Exhibit J

Drainage Report

PRELIMINARY
DRAINAGE ANALYSIS and
STORM WATER COMPLIANCE REPORT

1 Hot Springs Road
Santa Barbara, CA
93103

January 2025

PREPARED FOR:

City of Santa Barbara
Public Works Department/Engineering
630 Garden Street
Santa Barbara. CA 93101

PREPARED BY:

Robert Schmidt
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W.O. 23093

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PURPOSE

The purpose of this report is to analyze existing and proposed drainage characteristics of the project site, evaluate impacts, if any, to existing downstream properties and demonstrate compliance with City of Santa Barbara's NPDES Phase II General Permit for storm water discharges, which are defined in the City's Municipal Code (Chapter 22.87) and the City's Storm Water BMP Guidance Manual (2020).

PROJECT DESCRIPTION

The proposed project is located at 1 Hot Springs Road in Santa Barbara, CA (APN 017-393-002). The existing 2.46-acre lot is bound on the South by Channel Drive and on the West by East Cabrillo Boulevard. The Union Pacific Railroad runs along the entire North side of the project forming a roughly triangular shaped lot. See Figure 1 for the project vicinity map.

Figure 1. Vicinity Map

The proposed project proposes to develop the existing lot into a new 22-unit residential development with associated on-site and off-site improvements. Residential parking will be provided on-site in private garages and at-grade parking spaces. A common area and play area will be provided on the East portion of the site. Offsite improvements proposed within the public right-of-way include construction of curb, gutter, sidewalk, and a driveway

entrance along Channel Drive. The proposed improvements inherently enhance ADA accessibility.

SITE CONDITIONS

EXISTING SITE CONDITION AND DRAINAGE PATTERNS

The attached Existing Drainage Exhibit (Attachment 1) shows the existing parcel and the adjacent right-of-way, topography, surfacing, and drainage patterns. The existing parcel has an average slope of ±5%. Site surface drainage sheet-flows over land in a Southwesterly direction towards the public right-of-way where it eventually joins the public storm drain system.

The site soils are primarily silty clay and clayey sand. Infiltration testing was performed by Pacific Materials Laboratory in three locations on site. All 3 locations are within our primary proposed BMP location. Infiltration rates of 0.2 - 1.7 inches per hour were observed. The infiltration rate of 0.2 inches per hour was used for conservative BMP calculations in this study. See Appendix C and D.

POST-DEVELOPMENT SITE CONDITION AND DRAINAGE PATTERNS

The attached Preliminary Stormwater Control Plan (Attachment 2) depicts site drainage management areas and proposed stormwater management improvements for the project parcel and adjacent right-of-way.

Runoff from the redeveloped project parcel will continue to drain in the Southeasterly direction, towards the intersection of Channel Drive and East Cabrillo Boulevard. The proposed buildings and associated impervious site improvements will cover approximately 27.6% of the project parcel. Roof and surface drainage will be conveyed to various post-construction stormwater BMPs for stormwater treatment and retention including FloGard Plus downspout filters, FloGard Plus catch basin filters, bioretention basins, vegetated swales, and permeable pavers before discharging offsite to the adjacent street. On-site project area statistics are summarized below:

Project Parcel

- Proposed New Impervious Area = 20,944 sf
- Proposed Replaced Impervious Area = 3,242 sf
- Proposed Removed Impervious Area = 7,435 sf
- Proposed Existing Impervious Area to Remain = 400 sf

The total new/replaced/remaining impervious surfaces for the project parcel total approximately 24,586 sf, an increase of existing impervious areas by approximately 14,221 sf.

Runoff in the public right-of-way along the project frontage will maintain existing drainage patterns directed southeasterly towards the intersection of Channel Drive and East Cabrillo Boulevard. The proposed impervious improvements will cover approximately 74.1% of the project frontage area. Surface drainage from the sidewalk will be conveyed to the adjacent parkway for treatment. Surface drainage from the street will be conveyed to two curb inlet catch basins equipped with FloGard Plus insert filters for pre-treatment then to two separate underground Stormtech DC-780 chambers for retention and infiltration. Site statistics from the public right-of-way are summarized below:

Public Right-of-Way

- Proposed New Impervious Area = 5,163 sf
- Proposed Replaced Impervious Area = 4,077 sf
- Proposed Removed Impervious Area = 1,320 sf
- Proposed Existing Impervious Area to Remain = 9,795 sf

The total new/replaced/remaining impervious surfaces for the right-of-way improvements total approximately 19,035 sf, an increase of existing impervious areas by approximately 3,925 sf.

DESIGN METHODOLOGY

EXISTING RUNOFF

Pre-project hydrologic peak flows for the existing project parcel were analyzed using HydroCAD Stormwater Modeling System software. The existing runoff analysis is based on topography provided by MNS Engineers dated October 26, 2015. Runoff calculations were prepared using the Santa Barbara County Urban Hydrograph (SBUH) Method. The existing project site is approximately 11.6% impervious and 88.4% pervious. Results for the existing project site peak flow rates and runoff volumes are summarized in Table 1. The existing project right-of-way is approximately 58.8% impervious and 41.2% pervious. Results for the existing project right-of-way peak flow rates and runoff volumes are summarized in Table 2. Supporting calculations for pre-project runoff can be found in Appendix A, Pre-Project Hydrology Calculations.

Table 1. Pre-Project Site Storm Discharge Rates

Drainage Area	*Area (Ac)*	*1", 24-hour*	*Q2*	*Q5*	*Q10*	*Q25*
Peak Flows (cfs)	2.05	0.21	2.24	3.76	4.80	6.08
Volume (ac-ft)	2.05	0.045	0.335	0.555	0.706	0.895

Table 2. Pre-Poject Right-of-Way Storm Discharge Rates

Drainage Area	*Area (Ac)*	*1", 24-hour*	*Q2*	*Q5*	*Q10*	*Q25*
Peak Flows (cfs)	0.59	0.71	0.81	1.25	1.54	1.90
Volume (ac-ft)	0.59	0.027	0.123	0.189	0.234	0.290

POST-DEVELOPMENT RUNOFF

Post-development hydrologic peak flows for the project site and public right-of-way were analyzed using HydroCAD Stormwater Modeling System software. The runoff analysis is based on the Preliminary Site Improvement Plans for the site, dated November 2024, prepared by Flowers & Associates. Runoff calculations were prepared using the Santa Barbara County Urban Hydrograph (SBUH) Method. The proposed project site is approximately 27.6% impervious and 72.4% pervious. Results for the project site's post-development peak flow rates and runoff volumes are summarized in Table 3. The proposed project right-of-way is approximately 74.1% impervious and 25.9% pervious. Results for the project right-of-way's post development peak flow rates and runoff volumes are summarized in Table 4. Supporting calculations for post-development runoff can be found in Appendix B, Post-Development Hydrology Calculations.

Table 3. Post Development Site Storm Discharge Rates

Drainage Area	*Area (Ac)*	*1", 24-hour*	*Q2*	*Q5*	*Q10*	*Q25*
Peak Flows (cfs)	2.05	0.09	1.51	2.63	3.39	4.35
Volume (ac-ft)	2.05	0.046	0.273	0.436	0.549	0.691

Table 4. Post Development Right-of-Way Storm Discharge Rates

Drainage Area	*Area (Ac)*	*1", 24-hour*	*Q2*	*Q5*	*Q10*	*Q25*
Peak Flows (cfs)	0.59	0.00	0.69	1.00	1.20	1.44
Volume (ac-ft)	0.59	0.003	0.101	0.167	0.212	0.268

CITY OF SANTA BARBARA STORM WATER COMPLIANCE

The sum of the proposed on-site new and replaced impervious areas (24,186 sf) is over 15,000 sf putting the on-site improvements into the City's Tier 4 category for stormwater compliance. Tier 4 projects are required to comply with the following:

1. Storm Discharge Rate Control: Provide storm water detention as required to keep peak storm flow below the existing site flows, up to the 25-yr Storm.
2. Storm Water Volume Reduction: Retain the volume generated from the 95th percentile 24-hour rainfall event which is 1.2" for all replaced impervious area and the 2.4" for all new impervious area.
3. Water Quality Treatment: Treat the runoff from the 1-inch 24-hr storm from at least 95% of the project site's impervious area, via flow-through treatment.

The sum of the proposed new and replaced impervious areas within the public right-of-way (9,240 sf) is less than 15,000 sf putting the public right-of-way improvements into the City's Tier 3 category for stormwater compliance. Tier 3 projects are required to comply with the following:

1. Storm Discharge Rate Control: Provide storm water detention as required to keep peak storm flow below the existing site flows, up to the 25-yr Storm.
2. Storm Water Volume Reduction: Retain the larger of a) the volume difference between existing and proposed conditions for the 25-yr, 24-hr storm or b) the proposed 1-inch, 24-hr storm.
3. Water Quality Treatment: Treat the runoff from the 1-inch 24-hr storm from at least 95% of the project site's impervious area, via flow-through treatment.

Compliance with the above requirements for the project's on-site and public right-of-way improvements are further described in the following section.

Storm Water Discharge Rate Control Requirements

Comparison of the on-site existing peak flows in Table 1 to proposed peak flows in Table 3 show that the post-development condition for the project site results in decreased peak flows from the existing condition, thereby satisfying the Tier 4 storm water discharge rate control requirement. See Table 5 below for comparison of peak flows for the site.

Table 5. Pre-Project vs. Post-Development Site Peak Flow Comparison

	1", 24-hour (cfs)	*Q2 (cfs)*	*Q5 (cfs)*	*Q10 (cfs)*	*Q25 (cfs)*
Pre-Project	0.21	2.24	3.76	4.80	6.08
Post-Development	0.09	1.51	2.63	3.39	4.35
Change	**-0.12**	**-0.73**	**-1.13**	**-1.41**	**-1.73**

Comparison of the off-site existing peak flows in Table 2 to proposed peak flows in Table 4 show that the post-development condition for the project site results in decreased peak

flows from the existing condition, thereby satisfying the Tier 4 storm water discharge rate control requirement. See Table 6 below for comparison of peak flows for the site.

Table 6. Pre-Project vs. Post-Development ROW Peak Flow Comparison

	1", 24-hour (cfs)	*Q2 (cfs)*	*Q5 (cfs)*	*Q10 (cfs)*	*Q25 (cfs)*
Pre-Project	0.71	0.81	1.25	1.54	1.90
Post-Development	0.00	0.69	1.00	1.20	1.44
Change	**-0.71**	**-0.12**	**-0.25**	**-0.34**	**-0.46**

Storm Water Volume Reduction Requirements and Storm Water Quality Treatment Requirements

Since the project site proposes a significant increase to the site impervious areas, volume reduction requirements are applicable for the project parcel. The project is required to retain the runoff volume of the 1.2", 24-hour rainfall event for all replaced impervious area and the 2.4", 24-hour rainfall event for all new impervious area. This equates to 365 cubic feet (0.75*3,642/7.48) for the proposed replaced & existing to remain impervious areas and 4,200 cubic feet (1.5*20,944/7.48) for the proposed new impervious areas. The total required volume to be retained is **4,565** cubic feet.

The proposed project is also required to treat storm water runoff from the 1", 24-hr storm for trash, nutrients, bacteria, sediment, pesticides and herbicides, hydrocarbons and metals (defined as "pollutants of concern" in the City's Storm Water BMP Guidance Manual). The City's Storm Water BMP Guidance Manual advises projects to achieve storm water treatment through "natural" filtration and infiltration designs. The design volume required to be treated was calculated by assuming 0.623 gallons of runoff per square foot of impervious surface. This equates to **2,048** cubic feet (0.623*24,586/7.48) required to be treated.

Since the proposed right-of-way improvements proposes an increase to the site impervious areas, volume reduction requirements are applicable for the project parcel. The existing 25-yr, 24-hr pre-project runoff volume is 0.290 ac-ft (Table 2); the proposed 25-yr, 24-hr post-development runoff volume is 0.264 ac-ft (Table 4). Since the runoff volume for the proposed, post-development 25-yr, 24-hr storm is reduced from the existing, pre-development 25-yr, 24-hr storm the project is required to retain the proposed 1-inch 24-hr storm of 0.053 ac-ft or **1,364** cu ft.

The proposed right-of-way improvements are also required to treat storm water runoff from the 1", 24-hr storm for trash, nutrients, bacteria, sediment, pesticides and herbicides, hydrocarbons and metals (defined as "pollutants of concern" in the City's Storm Water BMP Guidance Manual). The City's Storm Water BMP Guidance Manual advises projects to achieve storm water treatment through "natural" filtration and infiltration designs. The design volume required to be treated was calculated by assuming 0.623 gallons of runoff

per square foot of impervious surface. This equates to **1,585** cubic feet (0.623*19,035/7.48) required to be treated.

The following stormwater treatment BMP's are proposed on the project site to satisfy volume reduction and storm water quality treatments:

Vegetated Swales: One vegetated swale is proposed and is identified in Attachment 2. Pre-treatment is provided by natural filtration and infiltration prior to being directed to BMP's.

FloGard Catch Basin Insert Filters: Two catch basins located at the two trash enclosures are proposed to be fitted with a FloGard Catch Basin insert filters and are identified in Attachment 2. The catch basin insert filters will provide storm water pre-treatment of the hardscape impervious areas prior to being directed to Bioretention basins.

FloGard Roof Drain Filters: All roof drains within the project area are proposed to be fitted with a FloGard downspout filter and are identified in Attachment 2. The downspout filters will provide storm water pre-treatment of the impervious roof areas prior to being directed to the permeable pavers.

Bioretention Areas: Three bioretention areas are proposed on the project site and are identified in Attachment 2. These areas are self-contained within landscaping areas and are designed to treat and retain a portion of the roof runoff from the building as well as hardscape proposed throughout the project site. These areas treat stormwater through soil filtration, (a minimum of 24 inches in depth), as well as biological plant uptake before infiltrating into the ground below. The special soil mix is constructed of 60-70% sand, 15-25% compost, and 10-20% clean topsoil; orgagnic content 8-12% and pH 5.5-7.5. For calculation purposes within the bioretention basin area, the soil media treatment rate of 2.5 inches per hour was used with a safety factor of 8 to be conservative. See Appendix C for specific calculations.

Permeable Pavement: Permeable paver driveways and parking areas are proposed on site and are identified in Attachment 2. Permeable paving is proposed on site to reduce site impervious areas and also to treat and retain runoff from the adjacent hardscape. Retention storage will be provided within the 12" minimum depth gravel layer, as detail on the Civil Engineering Plans. For calculation purposes an infiltration rate of 0.20 inches per hour was used with a safety factor of 4 to be conservative. See Appendix C for specific calculations.

Individual treatment BMPs were sized by determining the new impervious, replaced impervious, and existing impervious to remain for each DMA to calculate the volume produced from the 95th percentile 24-hour rainfall event (1.2" for all replaced and existing impervious areas to remain and the 2.4" for all new impervious areas). Sizing calculations for the bioretention and permeable pavement areas are attached for reference (Appendix C). Sizing of all treatment BMPs associated with the project parcel are summarized in Table 7 below. See the Conceptual Stormwater Control Plan (Attachment 2) for BMP locations.

Table 7. Project Site Stormwater BMP Sizing Summary

Drain. Mgmt. Area (DMA)	Treatment Method (BMP)	Exist. Imperv. To remain Area (sf)	Replaced Imperv. Area (sf)	New Imperv. Area (sf)	Total Imperv. Area (sf)	Design Volume (CF)	Provided Volume (CF)
A	Bioretention	400	0	1,507	1,907	342	394
B	Permeable Pavers	0	2,956	17,898	20,854	3,886	7,463
C(1)	Sidewalks tributary to vegetation	0	286	1,227	1,513	275	-
D	Bioretention	0	0	150	150	30	35
E	Bioretention	0	0	162	162	32	37
Site Totals:		**400**	**3,242**	**20,944**	**24,586**	**4,565**	**7,463**

Notes:
(1) DMA "C" provided volume is accounted for with DMA "B".

The following stormwater treatment BMP's are proposed in the project right-of-way to satisfy volume reduction and storm water quality treatments:

FloGard Curb Inlet Catch Basin Insert Filters: Two new curb inlet catch basins are proposed to be equipped with FloGard Catch Basin insert filters and are identified in Attachment 2. The catch basin insert filters will provide storm water pre-treatment of the hardscape impervious areas prior to being directed to the underground Stormtech Chambers.

StormTech DC-780 Chambers: Two underground stormwater basin areas are proposed and are identified in Attachment 2. These proprietary chambers are designed to retain stormwater volume retention requirements. Stormwater treatment is also provided at the base of the chambers within the gravel layers before infiltrating into native soils. See Appendix C for sizing design.

Individual treatment BMPs were sized by prorating the volume produced from the 95th percentile 24-hr rainfall event based on the percentage of area tributary to each treatment BMP. Sizing calculations for the Stormtech Chamber units are attached for reference (Appendix C). Sizing of all treatment BMPs associated with the project right-of-way are summarized in Table 8 below. See the Conceptual Stormwater Control Plan (Attachment 2) for BMP locations.

Table 8. Project Right-of-Way Stormwater BMP Sizing Summary

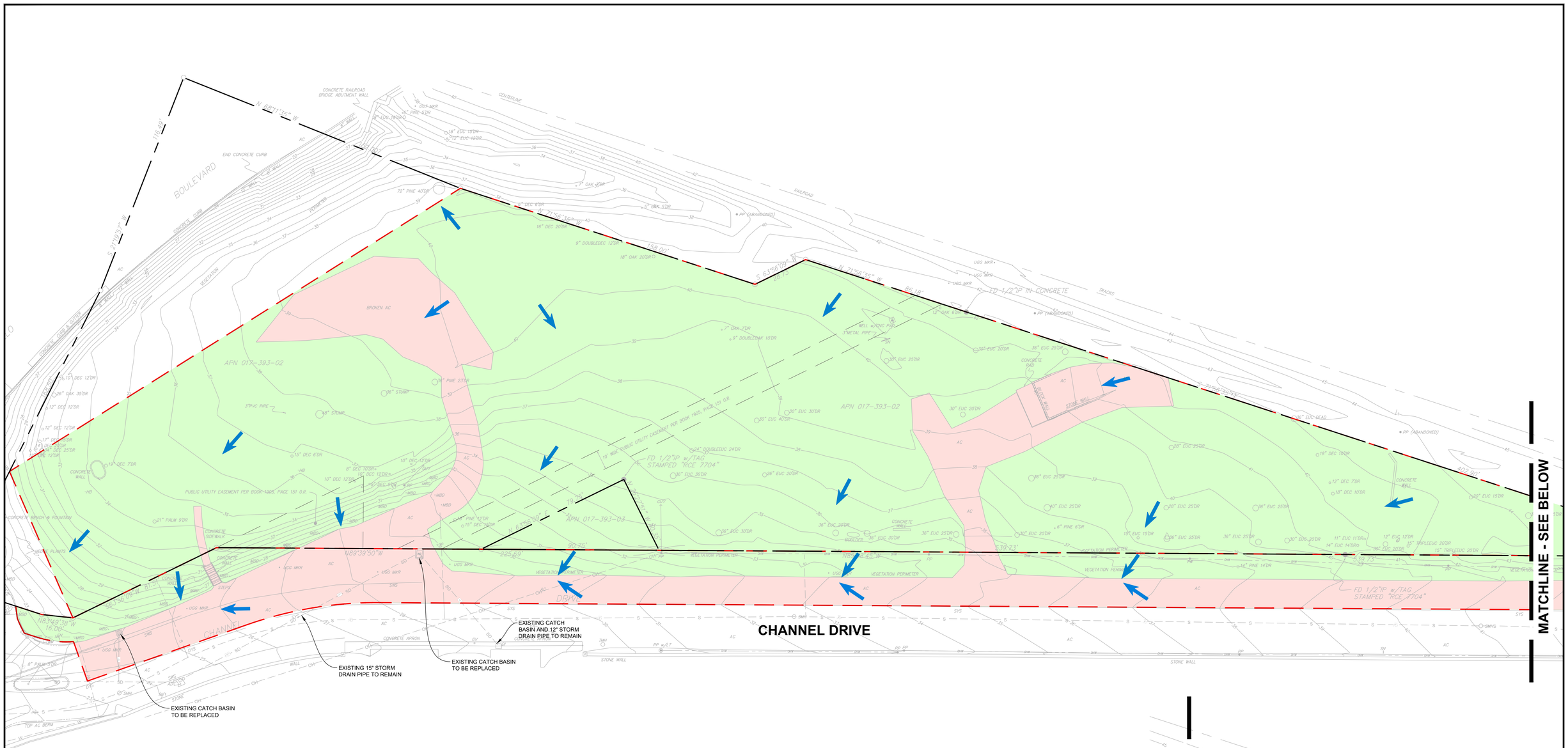
Drain. Mgmt. Area (DMA)	Treatment Method (BMP)	Exist. Imperv. To remain Area (sf)	Replaced Imperv. Area (sf)	New Imperv. Area (sf)	Total Imperv. Area (sf)	Design Volume (CF)	Provided Volume (CF)
F	Chambers	7,903	2,670	4,585	15,158	1,086	1,134
G	Chambers	1,892	1,403	417	3,712	266	370
H(1)	Unable to treat	0	4	161	165	12	-
Site Totals:		**9,795**	**4,077**	**5,163**	**19,035**	**1,364**	**1,504**

Notes:

(1) DMA "H" provided volume is accounted for with DMA "G". DMA H impervious area is less than 5% and therefore exempt from Tier 3 treatment requirements.

CONCLUSION

The preceding analysis demonstrates that this project meets and exceeds the City's Tier 4 storm water requirements for on-site treatment, volume reduction, and flow rate control and the project right-of-way meets and exceeds the City's Tier 3 storm water requirements for treatment, volume reduction, and flow rate control. Both on-site and off-site projects are consistent with the City's Storm Water Ordinance (22.87) and Storm Water BMP Guidance Manual (2020) design criteria for new development.



IMPORTANT NOTICE

ALL UTILITY LOCATIONS ARE APPROXIMATE CONTRACTOR IS TO NOTIFY UNDERGROUND SERVICE ALERT TWO WORKING DAYS PRIOR TO STARTING ANY EXCAVATION OR RESURFACING.

CALL TOLL FREE 1-800-422-4133

LEGEND

- PROPERTY LINE
- PROJECT BOUNDARY LINE
- DIRECTION OF FLOW FOR SURFACE RUNOFF
- EXISTING IMPERVIOUS AREA
- EXISTING PERVIOUS AREA

PROJECT PARCEL - SITE COVERAGE CALCS

EXISTING:	
PERVIOUS AREA	78,765 SF
IMPERVIOUS AREA	10,365 SF
TOTAL SITE	89,130 SF

PUBLIC RIGHT OF WAY - SITE COVERAGE CALCS

EXISTING:	
PERVIOUS AREA	10,592 SF
IMPERVIOUS AREA	15,110 SF
TOTAL SITE	25,702 SF

N

SCALE: 1"=20'
GRAPHIC SCALE
0 20 40 60

EXISTING DRAINAGE EXHIBIT

MULTI-FAMILY HOUSING DEVELOPMENT
1 HOT SPRINGS ROAD
CITY OF SANTA BARBARA, CALIFORNIA

C-6.0

DATE: 11/01/2024

FLOWERS & ASSOCIATES, INC.
115 W. Canon Perdido Street
Santa Barbara, CA 93101
Telephone (805) 966-2224
CIVIL ENGINEERING • PLANNING
CONSTRUCTION ENGINEERING

PRELIMINARY
NOT FOR CONSTRUCTION
BY: _____ DATE: _____

REGISTERED PROFESSIONAL ENGINEER ROBERT A. SCHMITZ No. 71335 CIVIL STATE OF CALIFORNIA

PLOTTED: Tuesday, January 21, 2025 10:13:18 AM
23093_PRELIMINARY GRADING.DWG
W.O. 23093

NOTE: ALL STORM DRAIN PIPE TO BE WATER TIGHT JOINTS.

PROJECT PARCEL - SITE COVERAGE CALCS

EXISTING:	
PERVIOUS AREA	78,765 SF
IMPERVIOUS AREA	10,365 SF
TOTAL SITE	89,130 SF
PROPOSED:	
PERVIOUS AREA	64,544 SF
-41,064 SF LANDSCAPE	
-23,480 SF PERMEABLE PAVERS	
IMPERVIOUS AREA	24,586 SF
TOTAL SITE	89,130 SF
PROPOSED NEW IMPERVIOUS AREA	= 20,944 SF
PROPOSED REPLACED IMPERVIOUS AREA	= 3,242 SF
EXISTING TO REMAIN IMPERVIOUS AREA	= 400 SF

NEW + REPLACED IMPERVIOUS AREA (24,186 SF) > 15,000 SF = TIER 4

PROJECT PARCEL REQUIREMENTS

VOLUME REDUCTION:	**4,565 CF**
TREATMENT:	**2,048 CF**

PROJECT RIGHT OF WAY - SITE COVERAGE CALCS

EXISTING:	
PERVIOUS AREA	10,592 SF
IMPERVIOUS AREA	15,110 SF
TOTAL SITE	25,702 SF
PROPOSED:	
PERVIOUS AREA	6,667 SF
IMPERVIOUS AREA	19,035 SF
TOTAL SITE	25,702 SF
PROPOSED NEW IMPERVIOUS AREA	= 5,163 SF
PROPOSED REPLACED IMPERVIOUS AREA	= 4,077 SF
EXISTING TO REMAIN IMPERVIOUS AREA	= 9,795 SF

NEW + REPLACED IMPERVIOUS AREA (9,223 SF) < 15,000 SF = TIER 3

PROJECT RIGHT OF WAY REQUIREMENTS

VOLUME REDUCTION:	**1,364 CF**
TREATMENT:	**1,585 CF**

GENERAL STORM WATER MANAGEMENT NOTES

1. THIS PLAN IS TO BE CONSTRUCTED IN CONJUNCTION WITH THE STORM WATER CONTROL PLAN FOR THIS PROJECT INCLUDING REPORT AND ANY SUBSEQUENT EXHIBITS.
2. SEE PRELIMINARY GRADING, DRAINAGE, AND SITE IMPROVEMENT PLAN FOR DETAILED GRADING AND CONSTRUCTION NOTES FOR SITE IMPROVEMENTS.

LEGEND

- PROPERTY LINE
- DRAINAGE MANAGEMENT AREA BOUNDARY
- A / 1.0 — DRAINAGE AREA DESIGNATION
- IMPERVIOUS AREA (SQUARE FEET)
- SD — PROPOSED STORM DRAIN PIPE
- PROPOSED SCM PERMEABLE PAVERS SEE TYPICAL DETAIL 2, THIS SHEET
- PROPOSED PERVIOUS AREA
- PROPOSED NEW IMPERVIOUS AREA
- PROPOSED REPLACED IMPERVIOUS AREA
- PROPOSED EXISTING IMPERVIOUS TO REMAIN

B 20,854 — ALL ROOF DRAINS TO HAVE FLOGARD PRE-TREATMENT FILTERS AND ARE DIRECTED TO PERMEABLE PAVERS FOR TREATMENT AND RETENTION

SCM 'B' - 23,480 SF OF PERMEABLE PAVERS TO PROVIDE TREATMENT AND 7,463 CF OF RETENTION

ROOF DRAINS DIRECTED TO OUTLET TO PERMEABLE PAVERS, TYP.

IMPERVIOUS HARDSCAPE DIRECTED TO CATCH BASIN WITH FLOGARD FILTER FOR PRE-TREATMENT AND THEN TO BIOTENTION BASIN 'D'

E 150

SCM 'E' - 20 SF BIORETENTION BASIN

ALL IMPERVIOUS PATHS (MAX. 6' WIDE) TRIBUTARY TO LANDSCAPE AREAS FOR TREATMENT

C 1,227

SCM 'D' - 20 SF BIORETENTION BASIN

D 150 — IMPERVIOUS HARDSCAPE DIRECTED TO CATCH BASIN WITH FLOGARD FILTER FOR PRE-TREATMENT AND THEN TO BIOTENTION BASIN 'D'

PROPOSED LANDSCAPE AREA DRAINS, TYPICAL

A 1,907 — IMPERVIOUS HARDSCAPE DIRECTED TO VEGETATED SWALE FOR PRE-TREATMENT AND THEN TO BIOTENTION BASIN 'A'

ROOF DRAINS DIRECTED TO OUTLET TO PERMEABLE PAVERS, TYP.

OVERFLOW CATCH BASIN, TYPICAL

ALL IMPERVIOUS PATHS (MAX. 6' WIDE) TRIBUTARY TO LANDSCAPE AREAS FOR TREATMENT (TYP.)

EXISTING CATCH BASIN AND 12" STORM DRAIN PIPE TO REMAIN

ALL IMPERVIOUS PATHS (MAX. 6' WIDE) TRIBUTARY TO LANDSCAPE AREAS FOR TREATMENT (TYP.)

CHANNEL DRIVE

PROPOSED TRENCH DRAIN

SCM 'A' - 210 SF BIORETENTION BASIN

PROPOSED VEGETATIVE SWALE TO BIORETENTION BASIN

EXISTING 15" STORM DRAIN PIPE TO REMAIN

ONSITE OVERFLOW OUTLET IN CURB

G 3,877 — IMPERVIOUS HARDSCAPE DIRECTED TO LANDSCAPED PARKWAY AND FLOGARD CURB INLET FILTERS FOR PRE-TREATMENT THEN TO UNDERGROUND STORMTECH CHAMBERS FOR RETENTION AND INFILTRATION

UNDERGROUND DC-780 STORMTECH CHAMBERS WITH 1,134 CF STORAGE MIN.

F 15,158 — IMPERVIOUS HARDSCAPE DIRECTED TO LANDSCAPED PARKWAY AND FLOGARD CURB INLET FILTERS FOR PRE-TREATMENT THEN TO UNDERGROUND STORMTECH CHAMBERS FOR RETENTION AND INFILTRATION

UNDERGROUND DC-780 STORMTECH CHAMBERS WITH 370 CF STORAGE MIN.

H 165 — UNABLE TO TREAT (TIER 3 EXEMPT <5%)

MATCHLINE - SEE BELOW

MATCHLINE - SEE ABOVE

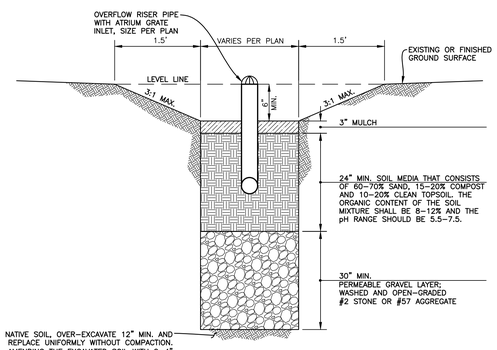
N

SCALE: 1"=20'
GRAPHIC SCALE
0 20 40 60

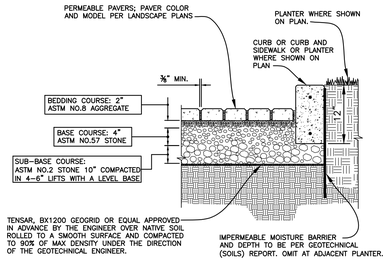
IMPORTANT NOTICE

ALL UTILITY LOCATIONS ARE APPROXIMATE CONTRACTOR IS TO NOTIFY UNDERGROUND SERVICE ALERT TWO WORKING DAYS PRIOR TO STARTING ANY EXCAVATION OR RESURFACING.

CALL TOLL FREE 1-800-422-4133

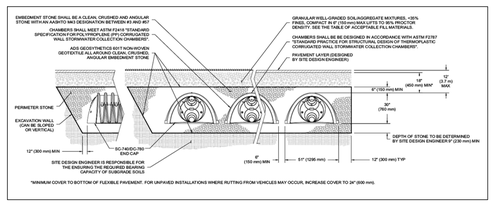


1 **TYPICAL BIORETENTION DETAIL**
NOT TO SCALE



NOTES:
1. NO. 2 STONE MAY BE SUBSTITUTED WITH NO. 3 OR NO. 4 STONE.
2. STRUCTURAL SECTION SHALL BE VERIFIED BY THE GEOTECHNICAL ENGINEER DURING CONSTRUCTION.
3. FOR EDGING CURB CONSTRUCT WEAKENED PLANE CONTROL JOINTS @ 10' INTERVALS AND CONSTRUCT 3/4" RADIUS ON ALL EXPOSED CORNERS.
4. AGGREGATE SPECIFICATIONS ARE PER ASTM D448–12.
5. ALL BASE MATERIAL SHALL BE WASHED, OPEN GRADED (NO SAND), CRUSHED (ANGULAR) AGGREGATE.

2 **TYPICAL PERMEABLE PAVEMENT DETAIL**
NOT TO SCALE



3 **TYPICAL UNDERGROUND CHAMBERS DETAIL**
NOT TO SCALE

NOTE: ALL STORM DRAIN CATCH BASINS, PIPES, AND CONNECTIONS TO BE WATER TIGHT

I UNDERSTAND THIS PROJECT IS SUBJECT TO CITY OF SANTA BARBARA TIER 4 STORMWATER REQUIREMENTS AND AGREE TO CONTRACT WITH THE CIVIL ENGINEER SUCH THAT A STAMPED LETTER VERIFYING THAT ALL POST CONSTRUCTION BMP'S ARE INSTALLED AS DESIGNED AND APPROVED.

I ALSO AGREE TO MAINTAIN THE PROPOSED STORMWATER BMP'S INCLUDING BIORETENTION AREA AND PERMEABLE PAVERS PURSUANT TO SBMC 22.87.030.

PROPERTY OWNER

PRELIMINARY STORMWATER CONTROL PLAN

MULTI-FAMILY HOUSING DEVELOPMENT
1 HOT SPRINGS ROAD
CITY OF SANTA BARBARA, CALIFORNIA

C-6.1
DATE: 11/01/2024

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CIVIL ENGINEERING • PLANNING
CONSTRUCTION ENGINEERING

PRELIMINARY
BY: NOT FOR CONSTRUCTION DATE:

REGISTERED PROFESSIONAL ENGINEER ROBERT A. SOHN JR. No. 71335 CIVIL STATE OF CALIFORNIA

APPENDIX A

HYDROCAD OUTPUT –
PRE-PROJECT HYDROLOGY CALCULATIONS

Summary for Subcatchment 4S: Existing

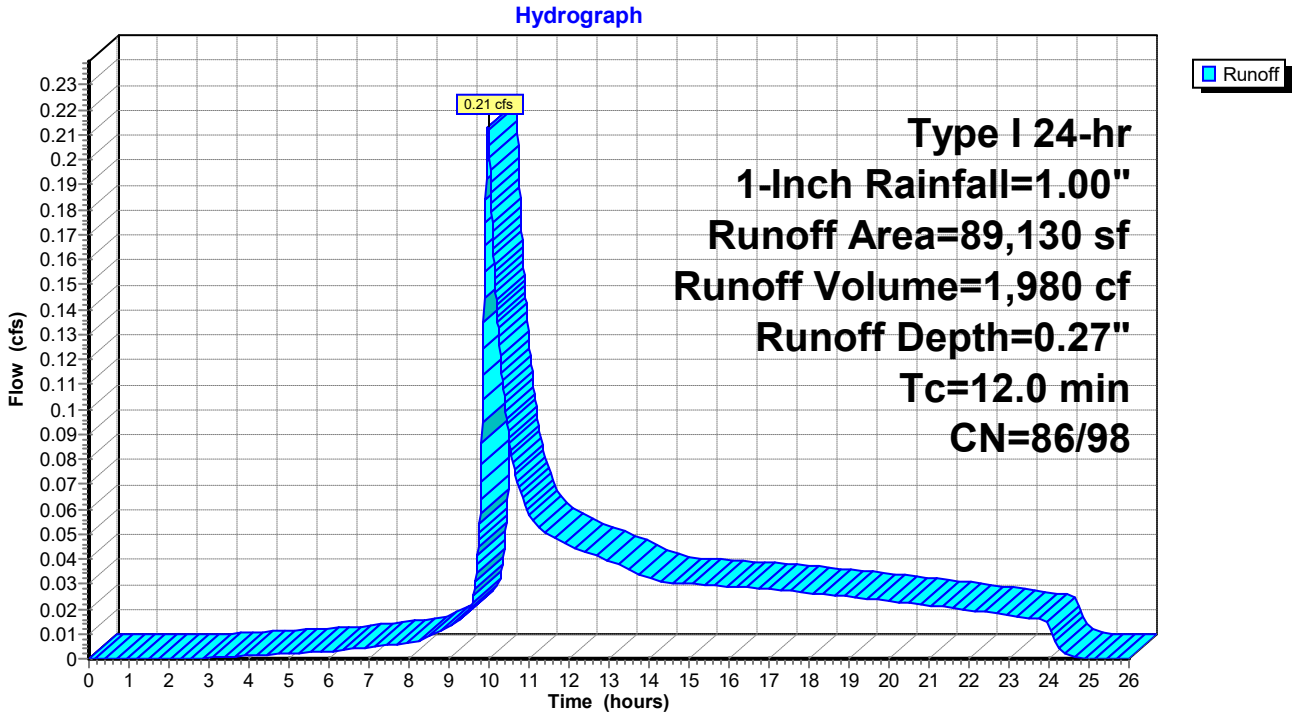
Runoff = 0.21 cfs @ 9.98 hrs, Volume= 1,980 cf, Depth= 0.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
78,765	86	<50% Grass cover, Poor, HSG C
10,365	98	Paved parking, HSG C
89,130	87	Weighted Average
78,765	86	88.37% Pervious Area
10,365	98	11.63% Impervious Area

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

Subcatchment 4S: Existing



Summary for Subcatchment 4S: Existing

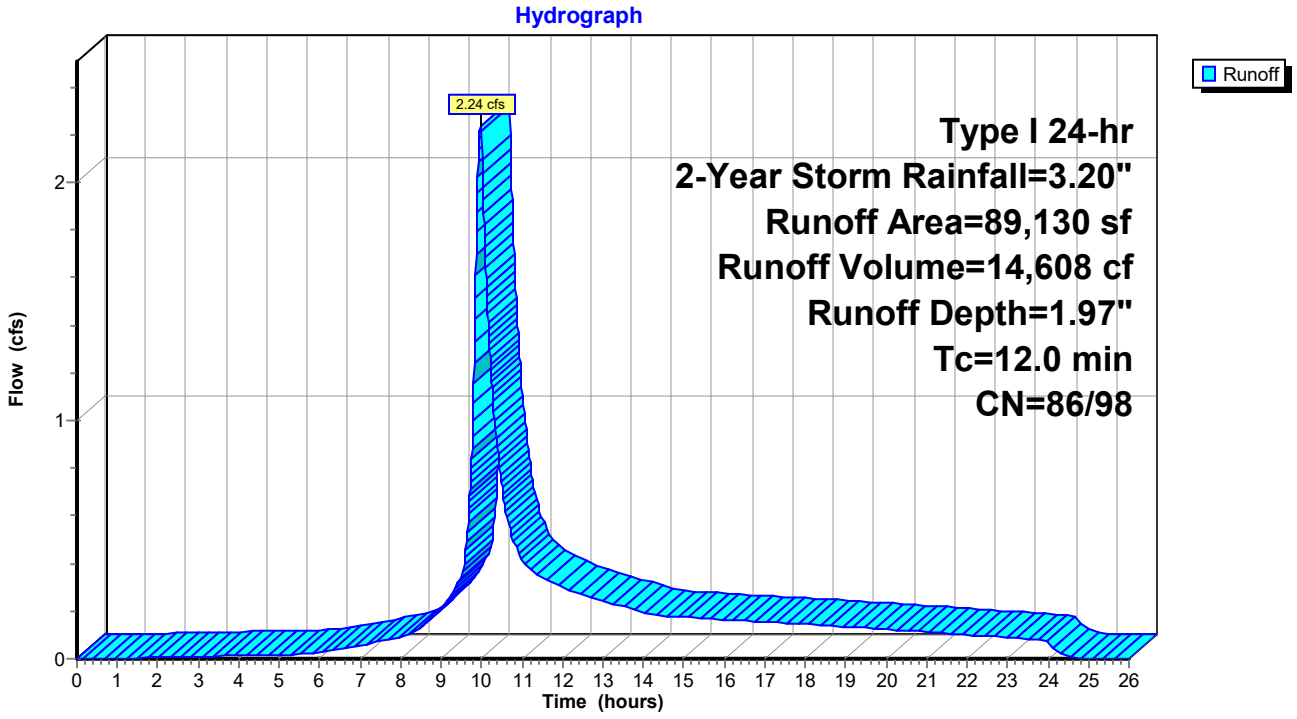
Runoff = 2.24 cfs @ 9.97 hrs, Volume= 14,608 cf, Depth= 1.97"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
78,765	86	<50% Grass cover, Poor, HSG C
10,365	98	Paved parking, HSG C
89,130	87	Weighted Average
78,765	86	88.37% Pervious Area
10,365	98	11.63% Impervious Area

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

Subcatchment 4S: Existing



Summary for Subcatchment 4S: Existing

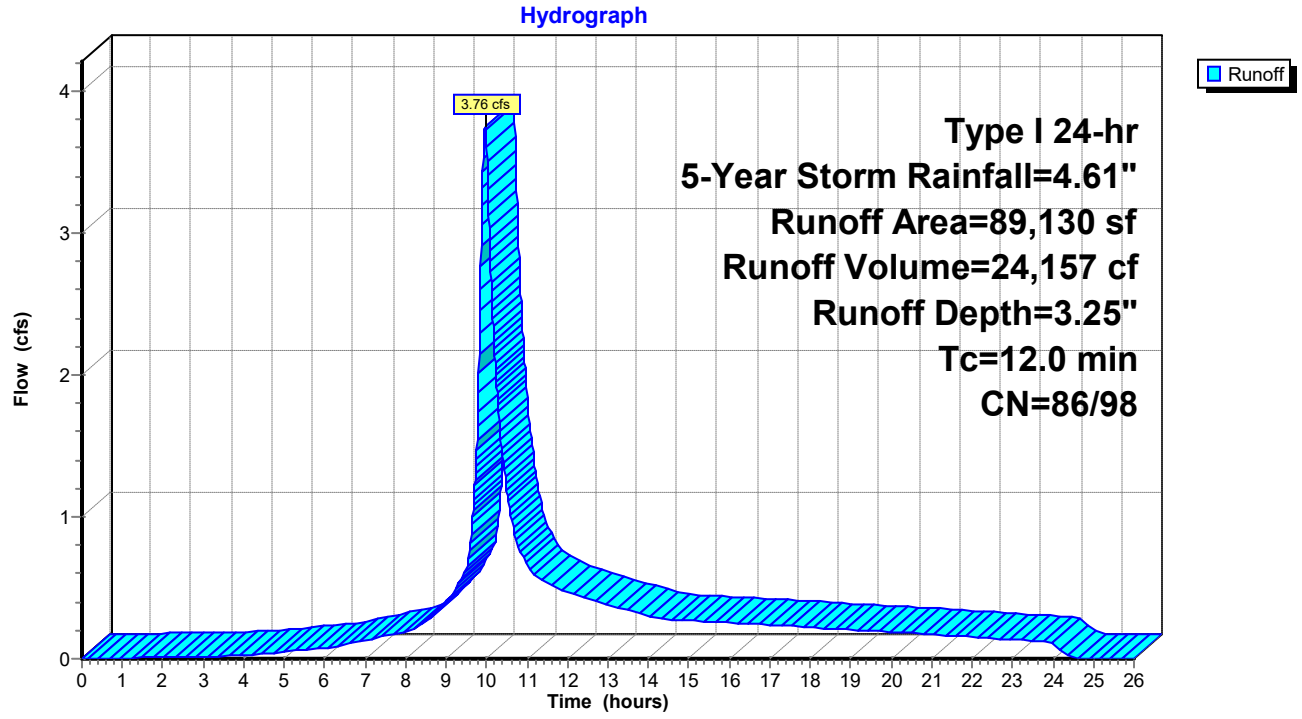
Runoff = 3.76 cfs @ 9.97 hrs, Volume= 24,157 cf, Depth= 3.25"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 5-Year Storm Rainfall=4.61"

Area (sf)	CN	Description
78,765	86	<50% Grass cover, Poor, HSG C
10,365	98	Paved parking, HSG C
89,130	87	Weighted Average
78,765	86	88.37% Pervious Area
10,365	98	11.63% Impervious Area

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

Subcatchment 4S: Existing



Summary for Subcatchment 4S: Existing

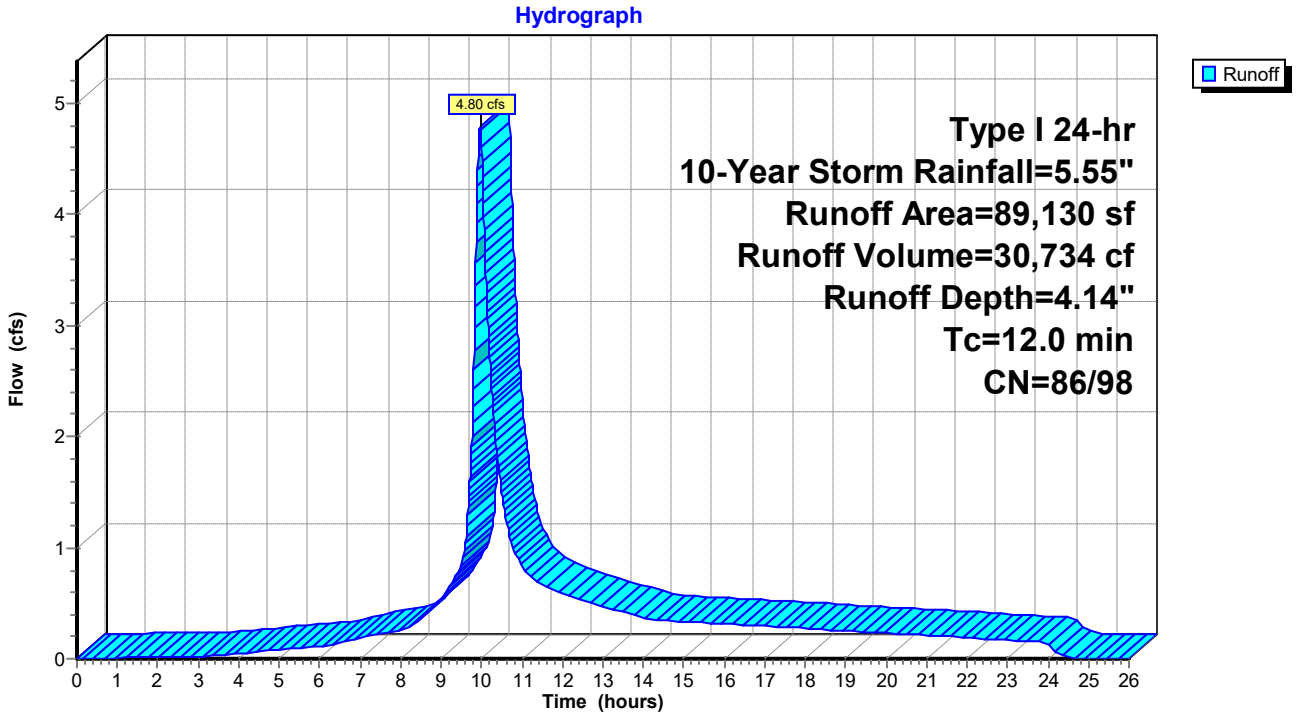
Runoff = 4.80 cfs @ 9.96 hrs, Volume= 30,734 cf, Depth= 4.14"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 10-Year Storm Rainfall=5.55"

Area (sf)	CN	Description
78,765	86	<50% Grass cover, Poor, HSG C
10,365	98	Paved parking, HSG C
89,130	87	Weighted Average
78,765	86	88.37% Pervious Area
10,365	98	11.63% Impervious Area

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

Subcatchment 4S: Existing



Summary for Subcatchment 4S: Existing

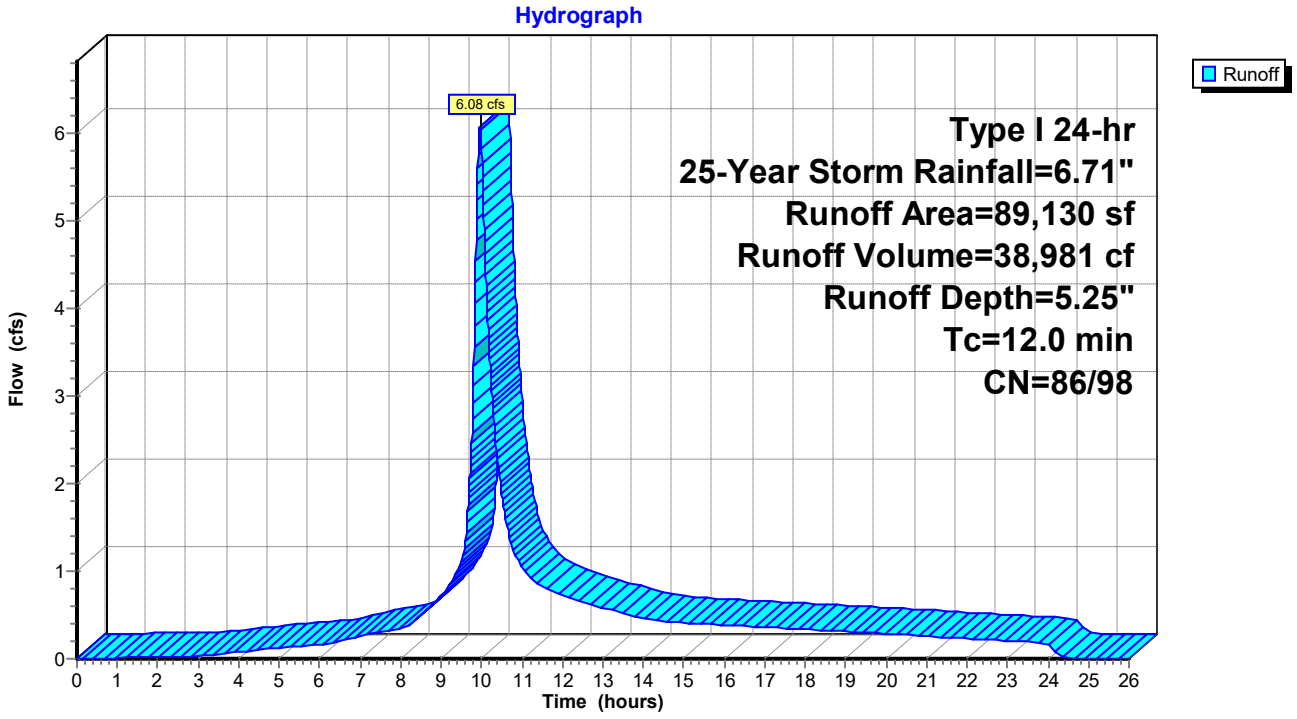
Runoff = 6.08 cfs @ 9.96 hrs, Volume= 38,981 cf, Depth= 5.25"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 25-Year Storm Rainfall=6.71"

