NOTICE OF PUBLIC HEARING
SUDBURY CONSERVATION COMMISSION

The Sudbury Conservation Commission will hold a public hearing to review the Notice of Intent filing for renovations to the existing vehicle service building, construction of a parking lot, and associated stormwater management system within the 100-foot Buffer Zone pursuant to the state Act and local Bylaw, at 105 Boston Post Road, Sudbury MA. John Welch, Herb Chambers of Sudbury, Inc., applicant. The hearing will be held on Mon., April 5, 2021 at 6:45 pm, via remote participation.

Please see the Conservation Commission web page for further information.
https://sudbury.ma.us/conservationcommission/meeting/conservation-commission-meeting-monday-april-5-2021-2/

SUDBURY CONSERVATION COMMISSION
March 22, 2021

Notice of Intent

105 Boston Post Road
Sudbury, MA

March 22, 2021

Prepared for:
Herb Chambers of Sudbury, Inc.
259 McGrath Highway
Somerville, MA 02143

Prepared by:
Crocker Design Group, LLC
2 Sharp Street Unit B
Hingham, MA 02043
781-919-0808

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5. **ORAD DEP FILE NO. 301-1320**
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   RDA, filed 11/6/2020

6. Additional Information

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Section 1

MA DEP Forms

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

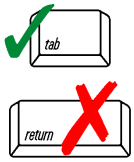
Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Sudbury
City/Town

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



Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

105 Boston Post Road — a. Street Address
Sudbury — b. City/Town
01776 — c. Zip Code

Latitude and Longitude:
42°21'45" — d. Latitude
71°23'32" — e. Longitude

K11 — f. Assessors Map/Plat Number
0017 — g. Parcel /Lot Number

2. Applicant:

John — a. First Name
Welch — b. Last Name
Herb Chambers of Sudbury, Inc. — c. Organization
259 McGrath Highway — d. Street Address
Somerville — e. City/Town
MA — f. State
01243 — g. Zip Code
617-666-8333 — h. Phone Number
i. Fax Number
jwelch@herbchambers.com — j. Email Address

3. Property owner (required if different from applicant): ☐ Check if more than one owner

John — a. First Name
Welch — b. Last Name
Herb Chambers 83 Boston Post Road, LLC - C/O Herb Chambers Companies — c. Organization
259 McGrath HWY — d. Street Address
Somerville — e. City/Town
MA — f. State
01243 — g. Zip Code
617-666-8333 — h. Phone Number
i. Fax Number
jwelch@herbchambers.com — j. Email address

4. Representative (if any):

Gabe — a. First Name
Crocker — b. Last Name
Crocker Design Group, LLC — c. Company
2 Sharp Street, Unit B — d. Street Address
Hingham — e. City/Town
MA — f. State
02043 — g. Zip Code
781-919-0808 — h. Phone Number
i. Fax Number
gabecrocker@crockerdesigngroup.com — j. Email address

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

$1,500.00 — a. Total Fee Paid
$737.50 — b. State Fee Paid
$762.50 — c. City/Town Fee Paid

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:

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Sudbury
City/Town

A. General Information (continued)

6. General Project Description:

See Narrative

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☒ Commercial/Industrial
4. ☐ Dock/Pier
5. ☐ Utilities
6. ☐ Coastal engineering Structure
7. ☐ Agriculture (e.g., cranberries, forestry)
8. ☐ Transportation
9. ☐ Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration 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. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

Southern Middlesex	
a. County	b. Certificate # (if registered land)
74344 / 9525	119 / 397
c. Book	d. Page Number

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

1. ☒ Buffer Zone Only – 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).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

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:

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Sudbury
City/Town

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

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Bank	1. linear feet	2. linear feet
b. ☐ Bordering Vegetated Wetland	1. square feet	2. square feet
c. ☐ Land Under Waterbodies and Waterways	1. square feet 3. cubic yards dredged	2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☐ Bordering Land Subject to Flooding	1. square feet 3. cubic feet of flood storage lost	2. square feet 4. cubic feet replaced
e. ☐ 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 available) - **specify coastal or inland**

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:

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)

Note: for coastal riverfront areas, please complete **Section B.2.f**. above.

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 Number

Document Transaction Number

Sudbury
City/Town

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

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. ☐ Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. ☐ Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. ☐ Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune nourishment

	Size of Proposed Alteration	Proposed Replacement (if any)
f. ☐ Coastal Banks	1. linear feet	
g. ☐ Rocky Intertidal Shores	1. square feet	
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rehab., creation
i. ☐ Land Under Salt Ponds	1. square feet 2. cubic yards dredged	
j. ☐ Land Containing Shellfish	1. square feet	
k. ☐ 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. ☐ Land Subject to Coastal Storm Flowage	1. square feet	

4. ☐ Restoration/Enhancement
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 enter the additional amount here.

a. square feet of BVW

b. square feet of Salt Marsh

5. ☐ Project Involves Stream Crossings

a. number of new stream crossings

b. number of replacement stream crossings

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

Provided by MassDEP:

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C. Other Applicable Standards and Requirements

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

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 and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

   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

   August 1, 2017
   b. Date of map

   If *yes*, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

   c. Submit Supplemental Information for Endangered Species Review*

   1. ☒ Percentage/acreage of property to be altered:

      (a) within wetland Resource Area — 0% (percentage/acreage)

      (b) outside Resource Area — 100% (percentage/acreage)

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

2. ☒ Project plans for entire project site, including wetland resource areas and areas outside of wetlands 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

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* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see https://www.mass.gov/ma-endangered-species-act-mesa-regulatory-review).
Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.

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:

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Sudbury
City/Town

C. Other Applicable Standards and Requirements (cont'd)

(c) ☒ MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review).
Make check payable to "Commonwealth of Massachusetts - NHESP" 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

(f) 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, https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing. a. NHESP Tracking # 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.

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

a. ☒ Not applicable – project is in inland resource area only b. ☐ Yes ☐ No

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

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

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project 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.

c. ☐ Is this an aquaculture project? d. ☐ Yes ☒ No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).

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 Number

Document Transaction Number

Sudbury
City/Town

C. Other Applicable Standards and Requirements (cont'd)

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

4. 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 MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

   b. ACEC

5. 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

6. 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

7. 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. Check why the project is exempt:

      1. ☐ Single-family house

      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

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

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.

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. (Electronic filers may omit this item.)

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.

Massachusetts Department of Environmental Protection
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WPA Form 3 – Notice of Intent

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

Provided by MassDEP:

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Sudbury
City/Town

D. Additional Information (cont'd)

3. ☒ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☒ List the titles and dates for all plans and other materials submitted with this NOI.

Proposed Site Development Plans - Parking Area Extension
a. Plan Title

Crocker Design Group, LLC
b. Prepared By

Gabe Crocker
c. Signed and Stamped by

3/22/2021
d. Final Revision Date

Varies
e. Scale

f. Additional Plan or Document Title

g. Date

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.

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:

1201
2. Municipal Check Number

3/18/2021
3. Check date

1200
4. State Check Number

3/18/2021
5. Check date

Gabriel
6. Payor name on check: First Name

Crocker
7. Payor name on check: Last Name

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 Number

Document Transaction Number

Sudbury
City/Town

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.

1. Signature of Applicant — 2. Date 1/25/2021

3. Signature of Property Owner (if different) — 4. Date

5. Signature of Representative (if any) — 6. Date 1/25/2021

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 any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

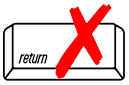
The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

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

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



A. Applicant Information

1. Location of Project:

105 Boston Post Road	Sudbury
a. Street Address	b. City/Town
c. Check number	d. Fee amount

2. Applicant Mailing Address:

John	Welch	
a. First Name	b. Last Name	
Herb Chambers of Sudbury, Inc.		
c. Organization		
259 McGrath HWY		
d. Mailing Address		
Somerville	MA	02143
e. City/Town	f. State	g. Zip Code
617-666-8333		jwelch@herbchambers.com
h. Phone Number	i. Fax Number	j. Email Address

3. Property Owner (if different):

John	Welch	
a. First Name	b. Last Name	
Herb Chambers 83 Boston Post Road, LLC - C/O Herb Chambers Companies		
c. Organization		
259 McGrath HWY		
d. Mailing Address		
Somerville	MA	01243
e. City/Town	f. State	g. Zip Code
617-666-8333		jwelch@herbchambers.com
h. Phone Number	i. Fax Number	j. Email Address

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

B. Fees

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

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

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
Category 2 (b, g)	3	$500	$1,500

Step 5/Total Project Fee: $1,500.00

Step 6/Fee Payments:

Total Project Fee:	$1,500.00 a. Total Fee from Step 5
State share of filing Fee:	$737.50 b. 1/2 Total Fee **less $**12.50
City/Town share of filling Fee:	$762.50 c. 1/2 Total Fee **plus** $12.50

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

CROCKER DESIGN GROUP LLC
2 SHARP ST
HINGHAM MA 02043

1200

53-7144/2113
35

DATE 3-18-21

CHECK ARMOR FRAUD PROTECTION

PAY TO THE ORDER OF Commanwealth of MA $ 737.50

Seven hundred thirty seven 50/100 DOLLARS

Photo Safe Deposit® Details on back

South Shore Bank
Member FDIC / DIF

FOR

⑈001200⑈ ⑆211371447⑆ 2235013055⑈

CROCKER DESIGN GROUP LLC
2 SHARP ST
HINGHAM MA 02043

1201

53-7144/2113
35

CHECK ARMOR

DATE 3-18-21

PAY TO THE ORDER OF Town of Sudbury $ 762.50

seven hundred sixty two 50/100 DOLLARS

Photo Safe Deposit® Details on back

South Shore Bank
Member FDIC/DIF

FOR Wet lands protection Act

⑈001201⑈ ⑆211371447⑆ 2235013055⑈

Section 2

Sudbury Conservation Commission Forms

Town of Sudbury

Conservation Commission

Conservation Department
275 Old Lancaster Rd.
Sudbury MA 01776
978-440-5472
ConCom@sudbury.ma.us

Notice of Intent Submission Checklist

A complete application package (double-sided and collated) must be submitted by close of business a minimum of two weeks in advance of a scheduled meeting. The Commission generally meets every other Monday. A list of meetings and submission deadlines can be found on the Commission's webpage (https://sudbury.ma.us/conservationcommission/). Incomplete packages may be returned and/or cause delay of your project.

Supplemental information for continued hearings must be submitted by 3:30 pm at least 4 business days in advanced of the next scheduled Commission meeting.

REQUIRED DOCUMENTATION:

✓ 1. One original signature and one copy of completed Notice of Intent Application Form (WPA Form 3) signed by the Applicant and Property Owner.

✓ 2. One completed NOI Wetland Fee Transmittal Form Pages 1 & 2.

✓ 3. One copy of the following maps, all with the site clearly identified. (One can generate these maps be using the Town GIS at www.mapsonline.net/sudburyma/ or by using Oliver through MassGIS at: http://maps.massgis.state.ma.us/map_ol/oliver.php.)
   - USGS
   - FEMA
   - NHESP

✓ 4. Two sets of full-sized stamped plans, including graphic scale (not more than 1 inch = 20 feet) and title block that shows proposed structures or modifications to existing structures, paving, drainage, or water control structures, and erosion controls. Be sure to include resource delineation, riverfront and/or buffer zones, and existing and proposed topography. GIS maps may be used for small projects at the discretion of the Conservation Commission.
   - ✓ Plan revisions shall be clearly noted and dated on the plans.
   - Colored plan shall be provided that clearly depict existing and proposed conditions with the ✓ following color scheme:
     - Existing conditions = Black
     - Proposed Construction = Red
     - Wetland boundaries = Blue
     - Buffer Zone = Yellow
     - Riverfront = Purple
     - Proposed Tree line = Green
     - Erosion Controls = Orange

✓ 5. One copy of the Abutter's list, Abutter Notification form, and proof of mailing. Notification can be either by hand or via certificate of mailing or certified mail. This certificate, return receipt green cards, copies of green cards, or proof of receipt of hand delivered mail, must be submitted prior to the hearing (scanned copies are OK).

✓ 6. Two copies of a narrative which should include the following information:

- Description of work within regulated resource areas, the buffer zones, and any impacts to these areas.
- Description of the project's compliance with the WPA performance standards. If work is proposed in the Riverfront Area, you must provide an alternatives analysis.
- Description of the project's compliance with the Sudbury Administration Wetlands Bylaw.
    - If work is proposed within Adjacent Upland Resource Area, you must provide an alternatives analysis.
    - If work is located adjacent to a stream, you must provide the required evidence in accordance with Section 2.3 of the Sudbury Administration Wetlands Bylaw Regulations to determine whether the stream is intermittent or perennial.

7. Proposed mitigation for unavoidable project impacts to regulated areas. Provide the following information:
    - Square footage of work proposed by type (i.e. disturbance, structures, impervious surface, etc.) within each regulated area, including the 100-foot Buffer Zone, 100-foot Adjacent Upland Resource Area, and 200-foot Riverfront Area (inner and outer riparian zones).
    - Square footage of proposed mitigation by type (i.e. native plantings, invasive species removal, impervious surface reduction, etc.) within each regulated area.

8. Description of wetland resource areas, date delineated, and name of wetland scientist that conducted the delineation

9. Photos of the site.

10. Applicable Filing Fees under the Wetlands Protection Act and the Sudbury Administrative Wetlands Bylaw Checks to the Town of Sudbury. See attached.

    * Please note, a legal notice fee will be billed directly to the Applicant. The Applicant is responsible for the cost of the legal notice in accordance with the state Wetlands Protection Act [310 CMR 10.05(5)(a)] and Sudbury Administration Wetlands Bylaw.

11. If applicable, one completed, signed Stormwater Management Form, Appendix C, if applicable. This does not apply to projects on single-family lots.

12. If applicable, one signed copy of any Operation and Maintenance Plans associated with elements located or that discharge to resource areas.

13. All documentation also must be provided in electronic format, including any revised information.

DEP MAILING

1. Send check for state fee made out to the Commonwealth of Massachusetts and copy of NOI Wetland Fee Transmittal Form Pages 1 & 2 to: DEP, Box 4062, Boston, MA 02211.

2. Send one complete copy of the Notice of Intent application, including copies of all required maps, project plans, Wetland Fee Transmittal Form, list of abutters, Notification to Abutters Form, and a copy of the check for state and town fee payments to:
   DEP-NERO, Wetlands Division 205 Lowell Street Wilmington, MA 01887.

Wetlands Protection Act Fee Payments: Category Activities and Fees

Category 1 (Fee for each activity is **$110**):

a.) work on single family lot; addition, pool, etc.;
b.) site work without a house;
c.) control vegetation;
d.) resource improvement;
e.) work on septic system separate from house;
f.) monitoring well activities minus roadway;
g.) new agricultural or aquaculture projects.

Category 2 (Fee for each activity is **$500**)

a.) construction of single family house;
b.) parking lot;
c.) beach nourishment;
d.) coastal limited projects;
e.) inland limited projects minus road crossings and agriculture;
f.) each crossing for driveway to single family house;
g.) each project source (storm drain) discharge;
h.) control vegetation in development;
i.) water level variations;
j.) any other activity not in Category 1, 3, 4, 5 or 6;
k.) water supply exploration.

Category 3 (Fee for each activity is **$1,050**)

a.) site preparation (for development) beyond Notice of Intent scope;
b.) each building (for development) including site;
c.) road construction not crossing or driveway;
d.) hazardous cleanup;
e.) water supply development.

Category 4 (Fee for each activity is **$1,450**):

a.) each crossing for development or commercial road;
b.) dam, sluiceway, tidegate (safety) work;
c.) landfills operation/closures;
d.) sand and gravel operations;
e.) railroad line construction;
f.) bridge;
g.) hazardous waste alterations to resource areas;
h.) dredging;
i.) package treatment plant and discharge;
j.) airport tree clearing;
k.) oil and/or hazardous material release response actions.

Category 5 (Fee is **$4 per linear foot**; total fee not less than $100 or more than $2,000):

a.) work on docks, piers, revetments, dikes, etc. (coastal or inland).

Category 6 (Fee is **$2 per linear foot for each resource area): For each resource area delineation, the fee shall not** exceed $200 for activities associated with a single family house or $2,000 for all other activities).

Sudbury Wetlands Administration Bylaw Fee Payments For All Applications:

Category A: Single minor project -- i.e., house addition, tennis court, swimming pool, or other accessory residential activity **$25 per project**

Category B: New single family dwelling **$250**

Category C: Subdivision--road and utilities only - **$500 plus $2 per foot** of road sideline within a resource area

Category D: Drainage, detention/retention basins **$500 plus $2 per 100 cubic feet of basin within a resource area**

Category E: Multiple Dwelling Structure **$500 plus $100/unit**, all or part of which is within a resource area

Category F: Commercial and Industrial Projects **$500 plus $0.50 per square foot of disturbance** in an undeveloped resource area

Category G: Application filed after Enforcement Order **double** the above fee

Category H: Determination of Applicability **no charge**

Category I: Remediation of a Contaminated Site or Enhancement of a Degraded Resource (excluding violations) **$25.00/project**

Additional Fees:

Abbreviated Notice of Resource Area Delineation:

New Construction: **$500 plus $2.00 for each linear foot of resource area subject to the Bylaw**
Existing Developed Single Family Lots: **$25.00**

Inspection Fee: $50.00 for each status inspection conducted as a follow up to a Notice of Violation.

CROCKER DESIGN GROUP LLC
2 SHARP ST
HINGHAM MA 02043

1197

53-7144/2113
35

DATE 3-15-21

CHECK ARMOR FRAUD PROTECTION

PAY TO THE ORDER OF Town of Sudbury $ 1,000.00

One thousand 00/100 DOLLARS

Photo Safe Deposit® Details on back

South Shore Bank
Member FDIC / DIF

FOR Admin wetlands bylaw

⑈001197⑈ ⑆211371447⑆ 2235013055⑈

1

Section 3

Abutter Notifications

Abutters List print this list

Date: January 13, 2021

Subject Property Address: 105 BOSTON POST RD Sudbury, MA
Subject Property ID: K11-0017

Search Distance: 100 Feet

Prop ID: K11-0007
Prop Location: 120 BOSTON POST RD Sudbury, MA
Owner: 120 BOSTON POST ROAD LLC
Co-Owner:
Mailing Address:

12 WASHINGTON ST
WELLESLEY, MA 02481

Prop ID: K11-0008
Prop Location: 104 BOSTON POST RD Sudbury, MA
Owner: SCF RC FUNDING IV LLC
Co-Owner:
Mailing Address:
902 CARNEGIE CENTER BLVD STE 520
PRINCETON, NJ 08542

Prop ID: K11-0015
Prop Location: 83 BOSTON POST RD Sudbury, MA
Owner: LAND ROVER METROWEST
Co-Owner:
Mailing Address:
83 BOSTON POST RD
SUDBURY, MA 01776

Prop ID: K11-0016
Prop Location: 103 BOSTON POST RD Sudbury, MA
Owner: LOTUS FAMILY ENTERPRISE LLC
Co-Owner:
Mailing Address:
27 GOODMANS HILL RD
SUDBURY, MA 01776

Prop ID: K11-0019
Prop Location: 141 BOSTON POST RD Sudbury, MA
Owner: RICHARD J BOSSE HOLDINGS LLC
Co-Owner:
Mailing Address:
141 BOSTON POST RD
SUDBURY, MA 01776

Prop ID: K11-0099
Prop Location: BOSTON POST RD Sudbury, MA
Owner: LAND ROVER METROWEST
Co-Owner:
Mailing Address:
83 BOSTON POST RD
SUDBURY, MA 01776

Prop ID: K11-0100-0-101
Prop Location: 111 BOSTON POST RD UNIT 101 Sudbury, MA
Owner: SUMMERS PHILIP W & CATHLEEN H
Co-Owner: TRUSTEES KMC REALTY TRUST
Mailing Address:
179 GREAT RD STE 109
ACTON, MA 01720

Prop ID: K11-0100-0-102
Prop Location: 111 BOSTON POST RD UNIT 102 Sudbury, MA
Owner: NOVUM 111 LLC
Co-Owner:
Mailing Address:
111 BOSTON POST RD 102
SUDBURY, MA 01776

Prop ID: K11-0100-0-103
Prop Location: 111 BOSTON POST RD UNIT 103 Sudbury, MA
Owner: ZHANG YAO
Co-Owner:
Mailing Address:
81 MAPLE LN
NORTHBOROUGH, MA 01532

Prop ID: K11-0100-0-104
Prop Location: 111 BOSTON POST RD UNIT 104 Sudbury, MA
Owner: 104-106 VILLAGE EAST LLC
Co-Owner:
Mailing Address:
49 BAY DRIVE
SUDBURY, MA 01776

Prop ID: K11-0100-0-105
Prop Location: 111 BOSTON POST RD UNIT 105 Sudbury, MA
Owner: OCEANO INC
Co-Owner: C/O PATRICIA SALVUCCI
Mailing Address:
3 CLARENDON ST
GLOUCESTER, MA 01930

Prop ID: K11-0100-0-106
Prop Location: 111 BOSTON POST RD UNIT 106 Sudbury, MA
Owner: 104-106 VILLAGE EAST LLC
Co-Owner:
Mailing Address:
49 BAY DRIVE
SUDBURY, MA 01776

Prop ID: K11-0100-0-107
Prop Location: 111 BOSTON POST RD UNIT 107 Sudbury, MA
Owner: MOHIT ENTERPRISES LLC
Co-Owner:
Mailing Address:
131 ORNAC SUITE 610
CONCORD, MA 01742

Prop ID: K11-0100-0-108
Prop Location: 111 BOSTON POST RD UNIT 108 Sudbury, MA
Owner: TARR BRYANT
Co-Owner:
Mailing Address:

111 BOSTON POST RD 108
SUDBURY, MA 01776

Prop ID: K11-0100-0-209
Prop Location: 111 BOSTON POST RD UNIT 209 Sudbury, MA
Owner: CANTWELL REALTY LLC
Co-Owner: C/O WILLIAM G MCCARTHY
Mailing Address:
25 WESTGATE RD
FRAMINGHAM, MA 01701

Prop ID: K11-0100-0-210
Prop Location: 111 BOSTON POST RD UNIT 210 Sudbury, MA
Owner: DIVINE HEART REALTY LLC
Co-Owner:
Mailing Address:
88 PLYMPTON RD
SUDBURY, MA 01776

Prop ID: K11-0100-0-211
Prop Location: 111 BOSTON POST RD UNIT 211 Sudbury, MA
Owner: ABC SOILS INC
Co-Owner:
Mailing Address:
111 BOSTON POST RD 211
SUDBURY, MA 01776

Prop ID: K11-0100-0-212
Prop Location: 111 BOSTON POST RD UNIT 212 Sudbury, MA
Owner: LIONSGATE PROPERTIES LLC
Co-Owner:
Mailing Address:
29 FARRAGUT RD
BOSTON, MA 02127

Prop ID: K11-0100-0-213
Prop Location: 111 BOSTON POST RD UNIT 213 Sudbury, MA
Owner: HOWE DEVELOPMENT CORP

Co-Owner:
Mailing Address:
111 BOSTON POST RD STE 213
SUDBURY, MA 01776

Prop ID: K11-0100-0-214
Prop Location: 111 BOSTON POST RD UNIT 214 Sudbury, MA
Owner: ABC SOILS INC
Co-Owner:
Mailing Address:
111 BOSTON POST RD 214
SUDBURY, MA 01776

Prop ID: K11-0100-0-215
Prop Location: 111 BOSTON POST RD UNIT 215 Sudbury, MA
Owner: K.A.B. & J .C.J. LLC
Co-Owner:
Mailing Address:
111 BOSTON POST RD 215
SUDBURY, MA 01776

Prop ID: K11-0100-0-216
Prop Location: 111 BOSTON POST RD UNIT 216 Sudbury, MA
Owner: SAI LUNG LLC
Co-Owner:
Mailing Address:
P.O. BOX 329
WAYLAND, MA 01778

Town of Wayland

41 COCHITUATE ROAD
WAYLAND MASSACHUSETTS 01778
www.wayland.ma.us TEL. 508-358-3788

WAYLAND ASSESSORS
2021 FEB 10 PM2:40

OFFICE STAFF
Bruce Morgan MAA, Director of Assessing
Matthew Lanefski, MAA, Assistant Assessor
Mary-Ann Wohlfarth, Sr. Admin. Coordinator

BOARD OF ASSESSORS
Jayson Brodie, Chair
Zachariah Ventresca, Vice Chair
John A. Todd
Molly Upton

Certification of Abutters

Date of request February 10, 2021

Please plan your submission accordingly. The Assessors' office has 10 business days to certify an abutters list Per MGL Ch. 66, S.10

Address to be certified 105 Boston Post Road, Sudbury, MA Parcel ID _____ (Map/Lot)

Owner's Name Herb Chambers/ John Welch
(PLEASE PRINT)

Owner's Mailing Address 529 McGrath Highway, Somerville, MA 02143

Name of Applicant Gabe Crocker, Crocker Design Group Telephone: 781-919-0808
(PLEASE PRINT)

2 Sharp Street, Unit B — Mailing Address of Applicant
Hingham — City/Town
MA — State
02188 — Zip

Signature of Applicant _____

Reason for List (check one) ☑ Conservation ☐ Health ☐ Planning ☐ Zoning ☐ Board of Selectmen

****Please check with the Board/Commission for their guidelines regarding the number of feet required for notification. Each Board/Commission has its own regulations for their abutters listing. There's no fee for certification, however the list/s of abutters must be provided by the person or company requesting certification.**

For use by Assessors

This is to certify that at the time of the last assessment for taxation made by the Town of Wayland, the names and addresses are the assessed owners to these parcels.

Certified By: _____ Date: 2-10-2021

CC: ☑ Conservation ☐ Health ☐ Planning ☐ Zoning ☐ Board of Selectmen

Abuttersrequestform.doc

Parcel Number	GIS Number	Cama Number	Property Address	Owner Name	Co-Owner Name	Owner Address	Owner Address 2	Owner City	Owner State	Owner Zip	
21-002A	F_685453_2956761	21-002A	534A BOSTON POST RD	RICHARD J BOSSE HOLDINGS LLC		141 BOSTON RD		SUDBURY	MA	01776	✓✓
21-003	F_685869_2957164	21-003	533 BOSTON POST RD	HERB CHAMBERS 533 BOSTON POST RD LLC	% LAND ROVER SUDBURY	533 BOSTON POST RD		WAYLAND	MA	01778	✓✓
21-005	F_685661_2957452	21-005	540 BOSTON POST RD	THOMPSON RONALD G	LAURIE THOMPSON	345 GREAT RD		BEDFORD	MA	01730	✓✓
94-001	F_694663_2954406	94-001	ACROSS TOWN	COMMONWEALTH OF MASS - - MWRA		100 FIRST AVE	CHARLESTOWN NAVY YARD	BOSTON	MA	02129	✓✓

~~mal~~
~~1-11-2021~~

mal
2-10-2021

Notification to Abutters
Under the Massachusetts Wetlands Protection Act
and t he Sudbury Wetlands Administrative Bylaw

In accordance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40, you are hereby notified of the following:

A. The name of the **Applicant** is John Welch

B. The Applicant has filed a Notice of Intent with the Sudbury Conservation Commission seeking permission to work in an Area Subject to Protection (Wetland Resource Area and/or Buffer Zone) under the Massachusetts Wetlands Protection Act (General Laws Chapter 131, Sec.40) and the Town of Sudbury Wetlands Administrative Bylaw.

C. The **address** of the lot where the activity is proposed: 105 Boston Post Road, Sudbury, MA 01776

D. The **proposed activity** is: Herb Chambers proposes to construct an inventory lot for the Herb Chambers Jaguar/Land Rover Dealership at the former MA DOT site. Proposed work includes the renovation of the existing 2-story metal structure to a vehicle service building, as well as designated parking for employees and vehicle service customers.

E. A **Public Hearing** regarding this Notice of Intent will be held on:
Monday, April 5, 2021 **at 6:30 PM.**

F. **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 Town of Sudbury 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 Sudbury Town Hall and other public buildings to the public, the Town has decided to implement the "remote participation" procedures allowed under Governor Baker's emergency Order for all boards, committees, and commissions.

G The public may participate in this meeting via Remote Participation:

From your computer, smart phone or tablet:

- https://us02web.zoom.us/j/98803339162
- Meeting ID: 988 0333 9162
- From your phone: **978-639-3366** or **470 250 9358**

H C opies of the Notice of Intent may be examined by visiting this Website:
https://sudbury.ma.us/conservationcommission/meetings/

I. Copies of the Notice of Intent may be obtained from either The Applicant, or the Applicant's representative Crocker Design Group, by calling this telephone number: 781-919-0808 between the hours of 9:00am - 5:00pm M-F

Note: Public Hearing Notice, including its date, time, and place, will be published at least 5 days in advance in either the Sudbury Crier or MetroWest newspapers (at the applicant's expense).

Abutter Notification Form for Conservation Notice of Intent

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.

1. Signature of Applicant	2. Date
_____	_____
3. Signature of Property Owner (if different)	4. Date
_____	_____
5. Signature of Representative (if any)	6. Date
_____	_____

Abutters may be found on the MAPS section on Town of Sudbury website.

Section 4

Project Information

4.1 EXECUTIVE SUMMARY

In accordance with the provisions of the Town of Sudbury Zoning Bylaws, the Applicant, Herb Chambers od Sudbury, Inc. (HC), proposes to utilize the existing one-story building (7,190SF footprint with small mezzanine) for repair of vehicles and upgrade the site features for employee parking and vehicle storage.

The site is bound by Boston Post Road (Route 20) to the north, Soul of India restaurant to the north, Jaguar Land Rover Sudbury to the east, a commercial building to the west with various tenants, and vacant Industrial zoned land to the south, part of 141 Boston Post Road. The site is located on Parcel K11-0017 and is 3.37 acres. The property is located within the Industrial Zoning District.

4.2 APPROVALS BEING SOUGHT

A Notice of Intent (NOI) is being filed with the Town of Sudbury Conservation Commission (SCC) and the Massachusetts Department of Environmental Protection (MA DEP) for the proposed work. The applicant requests that the permit approvals encompass the entirety of the scope listed below, and as shown in the accompanying plan set:

- The construction of an expanded parking lot for car dealership inventory
- The renovation of the existing single-story metal structure to a vehicle service building
- Designated parking for employees and service vehicle customers
- Associated stormwater treatment and drainage improvements

An Order of Resource Area Delineation (ORAD) (MA DEP# 301-1320) was issued on December 14, 2020 and is enclosed with this submission in Section 8 of the Stormwater Report. A Request for Determination of Applicability (RDA), enclosed in Section 5, was filed prior to the test pits performed on the property, and a negative determination was provided by the SCC.

This Stormwater Report will also be filed with the Sudbury Planning Board as part of the Site Plan Review submission in the near future. The applicant has also submitted an application to the Sudbury Zoning Board of Appeals.

4.2 WETLAND RESOURCE AREAS

The project site contains environmental resource areas and buffers, and therefore the project must be permitted through MassDEP and the Sudbury Conservation Commission. Per the ORAD, there is a Bordering Vegetated Wetland (BVW) to the South of the site containing shallow marshes and shrub swamps. The site is in close proximity to Bordering Land Subject to Flooding, and is entirely out of the surveyed FEMA 100-year floodplain. According to the latest Mass. Division of Fisheries and Wildlife – Natural Heritage Program mapping, the southern portion of the site is within an Estimated Habitat of Rare Wildlife (PH 1432) as designated by the Natural Heritage and Endangered Species Program of the Division of Fisheries and Wildlife; therefore, the project is subject to the Massachusetts Endangered Species Act (MESA) review. The applicant intends to apply for MESA review concurrently with the NOI submission to MA DEP/SCC. The site does not appear to contain any certified vernal pools or areas of critical environmental concern.

The wetland resource areas located to the south of the property were delineated by James Hall, PWS of CHA Consultants in October 2019, and DGT Associates, Inc. performed a review of the delineation boundaries. The Abbreviated Notice of Resource Area Delineation (ANRAD) submission, filed on November 19, 2020, and Order of Resource Area Delineation (ORAD) (MA DEP# 301-1320), issued on December 15, 2020, are enclosed with this submission in Section 8 of the Stormwater Report.

4.3 WORK WITHIN REGULATED RESOURCE AREAS

The following is a summary of the buffer and protection zones that portions of the project are proposed within:

1) 100' Bordering Vegetated Wetland (BVW) Buffer (310 CMR 10.55).
   Portions of the proposed improvements, including, but not limited to a permeable pavement parking lot, a small portion of retaining wall and landscaping are proposed within the 100' BVW buffer zone. The proposed improvements include a parking lot comprised primarily of permeable pavement, and landscaped islands/parking lot perimeter. Please see the accompanying plan set and supporting information for more details on the work proposed within the 100' BVW.

2) Bordering Land Subject to Flooding
   The site is located near a BLSF, associated with the Sudbury River. The elevation of the 100 year (1% chance of flooding) has been determined by the FEMA Flood Study Profile Data as elevation 121.0 (NAVD 88). The boundary of the BLSF is the 121-foot contour and this contour is to the south of the property.

3) Estimated Habitat of Rare Wildlife (EHRW)
   Portions of the proposed improvements, including, but not limited to the permeable pavement parking lot, and landscaping is proposed within the EHRW. There is a potential vernal pool located within the EHRW, approximately 40±' to the south of the property line. The amount of parking lot proposed within the EHRW is approximately 1.02 AC, and approximately 0.90 AC will be comprised of permeable pavement and landscaped islands. The developments proposed are an improvement to what exists currently and are located within the existing footprint of development so as not to encroach any closer to the resource area. The landscaped area adjacent to the property line and to the south of the parking lot will be densely planted and vegetated which will provide added wildlife habitat value.

4.4 COMPLIANCE WITH WPA/MA STORMWATER STANDARDS

The following section describes each of the ten (10) Massachusetts Stormwater Management Standards and describes how the project complies with each. All calculations associated with Standards 2, 3, and 4 are included in Section 4 of the Stormwater Report.

Standard 1: No New Untreated Discharges – No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

All new stormwater system conveyances are treated prior to discharge and result in no erosion occurring on site. The drainage system has been designed to direct stormwater runoff from impervious areas through various stormwater systems designed to capture, convey, treat, detain, recharge and infiltrate (where appropriate) the runoff prior to discharge.

Standard 2: Peak Rate Attenuation – Stormwater management systems have been designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

The stormwater system reduces peak rates of runoff to below pre-development levels.

Point of	1-Yr Storm (cfs)			2-Yr Storm (cfs)			5-Yr Storm (cfs)			10-Yr Storm (cfs)			25-Yr Storm (cfs)			100-Yr Storm (cfs)			1 in-Storm (cfs)		
Analysis	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
PD1	6.05	3.13	**-2.92**	8.11	4.27	**-3.84**	10.45	4.99	**-5.46**	13.46	5.89	**-7.57**	17.44	7.08	**-10.36**	25.98	9.77	**-16.21**	1.15	0.43	**-0.72**
PD2	0.20	0.11	**-0.09**	0.30	0.17	**-0.13**	0.40	0.24	**-0.16**	0.55	0.34	**-0.21**	0.74	0.48	**-0.26**	1.16	0.79	**-0.37**	0.01	0.00	**-0.01**

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

The stormwater system has been designed to comply with the recharge requirements for the MA Stormwater Management Regulations.

Refer to Section 4.1 in the Stormwater Report for a summary of the stormwater recharge calculations.

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

The project utilizes deep sump hooded catch basins, oil/grit separators, BioClean SciClone Water Quality Units, subsurface detention systems and permeable pavement. Please refer to Section 4.4 of the Stormwater Report for the TSS calculation spreadsheets.

Per the Town of Sudbury Stormwater Management Bylaw, water quality volume for sizing of BMP's is based on 1-inch of runoff from the tributary area. Please refer to Section 4.3 of the Stormwater Report for water quality calculations.

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

The project is not considered a LUHPPL. No extended vehicle service is proposed and the parking lot is not proposed as a high intensity use and does not represent fleet storage.

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

The project is not located near a critical area.

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

The project would qualify as a partial redevelopment and partial new development.

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

An Erosion and Sedimentation Controls Plan has been incorporated into the Site Plans.

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

A long-term Operation and Maintenance Plan has been incorporated herein. See Section 5.

Standard 10: Prohibition of Illicit Discharges – All illicit discharges to the stormwater management system are prohibited.

An Illicit Discharge Compliance Statement is included as required, and is enclosed in Section 2.2.

4.5 COMPLIANCE WITH SUDBURY ADMINISTRATION WETLANDS BYLAW (SAWB)

Plan Requirements

The SAWB requires that the boundaries and 100 ft buffer zones of wetland resource areas be shown on the project plans. The boundary of the wetlands, delineated and approved through and ORAD issued 12/15/2020 by the SCC, and the boundary of the 100-ft buffer zone is shown on the Site Plans, which are enclosed with this submission.

Applicable Performance Standards and Design Criteria

- *The commission may require that the applicant maintain a strip of continuous, undisturbed vegetative cover in part or all of the 100-ft buffer area.*

  Our client proposes to maintain a 13-15 ft strip of vegetation between the limit of the south of the parking lot and the boundary of the wetland resource area, which is an improvement from the existing condition which was limited to 11ft of separation between the pavement and the resource area, and the vegetation was inconsistent. We propose to densely plant the buffer strip between the parking lot and the fence to restore the functionality of the buffer zone, and wildlife habitat value. The existing chainlink fence at the southern edge of the property is proposed to remain, which will provide a boundary to restrict development, and will keep wildlife out of an active site with vehicle movement. The parking lot area within the 100-ft buffer zone is proposed to primary be permeable pavement, and will be used as an inventory lot. The active portion of the parking lot for employees and service customers will be in the Northern portion of the lot, outside of the 100-ft buffer.

- *Pre-project and post-project hydrology shall remain fundamentally the same as it pertains to protecting wetlands functions and values.*

Pre-project and post-project hydrology have been designed to remain generally the same, but with significant improvements to groundwater recharge, water quality and peak flow stormwater runoff into the buffer zone/wetland resource area.

- *A primary goal of stormwater design includes Low Impact Development (LID) principles focusing on infiltration of runoff throughout the site.*

  LID principles were considered for inclusion into the stormwater design, however due to space constraints and the intended use of the site, most are not feasible. Permeable pavement was included to treat and detain runoff within the wetland resource area.

- *Erosion control may require limiting stormwater discharge volumes and velocities. The commission may require the construction of such stormwater control structures.*

  Stormwater discharge volumes and velocities have been reduced from the existing condition. Also, a rip rap plunge pool has been designed for the outlet of the drainage system to minimize the potential for downstream erosion. Please see section 4.4 of the Stormwater Report for the Scour Hole Calculations, and the enclosed Site Plans for more details.

- *Where such waters are likely to contact wetland resources…the Commission may require the construction of specific structures to improve stormwater runoff quality.*

  In accordance with the MA Stormwater Standards, water quality treatment was included in the design. Water quality BMP's utilized in the design include: deep sump catch basins, oil/grit separators, BioClean SciColone Hydrodynamic Separators and permeable pavement. In accordance with the Town of Sudbury Stormwater Management Bylaws, the drainage design was designed to treat the first inch of stormwater runoff and remove 80% of TSS.

- *In accordance with the above, and the Sudbury Stormwater Management Bylaw, the Conservation Commission shall require hydrological calculations for the one, two, five, ten, twenty-five and one-hundred year storm events. Such calculations shall include runoff from all impervious surfaces associated with the project and both pre- and post-project calculations for discharge volumes, concentration times, discharge velocities and other quantities that the commission may require for complete information.*

  Per the Sudbury Stormwater Management Bylaw, the HydroCAD model calculations for the existing and proposed conditions include the one, two, five, ten, twenty-five, and one-hundred year storm events. Complete calculations can be found in Section 3 of the Stormwater Report. The tables below provide the existing and proposed runoff and discharge volumes for the required storms.

Peak Runoff Rates

Point of	1-Yr Storm (cfs)			2-Yr Storm (cfs)			5-Yr Storm (cfs)			10-Yr Storm (cfs)			25-Yr Storm (cfs)			100-Yr Storm (cfs)			1 in-Storm (cfs)		
Analysis	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
PD1	1.15	3.12	**1.97**	8.11	4.26	**-3.85**	10.45	4.98	**-5.47**	13.46	5.87	**-7.59**	17.44	7.00	**-10.44**	25.98	9.38	**-16.60**	1.15	0.43	**-0.72**
PD2	0.20	0.11	**-0.09**	0.30	0.17	**-0.13**	0.40	0.24	**-0.16**	0.55	0.34	**-0.21**	0.74	0.48	**-0.26**	1.16	0.79	**-0.37**	0.01	0.00	**-0.01**

Discharge Volumes

Point of	1-Yr Storm (ac-ft)			2-Yr Storm (ac-ft)			5-Yr Storm (ac-ft)			10-Yr Storm (ac-ft)			25-Yr Storm (ac-ft)			100-Yr Storm (ac-ft)			1 in-Storm (ac-ft)		
Analysis	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
PD1	0.44	0.35	**-0.10**	0.60	0.46	**-0.14**	0.45	0.59	**0.15**	1.01	0.77	**-0.25**	1.33	1.00	**-0.33**	2.03	1.53	**-0.51**	0.09	0.08	**-0.005**
PD2	0.02	0.01	**-0.01**	0.02	0.01	**-0.01**	0.03	0.02	**-0.01**	0.04	0.03	**-0.02**	0.05	0.04	**-0.02**	0.09	0.06	**-0.03**	0.00	0.00	**-0.001**

4.5.1 ALTERNATIVES ANALYSIS

Part of the proposed project involves work within the 100ft BVW Buffer Zone, and per the SAWB an alternatives analysis is required. The proposed alterations involve the redevelopment of approximately 1.21 acres within the Buffer Zone.

Below is an analysis of the alternative development option for the existing site.

Alternative #1: Leave the Site in its Existing Condition

The site is currently developed and was utilized as a MassDOT Highway Maintenance Facility. The site consists mostly of pavement and hard packed gravel and recycled asphalt with no stormwater treatment attenuation. A maintenance building with garage bays exists along with two (2) salt sheds that were recently removed. Leaving the site in its existing state may have a negative long-term impact on the adjacent wetland resources and habitat due to lack of proper stormwater and erosions controls and treatment.

Alternative #2: Different Development

The site is zoned Industrial District which would allow for a more intensive industrial type use on this site.

Conclusion

This project provides an opportunity to improve the stormwater discharge to the BVW, and bring the site into compliance with MA DEP and SAWB Standards, while allowing a low-intensity use to remain in place and compliment the abutting uses.

4.6 PROPOSED MITIGATION WITHIN REGULATED AREAS

Mitigation within the 100ft buffer zone includes:

- Please refer to the attached Existing and Proposed Buffer Zone Impact Exhibits for a visual representation of change in the vegetated and non vegetated areas in the 100ft BVW Buffer Zone. Also, please refer to the table below for a summary of the quantified areas.

100' BVW Buffer Area Impacts				
	Non-Vegetated Area		Vegetated Area	
	(SF)	(AC)	(SF)	(AC)
Existing	43,242	0.99	9,588	0.22
Proposed	37,065	0.85	15,765	0.36
Δ	(6,177)	-0.14	6,177	0.14
*32,578SF of the proposed non-vegetated area is porous pavement				

As shown in the table above, the vegetated areas are proposed to increase by 0.14 acres. These areas will be densely planted in an effort to create a natural buffer between the parking lot and the BVW. Also, 0.75 acres out of the 0.85 proposed non-vegetated surface within the buffer zone is proposed to be permeable pavement, which will reduce overland flow to the BVW significantly and promote stormwater treatment and groundwater recharge.

- The existing chain link fence will remain to serve two (2) purposes. The fence and the plantings will act as a physical barrier to prevent development encroachment within the wetland, and it will prevent wildlife from entering a site with vehicle activity.

- The existing pipe that outlets at the wetlands will be modified to include the installation of a flared end section and a riprap plunge pool installed to dissipate stormwater flow to the wetlands and prevent scour.

4.7 Figures

FIG 1 ORTHOGRAPHIC MAP
FIG 2 FEMA FLOODPLAIN MAP
FIG 3 MASSDEP WETLANDS MAP
FIG 4 USGS MAP
FIG 5 NHESP HABITAT MAP
FIG 6 ASSESSORS MAP

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043

Project
PROPOSED PARKING EXPANSION
105 BOSTON POST ROAD, SUDBURY, MA

Prepared for
HERB CHAMBERS
83 BOSTON POST ROAD, SUDBURY, MA

Drawing Title **AERIAL MAP**

DATE: 11.18.2020 | DRAWN: DJN
JOB NO.:100–108 | CHECK: ML
SCALE: 200 100 0 200

1

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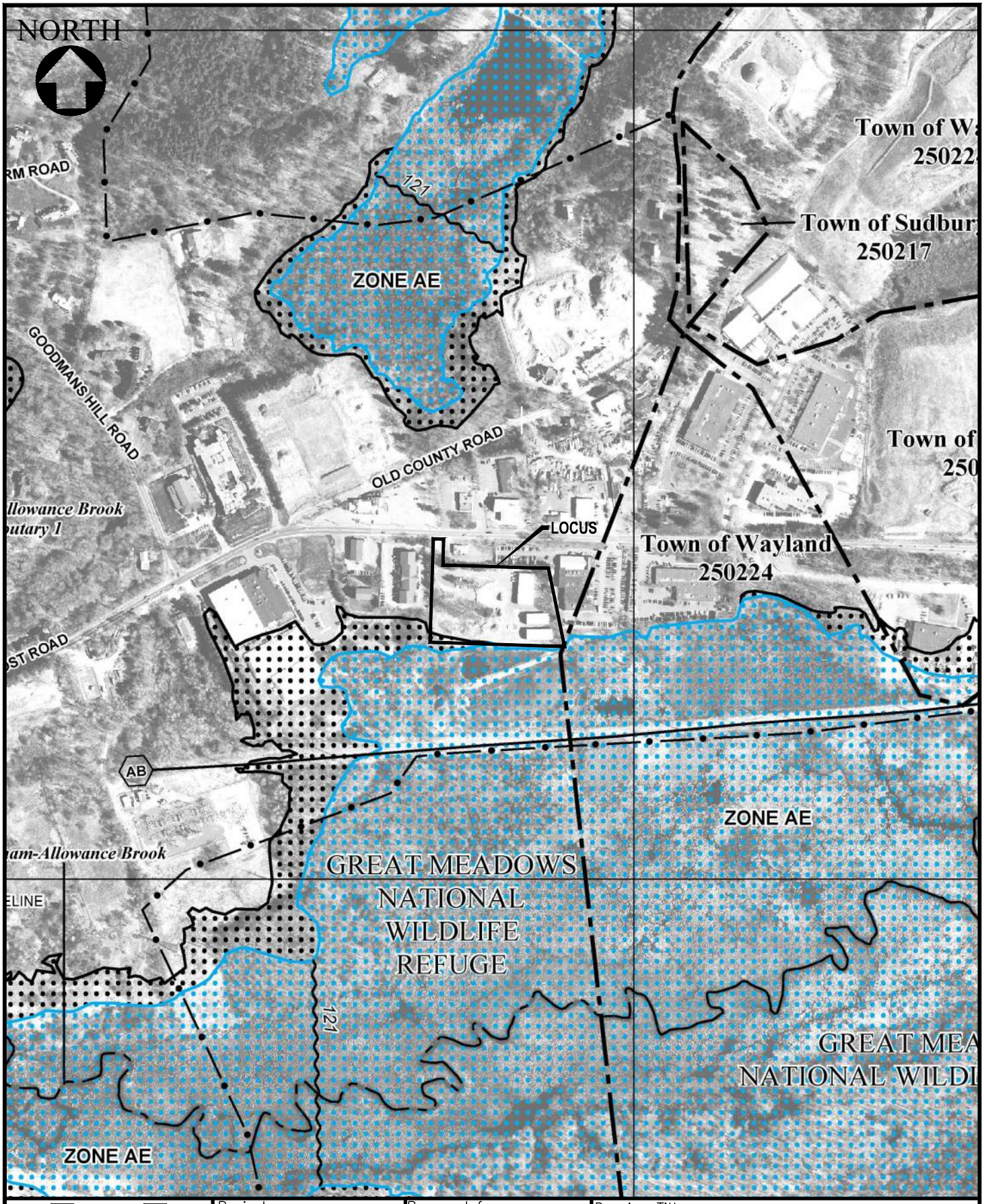

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043

Project
PROPOSED PARKING EXPANSION
105 BOSTON POST ROAD, SUDBURY, MA

Prepared for
HERB CHAMBERS
83 BOSTON POST ROAD, SUDBURY, MA

Drawing Title **FEMA FLOOD MAP**
EFFECTIVE PANEL 25017C0507F (7.7.2014)

DATE: 11.18.2020 | DRAWN: DJN
JOB NO.:100-108 | CHECK: ML
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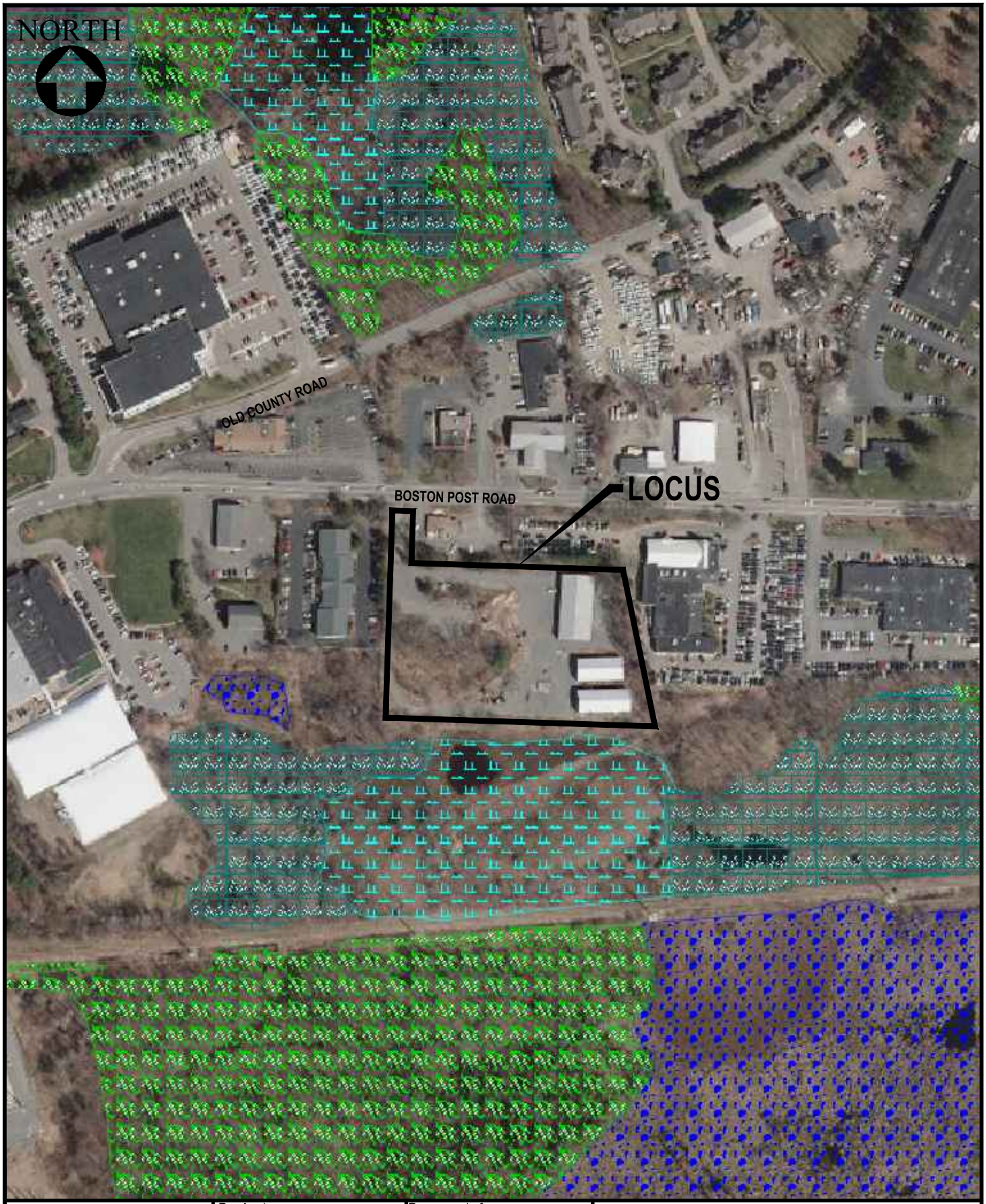

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043

Project
PROPOSED PARKING EXPANSION
105 BOSTON POST ROAD, SUDBURY, MA

Prepared for
HERB CHAMBERS
83 BOSTON POST ROAD, SUDBURY, MA

Drawing Title **WETLAND MAP**

DATE: 11.18.2020 | DRAWN: DJN
JOB NO.:100–108 | CHECK: ML
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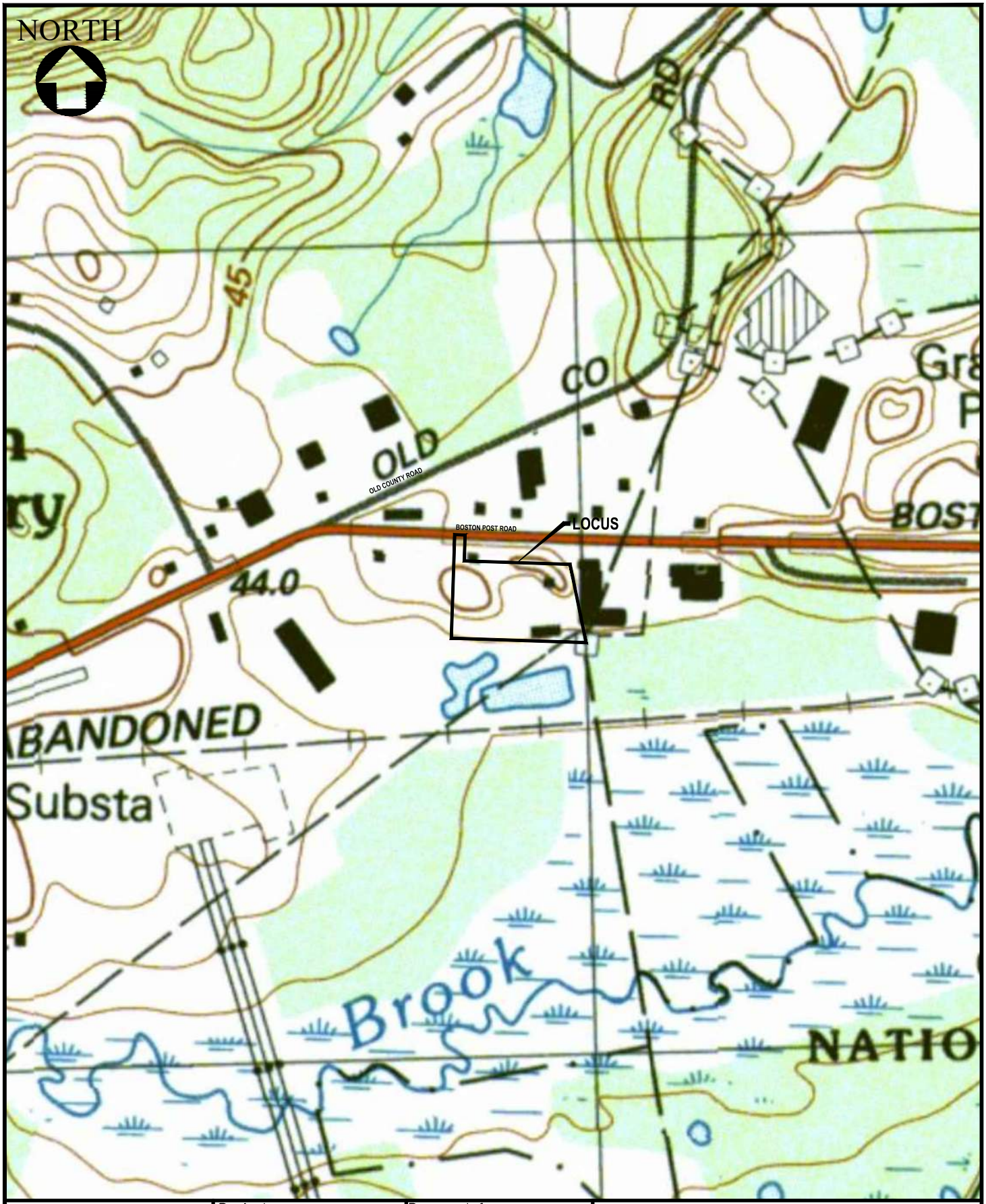

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043

Project
PROPOSED PARKING EXPANSION
105 BOSTON POST ROAD, SUDBURY, MA

Prepared for
HERB CHAMBERS
83 BOSTON POST ROAD, SUDBURY, MA

Drawing Title **USGS MAP**

DATE: 11.18.2020 | DRAWN: DJN
JOB NO.:100-108 | CHECK: ML
SCALE: 500 250 0 500

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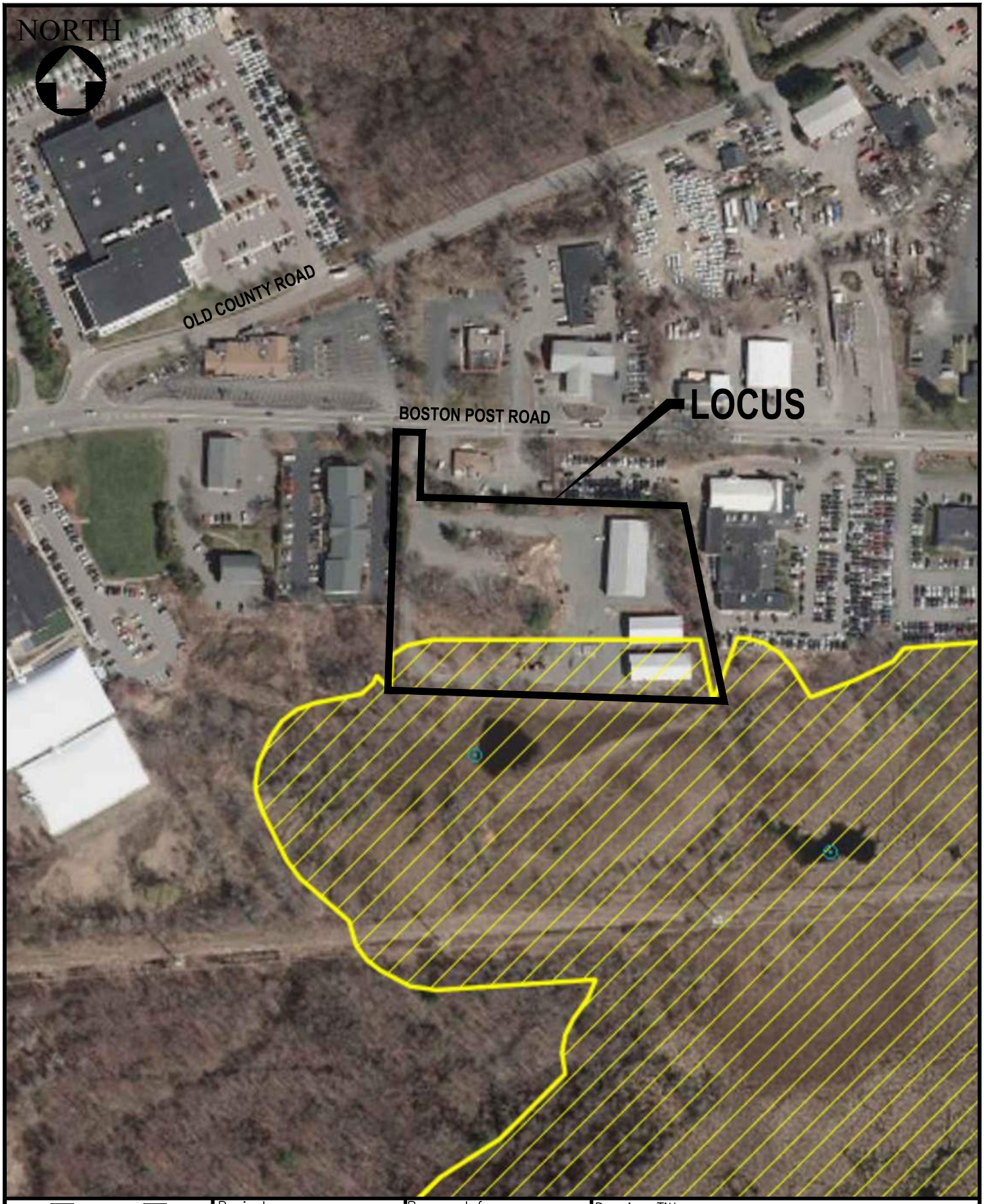

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043

Project
PROPOSED PARKING EXPANSION
105 BOSTON POST ROAD, SUDBURY, MA

Prepared for
HERB CHAMBERS
83 BOSTON POST ROAD, SUDBURY, MA

Drawing Title **NHESP MAP**

DATE: 11.18.2020 | DRAWN: DJN
JOB NO.:100-108 | CHECK: ML
SCALE: 250 125 0 250

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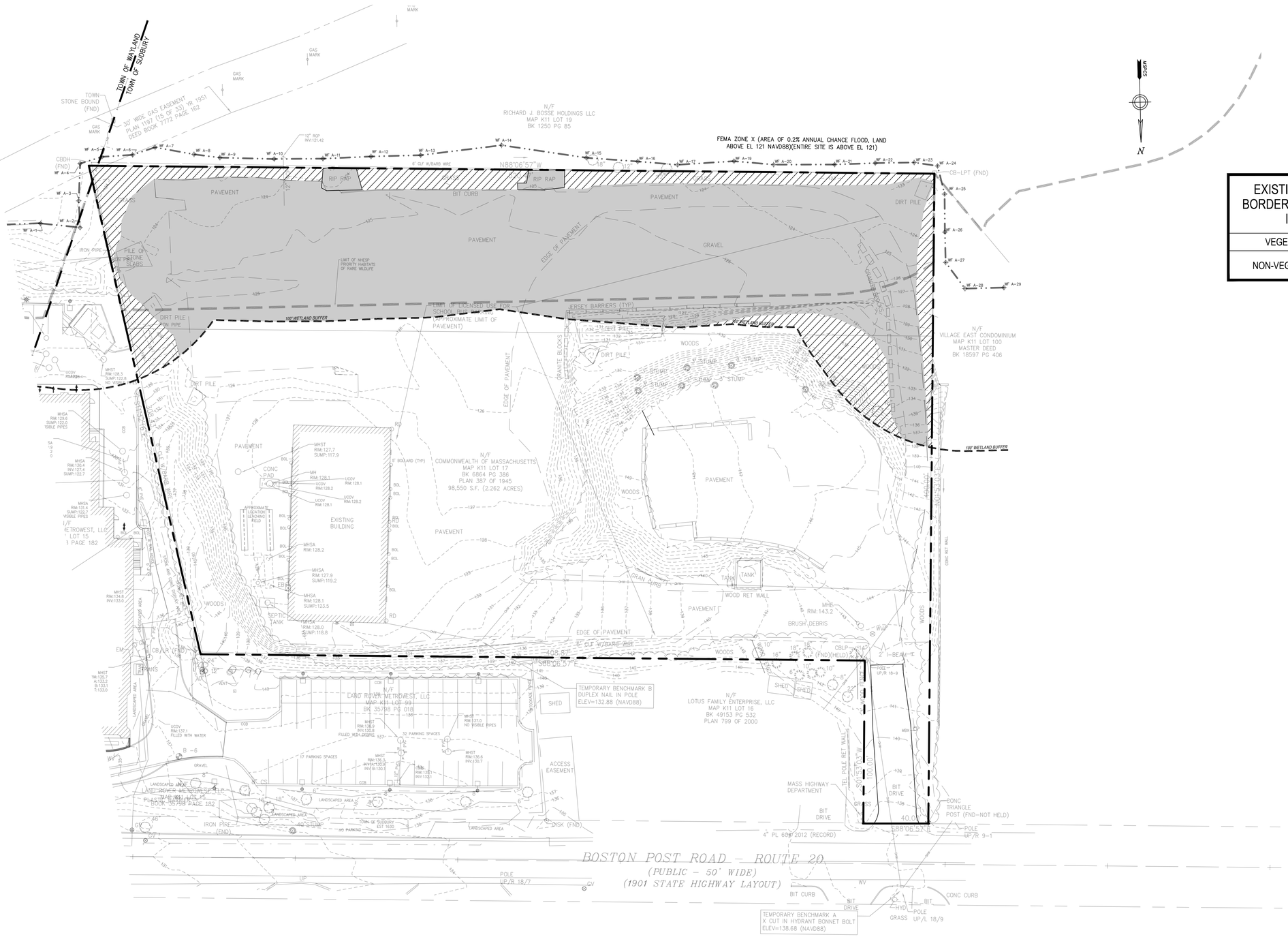

LEGEND

- VEGETATED
- NON-VEGETATED

EXISTING 100-FOOT BUFFER TO BORDERING VEGETATIVE WETLAND IMPACTS SUMMARY

VEGETATED	9,588 ± SF
NON-VEGETATED	43,242 ± SF

Date	Description	No.

Revisions

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-919-0808

Project

105 BOSTON POST ROAD

SUDBURY, MA

Prepared for

HERB CHAMBERS OF SUDBURY, INC.

259 MCGRATH HWY
SOMERVILLE, MA 02143

Drawing Title

EXISTING BUFFER ZONE IMPACT EXHIBIT

Project No.	100-108	Drawing No.	X-6
Date	3/22/2021		
Scale	1" = 30'		
Drawn By	DJN		
Approved By	GC		

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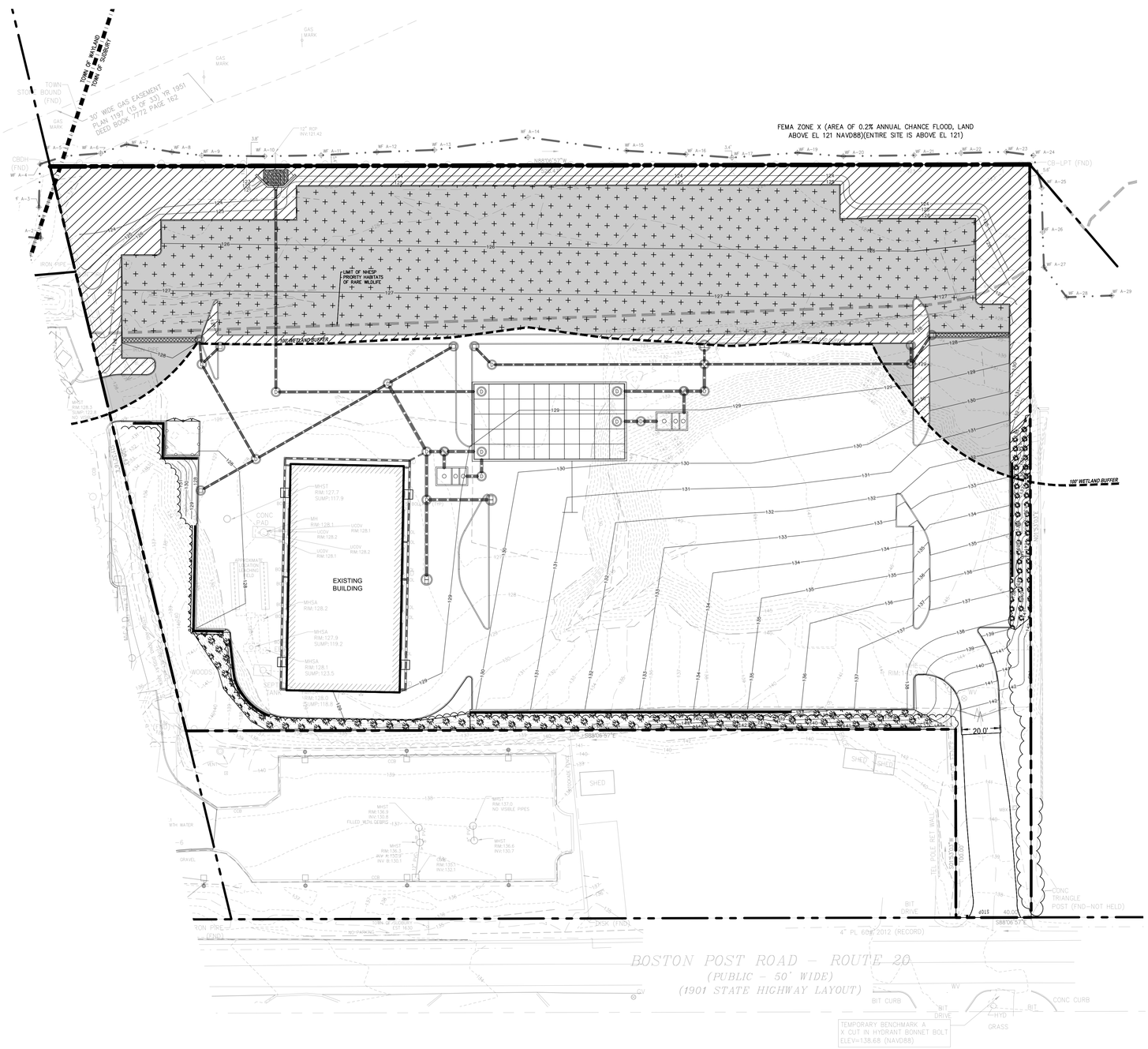


LEGEND

- VEGETATED
- NON-VEGETATED
- POROUS PAVEMENT

PROPOSED 100-FOOT BUFFER TO BORDERING VEGETATIVE WETLAND IMPACTS SUMMARY

VEGETATED AREA	15,765 ± SF
NON-VEGETATED AREA	37,065 ± SF[1]
TOTAL BUFFER AREA	52,830 ± SF

1.) 32,578 ± SF OF THE NON-VEGETATED AREA WITHIN THE 100 FOOT BUFFER TO THE WETLAND IS POROUS PAVEMENT.

30 15 0 30 60

Date	Description	No.

Revisions

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-919-0808

Project
105 BOSTON POST ROAD
SUDBURY, MA

Prepared for
HERB CHAMBERS OF SUDBURY, INC.
259 MCGRATH HWY
SOMERVILE, MA 02143

Drawing Title
PROPOSED BUFFER ZONE IMPACT EXHIBIT

Project No.	100-108
Date	3/22/2021
Scale	1"=30'
Drawn By	DJN
Approved By	GC

Drawing No.
X-7

C:\CDG\Crocker Design Group, LLC\Gabriel Crocker - Projects\100-108 Sudbury - Herb Chambers Mass DOT\dwg\Plot Sheets\Exhibits\ X-7 PROPOSED CONDITIONS Vegetated vs NonVegetated_recover.dwg, DEPROP WATERSHED MAP, Mar 12, 2021 09:53

Section 5

ORAD & RDA

DGT Associates
Surveying &
Engineering

1071 Worcester Rd.
Framingham, MA 01701
508.879.0030
www.dgtassociates.com

November 6, 2020 25638

Sudbury Conservation Commission
Attn: Lori Capone, Conservation Coordinator
245 Old Lancaster Road
Sudbury, MA 01776

RE: Request for Determination of Applicability (Bylaw)
105 Boston Post Road, Sudbury, Massachusetts

Dear Lori and Commissioners:

Enclosed herewith is a Request for Determination of Applicability (RDA) relative to the proposed soil test pits at the subject property to determine soil characteristics for planning purposes. As discussed, this RDA is being filed under the Sudbury Wetlands Administration Bylaw.

The enclosed information includes the following:

- Completed Mass WPA Form 1.
- A plan showing the soil test locations with erosion and sediment controls.

Please do not hesitate to contact me should you have any questions or need additional information.

Sincerely,
DGT Associates

Fredric W. King

Fredric W. King, P.E.
Senior Engineer and Wetland Specialist

Enclosures

CC: John Welch
Joshua Fox
Gabe Crocker
Brett Grunert

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

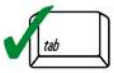
Sudbury
City/Town

WPA Form 1- Request for Determination of Applicability

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

A. General Information

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



1. Applicant:

Herb Chambers of Subury, Inc. Attention: John Welch	jwelch@herbchambers.com
Name	E-Mail Address

259 McGrath Highway
Mailing Address

Somerville	MA	01243
City/Town	State	Zip Code

617-666-8333	
Phone Number	Fax Number (if applicable)

2. Representative (if any):

DGT Associates, Inc.
Firm

Fredric King, P.E.	fking@dgtassociates.com
Contact Name	E-Mail Address

1071 Worcester Road
Mailing Address

Framingham	MA	01701
City/Town	State	Zip Code

774-244-7717	508-879-1797
Phone Number	Fax Number (if applicable)

B. Determinations

1. I request the Sudbury Conservation Conservation Commission make the following determination(s). Check any that apply:

☐ a. whether the **area** depicted on plan(s) and/or map(s) referenced below is an area subject to jurisdiction of the Wetlands Protection Act.

☐ b. whether the **boundaries** of resource area(s) depicted on plan(s) and/or map(s) referenced below are accurately delineated.

☐ c. whether the **work** depicted on plan(s) referenced below is subject to the Wetlands Protection Act.

☒ d. whether the area and/or work depicted on plan(s) referenced below is subject to the jurisdiction of any **municipal wetlands ordinance** or **bylaw** of:

Town of Sudbury
Name of Municipality

☐ e. whether the following **scope of alternatives** is adequate for work in the Riverfront Area as depicted on referenced plan(s).

C. Project Description

1. a. Project Location (use maps and plans to identify the location of the area subject to this request):

105 Boston Post Road	Sudbury, MA
Street Address	City/Town
K11-0017	
Assessors Map/Plat Number	Parcel/Lot Number

b. Area Description (use additional paper, if necessary):

A 3.4 acre site containing an existing building, parking lots, utilities, fencing and infrastructure at 105 Boston Post Road in Sudbury, MA

c. Plan and/or Map Reference(s):

Proposed Subsurface Exoloration Plan by Haley & Aldrich / DGT Markup	November 2020
Title	Date
Title	Date
Title	Date

2. a. Work Description (use additional paper and/or provide plan(s) of work, if necessary):

1. Excavation of soil test pits for evaluation of soil conditions at the site on the locations shown on the attached plan. Sediment controls will be installed prior to excavation and test pits will be backfilled and stabilized on the same day.

C. Project Description (cont.)

b. Identify provisions of the Wetlands Protection Act or regulations which may exempt the applicant from having to file a Notice of Intent for all or part of the described work (use additional paper, if necessary).

10.02(2)(b)2.g. Soil testing in Buffer Zone.

3. a. If this application is a Request for Determination of Scope of Alternatives for work in the Riverfront Area, indicate the one classification below that best describes the project.

- ☐ Single family house on a lot recorded on or before 8/1/96
- ☐ Single family house on a lot recorded after 8/1/96
- ☐ Expansion of an existing structure on a lot recorded after 8/1/96
- ☐ Project, other than a single-family house or public project, where the applicant owned the lot before 8/7/96
- ☐ New agriculture or aquaculture project
- ☐ Public project where funds were appropriated prior to 8/7/96
- ☐ Project on a lot shown on an approved, definitive subdivision plan where there is a recorded deed restriction limiting total alteration of the Riverfront Area for the entire subdivision
- ☐ Residential subdivision; institutional, industrial, or commercial project
- ☐ Municipal project
- ☐ District, county, state, or federal government project
- ☐ Project required to evaluate off-site alternatives in more than one municipality in an Environmental Impact Report under MEPA or in an alternatives analysis pursuant to an application for a 404 permit from the U.S. Army Corps of Engineers or 401 Water Quality Certification from the Department of Environmental Protection.

b. Provide evidence (e.g., record of date subdivision lot was recorded) supporting the classification above (use additional paper and/or attach appropriate documents, if necessary.)

Sudbury
City/Town

D. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Request for Determination of Applicability and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge.

I further certify that the property owner, if different from the applicant, and the appropriate DEP Regional Office were sent a complete copy of this Request (including all appropriate documentation) simultaneously with the submittal of this Request to the Conservation Commission.

Failure by the applicant to send copies in a timely manner may result in dismissal of the Request for Determination of Applicability.

Name and address of the property owner:

Herb Chambers 83 Boston Post Road, LLC - C/O Herb Chambers Companies
Name

259 McGrath HWY
Mailing Address

Somerville
City/Town

MA
State

01243
Zip Code

Signatures:

I also understand that notification of this Request will be placed in a local newspaper at my expense in accordance with Section 10.05(3)(b)(1) of the Wetlands Protection Act regulations.

John Welch HCC
Signature of Applicant

11-6-2020
Date

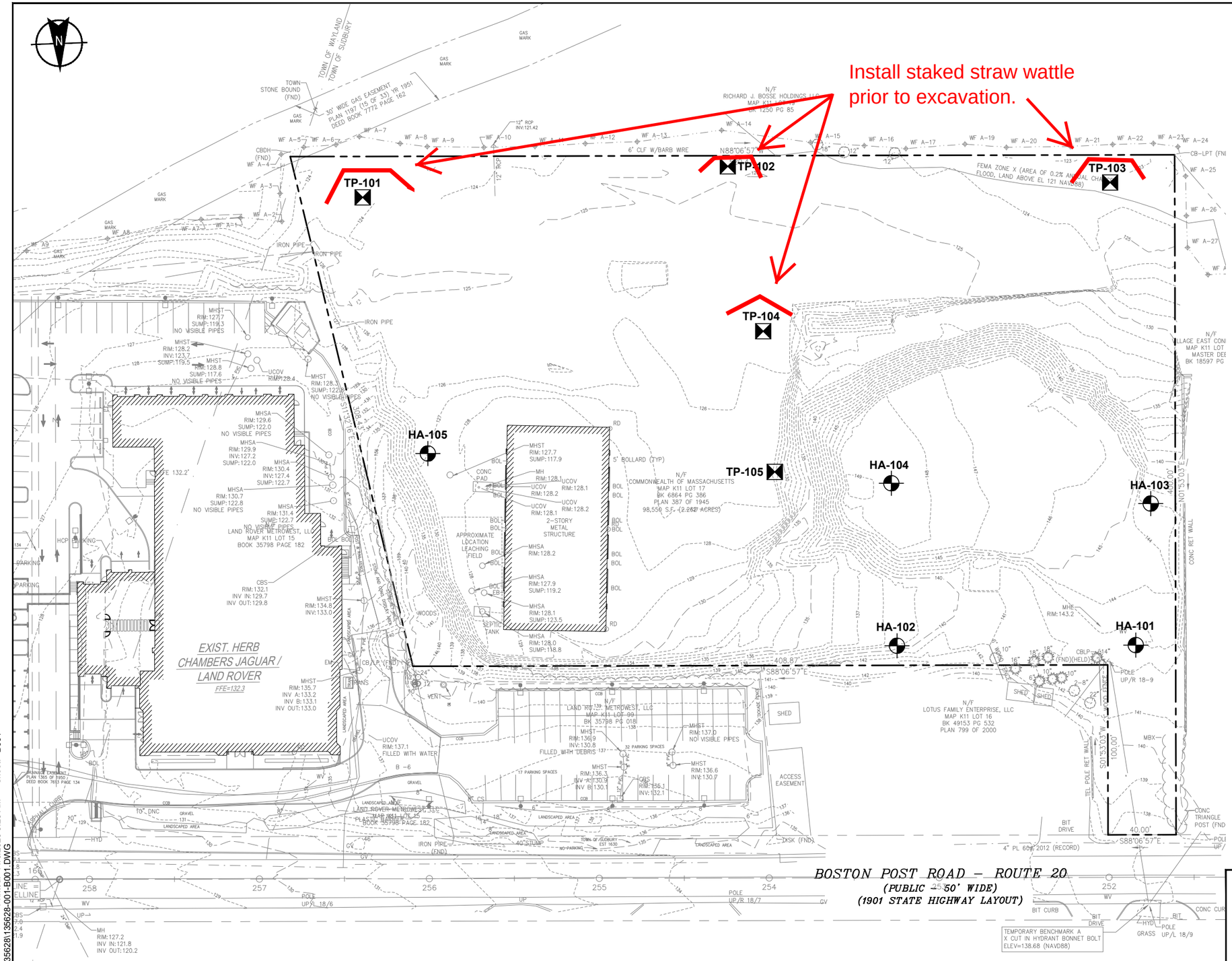
Fredric W. King
Signature of Representative (if any)

11-6-2020
Date

DGT MARK-UP OF PLAN SHOWN IN RED.

MARK-UP 11/6/2020

Install staked straw wattle prior to excavation.



LEGEND

HA-101 — DESIGNATION AND APPROXIMATE LOCATION OF PROPOSED TEST BORING

TP-101 — DESIGNATION AND APPROXIMATE LOCATION OF PROPOSED TEST PIT

NOTE

1. BASE PLAN TAKEN FROM AN ELECTRONIC FILE TITLED "EC.dwg", PROVIDED BY CROCKER DESIGN GROUP ON 6 OCTOBER 2020.
2. Cast excavated material to the up-gradient side of the test hole and straw wattle. Backfill all soil material into the test pit and make secure prior to removing the straw wattle.

0 60 120

SCALE IN FEET

HALEY ALDRICH

HERB CHAMBERS INVENTORY LOT
105 BOSTON POST ROAD
SUDBURY, MASSACHUSETTS

PROPOSED SUBSURFACE EXPLORATION PLAN

SCALE: AS SHOWN
NOVEMBER 2020

FIGURE

Saved by: DTE
J:\GRAPHICS\135628\135628-001-B001.DWG
Printed: 11/6/2020 9:25 AM
Sheet: B001

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 4B - Order of Resource Area Delineation
Massachusetts Wetlands Protection Act M.G.L. c. 131 S40

Provided by MassDEP:
MassDEP File #:301-1320
eDEP Transaction #:1244786
City/Town:SUDBURY

A. General Information

1. Conservation Commission SUDBURY
2. This Issuance is for (Check one):
   a. ☑ Order of Resource Area Delineation
   b. ☐ Amended Order of Resource Area Delineation

3. Applicant Details

a. First Name	JOHN		b. Last Name	WELCH	
c. Organization	HERB CHAMBERS OF SUDBURY, INC.				
d. Mailing Address	259 MCGRATH HWY				
e. City/Town	SOMERVILLE	f. State	MA	g. ZIP	02143

4. Property Owner (if different from applicant):

a. First Name		b. Last Name	
c. Organization			
d. Mailing Address			
e. City/Town	f. State		g. ZIP

5. Project Location

a. Street Address	105 BOSTON POST ROAD		
b. City/Town	SUDBURY	c. Zip	01776
d. Assessors Map/Plat#	K11	e. Parcel/Lot#	0017
f. Latitude	42.36235N	g. Longitude	71.39275W

6. Dates

a. Date ANRAD Filed	12/4/2020	b. Date Public Hearing Closed	12/14/2020	c. Date Of Issuance	12/15/2020

7. Final Approved Plans and Other Documents

Plan Title	Plan Prepared By	Plan Signed By	Plan Final Date	Plan Scale
EXISTING CONDITIONS PLAN	CHA CONSULTANTS		12/02/2019	1"=30'

B. Order of Delineation

1. The Conservation Commission has determined the following (check whichever is applicable)

a. ☑ **Accurate:** The boundaries described on the referenced plan(s) above and in the Abbreviated Notice of Resource Area Delineation are accurately drawn for the following resource area(s):

1. ☑ Bordering Vegetated Wetlands
2. ☐ Other resource area(s), specifically
   a.

b. ☐ **Modified:** The boundaries described on the plan(s) referenced above, as modified by the Conservation Commission from the plans contained in the Abbreviated Notice of Resource Area Delineation, are accurately drawn from the following resource area(s):

1. ☐ Bordering Vegetated Wetlands
2. ☐ Other resource area(s), specifically
   a.

c. ☐ **Inaccurate::** The boundaries described on the referenced plan(s) and in the Abbreviated Notice of Recource Area Delineation

were found to be inaccurate and cannot be confirmed for the following resource area(s):

1. ☐ Bordering Vegetated Wetlands
2. ☐ Other resource area(s), specifically
   a.
3. The boundaries were determined to be inaccurate because:

C. Findings

This Order of Resource Area Delineation determines that the boundaries of those resource areas noted above, have been delineated and approved by the Commission and are binding as to all decisions rendered pursuant to the Massachusetts Wetlands Protection Act (M.G.L. c.131, S 40) and its regulations (310 CMR 10.00). This Order does not, however, determine the boundaries of any resource area or Buffer Zone to any resource area not specifically noted above, regardless of whether such boundaries are contained on the plans attached to this Order or to the Abbreviated Notice of Resource Area Delineation. This Order must be signed by a majority of the Conservation Commission. The Order must be sent by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate DEP Regional Office (see http://www.mass.gov/dep/about/region/findyour.htm).

D. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate DEP Regional Office to issue a Superseding Order of Resource Area Delineation. When requested to issue a Superseding Order of Resource Area Delineation, the Department's review is limited to the objections to the resource area delineation(s) stated in the appeal request. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant. Any appellants seeking to appeal the Department?s Superseding Order of Resource Area Delineation will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order or Determination, or providing written information to the Department prior to issuance of a Superseding Order or Determination. The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act, (M.G.L. c. 131, S 40) and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal bylaw or ordinance, and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.

105 Boston Post Rd.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 4B - Order of Resource Area Delineation
Massachusetts Wetlands Protection Act M.G.L. c. 131 S40

Provided by MassDEP:
MassDEP File #:301-1320
eDEP Transaction #: 1244786
City or town: SUDBURY

E. Signatures

1. Date of Original Order _____

No. of Signatures required _____

Thomas R. Friedlander-Chairman

Dave Henkels-Vice Chairman

Kenneth Holtz

Richard Morse

Bruce Porter

Kasey Rogers

Mark Sevier

This Order is valid for three years from the date of issuance.

If this Order constitutes an Amended Order of Resource Area Delineation, this Order does not extend the issuance date of the original Final Order, and the Amended Order will expire on the date of the Original Final Order unless extended in writing by the Department.

This Order is issued to the applicant and the property owner (if different) as follows:

3. ☐ By hand delivery on

a. Date _____

4. By certified mail, return receipt requested on

a. Date _____

DGT Associates
Surveying &
Engineering

1071 Worcester Rd.
Framingham, MA 01701
508.879.0030
www.dgtassociates.com

November 24, 2020 25638

Sudbury Conservation Commission
Attn: Lori Capone, Conservation Coordinator
245 Old Lancaster Road
Sudbury, MA 01776

RE: Abbreviated Notice of Resource Area Delineation
105 Boston Post Road, Sudbury, Massachusetts

Dear Lori and Commissioners:
Enclosed herewith is the Abbreviated Notice of Resource Area Delineation (ANRAD) for the property at 105 Boston Post Road in Sudbury. This is being filed under both the Mass. Wetlands Protection Act and the Sudbury Wetlands Administration Bylaw.

The enclosed filing includes the following documents:

- Completed Mass WPA Form 4A.

ATTACHMENTS

1. List of Abutters
2. Copies of Filing Checks
3. Wetland Delineation Review by DGT Associates, 11/19/2020 (Contains Locus Map)
4. Existing Conditions Boundary Plan by CHA Consultants, dated 11/12/2019 Stamped 12/02/2019.

Note that I am filing this electronically via e-mail and will be dropping off a complete set with the filing fee checks today as well.

We are also filing these with the Mass. DEP Northeast Region and Lock Box as required.
Please do not hesitate to contact me should you have any questions or need additional information.

Sincerely,
DGT Associates

Fredric W. King

Fredric W. King, P.E.
Senior Engineer and Wetland Specialist

Enclosures as listed above.

CC: Mass. DEP Northeast Region
John Welch
Joshua Fox
Gabe Crocker

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4A – Abbreviated Notice of Resource Area Delineation

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

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Sudbury
City/Town

A. General Information

1. Project Location (**Note:** electronic filers will click on button for GIS locator):

105 Boston Post Road — a. Street Address
Sudbury — b. City/Town
01776 — c. Zip Code

Latitude and Longitude:
42.362350 — d. Latitude
71.392750 — e. Longitude

K11 — f. Assessors Map/Plat Number
0017 — g. Parcel /Lot Number

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

2. Applicant:

John — a. First Name
Welch — b. Last Name
Herb Chambers of Sudbury, Inc. — c. Organization
259 McGrath HWY — d. Mailing Address
Somerville — e. City/Town
MA — f. State
01243 — g. Zip Code
617-666-8333 — h. Phone Number
i. Fax Number
jwelch@herbchambers.com — j. Email Address

3. Property owner (if different from applicant):

☐ Check if more than one owner (attach additional sheet with names and contact information)

John — a. First Name
Welch — b. Last Name
Herb Chambers 83 Boston Post Road, LLC - C/O Herb Chambers Companies — c. Organization
259 McGrath HWY — d. Mailing Address
Somerville — e. City/Town
MA — f. State
01243 — g. Zip Code
617-666-8333 — h. Phone Number
i. Fax Number
jwelch@herbchambers.com — j. Email Address

Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

4. Representative (if any):

Fredric — a. Contact Person First Name
King — b. Contact Person Last Name
DGT Associates, Inc. — c. Organization
1071 Worcester Road — d. Mailing Address
Framingham — e. City/Town
MA — f. State
01701 — g. Zip Code
774-244-7717 — h. Phone Number
508-879-1797 — i. Fax Number
fking@dgtassociates.com — j. Email Address

Fees will be calculated for online users.

