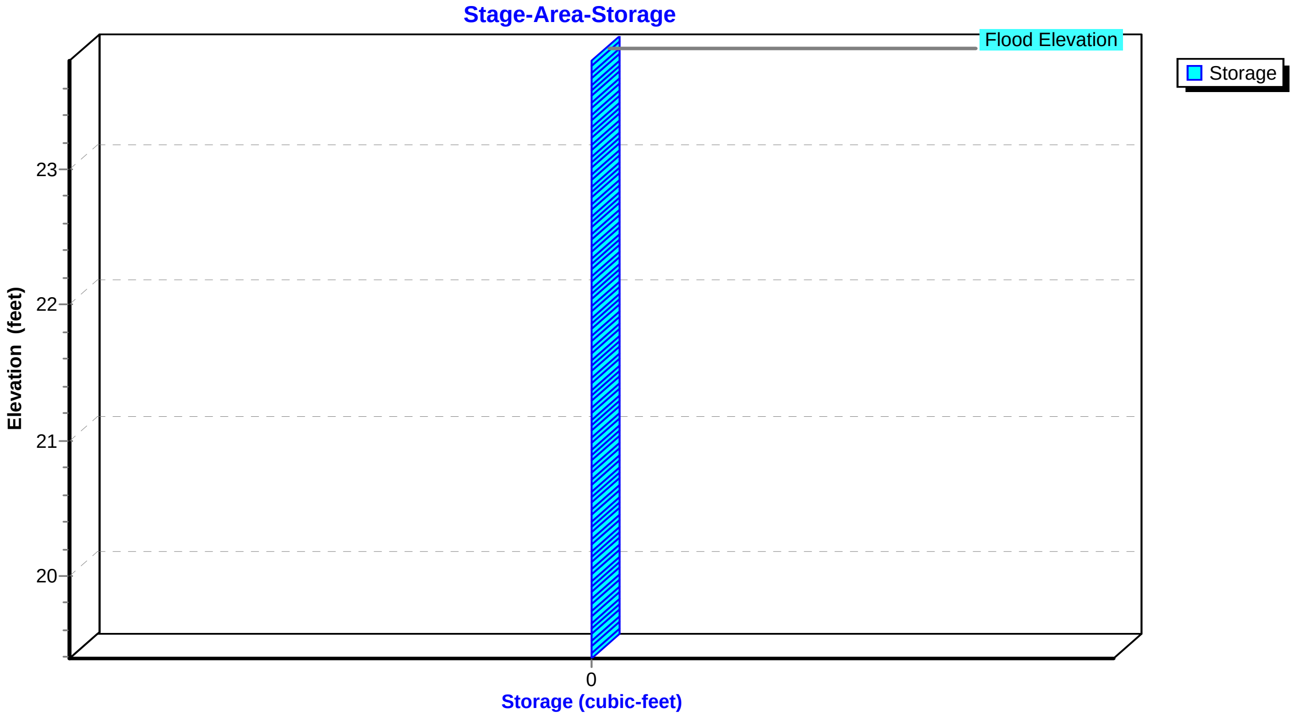
Device	Routing	Invert	Outlet Devices
#1	Primary	19.40'	**12.0" Round Culvert** L= 120.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.40' / 18.80' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.06 cfs @ 12.09 hrs HW=20.06' TW=19.40' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 1.06 cfs @ 2.74 fps)

Pond MH6: PDMH6



Pond MH6: PDMH6



Summary for Pond MH7: PDMH7

[80] Warning: Exceeded Pond CB7 by 0.02' @ 12.05 hrs (0.18 cfs 32 cf)

Inflow Area = 9,928 sf,100.00% Impervious, Inflow Depth = 6.86" for 50-yr event
Inflow = 1.55 cfs @ 12.09 hrs, Volume= 5,676 cf
Outflow = 1.55 cfs @ 12.09 hrs, Volume= 5,676 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.22 cfs @ 12.08 hrs, Volume= 5,289 cf
Secondary = 0.34 cfs @ 12.11 hrs, Volume= 387 cf

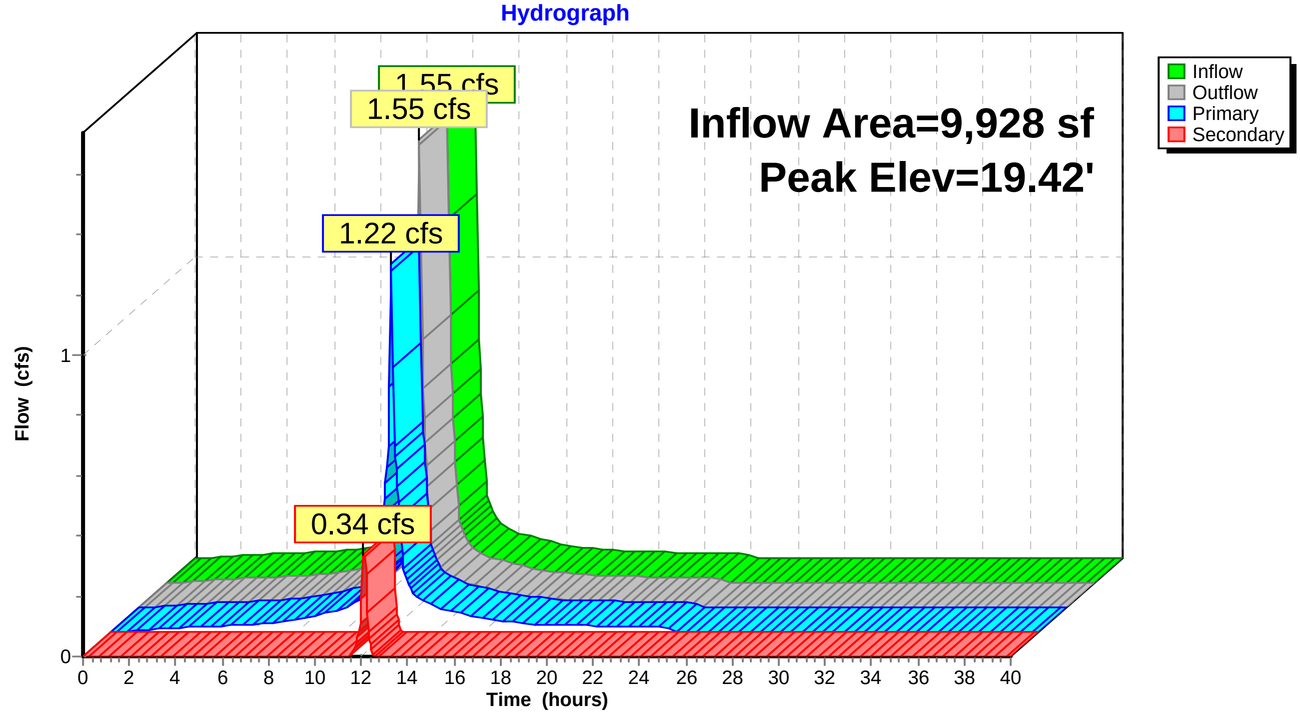
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.42' @ 12.13 hrs
Flood Elev= 21.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.70'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.70' / 18.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	18.70'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.70' / 18.20' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	19.00'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

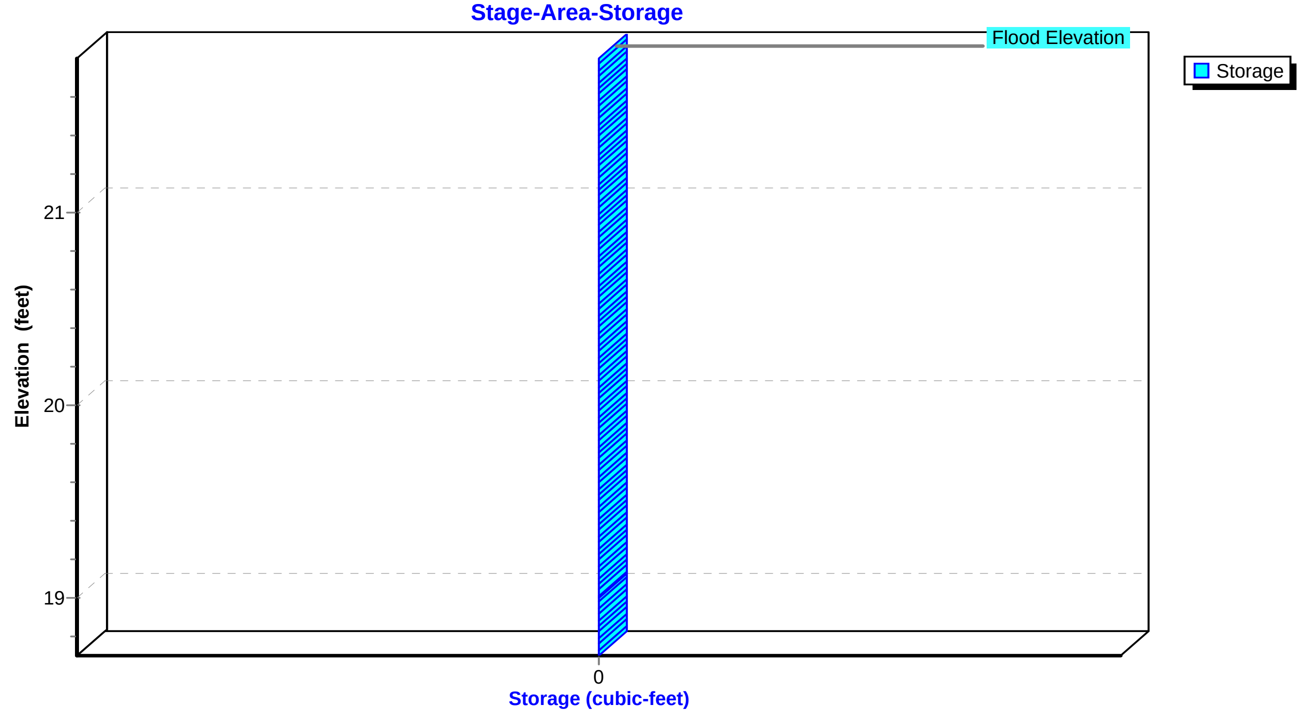
Primary OutFlow Max=0.95 cfs @ 12.08 hrs HW=19.40' TW=19.21' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.95 cfs @ 1.64 fps)

Secondary OutFlow Max=0.34 cfs @ 12.11 hrs HW=19.41' TW=19.11' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.34 cfs of 1.23 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.34 cfs @ 1.97 fps)

Pond MH7: PDMH7



Pond MH7: PDMH7



Summary for Pond MH8: PDMH8

[80] Warning: Exceeded Pond WQU2 by 0.01' @ 12.05 hrs (0.30 cfs 53 cf)

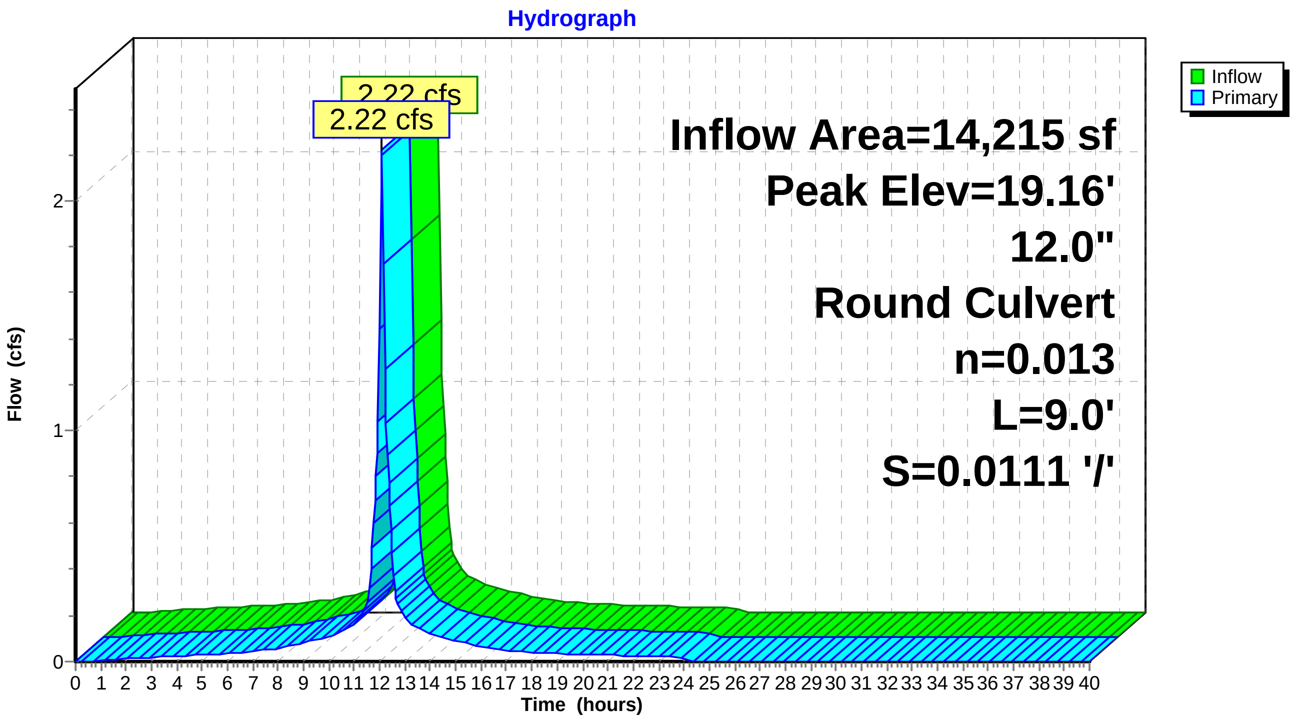
Inflow Area = 14,215 sf,100.00% Impervious, Inflow Depth = 6.86" for 50-yr event
Inflow = 2.22 cfs @ 12.09 hrs, Volume= 8,127 cf
Outflow = 2.22 cfs @ 12.09 hrs, Volume= 8,127 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.22 cfs @ 12.09 hrs, Volume= 8,127 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.16' @ 12.09 hrs
Flood Elev= 22.00'

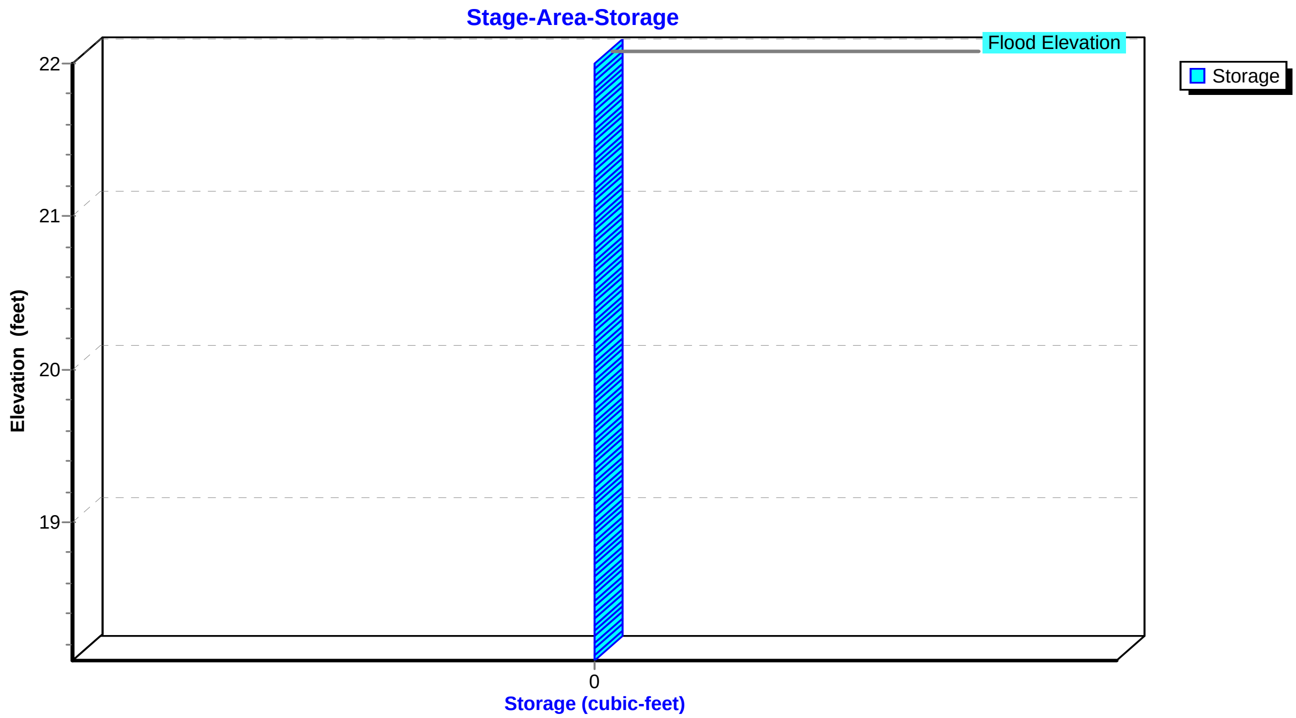
Device	Routing	Invert	Outlet Devices
#1	Primary	18.10'	**12.0" Round Culvert** L= 9.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.10' / 18.00' S= 0.0111 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.16 cfs @ 12.09 hrs HW=19.13' TW=17.40' (Dynamic Tailwater)
1=Culvert (Barrel Controls 2.16 cfs @ 3.30 fps)

Pond MH8: PDMH8



Pond MH8: PDMH8



Summary for Pond RG1: Rain Garden #1

Inflow Area = 25,212 sf, 56.56% Impervious, Inflow Depth = 5.39" for 50-yr event
Inflow = 3.41 cfs @ 12.09 hrs, Volume= 11,324 cf
Outflow = 1.18 cfs @ 12.37 hrs, Volume= 10,342 cf, Atten= 65%, Lag= 17.1 min
Primary = 1.18 cfs @ 12.37 hrs, Volume= 10,342 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.13' @ 12.37 hrs Surf.Area= 6,345 sf Storage= 4,522 cf
Flood Elev= 16.70' Surf.Area= 6,703 sf Storage= 6,272 cf

Plug-Flow detention time= 145.0 min calculated for 10,342 cf (91% of inflow)
Center-of-Mass det. time= 101.1 min (888.0 - 786.9)

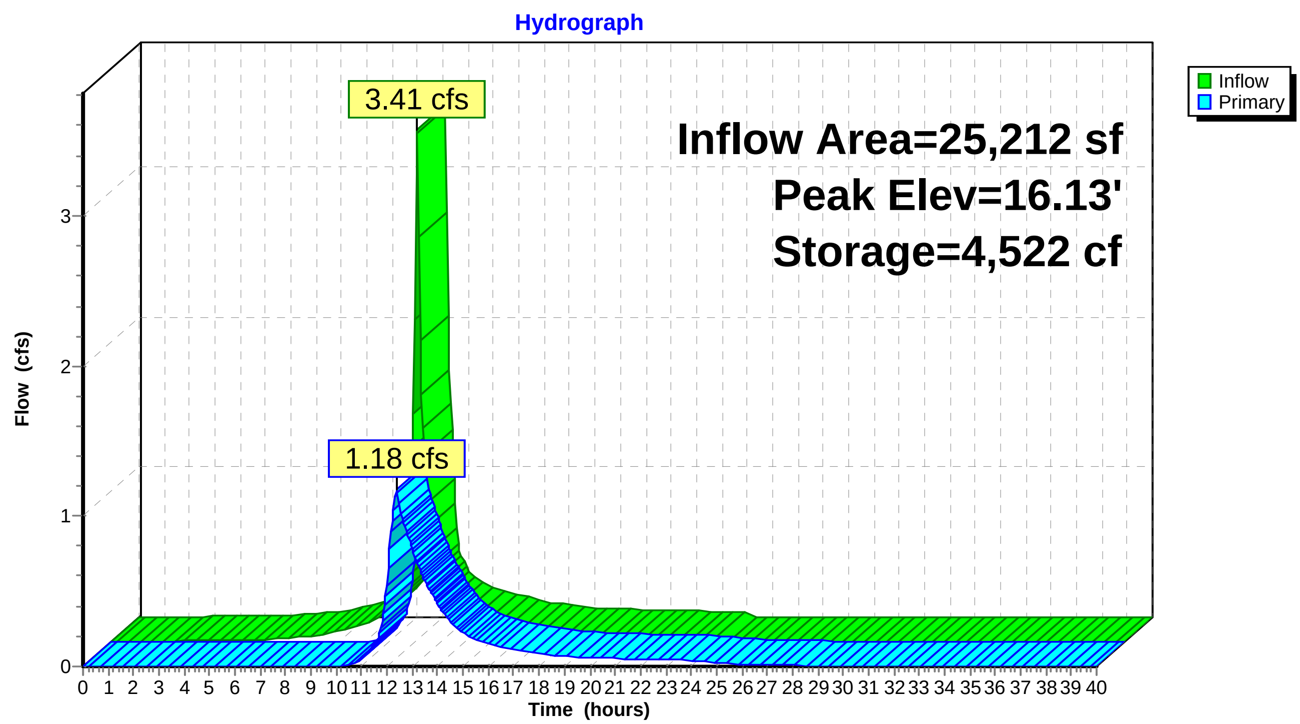
Volume	Invert	Avail.Storage	Storage Description
#1	15.30'	6,272 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
15.30	4,439	288.0	0	0	4,439
16.00	6,173	327.0	3,698	3,698	6,360
16.30	6,569	334.0	1,911	5,609	6,741
16.40	6,703	337.0	664	6,272	6,905

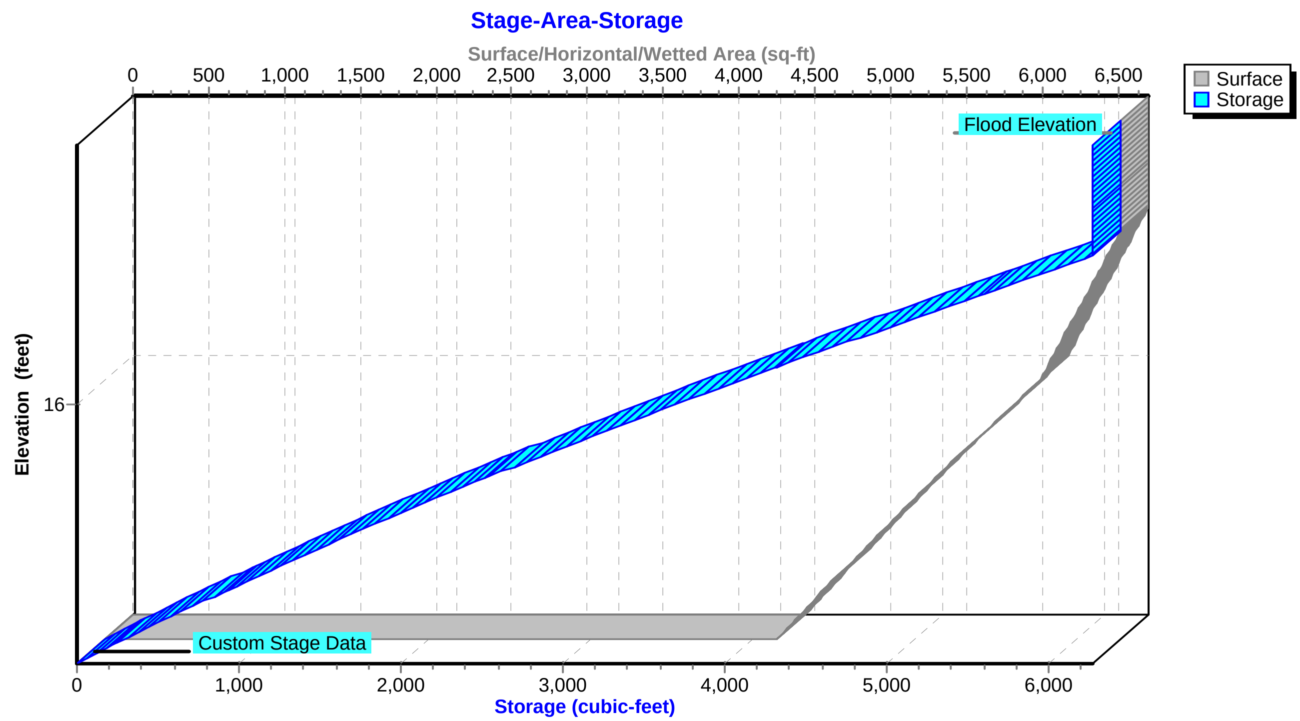
Device	Routing	Invert	Outlet Devices
#1	Primary	15.35'	**8.0" Round Culvert X 2.00** L= 65.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 15.35' / 15.00' S= 0.0054 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	15.50'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	15.80'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	16.10'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.17 cfs @ 12.37 hrs HW=16.13' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.17 cfs of 1.83 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.86 cfs @ 3.28 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.17 cfs @ 1.96 fps)
  └─**4=Orifice/Grate** (Weir Controls 0.14 cfs @ 0.58 fps)

Pond RG1: Rain Garden #1



Pond RG1: Rain Garden #1



Summary for Pond RG2: Rain Garden #2

[80] Warning: Exceeded Pond CB3 by 0.23' @ 24.45 hrs (0.12 cfs 1,156 cf)

Inflow Area = 10,003 sf, 68.81% Impervious, Inflow Depth = 5.99" for 50-yr event
Inflow = 1.45 cfs @ 12.09 hrs, Volume= 4,993 cf
Outflow = 1.43 cfs @ 12.12 hrs, Volume= 4,303 cf, Atten= 2%, Lag= 1.7 min
Primary = 1.43 cfs @ 12.12 hrs, Volume= 4,303 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.58' @ 12.12 hrs Surf.Area= 961 sf Storage= 1,110 cf
Flood Elev= 19.00' Surf.Area= 1,118 sf Storage= 1,546 cf

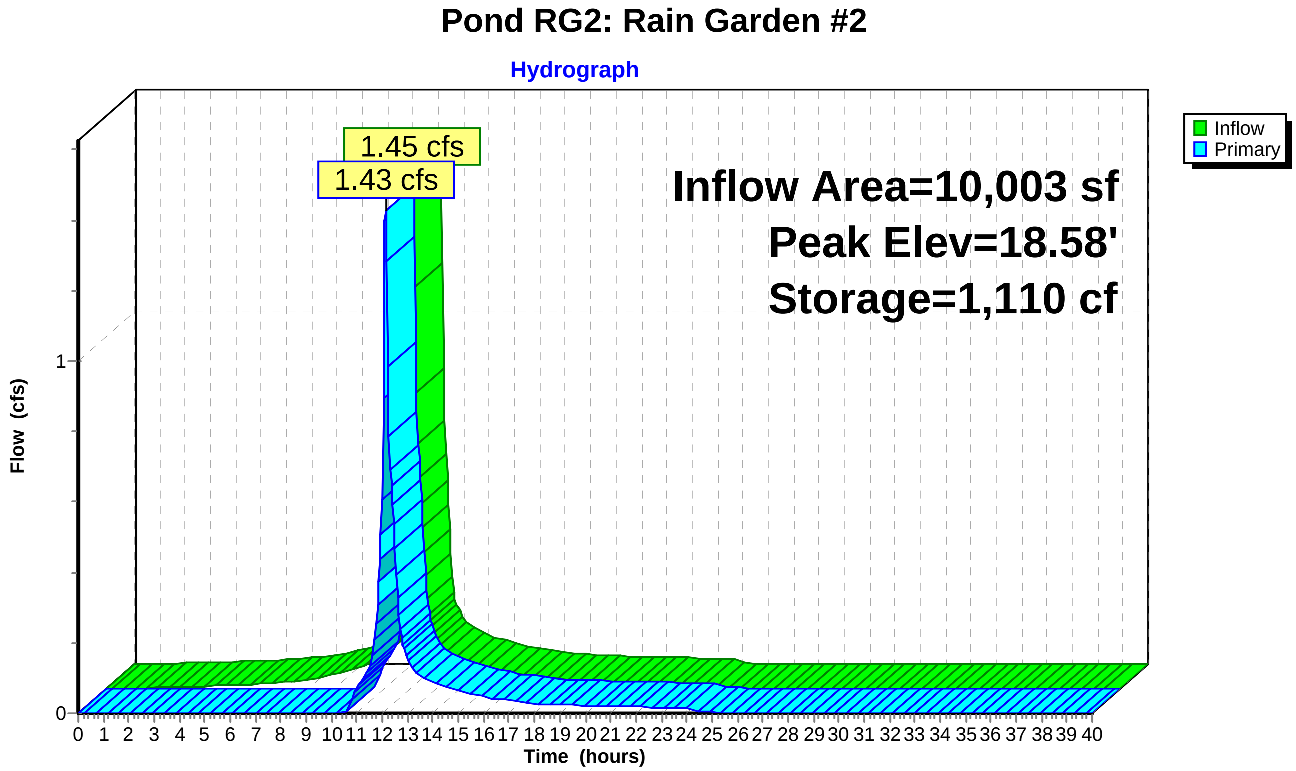
Plug-Flow detention time= 120.9 min calculated for 4,303 cf (86% of inflow)
Center-of-Mass det. time= 59.4 min (829.6 - 770.1)

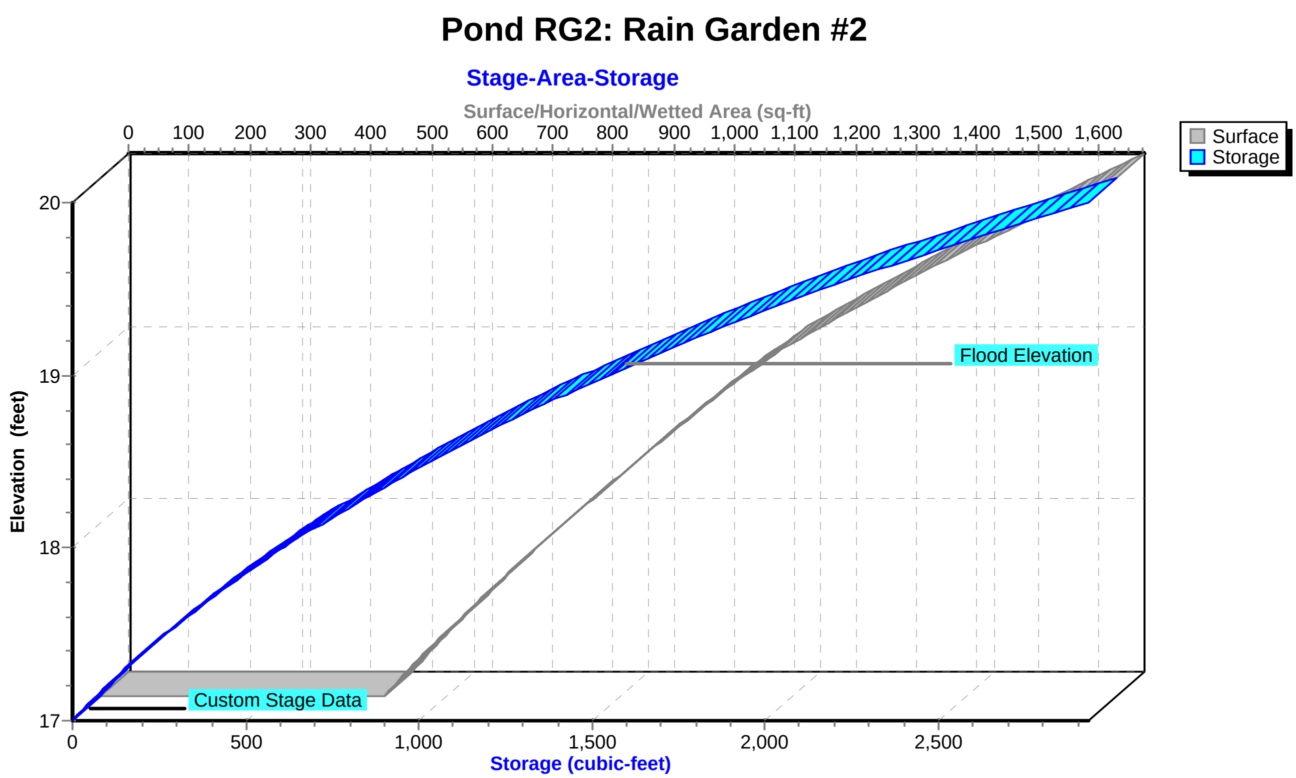
Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	2,934 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
17.00	468	89.0	0	0	468
18.00	765	108.0	610	610	782
19.00	1,118	127.0	936	1,546	1,156
20.00	1,676	152.0	1,388	2,934	1,728

Device	Routing	Invert	Outlet Devices
#1	Primary	16.50'	**12.0" Round Culvert X 2.00** L= 53.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 16.50' / 15.80' S= 0.0132 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	18.10'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	18.30'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	18.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.36 cfs @ 12.12 hrs HW=18.57' TW=16.64' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.36 cfs of 8.37 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.70 cfs @ 2.67 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.14 cfs @ 1.78 fps)
  └─**4=Orifice/Grate** (Weir Controls 0.52 cfs @ 0.89 fps)


Pond RG2: Rain Garden #2
Hydrograph
Inflow
Primary
1.45 cfs
1.43 cfs
Inflow Area=10,003 sf
Peak Elev=18.58'
Storage=1,110 cf
Flow (cfs)
Time (hours)
0
1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40


Pond RG2: Rain Garden #2
Stage-Area-Storage
Surface/Horizontal/Wetted Area (sq-ft)
0 100 200 300 400 500 600 700 800 900 1,000 1,100 1,200 1,300 1,400 1,500 1,600
Surface
Storage
Flood Elevation
Custom Stage Data
Elevation (feet)
17
18
19
20
0 500 1,000 1,500 2,000 2,500
Storage (cubic-feet)

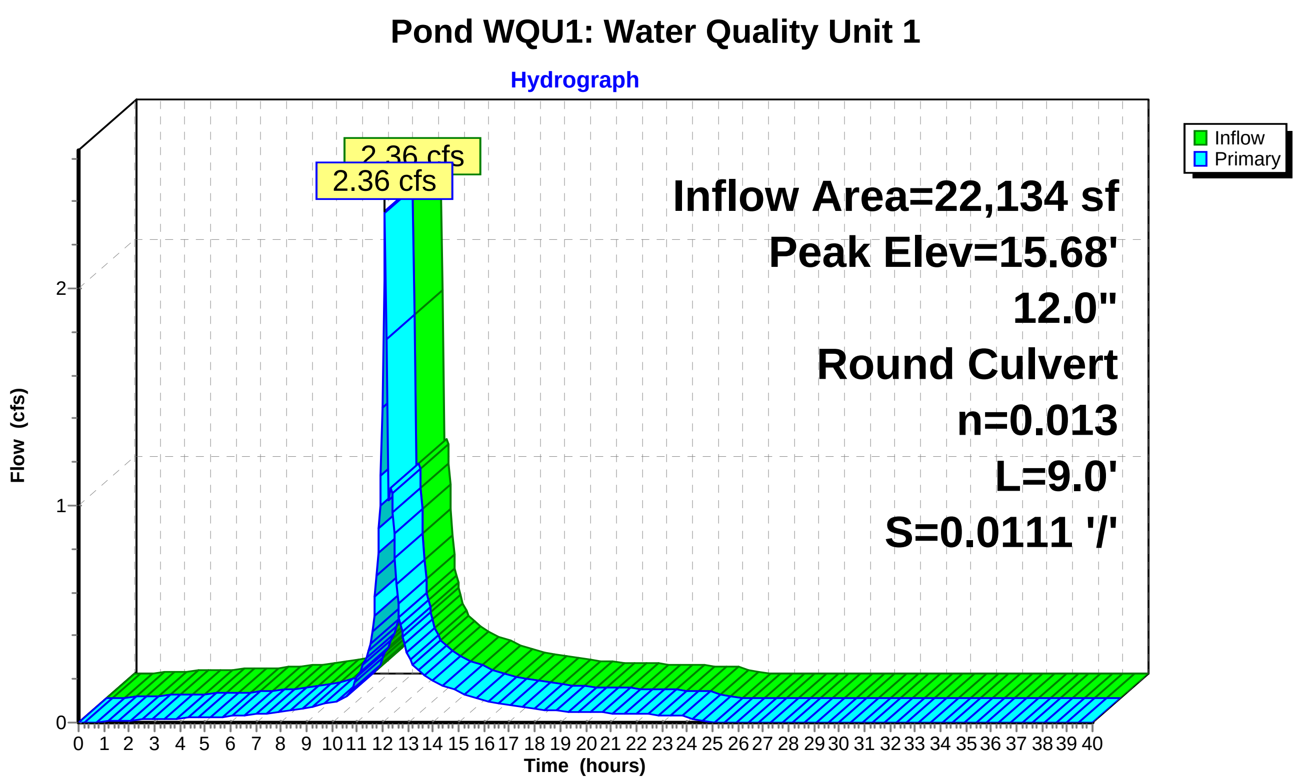
Summary for Pond WQU1: Water Quality Unit 1

Inflow Area = 22,134 sf, 85.50% Impervious, Inflow Depth = 5.43" for 50-yr event
Inflow = 2.36 cfs @ 12.09 hrs, Volume= 10,018 cf
Outflow = 2.36 cfs @ 12.09 hrs, Volume= 10,018 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.36 cfs @ 12.09 hrs, Volume= 10,018 cf

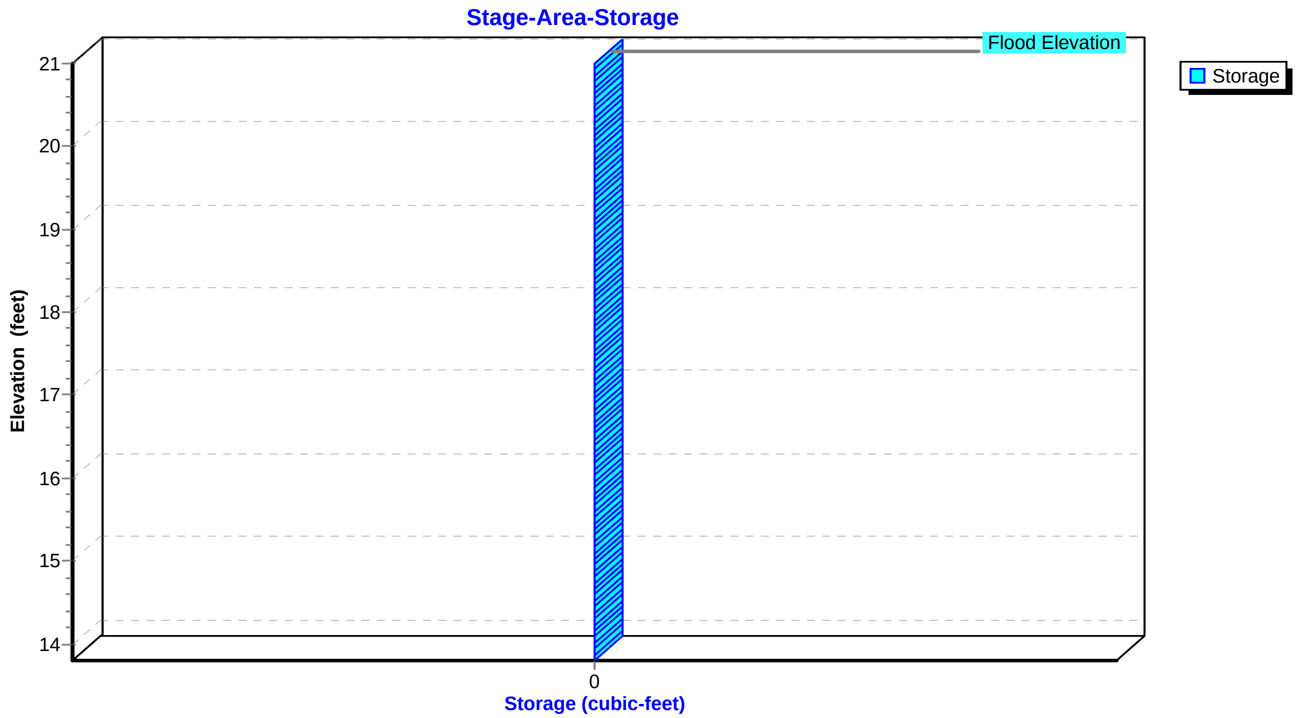
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.68' @ 12.13 hrs
Flood Elev= 21.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	13.80'	**12.0" Round Culvert** L= 9.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 13.80' / 13.70' S= 0.0111 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.29 cfs @ 12.09 hrs HW=15.42' TW=15.24' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 1.29 cfs @ 1.64 fps)



Pond WQU1: Water Quality Unit 1



Summary for Pond WQU2: Water Quality Unit 2

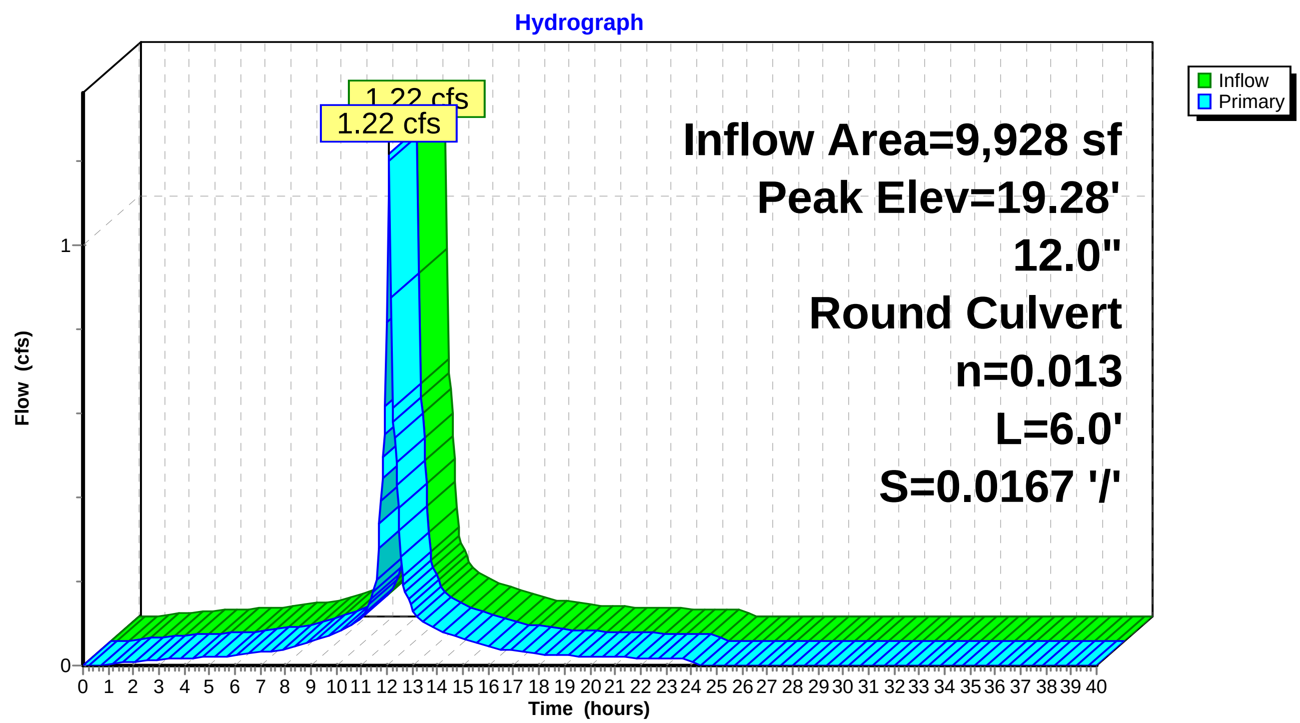
Inflow Area =	9,928 sf,100.00% Impervious,	Inflow Depth = 6.39" for 50-yr event			
Inflow =	1.22 cfs @	12.08 hrs,	Volume=	5,289 cf	
Outflow =	1.22 cfs @	12.08 hrs,	Volume=	5,289 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.22 cfs @	12.08 hrs,	Volume=	5,289 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.28' @ 12.12 hrs
Flood Elev= 22.30'

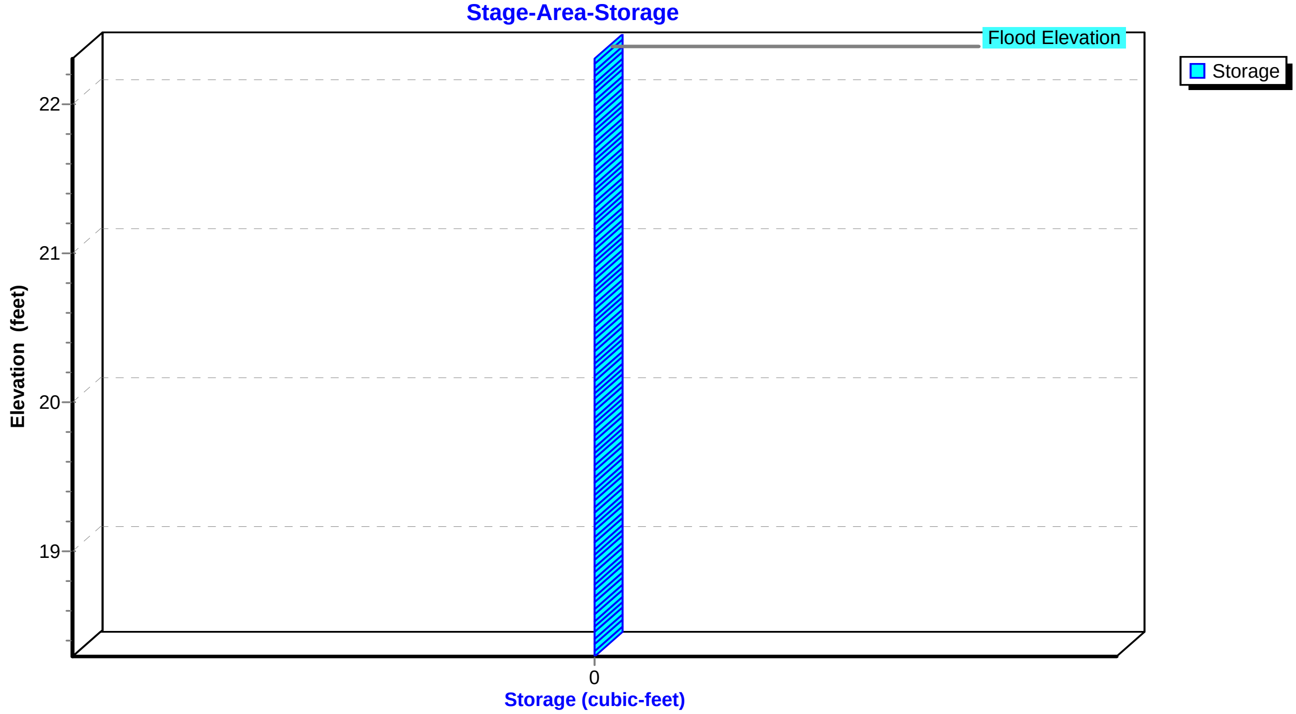
Device	Routing	Invert	Outlet Devices
#1	Primary	18.30'	**12.0" Round Culvert** L= 6.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.30' / 18.20' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.80 cfs @ 12.08 hrs HW=19.21' TW=19.13' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.80 cfs @ 1.06 fps)

Pond WQU2: Water Quality Unit 2



Pond WQU2: Water Quality Unit 2



Proposed Conditions Analysis
100-Year 24-Hour Storm Event

Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100: 100 - Pavement, Lawn, Runoff Area=20,037 sf 45.35% Impervious Runoff Depth=6.15"
Tc=6.0 min CN=82 Runoff=3.16 cfs 10,261 cf

Subcatchment 101: 101 - West Side Lawn to Runoff Area=271 sf 0.00% Impervious Runoff Depth=5.19"
Tc=6.0 min CN=74 Runoff=0.04 cfs 117 cf

Subcatchment 102: 102 - Existing Building Runoff Area=5,175 sf 100.00% Impervious Runoff Depth=8.06"
Tc=6.0 min CN=98 Runoff=0.95 cfs 3,476 cf

Subcatchment 200: 200 - Portion of Runoff Area=2,107 sf 100.00% Impervious Runoff Depth=8.06"
Tc=6.0 min CN=98 Runoff=0.38 cfs 1,415 cf

Subcatchment 201: 201 - Pavement Runoff Area=2,187 sf 95.93% Impervious Runoff Depth=7.94"
Tc=6.0 min CN=97 Runoff=0.40 cfs 1,447 cf

Subcatchment 202: 202 - Pavement Runoff Area=1,651 sf 100.00% Impervious Runoff Depth=8.06"
Tc=6.0 min CN=98 Runoff=0.30 cfs 1,109 cf

Subcatchment 203: 203 - Pavement Runoff Area=5,013 sf 96.69% Impervious Runoff Depth=7.94"
Tc=6.0 min CN=97 Runoff=0.91 cfs 3,317 cf

Subcatchment 204: 204 - Pavement Runoff Area=4,813 sf 100.00% Impervious Runoff Depth=8.06"
Tc=6.0 min CN=98 Runoff=0.88 cfs 3,233 cf

Subcatchment 205: 205 - Pavement Runoff Area=3,480 sf 100.00% Impervious Runoff Depth=8.06"
Tc=6.0 min CN=98 Runoff=0.64 cfs 2,337 cf

Subcatchment 206: 206 - Pavement Runoff Area=5,141 sf 100.00% Impervious Runoff Depth=8.06"
Tc=6.0 min CN=98 Runoff=0.94 cfs 3,453 cf

Subcatchment 207: 207 - Pavement Runoff Area=2,680 sf 100.00% Impervious Runoff Depth=8.06"
Tc=6.0 min CN=98 Runoff=0.49 cfs 1,800 cf

Subcatchment 208: 208 - Proposed Runoff Area=4,287 sf 100.00% Impervious Runoff Depth=8.06"
Tc=6.0 min CN=98 Runoff=0.78 cfs 2,879 cf

Subcatchment 209: 209 - Portion of Runoff Area=4,990 sf 40.80% Impervious Runoff Depth=6.38"
Tc=6.0 min CN=84 Runoff=0.81 cfs 2,655 cf

Subcatchment 210: 210 - Existing South Runoff Area=44,935 sf 0.00% Impervious Runoff Depth=4.14"
Flow Length=210' Tc=10.6 min CN=65 Runoff=4.24 cfs 15,496 cf

Subcatchment 300: 300 - Lawn East to DP3 Runoff Area=1,921 sf 0.00% Impervious Runoff Depth=5.19"
Tc=6.0 min CN=74 Runoff=0.26 cfs 832 cf

Pond CB1: PCB1 Peak Elev=17.12' Inflow=0.40 cfs 1,447 cf
12.0" Round Culvert n=0.013 L=21.0' S=0.0095 '/' Outflow=0.40 cfs 1,447 cf

Pond CB2: PCB2 Peak Elev=17.12' Inflow=0.30 cfs 1,109 cf
12.0" Round Culvert n=0.013 L=21.0' S=0.0095 '/' Outflow=0.30 cfs 1,109 cf

Pond CB3: PCB3 Peak Elev=18.74' Inflow=0.91 cfs 3,317 cf
12.0" Round Culvert n=0.013 L=64.0' S=0.0063 '/' Outflow=0.91 cfs 3,317 cf

Pond CB4: PCB4 Peak Elev=16.47' Inflow=0.88 cfs 3,233 cf
12.0" Round Culvert n=0.013 L=94.0' S=0.0085 '/' Outflow=0.88 cfs 3,233 cf

Pond CB5: PCB5 Peak Elev=16.46' Inflow=0.64 cfs 2,337 cf
12.0" Round Culvert n=0.013 L=93.0' S=0.0054 '/' Outflow=0.64 cfs 2,337 cf

