
NOTICE OF INTENT

140 Kendrick Street Redevelopment

Needham, Massachusetts

PREPARED FOR

Boston Properties
800 Boylston Street, Suite 1900
Boston, MA 02199
617-236-3392

PREPARED BY



101 Walnut Street
PO Box 9151
Watertown, MA 02471
617.924.1770

September 2020



September 24, 2020

Ref: 15060.00

Janet Bernardo, Chair
Needham Conservation Commission
500 Dedham Avenue
Needham, MA 02492

Re: 140 Kendrick Street Redevelopment, Needham, MA
Notice of Intent

Ms. Bernardo and Commissioners,

On behalf of the Applicant, Boston Properties, VHB respectfully submits the enclosed Notice of Intent (NOI) proposing to renovate a portion of their existing building at 140 Kendrick Street in Needham, Massachusetts to convert the campus from a single user to a multi-user campus. As part of that renovation, the Applicant proposes to improve some hardscape and landscape areas surrounding the building and improve stormwater treatment in the front of the building (the Project).

This NOI is filed pursuant to the Massachusetts Wetlands Protection Act (WPA) and the Needham Wetlands Protection Bylaw (the Bylaw). Portions of the proposed Project are within the 100-foot buffer zone to Bordering Vegetated Wetland (BVW), subject to the jurisdiction of the WPA and the Bylaw. Work is also proposed within the 100-foot buffer zone to isolated wetlands regulated under the Bylaw.

In compliance with the WPA (M.G.L. c. 131, § 40) and the Bylaw, notification to abutters regarding this NOI has been made by certified return receipt mail on this date. A copy of the abutter notification form and certified list of abutters are enclosed as part of the NOI. As required under the WPA, a copy of the NOI package has been filed with the Massachusetts Department of Environmental Protection Northeast Regional Office.

As required, a check made payable to the Commonwealth of Massachusetts in the amount \$512.50 has been sent directly to the DEP Lock Box for payment of the state's share of this filing fee. Checks made payable to the Town of Needham in the amounts of \$537.50 (municipal share of the WPA fee) and \$1,000.00 (Bylaw fee) are enclosed.

Engineers | Scientists | Planners | Designers

101 Walnut Street
PO Box 9151
Watertown, Massachusetts 02471
P 617.924.1770
F 617.924.2286

Ref: 15060.00
September 24, 2020
Page 2



We respectfully request that the Commission place this matter on the next available meeting agenda. Should you have any questions concerning this submittal or require additional information, please contact me at 617-607-6112 or llaich@vhb.com.

Sincerely,

A handwritten signature in blue ink, appearing to read "Laura Laich", written in a cursive style.

Laura Laich
Environmental Scientist
Vanasse Hangen Brustlin, Inc.

CC: DEP Northeast Regional Office
Boston Properties

NOTICE OF INTENT

140 Kendrick Street Redevelopment

Needham, Massachusetts

PREPARED FOR

Boston Properties
800 Boylston Street, Suite 1900
Boston, MA 02199
617-236-3392

PREPARED BY



101 Walnut Street
PO Box 9151
Watertown, MA 02471
617.924.1770

September 2020

Table of Contents

NOI Forms

- WPA Form 3
- NOI Fee Transmittal Form
- Copies of Filing Fee Checks
- Bylaw Permit Form
- NOI Application Checklist

NOI Figures

- Figure 1 – USGS Locus Map
- Figure 2 – Aerial Map
- Figure 3 – NHESP Map
- Figure 4 – FEMA Map

Attachment A – NOI Narrative

1	Attachment A - Notice of Intent Narrative	1
	Introduction	1
	Site Description	2
	Wetland Resource Areas.....	2
	Buffer Zone	4
2	Work Description	5
	Work in Buffer Zone	5
	Work in Locally-Established Areas.....	5
3	Mitigation Measures	6
	Erosion and Sediment Control	6
	Stormwater Management	8
4	Regulatory Compliance	9
	Buffer Zone	9
	Needham Wetlands Protection Regulations	9
5	Summary	12

Attachment B – Abutter Information

Attachment C – BVW Forms

Attachment D – Photolog

Attachment E – Stormwater Memorandum

Attachment F – Plans (Bound Separately)

Notice of Intent Forms

- › WPA Form 3
- › NOI Wetland Fee Transmittal Form
- › Copies of Filing Fee Checks
- › Bylaw Permit Form
- › NOI Application Checklist

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 3 - Notice of Intent
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File #:
eDEP Transaction #:1225392
City/Town:NEEDHAM

A. General Information

1. Project Location:

a. Street Address	140 KENDRICK STREET		
b. City/Town	NEEDHAM	c. Zip Code	02494
d. Latitude	42.29458N	e. Longitude	71.21478W
f. Map/Plat #	300	g. Parcel/Lot #	1

2. Applicant:

Individual Organization

a. First Name	RICK	b. Last Name	DEANGELIS
c. Organization	BOSTON PROPERTIES		
d. Mailing Address	800 BOYLSTON STREET, SUITE 1900		
e. City/Town	BOSTON	f. State	MA
g. Zip Code	02199		
h. Phone Number	617-236-3333	i. Fax	
j. Email	rdeangelis@bxp.com		

3. Property Owner:

more than one owner

a. First Name		b. Last Name	
c. Organization	BOSTON PROPERTIES		
d. Mailing Address	800 BOYLSTON STREET, SUITE 1900		
e. City/Town	BOSTON	f. State	MA
g. Zip Code	02199		
h. Phone Number	617-236-3392	i. Fax	
j. Email	gneeds@bxp.com		

4. Representative:

a. First Name	LAURA	b. Last Name	LAICH
c. Organization	VANASSE HANGEN BRUSTLIN, INC.		
d. Mailing Address	101 WALNUT STREET		
e. City/Town	WATERTOWN	f. State	MA
g. Zip Code	02472		
h. Phone Number	617-607-6112	i. Fax	
j. Email	llaich@vhb.com		

5. Total WPA Fee Paid (Automatically inserted from NOI Wetland Fee Transmittal Form):

a. Total Fee Paid	1,050.00	b. State Fee Paid	512.50	c. City/Town Fee Paid	537.50
-------------------	----------	-------------------	--------	-----------------------	--------

6. General Project Description:

THE APPLICANT IS PROPOSING TO RENOVATE A PORTION OF THEIR EXISTING BUILDING AT 140 KENDRICK STREET IN NEEDHAM, MASSACHUSETTS TO CONVERT THE CAMPUS FROM A SINGLE USER TO A MULTI-USER CAMPUS. AS PART OF THAT RENOVATION, THE APPLICANT PROPOSES TO IMPROVE SOME HARDSCAPE AND LANDSCAPE AREAS SURROUNDING THE BUILDING AND IMPROVE STORMWATER TREATMENT IN THE FRONT OF THE BUILDING.

7a. Project Type:

- | | |
|---|--|
| 1. <input type="checkbox"/> Single Family Home | 2. <input type="checkbox"/> Residential Subdivision |
| 3. <input type="checkbox"/> Limited Project Driveway Crossing | 4. <input checked="" type="checkbox"/> Commercial/Industrial |
| 5. <input type="checkbox"/> Dock/Pier | 6. <input type="checkbox"/> Utilities |

Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

WPA Form 3 - Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
 MassDEP File #:
 eDEP Transaction #:1225392
 City/Town:NEEDHAM

7. Coastal Engineering Structure
 9. Transportation
 8. Agriculture (eg., cranberries, forestry)
 10. Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. Yes No If yes, describe which limited project applies to this project:
 2. Limited Project

8. Property recorded at the Registry of Deeds for:

a. County:	b. Certificate:	c. Book:	d. Page:
NORFOLK		800	103

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

1. Buffer Zone & Resource Area Impacts (temporary & permanent):

This is a Buffer Zone only project - Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.

2. Inland Resource Areas: (See 310 CMR 10.54 - 10.58, if not applicable, go to Section B.3. Coastal Resource Areas)

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
---------------	-----------------------------	-------------------------------

a. <input type="checkbox"/> Bank	1. linear feet	2. linear feet
b. <input type="checkbox"/> Bordering Vegetated Wetland	1. square feet	2. square feet
c. <input type="checkbox"/> Land under Waterbodies and Waterways	1. Square feet	2. square feet
	3. cubic yards dredged	
d. <input type="checkbox"/> Bordering Land Subject to Flooding	1. square feet	2. square feet
	3. cubic feet of flood storage lost	4. cubic feet replaced
e. <input type="checkbox"/> Isolated Land Subject to Flooding	1. square feet	
	2. cubic feet of flood storage lost	3. cubic feet replaced

f. Riverfront Area

1. Name of Waterway (if any)
 2. Width of Riverfront Area (check one)
 25 ft. - Designated Densely Developed Areas only
 100 ft. - New agricultural projects only
 200 ft. - All other projects
 3. Total area of Riverfront Area on the site of the proposed project
 square feet
 4. Proposed Alteration of the Riverfront Area:

Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

WPA Form 3 - Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
 MassDEP File #:
 eDEP Transaction #:1225392
 City/Town:NEEDHAM

- a. total square feet b. square feet within 100 ft. c. square feet between 100 ft. and 200 ft.

5. Has an alternatives analysis been done and is it attached to this NOI? Yes No
 6. Was the lot where the activity is proposed created prior to August 1, 1996? Yes No

3.Coastal Resource Areas: (See 310 CMR 10.25 - 10.35)

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. <input type="checkbox"/> Designated Port Areas	Indicate size under	Land under the ocean below,
b. <input type="checkbox"/> Land Under the Ocean	1. square feet	
	2. cubic yards dredged	
c. <input type="checkbox"/> Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes, below	
d. <input type="checkbox"/> Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. <input type="checkbox"/> Coastal Dunes	1. square feet	2. cubic yards dune nourishment
f. <input type="checkbox"/> Coastal Banks	1. linear feet	
g. <input type="checkbox"/> Rocky Intertidal Shores	1. square feet	
h. <input type="checkbox"/> Salt Marshes	1. square feet	2. sq ft restoration, rehab, crea.
i. <input type="checkbox"/> Land Under Salt Ponds	1. square feet	
	2. cubic yards dredged	
j. <input type="checkbox"/> Land Containing Shellfish	1. square feet	
k. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, Inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above	
	1. cubic yards dredged	
l. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	1. square feet	

4.Restoration/Enhancement

Restoration/Replacement

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please entered the additional amount here.

- a. square feet of BVW b. square feet of Salt Marsh

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 3 - Notice of Intent
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File #:
eDEP Transaction #:1225392
City/Town:NEEDHAM

5. Projects Involves Stream Crossings

Project Involves Streams Crossings

If the project involves Stream Crossings, please enter the number of new stream crossings/number of replacement stream crossings.

a. number of new stream crossings

b. number of replacement stream crossings

C. Other Applicable Standards and Requirements

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage of Endangered Species program (NHESP)?

a. Yes No

If yes, include proof of mailing or hand delivery of NOI to:
Natural Heritage and Endangered Species
Program
Division of Fisheries and Wildlife
1 Rabbit Hill Road
Westborough, MA 01581

b. Date of map: FROM MAP VIEWER

If yes, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18)....

c. Submit Supplemental Information for Endangered Species Review * (Check boxes as they apply)

1. Percentage/acreage of property to be altered:

(a) within Wetland Resource Area

percentage/acreage

(b) outside Resource Area

percentage/acreage

2. Assessor's Map or right-of-way plan of site

3. Project plans for entire project site, including wetland resource areas and areas outside of wetland jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **

a. Project description (including description of impacts outside of wetland resource area & buffer zone)

b. Photographs representative of the site

c. MESA filing fee (fee information available at: <http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/regulatory-review/mass-endangered-species-act-mesa/mesa-fee-schedule.html>)

Make check payable to "Natural Heritage & Endangered Species Fund" and **mail to NHESP** at above address

Projects altering 10 or more acres of land, also submit:

d. Vegetation cover type map of site

e. Project plans showing Priority & Estimated Habitat boundaries

d. OR Check One of the following

1. Project is exempt from MESA review. Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, <http://www.mass.gov/eea/agencies/dfg/dfw/laws-regulations/cmr/321-cmr-1000-massachusetts-endangered-species-act.html#10.14>; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

WPA Form 3 - Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File #:
eDEP Transaction #:1225392
City/Town:NEEDHAM

2. Separate MESA review ongoing.

- a. NHESP Tracking Number
b. Date submitted to NHESP

3. Separate MESA review completed.

Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

* Some projects not in Estimated Habitat may be located in Priority Habitat, and require NHESP review...

2. For coastal projects only, is any portion of the proposed project located below the mean high waterline or in a fish run?

- a. Not applicable - project is in inland resource area only
b. Yes No

If yes, include proof of mailing or hand delivery of NOI to either:

South Shore - Cohasset to Rhode Island, and the Cape & Islands:

North Shore - Hull to New Hampshire:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 S. Rodney French Blvd
New Bedford, MA 02744

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930

If yes, it may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional office.

3. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

- a. Yes No

If yes, provide name of ACEC (see instructions to WPA Form 3 or DEP Website for ACEC locations). Note: electronic filers click on Website.

b. ACEC Name

4. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

- a. Yes No

5. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L.c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L.c. 130, § 105)?

- a. Yes No

6. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

a. Yes, Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:

- 1. Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol.2, Chapter 3)
2. A portion of the site constitutes redevelopment
3. Proprietary BMPs are included in the Stormwater Management System

b. No, Explain why the project is exempt:

Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

WPA Form 3 - Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File #:
eDEP Transaction #:1225392
City/Town:NEEDHAM

- 1. Single Family Home
2. Emergency Road Repair
3. Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department by regular mail delivery.

- 1. USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site.
2. Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.
3. Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s).
4. List the titles and dates for all plans and other materials submitted with this NOI.

a. Plan Title: 140 KENDRICK STREET
b. Plan Prepared By: NICK SKOLY
c. Plan Signed/Stamped By:
d. Revised Final Date: 9-23-20
e. Scale: 1:20

- 5. If there is more than one property owner, please attach a list of these property owners not listed on this form.
6. Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.
7. Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.
8. Attach NOI Wetland Fee Transmittal Form.
9. Attach Stormwater Report, if needed.

Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 3 - Notice of Intent
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
 MassDEP File #:
 eDEP Transaction #:1225392
 City/Town:NEEDHAM

E. Fees

1. Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

2. Municipal Check Number	3. Check date
4. State Check Number	5. Check date
6. Payer name on check: First Name	7. Payer name on check: Last Name

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

BP 140 KANDORICK STREET LLC
 By Boston Properties Limited Partnership
 1. Signature of Applicant ITS MANAGING MEMBER

Sept 24, 2020
 2. Date

By Boston Properties, Inc.
 3. Signature of Property Owner (if different) General Partner

4. Date

By Frederick J. Delaney
 5. Signature of Representative (if any) Senior Vice President

6. Date

For Conservation Commission:

Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:

One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a copy of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:

If the applicant has checked the "yes" box in Section C, Items 1-3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 3 - Notice of Wetland Fee Transmittal
Form

Provided by MassDEP:
 MassDEP File #:
 eDEP Transaction #:1225392
 City/Town:NEEDHAM

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. Applicant Information

1. Applicant:

a. First Name	RICK	b. Last Name	DEANGELIS		
c. Organization	BOSTON PROPERTIES				
d. Mailing Address	800 BOYLSTON STREET, SUITE 1900				
e. City/Town	BOSTON	f. State	MA	g. Zip Code	02199
h. Phone Number	6172363333	i. Fax		j. Email	rdeangelis@bxp.com

2. Property Owner:(if different)

a. First Name		b. Last Name			
c. Organization	BOSTON PROPERTIES				
d. Mailing Address	800 BOYLSTON STREET, SUITE 1900				
e. City/Town	BOSTON	f. State	MA	g. Zip Code	02199
h. Phone Number	6172363392	i. Fax		j. Email	gneeds@bxp.com

3. Project Location:

a. Street Address	140 KENDRICK STREET	b. City/Town	NEEDHAM
-------------------	---------------------	--------------	---------

Are you exempted from Fee? (YOU HAVE SELECTED 'NO')

Note: Fee will be exempted if you are one of the following:

- City/Town/County/District
- Municipal Housing Authority
- Indian Tribe Housing Authority
- MBTA

State agencies are only exempt if the fee is less than \$100

B. Fees

Activity Type	Activity Number	Activity Fee	RF Multiplier	Sub Total
A.) SITE PREPARATION (FOR DEVELOPMENT) BEYOND NOTICE OF INTENT SCOPE;	1	1050.00		1050.00
		City/Town share of filling fee	State share of filing fee	Total Project Fee
		\$537.50	\$512.50	\$1,050.00

WPA Town Filing Fee	\$
NGWP Town Filing Fee	\$
Waiver Fee	\$

APPLICATION FOR A PERMIT NEEDHAM GENERAL WETLANDS PROTECTION BYLAW ARTICLE 6

Notice of Intent

Request for Determination of Applicability

Description of Project

The Applicant, Boston Properties, is proposing to renovate a portion of their existing building at 140 Kendrick Street to convert the campus from a single user to a multi-user campus. As part of that renovation, the Applicant proposes to improve some hardscape and landscape areas surrounding the building and improve stormwater treatment in the front of the building.

Project Location

Street: 140 Kendrick Street
Assessor's Map: 300 **Parcel:** 1

Registry Information

Book: 800 **Page:** 103

Applicant

Name: Boston Properties
Address: 800 Boylston Street, Suite 1900
Boston, MA 02199

Owner (if different)

Name: _____
Address: _____

Date of Filing

9/24/20

Resources within which work is proposed:

- Bordering Vegetated Wetland
- Bank
- Bordering Land Subject to Flooding
- Isolated Land Subject to Flooding
- Buffer Zone

This application is is not filed simultaneously with a NOI/RDA under the Massachusetts Wetlands Protection Act.

Statement of Applicant: I hereby certify under the penalties of perjury that this application and all supporting plans and documents are true and complete to the best of my knowledge, and that these have been prepared in conformance with the requirements of the Needham General Wetlands Bylaw and supporting regulations. I further certify that all abutters and other parties have been notified of this application as required by the Bylaw. I understand I may be asked to pay for a consultant to review my application for the Commission.

Signature: Frank J. [Signature] By Boston Properties Limited Partnership
By Boston Properties, Inc. **Date:** Sept 24, 2020
Senior Vice President

**NOTICE OF INTENT APPLICATION CHECKLIST
NEEDHAM CONSERVATION COMMISSION
NEEDHAM GENERAL WETLANDS BY-LAW – ARTICLE 6**

THIS CHECKLIST MUST BE COMPLETED, SIGNED AND SUBMITTED WITH ANY NOTICE OF INTENT PERMIT APPLICATION. ALL REQUIRED INFORMATION AND NOTIFICATIONS MUST BE INCLUDED IN ORDER FOR THE APPLICATION TO BE CONSIDERED COMPLETE. BYLAW SECTION 1.05(4) LISTS THE REGULATORY REQUIREMENTS FOR AN APPLICATION.

NINE (9) PAPER COPIES AND ONE (1) ELECTRONIC COPY OF ALL MATERIALS MUST BE SUBMITTED AND CHECK(S) MADE OUT TO TOWN OF NEEDHAM FOR APPLICATION FEE (SEE FEE SCHEDULE)

ABUTTER NOTIFICATION (by certified mail, return receipt or hand delivery)

- List certified by the Assessor's Office of all abutters within 300 feet of the property line.
- Copy of the Assessor's Map or Subdivision Plan showing abutting and adjacent lots within 300 feet of the parcel on which work is proposed.
- Copy of draft notification made to abutters including date and specific time of public hearing. (See Sample online)
- Proof of notification to abutters and Board of Selectmen, Planning Board, Board of Health, and Building Inspector (SUBMIT AT OR PRIOR TO HEARING).

PLANS (shall include the following)

- An 8.5" x 11" section of the U.S. Geologic Survey quadrangle or other map of the area.
- TITLE block clearly stating the name of the project.
- Street address, map and parcel numbers.
- Date of plan (and most recent revision).
- Scale (1"=20' or 1"=40' or metric equivalent).
- Stamped and signed by a Professional Engineer or Registered Land Surveyor.
- Shows existing conditions (grades, structures, roads, treelines, and limits of existing lawn).
- Clearly shows the boundaries of all regulated resource areas (Vegetated Wetland, Bank, BLSF, ILSF, Riverfront Area, Vernal Pools), including the 100-foot and 50- or 25-foot Buffer Zone limits as defined under the Wetlands Protection Act and the Needham General Wetlands By-Law and Regulations.
- Clearly shows the location and numbers of all wetland flags and method of survey.
- Show proposed limit of work, including but not limited to proposed grades, locations of all structures, roads, paths, utilities, drainage structures, trees to be removed, changes in lawn edges, plantings (including replacement trees per Town Guidelines), and proposed tree line.
- Shows the minimum distance between the limit of proposed work (erosion controls) and the edge of wetland
- Details of any subsurface drainage structure.
- Detail of any erosion and sedimentation control measures.

DOCUMENTS

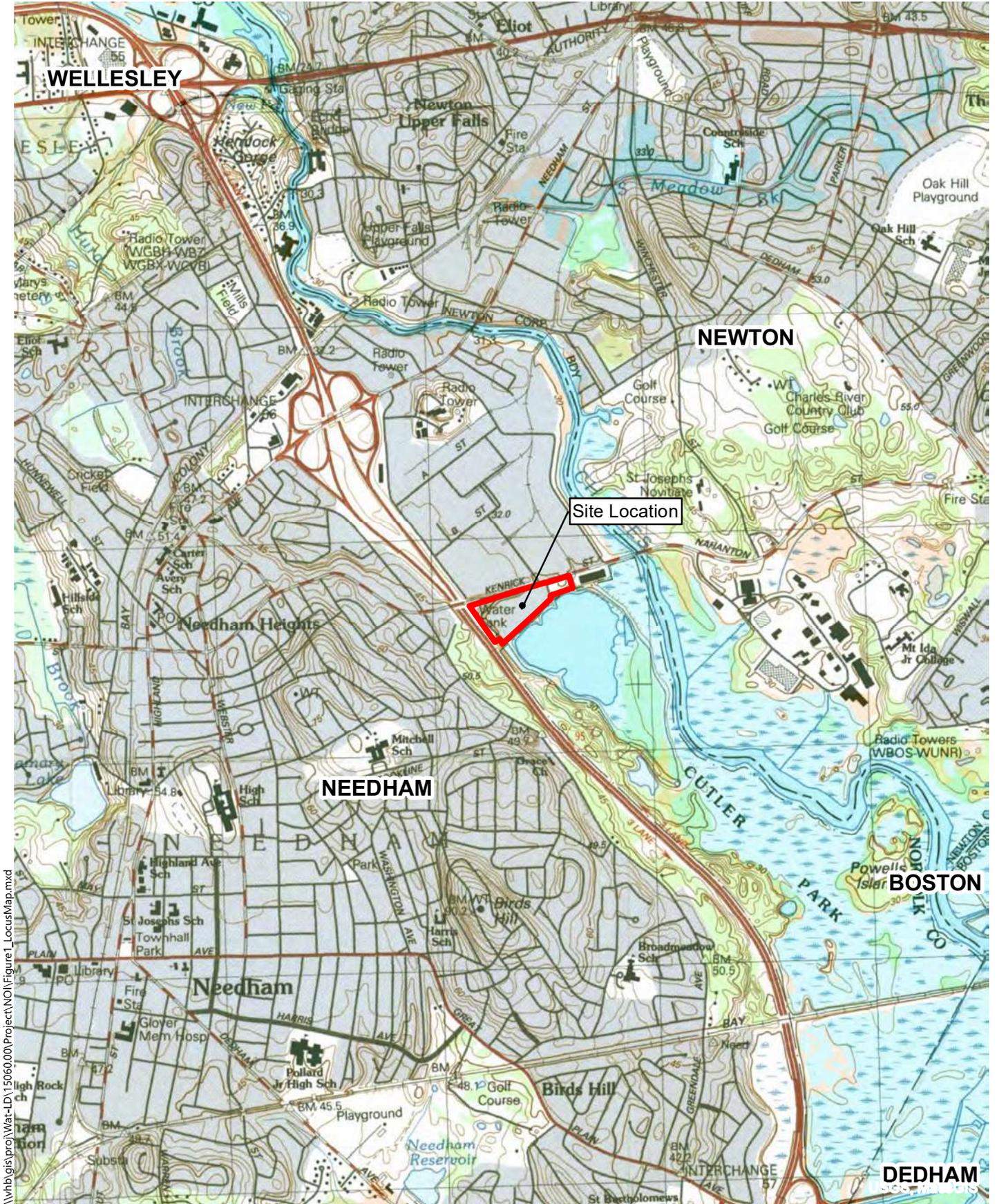
- WPA Form 3 – Notice of Intent.
- Application for a Permit (Needham General Wetlands Protection Bylaw Article 6).
- Written Description of the work proposed, including a description of any excavation, proposed structures, and erosion and sedimentation controls.
- Drainage calculations and plans, for any project other than a single family residence, that would alter the flow of runoff to a wetland or have a direct discharge of stormwater within the buffer zone.
- Quantitative documentation to support the delineation of the vegetated wetland, with certification from the wetland scientist responsible for the delineation, stating the basis for the delineation and the date on which the delineation was performed. DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Forms must document both upland and wetland plots.
- Wildlife habitat assessment, where alterations to a wetland resource area or naturally-vegetated buffer zone are proposed.
- Soil test results where infiltration measures are proposed.
- Request for a waiver from compliance with the regulation (including proposed basis for request) if regulatory performance standards cannot be met.

Signature:  **Date:** 9/24/20

Laura Laich, VHB

Notice of Intent Figures

- › Figure 1 – Site Location Map
- › Figure 2 – Aerial Map
- › Figure 3 – NHESP Map
- › Figure 4 – FEMA Map



\\vhb\gis\proj\Wat-LD\15060.00\Project\NON\Figure1_LocusMap.mxd



140 Kendrick Street | Needham, MA

Legend

Site Location

Figure 1 - USGS Locus Map

Source Info: USGS, MassGIS, VHB



\\vhb\gis\proj\Wat-LD\15060.00\Project\NON\Figure2_Aerial.mxd

USGS, MassGIS



140 Kendrick Street | Needham, MA

- Legend
- Site Location
 - Waterway
 - Water Body

Figure 2 - Aerial Map
Source Info: USGS, MassGIS, VHB



\\vhb\gis\proj\Wat-LD\15060.00\Project\NON\Figure3_NHESP.mxd

USGS, MassGIS



140 Kendrick Street | Needham, MA

- Legend**
- Site Location
 - Waterway
 - Water Body
 - NHESP Priority Habitats of Rare Species - None Present
 - NHESP Estimated Habitats of Rare Wildlife - None Present
 - NHESP Certified Vernal Pools
 - NHESP Potential Vernal Pools

Figure 3 - NHESP Map
Source Info: USGS, MassGIS, VHB



\\vhb\gis\proj\Wat-LD\15060.00\Project\NON\Figure4_FEMA_mxd

USGS, MassGIS



140 Kendrick Street | Needham, MA

Legend

-  Site Location
-  AE: 1% Annual Chance of Flooding, with BFE
-  Waterway
-  X: 0.2% Annual Chance of Flooding
-  Water Body

Figure 4 - FEMA Map
Source Info: USGS, MassGIS, VHB

Attachment A

Notice of Intent Narrative

- › Introduction
- › Site Description
- › Work Description
- › Mitigation Measures
- › Regulatory Compliance
- › Summary

Attachment A - Notice of Intent Narrative

This Notice of Intent (NOI) is filed pursuant to the Massachusetts Wetlands Protection Act (WPA) (MGL Chapter 131, Section 40) and its implementing regulations (310 CMR 10.00) and the Needham Wetlands Protection Bylaw (the Bylaw) and Needham Wetlands Protection Regulations.

Introduction

The Applicant, Boston Properties, is proposing to renovate a portion of their existing building at 140 Kendrick Street in Needham, Massachusetts (the Project Site) to convert the campus from a single user to a multi-user campus (Figures 1 and 2). As part of that renovation, the Applicant proposes to improve some hardscape and landscape areas surrounding the building and improve stormwater treatment in the front of the building (the Project).

Work is proposed within the 100-foot buffer zone to Bordering Vegetated Wetland (BVW), subject to the jurisdiction of the WPA and the Bylaw. The Bylaw also regulates isolated wetlands and work is proposed within the 100-foot buffer zone to isolated wetlands. The Bylaw assigns a 25-foot no disturb zone and 50-foot buffer zone from the edge of BVW and isolated wetlands. Work will remain within the previously disturbed footprint and will not encroach into resource areas.

Areas of disturbance have been minimized to the extent practicable, and temporary impacts will be restored in place to their original conditions and stabilized to prevent future erosion and degradation. The Project has been designed in compliance with the WPA and the Bylaw.

Wetland resource areas will be protected from impacts during construction through the implementation of an erosion and sedimentation control program. This program includes provisions to minimize areas of disturbance through phasing and sequencing, limit erosion through stabilization, and prevent sediment from leaving the site by installing structural controls. Runoff generated from the Project will be collected and treated in accordance with design guidelines¹ developed by Department of Environmental Protection (DEP) and standards contained in the WPA Regulations.

¹ DEP, 2008. *Massachusetts Stormwater Handbook*.

Site Description

The Project Site is located within a commercial area of Needham and bounded by Kendrick Street to the north, Kendrick Pond and Massachusetts Department of Conservation and Recreation (DCR) land to the east and south, and Interstate-95 to the west. Topography on the Project Site slopes towards the south.

According to the most recently available data provided by the Massachusetts Natural Heritage and Endangered Species Program² (NHESP), no portion of the Project Site is within Priority Habitat of Rare Species or Estimated Habitat of Rare Wildlife and there are no Certified or Potential Vernal Pools in the vicinity of the Project Site (Figure 3). The most recently issued Flood Insurance Rate Map (FIRM)³ for the area, produced by the Federal Emergency Management Agency (FEMA), indicates that no portion of the Project Site is within the mapped floodplain for the 100-year storm event (Figure 4).

According to the Massachusetts Department of Environmental Protection (DEP), the Project Site is not located within an Area of Critical Environmental Concern (ACEC) or an area designated as an Outstanding Resource Water (ORW)⁴. The Natural Resources Conservation Service (NRCS) soil survey⁵ has mapped the surface soils within the Project Site as Urban land.

Wetland resource areas on/near the site are described below.

Wetland Resource Areas

Wetlands on the Project Site were delineated on September 18, 2020 by environmental scientists with Vanasse Hangen Brustlin, Inc. in accordance with methods developed by the DEP⁶ and the U.S. Army Corps of Engineers⁷. The following sections of this narrative describe the wetlands and identify resource areas on the Project Site that are regulated under the WPA Regulations (310 CMR 10.00) and the Bylaw. The resource areas are depicted on the attached Project Plans (Attachment F). BVW Data Sheets for the wetlands on the property are provided in Attachment C of this NOI.

As defined at 310 CMR 10.55(2)(a) and (c), BVWs are 'freshwater wetlands that border on creeks, rivers, stream, ponds, and lakes.' The boundary of BVW is determined by the presence of 50 percent or more of wetland indicator plants and saturated or inundated conditions.

² NHESP, 2017. Massachusetts Natural Heritage Atlas. 13th Edition.

³ Federal Emergency Management Agency, National Hazard Flood Layer, Digital Flood Insurance Rate Map (DFIRM).

⁴ DEP, 2010. Designated Outstanding Resource Waters of Massachusetts.

⁵ Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey

⁶ DEP, 1995. *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act*.

⁷ USACE, 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0*.

Delineated wetlands on the Project Site include BVW and isolated wetlands, as summarized in the table below and described in more detail in the following sections of this attachment.

Table 1 Delineated Resource Areas

Wetland Number	Flag Numbers	Resource Type	Description
Wetland 1	W1-100 to W1-134	BVW	Palustrine emergent (PEM) wetland with a palustrine forested (PFO) fringe adjacent to the northwest side of Kendrick Pond
Wetland 2	W2-100 to W2-105	Isolated Wetland	Isolated PFO wetland in a topographic depression between the DCR path and the north side of Kendrick Pond
Wetland 3	W3-100 to W3-106	Isolated Wetland	Isolated PFO wetland in a topographic depression between the DCR path and the north side of Kendrick Pond
Wetland 4	W4-100 to W4-110	Isolated Wetland	Isolated PFO wetland between I-95 and the west side of the Project Site

Source: VHB, 2020.

Wetland 1

Wetland 1 is an emergent wetland with a forested fringe bordering the northern edge of Kendrick Pond. Wetland 1 is characterized by frequently submerged low-lying areas adjacent to the Pond. Wetland 1 falls under the jurisdiction of the WPA and the Bylaw.

Dominant plant species along the forested fringe in Wetland 1 include red maple (*Acer rubrum*), slippery elm (*Ulmus rubra*), glossy buckthorn (*Frangula alnus*), and buttonbush (*Cephalanthus occidentalis*). The herbaceous understory is sparse due to frequent inundation. Wetland 1 is denoted by pink flagging numbered from W1-100 through W1-134.

Wetland 2 and Wetland 3

Wetland 2 and Wetland 3 are isolated forested wetlands separated from Wetland 1 by an upland path. The two wetlands are in small topographic depressions sandwiched between the path and the DCR walkway to the north. Neither of these wetlands contain the volume required to qualify for Isolated Land Subject to Flooding (ILSF) under the WPA; therefore, they fall under the jurisdiction of the Bylaw only.

Dominant plant species in both Wetland 2 and Wetland 3 include red maple, slippery elm, and glossy buckthorn with limited herbaceous understory. Water-stained leaves and water marks on trees are present. Wetland 2 is denoted by pink flagging numbered from W2-100 through W2-105. Wetland 3 is denoted by pink flagging numbered from W3-100 through W3-106.

Wetland 4

Wetland 4 is an isolated forested wetland to the west of the Project Site and existing building. It is a low-lying area between I-95 to the west and the Project Site to the east. This wetland receives stormwater drainage from I-95 through a pipe outlet at the northern wetland edge. Signs of scour and sedimentation are present throughout the wetland from stormwater runoff. Wetland 4 does not contain the volume required to qualify for ILSF under the WPA; therefore, it falls under the jurisdiction of the Bylaw only.

Dominant plant species in Wetland 4 include red maple, slippery elm, glossy buckthorn, spotted ladythumb (*Polygonum persicaria*), and narrow-leaved fireweed (*Chamerion angustifolium*). Wetland 4 is denoted by pink flagging numbered from W4-100 through W4-110.

Buffer Zone

The WPA regulations (310 CMR 10.02(2)(b)) establish a 100-foot buffer zone from the limits of BVW described above. The buffer zone on the Project Site is predominantly previously disturbed and includes the DCR path, lawn, the existing patio and a portion of the existing building.

The Bylaw establishes a 25-foot no disturb zone and a 50-foot buffer zone from the edge of BVW and isolated wetlands. Portions of the existing DCR path and the maintained lawn at the Project Site are within the 50-foot buffer zone.

Work Description

The proposed Project will renovate a portion of the building and improve some hardscape and landscape areas surrounding the existing building. The exterior improvements will be limited to reworking parking spaces near the main entry, improving the vehicular drop off area and pedestrian circulation, and improving an outdoor patio at the rear of the building. A portion of the back patio is located within the 100-foot buffer zone to BVW and isolated wetlands. Refer to the Project Plans provided as Attachment F.

The Project will reduce overall impervious area at the Project Site. The existing patio is constructed of impervious material and will be replaced with permeable pavers with a stone reservoir. Proposed pedestrian connections to the existing DCR path at the rear of the property will be constructed with a pervious material. The Project also proposes to install a subsurface infiltration system at the front of the building in the drop-off area in order to provide stormwater infiltration and water quality improvements.

Work in Buffer Zone

The Project will result in alterations to previously disturbed areas of the 100-foot buffer zone. Proposed work within buffer zone consists of patio improvements, pedestrian connections to the DCR path, and landscaping. Landscaping will include native plantings within the buffer zone as shown on Plan Sheet L-200. The Project will reduce impervious area within the buffer zone by 1,216 square feet.

Work in Locally-Established Areas

No portion of the Project is within the 25-foot no-disturb zone. Proposed work within the locally established 50-foot buffer zone consists of a small portion of two pedestrian connections to the DCR path. These will be created using pervious materials within the existing maintained lawn associated with the facility. Proposed work will not encroach beyond the previously disturbed footprint.

Mitigation Measures

A suite of mitigation measures is proposed to prevent short- and long-term impacts to wetland resource areas and compensate for direct disturbances. Mitigation measures proposed for this project include a sediment and erosion control program, which will include structural and non-structural practices.

Erosion and Sediment Control

An erosion and sedimentation control program will be implemented to minimize temporary impacts to wetland resource areas during the construction phase of the project. The program incorporates Best Management Practices (BMPs) specified in guidelines developed by the DEP⁸ and the U.S. Environmental Protection Agency (EPA)⁹.