5. Total WPA Fee Paid (from attached ANRAD Wetland Fee Transmittal Form):

$ 1,354 — a. Total Fee Paid
$689.50 — b. State Fee Paid
$ 664.50 — c. City/Town Fee Paid

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4A – Abbreviated Notice of Resource Area Delineation

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

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Sudbury
City/Town

B. Area(s) Delineated

1. Bordering Vegetated Wetland (BVW) — 677 Linear Feet of Boundary Delineated

2. Check all methods used to delineate the Bordering Vegetated Wetland (BVW) boundary:

   a. ☐ MassDEP BVW Field Data Form (attached)

   b. ☒ Other Methods for Determining the BVW boundary (attach documentation):

      1. ☒ 50% or more wetland indicator plants
      2. ☒ Saturated/inundated conditions exist
      3. ☒ Groundwater indicators
      4. ☒ Direct observation
      5. ☒ Hydric soil indicators
      6. ☐ Credible evidence of conditions prior to disturbance

3. Indicate any other resource area boundaries that are delineated:

a. Resource Area _____ b. Linear Feet Delineated _____

c. Resource Area _____ d. Linear Feet Delineated _____

C. Additional Information

Applicants must include the following plans with this Abbreviated Notice of Resource Area Delineation. 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.

1. ☒ ANRAD (Delineation Plans only)
2. ☒ 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. (Electronic filers may omit this item.)
3. ☒ Plans identifying the boundaries of the Bordering Vegetated Wetlands (BVW) (and/or other resource areas, if applicable).
4. ☒ List the titles and final revision dates for all plans and other materials submitted with this Abbreviated Notice of Resource Area Delineation.

D. Fees

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4A – Abbreviated Notice of Resource Area Delineation

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

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Sudbury
City/Town

The fees for work proposed under each Abbreviated Notice of Resource Area Delineation must be calculated and submitted to the Conservation Commission and the Department (see Instructions and Wetland Fee Transmittal Form).

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 the attached Wetland Fee Transmittal Form) to confirm fee payment:

5534	11/19/2020
2. Municipal Check Number	3. Check date
5533	11/19/2020
4. State Check Number	5. Check date
Herb Chambers 83 Boston Post Road, LLC	
6. Payor name on check: First Name	7. Payor name on check: Last Name

E. Signatures

I certify under the penalties of perjury that the foregoing Abbreviated Notice of Resource Area Delineation and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4A – Abbreviated Notice of Resource Area Delineation

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

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Sudbury
City/Town

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 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.

I hereby grant permission, to the Agent or member of the Conservation Commission and the Department of Environmental Protection, to enter and inspect the area subject to this Notice at reasonable hours to evaluate the wetland resource boundaries subject to this Notice, and to require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.

I acknowledge that failure to comply with these certification requirements is grounds for the Conservation Commission or the Department to take enforcement action.

1. Signature of Applicant — 2. Date: 11-18-20

3. Signature of Property Owner (if different) — 4. Date

Fredric W. King — 11-23-2020

5. Signature of Representative (if any) — 6. Date

For Conservation Commission:
Two copies of the completed Abbreviated Notice of Resource Area Delineation (Form 4A), including supporting plans and documents; two copies of the ANRAD Wetland Fee Transmittal Form; and the city/town fee payment must be sent to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Abbreviated Notice of Resource Area Delineation (Form 4A), including supporting plans and documents; one copy of the ANRAD Wetland Fee Transmittal Form; and a copy of the state fee payment must be sent to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery. (E-filers may submit these electronically.)

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

ANRAD Wetland Fee Transmittal Form

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

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

A. Applicant Information

1. Location of Project:

105 Boston Post Road	Sudbury
a. Street Address	b. City/Town
$ 664.50	
c. Fee amount	d. Check number

2. Applicant:

John	Welch	Herb Chambers of Sudbury
a. First Name	b. Last Name	c. Company
259 McGrath Hwy		
d. Mailing Address		
Somerville	MA	01243
e. City/Town	f. State	g. Zip Code
617-666-8333		
h. Phone Number		

3. Property Owner (if different):

John	Welch	Herb Chambers Companies
a. First Name	b. Last Name	c. Company
259 McGrath Hwy		
d. Mailing Address		
Somerville	MA	02143
e. City/Town	f. State	g. Zip Code
617-666-8333		
h. Phone Number		

B. Fees

The fee is calculated as follows for each Resource Area Delineation included in the ANRAD (check applicable project type). The maximum fee for each ANRAD, regardless of the number of Resource Area Delineations, is $200 activities associated with a single-family house and $2,000 for any other activity.

☐ **Online users:** check box if fee exempt.

Bordering Vegetated Wetland Delineation Fee:

1. ☐	single family house project	a. feet of BVW	x $2.00 =	b. Fee for BVW
2. ☒	all other projects	677 a. feet of BVW	$ 1,354 x $2.00 =	$ 1,354 b. Fee for BVW

Other Resource Area (e.g., bank, riverfront area, etc.):

3. ☐	single family house project	a. linear feet	x $2.00 =	b. Fee
4. ☐	all other projects	a. linear feet	x $2.00 =	b. Fee

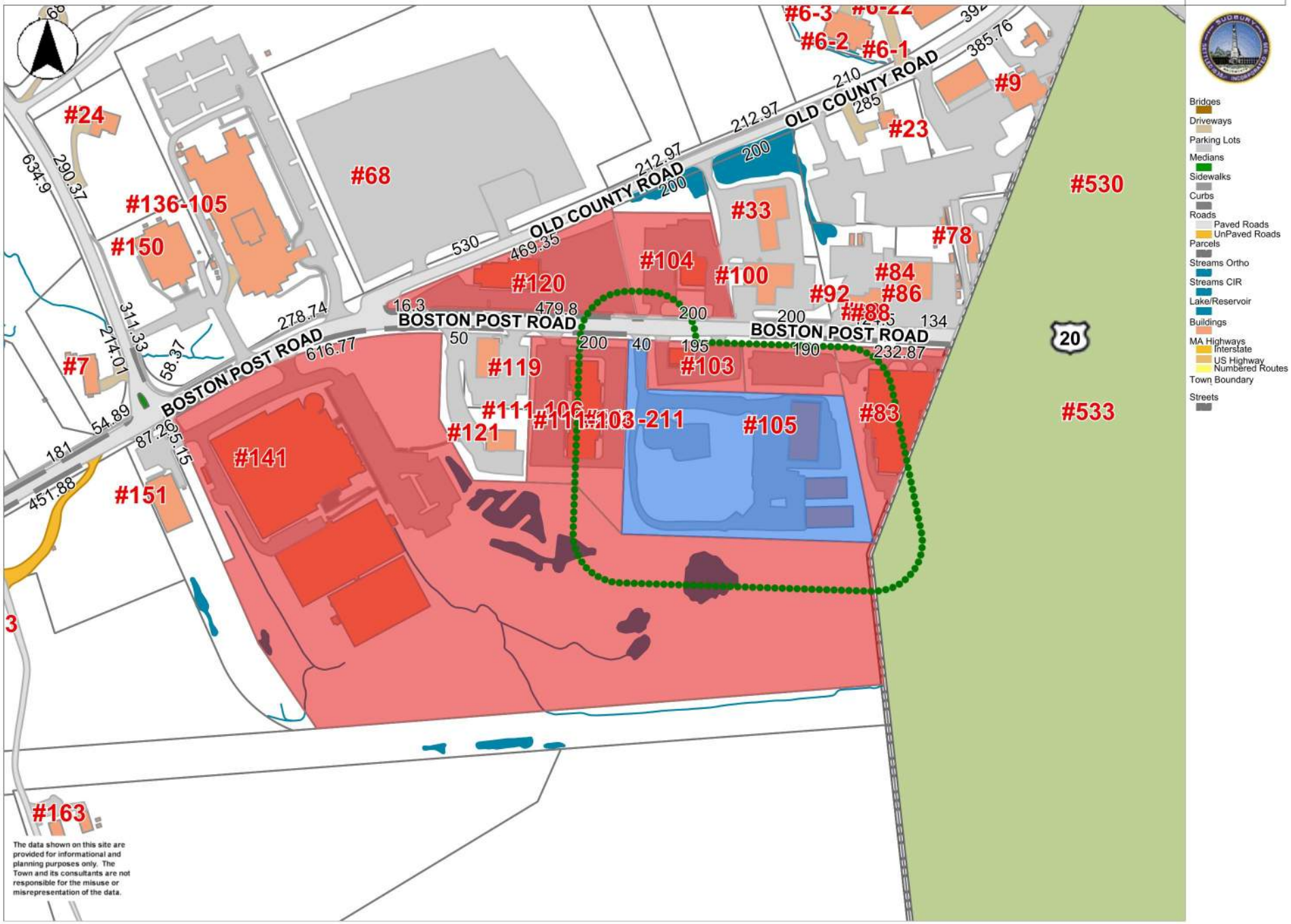
Total Fee for all Resource Areas:	$ 1,354 Fee
State share of filing fee:	$ 664.50 5. 1/2 of total fee **less** $12.50
City/Town share of filing fee:	$ 689.50 6. 1/2 of total fee **plus** $12.50

ANRAD FILING

105 BOSTON POST R
SUDBURY, MA

ATTACHMENT 1

LIST OF ABUTTERS



0 350 700 ft

Printed on 11/16/2020 at 02:37 PM

MapsOnline

From:	Gerry, Cynthia
To:	Fred King; Assessors, Board of
Subject:	RE: Check of Abutters lists for 105 and 141 Boston Post Road
Date:	Monday, November 16, 2020 4:35:10 PM

Good Afternoon-
The lists have been reviewed and verified. Both reflect current ownership and mailing information according to the Sudbury Assessor's Office records.
Best Regards,
Cynthia Gerry
Sudbury Assessors Office

From: Fred King <FKing@dgtassociates.com>
Sent: Monday, November 16, 2020 3:16 PM
To: Assessors, Board of <Assessors@sudbury.ma.us>
Subject: Check of Abutters lists for 105 and 141 Boston Post Road

Dear Assessors.
We are getting ready to file with the Conservation Commission for an Abbreviated Notice of Wetlands Area Delineation (ANRAD).
A separate filing is being made for each of the subject properties. 100 foot abutters distance.
As you instructed, I have prepared the attached Abutters List and map from the Sudbury GIS Mapping for each property and ask if you could check the prepared lists for any recent abutter changes.

If you have any questions, please do not hesitate to contact me.

Thank you for your instruction on preparing the list. It worked very well.

Sincerely,

Fred King

Fredric W. King, P.E., LEED® AP
Senior Engineer, Senior Wetland Specialist
DGT Associates (formerly Schofield Brothers)

DGT Associates
Surveying & Engineering

1071 Worcester Road
Framingham, MA 01701

Office: 508-879-0030
Direct: 857-524-1434
Cell: 774-244-7717
fking@dgtassociates.com

Abutters List print this list

Date: November 16, 2020

Subject Property Address: 105 BOSTON POST RD Sudbury, MA
Subject Property ID: K11-0017

Search Distance: 100 Feet

Prop ID: K11-0007
Prop Location: 120 BOSTON POST RD Sudbury, MA
Owner: 120 BOSTON POST ROAD LLC
Co-Owner:
Mailing Address:

12 WASHINGTON ST
WELLESLEY, MA 02481

Prop ID: K11-0008
Prop Location: 104 BOSTON POST RD Sudbury, MA
Owner: SCF RC FUNDING IV LLC
Co-Owner:
Mailing Address:
902 CARNEGIE CENTER BLVD STE 520
PRINCETON, NJ 08542

Prop ID: K11-0015
Prop Location: 83 BOSTON POST RD Sudbury, MA
Owner: LAND ROVER METROWEST
Co-Owner:
Mailing Address:
83 BOSTON POST RD
SUDBURY, MA 01776

Prop ID: K11-0016
Prop Location: 103 BOSTON POST RD Sudbury, MA
Owner: LOTUS FAMILY ENTERPRISE LLC
Co-Owner:
Mailing Address:
27 GOODMANS HILL RD
SUDBURY, MA 01776

Prop ID: K11-0019
Prop Location: 141 BOSTON POST RD Sudbury, MA
Owner: RICHARD J BOSSE HOLDINGS LLC
Co-Owner:
Mailing Address:
141 BOSTON POST RD
SUDBURY, MA 01776

Prop ID: K11-0099
Prop Location: BOSTON POST RD Sudbury, MA
Owner: LAND ROVER METROWEST
Co-Owner:
Mailing Address:
83 BOSTON POST RD
SUDBURY, MA 01776

Prop ID: K11-0100-0-101
Prop Location: 111 BOSTON POST RD UNIT 101 Sudbury, MA
Owner: SUMMERS PHILIP W & CATHLEEN H
Co-Owner: TRUSTEES KMC REALTY TRUST
Mailing Address:
179 GREAT RD STE 109
ACTON, MA 01720

Prop ID: K11-0100-0-102
Prop Location: 111 BOSTON POST RD UNIT 102 Sudbury, MA
Owner: NOVUM 111 LLC
Co-Owner:
Mailing Address:
111 BOSTON POST RD 102
SUDBURY, MA 01776

Prop ID: K11-0100-0-103
Prop Location: 111 BOSTON POST RD UNIT 103 Sudbury, MA
Owner: ZHANG YAO
Co-Owner:
Mailing Address:
81 MAPLE LN
NORTHBOROUGH, MA 01532

Prop ID: K11-0100-0-104
Prop Location: 111 BOSTON POST RD UNIT 104 Sudbury, MA
Owner: 104-106 VILLAGE EAST LLC
Co-Owner:
Mailing Address:
49 BAY DRIVE
SUDBURY, MA 01776

Prop ID: K11-0100-0-105
Prop Location: 111 BOSTON POST RD UNIT 105 Sudbury, MA
Owner: OCEANO INC
Co-Owner: C/O PATRICIA SALVUCCI
Mailing Address:
3 CLARENDON ST
GLOUCESTER, MA 01930

Prop ID: K11-0100-0-106
Prop Location: 111 BOSTON POST RD UNIT 106 Sudbury, MA
Owner: 104-106 VILLAGE EAST LLC
Co-Owner:
Mailing Address:
49 BAY DRIVE
SUDBURY, MA 01776

Prop ID: K11-0100-0-107
Prop Location: 111 BOSTON POST RD UNIT 107 Sudbury, MA
Owner: MOHIT ENTERPRISES LLC
Co-Owner:
Mailing Address:
131 ORNAC SUITE 610
CONCORD, MA 01742

Prop ID: K11-0100-0-108
Prop Location: 111 BOSTON POST RD UNIT 108 Sudbury, MA
Owner: TARR BRYANT
Co-Owner:
Mailing Address:

111 BOSTON POST RD 108
SUDBURY, MA 01776

Prop ID: K11-0100-0-209
Prop Location: 111 BOSTON POST RD UNIT 209 Sudbury, MA
Owner: CANTWELL REALTY LLC
Co-Owner: C/O WILLIAM G MCCARTHY
Mailing Address:
25 WESTGATE RD
FRAMINGHAM, MA 01701

Prop ID: K11-0100-0-210
Prop Location: 111 BOSTON POST RD UNIT 210 Sudbury, MA
Owner: DIVINE HEART REALTY LLC
Co-Owner:
Mailing Address:
88 PLYMPTON RD
SUDBURY, MA 01776

Prop ID: K11-0100-0-211
Prop Location: 111 BOSTON POST RD UNIT 211 Sudbury, MA
Owner: ABC SOILS INC
Co-Owner:
Mailing Address:
111 BOSTON POST RD 211
SUDBURY, MA 01776

Prop ID: K11-0100-0-212
Prop Location: 111 BOSTON POST RD UNIT 212 Sudbury, MA
Owner: LIONSGATE PROPERTIES LLC
Co-Owner:
Mailing Address:
29 FARRAGUT RD
BOSTON, MA 02127

Prop ID: K11-0100-0-213
Prop Location: 111 BOSTON POST RD UNIT 213 Sudbury, MA
Owner: HOWE DEVELOPMENT CORP

Co-Owner:
Mailing Address:
111 BOSTON POST RD STE 213
SUDBURY, MA 01776

Prop ID: K11-0100-0-214
Prop Location: 111 BOSTON POST RD UNIT 214 Sudbury, MA
Owner: ABC SOILS INC
Co-Owner:
Mailing Address:
111 BOSTON POST RD 214
SUDBURY, MA 01776

Prop ID: K11-0100-0-215
Prop Location: 111 BOSTON POST RD UNIT 215 Sudbury, MA
Owner: K.A.B. & J .C.J. LLC
Co-Owner:
Mailing Address:
111 BOSTON POST RD U215
SUDBURY, MA 01776

Prop ID: K11-0100-0-216
Prop Location: 111 BOSTON POST RD UNIT 216 Sudbury, MA
Owner: SAI LUNG LLC
Co-Owner:
Mailing Address:
P.O. BOX 329
WAYLAND, MA 01778

ANRAD FILING

105 BOSTON POST R
SUDBURY, MA

ATTACHMENT 2

COPIES OF FILING CHECKS

5534

HERB CHAMBERS 83 BOSTON POST ROAD, LLC
47 EASTERN BOULEVARD
GLASTONBURY, CT 06033

BANK OF AMERICA
51-57/119

Memo: WPA Town Fee

Six Hundred Eighty-Nine and 50/100 Dollars

	DATE	AMOUNT
5534	Nov 19, 2020	**********$689.50

PAY TO THE ORDER OF
Town of Sudbury
275 Old Lancaster Road
Sudbury, MA 01776

VOID AFTER 90 DAYS

AUTHORIZED SIGNATURE

Security features. Details on back.

⑈005534⑈ ⑆011900571⑆ 0038528738 35⑈

5533

HERB CHAMBERS 83 BOSTON POST ROAD, LLC
47 EASTERN BOULEVARD
GLASTONBURY, CT 06033

BANK OF AMERICA
51-57/119

Memo: WPA State Fee

Six Hundred Sixty-Four and 50/100 Dollars

	DATE	AMOUNT
5533	Nov 19, 2020	**********$664.50

PAY TO THE ORDER OF
Commonwealth of Massachussetts
Boston, MA 02108

VOID AFTER 90 DAYS

AUTHORIZED SIGNATURE

Security features. Details on back.

⑈005533⑈ ⑆011900571⑆ 0038528738 35⑈

5535

HERB CHAMBERS 83 BOSTON POST ROAD, LLC
47 EASTERN BOULEVARD
GLASTONBURY, CT 06033

BANK OF AMERICA
51-57/119

Memo: Town Bylaw Fee 105 Boston Post

One Thousand Three Hundred Fifty-Four and 00/100 Dollars

	DATE	AMOUNT
5535	Nov 19, 2020	********$1,354.00

PAY TO THE ORDER OF
Town of Sudbury
275 Old Lancaster Road
Sudbury, MA 01776

VOID AFTER 90 DAYS

AUTHORIZED SIGNATURE

Security features. Details on back.

⑈005535⑈ ⑆011900571⑆ 0038528738 35⑈

ANRAD FILING

105 BOSTON POST R
SUDBURY, MA

ATTACHMENT 3

WETLAND DELINEATION REPORT

DGT Associates
Surveying &
Engineering

1071 Worcester Rd.
Framingham, MA 01701
508.879.0030
www.dgtassociates.com

November 19, 2020 25638

Mr. John Welch
Herb Chambers of Sudbury
259 McGrath Hwy
Somerville, MA 02143

RE: 105 Boston Post Road, Sudbury – Wetland Resource Area Delineation Review

Dear Mr. Welch,

DGT Associates performed a review of the delineation of the boundaries of the Bordering Vegetated Wetlands (BVW) and Bordering Land Subject to Flooding (BLSF) at the subject property on September 25, 2020. The review of the delineations were performed by this writer, Fredric King, Senior Wetland Specialist.

The BVW delineation was performed by James Hall, PWS of CHA Consultants in October of 2019 to define Bordering Vegetated Wetland (BVW) Boundaries under the Mass. Wetlands Protection Act for use in the planning for a possible redevelopment of the property. Prior to the DGT review, surveyors from CHA Consulting re-staked and marked the delineation flagging to refresh the line. The BVW boundary is shown on the Existing Conditions Boundary Plan by CHA Consulting dated 11/12/2019.

The above plan also shows the elevation of the 100 Year Flood (1% chance of flooding) from the current FEMA Flood Hazard Map and Profile data for "Land Subject To Flooding" under the Mass. Wetlands Protection Act.

GENERAL SITE DESCRIPTION:

The project site is a 3.4 acre tract of land at 105 Boston Post Road in Sudbury, Massachusetts. The land contains 3 buildings that were formerly used as a maintenance and salt storage facility by the Mass. DOT with associated driveways, paved and gravel parking lots, septic system and utilities. The major portion of the site is developed for that use.

The site is in the watershed of Wash Brook located approximately 1000 feet south of the site. Wetland resource areas including Bordering Land Subject to Flooding (associated with the Sudbury River), and Bordering Vegetated Wetlands are located just off the site on abutting property to the south. The natural BVWs include shallow marshes and shrub swamps.

SOILS

The NRCS Web Soil Survey[1] indicates the near-surface soils (within about 70 inches from ground surface) at the site are classified as "Udorthents Urban Land Complex" within the developed (upland) portions of the site. The natural wetland areas are identified as "Freetown Muck".

WETLAND RESOURCE AREAS

BORDERING VEGETATED WETLANDS (BVW) REVIEW.

Per your request, DGT reviewed the delineation of Bordering Vegetated Wetlands that was previously performed by James Hall, PWS of CHA Consultants. This review was performed by this writer, Fredric King on September 25, 2020.

The BVWs at this site is located just off the site on the abutting property to the south. The delineation was marked by stakes and survey flagging numbered WF A-1 to WF A-29 and are shown on the survey plan. The boundary is on a steep fill slope into the wetland area. The majority of the wetland is a shallow marsh with a predominance of Common Reed (Phragmites australis) at this location. I found that the wetland boundary is easily determined by simple direct observation due to the steep fill bank that ends at the wetland.

The delineation is generally marked a few feet up the fill embankment and I had no disagreement with any of the flagged locations.

BORDERING LAND SUBJECT TO FLOODING REVIEW

The site is shown on the latest FEMA National Flood Insurance Program mapping as being in a Flood Zone AE. The elevation of the 100 year (1% chance of flooding) has been determined by the FEMA Flood Study Profile Data as Elevation 121.0 (1988 NAVD). According to FEMA, the elevation of the flooding in this area is the result of the backwater of the Sudbury River flooding. The topographic survey of the site by CHA is on this datum and the 121.0 contour is shown on the survey plan.

The boundary of BLSF is the 121 foot contour and this contour comes into the subject property along the southwest corner. DGT reviewed the FEMA mapping and Flood Profile information and concur with the CHA mapping.

DGT Associates
Surveying & Engineering

RE: 105 Boston Post Road, Sudbury, MA
Wetland Resource Area Delineation Review

November 19, 2020

NATURAL HERITAGE ENDANGERED SPECIES

According to the latest Mass. Division of Fisheries and Wildlife - Natural Heritage Program mapping, the southeastern portion of the site is in an area of "Priority Habitat of Rare Species" (Identified as PH 1434). This same area is also identified as an area of "Estimated Habitat of Rare Wetland Wildlife".

There are no officially "Certified Vernal Pools" in the vicinity of the site. However, the NHESP does identify the small ponding area on abutting property off the site to the south within the wetland area as a "Potential Vernal Pool". Note that during a Wetlands Filing for the abutting property in 2002 and 2003 (Ref DEP File #301-726), an investigation was conducted on the small pool mentioned above. This ponding area was found to provide vernal pool habitat.

Please note that the delineations performed are based on best professional judgment and interpretation per the applicable regulatory guidelines. The delineations are not an official "Determination" under the applicable wetlands laws and regulations until accepted by the Conservation Commission or Mass. DEP through the filing of an Abbreviated Notice of Resource Area Delineation or a Notice of Intent under the Mass. Wetlands Protection Act and local wetlands laws and regulations.

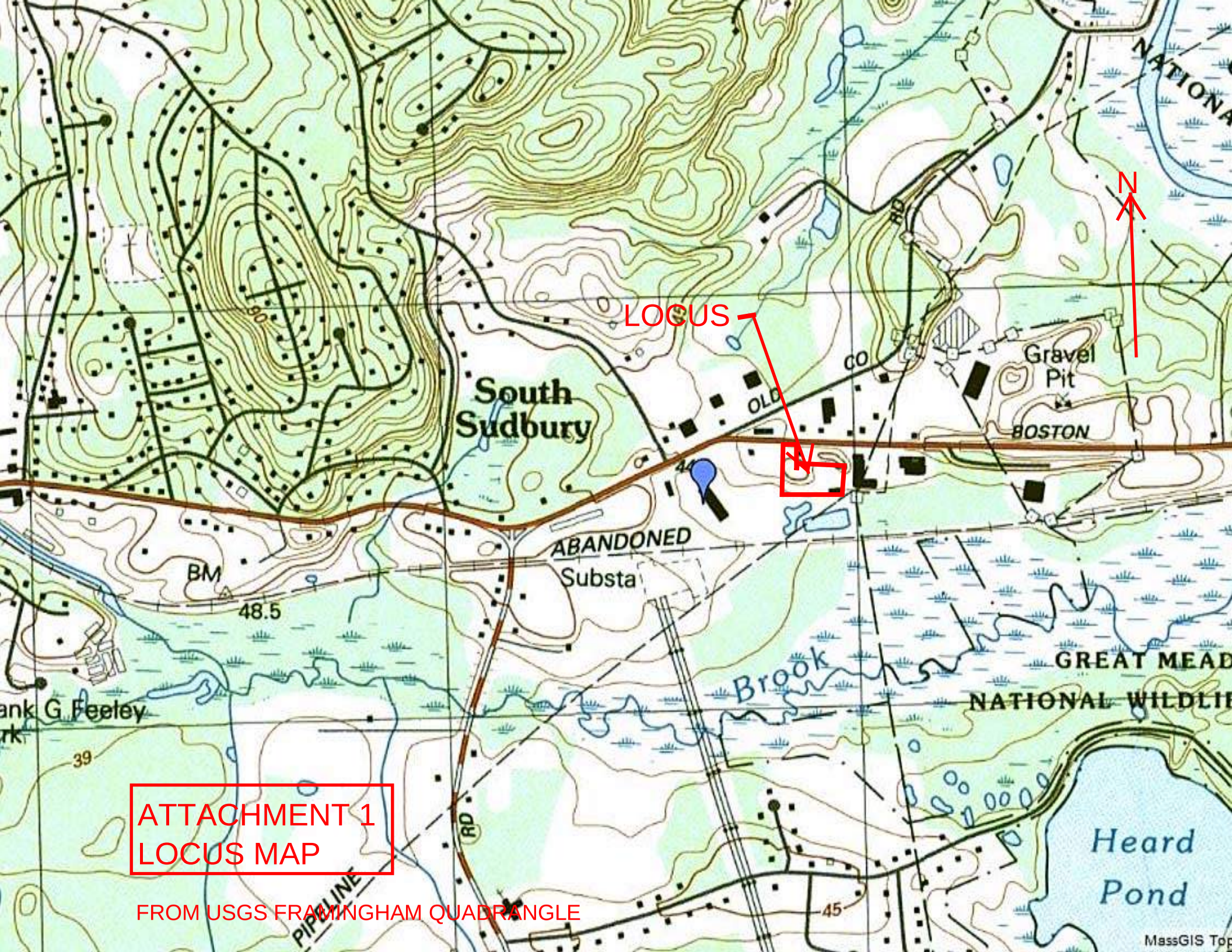
If you have any questions regarding the delineation or this report, please contact me.

Sincerely,
DGT Associates

Fredric W. King

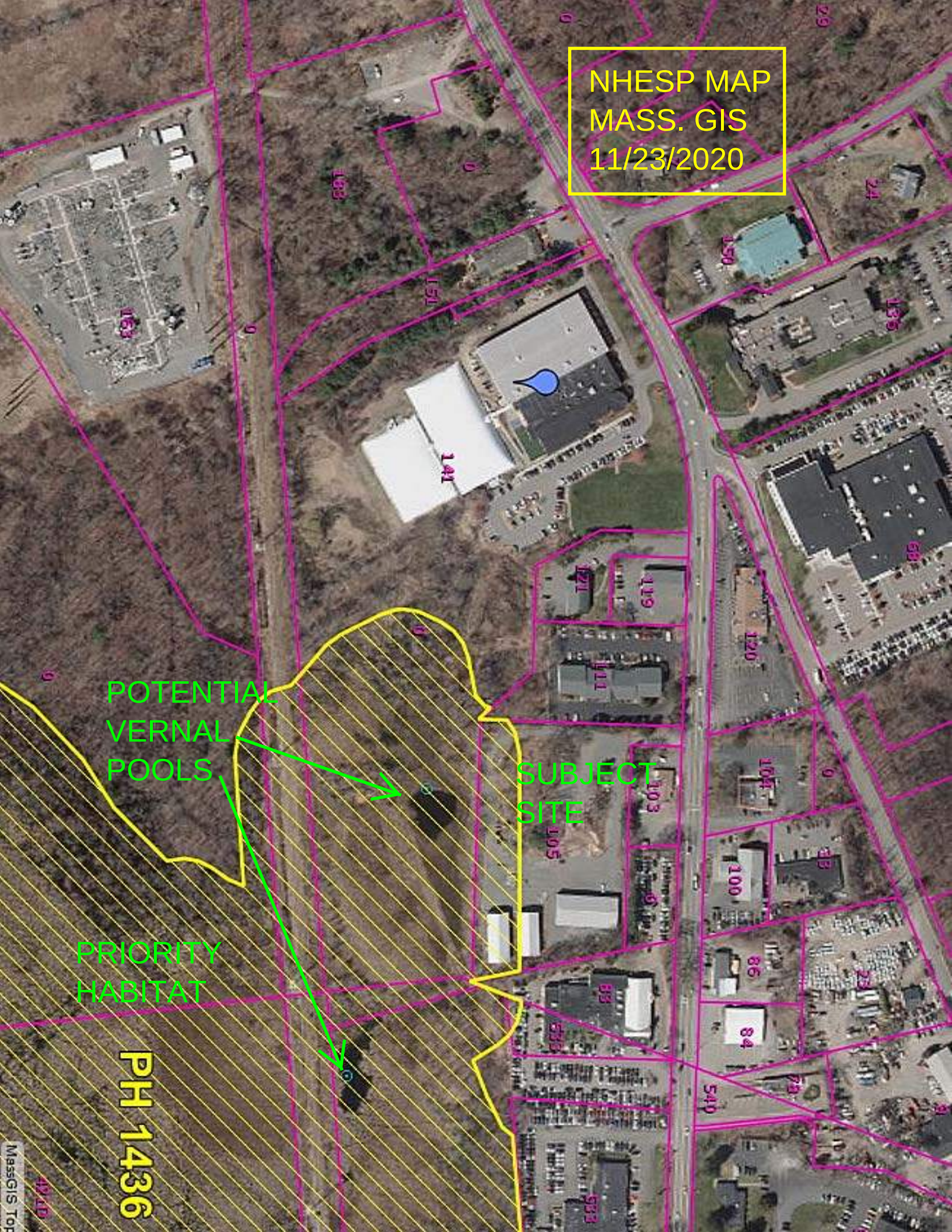
Fredric W. King, PE
Senior Engineer &
Wetland Specialist

Attachments:
1. Locus Map
2. Natural Heritage (NHESP Map)



ATTACHMENT 1
LOCUS MAP

FROM USGS FRAMINGHAM QUADRANGLE


NHESP MAP
MASS. GIS
11/23/2020
POTENTIAL
VERNAL
POOLS
SUBJECT
SITE
PRIORITY
HABITAT
PH 1436
MassGIS Top

ANRAD FILING

105 BOSTON POST R
SUDBURY, MA

ATTACHMENT 4

EXISTING CONDITIONS PLAN

Section 6

Additional Information

LONG-TERM STORMWATER OPERATION & MAINTENANCE PLAN

HERB CHAMBERS OF SUDBURY, INC.

105 BOSTON POST ROAD
SUDBURY, MA 01776

PROJECT OVERVIEW:

The proposed project consists of the construction of an inventory lot for the Herb Chambers of Sudbury, Inc. at the former MA DOT site in Sudbury, Massachusetts. Proposed work also includes the renovation of the existing 2-story metal structure to a vehicle service building, as well as designated parking for employees and vehicle service customers. The project has been designed to comply with the Massachusetts Stormwater Management Regulations.

Appended to this document is a sample maintenance form and a chart describing the anticipated frequency of tasks.

OWNER AND RESPONSIBLE PARTY:

Current Land Owners:
Herb Chambers 83 Boston Post
83 Boston Post Road
Sudbury, MA 01776

Proposed Site Contractor:
TBD

For any service beyond the service ability of staff on site for Herb Chambers, there will be subcontracting to the appropriate vendors such as street sweeping, catch basin and water quality unit cleaning, etc.

CONSTRUCTION MANAGEMENT:

A construction manager with adequate knowledge and experience on projects of similar size and scope shall be employed to oversee all site work related construction. The contractor shall incorporate the appropriate techniques to control sediment and erosion pollution during construction in accordance with the *Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas* and any conditions of approval from the local conservation commission.

Care should be taken when constructing stormwater control structures. Light earth-moving equipment shall be used to excavate in the vicinity of the infiltration areas. Use of heavy-equipment causes excessive compaction of the soils beneath the basin resulting in reduced

infiltration capacity. At no time shall temporary infiltration areas or settling basins be constructed in the vicinity of the proposed infiltration basins in order to prevent the soils from becoming clogged with sediment.

ON-GOING MAINTENANCE CONTRACT

The non-structural and structural approaches recommended below, as well as the required BMP maintenance, will be completed by the selected contractor. In Adequate personnel with appropriate training and access to proper equipment will be available to complete the tasks. Future responsible parties must be notified of their responsibility to operate and maintain the system in perpetuity.

MAINTENANCE LOG

The Responsible Party shall develop and maintain a log of inspections, maintenance, repairs, and disposal (including location of disposal) during the life of the project. Records will be maintained for at least 3 years and be made available to the Massachusetts Department of Environmental Protection or the Town of Sudbury in accordance with the provisions of the Massachusetts Stormwater Handbook. A sample of such a maintenance log is provided.

STORMWATER BMP MAINTENANCE

The proposed stormwater management system has been designed with appropriate BMPs aimed at reducing the pollutants discharge based upon the intended use of the property. All BMPs require regular maintenance to function as intended. Some management measures have simple maintenance requirements; others are more involved. The Responsible Party must have all BMPs regularly inspected to ensure they are operating properly on an as needed basis, including during runoff events exceeding 0.5 inches of rainfall.

A description of the non-structural and structural approaches to be incorporated is indicated below. The following best management practices are proposed to be incorporated into the stormwater management design to reduce source runoff and improve stormwater runoff discharge quality. The Responsible Party will regularly inspect all BMPs to ensure they are operating properly. If any deficiencies are identified during these inspections, action to resolve it will be initiated and documented on the maintenance log.

STRUCTURAL BMPs

<u>Deep Sump Hooded Catch Basins and Area/Yard Drains</u>

On a regular basis the inlet pipe and outlet pipe shall be checked for debris and removed as necessary to ensure unobstructed flow of water. Inspections shall occur at least four times per year, and at the end of the foliage and snow removal seasons. Inspections shall verify the tees are secure and free flowing. Sediments must also be removed four times per year or whenever the depth of deposits is greater than or equal

to one half the depth from the bottom of the invert of the lowest pipe in the basin. Basins shall be cleaned using a vacuum pump. All liquid shall be pumped from the sump of each basin at least once per year. All sediments and hydrocarbons should be properly handled and disposed of in accordance with local, state and federal guidelines and regulations.

Oil/Grit Separators

At a minimum, oil grit separators should be inspected monthly and sediment, trash and pollutants shall be cleaned out at least twice per year. In areas of high sediment loading, inspect and clean inlets and outlets after every major storm. Basins shall be cleaned using a vacuum pump. All sediments and hydrocarbons should be properly handled and disposed of in accordance with local, state and federal guidelines and regulations.

Subsurface Detention System

The subsurface system (retain-it, 3.5' tall) has been designed with an access manhole to aid in the removal of sediment and debris. Preventative maintenance shall be performed in accordance with manufacturer's instructions, which is enclosed in this section. Retain-it suggests periodic inspections with a greater number occurring during the systems start-up to identify any issues of concern as they may arise. Cleaning will take place at the completion of construction and as deemed necessary based on the inspections. Retain-it recommends use of a vacuum truck to suction the accumulated sediment, oils and greases, and trash and debris from the system. Oils and greases may additionally be handled by on-site staff utilizing absorbent products to soak up the oils. Refer to the enclosed "retain-it Owners Maintenance Manual."

Proprietary Water Quality Units

Hydrodynamic Separators shall be maintained in accordance with the manufacturer's recommendations. Refer to the enclosed "SciClone Operation & Maintenance" guide. Typically, a vacuum truck removes accumulated sediment and oil most efficiently. See maintenance documentation from the manufacturer. Inspection should occur at least twice annually, once in the fall and then in the spring after the snow melts. Ideally the unit should be checked frequently throughout the first year, and that will dictate the schedule going forward. All sediment and hydrocarbons should be properly handled and disposed of in accordance with local, state and federal guidelines and regulations. Cleaning will take place at the completion of construction and as deemed necessary based on the inspections and manufacturer's requirements.

NON-STRUCTURAL BMPs

Pavement Sweeping

As street sweeping is a BMP under DEP guidelines, this non-structural BMP is an effective removal of Total Suspended Solids (TSS) in a comprehensive stormwater management program. Litter and debris is to be regularly picked up and removed from the pavement and porous pavers. Paved areas are to be swept a minimum of quarterly per year.

Pervious Areas and Slopes

Runoff from pervious areas and slopes shall be directed over vegetated areas to promote settlement of suspended solids before entering a wetland or resource area. Steep pervious slopes will be permanently vegetated to dissipate energy and reduce potential erosion. No constructed vegetated slopes should exceed 2H:1V. Slopes exceeding 2:1 shall be stabilized with rip-rap, jute netting or other similar measures to minimize the potential for future erosion.

Drainage Control Structures, Flared End Sections, Trash Racks, Riprap Pads, Swales, and Level Spreader Splash Pads

Basin control structures and flared end sections shall be inspected and any debris or growth surrounding or within these structures shall be removed. Any/all debris or vegetation encroaching on the control structures our outfall components shall be removed or appropriately trimmed back to maintain the designed control elevation and flow patterns/cross section without impediment. Inspection should occur twice annually, once in the fall and then in the spring after the snow melts. Cleaning will take place at the completion of construction and as deemed necessary based on the inspections and manufacturer's requirements.

Porous Pavement

Porous pavement sections on site shall be monitored annually and following any storms to ensure proper drainage and note any deterioration. The surface shall be cleaned using power washers to dislodge any trapped particles followed by a vacuum sweep of the area. Exfiltration capability shall be assessed minimum once a year and as needed if capacity is found to decline. Repair as necessary and reseed grass pavers if bare spots arise.

Pest and Insect Control

- As a first-line defense against pests/insects and weeds (the "First-Line Defense"), the party responsible for maintenance shall avoid the use of non-organic pesticides, herbicides, fungicides and insecticides unless spot treatment is required for a specific control application. The owner shall not

be required to undertake extraordinary measures or incur unreasonable cost to locate, purchase or apply non-organic products.

- If the First-Line Defense fails, as determined by the owner or party responsible for maintenance, in its sole but reasonable discretion, non-organic approaches to pest/insect control may be used, the same to be applied by a professional licensed in the Commonwealth of Massachusetts, where required. But in no event shall such non-organic approaches be used within the 50ft. buffer zone to the wetlands, or within the Zone A.

Waste Management

Solid waste and recycling will be contained in dumpsters for routine and regular trash pickup.

Snow Removal

There shall be no plowing of stockpiling of snow within any resource areas. Deicing compounds must be stored or sheltered on impervious pads (i.e. in the maintenance facility). No de-icing compounds shall be stored or utilized in wetland resource areas nor the 50-foot buffer. Snow that is plowed from the paved driveway surfaces shall be plowed to the edges of the pavement. When capacity of these areas is exceeded, accumulated snow shall be removed or a sector of designated trailer parking spaces shall be utilized to stockpile snow on-site. Refer to the enclosed O&M Map which identifies location of BMPs and provides additional Snow Removal information.

It is anticipated the Sudbury Conservation Commission will include a condition of approval regarding prohibition of the use of de-icing chemicals except for magnesium acetate or an alternate approved by the Commission. Refer to the Order of Conditions issued by the Commission. Further approvals may be required should the Applicant wish to propose the use of alternate deicing materials other than what is ultimately conditioned in the Order

Hazardous Waste and Spill Control Containment

In the event of a discharge or spill of oil or another hazardous material, outlets to stormwater management facilities immediately downstream of the spill shall be plugged so that hazardous materials do not enter the system. In the event of a discharge of oil or other hazardous material, responsible facility personnel shall notify the appropriate state agencies, the Town of Sudbury DPW and the EPA National Response Center 1-800-424-8802 shall be notified. All hazardous waste materials will be disposed of in a manner specified by local, state and/or federal regulations and by the manufacturer of such products.

Stormwater BMP Inspection and Maintenance Log

Facility Name	
Address	
Begin Date	End Date

Date	BMP ID#	BMP Description	Inspected by:	Cause for Inspection	Exceptions Noted	Comments and Actions Taken

Instructions: Record all inspections and maintenance for all treatment BMPs on this form. Use additional log sheets and/or attach extended comments or documentation as necessary. Submit a copy of the completed log with the annual independent inspectors' report to the municipality and start a new log at that time.

BMP ID# — Always use ID# from the Operation and Maintenance Manual.

Inspected by — Note all inspections and maintenance on this form, including the required independent annual inspection.

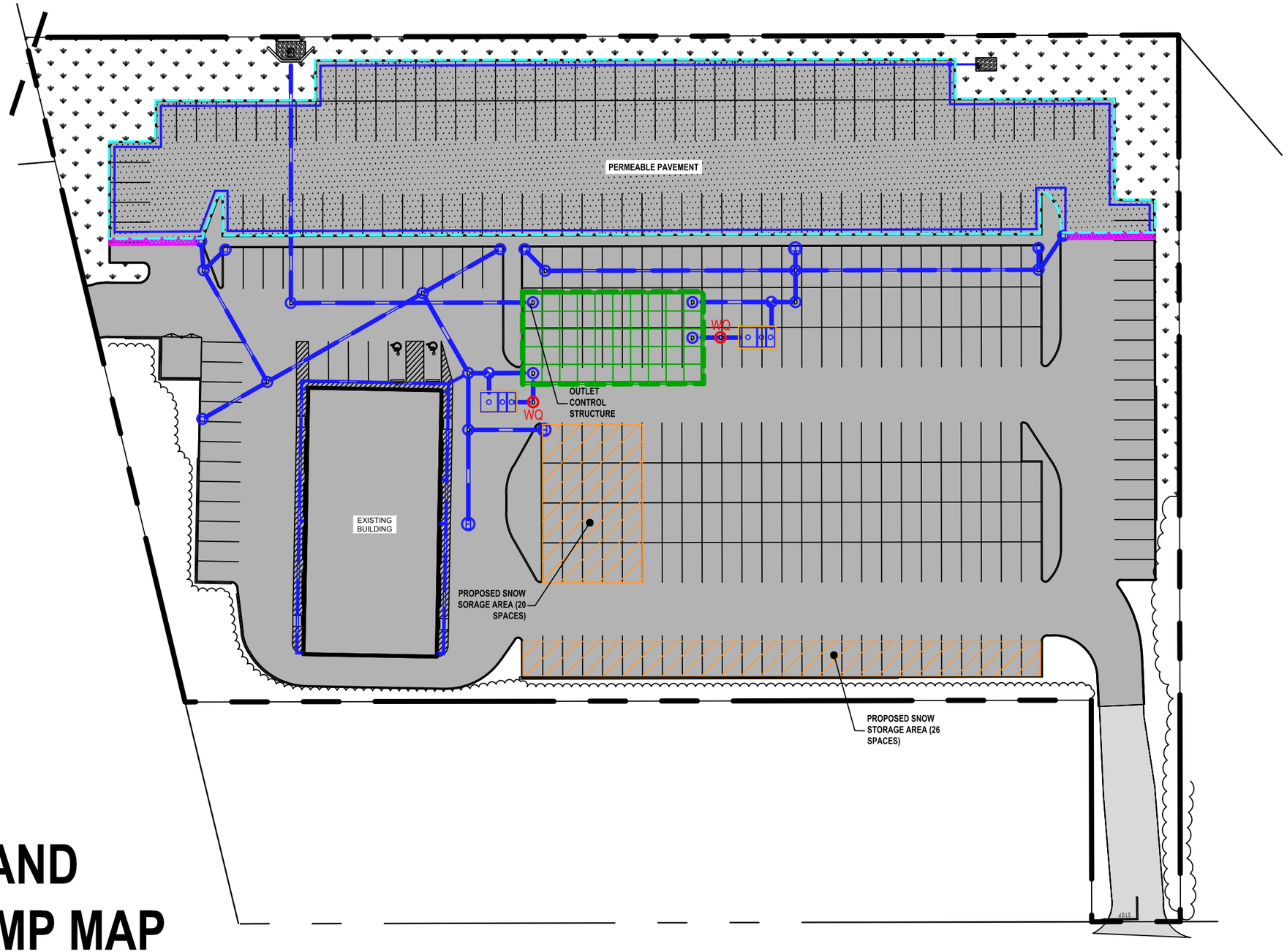
Cause for inspection — Note if the inspection is routine, pre-rainy-season, post-storm, annual, or in response to a noted problem or complaint.

Exceptions noted — Note any condition that requires correction or indicates a need for maintenance.

Comments and actions taken — Describe any maintenance done and need for follow-up.

Stormwater BMP Inspection Matrix

Conventional & LID Best Management Practices	**Inspection & Maint. Frequency**	**Erosion& Scour**	**Obstructions**	**Trash & Debris**	**Sediment Build-Up Removal**	**Vegetation Cover**	**Remove/Reset Filter Fabric & Stone As Required**	**Vac Truck Sediment & Contaminants**	**Remove/Reset Riprap as Required**
Catch Basins/Area & Yard Drains	Four times per year								
Pavement Sweeping	Four times per year								
Oil Grit Separators	Monthly								
Proprietary Water Quality Units	Twice-Annually (Spring and Fall)								
Subsurface Detention Structure	Annually								
Outlets (FES, Rip Rap Pad, Level Spreaders)	Twice-Annually (Spring and Fall)								
Permeable Pavement	Annually								



WQ SCICLONE WATER QUALITY UNIT

SUBSURFACE DETENTION SYSTEM

DRAINAGE SYSTEM

OIL/GRIT SEPARATOR

TRENCH DRAIN

SNOW STORAGE

PERMEABLE PAVEMENT

OPERATION AND MAINTENANCE BMP MAP

WAREHOUSE BUILDING

105 BOSTON POST ROAD,
SUDBURY, MA

50 25 0 50 100

SNOW STORAGE:

1. DRIVE AISLE TO BE PLOWED TO EACH EDGE OF PAVEMENT MAINTAINING MIN 20' WIDE ACCESS AT ALL TIMES
2. NO SNOW STORAGE SHALL OCCUR WITHIN WETLAND RESOURCE AREAS.

C:\CDG\Crocker Design Group, LLC\Gabriel Crocker - Projects\100-108 Sudbury - Herb Chambers Mass DOT\Permitting\Stormwater Report\5- Long-Term Pollution Prevention Plan_ O & M MAP - svp.dwg, C-3 LAYOUT OVERALL, Mar 18, 2021 14:07

EXISTING SITE PHOTOS

PHOTO LOCATION MAP

PHOTO 1

MAIN DRIVE AISLE AT NORTHERN EDGE OF THE PROPERTY LOOKING EAST.

PHOTO 2

ENTRY DRIVEWAY. PHOTO TAKEN LOOKING SOUTH FROM BOSTON POST ROAD.

PHOTO 3

NORTHEAST CORNER OF SERVICE GARAGE LOOKING TOWARDS THE HERB CHAMBERS JAGUAR/LAND ROVER DEALERSHIP.

PHOTO 4

NORTHEAST CORNER OF SERVICE GARAGE LOOKING TO SOUTH OF SITE.

PHOTO 5

EASTERN SIDE OF SERVICE GARAGE.

PHOTO 6

PARKING AREA TO EAST OF STOCKPILE" HILL.

PHOTO 7

PARKING AREA TO EAST OF "STOCKPILE" HILL.

PHOTO 8

PARKING AREA TO EAST OF "STOCKPILE" HILL.

PHOTO 9

MAIN DRIVE AISLE TO THE SOUTH OF THE SITE ADJACENT TO THE WETLANDS.

PHOTO 10

PARKING LOT AT SOUTHERN EDGE OF THE SITE ADJACENT TO THE WETLANDS.

PHOTO 11

PARKING LOT AT SOUTHERN EDGE OF THE SITE ADJACENT TO THE WETLANDS.

PHOTO 12

PARKING LOT AT SOUTHERN EDGE OF THE SITE ADJACENT TO THE WETLANDS.

PHOTO 13

CONNECTION DRIVEWAY TO JAGUAR/LAND ROVER AND SURROUNDING AREA.

PHOTO 14

MAIN DRIVE AISLE AT SOUTHWEST CORNER OF PARCEL LOOKING EAST.

PHOTO 15

MAIN DRIVE AISLE AT SOUTHWEST EDGE OF PARCEL LOOKING NORTH TOWARDS THE "STOCKPILE" HILL.

PHOTO 16

MAIN DRIVE AISLE AT WEST EDGE OF PARCEL LOOKING NORTH.

PHOTO 17

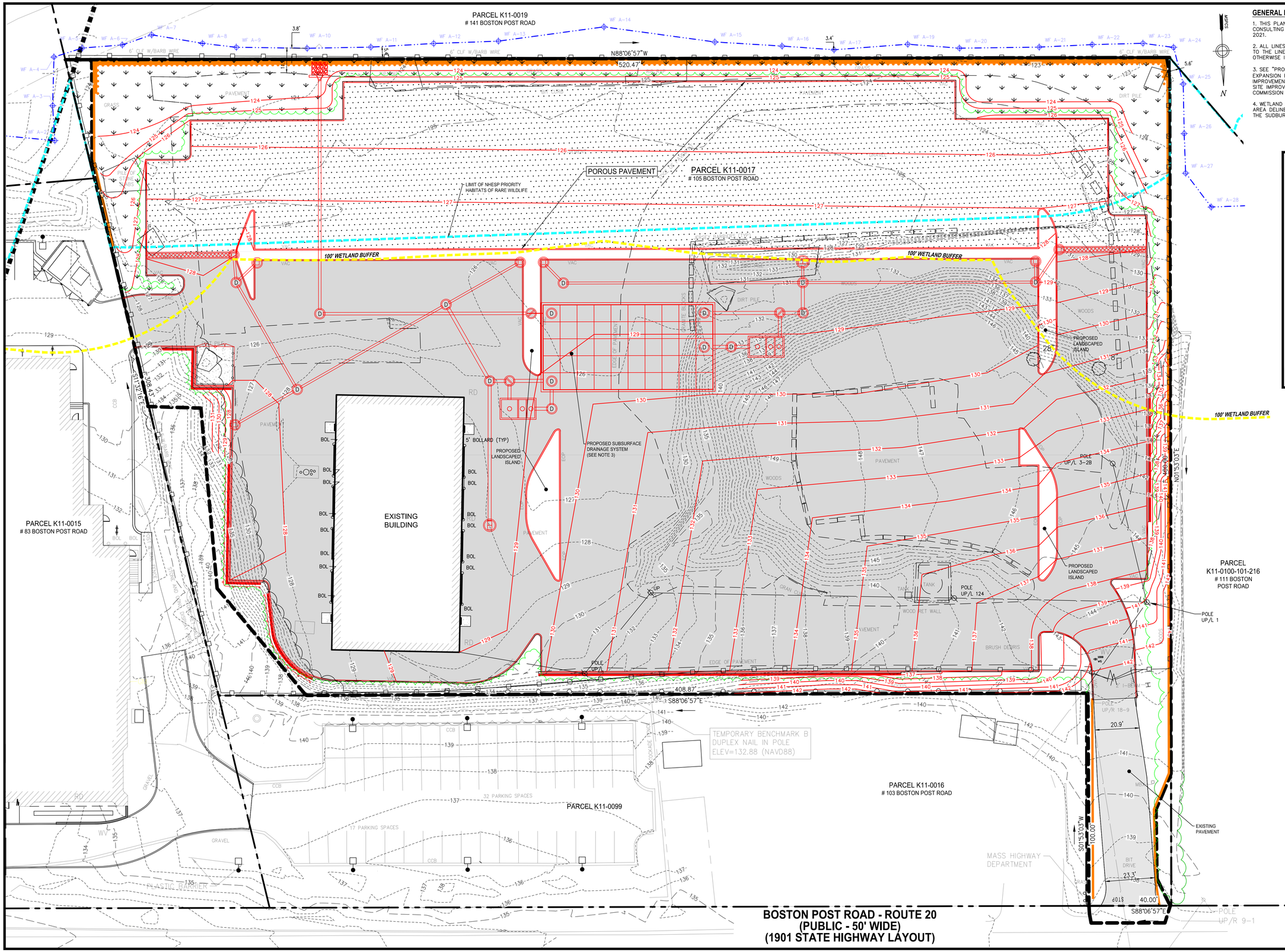
TOP OF "STOCKPILE" HILL, LOOKING SOUTH.

PHOTO 18

MAIN ENTRY / BOSTON POST ROAD.

Section 7

Attachments



GENERAL NOTES:

1. THIS PLAN REFERENCES A SURVEY PLAN PREPARED BY CHA CONSULTING DATED NOVEMBER 12, 2019, REVISED JANUARY 19, 2021.

2. ALL LINES AND DIMENSIONS ARE PARALLEL OR PERPENDICULAR TO THE LINES FROM WHICH THEY ARE MEASURED UNLESS OTHERWISE INDICATED.

3. SEE "PROPOSED SITE DEVELOPMENT PLANS – PARKING EXPANSION FOR JLR SUDBURY" FOR MORE DETAILED SITE IMPROVEMENTS. THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE SITE IMPROVEMENTS AS IT RELATES TO THE CONSERVATION COMMISSION JURISDICTION.

4. WETLAND DELINEATION HAS AN ACTIVE ORDER OF RESOURCE AREA DELINEATION, WHICH WAS ISSUED DECEMBER 15, 2020, BY THE SUDBURY CONSERVATION COMMISSION.

LEGEND

- EXISTING CONDITIONS
- PROPOSED CONSTRUCTION
- WETLAND BOUNDARIES
- BUFFER ZONE
- PROPOSED TREE LINE
- EROSION CONTROLS
- NATURAL HERITAGE
- PROPOSED PAVEMENT
- PROPOSED PAVEMENT (POROUS)

20 10 0 20 40

Date	Description	No.

Revisions

DRAFT

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-919-0808

Project
105 BOSTON POST ROAD
SUDBURY, MA

Prepared for
HERB CHAMBERS 83 BOSTON POST ROAD, LLC.
#83 BOSTON POST ROAD - ROUTE 20
SUDBURY, MA 01776

Drawing Title
CONSERVATION COMMISSION EXHIBIT

Project No.	100-108
Date	2/22/2021
Scale	1"=20'
Drawn By	DJN
Approved By	GC

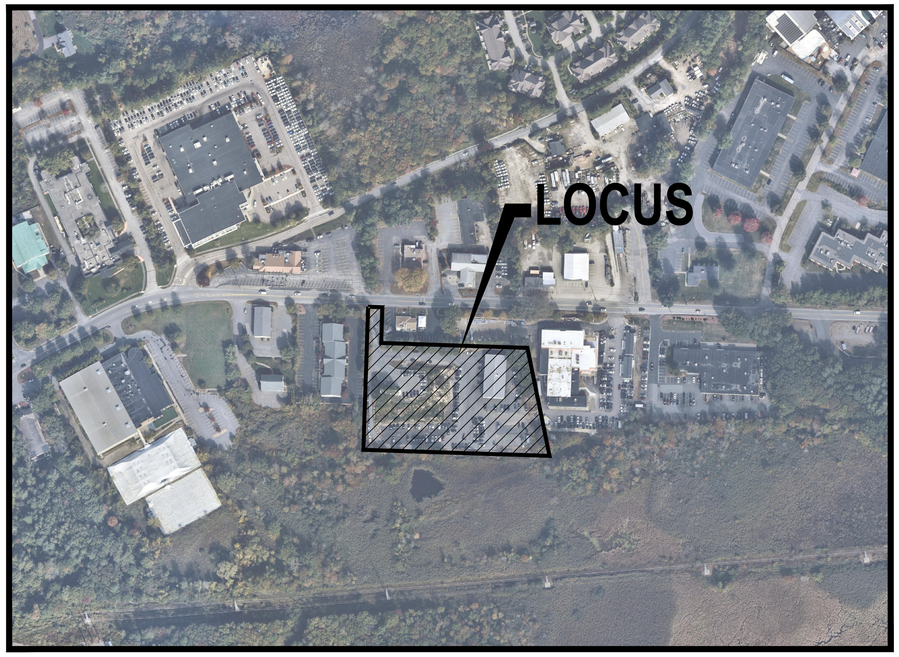
Drawing No.
X-4

C:\CDG\Crocker Design Group, LLC\Gabriel Crocker - Projects\100-108 Sudbury Herb Ch Mass Dot\dwg\Plot Sheets\Exhibits\ X-4 CONSERVATION COMMISSION PLAN.dwg, C-2 LAYOUT, Feb 12, 2021 13:31

PROPOSED SITE DEVELOPMENT PLANS

HERB CHAMBERS OF SUDBURY, INC.

105 BOSTON POST ROAD, SUDBURY, MA 01776

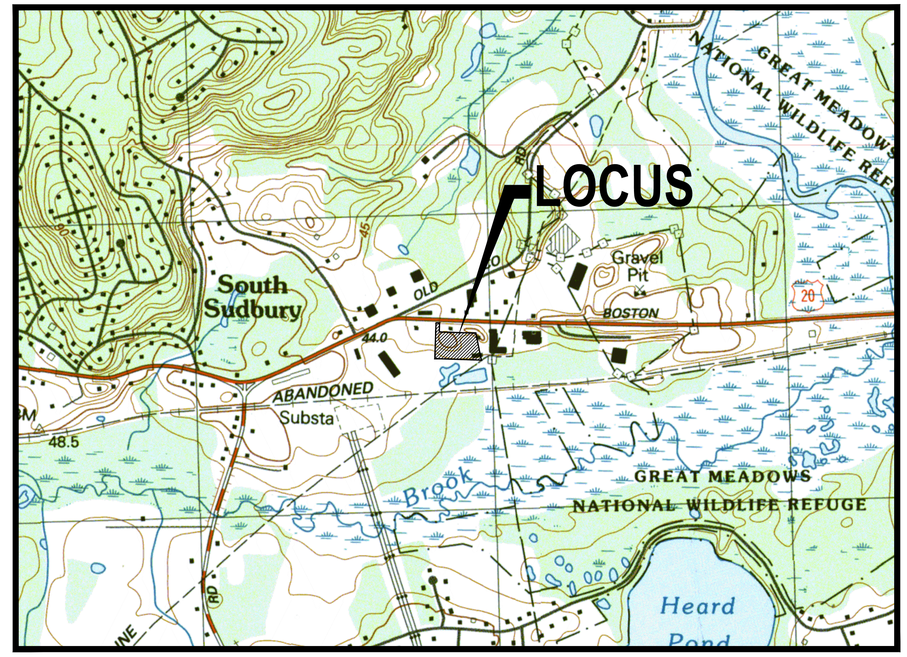


NORTH

AERIAL MAP

SCALE: 1' = 200'

200 100 0 200 4000



NORTH

USGS MAP

SCALE: 1' = 800'

800 400 0 800 1600

APPLICANT:

HERB CHAMBERS OF SUDBURY, INC.
259 MCGRATH HIGHWAY,
SOMERVILLE, MA 02143

SURVEYOR

CHA CONSULTING, INC.
141 LONGWATER DRIVE-SUITE 104
NORWELL, MA 02061

ENGINEER/PERMITTING:

CROCKER DESIGN GROUP, LLC.
2 SHARP STREET, UNIT B,
HINGHAM, MA 02043
781-919-0808

DRAWING INDEX:

C-0	COVER SHEET
C-1	DEMOLITION PLAN
C-2	SOIL EROSION AND SEDIMENT CONTROL PLAN
C-3	SITE PLAN
C-4	GRADING AND DRAINAGE PLAN
C-5	UTILITIES PLAN
C-6	LANDSCAPE PLAN
C-7	TEST PIT PLAN
C-8.1	DETAIL SHEET (1 OF 3)
C-8.2	DETAIL SHEET (2 OF 3)
C-8.3	DETAIL SHEET (3 OF 3)

SUPPLEMENTAL PLANS:

EXISTING CONDITIONS PLAN PREPARED BY
CHA CONSULTING, LLC.

Date	Description	No.

Revisions

3-22-2021

COMMONWEALTH OF MASSACHUSETTS
GABRIEL R. CROCKER
CIVIL
No. 47917
REGISTERED PROFESSIONAL ENGINEER

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

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HINGHAM, MA 02043
P: 781-919-0808

Project
105 BOSTON POST ROAD
SUDBURY, MA

Prepared for
HERB CHAMBERS OF SUDBURY, INC.
259 MCGRATH HWY
SOMERVILE, MA 02143

Drawing Title
COVER SHEET

Project No.	100-108	Drawing No.	C-0
Date	3/22/2021		
Scale	AS NOTED		
Drawn By	DJN		
Approved By	GC		

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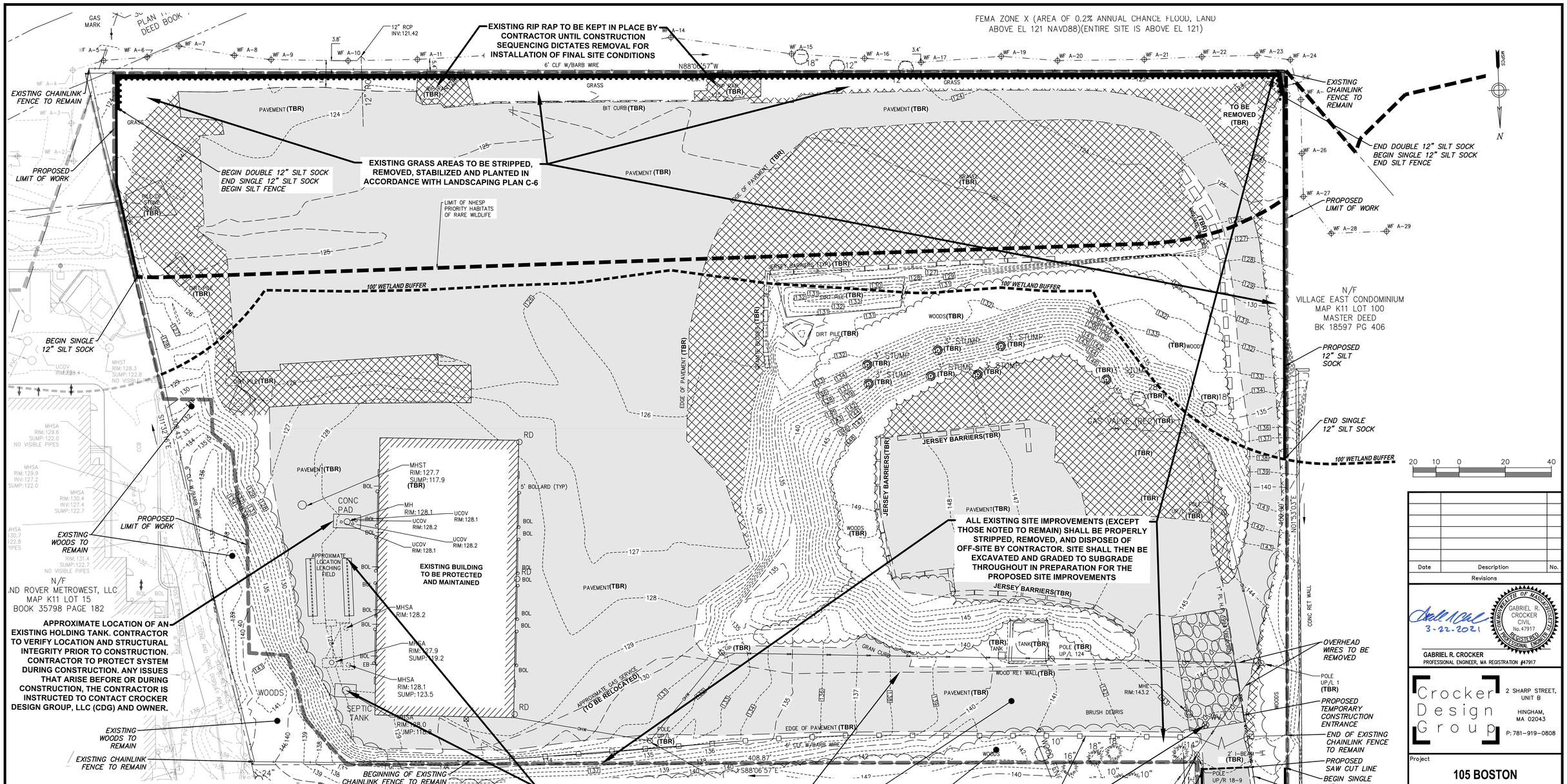

GENERAL NOTES

1) PROTECTIONS

A.) PROVIDE PROTECTION NECESSARY TO PREVENT DAMAGE TO EXISTING IMPROVEMENTS, TREES OR VEGETATION.

B.) PROTECT IMPROVEMENTS ON ADJOINING PROPERTIES AND ON OWNER'S PROPERTY.

C.) RESTORE DAMAGED IMPROVEMENTS TO ORIGINAL CONDITION AS ACCEPTABLE TO PARTIES HAVING JURISDICTION.

D.) CONDUCT OPERATIONS TO ENSURE MINIMUM INTERFERENCE WITH OPERATIONS, STREETS, WALKS, AND OTHER ADJACENT FACILITIES. DO NOT CLOSE OR OBSTRUCT STREETS, WALKS, OR OTHER OCCUPIED OR USED FACILITIES WITHOUT PERMISSION FROM AUTHORITIES HAVING JURISDICTION. STREETS AND ROADWAYS SHALL BE THOROUGHLY CLEANED AND/OR SWEPT ON A DAILY BASIS OR MORE FREQUENTLY AS REQUIRED BY THE GOVERNING AUTHORITY.

2.) UNLESS SPECIFIED OTHERWISE ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE MASSACHUSETTS HIGHWAY DEPARTMENT SPECIFICATIONS FOR HIGHWAYS AND BRIDGES AND/OR THE APPROPRIATE LOCAL AUTHORITIES.

3.) ALL SLOPES, UNLESS OTHERWISE SPECIFIED, SHALL BE LOAMED AND SEEDED FOR STABILIZATION AS SOON AS POSSIBLE TO PREVENT EROSION INTO WETLAND RESOURCE AREAS, ABUTTING PROPERTIES, OR PUBLIC WAYS. EROSION CONTROL BLANKETS ARE REQUIRED FOR ALL 2H:1V SLOPES. SLOPES MAY NOT EXCEED 2H:1V. SEE "SEEDING" NOTE 3.

4.) ANY DEVIATIONS, I.E. "FIELD CHANGES" FROM THE DESIGN PLAN(S) MUST BE APPROVED BY THE DESIGN ENGINEER IN WRITING. CONTRACTOR SHOULD BE AWARE THAT LOCAL AND

STATE AUTHORITIES HAVE JURISDICTION AND APPROVALS MUST BE OBTAINED FROM THE APPROPRIATE AUTHORITY PRIOR TO THE IMPLEMENTATION OF THE "FIELD CHANGE." CROCKER DESIGN GROUP, LLC. ASSUMES NO LIABILITY OR RESPONSIBILITY FOR WORK ASSOCIATED WITH FIELD CHANGES COMPLETED WITHOUT REGARD TO THE "FIELD CHANGE" PROCEDURE.

5.) RELOCATION OF ANY UTILITIES SHALL BE PERFORMED IN ACCORDANCE WITH THE PROVISIONS OF THE APPROPRIATE UTILITY COMPANY AND/OR REGULATORY AGENCY.

6.) * * * DIG SAFE NOTE * * * IN ACCORDANCE WITH MGL. CH. 82, SEC. 40 INCLUDING AMENDMENTS, ALL CONTRACTORS SHALL NOTIFY UTILITY COMPANIES AND GOVERNMENT AGENCIES, IN WRITING, OF THE INTENT TO EXCAVATE, BLAST, DEMOLISH, BORE, OR PERFORM OTHER EARTH MOVING OPERATIONS NO LESS THAN 72 HOURS AND NO MORE THAN 30 DAYS PRIOR TO THE COMMENCEMENT OF SUCH WORK (EXCLUSIVE OF SATURDAYS, SUNDAYS, AND LEGAL HOLIDAYS) OR CALL "DIG SAFE" AT 1-888-DIG-SAFE.

7.) LOCATION OF UNDERGROUND UTILITIES ON THIS PLAN ARE APPROXIMATE ONLY AND ARE BASED ON ACTUAL FIELD LOCATIONS OF VISIBLE STRUCTURES AND PLAN COMPILATIONS. EXISTING UTILITY LOCATIONS AND ELEVATIONS SHOWN SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION. TEST PITS SHALL BE PERFORMED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL INFORM THE DESIGN ENGINEER OF ANY DISCREPANCIES PRIOR TO THE START OF ANY CONSTRUCTION.

8.) USE OF EXPLOSIVES

A.) COMPLY WITH ALL LAWS, RULES AND REGULATIONS OF FEDERAL, STATE, AND LOCAL AUTHORITIES AND INSURERS WHICH GOVERN STORAGE, USE, MANUFACTURE, SALE, HANDLING, TRANSPORTATION, LICENSING, OR OTHER DISPOSITION OF

EXPLOSIVES. UTILIZE SPECIAL PRECAUTIONS FOR PROPER USE OF EXPLOSIVES TO PREVENT HARM TO HUMAN LIFE AND DAMAGE TO SURFACE STRUCTURES, ALL UTILITY LINES OR OTHER SUBSURFACE STRUCTURES. DO NOT CONDUCT BLASTING OPERATIONS UNTIL PERSONS IN VICINITY HAVE HAD AMPLE NOTICE AND HAVE REACHED POSITIONS OF SAFETY.

B.) BLASTING OF ANY ROCK SHALL REQUIRE APPROPRIATE APPROVALS FROM THE LOCAL FIRE DEPARTMENT, PLANNING BOARD, BUILDING INSPECTOR AND OTHER PERTINENT AGENCIES, PRIOR TO COMMENCEMENT OF WORK. ALL BLASTED ROCK OR OTHER EXCESS MATERIALS MUST BE REMOVED FROM THE SITE AND DISPOSED OF AT THE EXPENSE OF THE CONTRACTOR.

9.) ADDITIONAL BENCHMARKS TO BE SET BY CONTRACTOR PRIOR TO CONSTRUCTION TO ENSURE QUALITY WORKMANSHIP.

Date	Description	No.

Revisions

3-22-2021

COMMONWEALTH OF MASSACHUSETTS GABRIEL R. CROCKER CIVIL No. 47917 REGISTERED PROFESSIONAL ENGINEER

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043
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Project

105 BOSTON POST ROAD

SUDBURY, MA

Prepared for

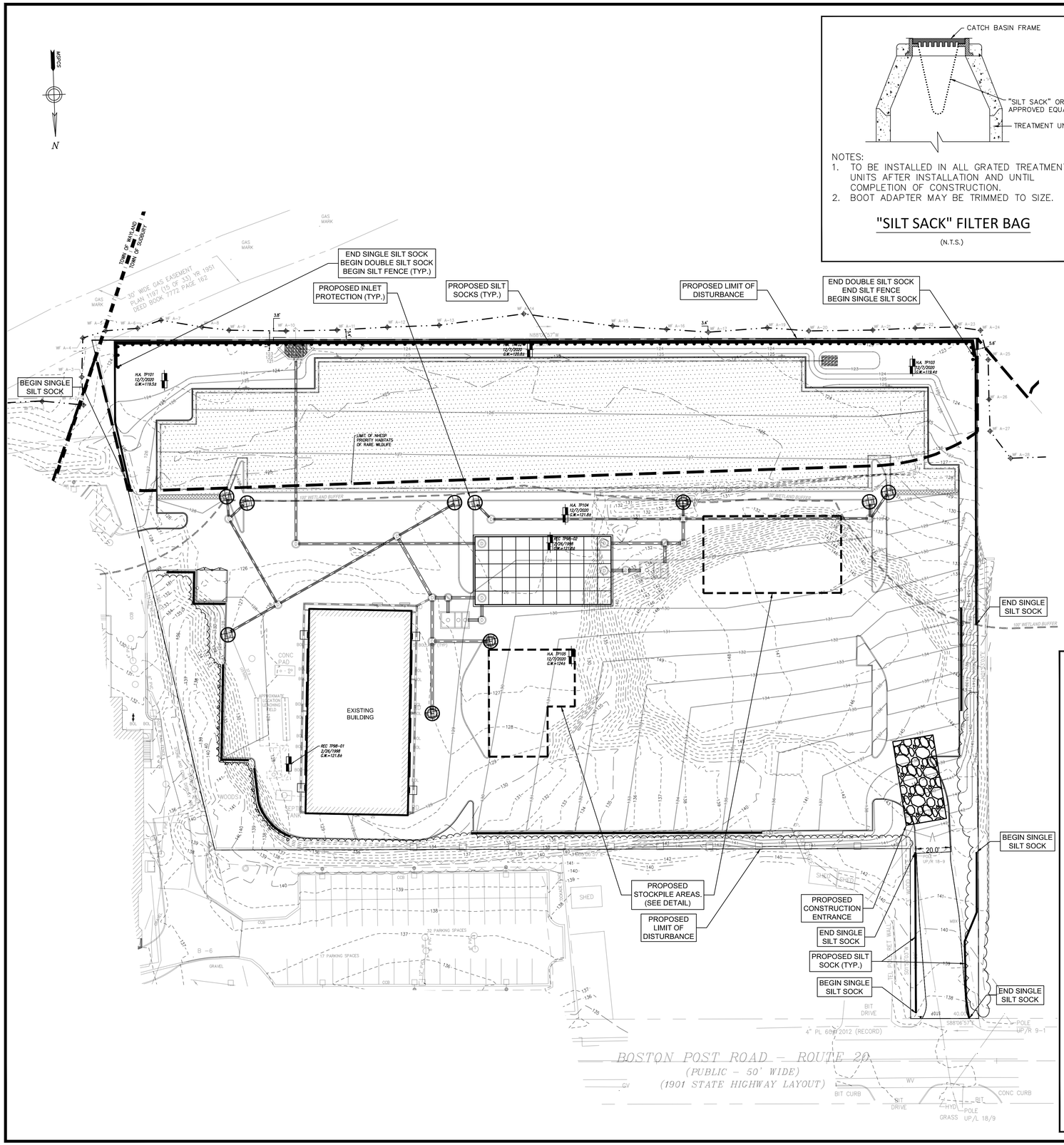
HERB CHAMBERS OF SUDBURY, INC.

259 MCGRATH HWY
SOMERVILLE, MA 02143

Drawing Title

DEMOLITION PLAN

Project No. 100-108	Drawing No.
Date 3/22/2021	C-1
Scale 1"=20'	
Drawn By DJN	
Approved By GC	



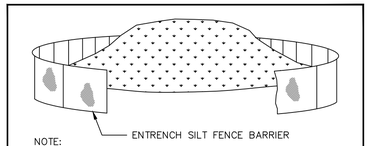
NOTES:
1. TO BE INSTALLED IN ALL GRATED TREATMENT UNITS AFTER INSTALLATION AND UNTIL COMPLETION OF CONSTRUCTION.
2. BOOT ADAPTER MAY BE TRIMMED TO SIZE.

"SILT SACK" FILTER BAG

(N.T.S.)

LEGEND

- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED HAY-BALES ROW
- PROPOSED SILT FENCE
- PROPOSED CONSTRUCTION ENTRANCE
- PROPOSED INLET PROTECTION (SILT SACK OR APPROVED EQUAL)

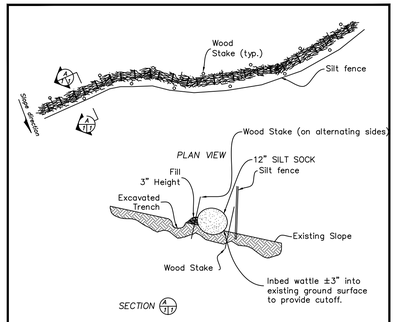


NOTE:

STABILIZE STOCKPILE WITH ANNUAL RYEGRASS, MULCH OR EROSION CONTROL BLANKETS.

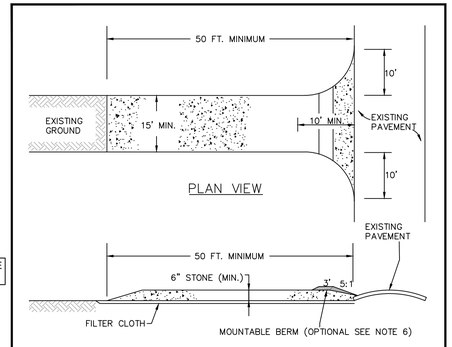
SOIL STOCKPILE

NOT TO SCALE



12" SILT SOCK / SILT FENCE DETAIL

NOT TO SCALE



CROSS SECTION

CONSTRUCTION SPECIFICATIONS:
1. STONE SIZE–USE 2" STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH–RECOMMEND GREATER THAN OR EQUAL TO 50 FEET WHERE SOILS ARE SANDS AND GRAVELS AND 100 FEET IN SILTS AND CLAYS.
3. THICKNESS–NOT LESS THAN SIX (6) INCHES.
4. WIDTH–FIFTEEN (15) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OF EGRESS OCCURS.
5. FILTER CLOTH–SHALL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SUFACE WATER–ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM SHALL BE INSTALLED.
7. MAINTENANCE– THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH SHALL PREVENT TRACKING OF FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS–OF–WAY MUST BE REMOVED IMMEDIATELY.
8. PERIODIC INSPECTION AND NEEDED MAINTENCE SHALL BE PROVIDED.

CONSTRUCTION ENTRANCE

NOT TO SCALE

GENERAL NOTES

1. CONTRACTOR TO ABIDE BY PROVISIONS OF EPA NOI NPDES STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AND BY STORMWATER MANAGEMENT OPERATION AND MAINTENANCE PLAN AS PREPARED BY CROCKER DESIGN GROUP, LLC.

2. ALL TEMPORARY STOCKPILE AREAS SHALL HAVE EROSION CONTROLS (SILT SOCK AND SILT FENCE) AROUND THE PERIMETER.

3. UNDERGROUND UTILITIES MAY EXIST THAT ARE NOT SHOWN ON THIS PLAN. DIG SAFE MUST BE NOTIFIED (1–800–344–7233) AT LEAST 72 HOURS PRIOR TO ANY CONSTRUCTION.

4. ALL SEDIMENTATION AND EROSION CONTROL MEASURES SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD. SEDIMENTATION AND EROSION CONTROL MEASURES SHALL BE IN PLACE AND OBSERVED PRIOR TO ANY WORK STARTING ON THE PROJECT.

5. SITE ENTRY AND EXIT LOCATIONS SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC ROADWAYS. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ON A PUBLIC ROADWAY MUST BE REMOVED IMMEDIATELY. WHEN WASHING IS REQUIRED TO REMOVE SEDIMENT PRIOR TO ENTRANCE TO A PUBLIC ROADWAY, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE WHICH DRAINS INTO AN APPROVED SEDIMENT BASIN. ALL FINES IMPOSED FOR TRACKING ONTO PUBLIC ROADS SHALL BE PAID BY THE CONTRACTOR.

6. TEMPORARY SEEDING OR OTHER METHOD OF STABILIZATION SHALL BE INITIATED WITHIN 14 DAYS OF THE LAST DISTURBANCE ON ANY AREA OF THE SITE, UNLESS ADDITIONAL CONSTRUCTION OF THE AREAS IS EXPECTED WITHIN 21 DAYS OF THE LAST DISTURBANCE.

7. UPON COMPLETION OF FINE GRADING, ALL AREAS NOT OTHERWISE PERMANENTLY STABILIZED SHALL BE SEEDED AND MAINTAINED UNTIL A UNIFORM COVERAGE OF 75%± MINIMUM DENSITY, AS DETERMINED BY THE OWNER'S REPRESENTATIVE, IS ACHIEVED.

8. MAINTENANCE – EROSION CONTROLS SHALL BE REPAIRED OR REPLACED AS INSPECTION DEEMS NECESSARY OR AS DIRECTED BY THE ENGINEER OR ARCHITECT. ACCUMULATED SILT AT ANY EROSION CONTROL DEVICE SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 6", AND SHALL BE DISTRIBUTED ON–SITE IN A MANNER NOT CONTRIBUTING TO ADDITIONAL SILTATION.

CONSTRUCTION PHASING

1. BELOW IS A GENERAL CONSTRUCTION PHASING. A MORE DETAILED SCHEDULE IS PRESENTED IN THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP).

2. CENTERLINE OF ROAD AND EXTENTS OF CONSTRUCTION TO BE DELINEATED BY CONTRACTOR.

3. EROSION AND SEDIMENTATION CONTROL MEASURES INCLUDING SILT SOCK AND SILT FENCE (OR OPTIONAL FILTER SACK IN LIEU OF SILT SOCK AND SILT FENCE) WILL BE INSTALLED. CONTRACTOR SHALL INSPECT CONTROL MEASURES MONTHLY AND AFTER RAIN EVENTS OF 0.5" OR GREATER.

4. THE PROJECT AREA WILL BE CLEARED OF DEBRIS AND BOULDERS. MATERIAL REMOVED FROM THE SITE WILL BE TRANSPORTED TO AN APPROPRIATE FACILITY OR WILL BE DISPOSED OF ELSEWHERE ACCORDING TO FEDERAL, STATE, AND LOCAL GUIDELINES. INACTIVE STOCKPILES OR AREAS OF GRANULAR MATERIAL OR TOPSOIL SHALL BE TEMPORARILY SEEDED OR MULCHED IN ORDER TO CONTROL SEDIMENT LADEN RUNOFF.

5. CONTRACTOR IS RESPONSIBLE TO SET OUT UTILITIES AND ANY NECESSARY GRADES.

6. GRADING OF SITE INCLUDING BUILDING PADS, PARKING AREAS, AND DETENTION BASINS AND DIGGING OF UTILITY TRENCHES TO DEFINED INVERT LEVELS. MATERIAL TO BE STORED ON AN UNUSED SITE AREA FOR FILL OR PROPERLY REMOVED FROM THE JOB SITE. IF SUITABLE TOPSOIL IS FOUND, IT WILL BE REMOVED AND STOCKPILED IN AN UPLAND AREA AT LEAST 100' FROM WETLANDS TO BE REUSED AS TOPSOIL ON THE PROJECT.

7. PLACING OF FILL OR SUITABLE MATERIAL ON ALL ACCESS ROADS FOR EASY ACCESS. SETTING OUT OF FOUNDATIONS AND SURROUNDING ROADS.

8. LAYING OF ALL UTILITIES INCLUDING DRAINAGE PIPES AND STRUCTURES FOLLOWED BY BACK–FILL, TAKING CARE TO LEAVE ONLY TRENCHES BEING WORKED ON OPEN.

9. FINE GRADING FOR THE PARKING AREAS, ROADWAYS, AND DRAINAGE BASINS TO BE COMPLETED.

10. DRAINAGE BASIN VEGETATION TO BE ESTABLISHED PRIOR TO DISCHARGE FROM CONSTRUCTED DRAINAGE STRUCTURES.

11. ONCE THE DRAINAGE STRUCTURES ARE INSTALLED, PROVIDE PROTECTION AT ALL CATCH BASINS AND INLETS TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE SYSTEM.

12. INSTALL BINDER COURSE AND SPREAD TOPSOIL AS NEEDED.

13. LIGHT POLES, SIGNAGE, ETC. WILL BE INSTALLED.

14. INSTALL TOP COURSE OF PAVING AND SIDEWALK.

15. THE FINAL PHASE OF CONSTRUCTION IS RESTORATION AND STABILIZATION OF ALL EXPOSED SURFACES. DISTURBED AREAS SHALL BE LANDSCAPED OR SEEDED (SEE ADDITIONAL DISCUSSION IN SWPPP). IN THE EVENT THAT WEATHER CONDITIONS PREVENT FINAL STABILIZATION, TEMPORARY EROSION AND SEDIMENTATION MEASURES WILL BE EMPLOYED UNTIL THE TEMPERATURE AND WEATHER IS SUITABLE FOR GRASS GROWING. A FINAL INSPECTION WILL ENSURE THAT THE SITE IS CLEARED OF ALL PROJECT DEBRIS AND THAT EROSION AND SEDIMENTATION CONTROLS ARE FUNCTIONING PROPERLY. SILT SOCK AND SILT FENCE WILL REMAIN IN PLACE UNTIL THE SITE IS FULLY STABILIZED AND THE SITE HAS PASSED FINAL INSPECTION. VEGETATION IS TO BE OF A UNIFORM DENSITY OF AT LEAST 75% FOR ACCEPTANCE.

(CONTINUATION OF GENERAL NOTES)

9. ANY CONTRACTOR IS RESPONSIBLE FOR REESTABLISHING ANY EROSION CONTROL DEVICE WHICH HE DISTURBS. EACH CONTRACTOR SHALL NOTIFY THE ENGINEER/ARCHITECT OF ANY DEFICIENCIES IN THE ESTABLISHED EROSION CONTROL MEASURES WHICH MAY LEAD TO UNAUTHORIZED DISCHARGE OR STORM WATER POLLUTION, SEDIMENTATION OR OTHER POLLUTANTS. UNAUTHORIZED POLLUTANTS INCLUDE, BUT ARE NOT LIMITED TO, EXCESS CONCRETE DUMPING OR CONCRETE RESIDUE, PAINTS, SOLVENTS, GREASE, FUEL AND LUBE OIL, PESTICIDES, ANY SOLID WASTE MATERIALS.

10. ALL SIDE SLOPES SHALL BE SEEDED WITH GRASS OR INSTALL JUTE NETTING TO PREVENT EROSION.

11. INSPECTIONS: INSPECTIONS ARE TO BE PERFORMED BY QUALIFIED PERSONNEL. DISTURBED AREAS THAT HAVE NOT BEEN FINALLY STABILIZED, AREAS USED FOR STORAGE, STRUCTURAL CONTROL MEASURES, AND LOCATIONS WHERE VEHICLES ENTER OR EXIT THE SITE, MUST BE INSPECTED ONCE EVERY 7 DAYS AND WITHIN 24 HOURS OF A STORM EVEN OF 0.5 INCHES OR GREATER. STABILIZED AREAS ARE TO BE INSPECTED ONCE PER MONTH DISTURBED AREAS AND STORAGE AREAS EXPOSED TO PRECIPITATION SHALL BE INSPECTED FOR EVIDENCE OF OR POTENTIAL FOR POLLUTANTS ENTERING THE DRAINAGE SYSTEM. CONTROL MEASURES SHALL BE OBSERVED TO ENSURE THEY ARE WORKING PROPERLY. DISCHARGE LOCATIONS AND POINTS SHALL BE INSPECTED TO ASCERTAIN WHETHER CONTROLS ARE PREVENTING SIGNIFICANT IMPACT. BASED ON THE RESULTS OF THE ABOVE INSPECTIONS, ANY NECESSARY CHANGES TO THE PLAN WILL BE MADE WITHIN 7 DAYS OF THE INSPECTION AND SUBMITTED TO THE TOWN OF SUDBURY PLANNING BOARD. THE CHANGES MUST BE IMPLEMENTED IN THE FIELD BEFORE THE NEXT STORM EVEN IF PRACTICABLE, OTHERWISE AS SOON AS POSSIBLE.

12. INSTALL AND MAINTAIN CATCH BASIN INSERTS IN ALL PROPOSED AND EXISTING CATCH BASINS.

13. PROVIDE TEMPORARY SEDIMENTATION BASINS, SILT SOCK, ETC. AS NECESSARY.

14. STOCKPILES ARE TO BE AT LEAST 100 FEET FROM WETLAND AREAS. STOCKPILES NOT TO BE REUSED WITHIN 30 DAYS ARE TO BE STABILIZED WITH SEED OR MULCH.

15. POTENTIAL STOCK PILE AREA TO BE PROTECTED WITH EROSION CONTROL MEASURES.

16. THE CONTRACTOR SHALL HAVE A WATER TRUCK ON–SITE AT ALL TIMES AND SHALL PROVIDE TEMPORARY PLANTINGS OR OTHER COVERINGS, SUCH AS WOOD CHIPS, TO MINIMIZE THE AMOUNT OF DUST LEAVING THE PREMISES.

30 15 0 30 60

Date	Description	No.

Revisions

3-22-2021

COMMONWEALTH OF MASSACHUSETTS
GABRIEL R. CROCKER
CIVIL
No. 47917
REGISTERED PROFESSIONAL ENGINEER

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

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Project

105 BOSTON POST ROAD

SUDBURY, MA

Prepared for

HERB CHAMBERS OF SUDBURY, INC.