Pond CB6: PCB6 Peak Elev=20.53' Inflow=0.94 cfs 3,453 cf
12.0" Round Culvert n=0.013 L=78.0' S=0.0051 '/' Outflow=0.94 cfs 3,453 cf

Pond CB7: PCB7 Peak Elev=19.61' Inflow=0.49 cfs 1,800 cf
12.0" Round Culvert n=0.013 L=11.0' S=0.0091 '/' Outflow=0.49 cfs 1,800 cf

Pond DP1: Design Pont #1_18" RCP Culvert - Northwest Inflow=1.92 cfs 12,871 cf
Primary=1.92 cfs 12,871 cf

Pond DP2: Design Pont #2_Wetland-South Inflow=7.85 cfs 30,083 cf
Primary=7.85 cfs 30,083 cf

Pond DP3: Design Pont #3_Abutting Lot-East Inflow=0.26 cfs 832 cf
Primary=0.26 cfs 832 cf

Pond IS: Infiltration System Peak Elev=18.43' Storage=2,189 cf Inflow=2.60 cfs 9,548 cf
Discarded=0.28 cfs 8,368 cf Primary=0.81 cfs 1,179 cf Outflow=1.09 cfs 9,548 cf

Pond MH1: PDMH1 Peak Elev=17.11' Inflow=0.70 cfs 2,556 cf
12.0" Round Culvert n=0.013 L=85.0' S=0.0059 '/' Outflow=0.70 cfs 2,556 cf

Pond MH2: PDMH2 Peak Elev=17.09' Inflow=2.38 cfs 7,838 cf
12.0" Round Culvert n=0.013 L=115.0' S=0.0052 '/' Outflow=2.38 cfs 7,838 cf

Pond MH3: PDMH3 Peak Elev=16.84' Inflow=2.38 cfs 7,838 cf
12.0" Round Culvert n=0.013 L=138.0' S=0.0051 '/' Outflow=2.38 cfs 7,838 cf

Pond MH4: PDMH4 Peak Elev=16.44' Inflow=3.88 cfs 13,408 cf
Primary=2.68 cfs 11,685 cf Secondary=1.60 cfs 1,723 cf Outflow=3.88 cfs 13,408 cf

Pond MH5: PDMH5 Peak Elev=15.79' Inflow=3.88 cfs 13,408 cf
12.0" Round Culvert n=0.013 L=23.0' S=0.0087 '/' Outflow=3.88 cfs 13,408 cf

Pond MH6: PDMH6 Peak Elev=20.14' Inflow=1.32 cfs 4,868 cf
12.0" Round Culvert n=0.013 L=120.0' S=0.0050 '/' Outflow=1.32 cfs 4,868 cf

Pond MH7: PDMH7 Peak Elev=19.59' Inflow=1.81 cfs 6,668 cf
Primary=1.44 cfs 6,136 cf Secondary=0.46 cfs 532 cf Outflow=1.81 cfs 6,668 cf

Pond MH8: PDMH8 Peak Elev=19.35' Inflow=2.60 cfs 9,548 cf
12.0" Round Culvert n=0.013 L=9.0' S=0.0111 '/' Outflow=2.60 cfs 9,548 cf

Pond RG1: Rain Garden #1 Peak Elev=16.20' Storage=4,934 cf Inflow=4.11 cfs 13,737 cf
Outflow=1.90 cfs 12,754 cf

Pond RG2: Rain Garden #2 Peak Elev=18.60' Storage=1,128 cf Inflow=1.72 cfs 5,971 cf
Outflow=1.69 cfs 5,282 cf

Pond WQU1: Water Quality Unit 1 Peak Elev=16.22' Inflow=2.68 cfs 11,685 cf
12.0" Round Culvert n=0.013 L=9.0' S=0.0111 '/' Outflow=2.68 cfs 11,685 cf

Pond WQU2: Water Quality Unit 2 Peak Elev=19.50' Inflow=1.44 cfs 6,136 cf
12.0" Round Culvert n=0.013 L=6.0' S=0.0167 '/' Outflow=1.44 cfs 6,136 cf

Summary for Subcatchment 100: 100 - Pavement, Lawn, and Direct Entry to Rain Garden

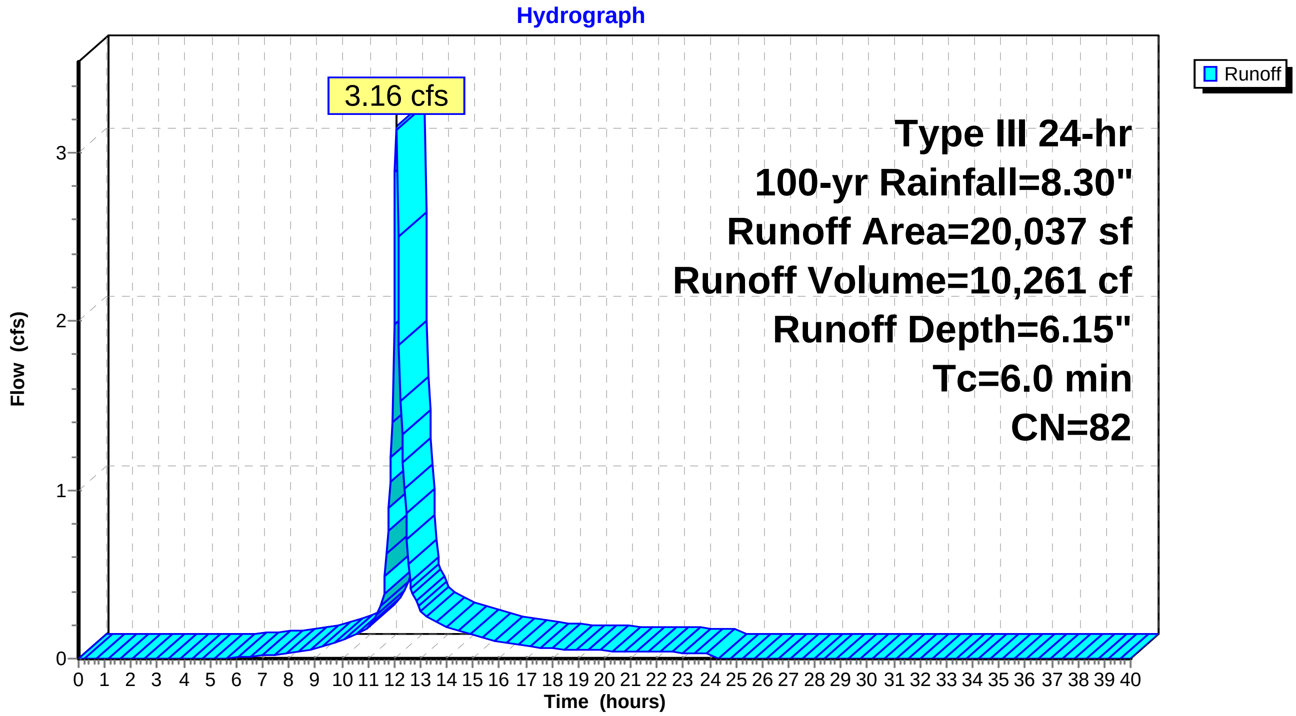
Runoff = 3.16 cfs @ 12.09 hrs, Volume= 10,261 cf, Depth= 6.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

	Area (sf)	CN	Description
	4,778	74	>75% Grass cover, Good, HSG C
*	6,173	65	Rain Garden surface area
	9,086	98	Paved parking, HSG C
	20,037	82	Weighted Average
	10,951		54.65% Pervious Area
	9,086		45.35% Impervious Area

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

Subcatchment 100: 100 - Pavement, Lawn, and Direct Entry to Rain Garden



Summary for Subcatchment 101: 101 - West Side Lawn to DP1

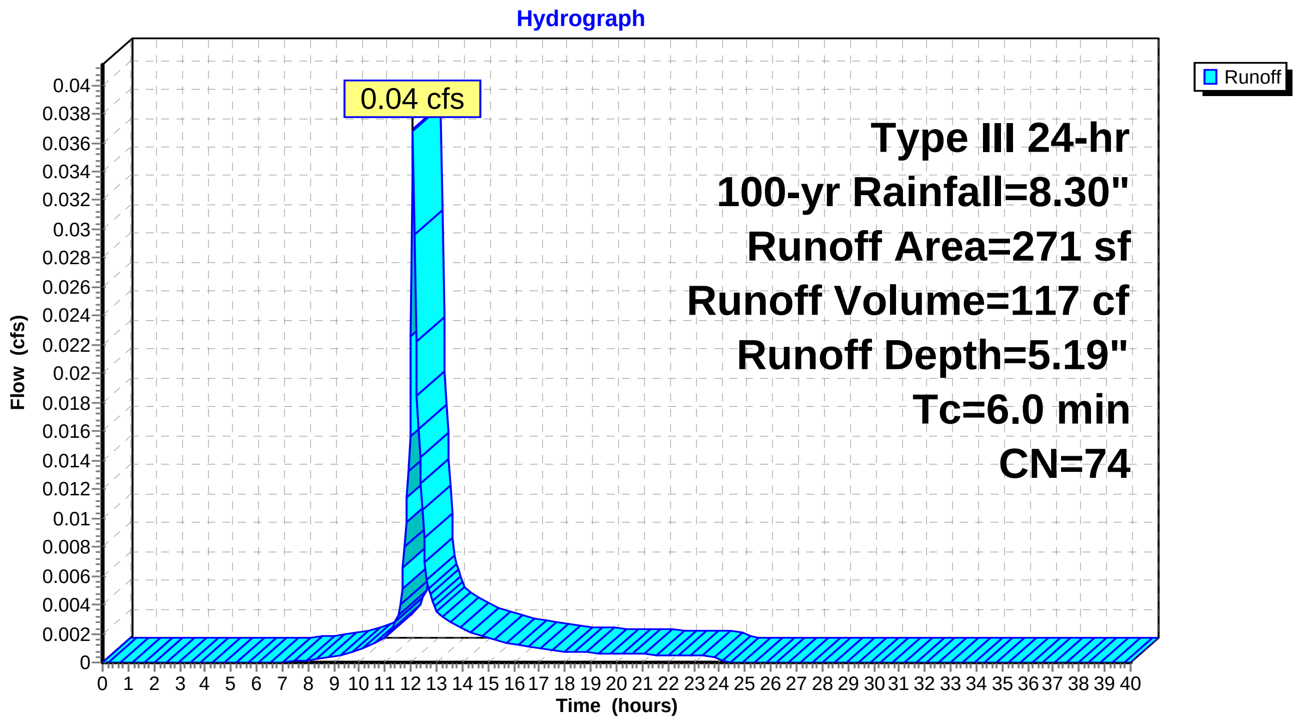
Runoff = 0.04 cfs @ 12.09 hrs, Volume= 117 cf, Depth= 5.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

Area (sf)	CN	Description
271	74	>75% Grass cover, Good, HSG C
271		100.00% Pervious Area

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

Subcatchment 101: 101 - West Side Lawn to DP1



Summary for Subcatchment 102: 102 - Existing Building

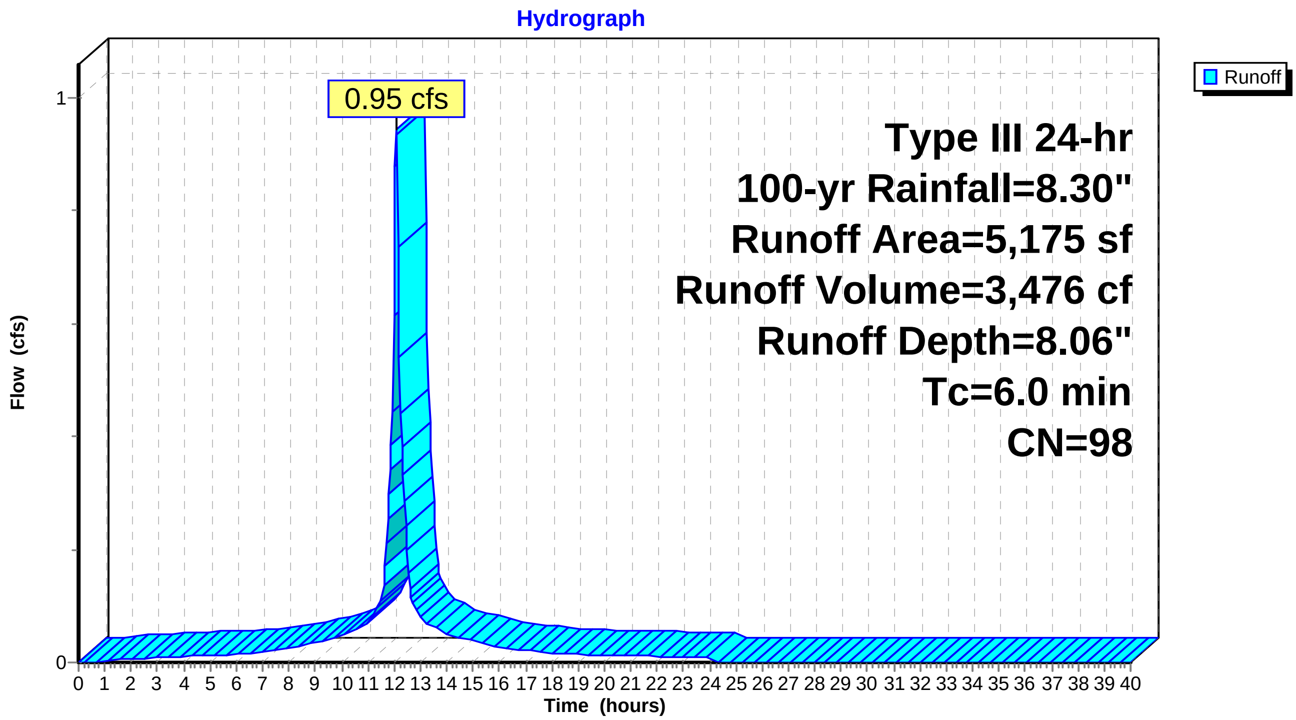
Runoff = 0.95 cfs @ 12.09 hrs, Volume= 3,476 cf, Depth= 8.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

	Area (sf)	CN	Description
*	5,175	98	Roofs, HSG C, Existing Building
	5,175		100.00% Impervious Area

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

Subcatchment 102: 102 - Existing Building



Summary for Subcatchment 200: 200 - Portion of Proposed Building Tenant A to Rain Garden #2

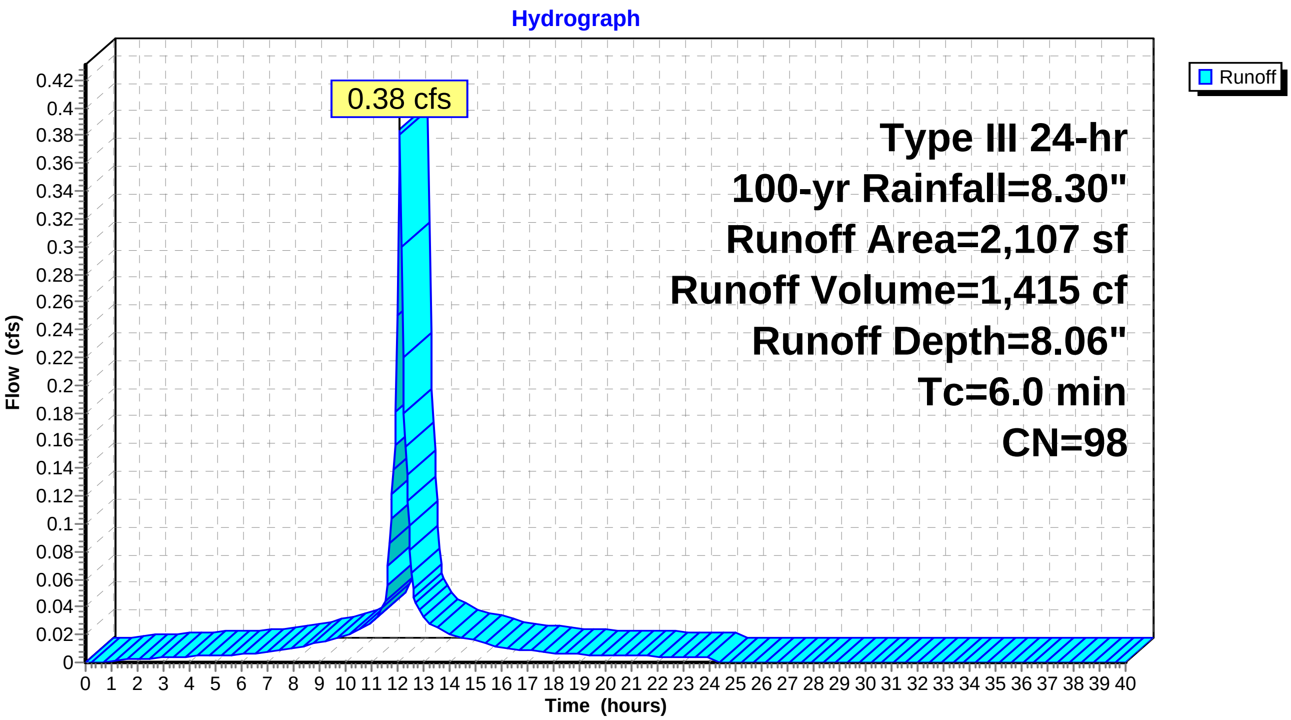
Runoff = 0.38 cfs @ 12.09 hrs, Volume= 1,415 cf, Depth= 8.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

	Area (sf)	CN	Description
*	2,107	98	Roofs, HSG C, Half Prop. Building A
	2,107		100.00% Impervious Area

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

Subcatchment 200: 200 - Portion of Proposed Building Tenant A to Rain Garden #2



Summary for Subcatchment 201: 201 - Pavement

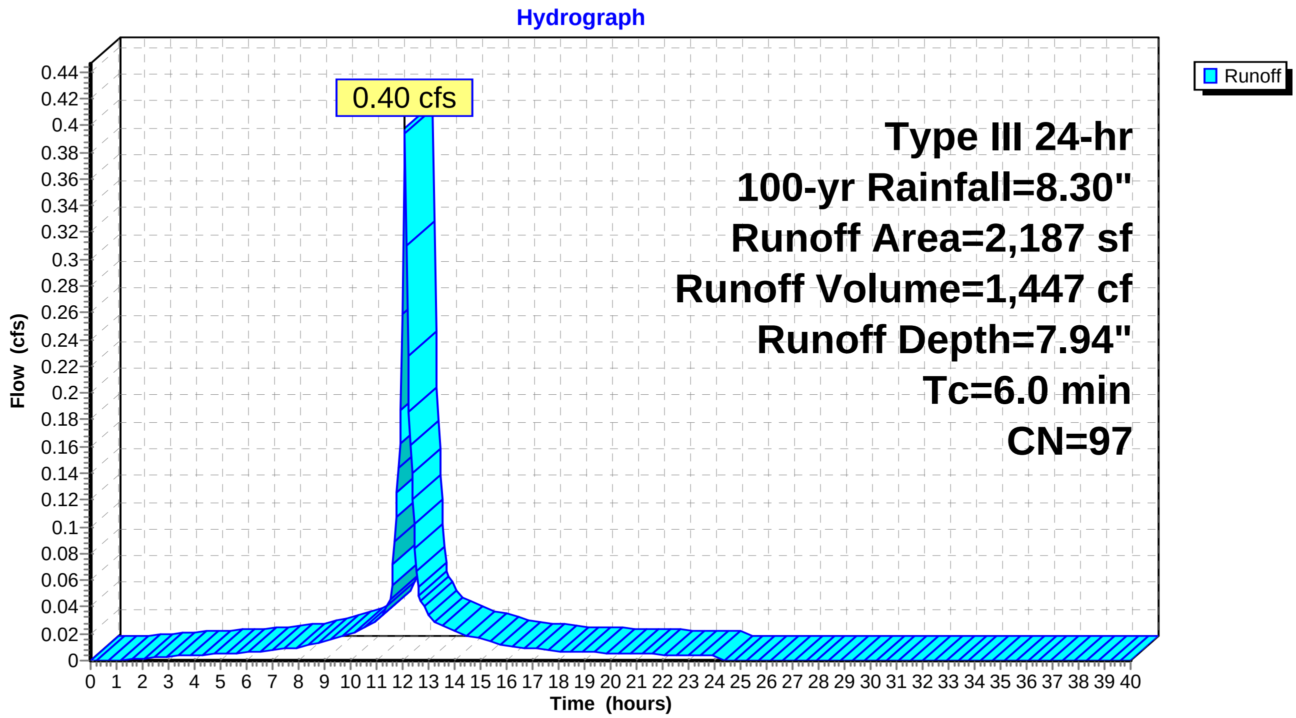
Runoff = 0.40 cfs @ 12.09 hrs, Volume= 1,447 cf, Depth= 7.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

Area (sf)	CN	Description
2,098	98	Paved parking, HSG C
89	74	>75% Grass cover, Good, HSG C
2,187	97	Weighted Average
89		4.07% Pervious Area
2,098		95.93% Impervious Area

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

Subcatchment 201: 201 - Pavement



Summary for Subcatchment 202: 202 - Pavement

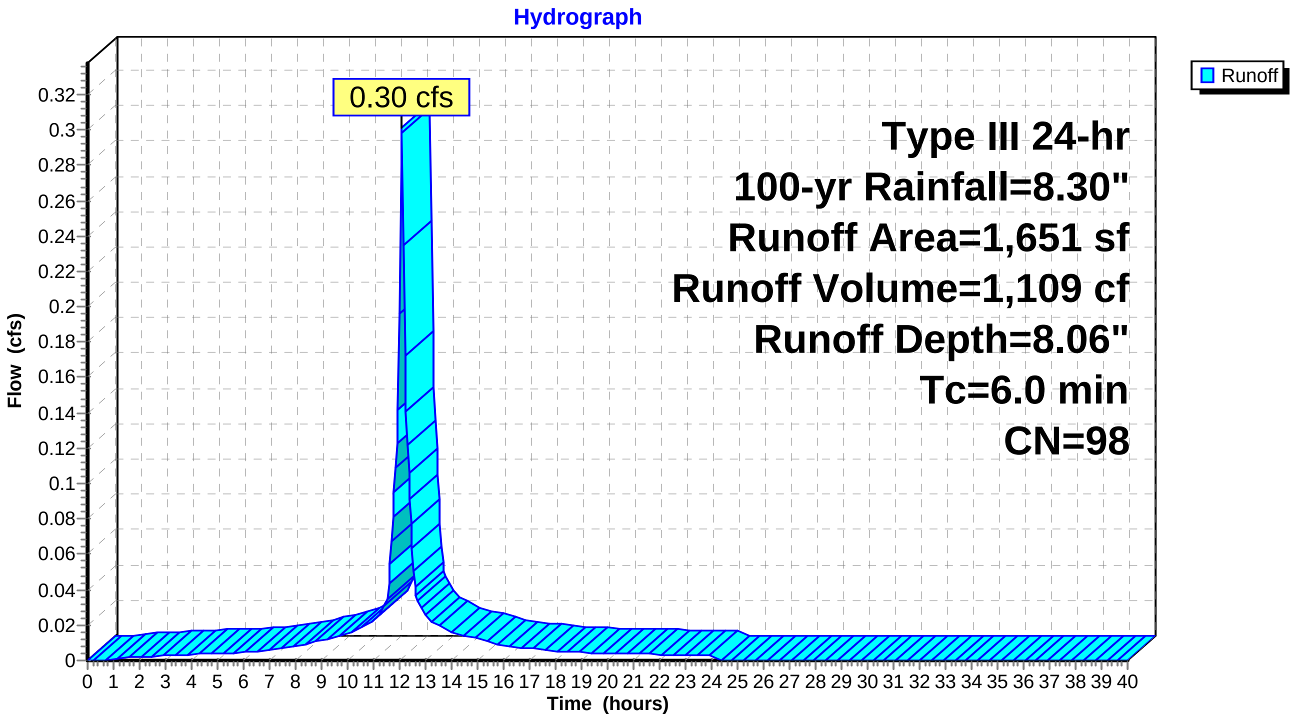
Runoff = 0.30 cfs @ 12.09 hrs, Volume= 1,109 cf, Depth= 8.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

Area (sf)	CN	Description
1,651	98	Paved parking, HSG C
1,651		100.00% Impervious Area

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

Subcatchment 202: 202 - Pavement



Summary for Subcatchment 203: 203 - Pavement

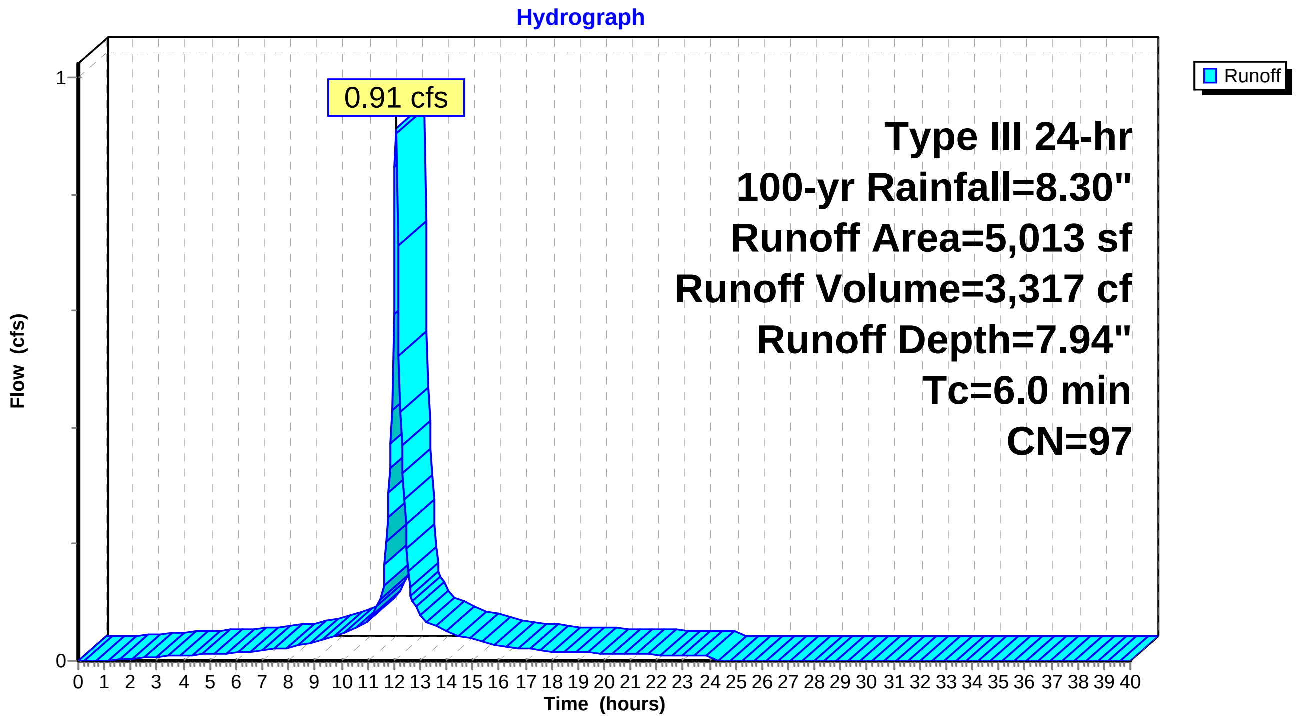
Runoff = 0.91 cfs @ 12.09 hrs, Volume= 3,317 cf, Depth= 7.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

Area (sf)	CN	Description
4,847	98	Paved parking, HSG C
166	74	>75% Grass cover, Good, HSG C
5,013	97	Weighted Average
166		3.31% Pervious Area
4,847		96.69% Impervious Area

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

Subcatchment 203: 203 - Pavement



Summary for Subcatchment 204: 204 - Pavement

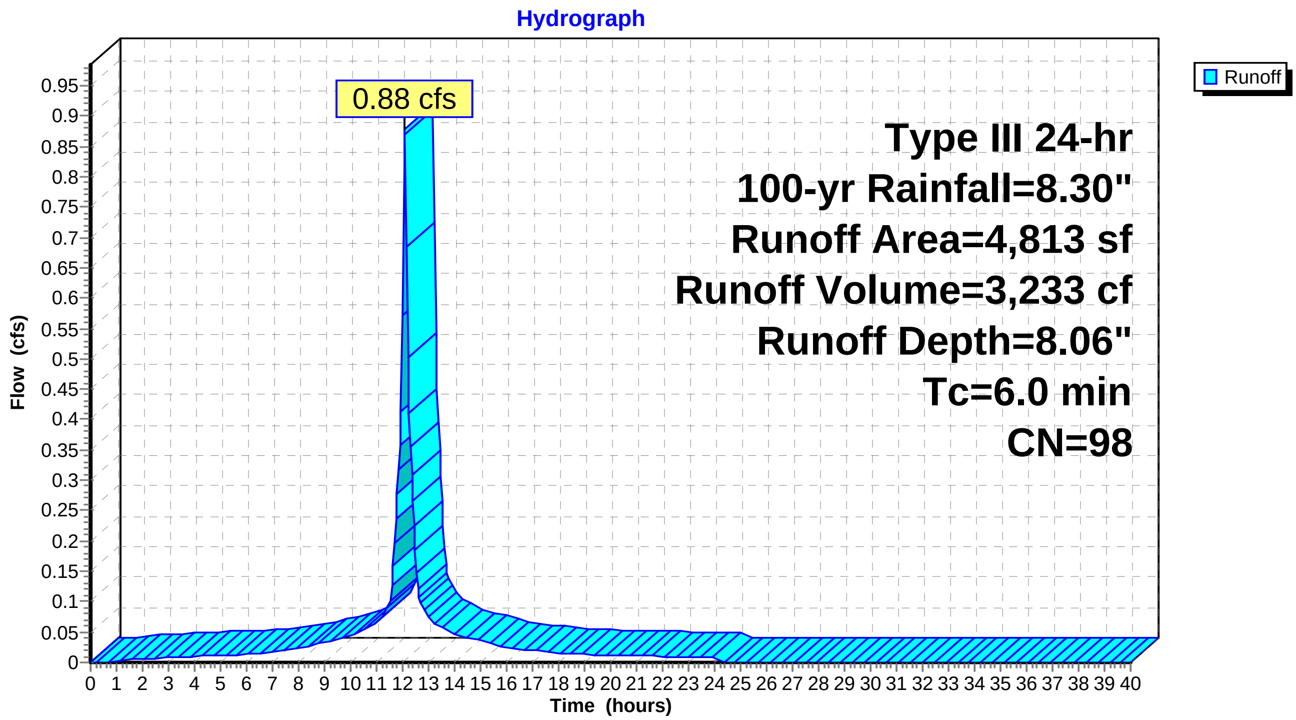
Runoff = 0.88 cfs @ 12.09 hrs, Volume= 3,233 cf, Depth= 8.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

Area (sf)	CN	Description
4,813	98	Paved parking, HSG C
4,813		100.00% Impervious Area

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

Subcatchment 204: 204 - Pavement



Summary for Subcatchment 205: 205 - Pavement

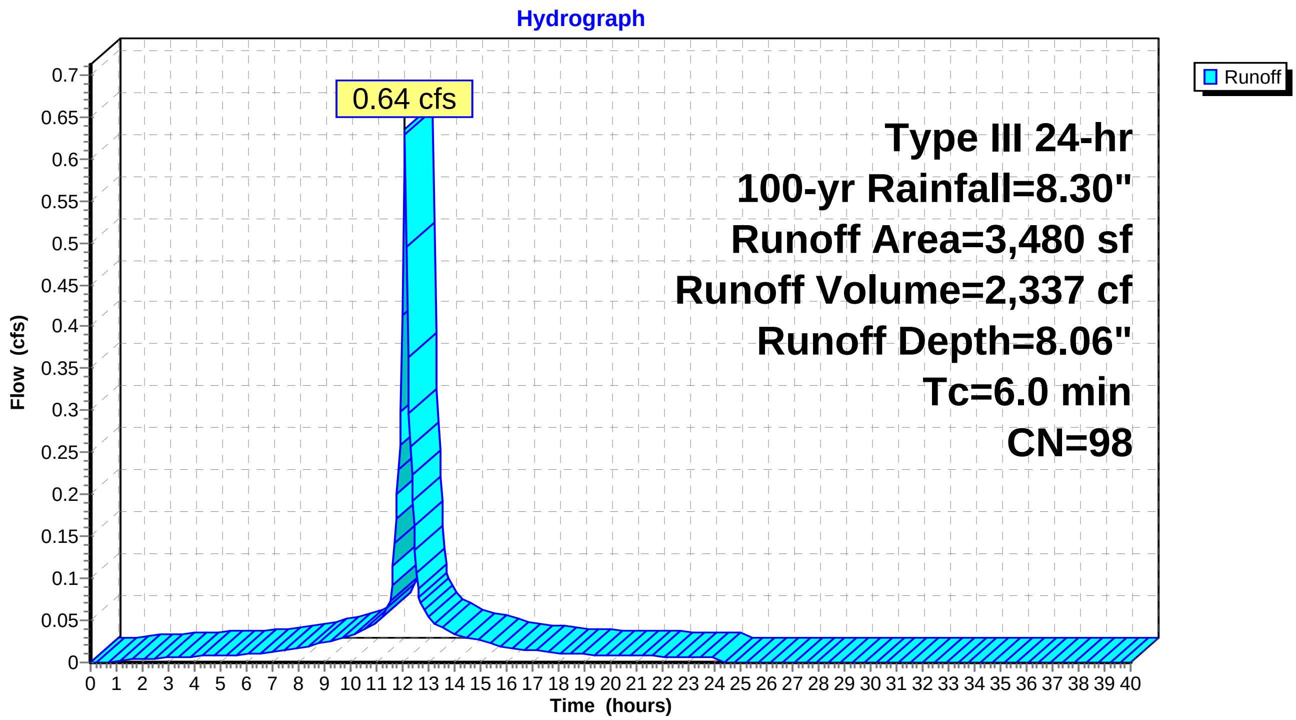
Runoff = 0.64 cfs @ 12.09 hrs, Volume= 2,337 cf, Depth= 8.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

Area (sf)	CN	Description
3,480	98	Paved parking, HSG C
3,480		100.00% Impervious Area

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

Subcatchment 205: 205 - Pavement



Summary for Subcatchment 206: 206 - Pavement

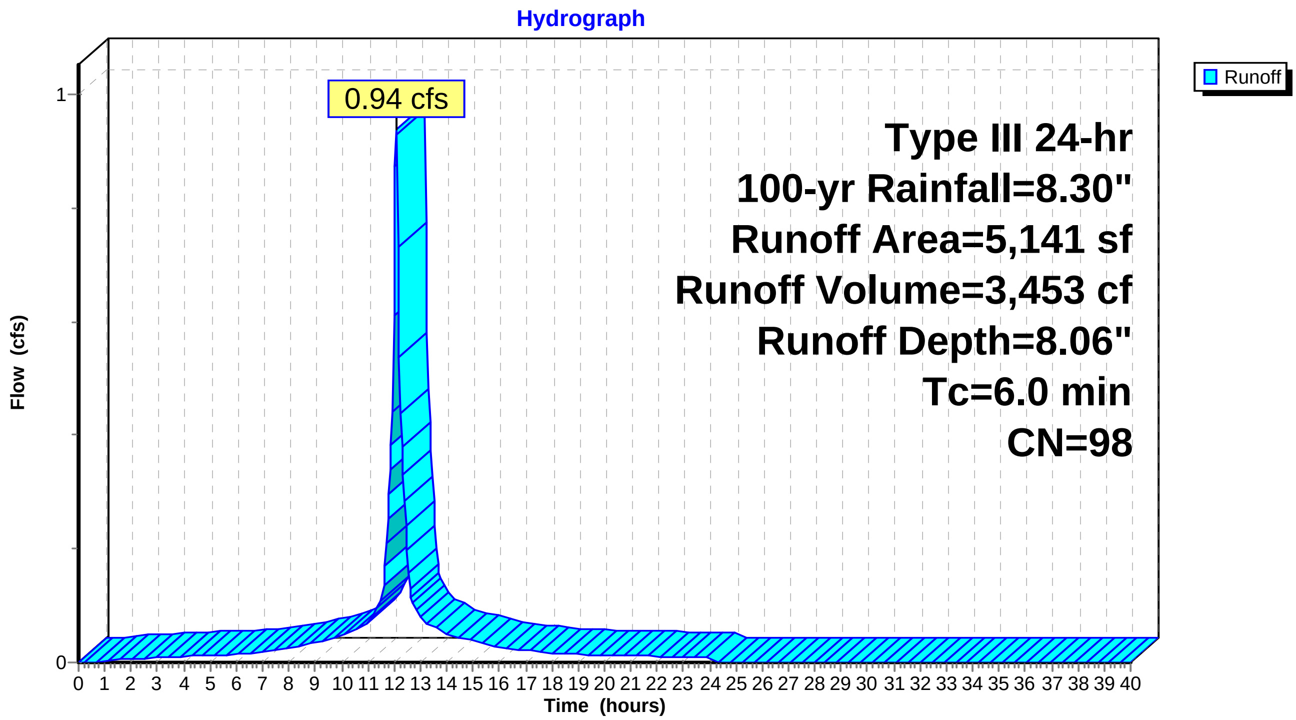
Runoff = 0.94 cfs @ 12.09 hrs, Volume= 3,453 cf, Depth= 8.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

Area (sf)	CN	Description
5,141	98	Paved parking, HSG C
5,141		100.00% Impervious Area

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

Subcatchment 206: 206 - Pavement



Summary for Subcatchment 207: 207 - Pavement

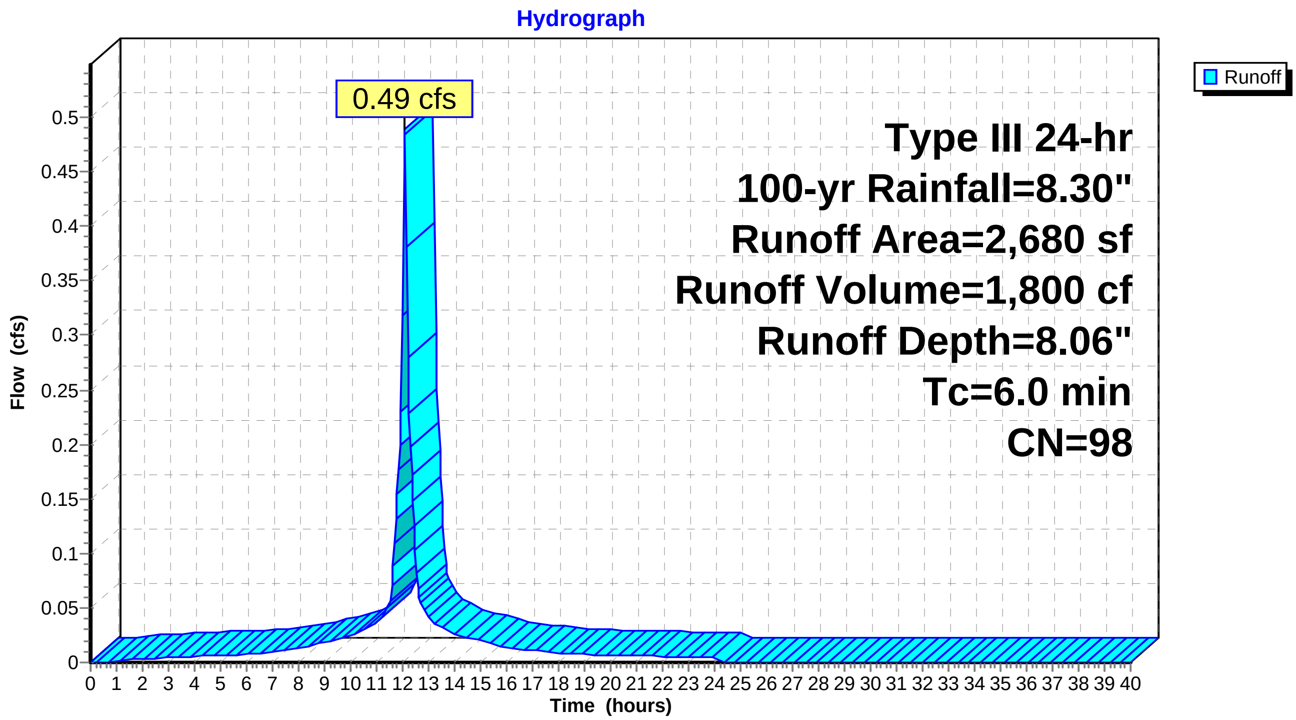
Runoff = 0.49 cfs @ 12.09 hrs, Volume= 1,800 cf, Depth= 8.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

Area (sf)	CN	Description
2,680	98	Paved parking, HSG C
2,680		100.00% Impervious Area

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

Subcatchment 207: 207 - Pavement



Summary for Subcatchment 208: 208 - Proposed Building Tenant B

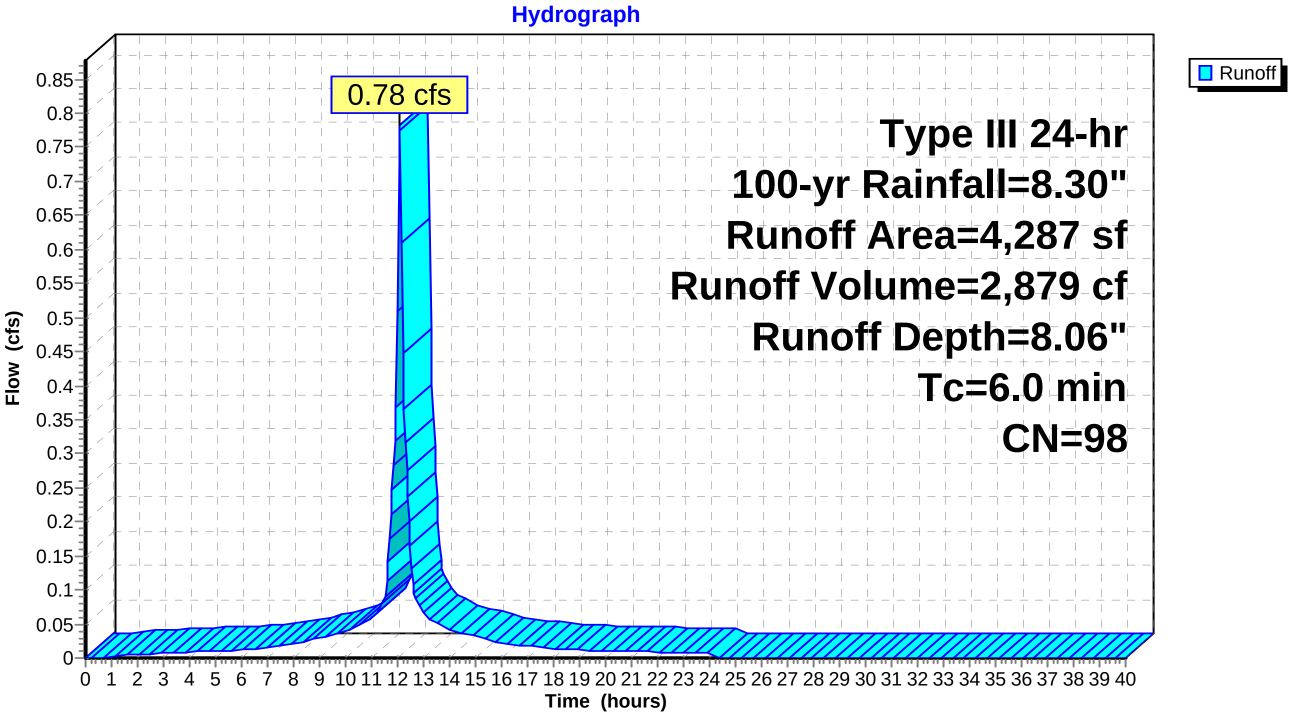
Runoff = 0.78 cfs @ 12.09 hrs, Volume= 2,879 cf, Depth= 8.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

Area (sf)	CN	Description
4,287	98	Roofs, HSG C
0	98	Roofs, HSG C
4,287	98	Weighted Average
4,287		100.00% Impervious Area

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

Subcatchment 208: 208 - Proposed Building Tenant B



mary for Subcatchment 209: 209 - Portion of Proposed Building Tentant A, Rain Garden #2, Lawn, and W

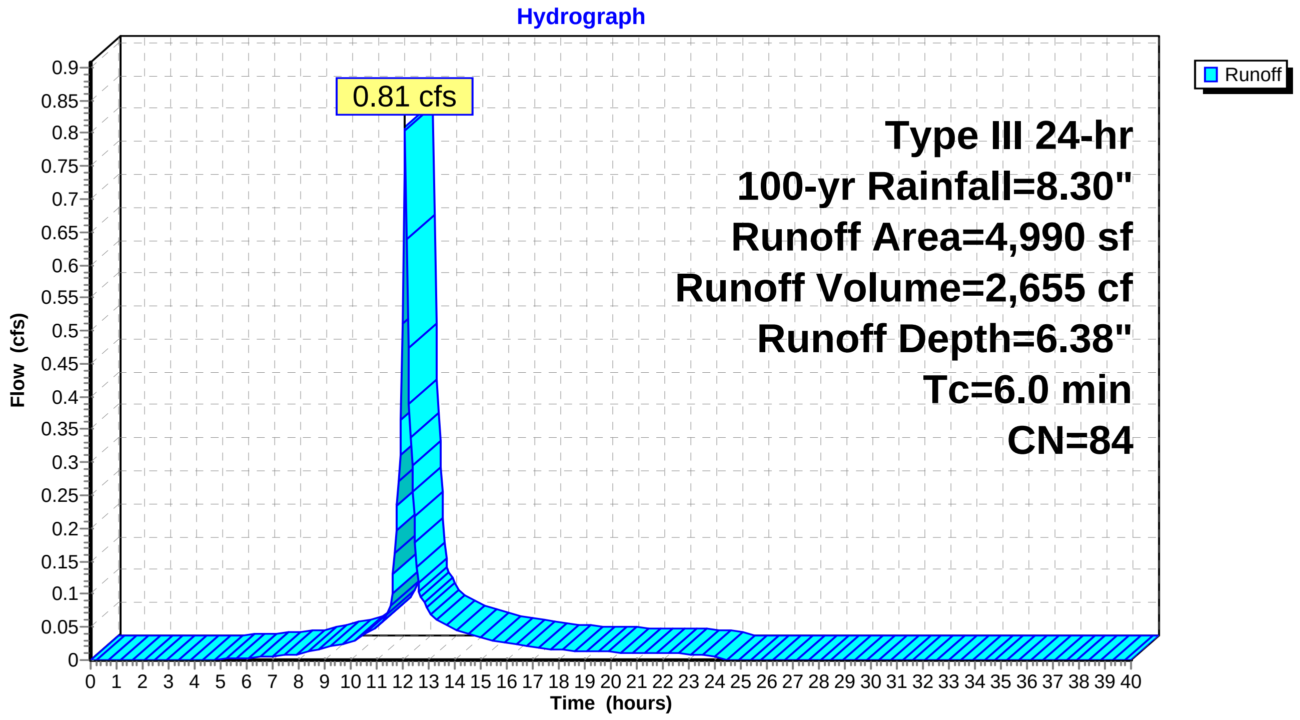
Runoff = 0.81 cfs @ 12.09 hrs, Volume= 2,655 cf, Depth= 6.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

	Area (sf)	CN	Description
*	876	65	Rain Garden Surface Area
	2,078	79	50-75% Grass cover, Fair, HSG C
	84	98	Unconnected pavement, HSG C
	1,952	98	Unconnected roofs, HSG C
	4,990	84	Weighted Average
	2,954		59.20% Pervious Area
	2,036		40.80% Impervious Area
	2,036		100.00% Unconnected

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

Subcatchment 209: 209 - Portion of Proposed Building Tentant A, Rain Garden #2, Lawn, and Walkwa



Summary for Subcatchment 210: 210 - Existing South features remaining to DP2

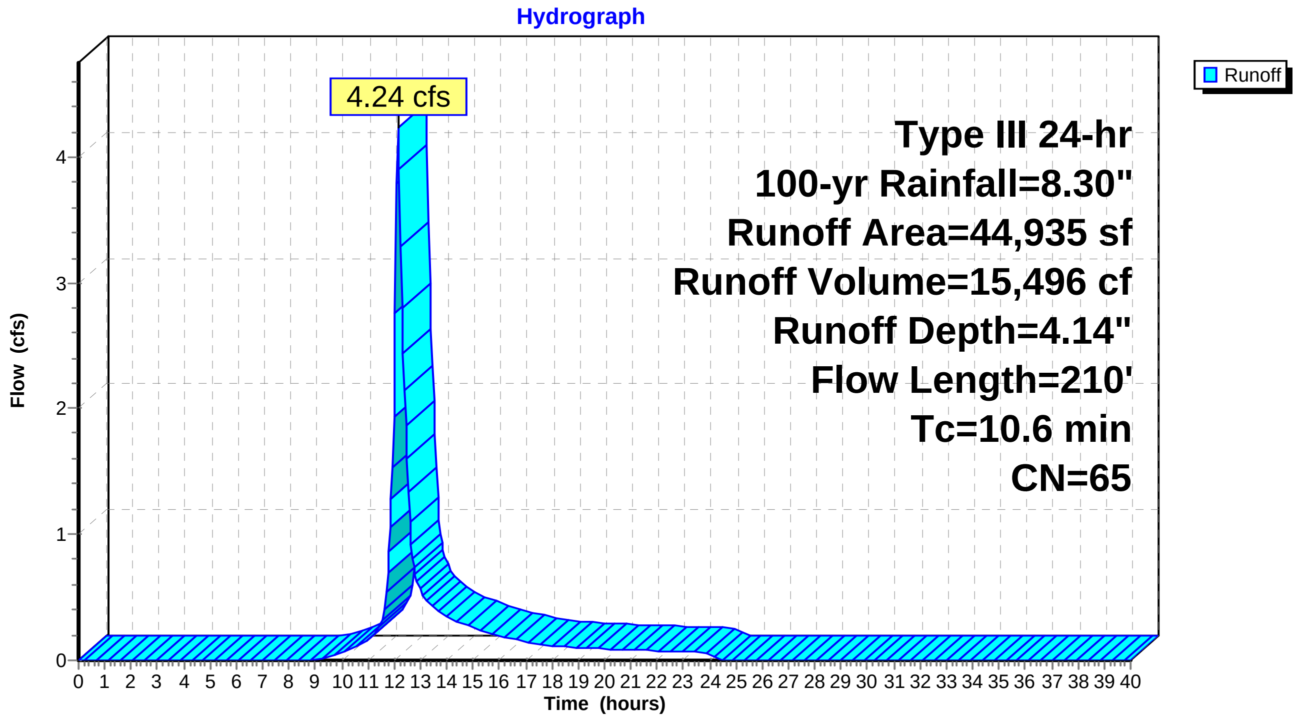
Runoff = 4.24 cfs @ 12.15 hrs, Volume= 15,496 cf, Depth= 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

	Area (sf)	CN	Description
	35,498	65	Brush, Good, HSG C
*	9,437	65	Brush, Good, HSG C, Wetland Brush
	44,935	65	Weighted Average
	44,935		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	100	0.0600	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
1.4	110	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.6	210	Total			