Proper implementation of the erosion and sedimentation control program will:

- › minimize exposed soil areas through sequencing and temporary stabilization;
- › place structures to manage stormwater runoff and erosion; and
- › establish a permanent vegetative cover or other forms of stabilization as soon as practicable.

The following sections describe the controls that will be used and practices that will be followed during construction. These practices comply with criteria contained in the NPDES General Permit for Discharges from Large and Small Construction Activities issued by the EPA.

Non-Structural Practices

Non-structural practices to be used during construction include temporary stabilization, temporary seeding, permanent seeding, and dust control. These practices will be initiated as soon as practicable in appropriate areas at the site.

Temporary Stabilization

Any areas of exposed soil or stockpiles that will remain inactive for more than 14 days will be covered with a layer of straw mulch applied at a rate of 90 pounds per 1,000 square feet. The mulch will be anchored with a tacking coat (non-tar) applied by hydroseeding. Steeper slopes (greater than 10 percent) will be covered with a bonded fiber matrix (EcoAegis® or similar) according to the recommendations provided by the manufacturer.

8 DEP, 1997. *Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas: A Guide for Planners, Designers, and Municipal Officials*.

9 EPA, 2007. *Interim Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites*. Office of Water. Report EPA 833-R-060-04.

Temporary Seeding

If conditions allow, a temporary vegetative cover will be established on areas of exposed soils (including stockpiles) that remain unstabilized for a period of more than 60 days. The seeded surfaces will be covered with a layer of straw mulch or bonded fiber matrix as described above. The seed mix shall include a blend of rapid germinating grasses that are indigenous to eastern Massachusetts.

Permanent Seeding

Upon completion of final grading, any areas not covered by pavement, other forms of stabilization, or other methods of landscaping will be seeded with New England Conservation/Wildlife mix produced by New England Wetland Plants, Inc. This seed mix includes Virginia wild rye (*Elymus virginicus*), little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), red fescue (*Festuca rubra*), switch grass (*Panicum virgatum*), partridge pea (*Chamaecrista fasciculata*), panicleleaf tick trefoil (*Desmodium paniculatum*), indian grass (*Sorghastrum nutans*), blue vervain (*Verbena hastata*), butterfly milkweed (*Asclepias tuberosa*), black eyed Susan (*Rudbeckia hirta*), common sneezeweed (*Helenium autumnale*), heath aster (*Aster pilosus/Symphotrichum pilosum*), early goldenrod (*Solidago juncea*), upland bentgrass (*Agrostis perennans*). The mix will be applied at a rate of 25 pounds per acre and will be covered with mulch or bonded fiber matrix as described above.

Dust Control

The erosion and sediment control program includes provisions to minimize the generation of dust during dry and windy conditions. When necessary, larger areas of exposed soil will be wetted to prevent wind borne transport of fine grained sediment. Enough water shall be applied to wet the upper 0.5 inches of soil. The water will be applied as a fine spray to prevent erosion. A water truck will be kept on the property (or at a nearby location) to facilitate this practice.

Structural Practices

Structural erosion and sedimentation controls to be used on the site include barriers and catch basin inlet protection.

Erosion Control Barriers

Prior to any ground disturbance, an approved erosion control barrier will be installed at the downgradient limit of work. As construction progresses, additional barriers will be installed around other erosion prone areas. The barriers will be entrenched into the substrate to prevent underflow.

If sediment has accumulated to a depth which impairs proper functioning of the barrier, it will be removed by hand or by machinery operating upslope of the barriers. This material will be either reused at the Site or disposed of at a suitable offsite location. Any damaged sections of the barrier will be repaired or replaced immediately upon discovery.

Catch Basin Inlet Protection

The inlets of existing and proposed catch basins will be protected from sediment inflow during the work period by surrounding them with a barrier of staked straw bales or by installing Silt Sacks®. If straw bales are used, a layer of non-woven filter fabric shall be placed beneath the grate of each basin. If sediment has collected behind the barrier or in the Silt Sack® to a point where it impairs proper functioning, it will be removed and will be either reused onsite or disposed of at a suitable offsite location.

Stormwater Management

Runoff generated from impervious surfaces will be collected and managed in accordance with the DEP Stormwater policies. The proposed Project will improve existing conditions by including measures to provide groundwater recharge and water quality treatment. Full details on the stormwater improvements are included in the accompanying Stormwater Memorandum (Attachment E), which includes compliance with applicable stormwater management standards cited in Section 310 CMR 10.05(6)(k) of the WPA Regulations.

Regulatory Compliance

The proposed Project includes work in the buffer zone. The Project includes controls and fully complies with the WPA regulations.

Buffer Zone

Work within buffer zones is not governed by specific regulatory performance standards. In general, work within buffer zones is permissible when said work has been designed, or can be conditioned, such that there will be no impact on the downgradient wetland resource area(s) being buffered. As stated in 310 CMR 10.53(1) of the WPA Regulations:

For work in Buffer Zone subject to review under 310 CMR 10.02(2)(b)3., the Issuing Authority shall impose conditions to protect the interests of the Act identified for the adjacent Resource Area... The issuing authority may consider the characteristics of the Buffer Zone, such as the presence of steep slopes, that may increase the potential for adverse impacts on Resource Areas. Conditions may include limitations on the scope and location of work in the Buffer Zone as necessary to avoid alteration of Resource Areas. The Issuing Authority may require erosion and sedimentation controls during construction, a clear limit of work, and the preservation of natural vegetation adjacent to the Resource Area and/or other measures commensurate with the scope and location of work with the Buffer Zone to protect the interests of the Act.

The Project has been designed to address these considerations. Measures have been incorporated into the Project design to ensure that work will be done in a manner that prevents impacts to downgradient wetland resources. A clear limit of work will be identified and erosion and sedimentation control areas will be installed throughout the Project Site. Temporary disturbance in vegetated areas of buffer zone will be restored in place and seeded with a native seed mix.

Needham Wetlands Protection Regulations

The Project also complies with the performance standards for buffer zone established by the Bylaw. Compliance with each of the applicable performance standards is demonstrated below:

(a) *No construction within 25 feet of the limit of Bank or Vegetated Wetland ("The 25-Foot Buffer Zone") may be permitted. Construction is here defined to include (but not limited to) all new roadways, driveways, buildings, decks (except as in (b) below), clearing and grading, stormwater detention basins, and point-source discharges. Any construction within the Buffer Zone must be designed to preserve a minimum of 25 feet of undisturbed natural vegetation and soils adjacent to a Vegetated Wetland or Bank.*

No portion of the Project will occur within 25 feet of the wetland limit.

(b) *Work within 25 feet of the limit of Bank or Vegetated wetland may be permitted when the work consists of:*

- removing existing structures;
- planting native tree, shrub, or herbaceous species;
- removing invasive plant species and restoring native vegetation;
- adding a deck or patio to an existing dwelling, where no new impervious surfaces are proposed and the work area is existing lawn.

No portion of the Project will occur within 25 feet of the wetland limit.

- (c) *Where the Buffer Zone provides wildlife habitat (i.e., is forested, meadowland, or otherwise undeveloped except for lawful existing lawn and ornamental or vegetable gardens), no alteration of vegetation or construction within 50 feet of the limit of Vegetated Wetland or Bank (the "50-Foot Buffer Zone") is permitted.*

Proposed work within the locally established 50-foot buffer zone consists of a small portion of two pedestrian connections to the DCR path. The condition of the buffer zone at these locations is existing maintained lawn.

- (d) *No construction may be permitted within 100 feet of a Vernal Pool, as defined in Section 1.04 above.*

While the presence or absence of a vernal pool cannot be determined outside of the spring season, Wetland 2 and Wetland 3 do not appear to provide vernal pool habitat. These are shallow depressions that act as ditches between the path through the woods and the DCR path. No portion of the Project is within 100 feet of a certified or potential vernal pool designated by NHESP.

- (e) *No work within the Buffer Zone shall impair the water quality, water temperature, or wildlife habitat of the adjacent Water Body, Waterway, Bank, or Vegetated Wetland.*

Proposed work in the buffer is designed to improve water quality within the adjacent wetlands and Kendrick Pond by reducing impervious surfaces on the Project Site and increasing stormwater infiltration. The Project will remain within the previously disturbed areas of the buffer zone and will not remove vegetated buffer or impair wildlife habitat.

- (f) *Where new point-source discharges are proposed within the Buffer Zone, a comprehensive stormwater management system shall be designed that will not degrade the values or functions of the receiving or downstream Water Bodies, Waterways, or Vegetated Wetlands, surface water, or ground water. Such stormwater management systems shall employ Best Practical Measures. Any point-source discharge must be designed to discharge water at non-erosive velocities equal to 2 c.f.s (cubic feet per second) or less.*

No new point-source discharges are proposed within the buffer zone.

- (g) *Where stormwater detention basins (including any infiltration or recharge basins) are proposed within the Buffer Zone, these shall be designed to be maintenance-free, selfcleaning, and to deter acts of vandalism. The inlet and outlet shall be designed to avoid scour and erosion of the basin bottom and discharge channel. The basin must be designed to avoid or minimize direct flows between the inlet and outlet, and to maximize the stormwater residence times.*

No stormwater detention basins are proposed within the buffer zone.

- (h) *Where proposed work within the Buffer Zone will increase impervious surfaces and reduce groundwater recharge, infiltration measures must be designed to maintain said groundwater recharge.*

No increase in impervious surfaces is proposed. The Project will result in an overall decrease in impervious surfaces and increased groundwater recharge.

- (i) *Erosion and sedimentation controls must be utilized for any construction within the Buffer Zone that will result in exposed soils. An erosion and sedimentation control plan must be prepared which provides specifications for temporary and permanent soil stabilization, using Best Practical Measures. No silt or sediment may be permitted to enter wetland resource areas during or subsequent to construction.*

Erosion and sedimentation controls will be utilized for the proposed Project as described above in this NOI Narrative and shown on the Project Plans (Attachment F).

Summary

The Applicant is proposing to renovate a portion of their existing building at 140 Kendrick Street in Needham, Massachusetts to convert the campus from a single user to a multi-user campus. As part of that renovation, the Applicant proposes to improve some hardscape and landscape areas surrounding the building and improve stormwater treatment in the front of the building.

Work is proposed within the 100-foot buffer zone to BVW and isolated wetlands. Work will remain within the previously disturbed footprint and will not encroach into resource areas. The Project will reduce overall impervious area at the Project Site and within the buffer zone.

Wetland resource areas will be protected from impacts during construction through the implementation of an erosion and sedimentation control program. Areas of disturbance have been minimized to the extent practicable, and temporary impacts will be restored in place to their original conditions and stabilized to prevent future erosion and degradation.

The Applicant respectfully requests that the Needham Conservation Commission find these measures adequately protective of the interests identified in the WPA and the Bylaw and issue an Order of Conditions approving the work described in this NOI and shown on the accompanying plans.

Attachment B

Abutter Information

- › Notice to Abutters
- › List of Abutters

Notification to Abutters Under the Massachusetts Wetland Protection Act & the Needham Wetlands Protection Bylaw

In accordance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40, and Needham Wetlands Protection Bylaw (Article 6) you are hereby notified of the following:

The name of the applicant is **Boston Properties** .

The applicant has filed a **Notice of Intent** with the Conservation Commission for the municipality of Needham, MA for **renovation of a portion of their existing building at 140 Kendrick Street, including improving some hardscape and landscape areas surrounding the building and improving stormwater treatment in front of the building.**

The address of the lot where the activity is proposed is **140 Kendrick Street (Assessor's Map 300 Parcel 1)**.

The hearing will be on **October 8** at **7:30** **PM.**

Public Participation will be via Virtual Means Only - In light of the ongoing COVID-19 coronavirus outbreak, Governor Baker issued an emergency Order on March 12, 2020, allowing public bodies greater flexibility in utilizing technology in the conduct of meetings under the Open Meeting Law. The Needham Conservation Commission greatly values the participation of its citizens in the public meeting process, but given the current circumstances and recommendations at both the state and federal levels to limit or avoid public gatherings, including Governor Baker's ban on gatherings of more than 10 people, together with the present closure of Needham Town Hall, the Public Service Administration Building, and other public buildings, the Town has decided to implement the "remote participation" procedures allowed under Governor Baker's emergency Order for all boards, committees, and commissions. (More information about this order can be found on the back of this sheet).

The public may participate in this meeting via Remote Participation:

- From your computer, smart phone or tablet: <https://us02web.zoom.us/j/82316889821>
- Meeting ID: 823-1688-9821
- From your phone: Dial +1 646-558-8656; Meeting ID: 82316889821#

Copies of the application may be obtained digitally from the Conservation Commission Staff by emailing conservation@needhamma.gov. Alternatively, you may call our office at 781-455-7550 x222 and leave a message with your contact information and the project address and a Staff Member will return your call during regular business hours.

Notice of the public hearing, including its date, time and place, will be published at least five (5) days in advance in a newspaper of local distribution.

NOTE: You also may contact the nearest Department of Environmental Protection Regional Office for more information about this application or the MA Wetlands Protection Act. To contact the DEP, call the Northeast Region at 978-694-3200.

**COVID-19 Emergency Response:
Implementation of Governor's Order Suspending Certain Provisions of the Open Meeting Law**

In light of the ongoing COVID-19 coronavirus outbreak, Governor Baker issued an emergency Order on March 12, 2020, allowing public bodies greater flexibility in utilizing technology in the conduct of meetings under the Open Meeting Law. The Needham Conservation Commission greatly values the participation of its citizens in the public meeting process, but given the current circumstances and recommendations at both the state and federal levels to limit or avoid public gatherings, including Governor Baker's ban on gatherings of more than 25 people, together with the present closure of Needham Town Hall and other public buildings to the public, The Town of Needham has decided to implement the "remote participation" procedures allowed under Governor Baker's emergency Order for all boards, committees, and commissions. This means that:

1. All or any of the members of the public body may choose to participate in a public meeting via remote access. Meetings may be virtual, in their entirety.
2. The public will be provided with alternative access through which they can watch or listen to meetings "in real time," and meeting notices will specify the manner in which members of the public may access audio or video of the meeting as it is occurring.
3. If, despite our best efforts, our technological capabilities do not adequately support public access to virtual or remote meetings, the Needham Conservation Commission will ensure that an audio or video recording, transcript, or other comprehensive record of the proceedings at the meeting is posted on the Town's website as soon as possible after the meeting.
4. Notices for public hearings will contain additional information about how the public may participate via electronic/technological means.
5. Where individuals have a right, or are required, to attend a public meeting or hearing, they will be provided with information about how to participate in the meeting/hearing remotely.
6. Meeting notices will still be posted at least 48 hours in advance (not counting Saturdays, Sundays, or legal holidays), unless it is an emergency meeting as defined under the Open Meeting Law (in which event, the meeting notice will be posted with as much advanced notice as is possible in the circumstances). Minutes will still be taken.

Please check individual meeting agendas on the calendar on the Town's website, located at www.needhamma.gov for the latest information regarding meetings. Each meeting may experience unique circumstances that may require last minute changes in protocol, including cancellation or rescheduling. We appreciate your patience as we undergo this shift in a significant aspect of how the Town of Needham conducts business.

Pursuant to Governor Baker's March 12, 2020 Order Suspending Certain Provisions of the Open Meeting Law, G.L. c. 30A, §18, and the Governor's March 15, 2020 Order imposing strict limitation on the number of people that may gather in one place, this meeting of the Needham Conservation Commission will be conducted via remote participation to the greatest extent possible. Specific information and the general guidelines for remote participation by members of the public and/or parties with a right and/or requirement to attend this meeting can be found on the Town of Needham website, at www.needhamma.gov. For this meeting, members of the public who wish to listen and/or watch the meeting may do so in the manner stated on the previous page by navigating to the Zoom Meeting via a web browser or by calling in by phone. No in-person attendance of members of the public will be permitted, but every effort will be made to ensure that the public can adequately access the proceedings in real time, via technological means. In the event that we are unable to do so, despite best efforts, we will post on the Needham Conservation Commission webpage an audio or video recording, transcript, or other comprehensive record of proceedings as soon as possible after the meeting.

140 KENDRICK STREET

OWNER NAME 1	OWNER NAME 2	MAILING ADDRESS	CITY	ST	ZIP	PARCEL ID	PROPERTY ADDRESS
TOWN OF NEEDHAM		1471 HIGHLAND AVE	NEEDHAM	MA	02492	19905700001	0 CHENEY ST
SHEA, MARTIN L & COUPER, AUDREY	SHEA, PATSY MURPHY	23 CHENEY ST	NEEDHAM	MA	02492	19905800001	23 CHENEY ST
BP 140 KENDRICK STREET PROPERTY LLC	800 BOYLSTON ST	234 KENDRICK ST	NEEDHAM	MA	02494	19905800024	00000 234 KENDRICK ST
TOWN OF NEEDHAM	SEWER DEPT--PUMPING STA	STE 1900	BOSTON	MA	02199	19930000001	100000 140 KENDRICK ST
COM REALTY CORPORATION		1471 HIGHLAND AVE	NEEDHAM	MA	02492	19930000002	200000 0 KENDRICK ST
155 FOURTH, LLC, TRUSTEE		P.O. BOX 514	NEEDHAM	MA	02494	19930000004	400000 60 KENDRICK ST
117 KENDRICK DE, LLC	C/O BLUESTONE MANAGEMENT SVCS	100 WELLS AVE - SUITE 200	NEWTON	MA	02459	19930000006	000000 63 KENDRICK ST
COCA COLA BEVERAGES NORTHEAST	116 HUNTINGTON AVE STE 600	C/O BULLFINCH COMPANIES INC	BOSTON	MA	02116	19930000012	200000 117 KENDRICK ST
METROPOLITAN DISTRICT COMMISSION	CUTLER PARK	1 EXECUTIVE PARK DR.	BEDFORD	NH	03110	19930000014	400000 9 B ST
		20 SOMERSET ST	BOSTON	MA	02108	19930100002	200000 0 KENDRICK ST

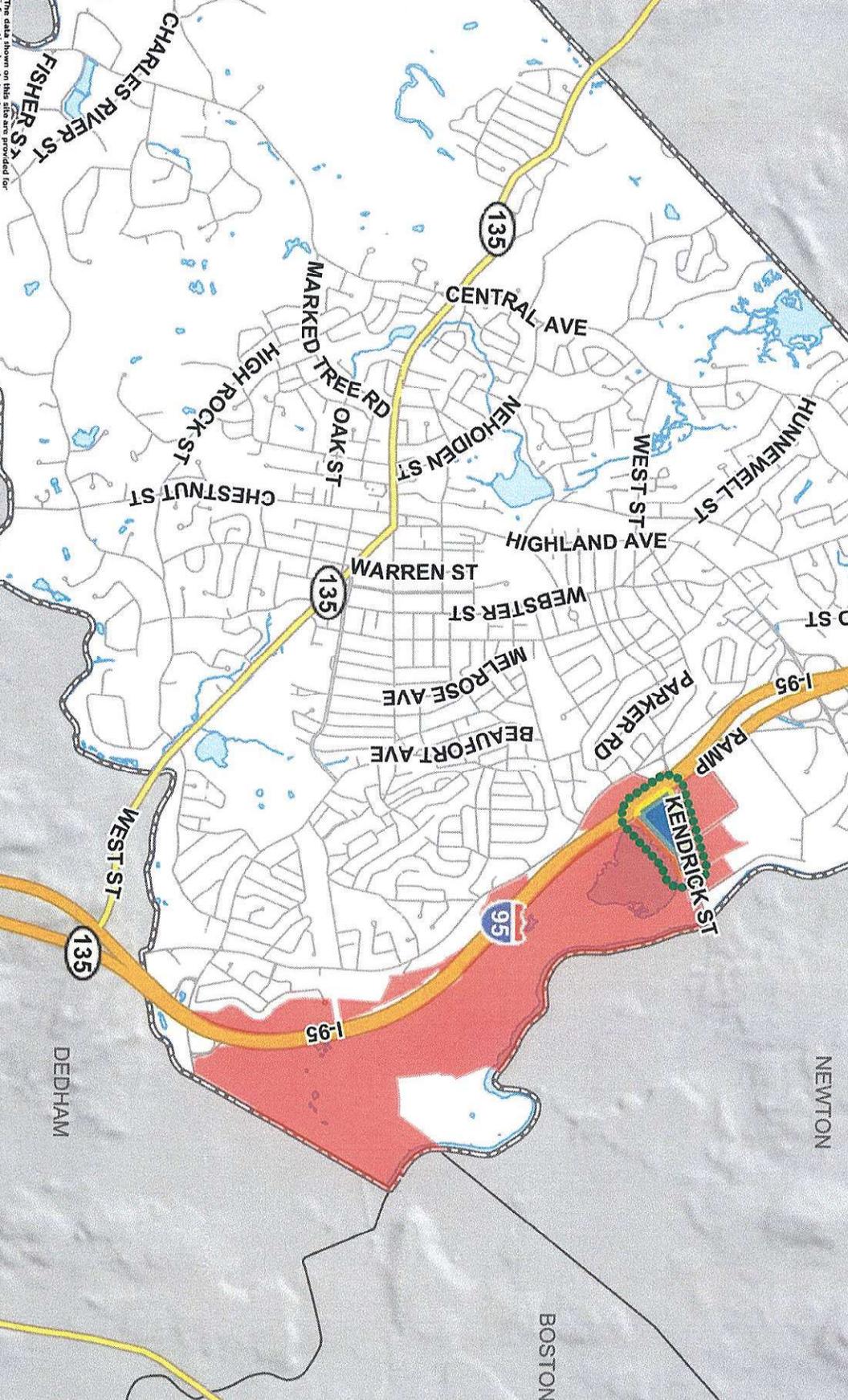
Certified as list of parties in interest under Mass. General Laws and Needham Zoning By-Law, to the Best of our knowledge for the Needham Board of Assessors





9

WELLESLEY



The data shown on this site are provided for informational purposes only. The Town and its consultants are not responsible for the misuse or misinterpretation of this information. Data should not be considered accurate, current or complete. Aerial data is created from April 2009 aerial photography.

0 4100

8200 ft

Printed on 09/11/2020 at 01:45 PM



- Parcels
- Towers
- Satellite Dish
- Tower
- Tower Anchor
- Painted Lines
- Crosswalk
- Parking Line
- Sports Lines
- Court Striping
- Field Striping
- Fences
- Fence
- Guardrail
- Hedge
- Railroad Track
- Trail
- Building
- Decks And Patios
- Swimming Pool
- Bridge
- Sidewalks
- Exterior Stairway
- Driveways
- Paved Driveway
- Unpaved Driveway
- Roads
- Paved Road
- Unpaved Road
- Parking Lots
- Paved Parking Lot
- Unpaved Parking Lot
- Electrical
- Electrical Box
- Electrical Substation
- 3/4cils Areas
- Baseball Infield
- Baseball
- Baseball and Tennis
- Baseball
- Golf Fairway, Green, Tee and Field
- Playground
- Tank
- Wellands
- MA Highways
- Interstate
- US Highway
- Numbered Routes
- Town Boundary
- Abutting Towns
- Abutting Towns Mask
- Road Centerlines
- Waterbody
- Streams And Drainage Dike

Attachment C

BVW Forms

DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

DEP File #:

Project location: 140 Kendrick Street, Needham

Prepared by: VHB, Inc.

- Check all that apply: Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
 Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
 Method other than dominance test used (attach additional information)

Section I. Vegetation		Transect Number: Downgradient	Date of Delineation: 18-Sep-20
Sample Layer and Plant Species	Scientific name	% Cover	% Dominance
Tree Layer			
Red Maple	<i>Acer rubrum</i>	64.0%	45.7%
Slippery Elm	<i>Ulmus rubra</i>	38.0%	27.1%
Red Oak	<i>Quercus rubra</i>	38.0%	27.1%
Sapling/Shrub Layer			
Glossy Buckthorn	<i>Fragula alnus</i>	64.0%	52.2%
Buttonbush	<i>Cephalanthus occidentalis</i>	38.0%	31.0%
Silky Dogwood	<i>Cornus amomum</i>	20.5%	16.7%
Climbing Woody Vine			
Ground Cover			
Broad-leaf Cattail	<i>Typha latifolia</i>	20.5%	100.0%
		Yes	OBL*
Remarks:			
Morphological Adaptations: 0			
* An asterisk after indicator status denotes wetlands plants: plants listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus Sphagnum; or plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL.			
Vegetation conclusion:			
Number of dominant wetland indicator plants: 6			
Number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants: 1			
Number of dominant non-wetland plants? yes			
If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.			

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? yes no

title/date: Soil Survey of Norfolk and Suffolk Counties - 1989
 map number: MA616

soil type mapped: Urban land, 0 to 15 percent slopes
 hydric soil inclusions: No

Are field observations consistent with soil survey? yes no

Remarks: Soil along the fringe of Kendrick Pond is within the floodplain and frequently inundated.

2. Soil Description

Depth (inches) Matrix Color Mottles Color or Texture
 0-1" Organics, leaf litter
 1-14" 10YR 2/1 Silty loam

Remarks:

3. Other:

Conclusion: Is soil hydric? yes no

Other Indicators of Hydrology: (check all that apply and describe)

- Site inundated: _____
- Depth to free water in observation hole: _____
- Depth to soil saturation in observation hole: _____
- Water marks: _____
- Drift Lines: _____
- Sediment deposits: _____
- Drainage patterns in BVW: _____
- Oxidized rhizospheres: _____
- Water-stained leaves: _____
- Recorded data (stream, lake, or tidal gauge; aerial photo; other): _____
- Other: _____

Vegetation and Hydrology Conclusion for Downgradient of W1-101		
	<u>yes</u>	<u>no</u>
Number of wetland indicator plants >= number of non-wetland plants	X	
Wetland hydrology present: hydric soils present	X	
other indicators of hydrology present	X	
Sample location is in a BVW	X	

Submit this form with the Request for Determination of Applicability or Notice of Intent

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? yes no

title/date: Soil Survey of Norfolk and Suffolk Counties - 1989
 map number: MA616

soil type mapped: Urban land, 0 to 15 percent slopes
 hydric soil inclusions: No

Are field observations consistent with soil survey? yes no
 Remarks: Soil is a silt texture at the plot in the forested perimeter of the pond and does not appear to be consistent with the urban fill at the developed Project Site.

2. Soil Description

Depth (inches) Matrix Color Mottles Color or Texture
 0-2 Organics, leaf litter
 2-12" 10YR 3/2 Fine sand, silt

Remarks:

3. Other: Despite some hydrophytic vegetation, no hydric soils or hydrology indicators present. Plot location adjacent to an elevated upland path.

Conclusion: Is soil hydric? yes no

Other Indicators of Hydrology: (check all that apply and describe)

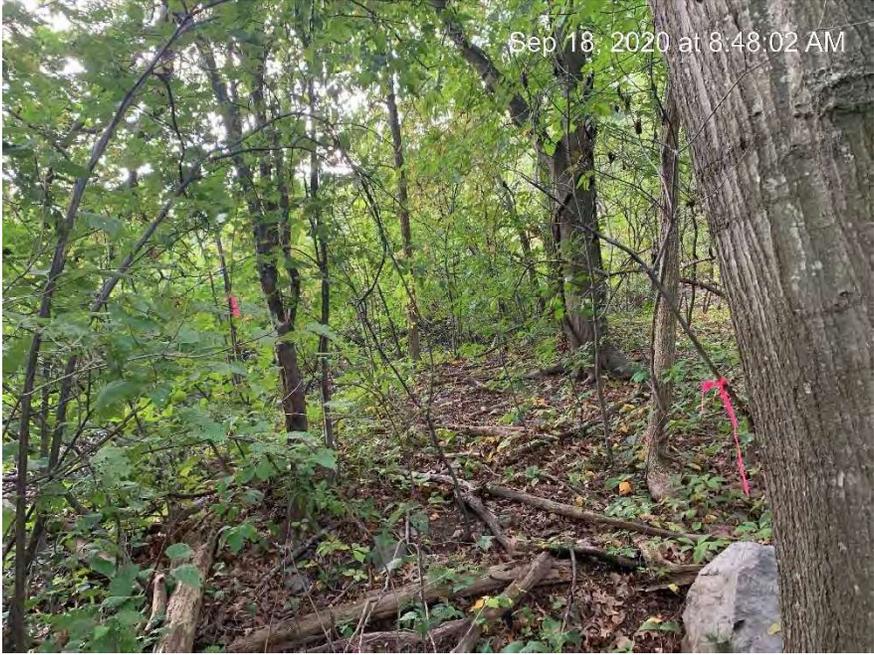
- Site inundated: _____
- Depth to free water in observation hole: _____
- Depth to soil saturation in observation hole: _____
- Water marks: _____
- Drift Lines: _____
- Sediment deposits: _____
- Drainage patterns in BVW: _____
- Oxidized rhizospheres: _____
- Water-stained leaves: _____
- Recorded data (stream, lake, or tidal gauge; aerial photo; other): _____
- Other: _____

Vegetation and Hydrology Conclusion for Upgradient of W1-101		yes	no
Number of wetland indicator plants	>= number of non-wetland plants	X	
Wetland hydrology present:	hydric soils present		X
	other indicators of hydrology present		X
Sample location is in a BVW			X

Submit this form with the Request for Determination of Applicability or Notice of Intent

Attachment D

Photolog



NO. 1 / 9.18.2020 8:48 AM

DESCRIPTION

Looking south at WF1-102 and WF1-101 of Wetland 1 at the southwest corner of the site.



NO. 2 / 9.18.2020 8:50 AM

DESCRIPTION

View of Wetland 1 at the south side of the site.



NO. 3 / 9.18.2020 8:54 AM

DESCRIPTION

View of the palustrine emergent (PEM) area of Wetland 1 facing southwest.



NO. 4 / 9.18.2020 9:08 AM

DESCRIPTION

View of the palustrine emergent (PEM) area of Wetland 1 facing southwest.



NO. 5 / 9.18.2020 9:25 AM

DESCRIPTION

View of Wetland 1 at the southeast side of the site.



NO. 6 / 9.18.2020 9:58 AM

DESCRIPTION

View of Wetland 2 at the southeast side of the site. Wetland 2 is separated from Wetland 1 by a small footpath, with the DCR pathway located north of Wetland 2.



NO. 7 / 9.18.2020 10:45 AM

DESCRIPTION

View of Wetland 3 at the southwest side of the site. Wetland 3 is separated from Wetland 1 by a small upland footpath.



NO. 8 / 9.18.2020 10:42 AM

DESCRIPTION

View of Wetland 4 at the west side of the site. Wetland 4 is a drainage ditch for stormwater runoff.



Attachment E

Stormwater Memorandum



Memorandum

To: Anthony L. Del Gaizo
Town Engineer
Public Services Administration
Building
500 Dedham Avenue
Needham, MA 02492

Date: September 23, 2020

Project #: 15060.00

From: Nicholas Skoly, PE

Re: 140 Kendrick Stormwater Analysis

On behalf of Boston Properties, Vanasse Hangen Brustlin, Inc. (VHB is pleased to submit the following memorandum to document the adherence to the Town of Needham Stormwater Regulations (Project). The proposed stormwater management infrastructure includes best management practices (BMP's) for maintaining stormwater runoff rates has been developed in compliance with the Massachusetts Stormwater Management Standards and the Town of Needham Requirements for On-Site Drainage (Stormwater management), as applicable.

A HydroCAD model, using TR-20 methodology, was developed to evaluate the site's existing and proposed stormwater runoff response for the 2-, 10-, 25-, and 100-year storm events. As summarized in the following sections, the analysis for these storm events indicates that there will be no increase in peak discharge rates or runoff volumes resulting from the additional impervious area.

Project Description

Boston Properties is proposing to renovate a portion of their existing building at 140 Kendrick Street. As part of that renovation, they are proposing to improve the hardscape and landscape areas surrounding the building. The exterior improvements will be limited to reworking parking spaces near the main entry, improving the vehicular drop off area and pedestrian circulation, and improving an outdoor patio.

Stormwater Approach

The exterior improvements are limited to the front entrance portion of the site located on the North side of the existing building and the back patio on the South side of the building. The improved drop-off area at the front entrance will generally maintain the same drainage patterns but will be improved with a subsurface detention system. Within the subcatchment, (approximately 60,675 sf) there is an increase in impervious area of approximately 1,620 sf. The improved patio area will generally maintain the same drainage patterns but will be improved with permeable pavers. Within the subcatchment (approximately 26,050 sf) there is a decrease in impervious area of approximately 960 sf.

The stormwater runoff in the proposed condition will be collected via the existing deep sump and hooded catch basins and routed to a subsurface detention basin installed adjacent to the catch basins via a pipe installed below the existing outlet of the catch basin. Once the detention basin reaches its capacity the stormwater will drain through the existing closed piping system and maintain the existing drainage patterns. The subsurface detention basin and permeable pavers provide the required volume for 1" over the impervious area. Under this requirement the design is required to store 3,575cf of runoff and the design provides stores 3,977cf. This storage assumes an infiltration rate of 1.02 which is consistent with the original stormwater design for the site. The Hydrologic model analyzes the subcatchment to the existing catch basin which encompasses all of the exterior work proposed.

Hydrologic Analysis

The rainfall runoff response of the Site under existing and proposed conditions was evaluated for storm events with recurrence intervals of 2-, 5-, 10-, 25-, and 100-years (as shown in the Site Construction permit Regulations.). Runoff coefficients for the pre- and post-development conditions, were determined using NRCS Technical Release 55 (TR-55) methodology as provided in HydroCAD. The HydroCAD model is based on NRCS Technical Release 20 (TR-20) Model for Project Formulation Hydrology. Printouts of the HydroCAD analyses are attached. Tables 1 below presents a summary of the existing and proposed conditions peak flow rates.

**Table 1
 Peak Discharge Rates (cubic feet per second)**

<u>Design Point</u>	<u>2-year</u>	<u>10-year</u>	<u>25-year</u>	<u>100-year</u>
Design Point 1:				
Closed Drainage System				
Existing	2.26	5.06	6.90	9.85
Proposed	0.73	1.84	4.88	9.63
Design Point 2				
Closed Drainage System				
Existing	0.02	0.5	1.0	1.90
Proposed	0.02	0.44	0.9	1.66

**Table 2
 Runoff Volumes (cubic feet)**

<u>Design Point</u>	<u>2-year</u>	<u>10-year</u>	<u>25-year</u>	<u>100-year</u>
Design Point 1:				
Closed Drainage System				
Existing	5,981	13,292	18,288	26,452
Proposed	1,987	8,158	13,001	20,981
Design Point 2:				
Closed Drainage System				
Existing	339	1,703	2,907	5,164
Proposed	293	1,474	2,545	4,681

Massachusetts Department of Environmental Protection (DEP) Stormwater Management Standards

Standard 1: No New Untreated Discharges or Erosion to Wetlands

The Project has been designed to comply with Standard 1.

The Best Management Practices (BMPs) included in the proposed stormwater management system have been designed in accordance with the Massachusetts Stormwater Handbook. Supporting information and computations demonstrating that no new untreated discharges will result from the Project are presented through compliance with Standards 4 through 6.

There are no new untreated discharges that will result from the project. The project is using existing infrastructure and supplementing it with additional stormwater BMPs.

Standard 2: Peak Rate Attenuation

The Project has been designed to fully comply with Standard 2.

This project has been designed to reduce the peak attenuation rate for the 2-yr, 10-yr, 25-yr and 100-yr storm, as shown in the tables above.

Standard 3: Stormwater Recharge

The Project has been designed to comply with Standard 3. All runoff from impervious areas from the site is discharging into an infiltration BMP. Recharge BMPs have been sized to infiltrate the required recharge volume and sized to drain within 72-hours. These calculations have been provided.

Standard 4: Water Quality

This project has been designed to comply with Standard 4. A water quality calculation has been provided to show that greater than 1" of volume will be treated on site.

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

This project is not considered a LUHPPL.

Standard 6: Critical Area

This project will not discharge stormwater near or to a critical area.

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the Maximum Extent Practicable

This project is a redevelopment project and has been designed to comply with all the Stormwater Management Standards.

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

The Project will disturb approximately 2 acres of land and is therefore required to obtain coverage under the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit. As required under this permit, a Stormwater Pollution Prevention Plan (SWPPP) will be developed and submitted before land disturbance begins. Recommended construction period pollution prevention and erosion and sedimentation controls to be finalized in the SWPPP are included attached.

Standard 9: Operation and Maintenance Plan

In compliance with Standard 9, a Post Construction Stormwater Operation and Maintenance (O&M) Plan has been developed for the Project. The O&M Plan is included in Appendix D as part of the Long Term Pollution Prevention Plan.

Standard 10: Prohibition of Illicit Discharges

Sanitary sewer and storm drainage structures which were part of the previous development on this site are to be completely removed during the site redevelopment. The design plans submitted with this report have been designed in full compliance with current standards. The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges.