259 MCGRATH HWY
SOMERVILE, MA 02143

Drawing Title

SOIL EROSION AND SEDIMENT CONTROL PLAN

Project No.	100-108	Drawing No.
Date	3/22/2021	C-2
Scale	1"=30'	
Drawn By	DJN	
Approved By	GC	

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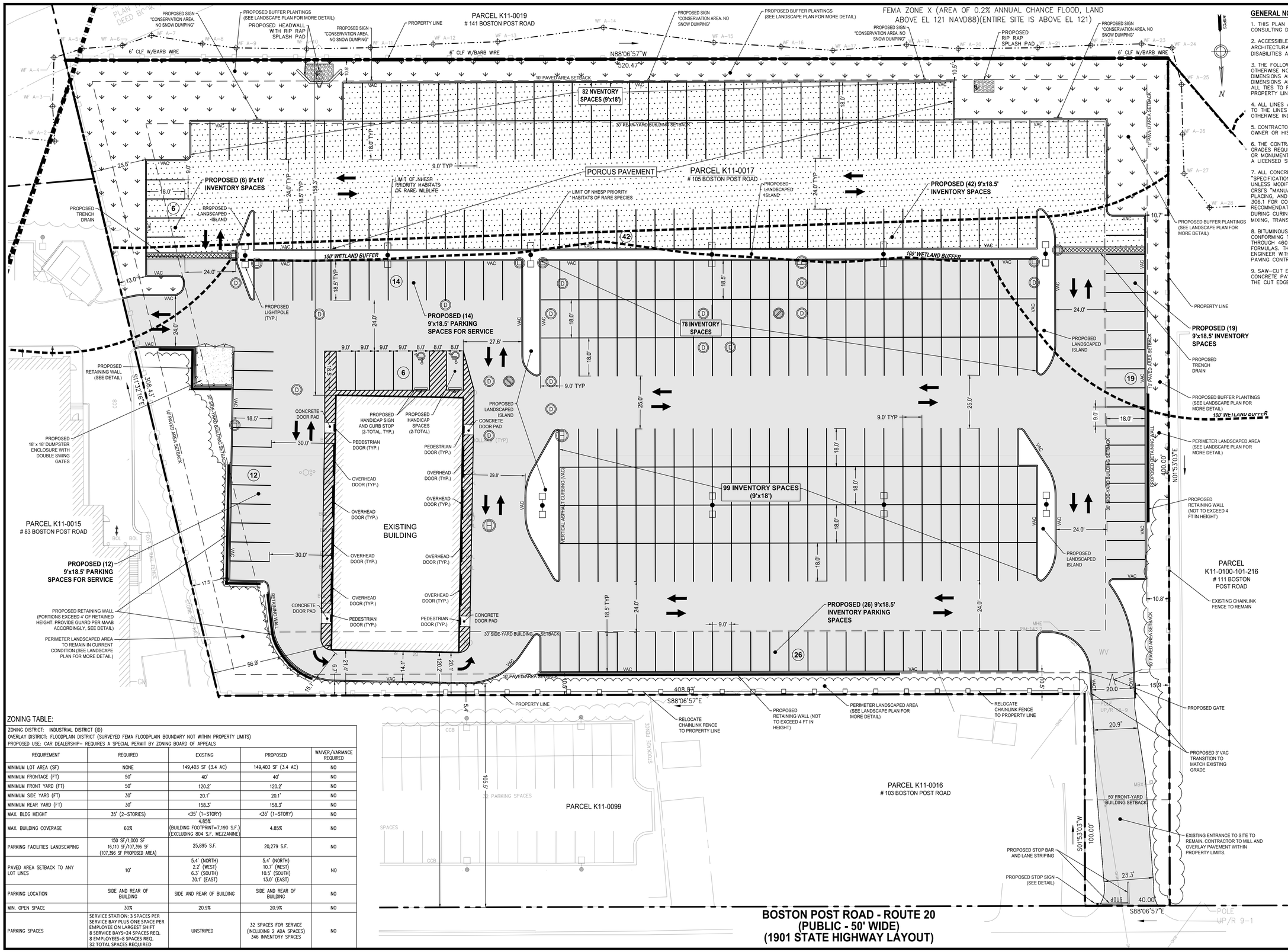

GENERAL NOTES:

1. THIS PLAN REFERENCES A SURVEY PLAN PREPARED BY CHA CONSULTING DATED NOVEMBER 12, 2019.

2. ACCESSIBLE CURB RAMPS SHALL BE PER THE MASSACHUSETTS ARCHITECTURAL ACCESS BOARD (AAB) AND THE AMERICANS WITH DISABILITIES ACT (ADA) ACCESSIBILITY GUIDELINES.

3. THE FOLLOWING LAYOUT CRITERIA SHALL CONTROL UNLESS OTHERWISE NOTED ON THE PLAN: DIMENSIONS ARE TO FACE OF CURB AT GUTTER LINE. DIMENSIONS ARE TO THE CENTER OF PAVEMENT MARKINGS. ALL TIES TO PROPERTY LINES ARE PERPENDICULAR TO THE PROPERTY LINE UNLESS OTHERWISE NOTED.

4. ALL LINES AND DIMENSIONS ARE PARALLEL OR PERPENDICULAR TO THE LINES FROM WHICH THEY ARE MEASURED UNLESS OTHERWISE INDICATED.

5. CONTRACTOR SHALL REPORT SIGNIFICANT CONFLICTS TO THE OWNER OR HIS REPRESENTATIVE FOR RESOLUTION.

6. THE CONTRACTOR SHALL FURNISH AND SET ALL LINES AND GRADES REQUIRED AND PROTECT ALL PERMANENT BENCHMARKS OR MONUMENTS. DAMAGED MONUMENTS SHALL BE REPLACED BY A LICENSED SURVEYOR AT NO COST TO THE OWNER.

7. ALL CONCRETE WORK SHALL COMPLY WITH ACI301, "SPECIFICATION FOR STRUCTURAL CONCRETE," AND ACI 316R, UNLESS MODIFIED BY THE CONTRACT DOCUMENTS. COMPLY WITH CRSI'S "MANUAL OF STANDARD PRACTICE" FOR FABRICATING, PLACING, AND SUPPORTING REINFORCEMENT. COMPLY WITH ACI 306.1 FOR COLD WEATHER PROTECTION, AND FOLLOW RECOMMENDATIONS IN ACI 350R FOR HOT WEATHER PROTECTION DURING CURING. COMPLY WITH ACI 304 "GUIDE FOR MEASURING, MIXING, TRANSPORTING, AND PLACING CONCRETE."

8. BITUMINOUS CONCRETE PAVEMENT: CLASS I, TYPE I-1 CONFORMING TO THE STANDARD SPECIFICATIONS, SECTIONS 460 THROUGH 460.02 FOR BINDER COURSE AND TOP COURSE JOB MIX FORMULAS. THE GENERAL CONTRACTOR SHALL SUPPLY THE ENGINEER WITH A CERTIFICATE OF COMPLIANCE SUPPLIED BY THE PAVING CONTRACTOR.

9. SAW-CUT EXISTING PAVEMENT WHERE NEW BITUMINOUS CONCRETE PAVEMENT IS TO COME IN CONTACT. PRIME COAT THE CUT EDGE PRIOR TO PLACEMENT.

ZONING TABLE:

ZONING DISTRICT: INDUSTRIAL DISTRICT (ID)
OVERLAY DISTRICT: FLOODPLAIN DISTRICT (SURVEYED FEMA FLOODPLAIN BOUNDARY NOT WITHIN PROPERTY LIMITS)
PROPOSED USE: CAR DEALERSHIP- REQUIRES A SPECIAL PERMIT BY ZONING BOARD OF APPEALS

REQUIREMENT	REQUIRED	EXISTING	PROPOSED	WAIVER/VARIANCE REQUIRED
MINIMUM LOT AREA (SF)	NONE	149,403 SF (3.4 AC)	149,403 SF (3.4 AC)	NO
MINIMUM FRONTAGE (FT)	50'	40'	40'	NO
MINIMUM FRONT YARD (FT)	50'	120.2'	120.2'	NO
MINIMUM SIDE YARD (FT)	30'	20.1'	20.1'	NO
MINIMUM REAR YARD (FT)	30'	158.3'	158.3'	NO
MAX. BLDG HEIGHT	35' (2-STORIES)	<35' (1-STORY)	<35' (1-STORY)	NO
MAX. BUILDING COVERAGE	60%	4.85% (BUILDING FOOTPRINT=7,190 S.F.) (EXCLUDING 804 S.F. MEZZANINE)	4.85%	NO
PARKING FACILITIES LANDSCAPING	150 SF/1,000 SF 16,110 SF/107,396 SF (107,396 SF PROPOSED AREA)	25,895 S.F.	20,279 S.F.	NO
PAVED AREA SETBACK TO ANY LOT LINES	10'	5.4' (NORTH) 2.2' (WEST) 6.3' (SOUTH) 30.1' (EAST)	5.4' (NORTH) 10.7' (WEST) 10.5' (SOUTH) 13.0' (EAST)	NO
PARKING LOCATION	SIDE AND REAR OF BUILDING	SIDE AND REAR OF BUILDING	SIDE AND REAR OF BUILDING	NO
MIN. OPEN SPACE	30%	20.9%	20.9%	NO
PARKING SPACES	SERVICE STATION: 3 SPACES PER SERVICE BAY PLUS ONE SPACE PER EMPLOYEE ON LARGEST SHIFT 8 SERVICE BAYS=24 SPACES REQ. 8 EMPLOYEES=8 SPACES REQ. 32 TOTAL SPACES REQUIRED	UNSTRIPED	32 SPACES FOR SERVICE (INCLUDING 2 ADA SPACES) 346 INVENTORY SPACES	NO

Date	Description	No.
	Revisions	

3-22-2021

COMMONWEALTH OF MASSACHUSETTS
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No. 47917
REGISTERED PROFESSIONAL ENGINEER

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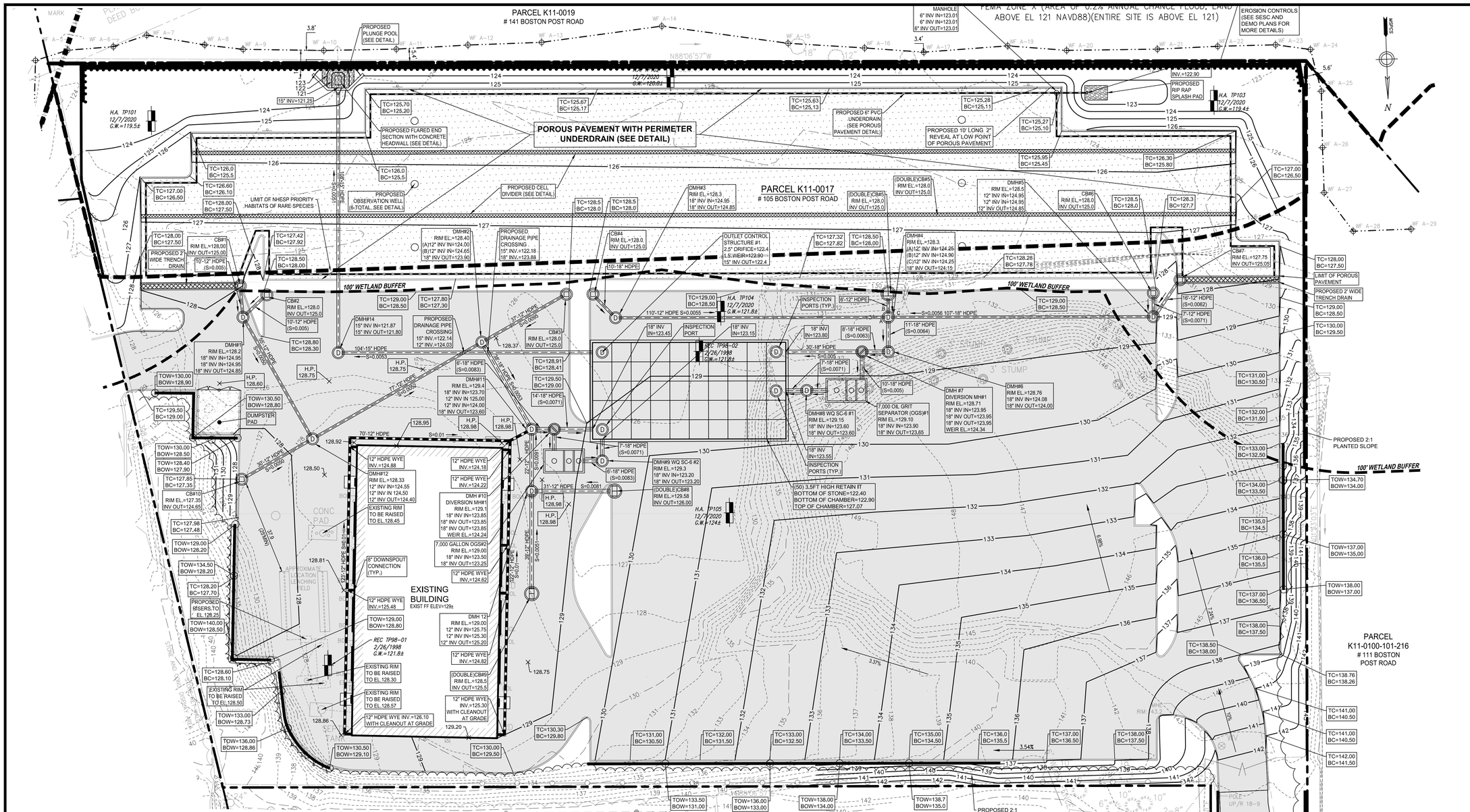
Project
105 BOSTON POST ROAD
SUDBURY, MA

Prepared for
HERB CHAMBERS OF SUDBURY, INC.
259 MCGRATH HWY
SOMERVILLE, MA 02143

Drawing Title
SITE PLAN

Project No.	100-108
Date	3/22/2021
Scale	1"=20'
Drawn By	DJN
Approved By	GC
Drawing No.	C-3



DRAINAGE NOTES:

1. MANHOLES SHALL BE 48-INCH DIAMETER (UNLESS OTHERWISE SPECIFIED). CAST-IN-PLACE BASES SHALL BE USED WHERE MANHOLES ARE CONSTRUCTED OVER EXISTING PIPES.

2. THE CONTRACTOR SHALL FILL ALL PRE-CAST TANKS WITH WATER FOR LEAKAGE OBSERVATIONS BY THE ENGINEER OVER A PERIOD OF 24-HOURS. ANY LEAKS SHALL BE REPAIRED BY THE CONTRACTOR.

3. FOR SPECIFIC INFORMATION OF FRAMES AND COVER FOR DRAINAGE STRUCTURES SEE DETAIL SHEET

4. DRAINAGE STRUCTURE COVERS SHALL HAVE THE WORD "DRAIN" CENTERED ON THE COVER IN 3-INCH HIGH LETTERS.

5. FRAMES, GRATES AND COVERS SHALL BE SET FIRM AND TRUE TO GRADE, ADJUST FOR GRADE WITH BRICK MASONRY.

6. ALL ON-SITE DRAIN LINES SHALL BE SMOOTH INT. WALLED CPE PIPE UNLESS OTHERWISE NOTED.

7. FLARED END SECTIONS SHALL BE PIPE MANUFACTURER STANDARD CONSTRUCTED FROM THE SAME MATERIAL AS THE PIPE.

8. INSTALL PIPE AND FLARED ENDS IN STRICT ACCORDANCE WITH PIPE MANUFACTURER INSTRUCTIONS.

9. PROTECT PROPOSED INFILTRATION BASINS FROM SEDIMENTATION THROUGHOUT CONSTRUCTION OPERATIONS. INFILTRATION BASINS ARE NOT TO BE USED UNTIL DRAINAGE SYSTEM IS INSTALLED AN FUNCTIONAL.

LEGEND:

EXISTING	PROPOSED	DESCRIPTION
124	124	MINOR CONTOUR
130	130	MAJOR CONTOUR
x125.4	+ 130.50	SPOT ELEVATION
	TC131.50 BC131.00	TOP/BOTTOM OF CURB ELEVATION
		PROPERTY LINE (ROW)
		POST AND RAIL FENCE
		CHAIN LINK FENCE
		GUARDRAIL/GUIDERAIL
		TREE LINE
		RIPRAP
S DMH	S SMH	SEWER LINE/MANHOLE
D DMH	D DMH	DRAIN LINE/MANHOLE
CB	CB	CATCH BASIN
DCB	DCB	DOUBLE CATCH BASIN
GAS	GAS	GAS LINE/GATE
W	W	WATER LINE/GATE
		HYDRANT
ECT	ECT	UNDERGROUND ELECTRIC,
		AREA LIGHT
	T	ELECTRICAL TRANSFORMER

GRADING NOTES:

1. THE CONTRACTOR SHALL VERIFY EXISTING GRADES IN THE FIELD AND REPORT ANY DISCREPANCIES IMMEDIATELY TO THE OWNER OR HIS REPRESENTATIVE.

2. EXCAVATION REQUIRED WITHIN THE PROXIMITY OF EXISTING UTILITY LINES SHALL BE DONE BY HAND. CONTRACTOR SHALL REPAIR ANY DAMAGE TO EXISTING UTILITY LINES OR STRUCTURES INCURRED DURING CONSTRUCTION OPERATIONS AT NO COST TO THE OWNER.

3. PITCH EVENLY BETWEEN SPOT GRADES. GRADE ALL AREAS TO DRAIN. ALL PAVED AREAS MUST PITCH TO DRAIN AT A MINIMUM OF 1/8" PER FOOT UNLESS OTHERWISE SPECIFIED. ANY DISCREPANCIES NOT ALLOWING THIS MINIMUM PITCH SHALL BE REPORTED TO THE OWNER OR HIS REPRESENTATIVE PRIOR TO CONTINUING WORK.

4. ALL SITEWORK SHALL CONFORM TO THE CONTRACT DOCUMENTS AND SHALL COMPLY WITH APPLICABLE CODES AND REGULATIONS, AND THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARED FOR THE PROJECT.

5. DURING THE PROGRESS OF THE WORK, THE CONTRACTOR MAY BE REQUIRED TO EXCAVATE ADDITIONAL TEST PITS FOR THE PURPOSE OF LOCATING UNDERGROUND UTILITIES OR STRUCTURES AS AN AID IN ESTABLISHING THE PRECISE LOCATION OF NEW WORK. THIS WORK IS TO BE PERFORMED AT NO ADDITIONAL COST TO THE OWNER. TEST PITS SHALL BE BACKFILLED, AS SOON AS THE DESIRED INFORMATION HAS BEEN OBTAINED.

6. PROTECT STRUCTURES, UTILITIES, SIDEWALKS, PAVEMENTS AND OTHER FACILITIES FROM DAMAGE CAUSED BY SETTLEMENT, LATERAL MOVEMENT, UNDERMINING, WASHOUT AND OTHER HAZARDS CREATED BY CONTRACTOR OPERATIONS.

7. UNLESS DIRECTED OTHERWISE, ALL EXISTING TURF OR VEGETATED AREAS WITHIN THE PROPOSED LIMITS OF WORK FOR EXCAVATION, GRADING, OR IMPROVEMENT SHALL BE CLEARED AND GRUBBED. WITHIN THE CLEARING AND GRUBBING AREA, REMOVE ALL TREES, SHRUBS AND ROOTS UNLESS DESIGNATED OTHERWISE. CLEARING SHALL INCLUDE THE FELLING, CUTTING AND OFF-SITE DISPOSAL OF ALL TREES, SHRUBS, STUMPS AND VEGETATIVE DEBRIS PRODUCED THROUGH THE CLEARING OPERATIONS.

8. FILL DEPRESSIONS CAUSED BY TEST PITS AND CLEARING AND GRUBBING OPERATIONS WITH SATISFACTORY SOIL MATERIAL UNLESS FURTHER EXCAVATION OR EARTHWORK IS INDICATED.

9. THE CONTRACTOR SHALL PREVENT SURFACE WATER AND SUBSURFACE OR GROUNDWATER FROM FLOWING INTO EXCAVATIONS OR EARTHWORK AREAS WHICH WOULD CAUSE FLOODING OF THE PROJECT SITE AND SURROUNDING AREA, OR SOFTENING OR LOOSENING OF THE SOIL AT EXCAVATION OR EARTHWORK SUB-GRADES.

10. THE CONTRACTOR SHALL PROVIDE, INSTALL, OPERATE, MAINTAIN AND REMOVE ADEQUATE AND SATISFACTORY DEWATERING SYSTEMS AND DRAINAGE OF EXCAVATIONS TO PERMIT CONSTRUCTION TO PROCEED "IN THE DRY". THE CONTRACTOR SHALL ASSUME ALL RESPONSIBILITY FOR THE ADEQUACY OF THE METHODS, MATERIALS AND EQUIPMENT EMPLOYED. THE CONTRACTOR SHALL BEAR THE FULL COST OF PROVIDING ALL NECESSARY DEWATERING.

11. THE CONTRACTOR SHALL PROHIBIT SEEPAGE, GROUNDWATER FLOW OR SURFACE INFILTRATION AND RUNOFF FROM UNDERMINING OR OTHERWISE DAMAGING ADJACENT STRUCTURES AND UTILITIES.

12. ANY WATER PUMPED FROM EXCAVATIONS WILL BE CONVEYED BY HOSE TO AN UPLAND AREA AND DISCHARGED INTO HAYBALE CORRALS OR SEDIMENTATION BAGS.

13. PAVING, CONCRETE WORK AND BASE COURSE PREPARATION SHALL BE DONE ONLY AFTER EXCAVATION AND CONSTRUCTION WORK WHICH MIGHT INJURE THEM HAS BEEN COMPLETED. DAMAGE CAUSED DURING CONSTRUCTION SHALL BE REPAIRED BEFORE ACCEPTANCE.

14. PAVEMENT OR BASE MATERIALS SHALL NOT BE PLACED ON A MUDDY OR FROZEN SUBGRADE.

15. ESTABLISHMENT OF GRADES, GRADE CONTROL, AND CONFORMANCE TO REQUIRED GRADE TOLERANCES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

16. PROTECT GRADED, FINISHED OR PAVED AREAS FROM DAMAGE AND KEEP THEM FREE OF TRASH AND DEBRIS RESULTING FROM CONSTRUCTION OPERATIONS. REPAIR AND RE-ESTABLISH GRADES IN SETTLED, ERODED AND RUTTED AREAS.

17. PAVEMENT EXCAVATED DURING UTILITY CONSTRUCTION, WHETHER ON THE SITE OR ADJACENT PROPERTIES, SHALL BE RESTORED AND MATCHED WITH EXACTLY THE SAME MATERIALS AND TOLERANCES AS PRIOR TO DISRUPTION, AT NO ADDITIONAL COST TO THE OWNER, OR ADJACENT PROPERTY OWNERS.

18. STONE USED FOR MACHINE PLACED RIP-RAP SHALL BE REASONABLY WELL GRADED, HARD, DURABLE, ANGULAR IN SHAPE, RESISTANT TO WEATHERING AND FREE FROM ORGANIC MATERIAL. ROUNDED STONES OR BOULDERS ARE NOT ACCEPTABLE. THE MINIMUM WEIGHT OF THE STONE SHALL BE 155 POUNDS PER CUBIC FOOT. STONE SHALL BE PLACED IN CONFORMANCE WITH THE LINES, GRADES AND THICKNESSES SHOWN ON THE DRAWINGS.

19. AT ALL LOCATIONS WHERE EXISTING CURBING OR PAVEMENT ABUTS NEW CONSTRUCTION, THE EDGE OF THE EXISTING CURB OR PAVEMENT SHALL BE SAW CUT TO A CLEAN, SMOOTH EDGE. BLEND NEW PAVEMENT, CURBS AND EARTHWORK SMOOTHLY INTO EXISTING BY MATCHING LINES, GRADES AND JOINTS.

20. ALL RIP RAP STONE SHALL BE HAND CHINKED AND SHALL CONFORM TO MASSACHUSETTS HIGHWAY DEPARTMENT STANDARDS.

Date	Description	No.

Revisions

3-22-2021

COMMONWEALTH OF MASSACHUSETTS
GABRIEL R. CROCKER
CIVIL
No. 47917
REGISTERED PROFESSIONAL ENGINEER

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-919-0808

Project

105 BOSTON POST ROAD

SUDBURY, MA

Prepared for

HERB CHAMBERS OF SUDBURY, INC.

259 MCGRATH HWY
SOMERVILE, MA 02143

Drawing Title

GRADING AND DRAINAGE PLAN

Project No. 100-108	Drawing No.
Date 3/22/2021	C-4
Scale 1"=20'	
Drawn By DJN	
Approved By GC	

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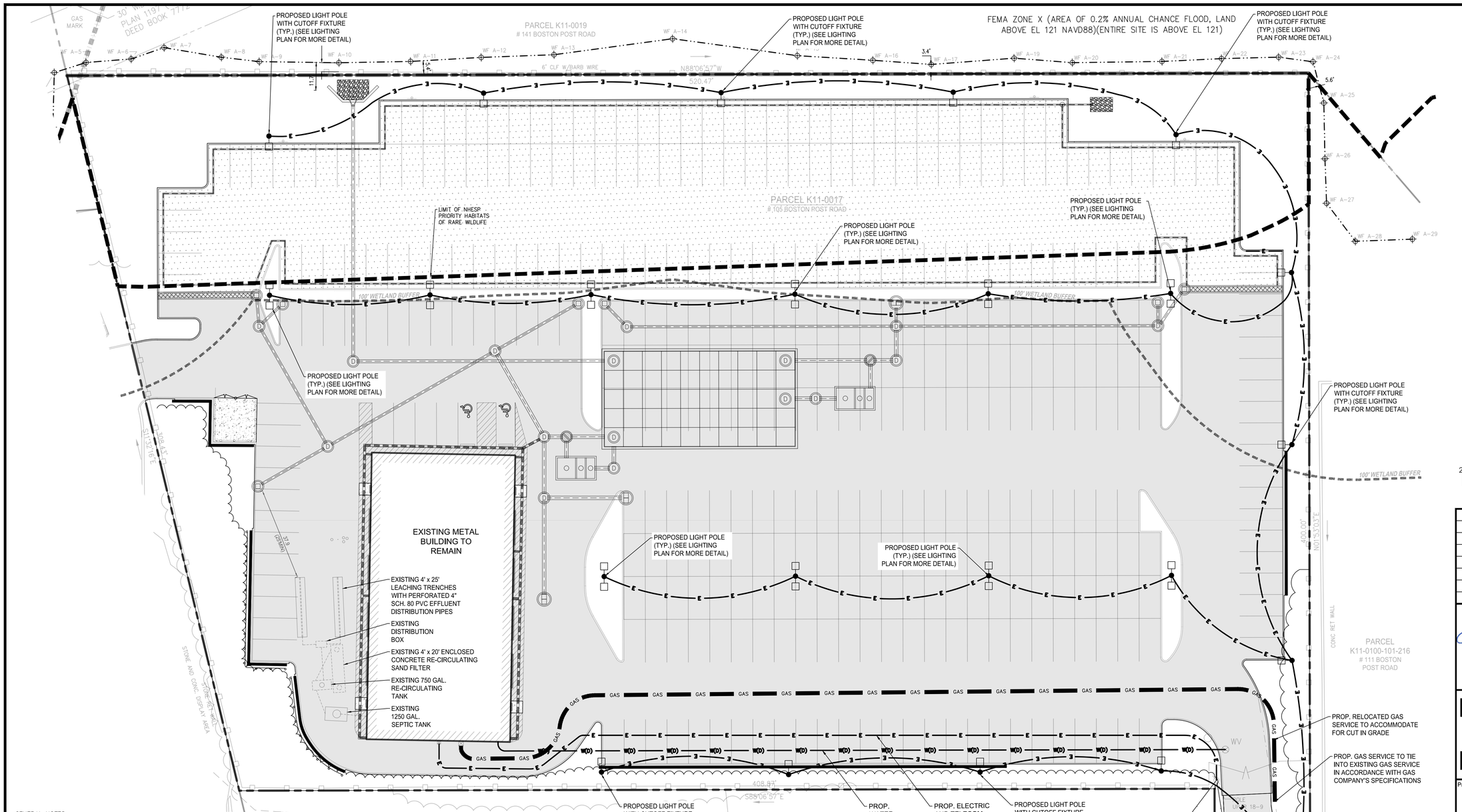

GENERAL NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THAT THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS DO NOT CONFLICT WITH ANY KNOWN EXISTING OR OTHER PROPOSED IMPROVEMENTS. IF ANY CONFLICTS ARE DISCOVERED, THE CONTRACTOR SHALL NOTIFY THE OWNER AND THE ENGINEER PRIOR TO INSTALLATION OF ANY PORTION OF THE SITE WORK WHICH WOULD BE AFFECTED.

2. AT ALL LOCATIONS WHERE EXISTING CURBING OR PAVEMENT ABUTS NEW CONSTRUCTION, THE EDGE OF THE EXISTING CURB OR PAVEMENT SHALL BE SAW CUT TO A CLEAN, SMOOTH EDGE. BLEND NEW PAVEMENT, CURBS AND EARTHWORK SMOOTHLY INTO EXISTING BY MATCHING LINES, GRADES AND JOINTS.

3. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES, AS REQUIRED. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE OWNER AND ARCHITECT FOR RESOLUTION.

4. ALL UTILITY COVERS, GRATES, ETC. SHALL BE ADJUSTED TO BE FLUSH WITH THE PAVEMENT FINISH GRADE UNLESS OTHERWISE NOTED. RIM ELEVATIONS OF DRAINAGE STRUCTURES AND MANHOLES ARE APPROXIMATE.

5. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE AWAY FROM ALL BUILDING FOUNDATIONS, STRUCTURES AND PLANTING BEDS. PITCH EVENLY BETWEEN SPOT GRADES.

6. THE CONTRACTOR SHALL PRESERVE FROM DAMAGE ALL VEGETATION DESIGNATED TO REMAIN AS SHOWN ON THE DRAWINGS, FLAGGED IN THE FIELD OR AS DIRECTED BY THE LANDSCAPE ARCHITECT. THE LIMIT OF CLEARING SHALL BE IN ACCORDANCE WITH LIMIT OF WORK AS SHOWN ON THE DRAWINGS, UNLESS OTHERWISE SPECIFIED. NO TREES SHALL BE CUT, REMOVED, DESTROYED OR TRIMMED OUTSIDE THE LIMIT OF WORK WITHOUT APPROVAL OF THE OWNER AND THE TOWN OF SUDBURY PLANNING BOARD.

7. THE CONTRACTOR SHALL ALTER THE MASONRY OF THE TOP SECTION OF ALL EXISTING DRAINAGE STRUCTURES AS NECESSARY FOR CHANGES IN GRADE, AND RESET ALL WATER AND DRAINAGE FRAMES, GRATES AND BOXES TO THE PROPOSED FINISH SURFACE GRADE.

8. UNDERGROUND UTILITIES WERE COMPILED FROM AVAILABLE RECORD PLANS OF UTILITY COMPANIES AND PUBLIC AGENCIES AND ARE APPROXIMATE AND ASSUMED. BEFORE COMMENCING SITE WORK IN ANY AREA, CONTACT "DIG SAFE" AT 1-888-344-7233 TO ACCURATELY LOCATE UNDERGROUND UTILITIES. ANY DAMAGE TO EXISTING UTILITIES OR STRUCTURES SHALL BE THE CONTRACTOR'S RESPONSIBILITY. NO EXCAVATION SHALL BE DONE UNTIL UTILITY COMPANIES ARE PROPERLY NOTIFIED IN ADVANCE.

9. ALL SITEWORK SHALL CONFORM TO THE CONTRACT DOCUMENTS AND SHALL COMPLY WITH APPLICABLE CODES AND REGULATIONS, AND THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARED FOR THE PROJECT. THE CONTRACTOR SHALL MAKE ALL NOTIFICATIONS REQUIRED FOR INSPECTIONS AND TESTING ASSOCIATED WITH SUCH.

10. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND CONSTRUCTION SHALL COMPLY WITH ALL TOWN OF SUDBURY DEPARTMENT OF PUBLIC WORKS FOR PAVING, PAVEMENT CUTTING, EXCAVATION, UTILITY CONNECTIONS, BACKFILLING, AND PATCHING.

11. ALL RIP RAP STONE SHALL BE HAND CHINKED AND SHALL CONFORM TO MASSACHUSETTS HIGHWAY DEPARTMENT STANDARDS.

12. SIZES OF DOMESTIC AND FIRE WATER SERVICES TO BE DETERMINED BY PROJECT MEP ENGINEER AND FIRE PROTECTION ENGINEER.

13. REFER TO PROPOSED SUBSURFACE DISPOSAL PLAN FOR SEPTIC SYSTEM DETAILS.

14. CONTRACTOR IS CAUTIONED THAT NOT EVERY FITTING ON THE WATER AND FIRE SERVICE ARE LABELED. TYPICAL FITTINGS ARE LABELED FROM TIME TO TIME, HOWEVER THE INTENT OF THESE DRAWINGS IS THAT THE CONTRACTOR PROVIDE A COMPLETE WORKING SYSTEM, INCLUSIVE OF ALL COMPONENTS NECESSARY TO CONSTRUCT , OPERATE AND MAINTAIN BOTH THE FIRE AND WATER SYSTEMS.

15. LOCATION OF ELECTRICAL AND TELECOM SYSTEMS ARE APPROXIMATE. REFER TO FINAL ELECTRICAL SITE PLANS FOR DETAIL INFORMATION AND LOCATION OF ALL ELECTRIC, TELECOM, CABLE AND EQUIPMENTS.

TITLE 5 ANALYSIS

DESIGN FLOW:

SERVICE: 15 GPD PER EMPLOYEE
8 EMPLOYEES x (15 GPD ÷ 1 EMPLOYEE)
= 120 GPD

120 GPD ÷ .74 GPD/SF = 162 SF

FLOW PROVIDED:
2 x 25 x (2 x 1.5 + 4) x .74 GPD/SF
=259 GPD PROVIDED

Date	Description	No.

Revisions

3-22-2021

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Project

105 BOSTON POST ROAD

SUDBURY, MA

Prepared for

HERB CHAMBERS OF SUDBURY, INC.

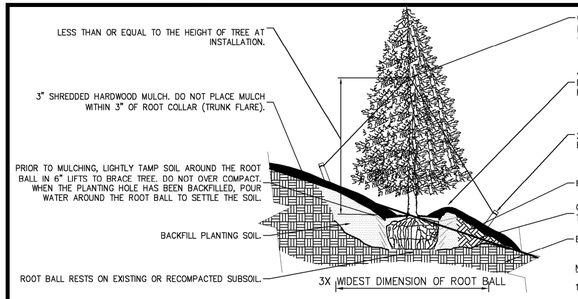
259 MCGRATH HWY
SOMERVILE, MA 02143

Drawing Title

UTILITIES PLAN

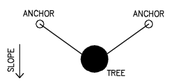
Project No.	100-108	Drawing No.
Date	3/22/2021	C-5
Scale	1"=20'	
Drawn By	DJN	
Approved By	GC	

C:\JOB\Crocker Design Group, LLC\Gabriel Crocker - Projects\100-108 Sudbury - Herb Chambers Mazda DOT\dwg\Plot Sheets\Site Plan Application\, CD\UTIL PLAN.dwg, C-5 GRAD, Mar 19, 2021 11:24



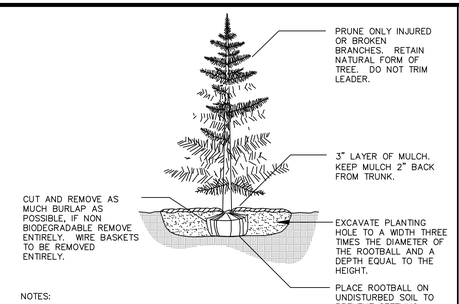
NOTES:

1. TREE SHALL BARE SAME RELATIONSHIP TO FINISH GRADE AS IN THE NURSERY.
2. PRUNE ANY BROKEN BRANCHES AFTER FINAL PLACEMENT. PRUNE PERIMETER BRANCHES AS REQUIRED BUT RETAIN NATURAL SHAPE OF TREE. NEVER CUT A LEADER. PRUNING TO BE PERFORMED BY A QUALIFIED LANDSCAPE PROFESSIONAL.
3. TREE SHALL BE PLUMB AND STRAIGHT.
4. AFTER PLACEMENT AND ROTATION OF TREE, REMOVE ALL ROPES FROM ROOT BALL AND CUT AND REMOVE TOP HALF OF BURLAP.



ANCHORING DIAGRAM
NOT TO SCALE

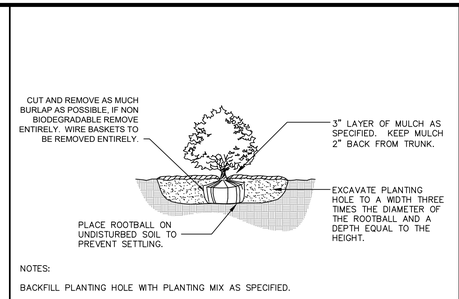
CONIFEROUS TREE PLANTING & STAKING DETAIL ON SLOPE (5% TO 50%)
NOT TO SCALE



NOTES:

1. BACKFILL PLANTING HOLE WITH PLANTING MIX AS SPECIFIED.
2. BACKFILL HALF THE SOIL AND WATER TO SETTLE OUT AIR POCKETS, COMPLETE BACKFILLING AND REPEAT WATERING.
3. IF ROOTS ARE CIRCLING THE ROOTBALL EXTERIOR, CUT ROOTS VERTICALLY IN SEVERAL PLACES PRIOR TO PLANTING.

EVERGREEN TREE PLANTING
NOT TO SCALE



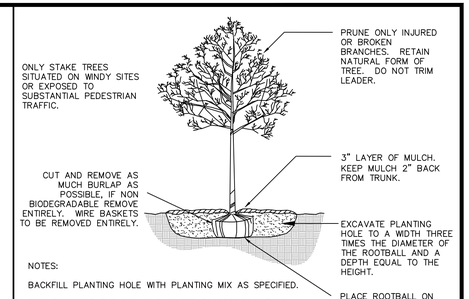
NOTES:

BACKFILL PLANTING HOLE WITH PLANTING MIX AS SPECIFIED.

BACKFILL HALF THE SOIL AND WATER TO SETTLE OUT AIR POCKETS, COMPLETE BACKFILLING AND REPEAT WATERING.

IF ROOTS ARE CIRCLING THE ROOTBALL EXTERIOR, CUT ROOTS VERTICALLY IN SEVERAL PLACES PRIOR TO PLANTING.

SHRUB PLANTING DETAIL
(NOT TO SCALE)



NOTES:

BACKFILL PLANTING HOLE WITH PLANTING MIX AS SPECIFIED.

BACKFILL HALF THE SOIL AND WATER TO SETTLE OUT AIR POCKETS, COMPLETE BACKFILLING AND REPEAT WATERING.

IF ROOTS ARE CIRCLING THE ROOTBALL EXTERIOR, CUT ROOTS VERTICALLY IN SEVERAL PLACES PRIOR TO PLANTING.

TREE PLANTING
(NOT TO SCALE)

PLANT SCHEDULE

SYM.	QTY.	BOTANICAL NAME	COMMON NAME	SIZE*
AR	2	ACER RUBRUM	RED MAPLE	2.5–3" CAL.
QA	19	QUERCUS ALBA	WHITE OAK	3" CAL
WH	46	CORYLUS AMERICANA	WITCH HAZEL	18–24" HT
VA	78	PRUNUS SEROTINA	WILD BLACK CHERRY	18–24" HT.
CA	107	CORNUS ALTERNIFOLIA	ALTERNATE LEAF DOGWOOD	18–24" HT
CR	92	CORNUS RACEMOSA	GREY DOGWOOD	18–24" HT
AM	69	ARONIA MELANOCARPA	BLACK CHOKEBERRY	18–24" HT
TD	78	TAXUS X MEDIA	DENSE YEW	18–24" HT

GENERAL NOTES

1. ALL PLANT MATERIAL SHALL CONFORM TO THE MINIMUM GUIDELINES ESTABLISHED BY THE AMERICAN STANDARD FOR NURSERY STOCK PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN, INC.
2. ALL PLANTING BEDS TO BE FILLED WITH SOIL AND CROWNED ABOVE ADJACENT LAWN OR IMPROVED AREAS.
3. ALL PLANTING BEDS TO BE MULCHED WITH AGED HARDWOOD BARK MULCH TO A DEPTH OF THREE (3) INCHES. PROVIDE FIVE (5) FOOT DIAMETER MULCH CIRCLE AROUND ALL INDIVIDUAL TREE PLANTINGS AND CONTINUOUS MULCH BED AROUND SHRUB PLANTINGS.
4. PLANT MATERIALS SHALL BEAR SAME RELATIONSHIP TO FINISH GRADE AS THEY BORE TO GRADE IN THE NURSERY.
5. SPACE PLANTS AT SCALED DISTANCES SHOWN ON DRAWINGS UNLESS OTHERWISE DETERMINED IN FIELD FOR SCREENING PURPOSES.
6. ANY PROPOSED SUBSTITUTION OF PLANT MATERIAL SHALL ONLY BE MADE AFTER PRIOR APPROVAL OF LANDSCAPE ARCHITECT OR OWNER'S REPRESENTATIVE.
7. ALL PLANT MATERIALS SHALL BE GUARANTEED FOR ONE YEAR FOLLOWING DATE OF FINAL WRITTEN ACCEPTANCE FROM THE OWNER OR HIS REPRESENTATIVE.
8. WARM SEASON GRASS MIX AREAS DEPICTED HEREIN SHALL NOT BE CONSTRUED AS THE FULL EXTENT REQUIRED; IN ADDITION TO AREAS INDICATED HEREIN, THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING WARM SEASON GRASS MIX FOR ALL STRIPPED GRAVEL PIT AREAS AND ALL AREAS DISTURBED DURING CONSTRUCTION WHICH MAY BE BEYOND THOSE INDICATED HEREIN.

SOIL NOTES:

1. ALL AREAS DISTURBED BY CONSTRUCTION NOT DESIGNATED TO RECEIVE OTHER TREATMENT SHALL BE LOAMED A MINIMUM DEPTH AS SPECIFIED BELOW. TOPSOIL FOR THIS PURPOSE SHALL BE TESTED BY AN APPROVED SOIL TESTING LABORATORY AND SHALL MEET THE FOLLOWING MINIMUM STANDARDS:
   a)TEXTURE: FINE SANDY LOAM OR SANDY LOAM, AS DETERMINED BY MECHANICAL ANALYSIS AND BASED ON THE USDA STANDARD SOIL CLASSIFICATION SYSTEM.
   b)ACIDITY: SOIL REACTION SHALL BE IN THE RANGE OF 5.5 TO 7.6, OR SHALL BE AMENDED TO MEET THIS RANGE.
   c)ORGANIC MATTER: TOPSOIL SHALL HAVE A RANGE BETWEEN 10% AND 20% ORGANIC MATTER CONTENT BASED ON THE LOSS ON IGNITION OF OVEN–DRIED SAMPLES.

TOPSOIL SHALL BE SPREAD TO A MINIMUM DEPTH OF SIX (6) INCHES AFTER SETTLING ON ALL TURFGRASS LAWN AREAS ADJACENT TO THE BUILDING, AS INDICATED IN THE PROJECT LEGEND. TOPSOIL SHALL BE SPREAD TO A MINIMUM DEPTH OF FOUR (4) INCHES AFTER SETTLING ON ALL GRAVEL PIT RECLAMATION AREAS, WARM SEASON GRASS MIX AREAS AND OTHER DISTURBED AREAS.

PLANTING MIX: MIX THE SPECIFIED MATERIALS ON–SITE IN THE FOLLOWING PROPORTIONS:
3 PARTS TOPSOIL AS SPECIFIED ABOVE, 1 PART PEAT MOSS, 1 PART SAND, WITH 5 POUNDS OF SUPERPHOSPHATE/CUBIC YARD OF MIXTURE (ONLY IF PLANTS ARE INSTALLED IN SPRING). ALL AMENDMENTS SHALL BE THOROUGHLY INCORPORATED INTO MIXTURE TO ASSURE UNIFORM DISTRIBUTION. PLANTING MIX SHALL BE USED TO BACKFILL ALL TREE AND SHRUB PLANTING HOLES, AS INDICATED IN THE PLANTING DETAILS, AND SHALL BE SPREAD TO A MINIMUM DEPTH OF FOUR (4) INCHES.

BASIN MIX: MIX THE SPECIFIED MATERIALS ON–SITE IN THE FOLLOWING PROPORTIONS:
1 PART TOPSOIL, 1 PART PEAT MOSS, 1 PART SAND, WITH 5 POUNDS OF SUPERPHOSPHATE/CUBIC YARD OF MIXTURE (ONLY IF PLANTS ARE INSTALLED IN SPRING). ALL AMENDMENTS SHALL BE THOROUGHLY INCORPORATED INTO MIXTURE TO ASSURE UNIFORM DISTRIBUTION.

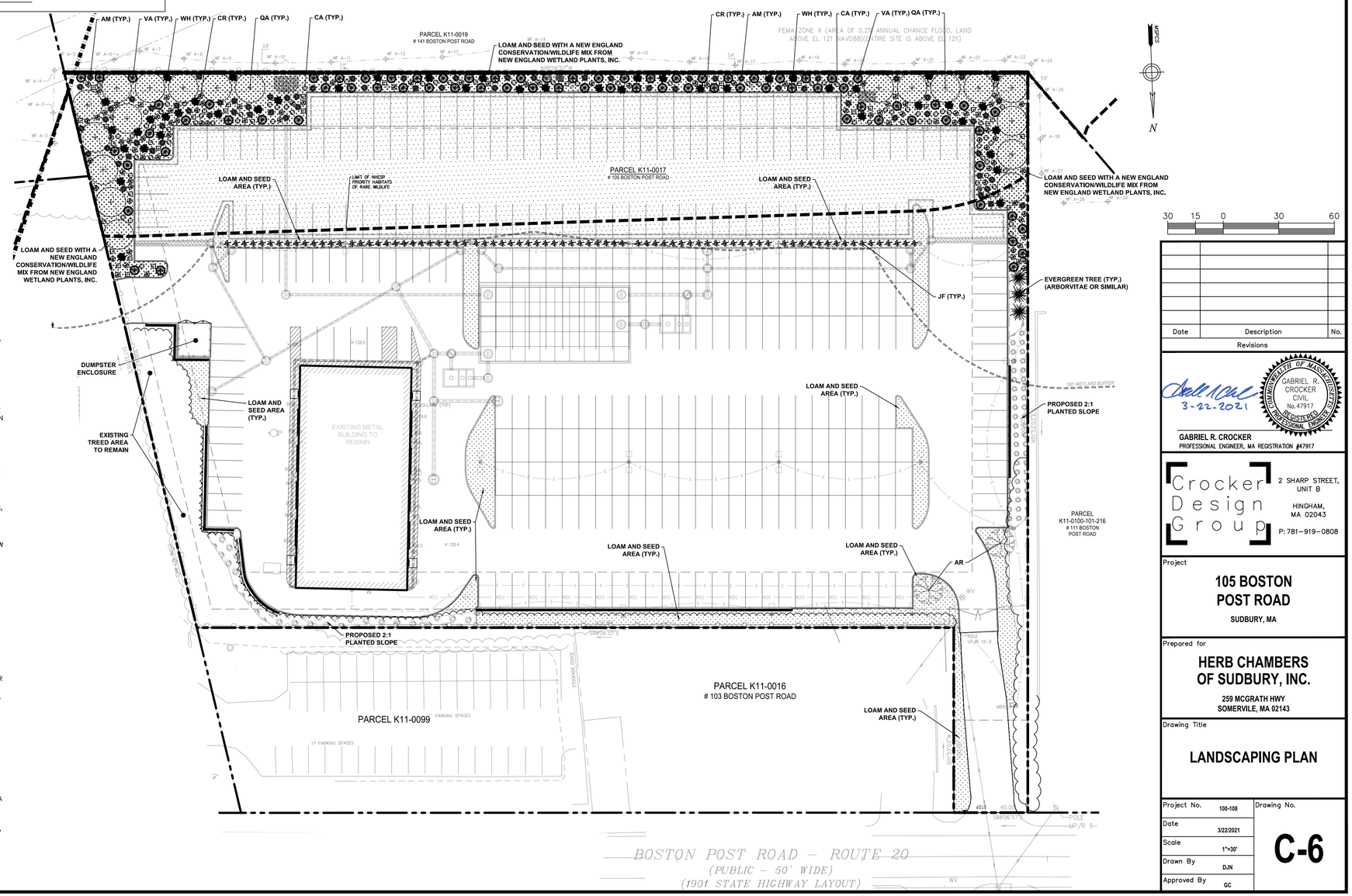
BASIN MIX SHALL BE SPREAD TO A MINIMUM DEPTH OF SIX (6) INCHES AFTER SETTLING ON ALL DETENTION BASIN BOTTOMS AND SLOPES.

SEED MIX NOTES:

1. SEED ALL TURFGRASS LAWN AREAS, AS INDICATED IN THE PROJECT LEGEND, WITH A DROUGHT TOLERANT, HIGH–FESCUE TURFGRASS SEED MIX SUCH AS PEARL'S PREMIUM GRASS SEED BY PEARL'S PREMIUM, WAYLAND, MA; ENVIROTURF BY BLUESTEM NURSERY, LAURIER, WA; ECO–LAWN BY WILDFLOWER FARM, COLDWATER, ONT, CAN; OR APPROVED EQUAL, APPLIED AT SEED PRODUCER'S RECOMMENDED RATE.
2. SEED ALL STORMWATER DETENTION BASIN AREAS WITH "NEW ENGLAND EROSION CONTROL/ RESTORATION MIX FOR DETENTION BASINS AND MOIST SITES" BY NEW ENGLAND WETLAND PLANTS OR APPROVED EQUAL, PER MANUFACTURER'S RECOMMENDATIONS.
3. SEED ALL GRAVEL PIT RESTORATION AREAS AND OTHER DISTURBED AREAS WITH "NEW ENGLAND NATIVE WARM SEASON GRASS MIX" BY NEW ENGLAND WETLAND PLANTS, AMHERST, MA, OR APPROVED EQUAL, PER MANUFACTURER'S RECOMMENDATIONS. WARM SEASON SEEDING PROGRAM WILL LIKELY TAKE 2–3 GROWING SEASONS UNTIL GOOD GROWTH IS ESTABLISHED. RESTORATION OF ALL GRAVEL PIT RESTORATION AREAS SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS, BEST MANAGEMENT PRACTICES FOR SAND AND GRAVEL PITS, MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION, MAY, 2003.
4. MULCH ALL SEEDED AREAS WITH 500–700 LBS. OF SALTMARSH HAY OR WEED–FREE STRAW PER ACRE, SPREAD EVENLY. ALL SLOPES OF 3:1 OR GREATER, AFTER BEING LOAMED, SEEDED, AND MULCHED, SHALL BE COVERED WITH JUTE OR BIODEGRADABLE TOBACCO NETTING SECURELY ANCHORED TO THE SLOPE. OVERLAP A NETTING JOINTS A MINIMUM OF 4" AND SECURE WITH A DOUBLE ROW OF STAPLES.*
5. MAINTENANCE OF SEED AREAS SHALL CONSIST OF WATERING, WEEDING, CURING, REPAIR OF ALL EROSION, AND RESEEDING AS NECESSARY TO ESTABLISH A UNIFORM STAND OF GRASS. LAWNS SHALL BE WATERED IN A SATISFACTORY MANNER DURING AND IMMEDIATELY AFTER PLANTING, AND NOT LESS THAN TWICE PER WEEK UNTIL FINAL ACCEPTANCE. ALL AREAS WHICH FAIL TO SHOW A UNIFORM STAND OF GRASS FOR ANY REASON SHALL BE RESEEDED REPEATEDLY UNTIL A UNIFORM STAND IS ATTAINED.
6. HYDROSEEDING IS AN ACCEPTABLE ALTERNATE METHOD OF SEEDING, IF UNDERTAKEN IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

–MATERIALS FOR HYDROSEEDING SHALL INCLUDE TACKIFIER, WOOD CELLULOSE FIBER MULCH, FERTILIZER, GROUND LIMESTONE AND WATER.
–PROVIDE JUTE MATTING OR BIODEGRADABLE TOBACCO NETTING ON ALL SLOPES EQUAL TO OR GREATER THAN 3:1. JUTE MATTING SHALL BE C–JUTE BY CONTECH CONSTRUCTION PRODUCTS, INC, GEOJUTE BY BELTON INDUSTRIES OR APPROVED EQUAL.*
–IF PROJECT SCHEDULE REQUIRES SEEDING TO BE PERFORMED AFTER OCTOBER 15 UNTIL MARCH 31, THE FOLLOWING IS REQUIRED: AFTER HYDROSEEDING/SEEDING, THOSE VEGETATED AREAS WHICH HAVE A SLOPE EQUAL TO OR STEEPER THAN 4:1 SHALL BE COVERED WITH JUTE MATTING AND STAPLED IN PLACE PER MANUFACTURERS REQUIREMENTS. PRECAUTIONS SHALL BE TAKEN TO MINIMIZE DISTURBANCE OF THE HYDROSEED/SEED WHEN INSTALLING THE JUTE.*
–HYDROSEEDING/ SEEDING MIXTURE:
–TACKIFER:
APPLY AT A RATE OF 60 GALLONS PER ACRE.
–WOOD CELLULOSE FIBER MULCH:
APPLY AT A RATE OF 2,000 POUNDS PER ACRE.
–APPLY FERTILIZER AND LIMESTONE AT RATES DETERMINED BY SOIL ANALYSIS

*STRAW MULCH AND NETTING ON SLOPES 3:1 OR GREATER IS NOT REQUIRED
ON HYDROSEEDING OPERATIONS IF SLOPES ARE SPRAYED WITH A BONDED
FIBER MATRIX MULCH, SUCH AS FLEXTERRA BY PROFILE PRODUCTS, LLC,
HYDROSTRAW BFM BY HYDROSTATION, INC., OR APPROVED EQUAL, INSTALLED
IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.



Date	Description	No.

Revisions

3-22-2021

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

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Project
105 BOSTON POST ROAD
SUDBURY, MA

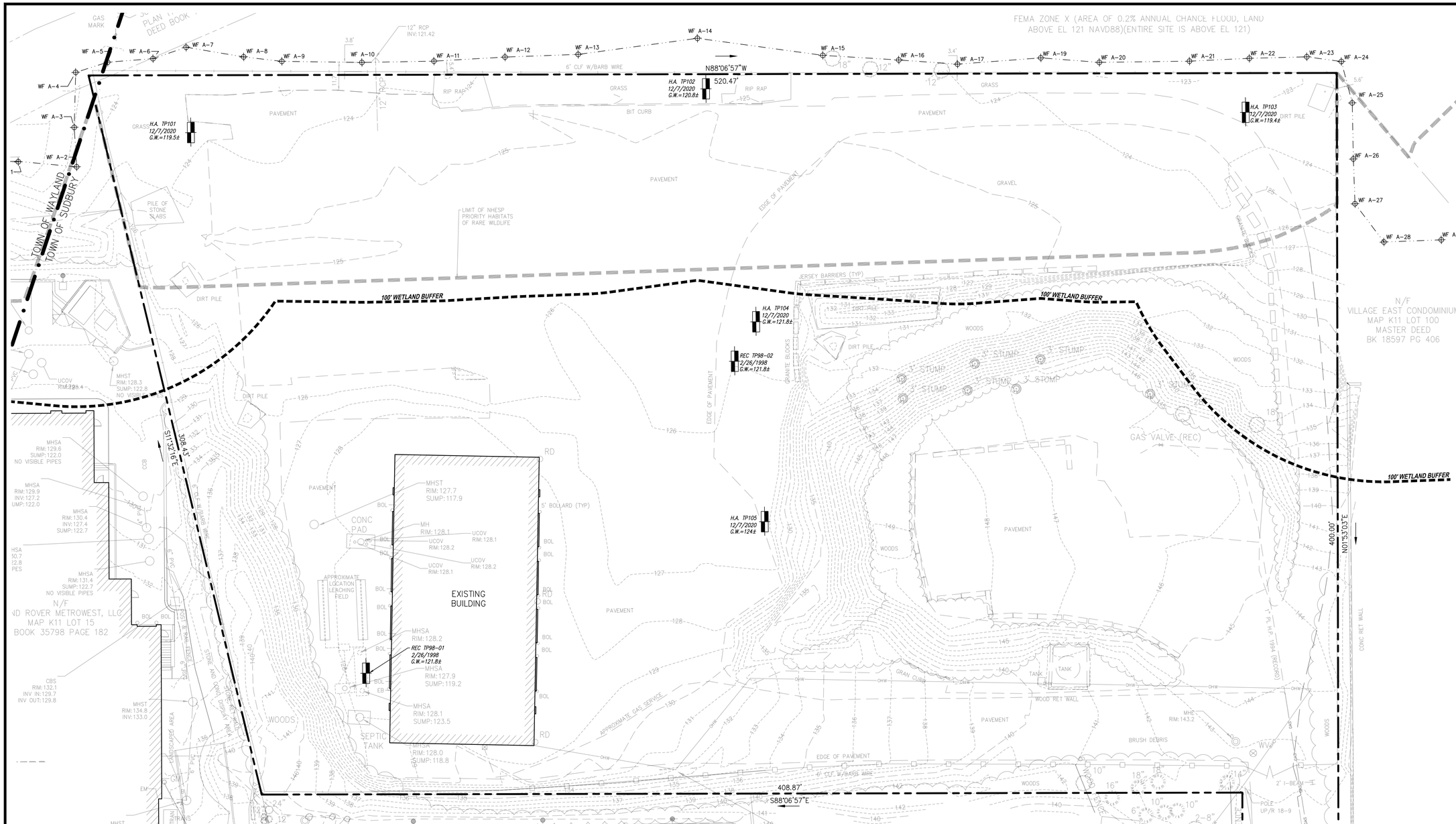
Prepared for
HERB CHAMBERS OF SUDBURY, INC.
259 MCGRATH HWY
SOMERVILE, MA 02143

Drawing Title
LANDSCAPING PLAN

Project No.	100-108
Date	3/22/2021
Scale	1"=30'
Drawn By	DJN
Approved By	GC

Drawing No.
C-6

C:\DOS\Crocker Design Group, LLC\Gabriel Crocker – Projects\100-108 Sudbury – Herb Chambers Mass DOT\dwg\Plot Sheet\Site Plan Application\ C7-LANDSCAPE PLAN.dwg, C-6-LANDSC PLAN, Mar 19, 2021 11:25



TEST PIT DATA

PERFORMED BY: RANSOM ENVIRONMENTAL CONSULTANTS
DATE: FEBRUARY 26, 1998

PERFORMED BY: SCOTT G. SHAY - HALEY & ALDRICH INC
DATE: DECEMBER 7, 2020

TP-98-01
EL. = 128.34
PAVEMENT — EL. = 127.68
FILL — EL. = 125.34
C- COARSE SAND — EL. = 121.34
DEPTH = 7'
ESHGW = 121.8

TP-98-02
EL. = 126.17
A — EL. = 125.59
B-LOAMY SAND — EL. = 124.84
C1-SANDY SILT — EL. = 123.59
C2-SILT LOAM — EL. = 121.17
DEPTH = 5'
ESHGW = 121.8

TP-101
EL. = 123.8
FILL-SANDY LOAM — EL. = 122.8
FILL-SAND — EL. = 119.3
O-LOAM — EL. = 118.0
SANDY LOAM — EL. = 116.3
DEPTH = 7.5'
ESHGW = 119.5

TP-102
EL. = 124.6
FILL-SANDY LOAM — EL. = 123.6
ASPHALT — EL. = 123.4
O-LOAM — EL. = 120.0
O-SILT LOAM — EL. = 118.4
E-SILT — EL. = 117.1
DEPTH = 7.5'
ESHGW = 120.8

TP-103
EL. = 123.2
FILL-SANDY LOAM — EL. = 122.4
FILL-SAND — EL. = 119.6
O-LOAM — EL. = 118.4
E-SILT — EL. = 117.7
DEPTH = 5.5'
ESHGW = 119.4

TP-104
EL. = 125.7
FILL-SILT LOAM — EL. = 124.9
FILL-LOAMY SAND — EL. = 123.4
O-SILT CLAY LOAM — EL. = 122.7
B-SANDY LOAM — EL. = 121.7
E-SILTY CLAY — EL. = 120.7
DEPTH = 5'
ESHGW = 121.8

TP-105
EL. = 126.9
FILL-SANDY LOAM — EL. = 124.9
C-SAND — EL. = 120.9
DEPTH = 6'
ESHGW = 124.0

Date	Description	No.

Revisions

3-22-2021

GABRIEL R. CROCKER
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Crocker Design Group
2 SHARP STREET, UNIT B
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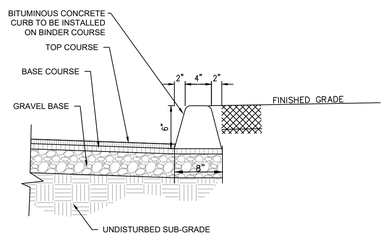
Project
105 BOSTON POST ROAD
SUDBURY, MA

Prepared for
HERB CHAMBERS OF SUDBURY, INC.
259 MCGRATH HWY
SOMERVILE, MA 02143

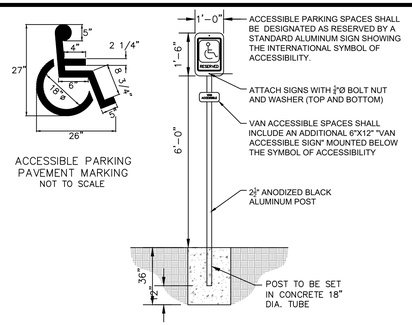
Drawing Title
TEST PIT PLAN

Project No.	100-108
Date	3/22/2021
Scale	1"=20'
Drawn By	DJN
Approved By	GC

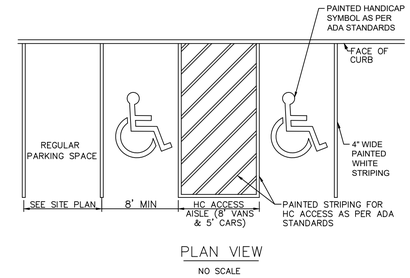
Drawing No.
C-7



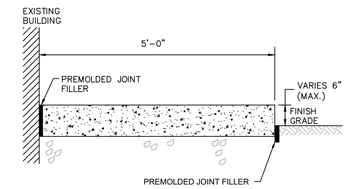
VERTICAL ASPHALT CURB
NOT TO SCALE



ACCESSIBLE PARKING SIGN
NOT TO SCALE



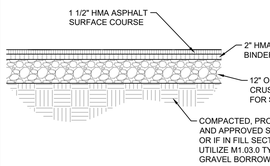
HANDICAP PARKING LOT STRIPING AND HC STALLS
NOT TO SCALE



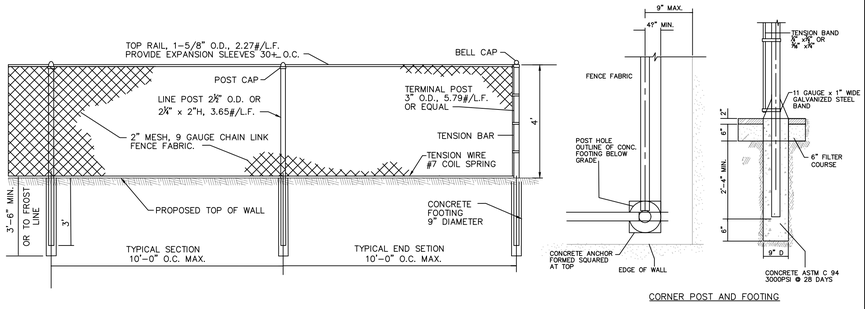
NOTE:
1. PADS AT DOORWAYS TO BE AT LEAST 5' DEEP AND EXTEND 1' BEYOND DOORWAY EACH SIDE. FINAL DIMENSIONS SHALL BE PER THE ARCHITECTURAL DOORS.
2. REFER TO STRUCTURAL DRAWINGS FOR THICKNESS, FOOTING DESIGN AND REINFORCING DETAILS.
3. MATCH WALK TO DOOR PAD GRADE WHERE NEW OR RECONSTRUCTED WALK IS PROPOSED.

DOOR PAD
NOT TO SCALE

CONSERVATION SIGN DETAIL
NOT TO SCALE

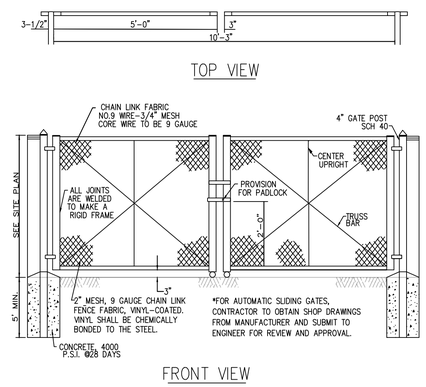


BITUMINOUS PAVEMENT SECTION
NOT TO SCALE

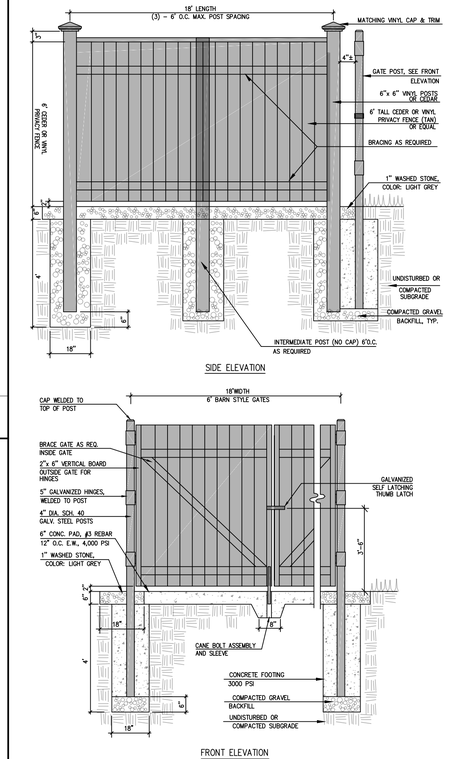


NOTE:
1. BLACK VINYL SLATS TO BE INSERTED IN EACH LINE OF MESH
2. FENCING ALONG THREE SIDES OF CONCRETE PAD

ELEVATION OF TYPICAL CHAIN LINK FENCE
NOT TO SCALE

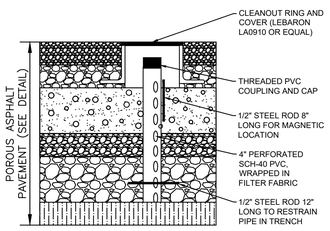


DRIVEWAY ENTRY GATE DETAIL (CHAIN LINK FENCE)
NOT TO SCALE

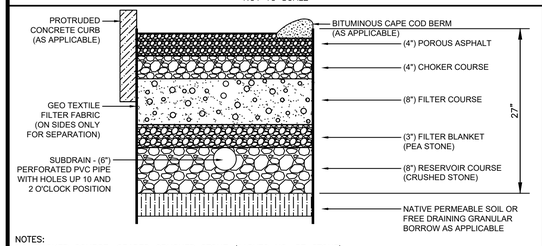


NOTE:
CONTRACTOR TO COORDINATE FENCE CONSTRUCTION WITH MANUFACTURER'S RECOMMENDATION.

DUMPSTER PAD AND ENCLOSURE
NOT TO SCALE

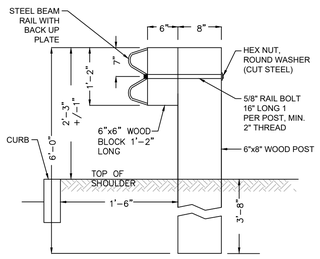


POROUS PAVEMENT OBSERVATION WELL DETAIL
NOT TO SCALE



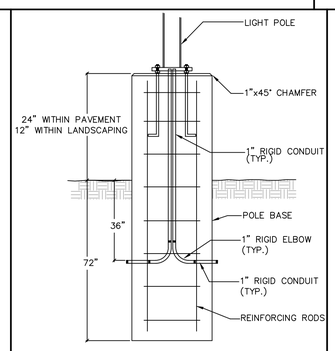
NOTES:
1. CHOKER COURSE: GRADED CRUSHED STONE (AASHTO NO. 57 STONE).
2. FILTER COURSE: POORLY GRADED SAND (MANUFACTURED) TO MEET NHDOT 304.1 WITH LESS THAN 4 PERCENT FINES.
3. FILTER BLANKET: 3/8" PEA GRAVEL.
4. RESERVOIR COURSE: 3/4" TO 2" WASHED STONE (AASHTO NO. 3).
5. EXCAVATION AND BACKFILL
   - ALL TOPSOIL, SUBSOIL AND DELETERIOUS MATERIAL, IF ANY, MUST BE EXCAVATED AND REMOVED FROM WITHIN FIVE (5) FEET FROM ALL SIDES OF THE INFILTRATION SYSTEM AND TO A DEPTH OF SIX (6) INCHES BELOW THE SURFACE OF THE NATURAL SAND/GRAVEL SOIL (C HORIZON). (NOTE THAT THIS WAS TO BE DONE DURING THE ESP PHASE)
   - GRANULAR FILL: FILL MATERIAL BELOW THE BOTTOM OF THE SYSTEM AND WITHIN FIVE (5) FEET OF THE SIDES OF THE SYSTEM SHALL BE FREE DRAINING GRANULAR FILL CONSISTING OF CLEAN SANDY GRAVELLY MATERIAL FROM NATURAL ON-SITE SOIL, FREE FROM ORGANIC MATTER AND DELETERIOUS MATTER APPROVED BY THE ENGINEER OR IMPORTED SAND MATERIAL MEETING THE SPECIFICATIONS FOR FREE DRAINING GRANULAR FILL. FILL MATERIAL SHALL BE COMPACTED TO 90% DENSITY. NOTE THAT THIS IS TO BE DONE DURING THE ESP PHASE. THE CONTRACTOR SHALL REMOVE AND DELETERIOUS MATERIAL, AND/OR ANY COMPACTED SOIL, IF ANY, AND INSTALL FILL MATERIAL AS DESCRIBED ABOVE AND PER THIS DETAIL.

POROUS PAVEMENT DETAIL
NOT TO SCALE



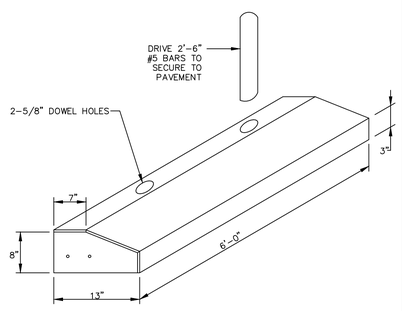
NOTES:
1. POSTS SPACED 6'-3" CENTER TO CENTER
2. PROVIDE TERMINAL SECTION AT ENDS

WOOD POST GUARD RAIL
NOT TO SCALE

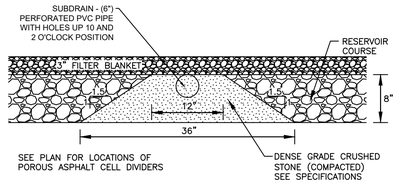


1. REFER TO FINAL ELECTRICAL PLAN FOR MORE SPECIFIC INFORMATION RELATED TO LIGHTS, LIGHT POLES, AND BASES

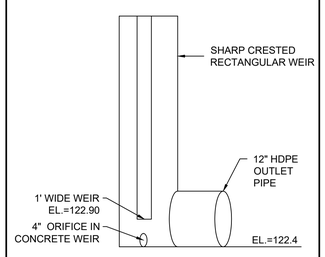
LIGHT POLE EXPOSED BASE DETAIL
NOT TO SCALE



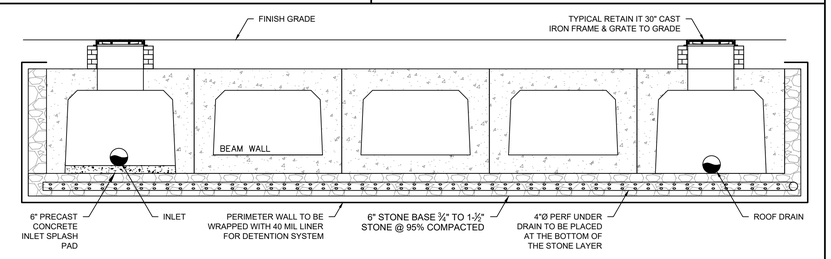
CONCRETE WHEEL STOP FOR HANDICAP PARKING SPACES
NOT TO SCALE



POROUS ASPHALT PAVEMENT CELL DIVIDER
NOT TO SCALE



RETAIN IT OUTLET CONTROL STRUCTURE
NOT TO SCALE



NOTE:
REFER TO SYSTEM SPECIFIC CROSS SECTION

TYPICAL 3.5 FT RETAIN-IT DETENTION SYSTEM
NOT TO SCALE

Date	Description	No.

Revisions

3-22-2021

COMMONWEALTH OF MASSACHUSETTS
GABRIEL R. CROCKER
CIVIL
No. 47917
REGISTERED PROFESSIONAL ENGINEER

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

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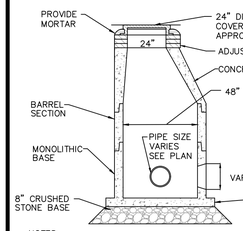
Project
105 BOSTON POST ROAD
SUDBURY, MA

Prepared for
HERB CHAMBERS OF SUDBURY, INC.
259 MCGRATH HWY
SOMERVILE, MA 02143

Drawing Title
DETAIL SHEET

Project No. 100-108	Drawing No. C-8.1
Date 3/22/2021	
Scale AS NOTED	
Drawn By DJN	
Approved By GC	

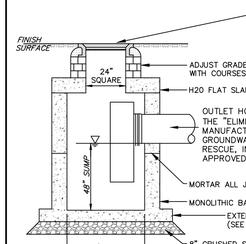
C:\CDG\Crocker Design Group, LLC\Gabriel Crocker - Projects\100-108 Sudbury - Herb Chambers Mass DOT\dwg\Plot Sheets\Site Plan Application\, DB: DETAIL SHEET dwg, C-7.1, DETAIL SHEET XL, Mar 19, 2021 11:25



NOTES:
1. MANHOLE DESIGN SHALL CONFORM TO LATEST ASTM C478.
2. REINFORCING STEEL SHALL CONFORM TO LATEST ASTM A 185.
3. CONCRETE COMPRESSIVE STRENGTH – 4,000 PSI @ 28 DAYS.
4. ONE POUR MONOLITHIC BASE.
5. BITUMASTIC BUTYL RUBBER FOR JOINTS SHALL CONFORM TO LATEST ASTM C443 AND FED SS-S-201A SPEC.
6. COVERS TO BE STAMPED "DRAIN"
7. CONTRACTOR TO PROVIDE BUOYANCY CALCULATIONS WITH THE PRECAST STRUCTURE SHOP DRAWING PACKAGE. ASSUME ESTIMATED SEASONAL HIGH GROUNDWATER IS 2 FEET BELOW EXISTING GRADE. USE FACTOR OF SAFETY OF 1.5 APPLIED TO UNIT FORCE.

PRECAST CONCRETE DRAIN MANHOLE

NOT TO SCALE

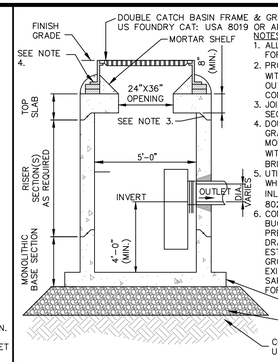


24" SQUARE HEAVY DUTY CAST IRON FRAME AND GRATE AS MANUFACTURED BY U.S. FOUNDRY (CAT. USA 8016) OR APPROVED EQUAL. IN LINE INLETS SHALL UTILIZE CURVED VANE IN DIRECTION OF FLOW (CAT. USA 8017 OR APPROVED EQUAL). INLETS AT SAGS SHALL BE VERTICAL GRATE. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR STRUCTURES, FRAMES AND GRATES FOR REVIEW AND APPROVAL.

NOTES:
1. STRUCTURE DESIGN TO LATEST ASTM C478.
2. REINFORCING STEEL CONFORMS TO LATEST ASTM A 185.
3. CONCRETE COMPRESSIVE STRENGTH – 4,000 PSI @ 28 DAYS.
4. LAT SLAB TOP AASHTO H-20
5. ONE POUR MONOLITHIC BASE.
6. UTILIZE CURVED VANE GRATES WHERE CATCH BASIN IS ON AN INLINE SLOPE CONDITION.
7. CONTRACTOR TO PROVIDE BUOYANCY CALCULATIONS WITH THE PRECAST STRUCTURE SHOP DRAWING PACKAGE. ASSUME ESTIMATED SEASONAL HIGH GROUNDWATER IS 2 FEET BELOW EXISTING GRADE. USE FACTOR OF SAFETY OF 1.5 APPLIED TO UNIT FORCE.

SINGLE GRATE CATCH BASIN

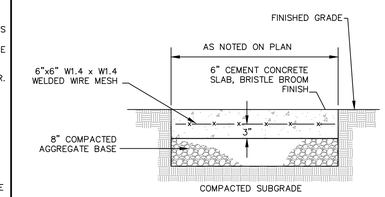
NOT TO SCALE



NOTES:
1. ALL SECTIONS SHALL BE DESIGNED FOR HS-20 LOADING.
2. PROVIDE "V" KNOCKOUTS FOR PIPES WITH 2" MAX. CLEARANCE TO OUTSIDE OF PIPE. MORTAR ALL PIPE CONNECTIONS.
3. JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE BUTYL RUBBER.
4. DOUBLE CATCH BASIN FRAME AND GRATE SHALL BE SET IN FULL MORTAR BED. ADJUST TO GRADE WITH CLAY BRICK AND MORTAR (5 BRICK COURSES MAXIMUM).
5. UTILIZE CURVED VANE GRATES WHERE CATCH BASIN IS ON AN INLINE SLOPE CONDITION (MODEL 8020 OR APPROVED EQUAL).
6. CONTRACTOR TO PROVIDE BUOYANCY CALCULATIONS WITH THE PRECAST STRUCTURE SHOP DRAWING PACKAGE. ASSUME ESTIMATED SEASONAL HIGH GROUNDWATER IS 2 FEET BELOW EXISTING GRADE. USE FACTOR OF SAFETY OF 1.5 APPLIED TO UNIT FORCE.

DOUBLE GRATE CATCH BASIN

NOT TO SCALE

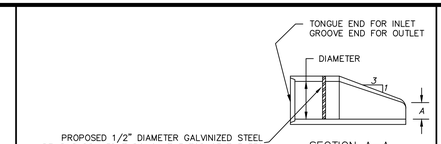


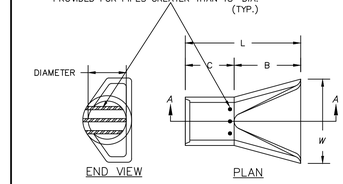
NOTES:
COORDINATE ALL PAD OPENINGS WITH EQUIPMENT MANUFACTURER END MESH 3" FROM WALKWAY EDGE

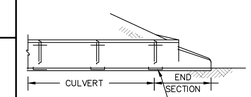
COORDINATE ALL PAD DIMENSIONS, THICKNESS, REINFORCING REQUIREMENTS WITH EQUIPMENT MANUFACTURER AND THE ASSOCIATED ENGINEER FOR THAT TRADE PRIOR TO CONSTRUCTION.

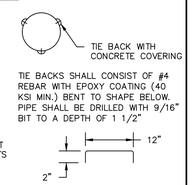
CONCRETE TRANSFORMER/ MECHANICAL PAD

NOT TO SCALE









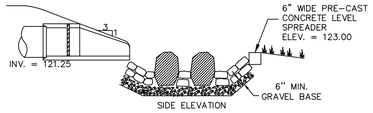
TIE BACKS SHALL CONSIST OF #4 REBAR WITH EPOXY COATING (40 KSI MIN.) BENT TO SHAPE BELOW. PIPE SHALL BE DRILLED WITH 9/16" BIT TO A DEPTH OF 1 1/2"

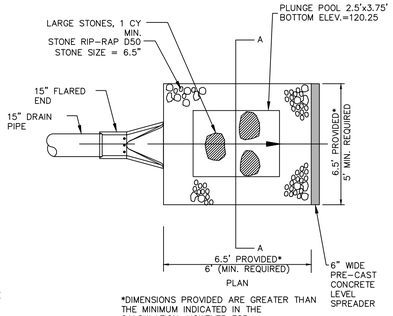
DIAMETER	WEIGHT	A	B	C	L	W
12"	340	4"	1'- 10"	2'- 0"	3'- 10"	2'- 0"
18"	670	9"	2'- 1"	2'- 1"	4'- 2"	3'- 0"
21"	1300	9 1/2"	3'- 6"	2'- 6"	6'- 0"	4'- 0"
24"	1300	9 1/2"	3'- 6"	2'- 6"	6'- 0"	4'- 0"
30"	1850	1'- 0"	4'- 5"	1'- 8"	6'- 1"	5'- 0"
36"	3500	1'- 3"	5'- 2"	2'- 11"	8'- 1"	6'- 0"
42"	4930	1'- 9"	5'- 3"	2'- 11"	8'- 2"	6'- 6"
48"	6700	2'- 0"	6'- 0"	2'- 2"	8'- 2"	7'- 0"
54"	7150	2'- 3"	5'- 6"	2'- 9"	8'- 3"	6'- 10"

NOTES:
1. CLASS AND TYPE OF CONCRETE SHALL BE AS SPECIFIED FOR REINFORCED CONCRETE PIPE.
2. STRUCTURAL DESIGN OF END SECTION SHALL CONFORM TO THAT OF STANDARD REINFORCED CONCRETE CULVERT PIPE.
3. LENGTH OF PIPE SHOWN ON THE PLANS DOES NOT INCLUDE CONNECTOR SECTION (LENGTH C).
4. SECURITY BARS REQUIRED FOR ALL DISCHARGE PIPES 18" IN DIAM. OR GREATER.

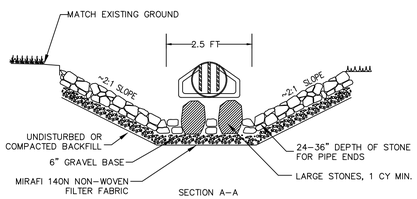
CONCRETE FLARED END SECTION WITH SECURITY BARS

NOT TO SCALE





*DIMENSIONS PROVIDED ARE GREATER THAN THE MINIMUM INDICATED IN THE CALCULATION, HOWEVER FOR CONSTRUCTIBILITY PURPOSES WE HAVE PROVIDED A LARGER RIP-RAP APRON SIZE.



LEVEL SPREADER/PLUNGE POOL/ENERGY DISSIPATER

NOT TO SCALE

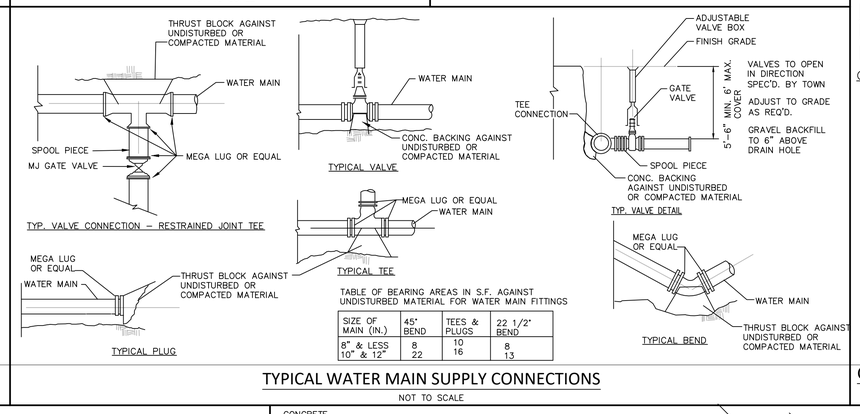
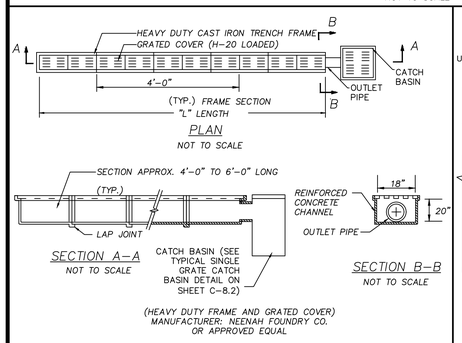


TABLE OF BEARING AREAS IN S.F. AGAINST UNDISTURBED MATERIAL FOR WATER MAIN FITTINGS

SIZE OF MAIN (IN.)	45° BEND	TEES & PLUGS	22 1/2° BEND
8" & LESS	8	10	8
10" & 12"	22	16	13

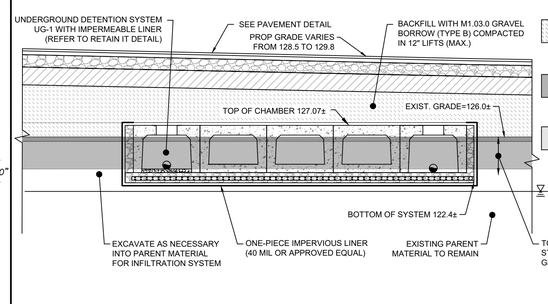
TYPICAL WATER MAIN SUPPLY CONNECTIONS

NOT TO SCALE



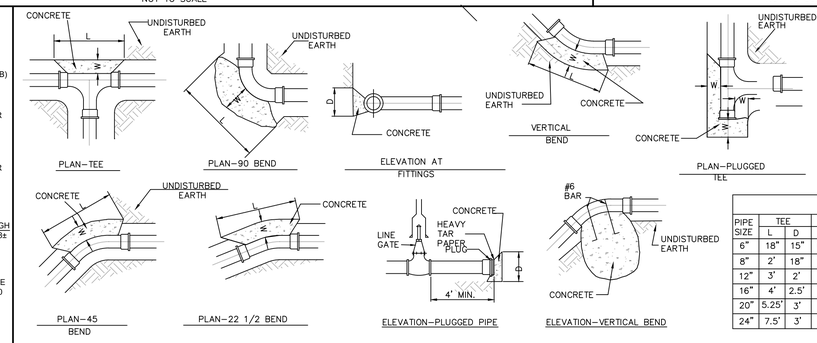
TRENCH DRAIN

NOT TO SCALE



SECTION UG-1 UNDERGROUND INFILTRATION SYSTEM

NOT TO SCALE



BASIS:
2,000 LB/SQ.FT. SOIL RESISTANCE 250 PSI WATER PRESSURE CORRECTION FACTORS FOR OTHER SOILS:

SOFT CLAY	4
SAND	2
SAND & GRAVEL	1.33
SHALE	0.4

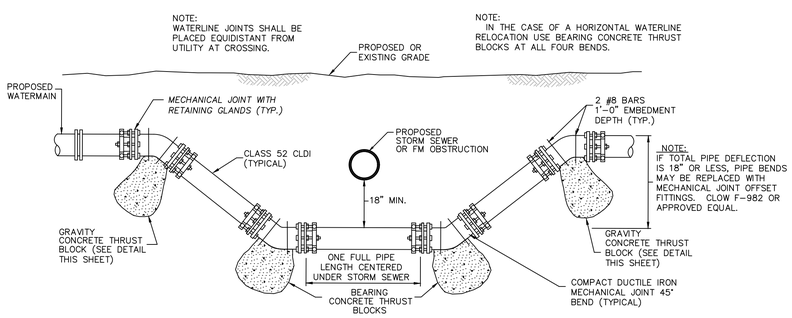
NOTE:
1. IF SOFT MATERIALS ARE ENCOUNTERED, THE THRUST BLOCKS SIZES SHALL BE ADJUSTED ACCORDINGLY.
2. CONCRETE TO BE 3000 PSI.

THRUST BLOCK SCHEDULE

PIPE SIZE	TEE		22 1/2		45		90		W
	L	D	L	D	L	D	L	D	
6"	18"	15"	15"	12"	15"	12"	15"	15"	21"
8"	2'	18"	18"	12"	18"	12"	2'	18"	2'
12"	3'	2'	2'	12"	2'	12"	3'	2'	28"
16"	4'	2.5'	2'	12"	2.33'	15"	4'	2.5'	31"
20"	5.25'	3'	2'	18"	3'	2'	5.25'	3'	33"
24"	7.5'	3'	3'	18"	4'	2.5'	7.5'	3'	3'

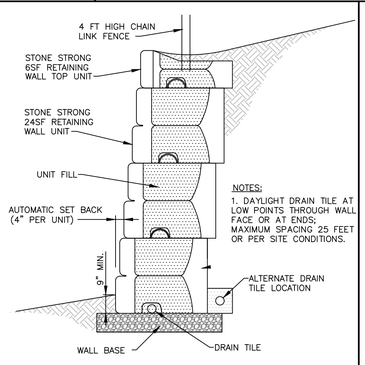
CONCRETE THRUST BLOCK

NOT TO SCALE



WATERLINE OBSTRUCTION DETAIL

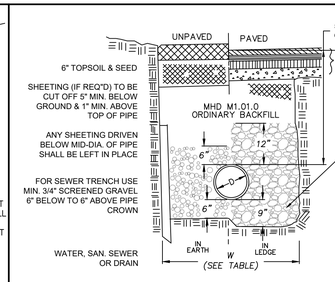
NOT TO SCALE



NOTES:
1. DAYLIGHT DRAIN TILE AT LOW POINTS THROUGH WALL FACE OR AT ENDS; MAXIMUM SPACING 25 FEET OR PER SITE CONDITIONS.

"STONE STRONG" RETAINING WALL CROSS SECTION

NOT TO SCALE



TRENCH WIDTH, W		
D DIAMETER OF PIPE	W UNSHEETED	W SHEETED
TO 12"	3'	4'
14" TO 24"	4'	5'
30" TO 36"	5'	6'

COMMON FILL TO CONSIST OF GRANULAR MATERIAL CONTAINING NO STONES LARGER THAN 6" IN GREATEST DIMENSION.

BACKFILL WATER OR DRAIN TRENCH WITH SELECT MATERIAL (M.H.D. M1.03.0 TYPE C OR EQUAL) CONTAINING NO STONES LARGER THAN 2" IN GREATEST DIMENSION TO 12" OVER PIPE.

PROVIDE SCREENED GRAVEL (CONFORMING TO M.H.D. M2.01.4) BEDDING TO MID-PIPE DIAMETER IN SEWER APPLICATIONS OR WHERE GROUNDWATER IS ENCOUNTERED AS DIRECTED BY THE ENGINEER.

REMOVE UNSUITABLE MATERIAL BELOW GRADE. IF ENCOUNTERED, TO SUITABLE DEPTHS AS DIRECTED BY ENGINEER AND REPLACE WITH CLEAN GRANULAR FILL.