Subcatchment 210: 210 - Existing South features remaining to DP2



Summary for Subcatchment 300: 300 - Lawn East to DP3

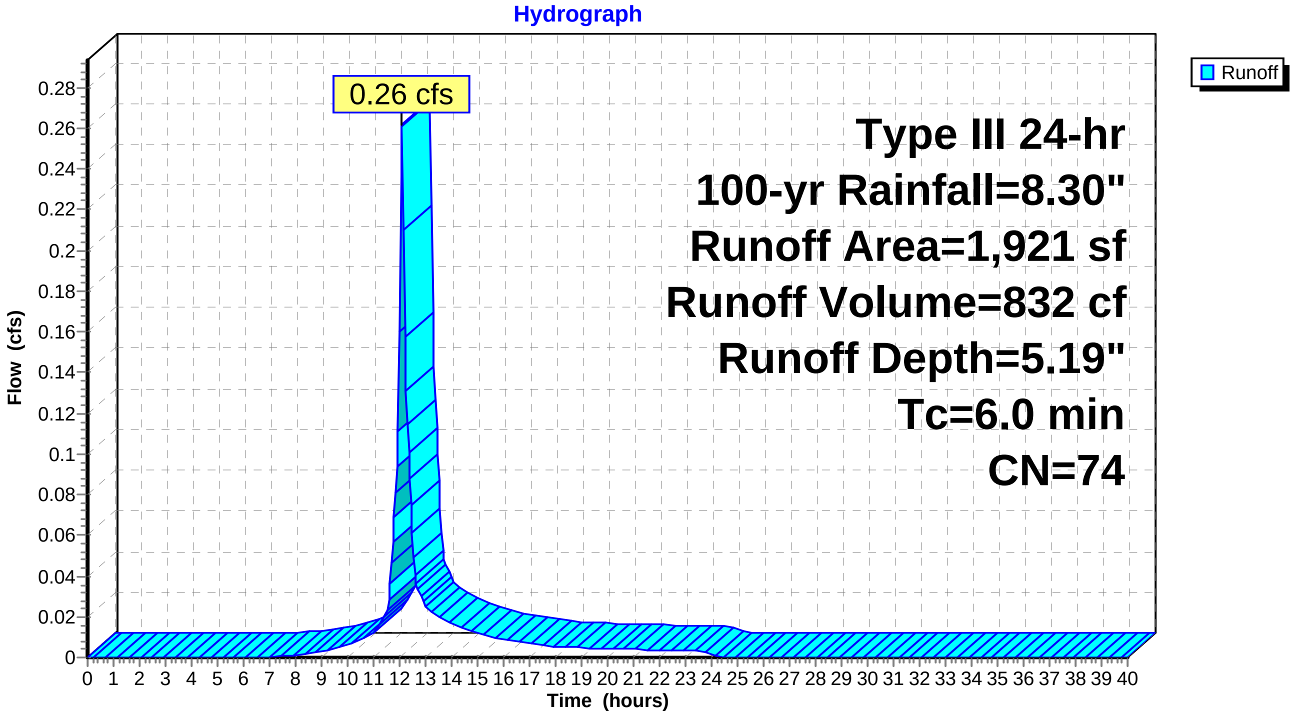
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 832 cf, Depth= 5.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.30"

Area (sf)	CN	Description
1,921	74	>75% Grass cover, Good, HSG C
1,921		100.00% Pervious Area

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

Subcatchment 300: 300 - Lawn East to DP3



Summary for Pond CB1: PCB1

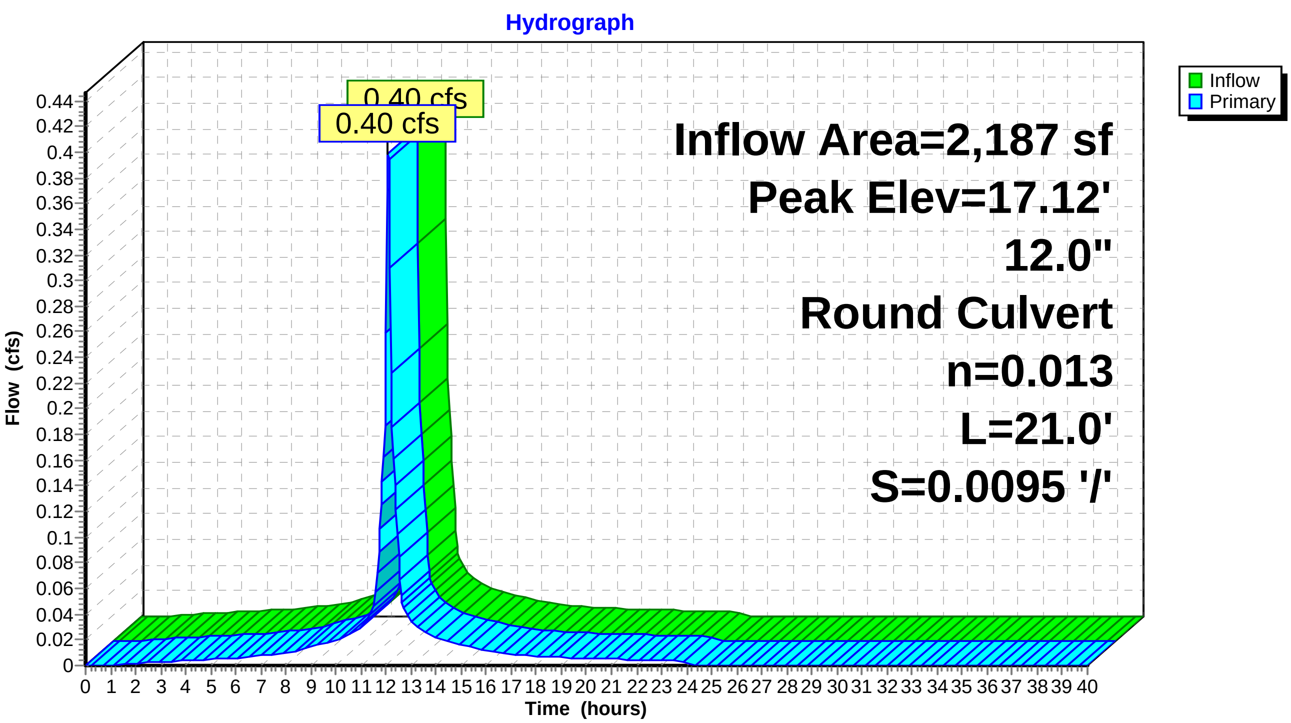
Inflow Area = 2,187 sf, 95.93% Impervious, Inflow Depth = 7.94" for 100-yr event
Inflow = 0.40 cfs @ 12.09 hrs, Volume= 1,447 cf
Outflow = 0.40 cfs @ 12.09 hrs, Volume= 1,447 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.40 cfs @ 12.09 hrs, Volume= 1,447 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 17.12' @ 12.31 hrs
Flood Elev= 19.50'

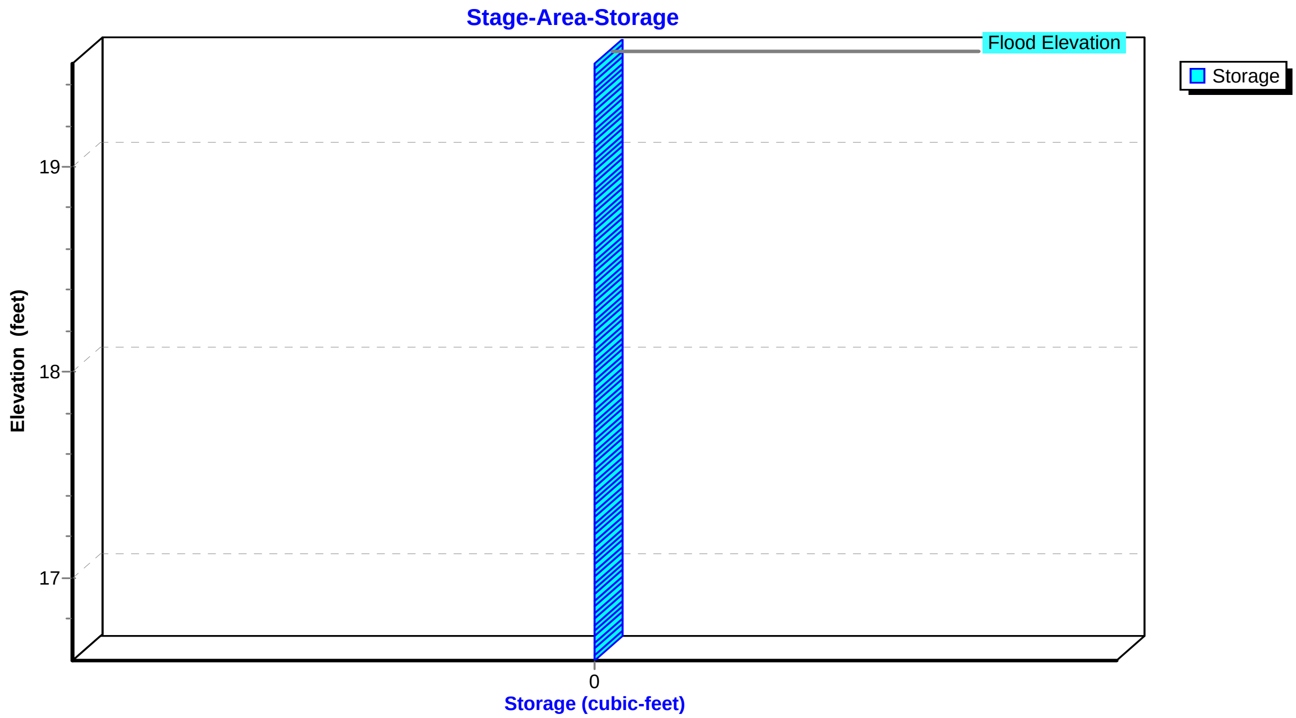
Device	Routing	Invert	Outlet Devices
#1	Primary	16.60'	**12.0" Round Culvert** L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.60' / 16.40' S= 0.0095 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.28 cfs @ 12.09 hrs HW=16.99' TW=16.89' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.28 cfs @ 1.45 fps)

Pond CB1: PCB1



Pond CB1: PCB1



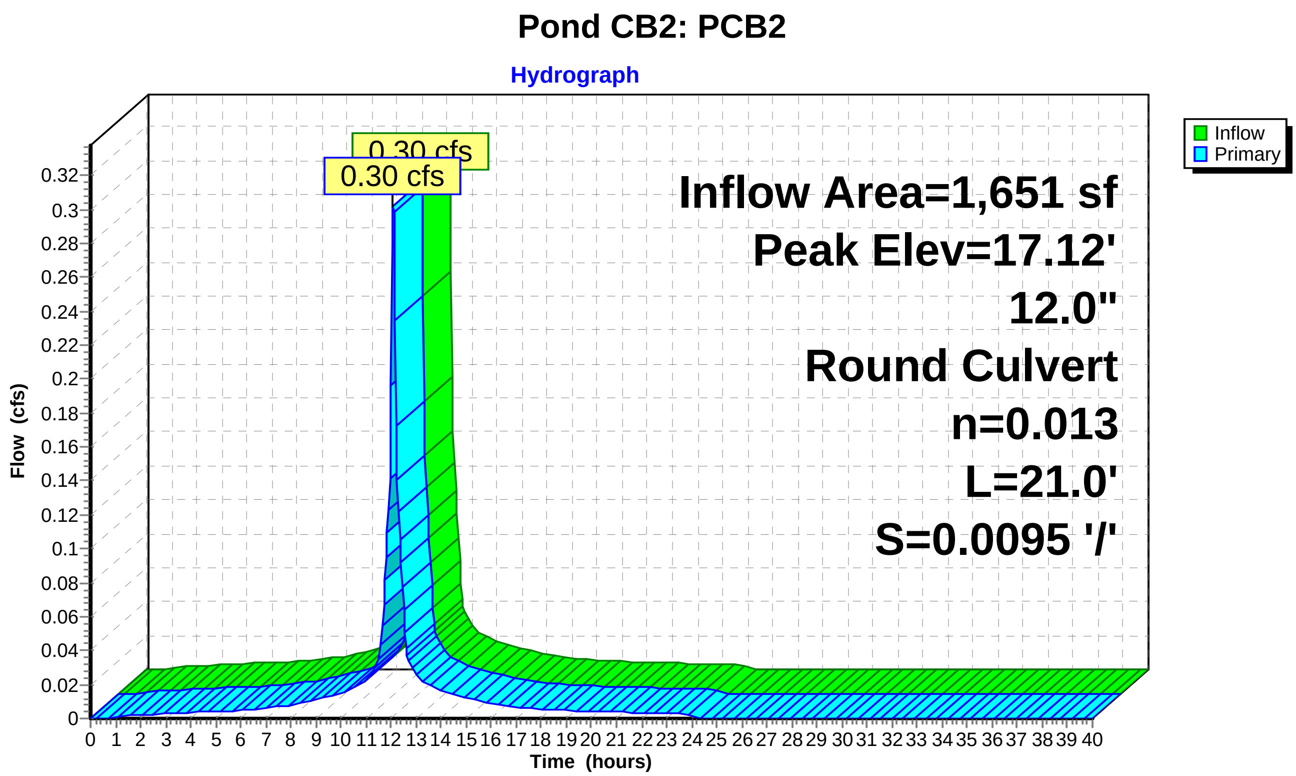
Summary for Pond CB2: PCB2

Inflow Area =	1,651 sf,100.00% Impervious,	Inflow Depth = 8.06" for 100-yr event			
Inflow =	0.30 cfs @	12.09 hrs,	Volume=	1,109 cf	
Outflow =	0.30 cfs @	12.09 hrs,	Volume=	1,109 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.30 cfs @	12.09 hrs,	Volume=	1,109 cf	

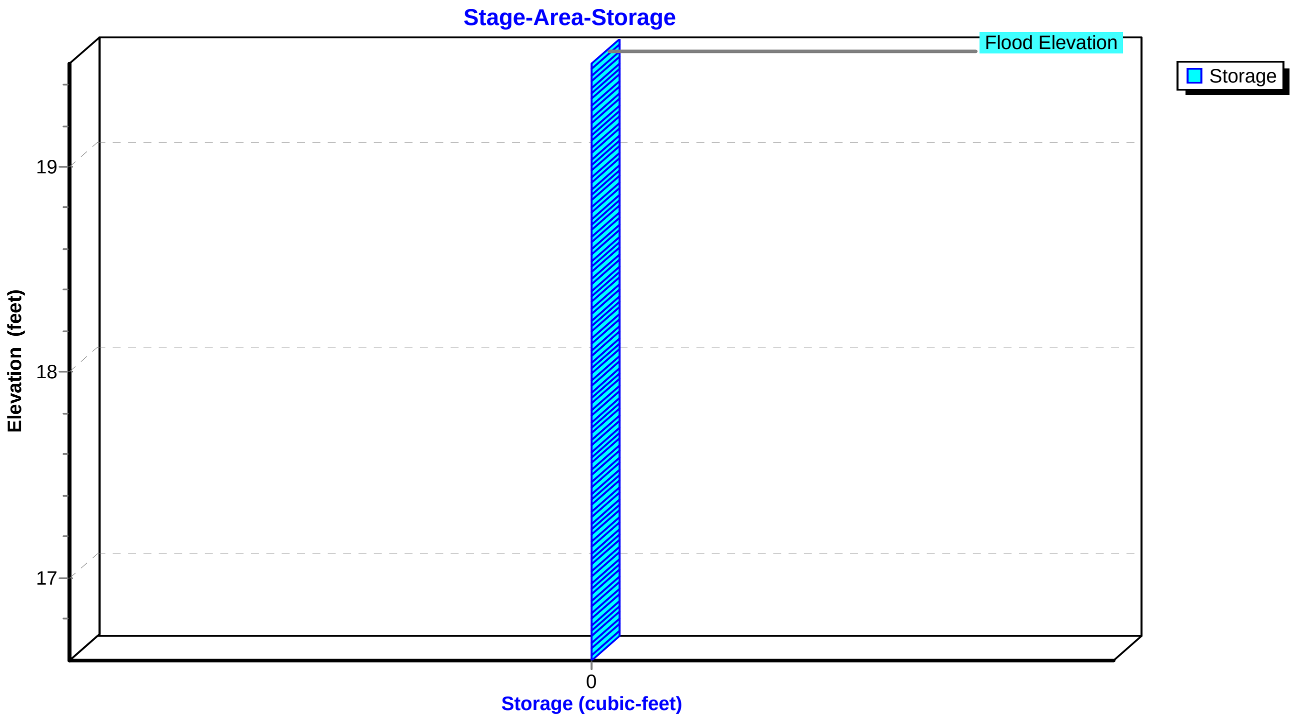
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 17.12' @ 12.31 hrs
Flood Elev= 19.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	16.60'	**12.0" Round Culvert** L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.60' / 16.40' S= 0.0095 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.18 cfs @ 12.09 hrs HW=16.95' TW=16.89' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 0.18 cfs @ 1.12 fps)



Pond CB2: PCB2



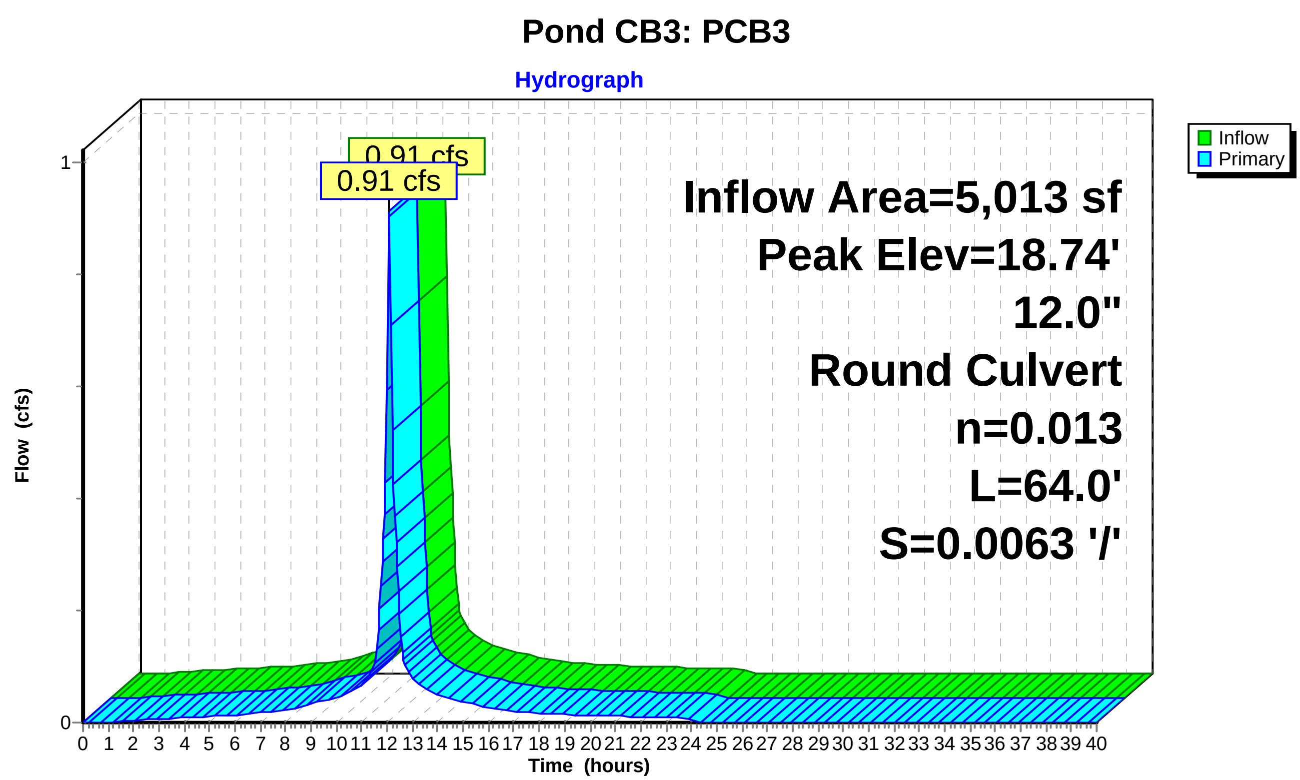
Summary for Pond CB3: PCB3

Inflow Area =		5,013 sf,	96.69% Impervious,	Inflow Depth = 7.94"	for 100-yr event
Inflow	=	0.91 cfs @	12.09 hrs, Volume=	3,317 cf	
Outflow	=	0.91 cfs @	12.09 hrs, Volume=	3,317 cf,	Atten= 0%, Lag= 0.0 min
Primary	=	0.91 cfs @	12.09 hrs, Volume=	3,317 cf	

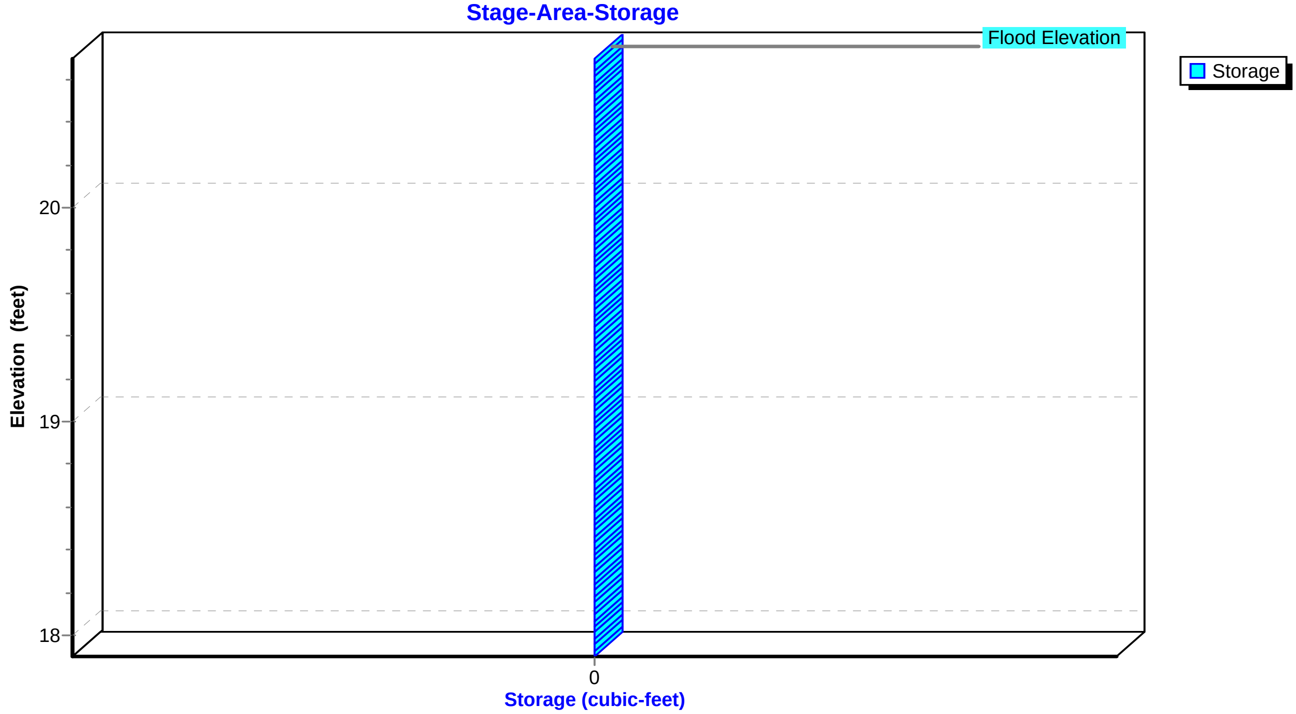
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.74' @ 12.11 hrs
Flood Elev= 20.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	17.90'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 17.90' / 17.50' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.79 cfs @ 12.09 hrs HW=18.72' TW=18.59' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.79 cfs @ 1.54 fps)



Pond CB3: PCB3



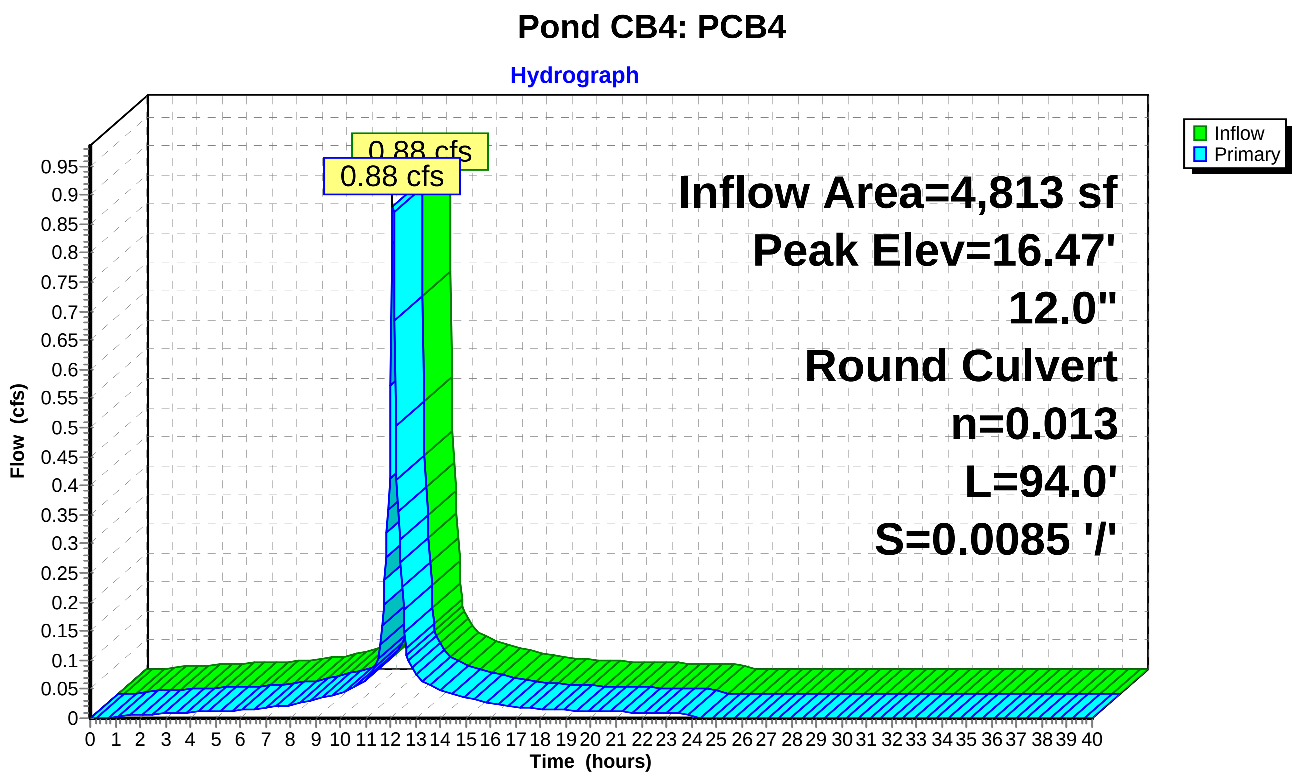
Summary for Pond CB4: PCB4

Inflow Area =	4,813 sf,100.00% Impervious,	Inflow Depth = 8.06"	for 100-yr event	
Inflow =	0.88 cfs @	12.09 hrs, Volume=	3,233 cf	
Outflow =	0.88 cfs @	12.09 hrs, Volume=	3,233 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.88 cfs @	12.09 hrs, Volume=	3,233 cf	

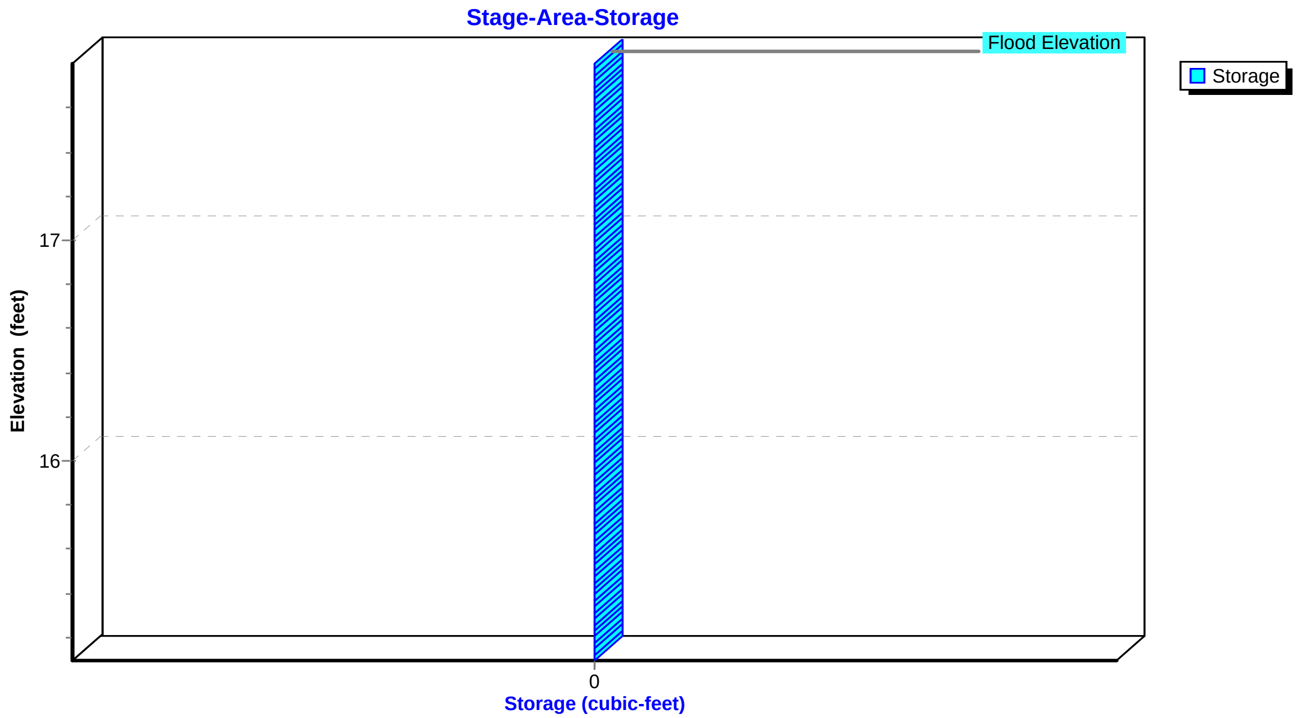
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.47' @ 12.20 hrs
Flood Elev= 17.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	15.10'	**12.0" Round Culvert** L= 94.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.10' / 14.30' S= 0.0085 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=15.75' TW=15.91' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)



Pond CB4: PCB4



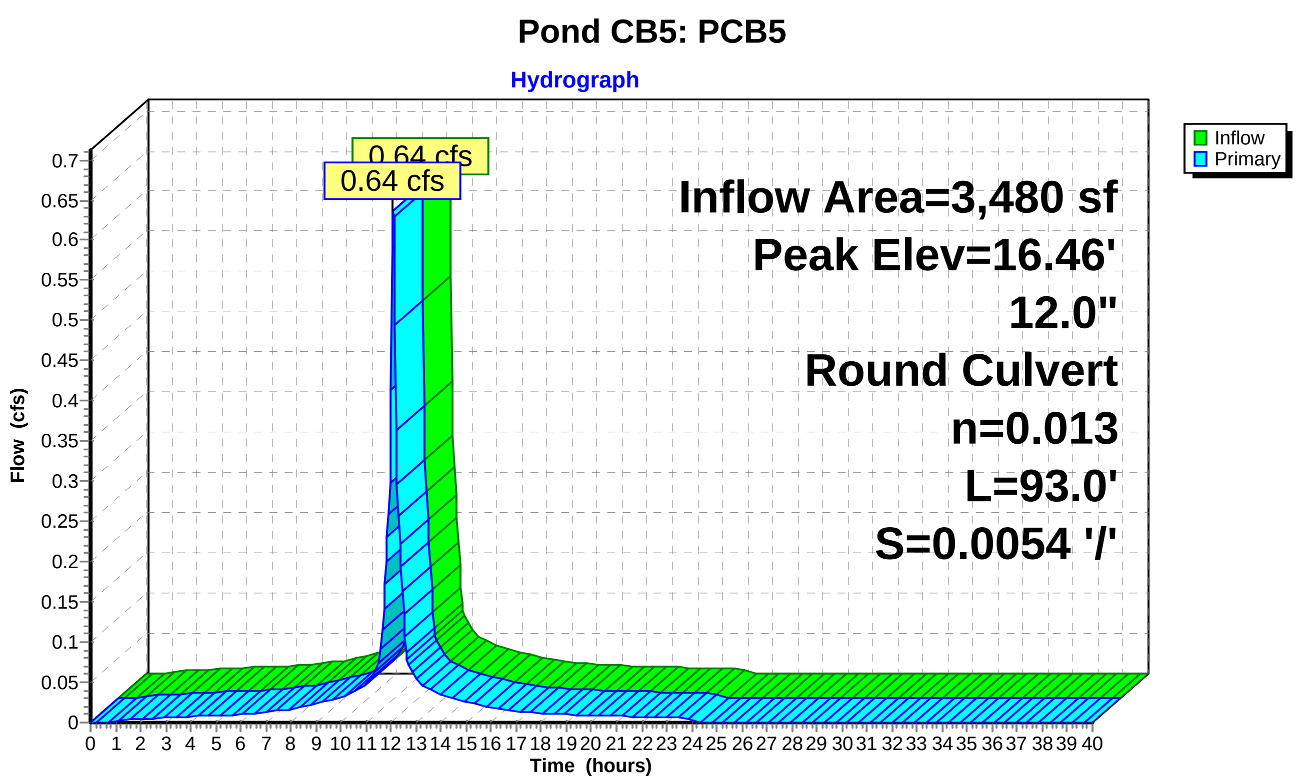
Summary for Pond CB5: PCB5

Inflow Area = 3,480 sf,100.00% Impervious, Inflow Depth = 8.06" for 100-yr event
Inflow = 0.64 cfs @ 12.09 hrs, Volume= 2,337 cf
Outflow = 0.64 cfs @ 12.09 hrs, Volume= 2,337 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.64 cfs @ 12.09 hrs, Volume= 2,337 cf

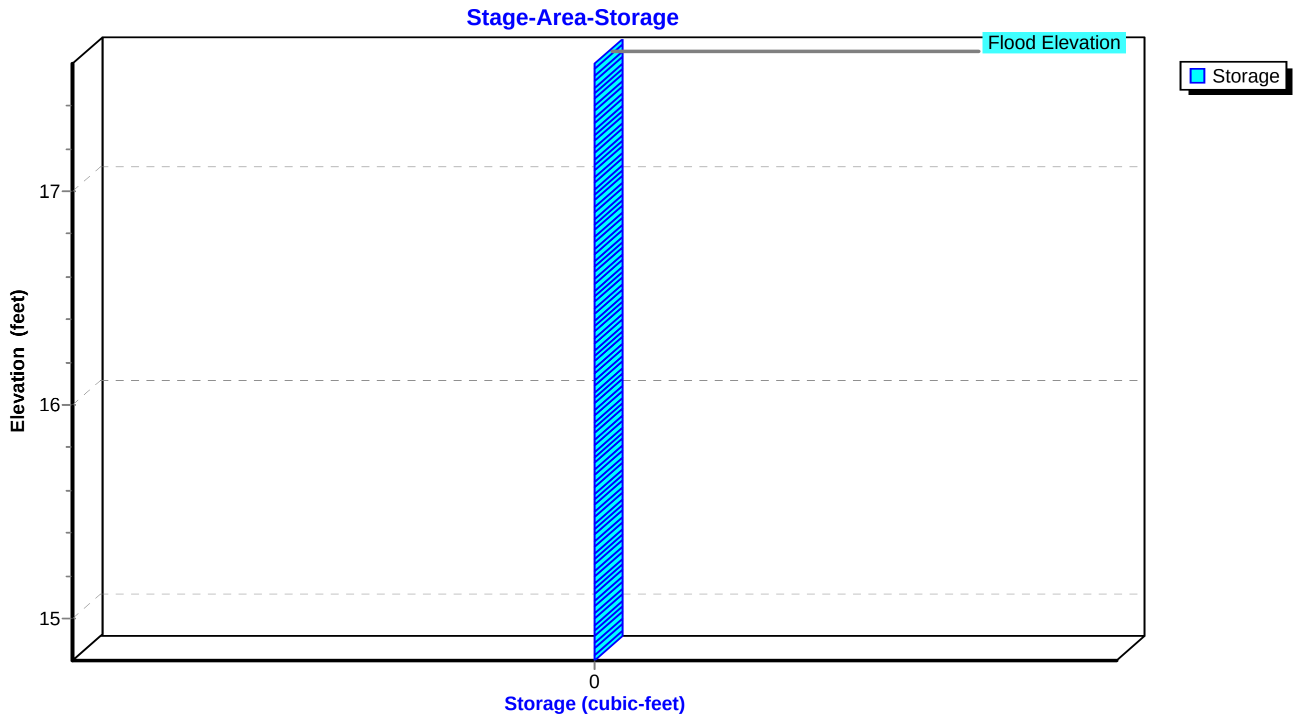
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.46' @ 12.20 hrs
Flood Elev= 17.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	14.80'	**12.0" Round Culvert** L= 93.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.80' / 14.30' S= 0.0054 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=15.51' TW=15.91' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)



Pond CB5: PCB5



Summary for Pond CB6: PCB6

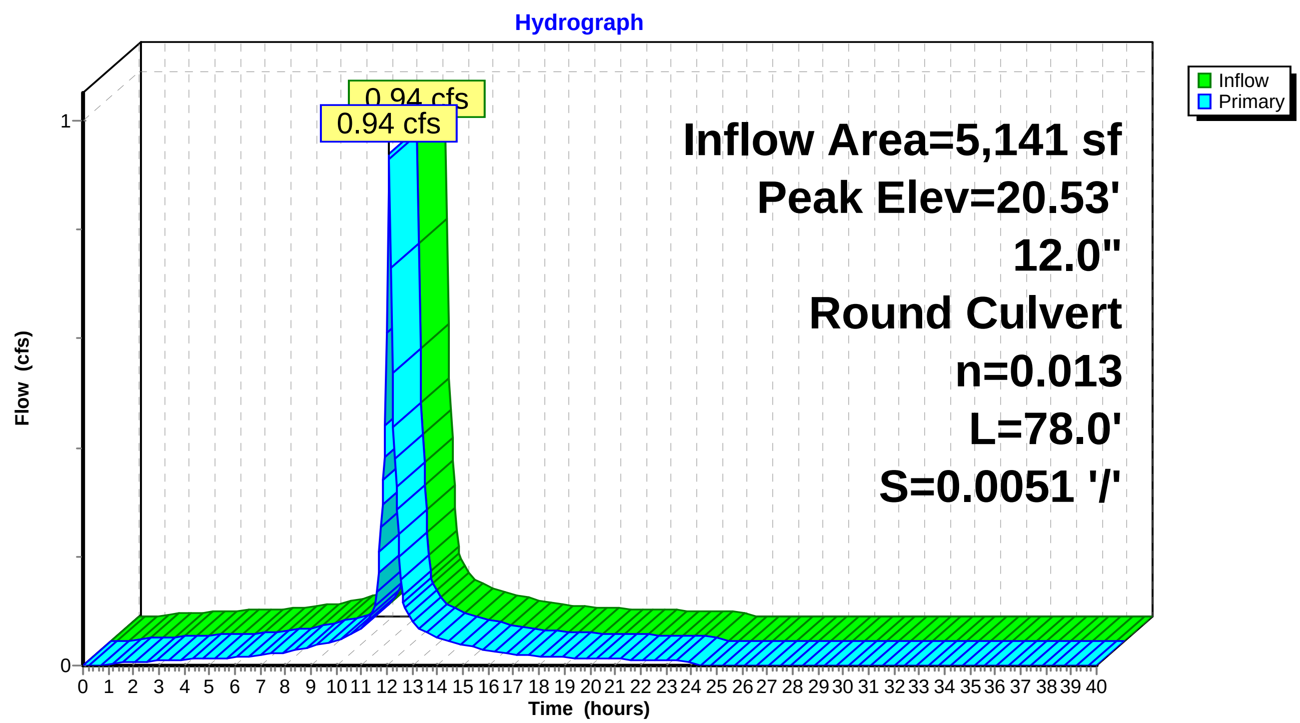
Inflow Area =	5,141 sf,100.00% Impervious,	Inflow Depth = 8.06" for 100-yr event			
Inflow =	0.94 cfs @	12.09 hrs,	Volume=	3,453 cf	
Outflow =	0.94 cfs @	12.09 hrs,	Volume=	3,453 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.94 cfs @	12.09 hrs,	Volume=	3,453 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 20.53' @ 12.10 hrs
Flood Elev= 22.60'

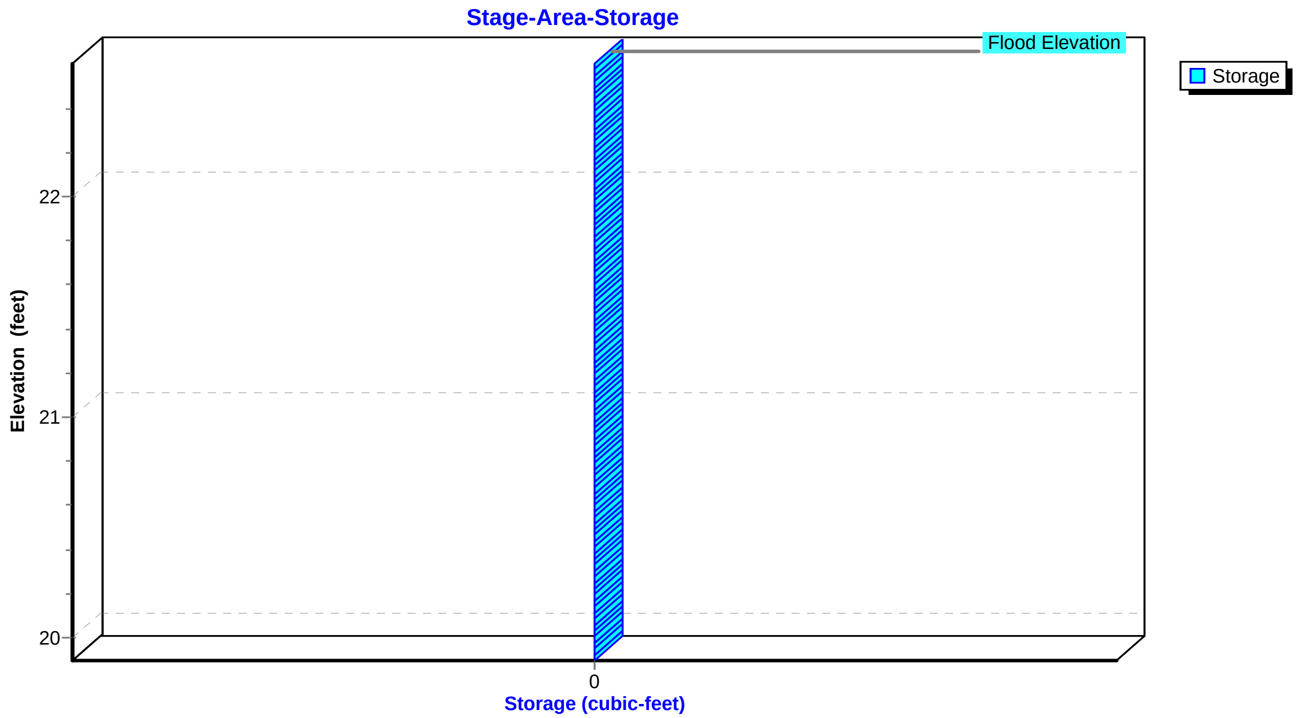
Device	Routing	Invert	Outlet Devices
#1	Primary	19.90'	**12.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.90' / 19.50' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.84 cfs @ 12.09 hrs HW=20.52' TW=20.13' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.84 cfs @ 2.36 fps)

Pond CB6: PCB6



Pond CB6: PCB6



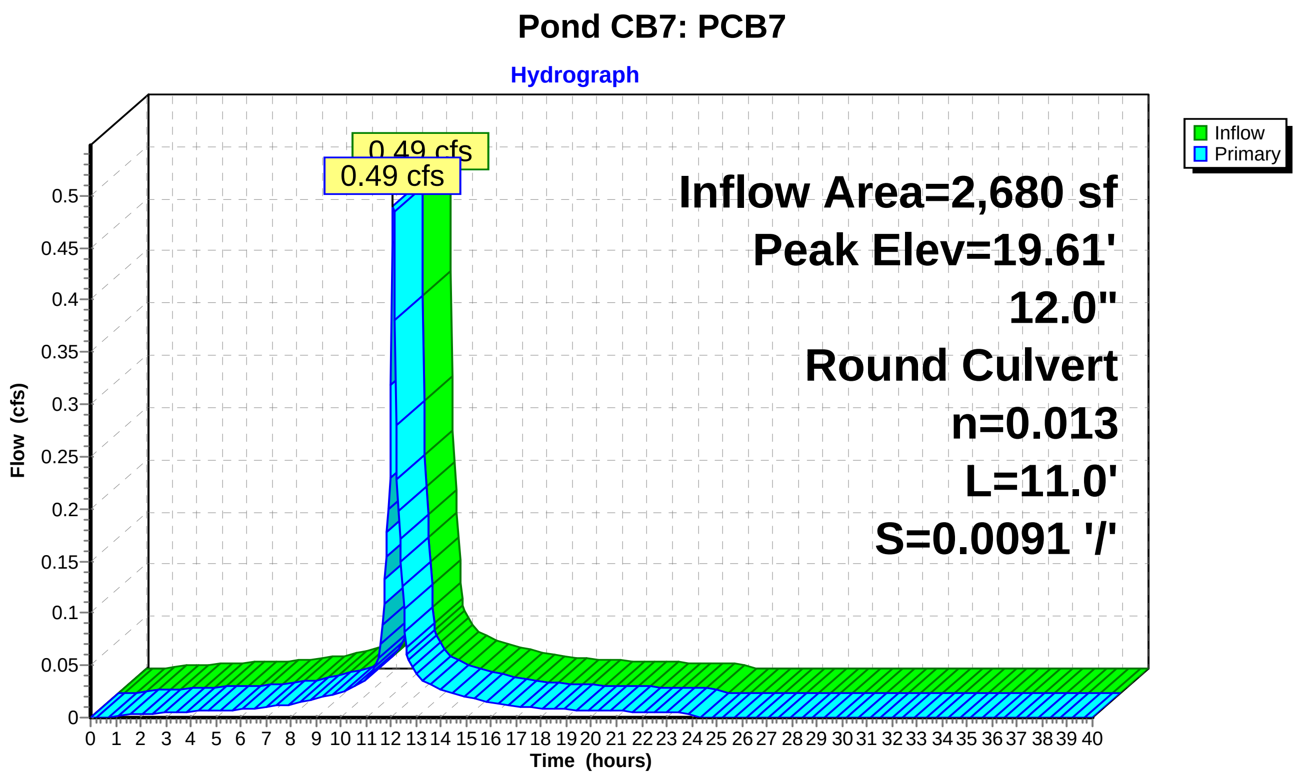
Summary for Pond CB7: PCB7

Inflow Area =	2,680 sf,100.00% Impervious,	Inflow Depth = 8.06"	for 100-yr event	
Inflow =	0.49 cfs @	12.09 hrs, Volume=	1,800 cf	
Outflow =	0.49 cfs @	12.09 hrs, Volume=	1,800 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.49 cfs @	12.09 hrs, Volume=	1,800 cf	

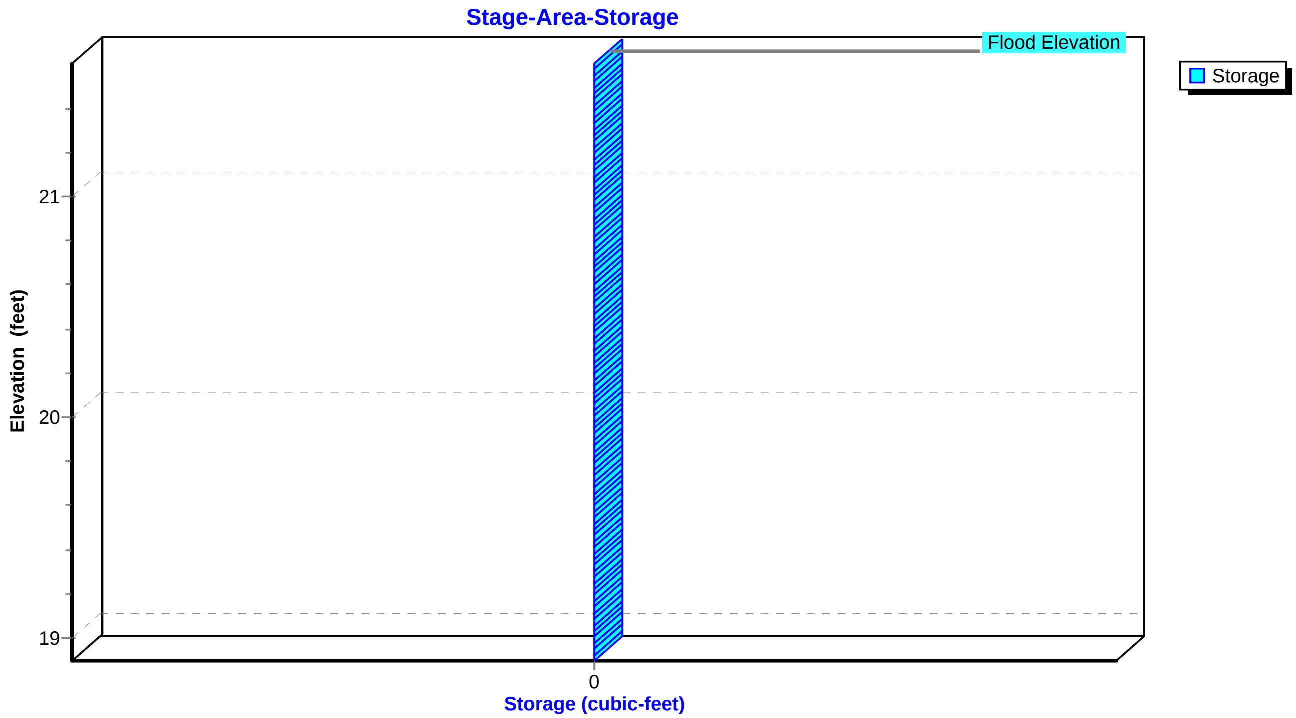
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.61' @ 12.20 hrs
Flood Elev= 21.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.90'	**12.0" Round Culvert** L= 11.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.90' / 18.80' S= 0.0091 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.04 cfs @ 12.09 hrs HW=19.48' TW=19.48' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.04 cfs @ 0.11 fps)



