Stantec

STORMWATER REPORT
The Residences of South Brookline
Brookline, Massachusetts

Submitted to:

Brookline Department of Public Works
Brookline Town Hall
333 Washington Street
Brookline, MA 02445

Prepared for:

Chestnut Hill Realty
300 Independence Drive
Chestnut Hill, MA 02467

Prepared by:

Stantec Planning & Landscape
Architecture, PC
226 Causeway Street
Boston, MA 02114

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STORMWATER REPORT
THE RESIDENCES OF SOUTH BROOKLINE
BROOKLINE, MASSACHUSETTS

Table of Contents

I. EXECUTIVE SUMMARY 5

II. PROJECT TYPE 7

III. LID MEASURES 9

1.0 STANDARD 1: NO NEW UNTREATED DISCHARGES 11

2.0 STANDARD 2: PEAK RATE ATTENUATION 13
2.1 SUMMARY 13
Table 2.1 – Peak Discharge Rates 13
2.2 ANALYSIS 14
2.2.1 Soil Conditions 14
Table 2.2 –NRCS Soil Classification 14
Table 2.3 –Groundwater Elevation Measurements 16
2.2.2 Discharge Points 16
2.2.3 Pre-Development Conditions 17
Table 2.3 – Pre-Development Conditions Drainage Area Summary 18
2.2.4 Post-Development Conditions 19
Table 2.4– Post-Development Conditions Drainage Area Summary 22
2.3 METHODOLOGY AND DESIGN CRITERIA 22
2.3.1 Hydrologic Modeling 22
2.3.2 Design Storms 23
2.3.3 Time of Concentration 23
2.3.4 Curve Numbers 23
2.3.5 Rainfall Depth 23
Figure 3– Soils Map 25
Figure 4 – Existing Watershed Plan 27
Figure 5 – Proposed Watershed Plan 29

3.0 STANDARD 3: RECHARGE 31
3.1 RECHARGE REQUIREMENT 31
3.1.1 Summary 31
Table3.1 – Recharge Summary 31
3.1.2 Determining the Recharge Requirement 32
Table 3.2 – Required Recharge Volume 32
3.1.3 Sizing the Recharge Volume 32
3.2 DRAWDOWN WITHIN 72 HOURS 33
Exhibit 3.1 – Drawdown Equation 33
Table3.3 – Summary of Drawdown Time 33
3.3 SEPARATION FROM SEASONAL HIGH GROUNDWATER 34

4.0 STANDARD 4: WATER QUALITY 35
4.1 LONG – TERM POLLUTION PREVENTION PLAN 35
4.2 WATER QUALITY TREATMENT VOLUME 36

4.3 TSS REMOVAL COMPUTATIONS....36

5.0 STANDARD 5: LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS....39

6.0 STANDARD 6: CRITICAL AREAS....41

7.0 STANDARD 7: REDEVELOPMENT....43

8.0 STANDARD 8: CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION & SEDIMENTATION CONTROL....45
8.1 EROSION AND SEDIMENT CONTROL MEASURES....45
8.2 MATERIAL MANAGEMENT PRACTICES....47
8.3 PRODUCT SPECIFIC PRACTICES....47
8.4 SPILL CONTROL/NOTIFICATION PRACTICES....48
8.5 MAINTENANCE PROGRAM PRACTICES: PRIOR OR DURING CONSTRUCTION....49

9.0 STANDARD 9: OPERATION AND MAINTENANCE PLAN....51
9.1 STRUCTURAL POLLUTANT CONTROLS....51
9.2 LONG TERM POLLUTION PREVENTION PLAN....53

10.0 STANDARD 10: PROHIBITION OF ILLICIT DISCHARGES....57

FIGURES

Figure 1 – USGS Topographic Map....
Figure 2 – Aerial Photo....

APPENDIX

APPENDIX A – MASSACHUSETTS STORMWATER REPORT CHECKLIST AND CERTIFICATION....
APPENDIX B – SOILS AND GEOTECHNICAL....
- CUSTOM SOIL RESOURCE REPORT....
- SOIL SUITABILITY LOGS....
- MONITORING WELL LOGS....
- GEOTECHNICAL REPORT (PARE CORPORATION)....

APPENDIX C – EXISTING CONDITIONS HYDROCAD CALCULATIONS....
APPENDIX D – PROPOSED CONDITIONS HYDROCAD CALCULATIONS....
APPENDIX E – MASSACHUSETTS RAINFALL DATA MAPS....
APPENDIX F – RECHARGE VOLUME AND DRAWDOWN TIME CALCULATIONS....
APPENDIX G – TSS REMOVAL WORKSHEETS AND TREATMENT TRAIN SUMMARY....
APPENDIX H – WATER QUALITY CALCULATIONS....
APPENDIX I – STORMCEPTOR DESIGN SUMMARY....
APPENDIX J– OPERATION AND MAINTENANCE LOG AND OPERATIONS AND MAINTENANCE PLAN EXHIBIT....
APPENDIX K – STORMCEPTOR INSPECTION AND MAINTENANCE INFORMATION....
APPENDIX L – STORMTANK MAINTENANCE GUIDELINES....

APPENDIX M – PIPE CALCULATION ....

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I. Executive Summary

Project Description

Chestnut Hill Realty is proposing to construct ten new buildings with associated parking, stormwater management infrastructure, utilities, walkways, landscaping and site amenities on their existing property at Hancock Village in Brookline, MA.

The existing Hancock Village property consists of approximately 70 total acres, with 789 existing townhouse style apartments and the retail development known as the Hancock Village at Chestnut Hill Shopping Center. The proposed project will add 184 new residential units.

The project is proposed on three lots, all owned by Chestnut Hill Realty and each part of the existing Hancock Village development, totaling 9.32 acres. One lot on the east side of Independence Drive and one lot on the west side.

Access to the site will be from Independence Drive and from the existing driveway at the end of Asheville Road. The unit mix includes 44 apartment units in nine (9) 2½ -story infill buildings with a total of 8 one bedroom units; 17 two bedroom units and 18 three bedroom units, and one 5-story apartment building with 70 one bedroom units and 75 two bedroom units. Parking for the two story buildings will be provided adjacent to the units in surface parking lots and parking garages. Parking for the apartment building will be provided in two levels of garage parking and a nearby surface lot.

Site Characteristics

The western portion of the proposed project, on the western side of Independence Drive, is consists of approximately 4.70+/- acres of land that is currently open space. The portion of the project located on the east side of Independence Drive consists of approximately 8.78+/- acres that is currently mainly existing open space, but is also comprised of existing parking areas, walkways, a segment of Thornton Road, and a segment of Ashville Road.

Stormwater runoff from the western portion of the site drains to existing infrastructure that discharges off site on property to the west of the Hancock Village property. Stormwater runoff from the eastern portion of the site drains either overland to Independence Drive, to existing drainage infrastructure in Thornton Road, offsite to properties located on Russett Road, or to existing infrastructure located along the edge of Hancock Village property adjacent to the V.F.W. Parkway.

Stormwater Management

The proposed buildings, parking areas, and walkways will increase the amount of impervious area on the site. The project has been designed to incorporate porous asphalt pavement and subsurface detention/infiltration basins to mitigate the rate of runoff from the site, reducing flow rates to below pre-development rates. The project will also incorporate best management practices that will promote stormwater recharge and result in Total Suspend Solids (TSS) removal. The project has been designed to meet all of the requirements of the Massachusetts Stormwater Management Standards.

II. Project Type

Chestnut Hill Realty proposes a **new development** project in accordance with MassDEP Stormwater Handbook Standard 7 (see Section 7, Standard 7: Redevelopment). The project includes new development of a previously developed site. The project is in full compliance with all of the Stormwater Management Standards.

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III. LID Measures

Key features of Low Impact Development (LID) stormwater management systems include implementing practices to maintain a site's existing hydrology. This is achieved using decentralized practices to manage stormwater close to the source of generation and maximizing onsite infiltration. This reduces runoff and landscape watering requirements. The project will implement low-impact development methods and strategies for treating and mitigating stormwater runoff.

The following LID techniques are Best Management Practices according to MassDEP and are specified in the proposed development program.

LID Techniques Implemented:

- No disturbance to any Wetland Resource Areas
- Subsurface Detention/Infiltration Basins
- Bioretention Basin
- Porous Asphalt Pavement

Additionally, efforts will be made to protect existing trees during the construction period to the maximum feasible extent. Major trees and valued vegetation occurring outside the limit of work will be clearly marked for protection and monitored during the construction process.

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1.0 Standard 1: No New Untreated Discharges

Stormwater Management Standard 1 States:

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

The project does not have direct discharge of stormwater to waters or wetlands. Standard 1 is therefore met.

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2.0 Standard 2: Peak Rate Attenuation

Stormwater Management Standard 2 States:

> *"Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates."*

2.1 SUMMARY

Per the requirement of the Massachusetts Stormwater Handbook, Standard 2, we evaluated the pre-development (existing condition) and post-development (proposed condition) peak discharge rates for the 2-, 10- and 100-year storm events. The peak discharge rates were calculated at fourteen (14) discharge (design) points. (See Figure 4, Existing Watershed Plan and Figure 5, Proposed Watershed Plan following this section). Below are the results from the analysis.

Table 2.1 – Peak Discharge Rates

	2-Year Storm		10-Year Storm		100-Year Storm	
Discharge Point	Pre - Dev. Peak Discharge Rate(cfs)	Post – Dev. Peak Discharge Rate(cfs)	Pre - Dev. Peak Discharge Rate(cfs)	Post – Dev. Peak Discharge Rate(cfs)	Pre - Dev. Peak Discharge Rate(cfs)	Post – Dev. Peak Discharge Rate(cfs)
DP-1A	1.14	0.98	3.04	2.26	6.49	4.53
DP-1B	1.00	0.88	3.34	3.03	7.84	6.35
DP-1C	0.58	0.28	1.48	1.43	3.10	3.06
DP-1	2.71	1.76	7.79	6.18	17.29	13.69
DP-2	0.08	0	0.19	0	0.37	0
DP-3A	0.19	0.11	0.75	0.36	1.87	0.83
DP-3B	0.84	0.80	1.54	1.49	2.65	2.59
DP-3C	0.31	0	1.10	0	2.65	0
DP-3D	0.66	0.12	1.68	0.55	3.51	1.41
DP-3	1.97	1.01	5.06	2.38	10.68	4.83
DP-4A	1.11	1.02	2.20	1.81	3.99	3.05
DP-4B	1.10	0.90	3.23	2.49	7.21	5.67
DP-4C	0.96	0.85	2.54	1.76	5.41	3.29
DP-4	3.16	2.77	7.96	5.99	16.60	11.97

The post-development peak discharge rates do not exceed pre-development peak discharge rates. Stormwater Management Standard 2 is met.

This section describes the pre- and post-development conditions and outlines the procedure for determining the peak discharge rates.

2.2 ANALYSIS

2.2.1 Soil Conditions

The Natural Resources Conservation Service (NRCS) was used to classify the soils within the project site. Table 2.2 summarizes the NRCS hydrologic soil group classification.

Table 2.2 –NRCS Soil Classification

Map Unit Symbol	Map Unit Name	Description	Hydrologic Soil Group
627C	Newport-Urban land complex	3-15 percent slopes	C
626B	Merrimac-Urban land complex	0-8 percent slopes	A
655	Udorthents, wet substratum		Not assigned
630C	Charlton-Hollis-Urban land complex	3 to 15 percent slopes	Not assigned

Supporting documentation can be found in Figure 3, Soils Map following this section and Appendix B, Custom Soil Resource Report.

Pare Corporation (Pare) performed subsurface explorations on site between September 8, 2008 and September 16, 2008 to provide generalized subsurface conditions for the redevelopment of the site. Seventy six (76) soil borings were drilled, and soil samples collected and classified in accordance with the USDA classification procedures. Sieve analyses were performed on selected soil samples. Information provided by Pare with respect to depth of ledge/bedrock, and with respect to soil classifications, and was utilized in the design of the stormwater management system.

Stantec installed eight (8) monitoring wells on site on January 15, 2013 and January 16, 2013. Soil samples were collected and classified in accordance with the USDA classification procedures. Sieve analyses were performed on selected soil samples. Water levels in the monitoring wells were measured by Stantec on January 22, 2013 and April 29, 2014, and those measurements were used as the basis for estimating seasonal high groundwater elevations.

Design assumptions related to soils on site and utilized in the design of the stormwater management system, based on NRCS soils mapping as well as information from the Pare and Stantec investigations, are summarized below:

Hydrologic Soil Group

The majority of the site is mapped by NRCS as Udorthents or Charlton-Hillis-Urban land complex, and no hydrologic soil group is assigned to those soils. The northwestern portion of the site is classified as Newport-Urban land complex, which is assigned to hydrologic soil group

"C", and the southeast corner of the site is classified as Merrimac-Urban land complex, belonging is assigned to hydrologic soil group "A".

A review of the soils classifications as prepared by Pare and Stantec was performed to estimate the hydrologic soil groups at the project site utilizing National Engineering Handbook, Part 630, "Hydrology", Chapter 7, "Hydrologic Soil Groups". The results of soil classifications on site indicate that depth to groundwater and/or restrictive layers is greater than 40 inches. Soil classifications of soil samples collected from depths of 0-2' and from 2'-4' feet throughout the site correlate, based on USDA textural classifications and associated Rawl's Rates (see Massachusetts Stormwater Handbook Chapter 7, Page 22) as either hydrologic soil group "A", "B" or "C". Based on the information and data reviewed, an average hydrologic soil group "B" is assumed for the purpose of generating hydrographs (TR-55 and TR-20 methodologies, see Appendix D) and for the calculation of required recharge volumes (see Section 3.1). For these purposes, this classification is conservative, as it will provide lower peak rates of runoff in the existing condition, and will require a more conservative recharge volume.

Soil Infiltration Rates

For the purposes of hydrograph routing in porous asphalt pavement areas and at stormwater detention/infiltration basins, no infiltration rate was included in the calculations. This is a conservative assumption.

For the purpose of required recharge volume drawdown, the Rawl's rate utilized at each site specific location is based on the soils at the depth of and below the proposed recharge volume. The most conservative Rawl's rate for all available soil samples was assumed.

Infiltration rates for each stormwater component summarized below:

Proposed Stormwater BMP	Bottom Elevation of Basin	USDA Soil Classification at Depth	Boring/Monitoring Well	Assumed Rawl's Rate at Depth (in/hr)
Subsurface Detention/Infiltration Basin (P-1A)	167.60	Sandy Clay Loam	MW-1	0.17
Bioretention Basin (P-1C)	161.50	Silt Loam	MW-2	0.27
Subsurface Detention/Infiltration Basin (P-1F)	158.00	Sandy Clay Loam	MW-3	0.17
Subsurface Detention/Infiltration Basin (P-4C)	153.50	Sandy Clay Loam	MW-7	0.17

Seasonal High Groundwater

Water level measurements observed by Stantec on January 22, 2013 and April 29, 2014 in each of the eight (8) monitoring wells installed throughout the site are summarized below. Measurements taken in April, 2014 are used as an Estimate of Seasonal High Groundwater.

Table 2.3 –Groundwater Elevation Measurements

Monitoring Well	Ground Surface Elev. (ft.)	Depth to Water (ft.,) (Jan. 22, 2013)	Water Level Measurement (Jan. 22, 2013)	Depth to Water (ft.,) (Apr. 29, 2014)	Water Level Measurement (Apr. 29, 2014)
MW-1	168.2	5.0	163.2	3.42	164.78
MW-2	159.7	2.2	157.5	1.17	158.53
MW-3	162.8	8.6	154.2	8	154.80
MW-4	181.0	>8.0*	173.0	>8.0*	173.0
MW-5	182.5	>8.0*	174.5	>8.0*	174.5
MW-6	171.0	8.5	162.5	7.92	163.08
MW-7	157.5	8.1	149.4	7.5	150.00
MW-8	158.1	9.0	149.1	8.33	149.77

* No water present in well

2.2.2 Discharge Points

The project site was divided into eleven (11) subcatchment areas for the pre-development conditions, with each subcatchment area contributing to a specific discharge point (See Figure 4). The peak discharge rate for the pre-and post-development conditions were analyzed for each of these 11 discharge points. Discharge points were also added together to represent the overall flow rates to the following general areas:

- DP-1 - Wetland system located to the west of the project site
- DP-3 – Russet Road
- DP-4 – Drainage infrastructure located along the VFW Parkway

Results of the analysis are found in Table 2.1.

2.2.3 Pre-Development Conditions

Each of the eleven subcatchment areas analyzed for the existing conditions are summarized below:

Subcatchment EX-1A

Subcatchment EX-1A includes existing open space, landscaped areas, and portions of existing roof areas. Stormwater runoff from EX-1A flows overland towards existing drainage structures located in an existing courtyard space. These drainage structures are considered Design Point DP-1A.

Subcatchment EX-1B

Subcatchment EX-1B includes existing open space, landscaped areas, and portions of existing roof areas. Stormwater runoff from EX-1B flows overland towards an existing 15" flared end that collects stormwater and that is connected to an existing 30" drain pipe that crosses the property. The discharge to this 30" drain pipe is considered Design Point DP-1B.

Subcatchment EX-1C

Subcatchment EX-1C includes existing open space, landscaped areas, and portions of existing roof areas. Stormwater runoff from EX-1C flows overland towards Independence Drive. The flow towards Independence Drive is considered Design Point DP-1C.

Subcatchment EX-2

Subcatchment EX-2 consists of undeveloped, wooded area that drains overland towards Thornton Road. The flow towards Thornton Road is considered DP-2.

Subcatchment EX-3A

Subcatchment EX-3A includes existing open space and landscaped areas. Stormwater runoff from EX-3A flows overland towards Russett Road, on the west side of Thornton Road. This flow towards Russett Road is considered Design Point DP-3A.

Subcatchment EX-3B

Subcatchment 3B includes existing open space and landscaped areas, portions of existing roof areas, and a portion of Thornton Road. Runoff from EX-3B flows to existing drainage structures located in Thornton Road. These drainage structures are considered DP-3B.

Subcatchment EX-3C

Subcatchment EX-3C includes existing open space and landscaped areas, and portions or existing roof area. Stormwater runoff from EX-3C flows overland towards Russett Road, between Thornton Road and Ashville Road. This flow towards Russett Road is considered Design Point DP-3C.

Subcatchment EX-3D

Subcatchment EX-3D includes existing open space and landscaped areas, undeveloped area, portions of existing roof areas, and a portion of Ashville Road. Runoff from EX-3D flows towards Ashville Road. Ashville Road is considered DP-3D.

Subcatchment EX-4A

Subcatchment EX-4A includes existing parking and roadway areas, landscaped areas, and undeveloped area. Runoff from EX-4A is collected in existing drainage structures that connect to drainage infrastructure on site parallel to the VFW parkway. The drainage structures that EX-4A drains to are considered DP-4A.

Subcatchment EX-4B

Subcatchment EX-4B includes existing open space and landscaped areas, walkways, and portions of existing roof areas. Runoff from EX-4B is collected in existing drainage structures that connect to drainage infrastructure on site parallel to the VFW parkway. The drainage structures that EX-4B drains to are considered DP-4B.

Subcatchment EX-4C

Subcatchment EX-4C includes undeveloped areas and a portion of Asheville Road. Runoff from EX-4C flows towards existing drainage infrastructure within the Hancock Village development that is connected to drainage infrastructure on site parallel to the VFW parkway. The drainage infrastructure that EX-4C drains to is considered DP-4C.

Subcatchment Area Summary

Table 2.3 summarizes the pre-development conditions drainage areas and includes information used for the hydraulic analysis (Appendix C, Existing Conditions HydroCAD Calculations).

Table 2.3 – Pre-Development Conditions Drainage Area Summary

Drainage Area	Area (acres)	Curve Number	Time of Concentration (min.)[1]
EX-1A	2.02	66	8
EX-1B	2.68	62	6.2
EX-1C	0.87	67	6
EX-2	0.09	70	6
EX-3A	0.69	60	6
EX-3B	0.52	80	6

[1] Section 2.3.3

EX-3C	0.94	61	6
EX-3D	0.99	67	6
EX-4A	0.85	76	6
EX-4B	2.26	64	6
EX-4C	1.57	66	6

2.2.4 Post-Development Conditions

For the proposed conditions, sixteen (16) subcatchment areas were analyzed. A summary of each of the subcatchments, is provided below:

Subcatchment PR-1A

Subcatchment PR-1A includes proposed roof areas, paved parking areas, landscaped areas and a subsurface detention/infiltration basin. Stormwater runoff from Subcatchment PR-1A flows into a subsurface detention/infiltration basin, represented in the HydroCAD model for the project as Pond-1A. Overflow from Pond-1A is connected to existing drainage structures located in an existing courtyard space (DP-1A). DP-1A contributes to discharge point DP-1.

Subcatchment PR-1B

Subcatchment PR-1B includes existing roof area, open space and landscaped areas that flows overland towards existing drainage structures located in an existing courtyard space (DP-1A). DP-1A contributes to discharge point DP-1.

Subcatchment PR-1C

Subcatchment PR-1C includes proposed roof areas, paved parking areas, landscaped areas and a bioretention basin. Stormwater runoff from Subcatchment PR-1C flows into a bioretention basin, represented in the HydroCAD model for the project as Pond-1C. Overflow from Pond-1C is connected to an existing 30” drain pipe that crosses the property. The discharge to this 30” drain pipe is considered Design Point DP-1B.DP-1B contributes to discharge point DP-1.

Subcatchment PR-1D

Subcatchment PR-1D includes existing open space, landscaped areas, portions of existing roof areas, and proposed driveway area. Stormwater runoff from PR-1D flows overland towards an existing 30” drain pipe that crosses the property (Design Point DP-1B). DP-1B contributes to discharge point DP-1.

Subcatchment PR-1E

Subcatchment PR-1E includes existing and proposed roof areas, paved parking areas, and landscaped areas. Stormwater runoff from Subcatchment PR-1E flows into a subsurface detention basin, represented in the HydroCAD model for the project as Pond-1E. Overflow from Pond-1E is connected to existing drainage structures located in Independence Drive. The existing drainage structures in Independence Drive area considered Design Point DP-1C. DP-1C contributes to discharge point DP-1.

Subcatchment PR-1F

Subcatchment PR-1F includes existing and proposed roof areas, paved parking areas, landscaped areas and subsurface detention/infiltration basins. Stormwater runoff from Subcatchment PR-1F flows through into to a subsurface detention/infiltration basin, represented in the HydroCAD model for the project as Pond-1F. Overflow from Pond-1F is connected to existing drainage structures located in Independence Drive (DP-1C). DP-1C contributes to discharge point DP-1.

Subcatchment PR-1G

Subcatchment PR-1G includes landscaped areas that will flow overland towards Independence Drive (DP-1C). DP-1C contributes to discharge point DP-1.

Subcatchment PR-3A

Subcatchment PR-3A includes sidewalk, landscaped and undeveloped area that will drain overland towards Russett Road, on the west side of Thornton Road (DP-3A). DP-3A contributes to discharge point DP-3.

Subcatchment PR-3B

Subcatchment PR-3B includes proposed walkways, existing roof and landscaped areas, and an existing portion of Thornton Road that will flow to drainage structures located in Thornton Road (DP-3B). DP-3B contributes to discharge point DP-3.

Subcatchment PR-3C

Subcatchment PR-3C includes landscaped areas. Runoff from PR-3C drains to a drainage system that discharges to Russett Road at Asheville Road (DP-3D). DP-3D contributes to discharge point DP-3.

Subcatchment PR-4A

Subcatchment PR-4A includes proposed driveway, existing parking and driveway areas and landscaped areas. Stormwater runoff from Subcatchment PR-4A is connected to an existing drainage system that connects to drainage infrastructure on site parallel to the VFW parkway (DP-4A). DP-4A contributes to discharge point DP-4.

<u>Subcatchment PR-4B</u>

Subcatchment PR-4B includes proposed roof area and landscaped area. Stormwater runoff from Subcatchment PR-4B is directed to a subsurface detention basin, represented in the HydroCAD model for the project as Pond-4B. Overflow from Pond-4B is discharged to a subsurface detention/infiltration basin, identified in the HydroCAD model for the projectas Pond-4C. Overflow from Pond 4C is to an existing drainage system that connects to drainage infrastructure on site parallel to the VFW parkway (DP-4B). DP-4B contributes to discharge point DP-4.

<u>Subcatchment PR-4C</u>

Subcatchment PR-4C includes proposed roof and landscape areas, and proposed paved parking area. Stormwater runoff from Subcatchment PR-4C flows into a subsurface detention/infiltration basin, represented in the HydroCAD model for the project as Pond-4C. Overflow from Pond-4C is connected to an existing drainage system that connects to drainage infrastructure on site parallel to the VFW parkway (DP-4B). DP-4B contributes to discharge point DP-4.

<u>Subcatchment PR-4D</u>

Subcatchment PR-4D includes existing roof and landscape areas, and proposed porous asphalt parking area. Stormwater runoff from Subcatchment PR-4D flows through or into to a porous asphalt pavement parking area, represented in the HydroCAD model for the project as Pond-4D. Overflow from Pond-4D is discharged to a subsurface detention/infiltration basin identified in the HydroCAD model as Pond-4C. Overflow from Pond-4C is discharged to an existing drainage system that connects to drainage infrastructure on site parallel to the VFW parkway (DP-4B). DP-4B contributes to discharge point DP-4.

<u>Subcatchment PR-4E</u>

Subcatchment PR-4E includes existing roof area, landscaped area and walkways. Runoff from Subcatchment PR-4E is collected and discharged to an existing drainage system that connects to drainage infrastructure on site parallel to the VFW parkway (DP-4B). DP-4B contributes to discharge point DP-4.

Subcatchment PR-4F

Subcatchment PR-4F includes proposed landscaped areas and a portion of Asheville Road. Runoff from PR-4F flows towards existing drainage infrastructure within the Hancock Village development that is connected to drainage infrastructure on site that evenatually discharges to the drainage system on site and parallel to the VFW parkway. The existing drainage system that PR-4F dicharges to is considered Design Point 4C (DP-4C). DP-4C contributes to discharge point DP-4.

Drainage Area Summary

Table 2.4 summarizes the post-development conditions drainage areas and includes information used for the hydraulic analysis (Appendix D, Proposed Conditions HydroCad Calculations).

Table 2.4– Post-Development Conditions Drainage Area Summary

Drainage Area	Area (acres)	Curve Number	Time of Concentration (min.)[2]
PR-1A	0.60	86	6
PR-1B	1.14	70	6
PR-1C	1.71	83	6
PR-1D	1.26	65	6
PR-1E	0.67	85	6
PR-1F	0.46	87	6
PR-1G	0.15	63	6
PR-3A	0.28	62	6
PR-3B	0.52	79	6
PR-3C	0.55	59	6
PR-4A	0.57	82	6
PR-4B	1.12	89	6
PR-4C	2.09	80	6
PR-4D	0.59	85	6
PR-4E	1.04	70	6
PR-4F	0.74	74	6

2.3 METHODOLOGY AND DESIGN CRITERIA

2.3.1 Hydrologic Modeling

The peak discharge rates and stormwater runoff volumes were calculated using the Soil Conservation Service (SCS) TR-55 and TR-20 methodologies and the computer program HydroCAD 10.00 by HydroCAD Software Solutions, LLC.

[2] Section 2.3.3

2.3.2 Design Storms

The analysis was performed on the 2-, 10-, and 100-year frequency rainfall events. The events were based on the 24-hour, type-III duration storm (See Appendix E, Massachusetts Rainfall Data Maps).

2.3.3 Time of Concentration

The time of concentration (T_c) for each watershed was determined by finding the time necessary for runoff to travel from the hydraulically most distant point in the watershed to the point of concentration. The travel path was drawn based on the topography and the time was calculated using the HydroCAD. A minimum T_c of 6.0 minutes was used to account for the initial storm fluctuation and depression storage.

2.3.4 Curve Numbers

Curve numbers were developed for each of the different use categories and hydrologic soil group types within each sub-area. The curve numbers were based on the SCS TR-55 methodology and are included in the HydroCAD input and output found in Appendix C and Appendix D.

2.3.5 Rainfall Depth

Rainfall depths were acquired from Technical Paper 40, “The Rainfall Frequency Atlas of the United States”. Rainfall events for the 2-, 10-, and 100-year storms were analyzed.

The following rainfall depths were used in the calculations:

Storm Event	Rainfall Depth
2-Year	3.20 inches
10-Year	4.60 inches
100-Year	6.70 inches

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BROOKLINE, MASSACHUSETTS

Figure 3– Soils Map

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Figure 3 - Soils Map
The Residences of South Brookline
Brookline, MA
February, 2013

Stantec
Planning and Landscape Architecture, PC
141 Portland Street
Boston, MA 02114

Data Source: "Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division" and aerial from "Bing Maps aerial imagery web mapping service"

Figure 4 – Existing Watershed Plan

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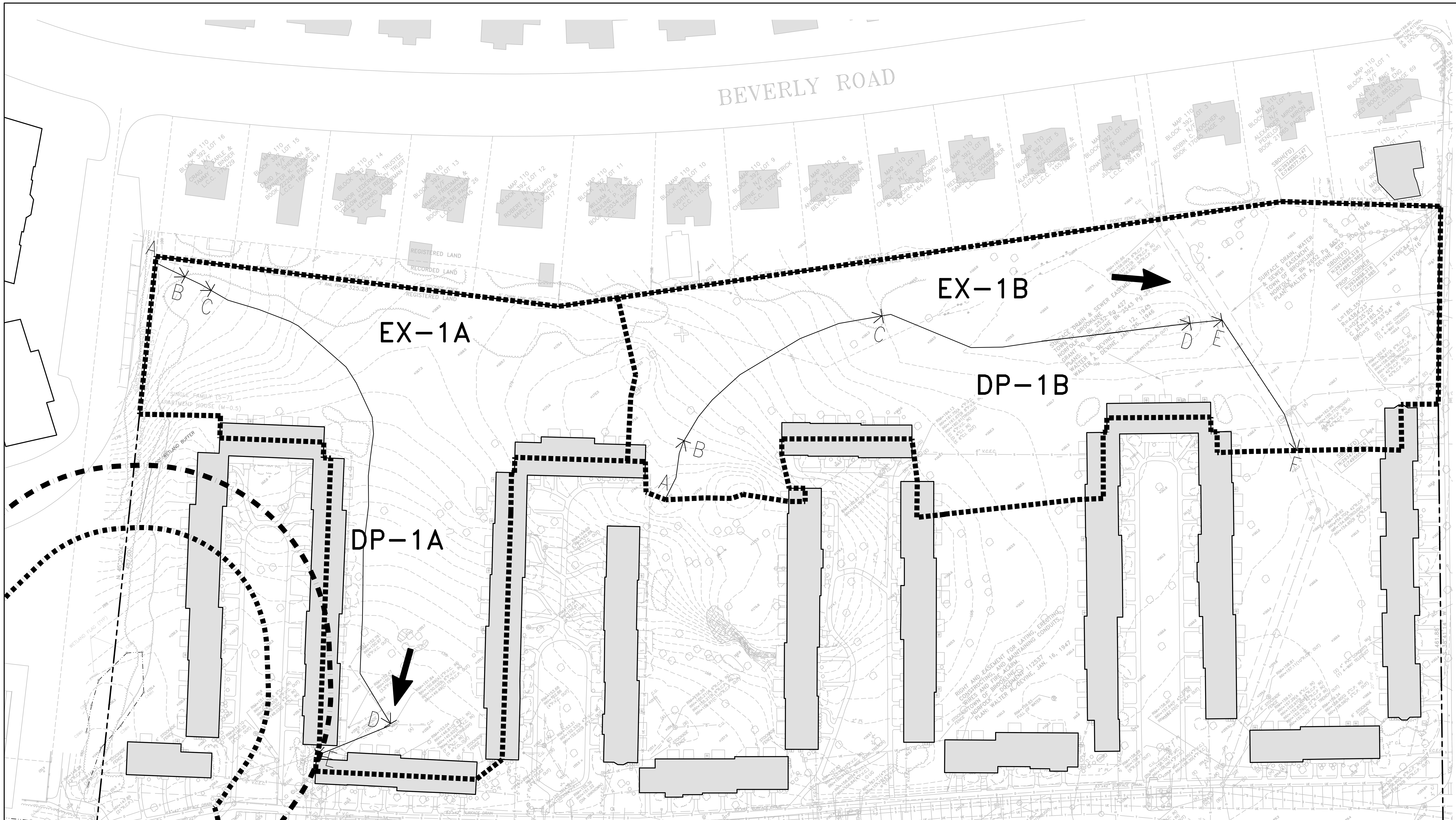

LEGEND

EX-1A	EXISTING DRAINAGE AREA
DP-1A	DISCHARGE POINT
DP-1	DISCHARGE POINT AT WETLANDS NORTH
DP-2	DISCHARGE POINT AT DRAIN SYSTEM IN INDEPENDENCE
DP-3	DISCHARGE POINT AT DRAIN SYSTEM IN RUSSETT RD.
DP-4	DISCHARGE POINT AT VFW PARKWAY
	EXISTING SUBCATCHMENT BOUNDARY
	PROPERTY BOUNDARY
A — B	TIME OF CONCENTRATION

NORTH

0 20' 40' 80'

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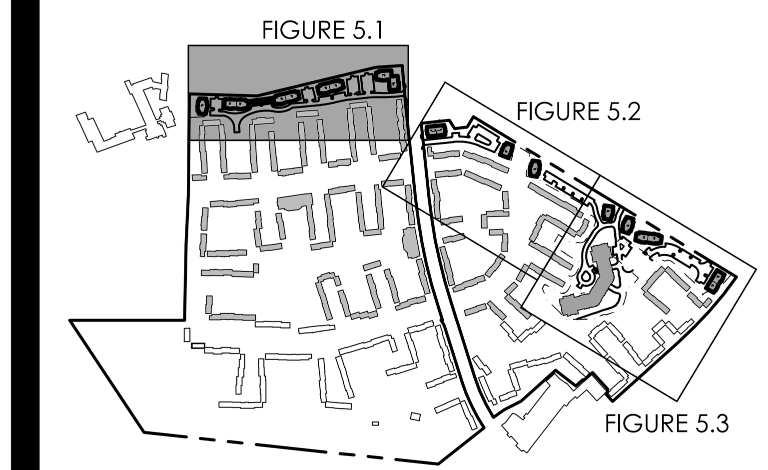

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CHESTNUT HILL REALTY

THE RESIDENCES AT SOUTH BROOKLINE

BROOKLINE, MA

Title

EXISTING WATERSHED PLAN

Project No.	Scale
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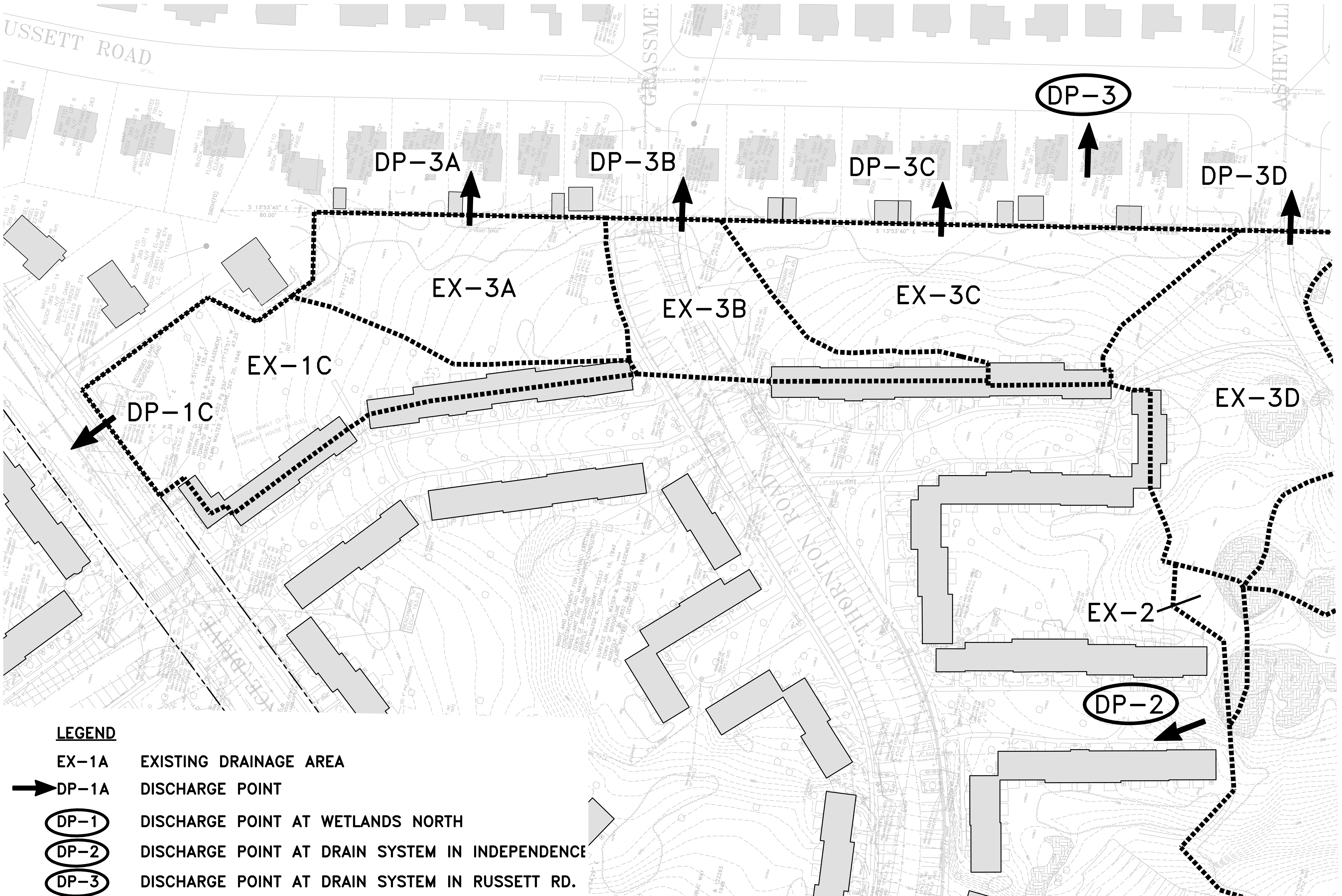
FIGURE 4.1



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	EXISTING SUBCATCHMENT BOUNDARY
	PROPERTY BOUNDARY
A B	TIME OF CONCENTRATION

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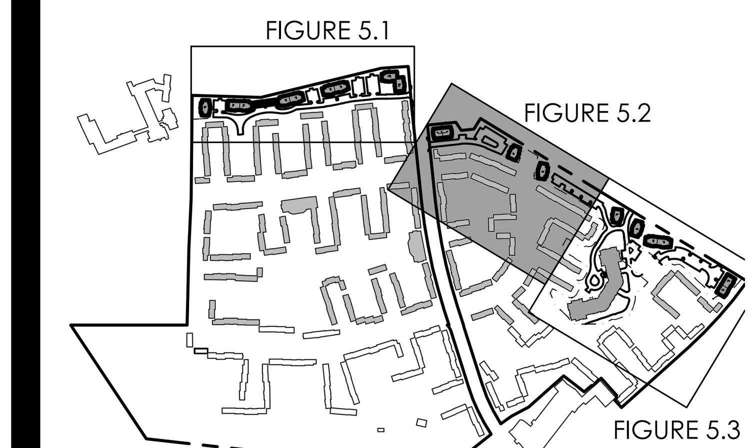

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CHESTNUT HILL REALTY

THE RESIDENCES AT SOUTH BROOKL

BROOKLINE, MA

Title

EXISTING WATERSHED PLAN

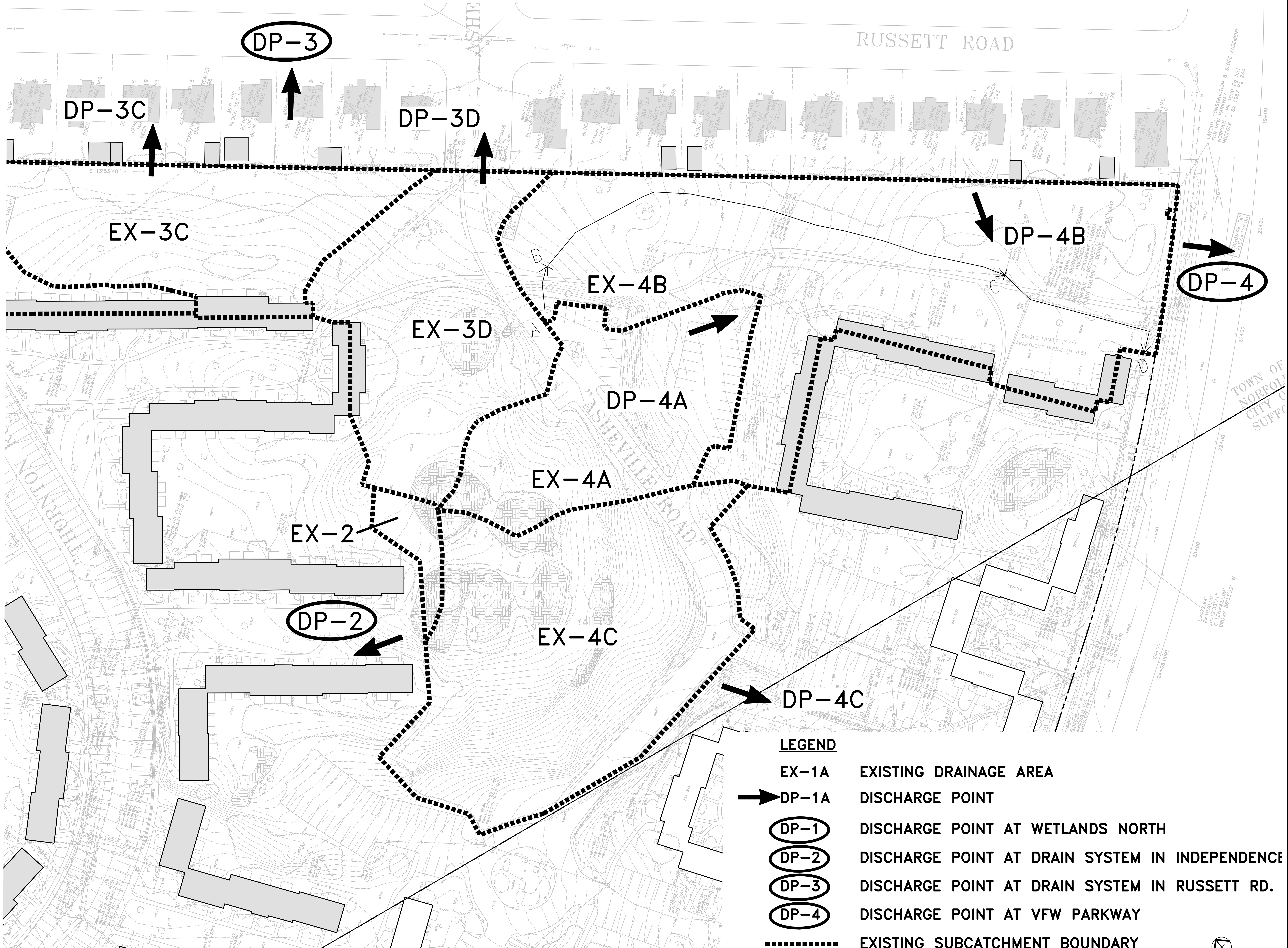
Project No. 210810271

Scale AS NOTED

Sheet

Drawing No.

FIGURE 4.2



LEGEND

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	PROPERTY BOUNDARY
A → B	TIME OF CONCENTRATION

NORTH

0 20' 40' 80'

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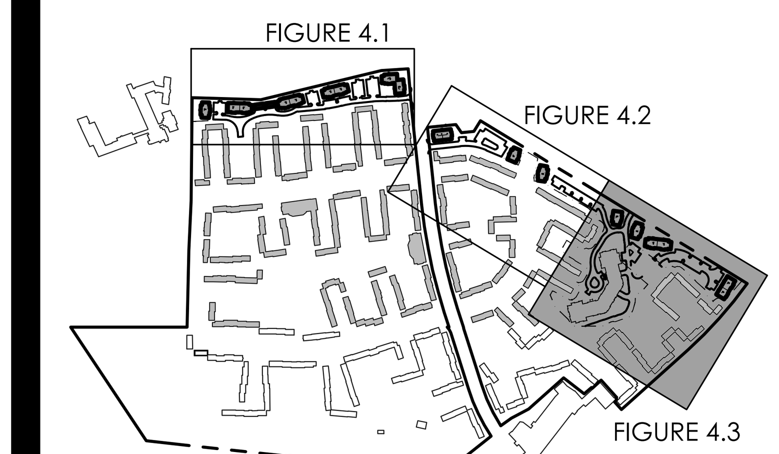

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CHESTNUT HILL REALTY

THE RESIDENCES AT SOUTH BROOKLIN

BROOKLINE, MA

Title

EXISTING WATERSHED PLAN

Project No. 210810271

Scale AS NOTED

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Drawing No.

FIGURE 4.3

STORMWATER REPORT
THE RESIDENCES OF SOUTH BROOKLINE
BROOKLINE, MASSACHUSETTS

Figure 5 – Proposed Watershed Plan

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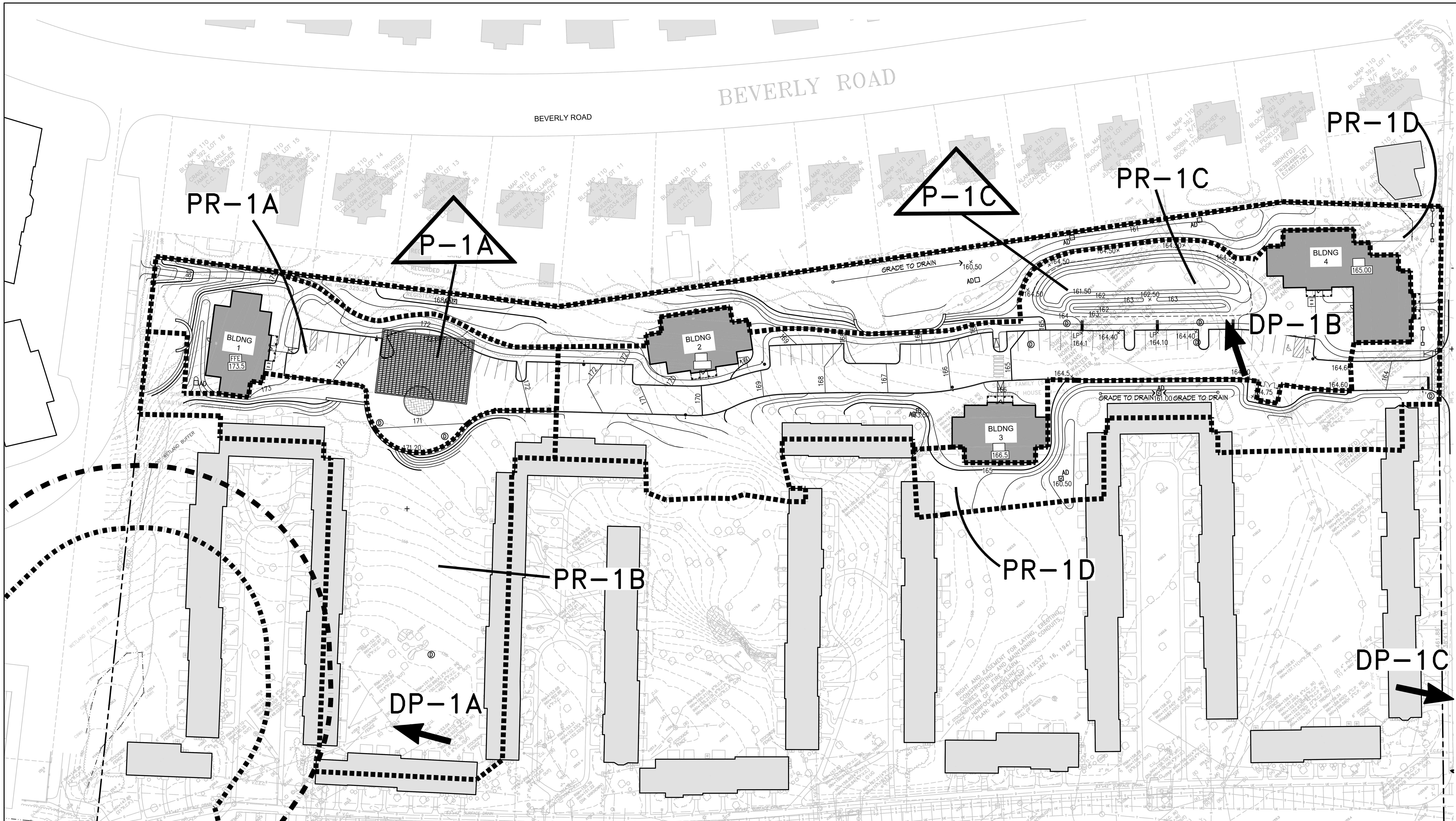

LEGEND

PR–1A	PROPOSED DRAINAGE AREA
DP–1A	DISCHARGE POINT
DP–1	DISCHARGE POINT AT WETLANDS NORTH
DP–3	DISCHARGE POINT AT DRAIN SYSTEM IN RUSSETT RD.
DP–4	DISCHARGE POINT AT VFW PARKWAY
P–1A	PROPOSED BASIN
	PROPOSED SUBCATCHMENT BOUNDARY
	PROPERTY BOUNDARY

NORTH

0 20' 40' 80'

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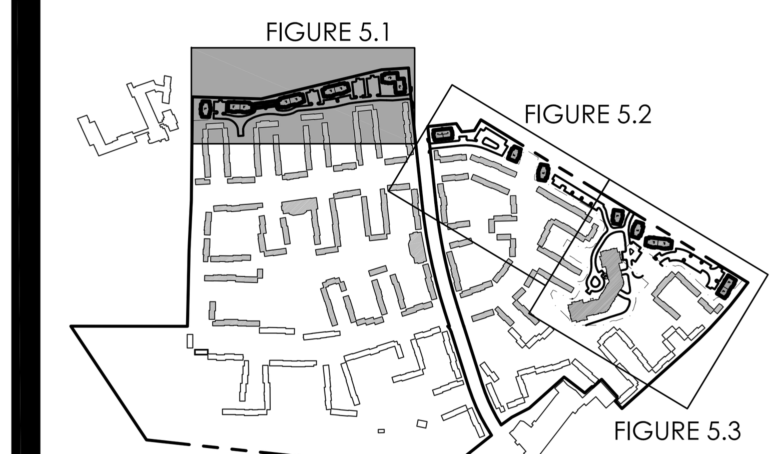

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CHESTNUT HILL REALTY

THE RESIDENCES AT SOUTH BROOKLINE

BROOKLINE, MA

Title

PROPOSED WATERSHED PLAN

Project No.	Scale	
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FIGURE 5.1

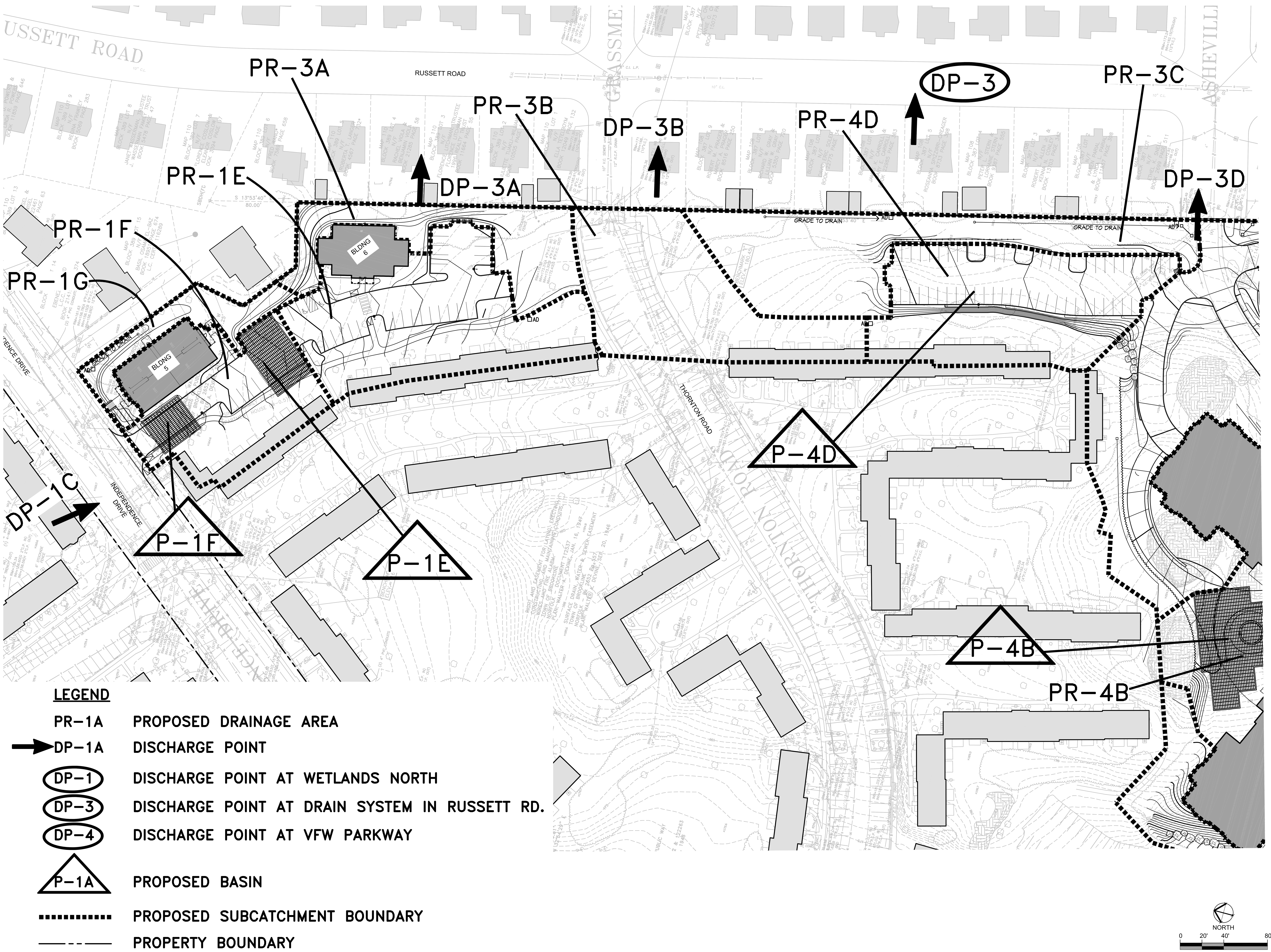

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FIGURE 5.1
FIGURE 5.2
FIGURE 5.3

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THE RESIDENCES AT SOUTH BROOKLINE

BROOKLINE, MA

Title

PROPOSED WATERSHED PLAN

Project No.	Scale
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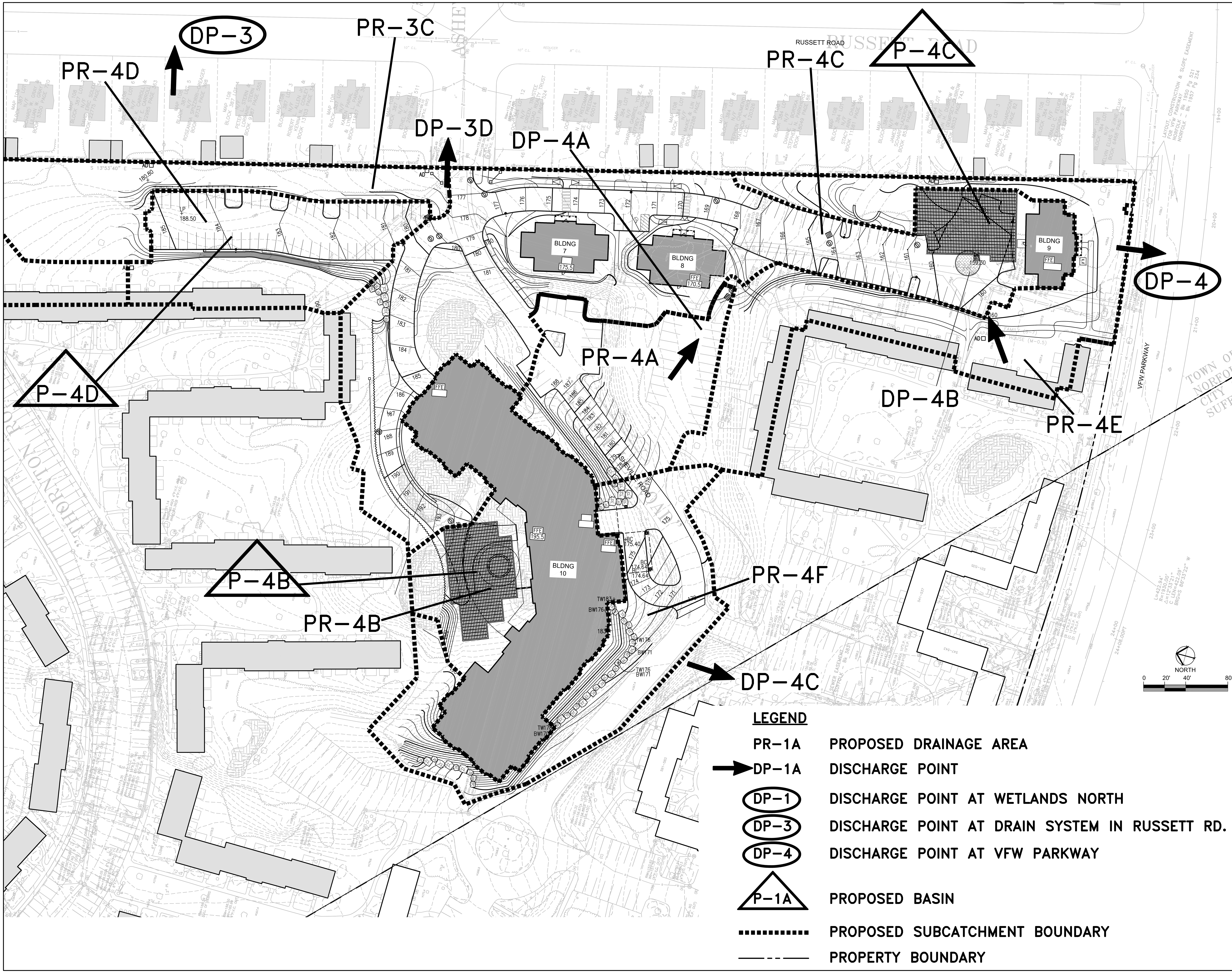
Sheet Drawing No.

FIGURE 5.2



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P-1A	PROPOSED BASIN
	PROPOSED SUBCATCHMENT BOUNDARY
	PROPERTY BOUNDARY

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FIGURE 5.1
FIGURE 5.2
FIGURE 5.3

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BROOKLINE, MA

Title

PROPOSED WATERSHED PLAN

Project No.	Scale
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FIGURE 5.3

3.0 Standard 3: Recharge

Stormwater Management Standard 3 States:

> *"The annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type."*
>
> *"Infiltration structures must be able to drain fully within 72 hours."*
>
> *"There must be at least a two-foot separation between the bottom of the infiltration structure and the seasonal high groundwater."*

For the project,

- The annual recharge from the post-development condition is able to approximate the annual recharge from the pre-development conditions based on soil type.
- The recharge volumes comprised of subsurface detention/infiltration basins and porous asphalt pavement are able to drain fully within 72 hours.
- There is greater than a two-foot separation between the bottom of the subsurface basin (infiltration structure) and the seasonal high groundwater.

Stormwater Management Standard 3 is met.

This section describes the procedures for determining compliancy with Stormwater Management Standard 3.

3.1 RECHARGE REQUIREMENT

3.1.1 Summary

The proposed stormwater management system will consist of two types of recharge areas; subsurface detention/infiltration basins and bioretention. The recharge areas for the project provide a recharge volume in excess of what is required based on the observed soils onsite.

Table 3.1 summarizes the recharge required and provided for the project.

Table3.1 – Recharge Summary

Storage Provided	Recharge Volume Required (cf)	Recharge Volume Provided (cf)
Suburface Detention/Infiltration Basins, Bioretention Basin	11,281	11,314

See Appendix F, Recharge Volume Calculations and Sections 3.1.2 and 3.1.3 for supporting calculations and analysis.

3.1.2 Determining the Recharge Requirement

The standard requires a determination of the Hydrologic Soil Group at the location where the recharge is proposed. A subsurface investigation was conducted which verified the soil strata as "B" soils beneath the proposed recharge systems. A complete summary of how the infiltration rate from recharge BMP was developed is provided in Section 2.2.1.

For hydrologic soil group "B," the required recharge volume equals 0.35 inches of runoff multiplied by the total impervious area at the post development condition. This results in an initial required recharge volume of 7,603 cf (Appendix F, Recharge Volume Calculations). This is summarized in Table 3.2 below.

Table 3.2 – Required Recharge Volume

Hydrologic Soil Group	Impervious Area (sf)	Target Depth*	Volume Required (cf)
B	260,688	0.35	7,603
		Initial Required Recharge Volume:	***7,603***

*The Target depth is from the Massachusetts Stormwater Handbook

During post-development conditions, 67 percent of the project area's impervious cover is routed through the subsurface detention/infiltration basins. This is greater than the minimum required 65 percent from the Stormwater Handbook. Therefore, a capture area adjustment is applied to the initial required recharge volume. The capture area adjustment is calculated by dividing the amount of impervious cover on the site (260,688 sf) by the amount of impervious area routed through the subsurface detention/infiltration basins (175,697 sf). This results in a capture area adjustment ratio of 1.48. This is multiplied by the initial required recharge volume of 7,603 cf resulting in a ***required recharge volume of 11,281 cf.***

3.1.3 Sizing the Recharge Volume

In order to accommodate the required recharge volume, the proposed stormwater management system will consist of subsurface detention/infiltration basins and bioretention basin. The recharge volumes were designed and sized using the "Static" method as described in the Massachusetts Stormwater Handbook, Volume 3, Chapter 1. The "Static" method was used to produce a larger storage volume resulting in a conservative approach. Hydrologic modeling (HydroCAD 10.00) was used to determine the size of the subsurface basin. See Appendix D for Ponds (P-1A, P-1C, P-1F, and P-4C). When designing the basins, the following was taken into consideration:

The basins are designed to accommodate the site characteristics of the ground surface, underlying soil types and subsurface conditions (seasonal high groundwater table, depth to bedrock, hydrologic conductivity rate and type of receiving soil layers). See Section 2.2.1.

Additionally, the basins are sized to provide a recharge volume of 11,314 **cubic feet**. This is in excess of what would be the required recharge if the site was comprised of suitable soils.

3.2 DRAWDOWN WITHIN 72 HOURS

The required drawdown time for the proposed recharge volumes shall be less than or equal to 72 hours. The drawdown time is calculated by dividing the storage volume by the permeability rate times the bottom area of the recharge volume.

Exhibit 3.1 – Drawdown Equation

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

where:

Rv = Required Storage Volume

K = Saturated Hydraulic Conductivity For "Static" and "Simple Dynamic" Methods, use Rawls Rate (Table 2.3.3, Massachusetts Stormwater Handbook). For "Dynamic Field" Method, use 50% of the in-situ saturated hydraulic conductivity.

Bottom Area = Bottom Area of Recharge Structure

The Storage Volume (Rv) for the subsurface basin and the Bottom Area was derived from HydroCAD (Appendix D) The Rawls Rate (K) used for the analysis was 0.17 in/hr and 0.27 in/hr (Section 2.2.1). This was the rate determined during the subsurface investigation and is equal to the Rawls rate corresponding to Hydrologic Soil Group "B". Supporting calculations are included in Appendix F Table 3.3 summarizes the drawdown time for the recharge volume.

Table3.3 – Summary of Drawdown Time

Subsurface Basin	Maximum Drawdown Time (hours)	Drawdown Time Provided (hours)
P-1A	72	9.55
P-1C	72	13.19
P-1F	72	19.18
P-4C	72	34.79

The drawdown times for all of the recharge volumes are less than the required drawdown time of 72 hours from Standard 3.

3.3 SEPARATION FROM SEASONAL HIGH GROUNDWATER

The Massachusetts Stormwater Handbook requires at least a two-foot separation between the bottom of the infiltration structure and the seasonal high groundwater table. During the subsurface investigations conducted by Pare and Stantec, and subsequent monitoring of groundwater elevations in monitoring wells,, groundwater was observed at varying elevations, see table 2.3 and description included in Section 2.2.1. The bottoms of the subsurface basins are listed in Appendix F.

The recharge volumes provide the required separation from the seasonally high groundwater table per Standard 3.

4.0 Standard 4: Water Quality

Stormwater Management Standard 4 states:

> *"Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:*
>
> *a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained.*
>
> *b. Structural stormwater best management practices are sized to capture the required water quality volume as determined in accordance with the Massachusetts Stormwater Handbook.*
>
> *c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

For the project,

- Pollution prevention practices are identified and a long term pollution prevention plan is implemented and maintained.
- The structural stormwater best management practices are sized to capture the required water quality volume as determined in accordance with the Massachusetts Stormwater Handbook
- Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

Stormwater Management Standard 4 is met.

This section describes the procedures for determining compliancy with Stormwater Management Standard 4.

4.1 LONG – TERM POLLUTION PREVENTION PLAN

The complete long-term pollution prevention plan for the project site is included as part of the Operation and Maintenance Plan (Section 9.2). A long term pollution prevention plan that fully meets the requirements of Standard 4 will be implemented and maintained.

- The pollution prevention plan includes; salt, sand and other deicing chemicals; proper management of fertilizers, herbicides, and pesticides; and stabilization of existing eroding surfaces.

- The new development design provides treatment for runoff from existing and proposed impervious surfaces within the project area to achieve 80% TSS removal.

- The contributing flow to the subsurface basin will be comprised of runoff from the roof of the proposed building. Since this roof will be non-metal it's runoff is considered to be "clean" and will not require TSS removal.

- The Standard has been met, except that not all of the site will flow to the subsurface detention/infiltration basins or the bioretention basinwhich have been sized to capture the required water quality volume. Stormwater from paved areas not directed to BMPs providing water quality volume will be routed thorugh BMPs that are sized to treat an equivalent Water Quality Flow Rate.

- The following pollution prevention measures have been considered:

    - Deicing materials will only be used to the extent needed to make the drive aisle and walkways safe.

    - Fertilizers, herbicides, and pesticides will only be used to the extent needed to maintain healthy plant materials and landscaped areas.

    - Landscaping that reduces the need for fertilizer, herbicides, and pesticides.

    - All trench drains will be inspected at least four times per year and cleaned a minimum of at least once per year. Sediment and/or floatable pollutants will be pumped from the trench drain. During colder periods, the trench drain grates will be kept free of snow and ice. During warmer periods, trench drain grates will be kept free of leaves, litter, sand, and debris.

- There are no discharges to impaired waters.

4.2 WATER QUALITY TREATMENT VOLUME

The project area is not located within a critical area therefore "Water Quality Depth" of 0.5-inches is utilized when computing the required water quality treatment. Water quality calculations are included in Appendix H.

4.3 TSS REMOVAL COMPUTATIONS

Standard 4 requires that a minimum of 80% Total Suspended Solids (TSS) removal rate be achieved in the proposed condition. TSS calculations are included in Appendix G of this report.

The following BMPs are proposed:

<u>Water Quality Units</u>
Nine water quality units (Stormceptor Model STC450i) are proposed to provide pretreatment

before stormwater is directed into four separate subsurface detention/infiltration basins, subsurface detention basin, or to the existing drainage system. The units have been sized based on the water quality volume (WQV) for runoff from a 1/2" storm event, in accordance with MassDEP guidance policies. WQV calculations are provided in Appendix H. The calculations for the TSS removal for each water quality unit and TSS removal for each treatment train are provided in Appendix G.

Subsurface Detention/Infiltration Basins
Four separate subsurface detention/infiltration basins (Stormtank units) are proposed to detain and infiltrate stormwater runoff. Stormwater will be pretreated prior to entering the system TSS removal in excess of 80% will be achieved for this treatment train

Subsurface Detention Basins
A separate subsurface detention basin (Stormtank units) is proposed to detain stormwater runoff. Stormwater will be pretreated prior to entering the system TSS removal in excess of 80% will be achieved for this treatment train

Bioretention Basin
A bioretention basin is proposed to detain and infiltrate stormwater runoff. Stormwater entering the system will be pretreated with a stone filter strip. An 80% TSS removal rate will be achieved for this treatment train.

Porous Asphalt Pavement
A surface parking and driveway constructed with porous asphalt pavement is proposed. The porous asphalt pavement will allow stormwater to travel vertically through a stone base before infiltrating into the subsoil. The stone storage bed has been designed to hold ½ inch of water quality volume and will drain within 72 hours therefore achieving 80% TSS removal based on compliance with the structural BMP specifications of the MassDEP stormwater handbook.

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5.0 Standard 5: Land Uses with Higher Potential Pollutant Loads

Stormwater Management Standard 5 states:

> *“For land uses with higher potential pollutant loads (LUHPPL), source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.”*
>
> *Stormwater discharges from LUHPPLs requires the use of a treatment train that provides 80% TSS removal prior to discharge and at least 44% TSS removal prior to discharge to the infiltration BMP.”*
>
> *“The infiltration BMP shall be designed to treat 1.0 in. of runoff times the total impervious area at the post development site.”*

The project is not considered a LUHPPL. Standard 5 is not applicable.

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6.0 Standard 6: Critical Areas

Stormwater Management Standard 6 states:

> *"Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook."*
>
> *Stormwater discharges from Outstanding Resource Waters requires the use of a treatment train that provides 80% TSS removal prior to discharge and at least 44% TSS removal prior to discharge to the infiltration BMP."*
>
> *"The infiltration BMP shall be designed to treat 1.0 in. of runoff times the total impervious area at the post development site."*

The project is not within a critical area. Standard 6 is not applicable.

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7.0 Standard 7: Redevelopment

Stormwater Management Standard 7 states:

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

The project is considered a new development in accordance with the Stormwater Handbook. The project includes new construction on a previously developed site.

The project is in full compliance with all the Stormwater Management Standards. Stormwater Management Standard 7 is met.

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8.0 Standard 8: Construction Period Pollution Prevention and Erosion & Sedimentation Control

Construction period pollution prevention and erosion and sedimentation control measures will be implemented at the project site to control construction related impacts during construction and land disturbance activities. The general contractor for the project will be responsible for implementation of the construction period controls.

8.1 EROSION AND SEDIMENT CONTROL MEASURES

The project will disturb more than one acre of land during the construction process and will require a NPDES Construction General Permit issued by the Environmental Protection Agency. As a result, a stormwater pollution prevention plan (SWPPP) will be required. The SWPPP document will satisfy the requirements of the construction period erosion, sedimentation and pollution prevention plan requirements outlined in Standard 8 of the Massachusetts Stormwater Handbook. A SWPPP has not been prepared for inclusion with this stormwater report; however one will be prepared prior to any construction activities at the site.

Without proper erosion and sediment control measures, grading, filling and installation of structures may cause erosion and sedimentation, resulting in temporarily increased turbidity and suspended solid loads. Runoff from construction sites may also transport sediment to downstream watercourses, where sediment deposition and accumulation will occur as flow velocities decrease.

Erosion and sedimentation controls will be employed to prevent the erosion and transport of sediment into adjacent areas and drainage systems during the earthwork and construction phases of the project. Erosion and sedimentation control measures will be installed prior to site excavation or disturbance and will be maintained throughout the construction period.

Below is a description of some of the erosion and sediment control measures that will be employed at the project and that will be included in the SWPPP.

Silt Fence and Straw Bale Barriers

Prior to any ground disturbance, a professional engineer or land surveyor will certify that a barrier of staked straw bales and silt fence is in place at the down gradient limit of work in accordance with the design plans. The barrier will be placed to trap sediment transported by runoff before it reaches the drainage system or leaves the construction site. The silt fence is a semi-permeable barrier made of a synthetic porous fabric which provides additional protection when used with straw bale barriers. When necessary, additional straw bale and silt fence barriers will be installed immediately down gradient of erosion-prone areas, such as the base of steep exposed slopes and around the base of stockpiles, throughout the construction phase of the project. The barriers will be entrenched into the substrate to prevent underflow.

The erosion control barriers will be inspected weekly and after every storm event. Any sediment that collects behind the barriers will be removed and will be either reused at the site or disposed of at a suitable offsite location. Any damaged sections of silt fence or hay bales will be repaired or replaced. The underside of straw bales will be kept in close contact with the earth and reset as necessary. Straw bale barriers and silt fences will be maintained and cleaned until slopes have healthy stands of grass.

Catch Basin Inlet Protection

The inlets of proposed and existing catch basins will be protected from sediment inflow during the work period through the installation of Siltsacks™. A layer of filter fabric will be installed beneath the grates of the catch basins. The inlets of existing catch basins will be protected by Siltsacks™. These protection measures will be inspected after every storm event and will be routinely maintained until the drainage area tributary to each inlet has been stabilized with vegetation and/or covered by pavement. Any sediment that collects behind the barrier or in the sacks will be removed and will be either reused onsite or disposed of at a suitable off-site location.

Dust Control

Fugitive dust from large areas of unstabilized soil can be a problem during construction. On dry and windy days when dust generation is a concern, a water truck will traverse the site and spray water as necessary to prevent dust from forming. Calcium chloride may also be applied to the ground in granular form to attract atmospheric moisture, dampening the ground and preventing fugitive dust.

Slope Stabilization

A temporary vegetative cover will be established on areas of exposed soils (including stockpiles) that remain inactive and unstabilized for a period of more than 30 days for slopes, and weather permitting. The seeded surfaces will be covered with a layer of straw mulch or hydro mulch as described above.

Upon completion of final grading, any areas not covered by pavement, other forms of stabilization, or other methods of landscaping will be seeded with an erosion control seed mix. On slopes 4:1 and greater, loamed and seeded areas will be mulched with hay to prevent erosion prior to germination of the seed. After disturbed areas have been stabilized, the temporary erosion control measures will be removed and accumulated sediment will be removed and disposed of in an appropriate location.

Stabilized Construction Entrance

Temporary stabilized construction entrances will be installed at the site. The purpose of the construction entrance is to remove sediment attached to vehicle tires and to minimize sediment transport and deposition onto public road surfaces. The construction entrances will be composed of beds of crushed stone which will be replenished as necessary to maintain their proper function. The stone will be placed over a layer of non-woven filter fabric. The stabilized construction entrances will remain in place until a binder coat of pavement has been established in areas to be paved.

8.2 MATERIAL MANAGEMENT PRACTICES

The following material management practices will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff. These include good housekeeping practices and guidelines for the handling of hazardous products. The following good housekeeping practices will be followed on-site during the construction period.

- An effort will be made to store only enough products required to do the job.
- All materials stored on-site will be stored in a neat, orderly manner in their appropriate containers, and (if possible) under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used before disposing of the container.
- Manufacturer's recommendations for proper use and disposal will be followed.
- The site superintendent will inspect the storage area daily to ensure proper use and disposal of materials on-site.

The following practices will reduce the risks associated with hazardous materials (e.g., petroleum products, solvents):

- A copy of all Material Safety Data Sheets (MSDS) for materials or products used during construction will be kept in the office trailer.
- Products will be kept in original containers unless they are not re-sealable.
- Original labels and material safety data (MSD sheets) will be retained; they contain important product information.
- If surplus product must be disposed, manufacturer's or local- and state-recommended methods for proper disposal will be followed.

8.3 PRODUCT SPECIFIC PRACTICES

The following product-specific practices will be followed on-site. Recommendations are provided for petroleum products, fertilizers, solvents, paints, and other hazardous substances.

Petroleum Products

All on-site vehicles will be monitored for leaks and will receive regular preventive maintenance to reduce the chance of leakage. No vehicle maintenance will occur on site. Petroleum products will be stored in tightly sealed containers that are clearly labeled. Any asphalt substances used on-site will be applied according to manufacturer's recommendations.

Fertilizers

Fertilizers will be applied only in the minimum amounts recommended by the manufacturer. Once applied, the fertilizer will be worked into the soil to limit exposure to stormwater. Storage will be in a covered area; and the contents of any partially used bags will be transferred to a sealable, plastic bin to avoid spills.

Solvents, Paints, and other Hazardous Substances

All containers will be tightly sealed and stored when not required for use. Excess materials will not be discharged to the storm sewer system, but will be properly disposed according to manufacturer's instructions or state and local regulations.

Concrete Trucks

Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water into catch basins or drainage systems that are already in place.

8.4 SPILL CONTROL/NOTIFICATION PRACTICES

In addition to the good housekeeping and material management practices discussed above, the following practices will be followed for spill control, notification and cleanup.

- Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be informed of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area on-site. Equipment and materials will include, but will not be limited to, shovels, wheel barrows, brooms, dust pans, mops, rags, gloves, goggles, kitty litter or Speedi-Dry, sand, sawdust, and plastic and metal trash containers specifically designated for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material in excess of reportable quantities, as established in the Massachusetts Contingency Plan (MCP), will be reported to the Massachusetts Department

of Environmental Protection Division of Hazardous Waste [(617) 292-5851 or (978) 661-7679].

- The construction superintendent responsible for the daily operations will be the spill prevention and cleanup coordinator. He will designate at least three other site personnel to receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of the responsible spill personnel will be posted in the material storage area and in the on-site office trailer.

8.5 MAINTENANCE PROGRAM PRACTICES: PRIOR OR DURING CONSTRUCTION

In addition to the maintenance described for each stormwater control, the following practices should be followed:

- Prior to construction, install erosion and sediment control measures as shown on the plan and details.
- The site contractor shall inspect all sediment and erosion control structures after each rainfall event and at the end of the working day.
- All measures shall be maintained in good working order. If repair is necessary, it shall be initiated within 24 hours of inspection.
- Silt shall be removed from the filter bags if depths reach 6-inches or greater and as-needed.
- Sediment shall be contained within the construction site and away from drainage structures.
- Damaged or deteriorated erosion control measures will be repaired immediately after identification.
- The contractor’s site superintendent will be responsible for inspection, maintenance and repair activities.

Erosion control measures shall remain in place until all construction is completed and all disturbed earth is stabilized.

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9.0 Standard 9: Operation and Maintenance Plan

The goal of the operation and maintenance plan is not only to protect resources on-site or nearby, but also to protect resources in the region that may be affected by the activities at the site. Water quality treatment measures and the implementation of Best Management Practices (BMP's) for structural controls will result in the treatment of site stormwater and the removal of a minimum of 80 percent of the total suspended solids (TSS) load in runoff prior to discharge from the site, consistent with Massachusetts DEP’s TSS removal standard.

The stormwater management system will be owned by the Chestnut Hill Realty. They will be responsible for operation and maintenance. An Operation and Maintenance Log has been prepared for this project and is included in this report as Appendix J.

9.1 STRUCTURAL POLLUTANT CONTROLS

The proposed stormwater management system is designed to protect runoff water quality through the removal of sediment and pollutants. Structural pollutant controls used to separate and capture stormwater pollutants are described below.

Proprietary Separators

Proprietary separators will be inspected and cleaned in strict accordance with the manufacturer’s recommendations and requirements. The manufacturer’s recommendations and requirements are included in Appendix K, Stormceptor Inspection and Maintenance Log.

Roof Drain Leaders

Roof runoff from the proposed building will be directed to underground piped drainage systems. Routine roof inspections will be performed. Roofs will be kept clean and free of debris, and the roof drainage systems will be kept clear. Gutters and downspouts connected to the drainage system will be cleaned at least twice per year, or more frequently as necessary.

Subsurface Detention/Infiltration Basins

The subsurface detention/infiltration basins at the proposed project site will be Brentwood Industries Stormtank. They are used for infiltration. The basins require maintenance to remain functional. Well maintained pretreatment BMP’s (i.e. Proprietary Separators) will reduce the need for maintenance of the subsurface basins.

See Appendix L, Stormtank Maintenance Guidelines for additional information.

Catch Basins and Area Drains

All catch basins at the site will be equipped with deep sumps and hooded outlets to trap debris, sediments, and floating contaminants, which are the largest constituents of urban runoff. The proper removal of sediments and associated pollutants and trash occurs only when catch basin inlets and sumps are cleaned out regularly. The more frequent the cleaning, the less likely sediments will be re-suspended and subsequently discharged. In addition, frequent cleaning also results in more volume available for future deposition and enhances overall performance.

Catch basins and area drains will be cleaned a minimum of four times and inspected monthly for the first year to determine the sediment loading for the site. Any sand, sediment, or debris that collects (when it reaches a depth of more than ½ the sump depth, which is 2 feet for catch basins and area drains) will be removed as needed. After the first year, the frequency of the catch basin cleaning should be reviewed and revised based upon the sediment loading observed in the first year. Any structural damage or other indication of malfunction will be reported to the site manager. During colder periods, the catch basin grates will be kept free of snow and ice.

This practice, in coordination with minimal use of sand, and street sweeping comprises a multi-level source control approach that prevents sand/sediments and litter from exiting off-site and/or ultimately into the resource areas.

Porous Asphalt Pavement

A large portion of the parking area consists of porous asphalt pavement. Porous asphalt pavement is a paved surface with a higher than normal percentage of air voids to allow water to pass through it and infiltrate into the subsoil. Regular maintenance of the area is required to help prevent clogging. After storms, monitor the surface to ensure that it is draining properly. As needed, clean the surface using a power washer to dislodge trapped particles and then vacuum sweep the area. The surface should be cleaned quarterly with a vacuum sweeping machine. Inspect the surface annually for deterioration. No winter sanding shall be conducted on the porous surface. Salt use shall be minimized during winter months. Do not reseal or repave with any impermeable material.

Bioretention Areas

The bioretention areas are shallow surface depressions planted with specially-selected native vegetation to treat runoff. The vegetation in the bioretention areas serve to filter runoff — improving water quality and reducing runoff quantity — and the root systems enhance infiltration. The soil medium filters out pollutants and allows storage and treatment of stormwater runoff through filtering. Bioretention areas in good working condition may mimic natural forest ecosystems through species diversity, density and distribution of vegetation, and the use of native species, resulting in a system that is resistant to insects, disease, pollution, and climatic stresses.

Bioretention areas require routine maintenance (similar to conventional landscaping maintenance) to ensure that the systems are in good working condition. Bioretention areas should be inspected twice the first year and annually thereafter for sediment buildup, erosion, vegetative conditions, etc. If sediment build-up is found, core aeration or cultivating of un-vegetated areas may be required to ensure adequate filtration.

The inflow location should be inspected annually for clogging. Any built-up sediment should be removed to prevent runoff from bypassing. The bioretention areas should be inspected after large storm events (greater than 1”) to ensure that proper drainage is occurring. While the plants selected for the rain garden are tolerant of wet soils, they are not wetland species that can survive long periods of inundation. Immediate attention is required to prevent the loss of plant materials if long periods of standing water are visible. Do not use fertilizers in the bioretention areas as excessive nutrients may migrate to the underdrain and be discharged to adjacent wetlands. Bioretention areas may require watering during periods of extended drought.

Vegetated Areas Maintenance

Although not a structural component of the drainage system, the maintenance of vegetated areas may affect the functioning of stormwater management practices. This includes the health/density of vegetative cover and activities such as the application and disposal of lawn and garden care products, disposal of leaves and yard trimmings.

Initial Post-Construction Inspection

During the initial period of vegetation establishment in disturbed areas pruning and weeding are required twice in first year by contractor or owner. Any dead vegetation/plantings found after the first year will be replaced. Proper mulching is mandatory and regular watering may be required initially to ensure proper establishment of new vegetation.

Long-Term Maintenance

Weeds and invasive plant species will be removed by hand. Leaf litter and other detritus shall be removed twice per year. If needed to maintain aesthetic appearance, perennial plantings may be trimmed at the end of the growing season. Trees and shrubs will be inspected twice per year to evaluate health and attended to as necessary. Seeded ground cover or grass areas shall not receive mulching. PH tests of the soils in the planting bed will occur annually. If the pH is below 5.2, limestone will be applied to increase it. If the pH is above 8.0, iron sulfate plus sulfur will be added accordingly.

9.2 LONG TERM POLLUTION PREVENTION PLAN

The following measures will be employed to control potential sources of contamination and prevent pollution at the project site:

Deicing

To prevent increased pollutant concentrations in stormwater discharges, the amount of road salt applied will be controlled. The amount of deicing materials used will be monitored with the goal of using only enough to make the drive aisle and walkways safe.

Fertilizer/Pesticide/Herbicide Application

The facility will require that landscaping maintenance contractors implement a program to test soils at the site annually and to limit the amount of fertilizer, pesticides and herbicides to only what is needed to maintain healthy plant materials and landscaped areas. PH tests of the soils in the planting bed will occur annually. If the pH is below 5.2, limestone will be applied to increase it. If the pH is above 8.0, iron sulfate plus sulfur will be added accordingly.

No pesticides or herbicides are to be used unless a single spot treatment is required for a specific control application.

Fertilizer usage will be avoided. If deemed necessary, slow release fertilizer will be used, and applied only in the minimum amounts recommended by the manufacturer. Once applied, the fertilizer will be worked into the soil to limit exposure to stormwater. Storage will be in a covered area; and the contents of any partially used bags will be transferred to a sealable, plastic bin to avoid spills.

Fertilizer will be used to begin the establishment of vegetation in bare or damaged areas, but will not be applied on a regular basis unless necessary.

Records of soil management, application dates, planting dates, preventive measures, treatments and other appropriate information should be kept. This information will be used as a reference when fertilizer/pesticide/herbicide management decisions in the future.

Materials Management/Housekeeping Practices

The following product-specific practices will be followed on-site. Recommendations are provided for petroleum products, fertilizers, solvents, paints, and other hazardous substances, and concrete.

Petroleum Products - No vehicle maintenance or handling of petroleum products will occur on site. Petroleum products will be stored in tightly sealed containers that are clearly labeled. Any asphalt substances used on-site will be applied according to manufacturer's recommendations.

Solvents, Paints, and other Hazardous Substances - All containers will be tightly sealed and stored indoors when not required for use. Excess materials will not be discharged to the storm sewer system, but will be properly disposed according to manufacturer's instructions or state and local regulations. Outside storage on the property will be prohibited.

Spill Prevention Practices

The facility will implement a spill prevention program that will include storm water contamination assessment, flow diversion, record keeping, internal reporting, employee training, and preventive maintenance. The following specific practices will be followed for spill control, notification and cleanup.

- Manufacturer's recommended methods for spill cleanup for any chemicals used or stored on site will be clearly posted and site personnel will be informed of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area on-site. Equipment and materials may include, as appropriate, shovels, wheel barrows, brooms, dust pans, mops, rags, gloves, goggles, kitty litter or Speedi-Dry, sand, sawdust, and plastic and metal trash containers specifically designated for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material in excess of reportable quantities, as established in the Massachusetts Contingency Plan (MCP), will be reported to the Massachusetts Department of Environmental Protection Division of Hazardous Waste [(617) 292-5851 or (978) 661-7679].

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10.0 Standard 10: Prohibition of Illicit Discharges

Standard 10 of the Massachusetts Stormwater Handbook prohibits illicit discharges to stormwater management systems. As stated in the handbook, “The stormwater management system is the system for conveying, treating, and infiltrating stormwater on-site, including stormwater best management practices and any pipes intended to transport stormwater to the groundwater, a surface water, or municipal separate storm sewer system. Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater.”

It is fully understood that the Storm Water Pollution Prevention Plan (SWPPP) for the project will include procedures to prevent illicit discharges to the stormwater management system during construction.

Standard 10 also states that “The Illicit Discharge Compliance Statement must be accompanied by a site map that is drawn to scale and that identifies the location of any systems for conveying stormwater on the site and shows that these systems do not allow the entry of any illicit discharges into the stormwater management system. The site map shall identify the location of any systems for conveying wastewater and/or groundwater on the site and show that there are no connections between the stormwater and wastewater management systems and the location of any measures taken to prevent the entry of illicit discharges into the stormwater management system.” Included with this report are drawings that display the location of all of the stormwater management components as well as other utilities (existing and proposed) on the project site and conforms to requirements of a “site map” to accompany the Illicit Discharge Compliance Statement.

The Illicit Discharge Compliance Statement for the project is as follows:

Illicit Discharge Compliance Statement

Per the requirements of Standard 10 of the Massachusetts Stormwater Management Standards it shall be stated that No Illicit Discharges exist on the project.

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Figures

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STORMWATER REPORT
THE RESIDENCES OF SOUTH BROOKLINE
BROOKLINE, MASSACHUSETTS

STORMWATER REPORT
THE RESIDENCES OF SOUTH BROOKLINE
BROOKLINE, MASSACHUSETTS

Figure 1 – USGS Topographic Map

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Figure 1 - USGS Topographic Map
The Residences of South Brookline
Brookline, MA
September 2013

Data Source: "Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division"

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Boston, MA 02114

Figure 2 – Aerial Photo

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Figure 2 - Aerial Photo
The Residences of South Brookline
Brookline, MA
September 2013

Data Source: "Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division" and aerial from "Bing Maps aerial imagery web mapping service"

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Appendix

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STORMWATER REPORT
THE RESIDENCES OF SOUTH BROOKLINE
BROOKLINE, MASSACHUSETTS

STORMWATER REPORT
THE RESIDENCES OF SOUTH BROOKLINE
BROOKLINE, MASSACHUSETTS

APPENDIX A – MASSACHUSETTS STORMWATER REPORT CHECKLIST AND CERTIFICATION

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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.

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[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
FRANK HOLMES
CIVIL
No. 40203
REGISTERED
PROFESSIONAL ENGINEER

Frank Holmes 8.22.14

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): Porous Pavement

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.

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[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 (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 (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.

Stantec

STORMWATER REPORT
THE RESIDENCES OF SOUTH BROOKLINE
BROOKLINE, MASSACHUSETTS

APPENDIX B – SOILS AND GEOTECHNICAL

- **CUSTOM SOIL RESOURCE REPORT**
- **SOIL SUITABILITY LOGS**
- **MONITORING WELL LOGS**
- **GEOTECHNICAL REPORT (PARE CORPORATION)**

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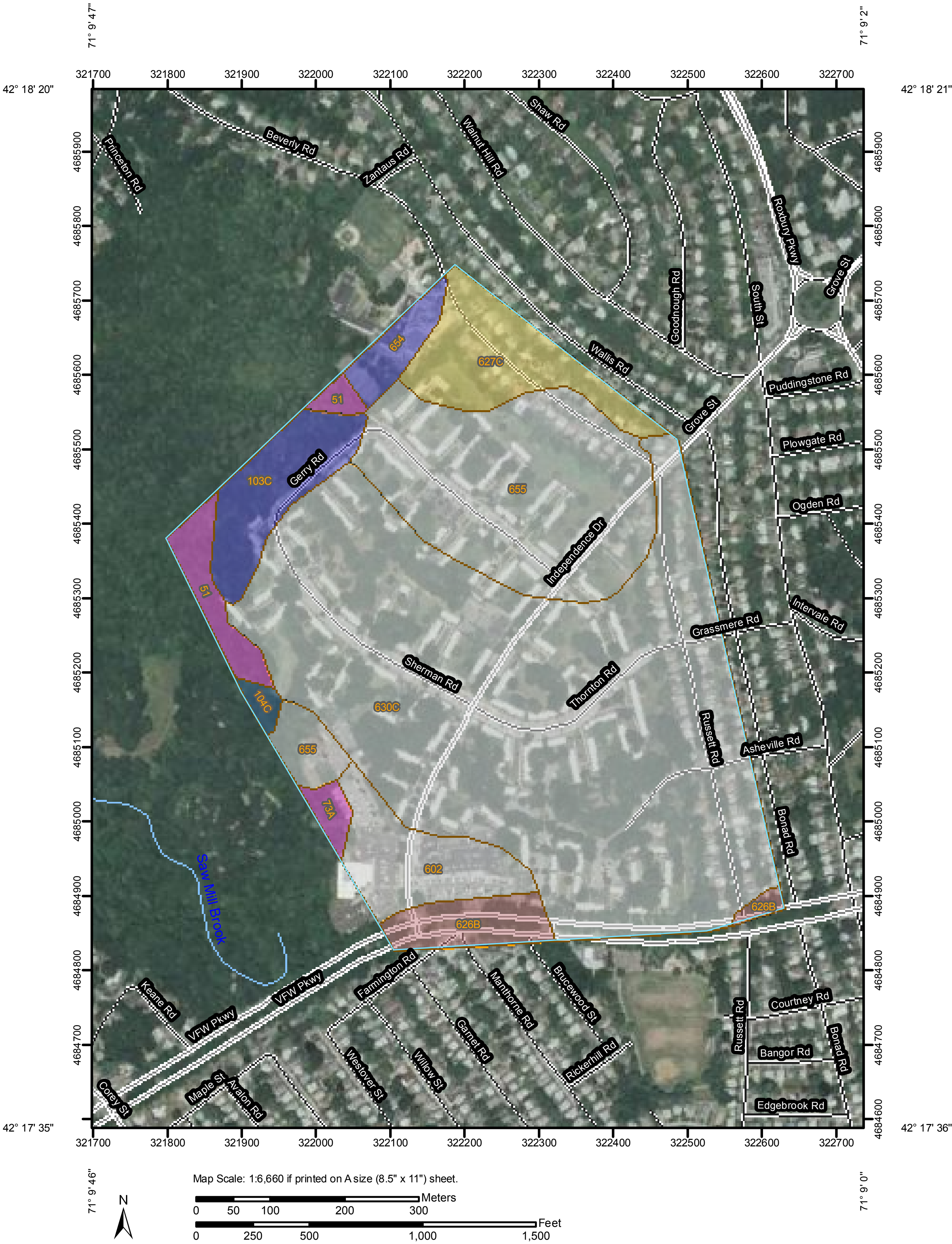


Map Scale: 1:6,660 if printed on A size (8.5" x 11") sheet.

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:6,660 if printed on A size (8.5" × 11") sheet.

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 19N NAD83

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 8, Jul 23, 2010

Date(s) aerial images were photographed: 7/10/2003

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.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Norfolk and Suffolk Counties, Massachusetts (MA616)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
51	Swansea muck, 0 to 1 percent slopes	D	3.2	2.6%
73A	Whitman fine sandy loam, 0 to 5 percent slopes, extremely stony	D	0.9	0.8%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	B	5.8	4.8%
104C	Hollis-Rock outcrop-Charlton complex, 3 to 15 percent slopes	C/D	0.6	0.5%
602	Urban land, 0 to 15 percent slopes		6.4	5.2%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	3.7	3.1%
627C	Newport-Urban land complex, 3 to 15 percent slopes	C	7.5	6.2%
630C	Charlton-Hollis-Urban land complex, 3 to 15 percent slopes		67.9	56.1%
654	Udorthents, loamy	B	2.1	1.8%
655	Udorthents, wet substratum		22.9	18.9%
Totals for Area of Interest			**121.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MW-1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-2"	A	DR Brown (10YR 2/2)				Fine Sandy Loam	0			Firm	
2"-29"	B	Yellowish Brown (10YR 4/4)				Loam w/ Clay pockets	5			Firm	
29"-120"	C/D	Olive (5Y 4/3 --> 4)				Sandy Clay Loam	5			Friable to Firm	

Additional Notes:

Water at 93 inches

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MW-2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-6"	A	DK Brown (10YR 2/2)				Silt Loam	0		Friable		
6"-18"	B	Olive Grey (5Y 5/2)				Silt	0		Friable		
18"-72"	C	Olive (5Y 5/3 --> 4)				Silt Loam	0		Firm		

Additional Notes:

Water at 30 inches

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MW-3

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-10"	A	DK Brown (10YR 3/3)				Fine Sandy Loam	1-2 +/-			Friable	
10"-144"	C/D	Olive Brown (2.5Y 5/2 --> 4)				Sandy Clay Loam	10 +/-			Firm	

Additional Notes:

Water at 112 inches

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MW-4

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-26"	A	DR Brown (10YR 5/3)				Fine Sandy Loam	1-2 +/-			Friable	
26"-96"	C/D	Olive Brown (2.5Y 5/2 --> 4)				Sandy Clay Loam	5 +/-			Firm	

Additional Notes:

No water observed at time of drilling

Auger encountered bedrock at 96 inches, advanced auger to 108 inches

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MW-5

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-7"	A	DK Brown (10YR 3/3)				Fine Sandy Loam	1-2 +/-			Friable	
7"-96"	C/D	Olive Brown (2.5Y 5/2 --> 4)				Sandy Clay Loam	5			Firm	

Additional Notes:

No water observed at time of drilling

Auger encountered bedrock at 96 inches, advanced auger to 108 inches

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MW-6

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-6"	A	DK Brown (10YR 3/3)				Fine Sandy Loam	2-4 +/-			Friable	
6"-120"	C/D	Olive Brown (2.5Y 5/2 --> 4				Sandy Clay Loam	10			Firm	

Additional Notes:

Water at 48 inches

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: MW-7

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-11"	A	DK Brown (10YR 2/2)				Fine Sandy Loam	1-2 +/-			Friable	
11"-144"	C/D	Olive Brown (2.5Y 5/3 --> 5)				Sandy Clay Loam	5 +/-			Firm	

Additional Notes:

Water at 120 inches

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

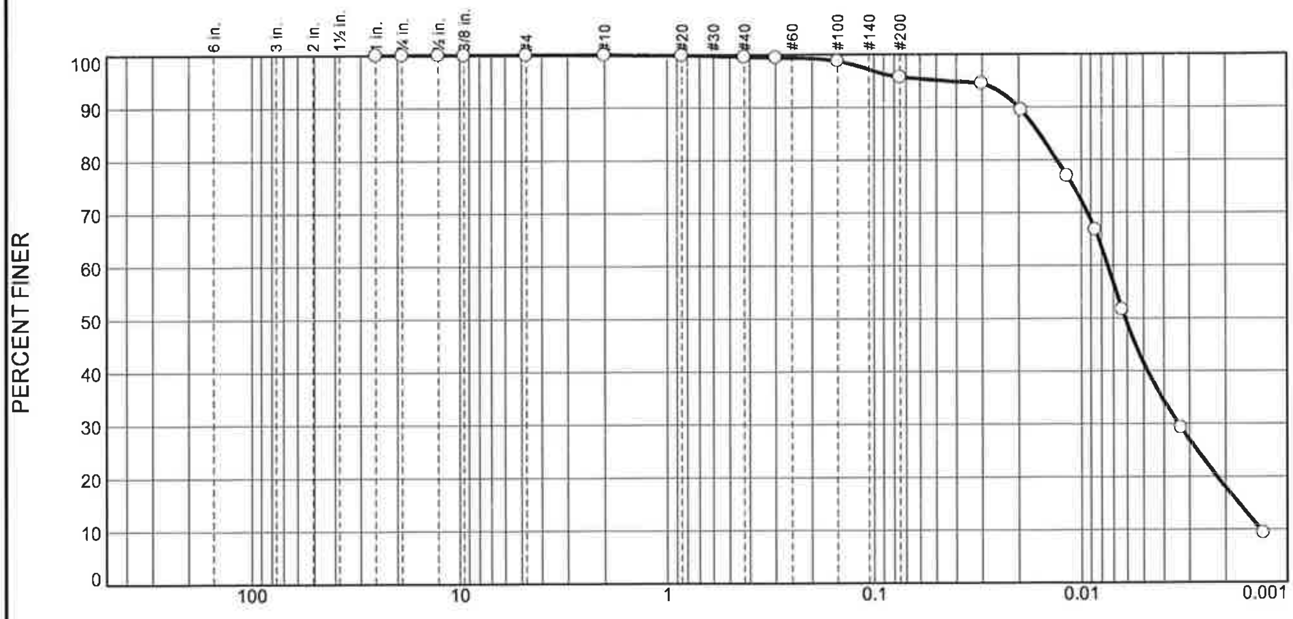
C. On-Site Review (continued)

Deep Observation Hole Number: MW-8

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-10"	A/B	DR Redish Brown (7.5YR 3/3) Yellowish Brown (10YR 5/6)				Fine Sandy Loam	5 +/-			Friable	
10"-36"	B/C	Brown (7.5YR 4/4 4/6)				Sandy Loam	5 +/-			Friable	
36"-117"	C/D	Olive Brown (2.5Y 5/4)				Sandy Clay Silt	15 +/-			Firm	
		Pale Yellow (10YR 7/3)									

Additional Notes:
Water at 108 inches

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.4	3.9	54.3	41.4

Test Results (ASTM C 136 & ASTM C 117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.6		
#50	99.4		
#100	98.7		
#200	95.7		
0.0303 mm.	94.4		
0.0195 mm.	89.5		
0.0117 mm.	76.9		
0.0086 mm.	66.8		
0.0064 mm.	51.7		
0.0033 mm.	29.2		
0.0013 mm.	9.3		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 0.0201 D_{85}= 0.0159 D_{60}= 0.0075
D_{50}= 0.0061 D_{30}= 0.0034 D_{15}= 0.0017
D_{10}= 0.0014 C_u= 5.51 C_c= 1.14

Remarks

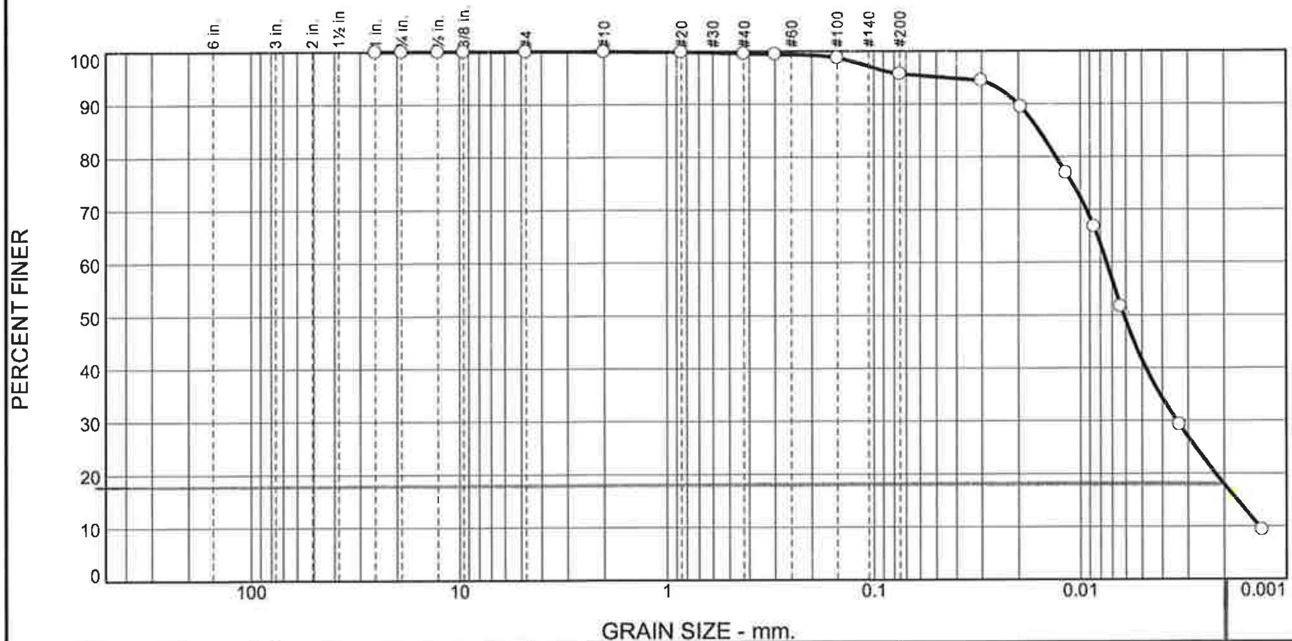
Date Received: 1/28/13 **Date Tested:** 1/29/13
Tested By: John McCarthy
Checked By:
Title:

Location: MW-2 **Date Sampled:** 1/28/13
Sample Number: 13-081 **Depth:** 4-6'

JOHN TURNER
Dover, NH

Client: Stantec
Project: Residences of South Brookline
Project No: 13-25-004 **Figure** 002

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay CLAY
0.0	0.0	0.0	0.0	0.4	3.9	77.7 ~~54.3~~	~~41.4~~ 18

Test Results (ASTM C 136 & ASTM C 117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.6		
#50	99.4		
#100	98.7		
#200	95.7		
0.0303 mm.	94.4		
0.0195 mm.	89.5		
0.0117 mm.	76.9		
0.0086 mm.	66.8		
0.0064 mm.	51.7		
0.0033 mm.	29.2		
0.0013 mm.	9.3		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

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D_{10}= 0.0014 C_u= 5.51 C_c= 1.14

Remarks

Date Received: 1/28/13 **Date Tested:** 1/29/13
Tested By: John McCarthy
Checked By:
Title:

Location: MW-2 **Date Sampled:** 1/28/13
Sample Number: 13-081 **Depth:** 4-6'

JOHN TURNER
Dover, NH

Client: Stantec
Project: Residences of South Brookline
Project No: 13-25-004 **Figure** 002

MONITORING WELL LOG

MW-1

Stantec

CLIENT

LOCATION **Hancock Village, Brookline, Massachusetts**

DATES: BORING **1/22/2013 to 1/22/2013** WATER LEVEL **93 inches**

PROJECT No. **210810271**

BOREHOLE No. **MW-1**

DATUM

DEPTH (ft)	ELEVATION (ft)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (in.)	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
0		Brown, silty SAND with organics (FINE SANDY LOAM)			Flush mounted roadway box					
		Loose, brown, fine to coarse SAND, trace gravel (LOAM WITH CLAY POCKETS)			2 inch PVC riser in drill cuttings	SS	1	2	8	
		Dense to very dense, brown, fine to coarse silty SAND and GRAVEL (SANDY CLAY LOAM)			2 inch PVC riser in bentonite	SS	2	21	54	
5					2 inch PVC riser in filter sand Top of screen at 5 feet	SS	3	22	49	
						SS	4	22	73	
					2 inch PVC in filter sand					
						SS	5	17	39	
10		Boring terminated at 10.0 feet below the ground surface. No refusal.			Bottom of screen at 10 feet					
15										

Driller: NH Boring, CME 550 rubber tired rig with autohammer, 4.25 inch HSA; Stantec Field Representative: Jason Ward

STANTEC-MON-I BORING LOGS.GPJ JW NHP.GDT 2/8/13

MONITORING WELL LOG

MW-2

Stantec

CLIENT

PROJECT No. 210810271

LOCATION **Hancock Village, Brookline, Massachusetts**

BOREHOLE No. **MW-2**

DATES: BORING **1/22/2013 to 1/22/2013** WATER LEVEL **30 inches** DATUM

DEPTH (ft)	ELEVATION (ft)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (in.)	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
0		Brown, silty SAND with organics (SILT LOAM)			Flush mounted roadway box					
		Loose, gray, silty fine SAND (SILT)			2 inch PVC riser in bentonite	SS	1	12	7	
		Very stiff, olive brown, silty CLAY (SILT LOAM)			2 inch PVC riser in filter sand					
					Top of screen at 2 feet	SS	2	20	16	
					2 inch PVC in filter sand					
5						SS	3	18	22	
					Bottom of screen at 6 feet	SS	4	0	Ref	
		Auger refusal at 6.3 feet below the ground surface. Probable bedrock.								
10										
15										

Driller: NH Boring, CME 550 rubber tired rig with autohammer, 4.25 inch HSA; Stantec Field Representative: Jason Ward

MONITORING WELL LOG

MW-3

Stantec

CLIENT

LOCATION Hancock Village, Brookline, Massachusetts

DATES: BORING 1/22/2013 to 1/22/2013 WATER LEVEL 112 inches

PROJECT No. 210810271

BOREHOLE No. MW-3

DATUM

DEPTH (ft)	ELEVATION (ft)	SOIL DESCRIPTION	WELL CONSTRUCTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (in.)	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
0		Brown, silty fine SAND with organics (FINE SANDY LOAM)	Flush mounted roadway box					
		Dense, brown, fine to coarse silty SAND and GRAVEL (SANDY CLAY LOAM)	2 inch PVC riser in cuttings	SS	1	10	8	
			2 inch PVC riser in bentonite	SS	2	18	42	
			2 inch PVC riser in filter sand					
5			Top of screen at 5 feet	SS	3	19	34	
				SS	4	18	41	
			2 inch PVC in filter sand					
				SS	5	1	37	
10			Bottom of screen at 10 feet					
				SS	6	13	31	
		Boring terminated at 12.0 feet below the ground surface. No refusal.						
15								

Driller: NH Boring, CME 550 rubber tired rig with autohammer, 4.25 inch HSA; Stantec Field Representative: Jason Ward

MONITORING WELL LOG

MW-4

Stantec

CLIENT

LOCATION **Hancock Village, Brookline, Massachusetts**

DATES: BORING **1/22/2013 to 1/22/2013** WATER LEVEL **NE**

PROJECT No. **210810271**

BOREHOLE No. **MW-4**

DATUM

DEPTH (ft)	ELEVATION (ft)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES TYPE	NUMBER	RECOVERY (in.)	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
0		Dark brown, fine to medium sandy SILT with organics (FINE SANDY LOAM)			Flush mounted roadway box; 2 inch PVC riser in cuttings	SS	1	2	10	
		Very dense, brown, fine to coarse silty SAND and GRAVEL (SANDY CLAY LOAM)			2 inch PVC riser in bentonite	SS	2	16	52	
					2 inch PVC riser in filter sand; Top of screen at 4 feet	SS	3	0	Ref	
5						SS	4		Ref	
					2 inch PVC in filter sand					
		Auger grinding from 8 to 9 feet. Probable bedrock.				SS	5	1	Ref	
		Auger refusal at 9.0 feet below the ground surface. Probable bedrock.			Bottom of screen at 9 feet					
10										
15										

Driller: NH Boring, CME 550 rubber tired rig with autohammer, 4.25 inch HSA; Stantec Field Representative: Jason Ward

MONITORING WELL LOG

MW-5

Stantec

CLIENT

PROJECT No. 210810271

LOCATION Hancock Village, Brookline, Massachusetts

BOREHOLE No. MW-5

DATES: BORING 1/23/2013 to 1/23/2013

WATER LEVEL NE

DATUM

DEPTH (ft)	ELEVATION (ft)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (in.)	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
0		Brown, silty fine SAND with organics (FINE SANDY LOAM)			Flush mounted roadway box					
		Very dense, brown, medium to coarse silty SAND and GRAVEL (SANDY CLAY LOAM)			2 inch riser in cuttings	SS	1	9	4	
					2 inch PVC riser in bentonite	SS	2	6	Ref	
		Auger grinding on cobbles from 3.5 to 7 feet.			2 inch PVC riser in filter sand					
					Top of screen at 4 feet					
5						SS	3	7	Ref	
					2 inch PVC in filter sand					
		Auger grinding from 8 to 9 feet. Probable bedrock.								
		Auger refusal at 9.0 feet below the ground surface. Probable bedrock.			Bottom of screen at 9 feet					
10										
15										

Driller: NH Boring, CME 550 rubber tired rig with autohammer, 4.25 inch HSA; Stantec Field Representative: Jason Ward

MONITORING WELL LOG

MW-6

Stantec

CLIENT

PROJECT No. **210810271**

LOCATION **Hancock Village, Brookline, Massachusetts**

BOREHOLE No. **MW-6**

DATES: BORING **1/23/2013 to 1/23/2013**

WATER LEVEL **48 inches**

DATUM

DEPTH (ft)	ELEVATION (ft)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (in.)	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
0		Brown, silty fine to medium SAND and Gravel with organics (FINE SANDY LOAM)			Flush mounted roadway box					
		Medium dense to very dense, light brown, fine to coarse silty SAND and GRAVEL (SANDY CLAY LOAM)			2 inch PVC riser in cuttings	SS	1	6	19	
					2 inch PVC riser in bentonite	SS	2	12	25	
					2 inch PVC riser in filter sand					
5					Top of screen at 5 feet	SS	3	12	44	
						SS	4	15	Ref	
					2 inch PVC in filter sand					
						SS	5	20	79	
10		Boring terminated at 10.0 feet below the ground surface. No refusal.			Bottom of screen at 10 feet					
15										

Driller: NH Boring, CME 550 rubber tired rig with autohammer, 4.25 inch HSA; Stantec Field Representative: Jason Ward

MONITORING WELL LOG

MW-7

Stantec

CLIENT:

LOCATION: **Hancock Village, Brookline, Massachusetts**

DATES: BORING **1/23/2013 to 1/23/2013** WATER LEVEL **120 inches**

PROJECT No. **210810271**

BOREHOLE No. **MW-7**

DATUM:

DEPTH (ft)	ELEVATION (ft)	SOIL DESCRIPTION	WELL CONSTRUCTION	SAMPLES TYPE	NUMBER	RECOVERY (in.)	N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
0		Brown, fine to medium sandy SILT with organics (FINE SANDY LOAM)	Flush mounted roadway box					
		Medium dense to very dense, light brown, fine to medium silty SAND and GRAVEL (SANDY CLAY LOAM)		SS	1	11	11	
			2 inch PVC riser in cuttings	SS	2	15	42	
5			2 inch PVC riser in bentonite	SS	3	18	57	
			2 inch PVC riser in filter sand					
			Top of screen at 7 feet	SS	4	17	54	
				SS	5	16	49	
10			2 inch PVC in filter sand	SS	6	10	24	
		Boring terminated at 12.0 feet below the ground surface. No refusal.	Bottom of screen at 12 feet					
15								

Driller: NH Boring, CME 550 rubber tired rig with autohammer, 4.25 inch HSA; Stantec Field Representative: Jason Ward

MONITORING WELL LOG

MW-8

Stantec

CLIENT

LOCATION **Hancock Village, Brookline, Massachusetts**

DATES: BORING **1/23/2013 to 1/23/2013** WATER LEVEL **108 inches**

PROJECT No. **210810271**

BOREHOLE No. **MW-8**

DATUM

DEPTH (ft)	ELEVATION (ft)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	WELL CONSTRUCTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (in.)	SAMPLES N-VALUE OR RQD	VOC CONCENTRATION (ppm or % LEL)
0		Brown, fine to medium silty SAND with organics (FINE SANDY LOAM)			Flush mounted roadway box					
		Dense, brown, fine to medium silty SAND, trace gravel (SANDY LOAM)			2 inch PVC riser in cuttings	SS	1	10	18	
					2 inch PVC riser in bentonite	SS	2	2	36	
		Dense to very dense, light brown, fine to medium silty SAND and GRAVEL (SANDY CLAY LOAM)			2 inch PVC riser in filter sand					
5					Top of screen at 4.8 feet	SS	3	16	52	
						SS	4	6	Ref	
					2 inch PVC in filter sand					
						SS	5	15	48	
10		Sampler refusal at 9.8 feet below the ground surface.			Bottom of screen at 9.8 feet					
15										

Driller: NH Boring, CME 550 rubber tired rig with autohammer, 4.25 inch HSA; Stantec Field Representative: Jason Ward

Stantec

STORMWATER REPORT
THE RESIDENCES OF SOUTH BROOKLINE
BROOKLINE, MASSACHUSETTS

APPENDIX C – EXISTING CONDITIONS HYDROCAD CALCULATIONS

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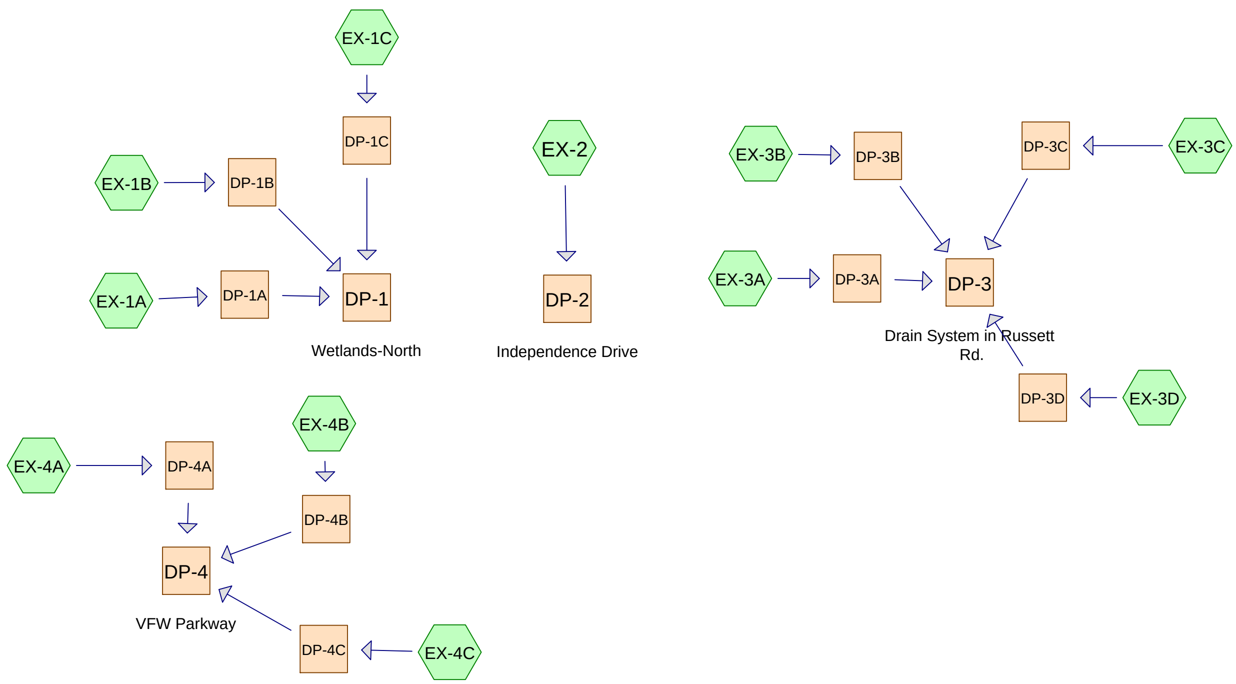
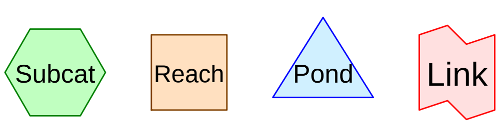




Routing Diagram for ex cond-with toc
Prepared by Stantec Consulting Ltd., Printed 7/11/2014
HydroCAD® 10.00 s/n 02809 © 2012 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
8.236	61	>75% Grass cover, Good, HSG B (EX-1A, EX-1B, EX-1C, EX-3A, EX-3B, EX-3C, EX-3D, EX-4A, EX-4B, EX-4C)
0.086	98	Ledge (EX-3D)
0.103	98	Paved parking (EX-3D)
3.069	55	Woods, Good, HSG B (EX-1A, EX-1B, EX-1C, EX-2, EX-3A, EX-3B, EX-3C, EX-3D, EX-4A, EX-4B, EX-4C)
0.292	98	ledge (EX-1A, EX-2, EX-4A, EX-4C)
0.113	98	pavement (EX-1A, EX-1B, EX-1C, EX-3A, EX-3C)
0.881	98	paving (EX-3B, EX-4A, EX-4B, EX-4C)
0.700	98	roofs (EX-1A, EX-1B, EX-1C, EX-3B, EX-3C, EX-3D, EX-4B)
13.482	**66**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
11.305	HSG B	EX-1A, EX-1B, EX-1C, EX-2, EX-3A, EX-3B, EX-3C, EX-3D, EX-4A, EX-4B, EX-4C
0.000	HSG C	
0.000	HSG D	
2.177	Other	EX-1A, EX-1B, EX-1C, EX-2, EX-3A, EX-3B, EX-3C, EX-3D, EX-4A, EX-4B, EX-4C
13.482		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	8.236	0.000	0.000	0.000	8.236	>75% Grass cover, Good	EX-1A, EX-1B, EX-1C, EX-3A, EX-3B, EX-3C, EX-3D, EX-4A, EX-4B, EX-4C
0.000	0.000	0.000	0.000	0.086	0.086	Ledge	EX-3D
0.000	0.000	0.000	0.000	0.103	0.103	Paved parking	EX-3D
0.000	3.069	0.000	0.000	0.000	3.069	Woods, Good	EX-1A, EX-1B, EX-1C, EX-2, EX-3A, EX-3B, EX-3C, EX-3D, EX-4A, EX-4B, EX-4C
0.000	0.000	0.000	0.000	0.292	0.292	ledge	EX-1A, EX-2, EX-4A, EX-4C
0.000	0.000	0.000	0.000	0.113	0.113	pavement	EX-1A, EX-1B, EX-1C, EX-3A, EX-3C
0.000	0.000	0.000	0.000	0.881	0.881	paving	EX-3B, EX-4A, EX-4B, EX-4C
0.000	0.000	0.000	0.000	0.700	0.700	roofs	EX-1A, EX-1B, EX-1C, EX-3B, EX-3C, EX-3D, EX-4B

Ground Covers (selected nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	**11.305**	**0.000**	**0.000**	**2.177**	**13.482**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	EX-1A	0.00	0.00	63.0	0.0064	0.011	15.0	0.0	0.0
2	EX-1B	0.00	0.00	26.0	0.0050	0.013	15.0	0.0	0.0
3	EX-1B	0.00	0.00	121.0	0.0075	0.013	30.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1A: Runoff Area=88,025 sf 14.89% Impervious Runoff Depth>0.64"
Flow Length=538' Tc=8.0 min CN=66 Runoff=1.14 cfs 0.108 af

Subcatchment EX-1B: Runoff Area=116,685 sf 4.46% Impervious Runoff Depth>0.48"
Flow Length=646' Tc=6.2 min CN=62 Runoff=1.00 cfs 0.107 af

Subcatchment EX-1C: Runoff Area=37,862 sf 16.95% Impervious Runoff Depth>0.69"
Tc=6.0 min CN=67 Runoff=0.58 cfs 0.050 af

Subcatchment EX-2: Runoff Area=4,076 sf 34.84% Impervious Runoff Depth>0.83"
Tc=6.0 min CN=70 Runoff=0.08 cfs 0.006 af

Subcatchment EX-3A: Runoff Area=30,237 sf 0.48% Impervious Runoff Depth>0.41"
Tc=6.0 min CN=60 Runoff=0.19 cfs 0.024 af

Subcatchment EX-3B: Runoff Area=22,520 sf 53.73% Impervious Runoff Depth>1.40"
Tc=6.0 min CN=80 Runoff=0.84 cfs 0.060 af

Subcatchment EX-3C: Runoff Area=40,917 sf 5.10% Impervious Runoff Depth>0.44"
Tc=6.0 min CN=61 Runoff=0.31 cfs 0.035 af

Subcatchment EX-3D: Runoff Area=42,933 sf 21.58% Impervious Runoff Depth>0.69"
Tc=6.0 min CN=67 Runoff=0.66 cfs 0.056 af

Subcatchment EX-4A: Runoff Area=37,240 sf 45.66% Impervious Runoff Depth>1.15"
Tc=6.0 min CN=76 Runoff=1.11 cfs 0.082 af

Subcatchment EX-4B: Runoff Area=98,280 sf 11.50% Impervious Runoff Depth>0.56"
Tc=6.0 min CN=64 Runoff=1.10 cfs 0.105 af

Subcatchment EX-4C: Runoff Area=68,497 sf 24.48% Impervious Runoff Depth>0.64"
Tc=6.0 min CN=66 Runoff=0.96 cfs 0.084 af

Reach DP-1: Wetlands-North Inflow=2.71 cfs 0.265 af
Outflow=2.71 cfs 0.265 af

Reach DP-1A: Inflow=1.14 cfs 0.108 af
Outflow=1.14 cfs 0.108 af

Reach DP-1B: Inflow=1.00 cfs 0.107 af
Outflow=1.00 cfs 0.107 af

Reach DP-1C: Inflow=0.58 cfs 0.050 af
Outflow=0.58 cfs 0.050 af

Reach DP-2: Independence Drive Inflow=0.08 cfs 0.006 af
Outflow=0.08 cfs 0.006 af

Reach DP-3: Drain System in Russett Rd.	Inflow=1.97 cfs 0.175 af Outflow=1.97 cfs 0.175 af
Reach DP-3A:	Inflow=0.19 cfs 0.024 af Outflow=0.19 cfs 0.024 af
Reach DP-3B:	Inflow=0.84 cfs 0.060 af Outflow=0.84 cfs 0.060 af
Reach DP-3C:	Inflow=0.31 cfs 0.035 af Outflow=0.31 cfs 0.035 af
Reach DP-3D:	Inflow=0.66 cfs 0.056 af Outflow=0.66 cfs 0.056 af
Reach DP-4: VFW Parkway	Inflow=3.16 cfs 0.271 af Outflow=3.16 cfs 0.271 af
Reach DP-4A:	Inflow=1.11 cfs 0.082 af Outflow=1.11 cfs 0.082 af
Reach DP-4B:	Inflow=1.10 cfs 0.105 af Outflow=1.10 cfs 0.105 af
Reach DP-4C:	Inflow=0.96 cfs 0.084 af Outflow=0.96 cfs 0.084 af

Total Runoff Area = 13.482 ac Runoff Volume = 0.717 af Average Runoff Depth = 0.64"
83.85% Pervious = 11.305 ac 16.15% Impervious = 2.177 ac