NOTES:
1. ALL TRENCH CONSTRUCTION TO CONFORM TO APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS.
2. COMPACT FILL AND TAMP PIPE TO 95% MAX. DRY DENSITY IN 6" LIFTS UNLESS OTHERWISE SPECIFIED.
3. INSTALL DUCTILE IRON WATER PIPE IN ACCORDANCE WITH ANSI A21.51 (AWWA C151) LAYING CONDITION TYPE 2 BACKFILL TO CONFORM TO MHD M1.03.0 GRAVEL BURROW TYPE c (2" MINUS) TO 12" ABOVE PIPE CROWN OR AS DIRECTED BY MANUFACTURER OR ENGINEER.
4. MATERIALS FOR SEWER BEDDING, HAUNCHING, AND BACKFILL TO CONFORM TO CLASSES I, II, OR III AS DESCRIBED IN ASTM D 2321 AND TR-16 GUIDES FOR THE DESIGN OF WASTEWATER TREATMENT WORKS.
5. BACKFILL RCP CLASS V ADS N-12 HDPE, AND/OR PVC DRAIN PIPE WITH MHD M1.03.0 GRAVEL BURROW TYPE c TO 12" ABOVE PIPE CROWN OR AS DIRECTED BY MANUFACTURER OR ENGINEER.
6. PROVIDE MINIMUM 5 FT. COVER OVER WATER MAIN AS MEASURED FROM BOTTOM OF CURB LINE. INSULATE WATERMAIN IN ACCORDANCE WITH M.H.D. SECTION 301 WATER SYSTEMS IN AREAS PRONE TO FROST ACTION AND/OR LESS THAN 5' MIN. COVER.

TYPICAL TRENCH SECTION

NOT TO SCALE

Date	Description	No.

Revisions

3-22-2021

COMMONWEALTH OF MASSACHUSETTS
GABRIEL R. CROCKER
CIVIL
No. 47917
REGISTERED PROFESSIONAL ENGINEER

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-919-0808

Project
105 BOSTON POST ROAD
SUDBURY, MA

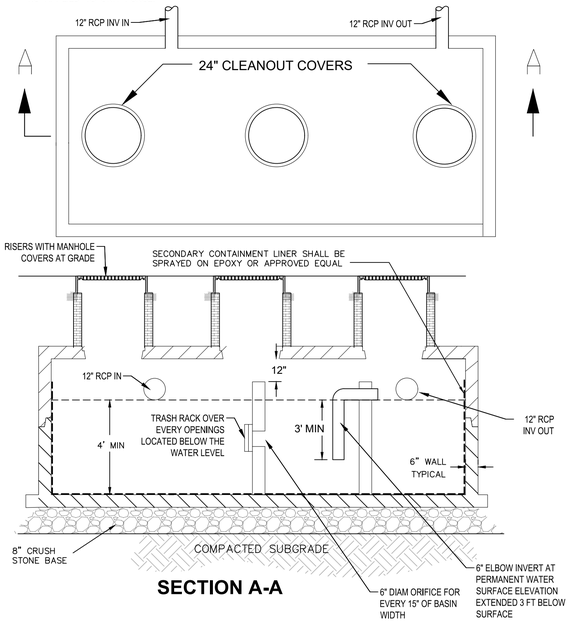
Prepared for
HERB CHAMBERS OF SUDBURY, INC.
259 MCGRATH HWY
SOMERVILE, MA 02143

Drawing Title
DETAIL SHEET

Project No. 100-108	Drawing No. C-8.2
Date 3/22/2021	
Scale AS NOTED	
Drawn By DJN	
Approved By GC	

C:\CDG\Crocker Design Group, LLC\Gabriel Crocker - Projects\100-108 Sudbury - Herb Chambers Mazda DOT\dwg\Plot Sheets\Site Plan Application\ 08. DETAIL SHEET.dwg, C7.2 DETAIL SHEET, Mar 19, 2021 11:25

NOTES:
1. MANHOLE DESIGN SHALL CONFORM TO LATEST ASTM C478.
2. REINFORCING STEEL SHALL CONFORM TO LATEST ASTM A 185.
3. CONCRETE COMPRESSIVE STRENGTH – 4,000 PSI @ 28 DAYS.
4. ONE POUR MONOLITHIC BASE.
5. BITUMASTIC BUTYL RUBBER FOR JOINTS SHALL CONFORM TO LATEST ASTM C443 AND FED SS–S–201A SPEC.
6. COVERS TO BE STAMPED "DRAIN"
7. CONTRACTOR TO PROVIDE BUOYANCY CALCULATIONS WITH THE PRECAST STRUCTURE SHOP DRAWING PACKAGE. ASSUME ESTIMATED SEASONAL HIGH GROUNDWATER IS 2 FEET BELOW EXISTING GRADE. USE FACTOR OF SAFETY OF 1.5 APPLIED TO UNIT FORCE.



TYPICAL OIL/GRIT SEPARATOR DETAIL

NOT TO SCALE

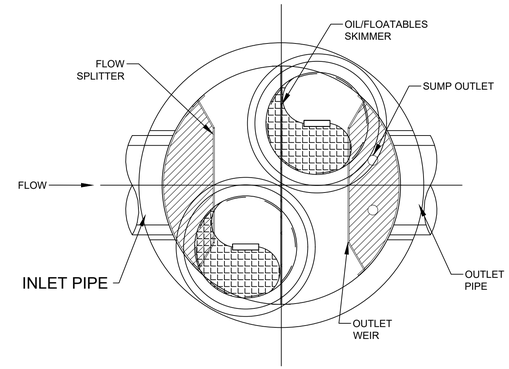
SITE SPECIFIC DATA*	
PROJECT NUMBER	100-108
PROJECT NAME	JLR - SUDBURY
PROJECT LOCATION	105 BOSTON POST ROAD
STRUCTURE ID	N/A
WATER QUALITY FLOW RATE (CFS)	1.57
PEAK FLOW RATE (CFS)	
PEAK STORM DURATION (YEARS)	

PIPE DATA	I.E. (#1/#2)	MATERIAL	DIAMETER
INLET PIPE 1	123.6/123.2	HDPE	12"
OUTLET PIPE 1	123.6/123.2	HDPE	12"
RIM ELEVATION	129.15/129.3		
SUMP ELEVATION	118.6/118.2		
SURFACE LOADING REQUIREMENT			HS-20
FRAME AND COVER			Ø30"
SKIMMER WALL HEIGHT			STANDARD
KNOWN GROUNDWATER ELEVATION			
NOTES: *PER ENGINEER OF RECORD			

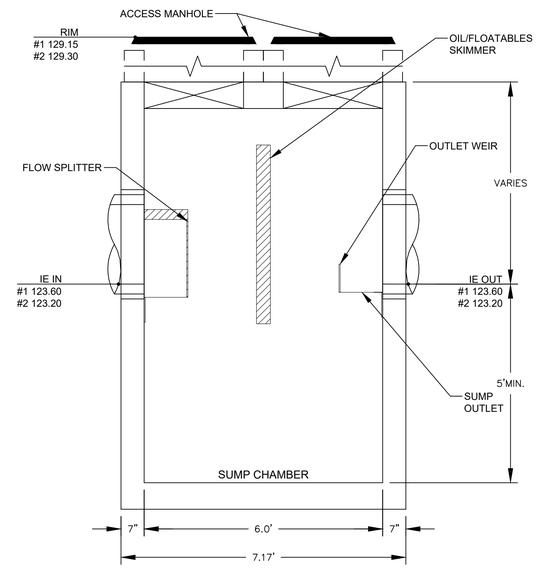
PERFORMANCE DATA	
TREATMENT FLOW RATE PER LOCAL REQUIREMENTS	1.57
SETTLING AREA (SF)	28.2600
LOADING RATE (GPM/SF)	24.9350
SEDIMENT STORAGE CAPACITY (CF)	141.3000

STORAGE CAPACITIES				
SUMP CHAMBER CAPACITY				
	DIAMETER (FT)	AREA (SF)	HEIGHT (FT)	TOTAL (CF)
CHAMBER 1	6.00	28.2600	5.00	141.30

GENERAL NOTES
1. BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. ALTERNATIVE HATCHES OR MANHOLES AVAILABLE UPON REQUEST.



PLAN VIEW
NTS



ELEVATION VIEW
NTS

INSTALLATION NOTES
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. MANUFACTURER RECOMMENDS A 6"-12" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. CONTRACTOR TO PROVIDE BUOYANCY CALCULATIONS WITH THE PRECAST STRUCTURE SHOP DRAWING PACKAGE. ASSUME ESTIMATED SEASONAL HIGH GROUNDWATER IS 2 FEET BELOW EXISTING GRADE. USE FACTOR OF SAFETY OF 1.5 APPLIED TO UNIT FORCE.

THE PRODUCT DESCRIBED MAY BE PROTECTED BY ONE OR MORE US PATENTS, RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

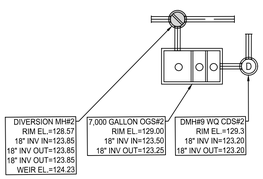
PROPRIETARY AND CONFIDENTIAL: THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF BIO CLEAN ENVIRONMENTAL SERVICES, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF BIO CLEAN ENVIRONMENTAL SERVICES, INC. IS PROHIBITED.

Bio Clean™ A Forterra Company

SC-6
HYDRODYNAMIC SEPARATOR

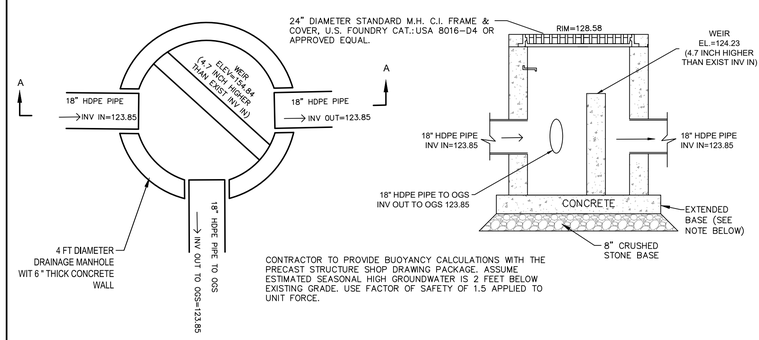
SciCLONE SC-6 WATER QUALITY STRUCTURE DETAILS

NOT TO SCALE



PLAN VIEW OGS-2

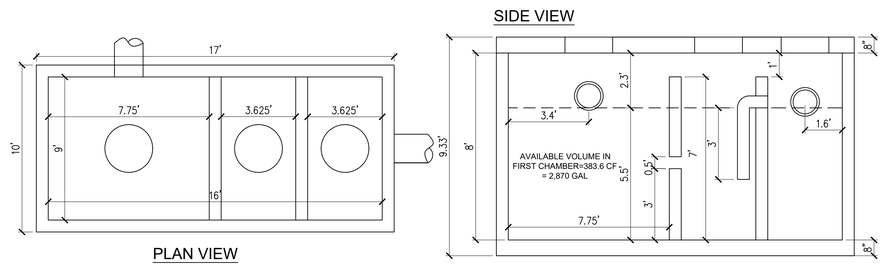
NOT TO SCALE



CONTRACTOR TO PROVIDE BUOYANCY CALCULATIONS WITH THE PRECAST STRUCTURE SHOP DRAWING PACKAGE. ASSUME ESTIMATED SEASONAL HIGH GROUNDWATER IS 2 FEET BELOW EXISTING GRADE. USE FACTOR OF SAFETY OF 1.5 APPLIED TO UNIT FORCE.

DIVERSION MANHOLE DVM OGS-2 DETAIL

NOT TO SCALE

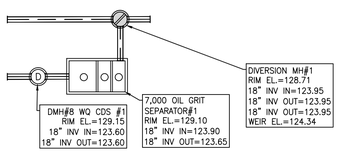


PLAN VIEW

NOTE: SEE TYPICAL OIL/GRIT SEPARATOR DETAIL IN THE UPPER LEFT HAND SIDE OF THIS PAGE FOR FURTHER INSTALLATION INFORMATION

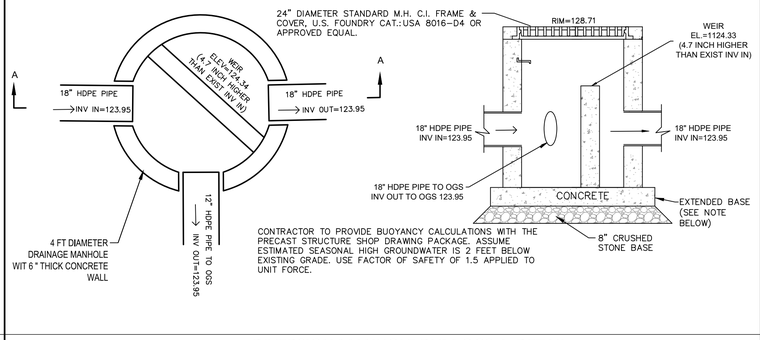
OGS-1 7,000 GAS OIL/GRIT SEPARATOR DETAIL

NOT TO SCALE



PLAN VIEW OGS-1

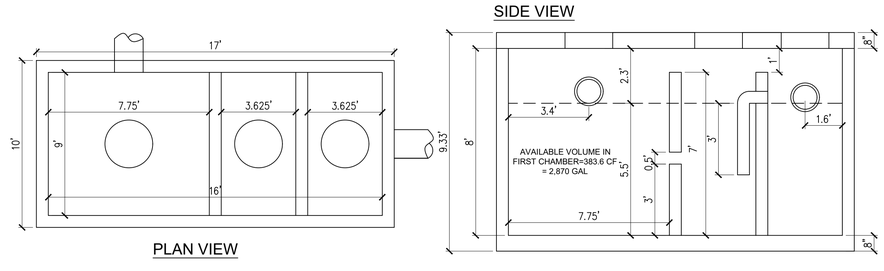
NOT TO SCALE



CONTRACTOR TO PROVIDE BUOYANCY CALCULATIONS WITH THE PRECAST STRUCTURE SHOP DRAWING PACKAGE. ASSUME ESTIMATED SEASONAL HIGH GROUNDWATER IS 2 FEET BELOW EXISTING GRADE. USE FACTOR OF SAFETY OF 1.5 APPLIED TO UNIT FORCE.

DIVERSION MANHOLE DVM OGS-1 DETAIL

NOT TO SCALE



PLAN VIEW

NOTE: SEE TYPICAL OIL/GRIT SEPARATOR DETAIL IN THE UPPER LEFT HAND SIDE OF THIS PAGE FOR FURTHER INSTALLATION INFORMATION

OGS-2 7,000 GAS OIL/GRIT SEPARATOR DETAIL

NOT TO SCALE

Date	Description	No.

Revisions

3-22-2021

COMMONWEALTH OF MASSACHUSETTS — GABRIEL R. CROCKER — CIVIL — No. 47917 — REGISTERED PROFESSIONAL ENGINEER

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781–919–0808

Project
105 BOSTON POST ROAD
SUDBURY, MA

Prepared for
HERB CHAMBERS OF SUDBURY, INC.
259 MCGRATH HWY
SOMERVILLE, MA 02143

Drawing Title
DETAIL SHEET

Project No.	100-108	Drawing No.
Date	3/22/2021	C-8.3
Scale	AS NOTED	
Drawn By	DJN	
Approved By	GC	

C:\CDG\Crocker Design Group, LLC\Gabriel Crocker - Projects\100-108 Sudbury - Herb Chambers Mass DOT\dwg\Plot Sheets\Site Plan Application\, DB, DETAIL SHEET.dwg, C-7.3, DETAIL SHEET X, Mar 19, 2021 11:25

March 22, 2021

1 Rabbit Hill Road
Westborough, MA 01581
ATTN: Regulatory Review

RE: Proposed Parking Lot Expansion
105 Boston Post Road, Sudbury MA, 02043

To Whom It May Concern,

On behalf of the applicant, Herb Chambers of Sudbury, Inc. (HC), Crocker Design Group, LLC. (CDG) submits this application for regulatory review in accordance with the Natural Heritage and Endangered Species Program (NHESP) and the Massachusetts Endangered Species Act (MESA) for the above-mentioned property.

The applicant proposes to renovate the existing MassDOT maintenance facility into a vehicle maintenance/service construct and vehicle inventory storage. Proposed work additionally includes the renovation of the existing 7,000 +/- SF metal building to a vehicle service building, as well as designated parking for employees and vehicle service customers. The proposed project also includes landscaping improvements, and drainage and utility upgrades.

In accordance with the Wetlands Protection Act, since the project is located within an Estimated Habitat and a Notice of Intent (NOI) is required to be filed with the Massachusetts Department of Environmental Protection, a copy of the NOI and associated Stormwater Report is enclosed with this submission. The NOI and the MESA filing are being submitted on 3/22/21.

Per the MESA Filing Checklist, the following enclosures are included with this submission:

Enclosure 1: MESA Project Review Checklist
Enclosure 2: Filing Fee
Enclosure 3: USGS Map
Enclosure 4: Site Plans, dated 3/22/21 (submitted under separate cover)
Enclosure 5: Assessors Map / Proof that Applicant is record Owner
Enclosure 6: Existing Site Photos
Enclosure 7: NOI Application, dated 3/22/21 (submitted under separate cover)
Enclosure 8: Stormwater Report, dated 3/22/21 (submitted under separate cover)

Should you have any questions, please don't hesitate to contact me at any time at gabecrocker@crockerdesigngroup.com or 781-919-0808.

Sincerely,
Crocker Design Group LLC

Gabe Crocker, P.E.
President

ENCLOSURE 1:

MESA PROJECT REVIEW CHECKLIST

MASSWILDLIFE

DIVISION OF
FISHERIES & WILDLIFE

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
MASS.GOV/MASSWILDLIFE

MESA Project Review Checklist

Massachusetts Endangered Species Act M.G.L. c.131A and Regulations (321 CMR 10.00)

1) Project Location:

105 Boston Post Road	Sudbury	01776
Street Address/Location	City/Town	Zip Code
K11	0017	
Assessors Map/Plat Number	Parcel /Lot Number	

Property recorded at the Registry of Deeds for:

Southern Middlesex		
County	Certificate # (if registered land)	
74344 / 9525	119 / 397	
Book	Page Number	

2) Applicant:

John	Welch	Herb Chambers of Sudbury, Inc.
First Name	Last Name	Company
259 McGrath Highway		
Mailing Address		
Somerville	Massachusetts	02143
City/Town	State	Zip Code
(617) 666-8333		jwelch@herbchambers.com
Phone Number	Fax Number	Email address

3) Property owner (if different from applicant):

Herb Chambers 83 Boston Post Road, LLC	C/O Herb Chambers Companies	
First Name	Last Name	Company
259 McGrath Highway		
Mailing Address		
Somerville	Massachusetts	01243
City/Town	State	Zip Code
(617)-666-8333		jwelch@herbchambers.com
Phone Number	Fax Number	Email address

4) Representative (if any):

Crocker Design Group		
Company		
Gabe	Crocker	
Contact Person First Name	Contact Person Last Name	
2 Sharp Street, Unit B		
Mailing Address		
Hingham	Massachusetts	02043
City/Town	State	Zip Code
(781) 919-0808		gabecrocker@crockerdesigngroup.com
Phone Number	Fax Number	Email address

Additional Information

1. Will this project require a filing with the Conservation Commission and/or DEP? ☐ No ☑ Yes
2. Has this project previously been issued a NHESP Tracking Number (either by previous NOI Submittal or MESA Information Request Form)? ☑ No ☐ Yes, if Yes -Tracking No._____

Project Description (attach separate sheet, as needed)

Please note, certain projects or activities are exempt from review, see 321 CMR 10.14. The MESA does not allow project segmentation. Your filing must reflect all anticipated work associated with the proposed project (CMR 321 10.16).

The applicant, Herb Chambers, proposes to construct an inventory lot for the Herb Chambers Jaguar/Land Rover Dealership at the former MA DOT site at 105 Boston Post Road in Sudbury, MA. The proposed work also includes the renovation of the existing 2-story metal structure to a vehicle service building, as well as designated parking for employees and vehicle service customers. The proposed project also includes landscaping improvements, and drainage and utility upgrades.

Include the Following Information:

ALL Applicants must submit:

- USGS map (1:24,000 or 1:25,000) with property boundary clearly outlined
- Project plans for entire site (including wetland Resource Areas, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work)
- Assessor's map or right-of-way plan of site
- Statement/proof that applicant is the Record Owner or that applicant is a person authorized in writing by the record owner to submit this filing
- Photographs representative of the site

Projects altering 10 or more acres, must also submit:

- A vegetation cover type map of the site
- Project plans showing Priority Habitat boundaries

The NHESP may request additional information, such as, but not limited to, species and habitat surveys, wetland reports, soil map and reports, and stormwater management reports (321 CMR 10.16). The NHESP will notify the applicant within 30 days if the materials submitted do not satisfy requirements for a filing and request submission of any missing materials (321 CMR 10.18(1)).

Filing Fee, Payable to Comm. of MA - NHESP (see website for fee information)

a. Total MESA Fee Paid $300.00 b. Acreage of Disturbance 3.30 c. Total Site Acreage 3.37

Required Signatures

I hereby certify under the penalties of perjury that the foregoing MESA filing and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge.

Signature of Property Owner/Record Owner of Property — Date 3·18·21

Signature of Applicant (if different from Owner) — Date 3·18·21

ENCLOSURE 2:

FILING FEE

CROCKER DESIGN GROUP LLC
2 SHARP ST
HINGHAM MA 02043

1198

53-7144/2113
35

CHECK ARMOR FRAUD PROTECTION

DATE 3-15-21

PAY TO THE ORDER OF Commanwealth of Massachusetts $ 300.00

three hundred 00/100 DOLLARS

Photo Safe Deposit® Details on back

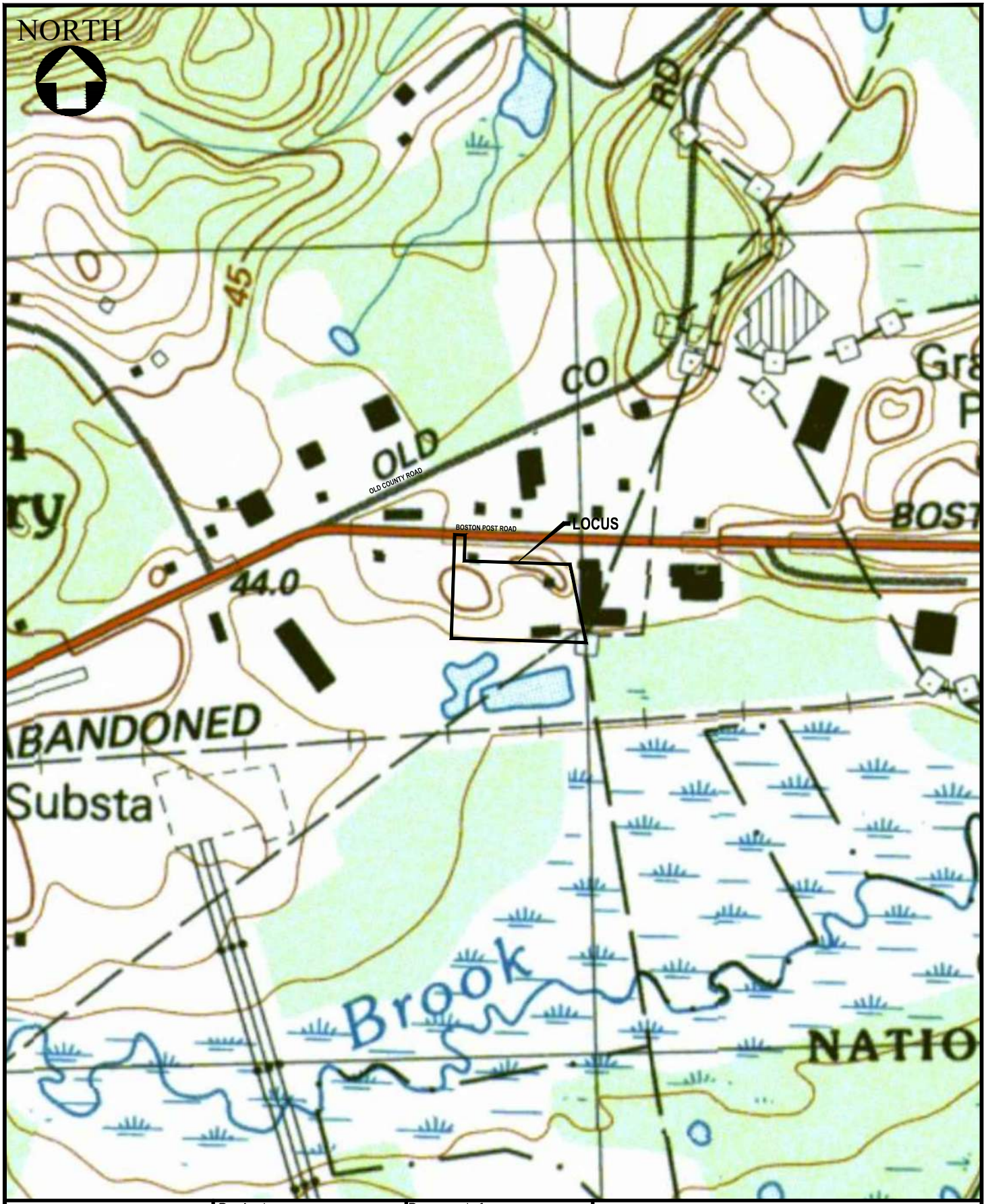
South Shore Bank
Member FDIC / DIF

FOR NHESP

⑈001198⑈ ⑆211371447⑆ 2235013055⑈

ENCLOSURE 3:

USGS MAP



Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043

Project
PROPOSED PARKING EXPANSION
105 BOSTON POST ROAD, SUDBURY, MA

Prepared for
HERB CHAMBERS
83 BOSTON POST ROAD, SUDBURY, MA

Drawing Title **USGS MAP**

DATE: 11.18.2020 | DRAWN: DJN
JOB NO.:100-108 | CHECK: ML
SCALE: 500 250 0 500

4

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ENCLOSURE 4:

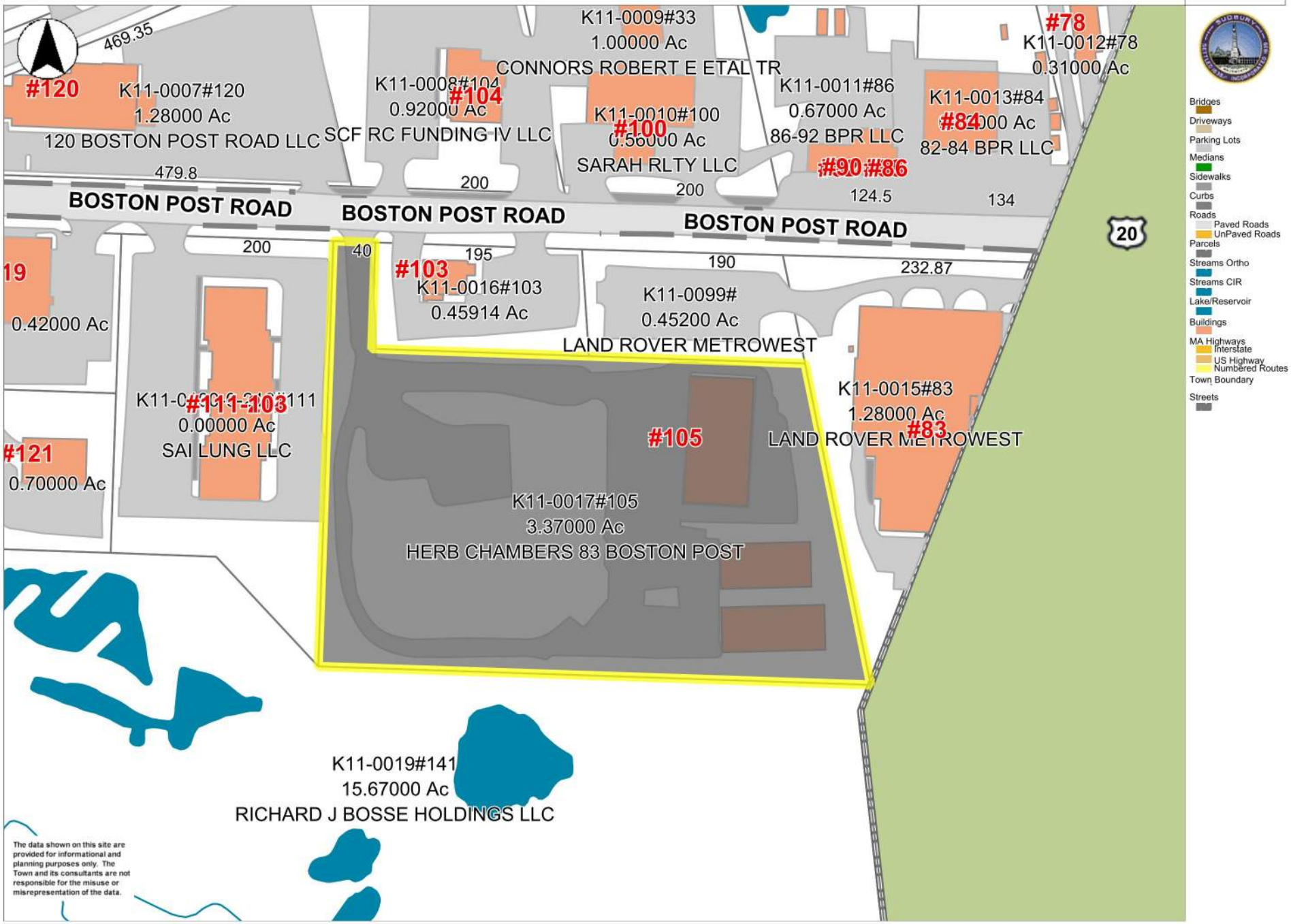
SITE PLANS, dated 3/22/21

(SUBMITTED UNDER SEPARATE COVER)

ENCLOSURE 5:

ASSESSORS MAP / PROOF THAT APPLICANT

IS PROPERTY OWNER



0 160 320 ft

Printed on 01/12/2021 at 11:22 AM

Assessors Map

ENCLOSURE 6:

EXISTING SITE PHOTOS

EXISTING SITE PHOTOS

PHOTO LOCATION MAP

PHOTO 1

MAIN DRIVE AISLE AT NORTHERN EDGE OF THE PROPERTY LOOKING EAST.

PHOTO 2

ENTRY DRIVEWAY. PHOTO TAKEN LOOKING SOUTH FROM BOSTON POST ROAD.

PHOTO 3

NORTHEAST CORNER OF SERVICE GARAGE LOOKING TOWARDS THE HERB CHAMBERS JAGUAR/LAND ROVER DEALERSHIP.

PHOTO 4

NORTHEAST CORNER OF SERVICE GARAGE LOOKING TO SOUTH OF SITE.

PHOTO 5

EASTERN SIDE OF SERVICE GARAGE.

PHOTO 6

PARKING AREA TO EAST OF STOCKPILE" HILL.

PHOTO 7

PARKING AREA TO EAST OF "STOCKPILE" HILL.

PHOTO 8

PARKING AREA TO EAST OF "STOCKPILE" HILL.

PHOTO 9

MAIN DRIVE AISLE TO THE SOUTH OF THE SITE ADJACENT TO THE WETLANDS.

PHOTO 10

PARKING LOT AT SOUTHERN EDGE OF THE SITE ADJACENT TO THE WETLANDS.

PHOTO 11

PARKING LOT AT SOUTHERN EDGE OF THE SITE ADJACENT TO THE WETLANDS.

PHOTO 12

PARKING LOT AT SOUTHERN EDGE OF THE SITE ADJACENT TO THE WETLANDS.

PHOTO 13

CONNECTION DRIVEWAY TO JAGUAR/LAND ROVER AND SURROUNDING AREA.

PHOTO 14

MAIN DRIVE AISLE AT SOUTHWEST CORNER OF PARCEL LOOKING EAST.

PHOTO 15

MAIN DRIVE AISLE AT SOUTHWEST EDGE OF PARCEL LOOKING NORTH TOWARDS THE "STOCKPILE" HILL.

PHOTO 16

MAIN DRIVE AISLE AT WEST EDGE OF PARCEL LOOKING NORTH.

PHOTO 17

TOP OF "STOCKPILE" HILL, LOOKING SOUTH.

PHOTO 18

MAIN ENTRY / BOSTON POST ROAD.

ENCLOSURE 7:

NOI APPLICATION, DATED 3/22/21

(SUBMITTED UNDER SEPARATE COVER)

ENCLOSURE 8:

STORMWATER REPORT, DATED 3/22/21

(SUBMITTED UNDER SEPARATE COVER)

Stormwater Management Report

For

Herb Chambers Jaguar/Land Rover of Sudbury
105 Boston Post Road- Route 20
Sudbury, MA

March 22, 2021

Prepared for:
Herb Chambers Companies
259 McGrath Highway
Somerville, MA 02143

Prepared by:
Crocker Design Group, LLC
2 Sharp Street Unit B
Hingham, MA 02043
781-919-0808

COMMONWEALTH OF MASSACHUSETTS
GABRIEL R CROCKER
CIVIL
NO. 47917
REGISTERED PROFESSIONAL ENGINEER

3-18-2021

Gabe Crocker
Massachusetts P.E. License #47917

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1.1 EXECUTIVE SUMMARY

In accordance with the provisions of the Town of Sudbury Zoning Bylaws, the Applicant, Herb Chambers od Sudbury, Inc. (HC), proposes to utilize the existing one-story building (7,190SF footprint with small mezzanine) for repair of vehicles and upgrade the site features for employee parking and vehicle storage.

The site is bound by Boston Post Road (Route 20) to the north, Soul of India restaurant to the north, Jaguar Land Rover Sudbury to the east, a commercial building to the west with various tenants, and vacant Industrial zoned land to the south, part of 141 Boston Post Road. The site is located on Parcel K11-0017 and is 3.37 acres. The property is located within the Industrial Zoning District.

1.2 APPROVALS BEING SOUGHT

A Notice of Intent (NOI) is being filed with the Town of Sudbury Conservation Commission (SCC) and the Massachusetts Department of Environmental Protection (MA DEP) for the proposed work. The applicant requests that the permit approvals encompass the entirety of the scope listed below, and as shown in the accompanying plan set:

- Upgrade of the existing parking lot to provide employee parking and vehicle storage
- The renovation of the existing single-story metal structure to be used for vehicle repair
- Associated stormwater treatment and drainage improvements

There is one (1) open permit within the limit of work. An Order of Resource Area Delineation (ORAD) (MA DEP# 301-1320) was issued on December 14, 2020 and is enclosed with this submission in Section 8. A Request for Determination of Applicability (RDA), enclosed in Section 8, was filed prior to the test pits performed on the property, and a negative determination was provided by the SCC.

This Stormwater Report will also be filed with the Sudbury Planning Board as part of the Site Plan Review submission in the near future. The applicant has also submitted an application to the Sudbury Zoning Board of Appeals.

1.3 FEMA – FLOODPLAIN SUMMARY

The parcel is shown on FEMA Flood Insurance Rate Map Panel 25017C0507F dated 7/7/2014. A small portion of the property at the southwest corner is located within Zone X, which is defined as areas determined to be outside the 500-year floodplain and determined to be outside the 1% and 0.2% annual chance floodplain. There is a Zone AE within close proximity of the work proposed. Zone AE is defined as an area inundated by 1% annual chance flooding, where Base Flood Elevations (BFE's) have been determined. The BFE of the Zone AE is elevation 121. The work proposed is entirely outside the limits of the FEMA Zone AE.

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1.4 ON-SITE SOIL INFORMATION

The Natural Resource Conservation Service (NRCS) maps the entirety of on-site soil as Udorthents-Urban land complex, Soil Map Unit 656, which is defined as "excavated and filled land."

Haley Aldrich performed five (5) test pits on December 7, 2020 within the limit of work. The test pits revealed a subsurface comprised of a brown silty sand, and classified it as "fill". The next layer was comprised of red-brown, poorly graded sand. The subsurface soil conditions in the area of the expanded parking lot and drainage improvements are consistent with a slowly-drained "B" soil. The proposed infiltration area is located fully within the limits of the HSG B soils and an infiltration rate of 0.52 inches per hour was used as this rate is consistent with loam.

Throughout the site, there is a layer of organic soil (OL/OH) located approximately 2.3-6 feet below existing grade. It is unknown what the infiltration capability of this layer is, and therefore it is assumed to be a "restrictive layer" from a stormwater infiltration standpoint. Infiltration BMP's (the permeable pavement) have been designed to have a minimum 2-foot separation between the bottom of the reservoir layer and the organic layer.

Depth to groundwater was noted at the bottom of each test pit log and appeared to vary throughout the site, between 4.3-6 feet below existing grade. As such, the design conservatively assumes a seasonal high groundwater elevation of a constant 4.3 feet below existing grade across the site.

Refer to Section 6 for complete soil information.

1.5 WETLANDS AND ENVIRONMENTAL RESOURCE AREAS ANALYSIS

The project does contain environmental resource areas, and therefore the project must be permitted through MassDEP the Sudbury Conservation Commission. Per the ORAD, there is a Bordering Vegetated Wetland (BVW) to the South of the site containing shallow marshes and shrub swamps and the site also includes Bordering Land Subject to Flooding. According to the latest Mass. Division of Fisheries and Wildlife – Natural Heritage Program mapping, the southern portion of the site is within an Estimated Habitat of Rare Wildlife (EHRW) as designated by the Natural Heritage and Endangered Species Program of the Division of Fisheries and Wildlife. There is a potential vernal pool within the EHRW, approximately 40±' to the south the property line. The site is entirely out of the FEMA 100-year floodplain, however, a portion of the property is within the Zone X. The proposed project area is entirely developed. The priority Habitat Mapping by NHESP shows the boundary of Priority Habitat covering the rear portion of the existing paved and compacted gravel parking area. The site does not appear to contain any areas that would qualify as significant Priority or Estimated Habitat, certified vernal pools or areas of critical environmental concern.

The wetland resource areas located to the south of the property were delineated by James Hall, PWS of CHA Consultants in October 2019, and DGT Associates, Inc. performed a review of the delineation boundaries. The Abbreviated Notice of Resource Area Delineation (ANRAD) submission, filed on

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November 19, 2020, and Order of Resource Area Delineation (ORAD) (MA DEP# 301-1320), issued on December 15, 2020, are enclosed with this submission in Section 8.

The following is a summary of the buffer and protection zones that portions of the project are proposed within:

1) 100' Bordering Vegetated Wetland (BVW) Buffer (310 CMR 10.55).

Portions of the proposed improvements, including, but not limited to a permeable pavement parking lot, a small portion of retaining wall and landscaping are proposed within the 100' BVW buffer zone. The proposed improvements include a parking lot comprised primarily of permeable pavement, and landscaped islands/parking lot perimeter. The project proposes to reduce impermeable surfaces within the buffer and increase vegetated surfaces, including a densely planted vegetated strip between the permeable pavement and the BVW. The table below provides a summary of the existing and proposed surfaces within the 100' BVW Buffer. Please also refer to Figures X6 and X7 for visual representation of the existing and proposed buffer zone impacts.

100' BVW Buffer Area Impacts				
	Non-Vegetated Area		Vegetated Area	
	(SF)	(AC)	(SF)	(AC)
Existing	43,242	0.99	9,588	0.22
Proposed	37,065	0.85	15,765	0.36
Δ	(6,177)	-0.14	6,177	0.14
*32,578SF of the proposed non-vegetated area is porous pavement				

Please see the accompanying plan set and supporting information for more details on the work proposed within the 100' BVW.

2) Bordering Land Subject to Flooding

The site is located near a BLSF, associated with the Sudbury River. The elevation of the 100 year (1% chance of flooding) has been determined by the FEMA Flood Study Profile Data as elevation 121.0 (NAVD 88). The boundary of the BLSF is the 121-foot contour and this contour is to the south of the property.

3) Estimated Habitat of Rare Wildlife (EHRW)

Portions of the proposed improvements, including, but not limited to the permeable pavement parking lot, and landscaping is proposed within the EHRW. As mentioned above, there is a potential vernal pool located within the EHRW, approximately 40±' to the south of the property line. The amount of parking lot proposed within the EHRW is approximately 1.02

AC, and approximately 0.90 AC will be comprised of permeable pavement and landscaped islands. The developments proposed are an improvement to what exists currently and are located within the existing footprint of development so as not to encroach any closer to the resource area. The landscaped area adjacent to the property line and to the south of the parking lot will be densely planted and vegetated which will provide added wildlife habitat value.

1.6 OBJECTIVE OF CALCULATIONS

The purpose of this stormwater analysis is to examine the stormwater runoff from the proposed site based upon the Massachusetts Department of Environmental Protection Stormwater Management Policy and the applicable provisions of the Town of Sudbury Bylaws and regulations.

The goal of the stormwater management system design on this project is to comply with the MA Stormwater Management Requirements and provide improved water quality, reduce post-development peak runoff rates below pre-development peak flow rates, maximize the opportunities for recharge and infiltration, and protect the surrounding area from any potential flooding and/or environmental impacts associated with the unmitigated condition. The following stormwater hydrology calculations were performed using the 1-inch, 1-year, 2-year, 5-year, 10-year, 25-year, and 100-year frequency, Type III, 24-hour SCS design storms and were compared for both pre-development and post-development conditions. The 1, 2, 5, 10, 25 and 100 year storms and 1-inch storm were evaluated to demonstrate the proposed peak rates of discharge and volumes do not exceed pre-development peak rates and volumes.

1.7 METHODOLOGY

We utilized the latest version of Hydro CAD for the overall stormwater hydrology/routing analysis to assess and compare peak rates of runoff and volumes at the various discharge points from the subject property. We then utilized to analyze the pipe design and to select appropriate pipe sizing.

Refer to Section 3 – HydroCAD Model, which includes the detailed print-out of the HydroCAD Model Reports for the 1, 2, 5, 10, 25 and 100-year storms as well as Section 7 – Hydraulic Pipe Analysis / Sizing, which includes reports for the 2, 10, 25, 50 and 100-year storms for pipe capacity analysis and sizing. Storm intensities for the pipe capacity analysis and sizing were determined by using the Steel Equation.

1.8 SITE HYDROLOGY

<u>Existing Conditions</u>

Please refer to the attached Existing Conditions Watershed Analysis Plan in Section 3.1. The property has been divided into two (2) subcatchment areas based on the existing site topography and flow paths. These subcatchments then combine where appropriate from an analysis standpoint where they discharge toward wetland resource areas, adjacent rights-of-way and abutting residential and commercial properties. Each subcatchment area has been analyzed and assigned an appropriate Curve Number to

represent the existing vegetative cover and underlying soils conditions. Times of concentration have been computed and the extent of pervious vs. impervious cover computed. This data was then input into HydroCAD to determine peak rates of runoff at the various design points which provide the locations for which to compare existing versus proposed conditions to document compliance that the peak rates have been reduced in the regulatory storm events as required. A summary table is provided in the Hydrology Model Results and Conclusions Section below.

For the purposes of this analysis, the pre- and post- development drainage conditions were analyzed at two (2) "design points" where stormwater runoff currently drains to under existing conditions. The design points are described below:

- Design Point #1 (PD1) is the Bordering Vegetated Wetland (BVW) to the south of the proposed work.
- Design Point #2 (PD2) is Boston Post Road- Route 20, to the North of the proposed work.

The existing site is approximately 3.37 acres of land consisting of an existing two-story metal building, a bituminous driveway and parking area, material stockpiles and a portion of the site that is undeveloped wooded area. The site generally conveys stormwater in a southerly direction. A more comprehensive description of the existing subcatchment areas is provided below:

- Subcatchment E1 is approximately 3.296 AC (143,574 SF) and is comprised of one (1) existing building, which appear to internal collection systems which discharge to a 12inch RCP pipe at PD1. E1 also contains paved parking areas, woods and grass/gravel areas, which overland flows to PD1 without treatment or attenuation. The woods were classified as being a woods/grass combination, poor because although there is vegetation and some tree cover, the "woods" are littered with material stockpiles and represents land cover with low retention and high runoff. This area is primarily impervious (CN: 90) and the minimum time of concentration of 6.0 minutes is used.
- Subcatchment E2 is approximately 0.160 AC (6,960 SF) of the existing driveway, and a portion of the existing woods and landscaped area. The runoff from this area flows towards PD2 without treatment or attenuation. This area is mostly impervious (CN: 83) and the minimum time of concentration of 6.0 minutes is used.

<u>Proposed Conditions</u>

The proposed project consists of a reconfigured and expanded parking for vehicle inventory and the renovation of an existing single-story metal structure into a vehicle service center. Construction will also include landscaping upgrades, stormwater treatment and drainage improvements and other associated utilities. The site, including the proposed parking areas, have been designed to drain to deep sump hooded catch basins or trench drains. The catch basins will capture and convey stormwater runoff, via an underground pipe system, to offline oil/grit separators, to proprietary treatment units and then to an underground detention system. Rooftop runoff has been designed to flow directly to the detention

system, although an infiltration system was considered but due to high seasonal groundwater restrictions was not included in the design.

Please refer to the attached Proposed Conditions Watershed Analysis Plan. The proposed project has been divided into four (4) subcatchment areas and the various stormwater detention and infiltration BMPs have been modeled. Appropriate Times of Concentration and Curve Numbers have been assigned for each catchment area. A more comprehensive description of the proposed subcatchment areas is provided below:

- Subcatchment P-1A is approximately 2.219 acres (96,659 SF) consisting of the renovated building, the northerly part of the parking lot (bituminous pavement), some newly landscaped area and a portion of the existing woods. The building roof that has an internal collection system which will discharge directly into the Retain-it detention system. Stormwater runoff from the landscaped area and bituminous parking lot will be collected through a series of deep sump catch basins, then through oil/grit separators, and then to proprietary water quality units, before discharging to the detention system. The detention system has an outlet control structure, which detains flow before discharging at the 15-inch HDPE pipe and scour hole at the BVW (PD1). This area is mostly impervious (CN: 93) and the minimum time of concentration of 6.0 minutes is used.
- Subcatchment P-1B is approximately 0.815 acres (35,501 SF) consisting of permeable pavement and landscaped area. Stormwater in this area drains vertically into the permeable pavement system where it is treated and infiltrated in the underlying base layers. The permeable pavement is modeled with a curve number of 98, and the BMP is then modeled as a pond. This area has a CN: 95 and the minimum time of concentration of 6.0 minutes is used.
- Subcatchment P-1U is approximately 13,343 SF and is primarily made up of the permeable landscaped/vegetated area at the perimeter of the parking lot (CN: 58). The minimum time of concentration of 6.0 minutes is used.
- Subcatchment P-2 is approximately 0.116 acres (2,364 SF) consisting of the bituminous paved driveway and landscaped area. The land in this subcatchment is existing to remain, and there are no grading or drainage changes proposed. Stormwater in this location generally overland flows from south to north before discharging to PD2, Boston Post Road. The area is a mix of impervious and pervious surfaces (CN: 78). The minimum time of concentration of 6.0 minutes is used.

Hydrology Model Results and Conclusions

The goal of the stormwater design is to fully comply with the Massachusetts Stormwater Policy and the Town of Sudbury Stormwater Management Regulations. This analysis confirms that the stormwater system is receiving proper treatment and peak rates of runoff have been reduced to below pre-development rates using stormwater Best Management Practices including deep sump hooded catch basins, SciClone Water Quality Units, underground detention systems and permeable pavement. The

discharge points from the site have been engineered to employ properly designed rip-rap splash pads to further reduce discharge velocities and to spread out the discharge to prevent scour and point discharge erosion. Water quality units have been properly sized in accordance with MADEP guidance for water quality flows.

The results of the pre- and post-development hydrology calculations provided in Section 3 are summarized in the following tables:

Table 1.8.1 shows the peak rate of runoff at each design point for the existing site as well as for the developed site at 1, 2, 5, 10, 25, 100-year and 1-inch design storms.

Point of	1-Yr Storm (cfs)			2-Yr Storm (cfs)			5-Yr Storm (cfs)			10-Yr Storm (cfs)			25-Yr Storm (cfs)			100-Yr Storm (cfs)			1 in-Storm (cfs)		
Analysis	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
PD1	6.05	3.13	**-2.92**	8.11	4.27	**-3.84**	10.45	4.99	**-5.46**	13.46	5.89	**-7.57**	17.44	7.08	**-10.36**	25.98	9.77	**-16.21**	1.15	0.43	**-0.72**
PD2	0.20	0.11	**-0.09**	0.30	0.17	**-0.13**	0.40	0.24	**-0.16**	0.55	0.34	**-0.21**	0.74	0.48	**-0.26**	1.16	0.79	**-0.37**	0.01	0.00	**-0.01**

Table 1.8.1

As shown in Table 1.8.1, the peak stormwater runoff generated by the development are the same or less in post development conditions versus the existing conditions at all design points, for every storm. The peak flow rates are reduced to PD1 by the use of an underground detention system and the permeable pavement. There is no work proposed within subcatchment P-2, but there is less land directed to this design point, and therefore peak flows have been reduced from the existing condition to PD-2.

Table 1.8.2 shows the total volume discharge at each design point for the existing site as well as for the developed site at 1, 2, 5, 10, 25, 100-year and 1-inch design storms.

Point of	1-Yr Storm (ac-ft)			2-Yr Storm (ac-ft)			5-Yr Storm (ac-ft)			10-Yr Storm (ac-ft)			25-Yr Storm (ac-ft)			100-Yr Storm (ac-ft)			1 in-Storm (ac-ft)		
Analysis	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
PD1	0.44	0.35	**-0.10**	0.60	0.46	**-0.14**	0.78	0.59	**-0.18**	1.01	0.78	**-0.24**	1.33	1.08	**-0.25**	2.03	1.77	**-0.26**	0.09	0.08	**-0.005**
PD2	0.02	0.01	**-0.01**	0.02	0.01	**-0.01**	0.03	0.02	**-0.01**	0.04	0.03	**-0.02**	0.05	0.04	**-0.02**	0.09	0.06	**-0.03**	0.00	0.00	**-0.001**

Table 1.8.2

As shown in Table 1.8.1, the total volume discharge generated by the development are the same or less in post development conditions versus the existing conditions at all design points, for every storm. Refer to Section 3 for the complete HydroCAD Analysis that documents the above results as well as the Existing and Proposed Conditions Watershed Plans, also enclosed in Section 3.

1.9 STORMWATER MANAGEMENT

The following section describes each of the ten (10) Massachusetts Stormwater Management Standards and describes how the project complies with each.

> Standard 1: No New Untreated Discharges – No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

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All new stormwater system conveyances are treated prior to discharge and result in no erosion occurring on site. The drainage system has been designed to direct stormwater runoff from impervious areas through various stormwater systems designed to capture, convey, treat, detain, recharge and infiltrate (where appropriate) the runoff prior to discharge.

Standard 2: Peak Rate Attenuation – Stormwater management systems have been designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. Please refer to Table 1.7.1 above.

The stormwater system reduces peak rates of runoff to below pre-development levels.

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

The stormwater system has been designed to comply with the recharge requirements for both the MA Stormwater Management Regulations. Refer to Section 4 for a summary of the stormwater recharge calculations.

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

The project utilizes deep sump hooded catch basins, oil/grit separators, SciClone Water Quality Units, subsurface detention systems and permeable pavement. Please refer to Section 4.4 for the TSS calculation spreadsheets.

Per the Town of Sudbury Stormwater Management Bylaw, water quality volume for sizing of BMP's is based on 1-inch of runoff from the tributary area. Please refer to Section 4 of this report for Stormwater Management Calculations.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPL) – For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate

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or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

The project is not considered a LUHPPL.

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

The project is not located near a critical area.

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

The project would qualify as a partial redevelopment and partial new development, and has been designed accordingly.

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

An Erosion and Sedimentation Controls Plan has been incorporated into the Site Plans. A draft SWPPP is also enclosed in Section 8.

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

A long-term Operation and Maintenance Plan has been incorporated herein. See Section 5.

Standard 10: Prohibition of Illicit Discharges – All illicit discharges to the stormwater management system are prohibited.

An Illicit Discharge Compliance Statement is included as required, and is enclosed in Section 2.2.

1.10 BEST MANAGEMENT PRACTICES (BMP'S)

A system of deep sump hooded catch basins, oil/grit separators, SciClone Hydrodynamic Separators, subsurface detention systems, and permeable pavement will be used to treat stormwater runoff on the site. See Section 4 for stormwater management calculations.

1.11 PIPE SIZING

Refer to Section 7 for the Hydraulic Pipe Analysis/Sizing calculations, which utilized the Rational Method and the Steel Equation for determining the storm intensities. Reports are included for the 2, 10, 25, 50 and 100-year storms for pipe capacity analysis and sizing.

The tributary area for each inlet/subcatchment area has been computed along with pipe length, slope and friction coefficient. This approach was used to size the pipes such that the 10-year storm event is contained within the pipe. The 100-year storm was then checked to confirm the hydraulic grade line for the pipe network does not exceed the rim elevations of the drainage structures. In addition, pipe velocities were checked to be within the range of 2fps to 10 fps flowing 1/3 full. Those calculations are included in Section 7 herein.

1.12 CONCLUSION

In conclusion, the project has been designed in accordance with the requirements of the MA DEP's Stormwater Management Standards and in compliance with the Town of Sudbury's Conservation Commission Wetland Regulations and Stormwater Management Bylaw.

1.13 Figures

FIG 1 ORTHOGRAPHIC MAP
FIG 2 FEMA FLOODPLAIN MAP
FIG 3 MASSDEP WETLANDS MAP
FIG 4 USGS MAP
FIG 5 NHESP HABITAT MAP
FIG 6 ASSESSORS MAP
FIG X6 PROPOSED BUFFER ZONE IMPACT AREA
FIG X7 EXISTING BUFFER ZONE IMPACT AREA

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2 SHARP STREET, UNIT B
HINGHAM, MA 02043

Project
PROPOSED PARKING EXPANSION
105 BOSTON POST ROAD, SUDBURY, MA

Prepared for
HERB CHAMBERS
83 BOSTON POST ROAD, SUDBURY, MA

Drawing Title **AERIAL MAP**

DATE: 11.18.2020 | DRAWN: DJN
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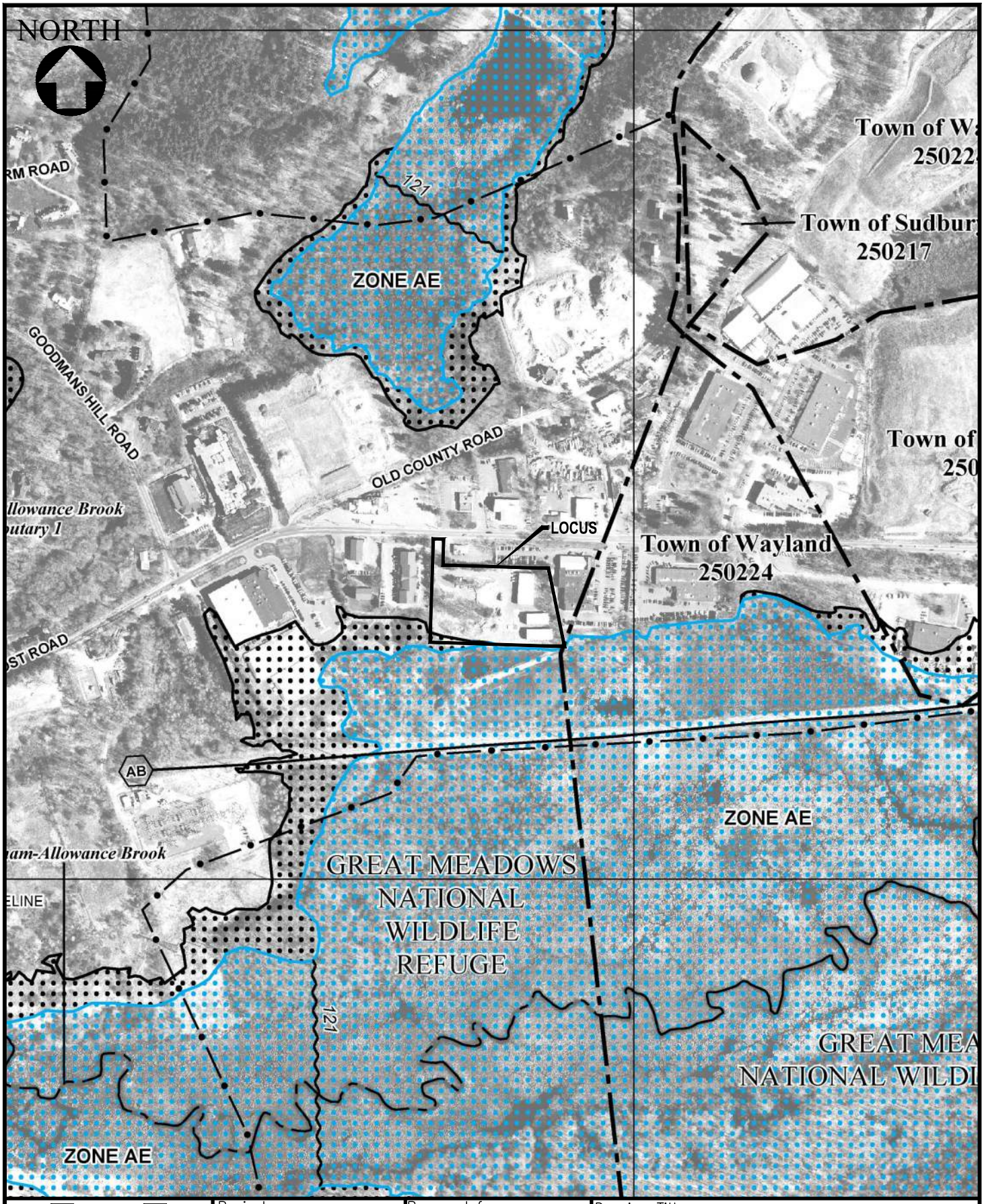

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2 SHARP STREET, UNIT B
HINGHAM, MA 02043

Project
PROPOSED PARKING EXPANSION
105 BOSTON POST ROAD, SUDBURY, MA

Prepared for
HERB CHAMBERS
83 BOSTON POST ROAD, SUDBURY, MA

Drawing Title **FEMA FLOOD MAP**
EFFECTIVE PANEL 25017C0507F (7.7.2014)

DATE: 11.18.2020 | DRAWN: DJN
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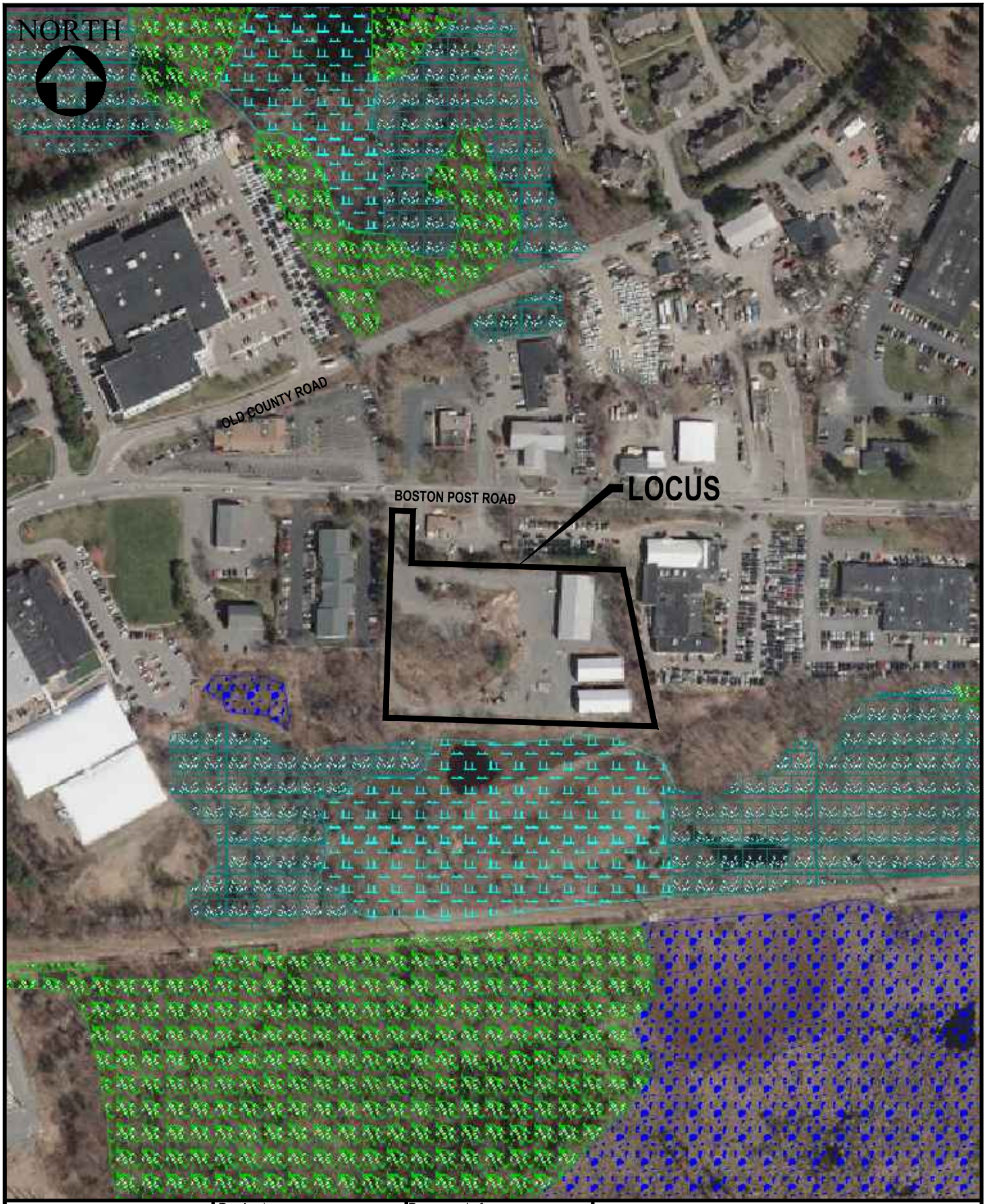

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2 SHARP STREET, UNIT B
HINGHAM, MA 02043

Project
PROPOSED PARKING EXPANSION
105 BOSTON POST ROAD, SUDBURY, MA

Prepared for
HERB CHAMBERS
83 BOSTON POST ROAD, SUDBURY, MA

Drawing Title **WETLAND MAP**

DATE: 11.18.2020 | DRAWN: DJN
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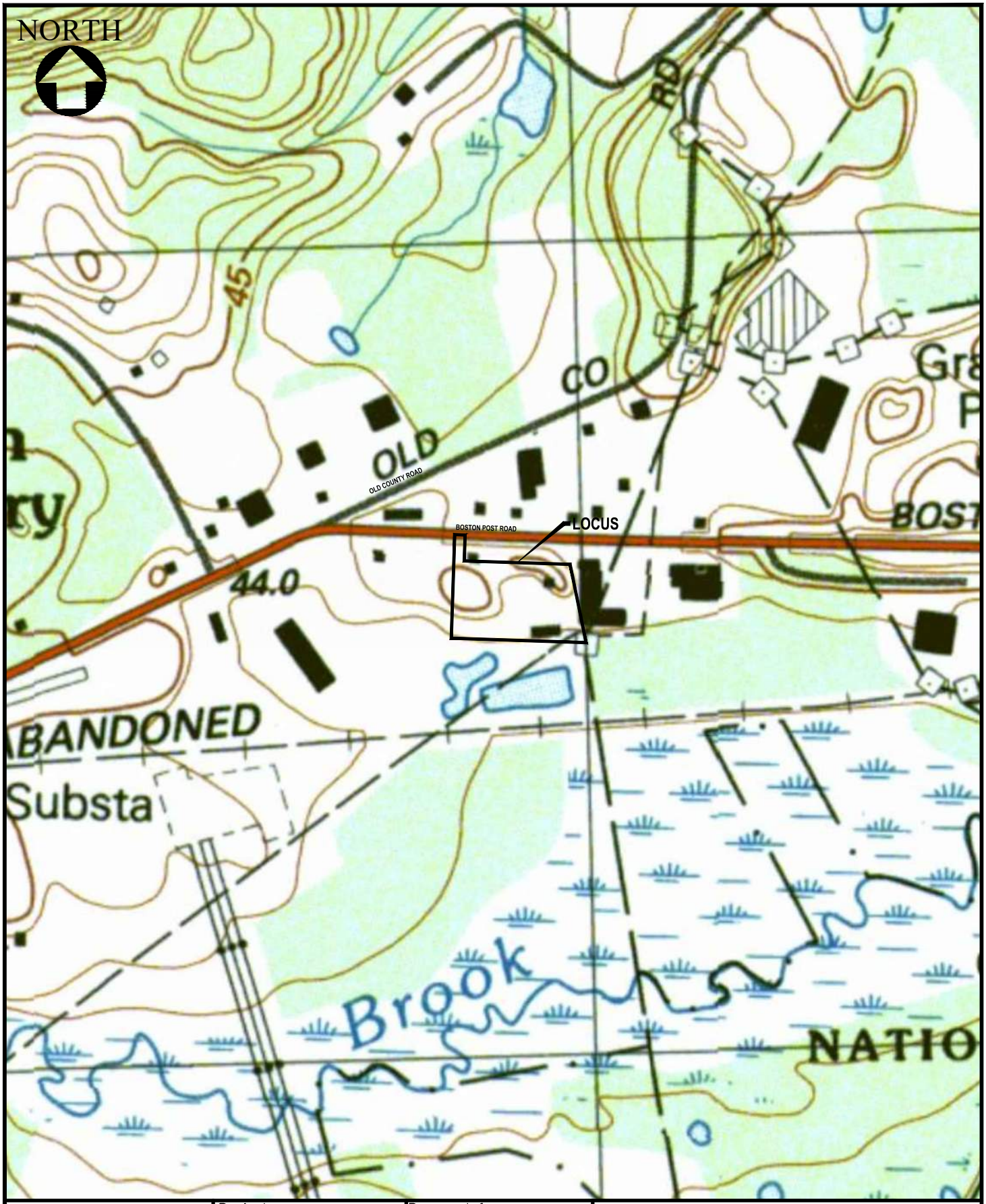

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2 SHARP STREET, UNIT B
HINGHAM, MA 02043

Project
PROPOSED PARKING EXPANSION
105 BOSTON POST ROAD, SUDBURY, MA

Prepared for
HERB CHAMBERS
83 BOSTON POST ROAD, SUDBURY, MA

Drawing Title **USGS MAP**

DATE: 11.18.2020 | DRAWN: DJN
JOB NO.:100-108 | CHECK: ML
SCALE: 500 250 0 500

4

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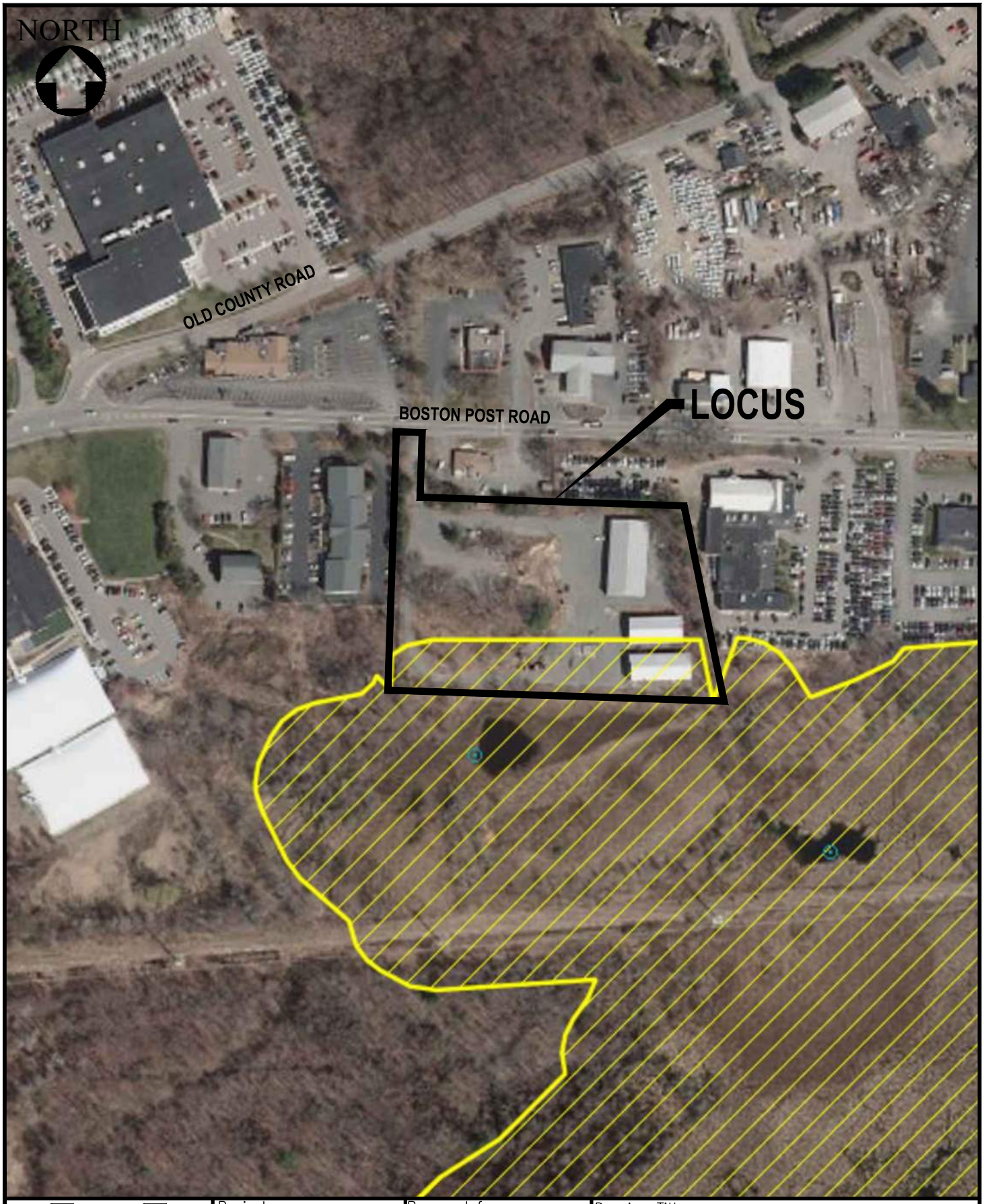

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043

Project
PROPOSED PARKING EXPANSION
105 BOSTON POST ROAD, SUDBURY, MA

Prepared for
HERB CHAMBERS
83 BOSTON POST ROAD, SUDBURY, MA

Drawing Title **NHESP MAP**

DATE: 11.18.2020 | DRAWN: DJN
JOB NO.:100-108 | CHECK: ML
SCALE: 250 125 0 250

5

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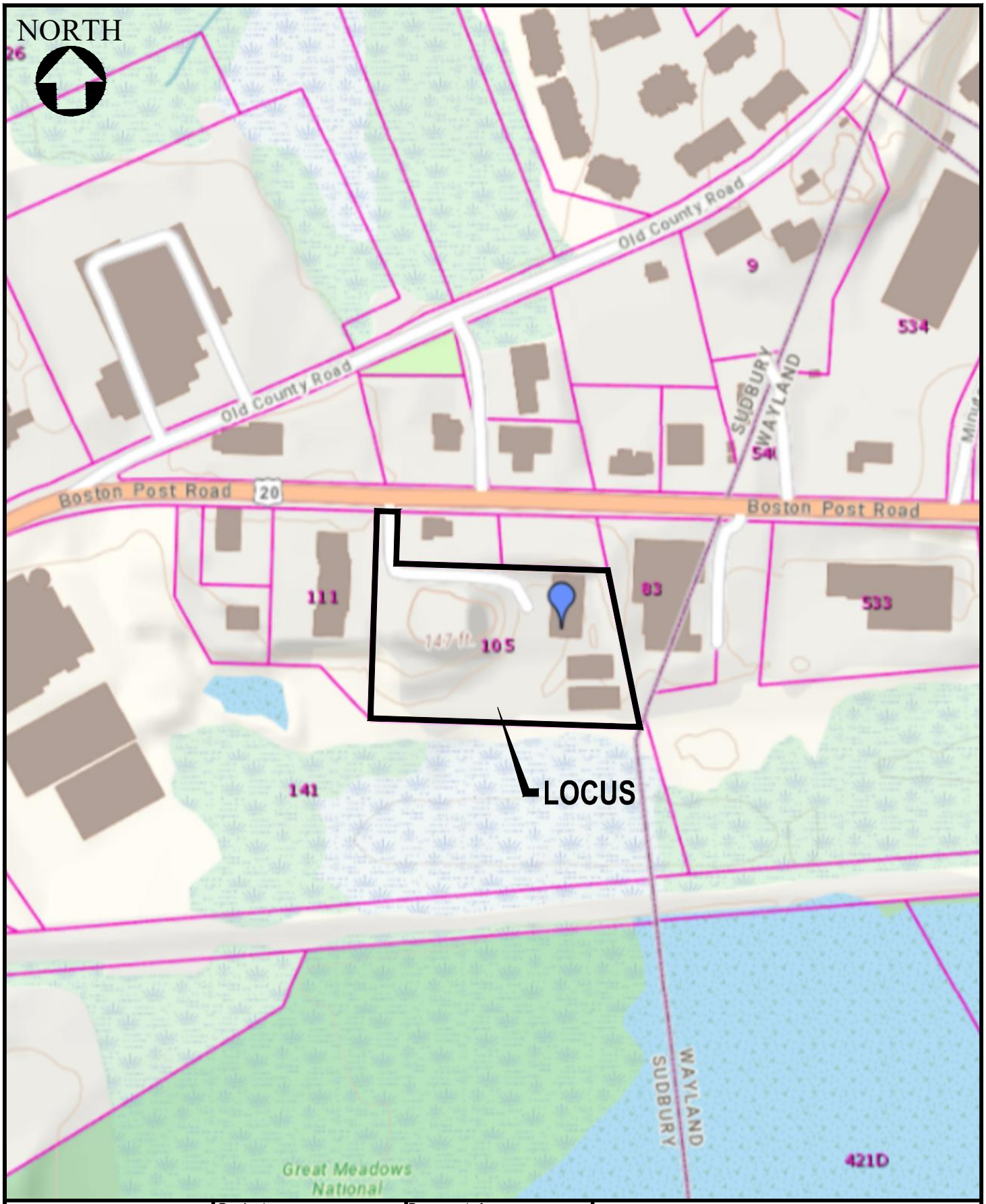

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043

Project
PROPOSED PARKING EXPANSION
105 BOSTON POST ROAD, SUDBURY, MA

Prepared for
HERB CHAMBERS
83 BOSTON POST ROAD, SUDBURY, MA

Drawing Title **ASSESSORS MAP**

DATE: 02.08.2020 | DRAWN: DJN
JOB NO.:100–108 | CHECK: ML
SCALE: 250 125 0 250

6

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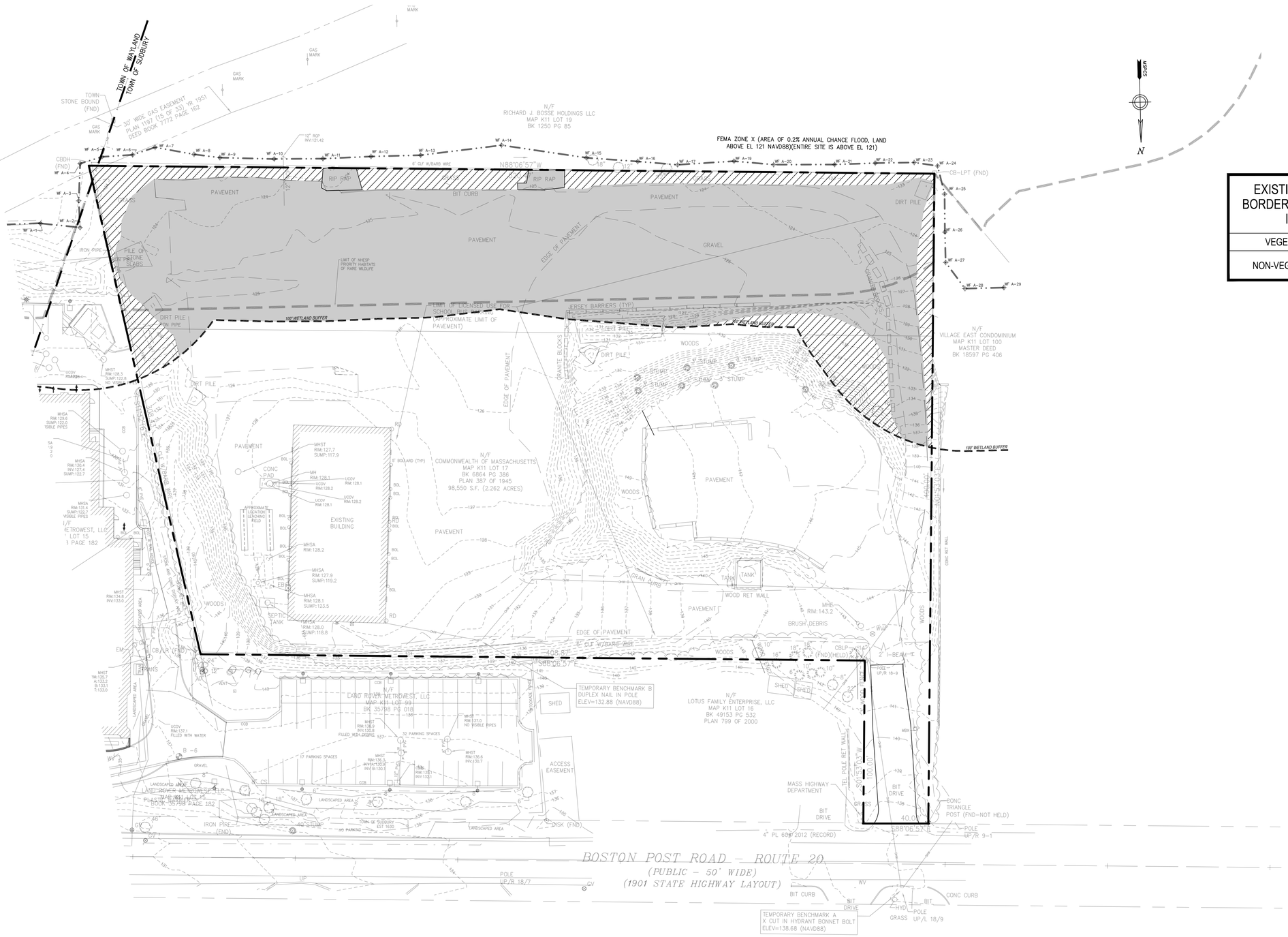


LEGEND

- VEGETATED
- NON-VEGETATED

EXISTING 100-FOOT BUFFER TO BORDERING VEGETATIVE WETLAND IMPACTS SUMMARY

VEGETATED	9,588 ± SF
NON-VEGETATED	43,242 ± SF

Date	Description	No.

Revisions

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-919-0808

Project

105 BOSTON POST ROAD

SUDBURY, MA

Prepared for

HERB CHAMBERS OF SUDBURY, INC.

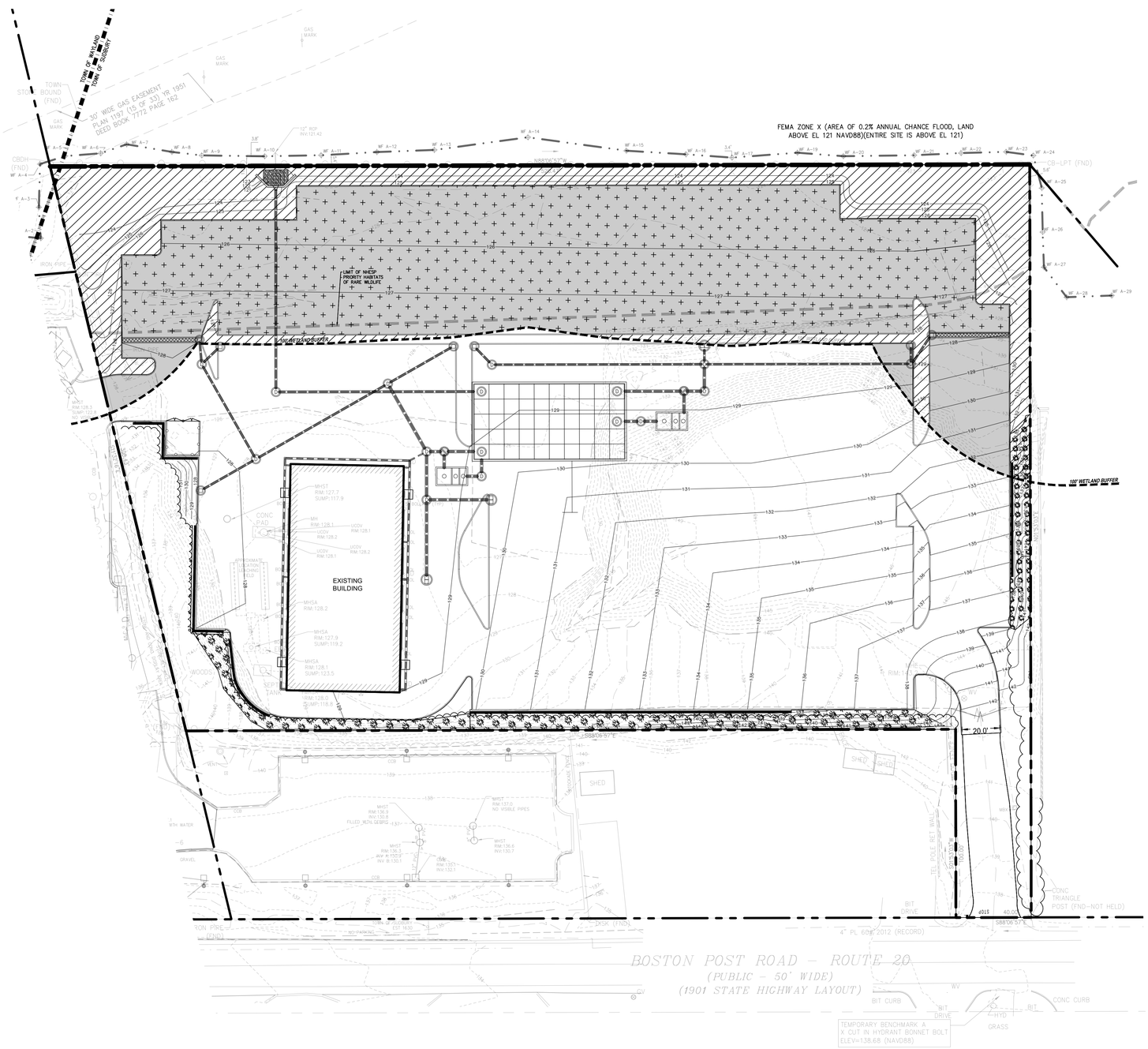
259 MCGRATH HWY
SOMERVILLE, MA 02143

Drawing Title

EXISTING BUFFER ZONE IMPACT EXHIBIT

Project No.	100-108	Drawing No.	X-6
Date	3/22/2021		
Scale	1" = 30'		
Drawn By	DJN		
Approved By	GC		

C:\CDG\Crocker Design Group, LLC\Gabriel Crocker - Projects\100-108 Sudbury - Herb Chambers Mass DOT\dwg\Plot Sheets\Exhibits_X-6 EXISTING CONDITIONS Vegetated vs Non-Vegetated_recover.dwg, OX-EX WATERSHED MAP, Mar 11, 2021 10:18



LEGEND

- VEGETATED
- NON-VEGETATED
- POROUS PAVEMENT

PROPOSED 100-FOOT BUFFER TO BORDERING VEGETATIVE WETLAND IMPACTS SUMMARY

VEGETATED AREA	15,765 ± SF
NON-VEGETATED AREA	37,065 ± SF[1]
TOTAL BUFFER AREA	52,830 ± SF

1.) 32,578 ± SF OF THE NON-VEGETATED AREA WITHIN THE 100 FOOT BUFFER TO THE WETLAND IS POROUS PAVEMENT.

30 15 0 30 60

Date	Description	No.

Revisions

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-919-0808

Project
105 BOSTON POST ROAD
SUDBURY, MA

Prepared for
HERB CHAMBERS OF SUDBURY, INC.
259 MCGRATH HWY
SOMERVILE, MA 02143

Drawing Title
PROPOSED BUFFER ZONE IMPACT EXHIBIT

Project No.	100-108
Date	3/22/2021
Scale	1"=30'
Drawn By	DJN
Approved By	GC

Drawing No.
X-7

C:\CDG\Crocker Design Group, LLC\Gabriel Crocker - Projects\100-108 Sudbury - Herb Chambers Mass DOT\dwg\Plot Sheets\Exhibits\ X-7 PROPOSED CONDITIONS Vegetated vs NonVegetated_recover.dwg, DEPROP WATERSHED MAP, Mar 12, 2021 09:53

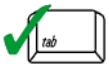
SECTION 2 – STORMWATER CHECKLIST

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

COMMONWEALTH OF MASSACHUSETTS
GABRIEL R
CROCKER
CIVIL
NO. 47917
REGISTERED
PROFESSIONAL ENGINEER

1/25/2021
Signature and Date

Checklist

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

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☐ Static ☒ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

☐ Site is comprised solely of C and D soils and/or bedrock at the land surface

☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

☒ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

ILLICIT DISCHARGE COMPLIANCE STATEMENT

Standard 10: Massachusetts Stormwater Standards Handbook

Illicit discharges are defined as discharges into waters of the State or municipal separate stormwater system (MS4) that are not entirely comprised of stormwater. Exclusions for non-stormwater discharges into drainage systems include activities or facilities for firefighting, water line flushing, landscape irrigation, uncontaminated groundwater discharge, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, water used to clean residential buildings without detergents, water used for street washing, and flows from riparian habitats/wetlands. These exclusions are subject to change and are under the discretion of the local governing authority.

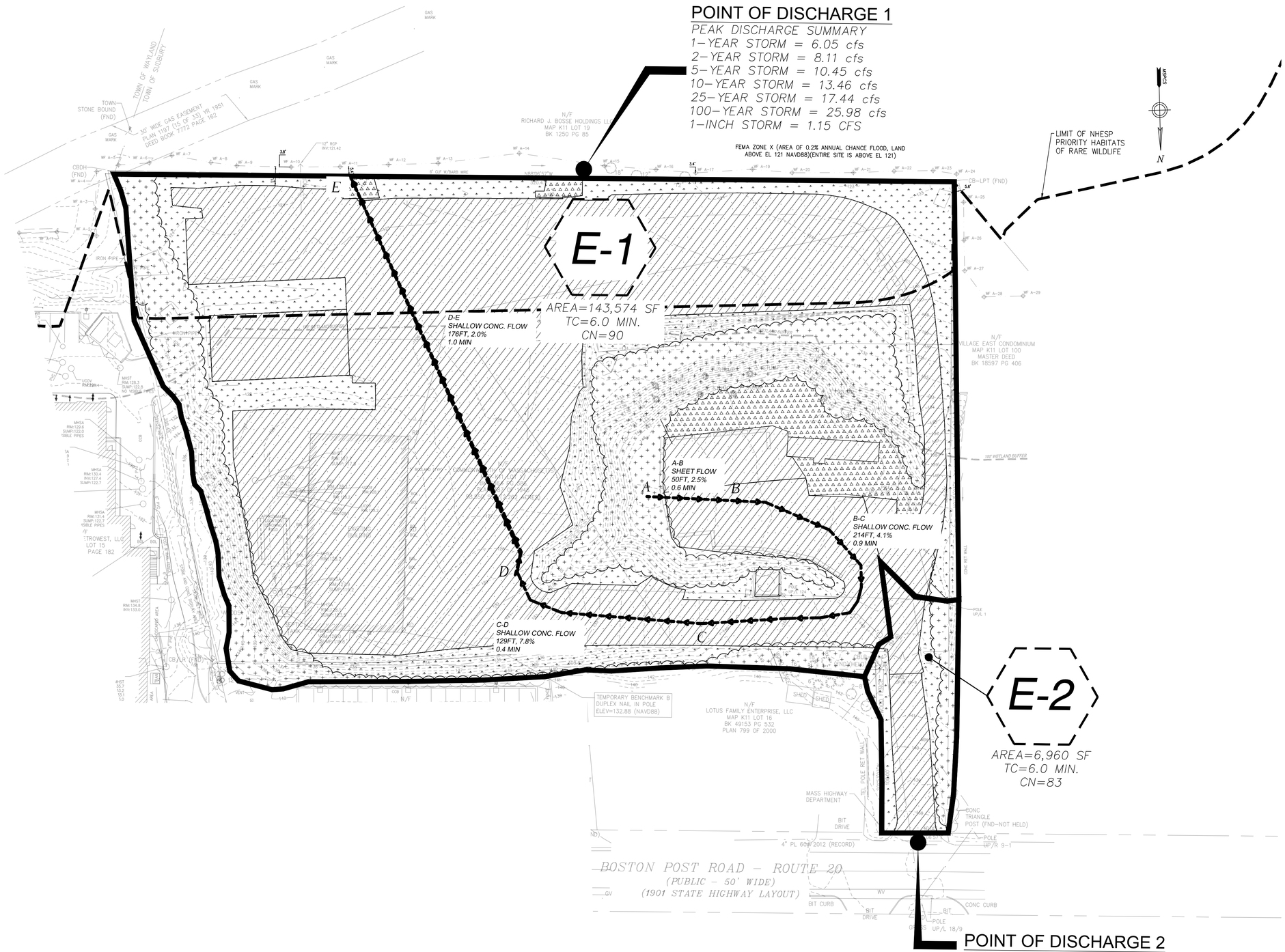
To the best of our knowledge and professional belief no illicit discharges to the stormwater system, surface waters, or wetland resource areas will remain on the site after construction. We will agree to implement a pollution prevention plan to prevent illicit discharges into the stormwater management system. The design of the site based on the plans entitled "PROPOSED SITE DEVELOPMENT PLANS – PARKING AREA EXTENSION" prepared by Crocker Design Group, 2 Sharp Street, Unit B, Hingham, Massachusetts show a separation and no direct connection between the stormwater management systems and the wastewater and/ or groundwater on the site. To the maximum extent practicable, the design prevents entry of illicit discharges into the stormwater management system.