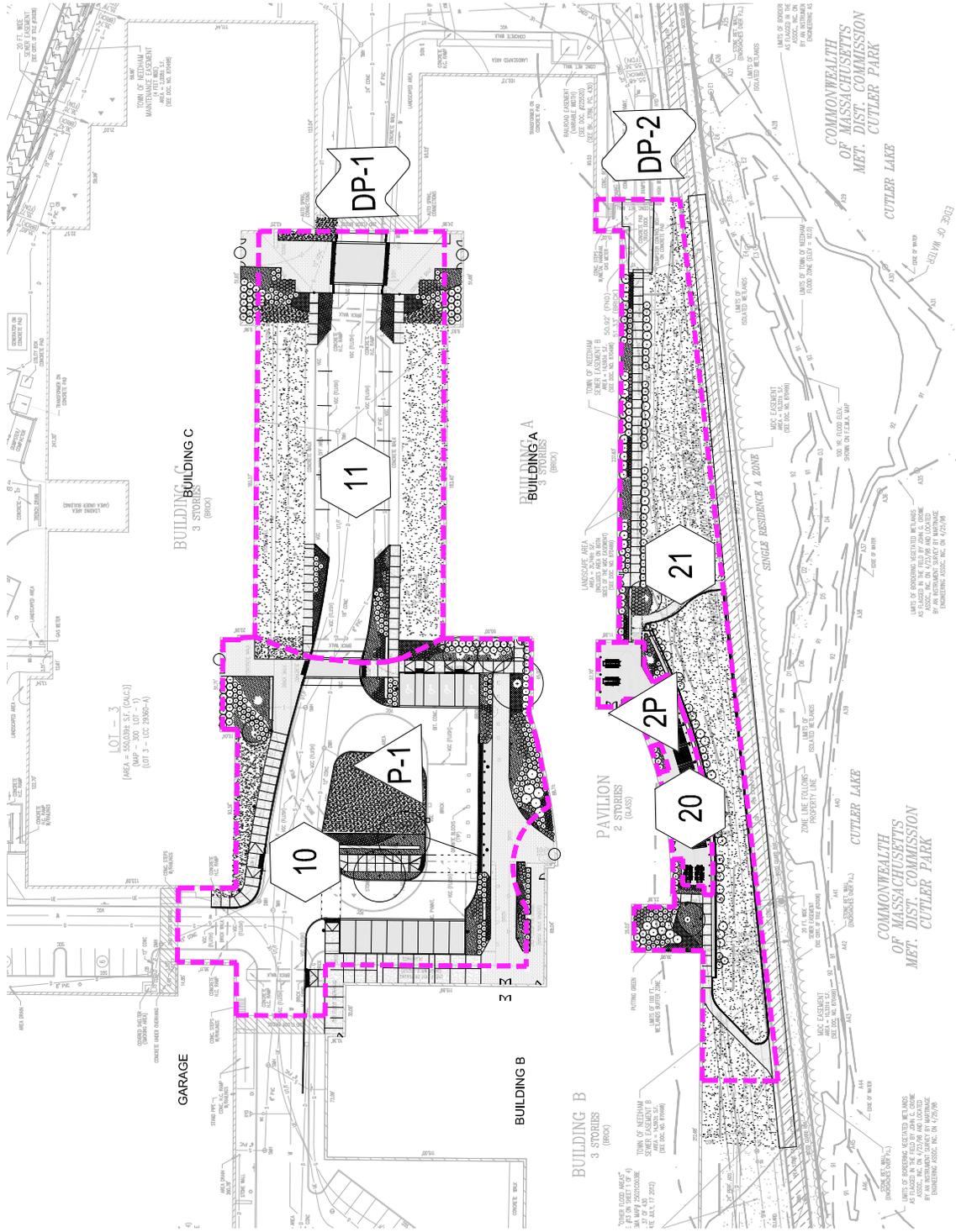
Stormwater Management Summary

The stormwater management design includes BMPs for maintaining stormwater runoff rates and has been developed with guidance provided by the DEP and in accordance with the applicable Town and State requirements listed in previous sections of the memo. A hydrologic model was developed to evaluate the Site's existing and proposed stormwater runoff response and the results of the analysis indicate that the site has been designed such that there will be no increase in peak discharge rates or volumes between the pre- and post-development conditions for the storm events studied. In addition, the subsurface infiltration system and permeable pavers provide a significant improvement to water quality as compared to the existing condition.

ATTACHMENTS:

Supporting Calculations:

Figure 1 – Existing Drainage Conditions
Figure 2 – Proposed Drainage Conditions
Figure 3 – Impervious Buffer Area Comparison
Water Quality Volume Calculations
Hydrologic Analysis
Long Term Pollution Prevention Plan
Operations and Maintenance Plan
FIRM



Legend

SYMBOLS



DESIGN POINT

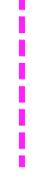


DRAINAGE AREA DESIGNATION



POND

LINETYPES



DRAINAGE AREA BOUNDARY



100' BUFFER ZONE



WETLAND BOUNDARY

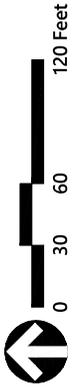


Proposed Drainage Conditions

Figure 2

140 Kendrick Street
Needham, MA

9/10/2020



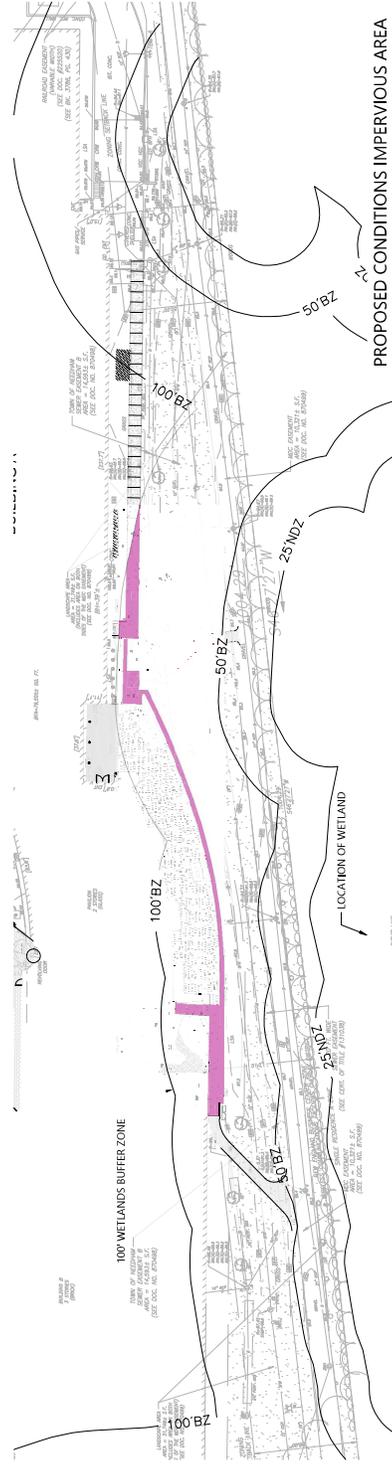
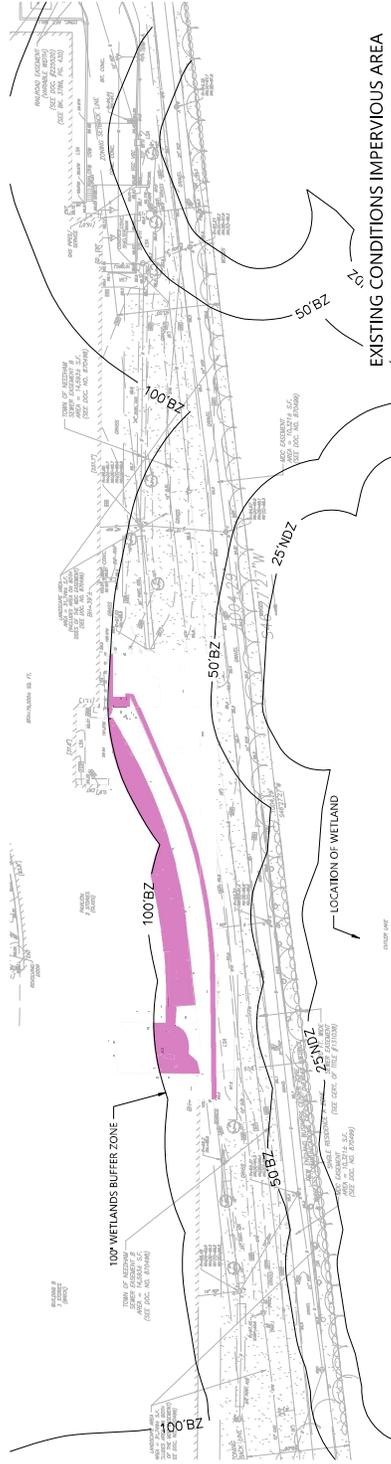
Wetland Buffer Areas

Designation	Existing	Proposed	Delta
APPROXIMATE IMPERVIOUS AREA WITHIN 100' BUFFER	2,480 SF	1,264 SF	-1,216 SF

Legend



IMPERVIOUS AREA WITHIN
100' BUFFER ZONE



Impervious Area
140 Kendrick Street
Needham, MA

Figure 3

9/23/20



Water Quality Volume Calculations

Project Name: 140 Kendrick Street
Project Location: Needham, MA

Proj. No.: -
Date: September 2020

Calculated by: NJS
Checked by:

Limit of Development Area

Total Impervious Area = 42,898 sf

Water Quality Requirement:

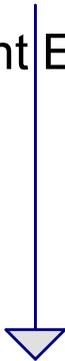
	Runoff Depth to be Treated (in.)	Required Volume (c.f.)
Water Quality Volume	1.0	3,575

Provided:

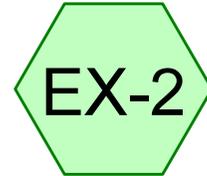
	Provided Volume (c.f.)	
Permeable Pavers (Rear of Building)	718	*For the 1-year design storm
Proposed Subsurface Infiltration System (Front Drop Off)	3,259	*For the 1-year design storm
<u>Total Provided:</u>	3,977	



Front Entry



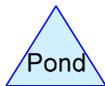
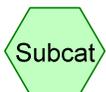
Front Entry



Back Patio



Back Patio



Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
44,485	39	>75% Grass cover, Good, HSG A (EX-1, EX-2)
42,240	98	Paved parking, HSG A (EX-1, EX-2)
86,725	68	TOTAL AREA

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: Front Entry

Runoff Area=60,675 sf 61.34% Impervious Runoff Depth=1.18"
Tc=5.0 min CN=75 Runoff=2.26 cfs 5,981 cf

SubcatchmentEX-2: Back Patio

Runoff Area=26,050 sf 19.27% Impervious Runoff Depth=0.16"
Tc=5.0 min CN=50 Runoff=0.02 cfs 339 cf

Link DP1: Front Entry

Inflow=2.26 cfs 5,981 cf
Primary=2.26 cfs 5,981 cf

Link DP2: Back Patio

Inflow=0.02 cfs 339 cf
Primary=0.02 cfs 339 cf

Total Runoff Area = 86,725 sf Runoff Volume = 6,320 cf Average Runoff Depth = 0.87"
51.29% Pervious = 44,485 sf 48.71% Impervious = 42,240 sf

Summary for Subcatchment EX-1: Front Entry

Runoff = 2.26 cfs @ 12.13 hrs, Volume= 5,981 cf, Depth= 1.18"

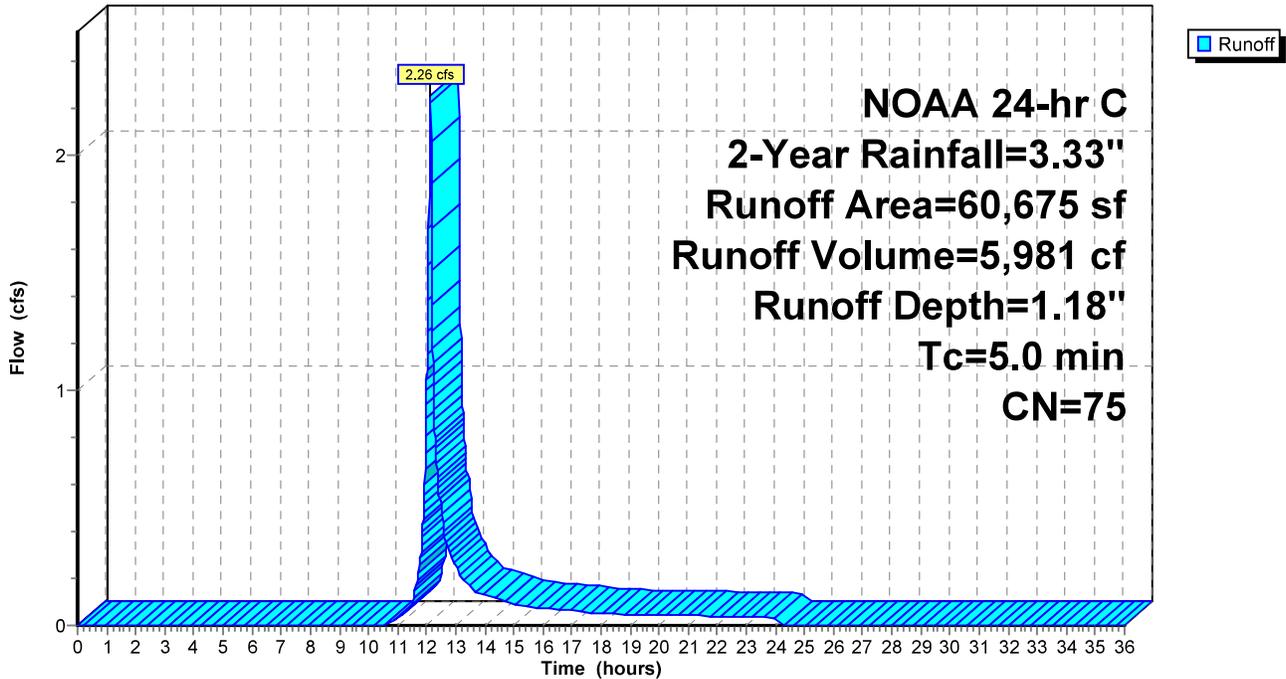
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.33"

Area (sf)	CN	Description
37,220	98	Paved parking, HSG A
23,455	39	>75% Grass cover, Good, HSG A
60,675	75	Weighted Average
23,455		38.66% Pervious Area
37,220		61.34% Impervious Area

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

Subcatchment EX-1: Front Entry

Hydrograph



Summary for Subcatchment EX-2: Back Patio

Runoff = 0.02 cfs @ 12.53 hrs, Volume= 339 cf, Depth= 0.16"

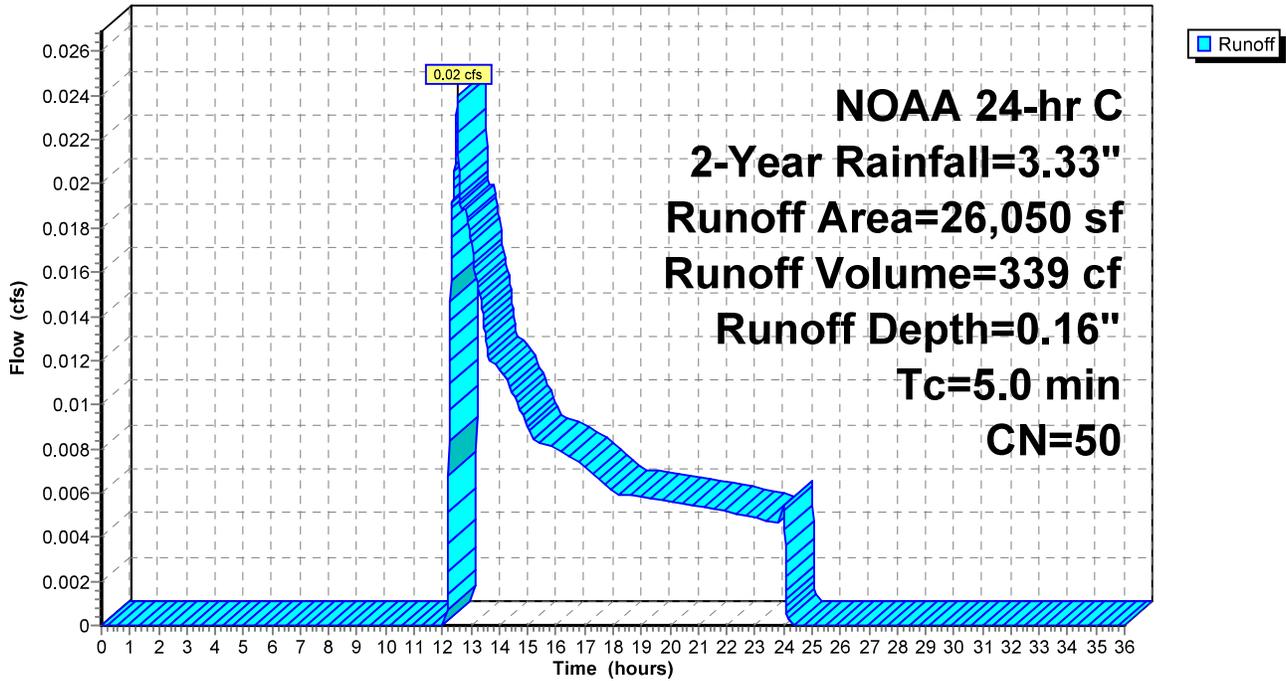
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.33"

Area (sf)	CN	Description
5,020	98	Paved parking, HSG A
21,030	39	>75% Grass cover, Good, HSG A
26,050	50	Weighted Average
21,030		80.73% Pervious Area
5,020		19.27% Impervious Area

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

Subcatchment EX-2: Back Patio

Hydrograph



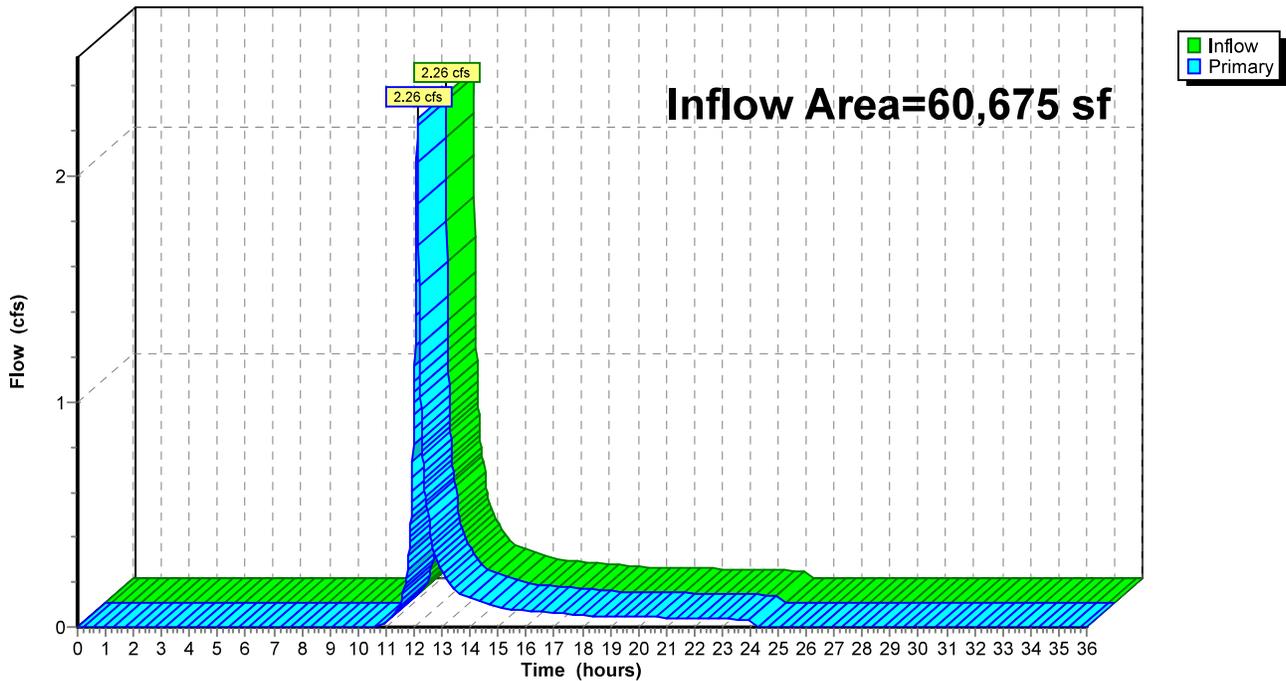
Summary for Link DP1: Front Entry

Inflow Area = 60,675 sf, 61.34% Impervious, Inflow Depth = 1.18" for 2-Year event
Inflow = 2.26 cfs @ 12.13 hrs, Volume= 5,981 cf
Primary = 2.26 cfs @ 12.13 hrs, Volume= 5,981 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP1: Front Entry

Hydrograph



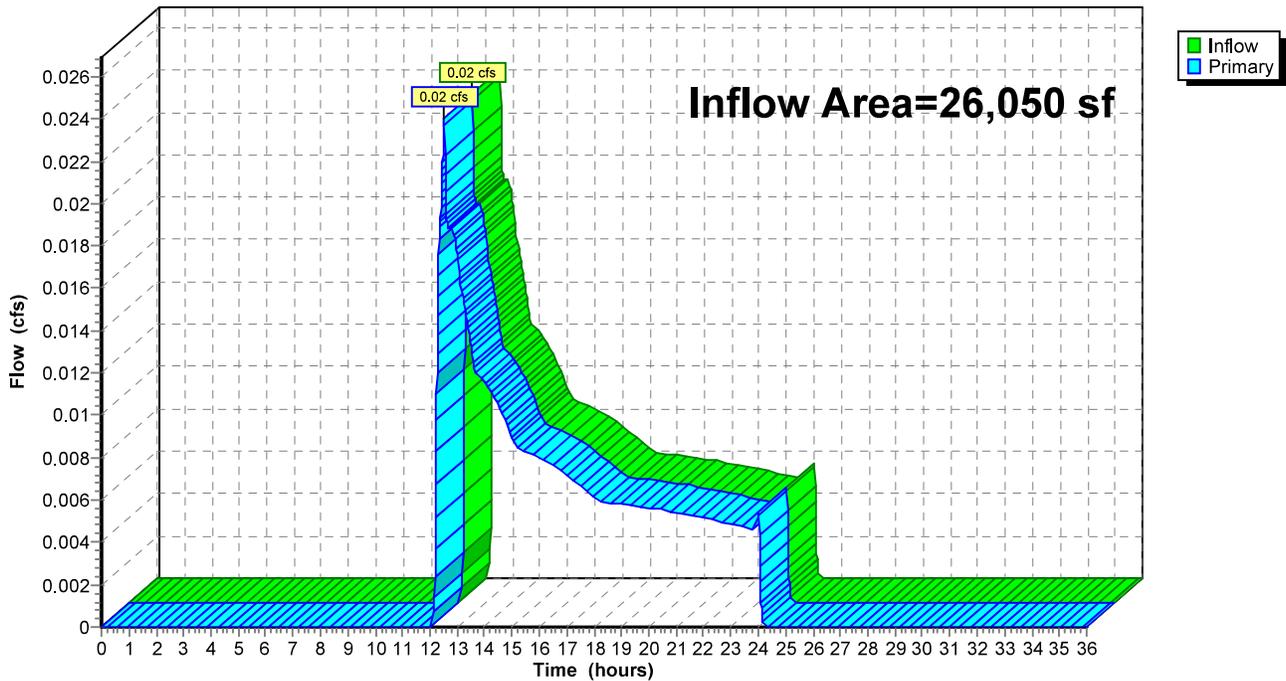
Summary for Link DP2: Back Patio

Inflow Area = 26,050 sf, 19.27% Impervious, Inflow Depth = 0.16" for 2-Year event
Inflow = 0.02 cfs @ 12.53 hrs, Volume= 339 cf
Primary = 0.02 cfs @ 12.53 hrs, Volume= 339 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP2: Back Patio

Hydrograph



Summary for Subcatchment EX-1: Front Entry

Runoff = 5.06 cfs @ 12.13 hrs, Volume= 13,292 cf, Depth= 2.63"

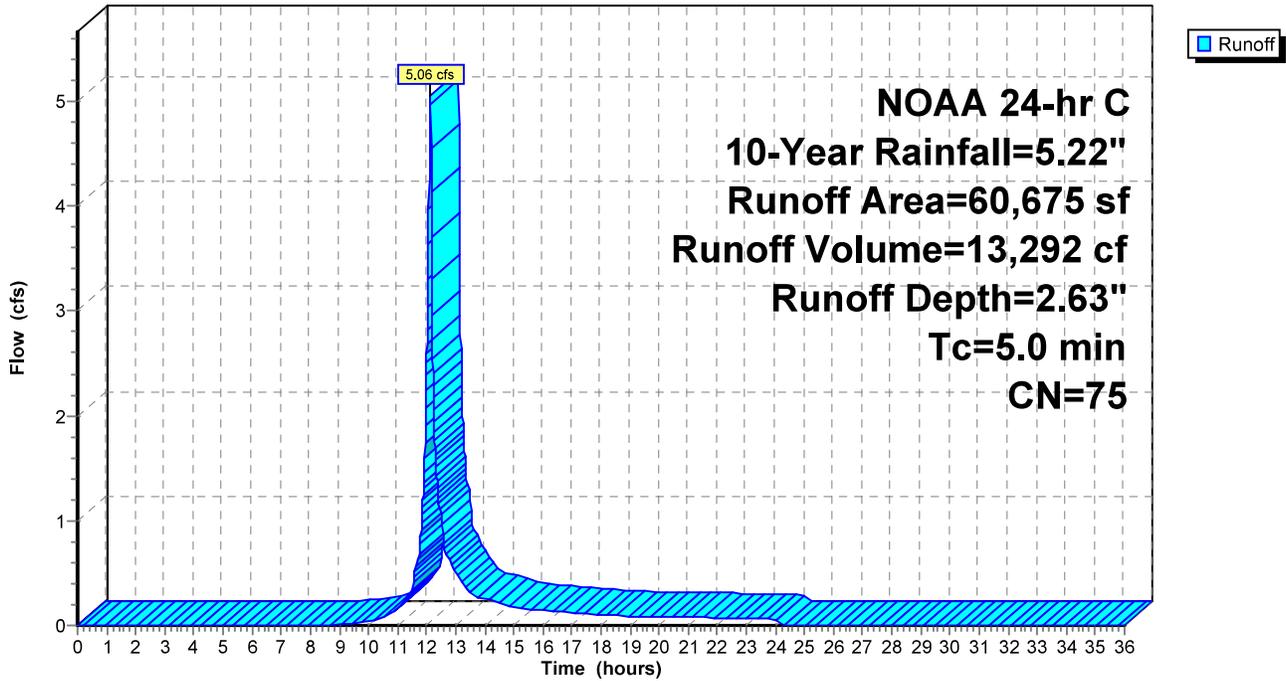
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-Year Rainfall=5.22"

Area (sf)	CN	Description
37,220	98	Paved parking, HSG A
23,455	39	>75% Grass cover, Good, HSG A
60,675	75	Weighted Average
23,455		38.66% Pervious Area
37,220		61.34% Impervious Area

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

Subcatchment EX-1: Front Entry

Hydrograph



Summary for Subcatchment EX-2: Back Patio

Runoff = 0.50 cfs @ 12.14 hrs, Volume= 1,703 cf, Depth= 0.78"

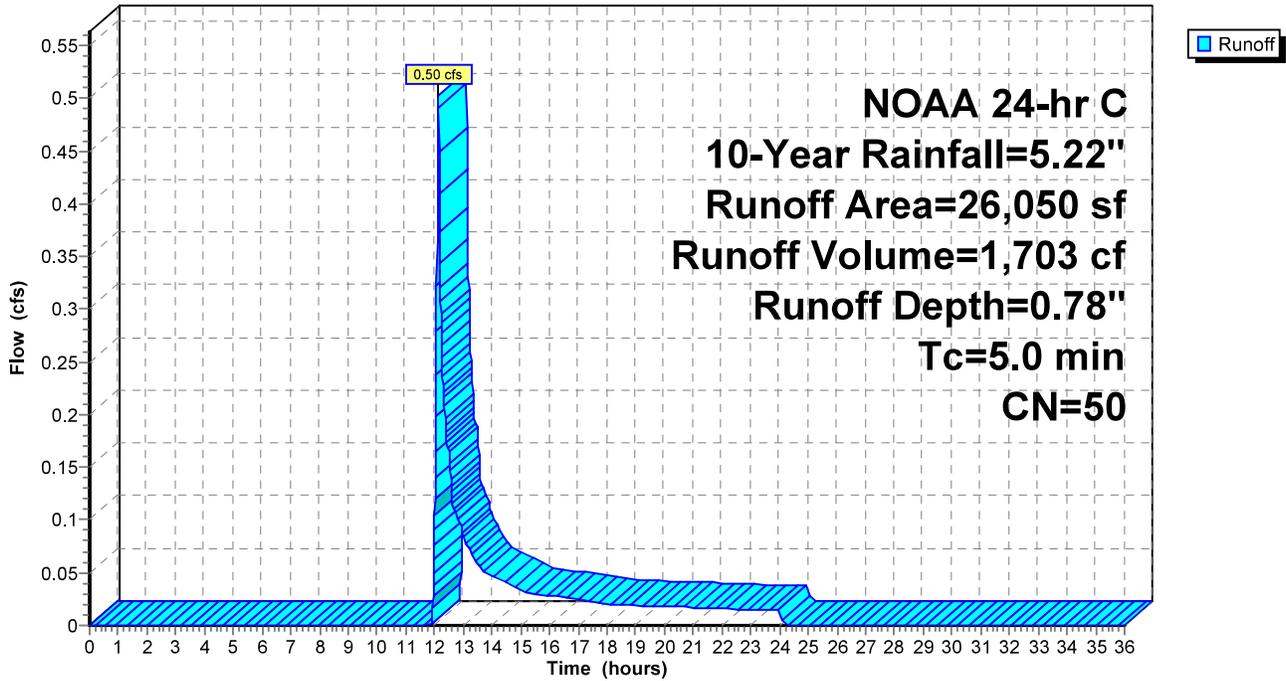
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-Year Rainfall=5.22"

Area (sf)	CN	Description
5,020	98	Paved parking, HSG A
21,030	39	>75% Grass cover, Good, HSG A
26,050	50	Weighted Average
21,030		80.73% Pervious Area
5,020		19.27% Impervious Area

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

Subcatchment EX-2: Back Patio

Hydrograph



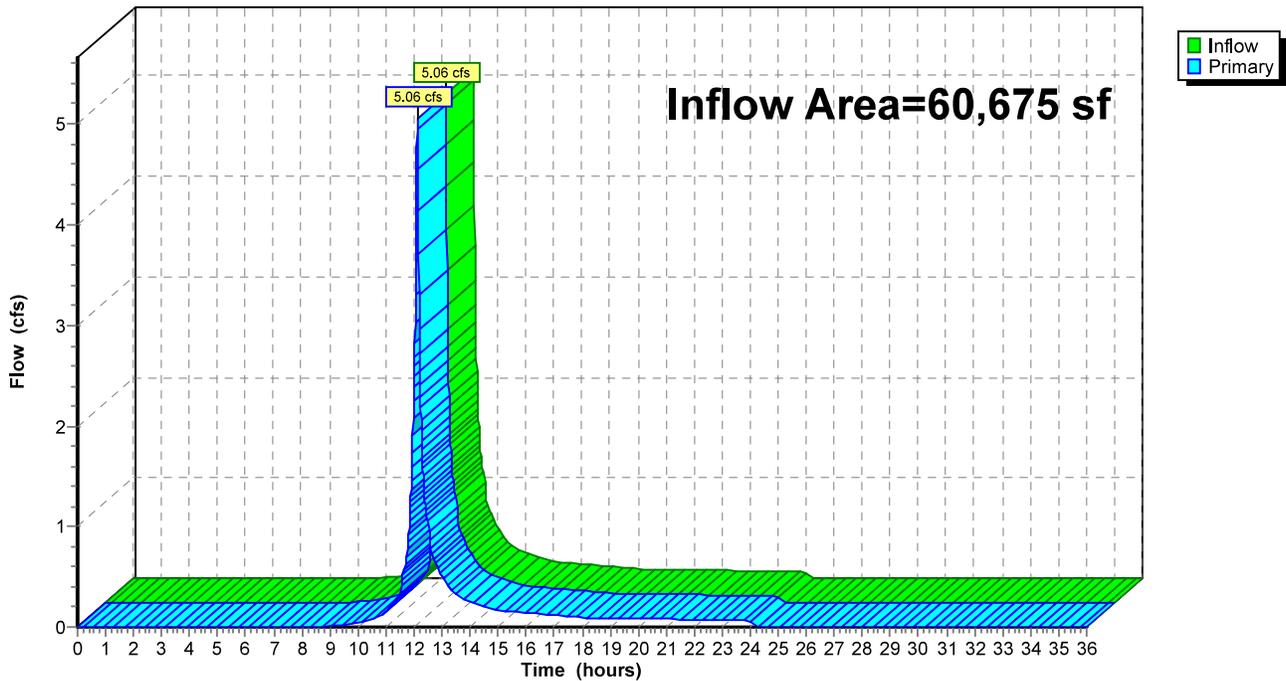
Summary for Link DP1: Front Entry

Inflow Area = 60,675 sf, 61.34% Impervious, Inflow Depth = 2.63" for 10-Year event
Inflow = 5.06 cfs @ 12.13 hrs, Volume= 13,292 cf
Primary = 5.06 cfs @ 12.13 hrs, Volume= 13,292 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP1: Front Entry

Hydrograph



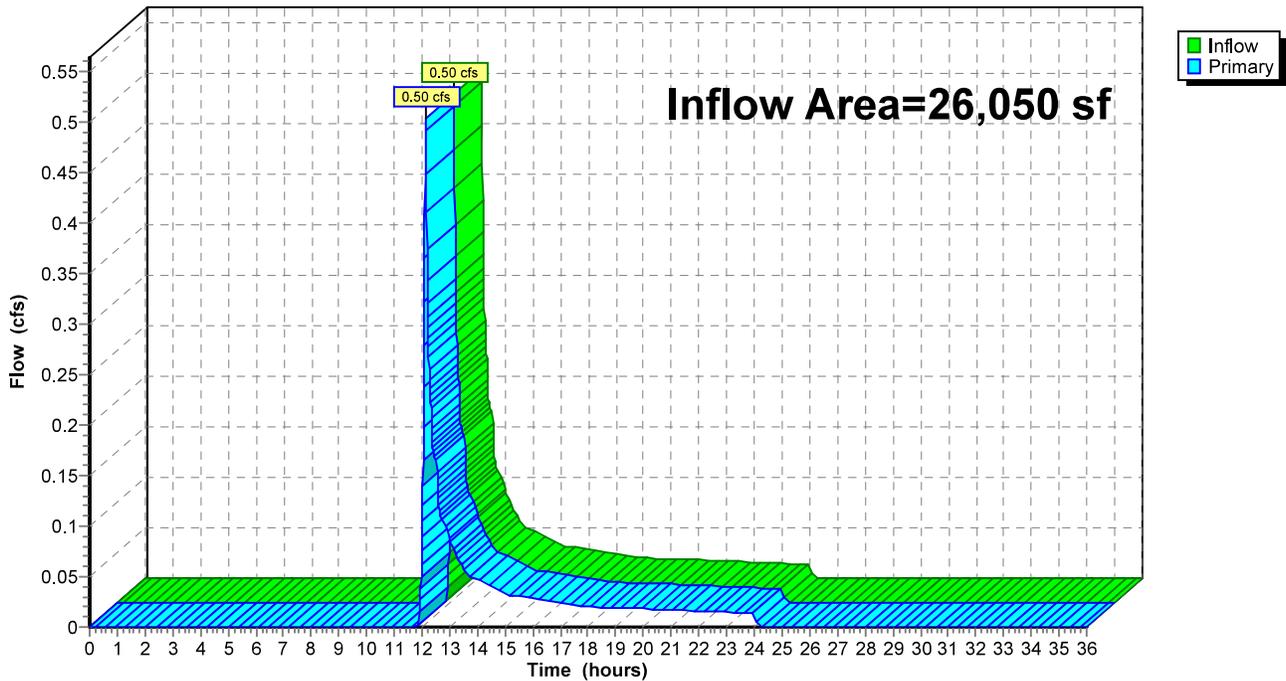
Summary for Link DP2: Back Patio

Inflow Area = 26,050 sf, 19.27% Impervious, Inflow Depth = 0.78" for 10-Year event
Inflow = 0.50 cfs @ 12.14 hrs, Volume= 1,703 cf
Primary = 0.50 cfs @ 12.14 hrs, Volume= 1,703 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP2: Back Patio

Hydrograph



Summary for Subcatchment EX-1: Front Entry

Runoff = 6.90 cfs @ 12.12 hrs, Volume= 18,288 cf, Depth= 3.62"