Summary for Subcatchment EX-1A:

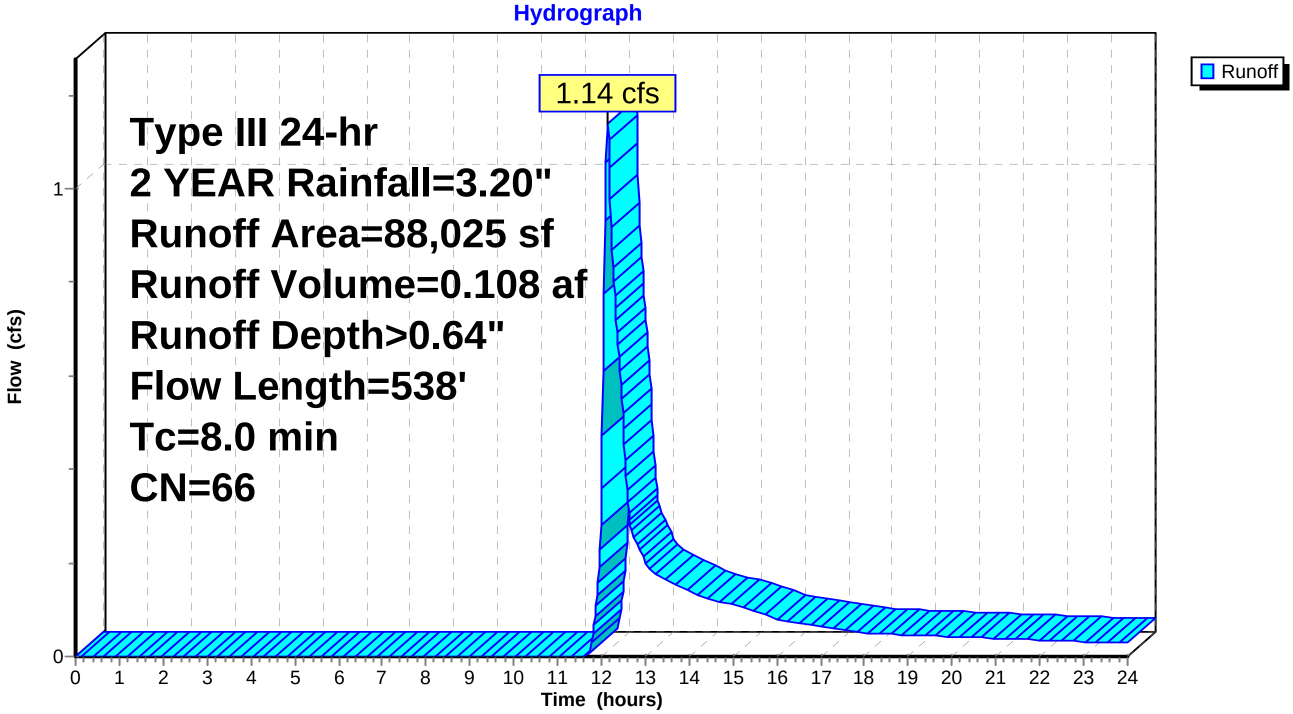
Runoff = 1.14 cfs @ 12.14 hrs, Volume= 0.108 af, Depth> 0.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	10,514	98	roofs
*	2,451	98	pavement
*	142	98	ledge
	62,001	61	>75% Grass cover, Good, HSG B
	12,917	55	Woods, Good, HSG B
	88,025	66	Weighted Average
	74,918		85.11% Pervious Area
	13,107		14.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	26	0.0960	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	24	0.0570	0.19		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.20"
1.8	425	0.0570	3.84		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.2	63	0.0064	4.98	6.11	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
8.0	538	Total			

Subcatchment EX-1A:



Summary for Subcatchment EX-1B:

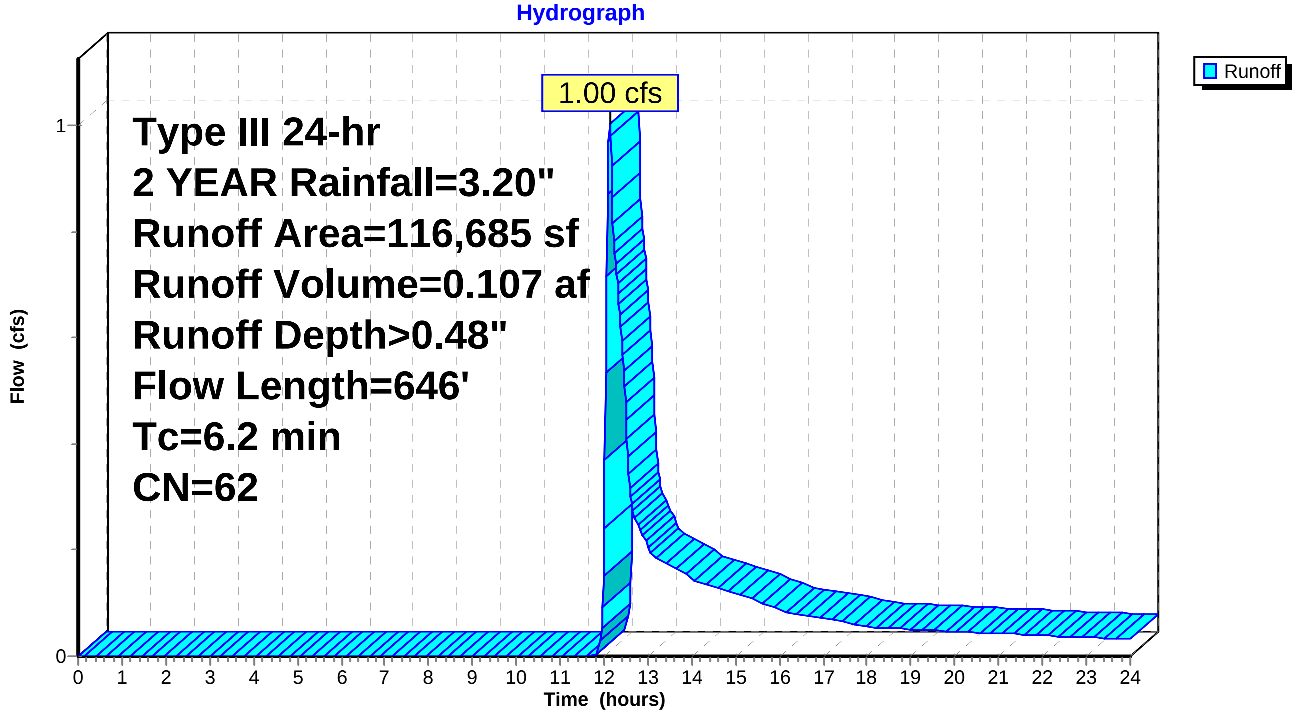
Runoff = 1.00 cfs @ 12.12 hrs, Volume= 0.107 af, Depth> 0.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	4,294	98	roofs
*	905	98	pavement
	106,591	61	>75% Grass cover, Good, HSG B
	4,895	55	Woods, Good, HSG B
	116,685	62	Weighted Average
	111,486		95.54% Pervious Area
	5,199		4.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.20"
0.8	195	0.0620	4.01		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
2.0	254	0.0180	2.16		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.1	26	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
0.3	121	0.0075	7.24	35.52	**Pipe Channel, E-F** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Concrete pipe, bends & connections
6.2	646	Total			

Subcatchment EX-1B:



Summary for Subcatchment EX-1C:

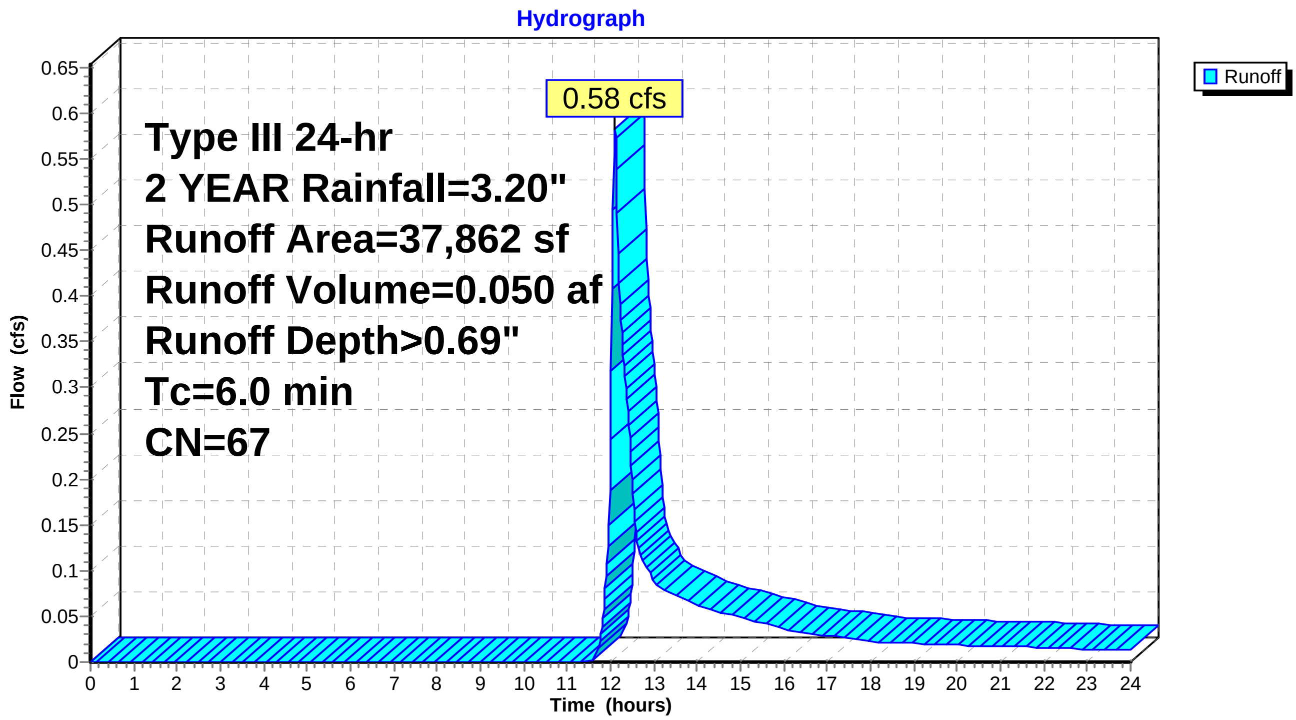
Runoff = 0.58 cfs @ 12.10 hrs, Volume= 0.050 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	5,283	98	roofs
*	1,134	98	pavement
	30,564	61	>75% Grass cover, Good, HSG B
	881	55	Woods, Good, HSG B
	37,862	67	Weighted Average
	31,445		83.05% Pervious Area
	6,417		16.95% Impervious Area

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

Subcatchment EX-1C:



Summary for Subcatchment EX-2:

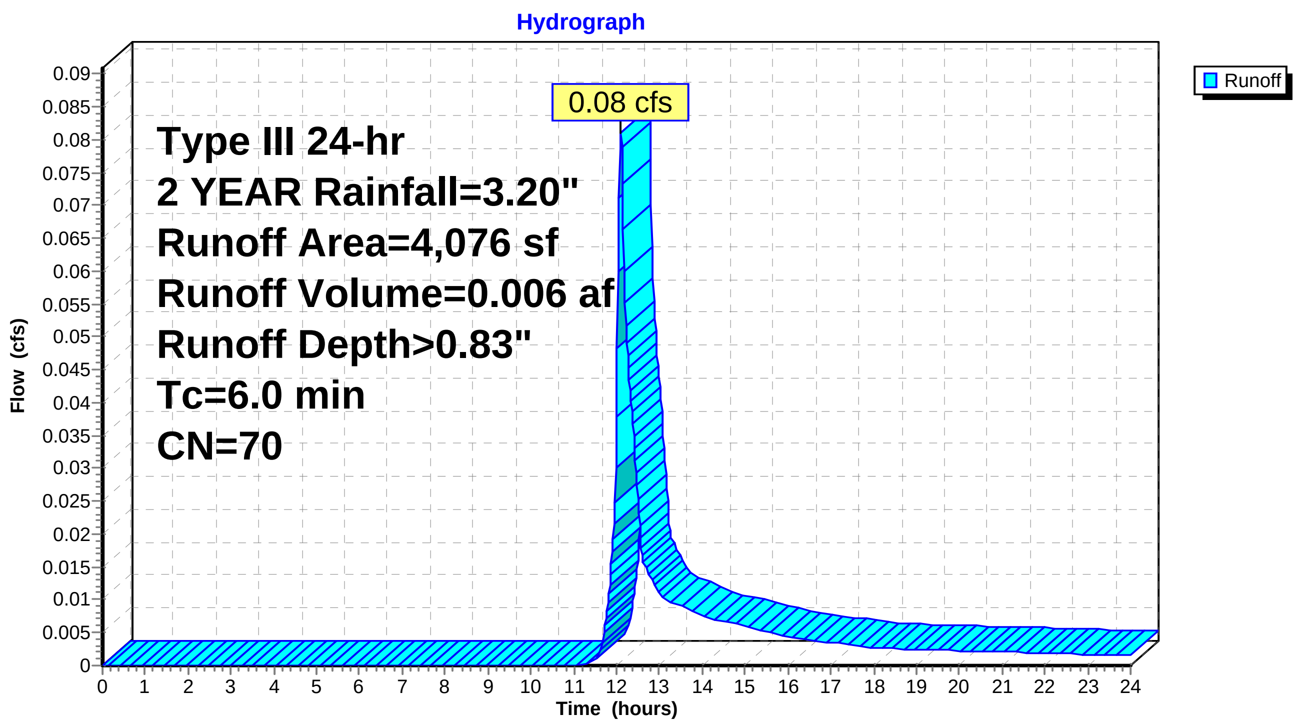
Runoff = 0.08 cfs @ 12.10 hrs, Volume= 0.006 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	2,656	55	Woods, Good, HSG B
*	1,420	98	ledge
	4,076	70	Weighted Average
	2,656		65.16% Pervious Area
	1,420		34.84% Impervious Area

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

Subcatchment EX-2:



Summary for Subcatchment EX-3A:

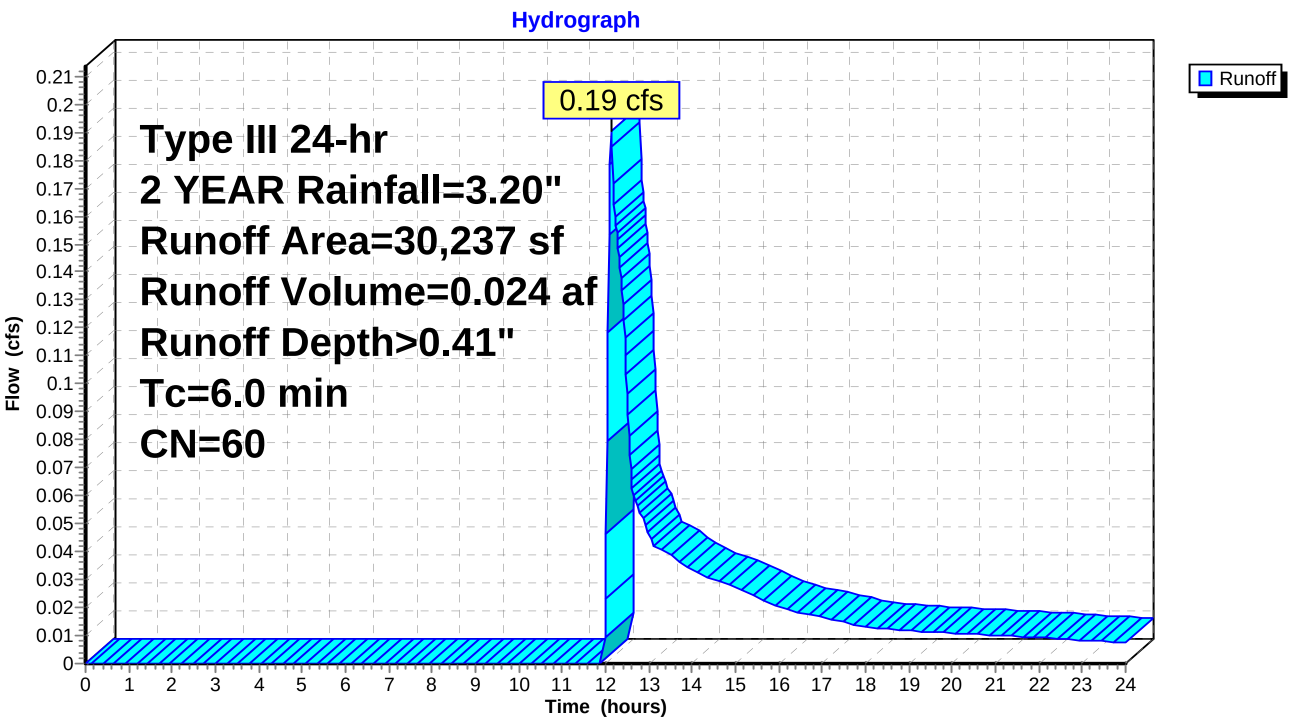
Runoff = 0.19 cfs @ 12.13 hrs, Volume= 0.024 af, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	22,731	61	>75% Grass cover, Good, HSG B
	7,361	55	Woods, Good, HSG B
*	145	98	pavement
	30,237	60	Weighted Average
	30,092		99.52% Pervious Area
	145		0.48% Impervious Area

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

Subcatchment EX-3A:



Summary for Subcatchment EX-3B:

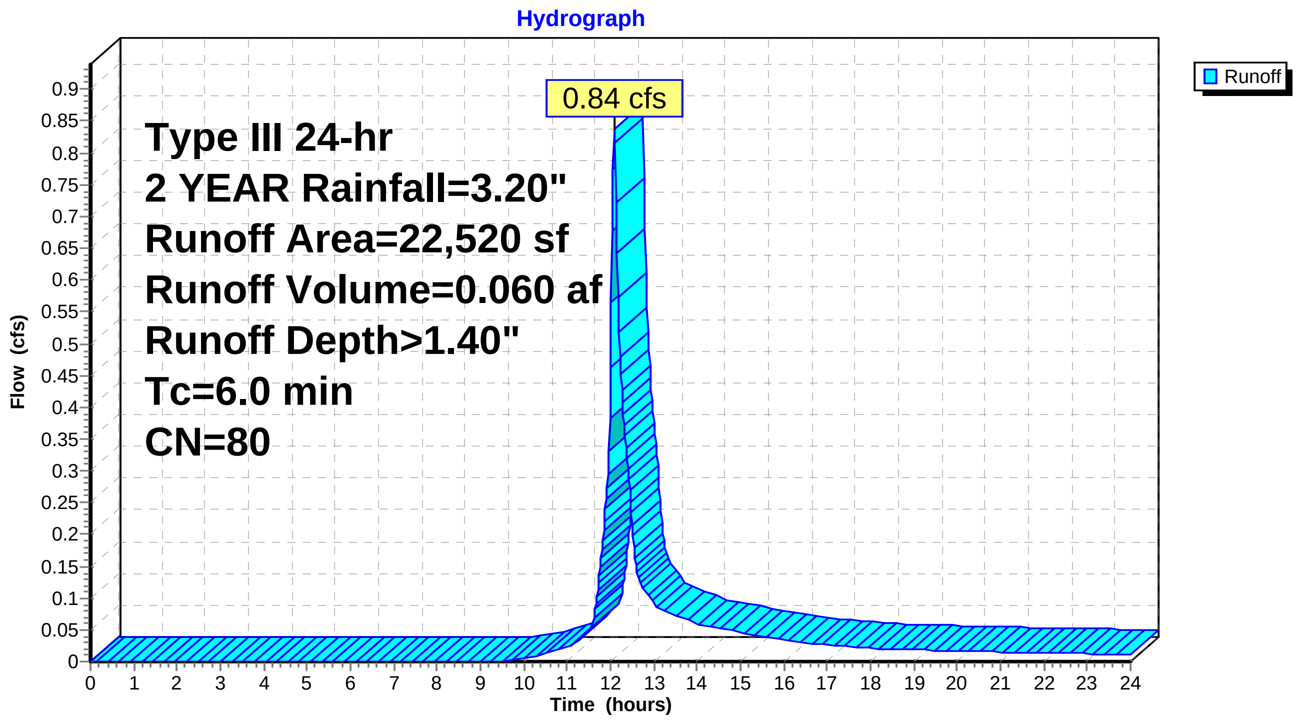
Runoff = 0.84 cfs @ 12.09 hrs, Volume= 0.060 af, Depth> 1.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	8,382	61	>75% Grass cover, Good, HSG B
*	9,854	98	paving
	2,245	98	roofs
	2,039	55	Woods, Good, HSG B
	22,520	80	Weighted Average
	10,421		46.27% Pervious Area
	12,099		53.73% Impervious Area

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

Subcatchment EX-3B:



Summary for Subcatchment EX-3C:

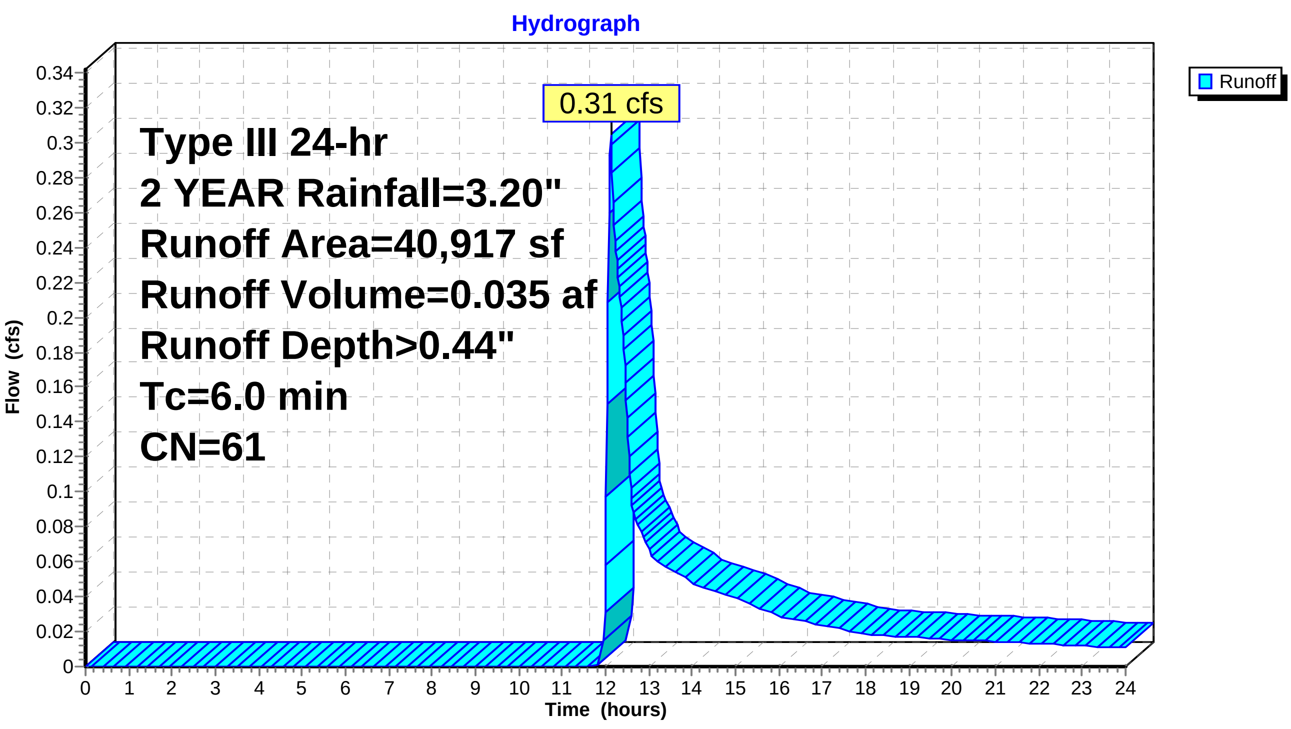
Runoff = 0.31 cfs @ 12.12 hrs, Volume= 0.035 af, Depth> 0.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	25,783	61	>75% Grass cover, Good, HSG B
	1,784	98	roofs
*	303	98	pavement
	13,047	55	Woods, Good, HSG B
	40,917	61	Weighted Average
	38,830		94.90% Pervious Area
	2,087		5.10% Impervious Area

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

Subcatchment EX-3C:



Summary for Subcatchment EX-3D:

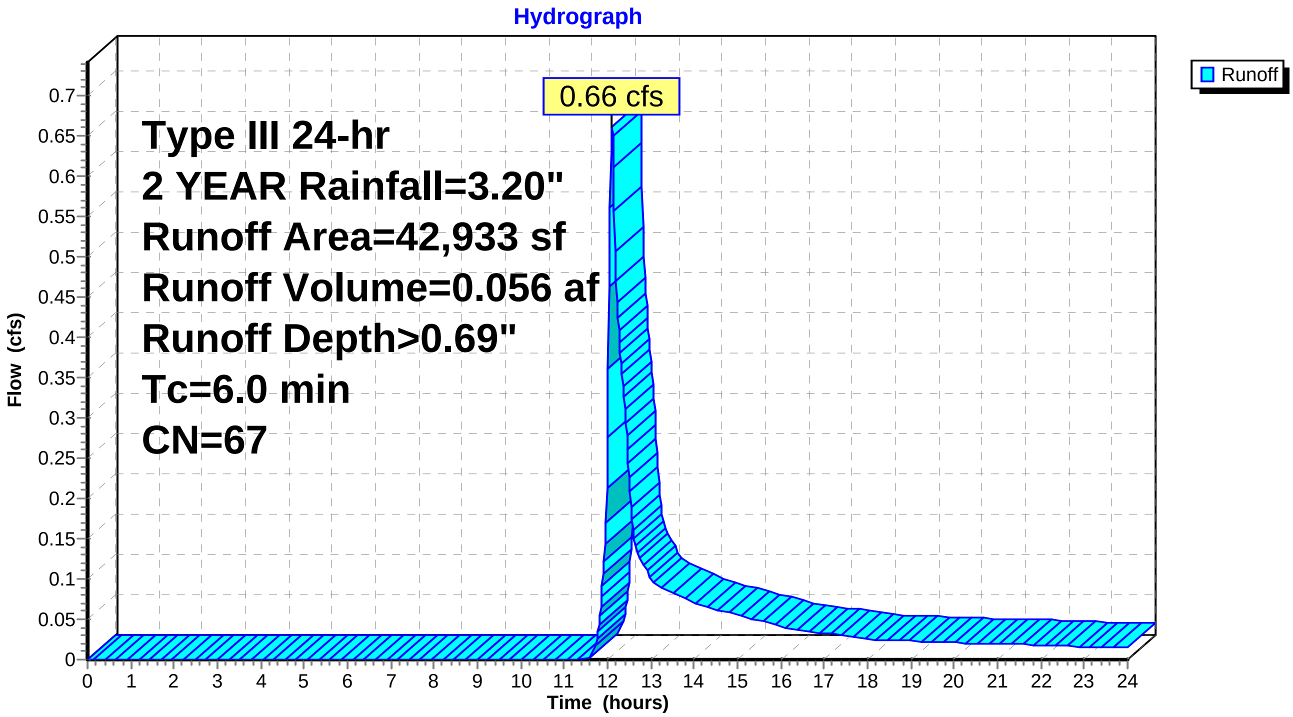
Runoff = 0.66 cfs @ 12.10 hrs, Volume= 0.056 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	17,697	61	>75% Grass cover, Good, HSG B
	995	98	roofs
	4,507	98	Paved parking
*	3,764	98	Ledge
	15,970	55	Woods, Good, HSG B
	42,933	67	Weighted Average
	33,667		78.42% Pervious Area
	9,266		21.58% Impervious Area

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

Subcatchment EX-3D:



Summary for Subcatchment EX-4A:

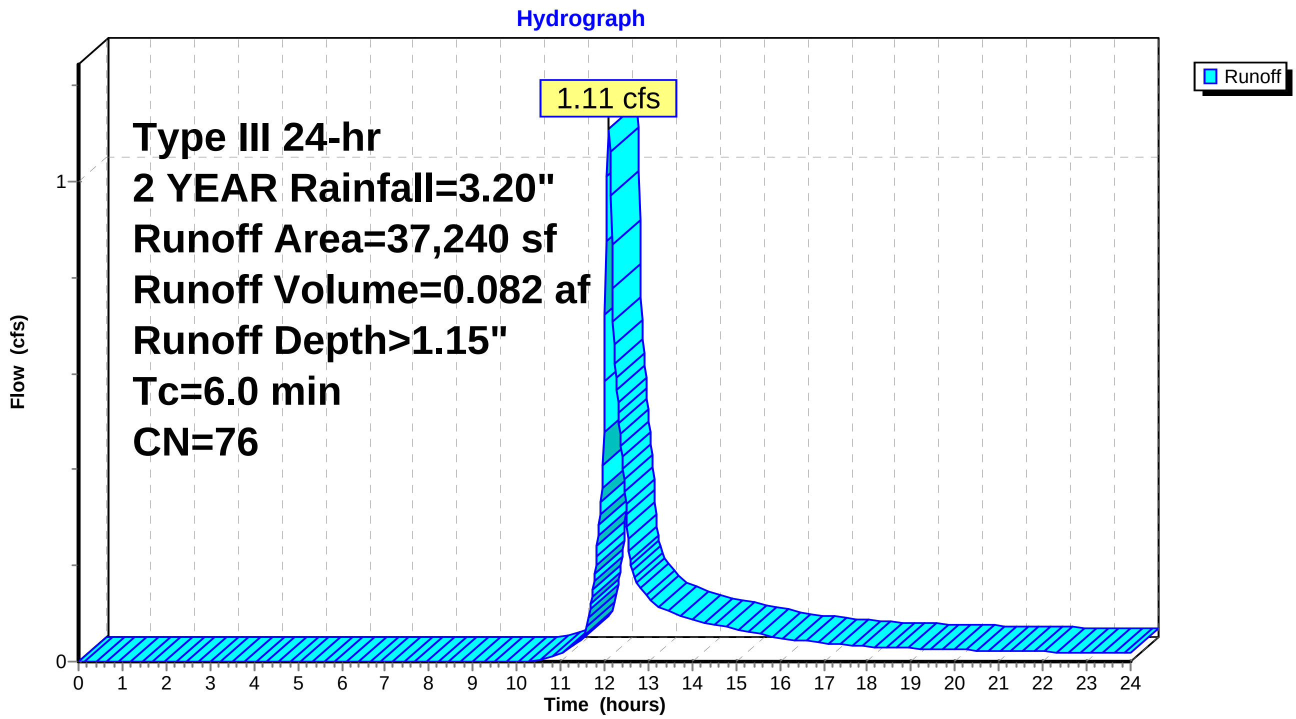
Runoff = 1.11 cfs @ 12.09 hrs, Volume= 0.082 af, Depth> 1.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	6,234	61	>75% Grass cover, Good, HSG B
*	14,643	98	paving
*	2,361	98	ledge
	14,002	55	Woods, Good, HSG B
	37,240	76	Weighted Average
	20,236		54.34% Pervious Area
	17,004		45.66% Impervious Area

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

Subcatchment EX-4A:



Summary for Subcatchment EX-4B:

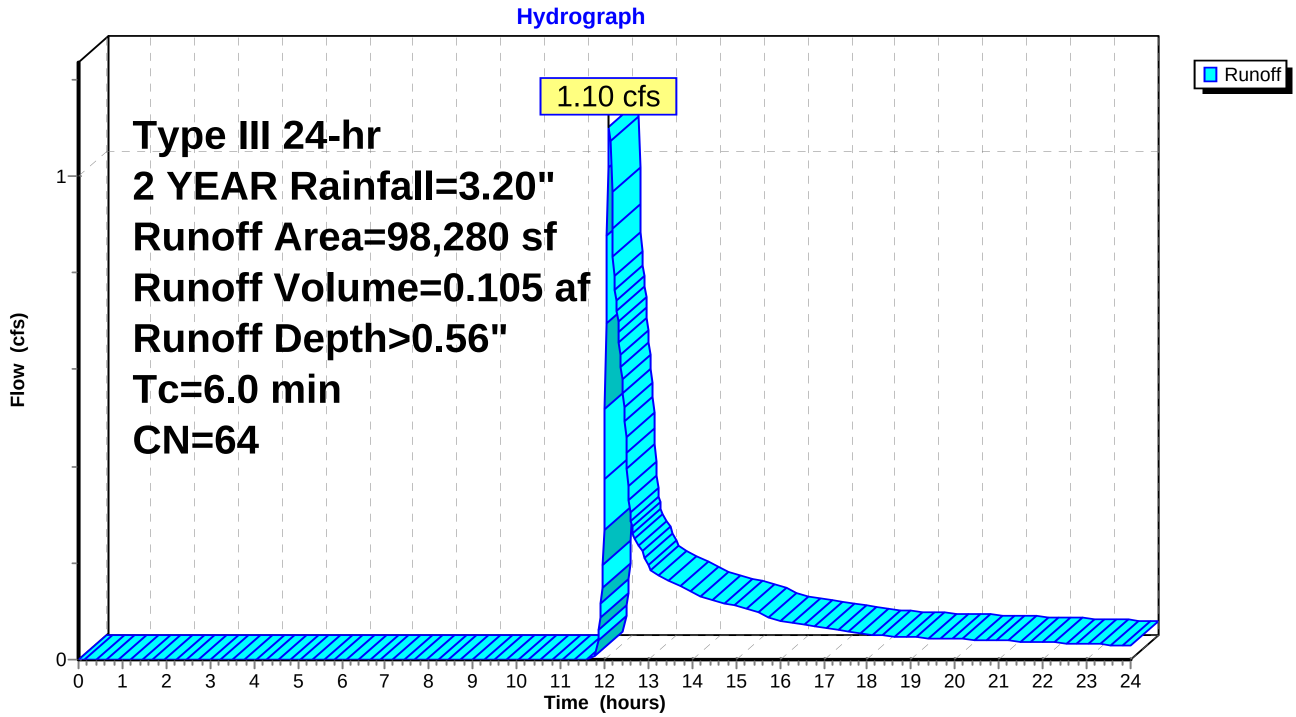
Runoff = 1.10 cfs @ 12.11 hrs, Volume= 0.105 af, Depth> 0.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	68,309	61	>75% Grass cover, Good, HSG B
*	5,937	98	paving
*	0	98	ledge
*	5,368	98	roofs
	18,666	55	Woods, Good, HSG B
	98,280	64	Weighted Average
	86,975		88.50% Pervious Area
	11,305		11.50% Impervious Area

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

Subcatchment EX-4B:



Summary for Subcatchment EX-4C:

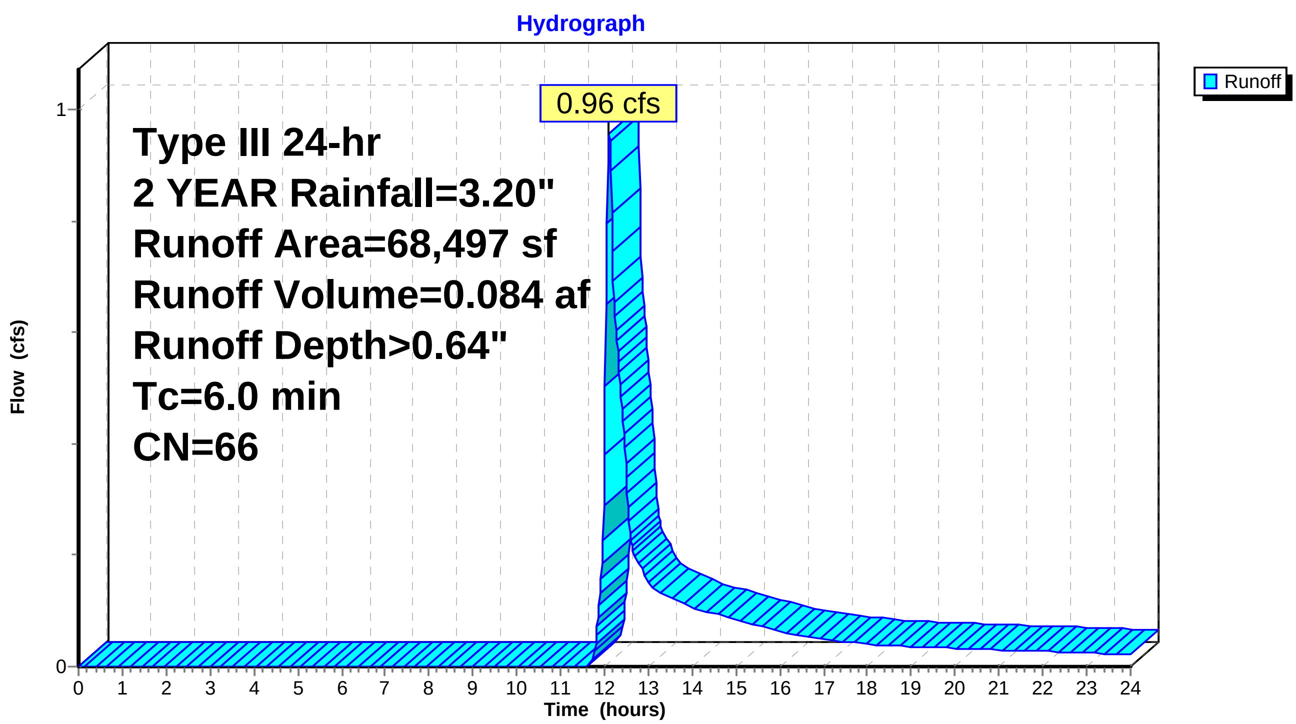
Runoff = 0.96 cfs @ 12.11 hrs, Volume= 0.084 af, Depth> 0.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	10,460	61	>75% Grass cover, Good, HSG B
*	7,958	98	paving
*	8,812	98	ledge
	41,267	55	Woods, Good, HSG B
	68,497	66	Weighted Average
	51,727		75.52% Pervious Area
	16,770		24.48% Impervious Area

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

Subcatchment EX-4C:



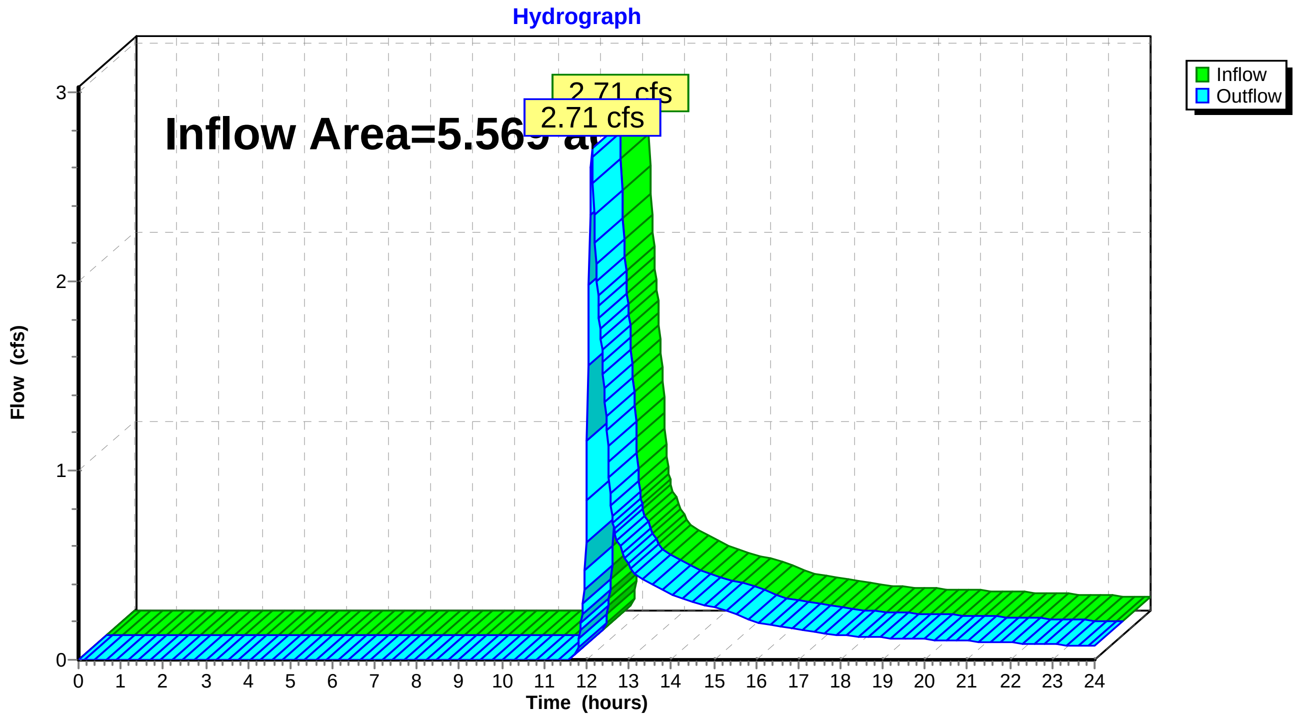
Summary for Reach DP-1: Wetlands-North

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

Inflow Area =	5.569 ac, 10.19% Impervious, Inflow Depth > 0.57"		for 2 YEAR event
Inflow =	2.71 cfs @ 12.12 hrs, Volume=	0.265 af	
Outflow =	2.71 cfs @ 12.12 hrs, Volume=	0.265 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1: Wetlands-North



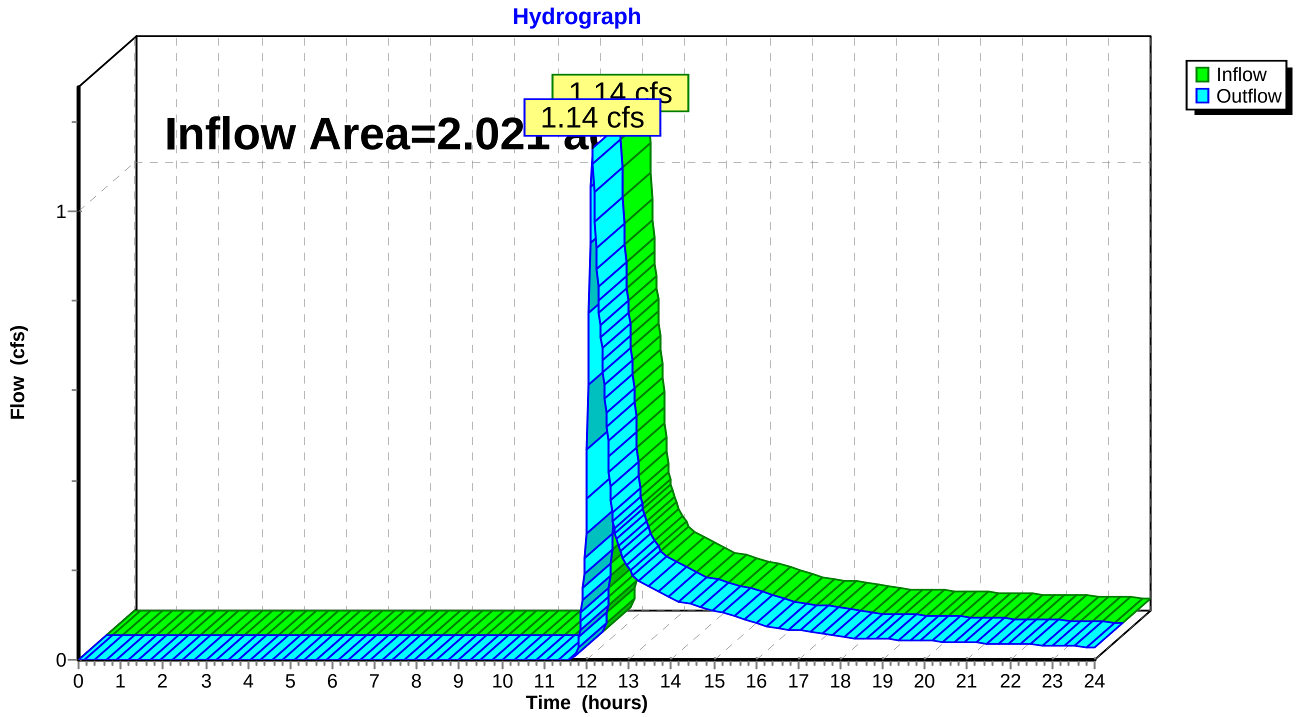
Summary for Reach DP-1A:

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

Inflow Area =	2.021 ac,	14.89% Impervious,	Inflow Depth > 0.64"	for 2 YEAR event	
Inflow =	1.14 cfs @	12.14 hrs,	Volume=	0.108 af	
Outflow =	1.14 cfs @	12.14 hrs,	Volume=	0.108 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1A:



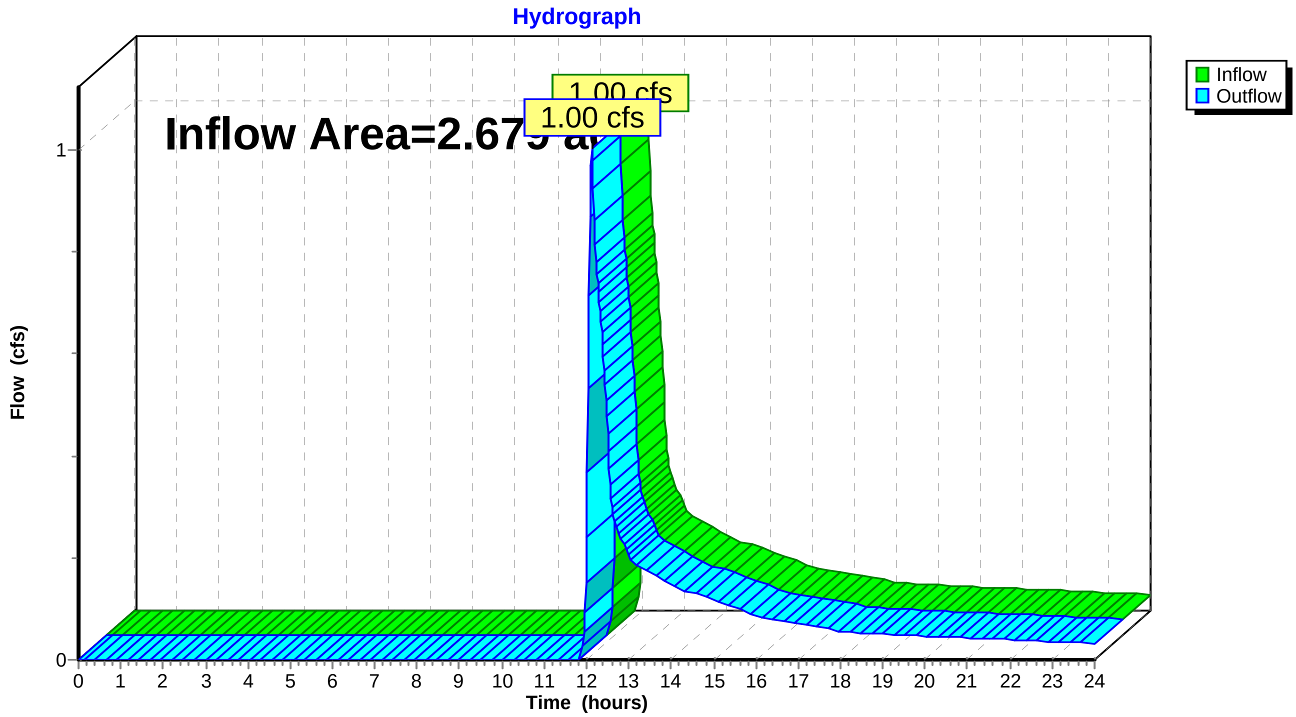
Summary for Reach DP-1B:

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

Inflow Area =	2.679 ac,	4.46% Impervious,	Inflow Depth > 0.48"	for 2 YEAR event	
Inflow =	1.00 cfs @	12.12 hrs,	Volume=	0.107 af	
Outflow =	1.00 cfs @	12.12 hrs,	Volume=	0.107 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1B:



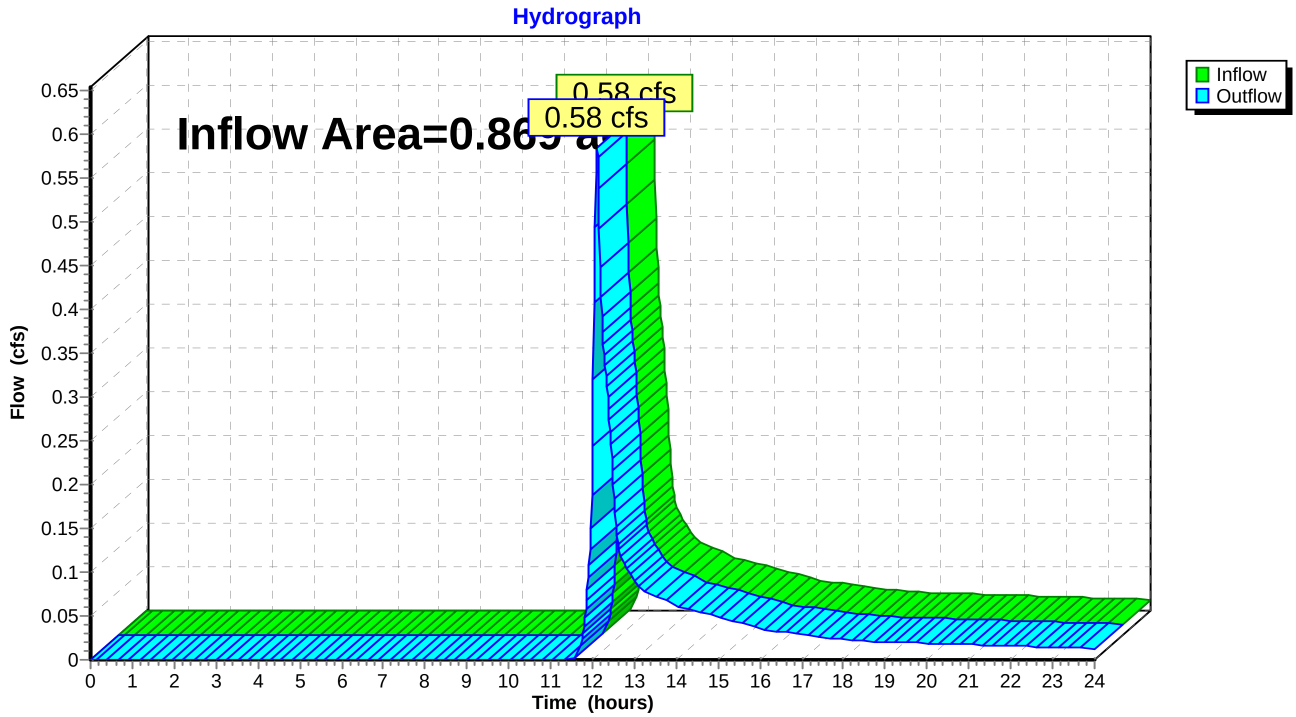
Summary for Reach DP-1C:

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

Inflow Area =	0.869 ac, 16.95% Impervious, Inflow Depth > 0.69"	for 2 YEAR event	
Inflow =	0.58 cfs @ 12.10 hrs, Volume=	0.050 af	
Outflow =	0.58 cfs @ 12.10 hrs, Volume=	0.050 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1C:



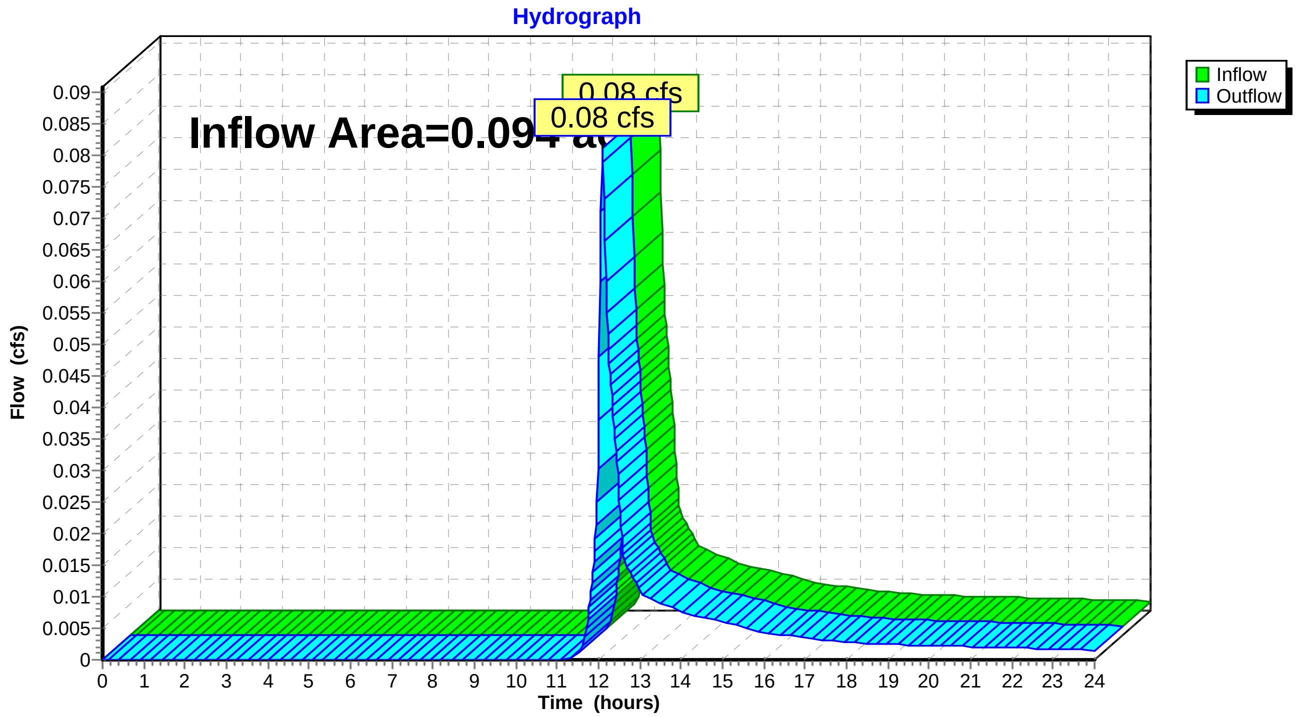
Summary for Reach DP-2: Independence Drive

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

Inflow Area =	0.094 ac,	34.84% Impervious,	Inflow Depth > 0.83"	for 2 YEAR event	
Inflow =	0.08 cfs @	12.10 hrs,	Volume=	0.006 af	
Outflow =	0.08 cfs @	12.10 hrs,	Volume=	0.006 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-2: Independence Drive



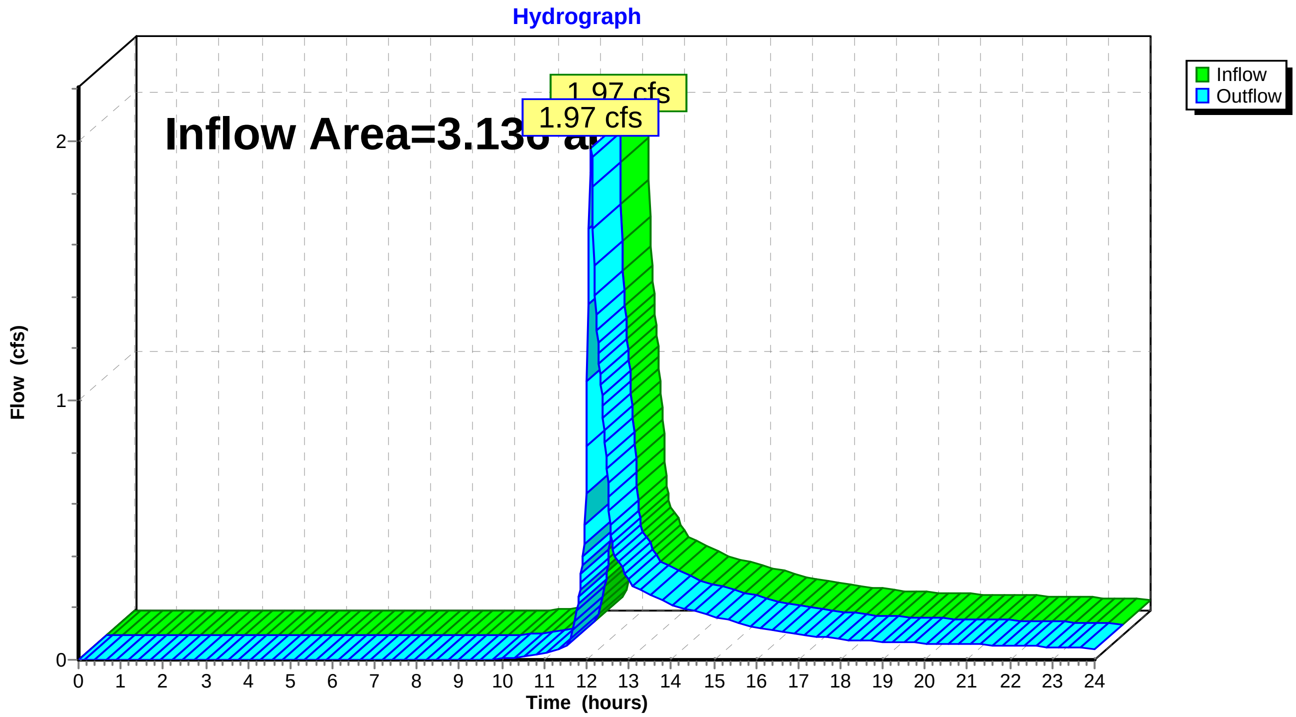
Summary for Reach DP-3: Drain System in Russett Rd.

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

Inflow Area =	3.136 ac, 17.27% Impervious, Inflow Depth > 0.67"	for 2 YEAR event	
Inflow =	1.97 cfs @ 12.11 hrs, Volume=	0.175 af	
Outflow =	1.97 cfs @ 12.11 hrs, Volume=	0.175 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3: Drain System in Russett Rd.



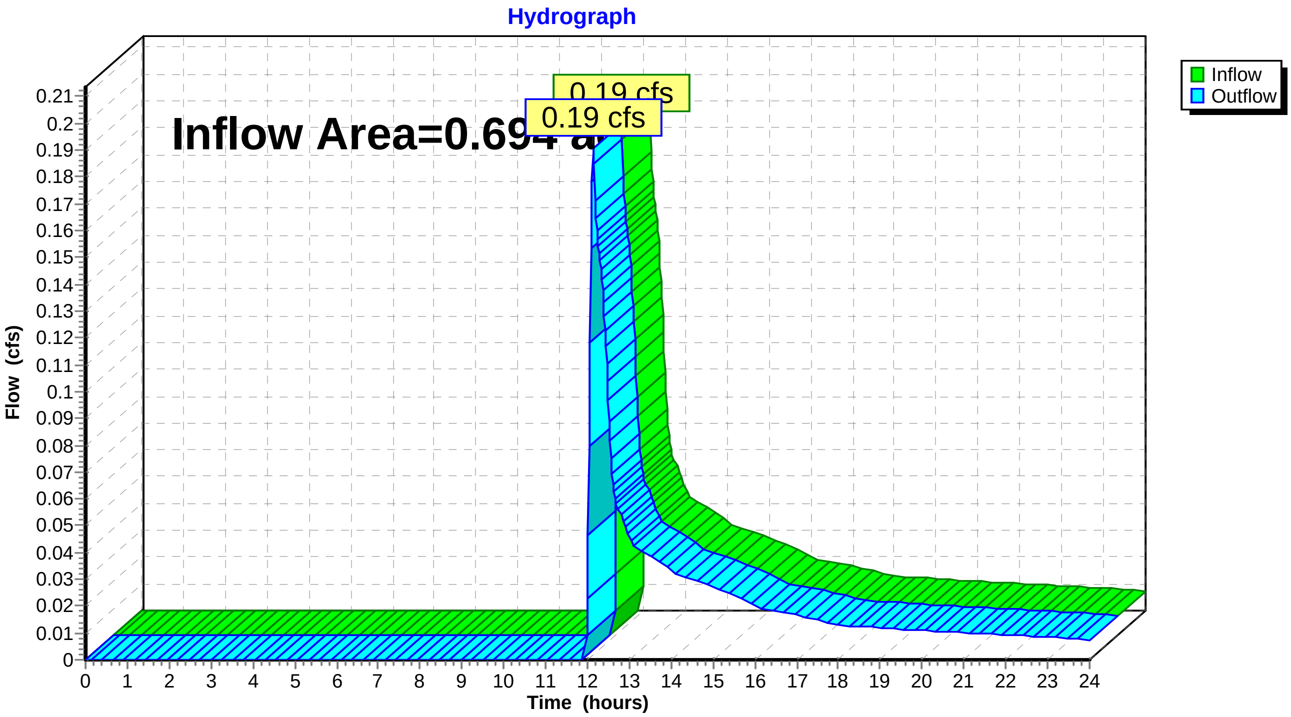
Summary for Reach DP-3A:

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

Inflow Area =	0.694 ac,	0.48% Impervious,	Inflow Depth > 0.41"	for 2 YEAR event	
Inflow =	0.19 cfs @	12.13 hrs, Volume=	0.024 af		
Outflow =	0.19 cfs @	12.13 hrs, Volume=	0.024 af,	Atten= 0%,	Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3A:



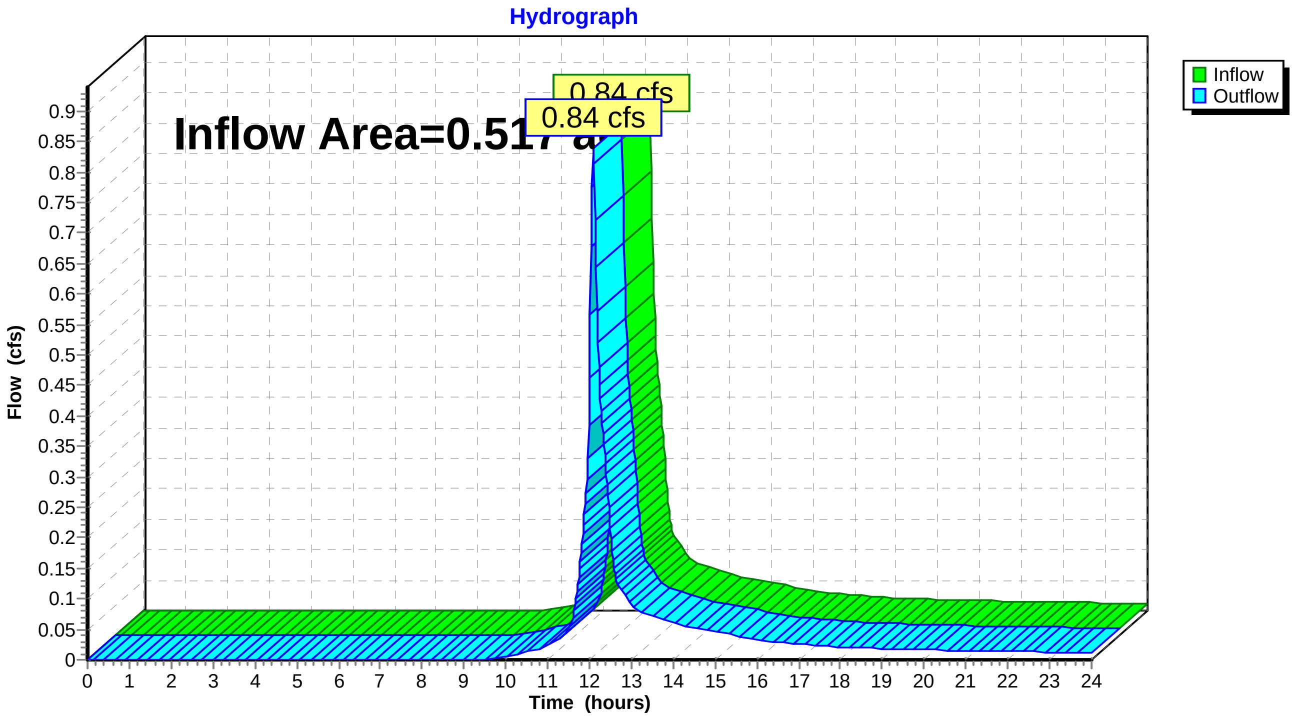
Summary for Reach DP-3B:

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

Inflow Area = 0.517 ac, 53.73% Impervious, Inflow Depth > 1.40" for 2 YEAR event
Inflow = 0.84 cfs @ 12.09 hrs, Volume= 0.060 af
Outflow = 0.84 cfs @ 12.09 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3B:



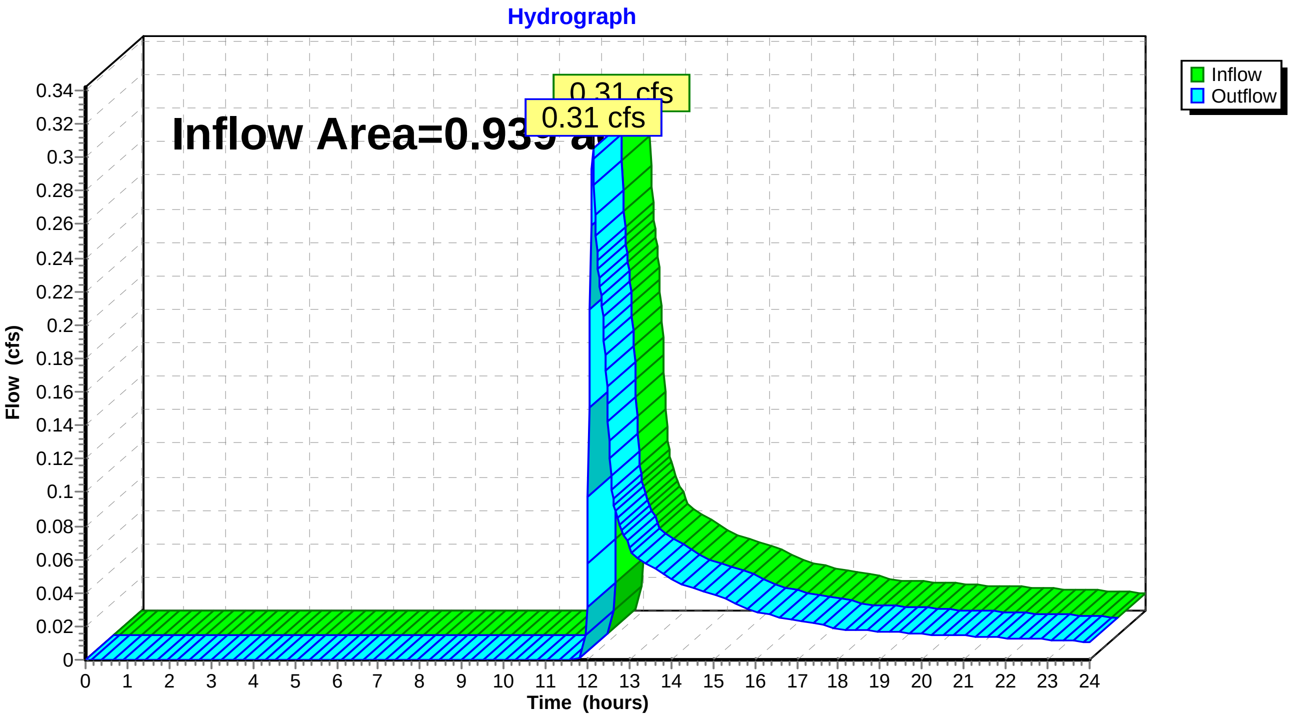
Summary for Reach DP-3C:

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

Inflow Area = 0.939 ac, 5.10% Impervious, Inflow Depth > 0.44" for 2 YEAR event
Inflow = 0.31 cfs @ 12.12 hrs, Volume= 0.035 af
Outflow = 0.31 cfs @ 12.12 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3C:



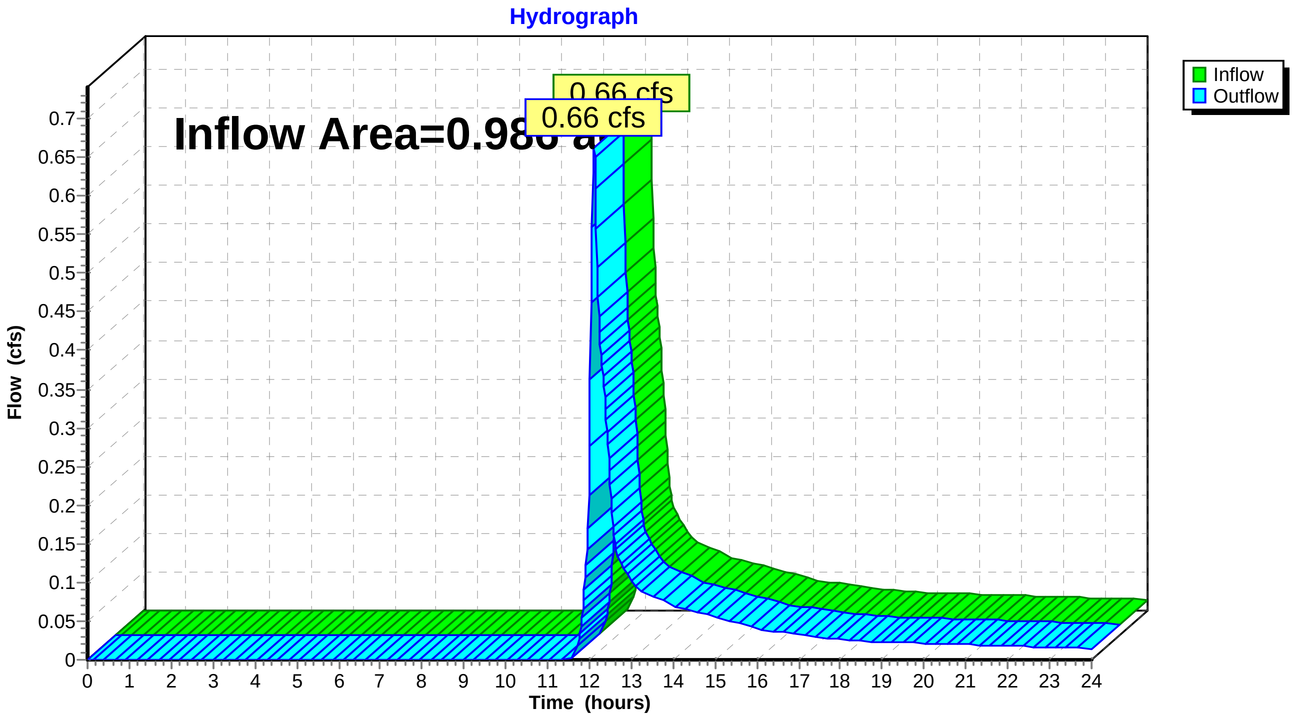
Summary for Reach DP-3D:

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

Inflow Area = 0.986 ac, 21.58% Impervious, Inflow Depth > 0.69" for 2 YEAR event
Inflow = 0.66 cfs @ 12.10 hrs, Volume= 0.056 af
Outflow = 0.66 cfs @ 12.10 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3D:



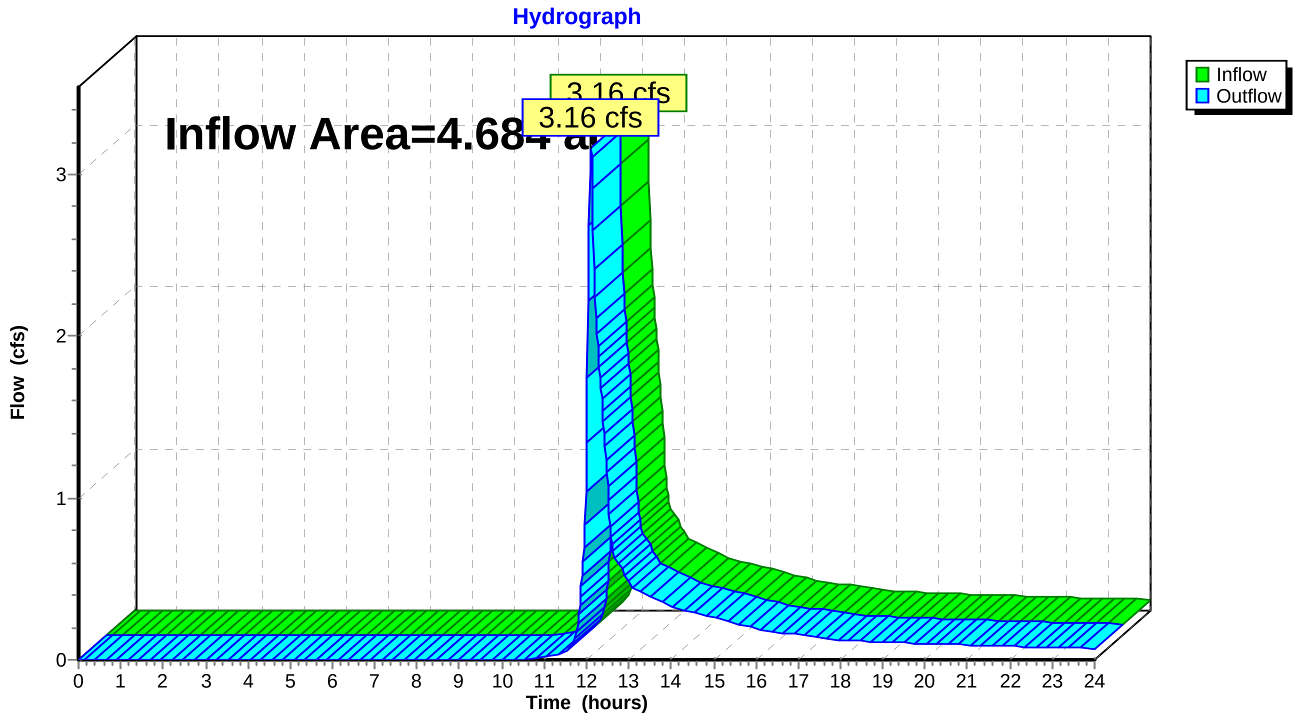
Summary for Reach DP-4: VFW Parkway

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

Inflow Area =	4.684 ac,	22.10% Impervious,	Inflow Depth > 0.69"	for 2 YEAR event	
Inflow =	3.16 cfs @	12.10 hrs,	Volume=	0.271 af	
Outflow =	3.16 cfs @	12.10 hrs,	Volume=	0.271 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4: VFW Parkway



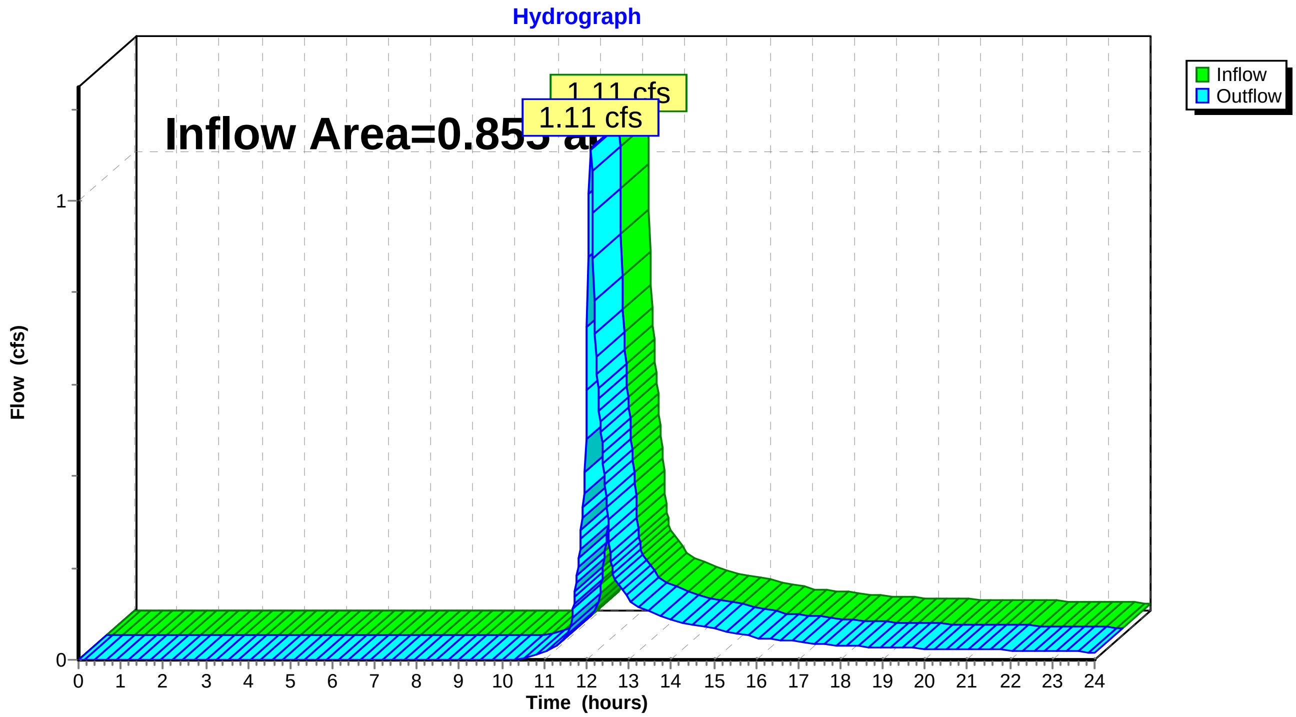
Summary for Reach DP-4A:

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

Inflow Area =	0.855 ac, 45.66% Impervious, Inflow Depth > 1.15" for 2 YEAR event		
Inflow =	1.11 cfs @ 12.09 hrs, Volume=	0.082 af	
Outflow =	1.11 cfs @ 12.09 hrs, Volume=	0.082 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4A:



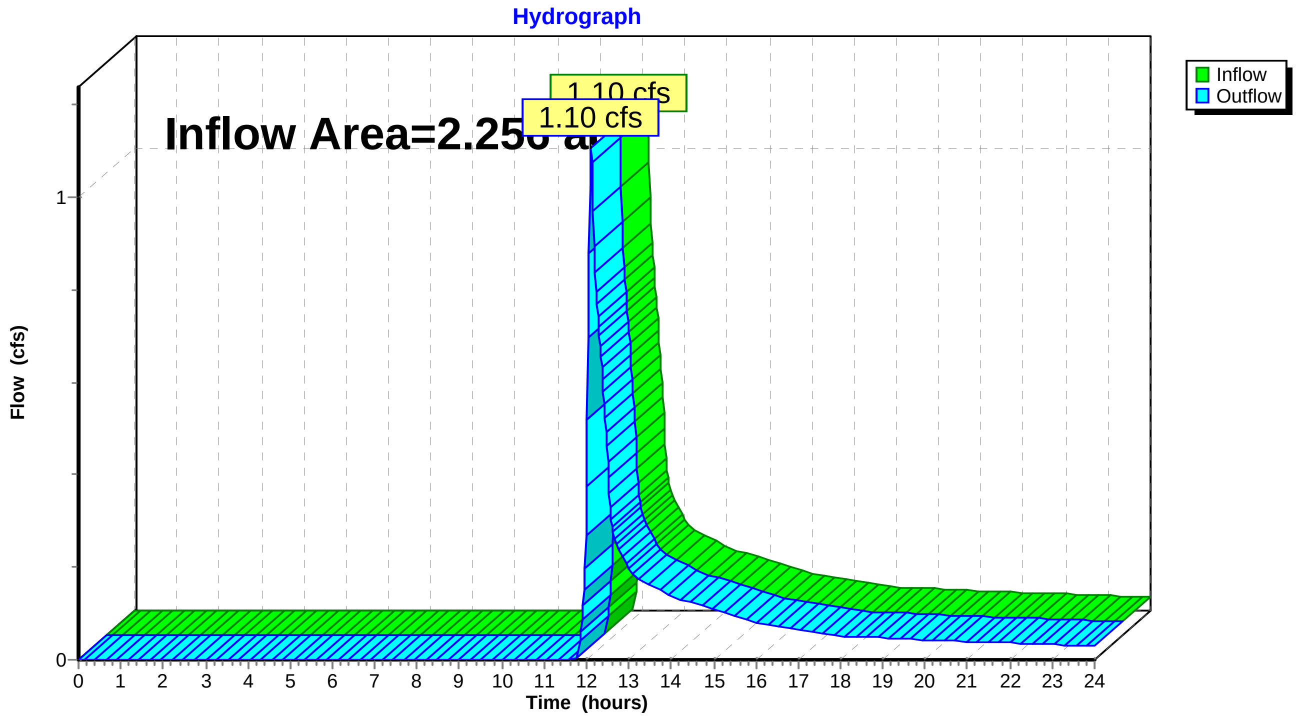
Summary for Reach DP-4B:

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

Inflow Area = 2.256 ac, 11.50% Impervious, Inflow Depth > 0.56" for 2 YEAR event
Inflow = 1.10 cfs @ 12.11 hrs, Volume= 0.105 af
Outflow = 1.10 cfs @ 12.11 hrs, Volume= 0.105 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4B:



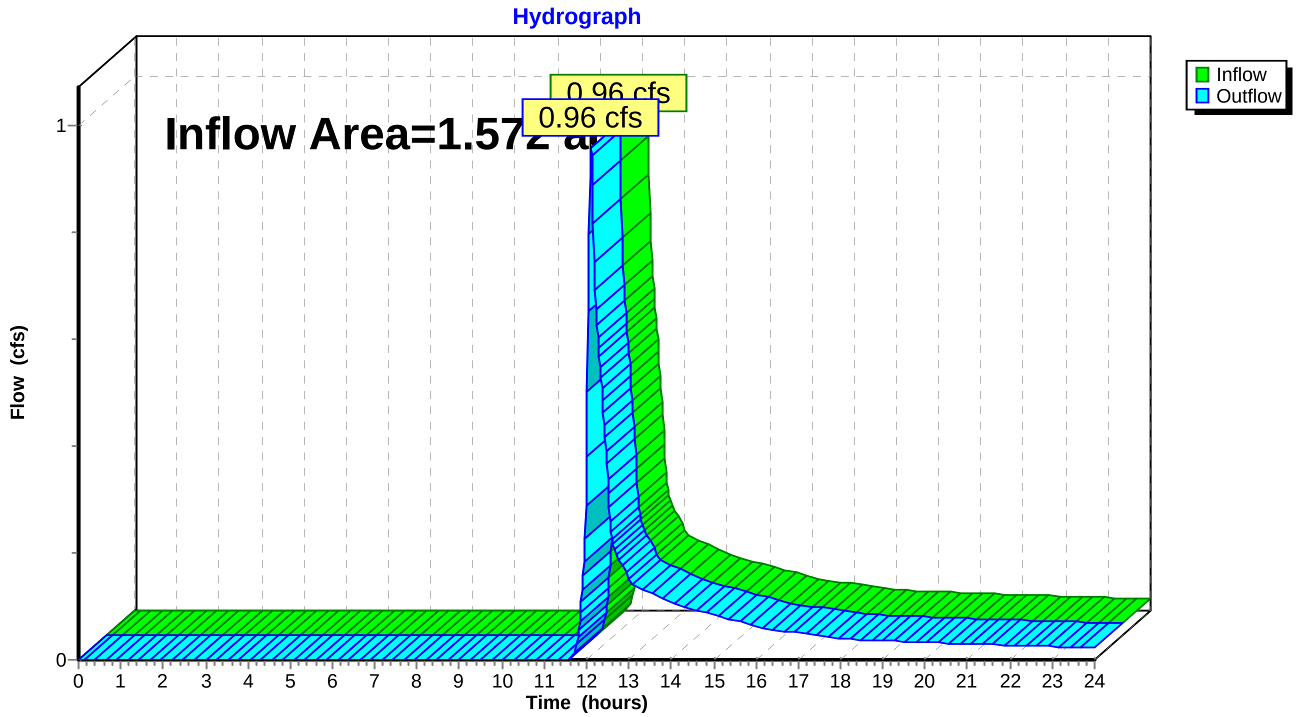
Summary for Reach DP-4C:

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

Inflow Area = 1.572 ac, 24.48% Impervious, Inflow Depth > 0.64" for 2 YEAR event
Inflow = 0.96 cfs @ 12.11 hrs, Volume= 0.084 af
Outflow = 0.96 cfs @ 12.11 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4C:



Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1A: Runoff Area=88,025 sf 14.89% Impervious Runoff Depth>1.46"
Flow Length=538' Tc=8.0 min CN=66 Runoff=3.04 cfs 0.246 af

Subcatchment EX-1B: Runoff Area=116,685 sf 4.46% Impervious Runoff Depth>1.20"
Flow Length=646' Tc=6.2 min CN=62 Runoff=3.34 cfs 0.267 af

Subcatchment EX-1C: Runoff Area=37,862 sf 16.95% Impervious Runoff Depth>1.53"
Tc=6.0 min CN=67 Runoff=1.48 cfs 0.111 af

Subcatchment EX-2: Runoff Area=4,076 sf 34.84% Impervious Runoff Depth>1.74"
Tc=6.0 min CN=70 Runoff=0.19 cfs 0.014 af

Subcatchment EX-3A: Runoff Area=30,237 sf 0.48% Impervious Runoff Depth>1.07"
Tc=6.0 min CN=60 Runoff=0.75 cfs 0.062 af

Subcatchment EX-3B: Runoff Area=22,520 sf 53.73% Impervious Runoff Depth>2.54"
Tc=6.0 min CN=80 Runoff=1.54 cfs 0.110 af

Subcatchment EX-3C: Runoff Area=40,917 sf 5.10% Impervious Runoff Depth>1.13"
Tc=6.0 min CN=61 Runoff=1.10 cfs 0.089 af

Subcatchment EX-3D: Runoff Area=42,933 sf 21.58% Impervious Runoff Depth>1.53"
Tc=6.0 min CN=67 Runoff=1.68 cfs 0.125 af

Subcatchment EX-4A: Runoff Area=37,240 sf 45.66% Impervious Runoff Depth>2.21"
Tc=6.0 min CN=76 Runoff=2.20 cfs 0.157 af

Subcatchment EX-4B: Runoff Area=98,280 sf 11.50% Impervious Runoff Depth>1.32"
Tc=6.0 min CN=64 Runoff=3.23 cfs 0.249 af

Subcatchment EX-4C: Runoff Area=68,497 sf 24.48% Impervious Runoff Depth>1.46"
Tc=6.0 min CN=66 Runoff=2.54 cfs 0.191 af

Reach DP-1: Wetlands-North Inflow=7.79 cfs 0.623 af
Outflow=7.79 cfs 0.623 af

Reach DP-1A: Inflow=3.04 cfs 0.246 af
Outflow=3.04 cfs 0.246 af

Reach DP-1B: Inflow=3.34 cfs 0.267 af
Outflow=3.34 cfs 0.267 af

Reach DP-1C: Inflow=1.48 cfs 0.111 af
Outflow=1.48 cfs 0.111 af

Reach DP-2: Independence Drive Inflow=0.19 cfs 0.014 af
Outflow=0.19 cfs 0.014 af

Reach DP-3: Drain System in Russett Rd.	Inflow=5.06 cfs 0.386 af Outflow=5.06 cfs 0.386 af
Reach DP-3A:	Inflow=0.75 cfs 0.062 af Outflow=0.75 cfs 0.062 af
Reach DP-3B:	Inflow=1.54 cfs 0.110 af Outflow=1.54 cfs 0.110 af
Reach DP-3C:	Inflow=1.10 cfs 0.089 af Outflow=1.10 cfs 0.089 af
Reach DP-3D:	Inflow=1.68 cfs 0.125 af Outflow=1.68 cfs 0.125 af
Reach DP-4: VFW Parkway	Inflow=7.96 cfs 0.598 af Outflow=7.96 cfs 0.598 af
Reach DP-4A:	Inflow=2.20 cfs 0.157 af Outflow=2.20 cfs 0.157 af
Reach DP-4B:	Inflow=3.23 cfs 0.249 af Outflow=3.23 cfs 0.249 af
Reach DP-4C:	Inflow=2.54 cfs 0.191 af Outflow=2.54 cfs 0.191 af

Total Runoff Area = 13.482 ac Runoff Volume = 1.620 af Average Runoff Depth = 1.44"
83.85% Pervious = 11.305 ac 16.15% Impervious = 2.177 ac

Summary for Subcatchment EX-1A:

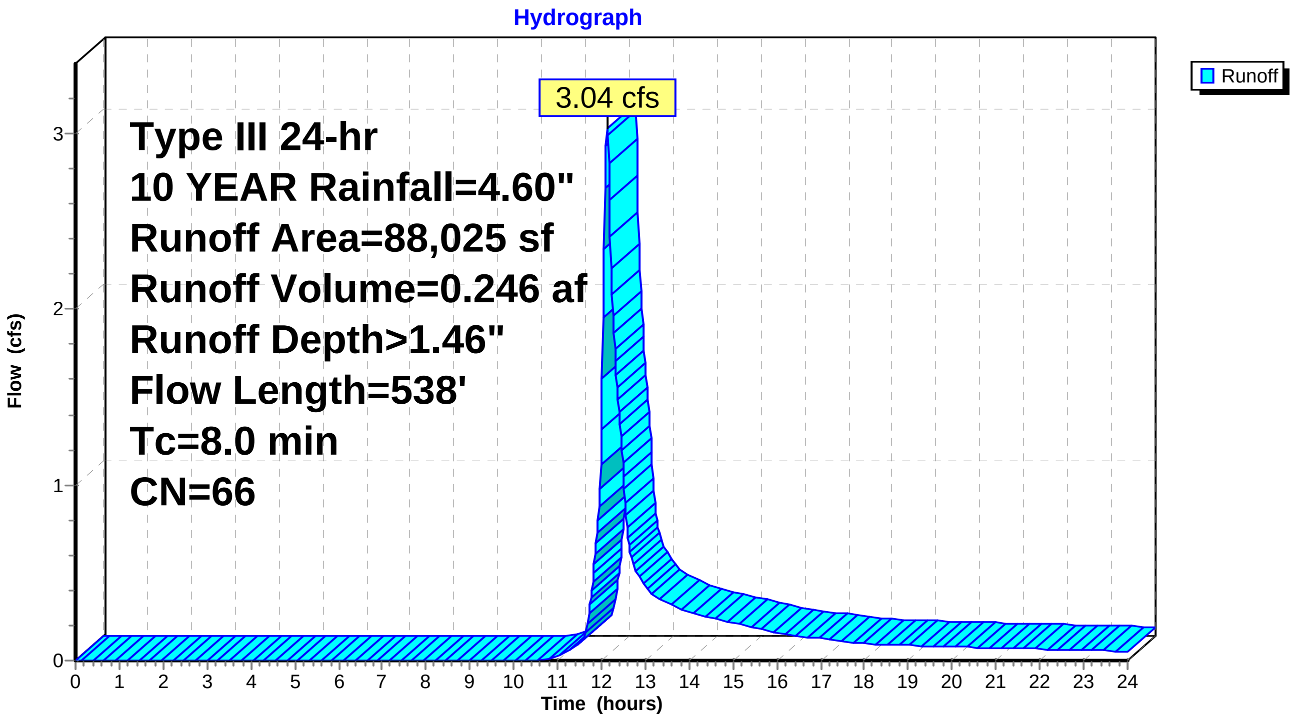
Runoff = 3.04 cfs @ 12.12 hrs, Volume= 0.246 af, Depth> 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	10,514	98	roofs
*	2,451	98	pavement
*	142	98	ledge
	62,001	61	>75% Grass cover, Good, HSG B
	12,917	55	Woods, Good, HSG B
	88,025	66	Weighted Average
	74,918		85.11% Pervious Area
	13,107		14.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	26	0.0960	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	24	0.0570	0.19		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.20"
1.8	425	0.0570	3.84		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.2	63	0.0064	4.98	6.11	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
8.0	538	Total			

Subcatchment EX-1A:



Summary for Subcatchment EX-1B:

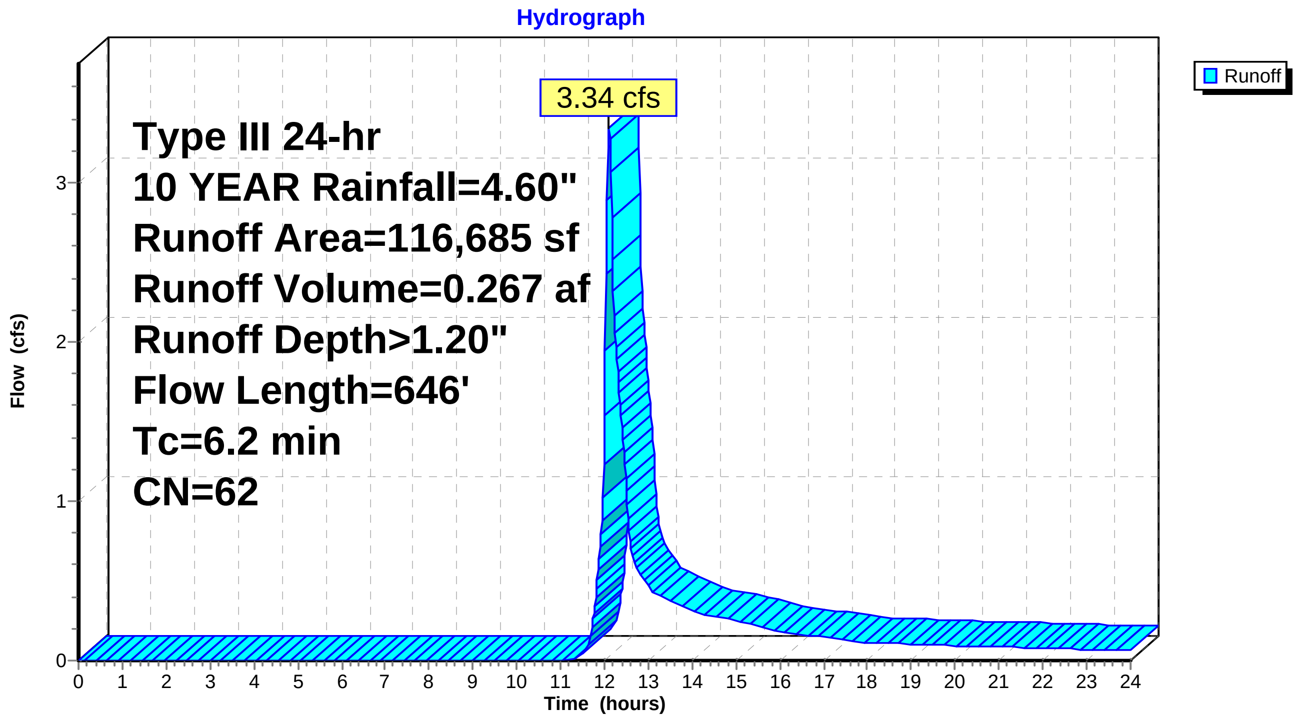
Runoff = 3.34 cfs @ 12.10 hrs, Volume= 0.267 af, Depth> 1.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	4,294	98	roofs
*	905	98	pavement
	106,591	61	>75% Grass cover, Good, HSG B
	4,895	55	Woods, Good, HSG B
	116,685	62	Weighted Average
	111,486		95.54% Pervious Area
	5,199		4.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.20"
0.8	195	0.0620	4.01		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
2.0	254	0.0180	2.16		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.1	26	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
0.3	121	0.0075	7.24	35.52	**Pipe Channel, E-F** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Concrete pipe, bends & connections
6.2	646	Total			

Subcatchment EX-1B:



Summary for Subcatchment EX-1C:

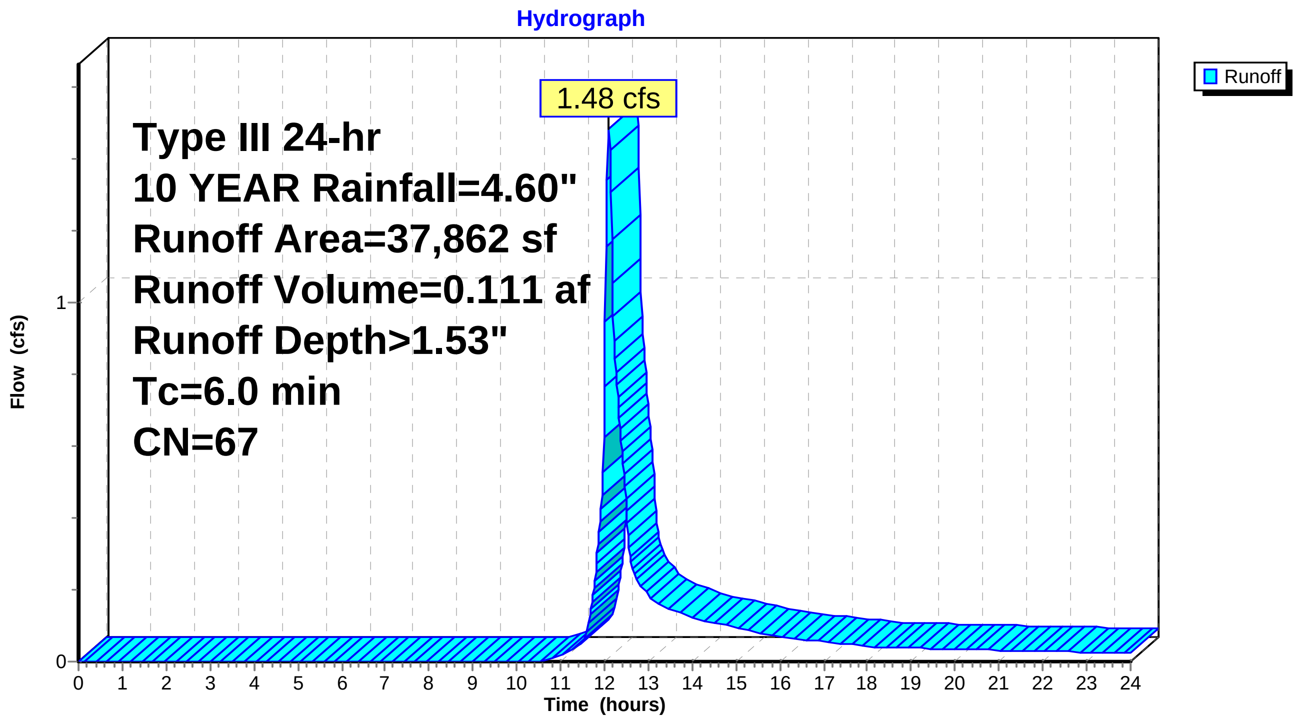
Runoff = 1.48 cfs @ 12.10 hrs, Volume= 0.111 af, Depth> 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	5,283	98	roofs
*	1,134	98	pavement
	30,564	61	>75% Grass cover, Good, HSG B
	881	55	Woods, Good, HSG B
	37,862	67	Weighted Average
	31,445		83.05% Pervious Area
	6,417		16.95% Impervious Area

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

Subcatchment EX-1C:



Summary for Subcatchment EX-2:

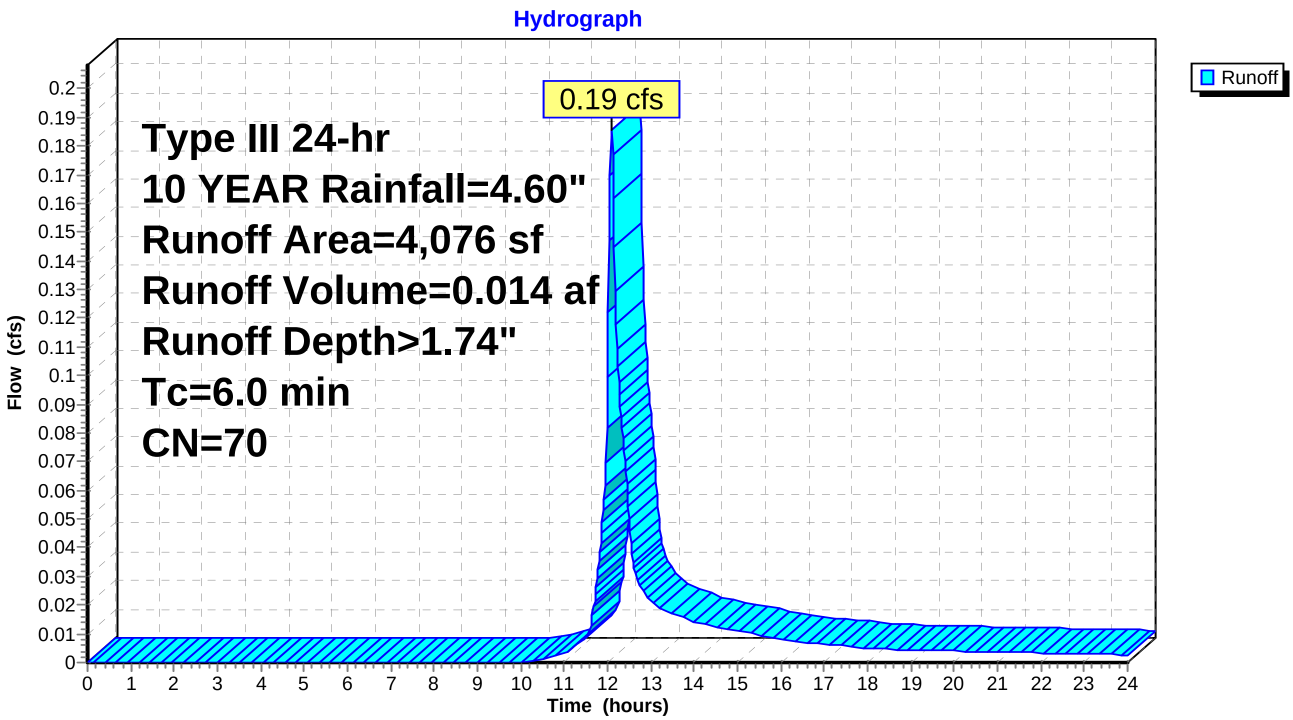
Runoff = 0.19 cfs @ 12.09 hrs, Volume= 0.014 af, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	2,656	55	Woods, Good, HSG B
*	1,420	98	ledge
	4,076	70	Weighted Average
	2,656		65.16% Pervious Area
	1,420		34.84% Impervious Area

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

Subcatchment EX-2:



Summary for Subcatchment EX-3A:

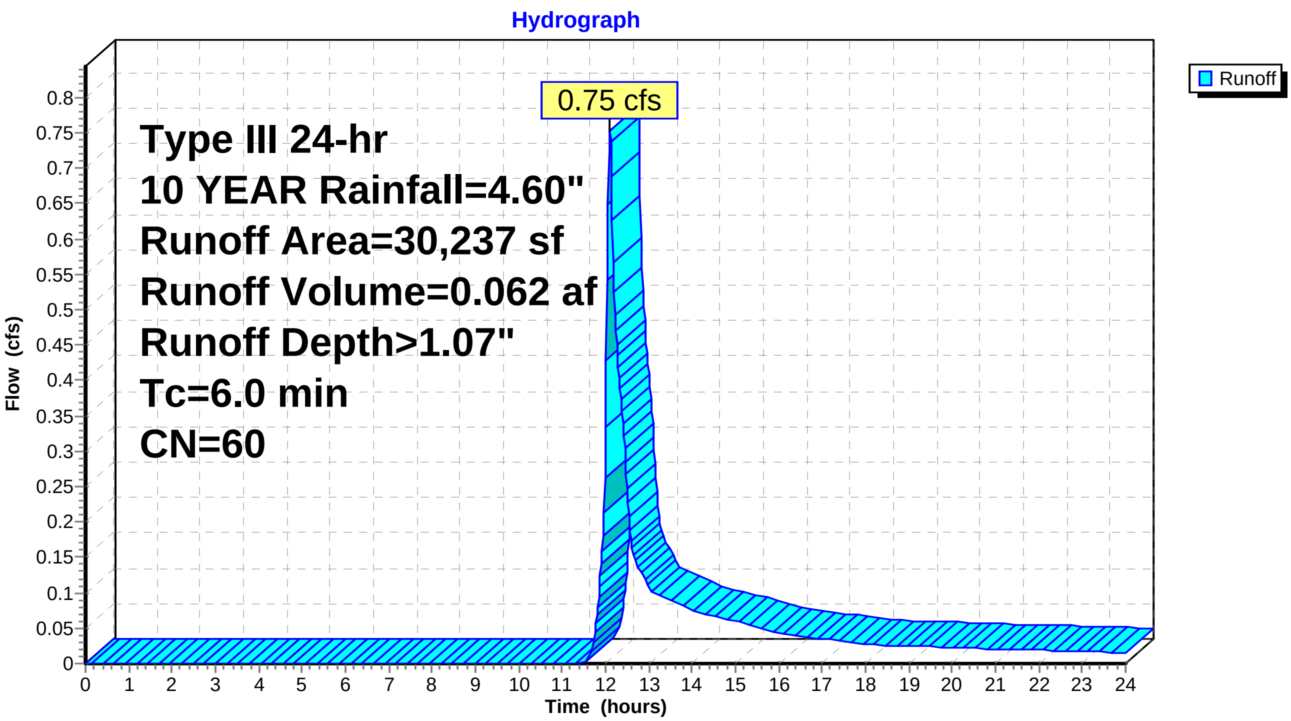
Runoff = 0.75 cfs @ 12.10 hrs, Volume= 0.062 af, Depth> 1.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	22,731	61	>75% Grass cover, Good, HSG B
	7,361	55	Woods, Good, HSG B
*	145	98	pavement
	30,237	60	Weighted Average
	30,092		99.52% Pervious Area
	145		0.48% Impervious Area

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

Subcatchment EX-3A:



Summary for Subcatchment EX-3B:

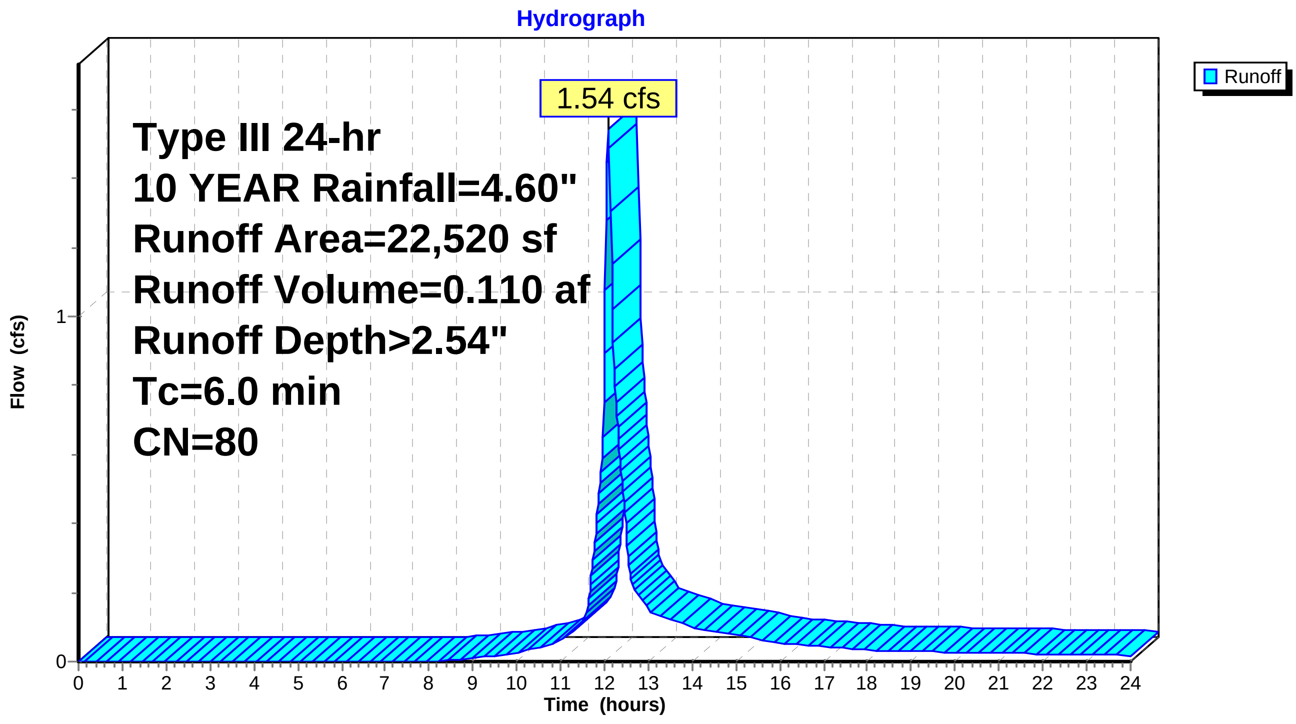
Runoff = 1.54 cfs @ 12.09 hrs, Volume= 0.110 af, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	8,382	61	>75% Grass cover, Good, HSG B
*	9,854	98	paving
	2,245	98	roofs
	2,039	55	Woods, Good, HSG B
	22,520	80	Weighted Average
	10,421		46.27% Pervious Area
	12,099		53.73% Impervious Area

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

Subcatchment EX-3B:



Summary for Subcatchment EX-3C:

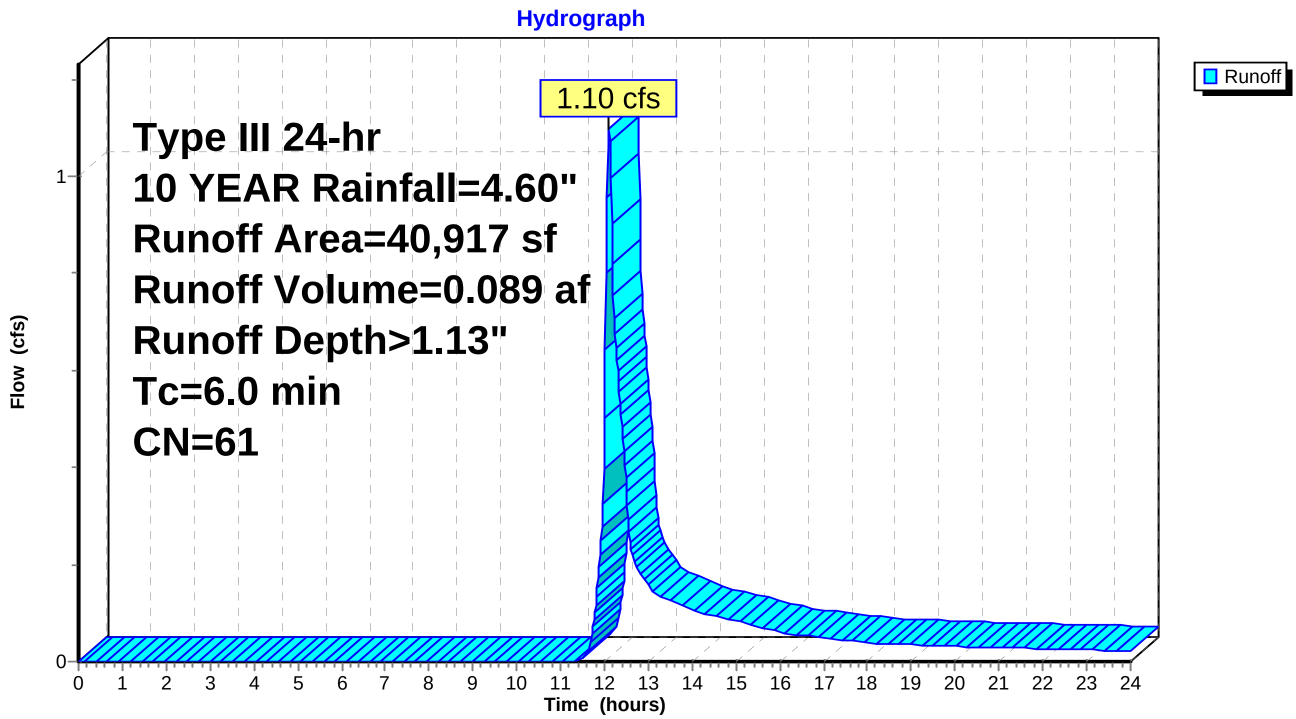
Runoff = 1.10 cfs @ 12.10 hrs, Volume= 0.089 af, Depth> 1.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	25,783	61	>75% Grass cover, Good, HSG B
	1,784	98	roofs
*	303	98	pavement
	13,047	55	Woods, Good, HSG B
	40,917	61	Weighted Average
	38,830		94.90% Pervious Area
	2,087		5.10% Impervious Area

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

Subcatchment EX-3C:



Summary for Subcatchment EX-3D:

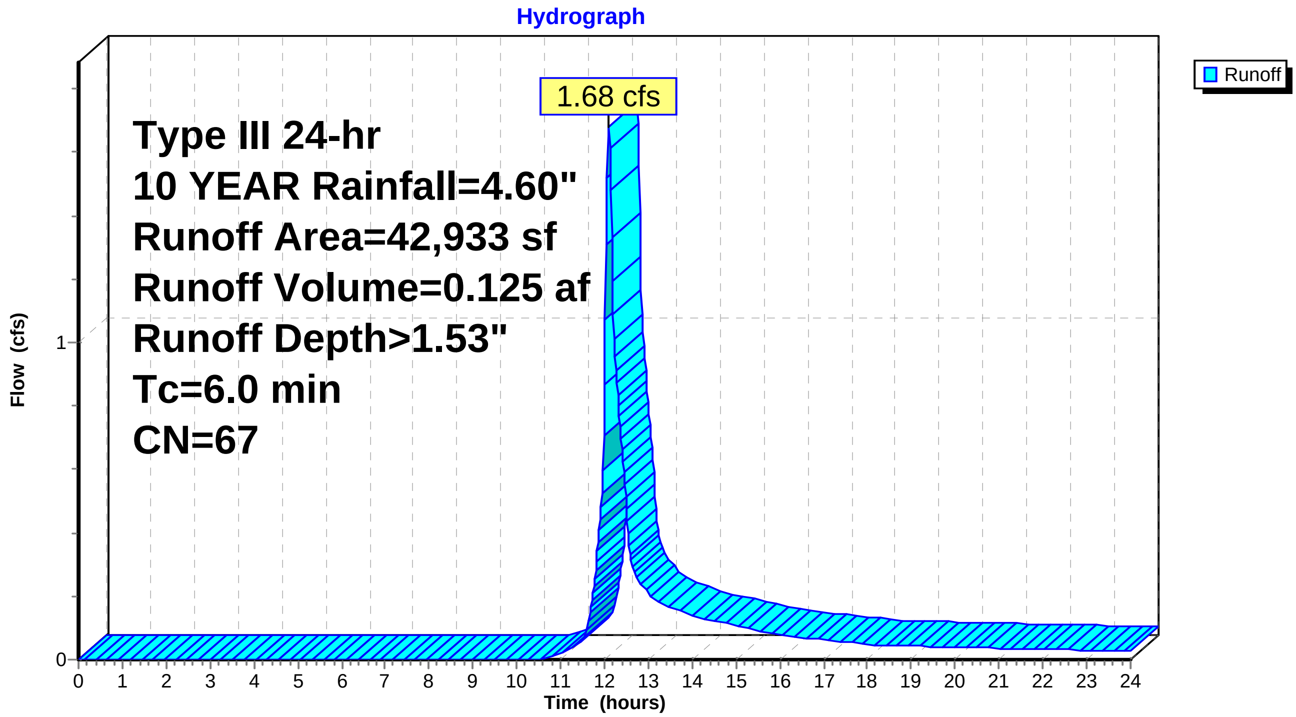
Runoff = 1.68 cfs @ 12.10 hrs, Volume= 0.125 af, Depth> 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	17,697	61	>75% Grass cover, Good, HSG B
	995	98	roofs
	4,507	98	Paved parking
*	3,764	98	Ledge
	15,970	55	Woods, Good, HSG B
	42,933	67	Weighted Average
	33,667		78.42% Pervious Area
	9,266		21.58% Impervious Area

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

Subcatchment EX-3D:



Summary for Subcatchment EX-4A:

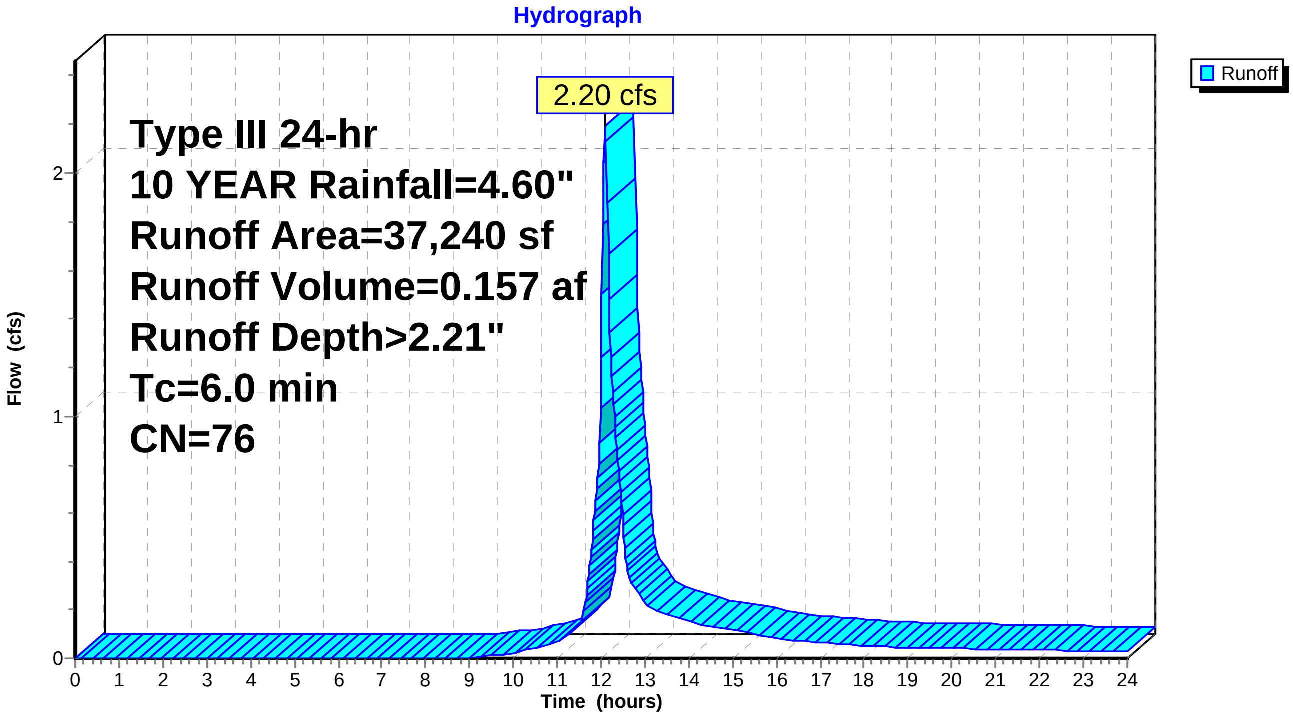
Runoff = 2.20 cfs @ 12.09 hrs, Volume= 0.157 af, Depth> 2.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	6,234	61	>75% Grass cover, Good, HSG B
*	14,643	98	paving
*	2,361	98	ledge
	14,002	55	Woods, Good, HSG B
	37,240	76	Weighted Average
	20,236		54.34% Pervious Area
	17,004		45.66% Impervious Area

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

Subcatchment EX-4A:



Summary for Subcatchment EX-4B:

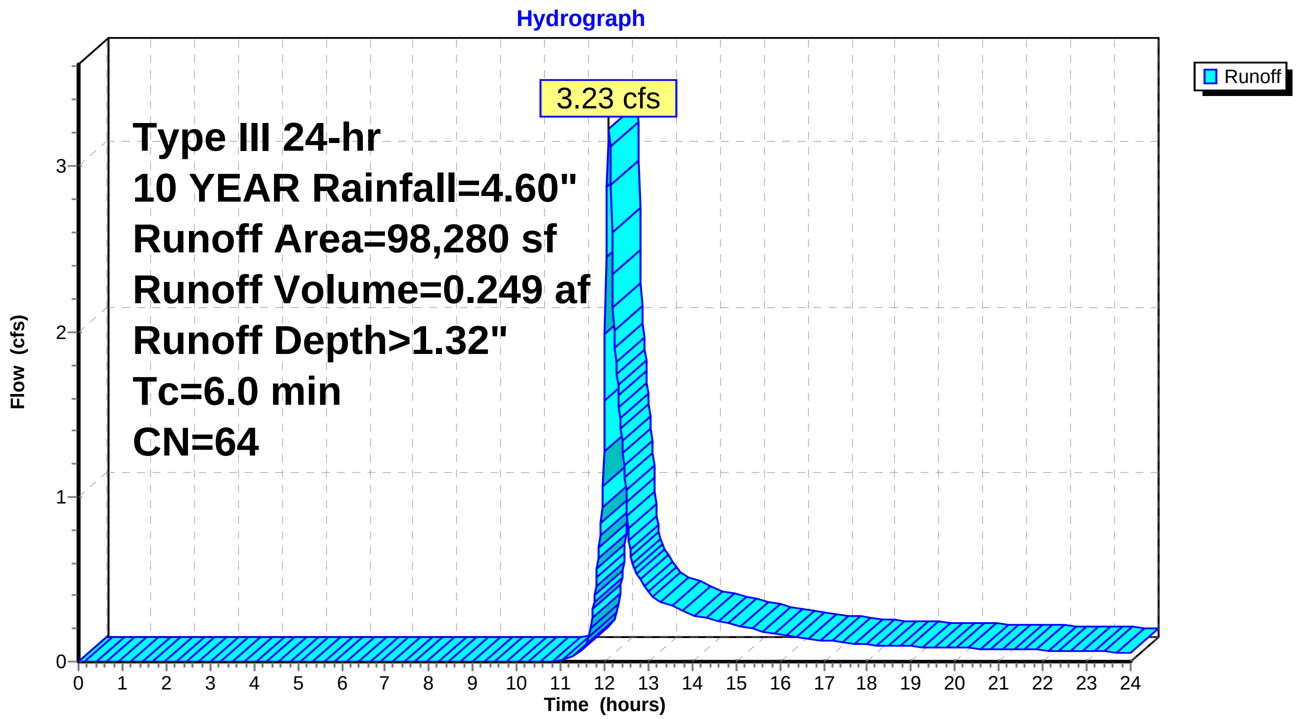
Runoff = 3.23 cfs @ 12.10 hrs, Volume= 0.249 af, Depth> 1.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	68,309	61	>75% Grass cover, Good, HSG B
*	5,937	98	paving
*	0	98	ledge
*	5,368	98	roofs
	18,666	55	Woods, Good, HSG B
	98,280	64	Weighted Average
	86,975		88.50% Pervious Area
	11,305		11.50% Impervious Area

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

Subcatchment EX-4B:



Summary for Subcatchment EX-4C:

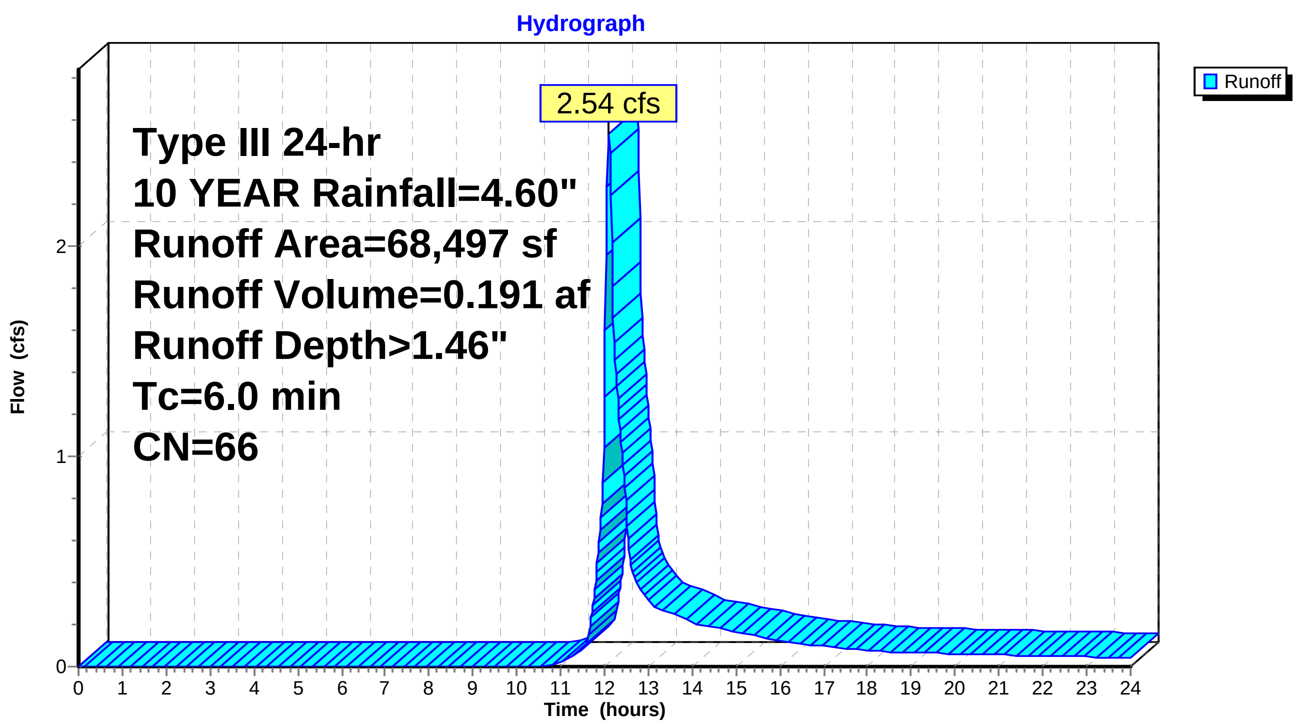
Runoff = 2.54 cfs @ 12.10 hrs, Volume= 0.191 af, Depth> 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	10,460	61	>75% Grass cover, Good, HSG B
*	7,958	98	paving
*	8,812	98	ledge
	41,267	55	Woods, Good, HSG B
	68,497	66	Weighted Average
	51,727		75.52% Pervious Area
	16,770		24.48% Impervious Area