Engineer's Name: Gabe Crocker, P.E.
(please print)

Engineer's Signature: _____ Date: 1/25/2021

Company: Crocker Design Group, LLC.

SECTION 3 – STORMATER HYDROLOGY MODEL



LEGEND

- GRASS AREA
- GRAVEL AREA
- PAVED AREA
- WOODED AREA

VOLUME TABLE

	POINT OF DISCHARGE 1 (ACRE-FOOT)	POINT OF DISCHARGE 2 (ACRE-FOOT)
1 INCH	0.088	.002
1 YEAR	0.440	.015
2 YEAR	0.596	.021
5 YEAR	0.776	.029
10 YEAR	1.012	.040
25 YEAR	1.331	.054
100 YEAR	2.032	.087

30 15 0 30 60

Date	Description	No.

Revisions

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-919-0808

Project
105 BOSTON POST ROAD
SUDBURY, MA

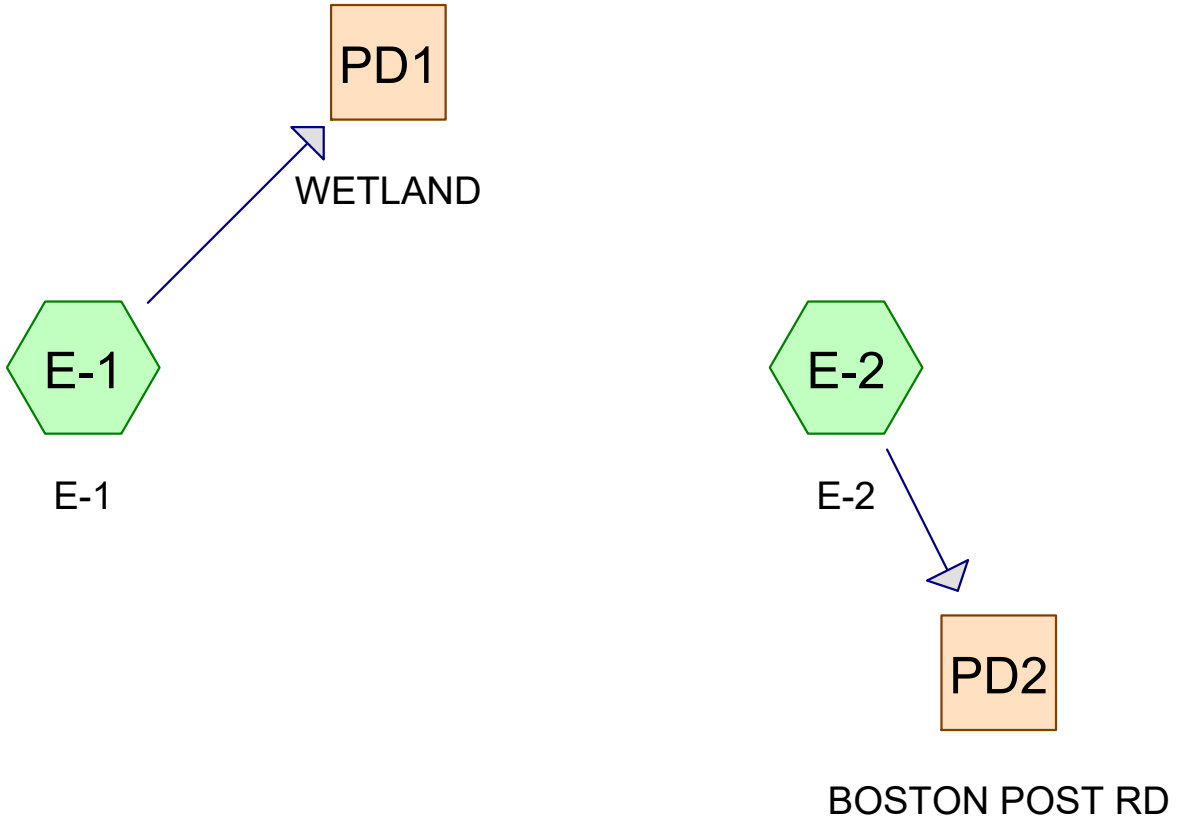
Prepared for
HERB CHAMBERS OF SUDBURY, INC.
259 MCGRATH HWY
SOMERVILE, MA 02143

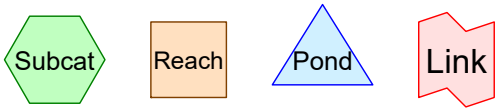
Drawing Title
EXISTING CONDITIONS WATERSHED MAP

Project No.	100-108
Date	3/22/2021
Scale	1" = 30'
Drawn By	DJN
Approved By	GC
Drawing No.	EH-1

SOIL NOTE

SITE IS MAPPED AS 656, UDORTHENTS-URBAN LAND COMPLEX, WHICH DOES NOT HAVE A HYDRAULIC SOIL RATING. USING 2.3.3, 1982 RAWLS RATE FROM VOLUME 3 CHAPTER 1 OF THE MASSACHUSETTS STORMWATER HANDBOOK AS WELL AS THE TEST PITS PERFORMED ON SITE, IT WAS DETERMINED THAT THE NRCS HYDROLOGIC SOIL GROUP (HSG) FOR THE SITE IS HSG-B.





Routing Diagram for 100-108 Existing Watershed- REV
Prepared by {enter your company name here}, Printed 3/12/2021
HydroCAD® 10.00-26 s/n 01012 © 2020 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "EXIST.hcp"

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.042	69	50-75% Grass cover, Fair, HSG B (E-2)
0.492	79	<50% Grass cover, Poor, HSG B (E-1)
0.166	98	Building (E-1)
0.107	96	Gravel surface, HSG B (E-1)
1.911	98	Paved parking, HSG B (E-1, E-2)
0.038	66	Woods, Poor, HSG B (E-2)
0.700	73	Woods/grass comb., Poor, HSG B (E-1)
3.456	**89**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
3.290	HSG B	E-1, E-2
0.000	HSG C	
0.000	HSG D	
0.166	Other	E-1
3.456		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.042	0.000	0.000	0.000	0.042	50-75% Grass cover, Fair	E-2
0.000	0.492	0.000	0.000	0.000	0.492	<50% Grass cover, Poor	E-1
0.000	0.000	0.000	0.000	0.166	0.166	Building	E-1
0.000	0.107	0.000	0.000	0.000	0.107	Gravel surface	E-1
0.000	1.911	0.000	0.000	0.000	1.911	Paved parking	E-1, E-2
0.000	0.038	0.000	0.000	0.000	0.038	Woods, Poor	E-2
0.000	0.700	0.000	0.000	0.000	0.700	Woods/grass comb., Poor	E-1
0.000	**3.290**	**0.000**	**0.000**	**0.166**	**3.456**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: E-1 Runoff Area=3.296 ac 60.59% Impervious Runoff Depth=0.32"
Flow Length=661' Tc=6.0 min CN=90 Runoff=1.15 cfs 0.088 af

Subcatchment E-2: E-2 Runoff Area=6,960 sf 49.94% Impervious Runoff Depth=0.13"
Tc=6.0 min CN=83 Runoff=0.01 cfs 0.002 af

Reach PD1: WETLAND Inflow=1.15 cfs 0.088 af
Outflow=1.15 cfs 0.088 af

Reach PD2: BOSTON POST RD Inflow=0.01 cfs 0.002 af
Outflow=0.01 cfs 0.002 af

Total Runoff Area = 3.456 ac Runoff Volume = 0.090 af Average Runoff Depth = 0.31"
39.90% Pervious = 1.379 ac 60.10% Impervious = 2.077 ac

Summary for Subcatchment E-1: E-1

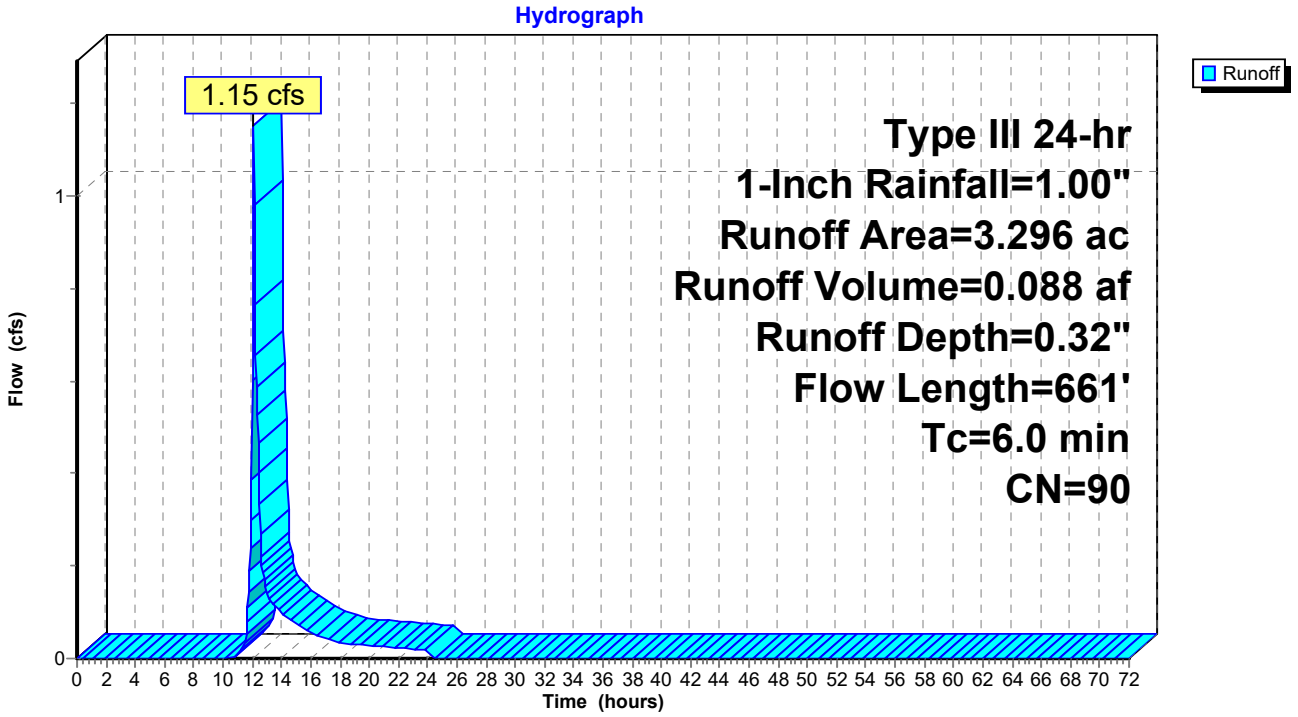
Runoff = 1.15 cfs @ 12.10 hrs, Volume= 0.088 af, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Inch Rainfall=1.00"

	Area (ac)	CN	Description
	0.492	79	<50% Grass cover, Poor, HSG B
	1.831	98	Paved parking, HSG B
	0.700	73	Woods/grass comb., Poor, HSG B
	0.107	96	Gravel surface, HSG B
*	0.166	98	Building
	3.296	90	Weighted Average
	1.299	77	39.41% Pervious Area
	1.997	98	60.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.35		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
0.9	214	0.0410	4.11		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.4	129	0.0780	5.67		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.6	268	0.0194	2.83		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
2.5					**Direct Entry, Min. TC**
6.0	661	Total			

Subcatchment E-1: E-1



Hydrograph for Subcatchment E-1: E-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.01	0.00	0.00
2.00	0.02	0.00	0.00
3.00	0.03	0.00	0.00
4.00	0.04	0.00	0.00
5.00	0.06	0.00	0.00
6.00	0.07	0.00	0.00
7.00	0.09	0.00	0.00
8.00	0.11	0.00	0.00
9.00	0.15	0.00	0.00
10.00	0.19	0.00	0.00
11.00	0.25	0.00	0.01
12.00	0.50	0.06	**0.60**
13.00	0.75	0.17	**0.15**
14.00	0.81	0.20	0.10
15.00	0.85	0.23	0.08
16.00	0.89	0.25	0.05
17.00	0.91	0.26	0.04
18.00	0.93	0.27	0.03
19.00	0.94	0.28	0.03
20.00	0.96	0.29	0.03
21.00	0.97	0.30	0.03
22.00	0.98	0.31	0.02
23.00	0.99	0.31	0.02
24.00	**1.00**	**0.32**	0.02
25.00	1.00	0.32	0.00
26.00	1.00	0.32	0.00
27.00	1.00	0.32	0.00
28.00	1.00	0.32	0.00
29.00	1.00	0.32	0.00
30.00	1.00	0.32	0.00
31.00	1.00	0.32	0.00
32.00	1.00	0.32	0.00
33.00	1.00	0.32	0.00
34.00	1.00	0.32	0.00
35.00	1.00	0.32	0.00
36.00	1.00	0.32	0.00
37.00	1.00	0.32	0.00
38.00	1.00	0.32	0.00
39.00	1.00	0.32	0.00
40.00	1.00	0.32	0.00
41.00	1.00	0.32	0.00
42.00	1.00	0.32	0.00
43.00	1.00	0.32	0.00
44.00	1.00	0.32	0.00
45.00	1.00	0.32	0.00
46.00	1.00	0.32	0.00
47.00	1.00	0.32	0.00
48.00	1.00	0.32	0.00
49.00	1.00	0.32	0.00
50.00	1.00	0.32	0.00
51.00	1.00	0.32	0.00
52.00	1.00	0.32	0.00
53.00	1.00	0.32	0.00
54.00	1.00	0.32	0.00
55.00	1.00	0.32	0.00
56.00	1.00	0.32	0.00
57.00	1.00	0.32	0.00
58.00	1.00	0.32	0.00
59.00	1.00	0.32	0.00
60.00	1.00	0.32	0.00
61.00	1.00	0.32	0.00
62.00	1.00	0.32	0.00
63.00	1.00	0.32	0.00
64.00	1.00	0.32	0.00
65.00	1.00	0.32	0.00
66.00	1.00	0.32	0.00
67.00	1.00	0.32	0.00
68.00	1.00	0.32	0.00
69.00	1.00	0.32	0.00
70.00	1.00	0.32	0.00
71.00	1.00	0.32	0.00
72.00	1.00	0.32	0.00

Summary for Subcatchment E-2: E-2

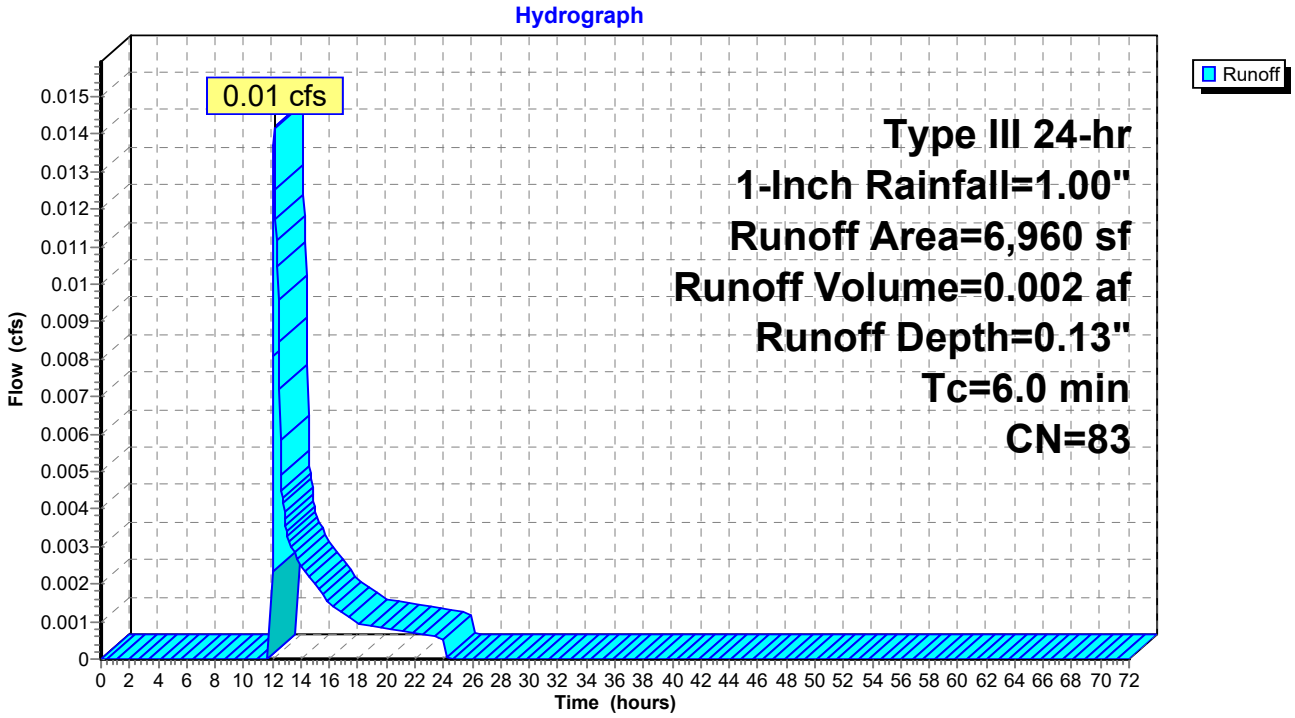
Runoff = 0.01 cfs @ 12.14 hrs, Volume= 0.002 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
3,476	98	Paved parking, HSG B
1,827	69	50-75% Grass cover, Fair, HSG B
1,657	66	Woods, Poor, HSG B
6,960	83	Weighted Average
3,484	68	50.06% Pervious Area
3,476	98	49.94% Impervious Area

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

Subcatchment E-2: E-2



Hydrograph for Subcatchment E-2: E-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.01	0.00	0.00
2.00	0.02	0.00	0.00
3.00	0.03	0.00	0.00
4.00	0.04	0.00	0.00
5.00	0.06	0.00	0.00
6.00	0.07	0.00	0.00
7.00	0.09	0.00	0.00
8.00	0.11	0.00	0.00
9.00	0.15	0.00	0.00
10.00	0.19	0.00	0.00
11.00	0.25	0.00	0.00
12.00	0.50	0.00	**0.00**
13.00	0.75	0.05	**0.00**
14.00	0.81	0.07	0.00
15.00	0.85	0.08	0.00
16.00	0.89	0.09	0.00
17.00	0.91	0.10	0.00
18.00	0.93	0.10	0.00
19.00	0.94	0.11	0.00
20.00	0.96	0.12	0.00
21.00	0.97	0.12	0.00
22.00	0.98	0.12	0.00
23.00	0.99	0.13	0.00
24.00	**1.00**	**0.13**	0.00
25.00	1.00	0.13	0.00
26.00	1.00	0.13	0.00
27.00	1.00	0.13	0.00
28.00	1.00	0.13	0.00
29.00	1.00	0.13	0.00
30.00	1.00	0.13	0.00
31.00	1.00	0.13	0.00
32.00	1.00	0.13	0.00
33.00	1.00	0.13	0.00
34.00	1.00	0.13	0.00
35.00	1.00	0.13	0.00
36.00	1.00	0.13	0.00
37.00	1.00	0.13	0.00
38.00	1.00	0.13	0.00
39.00	1.00	0.13	0.00
40.00	1.00	0.13	0.00
41.00	1.00	0.13	0.00
42.00	1.00	0.13	0.00
43.00	1.00	0.13	0.00
44.00	1.00	0.13	0.00
45.00	1.00	0.13	0.00
46.00	1.00	0.13	0.00
47.00	1.00	0.13	0.00
48.00	1.00	0.13	0.00
49.00	1.00	0.13	0.00
50.00	1.00	0.13	0.00
51.00	1.00	0.13	0.00
52.00	1.00	0.13	0.00
53.00	1.00	0.13	0.00
54.00	1.00	0.13	0.00
55.00	1.00	0.13	0.00
56.00	1.00	0.13	0.00
57.00	1.00	0.13	0.00
58.00	1.00	0.13	0.00
59.00	1.00	0.13	0.00
60.00	1.00	0.13	0.00
61.00	1.00	0.13	0.00
62.00	1.00	0.13	0.00
63.00	1.00	0.13	0.00
64.00	1.00	0.13	0.00
65.00	1.00	0.13	0.00
66.00	1.00	0.13	0.00
67.00	1.00	0.13	0.00
68.00	1.00	0.13	0.00
69.00	1.00	0.13	0.00
70.00	1.00	0.13	0.00
71.00	1.00	0.13	0.00
72.00	1.00	0.13	0.00

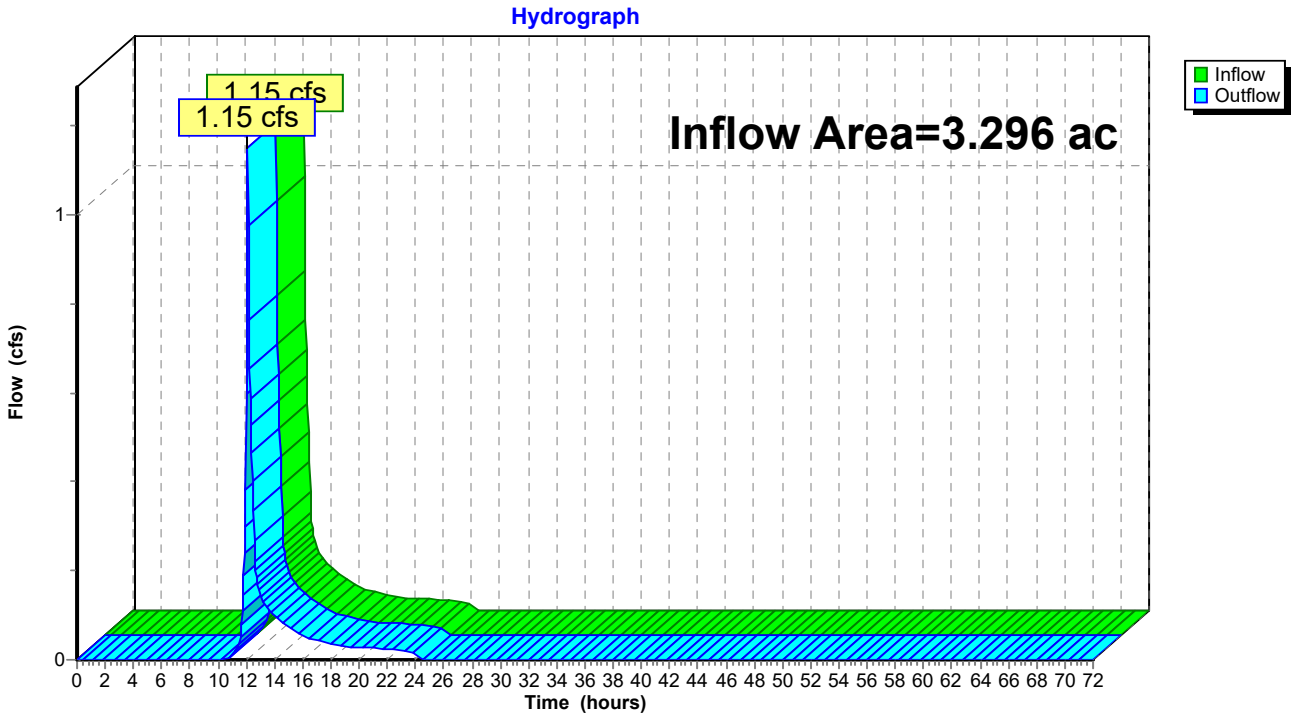
Summary for Reach PD1: WETLAND

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

Inflow Area = 3.296 ac, 60.59% Impervious, Inflow Depth = 0.32" for 1-Inch event
Inflow = 1.15 cfs @ 12.10 hrs, Volume= 0.088 af
Outflow = 1.15 cfs @ 12.10 hrs, Volume= 0.088 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD1: WETLAND



Hydrograph for Reach PD1: WETLAND

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.01		0.01	64.00	0.00		0.00
12.00	**0.60**		**0.60**	65.00	0.00		0.00
13.00	**0.15**		**0.15**	66.00	0.00		0.00
14.00	0.10		0.10	67.00	0.00		0.00
15.00	0.08		0.08	68.00	0.00		0.00
16.00	0.05		0.05	69.00	0.00		0.00
17.00	0.04		0.04	70.00	0.00		0.00
18.00	0.03		0.03	71.00	0.00		0.00
19.00	0.03		0.03	72.00	0.00		0.00
20.00	0.03		0.03				
21.00	0.03		0.03				
22.00	0.02		0.02				
23.00	0.02		0.02				
24.00	0.02		0.02				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

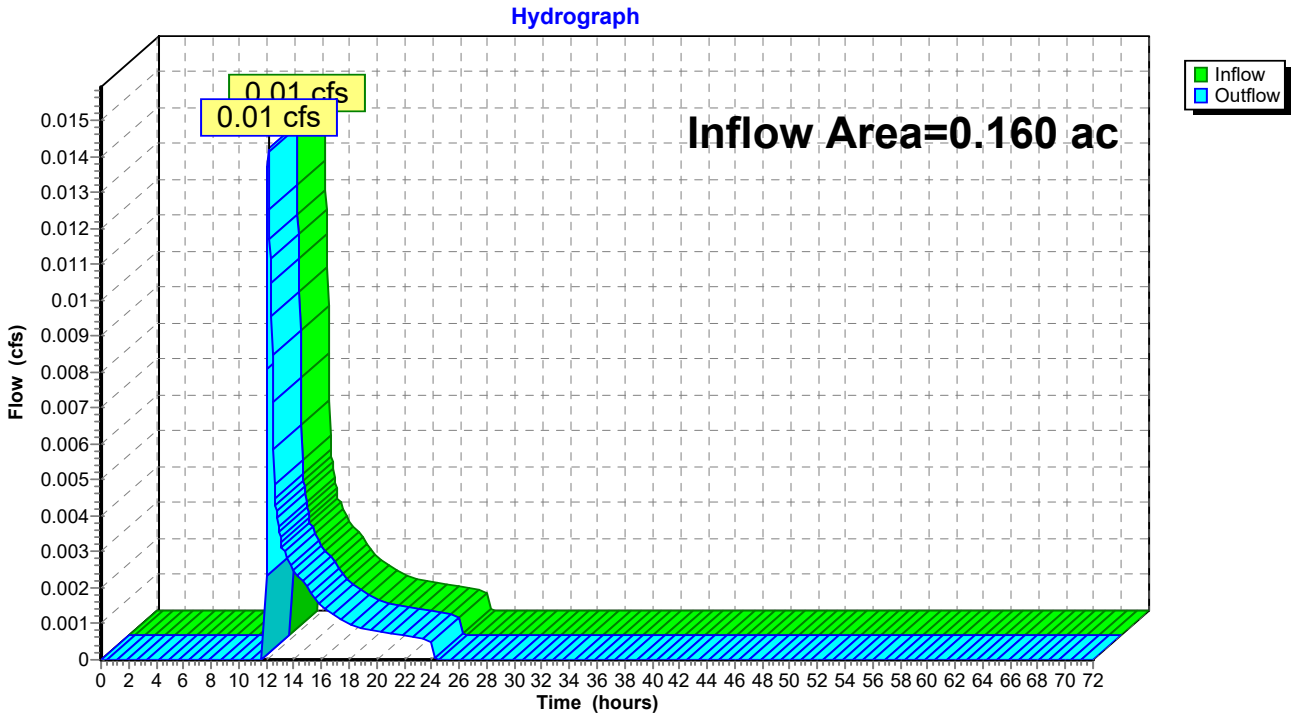
Summary for Reach PD2: BOSTON POST RD

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

Inflow Area = 0.160 ac, 49.94% Impervious, Inflow Depth = 0.13" for 1-Inch event
Inflow = 0.01 cfs @ 12.14 hrs, Volume= 0.002 af
Outflow = 0.01 cfs @ 12.14 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD2: BOSTON POST RD



Hydrograph for Reach PD2: BOSTON POST RD

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.00		0.00	64.00	0.00		0.00
12.00	**0.00**		**0.00**	65.00	0.00		0.00
13.00	**0.00**		**0.00**	66.00	0.00		0.00
14.00	0.00		0.00	67.00	0.00		0.00
15.00	0.00		0.00	68.00	0.00		0.00
16.00	0.00		0.00	69.00	0.00		0.00
17.00	0.00		0.00	70.00	0.00		0.00
18.00	0.00		0.00	71.00	0.00		0.00
19.00	0.00		0.00	72.00	0.00		0.00
20.00	0.00		0.00				
21.00	0.00		0.00				
22.00	0.00		0.00				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: E-1 Runoff Area=3.296 ac 60.59% Impervious Runoff Depth=1.60"
Flow Length=661' Tc=6.0 min CN=90 Runoff=6.05 cfs 0.440 af

Subcatchment E-2: E-2 Runoff Area=6,960 sf 49.94% Impervious Runoff Depth=1.12"
Tc=6.0 min CN=83 Runoff=0.20 cfs 0.015 af

Reach PD1: WETLAND Inflow=6.05 cfs 0.440 af
Outflow=6.05 cfs 0.440 af

Reach PD2: BOSTON POST RD Inflow=0.20 cfs 0.015 af
Outflow=0.20 cfs 0.015 af

Total Runoff Area = 3.456 ac Runoff Volume = 0.455 af Average Runoff Depth = 1.58"
39.90% Pervious = 1.379 ac 60.10% Impervious = 2.077 ac

Summary for Subcatchment E-1: E-1

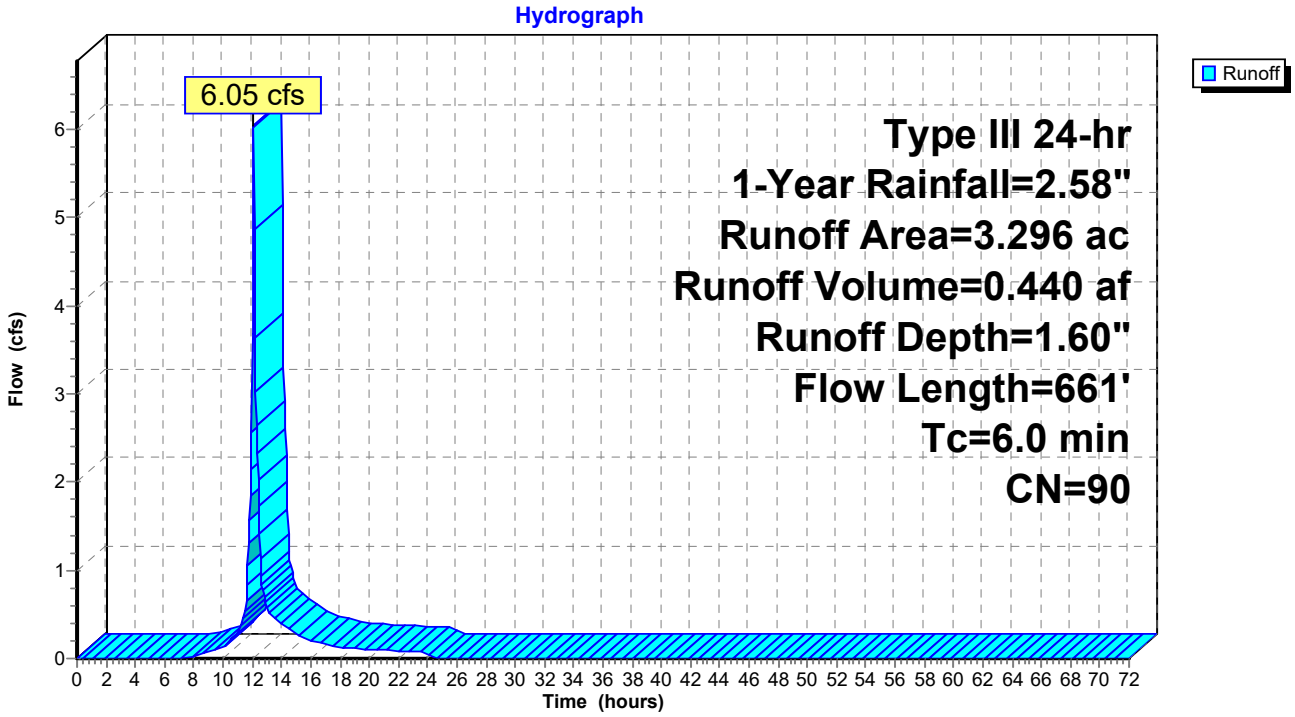
Runoff = 6.05 cfs @ 12.09 hrs, Volume= 0.440 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.58"

	Area (ac)	CN	Description
	0.492	79	<50% Grass cover, Poor, HSG B
	1.831	98	Paved parking, HSG B
	0.700	73	Woods/grass comb., Poor, HSG B
	0.107	96	Gravel surface, HSG B
*	0.166	98	Building
	3.296	90	Weighted Average
	1.299	77	39.41% Pervious Area
	1.997	98	60.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.35		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
0.9	214	0.0410	4.11		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.4	129	0.0780	5.67		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.6	268	0.0194	2.83		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
2.5					**Direct Entry, Min. TC**
6.0	661	Total			

Subcatchment E-1: E-1



Hydrograph for Subcatchment E-1: E-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.05	0.00	0.00
3.00	0.08	0.00	0.00
4.00	0.11	0.00	0.00
5.00	0.15	0.00	0.00
6.00	0.19	0.00	0.00
7.00	0.23	0.00	0.00
8.00	0.29	0.00	0.02
9.00	0.38	0.02	0.07
10.00	0.49	0.05	0.14
11.00	0.64	0.12	0.28
12.00	1.29	0.52	**3.68**
13.00	1.93	1.04	**0.59**
14.00	2.09	1.17	0.38
15.00	2.20	1.27	0.29
16.00	2.29	1.34	0.20
17.00	2.35	1.39	0.16
18.00	2.39	1.44	0.12
19.00	2.43	1.47	0.11
20.00	2.47	1.50	0.10
21.00	2.50	1.53	0.09
22.00	2.53	1.56	0.08
23.00	2.56	1.58	0.07
24.00	**2.58**	**1.60**	0.07
25.00	2.58	1.60	0.00
26.00	2.58	1.60	0.00
27.00	2.58	1.60	0.00
28.00	2.58	1.60	0.00
29.00	2.58	1.60	0.00
30.00	2.58	1.60	0.00
31.00	2.58	1.60	0.00
32.00	2.58	1.60	0.00
33.00	2.58	1.60	0.00
34.00	2.58	1.60	0.00
35.00	2.58	1.60	0.00
36.00	2.58	1.60	0.00
37.00	2.58	1.60	0.00
38.00	2.58	1.60	0.00
39.00	2.58	1.60	0.00
40.00	2.58	1.60	0.00
41.00	2.58	1.60	0.00
42.00	2.58	1.60	0.00
43.00	2.58	1.60	0.00
44.00	2.58	1.60	0.00
45.00	2.58	1.60	0.00
46.00	2.58	1.60	0.00
47.00	2.58	1.60	0.00
48.00	2.58	1.60	0.00
49.00	2.58	1.60	0.00
50.00	2.58	1.60	0.00
51.00	2.58	1.60	0.00
52.00	2.58	1.60	0.00
53.00	2.58	1.60	0.00
54.00	2.58	1.60	0.00
55.00	2.58	1.60	0.00
56.00	2.58	1.60	0.00
57.00	2.58	1.60	0.00
58.00	2.58	1.60	0.00
59.00	2.58	1.60	0.00
60.00	2.58	1.60	0.00
61.00	2.58	1.60	0.00
62.00	2.58	1.60	0.00
63.00	2.58	1.60	0.00
64.00	2.58	1.60	0.00
65.00	2.58	1.60	0.00
66.00	2.58	1.60	0.00
67.00	2.58	1.60	0.00
68.00	2.58	1.60	0.00
69.00	2.58	1.60	0.00
70.00	2.58	1.60	0.00
71.00	2.58	1.60	0.00
72.00	2.58	1.60	0.00

Summary for Subcatchment E-2: E-2

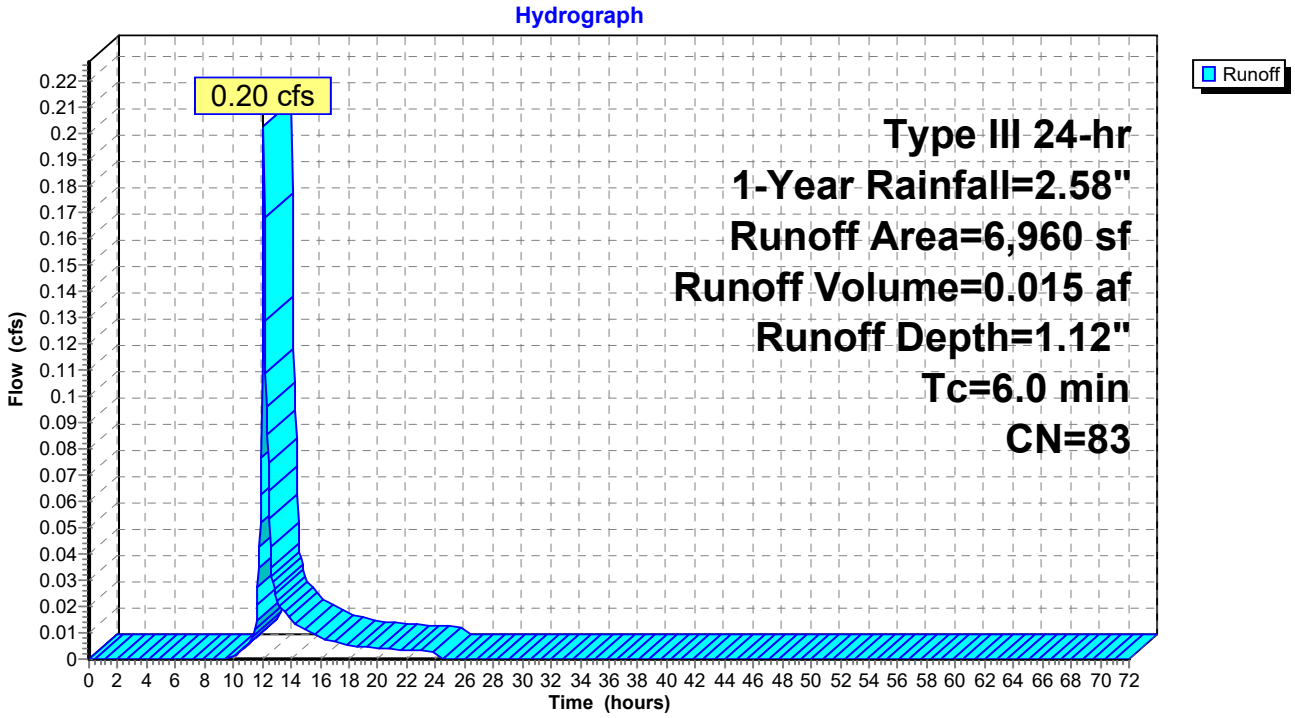
Runoff = 0.20 cfs @ 12.10 hrs, Volume= 0.015 af, Depth= 1.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.58"

Area (sf)	CN	Description
3,476	98	Paved parking, HSG B
1,827	69	50-75% Grass cover, Fair, HSG B
1,657	66	Woods, Poor, HSG B
6,960	83	Weighted Average
3,484	68	50.06% Pervious Area
3,476	98	49.94% Impervious Area

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

Subcatchment E-2: E-2



Hydrograph for Subcatchment E-2: E-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.05	0.00	0.00
3.00	0.08	0.00	0.00
4.00	0.11	0.00	0.00
5.00	0.15	0.00	0.00
6.00	0.19	0.00	0.00
7.00	0.23	0.00	0.00
8.00	0.29	0.00	0.00
9.00	0.38	0.00	0.00
10.00	0.49	0.00	0.00
11.00	0.64	0.02	0.01
12.00	1.29	0.26	**0.11**
13.00	1.93	0.65	**0.02**
14.00	2.09	0.76	0.01
15.00	2.20	0.84	0.01
16.00	2.29	0.90	0.01
17.00	2.35	0.94	0.01
18.00	2.39	0.98	0.01
19.00	2.43	1.01	0.00
20.00	2.47	1.03	0.00
21.00	2.50	1.06	0.00
22.00	2.53	1.08	0.00
23.00	2.56	1.10	0.00
24.00	**2.58**	**1.12**	0.00
25.00	2.58	1.12	0.00
26.00	2.58	1.12	0.00
27.00	2.58	1.12	0.00
28.00	2.58	1.12	0.00
29.00	2.58	1.12	0.00
30.00	2.58	1.12	0.00
31.00	2.58	1.12	0.00
32.00	2.58	1.12	0.00
33.00	2.58	1.12	0.00
34.00	2.58	1.12	0.00
35.00	2.58	1.12	0.00
36.00	2.58	1.12	0.00
37.00	2.58	1.12	0.00
38.00	2.58	1.12	0.00
39.00	2.58	1.12	0.00
40.00	2.58	1.12	0.00
41.00	2.58	1.12	0.00
42.00	2.58	1.12	0.00
43.00	2.58	1.12	0.00
44.00	2.58	1.12	0.00
45.00	2.58	1.12	0.00
46.00	2.58	1.12	0.00
47.00	2.58	1.12	0.00
48.00	2.58	1.12	0.00
49.00	2.58	1.12	0.00
50.00	2.58	1.12	0.00
51.00	2.58	1.12	0.00
52.00	2.58	1.12	0.00
53.00	2.58	1.12	0.00
54.00	2.58	1.12	0.00
55.00	2.58	1.12	0.00
56.00	2.58	1.12	0.00
57.00	2.58	1.12	0.00
58.00	2.58	1.12	0.00
59.00	2.58	1.12	0.00
60.00	2.58	1.12	0.00
61.00	2.58	1.12	0.00
62.00	2.58	1.12	0.00
63.00	2.58	1.12	0.00
64.00	2.58	1.12	0.00
65.00	2.58	1.12	0.00
66.00	2.58	1.12	0.00
67.00	2.58	1.12	0.00
68.00	2.58	1.12	0.00
69.00	2.58	1.12	0.00
70.00	2.58	1.12	0.00
71.00	2.58	1.12	0.00
72.00	2.58	1.12	0.00

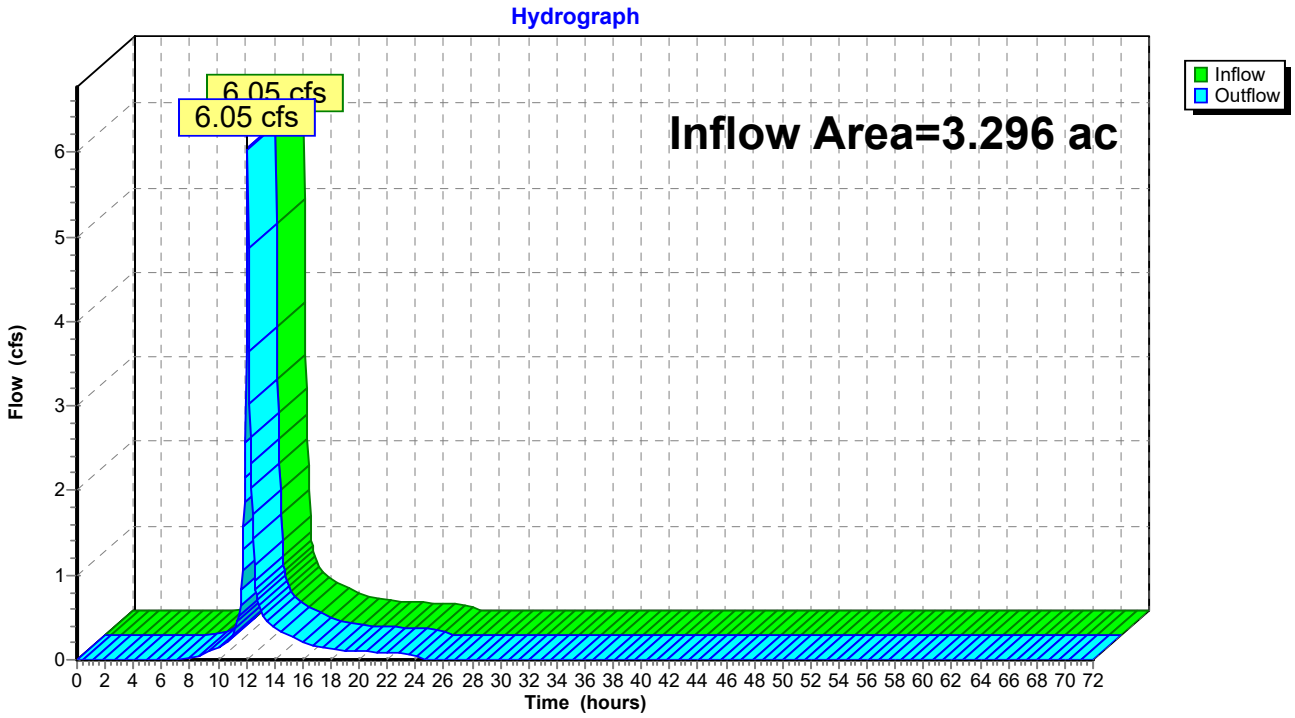
Summary for Reach PD1: WETLAND

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

Inflow Area = 3.296 ac, 60.59% Impervious, Inflow Depth = 1.60" for 1-Year event
Inflow = 6.05 cfs @ 12.09 hrs, Volume= 0.440 af
Outflow = 6.05 cfs @ 12.09 hrs, Volume= 0.440 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD1: WETLAND



Hydrograph for Reach PD1: WETLAND

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.02		0.02	61.00	0.00		0.00
9.00	0.07		0.07	62.00	0.00		0.00
10.00	0.14		0.14	63.00	0.00		0.00
11.00	0.28		0.28	64.00	0.00		0.00
12.00	**3.68**		**3.68**	65.00	0.00		0.00
13.00	**0.59**		**0.59**	66.00	0.00		0.00
14.00	0.38		0.38	67.00	0.00		0.00
15.00	0.29		0.29	68.00	0.00		0.00
16.00	0.20		0.20	69.00	0.00		0.00
17.00	0.16		0.16	70.00	0.00		0.00
18.00	0.12		0.12	71.00	0.00		0.00
19.00	0.11		0.11	72.00	0.00		0.00
20.00	0.10		0.10				
21.00	0.09		0.09				
22.00	0.08		0.08				
23.00	0.07		0.07				
24.00	0.07		0.07				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

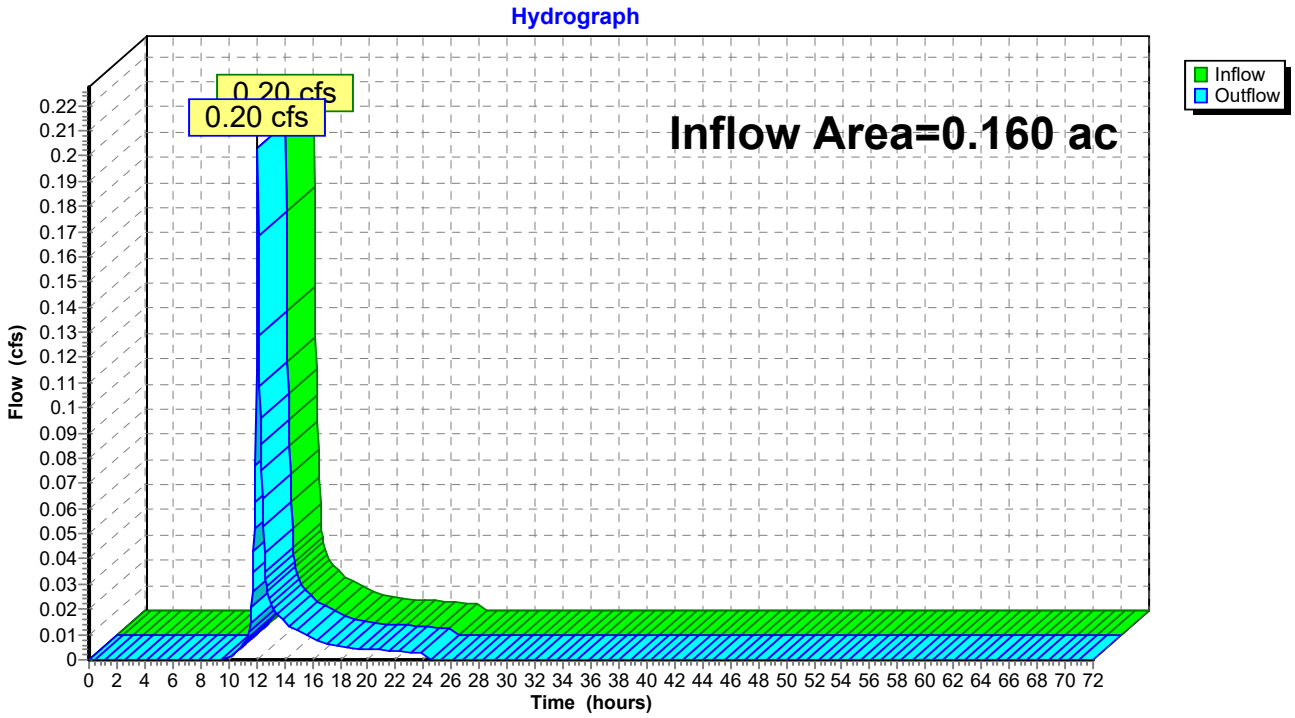
Summary for Reach PD2: BOSTON POST RD

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

Inflow Area = 0.160 ac, 49.94% Impervious, Inflow Depth = 1.12" for 1-Year event
Inflow = 0.20 cfs @ 12.10 hrs, Volume= 0.015 af
Outflow = 0.20 cfs @ 12.10 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD2: BOSTON POST RD



Hydrograph for Reach PD2: BOSTON POST RD

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00
1.00	0.00		0.00
2.00	0.00		0.00
3.00	0.00		0.00
4.00	0.00		0.00
5.00	0.00		0.00
6.00	0.00		0.00
7.00	0.00		0.00
8.00	0.00		0.00
9.00	0.00		0.00
10.00	0.00		0.00
11.00	0.01		0.01
12.00	**0.11**		**0.11**
13.00	**0.02**		**0.02**
14.00	0.01		0.01
15.00	0.01		0.01
16.00	0.01		0.01
17.00	0.01		0.01
18.00	0.01		0.01
19.00	0.00		0.00
20.00	0.00		0.00
21.00	0.00		0.00
22.00	0.00		0.00
23.00	0.00		0.00
24.00	0.00		0.00
25.00	0.00		0.00
26.00	0.00		0.00
27.00	0.00		0.00
28.00	0.00		0.00
29.00	0.00		0.00
30.00	0.00		0.00
31.00	0.00		0.00
32.00	0.00		0.00
33.00	0.00		0.00
34.00	0.00		0.00
35.00	0.00		0.00
36.00	0.00		0.00
37.00	0.00		0.00
38.00	0.00		0.00
39.00	0.00		0.00
40.00	0.00		0.00
41.00	0.00		0.00
42.00	0.00		0.00
43.00	0.00		0.00
44.00	0.00		0.00
45.00	0.00		0.00
46.00	0.00		0.00
47.00	0.00		0.00
48.00	0.00		0.00
49.00	0.00		0.00
50.00	0.00		0.00
51.00	0.00		0.00
52.00	0.00		0.00
53.00	0.00		0.00
54.00	0.00		0.00
55.00	0.00		0.00
56.00	0.00		0.00
57.00	0.00		0.00
58.00	0.00		0.00
59.00	0.00		0.00
60.00	0.00		0.00
61.00	0.00		0.00
62.00	0.00		0.00
63.00	0.00		0.00
64.00	0.00		0.00
65.00	0.00		0.00
66.00	0.00		0.00
67.00	0.00		0.00
68.00	0.00		0.00
69.00	0.00		0.00
70.00	0.00		0.00
71.00	0.00		0.00
72.00	0.00		0.00

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: E-1 Runoff Area=3.296 ac 60.59% Impervious Runoff Depth=2.17"
Flow Length=661' Tc=6.0 min CN=90 Runoff=8.11 cfs 0.596 af

Subcatchment E-2: E-2 Runoff Area=6,960 sf 49.94% Impervious Runoff Depth=1.61"
Tc=6.0 min CN=83 Runoff=0.30 cfs 0.021 af

Reach PD1: WETLAND Inflow=8.11 cfs 0.596 af
Outflow=8.11 cfs 0.596 af

Reach PD2: BOSTON POST RD Inflow=0.30 cfs 0.021 af
Outflow=0.30 cfs 0.021 af

Total Runoff Area = 3.456 ac Runoff Volume = 0.617 af Average Runoff Depth = 2.14"
39.90% Pervious = 1.379 ac 60.10% Impervious = 2.077 ac

Summary for Subcatchment E-1: E-1

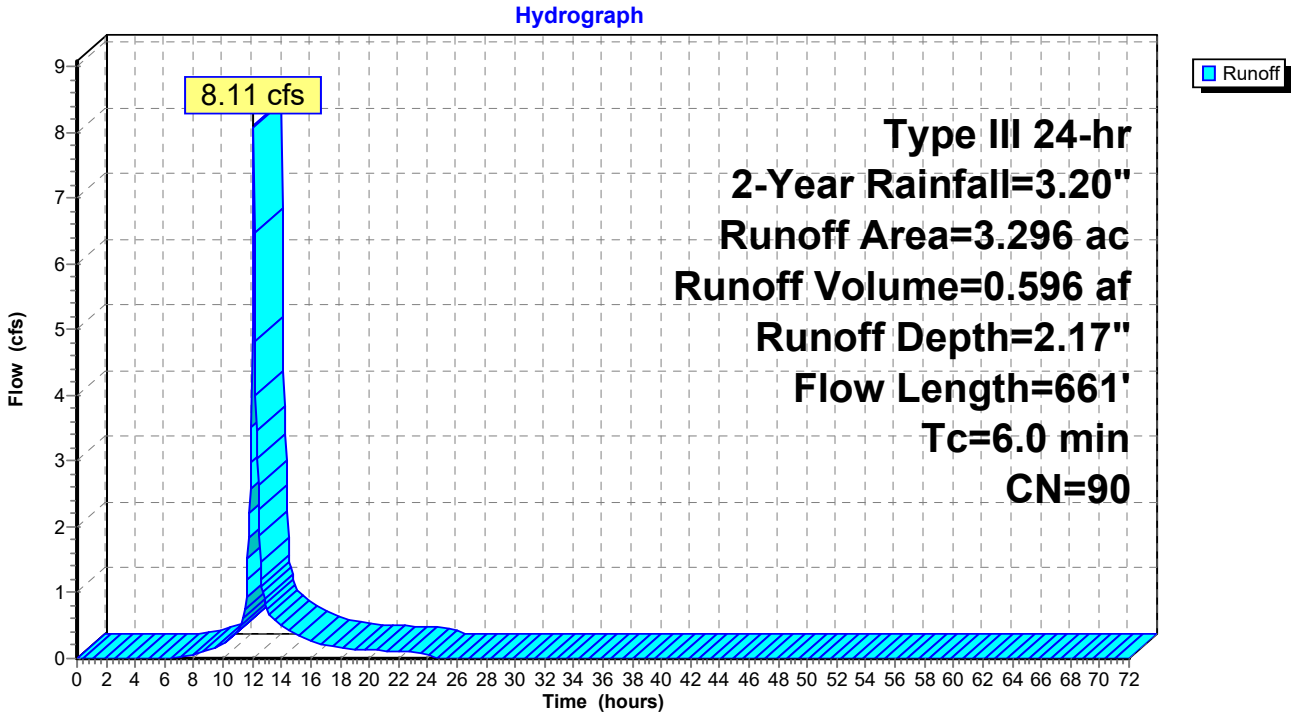
Runoff = 8.11 cfs @ 12.09 hrs, Volume= 0.596 af, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
	0.492	79	<50% Grass cover, Poor, HSG B
	1.831	98	Paved parking, HSG B
	0.700	73	Woods/grass comb., Poor, HSG B
	0.107	96	Gravel surface, HSG B
*	0.166	98	Building
	3.296	90	Weighted Average
	1.299	77	39.41% Pervious Area
	1.997	98	60.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.35		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
0.9	214	0.0410	4.11		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.4	129	0.0780	5.67		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.6	268	0.0194	2.83		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
2.5					**Direct Entry, Min. TC**
6.0	661	Total			

Subcatchment E-1: E-1



Hydrograph for Subcatchment E-1: E-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.06	0.00	0.00
3.00	0.10	0.00	0.00
4.00	0.14	0.00	0.00
5.00	0.18	0.00	0.00
6.00	0.23	0.00	0.00
7.00	0.29	0.00	0.02
8.00	0.36	0.02	0.06
9.00	0.47	0.04	0.12
10.00	0.60	0.10	0.22
11.00	0.80	0.20	0.42
12.00	1.60	0.76	**5.02**
13.00	2.40	1.44	**0.77**
14.00	2.60	1.62	0.49
15.00	2.73	1.74	0.37
16.00	2.84	1.83	0.26
17.00	2.91	1.90	0.21
18.00	2.97	1.96	0.16
19.00	3.02	2.00	0.14
20.00	3.06	2.04	0.13
21.00	3.10	2.08	0.12
22.00	3.14	2.11	0.11
23.00	3.17	2.14	0.10
24.00	**3.20**	**2.17**	0.08
25.00	3.20	2.17	0.00
26.00	3.20	2.17	0.00
27.00	3.20	2.17	0.00
28.00	3.20	2.17	0.00
29.00	3.20	2.17	0.00
30.00	3.20	2.17	0.00
31.00	3.20	2.17	0.00
32.00	3.20	2.17	0.00
33.00	3.20	2.17	0.00
34.00	3.20	2.17	0.00
35.00	3.20	2.17	0.00
36.00	3.20	2.17	0.00
37.00	3.20	2.17	0.00
38.00	3.20	2.17	0.00
39.00	3.20	2.17	0.00
40.00	3.20	2.17	0.00
41.00	3.20	2.17	0.00
42.00	3.20	2.17	0.00
43.00	3.20	2.17	0.00
44.00	3.20	2.17	0.00
45.00	3.20	2.17	0.00
46.00	3.20	2.17	0.00
47.00	3.20	2.17	0.00
48.00	3.20	2.17	0.00
49.00	3.20	2.17	0.00
50.00	3.20	2.17	0.00
51.00	3.20	2.17	0.00
52.00	3.20	2.17	0.00
53.00	3.20	2.17	0.00
54.00	3.20	2.17	0.00
55.00	3.20	2.17	0.00
56.00	3.20	2.17	0.00
57.00	3.20	2.17	0.00
58.00	3.20	2.17	0.00
59.00	3.20	2.17	0.00
60.00	3.20	2.17	0.00
61.00	3.20	2.17	0.00
62.00	3.20	2.17	0.00
63.00	3.20	2.17	0.00
64.00	3.20	2.17	0.00
65.00	3.20	2.17	0.00
66.00	3.20	2.17	0.00
67.00	3.20	2.17	0.00
68.00	3.20	2.17	0.00
69.00	3.20	2.17	0.00
70.00	3.20	2.17	0.00
71.00	3.20	2.17	0.00
72.00	3.20	2.17	0.00

Summary for Subcatchment E-2: E-2

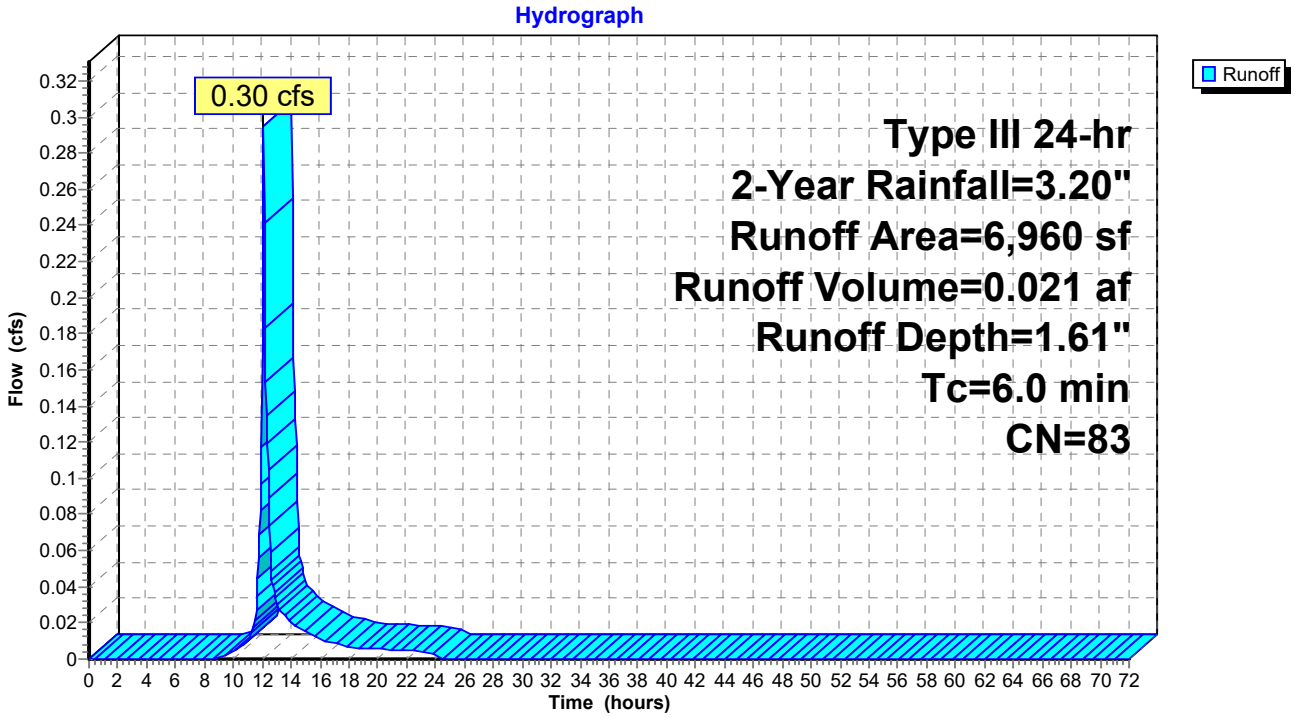
Runoff = 0.30 cfs @ 12.09 hrs, Volume= 0.021 af, Depth= 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
3,476	98	Paved parking, HSG B
1,827	69	50-75% Grass cover, Fair, HSG B
1,657	66	Woods, Poor, HSG B
6,960	83	Weighted Average
3,484	68	50.06% Pervious Area
3,476	98	49.94% Impervious Area

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

Subcatchment E-2: E-2



Hydrograph for Subcatchment E-2: E-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.06	0.00	0.00
3.00	0.10	0.00	0.00
4.00	0.14	0.00	0.00
5.00	0.18	0.00	0.00
6.00	0.23	0.00	0.00
7.00	0.29	0.00	0.00
8.00	0.36	0.00	0.00
9.00	0.47	0.00	0.00
10.00	0.60	0.02	0.00
11.00	0.80	0.06	0.01
12.00	1.60	0.44	**0.17**
13.00	2.40	0.98	**0.03**
14.00	2.60	1.13	0.02
15.00	2.73	1.24	0.02
16.00	2.84	1.32	0.01
17.00	2.91	1.37	0.01
18.00	2.97	1.42	0.01
19.00	3.02	1.46	0.01
20.00	3.06	1.50	0.01
21.00	3.10	1.53	0.01
22.00	3.14	1.56	0.00
23.00	3.17	1.59	0.00
24.00	**3.20**	**1.61**	0.00
25.00	3.20	1.61	0.00
26.00	3.20	1.61	0.00
27.00	3.20	1.61	0.00
28.00	3.20	1.61	0.00
29.00	3.20	1.61	0.00
30.00	3.20	1.61	0.00
31.00	3.20	1.61	0.00
32.00	3.20	1.61	0.00
33.00	3.20	1.61	0.00
34.00	3.20	1.61	0.00
35.00	3.20	1.61	0.00
36.00	3.20	1.61	0.00
37.00	3.20	1.61	0.00
38.00	3.20	1.61	0.00
39.00	3.20	1.61	0.00
40.00	3.20	1.61	0.00
41.00	3.20	1.61	0.00
42.00	3.20	1.61	0.00
43.00	3.20	1.61	0.00
44.00	3.20	1.61	0.00
45.00	3.20	1.61	0.00
46.00	3.20	1.61	0.00
47.00	3.20	1.61	0.00
48.00	3.20	1.61	0.00
49.00	3.20	1.61	0.00
50.00	3.20	1.61	0.00
51.00	3.20	1.61	0.00
52.00	3.20	1.61	0.00
53.00	3.20	1.61	0.00
54.00	3.20	1.61	0.00
55.00	3.20	1.61	0.00
56.00	3.20	1.61	0.00
57.00	3.20	1.61	0.00
58.00	3.20	1.61	0.00
59.00	3.20	1.61	0.00
60.00	3.20	1.61	0.00
61.00	3.20	1.61	0.00
62.00	3.20	1.61	0.00
63.00	3.20	1.61	0.00
64.00	3.20	1.61	0.00
65.00	3.20	1.61	0.00
66.00	3.20	1.61	0.00
67.00	3.20	1.61	0.00
68.00	3.20	1.61	0.00
69.00	3.20	1.61	0.00
70.00	3.20	1.61	0.00
71.00	3.20	1.61	0.00
72.00	3.20	1.61	0.00

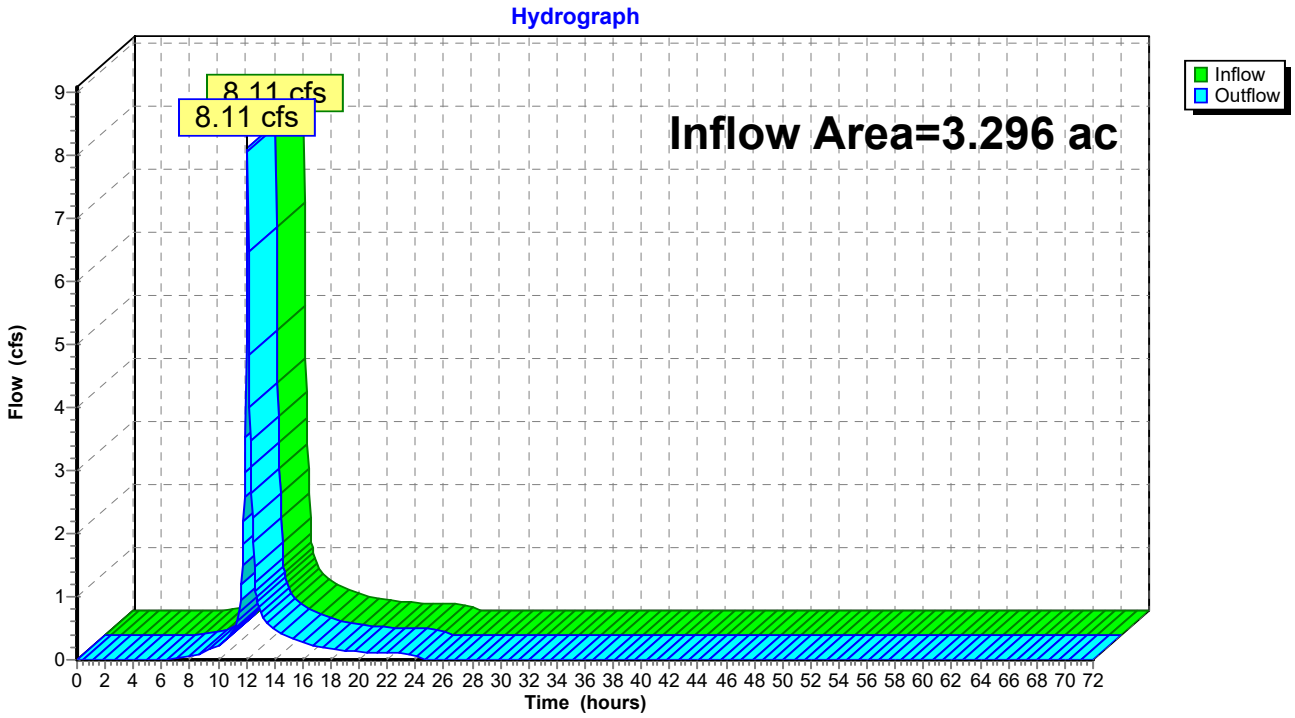
Summary for Reach PD1: WETLAND

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

Inflow Area = 3.296 ac, 60.59% Impervious, Inflow Depth = 2.17" for 2-Year event
Inflow = 8.11 cfs @ 12.09 hrs, Volume= 0.596 af
Outflow = 8.11 cfs @ 12.09 hrs, Volume= 0.596 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD1: WETLAND



Hydrograph for Reach PD1: WETLAND

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.02		0.02	60.00	0.00		0.00
8.00	0.06		0.06	61.00	0.00		0.00
9.00	0.12		0.12	62.00	0.00		0.00
10.00	0.22		0.22	63.00	0.00		0.00
11.00	0.42		0.42	64.00	0.00		0.00
12.00	**5.02**		**5.02**	65.00	0.00		0.00
13.00	**0.77**		**0.77**	66.00	0.00		0.00
14.00	0.49		0.49	67.00	0.00		0.00
15.00	0.37		0.37	68.00	0.00		0.00
16.00	0.26		0.26	69.00	0.00		0.00
17.00	0.21		0.21	70.00	0.00		0.00
18.00	0.16		0.16	71.00	0.00		0.00
19.00	0.14		0.14	72.00	0.00		0.00
20.00	0.13		0.13				
21.00	0.12		0.12				
22.00	0.11		0.11				
23.00	0.10		0.10				
24.00	0.08		0.08				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

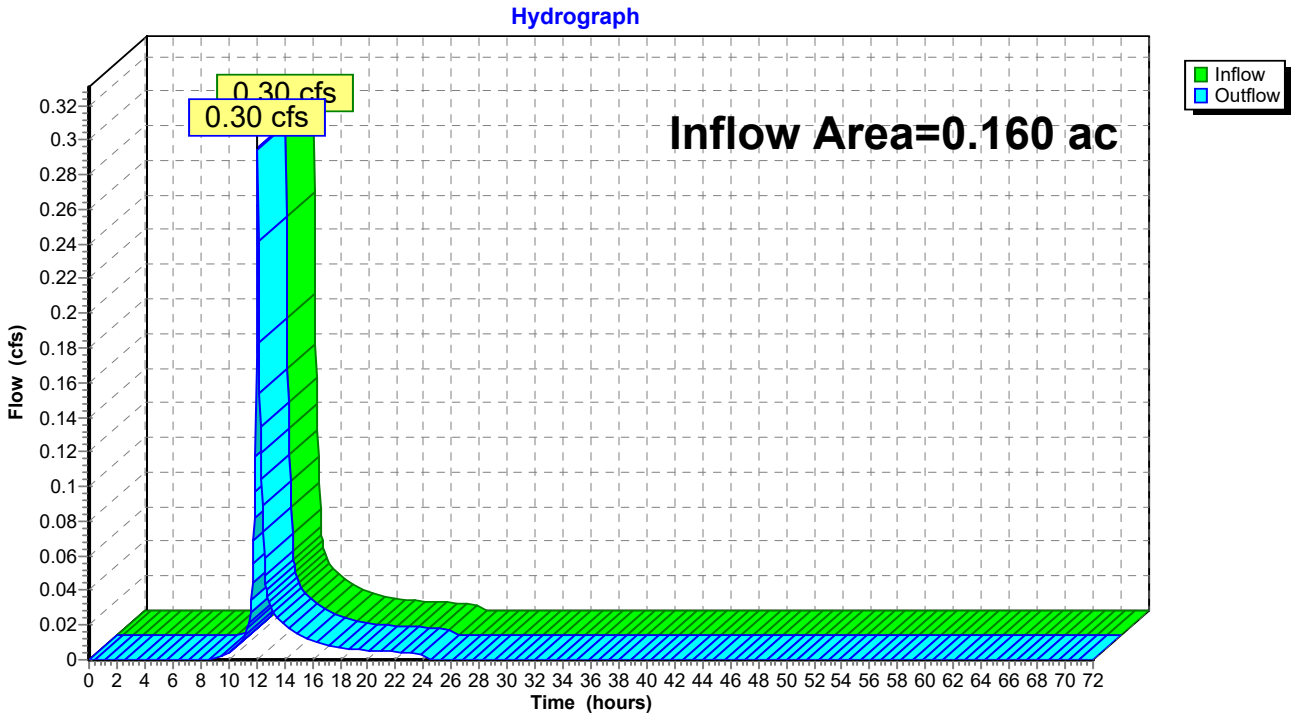
Summary for Reach PD2: BOSTON POST RD

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

Inflow Area = 0.160 ac, 49.94% Impervious, Inflow Depth = 1.61" for 2-Year event
Inflow = 0.30 cfs @ 12.09 hrs, Volume= 0.021 af
Outflow = 0.30 cfs @ 12.09 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD2: BOSTON POST RD



Hydrograph for Reach PD2: BOSTON POST RD

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.01		0.01	64.00	0.00		0.00
12.00	**0.17**		**0.17**	65.00	0.00		0.00
13.00	**0.03**		**0.03**	66.00	0.00		0.00
14.00	0.02		0.02	67.00	0.00		0.00
15.00	0.02		0.02	68.00	0.00		0.00
16.00	0.01		0.01	69.00	0.00		0.00
17.00	0.01		0.01	70.00	0.00		0.00
18.00	0.01		0.01	71.00	0.00		0.00
19.00	0.01		0.01	72.00	0.00		0.00
20.00	0.01		0.01				
21.00	0.01		0.01				
22.00	0.00		0.00				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: E-1 Runoff Area=3.296 ac 60.59% Impervious Runoff Depth=2.82"
Flow Length=661' Tc=6.0 min CN=90 Runoff=10.45 cfs 0.776 af

Subcatchment E-2: E-2 Runoff Area=6,960 sf 49.94% Impervious Runoff Depth=2.20"
Tc=6.0 min CN=83 Runoff=0.40 cfs 0.029 af

Reach PD1: WETLAND Inflow=10.45 cfs 0.776 af
Outflow=10.45 cfs 0.776 af

Reach PD2: BOSTON POST RD Inflow=0.40 cfs 0.029 af
Outflow=0.40 cfs 0.029 af

Total Runoff Area = 3.456 ac Runoff Volume = 0.805 af Average Runoff Depth = 2.80"
39.90% Pervious = 1.379 ac 60.10% Impervious = 2.077 ac

Summary for Subcatchment E-1: E-1

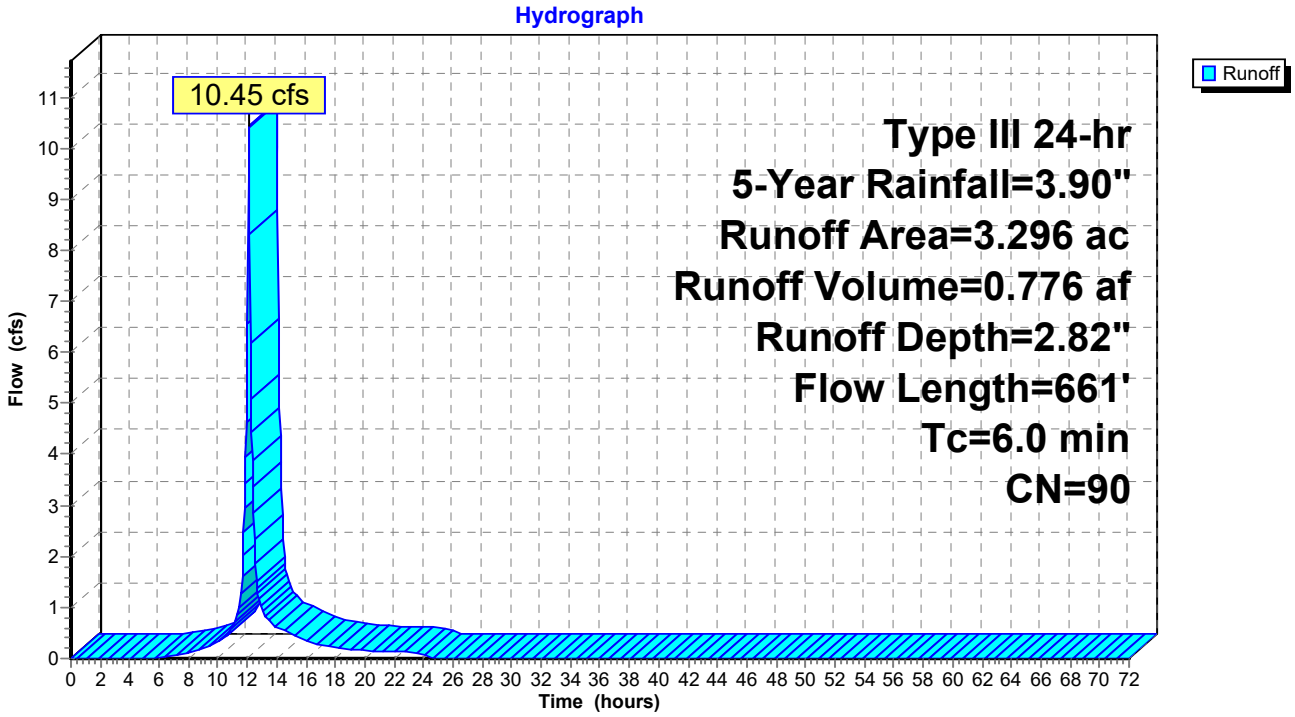
Runoff = 10.45 cfs @ 12.09 hrs, Volume= 0.776 af, Depth= 2.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-Year Rainfall=3.90"

	Area (ac)	CN	Description
	0.492	79	<50% Grass cover, Poor, HSG B
	1.831	98	Paved parking, HSG B
	0.700	73	Woods/grass comb., Poor, HSG B
	0.107	96	Gravel surface, HSG B
*	0.166	98	Building
	3.296	90	Weighted Average
	1.299	77	39.41% Pervious Area
	1.997	98	60.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.35		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
0.9	214	0.0410	4.11		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.4	129	0.0780	5.67		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.6	268	0.0194	2.83		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
2.5					**Direct Entry, Min. TC**
6.0	661	Total			

Subcatchment E-1: E-1



Hydrograph for Subcatchment E-1: E-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.04	0.00	0.00
2.00	0.08	0.00	0.00
3.00	0.12	0.00	0.00
4.00	0.17	0.00	0.00
5.00	0.22	0.00	0.00
6.00	0.28	0.00	0.02
7.00	0.35	0.01	0.05
8.00	0.44	0.04	0.10
9.00	0.57	0.08	0.19
10.00	0.74	0.16	0.32
11.00	0.98	0.30	0.58
12.00	1.95	1.05	**6.54**
13.00	2.92	1.92	**0.97**
14.00	3.16	2.13	0.61
15.00	3.33	2.29	0.47
16.00	3.46	2.41	0.33
17.00	3.55	2.49	0.26
18.00	3.62	2.56	0.20
19.00	3.68	2.62	0.18
20.00	3.73	2.67	0.16
21.00	3.78	2.71	0.15
22.00	3.82	2.75	0.13
23.00	3.86	2.79	0.12
24.00	**3.90**	**2.82**	0.11
25.00	3.90	2.82	0.00
26.00	3.90	2.82	0.00
27.00	3.90	2.82	0.00
28.00	3.90	2.82	0.00
29.00	3.90	2.82	0.00
30.00	3.90	2.82	0.00
31.00	3.90	2.82	0.00
32.00	3.90	2.82	0.00
33.00	3.90	2.82	0.00
34.00	3.90	2.82	0.00
35.00	3.90	2.82	0.00
36.00	3.90	2.82	0.00
37.00	3.90	2.82	0.00
38.00	3.90	2.82	0.00
39.00	3.90	2.82	0.00
40.00	3.90	2.82	0.00
41.00	3.90	2.82	0.00
42.00	3.90	2.82	0.00
43.00	3.90	2.82	0.00
44.00	3.90	2.82	0.00
45.00	3.90	2.82	0.00
46.00	3.90	2.82	0.00
47.00	3.90	2.82	0.00
48.00	3.90	2.82	0.00
49.00	3.90	2.82	0.00
50.00	3.90	2.82	0.00
51.00	3.90	2.82	0.00
52.00	3.90	2.82	0.00
53.00	3.90	2.82	0.00
54.00	3.90	2.82	0.00
55.00	3.90	2.82	0.00
56.00	3.90	2.82	0.00
57.00	3.90	2.82	0.00
58.00	3.90	2.82	0.00
59.00	3.90	2.82	0.00
60.00	3.90	2.82	0.00
61.00	3.90	2.82	0.00
62.00	3.90	2.82	0.00
63.00	3.90	2.82	0.00
64.00	3.90	2.82	0.00
65.00	3.90	2.82	0.00
66.00	3.90	2.82	0.00
67.00	3.90	2.82	0.00
68.00	3.90	2.82	0.00
69.00	3.90	2.82	0.00
70.00	3.90	2.82	0.00
71.00	3.90	2.82	0.00
72.00	3.90	2.82	0.00

Summary for Subcatchment E-2: E-2

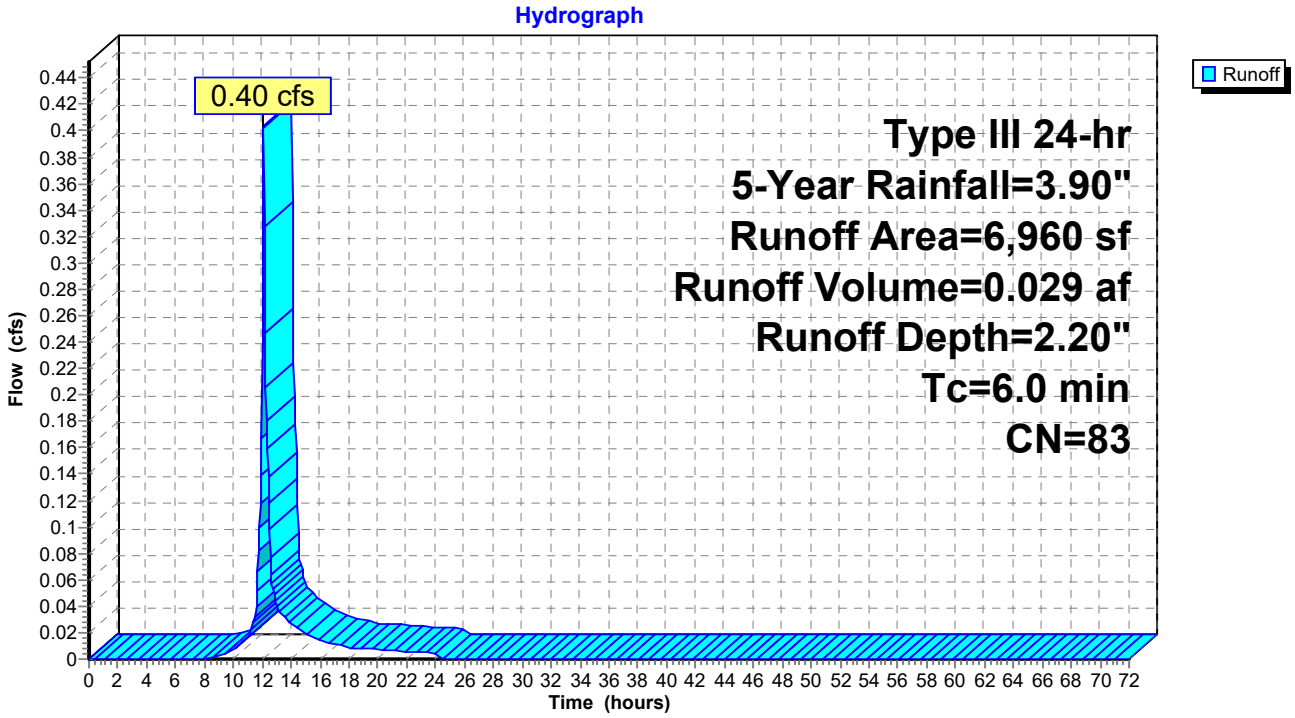
Runoff = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af, Depth= 2.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-Year Rainfall=3.90"

Area (sf)	CN	Description
3,476	98	Paved parking, HSG B
1,827	69	50-75% Grass cover, Fair, HSG B
1,657	66	Woods, Poor, HSG B
6,960	83	Weighted Average
3,484	68	50.06% Pervious Area
3,476	98	49.94% Impervious Area

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

Subcatchment E-2: E-2



Hydrograph for Subcatchment E-2: E-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	53.00	3.90	2.20	0.00
1.00	0.04	0.00	0.00	54.00	3.90	2.20	0.00
2.00	0.08	0.00	0.00	55.00	3.90	2.20	0.00
3.00	0.12	0.00	0.00	56.00	3.90	2.20	0.00
4.00	0.17	0.00	0.00	57.00	3.90	2.20	0.00
5.00	0.22	0.00	0.00	58.00	3.90	2.20	0.00
6.00	0.28	0.00	0.00	59.00	3.90	2.20	0.00
7.00	0.35	0.00	0.00	60.00	3.90	2.20	0.00
8.00	0.44	0.00	0.00	61.00	3.90	2.20	0.00
9.00	0.57	0.01	0.00	62.00	3.90	2.20	0.00
10.00	0.74	0.05	0.01	63.00	3.90	2.20	0.00
11.00	0.98	0.12	0.02	64.00	3.90	2.20	0.00
12.00	1.95	0.66	**0.24**	65.00	3.90	2.20	0.00
13.00	2.92	1.39	**0.04**	66.00	3.90	2.20	0.00
14.00	3.16	1.58	0.03	67.00	3.90	2.20	0.00
15.00	3.33	1.72	0.02	68.00	3.90	2.20	0.00
16.00	3.46	1.82	0.01	69.00	3.90	2.20	0.00
17.00	3.55	1.90	0.01	70.00	3.90	2.20	0.00
18.00	3.62	1.96	0.01	71.00	3.90	2.20	0.00
19.00	3.68	2.01	0.01	72.00	3.90	2.20	0.00
20.00	3.73	2.06	0.01				
21.00	3.78	2.10	0.01				
22.00	3.82	2.13	0.01				
23.00	3.86	2.17	0.01				
24.00	**3.90**	**2.20**	0.00				
25.00	3.90	2.20	0.00				
26.00	3.90	2.20	0.00				
27.00	3.90	2.20	0.00				
28.00	3.90	2.20	0.00				
29.00	3.90	2.20	0.00				
30.00	3.90	2.20	0.00				
31.00	3.90	2.20	0.00				
32.00	3.90	2.20	0.00				
33.00	3.90	2.20	0.00				
34.00	3.90	2.20	0.00				
35.00	3.90	2.20	0.00				
36.00	3.90	2.20	0.00				
37.00	3.90	2.20	0.00				
38.00	3.90	2.20	0.00				
39.00	3.90	2.20	0.00				
40.00	3.90	2.20	0.00				
41.00	3.90	2.20	0.00				
42.00	3.90	2.20	0.00				
43.00	3.90	2.20	0.00				
44.00	3.90	2.20	0.00				
45.00	3.90	2.20	0.00				
46.00	3.90	2.20	0.00				
47.00	3.90	2.20	0.00				
48.00	3.90	2.20	0.00				
49.00	3.90	2.20	0.00				
50.00	3.90	2.20	0.00				
51.00	3.90	2.20	0.00				
52.00	3.90	2.20	0.00				

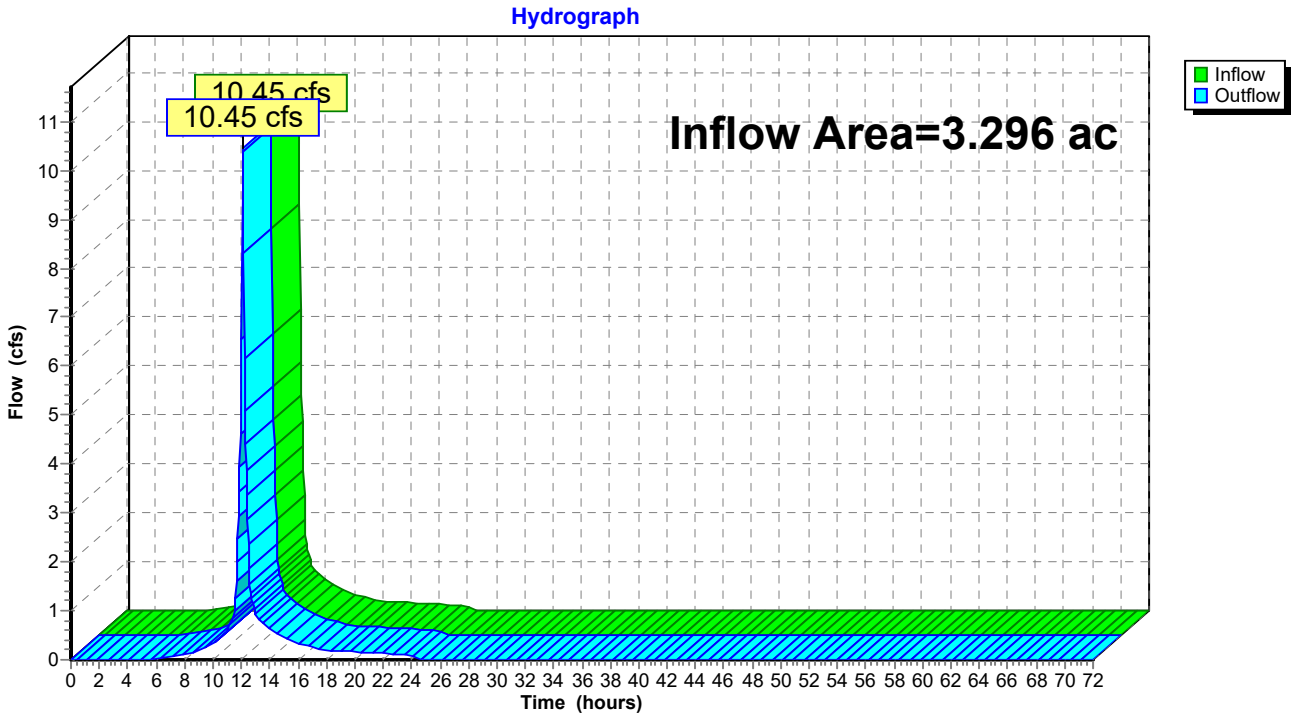
Summary for Reach PD1: WETLAND

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

Inflow Area = 3.296 ac, 60.59% Impervious, Inflow Depth = 2.82" for 5-Year event
Inflow = 10.45 cfs @ 12.09 hrs, Volume= 0.776 af
Outflow = 10.45 cfs @ 12.09 hrs, Volume= 0.776 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD1: WETLAND