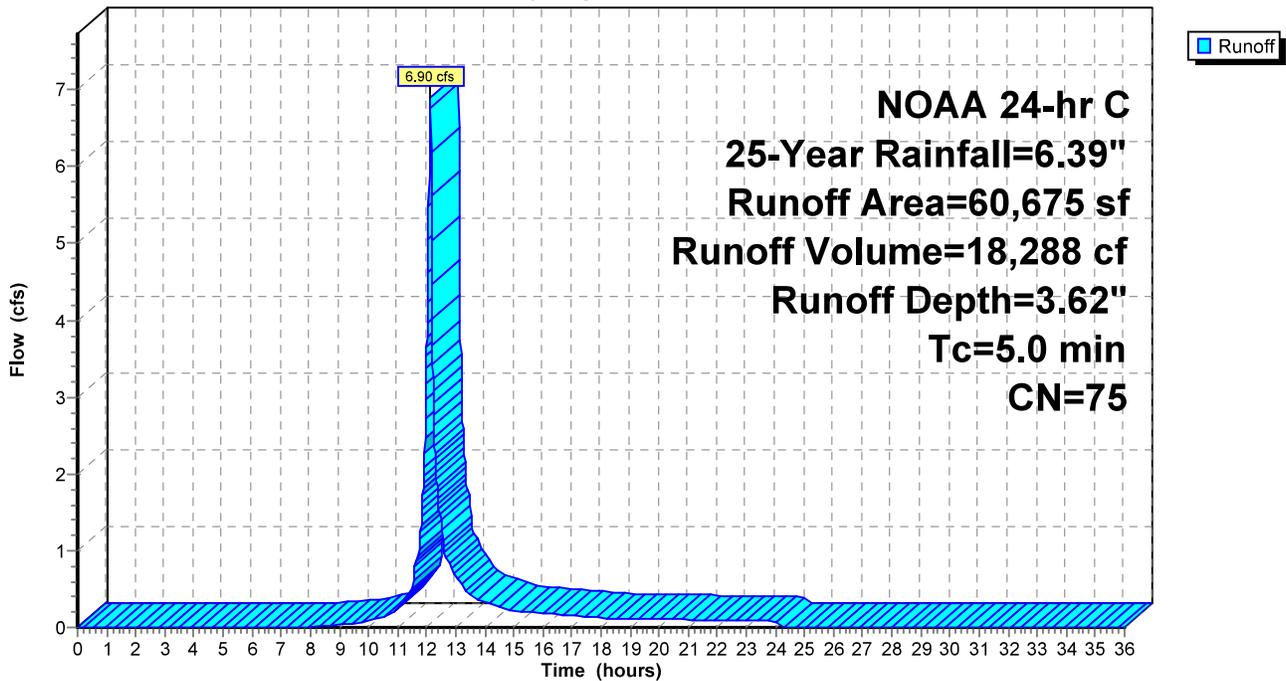
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 25-Year Rainfall=6.39"

Area (sf)	CN	Description
37,220	98	Paved parking, HSG A
23,455	39	>75% Grass cover, Good, HSG A
60,675	75	Weighted Average
23,455		38.66% Pervious Area
37,220		61.34% Impervious Area

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

Subcatchment EX-1: Front Entry

Hydrograph



Summary for Subcatchment EX-2: Back Patio

Runoff = 1.00 cfs @ 12.13 hrs, Volume= 2,907 cf, Depth= 1.34"

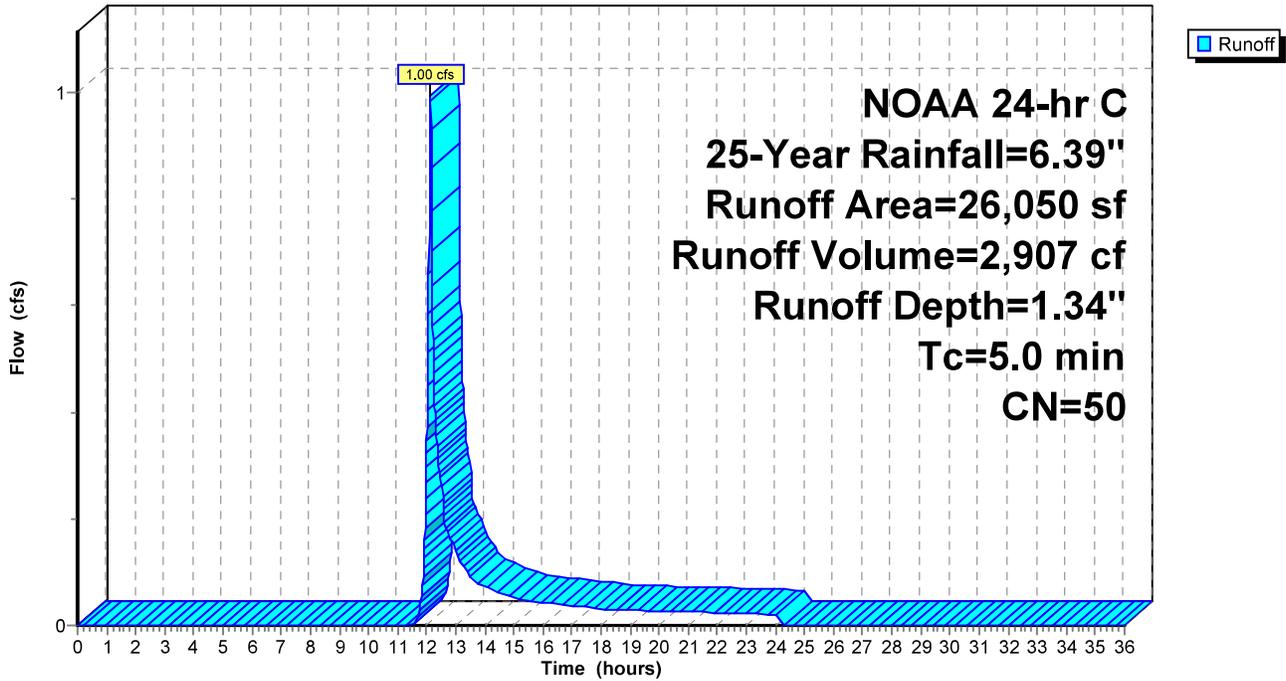
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 25-Year Rainfall=6.39"

Area (sf)	CN	Description
5,020	98	Paved parking, HSG A
21,030	39	>75% Grass cover, Good, HSG A
26,050	50	Weighted Average
21,030		80.73% Pervious Area
5,020		19.27% Impervious Area

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

Subcatchment EX-2: Back Patio

Hydrograph



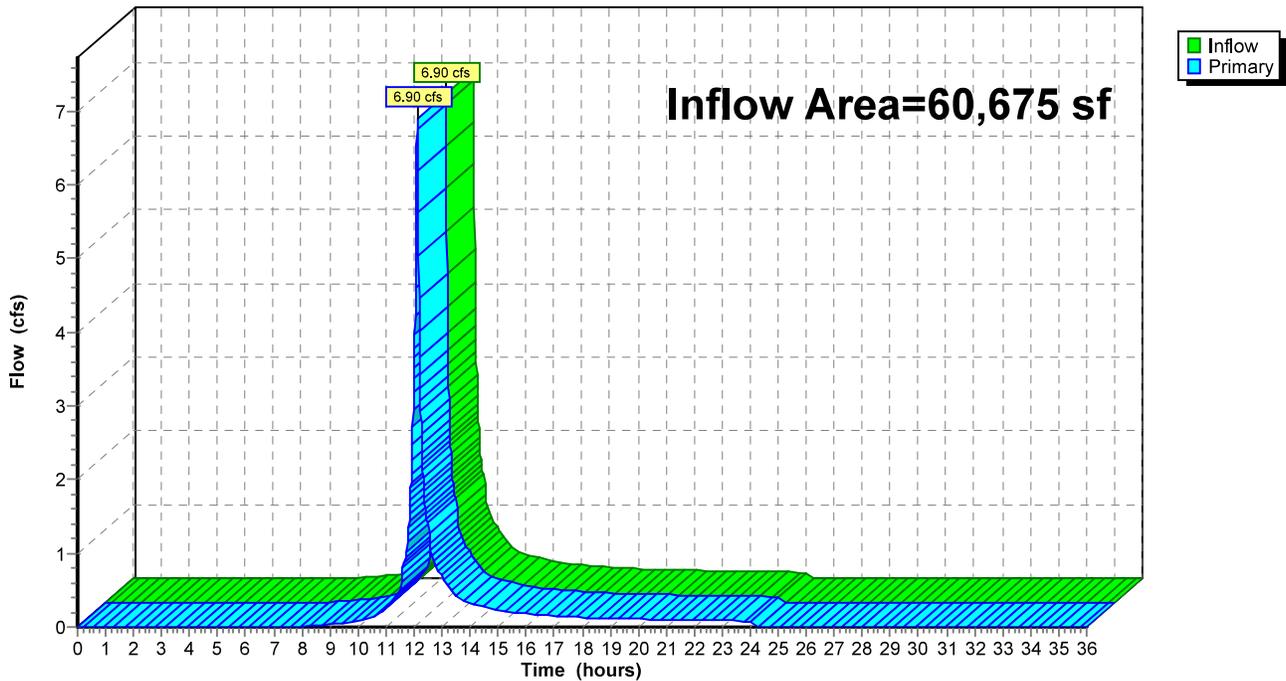
Summary for Link DP1: Front Entry

Inflow Area = 60,675 sf, 61.34% Impervious, Inflow Depth = 3.62" for 25-Year event
Inflow = 6.90 cfs @ 12.12 hrs, Volume= 18,288 cf
Primary = 6.90 cfs @ 12.12 hrs, Volume= 18,288 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP1: Front Entry

Hydrograph



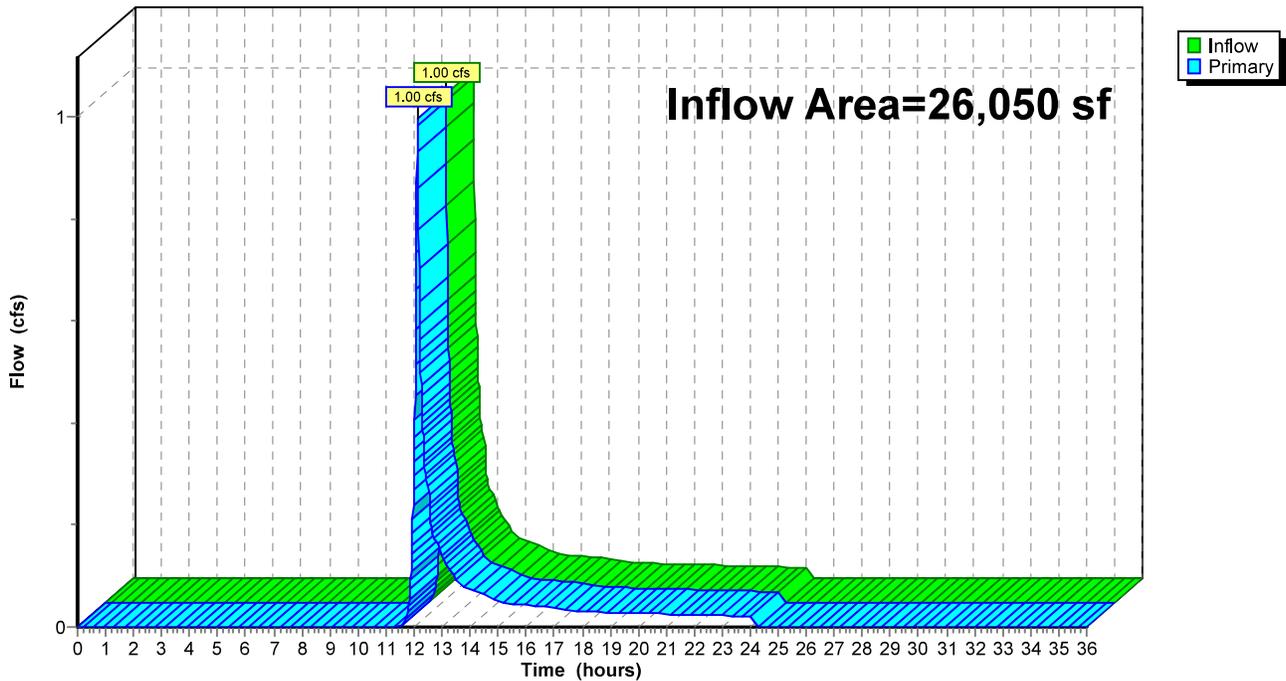
Summary for Link DP2: Back Patio

Inflow Area = 26,050 sf, 19.27% Impervious, Inflow Depth = 1.34" for 25-Year event
Inflow = 1.00 cfs @ 12.13 hrs, Volume= 2,907 cf
Primary = 1.00 cfs @ 12.13 hrs, Volume= 2,907 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP2: Back Patio

Hydrograph



Summary for Subcatchment EX-1: Front Entry

Runoff = 9.85 cfs @ 12.12 hrs, Volume= 26,452 cf, Depth= 5.23"

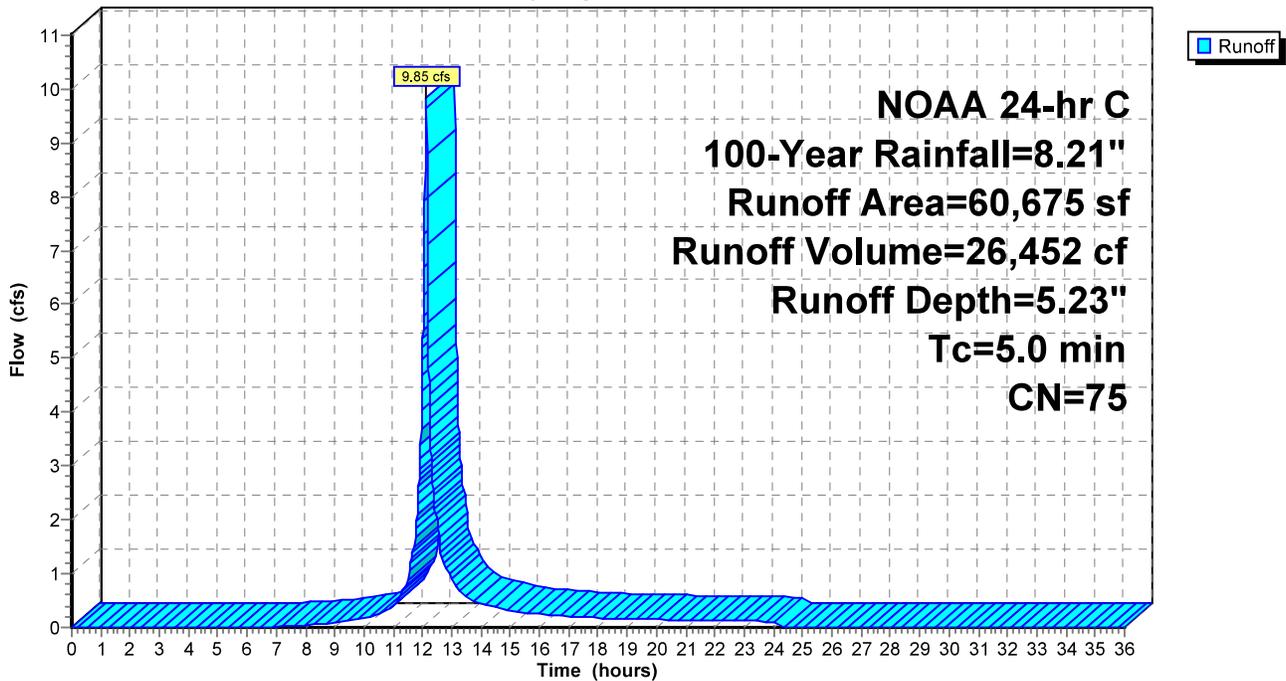
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.21"

Area (sf)	CN	Description
37,220	98	Paved parking, HSG A
23,455	39	>75% Grass cover, Good, HSG A
60,675	75	Weighted Average
23,455		38.66% Pervious Area
37,220		61.34% Impervious Area

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

Subcatchment EX-1: Front Entry

Hydrograph



Summary for Subcatchment EX-2: Back Patio

Runoff = 1.90 cfs @ 12.13 hrs, Volume= 5,164 cf, Depth= 2.38"

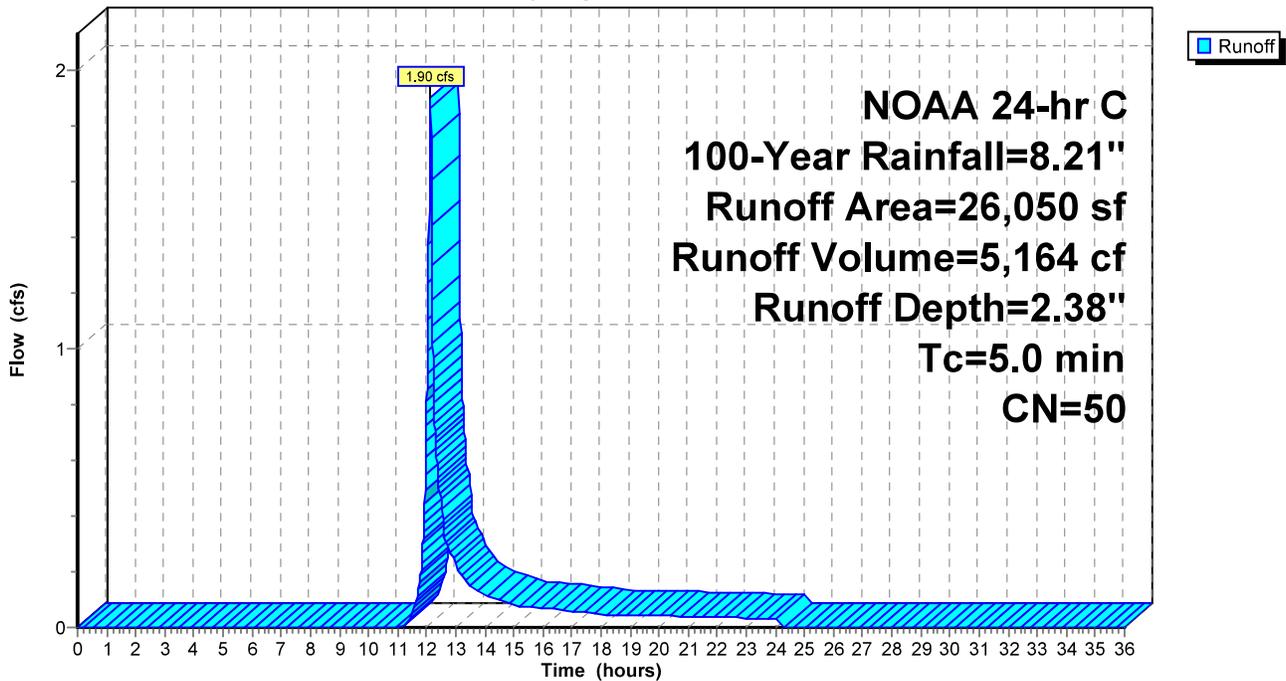
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-Year Rainfall=8.21"

Area (sf)	CN	Description
5,020	98	Paved parking, HSG A
21,030	39	>75% Grass cover, Good, HSG A
26,050	50	Weighted Average
21,030		80.73% Pervious Area
5,020		19.27% Impervious Area

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

Subcatchment EX-2: Back Patio

Hydrograph



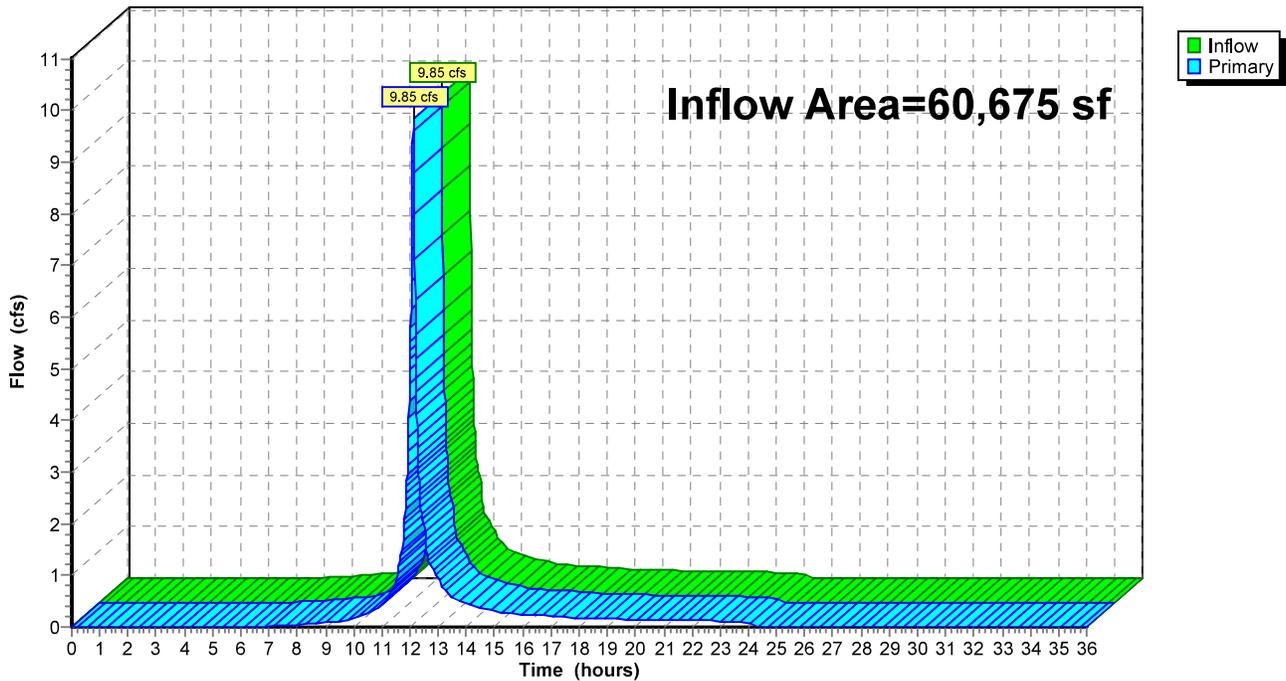
Summary for Link DP1: Front Entry

Inflow Area = 60,675 sf, 61.34% Impervious, Inflow Depth = 5.23" for 100-Year event
Inflow = 9.85 cfs @ 12.12 hrs, Volume= 26,452 cf
Primary = 9.85 cfs @ 12.12 hrs, Volume= 26,452 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP1: Front Entry

Hydrograph



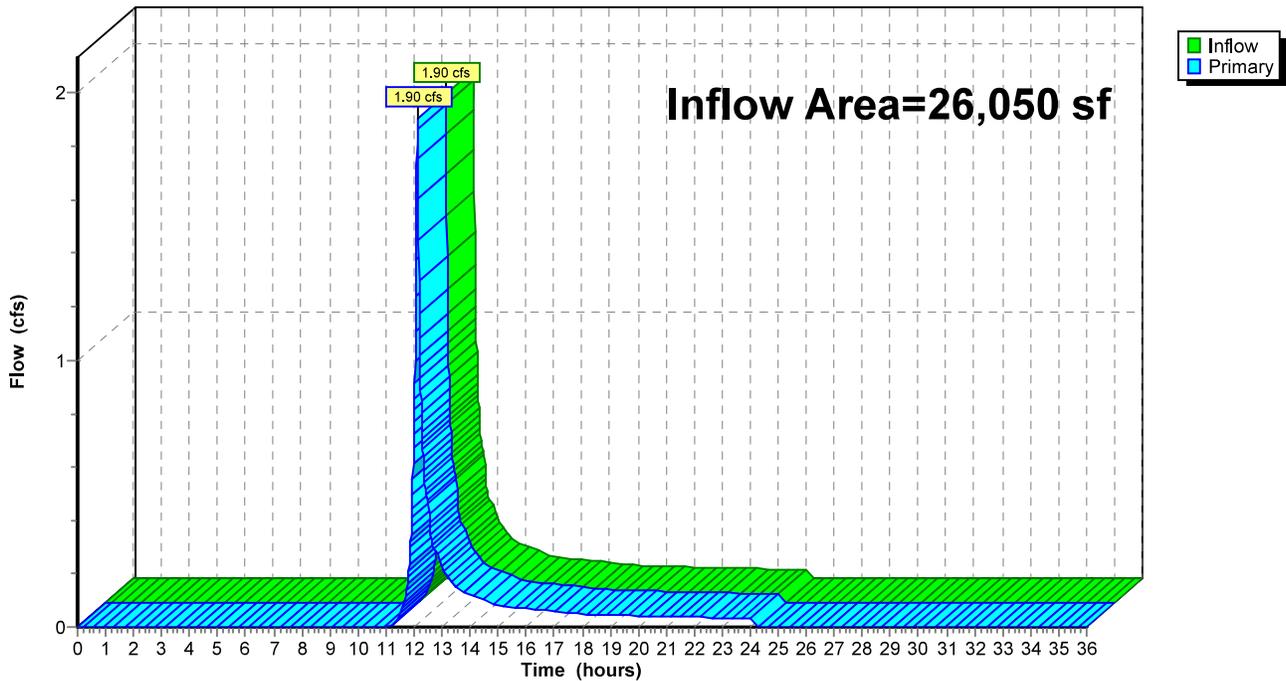
Summary for Link DP2: Back Patio

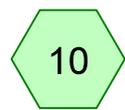
Inflow Area = 26,050 sf, 19.27% Impervious, Inflow Depth = 2.38" for 100-Year event
Inflow = 1.90 cfs @ 12.13 hrs, Volume= 5,164 cf
Primary = 1.90 cfs @ 12.13 hrs, Volume= 5,164 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP2: Back Patio

Hydrograph

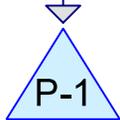




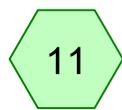
Front Entry



Diversion CB



Stormtech



Front Entry



Front Entry



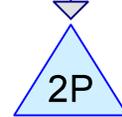
Back Patio



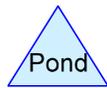
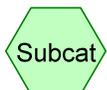
Back Patio



Permeable Pavers



Permeable Sidewalk



Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
40,332	39	>75% Grass cover, Good, HSG A (10, 11, 20)
42,893	98	Paved parking, HSG A (10, 11, 20)
3,500	98	Permeable (21)
86,725	71	TOTAL AREA

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Front Entry Runoff Area=34,320 sf 72.93% Impervious Runoff Depth=1.64"
Tc=5.0 min CN=82 Runoff=1.79 cfs 4,700 cf

Subcatchment11: Front Entry Runoff Area=26,355 sf 52.38% Impervious Runoff Depth=0.90"
Tc=5.0 min CN=70 Runoff=0.73 cfs 1,987 cf

Subcatchment20: Back Patio Runoff Area=22,550 sf 18.00% Impervious Runoff Depth=0.16"
Tc=5.0 min CN=50 Runoff=0.02 cfs 293 cf

Subcatchment21: Permeable Pavers Runoff Area=3,500 sf 100.00% Impervious Runoff Depth=3.10"
Tc=5.0 min CN=98 Runoff=0.29 cfs 903 cf

Pond 1P: Diversion CB Peak Elev=93.98' Inflow=1.79 cfs 4,700 cf
Primary=1.79 cfs 4,700 cf Secondary=0.00 cfs 0 cf Outflow=1.79 cfs 4,700 cf

Pond 2P: Permeable Sidewalk Peak Elev=98.60' Storage=135 cf Inflow=0.29 cfs 903 cf
Discarded=0.08 cfs 904 cf Primary=0.00 cfs 0 cf Secondary=0.00 cfs 0 cf Outflow=0.08 cfs 904 cf

Pond P-1: Stormtech Peak Elev=93.98' Storage=2,771 cf Inflow=1.79 cfs 4,700 cf
Discarded=0.05 cfs 4,511 cf Primary=0.00 cfs 0 cf Outflow=0.05 cfs 4,511 cf

Link DP1: Front Entry Inflow=0.73 cfs 1,987 cf
Primary=0.73 cfs 1,987 cf

Link DP2: Back Patio Inflow=0.02 cfs 293 cf
Primary=0.02 cfs 293 cf

Total Runoff Area = 86,725 sf Runoff Volume = 7,884 cf Average Runoff Depth = 1.09"
46.51% Pervious = 40,332 sf 53.49% Impervious = 46,393 sf

Summary for Subcatchment 10: Front Entry

Runoff = 1.79 cfs @ 12.13 hrs, Volume= 4,700 cf, Depth= 1.64"

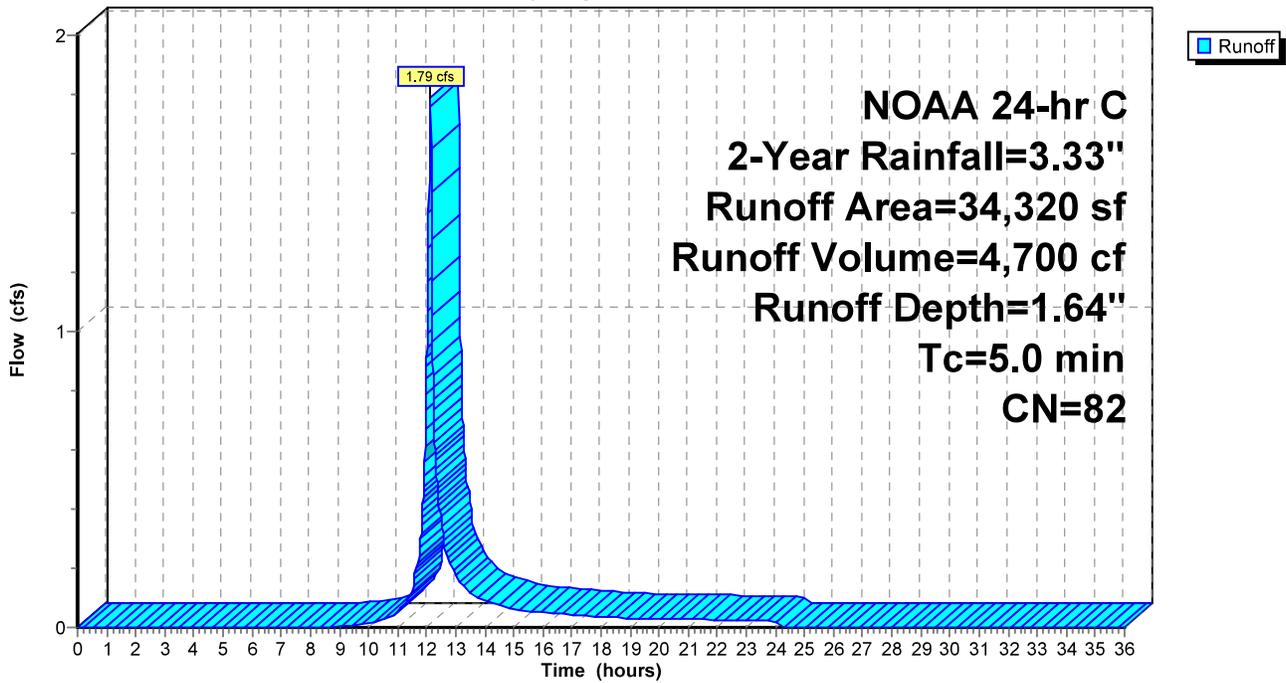
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.33"

Area (sf)	CN	Description
25,030	98	Paved parking, HSG A
9,290	39	>75% Grass cover, Good, HSG A
34,320	82	Weighted Average
9,290		27.07% Pervious Area
25,030		72.93% Impervious Area

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

Subcatchment 10: Front Entry

Hydrograph



Summary for Subcatchment 11: Front Entry

Runoff = 0.73 cfs @ 12.13 hrs, Volume= 1,987 cf, Depth= 0.90"

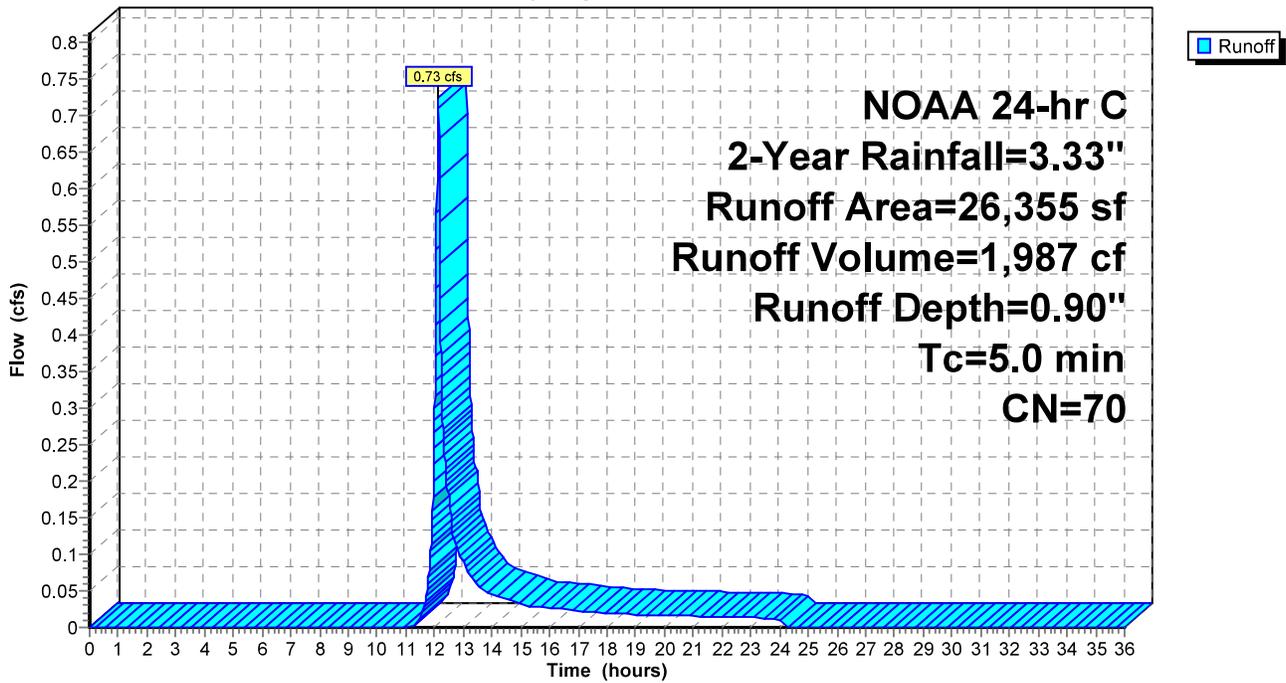
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.33"

Area (sf)	CN	Description
13,805	98	Paved parking, HSG A
12,550	39	>75% Grass cover, Good, HSG A
26,355	70	Weighted Average
12,550		47.62% Pervious Area
13,805		52.38% Impervious Area

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

Subcatchment 11: Front Entry

Hydrograph



Summary for Subcatchment 20: Back Patio

Runoff = 0.02 cfs @ 12.53 hrs, Volume= 293 cf, Depth= 0.16"

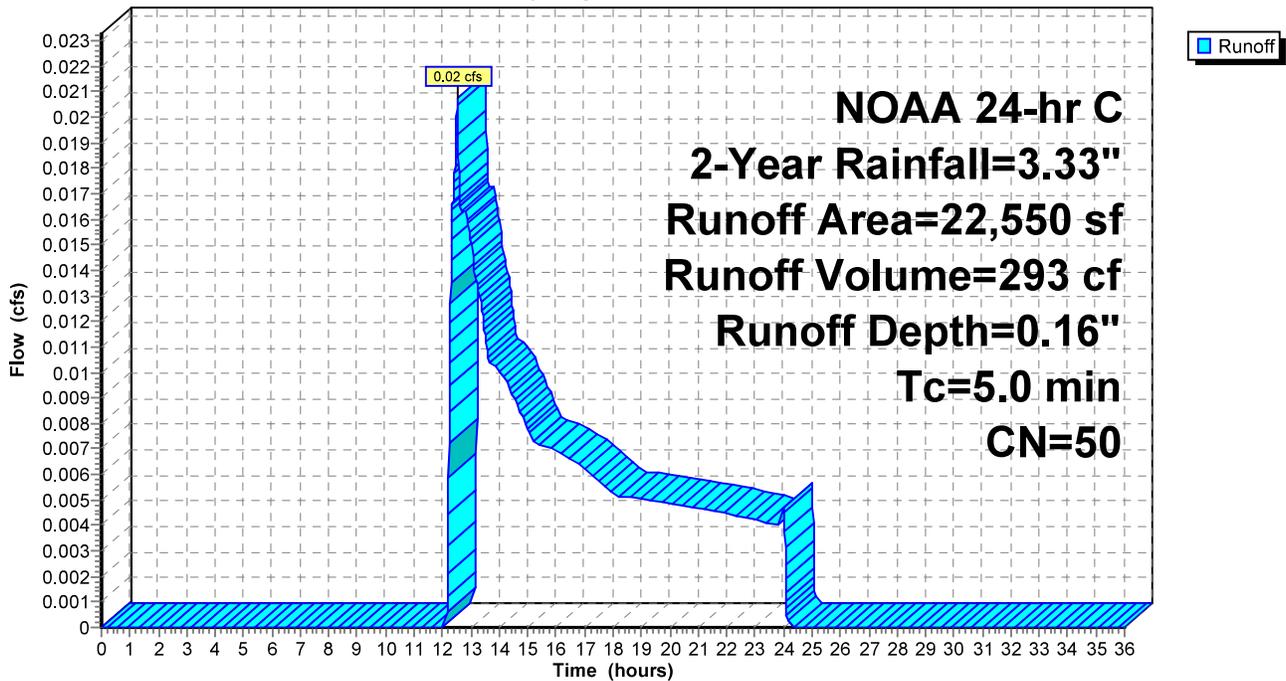
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.33"

