Bacon Wilson
ATTORNEYS AT LAW

AMHERST
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NORTHAMPTON
SPRINGFIELD
WESTFIELD

September 13, 2023

Hand Delivered

Leicester Planning Board
c/o David A. Genereux, Town Administrator
Town of Leicester
3 Washburn Square
Leicester, MA 01524

RE: Site Plan Approval & Special Permit Applications
1621 Main Street, Leicester, MA

Dear Mr. Genereux:

Please accept this submission packet on behalf of HY Ventures Leicester, LLC as formal Application for:

1. Site Plan Approval for the redevelopment of the parcel known as 1621 Main Street (the "Site"). The Applicant seeks to demolish the existing abandoned single-family home and construct an approximately 3,900 square foot commercial building with 30 parking spaces and a drive-through (2,400 square foot Starbucks with drive-through, and 1,500 square feet Nail Salon). The uses of a Starbucks and nail salon are allowed by right with Site Plan Approval by the Planning Board;

2. Special Permit to allow for the use of a drive-through for the Starbucks which is allowed under 3.2.03 Business(11) of the Leicester Zoning Bylaw; and,

3. Stormwater Permit under Chapter 15 of the Leicester General Laws and the Leicester Stormwater Regulations.

The following documents (as copies or original documents as appropriate) are included:

1. Site Plan Approval Application;
2. Special Permit Application;
3. Site Plan Approval and Special Permit Narrative;
4. List of Abutters;
5. Stormwater Management Report;
6. Stormwater Modification Letter for 1603 and 1605 Main Street;
7. Two (2) 24" x 36" site plan and elevations plan;
8. Two (2) 11" x 17" site plan and elevations plan; and,
9. Application Fee.

Thomas R. Reidy
Attorney
treidy@baconwilson.com

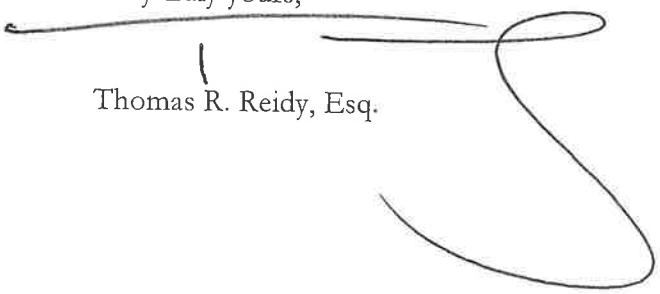
Bacon Wilson, P.C.\ Monsein & MacConnell
Attorneys at Law

6 South East Street
Amherst, MA 01002

Tel 413.256.6701
Fax 413.256.6469

Kindly place this matter on the Planning Board's agenda for the October 17th hearing, and please do not hesitate to contact me should you require any clarification.

Very truly yours,



Thomas R. Reidy, Esq.

For Planning Office Use:
File #:_____

Leicester Planning Board
Site Plan Review & Special Permit Application Form

PERMIT TYPE: ☐ Special Permit ☑ Site Plan Review

CONTACT INFORMATION

Owner Information			
Name:		**Company Name:**	HY Ventures Leicester, LLC
Signature:	Duly Authorized		
Address:	313 Boston Post Road, Suite 120, Marlborough, MA 01752		
Phone:	(413) 256-6701	**Email:**	treidy@baconwilson.com

Applicant Information			
Name:	See Owner Information.	**Company Name:**	
Signature:	Duly Authorized		
Address:			
Phone:		**Email:**	

Primary Contact Person (*The person that will be contacted by Planning Board staff during the application process.*)			
Name:	Thomas R. Reidy, Esq.	**Company Name:**	Bacon Wilson, P.C.
Address:	6 South East Street, Amherst, MA 01002		
Phone:	(413) 256-6701	**Email:**	treidy@baconwilson.com

PROJECT INFORMATION

Project Address:	1621 Main Street	**Zoning District:**	HB-1
Assessors Map & Parcel #	18A-13	**Deed Reference (Book & Page):**	Book 68752, Page 283
Applicable Zoning Bylaw Section(s):	3 2 03 Business (1 and 6-Restaurant and Service) Allowed by Right, 3 2 03 Business (11-Drive-Through) Allowed By Special Permit		
Proposed Land Use:	Nail Salon and Starbucks with a drive-through		
Existing Land Use:	Abandoned Single Family Home Lot		

For Planning Office Use:
File #:_____

PROJECT INFORMATION, Continued

Size of Proposed Structure(s):	3,900 Square Feet (2,400 Square feet- Starbucks, 1,500 Square Feet- Nail Salon)
Total Lot Area:	.921 Acres (40,123 Square Feet)

Water Source: *(Select One)*	◯ Private Well	◯ Cherry Valley & Rochdale Water District
	◯ Hillcrest Water District	◉ Leicester Water Supply District
Sewer Source: *(Select One)*	◯ Private Septic System	◯ Cherry Valley Sewer District
	◯ Hillcrest Water District	◉ Leicester Water Supply District
	◯ Oxford Rochdale Sewer District	

Brief Project Description:

Please include a brief description on this form (i.e. do not write "see attached"). *[Examples: New construction of a 20,000s.f. retail building and associated parking; Use of a 1,000s.f. portion of an existing structure for a proposed pet grooming clinic.]*

The Applicant seeks to demolish the existing abandoned single family home and construct a 3,900 square foot commercial building with 30 parking spaces and a drive-through (2,400 square feet- Starbucks, 1,500 square feet- Nail Salon)

Application Checklist

Use this checklist to ensure you have provided all required information. See Planning Board Site Plan Review & Special Permit Regulations for details. 13 copies are required except where noted.

☐ Plans (2-full-size & 11-11"x17")	☐ Detailed Project Narrative including any waiver requests [1]	☐ Drainage Analysis/ Stormwater Report, (3 copies) ☐ n/a
☐ Documentation of Availability of Water & Sewer ☐ n/a	☐ Certified Abutters List (1 copy)[2] ☐ n/a	☐ Traffic Study (3 copies) ☐ n/a
☐ Fees[3]	☐ .pdf copy of all required submittals (CD or USB Drive)	

1 See Planning Board Site Plan Regulations for details on what should be included in a Project Narrative. For special permits that don't require conformance with Site Plan Review submittal requirements, submit a narrative explaining conformance with special permit approval criteria (see Special Permit Regulations for details).

2 certified abutters lists are required for all Special Permits applications and for Major Site Plan Review Applications (new construction over 30,000 s.f. and ground-mounted solar over 250,000 s.f or 2 acres or more of tree clearing)

3 Please refer to the Planning Board's Fee Regulations. Checks must be made out to the Town of Leicester

For Planning Board Use:			
Date of Submittal:			
Public Hearing/Meeting Date(s):			
Date of Planning Board Vote:			
Date Decision Filed with Town Clerk:			

For Planning Office Use:
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For Planning Board Use:			
Date of Submittal:			
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Date of Planning Board Vote:			
Date Decision Filed with Town Clerk:			

HY VENTURES LEICESTER, LLC

1621 MAIN STREET

LEICESTER, MASSACHUSETTS

SITE PLAN REVIEW/SPECIAL PERMIT NARRATIVE

OVERVIEW

HY Ventures Leicester, LLC (the "Applicant") is proposing the redevelopment of the parcel known as 1621 Main Street. The Site is currently comprised of an abandoned single-family home in disrepair. The Site is bounded to the west by woods, to the north by a residential property, to the east by Main Street (Route-9) and to the south by as gas station and convenience store. The Site will be an approximately .92-acre (40,123 square foot) parcel located within the HB-1 zoning district.

The proposal is for the removal of the existing structure and the redevelopment of the site to include a 3,900 square foot commercial/restaurant building, with 2,400 square of feet of the structure being a Starbucks with drive-though and 1,500 square feet Nail Salon, with a total building coverage of 10%. The Site will provide 30 parking spaces, and attendant signage, landscaping, lighting and site infrastructure. The sewer and water will be provided by the Leicester Water Supply District ("Project").

The Starbucks and nail salon use are allowed by right under the Leicester Zoning Bylaw with Site Plan Approval by the Planning Board. The use of a drive-through is allowed by Special Permit granted by the Planning Board.

The proposed Project is for the reconstruction and alteration of the Site, which currently is comprised of an abandoned single-family home, for use as a Starbucks with a drive-through and a nail salon. The Site will include landscaping as more completely and specifically detailed in the Site Landscape Plan (Plan 7), included in the submission packet.

The Starbucks will likely not operate outside of Monday-Sunday 5 A.M. to 11 P.M. It is anticipated that there will be a total of 35 employees hired to operate the store, with 6-8 employees at peak business hours and 2-4 employees at lower intensity business hours. Majestic Nails is a nail salon that specializes in manicures, pedicures and waxing. It is anticipated that the business will operate Monday-Friday 9:30 A.M. to 7 P.M., Saturday 9 A.M. to 6 P.M. and will be closed on Sundays, and will have 8-10 employees hired to operate the business.

The proposed Site will have one right-in-only only curb cut on the northeasterly portion of the lot, with additional site access through the Site's southerly side, leading to the southerly adjacent property (to be memorialized in an access easement), which provides access to a signalized intersection. The siting of the access site driveways allows for proper circulation of passengers and delivery vehicles.

Site illumination will be downcast LED lights which prevent light nuisance or light spillage onto adjacent properties. Adequate lighting is provided to increase public safety.

Civil Design Group has also provided a Stormwater Management Report, which evidences a system design that results in post-development peak runoff rates not exceeding pre-developments peak runoff rates. The collection system has been designed to convey runoff for the 25-year storm event and the stormwater management system incorporates both structural and non-structural BMP's to adequately treat runoff from the proposed redevelopment area in accordance with the DEP Stormwater Management Policy to the maximum extent practicable. Comprehensive computations and calculations with supporting figures and plans are attached.

The proposed signage, lighting and traffic flow ensures the safety, public health and welfare of pedestrians both on and off the site.

The proposed Project is in harmony with the uses in the HB-1 zoning district, as the intent of the district is to provide for the development and redevelopment of Leicester's highway business corridors by allowing a mix of commercial, office, research, and light industrial activities that create employment opportunities and expand the tax base.

The redevelopment of the Site will both eliminate the existing infrastructure at the Site and replace them with a state-of-the-art facility, and the Leicester tax base will be diversified and expanded (the value of the existing parcel is $344,600). It is likely the assessed value will be significantly higher due to the proposed Project, resulting in more tax revenue for the town of Leicester. Further, the Project would be a convenience to the Town and those individuals looking for the goods that it offers, while providing additional job opportunities. Appropriate downcast lighting, building siting, and site management will ensure that the neighborhood is not detrimentally affected.

HY Ventures Leicester, LLC believes the Project will be a benefit to the community and is an appropriate development of the site.

STORMWATER MANAGEMENT REPORT

FOR A

COMMERCIAL DEVELOPMENT

1621 MAIN STREET
LEICESTER, MA 01524

PREPARED FOR:

HY VENTURES LEICESTER, LLC
313 BOSTON POST ROAD WEST
MARLBOROUGH, MA 01752

PREPARED BY:

CIVIL DESIGN GROUP, LLC
21 HIGH STREET, SUITE 207
NORTH ANDOVER, MA 01845

DATE: AUGUST 2023

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1.0 SITE LOCATION AND DESCRIPTION

Civil Design Group, LLC (CDG) has been retained by HY Ventures Leicester, LLC to prepare this Stormwater Management Report for the construction of commercial development located at 1621 Main Street in Leicester, Massachusetts (refer to Figure-1). The development program includes demolishing the existing single family home and includes constructing a new 3,900 square foot commercial/restaurant building with 30 parking spaces on a 0.92± acre site. The site is bounded to the south by woods, to the west by a residential property, to the north by Main Street and to the east by a gas station and convenience store.

According to FEMA flood insurance rate maps community panel number 25027C0780FE, effective date 06/21/2023, the site lies within Zone X, which is defined as areas determined to be outside the 0.2% (500-year) annual chance floodplain. Based on available MassGIS information, the does not include a wetland resource area and does not appear to lie within an Area of Critical Environmental Concern (ACEC), or an area mapped for rare and endangered species or certified vernal pools. The site does not lie within a groundwater protection area.

This study presents a comparative analysis of the pre-development and post-development hydrologic characteristics of the site, and outlines the proposed measures to mitigate flow, provide groundwater recharge, and improve water quality from the site in accordance with the municipal and the Massachusetts Department of Environmental Protection (DEP's) requirements. The proposed best management practices (BMPs) as outlined in this report include two subsurface infiltration systems to provide recharge and mitigation of the peak flow rates for the 2, 10, 25 and 100-year storm events and treatment devices to pretreat stormwater to the maximum extent practicable prior to discharging off site.

2.0 METHODOLOGY

Northeast Regional Climate Center (Cornell Rates) was utilized to source the precipitation values and Technical Release 55 (TR-55) methodology was utilized to determine weighted curve numbers (CNs) for each pre and post-development subcatchment area. Weighted CNs are based on ground cover type and hydrologic soil groups (HSGs). The times of concentration (Tc's) for each of the existing and proposed watersheds have been calculated. The areas that do not show a Tc travel path resulted in travel times of less than 6 minutes. CN and Tc values were then utilized to generate hydrographs using HydroCad 10.0, an industry standard software package that develops a hydrologic model based on the SCS method and computes peak discharges from rainfall runoff for urban and rural watersheds.

3.0 SOILS

According to the Natural Resources Conservation Service Web Soil Survey, underlying soils on the site are classified as Woodbridge fine sandy loam, which includes an associated hydrologic soil group [HSG] rating of C/D. Therefore, for the purposes of generating peak flow rates, this stormwater report utilizes an HSG rating of C for both the existing and proposed conditions, which is consistent with the recently approved project to the east. Furthermore, an infiltration rate of 0.27 in/hour is used for the expanded offsite infiltration basin which is the same rate used in the recently approved development.

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4.0 POINTS OF ANALYSIS

Points of Analysis (POAs) are discharge points or lines that convey runoff from the study area via overland flow or through drain pipes. The pre-development and post-development areas of disturbance drain to two (2) POAs listed and described below and shown on Figures 3 and 4.

TABLE-1: POINTS OF ANALYSIS

POINT OF ANALYSIS	DESCRIPTION
POA-1	A comparison line along the rear property line, which conveys runoff toward the wooded area to the south and eventually the downstream wetland.
1EV	The southwest corner of the abutting property, which conveys runoff toward the wooded area to the south and eventually the downstream wetland.

Both POA's merge to the same offsite location but they have been presented separately because they their respective watersheds are sourced on different properties.

5.0 EXISTING DRAINAGE WATERSHEDS

The existing watersheds are delineated based on topography, physical characteristics and drainage networks within the site limits and collect and direct stormwater towards the POAs. The total study area for this project is 0.94± acres as a portion of the upstream area between the Main Street curb line and front property line drain back towards the site. The pre-development watershed is described as follows:

Subcatchment EX-1: The 0.94-acre watershed is comprised of pavement, rooftop and grass areas. Runoff sheet flows via overland in a southerly direction towards POA-1.

6.0 PROPOSED DRAINAGE WATERSHEDS

Similar to the existing watersheds, the proposed watersheds are delineated based on topography, physical characteristics and drainage networks within the site limits and collect and direct stormwater towards the POAs. The two (2) post-development watersheds are described as follows:

Subcatchment PR-1: The 0.16-acre watershed is comprised of pavement and grass areas Runoff sheet flows via overland in a southerly direction towards POA-1.

Subcatchment PR-2: The 0.78-acre watershed is comprised of rooftop, pavement and grass areas. Runoff is collected in the new drainage system and is conveyed to the offsite expanded infiltration basin. The overflow runoff is discharged in a southerly direction towards 1EV.

7.0 PEAK FLOW RATE MITIGATION

The stormwater management system is designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates for the 2-year, 10-year, 25-year and 100-year, 24-hour storm events. Peak flow rates for the pre-development and post-development conditions are illustrated below:

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TABLE 2: PEAK FLOW RATE COMPARISON

POINT OF ANALYSIS	2-YEAR STORM EVENT (3.23"/24-HR)		10-YEAR STORM EVENT (4.58"/24-HR)		25-YEAR STORM EVENT (5.88"/24-HR)		100-YEAR STORM EVENT (8.68"/24-HR)	
	PRE (CFS)	POST (CFS)	PRE (CFS)	POST (CFS)	PRE (CFS)	POST (CFS)	PRE (CFS)	POST (CFS)
POA-1	*1.25*	**0.19**	*2.28*	**0.40**	*3.34*	**0.57**	*5.73*	**0.95**
1EV	*2.29**	**2.09**	*5.69**	**4.20**	*8.81**	**7.27**	*15.53**	**11.73**

*** Approved peak flow rates from previous project**

8.0 WATER QUALITY

The development program includes measures to treat runoff from impervious areas prior to discharging offsite. New stormwater controls have been incorporated into the design that result in a reduction in annual stormwater pollutant loads from the site. Through the use of structural and non-structural BMPs, the water quality volume from the watersheds contributing to the proposed drainage system will undergo treatment. Currently, the limit of work contains approximately 0.13 acres of impervious area or 13% of the site. The redevelopment program includes approximately 0.63 acres of impervious or 67% of the site, resulting in a net increase of 0.50 acres in impervious area. As depicted in Figure-5, subcatchments 1 and 4 corresponding to catch basins CB-1-CB-4 of the proposed drainage system, collect 0.53± acres of non-rooftop impervious area and will be treated to the standards (see below). The runoff from the remaining <0.01± acres of non-rooftop impervious area sheet flow onto Main Street. The following BMPs were selected to treat the average annual TSS load from stormwater runoff under the post-development condition. Refer to the TSS Removal Calculation Worksheet below.

- Deep Sump Hooded Catch Basins
  Stormwater runoff from proposed pavement areas will be directed via curbing and site grading to catch basins with deep sumps and hooded outlets. The catch basins will trap and remove sediment and larger particles from the stormwater and will improve the performance of subsequent BMP's. The sumps will be a minimum of 4' in depth and a regular inspection and cleaning schedule has been proposed to ensure optimal effectiveness. When properly designed and maintained, catch basin sumps are effective in reducing the sediment and pollutant load in runoff.

- Hydrodynamic Separator (HS4 Unit)
  Hydrodynamic Separators are designed to remove heavy particles, floating debris and hydrocarbons from stormwater. Stormwater enters the system where floatables and oils are separated prior to the clarified stormwater runoff discharging to an outlet pipe. See below for additional information about the TSS rates utilized for these proprietary BMPs.

- Infiltration Basin with Sediment Forebay
  A sediment forebay is an excavated pit or bermed area designed to slow incoming stormwater runoff and facilitate the gravity separation of suspended solids. Infiltration basins are stormwater runoff impoundments that are constructed over permeable soils. Pretreatment is critical for effective performance of infiltration basins. Runoff from the design storm is stored until it exfiltrates through the soil of the basin floor.

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TABLE 3: TSS REMOVAL CALCULATION WORKSHEET[1]

TREATMENT TRAIN-1 (TT#1): SC-1 - SC4 (0.53Ac)

BMP (A)	TSS Removal Rate (B)	Starting TSS Load (C)	Amount Removed (BxC) (D)	Remaining Load (C-D) (E)
Deep sump hooded catch basins	0.25	1.0	0.25	0.75
Infiltration w/ pre-treatment*	0.80[1]	0.75	0.60	0.15
Total TSS Removal = Summation of (D) =			**85%**	

*** Calculated using the Hydroworks software (minimum of 44% TSS Removal prior to infiltration)**

[1] 80% TSS removal credit when combined with adequate pretreatment

CUMULATIVE TSS REMOVAL: (0.53Acres x 0.85) + (0.01 Acres x 0.00) = 84%
0.54 Acres

Since the Hydroworks units are designed to treat the required flow without overflow, bypass, surcharge, or scouring, and since they include a built-in bypass mechanism to accommodate high flow storm events, they are considered "offline" units under the DEP policy as proposed.

9.0 GROUNDWATER RECHARGE

The DEP Stormwater Management Policy addresses the importance of recharging groundwater and reducing surface runoff. For a redevelopment project, the net increase in site impervious area must be infiltrated to approximate the annual recharge from pre-development conditions. The total impervious area contributing to the infiltration basin equals 2.78± acres. The required recharge equals a depth of runoff corresponding to the soil type multiplied by the net increase in impervious area for each soil type in the post development condition. Using a target factor of 0.25 inches for HSG-C, the total required recharge volume is as follows:

$$Rv = (F) \times (\text{newly created impervious area})$$

where,

Rv =Required recharge volume (cubic feet)
F = Target depth factor corresponding to the HSG.

$$Rv = 0.25 \text{ inch} \times 2.78 \text{ acres} \times (43{,}560 \text{ ft}^2/\text{acre}) \times (1 \text{ ft}/12 \text{ inch}) = 2{,}523 \text{ cubic feet}$$

The available storage within the infiltration basin below the lowest overflow outlet totals 5,124± cubic feet, thereby exceeding the required recharge volume.

10.0 DRAINAGE CONVEYANCE SYSTEM

The proposed stormwater conveyance system was designed to collect and convey runoff from developed areas to the associated stormwater management system BMP's described in this report. The drainage system consists

[1] TSS Removal Rate calculation includes non-rooftop impervious surfaces.

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four (4) deep sump hooded catch basins, one (1) water quality unit, one (1) infiltration basin and associated piping. Using the rational method to determine peak runoff flows, the proposed conveyance system is designed for the 25-year storm event.

11.0 COMPLIANCE WITH THE MASSACHUSETTS DEP STORMWATER HANDBOOK

This study presents a comparative analysis of the pre-development and post-development hydrologic characteristics of the site, and outlines the proposed measures to mitigate flow, provide groundwater recharge, and improve water quality from the site. The best management practices (BMPs) outlined in this report include measures to meet the municipal and the Massachusetts Department of Environmental Protection (DEP) requirements. Below is a summary of how the design complies with each applicable DEP standard.

Standard 1: No new stormwater conveyances may discharge untreated directly to or cause erosion in wetlands or waters of the Commonwealth.

The proposed stormwater conveyance system does not include any new *untreated* discharges. The overland and subsurface drainage connection points will remain consistent with the existing condition.

Standard 2: Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

As indicated above and within the supporting HydroCad calculations, the stormwater management system is designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

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

There is a net increase of impervious area and the corresponding required volume of runoff will be recharged to groundwater.

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

To aid in removal of total suspended solids, deep sump hooded catch basins and water quality units are proposed. Onsite non-rooftop impervious areas will be treated beyond 80%.

Standard 5: For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

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Source control such as rooftop capture and direct connection into the proposed drainage system have been implemented to reduce the discharge of stormwater from the site. In addition, installation of a water quality unit will increase TSS removal for the site from existing conditions.

Standard 6: Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

Not applicable.

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

Not applicable.

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

The 'Demolition and Erosion Control Plan' outlines and depicts measures to control construction related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities.

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

An Operation and Maintenance Plan (O&M) has been developed that outlines maintenance requirements to ensure longevity of BMP's. See Appendix A.

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

The proposed stormwater management system does not include any illicit discharges.

12.0 SUMMARY

The stormwater management system for the proposed redevelopment includes measures for collecting, conveying, treating and controlling stormwater runoff from the site. The site results in a net zero change in impervious area and post-development peak runoff rates have been attenuated for the 2, 10, 25 and 100-year storm events. The collection system has been designed to convey runoff for the 25-year storm event and the stormwater management system incorporates both structural and non-structural BMP's to adequately treat runoff from the proposed redevelopment area in accordance with the DEP Stormwater Management Policy to

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the maximum extent practicable. Comprehensive computations and calculations with supporting figures and plans are attached.

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1,000 0 500 1,000 2,000

GRAPHIC SCALE IN FEET

SOURCE: USGS TOPOGRAPHIC MAP

PROPOSED
COMMERCIAL DEVELOPMENT

1621 MAIN STREET
LEICESTER, MA

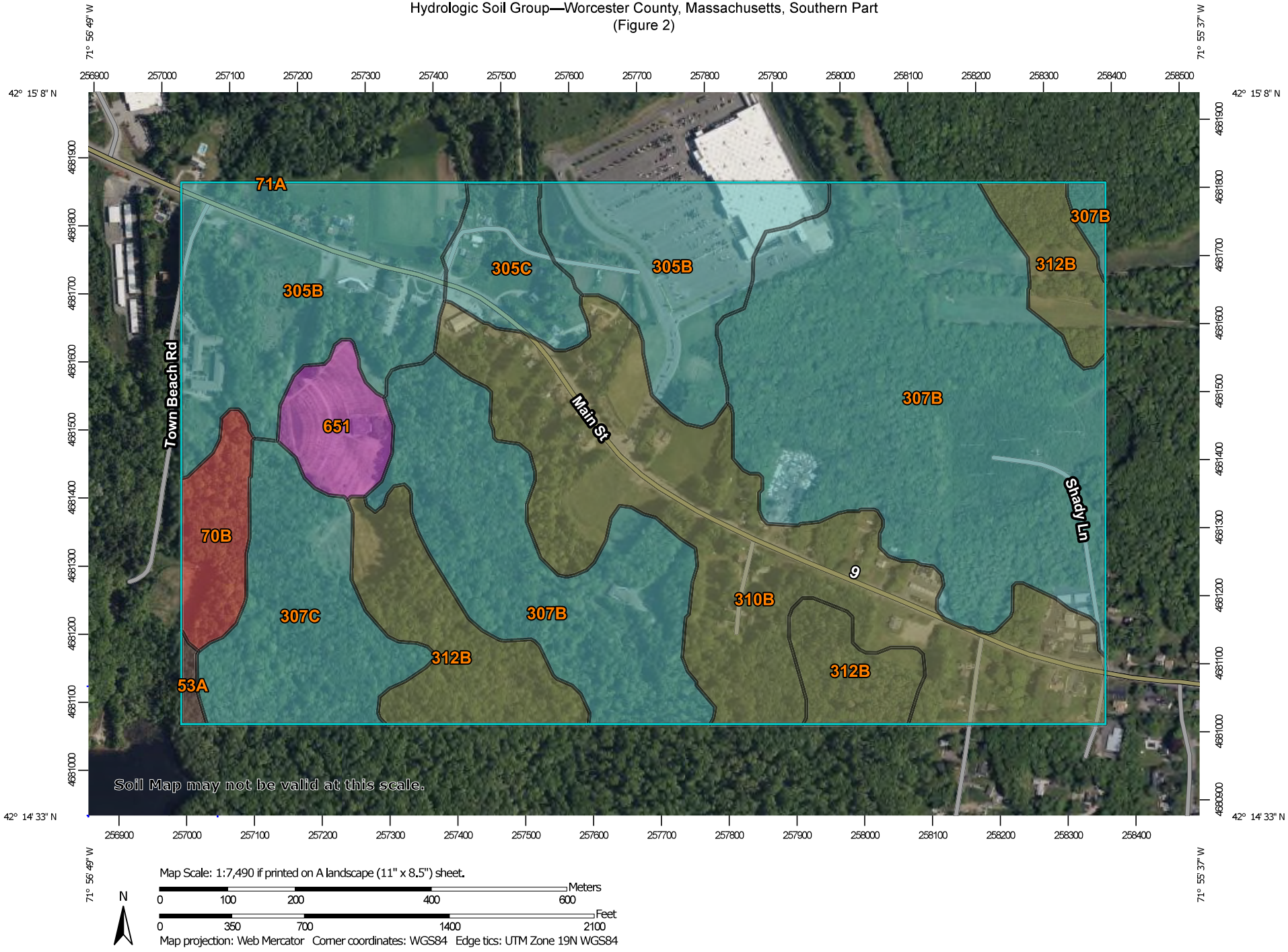
CIVIL DESIGN GROUP, LLC

21 HIGH STREET SUITE 207
NORTH ANDOVER, MA 01845
www.cdgengineering.com
p: 978-794-5400 f: 978-965-3971

FIGURE-1
USGS PLAN

08/2023

Hydrologic Soil Group—Worcester County, Massachusetts, Southern Part
(Figure 2)



Map Scale: 1:7,490 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Worcester County, Massachusetts, Southern Part
Survey Area Data: Version 15, Sep 9, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
53A	Freetown muck, ponded, 0 to 1 percent slopes	B/D	0.8	0.3%
70B	Ridgebury fine sandy loam, 3 to 8 percent slopes	D	7.0	2.6%
71A	Ridgebury fine sandy loam, 0 to 3 percent slopes, extremely stony	D	0.0	0.0%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	50.1	18.6%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	C	8.5	3.2%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	C	97.0	36.0%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	C	19.5	7.2%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	53.2	19.7%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	C/D	26.5	9.8%
651	Udorthents, smoothed	A	6.7	2.5%
Totals for Area of Interest			**269.3**	**100.0%**

Description

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

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

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

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

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

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

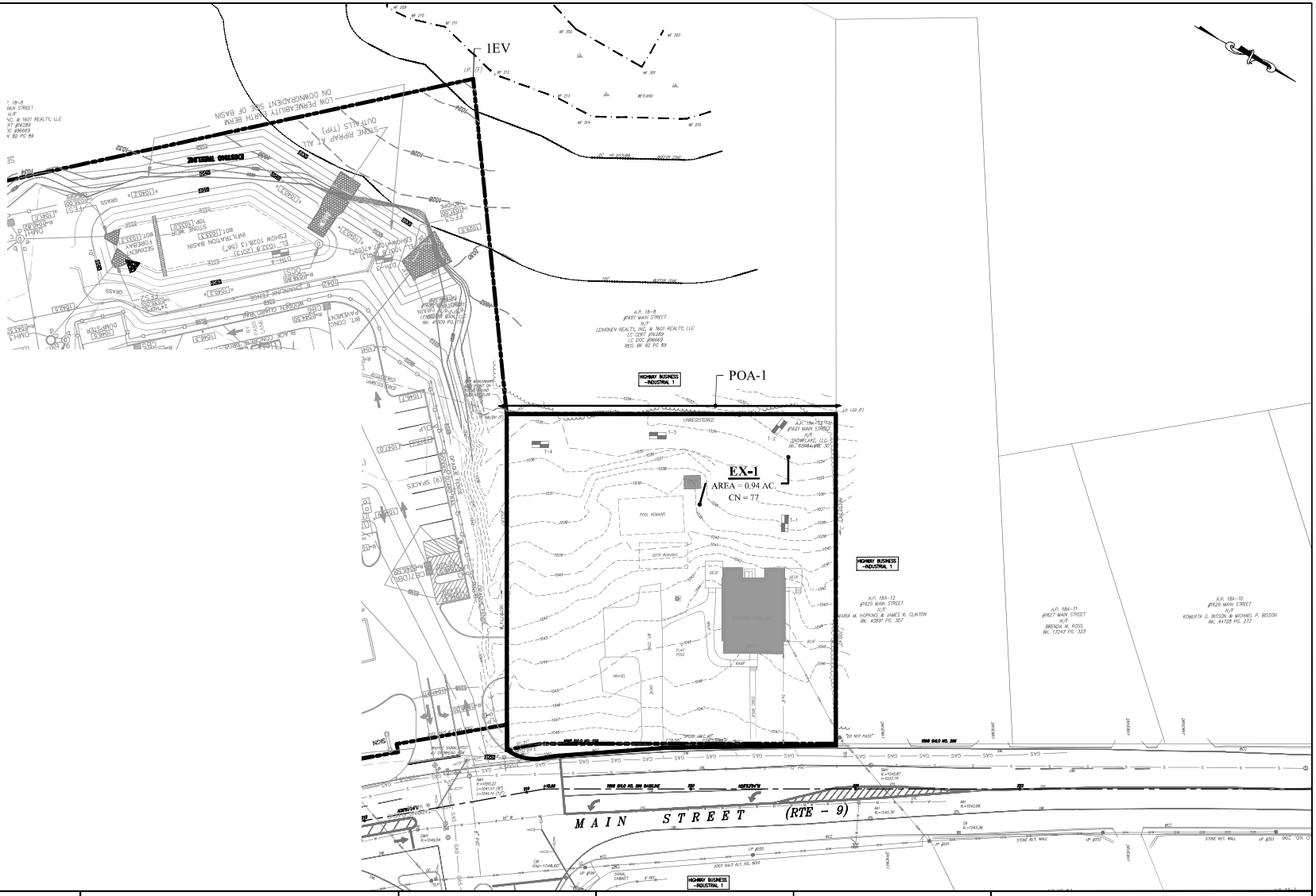
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



60 0 30 60 120

GRAPHIC SCALE IN FEET

CLIENT:
HY VENTURES LEICESTER, LLC
313 BOSTON POST ROAD WEST
MARLBOROUGH, MA 01752

SITE:
1621 MAIN STREET, LEICESTER, MA 01524

CIVIL DESIGN GROUP, LLC
21 HIGH STREET, SUITE 207
NORTH ANDOVER, MA 01845
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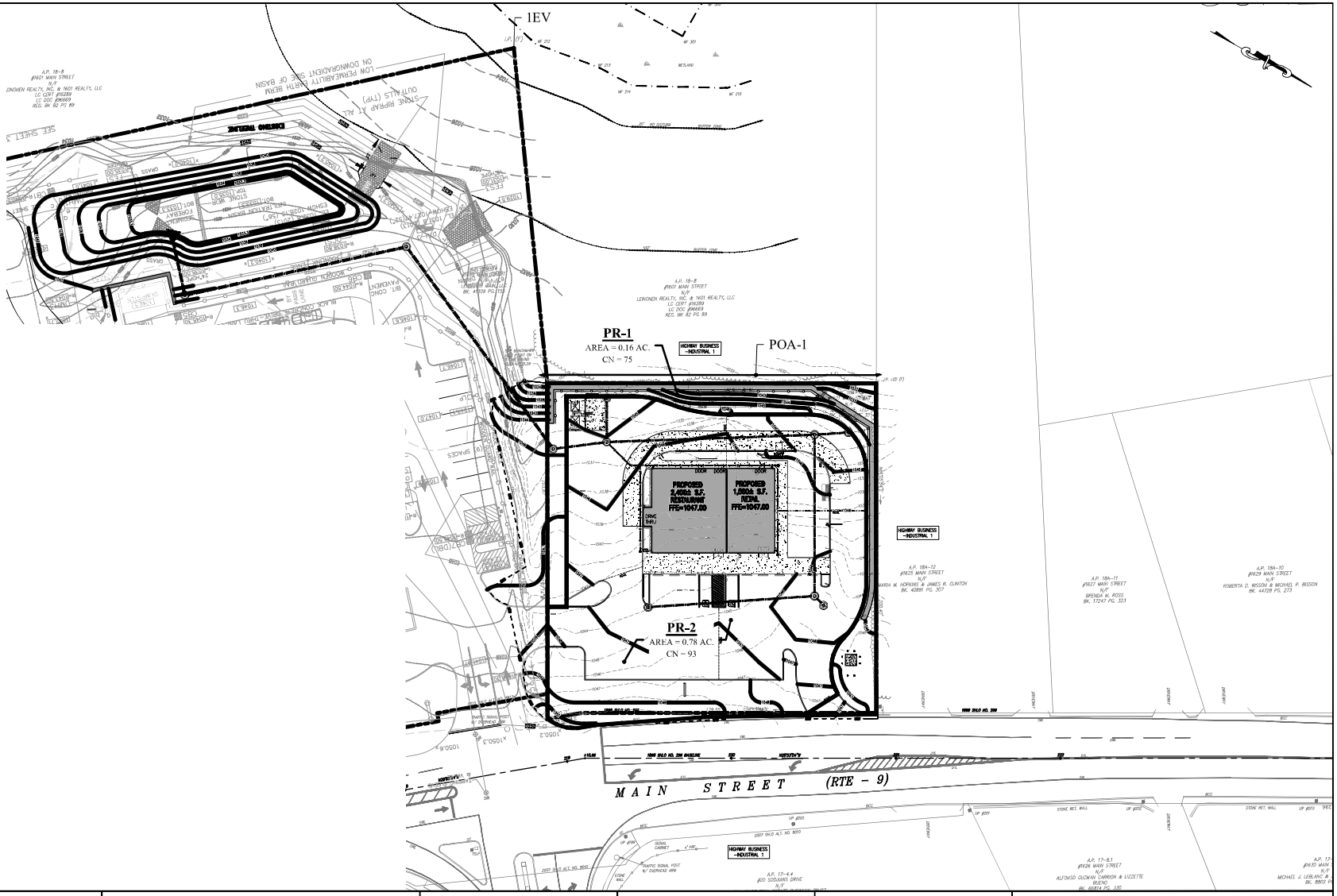
NOT FOR CONSTRUCTION