Area (sf)	CN	Description
78,765	86	<50% Grass cover, Poor, HSG C
10,365	98	Paved parking, HSG C
89,130	87	Weighted Average
78,765	86	88.37% Pervious Area
10,365	98	11.63% Impervious Area

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

Subcatchment 4S: Existing



Summary for Subcatchment 4S: Existing

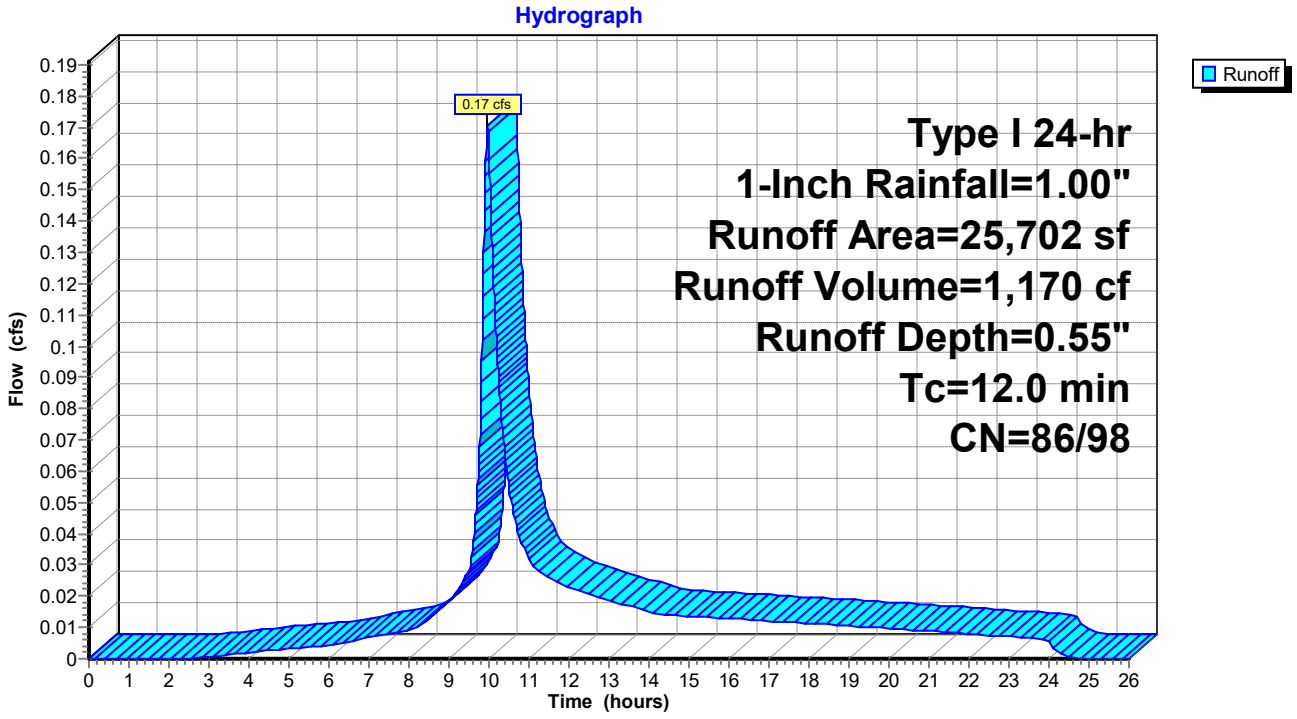
Runoff = 0.17 cfs @ 9.97 hrs, Volume= 1,170 cf, Depth= 0.55"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
10,592	86	<50% Grass cover, Poor, HSG C
15,110	98	Paved parking, HSG C
25,702	93	Weighted Average
10,592	86	41.21% Pervious Area
15,110	98	58.79% Impervious Area

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

Subcatchment 4S: Existing



Summary for Subcatchment 4S: Existing

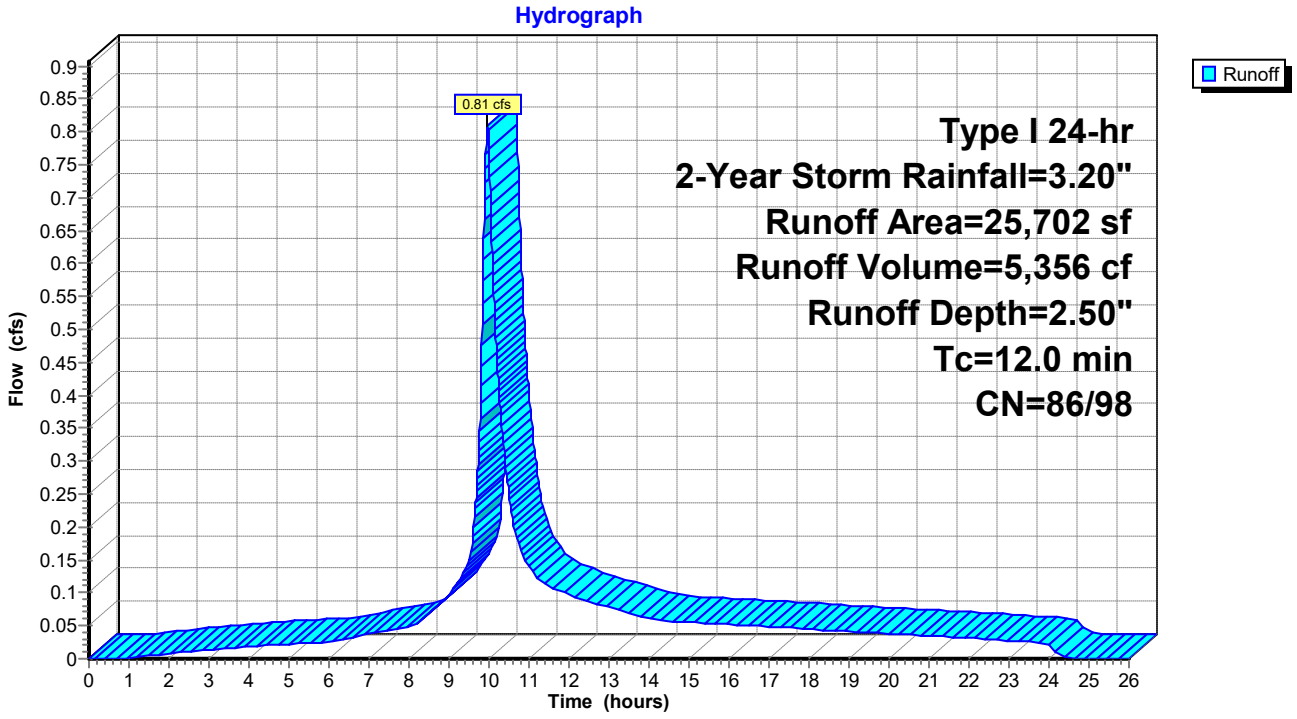
Runoff = 0.81 cfs @ 9.96 hrs, Volume= 5,356 cf, Depth= 2.50"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
10,592	86	<50% Grass cover, Poor, HSG C
15,110	98	Paved parking, HSG C
25,702	93	Weighted Average
10,592	86	41.21% Pervious Area
15,110	98	58.79% Impervious Area

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

Subcatchment 4S: Existing



Summary for Subcatchment 4S: Existing

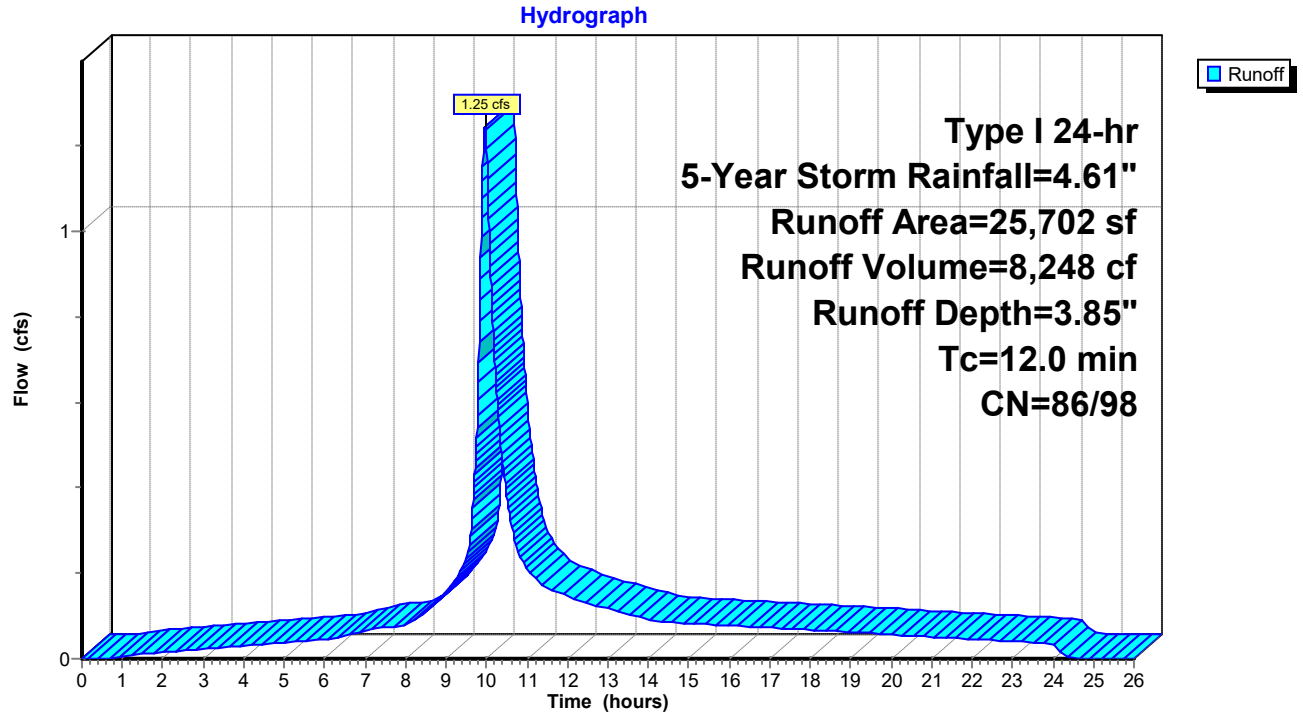
Runoff = 1.25 cfs @ 9.96 hrs, Volume= 8,248 cf, Depth= 3.85"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 5-Year Storm Rainfall=4.61"

Area (sf)	CN	Description
10,592	86	<50% Grass cover, Poor, HSG C
15,110	98	Paved parking, HSG C
25,702	93	Weighted Average
10,592	86	41.21% Pervious Area
15,110	98	58.79% Impervious Area

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

Subcatchment 4S: Existing



Summary for Subcatchment 4S: Existing

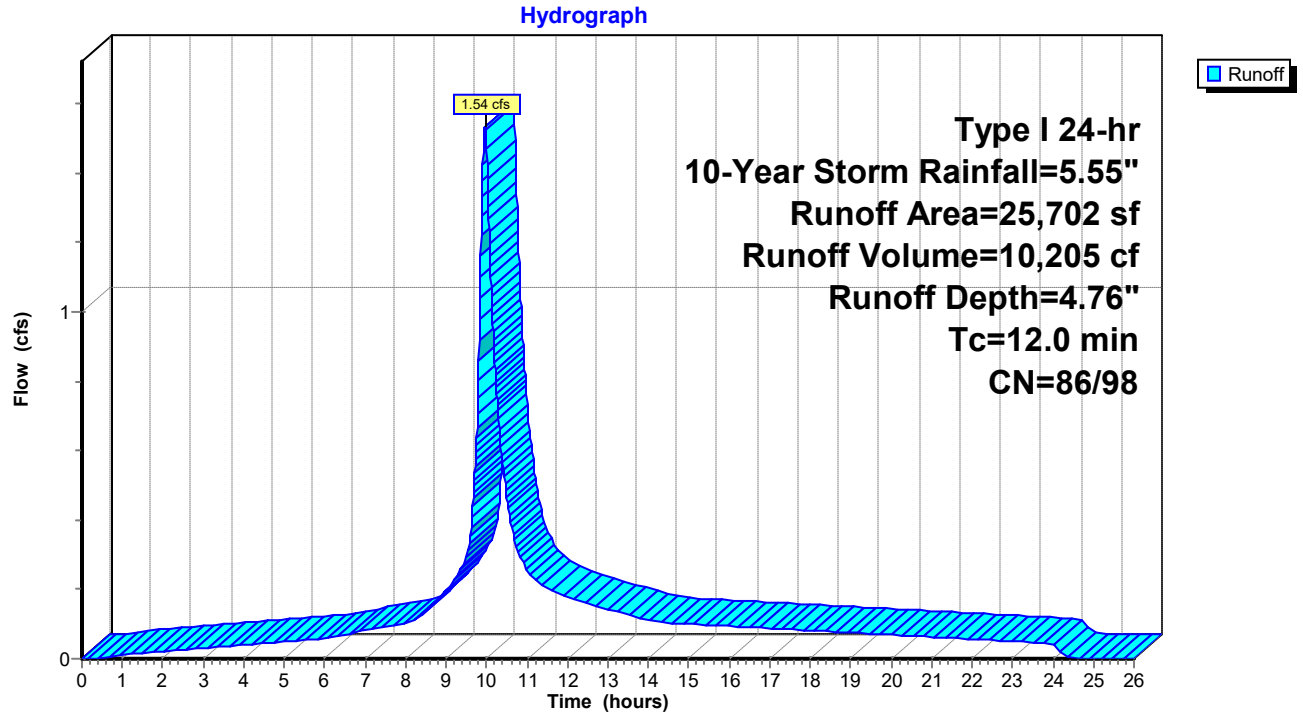
Runoff = 1.54 cfs @ 9.96 hrs, Volume= 10,205 cf, Depth= 4.76"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 10-Year Storm Rainfall=5.55"

Area (sf)	CN	Description
10,592	86	<50% Grass cover, Poor, HSG C
15,110	98	Paved parking, HSG C
25,702	93	Weighted Average
10,592	86	41.21% Pervious Area
15,110	98	58.79% Impervious Area

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

Subcatchment 4S: Existing



Summary for Subcatchment 4S: Existing

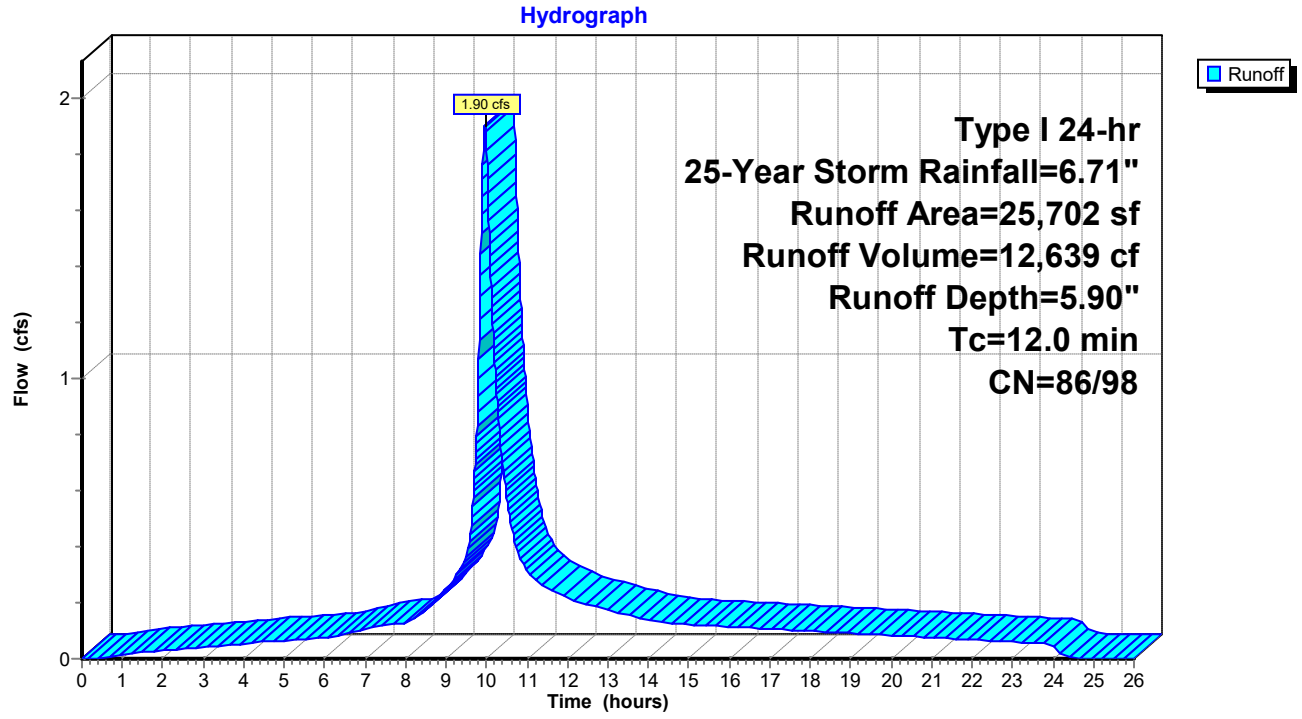
Runoff = 1.90 cfs @ 9.96 hrs, Volume= 12,639 cf, Depth= 5.90"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 25-Year Storm Rainfall=6.71"

Area (sf)	CN	Description
10,592	86	<50% Grass cover, Poor, HSG C
15,110	98	Paved parking, HSG C
25,702	93	Weighted Average
10,592	86	41.21% Pervious Area
15,110	98	58.79% Impervious Area

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

Subcatchment 4S: Existing



APPENDIX B

HYDROCAD OUTPUT –
POST-DEVELOPMENT HYDROLOGY CALCULATIONS

Summary for Subcatchment 1S: DMA D

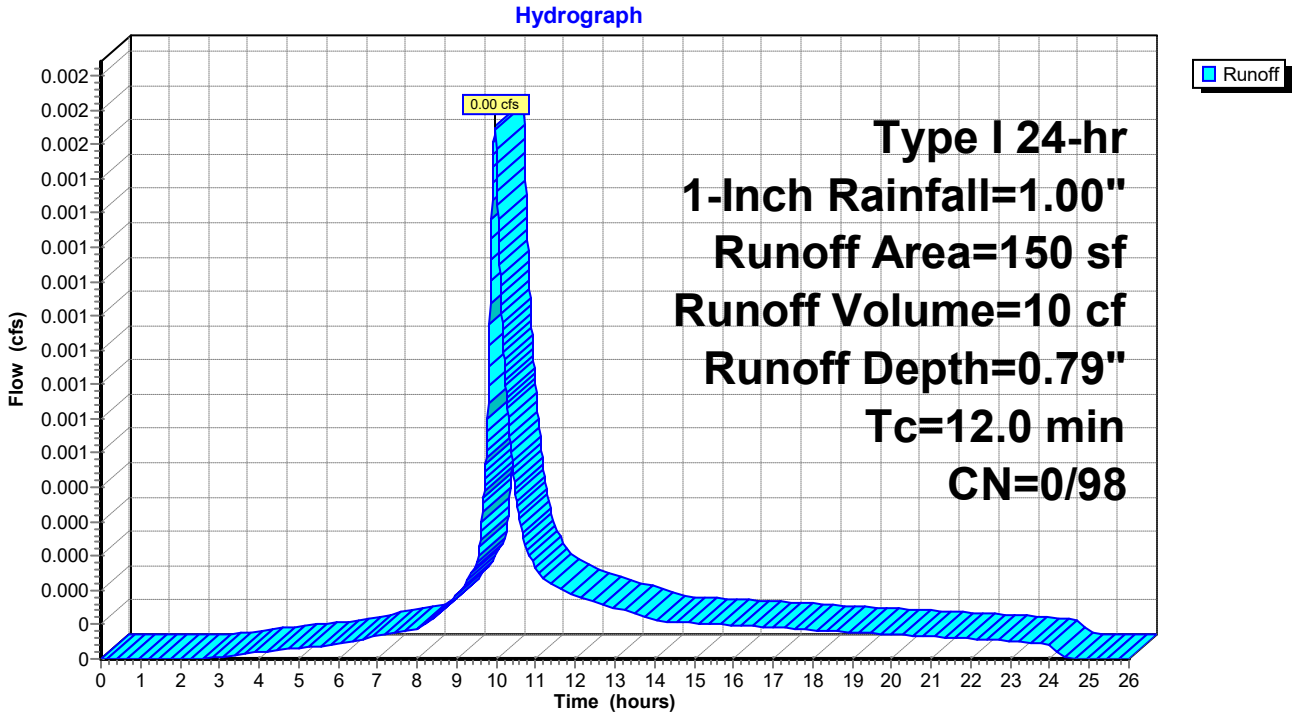
Runoff = 0.00 cfs @ 9.96 hrs, Volume= 10 cf, Depth= 0.79"
Routed to Pond 2P : BMP D

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
150	98	Unconnected pavement, HSG C
150	98	100.00% Impervious Area

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

Subcatchment 1S: DMA D



Summary for Subcatchment 3S: DMA E

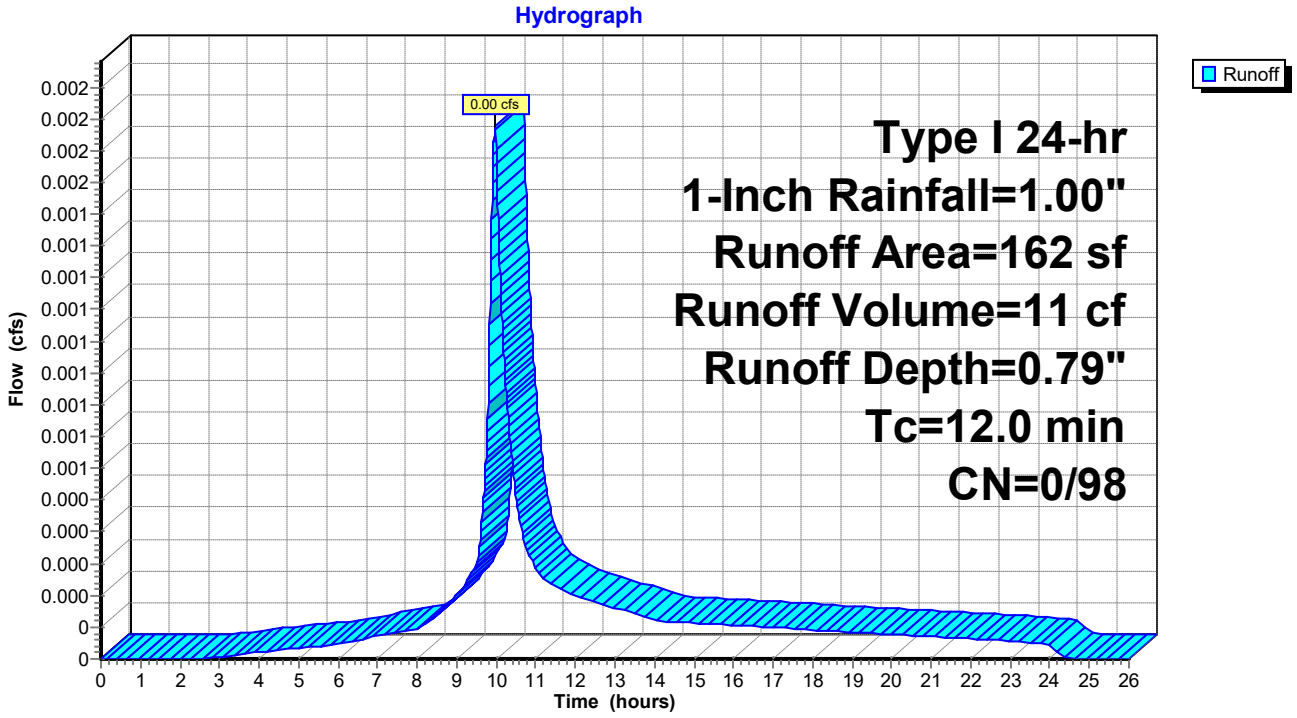
Runoff = 0.00 cfs @ 9.96 hrs, Volume= 11 cf, Depth= 0.79"
Routed to Pond 4P : BMP E

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
162	98	Unconnected pavement, HSG C
162	98	100.00% Impervious Area

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

Subcatchment 3S: DMA E



Summary for Subcatchment 5S: DMA C

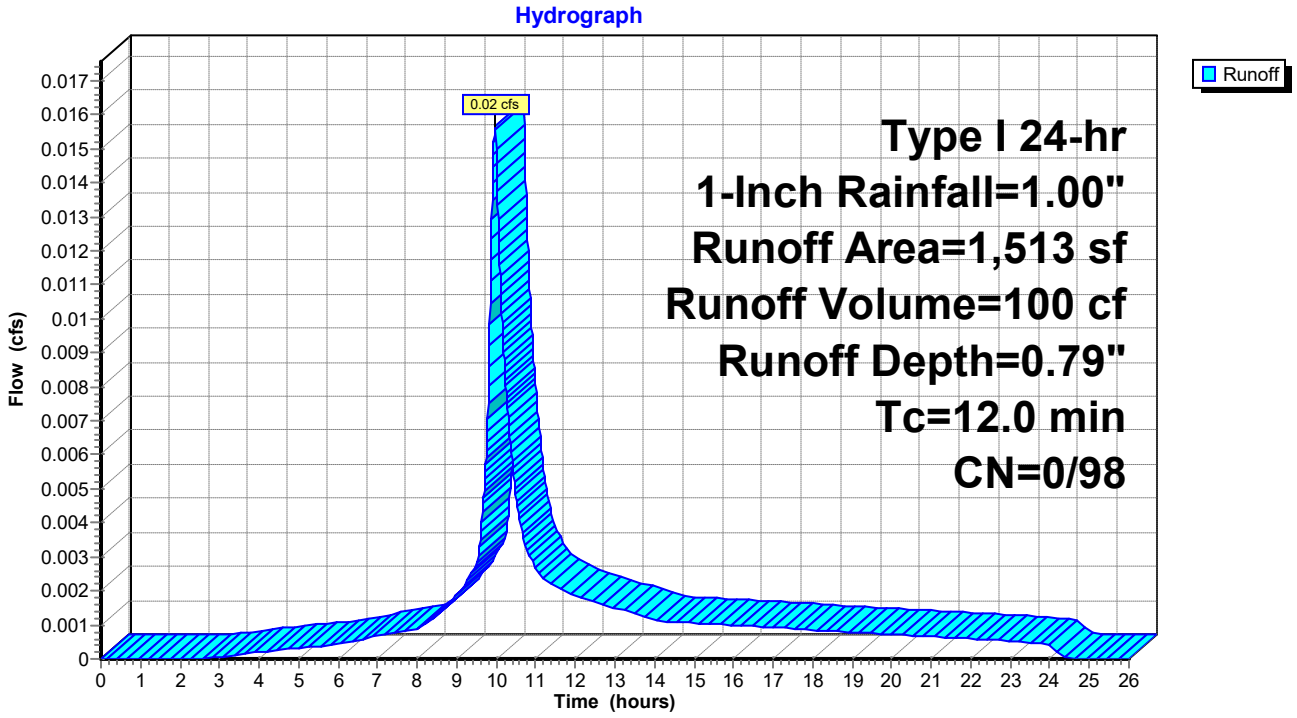
Runoff = 0.02 cfs @ 9.96 hrs, Volume= 100 cf, Depth= 0.79"
Routed to Pond 1P : BMP B

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
1,513	98	Unconnected pavement, HSG C
1,513	98	100.00% Impervious Area

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

Subcatchment 5S: DMA C



Summary for Subcatchment D1: DMA A

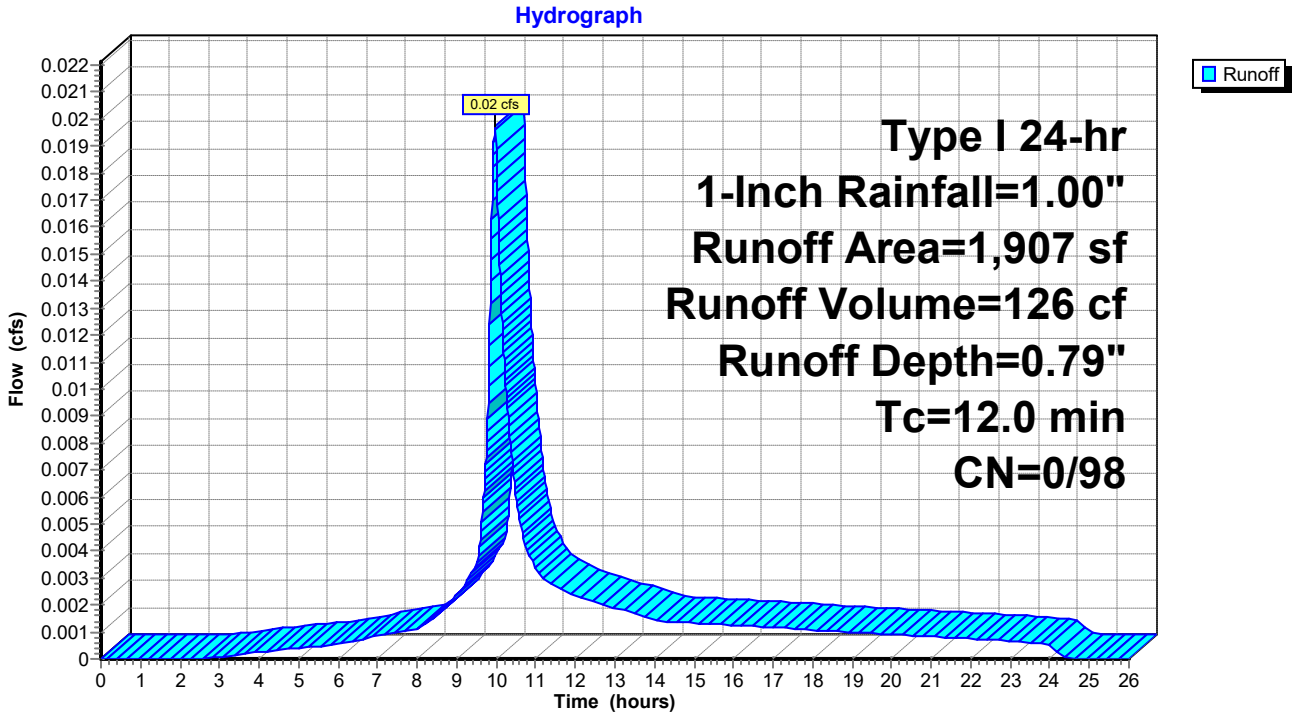
Runoff = 0.02 cfs @ 9.96 hrs, Volume= 126 cf, Depth= 0.79"
Routed to Pond P1 : BMP A

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
1,907	98	Paved parking, HSG C
1,907	98	100.00% Impervious Area

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

Subcatchment D1: DMA A



Summary for Subcatchment D2: DMA B

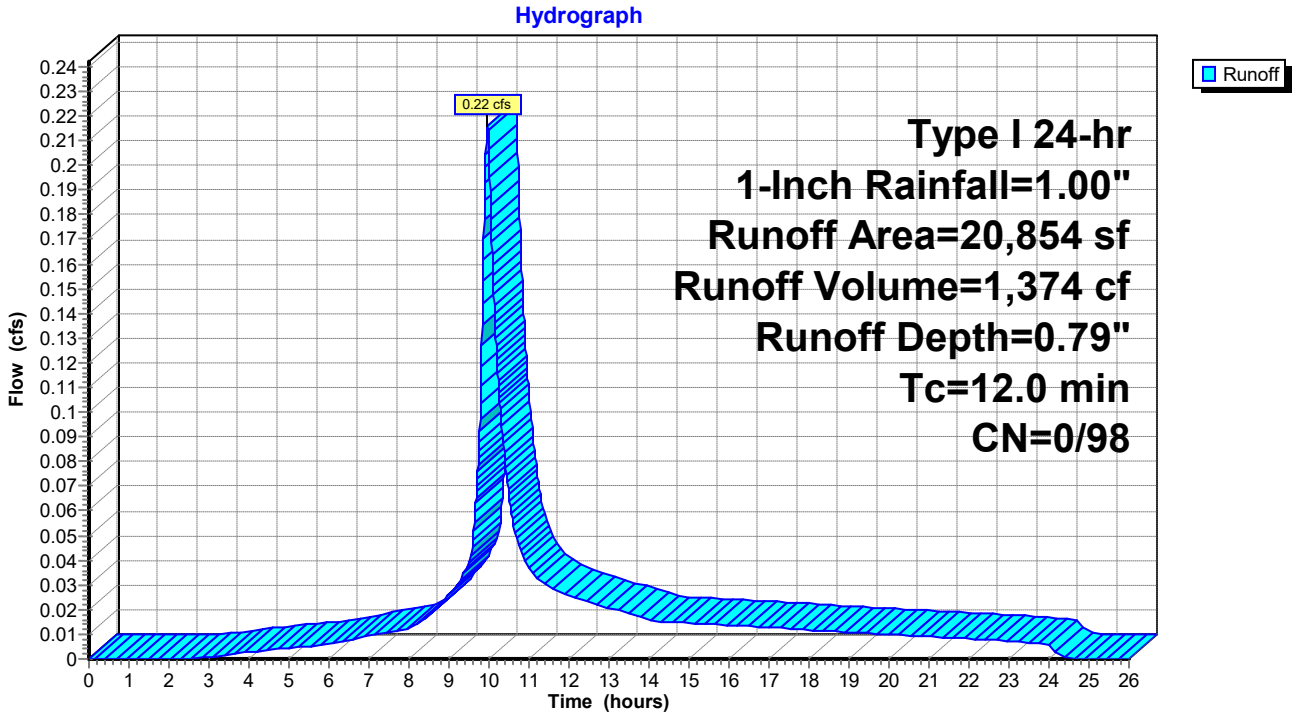
Runoff = 0.22 cfs @ 9.96 hrs, Volume= 1,374 cf, Depth= 0.79"
Routed to Pond 1P : BMP B

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
20,854	98	Paved parking, HSG C
20,854	98	100.00% Impervious Area

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

Subcatchment D2: DMA B



Summary for Subcatchment Ex.: Proposed (Pre bmp)

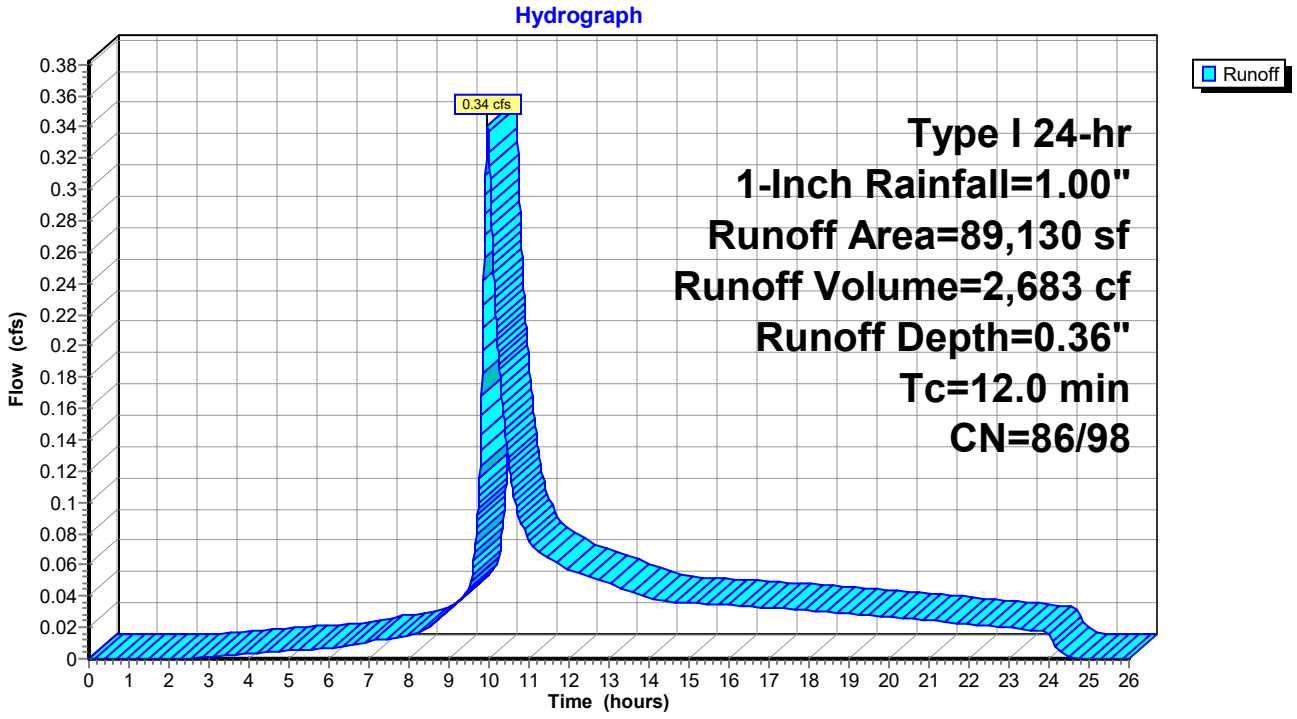
Runoff = 0.34 cfs @ 9.97 hrs, Volume= 2,683 cf, Depth= 0.36"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
24,586	98	Paved parking, HSG C
64,544	86	<50% Grass cover, Poor, HSG C
89,130	89	Weighted Average
64,544	86	72.42% Pervious Area
24,586	98	27.58% Impervious Area

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

Subcatchment Ex.: Proposed (Pre bmp)



Summary for Pond 1P: BMP B

Inflow Area = 22,367 sf,100.00% Impervious, Inflow Depth = 0.79" for 1-Inch event
Inflow = 0.23 cfs @ 9.96 hrs, Volume= 1,474 cf
Outflow = 0.03 cfs @ 9.76 hrs, Volume= 1,460 cf, Atten= 88%, Lag= 0.0 min
Discarded = 0.03 cfs @ 9.76 hrs, Volume= 1,460 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 24.95' @ 12.03 hrs Surf.Area= 23,480 sf Storage= 511 cf

Plug-Flow detention time= 191.7 min calculated for 1,460 cf (99% of inflow)
Center-of-Mass det. time= 185.1 min (935.8 - 750.8)

Volume	Invert	Avail.Storage	Storage Description
#1	24.90'	33,811 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

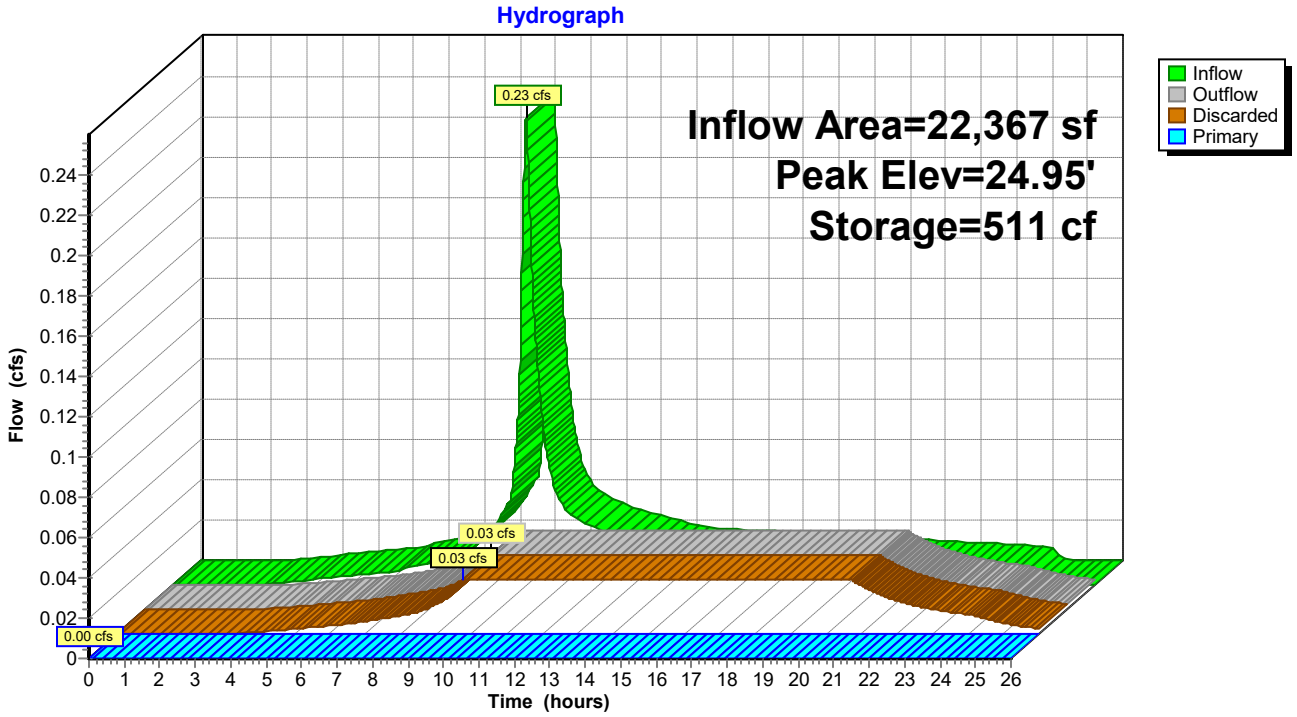
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.90	23,480	0.0	0	0
25.00	23,480	40.0	939	939
26.33	23,480	100.0	31,228	32,168
26.40	23,480	100.0	1,644	33,811

Device	Routing	Invert	Outlet Devices
#1	Discarded	24.90'	**0.050 in/hr Exfiltration over Horizontal area**
#2	Primary	26.33'	**12.0" x 12.0" Horiz. Orifice/Grate X 5.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 9.76 hrs HW=24.92' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.90' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: BMP B


Hydrograph
Inflow Area=22,367 sf
Peak Elev=24.95'
Storage=511 cf
Inflow
Outflow
Discarded
Primary
0.23 cfs
0.03 cfs
0.03 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Summary for Pond 2P: BMP D

Inflow Area = 150 sf,100.00% Impervious, Inflow Depth = 0.79" for 1-Inch event
Inflow = 0.00 cfs @ 9.96 hrs, Volume= 10 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 37.10' @ 26.00 hrs Surf.Area= 20 sf Storage= 10 cf

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

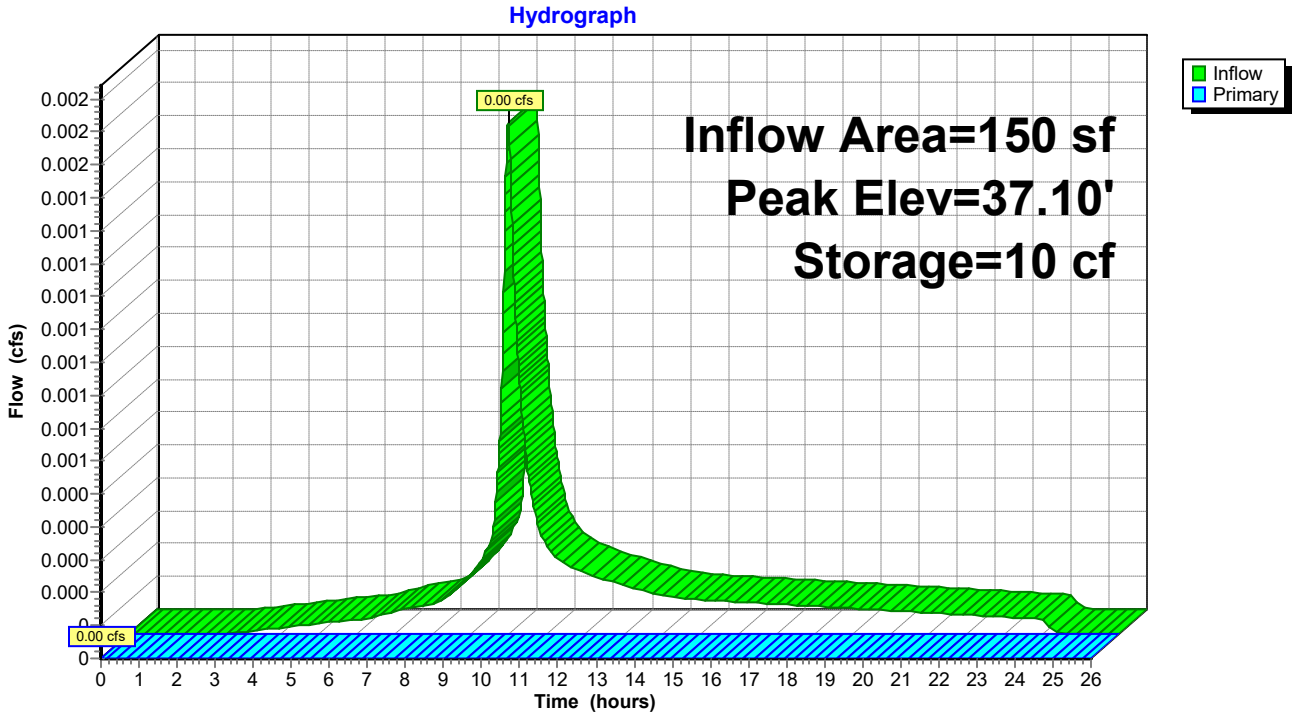
Volume	Invert	Avail.Storage	Storage Description
#1	34.30'	56 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.30	20	0.0	0	0
34.40	20	40.0	1	1
36.90	20	10.0	5	6
38.90	20	100.0	40	46
39.40	20	100.0	10	56

Device	Routing	Invert	Outlet Devices
#1	Primary	39.30'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=34.30' (Free Discharge)
↑—1=Orifice/Grate (Controls 0.00 cfs)

Pond 2P: BMP D


Hydrograph
Inflow
Primary
0.00 cfs
0.00 cfs
Inflow Area=150 sf
Peak Elev=37.10'
Storage=10 cf
Flow (cfs)
0.002
0.002
0.002
0.001
0.001
0.001
0.001
0.001
0.001
0.001
0.001
0.001
0.000
0.000
0.000
0.000
0
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Time (hours)

Summary for Pond 4P: BMP E

Inflow Area = 162 sf,100.00% Impervious, Inflow Depth = 0.79" for 1-Inch event
Inflow = 0.00 cfs @ 9.96 hrs, Volume= 11 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 33.84' @ 26.00 hrs Surf.Area= 20 sf Storage= 11 cf

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

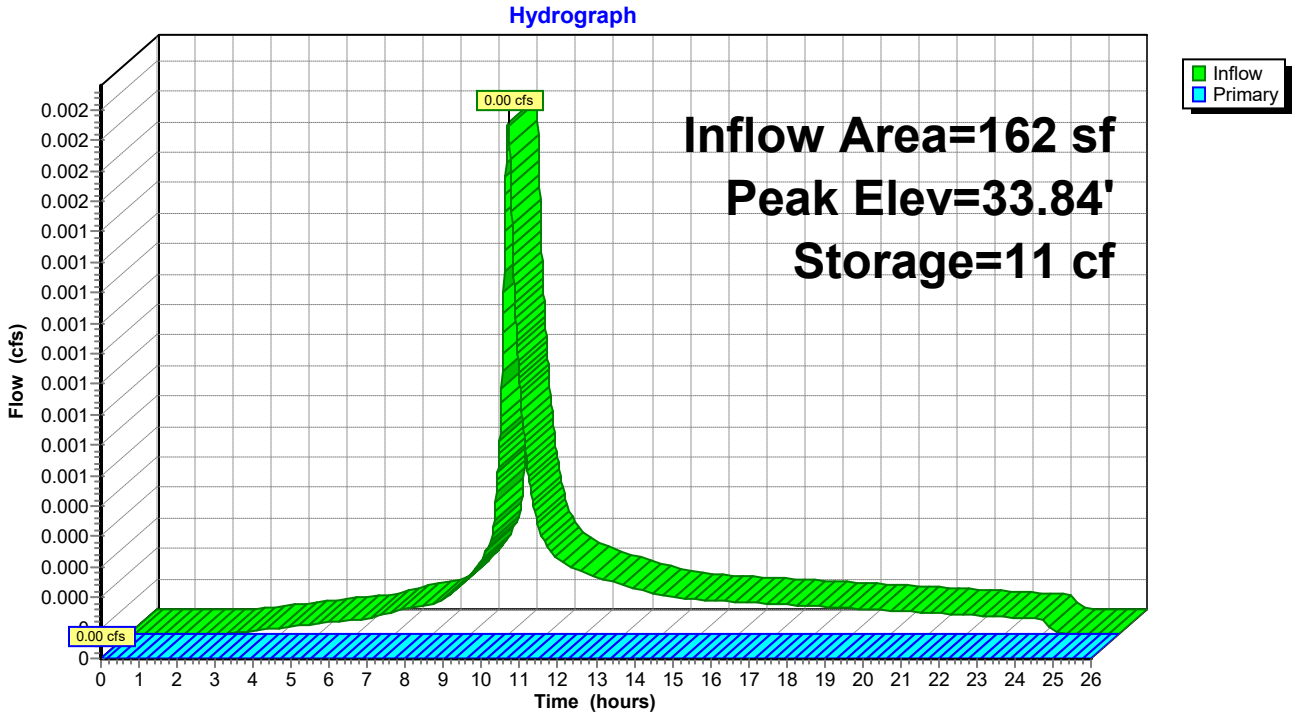
Volume	Invert	Avail.Storage	Storage Description
#1	31.00'	56 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.00	20	0.0	0	0
31.10	20	40.0	1	1
33.60	20	10.0	5	6
35.60	20	100.0	40	46
36.10	20	100.0	10	56