Hydrograph for Reach PD1: WETLAND

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.02		0.02	59.00	0.00		0.00
7.00	0.05		0.05	60.00	0.00		0.00
8.00	0.10		0.10	61.00	0.00		0.00
9.00	0.19		0.19	62.00	0.00		0.00
10.00	0.32		0.32	63.00	0.00		0.00
11.00	0.58		0.58	64.00	0.00		0.00
12.00	**6.54**		**6.54**	65.00	0.00		0.00
13.00	**0.97**		**0.97**	66.00	0.00		0.00
14.00	0.61		0.61	67.00	0.00		0.00
15.00	0.47		0.47	68.00	0.00		0.00
16.00	0.33		0.33	69.00	0.00		0.00
17.00	0.26		0.26	70.00	0.00		0.00
18.00	0.20		0.20	71.00	0.00		0.00
19.00	0.18		0.18	72.00	0.00		0.00
20.00	0.16		0.16				
21.00	0.15		0.15				
22.00	0.13		0.13				
23.00	0.12		0.12				
24.00	0.11		0.11				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

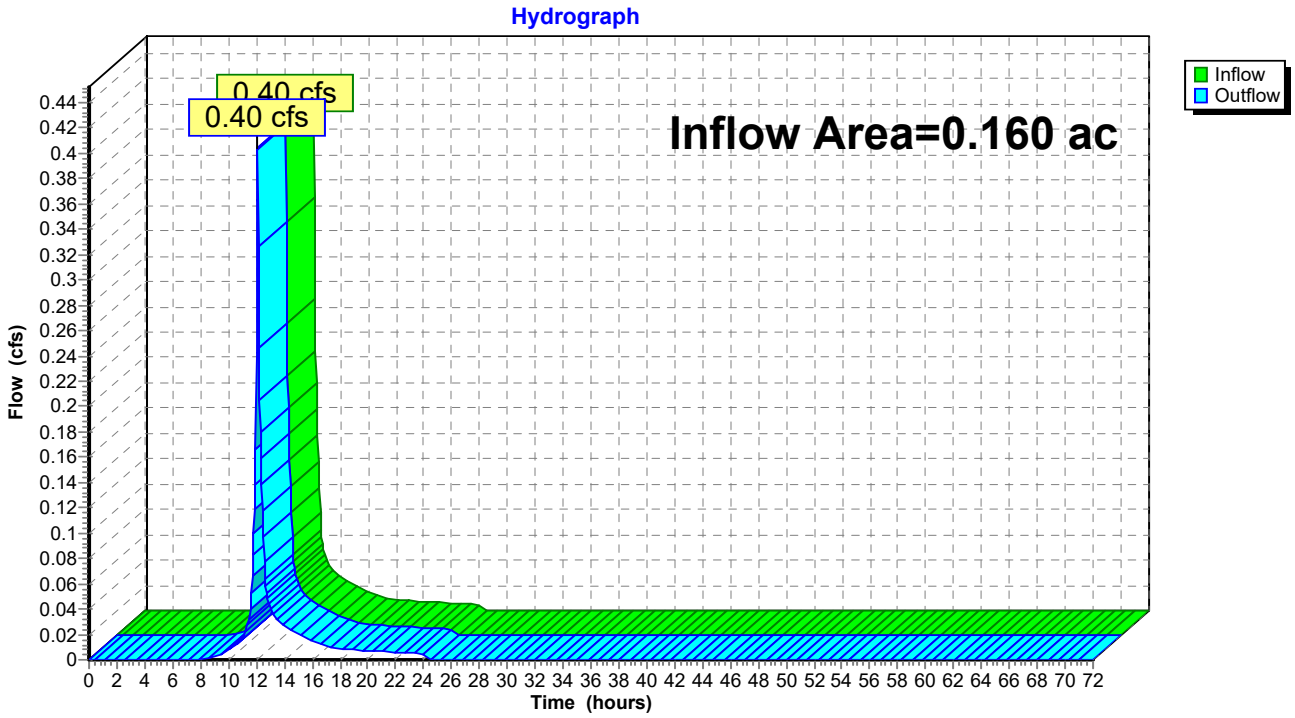
Summary for Reach PD2: BOSTON POST RD

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

Inflow Area = 0.160 ac, 49.94% Impervious, Inflow Depth = 2.20" for 5-Year event
Inflow = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af
Outflow = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD2: BOSTON POST RD



Hydrograph for Reach PD2: BOSTON POST RD

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.01		0.01	63.00	0.00		0.00
11.00	0.02		0.02	64.00	0.00		0.00
12.00	**0.24**		**0.24**	65.00	0.00		0.00
13.00	**0.04**		**0.04**	66.00	0.00		0.00
14.00	0.03		0.03	67.00	0.00		0.00
15.00	0.02		0.02	68.00	0.00		0.00
16.00	0.01		0.01	69.00	0.00		0.00
17.00	0.01		0.01	70.00	0.00		0.00
18.00	0.01		0.01	71.00	0.00		0.00
19.00	0.01		0.01	72.00	0.00		0.00
20.00	0.01		0.01				
21.00	0.01		0.01				
22.00	0.01		0.01				
23.00	0.01		0.01				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: E-1 Runoff Area=3.296 ac 60.59% Impervious Runoff Depth=3.68"
Flow Length=661' Tc=6.0 min CN=90 Runoff=13.46 cfs 1.012 af

Subcatchment E-2: E-2 Runoff Area=6,960 sf 49.94% Impervious Runoff Depth=2.99"
Tc=6.0 min CN=83 Runoff=0.55 cfs 0.040 af

Reach PD1: WETLAND Inflow=13.46 cfs 1.012 af
Outflow=13.46 cfs 1.012 af

Reach PD2: BOSTON POST RD Inflow=0.55 cfs 0.040 af
Outflow=0.55 cfs 0.040 af

Total Runoff Area = 3.456 ac Runoff Volume = 1.052 af Average Runoff Depth = 3.65"
39.90% Pervious = 1.379 ac 60.10% Impervious = 2.077 ac

Summary for Subcatchment E-1: E-1

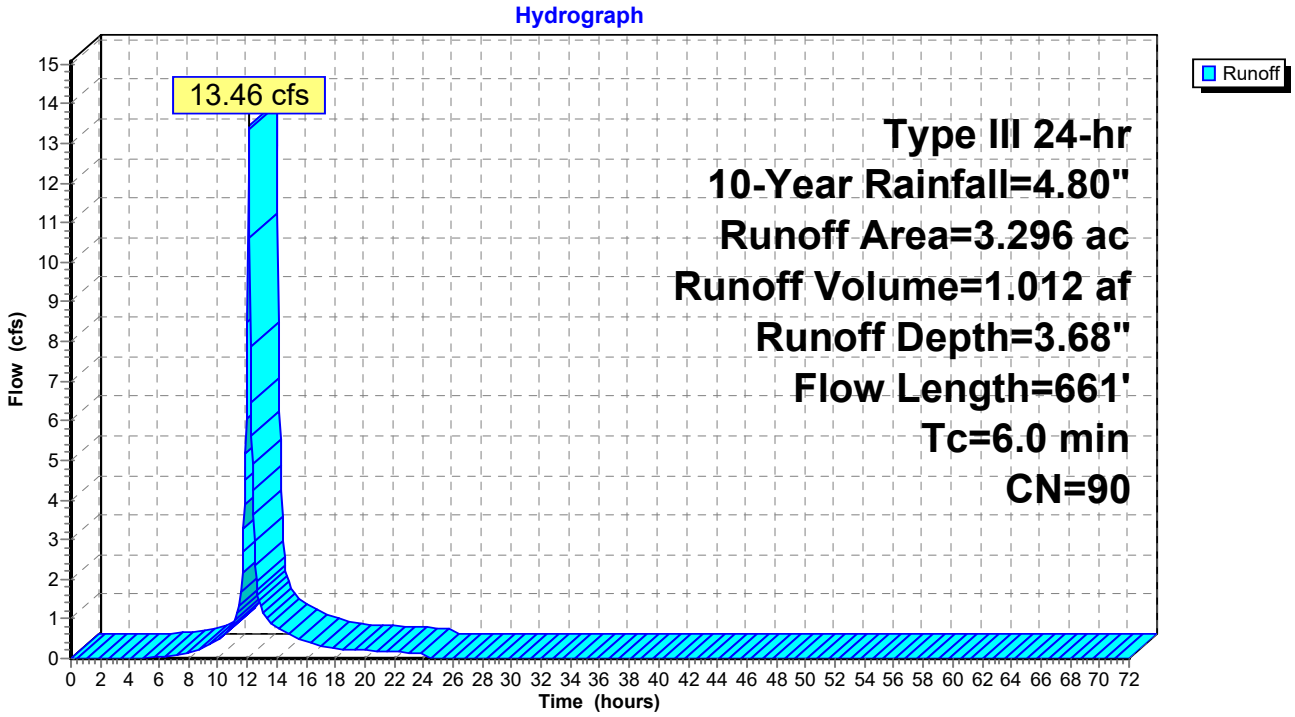
Runoff = 13.46 cfs @ 12.09 hrs, Volume= 1.012 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
	0.492	79	<50% Grass cover, Poor, HSG B
	1.831	98	Paved parking, HSG B
	0.700	73	Woods/grass comb., Poor, HSG B
	0.107	96	Gravel surface, HSG B
*	0.166	98	Building
	3.296	90	Weighted Average
	1.299	77	39.41% Pervious Area
	1.997	98	60.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.35		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
0.9	214	0.0410	4.11		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.4	129	0.0780	5.67		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.6	268	0.0194	2.83		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
2.5					**Direct Entry, Min. TC**
6.0	661	Total			

Subcatchment E-1: E-1



Hydrograph for Subcatchment E-1: E-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.00	0.00
3.00	0.15	0.00	0.00
4.00	0.21	0.00	0.00
5.00	0.27	0.00	0.02
6.00	0.35	0.01	0.05
7.00	0.43	0.03	0.09
8.00	0.55	0.07	0.16
9.00	0.70	0.14	0.29
10.00	0.91	0.26	0.46
11.00	1.20	0.46	0.80
12.00	2.40	1.44	**8.51**
13.00	3.60	2.54	**1.22**
14.00	3.89	2.82	0.77
15.00	4.10	3.01	0.58
16.00	4.25	3.16	0.41
17.00	4.37	3.27	0.33
18.00	4.45	3.35	0.25
19.00	4.53	3.42	0.22
20.00	4.59	3.49	0.20
21.00	4.65	3.54	0.18
22.00	4.71	3.59	0.17
23.00	4.76	3.64	0.15
24.00	**4.80**	**3.68**	0.13
25.00	4.80	3.68	0.00
26.00	4.80	3.68	0.00
27.00	4.80	3.68	0.00
28.00	4.80	3.68	0.00
29.00	4.80	3.68	0.00
30.00	4.80	3.68	0.00
31.00	4.80	3.68	0.00
32.00	4.80	3.68	0.00
33.00	4.80	3.68	0.00
34.00	4.80	3.68	0.00
35.00	4.80	3.68	0.00
36.00	4.80	3.68	0.00
37.00	4.80	3.68	0.00
38.00	4.80	3.68	0.00
39.00	4.80	3.68	0.00
40.00	4.80	3.68	0.00
41.00	4.80	3.68	0.00
42.00	4.80	3.68	0.00
43.00	4.80	3.68	0.00
44.00	4.80	3.68	0.00
45.00	4.80	3.68	0.00
46.00	4.80	3.68	0.00
47.00	4.80	3.68	0.00
48.00	4.80	3.68	0.00
49.00	4.80	3.68	0.00
50.00	4.80	3.68	0.00
51.00	4.80	3.68	0.00
52.00	4.80	3.68	0.00
53.00	4.80	3.68	0.00
54.00	4.80	3.68	0.00
55.00	4.80	3.68	0.00
56.00	4.80	3.68	0.00
57.00	4.80	3.68	0.00
58.00	4.80	3.68	0.00
59.00	4.80	3.68	0.00
60.00	4.80	3.68	0.00
61.00	4.80	3.68	0.00
62.00	4.80	3.68	0.00
63.00	4.80	3.68	0.00
64.00	4.80	3.68	0.00
65.00	4.80	3.68	0.00
66.00	4.80	3.68	0.00
67.00	4.80	3.68	0.00
68.00	4.80	3.68	0.00
69.00	4.80	3.68	0.00
70.00	4.80	3.68	0.00
71.00	4.80	3.68	0.00
72.00	4.80	3.68	0.00

Summary for Subcatchment E-2: E-2

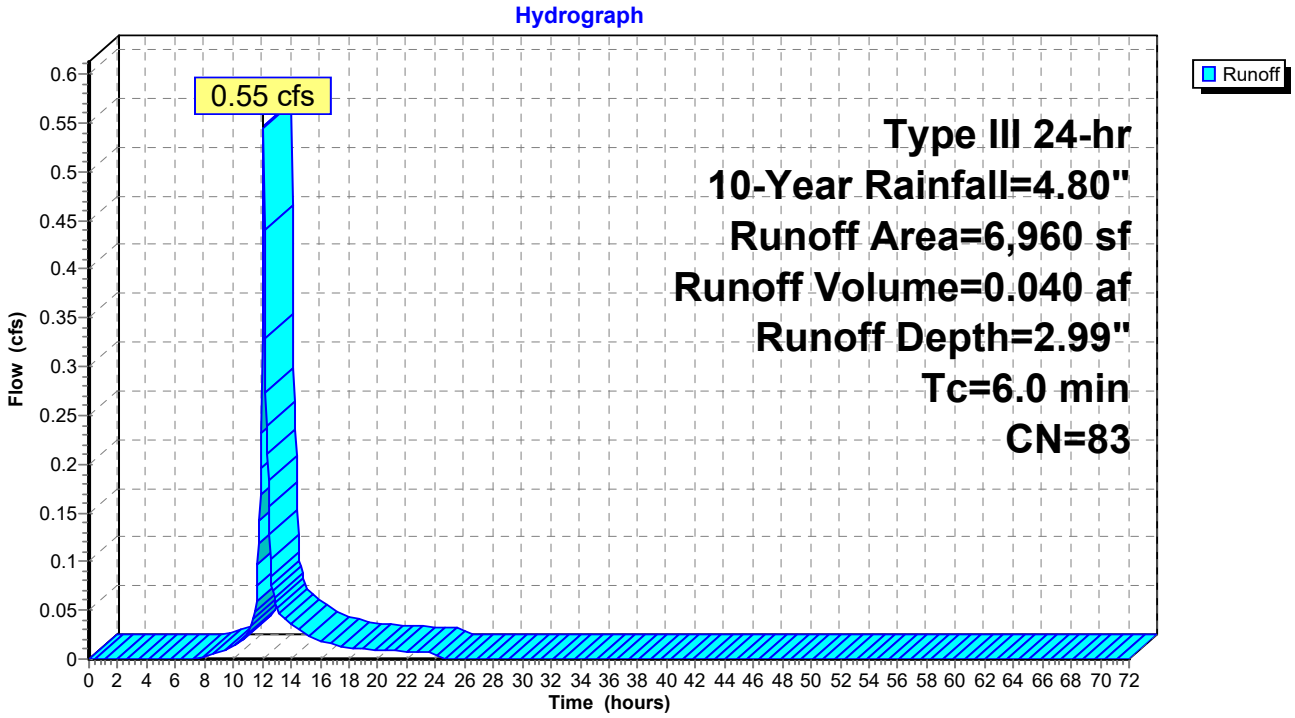
Runoff = 0.55 cfs @ 12.09 hrs, Volume= 0.040 af, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
3,476	98	Paved parking, HSG B
1,827	69	50-75% Grass cover, Fair, HSG B
1,657	66	Woods, Poor, HSG B
6,960	83	Weighted Average
3,484	68	50.06% Pervious Area
3,476	98	49.94% Impervious Area

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

Subcatchment E-2: E-2



Hydrograph for Subcatchment E-2: E-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.00	0.00
3.00	0.15	0.00	0.00
4.00	0.21	0.00	0.00
5.00	0.27	0.00	0.00
6.00	0.35	0.00	0.00
7.00	0.43	0.00	0.00
8.00	0.55	0.01	0.00
9.00	0.70	0.04	0.01
10.00	0.91	0.10	0.01
11.00	1.20	0.22	0.03
12.00	2.40	0.98	**0.33**
13.00	3.60	1.94	**0.05**
14.00	3.89	2.19	0.03
15.00	4.10	2.37	0.03
16.00	4.25	2.51	0.02
17.00	4.37	2.61	0.01
18.00	4.45	2.69	0.01
19.00	4.53	2.75	0.01
20.00	4.59	2.81	0.01
21.00	4.65	2.86	0.01
22.00	4.71	2.91	0.01
23.00	4.76	2.95	0.01
24.00	**4.80**	**2.99**	0.01
25.00	4.80	2.99	0.00
26.00	4.80	2.99	0.00
27.00	4.80	2.99	0.00
28.00	4.80	2.99	0.00
29.00	4.80	2.99	0.00
30.00	4.80	2.99	0.00
31.00	4.80	2.99	0.00
32.00	4.80	2.99	0.00
33.00	4.80	2.99	0.00
34.00	4.80	2.99	0.00
35.00	4.80	2.99	0.00
36.00	4.80	2.99	0.00
37.00	4.80	2.99	0.00
38.00	4.80	2.99	0.00
39.00	4.80	2.99	0.00
40.00	4.80	2.99	0.00
41.00	4.80	2.99	0.00
42.00	4.80	2.99	0.00
43.00	4.80	2.99	0.00
44.00	4.80	2.99	0.00
45.00	4.80	2.99	0.00
46.00	4.80	2.99	0.00
47.00	4.80	2.99	0.00
48.00	4.80	2.99	0.00
49.00	4.80	2.99	0.00
50.00	4.80	2.99	0.00
51.00	4.80	2.99	0.00
52.00	4.80	2.99	0.00
53.00	4.80	2.99	0.00
54.00	4.80	2.99	0.00
55.00	4.80	2.99	0.00
56.00	4.80	2.99	0.00
57.00	4.80	2.99	0.00
58.00	4.80	2.99	0.00
59.00	4.80	2.99	0.00
60.00	4.80	2.99	0.00
61.00	4.80	2.99	0.00
62.00	4.80	2.99	0.00
63.00	4.80	2.99	0.00
64.00	4.80	2.99	0.00
65.00	4.80	2.99	0.00
66.00	4.80	2.99	0.00
67.00	4.80	2.99	0.00
68.00	4.80	2.99	0.00
69.00	4.80	2.99	0.00
70.00	4.80	2.99	0.00
71.00	4.80	2.99	0.00
72.00	4.80	2.99	0.00

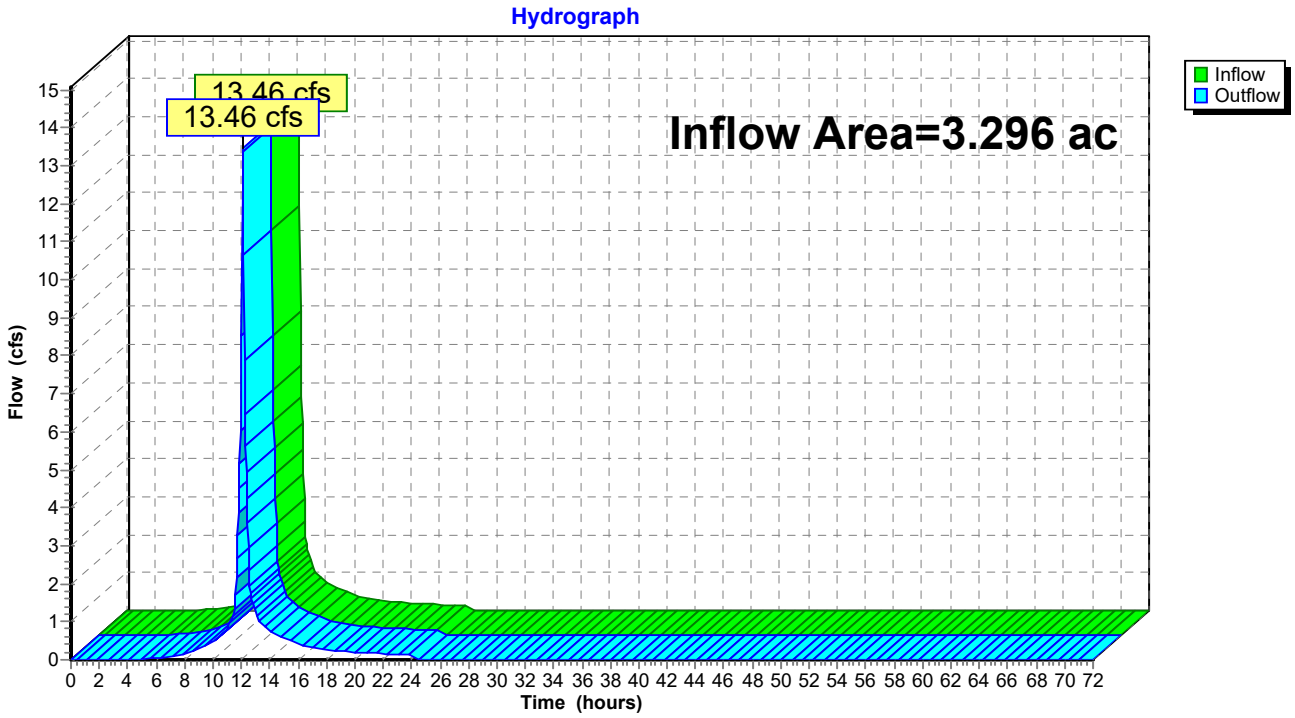
Summary for Reach PD1: WETLAND

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

Inflow Area = 3.296 ac, 60.59% Impervious, Inflow Depth = 3.68" for 10-Year event
Inflow = 13.46 cfs @ 12.09 hrs, Volume= 1.012 af
Outflow = 13.46 cfs @ 12.09 hrs, Volume= 1.012 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD1: WETLAND



Hydrograph for Reach PD1: WETLAND

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.02		0.02	58.00	0.00		0.00
6.00	0.05		0.05	59.00	0.00		0.00
7.00	0.09		0.09	60.00	0.00		0.00
8.00	0.16		0.16	61.00	0.00		0.00
9.00	0.29		0.29	62.00	0.00		0.00
10.00	0.46		0.46	63.00	0.00		0.00
11.00	0.80		0.80	64.00	0.00		0.00
12.00	**8.51**		**8.51**	65.00	0.00		0.00
13.00	**1.22**		**1.22**	66.00	0.00		0.00
14.00	0.77		0.77	67.00	0.00		0.00
15.00	0.58		0.58	68.00	0.00		0.00
16.00	0.41		0.41	69.00	0.00		0.00
17.00	0.33		0.33	70.00	0.00		0.00
18.00	0.25		0.25	71.00	0.00		0.00
19.00	0.22		0.22	72.00	0.00		0.00
20.00	0.20		0.20				
21.00	0.18		0.18				
22.00	0.17		0.17				
23.00	0.15		0.15				
24.00	0.13		0.13				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

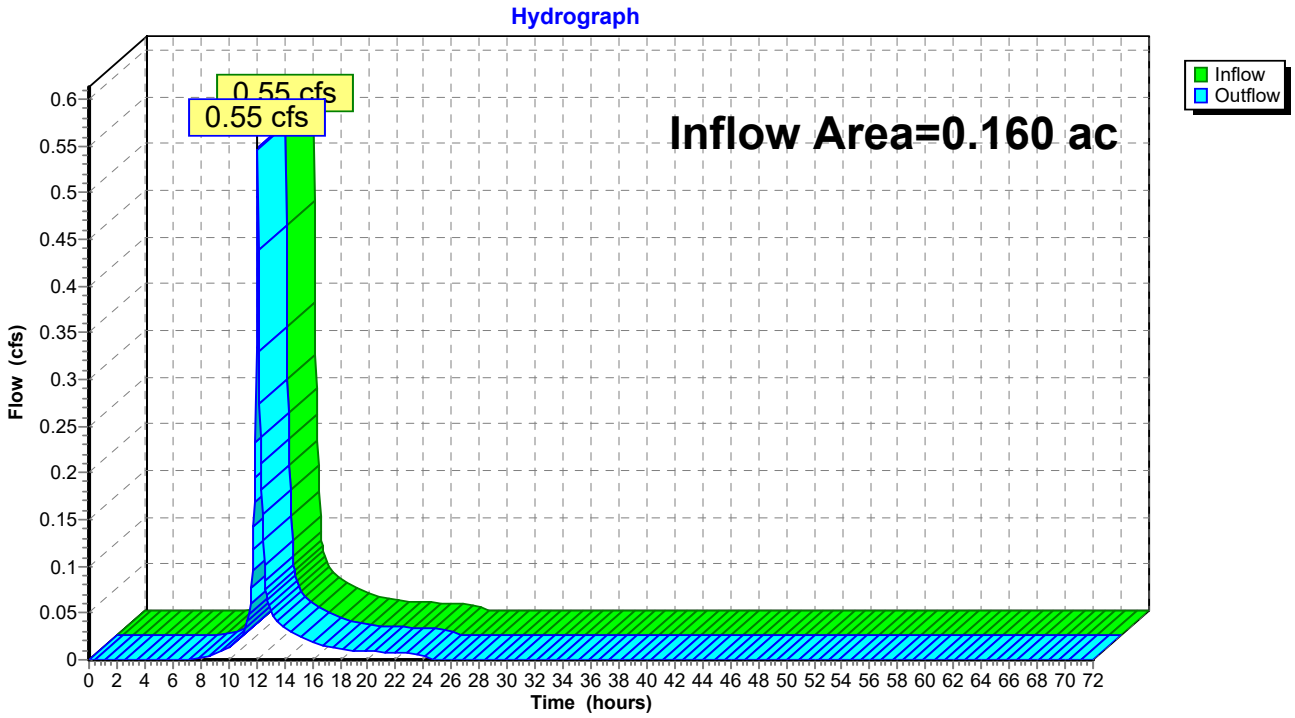
Summary for Reach PD2: BOSTON POST RD

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

Inflow Area = 0.160 ac, 49.94% Impervious, Inflow Depth = 2.99" for 10-Year event
Inflow = 0.55 cfs @ 12.09 hrs, Volume= 0.040 af
Outflow = 0.55 cfs @ 12.09 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD2: BOSTON POST RD



Hydrograph for Reach PD2: BOSTON POST RD

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.01		0.01	62.00	0.00		0.00
10.00	0.01		0.01	63.00	0.00		0.00
11.00	0.03		0.03	64.00	0.00		0.00
12.00	**0.33**		**0.33**	65.00	0.00		0.00
13.00	**0.05**		**0.05**	66.00	0.00		0.00
14.00	0.03		0.03	67.00	0.00		0.00
15.00	0.03		0.03	68.00	0.00		0.00
16.00	0.02		0.02	69.00	0.00		0.00
17.00	0.01		0.01	70.00	0.00		0.00
18.00	0.01		0.01	71.00	0.00		0.00
19.00	0.01		0.01	72.00	0.00		0.00
20.00	0.01		0.01				
21.00	0.01		0.01				
22.00	0.01		0.01				
23.00	0.01		0.01				
24.00	0.01		0.01				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: E-1 Runoff Area=3.296 ac 60.59% Impervious Runoff Depth=4.85"
Flow Length=661' Tc=6.0 min CN=90 Runoff=17.44 cfs 1.331 af

Subcatchment E-2: E-2 Runoff Area=6,960 sf 49.94% Impervious Runoff Depth=4.09"
Tc=6.0 min CN=83 Runoff=0.74 cfs 0.054 af

Reach PD1: WETLAND Inflow=17.44 cfs 1.331 af
Outflow=17.44 cfs 1.331 af

Reach PD2: BOSTON POST RD Inflow=0.74 cfs 0.054 af
Outflow=0.74 cfs 0.054 af

Total Runoff Area = 3.456 ac Runoff Volume = 1.385 af Average Runoff Depth = 4.81"
39.90% Pervious = 1.379 ac 60.10% Impervious = 2.077 ac

Summary for Subcatchment E-1: E-1

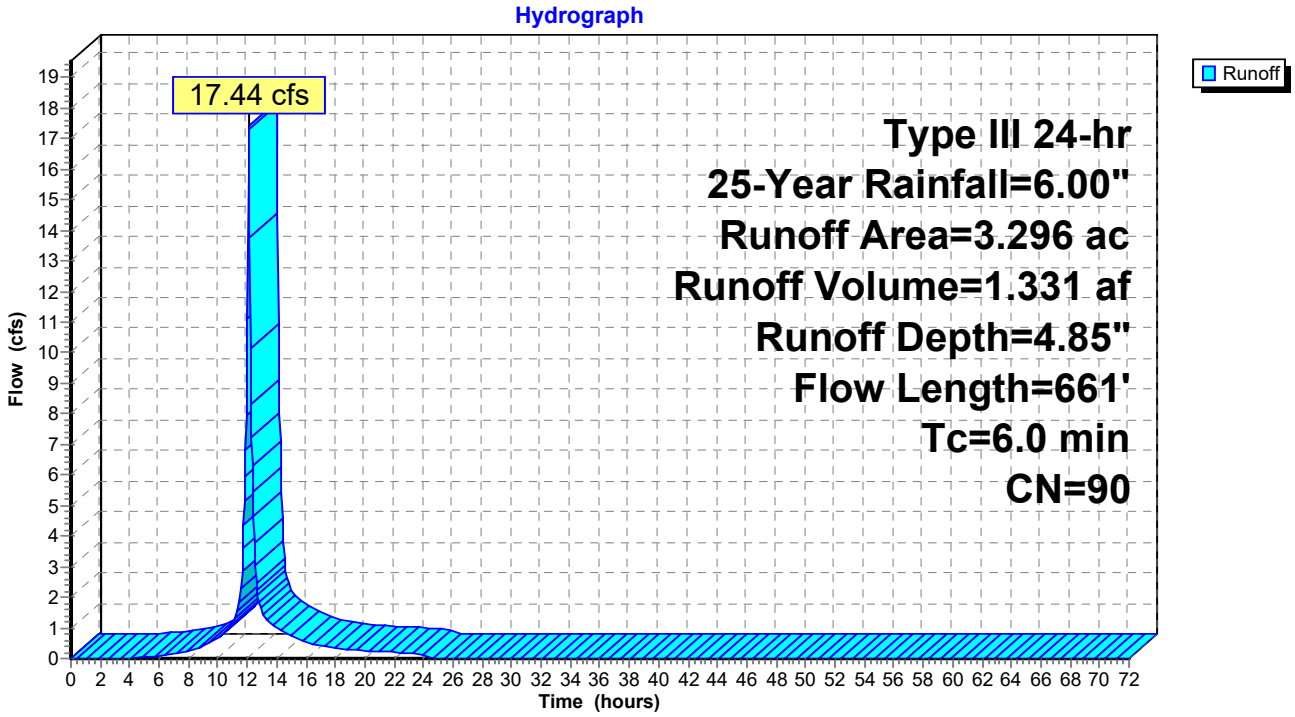
Runoff = 17.44 cfs @ 12.09 hrs, Volume= 1.331 af, Depth= 4.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.00"

	Area (ac)	CN	Description
	0.492	79	<50% Grass cover, Poor, HSG B
	1.831	98	Paved parking, HSG B
	0.700	73	Woods/grass comb., Poor, HSG B
	0.107	96	Gravel surface, HSG B
*	0.166	98	Building
	3.296	90	Weighted Average
	1.299	77	39.41% Pervious Area
	1.997	98	60.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.35		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
0.9	214	0.0410	4.11		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.4	129	0.0780	5.67		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.6	268	0.0194	2.83		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
2.5					**Direct Entry, Min. TC**
6.0	661	Total			

Subcatchment E-1: E-1



Hydrograph for Subcatchment E-1: E-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.06	0.00	0.00
2.00	0.12	0.00	0.00
3.00	0.18	0.00	0.00
4.00	0.26	0.00	0.01
5.00	0.34	0.01	0.05
6.00	0.43	0.03	0.09
7.00	0.54	0.07	0.16
8.00	0.68	0.14	0.25
9.00	0.87	0.24	0.43
10.00	1.13	0.41	0.66
11.00	1.50	0.68	1.10
12.00	3.00	1.98	**11.11**
13.00	4.50	3.40	**1.56**
14.00	4.87	3.75	0.98
15.00	5.13	4.00	0.74
16.00	5.32	4.18	0.52
17.00	5.46	4.32	0.41
18.00	5.57	4.43	0.32
19.00	5.66	4.51	0.28
20.00	5.74	4.59	0.25
21.00	5.82	4.67	0.23
22.00	5.88	4.73	0.21
23.00	5.95	4.79	0.19
24.00	**6.00**	**4.85**	0.17
25.00	6.00	4.85	0.00
26.00	6.00	4.85	0.00
27.00	6.00	4.85	0.00
28.00	6.00	4.85	0.00
29.00	6.00	4.85	0.00
30.00	6.00	4.85	0.00
31.00	6.00	4.85	0.00
32.00	6.00	4.85	0.00
33.00	6.00	4.85	0.00
34.00	6.00	4.85	0.00
35.00	6.00	4.85	0.00
36.00	6.00	4.85	0.00
37.00	6.00	4.85	0.00
38.00	6.00	4.85	0.00
39.00	6.00	4.85	0.00
40.00	6.00	4.85	0.00
41.00	6.00	4.85	0.00
42.00	6.00	4.85	0.00
43.00	6.00	4.85	0.00
44.00	6.00	4.85	0.00
45.00	6.00	4.85	0.00
46.00	6.00	4.85	0.00
47.00	6.00	4.85	0.00
48.00	6.00	4.85	0.00
49.00	6.00	4.85	0.00
50.00	6.00	4.85	0.00
51.00	6.00	4.85	0.00
52.00	6.00	4.85	0.00
53.00	6.00	4.85	0.00
54.00	6.00	4.85	0.00
55.00	6.00	4.85	0.00
56.00	6.00	4.85	0.00
57.00	6.00	4.85	0.00
58.00	6.00	4.85	0.00
59.00	6.00	4.85	0.00
60.00	6.00	4.85	0.00
61.00	6.00	4.85	0.00
62.00	6.00	4.85	0.00
63.00	6.00	4.85	0.00
64.00	6.00	4.85	0.00
65.00	6.00	4.85	0.00
66.00	6.00	4.85	0.00
67.00	6.00	4.85	0.00
68.00	6.00	4.85	0.00
69.00	6.00	4.85	0.00
70.00	6.00	4.85	0.00
71.00	6.00	4.85	0.00
72.00	6.00	4.85	0.00

Summary for Subcatchment E-2: E-2

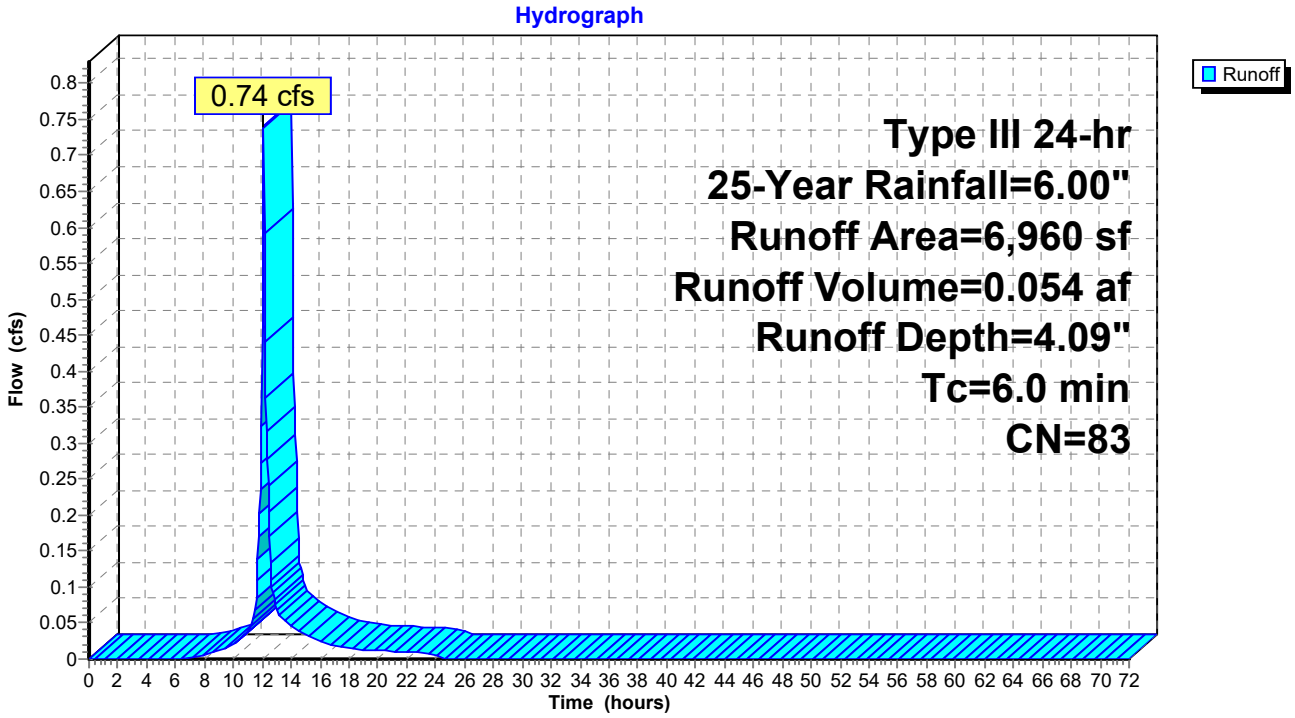
Runoff = 0.74 cfs @ 12.09 hrs, Volume= 0.054 af, Depth= 4.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
3,476	98	Paved parking, HSG B
1,827	69	50-75% Grass cover, Fair, HSG B
1,657	66	Woods, Poor, HSG B
6,960	83	Weighted Average
3,484	68	50.06% Pervious Area
3,476	98	49.94% Impervious Area

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

Subcatchment E-2: E-2



Hydrograph for Subcatchment E-2: E-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.06	0.00	0.00
2.00	0.12	0.00	0.00
3.00	0.18	0.00	0.00
4.00	0.26	0.00	0.00
5.00	0.34	0.00	0.00
6.00	0.43	0.00	0.00
7.00	0.54	0.01	0.00
8.00	0.68	0.03	0.01
9.00	0.87	0.09	0.01
10.00	1.13	0.19	0.02
11.00	1.50	0.38	0.04
12.00	3.00	1.45	**0.46**
13.00	4.50	2.73	**0.07**
14.00	4.87	3.05	0.04
15.00	5.13	3.29	0.03
16.00	5.32	3.46	0.02
17.00	5.46	3.59	0.02
18.00	5.57	3.69	0.01
19.00	5.66	3.78	0.01
20.00	5.74	3.85	0.01
21.00	5.82	3.92	0.01
22.00	5.88	3.98	0.01
23.00	5.95	4.04	0.01
24.00	**6.00**	**4.09**	0.01
25.00	6.00	4.09	0.00
26.00	6.00	4.09	0.00
27.00	6.00	4.09	0.00
28.00	6.00	4.09	0.00
29.00	6.00	4.09	0.00
30.00	6.00	4.09	0.00
31.00	6.00	4.09	0.00
32.00	6.00	4.09	0.00
33.00	6.00	4.09	0.00
34.00	6.00	4.09	0.00
35.00	6.00	4.09	0.00
36.00	6.00	4.09	0.00
37.00	6.00	4.09	0.00
38.00	6.00	4.09	0.00
39.00	6.00	4.09	0.00
40.00	6.00	4.09	0.00
41.00	6.00	4.09	0.00
42.00	6.00	4.09	0.00
43.00	6.00	4.09	0.00
44.00	6.00	4.09	0.00
45.00	6.00	4.09	0.00
46.00	6.00	4.09	0.00
47.00	6.00	4.09	0.00
48.00	6.00	4.09	0.00
49.00	6.00	4.09	0.00
50.00	6.00	4.09	0.00
51.00	6.00	4.09	0.00
52.00	6.00	4.09	0.00
53.00	6.00	4.09	0.00
54.00	6.00	4.09	0.00
55.00	6.00	4.09	0.00
56.00	6.00	4.09	0.00
57.00	6.00	4.09	0.00
58.00	6.00	4.09	0.00
59.00	6.00	4.09	0.00
60.00	6.00	4.09	0.00
61.00	6.00	4.09	0.00
62.00	6.00	4.09	0.00
63.00	6.00	4.09	0.00
64.00	6.00	4.09	0.00
65.00	6.00	4.09	0.00
66.00	6.00	4.09	0.00
67.00	6.00	4.09	0.00
68.00	6.00	4.09	0.00
69.00	6.00	4.09	0.00
70.00	6.00	4.09	0.00
71.00	6.00	4.09	0.00
72.00	6.00	4.09	0.00

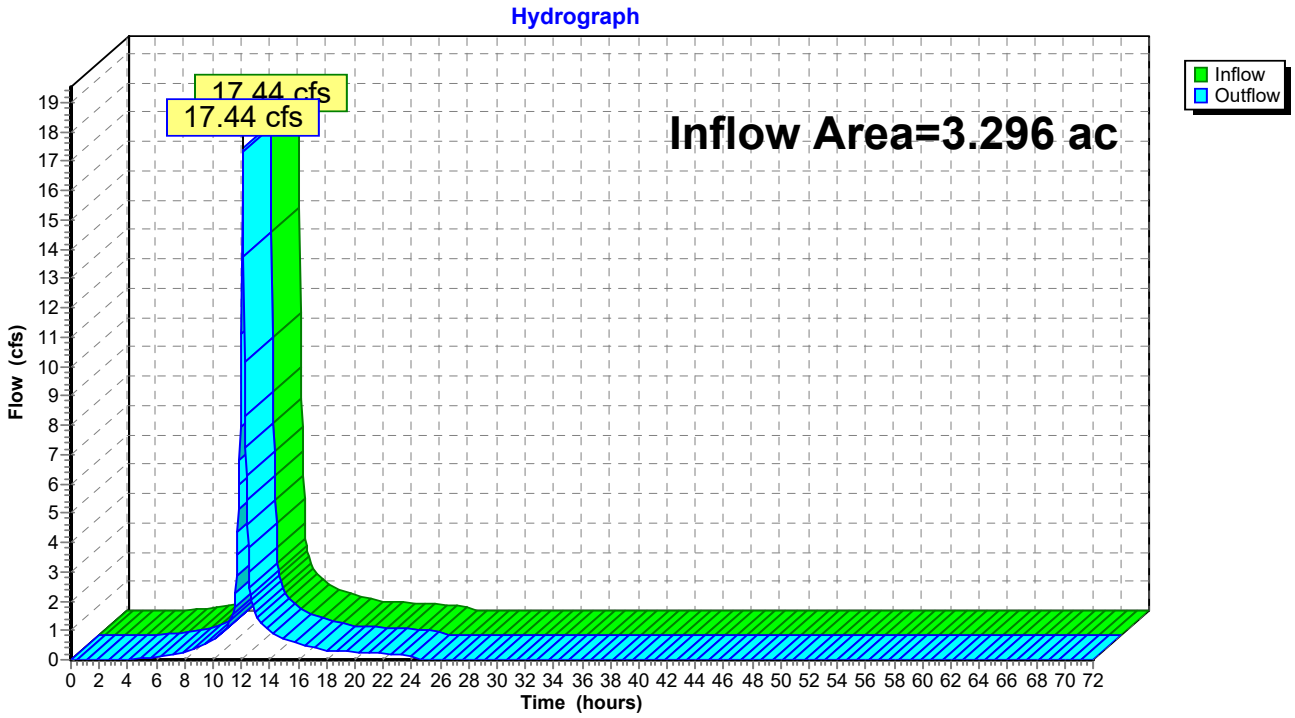
Summary for Reach PD1: WETLAND

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

Inflow Area = 3.296 ac, 60.59% Impervious, Inflow Depth = 4.85" for 25-Year event
Inflow = 17.44 cfs @ 12.09 hrs, Volume= 1.331 af
Outflow = 17.44 cfs @ 12.09 hrs, Volume= 1.331 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD1: WETLAND



Hydrograph for Reach PD1: WETLAND

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.01		0.01	57.00	0.00		0.00
5.00	0.05		0.05	58.00	0.00		0.00
6.00	0.09		0.09	59.00	0.00		0.00
7.00	0.16		0.16	60.00	0.00		0.00
8.00	0.25		0.25	61.00	0.00		0.00
9.00	0.43		0.43	62.00	0.00		0.00
10.00	0.66		0.66	63.00	0.00		0.00
11.00	1.10		1.10	64.00	0.00		0.00
12.00	**11.11**		**11.11**	65.00	0.00		0.00
13.00	**1.56**		**1.56**	66.00	0.00		0.00
14.00	0.98		0.98	67.00	0.00		0.00
15.00	0.74		0.74	68.00	0.00		0.00
16.00	0.52		0.52	69.00	0.00		0.00
17.00	0.41		0.41	70.00	0.00		0.00
18.00	0.32		0.32	71.00	0.00		0.00
19.00	0.28		0.28	72.00	0.00		0.00
20.00	0.25		0.25				
21.00	0.23		0.23				
22.00	0.21		0.21				
23.00	0.19		0.19				
24.00	0.17		0.17				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

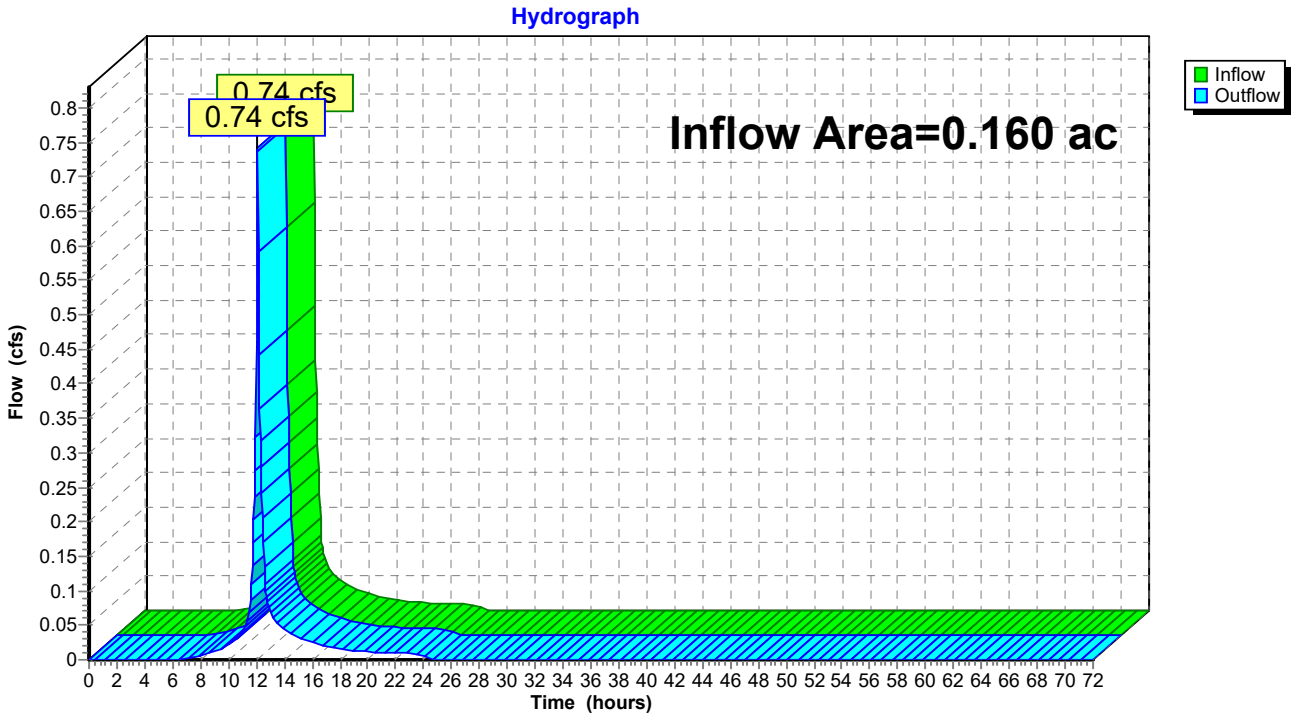
Summary for Reach PD2: BOSTON POST RD

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

Inflow Area = 0.160 ac, 49.94% Impervious, Inflow Depth = 4.09" for 25-Year event
Inflow = 0.74 cfs @ 12.09 hrs, Volume= 0.054 af
Outflow = 0.74 cfs @ 12.09 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD2: BOSTON POST RD



Hydrograph for Reach PD2: BOSTON POST RD

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.01		0.01	61.00	0.00		0.00
9.00	0.01		0.01	62.00	0.00		0.00
10.00	0.02		0.02	63.00	0.00		0.00
11.00	0.04		0.04	64.00	0.00		0.00
12.00	**0.46**		**0.46**	65.00	0.00		0.00
13.00	**0.07**		**0.07**	66.00	0.00		0.00
14.00	0.04		0.04	67.00	0.00		0.00
15.00	0.03		0.03	68.00	0.00		0.00
16.00	0.02		0.02	69.00	0.00		0.00
17.00	0.02		0.02	70.00	0.00		0.00
18.00	0.01		0.01	71.00	0.00		0.00
19.00	0.01		0.01	72.00	0.00		0.00
20.00	0.01		0.01				
21.00	0.01		0.01				
22.00	0.01		0.01				
23.00	0.01		0.01				
24.00	0.01		0.01				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: E-1 Runoff Area=3.296 ac 60.59% Impervious Runoff Depth=7.40"
Flow Length=661' Tc=6.0 min CN=90 Runoff=25.98 cfs 2.032 af

Subcatchment E-2: E-2 Runoff Area=6,960 sf 49.94% Impervious Runoff Depth=6.55"
Tc=6.0 min CN=83 Runoff=1.16 cfs 0.087 af

Reach PD1: WETLAND Inflow=25.98 cfs 2.032 af
Outflow=25.98 cfs 2.032 af

Reach PD2: BOSTON POST RD Inflow=1.16 cfs 0.087 af
Outflow=1.16 cfs 0.087 af

Total Runoff Area = 3.456 ac Runoff Volume = 2.119 af Average Runoff Depth = 7.36"
39.90% Pervious = 1.379 ac 60.10% Impervious = 2.077 ac

Summary for Subcatchment E-1: E-1

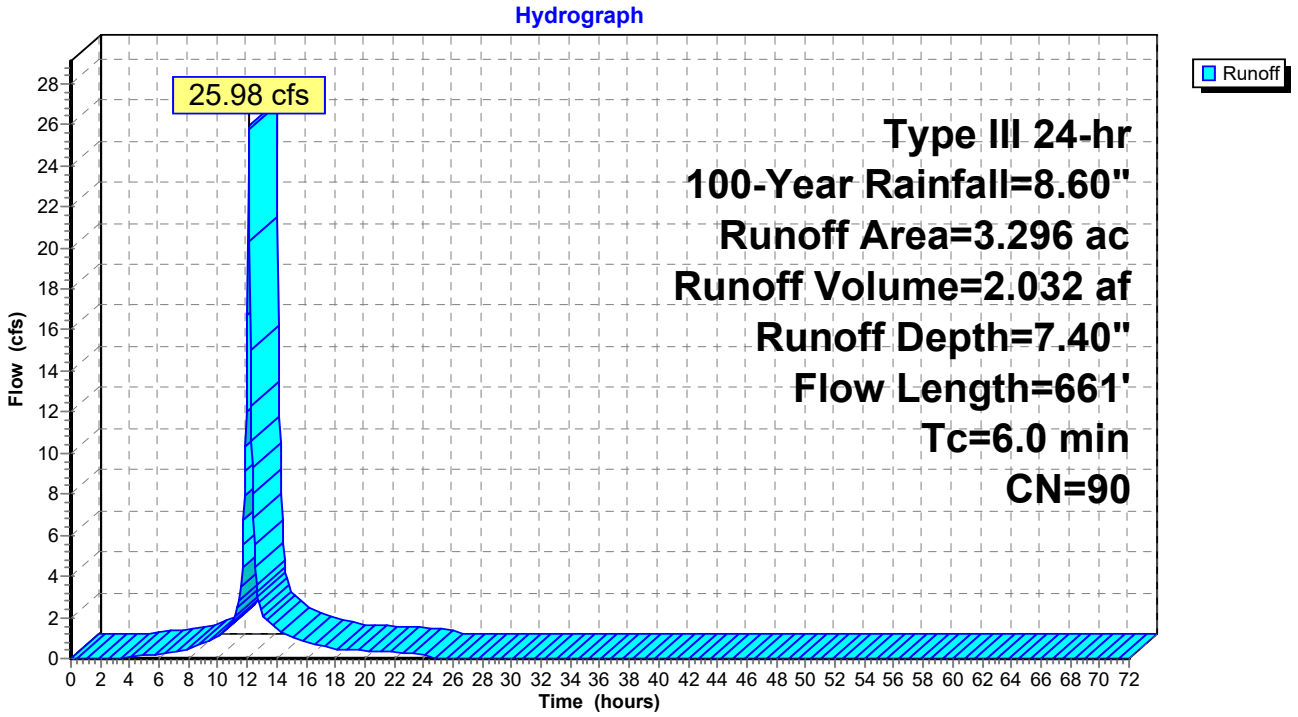
Runoff = 25.98 cfs @ 12.09 hrs, Volume= 2.032 af, Depth= 7.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

	Area (ac)	CN	Description
	0.492	79	<50% Grass cover, Poor, HSG B
	1.831	98	Paved parking, HSG B
	0.700	73	Woods/grass comb., Poor, HSG B
	0.107	96	Gravel surface, HSG B
*	0.166	98	Building
	3.296	90	Weighted Average
	1.299	77	39.41% Pervious Area
	1.997	98	60.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.35		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
0.9	214	0.0410	4.11		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.4	129	0.0780	5.67		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
1.6	268	0.0194	2.83		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
2.5					**Direct Entry, Min. TC**
6.0	661	Total			

Subcatchment E-1: E-1



Hydrograph for Subcatchment E-1: E-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.00	0.00
2.00	0.17	0.00	0.00
3.00	0.26	0.00	0.02
4.00	0.37	0.02	0.08
5.00	0.49	0.05	0.14
6.00	0.62	0.10	0.20
7.00	0.78	0.19	0.32
8.00	0.98	0.31	0.47
9.00	1.25	0.50	0.75
10.00	1.63	0.78	1.09
11.00	2.15	1.22	1.74
12.00	4.30	3.20	**16.71**
13.00	6.45	5.28	**2.28**
14.00	6.97	5.80	1.43
15.00	7.35	6.16	1.08
16.00	7.62	6.43	0.76
17.00	7.82	6.63	0.60
18.00	7.98	6.79	0.46
19.00	8.11	6.92	0.41
20.00	8.23	7.03	0.37
21.00	8.34	7.14	0.34
22.00	8.43	7.23	0.31
23.00	8.52	7.32	0.27
24.00	**8.60**	**7.40**	0.24
25.00	8.60	7.40	0.00
26.00	8.60	7.40	0.00
27.00	8.60	7.40	0.00
28.00	8.60	7.40	0.00
29.00	8.60	7.40	0.00
30.00	8.60	7.40	0.00
31.00	8.60	7.40	0.00
32.00	8.60	7.40	0.00
33.00	8.60	7.40	0.00
34.00	8.60	7.40	0.00
35.00	8.60	7.40	0.00
36.00	8.60	7.40	0.00
37.00	8.60	7.40	0.00
38.00	8.60	7.40	0.00
39.00	8.60	7.40	0.00
40.00	8.60	7.40	0.00
41.00	8.60	7.40	0.00
42.00	8.60	7.40	0.00
43.00	8.60	7.40	0.00
44.00	8.60	7.40	0.00
45.00	8.60	7.40	0.00
46.00	8.60	7.40	0.00
47.00	8.60	7.40	0.00
48.00	8.60	7.40	0.00
49.00	8.60	7.40	0.00
50.00	8.60	7.40	0.00
51.00	8.60	7.40	0.00
52.00	8.60	7.40	0.00
53.00	8.60	7.40	0.00
54.00	8.60	7.40	0.00
55.00	8.60	7.40	0.00
56.00	8.60	7.40	0.00
57.00	8.60	7.40	0.00
58.00	8.60	7.40	0.00
59.00	8.60	7.40	0.00
60.00	8.60	7.40	0.00
61.00	8.60	7.40	0.00
62.00	8.60	7.40	0.00
63.00	8.60	7.40	0.00
64.00	8.60	7.40	0.00
65.00	8.60	7.40	0.00
66.00	8.60	7.40	0.00
67.00	8.60	7.40	0.00
68.00	8.60	7.40	0.00
69.00	8.60	7.40	0.00
70.00	8.60	7.40	0.00
71.00	8.60	7.40	0.00
72.00	8.60	7.40	0.00

Summary for Subcatchment E-2: E-2

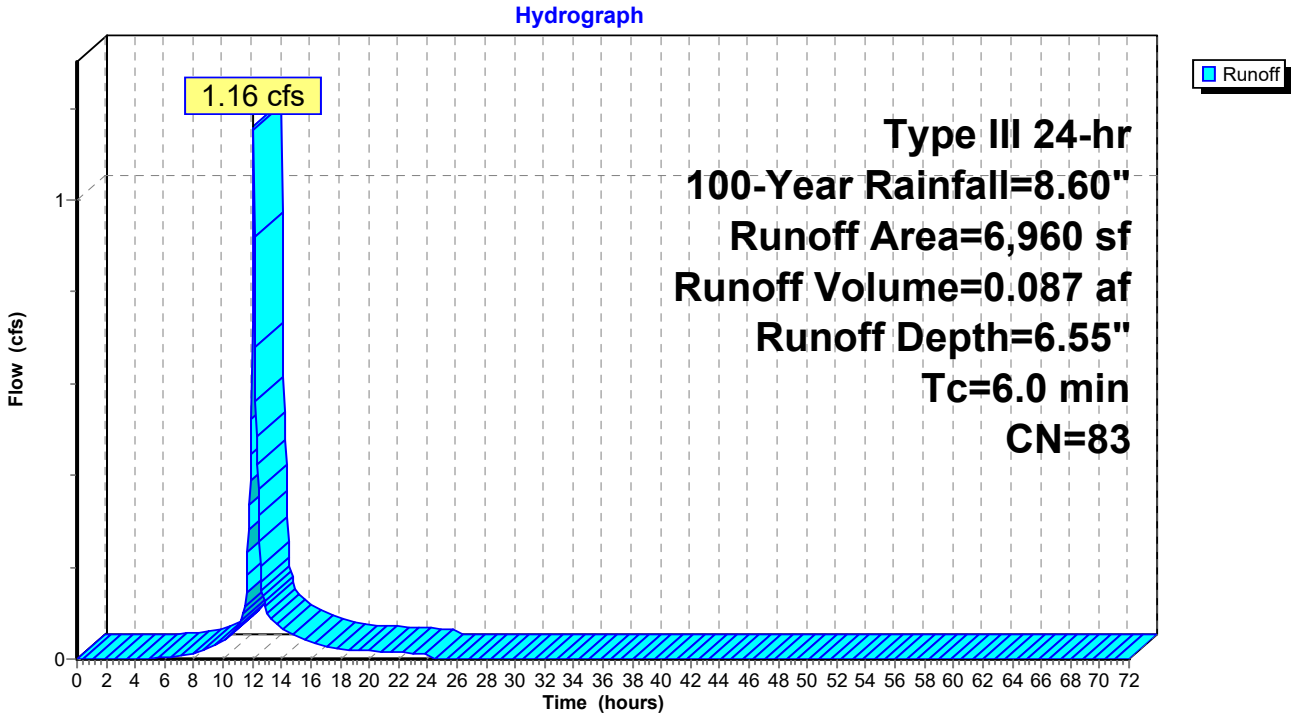
Runoff = 1.16 cfs @ 12.09 hrs, Volume= 0.087 af, Depth= 6.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
3,476	98	Paved parking, HSG B
1,827	69	50-75% Grass cover, Fair, HSG B
1,657	66	Woods, Poor, HSG B
6,960	83	Weighted Average
3,484	68	50.06% Pervious Area
3,476	98	49.94% Impervious Area

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

Subcatchment E-2: E-2



Hydrograph for Subcatchment E-2: E-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.00	0.00
2.00	0.17	0.00	0.00
3.00	0.26	0.00	0.00
4.00	0.37	0.00	0.00
5.00	0.49	0.00	0.00
6.00	0.62	0.02	0.00
7.00	0.78	0.06	0.01
8.00	0.98	0.12	0.01
9.00	1.25	0.25	0.02
10.00	1.63	0.45	0.04
11.00	2.15	0.80	0.07
12.00	4.30	2.55	**0.73**
13.00	6.45	4.51	**0.11**
14.00	6.97	5.00	0.07
15.00	7.35	5.36	0.05
16.00	7.62	5.61	0.04
17.00	7.82	5.81	0.03
18.00	7.98	5.96	0.02
19.00	8.11	6.08	0.02
20.00	8.23	6.20	0.02
21.00	8.34	6.30	0.02
22.00	8.43	6.39	0.01
23.00	8.52	6.48	0.01
24.00	**8.60**	**6.55**	0.01
25.00	8.60	6.55	0.00
26.00	8.60	6.55	0.00
27.00	8.60	6.55	0.00
28.00	8.60	6.55	0.00
29.00	8.60	6.55	0.00
30.00	8.60	6.55	0.00
31.00	8.60	6.55	0.00
32.00	8.60	6.55	0.00
33.00	8.60	6.55	0.00
34.00	8.60	6.55	0.00
35.00	8.60	6.55	0.00
36.00	8.60	6.55	0.00
37.00	8.60	6.55	0.00
38.00	8.60	6.55	0.00
39.00	8.60	6.55	0.00
40.00	8.60	6.55	0.00
41.00	8.60	6.55	0.00
42.00	8.60	6.55	0.00
43.00	8.60	6.55	0.00
44.00	8.60	6.55	0.00
45.00	8.60	6.55	0.00
46.00	8.60	6.55	0.00
47.00	8.60	6.55	0.00
48.00	8.60	6.55	0.00
49.00	8.60	6.55	0.00
50.00	8.60	6.55	0.00
51.00	8.60	6.55	0.00
52.00	8.60	6.55	0.00
53.00	8.60	6.55	0.00
54.00	8.60	6.55	0.00
55.00	8.60	6.55	0.00
56.00	8.60	6.55	0.00
57.00	8.60	6.55	0.00
58.00	8.60	6.55	0.00
59.00	8.60	6.55	0.00
60.00	8.60	6.55	0.00
61.00	8.60	6.55	0.00
62.00	8.60	6.55	0.00
63.00	8.60	6.55	0.00
64.00	8.60	6.55	0.00
65.00	8.60	6.55	0.00
66.00	8.60	6.55	0.00
67.00	8.60	6.55	0.00
68.00	8.60	6.55	0.00
69.00	8.60	6.55	0.00
70.00	8.60	6.55	0.00
71.00	8.60	6.55	0.00
72.00	8.60	6.55	0.00

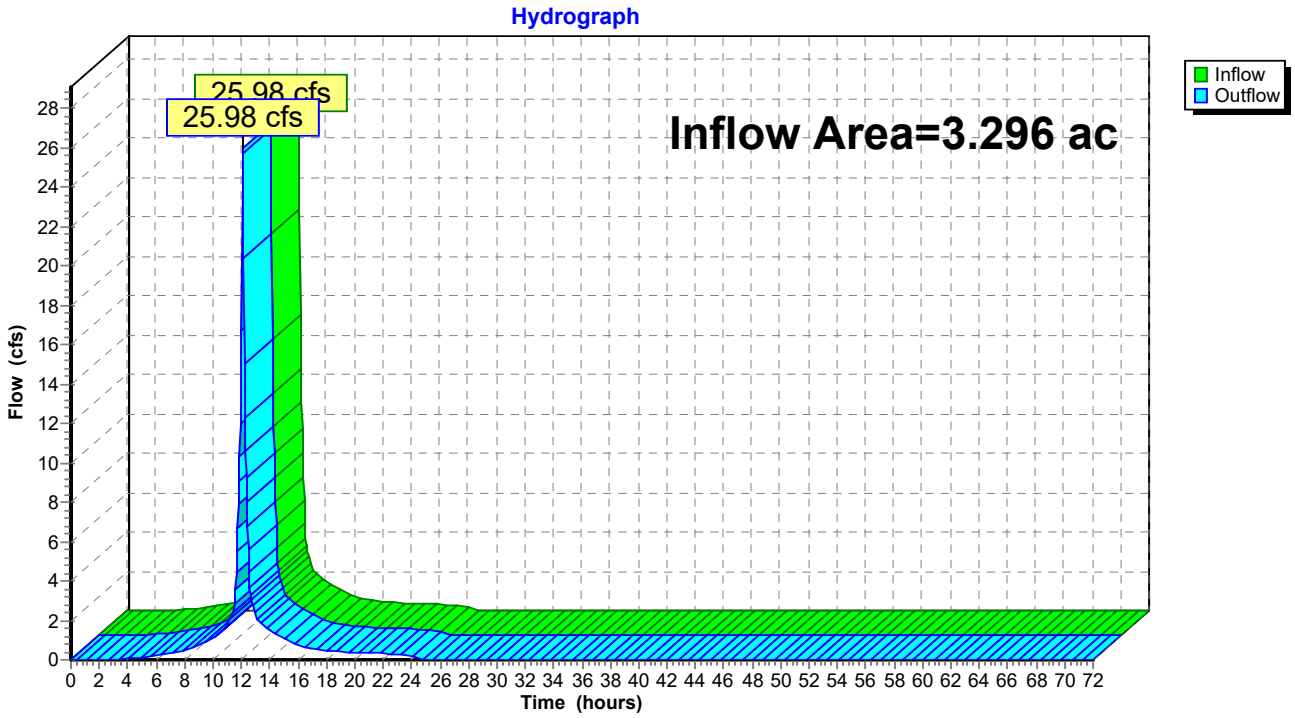
Summary for Reach PD1: WETLAND

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

Inflow Area = 3.296 ac, 60.59% Impervious, Inflow Depth = 7.40" for 100-Year event
Inflow = 25.98 cfs @ 12.09 hrs, Volume= 2.032 af
Outflow = 25.98 cfs @ 12.09 hrs, Volume= 2.032 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD1: WETLAND



Hydrograph for Reach PD1: WETLAND

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.02		0.02	56.00	0.00		0.00
4.00	0.08		0.08	57.00	0.00		0.00
5.00	0.14		0.14	58.00	0.00		0.00
6.00	0.20		0.20	59.00	0.00		0.00
7.00	0.32		0.32	60.00	0.00		0.00
8.00	0.47		0.47	61.00	0.00		0.00
9.00	0.75		0.75	62.00	0.00		0.00
10.00	1.09		1.09	63.00	0.00		0.00
11.00	1.74		1.74	64.00	0.00		0.00
12.00	**16.71**		**16.71**	65.00	0.00		0.00
13.00	**2.28**		**2.28**	66.00	0.00		0.00
14.00	1.43		1.43	67.00	0.00		0.00
15.00	1.08		1.08	68.00	0.00		0.00
16.00	0.76		0.76	69.00	0.00		0.00
17.00	0.60		0.60	70.00	0.00		0.00
18.00	0.46		0.46	71.00	0.00		0.00
19.00	0.41		0.41	72.00	0.00		0.00
20.00	0.37		0.37				
21.00	0.34		0.34				
22.00	0.31		0.31				
23.00	0.27		0.27				
24.00	0.24		0.24				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

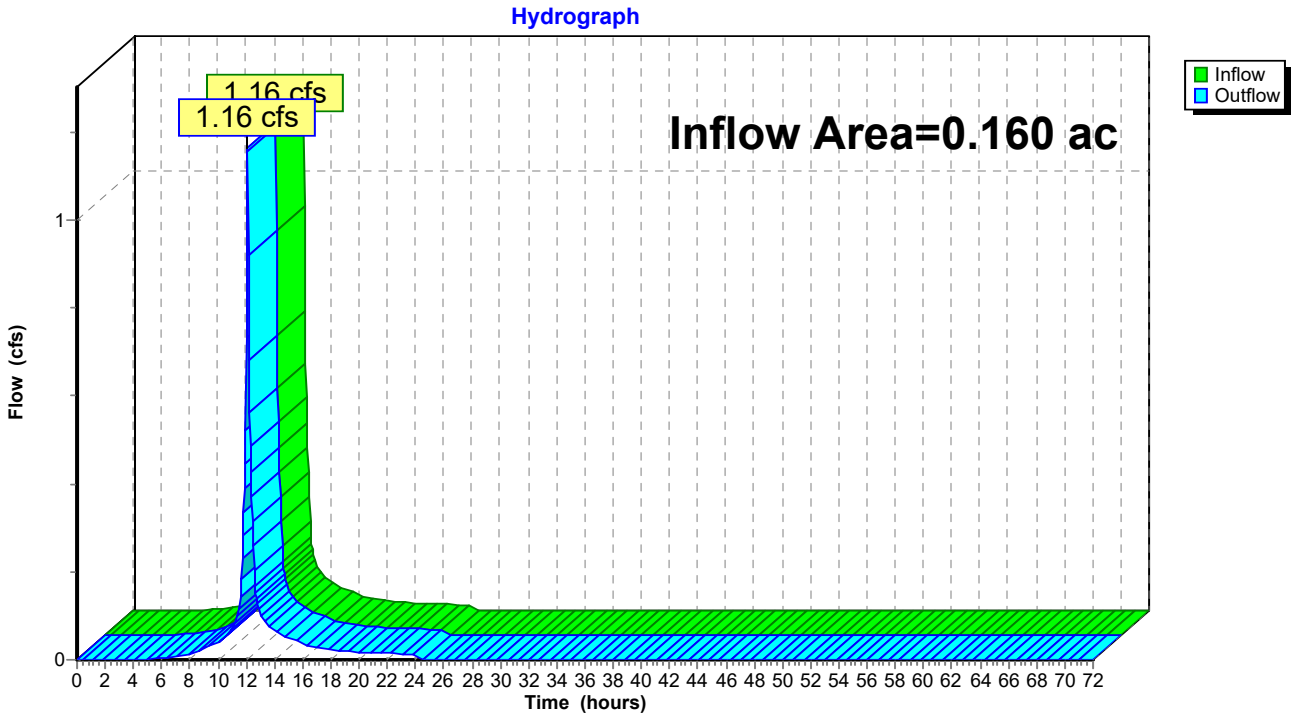
Summary for Reach PD2: BOSTON POST RD

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

Inflow Area = 0.160 ac, 49.94% Impervious, Inflow Depth = 6.55" for 100-Year event
Inflow = 1.16 cfs @ 12.09 hrs, Volume= 0.087 af
Outflow = 1.16 cfs @ 12.09 hrs, Volume= 0.087 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD2: BOSTON POST RD



Hydrograph for Reach PD2: BOSTON POST RD

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.01		0.01	60.00	0.00		0.00
8.00	0.01		0.01	61.00	0.00		0.00
9.00	0.02		0.02	62.00	0.00		0.00
10.00	0.04		0.04	63.00	0.00		0.00
11.00	0.07		0.07	64.00	0.00		0.00
12.00	**0.73**		**0.73**	65.00	0.00		0.00
13.00	**0.11**		**0.11**	66.00	0.00		0.00
14.00	0.07		0.07	67.00	0.00		0.00
15.00	0.05		0.05	68.00	0.00		0.00
16.00	0.04		0.04	69.00	0.00		0.00
17.00	0.03		0.03	70.00	0.00		0.00
18.00	0.02		0.02	71.00	0.00		0.00
19.00	0.02		0.02	72.00	0.00		0.00
20.00	0.02		0.02				
21.00	0.02		0.02				
22.00	0.01		0.01				
23.00	0.01		0.01				
24.00	0.01		0.01				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
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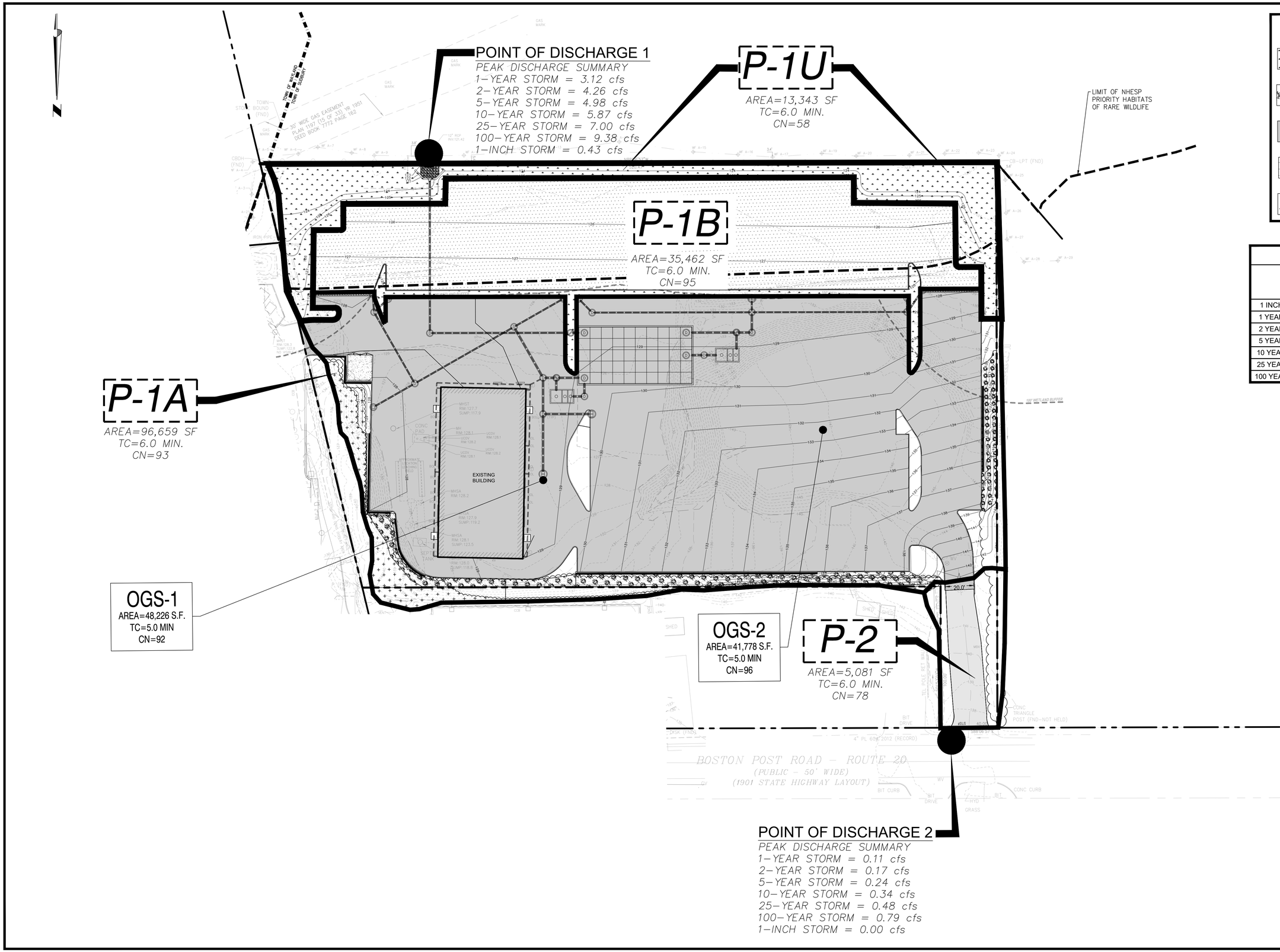
52.00	0.00		0.00				



LEGEND

- GRASS AREA
- LANDSCAPED AREA
- PAVED AREA
- POROUS AREA
- WOODED AREA

VOLUME TABLE

	POINT OF DISCHARGE 1 (ACRE-FOOT)	POINT OF DISCHARGE 2 (ACRE-FOOT)
1 INCH	0.084	.001
1 YEAR	0.350	.008
2 YEAR	0.464	.012
5 YEAR	0.597	.018
10 YEAR	0.771	.025
25 YEAR	1.007	.035
100 YEAR	1.530	.058

30 15 0 30 60

Date	Description	No.

Revisions

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-919-0808

Project
105 BOSTON POST ROAD
SUDBURY, MA

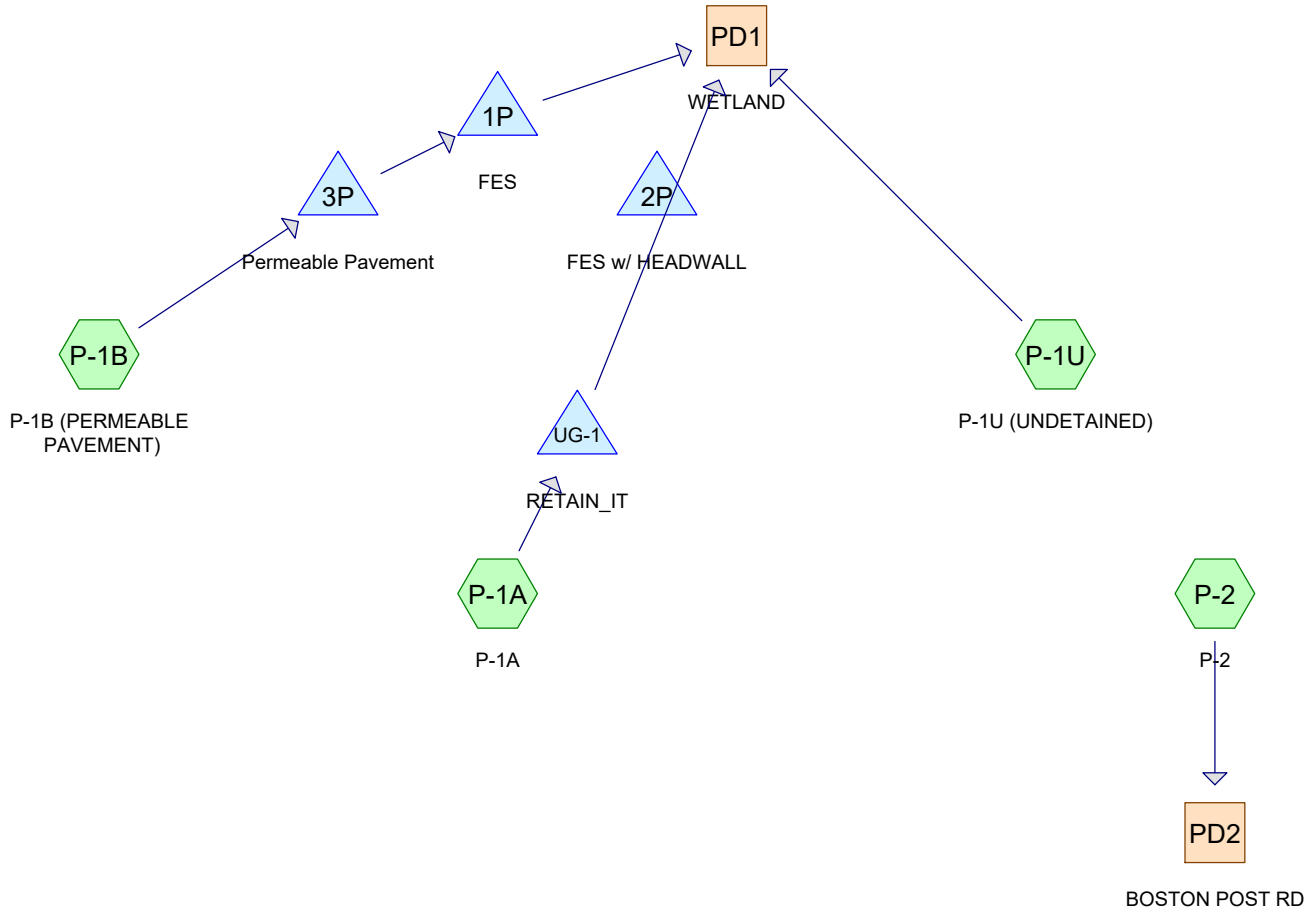
Prepared for
HERB CHAMBERS OF SUDBURY, INC.
259 MCGRATH HWY
SOMERVILE, MA 02143

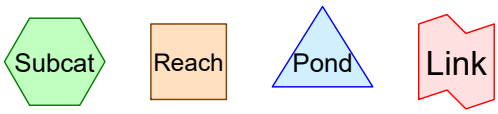
Drawing Title
PROPOSED CONDITIONS WATERSHED MAP

Project No.	100-108
Date	3/22/2021
Scale	1"=30'
Drawn By	DJN
Approved By	GC

Drawing No.
PH-1

C:\DDD\Crocker Design Group, LLC\Gabriel Crocker - Projects\100-108 Sudbury - Herb Chambers Mass DOT\dwg\Plot Sheets\Site Plan Application_11. PROP WATERSHED MAP.dwg, DX-PROP WATERSHED MAP, Mar 11, 2021 13:40





Routing Diagram for 100-108 Proposed Watershed
Prepared by {enter your company name here}, Printed 3/18/2021
HydroCAD® 10.00-26 s/n 01012 © 2020 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "EXIST.hcp"

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.128	61	>75% Grass cover, Good, HSG B (P-1B, P-2)
0.032	61	>75% Grass cover, Good, HSG B- ISLANDS (P-1A)
0.113	73	Existing Woods/grass comb., Poor, HSG B (P-1A)
1.785	98	Paved parking, HSG B (P-1A, P-2)
0.749	98	Perm. Pavement, 0% imp, HSG B (P-1B)
0.166	98	Unconnected roofs, HSG B (P-1A)
0.483	58	Woods/grass comb., Good, HSG B (P-1A, P-1U)
3.456	**90**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
3.456	HSG B	P-1A, P-1B, P-1U, P-2
0.000	HSG C	
0.000	HSG D	
0.000	Other	
3.456		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchmen Numbers
0.000	0.160	0.000	0.000	0.000	0.160	>75% Grass cover, Good	
0.000	0.113	0.000	0.000	0.000	0.113	Existing Woods/grass comb., Poor	
0.000	1.785	0.000	0.000	0.000	1.785	Paved parking	
0.000	0.749	0.000	0.000	0.000	0.749	Perm. Pavement, 0% imp	
0.000	0.166	0.000	0.000	0.000	0.166	Unconnected roofs	
0.000	0.483	0.000	0.000	0.000	0.483	Woods/grass comb., Good	
0.000	**3.456**	**0.000**	**0.000**	**0.000**	**3.456**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	3P	123.01	122.90	20.0	0.0055	0.012	12.0	0.0	0.0
2	UG-1	122.40	121.25	212.0	0.0054	0.011	15.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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

Subcatchment P-1A: P-1A Runoff Area=96,664 sf 85.49% Impervious Runoff Depth=0.45"
Tc=6.0 min CN=93 Runoff=1.14 cfs 0.083 af

Subcatchment P-1B: P-1B (PERMEABLE Runoff Area=35,462 sf 0.00% Impervious Runoff Depth=0.56"
Tc=6.0 min CN=95 Runoff=0.53 cfs 0.038 af

Subcatchment P-1U: P-1U (UNDETAINED) Runoff Area=13,343 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=58 Runoff=0.00 cfs 0.000 af

Subcatchment P-2: P-2 Runoff Area=5,081 sf 46.53% Impervious Runoff Depth=0.06"
Tc=6.0 min CN=78 Runoff=0.00 cfs 0.001 af

Reach PD1: WETLAND Inflow=0.43 cfs 0.083 af
Outflow=0.43 cfs 0.083 af

Reach PD2: BOSTON POST RD Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Pond 1P: FES Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Pond 2P: FES w/ HEADWALL
Primary=0.00 cfs 0.000 af

Pond 3P: Permeable Pavement Peak Elev=122.85' Storage=43 cf Inflow=0.53 cfs 0.038 af
Discarded=0.39 cfs 0.038 af Primary=0.00 cfs 0.000 af Outflow=0.39 cfs 0.038 af

Pond UG-1: RETAIN_IT Peak Elev=123.06' Storage=1,153 cf Inflow=1.14 cfs 0.083 af
Outflow=0.43 cfs 0.083 af

Total Runoff Area = 3.456 ac Runoff Volume = 0.122 af Average Runoff Depth = 0.42"
43.54% Pervious = 1.505 ac 56.46% Impervious = 1.951 ac

Summary for Subcatchment P-1A: P-1A

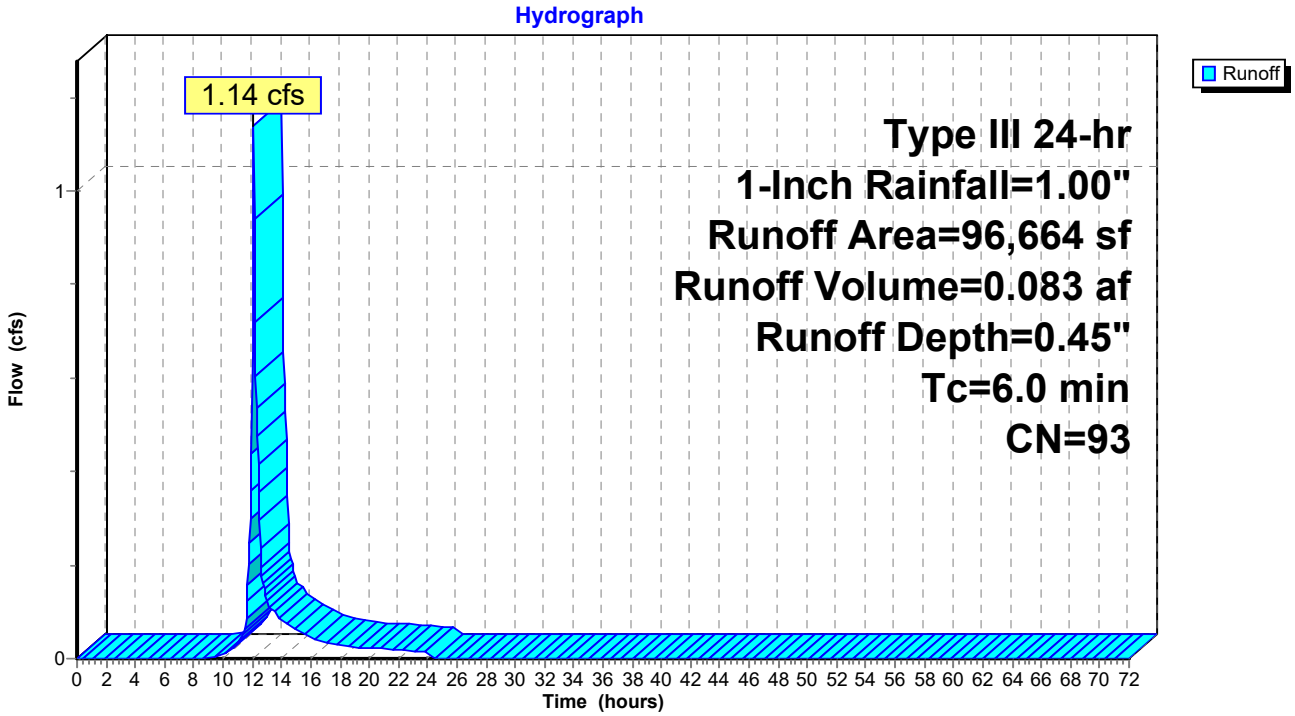
Runoff = 1.14 cfs @ 12.10 hrs, Volume= 0.083 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Inch Rainfall=1.00"

	Area (sf)	CN	Description
*	1,394	61	>75% Grass cover, Good, HSG B- ISLANDS
	75,402	98	Paved parking, HSG B
*	4,922	73	Existing Woods/grass comb., Poor, HSG B
	7,710	58	Woods/grass comb., Good, HSG B
	7,236	98	Unconnected roofs, HSG B
	96,664	93	Weighted Average
	14,026	64	14.51% Pervious Area
	82,638	98	85.49% Impervious Area
	7,236		8.76% Unconnected

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

Subcatchment P-1A: P-1A



Hydrograph for Subcatchment P-1A: P-1A

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.01	0.00	0.00
2.00	0.02	0.00	0.00
3.00	0.03	0.00	0.00
4.00	0.04	0.00	0.00
5.00	0.06	0.00	0.00
6.00	0.07	0.00	0.00
7.00	0.09	0.00	0.00
8.00	0.11	0.00	0.00
9.00	0.15	0.00	0.00
10.00	0.19	0.00	0.01
11.00	0.25	0.01	0.03
12.00	0.50	0.11	**0.65**
13.00	0.75	0.27	**0.13**
14.00	0.81	0.31	0.08
15.00	0.85	0.34	0.06
16.00	0.89	0.36	0.05
17.00	0.91	0.38	0.04
18.00	0.93	0.40	0.03
19.00	0.94	0.41	0.02
20.00	0.96	0.42	0.02
21.00	0.97	0.43	0.02
22.00	0.98	0.44	0.02
23.00	0.99	0.44	0.02
24.00	**1.00**	**0.45**	0.01
25.00	1.00	0.45	0.00
26.00	1.00	0.45	0.00
27.00	1.00	0.45	0.00
28.00	1.00	0.45	0.00
29.00	1.00	0.45	0.00
30.00	1.00	0.45	0.00
31.00	1.00	0.45	0.00
32.00	1.00	0.45	0.00
33.00	1.00	0.45	0.00
34.00	1.00	0.45	0.00
35.00	1.00	0.45	0.00
36.00	1.00	0.45	0.00
37.00	1.00	0.45	0.00
38.00	1.00	0.45	0.00
39.00	1.00	0.45	0.00
40.00	1.00	0.45	0.00
41.00	1.00	0.45	0.00
42.00	1.00	0.45	0.00
43.00	1.00	0.45	0.00
44.00	1.00	0.45	0.00
45.00	1.00	0.45	0.00
46.00	1.00	0.45	0.00
47.00	1.00	0.45	0.00
48.00	1.00	0.45	0.00
49.00	1.00	0.45	0.00
50.00	1.00	0.45	0.00
51.00	1.00	0.45	0.00
52.00	1.00	0.45	0.00
53.00	1.00	0.45	0.00
54.00	1.00	0.45	0.00
55.00	1.00	0.45	0.00
56.00	1.00	0.45	0.00
57.00	1.00	0.45	0.00
58.00	1.00	0.45	0.00
59.00	1.00	0.45	0.00
60.00	1.00	0.45	0.00
61.00	1.00	0.45	0.00
62.00	1.00	0.45	0.00
63.00	1.00	0.45	0.00
64.00	1.00	0.45	0.00
65.00	1.00	0.45	0.00
66.00	1.00	0.45	0.00
67.00	1.00	0.45	0.00
68.00	1.00	0.45	0.00
69.00	1.00	0.45	0.00
70.00	1.00	0.45	0.00
71.00	1.00	0.45	0.00
72.00	1.00	0.45	0.00