FIGURE-3 EXISTING WATERSHED

DATE: 08/15/2023 | CDG# 23028



60 0 30 60 120

GRAPHIC SCALE IN FEET

CLIENT:
HY VENTURES LEICESTER, LLC
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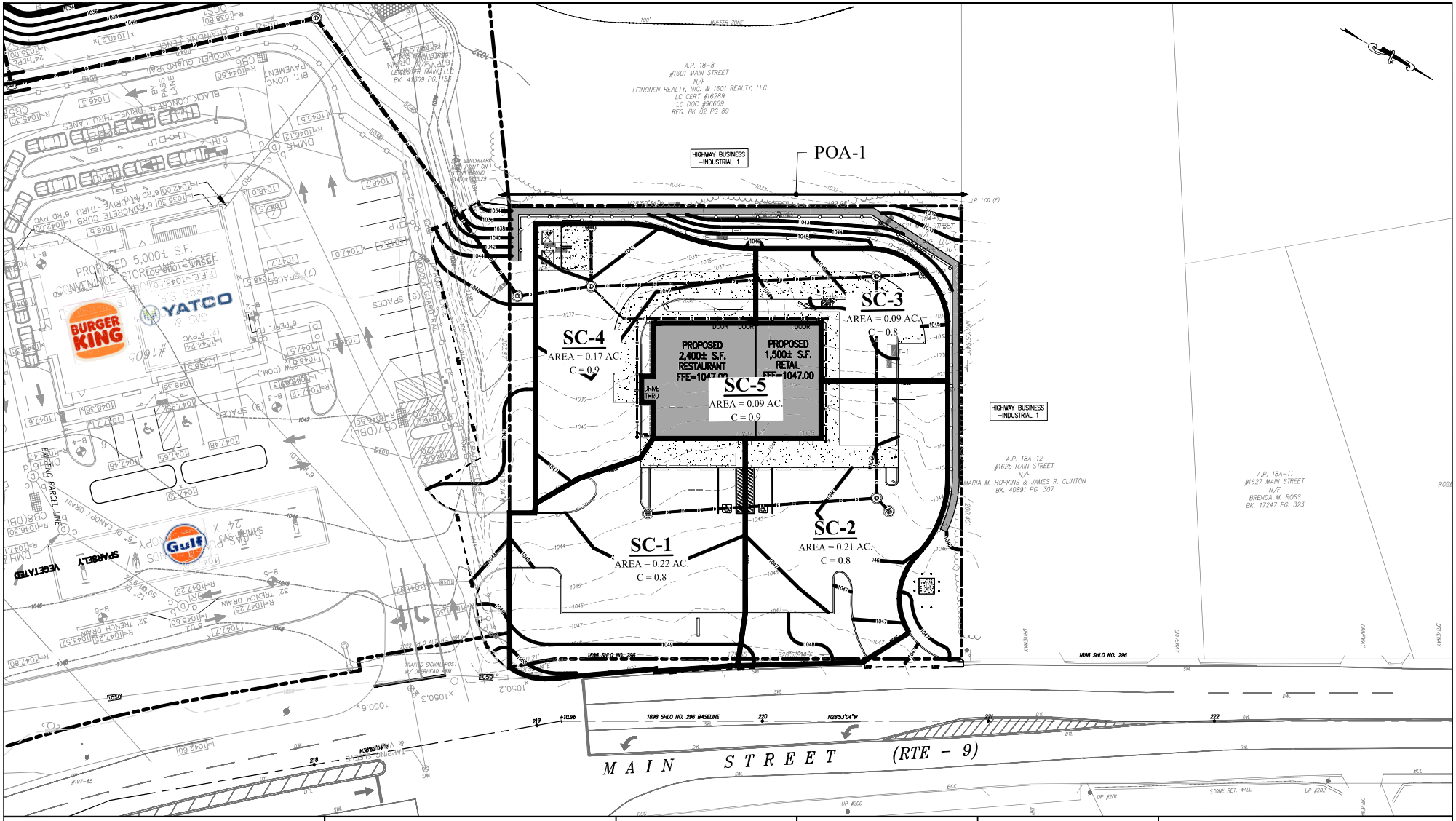
NOT FOR CONSTRUCTION

FIGURE-4 PROPOSED WATERSHED

DATE: 08/15/2023 | CDG# 23028



CLIENT:
HY VENTURES LEICESTER, LLC
313 BOSTON POST ROAD WEST
MARLBOROUGH, MA 01752

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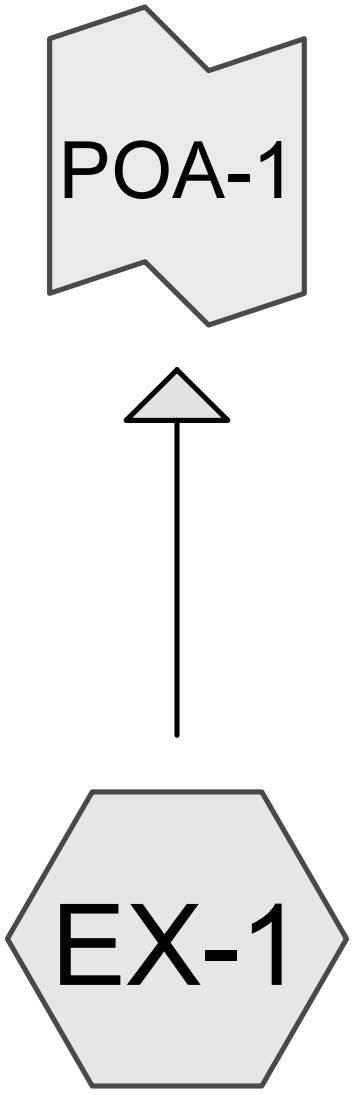
p: 978-794-5400 f: 978-965-3971

NOT FOR CONSTRUCTION

FIGURE-5 PROPOSED CATCH BASIN WATERSHEDS

DATE: 08/15/2023 | CDG# 23028



Subcat Reach Pond Link

Routing Diagram for Pre Development
Prepared by {enter your company name here}, Printed 8/15/2023
HydroCAD® 10.00-26 s/n 07576 © 2020 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.811	74	>75% Grass cover, Good, HSG C (EX-1)
0.081	98	Paved parking, HSG C (EX-1)
0.045	98	Roofs, HSG C (EX-1)
0.937	**77**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.937	HSG C	EX-1
0.000	HSG D	
0.000	Other	
0.937		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.811	0.000	0.000	0.811	>75% Grass cover, Good	EX-1
0.000	0.000	0.081	0.000	0.000	0.081	Paved parking	EX-1
0.000	0.000	0.045	0.000	0.000	0.045	Roofs	EX-1
0.000	**0.000**	**0.937**	**0.000**	**0.000**	**0.937**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Runoff Area=40,818 sf 13.44% Impervious Runoff Depth=1.32"
Tc=6.0 min CN=74/98 Runoff=1.25 cfs 0.103 af

Link POA-1: Inflow=1.25 cfs 0.103 af
Primary=1.25 cfs 0.103 af

Total Runoff Area = 0.937 ac Runoff Volume = 0.103 af Average Runoff Depth = 1.32"
86.56% Pervious = 0.811 ac 13.44% Impervious = 0.126 ac

Summary for Subcatchment EX-1:

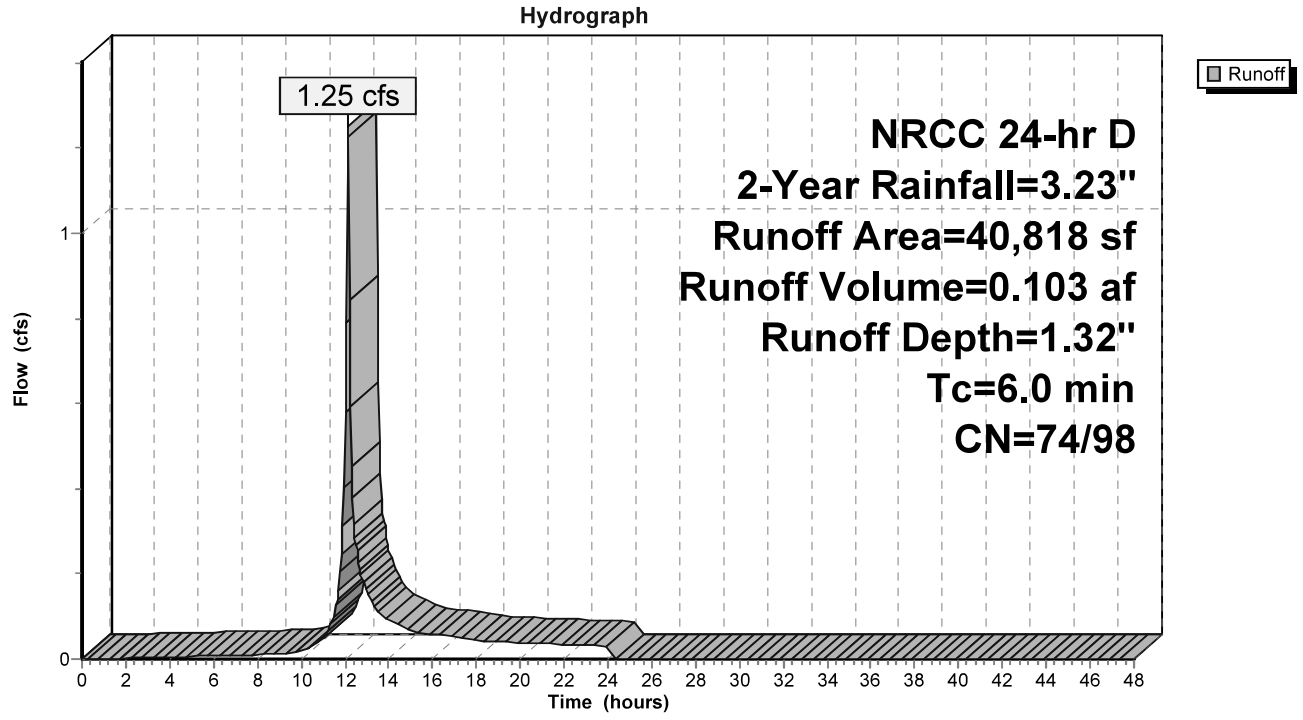
Runoff = 1.25 cfs @ 12.13 hrs, Volume= 0.103 af, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 2-Year Rainfall=3.23"

Area (sf)	CN	Description
35,332	74	>75% Grass cover, Good, HSG C
1,975	98	Roofs, HSG C
3,511	98	Paved parking, HSG C
40,818	77	Weighted Average
35,332	74	86.56% Pervious Area
5,486	98	13.44% Impervious Area

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

Subcatchment EX-1:

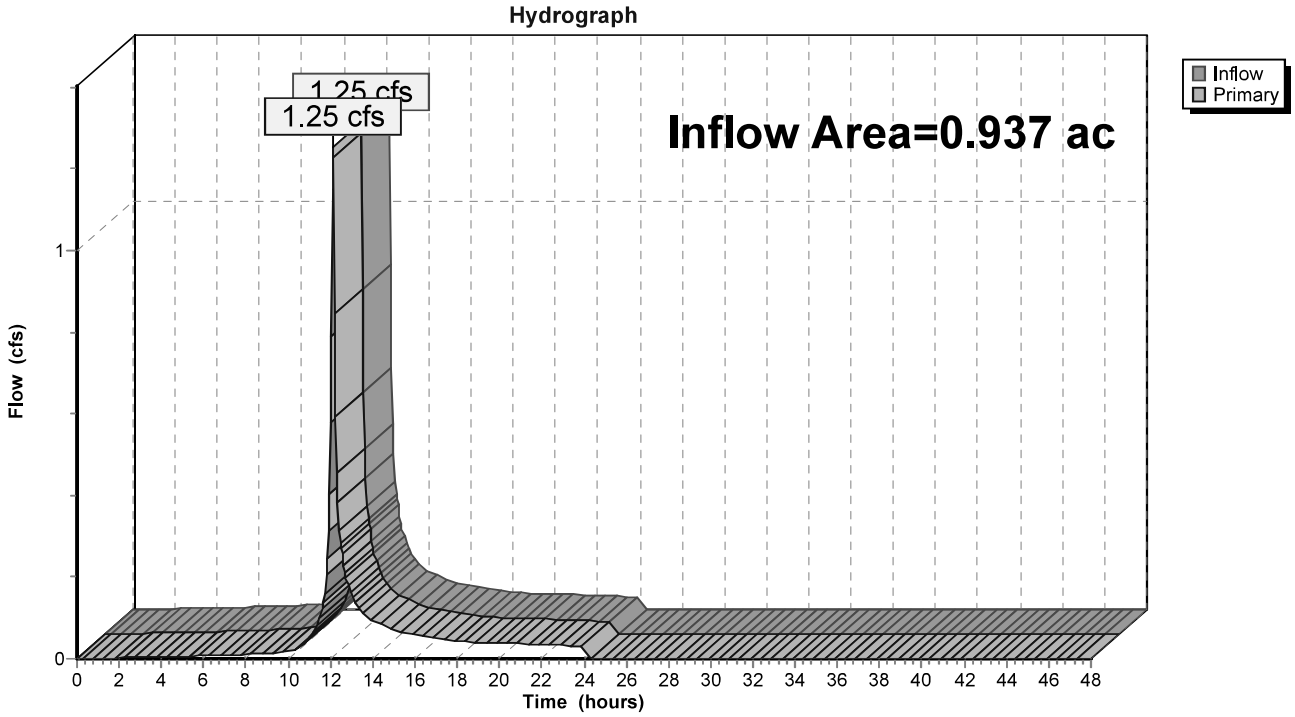


Summary for Link POA-1:

Inflow Area = 0.937 ac, 13.44% Impervious, Inflow Depth = 1.32" for 2-Year event
Inflow = 1.25 cfs @ 12.13 hrs, Volume= 0.103 af
Primary = 1.25 cfs @ 12.13 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA-1:



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Runoff Area=40,818 sf 13.44% Impervious Runoff Depth=2.34"
Tc=6.0 min CN=74/98 Runoff=2.28 cfs 0.183 af

Link POA-1: Inflow=2.28 cfs 0.183 af
Primary=2.28 cfs 0.183 af

Total Runoff Area = 0.937 ac Runoff Volume = 0.183 af Average Runoff Depth = 2.34"
86.56% Pervious = 0.811 ac 13.44% Impervious = 0.126 ac

Summary for Subcatchment EX-1:

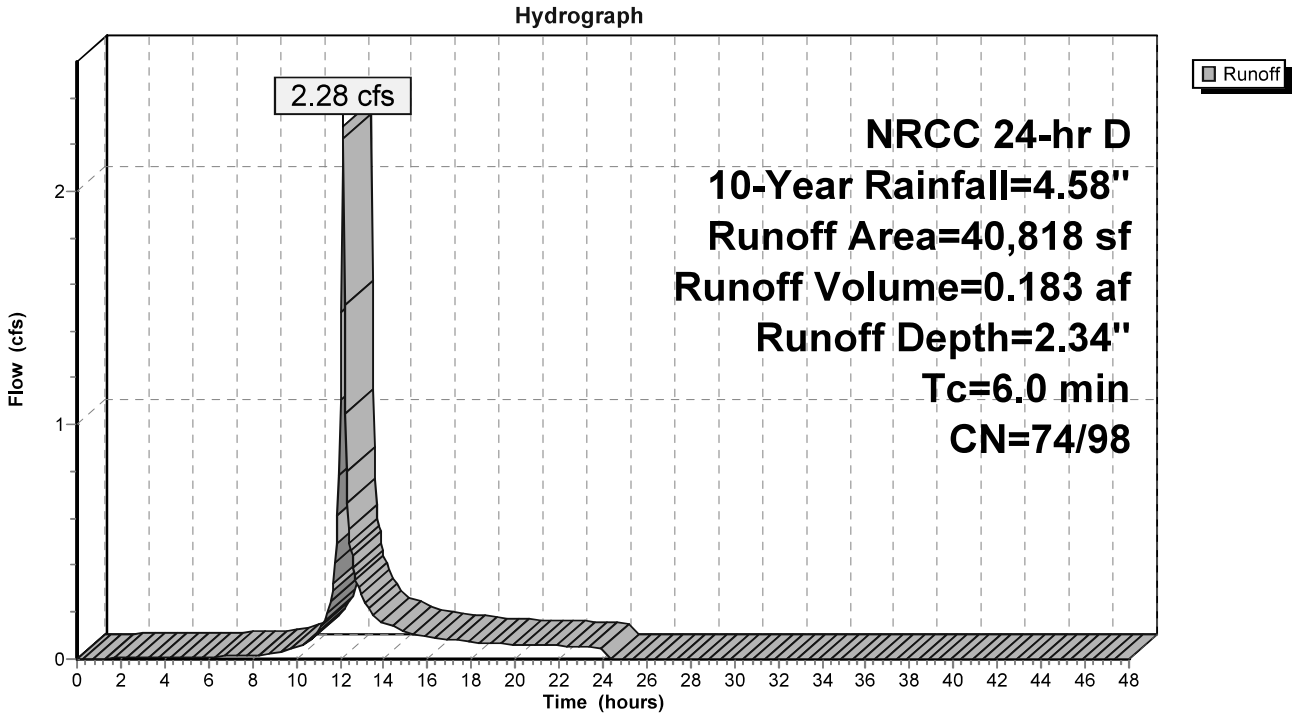
Runoff = 2.28 cfs @ 12.13 hrs, Volume= 0.183 af, Depth= 2.34"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 10-Year Rainfall=4.58"

Area (sf)	CN	Description
35,332	74	>75% Grass cover, Good, HSG C
1,975	98	Roofs, HSG C
3,511	98	Paved parking, HSG C
40,818	77	Weighted Average
35,332	74	86.56% Pervious Area
5,486	98	13.44% Impervious Area

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

Subcatchment EX-1:

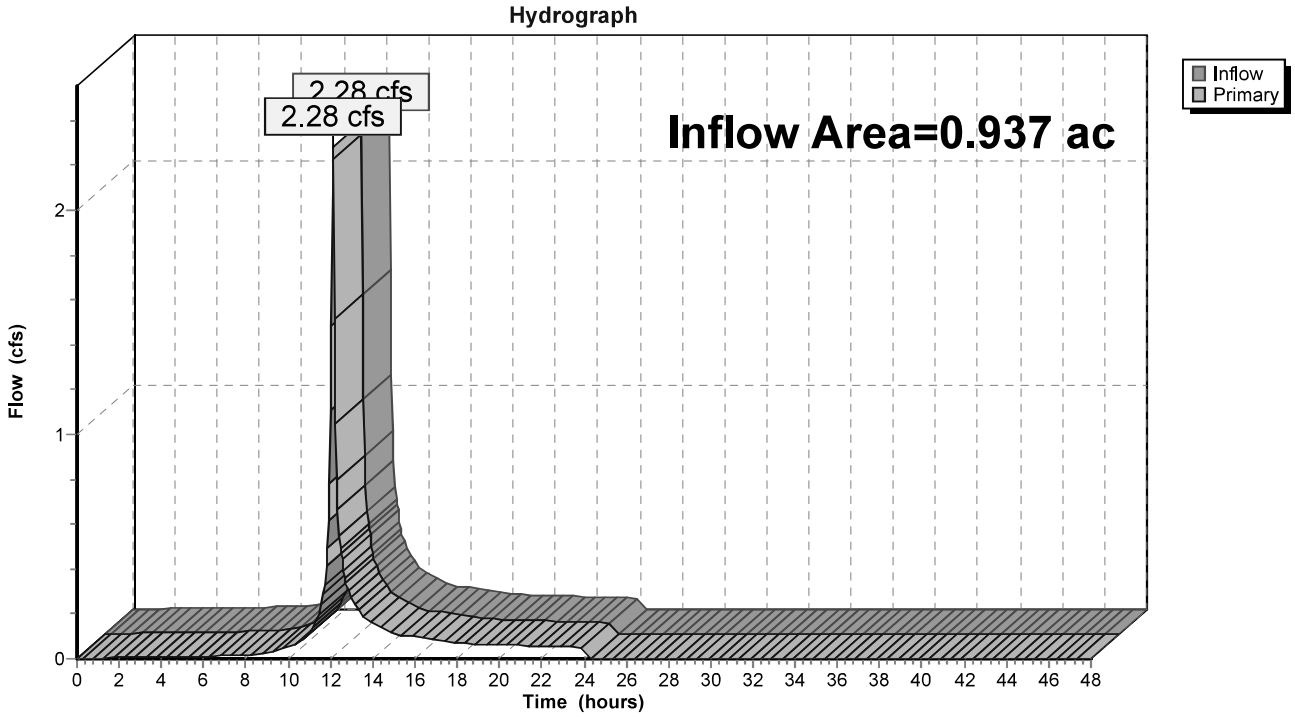


Summary for Link POA-1:

Inflow Area = 0.937 ac, 13.44% Impervious, Inflow Depth = 2.34" for 10-Year event
Inflow = 2.28 cfs @ 12.13 hrs, Volume= 0.183 af
Primary = 2.28 cfs @ 12.13 hrs, Volume= 0.183 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA-1:



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Runoff Area=40,818 sf 13.44% Impervious Runoff Depth=3.43"
Tc=6.0 min CN=74/98 Runoff=3.34 cfs 0.268 af

Link POA-1: Inflow=3.34 cfs 0.268 af
Primary=3.34 cfs 0.268 af

Total Runoff Area = 0.937 ac Runoff Volume = 0.268 af Average Runoff Depth = 3.43"
86.56% Pervious = 0.811 ac 13.44% Impervious = 0.126 ac

Summary for Subcatchment EX-1:

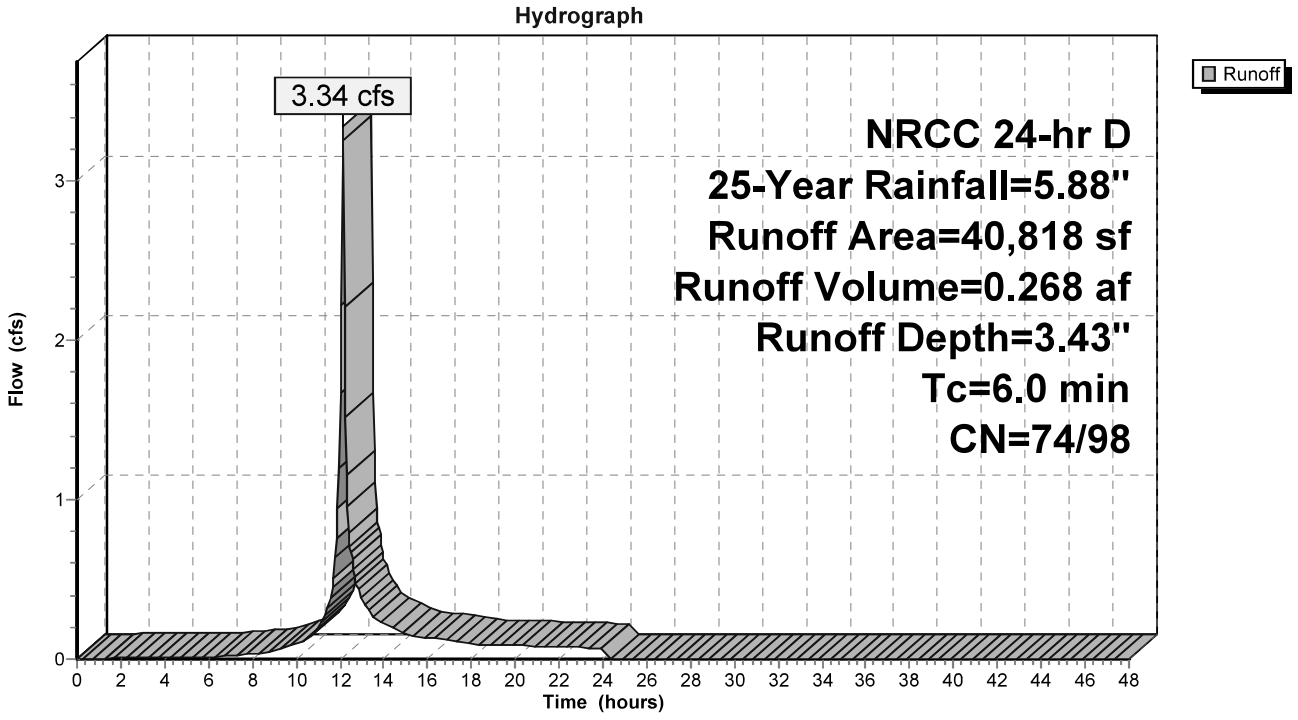
Runoff = 3.34 cfs @ 12.13 hrs, Volume= 0.268 af, Depth= 3.43"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (sf)	CN	Description
35,332	74	>75% Grass cover, Good, HSG C
1,975	98	Roofs, HSG C
3,511	98	Paved parking, HSG C
40,818	77	Weighted Average
35,332	74	86.56% Pervious Area
5,486	98	13.44% Impervious Area

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

Subcatchment EX-1:

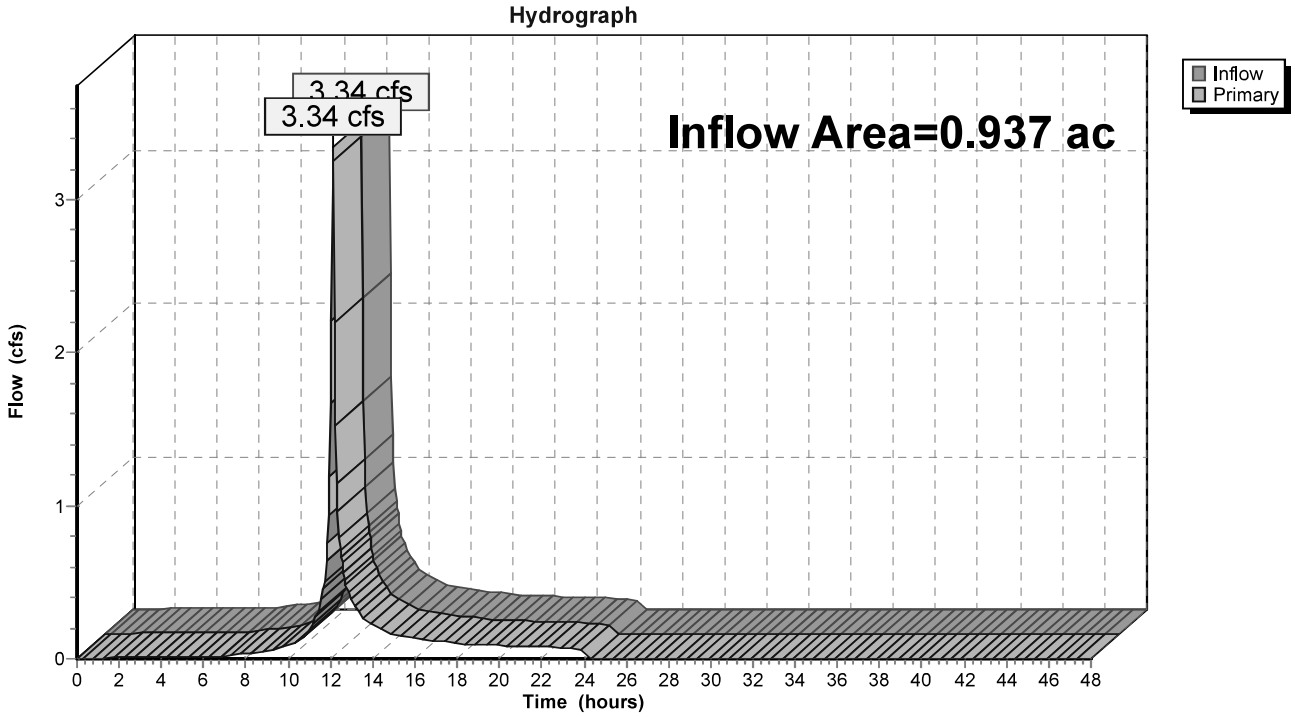


Summary for Link POA-1:

Inflow Area = 0.937 ac, 13.44% Impervious, Inflow Depth = 3.43" for 25-Year event
Inflow = 3.34 cfs @ 12.13 hrs, Volume= 0.268 af
Primary = 3.34 cfs @ 12.13 hrs, Volume= 0.268 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA-1:



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Runoff Area=40,818 sf 13.44% Impervious Runoff Depth=5.93"
Tc=6.0 min CN=74/98 Runoff=5.73 cfs 0.463 af

Link POA-1: Inflow=5.73 cfs 0.463 af
Primary=5.73 cfs 0.463 af

Total Runoff Area = 0.937 ac Runoff Volume = 0.463 af Average Runoff Depth = 5.93"
86.56% Pervious = 0.811 ac 13.44% Impervious = 0.126 ac

Summary for Subcatchment EX-1:

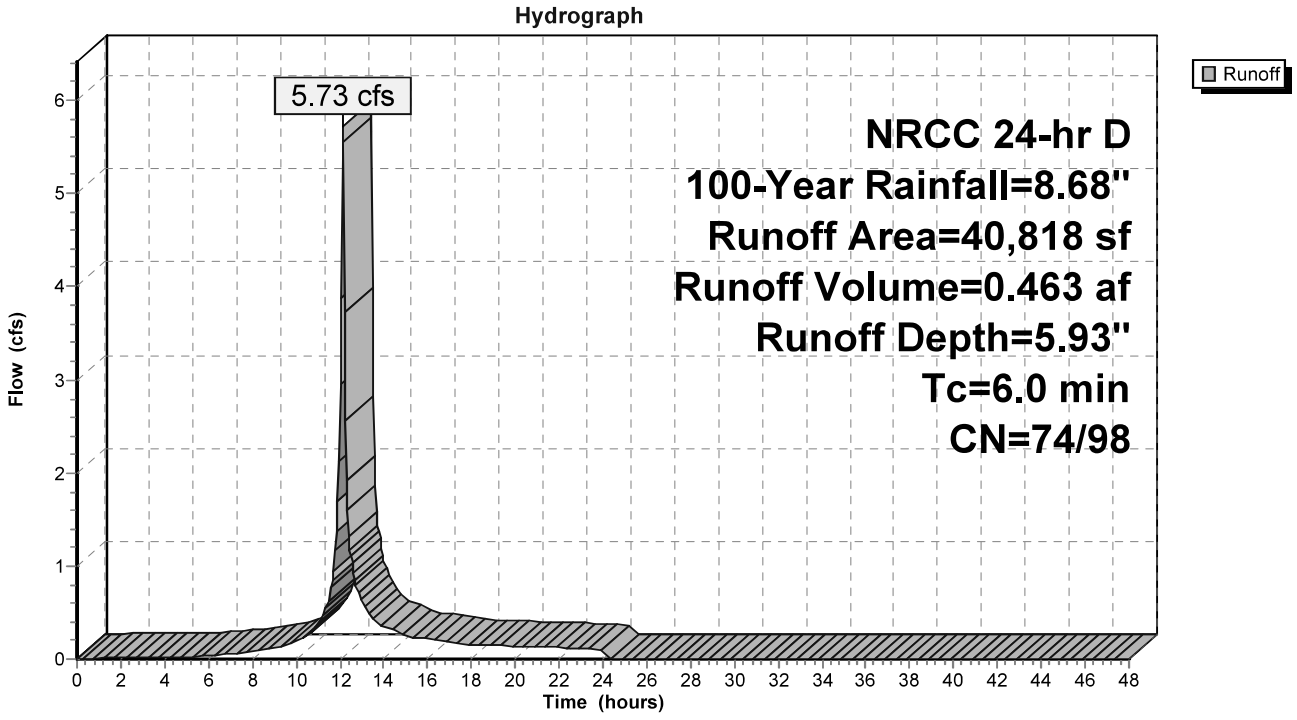
Runoff = 5.73 cfs @ 12.13 hrs, Volume= 0.463 af, Depth= 5.93"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 100-Year Rainfall=8.68"

Area (sf)	CN	Description
35,332	74	>75% Grass cover, Good, HSG C
1,975	98	Roofs, HSG C
3,511	98	Paved parking, HSG C
40,818	77	Weighted Average
35,332	74	86.56% Pervious Area
5,486	98	13.44% Impervious Area

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

Subcatchment EX-1:

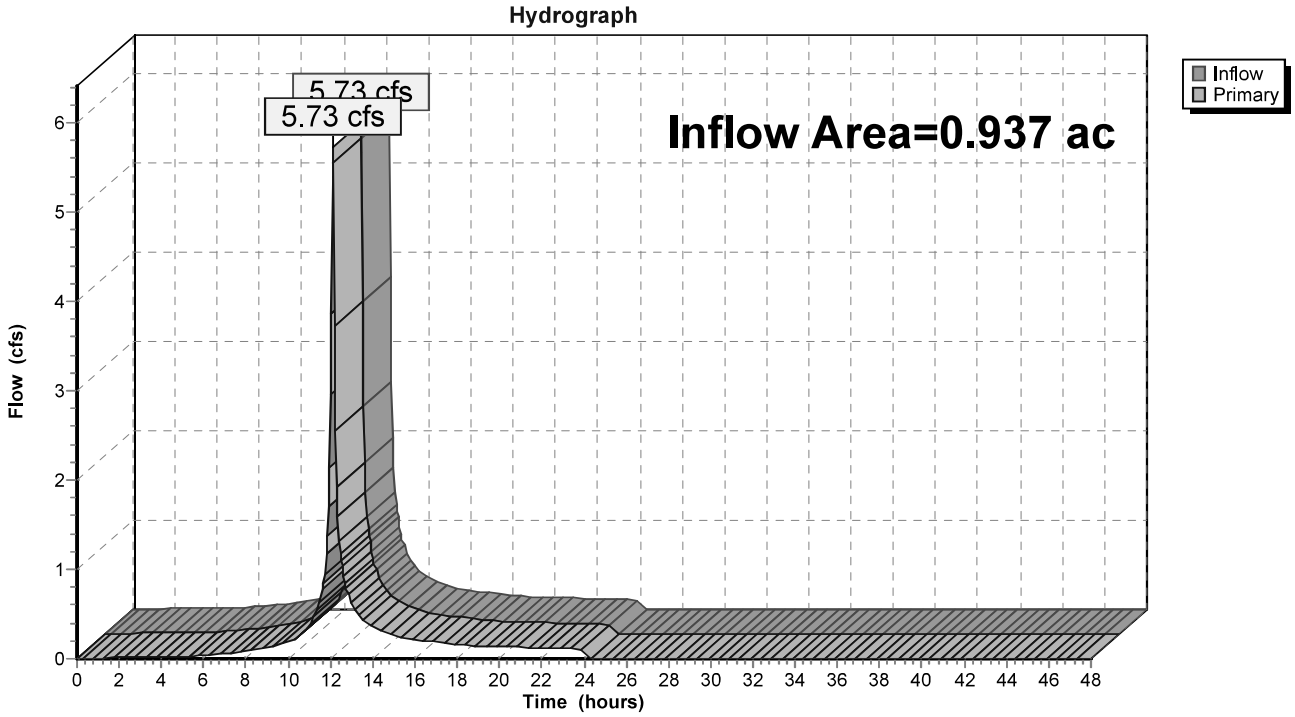


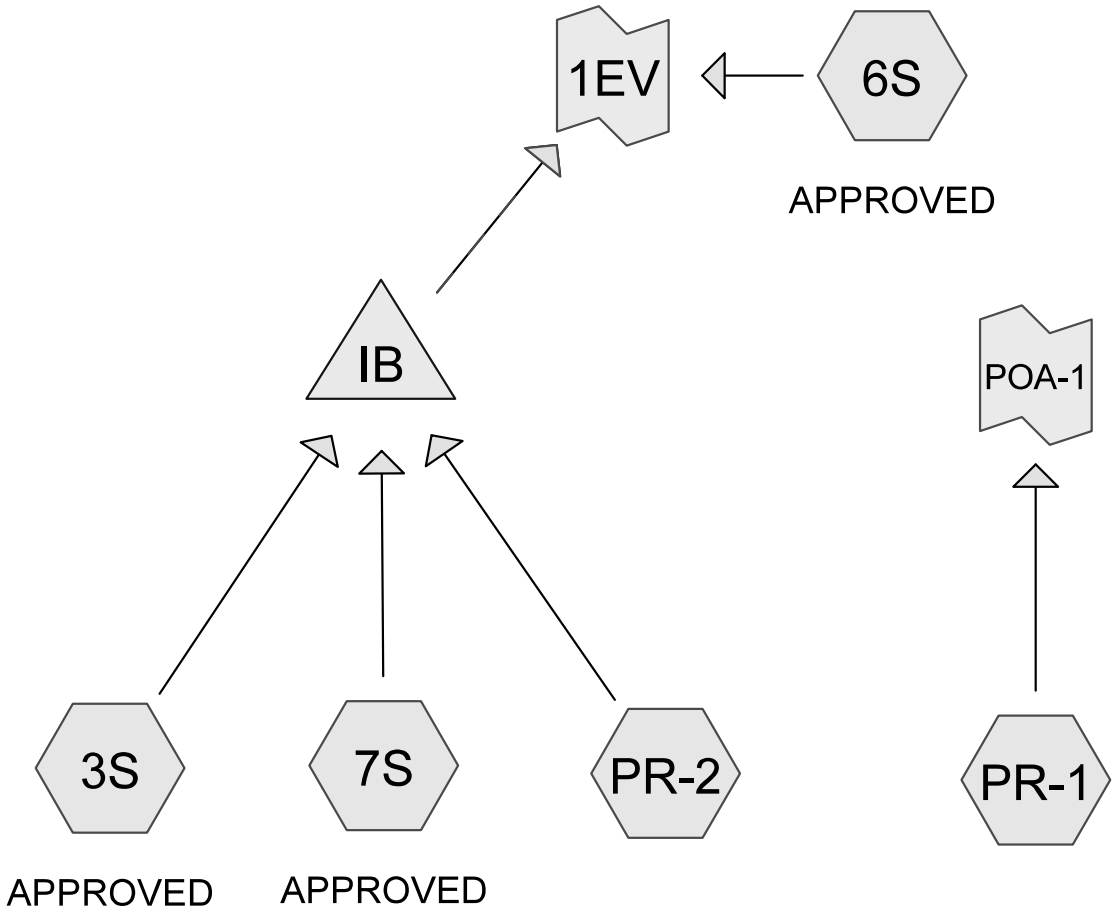
Summary for Link POA-1:

Inflow Area = 0.937 ac, 13.44% Impervious, Inflow Depth = 5.93" for 100-Year event
Inflow = 5.73 cfs @ 12.13 hrs, Volume= 0.463 af
Primary = 5.73 cfs @ 12.13 hrs, Volume= 0.463 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA-1:





Subcat Reach Pond Link

Routing Diagram for Post Development
Prepared by {enter your company name here}, Printed 8/15/2023
HydroCAD® 10.00-26 s/n 07576 © 2020 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.397	74	>75% Grass cover, Good, HSG C (3S, 6S, 7S, PR-1, PR-2)
0.013	89	Gravel roads, HSG C (7S)
2.183	98	Paved parking, HSG C (3S, PR-1, PR-2)
0.019	98	Riprap (6S, 7S)
0.511	98	Roofs, HSG C (3S, PR-2)
0.092	98	Unconnected pavement, HSG C (3S)
0.135	98	Water Surface, 0% imp, HSG C (7S)
0.248	70	Woods, Good, HSG C (6S)
4.598	**89**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
4.579	HSG C	3S, 6S, 7S, PR-1, PR-2
0.000	HSG D	
0.019	Other	6S, 7S
4.598		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.397	0.000	0.000	1.397	>75% Grass cover, Good	3S, 6S, 7S, PR-1, PR-2
0.000	0.000	0.013	0.000	0.000	0.013	Gravel roads	7S
0.000	0.000	2.183	0.000	0.000	2.183	Paved parking	3S, PR-1, PR-2
0.000	0.000	0.000	0.000	0.019	0.019	Riprap	6S, 7S
0.000	0.000	0.511	0.000	0.000	0.511	Roofs	3S, PR-2
0.000	0.000	0.092	0.000	0.000	0.092	Unconnected pavement	3S
0.000	0.000	0.135	0.000	0.000	0.135	Water Surface, 0% imp	7S
0.000	0.000	0.248	0.000	0.000	0.248	Woods, Good	6S
0.000	**0.000**	**4.579**	**0.000**	**0.019**	**4.598**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: APPROVED Runoff Area=119,356 sf 75.36% Impervious Runoff Depth=2.56"
Tc=6.0 min CN=77/98 Runoff=6.68 cfs 0.585 af

Subcatchment 6S: APPROVED Runoff Area=26,955 sf 2.64% Impervious Runoff Depth=1.00"
Tc=6.0 min CN=72/98 Runoff=0.63 cfs 0.052 af

Subcatchment 7S: APPROVED Runoff Area=13,165 sf 1.02% Impervious Runoff Depth=1.80"
Tc=6.0 min CN=85/98 Runoff=0.58 cfs 0.045 af

Subcatchment PR-1: Runoff Area=6,949 sf 3.19% Impervious Runoff Depth=1.12"
Tc=6.0 min CN=74/98 Runoff=0.19 cfs 0.015 af

Subcatchment PR-2: Runoff Area=33,868 sf 80.16% Impervious Runoff Depth=2.61"
Tc=6.0 min CN=74/98 Runoff=1.92 cfs 0.169 af

Pond IB: Peak Elev=1,036.44' Storage=14,887 cf Inflow=9.18 cfs 0.800 af
Discarded=0.04 cfs 0.105 af Primary=1.68 cfs 0.623 af Secondary=0.00 cfs 0.000 af Outflow=1.72 cfs 0.728 af

Link 1EV: Inflow=2.09 cfs 0.674 af
Primary=2.09 cfs 0.674 af

Link POA-1: Inflow=0.19 cfs 0.015 af
Primary=0.19 cfs 0.015 af

Total Runoff Area = 4.598 ac Runoff Volume = 0.866 af Average Runoff Depth = 2.26"
41.01% Pervious = 1.886 ac 58.99% Impervious = 2.713 ac

Summary for Subcatchment 3S: APPROVED

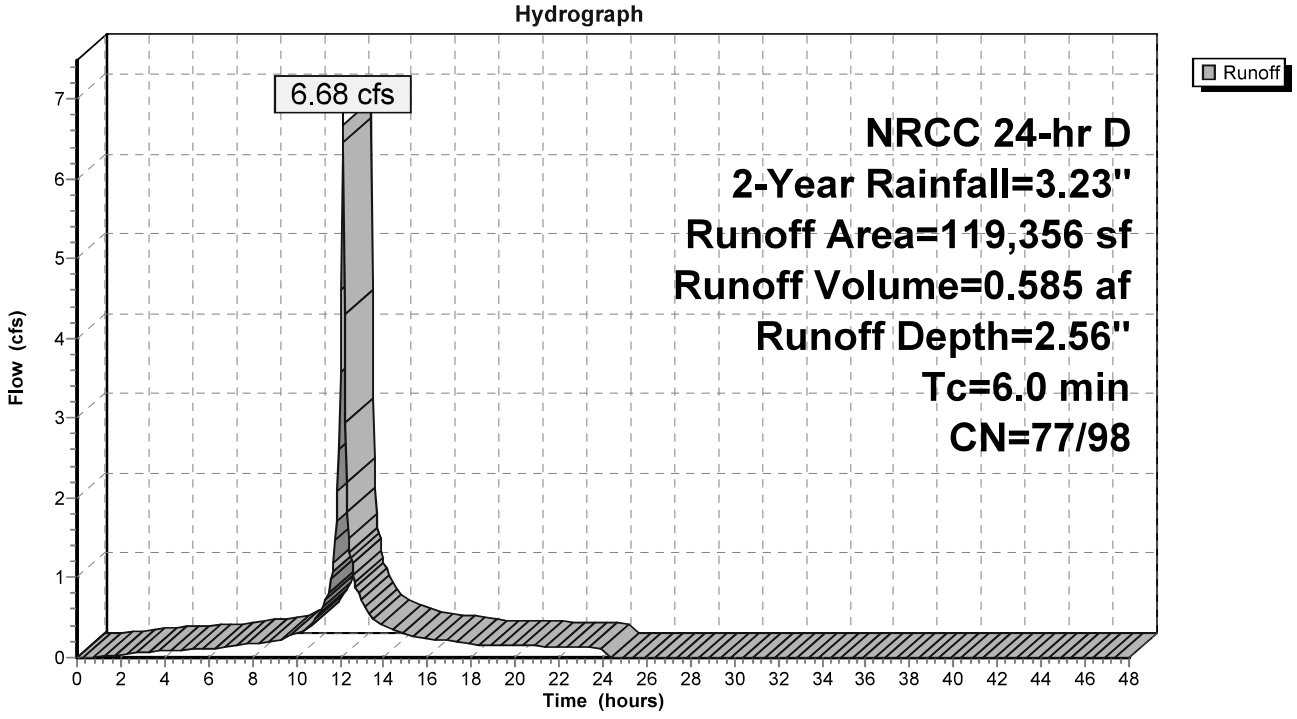
Runoff = 6.68 cfs @ 12.13 hrs, Volume= 0.585 af, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 2-Year Rainfall=3.23"

Area (sf)	CN	Description
25,414	74	>75% Grass cover, Good, HSG C
71,602	98	Paved parking, HSG C
18,342	98	Roofs, HSG C
3,998	98	Unconnected pavement, HSG C
119,356	93	Weighted Average
29,412	77	24.64% Pervious Area
89,944	98	75.36% Impervious Area

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

Subcatchment 3S: APPROVED



Summary for Subcatchment 6S: APPROVED

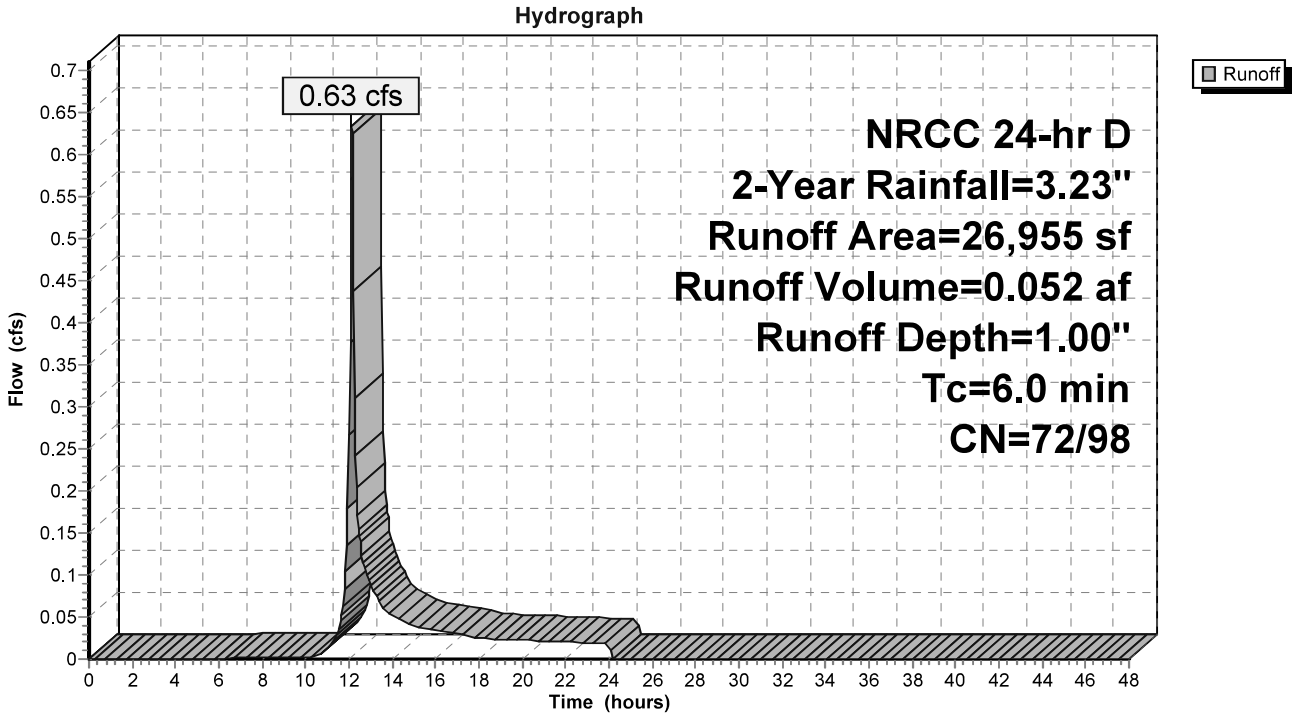
Runoff = 0.63 cfs @ 12.14 hrs, Volume= 0.052 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 2-Year Rainfall=3.23"

	Area (sf)	CN	Description
	15,442	74	>75% Grass cover, Good, HSG C
*	711	98	Riprap
	10,802	70	Woods, Good, HSG C
	26,955	73	Weighted Average
	26,244	72	97.36% Pervious Area
	711	98	2.64% Impervious Area

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

Subcatchment 6S: APPROVED



Summary for Subcatchment 7S: APPROVED

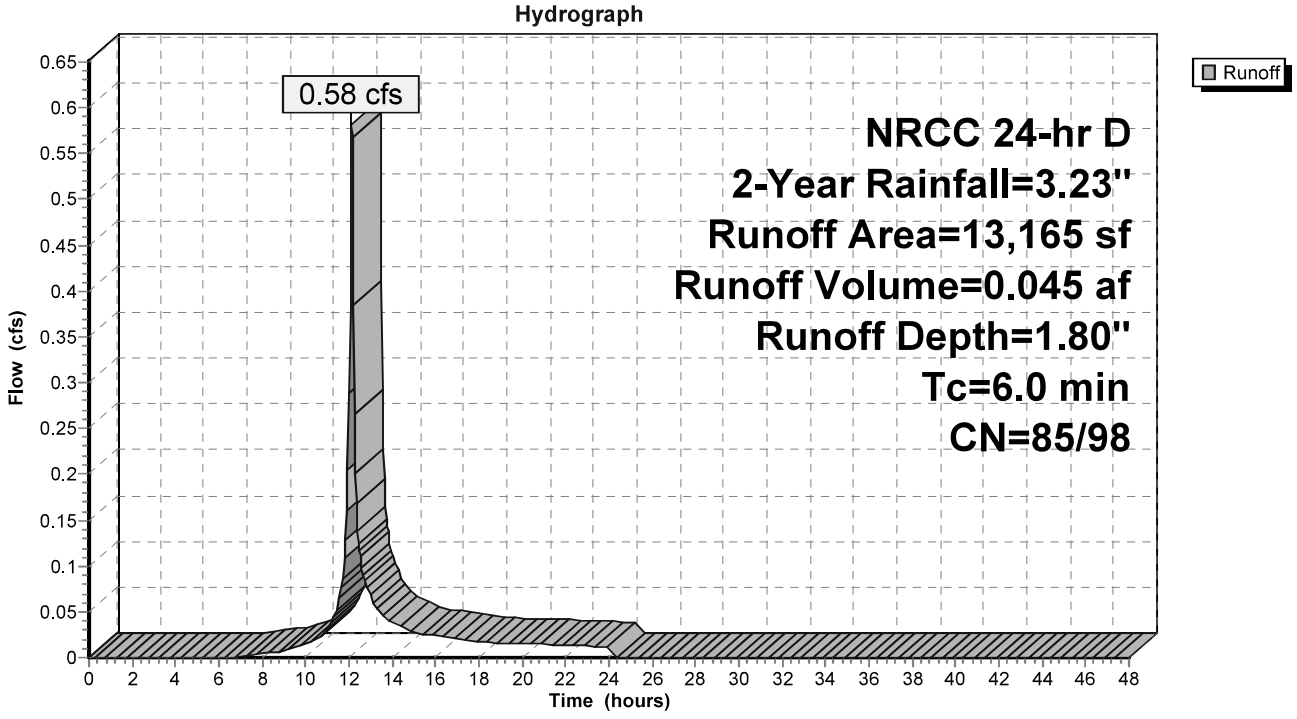
Runoff = 0.58 cfs @ 12.13 hrs, Volume= 0.045 af, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 2-Year Rainfall=3.23"

	Area (sf)	CN	Description
	6,571	74	>75% Grass cover, Good, HSG C
	5,880	98	Water Surface, 0% imp, HSG C
*	134	98	Riprap
	580	89	Gravel roads, HSG C
	13,165	86	Weighted Average
	13,031	85	98.98% Pervious Area
	134	98	1.02% Impervious Area

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

Subcatchment 7S: APPROVED



Summary for Subcatchment PR-1:

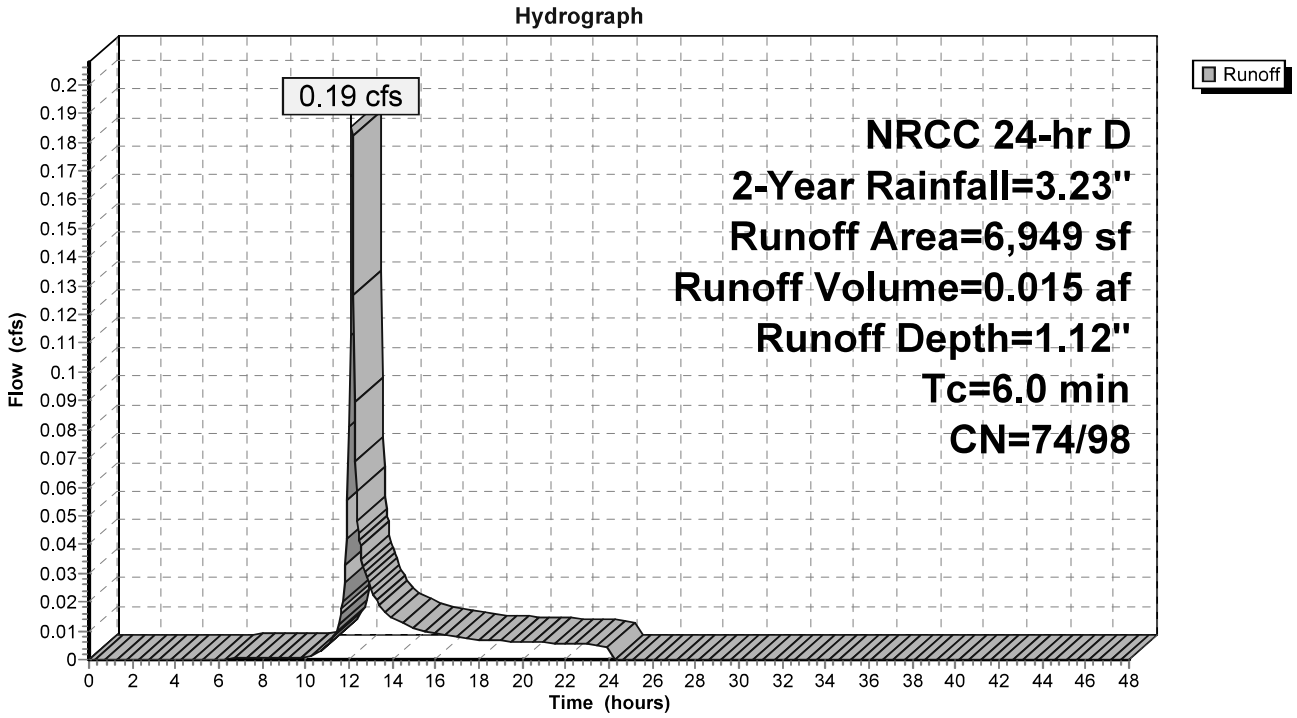
Runoff = 0.19 cfs @ 12.14 hrs, Volume= 0.015 af, Depth= 1.12"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 2-Year Rainfall=3.23"

Area (sf)	CN	Description
6,727	74	>75% Grass cover, Good, HSG C
222	98	Paved parking, HSG C
6,949	75	Weighted Average
6,727	74	96.81% Pervious Area
222	98	3.19% Impervious Area

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

Subcatchment PR-1:



Summary for Subcatchment PR-2:

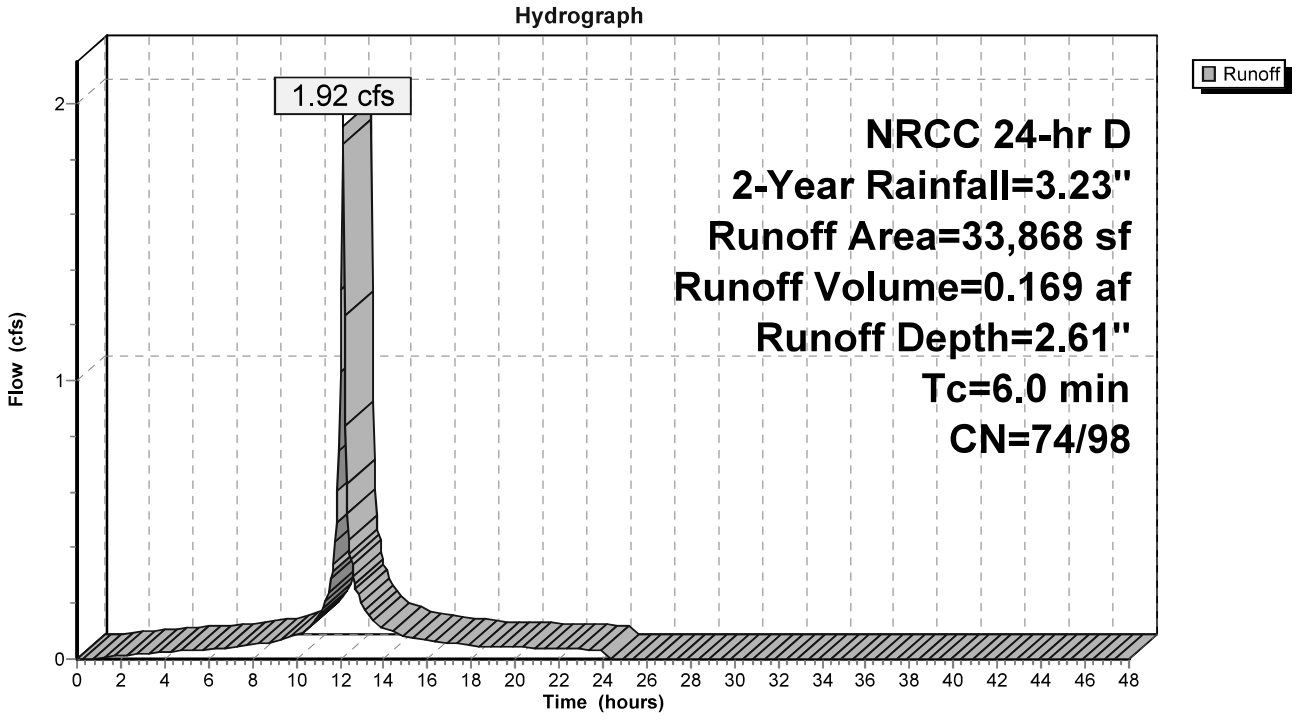
Runoff = 1.92 cfs @ 12.13 hrs, Volume= 0.169 af, Depth= 2.61"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 2-Year Rainfall=3.23"

Area (sf)	CN	Description
6,721	74	>75% Grass cover, Good, HSG C
3,900	98	Roofs, HSG C
23,247	98	Paved parking, HSG C
33,868	93	Weighted Average
6,721	74	19.84% Pervious Area
27,147	98	80.16% Impervious Area

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

Subcatchment PR-2:



Summary for Pond IB:

Inflow Area = 3.820 ac, 70.45% Impervious, Inflow Depth = 2.51" for 2-Year event
Inflow = 9.18 cfs @ 12.13 hrs, Volume= 0.800 af
Outflow = 1.72 cfs @ 12.51 hrs, Volume= 0.728 af, Atten= 81%, Lag= 22.7 min
Discarded = 0.04 cfs @ 12.51 hrs, Volume= 0.105 af
Primary = 1.68 cfs @ 12.51 hrs, Volume= 0.623 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,036.44' @ 12.51 hrs Surf.Area= 6,115 sf Storage= 14,887 cf

Plug-Flow detention time= 264.0 min calculated for 0.728 af (91% of inflow)
Center-of-Mass det. time= 212.5 min (990.5 - 778.0)

Volume	Invert	Avail.Storage	Storage Description
#1	1,033.30'	43,068 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,033.30	3,231	0	0
1,034.00	4,043	2,546	2,546
1,036.00	5,690	9,733	12,279
1,038.00	7,612	13,302	25,581
1,040.00	9,875	17,487	43,068

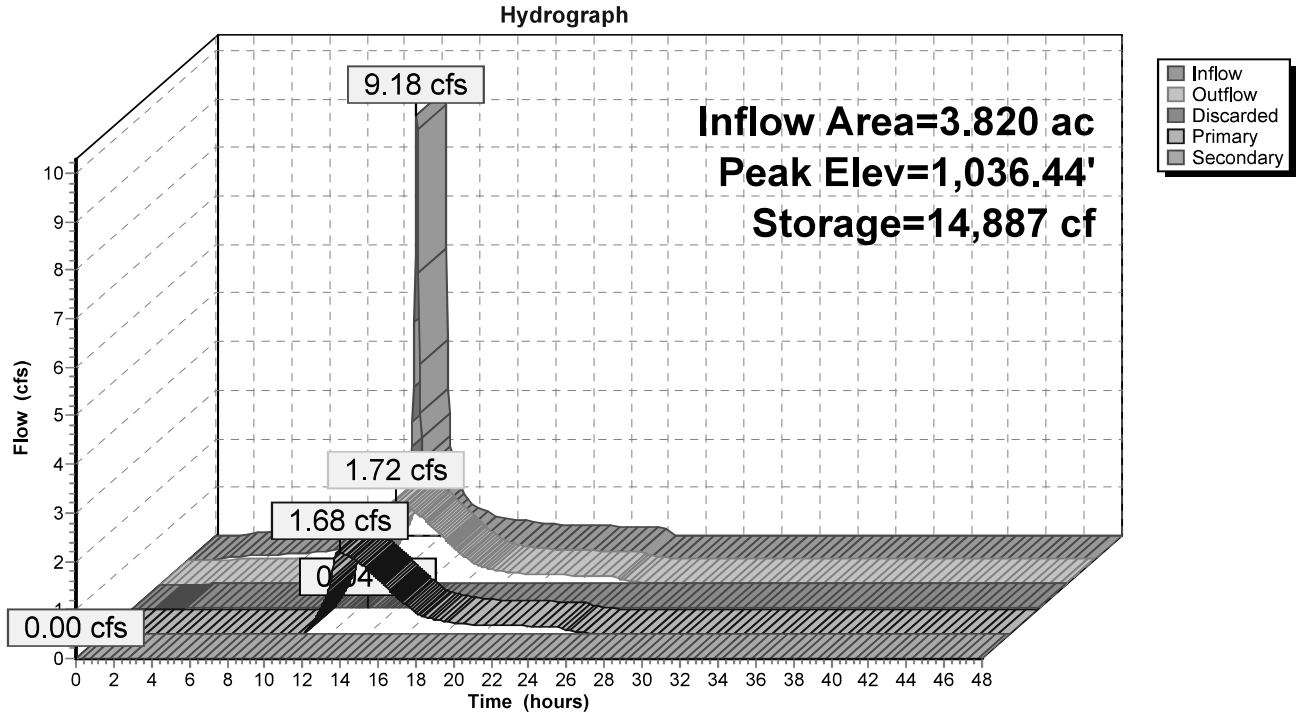
Device	Routing	Invert	Outlet Devices
#1	Primary	1,033.30'	**18.0" Round Culvert** L= 56.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 1,033.30' / 1,031.00' S= 0.0411 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	1,034.60'	**5.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 1	1,036.94'	**8.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	1,038.88'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	1,039.20'	**153.0 deg x 6.0' long x 2.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)
#6	Discarded	1,033.30'	**0.270 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.04 cfs @ 12.51 hrs HW=1,036.44' (Free Discharge)
└**6=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=1.68 cfs @ 12.51 hrs HW=1,036.44' (Free Discharge)
└**1=Culvert** (Passes 1.68 cfs of 11.61 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.68 cfs @ 6.15 fps)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,033.30' (Free Discharge)
└**5=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond IB:

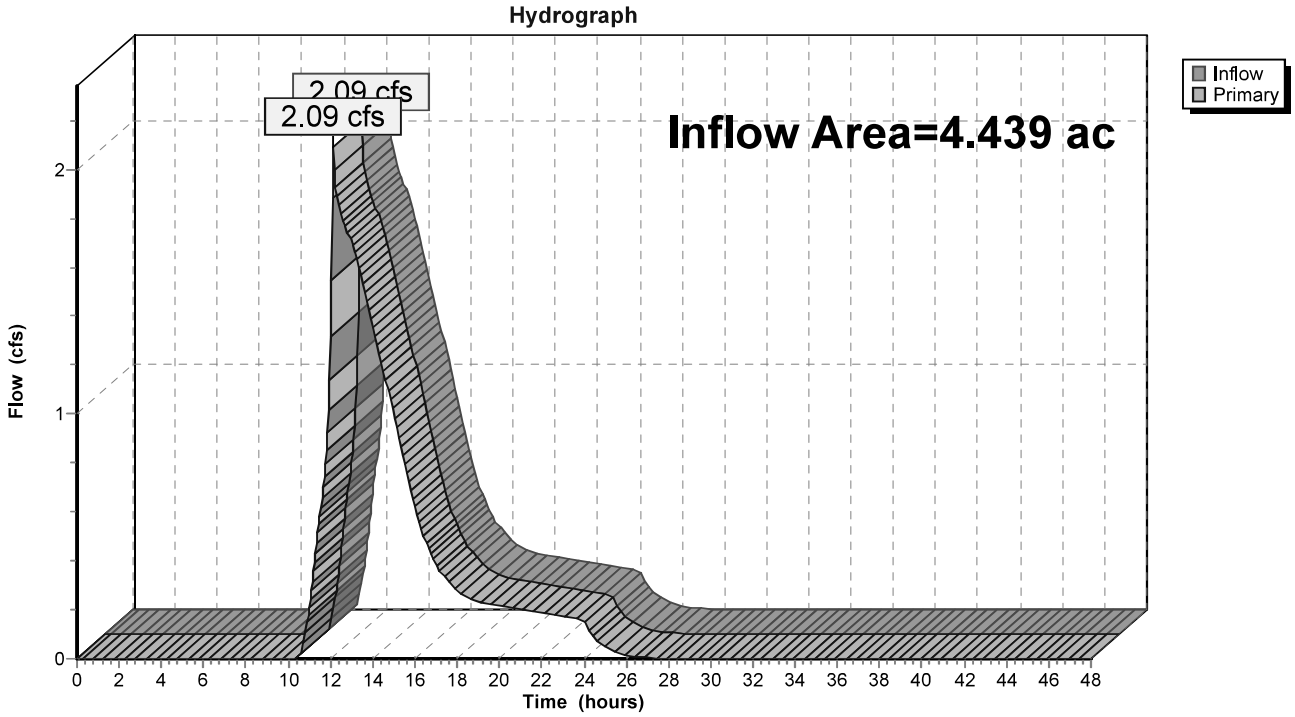

Hydrograph
9.18 cfs
1.72 cfs
1.68 cfs
0.00 cfs
Inflow Area=3.820 ac
Peak Elev=1,036.44'
Storage=14,887 cf
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
0 1 2 3 4 5 6 7 8 9 10

Summary for Link 1EV:

Inflow Area = 4.439 ac, 61.00% Impervious, Inflow Depth = 1.82" for 2-Year event
Inflow = 2.09 cfs @ 12.16 hrs, Volume= 0.674 af
Primary = 2.09 cfs @ 12.16 hrs, Volume= 0.674 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 1EV:

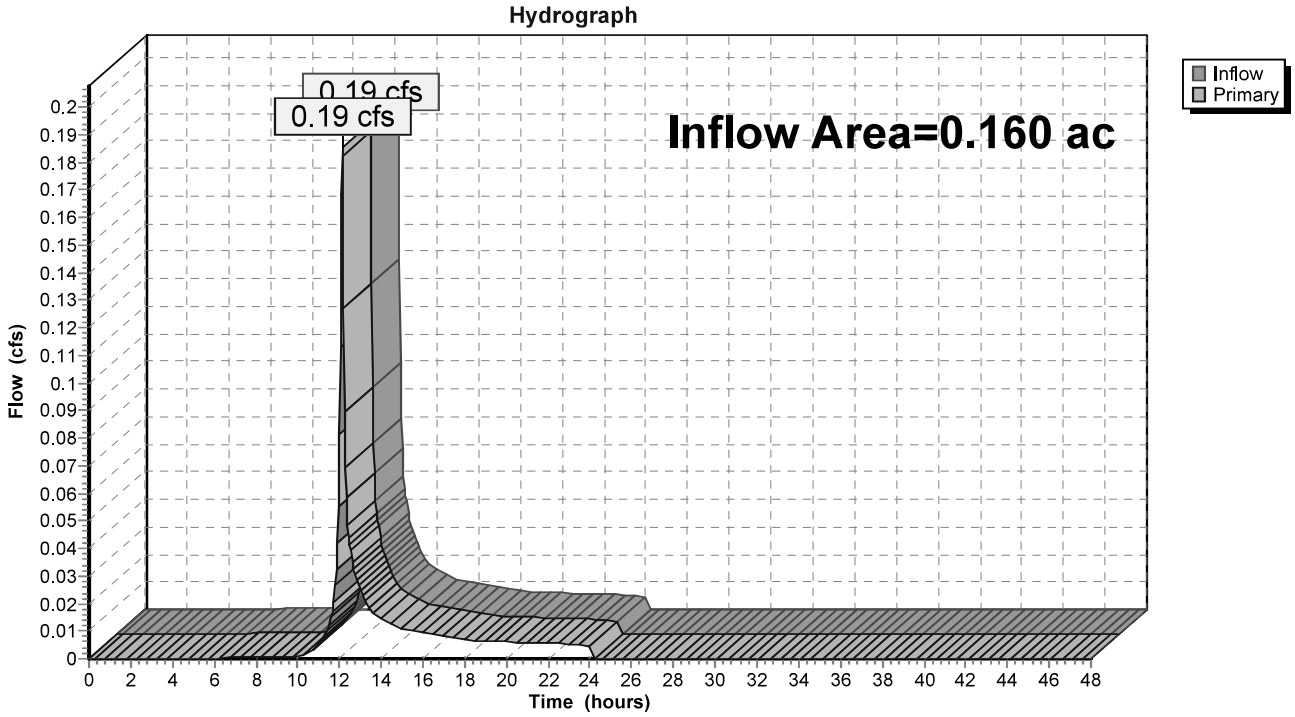


Summary for Link POA-1:

Inflow Area = 0.160 ac, 3.19% Impervious, Inflow Depth = 1.12" for 2-Year event
Inflow = 0.19 cfs @ 12.14 hrs, Volume= 0.015 af
Primary = 0.19 cfs @ 12.14 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA-1:



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: APPROVED Runoff Area=119,356 sf 75.36% Impervious Runoff Depth=4.09"
Tc=6.0 min CN=77/98 Runoff=10.57 cfs 0.934 af

Subcatchment 6S: APPROVED Runoff Area=26,955 sf 2.64% Impervious Runoff Depth=2.15"
Tc=6.0 min CN=72/98 Runoff=1.42 cfs 0.111 af

Subcatchment 7S: APPROVED Runoff Area=13,165 sf 1.02% Impervious Runoff Depth=3.24"
Tc=6.0 min CN=85/98 Runoff=1.03 cfs 0.082 af

Subcatchment PR-1: Runoff Area=6,949 sf 3.19% Impervious Runoff Depth=2.32"
Tc=6.0 min CN=74/98 Runoff=0.40 cfs 0.031 af

Subcatchment PR-2: Runoff Area=33,868 sf 80.16% Impervious Runoff Depth=4.14"
Tc=6.0 min CN=74/98 Runoff=3.02 cfs 0.268 af

Pond IB: Peak Elev=1,037.38' Storage=21,052 cf Inflow=14.62 cfs 1.285 af
Discarded=0.04 cfs 0.110 af Primary=3.77 cfs 1.102 af Secondary=0.00 cfs 0.000 af Outflow=3.81 cfs 1.212 af

Link 1EV: Inflow=4.20 cfs 1.213 af
Primary=4.20 cfs 1.213 af

Link POA-1: Inflow=0.40 cfs 0.031 af
Primary=0.40 cfs 0.031 af

Total Runoff Area = 4.598 ac Runoff Volume = 1.426 af Average Runoff Depth = 3.72"
41.01% Pervious = 1.886 ac 58.99% Impervious = 2.713 ac