Pond CB7: PCB7



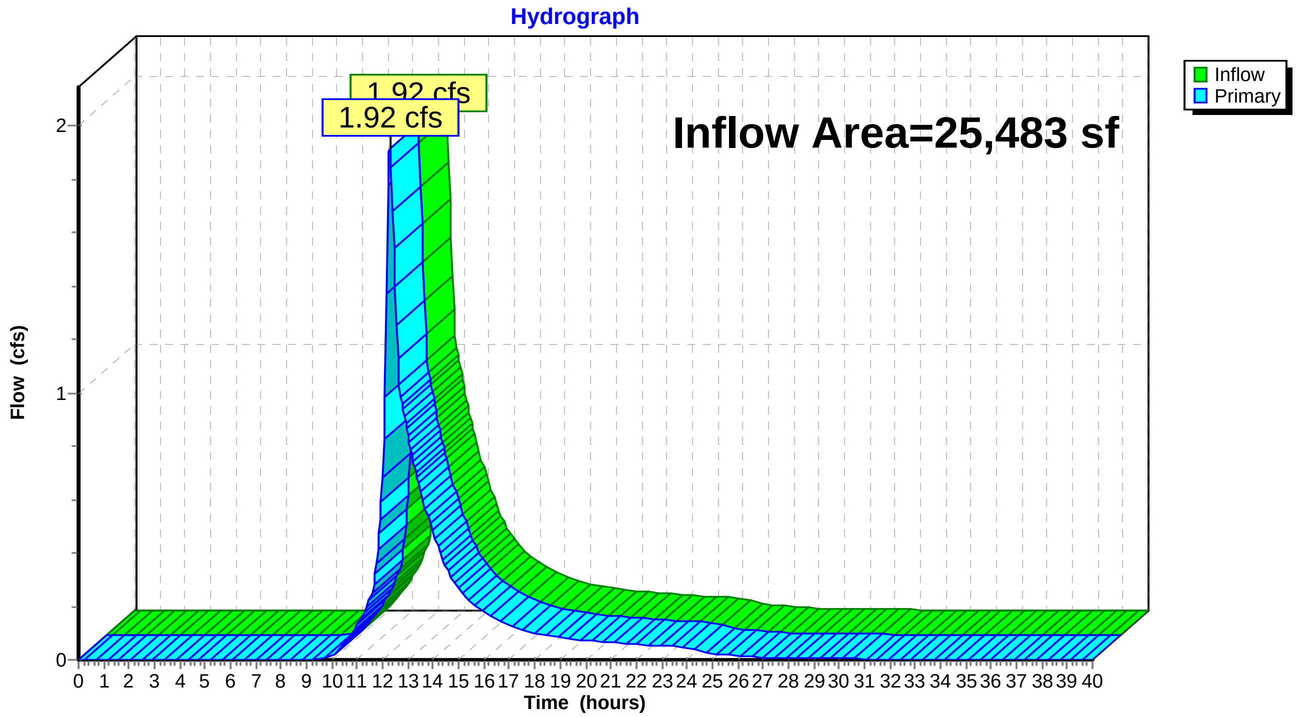
Summary for Pond DP1: Design Pont #1_18" RCP Culvert - Northwest

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	25,483 sf, 55.96% Impervious,	Inflow Depth > 6.06"	for 100-yr event
Inflow =	1.92 cfs @ 12.27 hrs, Volume=	12,871 cf	
Primary =	1.92 cfs @ 12.27 hrs, Volume=	12,871 cf, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Pond DP1: Design Pont #1_18" RCP Culvert - Northwest



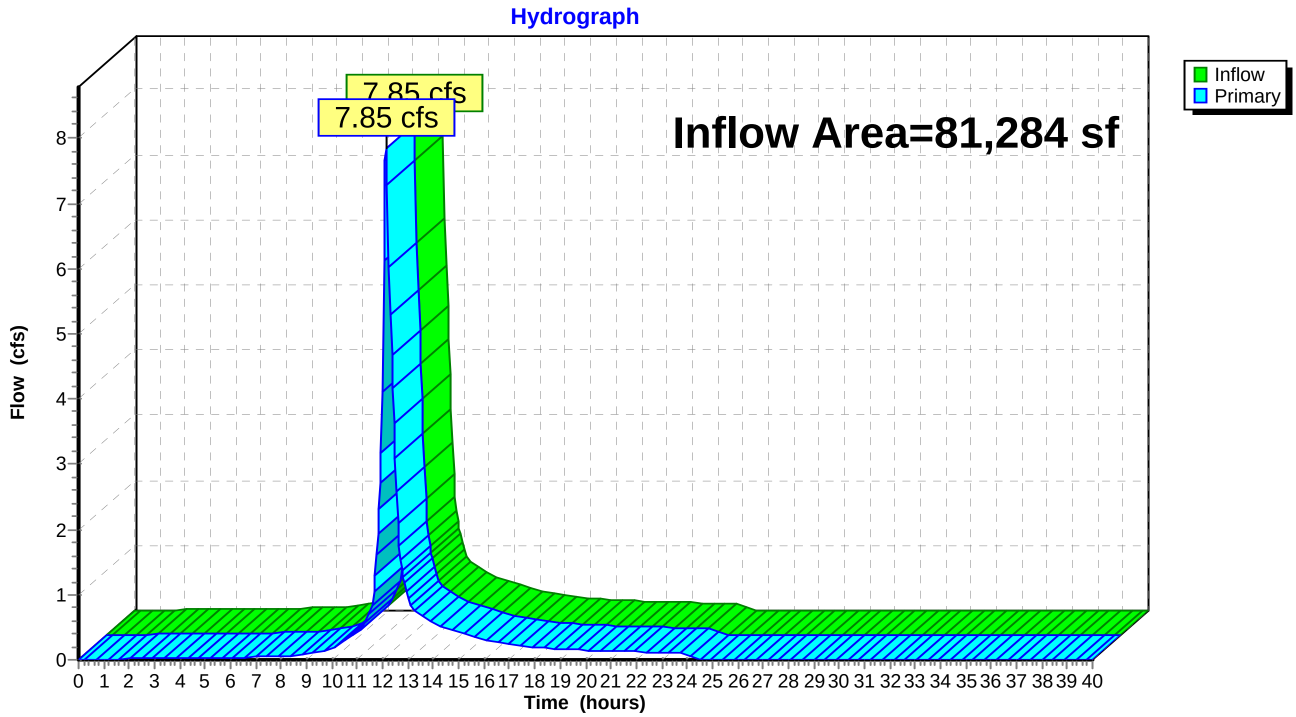
Summary for Pond DP2: Design Pont #2_Wetland-South

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 81,284 sf, 40.77% Impervious, Inflow Depth = 4.44" for 100-yr event
Inflow = 7.85 cfs @ 12.12 hrs, Volume= 30,083 cf
Primary = 7.85 cfs @ 12.12 hrs, Volume= 30,083 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Pond DP2: Design Pont #2_Wetland-South



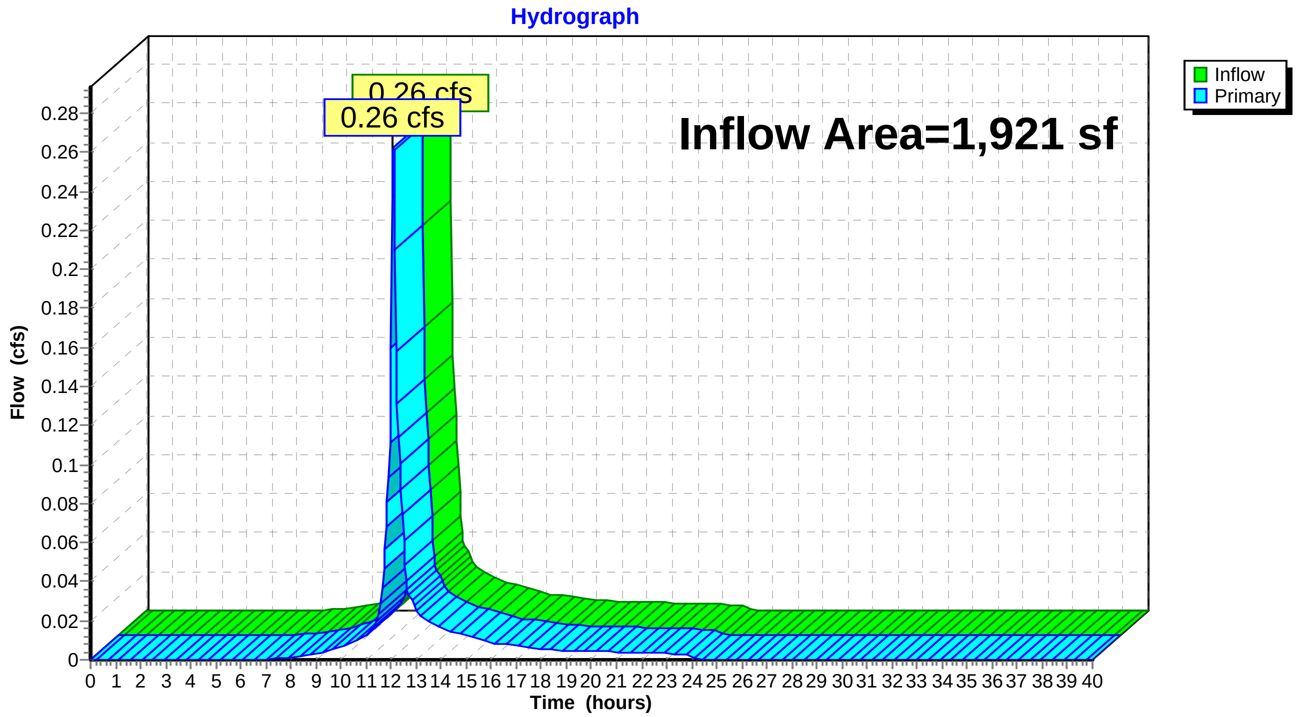
Summary for Pond DP3: Design Pont #3_Abutting Lot-East

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,921 sf, 0.00% Impervious, Inflow Depth = 5.19" for 100-yr event
Inflow = 0.26 cfs @ 12.09 hrs, Volume= 832 cf
Primary = 0.26 cfs @ 12.09 hrs, Volume= 832 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Pond DP3: Design Pont #3_Abutting Lot-East



Summary for Pond IS: Infiltration System

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	14,215 sf,100.00% Impervious,	Inflow Depth = 8.06" for 100-yr event		
Inflow =	2.60 cfs @	12.09 hrs, Volume=	9,548 cf	
Outflow =	1.09 cfs @	12.29 hrs, Volume=	9,548 cf,	Atten= 58%, Lag= 12.4 min
Discarded =	0.28 cfs @	11.60 hrs, Volume=	8,368 cf	
Primary =	0.81 cfs @	12.29 hrs, Volume=	1,179 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.43' @ 12.29 hrs Surf.Area= 1,463 sf Storage= 2,189 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 33.2 min (774.0 - 740.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	16.10'	670 cf	**6.28'W x 109.07'L x 3.52'H Field A**
			2,416 cf Overall - 741 cf Embedded = 1,675 cf x 40.0% Voids
#2A	16.60'	741 cf	**Contech ChamberMaxx** x 15 Inside #1
			Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
			Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
			Row Length Adjustment= +0.32' x 6.92 sf x 1 rows
#3B	16.10'	601 cf	**10.98'W x 59.25'L x 3.52'H Field B**
			2,294 cf Overall - 793 cf Embedded = 1,502 cf x 40.0% Voids
#4B	16.60'	793 cf	**Contech ChamberMaxx** x 16 Inside #3
			Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
			Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
			Row Length Adjustment= +0.32' x 6.92 sf x 2 rows
#5C	16.10'	143 cf	**2.54'W x 50.00'L x 3.21'H Field C**
			408 cf Overall - 50 cf Embedded = 358 cf x 40.0% Voids
#6C	17.10'	39 cf	**ADS N-12 12** x 2 Inside #5
			Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
			Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
			Row Length Adjustment= +8.00' x 0.81 sf x 1 rows
		2,986 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.10'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	17.90'	**12.0" Round Culvert**
			L= 66.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 17.90' / 16.50' S= 0.0212 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.28 cfs @ 11.60 hrs HW=16.14' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.81 cfs @ 12.29 hrs HW=18.42' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 0.81 cfs @ 1.94 fps)

Pond IS: Infiltration System - Chamber Wizard Field A

Chamber Model = Contech ChamberMaxx (Contech® ChamberMaxx®)
Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
Row Length Adjustment= +0.32' x 6.92 sf x 1 rows

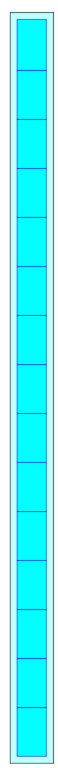
15 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 107.07' Row Length +12.0" End Stone x 2 = 109.07' Base Length
1 Rows x 51.4" Wide + 12.0" Side Stone x 2 = 6.28' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

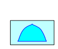
15 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 1 Rows = 741.1 cf Chamber Storage

2,415.8 cf Field - 741.1 cf Chambers = 1,674.7 cf Stone x 40.0% Voids = 669.9 cf Stone Storage

Chamber Storage + Stone Storage = 1,411.0 cf = 0.032 af
Overall Storage Efficiency = 58.4%
Overall System Size = 109.07' x 6.28' x 3.52'

15 Chambers
89.5 cy Field
62.0 cy Stone





Pond IS: Infiltration System - Chamber Wizard Field B

Chamber Model = Contech ChamberMaxx (Contech® ChamberMaxx®)
Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
Row Length Adjustment= +0.32' x 6.92 sf x 2 rows

51.4" Wide + 5.0" Spacing = 56.4" C-C Row Spacing

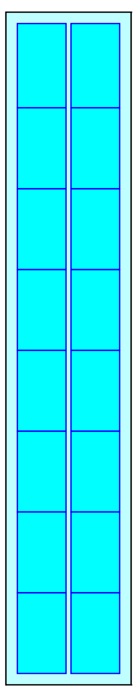
8 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 57.25' Row Length +12.0" End Stone x 2 = 59.25' Base Length
2 Rows x 51.4" Wide + 5.0" Spacing x 1 + 12.0" Side Stone x 2 = 10.98' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

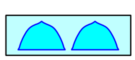
16 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 792.6 cf Chamber Storage

2,294.1 cf Field - 792.6 cf Chambers = 1,501.5 cf Stone x 40.0% Voids = 600.6 cf Stone Storage

Chamber Storage + Stone Storage = 1,393.2 cf = 0.032 af
Overall Storage Efficiency = 60.7%
Overall System Size = 59.25' x 10.98' x 3.52'

16 Chambers
85.0 cy Field
55.6 cy Stone





Pond IS: Infiltration System - Chamber Wizard Field C

Chamber Model = ADS N-12 12 (ADS N-12® Pipe)
Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
Row Length Adjustment= +8.00' x 0.81 sf x 1 rows

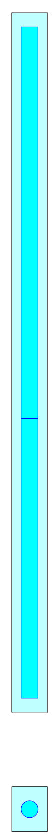
2 Chambers/Row x 20.00' Long +8.00' Row Adjustment = 48.00' Row Length +12.0" End Stone x 2 = 50.00' Base Length
1 Rows x 14.5" Wide + 8.0" Side Stone x 2 = 2.54' Base Width
12.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.21' Field Height

2 Chambers x 16.2 cf +8.00' Row Adjustment x 0.81 sf x 1 Rows = 38.9 cf Chamber Storage
2 Chambers x 20.9 cf +8.00' Row Adjustment x 1.05 sf x 1 Rows = 50.2 cf Displacement

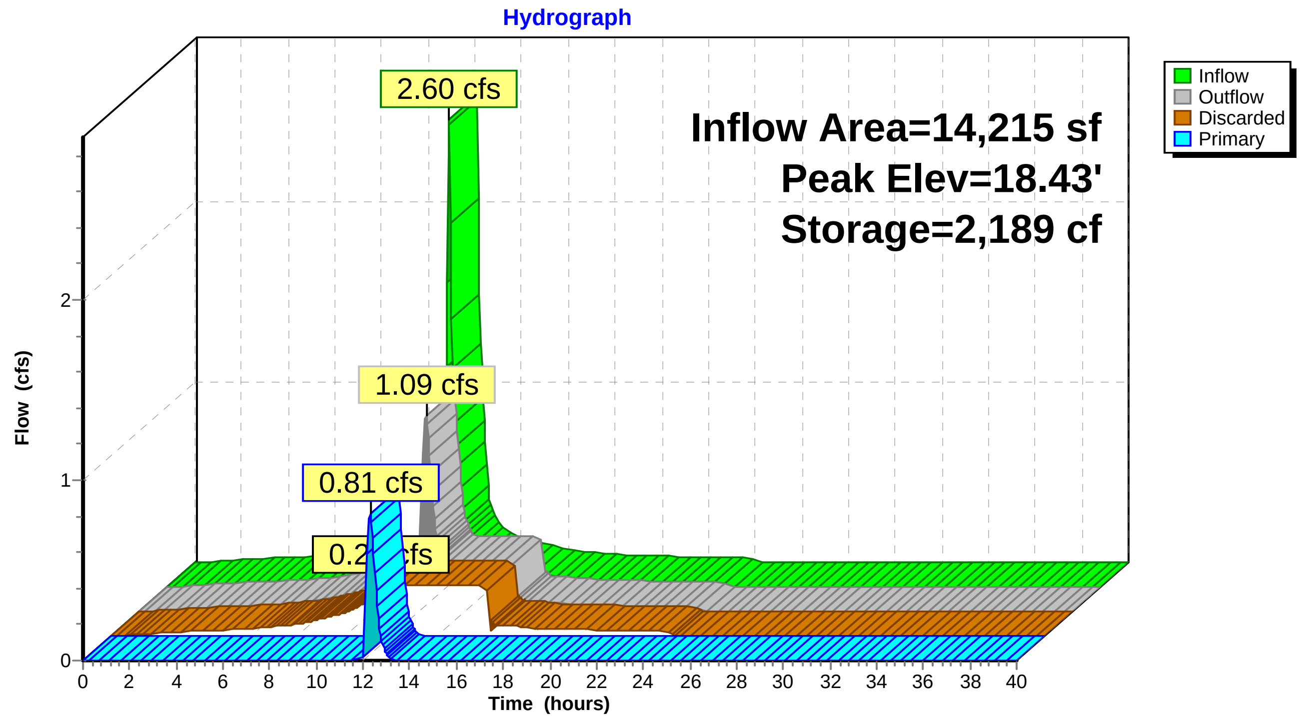
407.9 cf Field - 50.2 cf Chambers = 357.7 cf Stone x 40.0% Voids = 143.1 cf Stone Storage

Chamber Storage + Stone Storage = 181.9 cf = 0.004 af
Overall Storage Efficiency = 44.6%
Overall System Size = 50.00' x 2.54' x 3.21'

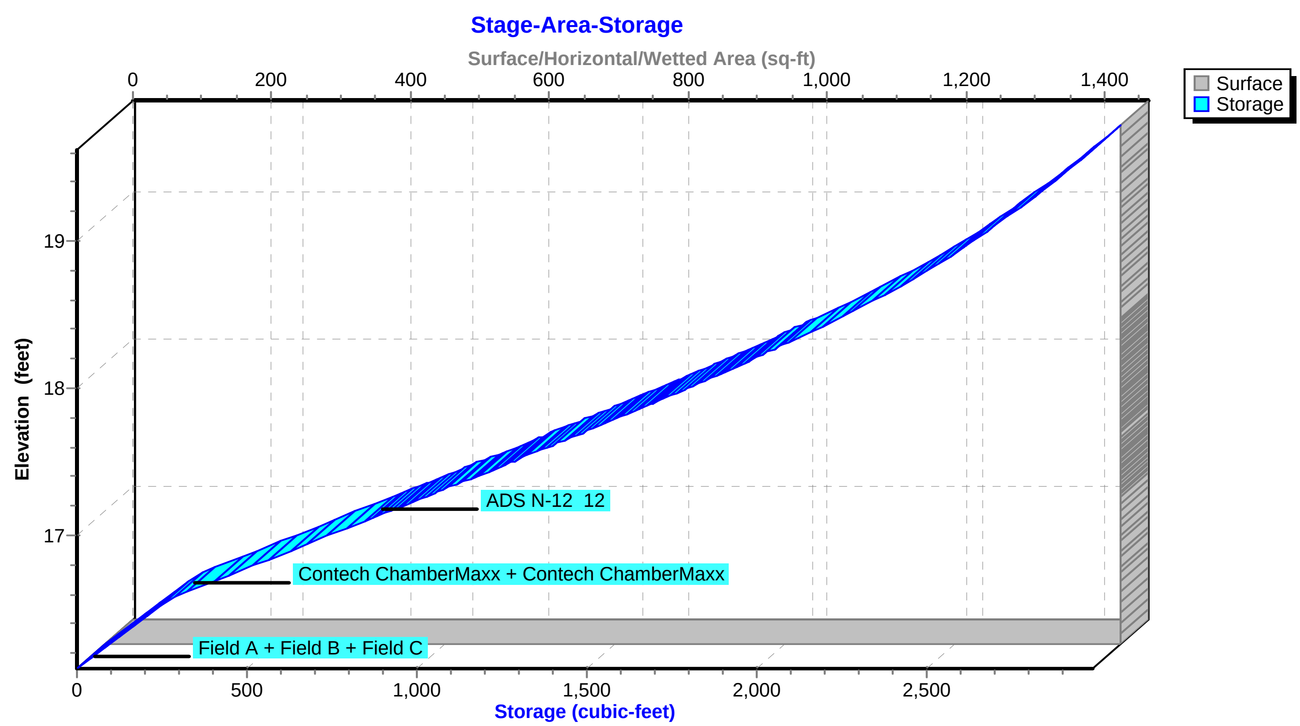
2 Chambers
15.1 cy Field
13.2 cy Stone



Pond IS: Infiltration System



Pond IS: Infiltration System



Summary for Pond MH1: PDMH1

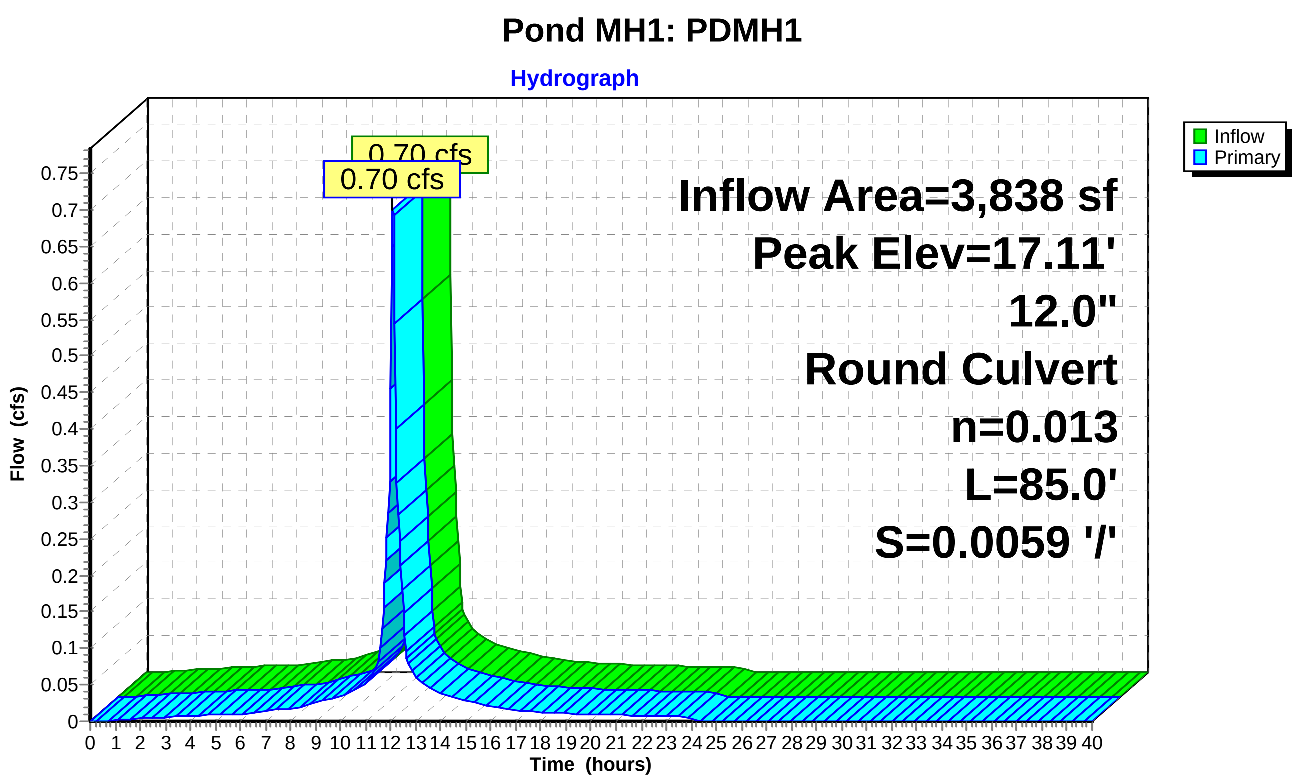
[80] Warning: Exceeded Pond CB1 by 0.12' @ 12.25 hrs (0.46 cfs 83 cf)
[80] Warning: Exceeded Pond CB2 by 0.14' @ 12.25 hrs (0.49 cfs 89 cf)

Inflow Area = 3,838 sf, 97.68% Impervious, Inflow Depth = 7.99" for 100-yr event
Inflow = 0.70 cfs @ 12.09 hrs, Volume= 2,556 cf
Outflow = 0.70 cfs @ 12.09 hrs, Volume= 2,556 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.70 cfs @ 12.09 hrs, Volume= 2,556 cf

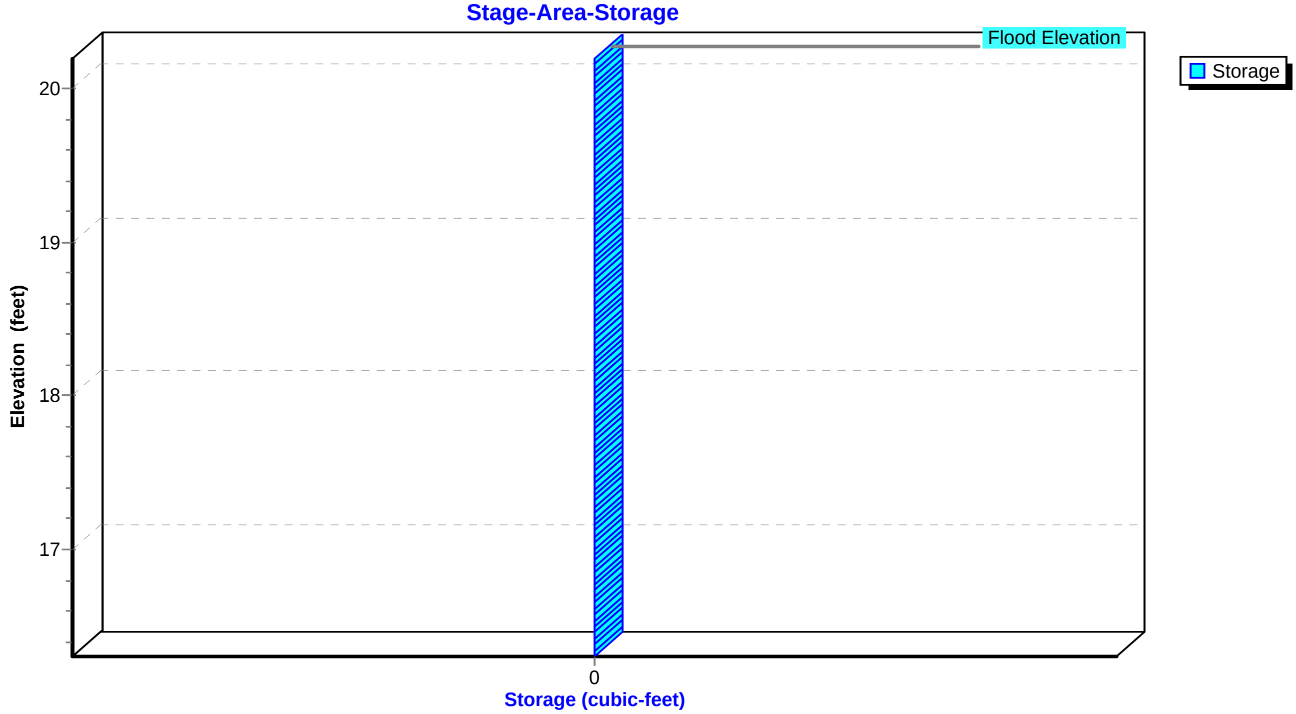
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 17.11' @ 12.26 hrs
Flood Elev= 20.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	16.30'	**12.0" Round Culvert** L= 85.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.30' / 15.80' S= 0.0059 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.40 cfs @ 12.09 hrs HW=16.89' TW=16.78' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.40 cfs @ 1.20 fps)



Pond MH1: PDMH1



Summary for Pond MH2: PDMH2

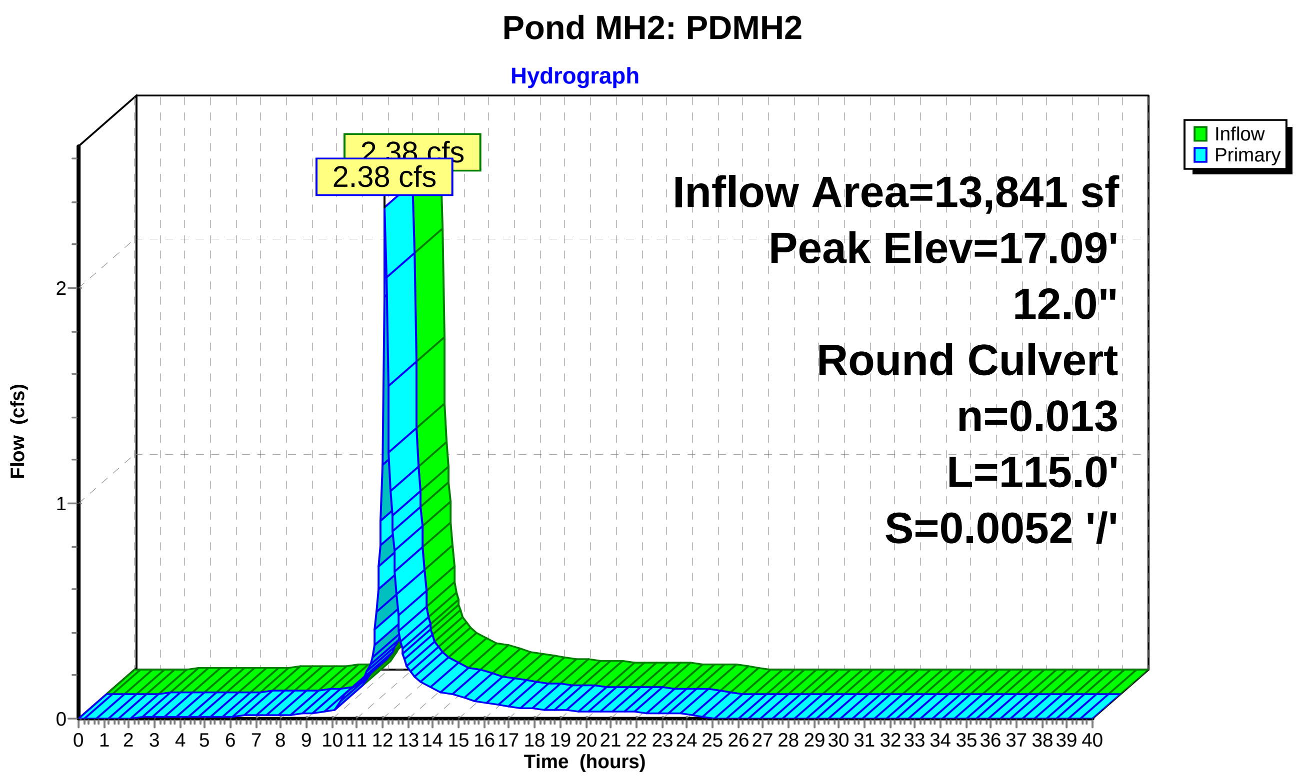
[80] Warning: Exceeded Pond MH1 by 0.14' @ 12.20 hrs (0.69 cfs 125 cf)

Inflow Area = 13,841 sf, 76.82% Impervious, Inflow Depth = 6.80" for 100-yr event
Inflow = 2.38 cfs @ 12.10 hrs, Volume= 7,838 cf
Outflow = 2.38 cfs @ 12.10 hrs, Volume= 7,838 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.38 cfs @ 12.10 hrs, Volume= 7,838 cf

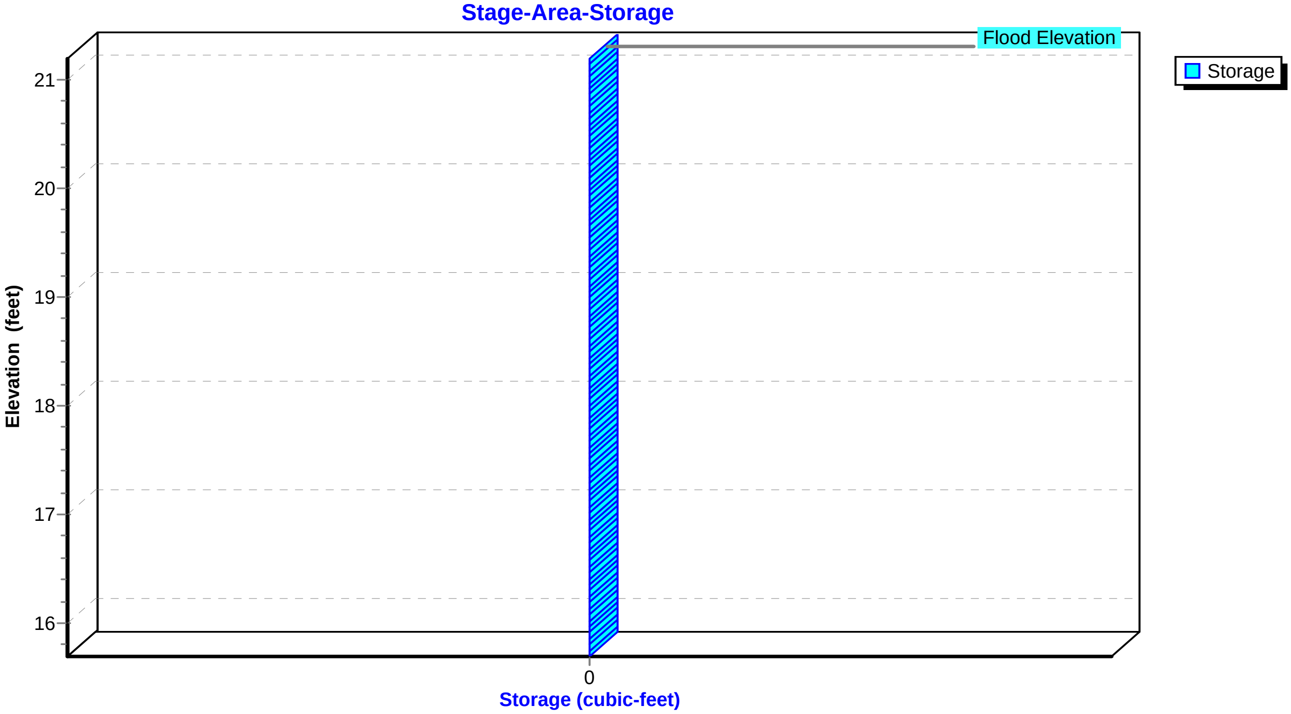
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 17.09' @ 12.21 hrs
Flood Elev= 21.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	15.70'	**12.0" Round Culvert** L= 115.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.70' / 15.10' S= 0.0052 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.94 cfs @ 12.10 hrs HW=16.84' TW=16.29' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 1.94 cfs @ 2.73 fps)



Pond MH2: PDMH2



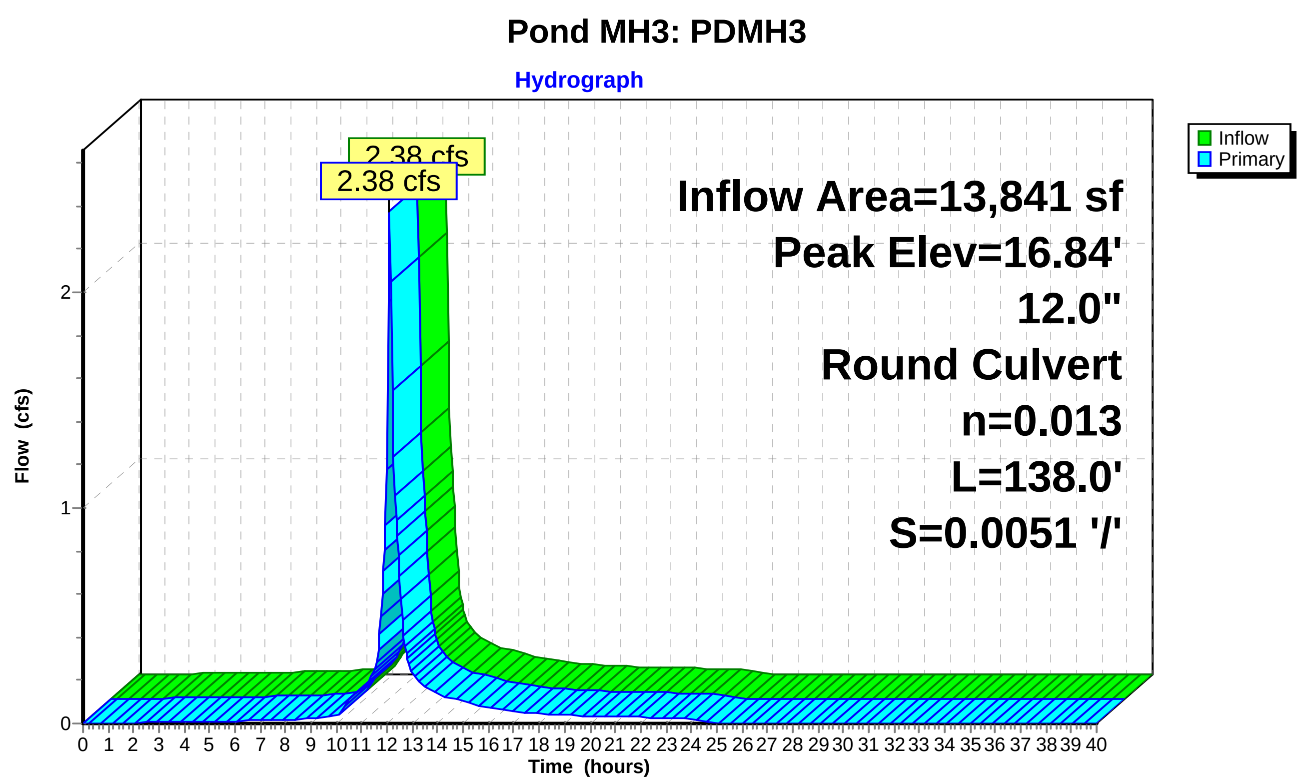
Summary for Pond MH3: PDMH3

Inflow Area =	13,841 sf,	76.82% Impervious,	Inflow Depth = 6.80"	for 100-yr event	
Inflow =	2.38 cfs @	12.10 hrs,	Volume=	7,838 cf	
Outflow =	2.38 cfs @	12.10 hrs,	Volume=	7,838 cf,	Atten= 0%, Lag= 0.0 min
Primary =	2.38 cfs @	12.10 hrs,	Volume=	7,838 cf	

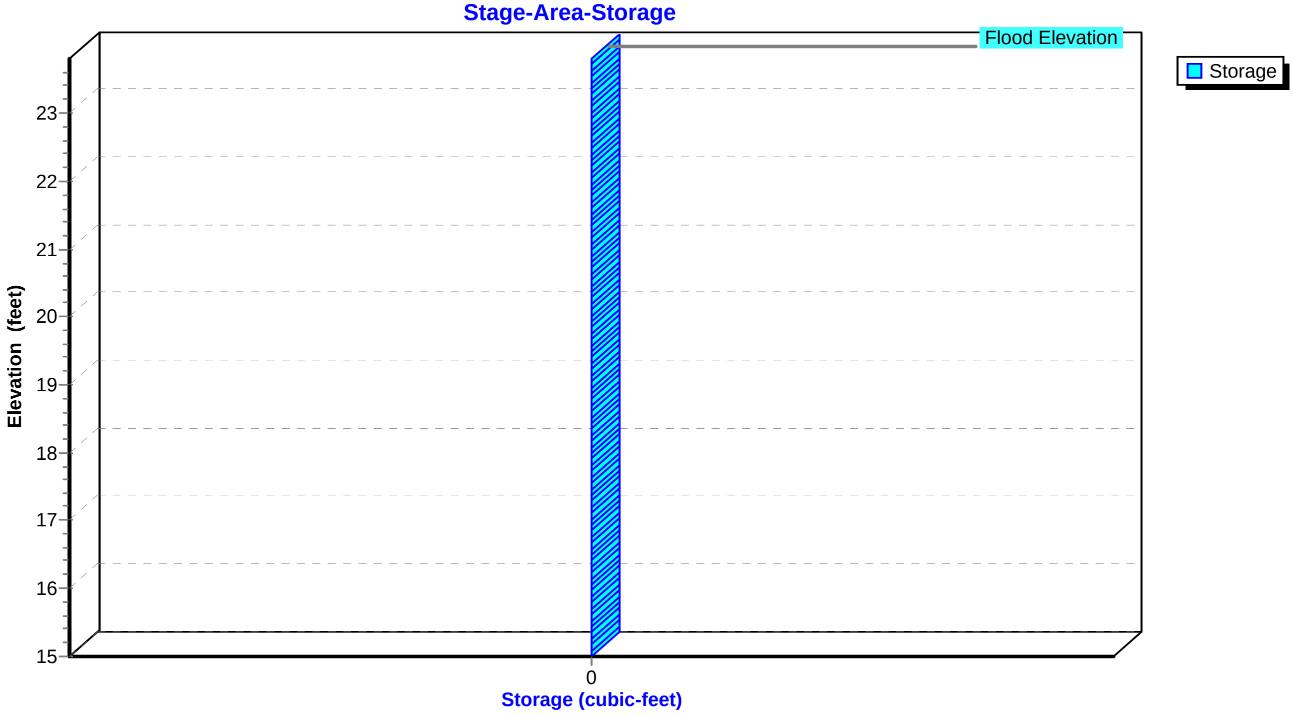
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.84' @ 12.18 hrs
Flood Elev= 23.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	**12.0" Round Culvert** L= 138.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 15.00' / 14.30' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.14 cfs @ 12.10 hrs HW=16.29' TW=16.10' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.14 cfs @ 1.47 fps)



Pond MH3: PDMH3



Summary for Pond MH4: PDMH4

[80] Warning: Exceeded Pond CB4 by 0.29' @ 12.10 hrs (1.32 cfs 513 cf)
[80] Warning: Exceeded Pond CB5 by 0.51' @ 12.10 hrs (2.12 cfs 752 cf)

Inflow Area = 22,134 sf, 85.50% Impervious, Inflow Depth = 7.27" for 100-yr event
Inflow = 3.88 cfs @ 12.10 hrs, Volume= 13,408 cf
Outflow = 3.88 cfs @ 12.10 hrs, Volume= 13,408 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.68 cfs @ 12.08 hrs, Volume= 11,685 cf
Secondary = 1.60 cfs @ 12.16 hrs, Volume= 1,723 cf

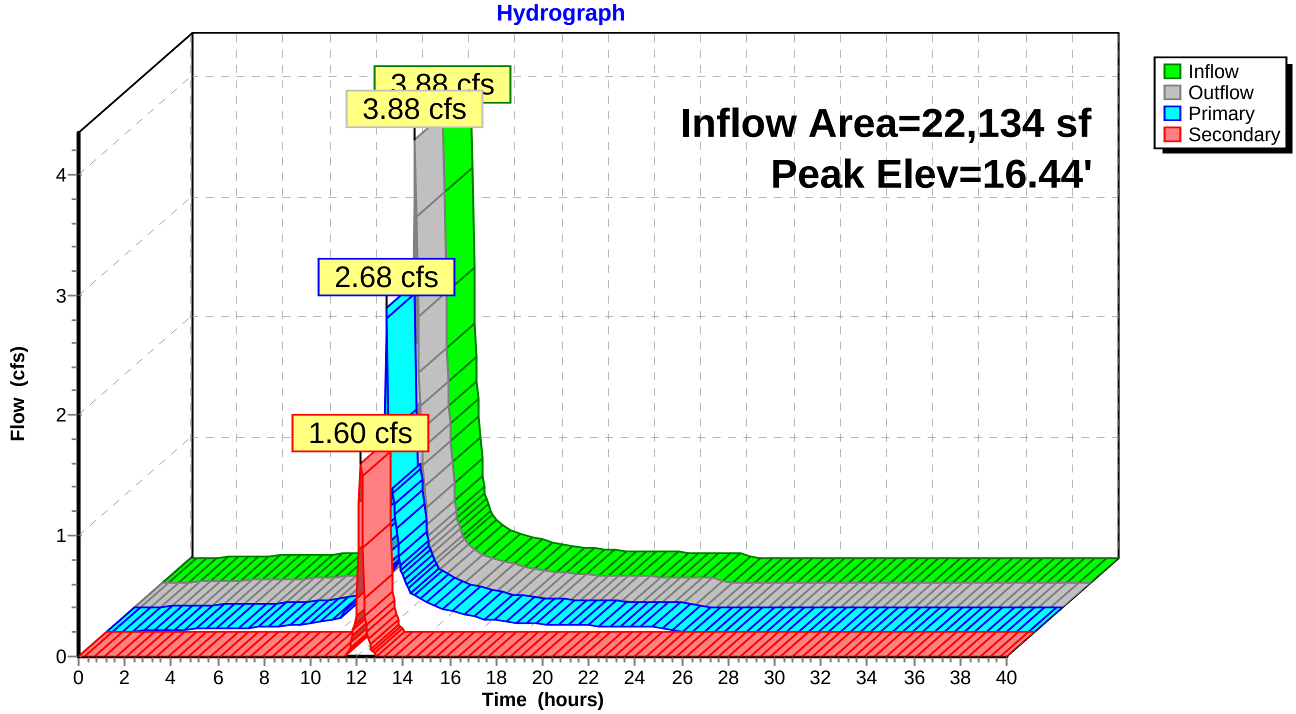
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.44' @ 12.15 hrs
Flood Elev= 21.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	14.20'	**12.0" Round Culvert** L= 6.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 14.10' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	14.20'	**12.0" Round Culvert** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 14.20' / 13.70' S= 0.0625 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	14.55'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

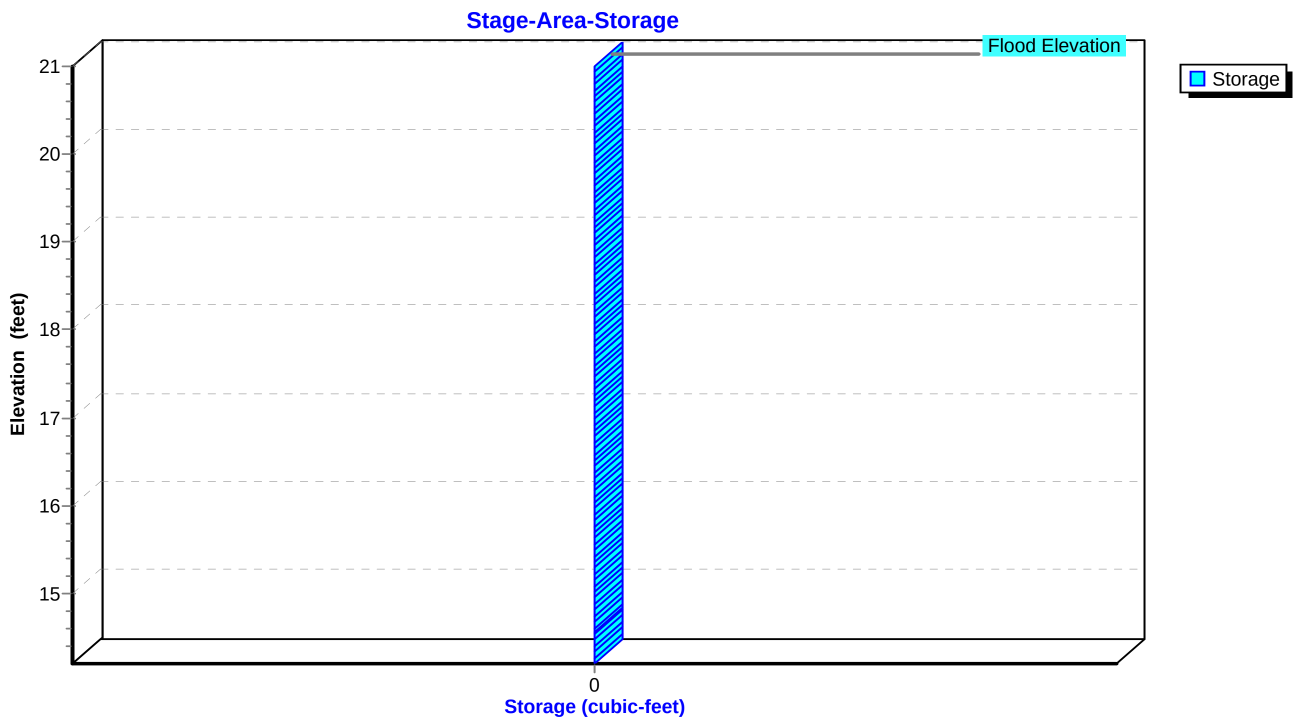
Primary OutFlow Max=0.40 cfs @ 12.08 hrs HW=15.83' TW=15.81' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.40 cfs @ 0.51 fps)

Secondary OutFlow Max=1.86 cfs @ 12.16 hrs HW=16.37' TW=15.13' (Dynamic Tailwater)
└─**2=Culvert** (Passes 1.86 cfs of 3.32 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 1.86 cfs @ 4.08 fps)

Pond MH4: PDMH4



Pond MH4: PDMH4



Summary for Pond MH5: PDMH5

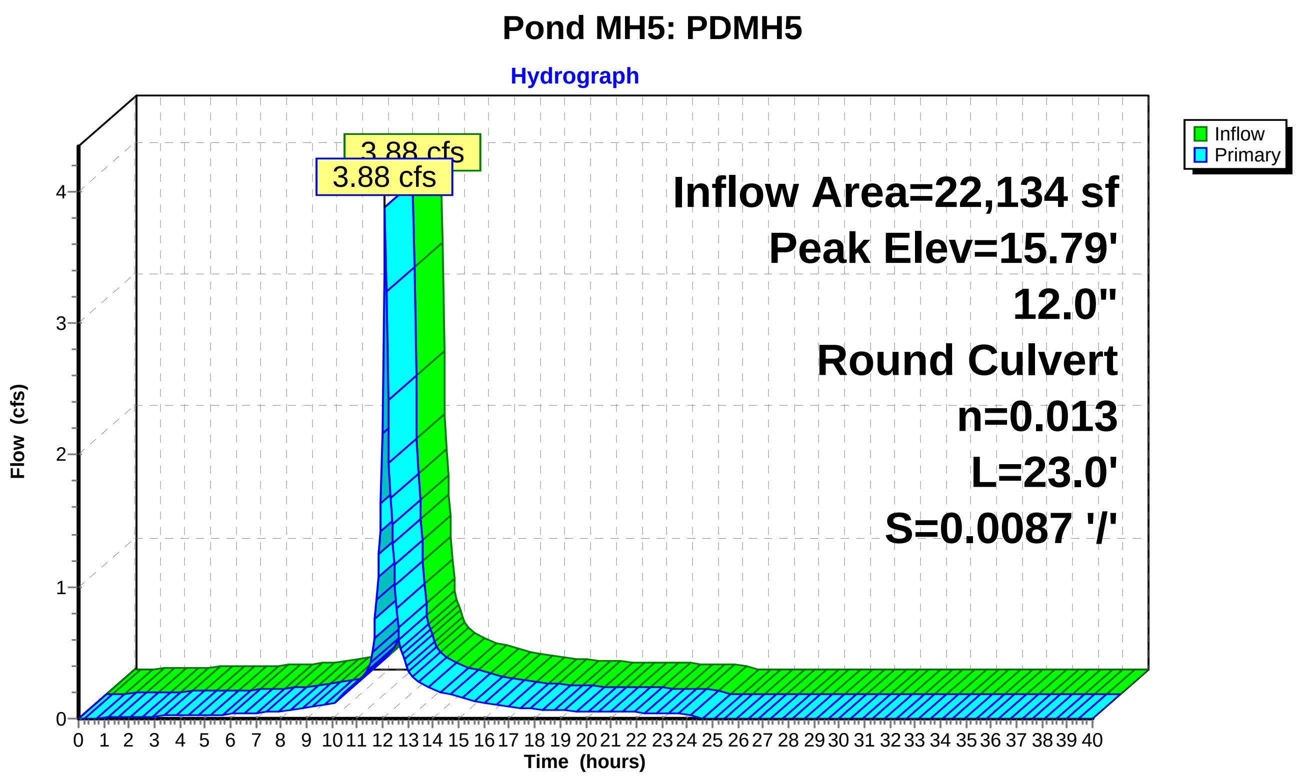
[80] Warning: Exceeded Pond WQU1 by 0.05' @ 12.05 hrs (0.68 cfs 123 cf)