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

Subcatchment EX-4C:



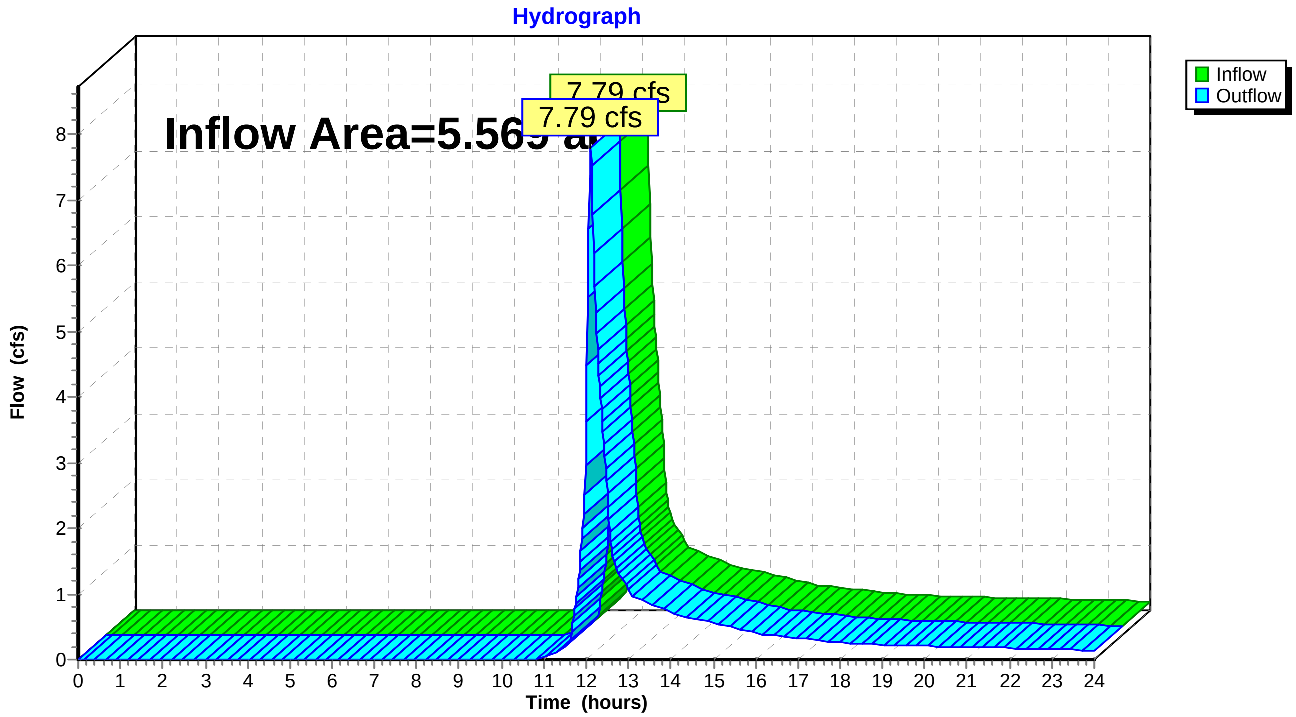
Summary for Reach DP-1: Wetlands-North

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

Inflow Area =	5.569 ac,	10.19% Impervious,	Inflow Depth > 1.34"	for 10 YEAR event	
Inflow =	7.79 cfs @	12.11 hrs,	Volume=	0.623 af	
Outflow =	7.79 cfs @	12.11 hrs,	Volume=	0.623 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1: Wetlands-North



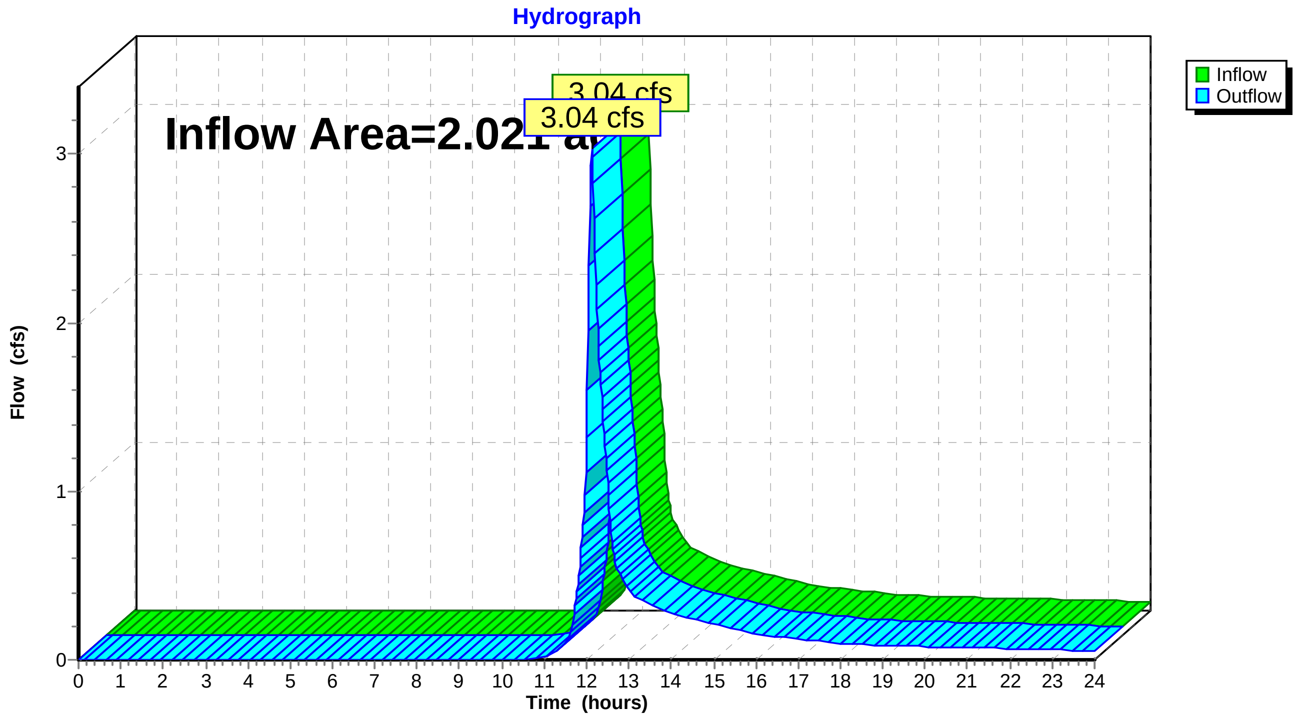
Summary for Reach DP-1A:

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

Inflow Area = 2.021 ac, 14.89% Impervious, Inflow Depth > 1.46" for 10 YEAR event
Inflow = 3.04 cfs @ 12.12 hrs, Volume= 0.246 af
Outflow = 3.04 cfs @ 12.12 hrs, Volume= 0.246 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1A:



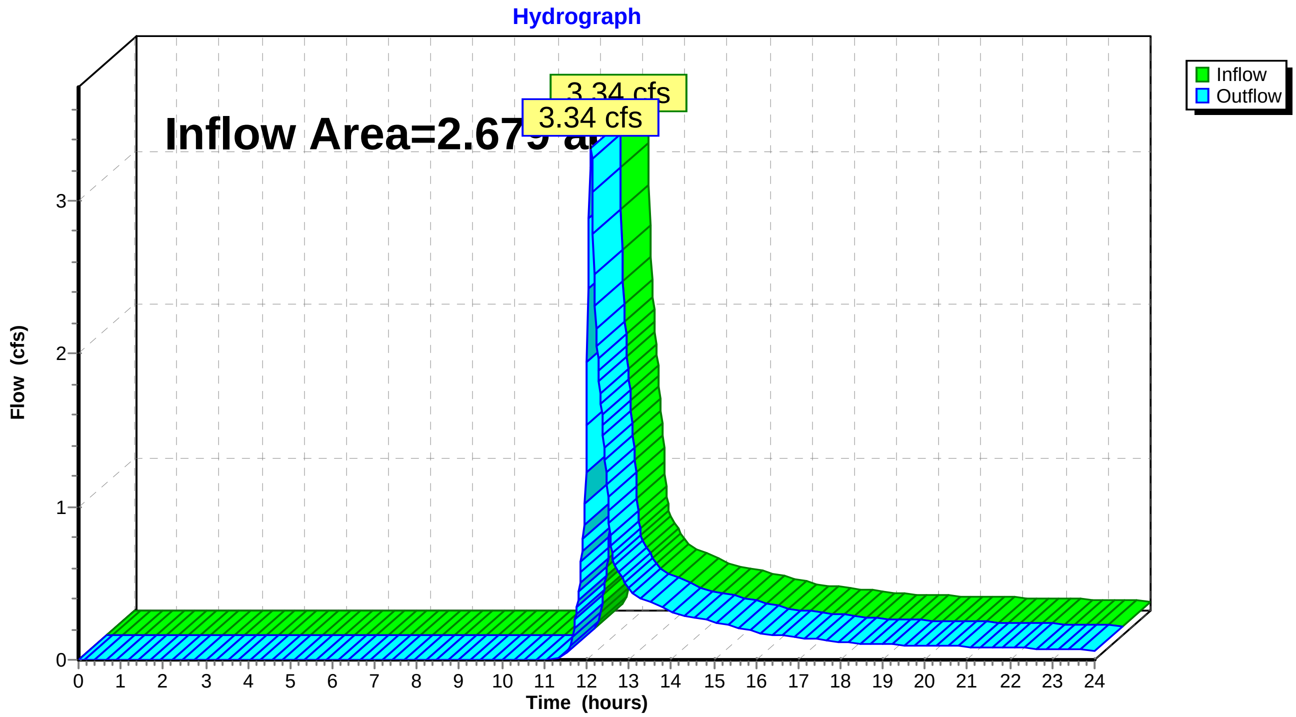
Summary for Reach DP-1B:

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

Inflow Area =	2.679 ac,	4.46% Impervious,	Inflow Depth > 1.20"	for 10 YEAR event	
Inflow =	3.34 cfs @	12.10 hrs,	Volume=	0.267 af	
Outflow =	3.34 cfs @	12.10 hrs,	Volume=	0.267 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1B:



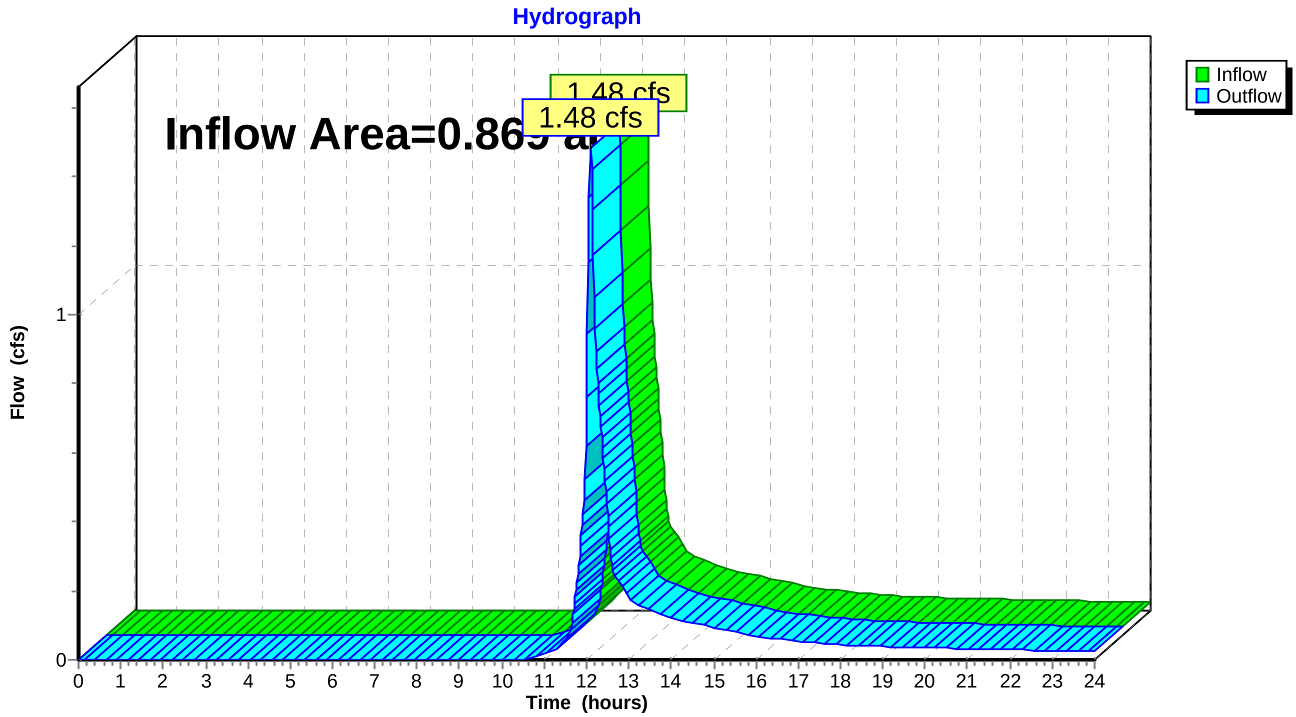
Summary for Reach DP-1C:

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

Inflow Area = 0.869 ac, 16.95% Impervious, Inflow Depth > 1.53" for 10 YEAR event
Inflow = 1.48 cfs @ 12.10 hrs, Volume= 0.111 af
Outflow = 1.48 cfs @ 12.10 hrs, Volume= 0.111 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1C:

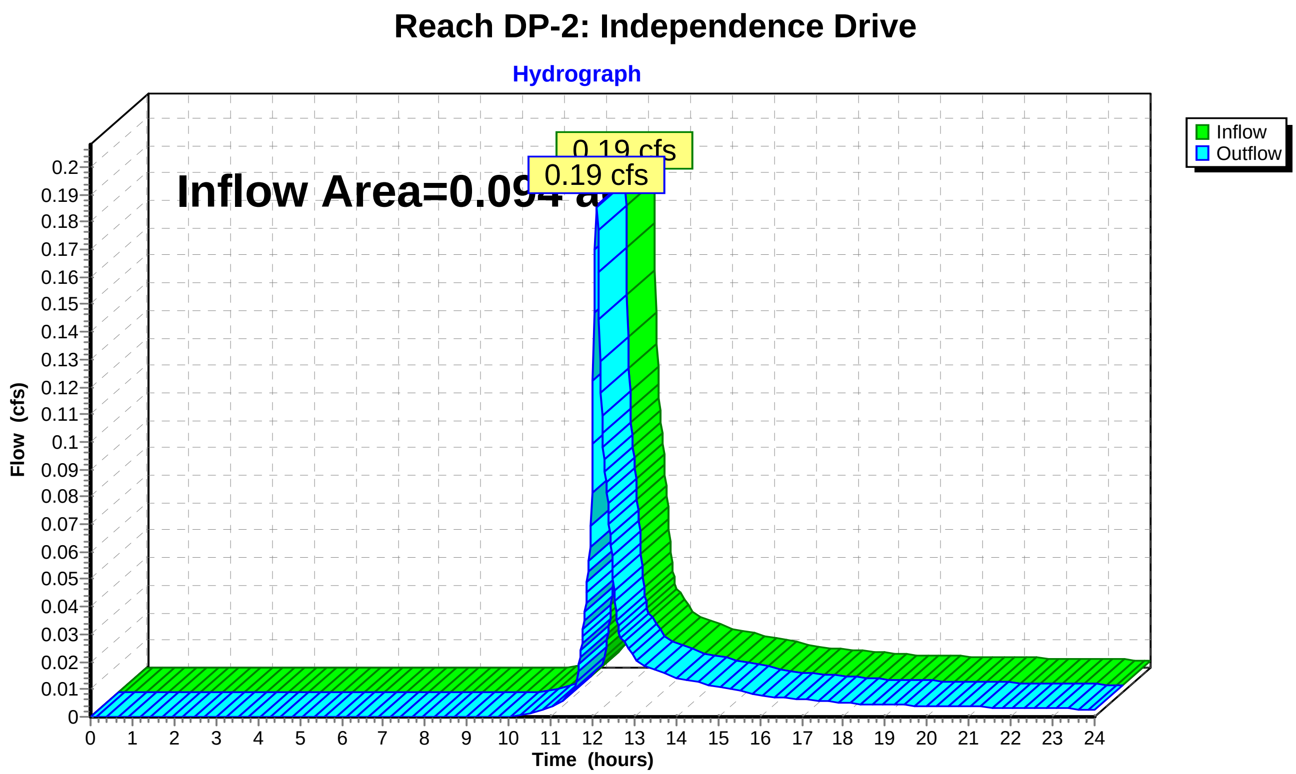


Summary for Reach DP-2: Independence Drive

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

Inflow Area =	0.094 ac,	34.84% Impervious,	Inflow Depth > 1.74"	for 10 YEAR event	
Inflow =	0.19 cfs @	12.09 hrs,	Volume=	0.014 af	
Outflow =	0.19 cfs @	12.09 hrs,	Volume=	0.014 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

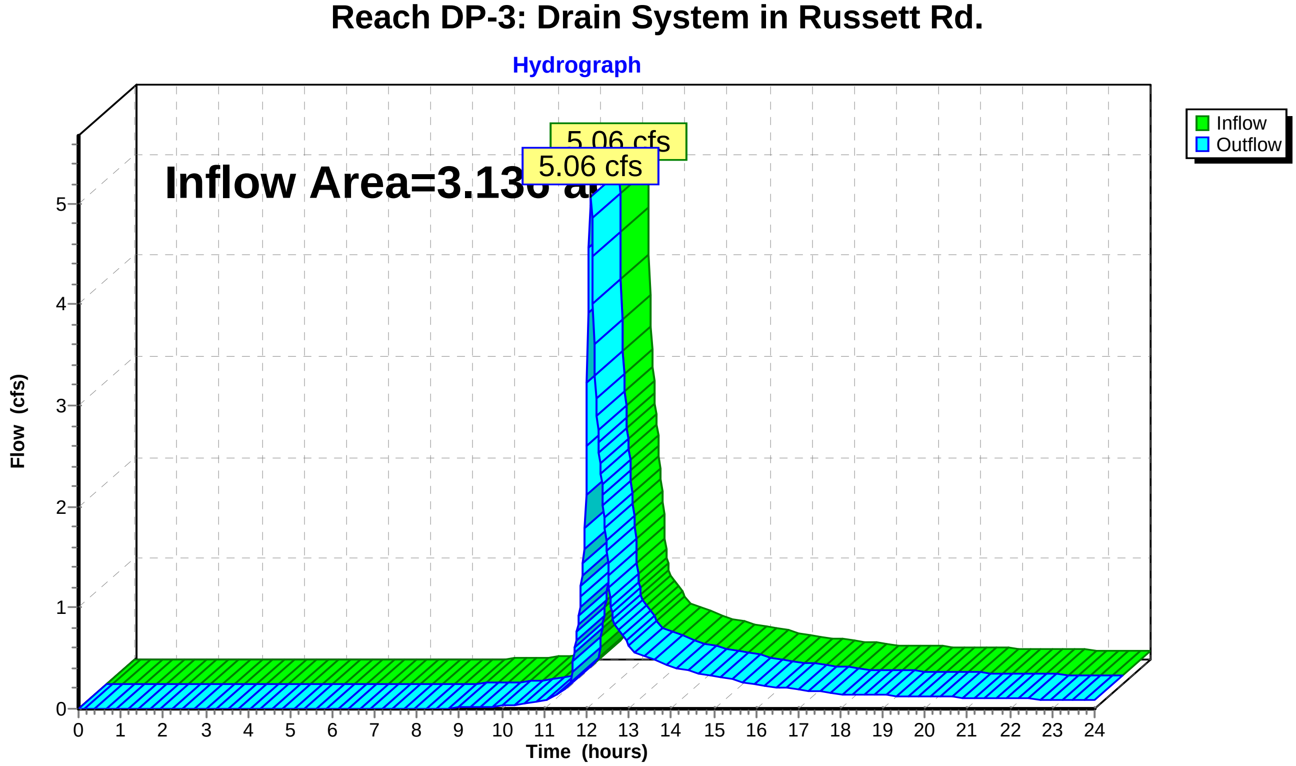


Summary for Reach DP-3: Drain System in Russett Rd.

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

Inflow Area =	3.136 ac, 17.27% Impervious, Inflow Depth > 1.48"	for 10 YEAR event	
Inflow =	5.06 cfs @ 12.10 hrs, Volume=	0.386 af	
Outflow =	5.06 cfs @ 12.10 hrs, Volume=	0.386 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs



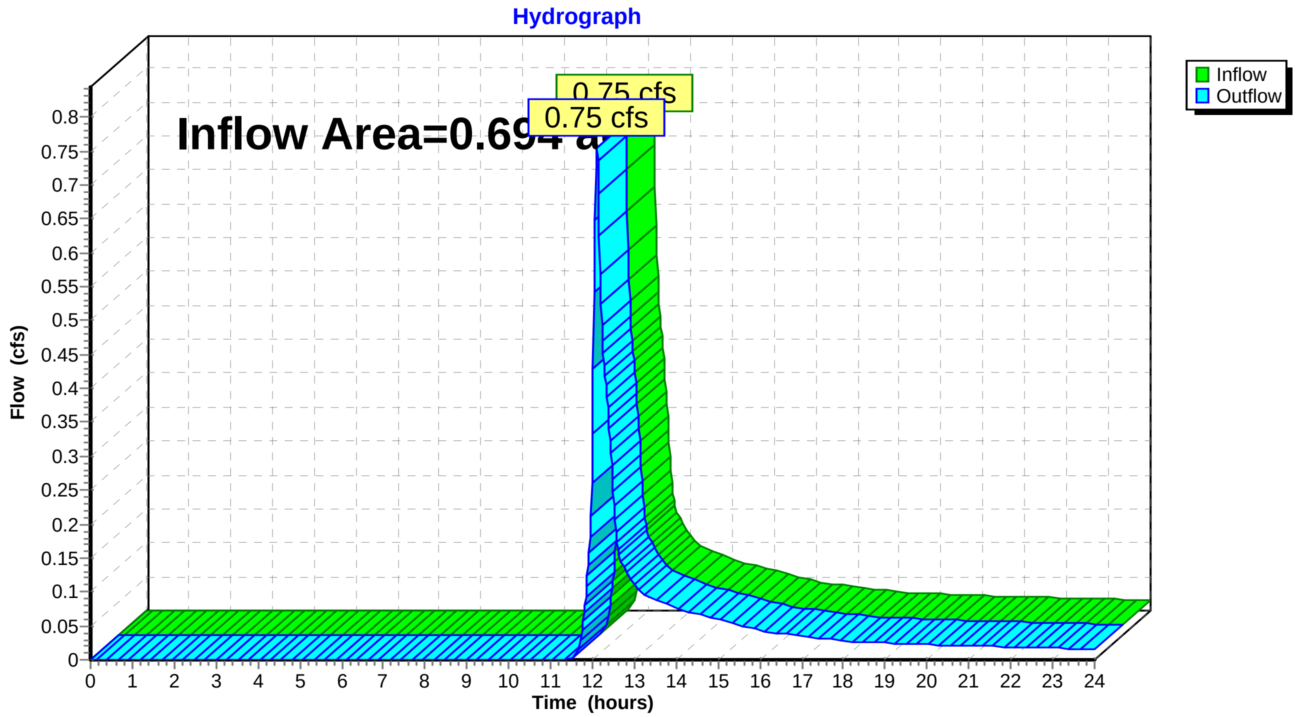
Summary for Reach DP-3A:

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

Inflow Area = 0.694 ac, 0.48% Impervious, Inflow Depth > 1.07" for 10 YEAR event
Inflow = 0.75 cfs @ 12.10 hrs, Volume= 0.062 af
Outflow = 0.75 cfs @ 12.10 hrs, Volume= 0.062 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3A:



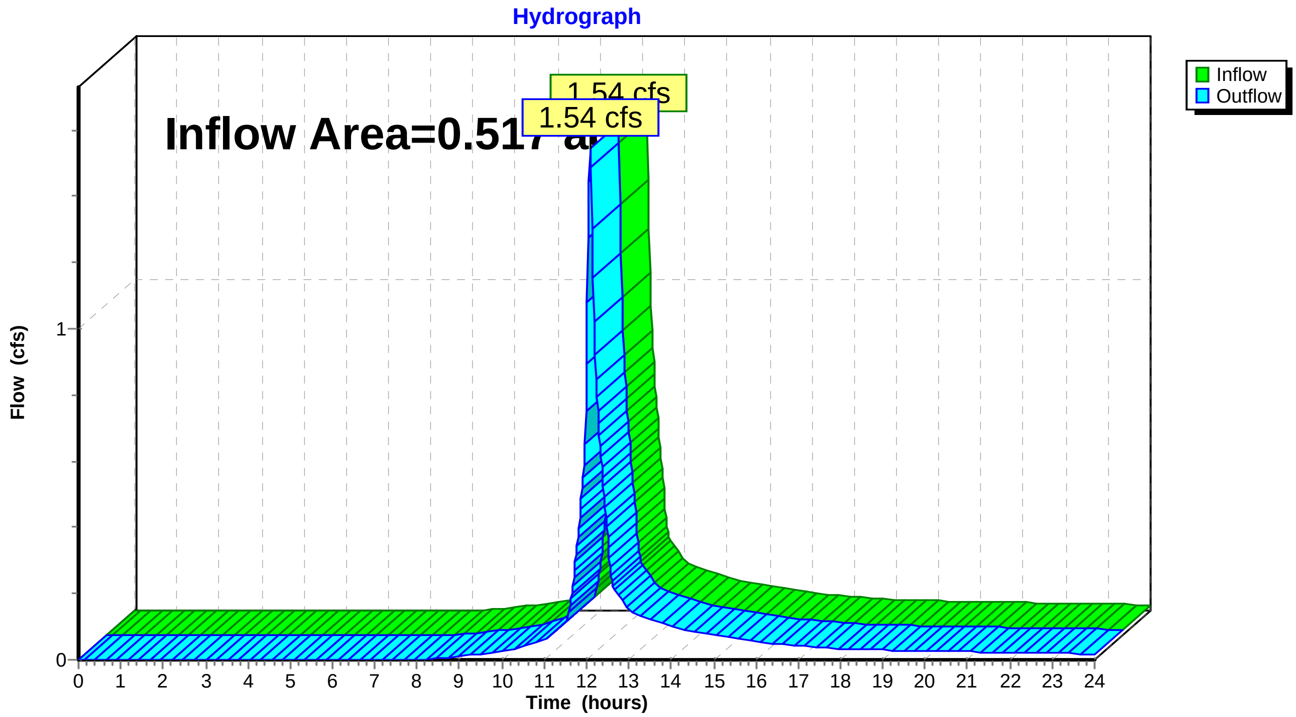
Summary for Reach DP-3B:

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

Inflow Area = 0.517 ac, 53.73% Impervious, Inflow Depth > 2.54" for 10 YEAR event
Inflow = 1.54 cfs @ 12.09 hrs, Volume= 0.110 af
Outflow = 1.54 cfs @ 12.09 hrs, Volume= 0.110 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3B:



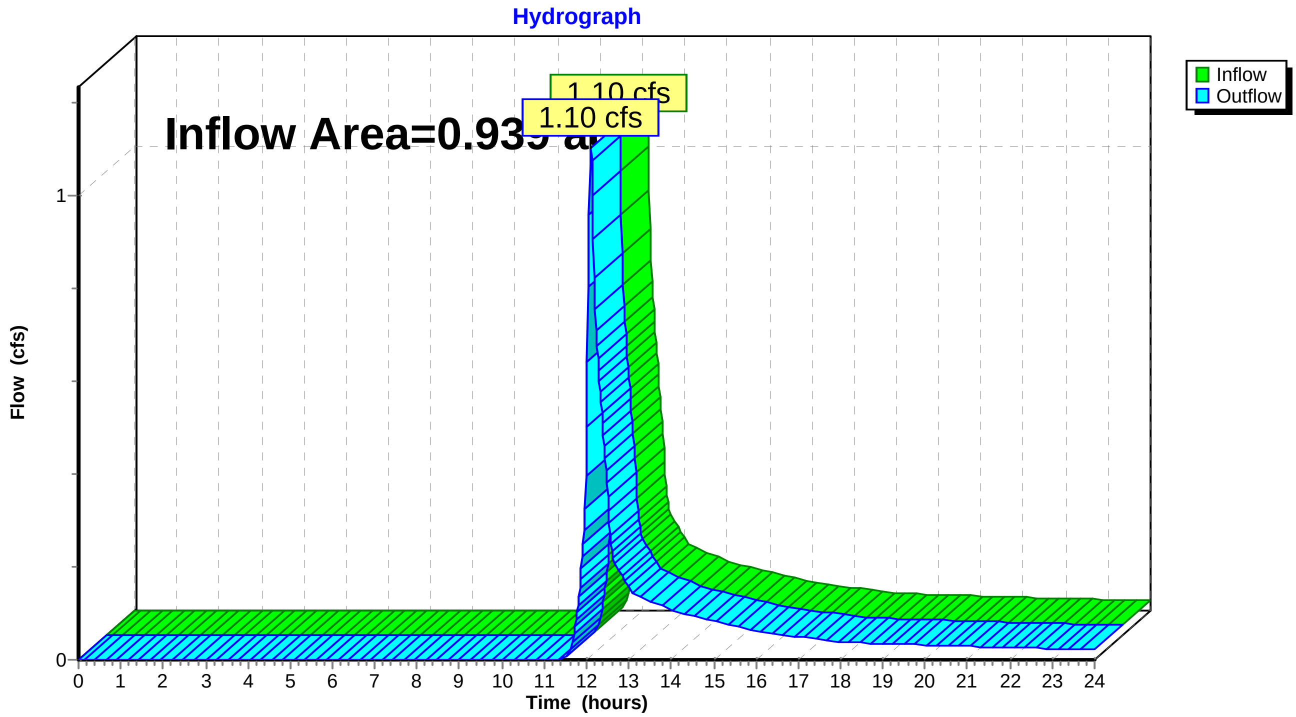
Summary for Reach DP-3C:

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

Inflow Area =	0.939 ac,	5.10% Impervious,	Inflow Depth > 1.13"	for 10 YEAR event	
Inflow =	1.10 cfs @	12.10 hrs,	Volume=	0.089 af	
Outflow =	1.10 cfs @	12.10 hrs,	Volume=	0.089 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3C:



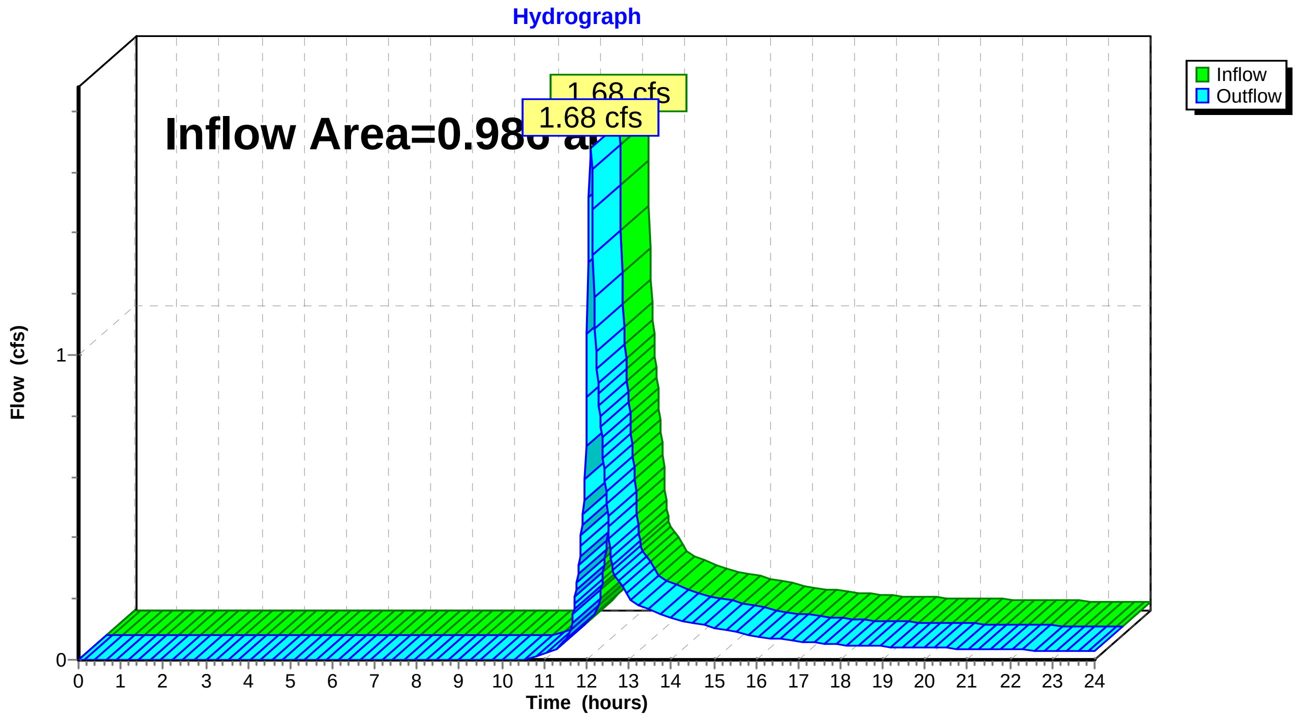
Summary for Reach DP-3D:

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

Inflow Area =	0.986 ac, 21.58% Impervious, Inflow Depth > 1.53"		for 10 YEAR event
Inflow =	1.68 cfs @ 12.10 hrs, Volume=	0.125 af	
Outflow =	1.68 cfs @ 12.10 hrs, Volume=	0.125 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3D:



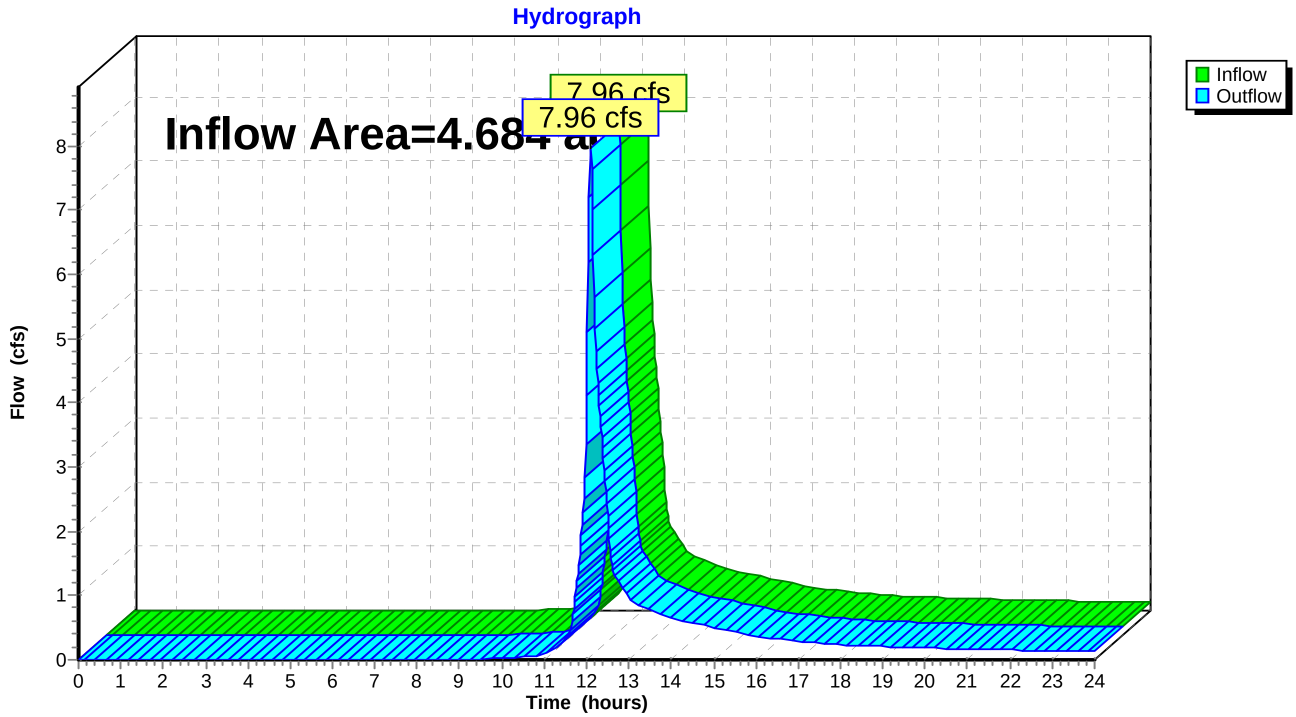
Summary for Reach DP-4: VFW Parkway

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

Inflow Area = 4.684 ac, 22.10% Impervious, Inflow Depth > 1.53" for 10 YEAR event
Inflow = 7.96 cfs @ 12.10 hrs, Volume= 0.598 af
Outflow = 7.96 cfs @ 12.10 hrs, Volume= 0.598 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4: VFW Parkway

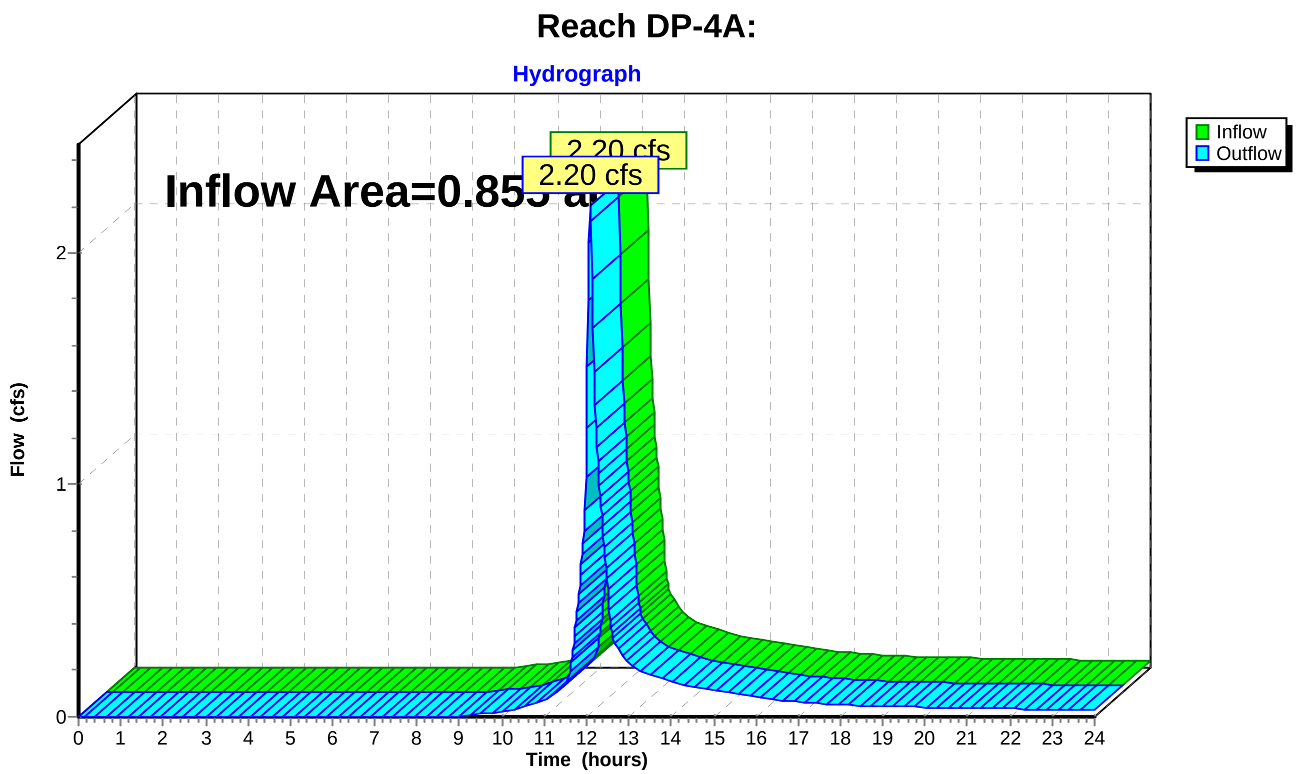


Summary for Reach DP-4A:

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

Inflow Area =	0.855 ac,	45.66% Impervious,	Inflow Depth > 2.21"	for 10 YEAR event	
Inflow =	2.20 cfs @	12.09 hrs,	Volume=	0.157 af	
Outflow =	2.20 cfs @	12.09 hrs,	Volume=	0.157 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs



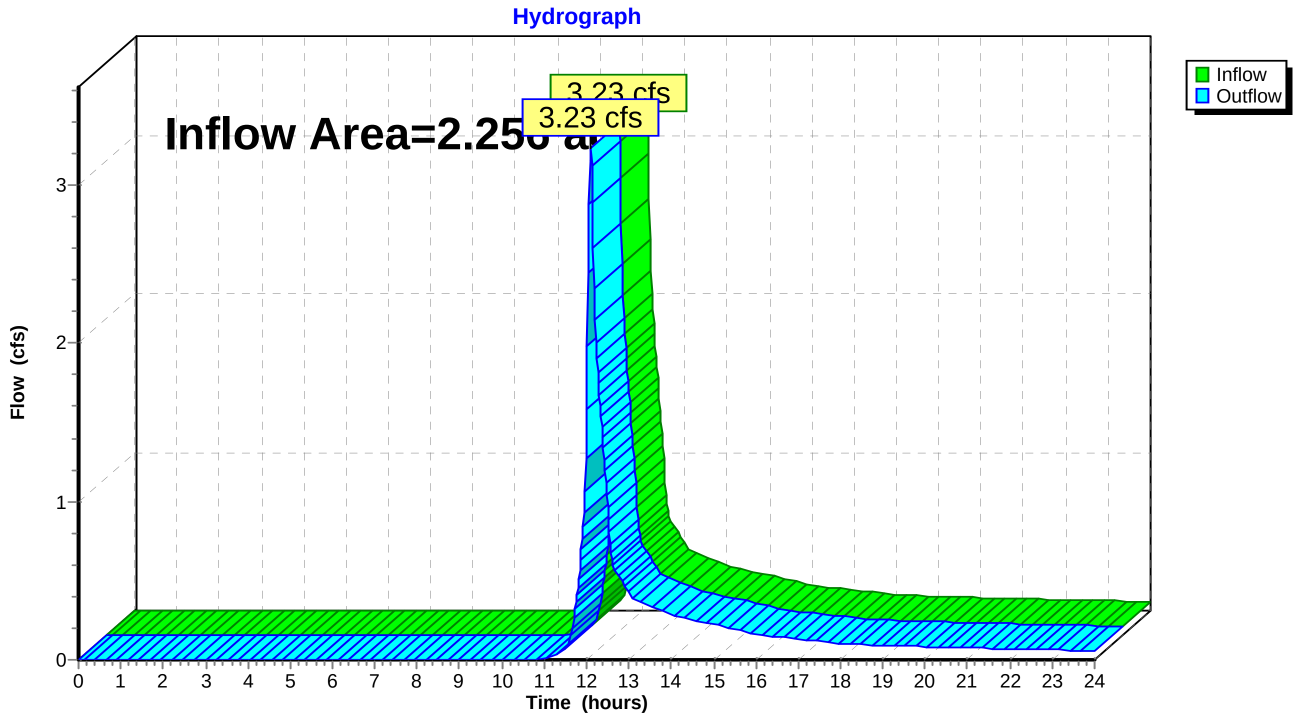
Summary for Reach DP-4B:

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

Inflow Area = 2.256 ac, 11.50% Impervious, Inflow Depth > 1.32" for 10 YEAR event
Inflow = 3.23 cfs @ 12.10 hrs, Volume= 0.249 af
Outflow = 3.23 cfs @ 12.10 hrs, Volume= 0.249 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4B:



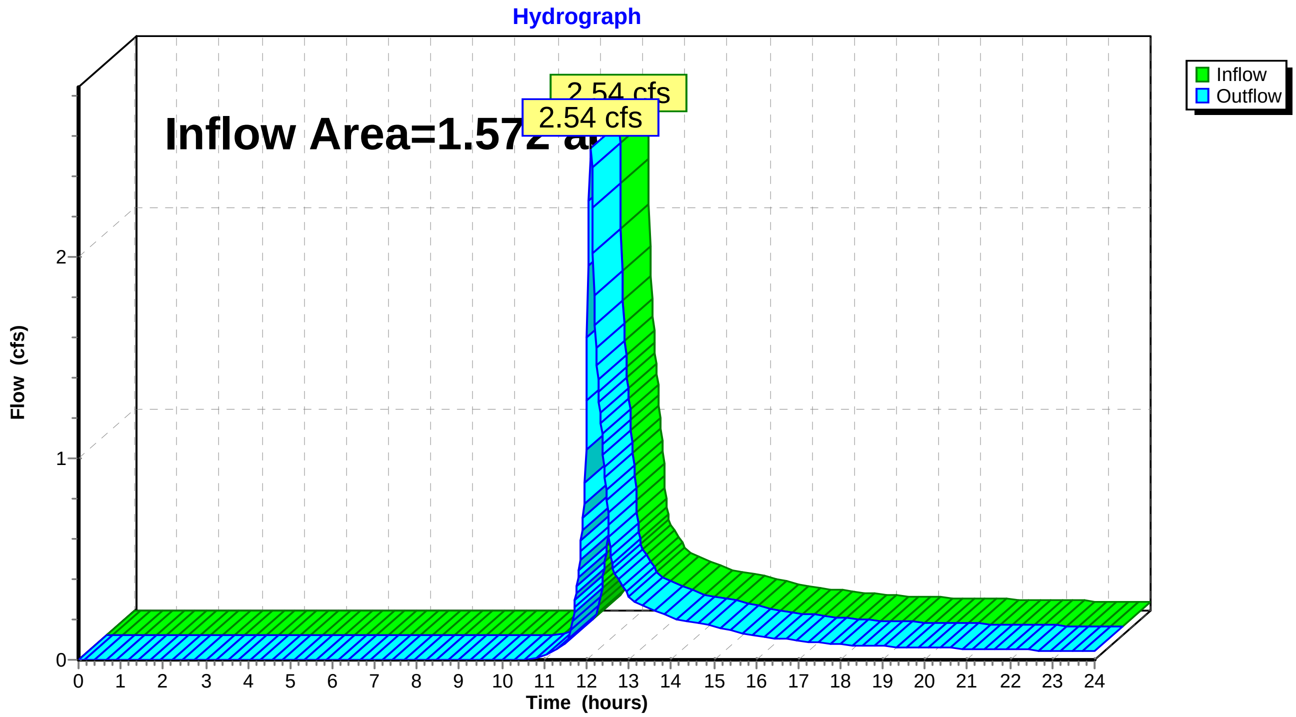
Summary for Reach DP-4C:

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

Inflow Area =	1.572 ac, 24.48% Impervious, Inflow Depth > 1.46"	for 10 YEAR event
Inflow =	2.54 cfs @ 12.10 hrs, Volume=	0.191 af
Outflow =	2.54 cfs @ 12.10 hrs, Volume=	0.191 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4C:



Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1A: Runoff Area=88,025 sf 14.89% Impervious Runoff Depth>2.97"
Flow Length=538' Tc=8.0 min CN=66 Runoff=6.49 cfs 0.499 af

Subcatchment EX-1B: Runoff Area=116,685 sf 4.46% Impervious Runoff Depth>2.58"
Flow Length=646' Tc=6.2 min CN=62 Runoff=7.84 cfs 0.576 af

Subcatchment EX-1C: Runoff Area=37,862 sf 16.95% Impervious Runoff Depth>3.07"
Tc=6.0 min CN=67 Runoff=3.10 cfs 0.222 af

Subcatchment EX-2: Runoff Area=4,076 sf 34.84% Impervious Runoff Depth>3.37"
Tc=6.0 min CN=70 Runoff=0.37 cfs 0.026 af

Subcatchment EX-3A: Runoff Area=30,237 sf 0.48% Impervious Runoff Depth>2.39"
Tc=6.0 min CN=60 Runoff=1.87 cfs 0.138 af

Subcatchment EX-3B: Runoff Area=22,520 sf 53.73% Impervious Runoff Depth>4.41"
Tc=6.0 min CN=80 Runoff=2.65 cfs 0.190 af

Subcatchment EX-3C: Runoff Area=40,917 sf 5.10% Impervious Runoff Depth>2.48"
Tc=6.0 min CN=61 Runoff=2.65 cfs 0.194 af

Subcatchment EX-3D: Runoff Area=42,933 sf 21.58% Impervious Runoff Depth>3.07"
Tc=6.0 min CN=67 Runoff=3.51 cfs 0.252 af

Subcatchment EX-4A: Runoff Area=37,240 sf 45.66% Impervious Runoff Depth>3.99"
Tc=6.0 min CN=76 Runoff=3.99 cfs 0.284 af

Subcatchment EX-4B: Runoff Area=98,280 sf 11.50% Impervious Runoff Depth>2.77"
Tc=6.0 min CN=64 Runoff=7.21 cfs 0.521 af

Subcatchment EX-4C: Runoff Area=68,497 sf 24.48% Impervious Runoff Depth>2.97"
Tc=6.0 min CN=66 Runoff=5.41 cfs 0.389 af

Reach DP-1: Wetlands-North Inflow=17.29 cfs 1.297 af
Outflow=17.29 cfs 1.297 af

Reach DP-1A: Inflow=6.49 cfs 0.499 af
Outflow=6.49 cfs 0.499 af

Reach DP-1B: Inflow=7.84 cfs 0.576 af
Outflow=7.84 cfs 0.576 af

Reach DP-1C: Inflow=3.10 cfs 0.222 af
Outflow=3.10 cfs 0.222 af

Reach DP-2: Independence Drive Inflow=0.37 cfs 0.026 af
Outflow=0.37 cfs 0.026 af

Reach DP-3: Drain System in Russett Rd.	Inflow=10.68 cfs 0.775 af Outflow=10.68 cfs 0.775 af
Reach DP-3A:	Inflow=1.87 cfs 0.138 af Outflow=1.87 cfs 0.138 af
Reach DP-3B:	Inflow=2.65 cfs 0.190 af Outflow=2.65 cfs 0.190 af
Reach DP-3C:	Inflow=2.65 cfs 0.194 af Outflow=2.65 cfs 0.194 af
Reach DP-3D:	Inflow=3.51 cfs 0.252 af Outflow=3.51 cfs 0.252 af
Reach DP-4: VFW Parkway	Inflow=16.60 cfs 1.194 af Outflow=16.60 cfs 1.194 af
Reach DP-4A:	Inflow=3.99 cfs 0.284 af Outflow=3.99 cfs 0.284 af
Reach DP-4B:	Inflow=7.21 cfs 0.521 af Outflow=7.21 cfs 0.521 af
Reach DP-4C:	Inflow=5.41 cfs 0.389 af Outflow=5.41 cfs 0.389 af

Total Runoff Area = 13.482 ac Runoff Volume = 3.292 af Average Runoff Depth = 2.93"
83.85% Pervious = 11.305 ac 16.15% Impervious = 2.177 ac

Summary for Subcatchment EX-1A:

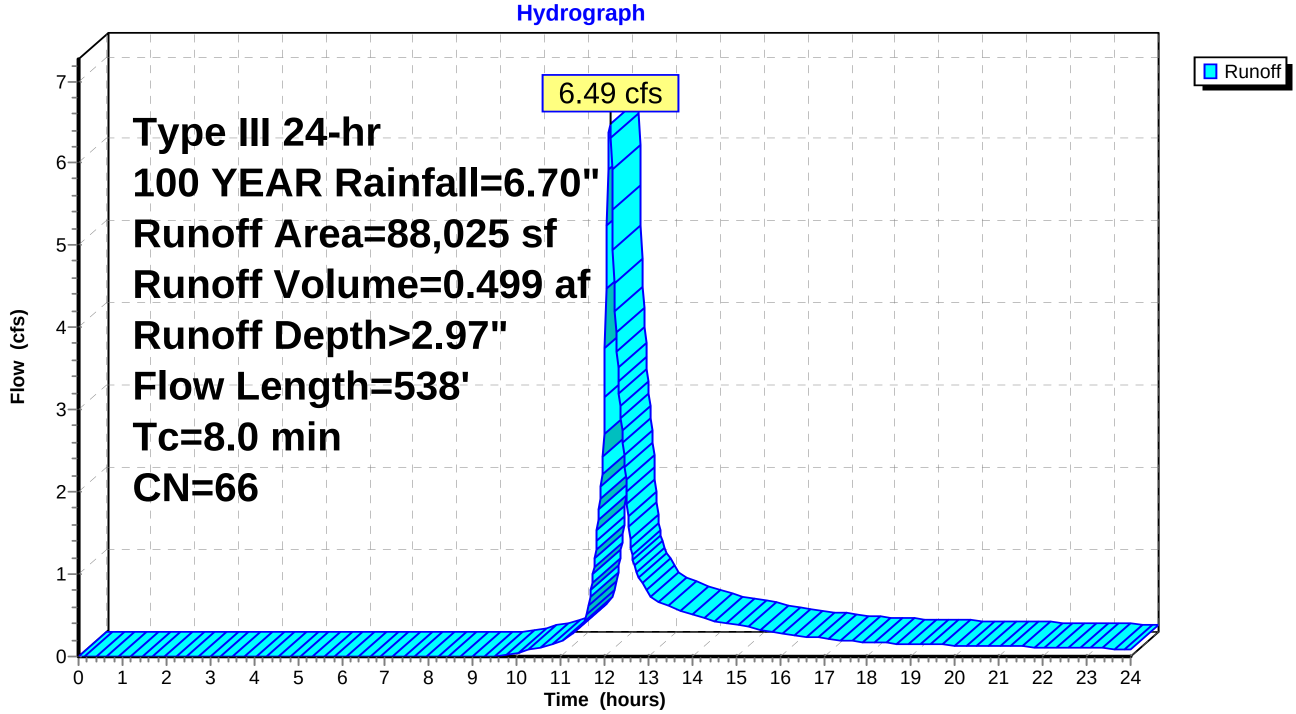
Runoff = 6.49 cfs @ 12.12 hrs, Volume= 0.499 af, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	10,514	98	roofs
*	2,451	98	pavement
*	142	98	ledge
	62,001	61	>75% Grass cover, Good, HSG B
	12,917	55	Woods, Good, HSG B
	88,025	66	Weighted Average
	74,918		85.11% Pervious Area
	13,107		14.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	26	0.0960	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	24	0.0570	0.19		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.20"
1.8	425	0.0570	3.84		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.2	63	0.0064	4.98	6.11	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
8.0	538	Total			

Subcatchment EX-1A:



Summary for Subcatchment EX-1B:

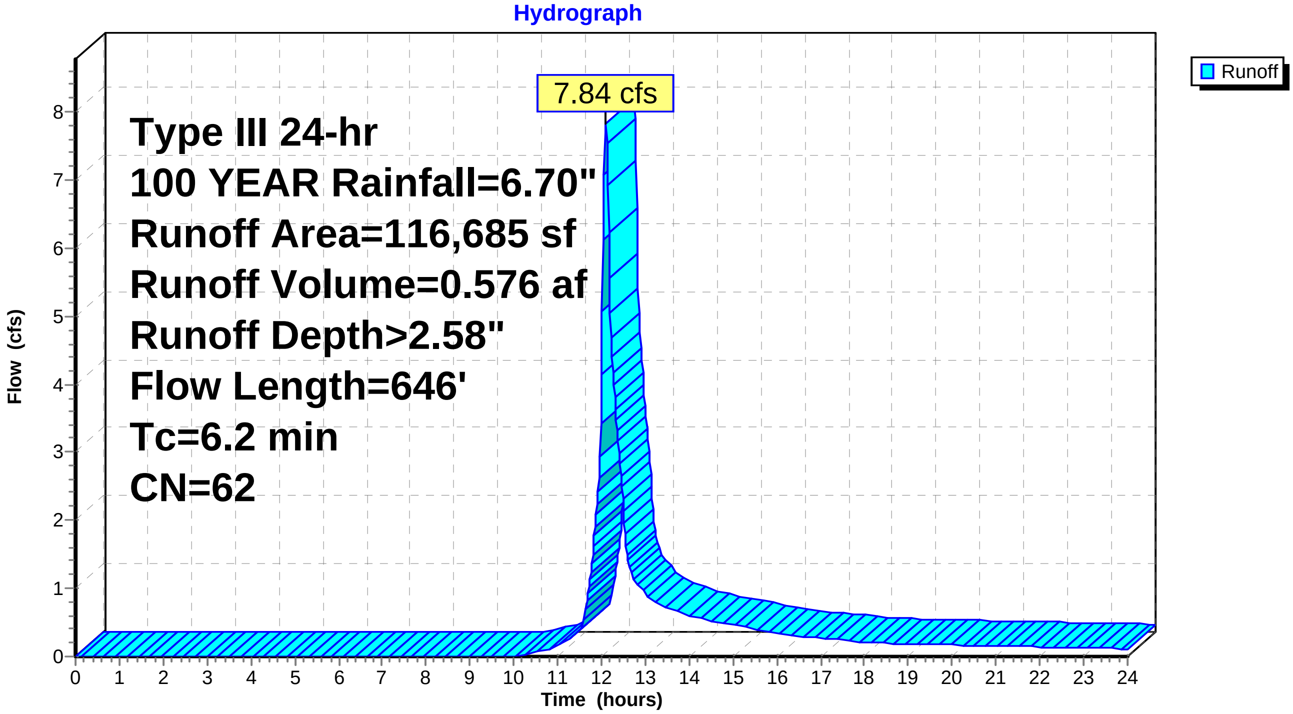
Runoff = 7.84 cfs @ 12.10 hrs, Volume= 0.576 af, Depth> 2.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	4,294	98	roofs
*	905	98	pavement
	106,591	61	>75% Grass cover, Good, HSG B
	4,895	55	Woods, Good, HSG B
	116,685	62	Weighted Average
	111,486		95.54% Pervious Area
	5,199		4.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.20"
0.8	195	0.0620	4.01		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
2.0	254	0.0180	2.16		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.1	26	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
0.3	121	0.0075	7.24	35.52	**Pipe Channel, E-F** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Concrete pipe, bends & connections
6.2	646	Total			

Subcatchment EX-1B:



Summary for Subcatchment EX-1C:

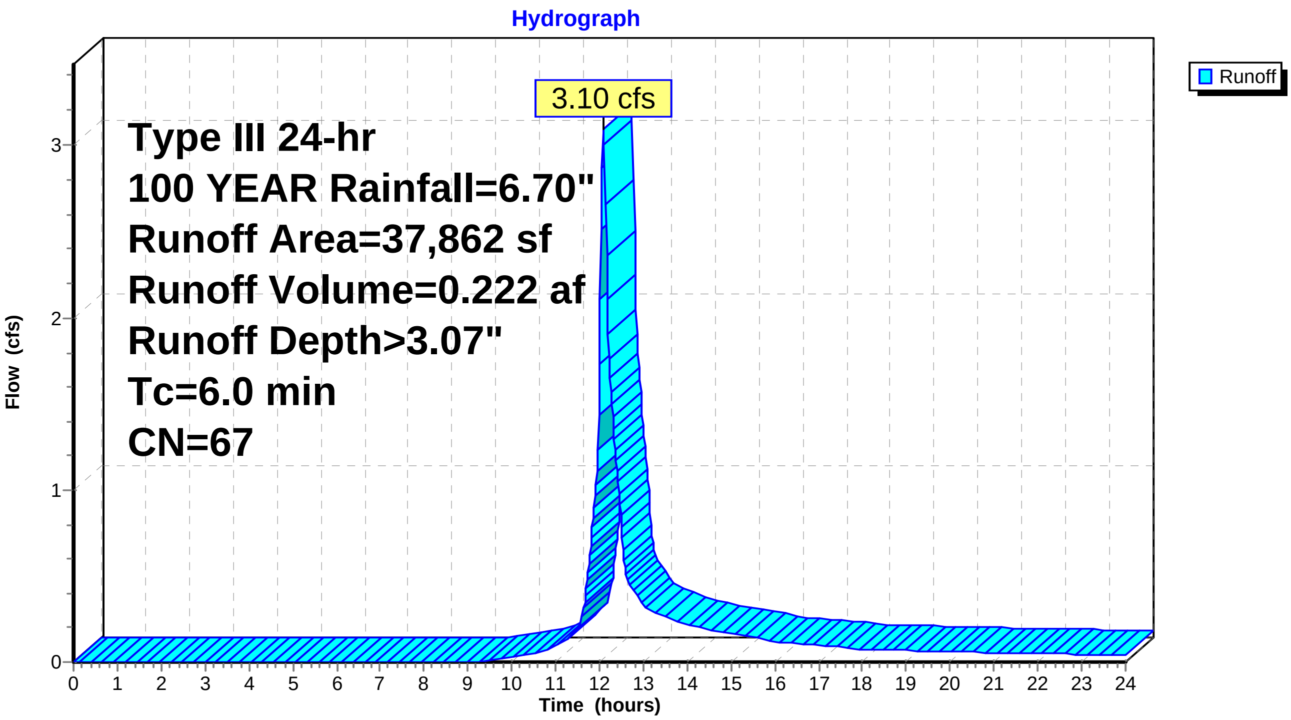
Runoff = 3.10 cfs @ 12.09 hrs, Volume= 0.222 af, Depth> 3.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	5,283	98	roofs
*	1,134	98	pavement
	30,564	61	>75% Grass cover, Good, HSG B
	881	55	Woods, Good, HSG B
	37,862	67	Weighted Average
	31,445		83.05% Pervious Area
	6,417		16.95% Impervious Area

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

Subcatchment EX-1C:



Summary for Subcatchment EX-2:

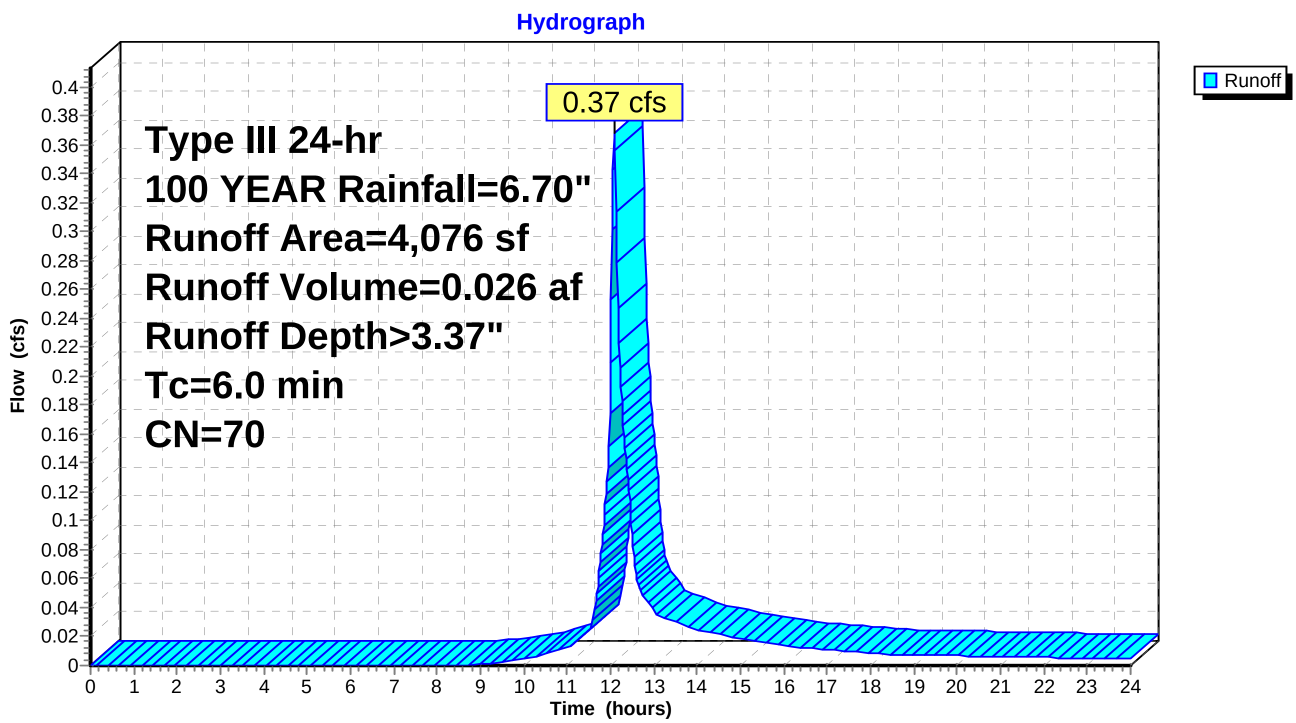
Runoff = 0.37 cfs @ 12.09 hrs, Volume= 0.026 af, Depth> 3.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	2,656	55	Woods, Good, HSG B
*	1,420	98	ledge
	4,076	70	Weighted Average
	2,656		65.16% Pervious Area
	1,420		34.84% Impervious Area

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

Subcatchment EX-2:



Summary for Subcatchment EX-3A:

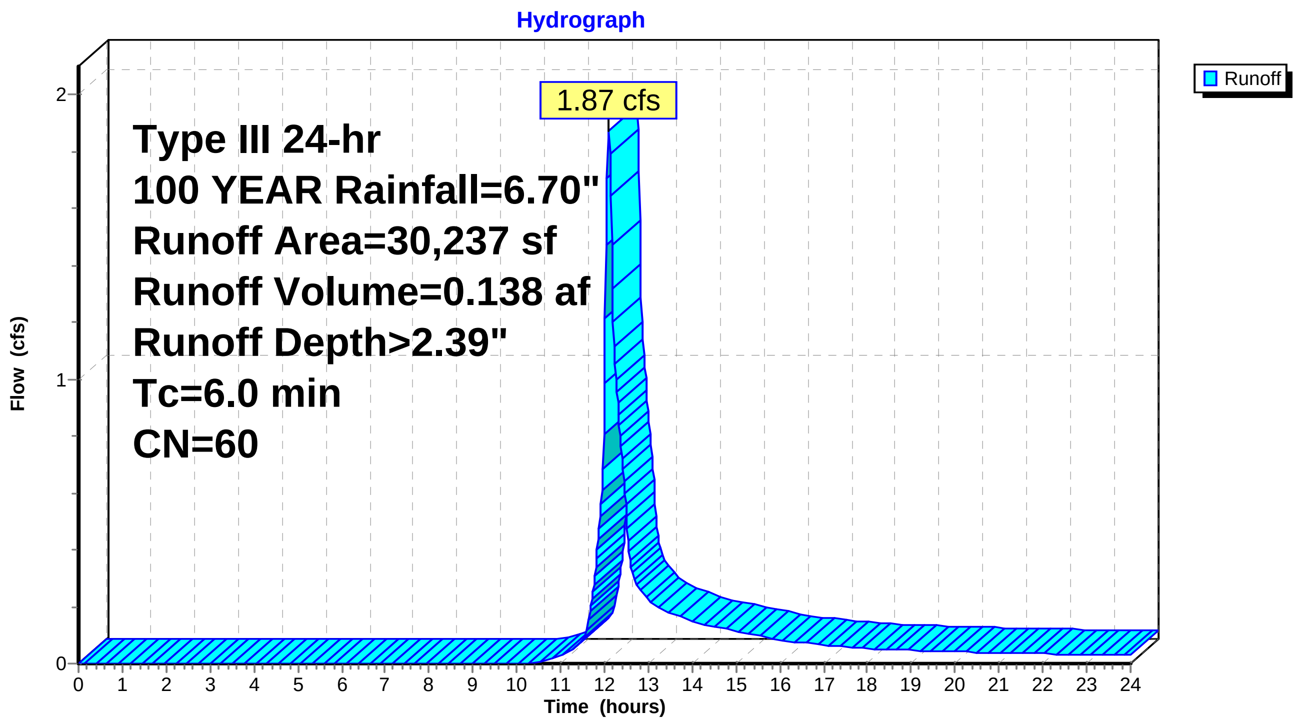
Runoff = 1.87 cfs @ 12.09 hrs, Volume= 0.138 af, Depth> 2.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	22,731	61	>75% Grass cover, Good, HSG B
	7,361	55	Woods, Good, HSG B
*	145	98	pavement
	30,237	60	Weighted Average
	30,092		99.52% Pervious Area
	145		0.48% Impervious Area

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

Subcatchment EX-3A:



Summary for Subcatchment EX-3B:

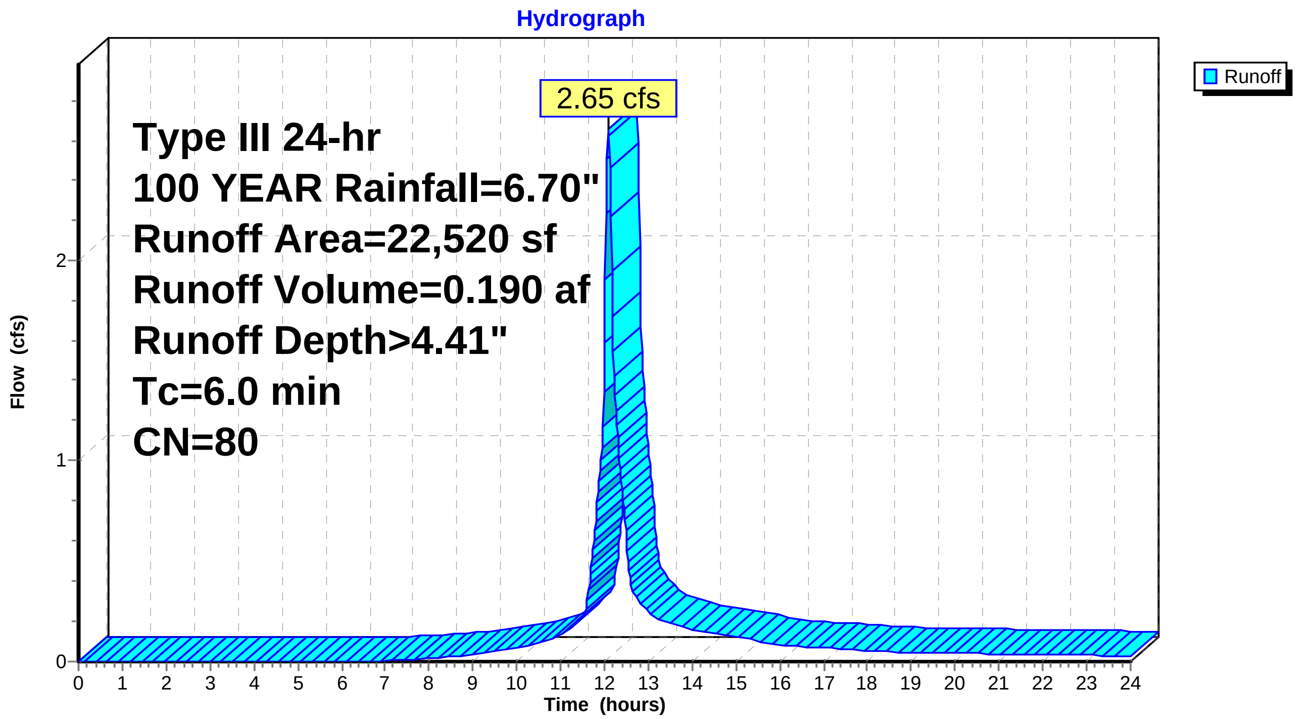
Runoff = 2.65 cfs @ 12.09 hrs, Volume= 0.190 af, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	8,382	61	>75% Grass cover, Good, HSG B
*	9,854	98	paving
	2,245	98	roofs
	2,039	55	Woods, Good, HSG B
	22,520	80	Weighted Average
	10,421		46.27% Pervious Area
	12,099		53.73% Impervious Area

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

Subcatchment EX-3B:



Summary for Subcatchment EX-3C:

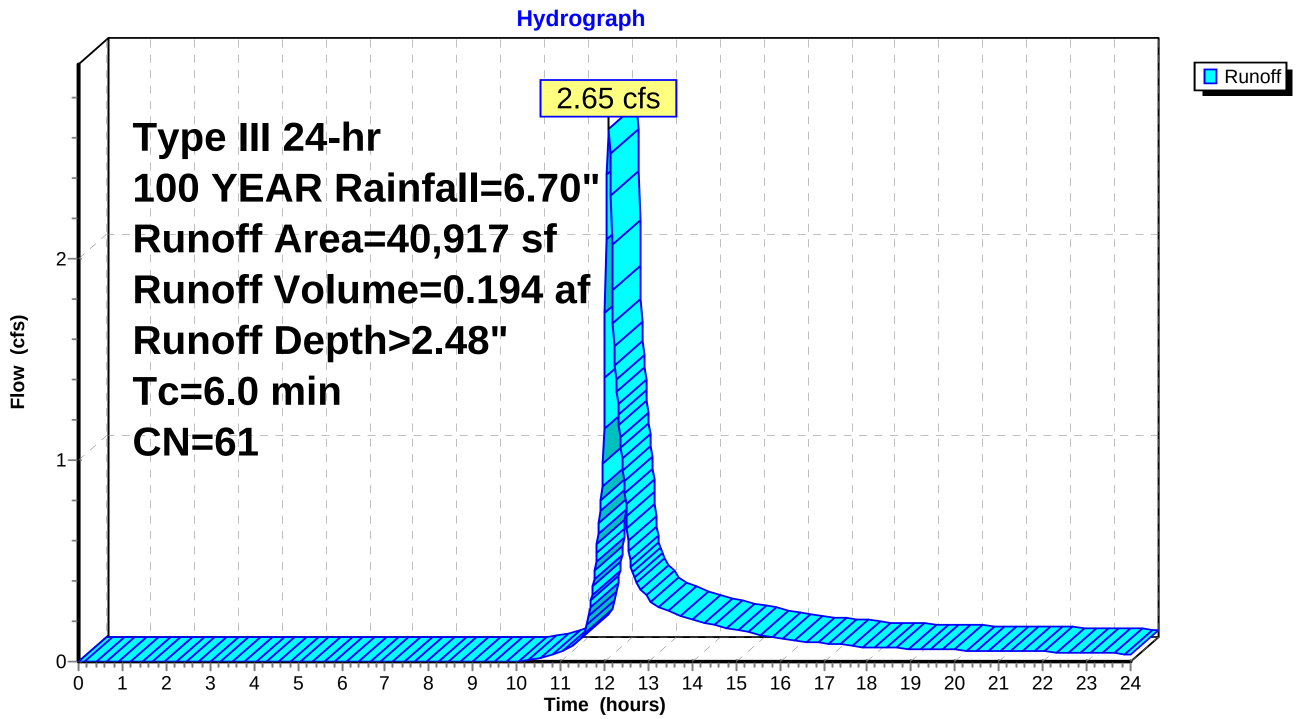
Runoff = 2.65 cfs @ 12.09 hrs, Volume= 0.194 af, Depth> 2.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	25,783	61	>75% Grass cover, Good, HSG B
	1,784	98	roofs
*	303	98	pavement
	13,047	55	Woods, Good, HSG B
	40,917	61	Weighted Average
	38,830		94.90% Pervious Area
	2,087		5.10% Impervious Area

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

Subcatchment EX-3C:



Summary for Subcatchment EX-3D:

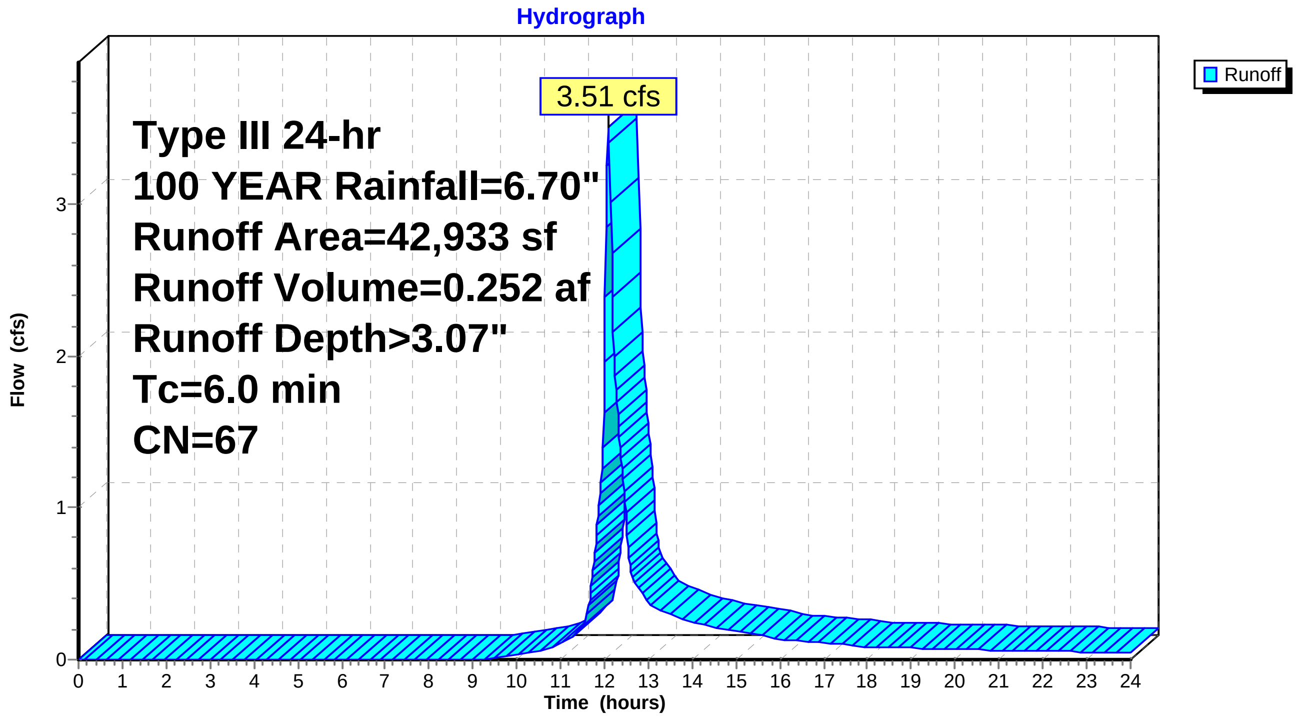
Runoff = 3.51 cfs @ 12.09 hrs, Volume= 0.252 af, Depth> 3.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	17,697	61	>75% Grass cover, Good, HSG B
	995	98	roofs
	4,507	98	Paved parking
*	3,764	98	Ledge
	15,970	55	Woods, Good, HSG B
	42,933	67	Weighted Average
	33,667		78.42% Pervious Area
	9,266		21.58% Impervious Area

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

Subcatchment EX-3D:



Summary for Subcatchment EX-4A:

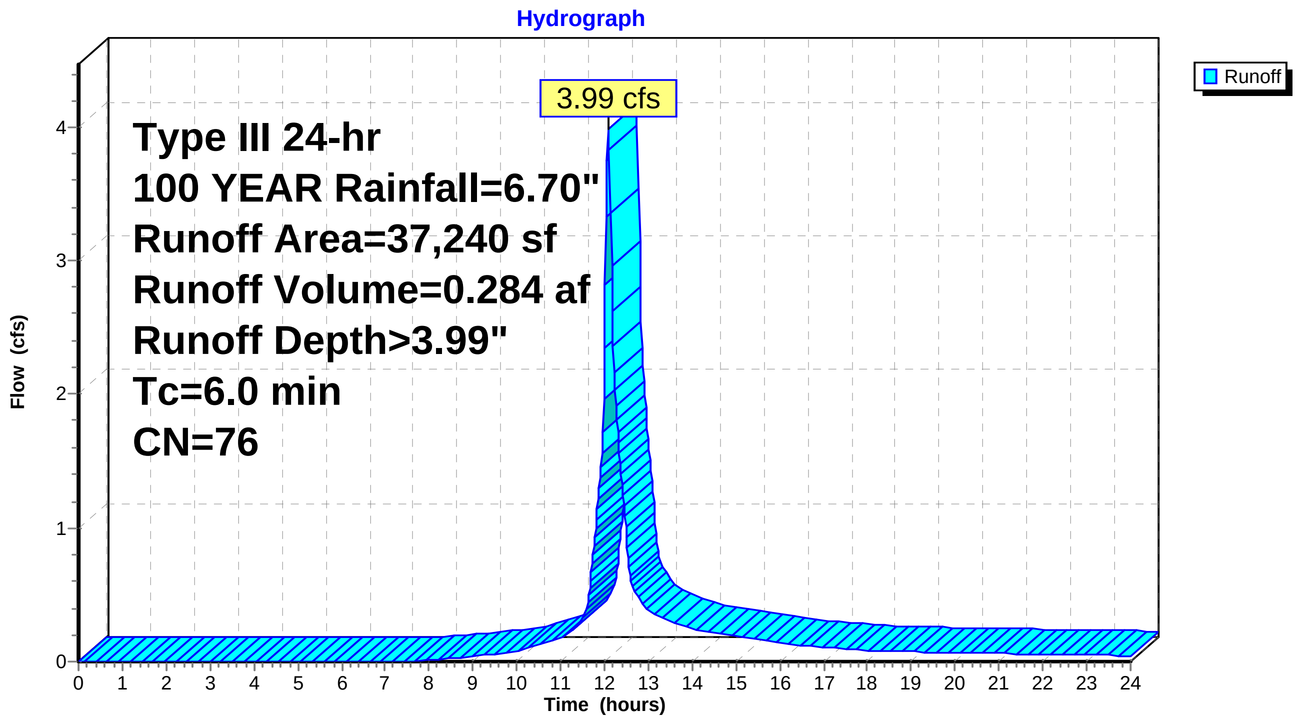
Runoff = 3.99 cfs @ 12.09 hrs, Volume= 0.284 af, Depth> 3.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	6,234	61	>75% Grass cover, Good, HSG B
*	14,643	98	paving
*	2,361	98	ledge
	14,002	55	Woods, Good, HSG B
	37,240	76	Weighted Average
	20,236		54.34% Pervious Area
	17,004		45.66% Impervious Area

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

Subcatchment EX-4A:



Summary for Subcatchment EX-4B:

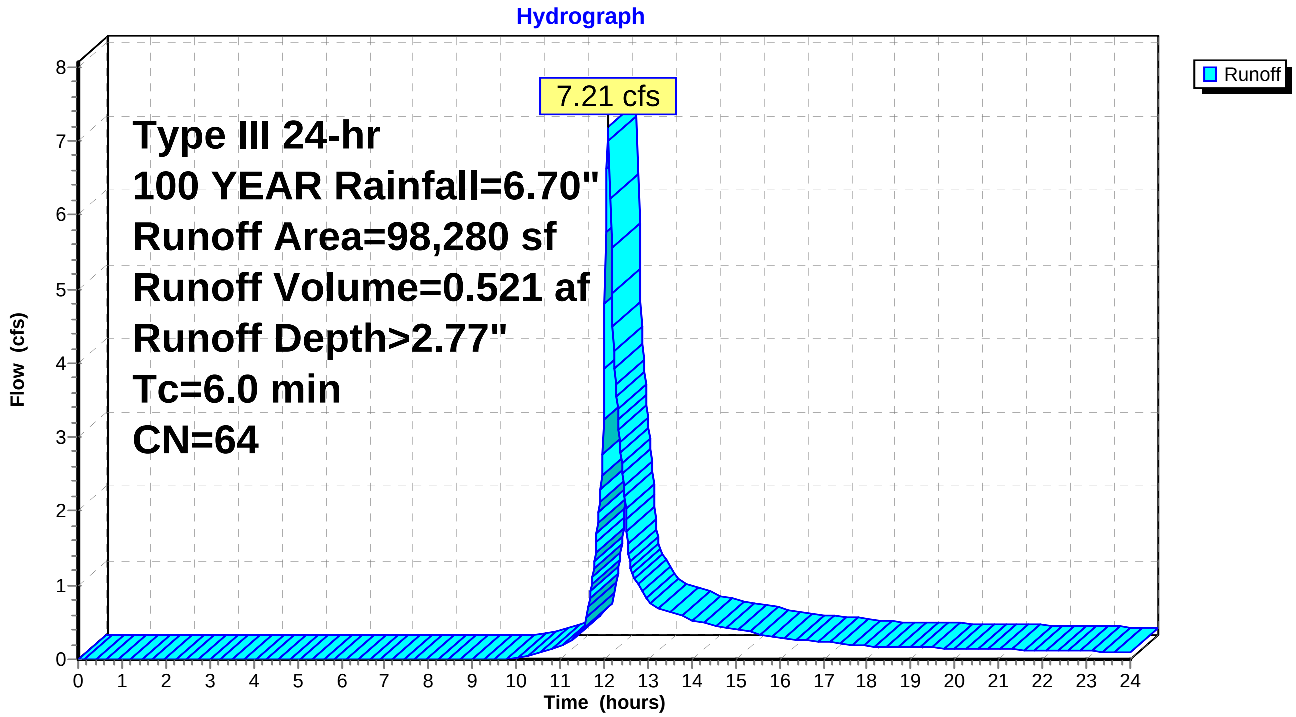
Runoff = 7.21 cfs @ 12.09 hrs, Volume= 0.521 af, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	68,309	61	>75% Grass cover, Good, HSG B
*	5,937	98	paving
*	0	98	ledge
*	5,368	98	roofs
	18,666	55	Woods, Good, HSG B
	98,280	64	Weighted Average
	86,975		88.50% Pervious Area
	11,305		11.50% Impervious Area

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

Subcatchment EX-4B:



Summary for Subcatchment EX-4C:

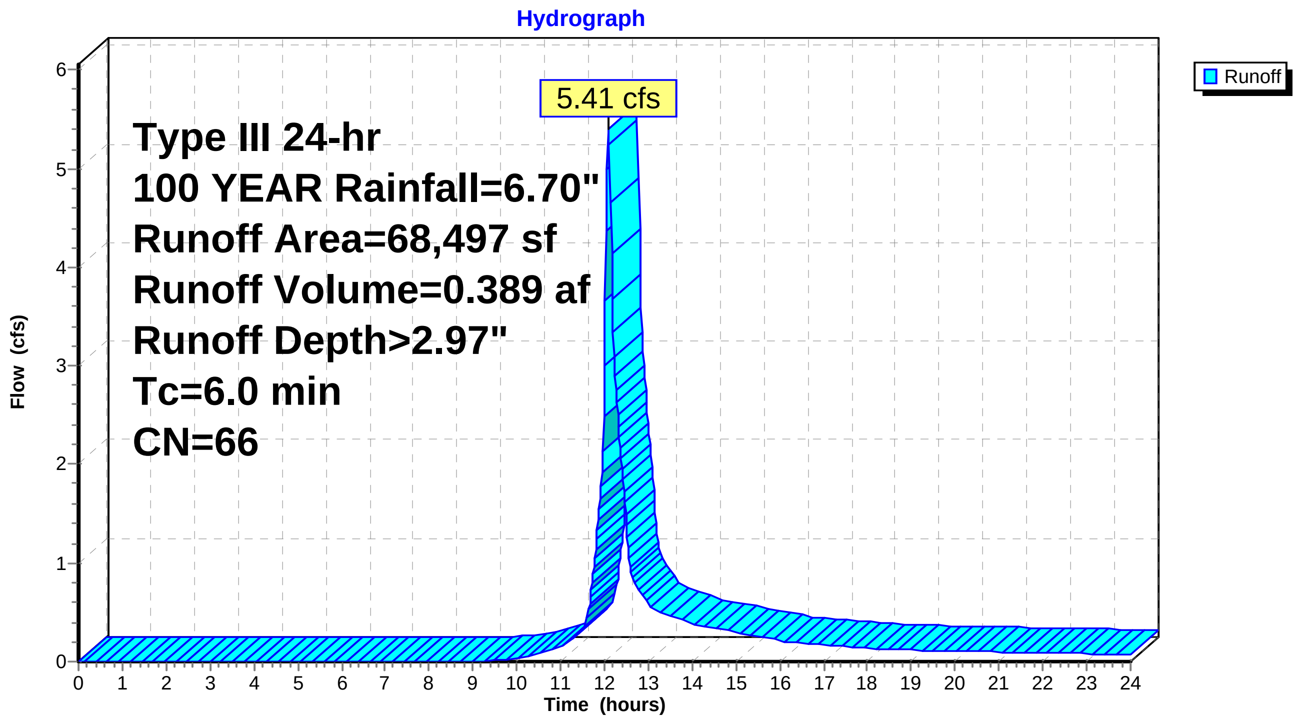
Runoff = 5.41 cfs @ 12.09 hrs, Volume= 0.389 af, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	10,460	61	>75% Grass cover, Good, HSG B
*	7,958	98	paving
*	8,812	98	ledge
	41,267	55	Woods, Good, HSG B
	68,497	66	Weighted Average
	51,727		75.52% Pervious Area
	16,770		24.48% Impervious Area

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

Subcatchment EX-4C:



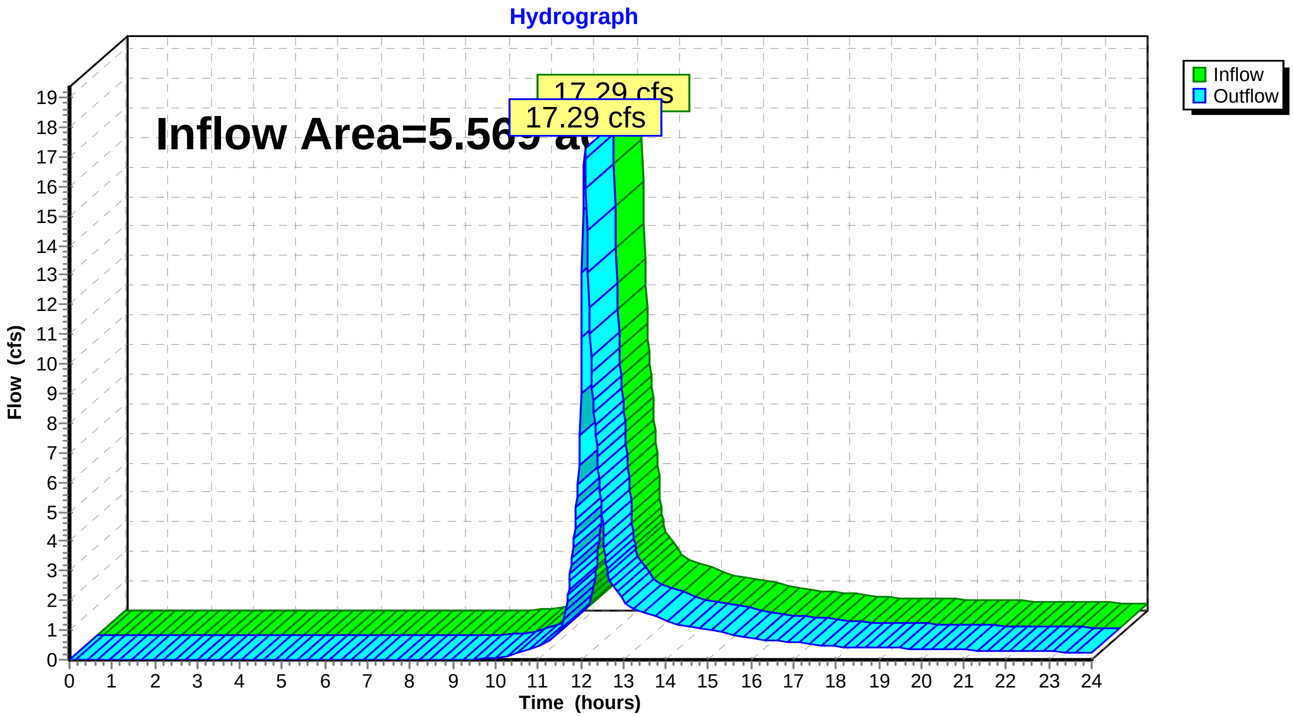
Summary for Reach DP-1: Wetlands-North

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

Inflow Area =	5.569 ac, 10.19% Impervious,	Inflow Depth > 2.80"	for 100 YEAR event	
Inflow =	17.29 cfs @	12.10 hrs, Volume=	1.297 af	
Outflow =	17.29 cfs @	12.10 hrs, Volume=	1.297 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1: Wetlands-North

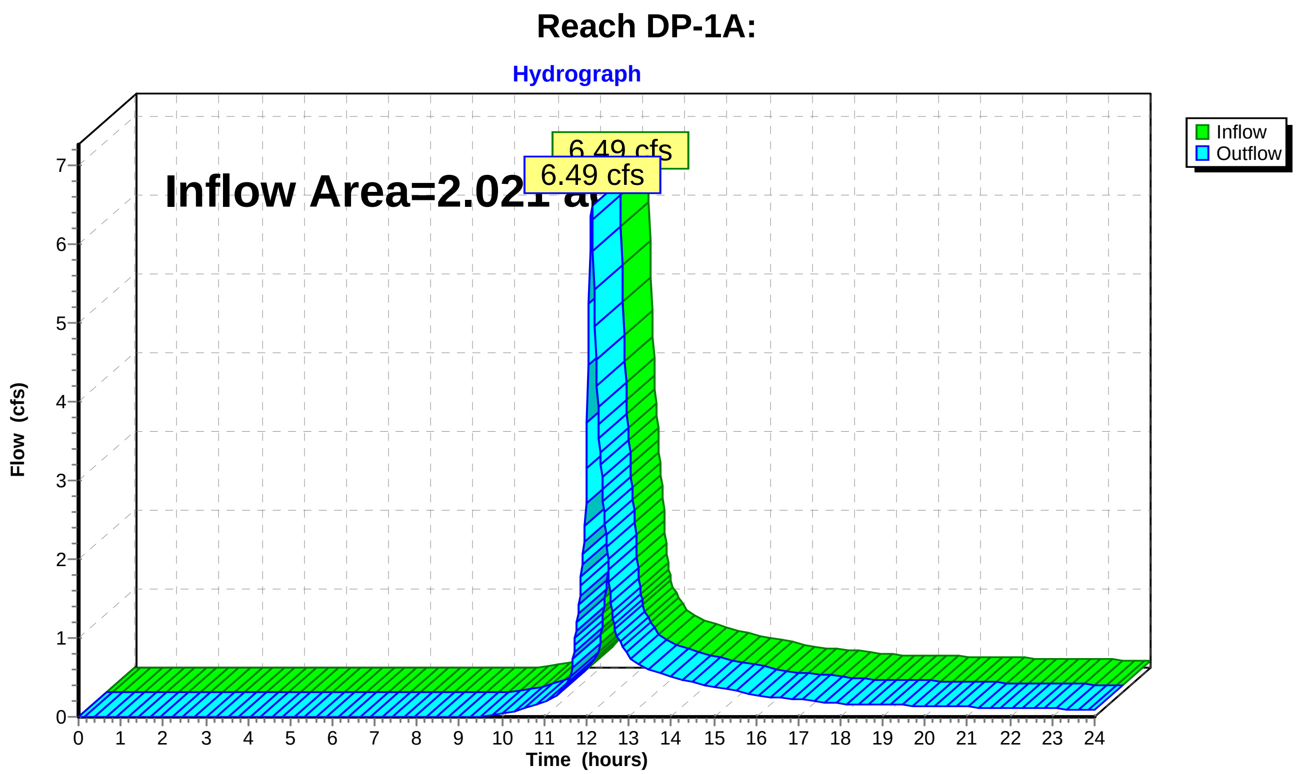


Summary for Reach DP-1A:

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

Inflow Area =	2.021 ac, 14.89% Impervious, Inflow Depth > 2.97"	for 100 YEAR event	
Inflow =	6.49 cfs @ 12.12 hrs, Volume=	0.499 af	
Outflow =	6.49 cfs @ 12.12 hrs, Volume=	0.499 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

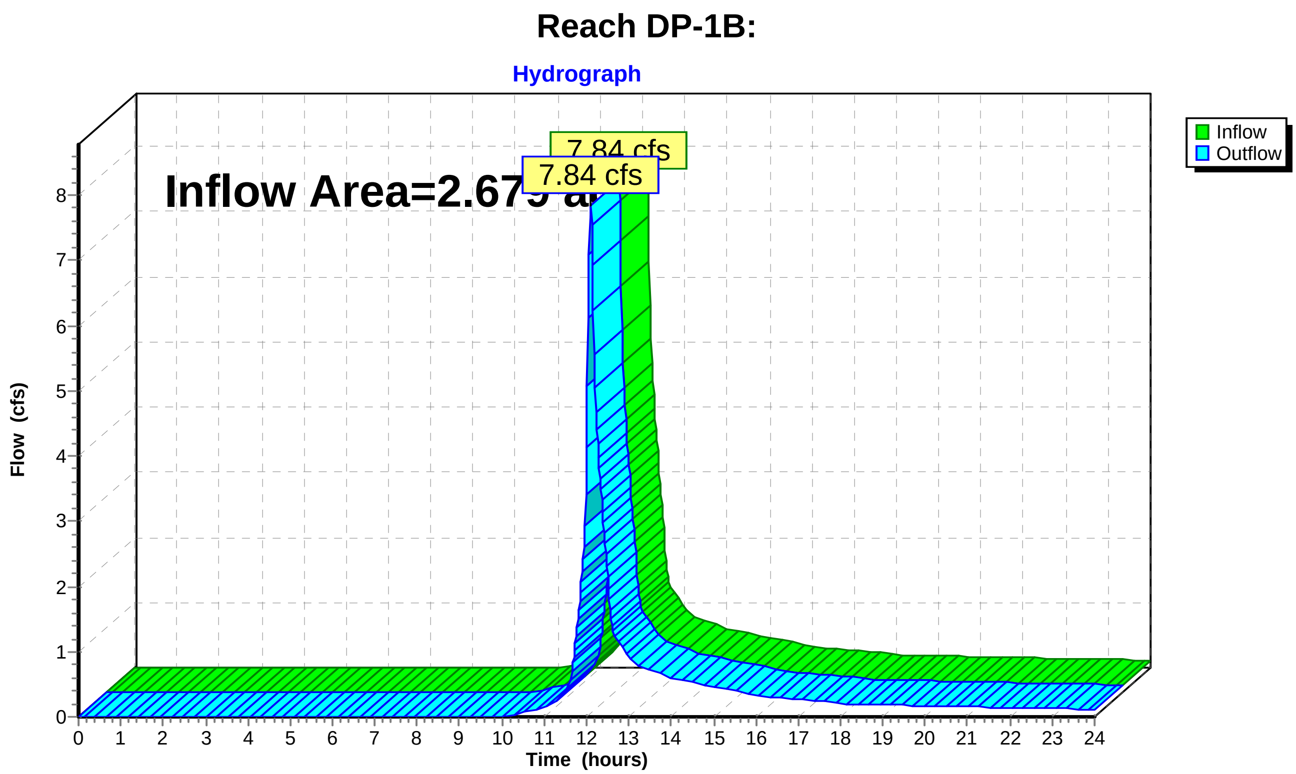


Summary for Reach DP-1B:

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

Inflow Area =	2.679 ac,	4.46% Impervious,	Inflow Depth > 2.58"	for 100 YEAR event	
Inflow =	7.84 cfs @	12.10 hrs,	Volume=	0.576 af	
Outflow =	7.84 cfs @	12.10 hrs,	Volume=	0.576 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs



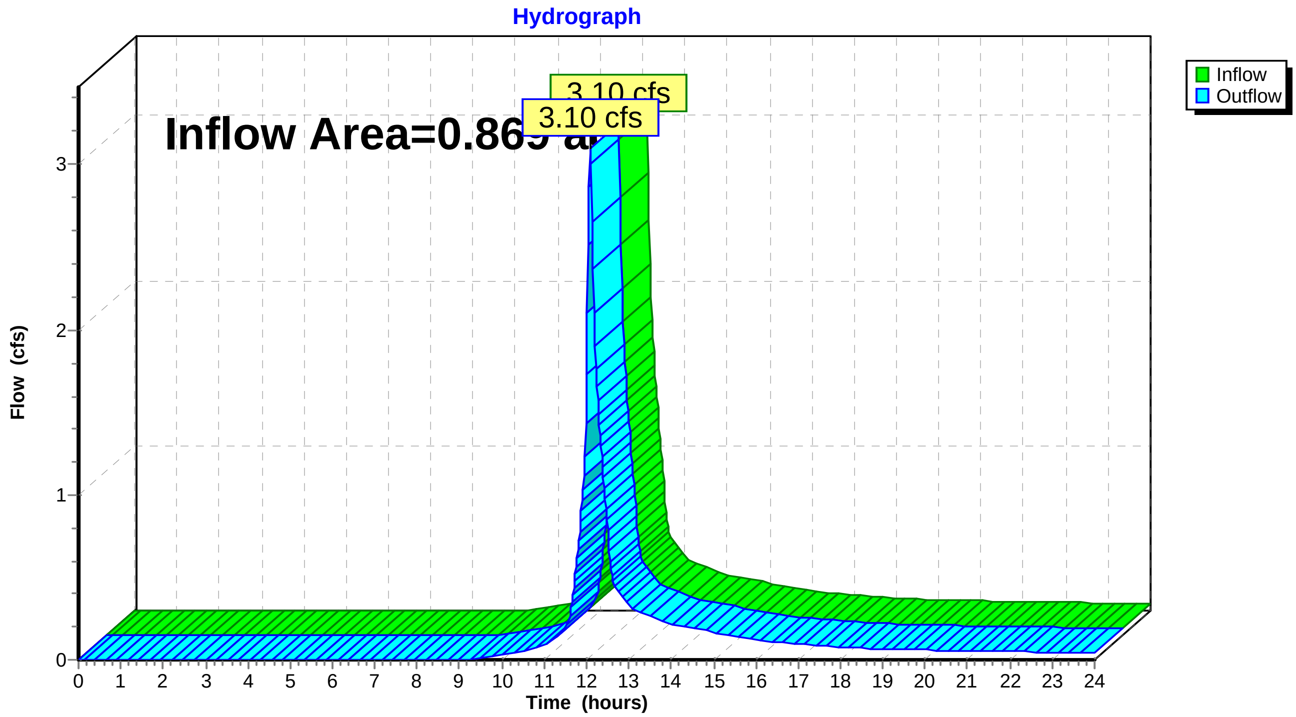
Summary for Reach DP-1C:

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

Inflow Area = 0.869 ac, 16.95% Impervious, Inflow Depth > 3.07" for 100 YEAR event
Inflow = 3.10 cfs @ 12.09 hrs, Volume= 0.222 af
Outflow = 3.10 cfs @ 12.09 hrs, Volume= 0.222 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1C:

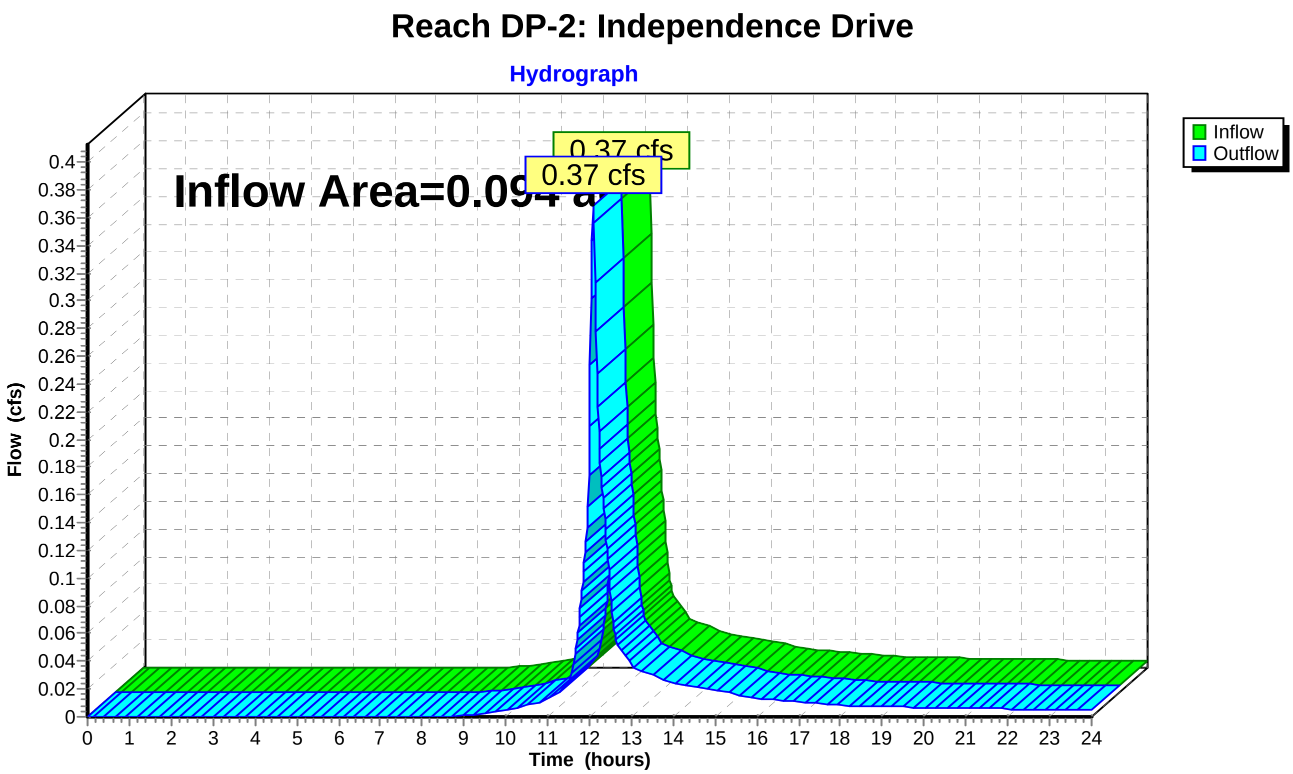


Summary for Reach DP-2: Independence Drive

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

Inflow Area =	0.094 ac,	34.84% Impervious,	Inflow Depth > 3.37"	for 100 YEAR event	
Inflow =	0.37 cfs @	12.09 hrs,	Volume=	0.026 af	
Outflow =	0.37 cfs @	12.09 hrs,	Volume=	0.026 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs



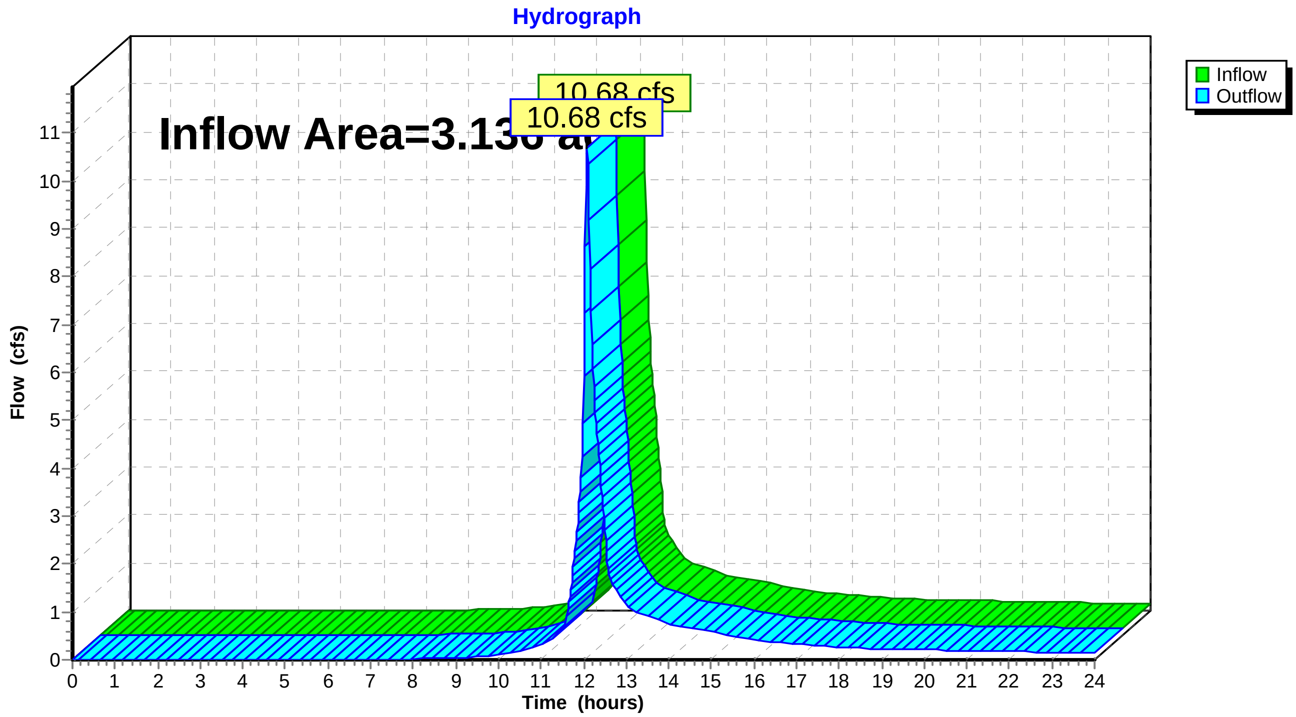
Summary for Reach DP-3: Drain System in Russett Rd.

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

Inflow Area = 3.136 ac, 17.27% Impervious, Inflow Depth > 2.96" for 100 YEAR event
Inflow = 10.68 cfs @ 12.09 hrs, Volume= 0.775 af
Outflow = 10.68 cfs @ 12.09 hrs, Volume= 0.775 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3: Drain System in Russett Rd.