Summary for Subcatchment 3S: APPROVED

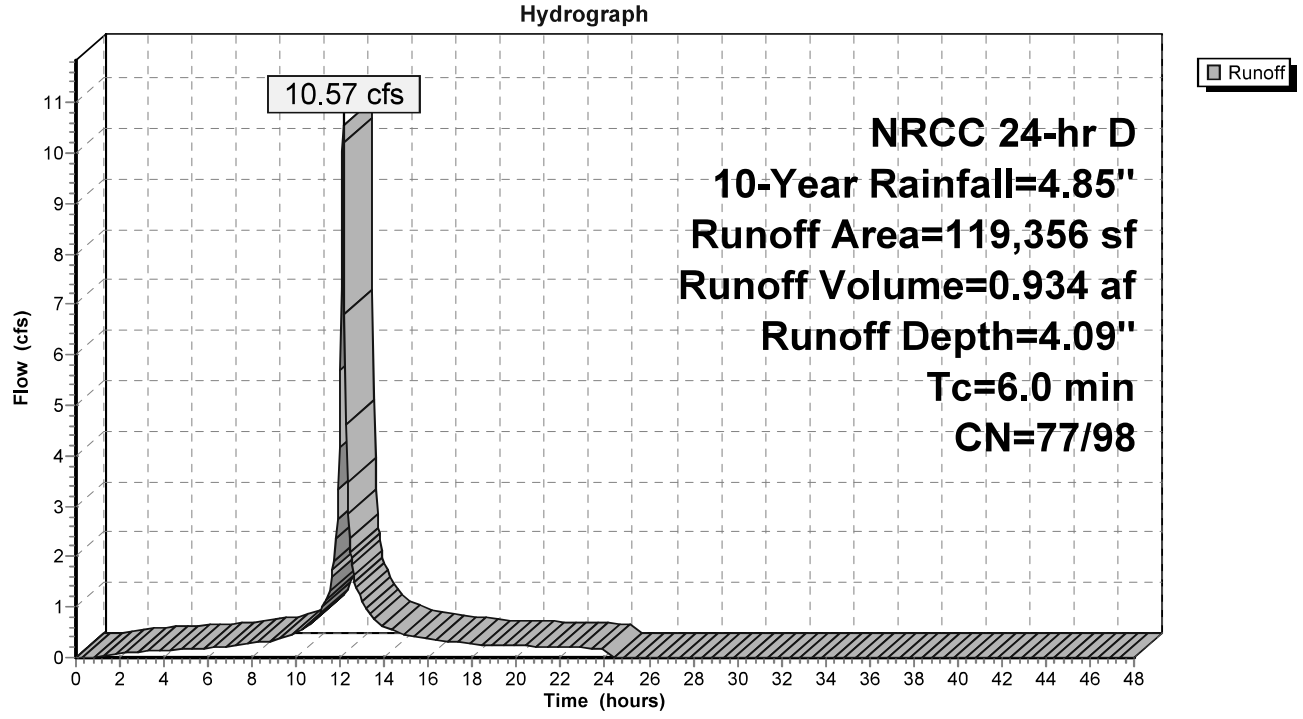
Runoff = 10.57 cfs @ 12.13 hrs, Volume= 0.934 af, Depth= 4.09"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 10-Year Rainfall=4.85"

Area (sf)	CN	Description
25,414	74	>75% Grass cover, Good, HSG C
71,602	98	Paved parking, HSG C
18,342	98	Roofs, HSG C
3,998	98	Unconnected pavement, HSG C
119,356	93	Weighted Average
29,412	77	24.64% Pervious Area
89,944	98	75.36% Impervious Area

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

Subcatchment 3S: APPROVED



Summary for Subcatchment 6S: APPROVED

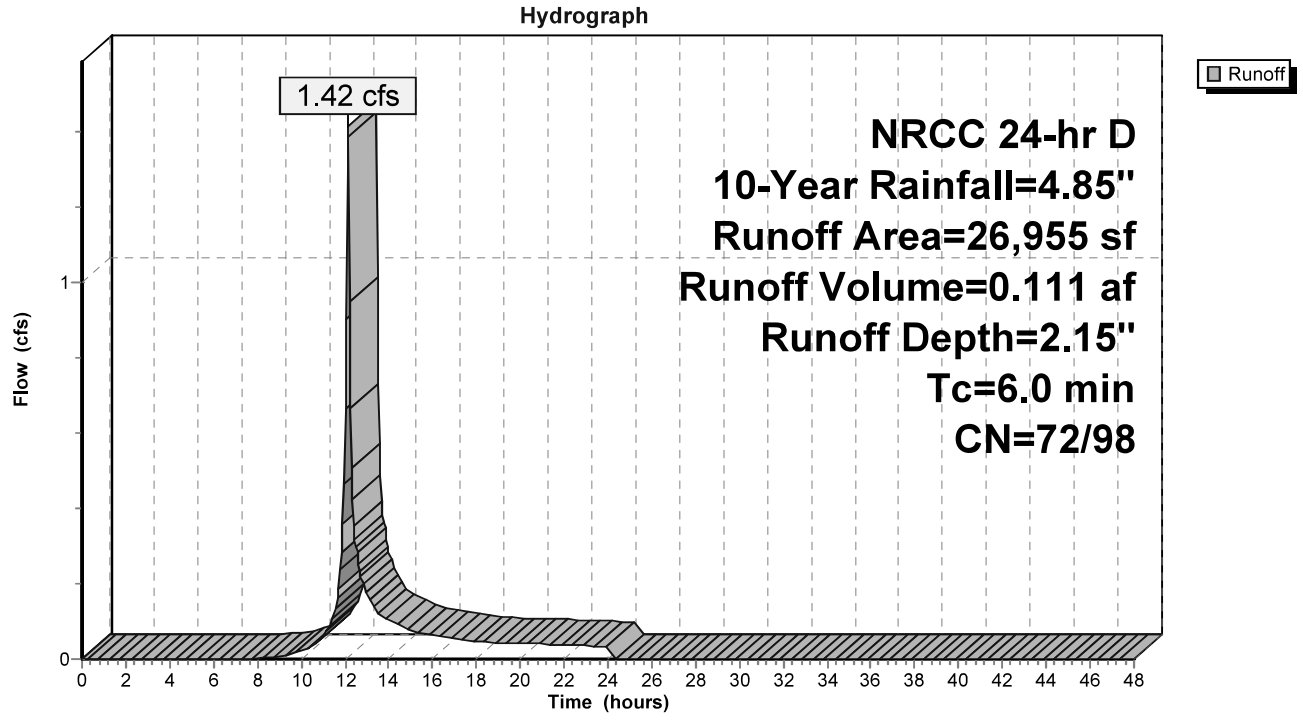
Runoff = 1.42 cfs @ 12.13 hrs, Volume= 0.111 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 10-Year Rainfall=4.85"

	Area (sf)	CN	Description
	15,442	74	>75% Grass cover, Good, HSG C
*	711	98	Riprap
	10,802	70	Woods, Good, HSG C
	26,955	73	Weighted Average
	26,244	72	97.36% Pervious Area
	711	98	2.64% Impervious Area

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

Subcatchment 6S: APPROVED



Summary for Subcatchment 7S: APPROVED

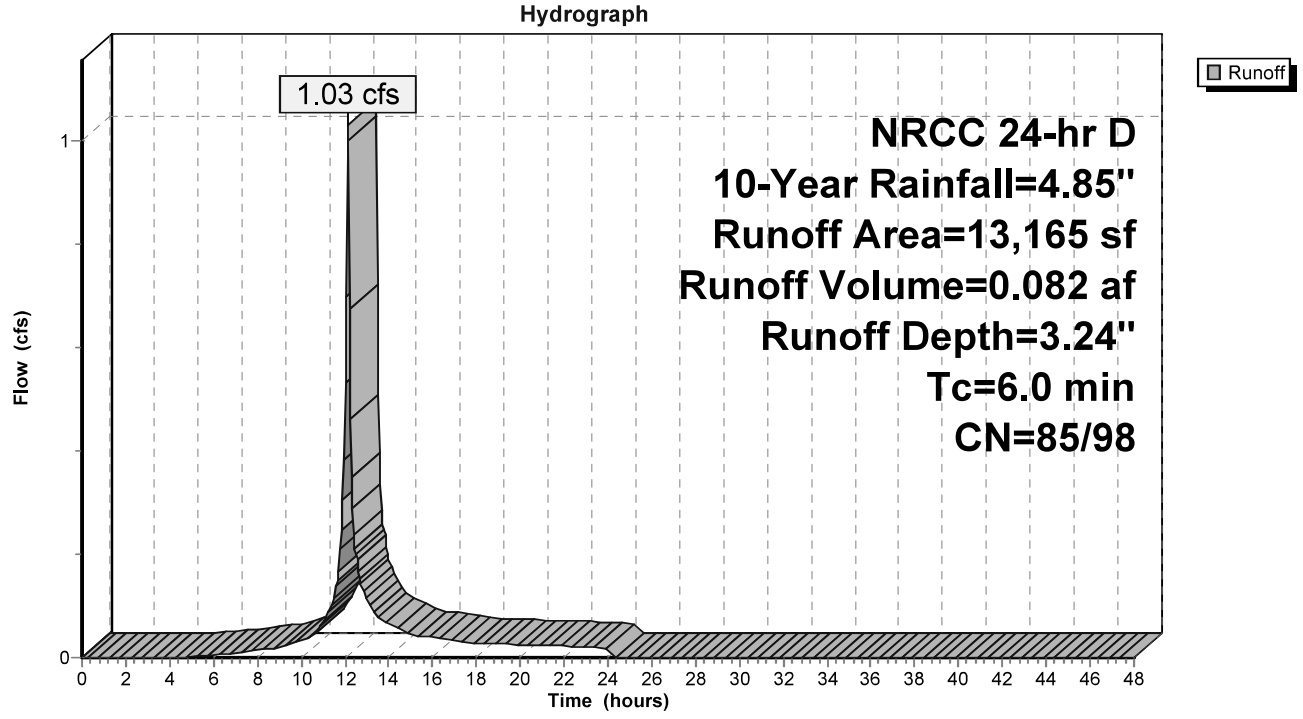
Runoff = 1.03 cfs @ 12.13 hrs, Volume= 0.082 af, Depth= 3.24"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 10-Year Rainfall=4.85"

	Area (sf)	CN	Description
	6,571	74	>75% Grass cover, Good, HSG C
	5,880	98	Water Surface, 0% imp, HSG C
*	134	98	Riprap
	580	89	Gravel roads, HSG C
	13,165	86	Weighted Average
	13,031	85	98.98% Pervious Area
	134	98	1.02% Impervious Area

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

Subcatchment 7S: APPROVED



Summary for Subcatchment PR-1:

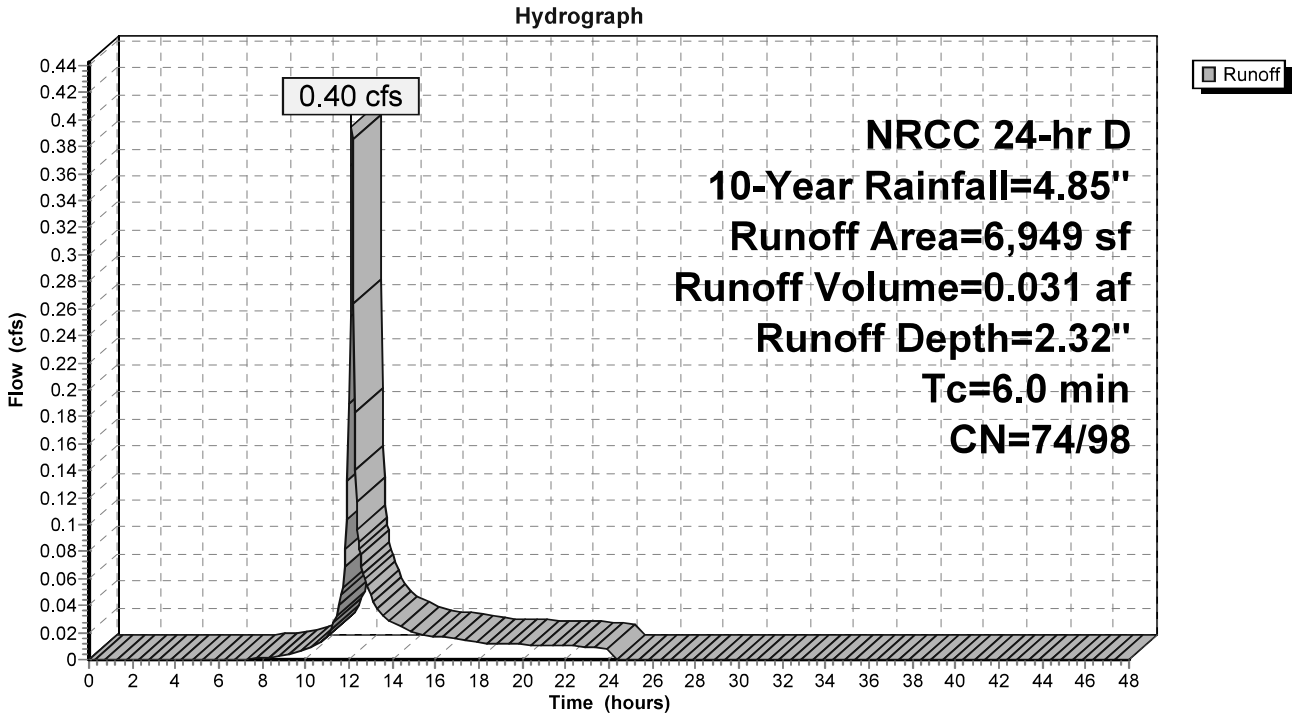
Runoff = 0.40 cfs @ 12.13 hrs, Volume= 0.031 af, Depth= 2.32"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 10-Year Rainfall=4.85"

Area (sf)	CN	Description
6,727	74	>75% Grass cover, Good, HSG C
222	98	Paved parking, HSG C
6,949	75	Weighted Average
6,727	74	96.81% Pervious Area
222	98	3.19% Impervious Area

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

Subcatchment PR-1:



Summary for Subcatchment PR-2:

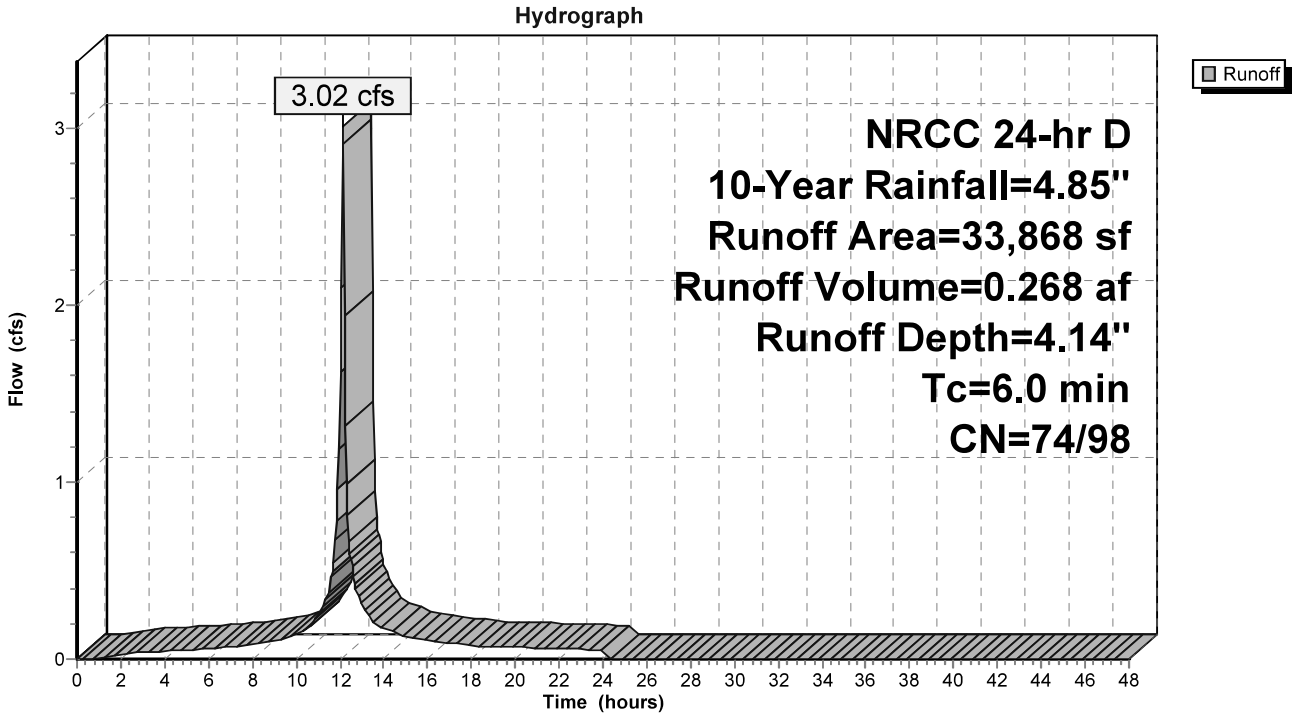
Runoff = 3.02 cfs @ 12.13 hrs, Volume= 0.268 af, Depth= 4.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 10-Year Rainfall=4.85"

Area (sf)	CN	Description
6,721	74	>75% Grass cover, Good, HSG C
3,900	98	Roofs, HSG C
23,247	98	Paved parking, HSG C
33,868	93	Weighted Average
6,721	74	19.84% Pervious Area
27,147	98	80.16% Impervious Area

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

Subcatchment PR-2:



Summary for Pond IB:

Inflow Area = 3.820 ac, 70.45% Impervious, Inflow Depth = 4.04" for 10-Year event
Inflow = 14.62 cfs @ 12.13 hrs, Volume= 1.285 af
Outflow = 3.81 cfs @ 12.36 hrs, Volume= 1.212 af, Atten= 74%, Lag= 14.2 min
Discarded = 0.04 cfs @ 12.36 hrs, Volume= 0.110 af
Primary = 3.77 cfs @ 12.36 hrs, Volume= 1.102 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,037.38' @ 12.36 hrs Surf.Area= 7,017 sf Storage= 21,052 cf

Plug-Flow detention time= 205.4 min calculated for 1.212 af (94% of inflow)
Center-of-Mass det. time= 170.9 min (940.7 - 769.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,033.30'	43,068 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,033.30	3,231	0	0
1,034.00	4,043	2,546	2,546
1,036.00	5,690	9,733	12,279
1,038.00	7,612	13,302	25,581
1,040.00	9,875	17,487	43,068

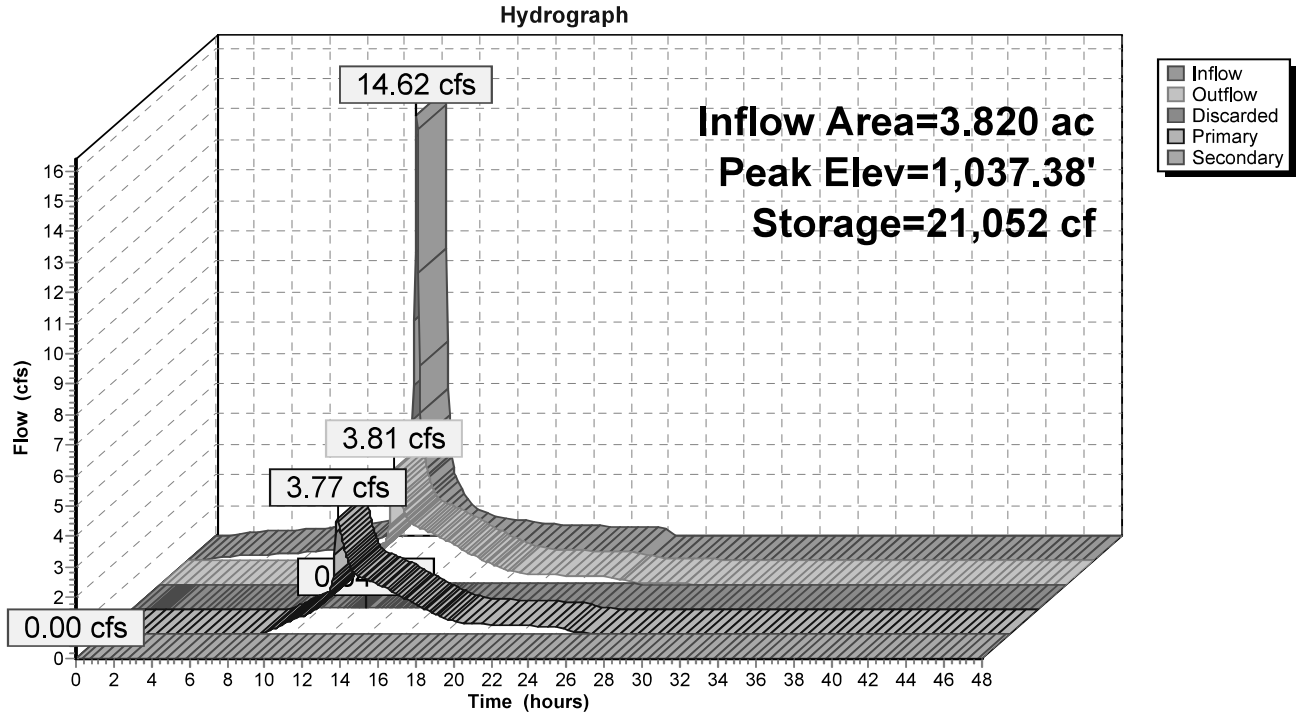
Device	Routing	Invert	Outlet Devices
#1	Primary	1,033.30'	**18.0" Round Culvert** L= 56.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 1,033.30' / 1,031.00' S= 0.0411 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	1,034.60'	**5.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 1	1,036.94'	**8.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	1,038.88'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	1,039.20'	**153.0 deg x 6.0' long x 2.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)
#6	Discarded	1,033.30'	**0.270 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.04 cfs @ 12.36 hrs HW=1,037.38' (Free Discharge)
└**6=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=3.75 cfs @ 12.36 hrs HW=1,037.38' (Free Discharge)
└**1=Culvert** (Passes 3.75 cfs of 13.70 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 2.11 cfs @ 7.72 fps)
  ├**3=Orifice/Grate** (Orifice Controls 1.65 cfs @ 2.26 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,033.30' (Free Discharge)
└**5=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond IB:

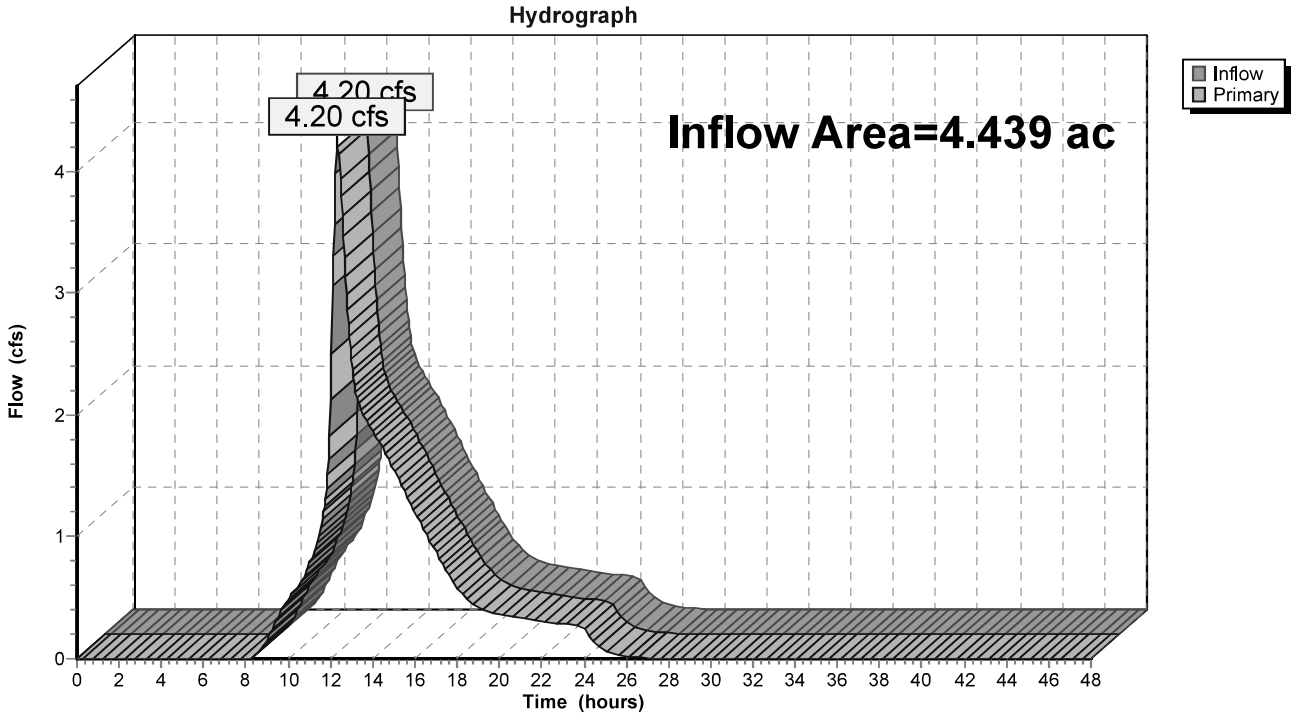

Hydrograph
14.62 cfs
3.81 cfs
3.77 cfs
0.00 cfs
Inflow Area=3.820 ac
Peak Elev=1,037.38'
Storage=21,052 cf
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Link 1EV:

Inflow Area = 4.439 ac, 61.00% Impervious, Inflow Depth = 3.28" for 10-Year event
Inflow = 4.20 cfs @ 12.33 hrs, Volume= 1.213 af
Primary = 4.20 cfs @ 12.33 hrs, Volume= 1.213 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 1EV:

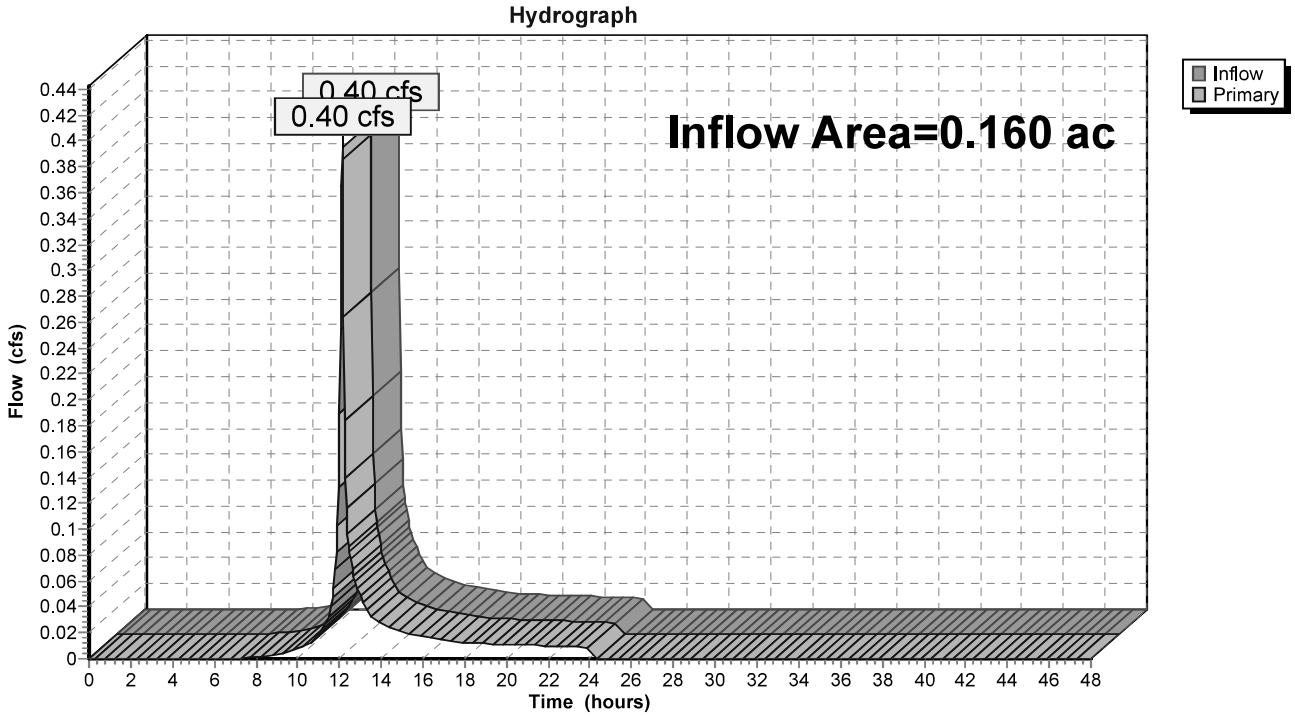


Summary for Link POA-1:

Inflow Area = 0.160 ac, 3.19% Impervious, Inflow Depth = 2.32" for 10-Year event
Inflow = 0.40 cfs @ 12.13 hrs, Volume= 0.031 af
Primary = 0.40 cfs @ 12.13 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA-1:



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: APPROVED Runoff Area=119,356 sf 75.36% Impervious Runoff Depth=5.31"
Tc=6.0 min CN=77/98 Runoff=13.64 cfs 1.212 af

Subcatchment 6S: APPROVED Runoff Area=26,955 sf 2.64% Impervious Runoff Depth=3.16"
Tc=6.0 min CN=72/98 Runoff=2.09 cfs 0.163 af

Subcatchment 7S: APPROVED Runoff Area=13,165 sf 1.02% Impervious Runoff Depth=4.42"
Tc=6.0 min CN=85/98 Runoff=1.39 cfs 0.111 af

Subcatchment PR-1: Runoff Area=6,949 sf 3.19% Impervious Runoff Depth=3.36"
Tc=6.0 min CN=74/98 Runoff=0.57 cfs 0.045 af

Subcatchment PR-2: Runoff Area=33,868 sf 80.16% Impervious Runoff Depth=5.36"
Tc=6.0 min CN=74/98 Runoff=3.88 cfs 0.347 af

Pond IB: Peak Elev=1,037.90' Storage=24,828 cf Inflow=18.91 cfs 1.670 af
Discarded=0.05 cfs 0.113 af Primary=6.30 cfs 1.485 af Secondary=0.00 cfs 0.000 af Outflow=6.35 cfs 1.597 af

Link 1EV: Inflow=7.27 cfs 1.647 af
Primary=7.27 cfs 1.647 af

Link POA-1: Inflow=0.57 cfs 0.045 af
Primary=0.57 cfs 0.045 af

Total Runoff Area = 4.598 ac Runoff Volume = 1.877 af Average Runoff Depth = 4.90"
41.01% Pervious = 1.886 ac 58.99% Impervious = 2.713 ac

Summary for Subcatchment 3S: APPROVED

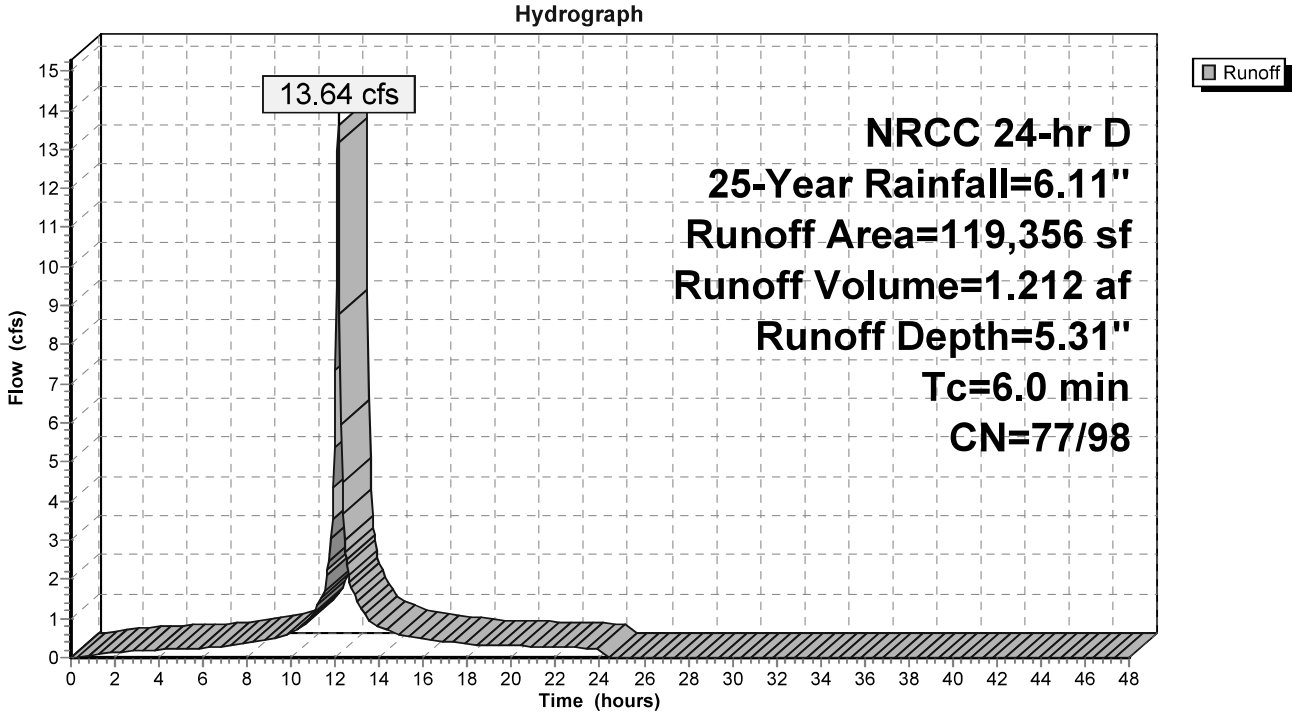
Runoff = 13.64 cfs @ 12.13 hrs, Volume= 1.212 af, Depth= 5.31"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 25-Year Rainfall=6.11"

Area (sf)	CN	Description
25,414	74	>75% Grass cover, Good, HSG C
71,602	98	Paved parking, HSG C
18,342	98	Roofs, HSG C
3,998	98	Unconnected pavement, HSG C
119,356	93	Weighted Average
29,412	77	24.64% Pervious Area
89,944	98	75.36% Impervious Area

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

Subcatchment 3S: APPROVED



Summary for Subcatchment 6S: APPROVED

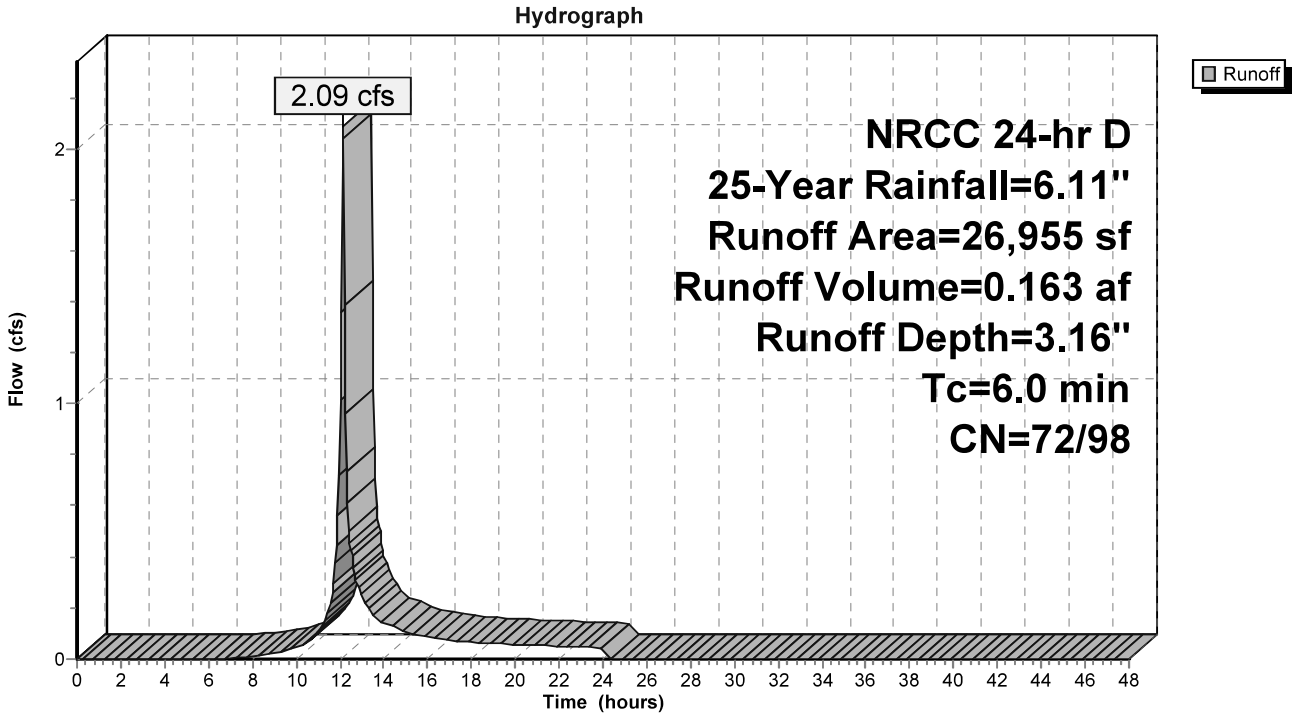
Runoff = 2.09 cfs @ 12.13 hrs, Volume= 0.163 af, Depth= 3.16"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 25-Year Rainfall=6.11"