Device	Routing	Invert	Outlet Devices
#1	Primary	36.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=31.00' (Free Discharge)
↑—1=Orifice/Grate (Controls 0.00 cfs)

Pond 4P: BMP E


Hydrograph
Inflow
Primary
0.00 cfs
Inflow Area=162 sf
Peak Elev=33.84'
Storage=11 cf
Flow (cfs)
0.002
0.002
0.002
0.002
0.001
0.001
0.001
0.001
0.001
0.001
0.001
0.001
0.001
0.000
0.000
0.000
0.000
0.00 cfs
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Time (hours)

Summary for Pond P1: BMP A

Inflow Area = 1,907 sf,100.00% Impervious, Inflow Depth = 0.79" for 1-Inch event
Inflow = 0.02 cfs @ 9.96 hrs, Volume= 126 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 37.71' @ 26.00 hrs Surf.Area= 210 sf Storage= 126 cf

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

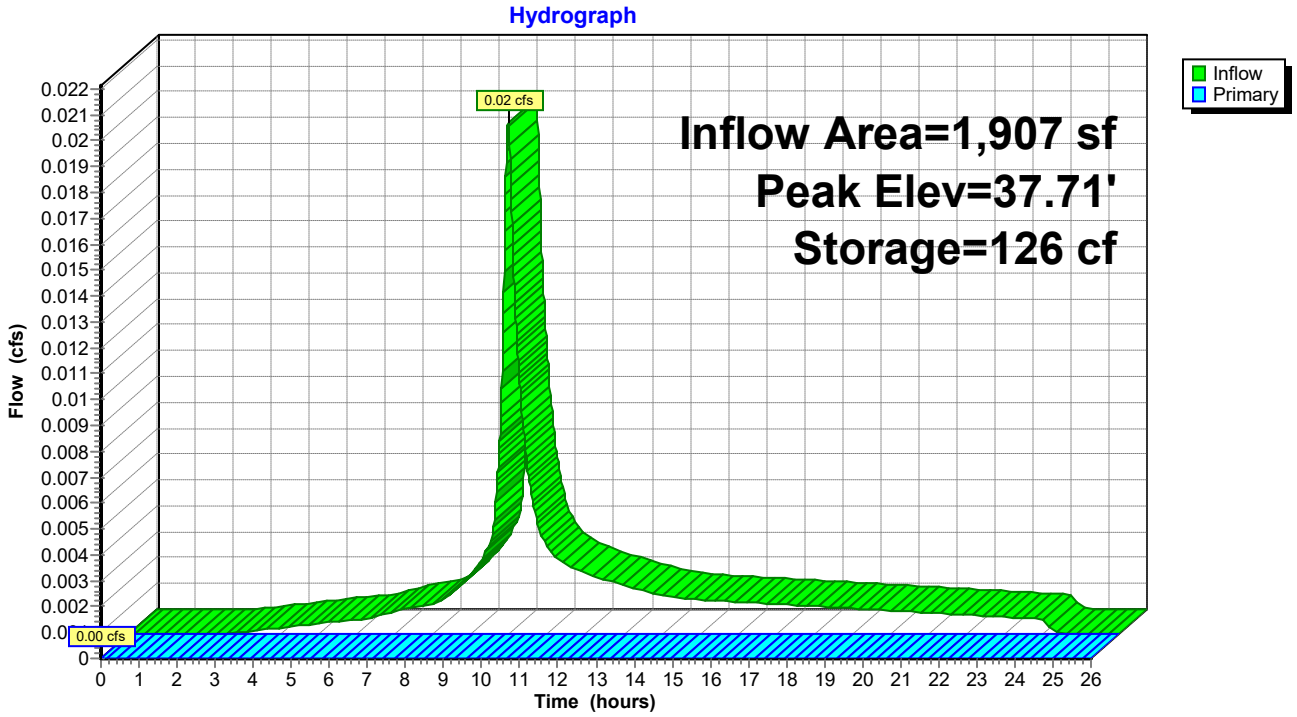
Volume	Invert	Avail.Storage	Storage Description
#1	34.80'	586 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.80	210	0.0	0	0
34.90	210	40.0	8	8
37.40	210	10.0	53	61
39.40	210	100.0	420	481
39.90	210	100.0	105	586

Device	Routing	Invert	Outlet Devices
#1	Primary	39.80'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=34.80' (Free Discharge)
1=Orifice/Grate (Controls 0.00 cfs)

Pond P1: BMP A


Hydrograph
Inflow Area=1,907 sf
Peak Elev=37.71'
Storage=126 cf
0.02 cfs
0.00 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0.022
0.021
0.02
0.019
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.0
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Summary for Subcatchment 1S: DMA D

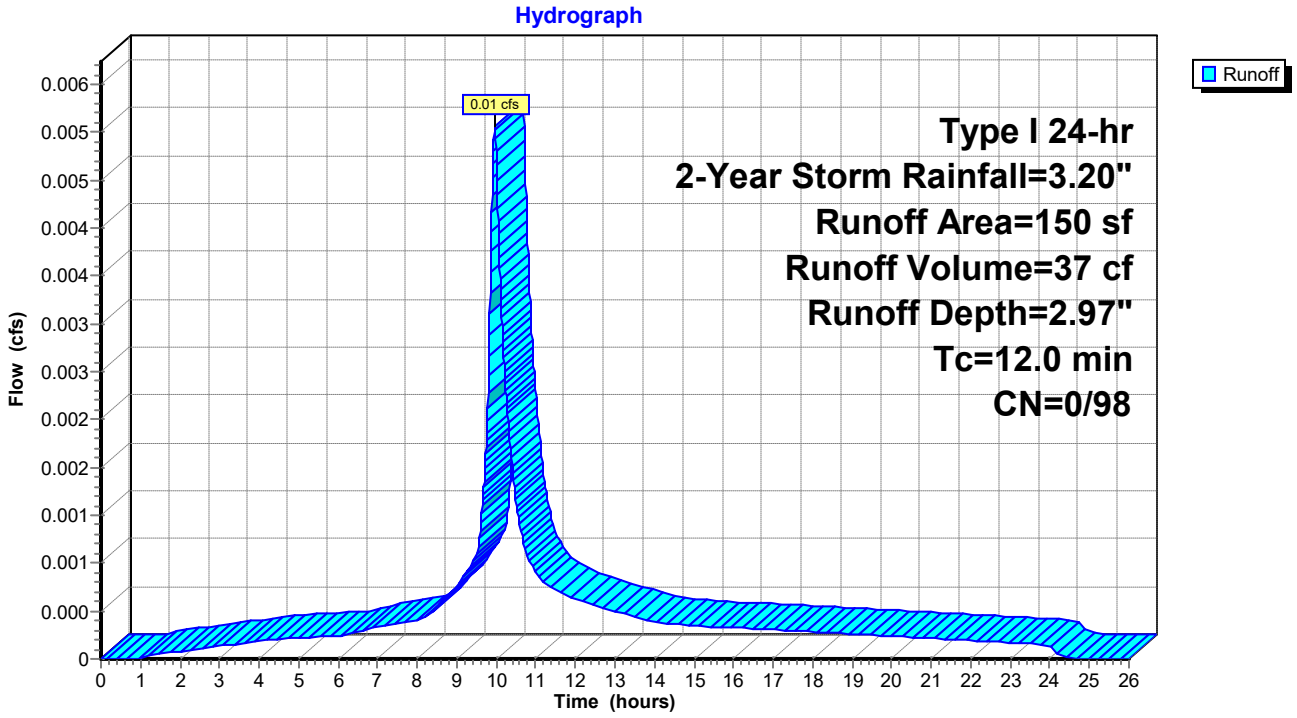
Runoff = 0.01 cfs @ 9.96 hrs, Volume= 37 cf, Depth= 2.97"
Routed to Pond 2P : BMP D

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
150	98	Unconnected pavement, HSG C
150	98	100.00% Impervious Area

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

Subcatchment 1S: DMA D



Summary for Subcatchment 3S: DMA E

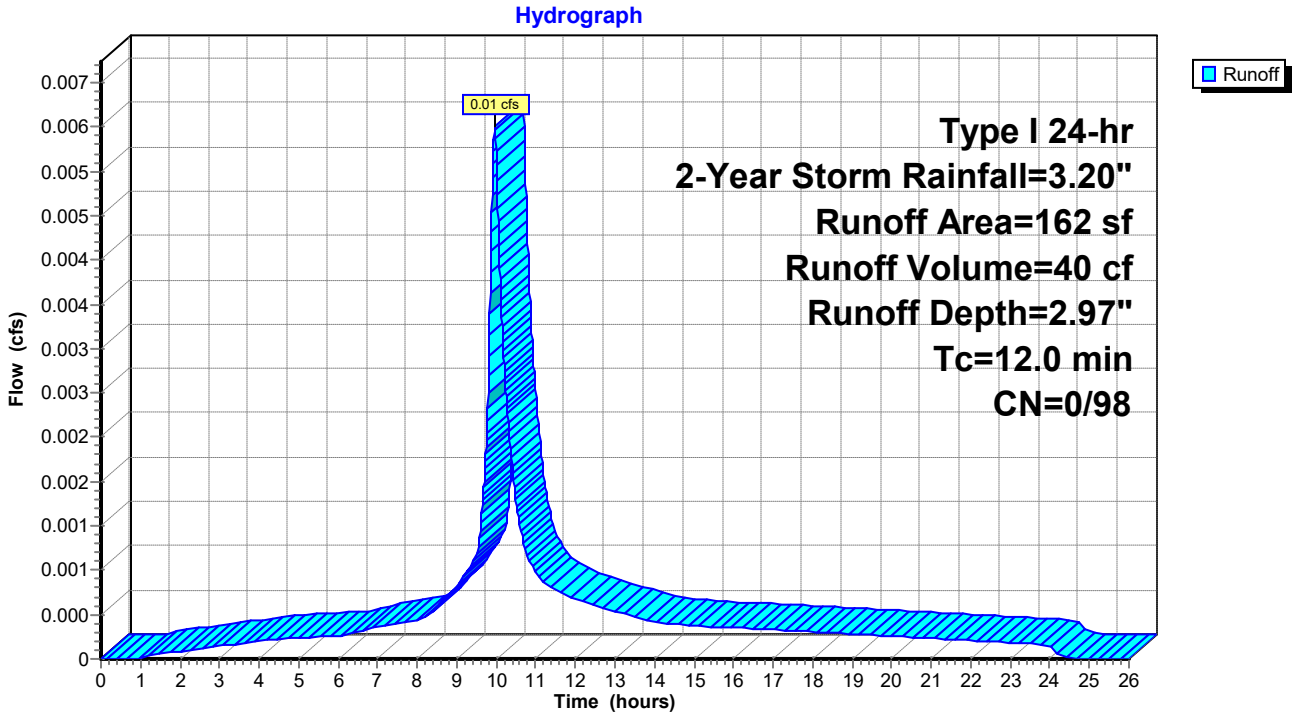
Runoff = 0.01 cfs @ 9.96 hrs, Volume= 40 cf, Depth= 2.97"
Routed to Pond 4P : BMP E

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
162	98	Unconnected pavement, HSG C
162	98	100.00% Impervious Area

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

Subcatchment 3S: DMA E



Summary for Subcatchment 5S: DMA C

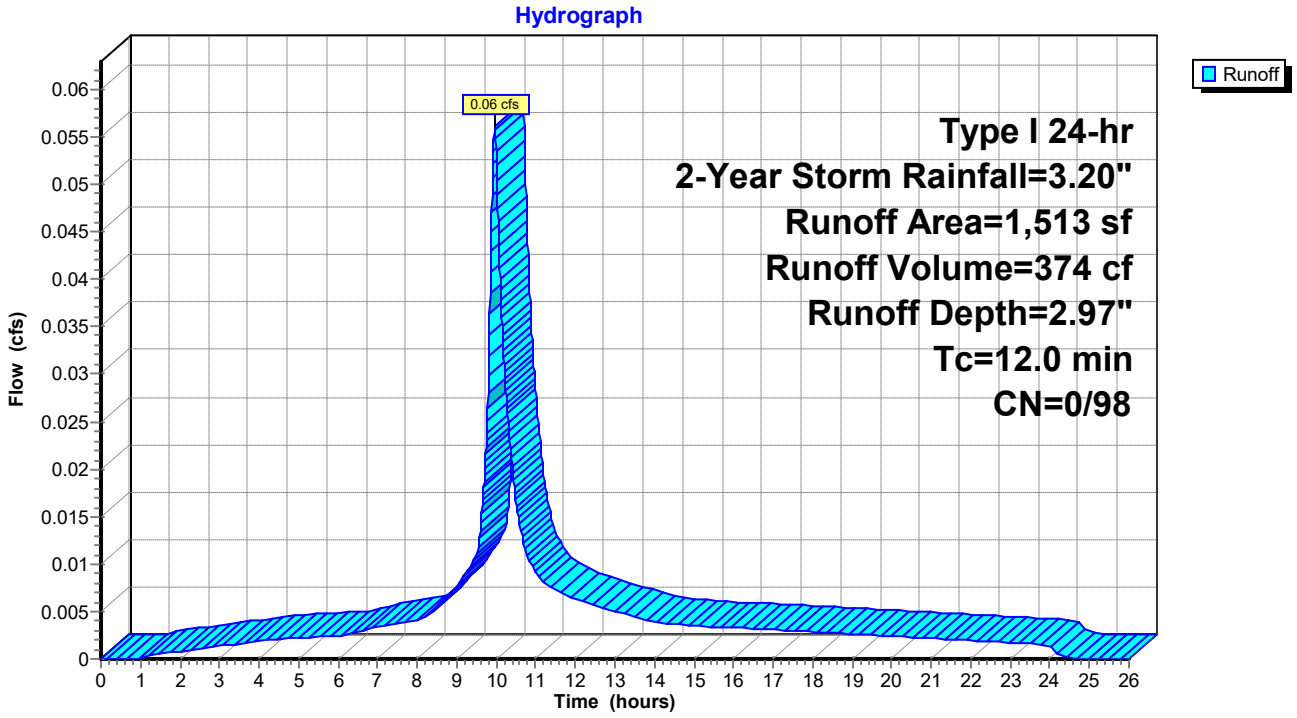
Runoff = 0.06 cfs @ 9.96 hrs, Volume= 374 cf, Depth= 2.97"
Routed to Pond 1P : BMP B

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
1,513	98	Unconnected pavement, HSG C
1,513	98	100.00% Impervious Area

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

Subcatchment 5S: DMA C



Summary for Subcatchment D1: DMA A

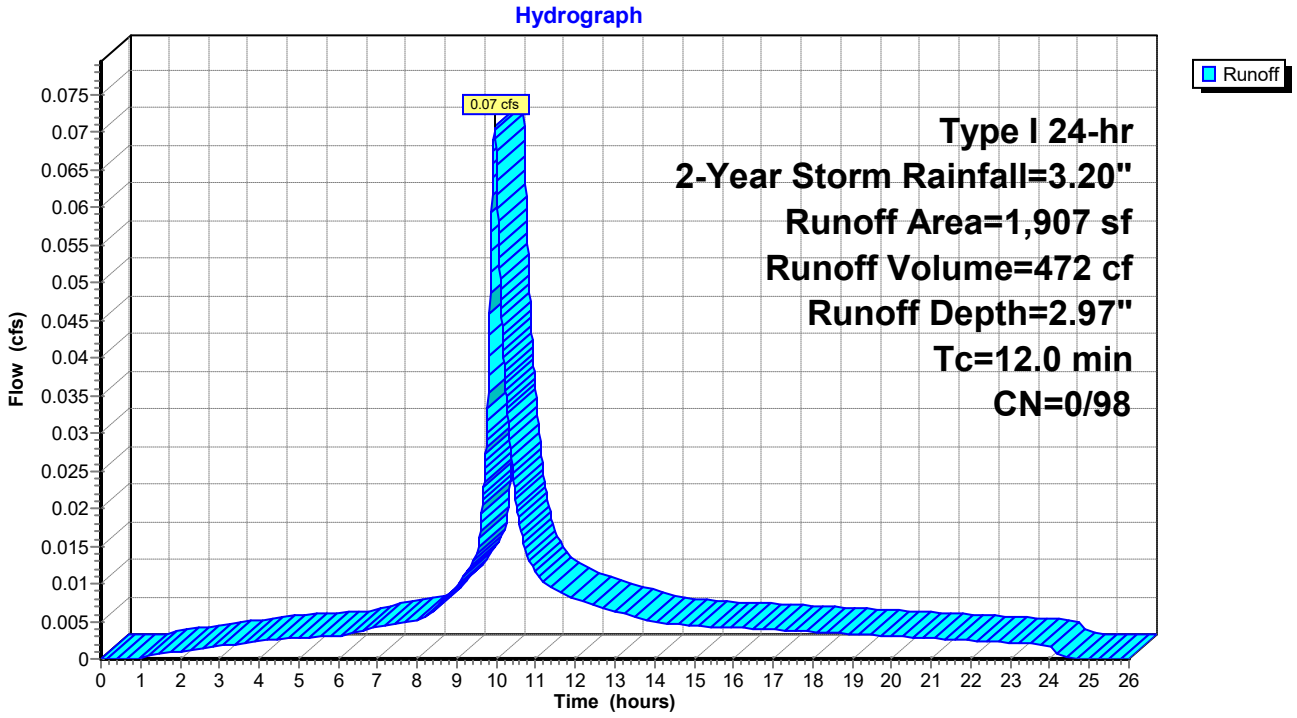
Runoff = 0.07 cfs @ 9.96 hrs, Volume= 472 cf, Depth= 2.97"
Routed to Pond P1 : BMP A

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
1,907	98	Paved parking, HSG C
1,907	98	100.00% Impervious Area

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

Subcatchment D1: DMA A



Summary for Subcatchment D2: DMA B

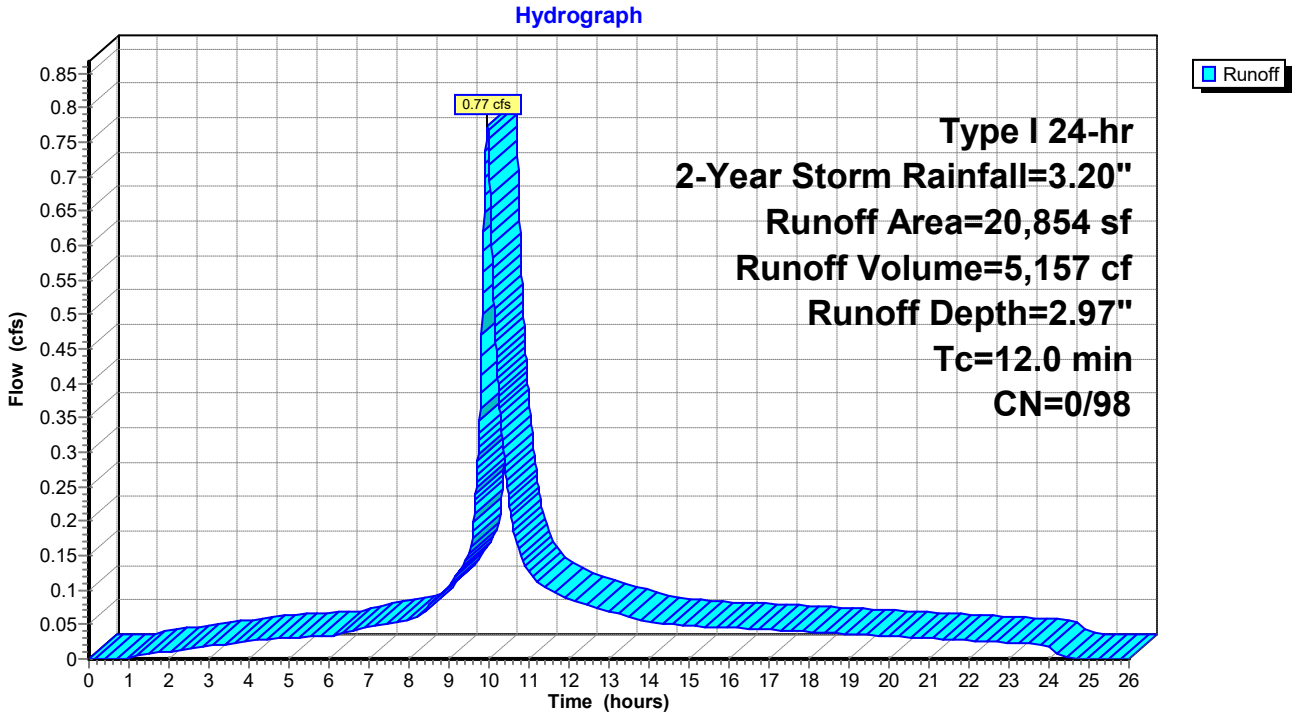
Runoff = 0.77 cfs @ 9.96 hrs, Volume= 5,157 cf, Depth= 2.97"
Routed to Pond 1P : BMP B

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
20,854	98	Paved parking, HSG C
20,854	98	100.00% Impervious Area

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

Subcatchment D2: DMA B



Summary for Subcatchment Ex.: Proposed (Pre bmp)

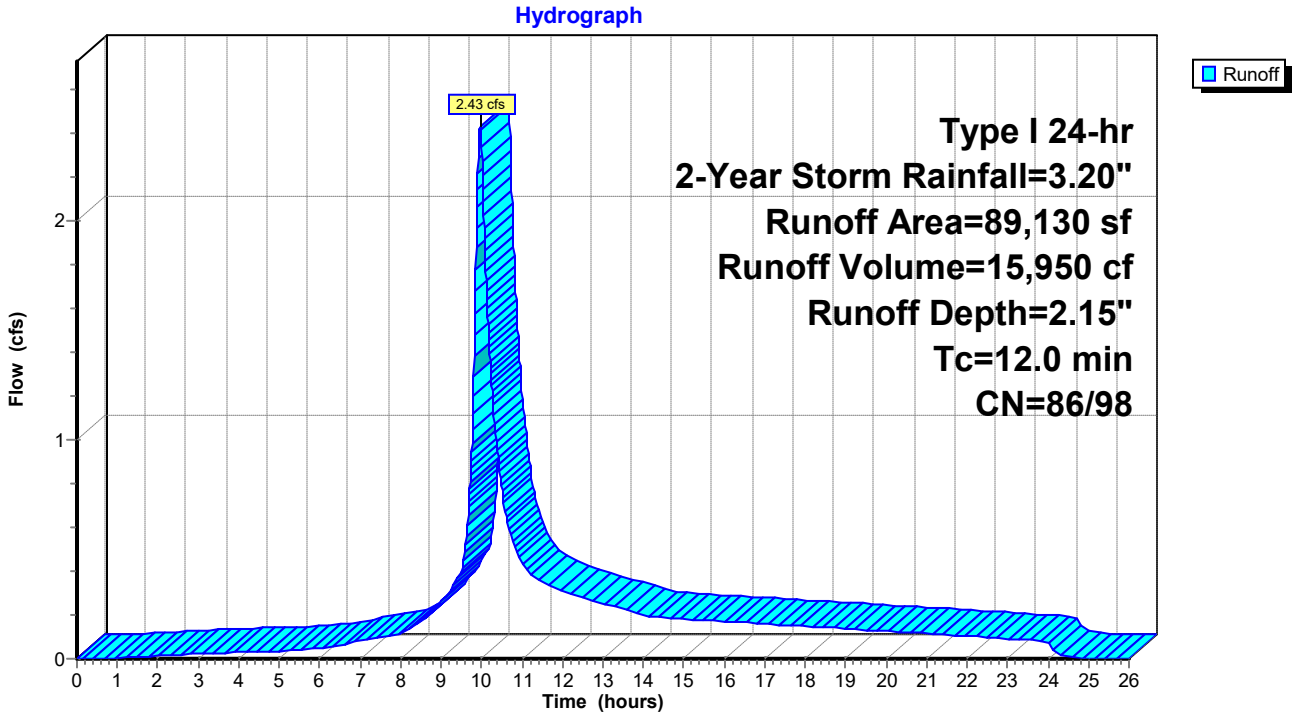
Runoff = 2.43 cfs @ 9.97 hrs, Volume= 15,950 cf, Depth= 2.15"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
24,586	98	Paved parking, HSG C
64,544	86	<50% Grass cover, Poor, HSG C
89,130	89	Weighted Average
64,544	86	72.42% Pervious Area
24,586	98	27.58% Impervious Area

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

Subcatchment Ex.: Proposed (Pre bmp)



Summary for Pond 1P: BMP B

Inflow Area = 22,367 sf,100.00% Impervious, Inflow Depth = 2.97" for 2-Year Storm event
Inflow = 0.83 cfs @ 9.96 hrs, Volume= 5,531 cf
Outflow = 0.03 cfs @ 5.60 hrs, Volume= 2,204 cf, Atten= 97%, Lag= 0.0 min
Discarded = 0.03 cfs @ 5.60 hrs, Volume= 2,204 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 25.11' @ 22.47 hrs Surf.Area= 23,480 sf Storage= 3,520 cf

Plug-Flow detention time= 394.6 min calculated for 2,204 cf (40% of inflow)
Center-of-Mass det. time= 172.1 min (882.4 - 710.3)

Volume	Invert	Avail.Storage	Storage Description
#1	24.90'	33,811 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

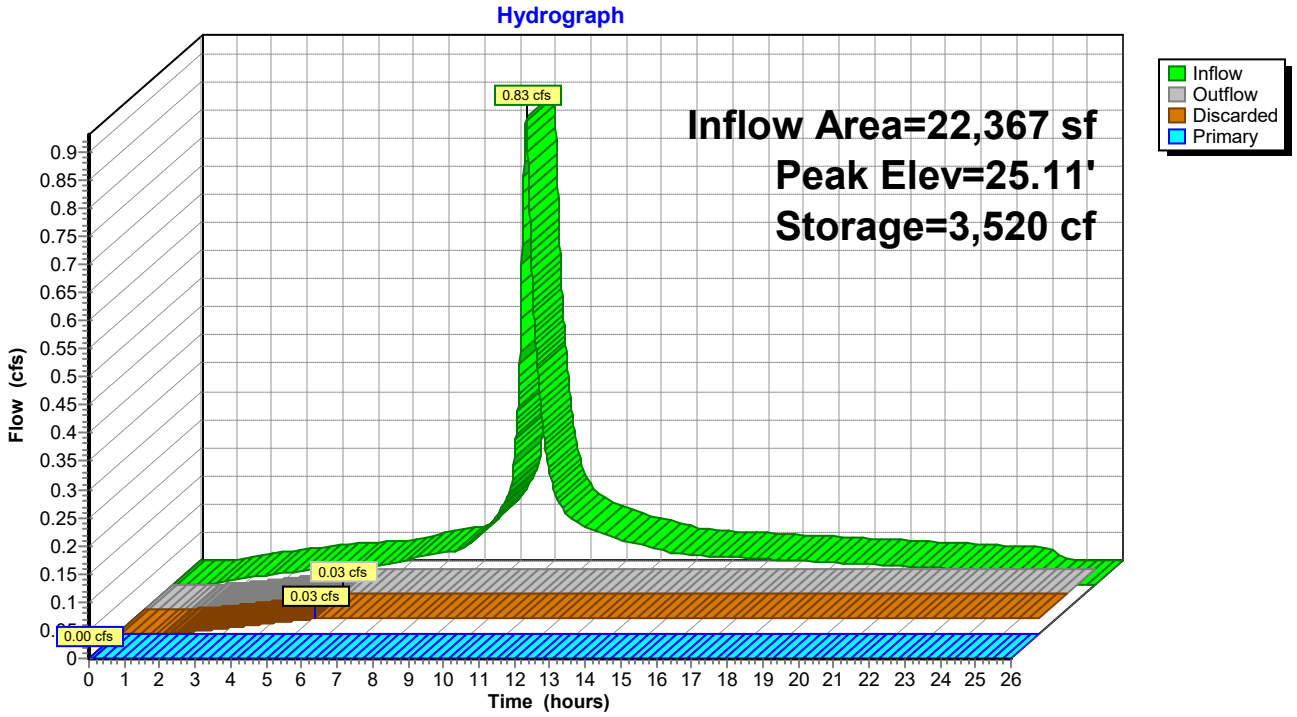
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.90	23,480	0.0	0	0
25.00	23,480	40.0	939	939
26.33	23,480	100.0	31,228	32,168
26.40	23,480	100.0	1,644	33,811

Device	Routing	Invert	Outlet Devices
#1	Discarded	24.90'	**0.050 in/hr Exfiltration over Horizontal area**
#2	Primary	26.33'	**12.0" x 12.0" Horiz. Orifice/Grate X 5.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 5.60 hrs HW=24.92' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.90' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: BMP B


Hydrograph
Inflow Area=22,367 sf
Peak Elev=25.11'
Storage=3,520 cf
0.83 cfs
0.03 cfs
0.03 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)

Summary for Pond 2P: BMP D

Inflow Area = 150 sf,100.00% Impervious, Inflow Depth = 2.97" for 2-Year Storm event
Inflow = 0.01 cfs @ 9.96 hrs, Volume= 37 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 38.46' @ 26.00 hrs Surf.Area= 20 sf Storage= 37 cf

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

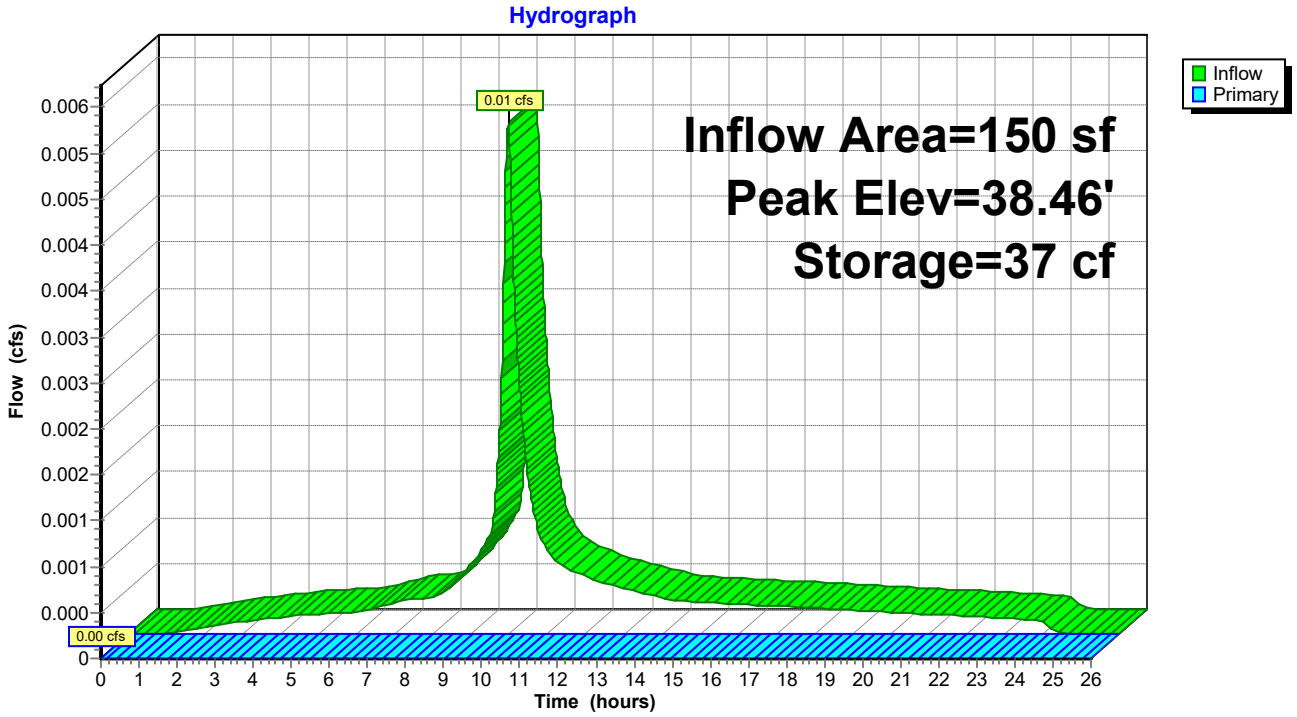
Volume	Invert	Avail.Storage	Storage Description
#1	34.30'	56 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.30	20	0.0	0	0
34.40	20	40.0	1	1
36.90	20	10.0	5	6
38.90	20	100.0	40	46
39.40	20	100.0	10	56

Device	Routing	Invert	Outlet Devices
#1	Primary	39.30'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=34.30' (Free Discharge)
↑—1=Orifice/Grate (Controls 0.00 cfs)

Pond 2P: BMP D


Hydrograph
Inflow Area=150 sf
Peak Elev=38.46'
Storage=37 cf
0.01 cfs
0.00 cfs
Inflow
Primary
Flow (cfs)
0.006
0.005
0.005
0.004
0.004
0.003
0.003
0.002
0.002
0.001
0.001
0.000
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Time (hours)

Summary for Pond 4P: BMP E

Inflow Area = 162 sf,100.00% Impervious, Inflow Depth = 2.97" for 2-Year Storm event
Inflow = 0.01 cfs @ 9.96 hrs, Volume= 40 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 35.31' @ 26.00 hrs Surf.Area= 20 sf Storage= 40 cf

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

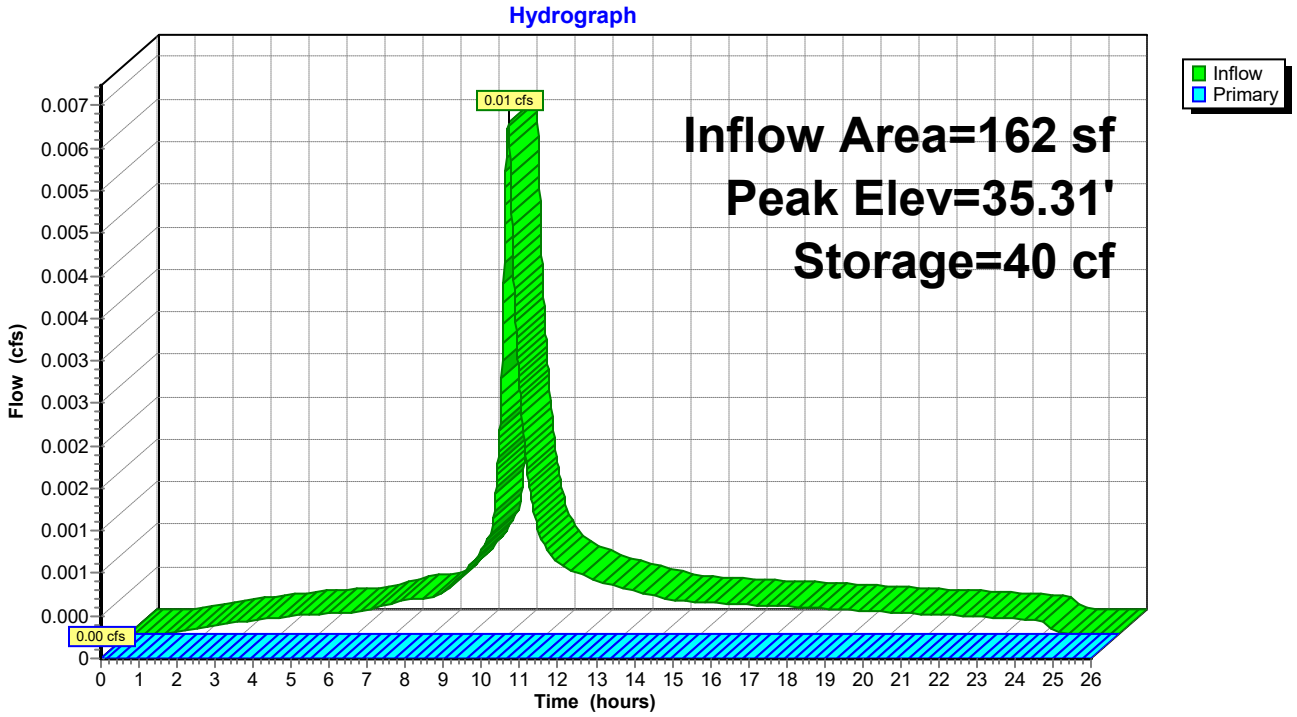
Volume	Invert	Avail.Storage	Storage Description
#1	31.00'	56 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.00	20	0.0	0	0
31.10	20	40.0	1	1
33.60	20	10.0	5	6
35.60	20	100.0	40	46
36.10	20	100.0	10	56

Device	Routing	Invert	Outlet Devices
#1	Primary	36.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=31.00' (Free Discharge)
↑—1=Orifice/Grate (Controls 0.00 cfs)

Pond 4P: BMP E


Hydrograph
Inflow Area=162 sf
Peak Elev=35.31'
Storage=40 cf
0.01 cfs
0.00 cfs
Inflow
Primary
Flow (cfs)
0.007
0.006
0.005
0.005
0.004
0.004
0.003
0.003
0.002
0.002
0.001
0.001
0.000
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Time (hours)

Summary for Pond P1: BMP A

Inflow Area = 1,907 sf,100.00% Impervious, Inflow Depth = 2.97" for 2-Year Storm event
Inflow = 0.07 cfs @ 9.96 hrs, Volume= 472 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 39.36' @ 26.00 hrs Surf.Area= 210 sf Storage= 472 cf

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

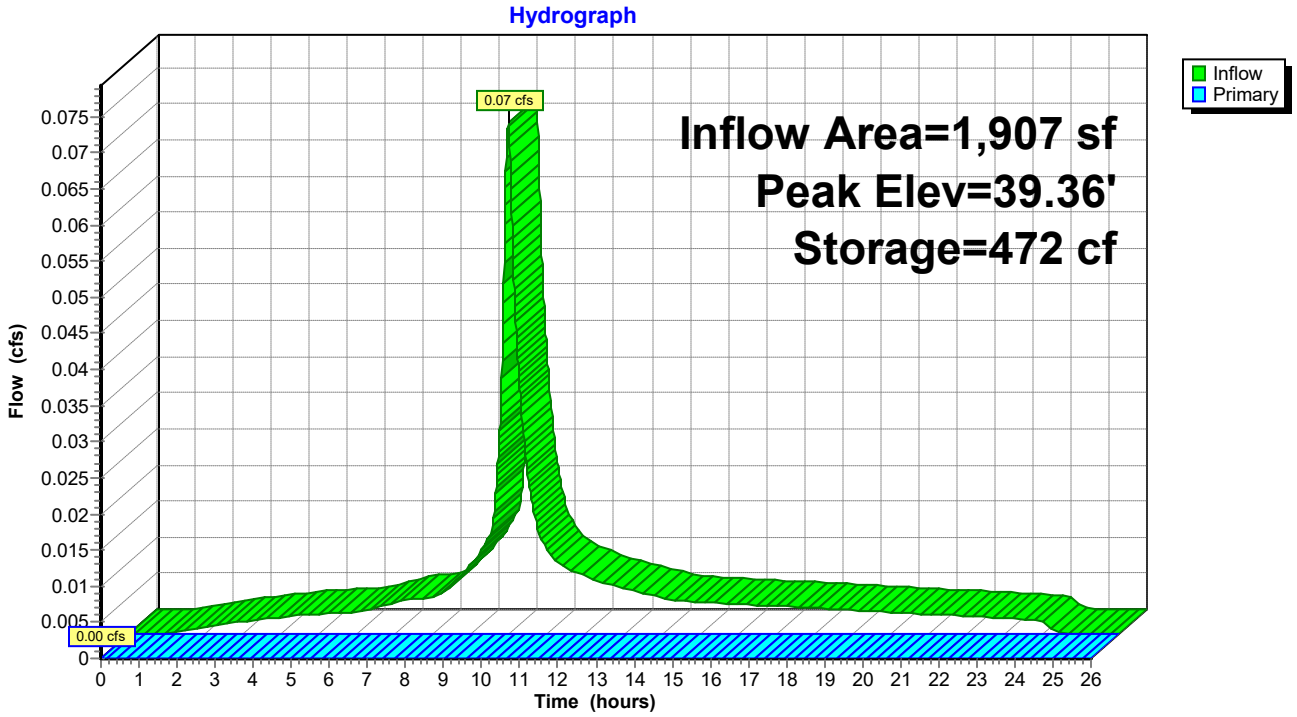
Volume	Invert	Avail.Storage	Storage Description
#1	34.80'	586 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.80	210	0.0	0	0
34.90	210	40.0	8	8
37.40	210	10.0	53	61
39.40	210	100.0	420	481
39.90	210	100.0	105	586

Device	Routing	Invert	Outlet Devices
#1	Primary	39.80'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=34.80' (Free Discharge)
1=Orifice/Grate (Controls 0.00 cfs)

Pond P1: BMP A


Hydrograph
Inflow
Primary
0.07 cfs
0.00 cfs
Inflow Area=1,907 sf
Peak Elev=39.36'
Storage=472 cf
Flow (cfs)
0 0.005 0.01 0.015 0.02 0.025 0.03 0.035 0.04 0.045 0.05 0.055 0.06 0.065 0.07 0.075
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Summary for Subcatchment 1S: DMA D

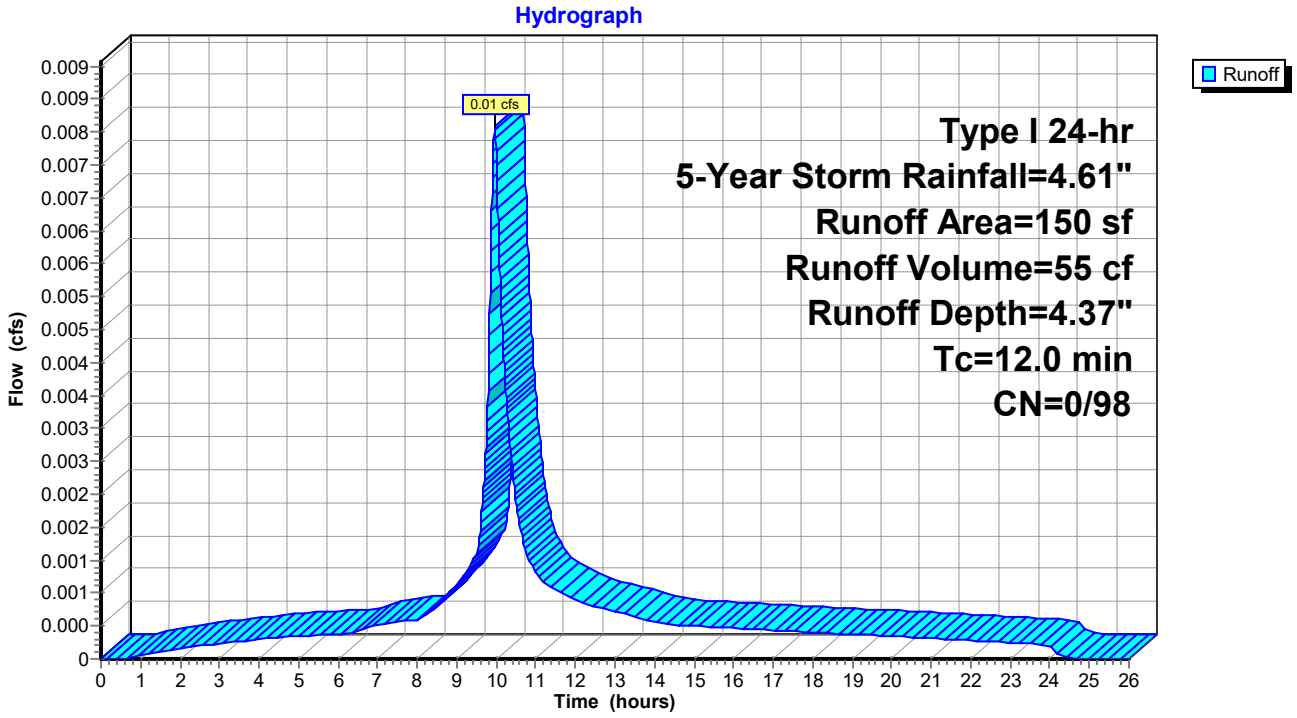
Runoff = 0.01 cfs @ 9.96 hrs, Volume= 55 cf, Depth= 4.37"
Routed to Pond 2P : BMP D

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 5-Year Storm Rainfall=4.61"

Area (sf)	CN	Description
150	98	Unconnected pavement, HSG C
150	98	100.00% Impervious Area

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

Subcatchment 1S: DMA D



Summary for Subcatchment 3S: DMA E

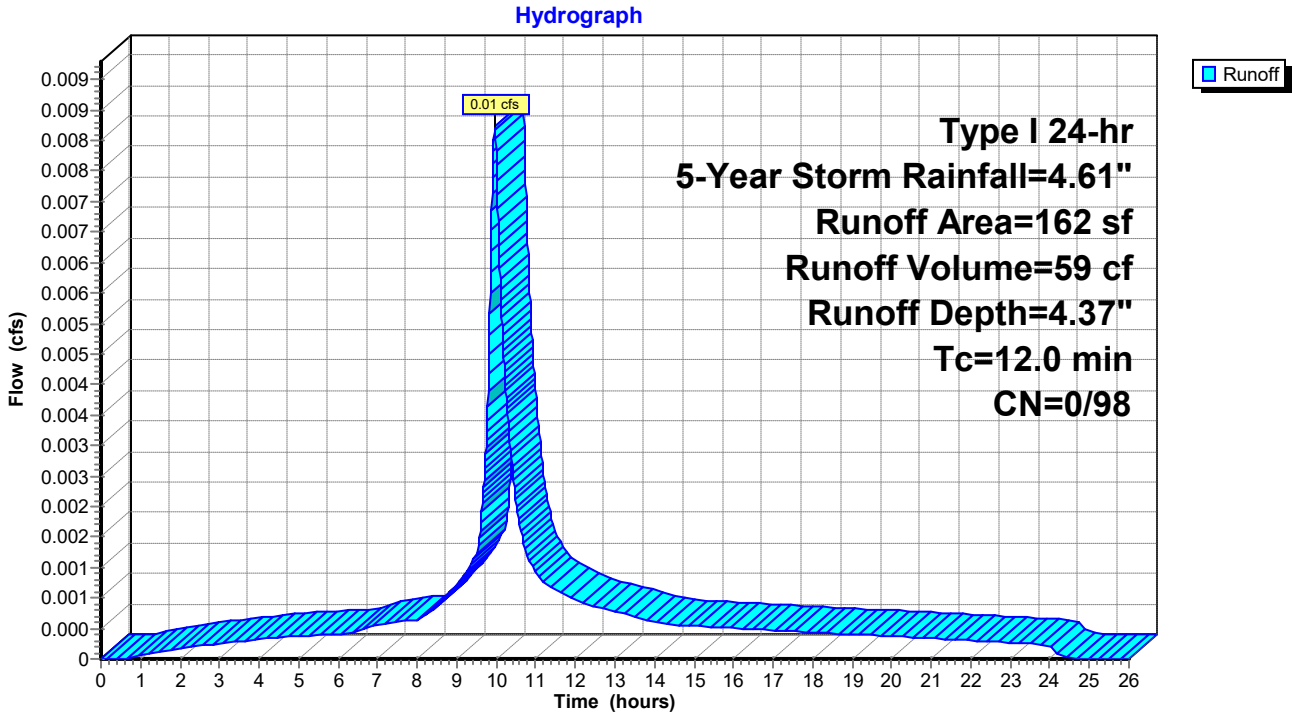
Runoff = 0.01 cfs @ 9.96 hrs, Volume= 59 cf, Depth= 4.37"
Routed to Pond 4P : BMP E

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 5-Year Storm Rainfall=4.61"

Area (sf)	CN	Description
162	98	Unconnected pavement, HSG C
162	98	100.00% Impervious Area