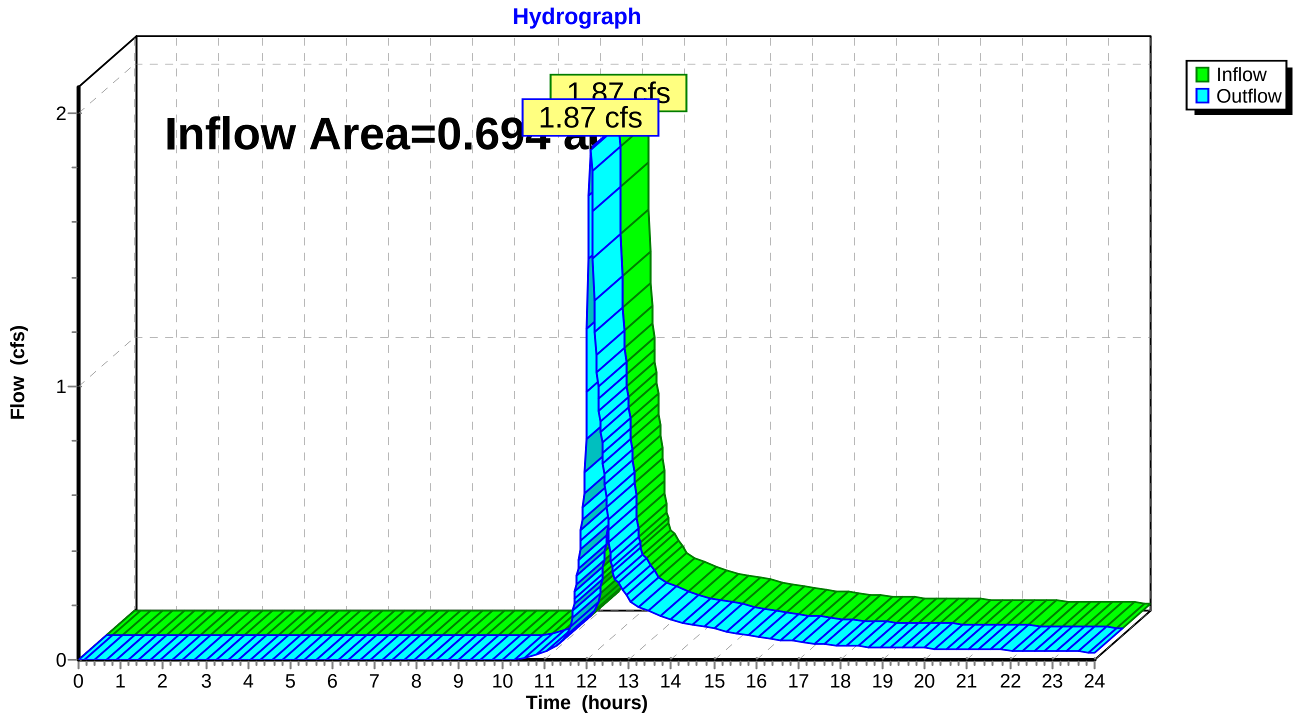
Summary for Reach DP-3A:

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

Inflow Area = 0.694 ac, 0.48% Impervious, Inflow Depth > 2.39" for 100 YEAR event
Inflow = 1.87 cfs @ 12.09 hrs, Volume= 0.138 af
Outflow = 1.87 cfs @ 12.09 hrs, Volume= 0.138 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3A:



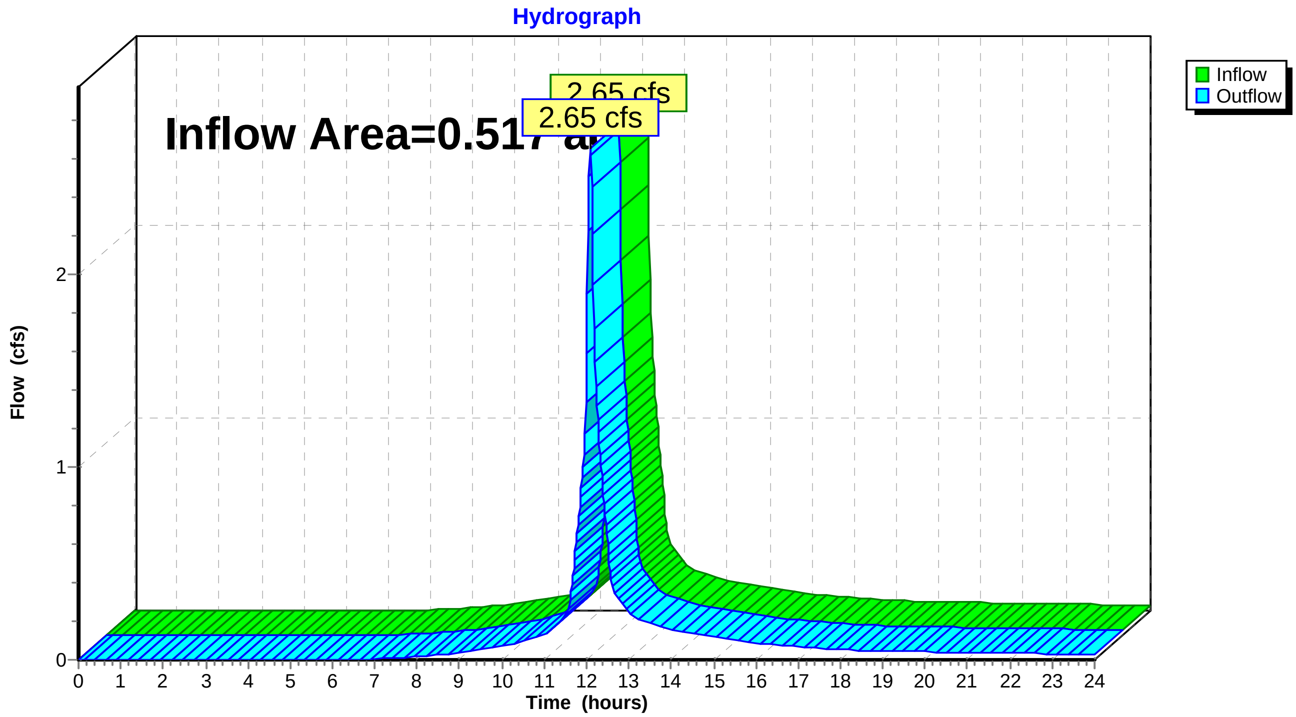
Summary for Reach DP-3B:

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

Inflow Area =	0.517 ac, 53.73% Impervious,	Inflow Depth > 4.41"	for 100 YEAR event	
Inflow =	2.65 cfs @	12.09 hrs, Volume=	0.190 af	
Outflow =	2.65 cfs @	12.09 hrs, Volume=	0.190 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3B:

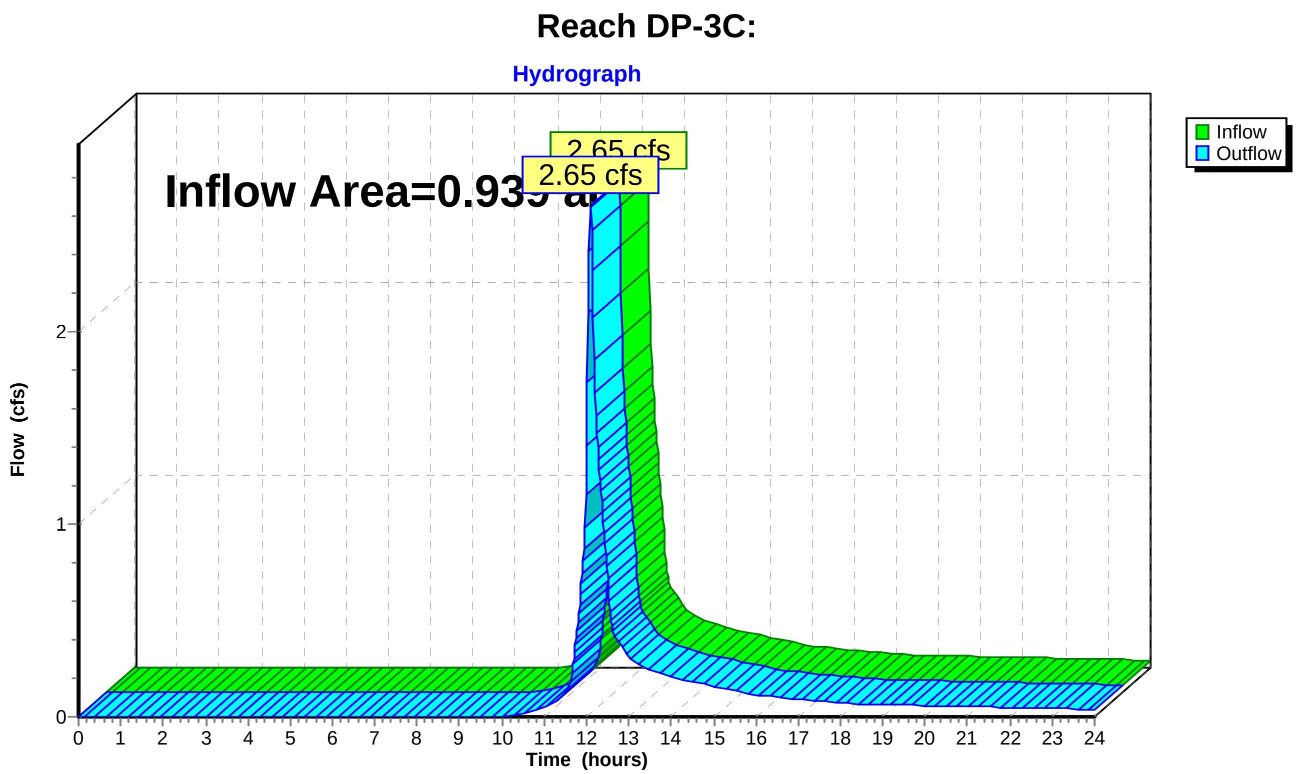


Summary for Reach DP-3C:

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

Inflow Area =	0.939 ac,	5.10% Impervious,	Inflow Depth > 2.48"	for 100 YEAR event	
Inflow =	2.65 cfs @	12.09 hrs,	Volume=	0.194 af	
Outflow =	2.65 cfs @	12.09 hrs,	Volume=	0.194 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs



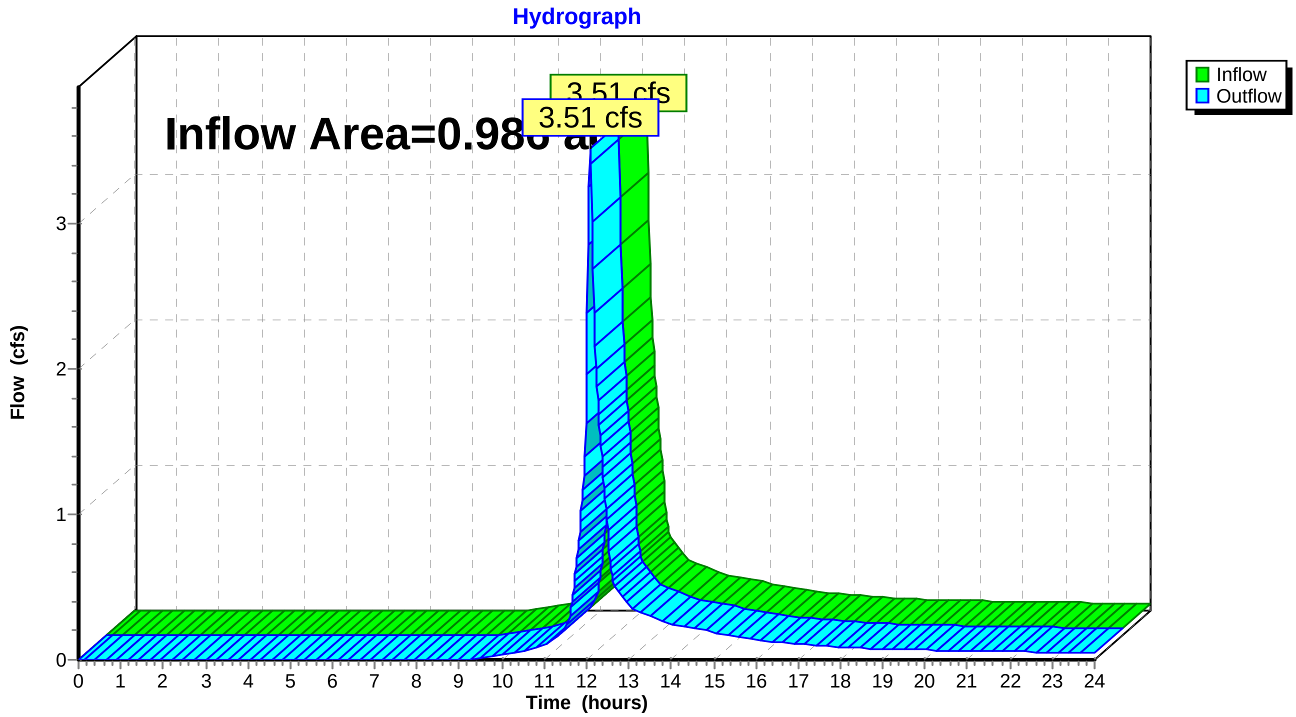
Summary for Reach DP-3D:

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

Inflow Area =	0.986 ac,	21.58% Impervious,	Inflow Depth > 3.07"	for 100 YEAR event	
Inflow =	3.51 cfs @	12.09 hrs,	Volume=	0.252 af	
Outflow =	3.51 cfs @	12.09 hrs,	Volume=	0.252 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3D:

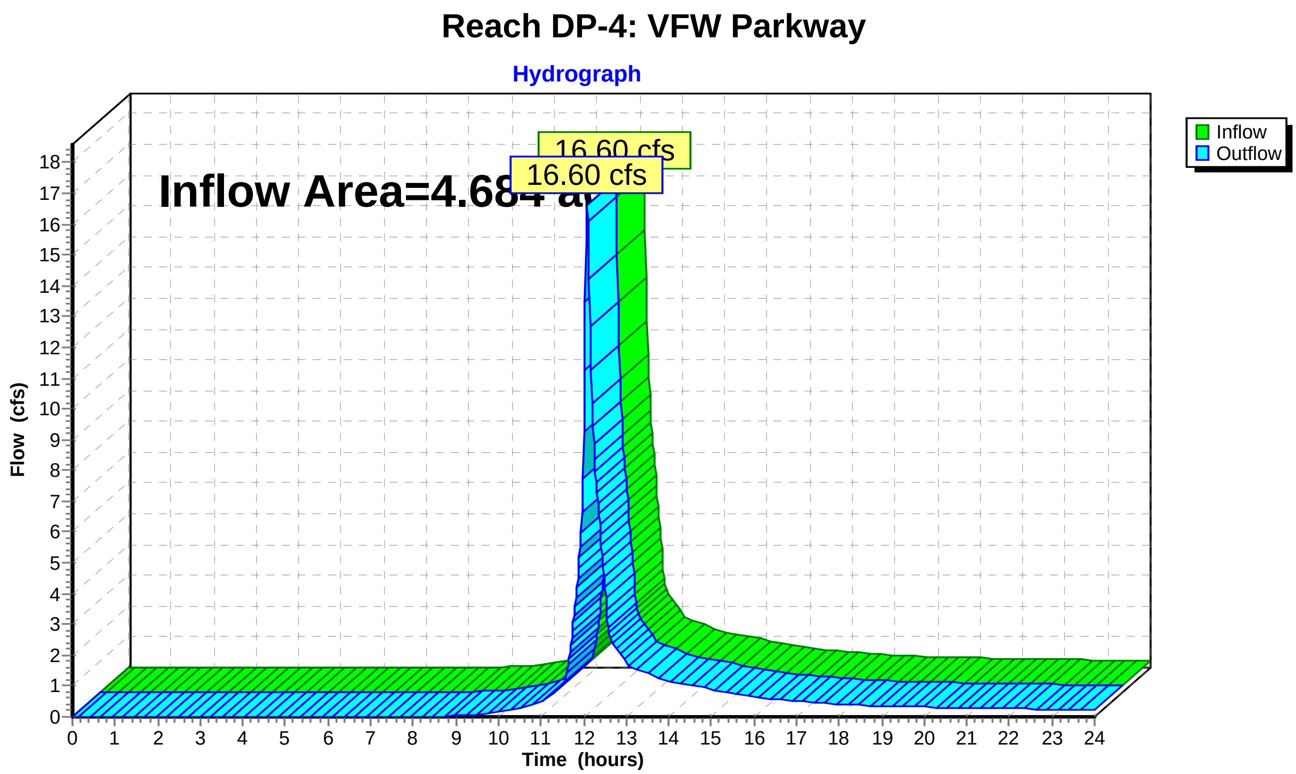


Summary for Reach DP-4: VFW Parkway

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

Inflow Area =	4.684 ac,	22.10% Impervious,	Inflow Depth > 3.06"	for 100 YEAR event	
Inflow =	16.60 cfs @	12.09 hrs,	Volume=	1.194 af	
Outflow =	16.60 cfs @	12.09 hrs,	Volume=	1.194 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs



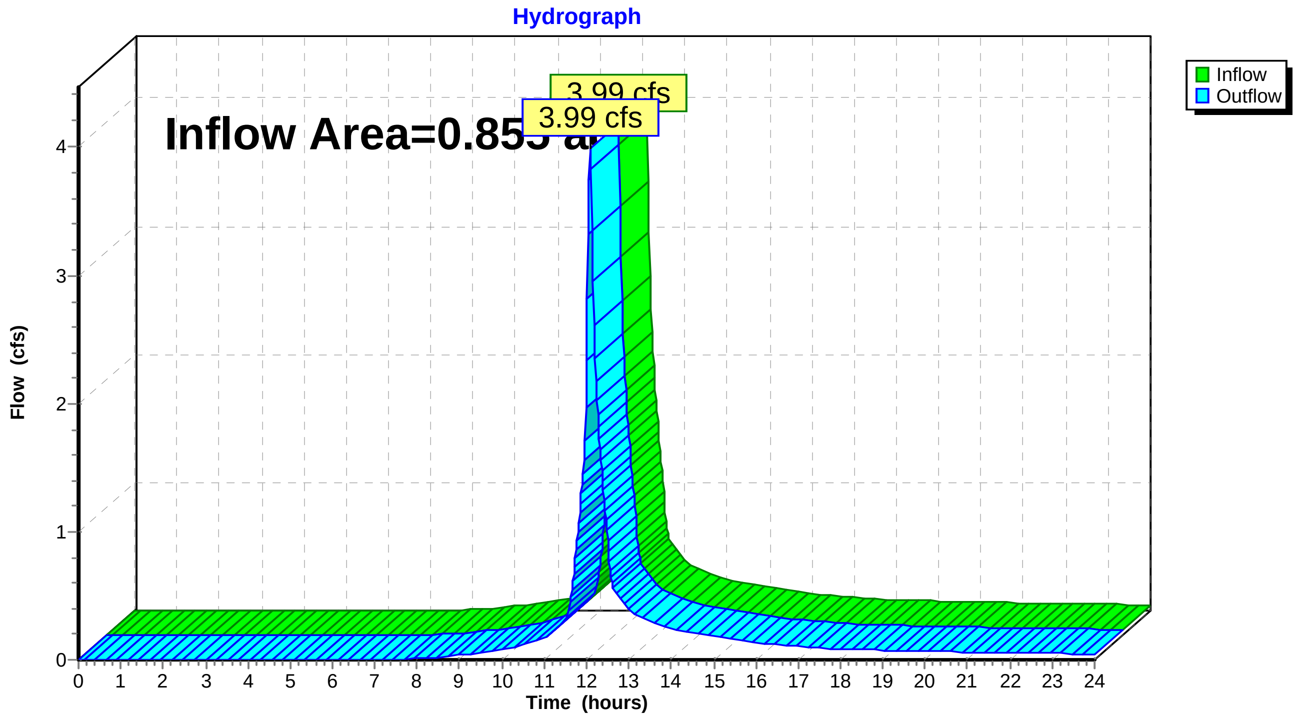
Summary for Reach DP-4A:

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

Inflow Area =	0.855 ac, 45.66% Impervious,	Inflow Depth > 3.99"	for 100 YEAR event
Inflow =	3.99 cfs @ 12.09 hrs,	Volume=	0.284 af
Outflow =	3.99 cfs @ 12.09 hrs,	Volume=	0.284 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4A:



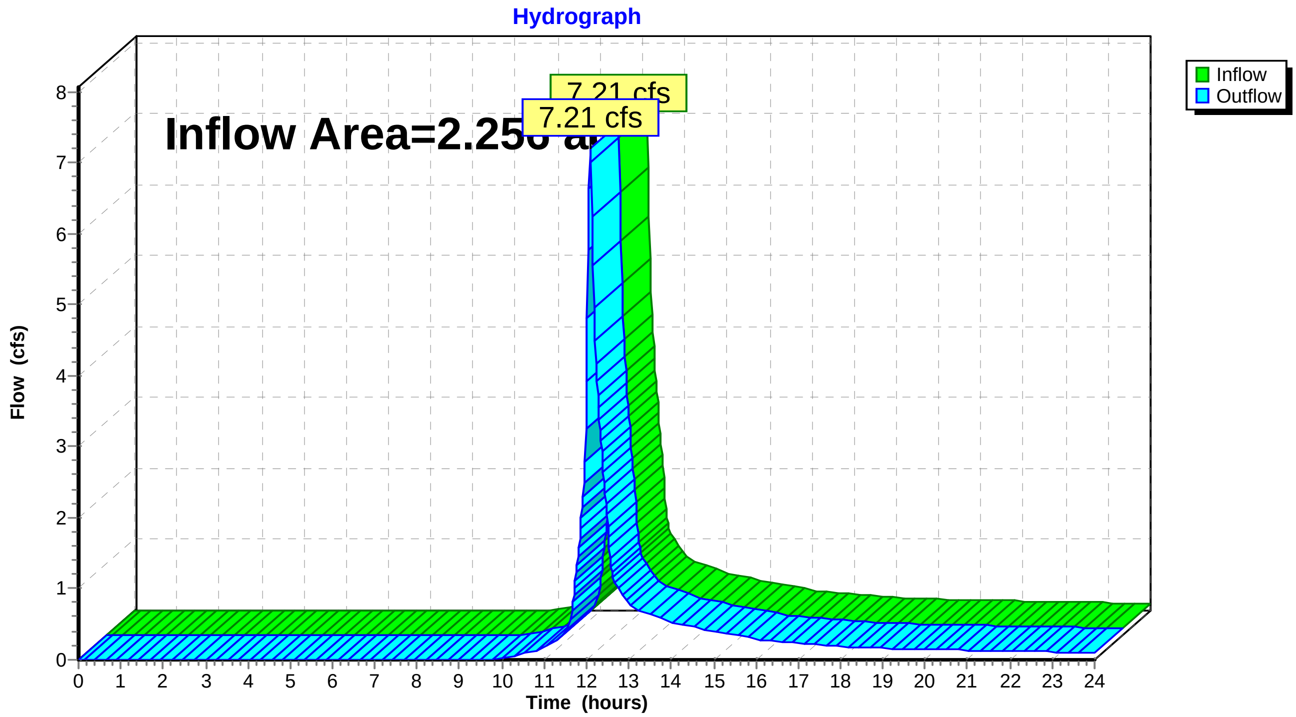
Summary for Reach DP-4B:

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

Inflow Area = 2.256 ac, 11.50% Impervious, Inflow Depth > 2.77" for 100 YEAR event
Inflow = 7.21 cfs @ 12.09 hrs, Volume= 0.521 af
Outflow = 7.21 cfs @ 12.09 hrs, Volume= 0.521 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4B:

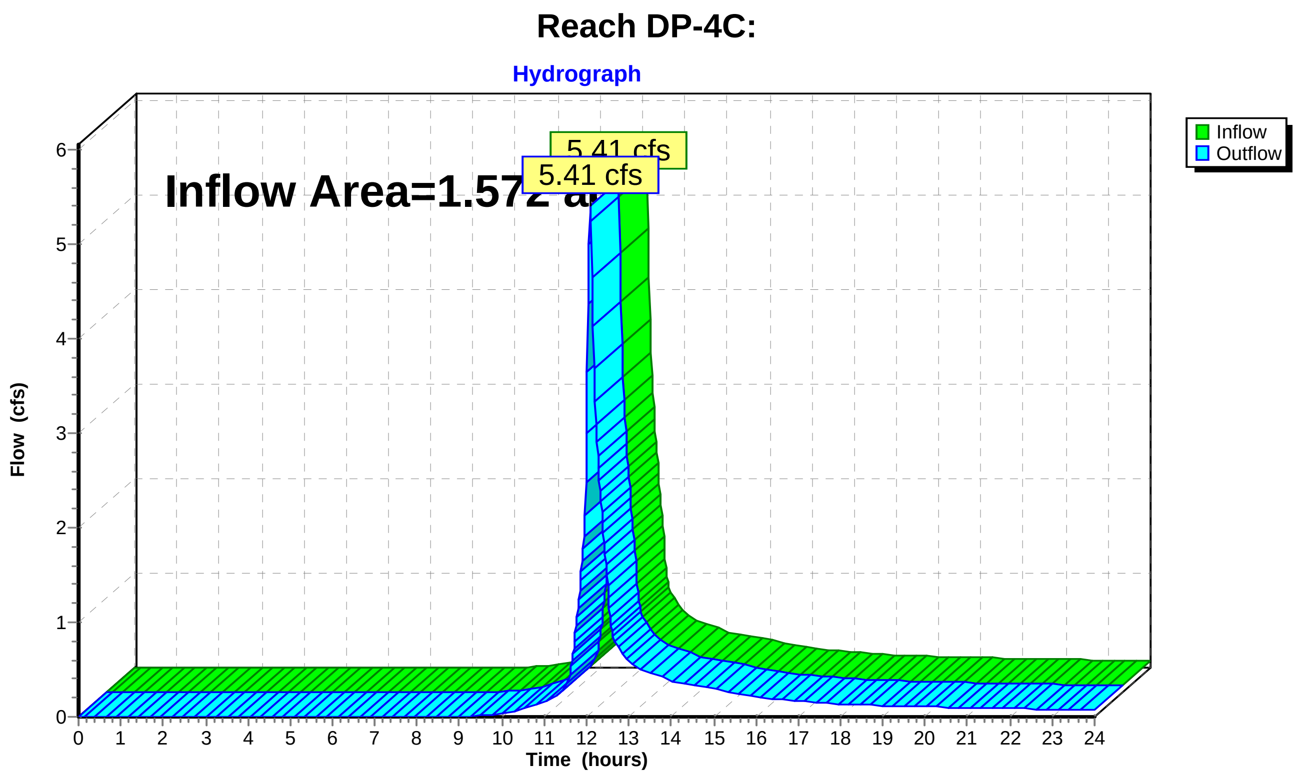


Summary for Reach DP-4C:

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

Inflow Area =	1.572 ac,	24.48% Impervious,	Inflow Depth > 2.97"	for 100 YEAR event
Inflow =	5.41 cfs @	12.09 hrs,	Volume=	0.389 af
Outflow =	5.41 cfs @	12.09 hrs,	Volume=	0.389 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs



APPENDIX D – PROPOSED CONDITIONS HYDROCAD CALCULATIONS

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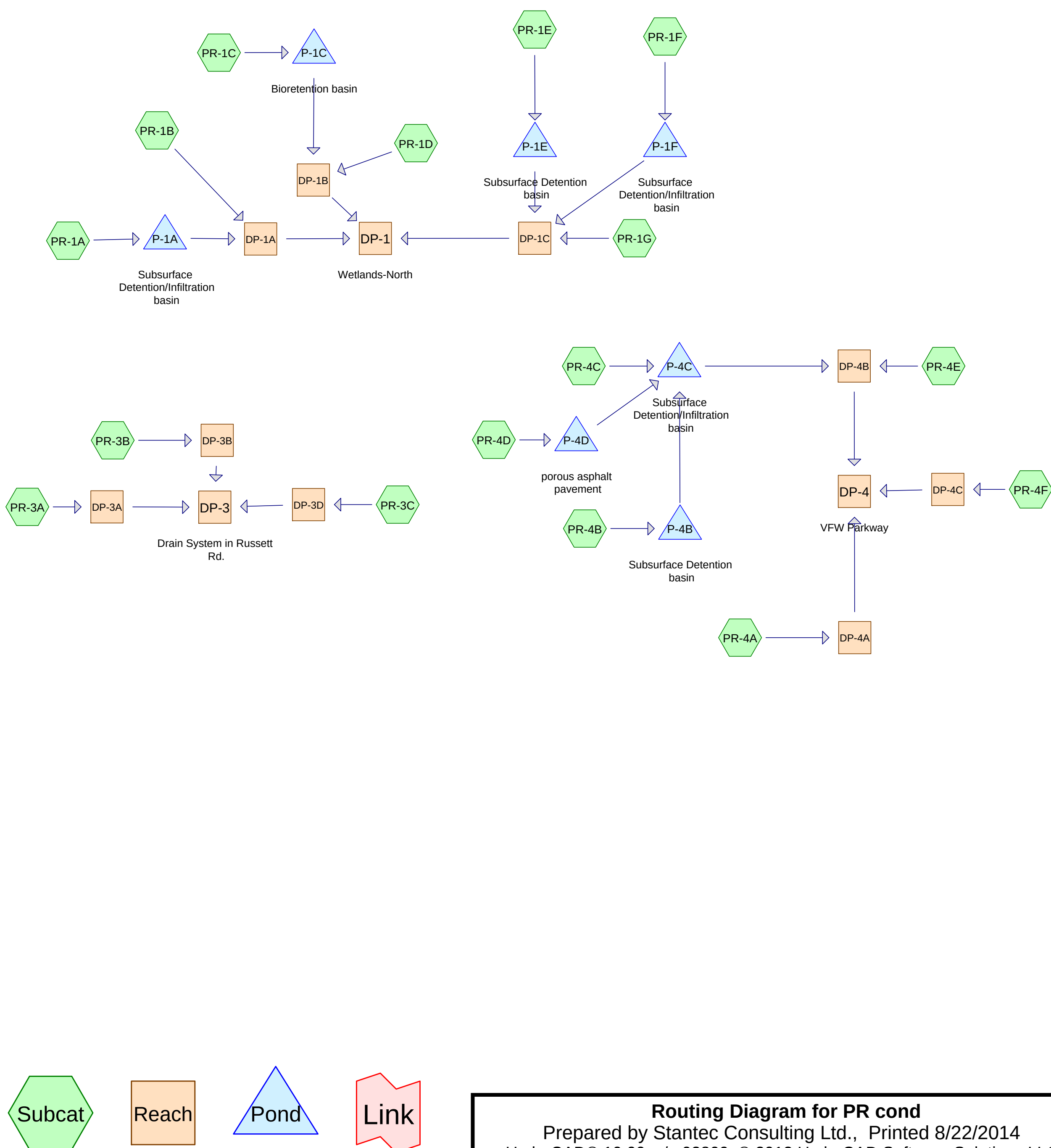


Routing Diagram for PR cond
Prepared by Stantec Consulting Ltd., Printed 8/22/2014
HydroCAD® 10.00 s/n 02809 © 2012 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
7.177	61	>75% Grass cover, Good, HSG B (PR-1A, PR-1B, PR-1C, PR-1D, PR-1E, PR-1F, PR-1G, PR-3A, PR-3B, PR-3C, PR-4A, PR-4B, PR-4C, PR-4D, PR-4E, PR-4F)
0.038	98	LEDGE (PR-4B)
1.827	98	Paved parking (PR-1A, PR-1C, PR-1D, PR-1E, PR-1F, PR-4D)
0.035	98	ROOF (PR-3B)
0.372	98	ROOFS (PR-4C, PR-4E)
0.322	55	Woods, Good, HSG B (PR-3A, PR-3B, PR-3C, PR-4A)
0.037	98	ledge (PR-1B, PR-4C)
0.052	98	pavement (PR-1B)
1.740	98	paving (PR-3B, PR-4A, PR-4C, PR-4E, PR-4F)
1.868	98	roofs (PR-1A, PR-1B, PR-1C, PR-1D, PR-1E, PR-1F, PR-4B, PR-4D)
0.008	98	sidewalk (PR-3A)
0.009	98	walkway (PR-1G)
13.483	**77**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
7.499	HSG B	PR-1A, PR-1B, PR-1C, PR-1D, PR-1E, PR-1F, PR-1G, PR-3A, PR-3B, PR-3C, PR-4A, PR-4B, PR-4C, PR-4D, PR-4E, PR-4F
0.000	HSG C	
0.000	HSG D	
5.985	Other	PR-1A, PR-1B, PR-1C, PR-1D, PR-1E, PR-1F, PR-1G, PR-3A, PR-3B, PR-4A, PR-4B, PR-4C, PR-4D, PR-4E, PR-4F
13.483		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	7.177	0.000	0.000	0.000	7.177	>75% Grass cover, Good	PR-1A, PR-1B, PR-1C, PR-1D, PR-1E, PR-1F, PR-1G, PR-3A, PR-3B, PR-3C, PR-4A, PR-4B, PR-4C, PR-4D, PR-4E, PR-4F
0.000	0.000	0.000	0.000	0.038	0.038	LEDGE	PR-4B
0.000	0.000	0.000	0.000	1.827	1.827	Paved parking	PR-1A, PR-1C, PR-1D, PR-1E, PR-1F, PR-4D
0.000	0.000	0.000	0.000	0.035	0.035	ROOF	PR-3B
0.000	0.000	0.000	0.000	0.372	0.372	ROOFS	PR-4C, PR-4E
0.000	0.322	0.000	0.000	0.000	0.322	Woods, Good	PR-3A, PR-3B, PR-3C, PR-4A
0.000	0.000	0.000	0.000	0.037	0.037	ledge	PR-1B, PR-4C
0.000	0.000	0.000	0.000	0.052	0.052	pavement	PR-1B
0.000	0.000	0.000	0.000	1.740	1.740	paving	PR-3B, PR-4A, PR-4C, PR-4E, PR-4F
0.000	0.000	0.000	0.000	1.868	1.868	roofs	PR-1A, PR-1B, PR-1C, PR-1D, PR-1E, PR-1F, PR-4B, PR-4D

Ground Covers (selected nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	0.008	0.008	sidewalk	PR-3A
0.000	0.000	0.000	0.000	0.009	0.009	walkway	PR-1G
0.000	**7.499**	**0.000**	**0.000**	**5.985**	**13.483**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	P-1A	169.00	167.00	28.0	0.0714	0.013	6.0	0.0	0.0
2	P-1C	161.00	159.00	107.0	0.0187	0.013	10.0	0.0	0.0
3	P-1E	163.30	159.10	93.0	0.0452	0.013	6.0	0.0	0.0
4	P-1F	159.20	159.10	2.0	0.0500	0.013	8.0	0.0	0.0
5	P-4B	191.00	190.90	3.0	0.0333	0.013	6.0	0.0	0.0
6	P-4C	154.55	154.30	10.0	0.0250	0.013	8.0	0.0	0.0
7	P-4D	176.10	175.90	15.0	0.0133	0.013	8.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1A: Runoff Area=25,996 sf 68.50% Impervious Runoff Depth>1.83"
Tc=6.0 min CN=86 Runoff=1.28 cfs 0.091 af

Subcatchment PR-1B: Runoff Area=49,468 sf 24.29% Impervious Runoff Depth>0.83"
Tc=6.0 min CN=70 Runoff=0.98 cfs 0.078 af

Subcatchment PR-1C: Runoff Area=74,374 sf 58.27% Impervious Runoff Depth>1.61"
Tc=6.0 min CN=83 Runoff=3.21 cfs 0.229 af

Subcatchment PR-1D: Runoff Area=54,933 sf 10.14% Impervious Runoff Depth>0.60"
Tc=6.0 min CN=65 Runoff=0.69 cfs 0.063 af

Subcatchment PR-1E: Runoff Area=29,315 sf 64.43% Impervious Runoff Depth>1.76"
Tc=6.0 min CN=85 Runoff=1.39 cfs 0.098 af

Subcatchment PR-1F: Runoff Area=20,052 sf 69.87% Impervious Runoff Depth>1.91"
Tc=6.0 min CN=87 Runoff=1.03 cfs 0.073 af

Subcatchment PR-1G: Runoff Area=6,425 sf 5.93% Impervious Runoff Depth>0.52"
Tc=6.0 min CN=63 Runoff=0.06 cfs 0.006 af

Subcatchment PR-3A: Runoff Area=12,308 sf 2.81% Impervious Runoff Depth>0.48"
Tc=6.0 min CN=62 Runoff=0.11 cfs 0.011 af

Subcatchment PR-3B: Runoff Area=22,498 sf 49.72% Impervious Runoff Depth>1.34"
Tc=6.0 min CN=79 Runoff=0.80 cfs 0.057 af

Subcatchment PR-3C: Runoff Area=23,850 sf 0.00% Impervious Runoff Depth>0.37"
Tc=6.0 min CN=59 Runoff=0.12 cfs 0.017 af

Subcatchment PR-4A: Runoff Area=24,808 sf 59.14% Impervious Runoff Depth>1.54"
Tc=6.0 min CN=82 Runoff=1.02 cfs 0.073 af

Subcatchment PR-4B: Runoff Area=48,935 sf 75.71% Impervious Runoff Depth>2.08"
Tc=6.0 min CN=89 Runoff=2.72 cfs 0.195 af

Subcatchment PR-4C: Runoff Area=91,234 sf 51.71% Impervious Runoff Depth>1.40"
Tc=6.0 min CN=80 Runoff=3.40 cfs 0.244 af

Subcatchment PR-4D: Runoff Area=25,594 sf 63.76% Impervious Runoff Depth>1.76"
Tc=6.0 min CN=85 Runoff=1.21 cfs 0.086 af

Subcatchment PR-4E: Runoff Area=45,196 sf 23.63% Impervious Runoff Depth>0.83"
Tc=6.0 min CN=70 Runoff=0.90 cfs 0.071 af

Subcatchment PR-4F: Runoff Area=32,347 sf 34.79% Impervious Runoff Depth>1.04"
Tc=6.0 min CN=74 Runoff=0.85 cfs 0.064 af

Reach DP-1: Wetlands-North Inflow=1.76 cfs 0.393 af
Outflow=1.76 cfs 0.393 af

Reach DP-1A: Inflow=0.98 cfs 0.079 af
Outflow=0.98 cfs 0.079 af

Reach DP-1B: Inflow=0.88 cfs 0.220 af
Outflow=0.88 cfs 0.220 af

Reach DP-1C: Inflow=0.28 cfs 0.094 af
Outflow=0.28 cfs 0.094 af

Reach DP-3: Drain System in Russett Rd. Inflow=1.01 cfs 0.086 af
Outflow=1.01 cfs 0.086 af

Reach DP-3A: Inflow=0.11 cfs 0.011 af
Outflow=0.11 cfs 0.011 af

Reach DP-3B: Inflow=0.80 cfs 0.057 af
Outflow=0.80 cfs 0.057 af

Reach DP-3D: Inflow=0.12 cfs 0.017 af
Outflow=0.12 cfs 0.017 af

Reach DP-4: VFW Parkway Inflow=2.77 cfs 0.348 af
Outflow=2.77 cfs 0.348 af

Reach DP-4A: Inflow=1.02 cfs 0.073 af
Outflow=1.02 cfs 0.073 af

Reach DP-4B: Inflow=0.90 cfs 0.211 af
Outflow=0.90 cfs 0.211 af

Reach DP-4C: Inflow=0.85 cfs 0.064 af
Outflow=0.85 cfs 0.064 af

Pond P-1A: Subsurface Detention/Infiltration Peak Elev=169.05' Storage=3,930 cf Inflow=1.28 cfs 0.091 af
6.0" Round Culvert n=0.013 L=28.0' S=0.0714 '/' Outflow=0.01 cfs 0.001 af

Pond P-1C: Bioretention basin Peak Elev=162.39' Storage=4,664 cf Inflow=3.21 cfs 0.229 af
Outflow=0.61 cfs 0.157 af

Pond P-1E: Subsurface Detention basin Peak Elev=163.48' Storage=2,670 cf Inflow=1.39 cfs 0.098 af
6.0" Round Culvert n=0.013 L=93.0' S=0.0452 '/' Outflow=0.09 cfs 0.043 af

Pond P-1F: Subsurface Detention/Infiltration Peak Elev=159.49' Storage=1,565 cf Inflow=1.03 cfs 0.073 af
8.0" Round Culvert n=0.013 L=2.0' S=0.0500 '/' Outflow=0.25 cfs 0.045 af

Pond P-4B: Subsurface Detention basin Peak Elev=190.93' Storage=8,479 cf Inflow=2.72 cfs 0.195 af
6.0" Round Culvert n=0.013 L=3.0' S=0.0333 '/' Outflow=0.00 cfs 0.000 af

Pond P-4C: Subsurface Detention/Infiltration Peak Elev=154.86' Storage=5,654 cf Inflow=3.40 cfs 0.247 af
8.0" Round Culvert n=0.013 L=10.0' S=0.0250 '/' Outflow=0.30 cfs 0.140 af

Pond P-4D: porous asphalt pavement Peak Elev=177.33' Storage=3,632 cf Inflow=1.21 cfs 0.086 af
Outflow=0.01 cfs 0.003 af

Total Runoff Area = 13.483 ac Runoff Volume = 1.459 af Average Runoff Depth = 1.30"
55.61% Pervious = 7.499 ac 44.39% Impervious = 5.985 ac

Summary for Subcatchment PR-1A:

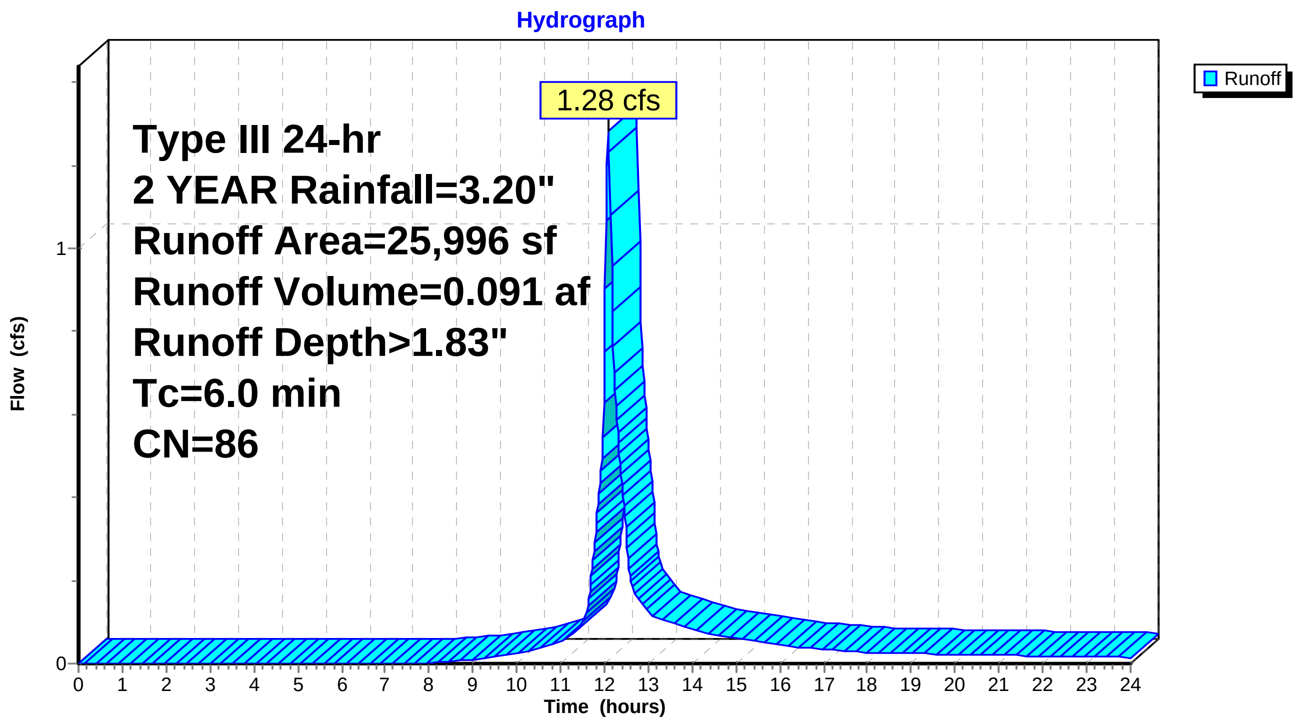
Runoff = 1.28 cfs @ 12.09 hrs, Volume= 0.091 af, Depth> 1.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
3,297	98	roofs
14,511	98	Paved parking
8,188	61	>75% Grass cover, Good, HSG B
25,996	86	Weighted Average
8,188		31.50% Pervious Area
17,808		68.50% Impervious Area

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

Subcatchment PR-1A:



Summary for Subcatchment PR-1B:

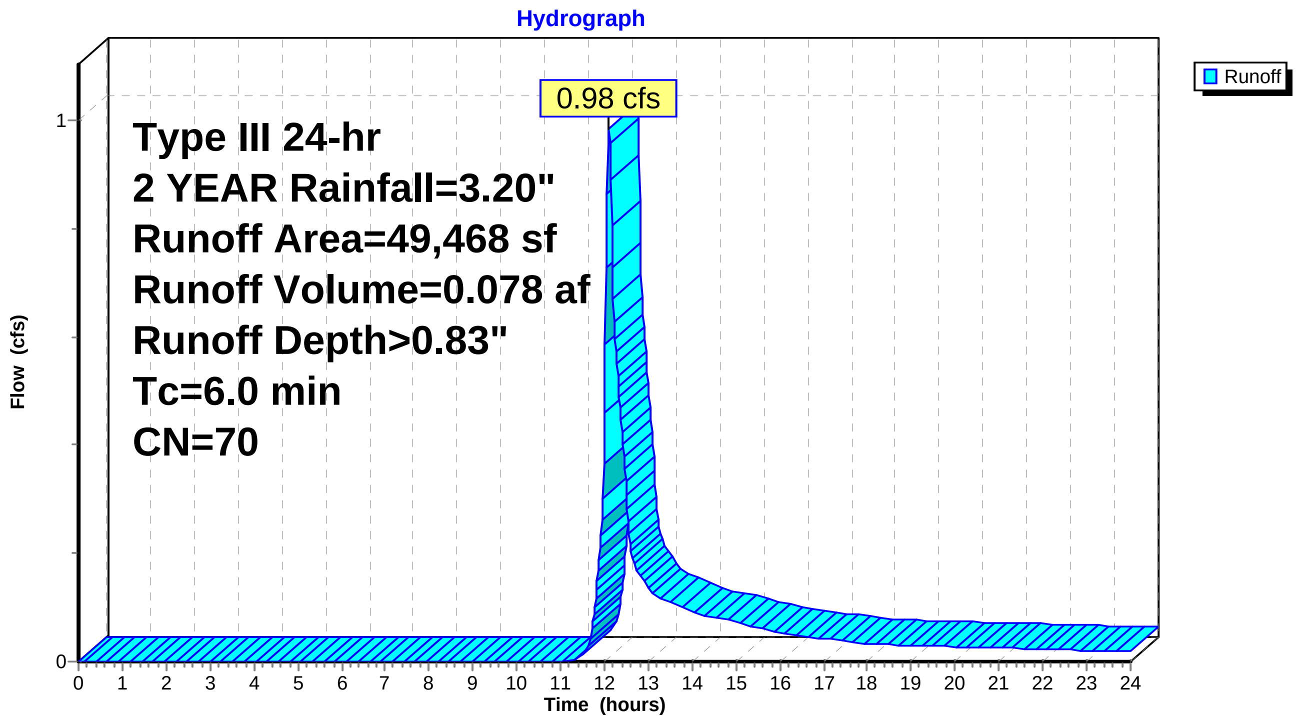
Runoff = 0.98 cfs @ 12.10 hrs, Volume= 0.078 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	9,606	98	roofs
*	2,267	98	pavement
*	142	98	ledge
	37,453	61	>75% Grass cover, Good, HSG B
	49,468	70	Weighted Average
	37,453		75.71% Pervious Area
	12,015		24.29% Impervious Area

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

Subcatchment PR-1B:



Summary for Subcatchment PR-1C:

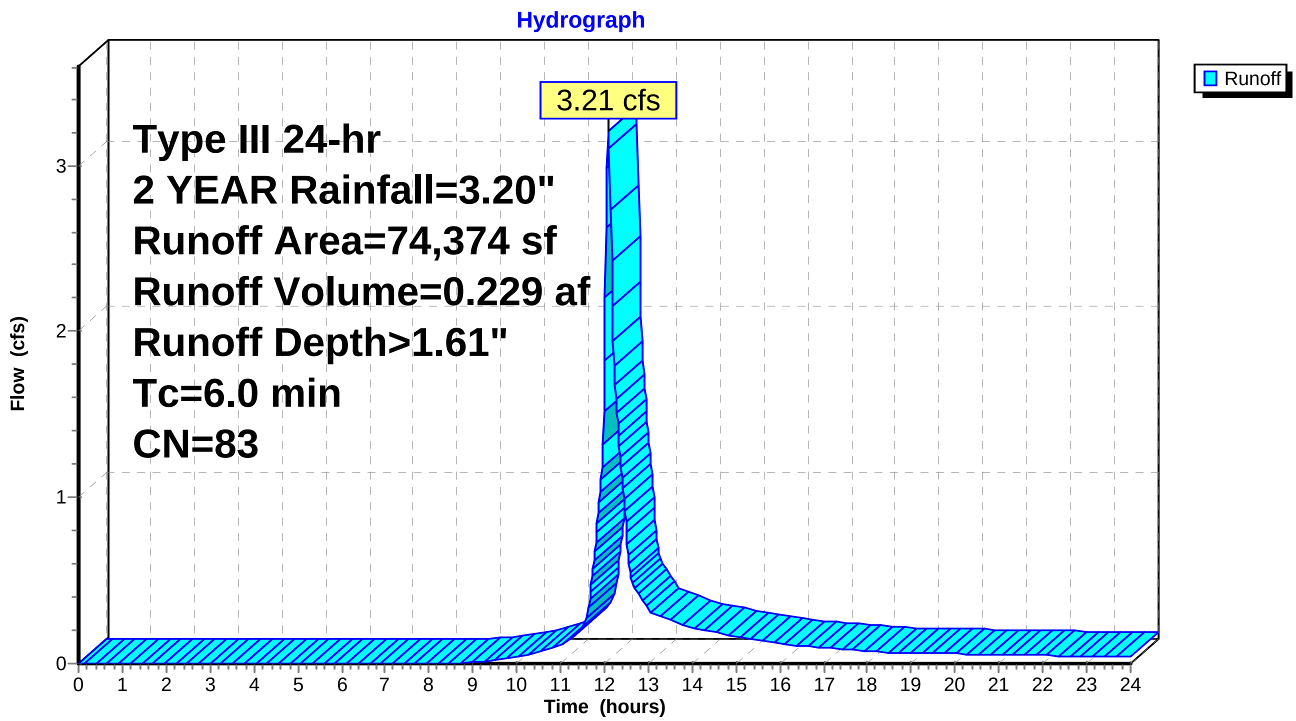
Runoff = 3.21 cfs @ 12.09 hrs, Volume= 0.229 af, Depth> 1.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
15,170	98	roofs
28,165	98	Paved parking
31,039	61	>75% Grass cover, Good, HSG B
74,374	83	Weighted Average
31,039		41.73% Pervious Area
43,335		58.27% Impervious Area

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

Subcatchment PR-1C:



Summary for Subcatchment PR-1D:

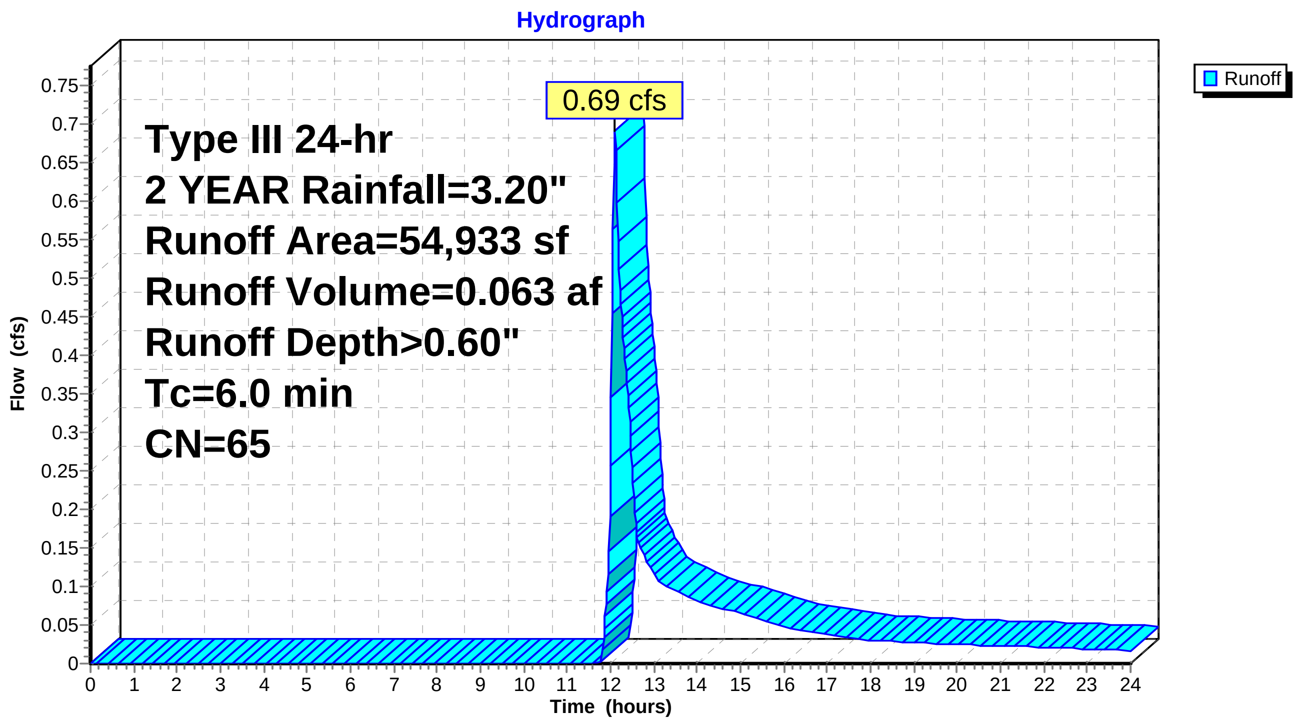
Runoff = 0.69 cfs @ 12.11 hrs, Volume= 0.063 af, Depth> 0.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
2,704	98	roofs
2,868	98	Paved parking
49,361	61	>75% Grass cover, Good, HSG B
54,933	65	Weighted Average
49,361		89.86% Pervious Area
5,572		10.14% Impervious Area

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

Subcatchment PR-1D:



Summary for Subcatchment PR-1E:

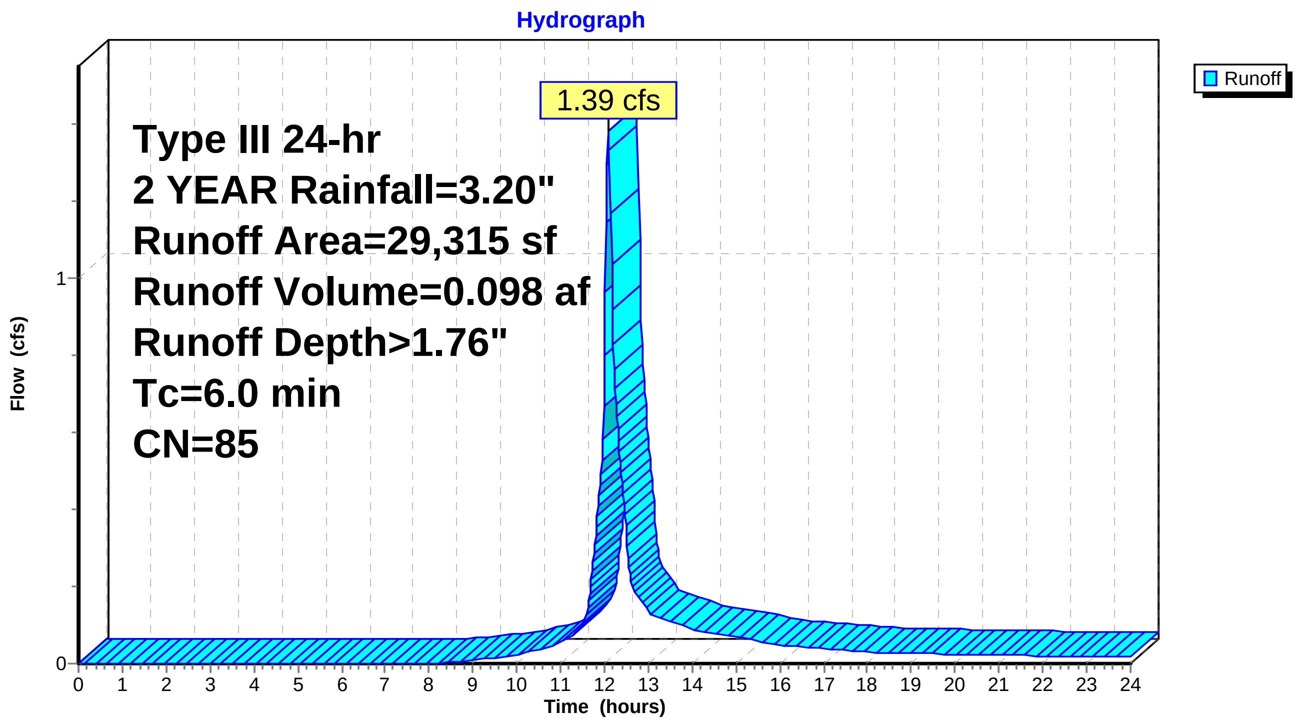
Runoff = 1.39 cfs @ 12.09 hrs, Volume= 0.098 af, Depth> 1.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
6,378	98	roofs
12,510	98	Paved parking
10,427	61	>75% Grass cover, Good, HSG B
29,315	85	Weighted Average
10,427		35.57% Pervious Area
18,888		64.43% Impervious Area

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

Subcatchment PR-1E:



Summary for Subcatchment PR-1F:

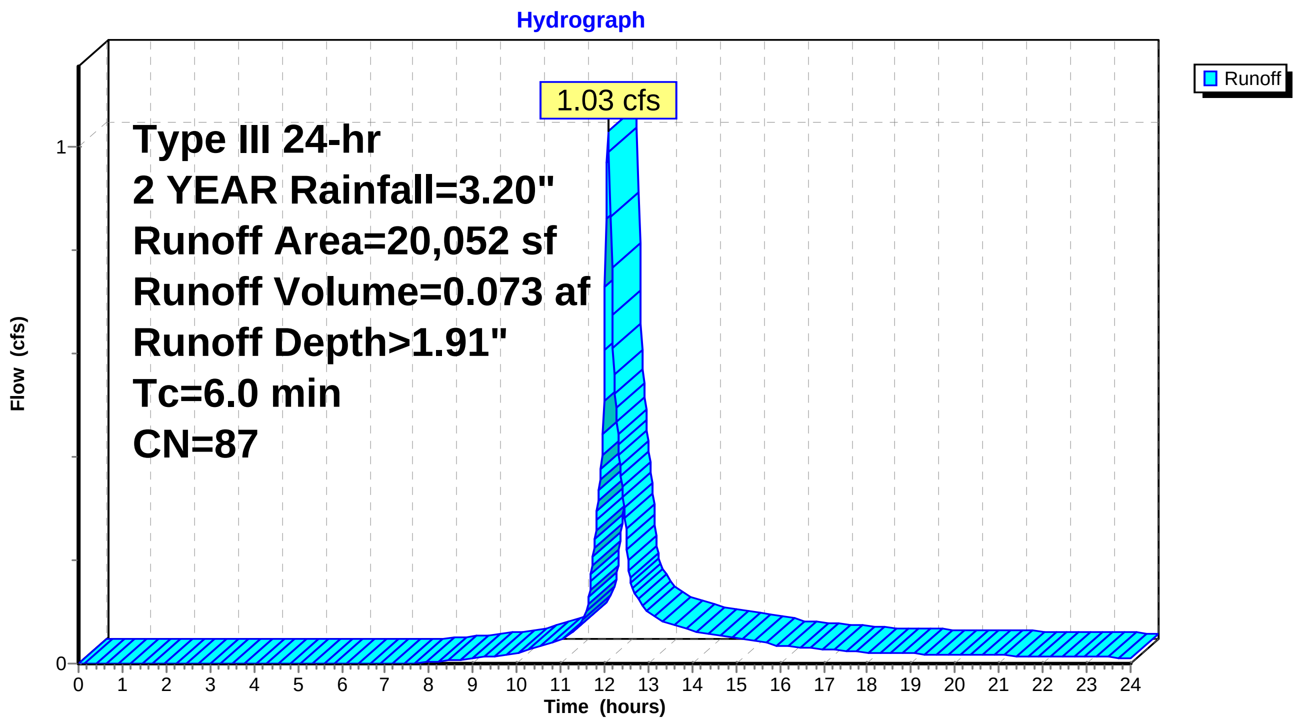
Runoff = 1.03 cfs @ 12.09 hrs, Volume= 0.073 af, Depth> 1.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
6,274	98	roofs
7,737	98	Paved parking
6,041	61	>75% Grass cover, Good, HSG B
20,052	87	Weighted Average
6,041		30.13% Pervious Area
14,011		69.87% Impervious Area

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

Subcatchment PR-1F:



Summary for Subcatchment PR-1G:

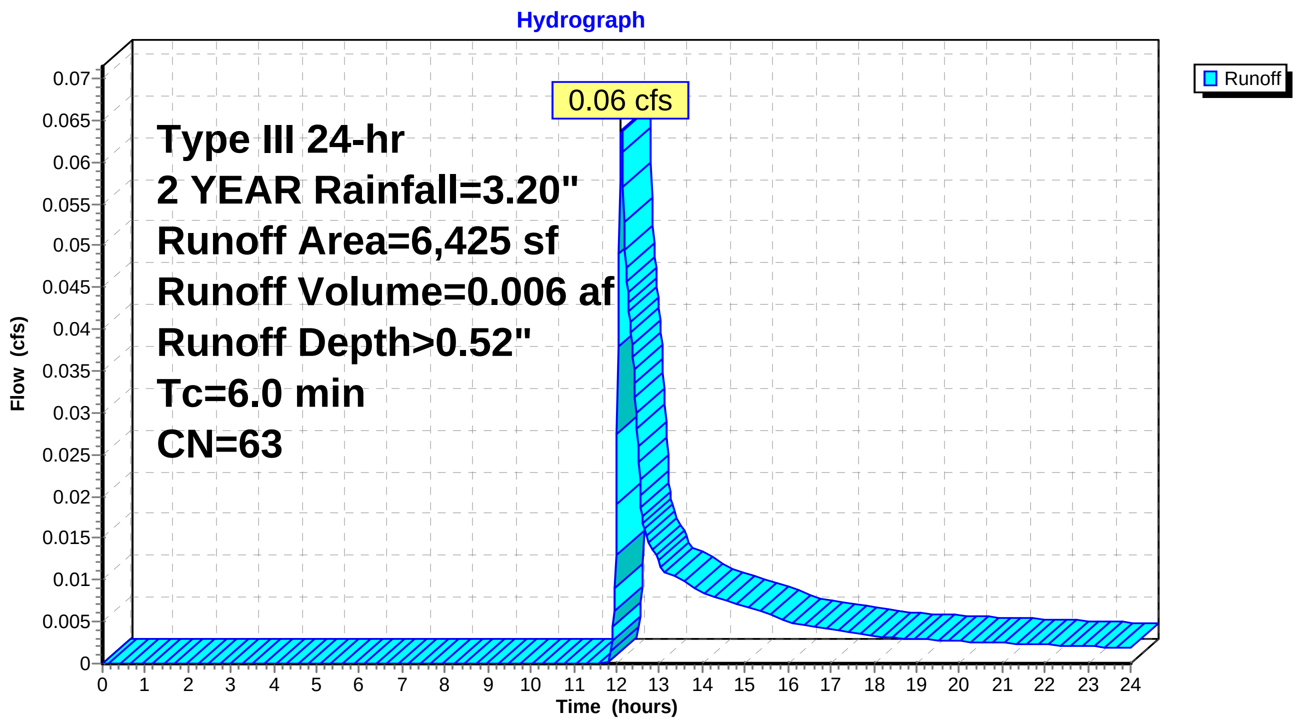
Runoff = 0.06 cfs @ 12.11 hrs, Volume= 0.006 af, Depth> 0.52"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	0	98	roofs
*	381	98	walkway
	6,044	61	>75% Grass cover, Good, HSG B
	6,425	63	Weighted Average
	6,044		94.07% Pervious Area
	381		5.93% Impervious Area

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

Subcatchment PR-1G:



Summary for Subcatchment PR-3A:

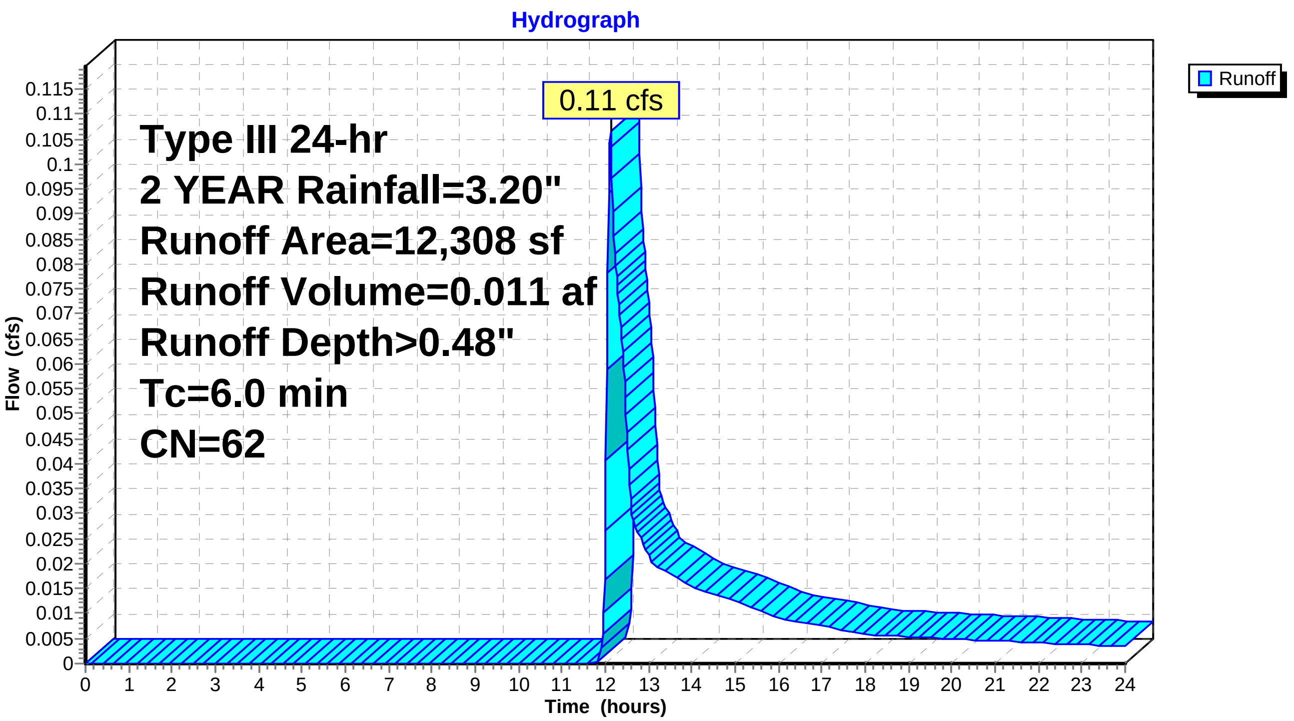
Runoff = 0.11 cfs @ 12.12 hrs, Volume= 0.011 af, Depth> 0.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	11,223	61	>75% Grass cover, Good, HSG B
*	346	98	sidewalk
	739	55	Woods, Good, HSG B
	12,308	62	Weighted Average
	11,962		97.19% Pervious Area
	346		2.81% Impervious Area

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

Subcatchment PR-3A:



Summary for Subcatchment PR-3B:

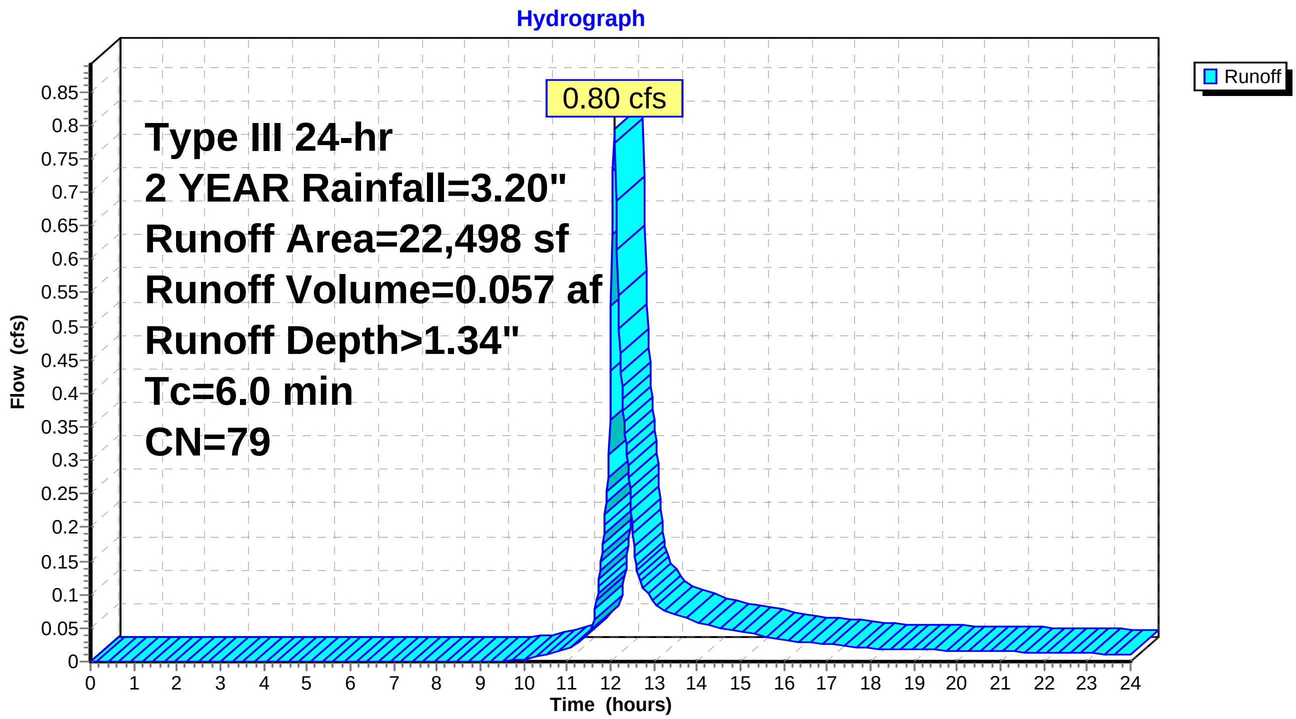
Runoff = 0.80 cfs @ 12.09 hrs, Volume= 0.057 af, Depth> 1.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	9,997	61	>75% Grass cover, Good, HSG B
*	9,671	98	paving
*	1,514	98	ROOF
	1,316	55	Woods, Good, HSG B
	22,498	79	Weighted Average
	11,313		50.28% Pervious Area
	11,185		49.72% Impervious Area

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

Subcatchment PR-3B:



Summary for Subcatchment PR-3C:

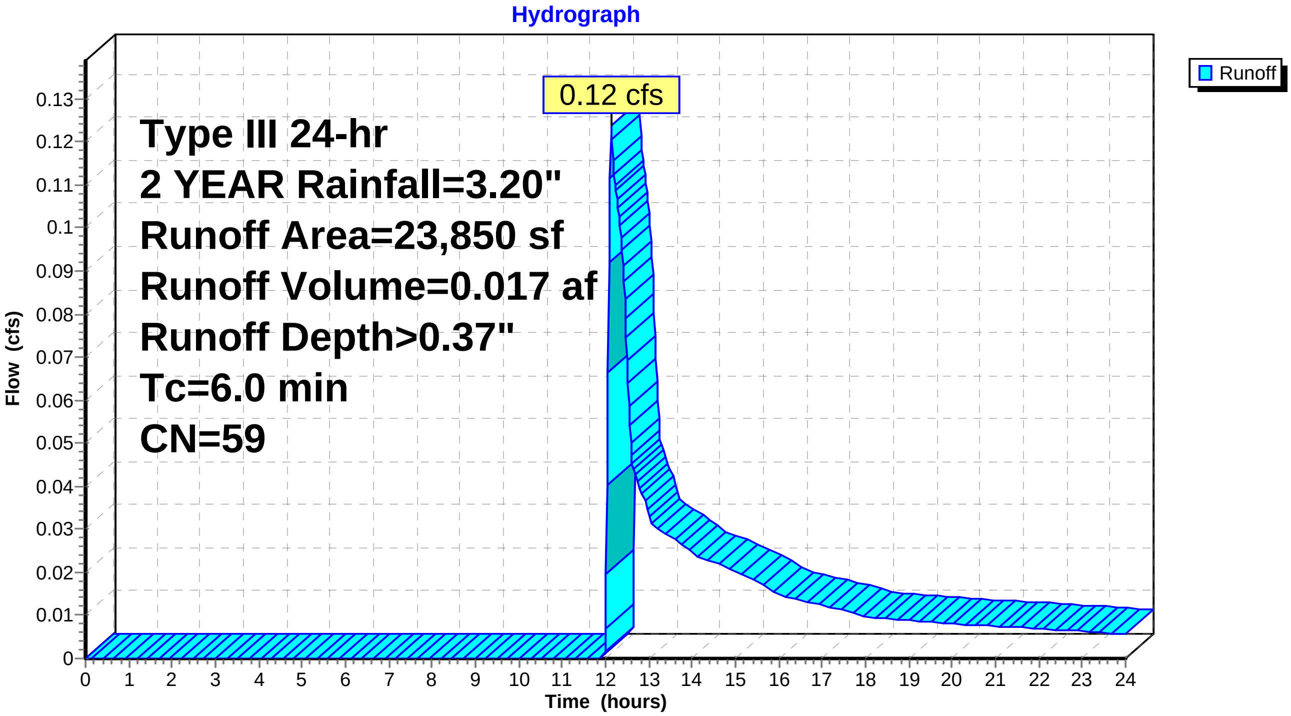
Runoff = 0.12 cfs @ 12.14 hrs, Volume= 0.017 af, Depth> 0.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
14,978	61	>75% Grass cover, Good, HSG B
8,872	55	Woods, Good, HSG B
23,850	59	Weighted Average
23,850		100.00% Pervious Area

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

Subcatchment PR-3C:



Summary for Subcatchment PR-4A:

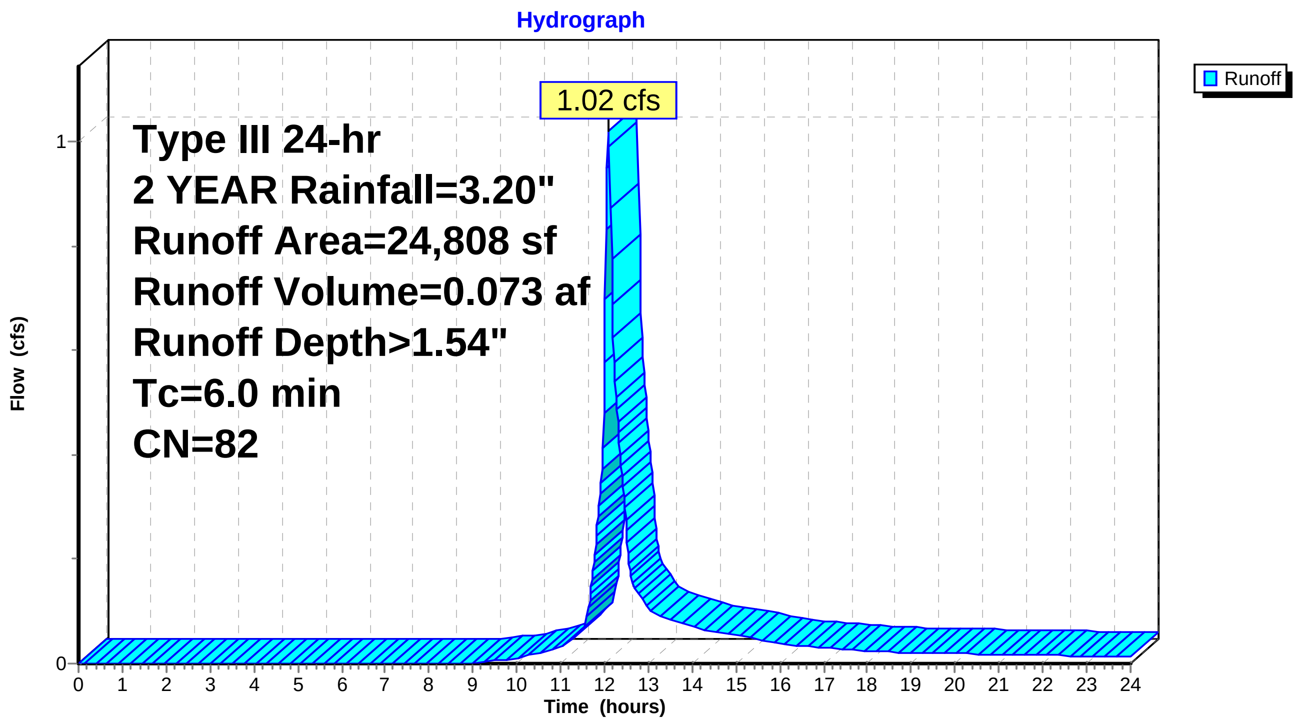
Runoff = 1.02 cfs @ 12.09 hrs, Volume= 0.073 af, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	7,054	61	>75% Grass cover, Good, HSG B
*	14,671	98	paving
	3,083	55	Woods, Good, HSG B
	24,808	82	Weighted Average
	10,137		40.86% Pervious Area
	14,671		59.14% Impervious Area

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

Subcatchment PR-4A:



Summary for Subcatchment PR-4B:

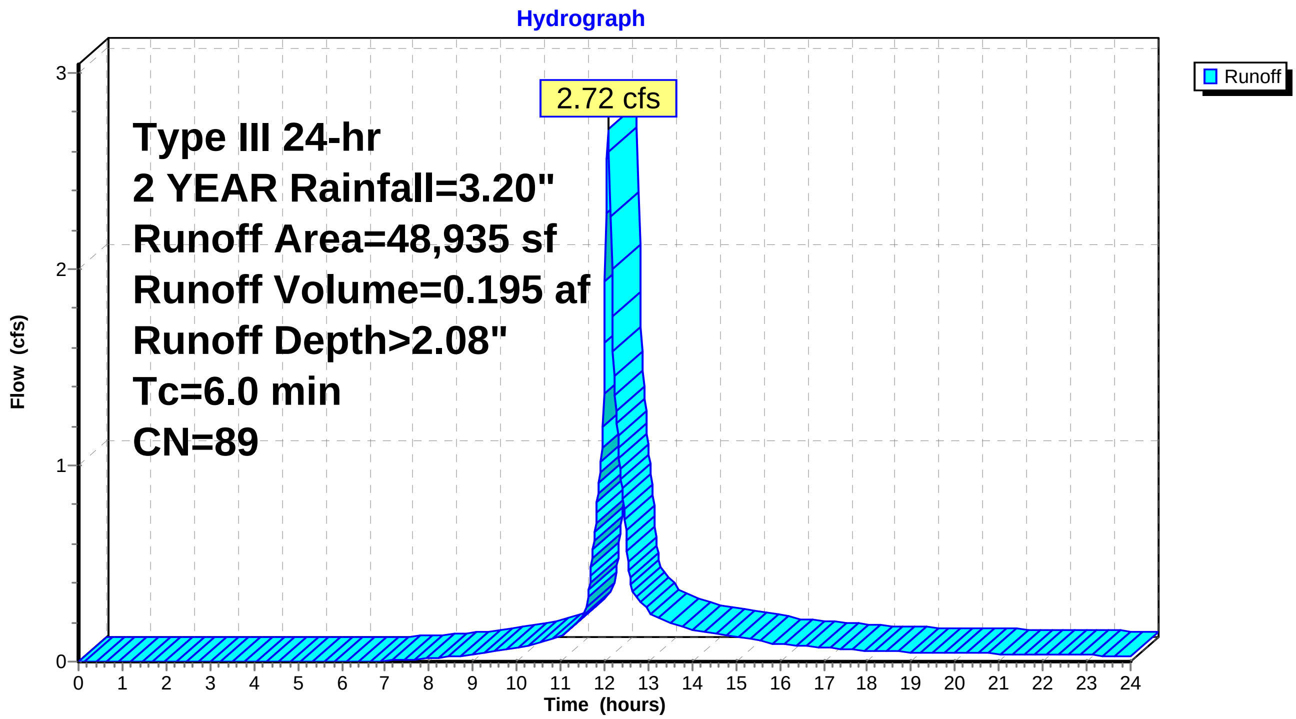
Runoff = 2.72 cfs @ 12.09 hrs, Volume= 0.195 af, Depth> 2.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
*	35,417	98	roofs
	0	98	Paved parking & roofs
*	1,634	98	LEDGE
	11,884	61	>75% Grass cover, Good, HSG B
	48,935	89	Weighted Average
	11,884		24.29% Pervious Area
	37,051		75.71% Impervious Area

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

Subcatchment PR-4B:



Summary for Subcatchment PR-4C:

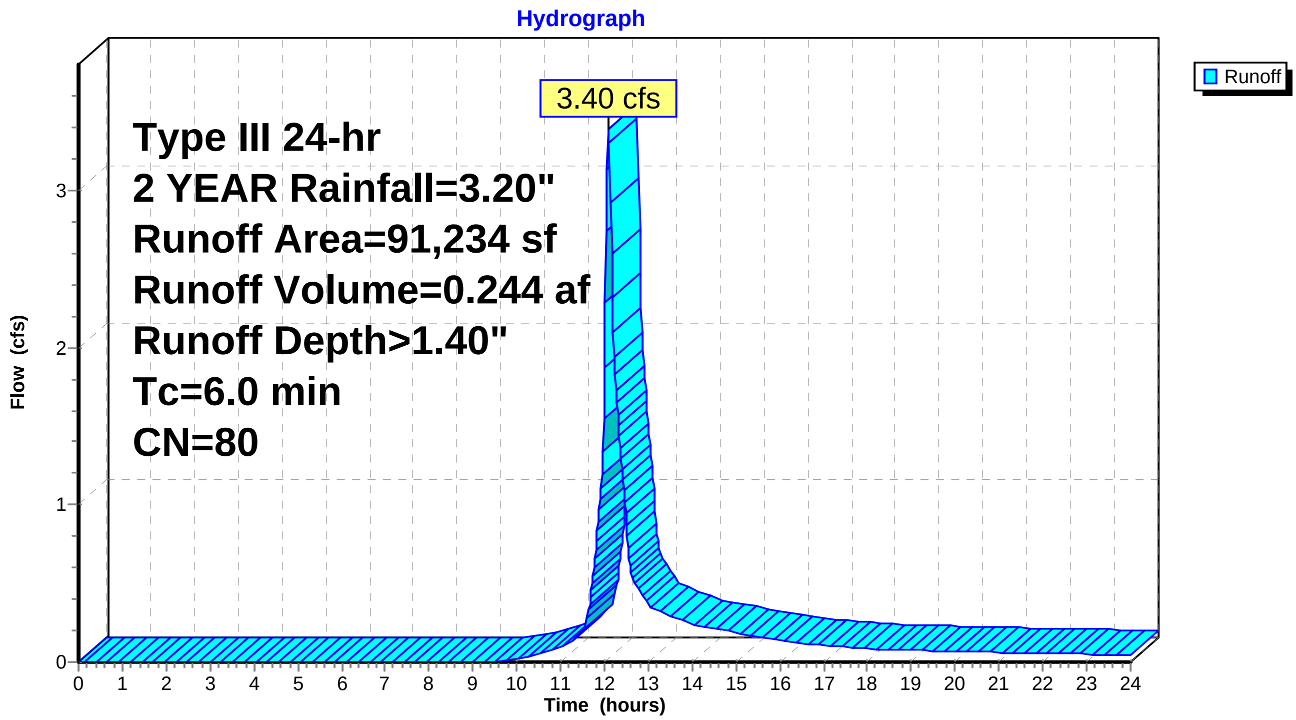
Runoff = 3.40 cfs @ 12.09 hrs, Volume= 0.244 af, Depth> 1.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	44,061	61	>75% Grass cover, Good, HSG B
*	34,868	98	paving
*	10,828	98	ROOFS
*	1,477	98	ledge
	91,234	80	Weighted Average
	44,061		48.29% Pervious Area
	47,173		51.71% Impervious Area

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

Subcatchment PR-4C:



Summary for Subcatchment PR-4D:

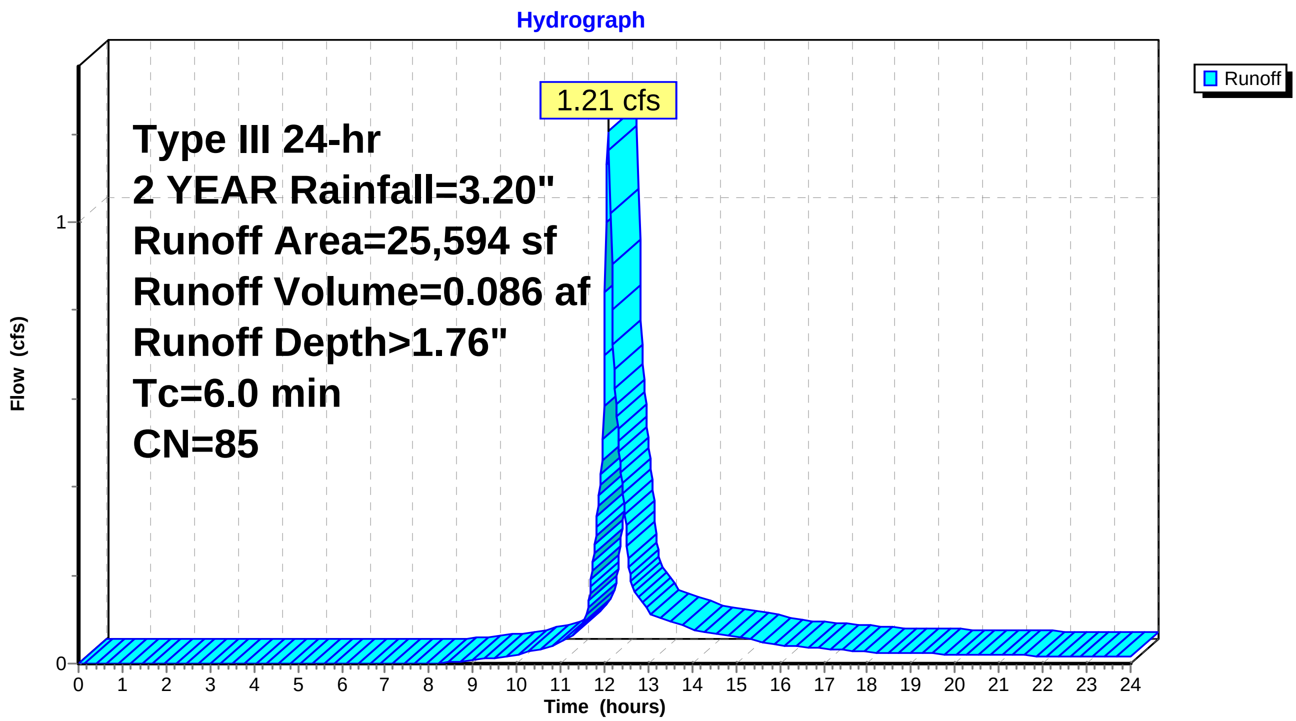
Runoff = 1.21 cfs @ 12.09 hrs, Volume= 0.086 af, Depth> 1.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

Area (sf)	CN	Description
9,275	61	>75% Grass cover, Good, HSG B
2,515	98	roofs
13,804	98	Paved parking
25,594	85	Weighted Average
9,275		36.24% Pervious Area
16,319		63.76% Impervious Area

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

Subcatchment PR-4D:



Summary for Subcatchment PR-4E:

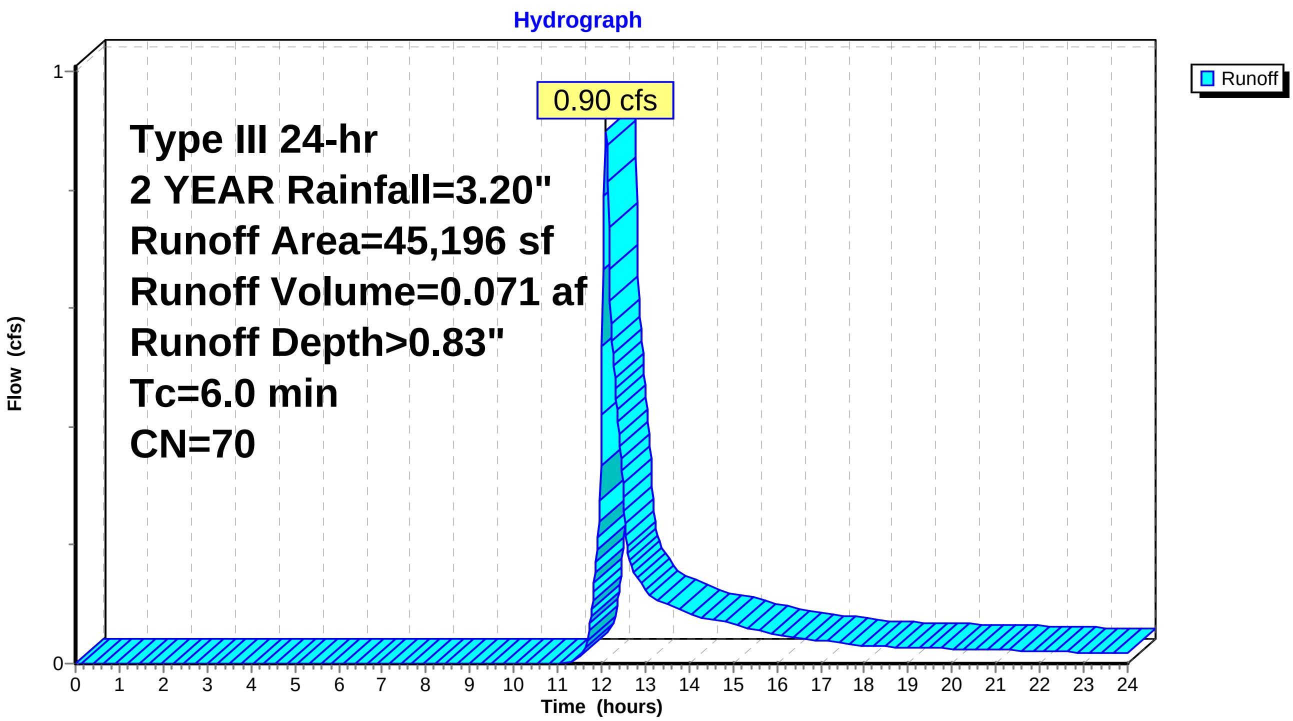
Runoff = 0.90 cfs @ 12.10 hrs, Volume= 0.071 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	34,517	61	>75% Grass cover, Good, HSG B
*	5,311	98	paving
*	5,368	98	ROOFS
	45,196	70	Weighted Average
	34,517		76.37% Pervious Area
	10,679		23.63% Impervious Area

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

Subcatchment PR-4E:



Summary for Subcatchment PR-4F:

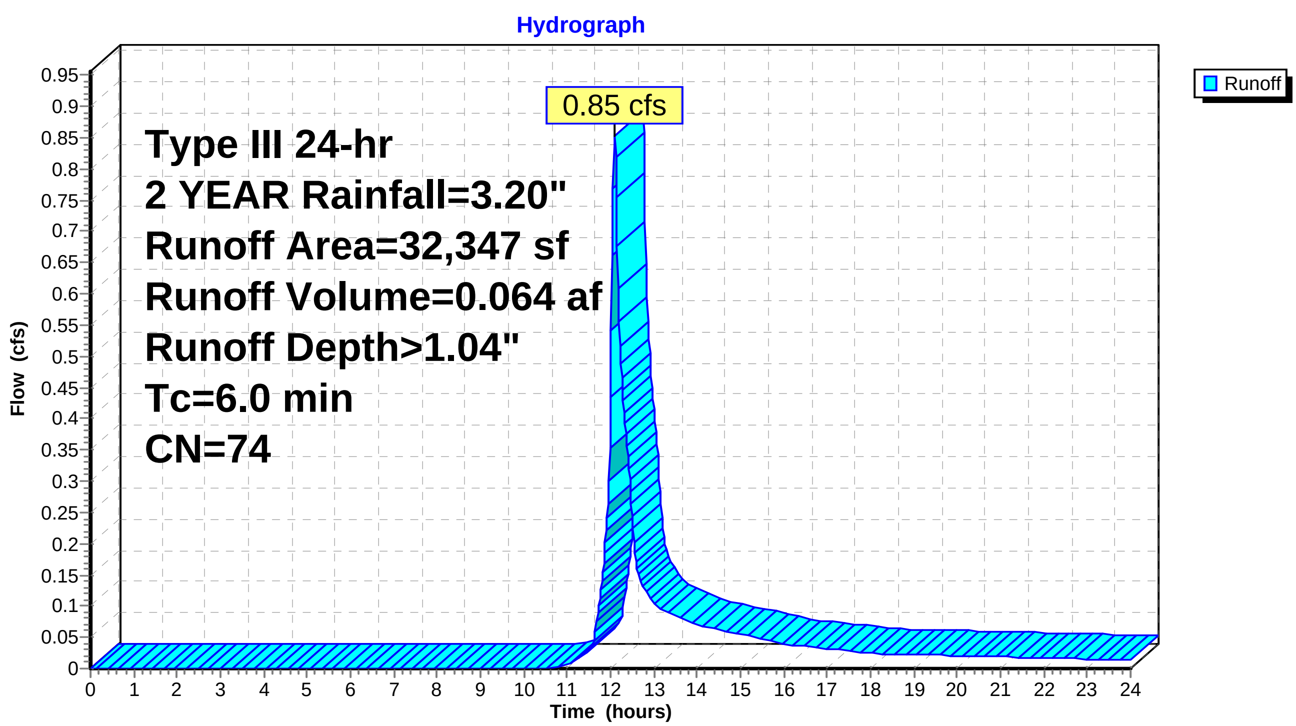
Runoff = 0.85 cfs @ 12.10 hrs, Volume= 0.064 af, Depth> 1.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YEAR Rainfall=3.20"

	Area (sf)	CN	Description
	21,093	61	>75% Grass cover, Good, HSG B
*	11,254	98	paving
*	0	98	ROOFS
	32,347	74	Weighted Average
	21,093		65.21% Pervious Area
	11,254		34.79% Impervious Area

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

Subcatchment PR-4F:



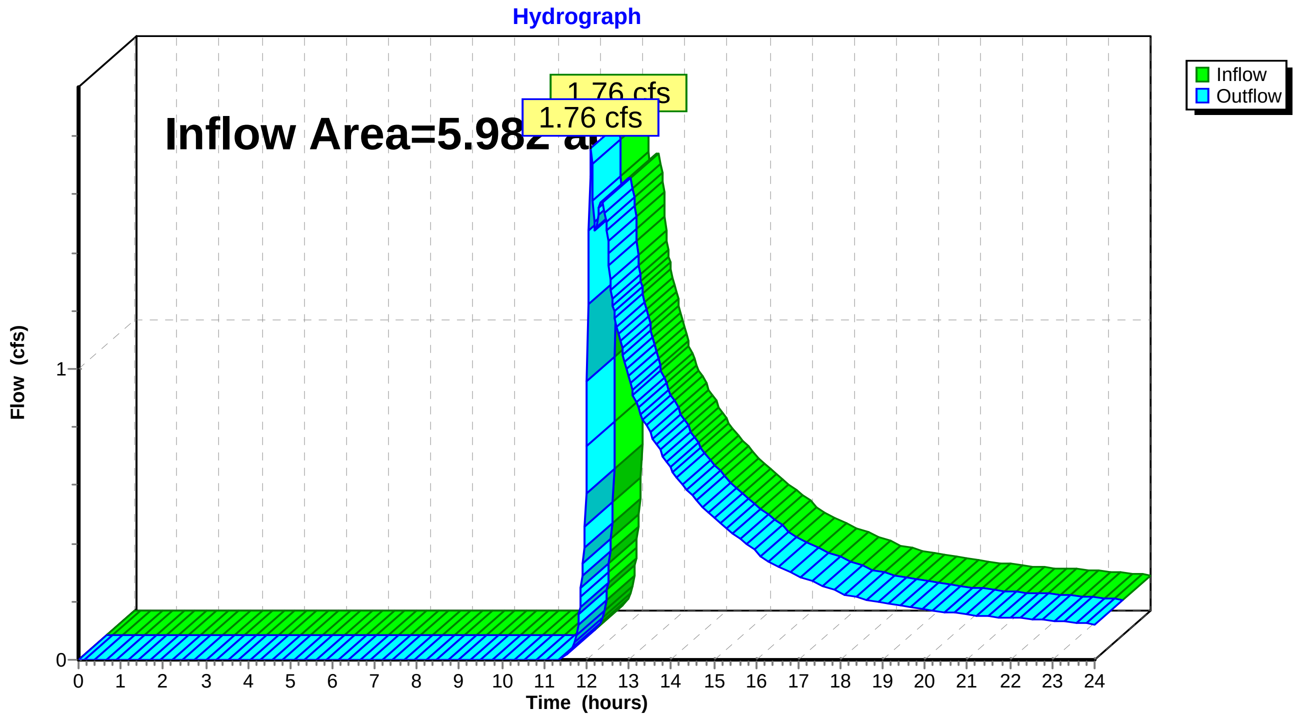
Summary for Reach DP-1: Wetlands-North

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

Inflow Area = 5.982 ac, 42.99% Impervious, Inflow Depth > 0.79" for 2 YEAR event
Inflow = 1.76 cfs @ 12.11 hrs, Volume= 0.393 af
Outflow = 1.76 cfs @ 12.11 hrs, Volume= 0.393 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1: Wetlands-North



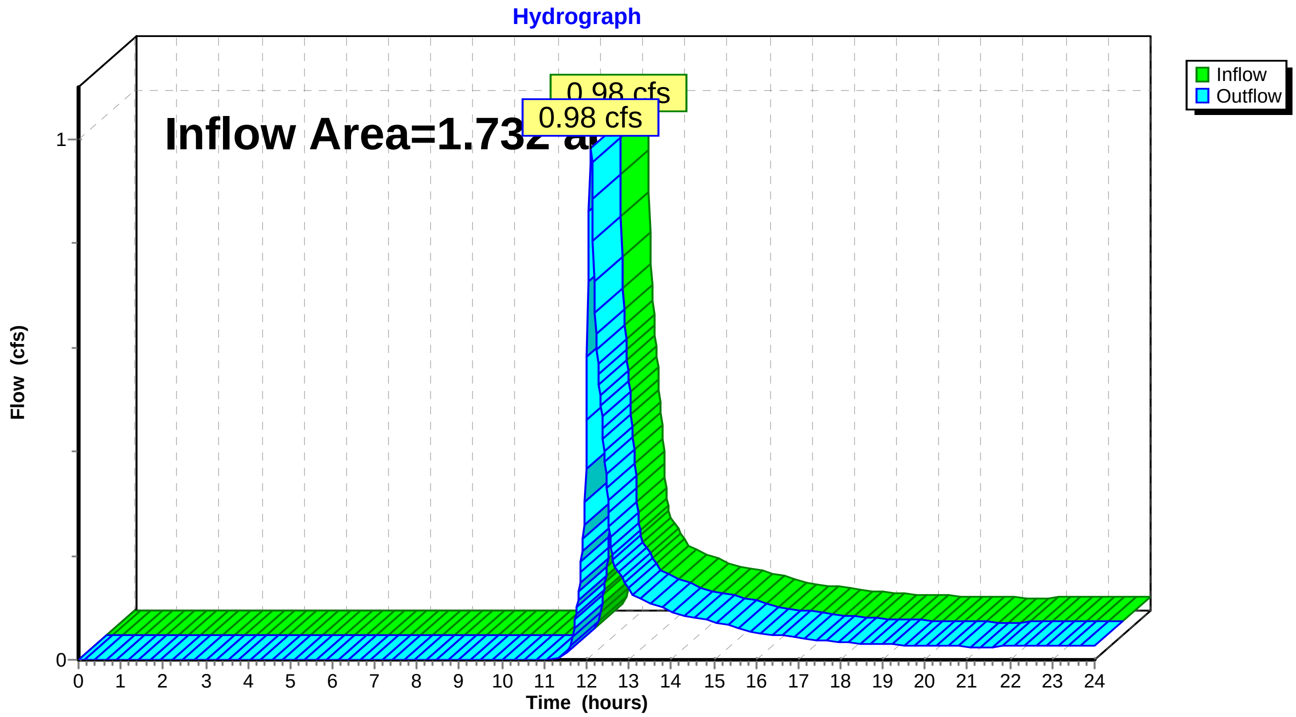
Summary for Reach DP-1A:

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

Inflow Area = 1.732 ac, 39.52% Impervious, Inflow Depth > 0.55" for 2 YEAR event
Inflow = 0.98 cfs @ 12.10 hrs, Volume= 0.079 af
Outflow = 0.98 cfs @ 12.10 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1A:



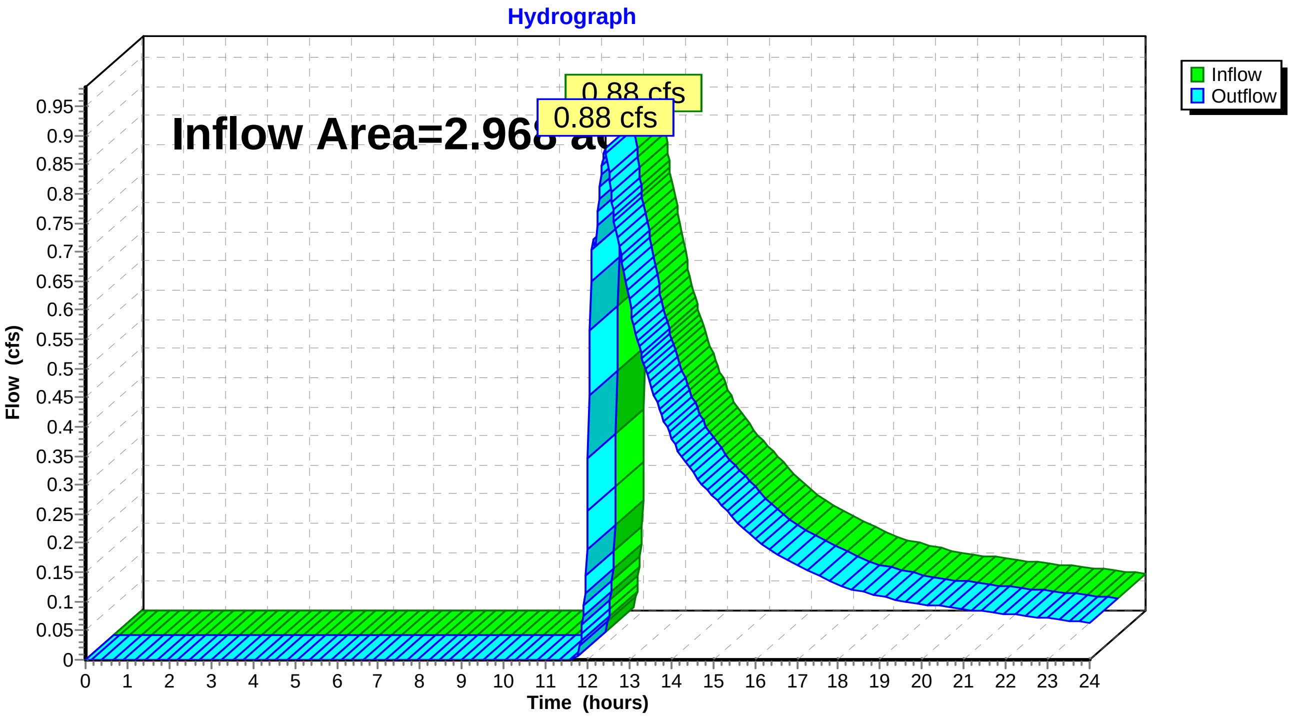
Summary for Reach DP-1B:

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

Inflow Area = 2.968 ac, 37.82% Impervious, Inflow Depth > 0.89" for 2 YEAR event
Inflow = 0.88 cfs @ 12.42 hrs, Volume= 0.220 af
Outflow = 0.88 cfs @ 12.42 hrs, Volume= 0.220 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1B:



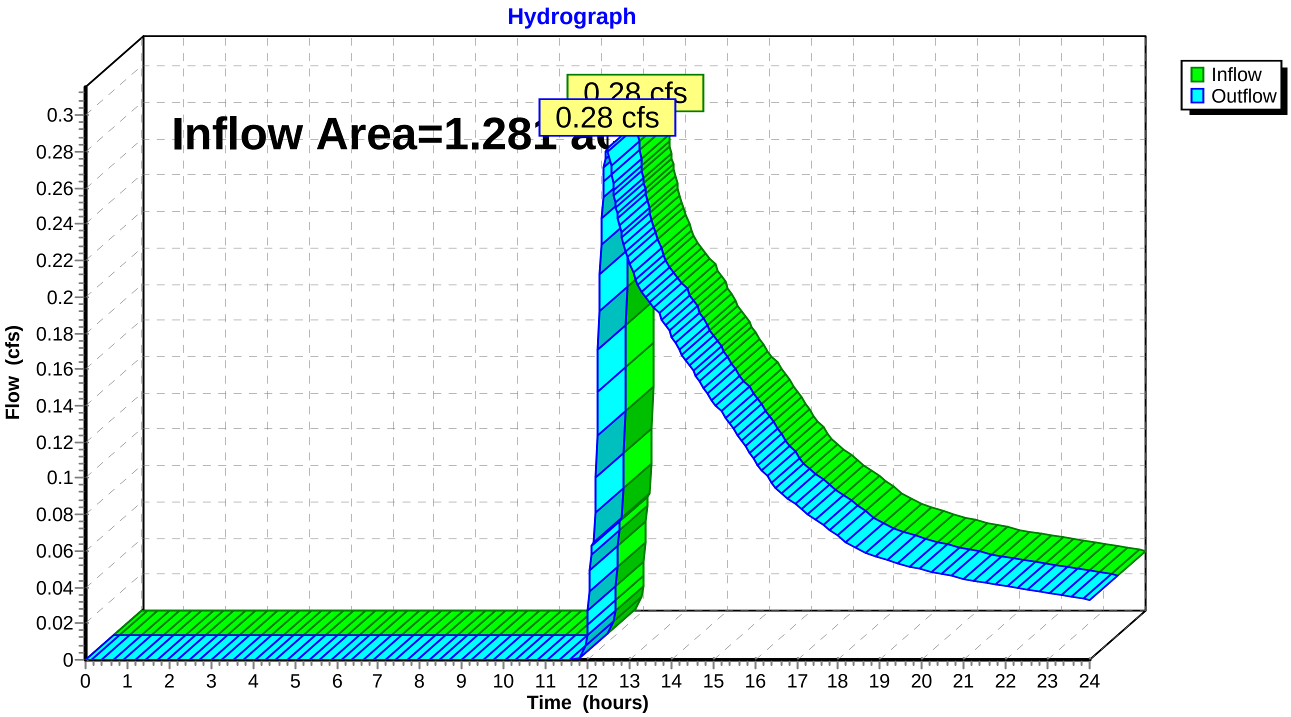
Summary for Reach DP-1C:

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

Inflow Area = 1.281 ac, 59.65% Impervious, Inflow Depth > 0.88" for 2 YEAR event
Inflow = 0.28 cfs @ 12.48 hrs, Volume= 0.094 af
Outflow = 0.28 cfs @ 12.48 hrs, Volume= 0.094 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1C:



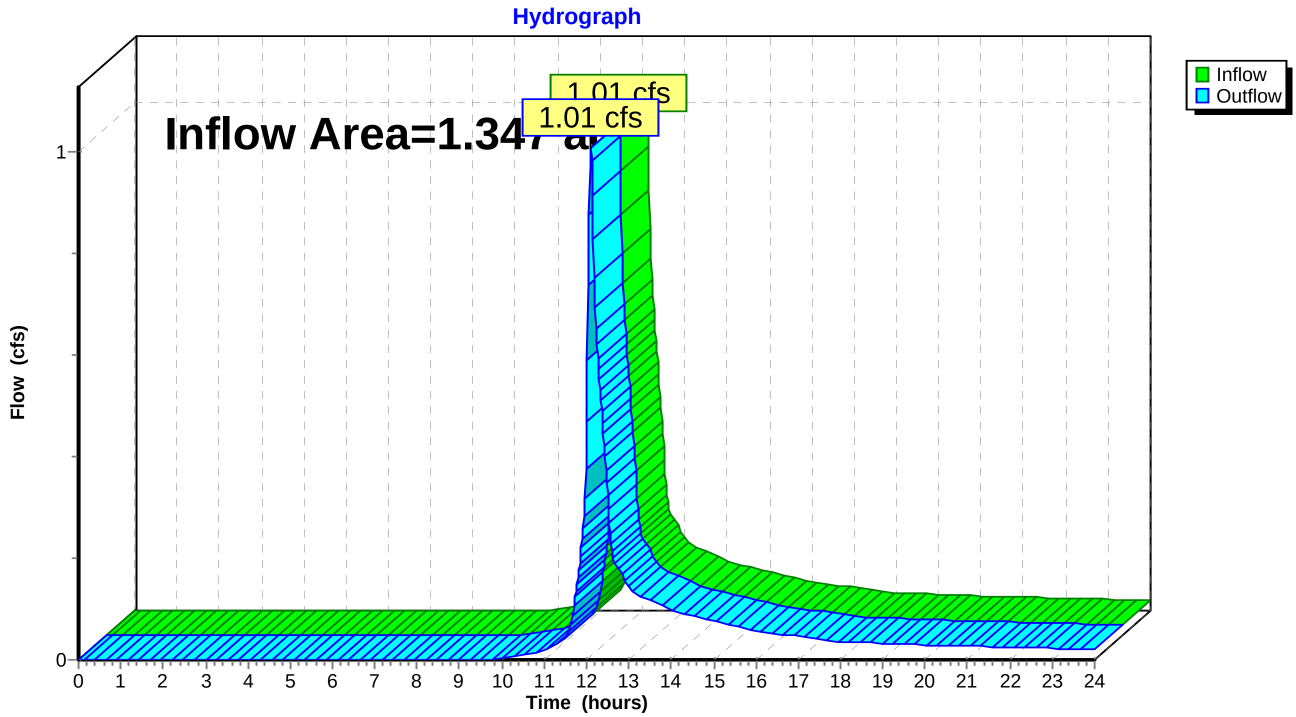
Summary for Reach DP-3: Drain System in Russett Rd.

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

Inflow Area = 1.347 ac, 19.66% Impervious, Inflow Depth > 0.76" for 2 YEAR event
Inflow = 1.01 cfs @ 12.10 hrs, Volume= 0.086 af
Outflow = 1.01 cfs @ 12.10 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3: Drain System in Russett Rd.



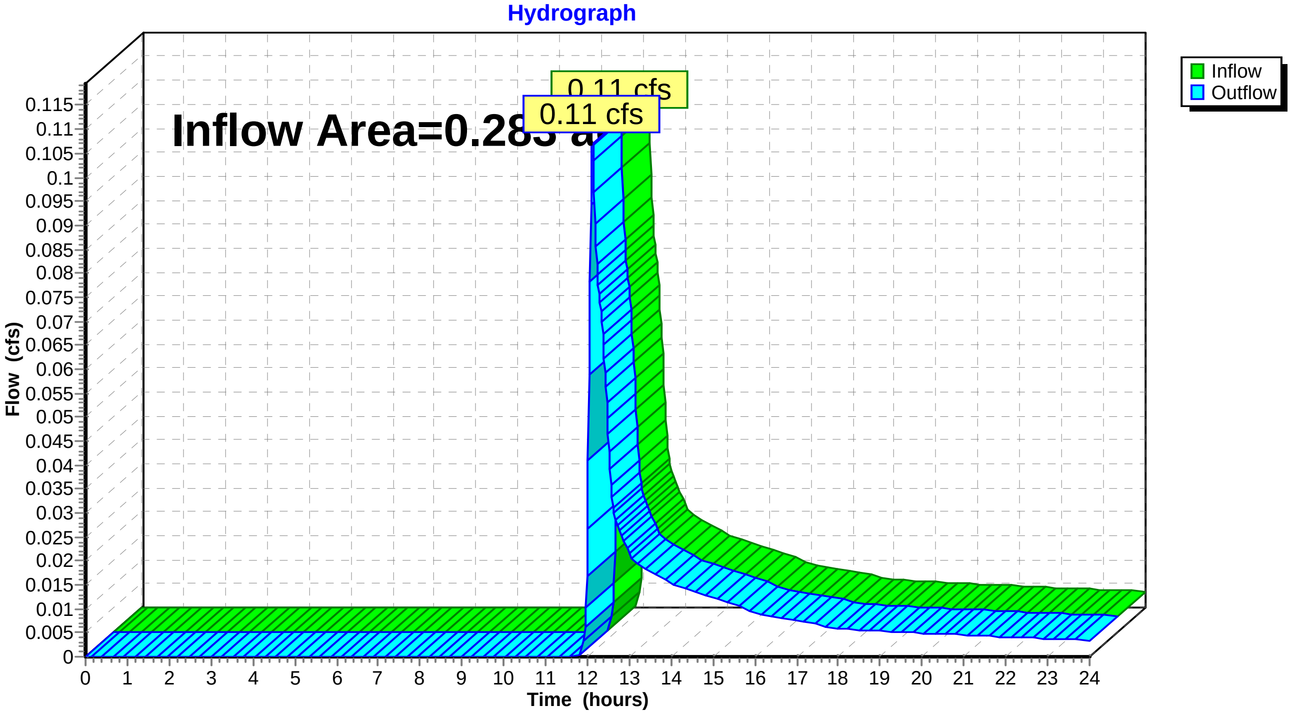
Summary for Reach DP-3A:

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

Inflow Area =	0.283 ac,	2.81% Impervious,	Inflow Depth > 0.48"	for 2 YEAR event
Inflow =	0.11 cfs @	12.12 hrs, Volume=	0.011 af	
Outflow =	0.11 cfs @	12.12 hrs, Volume=	0.011 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3A:



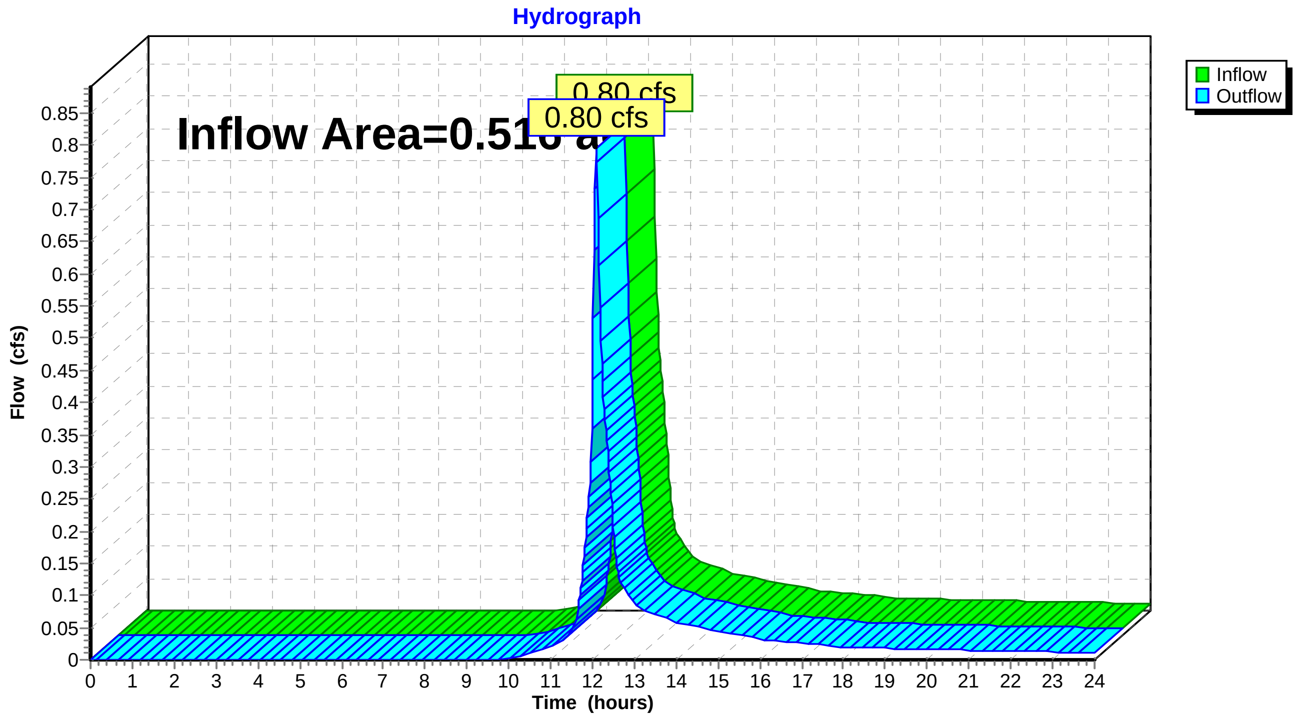
Summary for Reach DP-3B:

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

Inflow Area = 0.516 ac, 49.72% Impervious, Inflow Depth > 1.34" for 2 YEAR event
Inflow = 0.80 cfs @ 12.09 hrs, Volume= 0.057 af
Outflow = 0.80 cfs @ 12.09 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3B:



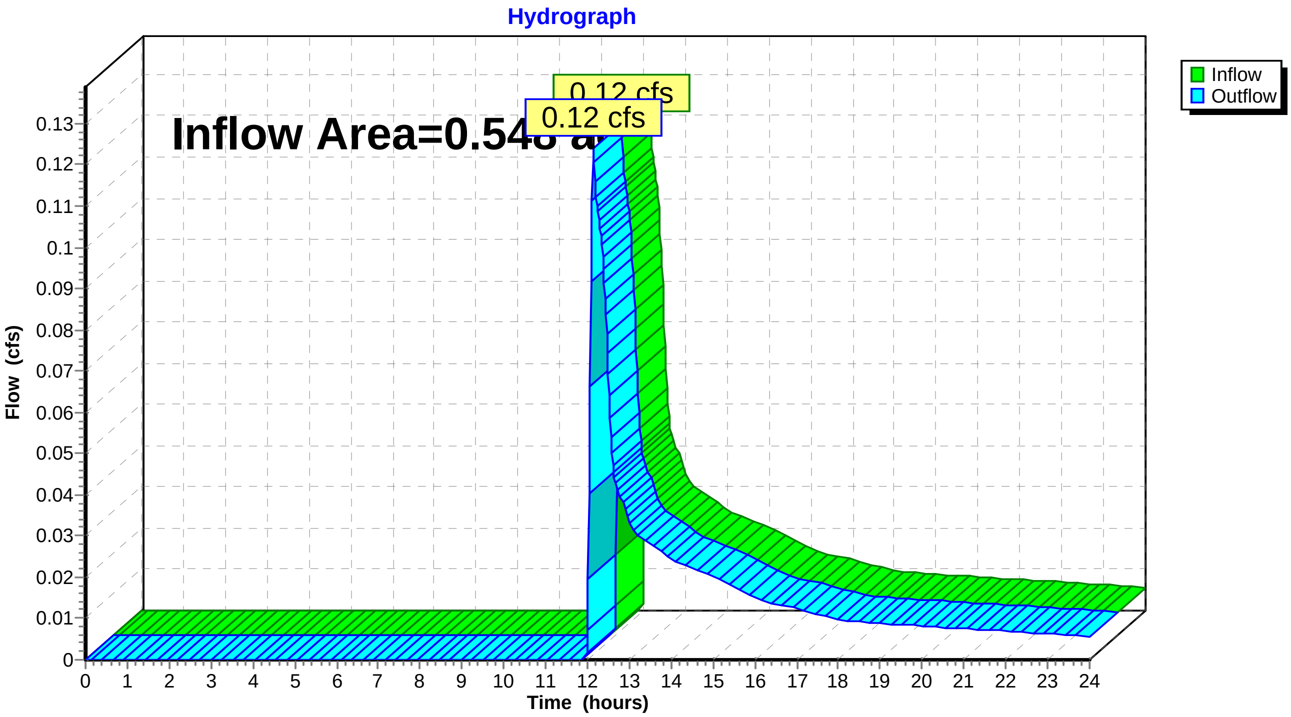
Summary for Reach DP-3D:

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

Inflow Area = 0.548 ac, 0.00% Impervious, Inflow Depth > 0.37" for 2 YEAR event
Inflow = 0.12 cfs @ 12.14 hrs, Volume= 0.017 af
Outflow = 0.12 cfs @ 12.14 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3D:



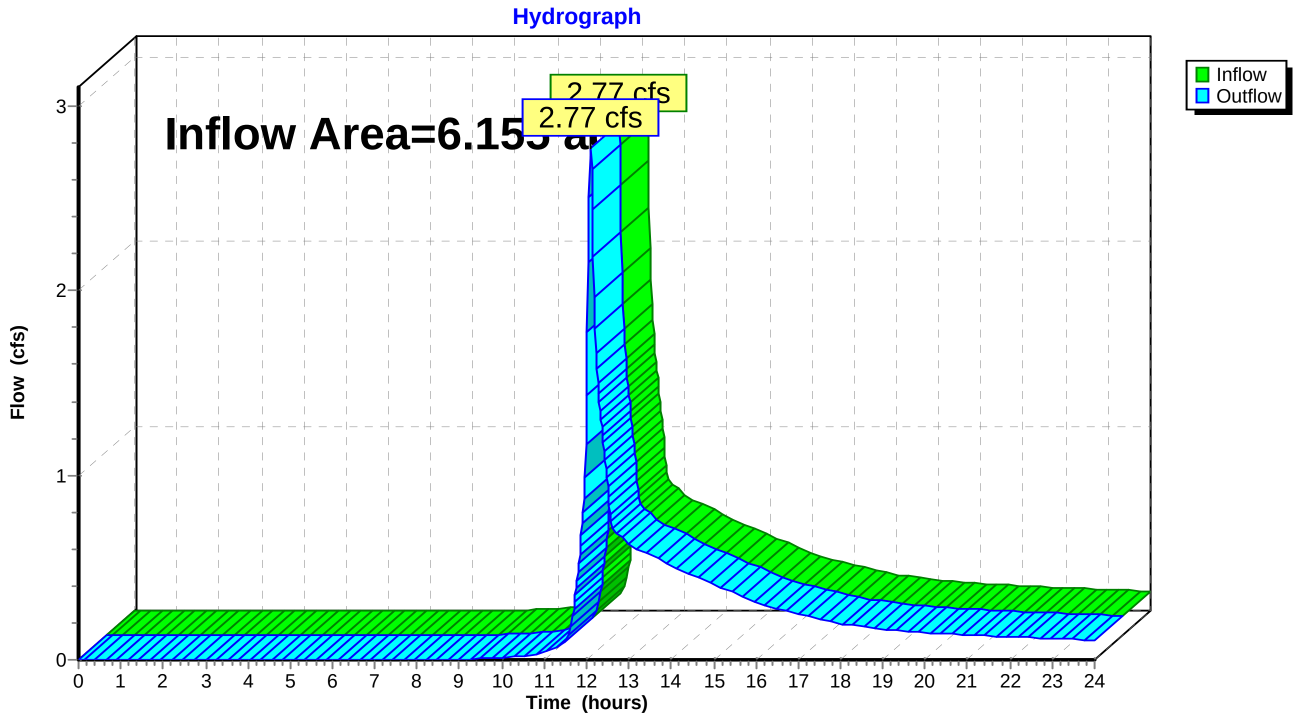
Summary for Reach DP-4: VFW Parkway

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

Inflow Area = 6.155 ac, 51.15% Impervious, Inflow Depth > 0.68" for 2 YEAR event
Inflow = 2.77 cfs @ 12.10 hrs, Volume= 0.348 af
Outflow = 2.77 cfs @ 12.10 hrs, Volume= 0.348 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4: VFW Parkway



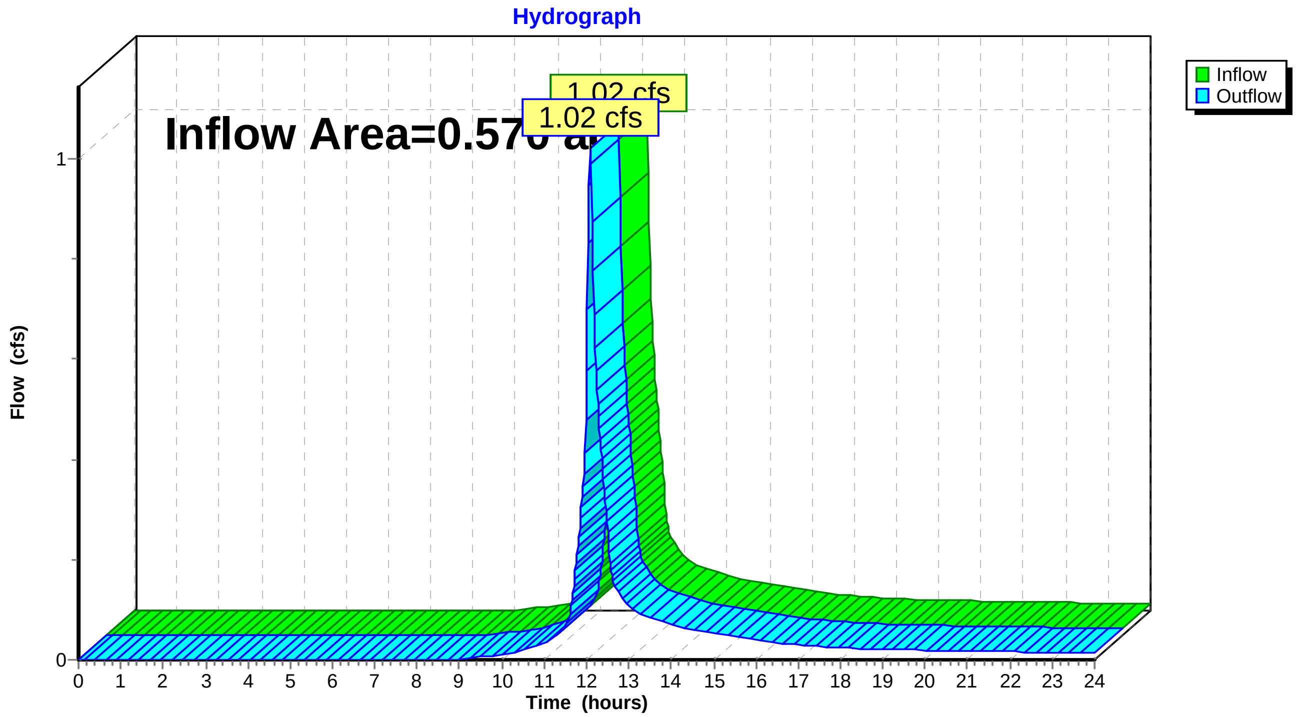
Summary for Reach DP-4A:

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

Inflow Area = 0.570 ac, 59.14% Impervious, Inflow Depth > 1.54" for 2 YEAR event
Inflow = 1.02 cfs @ 12.09 hrs, Volume= 0.073 af
Outflow = 1.02 cfs @ 12.09 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4A:



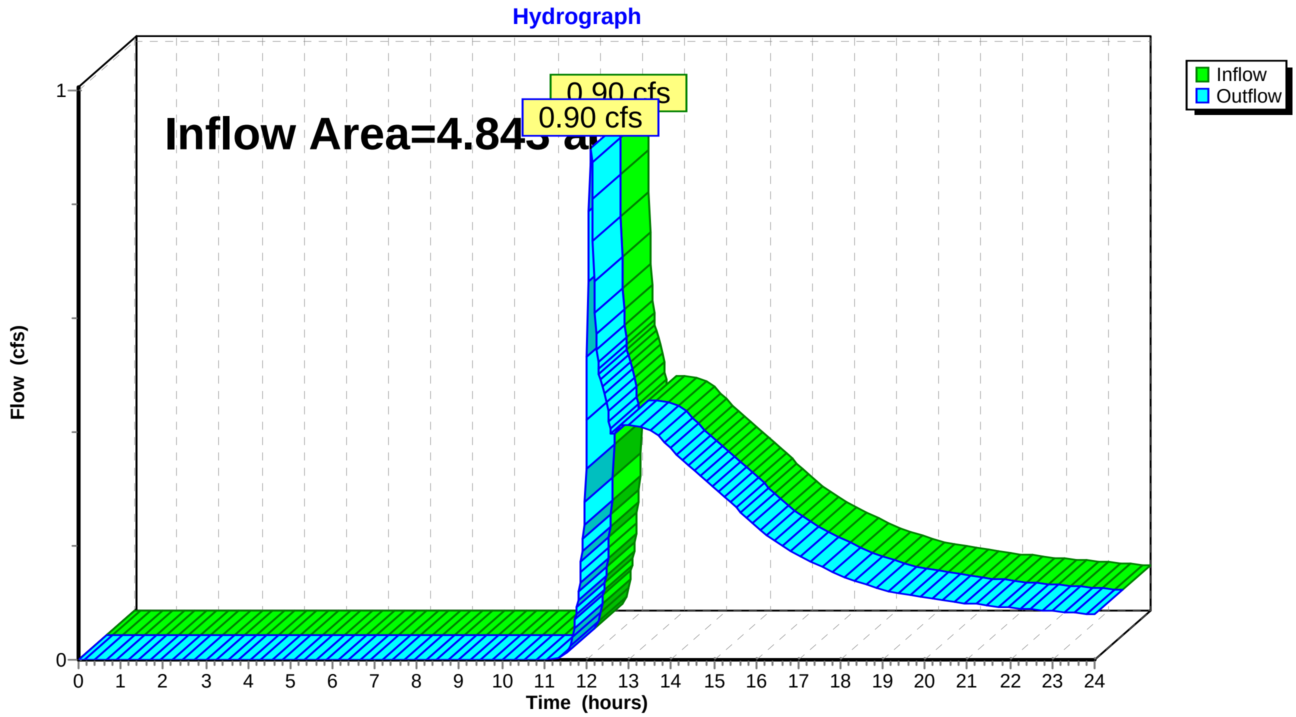
Summary for Reach DP-4B:

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

Inflow Area =	4.843 ac,	52.72% Impervious,	Inflow Depth > 0.52"	for 2 YEAR event
Inflow =	0.90 cfs @	12.10 hrs, Volume=	0.211 af	
Outflow =	0.90 cfs @	12.10 hrs, Volume=	0.211 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4B:



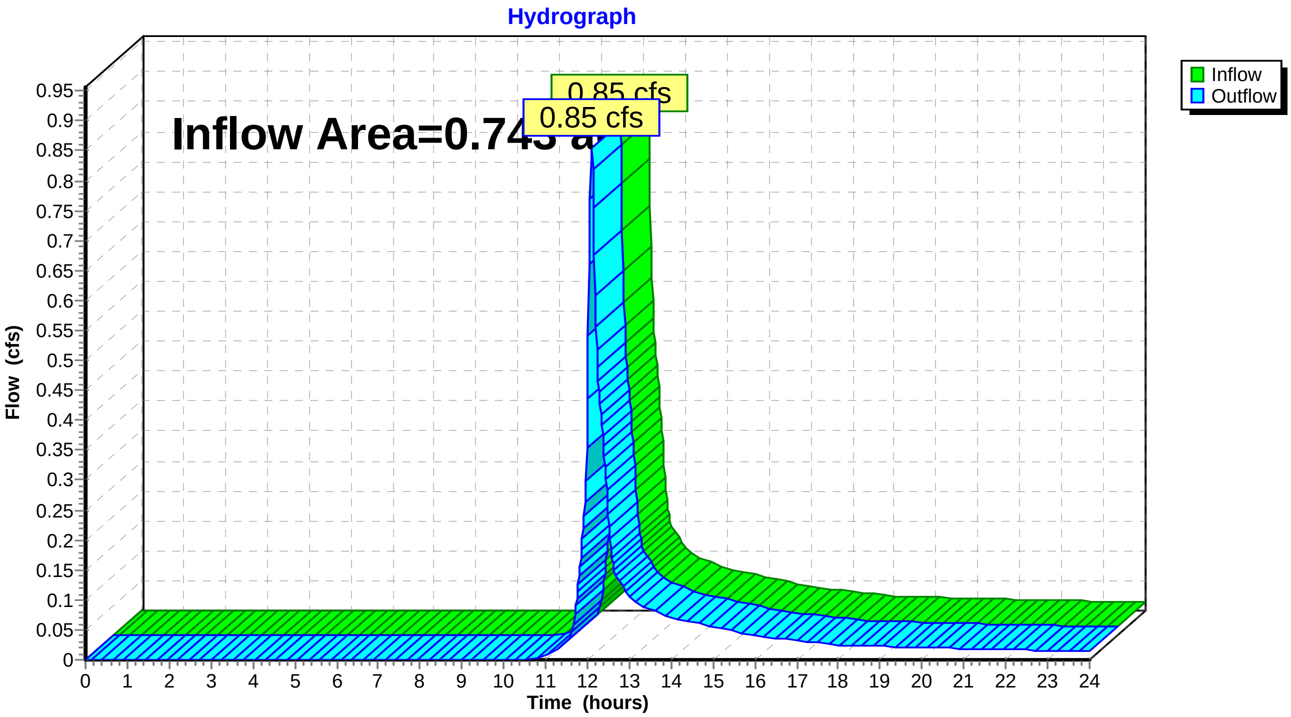
Summary for Reach DP-4C:

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

Inflow Area = 0.743 ac, 34.79% Impervious, Inflow Depth > 1.04" for 2 YEAR event
Inflow = 0.85 cfs @ 12.10 hrs, Volume= 0.064 af
Outflow = 0.85 cfs @ 12.10 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4C:



Summary for Pond P-1A: Subsurface Detention/Infiltration basin

Inflow Area = 0.597 ac, 68.50% Impervious, Inflow Depth > 1.83" for 2 YEAR event
Inflow = 1.28 cfs @ 12.09 hrs, Volume= 0.091 af
Outflow = 0.01 cfs @ 24.00 hrs, Volume= 0.001 af, Atten= 99%, Lag= 714.7 min
Primary = 0.01 cfs @ 24.00 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 169.05' @ 24.00 hrs Surf.Area= 3,838 sf Storage= 3,930 cf

Plug-Flow detention time= 845.0 min calculated for 0.001 af (1% of inflow)
Center-of-Mass det. time= 557.6 min (1,379.4 - 821.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	167.60'	1,850 cf	**101.00'W x 38.00'L x 3.00'H Field A** 11,514 cf Overall - 5,346 cf Embedded = 6,168 cf x 30.0% Voids
#2A	168.10'	5,186 cf	**StormTank 18W** x 792 Inside #1 Inside= 36.0"W x 18.0"H => 4.37 sf x 1.50'L = 6.5 cf Outside= 36.0"W x 18.0"H => 4.50 sf x 1.50'L = 6.8 cf
		7,036 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	169.00'	**6.0" Round Culvert** L= 28.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 169.00' / 167.00' S= 0.0714 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.01 cfs @ 24.00 hrs HW=169.05' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.01 cfs @ 0.74 fps)

Pond P-1A: Subsurface Detention/Infiltration basin - Chamber Wizard Field A

Chamber Model = StormTank 18W
Inside= 36.0"W x 18.0"H => 4.37 sf x 1.50'L = 6.5 cf
Outside= 36.0"W x 18.0"H => 4.50 sf x 1.50'L = 6.8 cf

36.0" Wide = 36.0" C-C Row Spacing

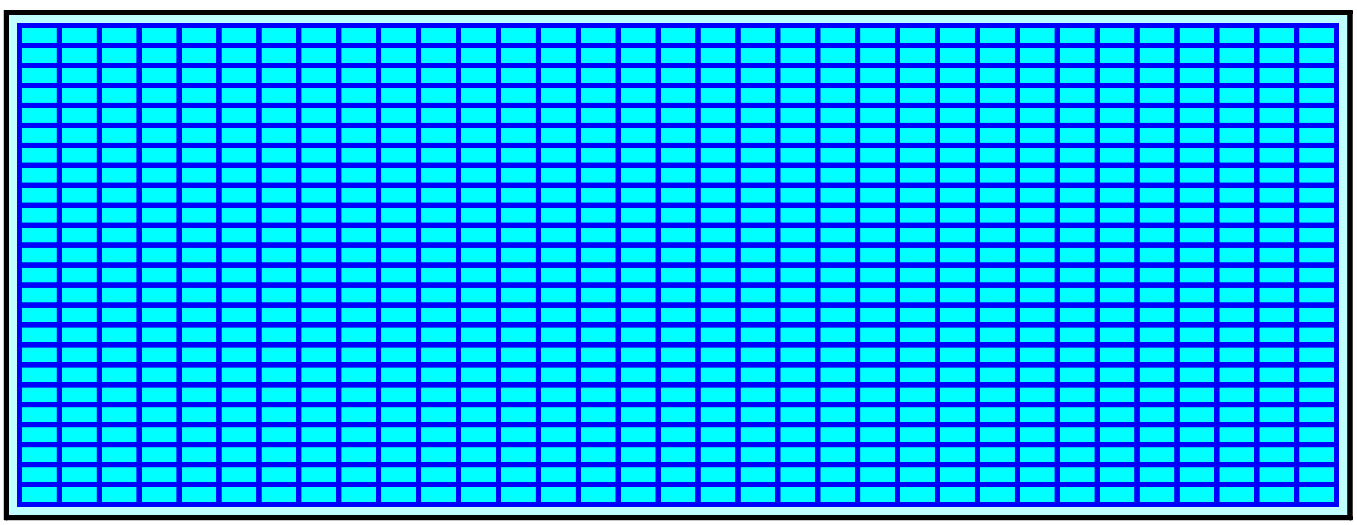
24 Chambers/Row x 1.50' Long = 36.00' Row Length +12.0" End Stone x 2 = 38.00' Base Length
33 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 101.00' Base Width
6.0" Base + 18.0" Chamber Height + 12.0" Cover = 3.00' Field Height

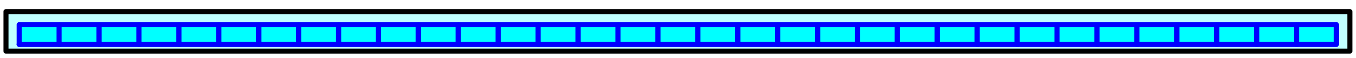
792 Chambers x 6.5 cf = 5,185.6 cf Chamber Storage
792 Chambers x 6.8 cf = 5,346.0 cf Displacement

11,514.0 cf Field - 5,346.0 cf Chambers = 6,168.0 cf Stone x 30.0% Voids = 1,850.4 cf Stone Storage