Inflow Area = 22,134 sf, 85.50% Impervious, Inflow Depth = 7.27" for 100-yr event
Inflow = 3.88 cfs @ 12.10 hrs, Volume= 13,408 cf
Outflow = 3.88 cfs @ 12.10 hrs, Volume= 13,408 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.88 cfs @ 12.10 hrs, Volume= 13,408 cf

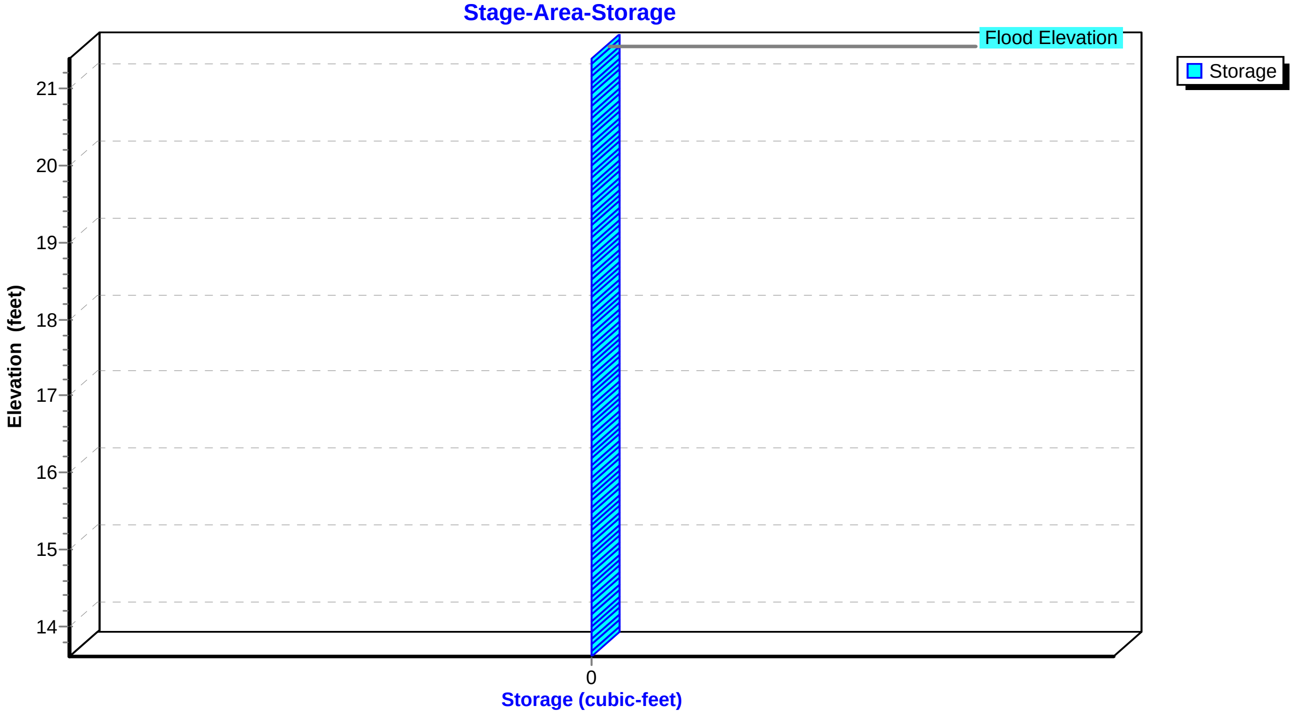
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 15.79' @ 12.10 hrs
Flood Elev= 21.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	13.60'	**12.0" Round Culvert** L= 23.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 13.60' / 13.40' S= 0.0087 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.85 cfs @ 12.10 hrs HW=15.76' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 3.85 cfs @ 4.90 fps)



Pond MH5: PDMH5



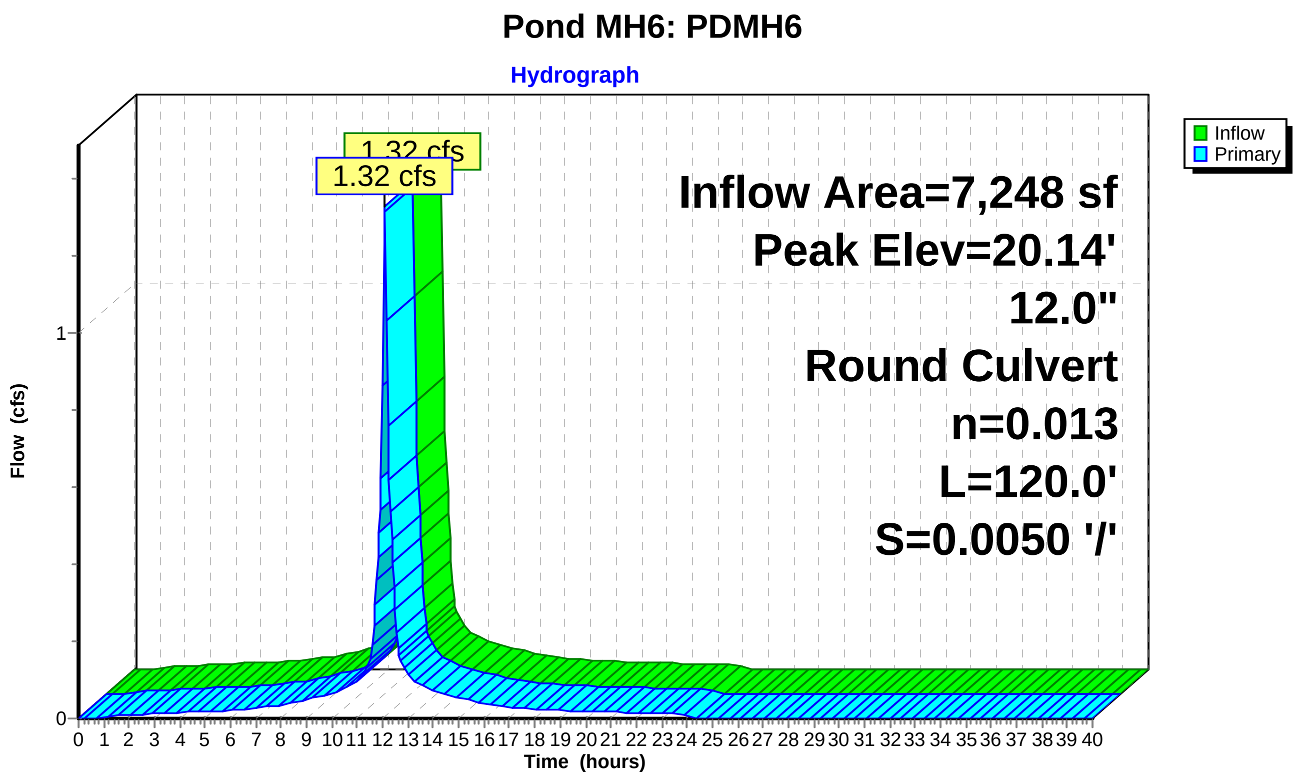
Summary for Pond MH6: PDMH6

Inflow Area =	7,248 sf,100.00% Impervious,	Inflow Depth = 8.06" for 100-yr event			
Inflow =	1.32 cfs @	12.09 hrs,	Volume=	4,868 cf	
Outflow =	1.32 cfs @	12.09 hrs,	Volume=	4,868 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.32 cfs @	12.09 hrs,	Volume=	4,868 cf	

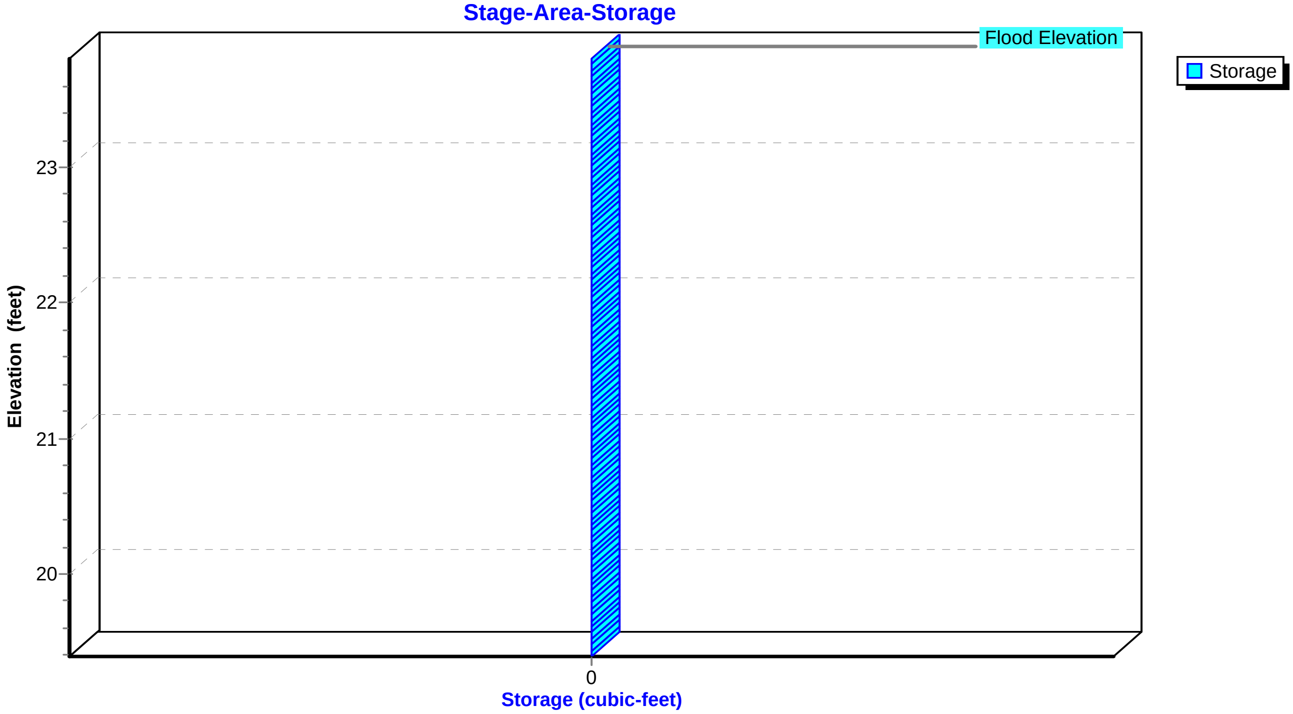
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 20.14' @ 12.10 hrs
Flood Elev= 23.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	19.40'	**12.0" Round Culvert** L= 120.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.40' / 18.80' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.22 cfs @ 12.09 hrs HW=20.13' TW=19.48' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.22 cfs @ 2.78 fps)



Pond MH6: PDMH6



Summary for Pond MH7: PDMH7

[80] Warning: Exceeded Pond CB7 by 0.06' @ 12.15 hrs (0.53 cfs 146 cf)

Inflow Area = 9,928 sf,100.00% Impervious, Inflow Depth = 8.06" for 100-yr event
Inflow = 1.81 cfs @ 12.09 hrs, Volume= 6,668 cf
Outflow = 1.81 cfs @ 12.09 hrs, Volume= 6,668 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.44 cfs @ 12.09 hrs, Volume= 6,136 cf
Secondary = 0.46 cfs @ 12.17 hrs, Volume= 532 cf

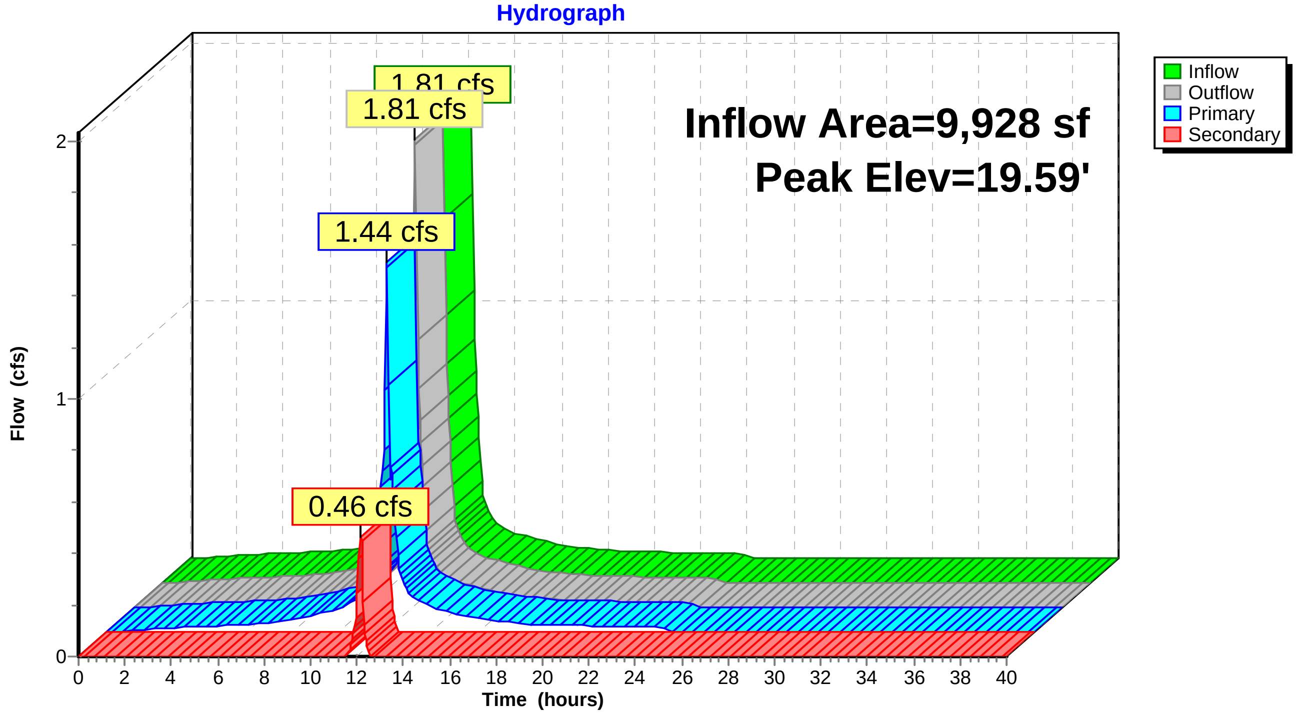
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.59' @ 12.15 hrs
Flood Elev= 21.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.70'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.70' / 18.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Secondary	18.70'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.70' / 18.20' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	19.00'	**0.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

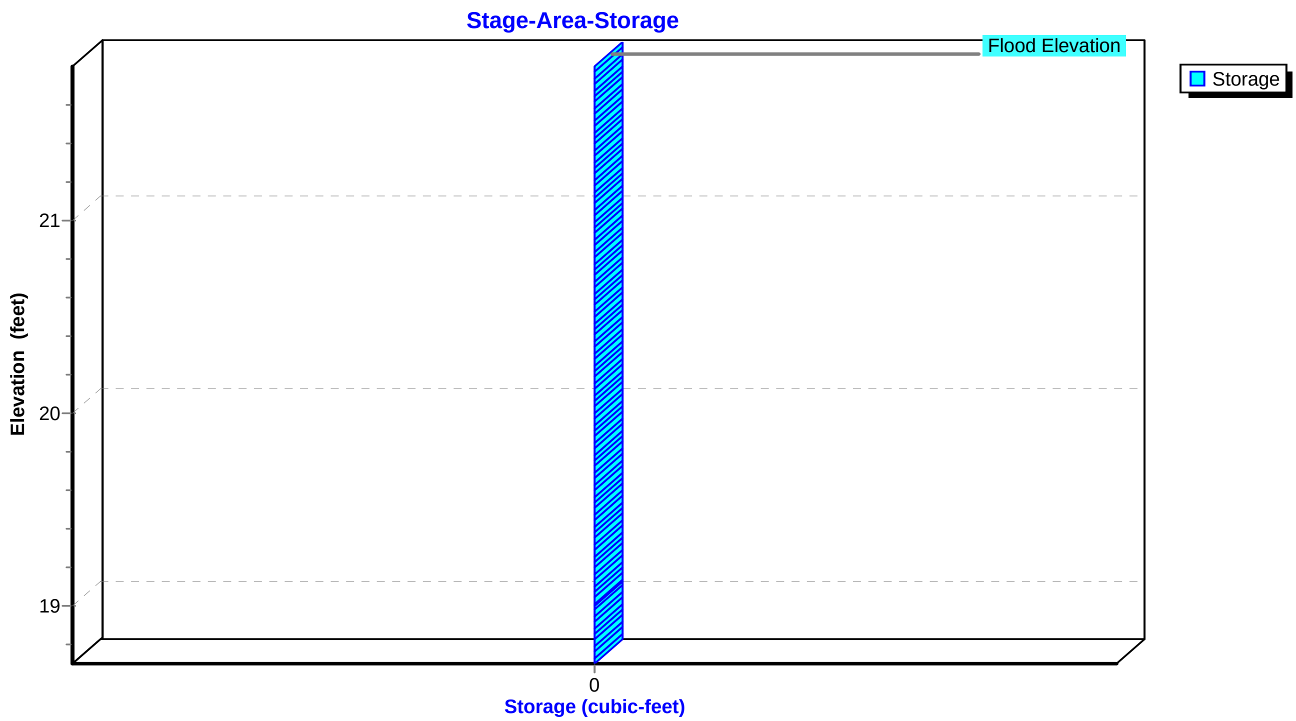
Primary OutFlow Max=0.74 cfs @ 12.09 hrs HW=19.48' TW=19.39' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.74 cfs @ 1.12 fps)

Secondary OutFlow Max=0.52 cfs @ 12.17 hrs HW=19.55' TW=19.01' (Dynamic Tailwater)
└**2=Culvert** (Passes 0.52 cfs of 1.77 cfs potential flow)
  └**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.52 cfs @ 2.43 fps)

Pond MH7: PDMH7



Pond MH7: PDMH7



Summary for Pond MH8: PDMH8

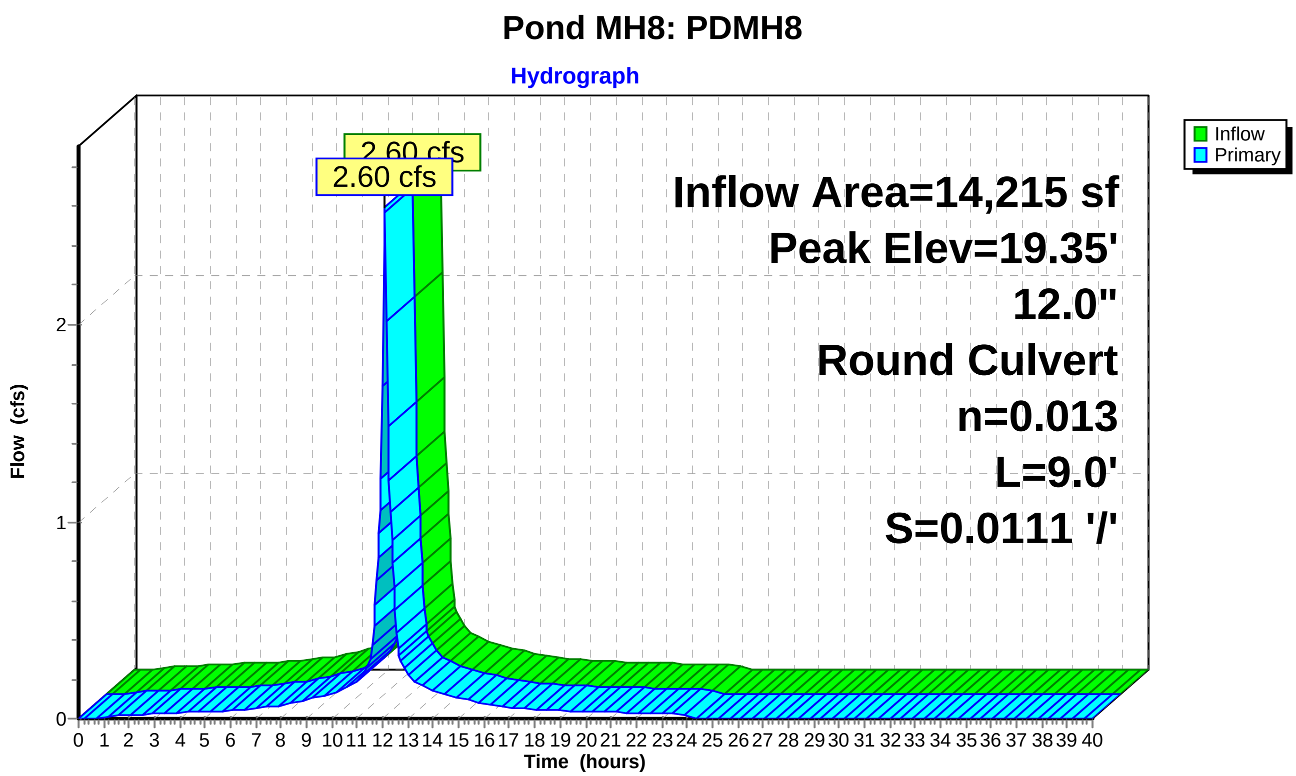
[80] Warning: Exceeded Pond WQU2 by 0.06' @ 12.05 hrs (0.75 cfs 135 cf)

Inflow Area = 14,215 sf,100.00% Impervious, Inflow Depth = 8.06" for 100-yr event
Inflow = 2.60 cfs @ 12.09 hrs, Volume= 9,548 cf
Outflow = 2.60 cfs @ 12.09 hrs, Volume= 9,548 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.60 cfs @ 12.09 hrs, Volume= 9,548 cf

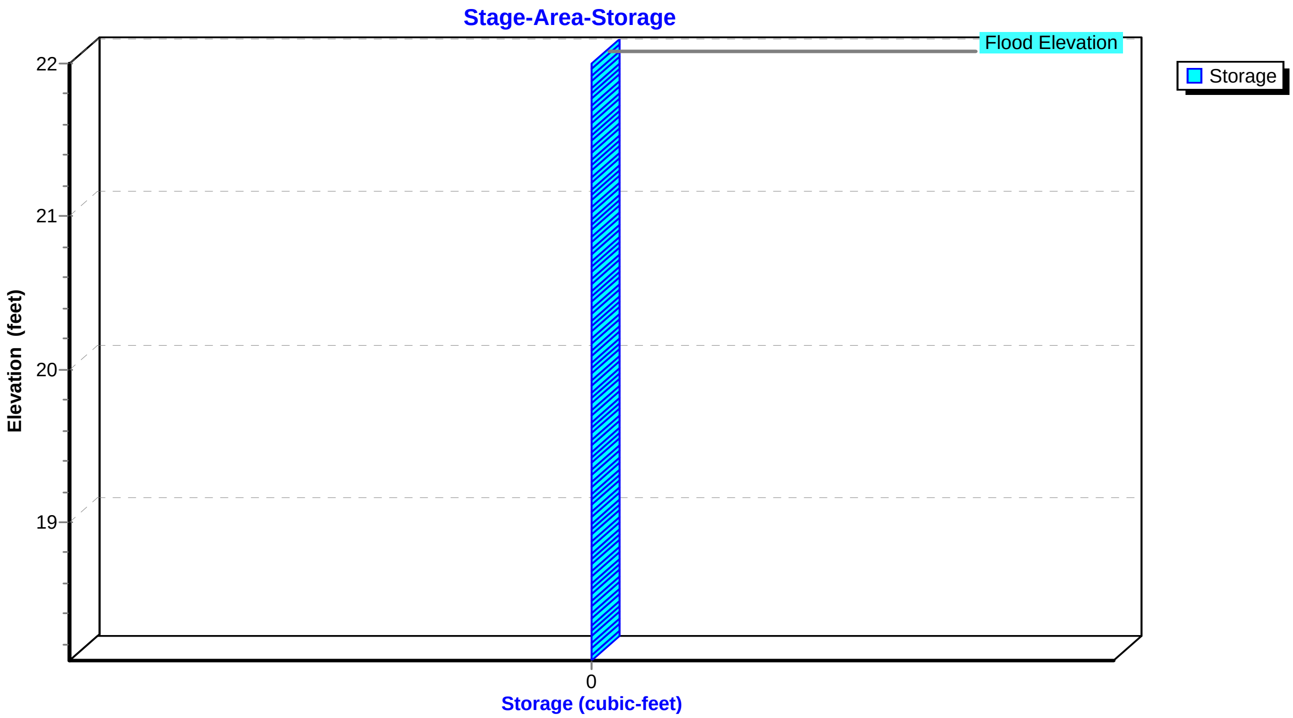
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.35' @ 12.09 hrs
Flood Elev= 22.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.10'	**12.0" Round Culvert** L= 9.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.10' / 18.00' S= 0.0111 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.53 cfs @ 12.09 hrs HW=19.32' TW=17.68' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.53 cfs @ 3.22 fps)



Pond MH8: PDMH8



Summary for Pond RG1: Rain Garden #1

Inflow Area = 25,212 sf, 56.56% Impervious, Inflow Depth = 6.54" for 100-yr event
Inflow = 4.11 cfs @ 12.09 hrs, Volume= 13,737 cf
Outflow = 1.90 cfs @ 12.27 hrs, Volume= 12,754 cf, Atten= 54%, Lag= 10.9 min
Primary = 1.90 cfs @ 12.27 hrs, Volume= 12,754 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.20' @ 12.27 hrs Surf.Area= 6,431 sf Storage= 4,934 cf
Flood Elev= 16.70' Surf.Area= 6,703 sf Storage= 6,272 cf

Plug-Flow detention time= 129.0 min calculated for 12,738 cf (93% of inflow)
Center-of-Mass det. time= 92.4 min (875.0 - 782.6)

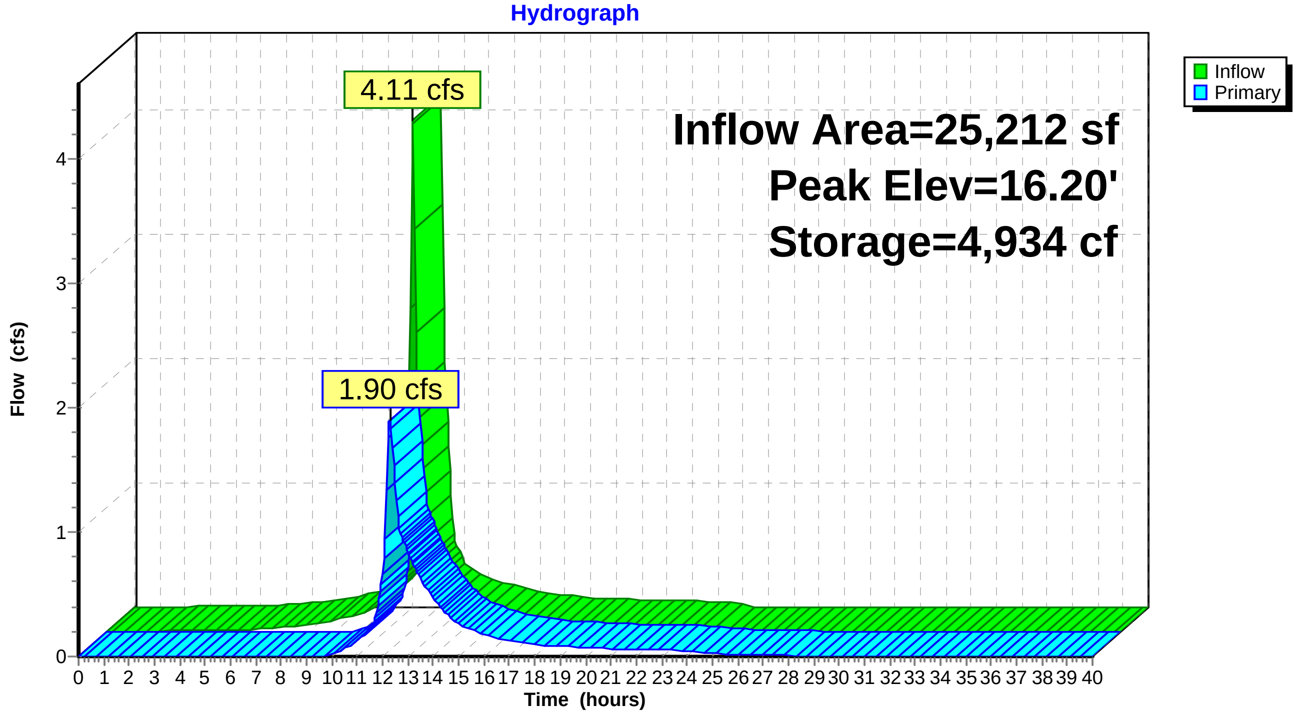
Volume	Invert	Avail.Storage	Storage Description
#1	15.30'	6,272 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
15.30	4,439	288.0	0	0	4,439
16.00	6,173	327.0	3,698	3,698	6,360
16.30	6,569	334.0	1,911	5,609	6,741
16.40	6,703	337.0	664	6,272	6,905

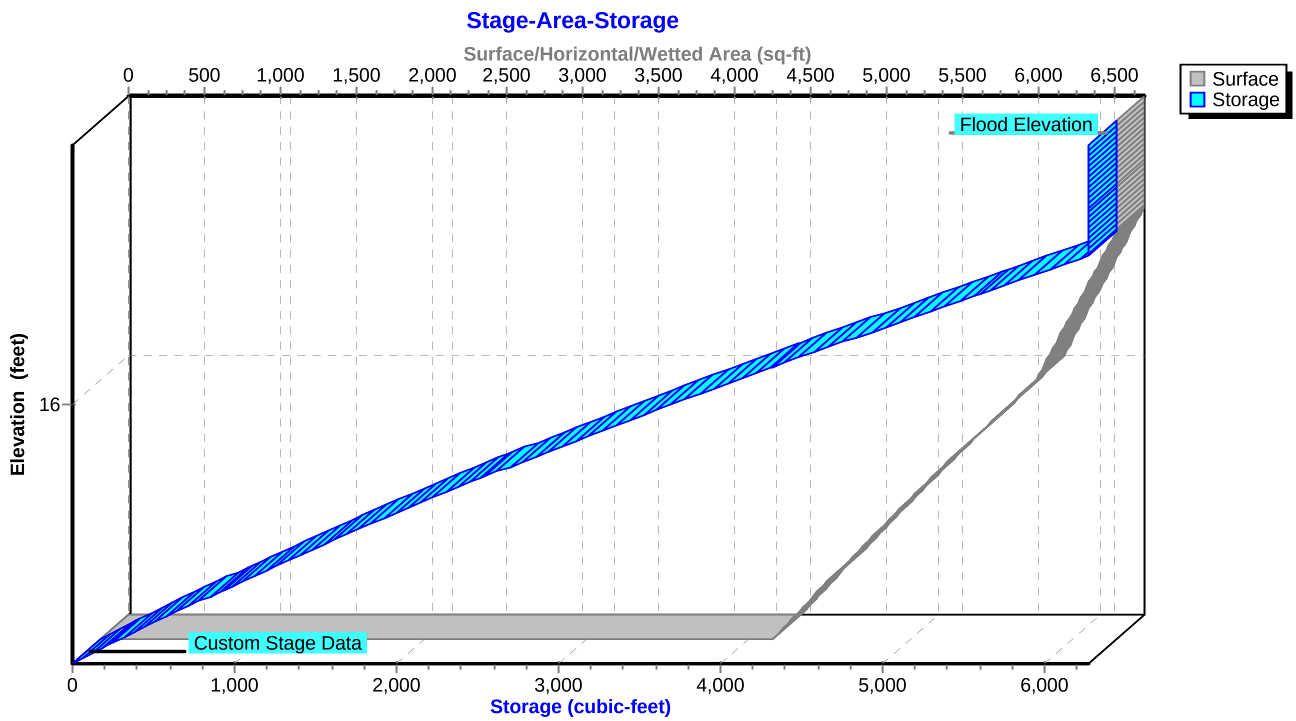
Device	Routing	Invert	Outlet Devices
#1	Primary	15.35'	**8.0" Round Culvert X 2.00** L= 65.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 15.35' / 15.00' S= 0.0054 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	15.50'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	15.80'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	16.10'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.88 cfs @ 12.27 hrs HW=16.19' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.88 cfs of 1.92 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.92 cfs @ 3.50 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.20 cfs @ 2.30 fps)
  └─**4=Orifice/Grate** (Weir Controls 0.76 cfs @ 1.01 fps)

Pond RG1: Rain Garden #1



Pond RG1: Rain Garden #1



Summary for Pond RG2: Rain Garden #2

[80] Warning: Exceeded Pond CB3 by 0.23' @ 24.45 hrs (0.12 cfs 1,164 cf)

Inflow Area = 10,003 sf, 68.81% Impervious, Inflow Depth = 7.16" for 100-yr event
Inflow = 1.72 cfs @ 12.09 hrs, Volume= 5,971 cf
Outflow = 1.69 cfs @ 12.11 hrs, Volume= 5,282 cf, Atten= 2%, Lag= 1.3 min
Primary = 1.69 cfs @ 12.11 hrs, Volume= 5,282 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 18.60' @ 12.11 hrs Surf.Area= 968 sf Storage= 1,128 cf
Flood Elev= 19.00' Surf.Area= 1,118 sf Storage= 1,546 cf

Plug-Flow detention time= 109.2 min calculated for 5,282 cf (88% of inflow)
Center-of-Mass det. time= 54.5 min (821.1 - 766.7)

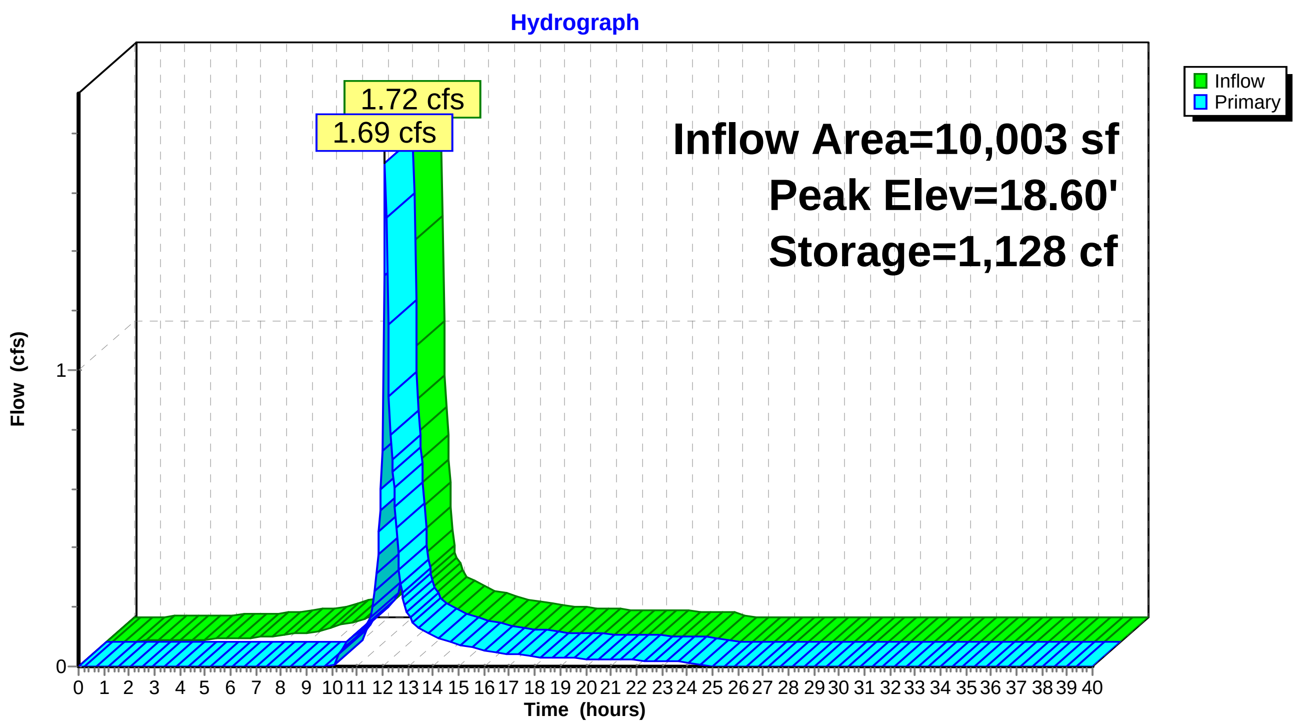
Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	2,934 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
17.00	468	89.0	0	0	468
18.00	765	108.0	610	610	782
19.00	1,118	127.0	936	1,546	1,156
20.00	1,676	152.0	1,388	2,934	1,728

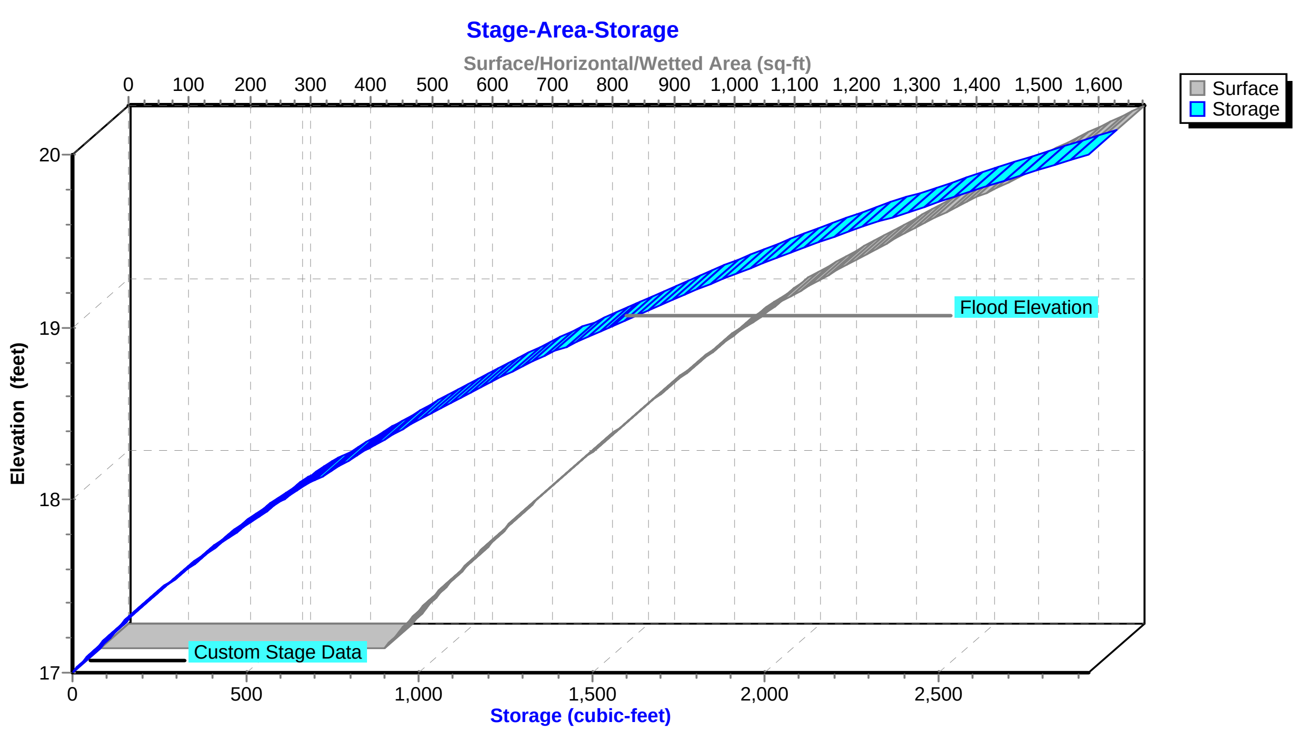
Device	Routing	Invert	Outlet Devices
#1	Primary	16.50'	**12.0" Round Culvert X 2.00** L= 53.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 16.50' / 15.80' S= 0.0132 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	18.10'	**4.0" Vert. Orifice/Grate X 3.00** C= 0.600
#3	Device 1	18.30'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	18.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.65 cfs @ 12.11 hrs HW=18.60' TW=16.84' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.65 cfs of 8.43 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.72 cfs @ 2.76 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.15 cfs @ 1.85 fps)
  └─**4=Orifice/Grate** (Weir Controls 0.78 cfs @ 1.01 fps)

Pond RG2: Rain Garden #2



Pond RG2: Rain Garden #2



Summary for Pond WQU1: Water Quality Unit 1

[80] Warning: Exceeded Pond MH4 by 0.05' @ 12.10 hrs (0.68 cfs 123 cf)

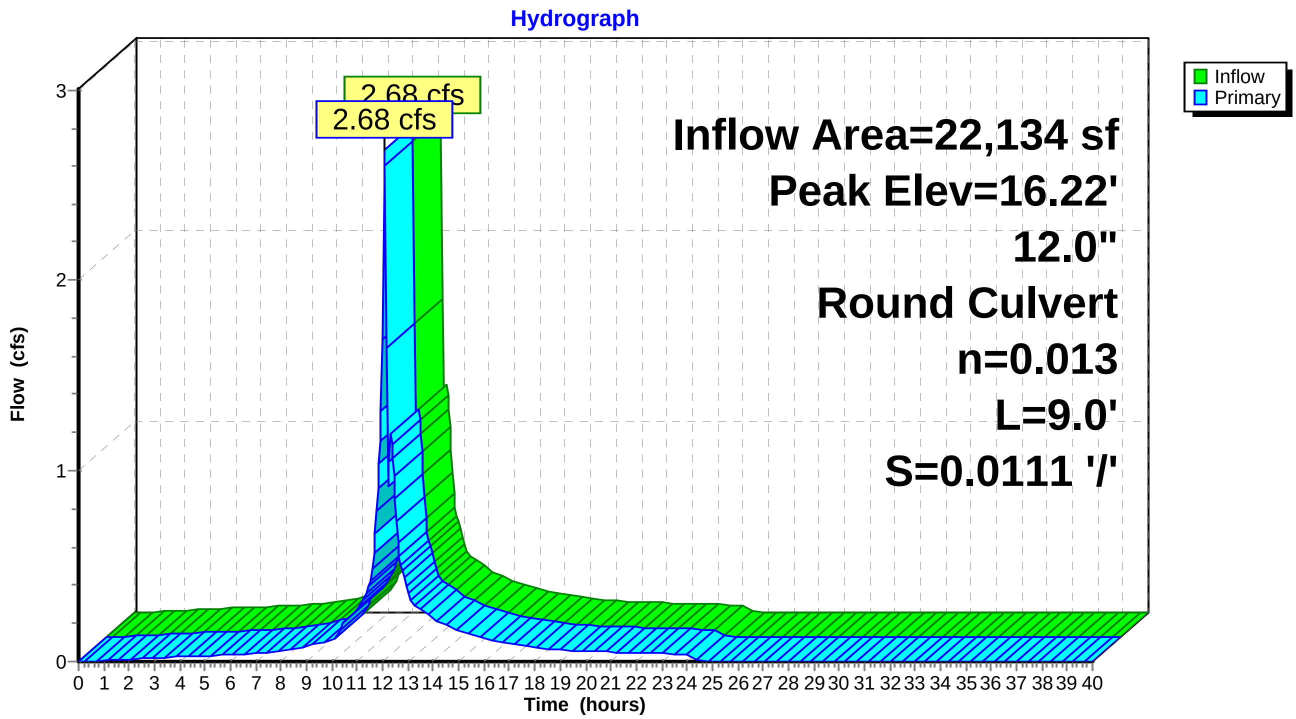
Inflow Area = 22,134 sf, 85.50% Impervious, Inflow Depth = 6.34" for 100-yr event
Inflow = 2.68 cfs @ 12.08 hrs, Volume= 11,685 cf
Outflow = 2.68 cfs @ 12.08 hrs, Volume= 11,685 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.68 cfs @ 12.08 hrs, Volume= 11,685 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 16.22' @ 12.12 hrs
Flood Elev= 21.00'

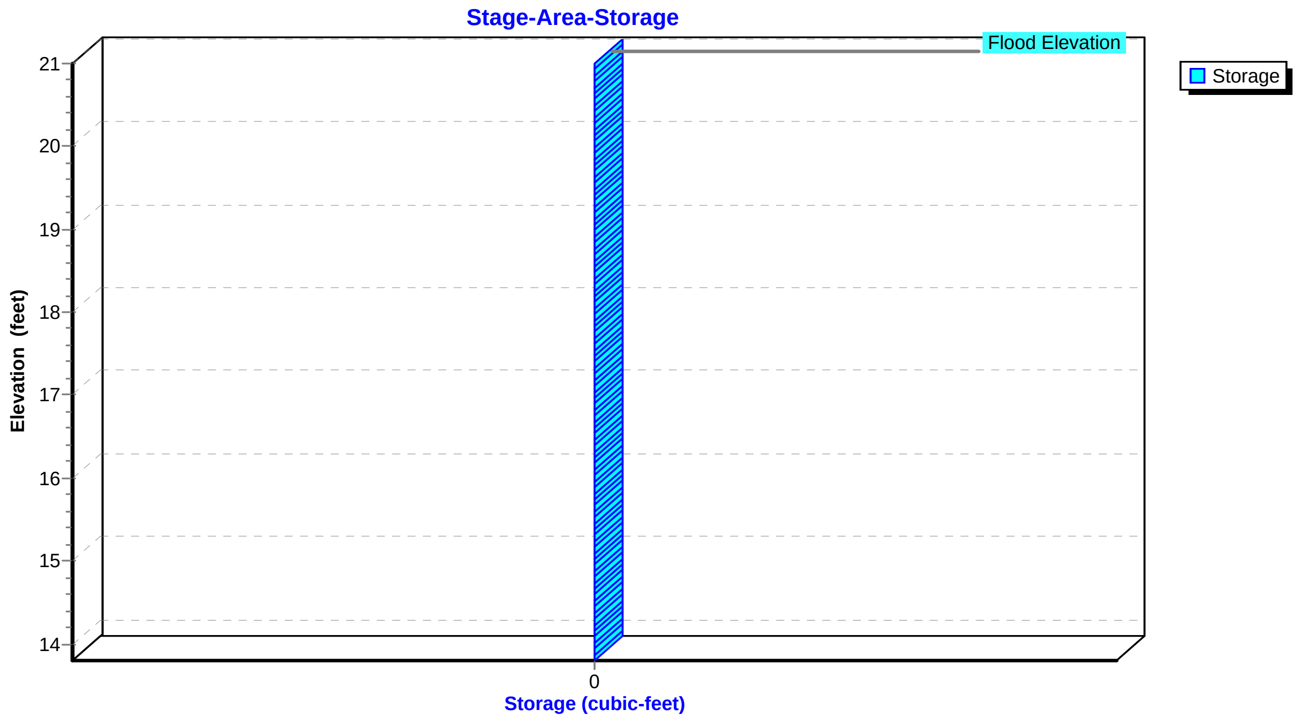
Device	Routing	Invert	Outlet Devices
#1	Primary	13.80'	**12.0" Round Culvert** L= 9.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 13.80' / 13.70' S= 0.0111 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.30 cfs @ 12.08 hrs HW=15.81' TW=15.62' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.30 cfs @ 1.66 fps)

Pond WQU1: Water Quality Unit 1



Pond WQU1: Water Quality Unit 1



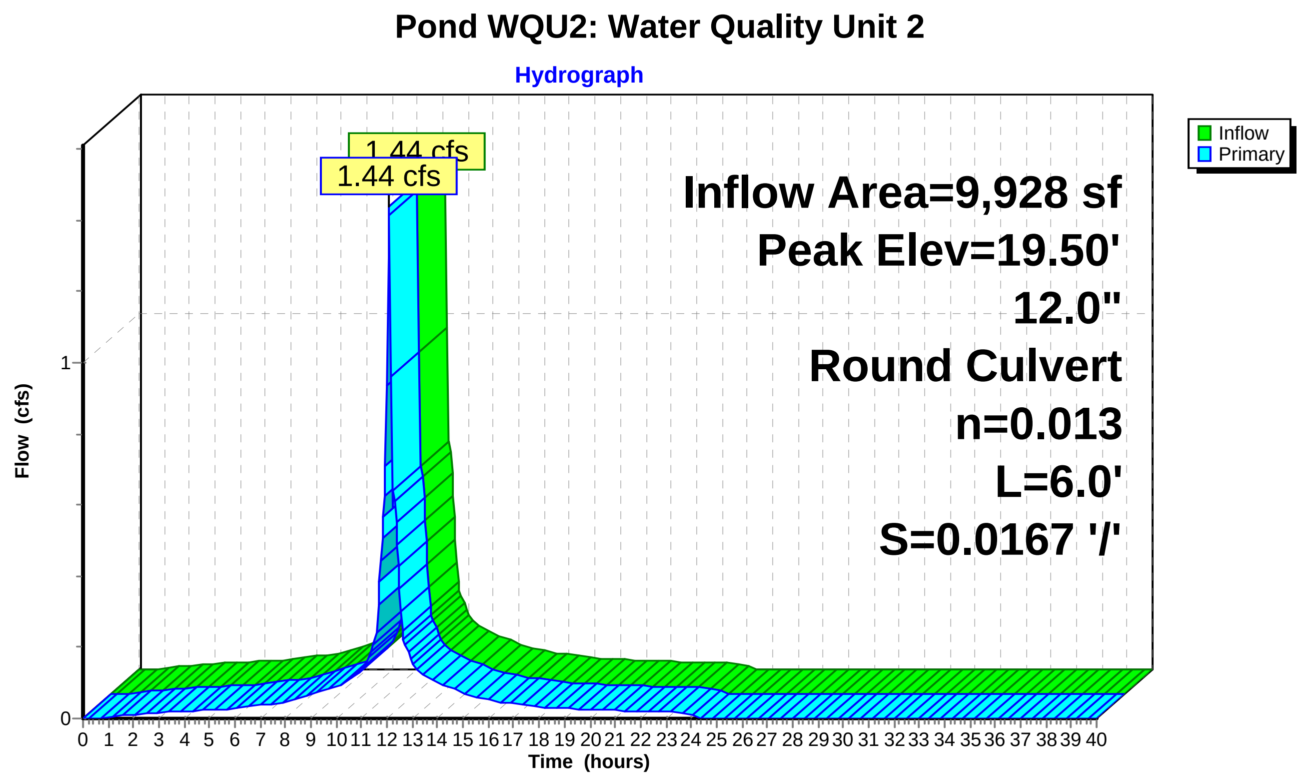
Summary for Pond WQU2: Water Quality Unit 2

