HUGHES ENVIRONMENTAL CONSULTING

44 MERRIMAC STREET, NEWBURYPORT, MA 01950 PO BOX 392, CONCORD, MA 01742
PHONE 978.465.5400 ● FAX 978.465.8100 PHONE/FAX 978.369.2100
EMAIL THUGHES@HUGHESENVR.COM

July 27, 2022

Nicholas Moreno Executive Director
Boston Conservation Commission
City of Boston Environment Department
Boston City Hall, Room 709
1 City Hall Square
Boston, MA 02201

Re: 581 American Legion Highway, DEP file number 006-1882

Dear Mr. Moreno:

The attached materials and this letter represent a response to issues raised at our last hearing for the project at 581 American Legion Highway. The following is a summary of issues raised in bold italic and our response in plain text.

A management plan for the Pennsylvania sedge.
I have attached a short landscape management plan that addresses overall vegetation management on site, including Pennsylvania sedge. The sedge should be mowed early spring, by May 1 or after November 15 to a height of 4 inches.

A maintenance plan for the pervious pavers.
The O&M plan was missing from the stormwater report. The attached report includes the O&M which includes vacuuming of the pavers (more detail is provided in the document).

Details from the 21E report on the history of USTs on the project site.
See the attached letter. Note that we have confirmed removal of tanks from the site and no observed contamination at the time. Prior to construction, additional subsurface investigation will be done as described in the letter.

Details from the project engineer on how the rainwater not being infiltrated will be managed.
The infiltration system is connected to the drain main with a 6" pipe this is used as an overflow.

A revised planting that provides BWSC the necessary access to their easement based on communications with BWSC.
We met with BWSC on site to better understand how they need to access certain areas of the site and have revised the plans accordingly. The main changes are as follows:

1. We will leave the area near the headwall paved. However, we will coordinate with BWSC to repave this area so it is superelevated towards a drip trench on the north side of the easement. Currently the pavement pitches towards the headwall and any water would flow untreated into the Brook. This repaving will also remove a pavement bump right at the headwall that sometimes makes work for BWSC staff a little rough when their equipment operates in this area. BWSC needs this surface

paved so they can operate equipment to clean out the brook at the inlet to the pipe (outlet to the open brook).

2. We are keeping an area of Pennsylvania sedge as a foot path for BWSC staff who use the northern side of the easement to clean things out of the brook since the southern side of the easement is much steeper.
3. We will bring in an arborist to evaluate all native trees in the easement and coordinate with BWSC to remove any hazards.
4. We have extended our plantings along the north side of the pavement within the Waterfront Resource area to somewhat offset the pavement remaining.
5. In the portion of the easement currently on the other side of the fence at 581 American Legion Highway, we will soften the slope a little to make the southern side easier for BWSC staff to walk and provide a more stable slope. This portion of the work will be monitored by the wetland scientist and coordinated with BWSC.

Proposals for what will be done if contaminated soils are discovered based on the 21E report.
In the event our subsurface exploration indicates contaminated soils such that stormwater cannot be infiltrated, then we will need to amend our plans based on the nature and location of any contamination in a manner acceptable to the Commission and to BWSC.

A concept plan for proposed mitigation on Lot 2.
The concept plan for lot 2 is attached. This concept would be refined and subject to a separate Notice of Intent, but gives a sense of how this resource area can be improved once both lots are redeveloped.

I look forward to discussing the above with the Commission at the August 3, 2022 hearing.

Sincerely,

Thomas G. Hughes, BS, MA

Enclosures: Vegetation Management Plan, dated July 26 2022
Letter from EBI, dated July 20, 2022
Photos of Easement Area
Updated Easement Mitigation Plan
Lot 2 Concept Plan
Revised Stormwater Report including O&M attachment

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PHONE/FAX 978.369.2100

581 American Legion Highway
Vegetation Management Plan

Date: July 26, 2022

Prepared For:
Boston Pinnacle Properties, LLC

Prepared By:
Thomas G. Hughes, BS, MA

Overview

The following Landscape Operation and Vegetation Management Plan was prepared for the property at 581 American Legion Highway as well as the Boston Water and Sewer Commission easement area directly to the north. The focus of this plan is the area within 50 feet of Canterbury Brook, which is located within the protected Riverfront Area and Waterfront Area. It should be noted that the entire site is jurisdictional to the Boston Conservation Commission, so all landscape maintenance on the property is subject to both the Order of Conditions issued for the project as well as state and local wetlands laws.

Area Overview and Jurisdiction of the Boston Conservation Commission:
The Wetlands Protection Act (Massachusetts General Laws (MGL) Chapter 131, Section 40, Act) protects wetland resource areas and the public interests they serve, including flood control, prevention of pollution and storm damage, and protection of public and private water supplies, groundwater supply, fisheries, land containing shellfish, and wildlife habitat. These public interests are protected by requiring certain activities within resource areas and their buffer zones to receive review and approval from the Conservation Commission. Additionally, the Boston Conservation Commission administers its own City Wetlands Protection Ordinance with additional protections. Any deviation from this plan will require written approval from the Conservation Commission and must be consistent with the Conservation Restriction and all other applicable laws. The entire property is located within protected resource areas and therefore subject to regulations administered by the Boston Conservation Commission.

On the property at 581 American Legion Highway, protected wetland resource areas at the time of permitting include:

- A 25-foot Riverfront Area from the mean high water of the Brook. This is jurisdictional under both the state and local wetlands regulations.
- A 25 foot Waterfront Resource Area. This is measured from the Riverfront Area. This is a resource area under the local ordinance and buffer zone under the state law.
- A 100 foot buffer zone from the bank of the brook. This is a resource area under the local ordinance and a buffer zone under the state law.

Vegetation on site will be maintained for health. This includes mowing sedge grasses once per growth season only in the early spring or late winter to 4 inches and pruning diseased or broken branching. This once per growing season should be done before May 1 or after November 15. Vegetation can also be pruned to prevent it from growing into the building or into parking areas and walkways. Outside of the 50-foot zone, marked on site plans as the Waterfront Resource Area, maintenance and mowing of any vegetation can also be done for aesthetics but must be maintained in a healthy condition. Plants throughout the site may only be replaced with the same species or as otherwise approved by the Boston Conservation Commission or their staff.

There will be no use of herbicides or pesticides on site, with the exception of cut and dab or similar direct application methods for invasive species when approved by the Conservation Commission or their staff.

The area off site in the easement area will be maintained for health for two growing seasons. Additionally, the property owners at 581 American Legion will conduct a sweep for litter and trash at least twice per year. In the event any obstruction of flow from debris or downed trees is noticed by the owners, they will contact BWSC to inform them of the situation.

EBI Consulting
environmental | engineering | due diligence

21 B Street
Burlington, MA 01803
Tel: (781) 273-2500
Fax: (781) 273-3311
www.ebiconsulting.com

July 20, 2022

Mr. Adam Burns
Boston Pinnacle Properties LLC
599 East Broadway
Boston MA 02127

RE: Discussion of Potential Environmental Response Actions
581 American Legion Highway, Roslindale, MA
EBI Project 1222000288

Dear Mr. Burns:

EnviroBusiness, Inc. (dba EBI Consulting, hereinafter "EBI") has prepared the following letter, per your request, to outline potential environmental response actions and procedures that may be necessary and/or appropriate to address concerns at the property related to the historic gasoline filling station and automotive service operations.

BACKGROUND

EBI completed a Phase I ESA dated August 3, 2020. Findings of the ESA included the following:

- Review of city directories indicates that a gasoline filling and/or automotive service station occupied 581 American Legion Highway at the Subject Property from 1935 to 2017. A gasoline tank is depicted on the south side of the 581 American Legion Highway building on the 1950 fire insurance map, and this building was identified as a filling station on the 1950, 1964, 1989, and 1990 fire insurance maps. No information regarding the removal of underground storage tanks (USTs) from the Subject Property have been identified during this assessment. The Subject Property address was identified on regulatory databases (EDR Hist Auto Station and HW GEN) indicating the presence of a gasoline service station from at least 1969 to 1975, and current automotive servicing operations generate hazardous waste. The 581 American Legion Highway building is currently occupied by One Stop Shop Auto Repair and Sales service station. The use of the Subject Property as a gasoline filling and/or automotive service station for approximately 90 years, as well as the potential for UST(s) to remain on the Subject Property, is considered a REC.

Subsequent to the completion of the ESA, EBI received a response from the City of Boston Fire Department that included a permit indicating that four USTs (two 6,000-gallon fiberglass tanks, one 4,000-gallon steel tank, and one 500-gallon tank containing waste oil) were removed on July 1, 1987. It is noted on the permits that no evidence of soil contamination was observed by the Fire Department during their inspection at the time of the removal. A copy of the Fire Department records is attached to this letter.

DISCUSSION OF POTENTIAL ENVIRONMENTAL INVESTIGATIONS AND RESPONSE ACTIONS

Based on the known historical use of the property, and as recommended in the Phase I ESA, a Phase II subsurface investigation will be conducted prior to any proposed construction and redevelopment in order to characterize subsurface conditions and identify if a release to the environment has occurred that would trigger regulatory response actions. A Phase II investigation would be conducted in general conformance with ASTM E1903-19 Standard Guide for Phase II Environmental Site Assessments. The scope of work would consist of a geophysical survey (using ground penetrating radar (GPR) and electromagnetic scanning) to confirm the previous removal of all USTs and identify potential subsurface utilities and structures, the advancement of soil borings in the vicinity of the former USTs, drains, and automotive service operations area to collect soil and groundwater samples for

analysis. Samples would be analyzed for petroleum hydrocarbons, volatile organic compounds (VOCs) and select metals as would be the typical contaminants of concern associated with the identified historical uses.

The results of the Phase II testing would be compared to applicable Massachusetts Contingency Plan (MCP; 310 CMR 40.000) Reportable Concentrations (RCs). If impacts above RCs are identified, the conditions would be reported to the Massachusetts Department of Environmental Protection (DEP), and further investigation and response actions would be conducted under the direction and oversight of a Licensed Site Professional (LSP).

Response actions to be taken will be entirely dependent upon the conditions encountered and the degree and volume of impacted media identified. Hypothetical scenarios that may be encountered and the means to address them are provided below.

If any additional USTs are identified to remain present beyond the four that are documented to have been removed in 1987, the USTs would be excavated and removed in accordance with the MassDEP Underground Storage Tank Program (310 CMR 80.00). UST removal would entail obtaining permits from the City of Boston Fire Department, uncovering, cleaning and rendering inert any tank, and removing the tank from the ground using a backhoe or excavator. This work is typically completed in one day. Post-removal sampling of soils from the bottom and sidewalls of the excavation would be conducted to evaluate whether a release from the UST has occurred and document soil conditions for closure. Based on the site history review conducted to date, there is no knowledge of any remaining tank(s), and the presence of additional USTs is considered unlikely.

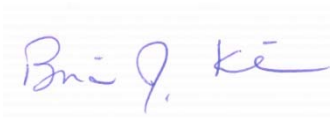
Should impacts to soil be identified associated with the former USTs or auto service operations, the most common and likely remedial approach is the targeted excavation and off-site disposal of the impacted soils. Soil excavation is conducted under the MCP as a Release Abatement Measure (RAM). Prior to excavation, a RAM Plan would be prepared and submitted to MassDEP. Appropriate siltation control would be installed to mitigate any runoff toward wetlands features. It is anticipated for a site of this size that any excavation would be limited to the removal of approximately 150 to 300 cubic yards of material, if not less. Excavation activities would therefore be limited in duration and would likely be completed and backfilled within several days. Approval for disposal of the soil at a receiving facility would be completed in advance so excavated soils can be live loaded, removed immediately, and would not need to be stockpiled for any duration of time at the property. Soil excavation activities may also be coordinated with future site development activities. During any excavation and truck loading activities, best management practices will be employed to clean trucks and tires before leaving the site to prevent contaminated soils from entering the roadway.

If reportable impacts to groundwater are also identified, the excavation of soil (i.e. source removal) would also be considered the most likely remedial approach. In some cases, remedial additives (such as oxygen release compounds) may be added to the excavation to further expedite the cleanup of residual groundwater impacts. The remedial additives stimulate the breakdown of dissolved compounds in groundwater through in-situ oxidation and/or bioremediation. The specific selection and design of a remedial additive program would be determined based on the site specific conditions encountered, and would be included in a RAM Plan to be submitted to and approved by MassDEP. Any application of remedial additives will be designed and conducted in compliance with 310 CMR 40.0046, which requires that such application does not result in the presence of Remedial Additives or Remedial Additive By-products in soil or groundwater at any point measured 50 feet or more downgradient from the furthest downgradient point of application above a background concentration or above a level that will exacerbate existing conditions. Monitoring of groundwater (collection of groundwater samples from an appropriately designed network of monitoring wells) is typically conducted for several quarters after a treatment event to document and confirm the cleanup of the groundwater and to monitor any migration of the remedial additives and/or remedial additive by-products. The details of the proposed monitoring would be included in the RAM Plan. After sampling confirms that target clean up levels have been achieved that support a finding of No Significant Risk, closure documents can be completed (Permanent Solution Statement) and submitted to MassDEP to close out the site.

In summary, environmental issues most commonly associated with historical UST and gasoline service station sites typically consist of petroleum and VOC impacts to soil and groundwater local to the area of the source. When readily accessible, as will be the case at this site, soil removal and disposal is the most direct and effective means of site remediation. Such an approach is commonly applied, is highly effective, and can be closely monitored and controlled.

Please call Brian Kilcoyne at 781-418-2349 with any comments or questions you may have.

Respectfully submitted,
EBI CONSULTING



Brian Kilcoyne
Senior Project Manager

Attachment: Boston Fire Department Records

C 10/5/87

02-03-86

F.P. 292A

Application # 908

CITY OF BOSTON
Boston Fire Department - Fire Prevention Div.

Application for Permit for Removal and Transportation to Approved Tank Yard

DATE 6/26/87

Reason for Removal:
1. Leaking ____
2. Storage Inc. ____
3. Upgrading ____
4. Other ____

C.82 S. 40 M.G.L.
DIG SAFE NUMBER
87226-4904
Start Date July 1-87

In accordance with the provisions of Chapter 148, G.L. as provided in Section 38A and Sec. 16.03 (b) of the Boston Fire Prevention Code application is hereby made by

James L. Grant Co.
(Name of person, firm or corporation)

David Grant
(Address) 25 Mallett St. - Readville, Mass.

For permission to remove and transport (number of tanks sizes 2-6000 Fiber - 1-4000 - Steel (Fiberglass) underground steel storage tank(s) from 1-500 Waste Oil 581 American Legion Hwy
(address, city & town)

FDID# 25035 to approved Tank Yard# 14401 (Tombarello)

502 CMR 3.03(6)
Haz. Waste Manifest
MAP-0000 229 56

State clearly type of inert gas used in steel storage tank Co2 Dry Ice
(Type used)

Name of person, firm, corporation disposing tank Tombarello (14401)

Date issued/rejected 6/26/87
Date of expiration 7/7/87
* Date of removal July 1
Fee ____

By: James L. Grant
Sign. of applicant

This section to be filled out after on site inspection by the Boston Fire Department

502 CMR 3.03 (10)
Any evidence of soil contamination? yes ____ no ✓

If yes notify D.E.Q.E.

Inspected by: [signature] 7/1/87 @ 0840 HRS
Boston Fire Department

908

* The Boston Fire Dept. must be notified at least 24 hours before tank removal, not including week ends and holidays.

02-03-86

306

F.P. 292P

Permit # 306

CITY OF BOSTON
Boston Fire Department - Fire Prevention Div.

PERMIT
For Removal and Transportation to approved Tank Yard

6/26 19 87

C.82 S.40 M.G.L.
DIG SAFE NUMBER
8726-4904
Start Date 7/1/87

In accordance with the provisions of Chapter 148, G.L. as provided in section 38A and Sec. 16.03 (b) of the Boston Fire Prevention Code
This permit is granted to
Name: James G. Grant Co.
Full name of person, firm or Corporation
To Remove and Transport underground steel storage tank(s)
to Approved tank yard# 14901
2-6000 fuel, 1-4000 steel
1-5000 waste oil.

State clearly type of inert gas used in steel storage tank steel tank: CO_2 (Dry Ice)
method

FDID# 25035 Name and address of contractor disposing tank
Lombardello-207 Marston St. 14901
Lawrence, Ma. 01841

Fee paid $ 200.00 Location to which tank will be transported
Approved tank yard#

This permit will expire 7/7/87 19

Maurice J. Mahoney
Signature of official granting permit(TITLE)
(Head of Fire Dept.)

This section to be filled out after on site inspection by the Boston Fire Department

502 CMR 3.03 (10)
Any evidence of soil contamination? yes _____ no X

If yes notify D.E.Q.E.

Inspected by: Thomas J. Hill 7/1/87 @ 0840 hrs
Boston Fire Department

306

NAME AND ADDRESS OF APPROVED TANK YARD: JOHN C. TOMBARELLO & SONS, 267 HAMPSHIRE ST, LAWRENCE, MASS. 01841

APPROVED TANK YARD NO. 1 4 9 0 1

Tank Yard Ledger 502 CMR 3.03(4) Number: 8 6 0 1 6 2 9

I certify under penalty of law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Grant and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID# 25035 to transport this tank to this yard.

Name and official title of approved tank yard owner or owners authorized representative:

SIGNATURE | COW TITLE | 7/2/87 DATE SIGNED

This signed receipt of disposal must be returned to the local head of the fire department FDID# 25035 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSAL)

FORM F.P. 291 (OVER) MASSACHUSETTS STATE FIRE MARSHAL'S OFFIC

RECEIPT OF DISPOSAL OF UNDERGROUND STEEL STORAGE TANK

NAME AND ADDRESS OF APPROVED TANK YARD: JOHN C. TOMBARELLO & SONS, 267 HAMPSHIRE ST, LAWRENCE, MASS. 01841

APPROVED TANK YARD NO. 1 4 9 0 1

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FORM F.P. 291 (OVER) MASSACHUSETTS STATE FIRE MARSHAL'S OFFIC

RMH ARNOLD CAWALE

64805

BOSTON FIRE DEPARTMENT
FIRE PREVENTION DIVISION
115 SOUTHAMPTON STREET

DIVISION: 2
DISTRICT: 12
Info - 343-3620

ABATEMENT ORDER

Date 08/23/95

ANDRE LAMERIQUE/QUALITY AUTO
Occupant

581 AMERICAN LEGION HY
ROSLINDALE MA 02131
Address / Mailing Address

581 AMERICAN LEGION HY

Inspection of the premises located at ..... reveals violation of fire laws herein specified:

Boston Fire Prevention Code, Section 1.14(A)(B) 1.17/29.02/1.09 19.03/25.02/

Fire Prevention Law, Chapter 148, Section SEC 13/

Board of Fire Regulations Governing ..... Rule .....

Commonwealth of Massachusetts Regulation .....

You are hereby ordered to abate or correct the conditions enumerated below as directed forthwith, or within 15 days

ORDERED:
BFPC 1.14(A)(B) 1.17 FAILURE TO SECURE NECESSARY PERMITS
BFPC 29.02 DUMPSTER
BFPC 1.09 19.03 GASES - HANDLING AND STORAGE - O+A
BFPC 25.02 OPEN AIR PARKING
CH148 SEC 13 PARKING/REPAIR GARAGE

ANDRE LAMERIQUE/QUALITY AUTO
581 AMERICAN LEGION HY
ROSLINDALE MA 02131

FAILURE TO COMPLY WILL RESULT IN COURT ACTION

Per Order: Martin E. Pierce Jr
Fire Commissioner/Chief of Department

This notice served on XXX BY MAIL

By John E Gordon
Signature Print Name

JOHN E GORDON-INSPECTOR 08/23/95
Title Date

COURT INSPECTOR FP D

Co. No. ..... Grp. No. .....

Form F.P.D. 23

RETURN THIS COPY TO FIRE PREVENTION DIVISION IMMEDIATELY ON ISSUANCE OF ORDER

RMH

64806

BOSTON FIRE DEPARTMENT
FIRE PREVENTION DIVISION
115 SOUTHAMPTON STREET

DIVISION: 2
DISTRICT: 12
Info - 343-3620

ABATEMENT ORDER

Date 08/23/95

Occupant ANDRE LAMERIQUE/QUALITY AUTO

Address 581 AMERICAN LEGION HY
ROSLINDALE MA 02131

Mailing Address

Inspection of the premises located at 581 AMERICAN LEGION HY reveals

violation of fire laws herein specified:

Boston Fire Prevention Code, Section 28.06 11.07(B)/21.03/

Fire Prevention Law, Chapter 148, Section SEC 5/

Board of Fire Regulations Governing Rule 527 SEC 9/

Commonwealth of Massachusetts Regulation

You are hereby ordered to abate or correct the conditions enumerated below as directed forthwith, or within 15 days

ORDERED:
BFPC 28.06 11.07(B) ABANDONED VEHICLES
BFPC 21.03 VERTICAL OPENINGS
CH148 SEC 5 RUBBISH AS A FIRE HAZARD
CMR 527 SEC 9 INSTALLATION,REMOVAL,ABANDONEMENT OF TANK(S)

ANDRE LAMERIQUE/QUALITY AUTO
581 AMERICAN LEGION HY
ROSLINDALE MA 02131

FAILURE TO COMPLY WILL RESULT IN COURT ACTION

By Order:
Martin E. Pierce Jr
Fire Commissioner/Chief of Department

This notice served on XXX BY MAIL XXX

By JOHN E GORDON-INSPECTOR 08/23/95
Signature Print Name FP Title Date

COURT INSPECTOR Co. No. Grp. No.

Form F.P.D. 23

RETURN THIS COPY TO FIRE PREVENTION DIVISION IMMEDIATELY ON ISSUANCE OF ORDER

BFD LICENSE #: 1275 DI:12 WD:18 ORIGINATION DATE: 12/16/66
LOCATION: 581 AMERICAN LEGION HWY. ZIP: 02131
OWNER.....:CANALE ARNOLD
OCCUPANT.....:
MAIL ST & NO..: CITY,STATE,ZIP:
INSPECTOR.....: REVISION DATE: / / USE: 0

~~16000 GAL GASOLINE UG~~ 275 FUEL OIL
100 GAL ANTI FREEZE
40 GAL GAS 2 VEH REP GAR
100 GAL WASTE OIL
200 GAL LUBRICATING OIL
START AMOUNTS---PAST: 1410.00 + CURRENT: 235.00 = TOTAL DUE: 1645.00

EXPIRATION DATE: / / PAYSTAT:
LAST DATE PAID IN FULL: 07/30/84 LICSTAT: / /

FAX 524-1936
17 RABBARA LANE
333-6956
524-0302
524-4455
cm-9-

BFD LICENSE #: 1275 DI:12 WD:18 ORIGINATION DATE: 12/16/66
**LOCATION: 581 AMERICAN LEGION HWY.
OWNER.....[redacted], HAROLD A. ZIP: 02131**
OCCUPANT.....:
MAIL ST & NO..:
INSPECTOR.....: CITY,STATE,ZIP:
REVISION DATE: / / USE: 0

16000 GAL GASOLINE UG
100 GAL ANTI FREEZE
40 GAL GAS 2 VEH REP GAR
100 GAL WASTE OIL
200 GAL LUBRICATING OIL

START AMOUNTS---PAST: 1410.00 + CURRENT: 235.00 = TOTAL DUE: 1645.00

EXPIRATION DATE: / / PAYSTAT:
LAST DATE PAID IN FULL: 07/30/84 LICSTAT: / /

((Add 275 FUEL)

ARNOLD CANALE

SAL'S CLEANING SERVICE

199 Savin Hill Avenue   Boston, MA 02125

Telephone (617)287-8939

Customer's Name ______ Address 47 S. Municipal A.4.S.
Street

City ______ State ______ Zip ______ Phone ______

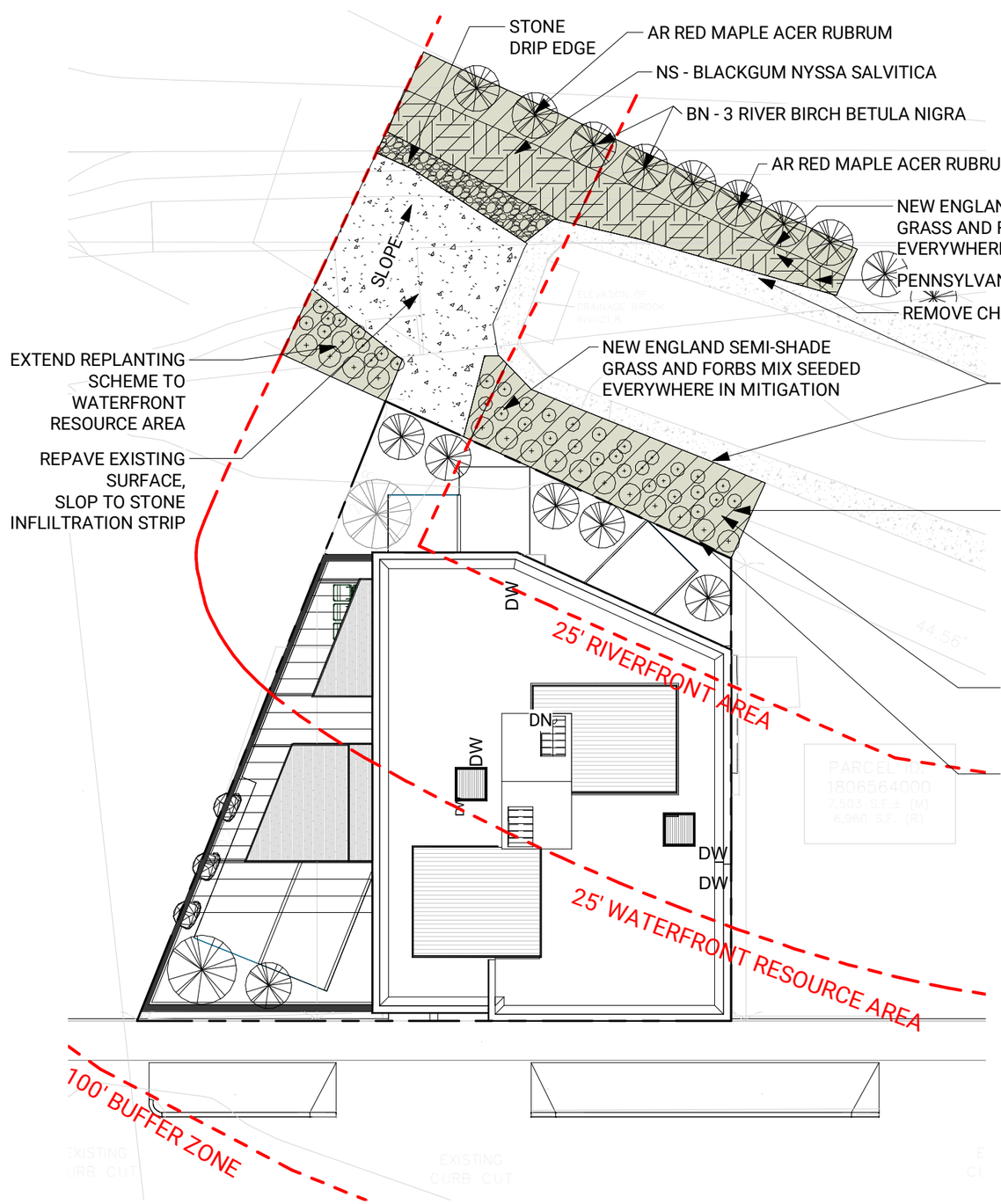
Job Description	Cost
Boston Fire Dept. 115 South Hampton St. Fifty 1,600.00 Sonny Thursday 8/24	Boston Bridget / Kenny 5th Fl spoke with Lt. Anderson

Total Cost $ ______

Signature ______ Date ______

EXISTING CONDITIONS PLAN		PROPOSED PLAN	
25' RIVERFRONT AREA		**25' RIVERFRONT AREA**	
PAVED AREA	-	PAVED AREA	-
ECOLOGICALLY COMPROMISED LANDSCAPE	588 SF	NATIVE HABITAT RESTORATION	588 SF
25' WATERFRONT RESOURCE AREA		**25' WATERFRONT RESOURCE AREA**	
PAVED AREA	473 SF	PAVED AREA	473 SF
ECOLOGICALLY COMPROMISED LANDSCAPE	464 SF	NATIVE HABITAT RESTORATION	464 SF

NOTE: IN BWSC EASEMENT AREA REMOVE ANY INVASIVE OR HAZARD TREE AND REPLACE WITH SMALLER TREES OR SHURBS. LOW DENSITY PLANTING TO ENSURE ACCESS BY BWSC



NOTE:
ALL PLANTS LARGES AVAILABLE STOCK FROM NEW ENGLAND WETLAND PLANTS.

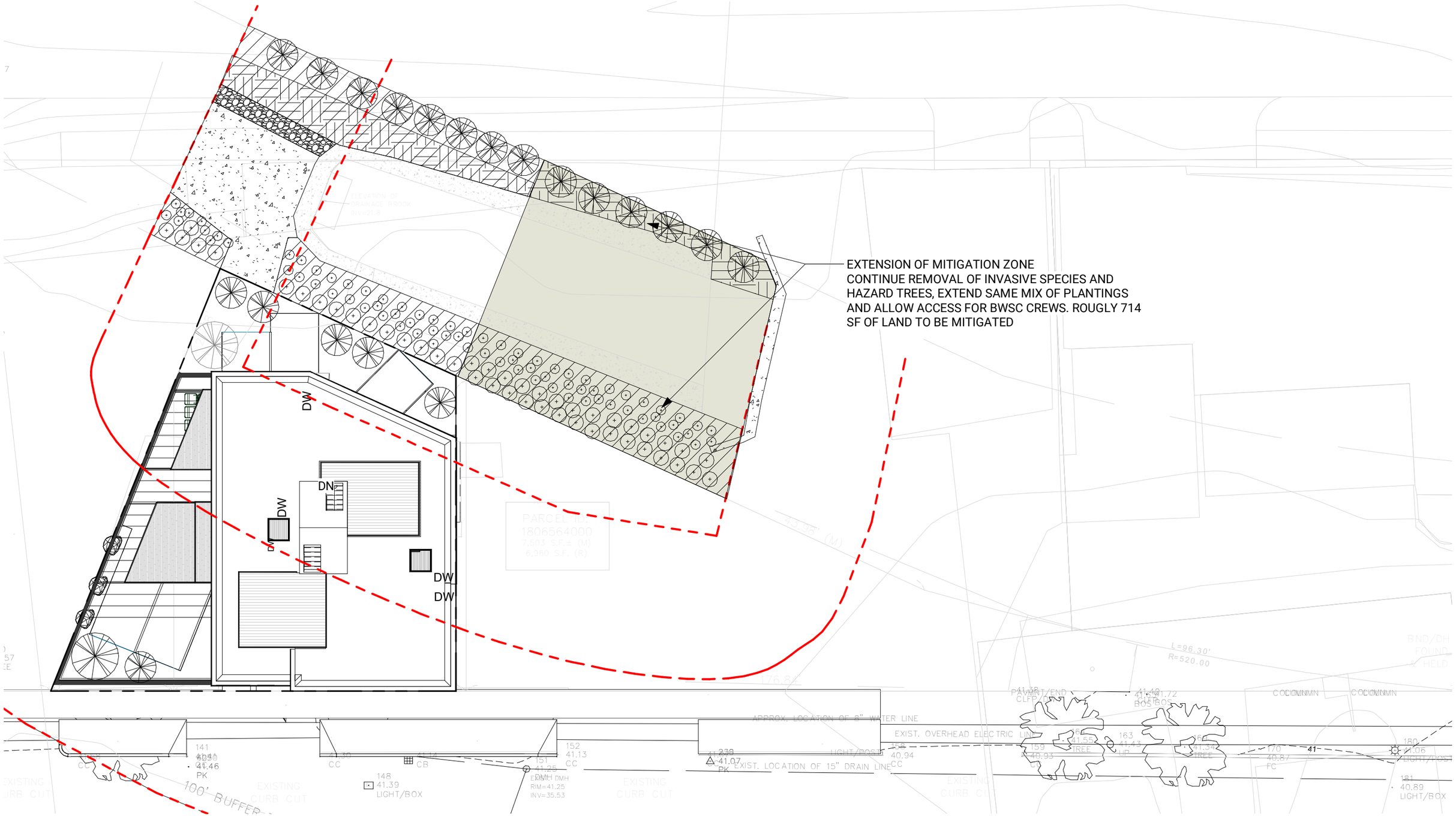
1 ARCHITECTURAL SITE PLAN
1/16" = 1'-0"

BA
BALANCE ARCHITECTS
1 Thompson Square, Boston, MA 02129
617.209.9539
www.balance-architects.com

LANDSCAPE CLEAN UP

581 AMERICAN LEGION
581 AMERICAN LEGION HIGHWAY, BOSTON, MA 02131

SKA-01
DATE: 7/26/2022
SCALE: 1/16" = 1'-0"



1 ARCHITECTURAL SITE PLAN - MITIGATION PLAN FOR BOTH PLOTS

1/16" = 1'-0"

BA
BALANCE ARCHITECTS
1 Thompson Square, Boston, MA 02129
617.209.9539
www.balance-architects.com

MITIGATION 2 LOTS

581 AMERICAN LEGION

581 AMERICAN LEGION HIGHWAY, BOSTON, MA 02131

SKA-02

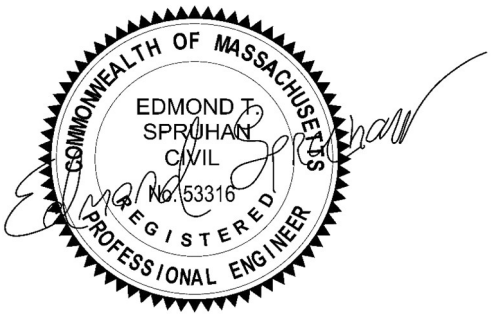
DATE: 07/26/22

SCALE: 1/16" = 1'-0"

SPRUHAN ENGINEERING, P.C.