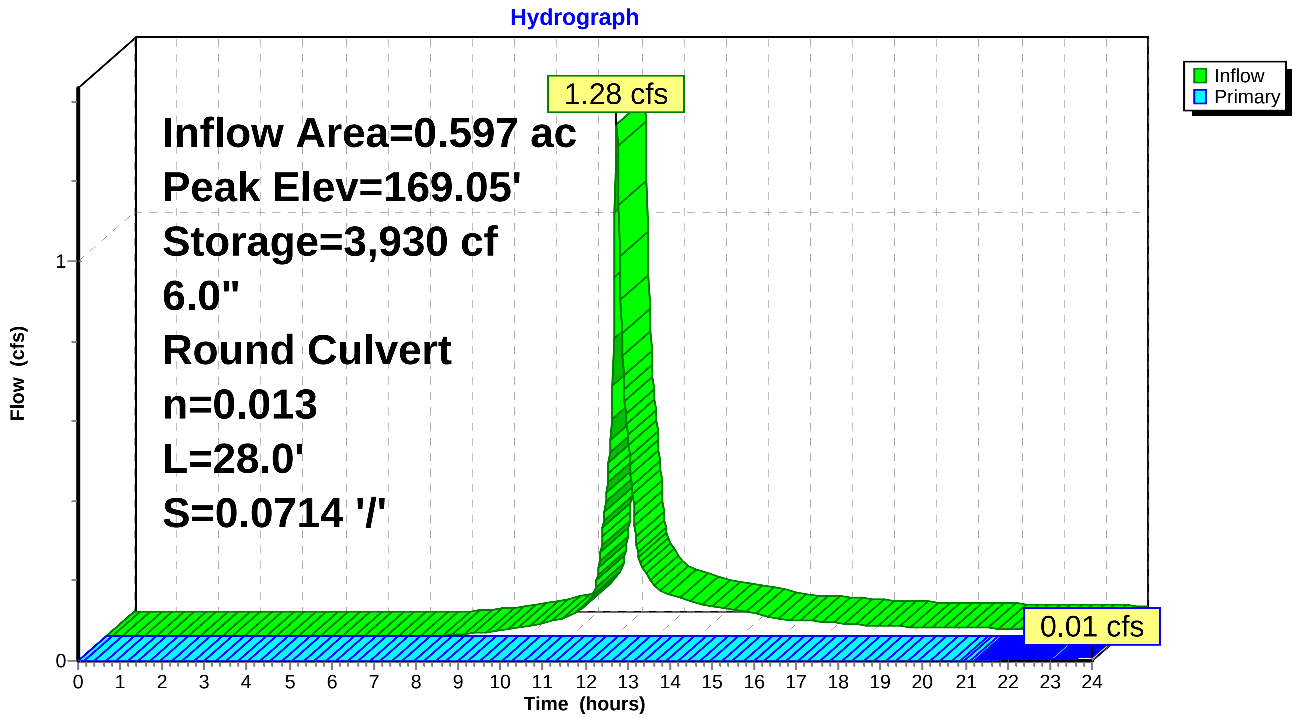
Chamber Storage + Stone Storage = 7,036.0 cf = 0.162 af
Overall Storage Efficiency = 61.1%

792 Chambers
426.4 cy Field
228.4 cy Stone





Pond P-1A: Subsurface Detention/Infiltration basin



Stage-Area-Storage for Pond P-1A: Subsurface Detention/Infiltration basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
167.60	0	168.66	2,558	169.72	6,023
167.62	23	168.68	2,628	169.74	6,046
167.64	46	168.70	2,699	169.76	6,069
167.66	69	168.72	2,770	169.78	6,092
167.68	92	168.74	2,841	169.80	6,115
167.70	115	168.76	2,912	169.82	6,138
167.72	138	168.78	2,982	169.84	6,161
167.74	161	168.80	3,053	169.86	6,184
167.76	184	168.82	3,124	169.88	6,207
167.78	207	168.84	3,195	169.90	6,230
167.80	230	168.86	3,266	169.92	6,253
167.82	253	168.88	3,336	169.94	6,276
167.84	276	168.90	3,407	169.96	6,299
167.86	299	168.92	3,478	169.98	6,322
167.88	322	168.94	3,549	170.00	6,345
167.90	345	168.96	3,619	170.02	6,368
167.92	368	168.98	3,690	170.04	6,391
167.94	391	169.00	3,761	170.06	6,414
167.96	415	169.02	3,832	170.08	6,437
167.98	438	169.04	3,903	170.10	6,460
168.00	461	169.06	3,973	170.12	6,483
168.02	484	169.08	4,044	170.14	6,506
168.04	507	169.10	4,115	170.16	6,529
168.06	530	169.12	4,186	170.18	6,552
168.08	553	169.14	4,257	170.20	6,575
168.10	576	169.16	4,327	170.22	6,598
168.12	646	169.18	4,398	170.24	6,622
168.14	717	169.20	4,469	170.26	6,645
168.16	788	169.22	4,540	170.28	6,668
168.18	859	169.24	4,610	170.30	6,691
168.20	930	169.26	4,681	170.32	6,714
168.22	1,000	169.28	4,752	170.34	6,737
168.24	1,071	169.30	4,823	170.36	6,760
168.26	1,142	169.32	4,894	170.38	6,783
168.28	1,213	169.34	4,964	170.40	6,806
168.30	1,284	169.36	5,035	170.42	6,829
168.32	1,354	169.38	5,106	170.44	6,852
168.34	1,425	169.40	5,177	170.46	6,875
168.36	1,496	169.42	5,248	170.48	6,898
168.38	1,567	169.44	5,318	170.50	6,921
168.40	1,637	169.46	5,389	170.52	6,944
168.42	1,708	169.48	5,460	170.54	6,967
168.44	1,779	169.50	5,531	170.56	6,990
168.46	1,850	169.52	5,601	170.58	7,013
168.48	1,921	169.54	5,672	170.60	**7,036**
168.50	1,991	169.56	5,743		
168.52	2,062	169.58	5,814		
168.54	2,133	169.60	5,885		
168.56	2,204	169.62	5,908		
168.58	2,275	169.64	5,931		
168.60	2,345	169.66	5,954		
168.62	2,416	169.68	5,977		
168.64	2,487	169.70	6,000		

Summary for Pond P-1C: Bioretention basin

Inflow Area = 1.707 ac, 58.27% Impervious, Inflow Depth > 1.61" for 2 YEAR event
Inflow = 3.21 cfs @ 12.09 hrs, Volume= 0.229 af
Outflow = 0.61 cfs @ 12.56 hrs, Volume= 0.157 af, Atten= 81%, Lag= 28.1 min
Primary = 0.61 cfs @ 12.56 hrs, Volume= 0.157 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 162.39' @ 12.56 hrs Surf.Area= 5,972 sf Storage= 4,664 cf

Plug-Flow detention time= 201.2 min calculated for 0.157 af (69% of inflow)
Center-of-Mass det. time= 101.8 min (934.0 - 832.2)

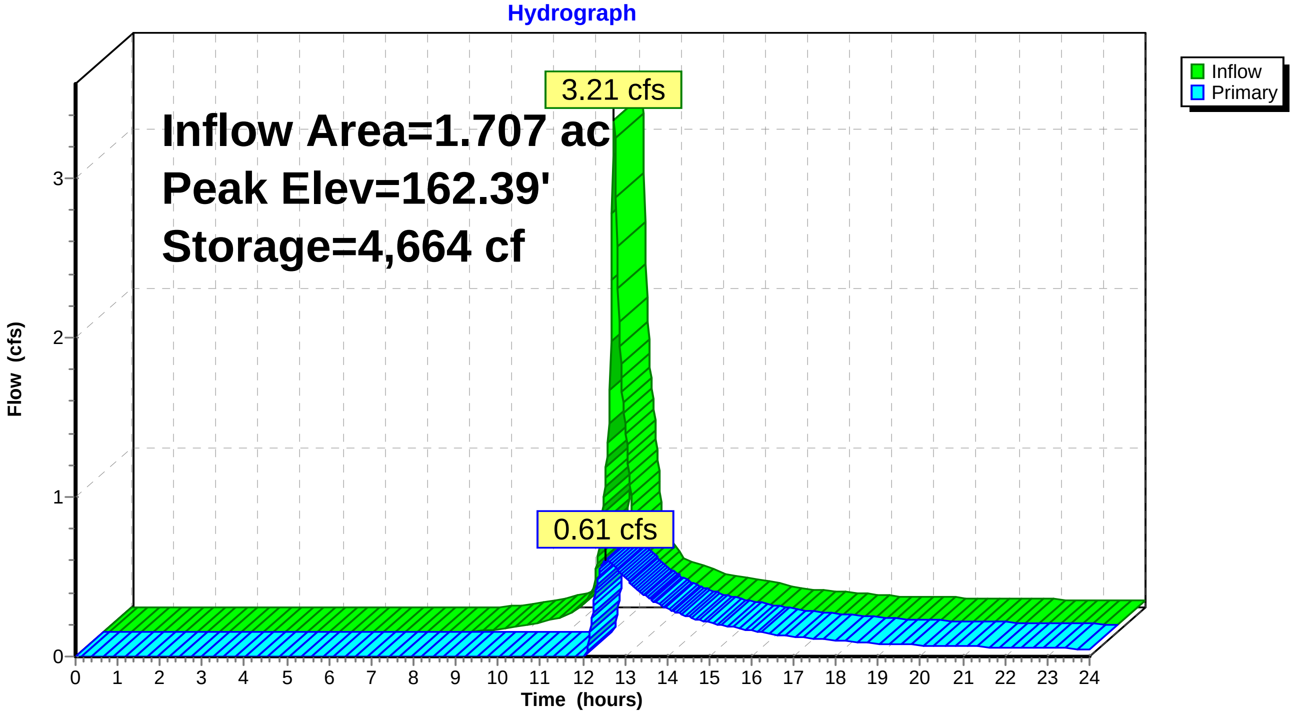
Volume	Invert	Avail.Storage	Storage Description
#1	161.50'	15,835 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.50	4,260	0	0
162.00	5,520	2,445	2,445
163.00	6,690	6,105	8,550
164.00	7,880	7,285	15,835

Device	Routing	Invert	Outlet Devices
#1	Primary	161.00'	**10.0" Round Culvert** L= 107.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.00' / 159.00' S= 0.0187 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Device 1	162.10'	**8.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	162.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.61 cfs @ 12.56 hrs HW=162.39' (Free Discharge)
└─**1=Culvert** (Passes 0.61 cfs of 2.59 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.26 cfs @ 1.82 fps)
  └─**3=Orifice/Grate** (Orifice Controls 0.34 cfs @ 2.12 fps)

Pond P-1C: Bioretention basin



Stage-Area-Storage for Pond P-1C: Bioretention basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
161.50	4,260	0
161.55	4,386	216
161.60	4,512	439
161.65	4,638	667
161.70	4,764	902
161.75	4,890	1,144
161.80	5,016	1,391
161.85	5,142	1,645
161.90	5,268	1,906
161.95	5,394	2,172
162.00	5,520	2,445
162.05	5,579	2,722
162.10	5,637	3,003
162.15	5,696	3,286
162.20	5,754	3,572
162.25	5,813	3,862
162.30	5,871	4,154
162.35	5,929	4,449
162.40	5,988	4,747
162.45	6,046	5,047
162.50	6,105	5,351
162.55	6,164	5,658
162.60	6,222	5,968
162.65	6,281	6,280
162.70	6,339	6,596
162.75	6,398	6,914
162.80	6,456	7,235
162.85	6,514	7,560
162.90	6,573	7,887
162.95	6,631	8,217
163.00	6,690	8,550
163.05	6,750	8,886
163.10	6,809	9,225
163.15	6,869	9,567
163.20	6,928	9,912
163.25	6,988	10,260
163.30	7,047	10,611
163.35	7,106	10,964
163.40	7,166	11,321
163.45	7,225	11,681
163.50	7,285	12,044
163.55	7,345	12,409
163.60	7,404	12,778
163.65	7,464	13,150
163.70	7,523	13,525
163.75	7,583	13,902
163.80	7,642	14,283
163.85	7,701	14,666
163.90	7,761	15,053
163.95	7,820	15,442
164.00	**7,880**	**15,835**

Summary for Pond P-1E: Subsurface Detention basin

Inflow Area = 0.673 ac, 64.43% Impervious, Inflow Depth > 1.76" for 2 YEAR event
Inflow = 1.39 cfs @ 12.09 hrs, Volume= 0.098 af
Outflow = 0.09 cfs @ 13.87 hrs, Volume= 0.043 af, Atten= 93%, Lag= 107.0 min
Primary = 0.09 cfs @ 13.87 hrs, Volume= 0.043 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 163.48' @ 13.87 hrs Surf.Area= 2,542 sf Storage= 2,670 cf

Plug-Flow detention time= 299.8 min calculated for 0.043 af (43% of inflow)
Center-of-Mass det. time= 180.2 min (1,005.6 - 825.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	162.00'	1,265 cf	**62.00'W x 41.00'L x 3.50'H Field A** 8,897 cf Overall - 4,680 cf Embedded = 4,217 cf x 30.0% Voids
#2A	162.50'	4,540 cf	**StormTank 24W** x 520 Inside #1 Inside= 36.0"W x 24.0"H => 5.82 sf x 1.50'L = 8.7 cf Outside= 36.0"W x 24.0"H => 6.00 sf x 1.50'L = 9.0 cf
		5,805 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	163.30'	**6.0" Round Culvert** L= 93.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 163.30' / 159.10' S= 0.0452 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.09 cfs @ 13.87 hrs HW=163.48' (Free Discharge)
↑**1=Culvert** (Inlet Controls 0.09 cfs @ 1.45 fps)

Pond P-1E: Subsurface Detention basin - Chamber Wizard Field A

Chamber Model = StormTank 24W
Inside= 36.0"W x 24.0"H => 5.82 sf x 1.50'L = 8.7 cf
Outside= 36.0"W x 24.0"H => 6.00 sf x 1.50'L = 9.0 cf

36.0" Wide = 36.0" C-C Row Spacing

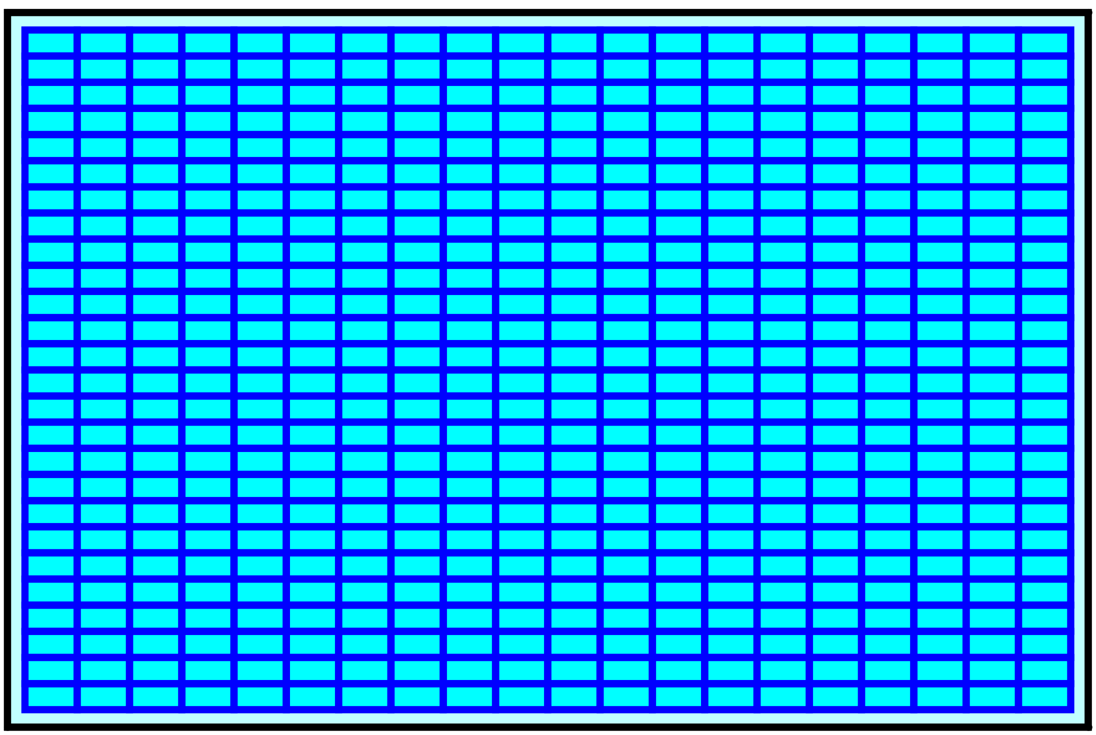
26 Chambers/Row x 1.50' Long = 39.00' Row Length +12.0" End Stone x 2 = 41.00' Base Length
20 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 62.00' Base Width
6.0" Base + 24.0" Chamber Height + 12.0" Cover = 3.50' Field Height

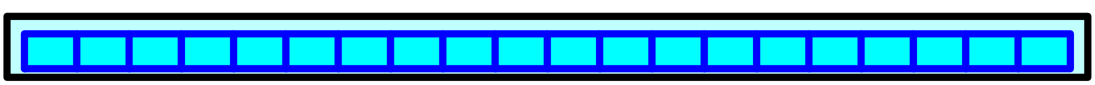
520 Chambers x 8.7 cf = 4,539.6 cf Chamber Storage
520 Chambers x 9.0 cf = 4,680.0 cf Displacement

8,897.0 cf Field - 4,680.0 cf Chambers = 4,217.0 cf Stone x 30.0% Voids = 1,265.1 cf Stone Storage

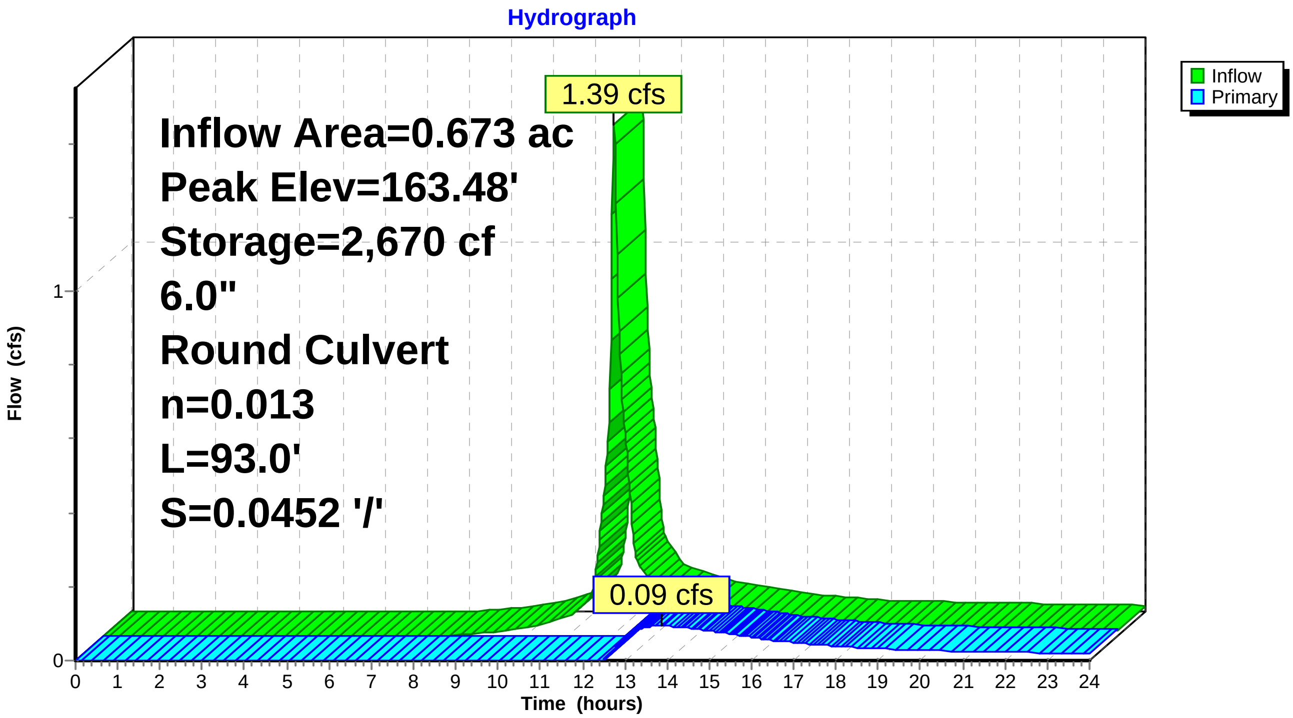
Chamber Storage + Stone Storage = 5,804.7 cf = 0.133 af
Overall Storage Efficiency = 65.2%

520 Chambers
329.5 cy Field
156.2 cy Stone





Pond P-1E: Subsurface Detention basin



Stage-Area-Storage for Pond P-1E: Subsurface Detention basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
162.00	0	164.65	5,156
162.05	38	164.70	5,195
162.10	76	164.75	5,233
162.15	114	164.80	5,271
162.20	153	164.85	5,309
162.25	191	164.90	5,347
162.30	229	164.95	5,385
162.35	267	165.00	5,423
162.40	305	165.05	5,462
162.45	343	165.10	5,500
162.50	381	165.15	5,538
162.55	498	165.20	5,576
162.60	614	165.25	5,614
162.65	731	165.30	5,652
162.70	847	165.35	5,690
162.75	964	165.40	5,728
162.80	1,080	165.45	5,767
162.85	1,197	165.50	**5,805**
162.90	1,313		
162.95	1,430		
163.00	1,547		
163.05	1,663		
163.10	1,780		
163.15	1,896		
163.20	2,013		
163.25	2,129		
163.30	2,246		
163.35	2,362		
163.40	2,479		
163.45	2,595		
163.50	2,712		
163.55	2,828		
163.60	2,945		
163.65	3,061		
163.70	3,178		
163.75	3,294		
163.80	3,411		
163.85	3,527		
163.90	3,644		
163.95	3,760		
164.00	3,877		
164.05	3,993		
164.10	4,110		
164.15	4,226		
164.20	4,343		
164.25	4,460		
164.30	4,576		
164.35	4,693		
164.40	4,809		
164.45	4,926		
164.50	5,042		
164.55	5,080		
164.60	5,118		

Summary for Pond P-1F: Subsurface Detention/Infiltration basin

Inflow Area = 0.460 ac, 69.87% Impervious, Inflow Depth > 1.91" for 2 YEAR event
Inflow = 1.03 cfs @ 12.09 hrs, Volume= 0.073 af
Outflow = 0.25 cfs @ 12.49 hrs, Volume= 0.045 af, Atten= 75%, Lag= 24.0 min
Primary = 0.25 cfs @ 12.49 hrs, Volume= 0.045 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 159.49' @ 12.49 hrs Surf.Area= 1,504 sf Storage= 1,565 cf

Plug-Flow detention time= 206.1 min calculated for 0.045 af (61% of inflow)
Center-of-Mass det. time= 100.9 min (919.1 - 818.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	158.00'	746 cf	**47.00'W x 32.00'L x 3.00'H Field A** 4,512 cf Overall - 2,025 cf Embedded = 2,487 cf x 30.0% Voids
#2A	158.50'	1,964 cf	**StormTank 18W** x 300 Inside #1 Inside= 36.0"W x 18.0"H => 4.37 sf x 1.50'L = 6.5 cf Outside= 36.0"W x 18.0"H => 4.50 sf x 1.50'L = 6.8 cf
		2,710 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	159.20'	**8.0" Round Culvert** L= 2.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.20' / 159.10' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.25 cfs @ 12.49 hrs HW=159.49' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.25 cfs @ 2.58 fps)

Pond P-1F: Subsurface Detention/Infiltration basin - Chamber Wizard Field A

Chamber Model = StormTank 18W
Inside= 36.0"W x 18.0"H => 4.37 sf x 1.50'L = 6.5 cf
Outside= 36.0"W x 18.0"H => 4.50 sf x 1.50'L = 6.8 cf

36.0" Wide = 36.0" C-C Row Spacing

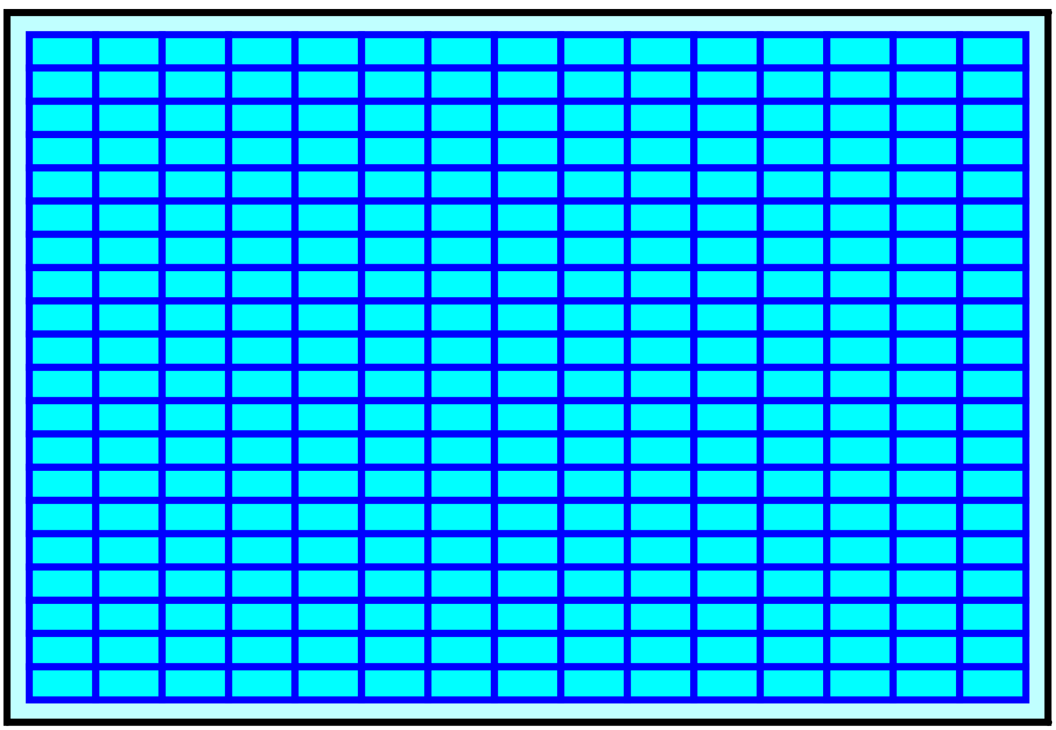
20 Chambers/Row x 1.50' Long = 30.00' Row Length +12.0" End Stone x 2 = 32.00' Base Length
15 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 47.00' Base Width
6.0" Base + 18.0" Chamber Height + 12.0" Cover = 3.00' Field Height

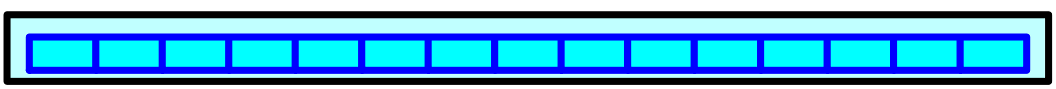
300 Chambers x 6.5 cf = 1,964.3 cf Chamber Storage
300 Chambers x 6.8 cf = 2,025.0 cf Displacement

4,512.0 cf Field - 2,025.0 cf Chambers = 2,487.0 cf Stone x 30.0% Voids = 746.1 cf Stone Storage

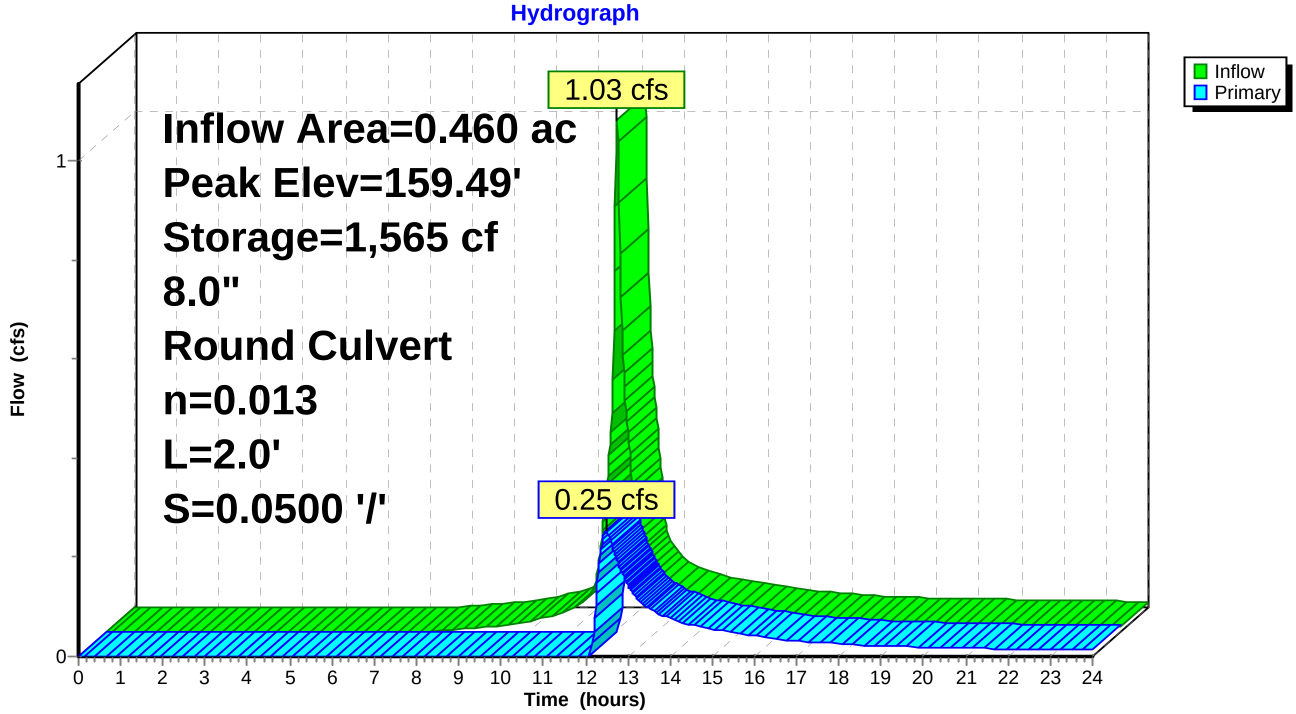
Chamber Storage + Stone Storage = 2,710.4 cf = 0.062 af
Overall Storage Efficiency = 60.1%

300 Chambers
167.1 cy Field
92.1 cy Stone





Pond P-1F: Subsurface Detention/Infiltration basin



Stage-Area-Storage for Pond P-1F: Subsurface Detention/Infiltration basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
158.00	0	159.06	985	160.12	2,313
158.02	9	159.08	1,012	160.14	2,322
158.04	18	159.10	1,039	160.16	2,331
158.06	27	159.12	1,066	160.18	2,340
158.08	36	159.14	1,093	160.20	2,349
158.10	45	159.16	1,120	160.22	2,358
158.12	54	159.18	1,147	160.24	2,367
158.14	63	159.20	1,175	160.26	2,376
158.16	72	159.22	1,202	160.28	2,385
158.18	81	159.24	1,229	160.30	2,395
158.20	90	159.26	1,256	160.32	2,404
158.22	99	159.28	1,283	160.34	2,413
158.24	108	159.30	1,310	160.36	2,422
158.26	117	159.32	1,337	160.38	2,431
158.28	126	159.34	1,364	160.40	2,440
158.30	135	159.36	1,392	160.42	2,449
158.32	144	159.38	1,419	160.44	2,458
158.34	153	159.40	1,446	160.46	2,467
158.36	162	159.42	1,473	160.48	2,476
158.38	171	159.44	1,500	160.50	2,485
158.40	180	159.46	1,527	160.52	2,494
158.42	190	159.48	1,554	160.54	2,503
158.44	199	159.50	1,581	160.56	2,512
158.46	208	159.52	1,608	160.58	2,521
158.48	217	159.54	1,636	160.60	2,530
158.50	226	159.56	1,663	160.62	2,539
158.52	253	159.58	1,690	160.64	2,548
158.54	280	159.60	1,717	160.66	2,557
158.56	307	159.62	1,744	160.68	2,566
158.58	334	159.64	1,771	160.70	2,575
158.60	361	159.66	1,798	160.72	2,584
158.62	388	159.68	1,825	160.74	2,593
158.64	415	159.70	1,852	160.76	2,602
158.66	443	159.72	1,880	160.78	2,611
158.68	470	159.74	1,907	160.80	2,620
158.70	497	159.76	1,934	160.82	2,629
158.72	524	159.78	1,961	160.84	2,638
158.74	551	159.80	1,988	160.86	2,647
158.76	578	159.82	2,015	160.88	2,656
158.78	605	159.84	2,042	160.90	2,665
158.80	632	159.86	2,069	160.92	2,674
158.82	659	159.88	2,096	160.94	2,683
158.84	687	159.90	2,124	160.96	2,692
158.86	714	159.92	2,151	160.98	2,701
158.88	741	159.94	2,178	161.00	**2,710**
158.90	768	159.96	2,205		
158.92	795	159.98	2,232		
158.94	822	160.00	2,259		
158.96	849	160.02	2,268		
158.98	876	160.04	2,277		
159.00	903	160.06	2,286		
159.02	931	160.08	2,295		
159.04	958	160.10	2,304		

Summary for Pond P-4B: Subsurface Detention basin

Inflow Area = 1.123 ac, 75.71% Impervious, Inflow Depth > 2.08" for 2 YEAR event
Inflow = 2.72 cfs @ 12.09 hrs, Volume= 0.195 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 190.93' @ 24.00 hrs Surf.Area= 5,704 sf Storage= 8,479 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1A	189.00'	2,749 cf	**92.00'W x 62.00'L x 3.50'H Field A** 19,964 cf Overall - 10,800 cf Embedded = 9,164 cf x 30.0% Voids
#2A	189.50'	10,476 cf	**StormTank 24W** x 1200 Inside #1 Inside= 36.0"W x 24.0"H => 5.82 sf x 1.50'L = 8.7 cf Outside= 36.0"W x 24.0"H => 6.00 sf x 1.50'L = 9.0 cf
		13,225 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	191.00'	**6.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 191.00' / 190.90' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=189.00' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)

Pond P-4B: Subsurface Detention basin - Chamber Wizard Field A

Chamber Model = StormTank 24W
Inside= 36.0"W x 24.0"H => 5.82 sf x 1.50'L = 8.7 cf
Outside= 36.0"W x 24.0"H => 6.00 sf x 1.50'L = 9.0 cf

36.0" Wide = 36.0" C-C Row Spacing

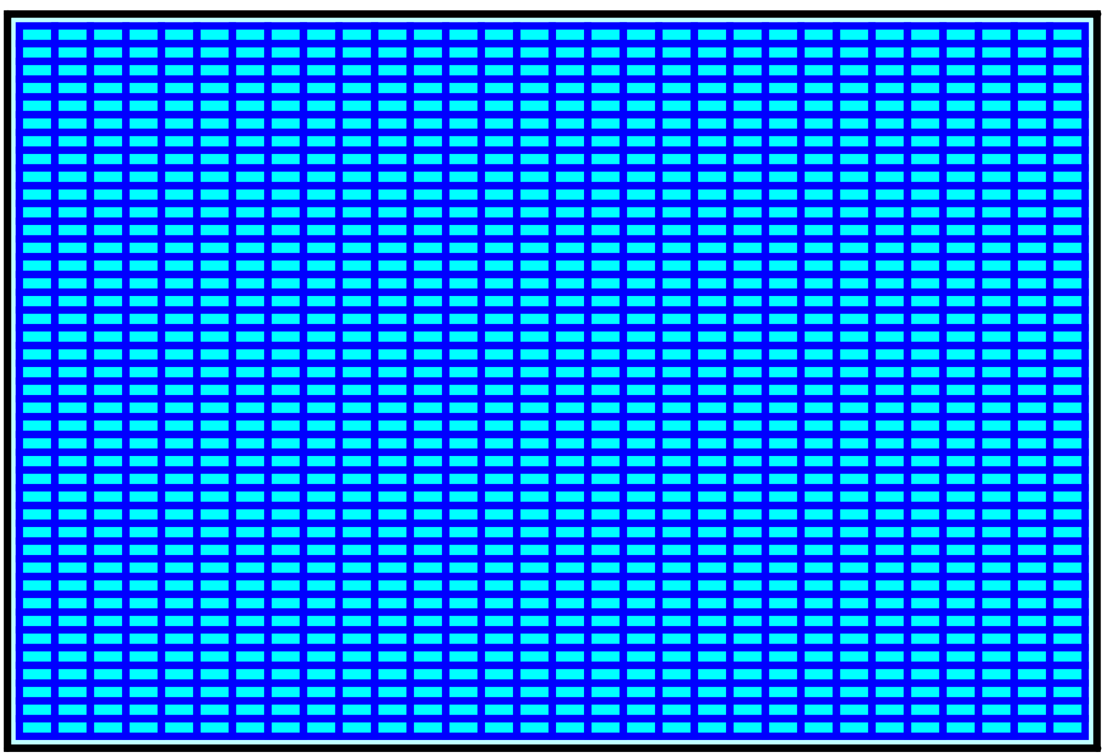
40 Chambers/Row x 1.50' Long = 60.00' Row Length +12.0" End Stone x 2 = 62.00' Base Length
30 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 92.00' Base Width
6.0" Base + 24.0" Chamber Height + 12.0" Cover = 3.50' Field Height

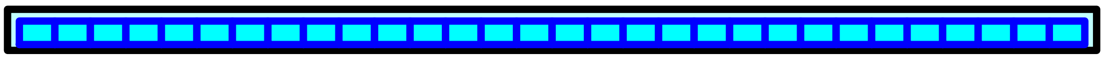
1,200 Chambers x 8.7 cf = 10,476.0 cf Chamber Storage
1,200 Chambers x 9.0 cf = 10,800.0 cf Displacement

19,964.0 cf Field - 10,800.0 cf Chambers = 9,164.0 cf Stone x 30.0% Voids = 2,749.2 cf Stone Storage

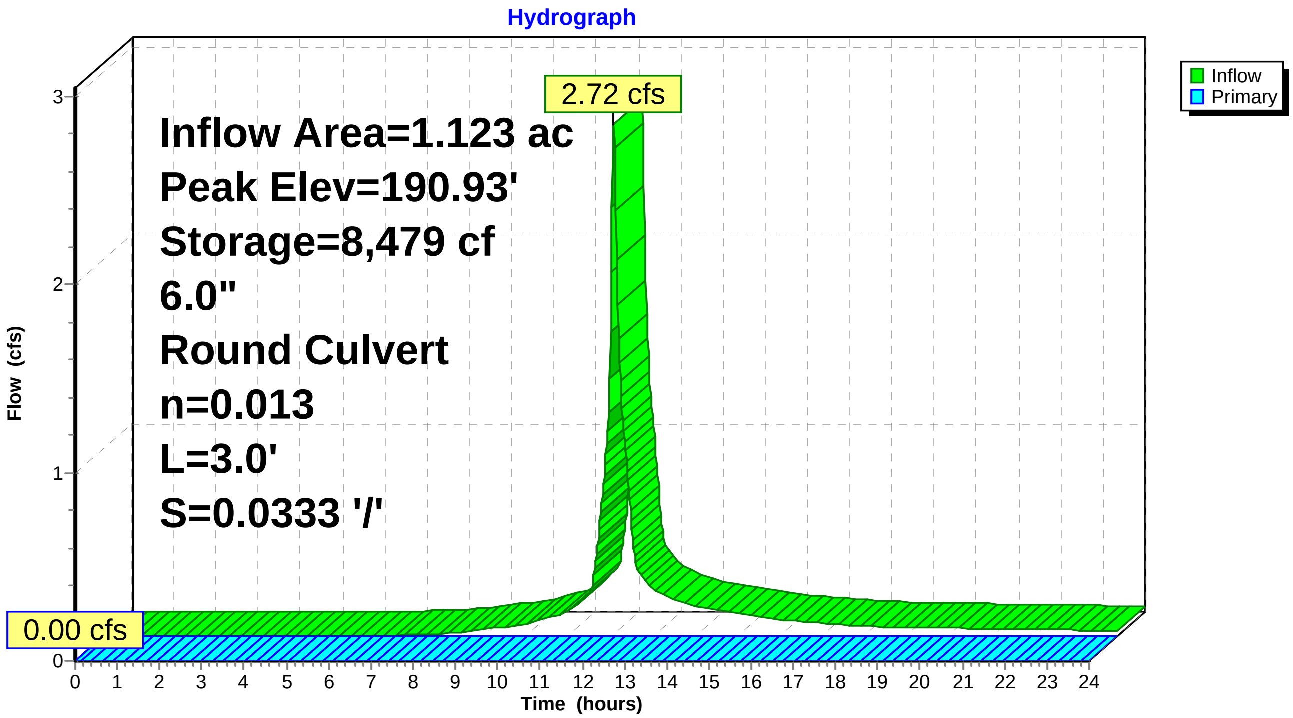
Chamber Storage + Stone Storage = 13,225.2 cf = 0.304 af
Overall Storage Efficiency = 66.2%

1,200 Chambers
739.4 cy Field
339.4 cy Stone





Pond P-4B: Subsurface Detention basin



Stage-Area-Storage for Pond P-4B: Subsurface Detention basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
189.00	0	191.65	11,771
189.05	86	191.70	11,856
189.10	171	191.75	11,942
189.15	257	191.80	12,027
189.20	342	191.85	12,113
189.25	428	191.90	12,198
189.30	513	191.95	12,284
189.35	599	192.00	12,370
189.40	684	192.05	12,455
189.45	770	192.10	12,541
189.50	856	192.15	12,626
189.55	1,122	192.20	12,712
189.60	1,389	192.25	12,797
189.65	1,655	192.30	12,883
189.70	1,921	192.35	12,969
189.75	2,188	192.40	13,054
189.80	2,454	192.45	13,140
189.85	2,721	192.50	**13,225**
189.90	2,987		
189.95	3,254		
190.00	3,520		
190.05	3,787		
190.10	4,053		
190.15	4,320		
190.20	4,586		
190.25	4,853		
190.30	5,119		
190.35	5,385		
190.40	5,652		
190.45	5,918		
190.50	6,185		
190.55	6,451		
190.60	6,718		
190.65	6,984		
190.70	7,251		
190.75	7,517		
190.80	7,784		
190.85	8,050		
190.90	8,316		
190.95	8,583		
191.00	8,849		
191.05	9,116		
191.10	9,382		
191.15	9,649		
191.20	9,915		
191.25	10,182		
191.30	10,448		
191.35	10,715		
191.40	10,981		
191.45	11,248		
191.50	11,514		
191.55	11,600		
191.60	11,685		

Summary for Pond P-4C: Subsurface Detention/Infiltration basin

Inflow Area = 3.805 ac, 60.65% Impervious, Inflow Depth > 0.78" for 2 YEAR event
Inflow = 3.40 cfs @ 12.09 hrs, Volume= 0.247 af
Outflow = 0.30 cfs @ 13.41 hrs, Volume= 0.140 af, Atten= 91%, Lag= 78.9 min
Primary = 0.30 cfs @ 13.41 hrs, Volume= 0.140 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 154.86' @ 13.41 hrs Surf.Area= 5,950 sf Storage= 5,654 cf

Plug-Flow detention time= 263.1 min calculated for 0.140 af (57% of inflow)
Center-of-Mass det. time= 142.5 min (989.8 - 847.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	153.50'	3,002 cf	**140.00'W x 42.50'L x 4.50'H Field A**
			26,775 cf Overall - 16,767 cf Embedded = 10,008 cf x 30.0% Voids
#2A	154.00'	16,264 cf	**StormTank 36W** x 1242 Inside #1
			Inside= 36.0"W x 36.0"H => 8.73 sf x 1.50'L = 13.1 cf
			Outside= 36.0"W x 36.0"H => 9.00 sf x 1.50'L = 13.5 cf
		19,266 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	154.55'	**8.0" Round Culvert**
			L= 10.0' RCP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 154.55' / 154.30' S= 0.0250 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.30 cfs @ 13.41 hrs HW=154.86' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.30 cfs @ 1.90 fps)

Pond P-4C: Subsurface Detention/Infiltration basin - Chamber Wizard Field A

Chamber Model = StormTank 36W
Inside= 36.0"W x 36.0"H => 8.73 sf x 1.50'L = 13.1 cf
Outside= 36.0"W x 36.0"H => 9.00 sf x 1.50'L = 13.5 cf

36.0" Wide = 36.0" C-C Row Spacing

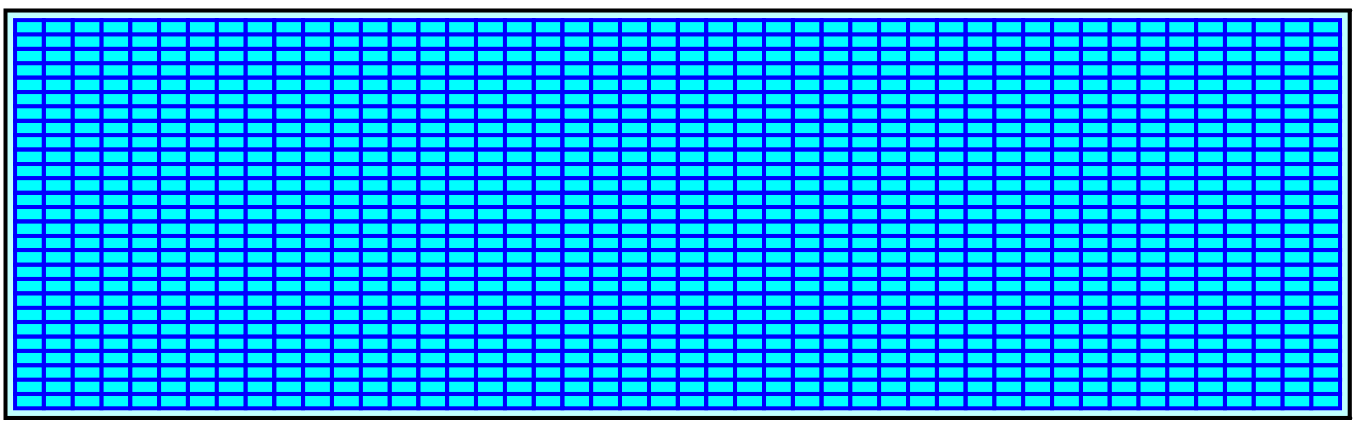
27 Chambers/Row x 1.50' Long = 40.50' Row Length +12.0" End Stone x 2 = 42.50' Base Length
46 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 140.00' Base Width
6.0" Base + 36.0" Chamber Height + 12.0" Cover = 4.50' Field Height

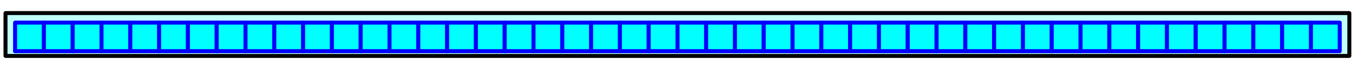
1,242 Chambers x 13.1 cf = 16,264.0 cf Chamber Storage
1,242 Chambers x 13.5 cf = 16,767.0 cf Displacement

26,775.0 cf Field - 16,767.0 cf Chambers = 10,008.0 cf Stone x 30.0% Voids = 3,002.4 cf Stone Storage

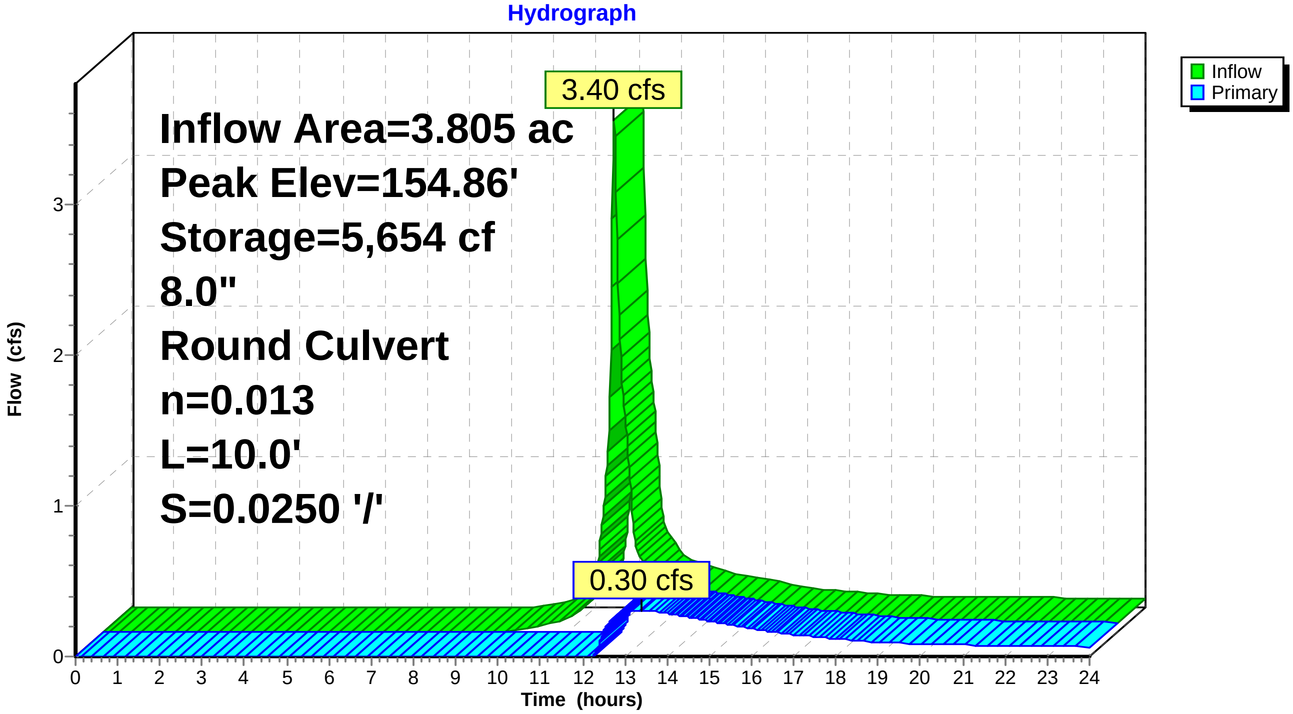
Chamber Storage + Stone Storage = 19,266.4 cf = 0.442 af
Overall Storage Efficiency = 72.0%

1,242 Chambers
991.7 cy Field
370.7 cy Stone





Pond P-4C: Subsurface Detention/Infiltration basin



Stage-Area-Storage for Pond P-4C: Subsurface Detention/Infiltration basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
153.50	0	156.15	12,781
153.55	89	156.20	13,058
153.60	178	156.25	13,334
153.65	268	156.30	13,611
153.70	357	156.35	13,887
153.75	446	156.40	14,164
153.80	536	156.45	14,440
153.85	625	156.50	14,717
153.90	714	156.55	14,993
153.95	803	156.60	15,270
154.00	893	156.65	15,546
154.05	1,169	156.70	15,823
154.10	1,445	156.75	16,099
154.15	1,722	156.80	16,375
154.20	1,998	156.85	16,652
154.25	2,275	156.90	16,928
154.30	2,551	156.95	17,205
154.35	2,828	157.00	17,481
154.40	3,104	157.05	17,571
154.45	3,381	157.10	17,660
154.50	3,657	157.15	17,749
154.55	3,934	157.20	17,838
154.60	4,210	157.25	17,928
154.65	4,487	157.30	18,017
154.70	4,763	157.35	18,106
154.75	5,040	157.40	18,195
154.80	5,316	157.45	18,285
154.85	5,593	157.50	18,374
154.90	5,869	157.55	18,463
154.95	6,146	157.60	18,552
155.00	6,422	157.65	18,642
155.05	6,699	157.70	18,731
155.10	6,975	157.75	18,820
155.15	7,252	157.80	18,909
155.20	7,528	157.85	18,999
155.25	7,805	157.90	19,088
155.30	8,081	157.95	19,177
155.35	8,358	158.00	**19,266**
155.40	8,634		
155.45	8,910		
155.50	9,187		
155.55	9,463		
155.60	9,740		
155.65	10,016		
155.70	10,293		
155.75	10,569		
155.80	10,846		
155.85	11,122		
155.90	11,399		
155.95	11,675		
156.00	11,952		
156.05	12,228		
156.10	12,505		

Summary for Pond P-4D: porous asphalt pavement

Inflow Area = 0.588 ac, 63.76% Impervious, Inflow Depth > 1.76" for 2 YEAR event
Inflow = 1.21 cfs @ 12.09 hrs, Volume= 0.086 af
Outflow = 0.01 cfs @ 24.00 hrs, Volume= 0.003 af, Atten= 99%, Lag= 714.7 min
Primary = 0.01 cfs @ 24.00 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 177.33' @ 24.00 hrs Surf.Area= 13,035 sf Storage= 3,632 cf

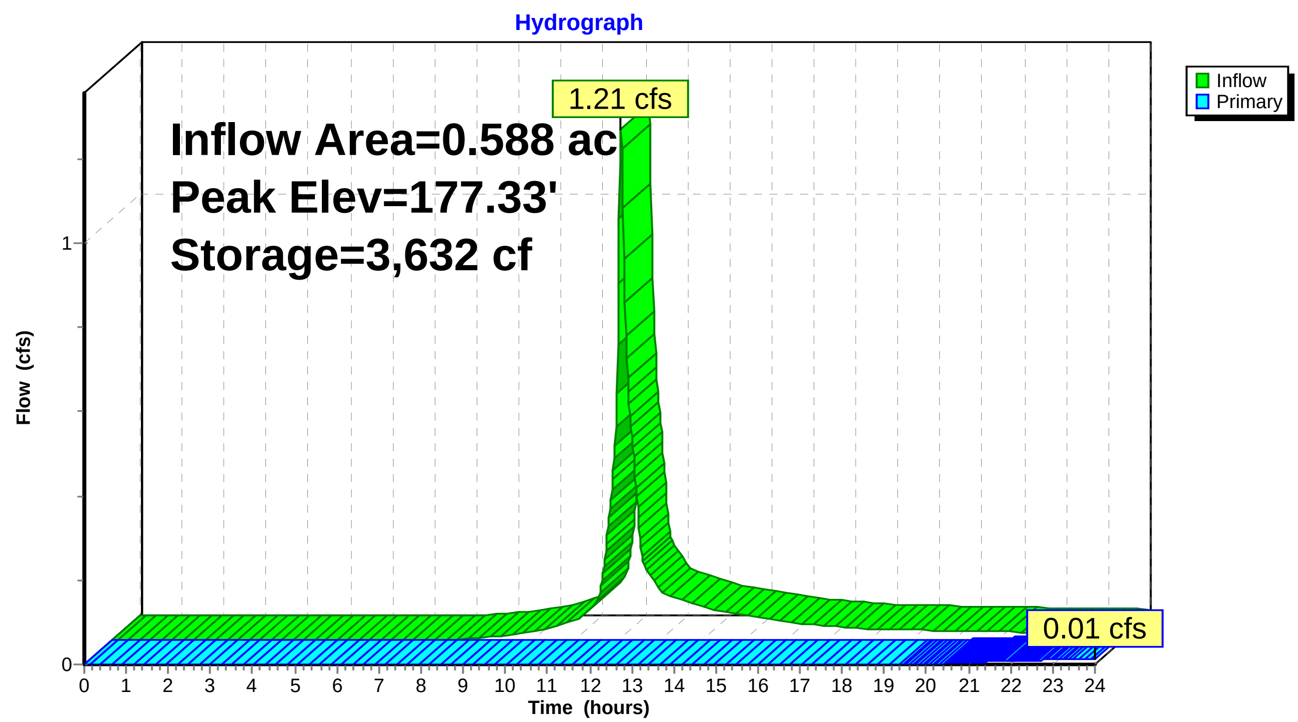
Plug-Flow detention time= 760.5 min calculated for 0.003 af (3% of inflow)
Center-of-Mass det. time= 524.4 min (1,349.8 - 825.4)

Volume	Invert	Avail.Storage	Storage Description
#1	176.40'	7,821 cf	**55.00'W x 237.00'L x 2.00'H Prismatoid** 26,070 cf Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	176.10'	**8.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 176.10' / 175.90' S= 0.0133 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	177.28'	**4.0" Vert. Orifice/Grate X 2.00** C= 0.600

Primary OutFlow Max=0.01 cfs @ 24.00 hrs HW=177.33' (Free Discharge)
1=Culvert (Passes 0.01 cfs of 1.59 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.01 cfs @ 0.75 fps)

Pond P-4D: porous asphalt pavement



Stage-Area-Storage for Pond P-4D: porous asphalt pavement

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
176.40	0	177.46	4,145
176.42	78	177.48	4,223
176.44	156	177.50	4,302
176.46	235	177.52	4,380
176.48	313	177.54	4,458
176.50	391	177.56	4,536
176.52	469	177.58	4,614
176.54	547	177.60	4,693
176.56	626	177.62	4,771
176.58	704	177.64	4,849
176.60	782	177.66	4,927
176.62	860	177.68	5,005
176.64	939	177.70	5,084
176.66	1,017	177.72	5,162
176.68	1,095	177.74	5,240
176.70	1,173	177.76	5,318
176.72	1,251	177.78	5,396
176.74	1,330	177.80	5,475
176.76	1,408	177.82	5,553
176.78	1,486	177.84	5,631
176.80	1,564	177.86	5,709
176.82	1,642	177.88	5,788
176.84	1,721	177.90	5,866
176.86	1,799	177.92	5,944
176.88	1,877	177.94	6,022
176.90	1,955	177.96	6,100
176.92	2,033	177.98	6,179
176.94	2,112	178.00	6,257
176.96	2,190	178.02	6,335
176.98	2,268	178.04	6,413
177.00	2,346	178.06	6,491
177.02	2,425	178.08	6,570
177.04	2,503	178.10	6,648
177.06	2,581	178.12	6,726
177.08	2,659	178.14	6,804
177.10	2,737	178.16	6,882
177.12	2,816	178.18	6,961
177.14	2,894	178.20	7,039
177.16	2,972	178.22	7,117
177.18	3,050	178.24	7,195
177.20	3,128	178.26	7,274
177.22	3,207	178.28	7,352
177.24	3,285	178.30	7,430
177.26	3,363	178.32	7,508
177.28	3,441	178.34	7,586
177.30	3,519	178.36	7,665
177.32	3,598	178.38	7,743
177.34	3,676	178.40	**7,821**
177.36	3,754		
177.38	3,832		
177.40	3,911		
177.42	3,989		
177.44	4,067		

Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1A: Runoff Area=25,996 sf 68.50% Impervious Runoff Depth>3.09"
Tc=6.0 min CN=86 Runoff=2.14 cfs 0.154 af

Subcatchment PR-1B: Runoff Area=49,468 sf 24.29% Impervious Runoff Depth>1.74"
Tc=6.0 min CN=70 Runoff=2.26 cfs 0.165 af

Subcatchment PR-1C: Runoff Area=74,374 sf 58.27% Impervious Runoff Depth>2.81"
Tc=6.0 min CN=83 Runoff=5.61 cfs 0.400 af

Subcatchment PR-1D: Runoff Area=54,933 sf 10.14% Impervious Runoff Depth>1.39"
Tc=6.0 min CN=65 Runoff=1.92 cfs 0.146 af

Subcatchment PR-1E: Runoff Area=29,315 sf 64.43% Impervious Runoff Depth>3.00"
Tc=6.0 min CN=85 Runoff=2.35 cfs 0.168 af

Subcatchment PR-1F: Runoff Area=20,052 sf 69.87% Impervious Runoff Depth>3.19"
Tc=6.0 min CN=87 Runoff=1.70 cfs 0.122 af

Subcatchment PR-1G: Runoff Area=6,425 sf 5.93% Impervious Runoff Depth>1.26"
Tc=6.0 min CN=63 Runoff=0.20 cfs 0.015 af

Subcatchment PR-3A: Runoff Area=12,308 sf 2.81% Impervious Runoff Depth>1.20"
Tc=6.0 min CN=62 Runoff=0.36 cfs 0.028 af

Subcatchment PR-3B: Runoff Area=22,498 sf 49.72% Impervious Runoff Depth>2.46"
Tc=6.0 min CN=79 Runoff=1.49 cfs 0.106 af

Subcatchment PR-3C: Runoff Area=23,850 sf 0.00% Impervious Runoff Depth>1.01"
Tc=6.0 min CN=59 Runoff=0.55 cfs 0.046 af

Subcatchment PR-4A: Runoff Area=24,808 sf 59.14% Impervious Runoff Depth>2.72"
Tc=6.0 min CN=82 Runoff=1.81 cfs 0.129 af

Subcatchment PR-4B: Runoff Area=48,935 sf 75.71% Impervious Runoff Depth>3.39"
Tc=6.0 min CN=89 Runoff=4.35 cfs 0.317 af

Subcatchment PR-4C: Runoff Area=91,234 sf 51.71% Impervious Runoff Depth>2.54"
Tc=6.0 min CN=80 Runoff=6.25 cfs 0.444 af

Subcatchment PR-4D: Runoff Area=25,594 sf 63.76% Impervious Runoff Depth>3.00"
Tc=6.0 min CN=85 Runoff=2.05 cfs 0.147 af

Subcatchment PR-4E: Runoff Area=45,196 sf 23.63% Impervious Runoff Depth>1.74"
Tc=6.0 min CN=70 Runoff=2.06 cfs 0.151 af

Subcatchment PR-4F: Runoff Area=32,347 sf 34.79% Impervious Runoff Depth>2.05"
Tc=6.0 min CN=74 Runoff=1.76 cfs 0.127 af

Reach DP-1: Wetlands-North Inflow=6.18 cfs 0.916 af
Outflow=6.18 cfs 0.916 af

Reach DP-1A: Inflow=2.26 cfs 0.225 af
Outflow=2.26 cfs 0.225 af

Reach DP-1B: Inflow=3.03 cfs 0.471 af
Outflow=3.03 cfs 0.471 af

Reach DP-1C: Inflow=1.43 cfs 0.220 af
Outflow=1.43 cfs 0.220 af

Reach DP-3: Drain System in Russett Rd. Inflow=2.38 cfs 0.180 af
Outflow=2.38 cfs 0.180 af

Reach DP-3A: Inflow=0.36 cfs 0.028 af
Outflow=0.36 cfs 0.028 af

Reach DP-3B: Inflow=1.49 cfs 0.106 af
Outflow=1.49 cfs 0.106 af

Reach DP-3D: Inflow=0.55 cfs 0.046 af
Outflow=0.55 cfs 0.046 af

Reach DP-4: VFW Parkway Inflow=5.99 cfs 0.890 af
Outflow=5.99 cfs 0.890 af

Reach DP-4A: Inflow=1.81 cfs 0.129 af
Outflow=1.81 cfs 0.129 af

Reach DP-4B: Inflow=2.49 cfs 0.634 af
Outflow=2.49 cfs 0.634 af

Reach DP-4C: Inflow=1.76 cfs 0.127 af
Outflow=1.76 cfs 0.127 af

Pond P-1A: Subsurface Detention/Infiltration Peak Elev=169.21' Storage=4,502 cf Inflow=2.14 cfs 0.154 af
6.0" Round Culvert n=0.013 L=28.0' S=0.0714 '/' Outflow=0.12 cfs 0.060 af

Pond P-1C: Bioretention basin Peak Elev=162.80' Storage=7,229 cf Inflow=5.61 cfs 0.400 af
Outflow=1.72 cfs 0.325 af

Pond P-1E: Subsurface Detention basin Peak Elev=163.88' Storage=3,594 cf Inflow=2.35 cfs 0.168 af
6.0" Round Culvert n=0.013 L=93.0' S=0.0452 '/' Outflow=0.54 cfs 0.111 af

Pond P-1F: Subsurface Detention/Infiltration Peak Elev=159.84' Storage=2,044 cf Inflow=1.70 cfs 0.122 af
8.0" Round Culvert n=0.013 L=2.0' S=0.0500 '/' Outflow=0.88 cfs 0.093 af

Pond P-4B: Subsurface Detention basin Peak Elev=191.27' Storage=10,266 cf Inflow=4.35 cfs 0.317 af
6.0" Round Culvert n=0.013 L=3.0' S=0.0333 '/' Outflow=0.18 cfs 0.097 af

Pond P-4C: Subsurface Detention/Infiltration Peak Elev=155.45' Storage=8,889 cf Inflow=6.25 cfs 0.603 af
8.0" Round Culvert n=0.013 L=10.0' S=0.0250 '/' Outflow=1.26 cfs 0.484 af

Pond P-4D: porous asphalt pavement Peak Elev=177.46' Storage=4,127 cf Inflow=2.05 cfs 0.147 af
Outflow=0.13 cfs 0.061 af

Total Runoff Area = 13.483 ac Runoff Volume = 2.665 af Average Runoff Depth = 2.37"
55.61% Pervious = 7.499 ac 44.39% Impervious = 5.985 ac

Summary for Subcatchment PR-1A:

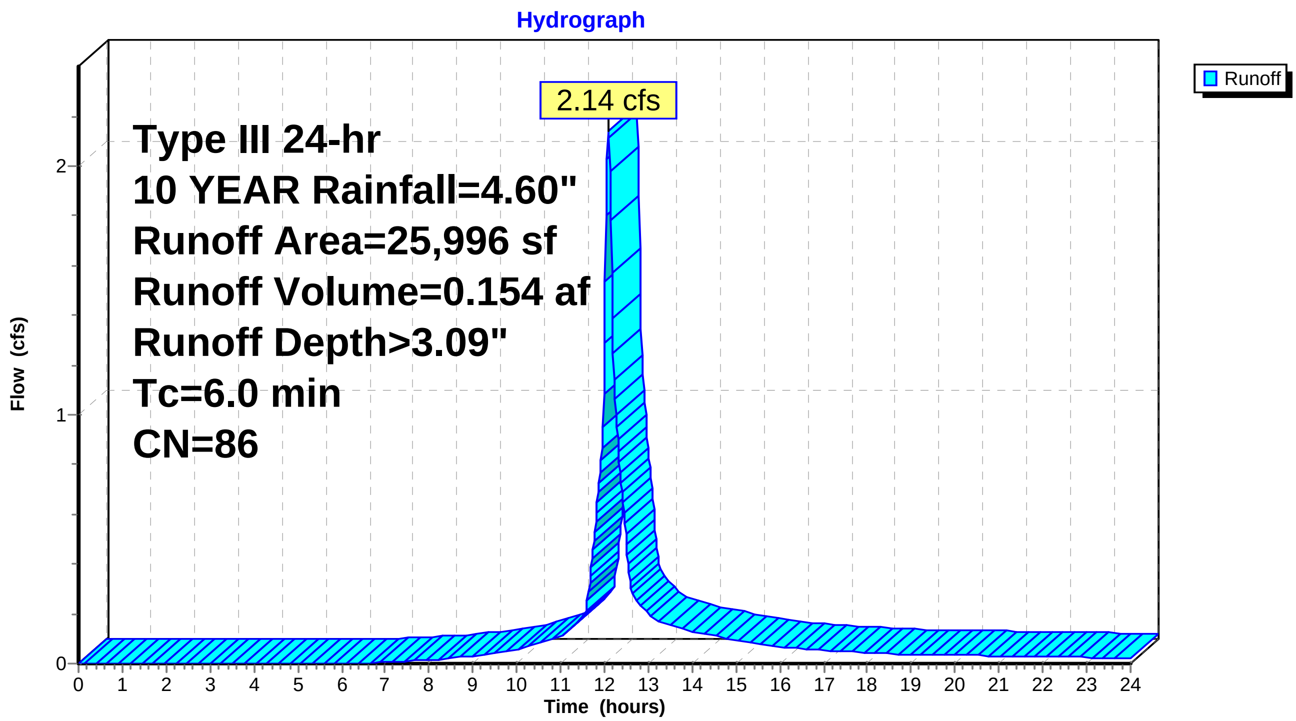
Runoff = 2.14 cfs @ 12.09 hrs, Volume= 0.154 af, Depth> 3.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

Area (sf)	CN	Description
3,297	98	roofs
14,511	98	Paved parking
8,188	61	>75% Grass cover, Good, HSG B
25,996	86	Weighted Average
8,188		31.50% Pervious Area
17,808		68.50% Impervious Area

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

Subcatchment PR-1A:



Summary for Subcatchment PR-1B:

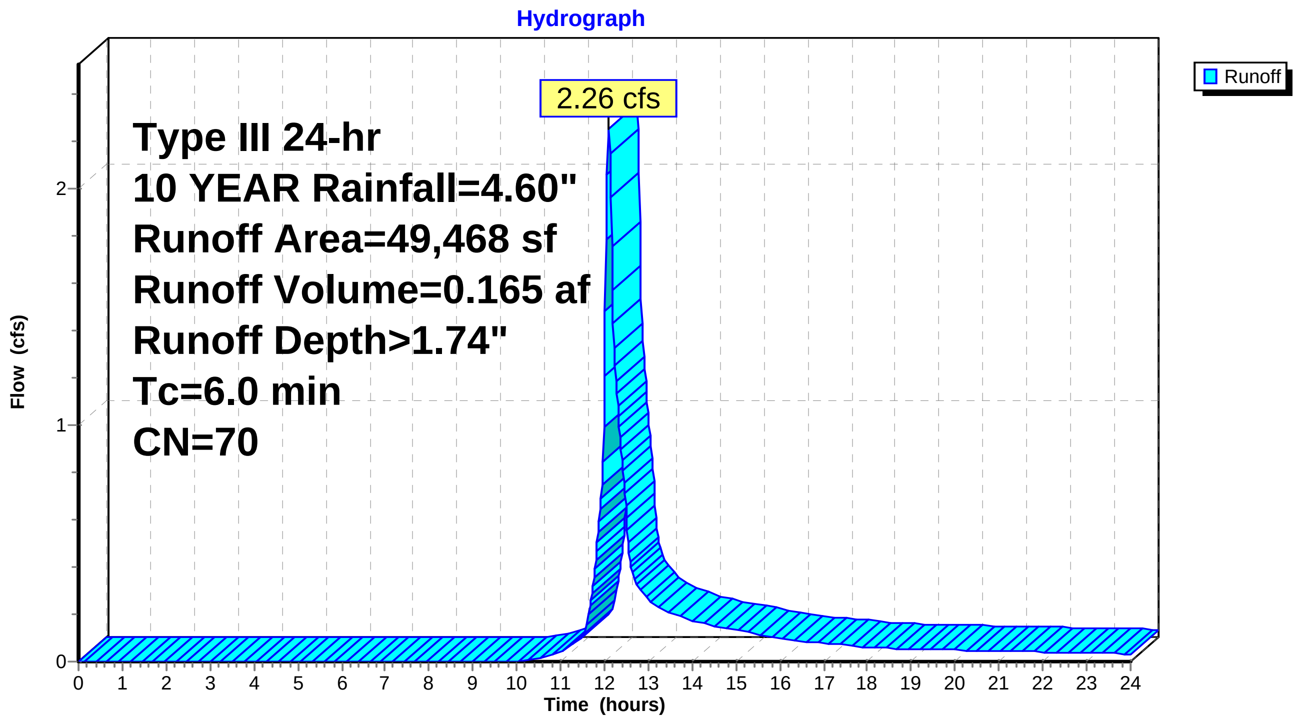
Runoff = 2.26 cfs @ 12.09 hrs, Volume= 0.165 af, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	9,606	98	roofs
*	2,267	98	pavement
*	142	98	ledge
	37,453	61	>75% Grass cover, Good, HSG B
	49,468	70	Weighted Average
	37,453		75.71% Pervious Area
	12,015		24.29% Impervious Area

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

Subcatchment PR-1B:



Summary for Subcatchment PR-1C:

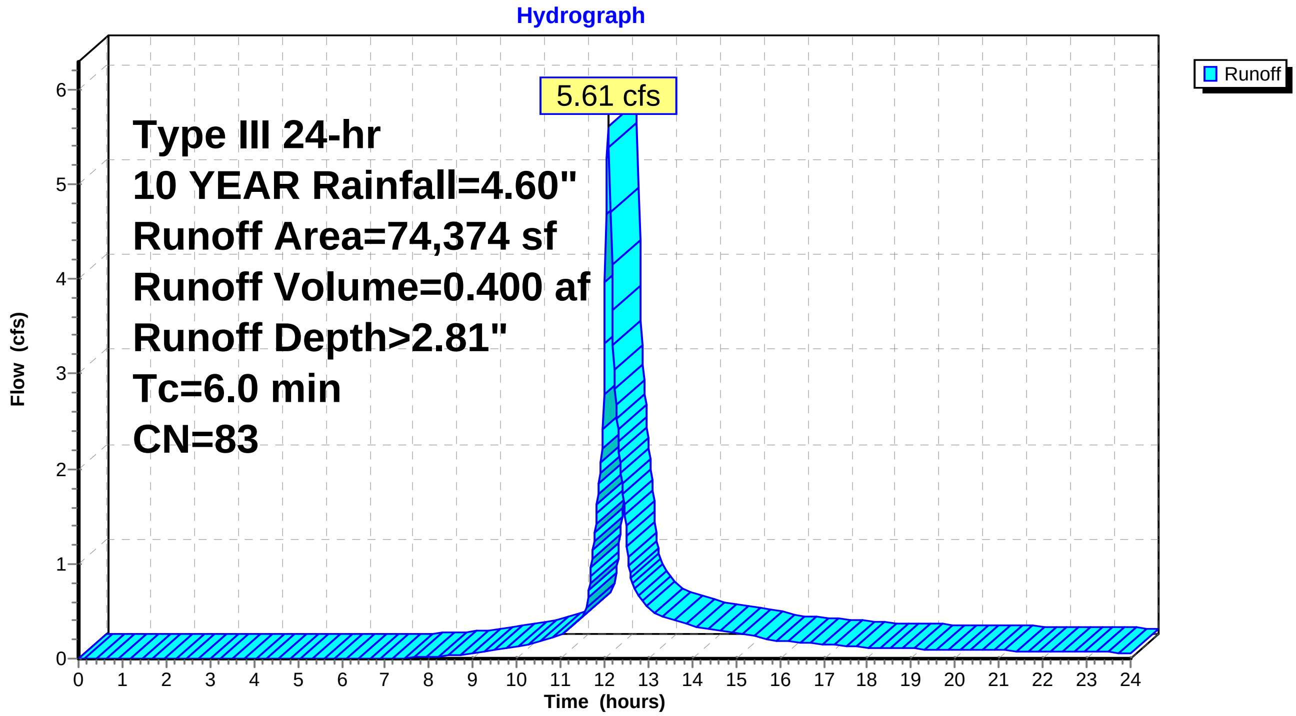
Runoff = 5.61 cfs @ 12.09 hrs, Volume= 0.400 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

Area (sf)	CN	Description
15,170	98	roofs
28,165	98	Paved parking
31,039	61	>75% Grass cover, Good, HSG B
74,374	83	Weighted Average
31,039		41.73% Pervious Area
43,335		58.27% Impervious Area

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

Subcatchment PR-1C:



Summary for Subcatchment PR-1D:

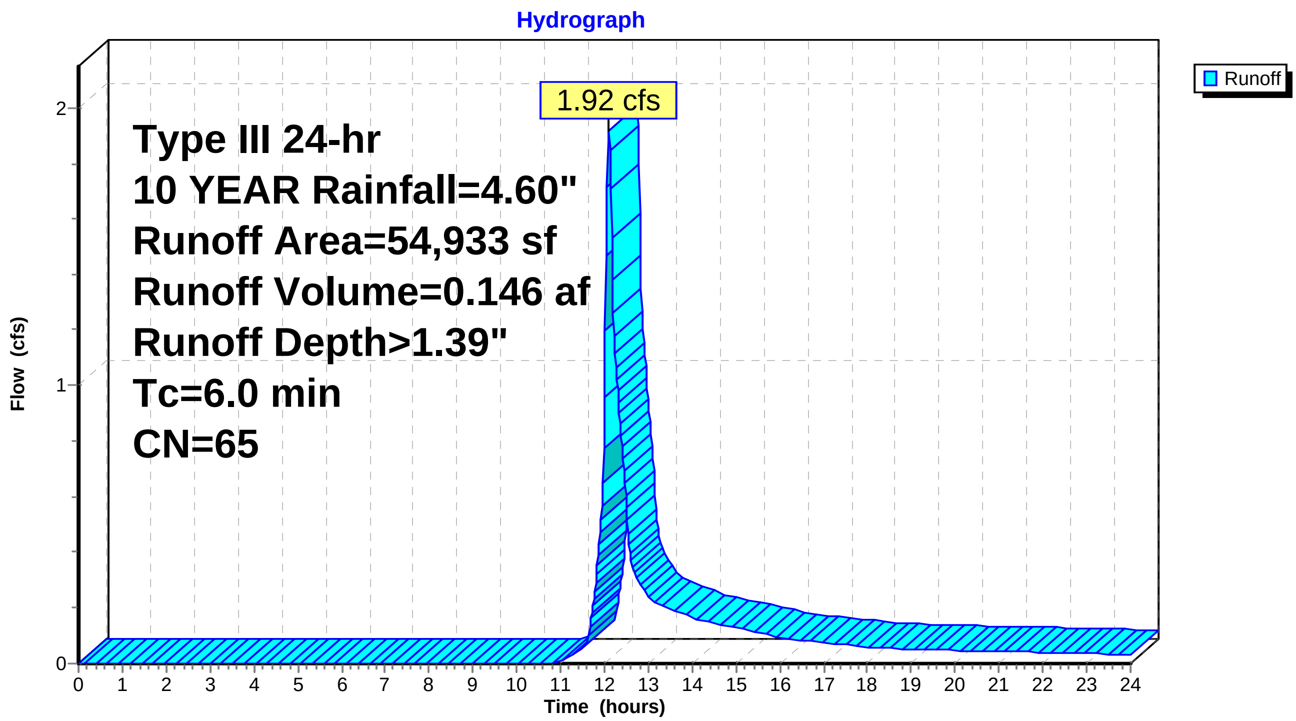
Runoff = 1.92 cfs @ 12.10 hrs, Volume= 0.146 af, Depth> 1.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

Area (sf)	CN	Description
2,704	98	roofs
2,868	98	Paved parking
49,361	61	>75% Grass cover, Good, HSG B
54,933	65	Weighted Average
49,361		89.86% Pervious Area
5,572		10.14% Impervious Area

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

Subcatchment PR-1D:



Summary for Subcatchment PR-1E:

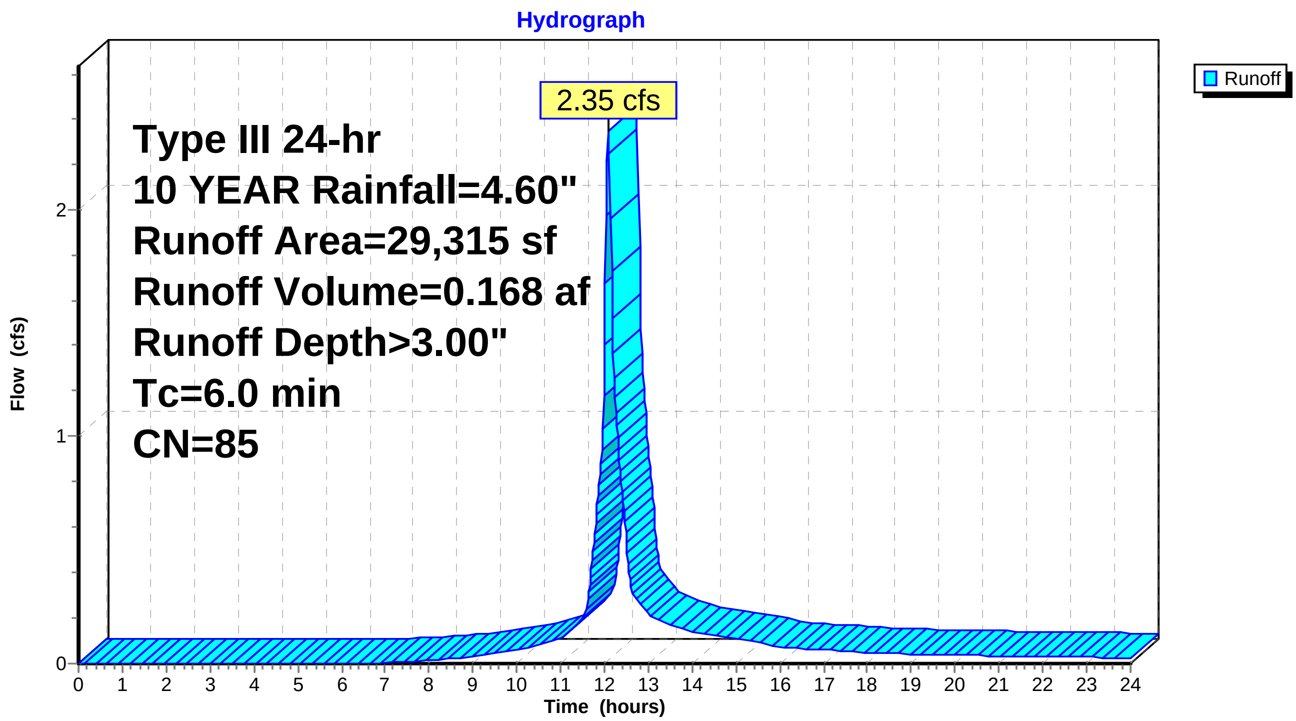
Runoff = 2.35 cfs @ 12.09 hrs, Volume= 0.168 af, Depth> 3.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

Area (sf)	CN	Description
6,378	98	roofs
12,510	98	Paved parking
10,427	61	>75% Grass cover, Good, HSG B
29,315	85	Weighted Average
10,427		35.57% Pervious Area
18,888		64.43% Impervious Area

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

Subcatchment PR-1E:



Summary for Subcatchment PR-1F:

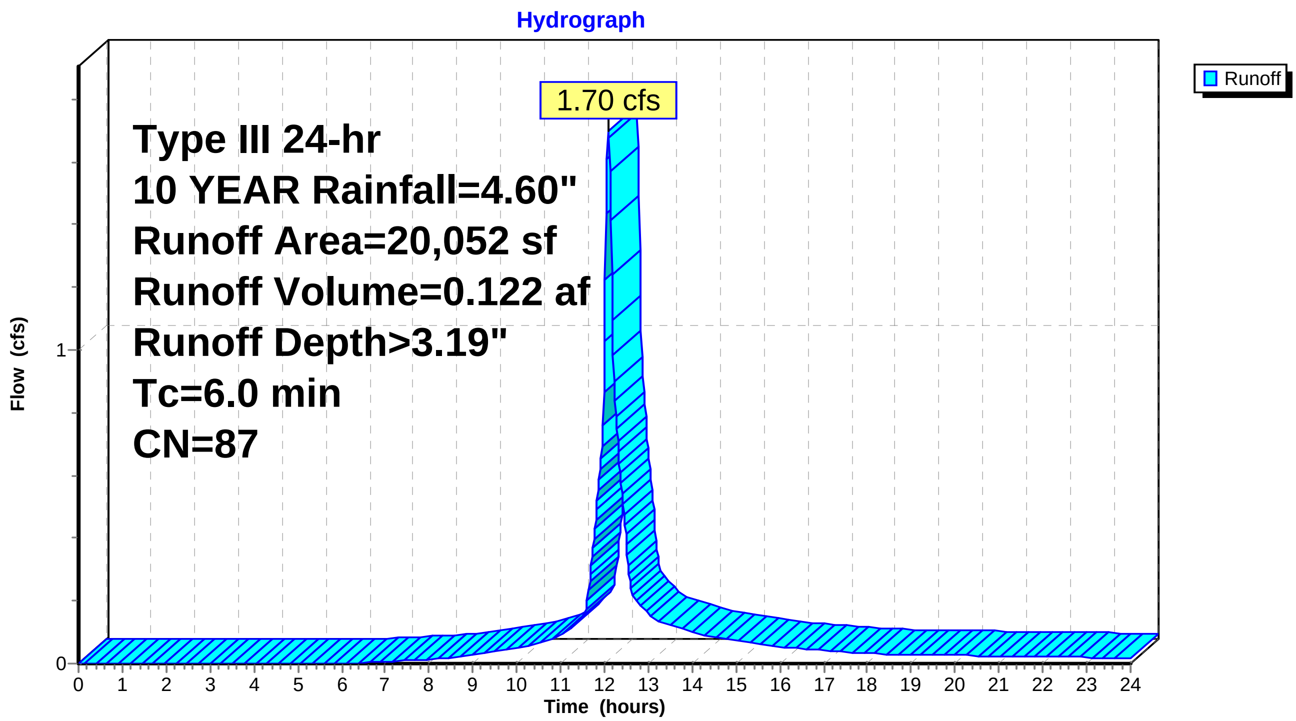
Runoff = 1.70 cfs @ 12.09 hrs, Volume= 0.122 af, Depth> 3.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

Area (sf)	CN	Description
6,274	98	roofs
7,737	98	Paved parking
6,041	61	>75% Grass cover, Good, HSG B
20,052	87	Weighted Average
6,041		30.13% Pervious Area
14,011		69.87% Impervious Area

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

Subcatchment PR-1F:



Summary for Subcatchment PR-1G:

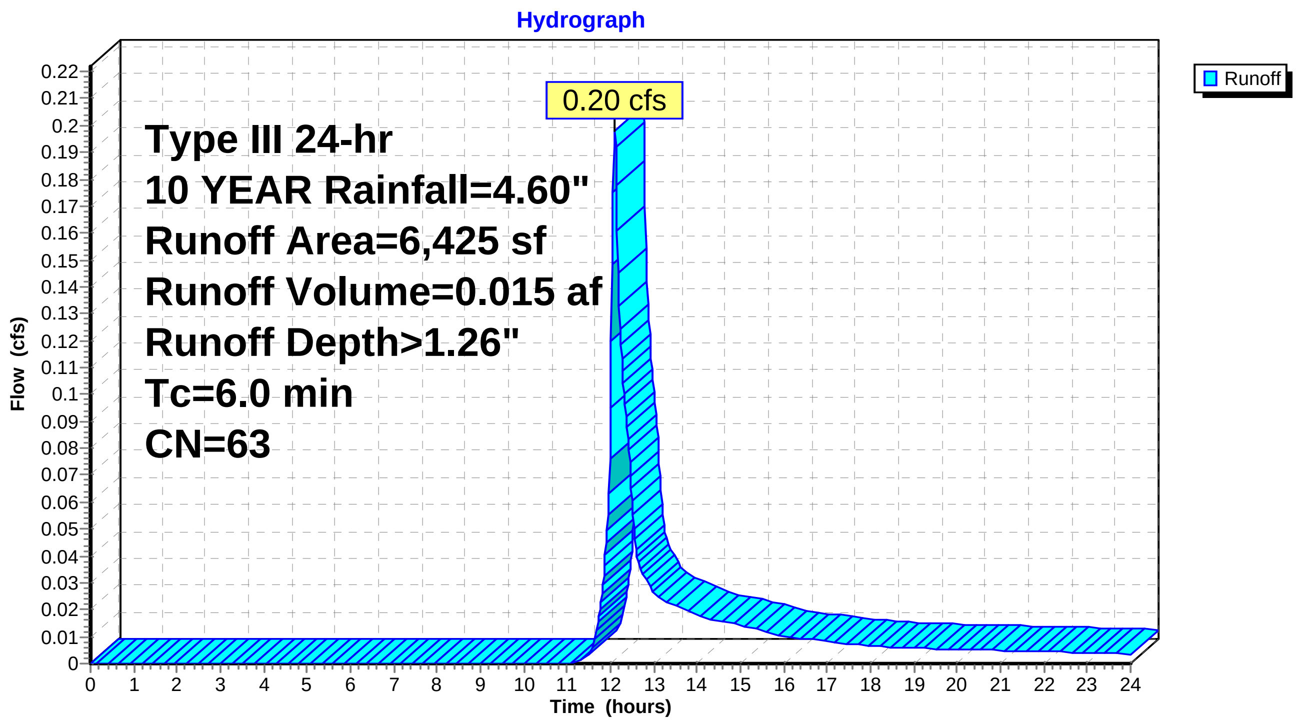
Runoff = 0.20 cfs @ 12.10 hrs, Volume= 0.015 af, Depth> 1.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	0	98	roofs
*	381	98	walkway
	6,044	61	>75% Grass cover, Good, HSG B
	6,425	63	Weighted Average
	6,044		94.07% Pervious Area
	381		5.93% Impervious Area

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

Subcatchment PR-1G:



Summary for Subcatchment PR-3A:

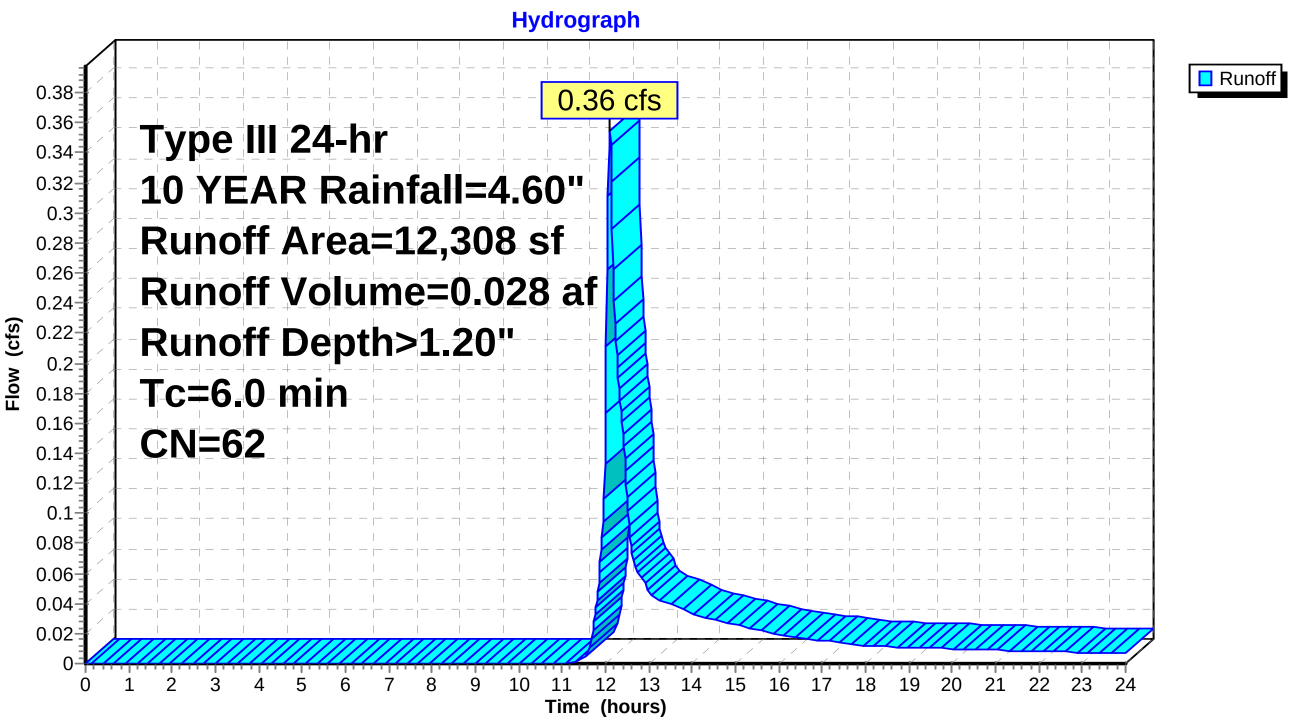
Runoff = 0.36 cfs @ 12.10 hrs, Volume= 0.028 af, Depth> 1.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	11,223	61	>75% Grass cover, Good, HSG B
*	346	98	sidewalk
	739	55	Woods, Good, HSG B
	12,308	62	Weighted Average
	11,962		97.19% Pervious Area
	346		2.81% Impervious Area

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

Subcatchment PR-3A:



Summary for Subcatchment PR-3B:

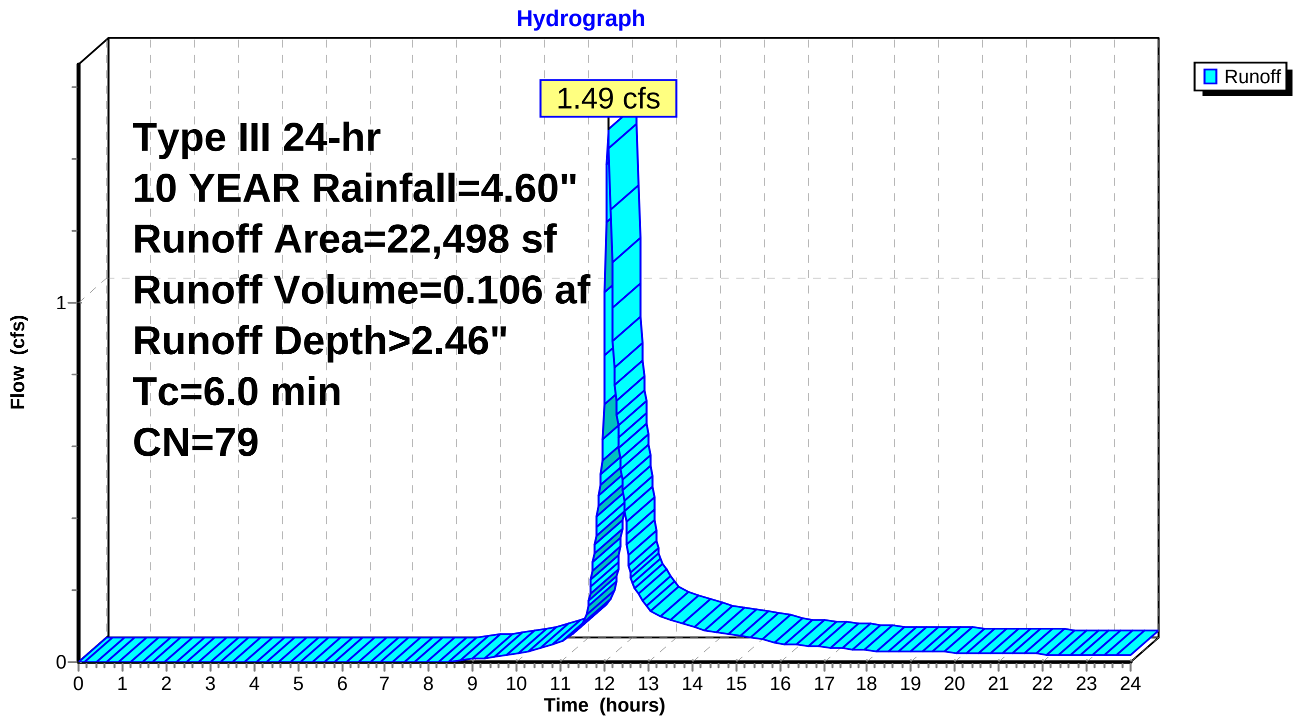
Runoff = 1.49 cfs @ 12.09 hrs, Volume= 0.106 af, Depth> 2.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	9,997	61	>75% Grass cover, Good, HSG B
*	9,671	98	paving
*	1,514	98	ROOF
	1,316	55	Woods, Good, HSG B
	22,498	79	Weighted Average
	11,313		50.28% Pervious Area
	11,185		49.72% Impervious Area

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

Subcatchment PR-3B:



Summary for Subcatchment PR-3C:

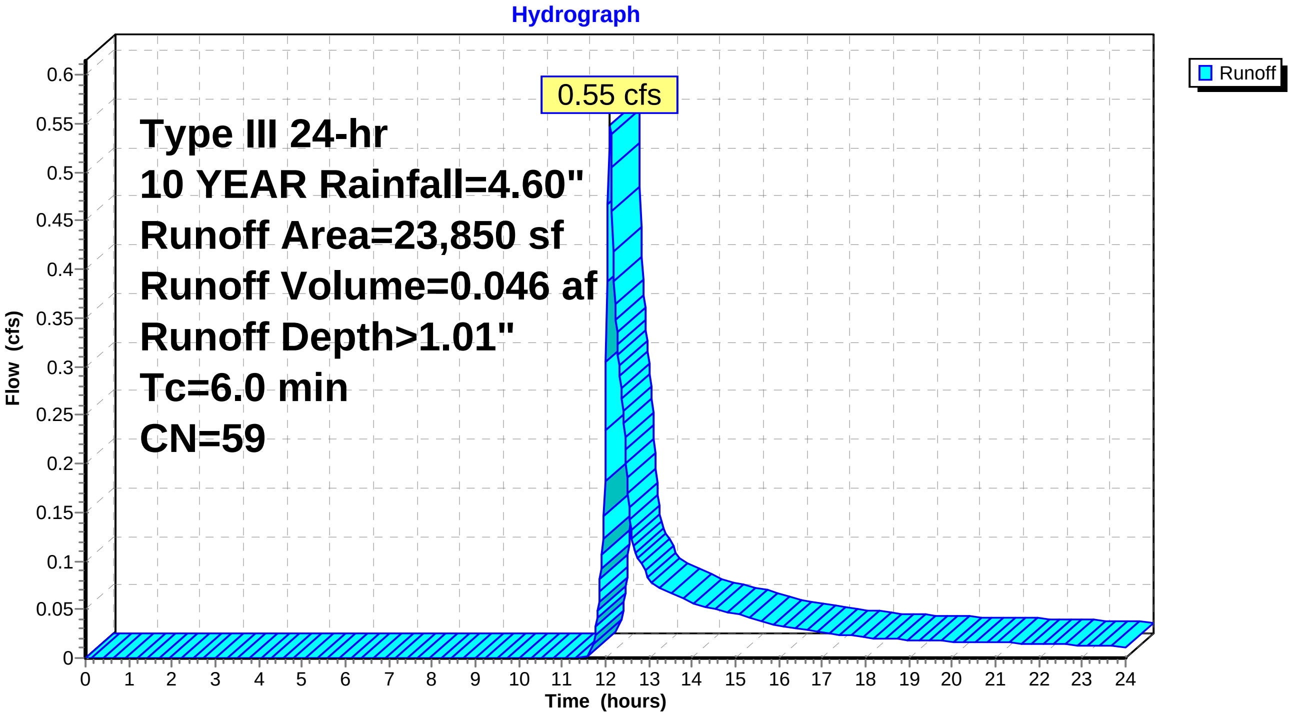
Runoff = 0.55 cfs @ 12.10 hrs, Volume= 0.046 af, Depth> 1.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

Area (sf)	CN	Description
14,978	61	>75% Grass cover, Good, HSG B
8,872	55	Woods, Good, HSG B
23,850	59	Weighted Average
23,850		100.00% Pervious Area

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

Subcatchment PR-3C:



Summary for Subcatchment PR-4A:

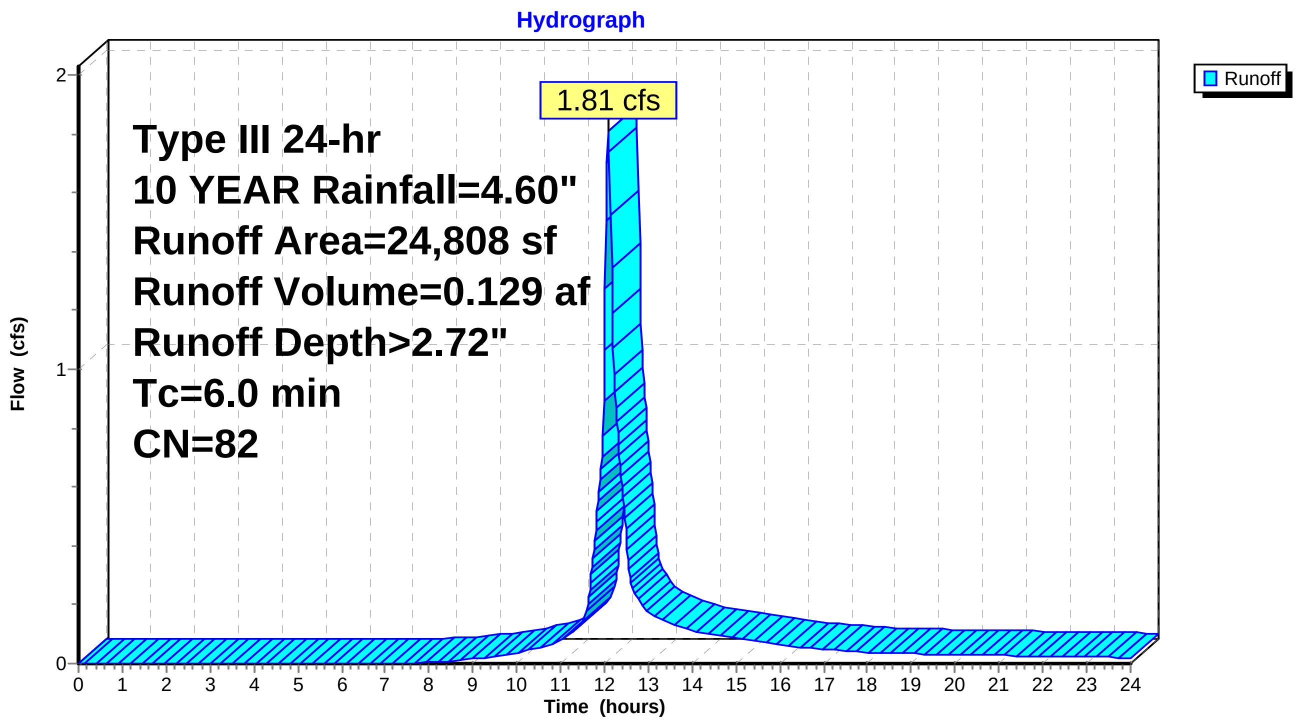
Runoff = 1.81 cfs @ 12.09 hrs, Volume= 0.129 af, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	7,054	61	>75% Grass cover, Good, HSG B
*	14,671	98	paving
	3,083	55	Woods, Good, HSG B
	24,808	82	Weighted Average
	10,137		40.86% Pervious Area
	14,671		59.14% Impervious Area

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

Subcatchment PR-4A:



Summary for Subcatchment PR-4B:

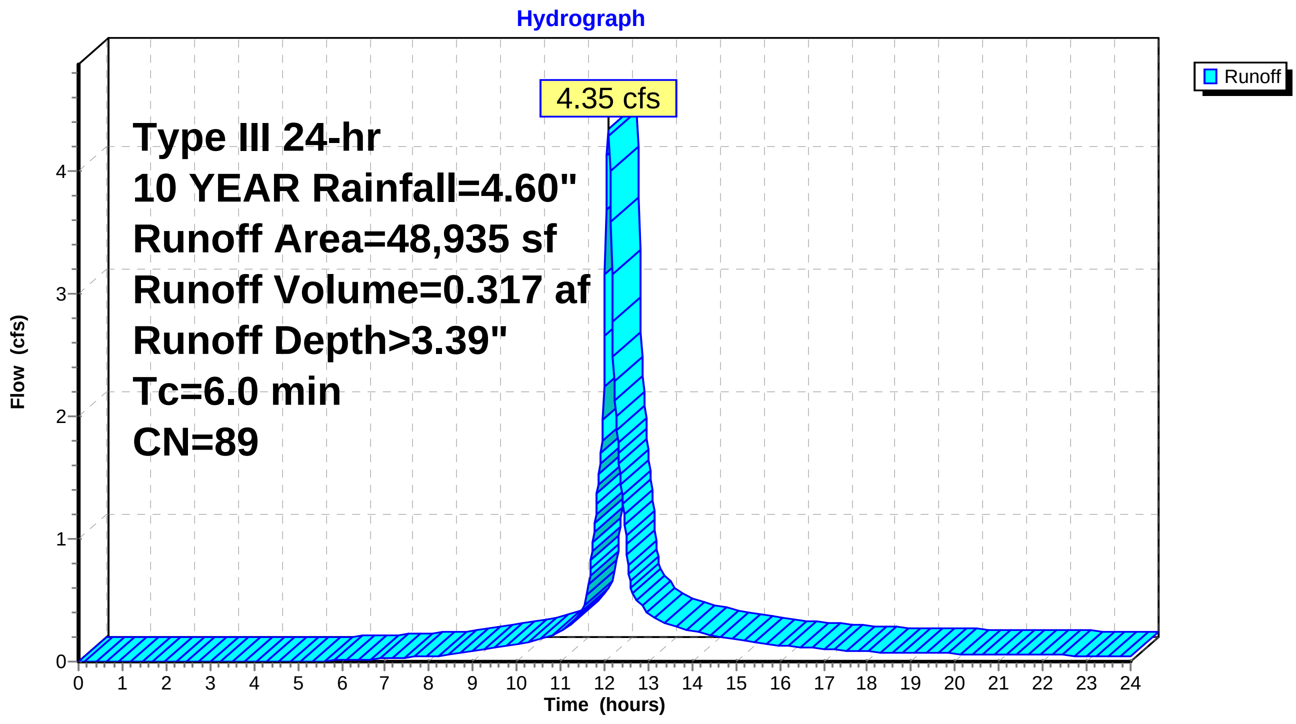
Runoff = 4.35 cfs @ 12.09 hrs, Volume= 0.317 af, Depth> 3.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
*	35,417	98	roofs
	0	98	Paved parking & roofs
*	1,634	98	LEDGE
	11,884	61	>75% Grass cover, Good, HSG B
	48,935	89	Weighted Average
	11,884		24.29% Pervious Area
	37,051		75.71% Impervious Area

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

Subcatchment PR-4B:



Summary for Subcatchment PR-4C:

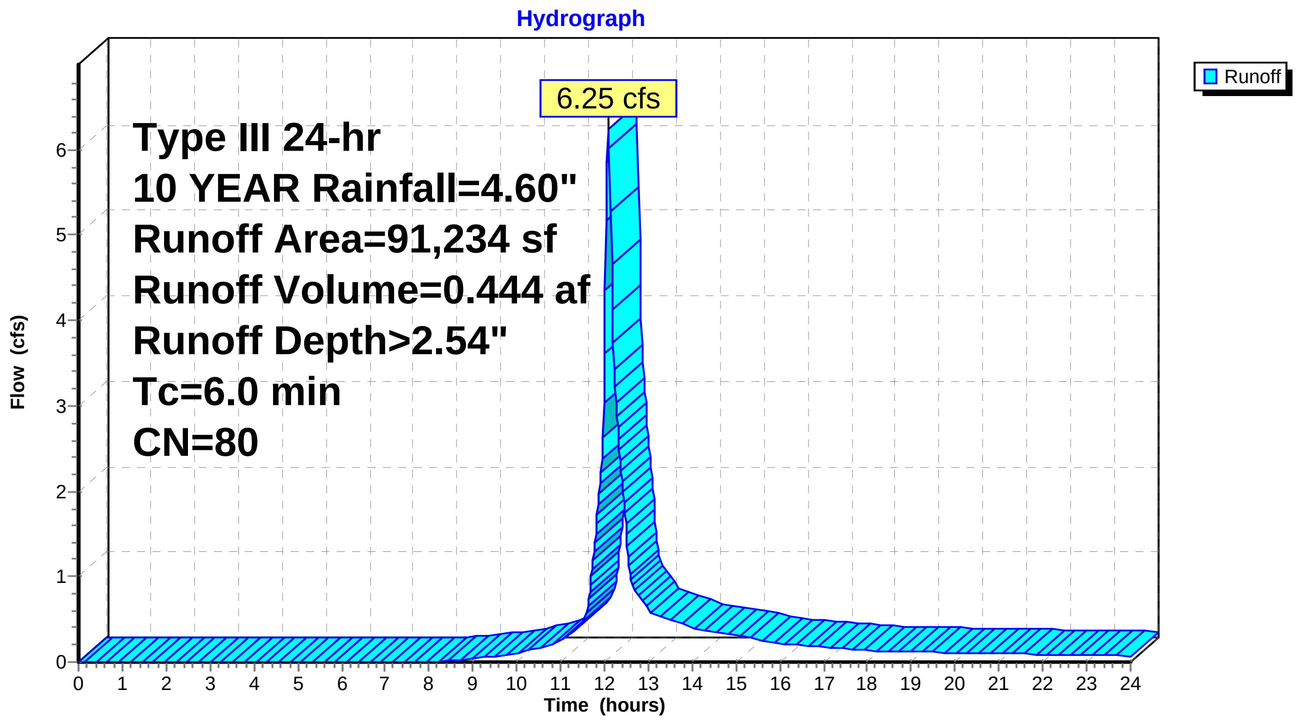
Runoff = 6.25 cfs @ 12.09 hrs, Volume= 0.444 af, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	44,061	61	>75% Grass cover, Good, HSG B
*	34,868	98	paving
*	10,828	98	ROOFS
*	1,477	98	ledge
	91,234	80	Weighted Average
	44,061		48.29% Pervious Area
	47,173		51.71% Impervious Area

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

Subcatchment PR-4C:



Summary for Subcatchment PR-4D:

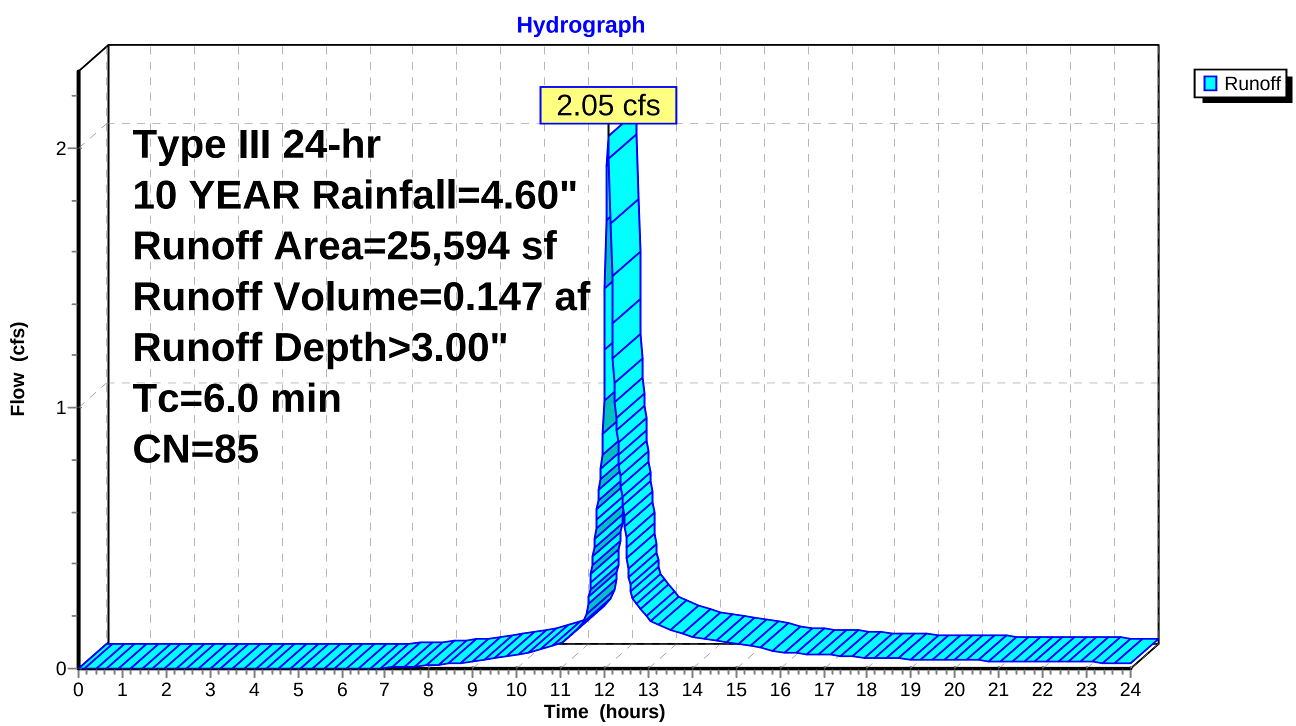
Runoff = 2.05 cfs @ 12.09 hrs, Volume= 0.147 af, Depth> 3.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

Area (sf)	CN	Description
9,275	61	>75% Grass cover, Good, HSG B
2,515	98	roofs
13,804	98	Paved parking
25,594	85	Weighted Average
9,275		36.24% Pervious Area
16,319		63.76% Impervious Area

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

Subcatchment PR-4D:



Summary for Subcatchment PR-4E:

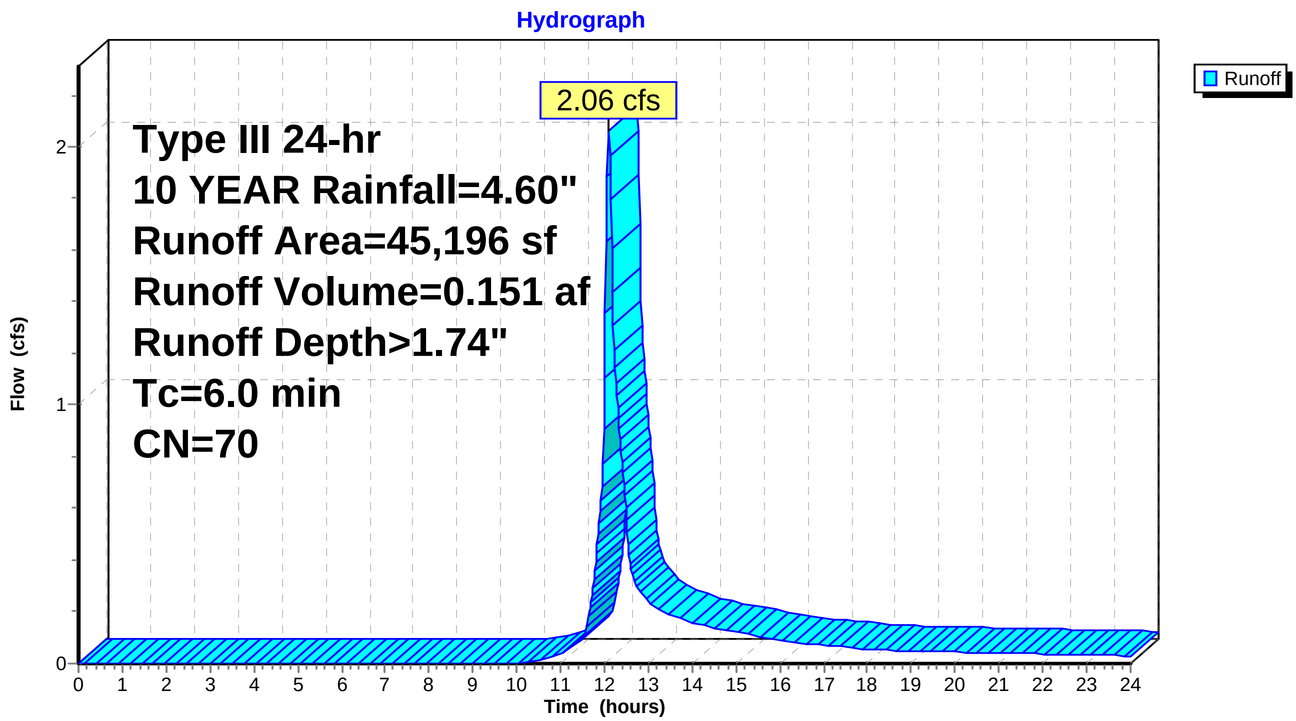
Runoff = 2.06 cfs @ 12.09 hrs, Volume= 0.151 af, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	34,517	61	>75% Grass cover, Good, HSG B
*	5,311	98	paving
*	5,368	98	ROOFS
	45,196	70	Weighted Average
	34,517		76.37% Pervious Area
	10,679		23.63% Impervious Area

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

Subcatchment PR-4E:



Summary for Subcatchment PR-4F:

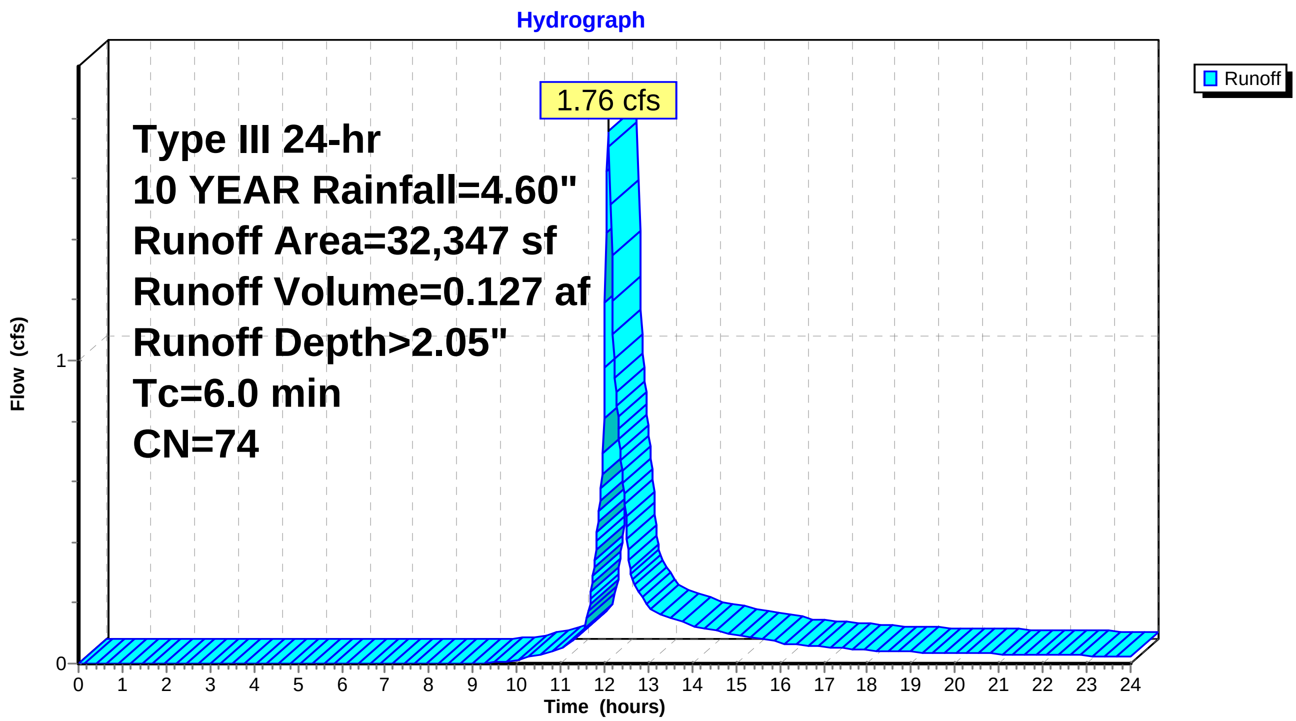
Runoff = 1.76 cfs @ 12.09 hrs, Volume= 0.127 af, Depth> 2.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YEAR Rainfall=4.60"

	Area (sf)	CN	Description
	21,093	61	>75% Grass cover, Good, HSG B
*	11,254	98	paving
*	0	98	ROOFS
	32,347	74	Weighted Average
	21,093		65.21% Pervious Area
	11,254		34.79% Impervious Area

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

Subcatchment PR-4F:



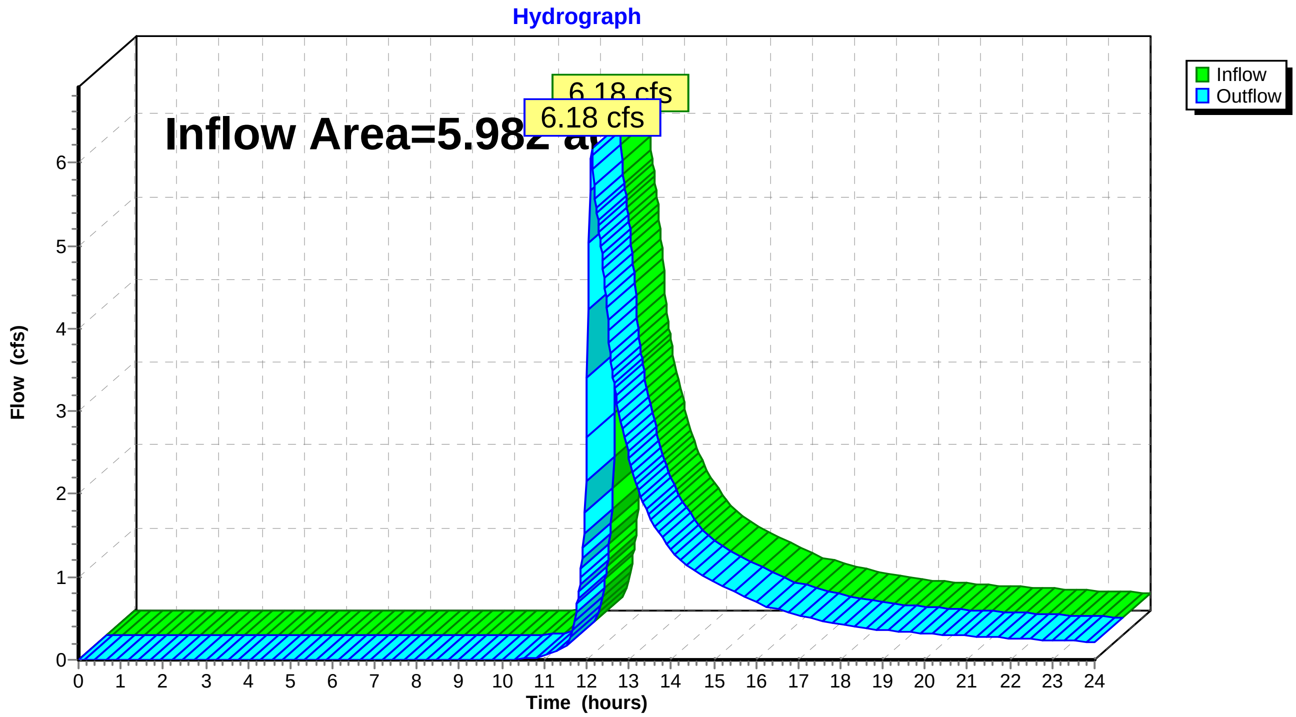
Summary for Reach DP-1: Wetlands-North

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

Inflow Area =	5.982 ac,	42.99% Impervious,	Inflow Depth > 1.84"	for 10 YEAR event	
Inflow =	6.18 cfs @	12.12 hrs,	Volume=	0.916 af	
Outflow =	6.18 cfs @	12.12 hrs,	Volume=	0.916 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1: Wetlands-North



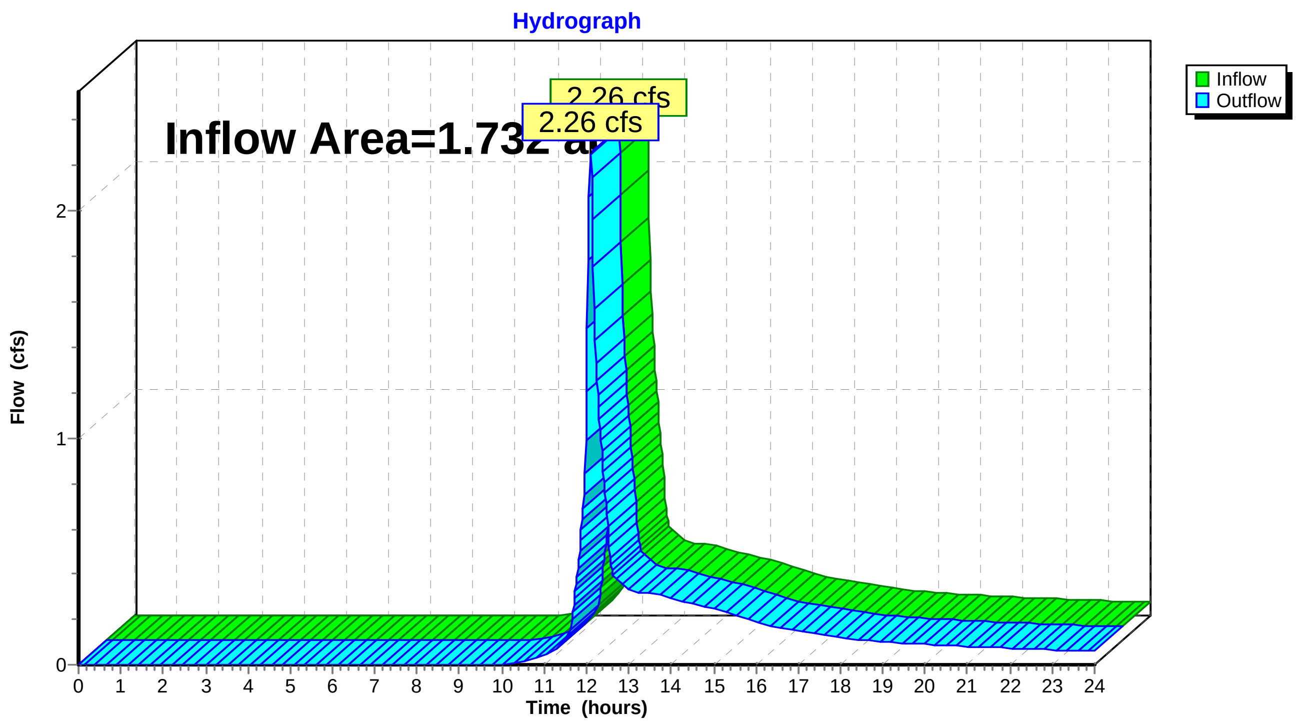
Summary for Reach DP-1A:

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

Inflow Area =	1.732 ac,	39.52% Impervious,	Inflow Depth > 1.56"	for 10 YEAR event	
Inflow =	2.26 cfs @	12.09 hrs,	Volume=	0.225 af	
Outflow =	2.26 cfs @	12.09 hrs,	Volume=	0.225 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1A:



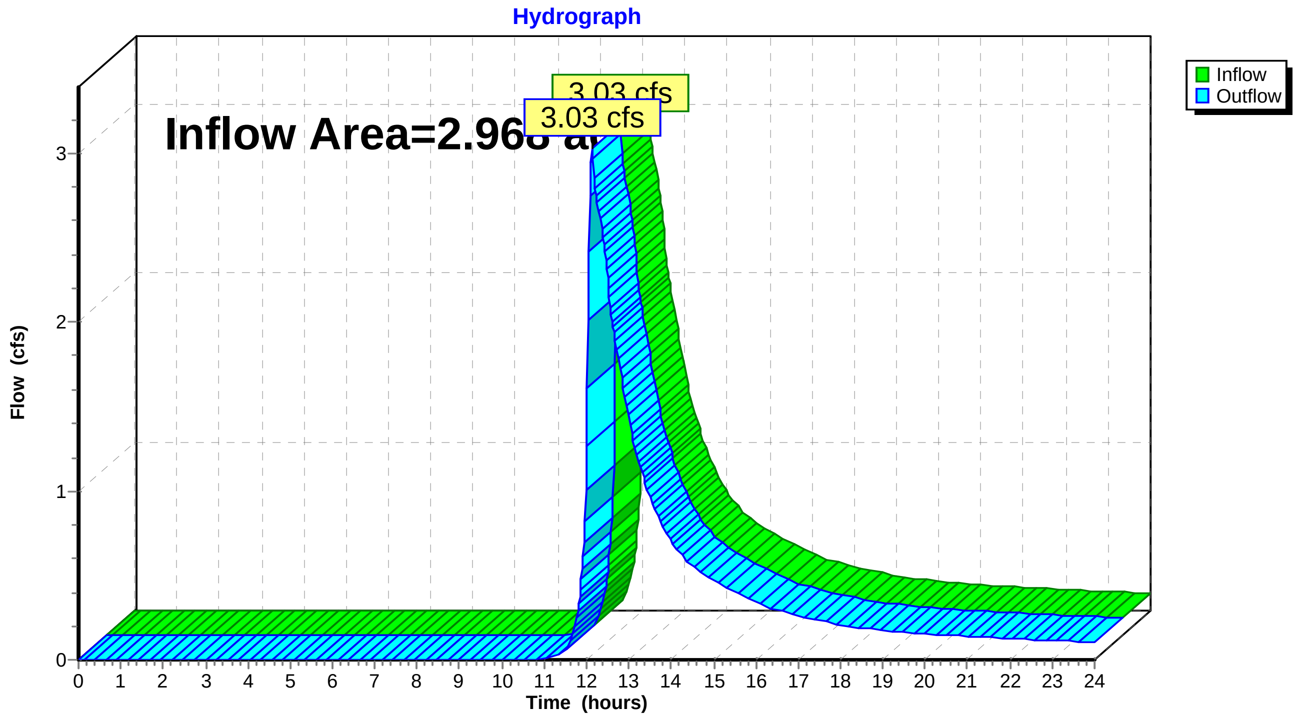
Summary for Reach DP-1B:

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

Inflow Area = 2.968 ac, 37.82% Impervious, Inflow Depth > 1.91" for 10 YEAR event
Inflow = 3.03 cfs @ 12.13 hrs, Volume= 0.471 af
Outflow = 3.03 cfs @ 12.13 hrs, Volume= 0.471 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1B:



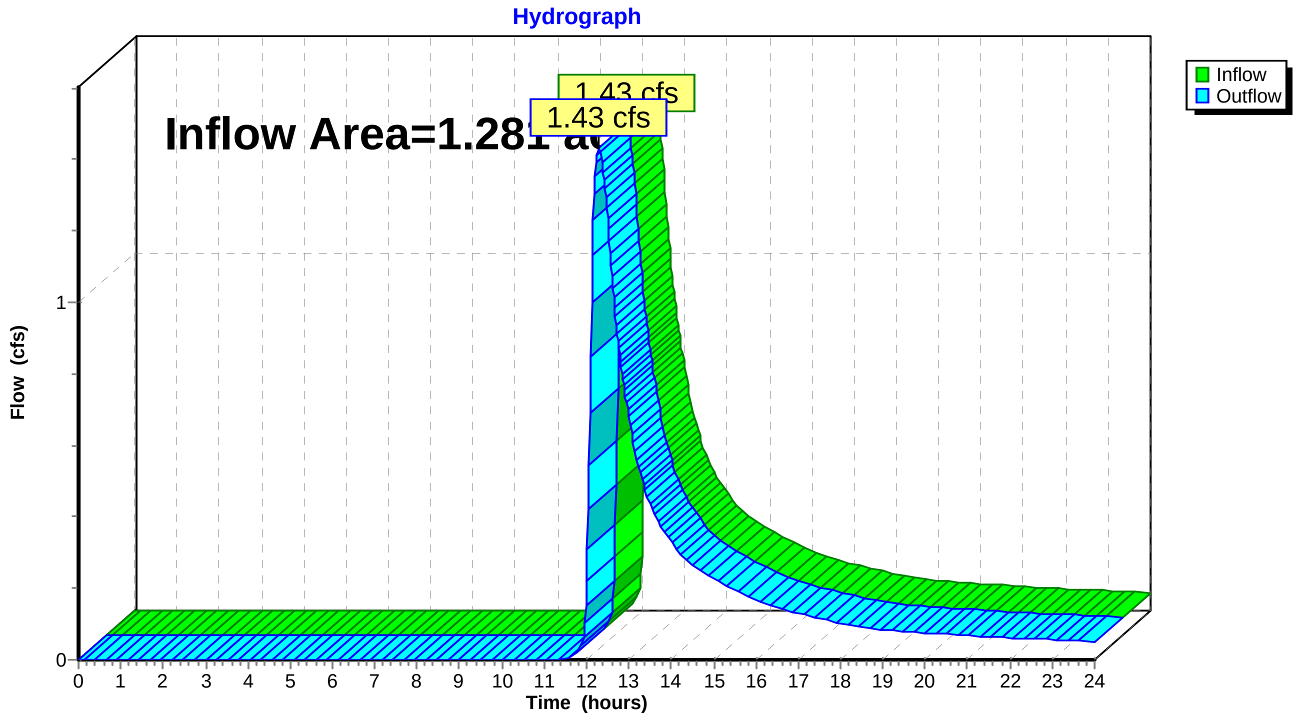
Summary for Reach DP-1C:

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

Inflow Area = 1.281 ac, 59.65% Impervious, Inflow Depth > 2.06" for 10 YEAR event
Inflow = 1.43 cfs @ 12.28 hrs, Volume= 0.220 af
Outflow = 1.43 cfs @ 12.28 hrs, Volume= 0.220 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1C:



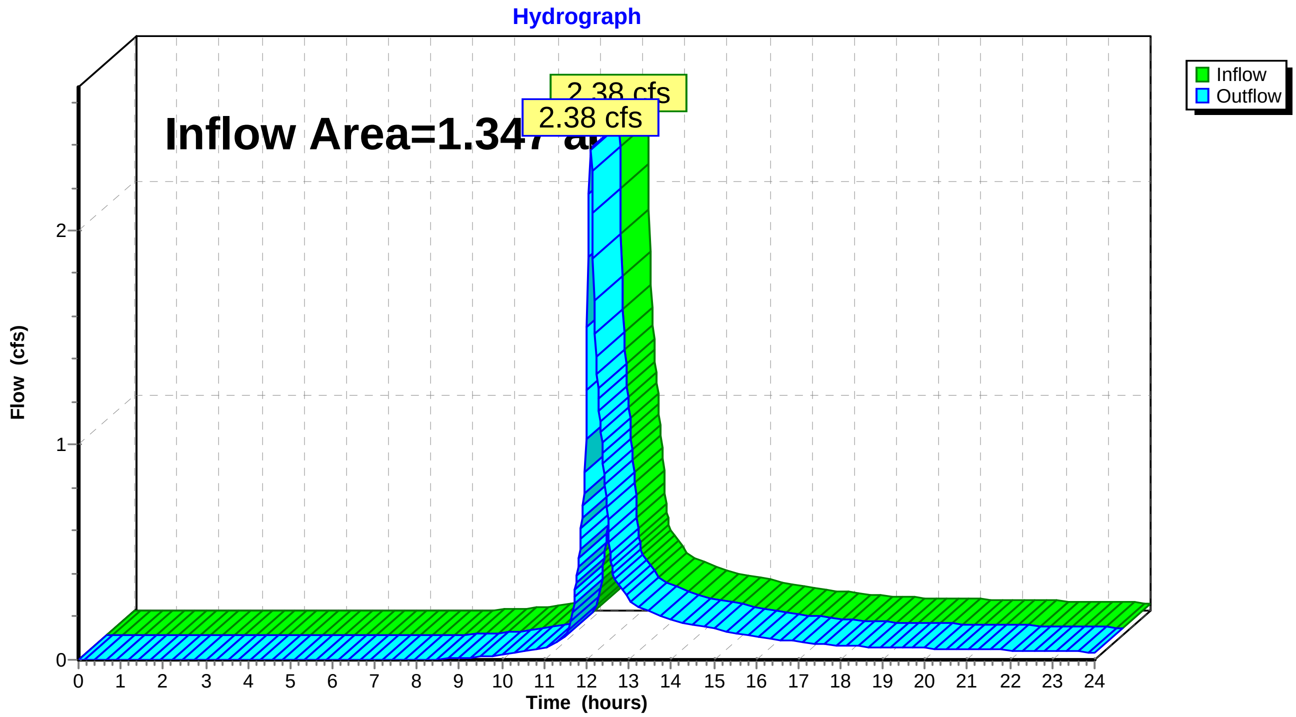
Summary for Reach DP-3: Drain System in Russett Rd.