Area (sf)	CN	Description
4,058	98	Paved parking, HSG A
18,492	39	>75% Grass cover, Good, HSG A
22,550	50	Weighted Average
18,492		82.00% Pervious Area
4,058		18.00% Impervious Area

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

Subcatchment 20: Back Patio

Hydrograph



Summary for Subcatchment 21: Permeable Pavers

Runoff = 0.29 cfs @ 12.12 hrs, Volume= 903 cf, Depth= 3.10"

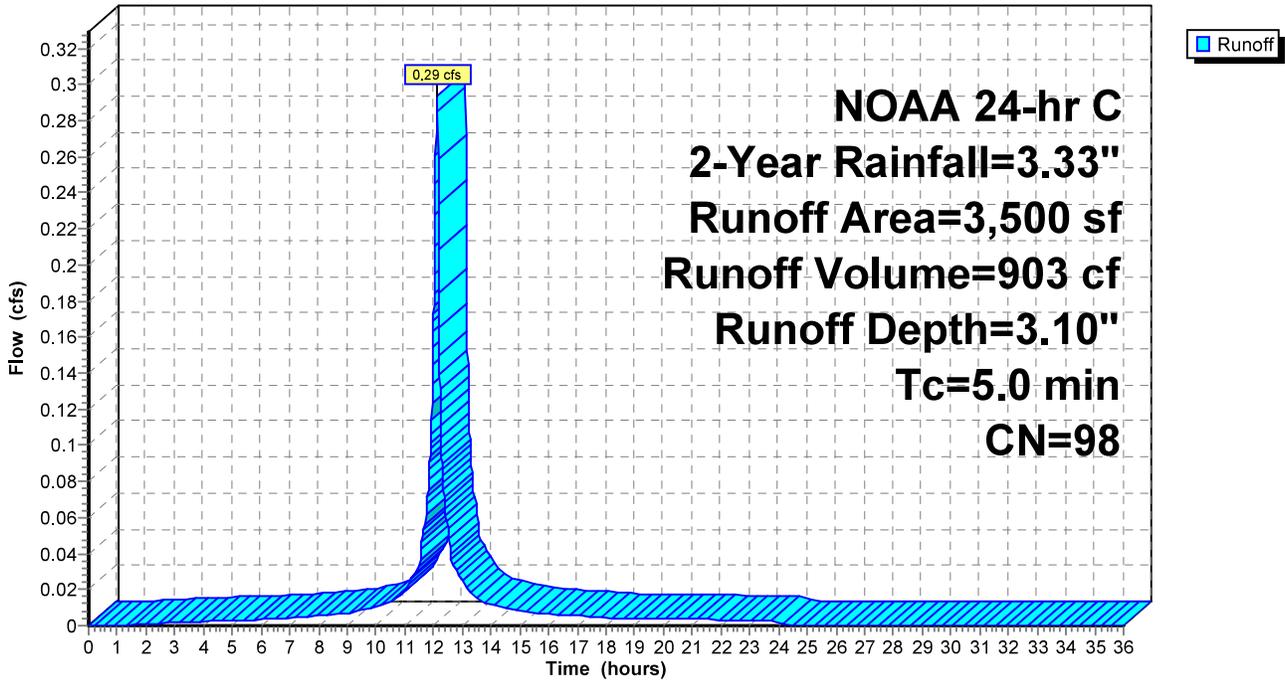
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-Year Rainfall=3.33"

Area (sf)	CN	Description
* 3,500	98	Permeable
3,500		100.00% Impervious Area

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

Subcatchment 21: Permeable Pavers

Hydrograph



Summary for Pond 1P: Diversion CB

Inflow Area = 34,320 sf, 72.93% Impervious, Inflow Depth = 1.64" for 2-Year event
 Inflow = 1.79 cfs @ 12.13 hrs, Volume= 4,700 cf
 Outflow = 1.79 cfs @ 12.13 hrs, Volume= 4,700 cf, Atten= 0%, Lag= 0.0 min
 Primary = 1.79 cfs @ 12.13 hrs, Volume= 4,700 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

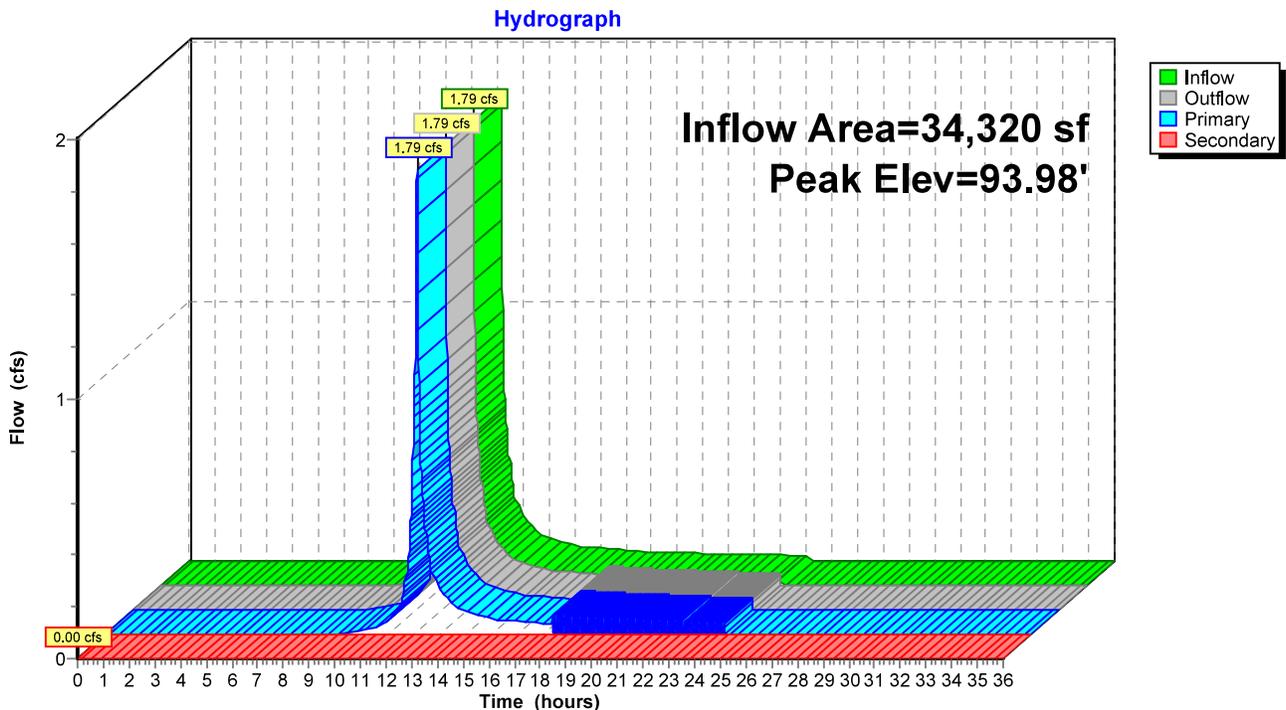
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 93.98' @ 16.27 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	24.0" Round Culvert L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 92.60' / 92.50' S= 0.0100'/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	94.40'	10.0" Round Culvert L= 5.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 94.40' / 94.30' S= 0.0200'/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf

Primary OutFlow Max=1.78 cfs @ 12.13 hrs HW=93.24' TW=92.93' (Dynamic Tailwater)
 ↳1=Culvert (Barrel Controls 1.78 cfs @ 3.11 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=92.60' TW=0.00' (Dynamic Tailwater)
 ↳2=Culvert (Controls 0.00 cfs)

Pond 1P: Diversion CB



Summary for Pond 2P: Permeable Sidewalk

Inflow Area = 3,500 sf, 100.00% Impervious, Inflow Depth = 3.10" for 2-Year event
 Inflow = 0.29 cfs @ 12.12 hrs, Volume= 903 cf
 Outflow = 0.08 cfs @ 12.01 hrs, Volume= 904 cf, Atten= 72%, Lag= 0.0 min
 Discarded = 0.08 cfs @ 12.01 hrs, Volume= 904 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 98.60' @ 12.32 hrs Surf.Area= 3,500 sf Storage= 135 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 6.7 min (762.5 - 755.8)

Volume	Invert	Avail.Storage	Storage Description
#1	98.50'	1,750 cf	Permeable (Prismatic) Listed below (Recalc) 4,375 cf Overall x 40.0% Voids
#2	99.75'	875 cf	Surface (Prismatic) Listed below (Recalc) -Impervious
		2,625 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
98.50	3,500	0	0
99.75	3,500	4,375	4,375

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
99.75	3,500	0	0
100.00	3,500	875	875

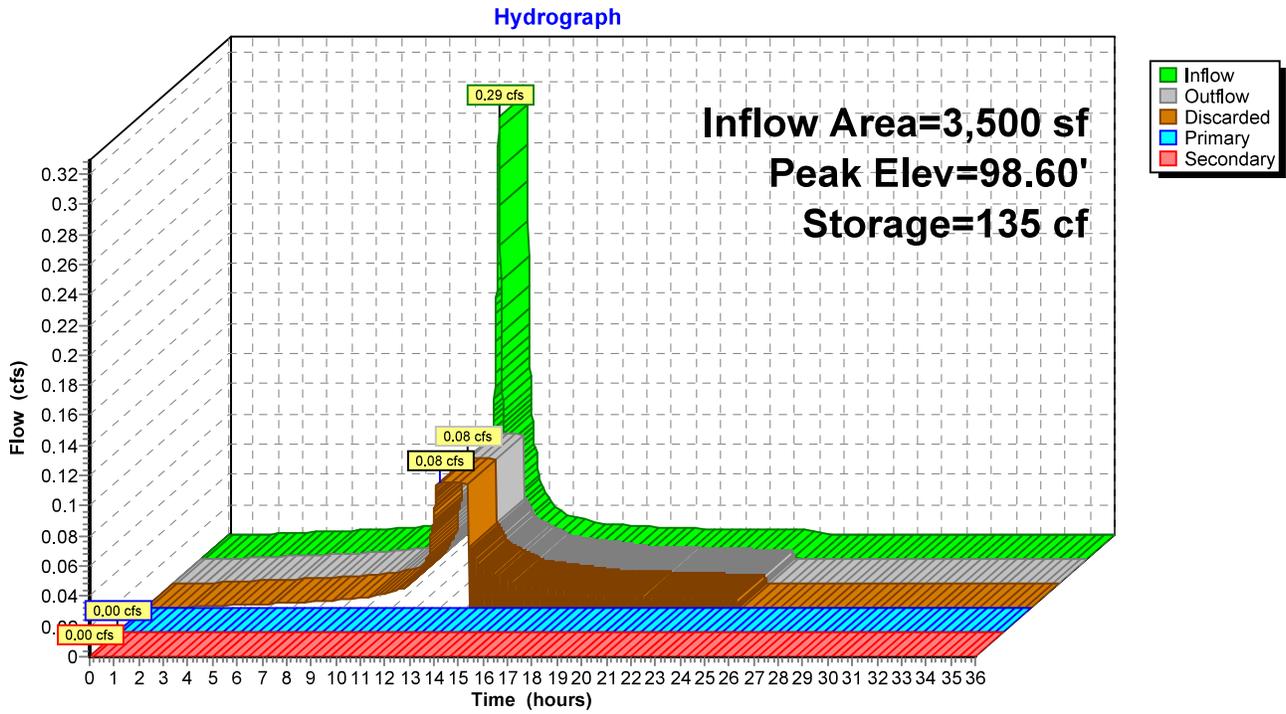
Device	Routing	Invert	Outlet Devices
#1	Discarded	98.50'	1.020 in/hr Exfiltration over Surface area
#2	Primary	98.75'	6.0" Round Culvert L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 98.75' / 98.40' S= 0.0350'/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Secondary	99.95'	20.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.08 cfs @ 12.01 hrs HW=98.52' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=98.50' TW=0.00' (Dynamic Tailwater)
 ↑2=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=98.50' TW=0.00' (Dynamic Tailwater)
 ↑3=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 2P: Permeable Sidewalk



Summary for Pond P-1: Stormtech

Inflow Area = 34,320 sf, 72.93% Impervious, Inflow Depth = 1.64" for 2-Year event
 Inflow = 1.79 cfs @ 12.13 hrs, Volume= 4,700 cf
 Outflow = 0.05 cfs @ 11.95 hrs, Volume= 4,511 cf, Atten= 97%, Lag= 0.0 min
 Discarded = 0.05 cfs @ 11.95 hrs, Volume= 4,511 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 93.98' @ 16.26 hrs Surf.Area= 2,062 sf Storage= 2,771 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 550.6 min (1,387.4 - 836.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	92.00'	1,878 cf	44.25'W x 46.34'L x 3.50'H Field A 7,176 cf Overall - 2,481 cf Embedded = 4,696 cf x 40.0% Voids
#2A	92.50'	2,481 cf	ADS_StormTech SC-740 +Cap x 54 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 54 Chambers in 9 Rows
#3	92.50'	861 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		5,220 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.50	12	0	0
96.90	12	53	53
97.00	110	6	59
97.50	3,100	803	861

Device	Routing	Invert	Outlet Devices
#1	Primary	96.90'	2.0' long x 2.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	92.00'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.05 cfs @ 11.95 hrs HW=92.51' (Free Discharge)
 ↑2=Exfiltration (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=92.00' TW=0.00' (Dynamic Tailwater)
 ↑1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P-1: Stormtech - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech@SC-740 with cap length)

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

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

6 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 44.34' Row Length +12.0" End Stone x 2 = 46.34' Base Length

9 Rows x 51.0" Wide + 6.0" Spacing x 8 + 12.0" Side Stone x 2 = 44.25' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

54 Chambers x 45.9 cf = 2,480.8 cf Chamber Storage

7,176.4 cf Field - 2,480.8 cf Chambers = 4,695.6 cf Stone x 40.0% Voids = 1,878.3 cf Stone Storage

Chamber Storage + Stone Storage = 4,359.0 cf = 0.100 af

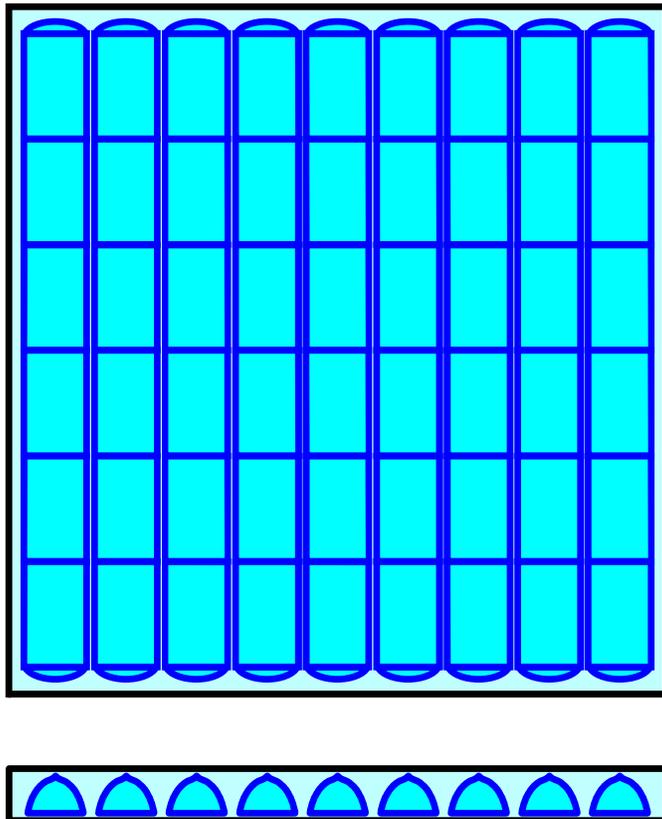
Overall Storage Efficiency = 60.7%

Overall System Size = 46.34' x 44.25' x 3.50'

54 Chambers

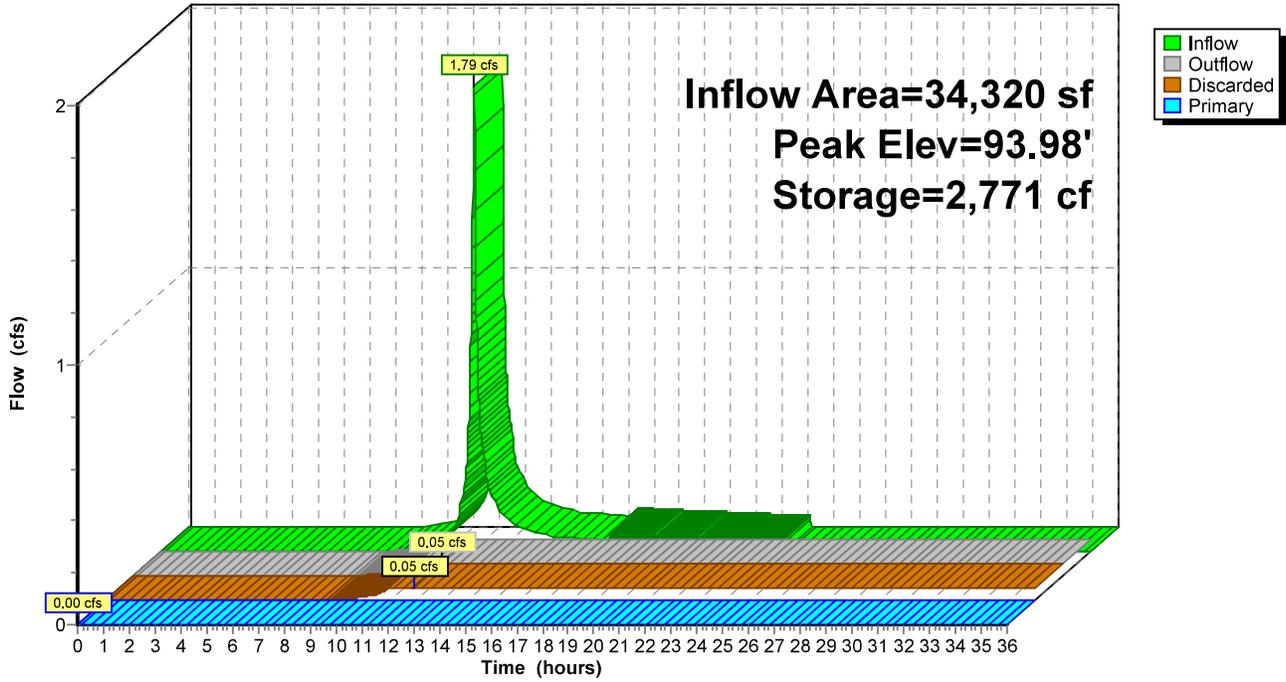
265.8 cy Field

173.9 cy Stone



Pond P-1: Stormtech

Hydrograph



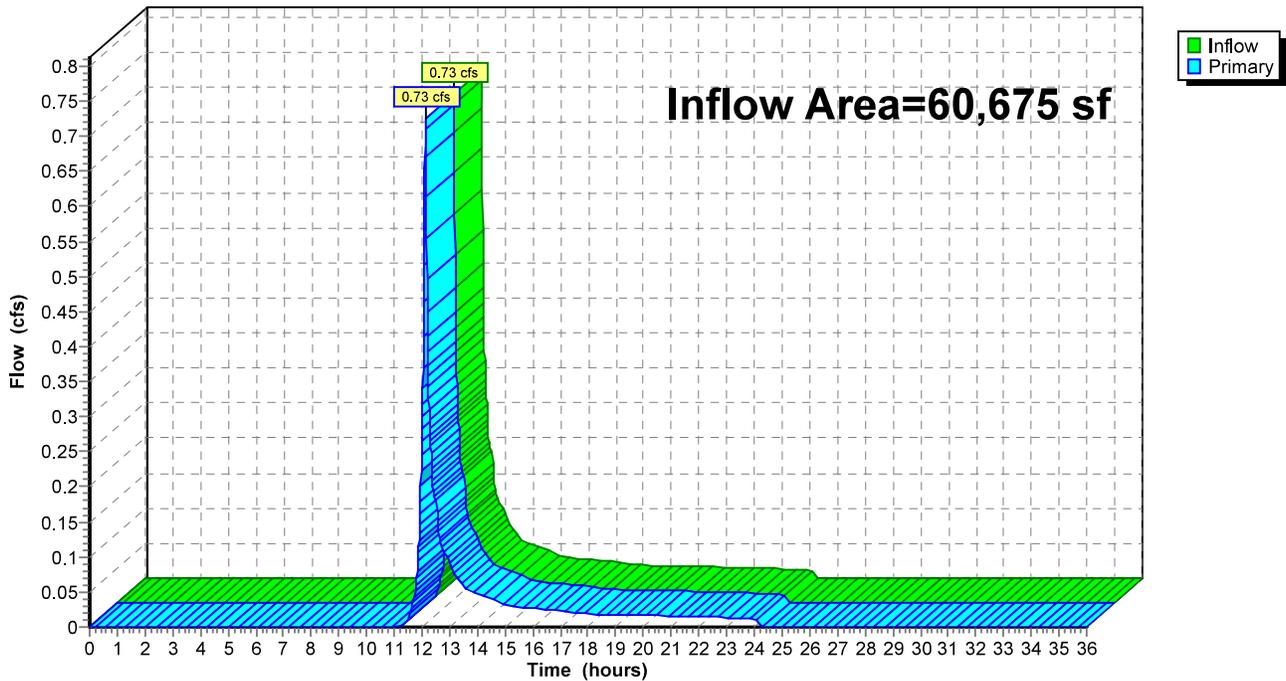
Summary for Link DP1: Front Entry

Inflow Area = 60,675 sf, 64.00% Impervious, Inflow Depth = 0.39" for 2-Year event
Inflow = 0.73 cfs @ 12.13 hrs, Volume= 1,987 cf
Primary = 0.73 cfs @ 12.13 hrs, Volume= 1,987 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP1: Front Entry

Hydrograph



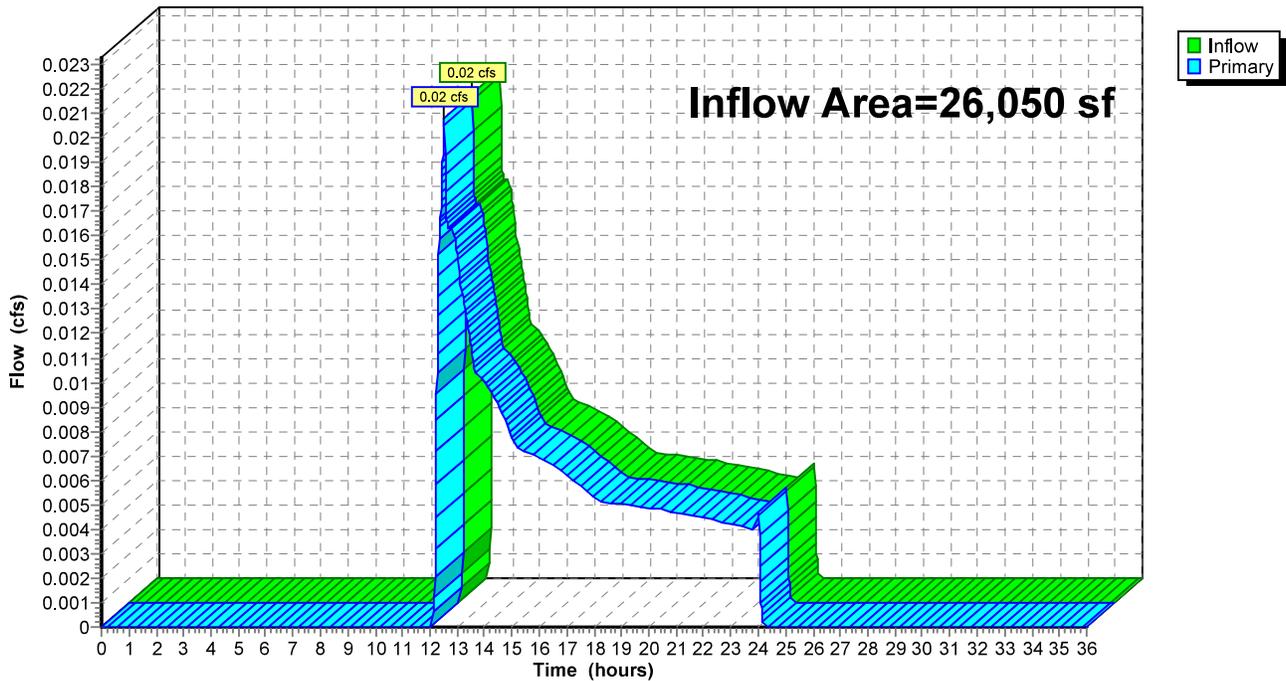
Summary for Link DP2: Back Patio

Inflow Area = 26,050 sf, 29.01% Impervious, Inflow Depth = 0.14" for 2-Year event
Inflow = 0.02 cfs @ 12.53 hrs, Volume= 293 cf
Primary = 0.02 cfs @ 12.53 hrs, Volume= 293 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP2: Back Patio

Hydrograph



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Front Entry Runoff Area=34,320 sf 72.93% Impervious Runoff Depth=3.28"
Tc=5.0 min CN=82 Runoff=3.50 cfs 9,371 cf

Subcatchment11: Front Entry Runoff Area=26,355 sf 52.38% Impervious Runoff Depth=2.20"
Tc=5.0 min CN=70 Runoff=1.84 cfs 4,834 cf

Subcatchment20: Back Patio Runoff Area=22,550 sf 18.00% Impervious Runoff Depth=0.78"
Tc=5.0 min CN=50 Runoff=0.44 cfs 1,474 cf

Subcatchment21: Permeable Pavers Runoff Area=3,500 sf 100.00% Impervious Runoff Depth=4.98"
Tc=5.0 min CN=98 Runoff=0.46 cfs 1,453 cf

Pond 1P: Diversion CB Peak Elev=94.94' Inflow=3.50 cfs 9,371 cf
Primary=3.50 cfs 6,045 cf Secondary=0.87 cfs 3,325 cf Outflow=3.50 cfs 9,370 cf

Pond 2P: Permeable Sidewalk Peak Elev=98.73' Storage=320 cf Inflow=0.46 cfs 1,453 cf
Discarded=0.08 cfs 1,454 cf Primary=0.00 cfs 0 cf Secondary=0.00 cfs 0 cf Outflow=0.08 cfs 1,454 cf

Pond P-1: Stormtech Peak Elev=94.94' Storage=3,928 cf Inflow=3.50 cfs 6,045 cf
Discarded=0.05 cfs 4,813 cf Primary=0.00 cfs 0 cf Outflow=0.05 cfs 4,813 cf

Link DP1: Front Entry Inflow=1.84 cfs 8,158 cf
Primary=1.84 cfs 8,158 cf

Link DP2: Back Patio Inflow=0.44 cfs 1,474 cf
Primary=0.44 cfs 1,474 cf

Total Runoff Area = 86,725 sf Runoff Volume = 17,132 cf Average Runoff Depth = 2.37"
46.51% Pervious = 40,332 sf 53.49% Impervious = 46,393 sf

Summary for Subcatchment 10: Front Entry

Runoff = 3.50 cfs @ 12.12 hrs, Volume= 9,371 cf, Depth= 3.28"

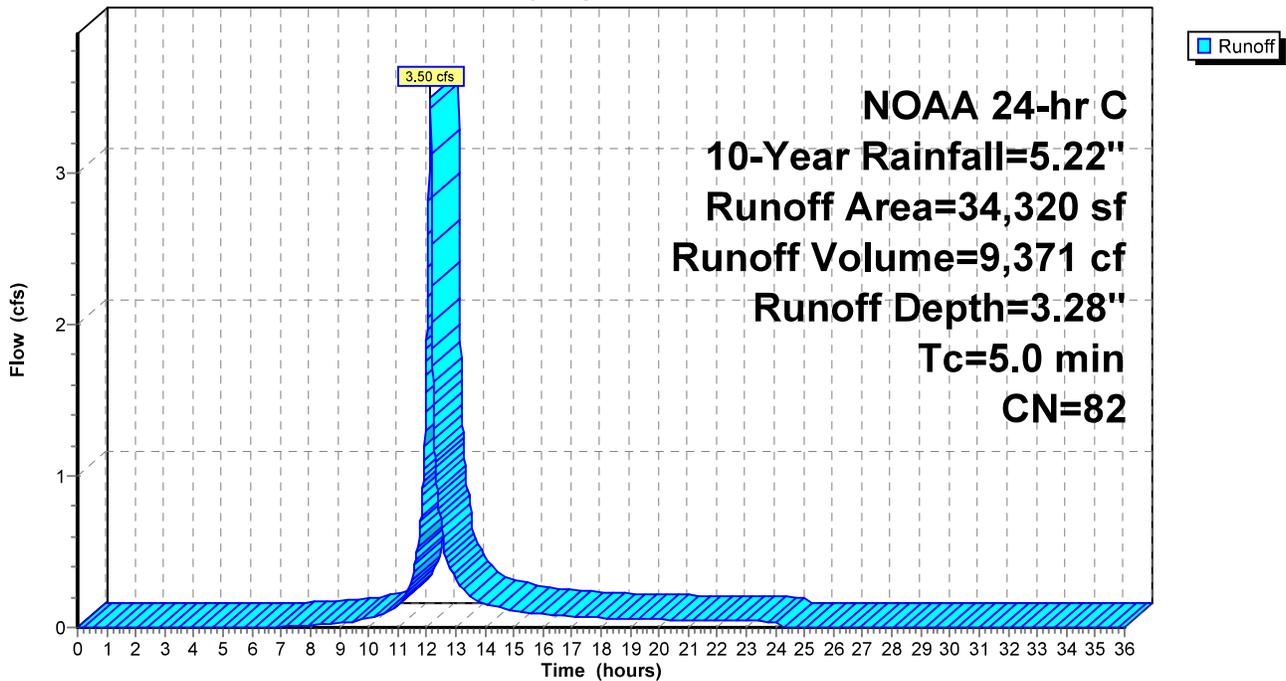
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.22"

Area (sf)	CN	Description
25,030	98	Paved parking, HSG A
9,290	39	>75% Grass cover, Good, HSG A
34,320	82	Weighted Average
9,290		27.07% Pervious Area
25,030		72.93% Impervious Area

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

Subcatchment 10: Front Entry

Hydrograph



Summary for Subcatchment 11: Front Entry

Runoff = 1.84 cfs @ 12.13 hrs, Volume= 4,834 cf, Depth= 2.20"

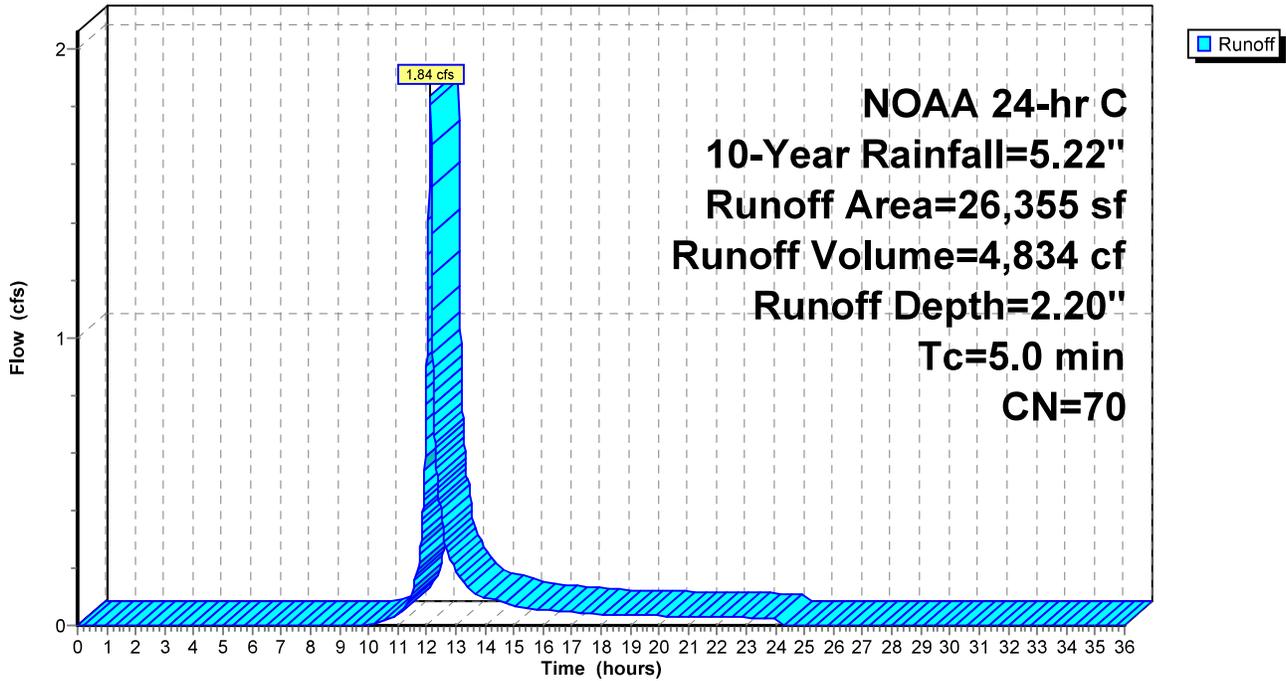
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.22"

Area (sf)	CN	Description
13,805	98	Paved parking, HSG A
12,550	39	>75% Grass cover, Good, HSG A
26,355	70	Weighted Average
12,550		47.62% Pervious Area
13,805		52.38% Impervious Area

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

Subcatchment 11: Front Entry

Hydrograph



Summary for Subcatchment 20: Back Patio

Runoff = 0.44 cfs @ 12.14 hrs, Volume= 1,474 cf, Depth= 0.78"

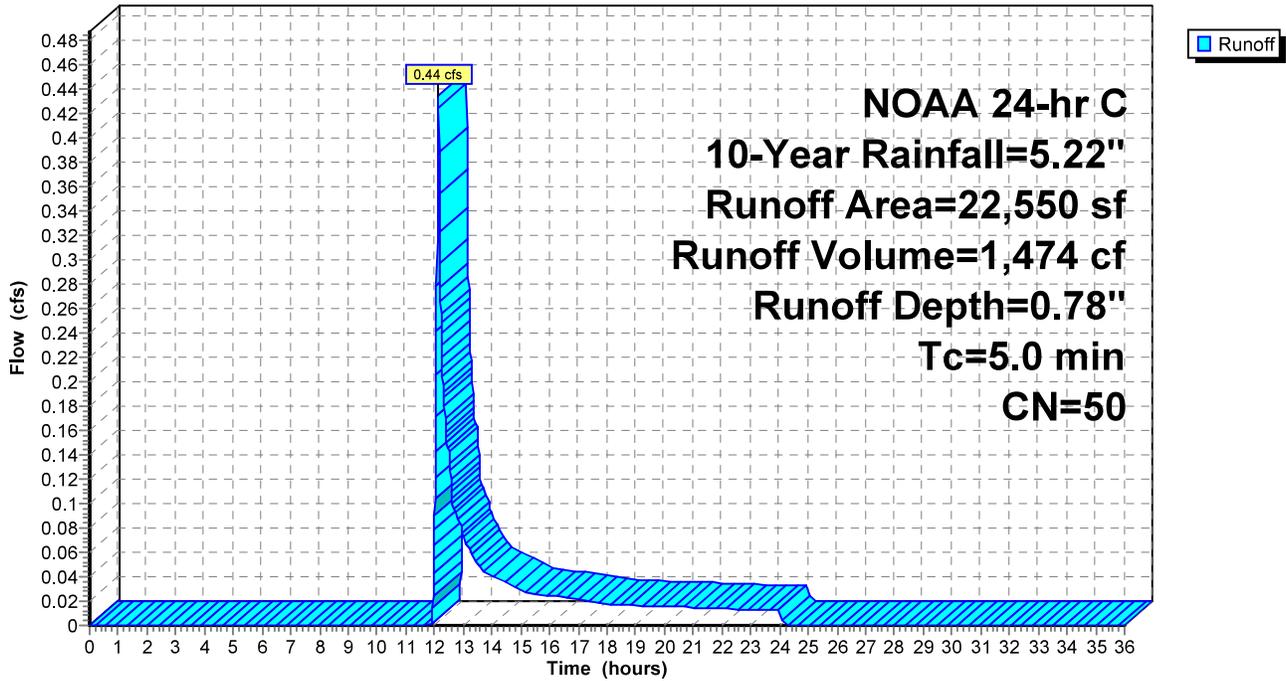
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.22"

Area (sf)	CN	Description
4,058	98	Paved parking, HSG A
18,492	39	>75% Grass cover, Good, HSG A
22,550	50	Weighted Average
18,492		82.00% Pervious Area
4,058		18.00% Impervious Area