STORMWATER REPORT

581 AMERICAN LEGION HIGHWAY, ROSLINDALE, MA



Prepared By: Spruhan Engineering, P.C.

Contents

1.0 Introduction

Spruhan Engineering, P.C. has prepared this Storm water Report for the proposed development located at 581 American Legion Highway, Roslindale, Massachusetts.

The proposed development consists of a 3-Story residential building, paved driveway/parking and landscaped areas. This project is considered a redevelopment according to the MassDEP stormwater standards; however, this project was designed to meet the full stormwater standards as a new development.

The purpose of this report is to demonstrate that the proposed conditions do not create any increased flowrate or runoff from the site. This is achieved by proposing an infiltration system.

2.0 Existing Conditions

The existing property is located at 581 American Legion Highway, Roslindale, Massachusetts. The site is bounded by residential dwellings on the rear and the west side and a church on the east side of the lot. The property is located in American legion highway between Canterbury St and Walk hill St. The existing roof area on the lot is 886.8 S.F., the existing paved area is 2,089.1 S.F., the existing gravel areas are 556.1 S.F., and the existing landscaped area on the lot is 259.5 S.F.

2.1 Existing Topography and Drainage Infrastructure.

In general, the property is relatively flat and slopes from North to the South of the lot ranging between approximately 1%. As there is no drainage system currently installed, all storm water scours across the surface at grade.

3.0 Proposed Conditions

3.1 Project Description

The development consists of a 3-Story residential building, paved driveway/parking and landscaped areas The proposed roof will have an area of 2,316.0 S.F, the proposed paved driveway to be captured by the infiltration system will have an area of 947.9 S.F., the permeable pavers will have an area of 218.9 S.F. and the remaining landscaped portion will have a footprint of 308.7 S.F.

3.2 Proposed site improvements

Proposed site improvements include a storm water recharge system designed to reduce the runoff from the lot and improve groundwater recharge. All impervious areas are being captured by the infiltration trench. The infiltration system was sized to reduce the flowrate and total runoff volume generated from the site post construction.

Also, deep sump catch basin and a "Unistorm" Oil, grease and sediment separator have been proposed before entering the recharge system to comply with the MassDEP water quality standards.

3.3 Storm Water Management System (Infiltration trench – Storm Techs)

The proposed infiltration system consists of 5 "Stormtech" plastic chambers with a 1ft crushed stone bed below.

The HydroCAD calculations demonstrate that the post-development runoff flowrate and volume for all storm events have been reduced compared to the pre-development conditions. These calculations can be seen in Appendix A. The summary of the HydroCAD calculations can be seen in the following table.

Summary of Calculations:

	Summary Table			
	Runoff Flow Rate		Volume of Runoff	
	EXISTING	PROPOSED	EXISTING	PROPOSED
2 Yr Storm (3.35 in/hr)	0.26 cfs	0.01 cfs	879 cf	57 cf
10 Yr Storm (5.26 in/hr)	0.43 cfs	0.03 cfs	1,459 cf	121 cf
25 Yr Storm (6.45 in/hr)	0.54 cfs	0.04 cfs	1,826 cf	165 cf
100 Yr Storm (8.29 in/hr)	0.70 cfs	0.36 cfs	2,396 cf	502 cf

3.4 Low Impact Development (LID)

Low Impact Development (LID) strategies use careful site design and decentralized stormwater management to reduce the environmental footprint of new growth and redevelopment. This approach improves water quality, minimizes the need for expensive pipe and pond stormwater systems, and creates more attractive developments.

The following strategies outline the LID methods that were implemented in this project.

1. Infiltration Trench: These are standard stormwater management structures that store water in the void space between crushed stone or gravel; the water slowly percolates downward into the subsoil.

Management Objectives:

1. Remove suspended solids, heavy metals trash, oil, and grease.
2. Reduce peak discharge rate and total runoff volume.
3. Provide modest infiltration and recharge.
4. Provide snow storage areas.

2. Use of Filter Mitts:

- Erosion control
- Detains sediment, absorbs orders and degrades volatile organic compounds allows water by-pass, and is a food resource for beneficial microorganisms, which remediate by metabolizing wood preservatives, petroleum products, pesticides and both chlorinated and non-chlorinated hydrocarbons in stormwater runoff from reaching water resources, prevents erosion and silting on embankments parallel to creeks, lakes, and rivers, prevents erosion and turf loss on roadsides, hillsides, playing fields, and golf courses.

3. Maintenance of Paved Surfaces:

5. No coal-tar pavement sealants.
6. No sodium de-icers.
7. Street sweeping

4. Low Impact Landscaping:

8. Native, drought tolerant species.
9. Encouraging longer grass length.
10. Planting native plants and trees.

3.5 DEP Stormwater management Summary

Standard 1: No New Untreated Discharges

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

- No new untreated stormwater will discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth." The project proposes no new untreated stormwater discharges.
- All proposed impervious areas will be captured by a sub-surface infiltration system.
- Deep sump catch basins and an oil grease separator are being proposed to treat the water prior to getting in to the infiltration system.

Standard 2: Peak Attenuation

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

- All the proposed impervious areas will be captured by the infiltration trench. The infiltration system was designed to reduce the flowrate and total runoff volume generated from the site post construction.
  Further information can be found on the Appendix A "HydroCAD calculations" and a summary of these calculations can bee find in page 3 of this report.

Standard 3: Recharge

"Loss of annual recharge to groundwatershall be eliminated or minimized through the use of infiltration measures including environmentally sensitive 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 condition is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook."

- Proposed site improvements include a storm water recharge system designed to reduce the runoff from the lot and improve groundwater recharge.
  The proposed infiltration system consists of 5 "Stormtech" plastic chambers with a 1ft crushed stone bed below.

Standard 4: Water Quality

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

- Stormwater system has been design remove 80% TSS with 44% TSS pre-treatment provided prior to entering the infiltration trench.

- The 80% credit was achieved in this project through the use of the following strategies:
    - Pre-treatment: Deep Hooded Sump Catch Basin + "Unistorm" Oil , grease and sediment separator.
    - Total Pre-treatment TSS = 64%
    - Treatment: Infiltration trench (structural control): 80% TSS removal rate.

- Total TSS Removal achieve is 93%. The breakdown of these calculations can be seen in Appendix C.

Standard 5: Land Uses with Higher Potential Pollutant Loads

"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 form such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMP's determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook.."

- The project does not propose Land Uses with Higher potential Pollutant Loads – N/A.

Standard 6: Critical Areas
"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 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."

- The project is not located in a critical area – N/A

Standard 7: Redevelopment
"A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable.
A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions."
A "redevelopment" project is defined in Massachusetts Stormwater Handbook as "Development, rehabilitation, expansion, and phased projects on previously developed sites, provided the redevelopment results in no increase in impervious area."

- Proposed construction of residential building and a paved parking/driveway.
- By definition this project qualifies as a redevelopment, however the project team has decided to treat this as a new development and comply with all the Stormwater Management Standards in an effort to protect the wetlands to the maximum extent possible.

Standard 8: Construction Period Pollution Prevention and Erosion and Sediment Control
"A plan to control construction related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented."

- Erosion and sedimentation controls will be installed before construction and maintained during the project.
  Further information can be found in the erosion control plan (Sheet 002) of the civil plans and in the appendix C of this report.

Standard 9: Long Term Operation and Maintenance Plan

"A long-term operation and maintenance plan shall be delivered and implemented to ensure that stormwater management systems function as designed."

- Operations and Maintenance Plan will be the responsibility of the owner. The details of this plan can be found in the attached appendix C.

Standard 10: Prohibition of Illicit Discharges

"All illicit discharges to the stormwater management system are prohibited."

- There are currently no known illicit discharges within the project limits.
- The project does not propose any illicit discharges.

4.0 Soil Information

The NRCS Web Soil Survey shows one Map Unit inside our area of interest. This is listed next and the percentages of Area of Interest in the Map unit Legend Table:

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
655	Udorthents, wet substratum	0.3	100.0%
Totals for Area of Interest		**0.3**	**100.0%**

- Map unit 655 refers to human transported fill with gravelly sand, which has Hydrological soil group "A" properties and these properties were applied to the HydroCAD software calcs.

  Further detailed information is described in Appendix B.

5.0 Total Suspended Solids (TSS) removal calculations

At a minimum all projects subject to a Major Stormwater Management Permit shall comply with the performance standards of the most recent version of Massachusetts Stormwater Standards and accompanying Stormwater Management Handbook (Handbook), and the Town of Dedham Drainage and Stormwater Design Standards. The following design standard considering TSS removal must be addressed:

- Stormwater management systems shall be designed to remove 80% of the average annual post-construction impervious area load of Total Suspended Solids (TSS). This Standard is met when:

  a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;

  b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and

  c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

The 80% credit was achieved in this project through the use of the following strategies:

- Pre-treatment: Deep Hooded Sump Catch Basin + "Unistorm" Oil , grease and sediment separator.
    - Total Pre-treatment TSS = 64%

- Treatment: Infiltration trench (structural control): 80% TSS removal rate.

Based on documentation for the "Unistorm" device selected for pre-treatment, the actual TSS removal rate will vary depending on the intensity of the storm. Documentation states that this removal rate can range between 52-77%. In order to remain conservative in the design, 52% was selected in the calculations.

Total TSS Removal achieve is 93%. The breakdown of these calculations can be seen in Appendix C.

6.0 Total Phosphorus (TP) removal calculations

The following calculations are based on Attachment 3 to Appendix E "Methods to Calculate Phosphorus Load Reductions for Structural Stormwater Best Management Practices in the Watershed" for MA MS4 General Permit.

Phosphorus load reduction target (P_{target}) = 60%

Contributing impervious drainages area (IA) = 0.07 acres

In the following Table 6.1 the average annual distinct phosphorus load (P Load) by land category are shown. To keep calculations on the conservative side a consideration of the D soil group will be taken as 100% of the area given that it's the previous soil before filling and it has a higher P load Export rate.

Table 6.1. Average annual distinct phosphorus load (P Load) export rates for use in estimating phosphorus load reduction credits the MA MS4 Permit

Phosphorous Category by Land Use	Land Surface Cover	P Load Export Rate, lbs/acre/year	P Load Export Rate, kg/ha/yr
Commercial (Com)	Directly connected impervious	1.78	2.0
Developed Land Pervious (DevPERV)- Hydrologic Soil Group D	Pervious	0.37	0.41

BMP Load= (IA_{LDR} X $PLER_{LDR}$) + ($IA_{DevPERVD}$ X $PLER_{DevPERVD}$)

BMP Load = (0.07 acres X 1.78 lbs/acre/year) + (.01 acres X 0.37 lbs/acre/year)

BMP Load= (0.12 lbs/year) + (.004 lbs/year)

BMP Load= .12 lbs/year

The performance curve for infiltration trench, Figure 3-1 IR=0.17 in/hr is used to determine the design storage volume of the BMP (BMP Volume $_{IA\text{-}in}$) needed to treat runoff from the contributing IA and achieve a P_{target}=60%. The curve for an infiltration rate of 0.17 in/hr is chosen for being the most conservative. From the Figure 3-1 BMP Volume $_{IA\text{-}in}$ for a P_{target} = 60% is 0.43 in.

The BMP Volume is converted to cubic feet (BMP Volume $_{IA\text{-}ft}{}^3$) using the next equation:

BMP Volume $_{IA\text{-}ft}{}^3$= IA (acre) x BMP Volume $_{IA\text{-}ft}{}^3$ x 3,630 ft^3/acre-in

BMP Volume $_{IA\text{-}ft}{}^3$= 0.12 acre x 0.43 in x 3,630 ft^3/acre-in

BMP Volume $_{IA\text{-}ft}{}^3$**= 187.3 ft^3.**

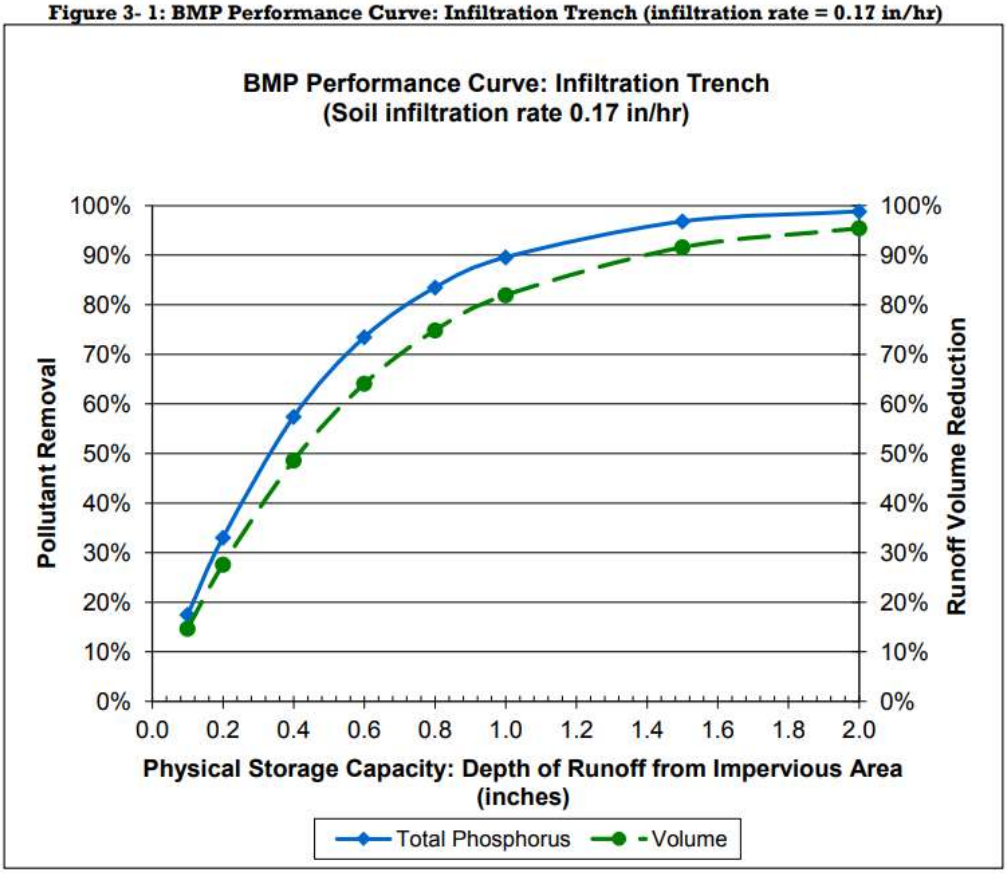
BMP-Reduction $_{lbs\text{-}P}$= BMP Load x (P $_{target}$ /100)

BMP-Reduction $_{lbs\text{-}P}$= 0.12 lbs/year x (60/100)

BMP-Reduction $_{lbs\text{-}P}$= **0.072 lbs/yr**

The volume of the proposed infiltration practice, 678 ft^3, exceeds the BMP Volume $_{IA\text{-}ft}{}^3$ needed, 187.3 ft^3 and is sufficient to achieve the P target of 60%.

Figure 3- 1: BMP Performance Curve: Infiltration Trench (infiltration rate = 0.17 in/hr)

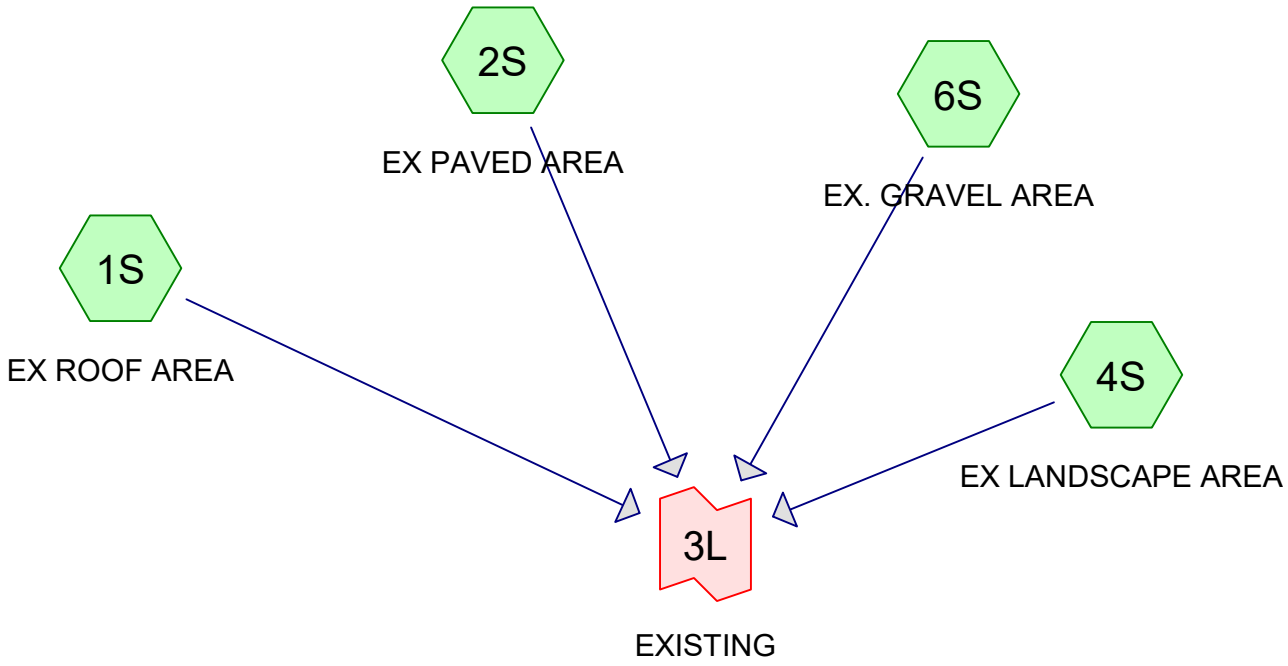


7.0 Draw down time (Time to empty) Calculations.

$$\boldsymbol{Time} = \frac{\boldsymbol{rv}}{(\boldsymbol{k})(\boldsymbol{Bottom\ Area})}$$

$$\boldsymbol{Time} = \frac{678\ \boldsymbol{cf}}{(\mathbf{2.41}\ \ \boldsymbol{in/hr})(\frac{\boldsymbol{1ft}}{\boldsymbol{12in}})(385\boldsymbol{Sf})} = 8.77 \text{ Hr.}$$

Appendix A
HydroCAD Calculations



Subcat Reach Pond Link

Routing Diagram for EXISTING
Prepared by SPRUHAN ENGINEERING P.E., Printed 5/31/2022

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
259	69	50-75% Grass cover, Fair, HSG B (4S)
556	85	Gravel roads, HSG B (6S)
2,089	98	Paved parking, HSG B (2S)
887	98	Roofs, HSG B (1S)
3,791	**94**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
3,791	HSG B	1S, 2S, 4S, 6S
0	HSG C	
0	HSG D	
0	Other	
3,791		**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EX ROOF AREA Runoff Area=887 sf 100.00% Impervious Runoff Depth=3.12"
Tc=5.0 min CN=98 Runoff=0.07 cfs 230 cf

Subcatchment 2S: EX PAVED AREA Runoff Area=2,089 sf 100.00% Impervious Runoff Depth=3.12"
Tc=5.0 min CN=98 Runoff=0.16 cfs 543 cf

Subcatchment 4S: EX LANDSCAPE AREA Runoff Area=259 sf 0.00% Impervious Runoff Depth=0.87"
Tc=5.0 min CN=69 Runoff=0.01 cfs 19 cf

Subcatchment 6S: EX. GRAVEL AREA Runoff Area=556 sf 0.00% Impervious Runoff Depth=1.89"
Tc=5.0 min CN=85 Runoff=0.03 cfs 87 cf

Link 3L: EXISTING Inflow=0.26 cfs 879 cf
Primary=0.26 cfs 879 cf

Total Runoff Area = 3,791 sf Runoff Volume = 879 cf Average Runoff Depth = 2.78"
21.50% Pervious = 815 sf 78.50% Impervious = 2,976 sf

Summary for Subcatchment 1S: EX ROOF AREA

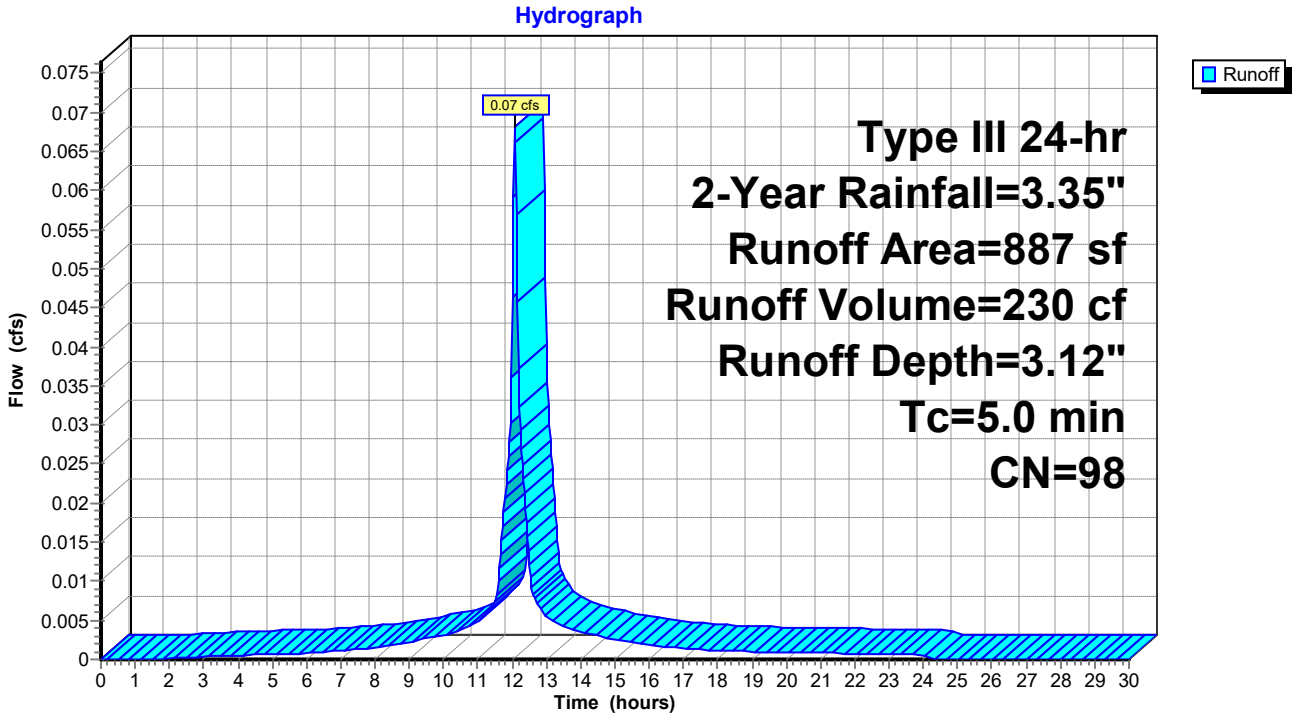
Runoff = 0.07 cfs @ 12.07 hrs, Volume= 230 cf, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.35"

Area (sf)	CN	Description
887	98	Roofs, HSG B
887		100.00% Impervious Area

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

Subcatchment 1S: EX ROOF AREA



Summary for Subcatchment 2S: EX PAVED AREA

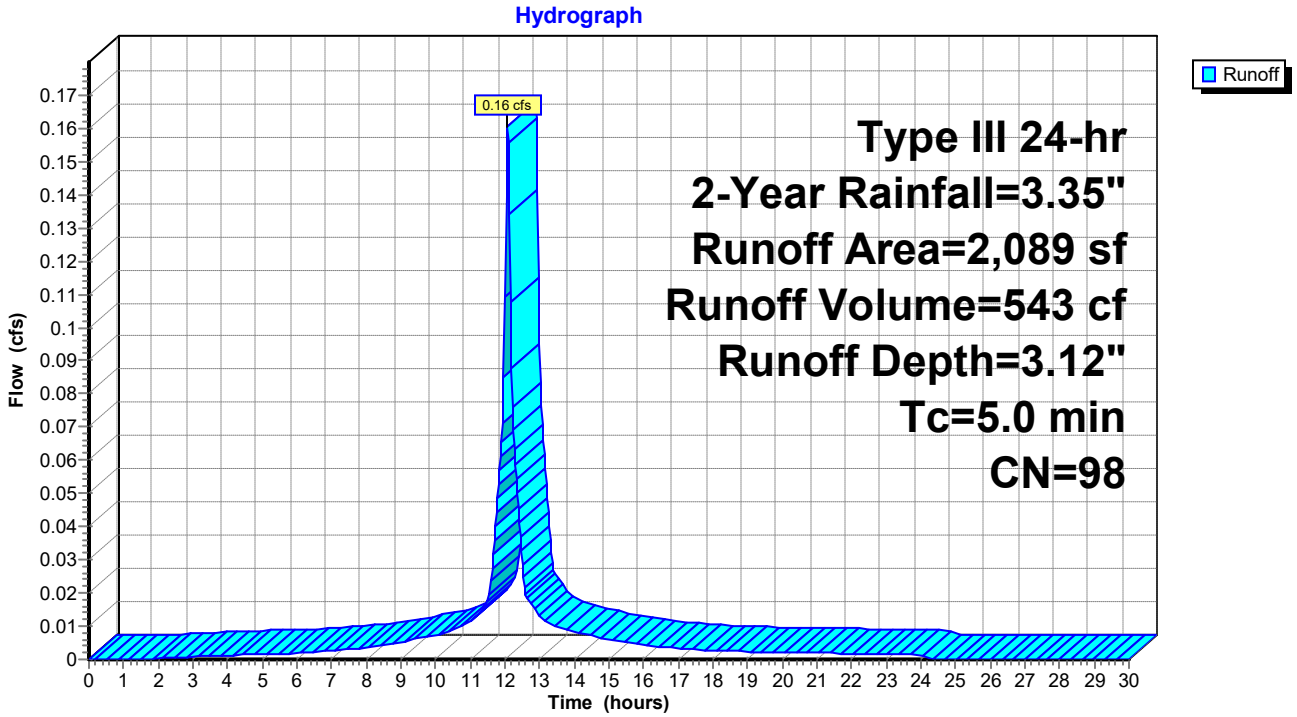
Runoff = 0.16 cfs @ 12.07 hrs, Volume= 543 cf, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.35"

Area (sf)	CN	Description
2,089	98	Paved parking, HSG B
2,089		100.00% Impervious Area

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

Subcatchment 2S: EX PAVED AREA



Summary for Subcatchment 4S: EX LANDSCAPE AREA

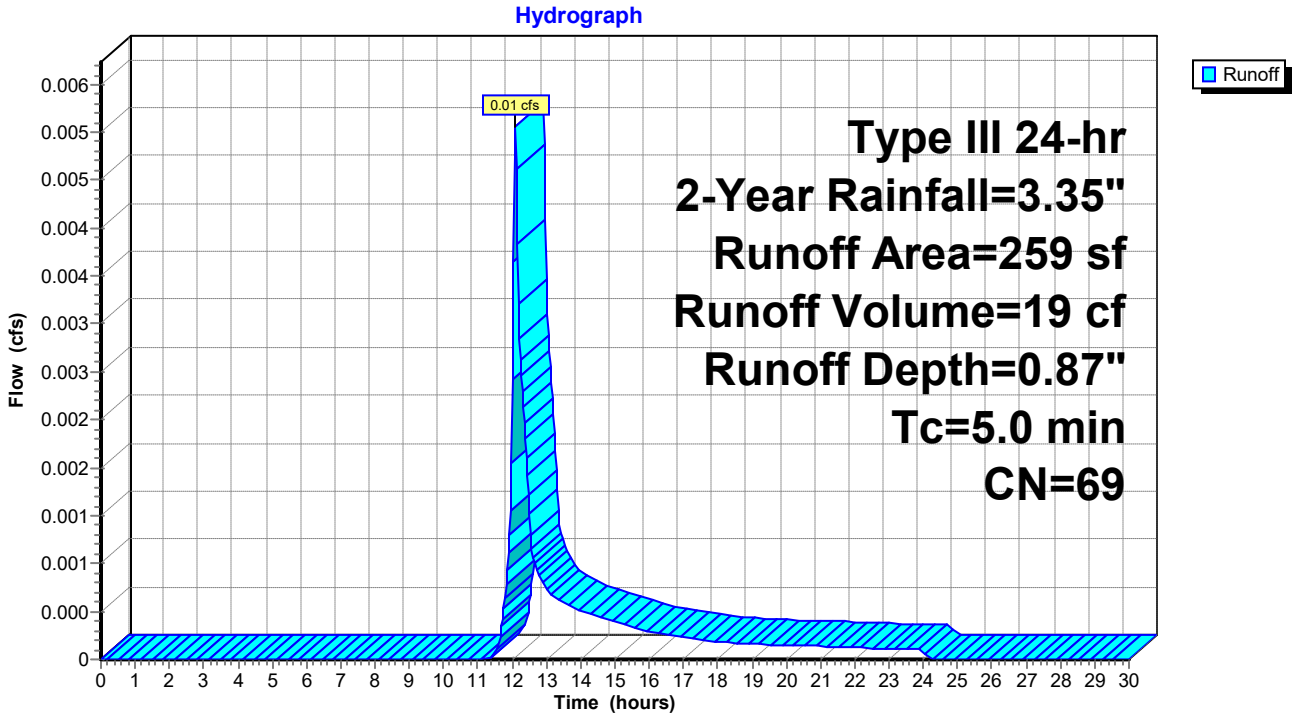
Runoff = 0.01 cfs @ 12.09 hrs, Volume= 19 cf, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.35"

Area (sf)	CN	Description
259	69	50-75% Grass cover, Fair, HSG B
259		100.00% Pervious Area

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

Subcatchment 4S: EX LANDSCAPE AREA



Summary for Subcatchment 6S: EX. GRAVEL AREA

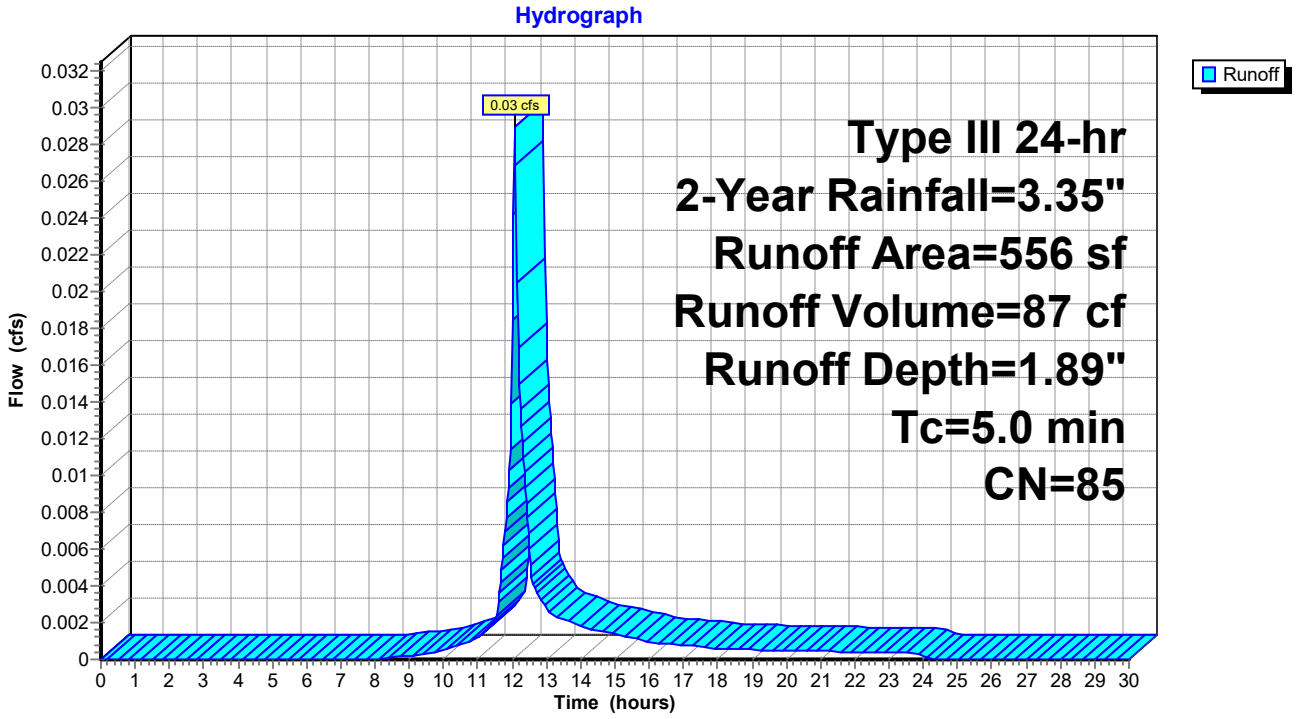
Runoff = 0.03 cfs @ 12.08 hrs, Volume= 87 cf, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.35"