	Area (sf)	CN	Description
	15,442	74	>75% Grass cover, Good, HSG C
*	711	98	Riprap
	10,802	70	Woods, Good, HSG C
	26,955	73	Weighted Average
	26,244	72	97.36% Pervious Area
	711	98	2.64% Impervious Area

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

Subcatchment 6S: APPROVED



Summary for Subcatchment 7S: APPROVED

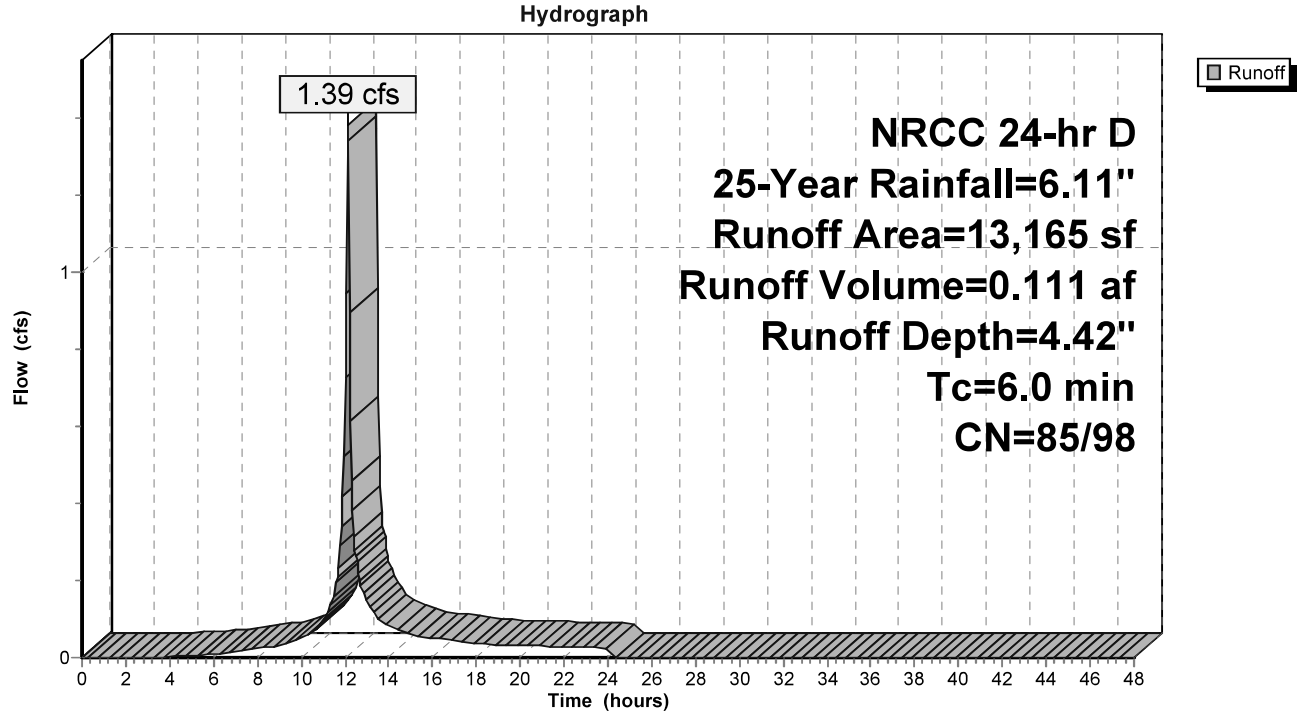
Runoff = 1.39 cfs @ 12.13 hrs, Volume= 0.111 af, Depth= 4.42"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 25-Year Rainfall=6.11"

	Area (sf)	CN	Description
	6,571	74	>75% Grass cover, Good, HSG C
	5,880	98	Water Surface, 0% imp, HSG C
*	134	98	Riprap
	580	89	Gravel roads, HSG C
	13,165	86	Weighted Average
	13,031	85	98.98% Pervious Area
	134	98	1.02% Impervious Area

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

Subcatchment 7S: APPROVED



Summary for Subcatchment PR-1:

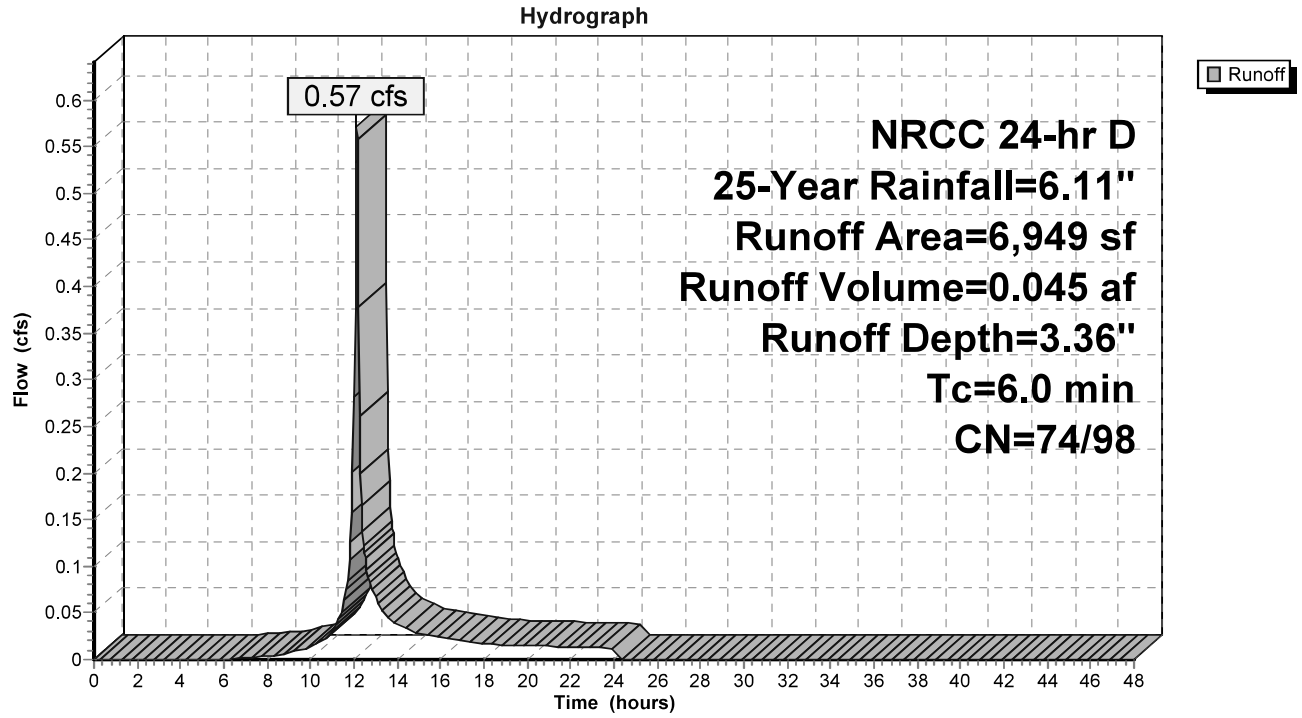
Runoff = 0.57 cfs @ 12.13 hrs, Volume= 0.045 af, Depth= 3.36"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 25-Year Rainfall=6.11"

Area (sf)	CN	Description
6,727	74	>75% Grass cover, Good, HSG C
222	98	Paved parking, HSG C
6,949	75	Weighted Average
6,727	74	96.81% Pervious Area
222	98	3.19% Impervious Area

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

Subcatchment PR-1:



Summary for Subcatchment PR-2:

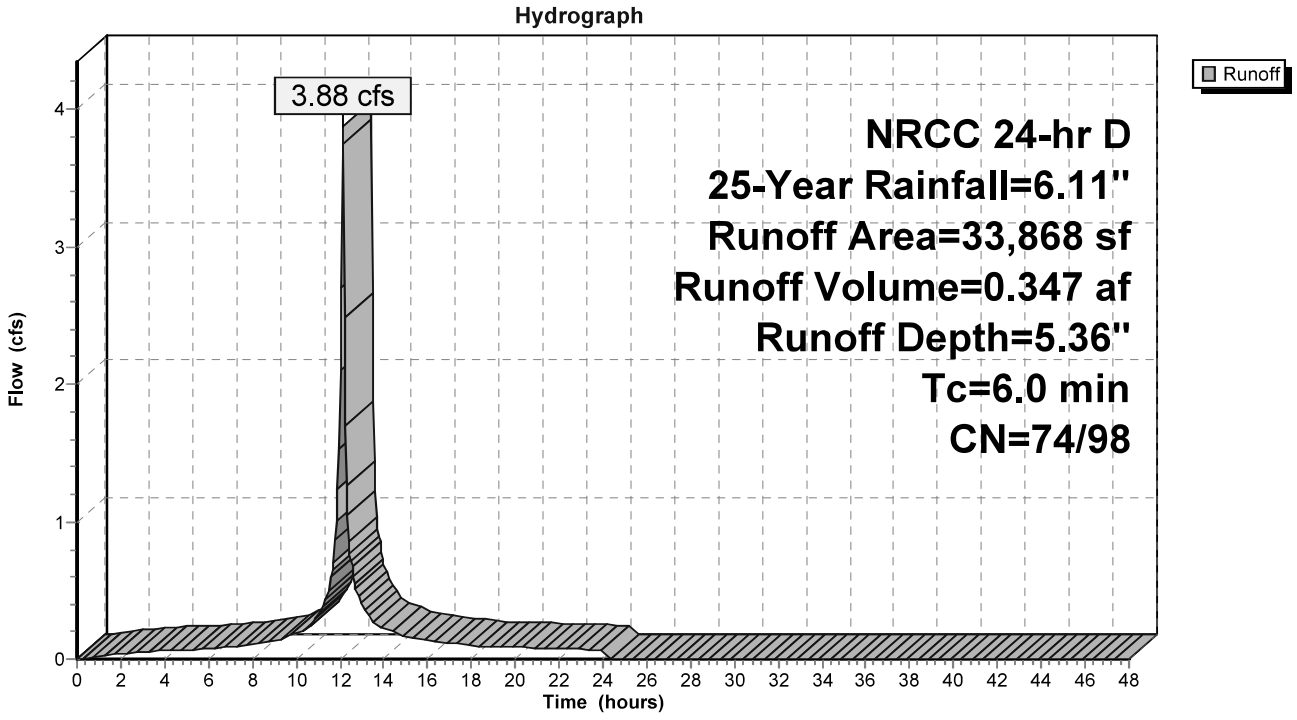
Runoff = 3.88 cfs @ 12.13 hrs, Volume= 0.347 af, Depth= 5.36"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 25-Year Rainfall=6.11"

Area (sf)	CN	Description
6,721	74	>75% Grass cover, Good, HSG C
3,900	98	Roofs, HSG C
23,247	98	Paved parking, HSG C
33,868	93	Weighted Average
6,721	74	19.84% Pervious Area
27,147	98	80.16% Impervious Area

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

Subcatchment PR-2:



Summary for Pond IB:

Inflow Area = 3.820 ac, 70.45% Impervious, Inflow Depth = 5.25" for 25-Year event
Inflow = 18.91 cfs @ 12.13 hrs, Volume= 1.670 af
Outflow = 6.35 cfs @ 12.30 hrs, Volume= 1.597 af, Atten= 66%, Lag= 10.6 min
Discarded = 0.05 cfs @ 12.30 hrs, Volume= 0.113 af
Primary = 6.30 cfs @ 12.30 hrs, Volume= 1.485 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,037.90' @ 12.30 hrs Surf.Area= 7,516 sf Storage= 24,828 cf

Plug-Flow detention time= 173.1 min calculated for 1.596 af (96% of inflow)
Center-of-Mass det. time= 147.1 min (912.6 - 765.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,033.30'	43,068 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,033.30	3,231	0	0
1,034.00	4,043	2,546	2,546
1,036.00	5,690	9,733	12,279
1,038.00	7,612	13,302	25,581
1,040.00	9,875	17,487	43,068

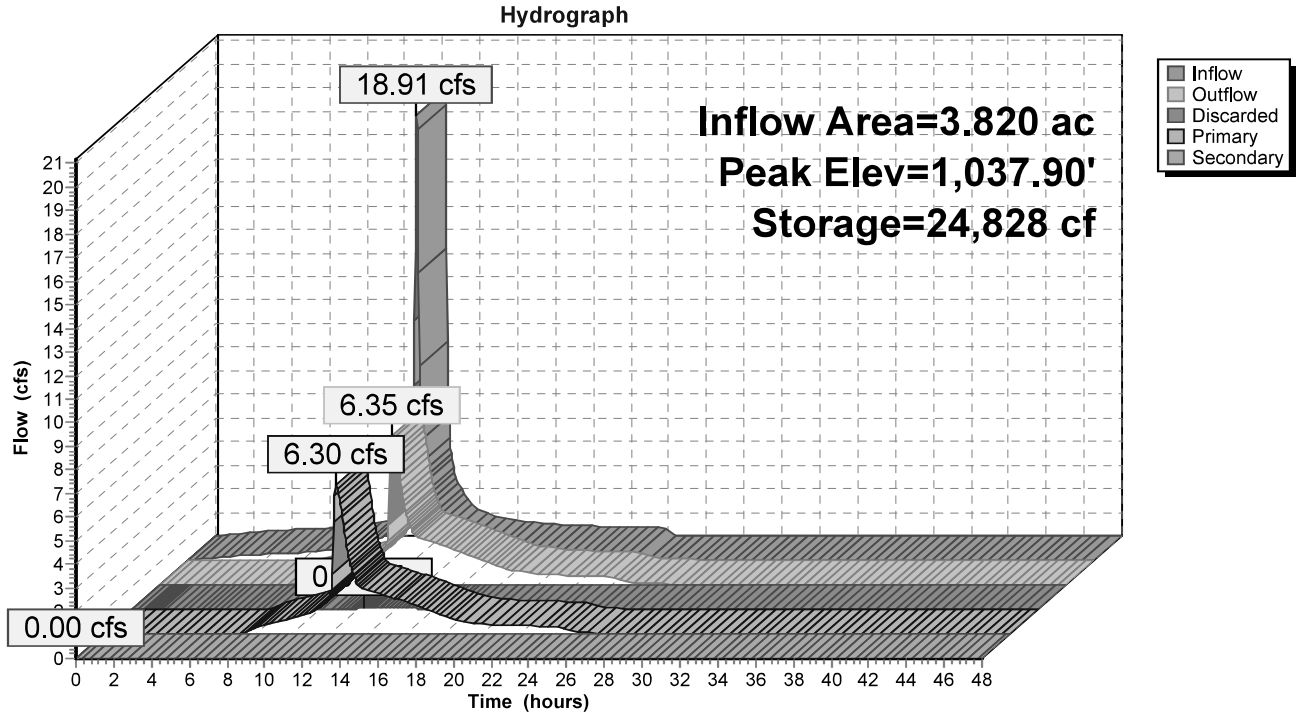
Device	Routing	Invert	Outlet Devices
#1	Primary	1,033.30'	**18.0" Round Culvert** L= 56.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 1,033.30' / 1,031.00' S= 0.0411 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	1,034.60'	**5.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 1	1,036.94'	**8.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	1,038.88'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	1,039.20'	**153.0 deg x 6.0' long x 2.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)
#6	Discarded	1,033.30'	**0.270 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.05 cfs @ 12.30 hrs HW=1,037.90' (Free Discharge)
└**6=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=6.30 cfs @ 12.30 hrs HW=1,037.90' (Free Discharge)
└**1=Culvert** (Passes 6.30 cfs of 14.73 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 2.31 cfs @ 8.46 fps)
  ├**3=Orifice/Grate** (Orifice Controls 3.99 cfs @ 3.81 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,033.30' (Free Discharge)
└**5=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond IB:

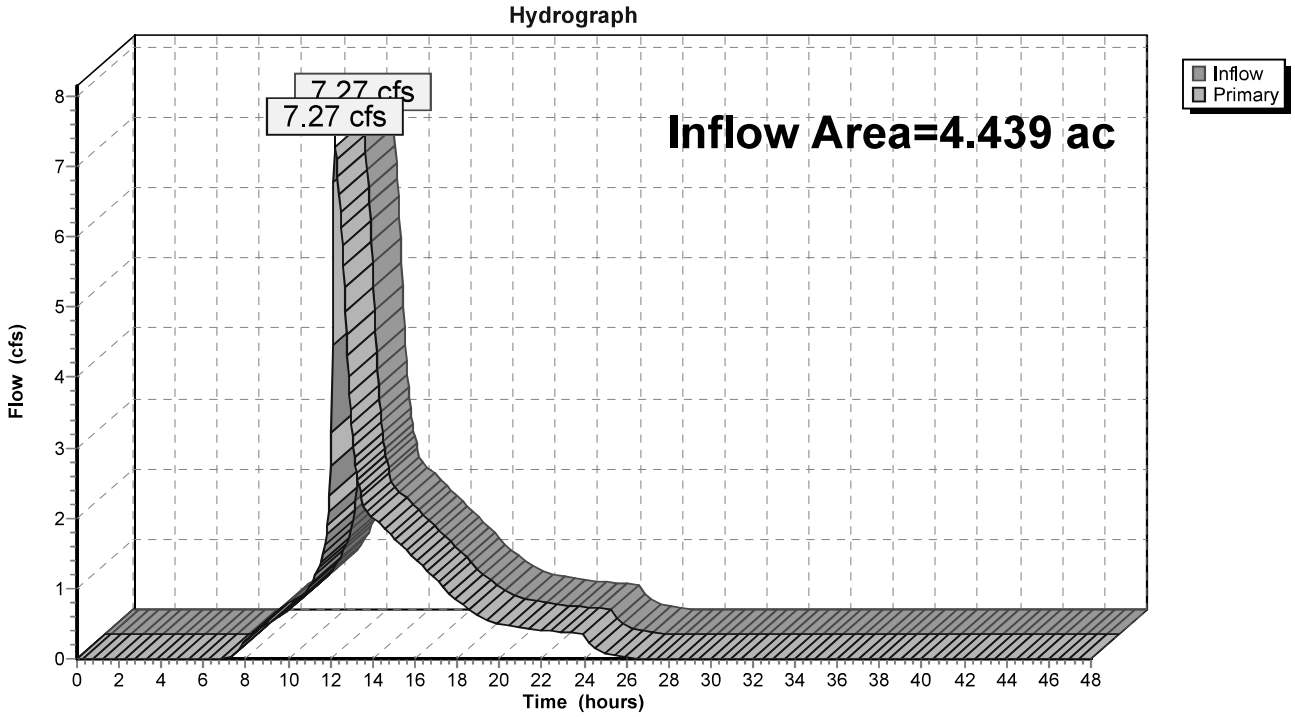

Hydrograph
18.91 cfs
6.35 cfs
6.30 cfs
0
0.00 cfs
Inflow Area=3.820 ac
Peak Elev=1,037.90'
Storage=24,828 cf
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Link 1EV:

Inflow Area = 4.439 ac, 61.00% Impervious, Inflow Depth = 4.45" for 25-Year event
Inflow = 7.27 cfs @ 12.22 hrs, Volume= 1.647 af
Primary = 7.27 cfs @ 12.22 hrs, Volume= 1.647 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 1EV:

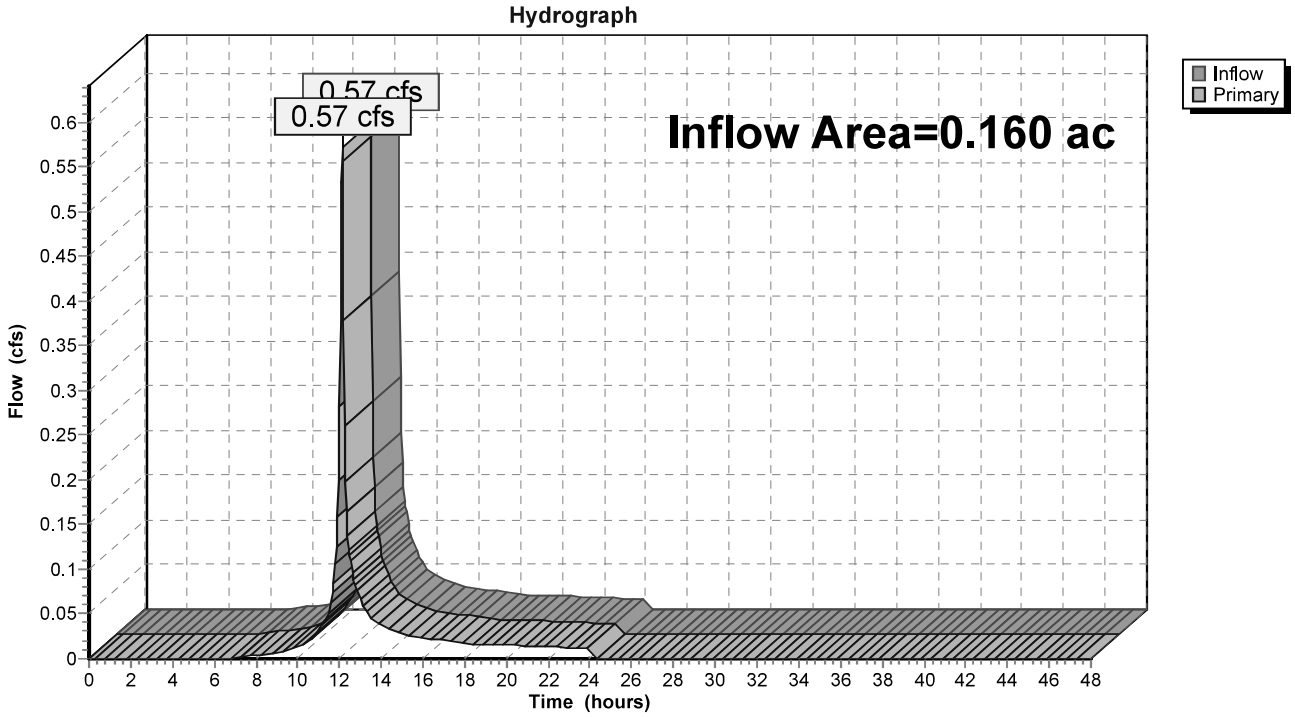


Summary for Link POA-1:

Inflow Area = 0.160 ac, 3.19% Impervious, Inflow Depth = 3.36" for 25-Year event
Inflow = 0.57 cfs @ 12.13 hrs, Volume= 0.045 af
Primary = 0.57 cfs @ 12.13 hrs, Volume= 0.045 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA-1:



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: APPROVED Runoff Area=119,356 sf 75.36% Impervious Runoff Depth=7.81"
Tc=6.0 min CN=77/98 Runoff=19.93 cfs 1.784 af

Subcatchment 6S: APPROVED Runoff Area=26,955 sf 2.64% Impervious Runoff Depth=5.38"
Tc=6.0 min CN=72/98 Runoff=3.53 cfs 0.277 af

Subcatchment 7S: APPROVED Runoff Area=13,165 sf 1.02% Impervious Runoff Depth=6.89"
Tc=6.0 min CN=85/98 Runoff=2.10 cfs 0.173 af

Subcatchment PR-1: Runoff Area=6,949 sf 3.19% Impervious Runoff Depth=5.63"
Tc=6.0 min CN=74/98 Runoff=0.95 cfs 0.075 af

Subcatchment PR-2: Runoff Area=33,868 sf 80.16% Impervious Runoff Depth=7.86"
Tc=6.0 min CN=74/98 Runoff=5.66 cfs 0.510 af

Pond IB: Peak Elev=1,038.97' Storage=33,504 cf Inflow=27.69 cfs 2.467 af
Discarded=0.05 cfs 0.117 af Primary=10.00 cfs 2.277 af Secondary=0.00 cfs 0.000 af Outflow=10.06 cfs 2.394 af

Link 1EV: Inflow=11.73 cfs 2.555 af
Primary=11.73 cfs 2.555 af

Link POA-1: Inflow=0.95 cfs 0.075 af
Primary=0.95 cfs 0.075 af

Total Runoff Area = 4.598 ac Runoff Volume = 2.819 af Average Runoff Depth = 7.36"
41.01% Pervious = 1.886 ac 58.99% Impervious = 2.713 ac

Summary for Subcatchment 3S: APPROVED

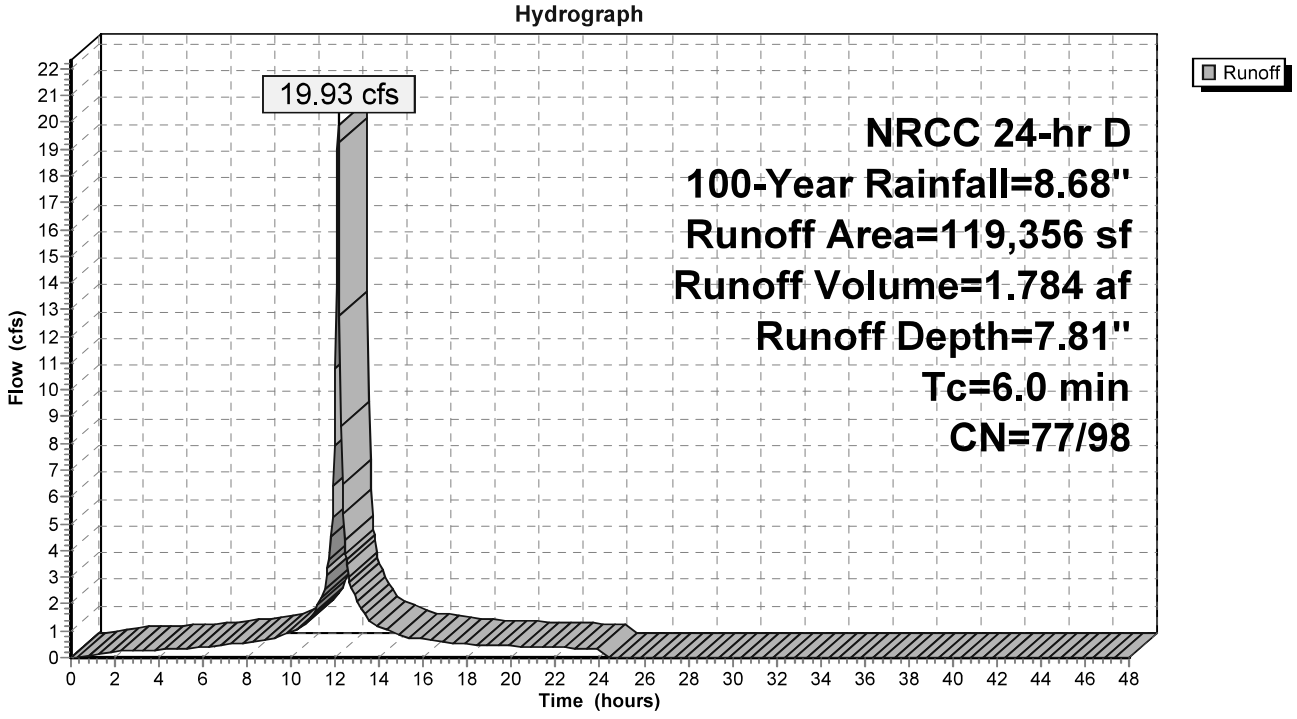
Runoff = 19.93 cfs @ 12.13 hrs, Volume= 1.784 af, Depth= 7.81"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 100-Year Rainfall=8.68"

Area (sf)	CN	Description
25,414	74	>75% Grass cover, Good, HSG C
71,602	98	Paved parking, HSG C
18,342	98	Roofs, HSG C
3,998	98	Unconnected pavement, HSG C
119,356	93	Weighted Average
29,412	77	24.64% Pervious Area
89,944	98	75.36% Impervious Area

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

Subcatchment 3S: APPROVED



Summary for Subcatchment 6S: APPROVED

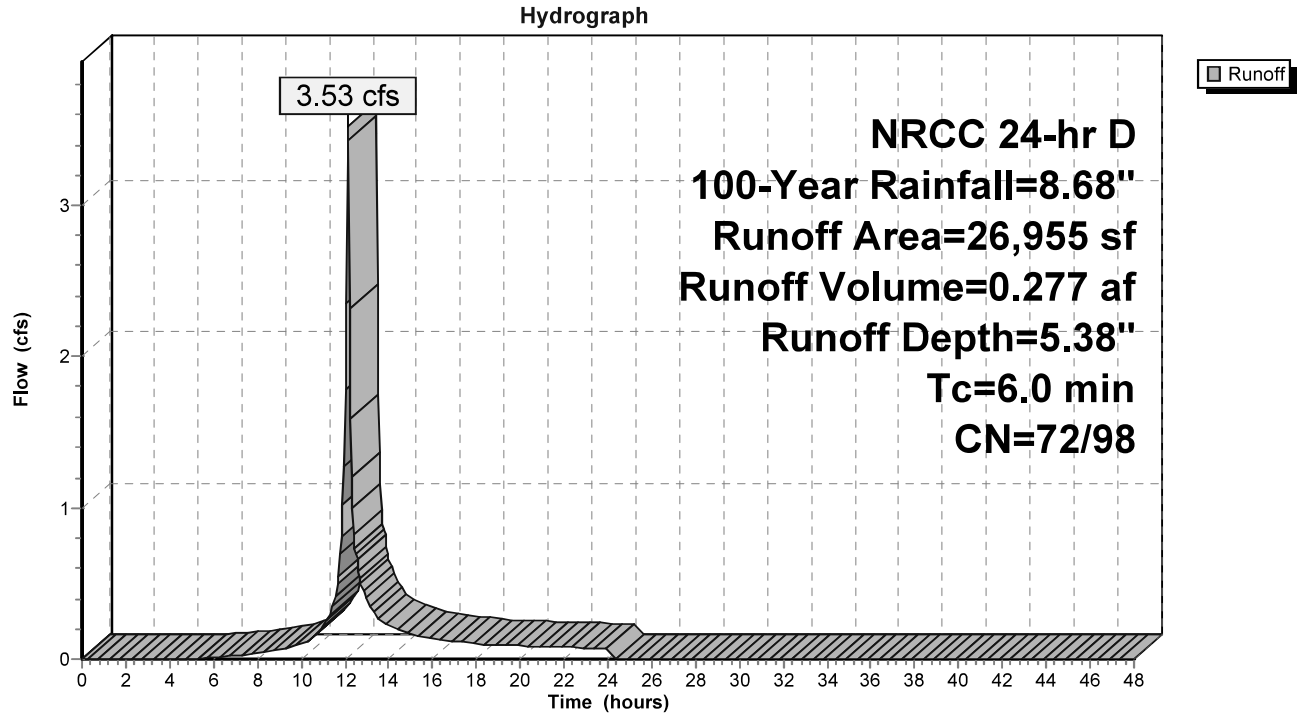
Runoff = 3.53 cfs @ 12.13 hrs, Volume= 0.277 af, Depth= 5.38"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 100-Year Rainfall=8.68"

	Area (sf)	CN	Description
	15,442	74	>75% Grass cover, Good, HSG C
*	711	98	Riprap
	10,802	70	Woods, Good, HSG C
	26,955	73	Weighted Average
	26,244	72	97.36% Pervious Area
	711	98	2.64% Impervious Area

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

Subcatchment 6S: APPROVED



Summary for Subcatchment 7S: APPROVED

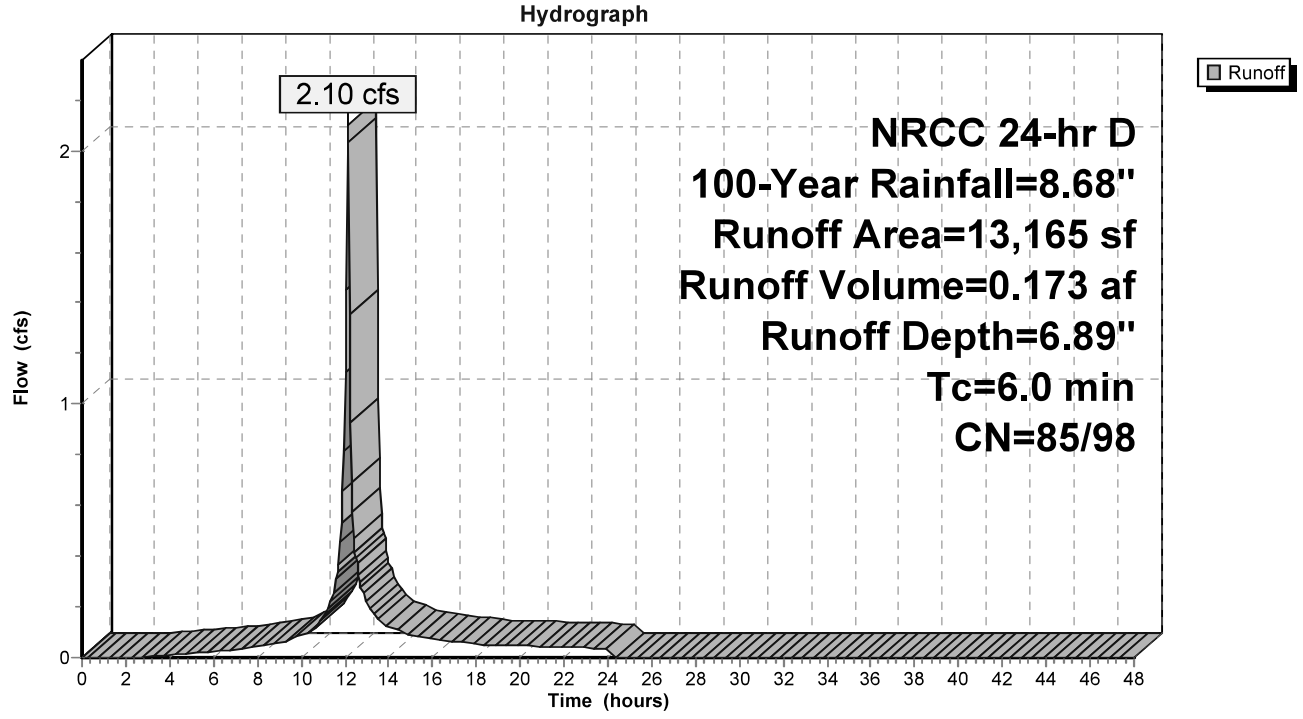
Runoff = 2.10 cfs @ 12.13 hrs, Volume= 0.173 af, Depth= 6.89"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 100-Year Rainfall=8.68"

	Area (sf)	CN	Description
	6,571	74	>75% Grass cover, Good, HSG C
	5,880	98	Water Surface, 0% imp, HSG C
*	134	98	Riprap
	580	89	Gravel roads, HSG C
	13,165	86	Weighted Average
	13,031	85	98.98% Pervious Area
	134	98	1.02% Impervious Area

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

Subcatchment 7S: APPROVED



Summary for Subcatchment PR-1:

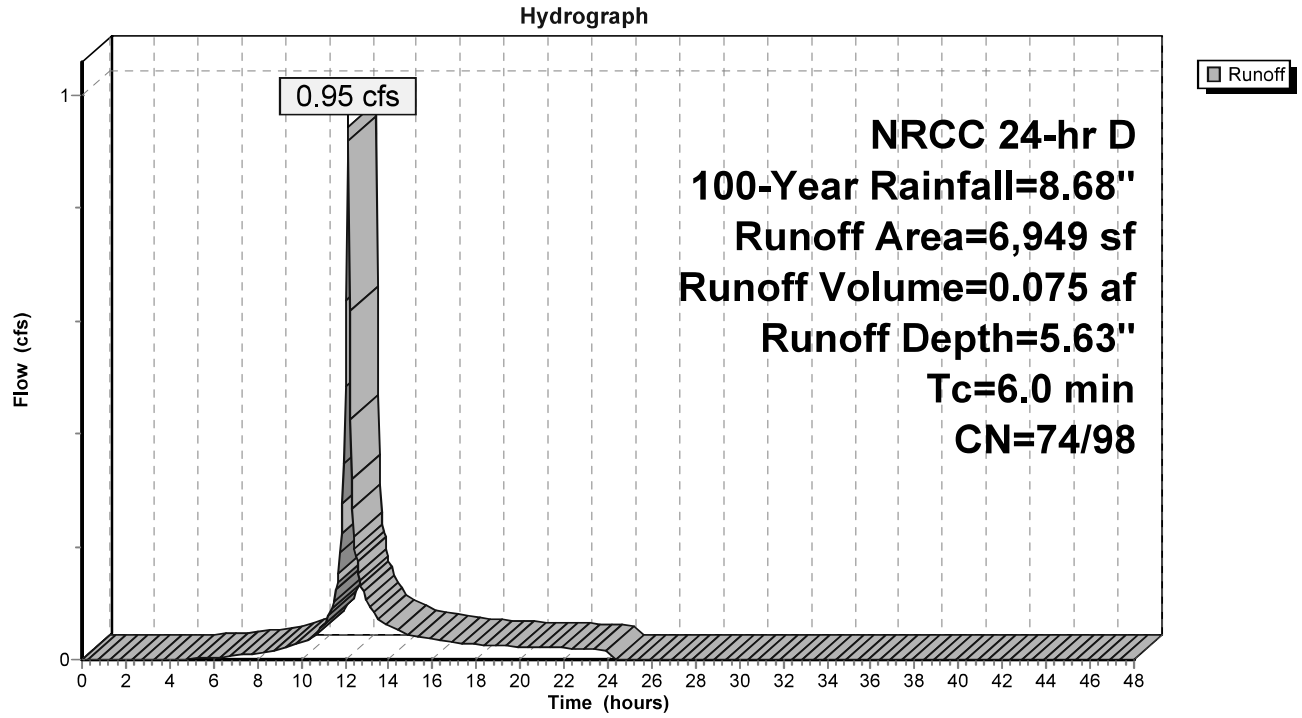
Runoff = 0.95 cfs @ 12.13 hrs, Volume= 0.075 af, Depth= 5.63"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 100-Year Rainfall=8.68"

Area (sf)	CN	Description
6,727	74	>75% Grass cover, Good, HSG C
222	98	Paved parking, HSG C
6,949	75	Weighted Average
6,727	74	96.81% Pervious Area
222	98	3.19% Impervious Area

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

Subcatchment PR-1:



Summary for Subcatchment PR-2:

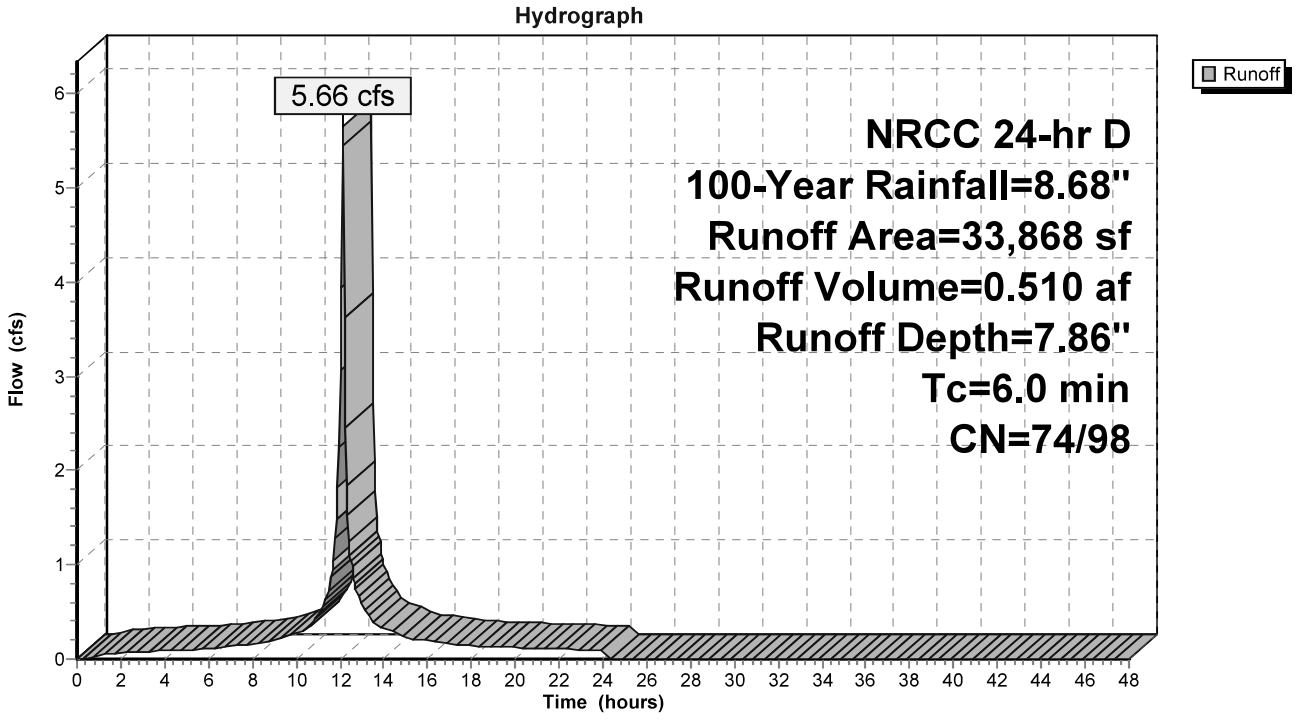
Runoff = 5.66 cfs @ 12.13 hrs, Volume= 0.510 af, Depth= 7.86"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-48.00 hrs, dt= 0.05
NRCC 24-hr D 100-Year Rainfall=8.68"

Area (sf)	CN	Description
6,721	74	>75% Grass cover, Good, HSG C
3,900	98	Roofs, HSG C
23,247	98	Paved parking, HSG C
33,868	93	Weighted Average
6,721	74	19.84% Pervious Area
27,147	98	80.16% Impervious Area

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

Subcatchment PR-2:



Summary for Pond IB:

Inflow Area = 3.820 ac, 70.45% Impervious, Inflow Depth = 7.75" for 100-Year event
Inflow = 27.69 cfs @ 12.13 hrs, Volume= 2.467 af
Outflow = 10.06 cfs @ 12.29 hrs, Volume= 2.394 af, Atten= 64%, Lag= 9.7 min
Discarded = 0.05 cfs @ 12.29 hrs, Volume= 0.117 af
Primary = 10.00 cfs @ 12.29 hrs, Volume= 2.277 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,038.97' @ 12.29 hrs Surf.Area= 8,711 sf Storage= 33,504 cf

Plug-Flow detention time= 139.2 min calculated for 2.391 af (97% of inflow)
Center-of-Mass det. time= 121.3 min (880.6 - 759.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,033.30'	43,068 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,033.30	3,231	0	0
1,034.00	4,043	2,546	2,546
1,036.00	5,690	9,733	12,279
1,038.00	7,612	13,302	25,581
1,040.00	9,875	17,487	43,068

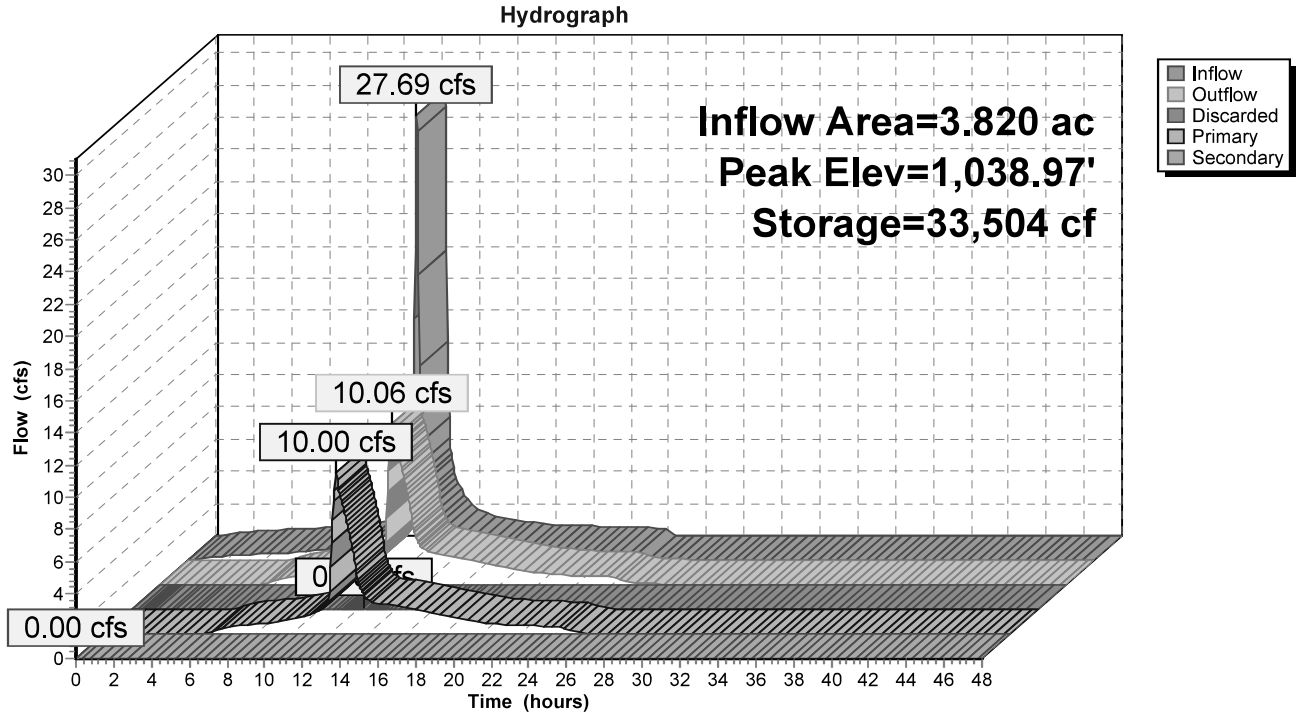
Device	Routing	Invert	Outlet Devices
#1	Primary	1,033.30'	**18.0" Round Culvert** L= 56.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 1,033.30' / 1,031.00' S= 0.0411 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	1,034.60'	**5.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 1	1,036.94'	**8.0" Vert. Orifice/Grate X 3.00** C= 0.600
#4	Device 1	1,038.88'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	1,039.20'	**153.0 deg x 6.0' long x 2.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)
#6	Discarded	1,033.30'	**0.270 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.05 cfs @ 12.29 hrs HW=1,038.97' (Free Discharge)
└**6=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=9.91 cfs @ 12.29 hrs HW=1,038.97' (Free Discharge)
└**1=Culvert** (Passes 9.91 cfs of 16.65 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 2.68 cfs @ 9.82 fps)
  ├**3=Orifice/Grate** (Orifice Controls 6.56 cfs @ 6.27 fps)
  └**4=Orifice/Grate** (Weir Controls 0.67 cfs @ 0.96 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,033.30' (Free Discharge)
└**5=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond IB:

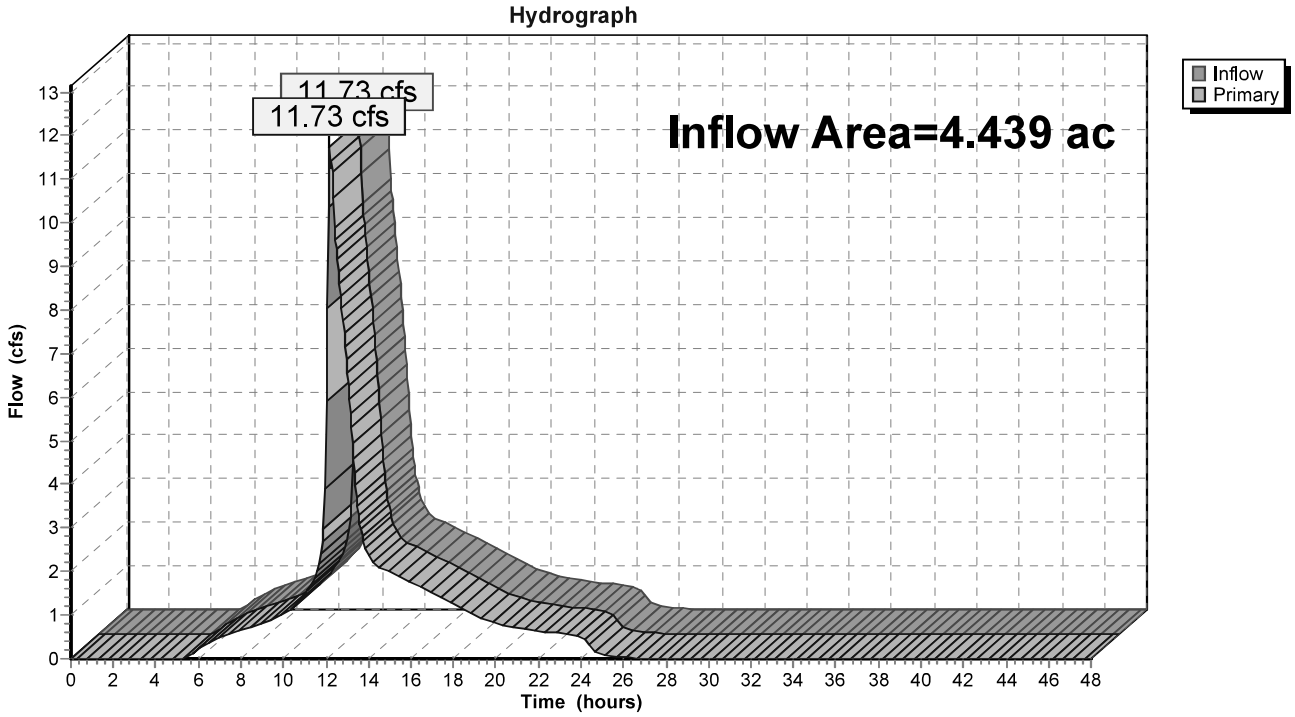

Hydrograph
27.69 cfs
10.06 cfs
10.00 cfs
0.00 cfs
Inflow Area=3.820 ac
Peak Elev=1,038.97'
Storage=33,504 cf
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Link 1EV:

Inflow Area = 4.439 ac, 61.00% Impervious, Inflow Depth = 6.91" for 100-Year event
Inflow = 11.73 cfs @ 12.16 hrs, Volume= 2.555 af
Primary = 11.73 cfs @ 12.16 hrs, Volume= 2.555 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 1EV:

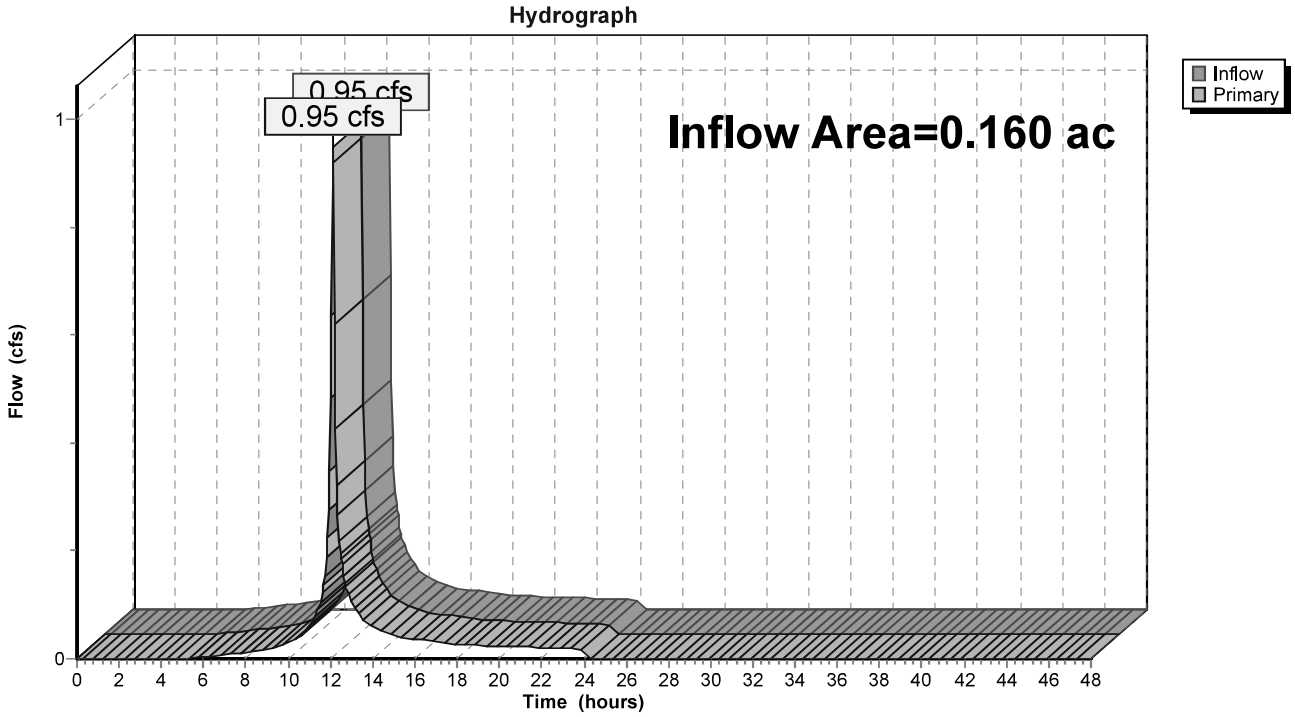


Summary for Link POA-1:

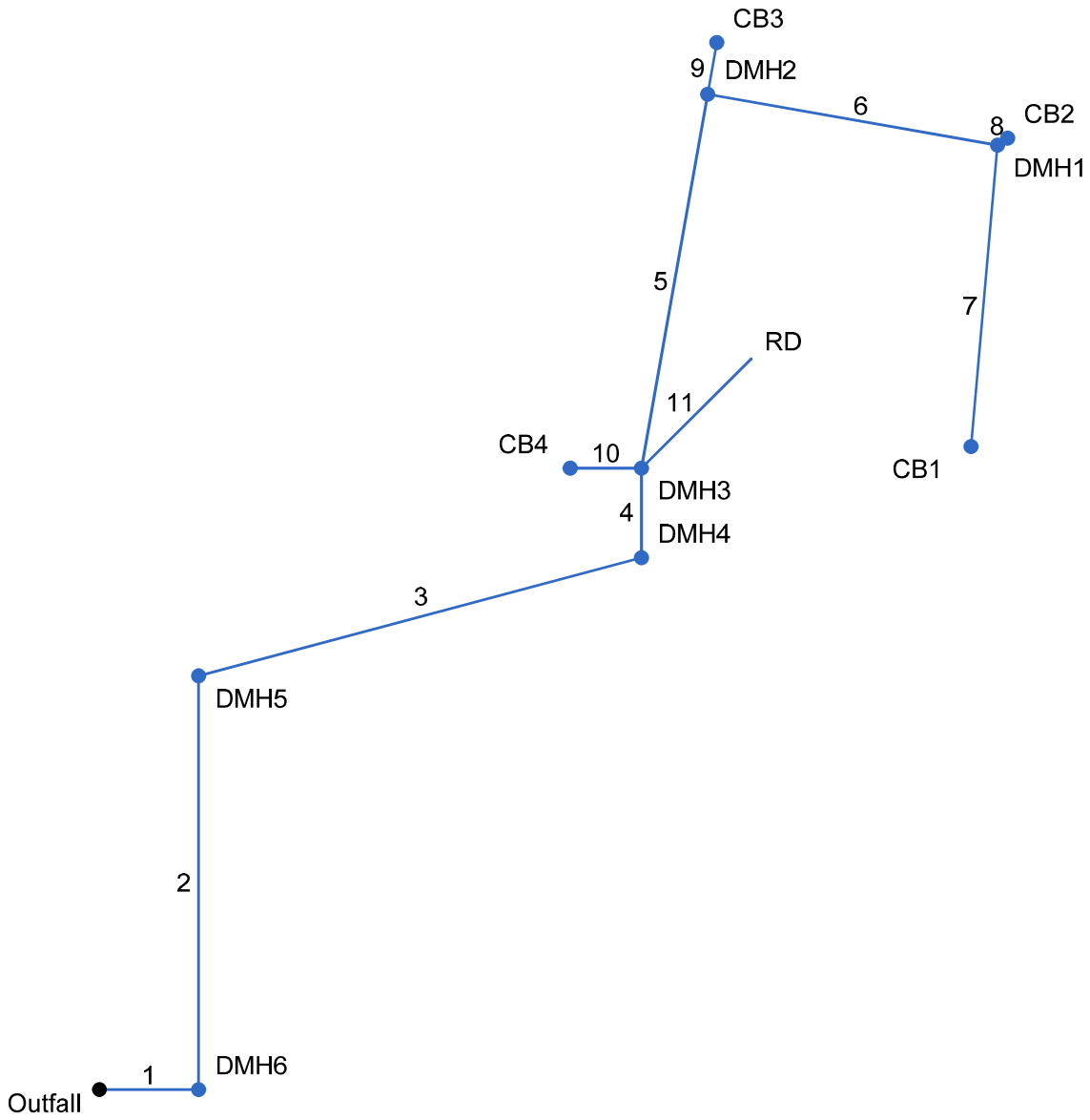
Inflow Area = 0.160 ac, 3.19% Impervious, Inflow Depth = 5.63" for 100-Year event
Inflow = 0.95 cfs @ 12.13 hrs, Volume= 0.075 af
Primary = 0.95 cfs @ 12.13 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link POA-1:



Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: System-1.stm	Number of lines: 11	Date: 8/15/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	32.000	0.000	MH	0.00	0.00	0.00	6.0	1035.00	0.62	1035.20	18	Cir	0.011	1.00	1045.00	DMH6-FES3
2	1	134.000	-90.000	MH	0.00	0.00	0.00	6.0	1035.30	0.52	1036.00	18	Cir	0.011	0.97	1042.00	DMH5-DMH6
3	2	148.000	75.000	MH	0.00	0.00	0.00	6.0	1036.10	0.51	1036.85	18	Cir	0.011	0.97	1045.00	DMH4-DMH5
4	3	29.000	-75.000	MH	0.00	0.00	0.00	6.0	1036.95	8.10	1039.30	12	Cir	0.011	1.00	1045.05	DMH3-DMH4
5	4	123.000	10.000	MH	0.00	0.00	0.00	6.0	1040.30	0.49	1040.90	12	Cir	0.011	1.00	1044.55	DMH2-DMH3
6	5	95.000	90.000	MH	0.00	0.00	0.00	6.0	1041.00	0.95	1041.90	12	Cir	0.011	1.00	1044.20	DMH1-DMH2
7	6	98.000	85.000	Grate	0.00	0.22	0.80	6.0	1042.00	1.02	1043.00	12	Cir	0.011	1.00	1046.00	CB1-DMH1
8	6	4.000	-45.000	Grate	0.00	0.21	0.80	6.0	1042.00	2.50	1042.10	12	Cir	0.011	1.00	1045.10	CB2-DMH1
9	5	17.000	0.000	Grate	0.00	0.09	0.80	6.0	1041.00	1.18	1041.20	12	Cir	0.011	1.00	1044.00	CB3-DMH2
10	4	23.000	-90.000	Grate	0.00	0.17	0.90	6.0	1041.30	1.30	1041.60	12	Cir	0.011	1.00	1044.60	CB4-DMH3
11	4	50.000	45.000	None	0.00	0.09	0.90	6.0	1041.30	5.40	1044.00	6	Cir	0.011	1.00	1047.00	RD-DMH3

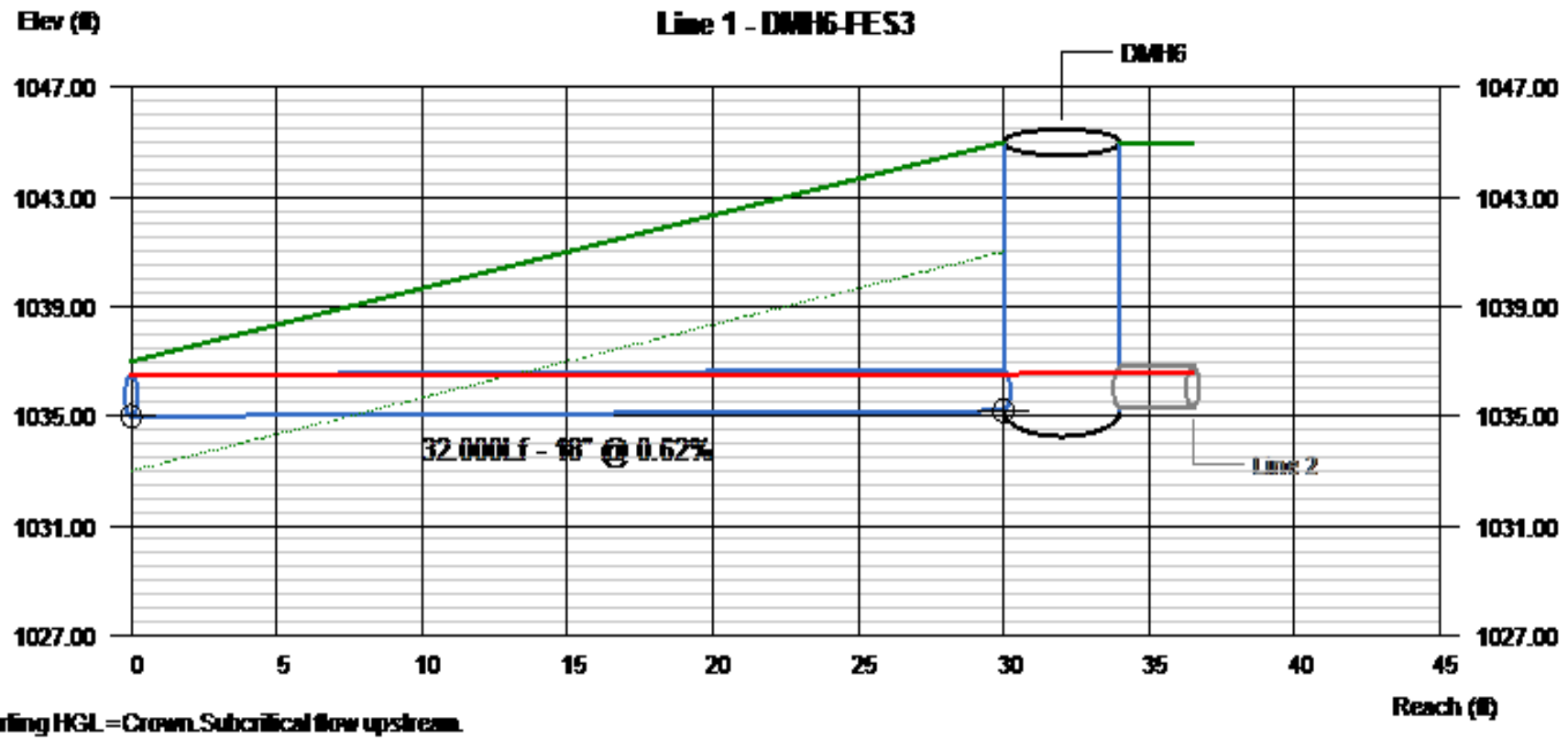
Project File: System-1.stm | Number of lines: 11 | Date: 8/15/2023

Storm Sewer Summary Report

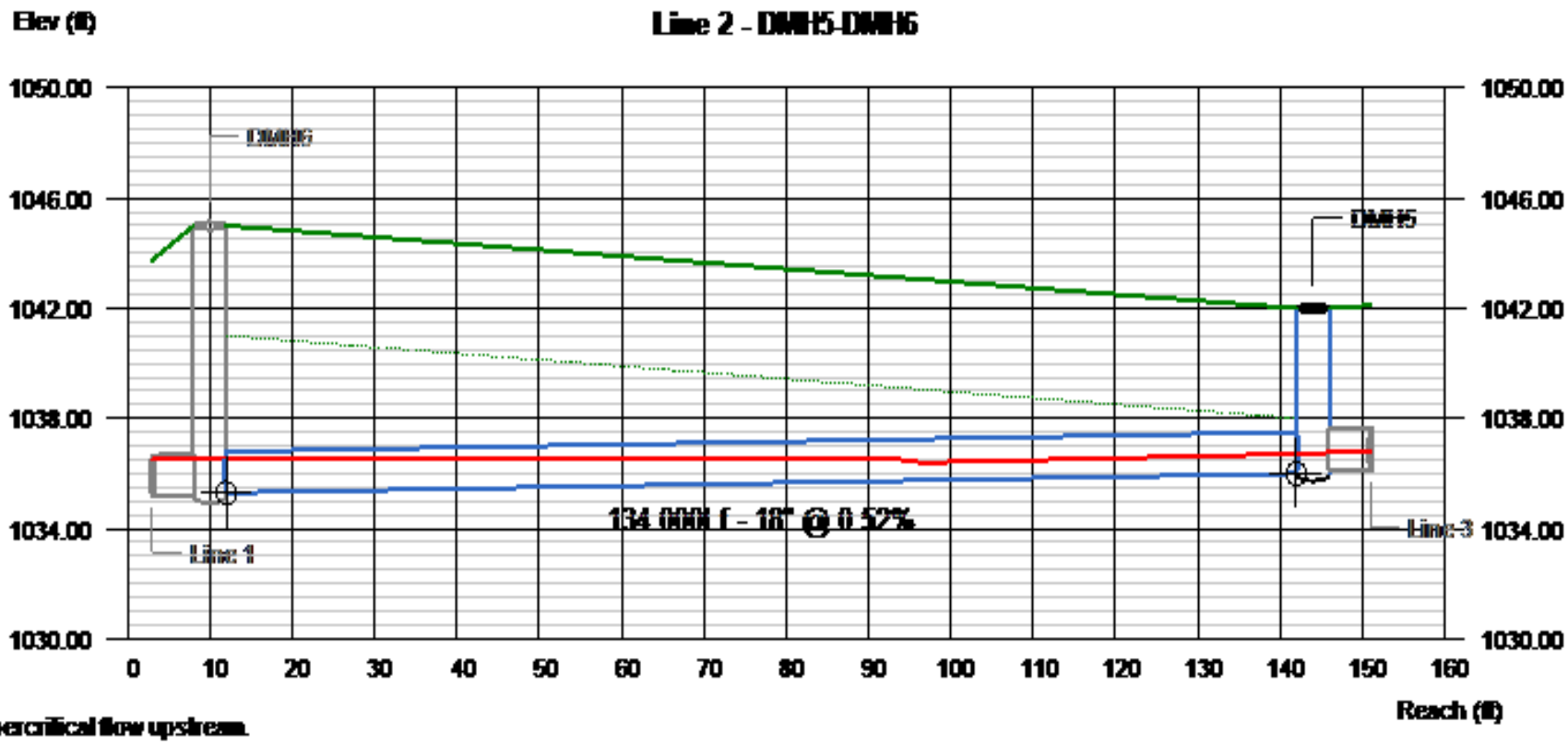
Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	DMH6-FES3	3.39	18	Cir	32.000	1035.00	1035.20	0.625	1036.50	1036.51	0.07	1036.58	End	Manhole
2	DMH5-DMH6	3.52	18	Cir	134.000	1035.30	1036.00	0.522	1036.58	1036.72	n/a	1036.72 j	1	Manhole
3	DMH4-DMH5	3.68	18	Cir	148.000	1036.10	1036.85	0.507	1036.78	1037.58	0.28	1037.58	2	Manhole
4	DMH3-DMH4	3.70	12	Cir	29.000	1036.95	1039.30	8.104	1037.58	1040.12	n/a	1040.12	3	Manhole
5	DMH2-DMH3	2.43	12	Cir	123.000	1040.30	1040.90	0.488	1040.99	1041.59	0.27	1041.87	4	Manhole
6	DMH1-DMH2	2.06	12	Cir	95.000	1041.00	1041.90	0.947	1041.87	1042.51	n/a	1042.51 j	5	Manhole
7	CB1-DMH1	1.11	12	Cir	98.000	1042.00	1043.00	1.020	1042.51	1043.44	n/a	1043.44 j	6	Grate
8	CB2-DMH1	1.06	12	Cir	4.000	1042.00	1042.10	2.499	1042.51	1042.53	n/a	1042.53 j	6	Grate
9	CB3-DMH2	0.45	12	Cir	17.000	1041.00	1041.20	1.176	1041.87	1041.48	n/a	1041.48	5	Grate
10	CB4-DMH3	0.96	12	Cir	23.000	1041.30	1041.60	1.304	1041.60	1042.01	0.16	1042.01	4	Grate
11	RD-DMH3	0.51	6	Cir	50.000	1041.30	1044.00	5.400	1041.50	1044.36	n/a	1044.36	4	None

Project File: System-1.stm | Number of lines: 11 | Run Date: 8/15/2023

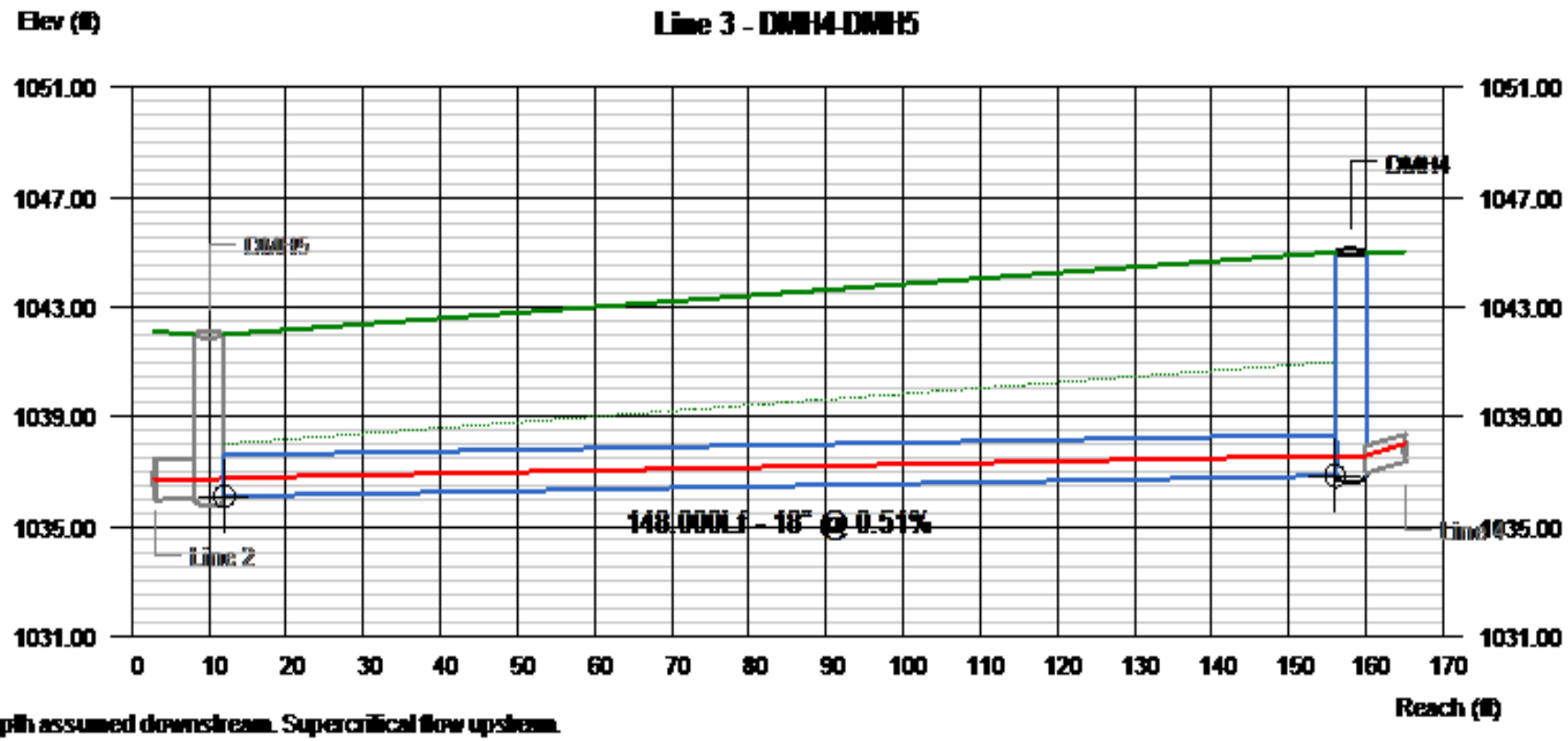
NOTES: Return period = 25 Yrs. ; j - Line contains hyd. jump.