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

Subcatchment 20: Back Patio

Hydrograph



Summary for Subcatchment 21: Permeable Pavers

Runoff = 0.46 cfs @ 12.12 hrs, Volume= 1,453 cf, Depth= 4.98"

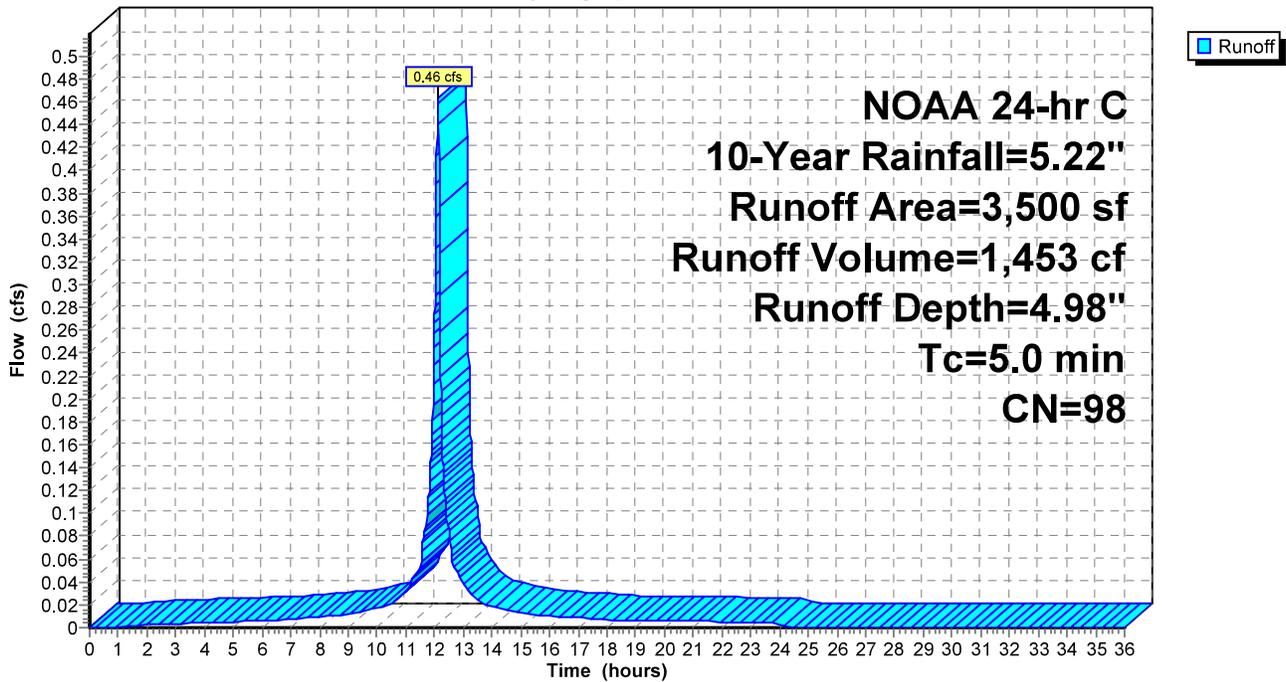
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.22"

Area (sf)	CN	Description
* 3,500	98	Permeable
3,500		100.00% Impervious Area

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

Subcatchment 21: Permeable Pavers

Hydrograph



Summary for Pond 1P: Diversion CB

Inflow Area = 34,320 sf, 72.93% Impervious, Inflow Depth = 3.28" for 10-Year event
 Inflow = 3.50 cfs @ 12.12 hrs, Volume= 9,371 cf
 Outflow = 3.50 cfs @ 12.12 hrs, Volume= 9,370 cf, Atten= 0%, Lag= 0.0 min
 Primary = 3.50 cfs @ 12.12 hrs, Volume= 6,045 cf
 Secondary = 0.87 cfs @ 12.36 hrs, Volume= 3,325 cf

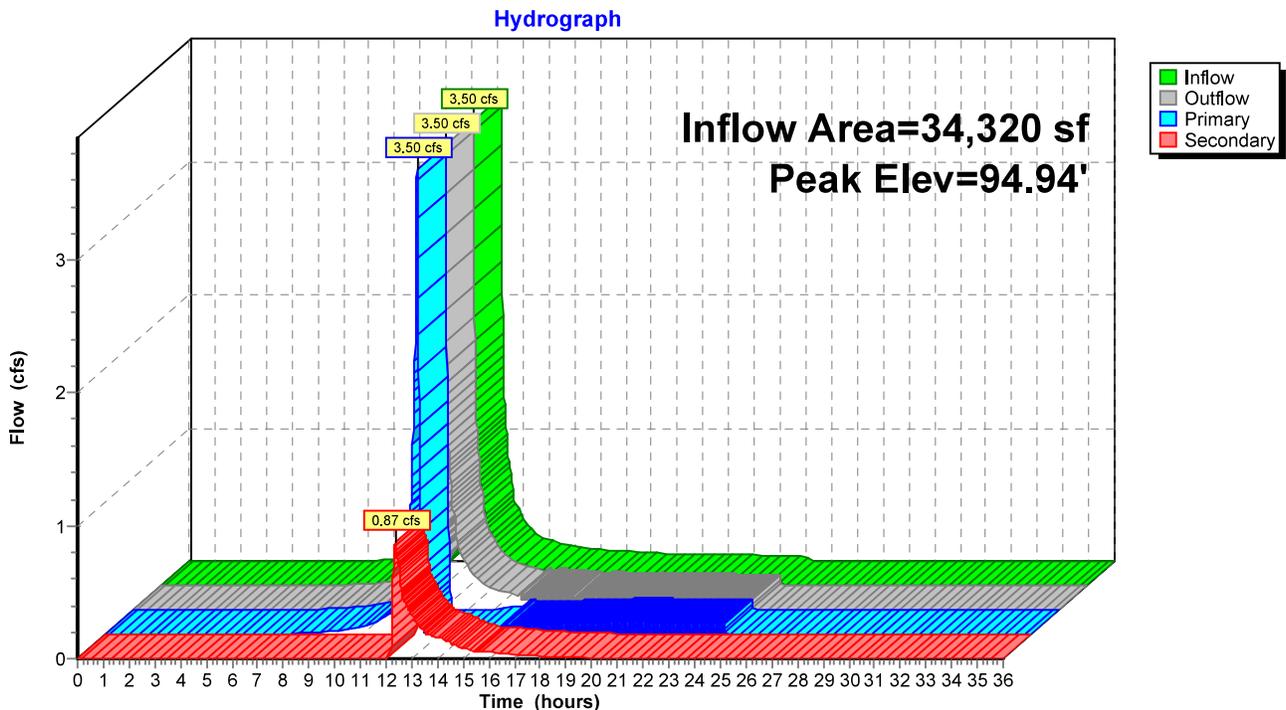
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 94.94' @ 12.36 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	24.0" Round Culvert L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 92.60' / 92.50' S= 0.0100 '/ Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	94.40'	10.0" Round Culvert L= 5.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 94.40' / 94.30' S= 0.0200 '/ Cc= 0.900 n= 0.012, Flow Area= 0.55 sf

Primary OutFlow Max=1.41 cfs @ 12.12 hrs HW=94.03' TW=94.02' (Dynamic Tailwater)
 ↳1=Culvert (Outlet Controls 1.41 cfs @ 0.82 fps)

Secondary OutFlow Max=0.87 cfs @ 12.36 hrs HW=94.94' TW=0.00' (Dynamic Tailwater)
 ↳2=Culvert (Barrel Controls 0.87 cfs @ 3.32 fps)

Pond 1P: Diversion CB



Summary for Pond 2P: Permeable Sidewalk

Inflow Area = 3,500 sf, 100.00% Impervious, Inflow Depth = 4.98" for 10-Year event
 Inflow = 0.46 cfs @ 12.12 hrs, Volume= 1,453 cf
 Outflow = 0.08 cfs @ 11.89 hrs, Volume= 1,454 cf, Atten= 82%, Lag= 0.0 min
 Discarded = 0.08 cfs @ 11.89 hrs, Volume= 1,454 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 98.73' @ 12.54 hrs Surf.Area= 3,500 sf Storage= 320 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 19.2 min (766.4 - 747.2)

Volume	Invert	Avail.Storage	Storage Description
#1	98.50'	1,750 cf	Permeable (Prismatic) Listed below (Recalc) 4,375 cf Overall x 40.0% Voids
#2	99.75'	875 cf	Surface (Prismatic) Listed below (Recalc) -Impervious
		2,625 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
98.50	3,500	0	0
99.75	3,500	4,375	4,375

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
99.75	3,500	0	0
100.00	3,500	875	875

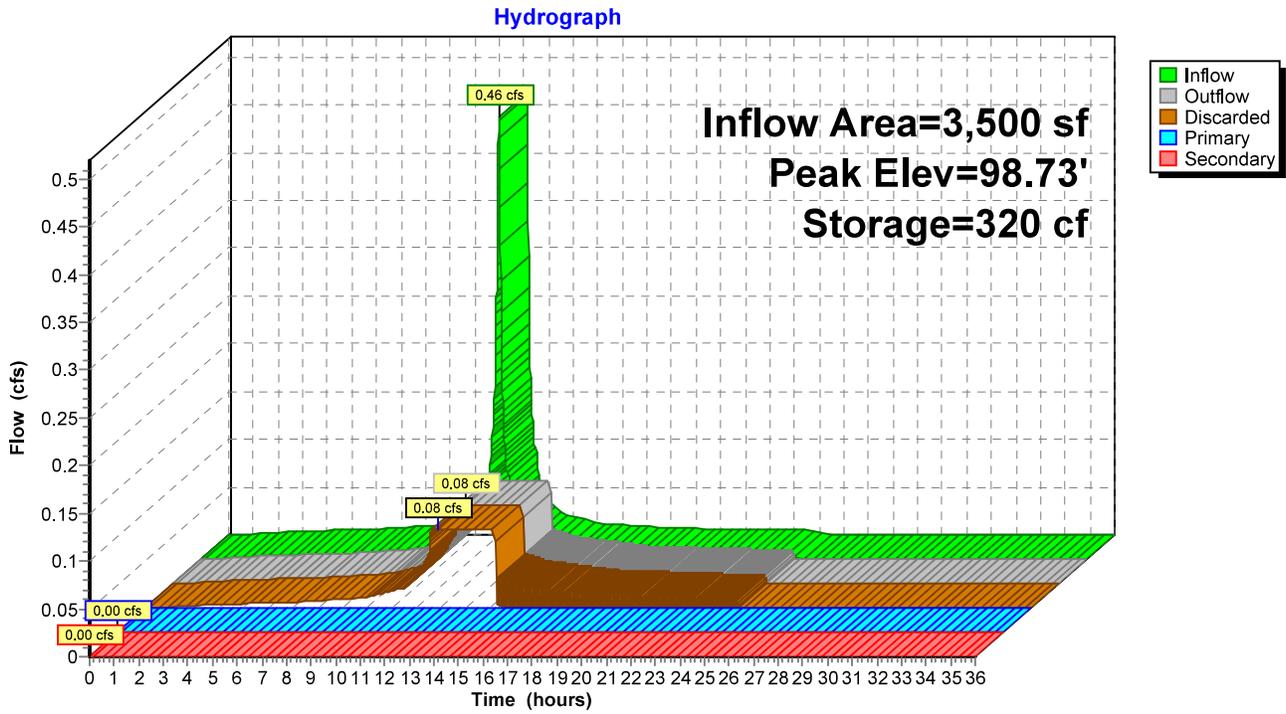
Device	Routing	Invert	Outlet Devices
#1	Discarded	98.50'	1.020 in/hr Exfiltration over Surface area
#2	Primary	98.75'	6.0" Round Culvert L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 98.75' / 98.40' S= 0.0350'/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Secondary	99.95'	20.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.08 cfs @ 11.89 hrs HW=98.52' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=98.50' TW=0.00' (Dynamic Tailwater)
 ↑2=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=98.50' TW=0.00' (Dynamic Tailwater)
 ↑3=Broad-Crested Rectangular Weir(Controls 0.00 cfs)

Pond 2P: Permeable Sidewalk



Summary for Pond P-1: Stormtech

Inflow Area = 34,320 sf, 72.93% Impervious, Inflow Depth = 2.11" for 10-Year event
 Inflow = 3.50 cfs @ 12.12 hrs, Volume= 6,045 cf
 Outflow = 0.05 cfs @ 11.45 hrs, Volume= 4,813 cf, Atten= 99%, Lag= 0.0 min
 Discarded = 0.05 cfs @ 11.45 hrs, Volume= 4,813 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 94.94' @ 12.36 hrs Surf.Area= 2,062 sf Storage= 3,928 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 523.5 min (1,335.6 - 812.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	92.00'	1,878 cf	44.25'W x 46.34'L x 3.50'H Field A 7,176 cf Overall - 2,481 cf Embedded = 4,696 cf x 40.0% Voids
#2A	92.50'	2,481 cf	ADS_StormTech SC-740 +Cap x 54 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 54 Chambers in 9 Rows
#3	92.50'	861 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		5,220 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.50	12	0	0
96.90	12	53	53
97.00	110	6	59
97.50	3,100	803	861

Device	Routing	Invert	Outlet Devices
#1	Primary	96.90'	2.0' long x 2.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	92.00'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.05 cfs @ 11.45 hrs HW=92.50' (Free Discharge)
 ↑ 2=Exfiltration (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=92.00' TW=0.00' (Dynamic Tailwater)
 ↑ 1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P-1: Stormtech - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech@SC-740 with cap length)

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

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

6 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 44.34' Row Length +12.0" End Stone x 2 = 46.34' Base Length

9 Rows x 51.0" Wide + 6.0" Spacing x 8 + 12.0" Side Stone x 2 = 44.25' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

54 Chambers x 45.9 cf = 2,480.8 cf Chamber Storage

7,176.4 cf Field - 2,480.8 cf Chambers = 4,695.6 cf Stone x 40.0% Voids = 1,878.3 cf Stone Storage

Chamber Storage + Stone Storage = 4,359.0 cf = 0.100 af

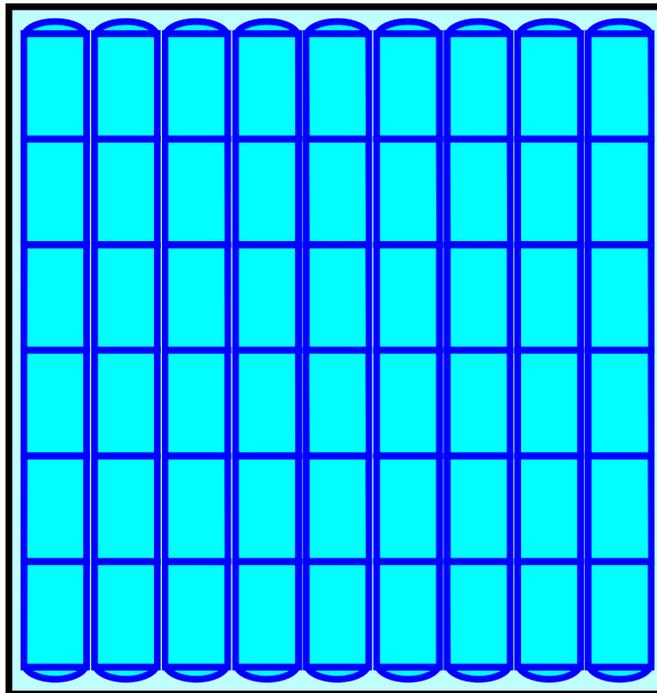
Overall Storage Efficiency = 60.7%

Overall System Size = 46.34' x 44.25' x 3.50'

54 Chambers

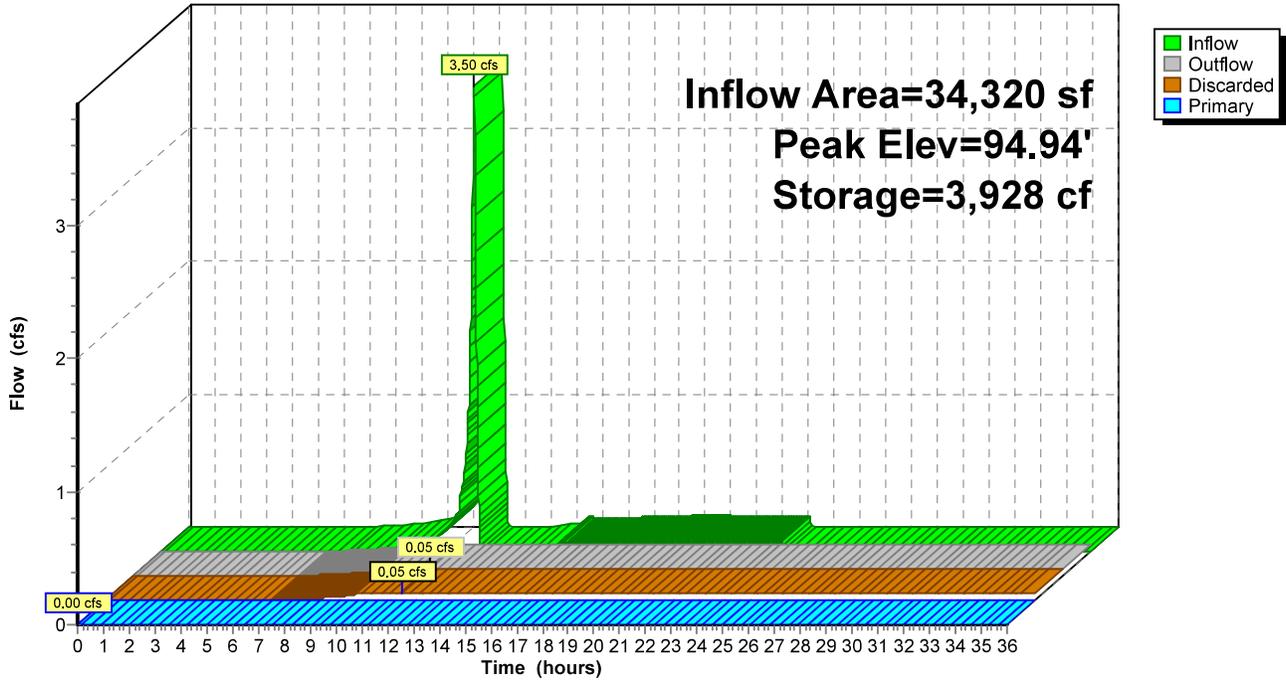
265.8 cy Field

173.9 cy Stone



Pond P-1: Stormtech

Hydrograph



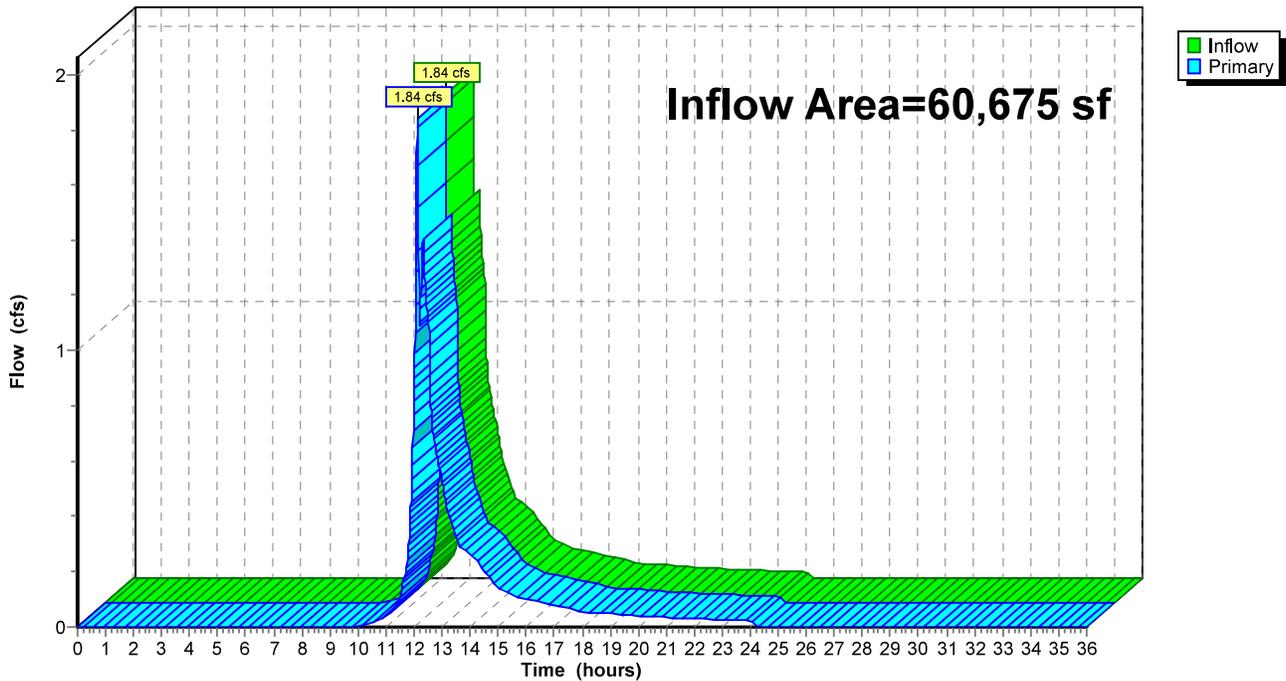
Summary for Link DP1: Front Entry

Inflow Area = 60,675 sf, 64.00% Impervious, Inflow Depth = 1.61" for 10-Year event
Inflow = 1.84 cfs @ 12.13 hrs, Volume= 8,158 cf
Primary = 1.84 cfs @ 12.13 hrs, Volume= 8,158 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP1: Front Entry

Hydrograph



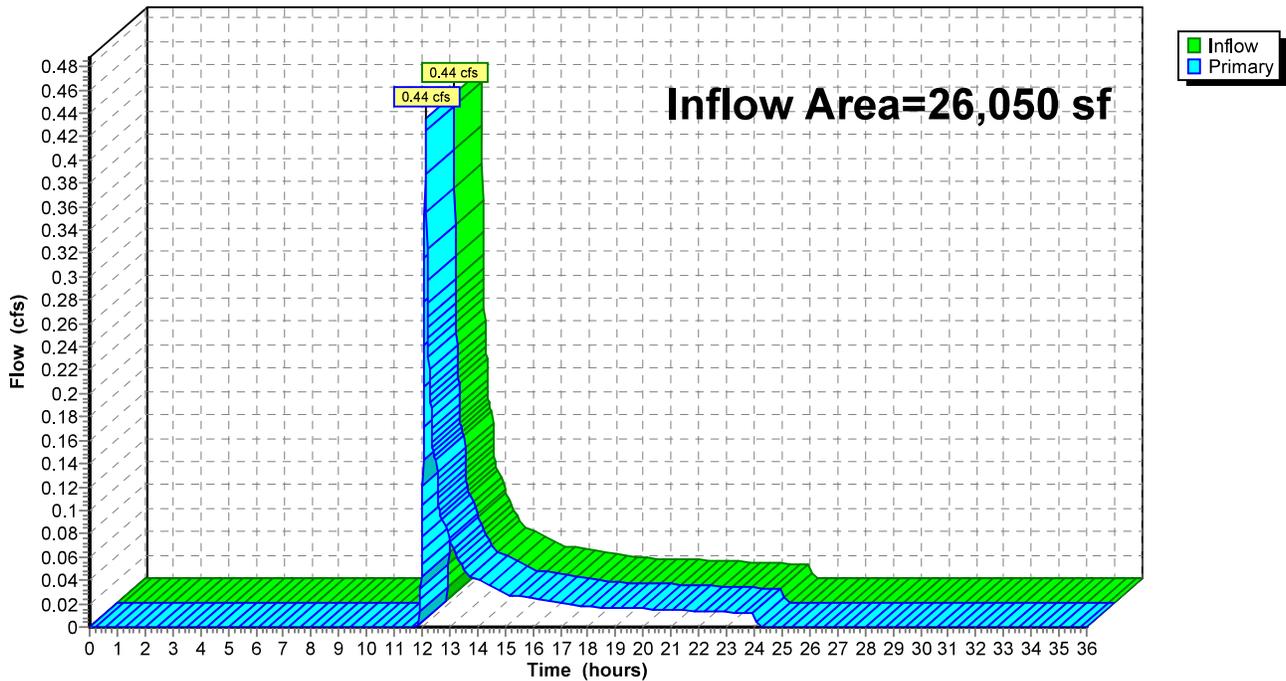
Summary for Link DP2: Back Patio

Inflow Area = 26,050 sf, 29.01% Impervious, Inflow Depth = 0.68" for 10-Year event
Inflow = 0.44 cfs @ 12.14 hrs, Volume= 1,474 cf
Primary = 0.44 cfs @ 12.14 hrs, Volume= 1,474 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP2: Back Patio

Hydrograph



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Front Entry Runoff Area=34,320 sf 72.93% Impervious Runoff Depth=4.35"
Tc=5.0 min CN=82 Runoff=4.58 cfs 12,433 cf

Subcatchment11: Front Entry Runoff Area=26,355 sf 52.38% Impervious Runoff Depth=3.12"
Tc=5.0 min CN=70 Runoff=2.61 cfs 6,848 cf

Subcatchment20: Back Patio Runoff Area=22,550 sf 18.00% Impervious Runoff Depth=1.34"
Tc=5.0 min CN=50 Runoff=0.86 cfs 2,517 cf

Subcatchment21: Permeable Pavers Runoff Area=3,500 sf 100.00% Impervious Runoff Depth=6.15"
Tc=5.0 min CN=98 Runoff=0.57 cfs 1,794 cf

Pond 1P: Diversion CB Peak Elev=95.75' Inflow=4.58 cfs 12,433 cf
Primary=4.16 cfs 6,296 cf Secondary=2.94 cfs 6,137 cf Outflow=4.58 cfs 12,433 cf

Pond 2P: Permeable Sidewalk Peak Elev=98.82' Storage=445 cf Inflow=0.57 cfs 1,794 cf
Discarded=0.08 cfs 1,766 cf Primary=0.01 cfs 28 cf Secondary=0.00 cfs 0 cf Outflow=0.10 cfs 1,794 cf

Pond P-1: Stormtech Peak Elev=97.03' Storage=4,425 cf Inflow=4.16 cfs 6,296 cf
Discarded=0.06 cfs 4,979 cf Primary=0.25 cfs 17 cf Outflow=0.31 cfs 4,995 cf

Link DP1: Front Entry Inflow=4.88 cfs 13,001 cf
Primary=4.88 cfs 13,001 cf

Link DP2: Back Patio Inflow=0.86 cfs 2,545 cf
Primary=0.86 cfs 2,545 cf

Total Runoff Area = 86,725 sf Runoff Volume = 23,592 cf Average Runoff Depth = 3.26"
46.51% Pervious = 40,332 sf 53.49% Impervious = 46,393 sf

Summary for Subcatchment 10: Front Entry

Runoff = 4.58 cfs @ 12.12 hrs, Volume= 12,433 cf, Depth= 4.35"

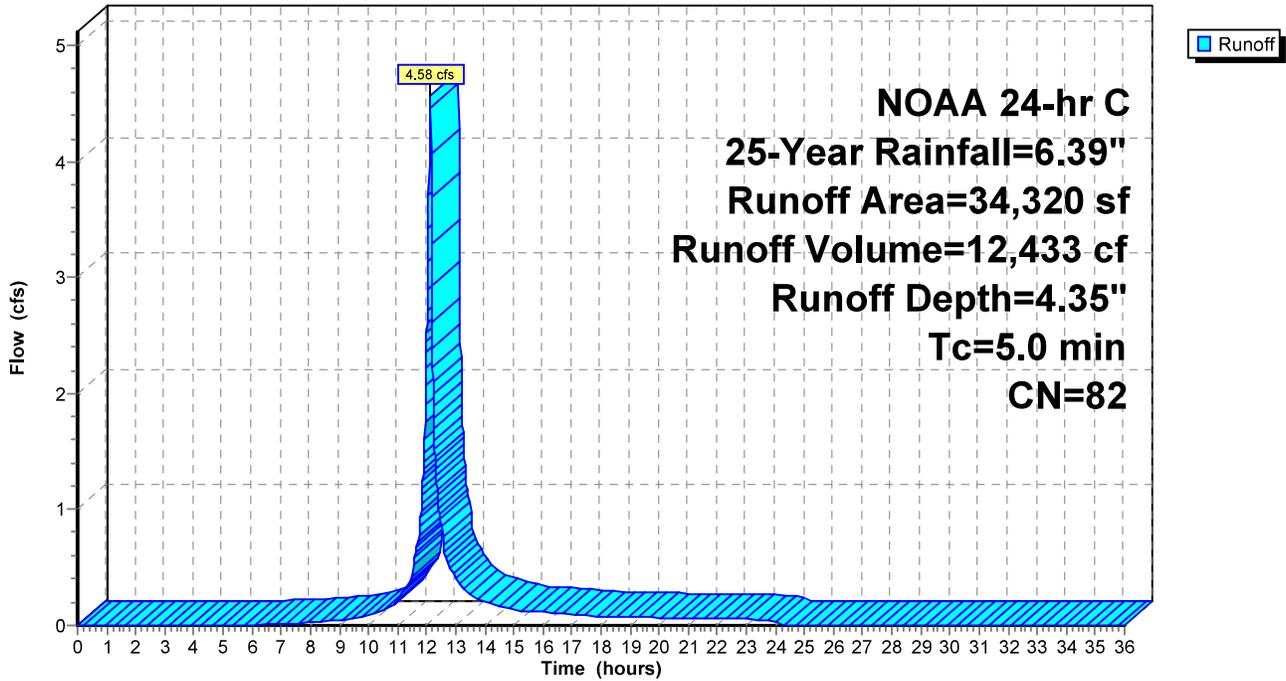
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 25-Year Rainfall=6.39"

Area (sf)	CN	Description
25,030	98	Paved parking, HSG A
9,290	39	>75% Grass cover, Good, HSG A
34,320	82	Weighted Average
9,290		27.07% Pervious Area
25,030		72.93% Impervious Area

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

Subcatchment 10: Front Entry

Hydrograph



Summary for Subcatchment 11: Front Entry

Runoff = 2.61 cfs @ 12.13 hrs, Volume= 6,848 cf, Depth= 3.12"

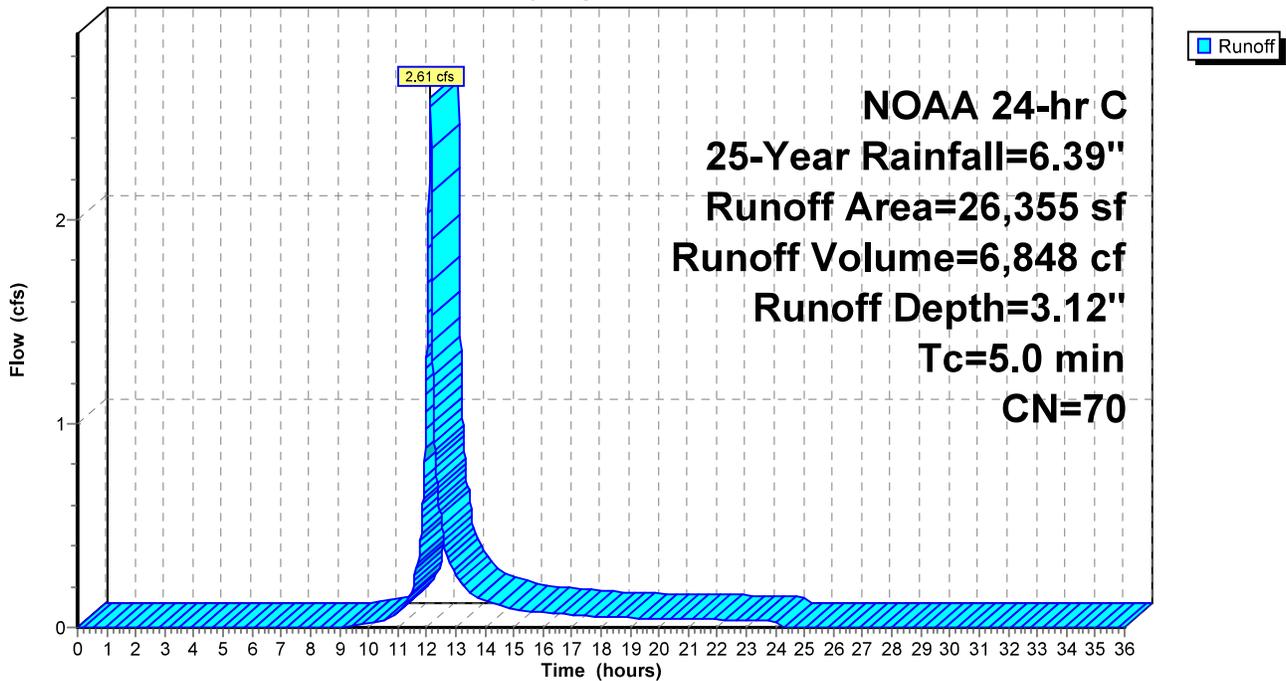
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 25-Year Rainfall=6.39"

Area (sf)	CN	Description
13,805	98	Paved parking, HSG A
12,550	39	>75% Grass cover, Good, HSG A
26,355	70	Weighted Average
12,550		47.62% Pervious Area
13,805		52.38% Impervious Area

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

Subcatchment 11: Front Entry

Hydrograph



Summary for Subcatchment 20: Back Patio

Runoff = 0.86 cfs @ 12.13 hrs, Volume= 2,517 cf, Depth= 1.34"

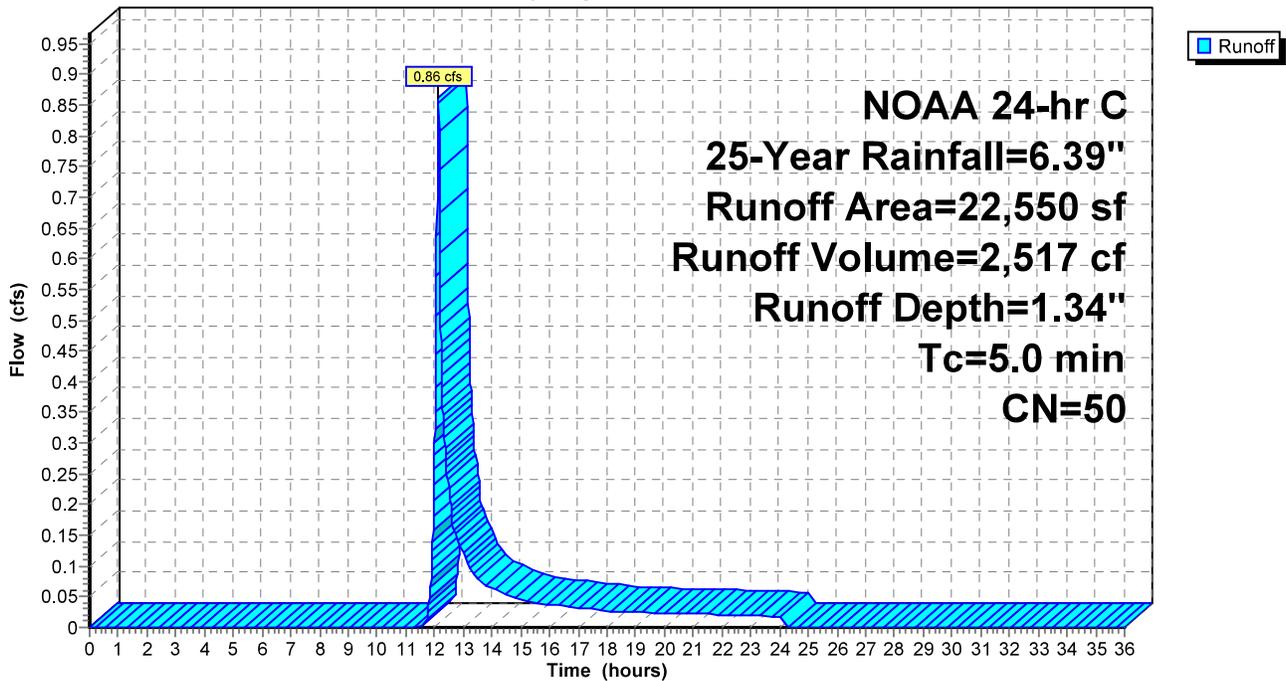
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 25-Year Rainfall=6.39"

Area (sf)	CN	Description
4,058	98	Paved parking, HSG A
18,492	39	>75% Grass cover, Good, HSG A
22,550	50	Weighted Average
18,492		82.00% Pervious Area
4,058		18.00% Impervious Area

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

Subcatchment 20: Back Patio

Hydrograph



Summary for Subcatchment 21: Permeable Pavers

Runoff = 0.57 cfs @ 12.12 hrs, Volume= 1,794 cf, Depth= 6.15"