Area (sf)	CN	Description
556	85	Gravel roads, HSG B
556		100.00% Pervious Area

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

Subcatchment 6S: EX. GRAVEL AREA

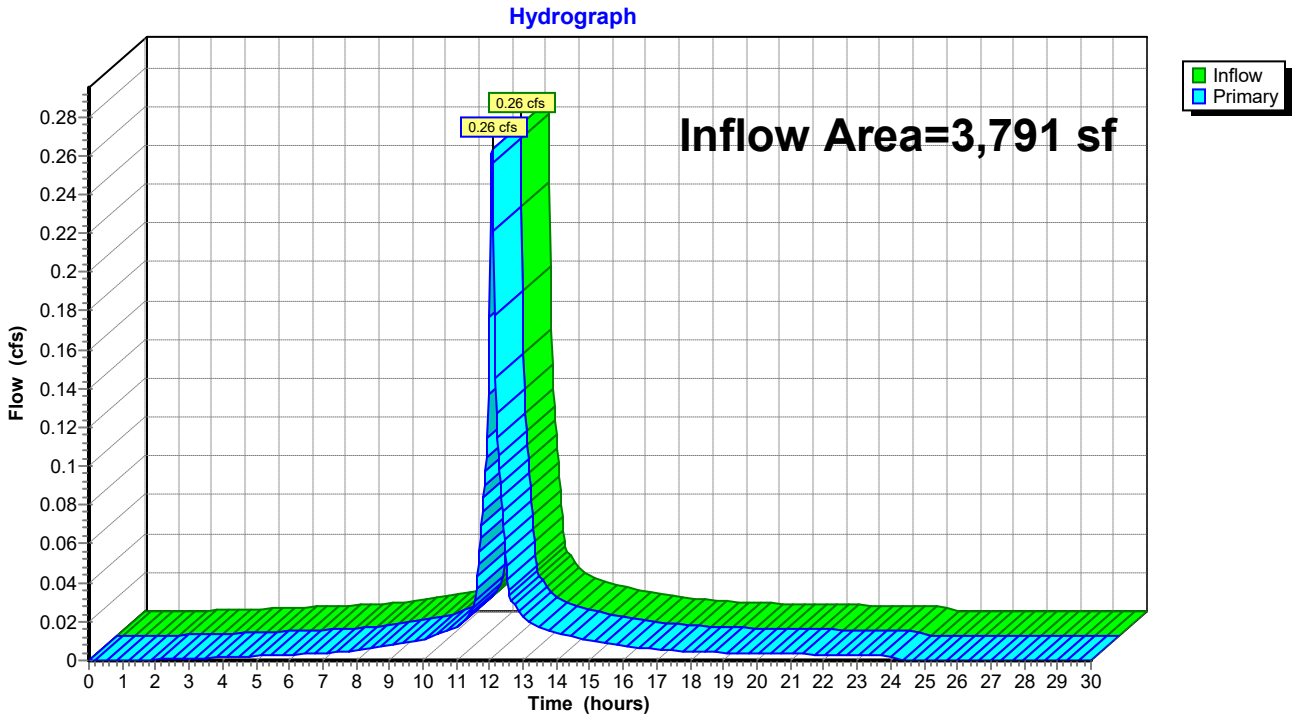


Summary for Link 3L: EXISTING

Inflow Area = 3,791 sf, 78.50% Impervious, Inflow Depth = 2.78" for 2-Year event
Inflow = 0.26 cfs @ 12.07 hrs, Volume= 879 cf
Primary = 0.26 cfs @ 12.07 hrs, Volume= 879 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: EXISTING



Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EX ROOF AREA Runoff Area=887 sf 100.00% Impervious Runoff Depth=5.02"
Tc=5.0 min CN=98 Runoff=0.11 cfs 371 cf

Subcatchment 2S: EX PAVED AREA Runoff Area=2,089 sf 100.00% Impervious Runoff Depth=5.02"
Tc=5.0 min CN=98 Runoff=0.25 cfs 874 cf

Subcatchment 4S: EX LANDSCAPE AREA Runoff Area=259 sf 0.00% Impervious Runoff Depth=2.15"
Tc=5.0 min CN=69 Runoff=0.02 cfs 46 cf

Subcatchment 6S: EX. GRAVEL AREA Runoff Area=556 sf 0.00% Impervious Runoff Depth=3.61"
Tc=5.0 min CN=85 Runoff=0.05 cfs 167 cf

Link 3L: EXISTING Inflow=0.43 cfs 1,459 cf
Primary=0.43 cfs 1,459 cf

Total Runoff Area = 3,791 sf Runoff Volume = 1,459 cf Average Runoff Depth = 4.62"
21.50% Pervious = 815 sf 78.50% Impervious = 2,976 sf

Summary for Subcatchment 1S: EX ROOF AREA

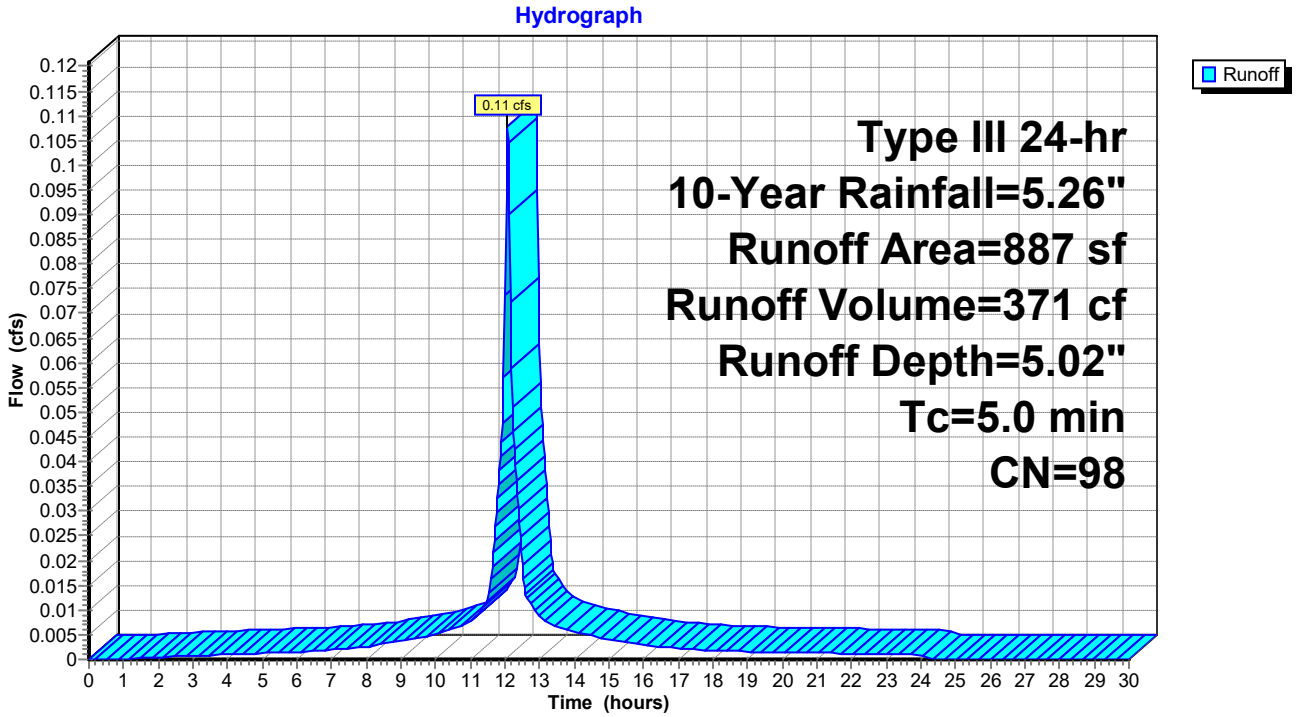
Runoff = 0.11 cfs @ 12.07 hrs, Volume= 371 cf, Depth= 5.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.26"

Area (sf)	CN	Description
887	98	Roofs, HSG B
887		100.00% Impervious Area

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

Subcatchment 1S: EX ROOF AREA



Summary for Subcatchment 2S: EX PAVED AREA

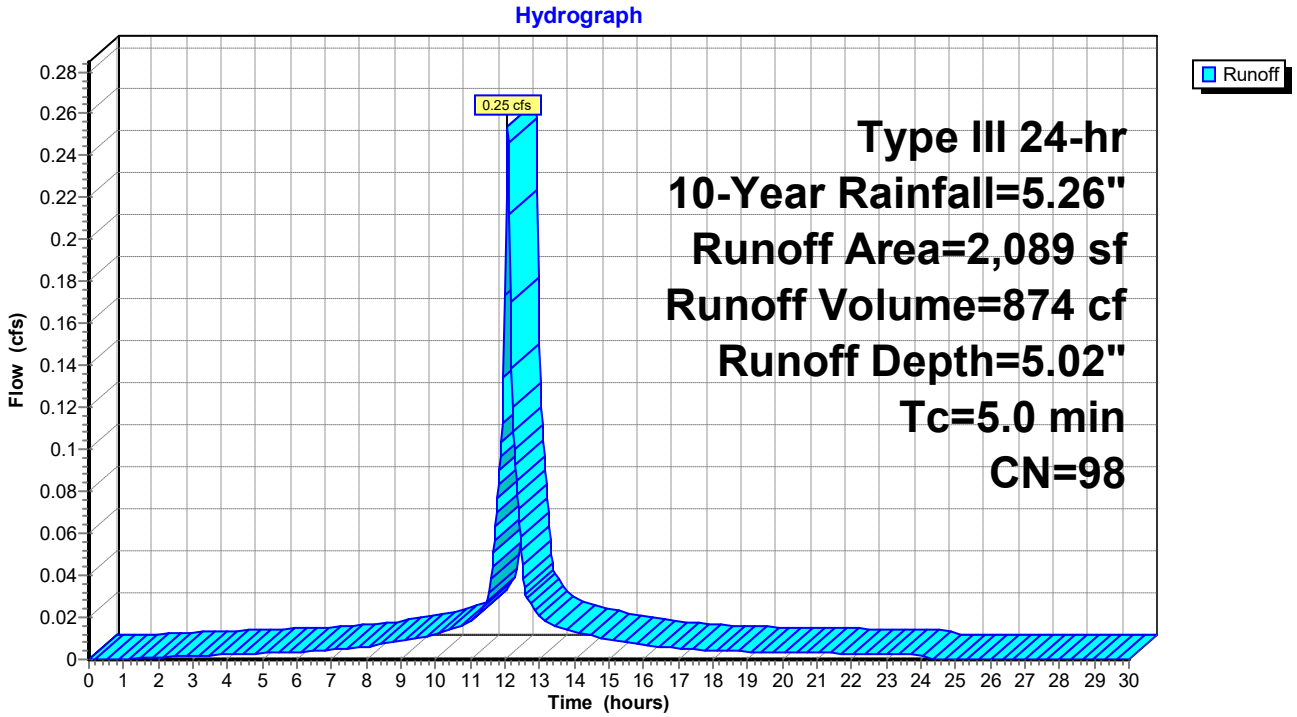
Runoff = 0.25 cfs @ 12.07 hrs, Volume= 874 cf, Depth= 5.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.26"

Area (sf)	CN	Description
2,089	98	Paved parking, HSG B
2,089		100.00% Impervious Area

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

Subcatchment 2S: EX PAVED AREA



Summary for Subcatchment 4S: EX LANDSCAPE AREA

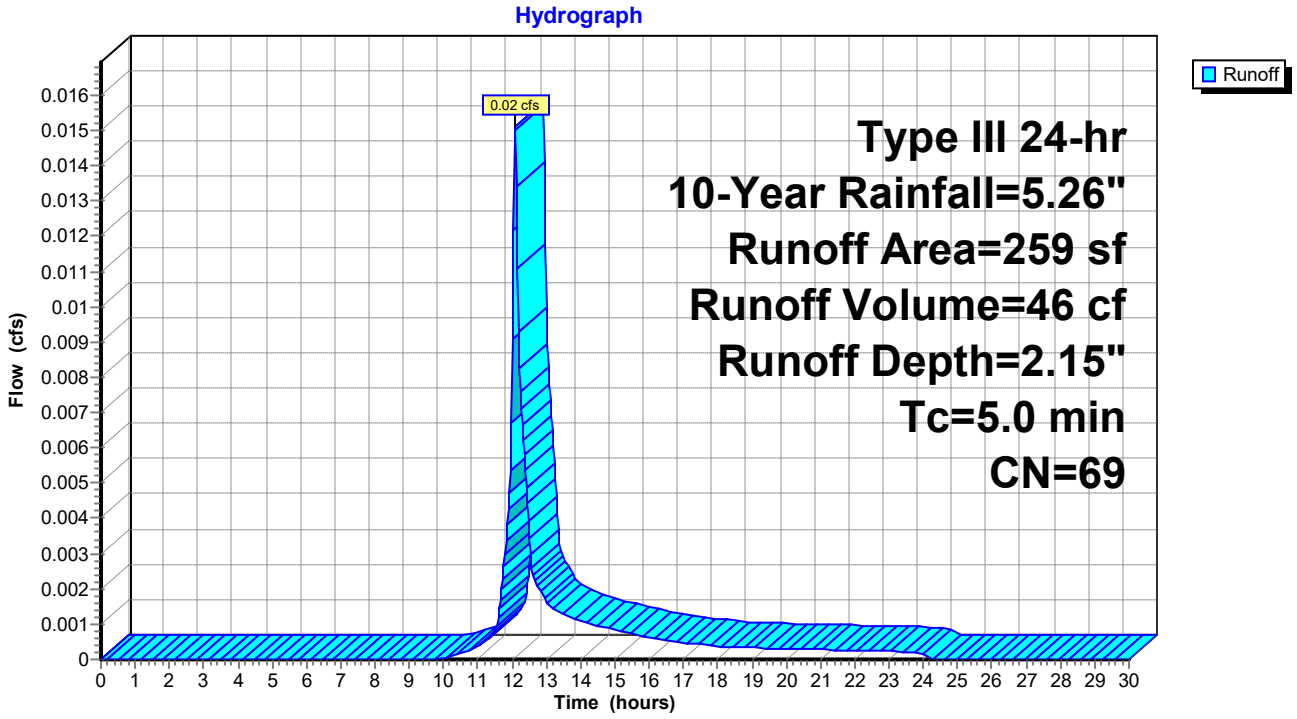
Runoff = 0.02 cfs @ 12.08 hrs, Volume= 46 cf, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.26"

Area (sf)	CN	Description
259	69	50-75% Grass cover, Fair, HSG B
259		100.00% Pervious Area

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

Subcatchment 4S: EX LANDSCAPE AREA



Summary for Subcatchment 6S: EX. GRAVEL AREA

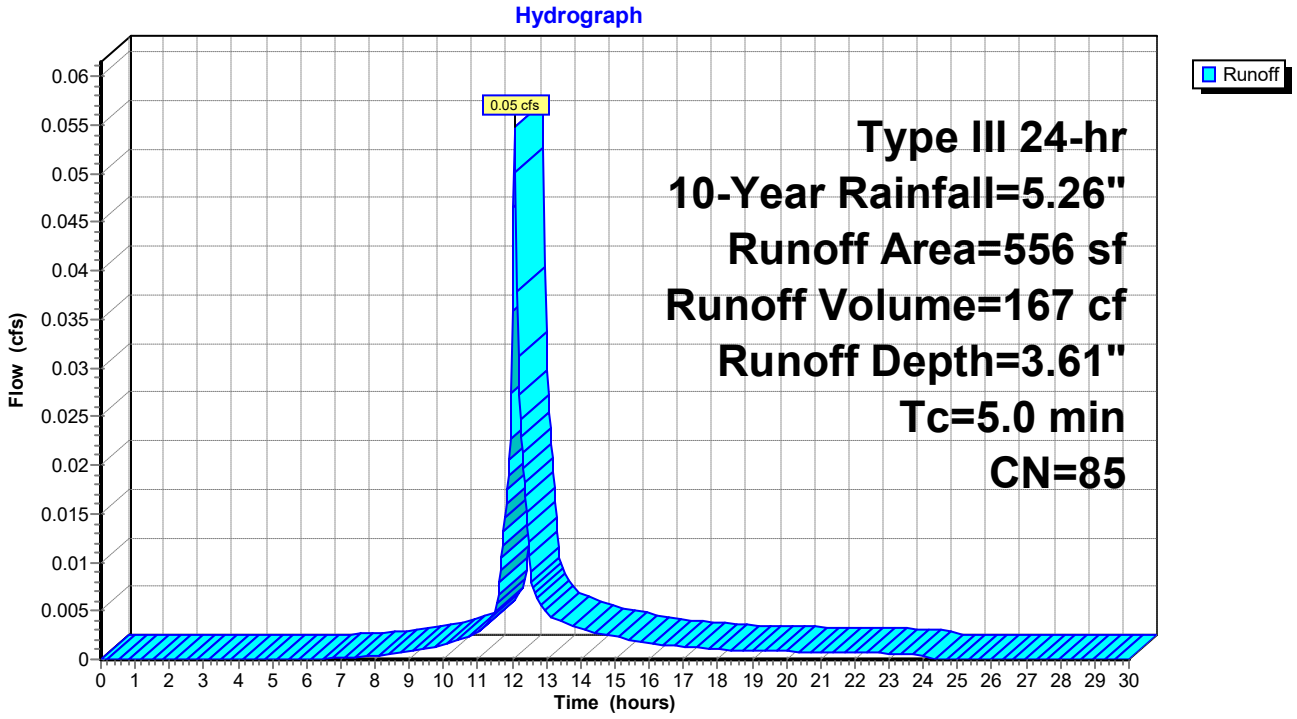
Runoff = 0.05 cfs @ 12.07 hrs, Volume= 167 cf, Depth= 3.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.26"

Area (sf)	CN	Description
556	85	Gravel roads, HSG B
556		100.00% Pervious Area

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

Subcatchment 6S: EX. GRAVEL AREA

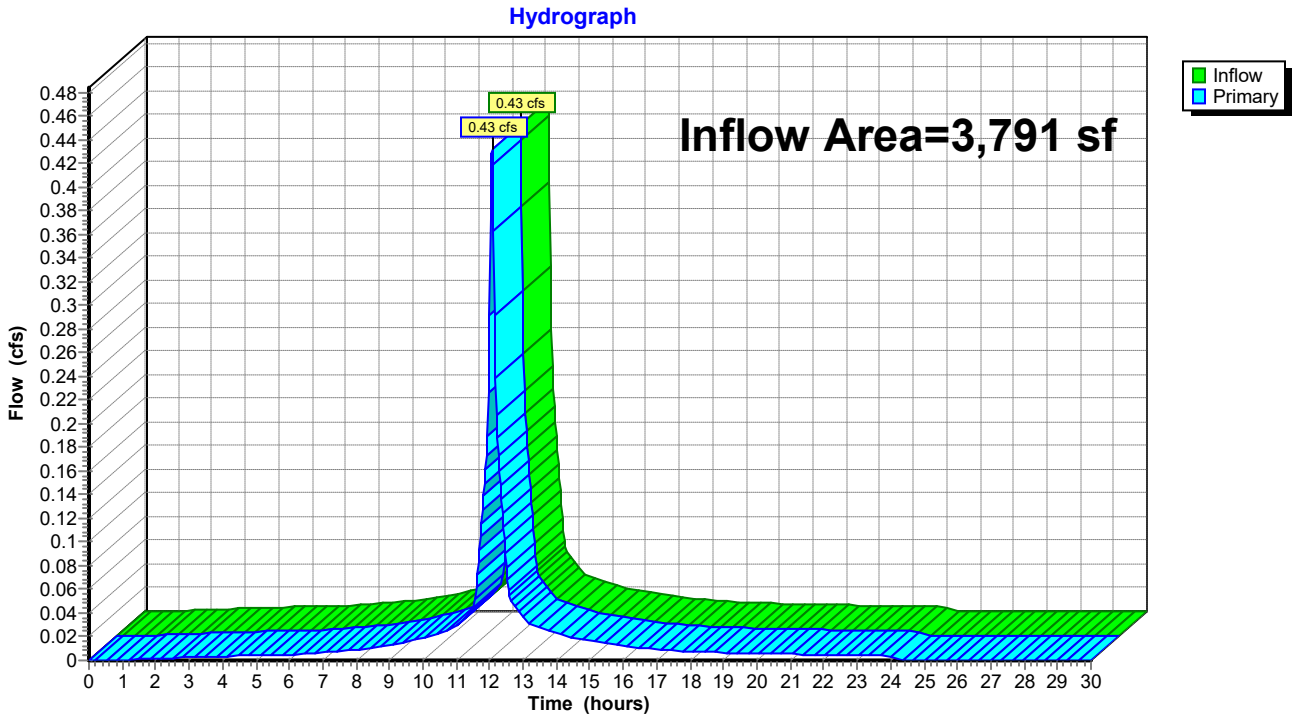


Summary for Link 3L: EXISTING

Inflow Area = 3,791 sf, 78.50% Impervious, Inflow Depth = 4.62" for 10-Year event
Inflow = 0.43 cfs @ 12.07 hrs, Volume= 1,459 cf
Primary = 0.43 cfs @ 12.07 hrs, Volume= 1,459 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: EXISTING



Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EX ROOF AREA Runoff Area=887 sf 100.00% Impervious Runoff Depth=6.21"
Tc=5.0 min CN=98 Runoff=0.13 cfs 459 cf

Subcatchment 2S: EX PAVED AREA Runoff Area=2,089 sf 100.00% Impervious Runoff Depth=6.21"
Tc=5.0 min CN=98 Runoff=0.31 cfs 1,081 cf

Subcatchment 4S: EX LANDSCAPE AREA Runoff Area=259 sf 0.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=69 Runoff=0.02 cfs 66 cf

Subcatchment 6S: EX. GRAVEL AREA Runoff Area=556 sf 0.00% Impervious Runoff Depth=4.73"
Tc=5.0 min CN=85 Runoff=0.07 cfs 219 cf

Link 3L: EXISTING Inflow=0.54 cfs 1,826 cf
Primary=0.54 cfs 1,826 cf

Total Runoff Area = 3,791 sf Runoff Volume = 1,826 cf Average Runoff Depth = 5.78"
21.50% Pervious = 815 sf 78.50% Impervious = 2,976 sf

Summary for Subcatchment 1S: EX ROOF AREA

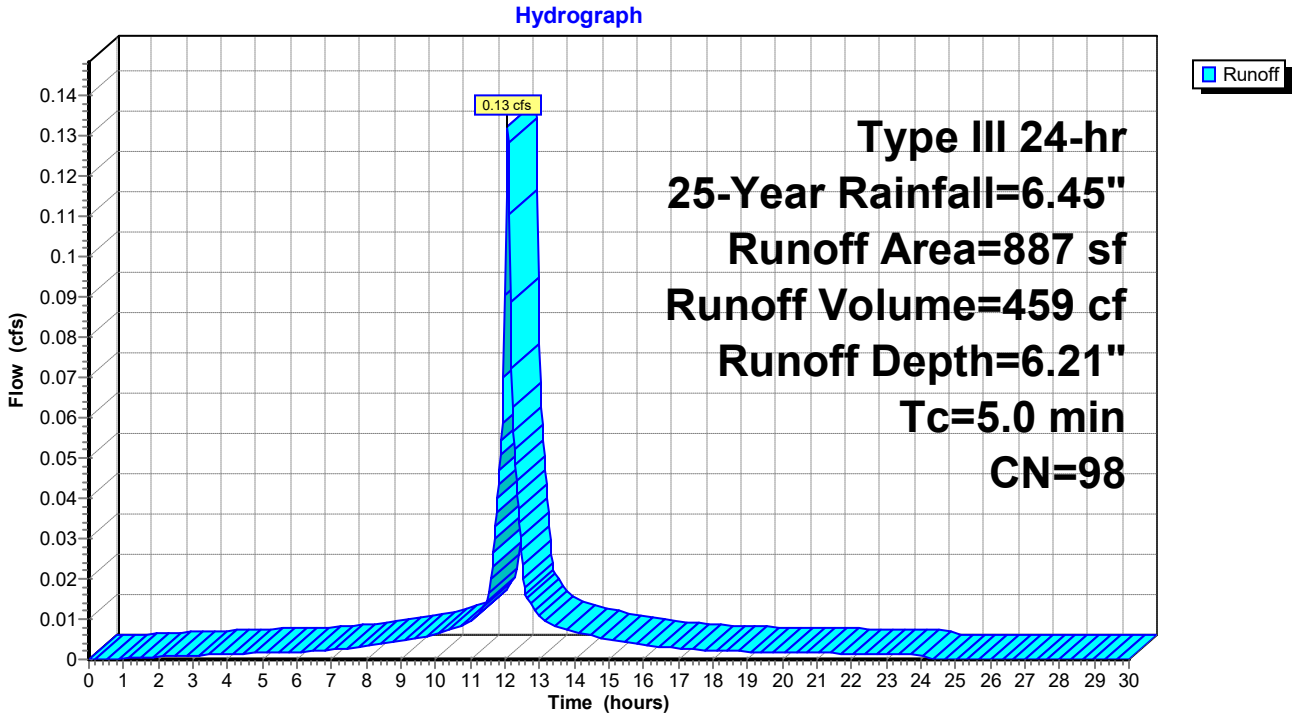
Runoff = 0.13 cfs @ 12.07 hrs, Volume= 459 cf, Depth= 6.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.45"

Area (sf)	CN	Description
887	98	Roofs, HSG B
887		100.00% Impervious Area

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

Subcatchment 1S: EX ROOF AREA



Summary for Subcatchment 2S: EX PAVED AREA

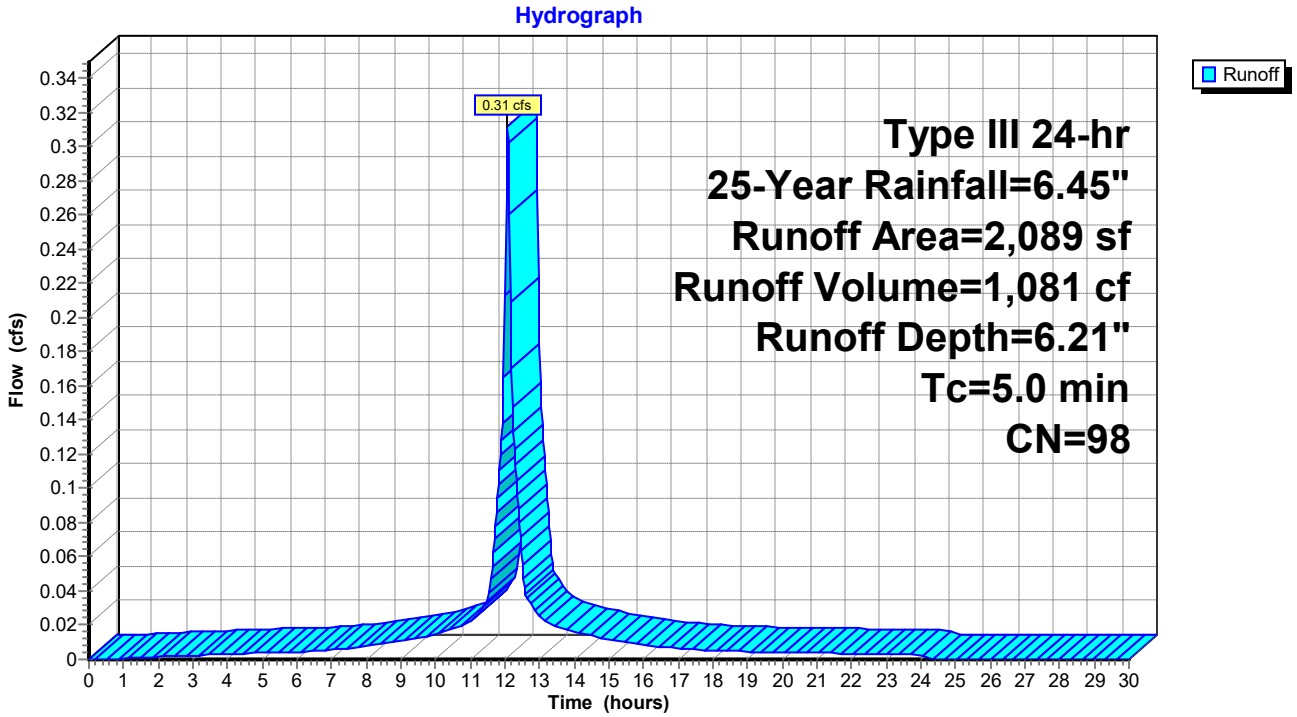
Runoff = 0.31 cfs @ 12.07 hrs, Volume= 1,081 cf, Depth= 6.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.45"

Area (sf)	CN	Description
2,089	98	Paved parking, HSG B
2,089		100.00% Impervious Area

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

Subcatchment 2S: EX PAVED AREA



Summary for Subcatchment 4S: EX LANDSCAPE AREA

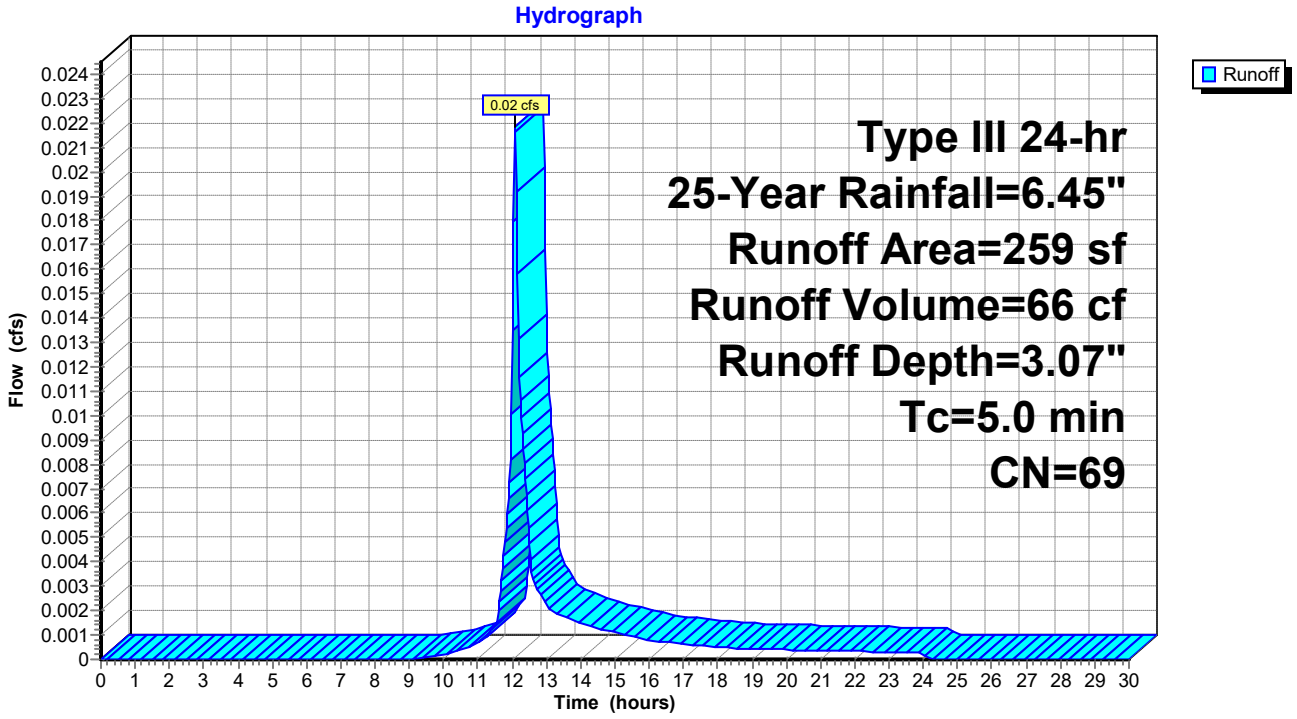
Runoff = 0.02 cfs @ 12.08 hrs, Volume= 66 cf, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.45"