Inflow Area =	9,928 sf,100.00% Impervious,	Inflow Depth = 7.42" for 100-yr event		
Inflow =	1.44 cfs @	12.09 hrs, Volume=	6,136 cf	
Outflow =	1.44 cfs @	12.09 hrs, Volume=	6,136 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.44 cfs @	12.09 hrs, Volume=	6,136 cf	

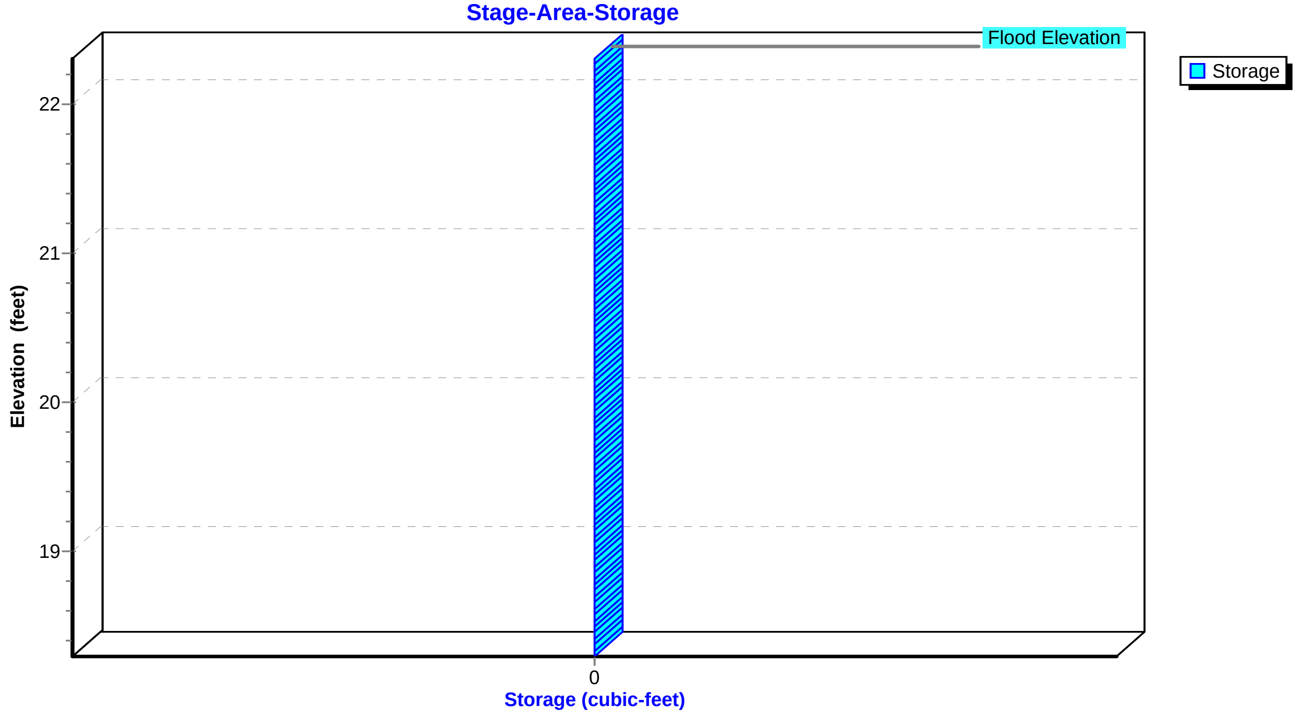
Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 19.50' @ 12.12 hrs
Flood Elev= 22.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	18.30'	**12.0" Round Culvert** L= 6.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.30' / 18.20' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

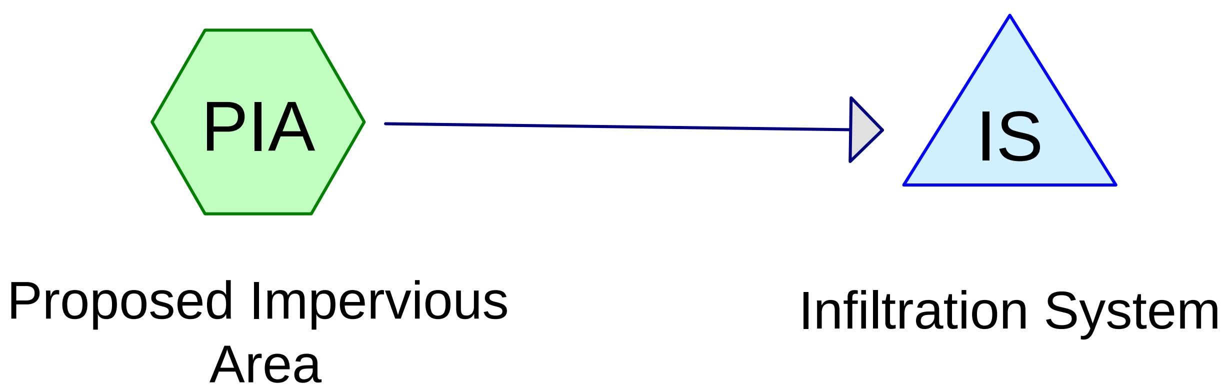
Primary OutFlow Max=0.82 cfs @ 12.09 hrs HW=19.39' TW=19.32' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.82 cfs @ 1.05 fps)

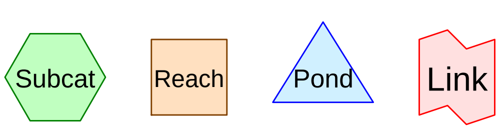


Pond WQU2: Water Quality Unit 2



Proposed Conditions Analysis
Groundwater Recharge – Simple Dynamic Method Calculations





Routing Diagram for Recharge Volume 12-22-17
Prepared by Lynnfield Engineering Inc., Printed 12/22/2017
HydroCAD® 10.00-18 s/n 06609 © 2016 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
47,400	98	total impervious area (PIA)

Time span=11.00-13.00 hrs, dt=0.05 hrs, 41 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 PIA: Proposed Impervious Runoff Area=47,400 sf 100.00% Impervious Runoff Depth>0.84"
Tc=6.0 min CN=98 Runoff=1.76 cfs 3,310 cf

Pond IS: Infiltration System Peak Elev=17.89' Storage=1,679 cf Inflow=1.76 cfs 3,310 cf
Discarded=0.28 cfs 1,774 cf Primary=0.00 cfs 0 cf Outflow=0.28 cfs 1,774 cf

Summary for Subcatchment PIA: Proposed Impervious Area

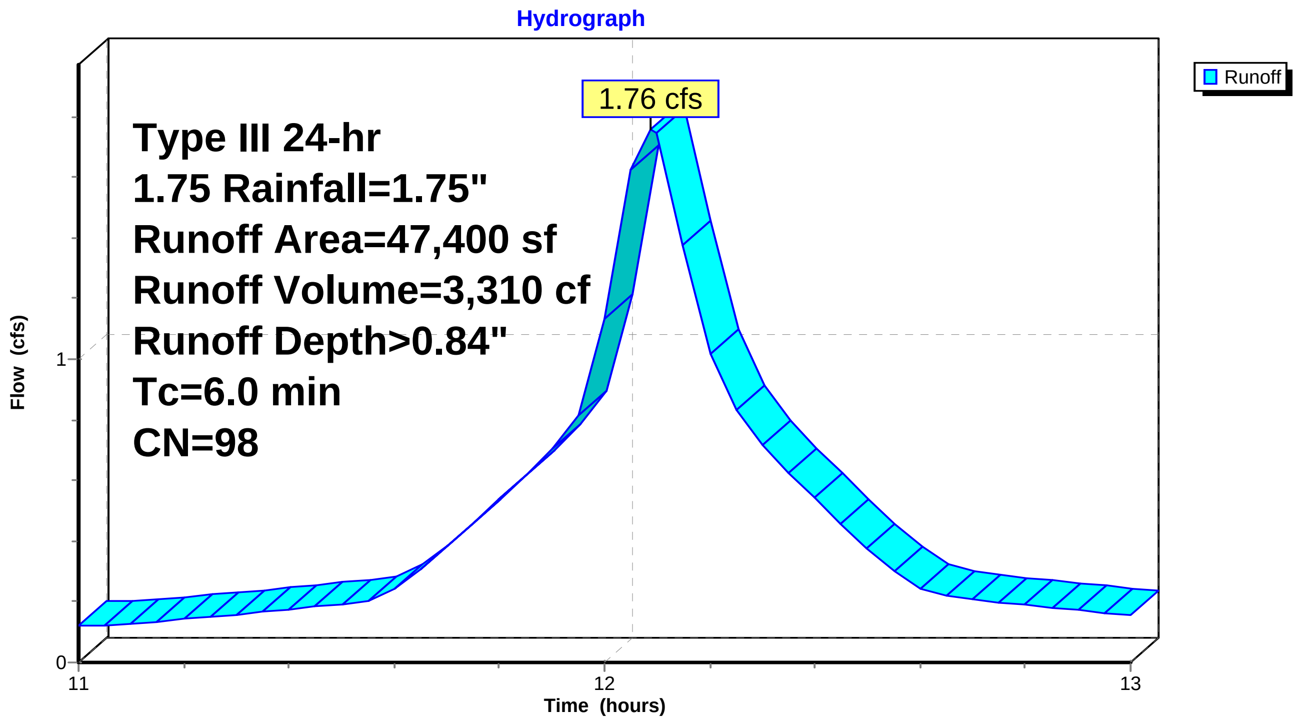
Runoff = 1.76 cfs @ 12.09 hrs, Volume= 3,310 cf, Depth> 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 11.00-13.00 hrs, dt= 0.05 hrs
Type III 24-hr 1.75 Rainfall=1.75"

	Area (sf)	CN	Description
*	47,400	98	total impervious area
	47,400		100.00% Impervious Area

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

Subcatchment PIA: Proposed Impervious Area



Summary for Pond IS: Infiltration System

[82] Warning: Early inflow requires earlier time span

Inflow Area = 47,400 sf,100.00% Impervious, Inflow Depth > 0.84" for 1.75 event
Inflow = 1.76 cfs @ 12.09 hrs, Volume= 3,310 cf
Outflow = 0.28 cfs @ 11.70 hrs, Volume= 1,774 cf, Atten= 84%, Lag= 0.0 min
Discarded = 0.28 cfs @ 11.70 hrs, Volume= 1,774 cf
Primary = 0.00 cfs @ 11.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 11.00-13.00 hrs, dt= 0.05 hrs
Peak Elev= 17.89' @ 12.57 hrs Surf.Area= 1,463 sf Storage= 1,679 cf

Plug-Flow detention time= 18.1 min calculated for 1,726 cf (52% of inflow)
Center-of-Mass det. time= 3.0 min (727.5 - 724.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	16.10'	670 cf	**6.28'W x 109.07'L x 3.52'H Field A** 2,416 cf Overall - 741 cf Embedded = 1,675 cf x 40.0% Voids
#2A	16.60'	741 cf	**Contech ChamberMaxx** x 15 Inside #1 Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap Row Length Adjustment= +0.32' x 6.92 sf x 1 rows
#3B	16.10'	601 cf	**10.98'W x 59.25'L x 3.52'H Field B** 2,294 cf Overall - 793 cf Embedded = 1,502 cf x 40.0% Voids
#4B	16.60'	793 cf	**Contech ChamberMaxx** x 16 Inside #3 Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap Row Length Adjustment= +0.32' x 6.92 sf x 2 rows
#5C	16.10'	143 cf	**2.54'W x 50.00'L x 3.21'H Field C** 408 cf Overall - 50 cf Embedded = 358 cf x 40.0% Voids
#6C	17.10'	39 cf	**ADS N-12 12** x 2 Inside #5 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf Row Length Adjustment= +8.00' x 0.81 sf x 1 rows
		2,986 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.10'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	17.90'	**12.0" Round Culvert** L= 23.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 17.90' / 17.00' S= 0.0391 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.28 cfs @ 11.70 hrs HW=16.15' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 11.00 hrs HW=16.11' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)

Pond IS: Infiltration System - Chamber Wizard Field A

Chamber Model = Contech ChamberMaxx (Contech® ChamberMaxx®)
Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
Row Length Adjustment= +0.32' x 6.92 sf x 1 rows

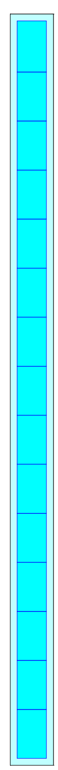
15 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 107.07' Row Length +12.0" End Stone x 2 = 109.07' Base Length
1 Rows x 51.4" Wide + 12.0" Side Stone x 2 = 6.28' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

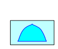
15 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 1 Rows = 741.1 cf Chamber Storage

2,415.8 cf Field - 741.1 cf Chambers = 1,674.7 cf Stone x 40.0% Voids = 669.9 cf Stone Storage

Chamber Storage + Stone Storage = 1,411.0 cf = 0.032 af
Overall Storage Efficiency = 58.4%
Overall System Size = 109.07' x 6.28' x 3.52'

15 Chambers
89.5 cy Field
62.0 cy Stone





Pond IS: Infiltration System - Chamber Wizard Field B

Chamber Model = Contech ChamberMaxx (Contech® ChamberMaxx®)
Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
Row Length Adjustment= +0.32' x 6.92 sf x 2 rows

51.4" Wide + 5.0" Spacing = 56.4" C-C Row Spacing

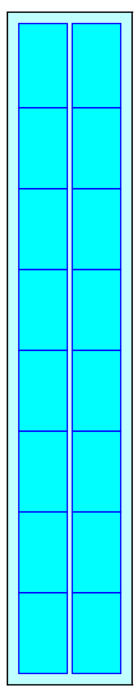
8 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 57.25' Row Length +12.0" End Stone x 2 = 59.25' Base Length
2 Rows x 51.4" Wide + 5.0" Spacing x 1 + 12.0" Side Stone x 2 = 10.98' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

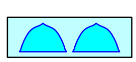
16 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 792.6 cf Chamber Storage

2,294.1 cf Field - 792.6 cf Chambers = 1,501.5 cf Stone x 40.0% Voids = 600.6 cf Stone Storage

Chamber Storage + Stone Storage = 1,393.2 cf = 0.032 af
Overall Storage Efficiency = 60.7%
Overall System Size = 59.25' x 10.98' x 3.52'

16 Chambers
85.0 cy Field
55.6 cy Stone





Pond IS: Infiltration System - Chamber Wizard Field C

Chamber Model = ADS N-12 12 (ADS N-12® Pipe)
Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
Row Length Adjustment= +8.00' x 0.81 sf x 1 rows

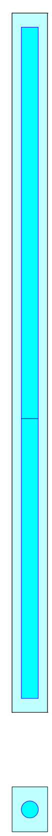
2 Chambers/Row x 20.00' Long +8.00' Row Adjustment = 48.00' Row Length +12.0" End Stone x 2 = 50.00' Base Length
1 Rows x 14.5" Wide + 8.0" Side Stone x 2 = 2.54' Base Width
12.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.21' Field Height

2 Chambers x 16.2 cf +8.00' Row Adjustment x 0.81 sf x 1 Rows = 38.9 cf Chamber Storage
2 Chambers x 20.9 cf +8.00' Row Adjustment x 1.05 sf x 1 Rows = 50.2 cf Displacement

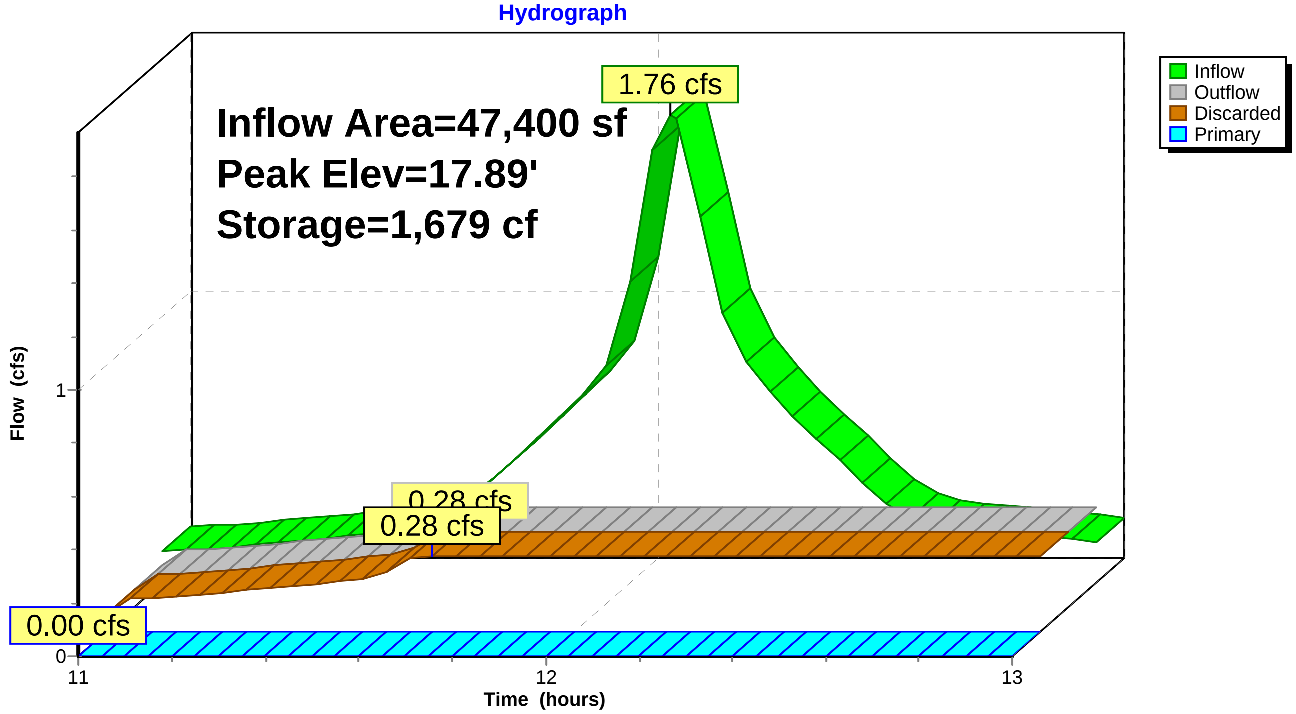
407.9 cf Field - 50.2 cf Chambers = 357.7 cf Stone x 40.0% Voids = 143.1 cf Stone Storage

Chamber Storage + Stone Storage = 181.9 cf = 0.004 af
Overall Storage Efficiency = 44.6%
Overall System Size = 50.00' x 2.54' x 3.21'

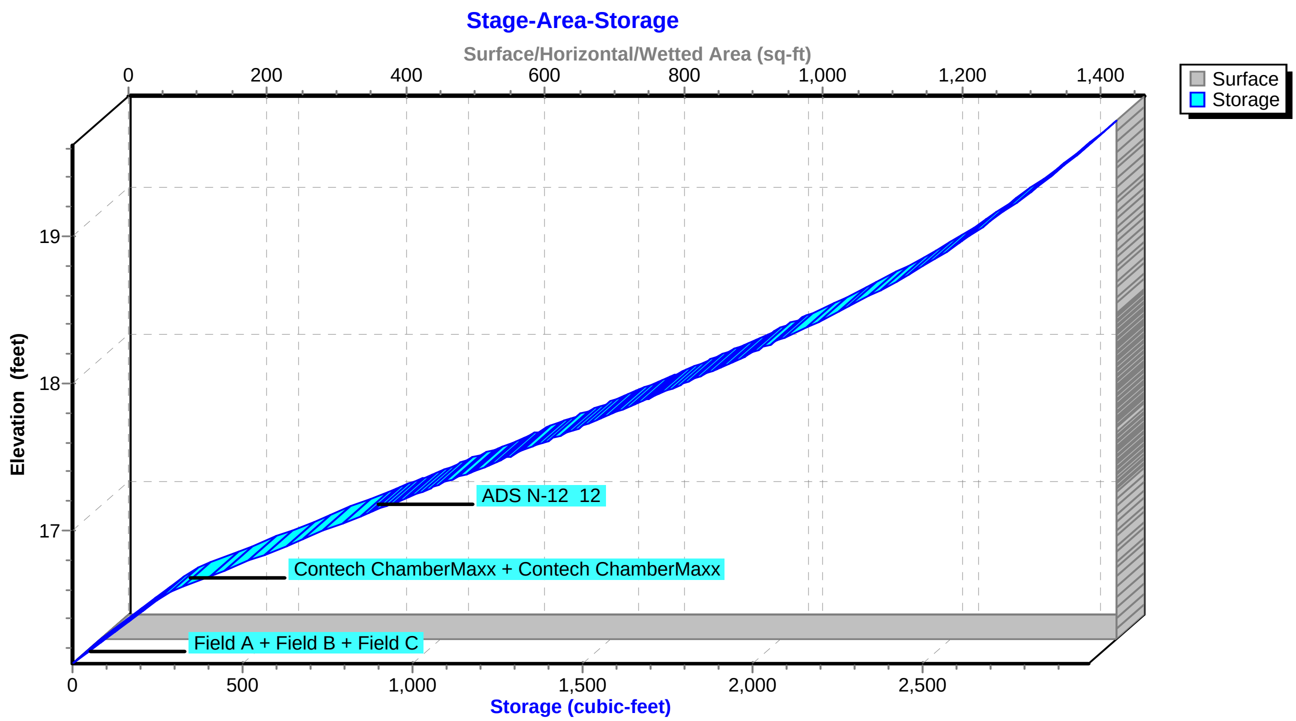
2 Chambers
15.1 cy Field
13.2 cy Stone



Pond IS: Infiltration System



Pond IS: Infiltration System



ATTACHMENT B

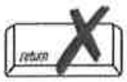
Massachusetts Stormwater Checklist

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

COMMONWEALTH OF MASSACHUSETTS
RICHARD BARTHELMES
NO. 33017
REGISTERED PROFESSIONAL ENGINEER

2/1/18

Signature and Date

Checklist

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

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

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

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

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

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☒ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☒ Grass Channel

☐ Green Roof

☐ Other (describe): ____________________

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

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

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

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☐ Static ☒ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

☐ is within the Zone II or Interim Wellhead Protection Area

☐ is near or to other critical areas

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☐ An Illicit Discharge Compliance Statement is attached;

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

ATTACHMENT C

Total Suspended Solids (TSS) Removal Calculations

INSTRUCTIONS:

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

Location: 75 Parker St., Newburyport, MA

Treatment Train: 1

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Rain Garden	**0.44**	**1.00**	**0.44**	**0.56**
Grass Channel	**0.50**	**0.56**	**0.28**	**0.28**
	0.00	**0.28**	**0.00**	**0.28**
	0.00	**0.28**	**0.00**	**0.28**
	0.00	**0.28**	**0.00**	**0.28**

Total TSS Removal = **72%**

Project: **Hawton Leath, 75 Parker Street, Newburyport, MA**

Prepared By: **Lynnfield Engineering**

Date: **12/22/2017**

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

INSTRUCTIONS:

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

Location: 75 Parker St., Newburyport, MA

Treatment Train: 2

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Contech Jellyfish WQU 1	**0.80**	**0.75**	**0.60**	**0.15**
Grass Channel	**0.50**	**0.15**	**0.08**	**0.08**
	0.00	**0.08**	**0.00**	**0.08**
	0.00	**0.08**	**0.00**	**0.08**

Total TSS Removal = 93%

Project: **Hawton Leath, 75 Parker Street, Newburyport, MA**

Prepared By: **Lynnfield Engineering**

Date: **12/22/2017**

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

INSTRUCTIONS:

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

Location: 75 Parker St., Newburyport, MA

Treatment Train: 3

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Contech Jellyfish WQU 2	**0.80**	**0.75**	**0.60**	**0.15**
Contech Chambermaxx Infiltration System	**0.80**	**0.15**	**0.12**	**0.03**
	0.00	**0.03**	**0.00**	**0.03**
	0.00	**0.03**	**0.00**	**0.03**

Total TSS Removal = **97%**

Project: **Hawton Leath, 75 Parker Street, Newburyport, MA**

Prepared By: **Lynnfield Engineering**

Date: **12/22/2017**

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

ATTACHMENT D

Contech Jellyfish Design Sheets

PROJECT INFORMATION			
Project Name:	**75 Parker Street**	**Project Number**	**573012**
City:	**Newburyport, MA**	**State**	**MA**
Prepared For:	**Eaglebrook Engineering & Survey**	**Date**	**10/9/17**

Hydrodynamic Separation Recommendations

Stormwater Standard No. 4 requires structural stormwater management practices to be sized to capture the required WQV in accordance with the Massachusetts Stormwater Handbook (310 CMR 10.05(6)(k)(4) and 314 CMR 9.06(6)(a)(4)). Stormwater Standard No. 4 requires that the full WQV be captured and treated to remove 80% of the average annual post-construction load of Total Suspended Solid (TSS). Only use impervious surfaces for these computations. *Runoff from pervious surfaces should not be included in the WQV computations for the Q rate.*

The recommended treatment model(s) below are designed to meet the above stated treatment requirements. Each recommended model is designed to remove at least 80% of the average annual post-construction load of Total Suspended Solids (TSS) for the preject's required treatment depth.

Treatment Depth	**1"**
# Rainfall Station*	**69**

*Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

Structure Name	Impervious Area (ac)	t_c (mins)	1" WQF (cfs)	Recommended Model	Model WQF Capacity (cfs)	Predicted TSS Removal
1	0.31	5	0.39	JF 4-2-1	0.45	>80%
2	0.35	5	0.43	JF 4-2-1	0.45	>80%

CONTECH ENGINEERED SOLUTIONS

Project Name:	75 Parker St		
Site Designation:	1	**Date:**	10/9/17
County or Independent City:	Newburyport	**Design Engineer:**	
State:	MA		

Mass Loading Calculations:

Peak Design Flow (cfs)	2.72
Water Quality Flow (cfs)	0.39
Annual Rainfall (inches)	50
Total Drainage Area, A (ac)	0.31
Post Development Impervious Area, A_I (ac)	0.31
Pervious Area, A_P (ac)	0.00
Impervious Runoff Coefficient, Rv	0.95
Pervious Runoff Coefficient, Rv	0.25
% Impervious	100%
Runoff Coefficient, Rc	0.95
TSS Removal By Pretreatment	0%
Agency Required TSS % Removal	80%
Required TSS Removal Efficiency of Filter	80%
Percent Runoff Capture	90%
Mean Annual Runoff, V_t (ft^3)	48,107
Event Mean Concentration of Pollutant, EMC (mg/L)	60
Annual Mass Load, M_{total} (lbs)	180.08

Flow Based Filter Sizing:

Mass to be Captured by System (lbs)	144.07
Filter Type	Jellyfish
Structure Type	Manhole
Cartridge Length	54''
Allowable Load Per Hi-Flo Cartridge (lbs)	125
Allowable Load Per Draindown Cartridge (lbs)	63
# Hi-Flo Cartridges Required	2
# Draindown Cartridges Required	1
Recommended Model	JF4-2-1
TSS Treatment Capacity (lbs)	313.00
Maximum Water Quality Flow	0.45 cfs

CONTECH ENGINEERED SOLUTIONS

Project Name:	75 Parker St		
Site Designation:	2	**Date:**	10/9/17
County or Independent City:	Newburyport	**Design Engineer:**	
State:	MA		

Mass Loading Calculations:

Peak Design Flow (cfs)	3.10
Water Quality Flow (cfs)	0.43
Annual Rainfall (inches)	50
Total Drainage Area, A (ac)	0.35
Post Development Impervious Area, A_I (ac)	0.35
Pervious Area, A_P (ac)	0.00
Impervious Runoff Coefficient, Rv	0.95
Pervious Runoff Coefficient, Rv	0.25
% Impervious	100%
Runoff Coefficient, Rc	0.95
TSS Removal By Pretreatment	0%
Agency Required TSS % Removal	80%
Required TSS Removal Efficiency of Filter	80%
Percent Runoff Capture	90%
Mean Annual Runoff, V_t (ft^3)	54,314
Event Mean Concentration of Pollutant, EMC (mg/L)	60
Annual Mass Load, M_{total} (lbs)	203.32

Flow Based Filter Sizing:

Mass to be Captured by System (lbs)	162.66
Filter Type	Jellyfish
Structure Type	Manhole
Cartridge Length	54''
Allowable Load Per Hi-Flo Cartridge (lbs)	125
Allowable Load Per Draindown Cartridge (lbs)	63
# Hi-Flo Cartridges Required	2
# Draindown Cartridges Required	1
Recommended Model	JF4-2-1
TSS Treatment Capacity (lbs)	313.00
Maximum Water Quality Flow	0.45 cfs

JELLYFISH® BUOYANCY CALCULATIONS SUMMARY
JF4-2-1 - 573012-10
75 PARKER ST. - PROPOSED BUILDING EXPANSION
NEWBURYPORT, MA
WQU 1

CONTECH® ENGINEERED SOLUTIONS

Preliminary

Dimensions (ft):		Heights (ft):	
Manhole Inside Diameter:	4	Riser 3 Section:	0.00
Manhole Outside Diameter:	4.83	Riser 2 Section:	4.00
Access Opening Diameter:	2.50	Riser 1 Section:	3.00
Top Slab Thickness:	0.67	Control Section:	4.00
Wall Thickness:	0.42	Base Section:	2.50
Pipe Opening Diameter:	1.00	Manhole Joint Height:	0.25
Base Slab Thickness:	0.50		
Base Extension:	0.50		

Unit Weights (lbs/ft^3):		Site Elevations (ft):	
Unit Weight of Concrete:	155	Groundwater Elevation:	14.10
Unit Weight of Water:	62.4	Rim Elevation:	21.90
Unit Weight of Saturated Soil:	48	Depth of Cover (ft):	0.60
Unit Weight of Unsaturated Soil:	110	Outlet Pipe Invert Elev (ft):	14.05
		Bottom Elev (ft):	6.38
		Top Slab Shoulder Elev (ft):	21.30
		Height of GW above Top Slab (ft):	0.00

Buoyancy Calculation Assumptions:

1. The resistant forces from soil friction, pipe connections, and weight of internal parts is not included.
2. The weight of castings and grade rings are ignored and assumed to balance with the weight of soil cover.
3. The structure is assumed to be empty of water and sediment.

Resistant Forces:	WEIGHT (LBS)	WEIGHT (TONS)
Top Slab:	1,389	0.7
Riser 3 Section:	0	0.0
Riser 2 Section:	3,585	1.8
Riser 1 Section:	2,689	1.3
Control Section:	3,585	1.8
Base Section (incl. slab):	4,312	2.2
Overlying Saturated Soil:	3,077	1.5
Overlying Unsaturated Soil:	8,399	4.2
Weight of water in System:	0	0.0
TOTALS	**27,035**	**13.5**

Upward Buoyant Force (lbs):	9096
Resistant Force (Weight - Down) (lbs):	27035
Net Force Down:	17,939
Safety Factor:	2.97

Calculated By: PWV

JELLYFISH® BUOYANCY CALCULATIONS SUMMARY
JF4-2-1 - 573012-20
75 PARKER ST. - PROPOSED BUILDING EXPANSION
NEWBURYPORT, MA
WQU 2

CONTECH ENGINEERED SOLUTIONS

Preliminary

Dimensions (ft):		Heights (ft):	
Manhole Inside Diameter:	4	Riser 3 Section:	0.00
Manhole Outside Diameter:	4.83	Riser 2 Section:	0.00
Access Opening Diameter:	#N/A	Riser 1 Section:	3.00
Top Slab Thickness:	0.67	Control Section:	4.00
Wall Thickness:	0.42	Base Section:	2.50
Pipe Opening Diameter:	1.00	Manhole Joint Height:	0.25
Base Slab Thickness:	0.50		
Base Extension:	0.50		

Unit Weights (lbs/ft^3):		Site Elevations (ft):	
Unit Weight of Concrete:	155	Groundwater Elevation:	14.10
Unit Weight of Water:	62.4	Rim Elevation:	22.30
Unit Weight of Saturated Soil:	48	Depth of Cover (ft):	0.00
Unit Weight of Unsaturated Soil:	110	Outlet Pipe Invert Elev (ft):	18.55
		Bottom Elev (ft):	10.88
		Top Slab Shoulder Elev (ft):	22.30
		Height of GW above Top Slab (ft):	0.00

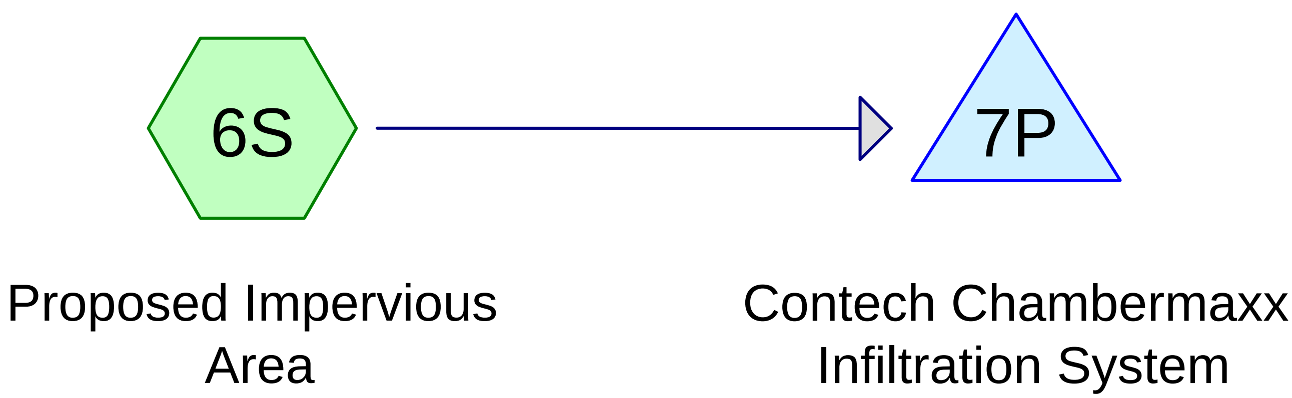
Buoyancy Calculation Assumptions:

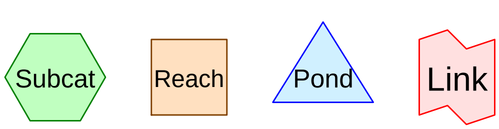
1. The resistant forces from soil friction, pipe connections, and weight of internal parts is not included.
2. The weight of castings and grade rings are ignored and assumed to balance with the weight of soil cover.
3. The structure is assumed to be empty of water and sediment.

Resistant Forces:	WEIGHT (LBS)	WEIGHT (TONS)
Top Slab:	1,389	0.7
Riser 3 Section:	0	0.0
Riser 2 Section:	0	0.0
Riser 1 Section:	2,689	1.3
Control Section:	3,585	1.8
Base Section (incl. slab):	4,312	2.2
Overlying Saturated Soil:	1,283	0.6
Overlying Unsaturated Soil:	7,557	3.8
Weight of water in System:	0	0.0
TOTALS	**20,814**	**10.4**

Upward Buoyant Force (lbs):	3944
Resistant Force (Weight - Down) (lbs):	20814
Net Force Down:	16,869
Safety Factor:	5.28

Calculated By: PWV





Routing Diagram for Recharge Volume
Prepared by Lynnfield Engineering, Printed 10/13/2017
HydroCAD® 10.00-18 s/n 06609 © 2016 HydroCAD Software Solutions LLC

Summary for Subcatchment 6S: Proposed Impervious Area

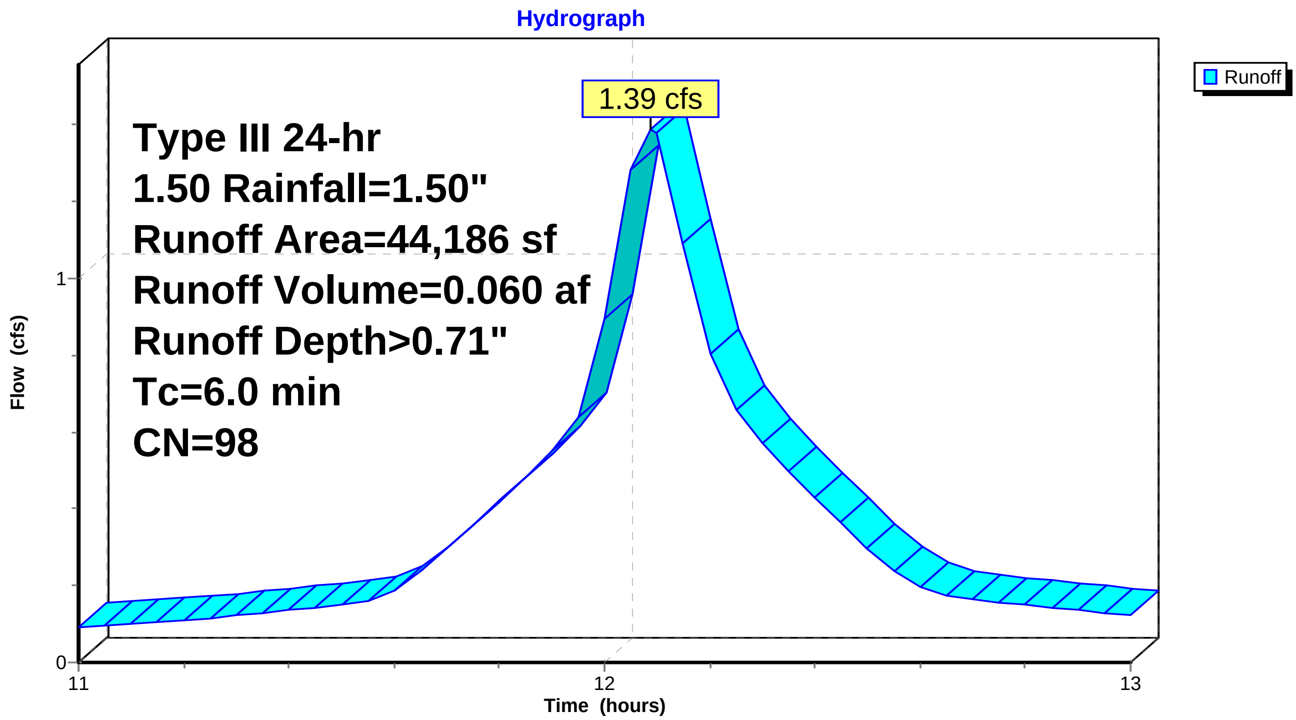
Runoff = 1.39 cfs @ 12.09 hrs, Volume= 0.060 af, Depth> 0.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 11.00-13.00 hrs, dt= 0.05 hrs
Type III 24-hr 1.50 Rainfall=1.50"

	Area (sf)	CN	Description
*	44,186	98	total impervious area
	44,186		100.00% Impervious Area

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

Subcatchment 6S: Proposed Impervious Area



Summary for Pond 7P: Contech Chambermaxx Infiltration System

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.014 ac,100.00% Impervious, Inflow Depth > 0.71" for 1.50 event
Inflow = 1.39 cfs @ 12.09 hrs, Volume= 0.060 af
Outflow = 0.23 cfs @ 11.70 hrs, Volume= 0.033 af, Atten= 83%, Lag= 0.0 min
Discarded = 0.23 cfs @ 11.70 hrs, Volume= 0.033 af
Primary = 0.00 cfs @ 11.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 11.00-13.00 hrs, dt= 0.05 hrs
Peak Elev= 17.77' @ 12.56 hrs Surf.Area= 1,217 sf Storage= 1,285 cf

Plug-Flow detention time= 18.8 min calculated for 0.033 af (56% of inflow)
Center-of-Mass det. time= 3.5 min (728.2 - 724.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	16.10'	583 cf	**6.28'W x 94.84'L x 3.52'H Field A** 2,101 cf Overall - 643 cf Embedded = 1,458 cf x 40.0% Voids
#2A	16.60'	643 cf	**Contech ChamberMaxx** x 13 Inside #1 Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap Row Length Adjustment= +0.32' x 6.92 sf x 1 rows
#3B	16.10'	459 cf	**10.98'W x 45.02'L x 3.52'H Field B** 1,743 cf Overall - 596 cf Embedded = 1,147 cf x 40.0% Voids
#4B	16.60'	596 cf	**Contech ChamberMaxx** x 12 Inside #3 Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap Row Length Adjustment= +0.32' x 6.92 sf x 2 rows
#5C	16.10'	143 cf	**2.54'W x 50.00'L x 3.21'H Field C** 408 cf Overall - 50 cf Embedded = 358 cf x 40.0% Voids
#6C	17.10'	39 cf	**ADS N-12 12** x 2 Inside #5 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf Row Length Adjustment= +8.00' x 0.81 sf x 1 rows
		2,462 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.10'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	17.90'	**12.0" Round Culvert** L= 23.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 17.90' / 17.00' S= 0.0391 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.23 cfs @ 11.70 hrs HW=16.15' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.23 cfs)

Primary OutFlow Max=0.00 cfs @ 11.00 hrs HW=16.11' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)

Pond 7P: Contech Chambermaxx Infiltration System - Chamber Wizard Field A

Chamber Model = Contech ChamberMaxx (Contech® ChamberMaxx®)
Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
Row Length Adjustment= +0.32' x 6.92 sf x 1 rows

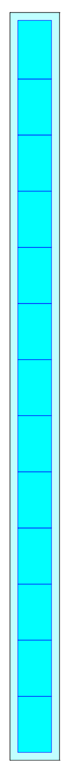
13 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 92.84' Row Length +12.0" End Stone x 2 = 94.84' Base Length
1 Rows x 51.4" Wide + 12.0" Side Stone x 2 = 6.28' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

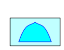
13 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 1 Rows = 642.6 cf Chamber Storage

2,100.5 cf Field - 642.6 cf Chambers = 1,457.9 cf Stone x 40.0% Voids = 583.2 cf Stone Storage

Chamber Storage + Stone Storage = 1,225.7 cf = 0.028 af
Overall Storage Efficiency = 58.4%
Overall System Size = 94.84' x 6.28' x 3.52'

13 Chambers
77.8 cy Field
54.0 cy Stone





Pond 7P: Contech Chambermaxx Infiltration System - Chamber Wizard Field B

Chamber Model = Contech ChamberMaxx (Contech® ChamberMaxx®)
Effective Size= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Overall Size= 51.4"W x 30.3"H x 7.58'L with 0.47' Overlap
Row Length Adjustment= +0.32' x 6.92 sf x 2 rows

51.4" Wide + 5.0" Spacing = 56.4" C-C Row Spacing

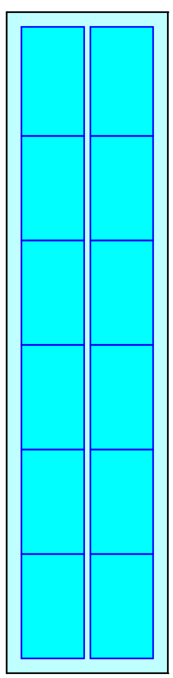
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.0" Spacing x 1 + 12.0" Side Stone x 2 = 10.98' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

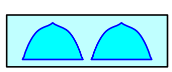
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Chamber Storage

1,743.0 cf Field - 595.5 cf Chambers = 1,147.5 cf Stone x 40.0% Voids = 459.0 cf Stone Storage

Chamber Storage + Stone Storage = 1,054.5 cf = 0.024 af
Overall Storage Efficiency = 60.5%
Overall System Size = 45.02' x 10.98' x 3.52'

12 Chambers
64.6 cy Field
42.5 cy Stone





Pond 7P: Contech Chambermaxx Infiltration System - Chamber Wizard Field C

Chamber Model = ADS N-12 12 (ADS N-12® Pipe)
Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
Row Length Adjustment= +8.00' x 0.81 sf x 1 rows

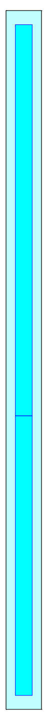
2 Chambers/Row x 20.00' Long +8.00' Row Adjustment = 48.00' Row Length +12.0" End Stone x 2 = 50.00' Base Length
1 Rows x 14.5" Wide + 8.0" Side Stone x 2 = 2.54' Base Width
12.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.21' Field Height

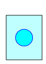
2 Chambers x 16.2 cf +8.00' Row Adjustment x 0.81 sf x 1 Rows = 38.9 cf Chamber Storage
2 Chambers x 20.9 cf +8.00' Row Adjustment x 1.05 sf x 1 Rows = 50.2 cf Displacement

407.9 cf Field - 50.2 cf Chambers = 357.7 cf Stone x 40.0% Voids = 143.1 cf Stone Storage

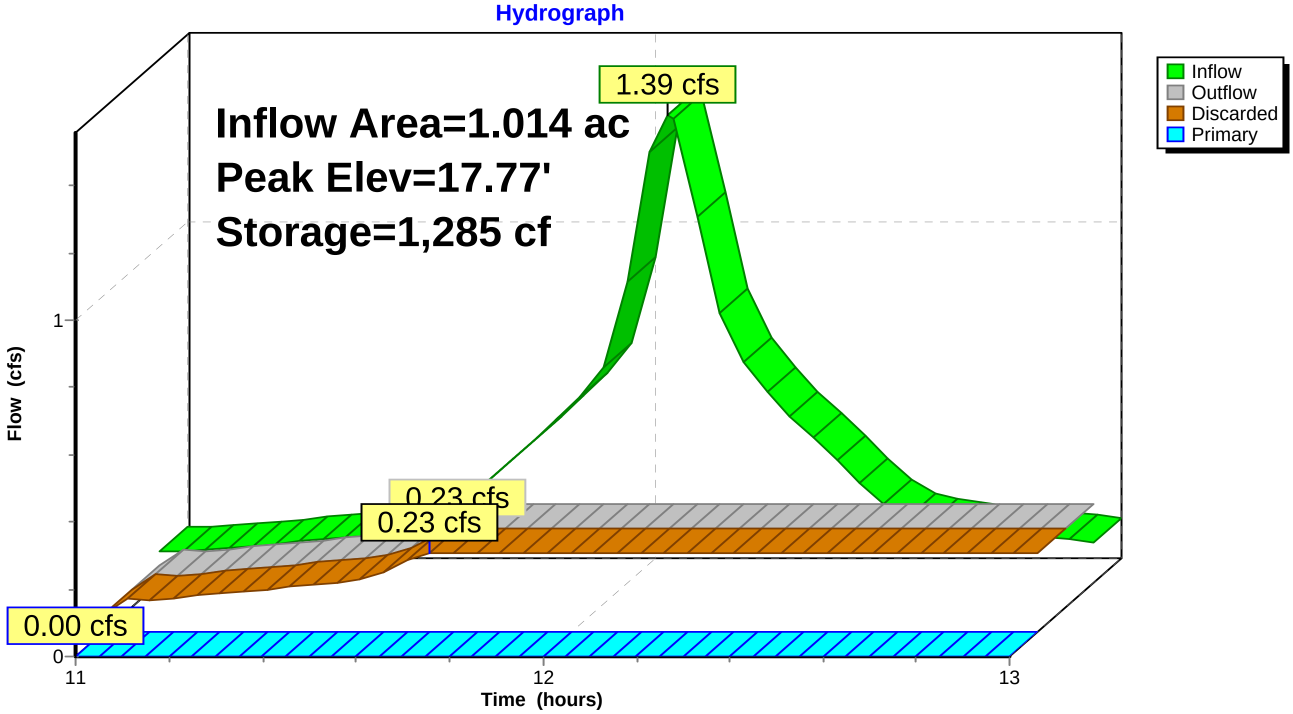
Chamber Storage + Stone Storage = 181.9 cf = 0.004 af
Overall Storage Efficiency = 44.6%
Overall System Size = 50.00' x 2.54' x 3.21'

2 Chambers
15.1 cy Field
13.2 cy Stone





Pond 7P: Contech Chambermaxx Infiltration System



ATTACHMENT E

NRCS Web Soil Survey Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for

Essex County, Massachusetts, Northern Part

July 6, 2017

Preface

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

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

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

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

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

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

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

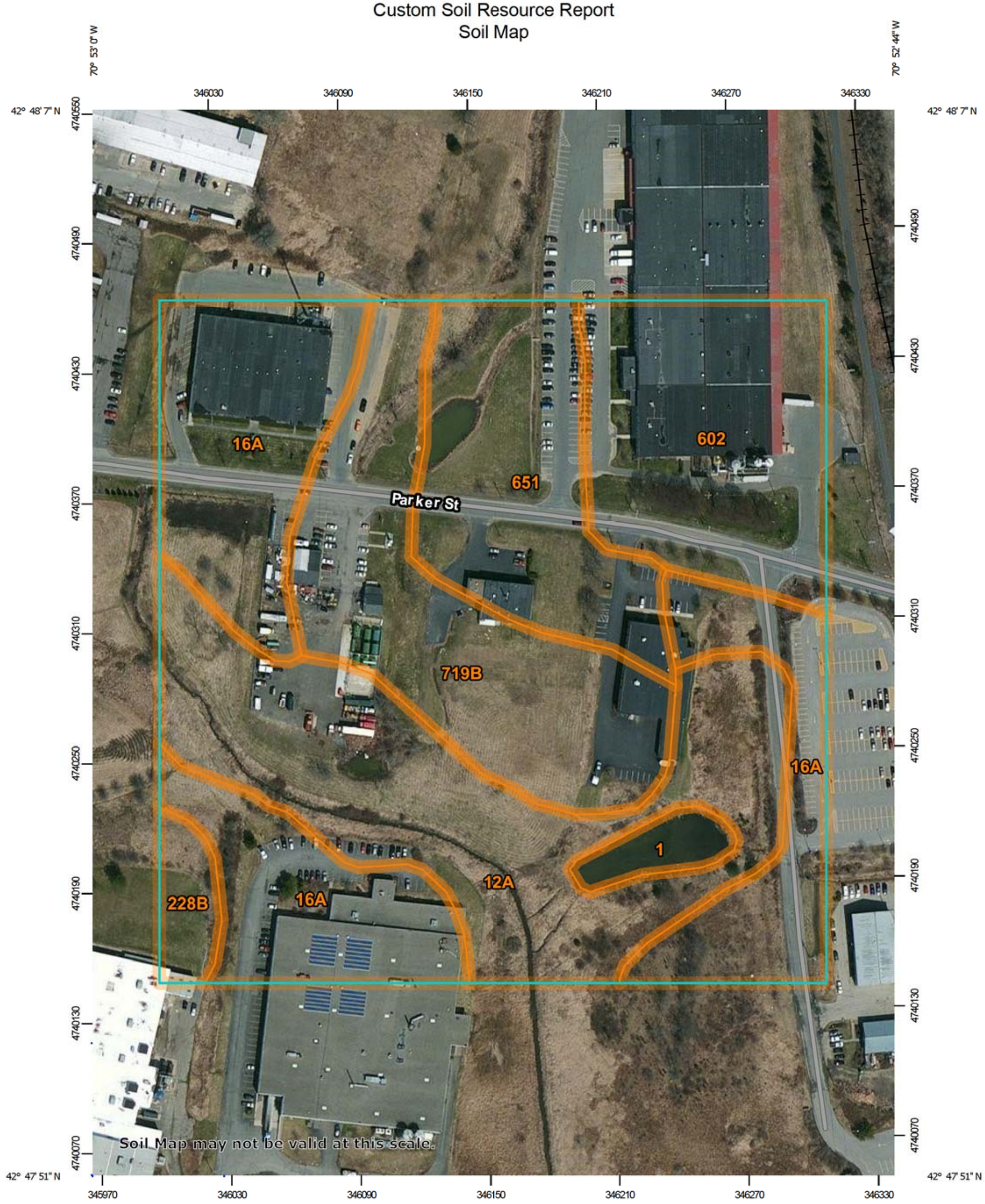
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Soil Map



Map Scale: 1:2,400 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 35, 70, 140, 210