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

Subcatchment 3S: DMA E



Summary for Subcatchment 5S: DMA C

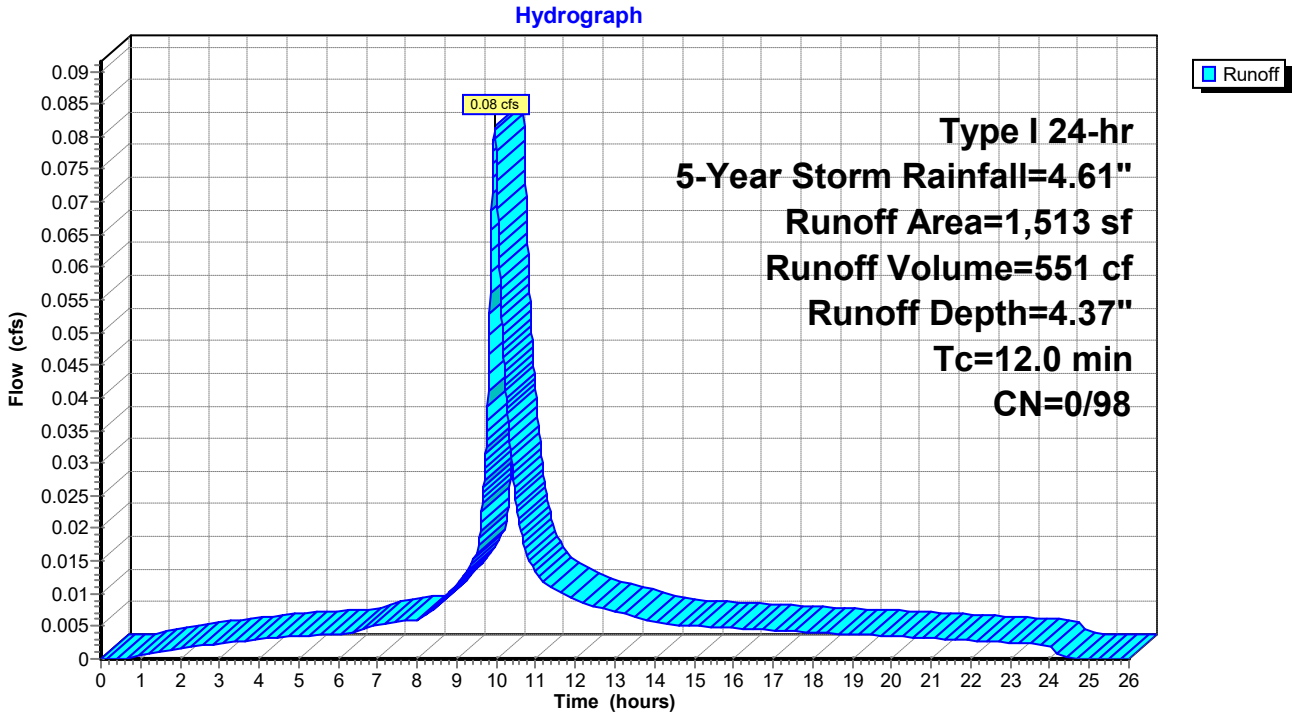
Runoff = 0.08 cfs @ 9.96 hrs, Volume= 551 cf, Depth= 4.37"
Routed to Pond 1P : BMP B

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 5-Year Storm Rainfall=4.61"

Area (sf)	CN	Description
1,513	98	Unconnected pavement, HSG C
1,513	98	100.00% Impervious Area

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

Subcatchment 5S: DMA C



Summary for Subcatchment D1: DMA A

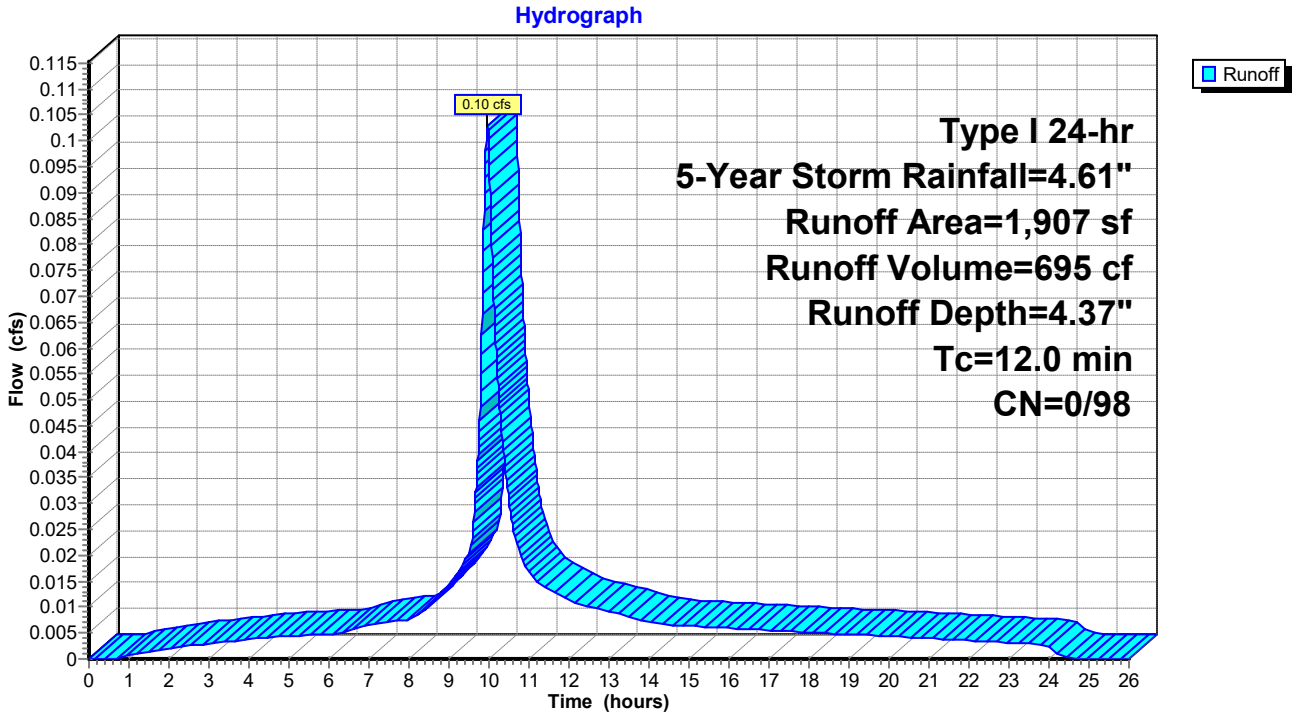
Runoff = 0.10 cfs @ 9.96 hrs, Volume= 695 cf, Depth= 4.37"
Routed to Pond P1 : BMP A

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 5-Year Storm Rainfall=4.61"

Area (sf)	CN	Description
1,907	98	Paved parking, HSG C
1,907	98	100.00% Impervious Area

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

Subcatchment D1: DMA A



Summary for Subcatchment D2: DMA B

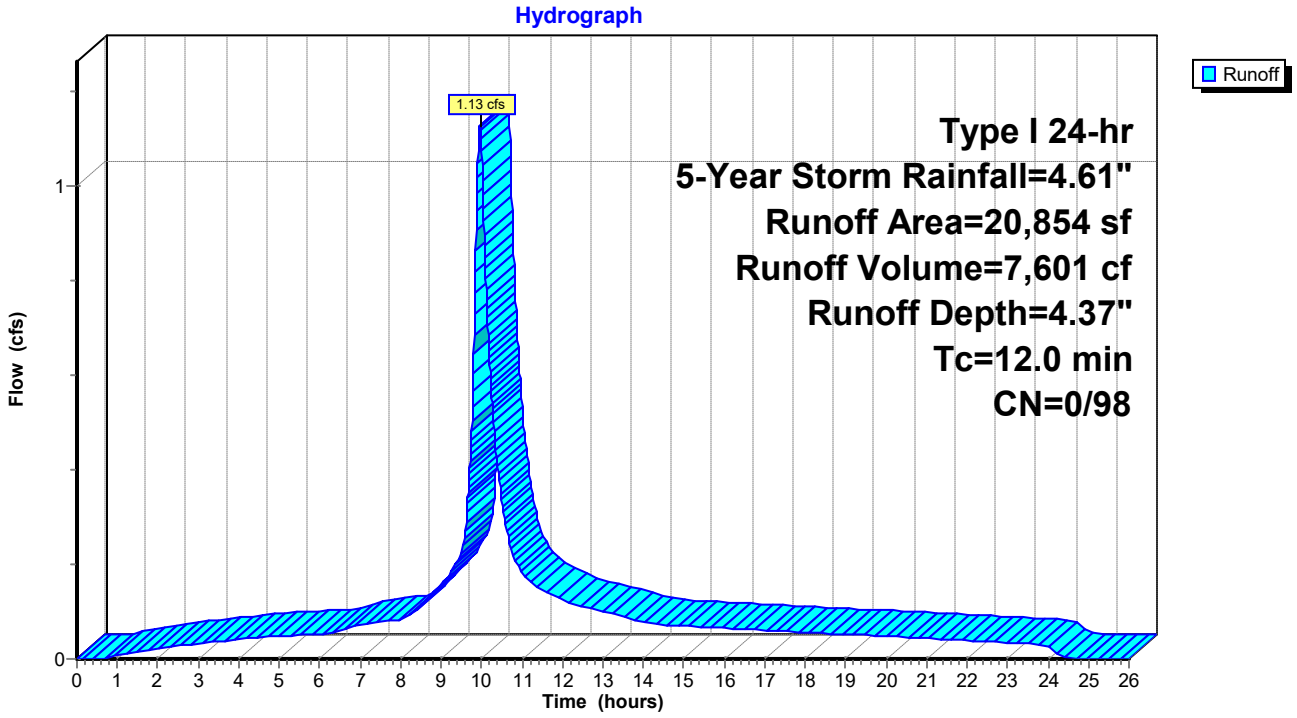
Runoff = 1.13 cfs @ 9.96 hrs, Volume= 7,601 cf, Depth= 4.37"
Routed to Pond 1P : BMP B

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 5-Year Storm Rainfall=4.61"

Area (sf)	CN	Description
20,854	98	Paved parking, HSG C
20,854	98	100.00% Impervious Area

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

Subcatchment D2: DMA B



Summary for Subcatchment Ex.: Proposed (Pre bmp)

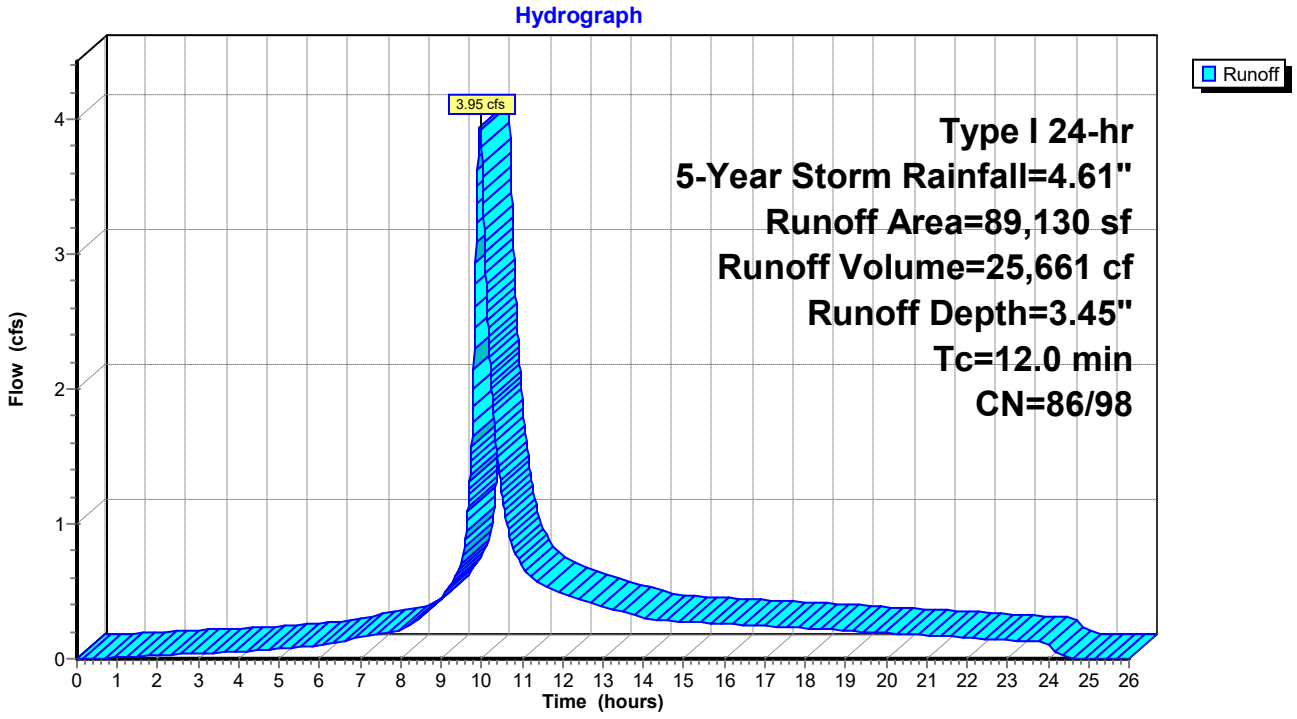
Runoff = 3.95 cfs @ 9.96 hrs, Volume= 25,661 cf, Depth= 3.45"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 5-Year Storm Rainfall=4.61"

Area (sf)	CN	Description
24,586	98	Paved parking, HSG C
64,544	86	<50% Grass cover, Poor, HSG C
89,130	89	Weighted Average
64,544	86	72.42% Pervious Area
24,586	98	27.58% Impervious Area

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

Subcatchment Ex.: Proposed (Pre bmp)



Summary for Pond 1P: BMP B

Inflow Area = 22,367 sf,100.00% Impervious, Inflow Depth = 4.37" for 5-Year Storm event
Inflow = 1.21 cfs @ 9.96 hrs, Volume= 8,152 cf
Outflow = 0.03 cfs @ 3.73 hrs, Volume= 2,310 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.03 cfs @ 3.73 hrs, Volume= 2,310 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 25.22' @ 24.04 hrs Surf.Area= 23,480 sf Storage= 6,015 cf

Plug-Flow detention time= 424.3 min calculated for 2,310 cf (28% of inflow)
Center-of-Mass det. time= 149.0 min (851.1 - 702.2)

Volume	Invert	Avail.Storage	Storage Description
#1	24.90'	33,811 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

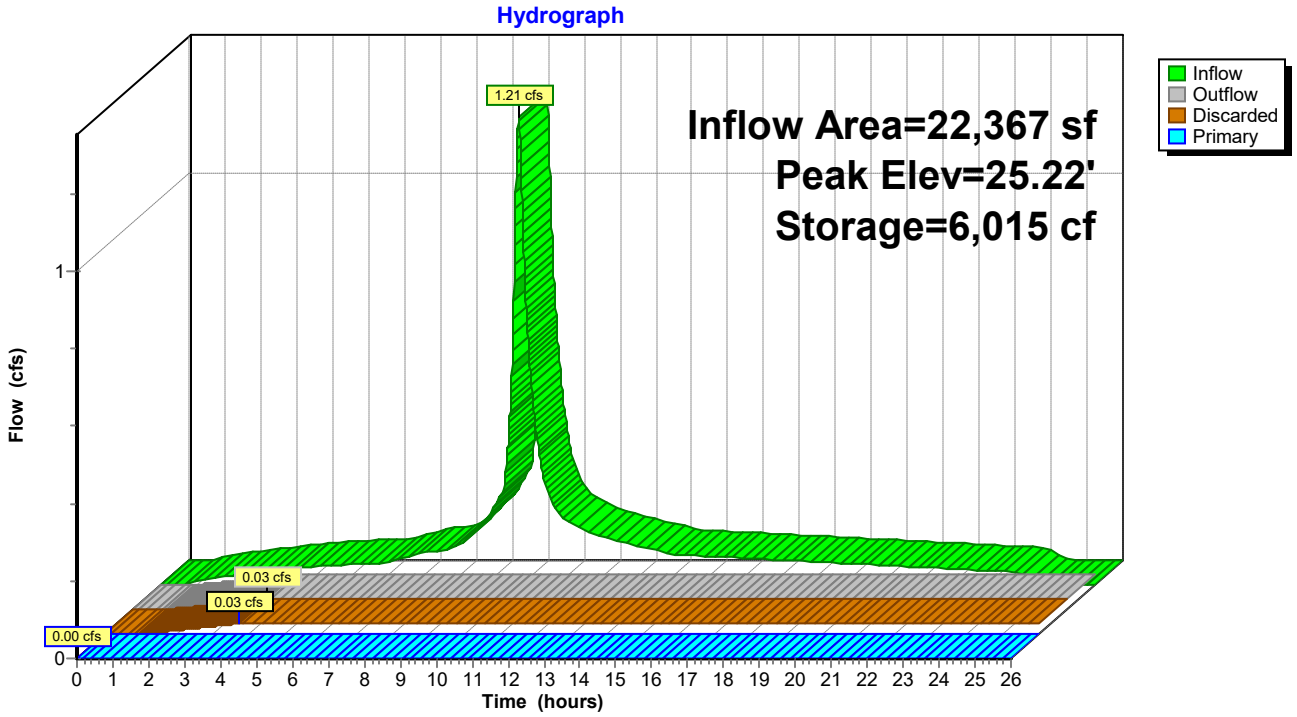
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.90	23,480	0.0	0	0
25.00	23,480	40.0	939	939
26.33	23,480	100.0	31,228	32,168
26.40	23,480	100.0	1,644	33,811

Device	Routing	Invert	Outlet Devices
#1	Discarded	24.90'	**0.050 in/hr Exfiltration over Horizontal area**
#2	Primary	26.33'	**12.0" x 12.0" Horiz. Orifice/Grate X 5.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 3.73 hrs HW=24.92' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.90' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: BMP B


Hydrograph
Inflow Area=22,367 sf
Peak Elev=25.22'
Storage=6,015 cf
Inflow
Outflow
Discarded
Primary
1.21 cfs
0.03 cfs
0.03 cfs
0.00 cfs
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Summary for Pond 2P: BMP D

Inflow Area = 150 sf,100.00% Impervious, Inflow Depth = 4.37" for 5-Year Storm event
Inflow = 0.01 cfs @ 9.96 hrs, Volume= 55 cf
Outflow = 0.00 cfs @ 23.17 hrs, Volume= 1 cf, Atten= 97%, Lag= 792.5 min
Primary = 0.00 cfs @ 23.17 hrs, Volume= 1 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 39.30' @ 23.17 hrs Surf.Area= 20 sf Storage= 54 cf

Plug-Flow detention time= 1,305.3 min calculated for 1 cf (2% of inflow)
Center-of-Mass det. time= 718.6 min (1,420.8 - 702.2)

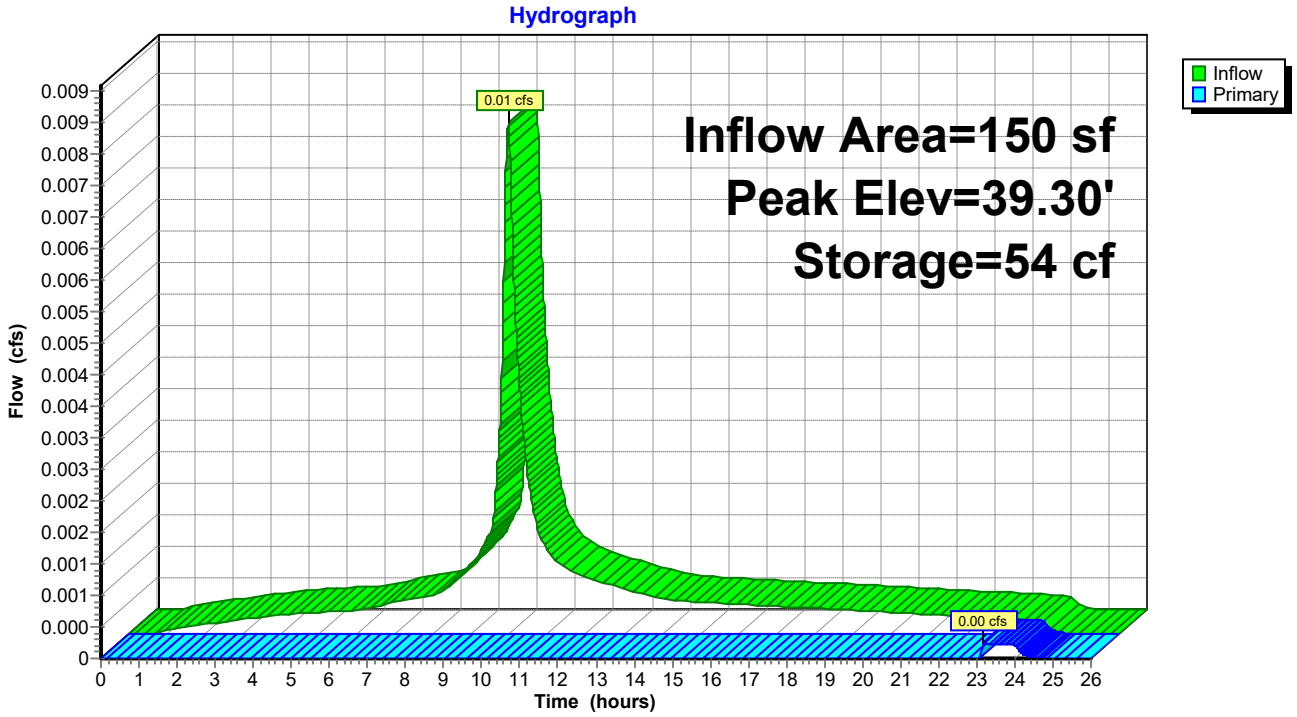
Volume	Invert	Avail.Storage	Storage Description
#1	34.30'	56 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.30	20	0.0	0	0
34.40	20	40.0	1	1
36.90	20	10.0	5	6
38.90	20	100.0	40	46
39.40	20	100.0	10	56

Device	Routing	Invert	Outlet Devices
#1	Primary	39.30'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 23.17 hrs HW=39.30' (Free Discharge)
↑**1=Orifice/Grate** (Weir Controls 0.00 cfs @ 0.06 fps)

Pond 2P: BMP D


Hydrograph
Inflow Area=150 sf
Peak Elev=39.30'
Storage=54 cf
0.01 cfs
0.00 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0.009
0.009
0.008
0.007
0.007
0.006
0.006
0.005
0.005
0.004
0.004
0.003
0.003
0.002
0.002
0.001
0.001
0.000
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Summary for Pond 4P: BMP E

Inflow Area = 162 sf,100.00% Impervious, Inflow Depth = 4.37" for 5-Year Storm event
Inflow = 0.01 cfs @ 9.96 hrs, Volume= 59 cf
Outflow = 0.00 cfs @ 19.50 hrs, Volume= 5 cf, Atten= 96%, Lag= 572.1 min
Primary = 0.00 cfs @ 19.50 hrs, Volume= 5 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 36.00' @ 19.50 hrs Surf.Area= 20 sf Storage= 54 cf

Plug-Flow detention time= 1,050.5 min calculated for 5 cf (9% of inflow)
Center-of-Mass det. time= 595.5 min (1,297.6 - 702.2)

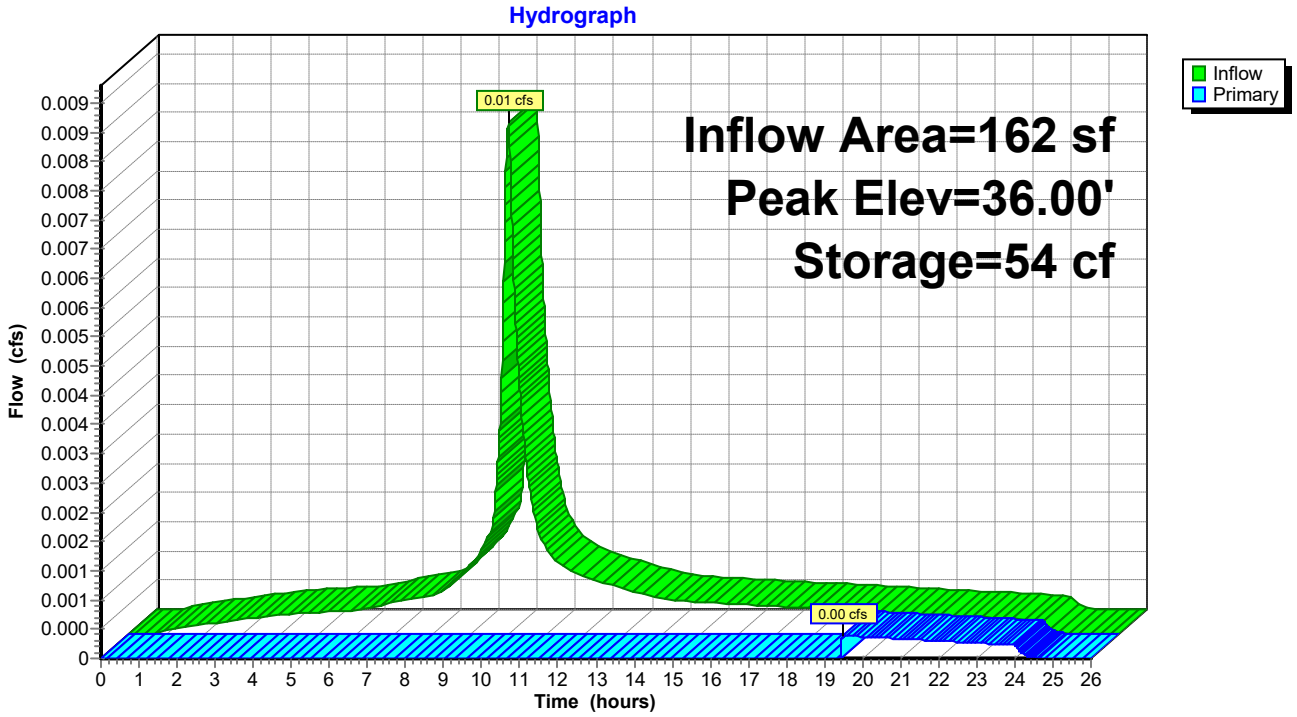
Volume	Invert	Avail.Storage	Storage Description
#1	31.00'	56 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.00	20	0.0	0	0
31.10	20	40.0	1	1
33.60	20	10.0	5	6
35.60	20	100.0	40	46
36.10	20	100.0	10	56

Device	Routing	Invert	Outlet Devices
#1	Primary	36.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 19.50 hrs HW=36.00' (Free Discharge)
↑—1=Orifice/Grate (Weir Controls 0.00 cfs @ 0.07 fps)

Pond 4P: BMP E


Hydrograph
Inflow
Primary
0.01 cfs
0.00 cfs
Inflow Area=162 sf
Peak Elev=36.00'
Storage=54 cf
Flow (cfs)
Time (hours)
0 0.000
0.001 0.001
0.002 0.002
0.003 0.003
0.004 0.004
0.005 0.005
0.006 0.006
0.007 0.007
0.008 0.008
0.009 0.009
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Summary for Pond P1: BMP A

Inflow Area = 1,907 sf,100.00% Impervious, Inflow Depth = 4.37" for 5-Year Storm event
Inflow = 0.10 cfs @ 9.96 hrs, Volume= 695 cf
Outflow = 0.01 cfs @ 16.27 hrs, Volume= 130 cf, Atten= 94%, Lag= 378.4 min
Primary = 0.01 cfs @ 16.27 hrs, Volume= 130 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 39.81' @ 16.27 hrs Surf.Area= 210 sf Storage= 567 cf

Plug-Flow detention time= 815.8 min calculated for 130 cf (19% of inflow)
Center-of-Mass det. time= 472.1 min (1,174.2 - 702.2)

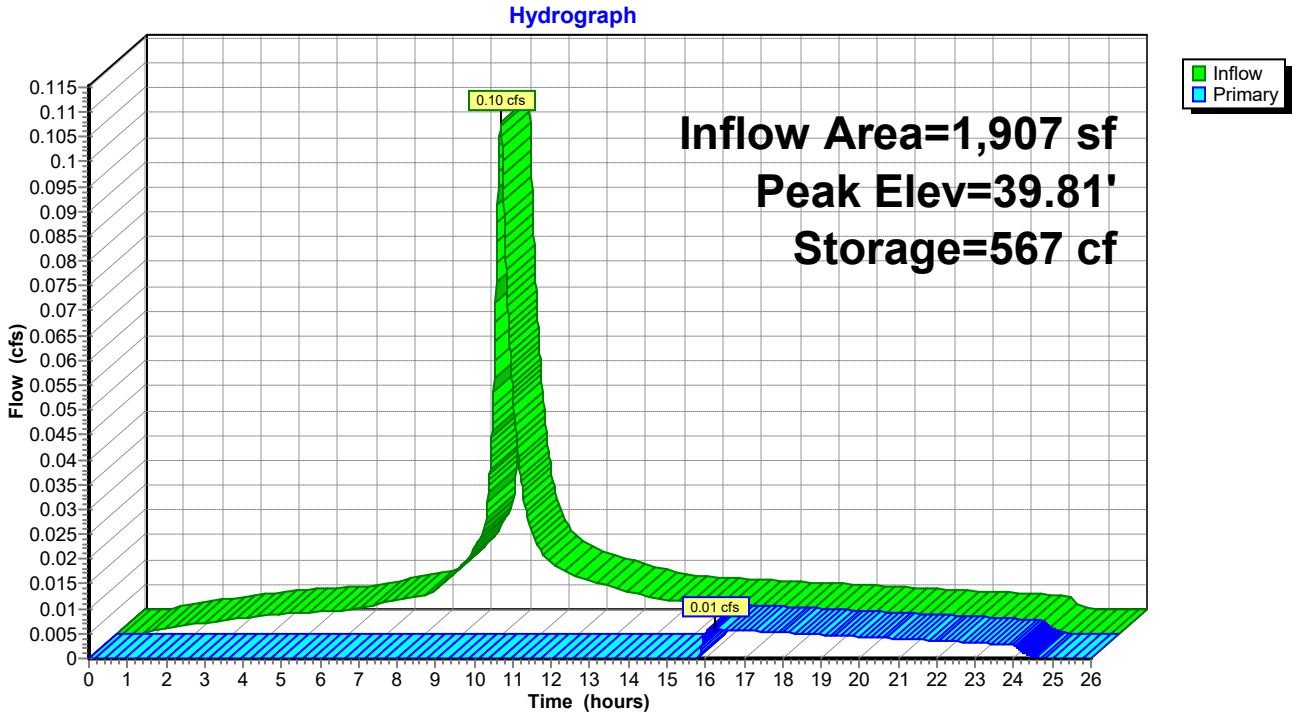
Volume	Invert	Avail.Storage	Storage Description
#1	34.80'	586 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.80	210	0.0	0	0
34.90	210	40.0	8	8
37.40	210	10.0	53	61
39.40	210	100.0	420	481
39.90	210	100.0	105	586

Device	Routing	Invert	Outlet Devices
#1	Primary	39.80'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 16.27 hrs HW=39.81' (Free Discharge)
1=Orifice/Grate (Weir Controls 0.00 cfs @ 0.29 fps)

Pond P1: BMP A


Hydrograph
Inflow Area=1,907 sf
Peak Elev=39.81'
Storage=567 cf
0.10 cfs
0.01 cfs
Inflow
Primary
Flow (cfs)
Time (hours)

Summary for Subcatchment 1S: DMA D

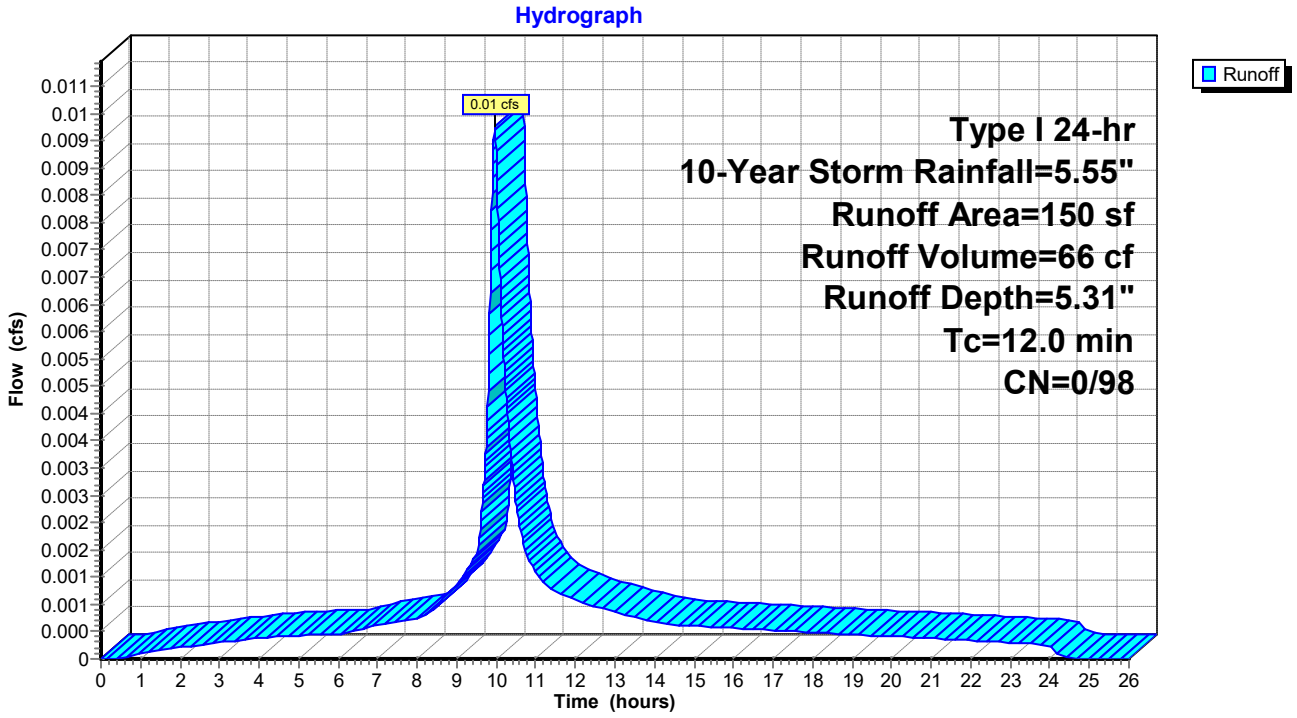
Runoff = 0.01 cfs @ 9.96 hrs, Volume= 66 cf, Depth= 5.31"
Routed to Pond 2P : BMP D

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 10-Year Storm Rainfall=5.55"

Area (sf)	CN	Description
150	98	Unconnected pavement, HSG C
150	98	100.00% Impervious Area

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

Subcatchment 1S: DMA D



Summary for Subcatchment 3S: DMA E

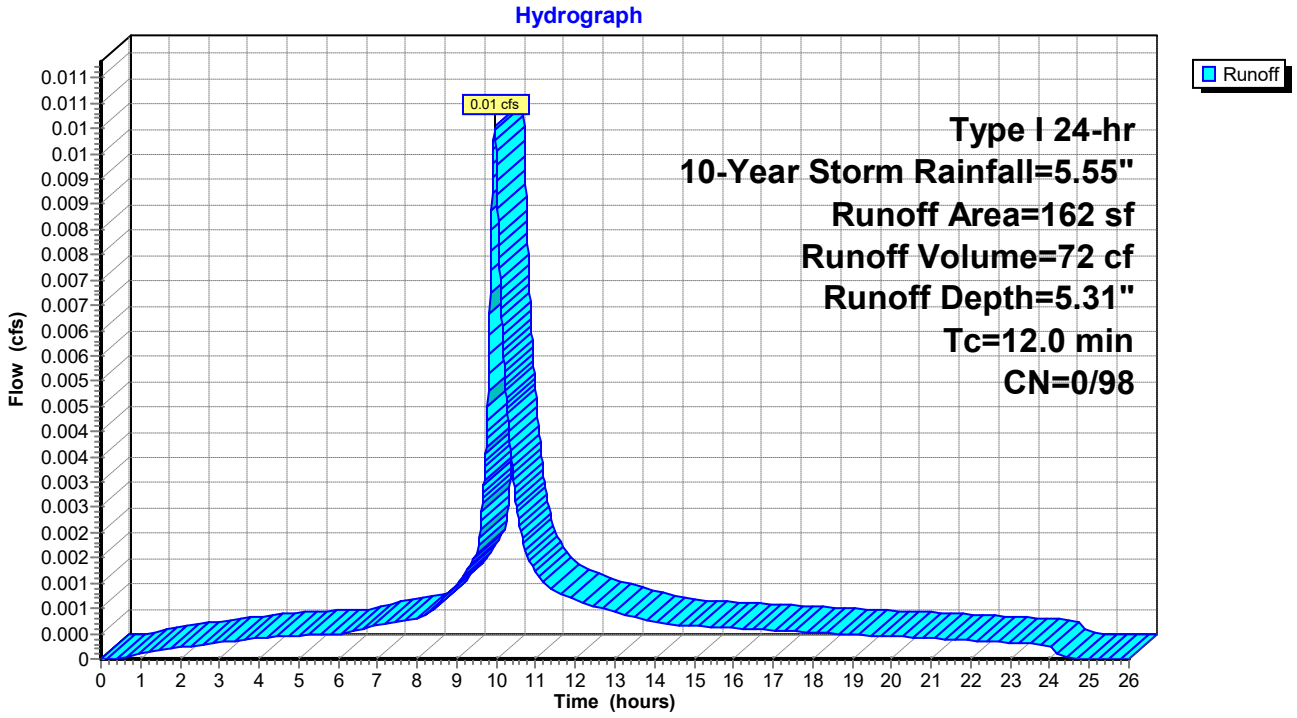
Runoff = 0.01 cfs @ 9.96 hrs, Volume= 72 cf, Depth= 5.31"
Routed to Pond 4P : BMP E

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 10-Year Storm Rainfall=5.55"

Area (sf)	CN	Description
162	98	Unconnected pavement, HSG C
162	98	100.00% Impervious Area

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

Subcatchment 3S: DMA E



Summary for Subcatchment 5S: DMA C

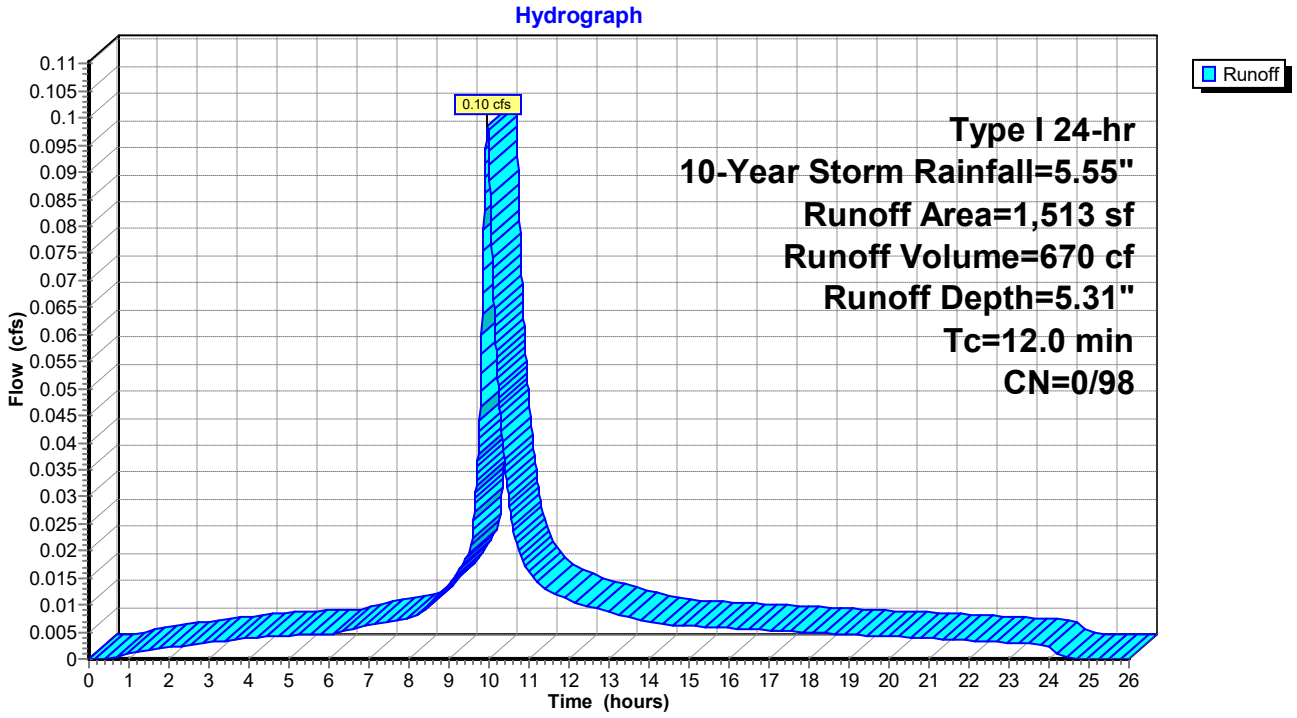
Runoff = 0.10 cfs @ 9.96 hrs, Volume= 670 cf, Depth= 5.31"
Routed to Pond 1P : BMP B

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 10-Year Storm Rainfall=5.55"

Area (sf)	CN	Description
1,513	98	Unconnected pavement, HSG C
1,513	98	100.00% Impervious Area

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

Subcatchment 5S: DMA C



Summary for Subcatchment D1: DMA A

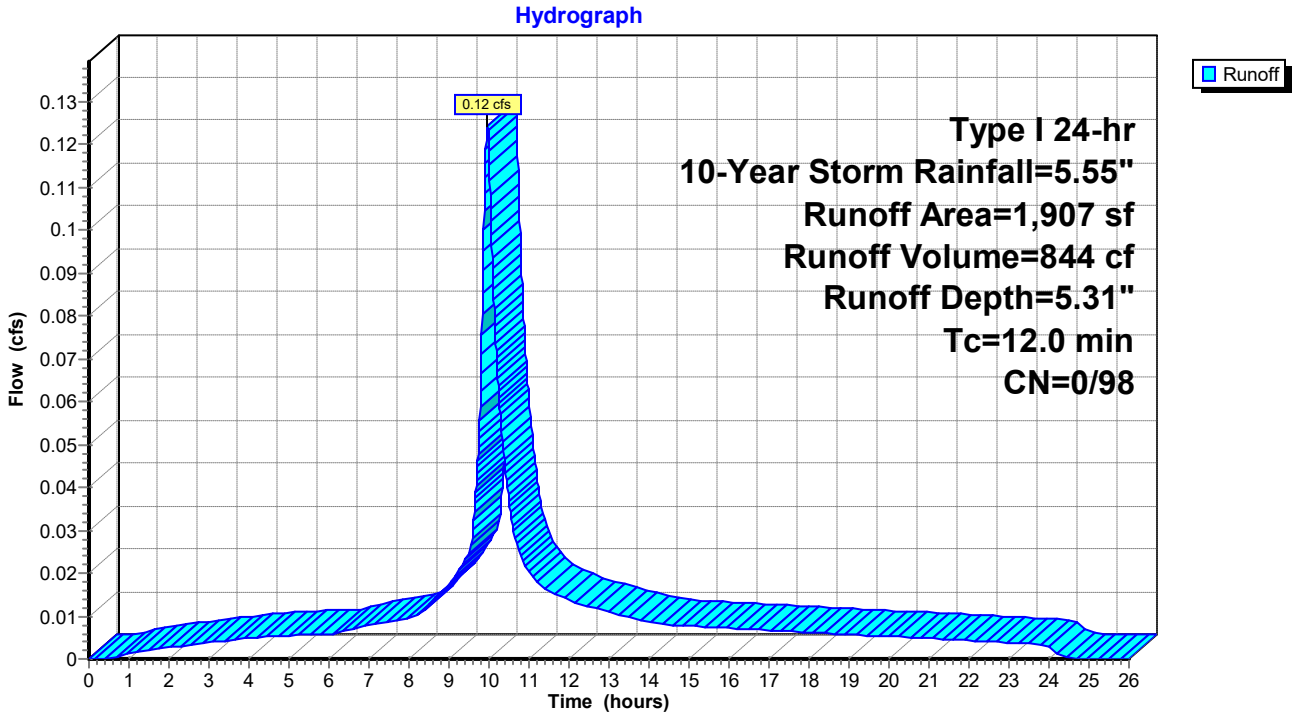
Runoff = 0.12 cfs @ 9.96 hrs, Volume= 844 cf, Depth= 5.31"
Routed to Pond P1 : BMP A

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 10-Year Storm Rainfall=5.55"

Area (sf)	CN	Description
1,907	98	Paved parking, HSG C
1,907	98	100.00% Impervious Area

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

Subcatchment D1: DMA A



Summary for Subcatchment D2: DMA B

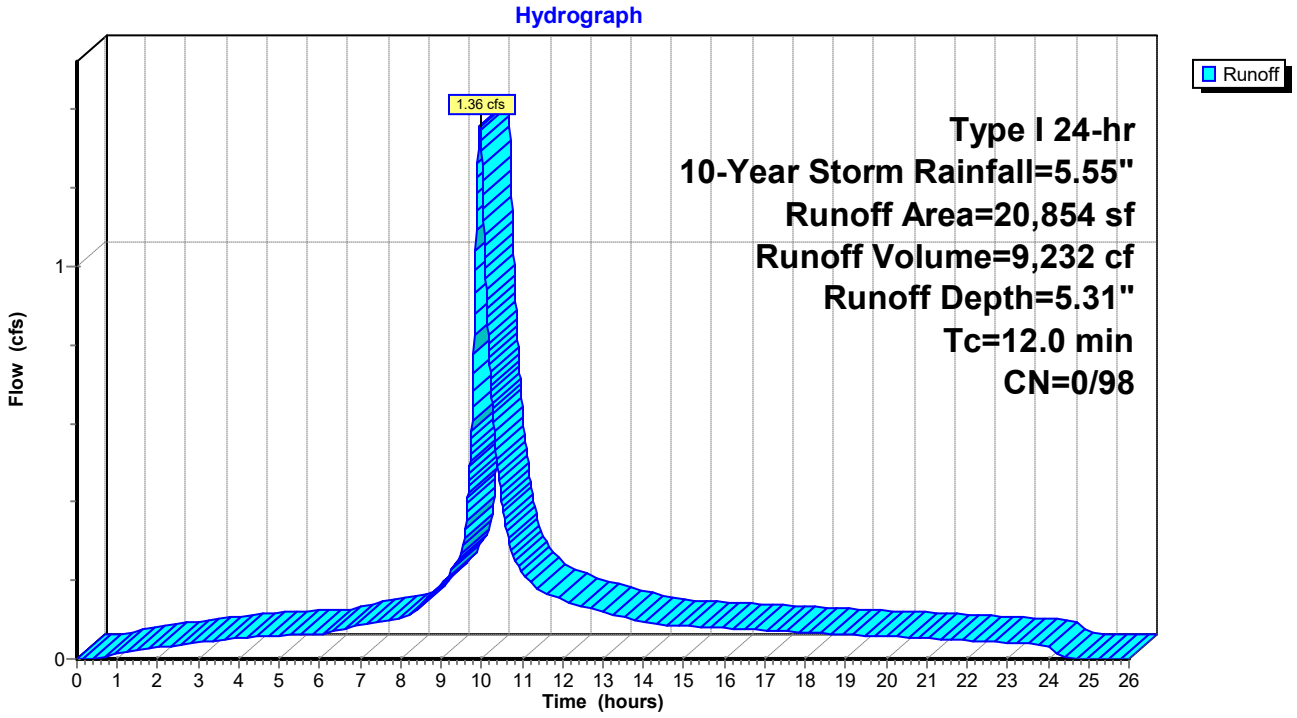
Runoff = 1.36 cfs @ 9.96 hrs, Volume= 9,232 cf, Depth= 5.31"
Routed to Pond 1P : BMP B

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 10-Year Storm Rainfall=5.55"

Area (sf)	CN	Description
20,854	98	Paved parking, HSG C
20,854	98	100.00% Impervious Area

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

Subcatchment D2: DMA B



Summary for Subcatchment Ex.: Proposed (Pre bmp)

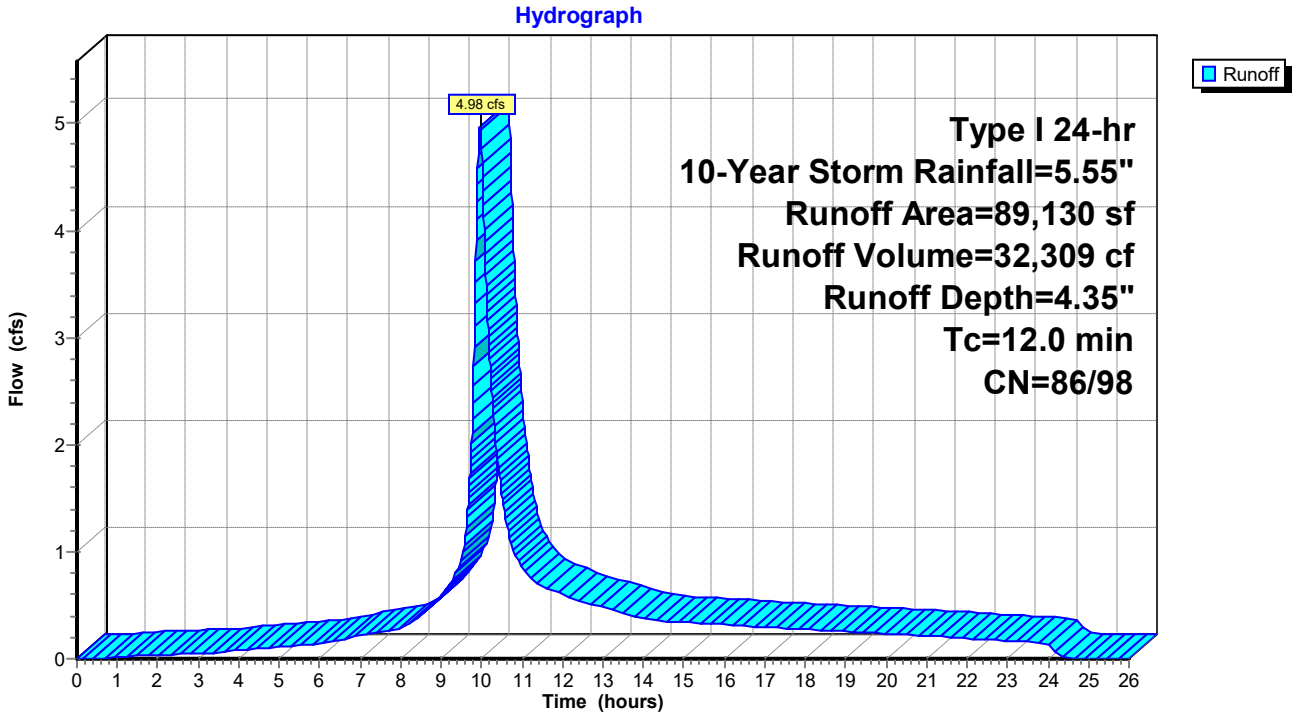
Runoff = 4.98 cfs @ 9.96 hrs, Volume= 32,309 cf, Depth= 4.35"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 10-Year Storm Rainfall=5.55"