Area (sf)	CN	Description
259	69	50-75% Grass cover, Fair, HSG B
259		100.00% Pervious Area

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

Subcatchment 4S: EX LANDSCAPE AREA



Summary for Subcatchment 6S: EX. GRAVEL AREA

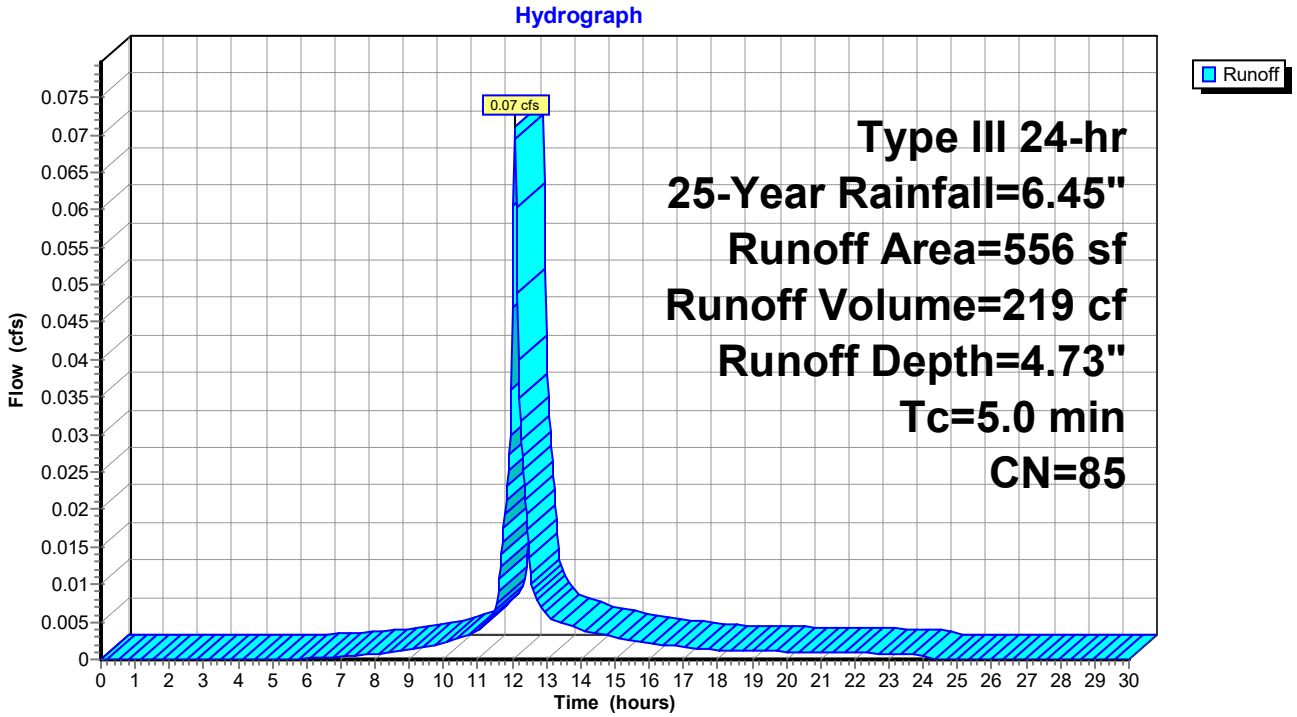
Runoff = 0.07 cfs @ 12.07 hrs, Volume= 219 cf, Depth= 4.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.45"

Area (sf)	CN	Description
556	85	Gravel roads, HSG B
556		100.00% Pervious Area

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

Subcatchment 6S: EX. GRAVEL AREA

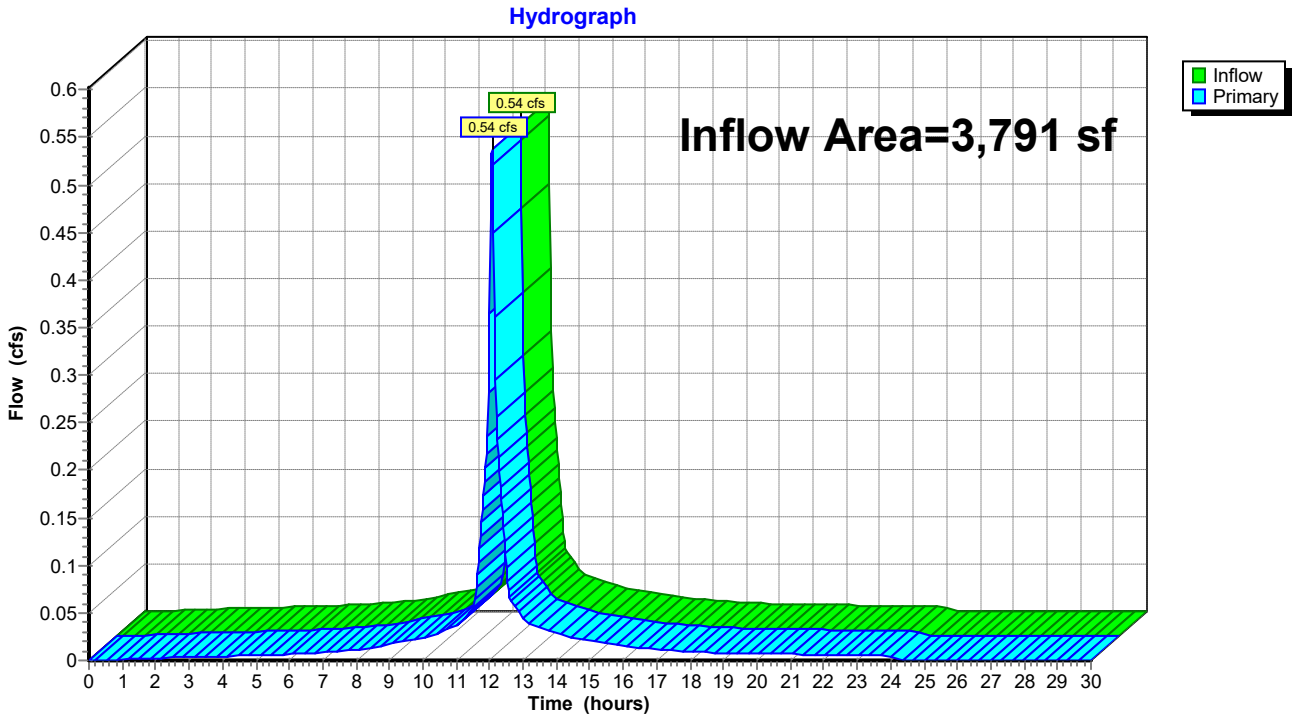


Summary for Link 3L: EXISTING

Inflow Area = 3,791 sf, 78.50% Impervious, Inflow Depth = 5.78" for 25-Year event
Inflow = 0.54 cfs @ 12.07 hrs, Volume= 1,826 cf
Primary = 0.54 cfs @ 12.07 hrs, Volume= 1,826 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: EXISTING



Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EX ROOF AREA Runoff Area=887 sf 100.00% Impervious Runoff Depth=8.05"
Tc=5.0 min CN=98 Runoff=0.17 cfs 595 cf

Subcatchment 2S: EX PAVED AREA Runoff Area=2,089 sf 100.00% Impervious Runoff Depth=8.05"
Tc=5.0 min CN=98 Runoff=0.40 cfs 1,401 cf

Subcatchment 4S: EX LANDSCAPE AREA Runoff Area=259 sf 0.00% Impervious Runoff Depth=4.60"
Tc=5.0 min CN=69 Runoff=0.03 cfs 99 cf

Subcatchment 6S: EX. GRAVEL AREA Runoff Area=556 sf 0.00% Impervious Runoff Depth=6.49"
Tc=5.0 min CN=85 Runoff=0.10 cfs 301 cf

Link 3L: EXISTING Inflow=0.70 cfs 2,396 cf
Primary=0.70 cfs 2,396 cf

Total Runoff Area = 3,791 sf Runoff Volume = 2,396 cf Average Runoff Depth = 7.59"
21.50% Pervious = 815 sf 78.50% Impervious = 2,976 sf

Summary for Subcatchment 1S: EX ROOF AREA

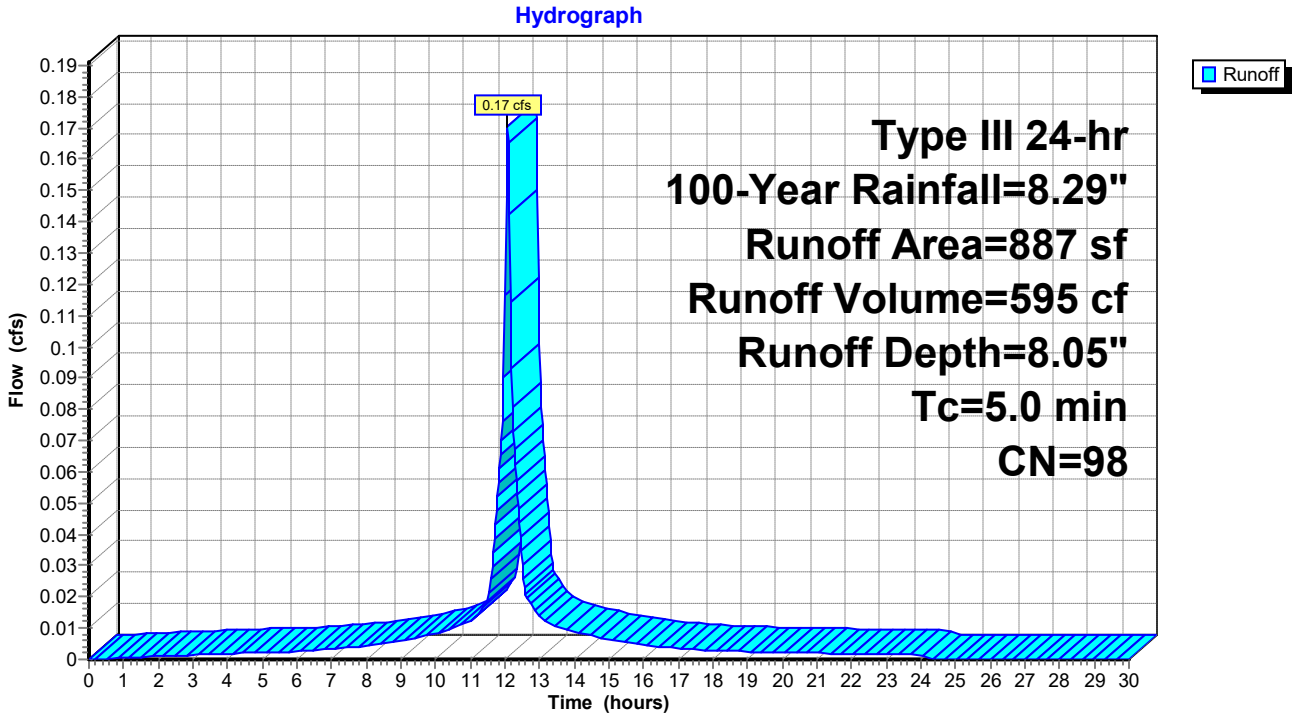
Runoff = 0.17 cfs @ 12.07 hrs, Volume= 595 cf, Depth= 8.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.29"

Area (sf)	CN	Description
887	98	Roofs, HSG B
887		100.00% Impervious Area

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

Subcatchment 1S: EX ROOF AREA



Summary for Subcatchment 2S: EX PAVED AREA

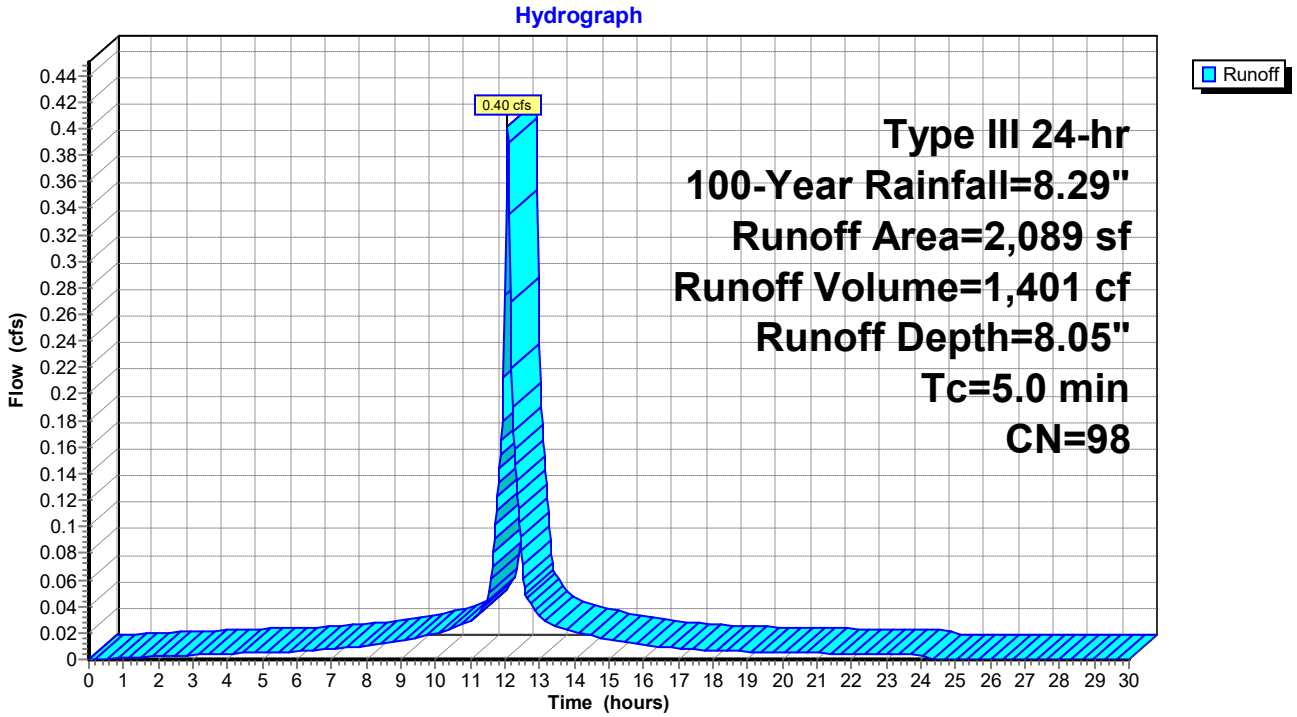
Runoff = 0.40 cfs @ 12.07 hrs, Volume= 1,401 cf, Depth= 8.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.29"

Area (sf)	CN	Description
2,089	98	Paved parking, HSG B
2,089		100.00% Impervious Area

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

Subcatchment 2S: EX PAVED AREA



Summary for Subcatchment 4S: EX LANDSCAPE AREA

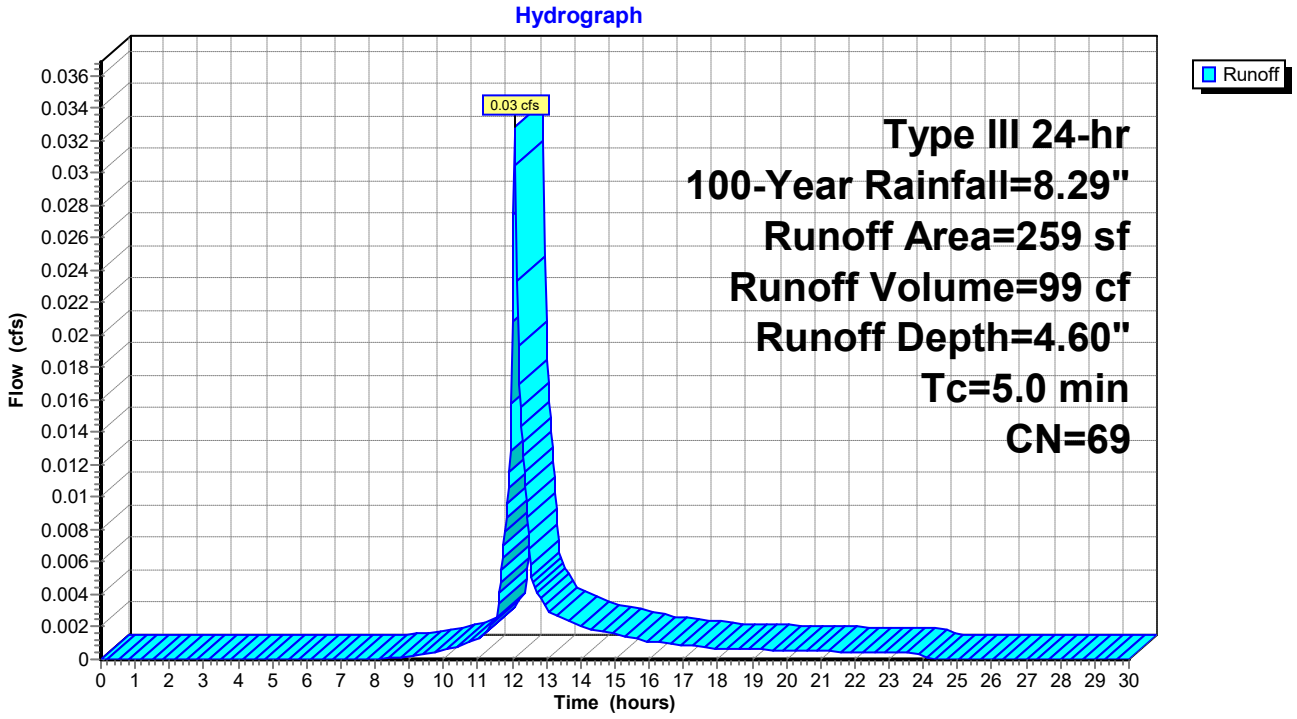
Runoff = 0.03 cfs @ 12.08 hrs, Volume= 99 cf, Depth= 4.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.29"

Area (sf)	CN	Description
259	69	50-75% Grass cover, Fair, HSG B
259		100.00% Pervious Area

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

Subcatchment 4S: EX LANDSCAPE AREA



Summary for Subcatchment 6S: EX. GRAVEL AREA

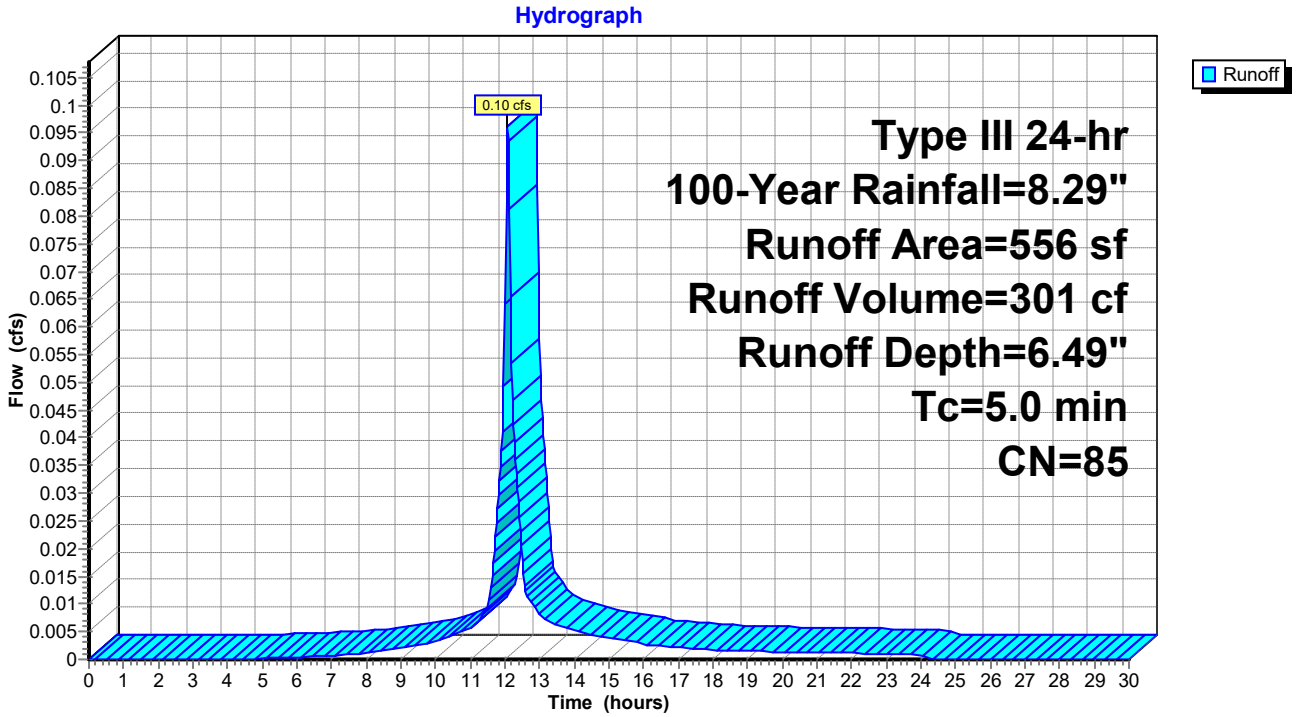
Runoff = 0.10 cfs @ 12.07 hrs, Volume= 301 cf, Depth= 6.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.29"

Area (sf)	CN	Description
556	85	Gravel roads, HSG B
556		100.00% Pervious Area

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

Subcatchment 6S: EX. GRAVEL AREA

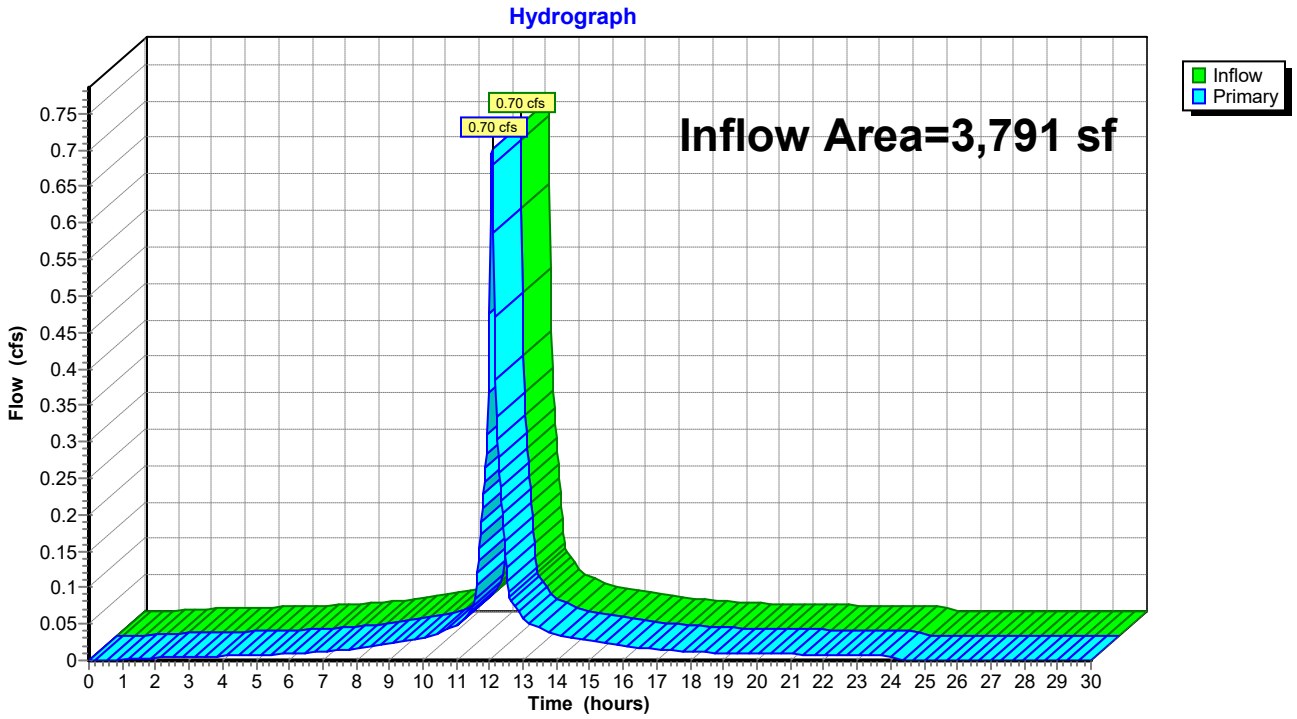


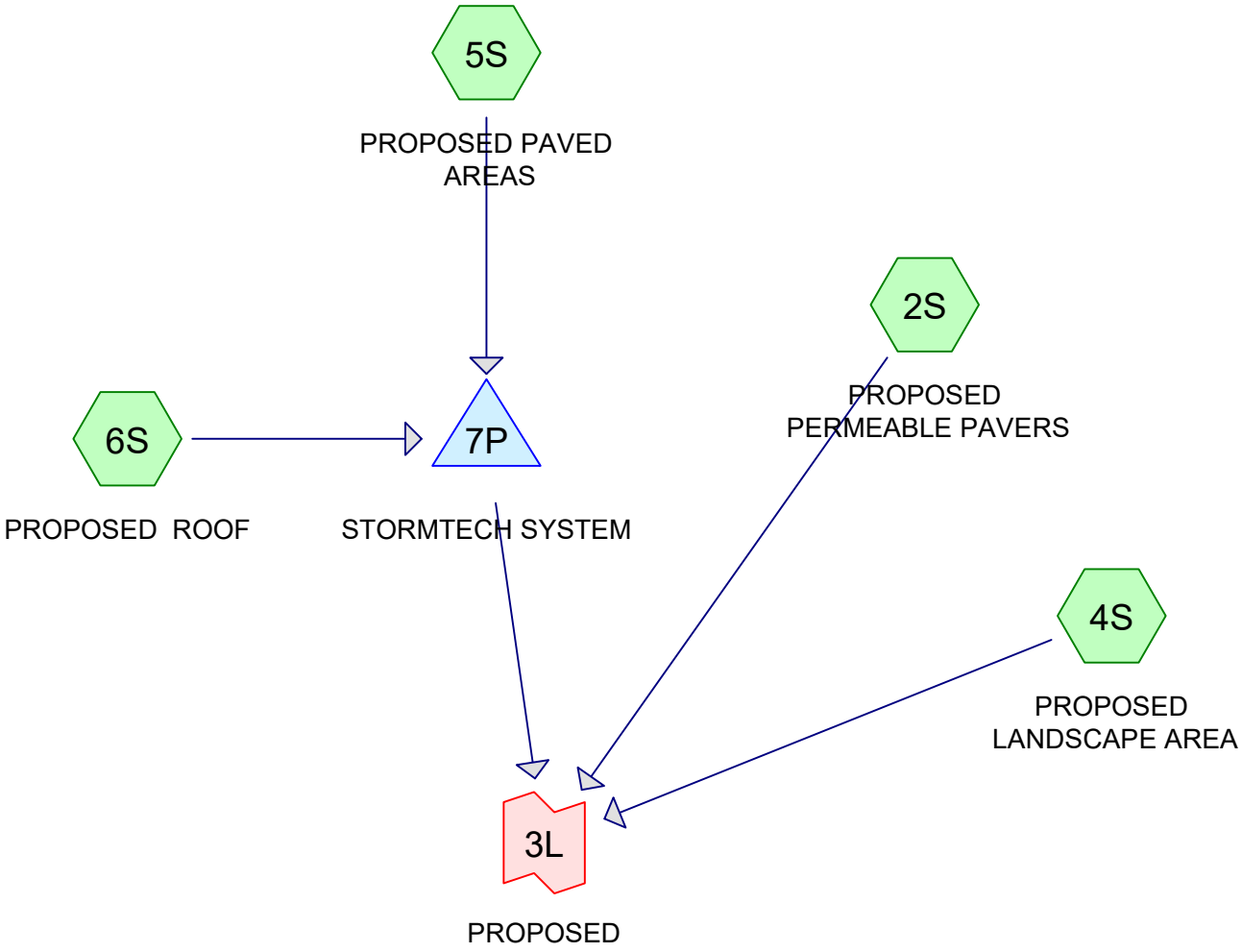
Summary for Link 3L: EXISTING

Inflow Area = 3,791 sf, 78.50% Impervious, Inflow Depth = 7.59" for 100-Year event
Inflow = 0.70 cfs @ 12.07 hrs, Volume= 2,396 cf
Primary = 0.70 cfs @ 12.07 hrs, Volume= 2,396 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: EXISTING





Subcat Reach Pond Link

Routing Diagram for PROPOSED
Prepared by SPRUHAN ENGINEERING P.E., Printed 6/13/2022

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
309	69	50-75% Grass cover, Fair, HSG B (4S)
948	98	Paved parking, HSG B (5S)
219	85	Permeable Pavers (2S)
2,316	98	Roofs, HSG B (6S)
3,792	**95**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
3,573	HSG B	4S, 5S, 6S
0	HSG C	
0	HSG D	
219	Other	2S
3,792		**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: PROPOSED PERMEABLE Runoff Area=219 sf 0.00% Impervious Runoff Depth=1.89"
Tc=15.0 min CN=85 Runoff=0.01 cfs 34 cf

Subcatchment 4S: PROPOSED LANDSCAPE Runoff Area=309 sf 0.00% Impervious Runoff Depth=0.87"
Tc=5.0 min CN=69 Runoff=0.01 cfs 22 cf

Subcatchment 5S: PROPOSED PAVED Runoff Area=948 sf 100.00% Impervious Runoff Depth=3.12"
Tc=5.0 min CN=98 Runoff=0.07 cfs 246 cf

Subcatchment 6S: PROPOSED ROOF Runoff Area=2,316 sf 100.00% Impervious Runoff Depth=3.12"
Tc=5.0 min CN=98 Runoff=0.18 cfs 602 cf

Pond 7P: STORMTECH SYSTEM Peak Elev=38.14' Storage=279 cf Inflow=0.25 cfs 848 cf
Discarded=0.03 cfs 848 cf Primary=0.00 cfs 0 cf Outflow=0.03 cfs 848 cf

Link 3L: PROPOSED Inflow=0.01 cfs 57 cf
Primary=0.01 cfs 57 cf

Total Runoff Area = 3,792 sf Runoff Volume = 905 cf Average Runoff Depth = 2.86"
13.92% Pervious = 528 sf 86.08% Impervious = 3,264 sf

Summary for Subcatchment 2S: PROPOSED PERMEABLE PAVERS

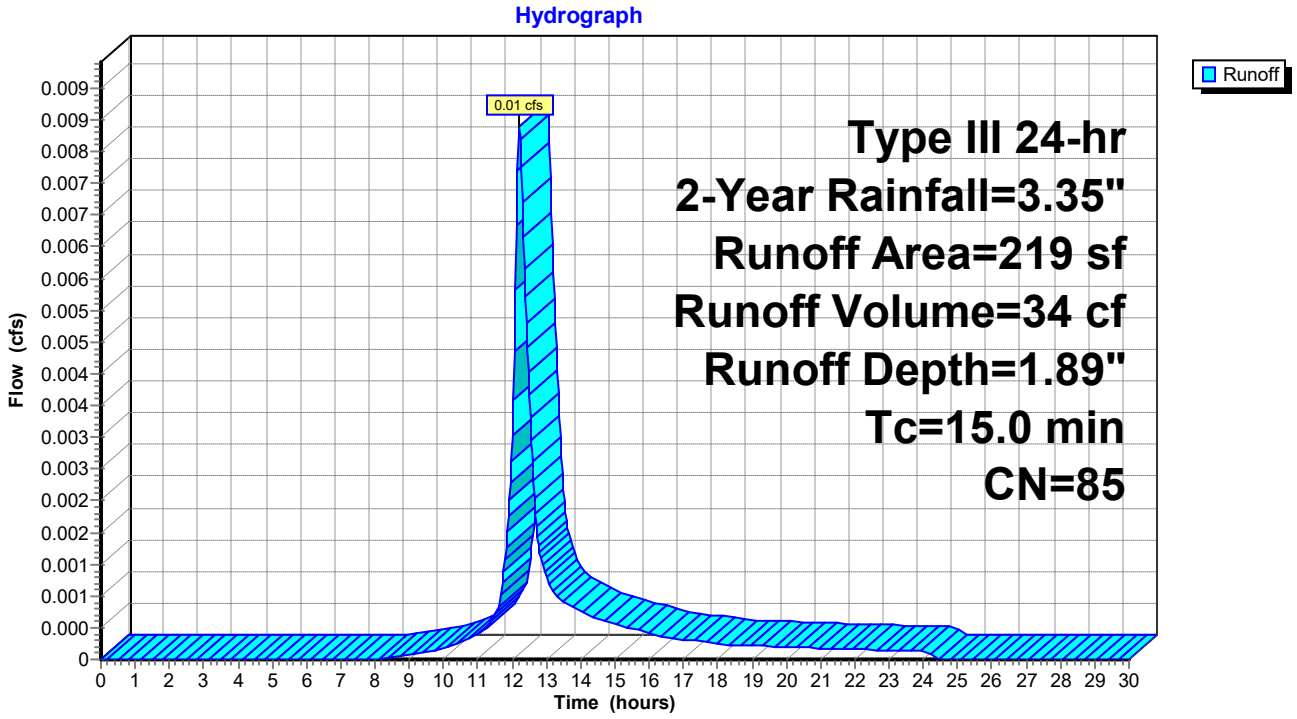
Runoff = 0.01 cfs @ 12.21 hrs, Volume= 34 cf, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.35"