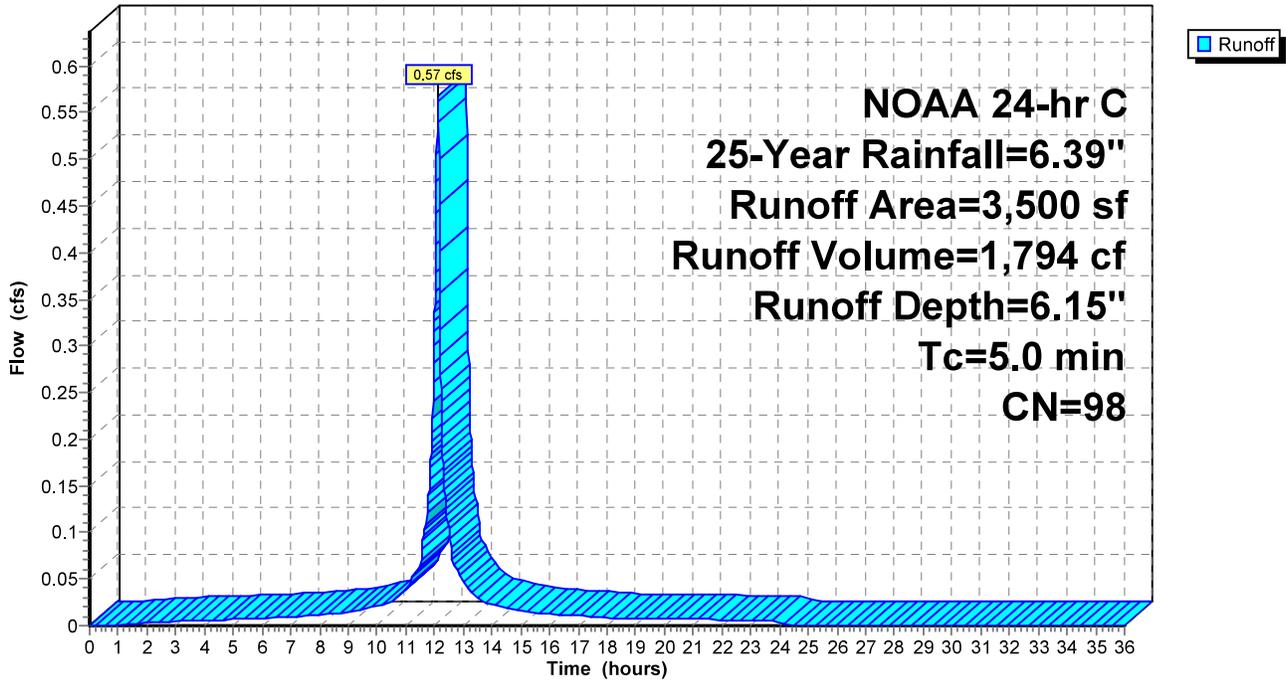
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 25-Year Rainfall=6.39"

Area (sf)	CN	Description
* 3,500	98	Permeable
3,500		100.00% Impervious Area

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

Subcatchment 21: Permeable Pavers

Hydrograph



Summary for Pond 1P: Diversion CB

Inflow Area = 34,320 sf, 72.93% Impervious, Inflow Depth = 4.35" for 25-Year event
 Inflow = 4.58 cfs @ 12.12 hrs, Volume= 12,433 cf
 Outflow = 4.58 cfs @ 12.12 hrs, Volume= 12,433 cf, Atten= 0%, Lag= 0.0 min
 Primary = 4.16 cfs @ 12.10 hrs, Volume= 6,296 cf
 Secondary = 2.94 cfs @ 12.18 hrs, Volume= 6,137 cf

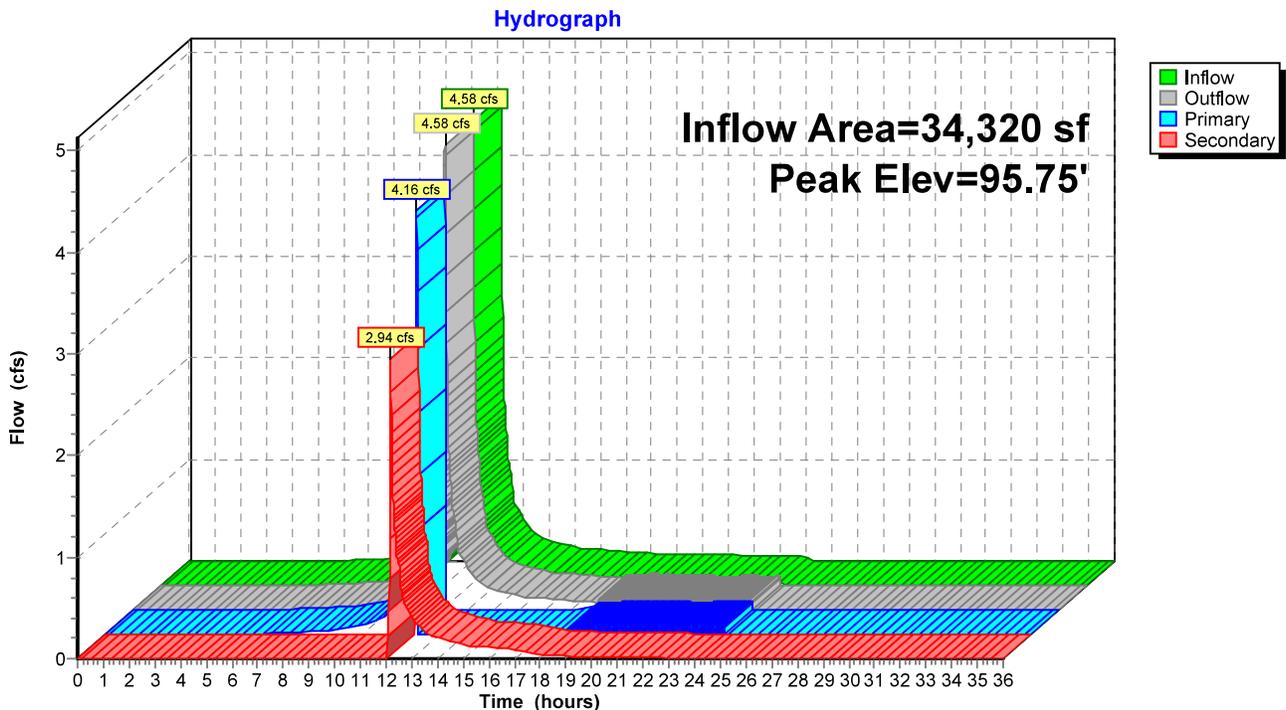
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 95.75' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	24.0" Round Culvert L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 92.60' / 92.50' S= 0.0100 '/ Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	94.40'	10.0" Round Culvert L= 5.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 94.40' / 94.30' S= 0.0200 '/ Cc= 0.900 n= 0.012, Flow Area= 0.55 sf

Primary OutFlow Max=0.00 cfs @ 12.10 hrs HW=94.60' TW=94.65' (Dynamic Tailwater)
 ↳1=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=2.87 cfs @ 12.18 hrs HW=95.72' TW=0.00' (Dynamic Tailwater)
 ↳2=Culvert (Barrel Controls 2.87 cfs @ 5.27 fps)

Pond 1P: Diversion CB



Summary for Pond 2P: Permeable Sidewalk

Inflow Area = 3,500 sf, 100.00% Impervious, Inflow Depth = 6.15" for 25-Year event
 Inflow = 0.57 cfs @ 12.12 hrs, Volume= 1,794 cf
 Outflow = 0.10 cfs @ 12.55 hrs, Volume= 1,794 cf, Atten= 83%, Lag= 25.7 min
 Discarded = 0.08 cfs @ 11.80 hrs, Volume= 1,766 cf
 Primary = 0.01 cfs @ 12.55 hrs, Volume= 28 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 98.82' @ 12.55 hrs Surf.Area= 3,500 sf Storage= 445 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 27.2 min (771.2 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1	98.50'	1,750 cf	Permeable (Prismatic) Listed below (Recalc) 4,375 cf Overall x 40.0% Voids
#2	99.75'	875 cf	Surface (Prismatic) Listed below (Recalc) -Impervious
		2,625 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
98.50	3,500	0	0
99.75	3,500	4,375	4,375

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
99.75	3,500	0	0
100.00	3,500	875	875

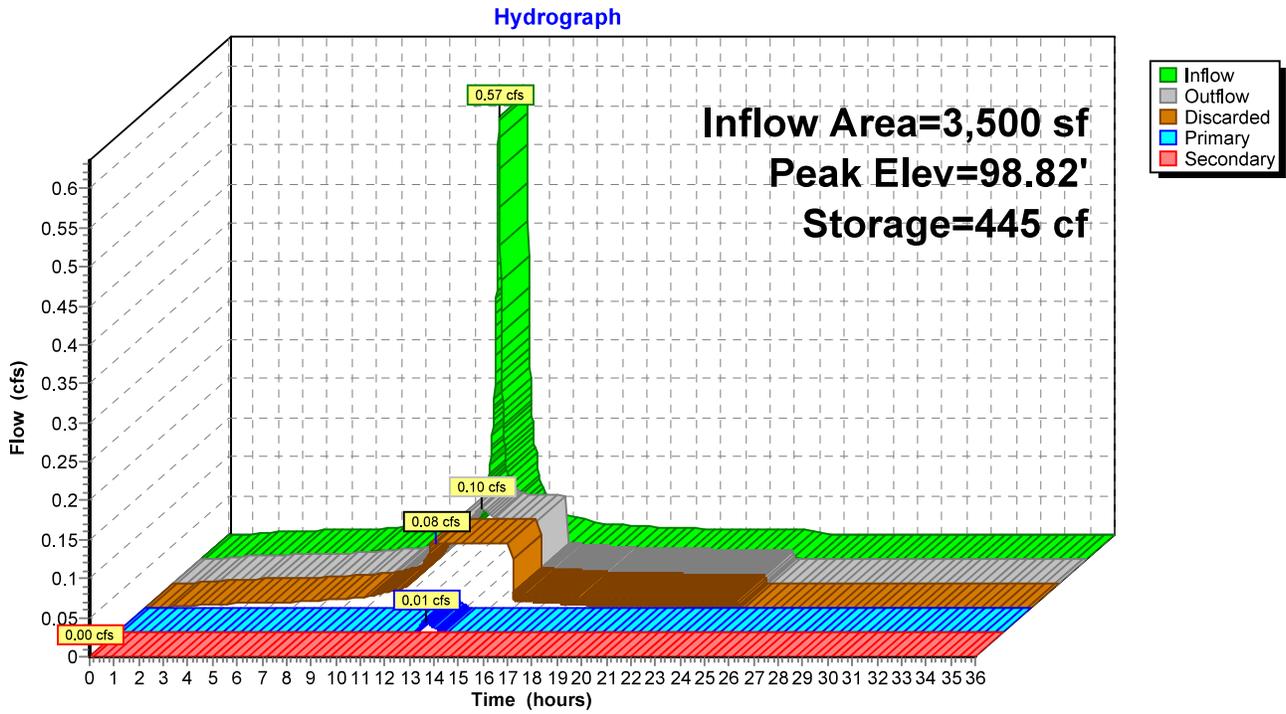
Device	Routing	Invert	Outlet Devices
#1	Discarded	98.50'	1.020 in/hr Exfiltration over Surface area
#2	Primary	98.75'	6.0" Round Culvert L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 98.75' / 98.40' S= 0.0350'/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Secondary	99.95'	20.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.08 cfs @ 11.80 hrs HW=98.52' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.01 cfs @ 12.55 hrs HW=98.82' TW=0.00' (Dynamic Tailwater)
 ↑2=Culvert (Inlet Controls 0.01 cfs @ 0.89 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=98.50' TW=0.00' (Dynamic Tailwater)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: Permeable Sidewalk



Summary for Pond P-1: Stormtech

Inflow Area = 34,320 sf, 72.93% Impervious, Inflow Depth = 2.20" for 25-Year event
 Inflow = 4.16 cfs @ 12.10 hrs, Volume= 6,296 cf
 Outflow = 0.31 cfs @ 12.18 hrs, Volume= 4,995 cf, Atten= 93%, Lag= 5.1 min
 Discarded = 0.06 cfs @ 12.18 hrs, Volume= 4,979 cf
 Primary = 0.25 cfs @ 12.18 hrs, Volume= 17 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 97.03' @ 12.18 hrs Surf.Area= 2,367 sf Storage= 4,425 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 522.9 min (1,305.2 - 782.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	92.00'	1,878 cf	44.25'W x 46.34'L x 3.50'H Field A 7,176 cf Overall - 2,481 cf Embedded = 4,696 cf x 40.0% Voids
#2A	92.50'	2,481 cf	ADS_StormTech SC-740 +Cap x 54 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 54 Chambers in 9 Rows
#3	92.50'	861 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		5,220 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.50	12	0	0
96.90	12	53	53
97.00	110	6	59
97.50	3,100	803	861

Device	Routing	Invert	Outlet Devices
#1	Primary	96.90'	2.0' long x 2.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	92.00'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.06 cfs @ 12.18 hrs HW=97.03' (Free Discharge)
 ↑2=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.24 cfs @ 12.18 hrs HW=97.03' TW=0.00' (Dynamic Tailwater)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 0.24 cfs @ 0.92 fps)

Pond P-1: Stormtech - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech@SC-740 with cap length)

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

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

6 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 44.34' Row Length +12.0" End Stone x 2 = 46.34' Base Length

9 Rows x 51.0" Wide + 6.0" Spacing x 8 + 12.0" Side Stone x 2 = 44.25' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

54 Chambers x 45.9 cf = 2,480.8 cf Chamber Storage

7,176.4 cf Field - 2,480.8 cf Chambers = 4,695.6 cf Stone x 40.0% Voids = 1,878.3 cf Stone Storage

Chamber Storage + Stone Storage = 4,359.0 cf = 0.100 af

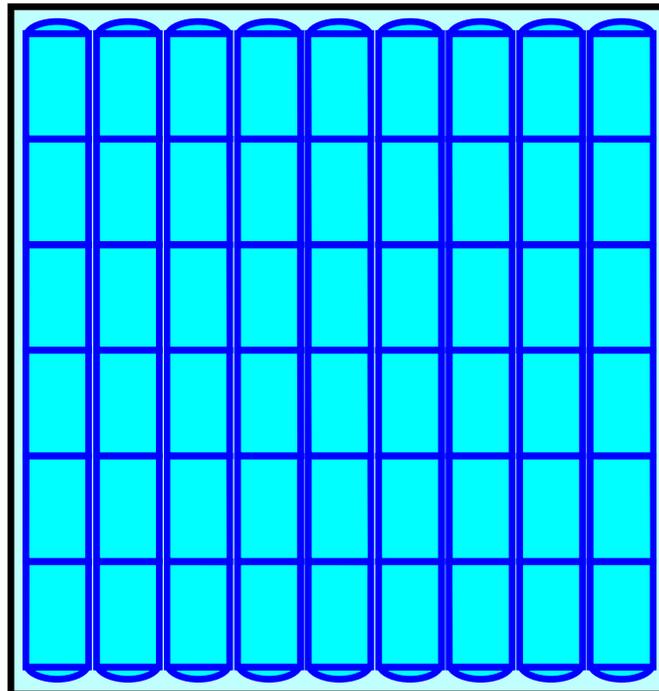
Overall Storage Efficiency = 60.7%

Overall System Size = 46.34' x 44.25' x 3.50'

54 Chambers

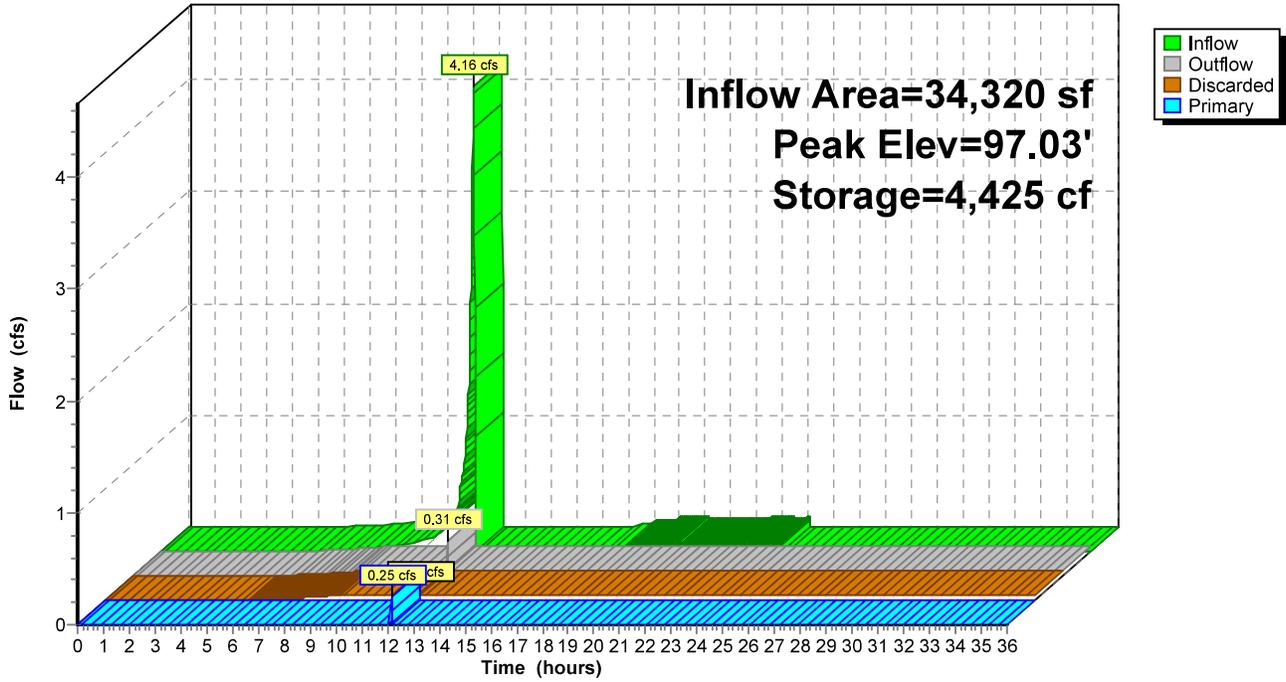
265.8 cy Field

173.9 cy Stone



Pond P-1: Stormtech

Hydrograph



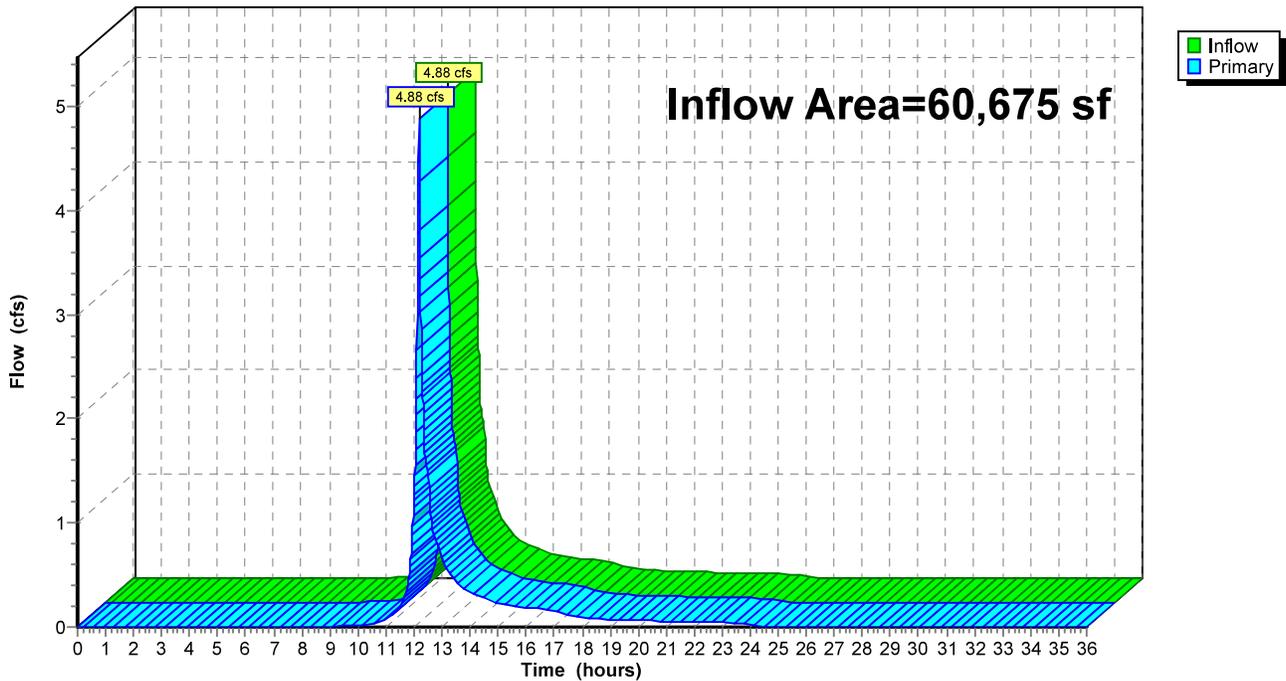
Summary for Link DP1: Front Entry

Inflow Area = 60,675 sf, 64.00% Impervious, Inflow Depth = 2.57" for 25-Year event
Inflow = 4.88 cfs @ 12.18 hrs, Volume= 13,001 cf
Primary = 4.88 cfs @ 12.18 hrs, Volume= 13,001 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP1: Front Entry

Hydrograph



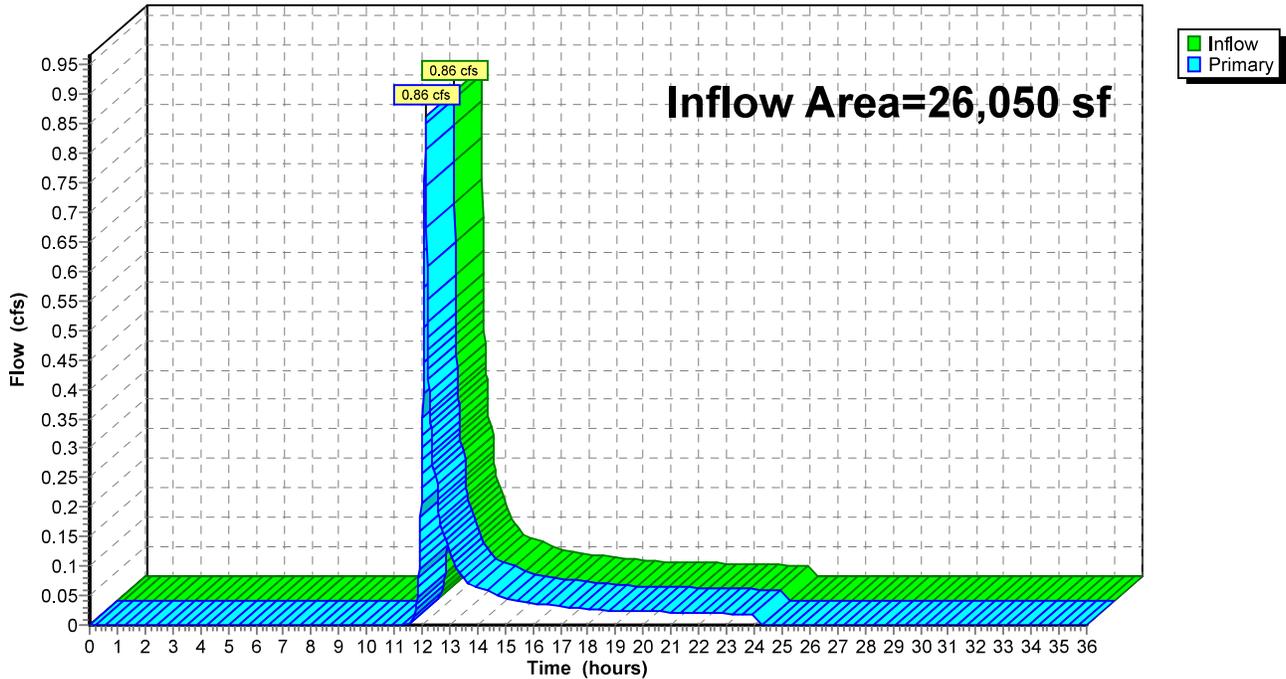
Summary for Link DP2: Back Patio

Inflow Area = 26,050 sf, 29.01% Impervious, Inflow Depth = 1.17" for 25-Year event
Inflow = 0.86 cfs @ 12.13 hrs, Volume= 2,545 cf
Primary = 0.86 cfs @ 12.13 hrs, Volume= 2,545 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP2: Back Patio

Hydrograph



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Front Entry Runoff Area=34,320 sf 72.93% Impervious Runoff Depth=6.06"
 Tc=5.0 min CN=82 Runoff=6.26 cfs 17,330 cf

Subcatchment11: Front Entry Runoff Area=26,355 sf 52.38% Impervious Runoff Depth=4.65"
 Tc=5.0 min CN=70 Runoff=3.85 cfs 10,202 cf

Subcatchment20: Back Patio Runoff Area=22,550 sf 18.00% Impervious Runoff Depth=2.38"
 Tc=5.0 min CN=50 Runoff=1.65 cfs 4,471 cf

Subcatchment21: Permeable Pavers Runoff Area=3,500 sf 100.00% Impervious Runoff Depth=7.97"
 Tc=5.0 min CN=98 Runoff=0.73 cfs 2,325 cf

Pond 1P: Diversion CB Peak Elev=97.19' Inflow=6.26 cfs 17,330 cf
 Primary=2.68 cfs 6,882 cf Secondary=5.05 cfs 10,449 cf Outflow=6.26 cfs 17,331 cf

Pond 2P: Permeable Sidewalk Peak Elev=98.92' Storage=585 cf Inflow=0.73 cfs 2,325 cf
 Discarded=0.08 cfs 2,116 cf Primary=0.08 cfs 210 cf Secondary=0.00 cfs 0 cf Outflow=0.16 cfs 2,326 cf

Pond P-1: Stormtech Peak Elev=97.18' Storage=4,540 cf Inflow=2.68 cfs 6,882 cf
 Discarded=0.08 cfs 5,210 cf Primary=0.78 cfs 331 cf Outflow=0.86 cfs 5,540 cf

Link DP1: Front Entry Inflow=9.63 cfs 20,981 cf
 Primary=9.63 cfs 20,981 cf

Link DP2: Back Patio Inflow=1.66 cfs 4,681 cf
 Primary=1.66 cfs 4,681 cf

Total Runoff Area = 86,725 sf Runoff Volume = 34,327 cf Average Runoff Depth = 4.75"
46.51% Pervious = 40,332 sf 53.49% Impervious = 46,393 sf

Summary for Subcatchment 10: Front Entry

Runoff = 6.26 cfs @ 12.12 hrs, Volume= 17,330 cf, Depth= 6.06"

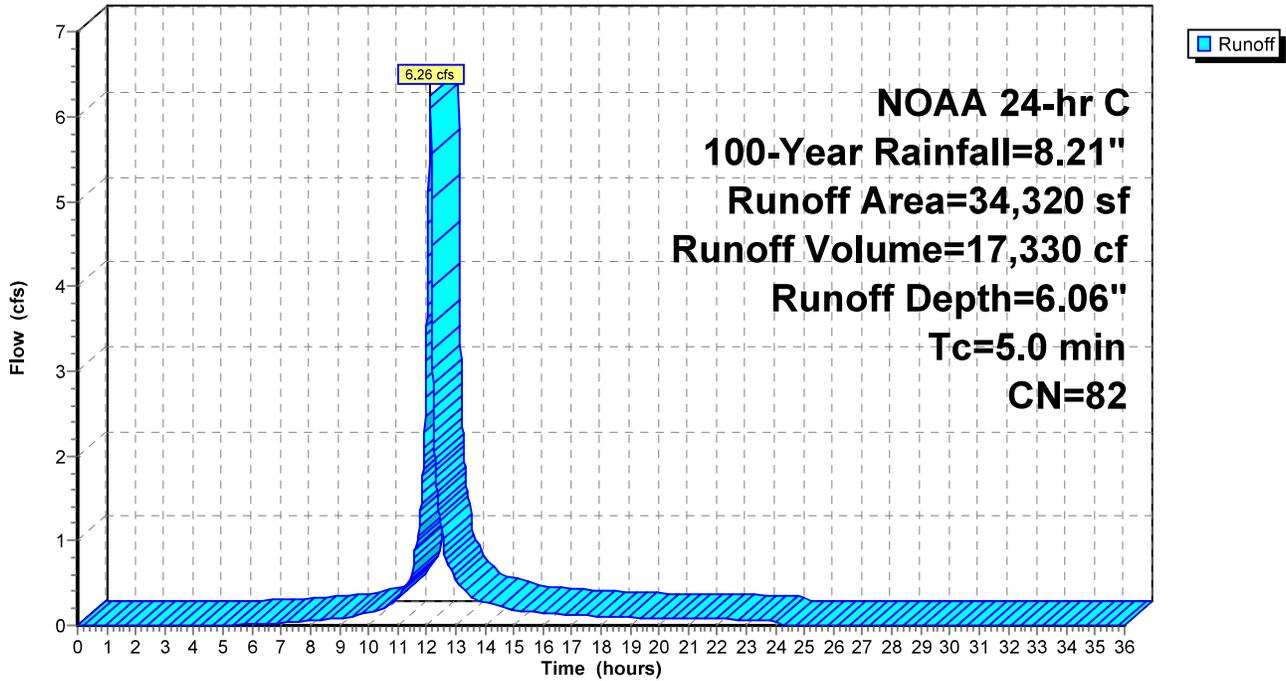
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.21"

Area (sf)	CN	Description
25,030	98	Paved parking, HSG A
9,290	39	>75% Grass cover, Good, HSG A
34,320	82	Weighted Average
9,290		27.07% Pervious Area
25,030		72.93% Impervious Area

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

Subcatchment 10: Front Entry

Hydrograph



Summary for Subcatchment 11: Front Entry

Runoff = 3.85 cfs @ 12.12 hrs, Volume= 10,202 cf, Depth= 4.65"

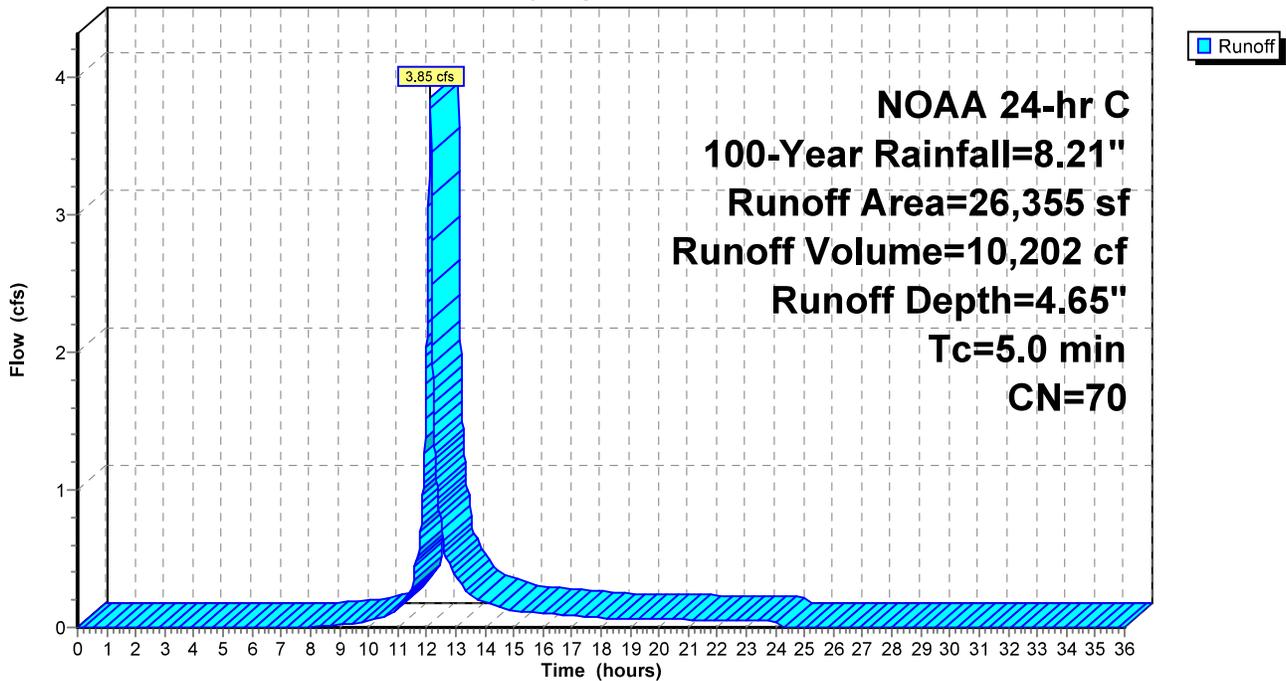
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.21"

Area (sf)	CN	Description
13,805	98	Paved parking, HSG A
12,550	39	>75% Grass cover, Good, HSG A
26,355	70	Weighted Average
12,550		47.62% Pervious Area
13,805		52.38% Impervious Area

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

Subcatchment 11: Front Entry

Hydrograph



Summary for Subcatchment 20: Back Patio

Runoff = 1.65 cfs @ 12.13 hrs, Volume= 4,471 cf, Depth= 2.38"

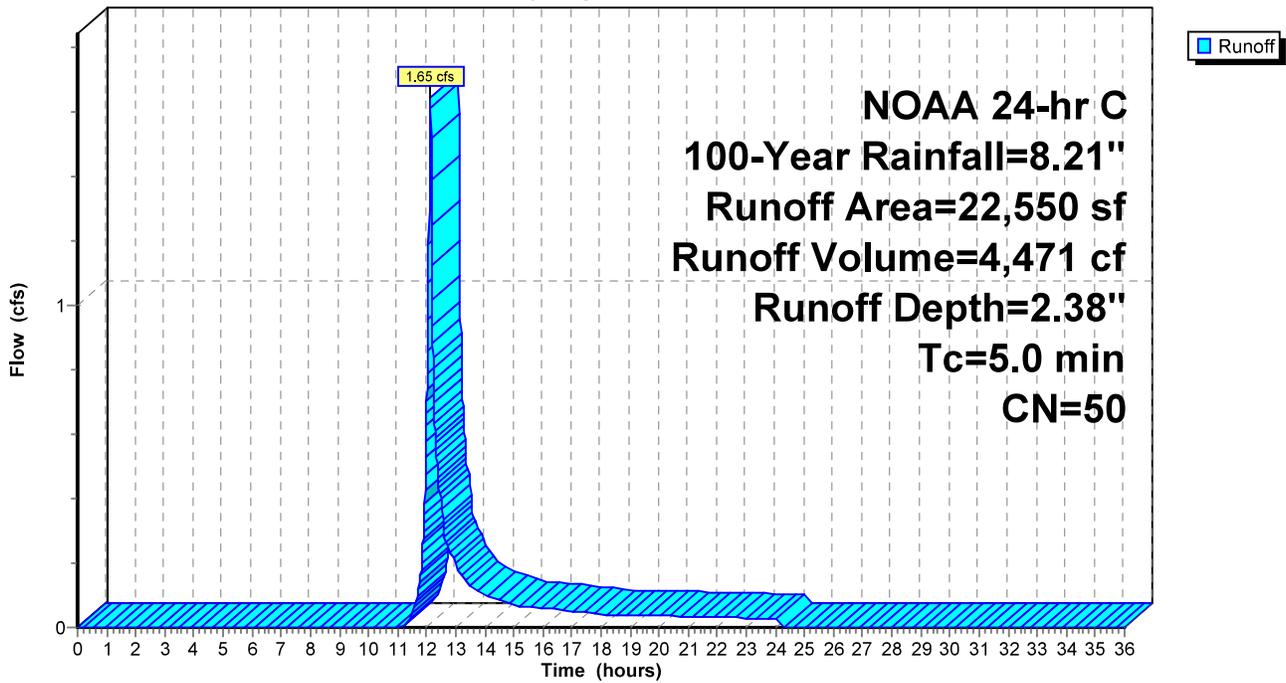
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.21"

Area (sf)	CN	Description
4,058	98	Paved parking, HSG A
18,492	39	>75% Grass cover, Good, HSG A
22,550	50	Weighted Average
18,492		82.00% Pervious Area
4,058		18.00% Impervious Area

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

Subcatchment 20: Back Patio

Hydrograph



Summary for Subcatchment 21: Permeable Pavers

Runoff = 0.73 cfs @ 12.12 hrs, Volume= 2,325 cf, Depth= 7.97"