Area (sf)	CN	Description
24,586	98	Paved parking, HSG C
64,544	86	<50% Grass cover, Poor, HSG C
89,130	89	Weighted Average
64,544	86	72.42% Pervious Area
24,586	98	27.58% Impervious Area

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

Subcatchment Ex.: Proposed (Pre bmp)



Summary for Pond 1P: BMP B

Inflow Area = 22,367 sf,100.00% Impervious, Inflow Depth = 5.31" for 10-Year Storm event
Inflow = 1.46 cfs @ 9.96 hrs, Volume= 9,902 cf
Outflow = 0.03 cfs @ 3.07 hrs, Volume= 2,351 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.03 cfs @ 3.07 hrs, Volume= 2,351 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 25.29' @ 24.07 hrs Surf.Area= 23,480 sf Storage= 7,720 cf

Plug-Flow detention time= 449.5 min calculated for 2,351 cf (24% of inflow)
Center-of-Mass det. time= 140.2 min (838.9 - 698.7)

Volume	Invert	Avail.Storage	Storage Description
#1	24.90'	33,811 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

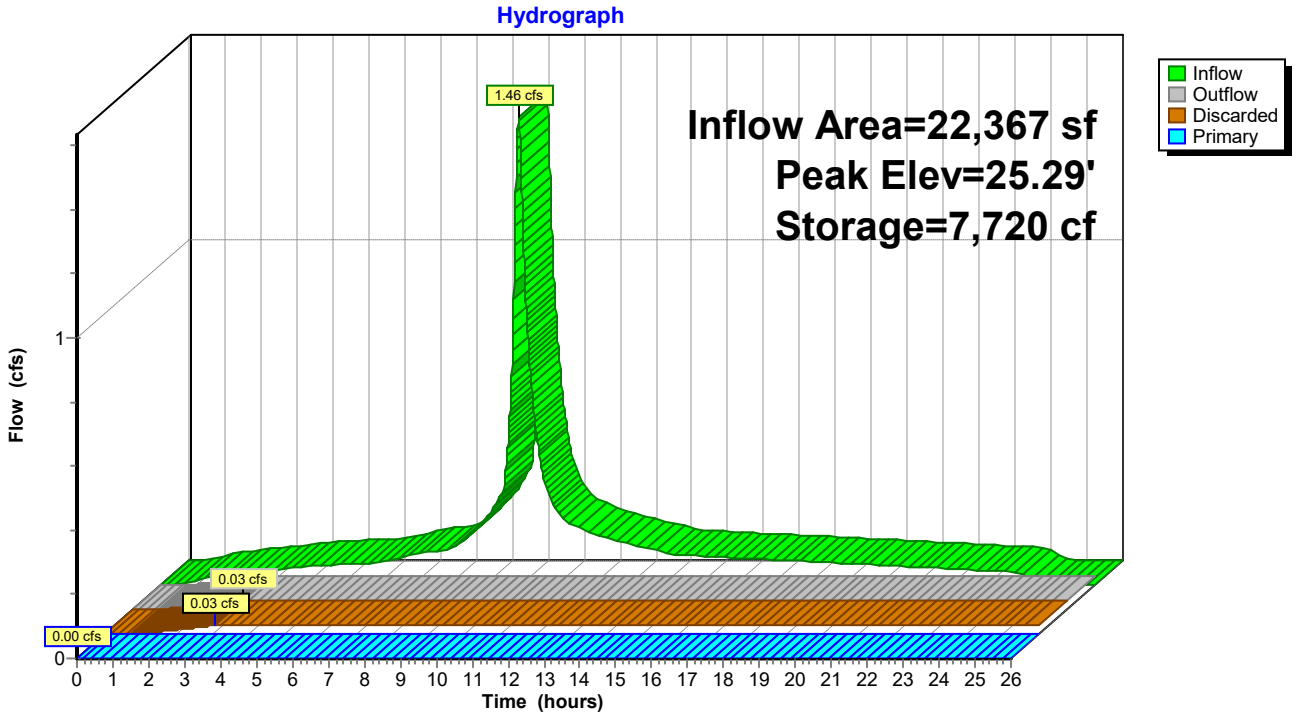
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.90	23,480	0.0	0	0
25.00	23,480	40.0	939	939
26.33	23,480	100.0	31,228	32,168
26.40	23,480	100.0	1,644	33,811

Device	Routing	Invert	Outlet Devices
#1	Discarded	24.90'	**0.050 in/hr Exfiltration over Horizontal area**
#2	Primary	26.33'	**12.0" x 12.0" Horiz. Orifice/Grate X 5.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 3.07 hrs HW=24.92' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.90' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: BMP B


Hydrograph
Inflow Area=22,367 sf
Peak Elev=25.29'
Storage=7,720 cf
1.46 cfs
0.03 cfs
0.03 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Summary for Pond 2P: BMP D

Inflow Area = 150 sf,100.00% Impervious, Inflow Depth = 5.31" for 10-Year Storm event
Inflow = 0.01 cfs @ 9.96 hrs, Volume= 66 cf
Outflow = 0.00 cfs @ 15.78 hrs, Volume= 13 cf, Atten= 94%, Lag= 349.3 min
Primary = 0.00 cfs @ 15.78 hrs, Volume= 13 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 39.30' @ 15.78 hrs Surf.Area= 20 sf Storage= 54 cf

Plug-Flow detention time= 814.3 min calculated for 13 cf (19% of inflow)
Center-of-Mass det. time= 466.6 min (1,165.3 - 698.7)

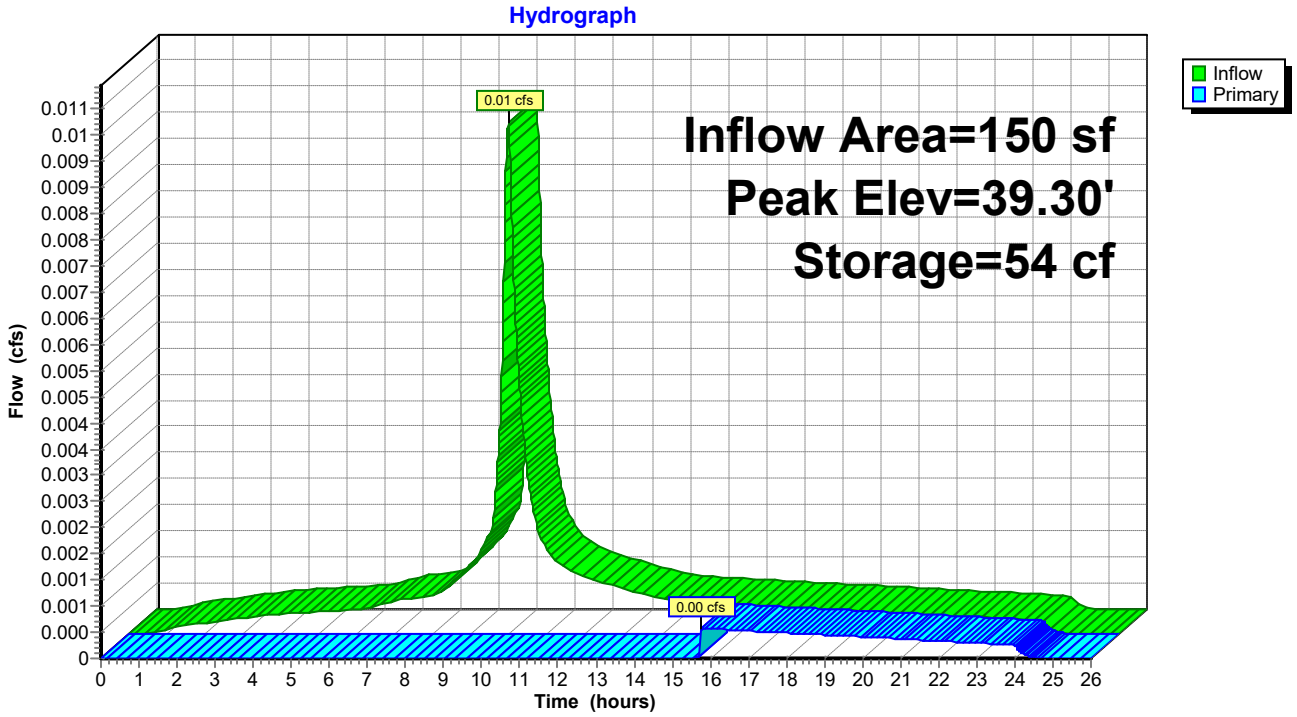
Volume	Invert	Avail.Storage	Storage Description
#1	34.30'	56 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.30	20	0.0	0	0
34.40	20	40.0	1	1
36.90	20	10.0	5	6
38.90	20	100.0	40	46
39.40	20	100.0	10	56

Device	Routing	Invert	Outlet Devices
#1	Primary	39.30'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 15.78 hrs HW=39.30' (Free Discharge)
↑**1=Orifice/Grate** (Weir Controls 0.00 cfs @ 0.09 fps)

Pond 2P: BMP D


Hydrograph
Inflow
Primary
0.01 cfs
0.00 cfs
Inflow Area=150 sf
Peak Elev=39.30'
Storage=54 cf
Flow (cfs)
0.011
0.01
0.009
0.009
0.008
0.008
0.007
0.007
0.006
0.006
0.005
0.005
0.004
0.004
0.003
0.003
0.002
0.002
0.001
0.001
0.000
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Time (hours)

Summary for Pond 4P: BMP E

Inflow Area = 162 sf,100.00% Impervious, Inflow Depth = 5.31" for 10-Year Storm event
Inflow = 0.01 cfs @ 9.96 hrs, Volume= 72 cf
Outflow = 0.00 cfs @ 13.97 hrs, Volume= 18 cf, Atten= 93%, Lag= 240.5 min
Primary = 0.00 cfs @ 13.97 hrs, Volume= 18 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 36.00' @ 13.97 hrs Surf.Area= 20 sf Storage= 54 cf

Plug-Flow detention time= 700.7 min calculated for 18 cf (25% of inflow)
Center-of-Mass det. time= 400.2 min (1,098.9 - 698.7)

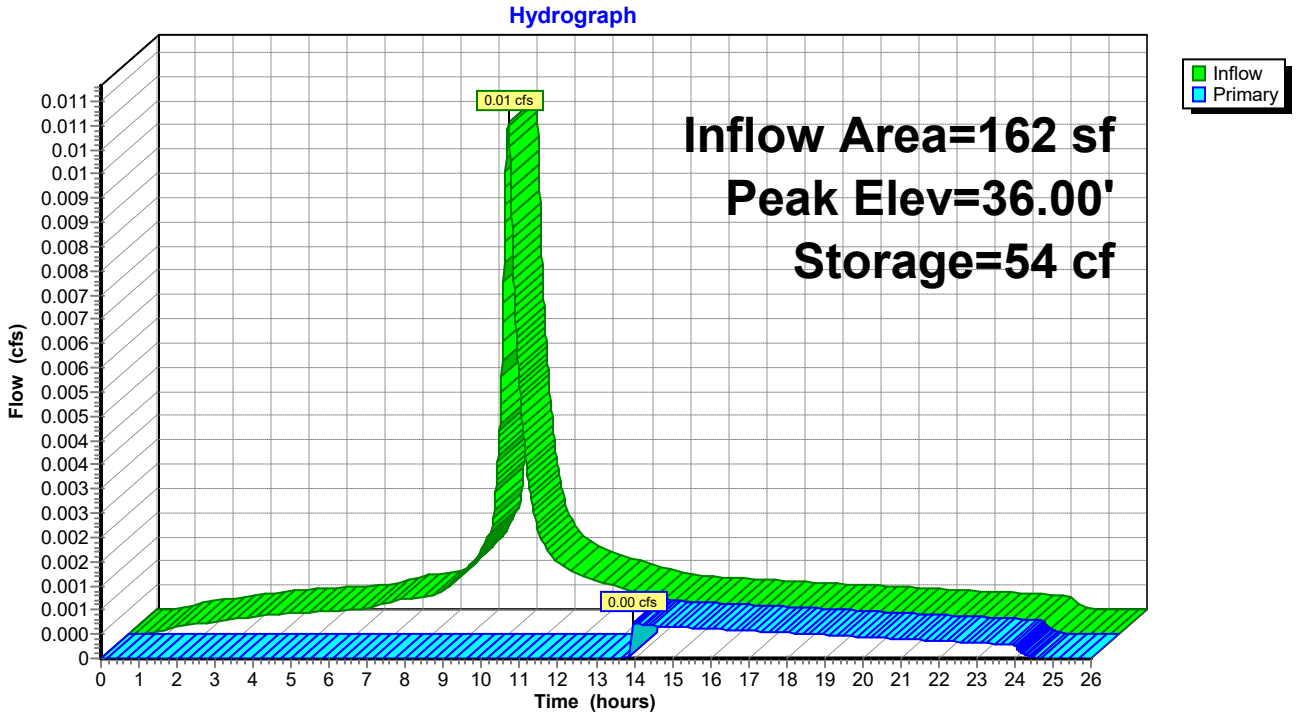
Volume	Invert	Avail.Storage	Storage Description
#1	31.00'	56 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.00	20	0.0	0	0
31.10	20	40.0	1	1
33.60	20	10.0	5	6
35.60	20	100.0	40	46
36.10	20	100.0	10	56

Device	Routing	Invert	Outlet Devices
#1	Primary	36.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 13.97 hrs HW=36.00' (Free Discharge)
↑—1=Orifice/Grate (Weir Controls 0.00 cfs @ 0.10 fps)

Pond 4P: BMP E


Hydrograph
Inflow
Primary
0.01 cfs
0.00 cfs
Inflow Area=162 sf
Peak Elev=36.00'
Storage=54 cf
Flow (cfs)
0.011
0.011
0.01
0.01
0.009
0.009
0.008
0.008
0.007
0.007
0.006
0.006
0.005
0.005
0.004
0.004
0.003
0.003
0.002
0.002
0.001
0.001
0.000
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Time (hours)

Summary for Pond P1: BMP A

Inflow Area = 1,907 sf,100.00% Impervious, Inflow Depth = 5.31" for 10-Year Storm event
Inflow = 0.12 cfs @ 9.96 hrs, Volume= 844 cf
Outflow = 0.01 cfs @ 12.51 hrs, Volume= 279 cf, Atten= 90%, Lag= 152.9 min
Primary = 0.01 cfs @ 12.51 hrs, Volume= 279 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 39.82' @ 12.51 hrs Surf.Area= 210 sf Storage= 568 cf

Plug-Flow detention time= 581.6 min calculated for 279 cf (33% of inflow)
Center-of-Mass det. time= 326.4 min (1,025.1 - 698.7)

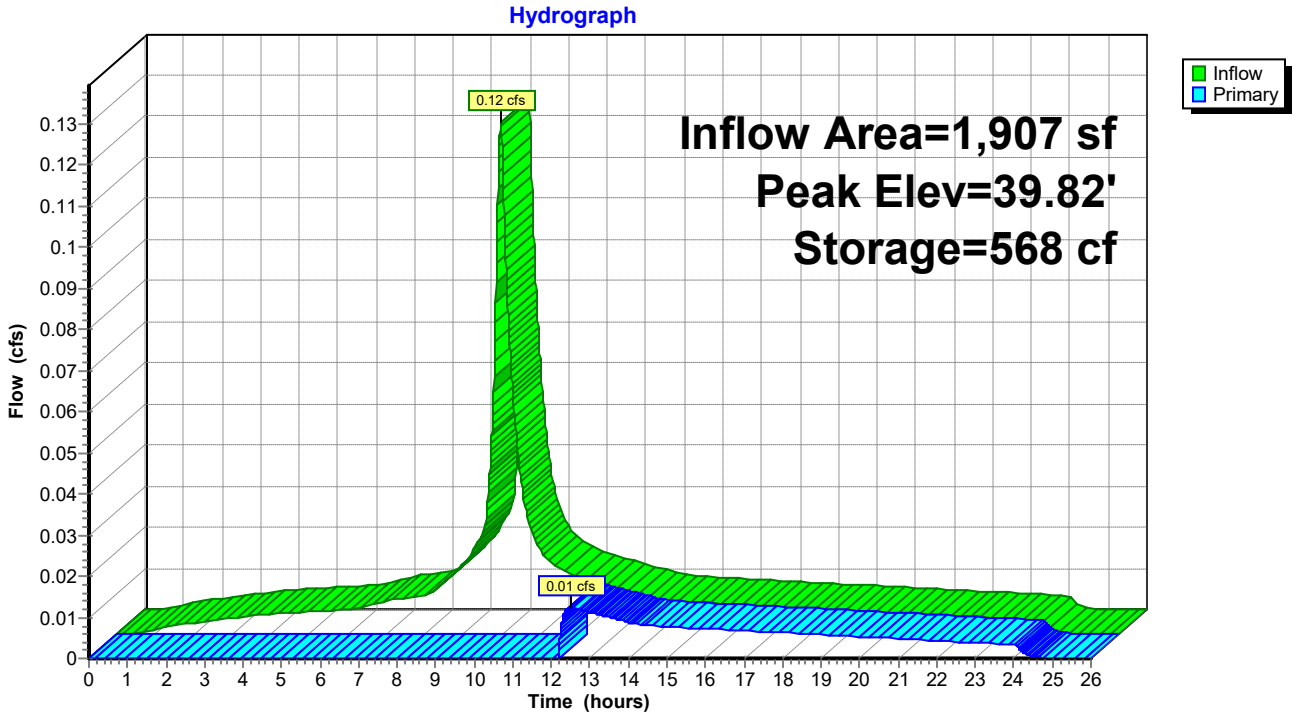
Volume	Invert	Avail.Storage	Storage Description
#1	34.80'	586 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.80	210	0.0	0	0
34.90	210	40.0	8	8
37.40	210	10.0	53	61
39.40	210	100.0	420	481
39.90	210	100.0	105	586

Device	Routing	Invert	Outlet Devices
#1	Primary	39.80'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.01 cfs @ 12.51 hrs HW=39.82' (Free Discharge)
1=Orifice/Grate (Weir Controls 0.01 cfs @ 0.42 fps)

Pond P1: BMP A


Hydrograph
Inflow
Primary
0.12 cfs
0.01 cfs
Inflow Area=1,907 sf
Peak Elev=39.82'
Storage=568 cf
Flow (cfs)
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
0.11
0.12
0.13
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Summary for Subcatchment 1S: DMA D

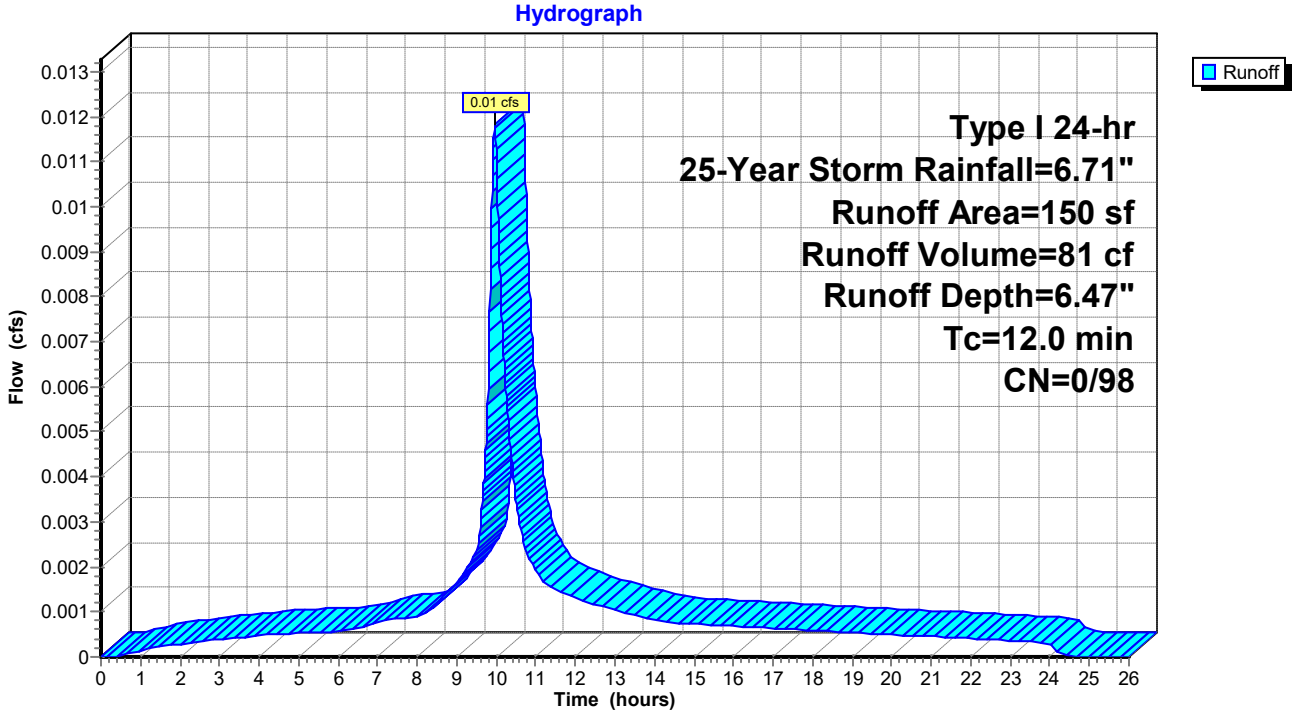
Runoff = 0.01 cfs @ 9.96 hrs, Volume= 81 cf, Depth= 6.47"
Routed to Pond 2P : BMP D

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 25-Year Storm Rainfall=6.71"

Area (sf)	CN	Description
150	98	Unconnected pavement, HSG C
150	98	100.00% Impervious Area

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

Subcatchment 1S: DMA D



Summary for Subcatchment 3S: DMA E

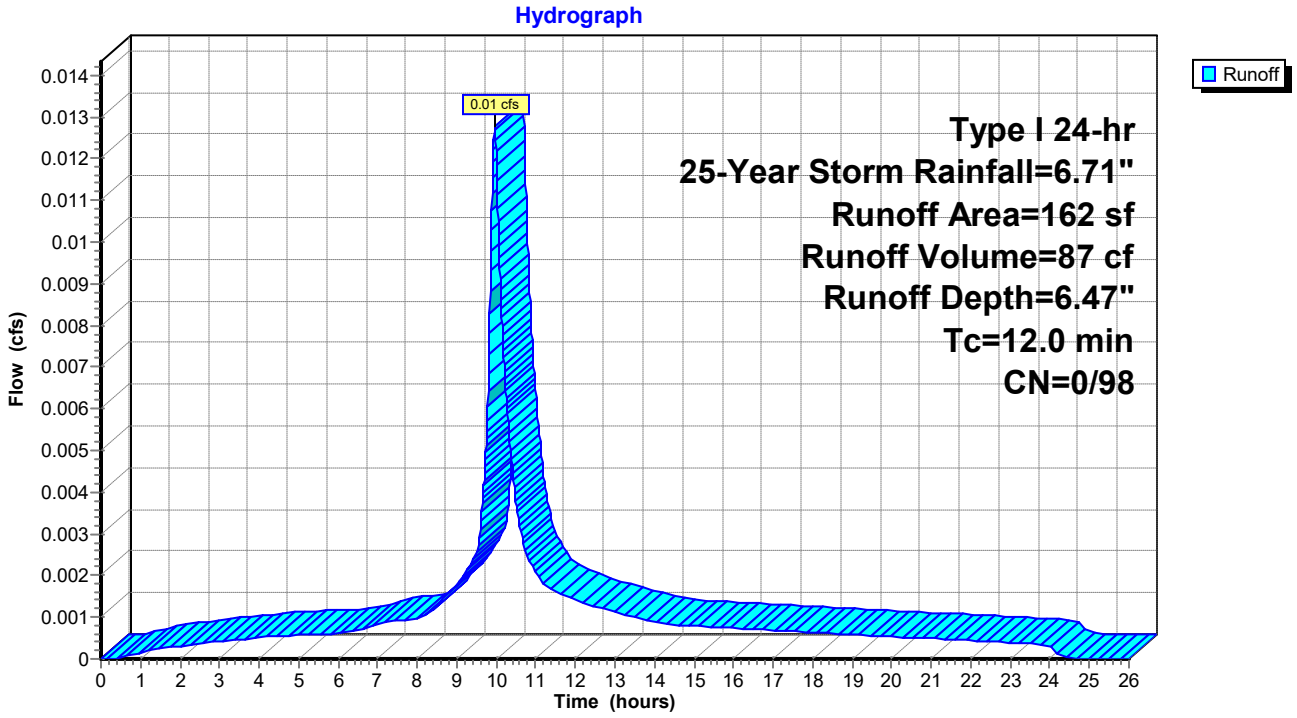
Runoff = 0.01 cfs @ 9.96 hrs, Volume= 87 cf, Depth= 6.47"
Routed to Pond 4P : BMP E

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 25-Year Storm Rainfall=6.71"

Area (sf)	CN	Description
162	98	Unconnected pavement, HSG C
162	98	100.00% Impervious Area

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

Subcatchment 3S: DMA E



Summary for Subcatchment 5S: DMA C

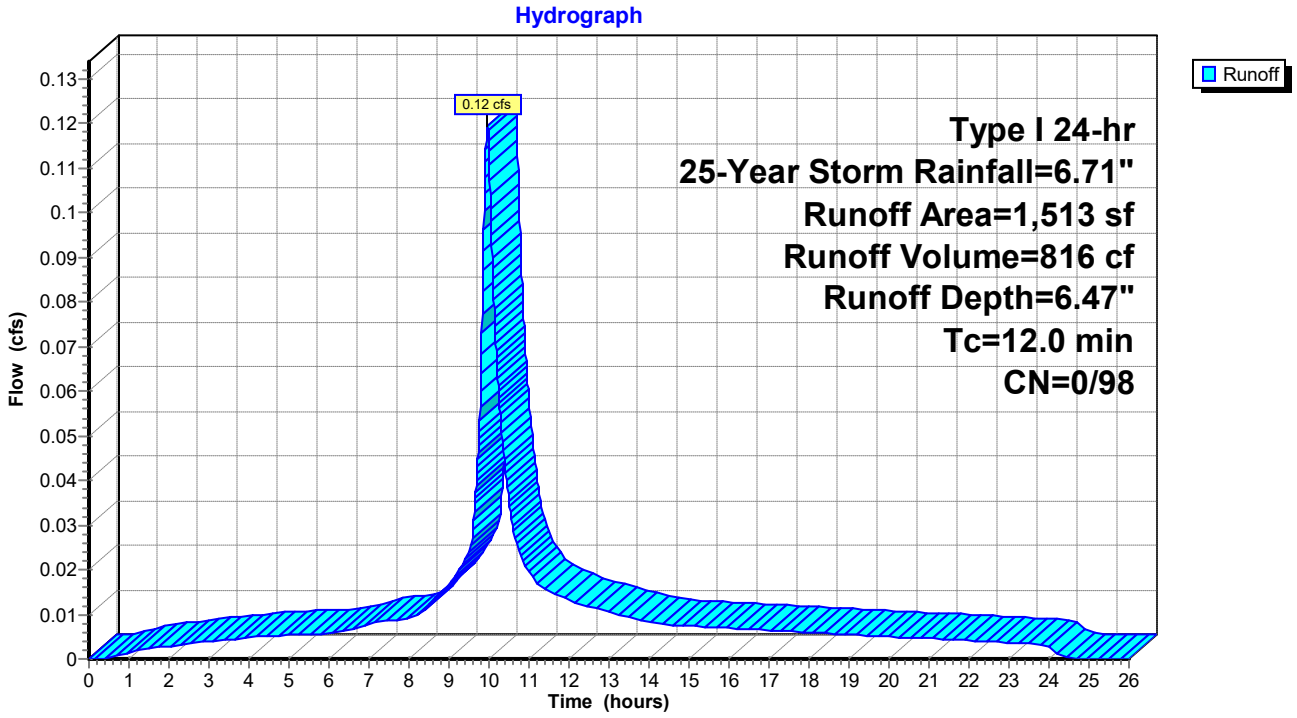
Runoff = 0.12 cfs @ 9.96 hrs, Volume= 816 cf, Depth= 6.47"
Routed to Pond 1P : BMP B

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 25-Year Storm Rainfall=6.71"

Area (sf)	CN	Description
1,513	98	Unconnected pavement, HSG C
1,513	98	100.00% Impervious Area

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

Subcatchment 5S: DMA C



Summary for Subcatchment D1: DMA A

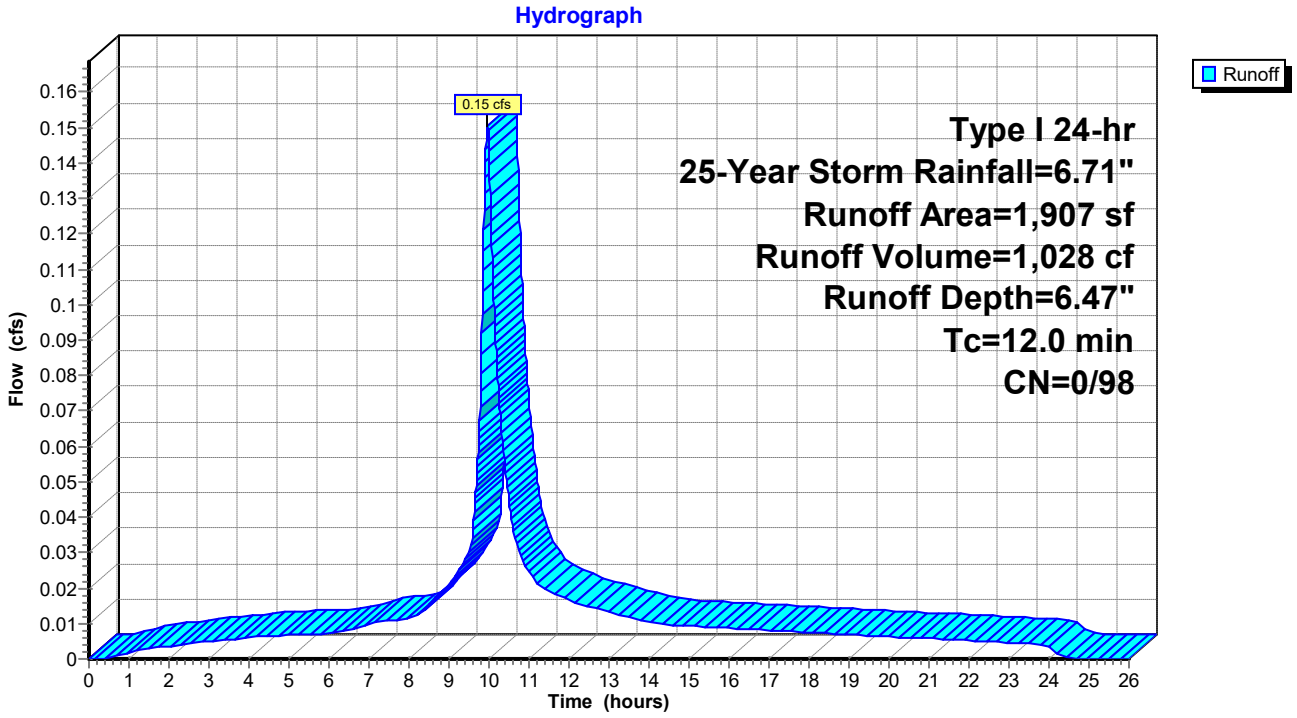
Runoff = 0.15 cfs @ 9.96 hrs, Volume= 1,028 cf, Depth= 6.47"
Routed to Pond P1 : BMP A

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 25-Year Storm Rainfall=6.71"

Area (sf)	CN	Description
1,907	98	Paved parking, HSG C
1,907	98	100.00% Impervious Area

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

Subcatchment D1: DMA A



Summary for Subcatchment D2: DMA B

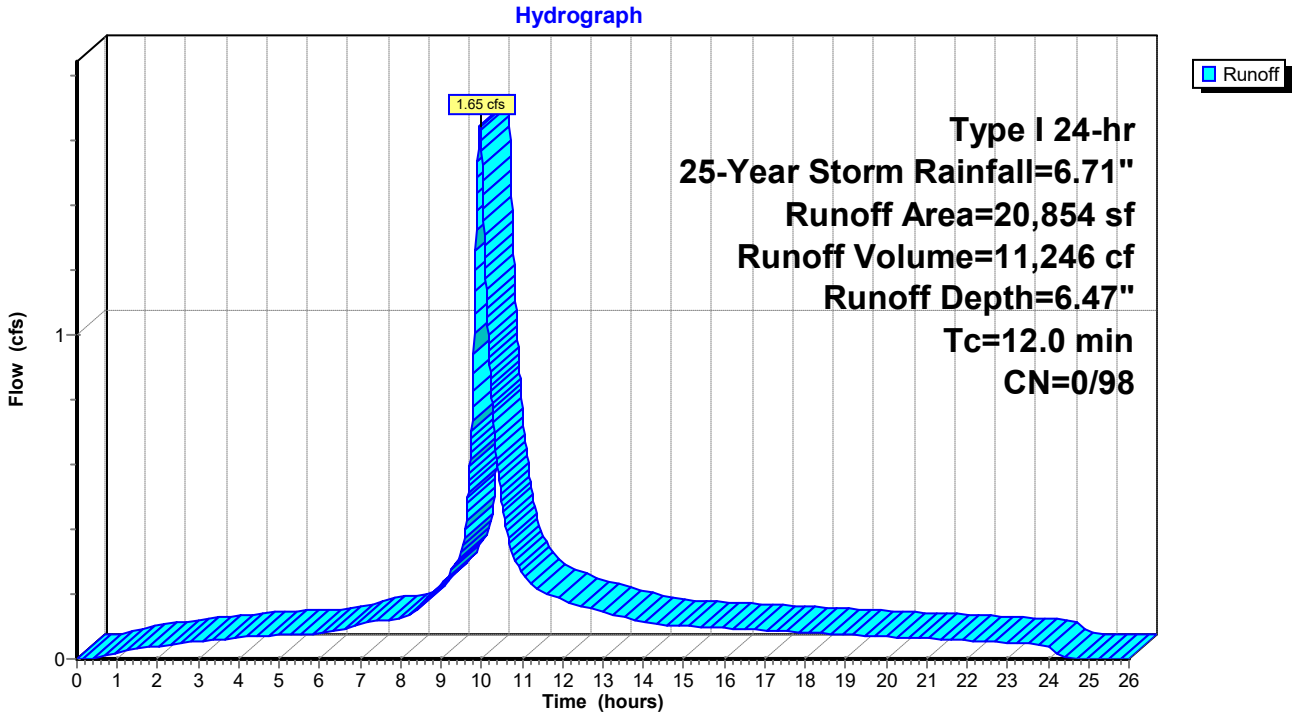
Runoff = 1.65 cfs @ 9.96 hrs, Volume= 11,246 cf, Depth= 6.47"
Routed to Pond 1P : BMP B

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 25-Year Storm Rainfall=6.71"

Area (sf)	CN	Description
20,854	98	Paved parking, HSG C
20,854	98	100.00% Impervious Area

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

Subcatchment D2: DMA B



Summary for Subcatchment Ex.: Proposed (Pre bmp)

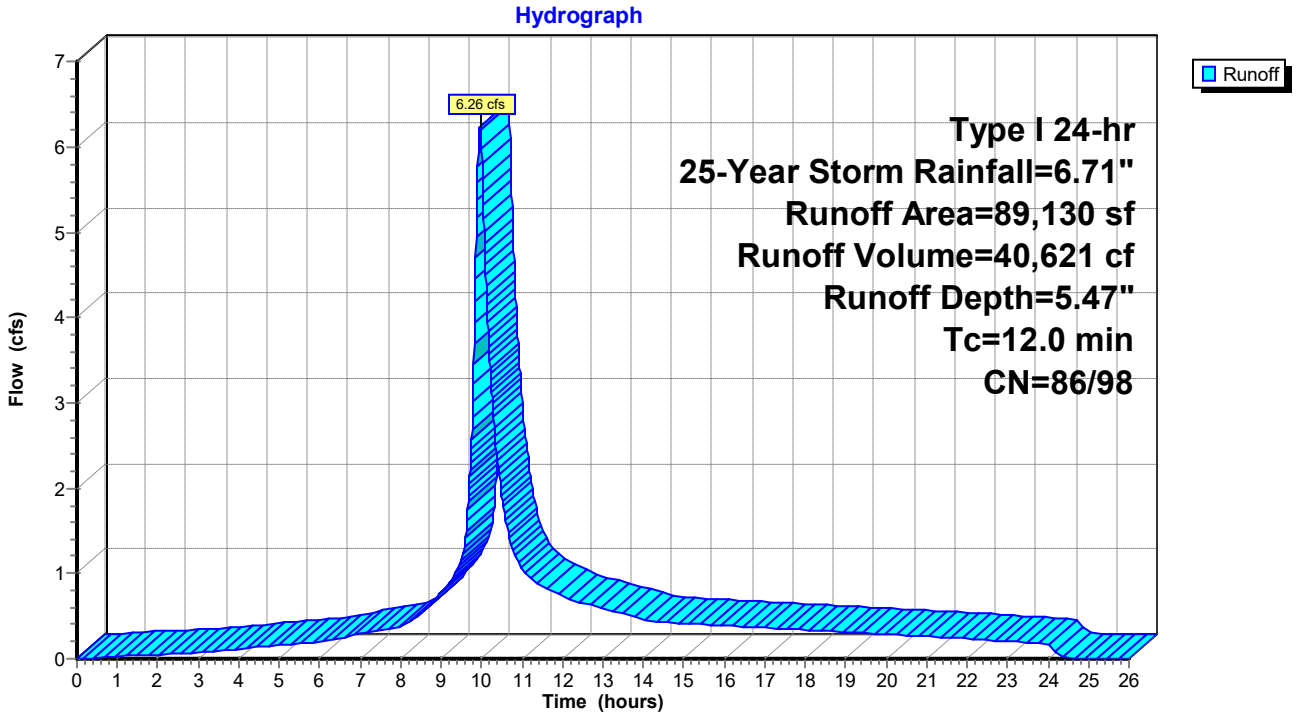
Runoff = 6.26 cfs @ 9.96 hrs, Volume= 40,621 cf, Depth= 5.47"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 25-Year Storm Rainfall=6.71"

Area (sf)	CN	Description
24,586	98	Paved parking, HSG C
64,544	86	<50% Grass cover, Poor, HSG C
89,130	89	Weighted Average
64,544	86	72.42% Pervious Area
24,586	98	27.58% Impervious Area

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

Subcatchment Ex.: Proposed (Pre bmp)



Summary for Pond 1P: BMP B

Inflow Area = 22,367 sf,100.00% Impervious, Inflow Depth = 6.47" for 25-Year Storm event
Inflow = 1.77 cfs @ 9.96 hrs, Volume= 12,062 cf
Outflow = 0.03 cfs @ 2.49 hrs, Volume= 2,386 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.03 cfs @ 2.49 hrs, Volume= 2,386 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 25.38' @ 24.11 hrs Surf.Area= 23,480 sf Storage= 9,842 cf

Plug-Flow detention time= 479.4 min calculated for 2,386 cf (20% of inflow)
Center-of-Mass det. time= 132.9 min (828.5 - 695.6)

Volume	Invert	Avail.Storage	Storage Description
#1	24.90'	33,811 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

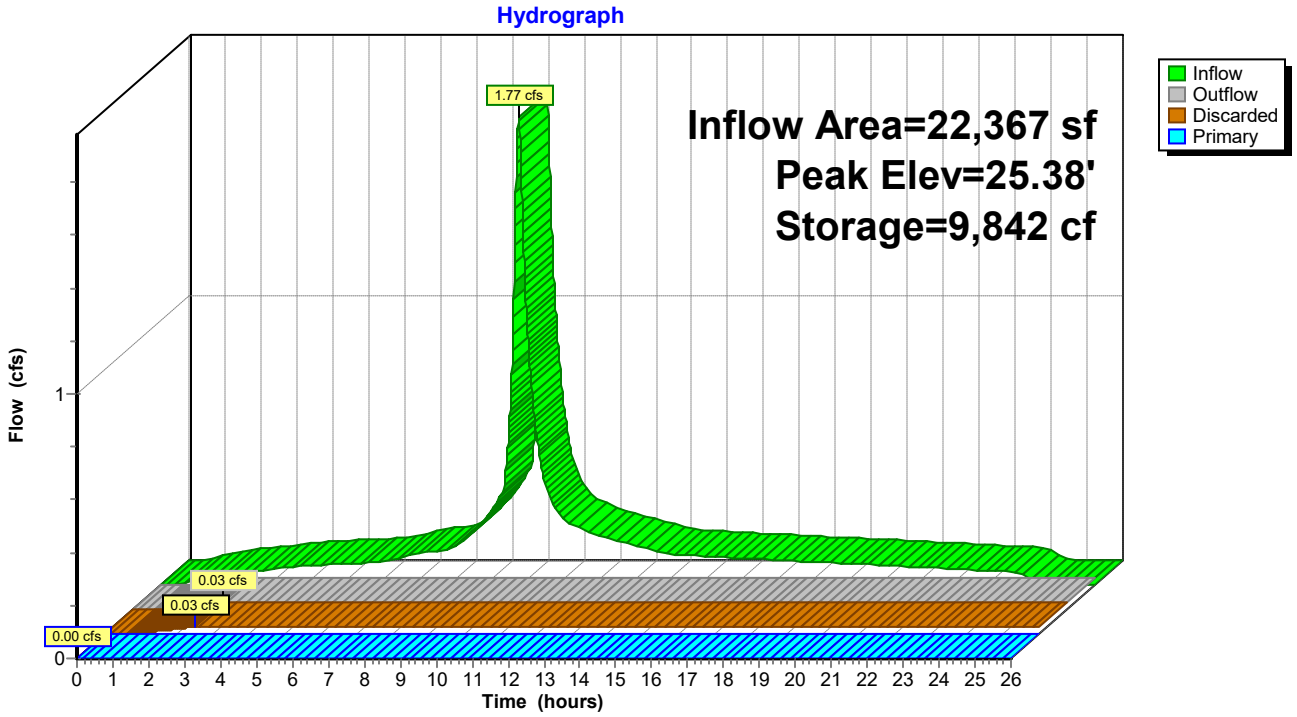
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.90	23,480	0.0	0	0
25.00	23,480	40.0	939	939
26.33	23,480	100.0	31,228	32,168
26.40	23,480	100.0	1,644	33,811

Device	Routing	Invert	Outlet Devices
#1	Discarded	24.90'	**0.050 in/hr Exfiltration over Horizontal area**
#2	Primary	26.33'	**12.0" x 12.0" Horiz. Orifice/Grate X 5.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 2.49 hrs HW=24.92' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.90' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: BMP B


Hydrograph
Inflow
Outflow
Discarded
Primary
1.77 cfs
0.03 cfs
0.03 cfs
0.00 cfs
Inflow Area=22,367 sf
Peak Elev=25.38'
Storage=9,842 cf
Flow (cfs)
0
1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Time (hours)

Summary for Pond 2P: BMP D

Inflow Area = 150 sf,100.00% Impervious, Inflow Depth = 6.47" for 25-Year Storm event
Inflow = 0.01 cfs @ 9.96 hrs, Volume= 81 cf
Outflow = 0.00 cfs @ 12.12 hrs, Volume= 27 cf, Atten= 89%, Lag= 129.4 min
Primary = 0.00 cfs @ 12.12 hrs, Volume= 27 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 39.30' @ 12.12 hrs Surf.Area= 20 sf Storage= 54 cf

Plug-Flow detention time= 576.0 min calculated for 27 cf (33% of inflow)
Center-of-Mass det. time= 319.8 min (1,015.4 - 695.6)

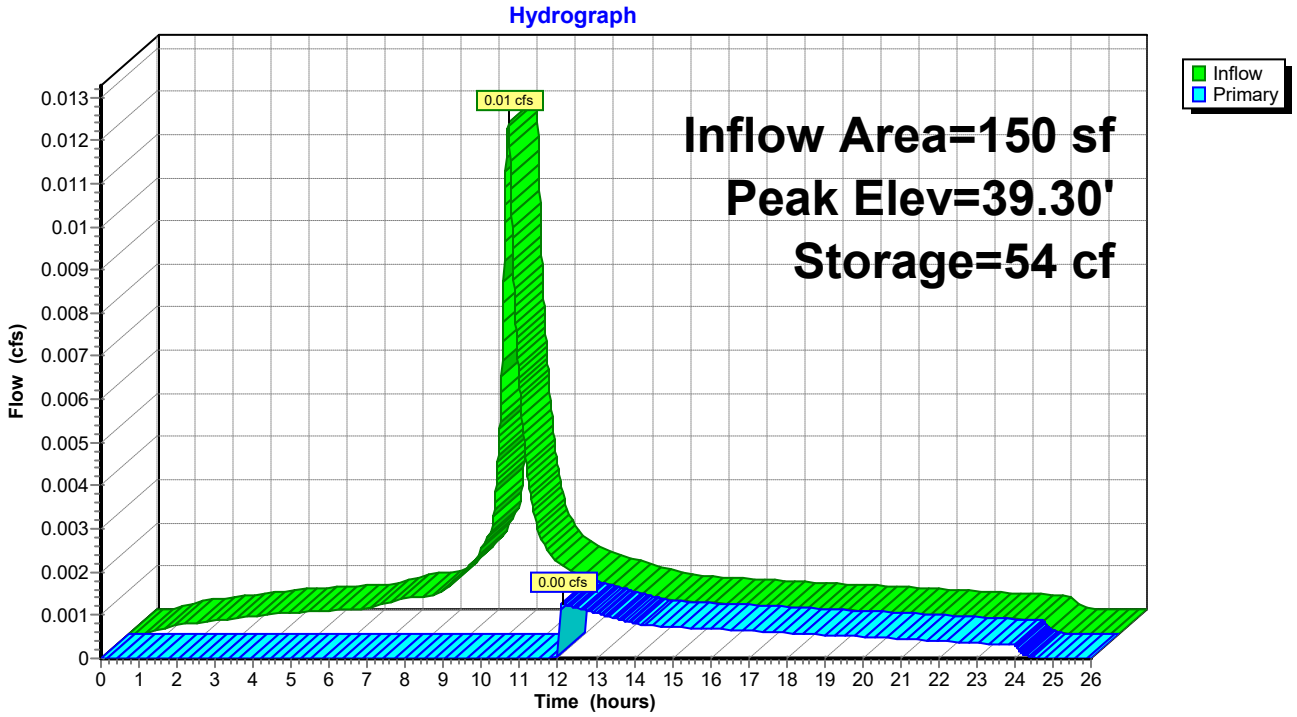
Volume	Invert	Avail.Storage	Storage Description
#1	34.30'	56 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.30	20	0.0	0	0
34.40	20	40.0	1	1
36.90	20	10.0	5	6
38.90	20	100.0	40	46
39.40	20	100.0	10	56

Device	Routing	Invert	Outlet Devices
#1	Primary	39.30'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 12.12 hrs HW=39.30' (Free Discharge)
↑**1=Orifice/Grate** (Weir Controls 0.00 cfs @ 0.13 fps)

Pond 2P: BMP D


Hydrograph
Inflow
Primary
0.01 cfs
0.00 cfs
Inflow Area=150 sf
Peak Elev=39.30'
Storage=54 cf
Flow (cfs)
0
0.001
0.002
0.003
0.004
0.005
0.006
0.007
0.008
0.009
0.01
0.011
0.012
0.013
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Time (hours)

Summary for Pond 4P: BMP E

Inflow Area = 162 sf,100.00% Impervious, Inflow Depth = 6.47" for 25-Year Storm event
Inflow = 0.01 cfs @ 9.96 hrs, Volume= 87 cf
Outflow = 0.00 cfs @ 11.34 hrs, Volume= 34 cf, Atten= 87%, Lag= 82.7 min
Primary = 0.00 cfs @ 11.34 hrs, Volume= 34 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 36.00' @ 11.34 hrs Surf.Area= 20 sf Storage= 54 cf

Plug-Flow detention time= 515.7 min calculated for 34 cf (38% of inflow)
Center-of-Mass det. time= 279.5 min (975.1 - 695.6)