	Area (sf)	CN	Description
*	219	85	Permeable Pavers
	219		100.00% Pervious Area

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

Subcatchment 2S: PROPOSED PERMEABLE PAVERS



Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

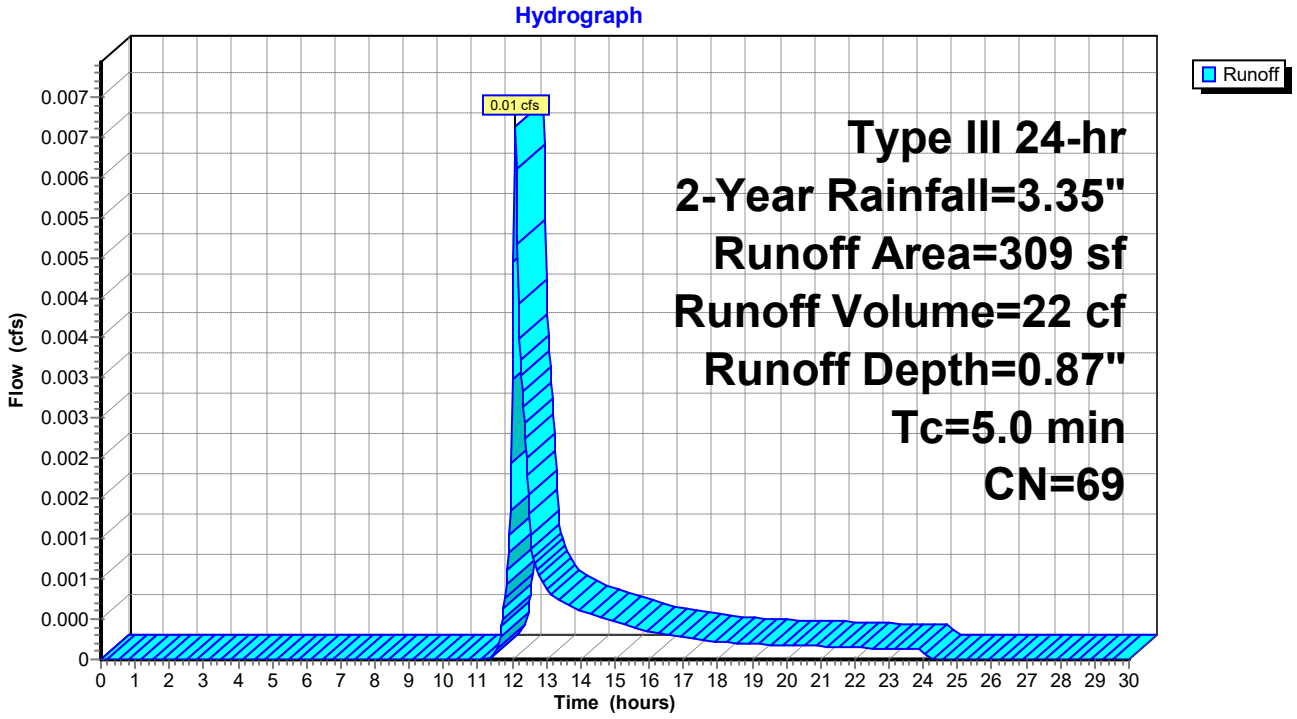
Runoff = 0.01 cfs @ 12.09 hrs, Volume= 22 cf, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.35"

Area (sf)	CN	Description
309	69	50-75% Grass cover, Fair, HSG B
309		100.00% Pervious Area

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

Subcatchment 4S: PROPOSED LANDSCAPE AREA



Summary for Subcatchment 5S: PROPOSED PAVED AREAS

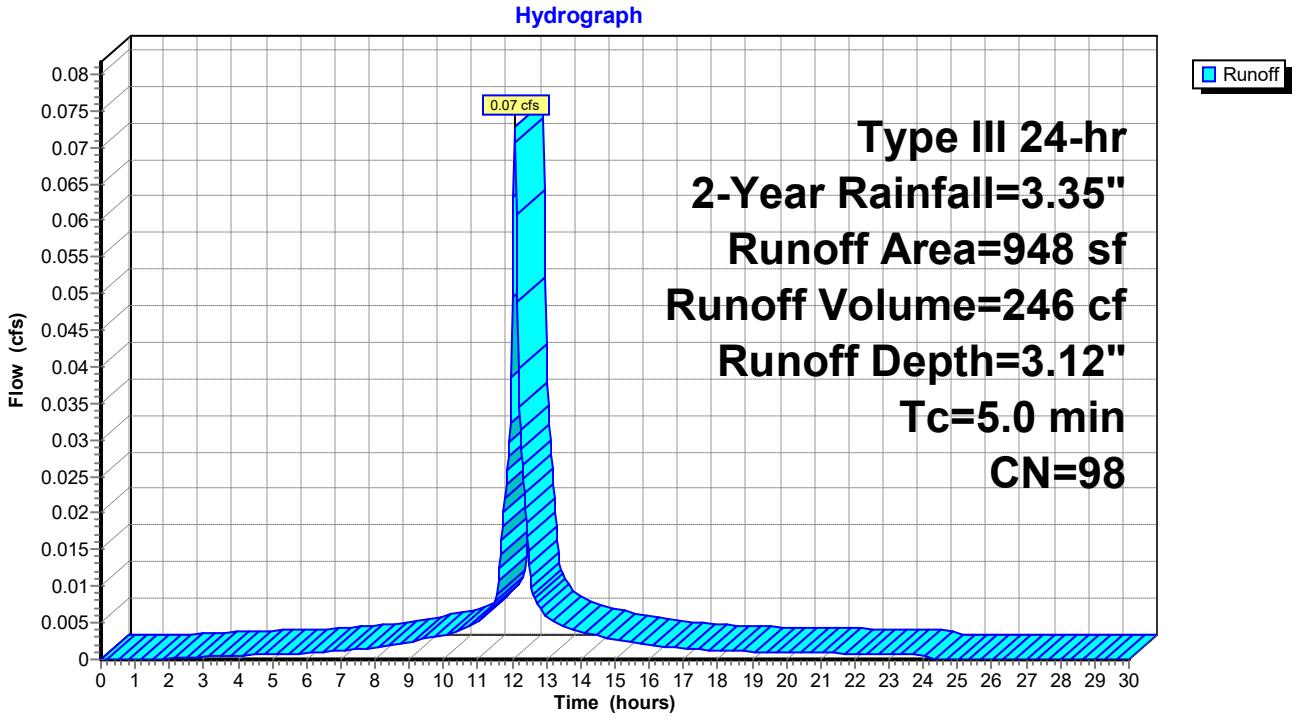
Runoff = 0.07 cfs @ 12.07 hrs, Volume= 246 cf, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.35"

Area (sf)	CN	Description
948	98	Paved parking, HSG B
948		100.00% Impervious Area

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

Subcatchment 5S: PROPOSED PAVED AREAS



Summary for Subcatchment 6S: PROPOSED ROOF

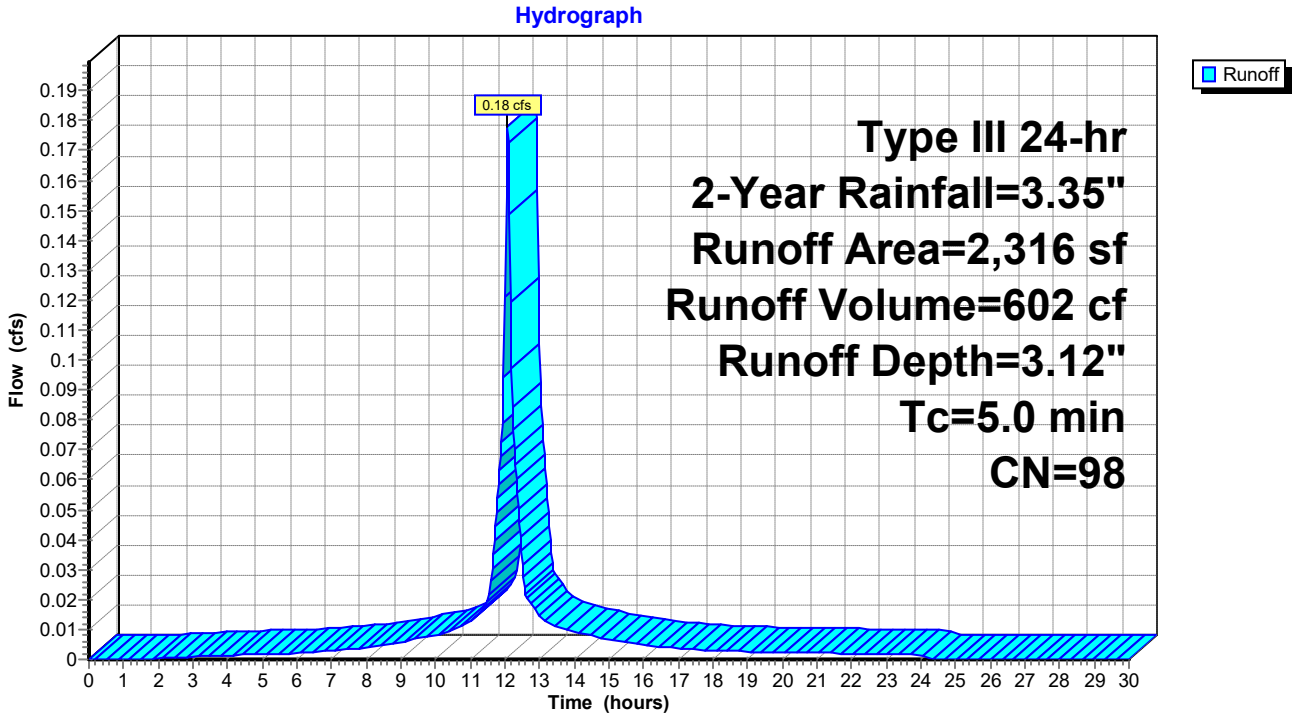
Runoff = 0.18 cfs @ 12.07 hrs, Volume= 602 cf, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.35"

Area (sf)	CN	Description
2,316	98	Roofs, HSG B
2,316		100.00% Impervious Area

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

Subcatchment 6S: PROPOSED ROOF



Summary for Pond 7P: STORMTECH SYSTEM

Inflow Area = 3,264 sf,100.00% Impervious, Inflow Depth = 3.12" for 2-Year event
Inflow = 0.25 cfs @ 12.07 hrs, Volume= 848 cf
Outflow = 0.03 cfs @ 12.61 hrs, Volume= 848 cf, Atten= 88%, Lag= 32.7 min
Discarded = 0.03 cfs @ 12.61 hrs, Volume= 848 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 38.14' @ 12.61 hrs Surf.Area= 388 sf Storage= 279 cf

Plug-Flow detention time= 66.2 min calculated for 848 cf (100% of inflow)
Center-of-Mass det. time= 66.1 min (820.7 - 754.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	36.50'	458 cf	**35.08'W x 11.06'L x 4.00'H Field A** 1,552 cf Overall - 244 cf Embedded = 1,308 cf x 35.0% Voids
#2A	37.50'	244 cf	**ADS_StormTech SC-740** x 5 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 5 rows
#3	40.50'	15 cf	**Ponding** Listed below -Impervious
		717 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Cum.Store (cubic-feet)
40.50	0
42.00	10
42.20	15

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	40.40'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 12.61 hrs HW=38.14' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=36.50' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 7P: STORMTECH SYSTEM - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 (ADS StormTech® SC-740 without end caps)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 5 rows

51.0" Wide + 24.0" Spacing = 75.0" C-C Row Spacing

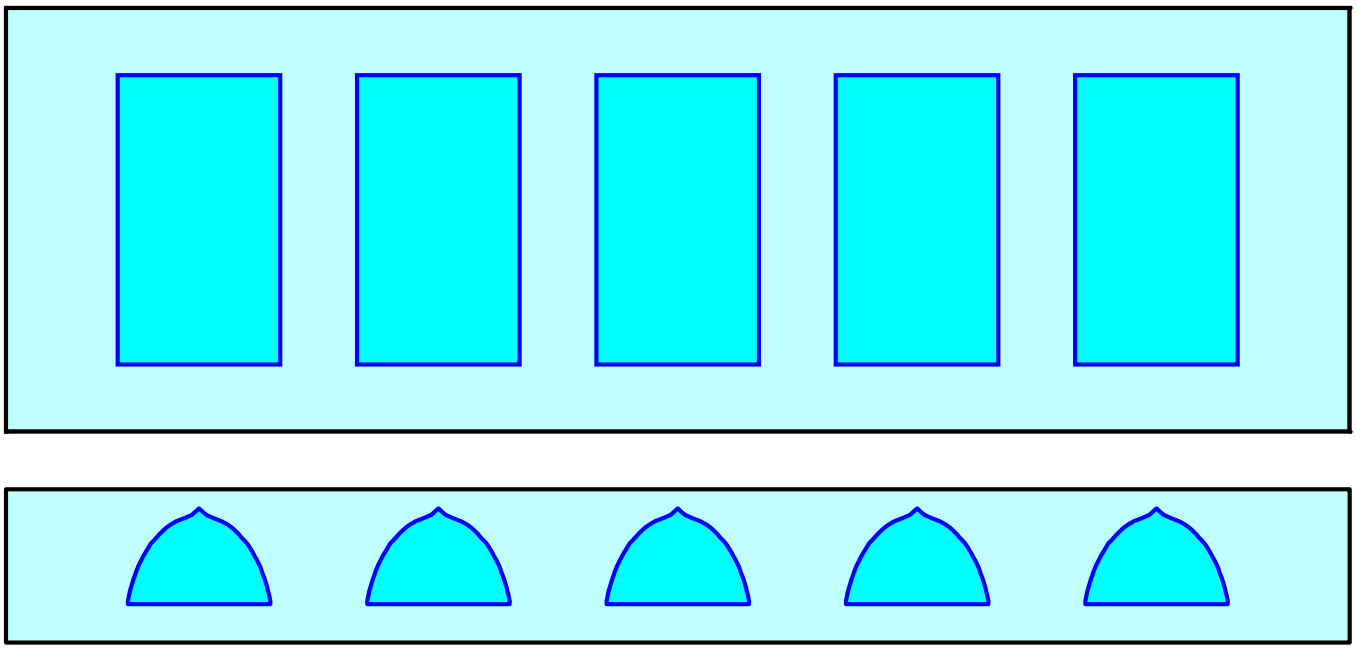
1 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 7.56' Row Length +21.0" End Stone x 2 = 11.06' Base Length
5 Rows x 51.0" Wide + 24.0" Spacing x 4 + 35.0" Side Stone x 2 = 35.08' Base Width
12.0" Base + 30.0" Chamber Height + 6.0" Cover = 4.00' Field Height

5 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 5 Rows = 243.8 cf Chamber Storage

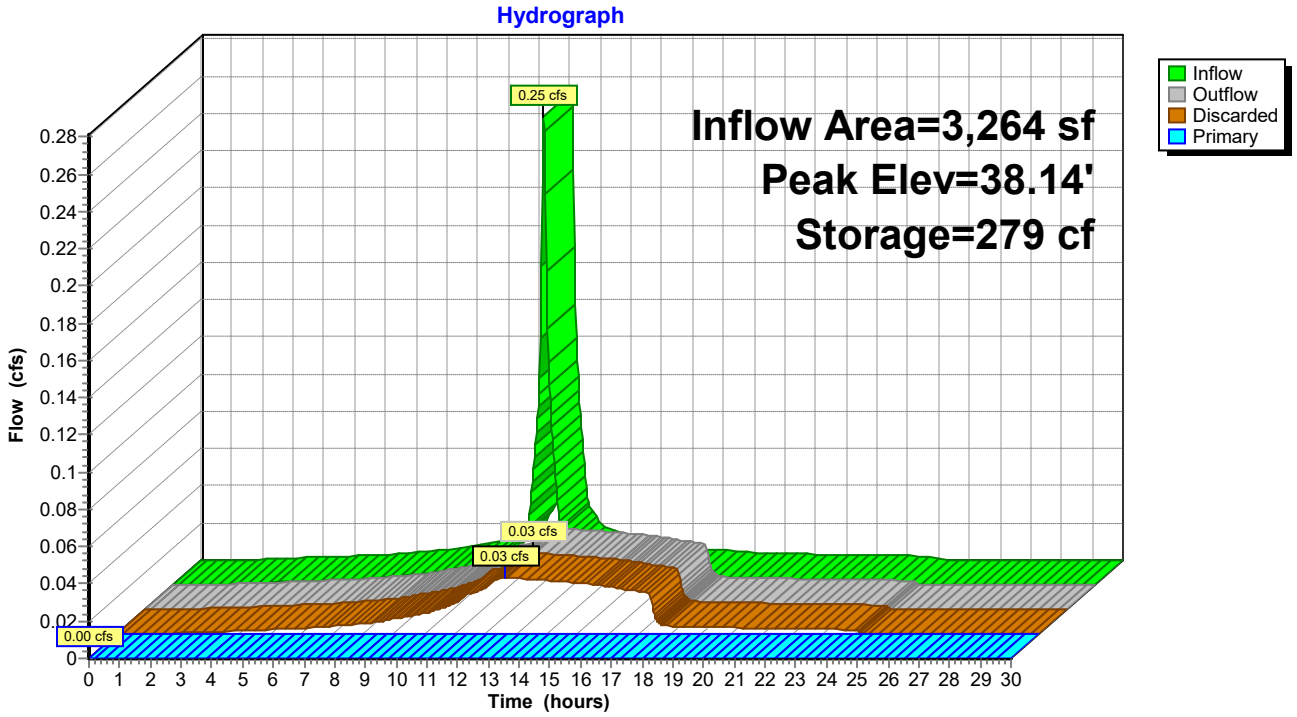
1,551.9 cf Field - 243.8 cf Chambers = 1,308.0 cf Stone x 35.0% Voids = 457.8 cf Stone Storage

Chamber Storage + Stone Storage = 701.6 cf = 0.016 af
Overall Storage Efficiency = 45.2%
Overall System Size = 11.06' x 35.08' x 4.00'

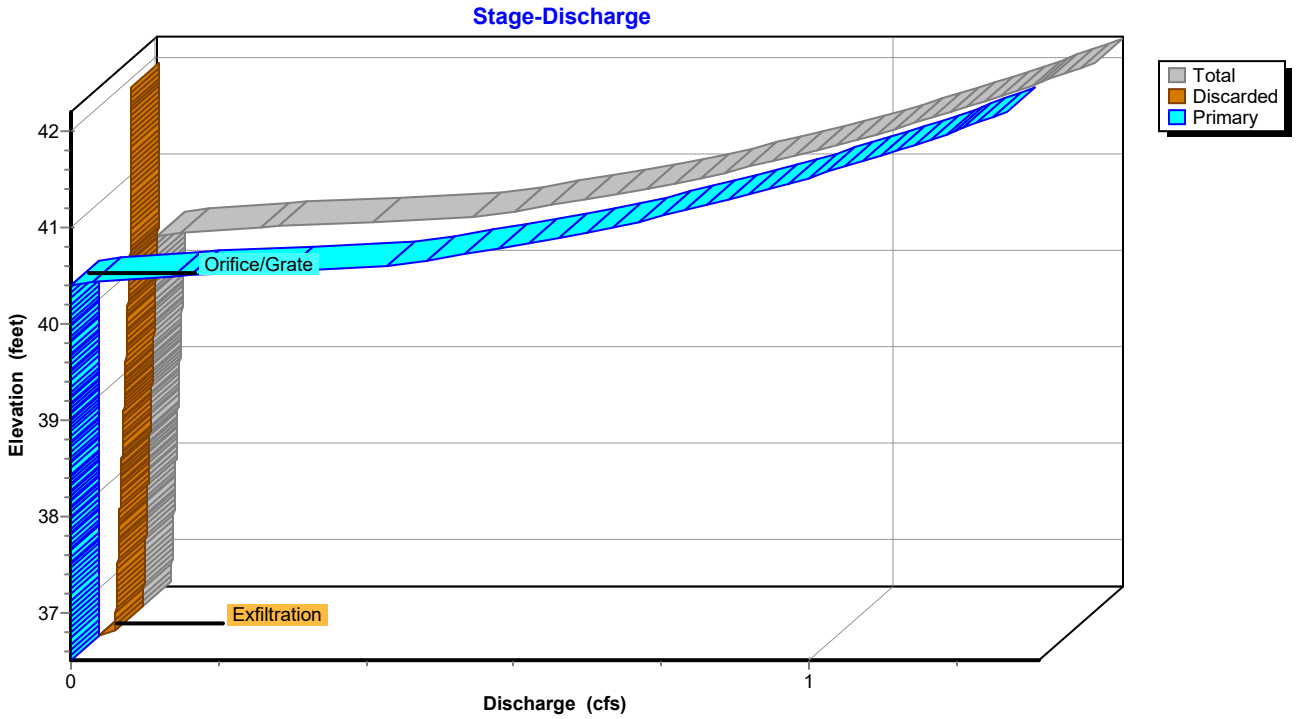
5 Chambers
57.5 cy Field
48.4 cy Stone



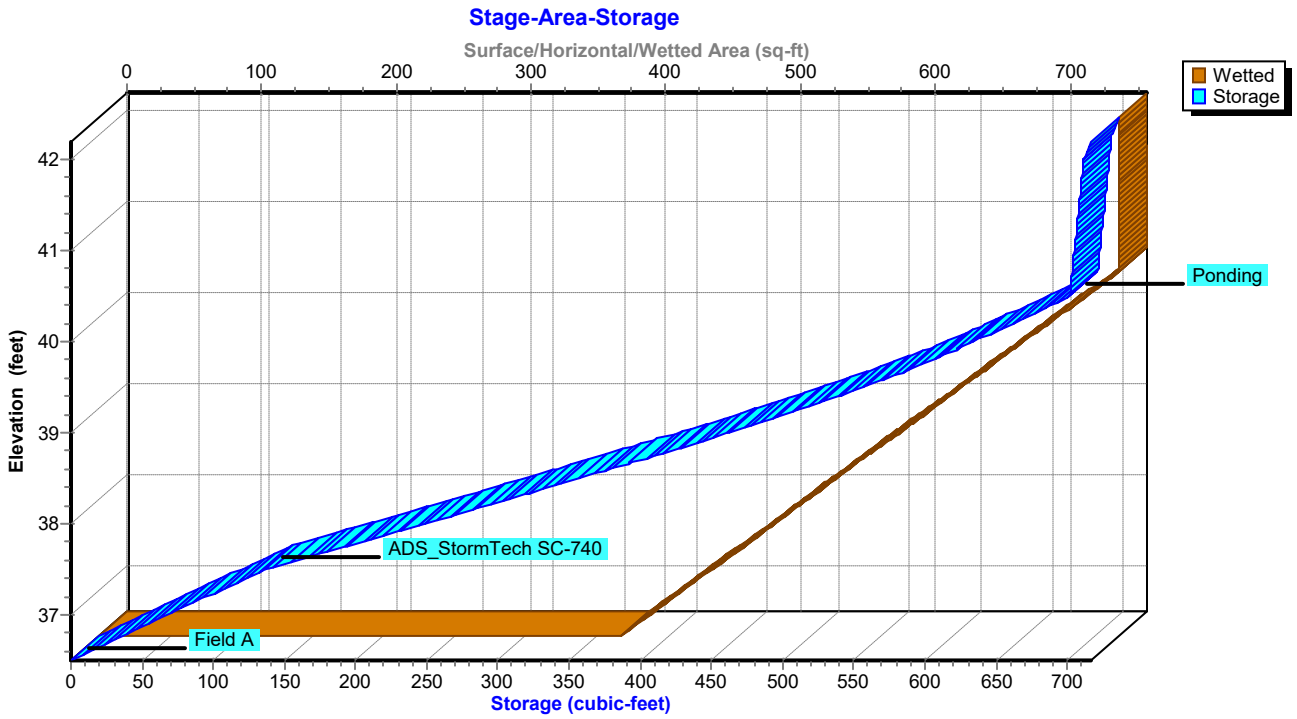
Pond 7P: STORMTECH SYSTEM



Pond 7P: STORMTECH SYSTEM



Pond 7P: STORMTECH SYSTEM

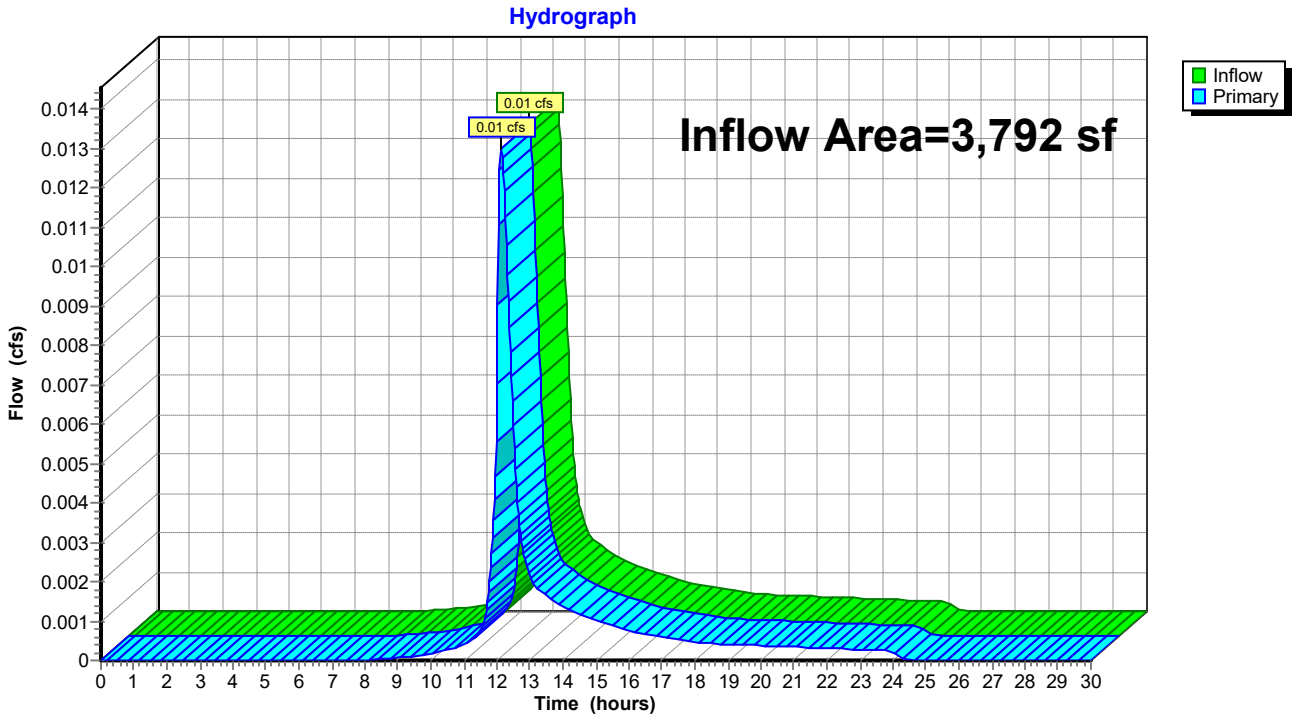


Summary for Link 3L: PROPOSED

Inflow Area = 3,792 sf, 86.08% Impervious, Inflow Depth = 0.18" for 2-Year event
Inflow = 0.01 cfs @ 12.13 hrs, Volume= 57 cf
Primary = 0.01 cfs @ 12.13 hrs, Volume= 57 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: PROPOSED



Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: PROPOSED PERMEABLE Runoff Area=219 sf 0.00% Impervious Runoff Depth=3.61"
Tc=15.0 min CN=85 Runoff=0.02 cfs 66 cf

Subcatchment 4S: PROPOSED LANDSCAPE Runoff Area=309 sf 0.00% Impervious Runoff Depth=2.15"
Tc=5.0 min CN=69 Runoff=0.02 cfs 55 cf

Subcatchment 5S: PROPOSED PAVED Runoff Area=948 sf 100.00% Impervious Runoff Depth=5.02"
Tc=5.0 min CN=98 Runoff=0.12 cfs 397 cf

Subcatchment 6S: PROPOSED ROOF Runoff Area=2,316 sf 100.00% Impervious Runoff Depth=5.02"
Tc=5.0 min CN=98 Runoff=0.28 cfs 969 cf

Pond 7P: STORMTECH SYSTEM Peak Elev=39.28' Storage=515 cf Inflow=0.40 cfs 1,366 cf
Discarded=0.04 cfs 1,366 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 1,366 cf

Link 3L: PROPOSED Inflow=0.03 cfs 121 cf
Primary=0.03 cfs 121 cf

Total Runoff Area = 3,792 sf Runoff Volume = 1,487 cf Average Runoff Depth = 4.71"
13.92% Pervious = 528 sf 86.08% Impervious = 3,264 sf

Summary for Subcatchment 2S: PROPOSED PERMEABLE PAVERS

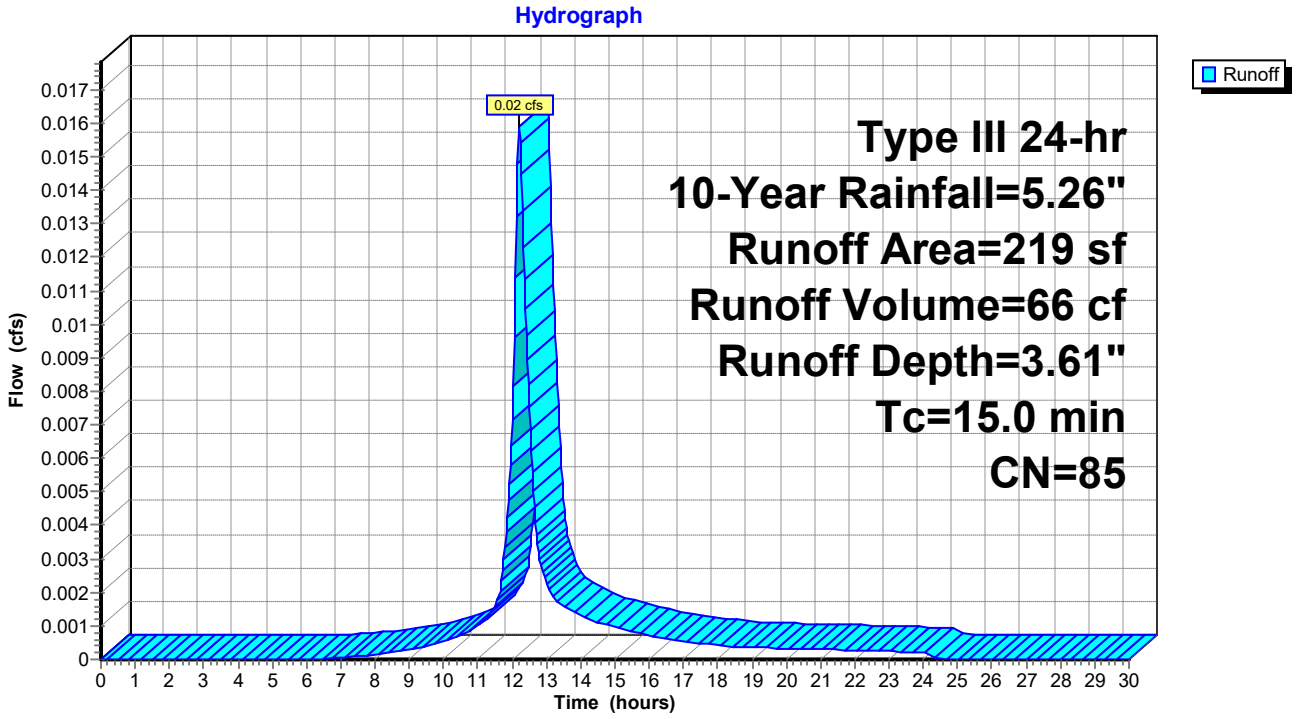
Runoff = 0.02 cfs @ 12.20 hrs, Volume= 66 cf, Depth= 3.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.26"