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

Inflow Area =	1.347 ac,	19.66% Impervious,	Inflow Depth > 1.61"	for 10 YEAR event
Inflow =	2.38 cfs @	12.09 hrs, Volume=	0.180 af	
Outflow =	2.38 cfs @	12.09 hrs, Volume=	0.180 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3: Drain System in Russett Rd.



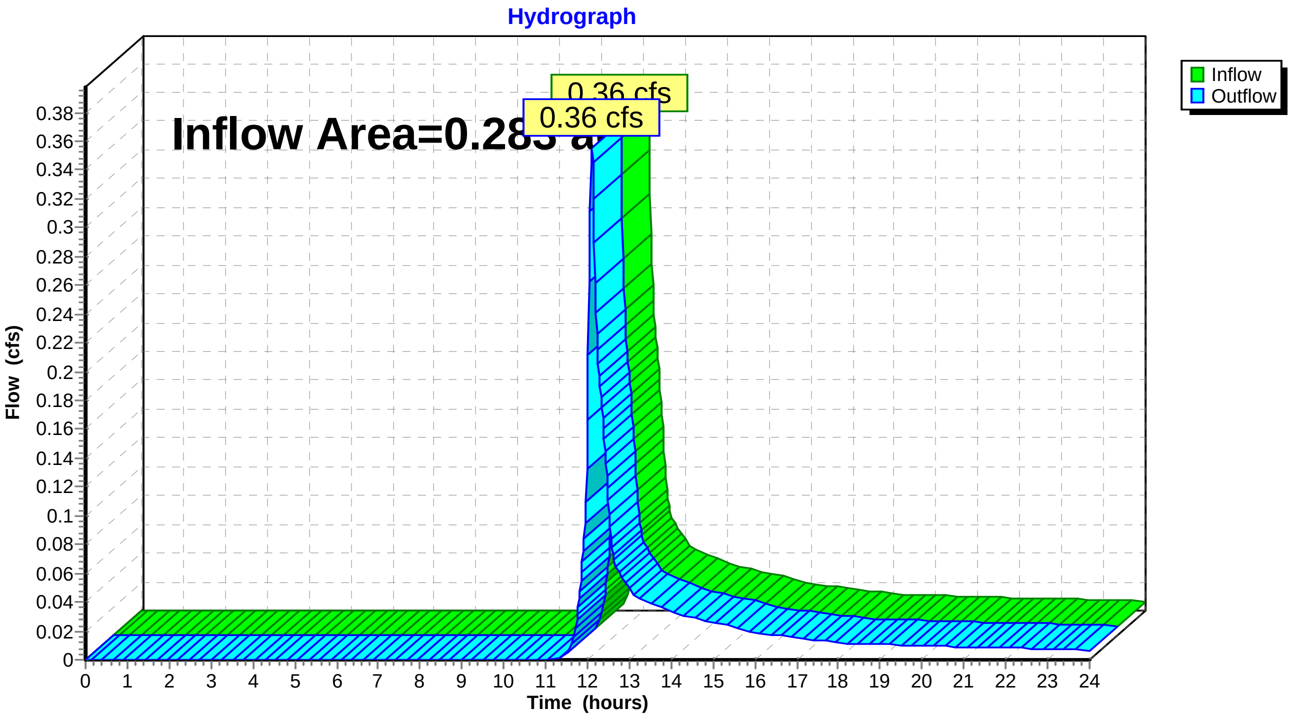
Summary for Reach DP-3A:

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

Inflow Area =	0.283 ac,	2.81% Impervious,	Inflow Depth > 1.20"	for 10 YEAR event	
Inflow =	0.36 cfs @	12.10 hrs,	Volume=	0.028 af	
Outflow =	0.36 cfs @	12.10 hrs,	Volume=	0.028 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3A:



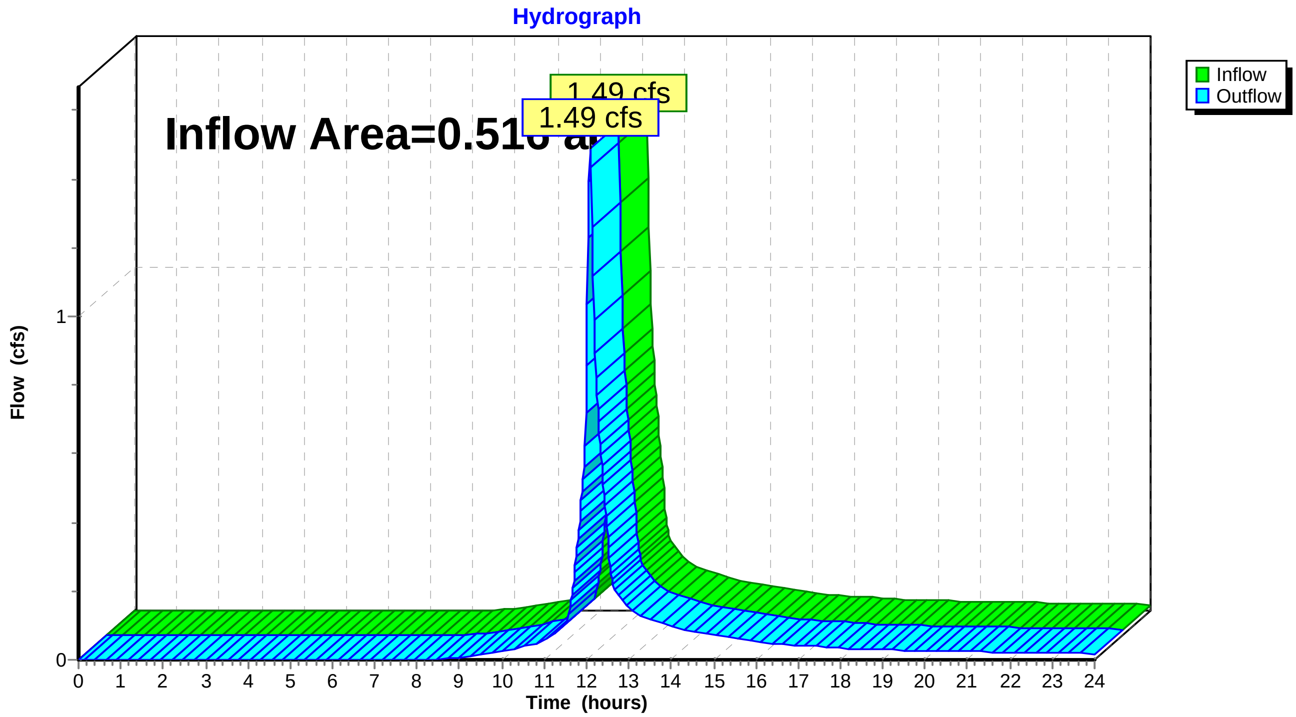
Summary for Reach DP-3B:

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

Inflow Area = 0.516 ac, 49.72% Impervious, Inflow Depth > 2.46" for 10 YEAR event
Inflow = 1.49 cfs @ 12.09 hrs, Volume= 0.106 af
Outflow = 1.49 cfs @ 12.09 hrs, Volume= 0.106 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3B:



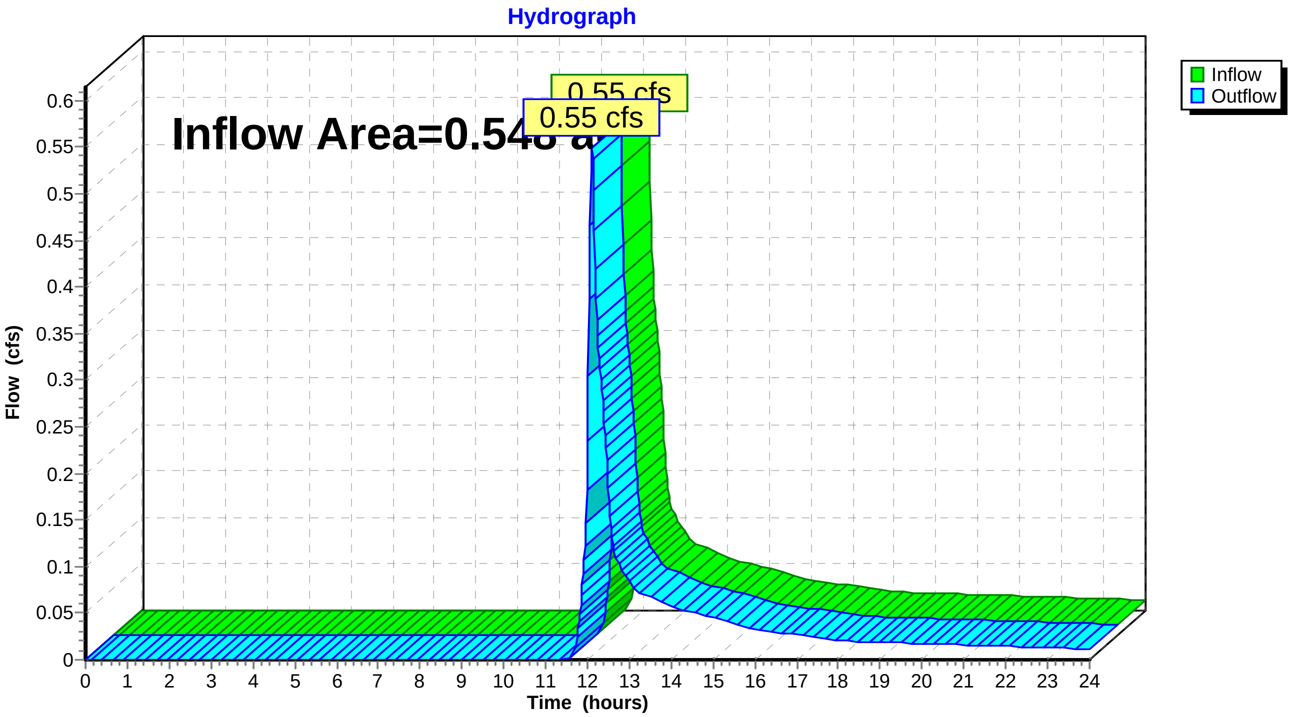
Summary for Reach DP-3D:

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

Inflow Area = 0.548 ac, 0.00% Impervious, Inflow Depth > 1.01" for 10 YEAR event
Inflow = 0.55 cfs @ 12.10 hrs, Volume= 0.046 af
Outflow = 0.55 cfs @ 12.10 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3D:



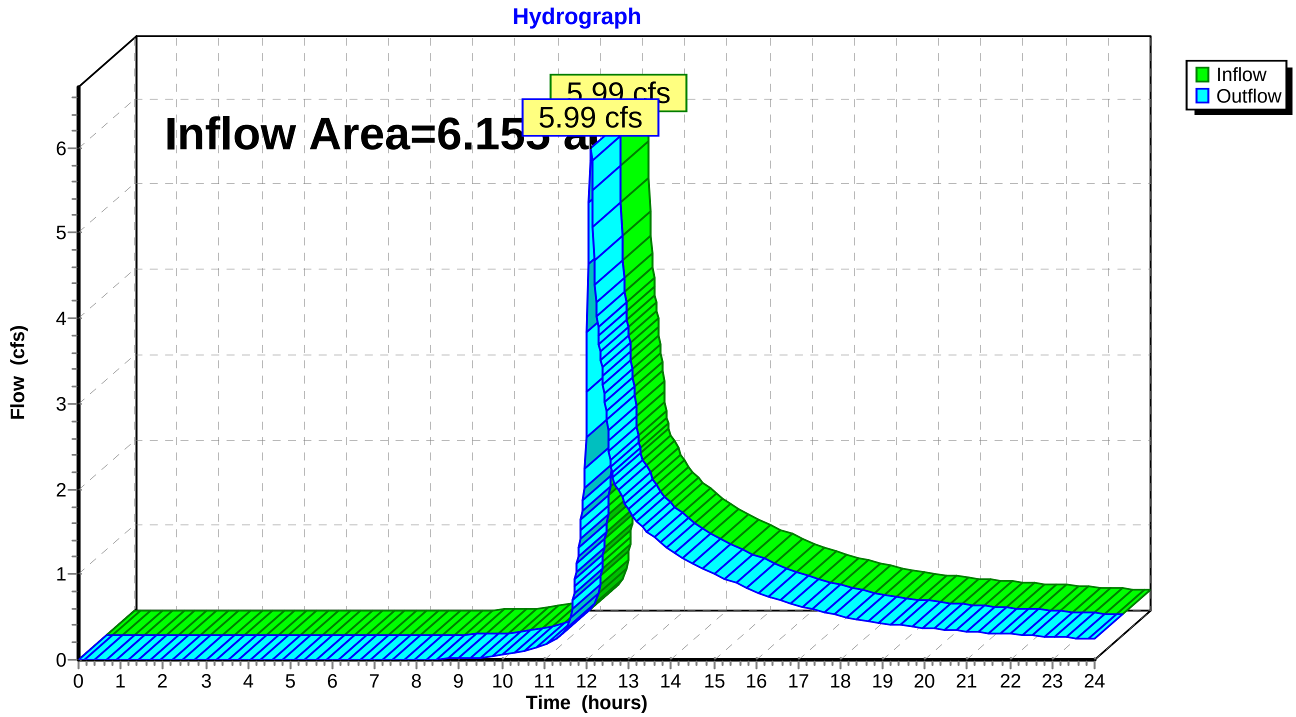
Summary for Reach DP-4: VFW Parkway

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

Inflow Area =	6.155 ac,	51.15% Impervious,	Inflow Depth > 1.74"	for 10 YEAR event	
Inflow =	5.99 cfs @	12.10 hrs,	Volume=	0.890 af	
Outflow =	5.99 cfs @	12.10 hrs,	Volume=	0.890 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4: VFW Parkway



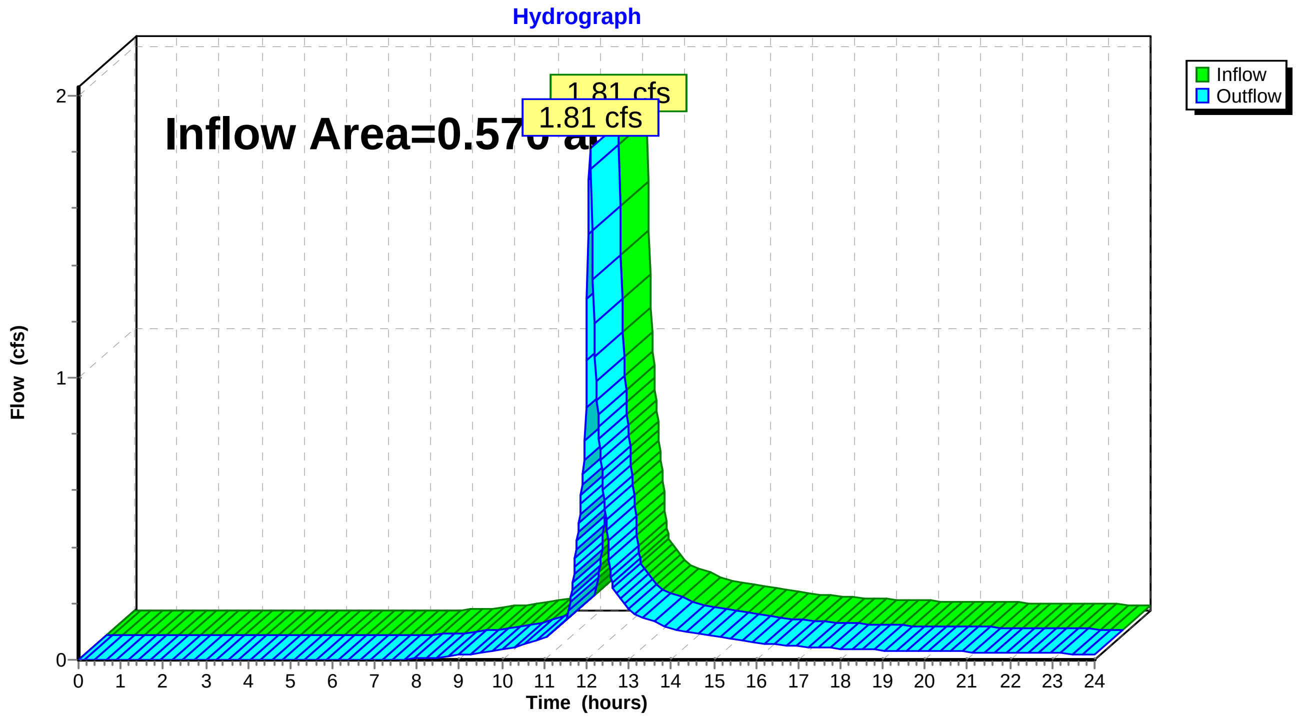
Summary for Reach DP-4A:

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

Inflow Area = 0.570 ac, 59.14% Impervious, Inflow Depth > 2.72" for 10 YEAR event
Inflow = 1.81 cfs @ 12.09 hrs, Volume= 0.129 af
Outflow = 1.81 cfs @ 12.09 hrs, Volume= 0.129 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4A:



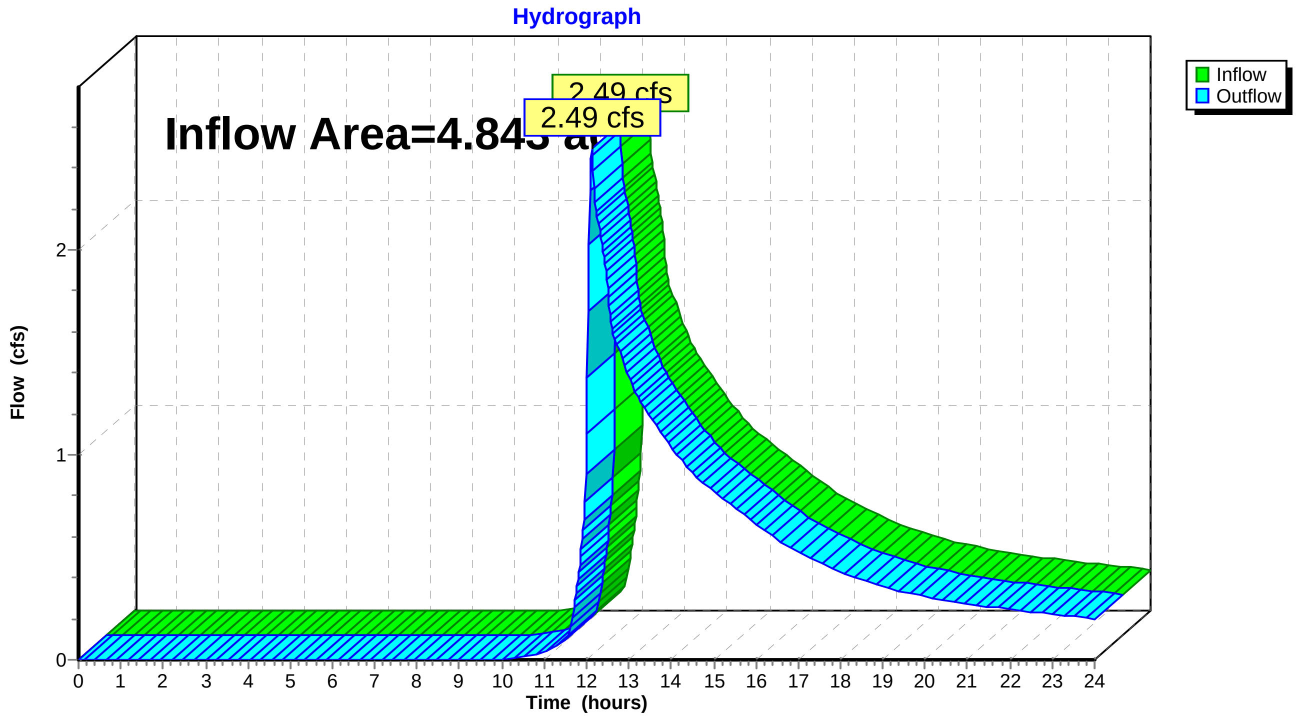
Summary for Reach DP-4B:

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

Inflow Area = 4.843 ac, 52.72% Impervious, Inflow Depth > 1.57" for 10 YEAR event
Inflow = 2.49 cfs @ 12.12 hrs, Volume= 0.634 af
Outflow = 2.49 cfs @ 12.12 hrs, Volume= 0.634 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4B:



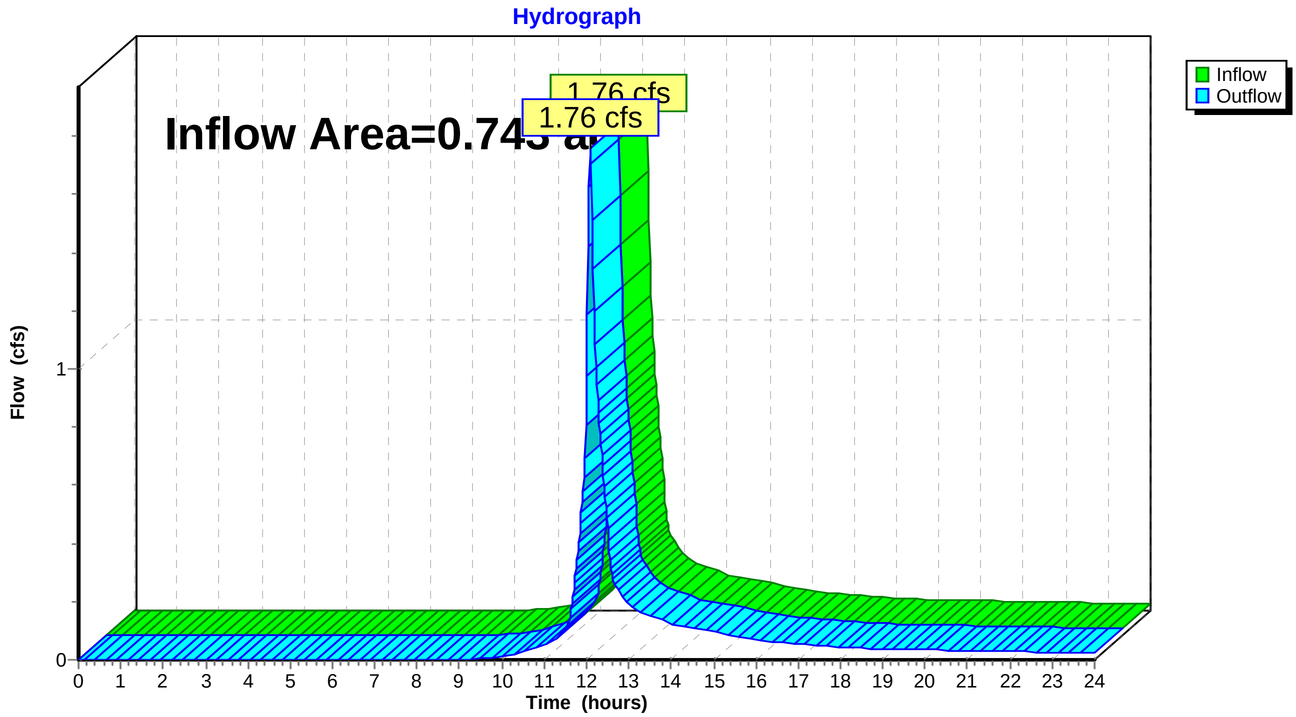
Summary for Reach DP-4C:

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

Inflow Area = 0.743 ac, 34.79% Impervious, Inflow Depth > 2.05" for 10 YEAR event
Inflow = 1.76 cfs @ 12.09 hrs, Volume= 0.127 af
Outflow = 1.76 cfs @ 12.09 hrs, Volume= 0.127 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4C:



Summary for Pond P-1A: Subsurface Detention/Infiltration basin

Inflow Area = 0.597 ac, 68.50% Impervious, Inflow Depth > 3.09" for 10 YEAR event
Inflow = 2.14 cfs @ 12.09 hrs, Volume= 0.154 af
Outflow = 0.12 cfs @ 14.09 hrs, Volume= 0.060 af, Atten= 94%, Lag= 120.5 min
Primary = 0.12 cfs @ 14.09 hrs, Volume= 0.060 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 169.21' @ 14.09 hrs Surf.Area= 3,838 sf Storage= 4,502 cf

Plug-Flow detention time= 329.6 min calculated for 0.060 af (39% of inflow)
Center-of-Mass det. time= 207.3 min (1,014.3 - 807.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	167.60'	1,850 cf	**101.00'W x 38.00'L x 3.00'H Field A** 11,514 cf Overall - 5,346 cf Embedded = 6,168 cf x 30.0% Voids
#2A	168.10'	5,186 cf	**StormTank 18W** x 792 Inside #1 Inside= 36.0"W x 18.0"H => 4.37 sf x 1.50'L = 6.5 cf Outside= 36.0"W x 18.0"H => 4.50 sf x 1.50'L = 6.8 cf
		7,036 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	169.00'	**6.0" Round Culvert** L= 28.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 169.00' / 167.00' S= 0.0714 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.12 cfs @ 14.09 hrs HW=169.21' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.12 cfs @ 1.56 fps)

Pond P-1A: Subsurface Detention/Infiltration basin - Chamber Wizard Field A

Chamber Model = StormTank 18W
Inside= 36.0"W x 18.0"H => 4.37 sf x 1.50'L = 6.5 cf
Outside= 36.0"W x 18.0"H => 4.50 sf x 1.50'L = 6.8 cf

36.0" Wide = 36.0" C-C Row Spacing

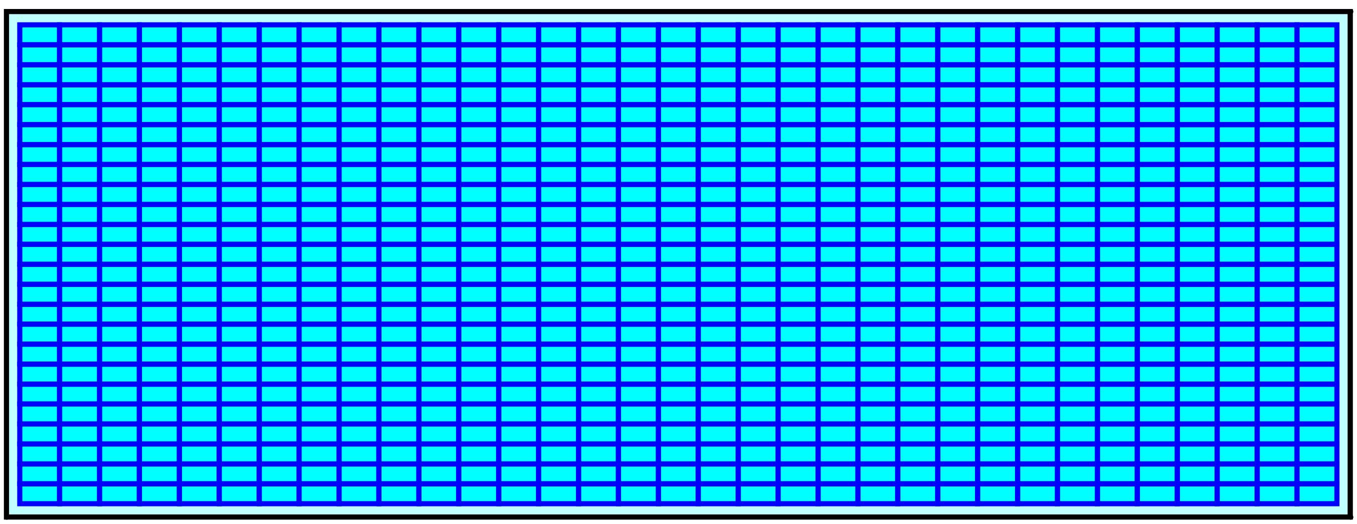
24 Chambers/Row x 1.50' Long = 36.00' Row Length +12.0" End Stone x 2 = 38.00' Base Length
33 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 101.00' Base Width
6.0" Base + 18.0" Chamber Height + 12.0" Cover = 3.00' Field Height

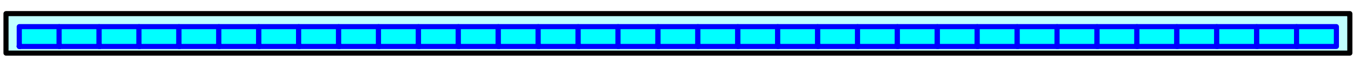
792 Chambers x 6.5 cf = 5,185.6 cf Chamber Storage
792 Chambers x 6.8 cf = 5,346.0 cf Displacement

11,514.0 cf Field - 5,346.0 cf Chambers = 6,168.0 cf Stone x 30.0% Voids = 1,850.4 cf Stone Storage

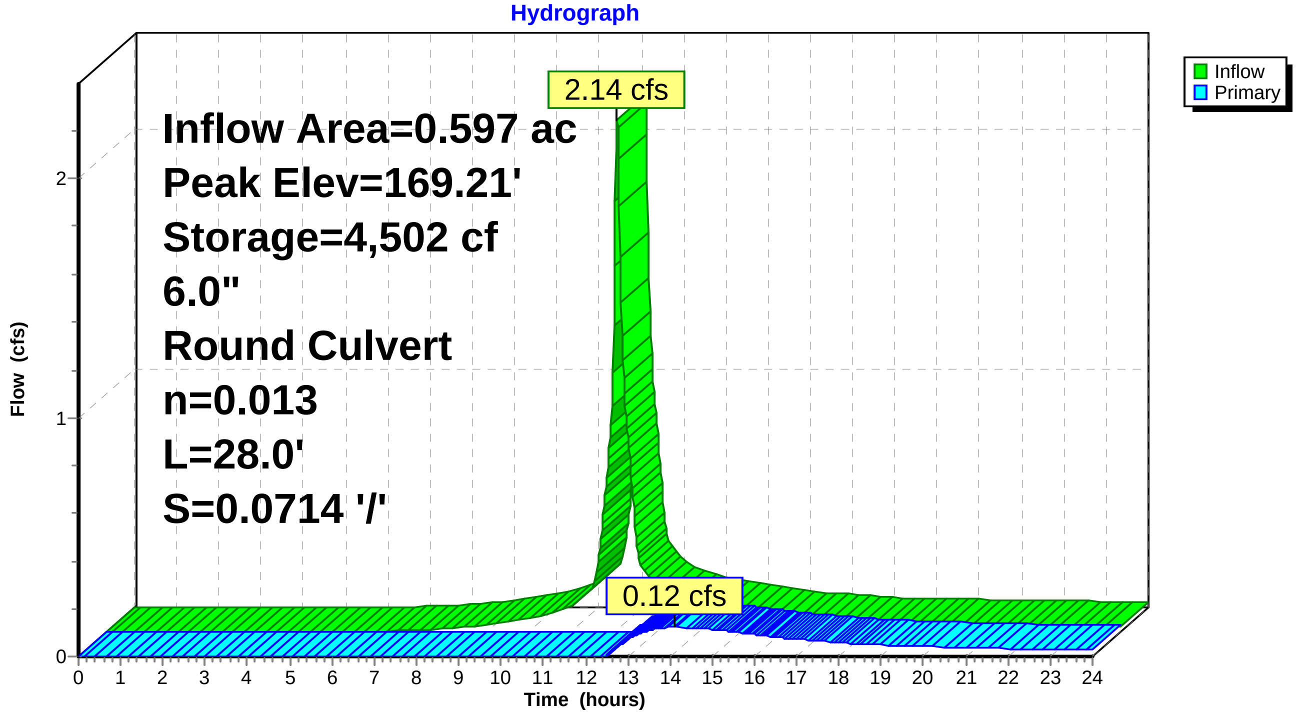
Chamber Storage + Stone Storage = 7,036.0 cf = 0.162 af
Overall Storage Efficiency = 61.1%

792 Chambers
426.4 cy Field
228.4 cy Stone





Pond P-1A: Subsurface Detention/Infiltration basin



Stage-Area-Storage for Pond P-1A: Subsurface Detention/Infiltration basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
167.60	0	168.66	2,558	169.72	6,023
167.62	23	168.68	2,628	169.74	6,046
167.64	46	168.70	2,699	169.76	6,069
167.66	69	168.72	2,770	169.78	6,092
167.68	92	168.74	2,841	169.80	6,115
167.70	115	168.76	2,912	169.82	6,138
167.72	138	168.78	2,982	169.84	6,161
167.74	161	168.80	3,053	169.86	6,184
167.76	184	168.82	3,124	169.88	6,207
167.78	207	168.84	3,195	169.90	6,230
167.80	230	168.86	3,266	169.92	6,253
167.82	253	168.88	3,336	169.94	6,276
167.84	276	168.90	3,407	169.96	6,299
167.86	299	168.92	3,478	169.98	6,322
167.88	322	168.94	3,549	170.00	6,345
167.90	345	168.96	3,619	170.02	6,368
167.92	368	168.98	3,690	170.04	6,391
167.94	391	169.00	3,761	170.06	6,414
167.96	415	169.02	3,832	170.08	6,437
167.98	438	169.04	3,903	170.10	6,460
168.00	461	169.06	3,973	170.12	6,483
168.02	484	169.08	4,044	170.14	6,506
168.04	507	169.10	4,115	170.16	6,529
168.06	530	169.12	4,186	170.18	6,552
168.08	553	169.14	4,257	170.20	6,575
168.10	576	169.16	4,327	170.22	6,598
168.12	646	169.18	4,398	170.24	6,622
168.14	717	169.20	4,469	170.26	6,645
168.16	788	169.22	4,540	170.28	6,668
168.18	859	169.24	4,610	170.30	6,691
168.20	930	169.26	4,681	170.32	6,714
168.22	1,000	169.28	4,752	170.34	6,737
168.24	1,071	169.30	4,823	170.36	6,760
168.26	1,142	169.32	4,894	170.38	6,783
168.28	1,213	169.34	4,964	170.40	6,806
168.30	1,284	169.36	5,035	170.42	6,829
168.32	1,354	169.38	5,106	170.44	6,852
168.34	1,425	169.40	5,177	170.46	6,875
168.36	1,496	169.42	5,248	170.48	6,898
168.38	1,567	169.44	5,318	170.50	6,921
168.40	1,637	169.46	5,389	170.52	6,944
168.42	1,708	169.48	5,460	170.54	6,967
168.44	1,779	169.50	5,531	170.56	6,990
168.46	1,850	169.52	5,601	170.58	7,013
168.48	1,921	169.54	5,672	170.60	**7,036**
168.50	1,991	169.56	5,743		
168.52	2,062	169.58	5,814		
168.54	2,133	169.60	5,885		
168.56	2,204	169.62	5,908		
168.58	2,275	169.64	5,931		
168.60	2,345	169.66	5,954		
168.62	2,416	169.68	5,977		
168.64	2,487	169.70	6,000		

Summary for Pond P-1C: Bioretention basin

Inflow Area = 1.707 ac, 58.27% Impervious, Inflow Depth > 2.81" for 10 YEAR event
Inflow = 5.61 cfs @ 12.09 hrs, Volume= 0.400 af
Outflow = 1.72 cfs @ 12.42 hrs, Volume= 0.325 af, Atten= 69%, Lag= 20.2 min
Primary = 1.72 cfs @ 12.42 hrs, Volume= 0.325 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 162.80' @ 12.42 hrs Surf.Area= 6,455 sf Storage= 7,229 cf

Plug-Flow detention time= 144.0 min calculated for 0.325 af (81% of inflow)
Center-of-Mass det. time= 70.8 min (887.0 - 816.2)

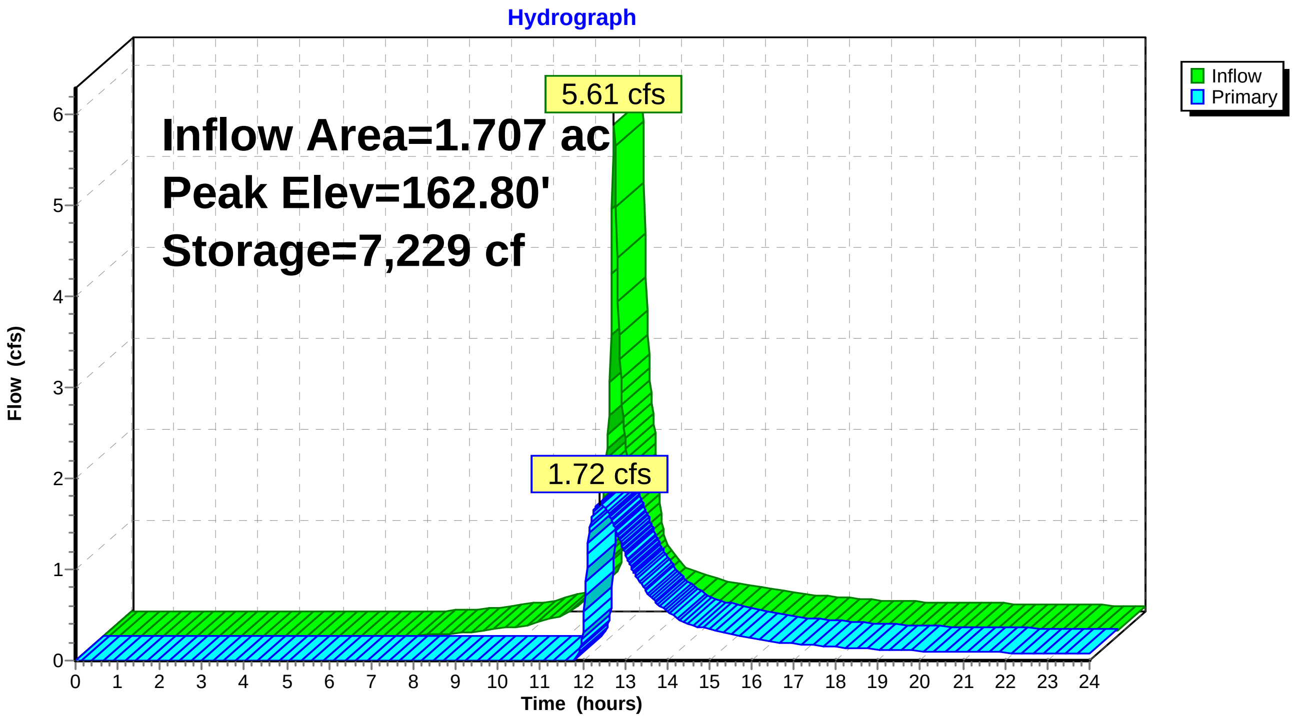
Volume	Invert	Avail.Storage	Storage Description
#1	161.50'	15,835 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.50	4,260	0	0
162.00	5,520	2,445	2,445
163.00	6,690	6,105	8,550
164.00	7,880	7,285	15,835

Device	Routing	Invert	Outlet Devices
#1	Primary	161.00'	**10.0" Round Culvert** L= 107.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.00' / 159.00' S= 0.0187 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Device 1	162.10'	**8.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	162.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.72 cfs @ 12.42 hrs HW=162.80' (Free Discharge)
└─**1=Culvert** (Passes 1.72 cfs of 3.09 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.02 cfs @ 2.91 fps)
  └─**3=Orifice/Grate** (Orifice Controls 0.70 cfs @ 3.57 fps)

Pond P-1C: Bioretention basin



Stage-Area-Storage for Pond P-1C: Bioretention basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
161.50	4,260	0
161.55	4,386	216
161.60	4,512	439
161.65	4,638	667
161.70	4,764	902
161.75	4,890	1,144
161.80	5,016	1,391
161.85	5,142	1,645
161.90	5,268	1,906
161.95	5,394	2,172
162.00	5,520	2,445
162.05	5,579	2,722
162.10	5,637	3,003
162.15	5,696	3,286
162.20	5,754	3,572
162.25	5,813	3,862
162.30	5,871	4,154
162.35	5,929	4,449
162.40	5,988	4,747
162.45	6,046	5,047
162.50	6,105	5,351
162.55	6,164	5,658
162.60	6,222	5,968
162.65	6,281	6,280
162.70	6,339	6,596
162.75	6,398	6,914
162.80	6,456	7,235
162.85	6,514	7,560
162.90	6,573	7,887
162.95	6,631	8,217
163.00	6,690	8,550
163.05	6,750	8,886
163.10	6,809	9,225
163.15	6,869	9,567
163.20	6,928	9,912
163.25	6,988	10,260
163.30	7,047	10,611
163.35	7,106	10,964
163.40	7,166	11,321
163.45	7,225	11,681
163.50	7,285	12,044
163.55	7,345	12,409
163.60	7,404	12,778
163.65	7,464	13,150
163.70	7,523	13,525
163.75	7,583	13,902
163.80	7,642	14,283
163.85	7,701	14,666
163.90	7,761	15,053
163.95	7,820	15,442
164.00	**7,880**	**15,835**

Summary for Pond P-1E: Subsurface Detention basin

Inflow Area = 0.673 ac, 64.43% Impervious, Inflow Depth > 3.00" for 10 YEAR event
Inflow = 2.35 cfs @ 12.09 hrs, Volume= 0.168 af
Outflow = 0.54 cfs @ 12.50 hrs, Volume= 0.111 af, Atten= 77%, Lag= 24.5 min
Primary = 0.54 cfs @ 12.50 hrs, Volume= 0.111 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 163.88' @ 12.50 hrs Surf.Area= 2,542 sf Storage= 3,594 cf

Plug-Flow detention time= 194.6 min calculated for 0.111 af (66% of inflow)
Center-of-Mass det. time= 96.5 min (906.7 - 810.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	162.00'	1,265 cf	**62.00'W x 41.00'L x 3.50'H Field A** 8,897 cf Overall - 4,680 cf Embedded = 4,217 cf x 30.0% Voids
#2A	162.50'	4,540 cf	**StormTank 24W** x 520 Inside #1 Inside= 36.0"W x 24.0"H => 5.82 sf x 1.50'L = 8.7 cf Outside= 36.0"W x 24.0"H => 6.00 sf x 1.50'L = 9.0 cf
		5,805 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	163.30'	**6.0" Round Culvert** L= 93.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 163.30' / 159.10' S= 0.0452 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.54 cfs @ 12.50 hrs HW=163.88' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.54 cfs @ 2.76 fps)

Pond P-1E: Subsurface Detention basin - Chamber Wizard Field A

Chamber Model = StormTank 24W
Inside= 36.0"W x 24.0"H => 5.82 sf x 1.50'L = 8.7 cf
Outside= 36.0"W x 24.0"H => 6.00 sf x 1.50'L = 9.0 cf

36.0" Wide = 36.0" C-C Row Spacing

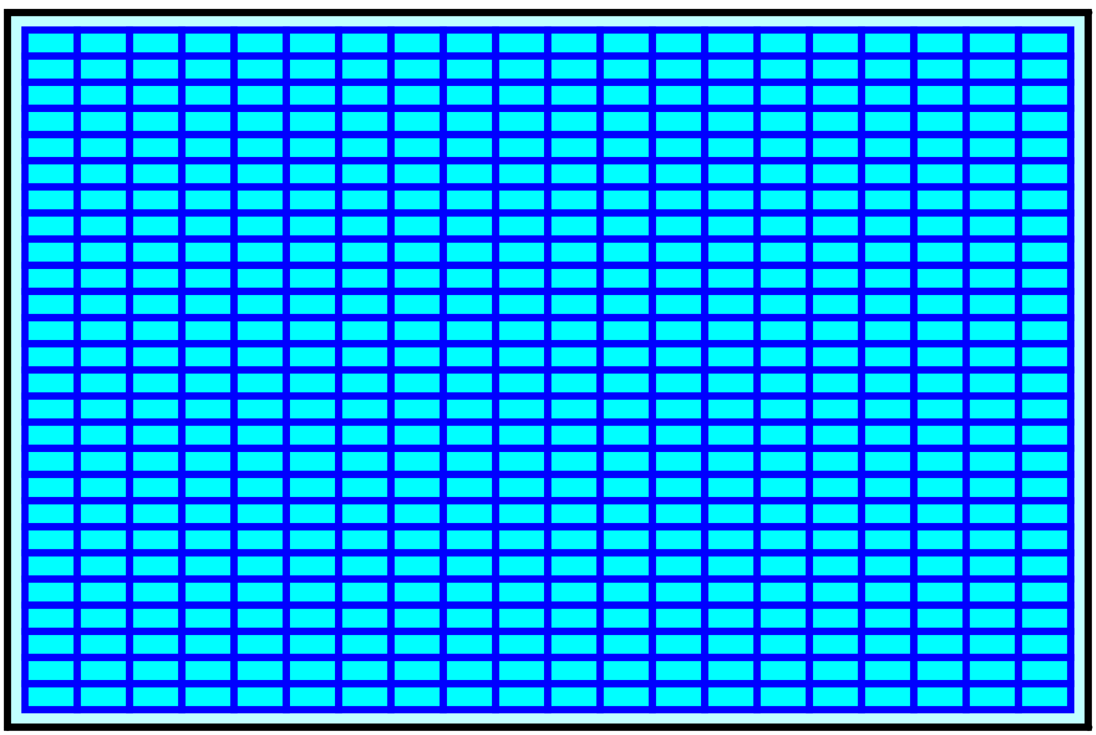
26 Chambers/Row x 1.50' Long = 39.00' Row Length +12.0" End Stone x 2 = 41.00' Base Length
20 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 62.00' Base Width
6.0" Base + 24.0" Chamber Height + 12.0" Cover = 3.50' Field Height

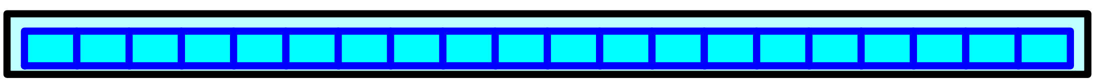
520 Chambers x 8.7 cf = 4,539.6 cf Chamber Storage
520 Chambers x 9.0 cf = 4,680.0 cf Displacement

8,897.0 cf Field - 4,680.0 cf Chambers = 4,217.0 cf Stone x 30.0% Voids = 1,265.1 cf Stone Storage

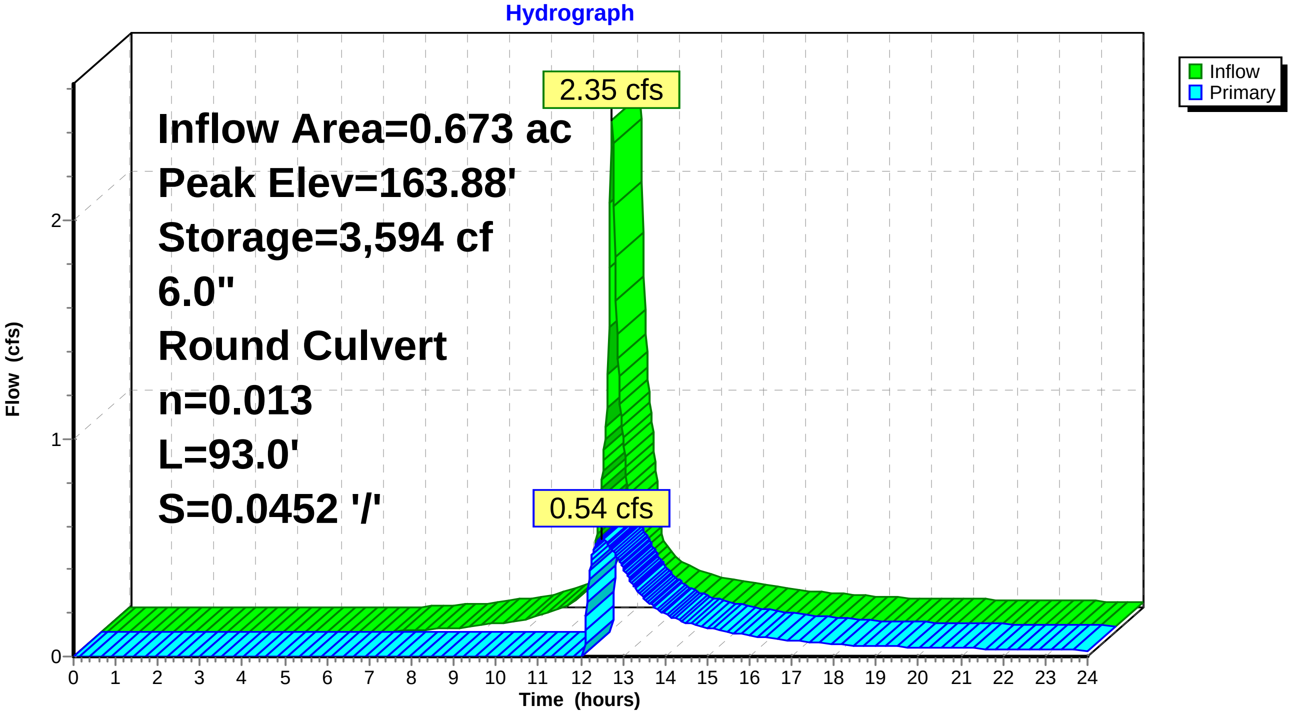
Chamber Storage + Stone Storage = 5,804.7 cf = 0.133 af
Overall Storage Efficiency = 65.2%

520 Chambers
329.5 cy Field
156.2 cy Stone





Pond P-1E: Subsurface Detention basin



Stage-Area-Storage for Pond P-1E: Subsurface Detention basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
162.00	0	164.65	5,156
162.05	38	164.70	5,195
162.10	76	164.75	5,233
162.15	114	164.80	5,271
162.20	153	164.85	5,309
162.25	191	164.90	5,347
162.30	229	164.95	5,385
162.35	267	165.00	5,423
162.40	305	165.05	5,462
162.45	343	165.10	5,500
162.50	381	165.15	5,538
162.55	498	165.20	5,576
162.60	614	165.25	5,614
162.65	731	165.30	5,652
162.70	847	165.35	5,690
162.75	964	165.40	5,728
162.80	1,080	165.45	5,767
162.85	1,197	165.50	**5,805**
162.90	1,313		
162.95	1,430		
163.00	1,547		
163.05	1,663		
163.10	1,780		
163.15	1,896		
163.20	2,013		
163.25	2,129		
163.30	2,246		
163.35	2,362		
163.40	2,479		
163.45	2,595		
163.50	2,712		
163.55	2,828		
163.60	2,945		
163.65	3,061		
163.70	3,178		
163.75	3,294		
163.80	3,411		
163.85	3,527		
163.90	3,644		
163.95	3,760		
164.00	3,877		
164.05	3,993		
164.10	4,110		
164.15	4,226		
164.20	4,343		
164.25	4,460		
164.30	4,576		
164.35	4,693		
164.40	4,809		
164.45	4,926		
164.50	5,042		
164.55	5,080		
164.60	5,118		

Summary for Pond P-1F: Subsurface Detention/Infiltration basin

Inflow Area = 0.460 ac, 69.87% Impervious, Inflow Depth > 3.19" for 10 YEAR event
Inflow = 1.70 cfs @ 12.09 hrs, Volume= 0.122 af
Outflow = 0.88 cfs @ 12.23 hrs, Volume= 0.093 af, Atten= 48%, Lag= 8.5 min
Primary = 0.88 cfs @ 12.23 hrs, Volume= 0.093 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 159.84' @ 12.23 hrs Surf.Area= 1,504 sf Storage= 2,044 cf

Plug-Flow detention time= 147.1 min calculated for 0.093 af (76% of inflow)
Center-of-Mass det. time= 64.6 min (868.3 - 803.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	158.00'	746 cf	**47.00'W x 32.00'L x 3.00'H Field A** 4,512 cf Overall - 2,025 cf Embedded = 2,487 cf x 30.0% Voids
#2A	158.50'	1,964 cf	**StormTank 18W** x 300 Inside #1 Inside= 36.0"W x 18.0"H => 4.37 sf x 1.50'L = 6.5 cf Outside= 36.0"W x 18.0"H => 4.50 sf x 1.50'L = 6.8 cf
		2,710 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	159.20'	**8.0" Round Culvert** L= 2.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.20' / 159.10' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.88 cfs @ 12.23 hrs HW=159.84' (Free Discharge)
1=Culvert (Barrel Controls 0.88 cfs @ 3.25 fps)

Pond P-1F: Subsurface Detention/Infiltration basin - Chamber Wizard Field A

Chamber Model = StormTank 18W
Inside= 36.0"W x 18.0"H => 4.37 sf x 1.50'L = 6.5 cf
Outside= 36.0"W x 18.0"H => 4.50 sf x 1.50'L = 6.8 cf

36.0" Wide = 36.0" C-C Row Spacing

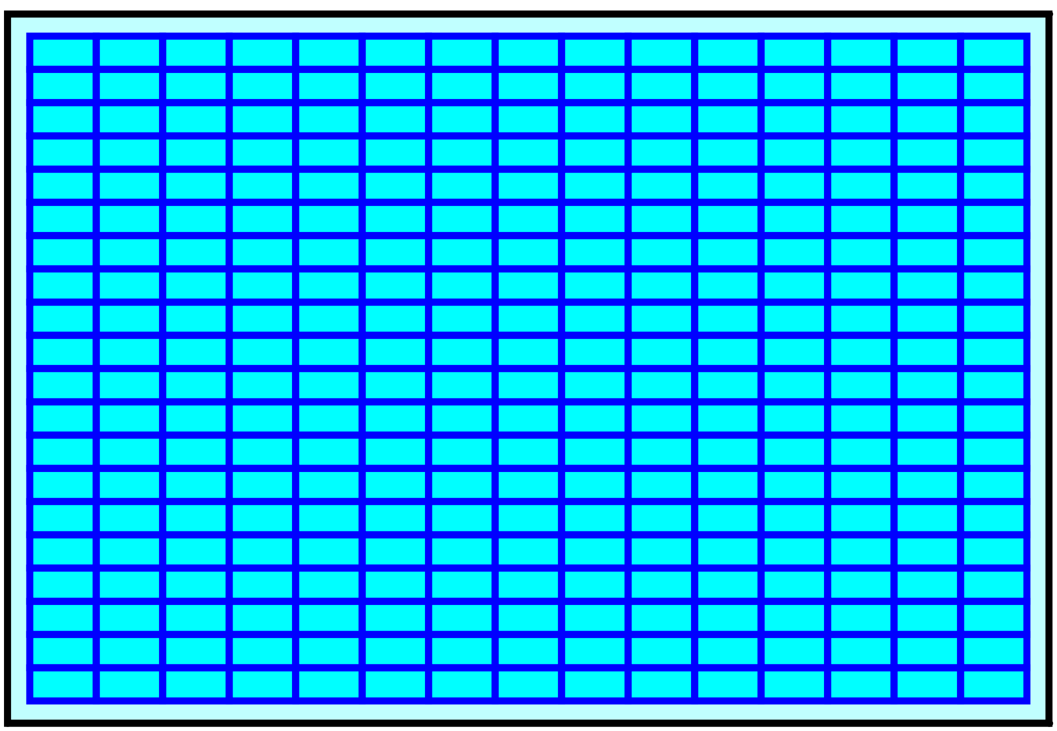
20 Chambers/Row x 1.50' Long = 30.00' Row Length +12.0" End Stone x 2 = 32.00' Base Length
15 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 47.00' Base Width
6.0" Base + 18.0" Chamber Height + 12.0" Cover = 3.00' Field Height

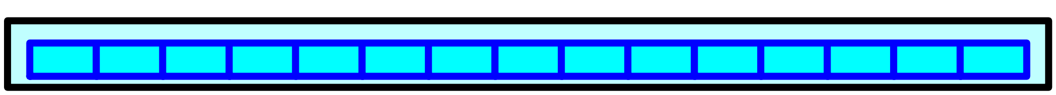
300 Chambers x 6.5 cf = 1,964.3 cf Chamber Storage
300 Chambers x 6.8 cf = 2,025.0 cf Displacement

4,512.0 cf Field - 2,025.0 cf Chambers = 2,487.0 cf Stone x 30.0% Voids = 746.1 cf Stone Storage

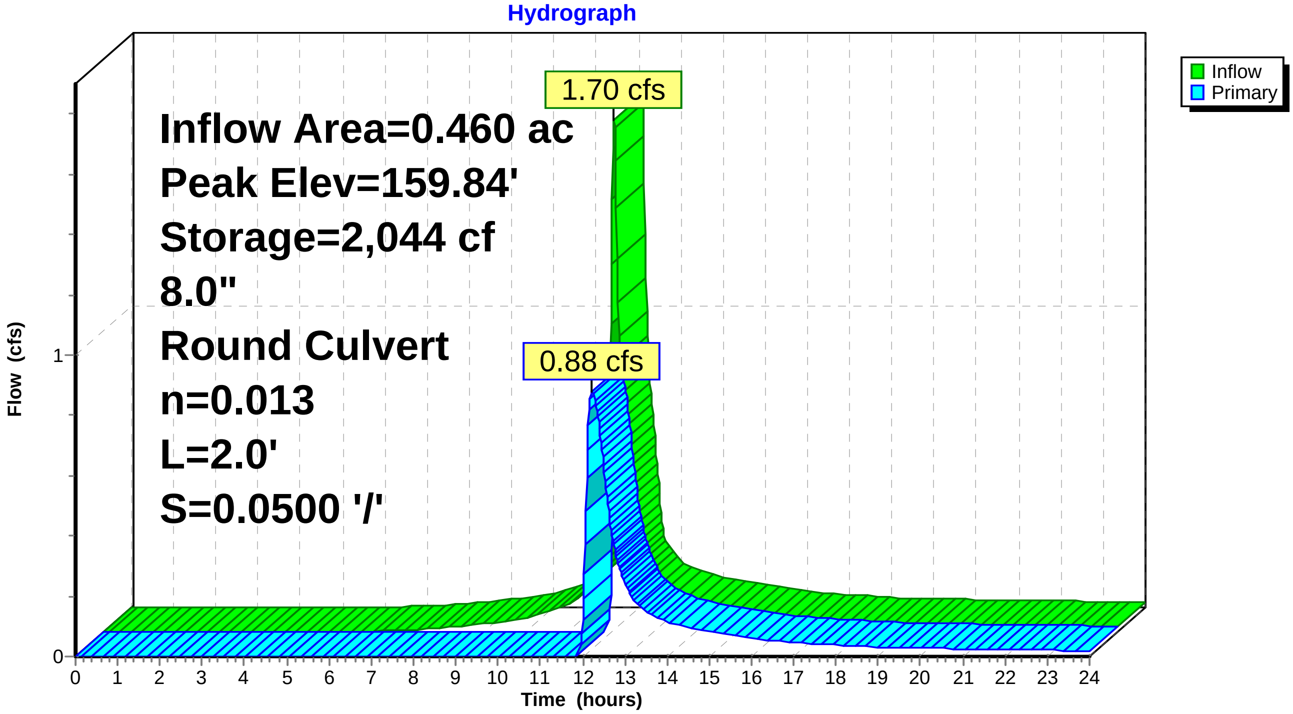
Chamber Storage + Stone Storage = 2,710.4 cf = 0.062 af
Overall Storage Efficiency = 60.1%

300 Chambers
167.1 cy Field
92.1 cy Stone





Pond P-1F: Subsurface Detention/Infiltration basin



Stage-Area-Storage for Pond P-1F: Subsurface Detention/Infiltration basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
158.00	0	159.06	985	160.12	2,313
158.02	9	159.08	1,012	160.14	2,322
158.04	18	159.10	1,039	160.16	2,331
158.06	27	159.12	1,066	160.18	2,340
158.08	36	159.14	1,093	160.20	2,349
158.10	45	159.16	1,120	160.22	2,358
158.12	54	159.18	1,147	160.24	2,367
158.14	63	159.20	1,175	160.26	2,376
158.16	72	159.22	1,202	160.28	2,385
158.18	81	159.24	1,229	160.30	2,395
158.20	90	159.26	1,256	160.32	2,404
158.22	99	159.28	1,283	160.34	2,413
158.24	108	159.30	1,310	160.36	2,422
158.26	117	159.32	1,337	160.38	2,431
158.28	126	159.34	1,364	160.40	2,440
158.30	135	159.36	1,392	160.42	2,449
158.32	144	159.38	1,419	160.44	2,458
158.34	153	159.40	1,446	160.46	2,467
158.36	162	159.42	1,473	160.48	2,476
158.38	171	159.44	1,500	160.50	2,485
158.40	180	159.46	1,527	160.52	2,494
158.42	190	159.48	1,554	160.54	2,503
158.44	199	159.50	1,581	160.56	2,512
158.46	208	159.52	1,608	160.58	2,521
158.48	217	159.54	1,636	160.60	2,530
158.50	226	159.56	1,663	160.62	2,539
158.52	253	159.58	1,690	160.64	2,548
158.54	280	159.60	1,717	160.66	2,557
158.56	307	159.62	1,744	160.68	2,566
158.58	334	159.64	1,771	160.70	2,575
158.60	361	159.66	1,798	160.72	2,584
158.62	388	159.68	1,825	160.74	2,593
158.64	415	159.70	1,852	160.76	2,602
158.66	443	159.72	1,880	160.78	2,611
158.68	470	159.74	1,907	160.80	2,620
158.70	497	159.76	1,934	160.82	2,629
158.72	524	159.78	1,961	160.84	2,638
158.74	551	159.80	1,988	160.86	2,647
158.76	578	159.82	2,015	160.88	2,656
158.78	605	159.84	2,042	160.90	2,665
158.80	632	159.86	2,069	160.92	2,674
158.82	659	159.88	2,096	160.94	2,683
158.84	687	159.90	2,124	160.96	2,692
158.86	714	159.92	2,151	160.98	2,701
158.88	741	159.94	2,178	161.00	**2,710**
158.90	768	159.96	2,205		
158.92	795	159.98	2,232		
158.94	822	160.00	2,259		
158.96	849	160.02	2,268		
158.98	876	160.04	2,277		
159.00	903	160.06	2,286		
159.02	931	160.08	2,295		
159.04	958	160.10	2,304		

Summary for Pond P-4B: Subsurface Detention basin

Inflow Area =	1.123 ac, 75.71% Impervious, Inflow Depth > 3.39" for 10 YEAR event			
Inflow =	4.35 cfs @	12.09 hrs, Volume=	0.317 af	
Outflow =	0.18 cfs @	15.17 hrs, Volume=	0.097 af,	Atten= 96%, Lag= 185.1 min
Primary =	0.18 cfs @	15.17 hrs, Volume=	0.097 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 191.27' @ 15.17 hrs Surf.Area= 5,704 sf Storage= 10,266 cf

Plug-Flow detention time= 397.1 min calculated for 0.097 af (31% of inflow)
Center-of-Mass det. time= 258.3 min (1,055.1 - 796.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	189.00'	2,749 cf	**92.00'W x 62.00'L x 3.50'H Field A** 19,964 cf Overall - 10,800 cf Embedded = 9,164 cf x 30.0% Voids
#2A	189.50'	10,476 cf	**StormTank 24W** x 1200 Inside #1 Inside= 36.0"W x 24.0"H => 5.82 sf x 1.50'L = 8.7 cf Outside= 36.0"W x 24.0"H => 6.00 sf x 1.50'L = 9.0 cf
		13,225 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	191.00'	**6.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 191.00' / 190.90' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.18 cfs @ 15.17 hrs HW=191.27' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.18 cfs @ 2.45 fps)

Pond P-4B: Subsurface Detention basin - Chamber Wizard Field A

Chamber Model = StormTank 24W
Inside= 36.0"W x 24.0"H => 5.82 sf x 1.50'L = 8.7 cf
Outside= 36.0"W x 24.0"H => 6.00 sf x 1.50'L = 9.0 cf

36.0" Wide = 36.0" C-C Row Spacing

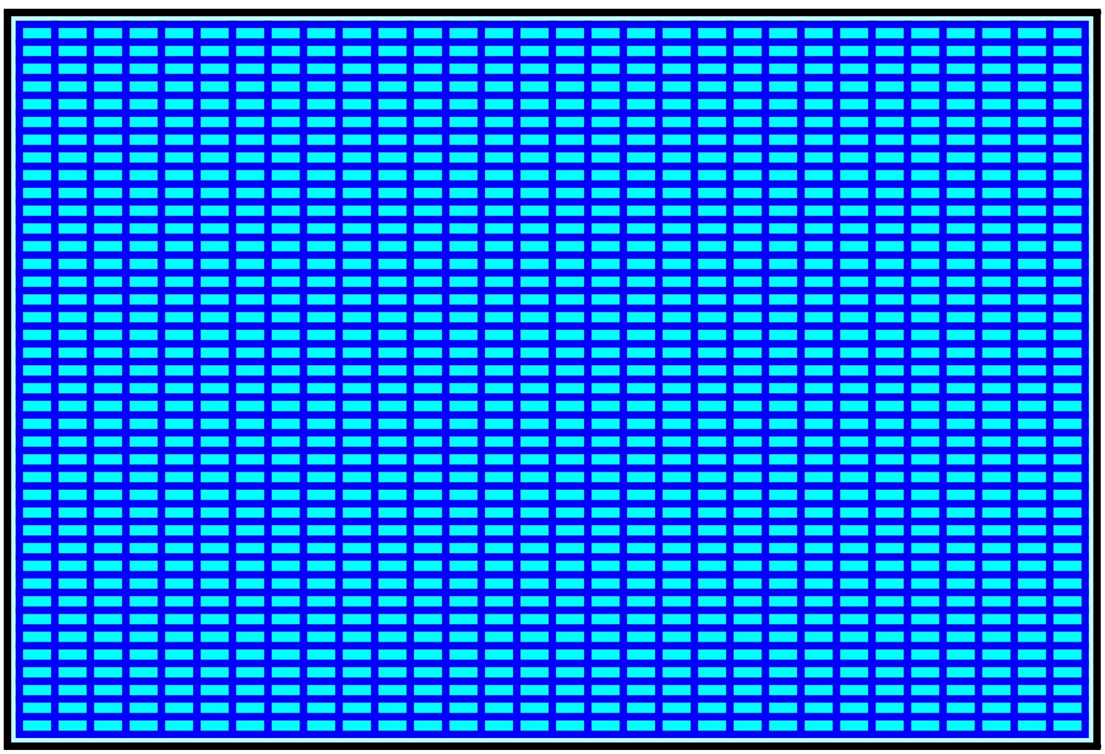
40 Chambers/Row x 1.50' Long = 60.00' Row Length +12.0" End Stone x 2 = 62.00' Base Length
30 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 92.00' Base Width
6.0" Base + 24.0" Chamber Height + 12.0" Cover = 3.50' Field Height

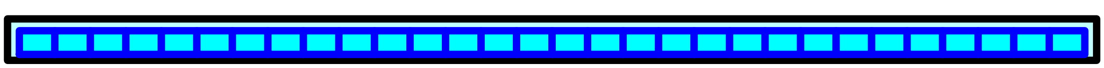
1,200 Chambers x 8.7 cf = 10,476.0 cf Chamber Storage
1,200 Chambers x 9.0 cf = 10,800.0 cf Displacement

19,964.0 cf Field - 10,800.0 cf Chambers = 9,164.0 cf Stone x 30.0% Voids = 2,749.2 cf Stone Storage

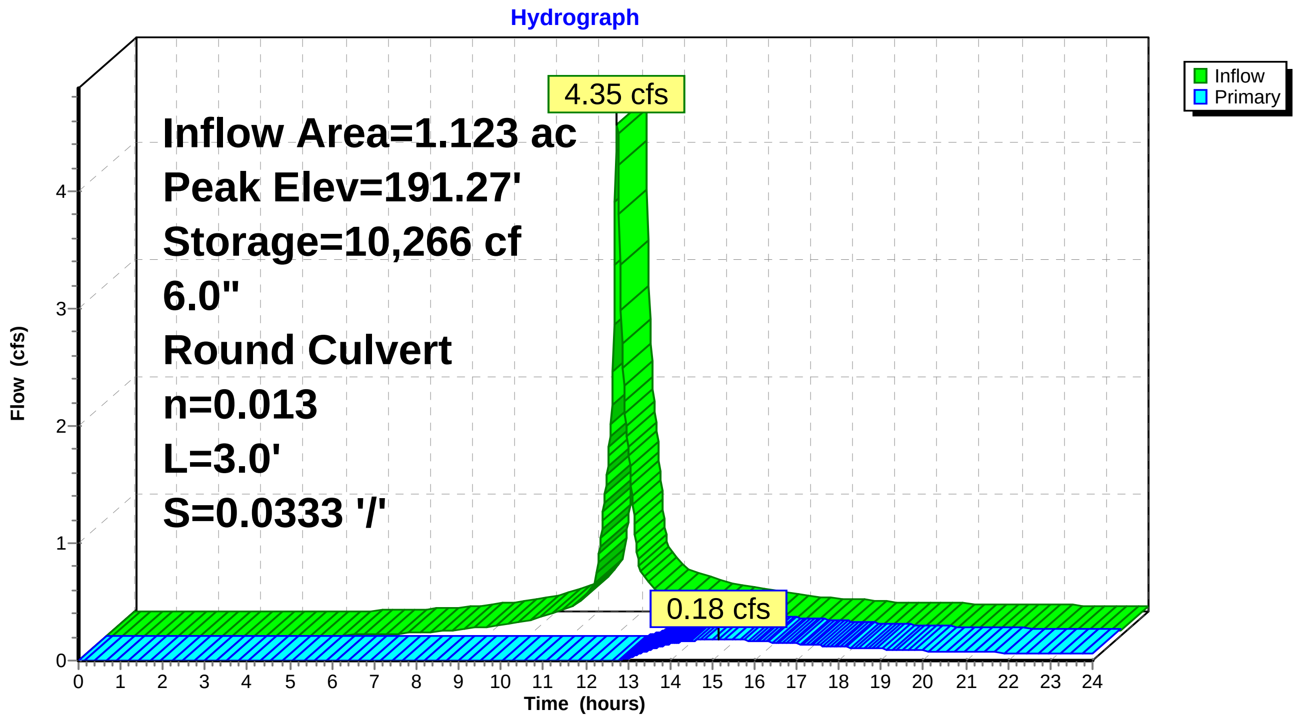
Chamber Storage + Stone Storage = 13,225.2 cf = 0.304 af
Overall Storage Efficiency = 66.2%

1,200 Chambers
739.4 cy Field
339.4 cy Stone





Pond P-4B: Subsurface Detention basin



Stage-Area-Storage for Pond P-4B: Subsurface Detention basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
189.00	0	191.65	11,771
189.05	86	191.70	11,856
189.10	171	191.75	11,942
189.15	257	191.80	12,027
189.20	342	191.85	12,113
189.25	428	191.90	12,198
189.30	513	191.95	12,284
189.35	599	192.00	12,370
189.40	684	192.05	12,455
189.45	770	192.10	12,541
189.50	856	192.15	12,626
189.55	1,122	192.20	12,712
189.60	1,389	192.25	12,797
189.65	1,655	192.30	12,883
189.70	1,921	192.35	12,969
189.75	2,188	192.40	13,054
189.80	2,454	192.45	13,140
189.85	2,721	192.50	**13,225**
189.90	2,987		
189.95	3,254		
190.00	3,520		
190.05	3,787		
190.10	4,053		
190.15	4,320		
190.20	4,586		
190.25	4,853		
190.30	5,119		
190.35	5,385		
190.40	5,652		
190.45	5,918		
190.50	6,185		
190.55	6,451		
190.60	6,718		
190.65	6,984		
190.70	7,251		
190.75	7,517		
190.80	7,784		
190.85	8,050		
190.90	8,316		
190.95	8,583		
191.00	8,849		
191.05	9,116		
191.10	9,382		
191.15	9,649		
191.20	9,915		
191.25	10,182		
191.30	10,448		
191.35	10,715		
191.40	10,981		
191.45	11,248		
191.50	11,514		
191.55	11,600		
191.60	11,685		

Summary for Pond P-4C: Subsurface Detention/Infiltration basin

Inflow Area = 3.805 ac, 60.65% Impervious, Inflow Depth > 1.90" for 10 YEAR event
Inflow = 6.25 cfs @ 12.09 hrs, Volume= 0.603 af
Outflow = 1.26 cfs @ 12.54 hrs, Volume= 0.484 af, Atten= 80%, Lag= 27.1 min
Primary = 1.26 cfs @ 12.54 hrs, Volume= 0.484 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 155.45' @ 12.54 hrs Surf.Area= 5,950 sf Storage= 8,889 cf

Plug-Flow detention time= 164.8 min calculated for 0.483 af (80% of inflow)
Center-of-Mass det. time= 81.1 min (960.9 - 879.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	153.50'	3,002 cf	**140.00'W x 42.50'L x 4.50'H Field A** 26,775 cf Overall - 16,767 cf Embedded = 10,008 cf x 30.0% Voids
#2A	154.00'	16,264 cf	**StormTank 36W** x 1242 Inside #1 Inside= 36.0"W x 36.0"H => 8.73 sf x 1.50'L = 13.1 cf Outside= 36.0"W x 36.0"H => 9.00 sf x 1.50'L = 13.5 cf
		19,266 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	154.55'	**8.0" Round Culvert** L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 154.55' / 154.30' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=1.26 cfs @ 12.54 hrs HW=155.45' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 1.26 cfs @ 3.61 fps)

Pond P-4C: Subsurface Detention/Infiltration basin - Chamber Wizard Field A

Chamber Model = StormTank 36W
Inside= 36.0"W x 36.0"H => 8.73 sf x 1.50'L = 13.1 cf
Outside= 36.0"W x 36.0"H => 9.00 sf x 1.50'L = 13.5 cf

36.0" Wide = 36.0" C-C Row Spacing

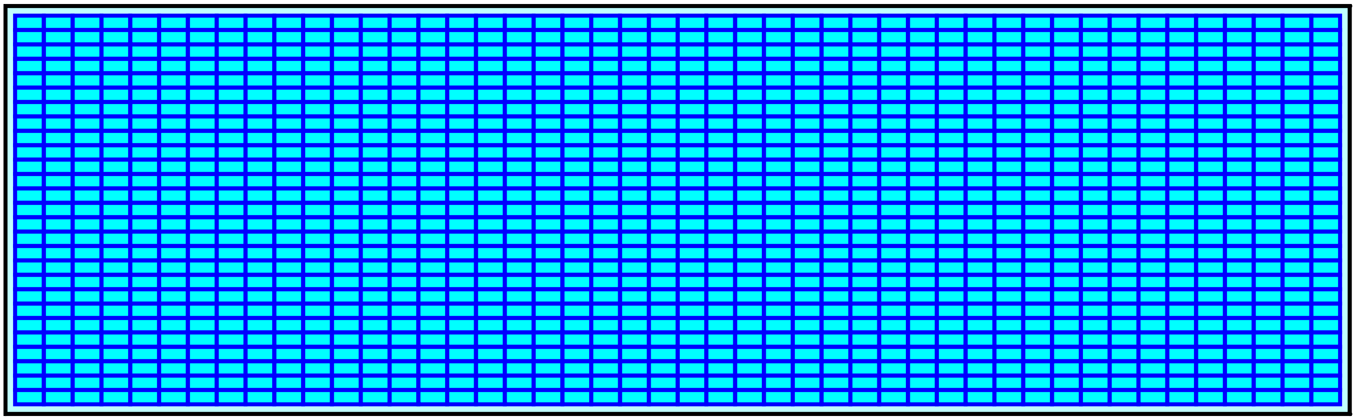
27 Chambers/Row x 1.50' Long = 40.50' Row Length +12.0" End Stone x 2 = 42.50' Base Length
46 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 140.00' Base Width
6.0" Base + 36.0" Chamber Height + 12.0" Cover = 4.50' Field Height

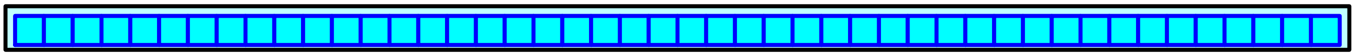
1,242 Chambers x 13.1 cf = 16,264.0 cf Chamber Storage
1,242 Chambers x 13.5 cf = 16,767.0 cf Displacement

26,775.0 cf Field - 16,767.0 cf Chambers = 10,008.0 cf Stone x 30.0% Voids = 3,002.4 cf Stone Storage

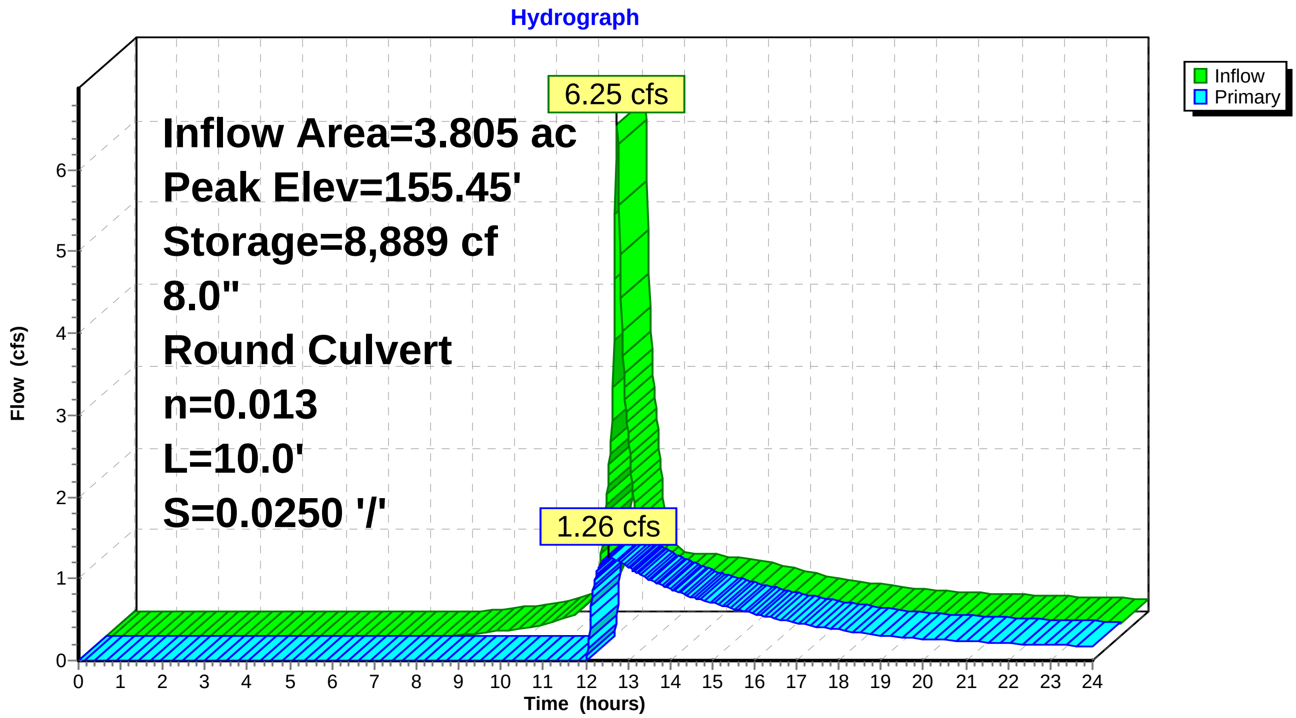
Chamber Storage + Stone Storage = 19,266.4 cf = 0.442 af
Overall Storage Efficiency = 72.0%

1,242 Chambers
991.7 cy Field
370.7 cy Stone





Pond P-4C: Subsurface Detention/Infiltration basin



Stage-Area-Storage for Pond P-4C: Subsurface Detention/Infiltration basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
153.50	0	156.15	12,781
153.55	89	156.20	13,058
153.60	178	156.25	13,334
153.65	268	156.30	13,611
153.70	357	156.35	13,887
153.75	446	156.40	14,164
153.80	536	156.45	14,440
153.85	625	156.50	14,717
153.90	714	156.55	14,993
153.95	803	156.60	15,270
154.00	893	156.65	15,546
154.05	1,169	156.70	15,823
154.10	1,445	156.75	16,099
154.15	1,722	156.80	16,375
154.20	1,998	156.85	16,652
154.25	2,275	156.90	16,928
154.30	2,551	156.95	17,205
154.35	2,828	157.00	17,481
154.40	3,104	157.05	17,571
154.45	3,381	157.10	17,660
154.50	3,657	157.15	17,749
154.55	3,934	157.20	17,838
154.60	4,210	157.25	17,928
154.65	4,487	157.30	18,017
154.70	4,763	157.35	18,106
154.75	5,040	157.40	18,195
154.80	5,316	157.45	18,285
154.85	5,593	157.50	18,374
154.90	5,869	157.55	18,463
154.95	6,146	157.60	18,552
155.00	6,422	157.65	18,642
155.05	6,699	157.70	18,731
155.10	6,975	157.75	18,820
155.15	7,252	157.80	18,909
155.20	7,528	157.85	18,999
155.25	7,805	157.90	19,088
155.30	8,081	157.95	19,177
155.35	8,358	158.00	**19,266**
155.40	8,634		
155.45	8,910		
155.50	9,187		
155.55	9,463		
155.60	9,740		
155.65	10,016		
155.70	10,293		
155.75	10,569		
155.80	10,846		
155.85	11,122		
155.90	11,399		
155.95	11,675		
156.00	11,952		
156.05	12,228		
156.10	12,505		

Summary for Pond P-4D: porous asphalt pavement

Inflow Area =	0.588 ac, 63.76% Impervious,	Inflow Depth > 3.00"	for 10 YEAR event
Inflow =	2.05 cfs @ 12.09 hrs,	Volume=	0.147 af
Outflow =	0.13 cfs @ 13.82 hrs,	Volume=	0.061 af, Atten= 94%, Lag= 104.2 min
Primary =	0.13 cfs @ 13.82 hrs,	Volume=	0.061 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 177.46' @ 13.82 hrs Surf.Area= 13,035 sf Storage= 4,127 cf

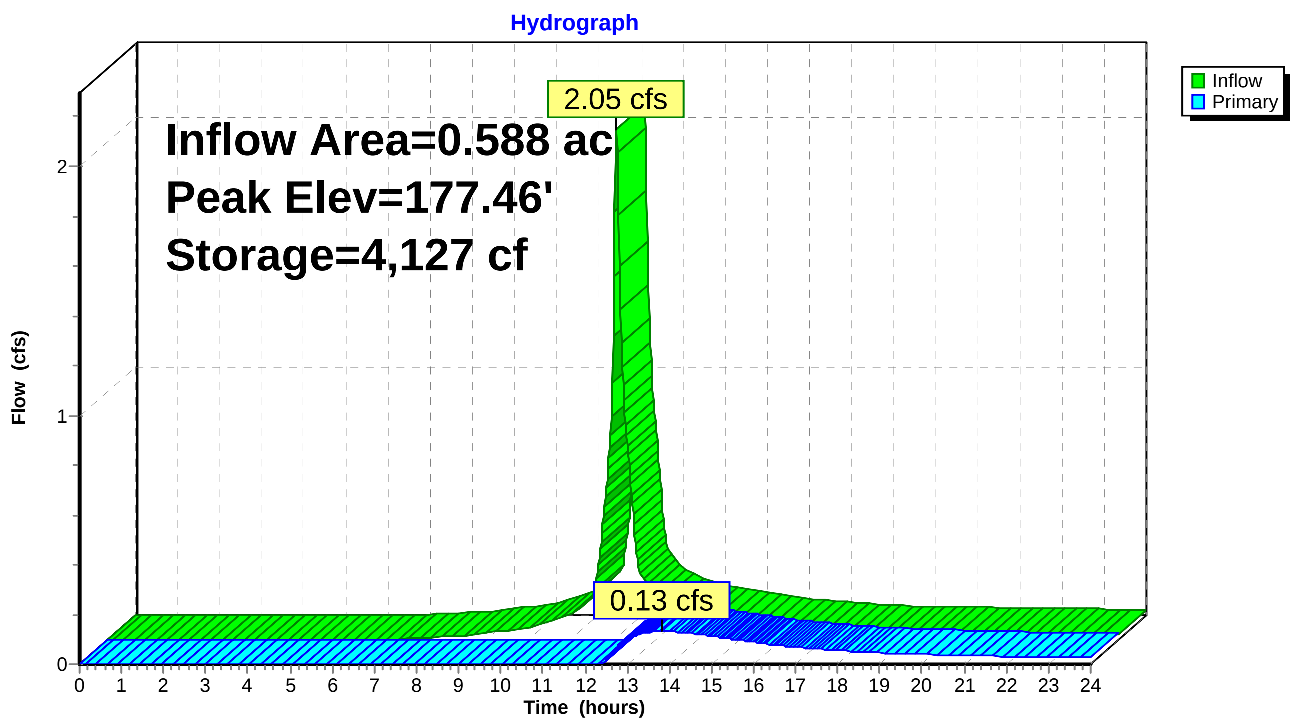
Plug-Flow detention time= 309.0 min calculated for 0.061 af (42% of inflow)
Center-of-Mass det. time= 189.8 min (1,000.0 - 810.2)

Volume	Invert	Avail.Storage	Storage Description
#1	176.40'	7,821 cf	**55.00'W x 237.00'L x 2.00'H Prismatoid** 26,070 cf Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	176.10'	**8.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 176.10' / 175.90' S= 0.0133 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	177.28'	**4.0" Vert. Orifice/Grate X 2.00** C= 0.600

Primary OutFlow Max=0.13 cfs @ 13.82 hrs HW=177.46' (Free Discharge)
└─**1=Culvert** (Passes 0.13 cfs of 1.70 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.13 cfs @ 1.43 fps)

Pond P-4D: porous asphalt pavement



Stage-Area-Storage for Pond P-4D: porous asphalt pavement

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
176.40	0	177.46	4,145
176.42	78	177.48	4,223
176.44	156	177.50	4,302
176.46	235	177.52	4,380
176.48	313	177.54	4,458
176.50	391	177.56	4,536
176.52	469	177.58	4,614
176.54	547	177.60	4,693
176.56	626	177.62	4,771
176.58	704	177.64	4,849
176.60	782	177.66	4,927
176.62	860	177.68	5,005
176.64	939	177.70	5,084
176.66	1,017	177.72	5,162
176.68	1,095	177.74	5,240
176.70	1,173	177.76	5,318
176.72	1,251	177.78	5,396
176.74	1,330	177.80	5,475
176.76	1,408	177.82	5,553
176.78	1,486	177.84	5,631
176.80	1,564	177.86	5,709
176.82	1,642	177.88	5,788
176.84	1,721	177.90	5,866
176.86	1,799	177.92	5,944
176.88	1,877	177.94	6,022
176.90	1,955	177.96	6,100
176.92	2,033	177.98	6,179
176.94	2,112	178.00	6,257
176.96	2,190	178.02	6,335
176.98	2,268	178.04	6,413
177.00	2,346	178.06	6,491
177.02	2,425	178.08	6,570
177.04	2,503	178.10	6,648
177.06	2,581	178.12	6,726
177.08	2,659	178.14	6,804
177.10	2,737	178.16	6,882
177.12	2,816	178.18	6,961
177.14	2,894	178.20	7,039
177.16	2,972	178.22	7,117
177.18	3,050	178.24	7,195
177.20	3,128	178.26	7,274
177.22	3,207	178.28	7,352
177.24	3,285	178.30	7,430
177.26	3,363	178.32	7,508
177.28	3,441	178.34	7,586
177.30	3,519	178.36	7,665
177.32	3,598	178.38	7,743
177.34	3,676	178.40	**7,821**
177.36	3,754		
177.38	3,832		
177.40	3,911		
177.42	3,989		
177.44	4,067		

Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1A: Runoff Area=25,996 sf 68.50% Impervious Runoff Depth>5.07"
Tc=6.0 min CN=86 Runoff=3.44 cfs 0.252 af

Subcatchment PR-1B: Runoff Area=49,468 sf 24.29% Impervious Runoff Depth>3.37"
Tc=6.0 min CN=70 Runoff=4.47 cfs 0.319 af

Subcatchment PR-1C: Runoff Area=74,374 sf 58.27% Impervious Runoff Depth>4.74"
Tc=6.0 min CN=83 Runoff=9.32 cfs 0.675 af

Subcatchment PR-1D: Runoff Area=54,933 sf 10.14% Impervious Runoff Depth>2.87"
Tc=6.0 min CN=65 Runoff=4.18 cfs 0.301 af

Subcatchment PR-1E: Runoff Area=29,315 sf 64.43% Impervious Runoff Depth>4.96"
Tc=6.0 min CN=85 Runoff=3.81 cfs 0.278 af

Subcatchment PR-1F: Runoff Area=20,052 sf 69.87% Impervious Runoff Depth>5.19"
Tc=6.0 min CN=87 Runoff=2.70 cfs 0.199 af

Subcatchment PR-1G: Runoff Area=6,425 sf 5.93% Impervious Runoff Depth>2.67"
Tc=6.0 min CN=63 Runoff=0.45 cfs 0.033 af

Subcatchment PR-3A: Runoff Area=12,308 sf 2.81% Impervious Runoff Depth>2.58"
Tc=6.0 min CN=62 Runoff=0.83 cfs 0.061 af

Subcatchment PR-3B: Runoff Area=22,498 sf 49.72% Impervious Runoff Depth>4.31"
Tc=6.0 min CN=79 Runoff=2.59 cfs 0.185 af

Subcatchment PR-3C: Runoff Area=23,850 sf 0.00% Impervious Runoff Depth>2.30"
Tc=6.0 min CN=59 Runoff=1.41 cfs 0.105 af

Subcatchment PR-4A: Runoff Area=24,808 sf 59.14% Impervious Runoff Depth>4.63"
Tc=6.0 min CN=82 Runoff=3.05 cfs 0.220 af

Subcatchment PR-4B: Runoff Area=48,935 sf 75.71% Impervious Runoff Depth>5.41"
Tc=6.0 min CN=89 Runoff=6.79 cfs 0.507 af

Subcatchment PR-4C: Runoff Area=91,234 sf 51.71% Impervious Runoff Depth>4.41"
Tc=6.0 min CN=80 Runoff=10.75 cfs 0.770 af

Subcatchment PR-4D: Runoff Area=25,594 sf 63.76% Impervious Runoff Depth>4.96"
Tc=6.0 min CN=85 Runoff=3.33 cfs 0.243 af

Subcatchment PR-4E: Runoff Area=45,196 sf 23.63% Impervious Runoff Depth>3.37"
Tc=6.0 min CN=70 Runoff=4.09 cfs 0.291 af

Subcatchment PR-4F: Runoff Area=32,347 sf 34.79% Impervious Runoff Depth>3.78"
Tc=6.0 min CN=74 Runoff=3.29 cfs 0.234 af

Reach DP-1: Wetlands-North Inflow=13.69 cfs 1.795 af
Outflow=13.69 cfs 1.795 af

Reach DP-1A: Inflow=4.53 cfs 0.475 af
Outflow=4.53 cfs 0.475 af

Reach DP-1B: Inflow=6.35 cfs 0.897 af
Outflow=6.35 cfs 0.897 af

Reach DP-1C: Inflow=3.06 cfs 0.422 af
Outflow=3.06 cfs 0.422 af

Reach DP-3: Drain System in Russett Rd. Inflow=4.83 cfs 0.351 af
Outflow=4.83 cfs 0.351 af

Reach DP-3A: Inflow=0.83 cfs 0.061 af
Outflow=0.83 cfs 0.061 af

Reach DP-3B: Inflow=2.59 cfs 0.185 af
Outflow=2.59 cfs 0.185 af

Reach DP-3D: Inflow=1.41 cfs 0.105 af
Outflow=1.41 cfs 0.105 af

Reach DP-4: VFW Parkway Inflow=11.97 cfs 1.828 af
Outflow=11.97 cfs 1.828 af

Reach DP-4A: Inflow=3.05 cfs 0.220 af
Outflow=3.05 cfs 0.220 af

Reach DP-4B: Inflow=5.67 cfs 1.375 af
Outflow=5.67 cfs 1.375 af

Reach DP-4C: Inflow=3.29 cfs 0.234 af
Outflow=3.29 cfs 0.234 af

Pond P-1A: Subsurface Detention/Infiltration Peak Elev=169.72' Storage=6,028 cf Inflow=3.44 cfs 0.252 af
6.0" Round Culvert n=0.013 L=28.0' S=0.0714 '/' Outflow=0.65 cfs 0.157 af

Pond P-1C: Bioretention basin Peak Elev=163.45' Storage=11,645 cf Inflow=9.32 cfs 0.675 af
Outflow=2.72 cfs 0.596 af

Pond P-1E: Subsurface Detention basin Peak Elev=165.07' Storage=5,473 cf Inflow=3.81 cfs 0.278 af
6.0" Round Culvert n=0.013 L=93.0' S=0.0452 '/' Outflow=1.16 cfs 0.220 af

Pond P-1F: Subsurface Detention/Infiltration Peak Elev=160.71' Storage=2,579 cf Inflow=2.70 cfs 0.199 af
8.0" Round Culvert n=0.013 L=2.0' S=0.0500 '/' Outflow=1.82 cfs 0.169 af

Pond P-4B: Subsurface Detention basin Peak Elev=192.36' Storage=12,984 cf Inflow=6.79 cfs 0.507 af
6.0" Round Culvert n=0.013 L=3.0' S=0.0333 '/' Outflow=1.00 cfs 0.283 af

Pond P-4C: Subsurface Peak Elev=157.06' Storage=17,594 cf Inflow=10.84 cfs 1.210 af
8.0" Round Culvert n=0.013 L=10.0' S=0.0250 '/' Outflow=2.48 cfs 1.084 af

Pond P-4D: porous asphalt pavement Peak Elev=177.87' Storage=5,764 cf Inflow=3.33 cfs 0.243 af
Outflow=0.55 cfs 0.156 af

Total Runoff Area = 13.483 ac Runoff Volume = 4.672 af Average Runoff Depth = 4.16"
55.61% Pervious = 7.499 ac 44.39% Impervious = 5.985 ac

Summary for Subcatchment PR-1A:

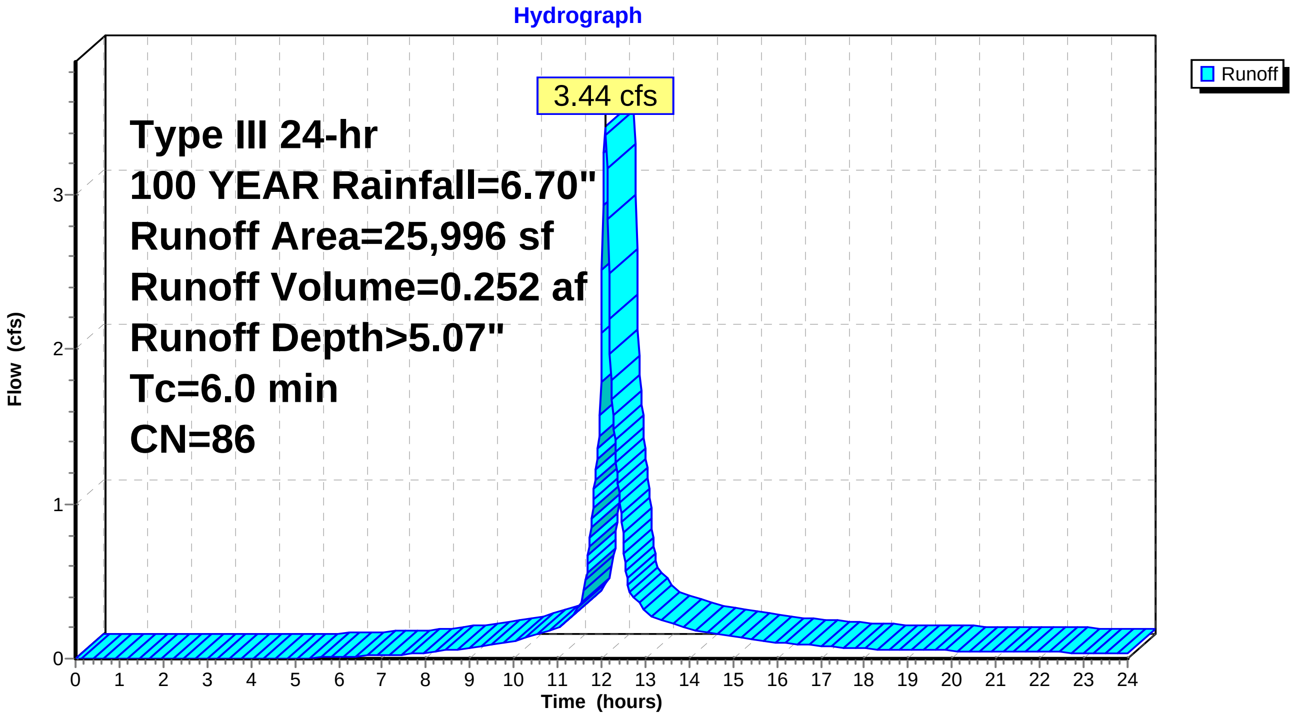
Runoff = 3.44 cfs @ 12.09 hrs, Volume= 0.252 af, Depth> 5.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

Area (sf)	CN	Description
3,297	98	roofs
14,511	98	Paved parking
8,188	61	>75% Grass cover, Good, HSG B
25,996	86	Weighted Average
8,188		31.50% Pervious Area
17,808		68.50% Impervious Area

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

Subcatchment PR-1A:



Summary for Subcatchment PR-1B:

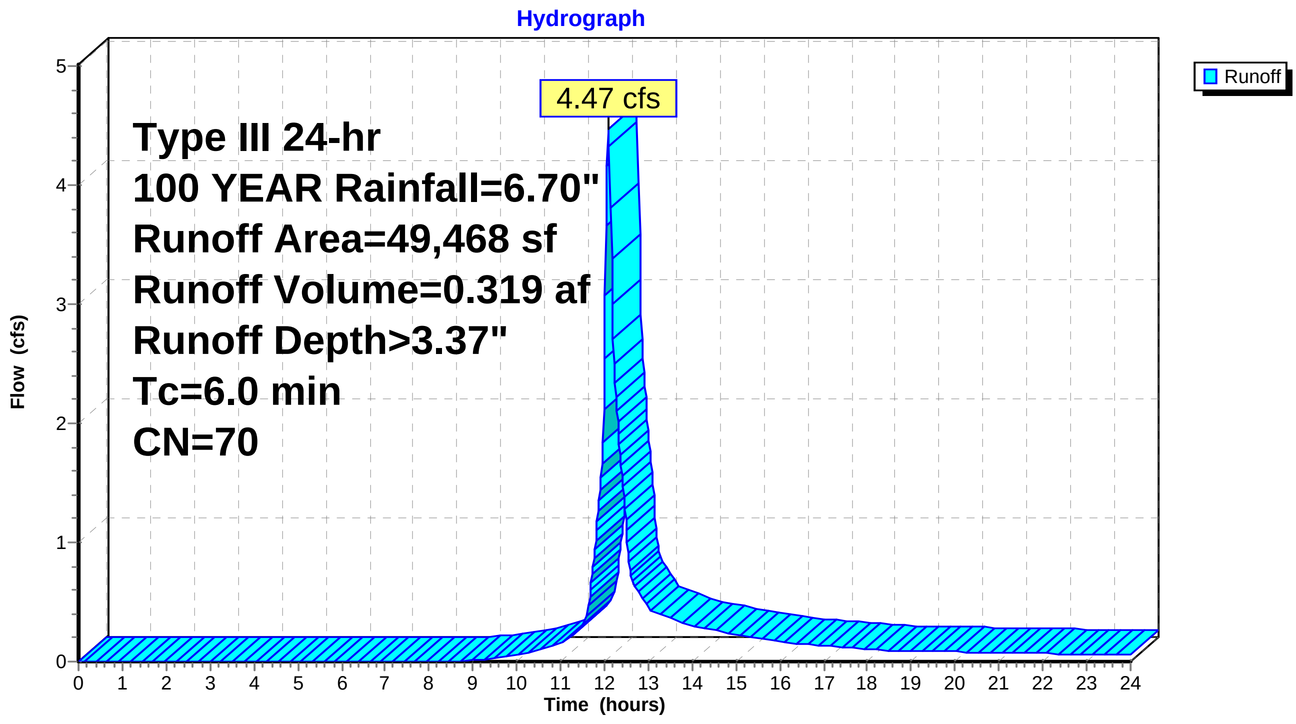
Runoff = 4.47 cfs @ 12.09 hrs, Volume= 0.319 af, Depth> 3.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	9,606	98	roofs
*	2,267	98	pavement
*	142	98	ledge
	37,453	61	>75% Grass cover, Good, HSG B
	49,468	70	Weighted Average
	37,453		75.71% Pervious Area
	12,015		24.29% Impervious Area

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

Subcatchment PR-1B:



Summary for Subcatchment PR-1C:

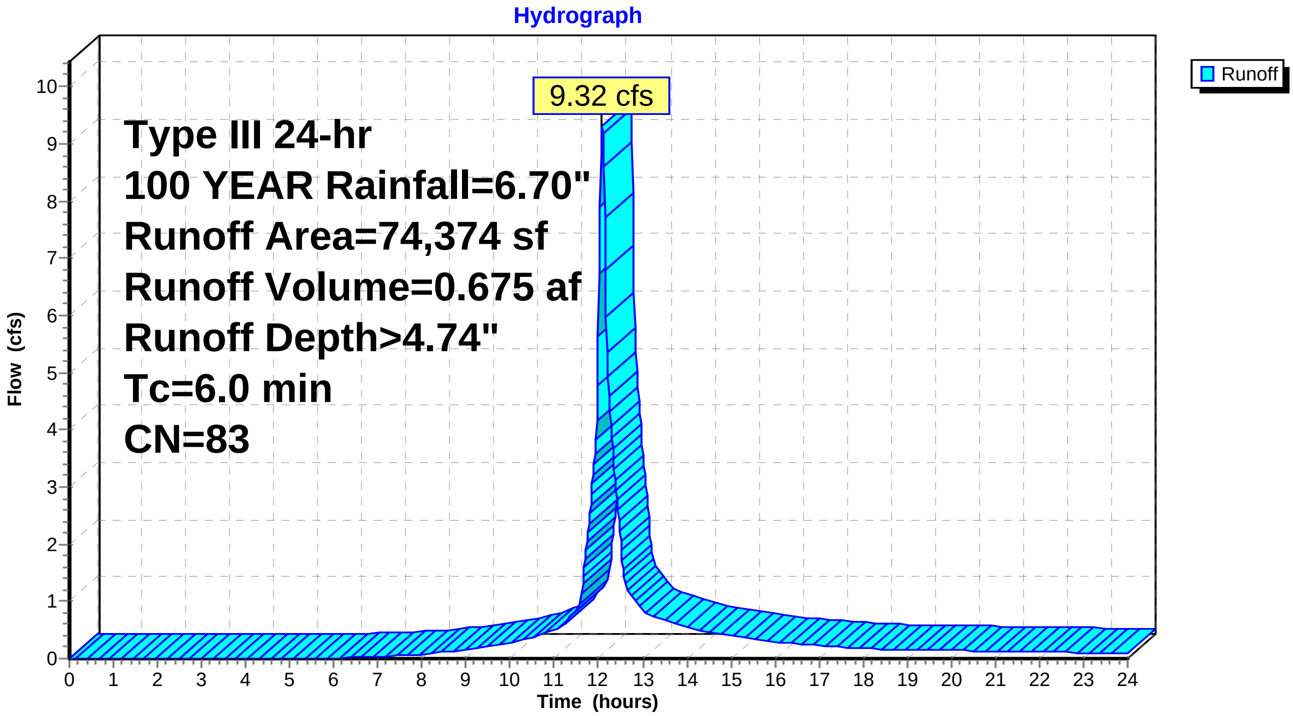
Runoff = 9.32 cfs @ 12.09 hrs, Volume= 0.675 af, Depth> 4.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

Area (sf)	CN	Description
15,170	98	roofs
28,165	98	Paved parking
31,039	61	>75% Grass cover, Good, HSG B
74,374	83	Weighted Average
31,039		41.73% Pervious Area
43,335		58.27% Impervious Area

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

Subcatchment PR-1C:



Summary for Subcatchment PR-1D:

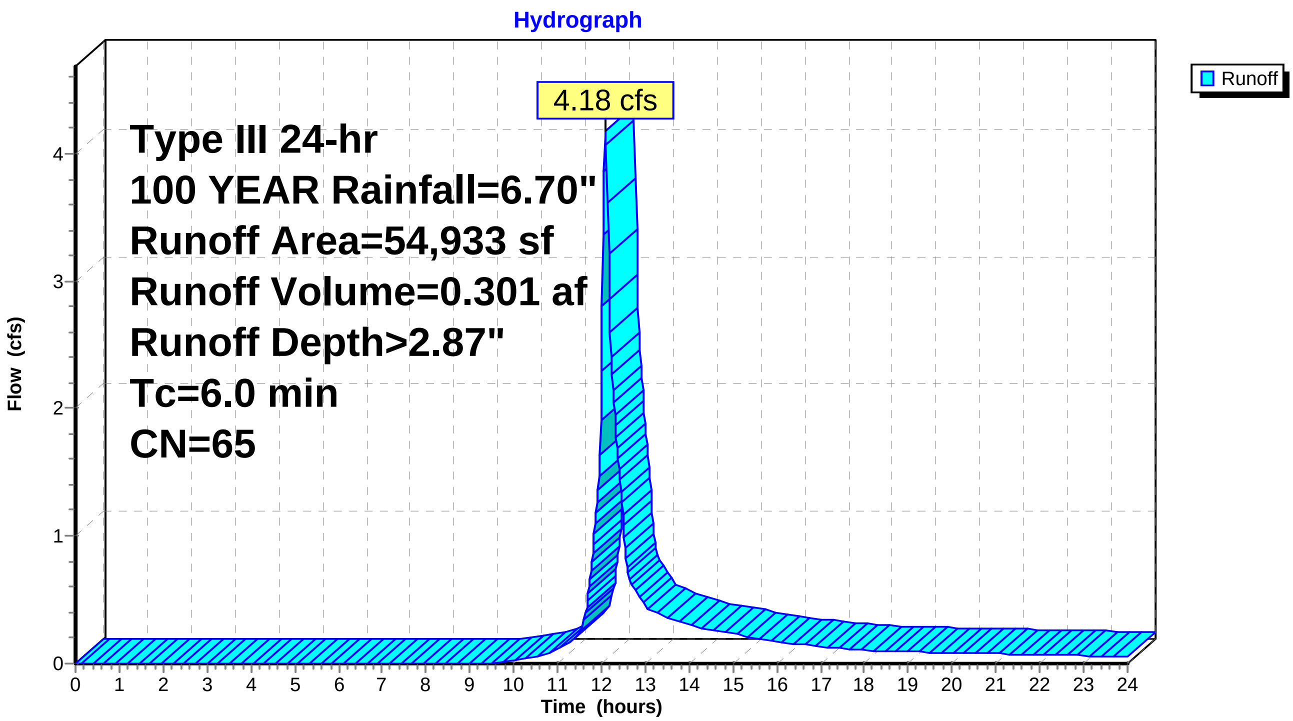
Runoff = 4.18 cfs @ 12.09 hrs, Volume= 0.301 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

Area (sf)	CN	Description
2,704	98	roofs
2,868	98	Paved parking
49,361	61	>75% Grass cover, Good, HSG B
54,933	65	Weighted Average
49,361		89.86% Pervious Area
5,572		10.14% Impervious Area

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

Subcatchment PR-1D:



Summary for Subcatchment PR-1E:

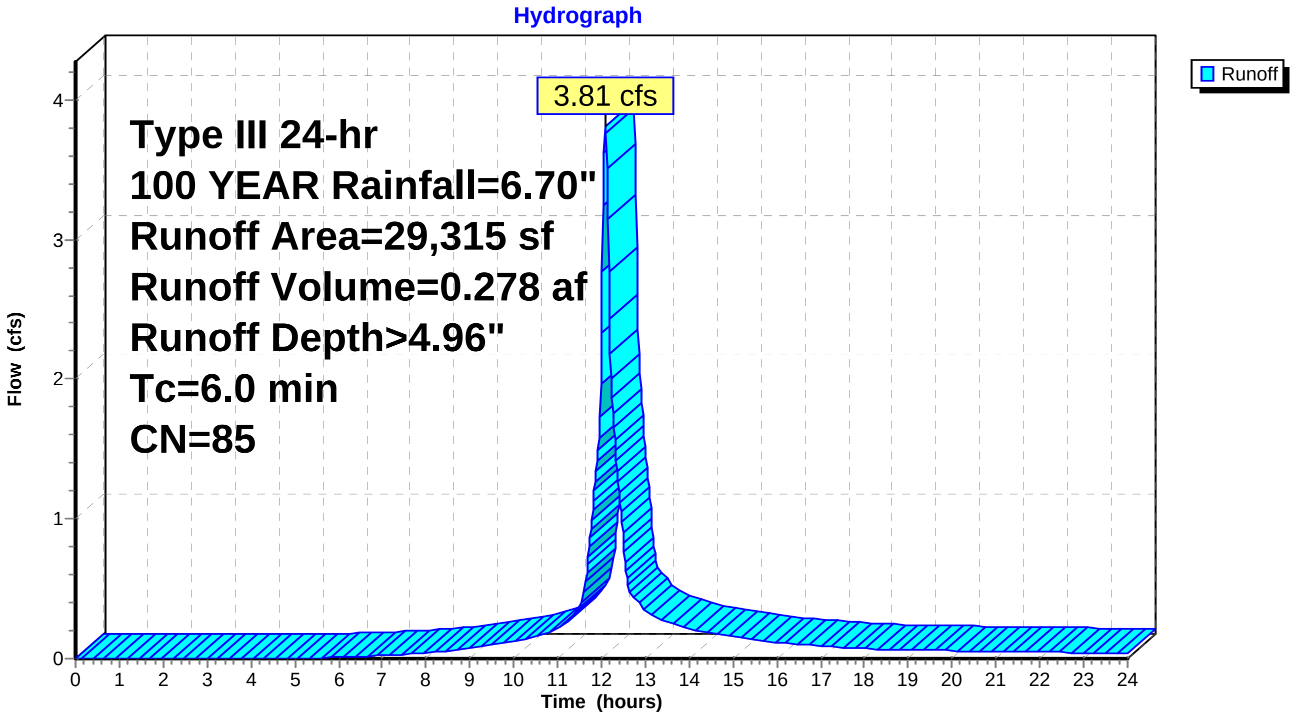
Runoff = 3.81 cfs @ 12.09 hrs, Volume= 0.278 af, Depth> 4.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

Area (sf)	CN	Description
6,378	98	roofs
12,510	98	Paved parking
10,427	61	>75% Grass cover, Good, HSG B
29,315	85	Weighted Average
10,427		35.57% Pervious Area
18,888		64.43% Impervious Area

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

Subcatchment PR-1E:



Summary for Subcatchment PR-1F:

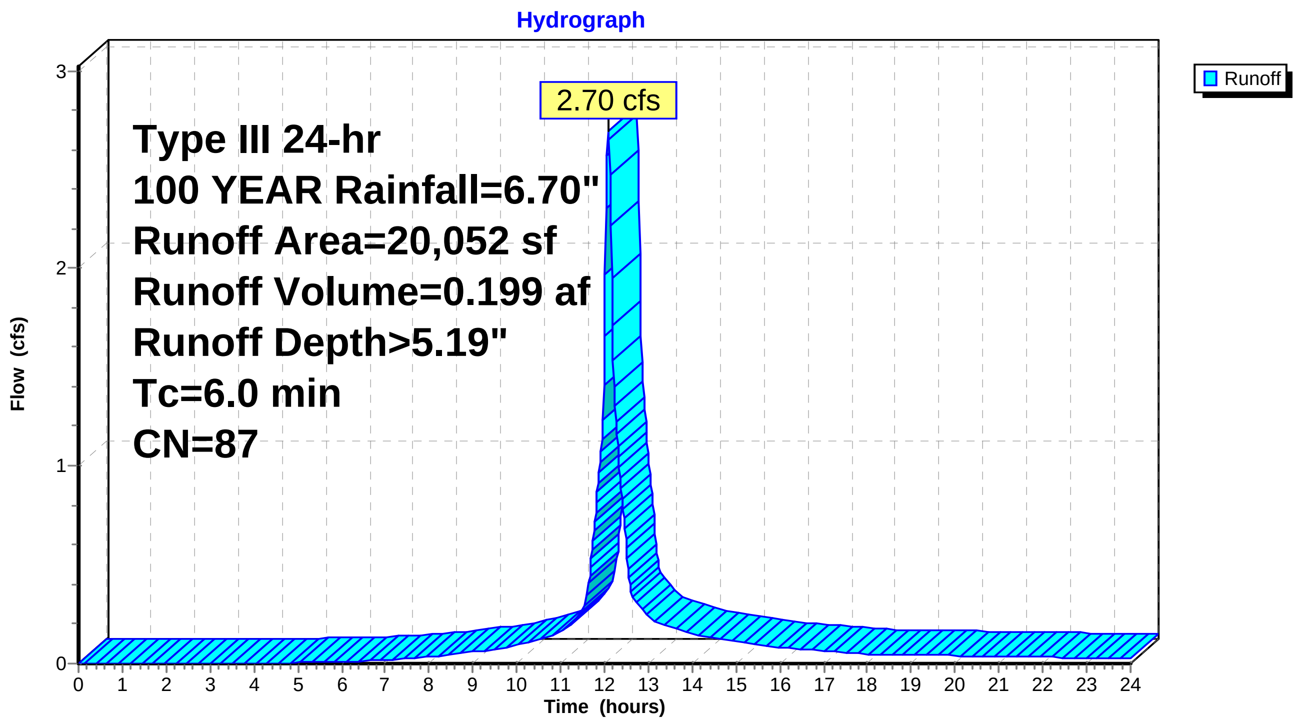
Runoff = 2.70 cfs @ 12.09 hrs, Volume= 0.199 af, Depth> 5.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

Area (sf)	CN	Description
6,274	98	roofs
7,737	98	Paved parking
6,041	61	>75% Grass cover, Good, HSG B
20,052	87	Weighted Average
6,041		30.13% Pervious Area
14,011		69.87% Impervious Area

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

Subcatchment PR-1F:



Summary for Subcatchment PR-1G:

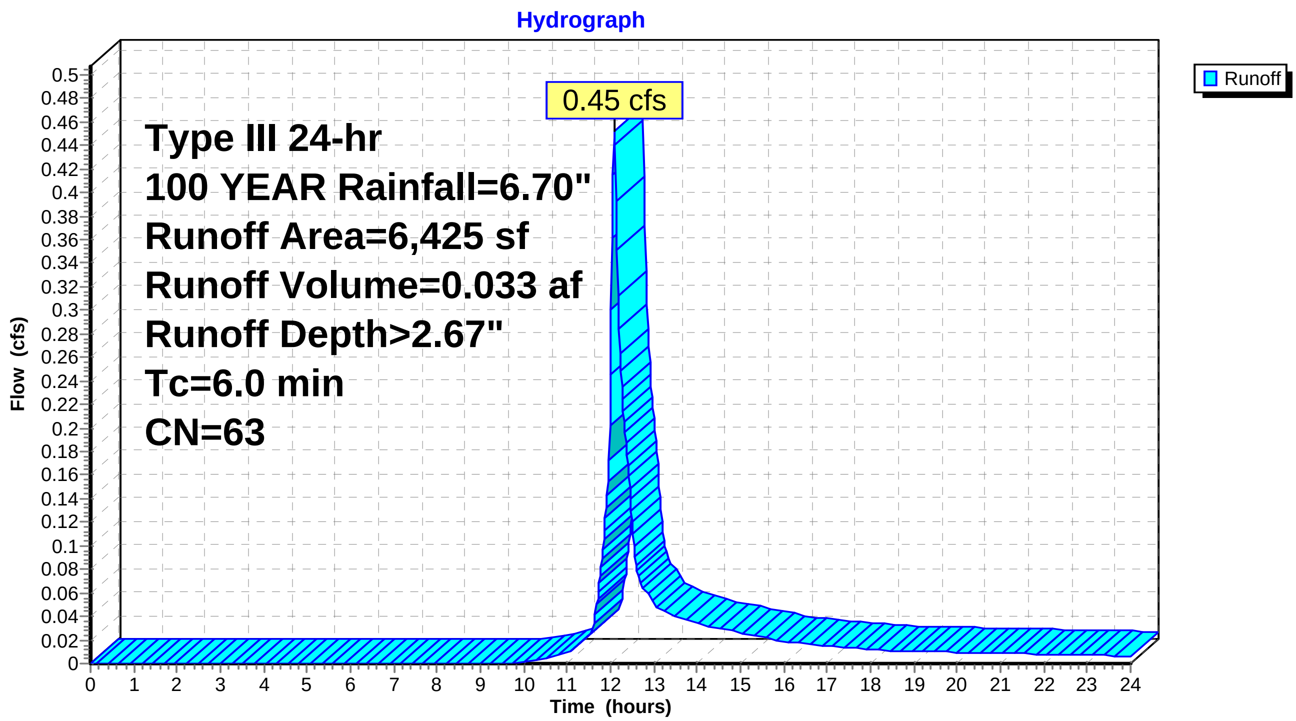
Runoff = 0.45 cfs @ 12.09 hrs, Volume= 0.033 af, Depth> 2.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	0	98	roofs
*	381	98	walkway
	6,044	61	>75% Grass cover, Good, HSG B
	6,425	63	Weighted Average
	6,044		94.07% Pervious Area
	381		5.93% Impervious Area