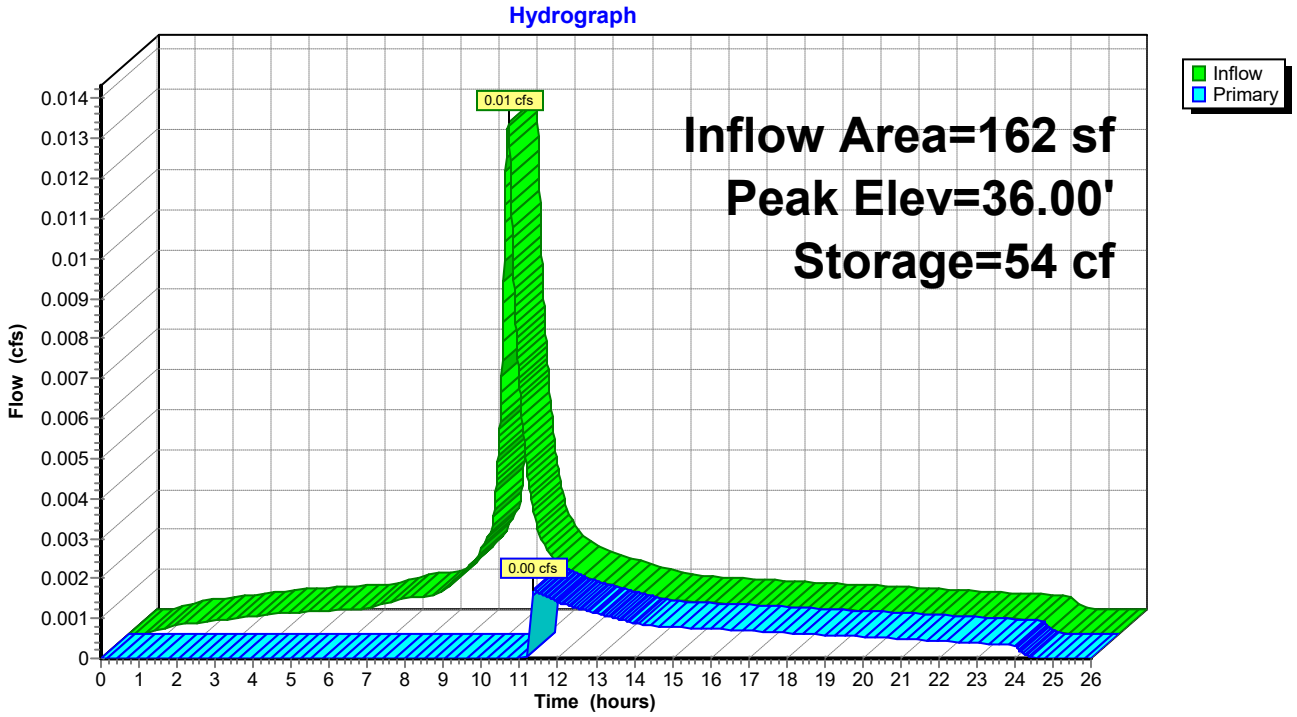
Volume	Invert	Avail.Storage	Storage Description
#1	31.00'	56 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.00	20	0.0	0	0
31.10	20	40.0	1	1
33.60	20	10.0	5	6
35.60	20	100.0	40	46
36.10	20	100.0	10	56

Device	Routing	Invert	Outlet Devices
#1	Primary	36.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 11.34 hrs HW=36.00' (Free Discharge)
↑**1=Orifice/Grate** (Weir Controls 0.00 cfs @ 0.16 fps)

Pond 4P: BMP E


Hydrograph
Inflow
Primary
0.01 cfs
0.00 cfs
Inflow Area=162 sf
Peak Elev=36.00'
Storage=54 cf
Flow (cfs)
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Time (hours)

Summary for Pond P1: BMP A

Inflow Area = 1,907 sf,100.00% Impervious, Inflow Depth = 6.47" for 25-Year Storm event
Inflow = 0.15 cfs @ 9.96 hrs, Volume= 1,028 cf
Outflow = 0.03 cfs @ 10.79 hrs, Volume= 463 cf, Atten= 81%, Lag= 49.9 min
Primary = 0.03 cfs @ 10.79 hrs, Volume= 463 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 39.84' @ 10.79 hrs Surf.Area= 210 sf Storage= 573 cf

Plug-Flow detention time= 451.3 min calculated for 463 cf (45% of inflow)
Center-of-Mass det. time= 236.4 min (932.0 - 695.6)

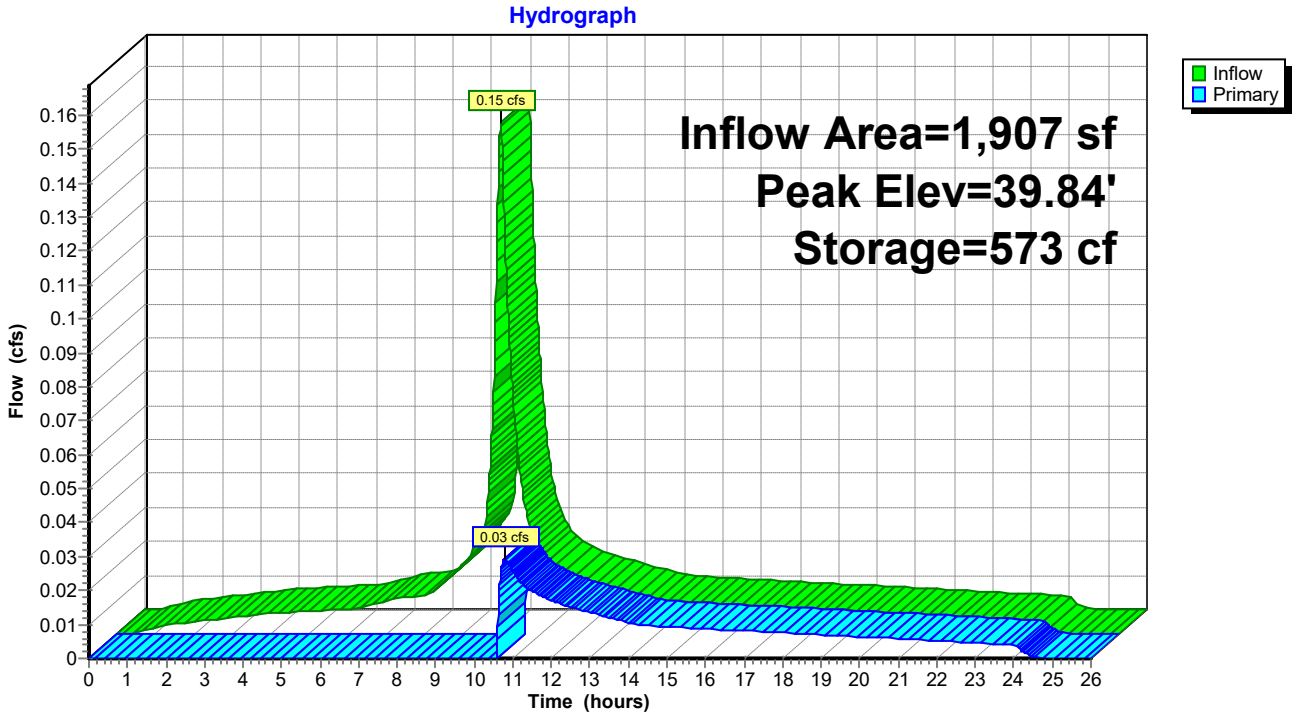
Volume	Invert	Avail.Storage	Storage Description
#1	34.80'	586 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.80	210	0.0	0	0
34.90	210	40.0	8	8
37.40	210	10.0	53	61
39.40	210	100.0	420	481
39.90	210	100.0	105	586

Device	Routing	Invert	Outlet Devices
#1	Primary	39.80'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.03 cfs @ 10.79 hrs HW=39.84' (Free Discharge)
↑**1=Orifice/Grate** (Weir Controls 0.03 cfs @ 0.64 fps)

Pond P1: BMP A


Hydrograph
Inflow Area=1,907 sf
Peak Elev=39.84'
Storage=573 cf
0.15 cfs
0.03 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0 0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.1 0.11 0.12 0.13 0.14 0.15 0.16
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Summary for Subcatchment 1S: DMA H

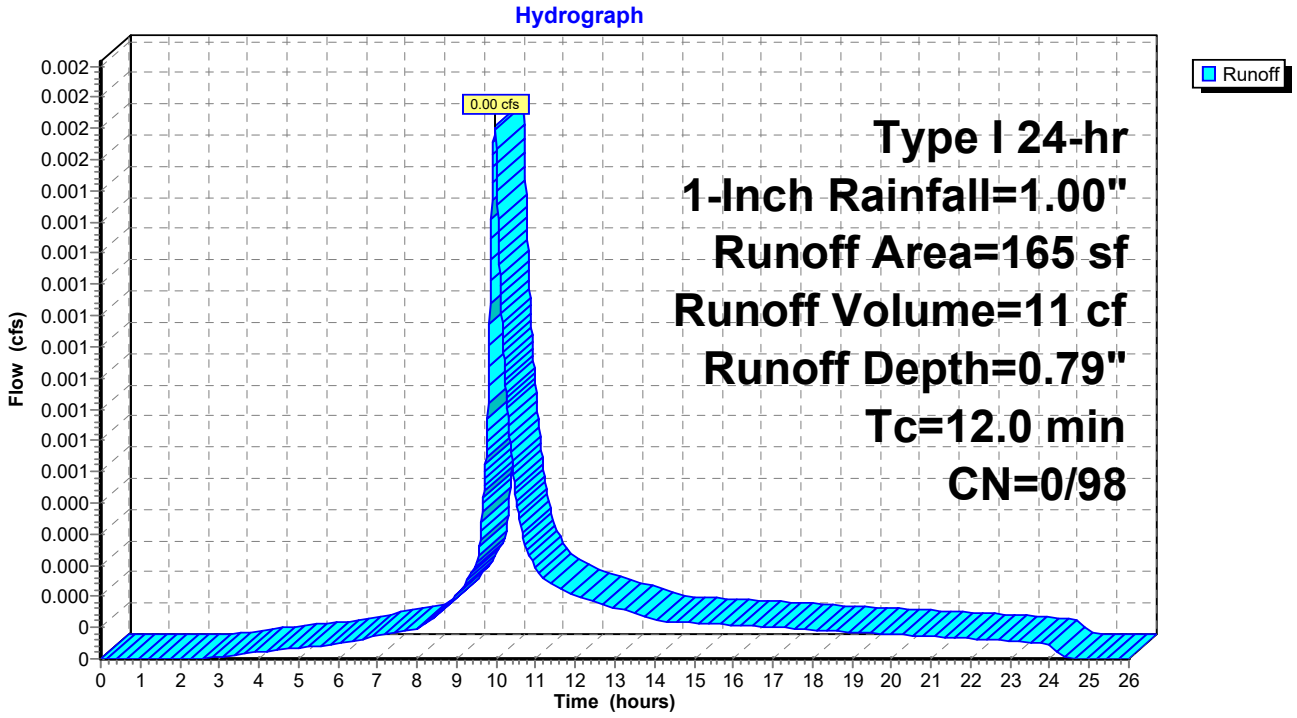
Runoff = 0.00 cfs @ 9.96 hrs, Volume= 11 cf, Depth= 0.79"
Routed to Pond 1P : BMP G

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
165	98	Unconnected pavement, HSG C
165	98	100.00% Impervious Area

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

Subcatchment 1S: DMA H



Summary for Subcatchment D1: DMA F

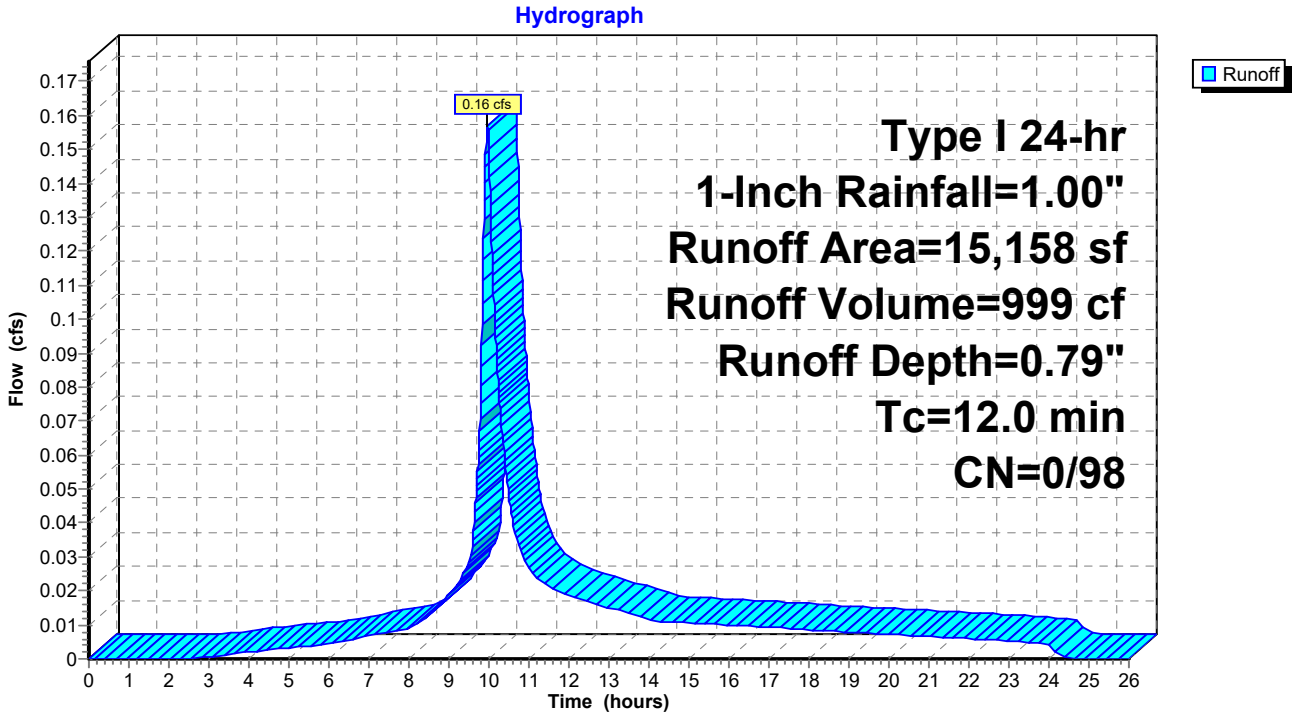
Runoff = 0.16 cfs @ 9.96 hrs, Volume= 999 cf, Depth= 0.79"
Routed to Pond P1 : BMP F

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
15,158	98	Paved parking, HSG C
15,158	98	100.00% Impervious Area

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

Subcatchment D1: DMA F



Summary for Subcatchment D2: DMA G

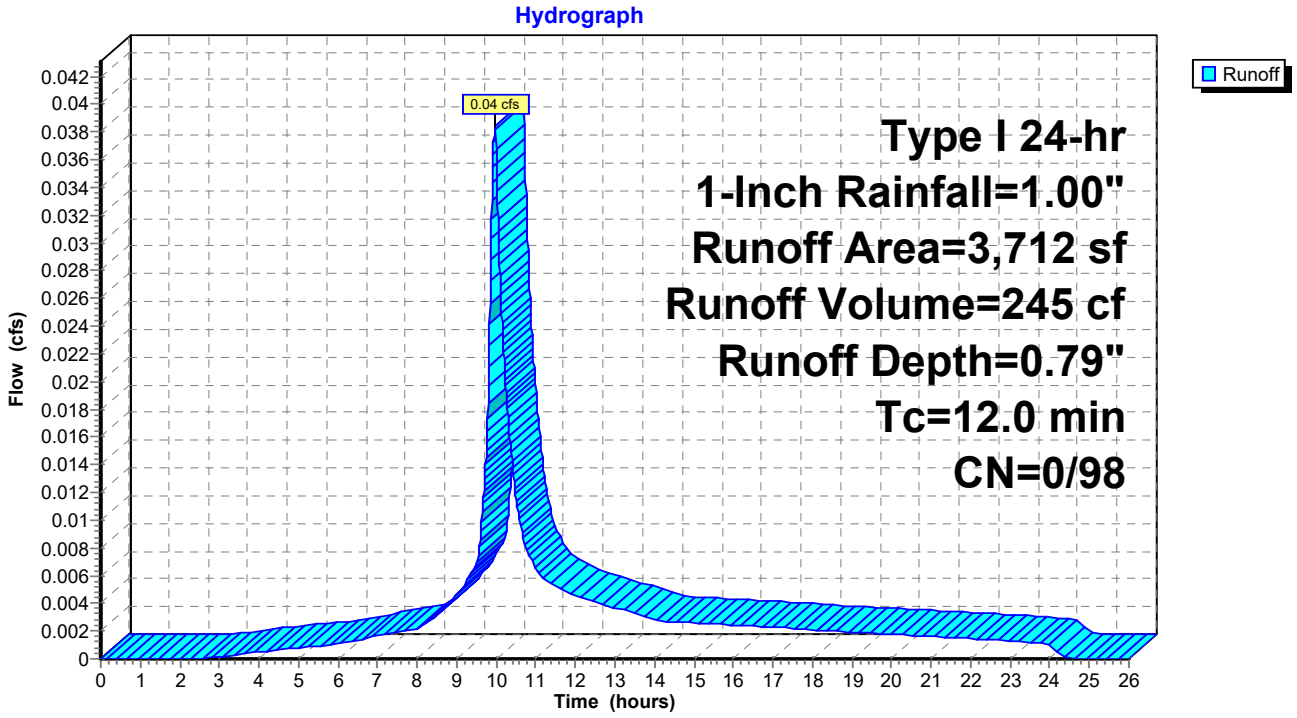
Runoff = 0.04 cfs @ 9.96 hrs, Volume= 245 cf, Depth= 0.79"
Routed to Pond 1P : BMP G

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
3,712	98	Paved parking, HSG C
3,712	98	100.00% Impervious Area

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

Subcatchment D2: DMA G



Summary for Subcatchment Pr: Proposed (pre-bmp)

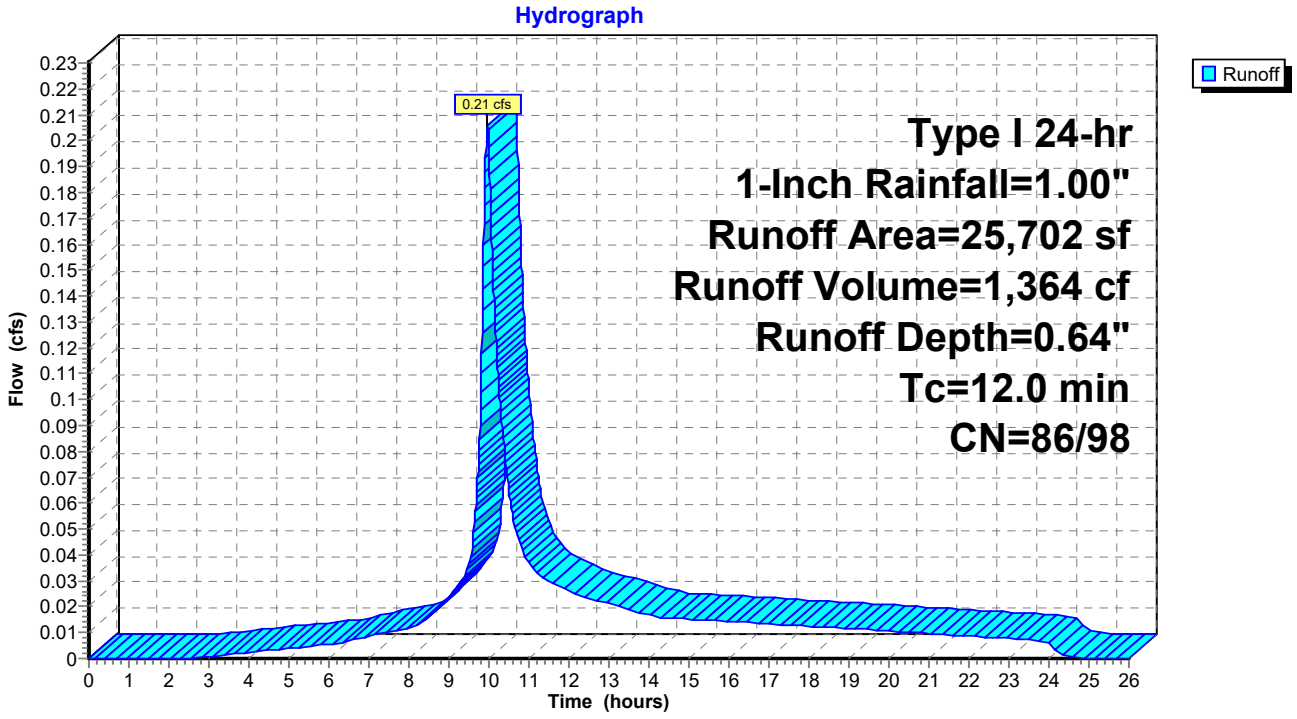
Runoff = 0.21 cfs @ 9.97 hrs, Volume= 1,364 cf, Depth= 0.64"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
19,035	98	Paved parking, HSG C
6,667	86	<50% Grass cover, Poor, HSG C
25,702	95	Weighted Average
6,667	86	25.94% Pervious Area
19,035	98	74.06% Impervious Area

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

Subcatchment Pr: Proposed (pre-bmp)



Summary for Pond 1P: BMP G

Inflow Area = 3,877 sf,100.00% Impervious, Inflow Depth = 0.79" for 1-Inch event
Inflow = 0.04 cfs @ 9.96 hrs, Volume= 256 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 20.60' @ 26.00 hrs Surf.Area= 201 sf Storage= 256 cf

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

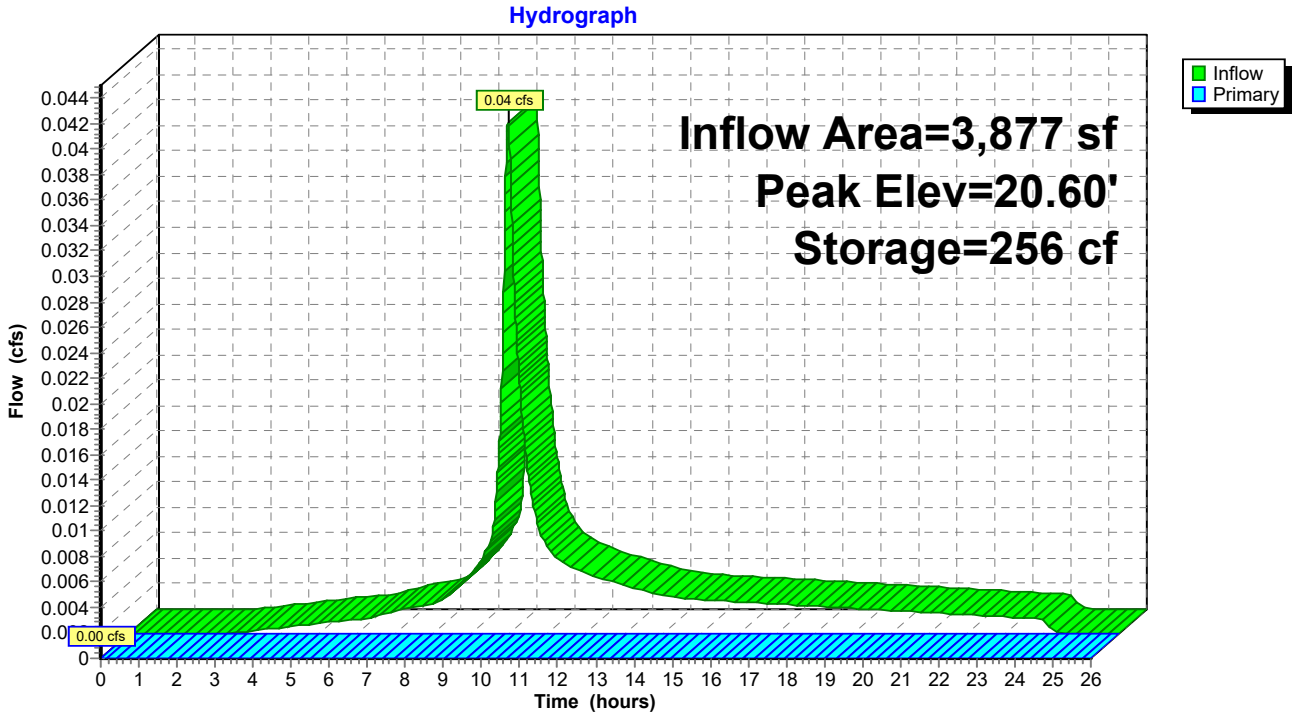
Volume	Invert	Avail.Storage	Storage Description
#1A	18.25'	180 cf	**6.25'W x 32.10'L x 3.75'H Field A** 752 cf Overall - 190 cf Embedded = 562 cf x 32.0% Voids
#2A	19.00'	190 cf	**ADS_StormTech DC-780 b +Cap**x 4 Inside #1 Effective Size= 45.4"W x 30.0"H => 6.49 sf x 7.12'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Cap Storage= 2.7 cf x 2 x 1 rows = 5.3 cf
		370 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.25' (Free Discharge)
↑—**1=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: BMP G


Hydrograph
Inflow
Primary
0.04 cfs
0.00 cfs
Inflow Area=3,877 sf
Peak Elev=20.60'
Storage=256 cf
Flow (cfs)
0.044
0.042
0.04
0.038
0.036
0.034
0.032
0.03
0.028
0.026
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.0
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Time (hours)

Summary for Pond P1: BMP F

Inflow Area = 15,158 sf,100.00% Impervious, Inflow Depth = 0.79" for 1-Inch event
Inflow = 0.16 cfs @ 9.96 hrs, Volume= 999 cf
Outflow = 0.01 cfs @ 21.41 hrs, Volume= 82 cf, Atten= 96%, Lag= 686.8 min
Primary = 0.01 cfs @ 21.41 hrs, Volume= 82 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 26.04' @ 21.41 hrs Surf.Area= 601 sf Storage= 927 cf

Plug-Flow detention time= 968.2 min calculated for 82 cf (8% of inflow)
Center-of-Mass det. time= 602.5 min (1,353.3 - 750.8)

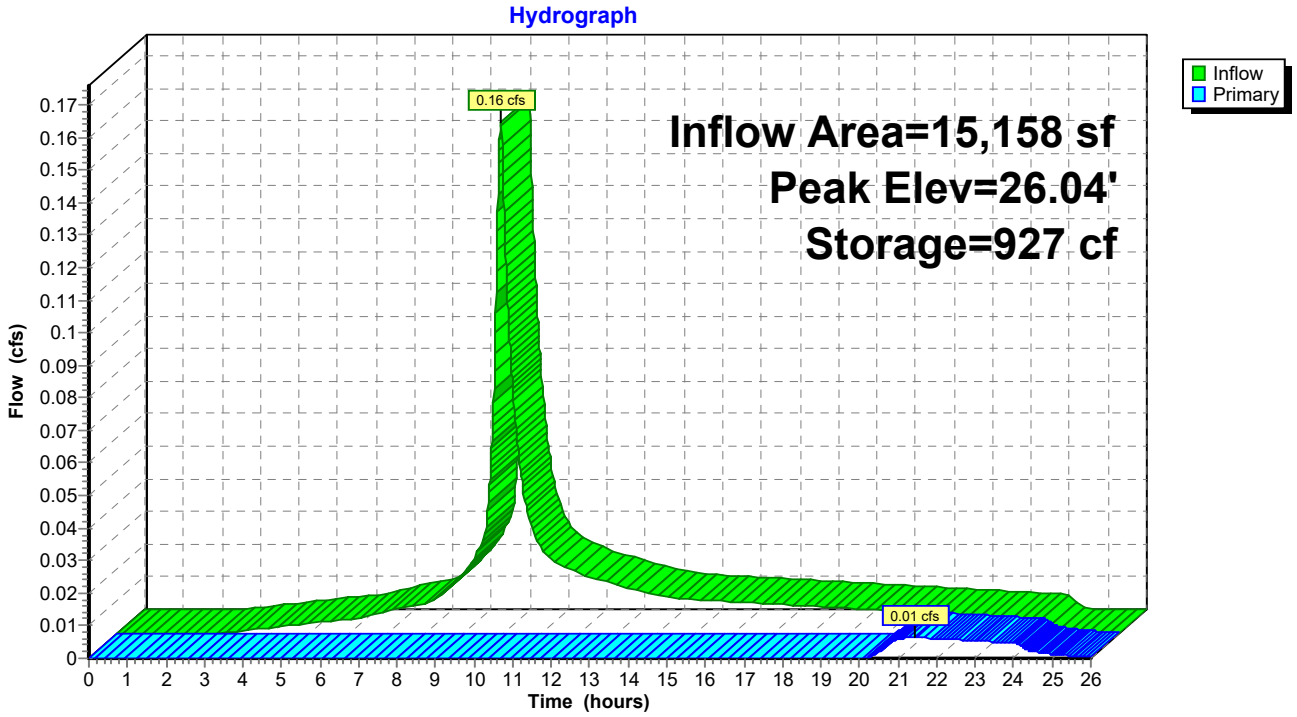
Volume	Invert	Avail.Storage	Storage Description
#1A	23.25'	527 cf	**6.25'W x 96.18'L x 3.75'H Field A** 2,254 cf Overall - 606 cf Embedded = 1,648 cf x 32.0% Voids
#2A	24.00'	606 cf	**ADS_StormTech DC-780 b +Cap**x 13 Inside #1 Effective Size= 45.4"W x 30.0"H => 6.49 sf x 7.12'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Cap Storage= 2.7 cf x 2 x 1 rows = 5.3 cf
		1,134 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.01 cfs @ 21.41 hrs HW=26.04' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.01 cfs @ 0.66 fps)

Pond P1: BMP F


Hydrograph
Inflow Area=15,158 sf
Peak Elev=26.04'
Storage=927 cf
0.16 cfs
0.01 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0 0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.1 0.11 0.12 0.13 0.14 0.15 0.16 0.17
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Summary for Subcatchment 1S: DMA H

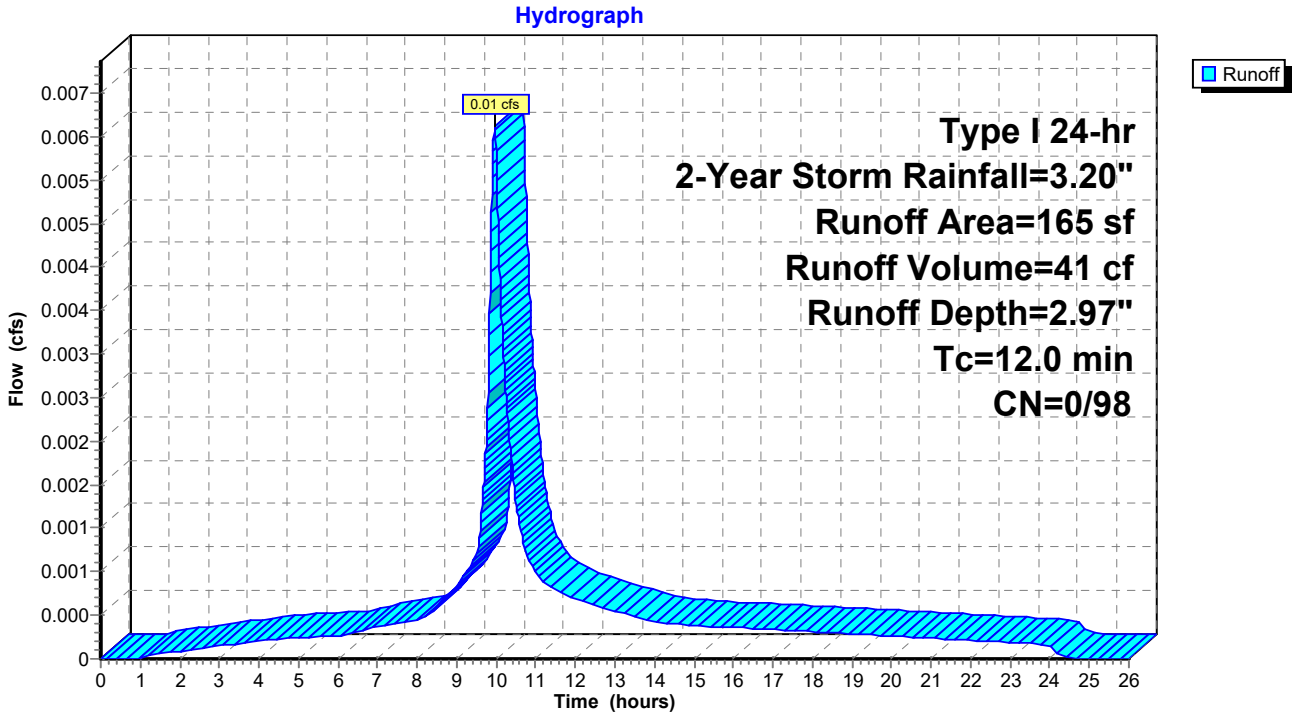
Runoff = 0.01 cfs @ 9.96 hrs, Volume= 41 cf, Depth= 2.97"
Routed to Pond 1P : BMP G

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
165	98	Unconnected pavement, HSG C
165	98	100.00% Impervious Area

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

Subcatchment 1S: DMA H



Summary for Subcatchment D1: DMA F

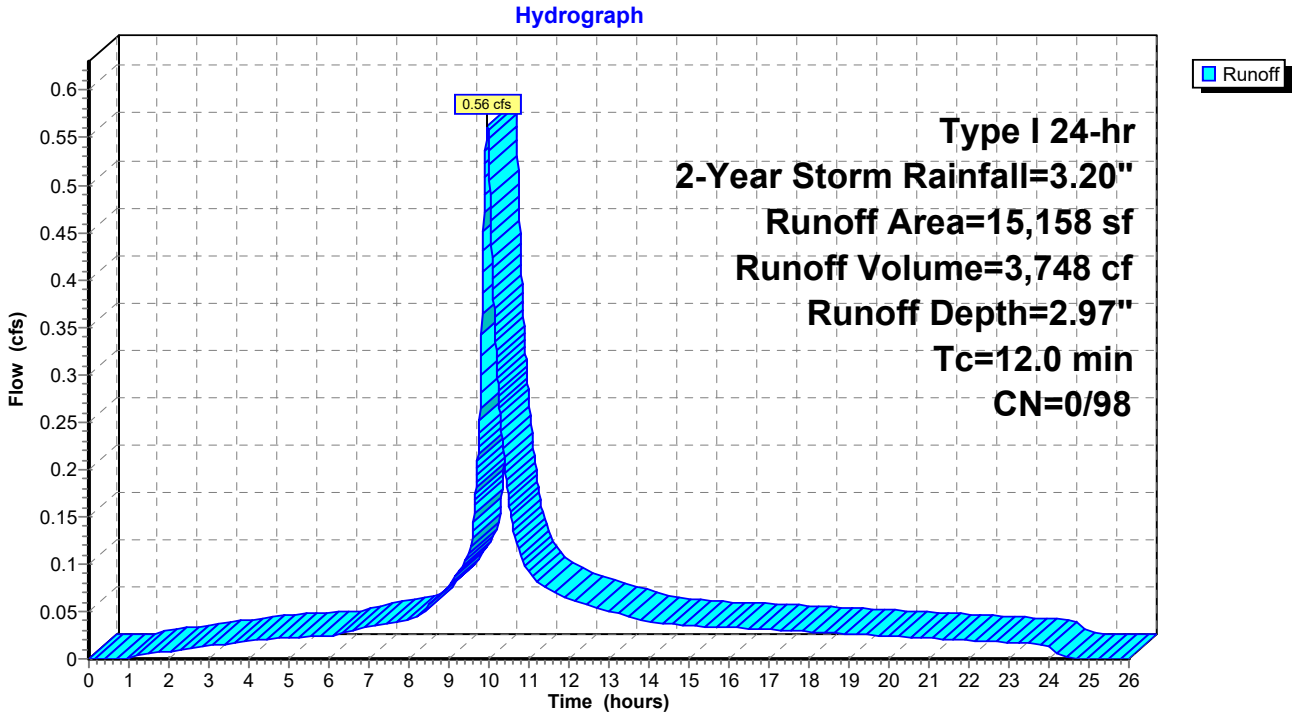
Runoff = 0.56 cfs @ 9.96 hrs, Volume= 3,748 cf, Depth= 2.97"
Routed to Pond P1 : BMP F

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
15,158	98	Paved parking, HSG C
15,158	98	100.00% Impervious Area

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

Subcatchment D1: DMA F



Summary for Subcatchment D2: DMA G

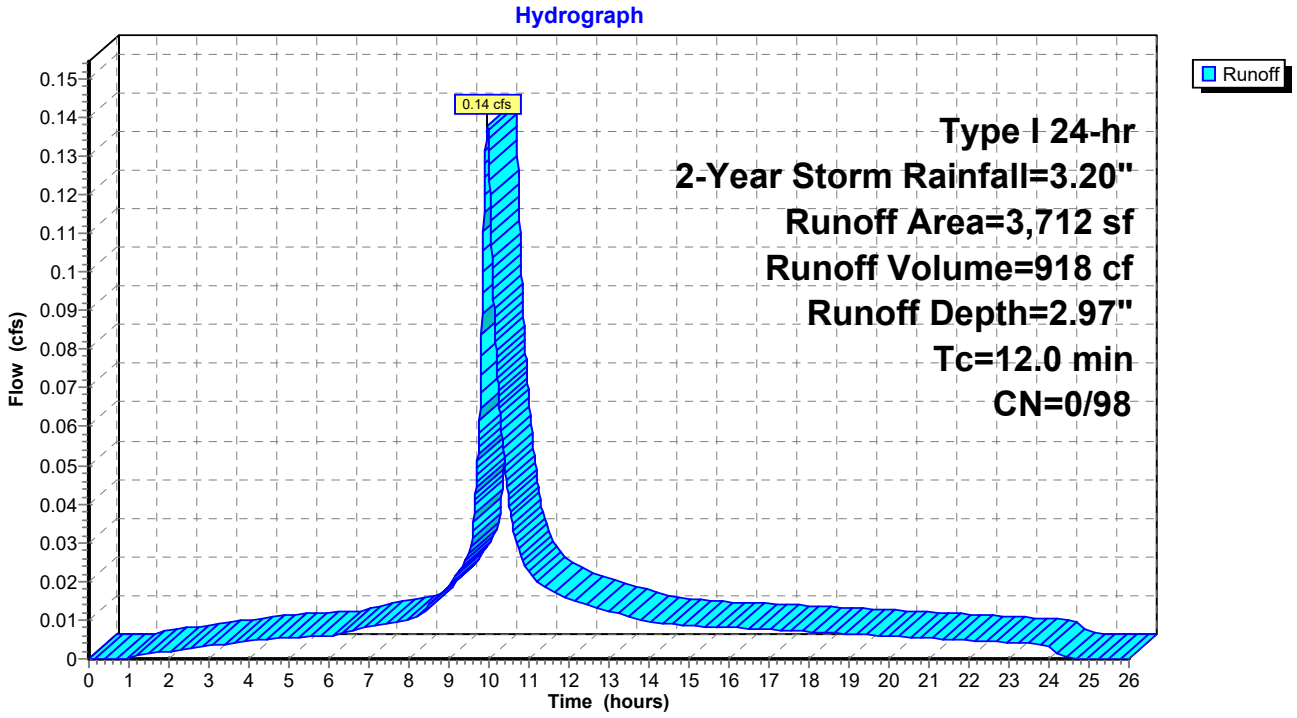
Runoff = 0.14 cfs @ 9.96 hrs, Volume= 918 cf, Depth= 2.97"
Routed to Pond 1P : BMP G

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
3,712	98	Paved parking, HSG C
3,712	98	100.00% Impervious Area

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

Subcatchment D2: DMA G



Summary for Subcatchment Pr: Proposed (pre-bmp)

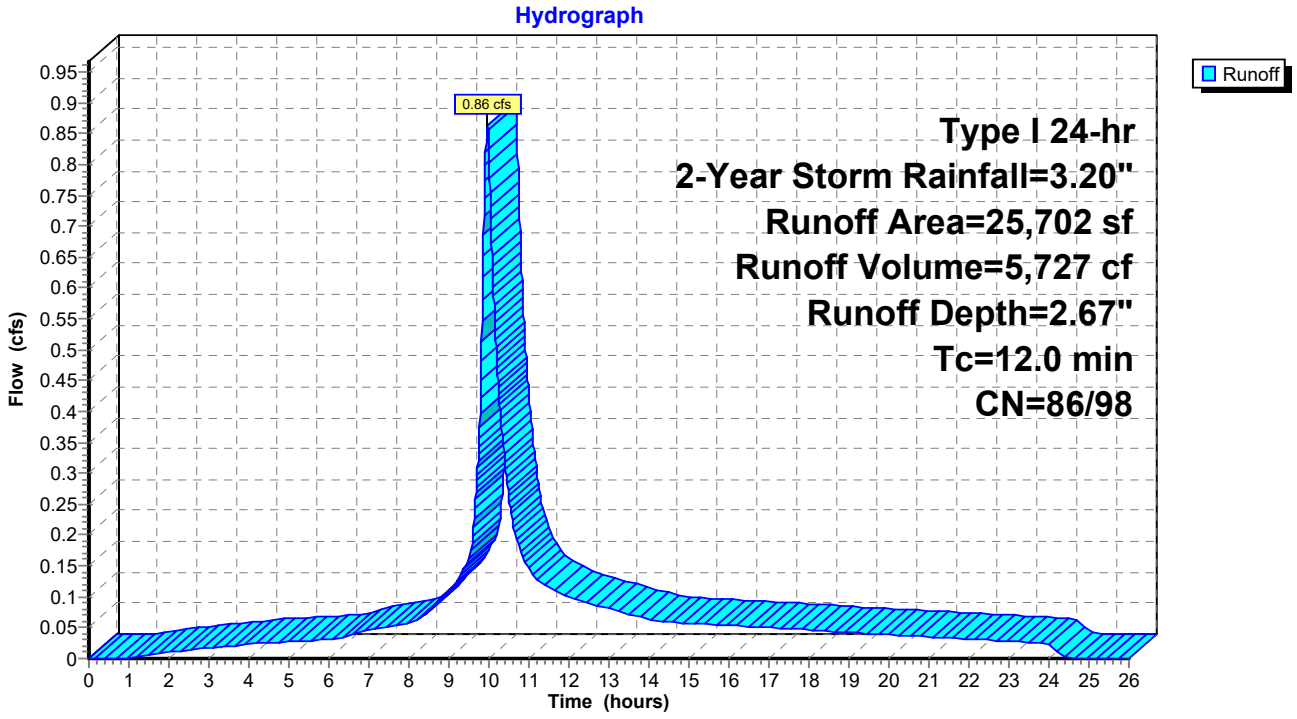
Runoff = 0.86 cfs @ 9.96 hrs, Volume= 5,727 cf, Depth= 2.67"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 2-Year Storm Rainfall=3.20"

Area (sf)	CN	Description
19,035	98	Paved parking, HSG C
6,667	86	<50% Grass cover, Poor, HSG C
25,702	95	Weighted Average
6,667	86	25.94% Pervious Area
19,035	98	74.06% Impervious Area

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

Subcatchment Pr: Proposed (pre-bmp)



Summary for Pond 1P: BMP G

Inflow Area = 3,877 sf,100.00% Impervious, Inflow Depth = 2.97" for 2-Year Storm event
Inflow = 0.14 cfs @ 9.96 hrs, Volume= 959 cf
Outflow = 0.14 cfs @ 9.98 hrs, Volume= 661 cf, Atten= 1%, Lag= 1.3 min
Primary = 0.14 cfs @ 9.98 hrs, Volume= 661 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 21.13' @ 9.98 hrs Surf.Area= 201 sf Storage= 310 cf

Plug-Flow detention time= 268.1 min calculated for 661 cf (69% of inflow)
Center-of-Mass det. time= 116.7 min (827.0 - 710.3)

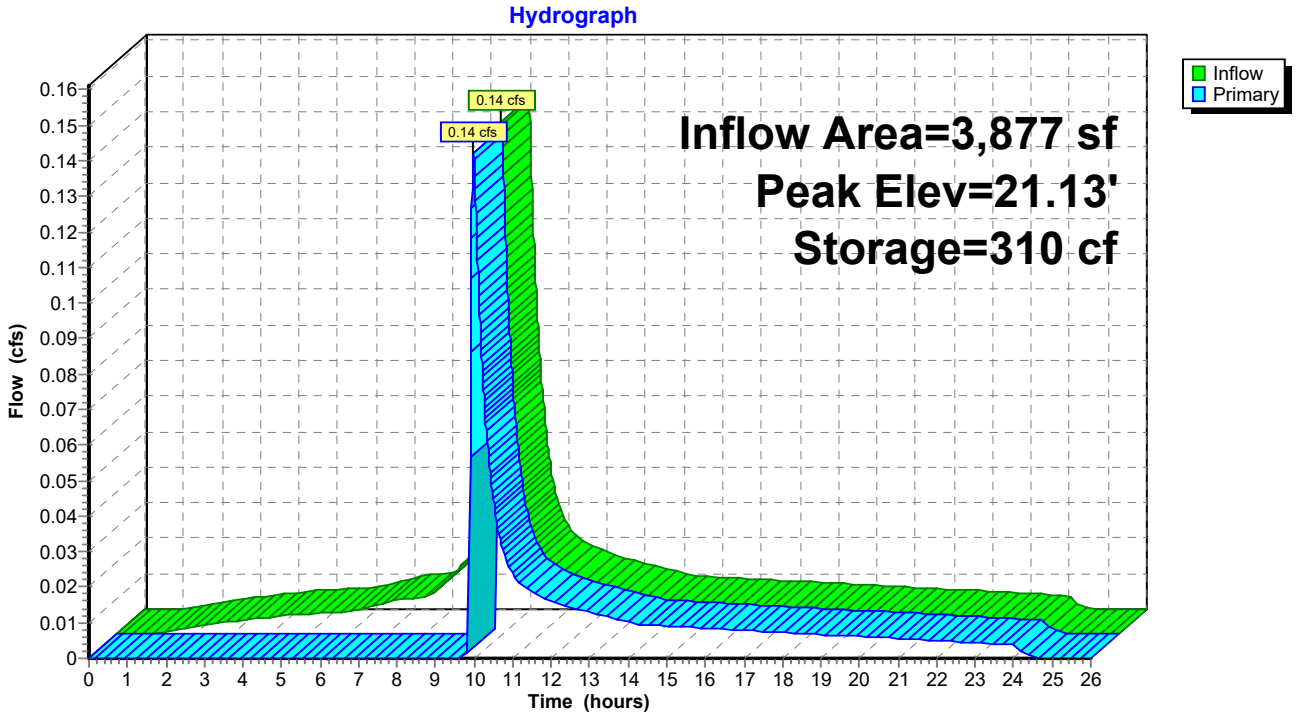
Volume	Invert	Avail.Storage	Storage Description
#1A	18.25'	180 cf	**6.25'W x 32.10'L x 3.75'H Field A** 752 cf Overall - 190 cf Embedded = 562 cf x 32.0% Voids
#2A	19.00'	190 cf	**ADS_StormTech DC-780 b +Cap**x 4 Inside #1 Effective Size= 45.4"W x 30.0"H => 6.49 sf x 7.12'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Cap Storage= 2.7 cf x 2 x 1 rows = 5.3 cf
		370 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.15 cfs @ 9.98 hrs HW=21.13' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.15 cfs @ 1.71 fps)

Pond 1P: BMP G


Hydrograph
Inflow Area=3,877 sf
Peak Elev=21.13'
Storage=310 cf
0.14 cfs
0.14 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
0.11
0.12
0.13
0.14
0.15
0.16
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Summary for Pond P1: BMP F

Inflow Area = 15,158 sf,100.00% Impervious, Inflow Depth = 2.97" for 2-Year Storm event
Inflow = 0.56 cfs @ 9.96 hrs, Volume= 3,748 cf
Outflow = 0.55 cfs @ 9.99 hrs, Volume= 2,831 cf, Atten= 2%, Lag= 1.5 min
Primary = 0.55 cfs @ 9.99 hrs, Volume= 2,831 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 26.44' @ 9.99 hrs Surf.Area= 601 sf Storage= 1,026 cf

Plug-Flow detention time= 232.5 min calculated for 2,830 cf (75% of inflow)
Center-of-Mass det. time= 102.8 min (813.1 - 710.3)