	Area (sf)	CN	Description
*	219	85	Permeable Pavers
	219		100.00% Pervious Area

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

Subcatchment 2S: PROPOSED PERMEABLE PAVERS



Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

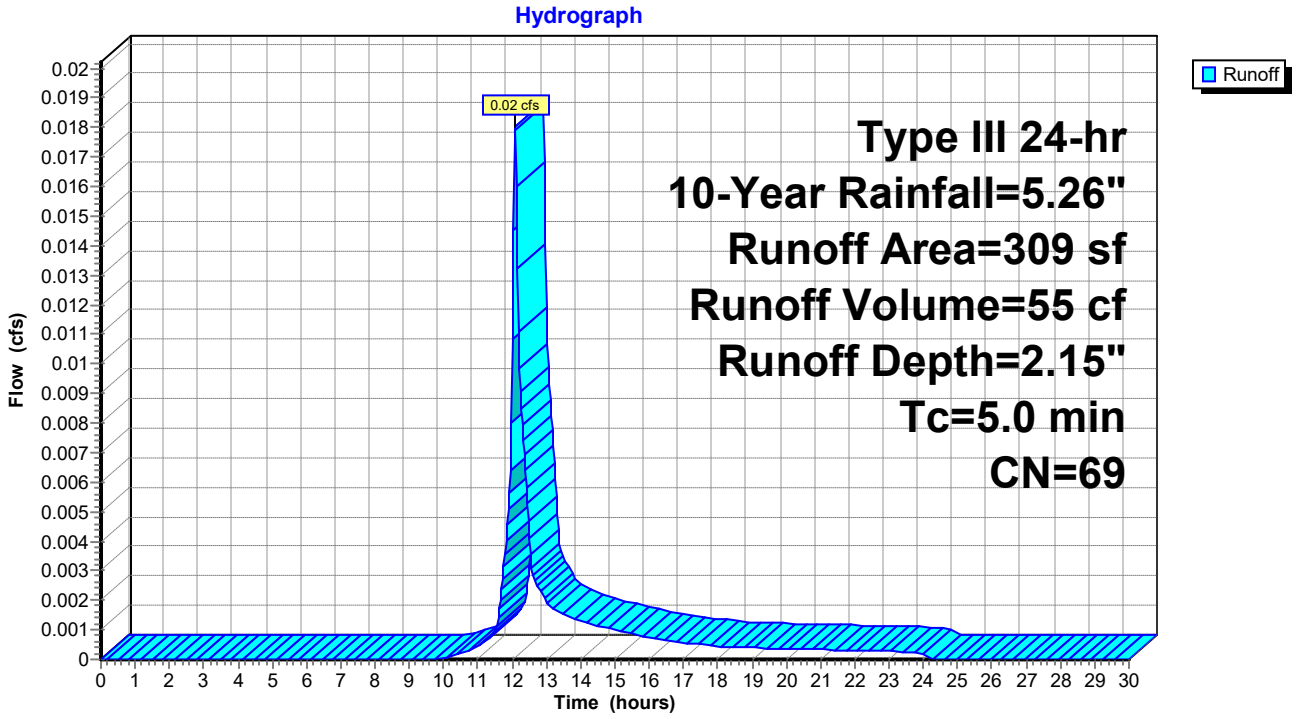
Runoff = 0.02 cfs @ 12.08 hrs, Volume= 55 cf, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.26"

Area (sf)	CN	Description
309	69	50-75% Grass cover, Fair, HSG B
309		100.00% Pervious Area

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

Subcatchment 4S: PROPOSED LANDSCAPE AREA



Summary for Subcatchment 5S: PROPOSED PAVED AREAS

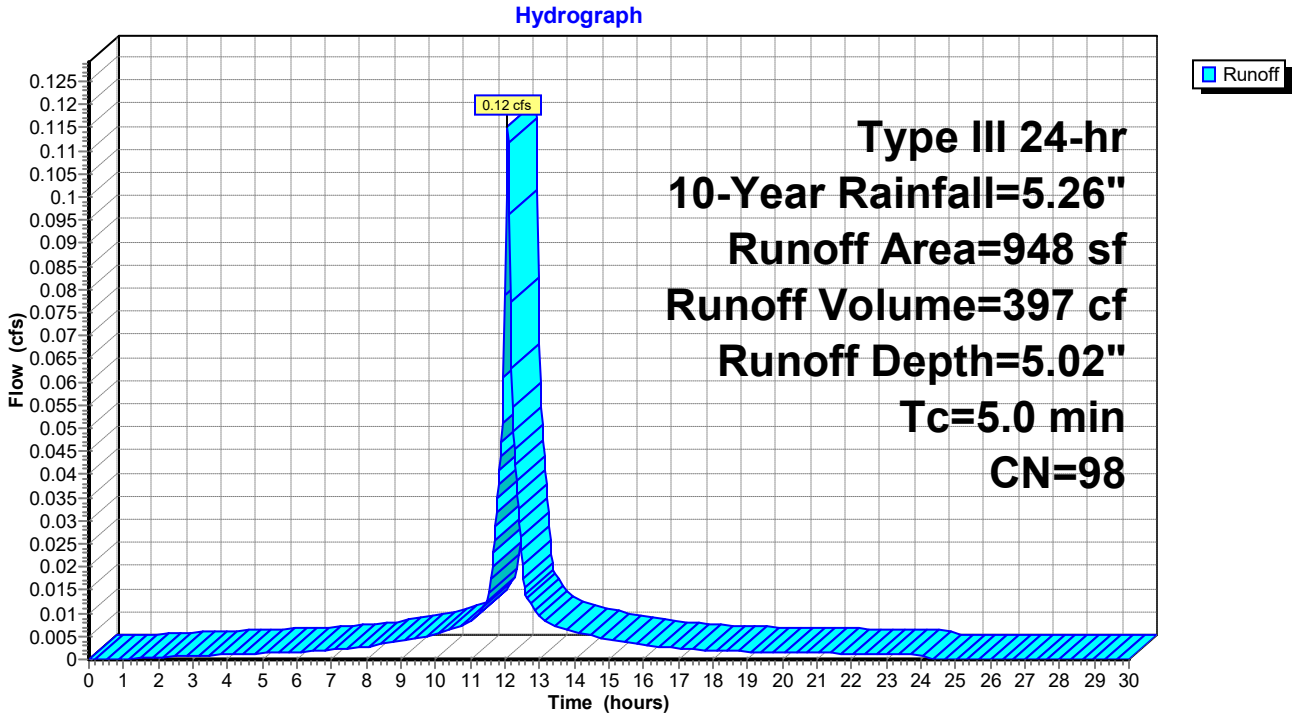
Runoff = 0.12 cfs @ 12.07 hrs, Volume= 397 cf, Depth= 5.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.26"

Area (sf)	CN	Description
948	98	Paved parking, HSG B
948		100.00% Impervious Area

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

Subcatchment 5S: PROPOSED PAVED AREAS



Summary for Subcatchment 6S: PROPOSED ROOF

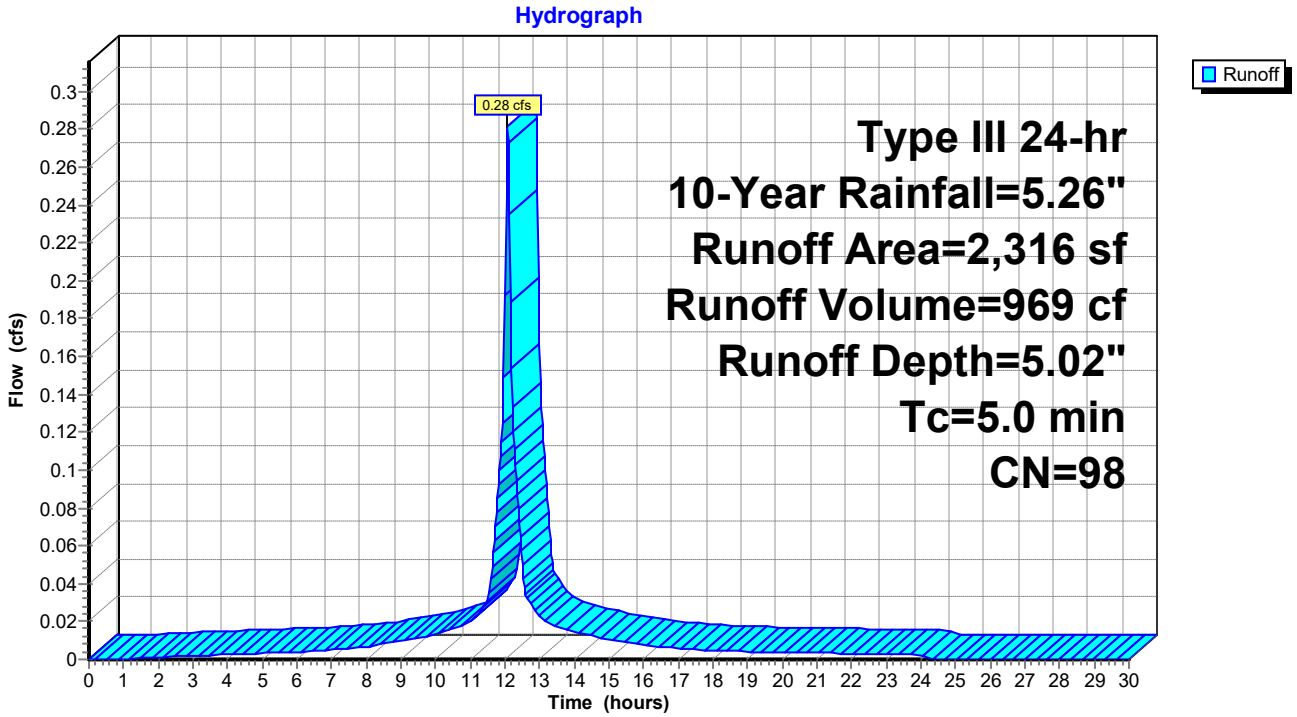
Runoff = 0.28 cfs @ 12.07 hrs, Volume= 969 cf, Depth= 5.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.26"

Area (sf)	CN	Description
2,316	98	Roofs, HSG B
2,316		100.00% Impervious Area

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

Subcatchment 6S: PROPOSED ROOF



Summary for Pond 7P: STORMTECH SYSTEM

Inflow Area = 3,264 sf,100.00% Impervious, Inflow Depth = 5.02" for 10-Year event
Inflow = 0.40 cfs @ 12.07 hrs, Volume= 1,366 cf
Outflow = 0.04 cfs @ 12.89 hrs, Volume= 1,366 cf, Atten= 91%, Lag= 48.9 min
Discarded = 0.04 cfs @ 12.89 hrs, Volume= 1,366 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 39.28' @ 12.89 hrs Surf.Area= 388 sf Storage= 515 cf

Plug-Flow detention time= 117.0 min calculated for 1,366 cf (100% of inflow)
Center-of-Mass det. time= 116.9 min (863.2 - 746.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	36.50'	458 cf	**35.08'W x 11.06'L x 4.00'H Field A** 1,552 cf Overall - 244 cf Embedded = 1,308 cf x 35.0% Voids
#2A	37.50'	244 cf	**ADS_StormTech SC-740** x 5 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 5 rows
#3	40.50'	15 cf	**Ponding** Listed below -Impervious
		717 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Cum.Store (cubic-feet)
40.50	0
42.00	10
42.20	15

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	40.40'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.89 hrs HW=39.28' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=36.50' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 7P: STORMTECH SYSTEM - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 (ADS StormTech® SC-740 without end caps)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 5 rows

51.0" Wide + 24.0" Spacing = 75.0" C-C Row Spacing

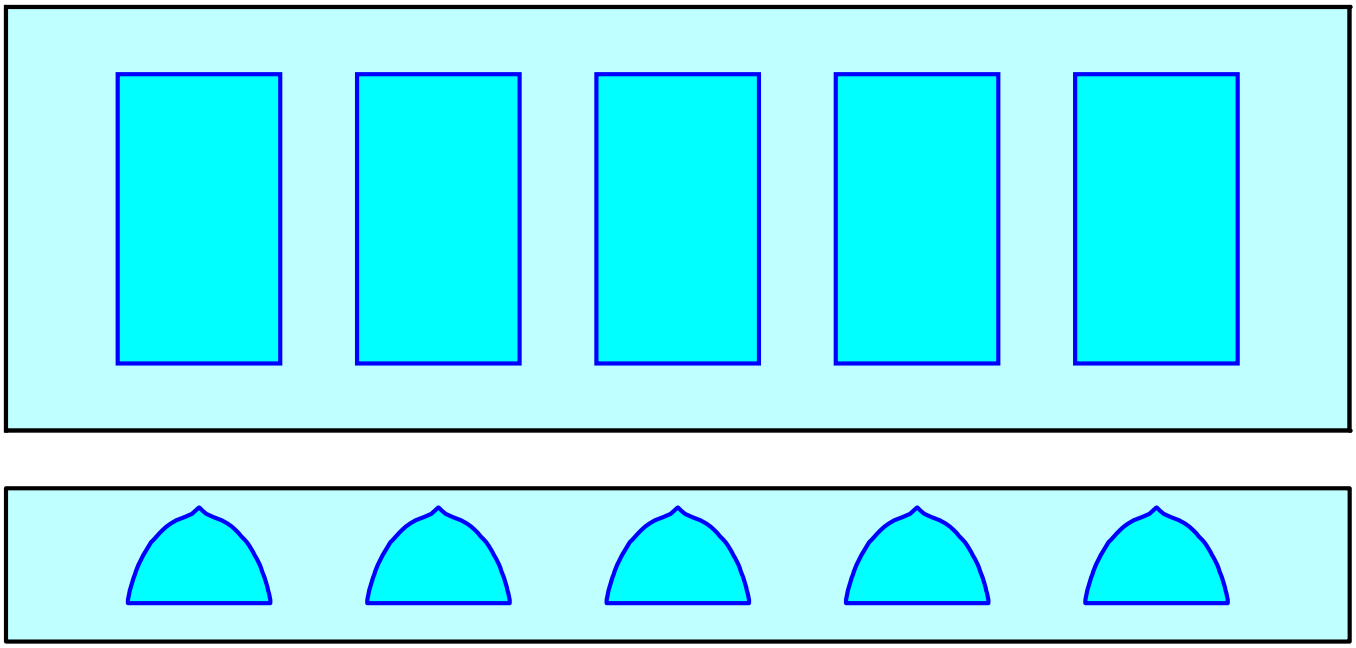
1 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 7.56' Row Length +21.0" End Stone x 2 = 11.06' Base Length
5 Rows x 51.0" Wide + 24.0" Spacing x 4 + 35.0" Side Stone x 2 = 35.08' Base Width
12.0" Base + 30.0" Chamber Height + 6.0" Cover = 4.00' Field Height

5 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 5 Rows = 243.8 cf Chamber Storage

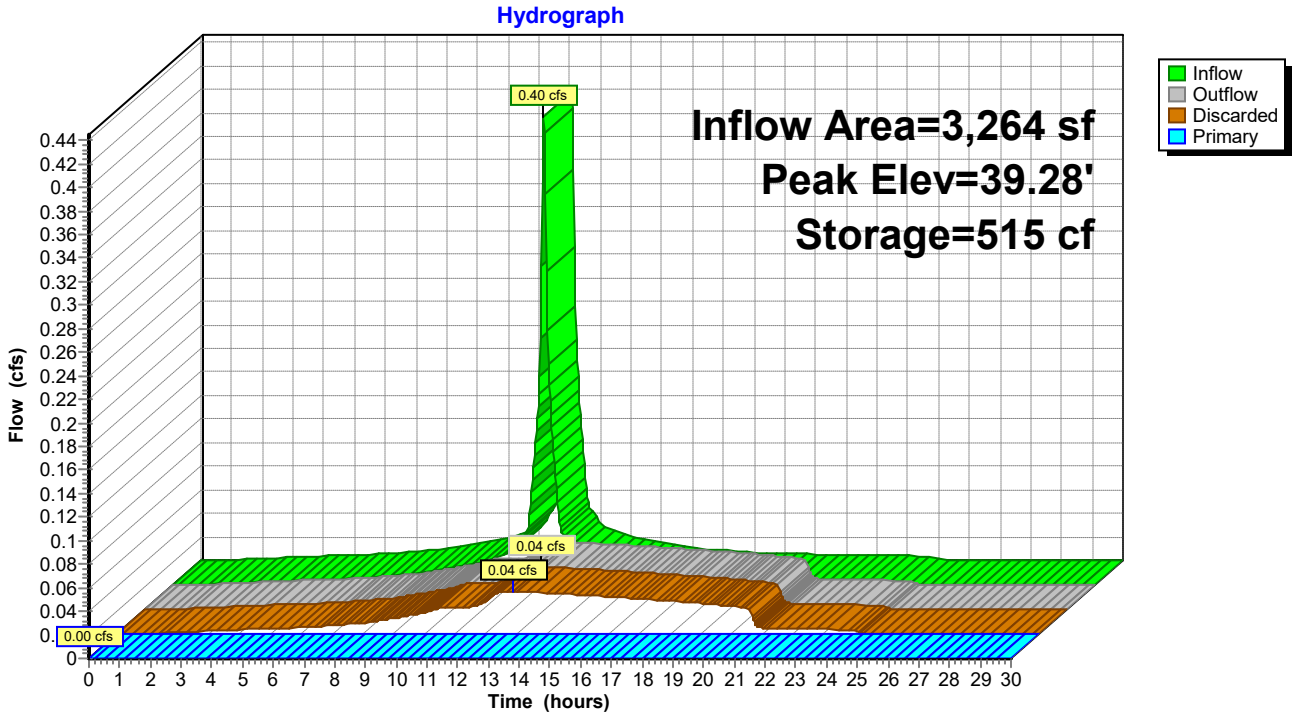
1,551.9 cf Field - 243.8 cf Chambers = 1,308.0 cf Stone x 35.0% Voids = 457.8 cf Stone Storage

Chamber Storage + Stone Storage = 701.6 cf = 0.016 af
Overall Storage Efficiency = 45.2%
Overall System Size = 11.06' x 35.08' x 4.00'

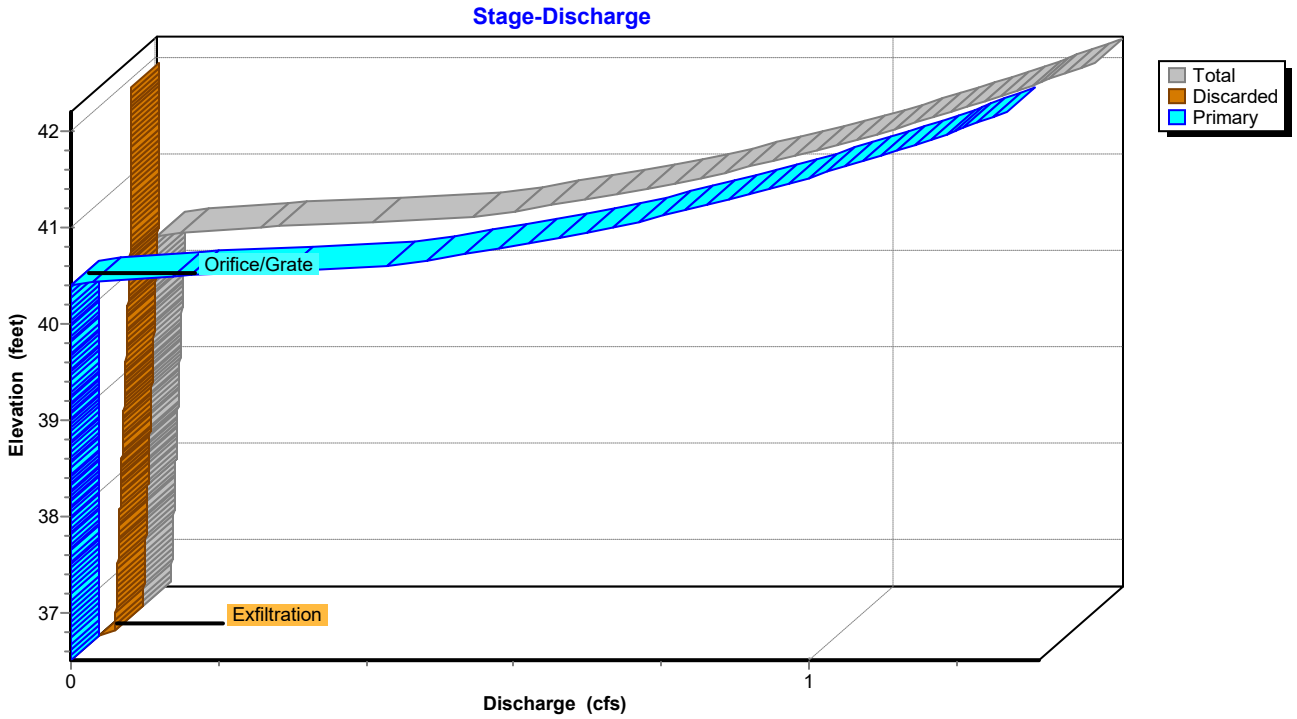
5 Chambers
57.5 cy Field
48.4 cy Stone



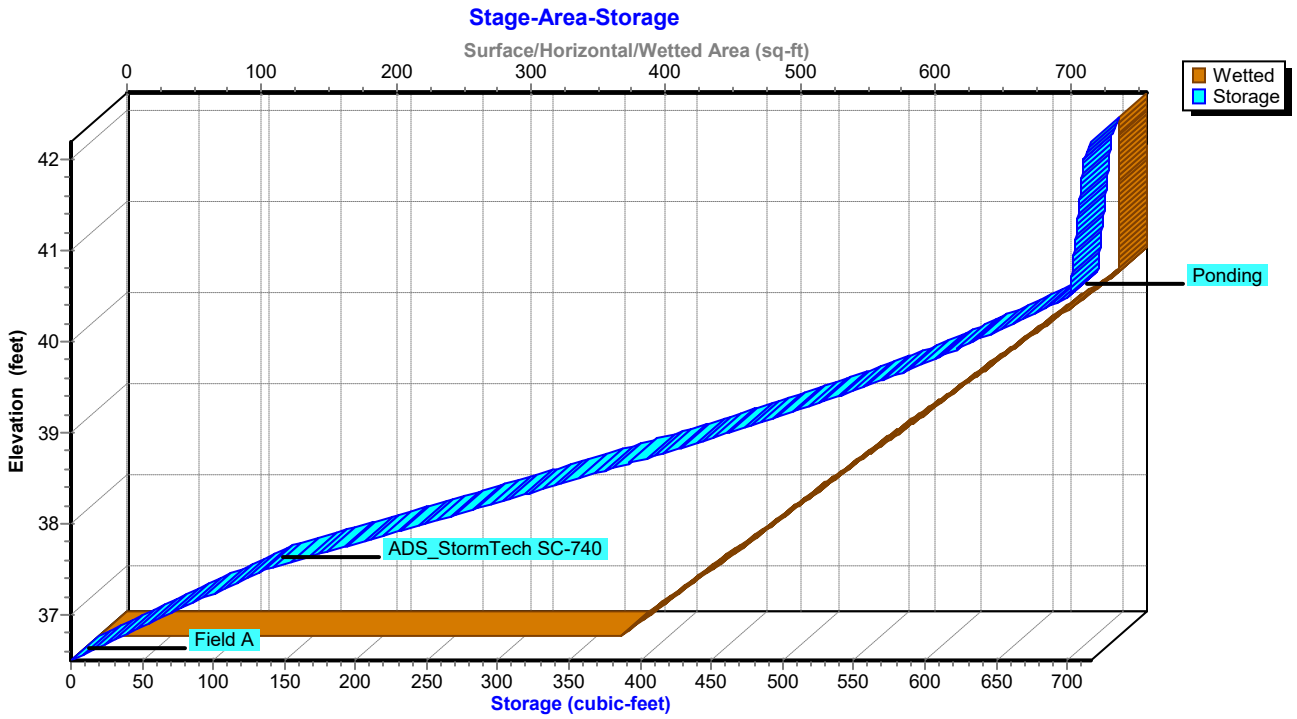
Pond 7P: STORMTECH SYSTEM



Pond 7P: STORMTECH SYSTEM



Pond 7P: STORMTECH SYSTEM

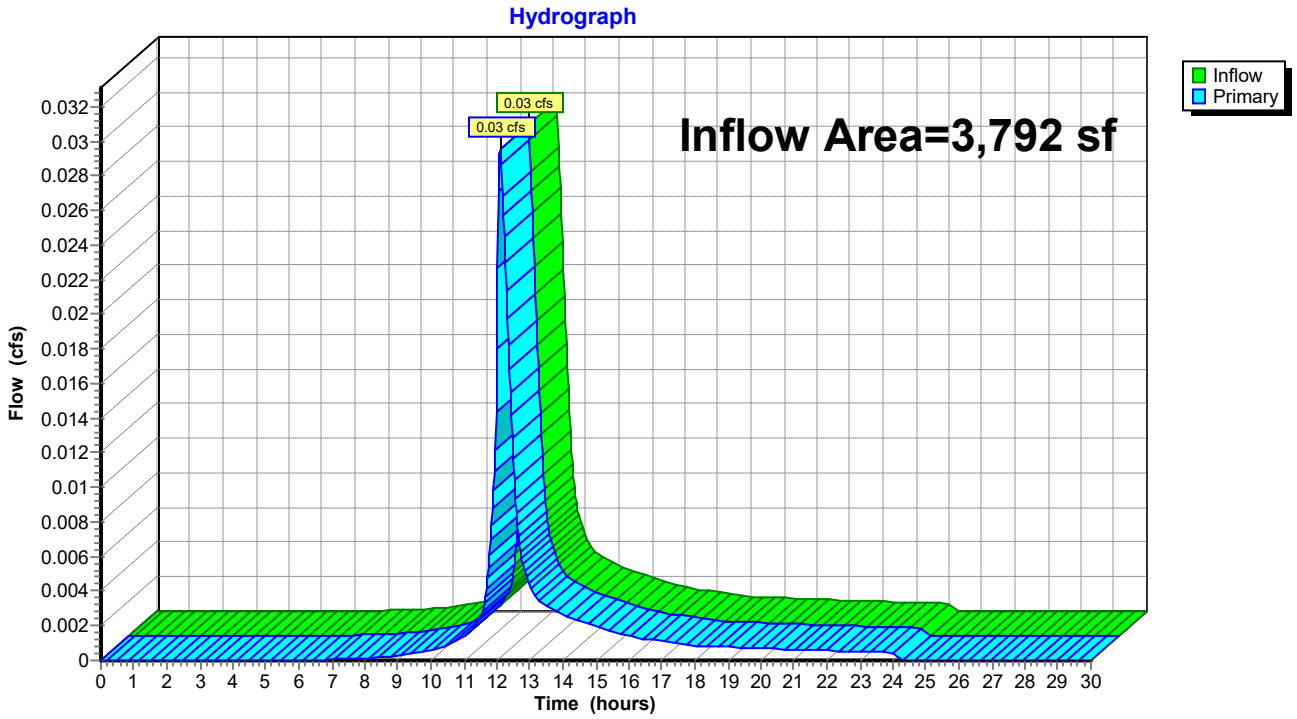


Summary for Link 3L: PROPOSED

Inflow Area = 3,792 sf, 86.08% Impervious, Inflow Depth = 0.38" for 10-Year event
Inflow = 0.03 cfs @ 12.10 hrs, Volume= 121 cf
Primary = 0.03 cfs @ 12.10 hrs, Volume= 121 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: PROPOSED



Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: PROPOSED PERMEABLE Runoff Area=219 sf 0.00% Impervious Runoff Depth=4.73"
Tc=15.0 min CN=85 Runoff=0.02 cfs 86 cf

Subcatchment 4S: PROPOSED LANDSCAPE Runoff Area=309 sf 0.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=69 Runoff=0.03 cfs 79 cf

Subcatchment 5S: PROPOSED PAVED Runoff Area=948 sf 100.00% Impervious Runoff Depth=6.21"
Tc=5.0 min CN=98 Runoff=0.14 cfs 491 cf

Subcatchment 6S: PROPOSED ROOF Runoff Area=2,316 sf 100.00% Impervious Runoff Depth=6.21"
Tc=5.0 min CN=98 Runoff=0.35 cfs 1,199 cf

Pond 7P: STORMTECH SYSTEM Peak Elev=40.29' Storage=674 cf Inflow=0.49 cfs 1,690 cf
Discarded=0.04 cfs 1,690 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 1,690 cf

Link 3L: PROPOSED Inflow=0.04 cfs 165 cf
Primary=0.04 cfs 165 cf

Total Runoff Area = 3,792 sf Runoff Volume = 1,855 cf Average Runoff Depth = 5.87"
13.92% Pervious = 528 sf 86.08% Impervious = 3,264 sf

Summary for Subcatchment 2S: PROPOSED PERMEABLE PAVERS

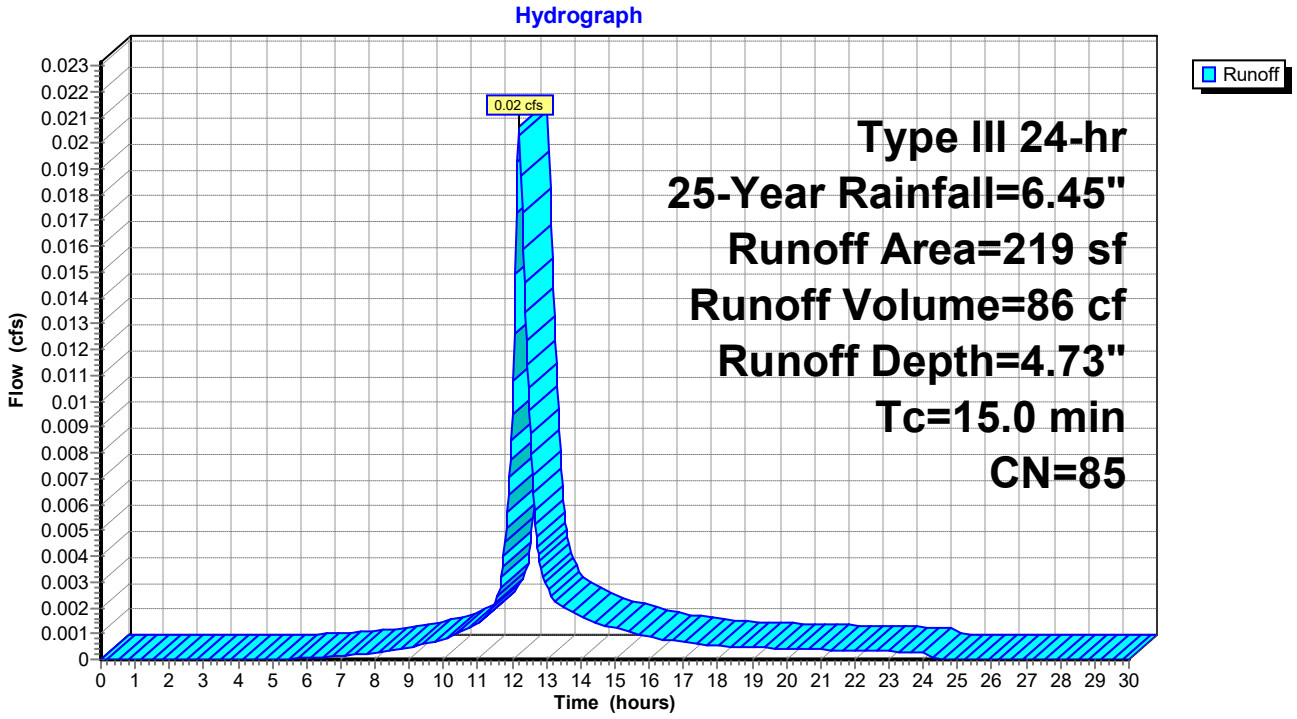
Runoff = 0.02 cfs @ 12.20 hrs, Volume= 86 cf, Depth= 4.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.45"