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

Subcatchment PR-1G:



Summary for Subcatchment PR-3A:

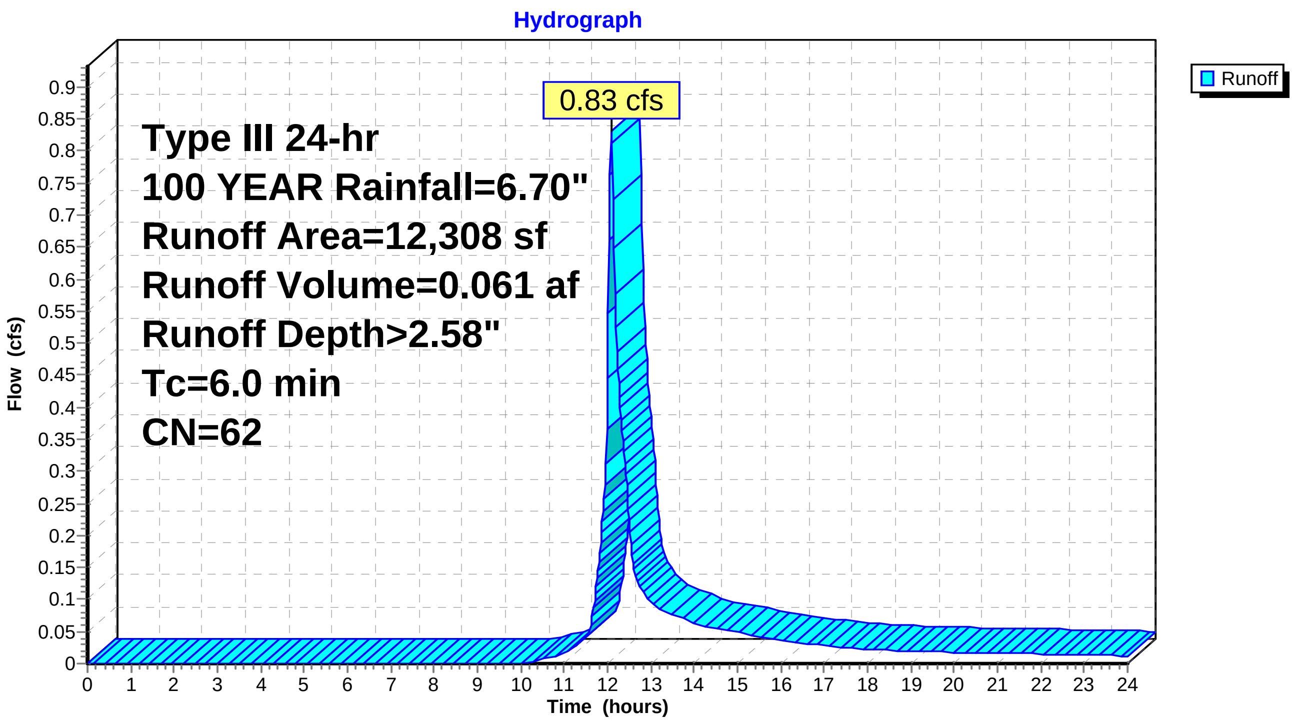
Runoff = 0.83 cfs @ 12.09 hrs, Volume= 0.061 af, Depth> 2.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	11,223	61	>75% Grass cover, Good, HSG B
*	346	98	sidewalk
	739	55	Woods, Good, HSG B
	12,308	62	Weighted Average
	11,962		97.19% Pervious Area
	346		2.81% Impervious Area

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

Subcatchment PR-3A:



Summary for Subcatchment PR-3B:

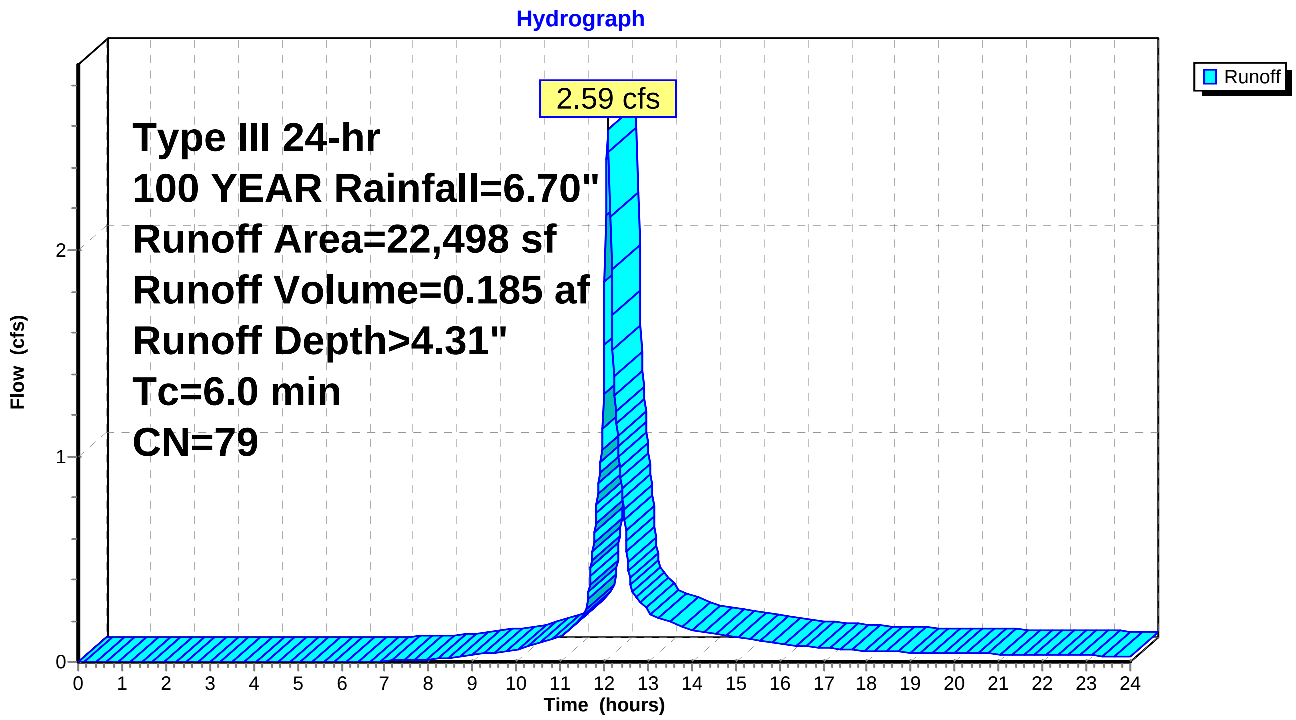
Runoff = 2.59 cfs @ 12.09 hrs, Volume= 0.185 af, Depth> 4.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	9,997	61	>75% Grass cover, Good, HSG B
*	9,671	98	paving
*	1,514	98	ROOF
	1,316	55	Woods, Good, HSG B
	22,498	79	Weighted Average
	11,313		50.28% Pervious Area
	11,185		49.72% Impervious Area

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

Subcatchment PR-3B:



Summary for Subcatchment PR-3C:

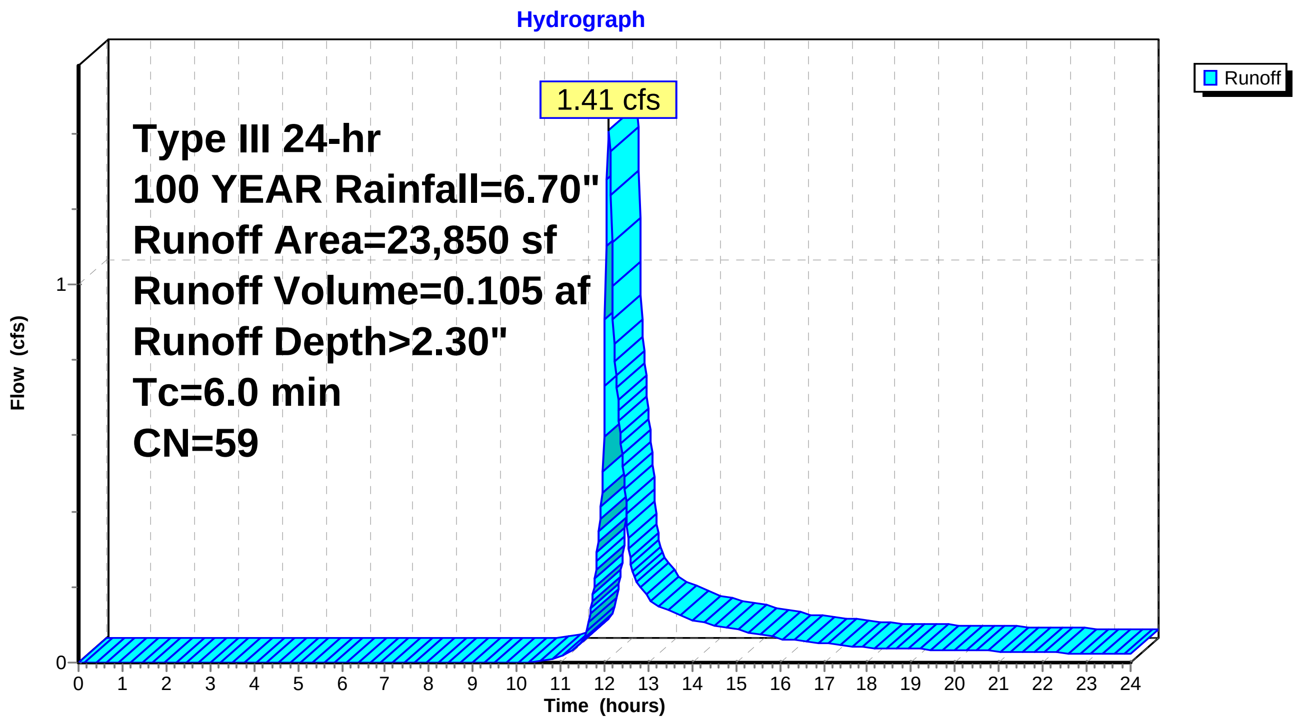
Runoff = 1.41 cfs @ 12.10 hrs, Volume= 0.105 af, Depth> 2.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

Area (sf)	CN	Description
14,978	61	>75% Grass cover, Good, HSG B
8,872	55	Woods, Good, HSG B
23,850	59	Weighted Average
23,850		100.00% Pervious Area

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

Subcatchment PR-3C:



Summary for Subcatchment PR-4A:

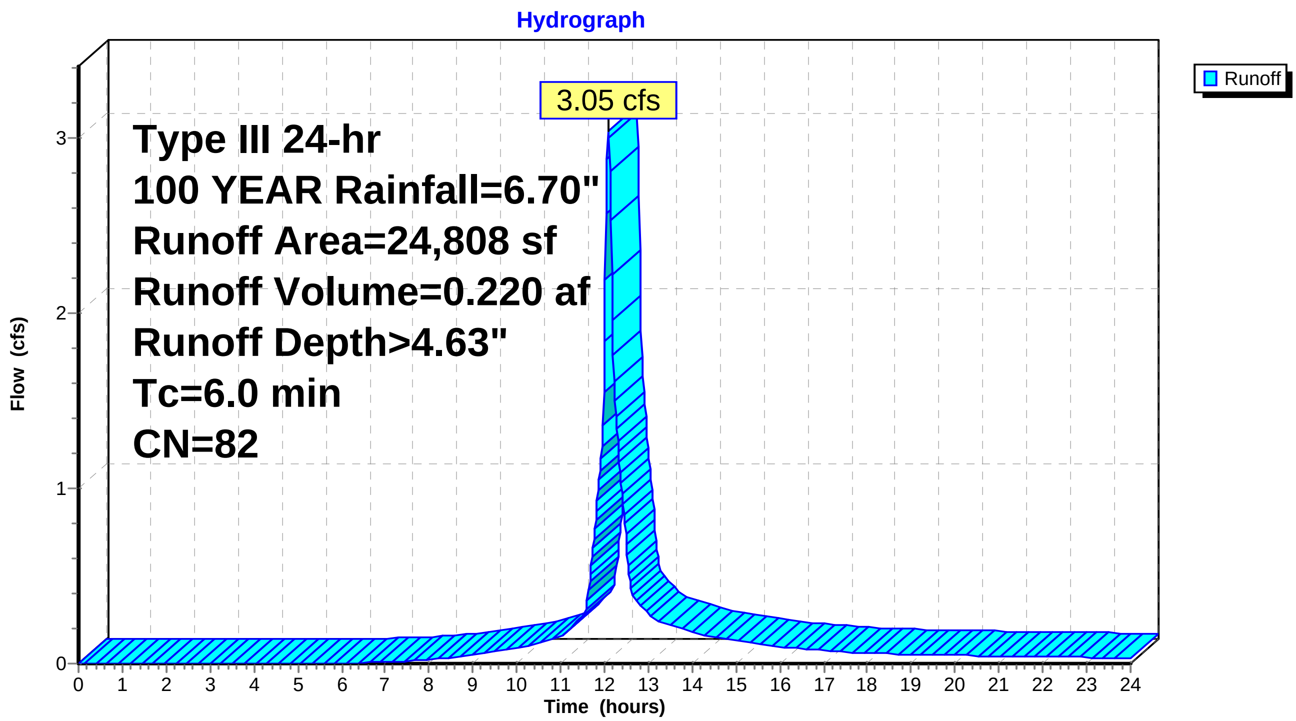
Runoff = 3.05 cfs @ 12.09 hrs, Volume= 0.220 af, Depth> 4.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	7,054	61	>75% Grass cover, Good, HSG B
*	14,671	98	paving
	3,083	55	Woods, Good, HSG B
	24,808	82	Weighted Average
	10,137		40.86% Pervious Area
	14,671		59.14% Impervious Area

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

Subcatchment PR-4A:



Summary for Subcatchment PR-4B:

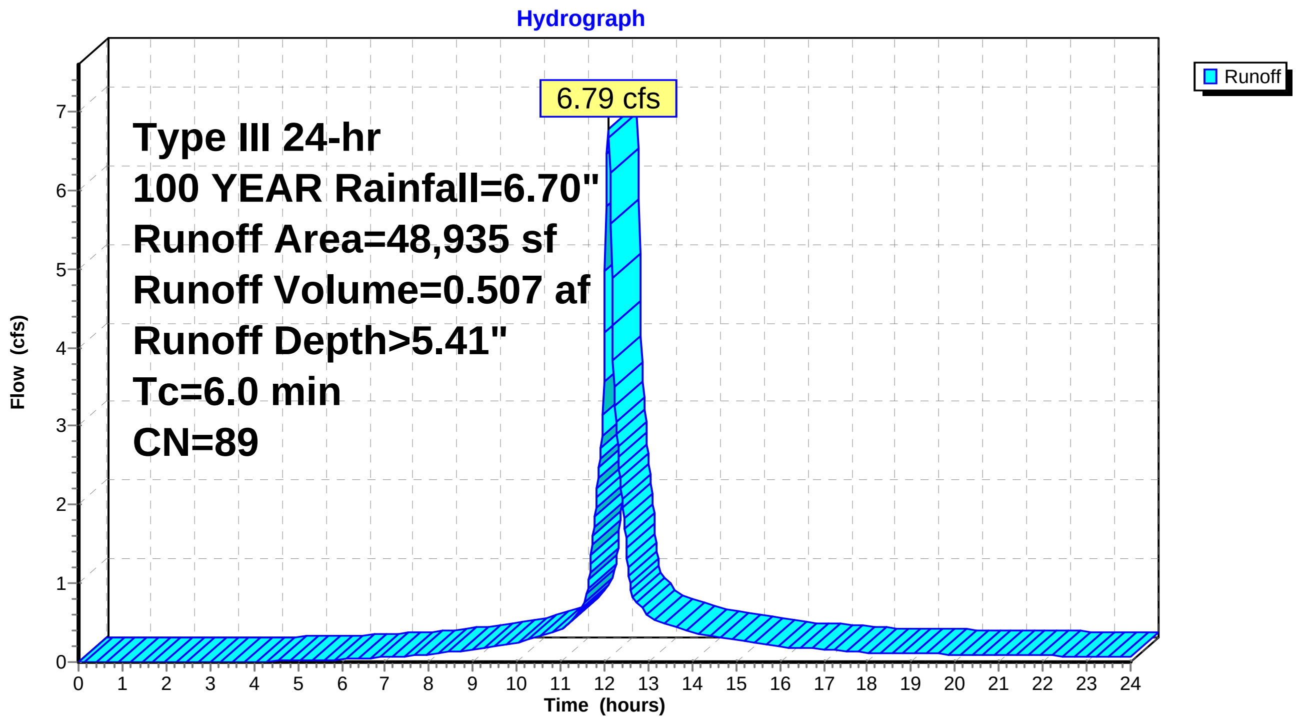
Runoff = 6.79 cfs @ 12.08 hrs, Volume= 0.507 af, Depth> 5.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
*	35,417	98	roofs
	0	98	Paved parking & roofs
*	1,634	98	LEDGE
	11,884	61	>75% Grass cover, Good, HSG B
	48,935	89	Weighted Average
	11,884		24.29% Pervious Area
	37,051		75.71% Impervious Area

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

Subcatchment PR-4B:



Summary for Subcatchment PR-4C:

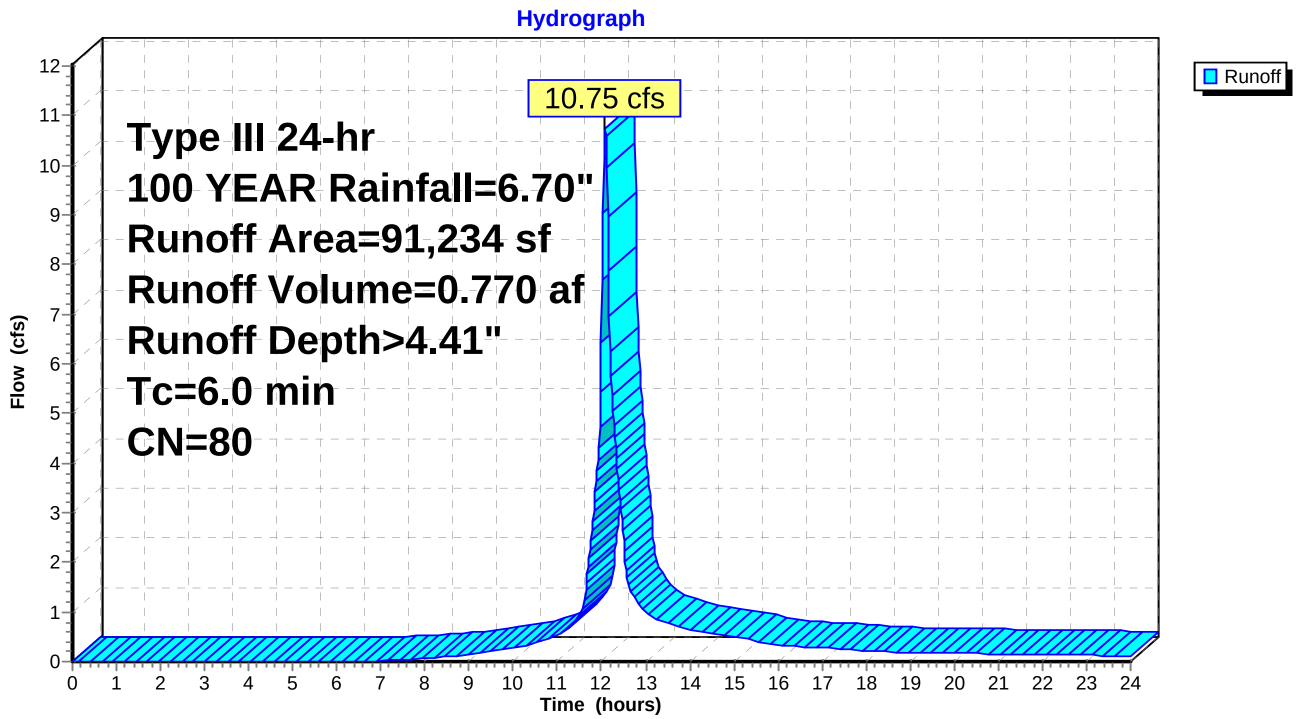
Runoff = 10.75 cfs @ 12.09 hrs, Volume= 0.770 af, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	44,061	61	>75% Grass cover, Good, HSG B
*	34,868	98	paving
*	10,828	98	ROOFS
*	1,477	98	ledge
	91,234	80	Weighted Average
	44,061		48.29% Pervious Area
	47,173		51.71% Impervious Area

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

Subcatchment PR-4C:



Summary for Subcatchment PR-4D:

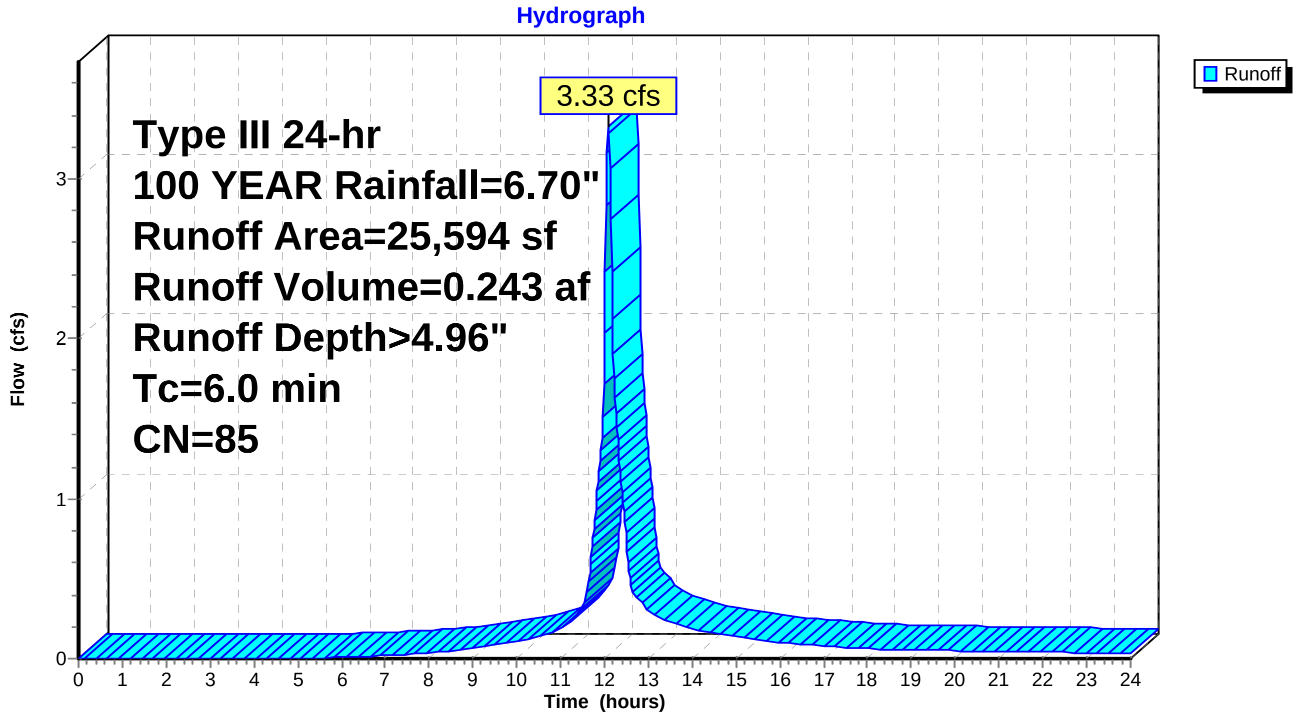
Runoff = 3.33 cfs @ 12.09 hrs, Volume= 0.243 af, Depth> 4.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

Area (sf)	CN	Description
9,275	61	>75% Grass cover, Good, HSG B
2,515	98	roofs
13,804	98	Paved parking
25,594	85	Weighted Average
9,275		36.24% Pervious Area
16,319		63.76% Impervious Area

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

Subcatchment PR-4D:



Summary for Subcatchment PR-4E:

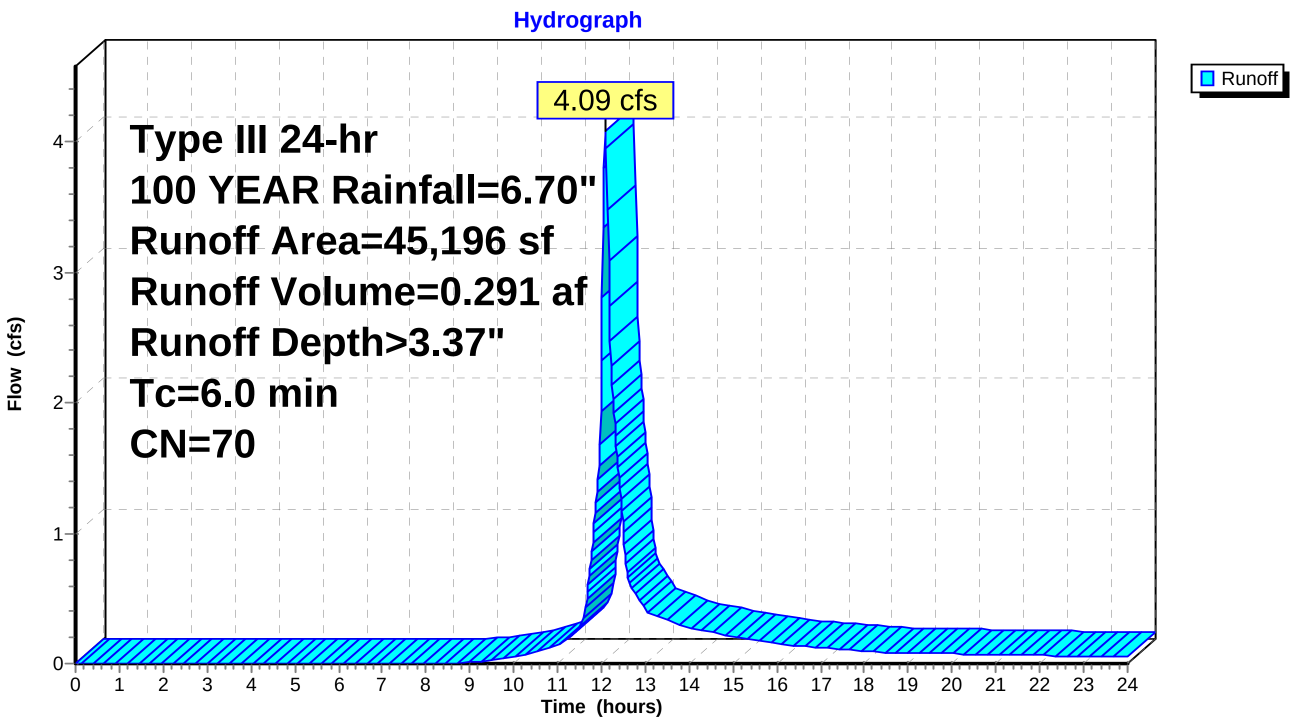
Runoff = 4.09 cfs @ 12.09 hrs, Volume= 0.291 af, Depth> 3.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	34,517	61	>75% Grass cover, Good, HSG B
*	5,311	98	paving
*	5,368	98	ROOFS
	45,196	70	Weighted Average
	34,517		76.37% Pervious Area
	10,679		23.63% Impervious Area

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

Subcatchment PR-4E:



Summary for Subcatchment PR-4F:

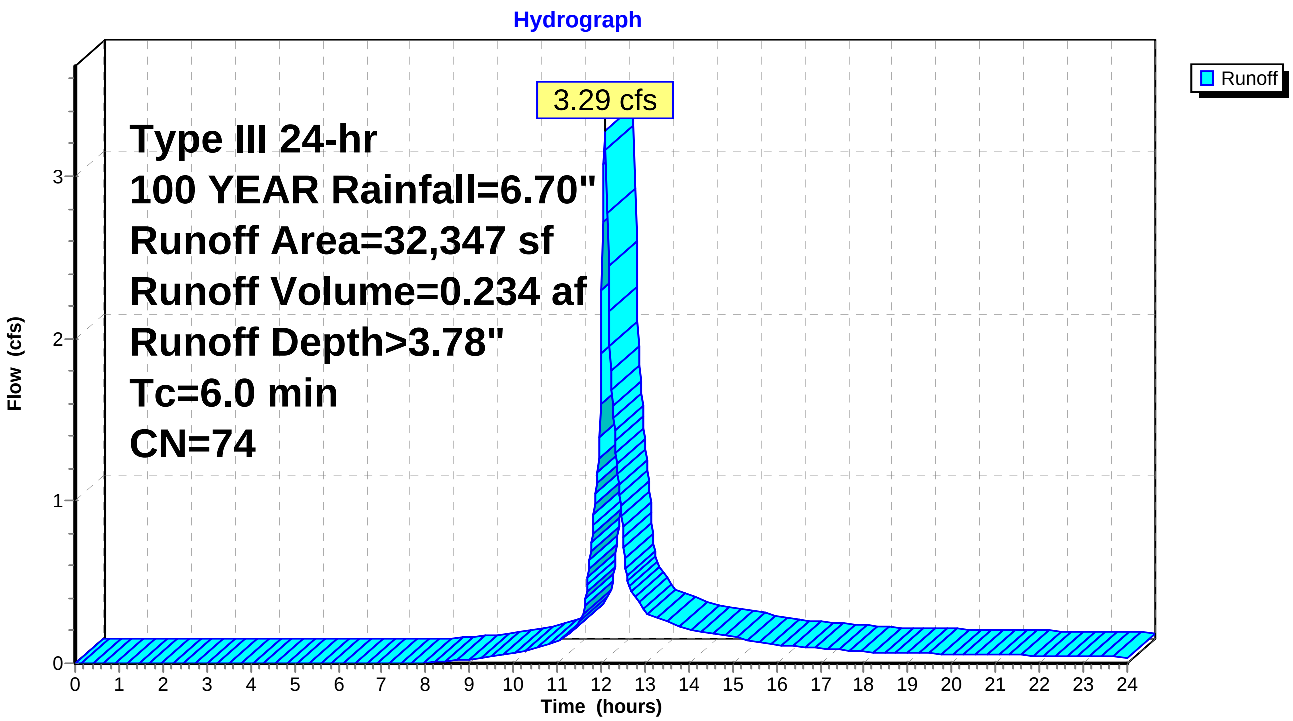
Runoff = 3.29 cfs @ 12.09 hrs, Volume= 0.234 af, Depth> 3.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YEAR Rainfall=6.70"

	Area (sf)	CN	Description
	21,093	61	>75% Grass cover, Good, HSG B
*	11,254	98	paving
*	0	98	ROOFS
	32,347	74	Weighted Average
	21,093		65.21% Pervious Area
	11,254		34.79% Impervious Area

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

Subcatchment PR-4F:



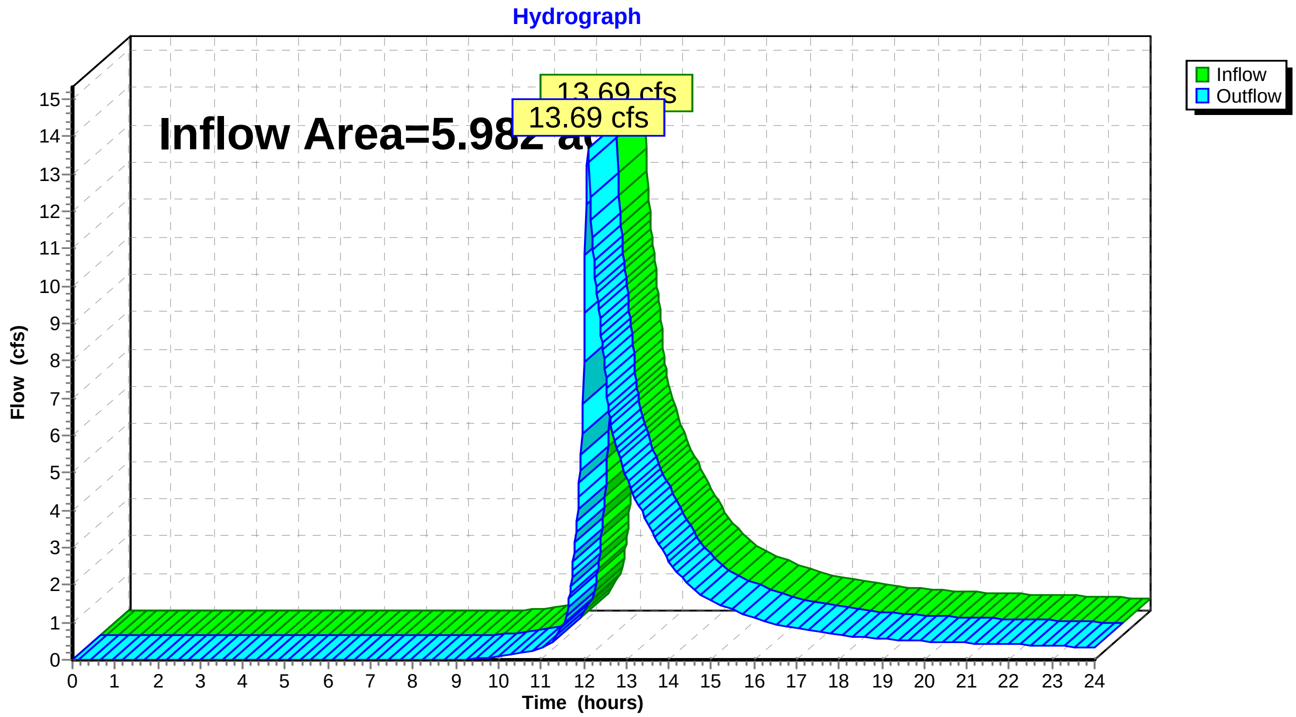
Summary for Reach DP-1: Wetlands-North

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

Inflow Area =	5.982 ac,	42.99% Impervious,	Inflow Depth > 3.60"	for 100 YEAR event	
Inflow =	13.69 cfs @	12.11 hrs,	Volume=	1.795 af	
Outflow =	13.69 cfs @	12.11 hrs,	Volume=	1.795 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1: Wetlands-North



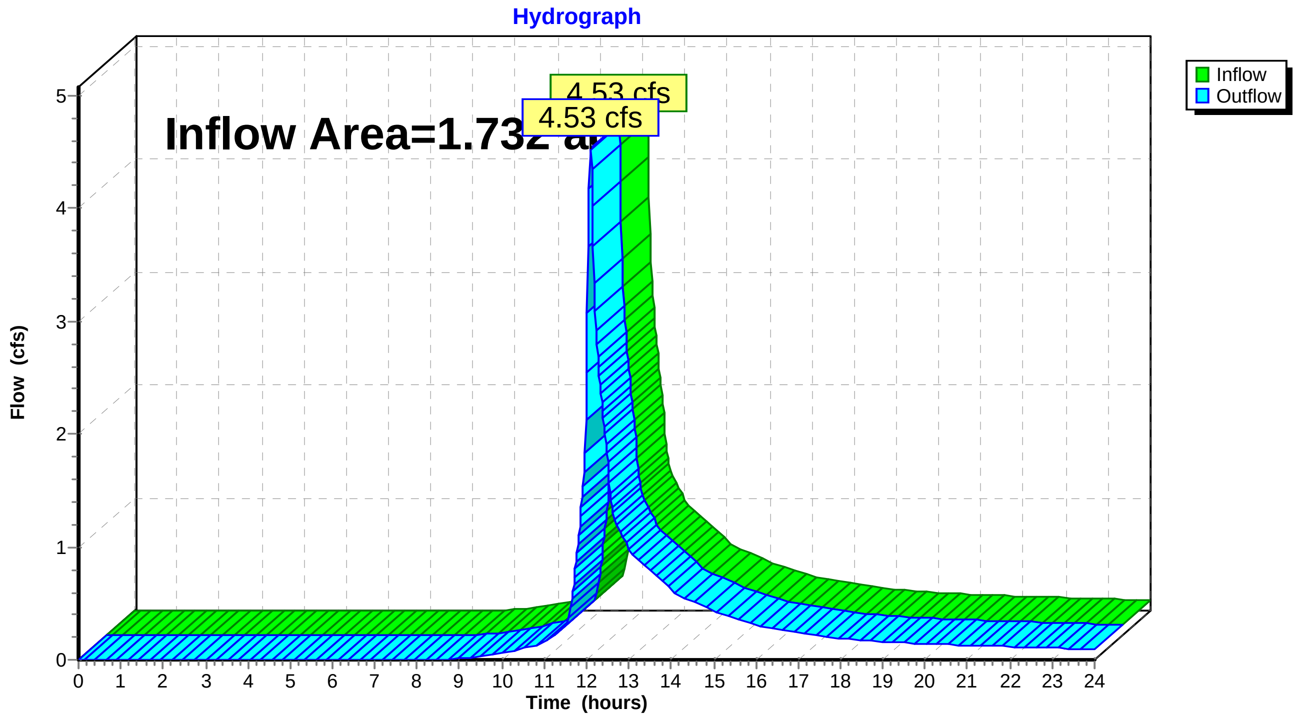
Summary for Reach DP-1A:

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

Inflow Area =	1.732 ac,	39.52% Impervious,	Inflow Depth > 3.29"	for 100 YEAR event	
Inflow =	4.53 cfs @	12.09 hrs,	Volume=	0.475 af	
Outflow =	4.53 cfs @	12.09 hrs,	Volume=	0.475 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1A:

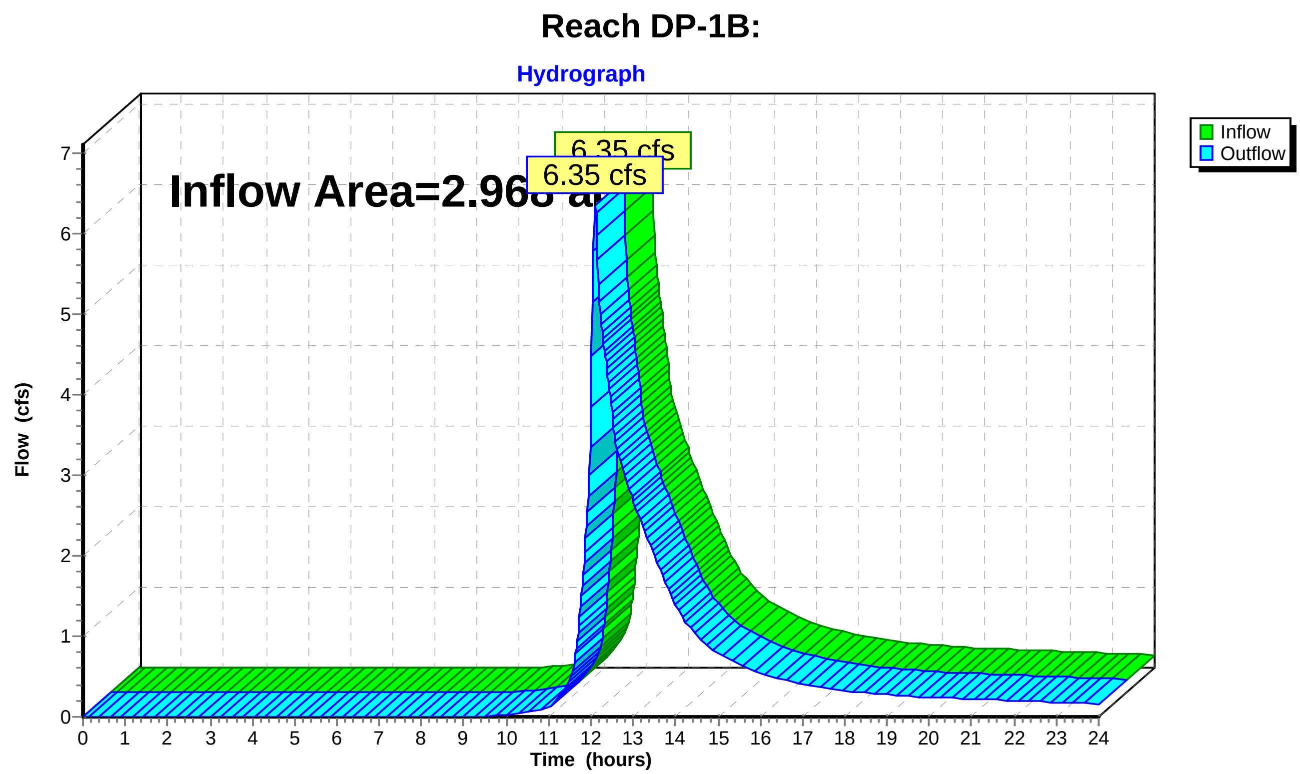


Summary for Reach DP-1B:

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

Inflow Area =	2.968 ac,	37.82% Impervious,	Inflow Depth > 3.63"	for 100 YEAR event	
Inflow =	6.35 cfs @	12.10 hrs,	Volume=	0.897 af	
Outflow =	6.35 cfs @	12.10 hrs,	Volume=	0.897 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs



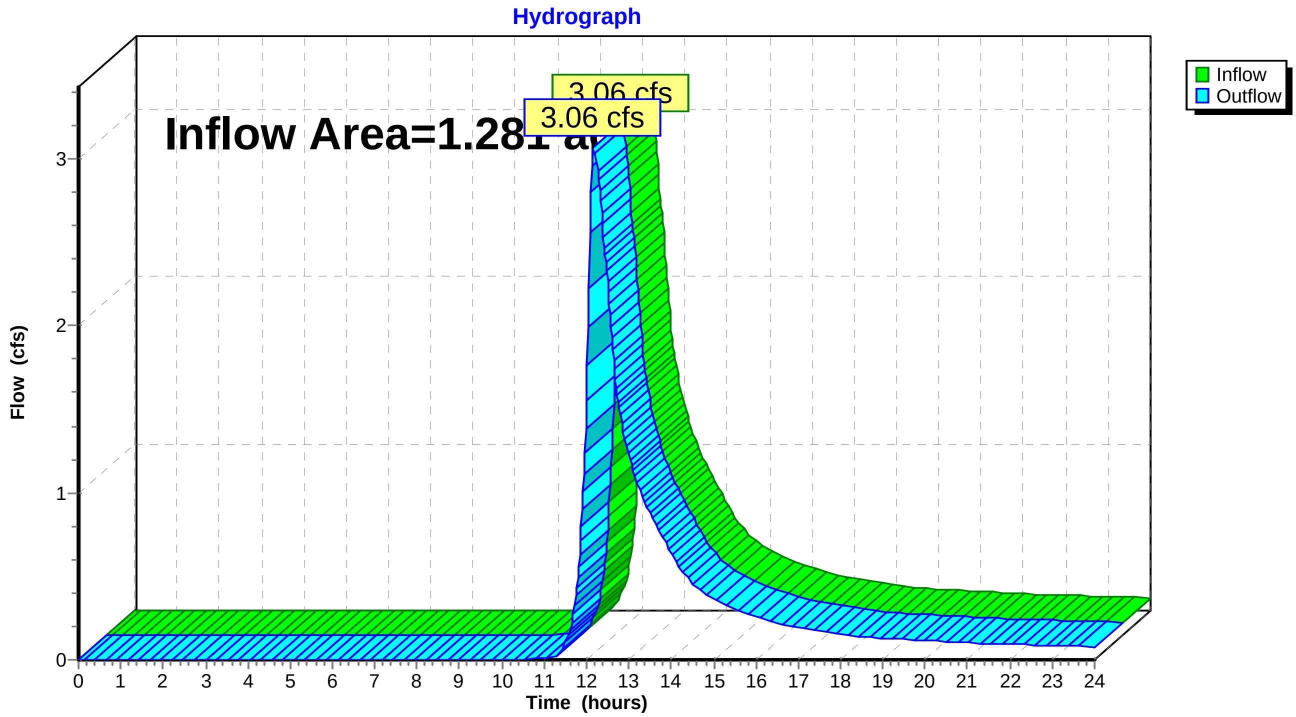
Summary for Reach DP-1C:

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

Inflow Area = 1.281 ac, 59.65% Impervious, Inflow Depth > 3.96" for 100 YEAR event
Inflow = 3.06 cfs @ 12.16 hrs, Volume= 0.422 af
Outflow = 3.06 cfs @ 12.16 hrs, Volume= 0.422 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-1C:



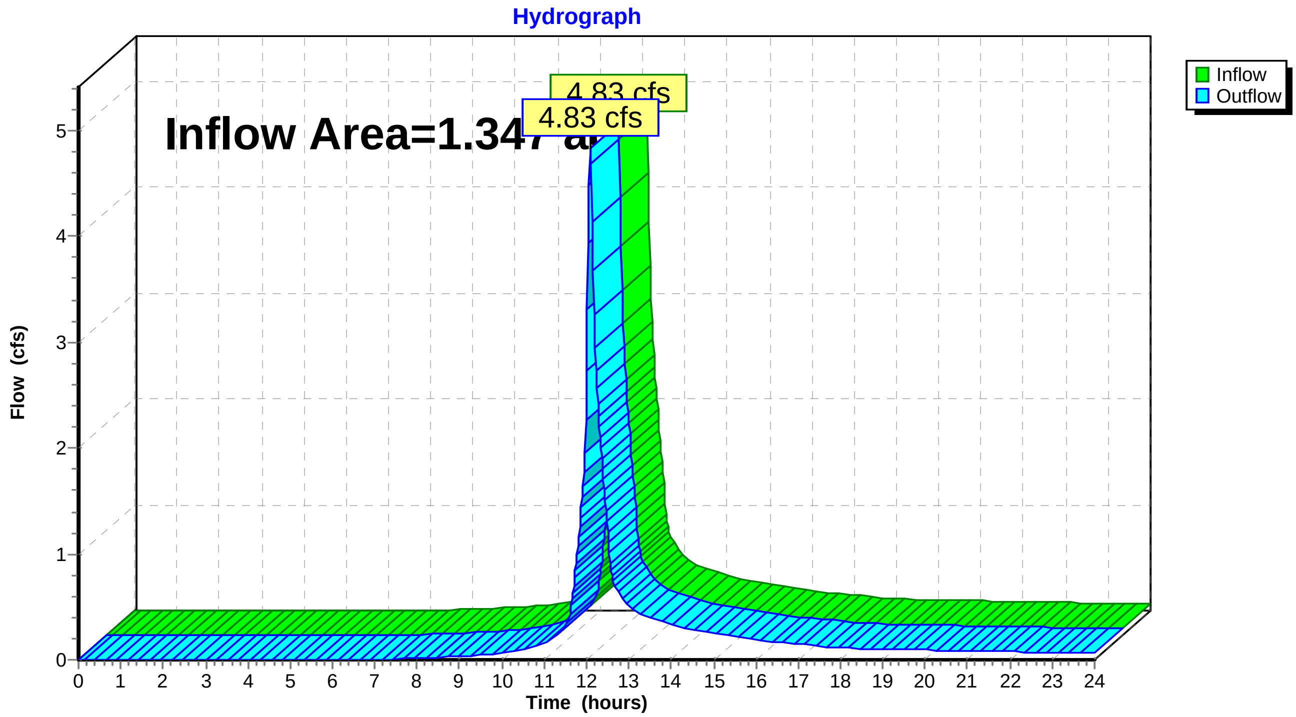
Summary for Reach DP-3: Drain System in Russett Rd.

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

Inflow Area = 1.347 ac, 19.66% Impervious, Inflow Depth > 3.13" for 100 YEAR event
Inflow = 4.83 cfs @ 12.09 hrs, Volume= 0.351 af
Outflow = 4.83 cfs @ 12.09 hrs, Volume= 0.351 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3: Drain System in Russett Rd.

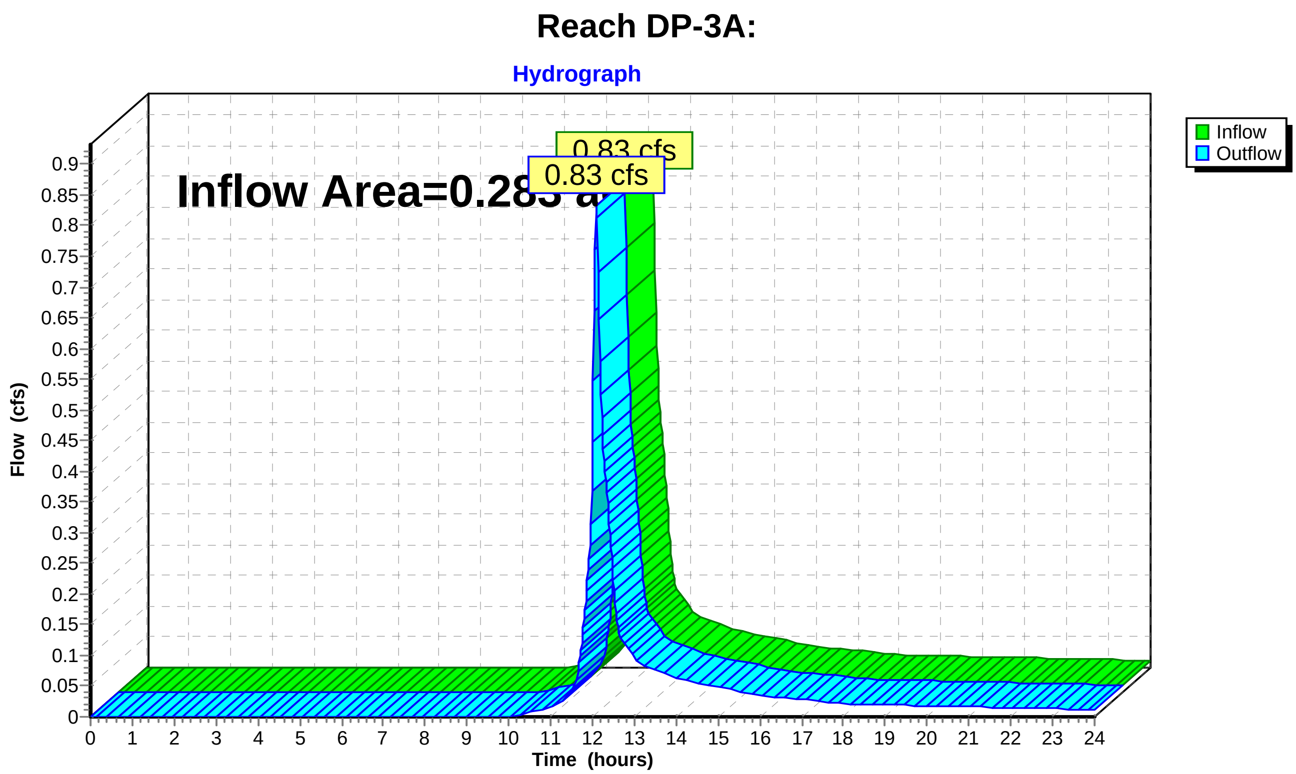


Summary for Reach DP-3A:

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

Inflow Area = 0.283 ac, 2.81% Impervious, Inflow Depth > 2.58" for 100 YEAR event
Inflow = 0.83 cfs @ 12.09 hrs, Volume= 0.061 af
Outflow = 0.83 cfs @ 12.09 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs



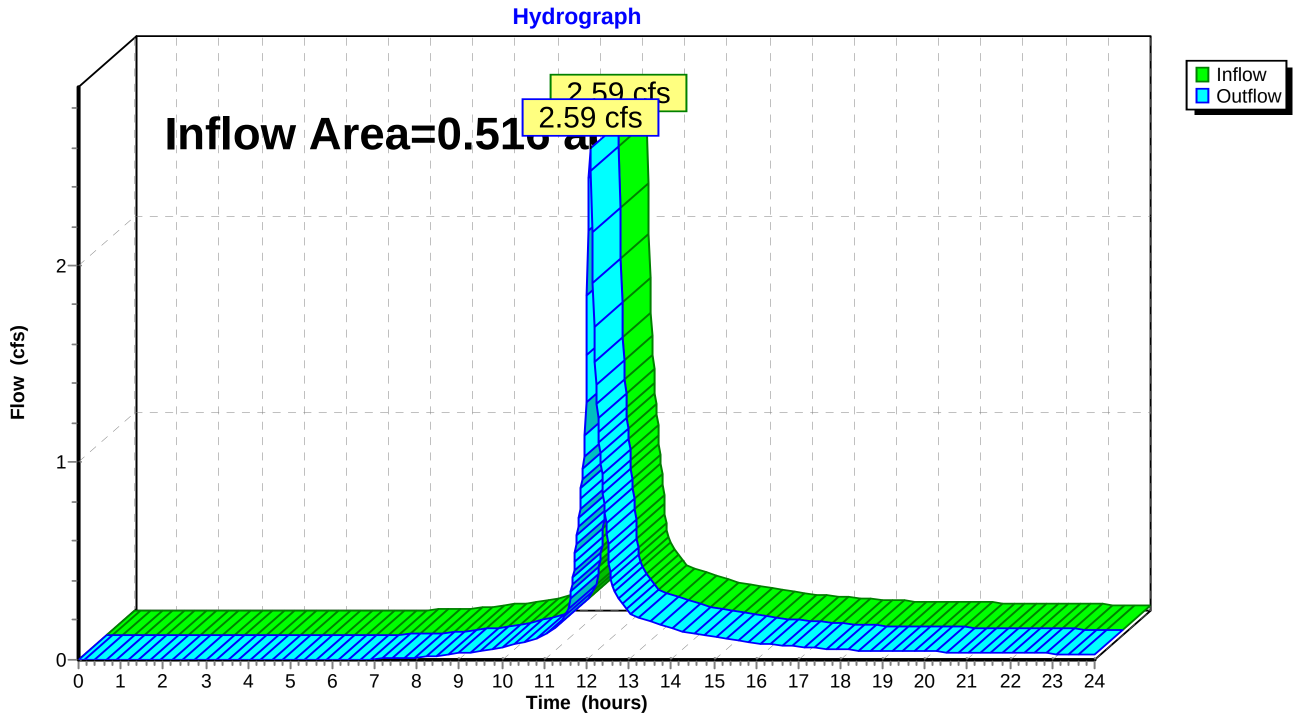
Summary for Reach DP-3B:

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

Inflow Area = 0.516 ac, 49.72% Impervious, Inflow Depth > 4.31" for 100 YEAR event
Inflow = 2.59 cfs @ 12.09 hrs, Volume= 0.185 af
Outflow = 2.59 cfs @ 12.09 hrs, Volume= 0.185 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3B:



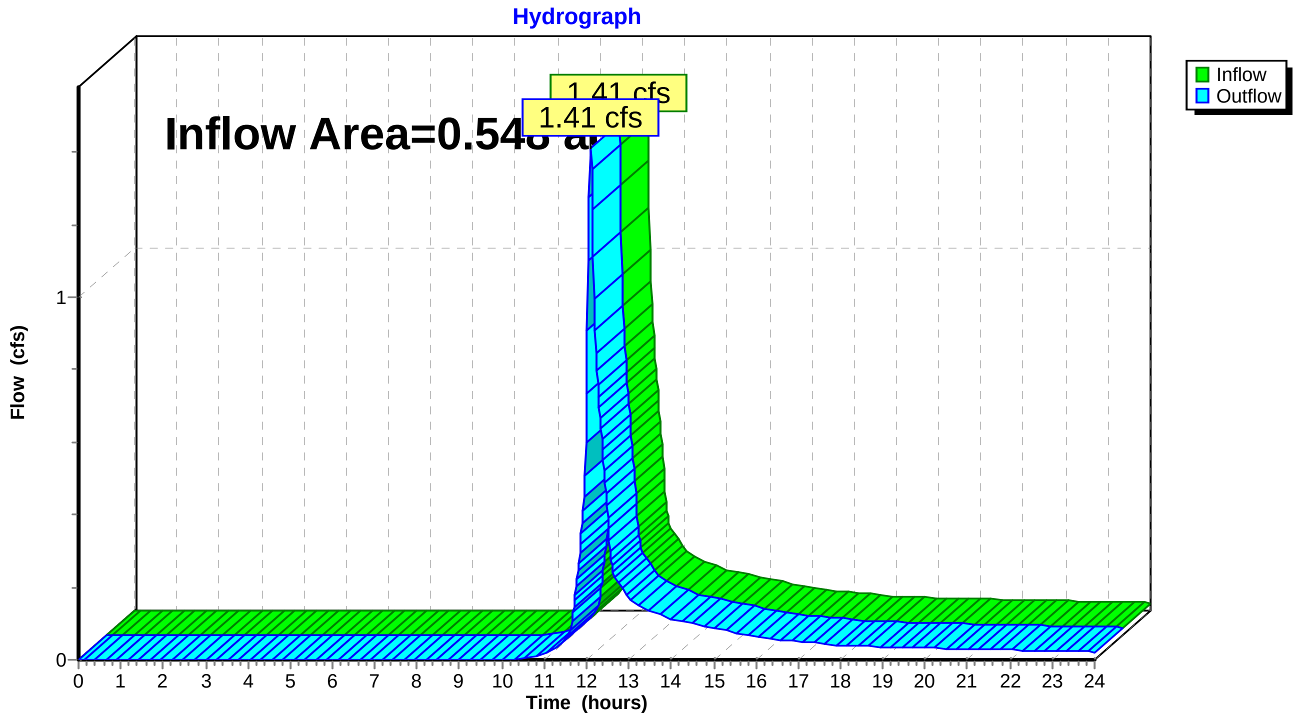
Summary for Reach DP-3D:

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

Inflow Area =	0.548 ac,	0.00% Impervious,	Inflow Depth > 2.30"	for 100 YEAR event	
Inflow =	1.41 cfs @	12.10 hrs,	Volume=	0.105 af	
Outflow =	1.41 cfs @	12.10 hrs,	Volume=	0.105 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-3D:



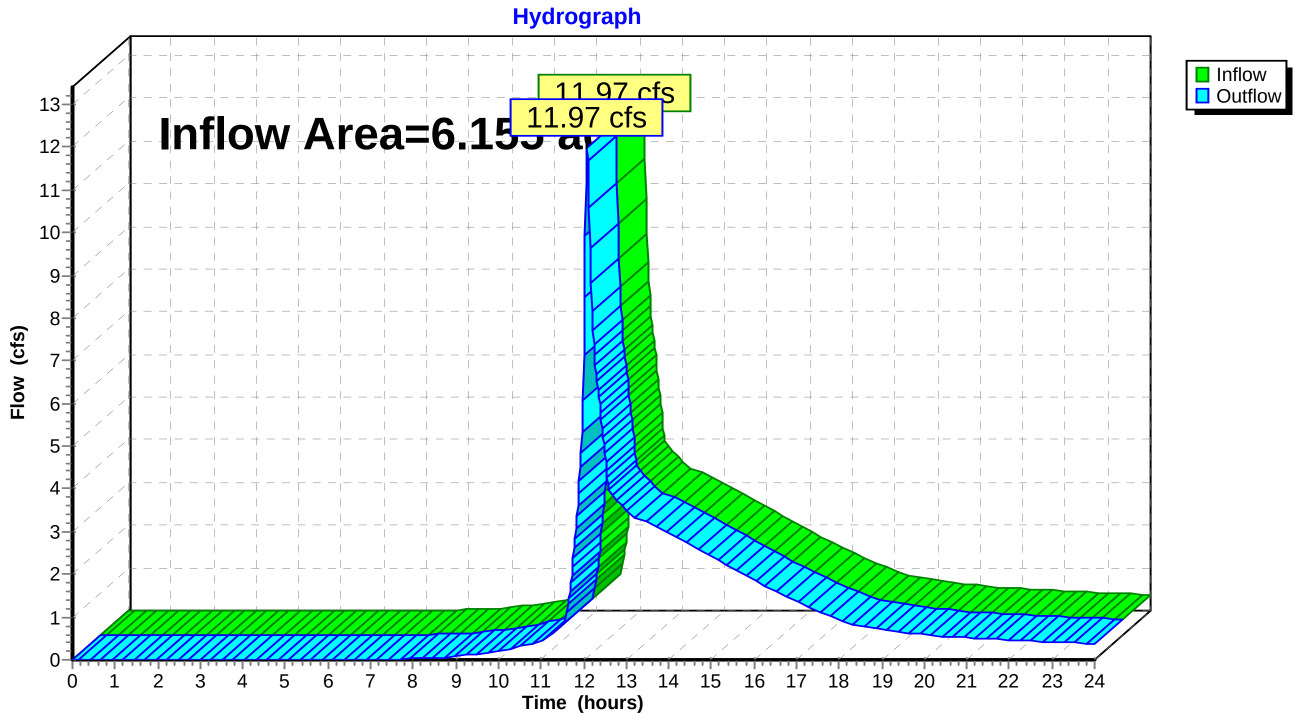
Summary for Reach DP-4: VFW Parkway

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

Inflow Area =	6.155 ac, 51.15% Impervious, Inflow Depth > 3.56"	for 100 YEAR event
Inflow =	11.97 cfs @ 12.09 hrs, Volume=	1.828 af
Outflow =	11.97 cfs @ 12.09 hrs, Volume=	1.828 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4: VFW Parkway



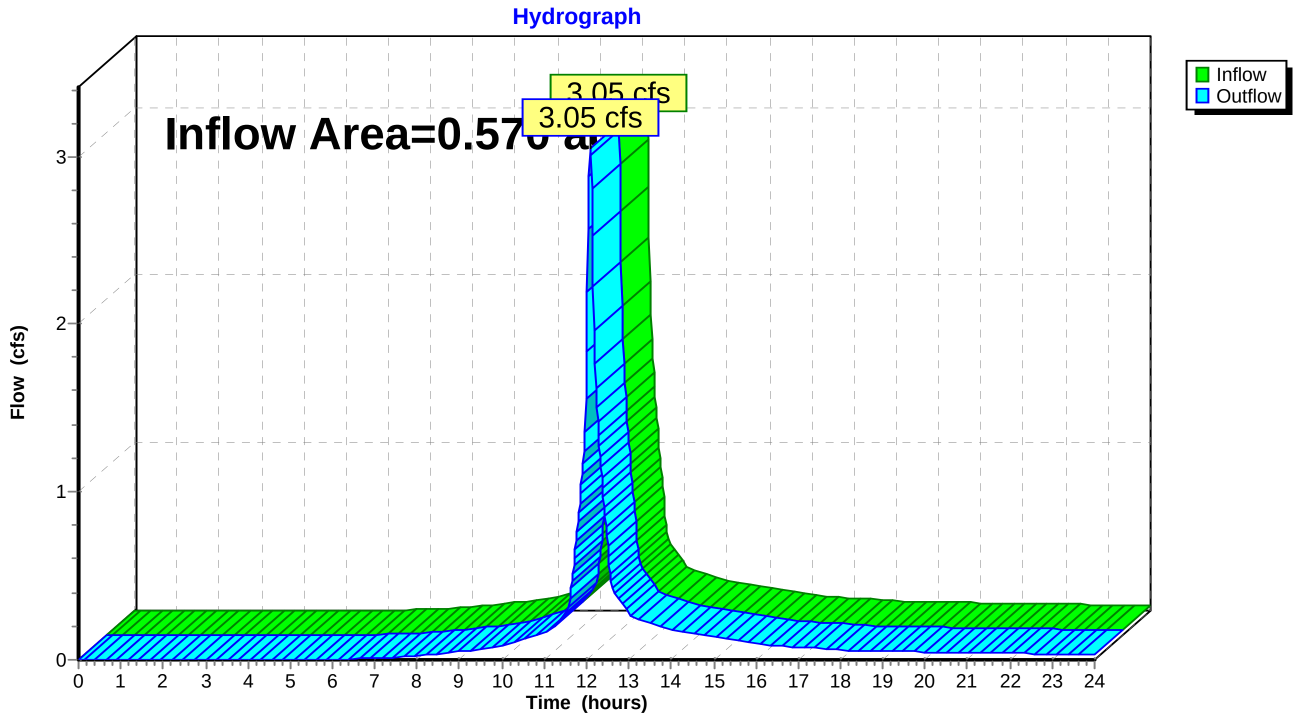
Summary for Reach DP-4A:

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

Inflow Area = 0.570 ac, 59.14% Impervious, Inflow Depth > 4.63" for 100 YEAR event
Inflow = 3.05 cfs @ 12.09 hrs, Volume= 0.220 af
Outflow = 3.05 cfs @ 12.09 hrs, Volume= 0.220 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4A:



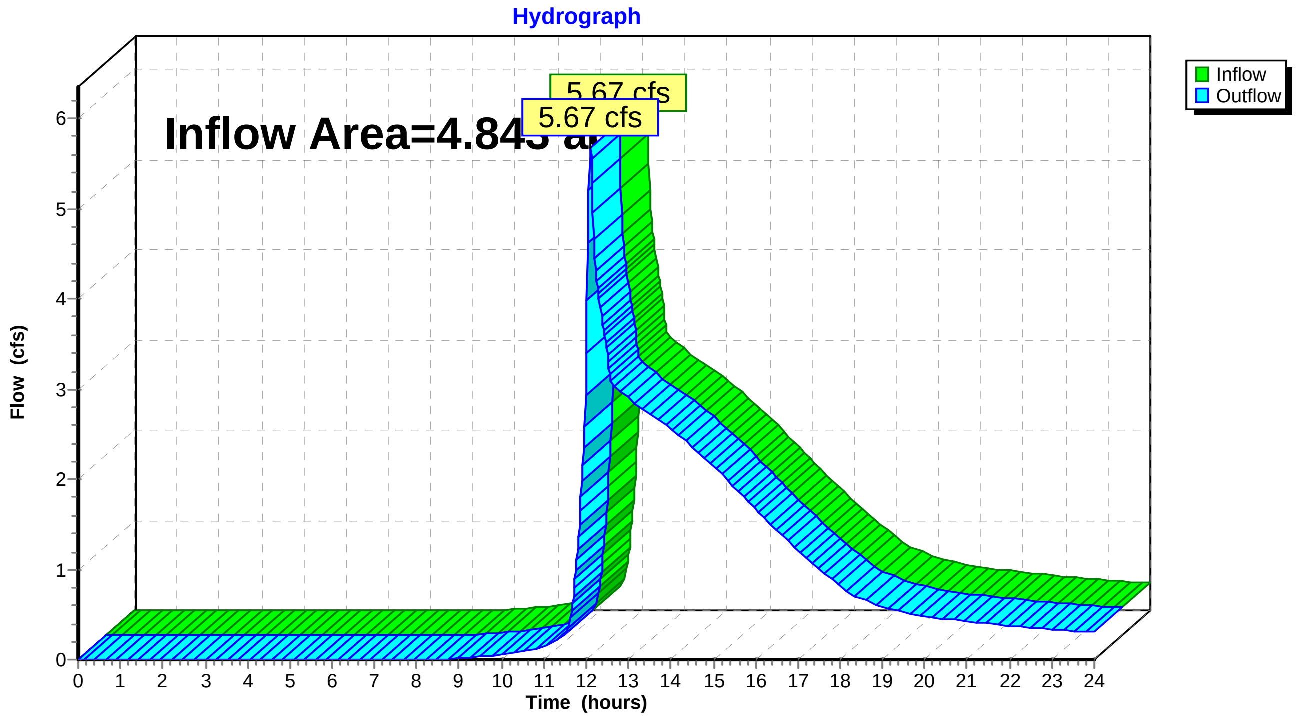
Summary for Reach DP-4B:

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

Inflow Area = 4.843 ac, 52.72% Impervious, Inflow Depth > 3.41" for 100 YEAR event
Inflow = 5.67 cfs @ 12.10 hrs, Volume= 1.375 af
Outflow = 5.67 cfs @ 12.10 hrs, Volume= 1.375 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4B:



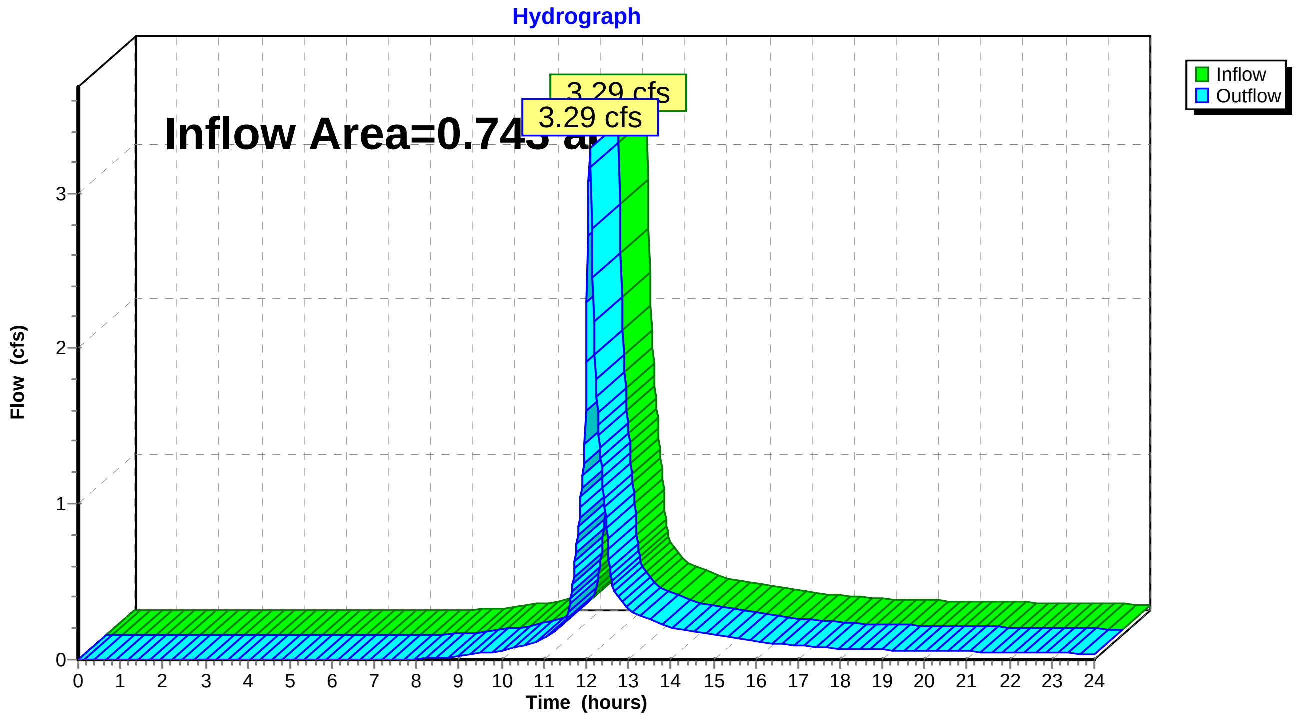
Summary for Reach DP-4C:

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

Inflow Area = 0.743 ac, 34.79% Impervious, Inflow Depth > 3.78" for 100 YEAR event
Inflow = 3.29 cfs @ 12.09 hrs, Volume= 0.234 af
Outflow = 3.29 cfs @ 12.09 hrs, Volume= 0.234 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Reach DP-4C:



Summary for Pond P-1A: Subsurface Detention/Infiltration basin

Inflow Area = 0.597 ac, 68.50% Impervious, Inflow Depth > 5.07" for 100 YEAR event
Inflow = 3.44 cfs @ 12.09 hrs, Volume= 0.252 af
Outflow = 0.65 cfs @ 12.53 hrs, Volume= 0.157 af, Atten= 81%, Lag= 26.7 min
Primary = 0.65 cfs @ 12.53 hrs, Volume= 0.157 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 169.72' @ 12.53 hrs Surf.Area= 3,838 sf Storage= 6,028 cf

Plug-Flow detention time= 221.5 min calculated for 0.157 af (62% of inflow)
Center-of-Mass det. time= 121.4 min (914.6 - 793.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	167.60'	1,850 cf	**101.00'W x 38.00'L x 3.00'H Field A**
			11,514 cf Overall - 5,346 cf Embedded = 6,168 cf x 30.0% Voids
#2A	168.10'	5,186 cf	**StormTank 18W** x 792 Inside #1
			Inside= 36.0"W x 18.0"H => 4.37 sf x 1.50'L = 6.5 cf
			Outside= 36.0"W x 18.0"H => 4.50 sf x 1.50'L = 6.8 cf
		7,036 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	169.00'	**6.0" Round Culvert**
			L= 28.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 169.00' / 167.00' S= 0.0714 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.65 cfs @ 12.53 hrs HW=169.72' (Free Discharge)
↑**1=Culvert** (Inlet Controls 0.65 cfs @ 3.31 fps)

Pond P-1A: Subsurface Detention/Infiltration basin - Chamber Wizard Field A

Chamber Model = StormTank 18W
Inside= 36.0"W x 18.0"H => 4.37 sf x 1.50'L = 6.5 cf
Outside= 36.0"W x 18.0"H => 4.50 sf x 1.50'L = 6.8 cf

36.0" Wide = 36.0" C-C Row Spacing

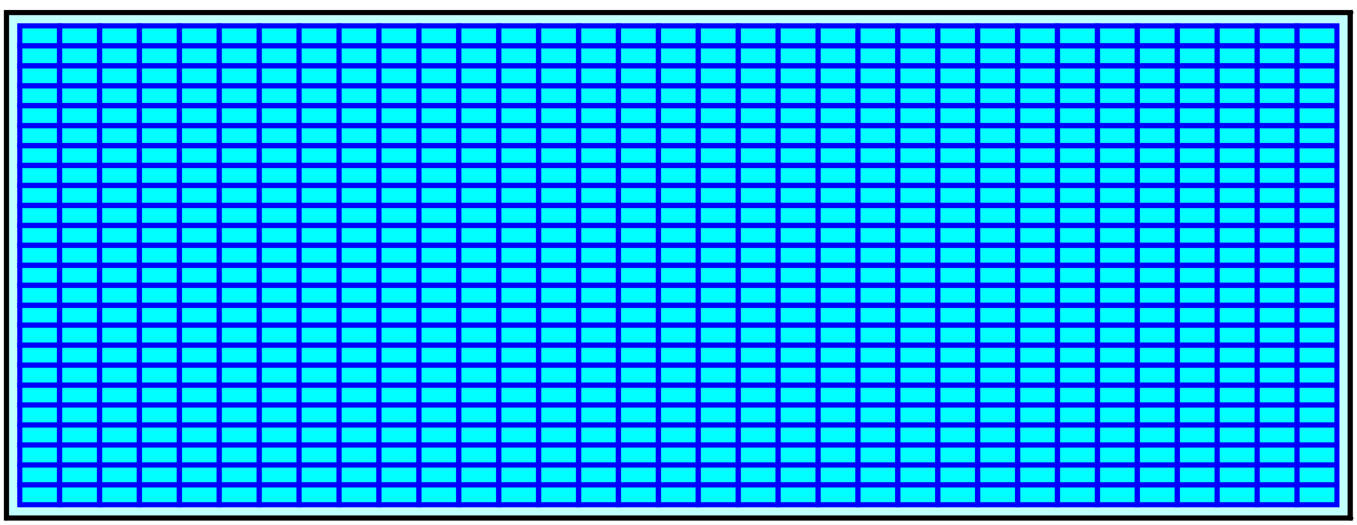
24 Chambers/Row x 1.50' Long = 36.00' Row Length +12.0" End Stone x 2 = 38.00' Base Length
33 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 101.00' Base Width
6.0" Base + 18.0" Chamber Height + 12.0" Cover = 3.00' Field Height

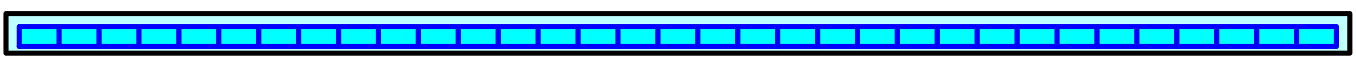
792 Chambers x 6.5 cf = 5,185.6 cf Chamber Storage
792 Chambers x 6.8 cf = 5,346.0 cf Displacement

11,514.0 cf Field - 5,346.0 cf Chambers = 6,168.0 cf Stone x 30.0% Voids = 1,850.4 cf Stone Storage

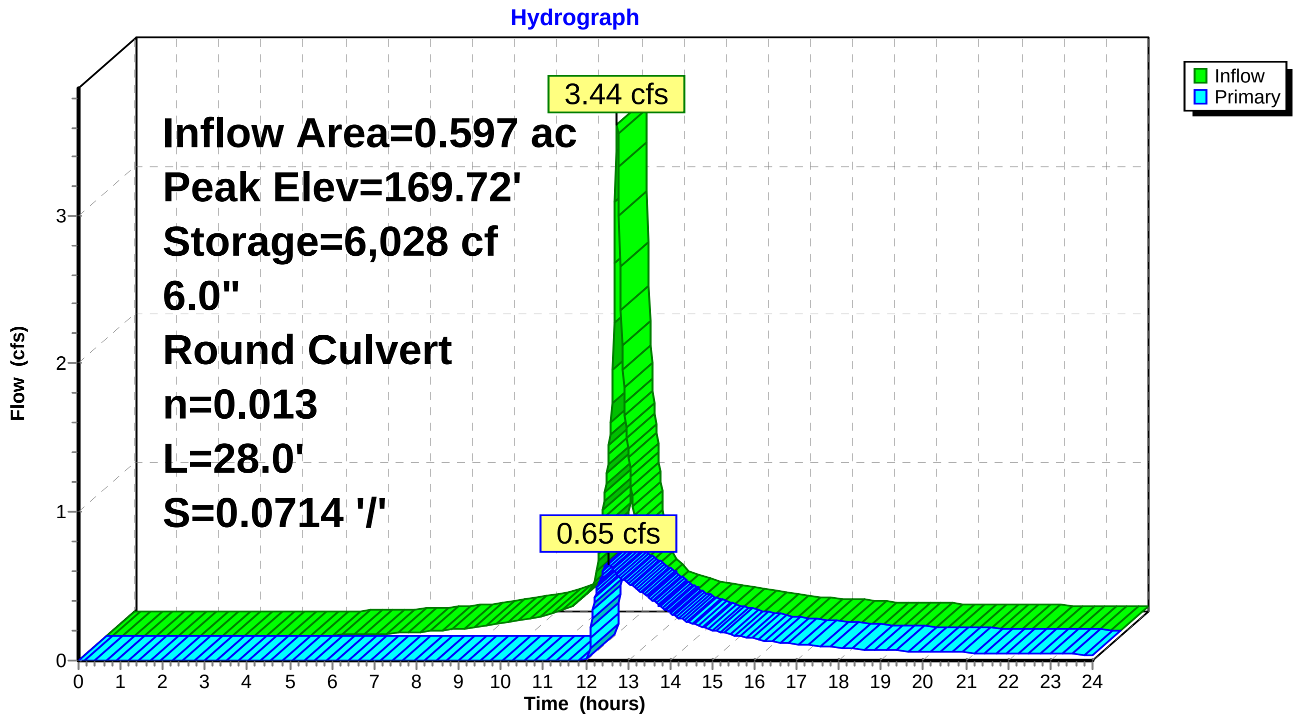
Chamber Storage + Stone Storage = 7,036.0 cf = 0.162 af
Overall Storage Efficiency = 61.1%

792 Chambers
426.4 cy Field
228.4 cy Stone





Pond P-1A: Subsurface Detention/Infiltration basin



Stage-Area-Storage for Pond P-1A: Subsurface Detention/Infiltration basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
167.60	0	168.66	2,558	169.72	6,023
167.62	23	168.68	2,628	169.74	6,046
167.64	46	168.70	2,699	169.76	6,069
167.66	69	168.72	2,770	169.78	6,092
167.68	92	168.74	2,841	169.80	6,115
167.70	115	168.76	2,912	169.82	6,138
167.72	138	168.78	2,982	169.84	6,161
167.74	161	168.80	3,053	169.86	6,184
167.76	184	168.82	3,124	169.88	6,207
167.78	207	168.84	3,195	169.90	6,230
167.80	230	168.86	3,266	169.92	6,253
167.82	253	168.88	3,336	169.94	6,276
167.84	276	168.90	3,407	169.96	6,299
167.86	299	168.92	3,478	169.98	6,322
167.88	322	168.94	3,549	170.00	6,345
167.90	345	168.96	3,619	170.02	6,368
167.92	368	168.98	3,690	170.04	6,391
167.94	391	169.00	3,761	170.06	6,414
167.96	415	169.02	3,832	170.08	6,437
167.98	438	169.04	3,903	170.10	6,460
168.00	461	169.06	3,973	170.12	6,483
168.02	484	169.08	4,044	170.14	6,506
168.04	507	169.10	4,115	170.16	6,529
168.06	530	169.12	4,186	170.18	6,552
168.08	553	169.14	4,257	170.20	6,575
168.10	576	169.16	4,327	170.22	6,598
168.12	646	169.18	4,398	170.24	6,622
168.14	717	169.20	4,469	170.26	6,645
168.16	788	169.22	4,540	170.28	6,668
168.18	859	169.24	4,610	170.30	6,691
168.20	930	169.26	4,681	170.32	6,714
168.22	1,000	169.28	4,752	170.34	6,737
168.24	1,071	169.30	4,823	170.36	6,760
168.26	1,142	169.32	4,894	170.38	6,783
168.28	1,213	169.34	4,964	170.40	6,806
168.30	1,284	169.36	5,035	170.42	6,829
168.32	1,354	169.38	5,106	170.44	6,852
168.34	1,425	169.40	5,177	170.46	6,875
168.36	1,496	169.42	5,248	170.48	6,898
168.38	1,567	169.44	5,318	170.50	6,921
168.40	1,637	169.46	5,389	170.52	6,944
168.42	1,708	169.48	5,460	170.54	6,967
168.44	1,779	169.50	5,531	170.56	6,990
168.46	1,850	169.52	5,601	170.58	7,013
168.48	1,921	169.54	5,672	170.60	**7,036**
168.50	1,991	169.56	5,743		
168.52	2,062	169.58	5,814		
168.54	2,133	169.60	5,885		
168.56	2,204	169.62	5,908		
168.58	2,275	169.64	5,931		
168.60	2,345	169.66	5,954		
168.62	2,416	169.68	5,977		
168.64	2,487	169.70	6,000		

Summary for Pond P-1C: Bioretention basin

Inflow Area = 1.707 ac, 58.27% Impervious, Inflow Depth > 4.74" for 100 YEAR event
Inflow = 9.32 cfs @ 12.09 hrs, Volume= 0.675 af
Outflow = 2.72 cfs @ 12.43 hrs, Volume= 0.596 af, Atten= 71%, Lag= 20.4 min
Primary = 2.72 cfs @ 12.43 hrs, Volume= 0.596 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 163.45' @ 12.43 hrs Surf.Area= 7,220 sf Storage= 11,645 cf

Plug-Flow detention time= 117.8 min calculated for 0.596 af (88% of inflow)
Center-of-Mass det. time= 64.2 min (865.6 - 801.5)

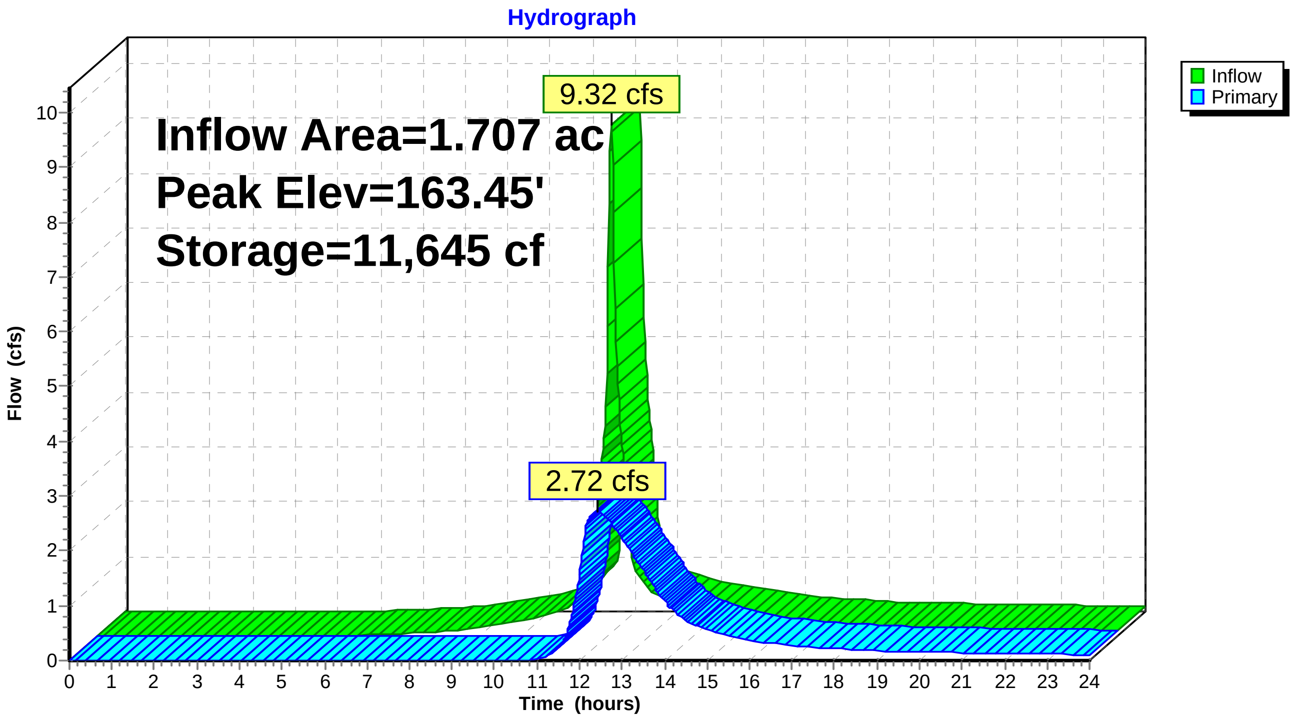
Volume	Invert	Avail.Storage	Storage Description
#1	161.50'	15,835 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.50	4,260	0	0
162.00	5,520	2,445	2,445
163.00	6,690	6,105	8,550
164.00	7,880	7,285	15,835

Device	Routing	Invert	Outlet Devices
#1	Primary	161.00'	**10.0" Round Culvert** L= 107.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 161.00' / 159.00' S= 0.0187 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Device 1	162.10'	**8.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	162.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=2.72 cfs @ 12.43 hrs HW=163.44' (Free Discharge)
└─**1=Culvert** (Passes 2.72 cfs of 3.46 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.69 cfs @ 4.84 fps)
  └─**3=Orifice/Grate** (Orifice Controls 1.03 cfs @ 5.26 fps)

Pond P-1C: Bioretention basin



Stage-Area-Storage for Pond P-1C: Bioretention basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
161.50	4,260	0
161.55	4,386	216
161.60	4,512	439
161.65	4,638	667
161.70	4,764	902
161.75	4,890	1,144
161.80	5,016	1,391
161.85	5,142	1,645
161.90	5,268	1,906
161.95	5,394	2,172
162.00	5,520	2,445
162.05	5,579	2,722
162.10	5,637	3,003
162.15	5,696	3,286
162.20	5,754	3,572
162.25	5,813	3,862
162.30	5,871	4,154
162.35	5,929	4,449
162.40	5,988	4,747
162.45	6,046	5,047
162.50	6,105	5,351
162.55	6,164	5,658
162.60	6,222	5,968
162.65	6,281	6,280
162.70	6,339	6,596
162.75	6,398	6,914
162.80	6,456	7,235
162.85	6,514	7,560
162.90	6,573	7,887
162.95	6,631	8,217
163.00	6,690	8,550
163.05	6,750	8,886
163.10	6,809	9,225
163.15	6,869	9,567
163.20	6,928	9,912
163.25	6,988	10,260
163.30	7,047	10,611
163.35	7,106	10,964
163.40	7,166	11,321
163.45	7,225	11,681
163.50	7,285	12,044
163.55	7,345	12,409
163.60	7,404	12,778
163.65	7,464	13,150
163.70	7,523	13,525
163.75	7,583	13,902
163.80	7,642	14,283
163.85	7,701	14,666
163.90	7,761	15,053
163.95	7,820	15,442
164.00	**7,880**	**15,835**

Summary for Pond P-1E: Subsurface Detention basin

Inflow Area =	0.673 ac,	64.43% Impervious,	Inflow Depth > 4.96"	for 100 YEAR event	
Inflow =	3.81 cfs @	12.09 hrs,	Volume=	0.278 af	
Outflow =	1.16 cfs @	12.41 hrs,	Volume=	0.220 af,	Atten= 69%, Lag= 19.4 min
Primary =	1.16 cfs @	12.41 hrs,	Volume=	0.220 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 165.07' @ 12.41 hrs Surf.Area= 2,542 sf Storage= 5,473 cf

Plug-Flow detention time= 154.3 min calculated for 0.220 af (79% of inflow)
Center-of-Mass det. time= 78.0 min (874.0 - 796.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	162.00'	1,265 cf	**62.00'W x 41.00'L x 3.50'H Field A** 8,897 cf Overall - 4,680 cf Embedded = 4,217 cf x 30.0% Voids
#2A	162.50'	4,540 cf	**StormTank 24W** x 520 Inside #1 Inside= 36.0"W x 24.0"H => 5.82 sf x 1.50'L = 8.7 cf Outside= 36.0"W x 24.0"H => 6.00 sf x 1.50'L = 9.0 cf
		5,805 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	163.30'	**6.0" Round Culvert** L= 93.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 163.30' / 159.10' S= 0.0452 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=1.16 cfs @ 12.41 hrs HW=165.06' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.16 cfs @ 5.92 fps)

Pond P-1E: Subsurface Detention basin - Chamber Wizard Field A

Chamber Model = StormTank 24W
Inside= 36.0"W x 24.0"H => 5.82 sf x 1.50'L = 8.7 cf
Outside= 36.0"W x 24.0"H => 6.00 sf x 1.50'L = 9.0 cf

36.0" Wide = 36.0" C-C Row Spacing

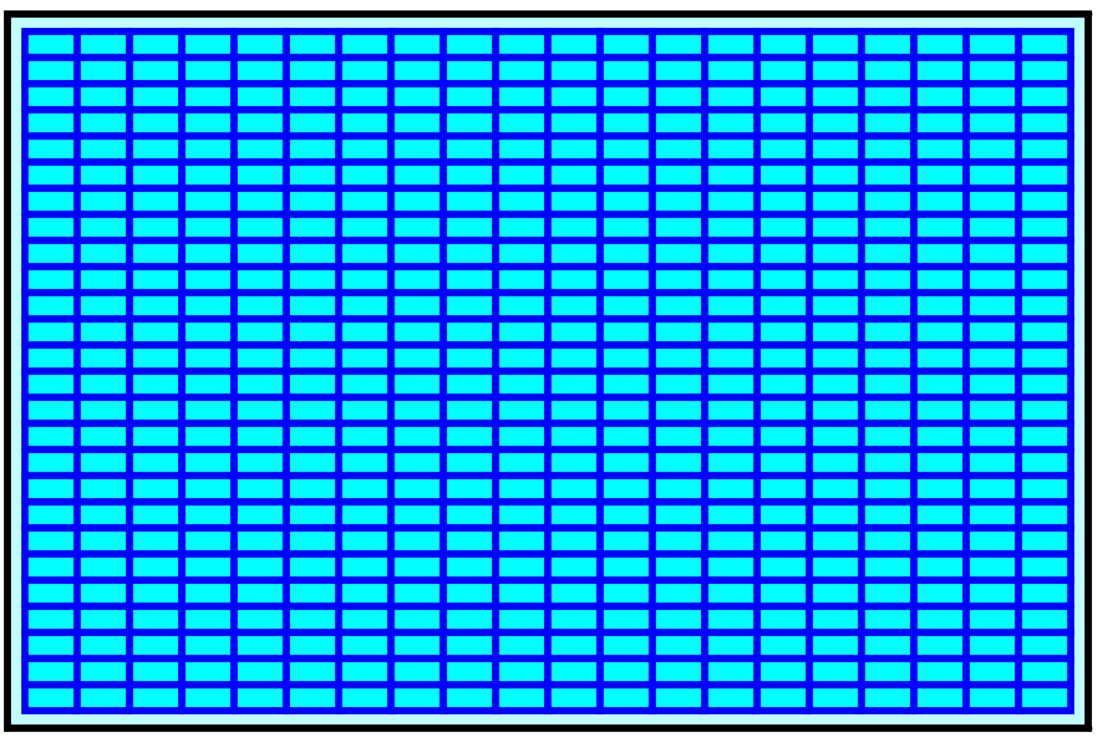
26 Chambers/Row x 1.50' Long = 39.00' Row Length +12.0" End Stone x 2 = 41.00' Base Length
20 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 62.00' Base Width
6.0" Base + 24.0" Chamber Height + 12.0" Cover = 3.50' Field Height

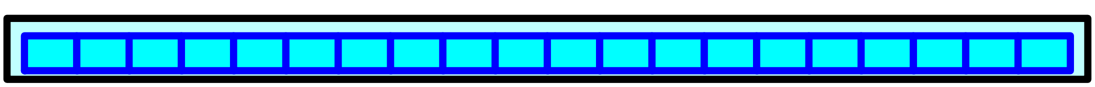
520 Chambers x 8.7 cf = 4,539.6 cf Chamber Storage
520 Chambers x 9.0 cf = 4,680.0 cf Displacement

8,897.0 cf Field - 4,680.0 cf Chambers = 4,217.0 cf Stone x 30.0% Voids = 1,265.1 cf Stone Storage

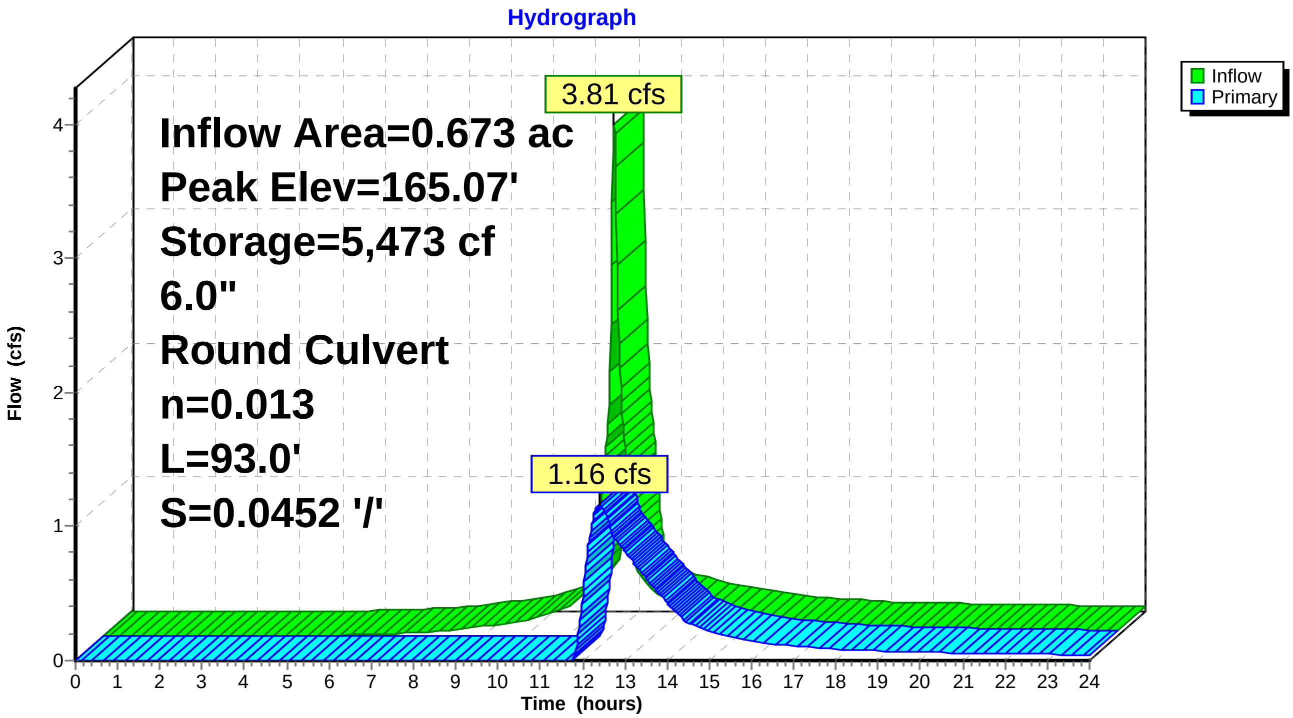
Chamber Storage + Stone Storage = 5,804.7 cf = 0.133 af
Overall Storage Efficiency = 65.2%

520 Chambers
329.5 cy Field
156.2 cy Stone





Pond P-1E: Subsurface Detention basin



Stage-Area-Storage for Pond P-1E: Subsurface Detention basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
162.00	0	164.65	5,156
162.05	38	164.70	5,195
162.10	76	164.75	5,233
162.15	114	164.80	5,271
162.20	153	164.85	5,309
162.25	191	164.90	5,347
162.30	229	164.95	5,385
162.35	267	165.00	5,423
162.40	305	165.05	5,462
162.45	343	165.10	5,500
162.50	381	165.15	5,538
162.55	498	165.20	5,576
162.60	614	165.25	5,614
162.65	731	165.30	5,652
162.70	847	165.35	5,690
162.75	964	165.40	5,728
162.80	1,080	165.45	5,767
162.85	1,197	165.50	**5,805**
162.90	1,313		
162.95	1,430		
163.00	1,547		
163.05	1,663		
163.10	1,780		
163.15	1,896		
163.20	2,013		
163.25	2,129		
163.30	2,246		
163.35	2,362		
163.40	2,479		
163.45	2,595		
163.50	2,712		
163.55	2,828		
163.60	2,945		
163.65	3,061		
163.70	3,178		
163.75	3,294		
163.80	3,411		
163.85	3,527		
163.90	3,644		
163.95	3,760		
164.00	3,877		
164.05	3,993		
164.10	4,110		
164.15	4,226		
164.20	4,343		
164.25	4,460		
164.30	4,576		
164.35	4,693		
164.40	4,809		
164.45	4,926		
164.50	5,042		
164.55	5,080		
164.60	5,118		

Summary for Pond P-1F: Subsurface Detention/Infiltration basin

Inflow Area = 0.460 ac, 69.87% Impervious, Inflow Depth > 5.19" for 100 YEAR event
Inflow = 2.70 cfs @ 12.09 hrs, Volume= 0.199 af
Outflow = 1.82 cfs @ 12.17 hrs, Volume= 0.169 af, Atten= 33%, Lag= 5.2 min
Primary = 1.82 cfs @ 12.17 hrs, Volume= 0.169 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 160.71' @ 12.17 hrs Surf.Area= 1,504 sf Storage= 2,579 cf

Plug-Flow detention time= 113.7 min calculated for 0.169 af (85% of inflow)
Center-of-Mass det. time= 51.0 min (841.2 - 790.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	158.00'	746 cf	**47.00'W x 32.00'L x 3.00'H Field A** 4,512 cf Overall - 2,025 cf Embedded = 2,487 cf x 30.0% Voids
#2A	158.50'	1,964 cf	**StormTank 18W** x 300 Inside #1 Inside= 36.0"W x 18.0"H => 4.37 sf x 1.50'L = 6.5 cf Outside= 36.0"W x 18.0"H => 4.50 sf x 1.50'L = 6.8 cf
		2,710 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	159.20'	**8.0" Round Culvert** L= 2.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.20' / 159.10' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=1.82 cfs @ 12.17 hrs HW=160.70' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.82 cfs @ 5.21 fps)

Pond P-1F: Subsurface Detention/Infiltration basin - Chamber Wizard Field A

Chamber Model = StormTank 18W
Inside= 36.0"W x 18.0"H => 4.37 sf x 1.50'L = 6.5 cf
Outside= 36.0"W x 18.0"H => 4.50 sf x 1.50'L = 6.8 cf

36.0" Wide = 36.0" C-C Row Spacing

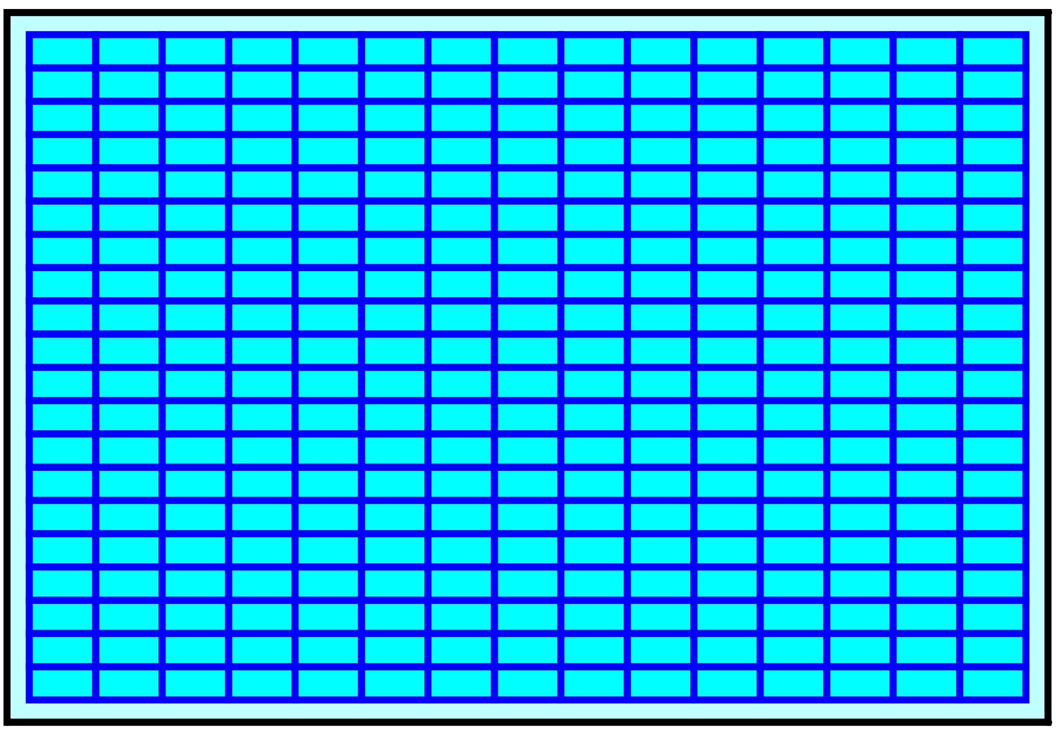
20 Chambers/Row x 1.50' Long = 30.00' Row Length +12.0" End Stone x 2 = 32.00' Base Length
15 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 47.00' Base Width
6.0" Base + 18.0" Chamber Height + 12.0" Cover = 3.00' Field Height

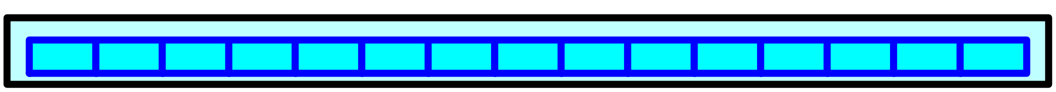
300 Chambers x 6.5 cf = 1,964.3 cf Chamber Storage
300 Chambers x 6.8 cf = 2,025.0 cf Displacement

4,512.0 cf Field - 2,025.0 cf Chambers = 2,487.0 cf Stone x 30.0% Voids = 746.1 cf Stone Storage

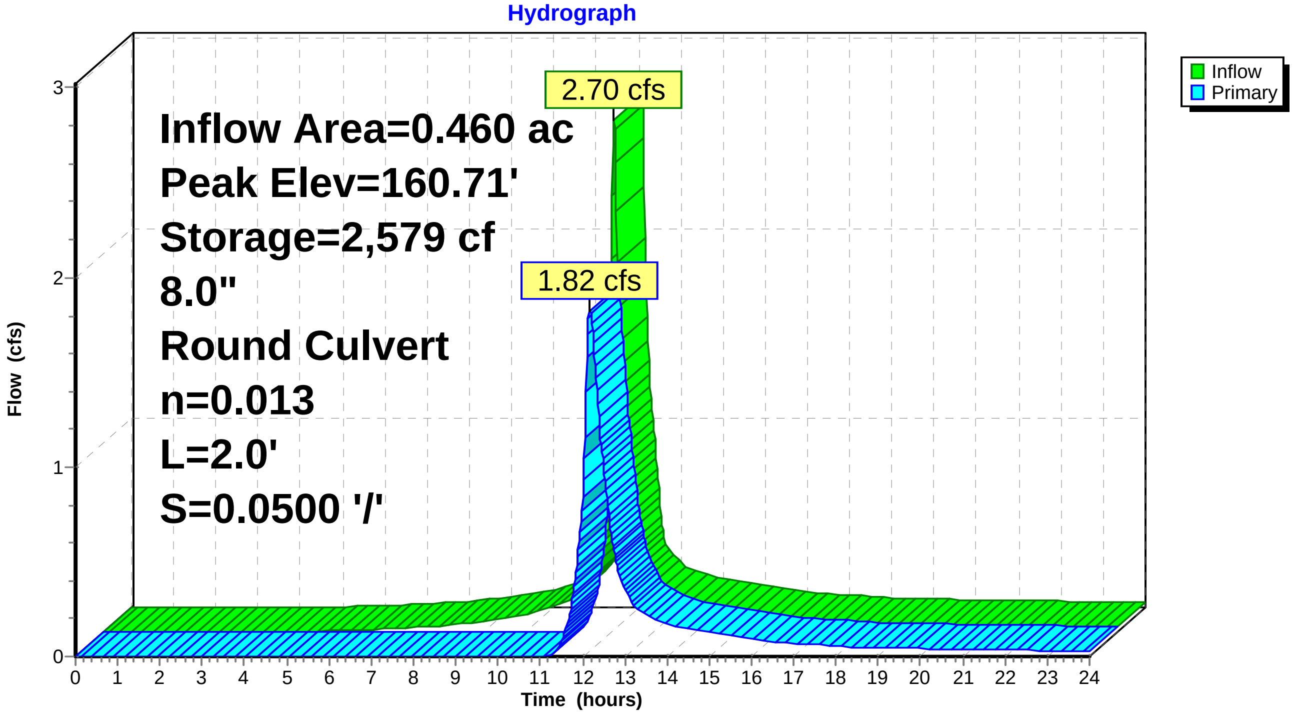
Chamber Storage + Stone Storage = 2,710.4 cf = 0.062 af
Overall Storage Efficiency = 60.1%

300 Chambers
167.1 cy Field
92.1 cy Stone





Pond P-1F: Subsurface Detention/Infiltration basin



Stage-Area-Storage for Pond P-1F: Subsurface Detention/Infiltration basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
158.00	0	159.06	985	160.12	2,313
158.02	9	159.08	1,012	160.14	2,322
158.04	18	159.10	1,039	160.16	2,331
158.06	27	159.12	1,066	160.18	2,340
158.08	36	159.14	1,093	160.20	2,349
158.10	45	159.16	1,120	160.22	2,358
158.12	54	159.18	1,147	160.24	2,367
158.14	63	159.20	1,175	160.26	2,376
158.16	72	159.22	1,202	160.28	2,385
158.18	81	159.24	1,229	160.30	2,395
158.20	90	159.26	1,256	160.32	2,404
158.22	99	159.28	1,283	160.34	2,413
158.24	108	159.30	1,310	160.36	2,422
158.26	117	159.32	1,337	160.38	2,431
158.28	126	159.34	1,364	160.40	2,440
158.30	135	159.36	1,392	160.42	2,449
158.32	144	159.38	1,419	160.44	2,458
158.34	153	159.40	1,446	160.46	2,467
158.36	162	159.42	1,473	160.48	2,476
158.38	171	159.44	1,500	160.50	2,485
158.40	180	159.46	1,527	160.52	2,494
158.42	190	159.48	1,554	160.54	2,503
158.44	199	159.50	1,581	160.56	2,512
158.46	208	159.52	1,608	160.58	2,521
158.48	217	159.54	1,636	160.60	2,530
158.50	226	159.56	1,663	160.62	2,539
158.52	253	159.58	1,690	160.64	2,548
158.54	280	159.60	1,717	160.66	2,557
158.56	307	159.62	1,744	160.68	2,566
158.58	334	159.64	1,771	160.70	2,575
158.60	361	159.66	1,798	160.72	2,584
158.62	388	159.68	1,825	160.74	2,593
158.64	415	159.70	1,852	160.76	2,602
158.66	443	159.72	1,880	160.78	2,611
158.68	470	159.74	1,907	160.80	2,620
158.70	497	159.76	1,934	160.82	2,629
158.72	524	159.78	1,961	160.84	2,638
158.74	551	159.80	1,988	160.86	2,647
158.76	578	159.82	2,015	160.88	2,656
158.78	605	159.84	2,042	160.90	2,665
158.80	632	159.86	2,069	160.92	2,674
158.82	659	159.88	2,096	160.94	2,683
158.84	687	159.90	2,124	160.96	2,692
158.86	714	159.92	2,151	160.98	2,701
158.88	741	159.94	2,178	161.00	**2,710**
158.90	768	159.96	2,205		
158.92	795	159.98	2,232		
158.94	822	160.00	2,259		
158.96	849	160.02	2,268		
158.98	876	160.04	2,277		
159.00	903	160.06	2,286		
159.02	931	160.08	2,295		
159.04	958	160.10	2,304		

Summary for Pond P-4B: Subsurface Detention basin

Inflow Area = 1.123 ac, 75.71% Impervious, Inflow Depth > 5.41" for 100 YEAR event
Inflow = 6.79 cfs @ 12.08 hrs, Volume= 0.507 af
Outflow = 1.00 cfs @ 12.58 hrs, Volume= 0.283 af, Atten= 85%, Lag= 29.9 min
Primary = 1.00 cfs @ 12.58 hrs, Volume= 0.283 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 192.36' @ 12.58 hrs Surf.Area= 5,704 sf Storage= 12,984 cf

Plug-Flow detention time= 254.9 min calculated for 0.283 af (56% of inflow)
Center-of-Mass det. time= 147.9 min (931.9 - 784.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	189.00'	2,749 cf	**92.00'W x 62.00'L x 3.50'H Field A** 19,964 cf Overall - 10,800 cf Embedded = 9,164 cf x 30.0% Voids
#2A	189.50'	10,476 cf	**StormTank 24W** x 1200 Inside #1 Inside= 36.0"W x 24.0"H => 5.82 sf x 1.50'L = 8.7 cf Outside= 36.0"W x 24.0"H => 6.00 sf x 1.50'L = 9.0 cf
		13,225 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	191.00'	**6.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 191.00' / 190.90' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=1.00 cfs @ 12.58 hrs HW=192.36' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.00 cfs @ 5.07 fps)

Pond P-4B: Subsurface Detention basin - Chamber Wizard Field A

Chamber Model = StormTank 24W
Inside= 36.0"W x 24.0"H => 5.82 sf x 1.50'L = 8.7 cf
Outside= 36.0"W x 24.0"H => 6.00 sf x 1.50'L = 9.0 cf

36.0" Wide = 36.0" C-C Row Spacing

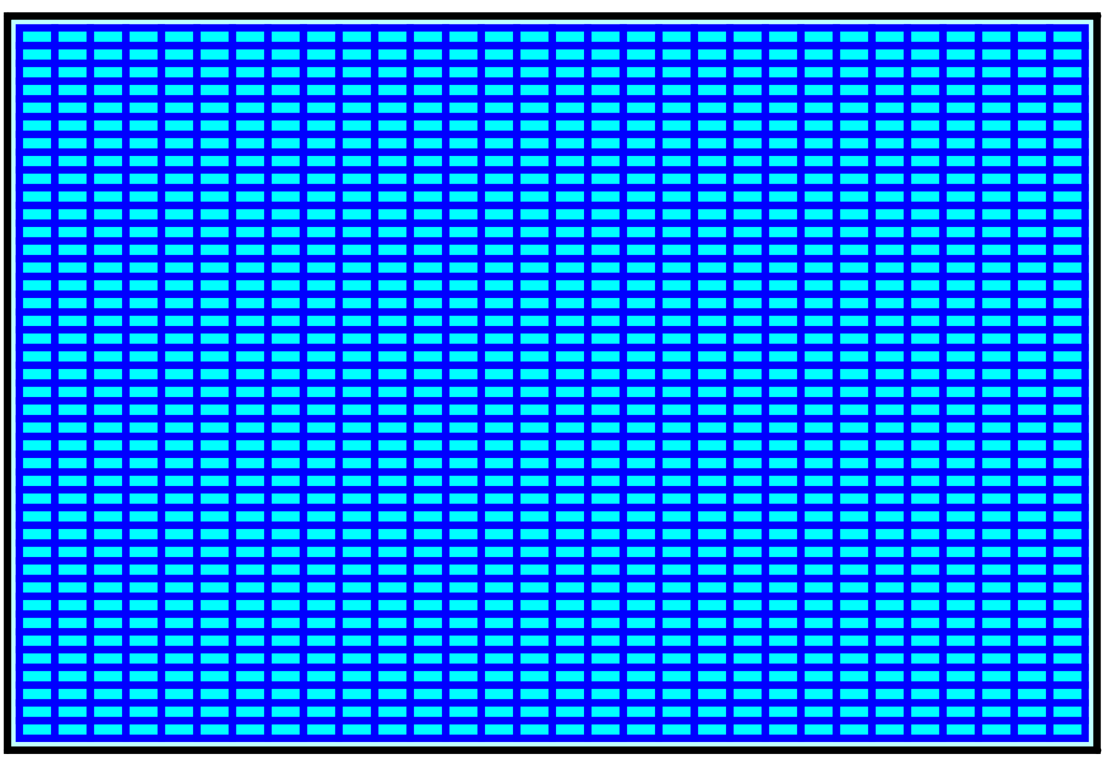
40 Chambers/Row x 1.50' Long = 60.00' Row Length +12.0" End Stone x 2 = 62.00' Base Length
30 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 92.00' Base Width
6.0" Base + 24.0" Chamber Height + 12.0" Cover = 3.50' Field Height

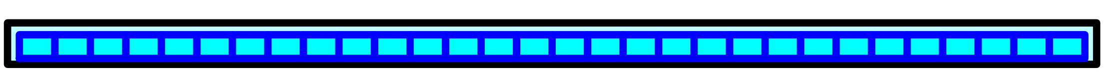
1,200 Chambers x 8.7 cf = 10,476.0 cf Chamber Storage
1,200 Chambers x 9.0 cf = 10,800.0 cf Displacement

19,964.0 cf Field - 10,800.0 cf Chambers = 9,164.0 cf Stone x 30.0% Voids = 2,749.2 cf Stone Storage

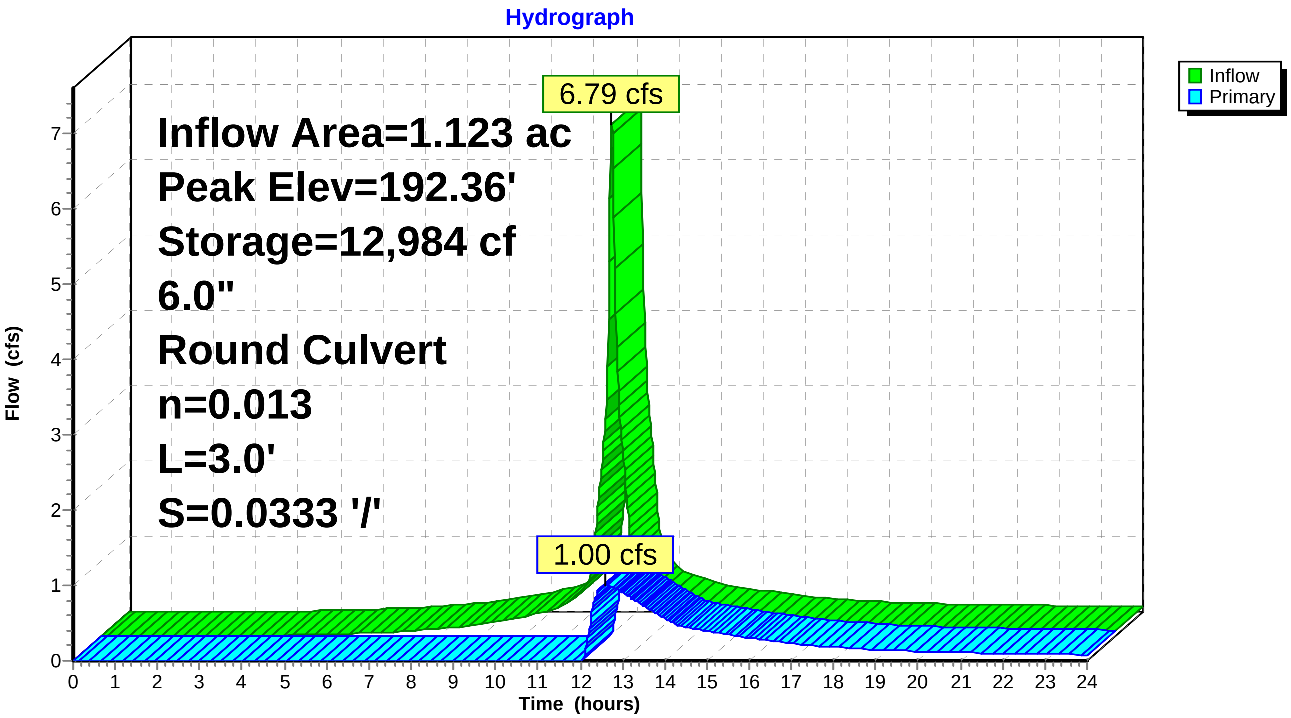
Chamber Storage + Stone Storage = 13,225.2 cf = 0.304 af
Overall Storage Efficiency = 66.2%

1,200 Chambers
739.4 cy Field
339.4 cy Stone





Pond P-4B: Subsurface Detention basin



Stage-Area-Storage for Pond P-4B: Subsurface Detention basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
189.00	0	191.65	11,771
189.05	86	191.70	11,856
189.10	171	191.75	11,942
189.15	257	191.80	12,027
189.20	342	191.85	12,113
189.25	428	191.90	12,198
189.30	513	191.95	12,284
189.35	599	192.00	12,370
189.40	684	192.05	12,455
189.45	770	192.10	12,541
189.50	856	192.15	12,626
189.55	1,122	192.20	12,712
189.60	1,389	192.25	12,797
189.65	1,655	192.30	12,883
189.70	1,921	192.35	12,969
189.75	2,188	192.40	13,054
189.80	2,454	192.45	13,140
189.85	2,721	192.50	**13,225**
189.90	2,987		
189.95	3,254		
190.00	3,520		
190.05	3,787		
190.10	4,053		
190.15	4,320		
190.20	4,586		
190.25	4,853		
190.30	5,119		
190.35	5,385		
190.40	5,652		
190.45	5,918		
190.50	6,185		
190.55	6,451		
190.60	6,718		
190.65	6,984		
190.70	7,251		
190.75	7,517		
190.80	7,784		
190.85	8,050		
190.90	8,316		
190.95	8,583		
191.00	8,849		
191.05	9,116		
191.10	9,382		
191.15	9,649		
191.20	9,915		
191.25	10,182		
191.30	10,448		
191.35	10,715		
191.40	10,981		
191.45	11,248		
191.50	11,514		
191.55	11,600		
191.60	11,685		

Summary for Pond P-4C: Subsurface Detention/Infiltration basin

Inflow Area = 3.805 ac, 60.65% Impervious, Inflow Depth > 3.81" for 100 YEAR event
Inflow = 10.84 cfs @ 12.09 hrs, Volume= 1.210 af
Outflow = 2.48 cfs @ 12.96 hrs, Volume= 1.084 af, Atten= 77%, Lag= 52.3 min
Primary = 2.48 cfs @ 12.96 hrs, Volume= 1.084 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 157.06' @ 12.96 hrs Surf.Area= 5,950 sf Storage= 17,594 cf

Plug-Flow detention time= 130.8 min calculated for 1.084 af (90% of inflow)
Center-of-Mass det. time= 81.6 min (932.9 - 851.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	153.50'	3,002 cf	**140.00'W x 42.50'L x 4.50'H Field A** 26,775 cf Overall - 16,767 cf Embedded = 10,008 cf x 30.0% Voids
#2A	154.00'	16,264 cf	**StormTank 36W** x 1242 Inside #1 Inside= 36.0"W x 36.0"H => 8.73 sf x 1.50'L = 13.1 cf Outside= 36.0"W x 36.0"H => 9.00 sf x 1.50'L = 13.5 cf
		19,266 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	154.55'	**8.0" Round Culvert** L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 154.55' / 154.30' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=2.48 cfs @ 12.96 hrs HW=157.06' (Free Discharge)
└─**1=Culvert** (Inlet Controls 2.48 cfs @ 7.11 fps)

Pond P-4C: Subsurface Detention/Infiltration basin - Chamber Wizard Field A

Chamber Model = StormTank 36W
Inside= 36.0"W x 36.0"H => 8.73 sf x 1.50'L = 13.1 cf
Outside= 36.0"W x 36.0"H => 9.00 sf x 1.50'L = 13.5 cf

36.0" Wide = 36.0" C-C Row Spacing

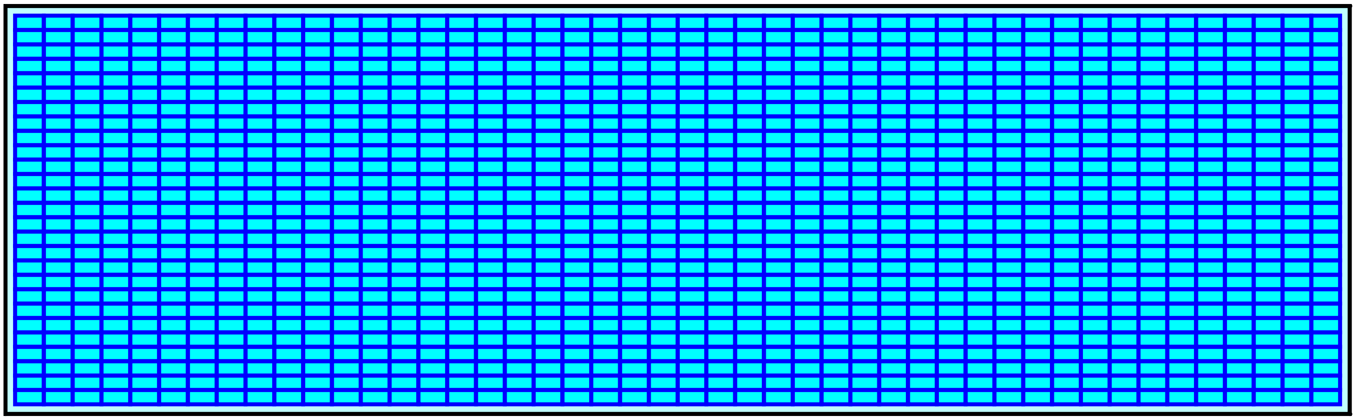
27 Chambers/Row x 1.50' Long = 40.50' Row Length +12.0" End Stone x 2 = 42.50' Base Length
46 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 140.00' Base Width
6.0" Base + 36.0" Chamber Height + 12.0" Cover = 4.50' Field Height

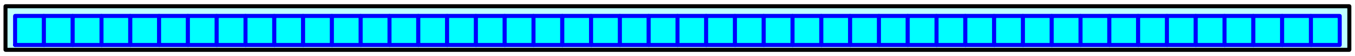
1,242 Chambers x 13.1 cf = 16,264.0 cf Chamber Storage
1,242 Chambers x 13.5 cf = 16,767.0 cf Displacement

26,775.0 cf Field - 16,767.0 cf Chambers = 10,008.0 cf Stone x 30.0% Voids = 3,002.4 cf Stone Storage

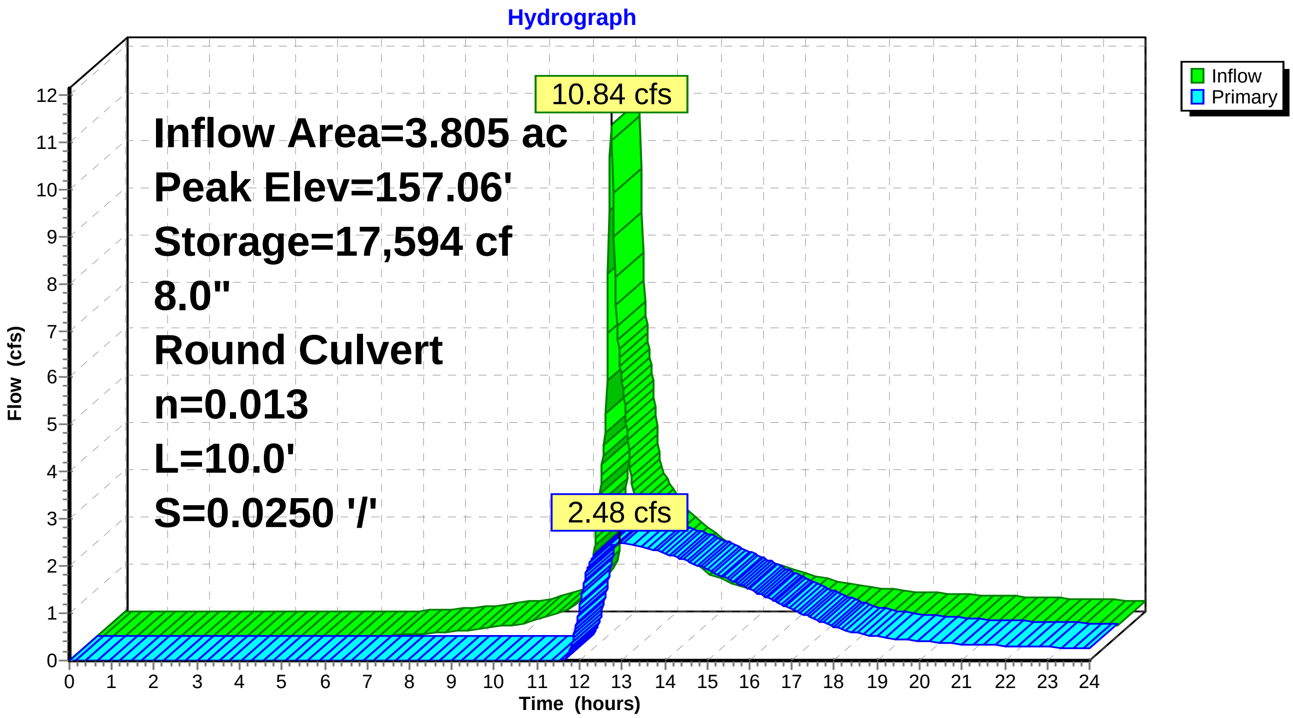
Chamber Storage + Stone Storage = 19,266.4 cf = 0.442 af
Overall Storage Efficiency = 72.0%