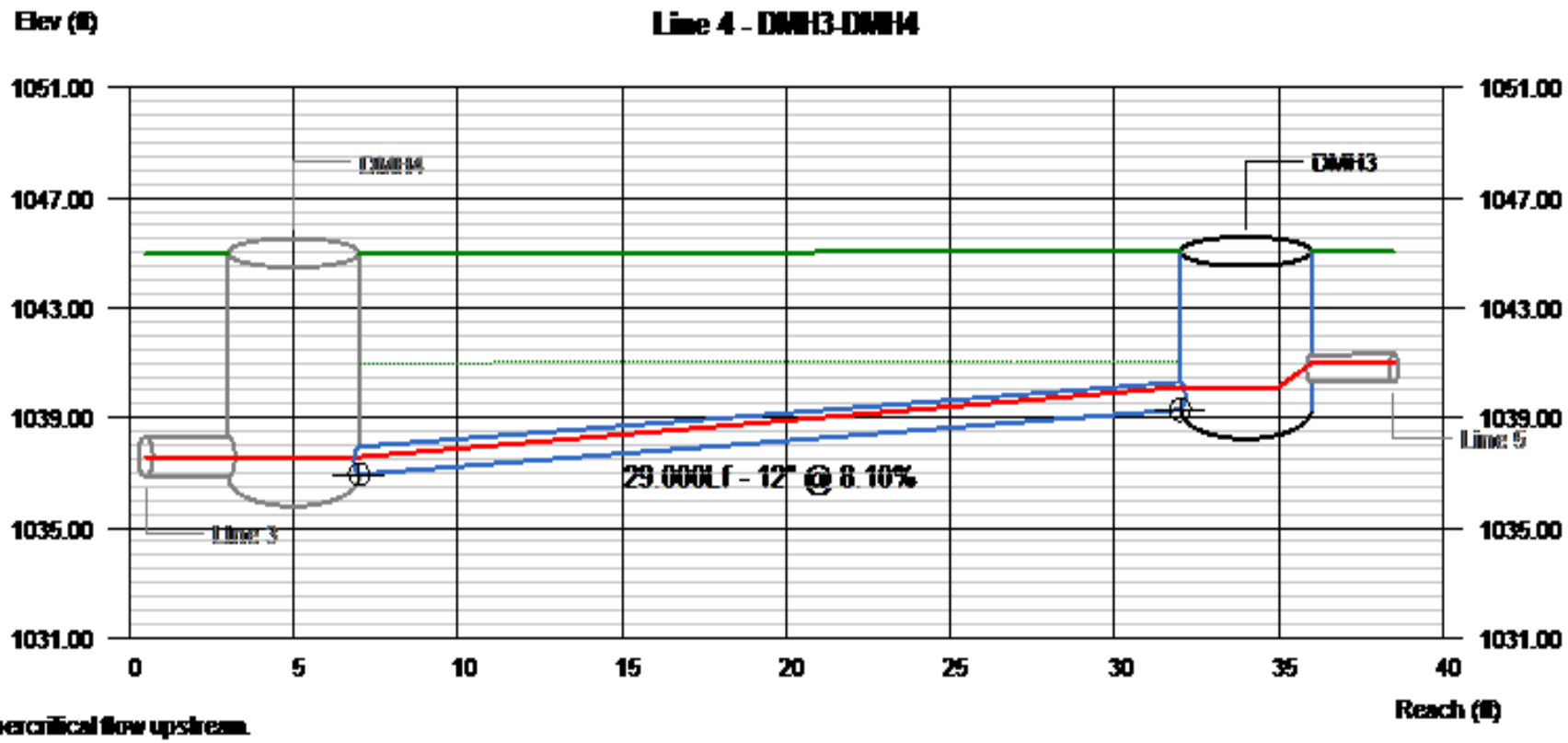
Starting HGL = Crown. Subcritical flow upstream.



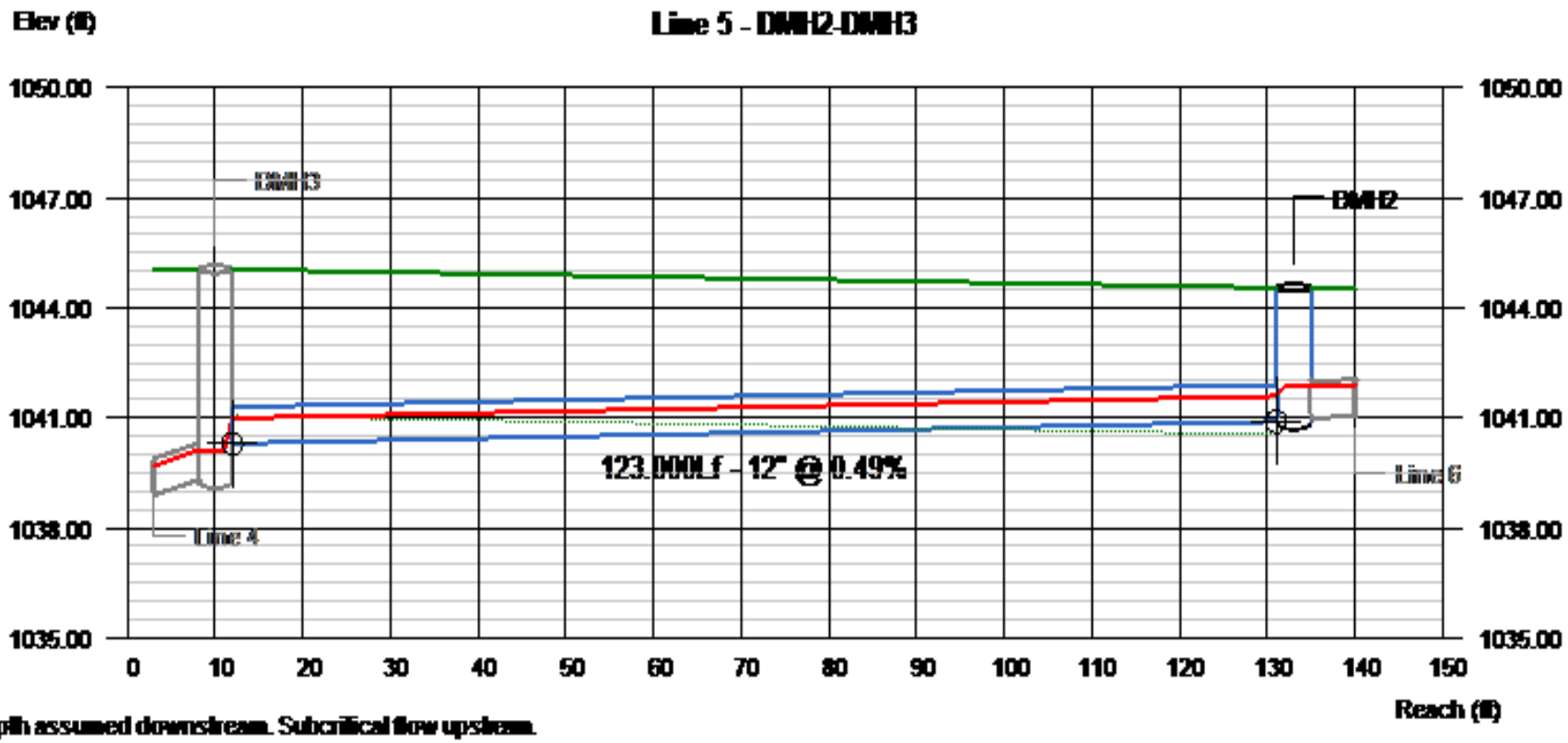
Supercritical flow upstream.



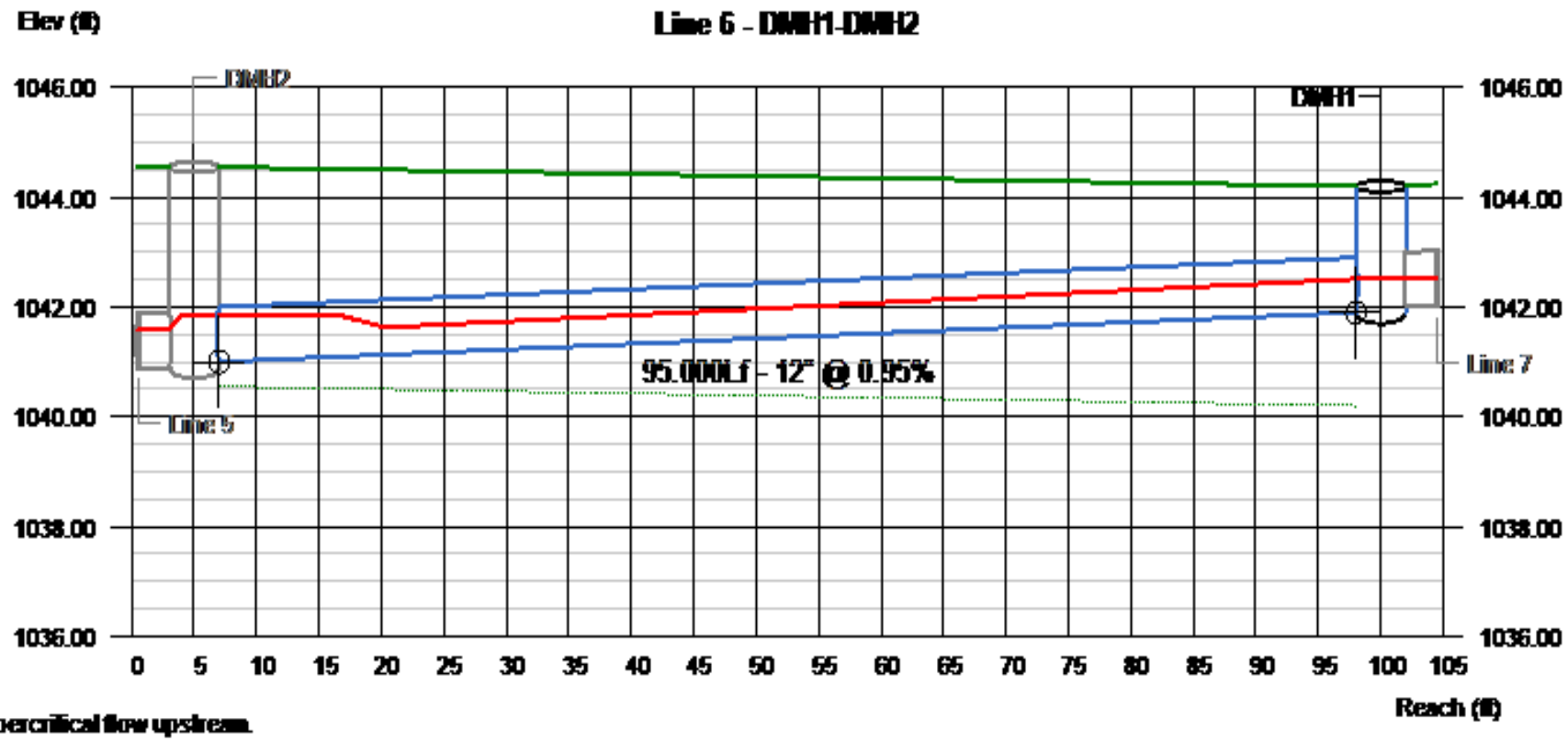
depth assumed downstream. Supercritical flow upstream.



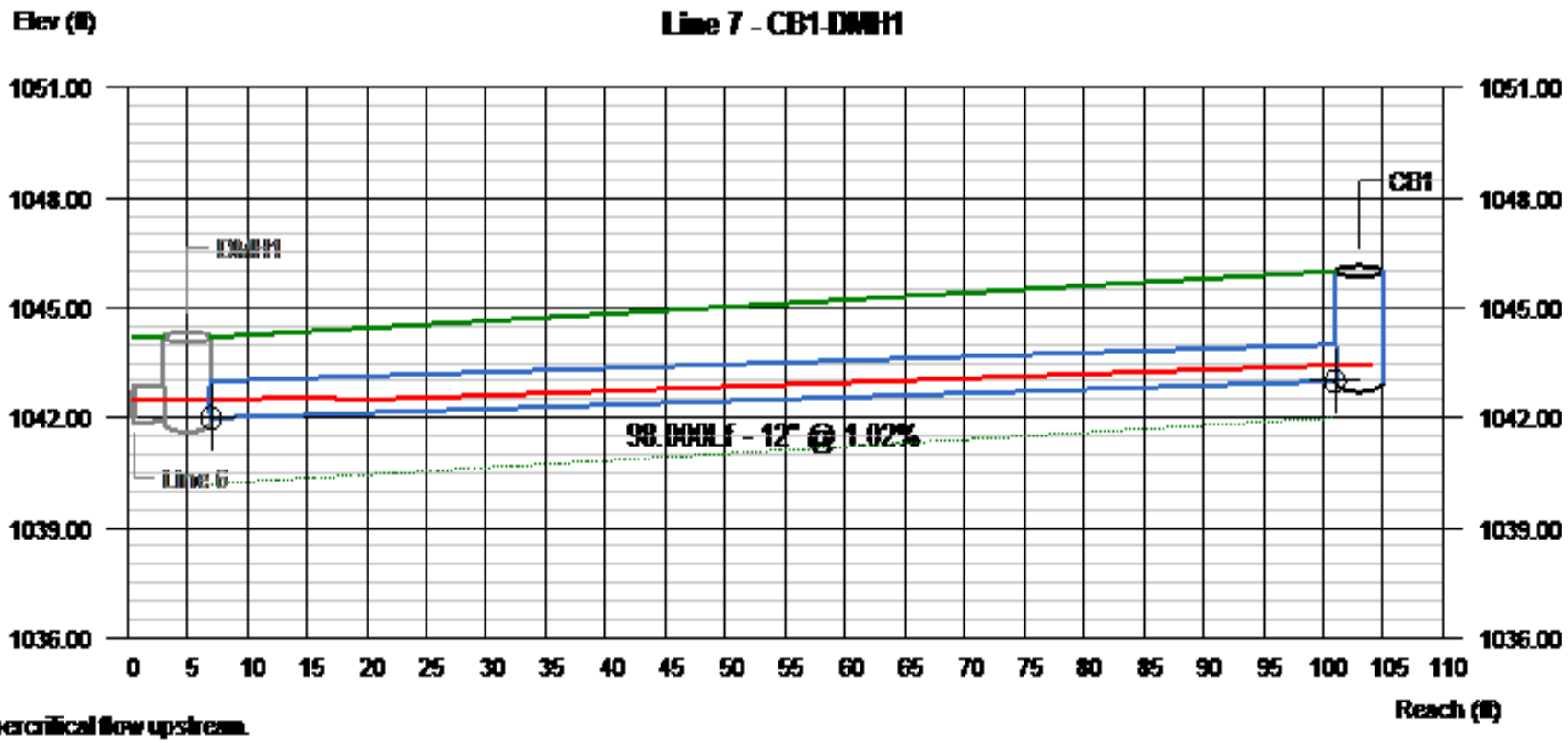
Supercritical flow upstream.



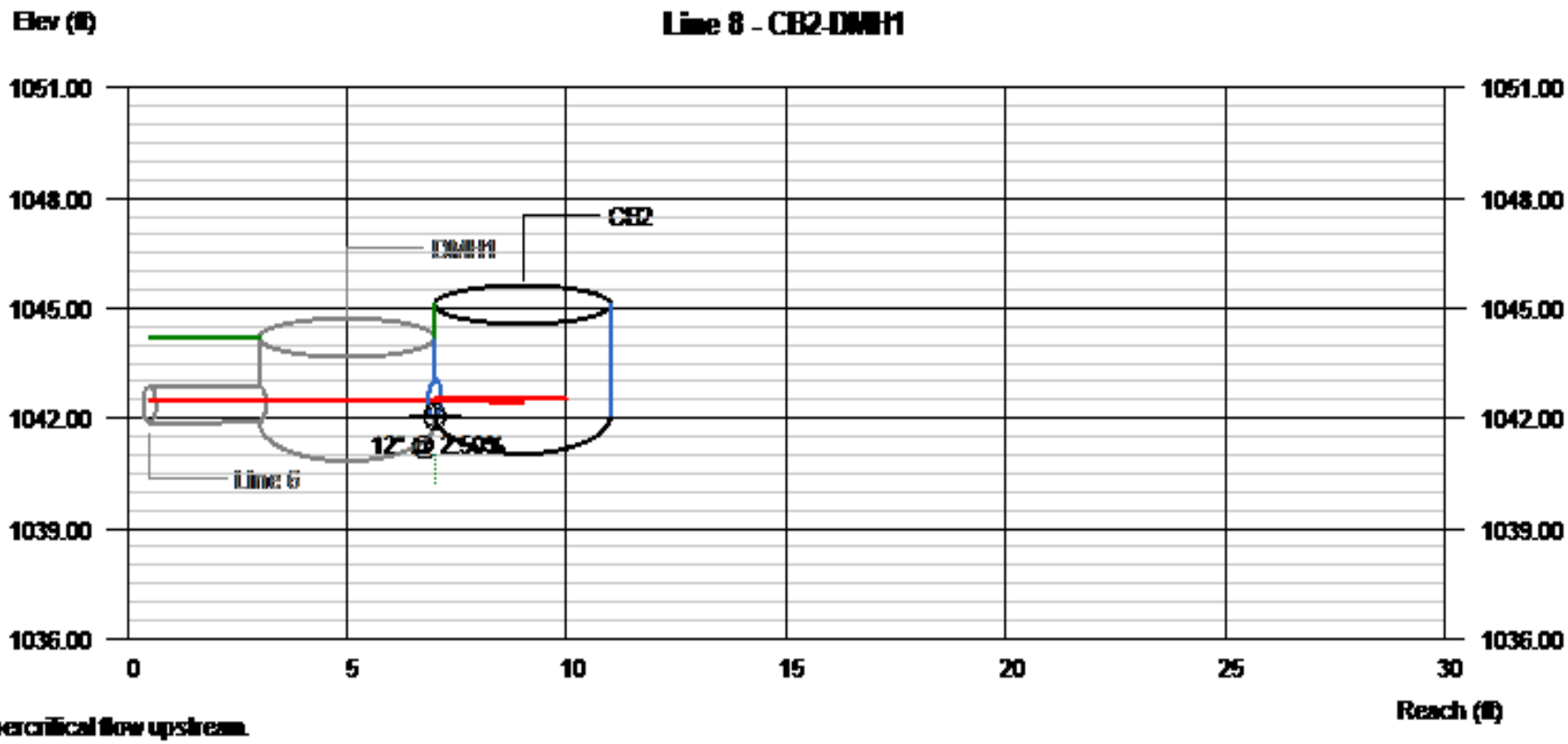
depth assumed downstream. Subcritical flow upstream.

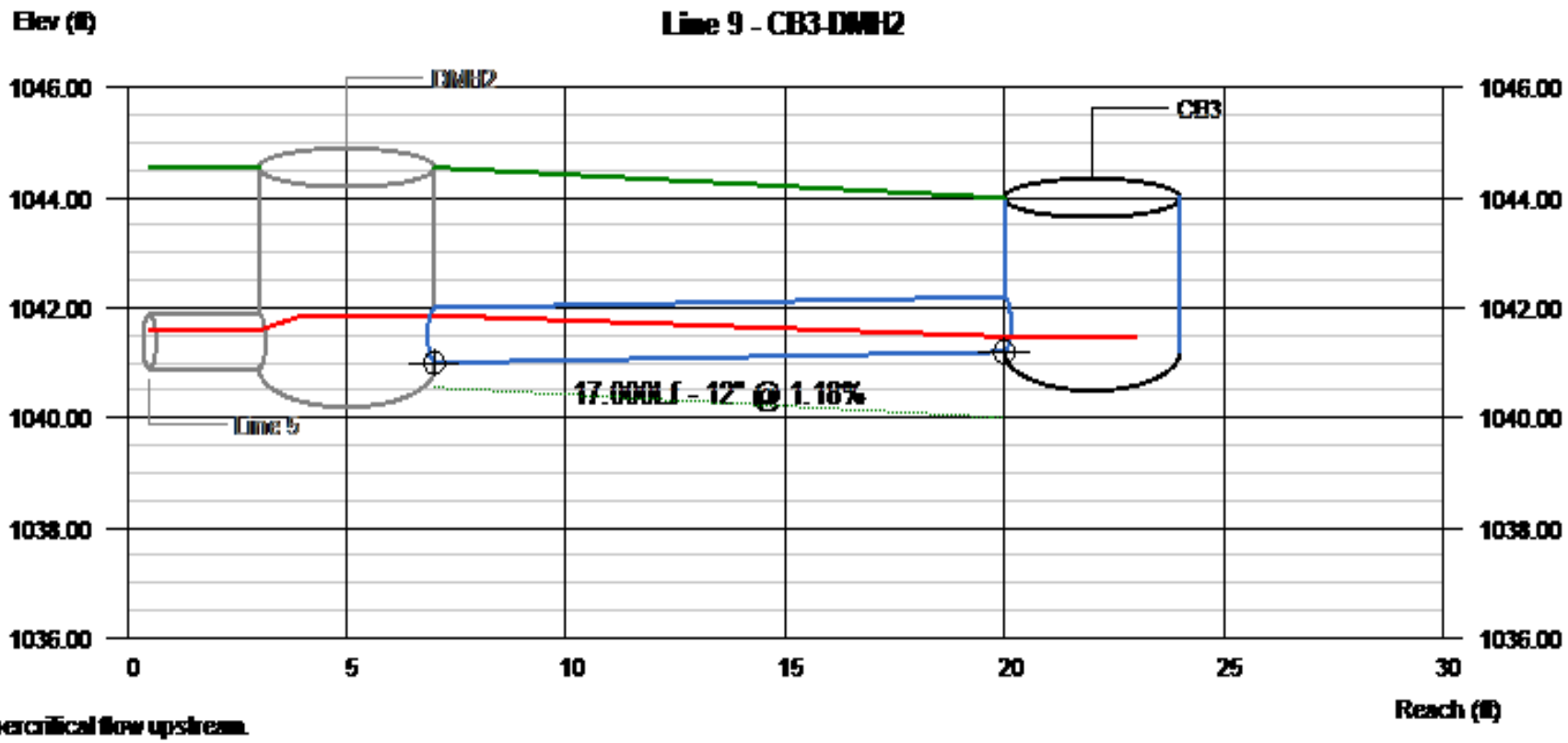


Supercritical flow upstream.

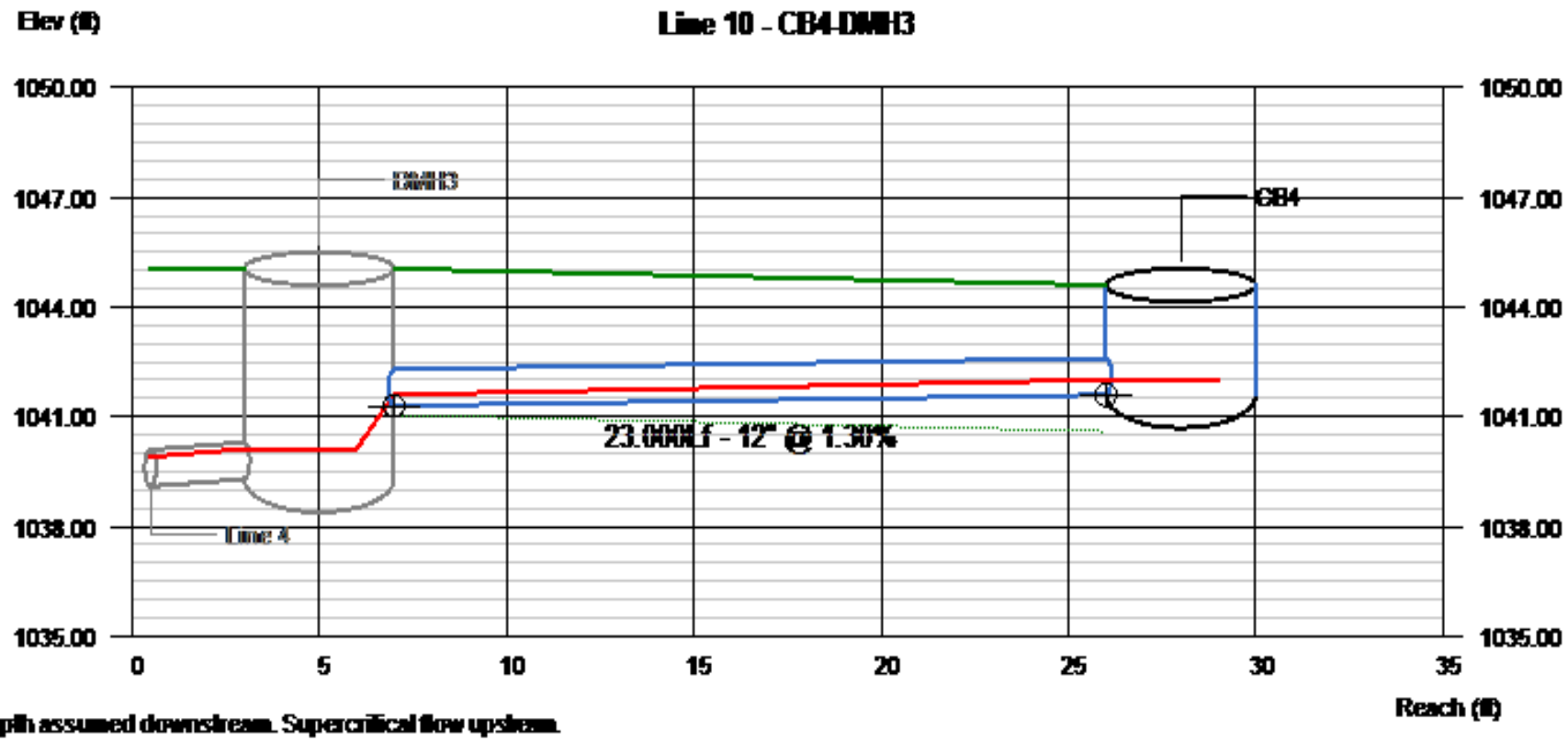


Supercritical flow upstream.

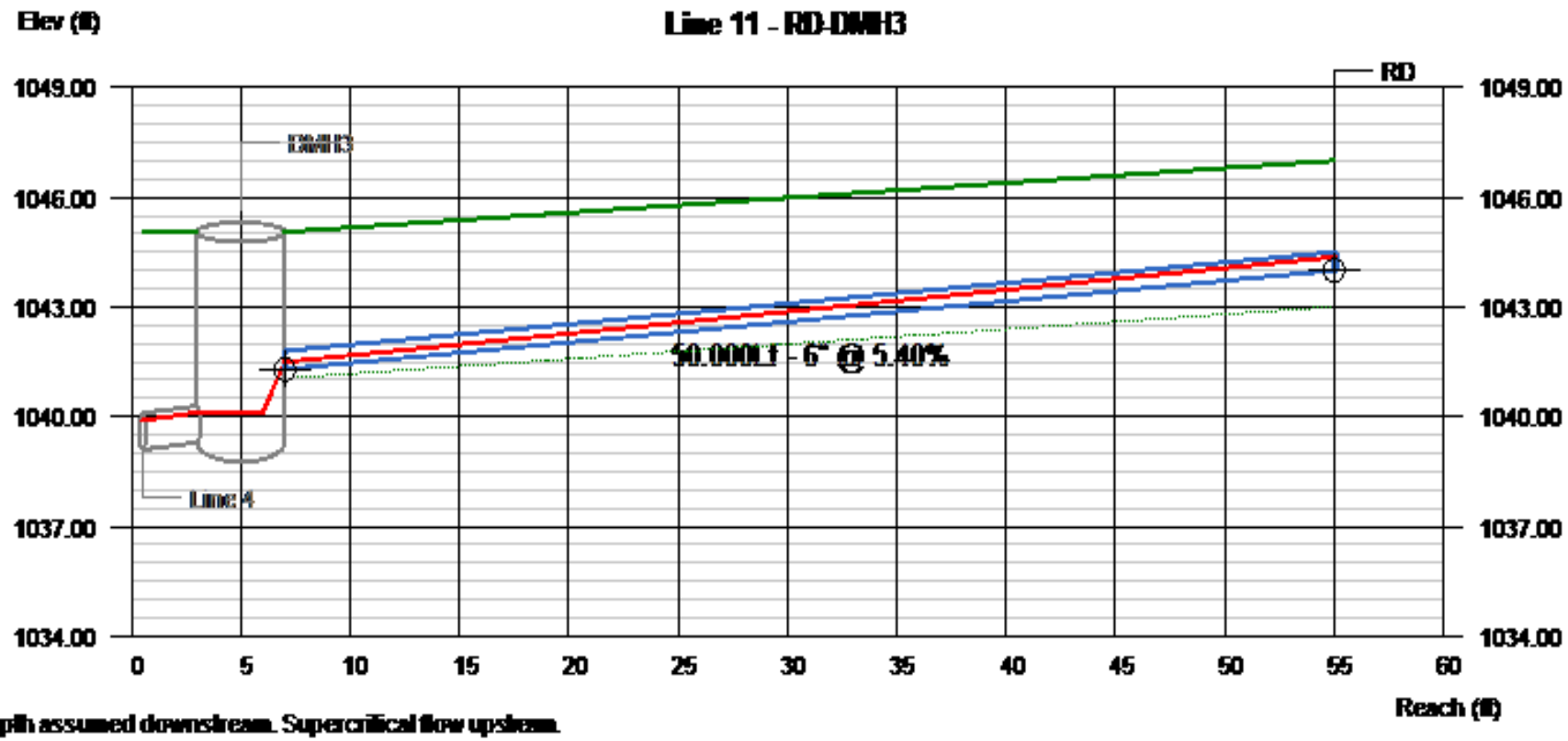

Elev (ft)
Line 8 - CB2-DMH1
1051.00
1048.00
1045.00
1042.00
1039.00
1036.00
0
5
10
15
20
25
30
Reach (ft)
CB2
DMH1
12" @ 2.50%
Line: 6
Supercritical flow upstream.



Supercritical flow upstream.



depth assumed downstream. Supercritical flow upstream.



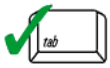
depth assumed downstream. Supercritical flow upstream.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

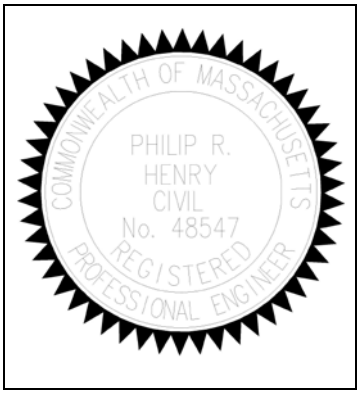
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



08/2023

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

OPERATION AND MAINTENANCE PLAN

FOR A

COMMERCIAL DEVELOPMENT

1621 MAIN STREET
LEICESTER, MA 01524

PREPARED FOR:

HY VENTURES LEICESTER, LLC
313 BOSTON POST ROAD WEST
MARLBOROUGH, MA 01752

PREPARED BY:

CIVIL DESIGN GROUP, LLC
21 HIGH STREET, SUITE 207
NORTH ANDOVER, MA 01845

DATE: AUGUST 2023

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OPERATION AND MAINTENANCE PLAN

1.0 INTRODUCTION

In accordance with the standards set forth by the Massachusetts Department of Environmental Protection (MADEP) Stormwater Management Policy, Civil Design Group, LLC has prepared the following Operations and Maintenance (O&M) Plan for a proposed convenience store and gas station located at the site below.

PROPERTY INFORMATION

PROPERTY ADDRESS	LANDOWNER & STORMWATER MANAGEMENT SYSTEM OWNER
1621 MAIN STREET LEICESTER, MA 01524	Owner: HY VENTURES LEICESTER, LLC
	Contact: TBD
	Phone: TBD
	Email: TBD

The landowner shall be responsible for the long-term operation and maintenance of the site and the stormwater management system and shall be responsible for record keeping of inspections, maintenance and repairs. If the site owner changes, the new site owner shall assume all responsibilities outlined in this O&M plan. The site owner shall hire a qualified professional to conduct scheduled inspections and maintain records in accordance with the inspection schedule outline enclosed within this document.

Site Engineer: Civil Design Group, LLC
Address: 21 High Street, Suite 207, North Andover, MA 01845
Office Phone: 978-794-5400
Contact: Philip R. Henry, P.E.

2.0 LONG TERM POLLUTION PREVENTION PLAN (LTPPP)

In accordance with Standard #4 from the MADEP Stormwater Management Policy, the following LTPPP has been prepared as part of this O&M Plan. The purpose of the LTPPP is to identify potential pollutant sources in stormwater discharges and implement prevention measures prior to affecting downstream resource areas.

Housekeeping:
The site shall be kept in a clean and working order. Substances and materials to be used on site that consistent with the nature of business shall be protected from the elements by storing indoors or in containers with appropriate lids. Proper disposal and care shall be followed when disposing of empty containers.

Solid Waste:
Solid waste materials shall be stored in the dumpsters provided on site. The dumpster enclosure shall be kept closed when not in use and the trash shall not be left outside of the enclosure. The owner shall contract with a waste management company to properly dispose of waste material. The dumpsters shall be emptied on a regular basis.

Pet Waste Management:
Pet waste is not anticipated based on the proposed use of the site.

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Petroleum Products:
Petroleum products shall be stored in sealed containers and clearly labeled. Petroleum storage tanks shall be located a minimum of 100 linear feet from wetland resource areas, drainage ways, inlets and surface waters unless stored within a building. Petroleum storage tanks shall be equipped with a secondary means of containment designed to provide a containment volume that is equal to 110% of the volume of the largest tank unless otherwise required. Drip pans or other form of containment shall be provided for all dispensers. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.

Fertilizers, Herbicides and Pesticides:
Fertilizers, herbicides and pesticides shall be used in the minimum amounts recommended by the manufacturer and applied to limit contact with stormwater. These products shall be stored in containers indoors.

Paints and Cleaning Solvents:
Paints and containers shall be properly stored in their original containers. Disposal of these products and their containers shall be in accordance with the manufacturer's recommendations.

Spill Prevention and Response:
In the event of a spill of a hazardous substance the following response action items shall be followed in order to prevent or minimize discharge to the stormwater management system.

1. Spills shall be immediately addressed.
2. Spills of hazardous substances shall be remediated using the manufacturers' protocol for cleanup.
3. Vehicular and fuel spills shall be remediated in accordance to local and state regulations.
4. The following equipment and materials shall be present on site and shall be clearly identifiable:
    a. Absorbent materials, brooms, dust pans, mops, rags, gloves, goggles, trash containers, etc.
5. Spills that are toxic or hazardous in nature shall be reported to the MA DEP and professional emergency contractor.
6. The owner shall designate individuals who will receive spill prevention and response training. These individuals will each become responsible for a particular phase of prevention and response. The names of these personnel shall be posted in the material storage area and in the management office.

3.0 STORMWATER MANAGEMENT SYSTEM

The components of the stormwater management system shall be inspected, monitored and maintained in accordance with the following to ensure that the on-site stormwater management/BMP facilities for the project function as intended. Routine inspection and proper maintenance of these individual components is essential to providing the long-term enhancement of both the quality and quantity of the runoff from the site.

The proposed stormwater management Best Management Practices (BMP's) have been designed to collect and convey runoff from developed areas in accordance with the Massachusetts DEP's Stormwater Management Policy. Using the rational method to determine peak runoff flows, the onsite drainage system is designed for the 25-year storm event. The drainage system consists of one (1) hydrodynamic separator, four (4) catch basins and associated piping and manholes. The drainage system discharges into a previously approved offsite infiltration basin that will be expanded to accommodate the additional flow. A drainage easement will need to be memorialized to allow for the conveyance, discharge and maintenance of the piping, hydrodynamic separator and basin.

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Street Sweeping
Sweeping shall be performed twice a year, once in the spring and once in the fall, within the parking lot and driveway areas to reduce the amount of sediment and trash entering the catch basins.