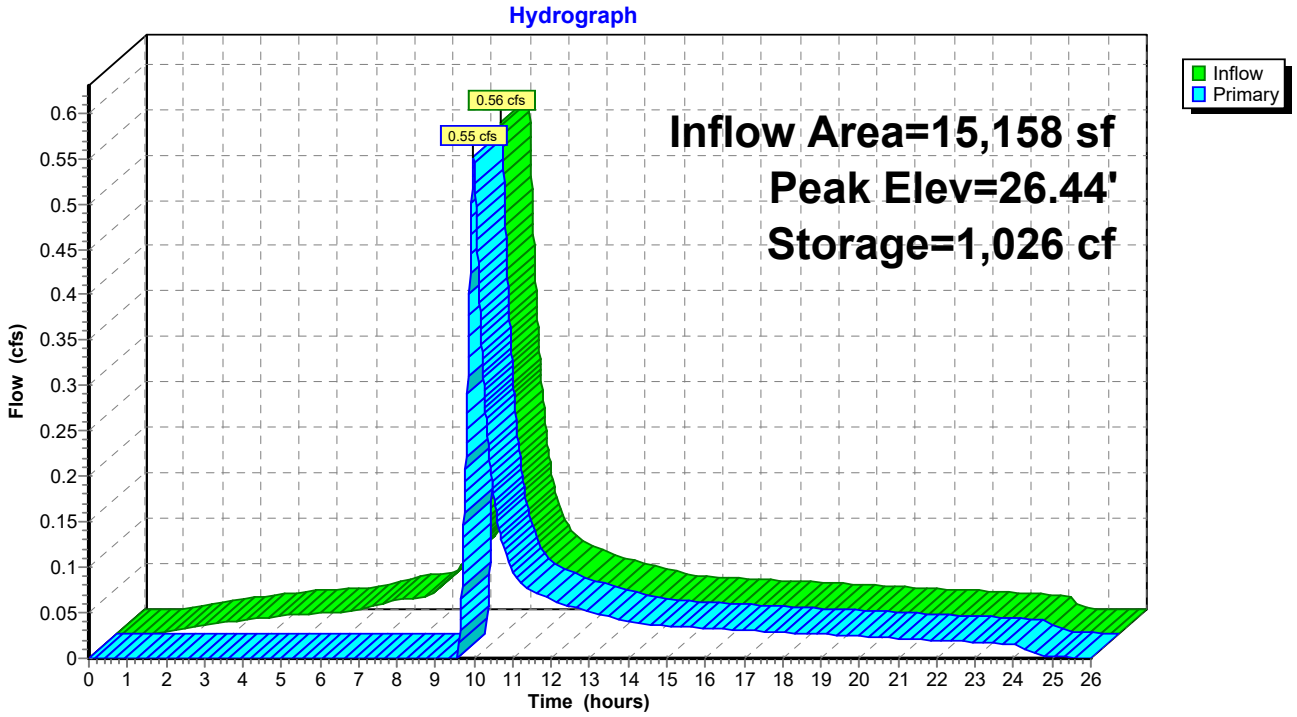
Volume	Invert	Avail.Storage	Storage Description
#1A	23.25'	527 cf	**6.25'W x 96.18'L x 3.75'H Field A** 2,254 cf Overall - 606 cf Embedded = 1,648 cf x 32.0% Voids
#2A	24.00'	606 cf	**ADS_StormTech DC-780 b +Cap**x 13 Inside #1 Effective Size= 45.4"W x 30.0"H => 6.49 sf x 7.12'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Cap Storage= 2.7 cf x 2 x 1 rows = 5.3 cf
		1,134 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.55 cfs @ 9.99 hrs HW=26.44' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.55 cfs @ 2.26 fps)

Pond P1: BMP F


Hydrograph
Inflow
Primary
0.56 cfs
0.55 cfs
Inflow Area=15,158 sf
Peak Elev=26.44'
Storage=1,026 cf
Flow (cfs)
Time (hours)
0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5 0.55 0.6
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Summary for Subcatchment 1S: DMA H

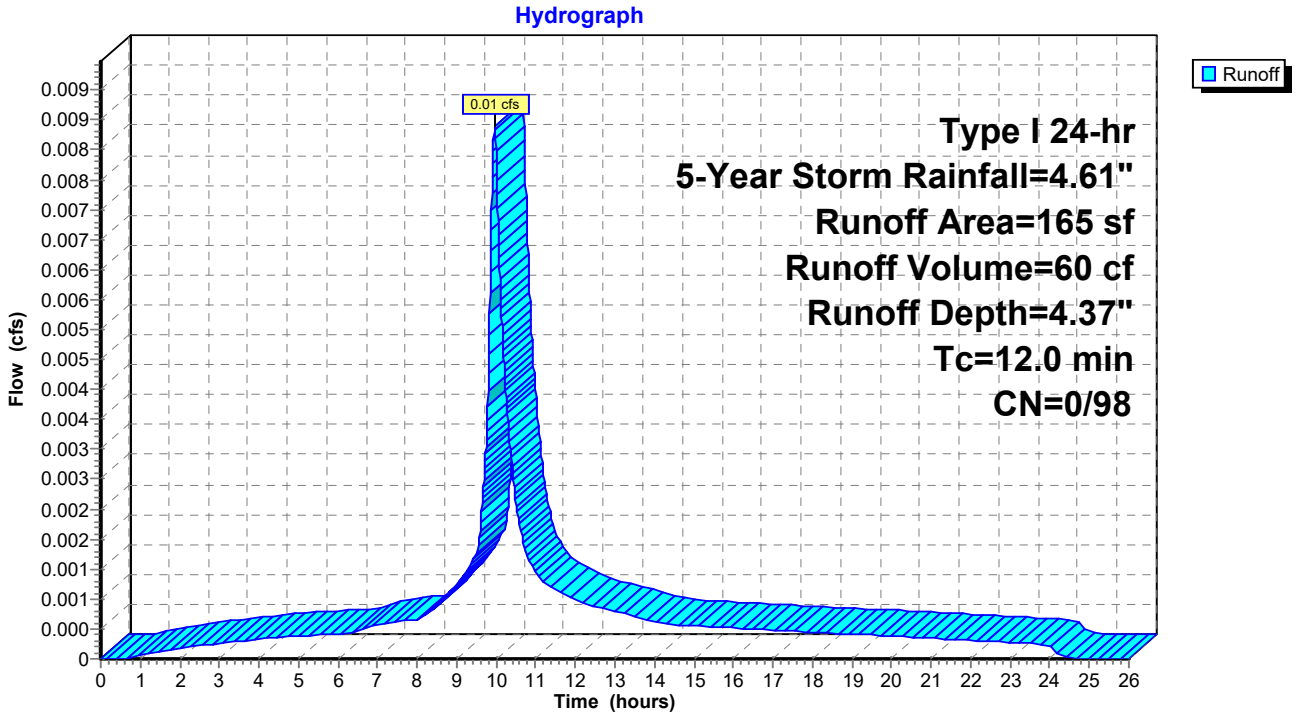
Runoff = 0.01 cfs @ 9.96 hrs, Volume= 60 cf, Depth= 4.37"
Routed to Pond 1P : BMP G

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 5-Year Storm Rainfall=4.61"

Area (sf)	CN	Description
165	98	Unconnected pavement, HSG C
165	98	100.00% Impervious Area

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

Subcatchment 1S: DMA H



Summary for Subcatchment D1: DMA F

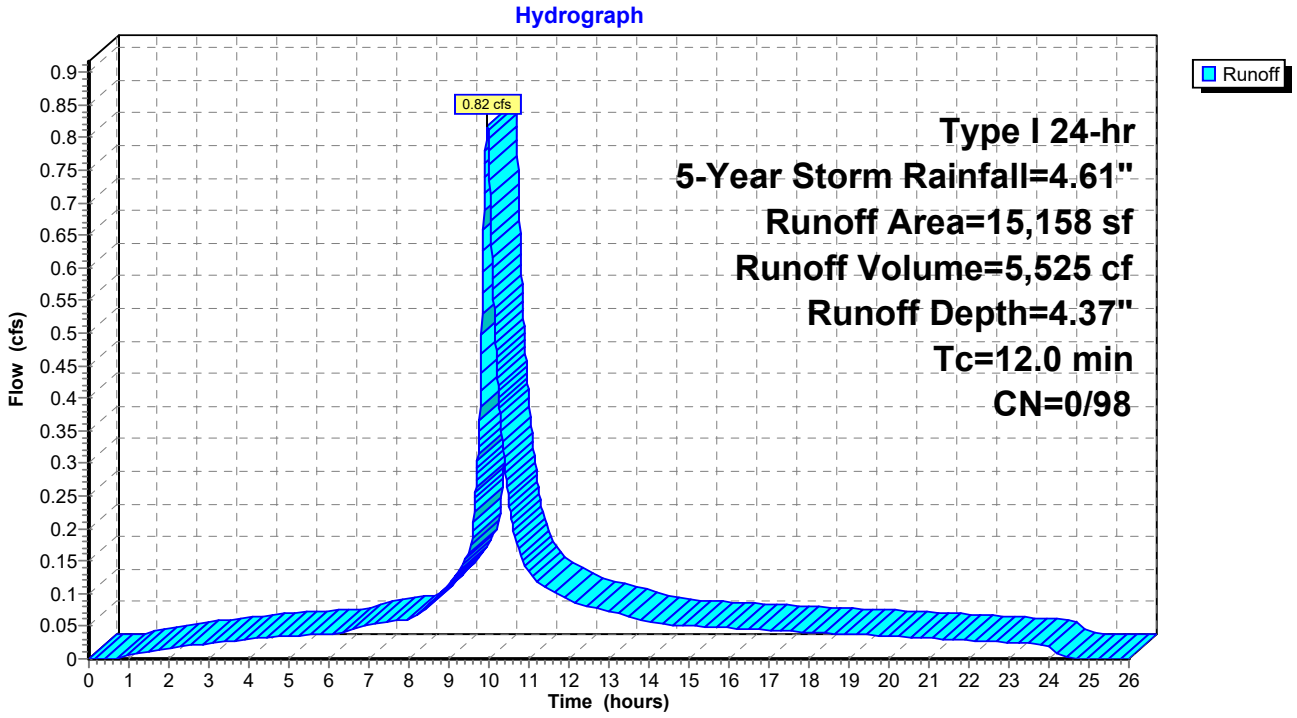
Runoff = 0.82 cfs @ 9.96 hrs, Volume= 5,525 cf, Depth= 4.37"
Routed to Pond P1 : BMP F

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 5-Year Storm Rainfall=4.61"

Area (sf)	CN	Description
15,158	98	Paved parking, HSG C
15,158	98	100.00% Impervious Area

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

Subcatchment D1: DMA F



Summary for Subcatchment D2: DMA G

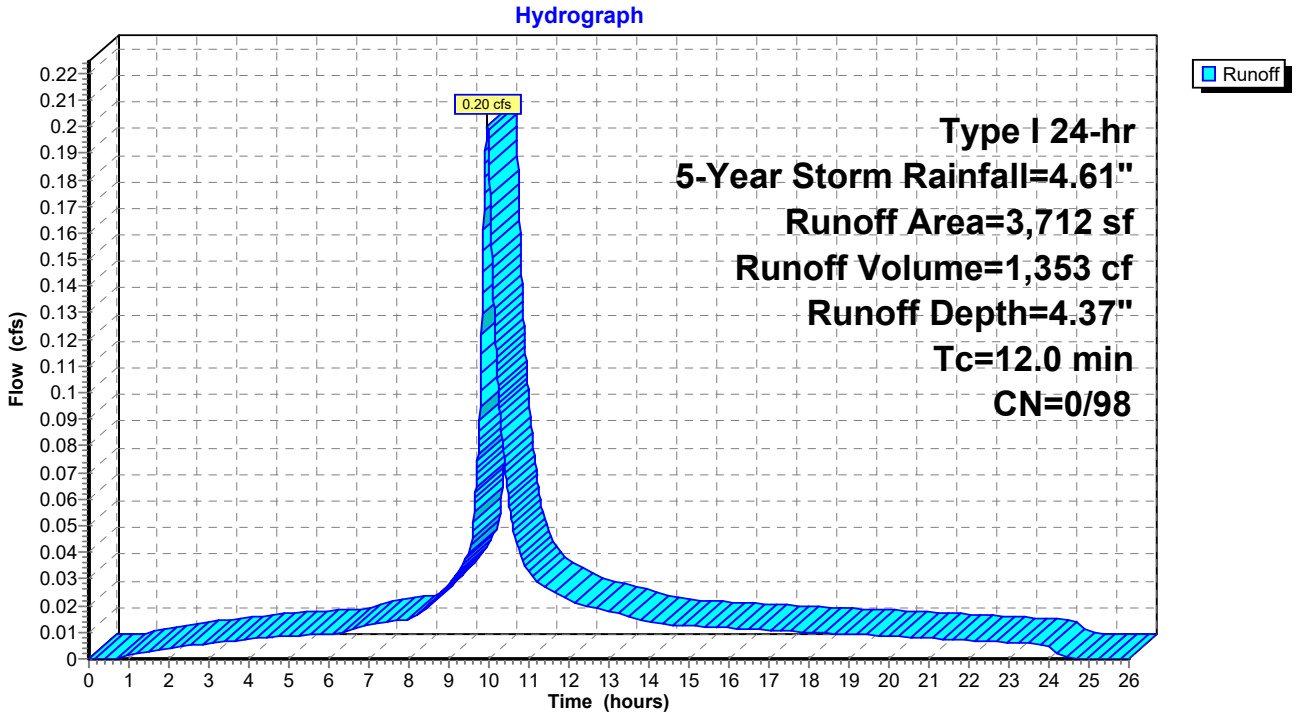
Runoff = 0.20 cfs @ 9.96 hrs, Volume= 1,353 cf, Depth= 4.37"
Routed to Pond 1P : BMP G

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 5-Year Storm Rainfall=4.61"

Area (sf)	CN	Description
3,712	98	Paved parking, HSG C
3,712	98	100.00% Impervious Area

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

Subcatchment D2: DMA G



Summary for Subcatchment Pr: Proposed (pre-bmp)

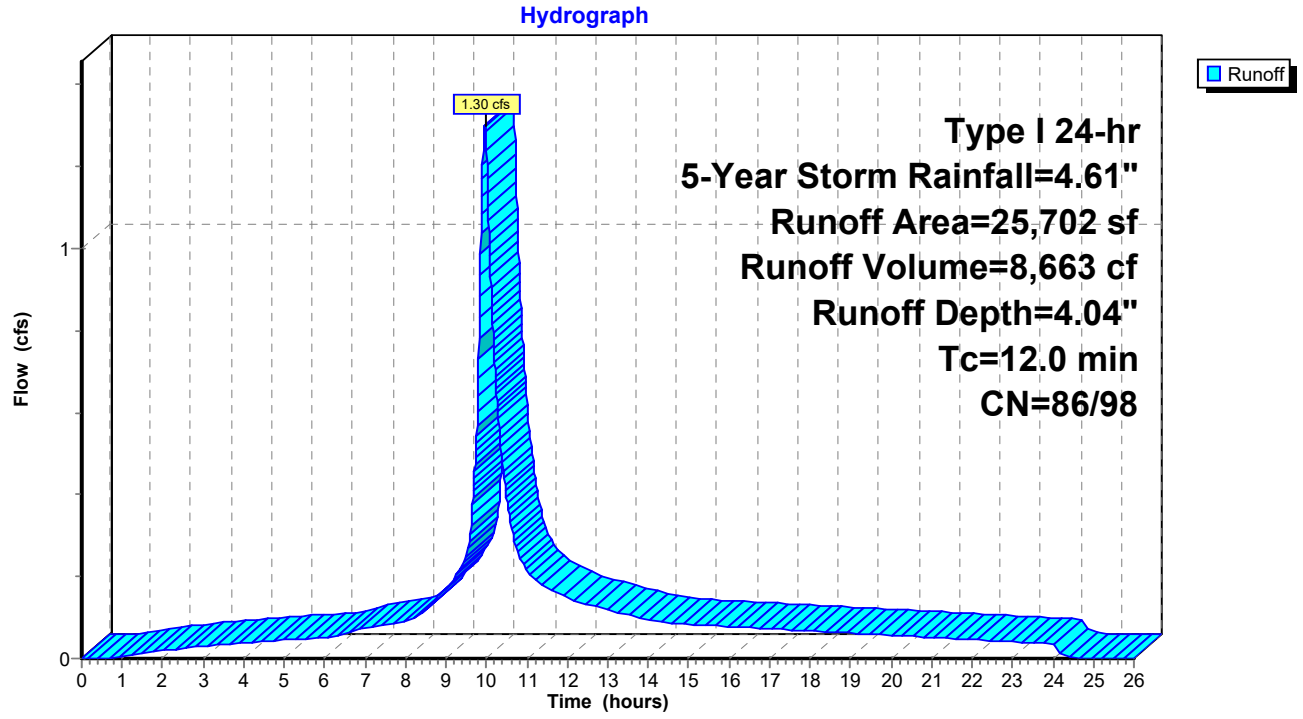
Runoff = 1.30 cfs @ 9.96 hrs, Volume= 8,663 cf, Depth= 4.04"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 5-Year Storm Rainfall=4.61"

Area (sf)	CN	Description
19,035	98	Paved parking, HSG C
6,667	86	<50% Grass cover, Poor, HSG C
25,702	95	Weighted Average
6,667	86	25.94% Pervious Area
19,035	98	74.06% Impervious Area

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

Subcatchment Pr: Proposed (pre-bmp)



Summary for Pond 1P: BMP G

Inflow Area = 3,877 sf,100.00% Impervious, Inflow Depth = 4.37" for 5-Year Storm event
Inflow = 0.21 cfs @ 9.96 hrs, Volume= 1,413 cf
Outflow = 0.20 cfs @ 10.00 hrs, Volume= 1,115 cf, Atten= 5%, Lag= 2.3 min
Primary = 0.20 cfs @ 10.00 hrs, Volume= 1,115 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 21.23' @ 10.00 hrs Surf.Area= 201 sf Storage= 318 cf

Plug-Flow detention time= 206.4 min calculated for 1,115 cf (79% of inflow)
Center-of-Mass det. time= 88.8 min (791.0 - 702.2)

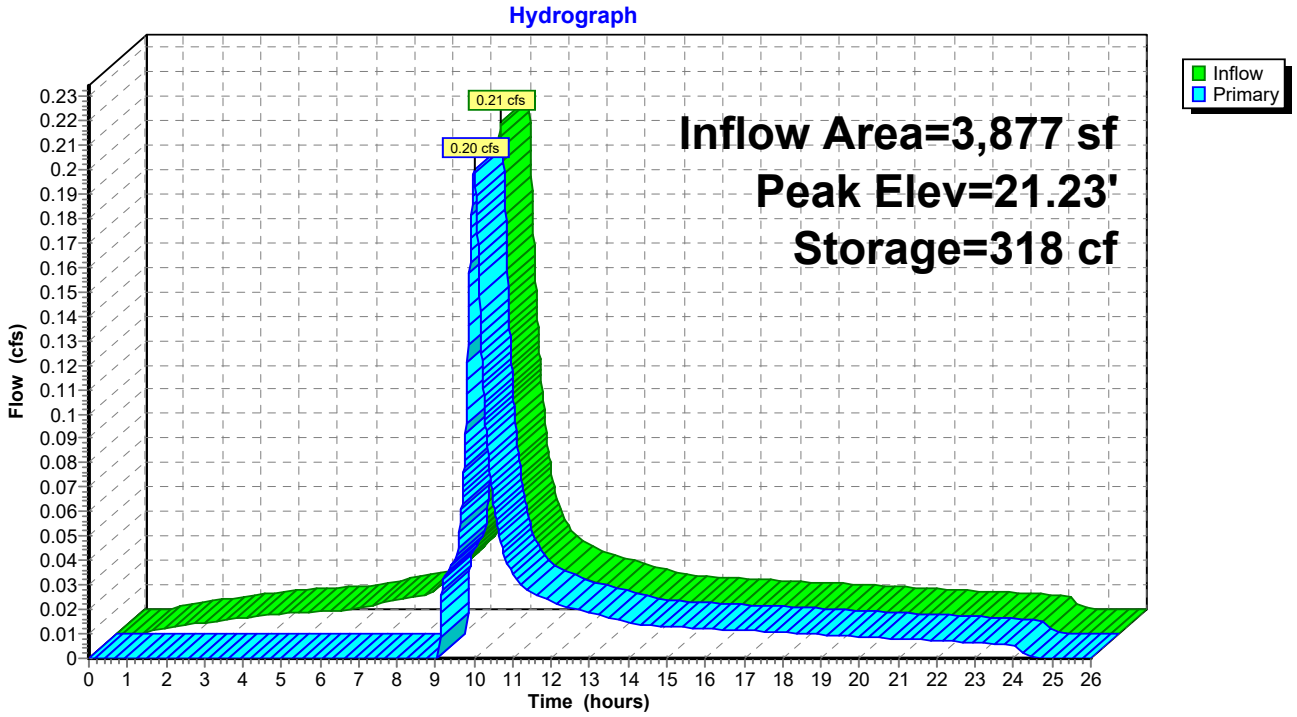
Volume	Invert	Avail.Storage	Storage Description
#1A	18.25'	180 cf	**6.25'W x 32.10'L x 3.75'H Field A** 752 cf Overall - 190 cf Embedded = 562 cf x 32.0% Voids
#2A	19.00'	190 cf	**ADS_StormTech DC-780 b +Cap**x 4 Inside #1 Effective Size= 45.4"W x 30.0"H => 6.49 sf x 7.12'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Cap Storage= 2.7 cf x 2 x 1 rows = 5.3 cf
		370 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.20 cfs @ 10.00 hrs HW=21.23' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.20 cfs @ 2.29 fps)

Pond 1P: BMP G


Hydrograph
Inflow Area=3,877 sf
Peak Elev=21.23'
Storage=318 cf
0.21 cfs
0.20 cfs
Inflow
Primary
Flow (cfs)
Time (hours)

Summary for Pond P1: BMP F

Inflow Area = 15,158 sf,100.00% Impervious, Inflow Depth = 4.37" for 5-Year Storm event
Inflow = 0.82 cfs @ 9.96 hrs, Volume= 5,525 cf
Outflow = 0.80 cfs @ 9.99 hrs, Volume= 4,607 cf, Atten= 2%, Lag= 1.5 min
Primary = 0.80 cfs @ 9.99 hrs, Volume= 4,607 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 26.56' @ 9.99 hrs Surf.Area= 601 sf Storage= 1,050 cf

Plug-Flow detention time= 178.1 min calculated for 4,605 cf (83% of inflow)
Center-of-Mass det. time= 80.2 min (782.4 - 702.2)

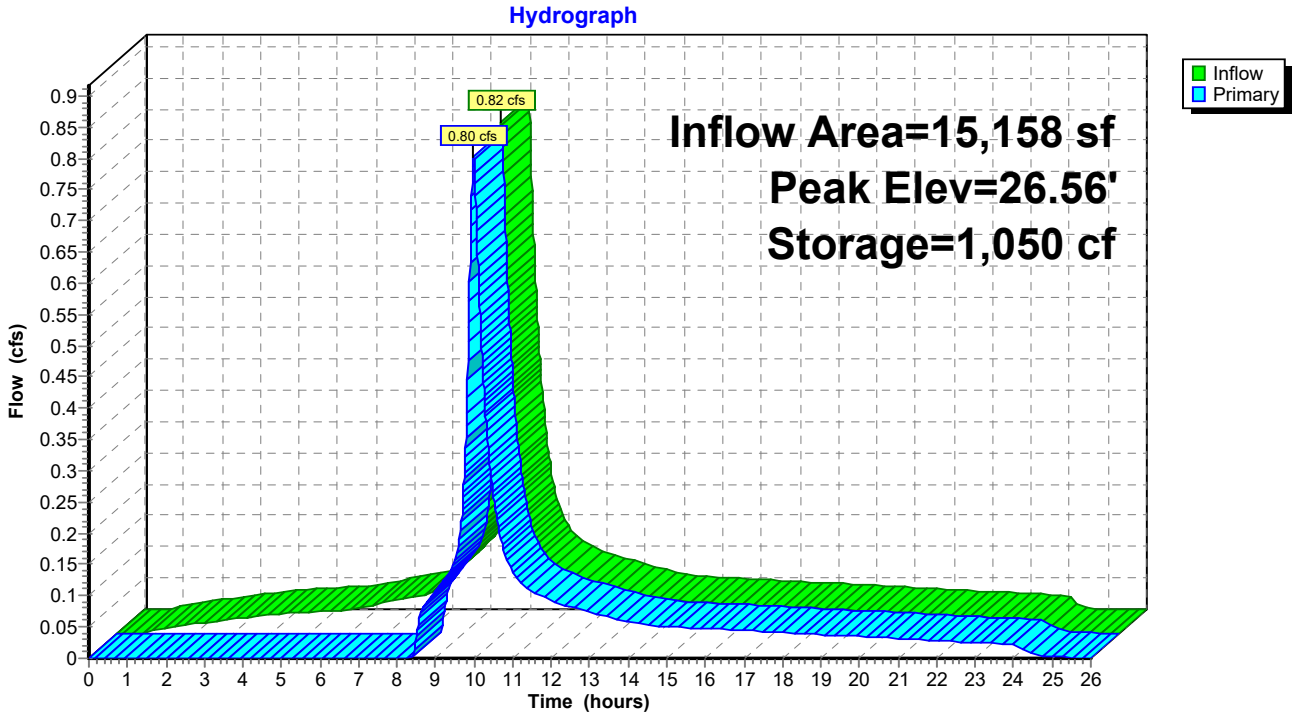
Volume	Invert	Avail.Storage	Storage Description
#1A	23.25'	527 cf	**6.25'W x 96.18'L x 3.75'H Field A** 2,254 cf Overall - 606 cf Embedded = 1,648 cf x 32.0% Voids
#2A	24.00'	606 cf	**ADS_StormTech DC-780 b +Cap**x 13 Inside #1 Effective Size= 45.4"W x 30.0"H => 6.49 sf x 7.12'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Cap Storage= 2.7 cf x 2 x 1 rows = 5.3 cf
		1,134 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.80 cfs @ 9.99 hrs HW=26.56' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.80 cfs @ 2.55 fps)

Pond P1: BMP F


Hydrograph
Inflow
Primary
0.82 cfs
0.80 cfs
Inflow Area=15,158 sf
Peak Elev=26.56'
Storage=1,050 cf
Flow (cfs)
Time (hours)
0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5 0.55 0.6 0.65 0.7 0.75 0.8 0.85 0.9
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Summary for Subcatchment 1S: DMA H

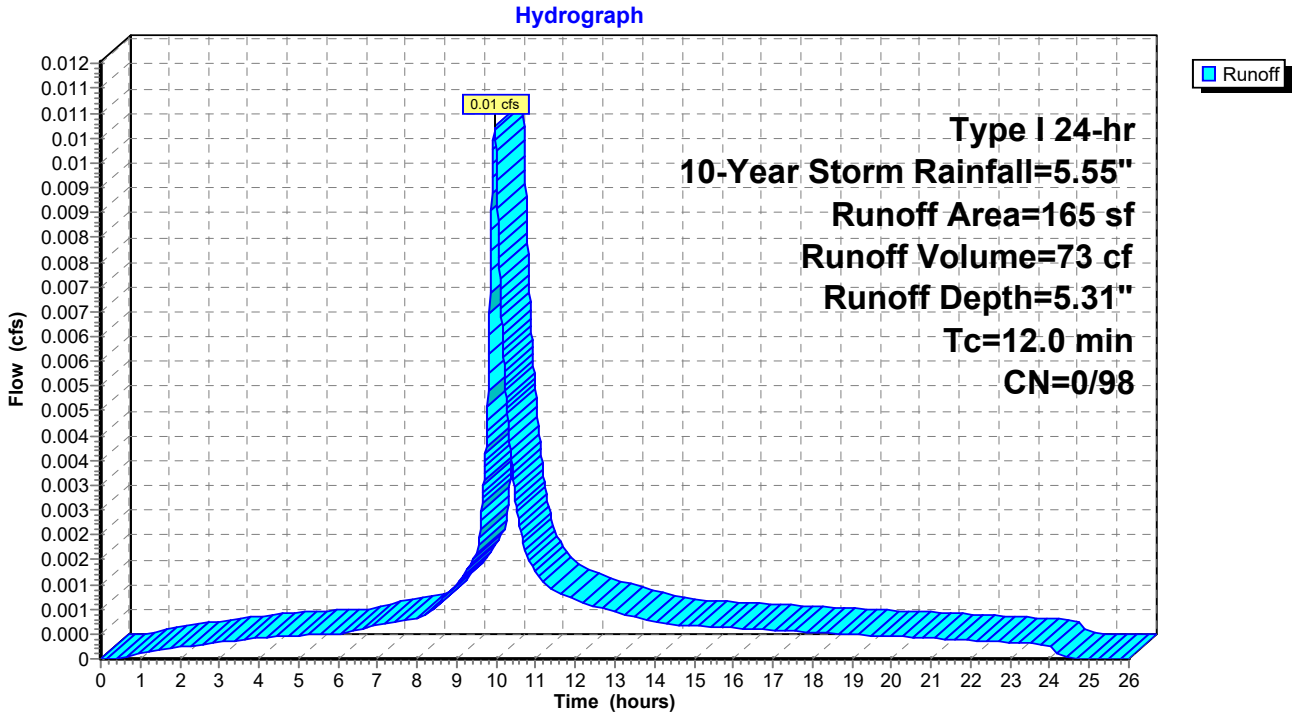
Runoff = 0.01 cfs @ 9.96 hrs, Volume= 73 cf, Depth= 5.31"
Routed to Pond 1P : BMP G

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 10-Year Storm Rainfall=5.55"

Area (sf)	CN	Description
165	98	Unconnected pavement, HSG C
165	98	100.00% Impervious Area

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

Subcatchment 1S: DMA H



Summary for Subcatchment D1: DMA F

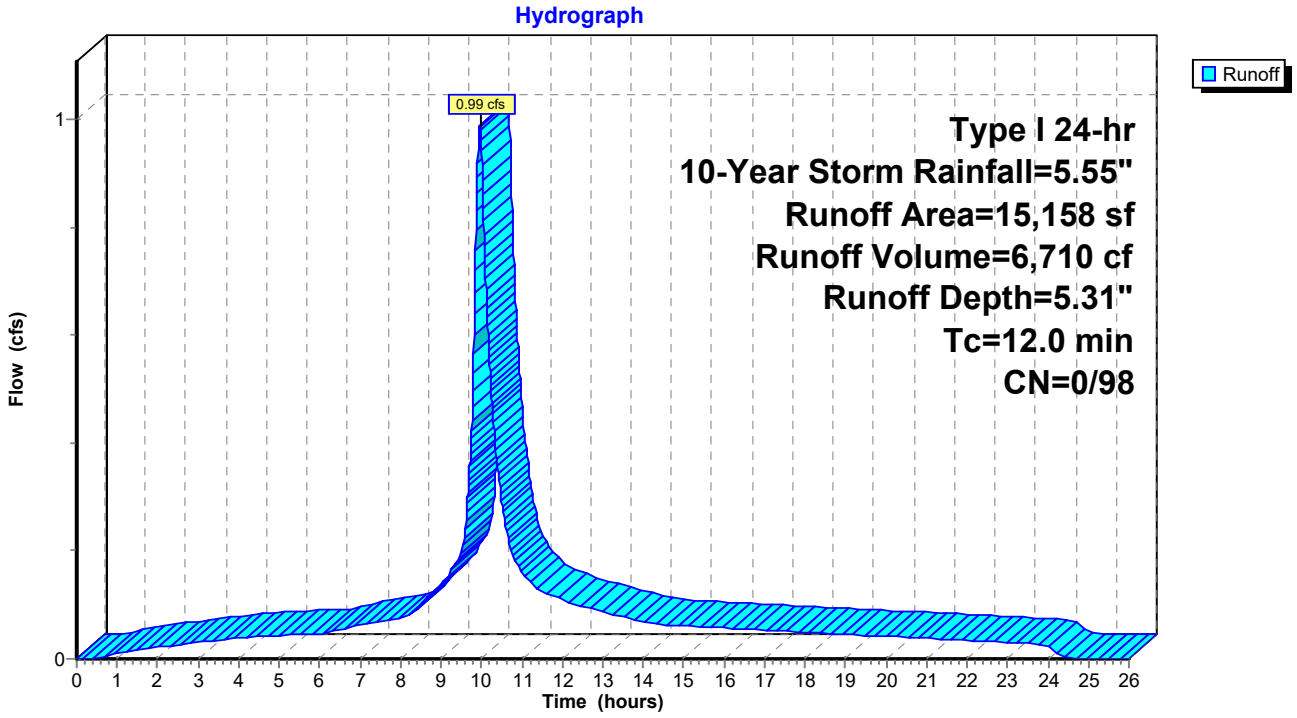
Runoff = 0.99 cfs @ 9.96 hrs, Volume= 6,710 cf, Depth= 5.31"
Routed to Pond P1 : BMP F

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 10-Year Storm Rainfall=5.55"

Area (sf)	CN	Description
15,158	98	Paved parking, HSG C
15,158	98	100.00% Impervious Area

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

Subcatchment D1: DMA F



Summary for Subcatchment D2: DMA G

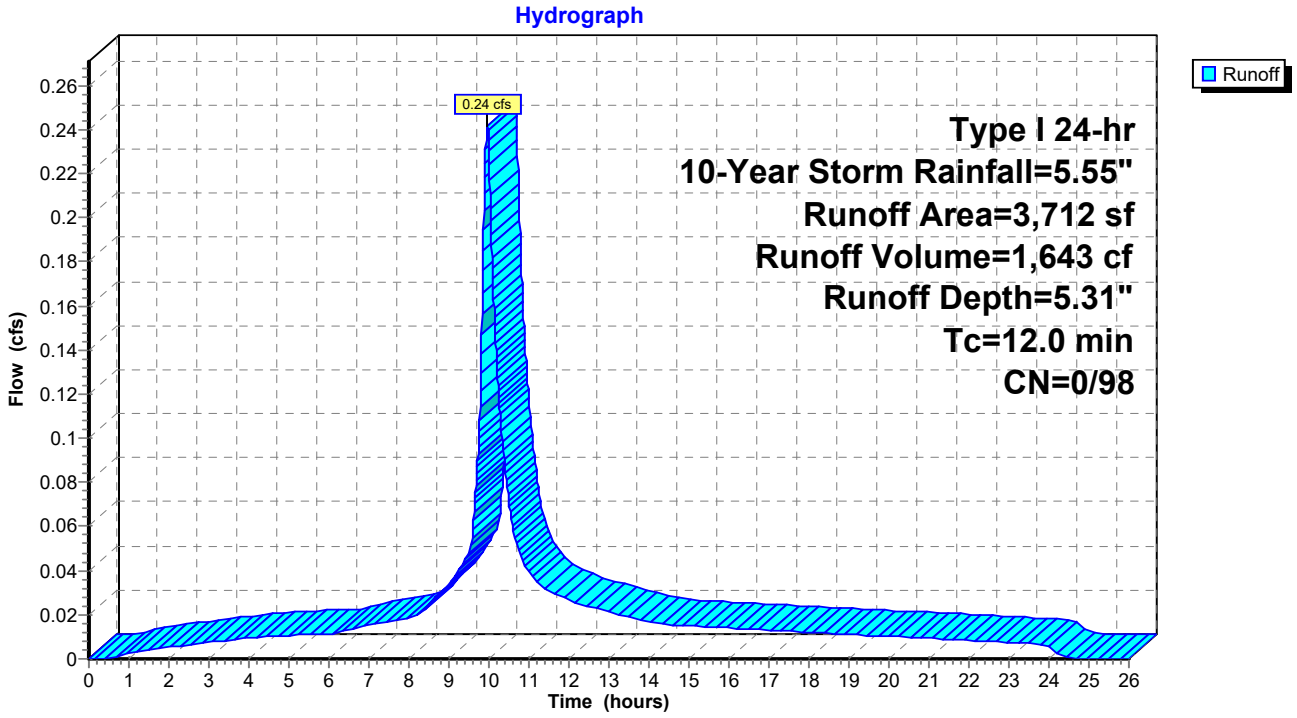
Runoff = 0.24 cfs @ 9.96 hrs, Volume= 1,643 cf, Depth= 5.31"
Routed to Pond 1P : BMP G

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 10-Year Storm Rainfall=5.55"

Area (sf)	CN	Description
3,712	98	Paved parking, HSG C
3,712	98	100.00% Impervious Area

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

Subcatchment D2: DMA G



Summary for Subcatchment Pr: Proposed (pre-bmp)

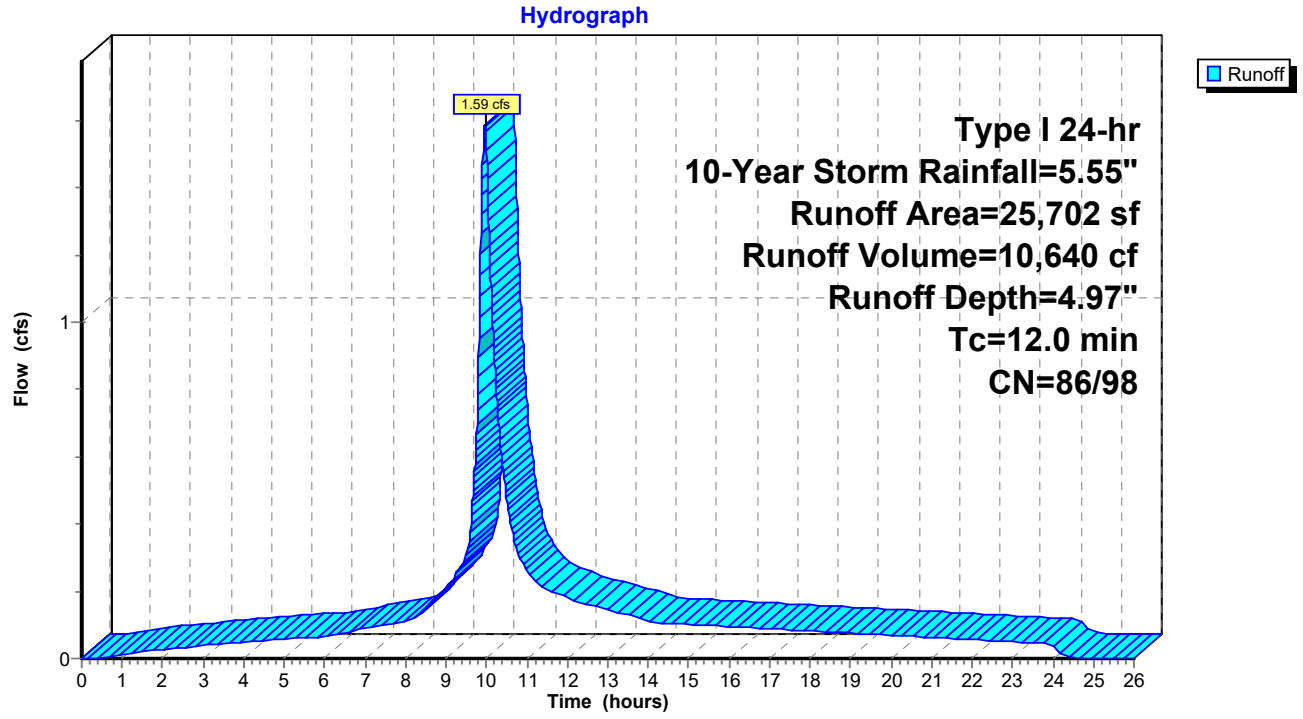
Runoff = 1.59 cfs @ 9.96 hrs, Volume= 10,640 cf, Depth= 4.97"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 10-Year Storm Rainfall=5.55"

Area (sf)	CN	Description
19,035	98	Paved parking, HSG C
6,667	86	<50% Grass cover, Poor, HSG C
25,702	95	Weighted Average
6,667	86	25.94% Pervious Area
19,035	98	74.06% Impervious Area

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

Subcatchment Pr: Proposed (pre-bmp)



Summary for Pond 1P: BMP G

Inflow Area = 3,877 sf,100.00% Impervious, Inflow Depth = 5.31" for 10-Year Storm event
Inflow = 0.25 cfs @ 9.96 hrs, Volume= 1,716 cf
Outflow = 0.24 cfs @ 10.00 hrs, Volume= 1,419 cf, Atten= 5%, Lag= 2.5 min
Primary = 0.24 cfs @ 10.00 hrs, Volume= 1,419 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 21.32' @ 10.00 hrs Surf.Area= 201 sf Storage= 326 cf

Plug-Flow detention time= 180.2 min calculated for 1,418 cf (83% of inflow)
Center-of-Mass det. time= 78.5 min (777.2 - 698.7)

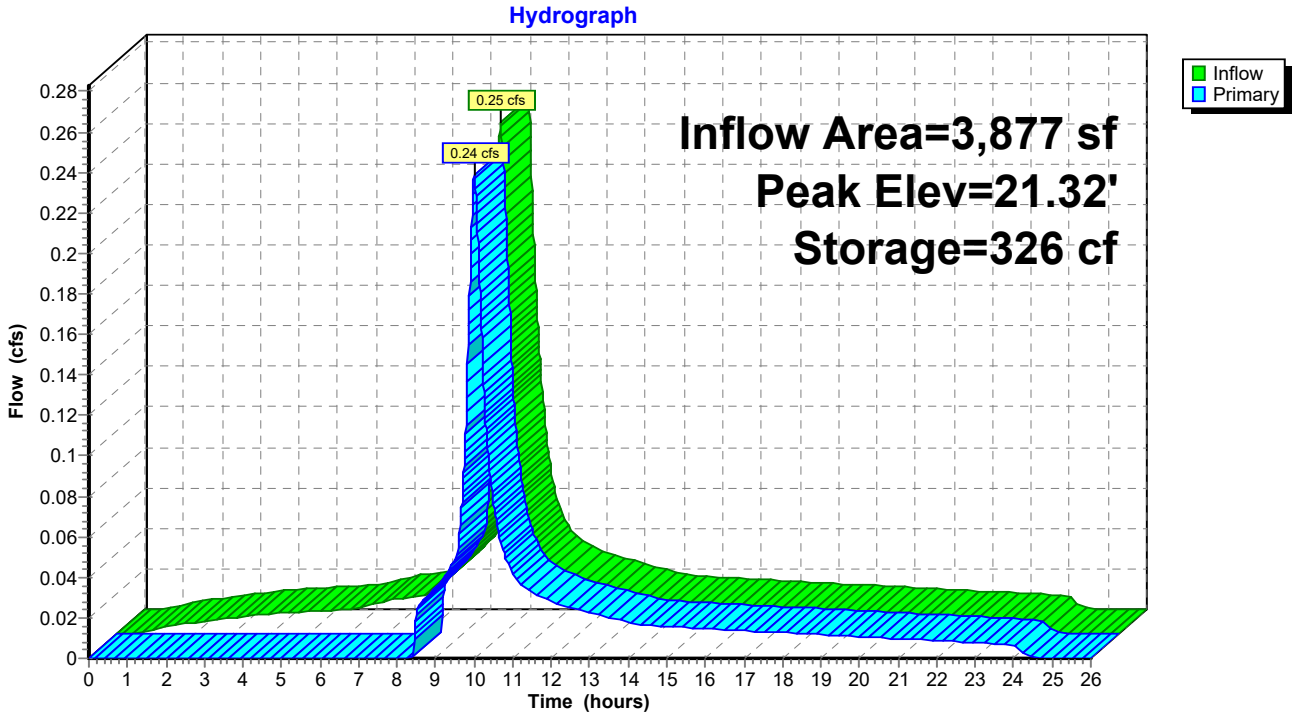
Volume	Invert	Avail.Storage	Storage Description
#1A	18.25'	180 cf	**6.25'W x 32.10'L x 3.75'H Field A** 752 cf Overall - 190 cf Embedded = 562 cf x 32.0% Voids
#2A	19.00'	190 cf	**ADS_StormTech DC-780 b +Cap**x 4 Inside #1 Effective Size= 45.4"W x 30.0"H => 6.49 sf x 7.12'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Cap Storage= 2.7 cf x 2 x 1 rows = 5.3 cf
		370 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.24 cfs @ 10.00 hrs HW=21.32' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.24 cfs @ 2.74 fps)

Pond 1P: BMP G


Hydrograph
Inflow Area=3,877 sf
Peak Elev=21.32'
Storage=326 cf
0.25 cfs
0.24 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
0.22
0.24
0.26
0.28
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Summary for Pond P1: BMP F

Inflow Area = 15,158 sf,100.00% Impervious, Inflow Depth = 5.31" for 10-Year Storm event
Inflow = 0.99 cfs @ 9.96 hrs, Volume= 6,710 cf
Outflow = 0.96 cfs @ 9.99 hrs, Volume= 5,793 cf, Atten= 3%, Lag= 1.8 min
Primary = 0.96 cfs @ 9.99 hrs, Volume= 5,793 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 26.66' @ 9.99 hrs Surf.Area= 601 sf Storage= 1,068 cf

Plug-Flow detention time= 154.9 min calculated for 5,793 cf (86% of inflow)
Center-of-Mass det. time= 70.8 min (769.5 - 698.7)

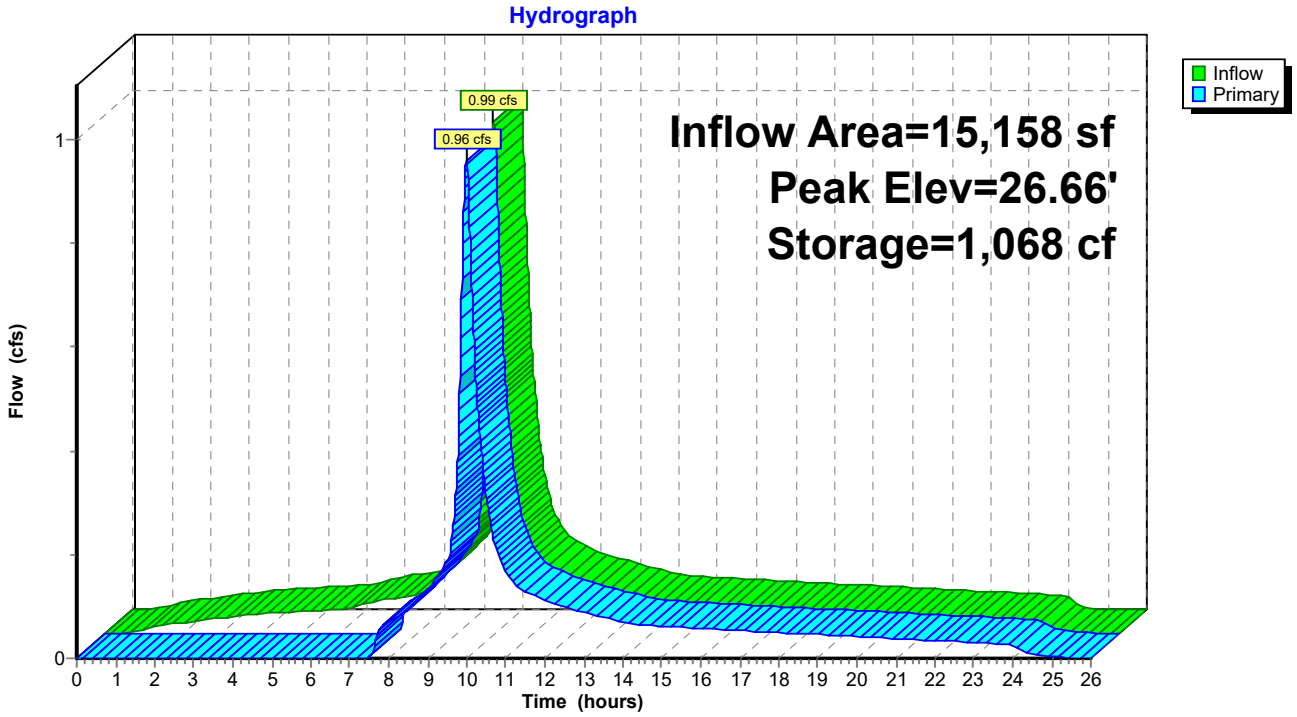
Volume	Invert	Avail.Storage	Storage Description
#1A	23.25'	527 cf	**6.25'W x 96.18'L x 3.75'H Field A** 2,254 cf Overall - 606 cf Embedded = 1,648 cf x 32.0% Voids
#2A	24.00'	606 cf	**ADS_StormTech DC-780 b +Cap**x 13 Inside #1 Effective Size= 45.4"W x 30.0"H => 6.49 sf x 7.12'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Cap Storage= 2.7 cf x 2 x 1 rows = 5.3 cf
		1,134 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.96 cfs @ 9.99 hrs HW=26.66' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.96 cfs @ 2.76 fps)

Pond P1: BMP F


Hydrograph
Inflow
Primary
0.99 cfs
0.96 cfs
Inflow Area=15,158 sf
Peak Elev=26.66'
Storage=1,068 cf
Flow (cfs)
0
1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Time (hours)

Summary for Subcatchment 1S: DMA H

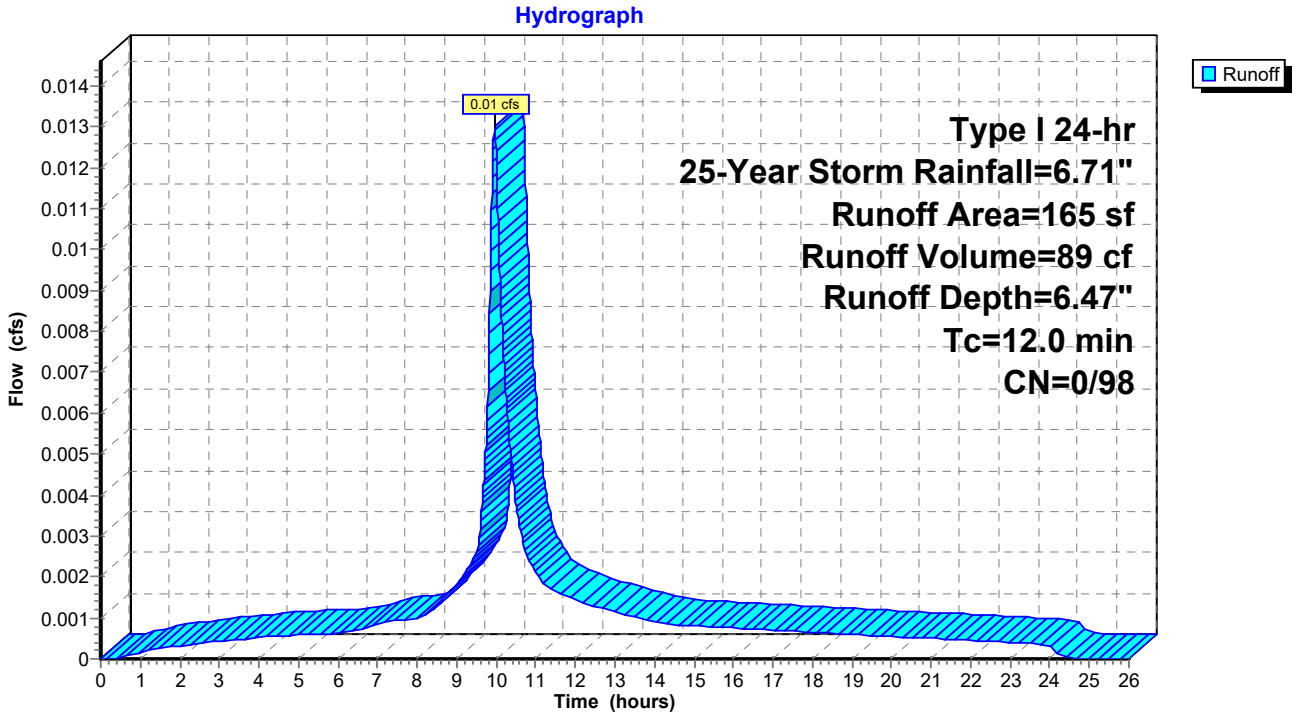
Runoff = 0.01 cfs @ 9.96 hrs, Volume= 89 cf, Depth= 6.47"
Routed to Pond 1P : BMP G