1,242 Chambers
991.7 cy Field
370.7 cy Stone





Pond P-4C: Subsurface Detention/Infiltration basin



Stage-Area-Storage for Pond P-4C: Subsurface Detention/Infiltration basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
153.50	0	156.15	12,781
153.55	89	156.20	13,058
153.60	178	156.25	13,334
153.65	268	156.30	13,611
153.70	357	156.35	13,887
153.75	446	156.40	14,164
153.80	536	156.45	14,440
153.85	625	156.50	14,717
153.90	714	156.55	14,993
153.95	803	156.60	15,270
154.00	893	156.65	15,546
154.05	1,169	156.70	15,823
154.10	1,445	156.75	16,099
154.15	1,722	156.80	16,375
154.20	1,998	156.85	16,652
154.25	2,275	156.90	16,928
154.30	2,551	156.95	17,205
154.35	2,828	157.00	17,481
154.40	3,104	157.05	17,571
154.45	3,381	157.10	17,660
154.50	3,657	157.15	17,749
154.55	3,934	157.20	17,838
154.60	4,210	157.25	17,928
154.65	4,487	157.30	18,017
154.70	4,763	157.35	18,106
154.75	5,040	157.40	18,195
154.80	5,316	157.45	18,285
154.85	5,593	157.50	18,374
154.90	5,869	157.55	18,463
154.95	6,146	157.60	18,552
155.00	6,422	157.65	18,642
155.05	6,699	157.70	18,731
155.10	6,975	157.75	18,820
155.15	7,252	157.80	18,909
155.20	7,528	157.85	18,999
155.25	7,805	157.90	19,088
155.30	8,081	157.95	19,177
155.35	8,358	158.00	**19,266**
155.40	8,634		
155.45	8,910		
155.50	9,187		
155.55	9,463		
155.60	9,740		
155.65	10,016		
155.70	10,293		
155.75	10,569		
155.80	10,846		
155.85	11,122		
155.90	11,399		
155.95	11,675		
156.00	11,952		
156.05	12,228		
156.10	12,505		

Summary for Pond P-4D: porous asphalt pavement

Inflow Area = 0.588 ac, 63.76% Impervious, Inflow Depth > 4.96" for 100 YEAR event
Inflow = 3.33 cfs @ 12.09 hrs, Volume= 0.243 af
Outflow = 0.55 cfs @ 12.56 hrs, Volume= 0.156 af, Atten= 84%, Lag= 28.5 min
Primary = 0.55 cfs @ 12.56 hrs, Volume= 0.156 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 177.87' @ 12.56 hrs Surf.Area= 13,035 sf Storage= 5,764 cf

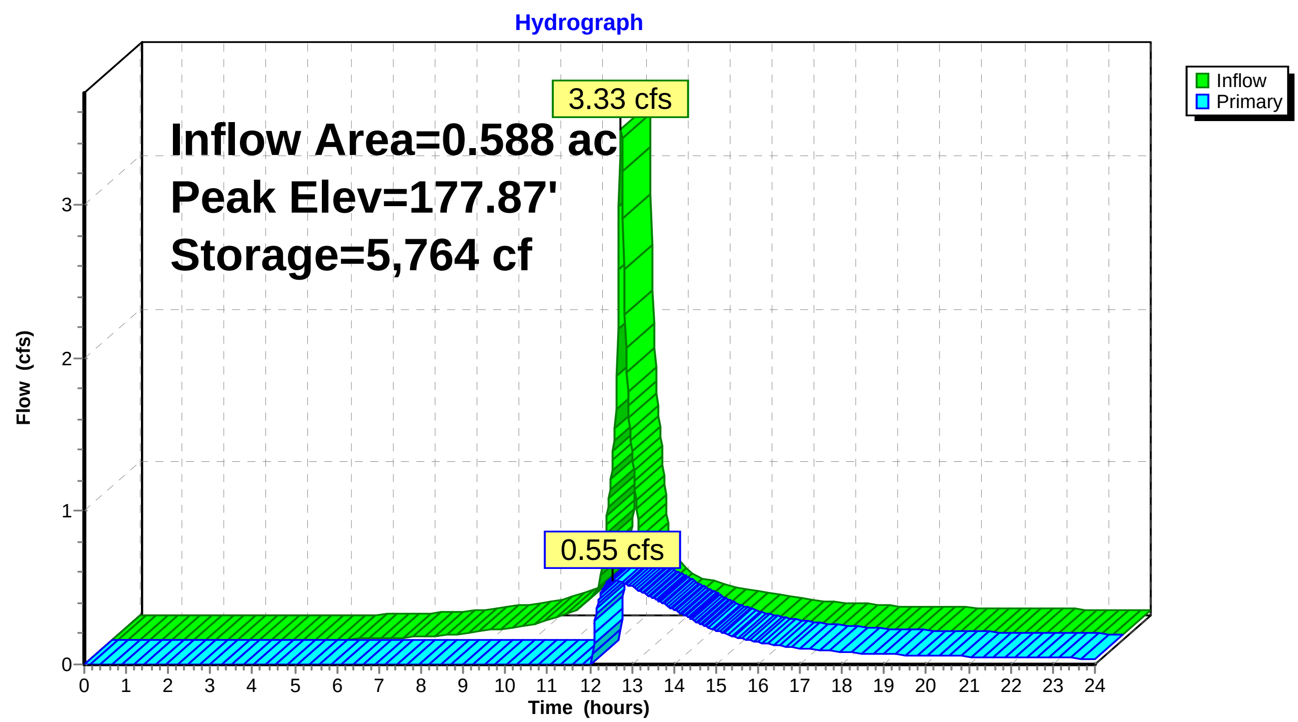
Plug-Flow detention time= 215.8 min calculated for 0.156 af (64% of inflow)
Center-of-Mass det. time= 117.3 min (913.3 - 796.0)

Volume	Invert	Avail.Storage	Storage Description
#1	176.40'	7,821 cf	**55.00'W x 237.00'L x 2.00'H Prismatoid** 26,070 cf Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	176.10'	**8.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 176.10' / 175.90' S= 0.0133 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	177.28'	**4.0" Vert. Orifice/Grate X 2.00** C= 0.600

Primary OutFlow Max=0.55 cfs @ 12.56 hrs HW=177.87' (Free Discharge)
└**1=Culvert** (Passes 0.55 cfs of 2.02 cfs potential flow)
　└**2=Orifice/Grate** (Orifice Controls 0.55 cfs @ 3.15 fps)

Pond P-4D: porous asphalt pavement



Stage-Area-Storage for Pond P-4D: porous asphalt pavement

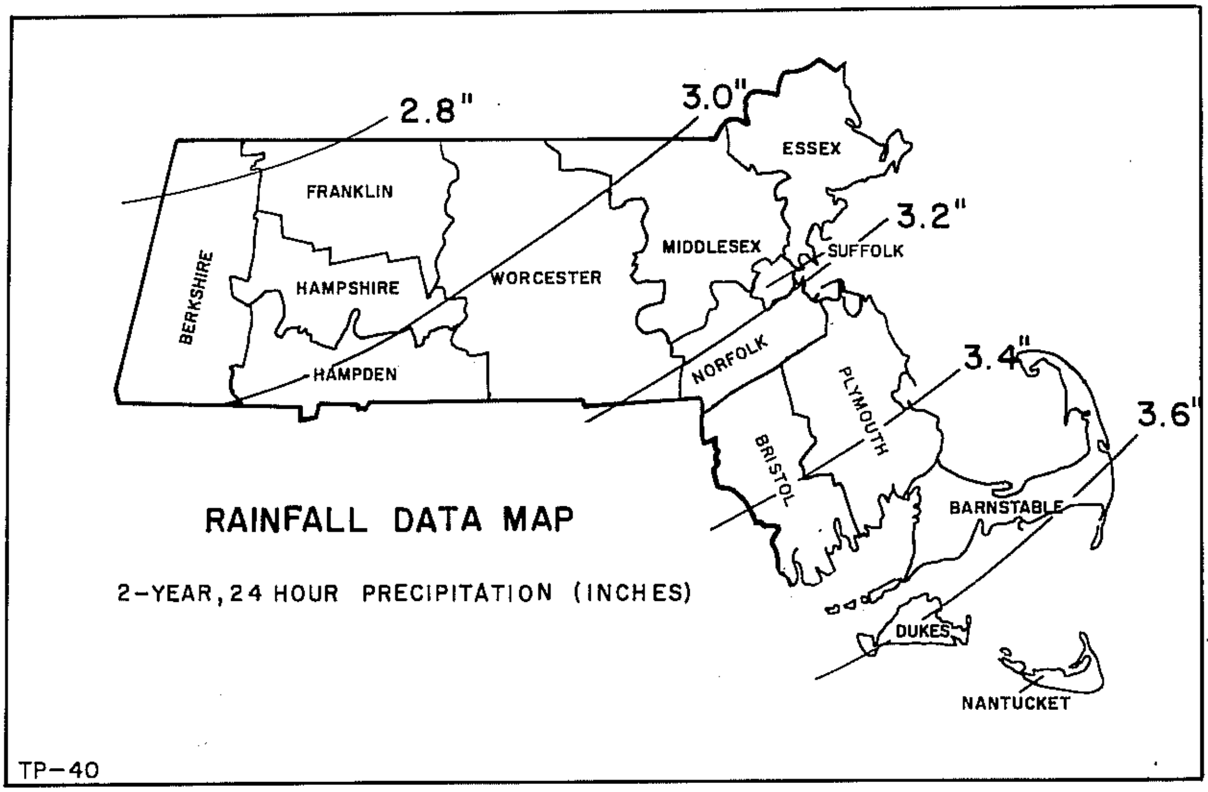
Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
176.40	0	177.46	4,145
176.42	78	177.48	4,223
176.44	156	177.50	4,302
176.46	235	177.52	4,380
176.48	313	177.54	4,458
176.50	391	177.56	4,536
176.52	469	177.58	4,614
176.54	547	177.60	4,693
176.56	626	177.62	4,771
176.58	704	177.64	4,849
176.60	782	177.66	4,927
176.62	860	177.68	5,005
176.64	939	177.70	5,084
176.66	1,017	177.72	5,162
176.68	1,095	177.74	5,240
176.70	1,173	177.76	5,318
176.72	1,251	177.78	5,396
176.74	1,330	177.80	5,475
176.76	1,408	177.82	5,553
176.78	1,486	177.84	5,631
176.80	1,564	177.86	5,709
176.82	1,642	177.88	5,788
176.84	1,721	177.90	5,866
176.86	1,799	177.92	5,944
176.88	1,877	177.94	6,022
176.90	1,955	177.96	6,100
176.92	2,033	177.98	6,179
176.94	2,112	178.00	6,257
176.96	2,190	178.02	6,335
176.98	2,268	178.04	6,413
177.00	2,346	178.06	6,491
177.02	2,425	178.08	6,570
177.04	2,503	178.10	6,648
177.06	2,581	178.12	6,726
177.08	2,659	178.14	6,804
177.10	2,737	178.16	6,882
177.12	2,816	178.18	6,961
177.14	2,894	178.20	7,039
177.16	2,972	178.22	7,117
177.18	3,050	178.24	7,195
177.20	3,128	178.26	7,274
177.22	3,207	178.28	7,352
177.24	3,285	178.30	7,430
177.26	3,363	178.32	7,508
177.28	3,441	178.34	7,586
177.30	3,519	178.36	7,665
177.32	3,598	178.38	7,743
177.34	3,676	178.40	**7,821**
177.36	3,754		
177.38	3,832		
177.40	3,911		
177.42	3,989		
177.44	4,067		

APPENDIX E – MASSACHUSETTS RAINFALL DATA MAPS

guidelines for
SOIL & WATER CONSERVATION

....in urbanizing areas of Massachusetts

USDA SOIL CONSERVATION SERVICE
AMHERST, MASSACHUSETTS OCTOBER 1977



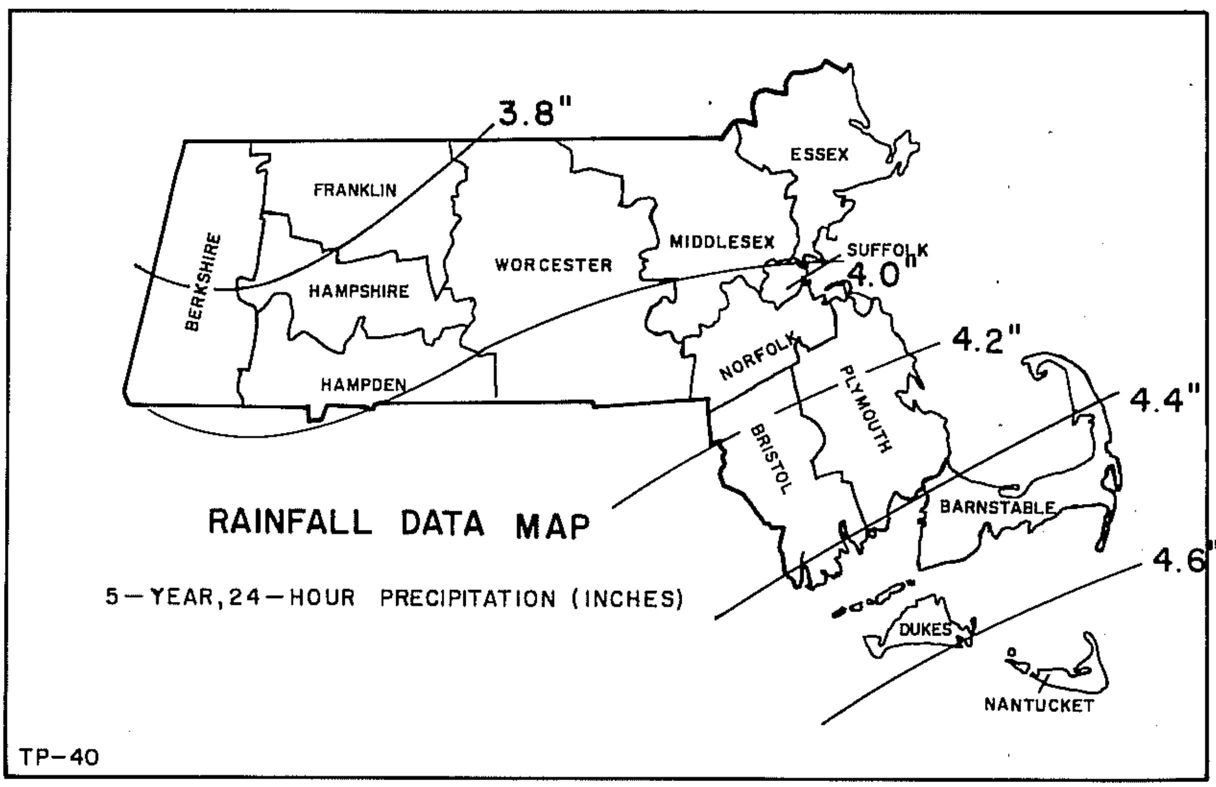
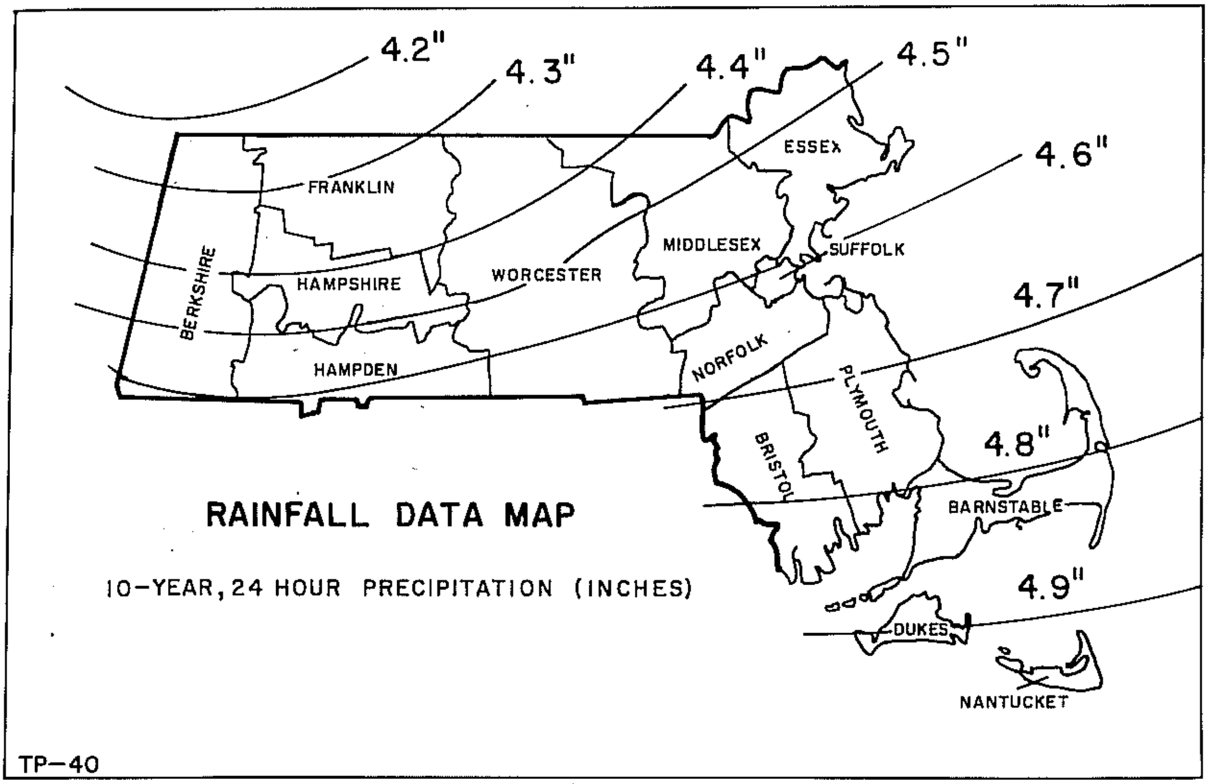


FIGURE B-1, SHEET 1 OF 3



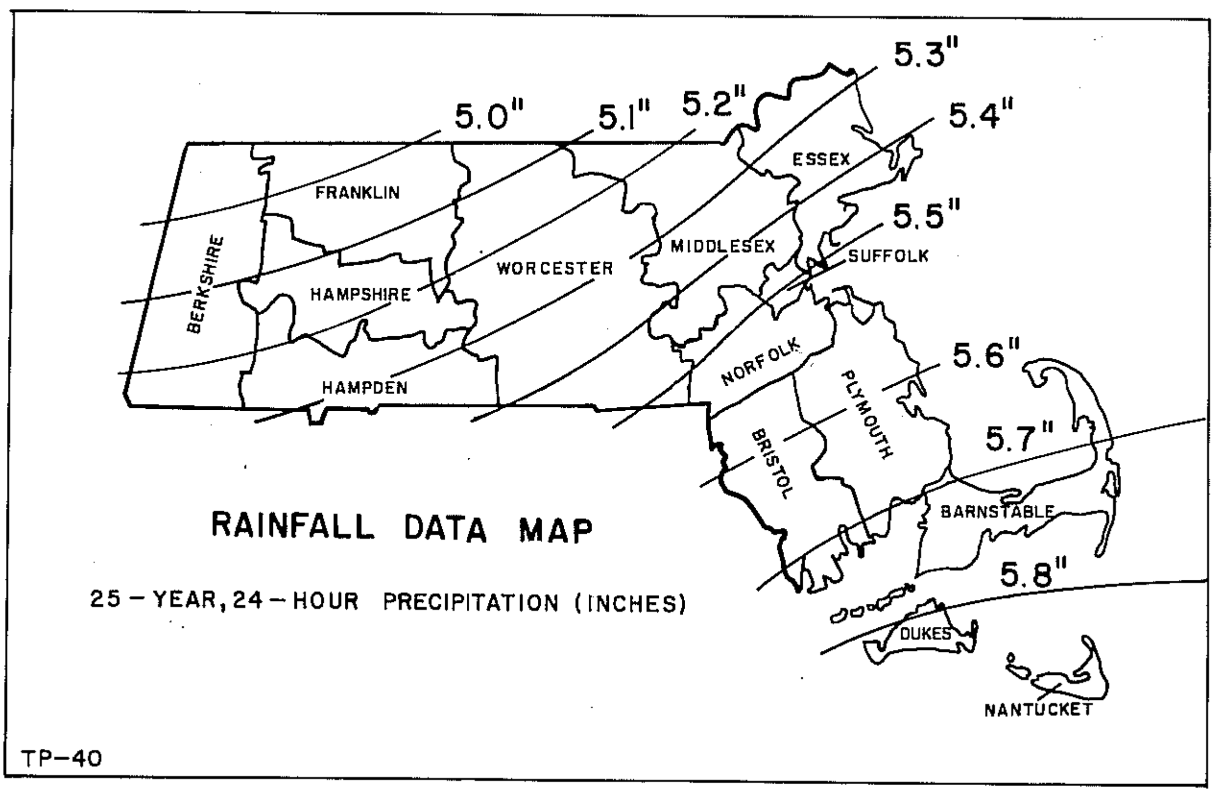
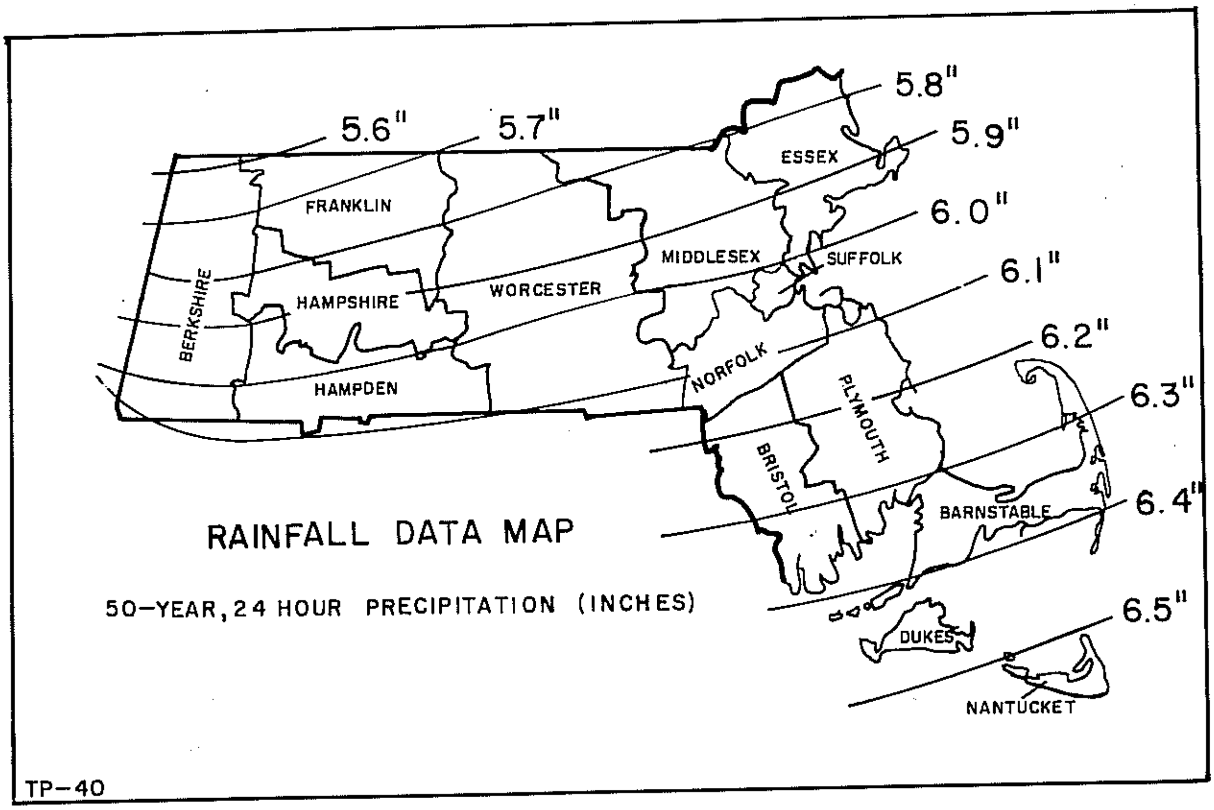


FIGURE B-1, SHEET 2 OF 3



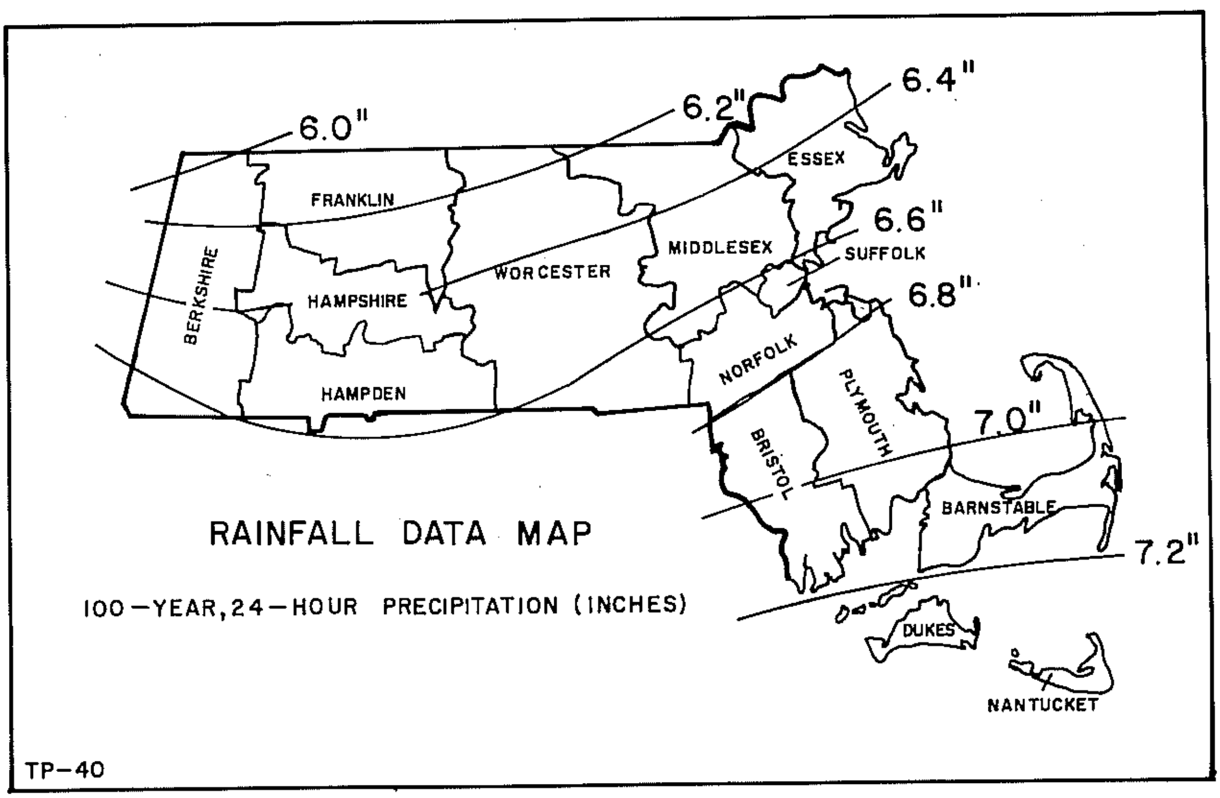


FIGURE B—I, SHEET 3 OF 3

Table B-9 Runoff depth in inches

Rainfall (inches)	Curve Number (CN)[1/]						
	60	65	70	75	80	85	90
1.0	0	0	0	0.03	0.08	0.17	0.32
1.2	0	0	0.03	0.07	0.15	0.28	0.46
1.4	0	0.02	0.06	0.13	0.24	0.39	0.61
1.6	0.01	0.05	0.11	0.20	0.34	0.52	0.76
1.8	0.03	0.09	0.17	0.29	0.44	0.65	0.93
2.0	0.06	0.14	0.24	0.38	0.56	0.80	1.09
2.5	0.17	0.30	0.46	0.65	0.89	1.18	1.53
3.0	0.33	0.51	0.72	0.96	1.25	1.59	1.98
4.0	0.76	1.03	1.33	1.67	2.04	2.46	2.92
5.0	1.30	1.65	2.04	2.45	2.89	3.37	3.88
6.0	1.92	2.35	2.80	3.28	3.78	4.31	4.85
7.0	2.60	3.10	3.62	4.15	4.69	5.26	5.82
8.0	3.33	3.90	4.47	5.04	5.62	6.22	6.81
9.0	4.10	4.72	5.34	5.95	6.57	7.19	7.79
10.0	4.90	5.57	6.23	6.88	7.52	8.16	8.78
11.0	5.72	6.44	7.13	7.82	8.48	9.14	9.77
12.0	6.56	7.32	8.05	8.76	9.45	10.12	10.76

1/ To obtain runoff depths for CN's and other rainfall amounts not shown in this table, use an arithmetic interpolation.

STORMWATER REPORT
THE RESIDENCES OF SOUTH BROOKLINE
BROOKLINE, MASSACHUSETTS

APPENDIX F – RECHARGE VOLUME AND DRAWDOWN TIME CALCULATIONS

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RECHARGE VOLUME CALCULATIONS, PART I

Date:	September 25, 2013
Revised:	July 7, 2014
Revised:	August 22, 2014
Project:	The Residences of South Brookline
Project No:	210810271
Location:	Brookline, MA
Prepared By:	ZY
Checked By:	FH

Recharge Area Design

Objective: Size an infiltration basin that will approximate the annual recharge from the existing conditions

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol.3, Ch.1)

Design Criteria:

The required recharge volume equals a depth of runoff corresponding to the soil type times the impervious areas covering that soil type at the post-development site. A subsurface investigation verified that the soils onsite are classified as HSG "B" soils.

Based on the Site Hydrologic Soil Group:

Hydrologic Soil Group	Soil Texture	Target Depth Factor (F)
A	Sand	0.60 inches
B	Loam	0.35 inches
C	Silty Loam	0.25 inches
D	Clay	0.10 inches

Recharge Volume Required:

	Impervious Area (sf)	Target Depth (in)	Volume Required (cf)
	260,688	0.35	7,603

	Impervious area routed through stormwater systems:	Capture Area Adjustment	
A	0	0	
B	175,697	1.48	
C	0	0	
D	0	0	
Total	175,697	11,281	(cf)

Recharge Volume Provided:

Subsurface detention/infiltration Basin P-1A

Outlet Elevation =	169.00	Area of contour =	3,838 sf		
Bottom Basin Elev =	167.60	Area of contour =	3,838 sf	Vol. of Recharge:	3,761 cf *

Bioretention Basin P-1C

Outlet Elevation =	162.00	Area of contour =	5,520 sf		
Bottom Basin Elev =	161.50	Area of contour =	4,260 sf	Vol. of Recharge:	2,445 cf *

Subsurface detention/infiltration Basin P-1F

Outlet Elevation =	159.20	Area of contour =	1,504 sf		
Bottom Basin Elev =	158.00	Area of contour =	1,504 sf	Vol. of Recharge:	1,175 cf *

Subsurface detention/infiltration Basin P-4C

Outlet Elevation =	154.55	Area of contour =	5,950 sf					
Bottom Basin Elev =	153.50	Area of contour =	5,950 sf	Vol. of Recharge:	3,933 cf *			
				Infiltration Basins Total	**11,314 cf**	>	11,281 cf	

* From HydroCAD storage table

RECHARGE VOLUME CALCULATIONS, PART II

Date:	September 25, 2013
Revised:	July 7, 2014
Revised:	August 22, 2014
Project:	The residences of South Brookline
Project No:	210810271
Location:	Brookline, MA
Prepared By:	ZY
Checked By:	FH

Required Drawdown Time

Objective: Size an infiltration basin that will approximate the annual recharge from the existing conditions

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol. 3, Ch. 1)

Design Criteria: The required recharge volume equals a depth of runoff corresponding to the soil type times the impervious areas covering that soil type at the post-development site.

Based on the Site Hydrologic Soil Group:

Hydrologic Soil Group	Soil Texture	Target Depth Factor (F)
A	Sand	0.60 inches
$\boxed{\text{B}}$	Loam	0.35 inches
C	Silty Loam	0.25 inches
D	Clay	0.10 inches

Required Recharge Volume Requried Recharge Volume = Target Depth Factor x Post Development Impervious Area/12

<u>Subsurface detention/infiltration Basin P-1A</u>

Total Imprevious Area:	17,808 sf
Total Requried Recharge Volume:	519 cf

<u>Bioretention Basin P-1C</u>

Total Imprevious Area:	43,335 sf
Total Requried Recharge Volume:	1,264 cf

<u>Subsurface detention/infiltration Basin P-1F</u>

Total Imprevious Area:	14,011 sf
Total Requried Recharge Volume:	409 cf

<u>Subsurface detention/infiltration Basin P-4C</u> *

Total Imprevious Area:	100,543 sf
Total Requried Recharge Volume:	2,933 cf

*(included PR-4B, PR-4C and PR-4D area)

Required Drawdown Time: Maximum of 72 Hours using the following equation:

$$\text{Drawdown Time} = \frac{R_v}{(K x A_{Bot})}$$

R_v = Required Recharge Volume
K = the Permeability Rate
A_{Bot} = Bottom area of Infiltration basin

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Subsurface detention/infiltration Basin P-1A

Outlet Elevation		R_v	K	A_{Bot}	Drawdown Time
		cf	in/hr	sf	Hours
169.00	100%	519	0.17	3,838	9.55

Bioretention Basin P-1C

Outlet Elevation		R_v	K	A_{Bot}	Drawdown Time
		cf	in/hr	sf	Hours
162.00	100%	1,264	0.27	4,260	13.19

Subsurface detention/infiltration Basin P-1F

Outlet Elevation		R_v	K	A_{Bot}	Drawdown Time
		cf	in/hr	sf	Hours
159.20	100%	409	0.17	1,504	19.18

Subsurface detention/infiltration Basin P-4C

Outlet Elevation		R_v	K	A_{Bot}	Drawdown Time
		cf	in/hr	sf	Hours
154.55	100%	2,933	0.17	5,950	34.79

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226 Causeway Street
Boston, MA 02114
Tel: (617) 523-8103 Fax: (617) 523-4333

STORMWATER REPORT
THE RESIDENCES OF SOUTH BROOKLINE
BROOKLINE, MASSACHUSETTS

APPENDIX G – TSS REMOVAL WORKSHEETS AND TREATMENT TRAIN SUMMARY

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TOTAL SUSPENDED SOLIDS (TSS) REMOVAL WORKSHEET

Project:	The Residences of South Brookline		
Date:	September 25, 2013		
Revision:	July 7, 2014		
Revision:	August 22, 2014	**Prepared By:**	ZY
Location:	Brookline, MA	**Checked By:**	FH

Treatment Train #1

Applicable Subcatchment: **Drainage Area PR-4D**

	A BMP	B TSS Removal Rate	C Starting TSS Load	D Amount Removed (BxC)	E Remaining Load (C-D)	F TSS Removal Rate
TREATMENT	**Porous Asphalt Pavement**	**0.80**	**1.00**	**0.80**	**0.20**	**80%**
		0.00	**0.20**	**0.00**	**0.20**	**80%**
		0.00	**0.20**	**0.00**	**0.20**	**80%**
		0.00	**0.20**	**0.00**	**0.20**	**80%**

Total TSS Removal = **80%**

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Treatment Train #2

Applicable Subcatchment: **Drainage Area PR-1A, PR-1F, PR-4C**

	A BMP	B TSS Removal Rate	C Starting TSS Load	D Amount Removed (BxC)	E Remaining Load (C-D)	F TSS Removal Rate
PRETREATMENT	**Stormceptor**	**0.80**	**1.00**	**0.80**	**0.20**	**80%**
		0.00	**0.20**	**0.00**	**0.20**	**80%**

	A BMP	B TSS Removal Rate	C Starting TSS Load	D Amount Removed (BxC)	E Remaining Load (C-D)	F TSS Removal Rate
TREATMENT	**Stormceptor**	**0.80**	**1.00**	**0.80**	**0.20**	**80%**
	Subsurface Detention/Infiltration Basin	**0.80**	**0.20**	**0.16**	**0.04**	**96%**
		0.00	**0.04**	**0.00**	**0.04**	**96%**
		0.00	**0.04**	**0.00**	**0.04**	**96%**

Total TSS Removal = **96%**

Treatment Train #3

Applicable Subcatchment: Drainage Area PR-1D, PR-4A

	A BMP	B TSS Removal Rate	C Starting TSS Load	D Amount Removed (BxC)	E Remaining Load (C-D)	F TSS Removal Rate
TREATMENT	**Stormceptor**	**0.80**	**1.00**	**0.80**	**0.20**	**80%**
		0.00	**0.20**	**0.00**	**0.20**	**80%**
		0.00	**0.20**	**0.00**	**0.20**	**80%**
		0.00	**0.20**	**0.00**	**0.20**	**80%**

Total TSS Removal = 80%

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Treatment Train #4

Applicable Subcatchment: **Drainage Area PR-1C**

	A BMP	B TSS Removal Rate	C Starting TSS Load	D Amount Removed (BxC)	E Remaining Load (C-D)	F TSS Removal Rate
PRETREATMENT	**Sediment Forebay**	**0.25**	**1.00**	**0.25**	**0.75**	**25%**
		0.00	**0.75**	**0.00**	**0.75**	**25%**

	A BMP	B TSS Removal Rate	C Starting TSS Load	D Amount Removed (BxC)	E Remaining Load (C-D)	F TSS Removal Rate
TREATMENT	**Sediment Forebay**	**0.25**	**1.00**	**0.25**	**0.75**	**25%**
	Bioretention Area	**0.90**	**0.75**	**0.68**	**0.08**	**93%**
		0.00	**0.08**	**0.00**	**0.08**	**93%**
		0.00	**0.08**	**0.00**	**0.08**	**93%**

Total TSS Removal = **93%**

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Treatment Train #5

Applicable Subcatchment: **Drainage Area PR-1E**

	A BMP	B TSS Removal Rate	C Starting TSS Load	D Amount Removed (BxC)	E Remaining Load (C-D)	F TSS Removal Rate
PRETREATMENT	**Stormceptor**	**0.80**	**1.00**	**0.80**	**0.20**	**80%**
		0.00	**0.20**	**0.00**	**0.20**	**80%**

	A BMP	B TSS Removal Rate	C Starting TSS Load	D Amount Removed (BxC)	E Remaining Load (C-D)	F TSS Removal Rate
TREATMENT	**Stormceptor**	**0.80**	**1.00**	**0.80**	**0.20**	**80%**
	Subsurface Detention Basin	**0.50**	**0.20**	**0.10**	**0.10**	**90%**
		0.00	**0.10**	**0.00**	**0.10**	**90%**
		0.00	**0.10**	**0.00**	**0.10**	**90%**

Total TSS Removal = **90%**

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TSS Removel Treatment Train Summary

Date: September 16, 2013
Revised: July 7, 2014
Project: The Residences of South Brookline
Project No: 2108-10271
Location: Brookline, MA

Prepared By: ZY
Checked By: FH

Objective: Stormwater management systems will be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This will be achieved by the use of following treatment trains.

Treatment Train 1: Porous Asphalt Pavement

Treatment Train 2: Stormceptor → Subsurface Detention/Infiltration Basin

Treatment Train 3: Stormceptor

Treatment Train 4: Bioretention Basin with sediment forebay

Treatment Train 5: Stormceptor → Subsurface Detention Basin

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226 Causeway St. Boston MA 02114
Tel: (617) 523-8103 Fax: (617) 523-4333

STORMWATER REPORT
THE RESIDENCES OF SOUTH BROOKLINE
BROOKLINE, MASSACHUSETTS

APPENDIX H – WATER QUALITY CALCULATIONS

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WATER QUALITY CALCULATIONS

Date: September 25, 2013
Revised: July 7, 2014
Revised: August 22, 2014
Project: The Residences of South Brookline
Project No: 210810271
Location: Brookline, MA

Prepared By: ZY
Checked By: FH

Objective: To determine the required Water Quality Volume (WQV) for adaqute stormwater treatment

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol. 3, Ch. 1)

Design Criteria: Volume to be treated = 0.5" x Post Development Impervious Area

Calculation results:

Designation	Volume Required (cf)	Volume Provided (cf)
Subsurface detention/infiltration Basin P-1A	742	3,761
Bioretention Basin P-1C	1,806	2,445
Subsurface detention Basin P-1E	787	2,246
Subsurface detention/infiltration Basin P-1F	584	1,175
Subsurface detention/infiltration Basin P-4C	1,966	3,933
Porous Asphalt Pavement P-4D	680	3,441

Volume to be Treated:

Subsurface detention/infiltration Basin P-1A
Total Post Development Impervious Area: 17,808 sf
Total Volume to be treated: **742 cf**

Bioretention Basin P-1C
Total Post Development Impervious Area: 43,335 sf
Total Volume to be treated: **1,806 cf**

Subsurface detention Basin P-1E
Total Post Development Impervious Area: 18,888 sf
Total Volume to be treated: **787 cf**

Subsurface detention/infiltration Basin P-1F
Total Post Development Impervious Area: 14,011 sf
Total Volume to be treated: **584 cf**

Subsurface detention/infiltration Basin P-4C
Total Post Development Impervious Area: 47,173 sf
Total Volume to be treated: **1,966 cf**

Porous Asphalt Pavement P-4D
Total Post Development Impervious Area: 16,319 sf

Total Volume to be treated: **680 cf**

Volume Provided:

Subsurface detention/infiltration Basin P-1A					
Outlet Elevation =	169.00	Area of contour =	3,838 sf	Vol. of Treatment:	**3,761 cf**
Bottom Basin Elev =	167.60	Area of contour =	3,838 sf		
Bioretention Basin P-1C					
Outlet Elevation =	162.00	Area of contour =	5,520 sf	Vol. of Treatment:	**2,445 cf**
Bottom Basin Elev =	161.50	Area of contour =	4,260 sf		
Subsurface detention Basin P-1E					
Outlet Elevation =	163.30	Area of contour =	2,542 sf	Vol. of Treatment:	**2,246 cf**
Bottom Basin Elev =	162.00	Area of contour =	2,542 sf		
Subsurface detention/infiltration Basin P-1F					
Outlet Elevation =	159.20	Area of contour =	1,504 sf	Vol. of Treatment:	**1,175 cf**
Bottom Basin Elev =	158.00	Area of contour =	1,504 sf		
Subsurface detention/infiltration Basin P-4C					
Outlet Elevation =	154.55	Area of contour =	5,950 sf	Vol. of Treatment:	**3,933 cf**
Bottom Basin Elev =	153.50	Area of contour =	5,950 sf		
Porous Asphalt Pavement P-4D					
Outlet Elevation =	177.28	Area of contour =	12,992 sf	Vol. of Treatment:	**3,441 cf**
Bottom Basin Elev =	176.40	Area of contour =	12,992 sf		

SEDIMENT FOREBAY CALCULATIONS

Date: July 7, 2014
Revised: August 20, 2014
Project: The Residences of South Brookline
Project No: 210810271
Location: Brookline, MA

Prepared By: ZY
Checked By: FH

Objective: To determine the required Water Quality Volume (WQV) for adaqute stormwater treatment

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol. 3, Ch. 1)

Design Criteria: Volume to be treated = 0.1" x Post Development Impervious Area to size a sediment forebay for bioretention basin

Calculation results:

Designation	Volume Required (cf)	Volume Provided (cf)
Bioretention Basin P-1C	361	750

Volume to be treated

Bioretention Basin P-1C

Total Post Development Impervious Area:	43,335 sf
Total Volume to be treated:	**361 cf**

Volume Provided:

Bioretention Basin P-1C

Outlet Elevation =	163.00	Area of contour =	1,133 sf	Vol. of Treatment:	**750 cf**
Bottom Forebay Elev =	162.00	Area of contour =	366 sf		

APPENDIX I – STORMCEPTOR DESIGN SUMMARY

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SIZING WATER QUALITY INLET - WQI-1

Date:	July 7, 2014
Revised:	August 22, 2014
Revised:	
Project:	The Residences of South Brookline
Project No:	210810271
Location:	Brookline, MA
Prepared By:	ZY
Checked By:	FH

Objective: To size the Stormceptor according to the DEP's Standard Method

Methodology: MA DEP's Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices, dated Sep. 10, 2013

Design Criteria: **Q0.5 = (qu)(A)(WQV)**

Q0.5 = flow rate associated with first 1/2-inch of runoff

qu = the unit peak discharge, in csm/in

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (use 1/2-inch in this method)

Flow Rate to be Treated:

Post Development Impervious Area (AC)

Total Post Development Drainage Area:	0.57	ac
Percentage of Impervious Area	58	%
Total Impervious Area:	0.33	ac

using time of concentration = 6 min = 0.1 hours

qu =		752	csm/in *
A=	0.33 AC X 0.0015625 mi2/AC =	0.00052	mi2
WQV =		0.5	in
Q0.5 =		0.19	CFS

Flow Rate Provided:

Stormceptor model: STC 450i

WQF provided: 0.37** CFS

* MassDEP Q Rate - Sept. 10, 2013 page 4

** For flow rate up to 0.37 cfs, a stormceptor 450i provides 80% TSS removal minimum.

SIZING WATER QUALITY INLET - WQI-2

Date:	July 7, 2014
Revised:	August 22, 2014
Revised:	
Project:	The Residences of South Brookline
Project No:	210810271
Location:	Brookline, MA

Prepared By:	ZY
Checked By:	FH

Objective: To size the Stormceptor according to the DEP's Standard Method

Methodology: MA DEP's Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices, dated Sep. 10, 2013

Design Criteria: **Q0.5 = (qu)(A)(WQV)**

Q0.5 = flow rate associated with first 1/2-inch of runoff

qu = the unit peak discharge, in csm/in

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (use 1/2-inch in this method)

Flow Rate to be Treated:

Post Development Impervious Area (AC)

Total Post Development Drainage Area:		0.05	ac
Percentage of Impervious Area		100	%
Total Impervious Area:		0.05	ac

using time of concentration = 6 min = 0.1 hours

qu =		752	csm/in *
A=	0.05 AC X 0.0015625 mi2/AC =	0.00008	mi2
WQV =		0.5	in
Q0.5 =		0.03	CFS

Flow Rate Provided:

Stormceptor model: STC 450i

WQF provided: 0.37** CFS

* MassDEP Q Rate - Sept. 10, 2013 page 4

** For flow rate up to 0.37 cfs, a stormceptor 450i provides 80% TSS removal minimum.

Stantec Planning and Landscape Architecture P.C.
226 Causeway Street
Boston, MA 02114
Tel: (617) 523-8103 Fax: (617) 523-4333

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SIZING WATER QUALITY INLET - WQI-3

Date:	July 7, 2014
Revised:	August 22, 2014
Revised:	
Project:	The Residences of South Brookline
Project No:	210810271
Location:	Brookline, MA
Prepared By:	ZY
Checked By:	FH

Objective: To size the Stormceptor according to the DEP's Standard Method

Methodology: MA DEP's Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices, dated Sep. 10, 2013

Design Criteria: **Q0.5 = (qu)(A)(WQV)**

Q0.5 = flow rate associated with first 1/2-inch of runoff

qu = the unit peak discharge, in csm/in

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (use 1/2-inch in this method)

Flow Rate to be Treated:

Post Development Impervious Area (AC)

Total Post Development Drainage Area:		0.56	ac
Percentage of Impervious Area		59	%
Total Impervious Area:		0.33	ac

using time of concentration = 6 min = 0.1 hours

qu =		752	csm/in *
A=	0.33 AC X 0.0015625 mi2/AC =	0.00052	mi2
WQV =		0.5	in
Q0.5 =		0.19	CFS

Flow Rate Provided:

Stormceptor model: STC 450i

WQF provided: 0.37** CFS

* MassDEP Q Rate - Sept. 10, 2013 page 4

** For flow rate up to 0.37 cfs, a stormceptor 450i provides 80% TSS removal minimum.

SIZING WATER QUALITY INLET - WQI-4

Date: July 7, 2014
Revised: August 22, 2014
Revised:
Project: The Residences of South Brookline
Project No: 210810271
Location: Brookline, MA

Prepared By: ZY
Checked By: FH

Objective: To size the Stormceptor according to the DEP's Standard Method

Methodology: MA DEP's Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices, dated Sep. 10, 2013

Design Criteria: **Q0.5 = (qu)(A)(WQV)**

Q0.5 = flow rate associated with first 1/2-inch of runoff

qu = the unit peak discharge, in csm/in

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (use 1/2-inch in this method)

Flow Rate to be Treated:

Post Development Impervious Area (AC)

Total Post Development Drainage Area:		0.37	ac
Percentage of Impervious Area		56	%
Total Impervious Area:		0.21	ac

using time of concentration = 6 min = 0.1 hours

qu =		752	csm/in *
A=	0.21 AC X 0.0015625 mi2/AC =	0.00032	mi2
WQV =		0.5	in
Q0.5 =		0.12	CFS

Flow Rate Provided:

Stormceptor model: STC 450i

WQF provided: 0.37** CFS

* MassDEP Q Rate - Sept. 10, 2013 page 4

** For flow rate up to 0.37 cfs, a stormceptor 450i provides 80% TSS removal minimum.

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SIZING WATER QUALITY INLET - WQI-5

Date:	July 7, 2014
Revised:	August 22, 2014
Revised:	
Project:	The Residences of South Brookline
Project No:	210810271
Location:	Brookline, MA
Prepared By:	ZY
Checked By:	FH

Objective: To size the Stormceptor according to the DEP's Standard Method

Methodology: MA DEP's Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices, dated Sep. 10, 2013

Design Criteria: **Q0.5 = (qu)(A)(WQV)**

Q0.5 = flow rate associated with first 1/2-inch of runoff

qu = the unit peak discharge, in csm/in

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (use 1/2-inch in this method)

Flow Rate to be Treated:

<u>Post Development Impervious Area (AC)</u>

Total Post Development Drainage Area:	1.17	ac
Percentage of Impervious Area	51	%
Total Impervious Area:	0.60	ac

using time of concentration = 6 min = 0.1 hours

qu =		752	csm/in *
A=	0.60 AC X 0.0015625 mi2/AC =	0.00093	mi2
WQV =		0.5	in
Q0.5 =		0.35	CFS

Flow Rate Provided:

Stormceptor model: STC 450i

WQF provided: 0.37** CFS

* MassDEP Q Rate - Sept. 10, 2013 page 4

** For flow rate up to 0.37 cfs, a stormceptor 450i provides 80% TSS removal minimum.

SIZING WATER QUALITY INLET - WQI-6

Date:	July 7, 2014
Revised:	August 22, 2014
Revised:	
Project:	The Residences of South Brookline
Project No:	210810271
Location:	Brookline, MA
Prepared By:	ZY
Checked By:	FH

Objective: To size the Stormceptor according to the DEP's Standard Method

Methodology: MA DEP's Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices, dated Sep. 10, 2013

Design Criteria: **Q0.5 = (qu)(A)(WQV)**

Q0.5 = flow rate associated with first 1/2-inch of runoff

qu = the unit peak discharge, in csm/in

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (use 1/2-inch in this method)

Flow Rate to be Treated:

Post Development Impervious Area (AC)

Total Post Development Drainage Area:		0.22	ac
Percentage of Impervious Area		59	%
Total Impervious Area:		0.13	ac

using time of concentration = 6 min = 0.1 hours

qu =		752	csm/in	*
A=	0.13 AC X 0.0015625 mi2/AC =	0.00020	mi2	
WQV =		0.5	in	
Q0.5 =		0.08	CFS	

Flow Rate Provided:

Stormceptor model: STC 450i

WQF provided: 0.37** CFS

* MassDEP Q Rate - Sept. 10, 2013 page 4

** For flow rate up to 0.37 cfs, a stormceptor 450i provides 80% TSS removal minimum.

SIZING WATER QUALITY INLET - WQI-7

Date:	July 7, 2014
Revised:	August 22, 2014
Revised:	
Project:	The Residences of South Brookline
Project No:	210810271
Location:	Brookline, MA
Prepared By:	ZY
Checked By:	FH

Objective: To size the Stormceptor according to the DEP's Standard Method

Methodology: MA DEP's Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices, dated Sep. 10, 2013

Design Criteria: **Q0.5 = (qu)(A)(WQV)**

Q0.5 = flow rate associated with first 1/2-inch of runoff

qu = the unit peak discharge, in csm/in

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (use 1/2-inch in this method)

Flow Rate to be Treated:

Post Development Impervious Area (AC)

Total Post Development Drainage Area:	0.36	ac
Percentage of Impervious Area	72	%
Total Impervious Area:	0.26	ac

using time of concentration = 6 min = 0.1 hours

qu =		752	csm/in *
A=	0.26 AC X 0.0015625 mi2/AC =	0.00041	mi2
WQV =		0.5	in
Q0.5 =		0.15	CFS

Flow Rate Provided:

Stormceptor model: STC 450i

WQF provided: 0.37** CFS

* MassDEP Q Rate - Sept. 10, 2013 page 4

** For flow rate up to 0.37 cfs, a stormceptor 450i provides 80% TSS removal minimum.

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SIZING WATER QUALITY INLET - WQI-8

Date: July 7, 2014
Revised: August 20, 2014
Revised:
Project: The Residences of South Brookline
Project No: 210810271
Location: Brookline, MA

Prepared By: ZY
Checked By: FH

Objective: To size the Stormceptor according to the DEP's Standard Method

Methodology: MA DEP's Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices, dated Sep. 10, 2013

Design Criteria: **Q0.5 = (qu)(A)(WQV)**

Q0.5 = flow rate associated with first 1/2-inch of runoff

qu = the unit peak discharge, in csm/in

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (use 1/2-inch in this method)

Flow Rate to be Treated:

Post Development Impervious Area (AC)

Total Post Development Drainage Area:	0.62	ac
Percentage of Impervious Area	51	%
Total Impervious Area:	0.32	ac

using time of concentration = 6 min = 0.1 hours

qu =		752	csm/in *
A=	0.32 AC X 0.0015625 mi2/AC =	0.00049	mi2
WQV =		0.5	in
Q0.5 =		0.19	CFS

Flow Rate Provided:

Stormceptor model: STC 450i

WQF provided: 0.37** CFS

* MassDEP Q Rate - Sept. 10, 2013 page 4

** For flow rate up to 0.37 cfs, a stormceptor 450i provides 80% TSS removal minimum.

SIZING WATER QUALITY INLET - WQI-9

Date:	July 7, 2014
Revised:	August 20, 2014
Revised:	
Project:	The Residences of South Brookline
Project No:	210810271
Location:	Brookline, MA
Prepared By:	ZY
Checked By:	FH

Objective: To size the Stormceptor according to the DEP's Standard Method

Methodology: MA DEP's Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices, dated Sep. 10, 2013

Design Criteria: **Q0.5 = (qu)(A)(WQV)**

Q0.5 = flow rate associated with first 1/2-inch of runoff

qu = the unit peak discharge, in csm/in

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (use 1/2-inch in this method)

Flow Rate to be Treated:

<u>Post Development Impervious Area (AC)</u>

Total Post Development Drainage Area:		0.52	ac
Percentage of Impervious Area		62	%
Total Impervious Area:		0.32	ac

using time of concentration = 6 min = 0.1 hours

qu =		752	csm/in *
A=	0.32 AC X 0.0015625 mi2/AC =	0.00050	mi2
WQV =		0.5	in
Q0.5 =		0.19	CFS

Flow Rate Provided:

Stormceptor model: STC 450i

WQF provided: 0.37** CFS

* MassDEP Q Rate - Sept. 10, 2013 page 4

** For flow rate up to 0.37 cfs, a stormceptor 450i provides 80% TSS removal minimum.

Figure 2: For First ½-inch of Runoff, Table of qu values for Ia/P Curve = 0.0.058, listed by tc, for Type III Storm Distribution

Tc (Hours)	qu (csm/in)
0.01	821
0.03	821
0.05	813
0.067	794
0.083	773
0.1	752
0.116	733
0.133	713
0.15	694
0.167	677
0.183	662
0.2	646
0.217	632
0.233	619
0.25	606
0.3	572
0.333	552
0.35	542
0.4	516
0.416	508
0.5	472
0.583	443
0.6	437
0.667	417
0.7	408
0.8	383
0.9	361
1	342
1.1	325
1.2	311
1.3	297
1.4	285
1.5	274
1.6	264
1.7	254

Tc (Hours)	qu (csm/in)
1.8	246
1.9	238
2	230
2.1	223
2.2	217
2.3	211
2.4	205
2.5	200
2.6	194
2.7	190
2.8	185
2.9	181
3	176
3.1	173
3.2	169
3.3	165
3.4	162
3.5	158
3.6	155
3.7	152
3.8	149
3.9	147
4	144
4.1	141
4.2	139
4.3	136
4.4	134
4.5	132
4.6	130
4.7	128
4.8	126
4.9	124
5	122
5.1	120
5.2	118

Tc (Hours)	qu (csm/in)
5.3	116
5.4	115
5.5	113
5.6	112
5.7	110
5.8	109
5.9	107
6	106
6.1	104
6.2	103
6.3	102
6.4	100
6.5	99
6.6	98
6.7	97
6.8	96
6.9	94
7	93
7.1	92
7.2	91
7.3	90
7.4	89
7.5	88
7.6	87
7.7	86
7.8	85
7.9	84
8	84
8.1	83
8.2	82
8.3	81
8.4	80
8.5	79
8.6	79
8.7	78

Tc (Hours)	qu (csm/in)
8.8	77
8.9	76
9	76
9.1	75
9.2	74
9.3	74
9.4	73
9.5	72
9.6	72
9.7	71
9.8	70
9.9	70
10	69

CONCLUSION

Performance evaluation of a Stormceptor model STC 900 for fine to medium sand particles, based on *OK-110*, has been completed. The testing protocol followed the protocol outlined by the City of Indianapolis, Indiana in the document titled: *"Level of Agreement to Provide Stormwater Quality Treatment System Technical Services for: Rinker Materials"*.

Test results indicated that 80% TSS removal is achieved for up to 130% of the unit's operating rate when tested with the lower chamber pre-loaded to 50% sediment capacity. For an STC 900, 130% operating rate is 0.83 cfs (23.5 L/s). Table 8 summarizes the maximum flow rate, based on 130% operating rate, of each Stormceptor model when 80% TSS, as defined by OK-110, removal is achieved.

Table 8. Maximum Operating Rates for which 80% TSS Removal is achieved by Stormceptor Model.

Stormceptor Model	Treatment Flow Rate cfs (L/s)
STC 450i	0.37 (10.5)
STC 900	0.83 (23.5)
STC 1200	0.83 (23.5)
STC 1800	0.83 (23.5)
STC 2400	1.38 (39.1)
STC 3600	1.38 (39.1)
STC 4800	2.30 (65.1)
STC 6000	2.30 (65.1)
STC 7200	3.22 (91.2)
STC 11000	4.59 (130.0)
STC 13000	4.59 (130.0)
STC 16000	6.43 (182.0)

Results of the scour test at 100%, 125% and 290% operating rate and an initial sediment capacity of 50% and 100%, indicate that the Stormceptor System does not scour. Scour tests completed at 100% sediment capacity demonstrate the necessity of maintenance for the long term operation of stormwater treatment systems.

APPENDIX J– OPERATION AND MAINTENANCE LOG AND OPERATIONS AND MAINTENANCE PLAN EXHIBIT

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The Residences of South Brookline

Operation and Maintenance Log

Structural Best Management Practice	Action	Date Completed	Comments	Completed By	Action	Date Completed	Comments	Completed By
Catch Basin – Inspect monthly for the first year. Then inspect four times per year. Clean when the sump is half full (2 feet) of sediment.	Inspect				Inspect			
	Inspect				Inspect			
	Clean				Clean			
Area Drain– Inspect monthly for the first year. Then inspect four times per year. Clean when the sump is half full (2 feet) of sediment.	Inspect				Inspect			
	Inspect				Inspect			
	Clean				Clean			
Roof Leaders – Clean four times per year or more frequently as necessary	Clean				Clean			
Subsurface Detention/Infiltration Basin – Inspect the basin after each major rainstorm for the first service year of operation, and per manufactures recommendation, minimum.	Inspect				Inspect			
Vegetated Areas Maintenance – Prune and weed twice per year, inspect trees and shrubs four times per year	Prune / Weed				Prune / Weed			
	Inspect				Inspect			

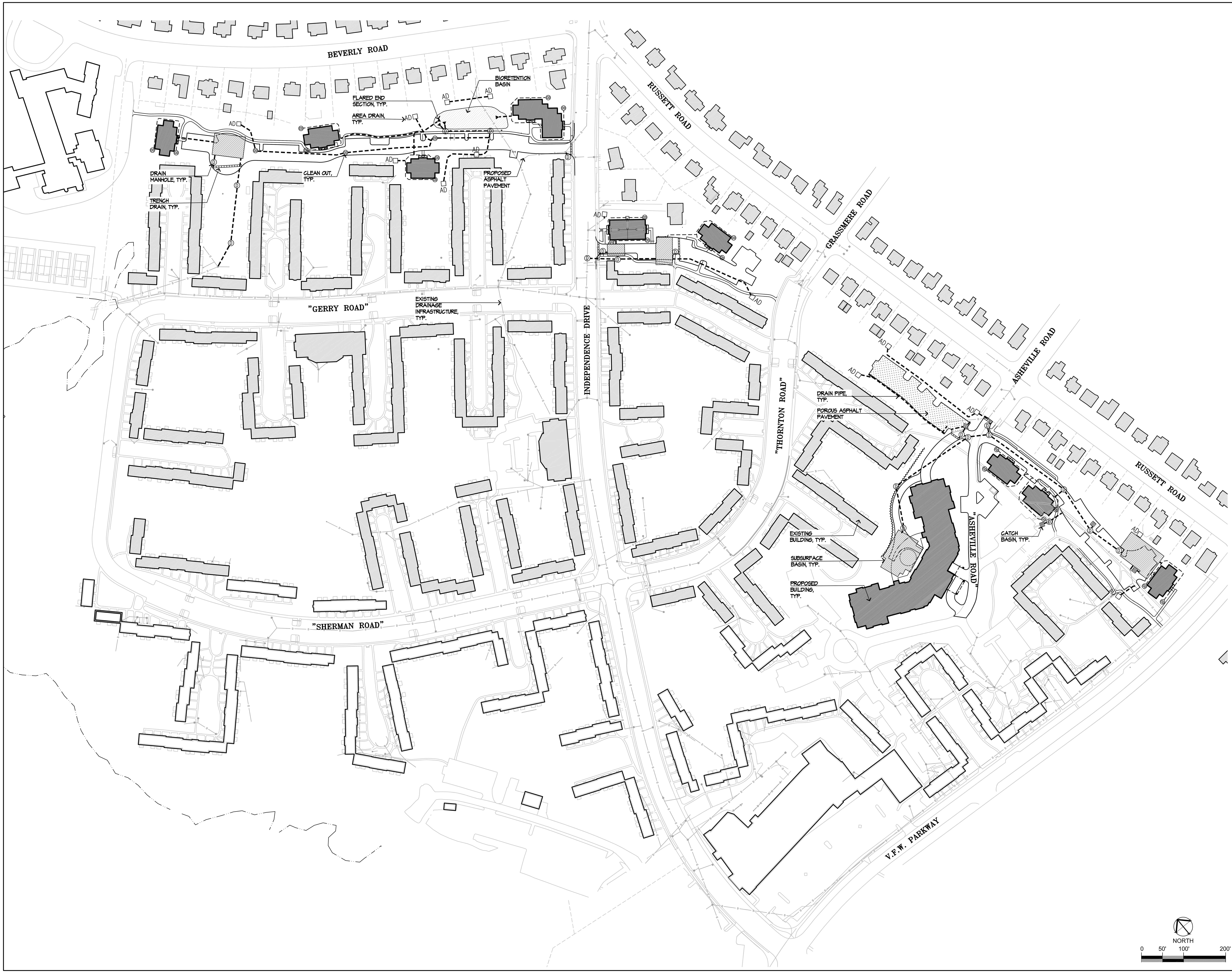
The Residences of South Brookline

Operation and Maintenance Log

Porous Pavement – Vacuum sweep quarterly, inspect annually for deterioration	Vacuum Sweep				Vacuum Sweep			
	Vacuum Sweep				Vacuum Sweep			
	Vacuum Sweep				Vacuum Sweep			
	Vacuum Sweep				Vacuum Sweep			
	Vacuum Sweep				Vacuum Sweep			
	Vacuum Sweep				Vacuum Sweep			
Bioretention Areas – Inspect annually (twice during first year of operation) and after large storm events.	Inspect				Clean (if required)			
WQU (Stormceptor) – Inspect annually, clean as required.	Clean				Clean			

Inspections for Year:_________

NOTE: See Section 9.0, Standard 9: Operations and Maintenance Plan for additional details.



Stantec

226 Causeway Street, 6th Floor
Boston MA U.S.A., 02114
www.stantec.com
P.617.523.8103

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Permit-Seal

Client/Project

CHESTNUT HILL REALTY

THE RESIDENCES AT SOUTH BROOKLINE

BROOKLINE, MA

Title

OPERATIONS AND MAINTENANCE PLAN EXHIBIT

Project No.	Scale
210810271	AS NOTED

Drawing No.

OM-1

APPENDIX K – STORMCEPTOR INSPECTION AND MAINTENANCE INFORMATION

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Rinker MATERIALS™

THE STORMCEPTOR® SYSTEM

Owner's Manual

Stormceptor® Owner's Manual Contents

1. Stormceptor Overview

2. Stormceptor System Operation

3. Identification of Stormceptor

4. Stormceptor Maintenance Guidelines

   4.1 Recommended Maintenance Procedure

   4.2 Disposal of Trapped Material from Stormceptor

5. Recommended Safety Procedures

6. Stormceptor Monitoring Protocol

   6.1 Pollutants to be Monitored

   6.2 Monitoring Methodology

		Page
List of Tables		
Table 1.	Stormceptor Dimensions	4
Table 2.	Stormceptor Capacities	5
Table 3.	Sediment Depths Indicating Required Maintenance	5
Table 4.	Monitoring Pollutants	9
List of Figures		
Figure 1.	Single Inlet/Outlet "Disc" Insert In-Line Stormceptor	6
Figure 2.	STC 450*i* Inlet Stormceptor	6

Rev. 3/2006

Thank You!

We want to thank you for selecting the Stormceptor System to use in your efforts in protecting the environment. Stormceptor is one of the most effective and maintenance friendly storm water quality treatment devices available. If you have any questions regarding the operation and maintenance of the Stormceptor System, please call your local Rinker Materials representative, or the Stormceptor Information Line at (800) 909-7763.

1. *Stormceptor Overview*

The Stormceptor System is a water quality device used to remove total suspended solids (TSS) and free oil (TPH) from storm water run-off. Stormceptor takes the place of a conventional manhole or inlet structure within a storm drain system. Rinker Materials manufactures the Stormceptor System with precast concrete components and a fiberglass disc insert. A fiberglass Stormceptor can also be provided for special applications.

The Stormceptor System product line consists of four patented designs:

- The In-Line (Conventional) Stormceptor, available in eight model sizes ranging from 900 to 7200 gallon storage capacity.
- An In-Line (Series) Stormceptor is available in three model sizes ranging from 11,000 to 16,000 gallon storage capacity.
- The Submerged Stormceptor, an in-line system designed for oil and sediment removal in partially submerged pipes, available in all models sizes ranging from 450*i* to 16,000 gallon storage capacity.
- The Inlet Stormceptor is a 450 gallon unit designed for small drainage areas.

Stormceptor removes free oil and suspended solids from storm water preventing hazardous spills and non-point source pollution from entering downstream lakes and rivers. Rinker Materials and its affiliates market and manufacture the Stormceptor System in the United States and Australia. Several thousand Stormceptor Systems have been installed in various locations throughout North America, Australia and the Caribbean since 1990.

In the Stormceptor, a fiberglass insert separates the treatment chamber from the by-pass chamber. The different insert designs are illustrated in Figures 1 and 2. These designs are easily distinguishable from the surface once the cover has been removed.

There are four versions of the in-line disc insert: single inlet/outlet, multiple inlet, in-line series insert and submerged designs. In the non-submerged "disc" design you will be able to see the inlet pipe, the drop pipe opening to the lower chamber, the weir, a 6" oil inspection/cleanout pipe, a large 24" riser pipe opening offset on the outlet side of the structure, and the outlet pipe from the unit. The weir will be around the 24" outlet pipe on the multiple inlet disc insert and on large diameter pipe applications.

The STC (series) Stormceptors consist of two chambers comprised of similar fiberglass inserts. These units also contain a 6" oil/inspection cleanout pipe and 24" outlet riser pipes.

The submerged disc insert has a higher weir and a second inlet drop pipe. In the inlet design you will be able to see an inlet drop pipe and an outlet riser pipe as well as a central oil inspection/cleanout port.

2. ***Stormceptor System Operation***

The Stormceptor consists of a lower treatment chamber, which is always full of water, and a by-pass chamber. Storm water flows into the by-pass chamber via the storm sewer pipe or grated inlet (Inlet Stormceptor). Normal flows are diverted by a weir and drop pipe arrangement into a treatment chamber. Water flows up through the submerged outlet pipe based on the head at the inlet weir and is discharged back into the by-pass chamber downstream of the weir. The treated storm water continues down stream via the storm sewer system.

Oil and other liquids with a specific gravity less than water rise in the treatment chamber and become trapped under the fiberglass insert. Sediment will settle to the bottom of the chamber by gravity. The circular design of the treatment chamber is critical to prevent turbulent eddy currents and to promote settling.

During infrequent high flow conditions, storm water will by-pass the weir and be conveyed to the outlet sewer directly. The by-pass is an integral part of the Stormceptor since other oil/grit separators have been noted to scour during high flow conditions (Schueler and Shepp, 1993).

For further details please refer to *The Stormceptor System Technical Manual*.

The key benefits of Stormceptor include:

- Capable of removing more than 80% of the total sediment load when properly applied as a source control for small drainage areas
- Removes free oil from storm water during normal flow conditions
- Will not scour or resuspend trapped pollutants
- Ideal spill control device for commercial and industrial developments
- Vertical orientation facilitates maintenance and inspections
- Small foot print

3. ***Identification of Stormceptor***

All In-Line (including Submerged) Stormceptors are provided with their own frame and cover.
The cover has the name STORMCEPTOR clearly embossed on it to allow easy identification of the unit. The name Stormceptor is not embossed on the inlet models due to the variability of inlet grates used/approved across North America. You will be able to identify the Inlet Stormceptor by looking into the grate since the insert will be visible.

Once you have located a unit, there still may be a question as to the size of the unit. Comparing the measured depth from the water level (bottom of insert) to the bottom of the tank with Table 1 should help determine the size of the unit.

Table 1. Stormceptor Dimensions*	
Model	**Pipe Invert to Top of Base Slab**
450*i*	60"
900	55"
1200	71"
1800	105"
2400	94"
3600	134"
4800	128"
6000	150"
7200	134"
11000*s*	128"**
13000*s*	150"**
16000*s*	134"**

** Depths are approximate*

*** Depths per structure*

Starting in 1996, a metal serial number tag has been affixed to the fiberglass insert. If the unit does not have a serial number, or if there is any uncertainty regarding the size of the Stormceptor using depth measurements, please contact the Rinker Materials Stormceptor information line at (800) 909-7763 for assistance.

4. *Stormceptor Maintenance Guidelines*

The performance of all storm water quality measures that rely on sedimentation decreases as they fill with sediment (See Table 2 for Stormceptor capacities). An estimate of performance loss can be made from the relationship between performance and storage volume. Rinker Materials recommends maintenance be performed when the sediment volume in the unit reaches 15% of the total storage. This recommendation is based on several factors:

- Sediment removal is easier when removed on a regular basis (as sediment builds up it compacts and solidifies making maintenance more difficult).
- Development of a routine maintenance interval helps ensure a regular maintenance schedule is followed. Although the frequency of maintenance will depend on site conditions, it is estimated that annual maintenance will be required for most applications; annual maintenance is a routine occurrence which is easy to plan for and remember.
- A minimal performance degradation due to sediment build-up can occur.

In the event of any hazardous material spill, Rinker Materials recommends maintenance be performed immediately. Maintenance should be performed by a licensed liquid waste hauler. You should also notify the appropriate regulatory agencies as required.

Table 2. Stormceptor Capacities			
Model	**Sediment Capacity ft³ (L)**	**Oil Capacity US gal (L)**	**Total Holding Capacity US gal (L)**
450*i*	45 (1276)	86 (326)	470 (1779)
900	75 (2135)	251 (950)	952 (3604)
1200	113 (3202)	251 (950)	1234 (4671)
1800	193 (5470)	251 (950)	1833 (6939)
2400	155 (4387)	840 (3180)	2462 (9320)
3600	323 (9134)	840 (3180)	3715 (14063)
4800	465 (13158)	909 (3441)	5059 (19150)
6000	609 (17235)	909 (3441)	6136 (23227)
7200	726 (20551)	1059 (4009)	7420 (28088)
11000*s*	942 (26687)	2797 (10588)*	11194 (42374)
13000*s*	1230 (34841)	2797 (10588)*	13348 (50528)
16000*s*	1470 (41632)	3055 (11564)*	15918 (60256)

** Total both structures combined*

4.1 ***Recommended Maintenance Procedure***

For the "disc" design, oil is removed through the 6" inspection/cleanout pipe and sediment is removed through the 24" diameter outlet riser pipe. Alternatively, oil could be removed from the 24" opening if water is removed from the treatment chamber, lowering the oil level below the drop pipes.

The depth of sediment can be measured from the surface of the Stormceptor with a dipstick tube equipped with a ball valve (Sludge Judge®). It is recommended that maintenance be performed once the sediment depth exceeds the guideline values provided in Table 3 for the reasons noted in Section 4.0 Stormceptor Maintenance Guidelines.

Table 3. Sediment Depths Indicating Required Maintenance	
Model	**Sediment Depth***
450*i*	8" (200 mm)
900	8" (200 mm)
1200	10" (250 mm)
1800	15" (375 mm)
2400	12" (300 mm)
3600	17" (425 mm)
4800	15" (375 mm)
6000	18" (450 mm)
7200	15" (375 mm)
11000*s*	17" (425 mm)**
13000*s*	20" (500 mm)**
16000*s*	17" (425 mm)**

** Depths are approximate*

*** In each structure*

No entry into the unit is required for routine maintenance of the Inlet Stormceptor or the smaller disc insert models of the In-Line Stormceptor. Entry to the level of the disc insert may be required for servicing the larger disc insert models. Any potential obstructions at the inlet can be observed from the surface. The fiberglass insert has been designed as a platform for authorized maintenance personnel in the event that an obstruction needs to be removed.

Typically, maintenance is performed by the Vacuum Service Industry, a well established sector of the service industry that cleans underground tanks, sewers, and catch-basins. Costs to clean a Stormceptor will vary based on the size of the unit and transportation distances. If you need assistance for cleaning a Stormceptor unit, contact your local Rinker Materials representative, or the Stormceptor Information Line at (800) 909-7763.

Figures 1 and 2 will help illustrate the access point for routine maintenance of Stormceptor.

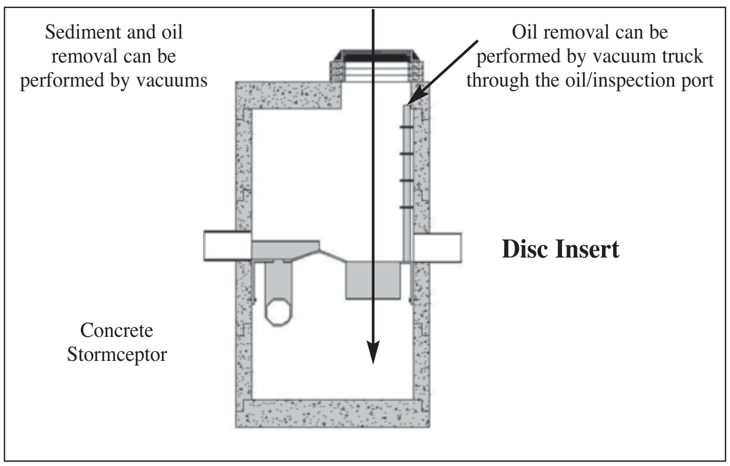

Figure 1 Single Inlet/Outlet "Disc" Insert
In-Line Stormceptor

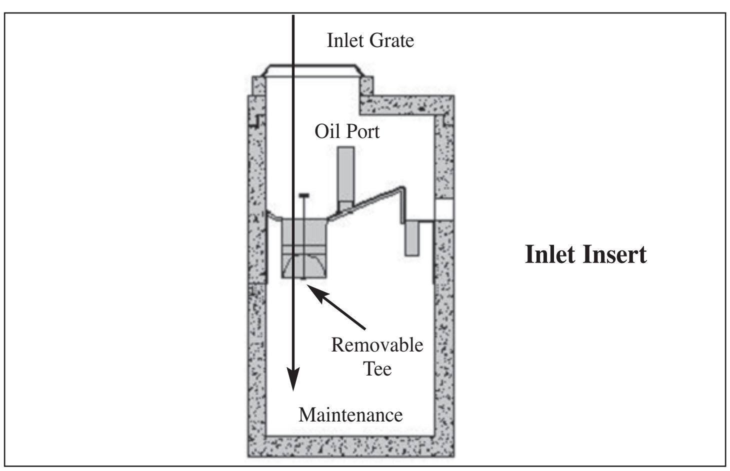

Figure 2 STC 450*i*
Inlet Stormceptor

4.2 *Disposal of Trapped Material from Stormceptor*

The requirements for the disposal of material from Stormceptor are similar to that of any other Best Management Practices (BMP). Local guidelines should be consulted prior to disposal of the separator contents.

In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste. In some areas, mixing the water with the sediment will create a slurry that can be discharged into a trunk sanitary sewer. In all disposal options, approval from the disposal facility operator/agency is required. Petroleum waste products collected in Stormceptor (oil/chemical/fuel spills) should be removed by a licensed waste management company.

What if I see an oil rainbow or sheen at the Stormceptor outlet?

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a rainbow or sheen can be seen at very small oil concentrations (< 10 ppm). Stormceptor will remove over 95% of all free oil and the appearance of a sheen at the outlet with high influent oil concentrations does not mean that the unit is not working to this level of removal. In addition, if the influent oil is emulsified, the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified or dissolved oil conditions.

5.0 *Recommended Safety Procedures*

Rinker Materials strongly recommends that any person who enters a Stormceptor System follow all applicable OSHA regulations for entry in permit required confined spaces, as outlined in 29 CFR 1910.146. A permit required confined space consists of a space that:

- Is large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry and exit.
- Is not designed for continuous employee occupancy.
- Contains or has one of the following:
  - a potential to contain a hazardous atmosphere.
  - a material that has the potential for engulfing an entrant.
  - any other recognized serious safety hazard.

Storm water and wastewater systems fall under OSHA guidelines for a permit required confined space. Failure to follow OSHA guidelines for entry and work in a permit required confined space can result in serious injury or death. Please exercise extreme caution and follow appropriate safety procedures when entering any confined space.

Two square pick holes in the cover vent the Stormceptor, allow for removal of the cover, and provide sampling ports for air quality monitoring before the cover is removed. If you must enter the Stormceptor, please note that if the disc insert inside is wet, it can be slippery.

Recognizing that every work site is different, the responsibility for safety falls on the contractor. The contractor must ensure that all employees and subcontractors follow established safety procedures and OSHA regulations for working in and around permit required confined spaces as well as for any other safety hazard that may be present on that particular site.

6.0 *Stormceptor Monitoring Protocol*

If monitoring of your Stormceptor System is required, we recommend you follow the procedures outlined below by the Rinker Materials Stormceptor office. If you have any questions regarding monitoring please contact the Rinker Materials Stormceptor Product Manager at (800) 909-7763.

6.1 *Pollutants to be Monitored*

Table 4 indicates the pollutants to be monitored during the storm events and the minimum acceptable detection limit for each pollutant to be analyzed. Approved federal or state laboratory analysis methodologies are to be used for the analysis.

The optional metals indicated in Table 4 refer to the Resource Conservation Recovery Act and may be covered by a generic metals scan. Bacteria monitoring will not be required unless explicitly requested elsewhere.

Two sediment samples are to be extracted from the monitored Stormceptor at the end of the study and analyzed for the particle size distribution and water content. A minimum of 8 U.S. sieve sizes should be used to determine the particle size distribution. Sieves that are used must include, but are not limited to 35, 60, 100, 140, 200, 270 and 400. Three clay particle sizes must be analyzed to denote particle sizes between 5 and 25 μm. The particle size distributions should be plotted on a standard grain size distribution graph.

Table 4. Monitoring Pollutants	
Pollutant	**Minimum Detection Limit (MDL)**
Total Suspended Solids (TSS)	5 mg/l
Total Phosphorus (P)	0.02 mg/l
Total Kjeldahl Nitrogen (TKN)	0.1 mg/l
Copper (Cu)	0.001 mg/l
Cadmium (Cd)	0.005 mg/l
Lead (Pb)	0.05 mg/l
Zinc (Zn)	0.01 mg/l
Chromium (Cr)	0.01 mg/l
Total Petroleum Hydrocarbons (TPH)	1 mg/l
Conductivity	0.1 μmho/cm
Fecal Coliform*	1/100 ml
Additional Metals (optional)	
Arsenic (As)	0.005 mg/l
Barium (Ba)	0.01 mg/l
Mercury (Hg)	0.0005 mg/l
Selenium (Se)	0.005 mg/l
Silver (Ag)	0.01 mg/l

* Only if explicitly requested in Terms of Reference

6.2 *Monitoring Methodology*

The following monitoring protocol should be followed to ensure reasonable monitoring results and interpretation:

- Monitoring protocols should conform to **EPA 40 CFR Part 136.**
- The **EPA guideline of 72 hours dry period** prior to a monitoring event should be used. This will ensure that there is sufficient pollutant build-up available for wash-off during the monitored event.
- Flow proportional monitoring must be conducted for the parameters indicated in Table 1. Samples should be analyzed separately for the first flush versus the remainder of the storm event. Monitoring need not extend longer than an 8-hour period after the start of the storm event (composite).
- **Sediment sampling** (measuring the sediment depth in the unit at the beginning and end of the monitoring period) must be conducted. The water content of the sediment layer must be analyzed to determine the dry volume of suspended solids. Sediment depth sampling will indicate the rate of pollution accumulation in the unit, provide confirmation that the unit is not scouring and confirm the flow proportional monitoring results. A mass balance using the sediment sampling should be calculated to validate the flow proportional sampling.

- **Grab sampling** (just taking samples at the inlet and outlet) is an unacceptable methodology for testing the performance of the Stormceptor during wet weather conditions unless it is flow weighted (flow weighted composite sample from numerous grab samples) over the entire storm.
- The oil containment area underneath the insert should be inspected via the vent pipe for dry weather spills capture once a month during the monitoring period since the flow rate of a dry weather spill may not trigger the automated samplers.
- A tipping bucket rain gauge should be installed on-site to record the distribution of storm intensities and rainfall volume during the monitored events.
- Results that are within the laboratory error (both inlet and outlet) or are representative of relatively clean water should be discarded. Typical concentrations of pollutants in storm water are:

TSS	100 mg/L
Total P	0.33 mg/L
TKN	1.50 mg/L
Total Cu	34 μg/L
Total Pb	144 μg/L
Total Zn	160 μg/L

A threshold first flush/composite TSS value of 50 mg/L at the inlet to the Stormceptor should be used as the lower limit of an acceptable storm for reporting event efficiency. Monitoring results where the influent TSS concentration is less than 50 mg/L should only be used in mass load removal calculations over the entire monitoring period with other storms where the influent concentration is greater than 50 mg/L. The results should not be analyzed if the influent TSS concentrations during all monitored storms are less than 50 mg/L. Storms where the influent TSS concentration is less than 10 mg/L should be discarded from all analyses.

- A threshold storm event volume equal to 1.5 times the storage volume of the Stormceptor being monitored should be used as the lower limit of an acceptable storm for monitoring.
- Sampling at the outlet of the Stormceptor should be conducted within the 24" outlet riser pipe to accurately define event performance.
- The personnel monitoring the Stormceptor should record incidental information in a log file. Information such as weather, site conditions, inspection and maintenance information, monitoring equipment failure, etc. provide valuable information that can explain anomalous results.
- Laboratory results of monitored samples should be analyzed within 10 days of being submitted to the lab.
- Weekly inspections of the sampling tubes, flow meter, rain gauge, and quality samplers should be conducted to ensure proper operation of the monitoring equipment. Debris and sediment that collects around the sampling intakes should be cleaned after each event.
- During the installation of automated quality samplers, care should be exercised to ensure that representative samples will be extracted (placement of intakes, ensuring that tubing is not constricted or crimped).
- Sampling should be conducted for a minimum of 6 storms. Ideally 15 storms should be sampled if the budget allows.

Call the Stormceptor Information Line (800-909-7763) for more detailed information and test results.

TECHNICAL INFORMATION:

- Stormceptor CD ROM
- Stormceptor Technical Manual
- Stormceptor Installation Guide
- Stormceptor Brochure

TEST RESULTS:

- STEP Report (Independent Verification)
- University of Coventry Study
- ETV Canada (Federal Verification)
- National Water Research Institute Test
- Westwood, MA Field Monitoring Study
- Edmonton, Canada Field Monitoring Study
- Seattle Field Monitoring
- Como Park, MN Field Monitoring Study
- Florida Atlantic University Submerged Stormceptor Testing
- Oil Removal Field Validation
- Sludge Analyses and Particle Size Analyses

Rinker MATERIALS™

6560 Langfield Rd., Bldg. 3
Houston, TX 77092
Phone: 832-590-5300
Fax: 832-590-5399
Toll Free: 800-909-7763
www.rinkerstormceptor.com

STORMWATER REPORT
THE RESIDENCES OF SOUTH BROOKLINE
BROOKLINE, MASSACHUSETTS

APPENDIX L – STORMTANK MAINTENANCE GUIDELINES

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Maintenance Guidelines

General:

The StormTank™ Stormwater Storage Module is a component in a stormwater collection system, providing storage for the detention or infiltration of runoff. No two systems are the same; with varying shapes, sizes and configurations. Some include pre-treatment to remove sediment and/or contaminants prior to entering the storage area and some do not. Systems without pre-treatment require greater attention to system functionality and may require additional maintenance.

In order to sustain system functionality Brentwood offers the following general maintenance guidelines.

Precautions:

1. Prior to & During Construction - Siltation prevention of the stormwater system.
   a. Conform to all local, state and federal regulations for sediment and erosion control during construction.
   b. Install site erosion and sediment BMP's (Best Management Practices) required to prevent siltation of the stormwater system.
   c. Inspect and maintain erosion and sediment BMP's during construction.
2. Post Construction - Prior to commissioning the StormTank™ system.
   a. Remove and properly dispose of construction erosion and sediment BMP's per all local, state and federal regulations. Care should be taken during removal of the BMP's as not to allow collected sediment or debris into the stormwater system.
   b. Flush the StormTank™ system to remove any sediment or construction debris immediately after the BMP's removal. Follow the maintenance procedure outlined.

Inspections:

Follow all local, state, and federal regulations regarding stormwater BMP inspection requirements.

Brentwood Industries makes the following recommendations:

1. Frequency
   a. During the first service year a visual inspection should be completed during and after each major rainfall event, in addition to semi-annually, to establish a pattern of sediment and debris buildup.
      i. Each stormwater system is unique and multiple criteria can affect maintenance frequency such as:

a) System Design: pre-treatment/no-pretreatment, inlet protection, stand alone device.
b) Surface Area Collecting From: hardscape, gravel, soil.
c) Adjacent Area: soil runoff, gravel, trash.
d) Seasonal Changes: fall-leaves, winter-salt/cinders.

b. Second year plus; establish an annual inspection frequency based on the information collected during the first year. At a minimum an inspection should be perform semi-annually.
c. Seasonal change; regional areas affected by seasonal change (spring, summer, fall, winter) may require additional inspections at the change of seasons in addition to semi-annually.

2. Inspect:
   a. Inspection ports.
   b. Inflow and outflow points including the inlet/manhole and pipes.
   c. Discharge area.
3. Identify and Report maintenance required:
   a. Sediment and debris accumulation.
   b. System backing up.
   c. Flow rate change.

Maintenance Procedures:

1. Conform to all local, state and federal regulations.
2. Determine if maintenance is required. If a pre-treatment device is installed, follow manufacturer recommendations.
3. Using a vacuum pump truck evacuate debris from the inflow and outflow points.
4. Flush the system with clean water forcing debris from the system. Take care to avoid extreme direct water pressure when flushing the system.
5. Repeat steps 3 and 4 until no debris is evident.

These maintenance guidelines were written by Brentwood Industries, Inc. with the express purpose of providing helpful hints. These guidelines are no to be construed as the only Brentwood approved methods for StormTank™ system maintenance or the final authority in system maintenance. Check with the stormwater system owner/project engineer for their contract/specification requirements and or recommendations. Contact your local StormTank™ distributor or Brentwood Industries for additional technical support if required.

STORMWATER REPORT
THE RESIDENCES OF SOUTH BROOKLINE
BROOKLINE, MASSACHUSETTS

APPENDIX M – PIPE CALCULATION

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Stantec

Stantec Consulting Services, Inc.
226 Causeway Street
Boston, MA 02114
(617) 523-8103

Project: The residences of South Brookline **Location:** Brookline, MA

Design Storm (Years): 25Y **Designed By:** ZYY **Date:** 7/7/2014

Checked BY: FH **Revised:** 8/22/2014

Pipe Calculations

LOCATION			DRAINAGE AREA				FLOW TIME		RUNOFF		FLOW IN PIPE											
			(Acres)				(min)		(cfs)		PIPE				FULL FLOW		DESIGN FLOW		RIM	INVERT		
Description	From	To	Area Ac	Runoff Coeff., C	Increment CA	Sum CA	Tc	Time In Section	Intensity (In/Hr)	Design Flow	Diam (In.)	Length (Ft.)	Slope (Ft./Ft.)	Manning Coeff.	Capacity (Cfs)	Velocity (Fps)	Depth (Ft.)	Velocity (Fps.)	Upper	Upper	Lower	PIPE % FULL
	AD-1B	RD	0.08	0.30	0.02		5.0	0.1	6.0	0.1	**6**	13	0.0077	0.013	0.5	2.5	0.15	2.0	170.90	169.90	169.80	20
	BLDG1	P-1A	0.08	0.90	0.09		5.0	0.6	6.0	0.5	**8**	86	0.0050	0.013	0.9	2.4	0.36	2.5	173.50	168.93	168.50	56
	TD1	DMH1	0.53	0.68	0.36		5.0	0.0	6.0	2.2	**10**	2	0.0250	0.013	3.5	6.3	0.49	6.8	171.00	169.00	168.95	63
	DMH1	P-1A				0.36	5.0	0.1	6.0	2.2	**10**	22	0.0273	0.013	3.6	6.6	0.48	7.1	171.05	168.70	168.10	61
	DMH2	DMH3	(1)							0.7	**8**	176	0.0517	0.013	2.8	7.8	0.23	6.6	171.05	161.00	151.90	25
	DMH3	EX. DMH								0.7	**8**	64.4	0.0219	0.013	1.8	5.1	0.29	4.8	154.90	151.00	149.59	39
	BLDG2	JUNCTION	0.08	0.90	0.07		5.0	0.7	6.0	0.4	**8**	179	0.0234	0.013	1.9	5.3	0.21	4.2	169.00	166.00	161.82	21
	BLDG3	JUNCTION	0.07	0.90	0.06		5.0	0.4	6.0	0.4	**8**	51	0.0051	0.013	0.9	2.5	0.31	2.4	165.60	162.08	161.82	44
	AD-6	JUNCTION	0.20	0.42	0.08		5.0	0.1	6.0	0.5	**8**	22	0.0068	0.013	1.0	2.8	0.33	2.9	165.50	162.35	162.20	50
	AD6, BLDG2 AND 3	P-1D				0.21	5.7	0.3	5.9	1.2	**10**	64	0.0050	0.013	1.6	2.8	0.55	3.1	165.60	161.82	161.50	75
	BLDG4	P-1D	0.14	0.90	0.13		5.0	0.2	6.0	0.8	**8**	31	0.0052	0.013	0.9	2.5	0.50	2.8	164.00	161.66	161.50	89
	TD2	DMH5	0.05	0.90	0.05		5.0	0.0	6.0	0.3	**6**	4	0.0250	0.013	0.9	4.5	0.20	4.1	163.10	160.60	160.50	33
	DMH5	EX. DMH				0.05	5.0	0.0	6.0	0.3	**6**	6	0.0250	0.013	0.9	4.5	0.20	4.1	163.60	160.25	160.10	33
	BLDG6	P-1F	0.08	0.90	0.07		5.0	0.2	6.0	0.4	**8**	71	0.0634	0.013	3.0	8.7	0.18	6.2	173.00	168.00	163.50	13
	TD3	DMH6	0.56	0.65	0.36		5.0	0.0	6.0	2.2	**10**	2	0.0250	0.013	3.5	6.3	0.49	6.8	168.90	163.90	163.85	63
	DMH6	P-1F				0.36	5.0	0.0	6.0	2.2	**10**	3	0.0333	0.013	4.0	7.3	0.44	7.6	168.90	163.60	163.50	55
	BLDG5	P-1G	0.09	0.90	0.08		5.0	0.0	6.0	0.5	**8**	5	0.0100	0.013	1.2	3.5	0.30	3.4	173.00	159.05	159.00	42
	TD3A	DMH8A	0.37	0.64	0.24		5.0	0.0	6.0	1.4	**8**	2	0.0250	0.013	1.9	5.5	0.43	6.0	160.90	158.90	158.85	74
	DMH8A	P-1G				0.24	5.0	0.0	6.0	1.4	**10**	11	0.0091	0.013	2.1	3.8	0.51	4.1	161.00	158.60	158.50	67
	DMH7	DMH8	(2)							3.0	**10**	67.7	0.0369	0.013	4.2	7.7	0.53	8.5	163.50	159.00	156.50	71

Stantec Consulting Services, Inc.

226 Causeway Street

Boston, MA 02114

(617) 523-8103

Pipe Calculations

Project: The residences of South Brookline

Location: Brookline, MA

Design Storm (Years): 25Y

Designed By: ZYY

Checked BY: FH

Date: *7/7/2014*

Revised: 8/22/2014

LOCATION			DRAINAGE AREA				FLOW TIME		RUNOFF		FLOW IN PIPE											
			(Acres)				(min)		(cfs)		PIPE				FULL FLOW		DESIGN FLOW		RIM	INVERT		
Description	From	To	Area Ac	Runoff Coeff., C	Increment CA	Sum CA	Tc	Time In Section	Intensity (In/Hr)	Design Flow	Diam (In.)	Length (Ft.)	Slope (Ft./Ft.)	Manning Coeff.	Capacity (Cfs)	Velocity (Fps)	Depth (Ft.)	Velocity (Fps.)	Upper	Upper	Lower	PIPE % FULL
	BLDG10	P-4B	0.80	0.90	0.72		5.0	0.0	6.0	4.3	**12**	16	0.0219	0.013	5.3	6.7	0.70	7.6	195.00	190.85	190.50	81
	TD4	DMH9	0.68	0.49	0.33		5.0	0.0	6.0	2.0	**8**	5	0.0400	0.013	2.4	6.9	0.48	7.8	180.00	176.70	176.50	83
	P-4D	DMH9	(3)							0.6	**8**	18	0.0111	0.013	1.3	3.6	0.32	3.5	179.10	176.10	175.90	46
	DMH9	DMH12								2.6	**10**	5	0.0200	0.013	3.1	5.7	0.60	6.4	179.50	175.65	175.55	84
	DMH10	DMH11	(4)							1.0	**8**	109	0.0321	0.013	2.2	6.2	0.31	6.0	193.90	188.00	184.50	45
	DMH11	DMH12								1.0	**8**	195	0.0308	0.013	2.1	6.1	0.32	5.9	188.00	182.00	176.00	48
	DMH12	DMH14								3.6	**12**	58.4	0.0334	0.013	6.5	8.3	0.53	8.5	179.00	175.45	173.50	55
	TD5	DMH13	0.22	0.65	0.14		5.0	0.0	6.0	0.8	**8**	5	0.0200	0.013	1.7	4.9	0.32	4.7	175.95	172.95	172.85	47
	DMH13	DMH14				0.14	5.0	0.1	6.0	0.8	**8**	14	0.0071	0.013	1.0	2.9	0.46	3.3	176.40	172.60	172.50	80
	DMH14	DMH15								4.4	**12**	220.5	0.0295	0.013	6.1	7.8	0.64	8.6	177.20	172.40	165.90	72
	BLDG7 AND 8	DMH15	0.16	0.90	0.14		5	0.08	6.00	0.8	**8**	25	0.0280	0.013	2.0	5.8	0.29	5.4	170.00	165.60	164.90	40
	DMH15	DMH16								5.2	**15**	114.5	0.0175	0.013	8.6	7.0	0.71	7.4	168.90	162.00	160.00	60
	CB5	DMH16	0.36	0.73	0.26		5	0.01	6.00	1.6	**8**	5	0.0400	0.013	2.4	6.9	0.40	7.5	164.10	161.10	160.90	67
	DMH16	DMH16A								6.8	**15**	83.3	0.0276	0.013	10.8	8.7	0.73	9.2	164.20	158.00	155.70	63
	DMH16A	P-4C								6.8	**15**	8	0.0125	0.013	7.2	5.9	0.98	6.7	160.80	155.60	155.50	94
	BLDG9	P-4C	0.07	0.90	0.06		5.0	0.0	6.0	0.4	**8**	5	0.0200	0.013	1.7	4.9	0.22	3.9	160.00	155.60	155.50	24
	CB6	P-4C	0.36	0.83	0.30		5.0	0.0	6.0	1.8	**10**	5	0.0400	0.013	4.4	8.0	0.37	7.5	159.30	156.00	155.80	41
	AD-1A	DMH4B	1.03	0.38	0.39		5.0	1.6	6.0	2.3	**10**	505	0.0133	0.013	2.5	4.6	0.64	5.2	168.00	165.00	158.30	92
	AD-1	DMH4B	0.99	0.34	0.34		5.0	0.3	6.0	2.0	**10**	71	0.0099	0.013	2.2	4.0	0.63	4.5	160.50	159.00	158.30	91

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226 Causeway Street
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(617) 523-8103

Pipe Calculations

Project: The residences of South Brookline ***Location:*** Brookline, MA

Design Storm (Years): 25Y ***Designed By:*** ZYY ***Date:*** *7/7/2014*

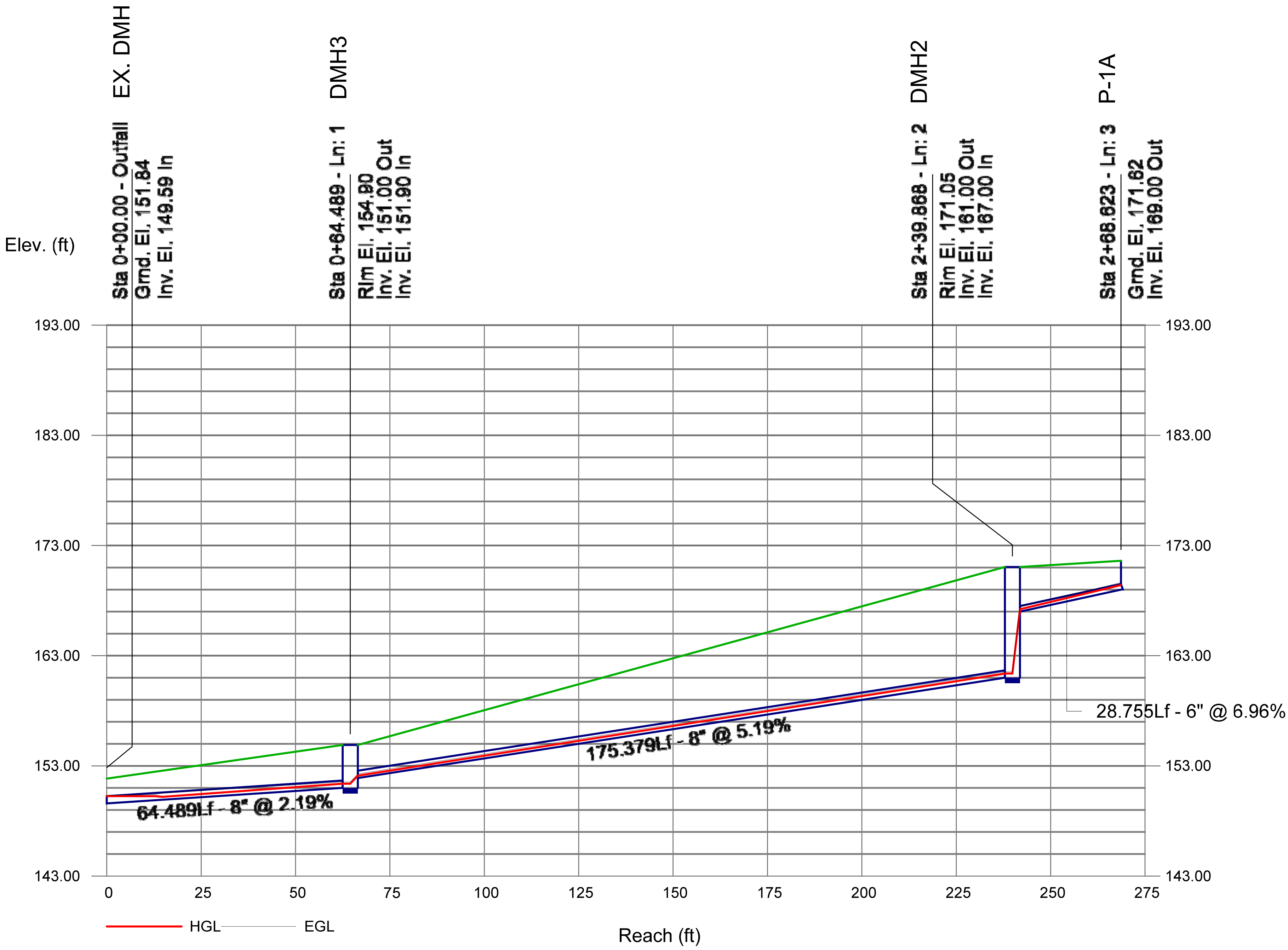
Checked BY: FH ***Revised:*** 8/22/2014

LOCATION			DRAINAGE AREA (Acres)				FLOW TIME (min)		RUNOFF (cfs)		FLOW IN PIPE											
											PIPE				FULL FLOW		DESIGN FLOW		RIM	INVERT		
Description	From	To	Area Ac	Runoff Coeff., C	Increment CA	Sum CA	Tc	Time In Section	Intensity (In/Hr)	Design Flow	Diam (In.)	Length (Ft.)	Slope (Ft./Ft.)	Manning Coeff.	Capacity (Cfs)	Velocity (Fps)	Depth (Ft.)	Velocity (Fps.)	Upper	Upper	Lower	**PIPE % FULL**
	DMH4B	DMH4C				0.73	6.6	0.6	5.8	4.2	**15**	140	0.0050	0.013	4.6	3.7	0.96	4.2	164.80	158.20	157.50	91
	AD-4	AD5	0.40	0.42	0.17		5.0	0.7	6.0	1.0	**10**	130	0.0050	0.013	1.6	2.8	0.48	3.0	160.50	158.45	157.80	63
	AD-5	DMH4C	0.10	0.47		0.22	5.7	0.3	5.9	1.3	**10**	58	0.0052	0.013	1.6	2.9	0.58	3.3	161.00	157.80	157.50	81
	DMH4C	DMH4				0.95	7.2	0.0	5.5	5.2	**15**	13	0.0308	0.013	11.4	9.2	0.59	9.0	164.40	157.40	157.00	46
	AD-2	EX.DMH	0.20	0.37	0.07		5.0	0.4	6.0	0.4	**6**	68	0.0076	0.013	0.5	2.5	0.35	2.8	160.50	158.00	157.48	80
	AD-3	EX.DMH	0.62	0.36	0.22		5.0	0.1	6.0	1.3	**8**	28	0.0364	0.013	2.3	6.6	0.36	6.7	160.50	158.50	157.48	57
	AD-7A	EX.DMH	0.23	0.35	0.08		5.0	0.0	6.0	0.5	**6**	7	0.0429	0.013	1.2	5.9	0.22	5.4	161.30	159.30	159.00	42
	AD-7	EX.DMH	0.08	0.48	0.04		5.0	0.8	6.0	0.2	**6**	220	0.0523	0.013	1.3	6.5	0.14	4.8	178.00	175.00	163.50	15
	AD-8	6" PERF	0.04	0.54	0.02		5.0	0.4	6.0	0.1	**6**	48	0.0062	0.013	0.4	2.2	0.17	1.8	187.10	186.10	185.80	25
	AD-9	AD10	0.40	0.30	0.12		5.0	1.3	6.0	0.7	**8**	283	0.0095	0.013	1.2	3.4	0.37	3.5	179.50	177.50	174.80	58
	AD10	EX.DMH	0.14	0.42	0.06	0.18	5.8	0.1	5.5	1.0	**8**	28	0.0357	0.013	2.3	6.5	0.31	6.3	177.80	173.00	172.00	43
	AD11	EX.DRAIN	0.67	0.37	0.25	0.25	5.4	0.7	5.5	1.4	**8**	184	0.0144	0.013	1.5	4.1	0.52	4.7	158.90	156.95	154.30	93
	AD-12	EX.DRAIN	0.44	0.42	0.18	0.18	6.3	0.2	5.5	1.0	**8**	45	0.0111	0.013	1.3	3.6	0.45	4.0	156.80	154.80	154.30	77

(1) peak flow from Pond P-1A during 100-yr storm
(2) combined peak flow from Ponds P-1E and P-1F during 100-yr storm
(3) combined peak flow from Ponds P-4D during 100-yr storm
(4) combined peak flow from Ponds P-4B during 100-yr storm

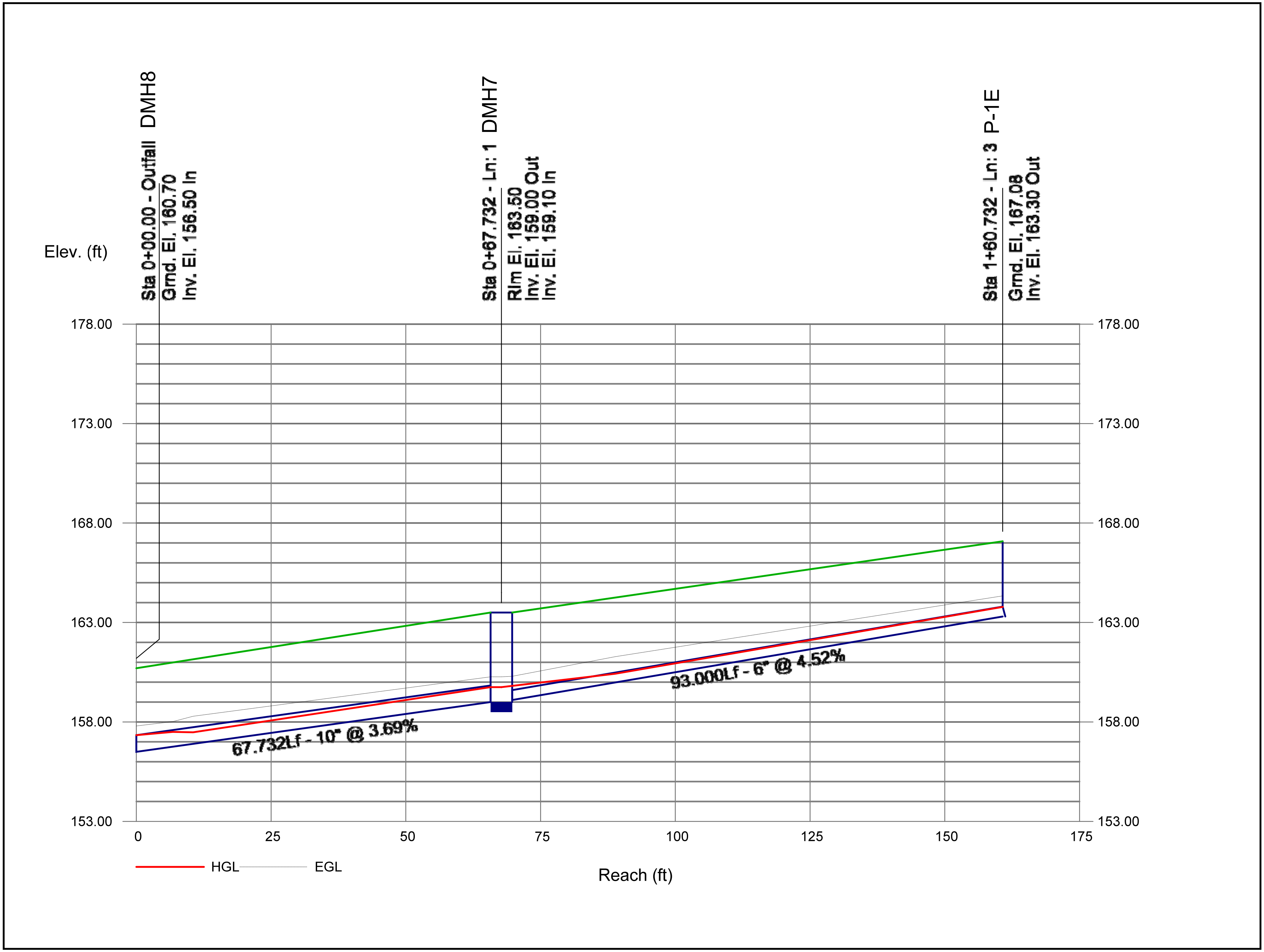
Storm Sewer Profile

Proj. file: dmh2-2014-8-21.stm



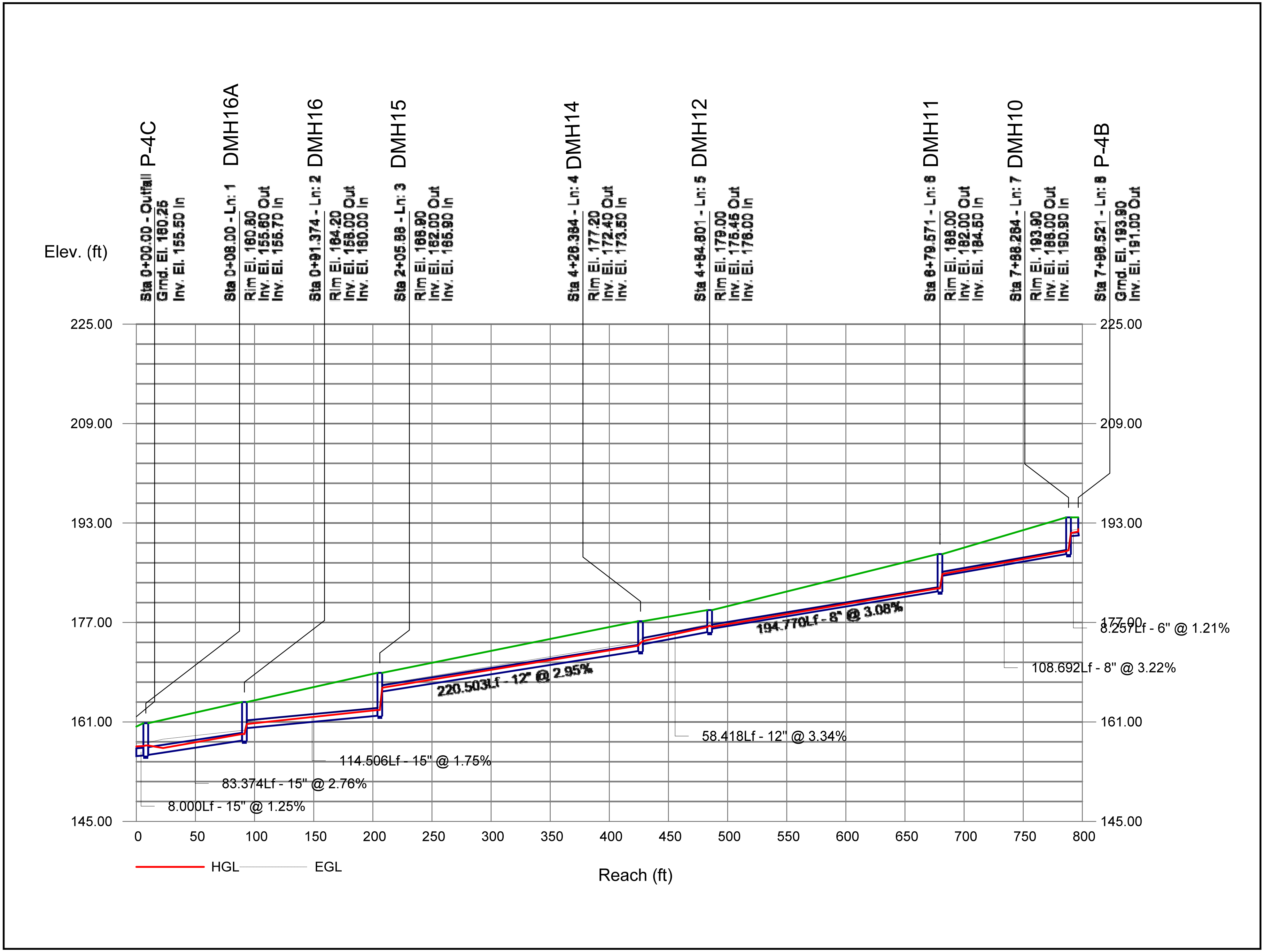
Storm Sewer Profile

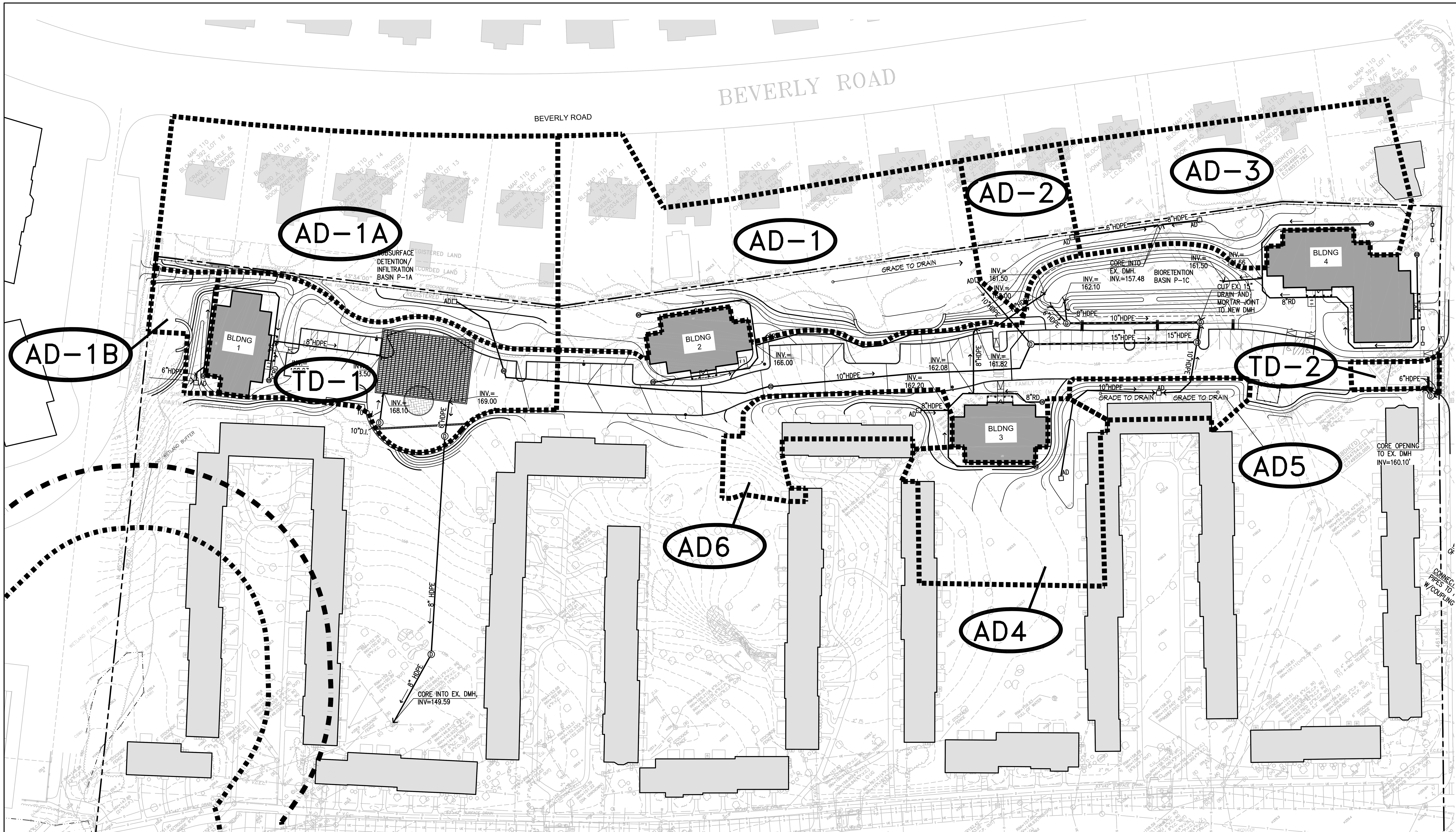
Proj. file: Dmh7.stm



Storm Sewer Profile

Proj. file: DMH10-2014-8-21.stm





LEGEND

AD-1	DISCHARGE POINT AT AREA DRAIN
TD-1	DISCHARGE POINT AT TRENCH DRAIN
CB-1	DISCHARGE POINT AT CATCH BASIN
	PROPOSED SUBCATCHMENT BOUNDARY
	PROPERTY BOUNDARY

NORTH

0 20' 40' 80'

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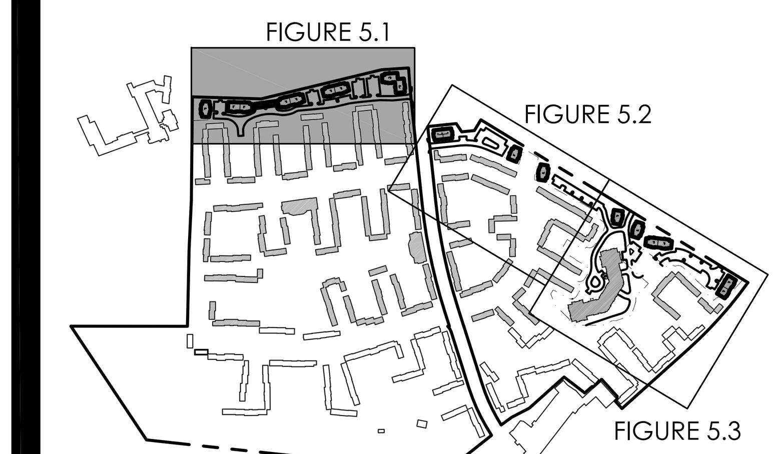

	By	Appd.	MM.DD.YY
REVISED	ZY	FH	08.22.14
REVISED	ZY	FH	07.11.14
-	ZY	FH	10.01.13
Issued	By	Appd.	MM.DD.YY

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CHESTNUT HILL REALTY

THE RESIDENCES AT SOUTH BROOKLINE

BROOKLINE, MA

Title

SUBCATCHMENT BASIN PLAN

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210810271	AS NOTED

Sheet | Drawing No.

FIGURE 6.1

LEGEND

AD-1	DISCHARGE POINT AT AREA DRAIN
TD-1	DISCHARGE POINT AT TRENCH DRAIN
CB-1	DISCHARGE POINT AT CATCH BASIN
▪▪▪▪▪▪▪▪	PROPOSED SUBCATCHMENT BOUNDARY
——-·-——	PROPERTY BOUNDARY

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FIGURE 5.1
FIGURE 5.2
FIGURE 5.3

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-	ZY	FH	10.01.13
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Scale AS NOTED
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Drawing No.

FIGURE 6.2

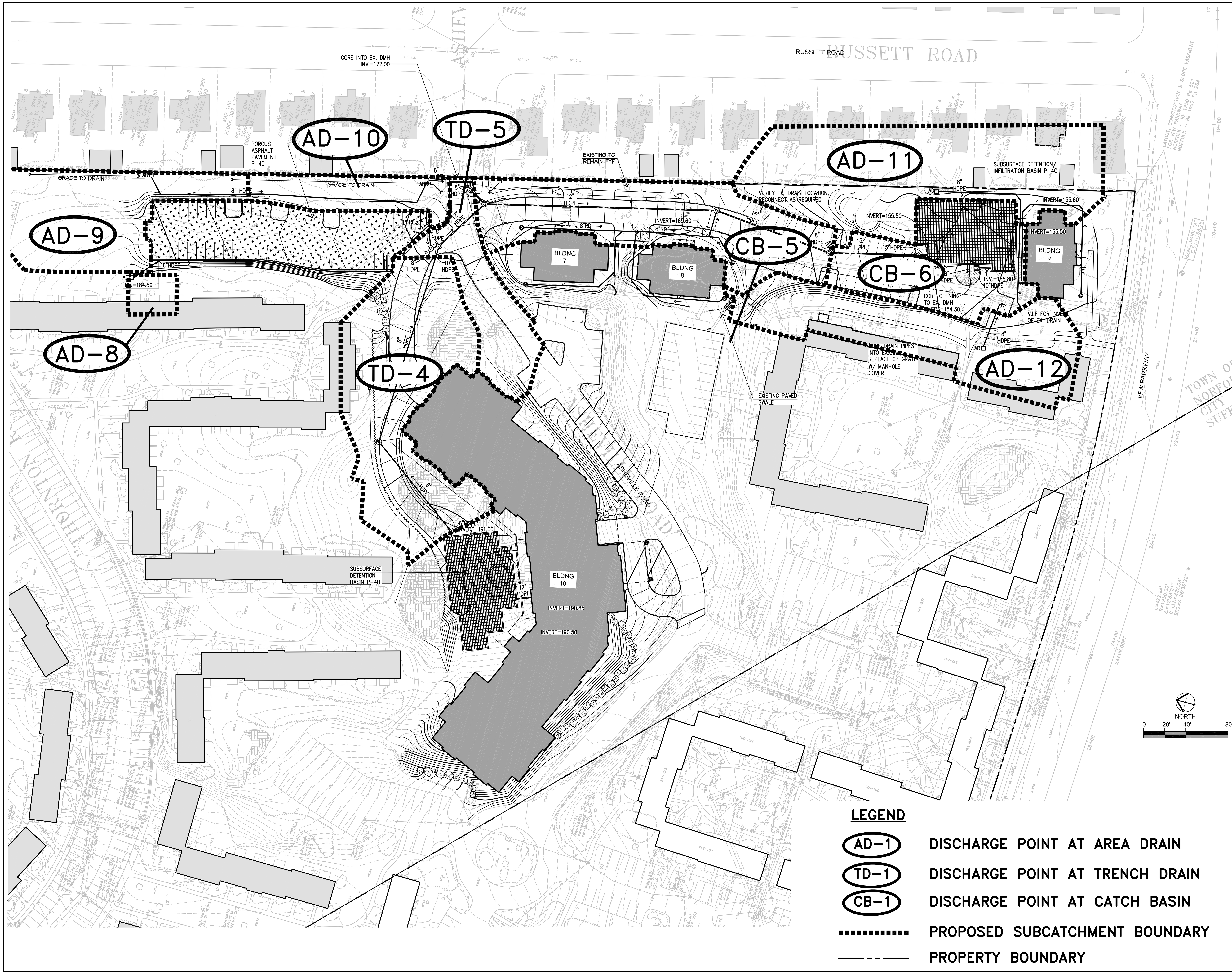

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FIGURE 6.1
FIGURE 6.2
FIGURE 6.3

REVISED	ZY	FH	08.22.14
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FIGURE 6.3