Summary for Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)

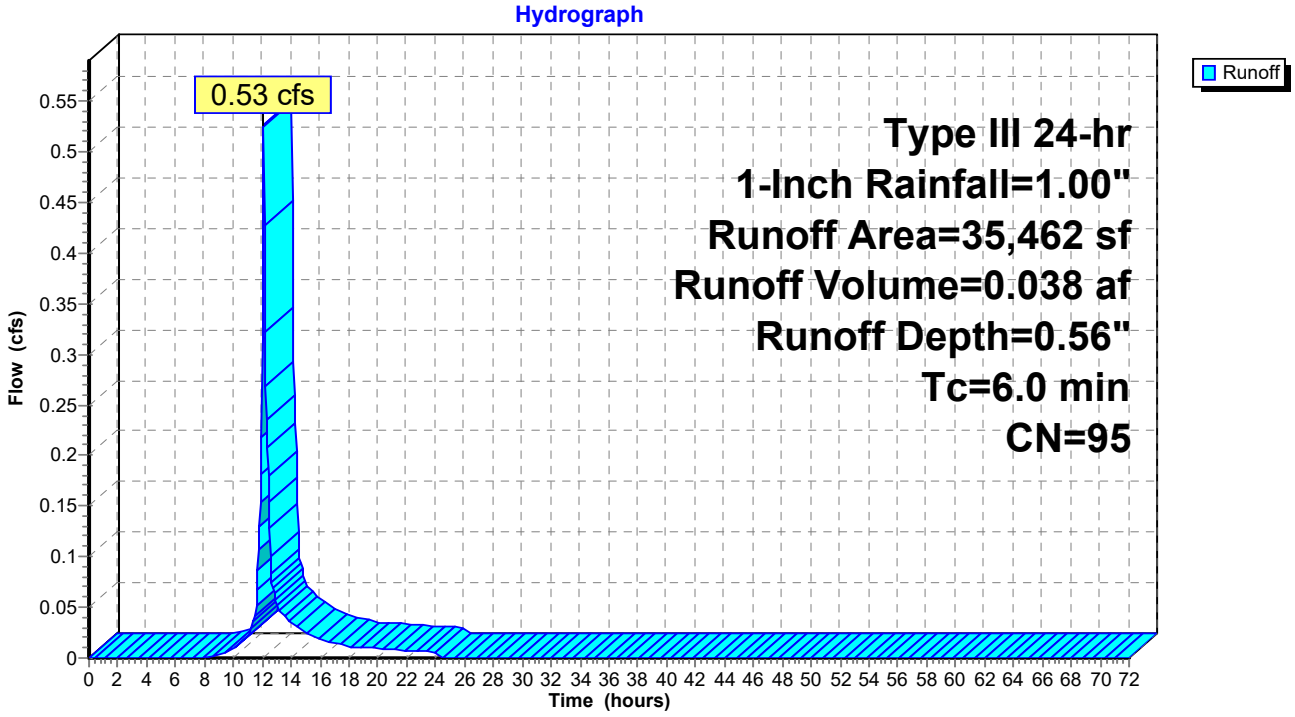
Runoff = 0.53 cfs @ 12.09 hrs, Volume= 0.038 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Inch Rainfall=1.00"

	Area (sf)	CN	Description
*	32,606	98	Perm. Pavement, 0% imp, HSG B
	2,856	61	>75% Grass cover, Good, HSG B
	35,462	95	Weighted Average
	35,462	95	100.00% Pervious Area

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

Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)



Hydrograph for Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.01	0.00	0.00
2.00	0.02	0.00	0.00
3.00	0.03	0.00	0.00
4.00	0.04	0.00	0.00
5.00	0.06	0.00	0.00
6.00	0.07	0.00	0.00
7.00	0.09	0.00	0.00
8.00	0.11	0.00	0.00
9.00	0.15	0.00	0.00
10.00	0.19	0.01	0.01
11.00	0.25	0.03	0.02
12.00	0.50	0.17	**0.32**
13.00	0.75	0.35	**0.05**
14.00	0.81	0.40	0.03
15.00	0.85	0.44	0.03
16.00	0.89	0.47	0.02
17.00	0.91	0.49	0.01
18.00	0.93	0.50	0.01
19.00	0.94	0.51	0.01
20.00	0.96	0.53	0.01
21.00	0.97	0.54	0.01
22.00	0.98	0.55	0.01
23.00	0.99	0.56	0.01
24.00	**1.00**	**0.56**	0.01
25.00	1.00	0.56	0.00
26.00	1.00	0.56	0.00
27.00	1.00	0.56	0.00
28.00	1.00	0.56	0.00
29.00	1.00	0.56	0.00
30.00	1.00	0.56	0.00
31.00	1.00	0.56	0.00
32.00	1.00	0.56	0.00
33.00	1.00	0.56	0.00
34.00	1.00	0.56	0.00
35.00	1.00	0.56	0.00
36.00	1.00	0.56	0.00
37.00	1.00	0.56	0.00
38.00	1.00	0.56	0.00
39.00	1.00	0.56	0.00
40.00	1.00	0.56	0.00
41.00	1.00	0.56	0.00
42.00	1.00	0.56	0.00
43.00	1.00	0.56	0.00
44.00	1.00	0.56	0.00
45.00	1.00	0.56	0.00
46.00	1.00	0.56	0.00
47.00	1.00	0.56	0.00
48.00	1.00	0.56	0.00
49.00	1.00	0.56	0.00
50.00	1.00	0.56	0.00
51.00	1.00	0.56	0.00
52.00	1.00	0.56	0.00
53.00	1.00	0.56	0.00
54.00	1.00	0.56	0.00
55.00	1.00	0.56	0.00
56.00	1.00	0.56	0.00
57.00	1.00	0.56	0.00
58.00	1.00	0.56	0.00
59.00	1.00	0.56	0.00
60.00	1.00	0.56	0.00
61.00	1.00	0.56	0.00
62.00	1.00	0.56	0.00
63.00	1.00	0.56	0.00
64.00	1.00	0.56	0.00
65.00	1.00	0.56	0.00
66.00	1.00	0.56	0.00
67.00	1.00	0.56	0.00
68.00	1.00	0.56	0.00
69.00	1.00	0.56	0.00
70.00	1.00	0.56	0.00
71.00	1.00	0.56	0.00
72.00	1.00	0.56	0.00

Summary for Subcatchment P-1U: P-1U (UNDETAINED)

[45] Hint: Runoff=Zero

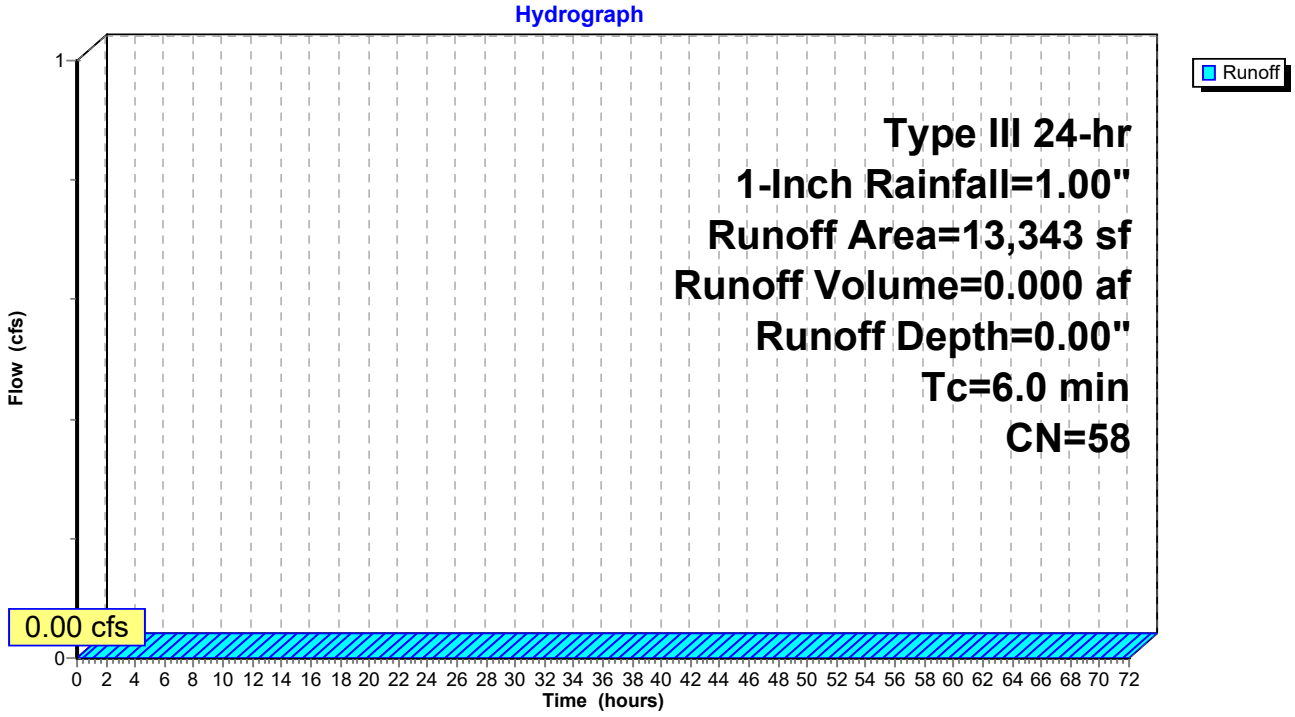
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
13,343	58	Woods/grass comb., Good, HSG B
13,343	58	100.00% Pervious Area

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

Subcatchment P-1U: P-1U (UNDETAINED)



Hydrograph for Subcatchment P-1U: P-1U (UNDETAINED)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	**0.00**	**0.00**
1.00	0.01	0.00	0.00
2.00	0.02	0.00	0.00
3.00	0.03	0.00	0.00
4.00	0.04	0.00	0.00
5.00	0.06	0.00	0.00
6.00	0.07	0.00	0.00
7.00	0.09	0.00	0.00
8.00	0.11	0.00	0.00
9.00	0.15	0.00	0.00
10.00	0.19	0.00	0.00
11.00	0.25	0.00	0.00
12.00	0.50	0.00	0.00
13.00	0.75	0.00	0.00
14.00	0.81	0.00	0.00
15.00	0.85	0.00	0.00
16.00	0.89	0.00	0.00
17.00	0.91	0.00	0.00
18.00	0.93	0.00	0.00
19.00	0.94	0.00	0.00
20.00	0.96	0.00	0.00
21.00	0.97	0.00	0.00
22.00	0.98	0.00	0.00
23.00	0.99	0.00	0.00
24.00	**1.00**	0.00	0.00
25.00	1.00	0.00	0.00
26.00	1.00	0.00	0.00
27.00	1.00	0.00	0.00
28.00	1.00	0.00	0.00
29.00	1.00	0.00	0.00
30.00	1.00	0.00	0.00
31.00	1.00	0.00	0.00
32.00	1.00	0.00	0.00
33.00	1.00	0.00	0.00
34.00	1.00	0.00	0.00
35.00	1.00	0.00	0.00
36.00	1.00	0.00	0.00
37.00	1.00	0.00	0.00
38.00	1.00	0.00	0.00
39.00	1.00	0.00	0.00
40.00	1.00	0.00	0.00
41.00	1.00	0.00	0.00
42.00	1.00	0.00	0.00
43.00	1.00	0.00	0.00
44.00	1.00	0.00	0.00
45.00	1.00	0.00	0.00
46.00	1.00	0.00	0.00
47.00	1.00	0.00	0.00
48.00	1.00	0.00	0.00
49.00	1.00	0.00	0.00
50.00	1.00	0.00	0.00
51.00	1.00	0.00	0.00
52.00	1.00	0.00	0.00
53.00	1.00	0.00	0.00
54.00	1.00	0.00	0.00
55.00	1.00	0.00	0.00
56.00	1.00	0.00	0.00
57.00	1.00	0.00	0.00
58.00	1.00	0.00	0.00
59.00	1.00	0.00	0.00
60.00	1.00	0.00	0.00
61.00	1.00	0.00	0.00
62.00	1.00	0.00	0.00
63.00	1.00	0.00	0.00
64.00	1.00	0.00	0.00
65.00	1.00	0.00	0.00
66.00	1.00	0.00	0.00
67.00	1.00	0.00	0.00
68.00	1.00	0.00	0.00
69.00	1.00	0.00	0.00
70.00	1.00	0.00	0.00
71.00	1.00	0.00	0.00
72.00	1.00	0.00	0.00

Summary for Subcatchment P-2: P-2

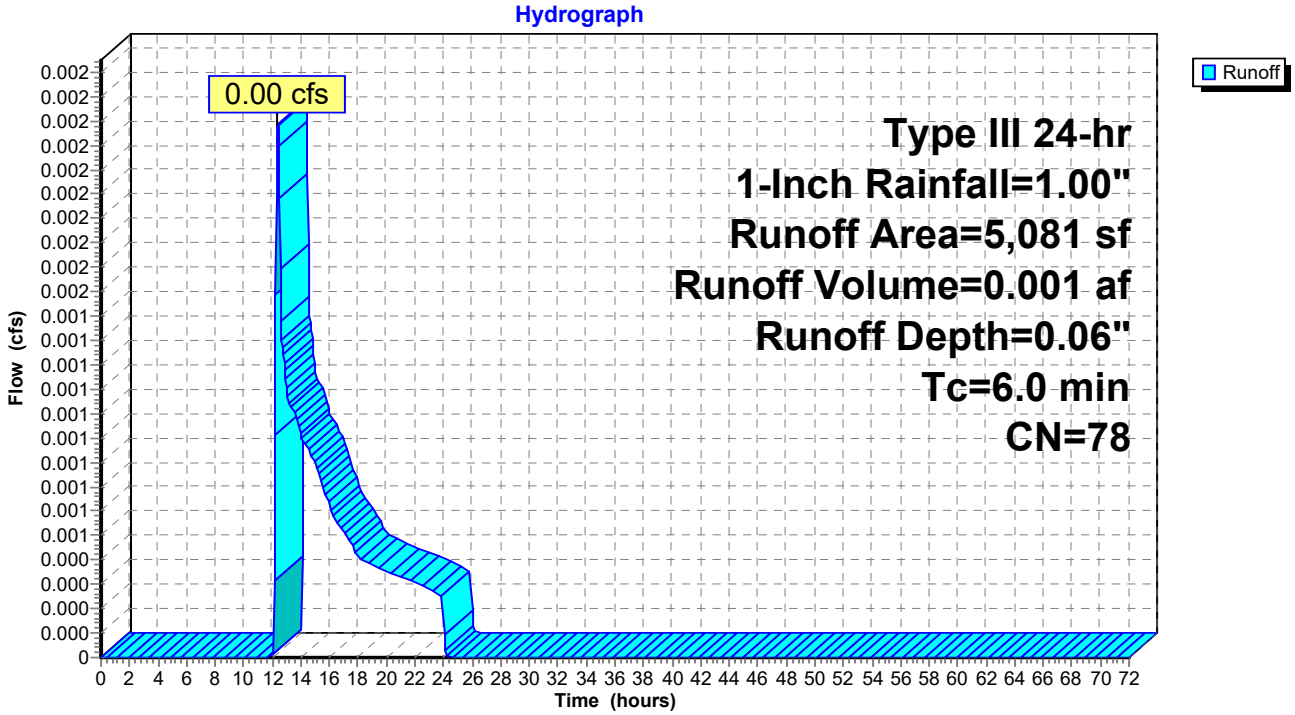
Runoff = 0.00 cfs @ 12.39 hrs, Volume= 0.001 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
2,364	98	Paved parking, HSG B
2,717	61	>75% Grass cover, Good, HSG B
5,081	78	Weighted Average
2,717	61	53.47% Pervious Area
2,364	98	46.53% Impervious Area

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

Subcatchment P-2: P-2



Hydrograph for Subcatchment P-2: P-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.01	0.00	0.00
2.00	0.02	0.00	0.00
3.00	0.03	0.00	0.00
4.00	0.04	0.00	0.00
5.00	0.06	0.00	0.00
6.00	0.07	0.00	0.00
7.00	0.09	0.00	0.00
8.00	0.11	0.00	0.00
9.00	0.15	0.00	0.00
10.00	0.19	0.00	0.00
11.00	0.25	0.00	0.00
12.00	0.50	0.00	**0.00**
13.00	0.75	0.01	**0.00**
14.00	0.81	0.02	0.00
15.00	0.85	0.03	0.00
16.00	0.89	0.03	0.00
17.00	0.91	0.04	0.00
18.00	0.93	0.04	0.00
19.00	0.94	0.04	0.00
20.00	0.96	0.05	0.00
21.00	0.97	0.05	0.00
22.00	0.98	0.05	0.00
23.00	0.99	0.06	0.00
24.00	**1.00**	**0.06**	0.00
25.00	1.00	0.06	0.00
26.00	1.00	0.06	0.00
27.00	1.00	0.06	0.00
28.00	1.00	0.06	0.00
29.00	1.00	0.06	0.00
30.00	1.00	0.06	0.00
31.00	1.00	0.06	0.00
32.00	1.00	0.06	0.00
33.00	1.00	0.06	0.00
34.00	1.00	0.06	0.00
35.00	1.00	0.06	0.00
36.00	1.00	0.06	0.00
37.00	1.00	0.06	0.00
38.00	1.00	0.06	0.00
39.00	1.00	0.06	0.00
40.00	1.00	0.06	0.00
41.00	1.00	0.06	0.00
42.00	1.00	0.06	0.00
43.00	1.00	0.06	0.00
44.00	1.00	0.06	0.00
45.00	1.00	0.06	0.00
46.00	1.00	0.06	0.00
47.00	1.00	0.06	0.00
48.00	1.00	0.06	0.00
49.00	1.00	0.06	0.00
50.00	1.00	0.06	0.00
51.00	1.00	0.06	0.00
52.00	1.00	0.06	0.00
53.00	1.00	0.06	0.00
54.00	1.00	0.06	0.00
55.00	1.00	0.06	0.00
56.00	1.00	0.06	0.00
57.00	1.00	0.06	0.00
58.00	1.00	0.06	0.00
59.00	1.00	0.06	0.00
60.00	1.00	0.06	0.00
61.00	1.00	0.06	0.00
62.00	1.00	0.06	0.00
63.00	1.00	0.06	0.00
64.00	1.00	0.06	0.00
65.00	1.00	0.06	0.00
66.00	1.00	0.06	0.00
67.00	1.00	0.06	0.00
68.00	1.00	0.06	0.00
69.00	1.00	0.06	0.00
70.00	1.00	0.06	0.00
71.00	1.00	0.06	0.00
72.00	1.00	0.06	0.00

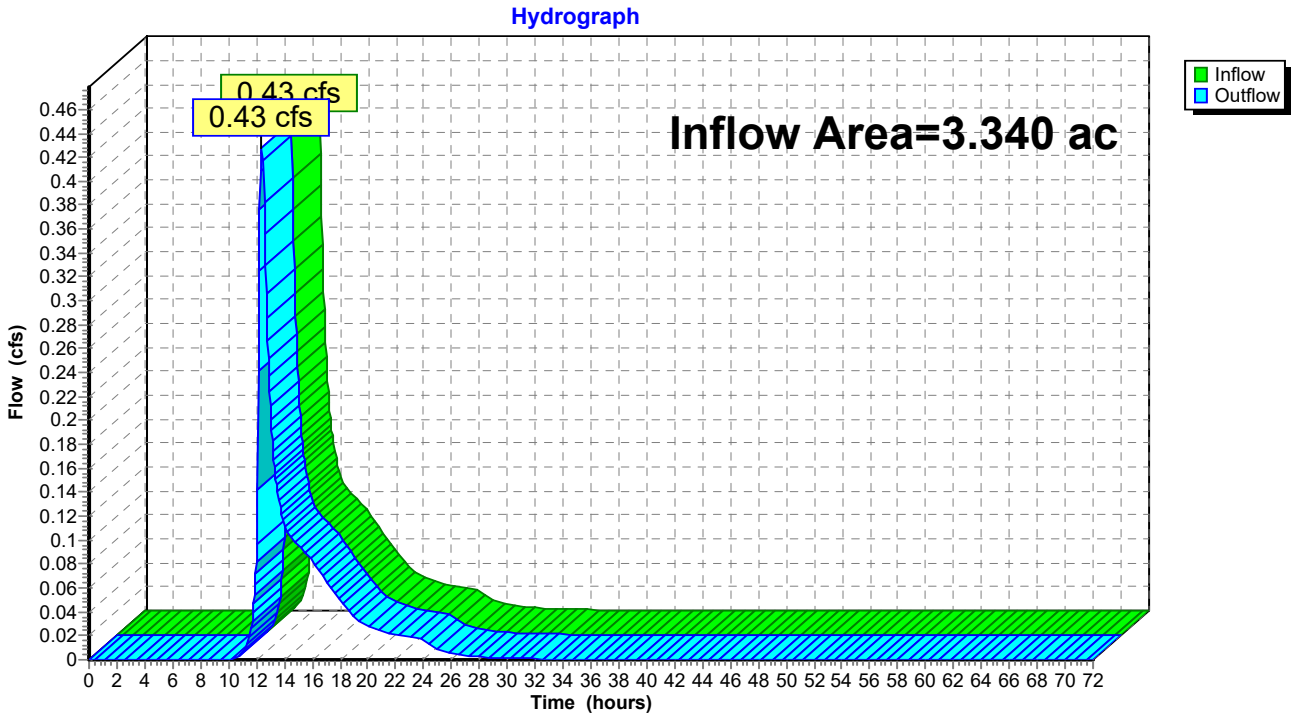
Summary for Reach PD1: WETLAND

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

Inflow Area = 3.340 ac, 56.81% Impervious, Inflow Depth = 0.30" for 1-Inch event
Inflow = 0.43 cfs @ 12.39 hrs, Volume= 0.083 af
Outflow = 0.43 cfs @ 12.39 hrs, Volume= 0.083 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD1: WETLAND



Hydrograph for Reach PD1: WETLAND

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.01		0.01	64.00	0.00		0.00
12.00	**0.08**		**0.08**	65.00	0.00		0.00
13.00	**0.21**		**0.21**	66.00	0.00		0.00
14.00	0.11		0.11	67.00	0.00		0.00
15.00	0.10		0.10	68.00	0.00		0.00
16.00	0.08		0.08	69.00	0.00		0.00
17.00	0.07		0.07	70.00	0.00		0.00
18.00	0.05		0.05	71.00	0.00		0.00
19.00	0.04		0.04	72.00	0.00		0.00
20.00	0.03		0.03				
21.00	0.02		0.02				
22.00	0.02		0.02				
23.00	0.02		0.02				
24.00	0.02		0.02				
25.00	0.01		0.01				
26.00	0.01		0.01				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

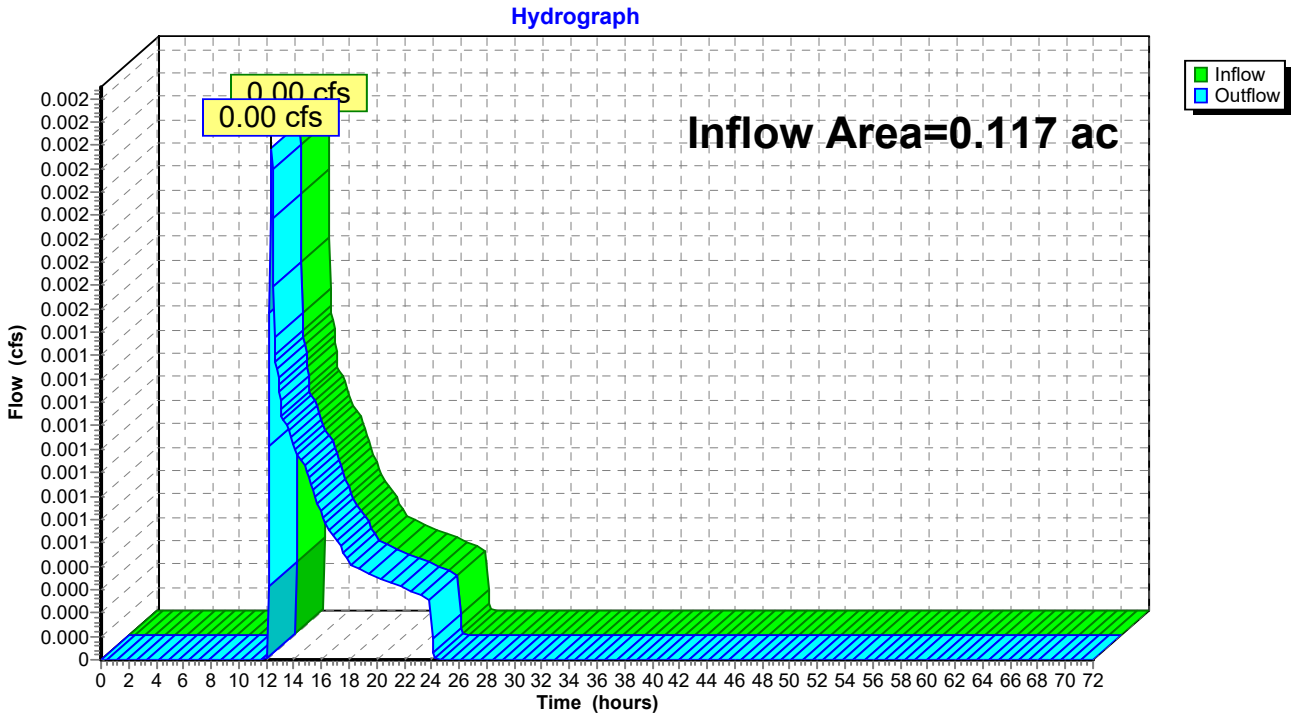
Summary for Reach PD2: BOSTON POST RD

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

Inflow Area = 0.117 ac, 46.53% Impervious, Inflow Depth = 0.06" for 1-Inch event
Inflow = 0.00 cfs @ 12.39 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 12.39 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD2: BOSTON POST RD



Hydrograph for Reach PD2: BOSTON POST RD

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.00		0.00	64.00	0.00		0.00
12.00	**0.00**		**0.00**	65.00	0.00		0.00
13.00	**0.00**		**0.00**	66.00	0.00		0.00
14.00	0.00		0.00	67.00	0.00		0.00
15.00	0.00		0.00	68.00	0.00		0.00
16.00	0.00		0.00	69.00	0.00		0.00
17.00	0.00		0.00	70.00	0.00		0.00
18.00	0.00		0.00	71.00	0.00		0.00
19.00	0.00		0.00	72.00	0.00		0.00
20.00	0.00		0.00				
21.00	0.00		0.00				
22.00	0.00		0.00				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

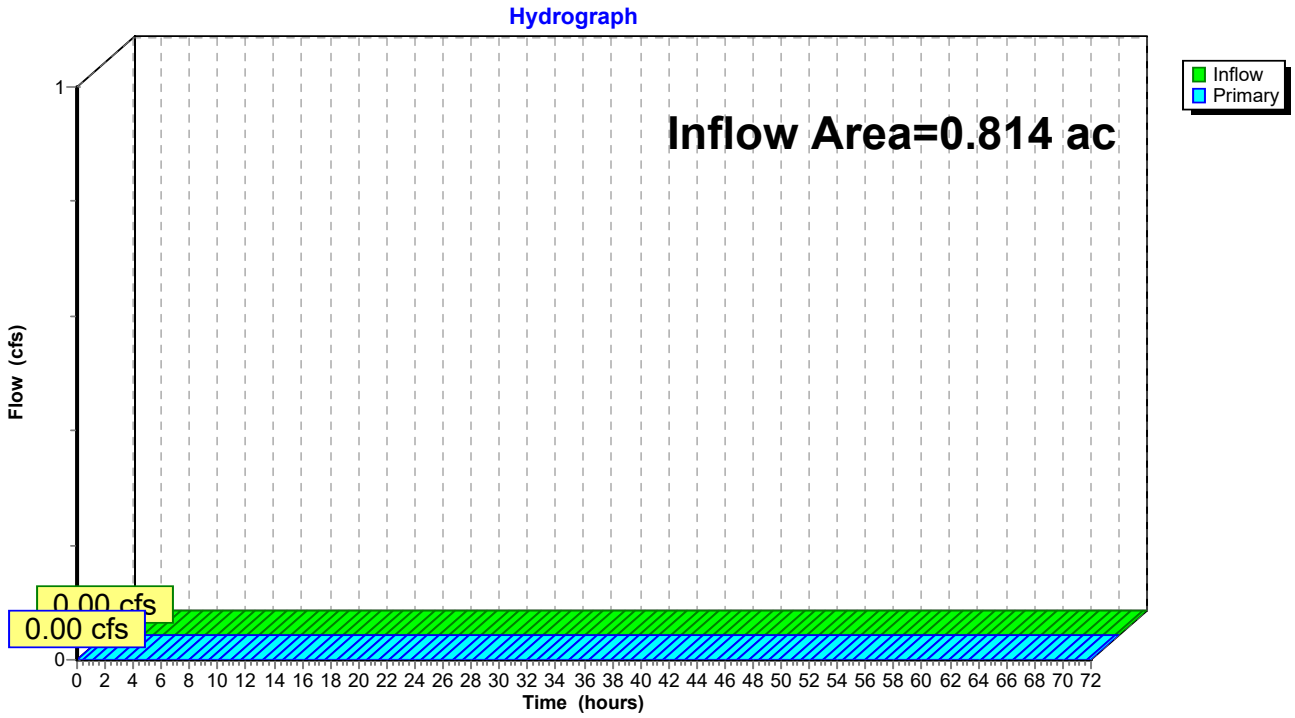
Summary for Pond 1P: FES

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

Inflow Area = 0.814 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Inch event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 1P: FES



Hydrograph for Pond 1P: FES

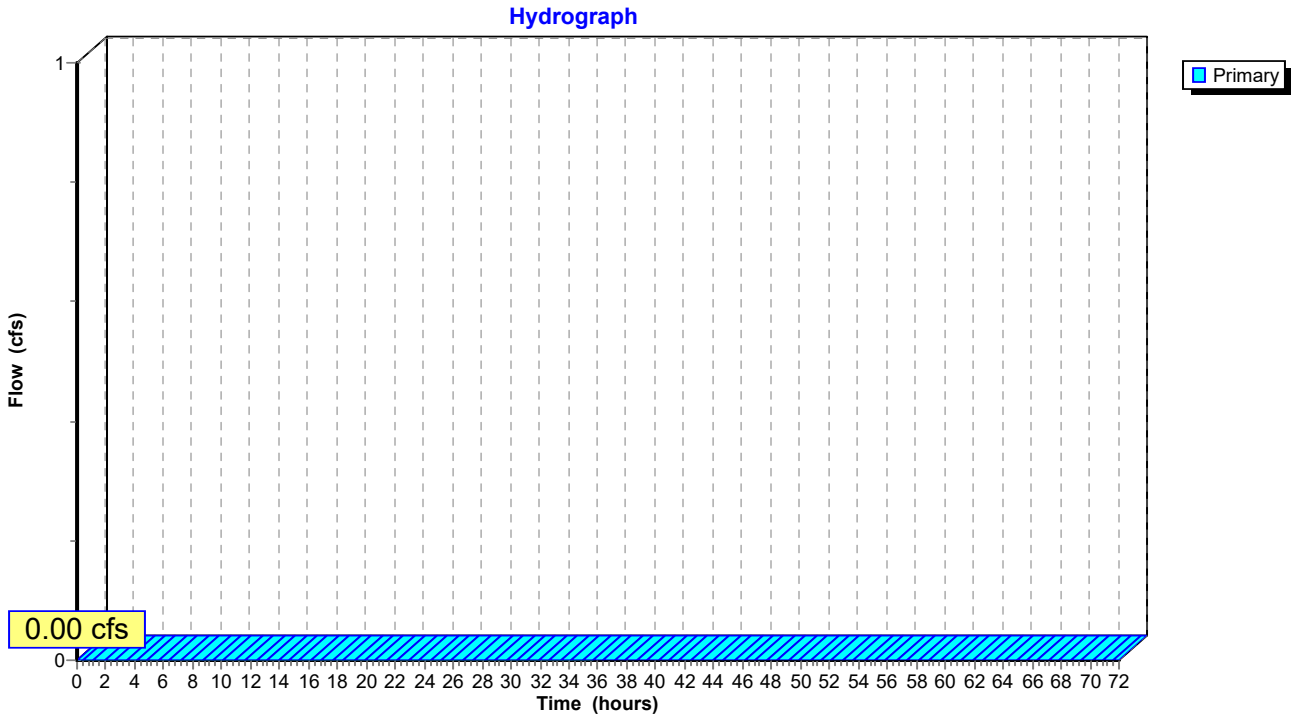
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	**0.00**		**0.00**
1.00	0.00		0.00
2.00	0.00		0.00
3.00	0.00		0.00
4.00	0.00		0.00
5.00	0.00		0.00
6.00	0.00		0.00
7.00	0.00		0.00
8.00	0.00		0.00
9.00	0.00		0.00
10.00	0.00		0.00
11.00	0.00		0.00
12.00	0.00		0.00
13.00	0.00		0.00
14.00	0.00		0.00
15.00	0.00		0.00
16.00	0.00		0.00
17.00	0.00		0.00
18.00	0.00		0.00
19.00	0.00		0.00
20.00	0.00		0.00
21.00	0.00		0.00
22.00	0.00		0.00
23.00	0.00		0.00
24.00	0.00		0.00
25.00	0.00		0.00
26.00	0.00		0.00
27.00	0.00		0.00
28.00	0.00		0.00
29.00	0.00		0.00
30.00	0.00		0.00
31.00	0.00		0.00
32.00	0.00		0.00
33.00	0.00		0.00
34.00	0.00		0.00
35.00	0.00		0.00
36.00	0.00		0.00
37.00	0.00		0.00
38.00	0.00		0.00
39.00	0.00		0.00
40.00	0.00		0.00
41.00	0.00		0.00
42.00	0.00		0.00
43.00	0.00		0.00
44.00	0.00		0.00
45.00	0.00		0.00
46.00	0.00		0.00
47.00	0.00		0.00
48.00	0.00		0.00
49.00	0.00		0.00
50.00	0.00		0.00
51.00	0.00		0.00
52.00	0.00		0.00
53.00	0.00		0.00
54.00	0.00		0.00
55.00	0.00		0.00
56.00	0.00		0.00
57.00	0.00		0.00
58.00	0.00		0.00
59.00	0.00		0.00
60.00	0.00		0.00
61.00	0.00		0.00
62.00	0.00		0.00
63.00	0.00		0.00
64.00	0.00		0.00
65.00	0.00		0.00
66.00	0.00		0.00
67.00	0.00		0.00
68.00	0.00		0.00
69.00	0.00		0.00
70.00	0.00		0.00
71.00	0.00		0.00
72.00	0.00		0.00

Summary for Pond 2P: FES w/ HEADWALL

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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Pond 2P: FES w/ HEADWALL



Summary for Pond 3P: Permeable Pavement

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=116)

Inflow Area =	0.814 ac,	0.00% Impervious,	Inflow Depth =	0.56"	for 1-Inch event
Inflow =	0.53 cfs @	12.09 hrs,	Volume=	0.038 af	
Outflow =	0.39 cfs @	12.25 hrs,	Volume=	0.038 af,	Atten= 26%, Lag= 9.4 min
Discarded =	0.39 cfs @	12.25 hrs,	Volume=	0.038 af	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 122.85' @ 12.17 hrs Surf.Area= 32,578 sf Storage= 43 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.5 min (824.5 - 824.0)

Volume	Invert	Avail.Storage	Storage Description
#1	122.85'	11,044 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

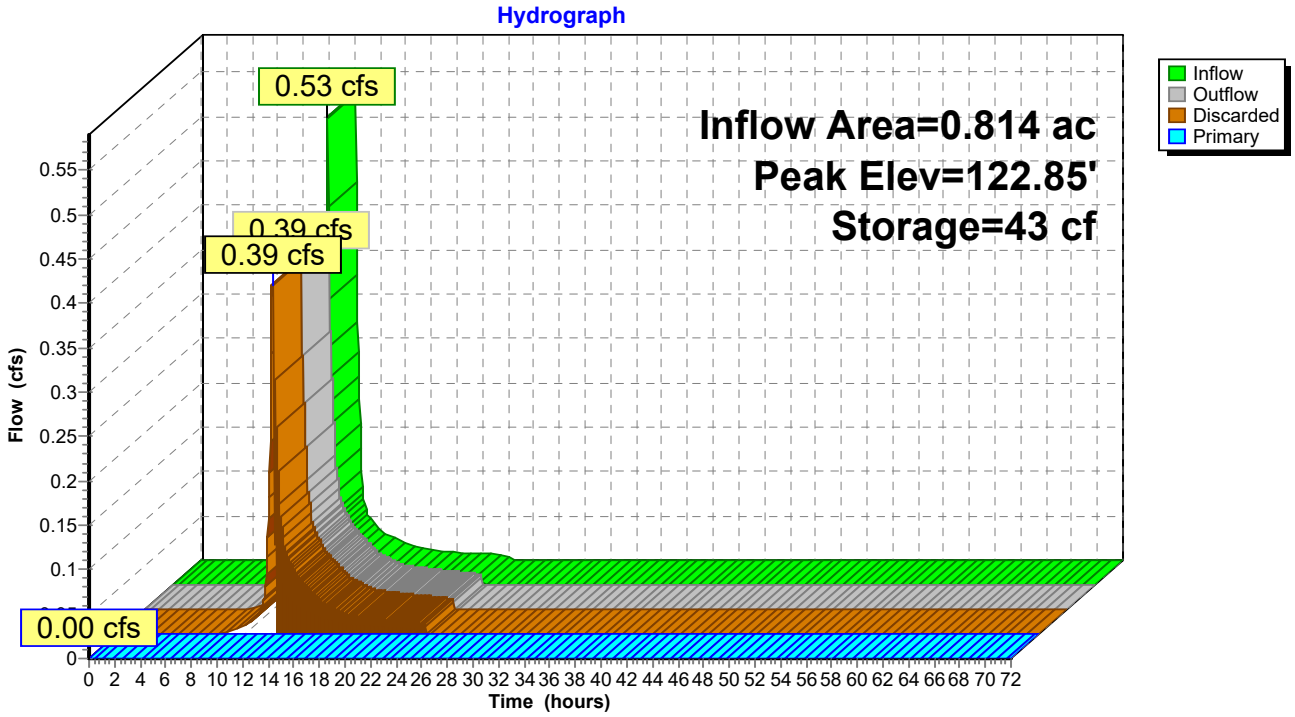
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
122.85	32,578	0.0	0	0
123.51	32,578	40.0	8,601	8,601
123.76	32,578	30.0	2,443	11,044

Device	Routing	Invert	Outlet Devices
#1	Discarded	122.85'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	123.01'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.01' / 122.90' S= 0.0055 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

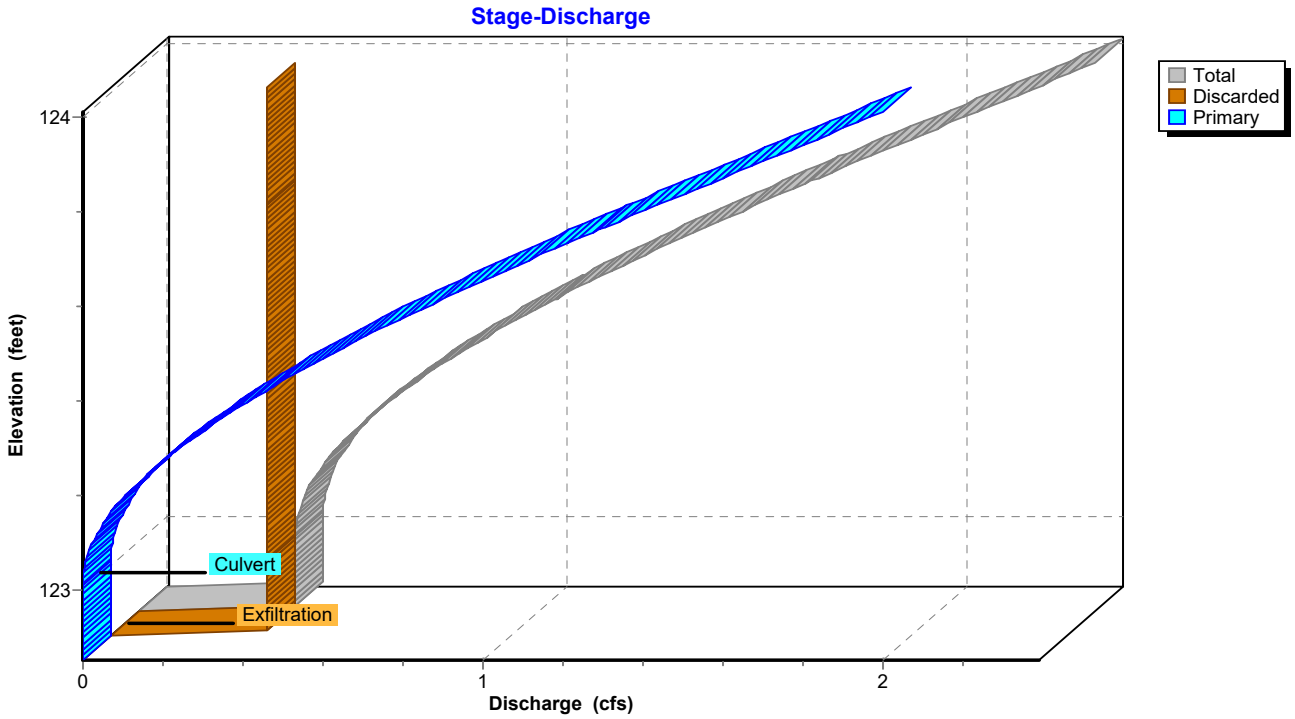
Discarded OutFlow Max=0.39 cfs @ 12.25 hrs HW=122.85' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=122.85' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.00 cfs)

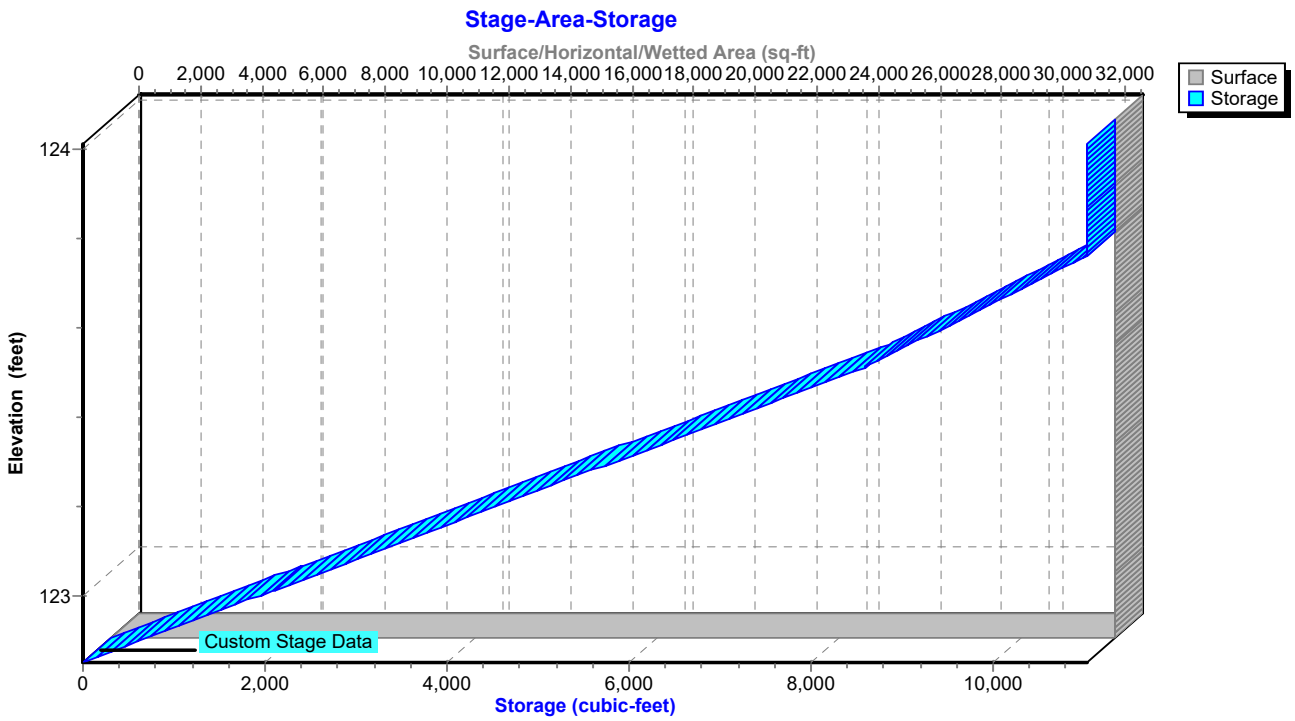
Pond 3P: Permeable Pavement



Pond 3P: Permeable Pavement



Pond 3P: Permeable Pavement



Hydrograph for Pond 3P: Permeable Pavement

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	122.85	0.00	0.00	**0.00**
2.50	0.00	0	122.85	0.00	0.00	0.00
5.00	0.00	0	122.85	0.00	0.00	0.00
7.50	0.00	0	122.85	0.00	0.00	0.00
10.00	**0.01**	**0**	**122.85**	**0.01**	**0.01**	0.00
12.50	**0.13**	**0**	**122.85**	**0.23**	**0.23**	0.00
15.00	0.03	0	122.85	0.05	0.05	0.00
17.50	0.01	0	122.85	0.03	0.03	0.00
20.00	0.01	0	122.85	0.02	0.02	0.00
22.50	0.01	0	122.85	0.01	0.01	0.00
25.00	0.00	0	122.85	0.00	0.00	0.00
27.50	0.00	0	122.85	0.00	0.00	0.00
30.00	0.00	0	122.85	0.00	0.00	0.00
32.50	0.00	0	122.85	0.00	0.00	0.00
35.00	0.00	0	122.85	0.00	0.00	0.00
37.50	0.00	0	122.85	0.00	0.00	0.00
40.00	0.00	0	122.85	0.00	0.00	0.00
42.50	0.00	0	122.85	0.00	0.00	0.00
45.00	0.00	0	122.85	0.00	0.00	0.00
47.50	0.00	0	122.85	0.00	0.00	0.00
50.00	0.00	0	122.85	0.00	0.00	0.00
52.50	0.00	0	122.85	0.00	0.00	0.00
55.00	0.00	0	122.85	0.00	0.00	0.00
57.50	0.00	0	122.85	0.00	0.00	0.00
60.00	0.00	0	122.85	0.00	0.00	0.00
62.50	0.00	0	122.85	0.00	0.00	0.00
65.00	0.00	0	122.85	0.00	0.00	0.00
67.50	0.00	0	122.85	0.00	0.00	0.00
70.00	0.00	0	122.85	0.00	0.00	0.00

Stage-Discharge for Pond 3P: Permeable Pavement

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
122.85	0.00	**0.00**	0.00
122.87	0.39	**0.39**	0.00
122.89	0.39	0.39	0.00
122.91	0.39	0.39	0.00
122.93	0.39	0.39	0.00
122.95	0.39	0.39	0.00
122.97	0.39	0.39	0.00
122.99	0.39	0.39	0.00
123.01	0.39	0.39	0.00
123.03	0.39	0.39	0.00
123.05	0.40	0.39	0.00
123.07	0.40	0.39	0.01
123.09	0.41	0.39	0.02
123.11	0.42	0.39	0.03
123.13	0.44	0.39	0.04
123.15	0.45	0.39	0.06
123.17	0.47	0.39	0.08
123.19	0.49	0.39	0.10
123.21	0.51	0.39	0.12
123.23	0.54	0.39	0.14
123.25	0.56	0.39	0.17
123.27	0.59	0.39	0.20
123.29	0.62	0.39	0.23
123.31	0.65	0.39	0.26
123.33	0.68	0.39	0.29
123.35	0.72	0.39	0.32
123.37	0.75	0.39	0.36
123.39	0.79	0.39	0.40
123.41	0.83	0.39	0.44
123.43	0.87	0.39	0.48
123.45	0.91	0.39	0.52
123.47	0.95	0.39	0.56
123.49	1.00	0.39	0.60
123.51	1.04	0.39	0.65
123.53	1.09	0.39	0.69
123.55	1.13	0.39	0.74
123.57	1.18	0.39	0.79
123.59	1.23	0.39	0.84
123.61	1.28	0.39	0.89
123.63	1.33	0.39	0.94
123.65	1.38	0.39	0.99
123.67	1.44	0.39	1.04
123.69	1.49	0.39	1.10
123.71	1.54	0.39	1.15
123.73	1.60	0.39	1.21
123.75	1.65	0.39	1.26
123.77	1.71	0.39	1.32
123.79	1.77	0.39	1.37
123.81	1.82	0.39	1.43
123.83	1.88	0.39	1.49
123.85	1.94	0.39	1.54
123.87	1.99	0.39	1.60
123.89	2.05	0.39	1.66
123.91	2.11	0.39	1.71
123.93	2.16	0.39	1.77
123.95	2.22	0.39	1.83
123.97	2.28	0.39	1.89
123.99	2.33	0.39	1.94
124.01	**2.39**	0.39	**2.00**

Stage-Area-Storage for Pond 3P: Permeable Pavement

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
122.85	**32,578**	0
122.87	32,578	261
122.89	32,578	521
122.91	32,578	782
122.93	32,578	1,042
122.95	32,578	1,303
122.97	32,578	1,564
122.99	32,578	1,824
123.01	32,578	2,085
123.03	32,578	2,346
123.05	32,578	2,606
123.07	32,578	2,867
123.09	32,578	3,127
123.11	32,578	3,388
123.13	32,578	3,649
123.15	32,578	3,909
123.17	32,578	4,170
123.19	32,578	4,431
123.21	32,578	4,691
123.23	32,578	4,952
123.25	32,578	5,212
123.27	32,578	5,473
123.29	32,578	5,734
123.31	32,578	5,994
123.33	32,578	6,255
123.35	32,578	6,516
123.37	32,578	6,776
123.39	32,578	7,037
123.41	32,578	7,297
123.43	32,578	7,558
123.45	32,578	7,819
123.47	32,578	8,079
123.49	32,578	8,340
123.51	32,578	8,601
123.53	32,578	8,796
123.55	32,578	8,992
123.57	32,578	9,187
123.59	32,578	9,382
123.61	32,578	9,578
123.63	32,578	9,773
123.65	32,578	9,969
123.67	32,578	10,164
123.69	32,578	10,360
123.71	32,578	10,555
123.73	32,578	10,751
123.75	32,578	**10,946**
123.77	32,578	**11,044**
123.79	32,578	11,044
123.81	32,578	11,044
123.83	32,578	11,044
123.85	32,578	11,044
123.87	32,578	11,044
123.89	32,578	11,044
123.91	32,578	11,044
123.93	32,578	11,044
123.95	32,578	11,044
123.97	32,578	11,044
123.99	32,578	11,044
124.01	32,578	11,044

Summary for Pond UG-1: RETAIN_IT

Inflow Area = 2.219 ac, 85.49% Impervious, Inflow Depth = 0.45" for 1-Inch event
Inflow = 1.14 cfs @ 12.10 hrs, Volume= 0.083 af
Outflow = 0.43 cfs @ 12.39 hrs, Volume= 0.083 af, Atten= 63%, Lag= 17.8 min
Primary = 0.43 cfs @ 12.39 hrs, Volume= 0.083 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.06' @ 12.39 hrs Surf.Area= 3,444 sf Storage= 1,153 cf

Plug-Flow detention time= 94.4 min calculated for 0.083 af (100% of inflow)
Center-of-Mass det. time= 93.5 min (934.4 - 840.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	122.40'	1,095 cf	**42.00'W x 82.00'L x 4.67'H Field A** 16,072 cf Overall - 13,333 cf Embedded = 2,739 cf x 40.0% Voids
#2A	122.90'	9,855 cf	**retain_it retain_it 3.5'** x 50 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 5 Rows adjusted for 184.2 cf perimeter wall
		10,950 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	122.40'	**15.0" Round Culvert** L= 212.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 122.40' / 121.25' S= 0.0054 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.23 sf
#2	Device 1	122.40'	**2.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	122.90'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.43 cfs @ 12.39 hrs HW=123.06' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.43 cfs of 1.43 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.12 cfs @ 3.59 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.30 cfs @ 1.30 fps)

Pond UG-1: RETAIN_IT - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it®)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
5 Rows adjusted for 184.2 cf perimeter wall

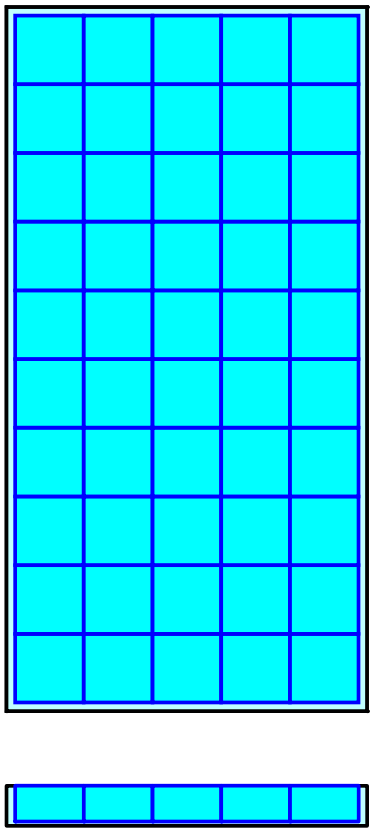
10 Chambers/Row x 8.00' Long = 80.00' Row Length +12.0" End Stone x 2 = 82.00' Base Length
5 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 42.00' Base Width
6.0" Base + 50.0" Chamber Height = 4.67' Field Height

6.1 cf Sidewall x 10 x 2 + 6.1 cf Endwall x 5 x 2 = 184.2 cf Perimeter Wall
50 Chambers x 200.8 cf - 184.2 cf Perimeter wall = 9,854.8 cf Chamber Storage
50 Chambers x 266.7 cf = 13,333.3 cf Displacement

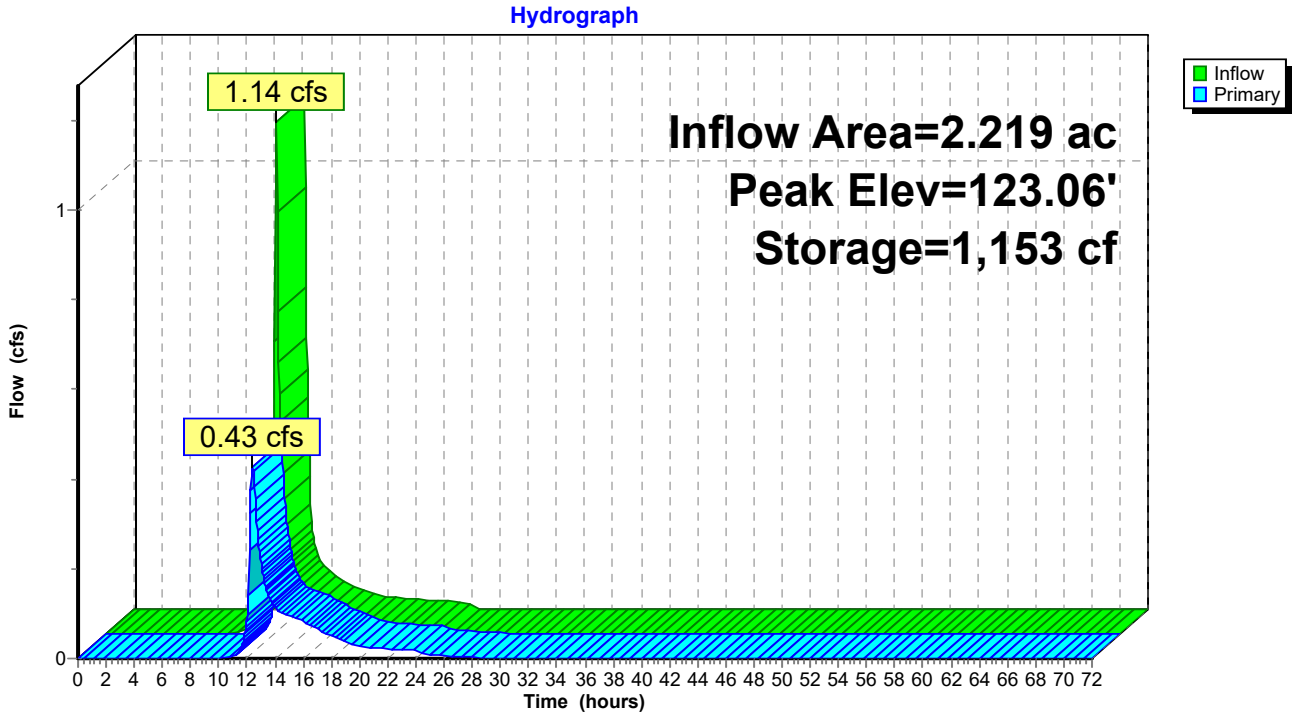
16,072.0 cf Field - 13,333.3 cf Chambers = 2,738.7 cf Stone x 40.0% Voids = 1,095.5 cf Stone Storage

Chamber Storage + Stone Storage = 10,950.3 cf = 0.251 af
Overall Storage Efficiency = 68.1%
Overall System Size = 82.00' x 42.00' x 4.67'

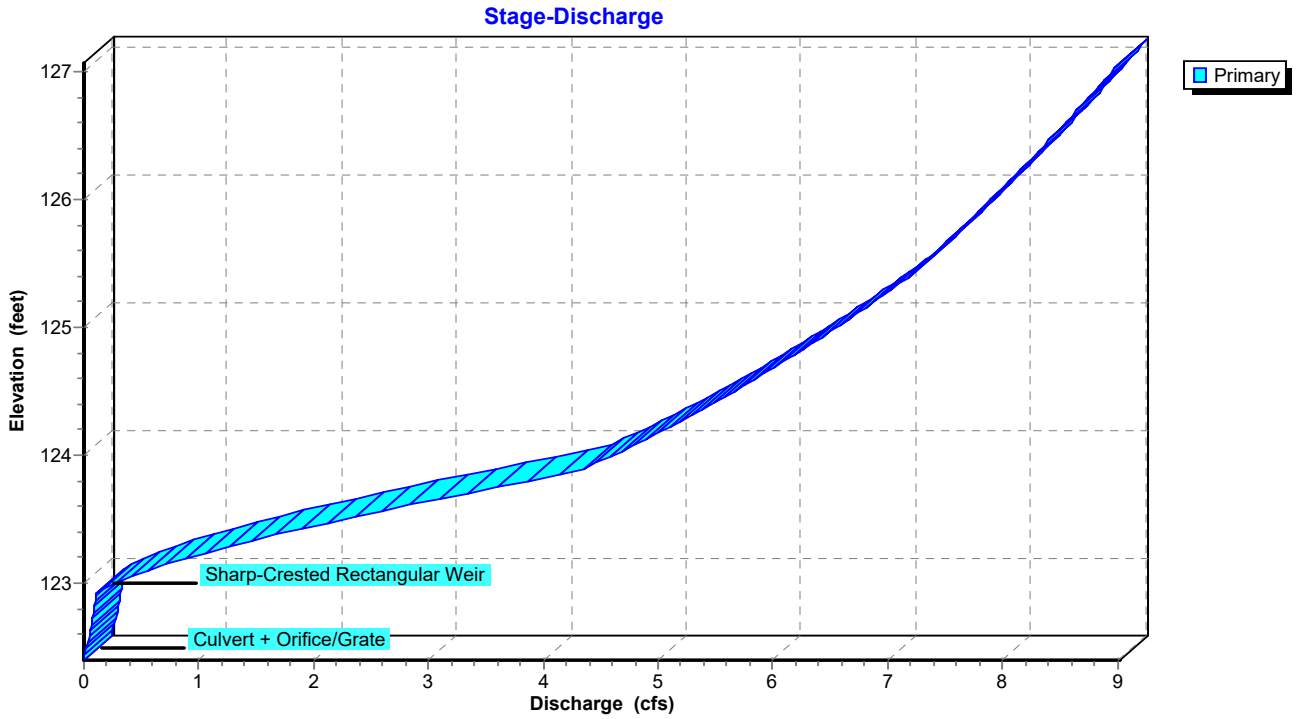
50 Chambers
595.3 cy Field
101.4 cy Stone



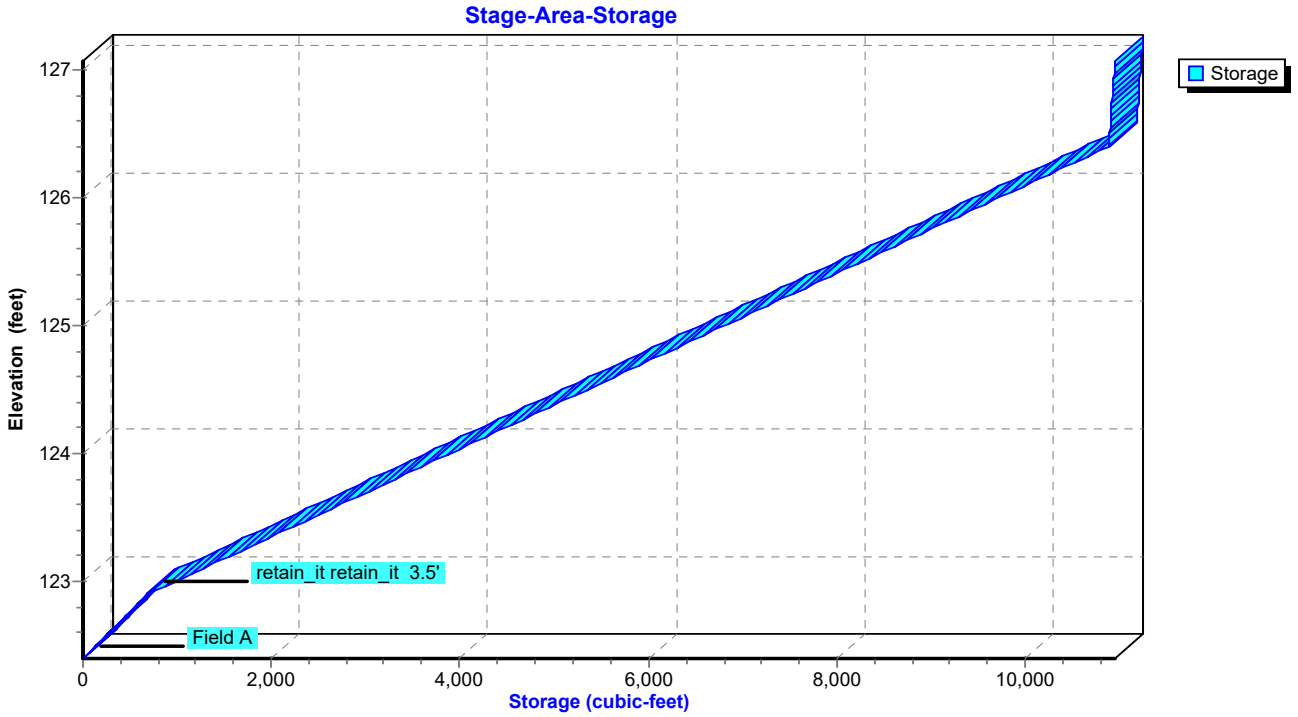
Pond UG-1: RETAIN_IT



Pond UG-1: RETAIN_IT



Pond UG-1: RETAIN_IT



Hydrograph for Pond UG-1: RETAIN_IT

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	122.40	0.00
2.50	0.00	0	122.40	0.00
5.00	0.00	0	122.40	0.00
7.50	0.00	0	122.40	0.00
10.00	**0.01**	**12**	**122.41**	**0.00**
12.50	**0.30**	**1,130**	**123.05**	**0.40**
15.00	0.06	619	122.85	0.10
17.50	0.03	317	122.63	0.06
20.00	0.02	183	122.53	0.03
22.50	0.02	151	122.51	0.02
25.00	0.00	96	122.47	0.01
27.50	0.00	51	122.44	0.00
30.00	0.00	35	122.43	0.00
32.50	0.00	26	122.42	0.00
35.00	0.00	21	122.42	0.00
37.50	0.00	17	122.41	0.00
40.00	0.00	15	122.41	0.00
42.50	0.00	13	122.41	0.00
45.00	0.00	12	122.41	0.00
47.50	0.00	10	122.41	0.00
50.00	0.00	9	122.41	0.00
52.50	0.00	9	122.41	0.00
55.00	0.00	8	122.41	0.00
57.50	0.00	7	122.41	0.00
60.00	0.00	7	122.41	0.00
62.50	0.00	6	122.40	0.00
65.00	0.00	6	122.40	0.00
67.50	0.00	6	122.40	0.00
70.00	0.00	5	122.40	0.00

Stage-Discharge for Pond UG-1: RETAIN_IT

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
122.40	0.00	125.05	6.64
122.45	0.00	125.10	6.72
122.50	0.02	125.15	6.80
122.55	0.03	125.20	6.88
122.60	0.05	125.25	6.96
122.65	0.06	125.30	7.04
122.70	0.07	125.35	7.11
122.75	0.08	125.40	7.19
122.80	0.09	125.45	7.25
122.85	0.10	125.50	7.31
122.90	0.10	125.55	7.37
122.95	0.16	125.60	7.43
123.00	0.27	125.65	7.49
123.05	0.40	125.70	7.55
123.10	0.55	125.75	7.61
123.15	0.72	125.80	7.67
123.20	0.91	125.85	7.73
123.25	1.11	125.90	7.79
123.30	1.32	125.95	7.84
123.35	1.54	126.00	7.90
123.40	1.77	126.05	7.96
123.45	2.01	126.10	8.01
123.50	2.26	126.15	8.07
123.55	2.52	126.20	8.12
123.60	2.78	126.25	8.18
123.65	3.04	126.30	8.23
123.70	3.31	126.35	8.29
123.75	3.59	126.40	8.34
123.80	3.87	126.45	8.39
123.85	4.16	126.50	8.45
123.90	4.36	126.55	8.50
123.95	4.49	126.60	8.55
124.00	4.61	126.65	8.60
124.05	4.72	126.70	8.65
124.10	4.84	126.75	8.70
124.15	4.95	126.80	8.76
124.20	5.06	126.85	8.81
124.25	5.16	126.90	8.86
124.30	5.27	126.95	8.91
124.35	5.37	127.00	8.96
124.40	5.47	127.05	**9.01**
124.45	5.57		
124.50	5.67		
124.55	5.76		
124.60	5.85		
124.65	5.95		
124.70	6.04		
124.75	6.13		
124.80	6.21		
124.85	6.30		
124.90	6.39		
124.95	6.47		
125.00	6.56		

Stage-Area-Storage for Pond UG-1: RETAIN_IT

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
122.40	0	125.05	6,952
122.45	69	125.10	7,098
122.50	138	125.15	7,244
122.55	207	125.20	7,389
122.60	276	125.25	7,535
122.65	344	125.30	7,681
122.70	413	125.35	7,826
122.75	482	125.40	7,972
122.80	551	125.45	8,118
122.85	620	125.50	8,263
122.90	689	125.55	8,409
122.95	834	125.60	8,555
123.00	980	125.65	8,700
123.05	1,126	125.70	8,846
123.10	1,271	125.75	8,992
123.15	1,417	125.80	9,137
123.20	1,563	125.85	9,283
123.25	1,708	125.90	9,429
123.30	1,854	125.95	9,574
123.35	2,000	126.00	9,720
123.40	2,145	126.05	9,866
123.45	2,291	126.10	10,011
123.50	2,437	126.15	10,157
123.55	2,582	126.20	10,303
123.60	2,728	126.25	10,448
123.65	2,874	126.30	10,594
123.70	3,019	126.35	10,740
123.75	3,165	126.40	10,885
123.80	3,311	126.45	10,890
123.85	3,456	126.50	10,895
123.90	3,602	126.55	10,900
123.95	3,748	126.60	10,905
124.00	3,893	126.65	10,910
124.05	4,039	126.70	10,915
124.10	4,185	126.75	10,919
124.15	4,330	126.80	10,924
124.20	4,476	126.85	10,929
124.25	4,622	126.90	10,934
124.30	4,767	126.95	10,939
124.35	4,913	127.00	10,944
124.40	5,059	127.05	**10,949**
124.45	5,204		
124.50	5,350		
124.55	5,496		
124.60	5,641		
124.65	5,787		
124.70	5,933		
124.75	6,078		
124.80	6,224		
124.85	6,370		
124.90	6,515		
124.95	6,661		
125.00	6,807		

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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

Subcatchment P-1A: P-1A Runoff Area=96,664 sf 85.49% Impervious Runoff Depth=1.85"
Tc=6.0 min CN=93 Runoff=4.63 cfs 0.343 af

Subcatchment P-1B: P-1B (PERMEABLE Runoff Area=35,462 sf 0.00% Impervious Runoff Depth=2.04"
Tc=6.0 min CN=95 Runoff=1.83 cfs 0.138 af

Subcatchment P-1U: P-1U (UNDETAINED) Runoff Area=13,343 sf 0.00% Impervious Runoff Depth=0.15"
Tc=6.0 min CN=58 Runoff=0.02 cfs 0.004 af

Subcatchment P-2: P-2 Runoff Area=5,081 sf 46.53% Impervious Runoff Depth=0.84"
Tc=6.0 min CN=78 Runoff=0.11 cfs 0.008 af

Reach PD1: WETLAND Inflow=3.13 cfs 0.347 af
Outflow=3.13 cfs 0.347 af

Reach PD2: BOSTON POST RD Inflow=0.11 cfs 0.008 af
Outflow=0.11 cfs 0.008 af

Pond 1P: FES Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Pond 2P: FES w/ HEADWALL
Primary=0.00 cfs 0.000 af

Pond 3P: Permeable Pavement Peak Elev=122.96' Storage=1,400 cf Inflow=1.83 cfs 0.138 af
Discarded=0.39 cfs 0.139 af Primary=0.00 cfs 0.000 af Outflow=0.39 cfs 0.139 af

Pond UG-1: RETAIN_IT Peak Elev=123.67' Storage=2,919 cf Inflow=4.63 cfs 0.343 af
Outflow=3.13 cfs 0.343 af

Total Runoff Area = 3.456 ac Runoff Volume = 0.494 af Average Runoff Depth = 1.71"
43.54% Pervious = 1.505 ac 56.46% Impervious = 1.951 ac

Summary for Subcatchment P-1A: P-1A

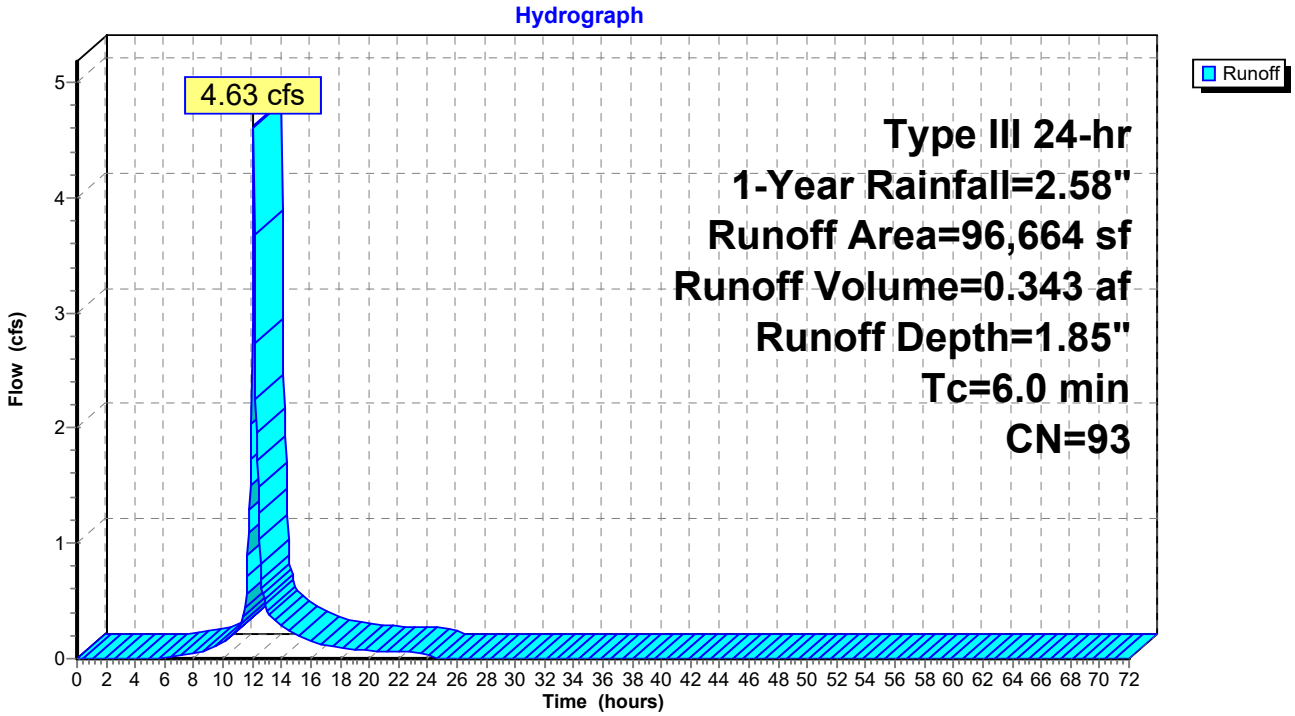
Runoff = 4.63 cfs @ 12.09 hrs, Volume= 0.343 af, Depth= 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.58"

	Area (sf)	CN	Description
*	1,394	61	>75% Grass cover, Good, HSG B- ISLANDS
	75,402	98	Paved parking, HSG B
*	4,922	73	Existing Woods/grass comb., Poor, HSG B
	7,710	58	Woods/grass comb., Good, HSG B
	7,236	98	Unconnected roofs, HSG B
	96,664	93	Weighted Average
	14,026	64	14.51% Pervious Area
	82,638	98	85.49% Impervious Area
	7,236		8.76% Unconnected

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

Subcatchment P-1A: P-1A



Hydrograph for Subcatchment P-1A: P-1A

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.05	0.00	0.00
3.00	0.08	0.00	0.00
4.00	0.11	0.00	0.00
5.00	0.15	0.00	0.00
6.00	0.19	0.00	0.01
7.00	0.23	0.01	0.02
8.00	0.29	0.02	0.04
9.00	0.38	0.05	0.08
10.00	0.49	0.10	0.14
11.00	0.64	0.20	0.26
12.00	1.29	0.69	**2.89**
13.00	1.93	1.26	**0.43**
14.00	2.09	1.40	0.27
15.00	2.20	1.50	0.21
16.00	2.29	1.58	0.15
17.00	2.35	1.64	0.12
18.00	2.39	1.68	0.09
19.00	2.43	1.72	0.08
20.00	2.47	1.75	0.07
21.00	2.50	1.78	0.07
22.00	2.53	1.81	0.06
23.00	2.56	1.83	0.05
24.00	**2.58**	**1.85**	0.05
25.00	2.58	1.85	0.00
26.00	2.58	1.85	0.00
27.00	2.58	1.85	0.00
28.00	2.58	1.85	0.00
29.00	2.58	1.85	0.00
30.00	2.58	1.85	0.00
31.00	2.58	1.85	0.00
32.00	2.58	1.85	0.00
33.00	2.58	1.85	0.00
34.00	2.58	1.85	0.00
35.00	2.58	1.85	0.00
36.00	2.58	1.85	0.00
37.00	2.58	1.85	0.00
38.00	2.58	1.85	0.00
39.00	2.58	1.85	0.00
40.00	2.58	1.85	0.00
41.00	2.58	1.85	0.00
42.00	2.58	1.85	0.00
43.00	2.58	1.85	0.00
44.00	2.58	1.85	0.00
45.00	2.58	1.85	0.00
46.00	2.58	1.85	0.00
47.00	2.58	1.85	0.00
48.00	2.58	1.85	0.00
49.00	2.58	1.85	0.00
50.00	2.58	1.85	0.00
51.00	2.58	1.85	0.00
52.00	2.58	1.85	0.00
53.00	2.58	1.85	0.00
54.00	2.58	1.85	0.00
55.00	2.58	1.85	0.00
56.00	2.58	1.85	0.00
57.00	2.58	1.85	0.00
58.00	2.58	1.85	0.00
59.00	2.58	1.85	0.00
60.00	2.58	1.85	0.00
61.00	2.58	1.85	0.00
62.00	2.58	1.85	0.00
63.00	2.58	1.85	0.00
64.00	2.58	1.85	0.00
65.00	2.58	1.85	0.00
66.00	2.58	1.85	0.00
67.00	2.58	1.85	0.00
68.00	2.58	1.85	0.00
69.00	2.58	1.85	0.00
70.00	2.58	1.85	0.00
71.00	2.58	1.85	0.00
72.00	2.58	1.85	0.00

Summary for Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)

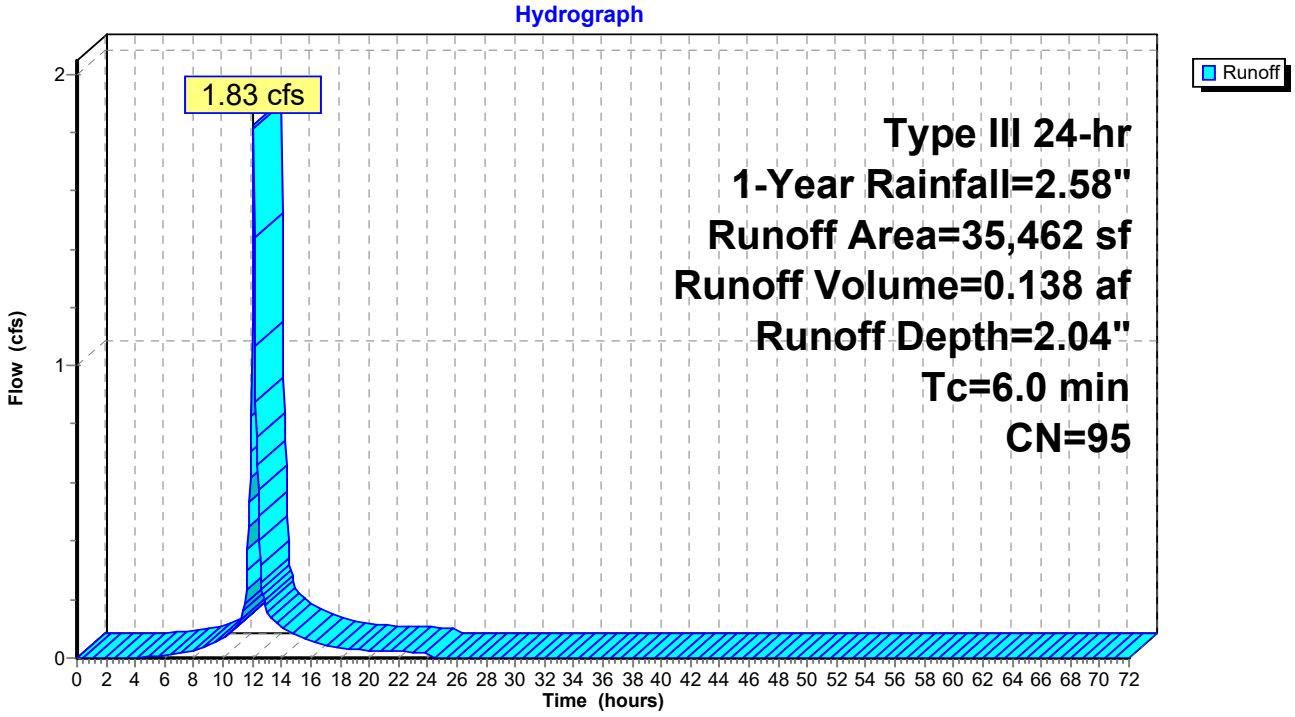
Runoff = 1.83 cfs @ 12.09 hrs, Volume= 0.138 af, Depth= 2.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.58"

	Area (sf)	CN	Description
*	32,606	98	Perm. Pavement, 0% imp, HSG B
	2,856	61	>75% Grass cover, Good, HSG B
	35,462	95	Weighted Average
	35,462	95	100.00% Pervious Area

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

Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)



Hydrograph for Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.05	0.00	0.00
3.00	0.08	0.00	0.00
4.00	0.11	0.00	0.00
5.00	0.15	0.00	0.00
6.00	0.19	0.01	0.01
7.00	0.23	0.03	0.01
8.00	0.29	0.05	0.02
9.00	0.38	0.09	0.04
10.00	0.49	0.16	0.07
11.00	0.64	0.27	0.11
12.00	1.29	0.82	**1.16**
13.00	1.93	1.42	**0.16**
14.00	2.09	1.57	0.10
15.00	2.20	1.68	0.08
16.00	2.29	1.76	0.06
17.00	2.35	1.82	0.04
18.00	2.39	1.86	0.03
19.00	2.43	1.90	0.03
20.00	2.47	1.93	0.03
21.00	2.50	1.96	0.02
22.00	2.53	1.99	0.02
23.00	2.56	2.02	0.02
24.00	**2.58**	**2.04**	0.02
25.00	2.58	2.04	0.00
26.00	2.58	2.04	0.00
27.00	2.58	2.04	0.00
28.00	2.58	2.04	0.00
29.00	2.58	2.04	0.00
30.00	2.58	2.04	0.00
31.00	2.58	2.04	0.00
32.00	2.58	2.04	0.00
33.00	2.58	2.04	0.00
34.00	2.58	2.04	0.00
35.00	2.58	2.04	0.00
36.00	2.58	2.04	0.00
37.00	2.58	2.04	0.00
38.00	2.58	2.04	0.00
39.00	2.58	2.04	0.00
40.00	2.58	2.04	0.00
41.00	2.58	2.04	0.00
42.00	2.58	2.04	0.00
43.00	2.58	2.04	0.00
44.00	2.58	2.04	0.00
45.00	2.58	2.04	0.00
46.00	2.58	2.04	0.00
47.00	2.58	2.04	0.00
48.00	2.58	2.04	0.00
49.00	2.58	2.04	0.00
50.00	2.58	2.04	0.00
51.00	2.58	2.04	0.00
52.00	2.58	2.04	0.00
53.00	2.58	2.04	0.00
54.00	2.58	2.04	0.00
55.00	2.58	2.04	0.00
56.00	2.58	2.04	0.00
57.00	2.58	2.04	0.00
58.00	2.58	2.04	0.00
59.00	2.58	2.04	0.00
60.00	2.58	2.04	0.00
61.00	2.58	2.04	0.00
62.00	2.58	2.04	0.00
63.00	2.58	2.04	0.00
64.00	2.58	2.04	0.00
65.00	2.58	2.04	0.00
66.00	2.58	2.04	0.00
67.00	2.58	2.04	0.00
68.00	2.58	2.04	0.00
69.00	2.58	2.04	0.00
70.00	2.58	2.04	0.00
71.00	2.58	2.04	0.00
72.00	2.58	2.04	0.00

Summary for Subcatchment P-1U: P-1U (UNDETAINED)

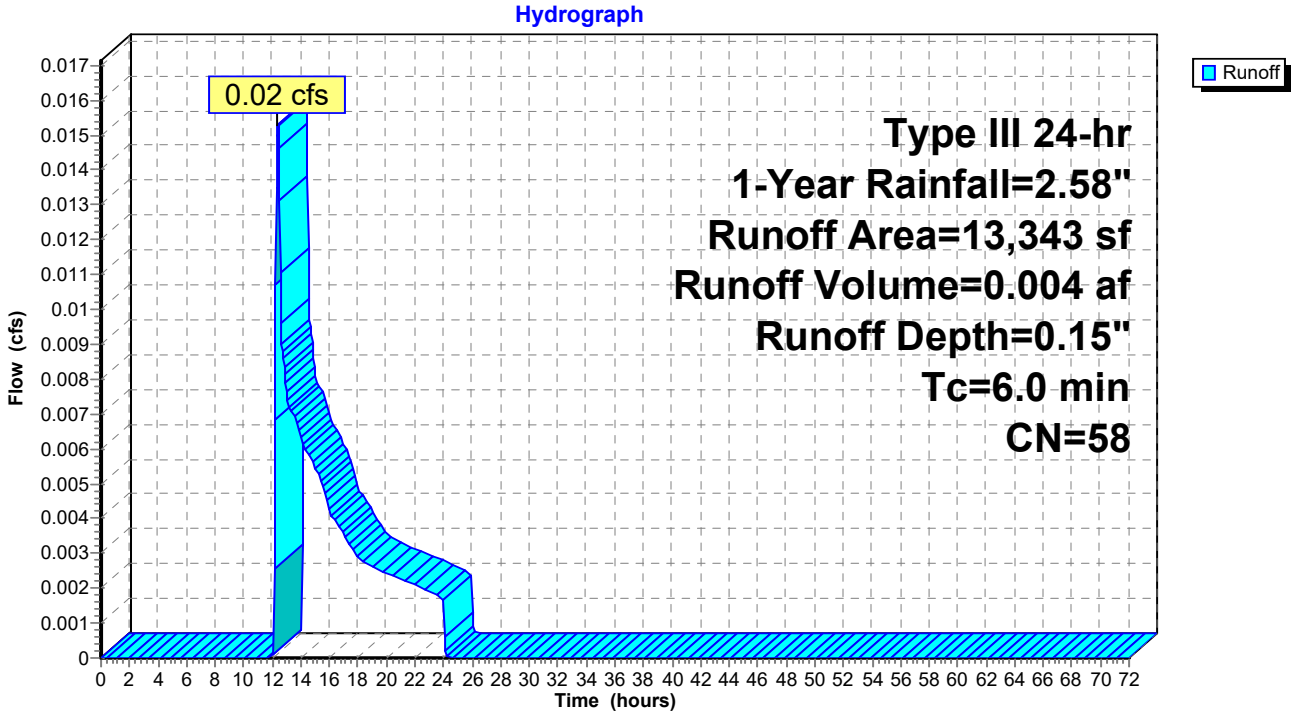
Runoff = 0.02 cfs @ 12.39 hrs, Volume= 0.004 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.58"

Area (sf)	CN	Description
13,343	58	Woods/grass comb., Good, HSG B
13,343	58	100.00% Pervious Area

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

Subcatchment P-1U: P-1U (UNDETAINED)



Hydrograph for Subcatchment P-1U: P-1U (UNDETAINED)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.05	0.00	0.00
3.00	0.08	0.00	0.00
4.00	0.11	0.00	0.00
5.00	0.15	0.00	0.00
6.00	0.19	0.00	0.00
7.00	0.23	0.00	0.00
8.00	0.29	0.00	0.00
9.00	0.38	0.00	0.00
10.00	0.49	0.00	0.00
11.00	0.64	0.00	0.00
12.00	1.29	0.00	**0.00**
13.00	1.93	0.03	**0.01**
14.00	2.09	0.05	0.01
15.00	2.20	0.07	0.01
16.00	2.29	0.09	0.00
17.00	2.35	0.10	0.00
18.00	2.39	0.11	0.00
19.00	2.43	0.12	0.00
20.00	2.47	0.13	0.00
21.00	2.50	0.13	0.00
22.00	2.53	0.14	0.00
23.00	2.56	0.15	0.00
24.00	**2.58**	**0.15**	0.00
25.00	2.58	0.15	0.00
26.00	2.58	0.15	0.00
27.00	2.58	0.15	0.00
28.00	2.58	0.15	0.00
29.00	2.58	0.15	0.00
30.00	2.58	0.15	0.00
31.00	2.58	0.15	0.00
32.00	2.58	0.15	0.00
33.00	2.58	0.15	0.00
34.00	2.58	0.15	0.00
35.00	2.58	0.15	0.00
36.00	2.58	0.15	0.00
37.00	2.58	0.15	0.00
38.00	2.58	0.15	0.00
39.00	2.58	0.15	0.00
40.00	2.58	0.15	0.00
41.00	2.58	0.15	0.00
42.00	2.58	0.15	0.00
43.00	2.58	0.15	0.00
44.00	2.58	0.15	0.00
45.00	2.58	0.15	0.00
46.00	2.58	0.15	0.00
47.00	2.58	0.15	0.00
48.00	2.58	0.15	0.00
49.00	2.58	0.15	0.00
50.00	2.58	0.15	0.00
51.00	2.58	0.15	0.00
52.00	2.58	0.15	0.00
53.00	2.58	0.15	0.00
54.00	2.58	0.15	0.00
55.00	2.58	0.15	0.00
56.00	2.58	0.15	0.00
57.00	2.58	0.15	0.00
58.00	2.58	0.15	0.00
59.00	2.58	0.15	0.00
60.00	2.58	0.15	0.00
61.00	2.58	0.15	0.00
62.00	2.58	0.15	0.00
63.00	2.58	0.15	0.00
64.00	2.58	0.15	0.00
65.00	2.58	0.15	0.00
66.00	2.58	0.15	0.00
67.00	2.58	0.15	0.00
68.00	2.58	0.15	0.00
69.00	2.58	0.15	0.00
70.00	2.58	0.15	0.00
71.00	2.58	0.15	0.00
72.00	2.58	0.15	0.00