	Area (sf)	CN	Description
*	219	85	Permeable Pavers
	219		100.00% Pervious Area

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

Subcatchment 2S: PROPOSED PERMEABLE PAVERS



Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

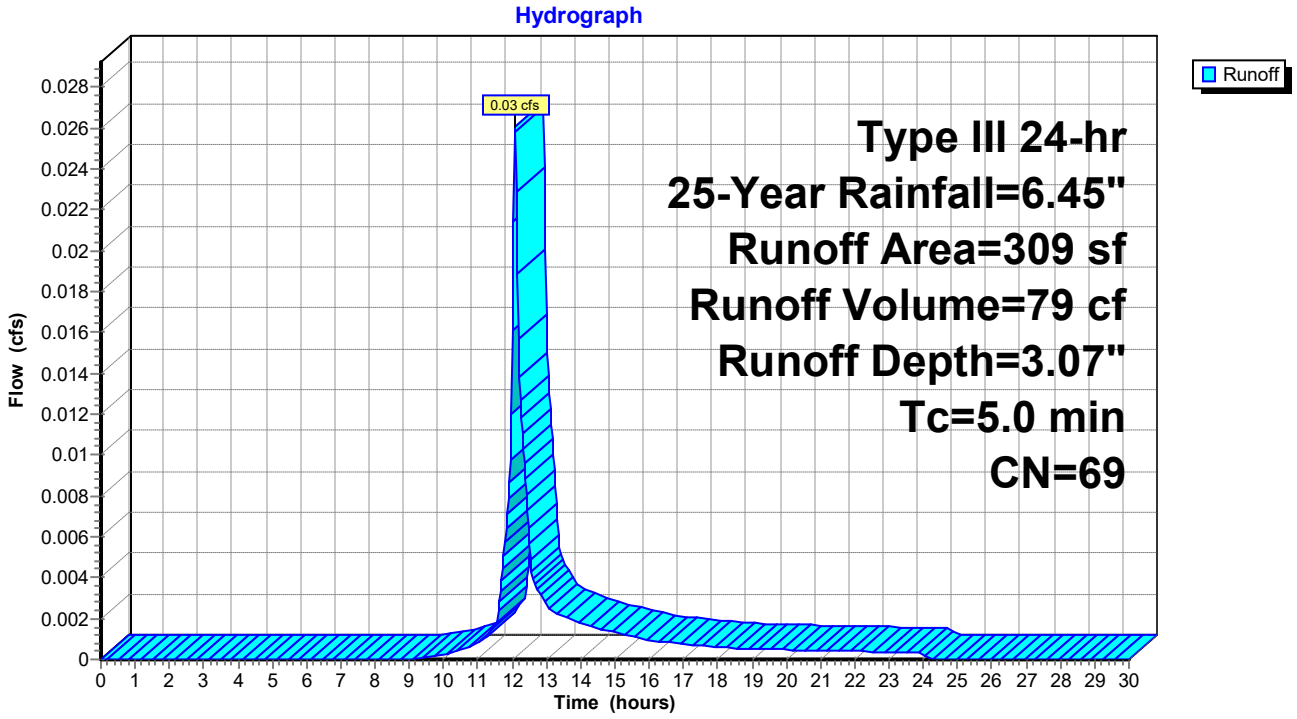
Runoff = 0.03 cfs @ 12.08 hrs, Volume= 79 cf, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.45"

Area (sf)	CN	Description
309	69	50-75% Grass cover, Fair, HSG B
309		100.00% Pervious Area

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

Subcatchment 4S: PROPOSED LANDSCAPE AREA



Summary for Subcatchment 5S: PROPOSED PAVED AREAS

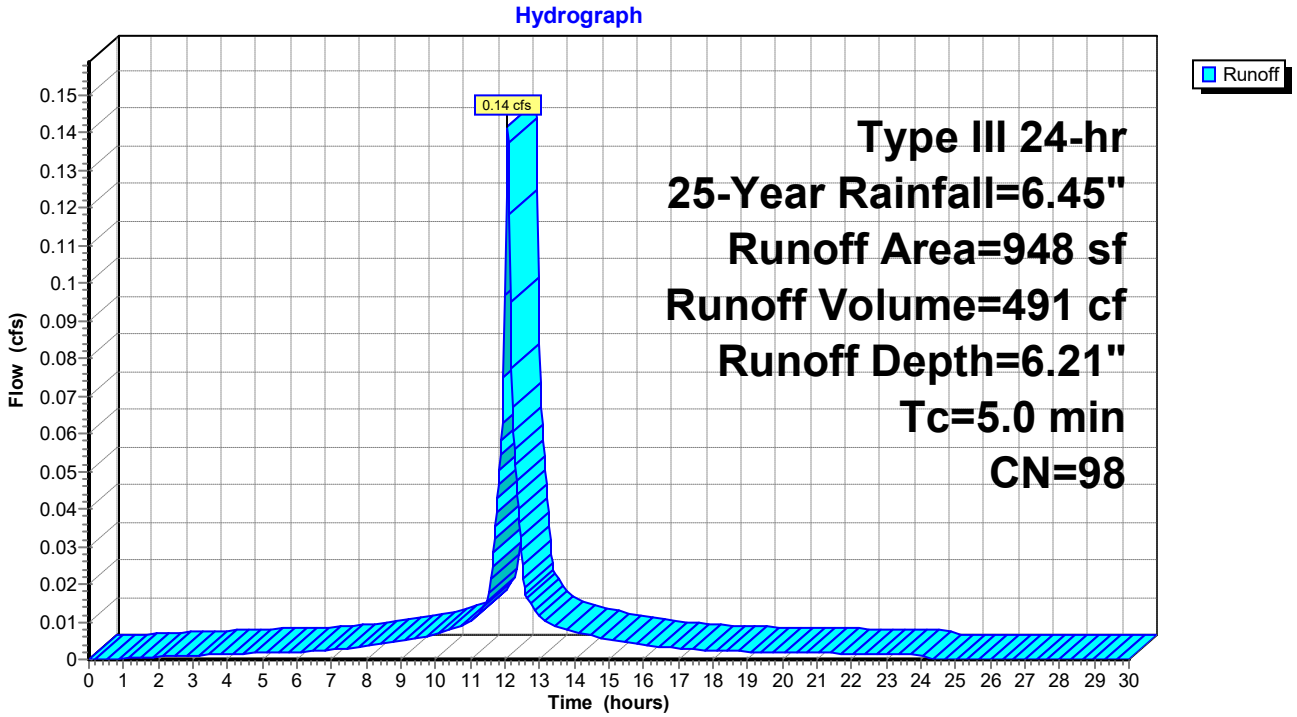
Runoff = 0.14 cfs @ 12.07 hrs, Volume= 491 cf, Depth= 6.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.45"

Area (sf)	CN	Description
948	98	Paved parking, HSG B
948		100.00% Impervious Area

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

Subcatchment 5S: PROPOSED PAVED AREAS



Summary for Subcatchment 6S: PROPOSED ROOF

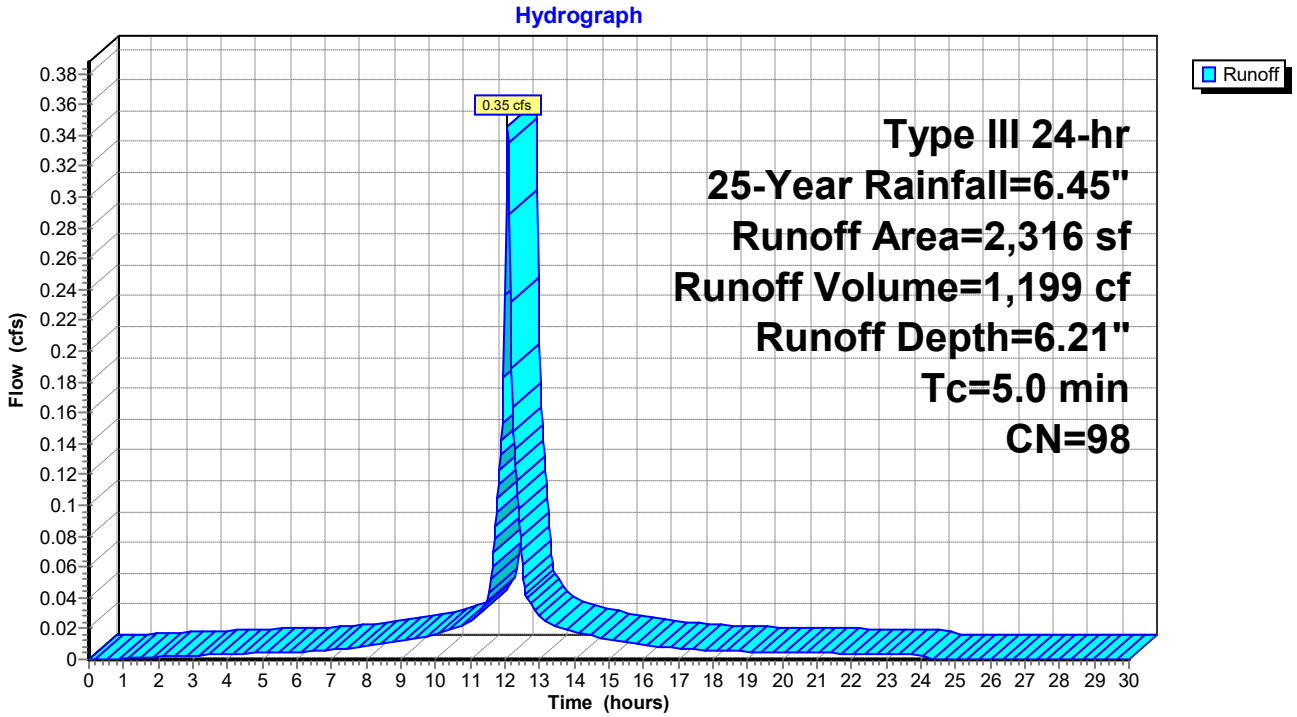
Runoff = 0.35 cfs @ 12.07 hrs, Volume= 1,199 cf, Depth= 6.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.45"

Area (sf)	CN	Description
2,316	98	Roofs, HSG B
2,316		100.00% Impervious Area

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

Subcatchment 6S: PROPOSED ROOF



Summary for Pond 7P: STORMTECH SYSTEM

Inflow Area = 3,264 sf,100.00% Impervious, Inflow Depth = 6.21" for 25-Year event
Inflow = 0.49 cfs @ 12.07 hrs, Volume= 1,690 cf
Outflow = 0.04 cfs @ 12.95 hrs, Volume= 1,690 cf, Atten= 92%, Lag= 52.8 min
Discarded = 0.04 cfs @ 12.95 hrs, Volume= 1,690 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 40.29' @ 12.95 hrs Surf.Area= 388 sf Storage= 674 cf

Plug-Flow detention time= 145.4 min calculated for 1,688 cf (100% of inflow)
Center-of-Mass det. time= 145.2 min (888.4 - 743.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	36.50'	458 cf	**35.08'W x 11.06'L x 4.00'H Field A** 1,552 cf Overall - 244 cf Embedded = 1,308 cf x 35.0% Voids
#2A	37.50'	244 cf	**ADS_StormTech SC-740** x 5 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 5 rows
#3	40.50'	15 cf	**Ponding** Listed below -Impervious
		717 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Cum.Store (cubic-feet)
40.50	0
42.00	10
42.20	15

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	40.40'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.95 hrs HW=40.29' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=36.50' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 7P: STORMTECH SYSTEM - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 (ADS StormTech® SC-740 without end caps)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 5 rows

51.0" Wide + 24.0" Spacing = 75.0" C-C Row Spacing

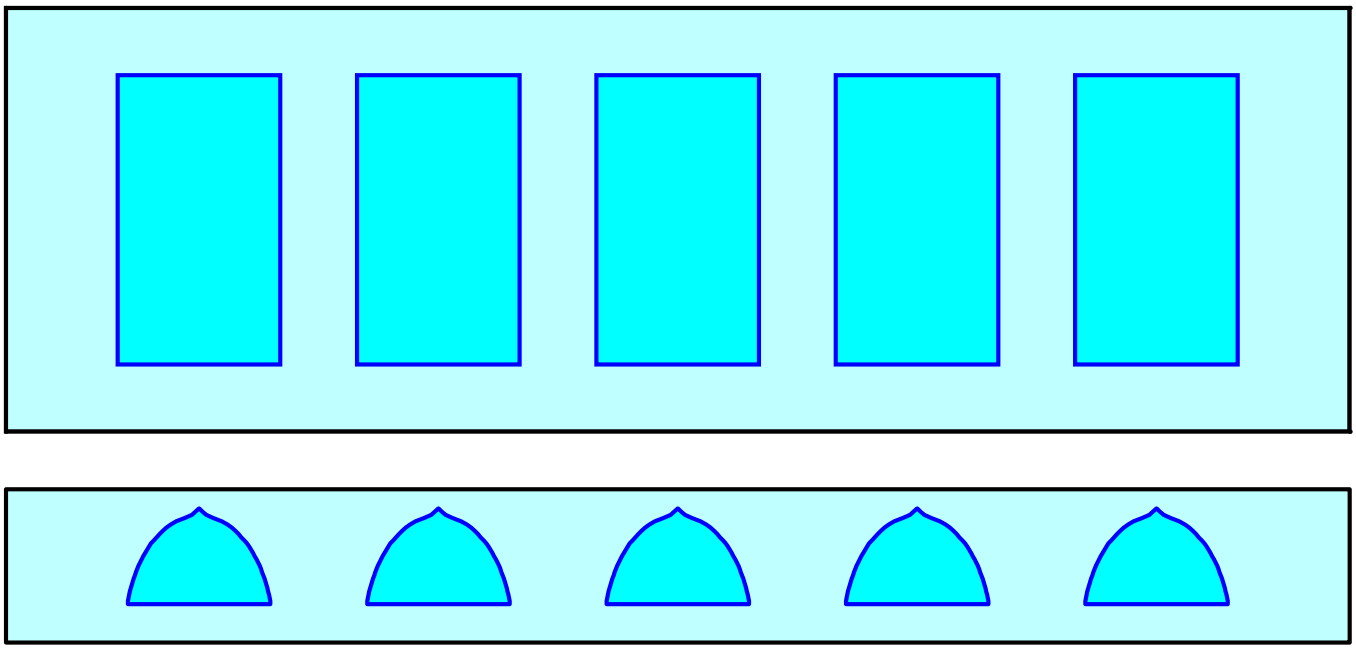
1 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 7.56' Row Length +21.0" End Stone x 2 = 11.06' Base Length
5 Rows x 51.0" Wide + 24.0" Spacing x 4 + 35.0" Side Stone x 2 = 35.08' Base Width
12.0" Base + 30.0" Chamber Height + 6.0" Cover = 4.00' Field Height

5 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 5 Rows = 243.8 cf Chamber Storage

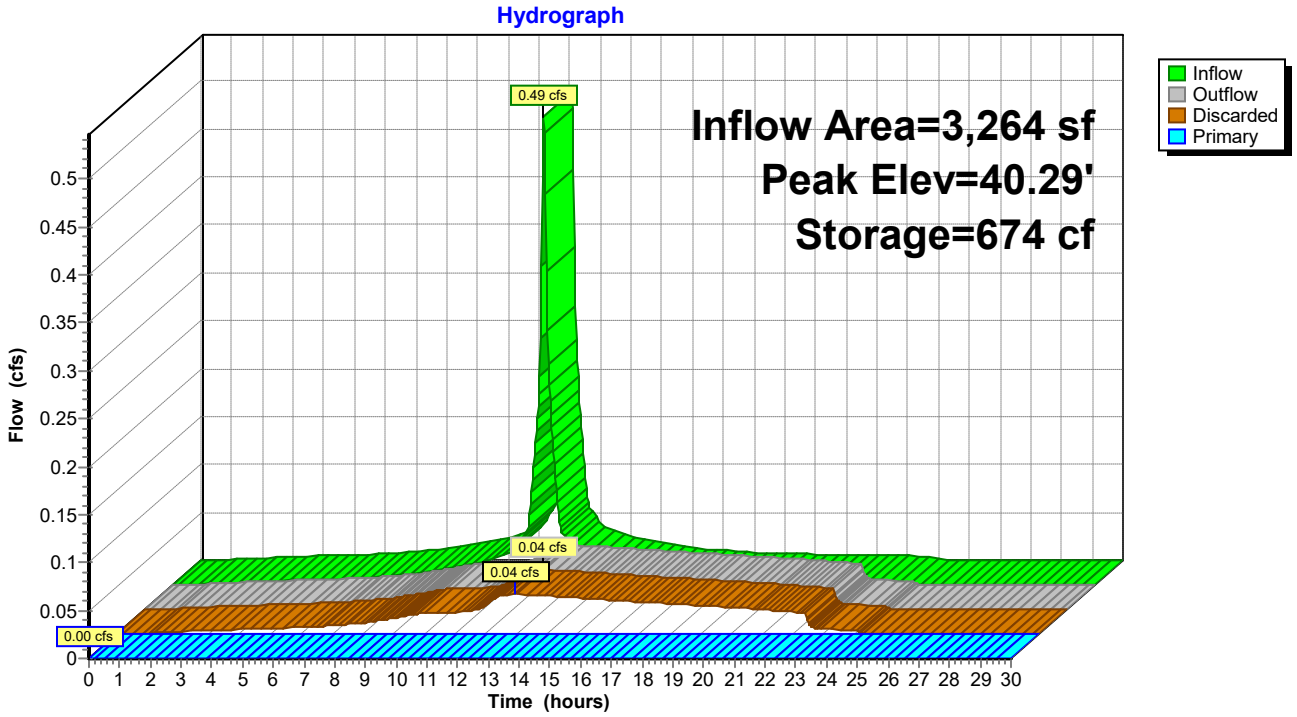
1,551.9 cf Field - 243.8 cf Chambers = 1,308.0 cf Stone x 35.0% Voids = 457.8 cf Stone Storage

Chamber Storage + Stone Storage = 701.6 cf = 0.016 af
Overall Storage Efficiency = 45.2%
Overall System Size = 11.06' x 35.08' x 4.00'

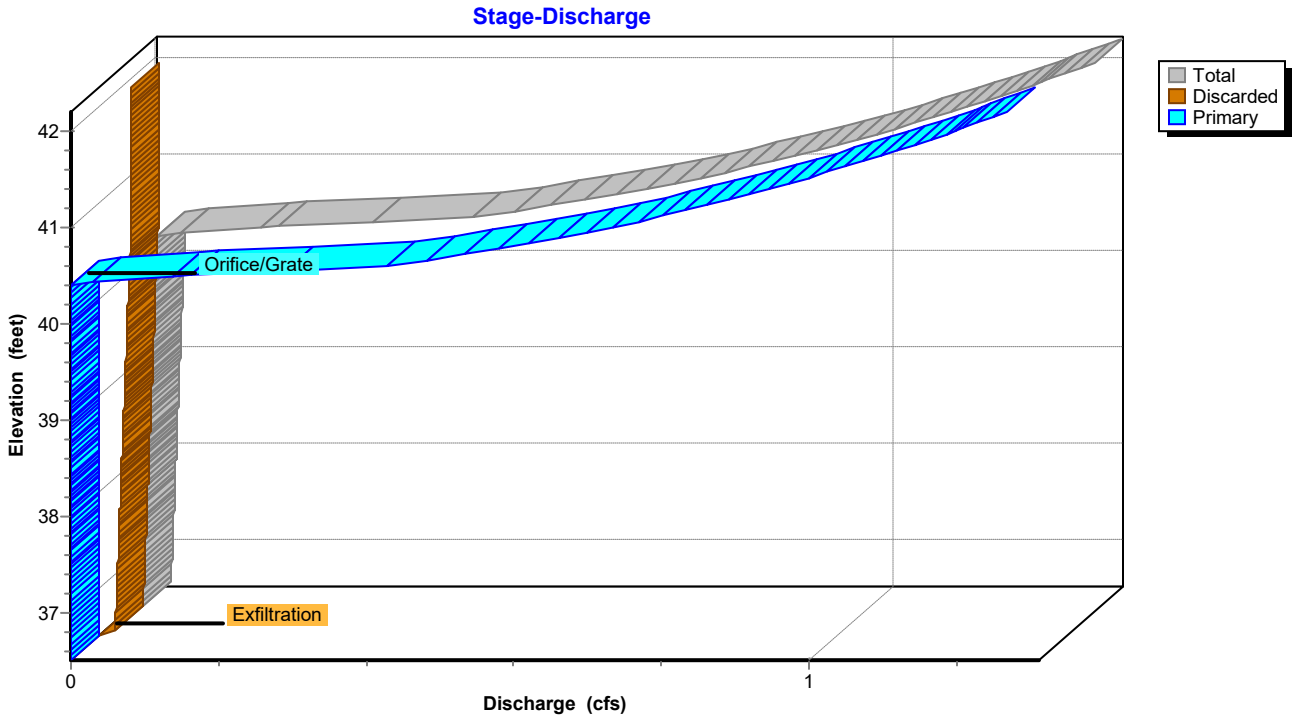
5 Chambers
57.5 cy Field
48.4 cy Stone



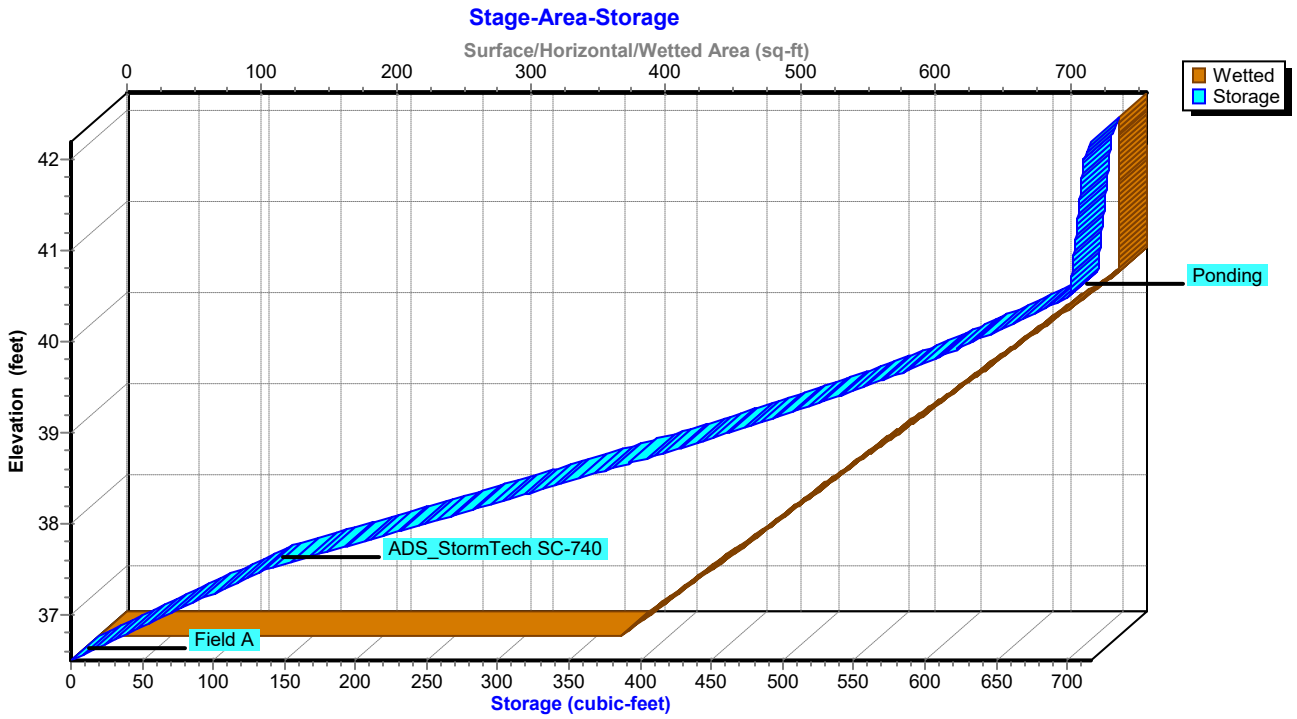
Pond 7P: STORMTECH SYSTEM



Pond 7P: STORMTECH SYSTEM



Pond 7P: STORMTECH SYSTEM

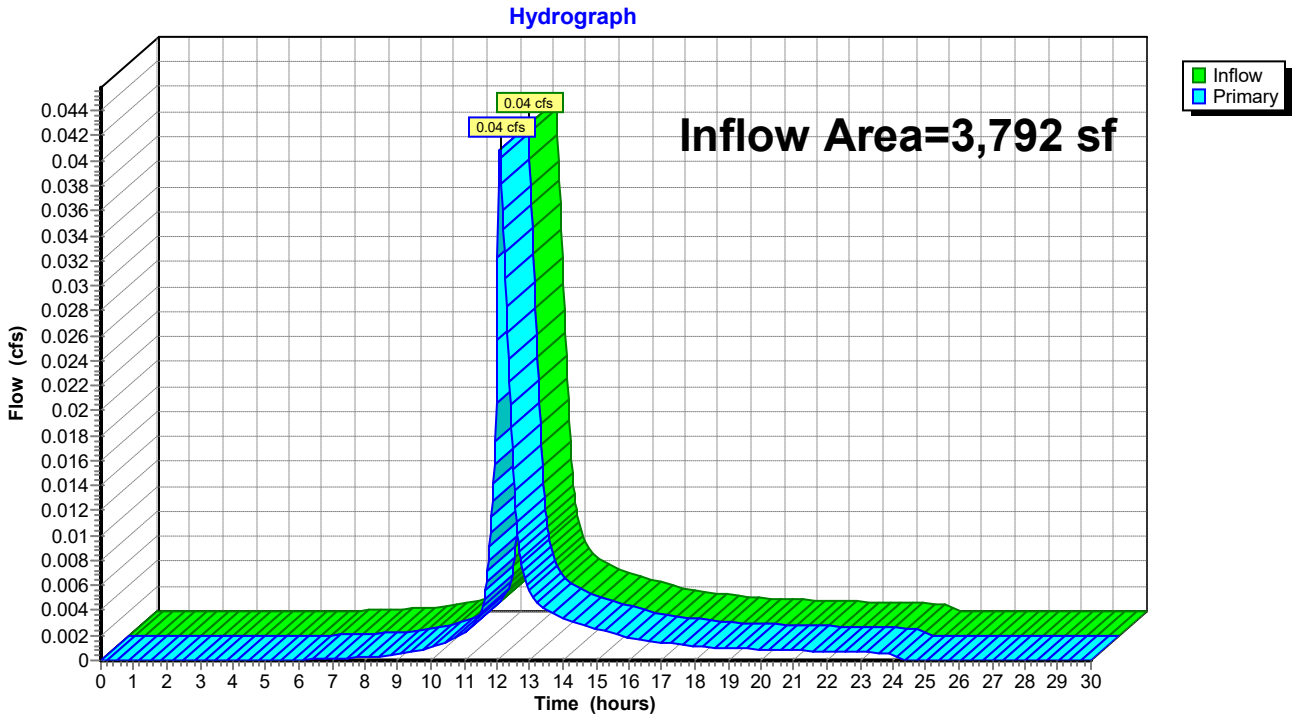


Summary for Link 3L: PROPOSED

Inflow Area = 3,792 sf, 86.08% Impervious, Inflow Depth = 0.52" for 25-Year event
Inflow = 0.04 cfs @ 12.10 hrs, Volume= 165 cf
Primary = 0.04 cfs @ 12.10 hrs, Volume= 165 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: PROPOSED



Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: PROPOSED PERMEABLE Runoff Area=219 sf 0.00% Impervious Runoff Depth=6.49"
Tc=15.0 min CN=85 Runoff=0.03 cfs 119 cf

Subcatchment 4S: PROPOSED LANDSCAPE Runoff Area=309 sf 0.00% Impervious Runoff Depth=4.60"
Tc=5.0 min CN=69 Runoff=0.04 cfs 118 cf

Subcatchment 5S: PROPOSED PAVED Runoff Area=948 sf 100.00% Impervious Runoff Depth=8.05"
Tc=5.0 min CN=98 Runoff=0.18 cfs 636 cf

Subcatchment 6S: PROPOSED ROOF Runoff Area=2,316 sf 100.00% Impervious Runoff Depth=8.05"
Tc=5.0 min CN=98 Runoff=0.45 cfs 1,554 cf

Pond 7P: STORMTECH SYSTEM Peak Elev=40.56' Storage=702 cf Inflow=0.63 cfs 2,190 cf
Discarded=0.04 cfs 1,926 cf Primary=0.31 cfs 265 cf Outflow=0.35 cfs 2,191 cf

Link 3L: PROPOSED Inflow=0.36 cfs 502 cf
Primary=0.36 cfs 502 cf

Total Runoff Area = 3,792 sf Runoff Volume = 2,426 cf Average Runoff Depth = 7.68"
13.92% Pervious = 528 sf 86.08% Impervious = 3,264 sf

Summary for Subcatchment 2S: PROPOSED PERMEABLE PAVERS

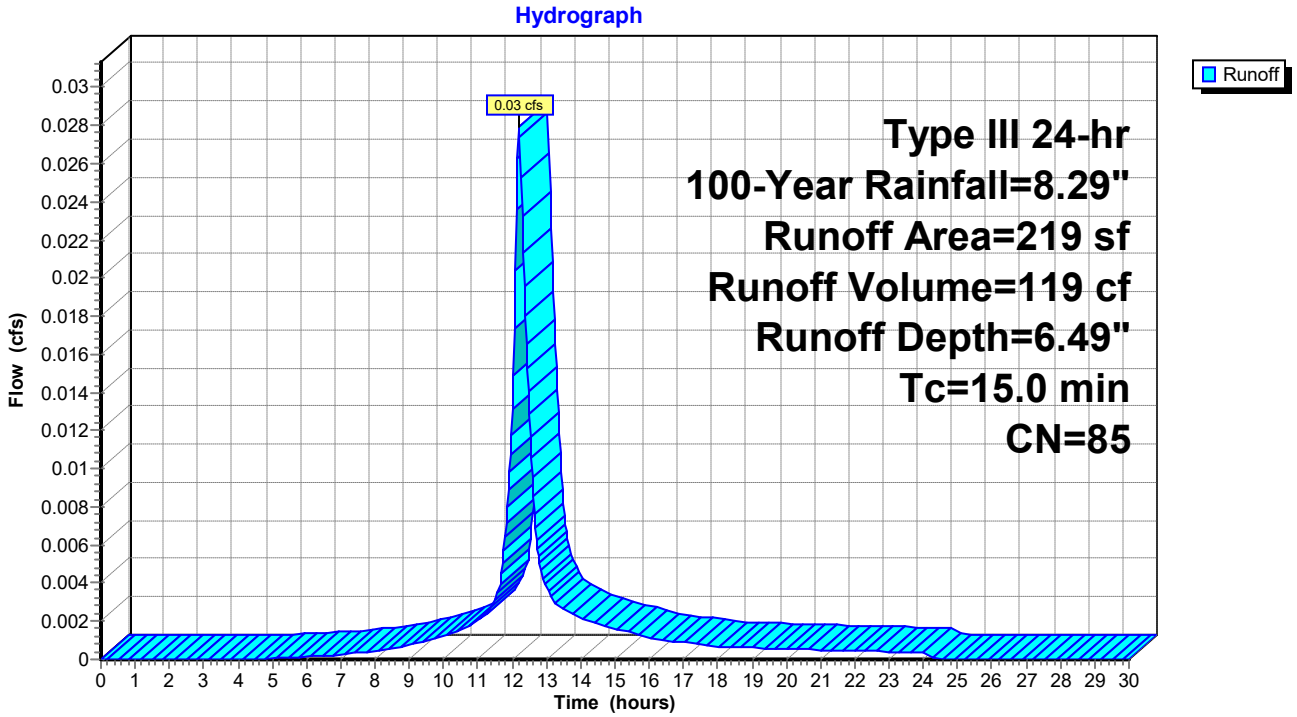
Runoff = 0.03 cfs @ 12.20 hrs, Volume= 119 cf, Depth= 6.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.29"

	Area (sf)	CN	Description
*	219	85	Permeable Pavers
	219		100.00% Pervious Area

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

Subcatchment 2S: PROPOSED PERMEABLE PAVERS



Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

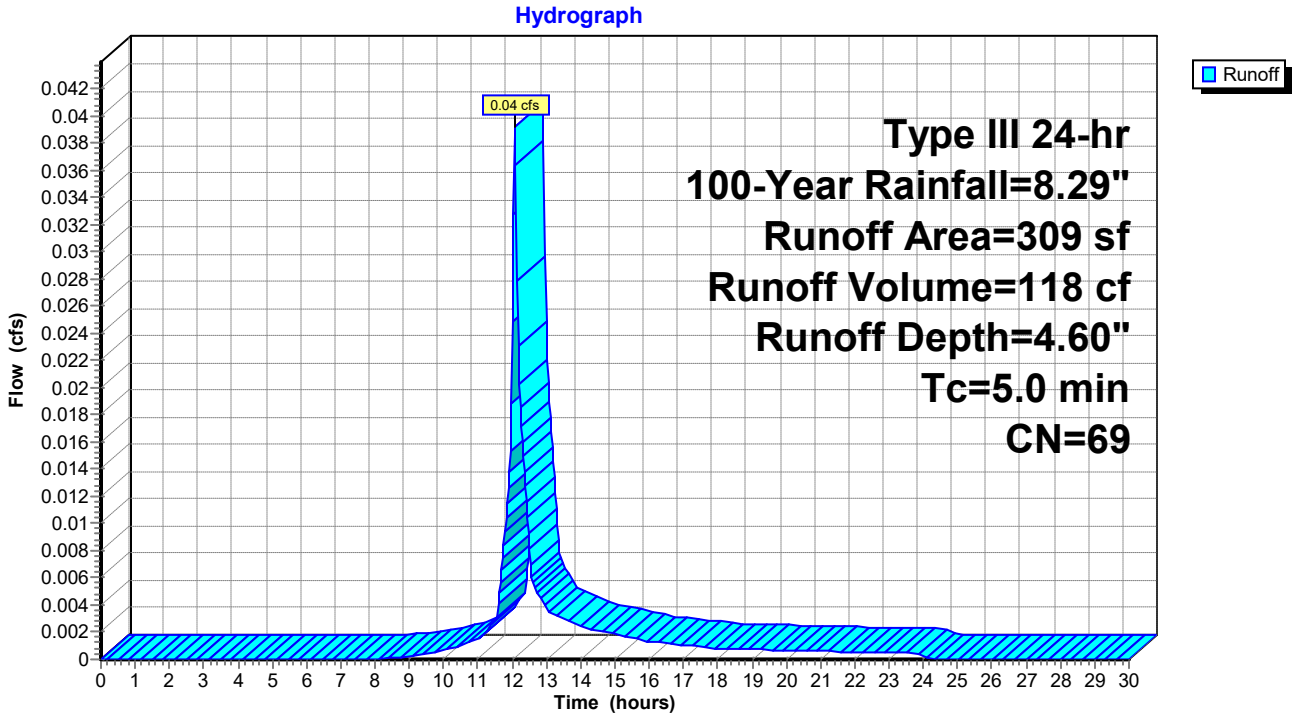
Runoff = 0.04 cfs @ 12.08 hrs, Volume= 118 cf, Depth= 4.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.29"