Feet: 0, 100, 200, 400, 600

N

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

> Warning: Soil Map may not be valid at this scale.
>
> Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

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

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

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

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 12, Sep 14, 2016

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

Date(s) aerial images were photographed: Mar 30, 2011—Apr 8, 2011

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

Map Unit Legend

Essex County, Massachusetts, Northern Part (MA605)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
1	Water	0.4	1.7%
12A	Maybid silt loam, 0 to 3 percent slopes	5.7	23.5%
16A	Scantic silt loam, 0 to 3 percent slopes	6.7	27.7%
228B	Buxton silt loam, 3 to 8 percent slopes	0.5	2.0%
602	Urban land	3.6	14.7%
651	Udorthents, smoothed	3.2	13.1%
719B	Suffield silt loam, 3 to 8 percent slopes	4.2	17.3%
Totals for Area of Interest		**24.2**	**100.0%**

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Essex County, Massachusetts, Northern Part

1—Water

Map Unit Setting

National map unit symbol: vjx4
Frost-free period: 125 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

12A—Maybid silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: vjhj
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Maybid

Setting

Landform: Depressions, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Soft silty and clayey glaciolacustrine deposits and/or firm silty marine deposits

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 19 inches: silty clay
H3 - 19 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent

Available water storage in profile: Moderate (about 8.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Scantic

Percent of map unit: 12 percent
Landform: Depressions
Hydric soil rating: Yes

Swansea

Percent of map unit: 3 percent
Landform: Bogs
Hydric soil rating: Yes

16A—Scantic silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: vjrl
Elevation: 10 to 900 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Scantic

Setting

Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Soft fine-silty glaciolacustrine deposits and/or soft fine-silty glaciomarine deposits over hard fine-silty glaciolacustrine deposits and/or hard fine-silty glaciomarine deposits

Typical profile

H1 - 0 to 11 inches: silt loam
H2 - 11 to 26 inches: silty clay loam
H3 - 26 to 60 inches: clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Maybid

Percent of map unit: 10 percent
Landform: Depressions
Hydric soil rating: Yes

Buxton

Percent of map unit: 5 percent
Hydric soil rating: No

228B—Buxton silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: vj37
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Buxton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Buxton

Setting

Landform: Valleys, valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Concave

Parent material: Soft fine-loamy glaciolacustrine deposits derived from mica schist over hard fine-loamy glaciolacustrine deposits derived from mica schist

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 30 inches: silt loam
H3 - 30 to 60 inches: silty clay

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Suffield

Percent of map unit: 15 percent
Hydric soil rating: No

Scantic

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

602—Urban land

Map Unit Setting

National map unit symbol: vjx3
Frost-free period: 125 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Excavated and filled land

Minor Components

Udorthents

Percent of map unit: 10 percent
Hydric soil rating: No

Charlton

Percent of map unit: 2 percent
Hydric soil rating: No

Hinckley

Percent of map unit: 2 percent
Hydric soil rating: No

Merrimac

Percent of map unit: 2 percent
Hydric soil rating: No

Paxton

Percent of map unit: 2 percent
Hydric soil rating: No

Windsor

Percent of map unit: 2 percent
Hydric soil rating: No

651—Udorthents, smoothed

Map Unit Setting

National map unit symbol: vjwk
Elevation: 0 to 3,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Parent material: Excavated and filled land loamy and/or excavated and filled land sandy and gravelly

Typical profile

H1 - 0 to 6 inches: variable
H2 - 6 to 60 inches: variable

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: Unranked

Minor Components

Urban land

Percent of map unit: 10 percent
Hydric soil rating: Unranked

Beaches

Percent of map unit: 8 percent
Hydric soil rating: Unranked

Dumps

Percent of map unit: 2 percent
Hydric soil rating: Unranked

719B—Suffield silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: vjsr
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Suffield

Setting

Landform: Lakebeds (relict), lakebeds (relict)
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex

Parent material: Soft coarse-silty glaciolacustrine deposits over hard clayey glaciolacustrine deposits

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 35 inches: silt loam
H3 - 35 to 60 inches: silty clay

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 18 to 40 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Buxton

Percent of map unit: 10 percent
Hydric soil rating: No

Scantic

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

References

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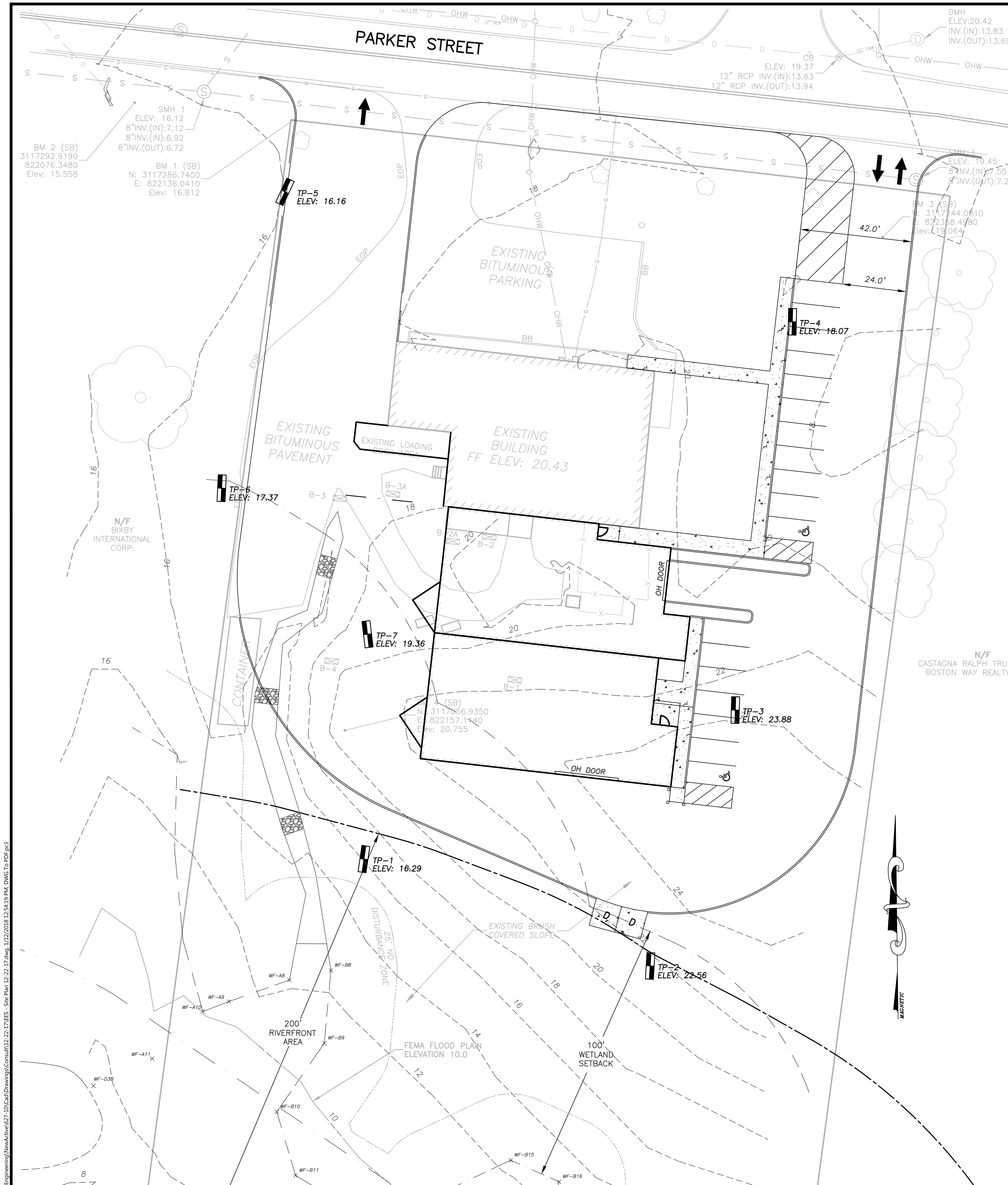
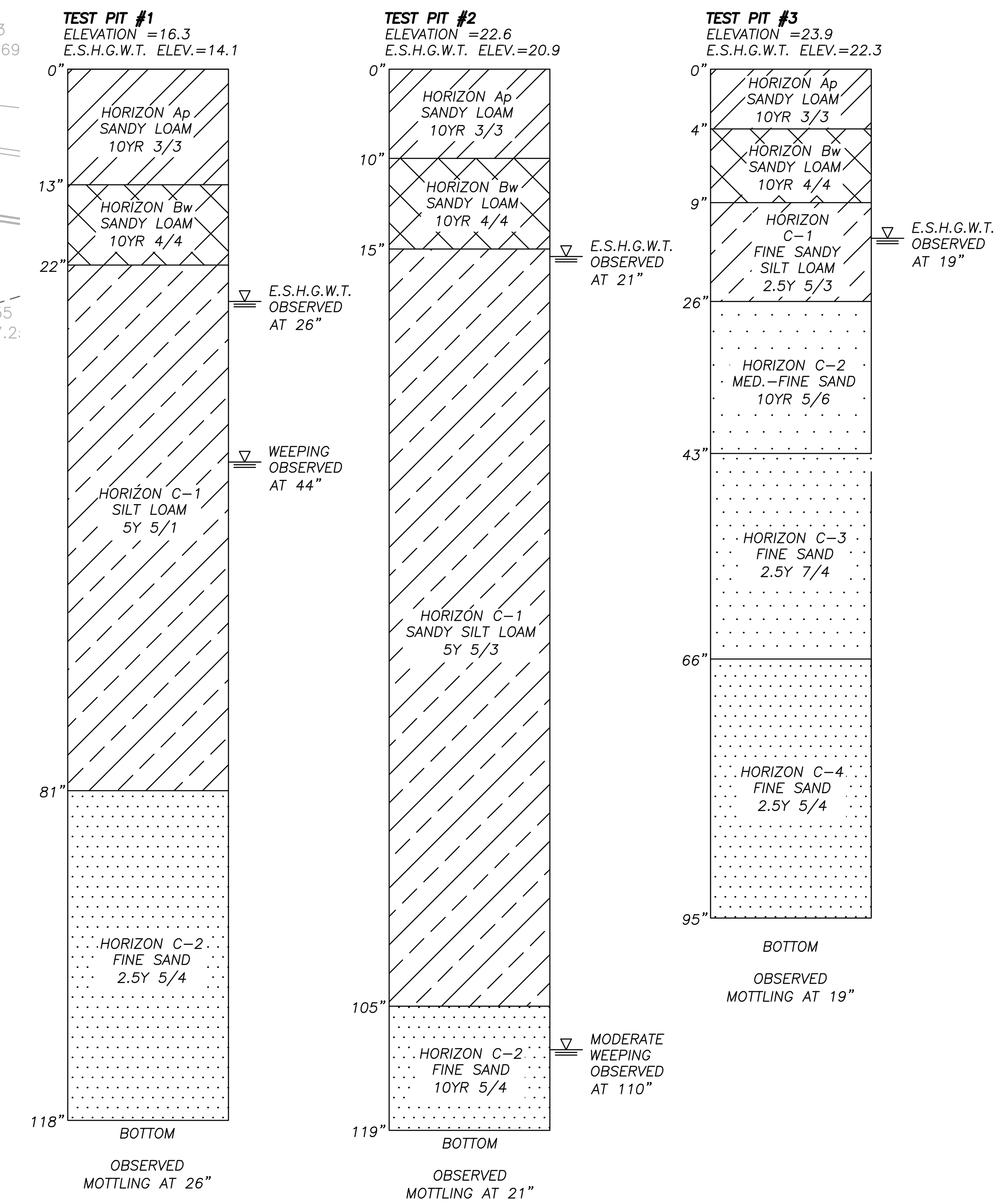
ATTACHMENT F

Soil Test Pit Logs

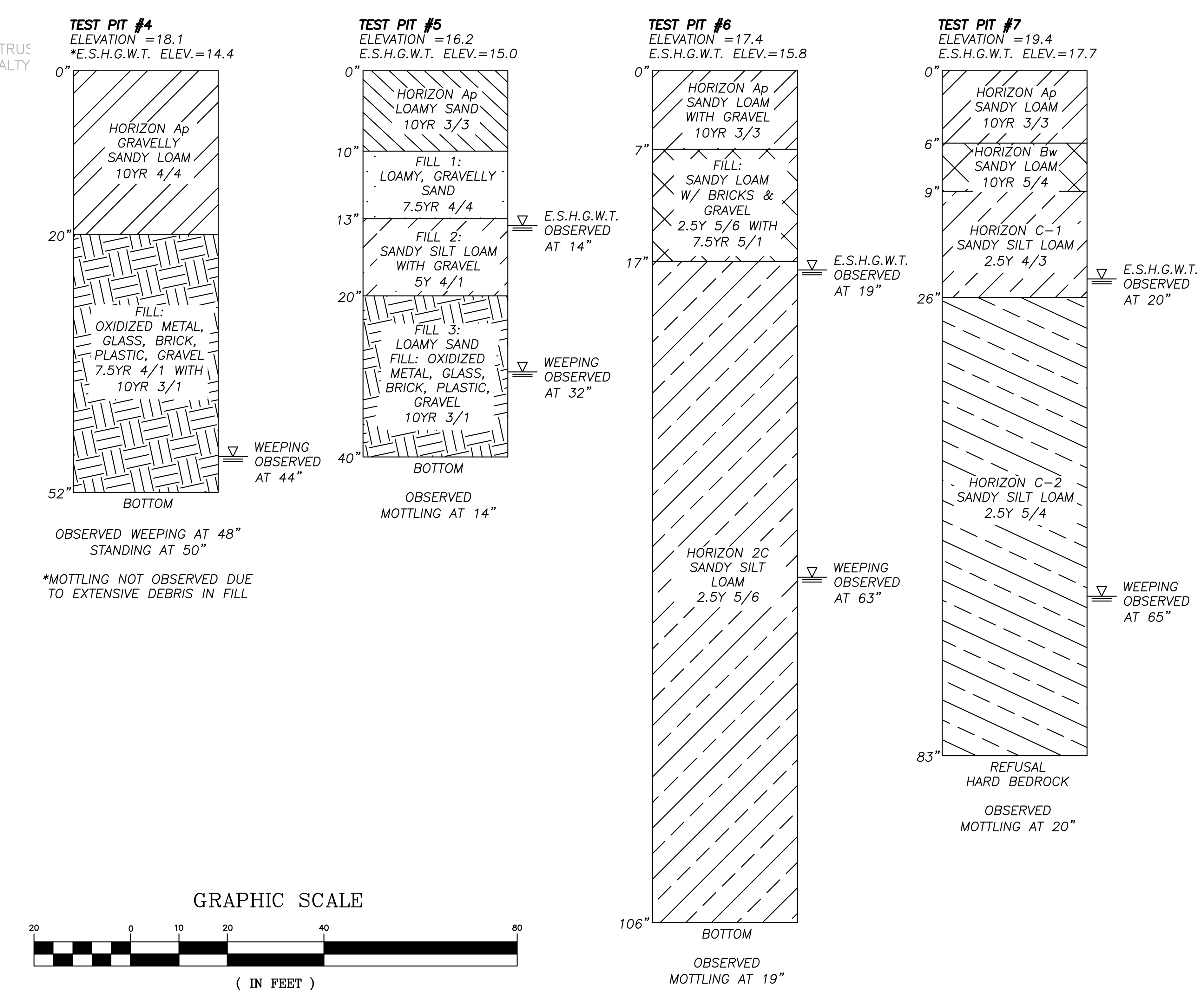




TEST PIT NOTES:

1. THE SOIL TEST PITS WERE PERFORMED BY EAGLEBROOK ENGINEERING & SURVEY, LLC ON JULY 7, 2017.

2. ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AND WERE ESTABLISHED BY GPS SURVEYING.



CORNERSTONE CONSTRUCTION SERVICES LLC

9F PRESIDENTIAL WAY
WOBURN, MASSACHUSETTS 01801
(781) 937-3045

PROPOSED BUILDING EXPANSION
75 PARKER STREET
NEWBURYPORT, MASSACHUSETTS
PREPARED FOR

REVISIONS			
No.	DATE	DESCRIPTION	PROJECT	BY

CONCEPTUAL LAYOUT PLAN

DRAWN BY: BSM
CHECKED BY: KCK
SCALE: 1"=20'
DATE: FEBRUARY 2018

SHEET No. C-2

PROJECT No. LE 627-10

Commonwealth of Massachusetts
City/Town of Newburyport

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Port City Realty LLC
Owner Name

75 Parker Street
Street Address

Map 78, Block 1, Lot A
Map/Lot #

Newburyport
City

MA
State

01950
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: Web Soil Survey (Source) 719B (Soil Map Unit)

   Suffield Silt Loam, 3%-8% slopes
   Soil Name

   Presence of fine material, silt and possible clay
   Soil Limitations

   Soft coarse-silty glaciolacustrine deposits over hard clayey glaciolacustrine deposits

   Lakebed
   Landform

3. Surficial Geological Report Available? ☒ Yes ☐ No If yes: 2006/USGS, Stone (Year Published/Source) 1:24,000 (Publication Scale) Map Unit

4. Flood Rate Insurance Map

   Above the 500-year flood boundary? ☒ Yes ☐ No
   If Yes, continue to #5.

   Within the 100-year flood boundary? ☐ Yes ☒ No
   Test pits located outside flood boundary

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No MassGIS Wetland Data Layer: Wetland Type

7. Current Water Resource Conditions (USGS): 7/6/17 (Month/Year) Range: ☒ Above Normal ☐ Normal ☐ Below Normal

8. Other references reviewed: SearchWell, MassGIS

   Note: Section of property within wetland. Test pits were located outside of wetland.

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-1 | Date: July 7, 2017 | Time: 0830 | Weather: Cloudy, Showers, 75 deg F

1. Location

Ground Elevation at Surface of Hole: 16.3 feet | Latitude/Longitude: 42.799529 / -70.881553

Description of Location: Field/Lawn adjacent to Commerical Buildings and wetland

2. Land Use: Field/Lawn for Commerical Building (e.g., woodland, agricultural field, vacant lot, etc.) | Surface Stones (e.g., cobbles, stones, boulders, etc.): Ledge | Slope (%): 3-8

Vegetation: Trimmed brush, grass | Landform: Lakebed | Position on Landscape (SU, SH, BS, FS, TS): Shoulder

3. Distances from:

Open Water Body	150 feet	Drainage Way	36 feet	Wetlands	52 feet
Property Line	75 feet	Drinking Water Well	>100 feet	Other	feet

4. Parent Material: Silt Loam | Unsuitable Materials Present: ☐ Yes ☒ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No | If yes: 44 Depth Weeping from Pit | 118 Depth Standing Water in Hole

Estimated Depth to High Groundwater: 26 inches | elevation

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: Test Pit-1 (TP-1)

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-13	Ap	10YR 3/3	-	-	-	Sandy Loam	0	0	Massive	Friable	
13-22	Bw	10YR 4/4	-	-	-	Fine Sandy Loam	0	0	Massive	Friable	
22-81	C	5Y 5/1	26"	10YR 5/4	5	Silt Loam	0	0	Platy	Firm-Very Firm	Easily smeared
81-118	C2	2.5Y 5/4		7.5YR 4/4 Common		Fine Sand	0	0	Single Grain	Loose	
Bottom											

Additional Notes:

C Horizon: Somewhat greasy and sticky. Firm with added water but still friable.

Commonwealth of Massachusetts
City/Town of Newburyport

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-2 | Date: July 7, 2017 | Time: 0920 | Weather: Cloudy, 75 deg. F

1. Location

Ground Elevation at Surface of Hole: 22.6 feet

Latitude/Longitude: 42.799406 / -70.8811120

2. Land Use: Field/Lawn for Commerical Building (e.g., woodland, agricultural field, vacant lot, etc.)

Surface Stones (e.g., cobbles, stones, boulders, etc.): Ledge

Slope (%): 3%-8%

Vegetation: Trimmed brush

Landform: Lakebed

Position on Landscape (SU, SH, BS, FS,: Shoulder

3. Distances from:

Open Water Body	228 feet	Drainage Way	130 feet	Wetlands	106 feet
Property Line	43 feet	Drinking Water Well	>100 feet	Other	feet

4. Parent Material: Sandy Silt Loam

Unsuitable Materials Present: ☐ Yes ☒ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No

If yes: Very moderate @ 110" (Depth Weeping from Pit) | ____ (Depth Standing Water in Hole)

Estimated Depth to High Groundwater: 21 inches | ____ elevation

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	Ap	10YR 3/3				Sandy Loam	0	0	Massive	Friiable	
10-15	Bw	10YR 4/4				Sandy Loam	0	0	Massive	Friable	
15-105	C	5Y 5/3	21"	5YR 3/4	5	Sandy Silt Loam	0	0	Platy	Firm	Easily Smeared
105-119	C2	10YR 5/4		Common		Fine Sand	0	0	Single Grain	Loose	
Bottom											

Additional Notes:

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # TP-1	Obs. Hole # TP-2
☐ Depth observed standing water in observation hole	inches	inches
☐ Depth weeping from side of observation hole	inches	inches
☒ Depth to soil redoximorphic features (mottles)	26 inches	21 inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	inches	inches

Index Well Number ______ Reading Date ______

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole # ______ S_c ______ S_r ______ OW_c ______ OW_{max} ______ OW_r ______ S_h ______

Obs. Hole # ______ S_c ______ S_r ______ OW_c ______ OW_{max} ______ OW_r ______ S_h ______

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

   ☒ Yes ☐ No

   b. If yes, at what depth was it observed? Upper boundary: 22 inches Lower boundary: 118 inches

   c. If no, at what depth was impervious material observed? Upper boundary: ______ inches Lower boundary: ______ inches

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-3 | Date: July 7, 2017 | Time: 0945 | Weather: Cloudy, Showers, 75 deg F

1. Location

   Ground Elevation at Surface of Hole: 23.9 feet

   Latitude/Longitude: 42.799767 / -70.881106

   Description of Location: Field/Lawn adjacent to Commerical Buildings and wetland

2. Land Use: Field/Lawn for Commerical Building (e.g., woodland, agricultural field, vacant lot, etc.)

   Surface Stones (e.g., cobbles, stones, boulders, etc.): Ledge

   Slope (%): 3-8

   Vegetation: Grass

   Landform: Lakebed

   Position on Landscape (SU, SH, BS, FS, TS): Summit/Shoulder

3. Distances from:

   Open Water Body: 305 feet

   Drainage Way: 200 feet

   Wetlands: 213 feet

   Property Line: 13 feet

   Drinking Water Well: >100 feet

   Other: ______ feet

4. Parent Material: Sandy Silt Loam

   Unsuitable Materials Present: ☐ Yes ☒ No

   If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No

   If yes: ______ Depth Weeping from Pit ______ Depth Standing Water in Hole

   Estimated Depth to High Groundwater: 19 inches ______ elevation

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: Test Pit-3 (TP-3)

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-4	Ap	10YR 3/3	-	-	-	Sandy Loam	0	0	Massive	Friable	
4-9	Bw	10YR 4/4	-	-	-	Sandy Loam	0	0	Massive	Friable	
9-26	C	2.5Y 5/3	19"	10YR 5/4	5	Fine Sandy Silt Loam	0	0	Platy	Firm	Crumbles when dry Sticky when wet
26-43	C2	10YR 5/6		Common		Med-Fine Sand	0	0	Single Grain	Loose	compacted layering
43-66	C3	2.5Y 7/4		Common		Fine Sand	0	0	Single Grain	Loose	
66-95	C4	2.5Y 5/4		Common		Fine Sand	0	0	Single Grain	Loose	Slightly Moist
Bottom											

Additional Notes:

C Horizon: Slightly Moist

C2 Horizon: Compacted layering with streaks of 10YR 4/3

C3 Horizon: Consistent soft and clean sand

C4 Horizon : Slightly moist, consistent slightly darker color than C3

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-6 | July 7, 2017 (Date) | 1100 (Time) | Cloudy, 75 deg. F (Weather)

1. Location

Ground Elevation at Surface of Hole: 17.4 feet

Latitude/Longitude: 42.800138 / -70.880939

2. Land Use: Field/Lawn for Commerical Building (e.g., woodland, agricultural field, vacant lot, etc.)

Ledge — Surface Stones (e.g., cobbles, stones, boulders, etc.)

3%-8% — Slope (%)

Grass — Vegetation

Lakebed — Landform

Footslope — Position on Landscape (SU, SH, BS, FS,

3. Distances from:

Open Water Body	224 feet	Drainage Way	121 feet
Wetlands	170 feet	Property Line	10 feet
Drinking Water Well	>100 feet	Other	feet

4. Parent Material: Sandy Silt Loam

Unsuitable Materials Present: ☒ Yes ☐ No

If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No

If yes: 63"" Depth Weeping from Pit; 104 Depth Standing Water in Hole

Estimated Depth to High Groundwater: 19 inches; elevation

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-6

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-7	Ap	10YR 3/3				Sandy Loam	0	0	Granular	Friable	
7-17	Fill					Fill, Bricks, some gravel	10	0	Massive	Friable	
17-106	C	2.5Y 5/6	19"	5YR 5/2	5	Sandy Silt Loam	0	0	Platy	Firm	slightly sticky
Bottom											

Additional Notes:

Slight weeping at 63". Moderate weeping at 95". Standing water at 104"

Fill layer has streaks of 7.5YR 5/1. Fill consists of predominately varying size of crushed bricks. Possible human transported organics between compacted brick material.

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # TP-3	Obs. Hole # TP-6
☐ Depth observed standing water in observation hole	inches	inches
☐ Depth weeping from side of observation hole	inches	inches
☒ Depth to soil redoximorphic features (mottles)	19 inches	19 inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	inches	inches

Index Well Number ______ Reading Date ______

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole # ______ S_c ______ S_r ______ OW_c ______ OW_{max} ______ OW_r ______ S_h ______

Obs. Hole # ______ S_c ______ S_r ______ OW_c ______ OW_{max} ______ OW_r ______ S_h ______

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

   ☒ Yes ☐ No

   b. If yes, at what depth was it observed? Upper boundary: 17 inches Lower boundary: 95 inches

   c. If no, at what depth was impervious material observed? Upper boundary: ______ inches Lower boundary: ______ inches

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-7 | Date: July 7, 2017 | Time: 1215 | Weather: Cloudy, Showers, 75 deg F

1. Location

   Ground Elevation at Surface of Hole: 19.4 feet

   Latitude/Longitude: 42.799800 / -70.881546

   Description of Location: Field/Lawn adjacent to Commerical Buildings and wetland

2. Land Use: Field/Lawn for Commerical Building (e.g., woodland, agricultural field, vacant lot, etc.)

   Surface Stones (e.g., cobbles, stones, boulders, etc.): Ledge

   Slope (%): 3-8

   Vegetation: Trimmed brush, grass

   Landform: Lakebed

   Position on Landscape (SU, SH, BS, FS, TS): Shoulder

3. Distances from:

   Open Water Body: 204 feet

   Drainage Way: 22 feet

   Wetlands: 121 feet

   Property Line: 69 feet

   Drinking Water Well: >100 feet

   Other: feet

4. Parent Material: Sandy Silt Loam

   Unsuitable Materials Present: ☒ Yes ☐ No

   If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☒ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No

   If yes: 65 Depth Weeping from Pit; Depth Standing Water in Hole

   Estimated Depth to High Groundwater: 20 inches; elevation

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: Test Pit-7 (TP-7)

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	Ap	10YR 3/3	-	-	-	Sandy Loam	0	0	Massive	Friable	
6-9	Bw	10YR 5/4	-	-	-	Sandy Loam	0	0	Massive	Friable	
9-26	C	2.5Y 4/3	20"	10YR 5/6	5	Sandy Silt Loam	0	0	Platy	Friable-Frim	Slightly sticky
26-83	C2	2.5Y 5/4		Common		Sandy Silt Loam	0	0	Platy	Friable	Gritty, Moist
93	Refusal					Hard Bedrock	0	0			

Additional Notes:

C2 Horizon: Slightly higher sand content than C Horizon, not as firm but still slightly sticky when when.

C2 Horizon: Moist at 40", wet at 65"+

D. Determination of High Groundwater Elevation

1. Method Used: Obs. Hole # TP-7 Obs. Hole # ______

	Obs. Hole # TP-7	Obs. Hole #
☐ Depth observed standing water in observation hole	______ inches	______ inches
☐ Depth weeping from side of observation hole	______ inches	______ inches
☒ Depth to soil redoximorphic features (mottles)	20 inches	______ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	______ inches	______ inches

______ Index Well Number ______ Reading Date

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole # ______ S_c ______ S_r ______ OW_c ______ OW_{max} ______ OW_r ______ S_h ______

Obs. Hole # ______ S_c ______ S_r ______ OW_c ______ OW_{max} ______ OW_r ______ S_h ______

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material
   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

      ☒ Yes ☐ No

   b. If yes, at what depth was it observed? Upper boundary: 9 inches Lower boundary: 83 inches
   c. If no, at what depth was impervious material observed? Upper boundary: ______ inches Lower boundary: ______ inches

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Port City Realty LLC
Owner Name

75 Parker Street
Street Address

Map 78, Block 1, Lot A
Map/Lot #

Newburyport
City

MA
State

01950
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: Web Soil Survey (Source) 651 (Soil Map Unit)

   Udorthents, smoothed
   Soil Name

   Filled land
   Soil Limitations

   Excavated and filled land loamy and/or excavated and filled land sandy and gravelly

   Lakebed
   Landform

3. Surficial Geological Report Available? ☒ Yes ☐ No If yes: 2006/USGS, Stone (Year Published/Source) 1:24,000 (Publication Scale) ______ (Map Unit)

4. Flood Rate Insurance Map

   Above the 500-year flood boundary? ☒ Yes ☐ No
   If Yes, continue to #5.

   Within the 100-year flood boundary? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No MassGIS Wetland Data Layer: ______ (Wetland Type)

7. Current Water Resource Conditions (USGS): 7/6/17 (Month/Year) Range: ☒ Above Normal ☐ Normal ☐ Below Normal

8. Other references reviewed: SearchWell

   Note: Section of property within wetland. Test pits located outside wetland.

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-4 | Date: July 7, 2017 | Time: 1030 | Weather: Cloudy, Showers, 75 deg F

1. Location

Ground Elevation at Surface of Hole: 18.1 feet   Latitude/Longitude: 42.800175 / -70.880926

Description of Location: Field/Lawn adjacent to Commerical Buildings and wetland

2. Land Use: Field/Lawn for Commerical Building (e.g., woodland, agricultural field, vacant lot, etc.)

Surface Stones (e.g., cobbles, stones, boulders, etc.): Ledge   Slope (%): 3-8

Vegetation: Grass   Landform: Lakebed   Position on Landscape (SU, SH, BS, FS, TS): Footslope

3. Distances from:

Open Water Body	>100 feet	Drainage Way	>50 feet	Wetlands	335 feet
Property Line	20 feet	Drinking Water Well	>100 feet	Other	feet

4. Parent Material: Loamy Fill   Unsuitable Materials Present: ☒ Yes ☐ No

If Yes: ☒ Disturbed Soil ☒ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No   If yes: 48 Depth Weeping from Pit   50 Depth Standing Water in Hole

Estimated Depth to High Groundwater: ______ inches ______ elevation

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: Test Pit-4 (TP-4)

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-20	Ap	10YR 4/4	-	-	-	Sandy Loam	5	0	Massive	Friable	
20-52	Fill	7.5Y 4/1	NF	-	-	Loamy Fill, Metal, Glass	10	0	Inconsistent	Loose to Firm	Landfill material
Bottom											

Additional Notes:

Fill consists of old car parts, rusted metal, ashes, glass, mixed gravel. Very inconsistent. Highly oxidized material and human disturbance prevented observation of redoximorphic features in limited observable soil material.

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-5 | July 7, 2017 (Date) | 1100 (Time) | Cloudy, 75 deg. F (Weather)

1. Location

Ground Elevation at Surface of Hole: 16.2 feet   Latitude/Longitude: 42.800276 / -70.881599

2. Land Use: Field/Lawn for Commerical Building (e.g., woodland, agricultural field, vacant lot, etc.)

Ledge — Surface Stones (e.g., cobbles, stones, boulders, etc.)

3%-8% — Slope (%)

Grass — Vegetation

Lakebed — Landform

Footslope — Position on Landscape (SU, SH, BS, FS,

3. Distances from:

Open Water Body	344 feet	Drainage Way	37 feet	Wetlands	288 feet
Property Line	18 feet	Drinking Water Well	>100 feet	Other	feet

4. Parent Material: Sandy Silt Loam w/gravel   Unsuitable Materials Present: ☒ Yes ☐ No

If Yes: ☒ Disturbed Soil ☒ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No   If yes: 32" Depth Weeping from Pit   38" Depth Standing Water in Hole

Estimated Depth to High Groundwater: 14 inches   ______ elevation

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-5

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	Ap	10YR 3/3				Loamy Sand	0	0	Massive	Friable	
10-13	Fill	7.5YR4/4				Loamy Sand w/ gravel	30	0	Massive	Friable	
13-20	Fill	5Y 4/1	14"	10YR 4/4	5	Sandy Silt Loam,w gravel	20	0	Massive	Friable	Gritty
20-40	Fill	10YR 3/1	NF			Loamy Fill, metal, glass	0	0	Inconsistent	Loose to Firm	Landfill material
Bottom											

Additional Notes:

Fill material consists of metal, glass, nylon rope, plastic, some gravel. Very moderate weeping at 32". Standing water quick to settle at 38".
Mottling not found in bottom fill layer due to extensive fill debris among limited observable soil material.

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # TP-4	Obs. Hole # TP-5
☐ Depth observed standing water in observation hole	inches	inches
☒ Depth weeping from side of observation hole	44 inches	inches
☒ Depth to soil redoximorphic features (mottles)	inches	14 inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	inches	inches

Index Well Number ______ Reading Date ______

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole # ______ S_c ______ S_r ______ OW_c ______ OW_{max} ______ OW_r ______ S_h ______

Obs. Hole # ______ S_c ______ S_r ______ OW_c ______ OW_{max} ______ OW_r ______ S_h ______

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

   ☐ Yes ☒ No

   b. If yes, at what depth was it observed? Upper boundary: ______ inches Lower boundary: ______ inches

   c. If no, at what depth was impervious material observed? Upper boundary: 13 inches Lower boundary: 52 inches

Commonwealth of Massachusetts
City/Town of Newburyport
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Board of Health Witness

Name of Board of Health Witness

Board of Health

G. Soil Evaluator Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

Date

Testing performed by Kenneth Knowles and Ben Minnix

Typed or Printed Name of Soil Evaluator / License #

Expiration Date of License

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

ATTACHMENT G

Mounding Analysis Report

MOUNDING ANALYSIS

The analysis was performed using a computer model of the Hantush Method developed by GeoHydroCycle, Inc. The analysis computed the groundwater mound resulting from loading beneath the infiltration system on an annual basis. A number of references were used in determining the parameters of the mounding analysis including numerous technical manuals, USGS geology maps, on-site soil testing results, MassDEP well drilling data, and stormwater runoff calculations.

The regulatory requirements, calculation methodology, design parameters, and results of the analysis are detailed below.

<u>Massachusetts Stormwater Management Standards</u>

Volume 3, Chapter 1, of the Massachusetts Stormwater Handbook specifies the documentation necessary to demonstrate compliance with Standard number 3, Recharge to Groundwater. There are three benchmarks which apply:

"Mounding analysis is required when the vertical separation from the bottom of an exfiltration system to seasonal high groundwater is less than four feet and the recharge system is proposed to attenuate the peak discharge from a 10-year or higher 24-hour storm"

The subsurface infiltration system is designed as infiltration systems and are sized to attenuate the 10-year 24-hour storm event or greater and based on on-site soil testing are less than four feet above seasonal high groundwater. Therefore, a mounding analysis is required.

"...the mounding analysis must demonstrate that the Required Recharge Volume is fully dewatered within 72 hours (so the next storm can be stored for exfiltration)."

"The mounding analysis must also show that the groundwater mound that forms under the recharge system will not break out above the land or water surface of a wetland (e.g., it doesn't increase the water sheet elevation in a Bordering Vegetated Wetland, Salt Marsh, or Land Under Water within the 72-hour evaluation period)."

The mounding analysis demonstrates that a mound of 0.17' develops beneath the infiltration system after an average year of rainfall. The mound height dissipates to 0.15' twenty feet beyond the system, where the proposed toe of slope meets existing grade, and dissipates to 0.13' at the wetland edge 40' from the system. The analysis demonstrates that the mound that forms does not affect the storage layer beneath the system nor does it affect the sheet elevation in the bordering vegetated wetland. A separate analysis was also performed to check that a temporary localized mound during a 100-year event will dissipate within 72 hours. The analysis confirmed that the localized mound during a 100-year 24-hour storm event reduces to 0.57' after 72 hours, so all storage in the infiltration system is available for a subsequent storm.

Calculation Methodology and Design Parameters

The analysis was performed using a computer model of the Hantush Method developed by GeoHydroCycle, Inc. The Massachusetts Stormwater Management Standards require the Hantush or equivalent method be used for the mounding analysis.

Several references were used in determining the soil parameters and site characteristics required by the Hantush method. Each variable in the Hantush Method and the value used in the analysis is as follows:

Constant Head Boundary

A constant head boundary is not used in the analysis.

Rate of Application

The rate of application was calculated based on the annual precipitation amount for Boston, Massachusetts multiplied by the area contributing to the infiltration system.

Subsurface Infiltration System:

Annual Precipitation Amount = 43.84 inches
Contributing Area = 11,070 SF
Total Volume = 40,442 CF/year
Total time = 365 days
Infiltration system bottom area = 1,250 SF
Application rate = 0.088 ft/day

Angle from Y-axis

The angle from the y-axis is defined as the angle between the y-axis (length of the infiltration system) and the constant head boundary (walls). An angle of 90 degrees was used.

Aquifer Hydraulic Conductivity

The hydraulic conductivity of the soil is a measure of the soil's ability to transmit water when subjected to a hydraulic gradient. The hydraulic conductivity depends on the soil grain size, the structure of the soil matrix, and the saturation of the soil matrix. The soils were classified as sand. Based on the Massachusetts Stormwater Regulations, Table 2.3.3, 1982 Rawls Rates, the infiltration rate used was 8.27 inches per hour. The 8.27 inches per hour was converted to 16.5 feet per day.

Initial Saturated Thickness

The saturated thickness is the depth of the parent material to an impermeable layer which will restrict the vertical movement of water. Several references were reviewed in order to estimate the depth to bedrock including the "Surficial Geology of the Salem Depot – Newburyport East – Wilmington – Rockport 12-Quadrangle area in Northeast Massachusetts" 2006, published by the United State Geologic Survey, and MassDEP online database of well drilling in Newburyport and Newbury, Massachusetts.

In addition to the surficial mapping, a search of the MassDEP database for drilled wells yielded several wells located in the general vicinity of the locus property. The following wells in the general vicinity of the locus property logged a depth to bedrock:

- 18 High Street in Newbury, depth to bedrock = 115'
- 7 Pouls Way, Newbury, depth to bedrock = 89'
- 212 High Street, Newburyport, depth to bedrock = 75'
- 51 High Street, Newburyport, depth to bedrock = 50'

Other wells were identified in the MADEP database that did not log or encounter bedrock in the vicinity of the locus property. These wells tended to be shallow monitoring wells typically advanced to only 25'. The analysis conservatively used 25 feet for the initial saturated thickness.

Fillable Porosity

Typical values of fillable porosity range between 20-30% and increase with the distance above the water table. The Saint Johns River Water Management District prepared Special Publication SJ93-SP10 for recommended hydro-geotechnical design methodologies. The results of the study indicated, for a fine sand aquifer, a 20% porosity for Hydrologic Soil Group (HSG) D soils, a 25% porosity for HSG B & C soils, and a 30% porosity for HSG A soils. An average value of 30% (0.30) was used.

Mounding Analysis Results

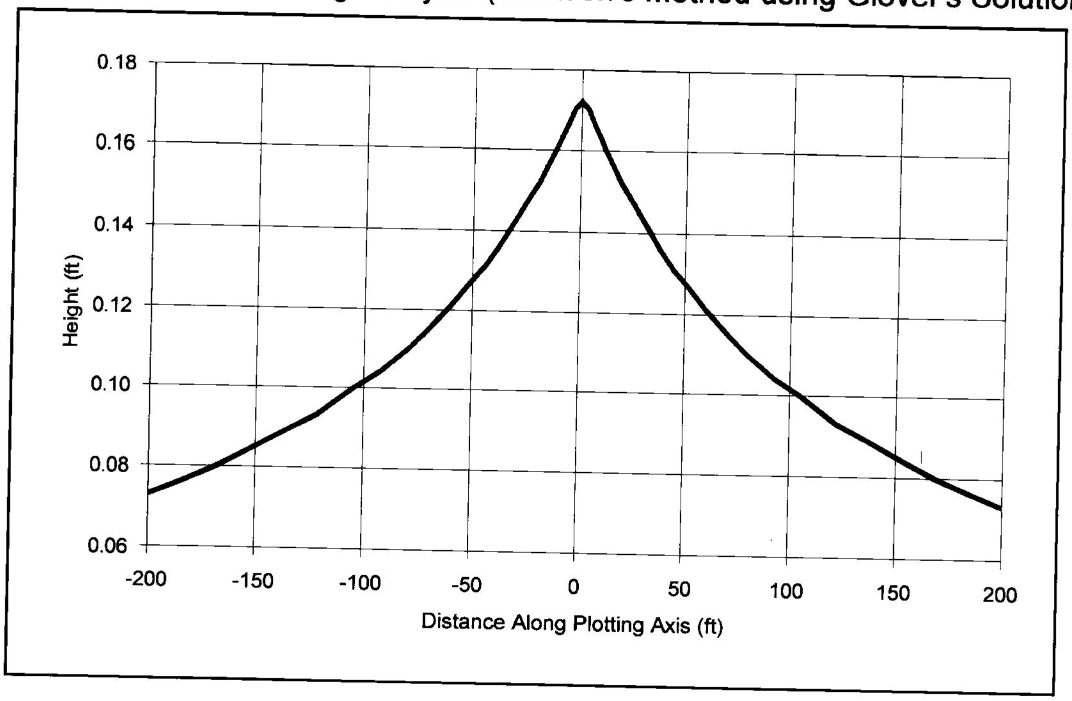
Attached are the calculations Height vs. Time calculation results for the infiltration system.

The annual inflow volume to the infiltration system results in a ground water mound of 0.17 feet beneath the system, so the infiltration system storage volume is not affected by the long-term application of runoff beneath the system. The mound dissipates to 0.13' at the edge of the bordering vegetated wetlands.

The temporary mound that develops beneath the system during a 100-year 24 hour storm event dissipates to 0.57' after 72 hours, so the storage capacity of the infiltration system is available for subsequent storms.

The infiltration system complies with the requirements of the Stormwater Management Guidelines.

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Eaglebrook Engineering & Survey

PROJECT: Parker St, Newburyport

ANALYST: Kenneth Knowles, P.E.

DATE: 12/21/2017 TIME: 5:15:55 PM

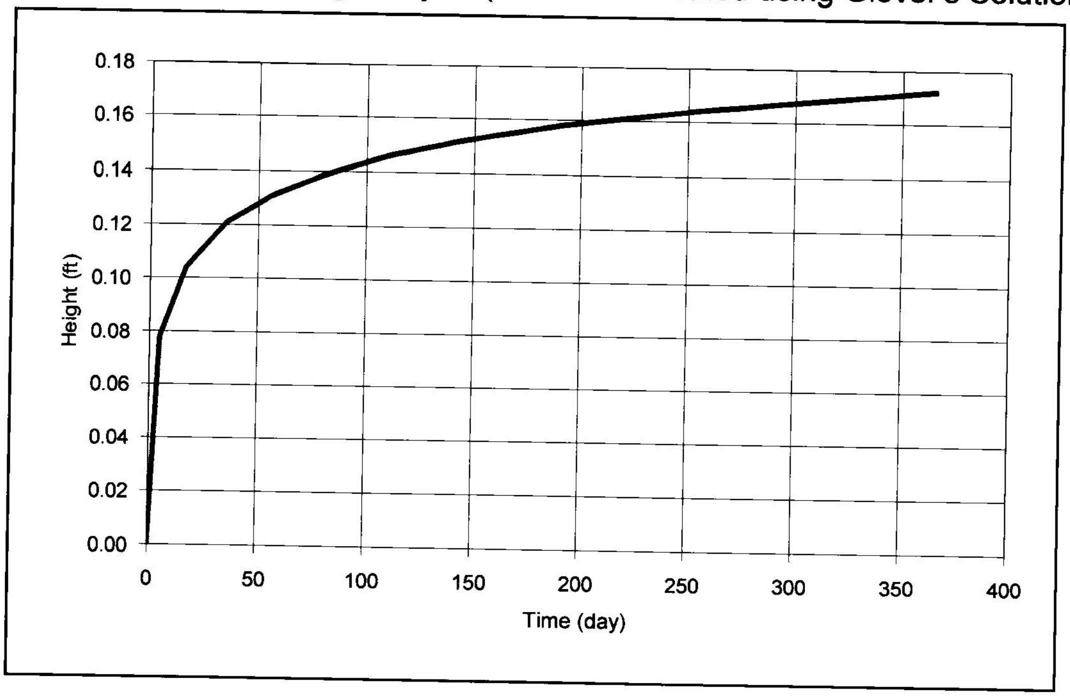
INPUT PARAMETERS

Application rate: 0.166 c.ft/day/sq. ft
Duration of application: 365 days
Fillable porosity: 0.3
Hydraulic conductivity: 16.5 ft/day
Initial saturated thickness: 25 ft
Length of application area: 109 ft
Width of application area: 6.3 ft
No constant head boundary used
Plotting axis from Y-Axis: 90 degrees
Edge of recharge area:
positive X: 3.2 ft
positive Y: 0 ft
Total volume applied: 41607.15 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-200	0	-200	0.07
-168.2	0	-168	0.08
-136.4	0	-136	0.09
-104.6	0	-105	0.1
-79.6	0	-80	0.11
-60.2	0	-60	0.12
-44.4	0	-44	0.13
-31	0	-31	0.14
-19.4	0	-19	0.15
-11.6	0	-12	0.16
-6.3	0	-6	0.17
0	0	0	0.17
6.3	0	6	0.17
11.6	0	12	0.16
19.4	0	19	0.15
31	0	31	0.14
44.4	0	44	0.13
60.2	0	60	0.12
79.6	0	80	0.11
104.6	0	105	0.1
136.4	0	136	0.09
168.2	0	168	0.08
200	0	200	0.07

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Eaglebrook Engineering & Survey

PROJECT: Parker St, Newburyport

ANALYST: Kenneth Knowles, P.E.

DATE: 12/21/2017 TIME: 5:16:37 PM

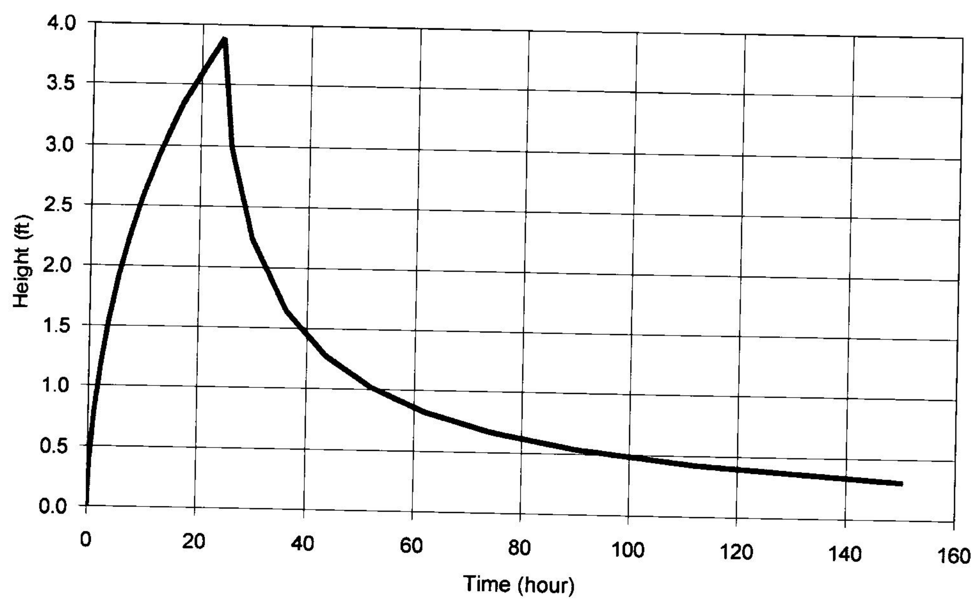
INPUT PARAMETERS

Application rate: 0.166 c.ft/day/sq. ft
Duration of application: 365 day
Total simulation time: 365 day
Fillable porosity: 0.3
Hydraulic conductivity: 16.5 ft/day
Initial saturated thickness: 25 ft
Length of application area: 109 ft
Width of application area: 6.3 ft
No constant head boundary used
Groundwater mounding @
X coordinate: 0 ft
Y coordinate: 0 ft
Total volume applied: 41607.15 cft

MODEL RESULTS

Time (day)	Mound Height (ft)
0	0
5	0.08
17	0.1
35	0.12
57	0.13
81	0.14
110	0.15
145	0.15
191	0.16
255	0.16
365	0.17

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Eaglebrook Engineering & Survey

PROJECT: Parker St, Newburyport

ANALYST: Kenneth Knowles, P.E.

DATE: 12/21/2017 TIME: 5:22:56 PM

INPUT PARAMETERS

Application rate: 0.58 c.ft/hour/sq. ft
Duration of application: 24 hour
Total simulation time: 150 hour
Fillable porosity: 0.3
Hydraulic conductivity: 0.69 ft/hour
Initial saturated thickness: 25 ft
Length of application area: 109 ft
Width of application area: 6.3 ft
No constant head boundary used
Groundwater mounding @
X coordinate: 0 ft
Y coordinate: 0 ft
Total volume applied: 9558.864 cft

MODEL RESULTS

Time (hour)	Mound Height (ft)
0	0
0	0.36
1	0.79
2	1.22
4	1.58
5	1.92
7	2.24
10	2.58
13	2.94
17	3.35
24	3.89
26	2.99
30	2.23
36	1.64
44	1.28
52	1.02
62	0.83
74	0.67
90	0.54
112	0.42
150	0.31

ATTACHMENT H

Construction Inspection Log Form and Inspection and Maintenance Plan

General Information (see reverse for instructions)					
Name of Project		**NPDES ID No.**		**Inspection Date**	
Weather conditions during inspection		**Inspection start time**		**Inspection end time**	
Inspector Name, Title & Contact Information					
Present Phase of Construction					
Inspection Location (if multiple inspections are required, specify location where this inspection is being conducted)					

Inspection Frequency *(Note: you may be subject to different inspection frequencies in different areas of the site. Check all that apply)*

Standard Frequency:

☐ Every 7 days
☐ Every 14 days and within 24 hours of a 0.25" rain or the occurrence of runoff from snowmelt sufficient to cause a discharge

Increased Frequency:

☐ Every 7 days and within 24 hours of a 0.25" rain (for areas of sites discharging to sediment or nutrient-impaired waters or to waters designated as Tier 2, Tier 2.5, or Tier 3)

Reduced Frequency:

☐ Twice during first month, no more than 14 calendar days apart; then once per month after first month; (for stabilized areas)
☐ Twice during first month, no more than 14 calendar days apart; then once more within 24 hours of a 0.25" rain (for stabilized areas on "linear construction sites")
☐ Once per month and within 24 hours of a 0.25" rain (for arid, semi-arid, or drought-stricken areas during seasonally dry periods or during drought)
☐ Once per month (for frozen conditions where earth-disturbing activities are being conducted)

Was this inspection triggered by a 0.25" storm event? ☐ Yes ☐ No

If yes, how did you determined whether a 0.25" storm event has occurred?