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 25-Year Storm Rainfall=6.71"

Area (sf)	CN	Description
165	98	Unconnected pavement, HSG C
165	98	100.00% Impervious Area

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

Subcatchment 1S: DMA H



Summary for Subcatchment D1: DMA F

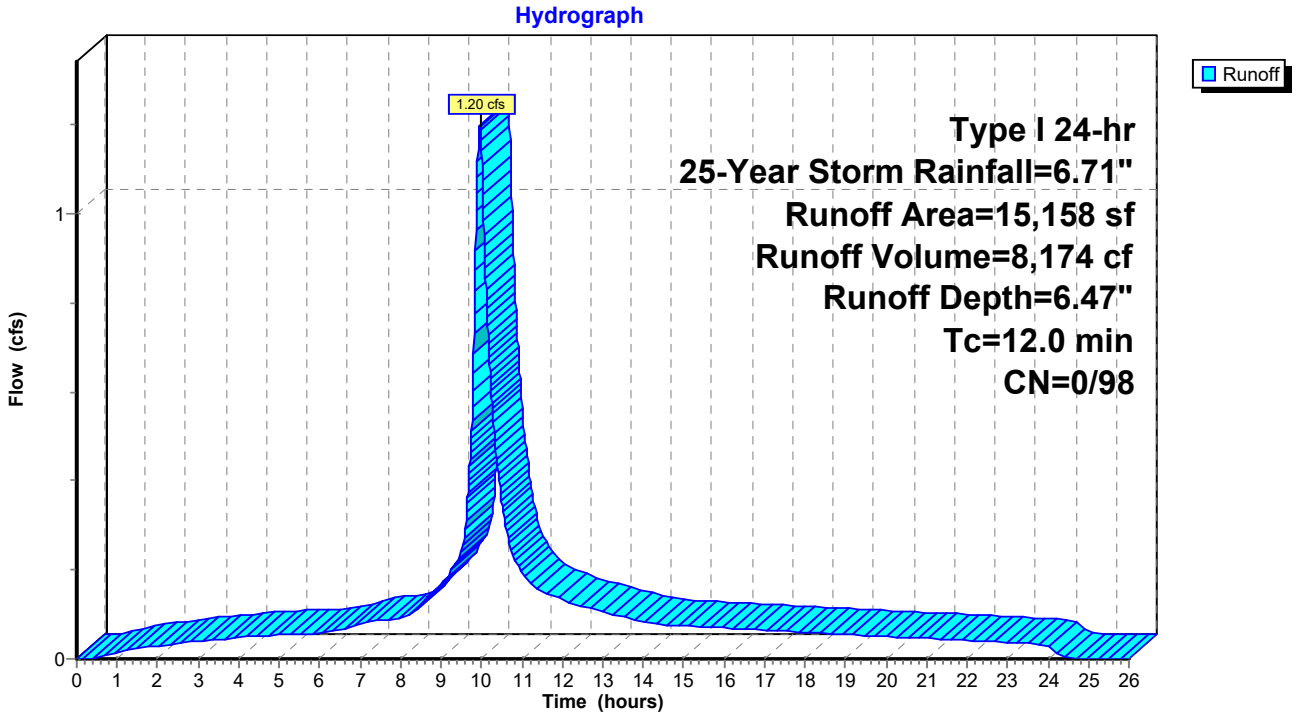
Runoff = 1.20 cfs @ 9.96 hrs, Volume= 8,174 cf, Depth= 6.47"
Routed to Pond P1 : BMP F

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 25-Year Storm Rainfall=6.71"

Area (sf)	CN	Description
15,158	98	Paved parking, HSG C
15,158	98	100.00% Impervious Area

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

Subcatchment D1: DMA F



Summary for Subcatchment D2: DMA G

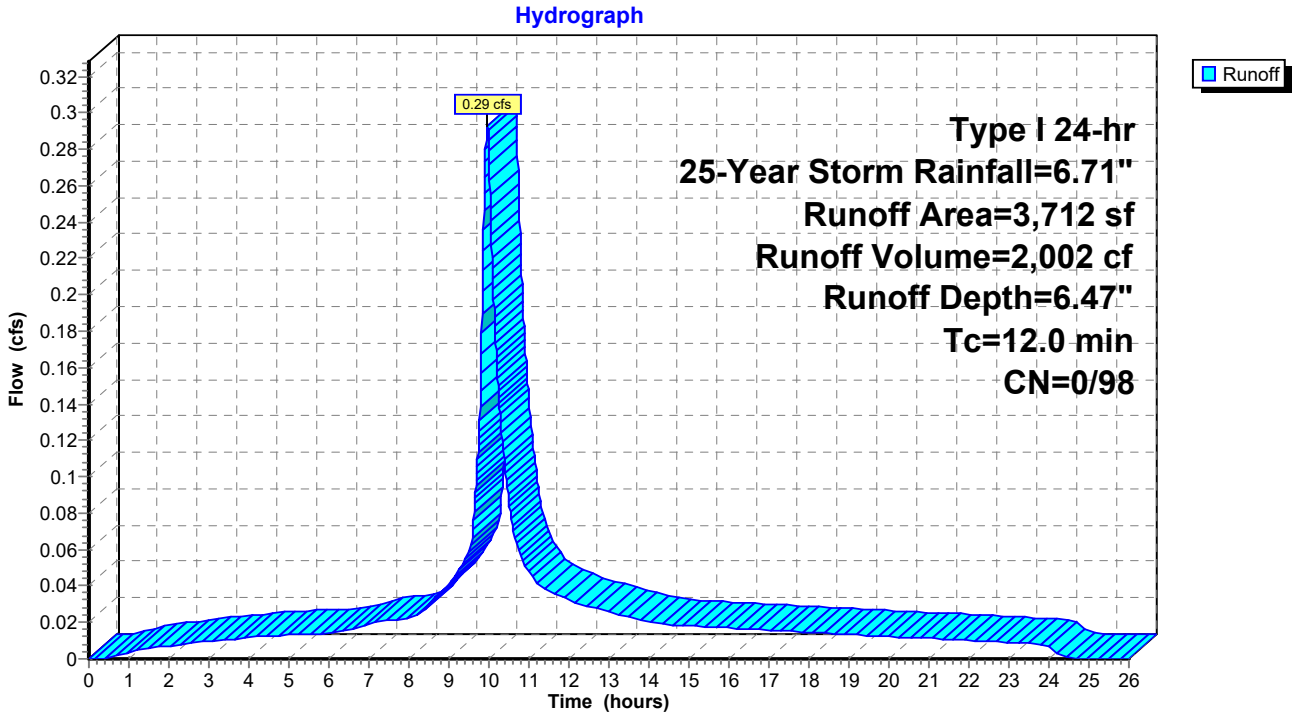
Runoff = 0.29 cfs @ 9.96 hrs, Volume= 2,002 cf, Depth= 6.47"
Routed to Pond 1P : BMP G

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 25-Year Storm Rainfall=6.71"

Area (sf)	CN	Description
3,712	98	Paved parking, HSG C
3,712	98	100.00% Impervious Area

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

Subcatchment D2: DMA G



Summary for Subcatchment Pr: Proposed (pre-bmp)

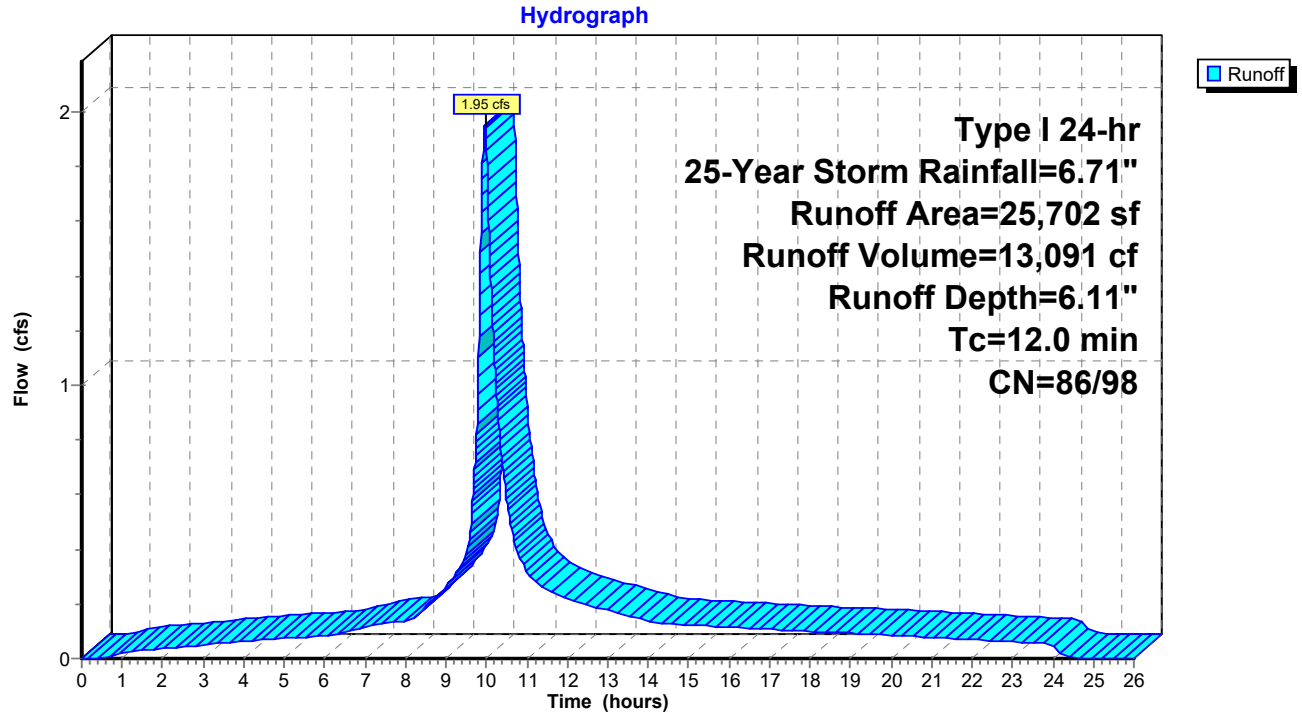
Runoff = 1.95 cfs @ 9.96 hrs, Volume= 13,091 cf, Depth= 6.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type I 24-hr 25-Year Storm Rainfall=6.71"

Area (sf)	CN	Description
19,035	98	Paved parking, HSG C
6,667	86	<50% Grass cover, Poor, HSG C
25,702	95	Weighted Average
6,667	86	25.94% Pervious Area
19,035	98	74.06% Impervious Area

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

Subcatchment Pr: Proposed (pre-bmp)



Summary for Pond 1P: BMP G

Inflow Area = 3,877 sf,100.00% Impervious, Inflow Depth = 6.47" for 25-Year Storm event
Inflow = 0.31 cfs @ 9.96 hrs, Volume= 2,091 cf
Outflow = 0.29 cfs @ 10.01 hrs, Volume= 1,793 cf, Atten= 6%, Lag= 2.7 min
Primary = 0.29 cfs @ 10.01 hrs, Volume= 1,793 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 21.47' @ 10.01 hrs Surf.Area= 201 sf Storage= 336 cf

Plug-Flow detention time= 156.2 min calculated for 1,792 cf (86% of inflow)
Center-of-Mass det. time= 69.0 min (764.6 - 695.6)

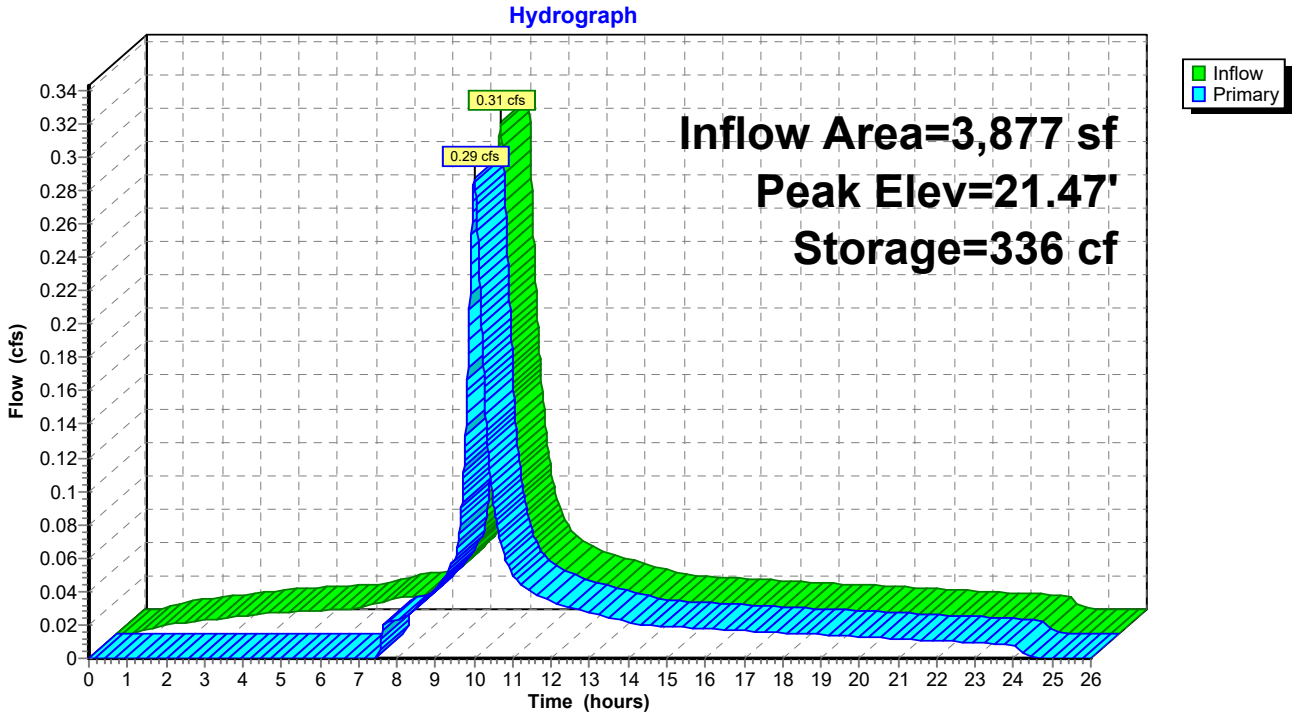
Volume	Invert	Avail.Storage	Storage Description
#1A	18.25'	180 cf	**6.25'W x 32.10'L x 3.75'H Field A** 752 cf Overall - 190 cf Embedded = 562 cf x 32.0% Voids
#2A	19.00'	190 cf	**ADS_StormTech DC-780 b +Cap**x 4 Inside #1 Effective Size= 45.4"W x 30.0"H => 6.49 sf x 7.12'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Cap Storage= 2.7 cf x 2 x 1 rows = 5.3 cf
		370 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	21.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.29 cfs @ 10.01 hrs HW=21.47' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.29 cfs @ 3.29 fps)

Pond 1P: BMP G


Hydrograph
Inflow Area=3,877 sf
Peak Elev=21.47'
Storage=336 cf
0.31 cfs
0.29 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0 0.02 0.04 0.06 0.08 0.1 0.12 0.14 0.16 0.18 0.2 0.22 0.24 0.26 0.28 0.3 0.32 0.34
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Summary for Pond P1: BMP F

Inflow Area = 15,158 sf,100.00% Impervious, Inflow Depth = 6.47" for 25-Year Storm event
Inflow = 1.20 cfs @ 9.96 hrs, Volume= 8,174 cf
Outflow = 1.15 cfs @ 9.99 hrs, Volume= 7,256 cf, Atten= 4%, Lag= 2.0 min
Primary = 1.15 cfs @ 9.99 hrs, Volume= 7,256 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Peak Elev= 26.80' @ 9.99 hrs Surf.Area= 601 sf Storage= 1,096 cf

Plug-Flow detention time= 133.6 min calculated for 7,256 cf (89% of inflow)
Center-of-Mass det. time= 62.1 min (757.6 - 695.6)

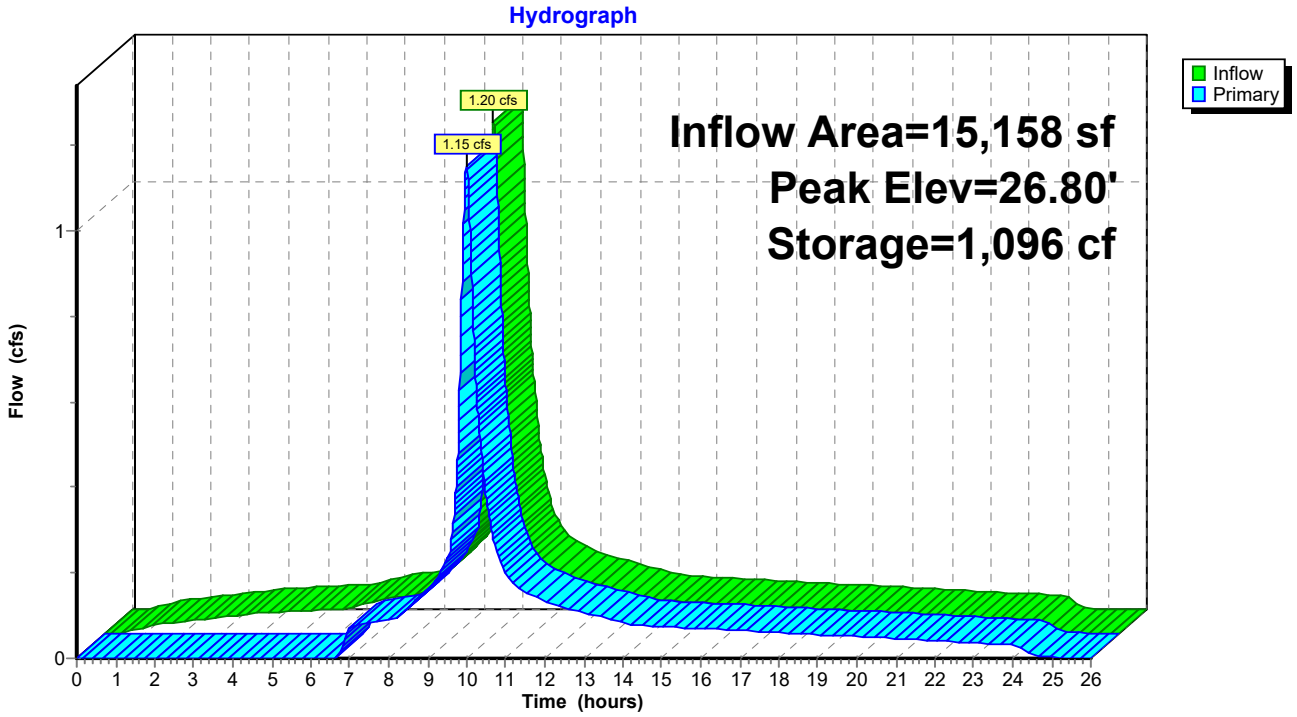
Volume	Invert	Avail.Storage	Storage Description
#1A	23.25'	527 cf	**6.25'W x 96.18'L x 3.75'H Field A** 2,254 cf Overall - 606 cf Embedded = 1,648 cf x 32.0% Voids
#2A	24.00'	606 cf	**ADS_StormTech DC-780 b +Cap**x 13 Inside #1 Effective Size= 45.4"W x 30.0"H => 6.49 sf x 7.12'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Cap Storage= 2.7 cf x 2 x 1 rows = 5.3 cf
		1,134 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.15 cfs @ 9.99 hrs HW=26.80' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 1.15 cfs @ 3.30 fps)

Pond P1: BMP F


Hydrograph
Inflow
Primary
1.20 cfs
1.15 cfs
Inflow Area=15,158 sf
Peak Elev=26.80'
Storage=1,096 cf
Flow (cfs)
0
1
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

APPENDIX C

STORM WATER TREATMENT BMP SIZING WORKSHEETS

A. Bioretention Sizing Worksheet			
Step 1: Determine design volume for sizing, V_{design}			
1-1. Enter the volume difference between the pre- and post- development conditions for the 25-year, 24-hr design storm, V_{25}, calculated using SBUH method, Appendix C	V_{25}=	N/A	ft^3
1-2. Enter the volume generated from a 2.4", 24-hr storm event, $V_{2.4\text{-inch}}$, calculated using, Appendix C (0.75 gal*replaced Imperv.)+(1.5 gal*new imperv.)	$V_{2.4\text{-inch}}$=	342	ft^3
1-3. Determine design volume for sizing which is the larger of V_{25} and $V_{2.4\text{-inch}}$ and is the volume to be retained onsite	V_{design}=	394	ft^3
Step 2: Calculate design infiltration rate			
2-1. Enter soil infiltration rate (0.05 in/hr min.), $K_{measured}$	$k_{measured}$	2.50	in/hr
2-2. Enter infiltration rate safety factor, F: **F=8**, if 1 or more infiltration tests were conducted and slope is less than 15%; **F=6** if 1 or more infiltration tests were conducted within the BMP footprint, pre-treatment BMP(s) will be used, and the slope of the drainage area is less than 10% or only treating clean impervious surfaces; **F=4** if 1 infiltration test was conducted locations within the BMP footprint per 1,000 sf or less of BMP surface area, pre-treatment BMP(s) will be used and the slope of the drainage area is less than 5% or only treating impervious surfaces; **F=2** if 2 infiltration tests were conducted within the BMP footprinter per 1,000 sf or less of BMP surface area or 5 or more infiltration tests were conducted in the BMP footprint, pre-treatment media filtration or sedimentation BMP(s) will be used and the slope of the drainage area is less than 2% or only treating clean impervious surfaces)	F=	8.00	
2-3. Calculate the design infiltration rate, k_{design}+$k_{measured}$/F	K_{design}=	0.31	in/hr
Step 3: Calculate bioretention area			
3-1. Calculate maximum ponding depth, $d_{p,max}$= (k_{design}*48hr)	$d_{p,max}$=	15	in
3-2. Choose ponding depth, d_p(<=) $d_{p,max}$ and d_p(<=) 12 in.	d_p=	6	in
3-3. Enter thickness of planting mix (min 24"), d_{mix}	d_{mix}=	24	in
3-4. Choose thickness of gravel, d_{gravel}	d_{gravel}=	30	in
3-5. Calculate the effective storage depth, $d_{effective}$=d_p+0.25*d_{mix}+0.32*d_{gravel}	$d_{effective}$=	21.6	in
3-6. Check the drawdown of the effective depth, $t_{effective}$=($d_{effective}$)/(k_{design})<= 72 hr. (if the drawdown is greater than 72 hours, the gravel thickness and/or the ponding depth must be reduced in steps 3-2 or 3-4.)	$t_{effective}$=	69.12	hr
3-7. If the drawdown is greater than 48 hours, then adjust the design volume, V_{design}=V_{design}*1.15.	V_{design}=	394	ft^3
3-8. Calculate bioretention surface area, A_{st} = (V_{design}*12in/ft)/($d_{effective}$+K_{design}*4 hr)	A_{st}=	206.91	ft^2

B. Permeable Paving Sizing Worksheet			
Step 1: Determine design volume Reduction, $V_{reduction}$			
1-1. Enter the volume difference between the pre- and post- development conditions for the 25-year, 24-hr design storm, V_{25}, calculated using SBUH method, Appendix C	V_{25}=	N/A	ft^3
1-2. Enter the volume generated from a 2.4", 24-hr storm event, $V_{2.4\text{-}inch}$, calculated using, Appendix C (0.75 gal*replaced Imperv.)+(1.5 gal*new imperv.)	$V_{2.4\text{-}inch}$=	3886	ft^3
1-3. Determine design volume for sizing which is the larger of V_{25} and $V_{2.4\text{-}inch}$ and is the volume to be retained onsite	$V_{reduction}$=	3886	ft^3
Step 2: Calculate design infiltration rate			
2-1. Enter soil infiltration rate (0.05 in/hr min.), $K_{measured}$	$k_{measured}$	0.20	in/hr
2-2. Enter infiltration rate safety factor, F: **F=8**, if 1 or more infiltration tests were conducted and slope is less than 15%; **F=6** if 1 or more infiltration tests were conducted within the BMP footprint, pre-treatment BMP(s) will be used, and the slope of the drainage area is less than 10% or only treating clean impervious surfaces; **F=4** if 1 infiltration test was conducted locations within the BMP footprint per 1,000 sf or less of BMP surface area, pre-treatment BMP(s) will be used and the slope of the drainage area is less than 5% or only treating impervious surfaces; **F=2** if 2 infiltration tests were conducted within the BMP footprinter per 1,000 sf or less of BMP surface area or 5 or more infiltration tests were conducted in the BMP footprint, pre-treatment media filtration or sedimentation BMP(s) will be used and the slope of the drainage area is less than 2% or only treating clean impervious surfaces)	F=	4.00	
2-3. Calculate the design infiltration rate, k_{design}+$k_{measured}$/F	K_{design}=	0.05	in/hr
Step 3: Calculate permeable pavement surface area			
3-1. Enter the impervious area draining to the permeable pavement plus the potential area to be permeable pavement, A_{imp}	A_{imp}=	44334	ft^2
3-2. Calculate surface area based on impervious ratio, $A_{sf>}=A_{imp}/2$	A_{sf}=	22167	ft^2
3-3. Calculate the gravel thickness to drawdown in 24 hours, $d_{gravel,dd}$ = (k_{design}/12 in/ft * 24hr) / 0.32.	$d_{gravel,dd}$=	0.31	ft
3-4. Choose thickness of gravel drainage layer, if $d_{gravel,dd}$ > 1ft, then choose 1ft<d_{gravel}<$d_{gravel,dd}$ if $d_{gravel,dd}$ < 1ft, then d_{gravel} = 1ft.	d_{gravel}=	1	ft
3-5. Calculate volume retention capacity, $V_{ret} = A_{sf}((4hr*k_{design}/12 \text{ in/ft}) + 0.32*d_{gravel})$	V_{ret}=	7462.89	ft^3
3-6. Check volume retention requirements meet design volume, $V_{ret} > V_{design}$ (if not, then increase gravel layer or the surface area in steps 3-2 and 3-4).		yes	

D. Bioretention Sizing Worksheet			
Step 1: Determine design volume for sizing, V_{design}			
1-1. Enter the volume difference between the pre- and post- development conditions for the 25-year, 24-hr design storm, V_{25}, calculated using SBUH method, Appendix C	V_{25}=	N/A	ft^3
1-2. Enter the volume generated from a 2.4", 24-hr storm event, $V_{2.4\text{-inch}}$, calculated using, Appendix C (0.75 gal*replaced Imperv.)+(1.5 gal*new imperv.)	$V_{2.4\text{-inch}}$=	30	ft^3
1-3. Determine design volume for sizing which is the larger of V_{25} and $V_{2.4\text{-inch}}$ and is the volume to be retained onsite	V_{design}=	35	ft^3
Step 2: Calculate design infiltration rate			
2-1. Enter soil infiltration rate (0.05 in/hr min.), $K_{measured}$	$k_{measured}$	2.50	in/hr
2-2. Enter infiltration rate safety factor, F: **F=8**, if 1 or more infiltration tests were conducted and slope is less than 15%; **F=6** if 1 or more infiltration tests were conducted within the BMP footprint, pre-treatment BMP(s) will be used, and the slope of the drainage area is less than 10% or only treating clean impervious surfaces; **F=4** if 1 infiltration test was conducted locations within the BMP footprint per 1,000 sf or less of BMP surface area, pre-treatment BMP(s) will be used and the slope of the drainage area is less than 5% or only treating impervious surfaces; **F=2** if 2 infiltration tests were conducted within the BMP footprinter per 1,000 sf or less of BMP surface area or 5 or more infiltration tests were conducted in the BMP footprint, pre-treatment media filtration or sedimentation BMP(s) will be used and the slope of the drainage area is less than 2% or only treating clean impervious surfaces)	F=	8.00	
2-3. Calculate the design infiltration rate, k_{design}+$k_{measured}$/F	K_{design}=	0.31	in/hr
Step 3: Calculate bioretention area			
3-1. Calculate maximum ponding depth, $d_{p,max}$= (k_{design}*48hr)	$d_{p,max}$=	15	in
3-2. Choose ponding depth, d_p(<=) $d_{p,max}$ and d_p(<=) 12 in.	d_p=	6	in
3-3. Enter thickness of planting mix (min 24"), d_{mix}	d_{mix}=	24	in
3-4. Choose thickness of gravel, d_{gravel}	d_{gravel}=	30	in
3-5. Calculate the effective storage depth, $d_{effective}$=d_p+0.25*d_{mix}+0.32*d_{gravel}	$d_{effective}$=	21.6	in
3-6. Check the drawdown of the effective depth, $t_{effective}$=($d_{effective}$)/(k_{design})<= 72 hr. (if the drawdown is greater than 72 hours, the gravel thickness and/or the ponding depth must be reduced in steps 3-2 or 3-4.)	$t_{effective}$=	69.12	hr
3-7. If the drawdown is greater than 48 hours, then adjust the design volume, V_{design}=V_{design}*1.15.	V_{design}=	35	ft^3
3-8. Calculate bioretention surface area, A_{st} = (V_{design}*12in/ft)/($d_{effective}$+K_{design}*4 hr)	A_{st}=	18.38	ft^2

E. Bioretention Sizing Worksheet			
Step 1: Determine design volume for sizing, V_{design}			
1-1. Enter the volume difference between the pre- and post- development conditions for the 25-year, 24-hr design storm, V_{25}, calculated using SBUH method, Appendix C	V_{25}=	N/A	ft^3
1-2. Enter the volume generated from a 2.4", 24-hr storm event, $V_{2.4\text{-inch}}$, calculated using, Appendix C (0.75 gal*replaced Imperv.)+(1.5 gal*new imperv.)	$V_{2.4\text{-inch}}$=	32	ft^3
1-3. Determine design volume for sizing which is the larger of V_{25} and $V_{2.4\text{-inch}}$ and is the volume to be retained onsite	V_{design}=	37	ft^3
Step 2: Calculate design infiltration rate			
2-1. Enter soil infiltration rate (0.05 in/hr min.), $K_{measured}$	$k_{measured}$	2.50	in/hr
2-2. Enter infiltration rate safety factor, F: **F=8**, if 1 or more infiltration tests were conducted and slope is less than 15%; **F=6** if 1 or more infiltration tests were conducted within the BMP footprint, pre-treatment BMP(s) will be used, and the slope of the drainage area is less than 10% or only treating clean impervious surfaces; **F=4** if 1 infiltration test was conducted locations within the BMP footprint per 1,000 sf or less of BMP surface area, pre-treatment BMP(s) will be used and the slope of the drainage area is less than 5% or only treating impervious surfaces; **F=2** if 2 infiltration tests were conducted within the BMP footprinter per 1,000 sf or less of BMP surface area or 5 or more infiltration tests were conducted in the BMP footprint, pre-treatment media filtration or sedimentation BMP(s) will be used and the slope of the drainage area is less than 2% or only treating clean impervious surfaces)	F=	8.00	
2-3. Calculate the design infiltration rate, k_{design}+$k_{measured}$/F	K_{design}=	0.31	in/hr
Step 3: Calculate bioretention area			
3-1. Calculate maximum ponding depth, $d_{p,max}$= (k_{design}*48hr)	$d_{p,max}$=	15	in
3-2. Choose ponding depth, d_p(<=) $d_{p,max}$ and d_p(<=) 12 in.	d_p=	6	in
3-3. Enter thickness of planting mix (min 24"), d_{mix}	d_{mix}=	24	in
3-4. Choose thickness of gravel, d_{gravel}	d_{gravel}=	30	in
3-5. Calculate the effective storage depth, $d_{effective}$=d_p+0.25*d_{mix}+0.32*d_{gravel}	$d_{effective}$=	21.6	in
3-6. Check the drawdown of the effective depth, $t_{effective}$=($d_{effective}$)/(k_{design})<= 72 hr. (if the drawdown is greater than 72 hours, the gravel thickness and/or the ponding depth must be reduced in steps 3-2 or 3-4.)	$t_{effective}$=	69.12	hr
3-7. If the drawdown is greater than 48 hours, then adjust the design volume, V_{design}=V_{design}*1.15.	V_{design}=	37	ft^3
3-8. Calculate bioretention surface area, A_{st} = (V_{design}*12in/ft)/($d_{effective}$+K_{design}*4 hr)	A_{st}=	19.43	ft^2

User Inputs

Chamber Model:	DC-780
Outlet Control Structure:	No
Project Name:	1 Hot Springs Rd - DMA F
Engineer:	Chelsea yznaga
Project Location:	
Measurement Type:	Imperial
Required Storage Volume:	1086 cubic ft.
Stone Porosity:	32%
Stone Foundation Depth:	9 in.
Stone Above Chambers:	6 in.
Design Constraint Dimensions:	(10 ft. x 200 ft.)

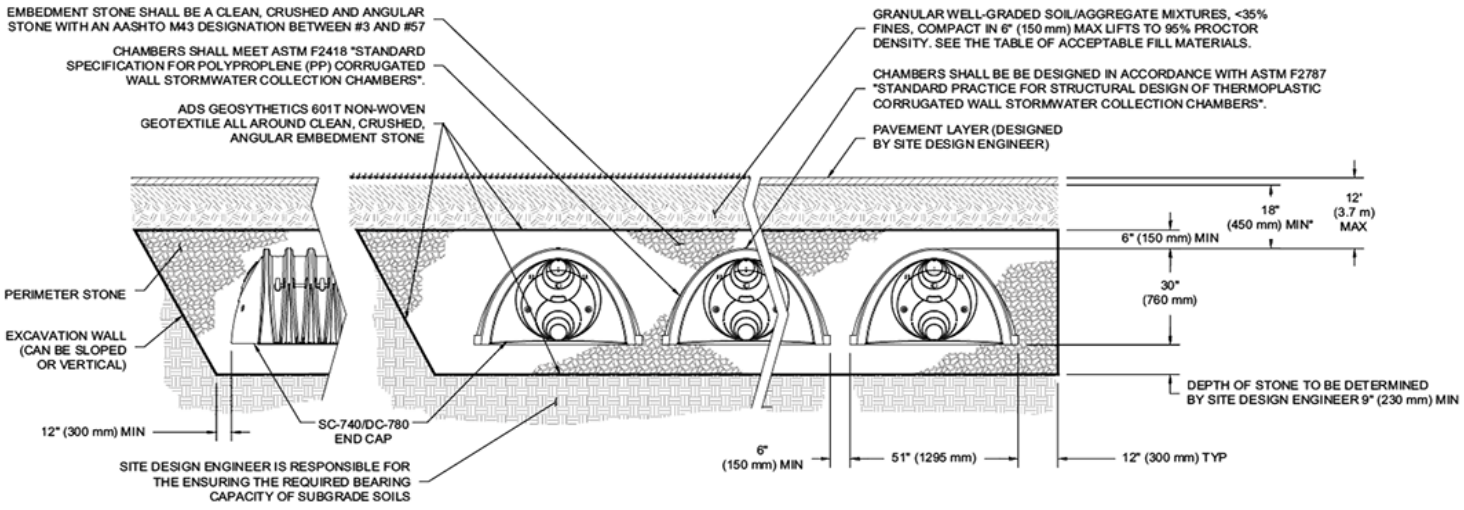
Results

System Volume and Bed Size

Installed Storage Volume:	1133.50 cubic ft.
Storage Volume Per Chamber:	46.20 cubic ft.
Number Of Chambers Required:	13
Number Of End Caps Required:	2
Chamber Rows:	1
Maximum Length:	96.12 ft.
Maximum Width:	6.25 ft.
Approx. Bed Size Required:	600.73 square ft.
Average Cover Over Chambers:	N/A .

System Components

Amount Of Stone Required:	61 cubic yards
Volume Of Excavation (Not Including Fill):	84 cubic yards
Total Non-woven Geotextile Required:	263 square yards
Woven Geotextile Required (excluding Isolator Row):	0 square yards
Woven Geotextile Required (Isolator Row):	63 square yards
Total Woven Geotextile Required:	63 square yards
Impervious Liner Required:	0 square yards



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

User Inputs

Chamber Model:	DC-780
Outlet Control Structure:	No
Project Name:	1 Hot Springs Rd - DMA G
Engineer:	Chelsea yznaga
Project Location:	
Measurement Type:	Imperial
Required Storage Volume:	300 cubic ft.
Stone Porosity:	32%
Stone Foundation Depth:	9 in.
Stone Above Chambers:	6 in.
Design Constraint Dimensions:	(10 ft. x 200 ft.)

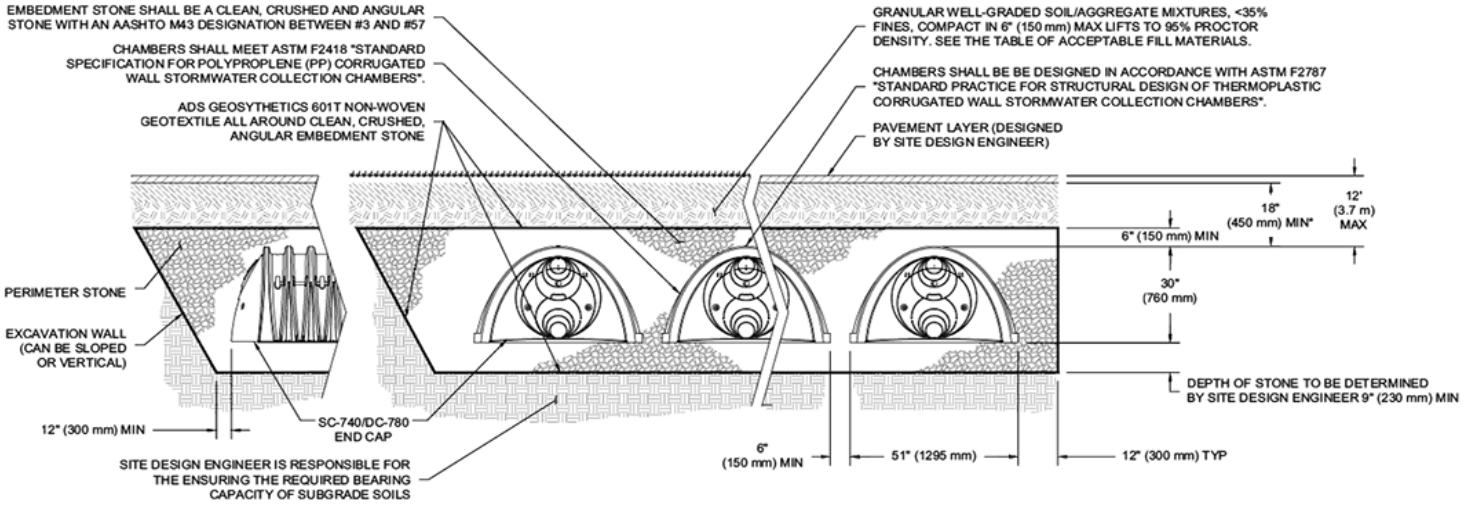
Results

System Volume and Bed Size

Installed Storage Volume:	369.96 cubic ft.
Storage Volume Per Chamber:	46.20 cubic ft.
Number Of Chambers Required:	4
Number Of End Caps Required:	2
Chamber Rows:	1
Maximum Length:	32.07 ft.
Maximum Width:	6.25 ft.
Approx. Bed Size Required:	200.42 square ft.
Average Cover Over Chambers:	N/A .

System Components

Amount Of Stone Required:	21 cubic yards
Volume Of Excavation (Not Including Fill):	28 cubic yards
Total Non-woven Geotextile Required:	92 square yards
Woven Geotextile Required (excluding Isolator Row):	0 square yards
Woven Geotextile Required (Isolator Row):	21 square yards
Total Woven Geotextile Required:	21 square yards
Impervious Liner Required:	0 square yards



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

APPENDIX D

PACIFIC MATERIALS LABORATORY INFILTRATION REPORT

Pacific
Materials
Laboratory
of Santa Barbara, Inc.

35-A South La Patera Lane
P.O. Box 96, Goleta, CA 93116
Phone: (805) 964-6901
FAX No: (805) 964-6239
E-mail: pml@pml.sbcoxmail.com

September 5, 2024
Lab No: 144949-2
File No: 24-16249-2

1 HSR GP, LLC
Attn: Brian Holland, Management Member
Email: bcraig.holland@gmail.com

SUBJECT: Infiltration Tests
Channel Drive and Cabrillo Boulevard
Santa Barbara, California

Dear Mr. Holland:

In accordance with your request, infiltration tests were performed at the locations shown on Plate 1. Three (3) test pits were excavated to a depth of 1 foot. Soil samples obtained from the pits were tested to determine the soil type. The soil type is silty clay, clayey sand, and silty clay. The test results are provided in Appendix A.

Percolation tests were performed by placing a 12-inch-deep water head in each pit. The water was allowed to soak into the soil overnight. The next day, a 6-inch-deep water head was placed in each pit and the water surface was measured to determine the water surface drop in inches per hour. The infiltration rates are reported in the table below.

TEST PIT NO.	DEPTH (feet)	PERCOLATION RATE (inches/hour)	INFILTRATION RATE* (inches/hour)
P-1	1.0	0.5	0.2
P-2	1.0	4.9	1.7
P-3	1.0	0.6	0.2

* Infiltration Rate calculated from Percolation Rate using the Porchet Method

Based on the City of Santa Barbara Storm Water BMP Guidance Manual for Post-Construction Stormwater Management, Chapter 3 Site Soil Infiltration Assessment, Section 3.4 Infiltration Tests, sites considered amenable to an infiltration BMP must have an infiltration rate between 0.05[1] and 2.4 inches/hour. Based on the test results, Test Pit No. 1,2, and 3 resulted in amenable infiltration rates.

[1] Per Santa Barbara City Creeks Division, the lower limit infiltration rate was intended to be changed to 0.05 in./hr. in the July 2013 revision of the Santa Barbara City Storm Water BMP Guidance Manual, but somehow this change was missed as the revision received its final approval. The July 2013 revision actually reads 0.5 in./hr., but the Santa Barbara City Creeks Division utilizes 0.05 in./hr. as the lower limit infiltration rate in its review of Tier 3 BMP systems. The intent of the change was to attain filtration of a minimum of 1 inch of storm water in a 24-hour period, which 0.05 in./hr. would achieve.

The infiltration tests were supplemented by one (1) boring which extended to a depth of 50 feet below the present ground surface in order to comply with the requirement of excavations extending to a depth of 11 feet below the bottom of the proposed infiltration chambers.

The previously-completed exploratory boring is presented graphically on Enclosure B. The existing ground surface at the test location is relatively level sloping less than 3% in a northerly direction.

If you have any questions concerning this matter, please do not hesitate to call. Thank you for the opportunity of providing this service.

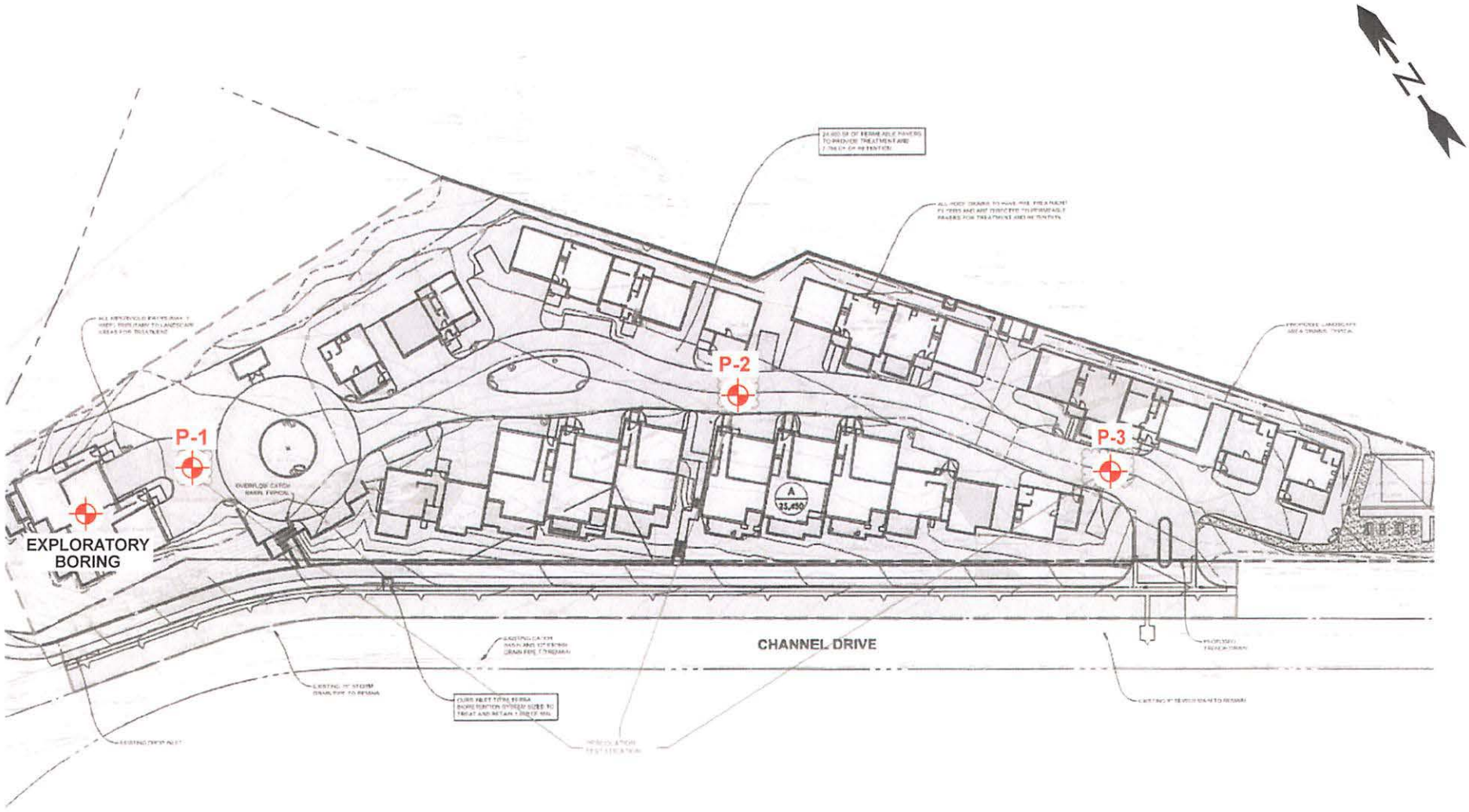
Respectfully submitted,

PACIFIC MATERIALS LABORATORY, INC.

Ronald J. Pike, C. E. 42788

RJP:ttm

cc: 1 HSR GP, LLC, Attn: Brian Holland, Management Member,
Email: bcraig.holland@gmail.com
SB City Bldg. Dept.



SITE PLAN

APN 017-391-008, -01
APN 017-393-002, -01, -02, -03, -04, -05
Channel Drive and Cabrillo Boulevard
Santa Barbara, California

Pacific Materials Laboratory, Inc.

Scale: none	Plate 1 Lab No: 144949-2 File No: 24-16249-2 September 5, 2024

September 5, 2024

Lab No: 144949-2
File No: 24-16249-2

BORING LOG DATA

BORING NO. B-1

Field Technician: Mann/Trujillo

Date Drilled: 08/14/24

Blow Counts		Moisture Content (%)	Depth (ft)	Soil Log	Soil Description
			0		Light brown sandy CLAY
59		10.7	5		
					Light brown clayey silty SAND with cobbles
					Silty, sandy CLAY
50 for 5"		9.7	10		
					Light brown clayey SAND
51		9.7	15		
					Clayey silty SAND
17		12.1	20		
					SAND
			25		
			▼		Groundwater was encountered at 28 feet 2 inches.
50 for 5"		16.6	30		
					Clayey silty SAND with sandstone cobbles
					Black CLAY
			35		
68		23.3	40		
					Sandstone bedrock
50			45		

LEGEND

■ - Modified California Sampler

APPENDIX A

LABORATORY TESTS

September 5, 2024

Lab No: 144949-2

File No: 24-16249-2

SAND-SILT-CLAY By Hydrometer ASTM D 422					
SAMPLE LOCATION	DEPTH (ft.)	SAND %	SILT %	CLAY %	SOIL DESCRIPTION
P-1	1	18	46	36	Silty CLAY
P-2	1	62	18	20	Clayey SAND
P-3	1	2	54	44	Silty CLAY