Area (sf)	CN	Description
309	69	50-75% Grass cover, Fair, HSG B
309		100.00% Pervious Area

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

Subcatchment 4S: PROPOSED LANDSCAPE AREA



Summary for Subcatchment 5S: PROPOSED PAVED AREAS

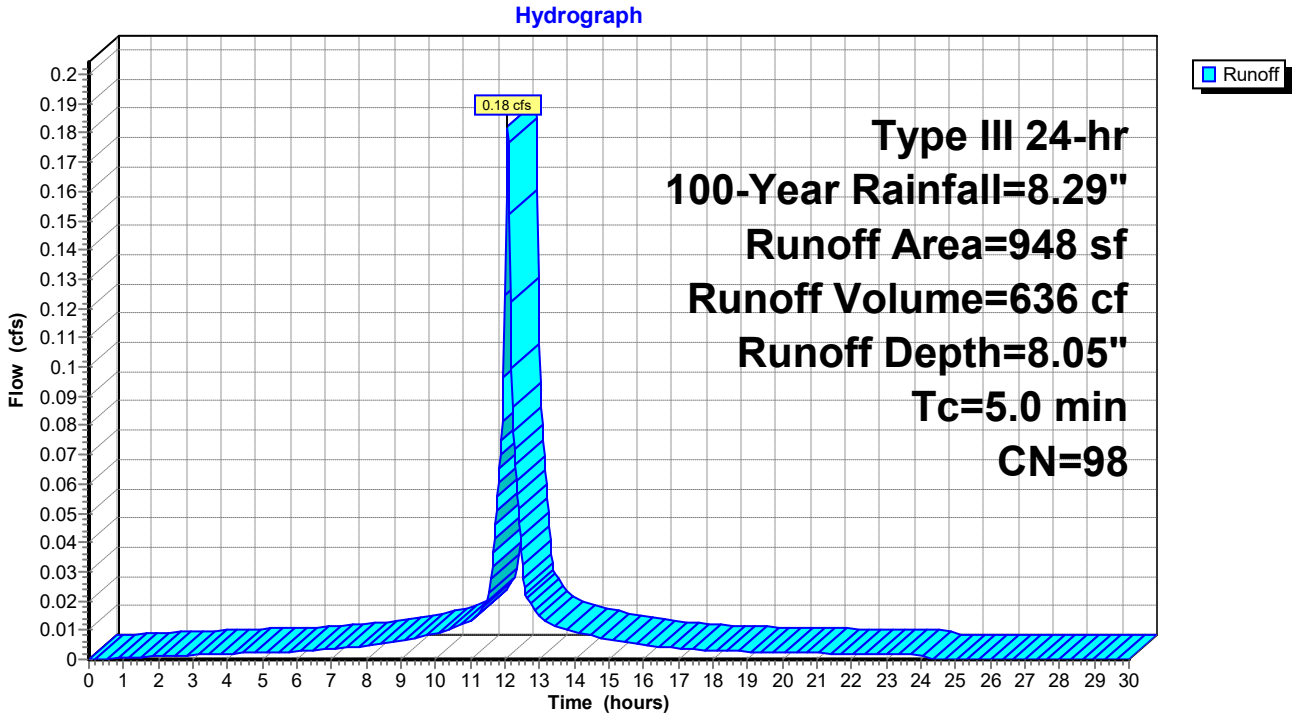
Runoff = 0.18 cfs @ 12.07 hrs, Volume= 636 cf, Depth= 8.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.29"

Area (sf)	CN	Description
948	98	Paved parking, HSG B
948		100.00% Impervious Area

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

Subcatchment 5S: PROPOSED PAVED AREAS



Summary for Subcatchment 6S: PROPOSED ROOF

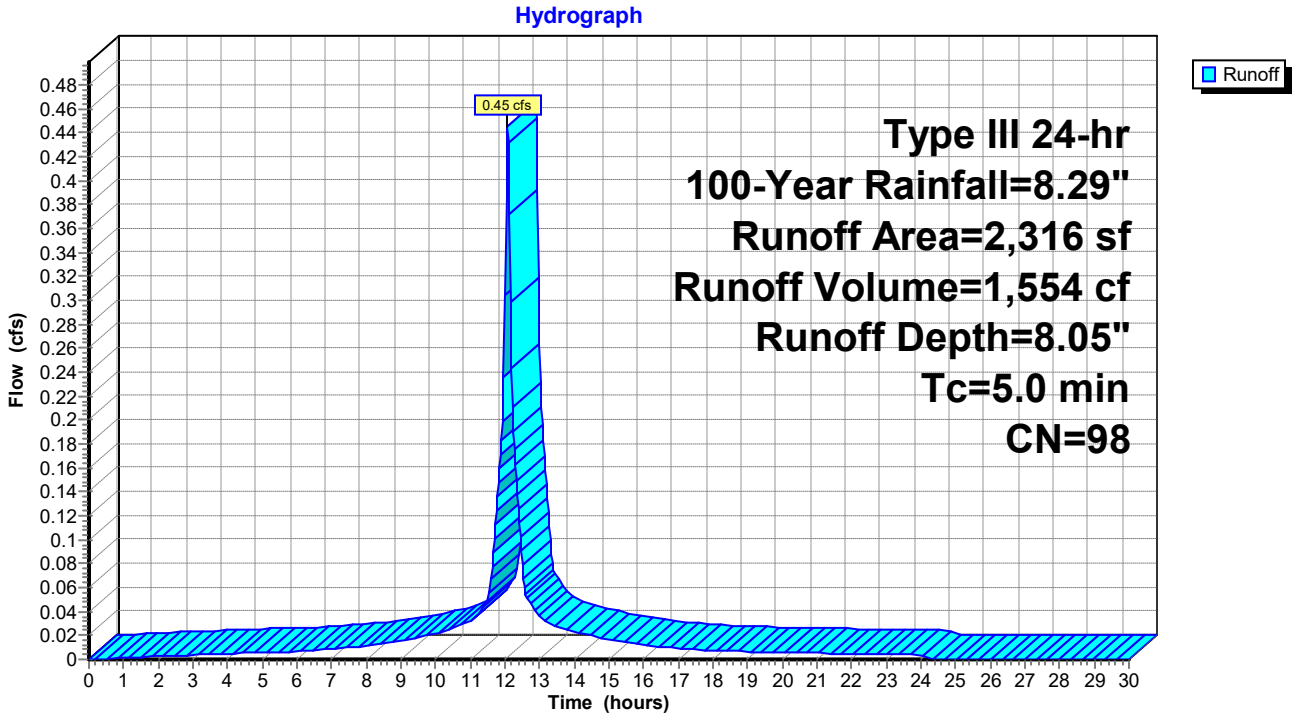
Runoff = 0.45 cfs @ 12.07 hrs, Volume= 1,554 cf, Depth= 8.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.29"

Area (sf)	CN	Description
2,316	98	Roofs, HSG B
2,316		100.00% Impervious Area

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

Subcatchment 6S: PROPOSED ROOF



Summary for Pond 7P: STORMTECH SYSTEM

Inflow Area = 3,264 sf,100.00% Impervious, Inflow Depth = 8.05" for 100-Year event
Inflow = 0.63 cfs @ 12.07 hrs, Volume= 2,190 cf
Outflow = 0.35 cfs @ 12.21 hrs, Volume= 2,191 cf, Atten= 43%, Lag= 8.5 min
Discarded = 0.04 cfs @ 12.21 hrs, Volume= 1,926 cf
Primary = 0.31 cfs @ 12.21 hrs, Volume= 265 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 40.56' @ 12.21 hrs Surf.Area= 388 sf Storage= 702 cf

Plug-Flow detention time= 134.2 min calculated for 2,189 cf (100% of inflow)
Center-of-Mass det. time= 134.6 min (874.4 - 739.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	36.50'	458 cf	**35.08'W x 11.06'L x 4.00'H Field A** 1,552 cf Overall - 244 cf Embedded = 1,308 cf x 35.0% Voids
#2A	37.50'	244 cf	**ADS_StormTech SC-740** x 5 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 5 rows
#3	40.50'	15 cf	**Ponding** Listed below -Impervious
		717 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Cum.Store (cubic-feet)
40.50	0
42.00	10
42.20	15

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	40.40'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.21 hrs HW=40.56' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.31 cfs @ 12.21 hrs HW=40.55' (Free Discharge)
↑—**2=Orifice/Grate** (Weir Controls 0.31 cfs @ 1.28 fps)

Pond 7P: STORMTECH SYSTEM - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 (ADS StormTech® SC-740 without end caps)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 5 rows

51.0" Wide + 24.0" Spacing = 75.0" C-C Row Spacing

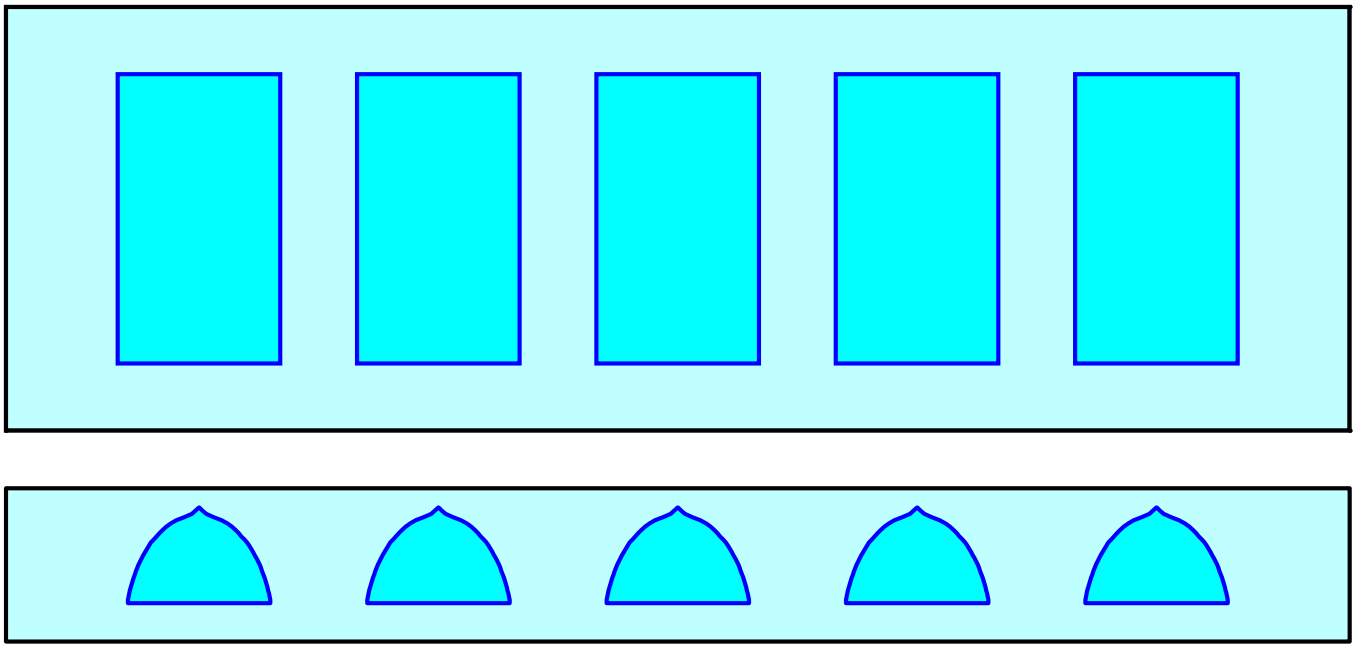
1 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 7.56' Row Length +21.0" End Stone x 2 = 11.06' Base Length
5 Rows x 51.0" Wide + 24.0" Spacing x 4 + 35.0" Side Stone x 2 = 35.08' Base Width
12.0" Base + 30.0" Chamber Height + 6.0" Cover = 4.00' Field Height

5 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 5 Rows = 243.8 cf Chamber Storage

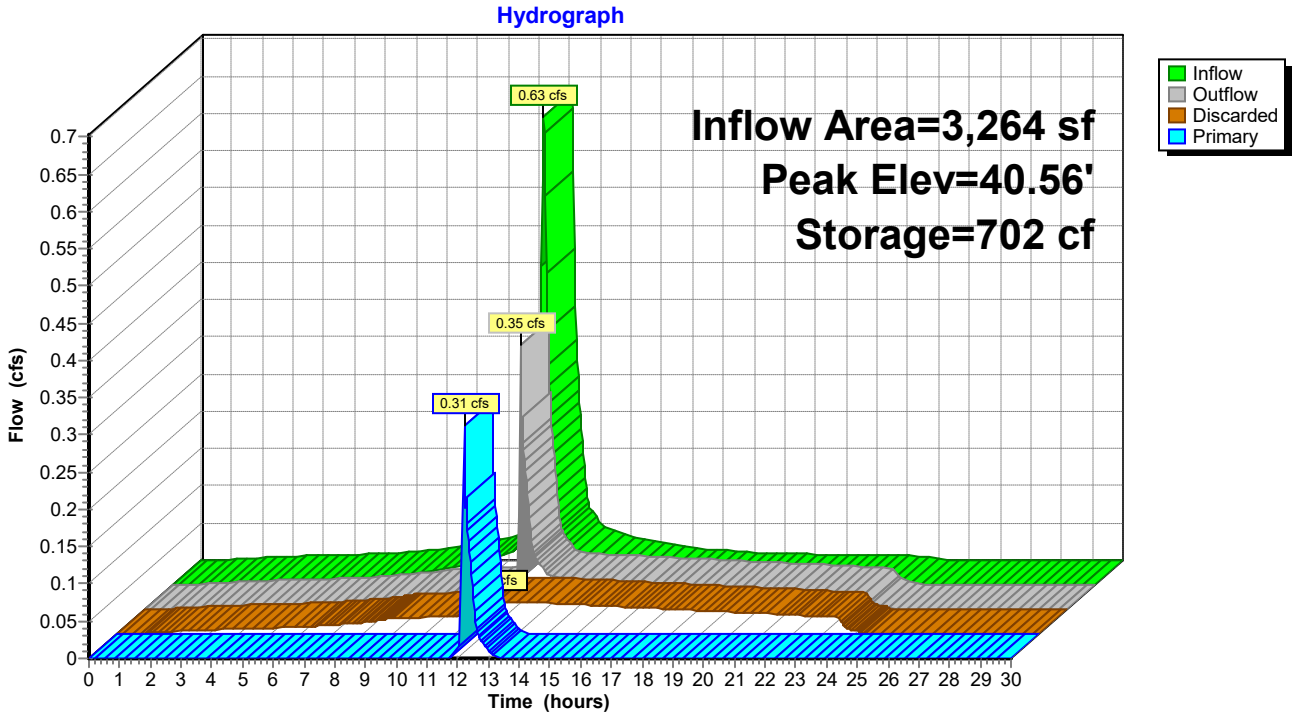
1,551.9 cf Field - 243.8 cf Chambers = 1,308.0 cf Stone x 35.0% Voids = 457.8 cf Stone Storage

Chamber Storage + Stone Storage = 701.6 cf = 0.016 af
Overall Storage Efficiency = 45.2%
Overall System Size = 11.06' x 35.08' x 4.00'

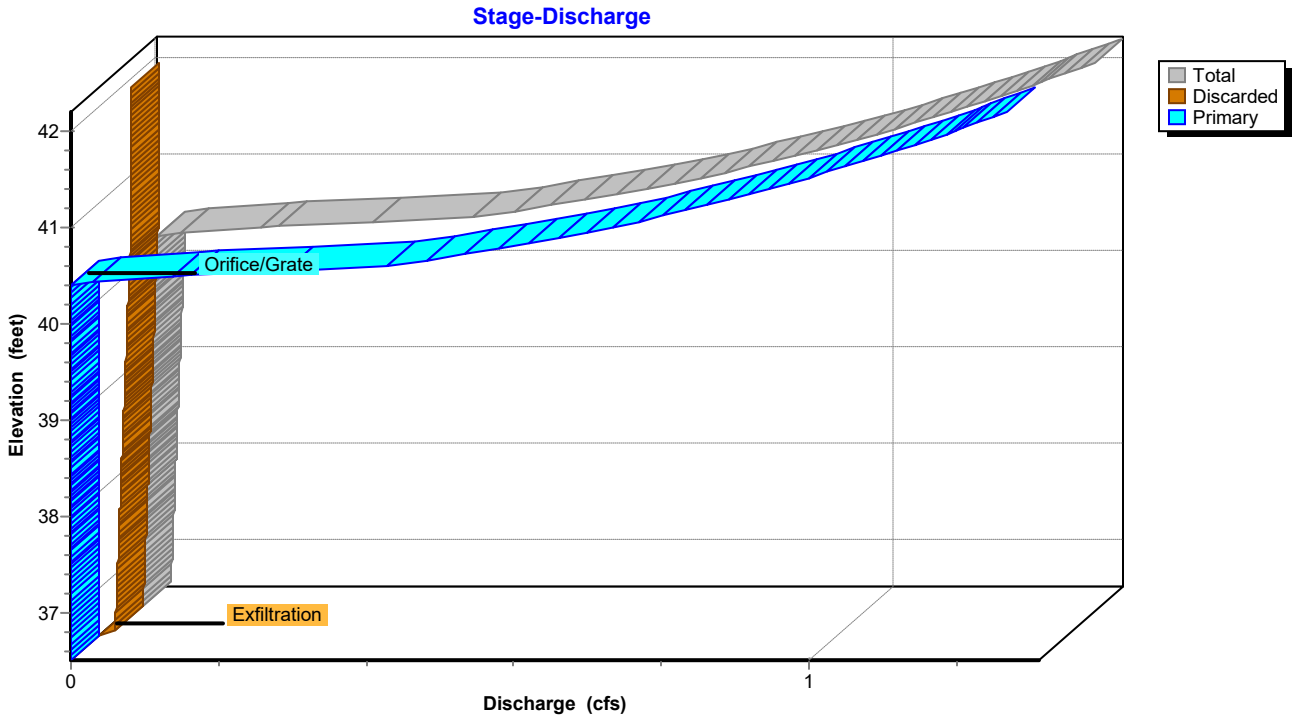
5 Chambers
57.5 cy Field
48.4 cy Stone



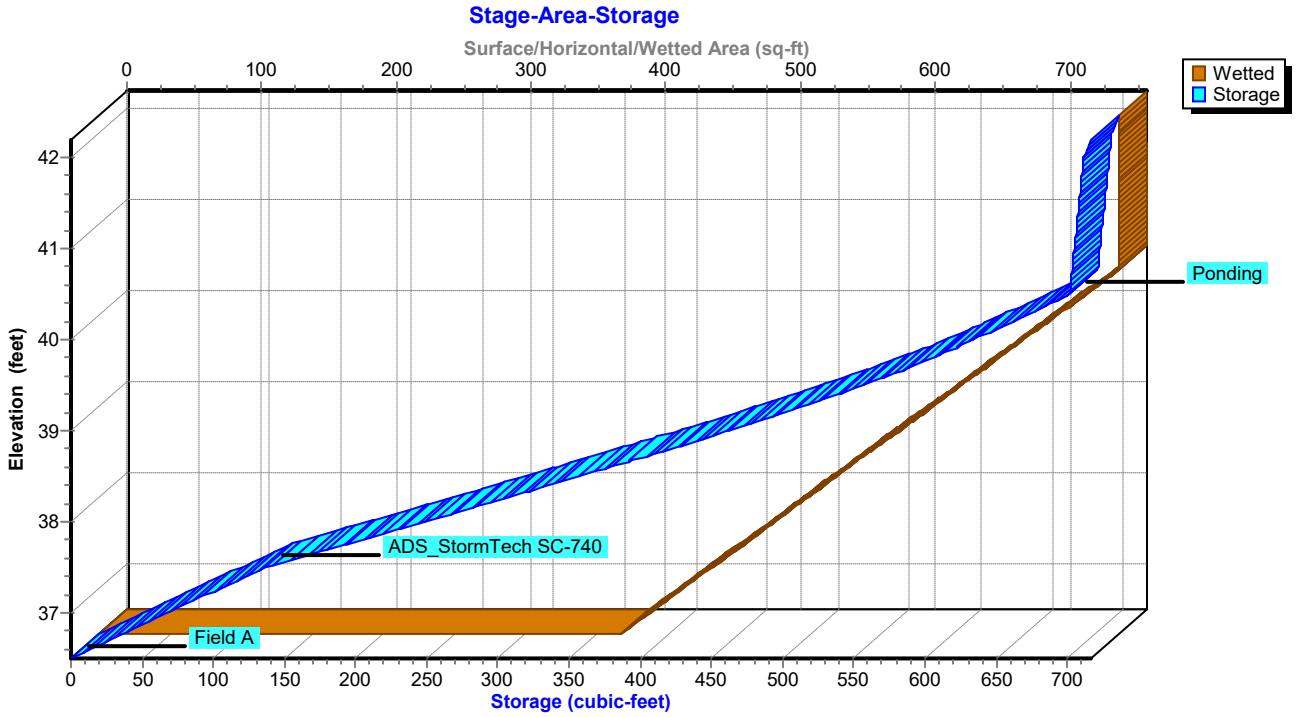
Pond 7P: STORMTECH SYSTEM



Pond 7P: STORMTECH SYSTEM



Pond 7P: STORMTECH SYSTEM

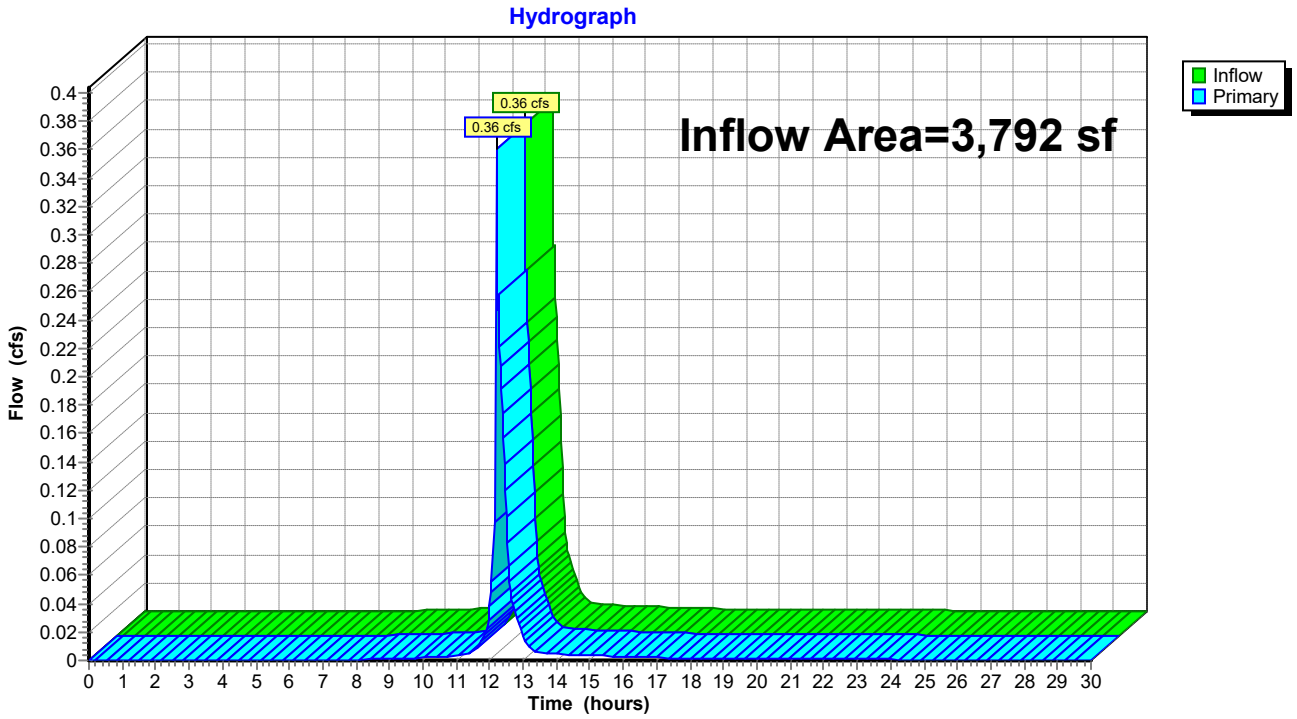


Summary for Link 3L: PROPOSED

Inflow Area = 3,792 sf, 86.08% Impervious, Inflow Depth = 1.59" for 100-Year event
Inflow = 0.36 cfs @ 12.21 hrs, Volume= 502 cf
Primary = 0.36 cfs @ 12.21 hrs, Volume= 502 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: PROPOSED



Appendix B
Soils information

Custom Soil Resource Report
Soil Map

Map Scale: 1:357 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 15 30 60 90

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

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 17, Sep 3, 2021

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

Date(s) aerial images were photographed: Sep 25, 2020—Oct 4, 2020

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
655	Udorthents, wet substratum	0.3	100.0%
Totals for Area of Interest		**0.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Norfolk and Suffolk Counties, Massachusetts

655—Udorthents, wet substratum

Map Unit Setting

National map unit symbol: vkyd
Elevation: -30 to 310 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Landform position (two-dimensional): Shoulder, footslope
Landform position (three-dimensional): Riser, tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Excavated and filled sandy and gravelly human transported material over highly-decomposed herbaceous organic material

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Minor Components

Urban land

Percent of map unit: 3 percent
Hydric soil rating: Unranked

Ipswich

Percent of map unit: 2 percent
Landform: Marshes
Hydric soil rating: Yes

Appendix C
TSS Calculations

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: PRE-TREATMENT

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Treatment Practice	**0.52**	**0.75**	**0.39**	**0.36**
	0.00	**0.36**	**0.00**	**0.36**
	0.00	**0.36**	**0.00**	**0.36**
	0.00	**0.36**	**0.00**	**0.36**

Total TSS Removal = **64%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 581 AMERICAN LEGION HIGHWAY

Prepared By: GP

Date: 6/3/2022

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: TREATMENT

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Basin	0.80	1.00	0.80	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20

Total TSS Removal = 80%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 581 AMERICAN LEGION HIGHWAY
Prepared By: GP
Date: 6/3/2022

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: FULL TREATRMENT TRAIN

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Treatment Practice	**0.52**	**0.75**	**0.39**	**0.36**
Infiltration Trench	**0.80**	**0.36**	**0.29**	**0.07**
	0.00	**0.07**	**0.00**	**0.07**
	0.00	**0.07**	**0.00**	**0.07**

Total TSS Removal = **93%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 581 AMERICAN LEGION HIGHWAY

Prepared By: GP

Date: 6/3/2022

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

APPENDIX D

Operation & Maintenance Plan.

OPERATION AND MAINTENANCE PLAN
581 AMERICAN LEGION HIGHWAY
BOSTON, MASSACHUSETTS

1 June 2022

Prepared by Spruhan Engineering, P.C.

The proposed project includes stormwater runoff controls associated with the development of a three-story building (5 units) that will require continued maintenance by the proponent and then homeowner(s) upon sale. The major components associated with maintenance needs are the trench drain, manhole, and infiltration system. These will need to be inspected and cleaned periodically as noted below. Cleaning of these structures shall be contracted by the proponent and then homeowner(s) upon sale via a specialty contractor with hydraulic cleaning ability. In addition to the facilities noted below, the homeowners should maintain any roof gutters/drains on a regular basis to prevent clogging and carryover of debris into the drainage systems. The property owner should also provide for the periodic cleaning of the driveway areas to remove large debris and sand particles prior to discharge through the trench drains. The following outlines the major maintenance issues associated with the project:

Maintenance Responsibilities:

The maintenance of the stormwater runoff controls is the responsibility of the proponent until the property is sold; after any sale, the responsibility shifts to the homeowner(s) or successive homeowner(s).

The actual work to inspect and clean the trench drain, manhole sump, and infiltration systems shall be subcontracted to a company that specializes in the cleaning of storm drainage facilities.

Permeable pavers.

Normal Maintenance: All permeable pavers surfaces will require standard structural BMP practices for pavement maintenance regarding sweeping procedures. A dry vacuum type sweeper may be used during dry periods to remove encrusted sediment, leaves, grass clippings, etc. Vacuum and sweeper

settings may require adjustments to prevent uptake of aggregate from the paver voids and joints. Once a year sweeping is normal unless excessive silts and fines are present, which will require additional monitoring of the surface to determine silt build-up and then adjust the sweeping schedule to remove accumulated debris. Additional void materials may be added by mechanically or manually sweeping into joints and void areas if necessary. Refer to specifications for type and grade. It is not recommended to utilize pressure washer on open jointed systems. Adjacent properties, pavements, landscaped areas and grasses should be monitored periodically to ensure that run-off from these sources is not depositing silts and debris on the permeable surface. Construction traffic, agricultural areas (no ground cover), beach area, and areas subject to high winds that will carry these fine particles, will require more frequent sweeping than urban areas. Settlements in pavement surface, access for utility repair, removal of broken or damaged pavers may be performed by an experienced paver installer. Pavers will be removed, setting bed and void materials will be salvaged and kept separate. Base materials are to be removed if access for utilities is required, Settlement repair depending on depth will be restored with additional base materials if settlement exceeds ½". Setting bed will be made level and pavers re-instated with void materials replaced in joints and voids with compaction bringing the pavers to flush condition and ready to use.

Remedial Maintenance: Application of a commercial vacuum sweeper with water jets, sweeper and vacuum bar attachment will cause evacuation of clogged void materials from joint and void openings. This material may be recycled at a wash site or new aggregate materials may be utilized. (Refer to specifications for size and grade) Jointing materials are to be swept into joints and void openings until full, typically the bottom of chamfer is full.

Winter Maintenance: Snow Removal: A four season parking surface, street or plaza may be plowed with truck-mounted blades, power brooms, snow-blowers or manually shoveled. Salt may be used to melt ice, but will affect the quality and pH of water leaving the permeable paver system and could require additional monitoring and analysis. Sand should not be used as this will accelerate rate of clogging in voids and will require an increased frequency of sweeping. Open graded chips may used for traction when ice is present, but more than likely will require sweeping and removal in the spring.

Trench Drains, & Manhole Sumps:

The trench drains and manhole sump shall be inspected after completion of construction to assure that all debris has been removed and construction material will not cause the system to clog. This inspection should also include the drain lines within the system.

The trench drains shall be inspected twice per year and after significant storm events and all debris removed. The manhole sump should be inspected twice per year; if depth of sediment in sumps exceeds 50% capacity, sediment must be removed. The structures should be cleaned with a hydraulic vacuum system at least once per year to remove accumulated solids and debris. At the same time, the drain lines should be inspected and cleaned, if needed. Assuming the structures and drain lines are maintained and cleaning is in accordance with normal standards, the solids removal efficiency should be as required to prevent carry over of large solids to the infiltration systems.

Infiltration System:

The storage/infiltration system should be inspected after completion of construction to assure that all debris has been removed and construction material will not cause the systems to clog.

The storage/infiltration system should be inspected two times over the first year of operation to determine the level of required maintenance. This inspection should be performed by the proponent's/homeowner's engineer. As a preliminary schedule, the system piping should be cleaned once a year to remove any accumulated sediments and sediments in the infiltration chambers should be removed when they reach two inches in depth.

Other Activities:

Pavement Sweeping: The paved areas shall be swept twice per year, once in the spring right after snowmelt, and once in the fall.

Lawn and Landscape Repairs: The lawn and landscaped areas on the site shall be inspected in the spring and fall of each year and the areas shall be restabilized as needed by seeding as lawn or mulching of landscaped areas.

OPERATION & MAINTENANCE PLAN
LOG SHEET
581 AMERICAN LEGION HIGHWAY
BOSTON, MASSACHUSETTS

INSPECTION REPORT:

Inspection Firm: _____

Inspector's Name:_____Date:_____

Components Inspected:_____

_____

Signed: _____

SYSTEM MAINTENANCE:

Maintenance Firm:_____Date:_____

Trench Drain Cleaned: Yes _____No_____Comments:_____

_____

Manhole Sump Cleaned: Yes_____No_____Comments:_____

_____

Drain Lines Inspected: Yes_____No_____Comments:_____

_____

Infiltration System Cleaned: Yes_____No_____Comments:_____

_____

Estimate of Material Removed: _____

Other Comments: _____

_____

Signed: _____