☐ Rain gauge on site ☐ Weather station representative of site. Specify weather station source:

Total rainfall amount that triggered the inspection (in inches):

Was this inspection triggered by the occurrence of runoff from snowmelt sufficient to cause a discharge? ☐ Yes ☐ No

Unsafe Conditions for Inspection

Did you determine that any portion of your site was unsafe for inspection per CGP Part 4.5? ☐ Yes ☐ No

If "yes", complete the following:

- Describe the conditions that prevented you from conducting the inspection in this location:

- Location(s) where conditions were found:

Condition and Effectiveness of Erosion and Sediment (E&S) Controls (CGP Part 2.2) (see reverse for instructions)				
Type/Location of E&S Control [Add an additional sheet if necessary]	**Maintenance Needed?***	**Corrective Action Required?***	**Date on Which Maintenance or Corrective Action First Identified?**	**Notes**
1.	☐Yes ☐No	☐Yes ☐No		
2.	☐Yes ☐No	☐Yes ☐No		
3.	☐Yes ☐No	☐Yes ☐No		
4.	☐Yes ☐No	☐Yes ☐No		
5.	☐Yes ☐No	☐Yes ☐No		
6.	☐Yes ☐No	☐Yes ☐No		
7.	☐Yes ☐No	☐Yes ☐No		
8.	☐Yes ☐No	☐Yes ☐No		
9.	☐Yes ☐No	☐Yes ☐No		
10.	☐Yes ☐No	☐Yes ☐No		

*** Note:** The permit differentiates between conditions requiring routine maintenance, and those requiring corrective action. The permit requires maintenance in order to keep controls in effective operating condition. Corrective actions are triggered only for specific conditions, which include: 1) A stormwater control needs repair or replacement (beyond routine maintenance) if it is not operating as intended; 2) A stormwater control necessary to comply with the permit was never installed or was installed incorrectly; 3) You become aware that the stormwater controls you have installed and are maintaining are not effective enough for the discharge to meet applicable water quality standards or applicable requirements in Part 3.1; 4) One of the prohibited discharges in Part 1.3 is occurring or has occurred; or 5) EPA requires corrective actions as a result of a permit violation found during an inspection carried out under Part 4.8. If a condition on your site requires a corrective action, you must also fill out a corrective action form found at https://www.epa.gov/npdes/stormwater-discharges-construction-activities#resources. See Part 5 of the permit for more information.

Condition and Effectiveness of Pollution Prevention (P2) Practices (CGP Part 2.3) (see reverse for instructions)				
Type/Location of P2 Practices [Add an additional sheet if necessary]	**Maintenance Needed?***	**Corrective Action Required?***	**Date on Which Maintenance or Corrective Action First Identified?**	**Notes**
1.	☐Yes ☐No	☐Yes ☐No		
2.	☐Yes ☐No	☐Yes ☐No		
3.	☐Yes ☐No	☐Yes ☐No		
4.	☐Yes ☐No	☐Yes ☐No		
5.	☐Yes ☐No	☐Yes ☐No		
6.	☐Yes ☐No	☐Yes ☐No		
7.	☐Yes ☐No	☐Yes ☐No		
8.	☐Yes ☐No	☐Yes ☐No		
9.	☐Yes ☐No	☐Yes ☐No		
10.	☐Yes ☐No	☐Yes ☐No		

*** Note:** The permit differentiates between conditions requiring routine maintenance, and those requiring corrective action. The permit requires maintenance in order to keep controls in effective operating condition. Corrective actions are triggered only for specific conditions, which include: 1) A stormwater control needs repair or replacement (beyond routine maintenance) if it is not operating as intended; 2) A stormwater control necessary to comply with the permit was never installed or was installed incorrectly; 3) You become aware that the stormwater controls you have installed and are maintaining are not effective enough for the discharge to meet applicable water quality standards or applicable requirements in Part 3.1; 4) One of the prohibited discharges in Part 1.3 is occurring or has occurred; or 5) EPA requires corrective actions as a result of a permit violation found during an inspection carried out under Part 4.8. If a condition on your site requires a corrective action, you must also fill out a corrective action form found at https://www.epa.gov/npdes/stormwater-discharges-construction-activities#resources. See Part 5 of the permit for more information.

Stabilization of Exposed Soil (CGP Part 2.2.14) (see reverse for instructions)			
Stabilization Area [Add an additional sheet if necessary]	**Stabilization Method**	**Have You Initiated Stabilization?**	**Notes**
1.		☐ YES ☐ NO If yes, provide date:	
2.		☐ YES ☐ NO If yes, provide date:	
3.		☐ YES ☐ NO If yes, provide date:	
4.		☐ YES ☐ NO If yes, provide date:	
5.		☐ YES ☐ NO If yes, provide date:	

Description of Discharges (CGP Part 4.6.6) (see reverse for instructions)	
Was a stormwater discharge or other discharge occurring from any part of your site at the time of the inspection? ☐ Yes ☐ No **If "yes", provide the following information for each point of discharge:**	
Discharge Location [Add an additional sheet if necessary]	**Observations**
1.	Describe the discharge: At points of discharge and the channels and banks of waters of the U.S. in the immediate vicinity, are there any visible signs of erosion and/or sediment accumulation that can be attributed to your discharge? ☐ Yes ☐ No If yes, describe what you see, specify the location(s) where these conditions were found, and indicate whether modification, maintenance, or corrective action is needed to resolve the issue:
2.	Describe the discharge: At points of discharge and the channels and banks of waters of the U.S. in the immediate vicinity, are there any visible signs of erosion and/or sediment accumulation that can be attributed to your discharge? ☐ Yes ☐ No If yes, describe what you see, specify the location(s) where these conditions were found, and indicate whether modification, maintenance, or corrective action is needed to resolve the issue:

Contractor or Subcontractor Signature and Certification

(see reverse for instructions)

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature of Contractor or Subcontractor: ______________________________ **Date:**

Printed Name and Affiliation: ______________________________

Operator Signature and Certification

(see reverse for instructions)

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature of Operator or "Duly Authorized Representative": ______________________________ **Date:**

Printed Name and Affiliation: ______________________________

APPENDIX I

INSPECTION AND MAINTENANCE PLAN

INSPECTION AND MAINTENANCE PLAN
STORMWATER MANAGEMENT SYSTEM
PROPOSED BUILDING EXPANSION
75 PARKER STREET
NEWBURYPORT, MASSACHUSETTS

Prepared For:

Port City Realty, LLC
75 Parker Street
Newburyport, Massachusetts 01950

COMMONWEALTH OF MASSACHUSETTS
RICHARD BARTHELMES
NO. 33017
REGISTERED
PROFESSIONAL ENGINEER

3/30/18

Prepared By:

CORNERSTONE

9F Presidential Way
Woburn, MA 01801

March 30, 2018

TABLE OF CONTENTS

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SECTION 1 - PROJECT DESCRIPTION

1.1. GENERAL

The Owner, Port City Realty, LLC, is proposing the construction of a building addition, parking lot and stormwater management system in the northern portion of the existing site. The Owner will be responsible for any future maintenance and implementation of this Inspection and Maintenance Plan. This Inspection and Maintenance Plan will be implemented for the site. A copy of the plan is presented in Appendix A. Figure No. C-5 presents a plan of stormwater management system.

Owner

Port City Realty, LLC
75 Parker Street
Newburyport, MA 01950
Telephone: 978-465-3791

Facility Contact (Site Operation and Maintenance)

Lisa Cosimano Gallagher
Port City Realty, LLC
75 Parker Street
Newburyport, MA 01950
Telephone: 978-465-3791

Engineer

Richard Barthelmes, P.E.
Cornerstone Construction Services, LLC
9F Presidential Way
Woburn, MA 01801
Telephone: 781-937-3045

1.2 CONSTRUCTION PERIOD STORMWATER POLLUTION PREVENTION AND EROSION SEDIMENTATION CONTROLS PLAN

Narrative

The applicant proposes to construct a building addition, associated parking areas, stormwater systems, and utilities to service the new site improvements. The proposed stormwater improvements include deep sump catchbasins, hydrodynamic separator units, and an underground infiltration system.

Name of Person Responsible for Plan compliance

Lisa Cosimano Gallagher
Port City Realty, LLC
75 Parker Street
Newburyport, MA 01950
Telephone: 978-465-3791

Construction Period Pollution Prevention Measures

The following erosion control measures are proposed:

- Silt fence and hay bale erosion control barriers.
- Stabilized construction entrance.
- Silt sock inserts at the inlet of all catchbasins to be used as temporary construction measures to prevent siltation from entering the stormwater system.
- Jute netting or other temporary measures during construction.

Erosion and Sedimentation Control Plan Drawings

The Erosion and Sedimentation Control Plan depicts the location of erosion and sedimentation controls.

Vegetation Planning

The applicant proposes to permanently vegetate all disturbed areas to prevent erosion and siltation. The areas shall be stabilized with six inches of loam and grass seed or hydroseed.

If construction ceases 21 days or more, all denuded areas shall receive temporary seeding within 14 days to ensure erosion on these areas will not occur.

Site Development Plan

Refer to Site Plans and Details for the existing and proposed site conditions.

Construction Sequencing Plan

The sequence of major events is anticipated to be:

1. Install erosion and sedimentation control measures.
2. Remove and stockpile loam.
3. Install stormwater management system.
4. Install underground utilities.
5. Install building foundation.
6. Construct proposed building.
7. Install proposed plants, loam, seed and stabilize areas outside limits of paved areas.
8. Install bituminous concrete pavement and other site structures.
9. Perform site cleanup.
10. Inspect site to assure site stabilization prior to placing the stormwater management system online.

This sequence is provided for informational purposes only. The contractor shall be responsible for all means and methods of construction and adhering to all OSHA and City of Newburyport requirements and may modify this sequence to conform to these requirements, as necessary.

Sequencing of Erosion and Sedimentation Controls

1. Install perimeter erosion control measures.
2. Install stabilized construction entrance.
3. Inspect and maintain erosion control measures as prescribed.
4. When construction is complete and site is stabilized, remove trapped sediments from collector devices as appropriate and then remove temporary erosion control measures.

Inspection Schedule

The erosion control measures shall be inspected once every 14 days, after every rainfall of 0.25 inches or greater and at least daily during prolonged rainfall events.

Maintenance Schedule

Repairs to the erosion control fences and devices shall be made as necessary and sediment shall be removed when deposits have reached one third (1/3) of the barrier height.

Repairs to the silt sacks shall be made after every rainfall as necessary. When sediment has reached one third (1/3) the depth of the trap, the sediment shall be removed.

The stabilized construction entrance stone shall be replaced as necessary to prevent tracking sediment onto public roadways.

Inspection and Maintenance Log Form

The site superintendent is responsible for maintaining inspection log forms on site during construction. A copy of the inspection form is presented in Attachment No. 1.

1.3 POST-CONSTRUCTION INSPECTIONS AND MAINTENANCE OF STORMWATER BMPS

Deep Sump Catch basins

The deep sump catchbasins shall be inspected four times per year for the first year. If the depth of sediment is not greater than two feet during the first year of inspection then the inspections shall be performed once per year. The catch basins shall be cleaned once the depth of sediment reaches two feet which is one half the sump depths. Vacuum trucks are preferred due to their effectiveness and they are less likely to damage the oil/grease hood.

Hydrodynamic Separator Units

Units shall be inspected four times per year for the first year. After the first year the unit needs to be inspected once per year. Inspections should be performed with a “sludge judge” to measure the oil depth, if any, and the sediment depth. Cleaning is required when the sediment depth reaches 75% of the storage capacity of the unit. Cleaning must be performed with a vacuum truck. Attachment No. 2 presents the manufacturer inspection/maintenance guide for the units.

Infiltration System

The infiltration system shall be inspected four times per year for the first year. After the first year, the units need to be inspected annually. The detention system has inspection ports or manholes to visibly observe the bottom of the system. Visible observations shall inspection of the bottom of bed for ponding water, debris or sediment, inspection of the inlet and outlet to ensure they are free from debris and sediment and that there are no other obstructions; inspection of the structural integrity of the units from above ground settlement or by observations from the ports/manholes

Maintenance of Landscaped Areas

Landscaped and grass areas immediately adjacent to the proposed parking areas and buildings shall be mowed as required. Grass clippings shall be directed away from the stormwater systems. Fertilizers or pesticides shall not be used with grassed and landscaped areas.

Pavement Maintenance

Paved areas of the site shall be inspected on a regular basis and cleaned of accumulated sand and debris. At a minimum, paved areas shall be cleaned on an annual basis. Pavement cleaning shall be performed by a qualified contractor and all material removed transported off site for disposal. Paved areas of the site shall be swept on an annual basis.

Snow Removal/Storage

Snow from the proposed parking lot area will be transported offsite by the snow removal contractor. No stockpiling or storage of snow from paved areas of the site is to be performed. Deicing chemicals are not to be utilized on the site. In addition, pesticides, fertilizers and other chemical shall not be used on the site. Signage will be maintained including no stockpiling of snow or salt usage at the site.

Debris and Litter Removal

Trash may collect potentially causing clogging of the facilities. All litter and debris should be collected and removed from the site on a regular basis.

Vehicle Washing

Washing of vehicles is prohibited on the site.

Operation and Maintenance Budget

Operation and maintenance costs at the site includes third-party inspections, cleaning of catch basins and separator units and sweeping of the parking lot areas,

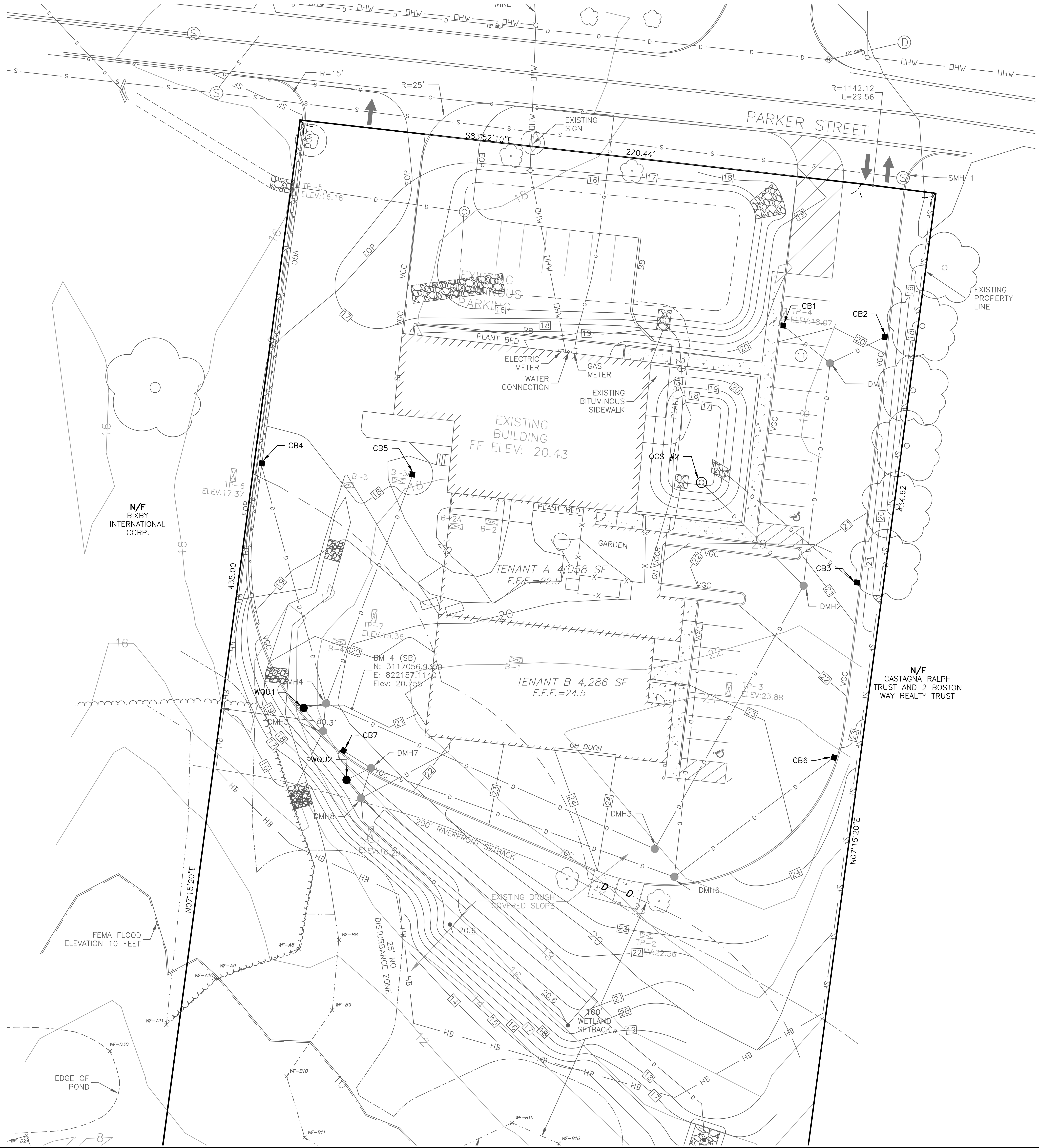
Table No. 1 presents a summary of anticipated costs in the first year of operation following construction of the site. Inspections and cleaning of catch basins and separator units at the site may be reduced to annually based on the findings of the first-year inspections completed.

TABLE NO. 1
Operation and Maintenance Budget
Proposed Building Expansion
75 Parker Street
Newburyport, MA

Third Party Inspections (4)	$1,600[1]
Annual Parking Lot Sweeping	750
Catch Basin/Separator Cleaning (4)	2,000[1]
Plant Replacement	1,000
Jellyfish Filter Cleaning	1,500
	$6,850
10% Contingency	685
Total Estimated Annual Cost	$7,535

[1] Inspection frequency may be reduced to annually after year one based on the findings of quarterly stormwater inspections completed.

FIGURES

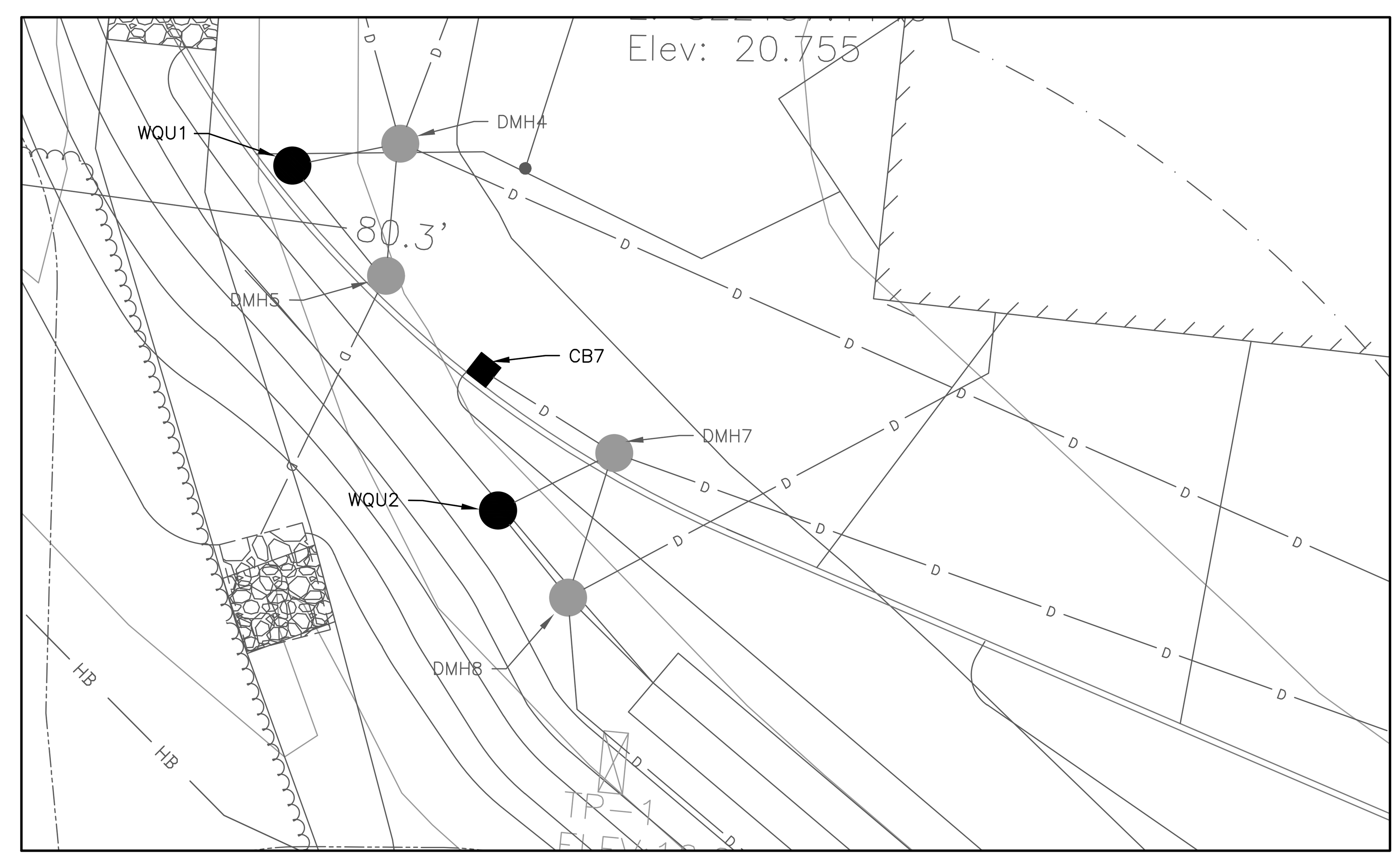


LEGEND:

- PROPOSED EDGE OF PAVEMENT
- PROPOSED BIORETENTION SWALE
- FEMA FLOOD ELEVATION LINE
- PROPOSED 5' CONCRETE SIDEWALK
- PROPOSED BUILDING ADDITION
- 23.2 PROPOSED SPOT GRADE

GRADING NOTES:

1. GRADE THE PARKING LOT TO PROVIDE POSITIVE DRAINAGE AWAY FROM BUILDINGS TOWARDS PROPOSED DRAINAGE CATCHBASINS, GRASSED SWALE, AND RAIN GARDEN. THE PARKING LOT SHALL BE FREE FROM LOW SPOTS. AREAS TO PAY PARTICULAR ATTENTION TO ARE ADJACENT TO CURBED LANDSCAPED ISLANDS, LOADING DOCKS, HANDICAP RAMPS, AND SIDEWALKS.
2. ALL HANDICAP ACCESSIBLE SPACES, LOADING AREAS, AND ROUTES SHALL BE GRADED AT A MAXIMUM OF 1.5% IN ANY DIRECTION.
3. ADJUST ALL EXISTING CATCHBASINS, MANHOLE COVERS, HYDRANTS, AND VALVE BOXES TO REMAIN TO PROPOSED GRADE.
4. PROVIDE INLET PROTECTION BARRIERS AROUND ALL EXISTING AND PROPOSED CATCHBASIN INLETS WITHIN THE WORK LIMITS AND IMMEDIATELY ADJACENT TO THE LIMIT OF WORK FOR THE DURATION OF THE PROJECT UNTIL PAVEMENT HAS BEEN INSTALLED AND LANDSCAPED AREAS HAVE BEEN STABILIZED.
5. INSTALL STABILIZED CONSTRUCTION ENTRANCES AT ALL ENTRANCES TO THE SITE USED FOR CONSTRUCTION ACCESS.
6. ALL DISTURBED AREAS NOT TO BE PAVED OR OTHERWISE TREATED SHALL RECEIVE 6" OF LOAM AND SEED.



DETAIL VIEW
SCALE: 1" = 10'

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

CORNERSTONE CONSTRUCTION
9F PRESIDENTIAL WAY
WOBURN, MASSACHUSETTS 01801
(781) 937-3045

PROPOSED BUILDING ADDITION
75 PARKER STREET
NEWBURYPORT, MASSACHUSETTS
PREPARED FOR
PORT CITY REALTY LLC.
75 PARKER STREET
NEWBURYPORT, MASSACHUSETTS

REVISIONS		
No.	DATE	DESCRIPTION	BY

STORMWATER MANAGEMENT SYSTEM

DRAWN BY:	NC
CHECKED BY:	RB
SCALE:	1"=20'
DATE:	1/12/18

SHEET No. C-1

PROJECT No. LE 627-20

ATTACHMENT I

Stormwater Inspection Report Form and Site Inspection Checklist

Stormwater Inspection Report
Proposed Building Expansion
75 Parker Street
Newburyport, MA

Date/Time: ______________________

Weather: ______________________

Last Inspection: ______________________

Inspector: ______________________

Description	Photo	Sediment Depth (in.)	Presence of oil/debris (Y/N)	Comments

ATTACHMENT D

Contech ChamberMaxx Inspection and Maintenance Guide and
Contech Jellyfish Design Sheets

CONTECH®
ENGINEERED SOLUTIONS

ChamberMaxx® Inspection and Maintenance Guide

CHAMBERMaxx®

ChamberMaxx®

Safety

Before entering into any storm sewer or underground retention/detention system check to make sure all OSHA and local safety regulations and guidelines are observed during the maintenance process. Hard hats, safety glasses, steel-toed boots and any other appropriate personal protective equipment shall be worn at all times.

Inspection Frequency

Inspections are recommended at a minimum annually. The first year of operation may require more frequent inspections. Frequency of inspections will vary significantly on the local site conditions. An individual inspection schedule should be established for each site.

Inspections

Inspection is the key to effective maintenance and is easily performed. Inspections may need to be performed more often in the winter months in climates where sanding operations may lead to rapid sediment accumulations, or in equipment washdown areas. It is very useful to keep a record of each inspection. A sample inspection log is included for your use.

The entire treatment train should be inspected and maintained. The treatment train may consist of an upstream sump manhole, manifold system or pre-treatment HDS device. Inspections should start at the upstream device and continue downstream to the discharge orifice if incorporated into the chamber system.

Pre-Treatment Device Inspection

Inspection and maintenance procedures provided by the manufacturer should be followed for pre-treatment systems such as a CDS®, Vortechs®, VortSentry® or VortSentry® HS. Expected pollutants will be floatable trash, sediment and oil and grease. Pre-treatement devices are recommended for all detention/retention devices regardless of type.

Containment Row™ Inspection

The optional Containment Row consists of a diversion concrete manhole with a weir and a drain down orifice, and a row of chambers placed on woven geotextile. The diversion weir directs the first flush flows into the Containment Row of chambers. The majority of sediment will be captured in the Containment Row due to the extended detention time which allows the particles to settle out. Higher flows overtop (bypass) the weir into the manifold system.

The Containment Row will typically be located in the first row of chambers connected to the diversion manhole. Inspection can be done through accessing the diversion manhole and visually inspecting the Containment Row through the inlet pipe. Inspection ports throughout the system can be used for visual observation and measurement of sediment accumulation using a stadia rod. When the depth of sediment accumulates over 4-inch (102 mm), cleanout is recommended.

Manifold System Inspection

The main manifold pipe can be inspected from the diversion manhole upstream. When a quarter of the pipe volume has been filled with sediment the header system should be maintained.

Visual Inspection

Maintenance or further investigation may be required if any of the following conditions exist:

- Evidence of an unusual amount of silt and soil build-up on the surface.
- Clogged outlet drainpipe.
- System does not drain to the elevation of the lowest pipe in dry conditions.
- Evidence of potholes or sinkholes

Maintenance

Underground stormwater retention/detention systems should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities rather than the size or configuration of the system. If accumulated silt is interfering with the operation of the detention system (i.e.: blocking outlet pipes or deposits significantly reduce the storage capacity of the system) it should be removed.

It is easiest to maintain a system when there is no flow entering. For this reason, cleanout should be scheduled during dry weather.

A vacuum truck or other similar devices can be used to remove sediment from the treatment train. Starting upstream, maintain manholes with sumps and any pre-treatment devices (following manufacturer recommended procedures). Once maintenance is complete, replace all caps, lids and covers. It is important to document maintenance events on the Inspection and Maintenance Log.

Header System Maintenance:

If maintenance is required, use a high pressure nozzle with rear facing jets to wash the sediments and debris into the diversion manhole. Use the vacuum hose stinger nozzle to remove the washed sediments from the sump of the diversion manhole. It is important to not flush sediments into the chamber system during the maintenance process.

Containment Row™ Maintenance

If maintenance is required, a JetVac truck utilizing a high pressure nozzle (sledge dredging tool) with rear facing jets will be required. Insert the nozzle from the diversion manhole into the Containment Row through the inlet pipe. Turn the water feed hose on and feed the supply hose until the nozzle has reached the end of the Containment Row. Withdraw the nozzle slowly.

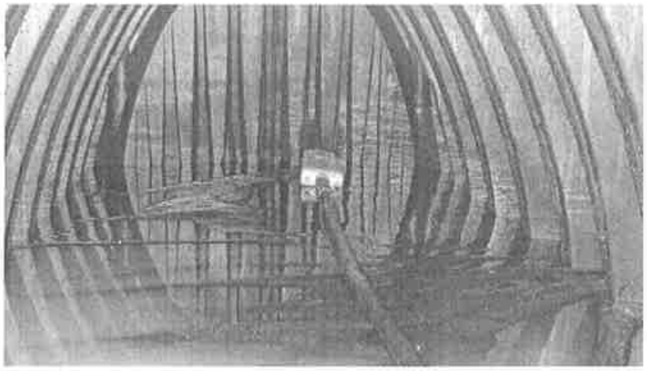


Figure 1— Containment Row shown with high pressure cleaning nozzle

The tool will backflush the Containment Row forcing debris into the diversion manhole sump. Use the stringer vacuum hose to remove the sediments and debris from the sump of the diversion manhole. Multiple passes may be required to fully cleanout the Containment Row. Vacuum out the diversion manhole and remove all debris. See Figure 1.

Inspection & Maintenance Log Sample Template

ChamberMaxx **Location:**

Date	Depth of Sediment	Accumulated Trash	Name of Inspector	Maintenance Performed/Notes

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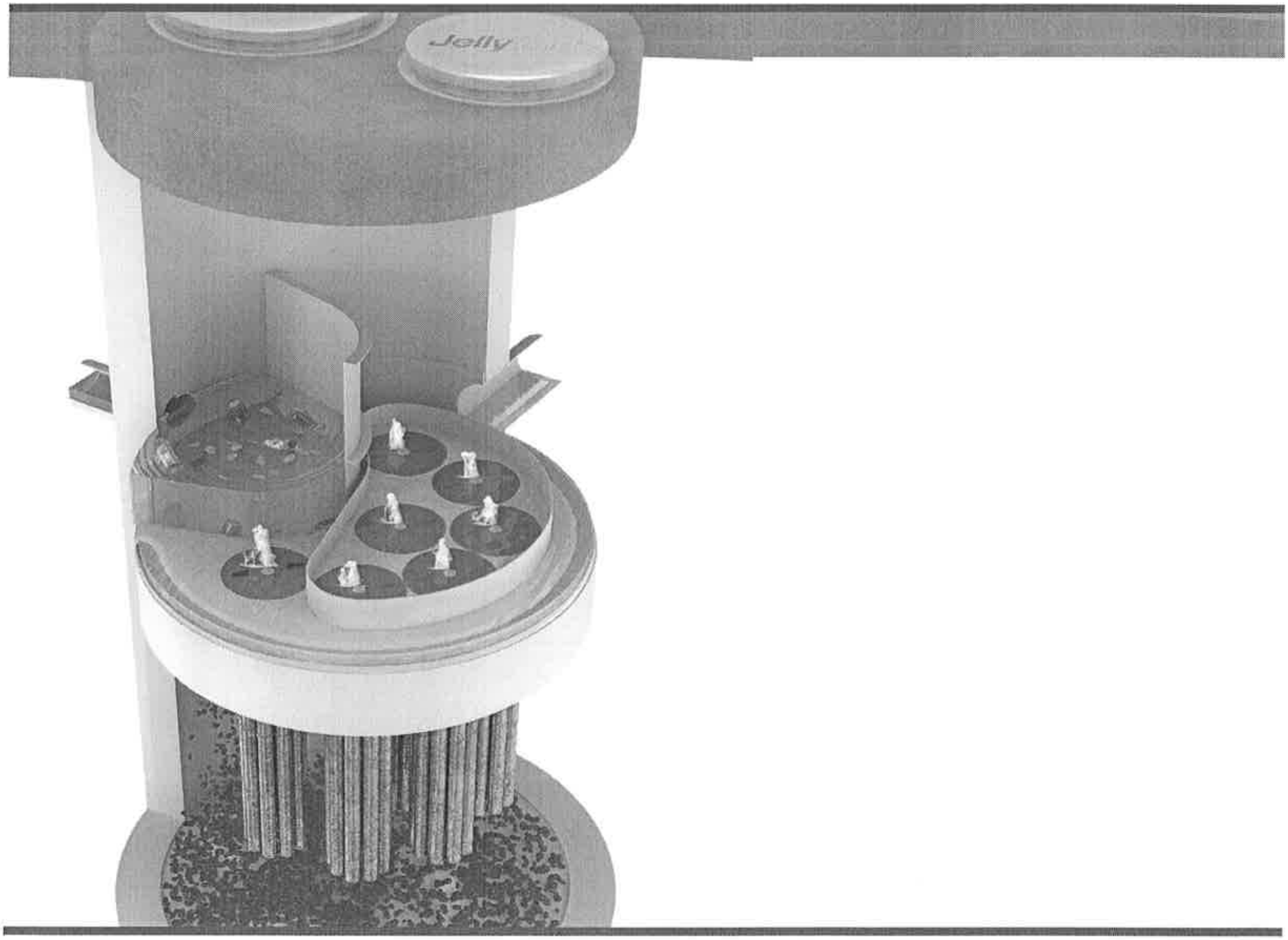
JellyFish® Filter Maintenance Guide



Jellyfish®

Jellyfish®

JELLYFISH® FILTER MANHOLE CONFIGURATIONS INSPECTION & MAINTENANCE GUIDE

TABLE OF CONTENTS

1.0 Inspection and Maintenance Overview

The primary purpose of the Jellyfish® Filter is to capture and remove pollutants from stormwater runoff. As with any filtration system, these pollutants must be removed to maintain the filter's maximum treatment performance. Regular inspection and maintenance are required to insure proper functioning of the system.

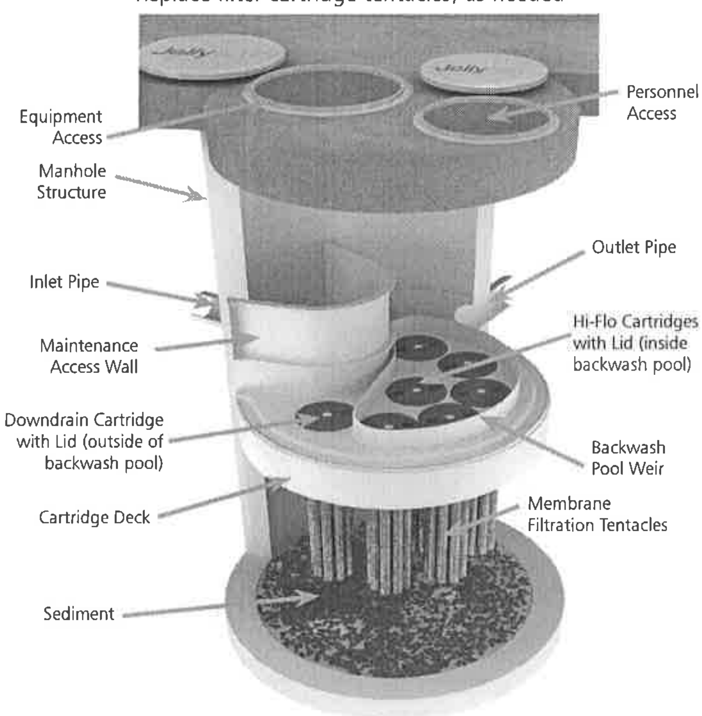
Maintenance frequencies and requirements are site specific and vary depending on pollutant loading. Additional maintenance activities may be required in the event of non-storm event runoff, such as base-flow or seasonal flow, an upstream chemical spill or due to excessive sediment loading from site erosion or extreme runoff events. It is a good practice to inspect the system after major storm events.

Inspection activities are typically conducted from surface observations and include:

- Observe if standing water is present
- Observe if there is any physical damage to the deck or cartridge lids
- Observe the amount of debris in the Maintenance Access Wall (MAW)

Maintenance activities typically include:

- Removal of oil, floatable trash and debris
- Removal of collected sediments
- Rinsing and re-installing the filter cartridges
- Replace filter cartridge tentacles, as needed



Note: Separator Skirt not shown

2.0 Inspection Timing

Inspection of the Jellyfish Filter is key in determining the maintenance requirements for, and to develop a history of the site's pollutant loading characteristics. In general, inspections should be performed at the times indicated below; *or per the approved project stormwater quality documents (if applicable), whichever is more frequent.*

1. Post-construction inspection is required prior to putting the Jellyfish Filter into service. All construction debris or construction-related sediment within the device must be removed, and any damage to system components repaired, before installing the filter cartridges.
2. A minimum of two inspections during the first year of operation to assess the sediment and floatable pollutant accumulation, and to ensure proper functioning of the system.
3. Inspection frequency in subsequent years is based on the inspection and maintenance plan developed in the first year of operation. Minimum frequency should be once per year.
4. Inspection is recommended after each major storm event.
5. Inspection is required immediately after an upstream oil, fuel or other chemical spill.

3.0 Inspection Procedure

The following procedure is recommended when performing inspections:

1. Provide traffic control measures as necessary.
2. Inspect the MAW for floatable pollutants such as trash, debris, and oil sheen.
3. Measure oil and sediment depth in several locations, by lowering a sediment probe through the MAW opening until contact is made with the floor of the structure. Record sediment depth, and presences of any oil layers.
4. Inspect cartridge lids. Missing or damaged cartridge lids to be replaced.
5. Inspect the MAW, cartridge deck, and backwash pool weir, for cracks or broken components. If damaged, repair is required.

3.1 Dry weather inspections

- Inspect the cartridge deck for standing water, and/or sediment on the deck.
- No standing water under normal operating conditions.
- Standing water inside the backwash pool, but not outside the backwash pool indicates that the filter cartridges need to be rinsed.

Inspection Utilitzing Sediment Probe

- Standing water outside the backwash pool may indicate a backwater condition caused by high water elevation in the receiving water body, or possibly a blockage in downstream infrastructure.
- Any appreciable sediment (≥1/16") accumulated on the deck surface should be removed.

3.2 Wet weather inspections

- Observe the rate and movement of water in the unit. Note the depth of water above deck elevation within the MAW.
- Less than 6 inches, flow should be exiting the cartridge lids of each of the draindown cartridges (i.e. cartridges located outside the backwash pool).
- Greater than 6 inches, flow should be exiting the cartridge lids of each of the draindown cartridges and each of the hi-flo cartridges (i.e. cartridges located inside the backwash pool), and water should be overflowing the backwash pool weir.
- 18 inches or greater and relatively little flow is exiting the cartridge lids and outlet pipe, this condition indicates that the filter cartridges are occluded with sediment and need to be rinsed

4.0 Maintenance Requirements

Required maintenance for the Jellyfish Filter is based upon results of the most recent inspection, historical maintenance records, or the site specific water quality management plan; whichever is more frequent. In general, maintenance requires some combination of the following:

1. Sediment removal for depths reaching 12 inches or greater, or within 3 years of the most recent sediment cleaning, whichever occurs sooner.
2. Floatable trash, debris, and oil removal.
3. Deck cleaned and free from sediment.
4. Filter cartridges rinsed and re-installed as required by the most recent inspection results, or within 12 months of the most recent filter rinsing, whichever occurs sooner.
5. Replace tentacles if rinsing does not restore adequate hydraulic capacity, remove accumulated sediment, or if damaged or missing. It is recommended that tentacles should remain in service no longer than 5 years before replacement.
6. Damaged or missing cartridge deck components must be repaired or replaced as indicated by results of the most recent inspection.
7. The unit must be cleaned out and filter cartridges inspected immediately after an upstream oil, fuel, or chemical spill. Filter cartridge tentacles should be replaced if damaged or compromised by the spill.

5.0 Maintenance Procedure

The following procedures are recommended when maintaining the Jellyfish Filter:

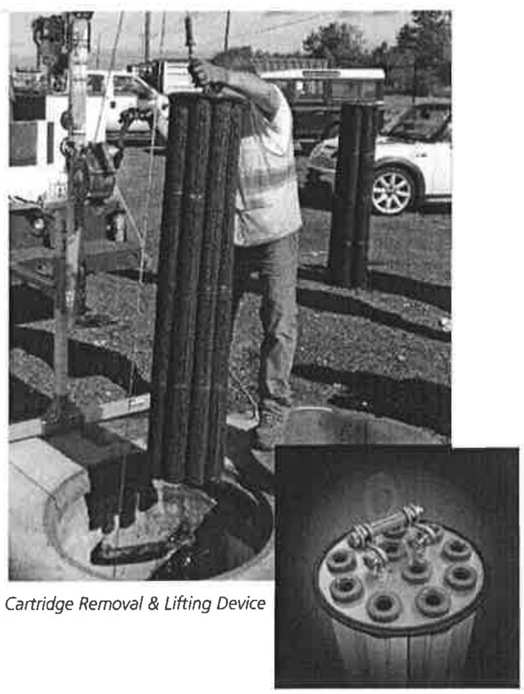
1. Provide traffic control measures as necessary.
2. Open all covers and hatches. Use ventilation equipment as required, according to confined space entry procedures.
3. Caution: Dropping objects onto the cartridge deck may cause damage.
4. Perform Inspection Procedure prior to maintenance activity.
5. To access the cartridge deck for filter cartridge service, descend the ladder and step directly onto the deck. Caution: Do not step onto the maintenance access wall (MAW) or backwash pool weir, as damage may result. Note that the cartridge deck may be slippery.
6. Maximum weight of maintenance crew and equipment on the cartridge deck not to exceed 450 lbs.

5.1 Filter Cartridge Removal

1. Remove a cartridge lid.
2. Remove cartridges from the deck using the lifting loops in the cartridge head plate. Rope or a lifting device (available from Contech) should be used. Caution: Should a snag occur, do not force the cartridge upward as damage to the tentacles may result. Wet cartridges typically weigh between 100 and 125 lbs.
3. Replace and secure the cartridge lid on the exposed empty receptacle as a safety precaution. Contech does not recommend exposing more than one empty cartridge receptacle at a time.

5.2 Filter Cartridge Rinsing

1. Remove all 11 tentacles from the cartridge head plate. Take care not to damage or break the plastic threaded nut or connector.
2. Position tentacles in a container (or over the MAW), with the



Cartridge Removal & Lifting Device

threaded connector (open end) facing down, so rinse water is flushed through the membrane and captured in the container.

3. Using the Jellyfish rinse tool (available from Contech) or a low-pressure garden hose sprayer, direct water spray onto the tentacle membrane, sweeping from top to bottom along the length of the tentacle. Rinse until all sediment is removed from the membrane. Caution: Do not use a high pressure sprayer or focused stream of water on the membrane. Excessive water pressure may damage the membrane.

4. Collected rinse water is typically removed by vacuum hose.
5. Reattach tentacles to cartridge head plate. Reuse O-rings and nuts, ensuring proper placement on each tentacle.

5.3 Cleaning Procedure

1. Perform vacuum cleaning of the Jellyfish Filter only after filter cartridges have been removed from the system. Access the lower chamber for vacuum cleaning only through the maintenance access wall (MAW) opening, being careful not to damage the flexible plastic separator skirt that is attached to the underside of the deck. The separator skirt surrounds the filter cartridge zone, and could be torn if contacted by the wand. Do not lower the vacuum wand through a cartridge receptacle, as damage to the receptacle will result.
2. Vacuum floatable trash, debris, and oil, from the MAW opening. Alternatively, floatable solids may be removed by a net or skimmer.

Tentacle Rinse Using Jellyfish Rinse Tool

3. Pressure wash cartridge deck and receptacles to remove all sediment and debris. Sediment should be rinsed into the sump area. Take care not to flush rinse water into the outlet pipe.
4. Remove water from the sump area. Vacuum or pump equipment should only be introduced through the MAW.
5. Remove the sediment from the bottom of the unit through the MAW opening.

Vacuuming Sump Through MAW

6. For larger diameter Jellyfish Filter manholes (≥8-ft) and vaults without an MAW opening, complete sediment removal may be facilitated by removing a cartridge lid from an empty receptacle and inserting a jetting wand (not a vacuum wand) through the receptacle. Use the sprayer to rinse loosened sediment toward the vacuum hose in the MAW opening, being careful not to damage the receptacle.
7. After the unit is clean, re-fill the lower chamber with water if required by the local jurisdiction, and re-install filter cartridges.
8. Dispose of sediment, floatable trash and debris, oil, spent tentacles, and water according to local regulatory requirements.

5.4 Filter Cartridge Replacement

1. Cartridges should be installed after the deck has been cleaned. It is important that the receptacle surfaces be free from grit and debris.
2. If rinsing is ineffective in removing sediment from the tentacles, or if tentacles are damaged, provisions must be made to replace the spent or damaged tentacles with new tentacles. Contact Contech to order replacement tentacles.
3. Lower filter cartridge to the cartridge deck. Remove cartridge lid from deck and carefully lower the filter cartridge into the receptacle until head plate gasket is seated squarely in receptacle. Caution: Should a snag occur when lowering the cartridge into the receptacle, do not force the cartridge downward; damage may occur.
4. Replace the cartridge lid and check fit before completing rotation to a firm hand-tight attachment.

5.5 Chemical Spills

Caution: If a chemical spill has been captured, do not attempt maintenance. Immediately contact the local hazard response agency and contact Contech.

6.0 Related Maintenance Activities

Jellyfish units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

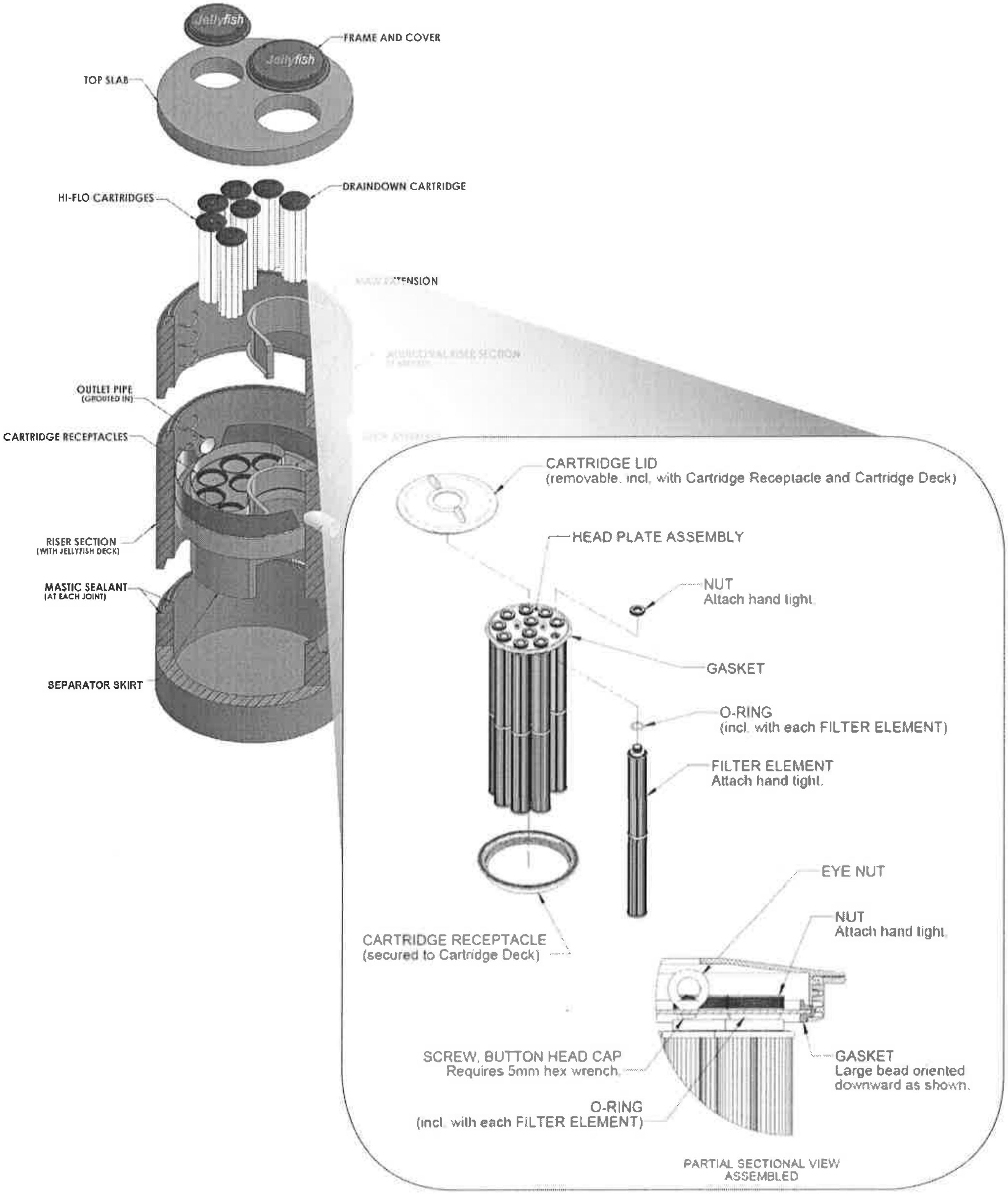
In order for maintenance of the Jellyfish filter to be successful, it is imperative that all other components be properly maintained. The maintenance and repair of upstream facilities should be carried out prior to Jellyfish maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

7.0 Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads. Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Jellyfish Filter Components & Filter Cartridge



Jellyfish Filter Inspection and Maintenance Log

Owner:				Jellyfish Model No:		
Location:				GPS Coordinates:		
Lande Use:	Commercial:		Industrial:		Service Station:	
	Roadway/Highway:		Airport:		Residential:	

Date/Time:						
Inspector:						
Maintenance Contractor:						
Visible Oil Present: (Y/N)						
Oil Quantity Removed:						
Floatable Debris Present: (Y/N)						
Floatable Debris Removed: (Y/N)						
Water Depth in Backwash Pool						
Draindown Cartridges externally rinsed and recommissioned: (Y/N)						
New tentacles put on Cartridges: (Y/N)						
Hi-Flo Cartridges externally rinsed and recommissioned: (Y/N)						
New tentacles put on Hi-Flo Cartridges: (Y/N)						
Sediment Depth Measured: (Y/N)						
Sediment Depth (inches or mm):						
Sediment Removed: (Y/N)						
Cartridge Lids intact: (Y/N)						
Observed Damage:						
Comments:						

Jellyfish®

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800.338.1122
www.ContechES.com

Support

- Drawings and specifications are available at ContechES.com/jellyfish.
- Site-specific design support is available from Contech Engineered Solutions.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, wastewater treatment and earth stabilization products. For information on other Contech segment offerings, visit ContechES.com or call 800.338.1122

The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; related foreign patents or other patents pending.