Deep Sump Hooded Catch Basins
Stormwater runoff from proposed pavement areas is directed via curbing and site grading to catch basins with deep sumps and hooded outlets and trench drains. These structures are designed to trap and remove sediment and larger particles from the stormwater and improve the performance of subsequent BMP's. The catch basin sumps are a minimum of 4' in depth and a routine inspection and cleaning schedule shall be followed to ensure optimal effectiveness.

Inspection Frequency:	Quarterly
Inspection Tools:	Manhole hook; survey rod; sludge judge
Items to Inspect:	Measure sediment in sump using survey rod; visually check for floating debris or trash; visually check for oil and if more than a sheen is present, use sludge judge to measure thickness of layer; visually ensure that hood is in place; visually ensure that grate is in good condition; visually ensure that outlet pipe is unobstructed
Maintenance Threshold(s):	Annually or ≥24" sediment in sump (whichever comes first); discernible layer of oil/hydrocarbons on surface; floating trash
Maintenance Equipment:	Vactor or clamshell for sediment removal; vactor and/or oil sorbent pads for oil/hydrocarbon removal; net for floating debris or trash removal

Hydrodynamic Separator
Hydrodynamic Separators are designed to remove heavy particles, floating debris and hydrocarbons from stormwater. Stormwater enters the system where floatables and oils are separated prior to the clarified stormwater runoff discharging to an outlet pipe. See the attached product description sheets for additional information, including maintenance recommendations.

- Inspection Frequency: Quarterly
- Cleaning Threshold(s): Per manufacturer's recommendations
- Equipment: Vactor

4.0 SNOW MANAGEMENT AND DEICING CONTROL

The Owner shall contract with a company to properly clear and remove snow. The contractor shall be responsible for maintaining all roads, driveways, parking lots, sidewalks and pedestrian access onsite as well as along the right-of-way frontage. Snow shall be piled in the designated areas snow storage areas to the extent practicable. Snow shall be removed from the site if the capacity of the designated areas is reached, and disposed of in accordance with applicable regulations and requirements.

Deicing chemicals shall be kept indoors in a safe location and shall be clearly labeled. Deicing solutions such as calcium chloride, rock salt and/or sand may be used unless otherwise restricted by the municipality. Deicing methods shall be used in conjunction with snow removal to maintain safe pedestrian and vehicular access.

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5.0 ILLICIT DISCHARGE STATEMENT

The stormwater management system is *not* intended to convey any illicit discharges and or pollutants and as such, control measures that are identified within this report shall be strictly adhered to in order to minimize the risk of contamination. Any unknown existing illicit discharges that are discovered as part of the redevelopment of the subject site shall be eliminated in accordance with local, state and federal regulations.

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ILLICIT DISCHARGE STATEMENT

FOR A

COMMERCIAL DEVELOPMENT

1621 MAIN STREET
LEICESTER, MASSACHUSETTS

DATE: AUGUST 2023

Illicit discharges to the stormwater management system are discharges not entirely comprised of stormwater. There are no known illicit discharges currently at the site nor are any illicit discharges proposed as part of the project. The stormwater management system is *not* intended to convey any illicit discharges and or pollutants. Any unknown existing illicit discharges that are discovered as part of the development of the subject site shall be eliminated in accordance with local, state and federal regulations.

Signature

Hussein Yatim/Principal

Name/Title

8/16/2023

Date

APPENDIX-A

OPERATION AND MAINTENANCE REPORT FORM

STORMWATER DIVISION
OF CIVIL DESIGN GROUP, LLC

21 High Street, Suite 207
North Andover, MA 01845
Tel 978.794.5400
www.cdgengineering.com

QUARTERLY STORMWATER INSPECTION REPORT

Site:	Commercial Development	**Date:**	
Address:	1621 Main Street, Leicester, MA	**Time:**	
Inspector:		**Weather:**	

CATCH BASIN, YARD DRAIN, TRENCH DRAINS (QUARTERLY)

Unit #	Sediment (inches)	Oil (inches)	Hood/ Pipes	Grate	Last Cleaned	Attention Recommended
CB-1						
CB-2						
CB-3						
CB-4						

PROPRIETARY SEPARATORS (QUARTERLY)

Unit #	Sediment (inches)	Oil (inches)	Trash	Cover	Last Cleaned	Attention Recommended
DMH-6 (HS4)						

Unit #	Sediment (inches)	Oil (inches)	Trash	Cover	Last Cleaned	Attention Recommended

Hydroworks® HydroStorm

Operations & Maintenance Manual

Version 1.0

Please call Hydroworks at 888-290-7900 or email us at support@hydroworks.com if you have any questions regarding the Inspection Checklist. Please fax a copy of the completed checklist to Hydroworks at 888-783-7271 for our records.

Introduction

The HydroStorm is a state of the art hydrodynamic separator. Hydrodynamic separators remove solids, debris and lighter than water (oil, trash, floating debris) pollutants from stormwater. Hydrodynamic separators and other water quality measures are mandated by regulatory agencies (Town/City, State, Federal Government) to protect storm water quality from pollution generated by urban development (traffic, people) as part of new development permitting requirements.

As storm water treatment structures fill up with pollutants they become less and less effective in removing new pollution. Therefore, it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The HydroStorm is no different in this regard and this manual has been assembled to provide the owner/operator with the necessary information to inspect and coordinate maintenance of their HydroStorm.

Hydroworks® HydroStorm Operation

The Hydroworks HydroStorm (HS) separator is a unique hydrodynamic by-pass separator. It incorporates a protected submerged pretreatment zone to collect larger solids, a treatment tank to remove finer solids, and a dual set of weirs to create a high flow bypass. High flows are conveyed directly to the outlet and do not enter the treatment area, however, the submerged pretreatment area still allows removal of coarse solids during high flows.

Under normal or low flows, water enters an inlet area with a horizontal grate. The area underneath the grate is submerged with openings to the main treatment area of the separator. Coarse solids fall through the grate and are either trapped in the pretreatment area or conveyed into the main treatment area depending on the flow rate. Fines are transported into the main treatment area. Openings and weirs in the pretreatment area allow entry of water and solids into the main treatment area and cause water to rotate in the main treatment area creating a vortex motion. Water in the main treatment area is forced to rise along the walls of the separator to discharge from the treatment area to the downstream pipe.

The vortex motion forces solids and floatables to the middle of the inner chamber. Floatables are trapped since the inlet to the treatment area is submerged. The design maximizes the retention of settled solids since solids are forced to the center of the inner chamber by the vortex motion of water while water must flow up the walls of the separator to discharge into the downstream pipe.

A set of high flow weirs near the outlet pipe create a high flow bypass over both the pretreatment area and main treatment chamber. The rate of flow into the treatment area is regulated by the number and size of openings into the treatment chamber and the height of by-pass weirs. High flows flow over the weirs directly to the outlet pipe preventing the scour and resuspension of any fines collected in the treatment chamber.

A central access tube is located in the structure to provide access for cleaning. The arrangement of the inlet area and bypass weirs near the outlet pipe facilitate the use of multiple inlet pipes.

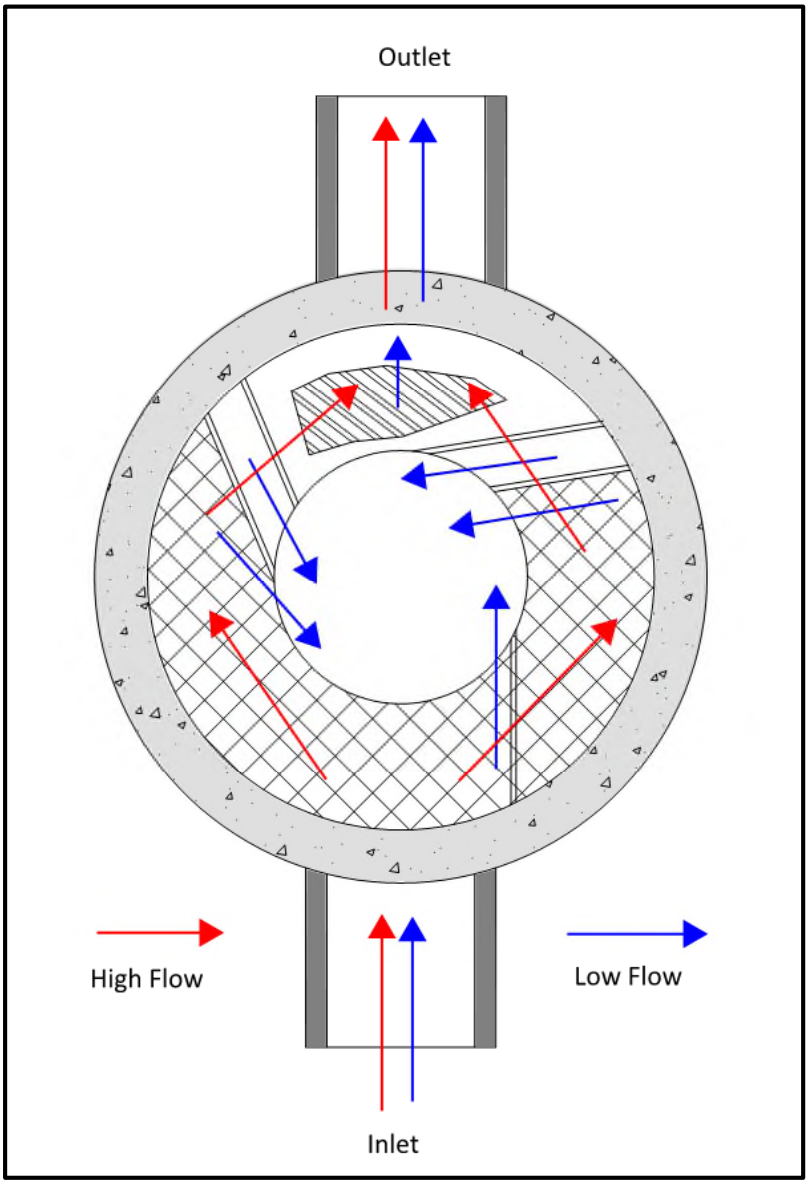


Figure 1. Hydroworks HydroStorm Operation – Plan View

Figure 2 is a profile view of the HydroStorm separator showing the flow patterns for low and high flows.

Hydroworks

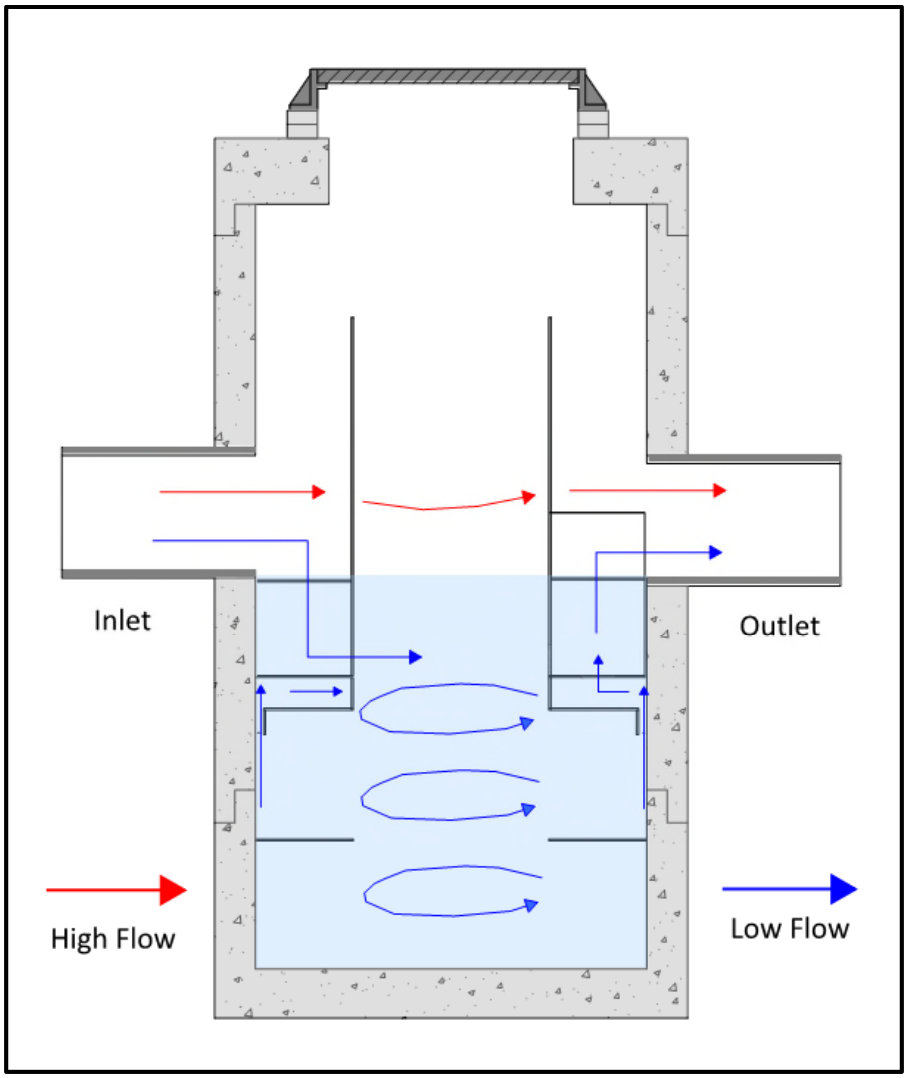


Figure 2. Hydroworks HydroStorm Operation – Profile View

The HS 4i is an inlet version of the HS 4 separator. There is a catch-basin grate on top of the HS 4i. A funnel sits sits underneath the grate on the frame and directs the water to the inlet side of the separator to ensure all lows flows are properly treated. The whole funnel is removed for inspection and cleaning.

Hydroworks

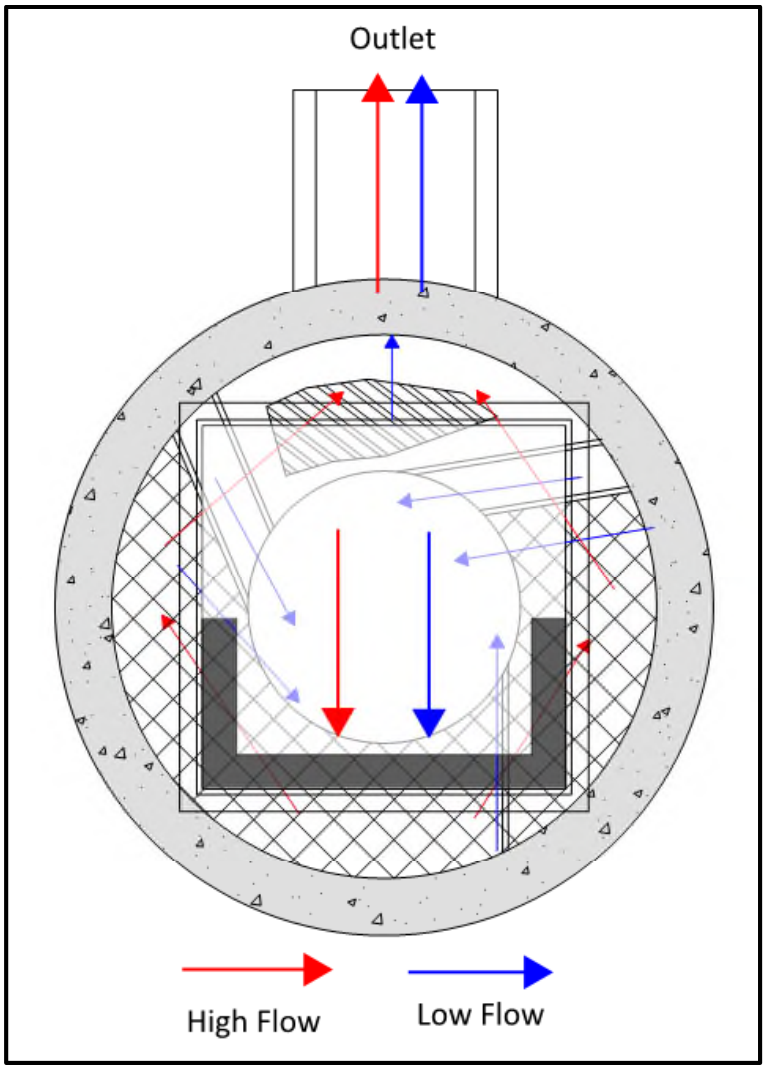


Figure 3. Hydroworks HS 4i Funnel

Inspection

Procedure

Floatables

A visual inspection can be conducted for floatables by removing the covers and looking down into the center access tube of the separator. Separators with an inlet grate (HS 4i or custom separator) will have a plastic funnel located under the grate that must be removed from the frame prior to inspection or maintenance. If you are missing a funnel please contact Hydroworks at the numbers provided at the end of this document.

Hydroworks

TSS/Sediment

Inspection for TSS build-up can be conducted using a Sludge Judge®, Core Pro®, AccuSludge® or equivalent sampling device that allows the measurement of the depth of TSS/sediment in the unit. These devices typically have a ball valve at the bottom of the tube that allows water and TSS to flow into the tube when lowering the tube into the unit. Once the unit touches the bottom of the device, it is quickly pulled upward such that the water and TSS in the tube forces the ball valve closed allowing the user to see a full core of water/TSS in the unit. The unit should be inspected for TSS through each of the access covers. Several readings (2 or 3) should be made at each access cover to ensure that an accurate TSS depth measurement is recorded.

Frequency

Construction Period

The HydroStorm separator should be inspected every four weeks and after every large storm (over 0.5" (12.5 mm) of rain) during the construction period.

Post-Construction Period

The Hydroworks HydroStorm separator should be inspected during the first year of operation for normal stabilized sites (grassed or paved areas). If the unit is subject to oil spills or runoff from unstabilized (storage piles, exposed soils) areas the HydroStorm separator should be inspected more frequently (4 times per year). The initial annual inspection will indicate the required future frequency of inspection and maintenance if the unit was maintained after the construction period.

Reporting

Reports should be prepared as part of each inspection and include the following information:

1. Date of inspection
2. GPS coordinates of Hydroworks unit
3. Time since last rainfall
4. Date of last inspection
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, blockages)
8. Presence of oil sheen or depth of oil layer
9. Estimate of depth/volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/or maintenance for the unit
12. Estimation of time before maintenance is required if not required at time of inspection

A sample inspection checklist is provided at the end of this manual.

Maintenance

Procedure

The Hydroworks HydroStorm unit is typically maintained using a vacuum truck. There are numerous companies that can maintain the HydroStorm separator. Maintenance with a vacuum truck involves removing all of the water and sediment together. The water is then separated from the sediment on the truck or at the disposal facility.

A central access opening (24" or greater) is provided to the gain access to the lower treatment tank of the unit. This is the primary location to maintain by vacuum truck. The pretreatment area can also be vacuumed and/or flushed into the lower treatment tank of the separator for cleaning via the central access once the water level is lowered below the pretreatment floor.

In instances where a vacuum truck is not available other maintenance methods (i.e. clamshell bucket) can be used, but they will be less effective. If a clamshell bucket is used the water must be decanted prior to cleaning since the sediment is under water and typically fine in nature. Disposal of the water will depend on local requirements. Disposal options for the decanted water may include:

1. Discharge into a nearby sanitary sewer manhole
2. Discharge into a nearby LID practice (grassed swale, bioretention)
3. Discharge through a filter bag into a downstream storm drain connection

The local municipality should be consulted for the allowable disposal options for both water and sediments prior to any maintenance operation. Once the water is decanted the sediment can be removed with the clamshell bucket.

Disposal of the contents of the separator depend on local requirements. Maintenance of a Hydroworks HydroStorm unit will typically take 1 to 2 hours based on a vacuum truck and longer for other cleaning methods (i.e. clamshell bucket).

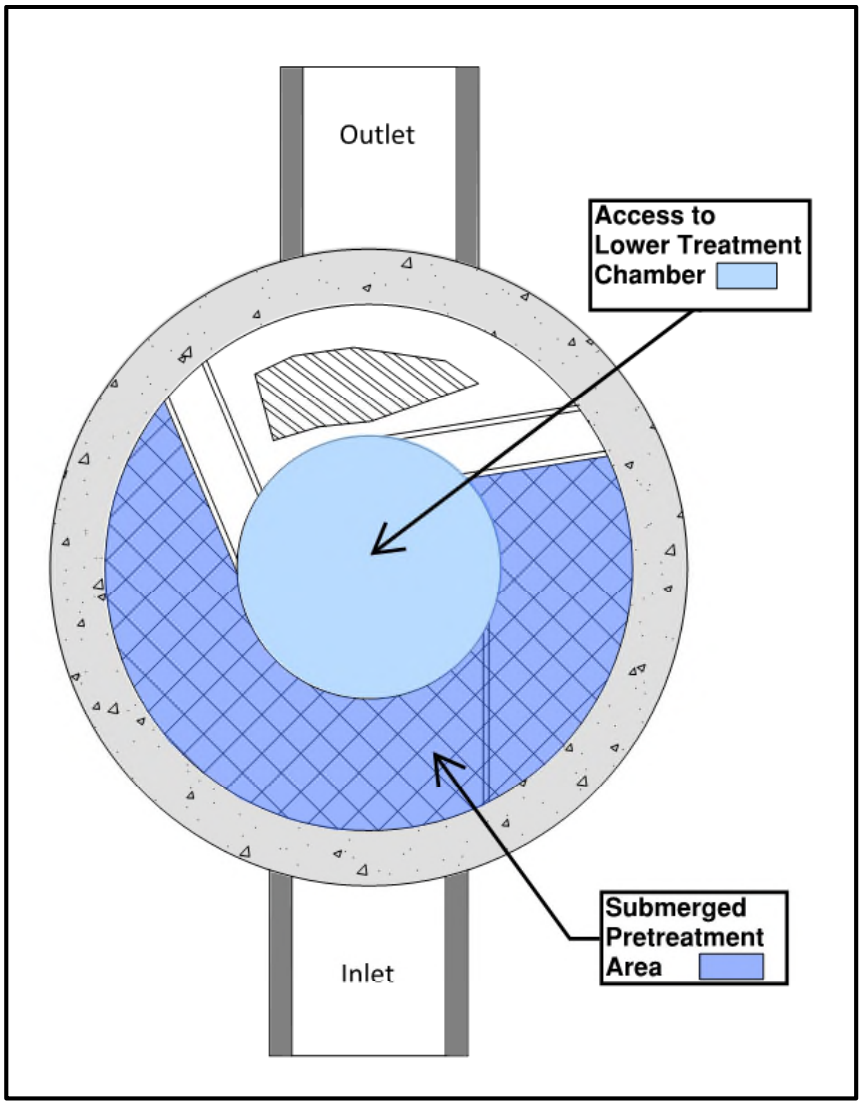


Figure 3. Maintenance Access

Frequency

Construction Period

A HydroStorm separator can fill with construction sediment quickly during the construction period. The HydroStorm must be maintained during the construction period when the depth of TSS/sediment reaches 24" (600 mm). It must also be maintained during the construction period if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the area of the separator

The HydroStorm separator should be maintained at the end of the construction period, prior to operation for the post-construction period.

Hydroworks

Post-Construction Period

The HydroStorm was independently tested by Alden Research Laboratory in 2017. A HydroStorm HS 4 was tested for scour with a 50% sediment depth of 0.5 ft. Therefore, maintenance for sediment accumulation is required if the depth of sediment is 1 ft or greater in separators with standard water (sump) depths (Table 1).

There will be designs with increased sediment storage based on specifications or site-specific criteria. A measurement of the total water depth in the separator through the central access tube should be taken and compared to water depth given in Table 1. The standard water depth from Table 1 should be subtracted from the measured water depth and the resulting extra depth should be added to the 1 ft to determine the site-specific sediment maintenance depth for that separator.

For example, if the measured water depth in the HS-7 is 7 feet, then the sediment maintenance depth for that HS-7 is 2 ft (= 1 + 7 – 6) and the separator does not need to be cleaned for sediment accumulation until the measure sediment depth is 2 ft.

The HydroStorm separator must also be maintained if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the water surface of the separator.

Table 1 Standard Dimensions for Hydroworks HydroStorm Models

Model	Diameter (ft)	Total Water Depth (ft)	Sediment Maintenance Depth for Table 1 Total Water Depth(ft)
HS-3	3	3	1
HS-4	4	4	1
HS-5	5	4	1
HS-6	6	4	1
HS-7	7	6	1
HS-8	8	7	1
HS-9	9	7.5	1
HS-10	10	8	1
HS-11	11	9	1
HS-12	12	9.5	1

HYDROSTORM INSPECTION SHEET

Date _____
Date of Last Inspection _____

Site _____
City _____
State _____
Owner _____

GPS Coordinates _____

Date of last rainfall _____

Site Characteristics	**Yes**	**No**
Soil erosion evident	☐	☐
Exposed material storage on site	☐	☐
Large exposure to leaf litter (lots of trees)	☐	☐
High traffic (vehicle) area	☐	☐

HydroStorm	**Yes**	**No**
Obstructions in the inlet or outlet	☐ *	☐
Missing internal components	☐ **	☐
Improperly installed inlet or outlet pipes	☐ ***	☐
Internal component damage (cracked, broken, loose pieces)	☐ **	☐
Floating debris in the separator (oil, leaves, trash)	☐	☐
Large debris visible in the separator	☐ *	☐
Concrete cracks/deficiencies	☐ ***	☐
Exposed rebar	☐ **	☐
Water seepage (water level not at outlet pipe invert)	☐ ***	☐

Water level depth below outlet pipe invert _____“

Routine Measurements

Floating debris depth	**< 0.5” (13mm)**	☐	**>0.5” 13mm)**	☐ *
Floating debris coverage	**< 50% of surface area**	☐	**> 50% surface area**	☐ *
Sludge depth	**< 12” (300mm)**	☐	**> 12” (300mm)**	☐ ****

* Maintenance required
** Repairs required
*** Further investigation is required

Hydroworks

Other Comments:

Hydroworks

Hydroworks® HydroStorm

One Year Limited Warranty

Hydroworks, LLC warrants, to the purchaser and subsequent owner(s) during the warranty period subject to the terms and conditions hereof, the Hydroworks HydroStorm to be free from defects in material and workmanship under normal use and service, when properly installed, used, inspected and maintained in accordance with Hydroworks written instructions, for the period of the warranty. The standard warranty period is 1 year.

The warranty period begins once the separator has been manufactured and is available for delivery. Any components determined to be defective, either by failure or by inspection, in material and workmanship will be repaired, replaced or remanufactured at Hydroworks' option provided, however, that by doing so Hydroworks, LLC will not be obligated to replace an entire insert or concrete section, or the complete unit. This warranty does not cover shipping charges, damages, labor, any costs incurred to obtain access to the unit, any costs to repair/replace any surface treatment/cover after repair/replacement, or other charges that may occur due to product failure, repair or replacement.

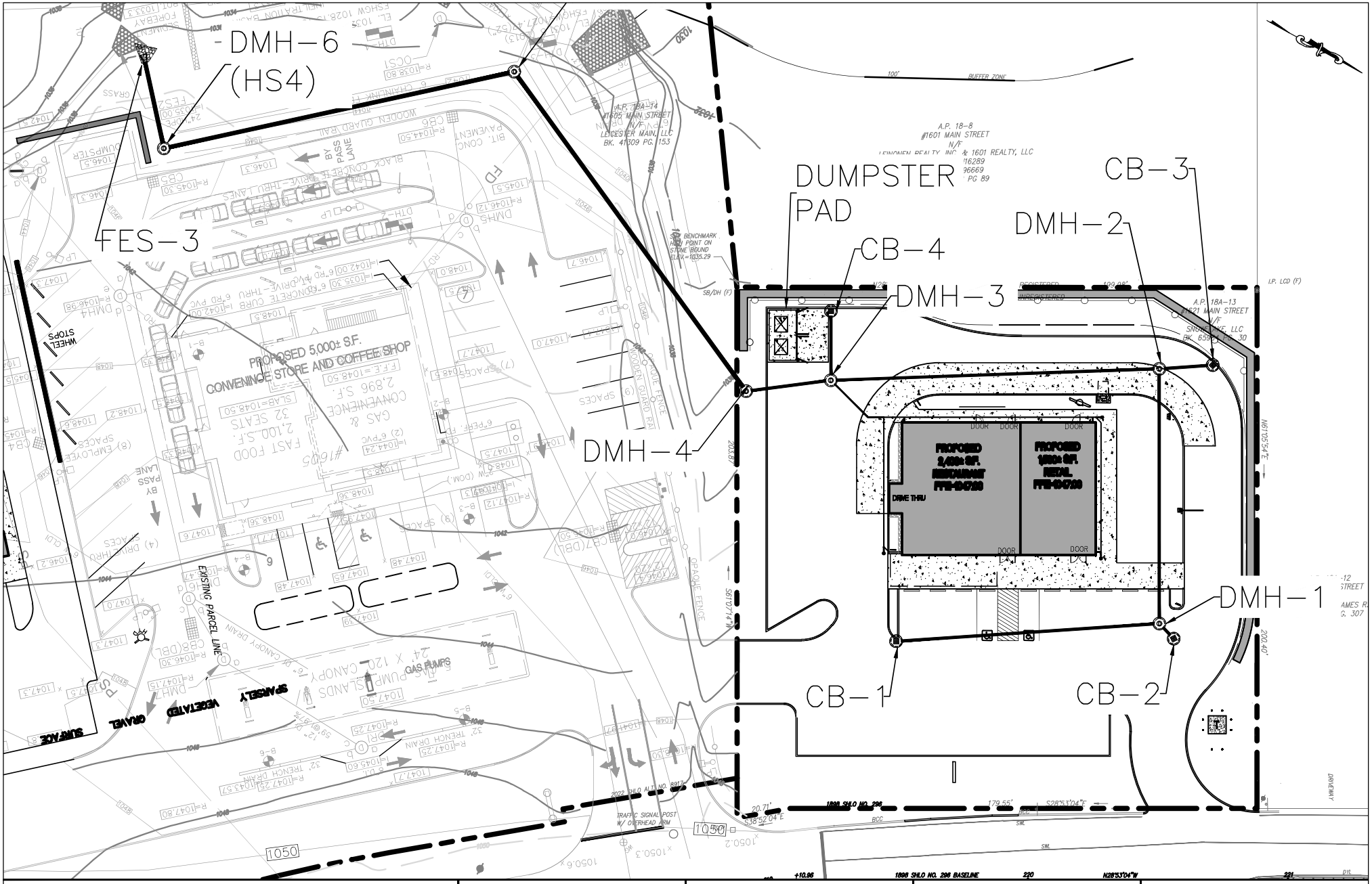
This warranty does not apply to any material that has been disassembled or modified without prior approval of Hydroworks, LLC, that has been subjected to misuse, misapplication, neglect, alteration, accident or act of God, or that has not been installed, inspected, operated or maintained in accordance with Hydroworks, LLC instructions and is in lieu of all other warranties expressed or implied. Hydroworks, LLC does not authorize any representative or other person to expand or otherwise modify this limited warranty.

The owner shall provide Hydroworks, LLC with written notice of any alleged defect in material or workmanship including a detailed description of the alleged defect upon discovery of the defect. Hydroworks, LLC should be contacted at 136 Central Ave., Clark, NJ 07066 or any other address as supplied by Hydroworks, LLC. (888-290-7900).

This limited warranty is exclusive. There are no other warranties, express or implied, or merchantability or fitness for a particular purpose and none shall be created whether under the uniform commercial code, custom or usage in the industry or the course of dealings between the parties. Hydroworks, LLC will replace any goods that are defective under this warranty as the sole and exclusive remedy for breach of this warranty.

Subject to the foregoing, all conditions, warranties, terms, undertakings or liabilities (including liability as to negligence), expressed or implied, and howsoever arising, as to the condition, suitability, fitness, safety, or title to the Hydroworks HydroStorm are hereby negated and excluded and Hydroworks, LLC gives and makes no such representation, warranty or undertaking except as expressly set forth herein. Under no circumstances shall Hydroworks, LLC be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the HydroStorm, or the cost of other goods or services related to the purchase and installation of the HydroStorm. For this Limited Warranty to apply, the HydroStorm must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Hydroworks' written installation instructions.

Hydroworks, LLC expressly disclaims liability for special, consequential or incidental damages (even if it has been advised of the possibility of the same) or breach of expressed or implied warranty. Hydroworks, LLC shall not be liable for penalties or liquidated damages, including loss of production and profits; labor and materials; overhead costs; or other loss or expense incurred by the purchaser or any third party. Specifically excluded from limited warranty coverage are damages to the HydroStorm arising from ordinary wear and tear; alteration, accident, misuse, abuse or neglect; improper maintenance, failure of the product due to improper installation of the concrete sections or improper sizing; or any other event not caused by Hydroworks, LLC. This limited warranty represents Hydroworks' sole liability to the purchaser for claims related to the HydroStorm, whether the claim is based upon contract, tort, or other legal basis.



50 0 25 50 100

GRAPHIC SCALE IN FEET

CLIENT:

HY VENTURES LEICESTER, LLC

313 BOSTON POST ROAD WEST
MARLBOROUGH, MA 01752

SITE:

PROPOSED COMMERCIAL DEVELOPMENT

1621 MAIN STREET
LECIESTER, MA

CIVIL DESIGN GROUP, LLC

21 HIGH STREET SUITE 207
NORTH ANDOVER, MA 01845
www.cdgengineering.com
p: 978-794-5400 f: 978-965-3971

FIGURE 1: BMP LOCATION PLAN

08/2023

Bacon Wilson
ATTORNEYS AT LAW

AMHERST
HADLEY
NORTHAMPTON
SPRINGFIELD
WESTFIELD

September 14, 2023

Hand Delivered

Planning Department
c/o Joshua Campbell, Planning Board Chair
Town of Leicester
3 Washburn Square
Leicester, MA 01524

RE: Stormwater Modification
1603-1605 & 1621 Main Street, Leicester, MA

Dear Mr. Campbell:

Please accept this letter on behalf of the owner of the property, TK8 Leicester, LLC as a request for modification to the approved stormwater infiltration basin at 1603-1605 Main Street pursuant to Condition 5 of the "Pre-Construction/Use" Section of the Special Permit/Site Plan Review and Stormwater Permit Decision issued by the Town of Leicester Planning Board and Recorded in the Worcester County Registry of Deeds at Book 67852, Page 295.

The condition requires that requests for substantial modifications to the approved proposal, plans or supporting documents be made to the Planning Board. The landowner seeks to allow an adjacent property (1621 Main Street) to utilize the stormwater basin on 1603-1605 Main Street for redevelopment of the 1621 Main Street site.

The 1621 Main Street redevelopment is subject to its own Special Permit/Site Plan Review and Stormwater Permit process. Any review of the shared stormwater infiltration system—and therefore the change to the 1603-1605 approval—can be accomplished through the 1621 Main Street process and a separate Modification or hearing on such a change to the 1603-1605 site would be unnecessary.

The requested modifications are more fully explained in the attached memorandum from Phillip E. Henry, P.E. of Civil Design Group, LLC.

Very truly yours,

TK8 Leicester, LLC

Thomas R. Reidy, Esq.
Duly Authorized

Thomas R. Reidy
Attorney
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6 South East Street
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Tel 413.256.6701
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CIVIL DESIGN GROUP, LLC
ENGINEERING. LAND USE. PLANNING. PERMITTING.

21 High Street, Suite 207
North Andover, MA 01845
Tel 978.794.5400
www.cdgengineering.com

Memorandum

To: Leicester Planning Board

From: Philip Henry, P.E.

Date: August 22, 2023

Re: Stormwater Modifications
1603, 1605 & 1621 Main Street
Leicester, MA 01524

The above ground infiltration basin that was part of the Site Development Plan for 1603 & 1605 Main Street, Leicester, MA and approved as part of the November, 30, 2021 Special Permit/Site Plan Review & Stormwater Permit Decision is proposed to be modified. The proposed development located at 1621 Main Street abuts the 1603/1605 project to west and plans to convey stormwater to the previously approved infiltration basin via catch basins, drain manholes and associated piping. The basin's volumetric capacity is proposed to be expanded to account for the increase in stormwater runoff, however, the peak flow rate out of the basin as well as the high water level has been either maintained or slightly decreased as compared to the approved stormwater characteristics. The outlet control structure, infiltration rate and the overflow spillway also remained unchanged from the approved development, therefore, the expanded basin footprint and capacity is intended to function in similar fashion to the approved design.