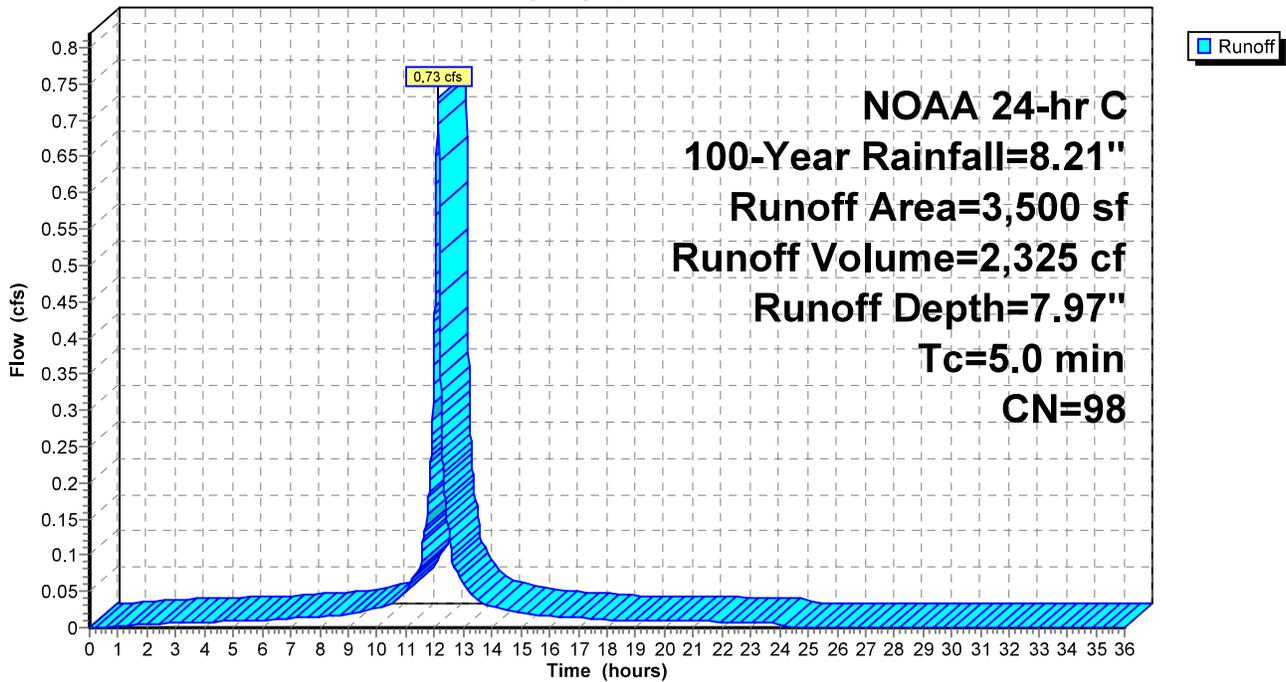
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-Year Rainfall=8.21"

Area (sf)	CN	Description
* 3,500	98	Permeable
3,500		100.00% Impervious Area

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

Subcatchment 21: Permeable Pavers

Hydrograph



Summary for Pond 1P: Diversion CB

Inflow Area = 34,320 sf, 72.93% Impervious, Inflow Depth = 6.06" for 100-Year event
 Inflow = 6.26 cfs @ 12.12 hrs, Volume= 17,330 cf
 Outflow = 6.26 cfs @ 12.12 hrs, Volume= 17,331 cf, Atten= 0%, Lag= 0.0 min
 Primary = 2.68 cfs @ 11.98 hrs, Volume= 6,882 cf
 Secondary = 5.05 cfs @ 12.15 hrs, Volume= 10,449 cf

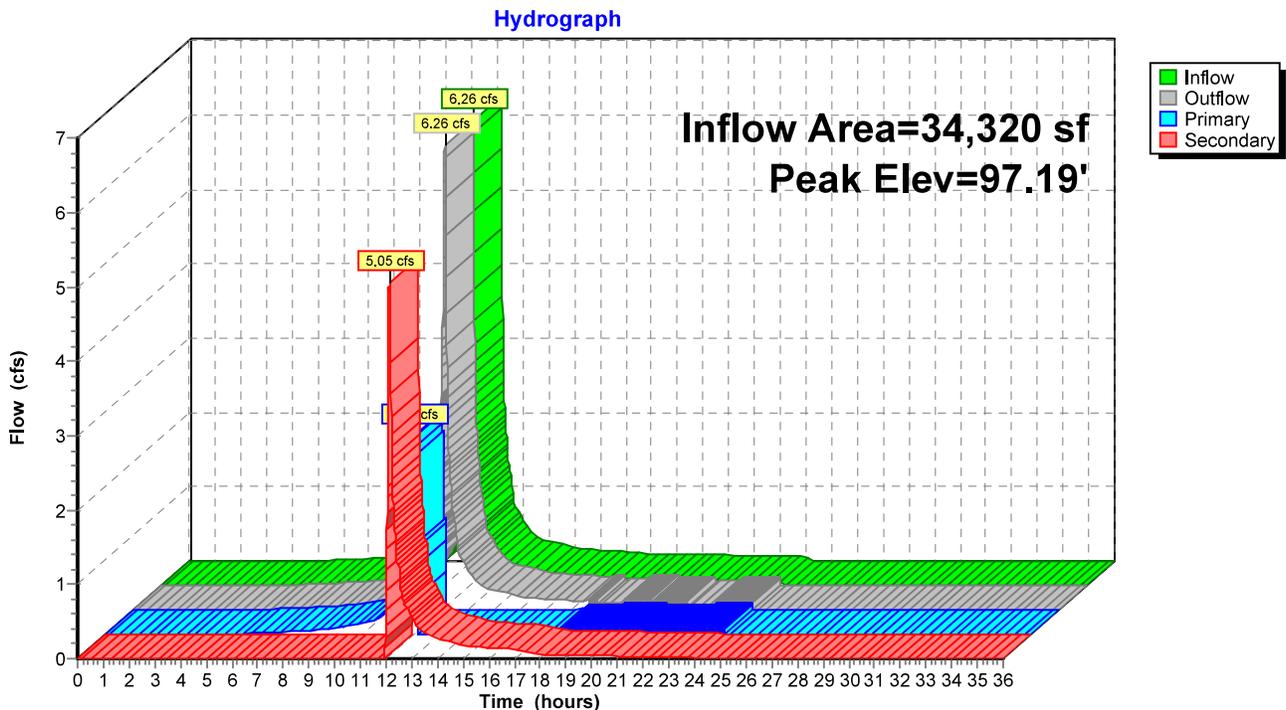
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 97.19' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	24.0" Round Culvert L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 92.60' / 92.50' S= 0.0100'/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	94.40'	10.0" Round Culvert L= 5.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 94.40' / 94.30' S= 0.0200'/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf

Primary OutFlow Max=0.00 cfs @ 11.98 hrs HW=94.76' TW=94.82' (Dynamic Tailwater)
 ↳1=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=5.05 cfs @ 12.15 hrs HW=97.19' TW=0.00' (Dynamic Tailwater)
 ↳2=Culvert (Inlet Controls 5.05 cfs @ 9.26 fps)

Pond 1P: Diversion CB



Summary for Pond 2P: Permeable Sidewalk

Inflow Area = 3,500 sf, 100.00% Impervious, Inflow Depth = 7.97" for 100-Year event
 Inflow = 0.73 cfs @ 12.12 hrs, Volume= 2,325 cf
 Outflow = 0.16 cfs @ 12.38 hrs, Volume= 2,326 cf, Atten= 78%, Lag= 15.6 min
 Discarded = 0.08 cfs @ 11.69 hrs, Volume= 2,116 cf
 Primary = 0.08 cfs @ 12.38 hrs, Volume= 210 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 98.92' @ 12.38 hrs Surf.Area= 3,500 sf Storage= 585 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 30.3 min (770.8 - 740.5)

Volume	Invert	Avail.Storage	Storage Description
#1	98.50'	1,750 cf	Permeable (Prismatic) Listed below (Recalc) 4,375 cf Overall x 40.0% Voids
#2	99.75'	875 cf	Surface (Prismatic) Listed below (Recalc) -Impervious
		2,625 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
98.50	3,500	0	0
99.75	3,500	4,375	4,375

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
99.75	3,500	0	0
100.00	3,500	875	875

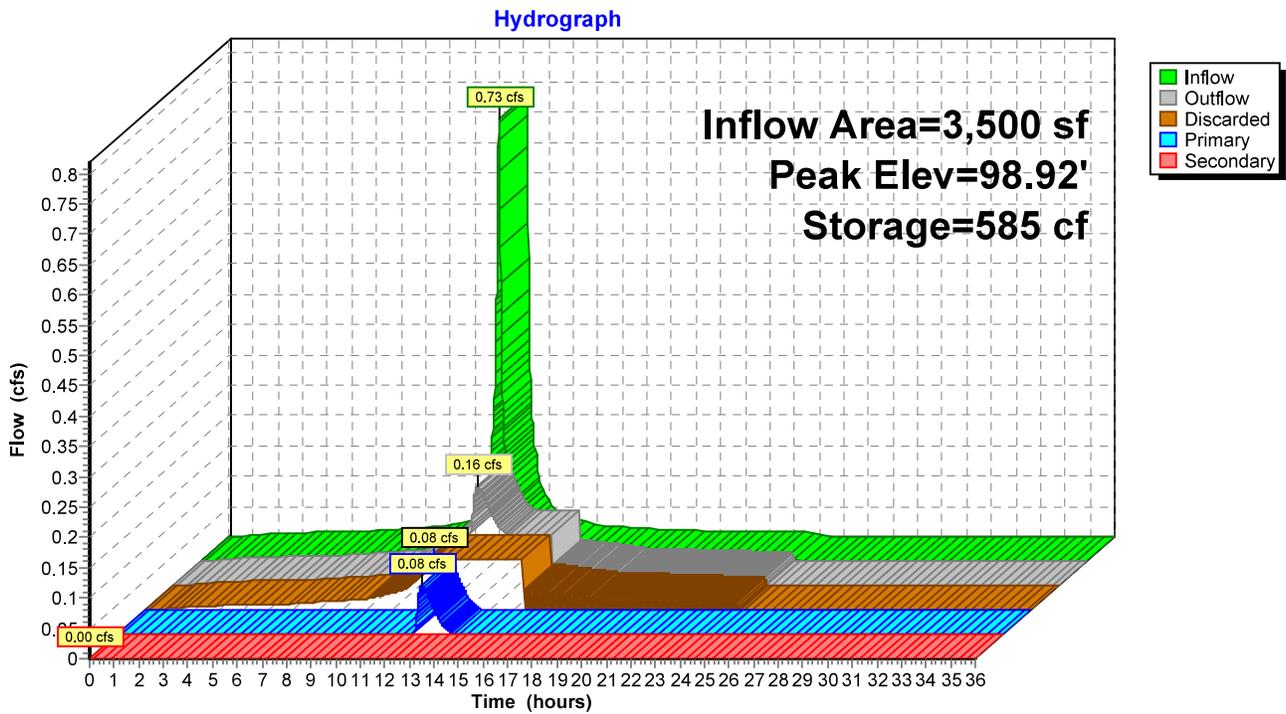
Device	Routing	Invert	Outlet Devices
#1	Discarded	98.50'	1.020 in/hr Exfiltration over Surface area
#2	Primary	98.75'	6.0" Round Culvert L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 98.75' / 98.40' S= 0.0350'/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Secondary	99.95'	20.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.08 cfs @ 11.69 hrs HW=98.52' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.08 cfs @ 12.38 hrs HW=98.92' TW=0.00' (Dynamic Tailwater)
 ↑2=Culvert (Inlet Controls 0.08 cfs @ 1.40 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=98.50' TW=0.00' (Dynamic Tailwater)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: Permeable Sidewalk



Summary for Pond P-1: Stormtech

Inflow Area = 34,320 sf, 72.93% Impervious, Inflow Depth = 2.41" for 100-Year event
 Inflow = 2.68 cfs @ 11.98 hrs, Volume= 6,882 cf
 Outflow = 0.86 cfs @ 12.14 hrs, Volume= 5,540 cf, Atten= 68%, Lag= 9.7 min
 Discarded = 0.08 cfs @ 12.14 hrs, Volume= 5,210 cf
 Primary = 0.78 cfs @ 12.14 hrs, Volume= 331 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 97.18' @ 12.14 hrs Surf.Area= 3,265 sf Storage= 4,540 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 479.8 min (1,236.3 - 756.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	92.00'	1,878 cf	44.25'W x 46.34'L x 3.50'H Field A 7,176 cf Overall - 2,481 cf Embedded = 4,696 cf x 40.0% Voids
#2A	92.50'	2,481 cf	ADS_StormTech SC-740 +Cap x 54 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 54 Chambers in 9 Rows
#3	92.50'	861 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		5,220 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.50	12	0	0
96.90	12	53	53
97.00	110	6	59
97.50	3,100	803	861

Device	Routing	Invert	Outlet Devices
#1	Primary	96.90'	2.0' long x 2.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	92.00'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.08 cfs @ 12.14 hrs HW=97.18' (Free Discharge)
 ↳ 2=Exfiltration (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.78 cfs @ 12.14 hrs HW=97.18' TW=0.00' (Dynamic Tailwater)
 ↳ 1=Broad-Crested Rectangular Weir (Weir Controls 0.78 cfs @ 1.37 fps)

Pond P-1: Stormtech - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)

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

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

6 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 44.34' Row Length +12.0" End Stone x 2 = 46.34' Base Length

9 Rows x 51.0" Wide + 6.0" Spacing x 8 + 12.0" Side Stone x 2 = 44.25' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

54 Chambers x 45.9 cf = 2,480.8 cf Chamber Storage

7,176.4 cf Field - 2,480.8 cf Chambers = 4,695.6 cf Stone x 40.0% Voids = 1,878.3 cf Stone Storage

Chamber Storage + Stone Storage = 4,359.0 cf = 0.100 af

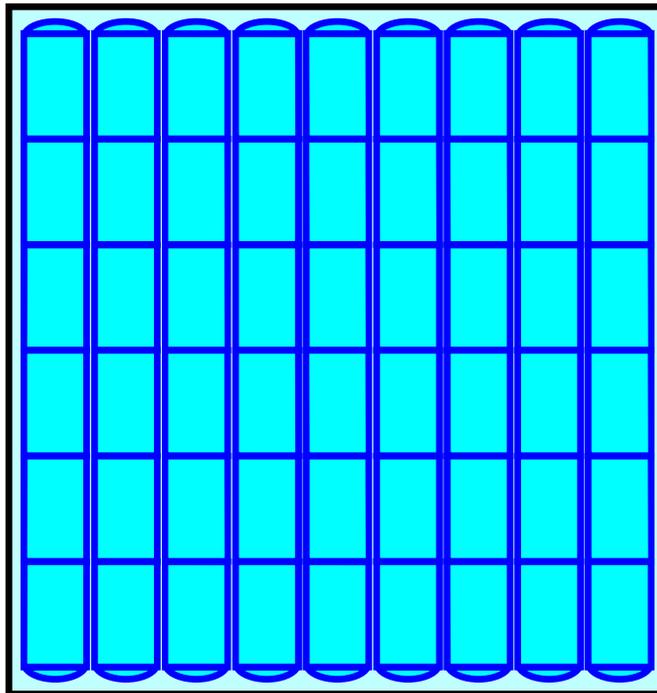
Overall Storage Efficiency = 60.7%

Overall System Size = 46.34' x 44.25' x 3.50'

54 Chambers

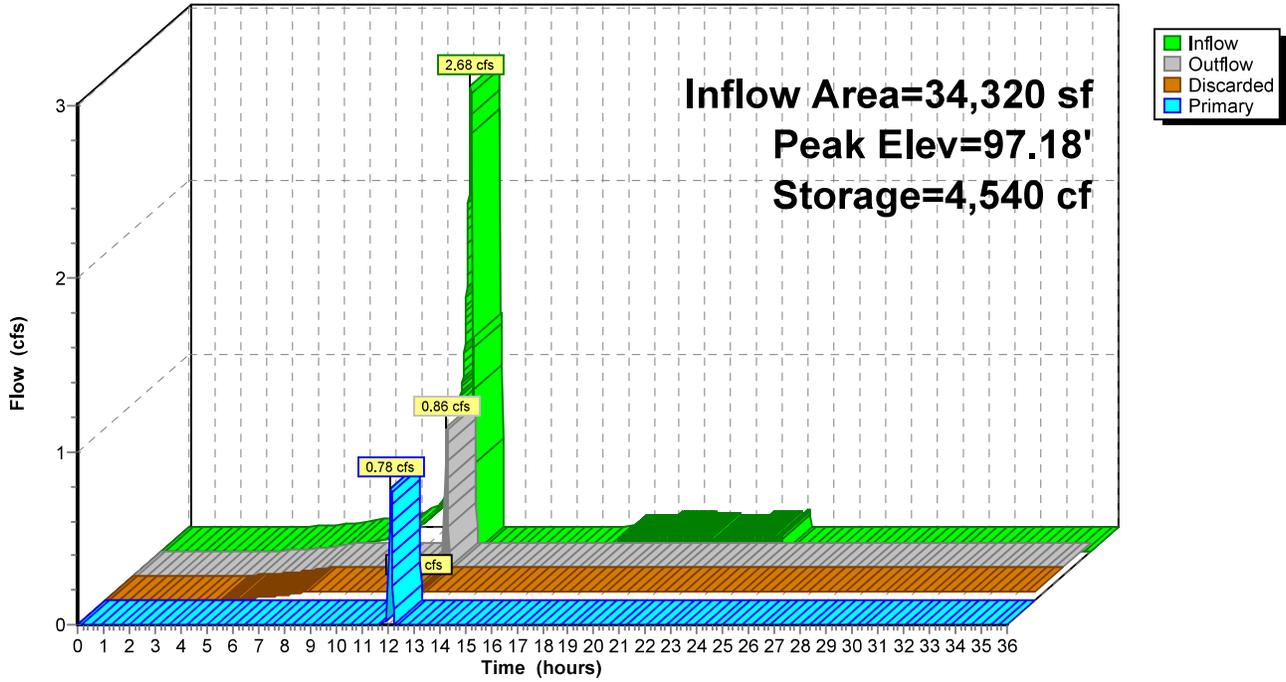
265.8 cy Field

173.9 cy Stone



Pond P-1: Stormtech

Hydrograph



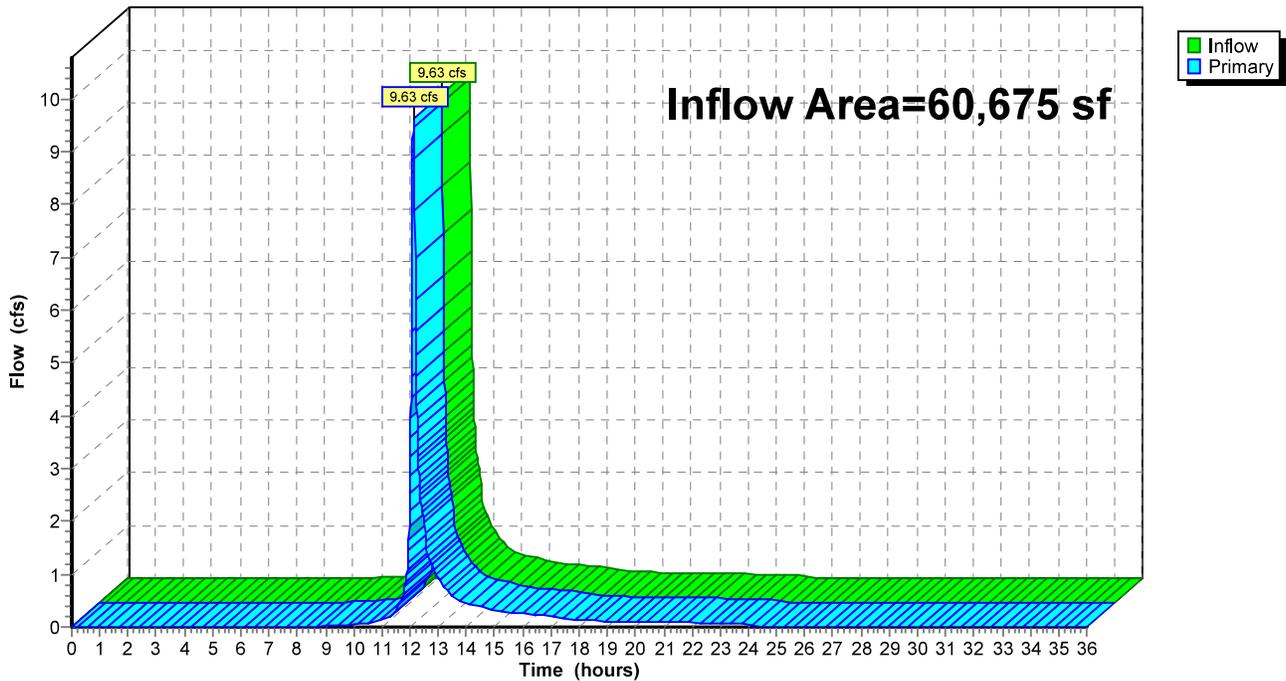
Summary for Link DP1: Front Entry

Inflow Area = 60,675 sf, 64.00% Impervious, Inflow Depth = 4.15" for 100-Year event
Inflow = 9.63 cfs @ 12.13 hrs, Volume= 20,981 cf
Primary = 9.63 cfs @ 12.13 hrs, Volume= 20,981 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP1: Front Entry

Hydrograph



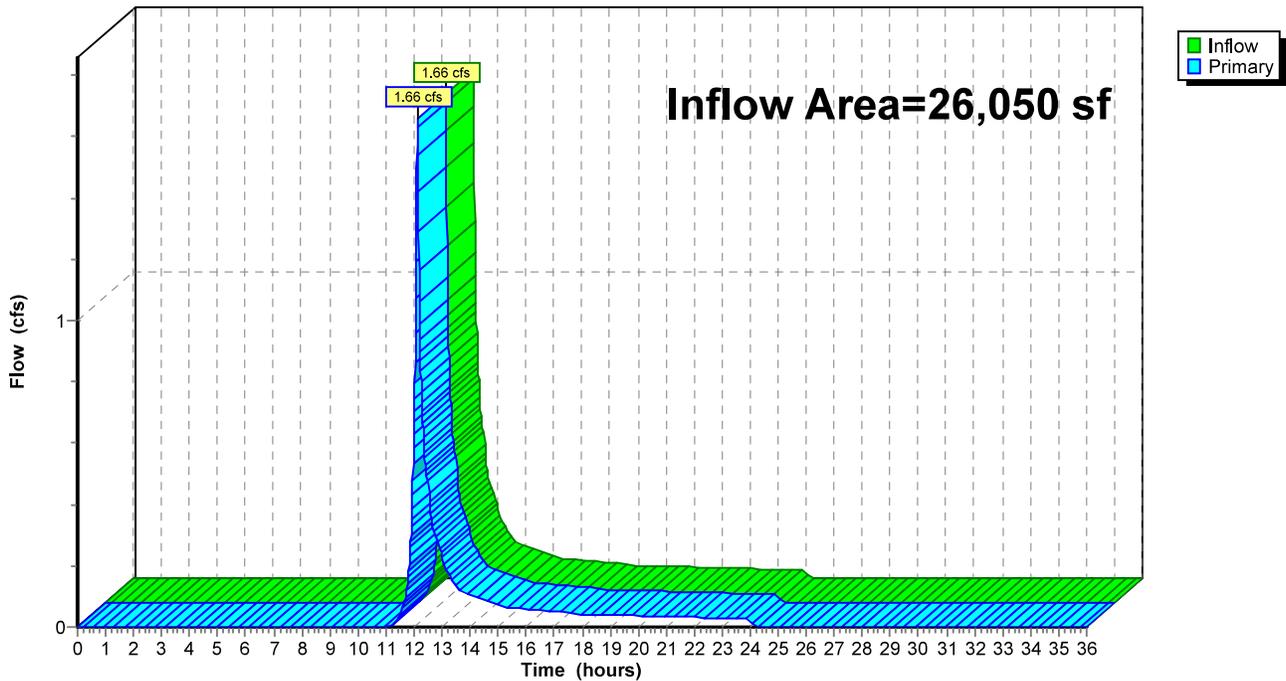
Summary for Link DP2: Back Patio

Inflow Area = 26,050 sf, 29.01% Impervious, Inflow Depth = 2.16" for 100-Year event
Inflow = 1.66 cfs @ 12.13 hrs, Volume= 4,681 cf
Primary = 1.66 cfs @ 12.13 hrs, Volume= 4,681 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link DP2: Back Patio

Hydrograph





Long-Term Pollution Prevention Plan

This Long-Term Pollution Prevention Plan has been developed to establish site management practices that improve the quality of stormwater discharges from the Project.

Description of Pollutant Sources

The project contains parking and drive areas that will experience high volume traffic that will potentially be a pollutant source.

Pollutant Control Approach

Maintenance of Pavement Systems

Standard Asphalt Pavement

Regular maintenance of pavement surfaces will prevent pollutants such as oil and grease, trash, and sediments from entering the stormwater management system. The following practices should be performed:

- Sweep or vacuum asphalt pavement areas [semi-annually, annually, monthly, etc] with a commercial cleaning unit and dispose of removed material.
- Check loading docks and dumpster areas frequently for spillage and/or pavement staining and clean as necessary
- Routinely pick up and remove litter from the parking areas, islands, and perimeter landscaping.

Permeable Pavers

The primary maintenance requirement for permeable pavers is to clean the surface drainage voids. Fine debris and dirt accumulate in the drainage openings and reduce the pavement's flow capacity. Even though some irreplaceable loss in permeability should be expected over the paver's lifetime, one can increase the longevity of the system by following the maintenance schedule for vacuum sweeping and high-



pressure washing, restricting the area's use by heavy vehicles, limiting the use of de-icing chemicals and sand, and implementing a stringent sediment control plan.

Preventing Clogging of Permeable Paver Surface Areas

- Patio areas and/or other areas with permeable pavers shall be cleaned annually with vacuums or washed with high pressure washers.
- Do not allow construction staging, soil/mulch storage, etc. on unprotected pavement surface.
- Maintain vegetated areas adjacent to areas with permeable pavers to prevent washout of soil onto surface.
- Do not apply any type of sealant to permeable pavers.

Inspecting the System

- Inspect areas paved with permeable pavers monthly for the first three months after construction to ensure proper functioning and correct any areas that have settled or experienced washouts.
- Inspect areas paved with permeable pavers annually after initial three month period. Annual inspections should take place after large storms, when puddles will make any clogging obvious.

Maintenance of Vegetated Areas

Proper maintenance of vegetated areas can prevent the pollution of stormwater runoff by controlling the source of pollutants such as suspended sediments, excess nutrients, and chemicals from landscape care products. Practices that should be followed under the regular maintenance of the vegetated landscape include:

- Inspect planted areas on a semi-annual basis and remove any litter.
- Maintain planted areas adjacent to pavement to prevent soil washout.
- Immediately clean any soil deposited on pavement.
- Re-seed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming.
- Plant alternative mixture of grass species in the event of unsuccessful establishment.
- The grass vegetation should be cut to a height between three and four inches.
- Pesticide/Herbicide Usage – No pesticides are to be used unless a single spot treatment is required for a specific control application.
- Fertilizer usage should be avoided. If deemed necessary, slow release fertilizer should be used. Fertilizer may be used to begin the establishment of vegetation in bare or damaged areas, but should not be applied on a regular basis unless necessary.
- Pet waste provision if applicable.



Management of Snow and Ice

Storage and Disposal

Snow shall be stockpiled on standard pavement surfaces so sand and salt may be swept in the spring or removed as snow melts and drains through the stormwater management system. Recommended locations for snow storage are shown on the attached Snow Storage Plan. Key practices for the safe storage and disposal of snow include:

- Under no circumstances shall snow be disposed or stored in wetland resource areas.
- Under no circumstances shall snow be disposed or stored in stormwater basins, ponds, rain gardens, swales, channels, or trenches.
- Do not stockpile snow on permeable pavement surfaces. Sand and grit in snow will clog pavement.
- Plow parking areas paved with permeable asphalt pavement carefully. Plow blades should be set approximately 1" higher than usual to avoid scarring the pavement and loosening material that could potentially clog surface pores.
- Do not apply abrasives such as sand or grit on or adjacent to permeable asphalt pavement.
- Monitor application rates of deicing materials on permeable pavement areas and reduce application rate accordingly. Permeable pavements tend to require less deicer per unit area because the water is not required to remain liquid over the entire parking surface area before discharge.
- Do not apply abrasives such as sand or grit on or adjacent to permeable pavers.
- Avoid plowing of areas with permeable pavers.

Salt and Deicing Chemicals

The amount of salt and deicing chemicals to be used on the site shall be reduced to the minimum amount needed to provide safe pedestrian and vehicle travel. The following practices should be followed to control the amount of salt and deicing materials that come into contact with stormwater runoff:

- Devices used for spreading salt and deicing chemicals should be capable of varying the rate of application based on the site specific conditions.
- Specific environmentally sensitive areas [engineer to identify] should be designated as no and/or reduced salt areas.
- Alternate materials [list alternate materials] should be used in place of standard salt and deicing chemicals in specific environmentally sensitive areas [engineer to identify].
- Sand and salt should be stockpiled under covered storage facilities that prevent precipitation and adjacent runoff from coming in contact with the deicing materials



Spill Prevention and Response Plan

Spill prevention equipment and training will be provided by the property management company.

Initial Notification

In the event of a spill the facility and/or construction manager or supervisor will be notified immediately.

FACILITY MANAGER

Name: _____ Home Phone: _____
Phone: _____ E-mail: _____

CONSTRUCTION MANAGER

Name: _____ Home Phone: _____
Phone: _____ E-mail: _____

The supervisor will first contact the Fire Department and then notify the Police Department, the Public Health Commission and the Conservation Commission. The Fire Department is ultimately responsible for matters of public health and safety and should be notified immediately.

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (DEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the main construction/facility office and readily accessible to all employees. A hazardous waste spill report shall be completed as necessary using the attached form.



Emergency Notification Phone Numbers

1. FACILITY MANAGER

Name: _____ Home Phone: _____

Phone: _____ E-mail: _____

ALTERENATE

Name: _____ Home Phone: _____

Phone: _____ E-mail: _____

2. FIRE DEPARTMENT

Emergency: 911

Business: (781) 270-1925

POLICE DEPARTMENT

Emergency: 911

Business: _____

3. CLEANUP CONTRACTOR:

Address: _____

Phone: _____

4. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

Emergency: _____

Northeast Region – Woburn Office: _____

5. NATIONAL RESPONSE CENTER

Phone: (800) 424-8802

ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY

Emergency: _____

Business: _____

6. CONSERVATION COMMISSION

Contact: _____

Phone: _____

BOARD OF HEALTH

Contact: _____

Phone: _____



Hazardous Waste / Oil Spill Report

Date _____ Time _____ AM / PM

Exact location (Transformer #) _____

Type of equipment _____ Make _____ Size _____

S / N _____ Weather Conditions _____

On or near Water Yes If Yes, name of body of Water

No

Type of chemical/oil spilled _____

Amount of chemical/oil spilled _____

Cause of Spill _____

Measures taken to contain or clean up spill _____

Amount of chemical/oil recovered _____ Method _____

Material collected as a result of cleanup:

_____ Drums containing _____

_____ Drums containing _____

_____ Drums containing _____

Location and method of debris disposal

Name and address of any person, firm, or corporation suffering damages:

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring:

Spill reported to General Office by _____ Time _____ AM / PM

Spill reported to DEP / National Response Center by _____

DEP Date _____ Time _____ AM / PM Inspector _____

NRC Date _____ Time _____ AM / PM Inspector _____

Additional comments: _____



Assessment - Initial Containment

The supervisor or manager will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. A list of recommended spill equipment to be kept on site is included on the following page.

Fire / Police Department	911
Municipality Health Department	_____
Municipality Conservation Commission:	_____



Emergency Response Equipment

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

Supplies		Recommended Suppliers
SORBENT PILLOWS/"PIGS"	2	http://www.newpig.com
SORBENT BOOM/SOCK	25 FEET	Item # KIT276 — mobile container with two pigs,
SORBENT PADS	50	26 feet of sock, 50 pads, and five pounds of
LITE-DRI® ABSORBENT	5	absorbent (or equivalent)
POUNDS		http://www.forestry-suppliers.com
SHOVEL	1	Item # 43210 — Manhole cover pick (or
PRY BAR	1	equivalent)
GOGGLES	1 PAIR	Item # 33934 — Shovel (or equivalent)
GLOVES – HEAVY	1 PAIR	Item # 90926 — Gloves (or equivalent)
		<i>Item # 23334 — Goggles (or equivalent)</i>



Stormwater Operation and Maintenance Plan

Project Information

Site

140 Kendrick Street
Needham MA

Owner

Boston Properties
101 Federal Street
Boston, MA 02110

Site Supervisor

Name: __TBD_____

Telephone: _____

Cell phone: _____

Email: _____



Description of Stormwater Maintenance Measures

The following Operation and Maintenance (O&M) program is proposed to ensure the continued effectiveness of the stormwater management system. Attached to this plan are a Stormwater Best Management Practices Checklist and Maintenance Figure for use during the long term operation and maintenance of the stormwater management system.

Catch Basins

- All catch basins shall be inspected and cleaned a minimum of at least once per year.
- Sediment (if more than six inches deep) and/or floatable pollutants shall be pumped from the basin and disposed of at an approved offsite facility in accordance with all applicable regulations.
- Any structural damage or other indication of malfunction will be reported to the site manager and repaired as necessary
- During colder periods, the catch basin grates must be kept free of snow and ice.
- During warmer periods, the catch basin grates must be kept free of leaves, litter, sand, and debris.

Subsurface Infiltration System

- The subsurface infiltration systems will be inspected at least once each year by removing the manhole/access port covers and determining the thickness of sediment that has accumulated in the sediment removal row.
- If sediment is more than six inches deep, it must be suspended via flushing with clean water and removed using a vactor truck.
- Manufacturer's specifications and instructions for cleaning the sediment removal row is provided as an attachment to this section.
- Emergency overflow pipes will be examined at least once each year and verified that no blockage has occurred.
- System will be observed after rainfalls to see if it is properly draining.

Inspection & Maintenance

Step 1) Inspect Isolator Row for Sediment

A. Inspection ports (if present)

A.1. Remove/open lid on Nyloplast inline drain

A.2. Remove and clean Flexstorm filter (if installed)

A.3. Using a flashlight and stadia rod, measure depth of sediment and record on maintenance log



- A.4. Lower a camera into Isolator Row for visual inspection of sediment levels (optional)
- A.5. If sediment is at, or above, 3" proceed to Step 2. If not, proceed to Step 3

Step 2) Clean out Isolator Row using the JetVac process

- A. A fixed culvert cleaning nozzle with rear facing spread of 45" (1.1m) or more is preferred.
- B. Apply multiple passes of JetVac until backflush water is clean
- C. Vacuum structure sump as required

Permeable Pavers

The primary maintenance requirement for permeable pavers is to clean the surface drainage voids. Fine debris and dirt accumulate in the drainage openings and reduce the pavement's flow capacity. Even though some irreplaceable loss in permeability should be expected over the paver's lifetime, one can increase the longevity of the system by following the maintenance schedule for vacuum sweeping and high-pressure washing, restricting the area's use by heavy vehicles, limiting the use of de-icing chemicals and sand, and implementing a stringent sediment control plan.

Preventing Clogging of Permeable Paver Surface Areas

- Patio areas and/or other areas with permeable pavers shall be cleaned annually with vacuums or washed with high pressure washers.
- Do not allow construction staging, soil/mulch storage, etc. on unprotected pavement surface.
- Maintain vegetated areas adjacent to areas with permeable pavers to prevent washout of soil onto surface.
- Do not apply any type of sealant to permeable pavers.

Inspecting the System

- Inspect areas paved with permeable pavers monthly for the first three months after construction to ensure proper functioning and correct any areas that have settled or experienced washouts.
- Inspect areas paved with permeable pavers annually after initial three month period. Annual inspections should take place after large storms, when puddles will make any clogging obvious.

Stormwater Outfalls

- Inspect outfall locations monthly for the first three months after construction to ensure proper functioning and correct any areas that have settled or experienced washouts.
- Inspect outfalls annually after initial three month period.



- Annual inspections should be supplemented after large storms, when washouts may occur.
- Maintain vegetation around outfalls to prevent blockages at the outfall.
- Maintain rip rap pad below each outfall and replace any washouts.
- Remove and dispose of any trash or debris at the outfall.

Roof Drain Leaders

- Perform routine roof inspections quarterly.
- Keep roofs clean and free of debris.
- Keep roof drainage systems clear.
- Keep roof access limited to authorized personnel.
- Clean inlets draining to the subsurface bed twice per year as necessary.



Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

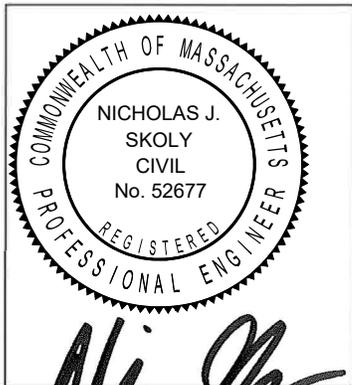
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Signature and Date

9/24/20

Checklist

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

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

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

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
 - Credit 1
 - Credit 2
 - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): Permeable Paving, Subsurface Infiltration

Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

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

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does **not** cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
- Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
 - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

Attachment F Project Plans

› Bound Separately