Summary for Subcatchment P-2: P-2

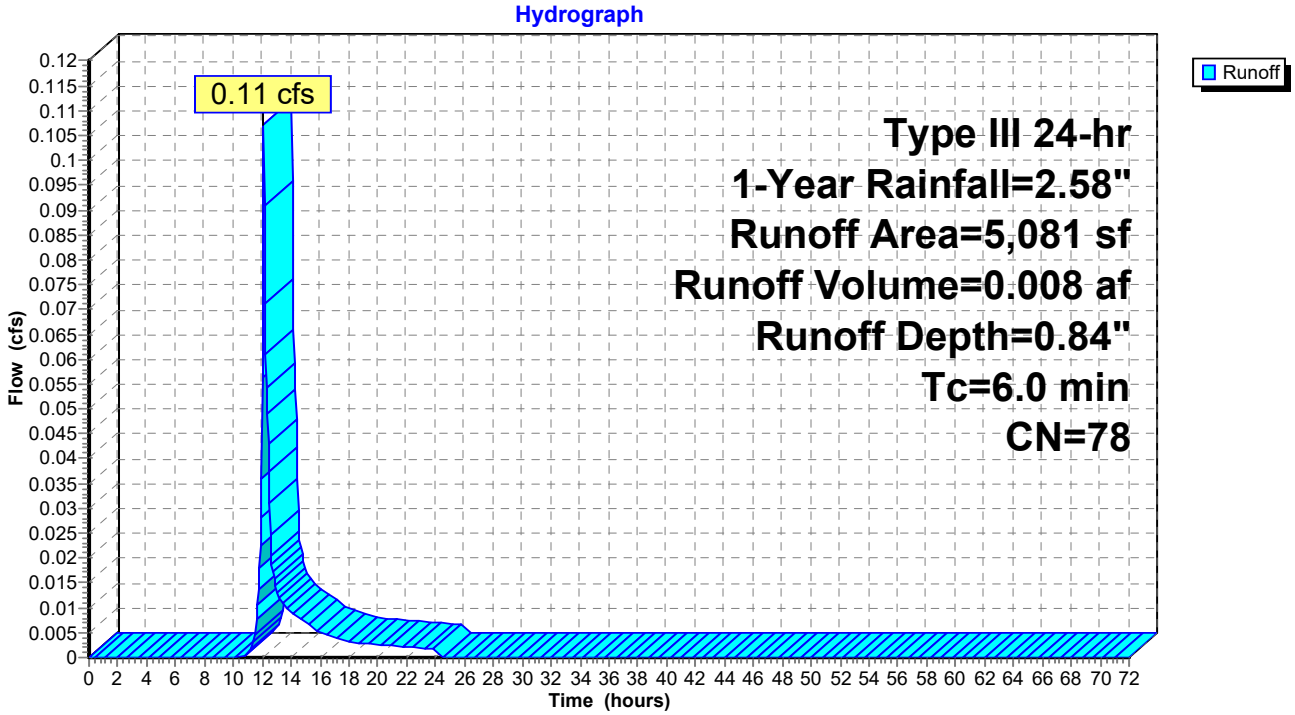
Runoff = 0.11 cfs @ 12.10 hrs, Volume= 0.008 af, Depth= 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.58"

Area (sf)	CN	Description
2,364	98	Paved parking, HSG B
2,717	61	>75% Grass cover, Good, HSG B
5,081	78	Weighted Average
2,717	61	53.47% Pervious Area
2,364	98	46.53% Impervious Area

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

Subcatchment P-2: P-2



Hydrograph for Subcatchment P-2: P-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.05	0.00	0.00
3.00	0.08	0.00	0.00
4.00	0.11	0.00	0.00
5.00	0.15	0.00	0.00
6.00	0.19	0.00	0.00
7.00	0.23	0.00	0.00
8.00	0.29	0.00	0.00
9.00	0.38	0.00	0.00
10.00	0.49	0.00	0.00
11.00	0.64	0.00	0.00
12.00	1.29	0.15	**0.06**
13.00	1.93	0.45	**0.01**
14.00	2.09	0.54	0.01
15.00	2.20	0.60	0.01
16.00	2.29	0.65	0.01
17.00	2.35	0.69	0.00
18.00	2.39	0.72	0.00
19.00	2.43	0.75	0.00
20.00	2.47	0.77	0.00
21.00	2.50	0.79	0.00
22.00	2.53	0.81	0.00
23.00	2.56	0.82	0.00
24.00	**2.58**	**0.84**	0.00
25.00	2.58	0.84	0.00
26.00	2.58	0.84	0.00
27.00	2.58	0.84	0.00
28.00	2.58	0.84	0.00
29.00	2.58	0.84	0.00
30.00	2.58	0.84	0.00
31.00	2.58	0.84	0.00
32.00	2.58	0.84	0.00
33.00	2.58	0.84	0.00
34.00	2.58	0.84	0.00
35.00	2.58	0.84	0.00
36.00	2.58	0.84	0.00
37.00	2.58	0.84	0.00
38.00	2.58	0.84	0.00
39.00	2.58	0.84	0.00
40.00	2.58	0.84	0.00
41.00	2.58	0.84	0.00
42.00	2.58	0.84	0.00
43.00	2.58	0.84	0.00
44.00	2.58	0.84	0.00
45.00	2.58	0.84	0.00
46.00	2.58	0.84	0.00
47.00	2.58	0.84	0.00
48.00	2.58	0.84	0.00
49.00	2.58	0.84	0.00
50.00	2.58	0.84	0.00
51.00	2.58	0.84	0.00
52.00	2.58	0.84	0.00
53.00	2.58	0.84	0.00
54.00	2.58	0.84	0.00
55.00	2.58	0.84	0.00
56.00	2.58	0.84	0.00
57.00	2.58	0.84	0.00
58.00	2.58	0.84	0.00
59.00	2.58	0.84	0.00
60.00	2.58	0.84	0.00
61.00	2.58	0.84	0.00
62.00	2.58	0.84	0.00
63.00	2.58	0.84	0.00
64.00	2.58	0.84	0.00
65.00	2.58	0.84	0.00
66.00	2.58	0.84	0.00
67.00	2.58	0.84	0.00
68.00	2.58	0.84	0.00
69.00	2.58	0.84	0.00
70.00	2.58	0.84	0.00
71.00	2.58	0.84	0.00
72.00	2.58	0.84	0.00

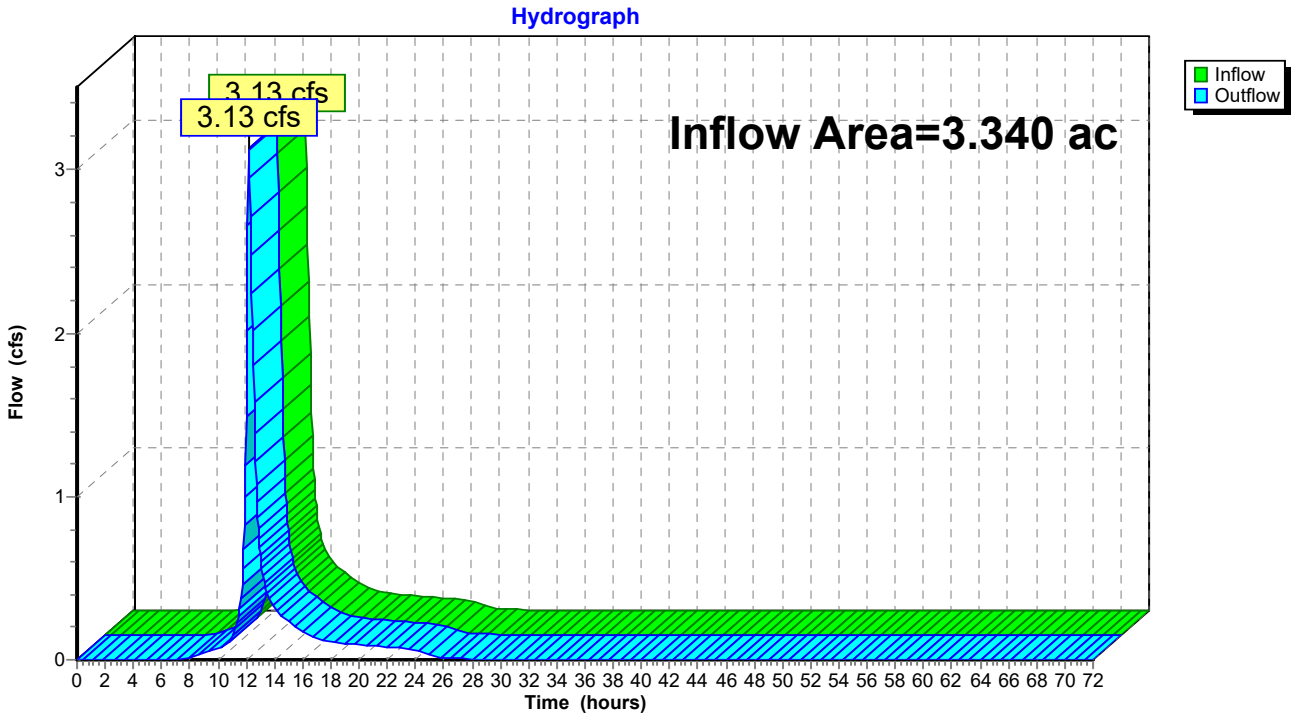
Summary for Reach PD1: WETLAND

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

Inflow Area = 3.340 ac, 56.81% Impervious, Inflow Depth = 1.25" for 1-Year event
Inflow = 3.13 cfs @ 12.18 hrs, Volume= 0.347 af
Outflow = 3.13 cfs @ 12.18 hrs, Volume= 0.347 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD1: WETLAND



Hydrograph for Reach PD1: WETLAND

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.02		0.02	61.00	0.00		0.00
9.00	0.05		0.05	62.00	0.00		0.00
10.00	0.08		0.08	63.00	0.00		0.00
11.00	0.14		0.14	64.00	0.00		0.00
12.00	**1.50**		**1.50**	65.00	0.00		0.00
13.00	**0.64**		**0.64**	66.00	0.00		0.00
14.00	0.32		0.32	67.00	0.00		0.00
15.00	0.23		0.23	68.00	0.00		0.00
16.00	0.18		0.18	69.00	0.00		0.00
17.00	0.14		0.14	70.00	0.00		0.00
18.00	0.11		0.11	71.00	0.00		0.00
19.00	0.10		0.10	72.00	0.00		0.00
20.00	0.09		0.09				
21.00	0.09		0.09				
22.00	0.08		0.08				
23.00	0.07		0.07				
24.00	0.06		0.06				
25.00	0.03		0.03				
26.00	0.01		0.01				
27.00	0.01		0.01				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

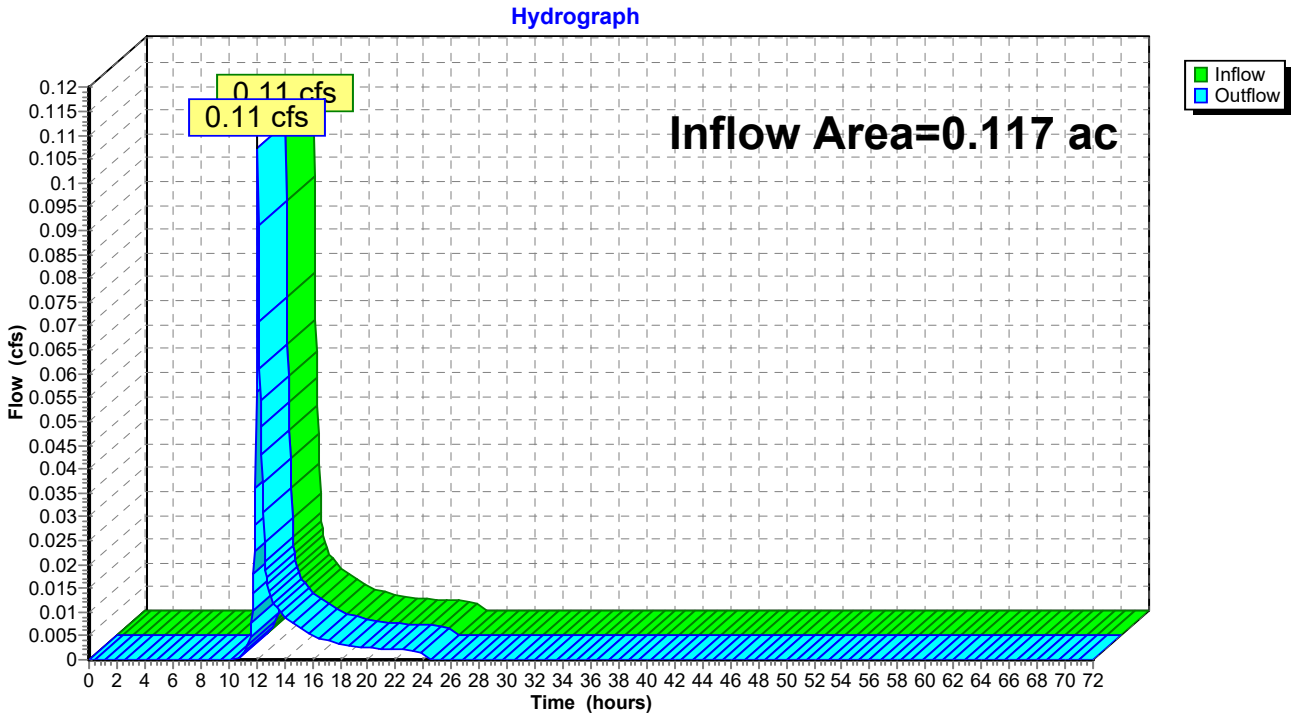
Summary for Reach PD2: BOSTON POST RD

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

Inflow Area = 0.117 ac, 46.53% Impervious, Inflow Depth = 0.84" for 1-Year event
Inflow = 0.11 cfs @ 12.10 hrs, Volume= 0.008 af
Outflow = 0.11 cfs @ 12.10 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD2: BOSTON POST RD



Hydrograph for Reach PD2: BOSTON POST RD

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.00		0.00	64.00	0.00		0.00
12.00	**0.06**		**0.06**	65.00	0.00		0.00
13.00	**0.01**		**0.01**	66.00	0.00		0.00
14.00	0.01		0.01	67.00	0.00		0.00
15.00	0.01		0.01	68.00	0.00		0.00
16.00	0.01		0.01	69.00	0.00		0.00
17.00	0.00		0.00	70.00	0.00		0.00
18.00	0.00		0.00	71.00	0.00		0.00
19.00	0.00		0.00	72.00	0.00		0.00
20.00	0.00		0.00				
21.00	0.00		0.00				
22.00	0.00		0.00				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

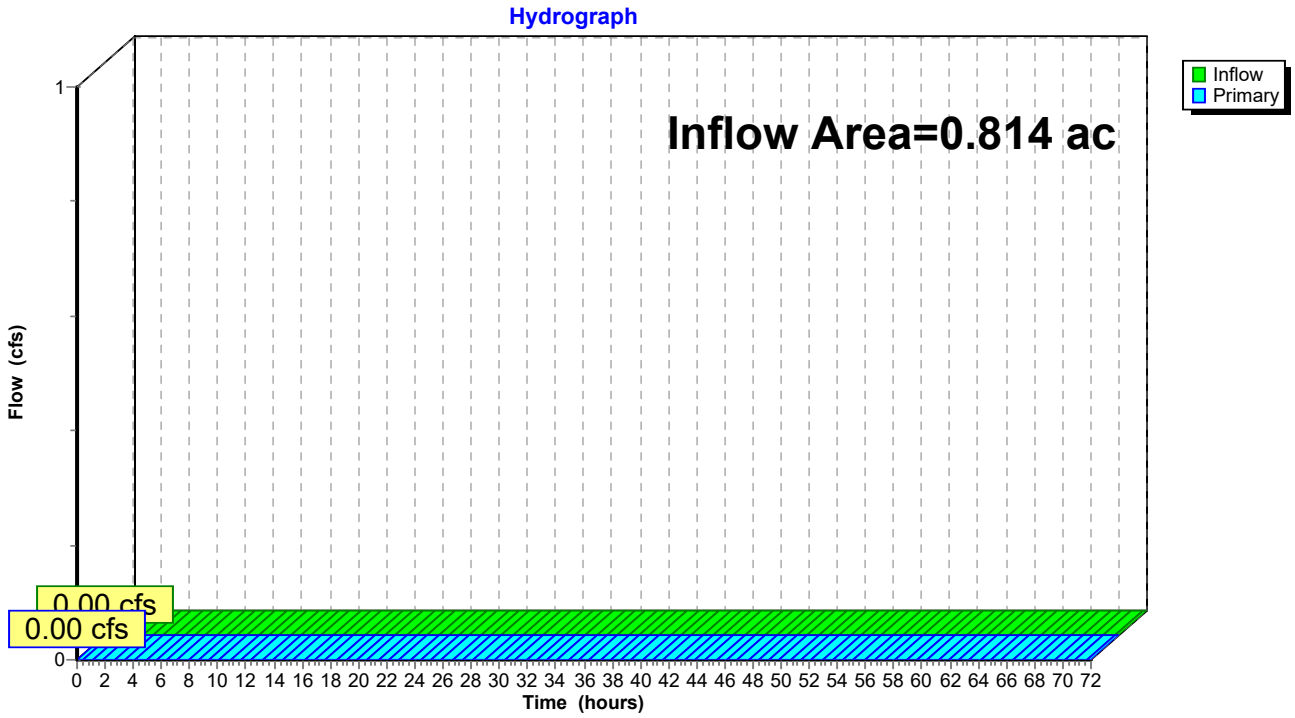
Summary for Pond 1P: FES

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

Inflow Area = 0.814 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 1P: FES



Hydrograph for Pond 1P: FES

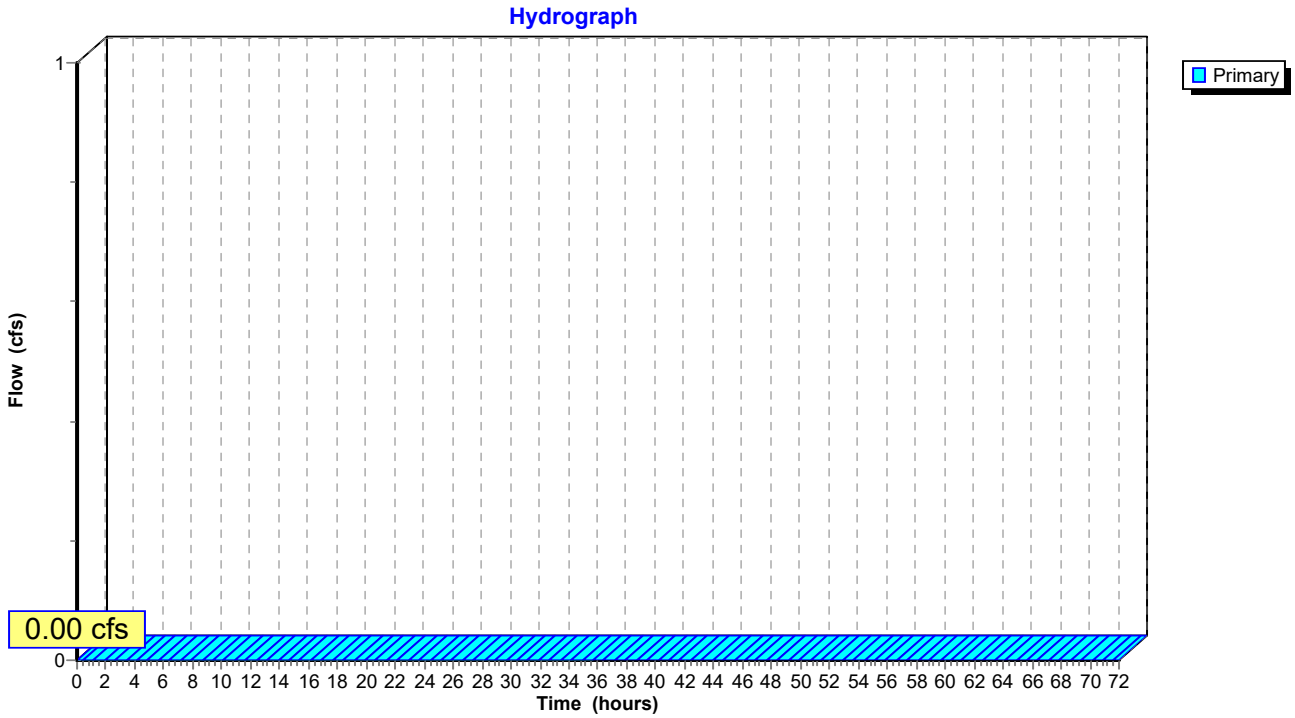
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	**0.00**		**0.00**
1.00	0.00		0.00
2.00	0.00		0.00
3.00	0.00		0.00
4.00	0.00		0.00
5.00	0.00		0.00
6.00	0.00		0.00
7.00	0.00		0.00
8.00	0.00		0.00
9.00	0.00		0.00
10.00	0.00		0.00
11.00	0.00		0.00
12.00	0.00		0.00
13.00	0.00		0.00
14.00	0.00		0.00
15.00	0.00		0.00
16.00	0.00		0.00
17.00	0.00		0.00
18.00	0.00		0.00
19.00	0.00		0.00
20.00	0.00		0.00
21.00	0.00		0.00
22.00	0.00		0.00
23.00	0.00		0.00
24.00	0.00		0.00
25.00	0.00		0.00
26.00	0.00		0.00
27.00	0.00		0.00
28.00	0.00		0.00
29.00	0.00		0.00
30.00	0.00		0.00
31.00	0.00		0.00
32.00	0.00		0.00
33.00	0.00		0.00
34.00	0.00		0.00
35.00	0.00		0.00
36.00	0.00		0.00
37.00	0.00		0.00
38.00	0.00		0.00
39.00	0.00		0.00
40.00	0.00		0.00
41.00	0.00		0.00
42.00	0.00		0.00
43.00	0.00		0.00
44.00	0.00		0.00
45.00	0.00		0.00
46.00	0.00		0.00
47.00	0.00		0.00
48.00	0.00		0.00
49.00	0.00		0.00
50.00	0.00		0.00
51.00	0.00		0.00
52.00	0.00		0.00
53.00	0.00		0.00
54.00	0.00		0.00
55.00	0.00		0.00
56.00	0.00		0.00
57.00	0.00		0.00
58.00	0.00		0.00
59.00	0.00		0.00
60.00	0.00		0.00
61.00	0.00		0.00
62.00	0.00		0.00
63.00	0.00		0.00
64.00	0.00		0.00
65.00	0.00		0.00
66.00	0.00		0.00
67.00	0.00		0.00
68.00	0.00		0.00
69.00	0.00		0.00
70.00	0.00		0.00
71.00	0.00		0.00
72.00	0.00		0.00

Summary for Pond 2P: FES w/ HEADWALL

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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Pond 2P: FES w/ HEADWALL



Summary for Pond 3P: Permeable Pavement

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=98)

Inflow Area =	0.814 ac,	0.00% Impervious,	Inflow Depth =	2.04"	for 1-Year event
Inflow =	1.83 cfs @	12.09 hrs,	Volume=	0.138 af	
Outflow =	0.39 cfs @	11.95 hrs,	Volume=	0.139 af,	Atten= 79%, Lag= 0.0 min
Discarded =	0.39 cfs @	11.95 hrs,	Volume=	0.139 af	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 122.96' @ 12.51 hrs Surf.Area= 32,578 sf Storage= 1,400 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 18.9 min (806.7 - 787.9)

Volume	Invert	Avail.Storage	Storage Description
#1	122.85'	11,044 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

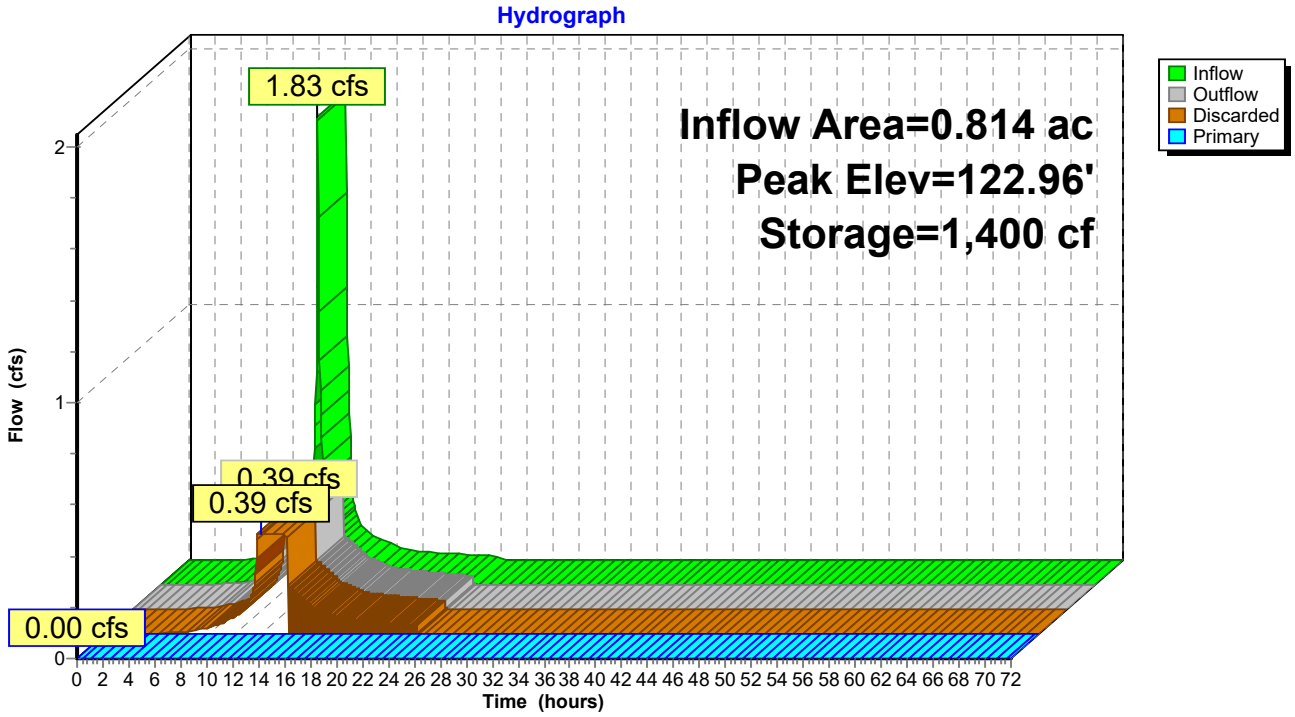
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
122.85	32,578	0.0	0	0
123.51	32,578	40.0	8,601	8,601
123.76	32,578	30.0	2,443	11,044

Device	Routing	Invert	Outlet Devices
#1	Discarded	122.85'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	123.01'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.01' / 122.90' S= 0.0055 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

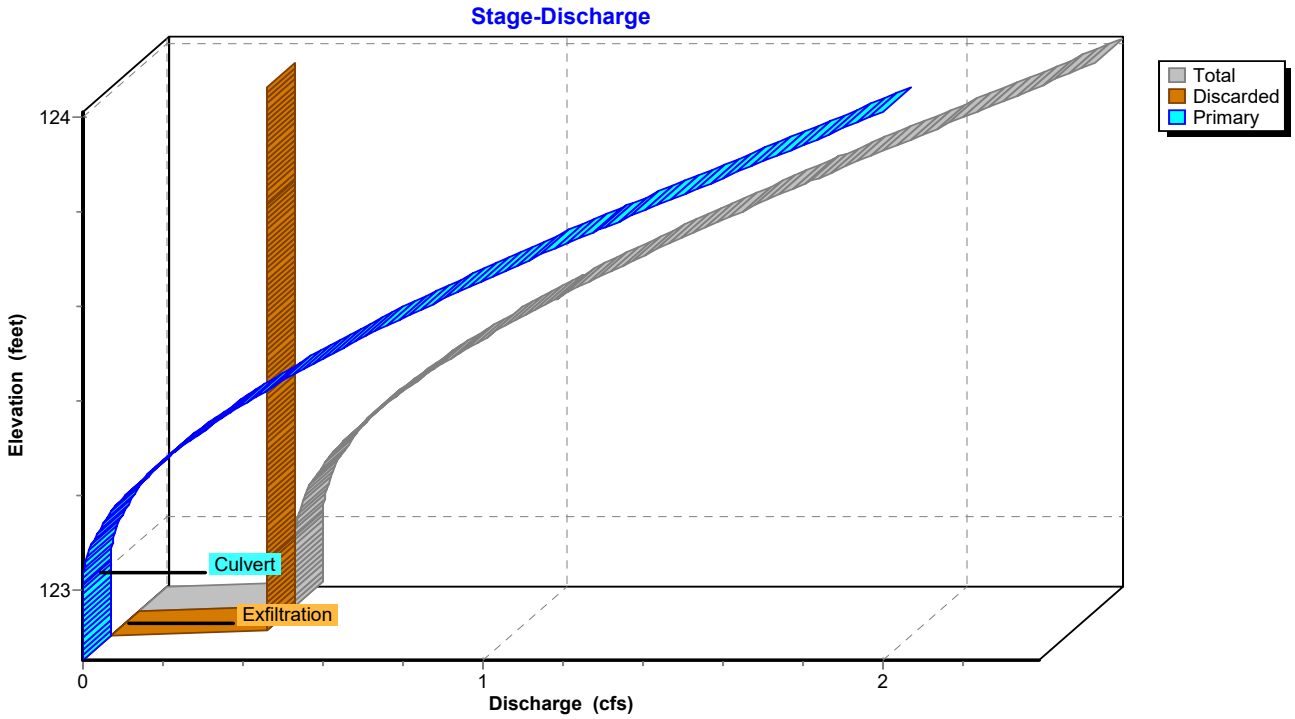
Discarded OutFlow Max=0.39 cfs @ 11.95 hrs HW=122.86' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=122.85' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.00 cfs)

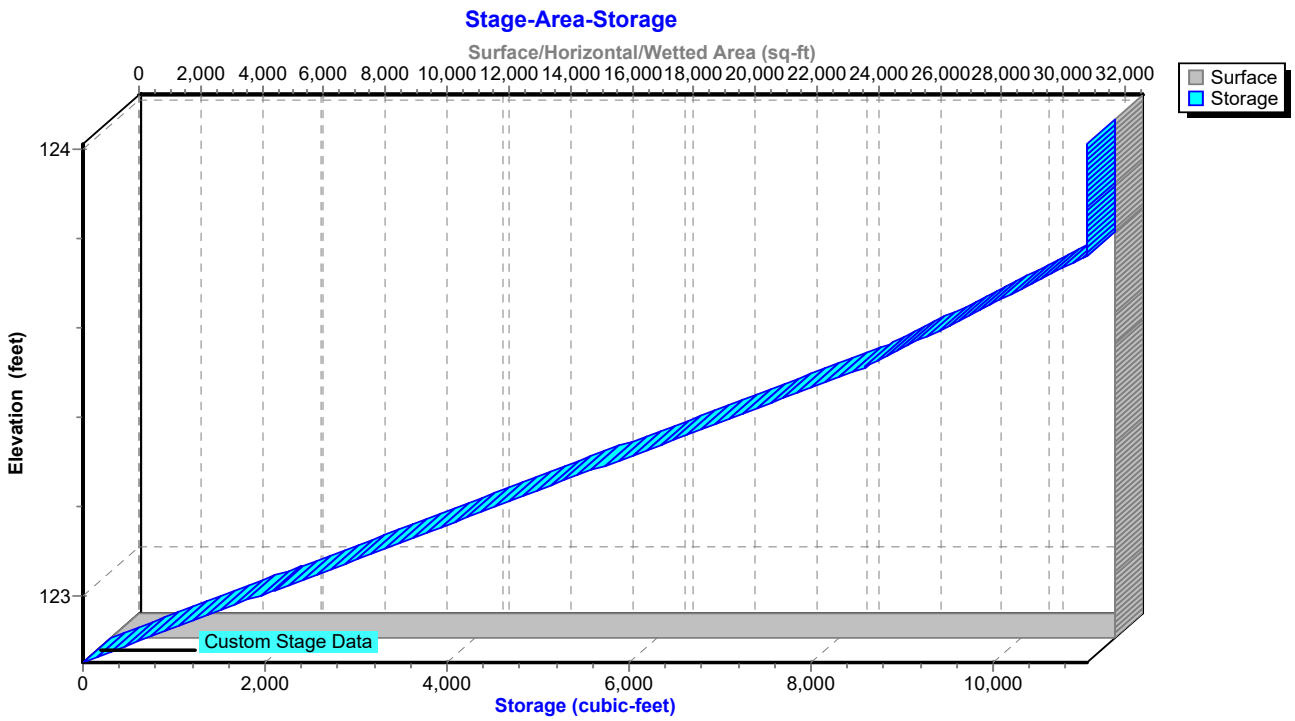
Pond 3P: Permeable Pavement



Pond 3P: Permeable Pavement



Pond 3P: Permeable Pavement



Hydrograph for Pond 3P: Permeable Pavement

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	122.85	0.00	0.00	**0.00**
2.50	0.00	0	122.85	0.00	0.00	0.00
5.00	0.00	0	122.85	0.00	0.00	0.00
7.50	0.02	0	122.85	0.02	0.02	0.00
10.00	**0.07**	0	122.85	**0.07**	**0.07**	0.00
12.50	**0.40**	**1,400**	**122.96**	**0.39**	**0.39**	0.00
15.00	0.08	0	122.85	0.00	0.00	0.00
17.50	0.04	0	122.85	0.00	0.00	0.00
20.00	0.03	0	122.85	0.00	0.00	0.00
22.50	0.02	0	122.85	0.00	0.00	0.00
25.00	0.00	0	122.85	0.00	0.00	0.00
27.50	0.00	0	122.85	0.00	0.00	0.00
30.00	0.00	0	122.85	0.00	0.00	0.00
32.50	0.00	0	122.85	0.00	0.00	0.00
35.00	0.00	0	122.85	0.00	0.00	0.00
37.50	0.00	0	122.85	0.00	0.00	0.00
40.00	0.00	0	122.85	0.00	0.00	0.00
42.50	0.00	0	122.85	0.00	0.00	0.00
45.00	0.00	0	122.85	0.00	0.00	0.00
47.50	0.00	0	122.85	0.00	0.00	0.00
50.00	0.00	0	122.85	0.00	0.00	0.00
52.50	0.00	0	122.85	0.00	0.00	0.00
55.00	0.00	0	122.85	0.00	0.00	0.00
57.50	0.00	0	122.85	0.00	0.00	0.00
60.00	0.00	0	122.85	0.00	0.00	0.00
62.50	0.00	0	122.85	0.00	0.00	0.00
65.00	0.00	0	122.85	0.00	0.00	0.00
67.50	0.00	0	122.85	0.00	0.00	0.00
70.00	0.00	0	122.85	0.00	0.00	0.00

Stage-Discharge for Pond 3P: Permeable Pavement

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
122.85	0.00	**0.00**	0.00
122.87	0.39	**0.39**	0.00
122.89	0.39	0.39	0.00
122.91	0.39	0.39	0.00
122.93	0.39	0.39	0.00
122.95	0.39	0.39	0.00
122.97	0.39	0.39	0.00
122.99	0.39	0.39	0.00
123.01	0.39	0.39	0.00
123.03	0.39	0.39	0.00
123.05	0.40	0.39	0.00
123.07	0.40	0.39	0.01
123.09	0.41	0.39	0.02
123.11	0.42	0.39	0.03
123.13	0.44	0.39	0.04
123.15	0.45	0.39	0.06
123.17	0.47	0.39	0.08
123.19	0.49	0.39	0.10
123.21	0.51	0.39	0.12
123.23	0.54	0.39	0.14
123.25	0.56	0.39	0.17
123.27	0.59	0.39	0.20
123.29	0.62	0.39	0.23
123.31	0.65	0.39	0.26
123.33	0.68	0.39	0.29
123.35	0.72	0.39	0.32
123.37	0.75	0.39	0.36
123.39	0.79	0.39	0.40
123.41	0.83	0.39	0.44
123.43	0.87	0.39	0.48
123.45	0.91	0.39	0.52
123.47	0.95	0.39	0.56
123.49	1.00	0.39	0.60
123.51	1.04	0.39	0.65
123.53	1.09	0.39	0.69
123.55	1.13	0.39	0.74
123.57	1.18	0.39	0.79
123.59	1.23	0.39	0.84
123.61	1.28	0.39	0.89
123.63	1.33	0.39	0.94
123.65	1.38	0.39	0.99
123.67	1.44	0.39	1.04
123.69	1.49	0.39	1.10
123.71	1.54	0.39	1.15
123.73	1.60	0.39	1.21
123.75	1.65	0.39	1.26
123.77	1.71	0.39	1.32
123.79	1.77	0.39	1.37
123.81	1.82	0.39	1.43
123.83	1.88	0.39	1.49
123.85	1.94	0.39	1.54
123.87	1.99	0.39	1.60
123.89	2.05	0.39	1.66
123.91	2.11	0.39	1.71
123.93	2.16	0.39	1.77
123.95	2.22	0.39	1.83
123.97	2.28	0.39	1.89
123.99	2.33	0.39	1.94
124.01	**2.39**	0.39	**2.00**

Stage-Area-Storage for Pond 3P: Permeable Pavement

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
122.85	**32,578**	0
122.87	32,578	261
122.89	32,578	521
122.91	32,578	782
122.93	32,578	1,042
122.95	32,578	1,303
122.97	32,578	1,564
122.99	32,578	1,824
123.01	32,578	2,085
123.03	32,578	2,346
123.05	32,578	2,606
123.07	32,578	2,867
123.09	32,578	3,127
123.11	32,578	3,388
123.13	32,578	3,649
123.15	32,578	3,909
123.17	32,578	4,170
123.19	32,578	4,431
123.21	32,578	4,691
123.23	32,578	4,952
123.25	32,578	5,212
123.27	32,578	5,473
123.29	32,578	5,734
123.31	32,578	5,994
123.33	32,578	6,255
123.35	32,578	6,516
123.37	32,578	6,776
123.39	32,578	7,037
123.41	32,578	7,297
123.43	32,578	7,558
123.45	32,578	7,819
123.47	32,578	8,079
123.49	32,578	8,340
123.51	32,578	8,601
123.53	32,578	8,796
123.55	32,578	8,992
123.57	32,578	9,187
123.59	32,578	9,382
123.61	32,578	9,578
123.63	32,578	9,773
123.65	32,578	9,969
123.67	32,578	10,164
123.69	32,578	10,360
123.71	32,578	10,555
123.73	32,578	10,751
123.75	32,578	**10,946**
123.77	32,578	**11,044**
123.79	32,578	11,044
123.81	32,578	11,044
123.83	32,578	11,044
123.85	32,578	11,044
123.87	32,578	11,044
123.89	32,578	11,044
123.91	32,578	11,044
123.93	32,578	11,044
123.95	32,578	11,044
123.97	32,578	11,044
123.99	32,578	11,044
124.01	32,578	11,044

Summary for Pond UG-1: RETAIN_IT

Inflow Area = 2.219 ac, 85.49% Impervious, Inflow Depth = 1.85" for 1-Year event
Inflow = 4.63 cfs @ 12.09 hrs, Volume= 0.343 af
Outflow = 3.13 cfs @ 12.18 hrs, Volume= 0.343 af, Atten= 32%, Lag= 5.6 min
Primary = 3.13 cfs @ 12.18 hrs, Volume= 0.343 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.67' @ 12.18 hrs Surf.Area= 3,444 sf Storage= 2,919 cf

Plug-Flow detention time= 52.6 min calculated for 0.343 af (100% of inflow)
Center-of-Mass det. time= 52.1 min (852.4 - 800.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	122.40'	1,095 cf	**42.00'W x 82.00'L x 4.67'H Field A** 16,072 cf Overall - 13,333 cf Embedded = 2,739 cf x 40.0% Voids
#2A	122.90'	9,855 cf	**retain_it retain_it 3.5'** x 50 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 5 Rows adjusted for 184.2 cf perimeter wall
		10,950 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	122.40'	**15.0" Round Culvert** L= 212.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 122.40' / 121.25' S= 0.0054 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.23 sf
#2	Device 1	122.40'	**2.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	122.90'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=3.10 cfs @ 12.18 hrs HW=123.66' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.10 cfs of 3.72 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.18 cfs @ 5.18 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 2.93 cfs @ 2.85 fps)

Pond UG-1: RETAIN_IT - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it®)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
5 Rows adjusted for 184.2 cf perimeter wall

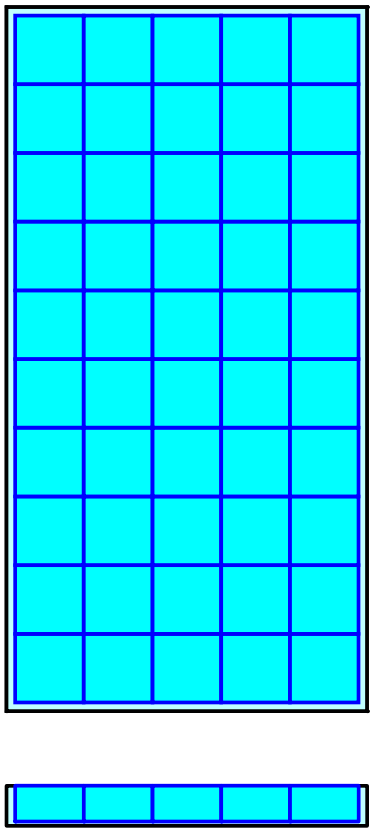
10 Chambers/Row x 8.00' Long = 80.00' Row Length +12.0" End Stone x 2 = 82.00' Base Length
5 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 42.00' Base Width
6.0" Base + 50.0" Chamber Height = 4.67' Field Height

6.1 cf Sidewall x 10 x 2 + 6.1 cf Endwall x 5 x 2 = 184.2 cf Perimeter Wall
50 Chambers x 200.8 cf - 184.2 cf Perimeter wall = 9,854.8 cf Chamber Storage
50 Chambers x 266.7 cf = 13,333.3 cf Displacement

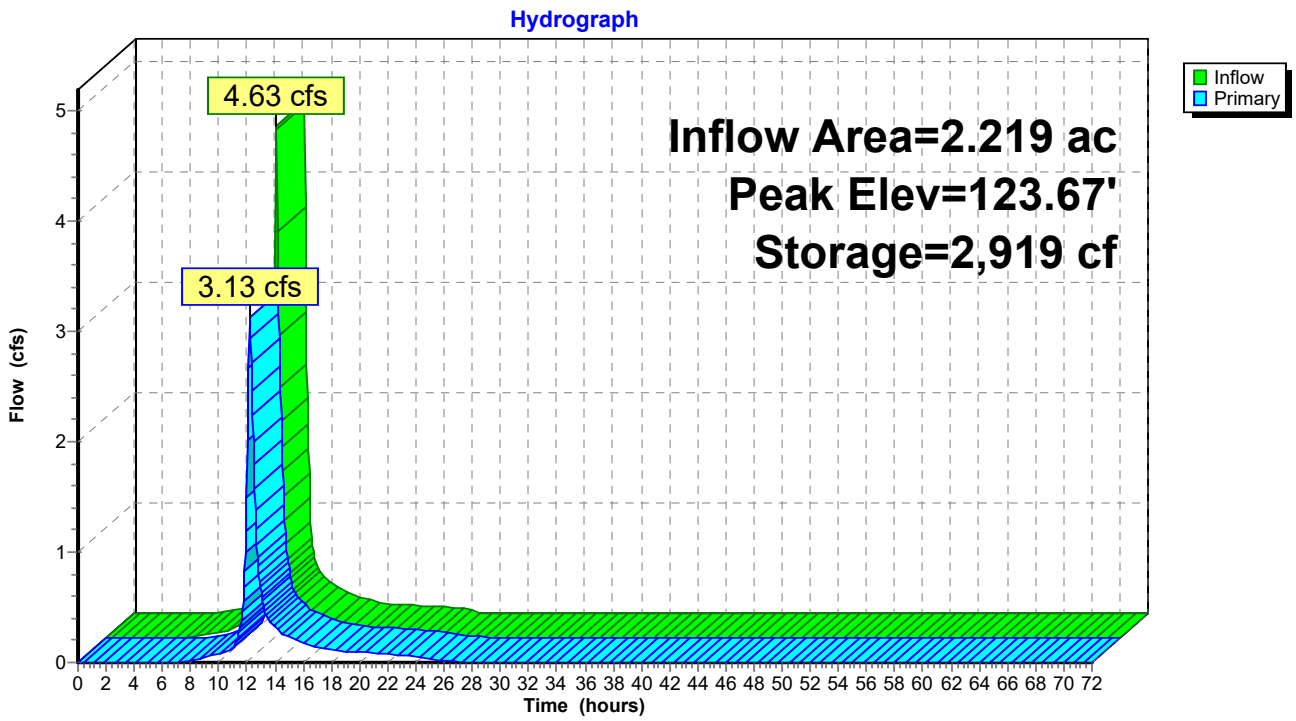
16,072.0 cf Field - 13,333.3 cf Chambers = 2,738.7 cf Stone x 40.0% Voids = 1,095.5 cf Stone Storage

Chamber Storage + Stone Storage = 10,950.3 cf = 0.251 af
Overall Storage Efficiency = 68.1%
Overall System Size = 82.00' x 42.00' x 4.67'

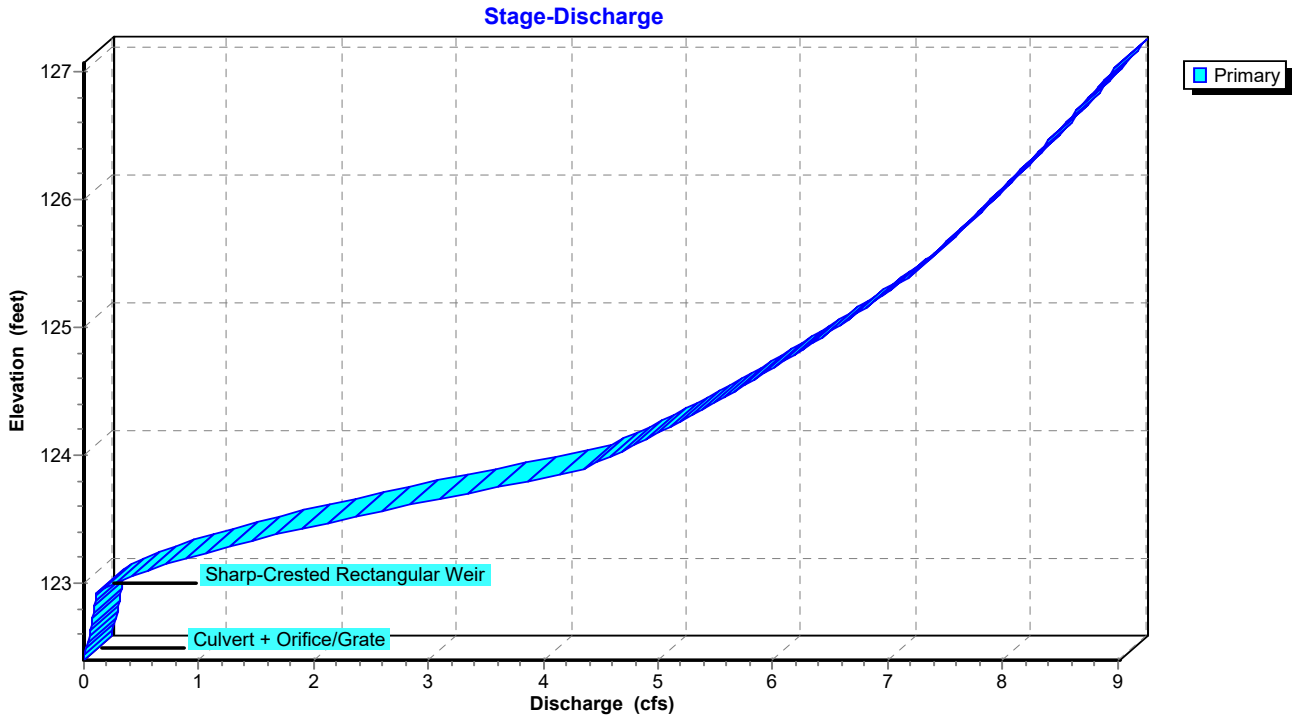
50 Chambers
595.3 cy Field
101.4 cy Stone



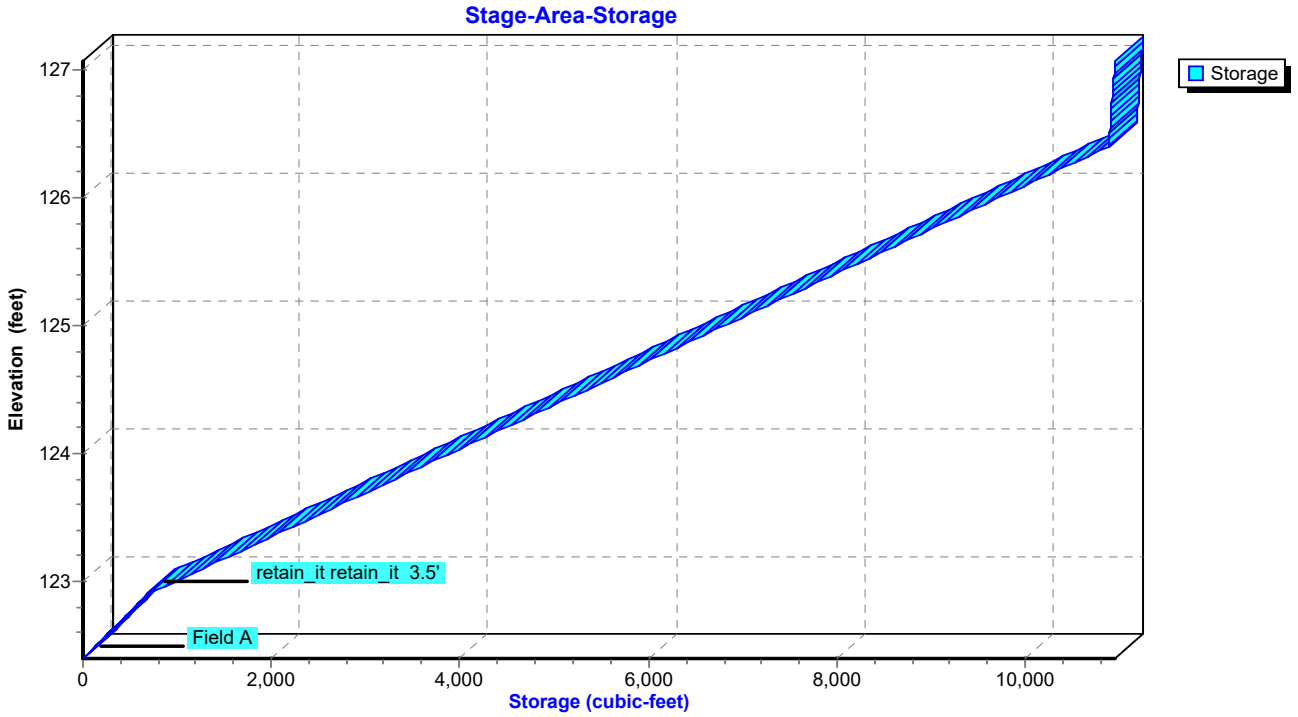
Pond UG-1: RETAIN_IT



Pond UG-1: RETAIN_IT



Pond UG-1: RETAIN_IT



Hydrograph for Pond UG-1: RETAIN_IT

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	122.40	0.00
2.50	0.00	0	122.40	0.00
5.00	0.00	0	122.40	0.00
7.50	0.03	92	122.47	0.01
10.00	**0.14**	**433**	**122.71**	**0.08**
12.50	**1.04**	**2,152**	**123.40**	**1.79**
15.00	0.21	930	122.98	0.23
17.50	0.10	746	122.92	0.12
20.00	0.07	572	122.82	0.09
22.50	0.06	408	122.70	0.07
25.00	0.00	183	122.53	0.03
27.50	0.00	71	122.45	0.01
30.00	0.00	43	122.43	0.00
32.50	0.00	31	122.42	0.00
35.00	0.00	24	122.42	0.00
37.50	0.00	19	122.41	0.00
40.00	0.00	16	122.41	0.00
42.50	0.00	14	122.41	0.00
45.00	0.00	12	122.41	0.00
47.50	0.00	11	122.41	0.00
50.00	0.00	10	122.41	0.00
52.50	0.00	9	122.41	0.00
55.00	0.00	8	122.41	0.00
57.50	0.00	8	122.41	0.00
60.00	0.00	7	122.41	0.00
62.50	0.00	7	122.40	0.00
65.00	0.00	6	122.40	0.00
67.50	0.00	6	122.40	0.00
70.00	0.00	6	122.40	0.00

Stage-Discharge for Pond UG-1: RETAIN_IT

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
122.40	0.00	125.05	6.64
122.45	0.00	125.10	6.72
122.50	0.02	125.15	6.80
122.55	0.03	125.20	6.88
122.60	0.05	125.25	6.96
122.65	0.06	125.30	7.04
122.70	0.07	125.35	7.11
122.75	0.08	125.40	7.19
122.80	0.09	125.45	7.25
122.85	0.10	125.50	7.31
122.90	0.10	125.55	7.37
122.95	0.16	125.60	7.43
123.00	0.27	125.65	7.49
123.05	0.40	125.70	7.55
123.10	0.55	125.75	7.61
123.15	0.72	125.80	7.67
123.20	0.91	125.85	7.73
123.25	1.11	125.90	7.79
123.30	1.32	125.95	7.84
123.35	1.54	126.00	7.90
123.40	1.77	126.05	7.96
123.45	2.01	126.10	8.01
123.50	2.26	126.15	8.07
123.55	2.52	126.20	8.12
123.60	2.78	126.25	8.18
123.65	3.04	126.30	8.23
123.70	3.31	126.35	8.29
123.75	3.59	126.40	8.34
123.80	3.87	126.45	8.39
123.85	4.16	126.50	8.45
123.90	4.36	126.55	8.50
123.95	4.49	126.60	8.55
124.00	4.61	126.65	8.60
124.05	4.72	126.70	8.65
124.10	4.84	126.75	8.70
124.15	4.95	126.80	8.76
124.20	5.06	126.85	8.81
124.25	5.16	126.90	8.86
124.30	5.27	126.95	8.91
124.35	5.37	127.00	8.96
124.40	5.47	127.05	**9.01**
124.45	5.57		
124.50	5.67		
124.55	5.76		
124.60	5.85		
124.65	5.95		
124.70	6.04		
124.75	6.13		
124.80	6.21		
124.85	6.30		
124.90	6.39		
124.95	6.47		
125.00	6.56		

Stage-Area-Storage for Pond UG-1: RETAIN_IT

Elevation (feet)	Storage (cubic-feet)
122.40	0
122.45	69
122.50	138
122.55	207
122.60	276
122.65	344
122.70	413
122.75	482
122.80	551
122.85	620
122.90	689
122.95	834
123.00	980
123.05	1,126
123.10	1,271
123.15	1,417
123.20	1,563
123.25	1,708
123.30	1,854
123.35	2,000
123.40	2,145
123.45	2,291
123.50	2,437
123.55	2,582
123.60	2,728
123.65	2,874
123.70	3,019
123.75	3,165
123.80	3,311
123.85	3,456
123.90	3,602
123.95	3,748
124.00	3,893
124.05	4,039
124.10	4,185
124.15	4,330
124.20	4,476
124.25	4,622
124.30	4,767
124.35	4,913
124.40	5,059
124.45	5,204
124.50	5,350
124.55	5,496
124.60	5,641
124.65	5,787
124.70	5,933
124.75	6,078
124.80	6,224
124.85	6,370
124.90	6,515
124.95	6,661
125.00	6,807
125.05	6,952
125.10	7,098
125.15	7,244
125.20	7,389
125.25	7,535
125.30	7,681
125.35	7,826
125.40	7,972
125.45	8,118
125.50	8,263
125.55	8,409
125.60	8,555
125.65	8,700
125.70	8,846
125.75	8,992
125.80	9,137
125.85	9,283
125.90	9,429
125.95	9,574
126.00	9,720
126.05	9,866
126.10	10,011
126.15	10,157
126.20	10,303
126.25	10,448
126.30	10,594
126.35	10,740
126.40	10,885
126.45	10,890
126.50	10,895
126.55	10,900
126.60	10,905
126.65	10,910
126.70	10,915
126.75	10,919
126.80	10,924
126.85	10,929
126.90	10,934
126.95	10,939
127.00	10,944
127.05	**10,949**

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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

Subcatchment P-1A: P-1A Runoff Area=96,664 sf 85.49% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=93 Runoff=6.02 cfs 0.452 af

Subcatchment P-1B: P-1B (PERMEABLE Runoff Area=35,462 sf 0.00% Impervious Runoff Depth=2.64"
Tc=6.0 min CN=95 Runoff=2.33 cfs 0.179 af

Subcatchment P-1U: P-1U (UNDETAINED) Runoff Area=13,343 sf 0.00% Impervious Runoff Depth=0.34"
Tc=6.0 min CN=58 Runoff=0.06 cfs 0.009 af

Subcatchment P-2: P-2 Runoff Area=5,081 sf 46.53% Impervious Runoff Depth=1.27"
Tc=6.0 min CN=78 Runoff=0.17 cfs 0.012 af

Reach PD1: WETLAND Inflow=4.27 cfs 0.461 af
Outflow=4.27 cfs 0.461 af

Reach PD2: BOSTON POST RD Inflow=0.17 cfs 0.012 af
Outflow=0.17 cfs 0.012 af

Pond 1P: FES Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Pond 2P: FES w/ HEADWALL
Primary=0.00 cfs 0.000 af

Pond 3P: Permeable Pavement Peak Elev=123.01' Storage=2,125 cf Inflow=2.33 cfs 0.179 af
Discarded=0.39 cfs 0.180 af Primary=0.00 cfs 0.000 af Outflow=0.39 cfs 0.180 af

Pond UG-1: RETAIN_IT Peak Elev=123.86' Storage=3,488 cf Inflow=6.02 cfs 0.452 af
Outflow=4.22 cfs 0.452 af

Total Runoff Area = 3.456 ac Runoff Volume = 0.653 af Average Runoff Depth = 2.27"
43.54% Pervious = 1.505 ac 56.46% Impervious = 1.951 ac

Summary for Subcatchment P-1A: P-1A

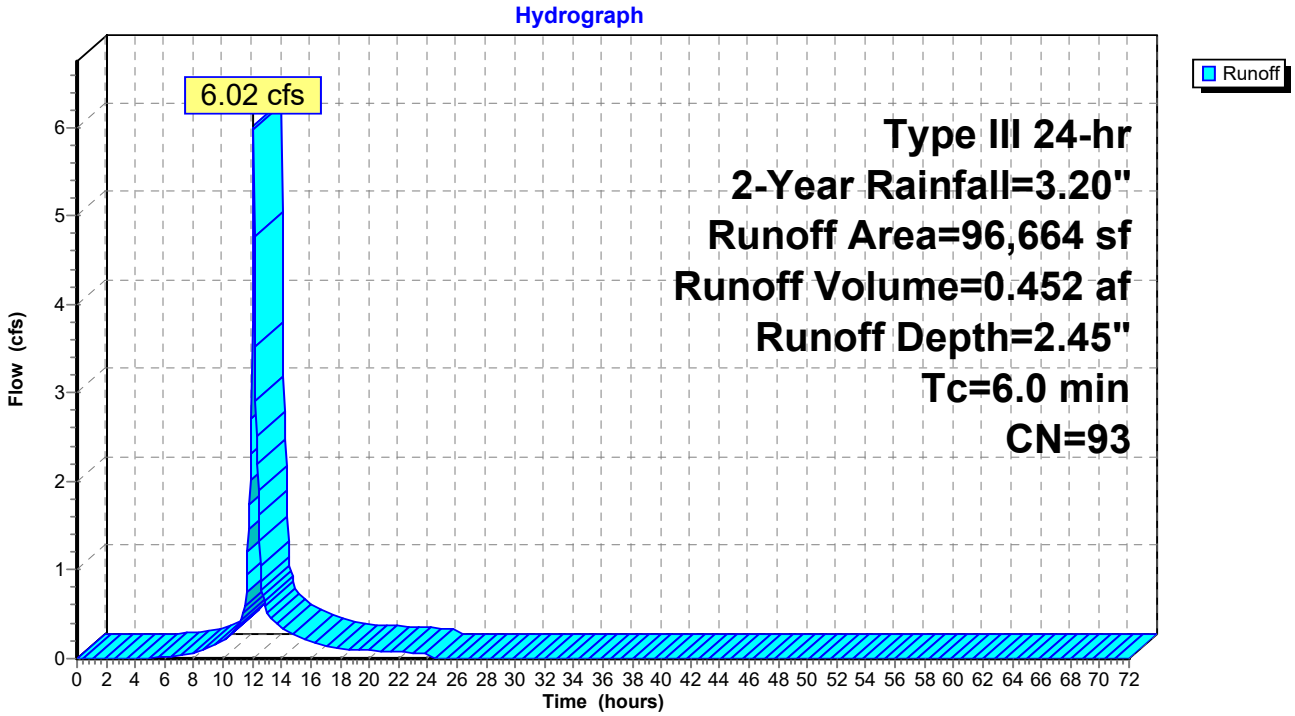
Runoff = 6.02 cfs @ 12.09 hrs, Volume= 0.452 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	1,394	61	>75% Grass cover, Good, HSG B- ISLANDS
	75,402	98	Paved parking, HSG B
*	4,922	73	Existing Woods/grass comb., Poor, HSG B
	7,710	58	Woods/grass comb., Good, HSG B
	7,236	98	Unconnected roofs, HSG B
	96,664	93	Weighted Average
	14,026	64	14.51% Pervious Area
	82,638	98	85.49% Impervious Area
	7,236		8.76% Unconnected

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

Subcatchment P-1A: P-1A



Hydrograph for Subcatchment P-1A: P-1A

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.06	0.00	0.00
3.00	0.10	0.00	0.00
4.00	0.14	0.00	0.00
5.00	0.18	0.00	0.01
6.00	0.23	0.01	0.02
7.00	0.29	0.02	0.04
8.00	0.36	0.05	0.07
9.00	0.47	0.09	0.13
10.00	0.60	0.17	0.21
11.00	0.80	0.30	0.36
12.00	1.60	0.95	**3.80**
13.00	2.40	1.69	**0.55**
14.00	2.60	1.87	0.35
15.00	2.73	2.00	0.26
16.00	2.84	2.10	0.18
17.00	2.91	2.17	0.15
18.00	2.97	2.22	0.11
19.00	3.02	2.27	0.10
20.00	3.06	2.31	0.09
21.00	3.10	2.35	0.08
22.00	3.14	2.39	0.07
23.00	3.17	2.42	0.07
24.00	**3.20**	**2.45**	0.06
25.00	3.20	2.45	0.00
26.00	3.20	2.45	0.00
27.00	3.20	2.45	0.00
28.00	3.20	2.45	0.00
29.00	3.20	2.45	0.00
30.00	3.20	2.45	0.00
31.00	3.20	2.45	0.00
32.00	3.20	2.45	0.00
33.00	3.20	2.45	0.00
34.00	3.20	2.45	0.00
35.00	3.20	2.45	0.00
36.00	3.20	2.45	0.00
37.00	3.20	2.45	0.00
38.00	3.20	2.45	0.00
39.00	3.20	2.45	0.00
40.00	3.20	2.45	0.00
41.00	3.20	2.45	0.00
42.00	3.20	2.45	0.00
43.00	3.20	2.45	0.00
44.00	3.20	2.45	0.00
45.00	3.20	2.45	0.00
46.00	3.20	2.45	0.00
47.00	3.20	2.45	0.00
48.00	3.20	2.45	0.00
49.00	3.20	2.45	0.00
50.00	3.20	2.45	0.00
51.00	3.20	2.45	0.00
52.00	3.20	2.45	0.00
53.00	3.20	2.45	0.00
54.00	3.20	2.45	0.00
55.00	3.20	2.45	0.00
56.00	3.20	2.45	0.00
57.00	3.20	2.45	0.00
58.00	3.20	2.45	0.00
59.00	3.20	2.45	0.00
60.00	3.20	2.45	0.00
61.00	3.20	2.45	0.00
62.00	3.20	2.45	0.00
63.00	3.20	2.45	0.00
64.00	3.20	2.45	0.00
65.00	3.20	2.45	0.00
66.00	3.20	2.45	0.00
67.00	3.20	2.45	0.00
68.00	3.20	2.45	0.00
69.00	3.20	2.45	0.00
70.00	3.20	2.45	0.00
71.00	3.20	2.45	0.00
72.00	3.20	2.45	0.00

Summary for Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)

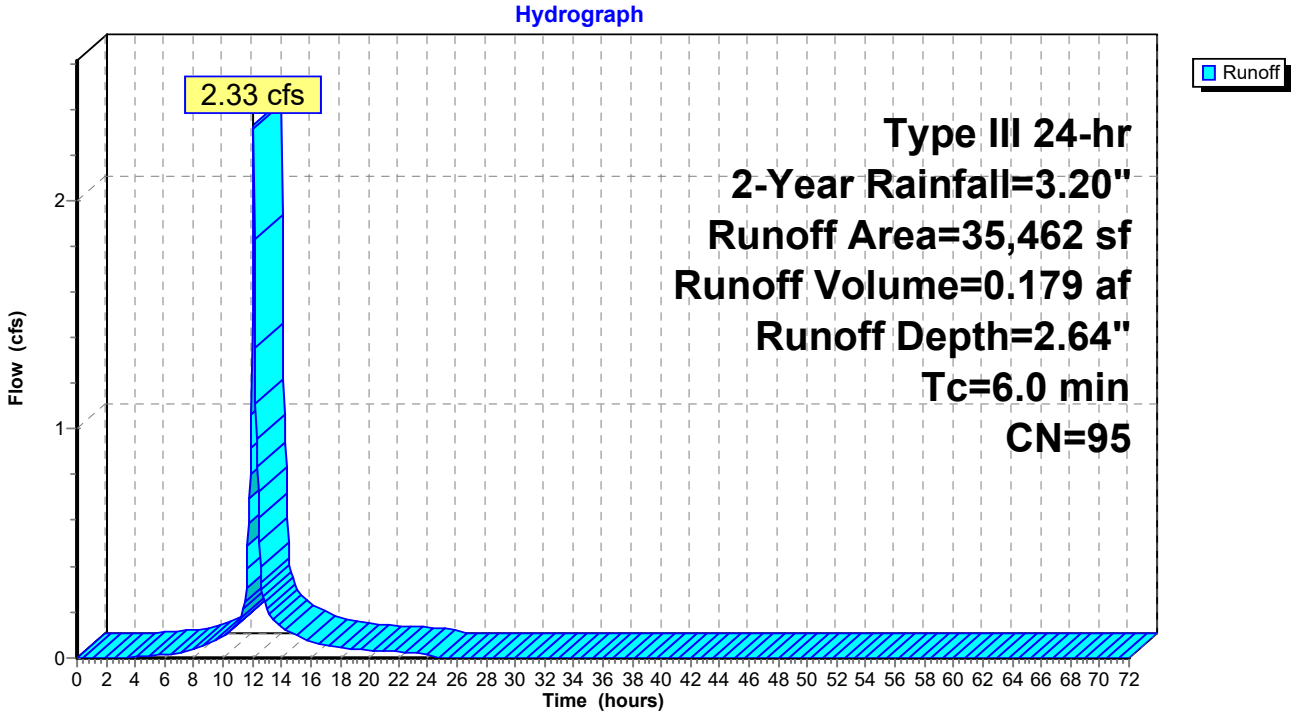
Runoff = 2.33 cfs @ 12.09 hrs, Volume= 0.179 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	32,606	98	Perm. Pavement, 0% imp, HSG B
	2,856	61	>75% Grass cover, Good, HSG B
	35,462	95	Weighted Average
	35,462	95	100.00% Pervious Area

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

Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)



Hydrograph for Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.06	0.00	0.00
3.00	0.10	0.00	0.00
4.00	0.14	0.00	0.00
5.00	0.18	0.01	0.01
6.00	0.23	0.02	0.01
7.00	0.29	0.05	0.02
8.00	0.36	0.09	0.04
9.00	0.47	0.15	0.06
10.00	0.60	0.24	0.09
11.00	0.80	0.40	0.15
12.00	1.60	1.11	**1.49**
13.00	2.40	1.87	**0.21**
14.00	2.60	2.06	0.13
15.00	2.73	2.19	0.10
16.00	2.84	2.29	0.07
17.00	2.91	2.36	0.05
18.00	2.97	2.42	0.04
19.00	3.02	2.47	0.04
20.00	3.06	2.51	0.03
21.00	3.10	2.55	0.03
22.00	3.14	2.58	0.03
23.00	3.17	2.62	0.03
24.00	**3.20**	**2.64**	0.02
25.00	3.20	2.64	0.00
26.00	3.20	2.64	0.00
27.00	3.20	2.64	0.00
28.00	3.20	2.64	0.00
29.00	3.20	2.64	0.00
30.00	3.20	2.64	0.00
31.00	3.20	2.64	0.00
32.00	3.20	2.64	0.00
33.00	3.20	2.64	0.00
34.00	3.20	2.64	0.00
35.00	3.20	2.64	0.00
36.00	3.20	2.64	0.00
37.00	3.20	2.64	0.00
38.00	3.20	2.64	0.00
39.00	3.20	2.64	0.00
40.00	3.20	2.64	0.00
41.00	3.20	2.64	0.00
42.00	3.20	2.64	0.00
43.00	3.20	2.64	0.00
44.00	3.20	2.64	0.00
45.00	3.20	2.64	0.00
46.00	3.20	2.64	0.00
47.00	3.20	2.64	0.00
48.00	3.20	2.64	0.00
49.00	3.20	2.64	0.00
50.00	3.20	2.64	0.00
51.00	3.20	2.64	0.00
52.00	3.20	2.64	0.00
53.00	3.20	2.64	0.00
54.00	3.20	2.64	0.00
55.00	3.20	2.64	0.00
56.00	3.20	2.64	0.00
57.00	3.20	2.64	0.00
58.00	3.20	2.64	0.00
59.00	3.20	2.64	0.00
60.00	3.20	2.64	0.00
61.00	3.20	2.64	0.00
62.00	3.20	2.64	0.00
63.00	3.20	2.64	0.00
64.00	3.20	2.64	0.00
65.00	3.20	2.64	0.00
66.00	3.20	2.64	0.00
67.00	3.20	2.64	0.00
68.00	3.20	2.64	0.00
69.00	3.20	2.64	0.00
70.00	3.20	2.64	0.00
71.00	3.20	2.64	0.00
72.00	3.20	2.64	0.00

Summary for Subcatchment P-1U: P-1U (UNDETAINED)

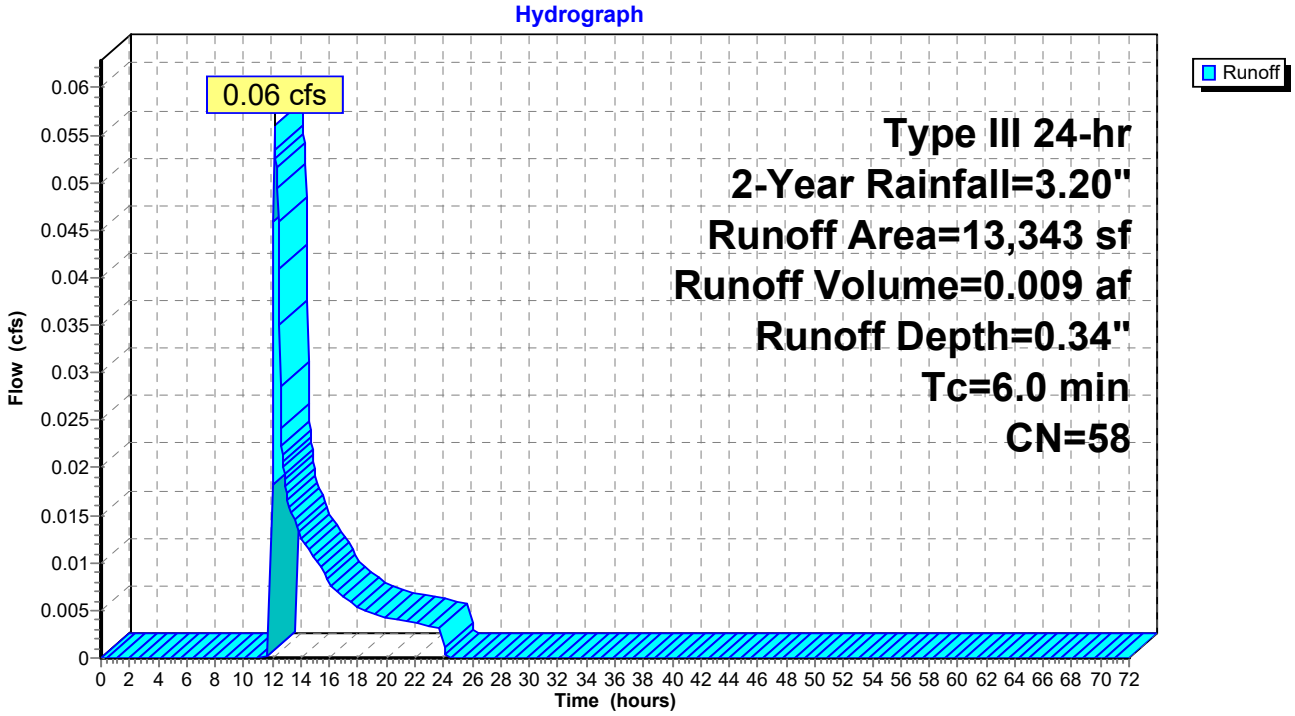
Runoff = 0.06 cfs @ 12.17 hrs, Volume= 0.009 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
13,343	58	Woods/grass comb., Good, HSG B
13,343	58	100.00% Pervious Area

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

Subcatchment P-1U: P-1U (UNDETAINED)



Hydrograph for Subcatchment P-1U: P-1U (UNDETAINED)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.06	0.00	0.00
3.00	0.10	0.00	0.00
4.00	0.14	0.00	0.00
5.00	0.18	0.00	0.00
6.00	0.23	0.00	0.00
7.00	0.29	0.00	0.00
8.00	0.36	0.00	0.00
9.00	0.47	0.00	0.00
10.00	0.60	0.00	0.00
11.00	0.80	0.00	0.00
12.00	1.60	0.00	**0.00**
13.00	2.40	0.11	**0.02**
14.00	2.60	0.16	0.01
15.00	2.73	0.19	0.01
16.00	2.84	0.22	0.01
17.00	2.91	0.25	0.01
18.00	2.97	0.26	0.01
19.00	3.02	0.28	0.00
20.00	3.06	0.29	0.00
21.00	3.10	0.31	0.00
22.00	3.14	0.32	0.00
23.00	3.17	0.33	0.00
24.00	**3.20**	**0.34**	0.00
25.00	3.20	0.34	0.00
26.00	3.20	0.34	0.00
27.00	3.20	0.34	0.00
28.00	3.20	0.34	0.00
29.00	3.20	0.34	0.00
30.00	3.20	0.34	0.00
31.00	3.20	0.34	0.00
32.00	3.20	0.34	0.00
33.00	3.20	0.34	0.00
34.00	3.20	0.34	0.00
35.00	3.20	0.34	0.00
36.00	3.20	0.34	0.00
37.00	3.20	0.34	0.00
38.00	3.20	0.34	0.00
39.00	3.20	0.34	0.00
40.00	3.20	0.34	0.00
41.00	3.20	0.34	0.00
42.00	3.20	0.34	0.00
43.00	3.20	0.34	0.00
44.00	3.20	0.34	0.00
45.00	3.20	0.34	0.00
46.00	3.20	0.34	0.00
47.00	3.20	0.34	0.00
48.00	3.20	0.34	0.00
49.00	3.20	0.34	0.00
50.00	3.20	0.34	0.00
51.00	3.20	0.34	0.00
52.00	3.20	0.34	0.00
53.00	3.20	0.34	0.00
54.00	3.20	0.34	0.00
55.00	3.20	0.34	0.00
56.00	3.20	0.34	0.00
57.00	3.20	0.34	0.00
58.00	3.20	0.34	0.00
59.00	3.20	0.34	0.00
60.00	3.20	0.34	0.00
61.00	3.20	0.34	0.00
62.00	3.20	0.34	0.00
63.00	3.20	0.34	0.00
64.00	3.20	0.34	0.00
65.00	3.20	0.34	0.00
66.00	3.20	0.34	0.00
67.00	3.20	0.34	0.00
68.00	3.20	0.34	0.00
69.00	3.20	0.34	0.00
70.00	3.20	0.34	0.00
71.00	3.20	0.34	0.00
72.00	3.20	0.34	0.00

Summary for Subcatchment P-2: P-2

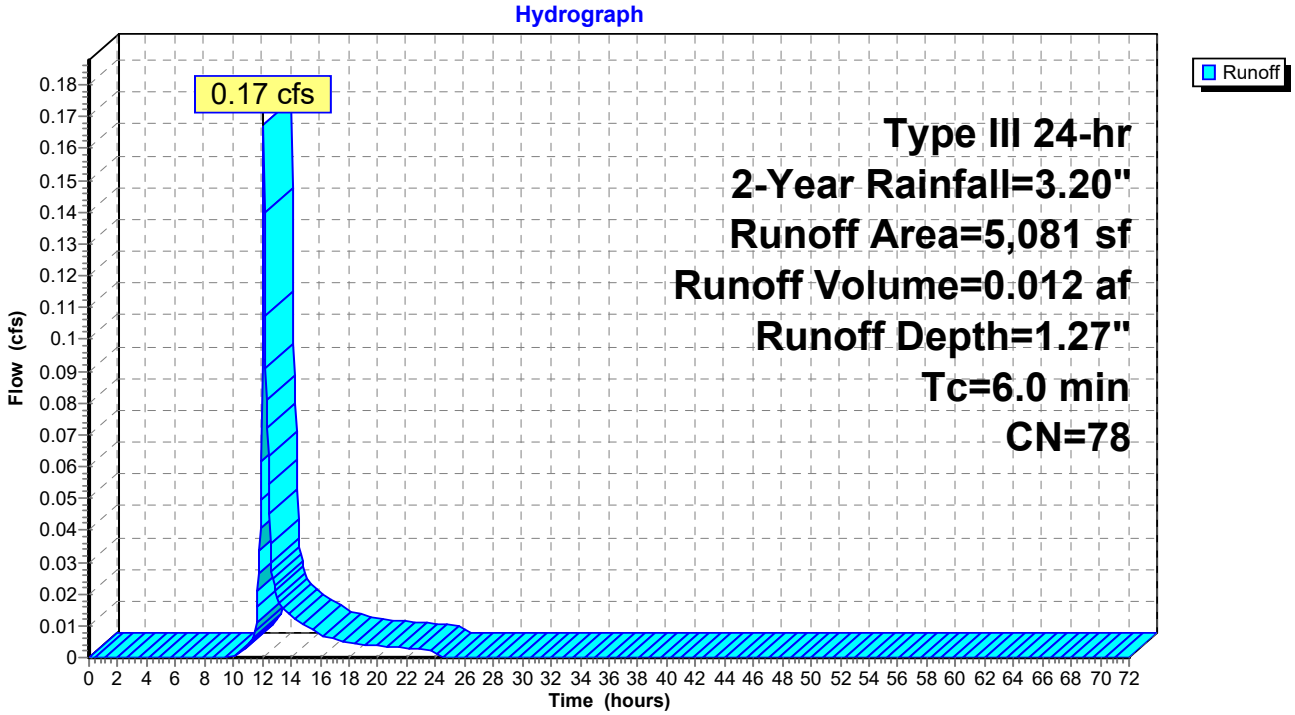
Runoff = 0.17 cfs @ 12.10 hrs, Volume= 0.012 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
2,364	98	Paved parking, HSG B
2,717	61	>75% Grass cover, Good, HSG B
5,081	78	Weighted Average
2,717	61	53.47% Pervious Area
2,364	98	46.53% Impervious Area

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

Subcatchment P-2: P-2



Hydrograph for Subcatchment P-2: P-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.03	0.00	0.00
2.00	0.06	0.00	0.00
3.00	0.10	0.00	0.00
4.00	0.14	0.00	0.00
5.00	0.18	0.00	0.00
6.00	0.23	0.00	0.00
7.00	0.29	0.00	0.00
8.00	0.36	0.00	0.00
9.00	0.47	0.00	0.00
10.00	0.60	0.00	0.00
11.00	0.80	0.02	0.00
12.00	1.60	0.28	**0.09**
13.00	2.40	0.72	**0.02**
14.00	2.60	0.85	0.01
15.00	2.73	0.94	0.01
16.00	2.84	1.01	0.01
17.00	2.91	1.07	0.01
18.00	2.97	1.11	0.00
19.00	3.02	1.14	0.00
20.00	3.06	1.17	0.00
21.00	3.10	1.20	0.00
22.00	3.14	1.23	0.00
23.00	3.17	1.25	0.00
24.00	**3.20**	**1.27**	0.00
25.00	3.20	1.27	0.00
26.00	3.20	1.27	0.00
27.00	3.20	1.27	0.00
28.00	3.20	1.27	0.00
29.00	3.20	1.27	0.00
30.00	3.20	1.27	0.00
31.00	3.20	1.27	0.00
32.00	3.20	1.27	0.00
33.00	3.20	1.27	0.00
34.00	3.20	1.27	0.00
35.00	3.20	1.27	0.00
36.00	3.20	1.27	0.00
37.00	3.20	1.27	0.00
38.00	3.20	1.27	0.00
39.00	3.20	1.27	0.00
40.00	3.20	1.27	0.00
41.00	3.20	1.27	0.00
42.00	3.20	1.27	0.00
43.00	3.20	1.27	0.00
44.00	3.20	1.27	0.00
45.00	3.20	1.27	0.00
46.00	3.20	1.27	0.00
47.00	3.20	1.27	0.00
48.00	3.20	1.27	0.00
49.00	3.20	1.27	0.00
50.00	3.20	1.27	0.00
51.00	3.20	1.27	0.00
52.00	3.20	1.27	0.00
53.00	3.20	1.27	0.00
54.00	3.20	1.27	0.00
55.00	3.20	1.27	0.00
56.00	3.20	1.27	0.00
57.00	3.20	1.27	0.00
58.00	3.20	1.27	0.00
59.00	3.20	1.27	0.00
60.00	3.20	1.27	0.00
61.00	3.20	1.27	0.00
62.00	3.20	1.27	0.00
63.00	3.20	1.27	0.00
64.00	3.20	1.27	0.00
65.00	3.20	1.27	0.00
66.00	3.20	1.27	0.00
67.00	3.20	1.27	0.00
68.00	3.20	1.27	0.00
69.00	3.20	1.27	0.00
70.00	3.20	1.27	0.00
71.00	3.20	1.27	0.00
72.00	3.20	1.27	0.00

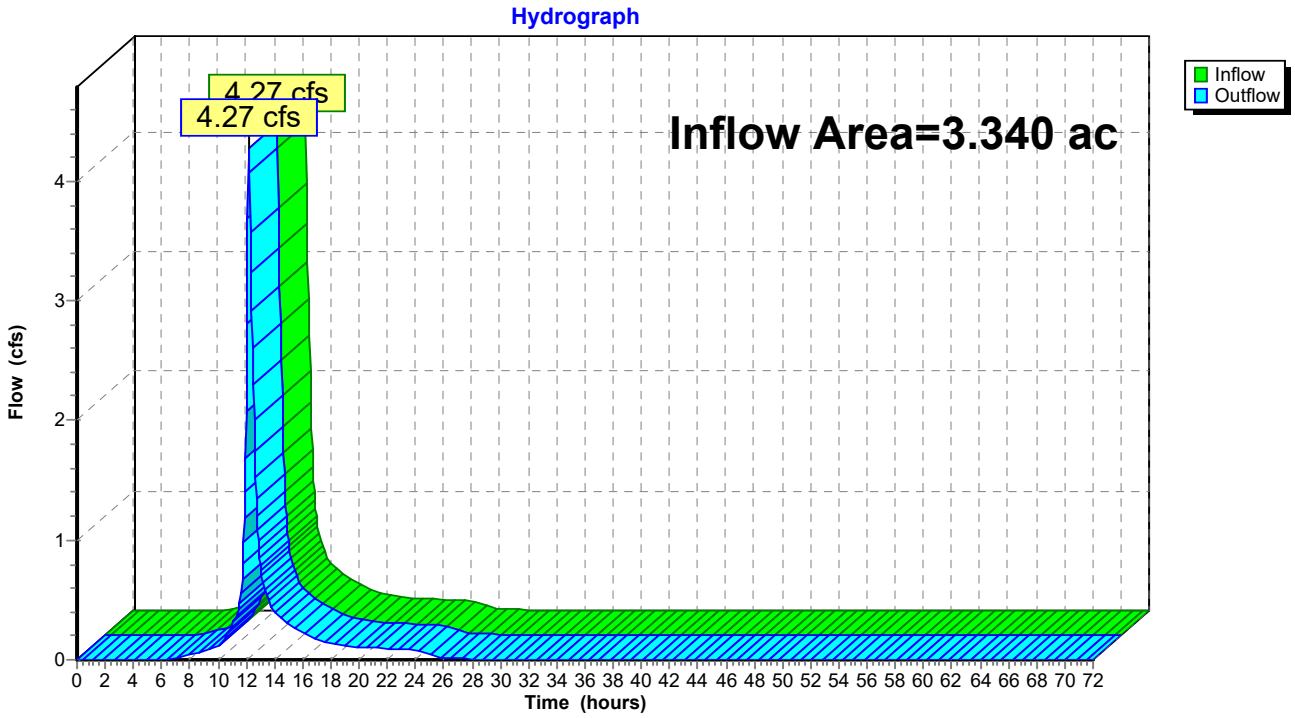
Summary for Reach PD1: WETLAND

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

Inflow Area = 3.340 ac, 56.81% Impervious, Inflow Depth = 1.66" for 2-Year event
Inflow = 4.27 cfs @ 12.17 hrs, Volume= 0.461 af
Outflow = 4.27 cfs @ 12.17 hrs, Volume= 0.461 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD1: WETLAND



Hydrograph for Reach PD1: WETLAND

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.02		0.02	60.00	0.00		0.00
8.00	0.04		0.04	61.00	0.00		0.00
9.00	0.07		0.07	62.00	0.00		0.00
10.00	0.10		0.10	63.00	0.00		0.00
11.00	0.29		0.29	64.00	0.00		0.00
12.00	**2.09**		**2.09**	65.00	0.00		0.00
13.00	**0.80**		**0.80**	66.00	0.00		0.00
14.00	0.41		0.41	67.00	0.00		0.00
15.00	0.30		0.30	68.00	0.00		0.00
16.00	0.22		0.22	69.00	0.00		0.00
17.00	0.17		0.17	70.00	0.00		0.00
18.00	0.14		0.14	71.00	0.00		0.00
19.00	0.12		0.12	72.00	0.00		0.00
20.00	0.11		0.11				
21.00	0.10		0.10				
22.00	0.10		0.10				
23.00	0.09		0.09				
24.00	0.08		0.08				
25.00	0.04		0.04				
26.00	0.02		0.02				
27.00	0.01		0.01				
28.00	0.01		0.01				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

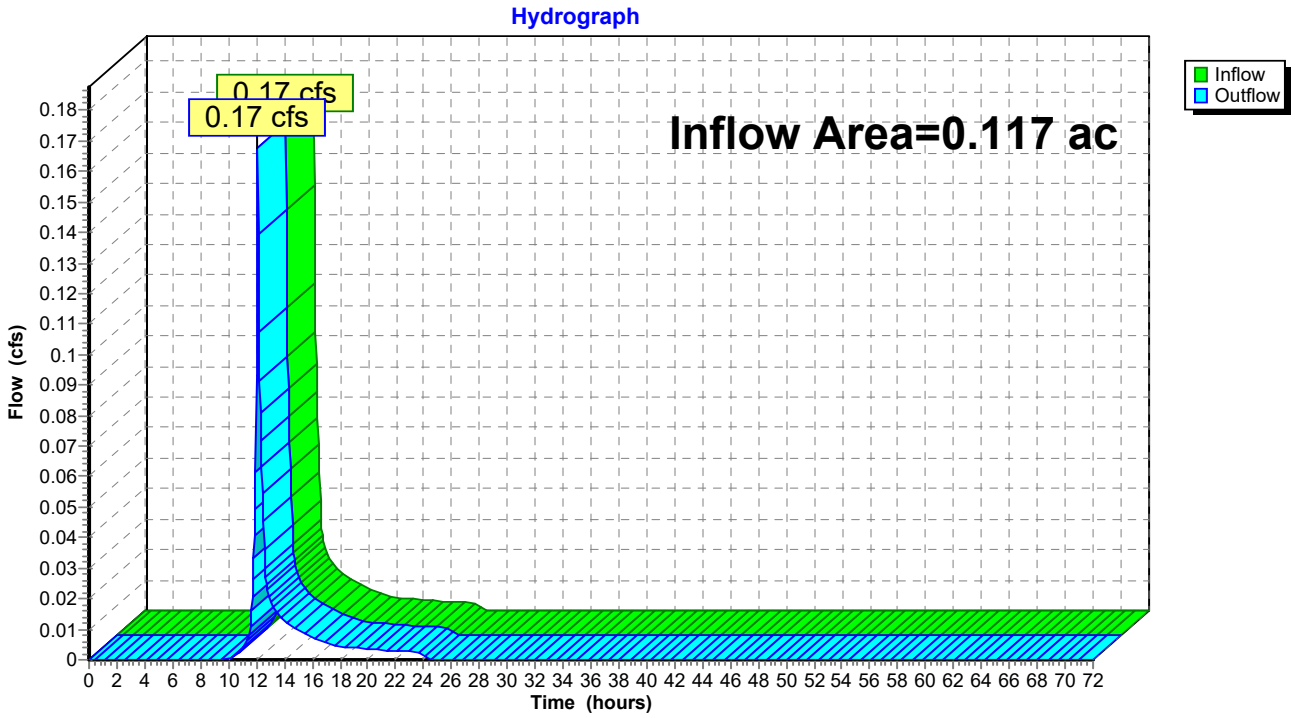
Summary for Reach PD2: BOSTON POST RD

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

Inflow Area = 0.117 ac, 46.53% Impervious, Inflow Depth = 1.27" for 2-Year event
Inflow = 0.17 cfs @ 12.10 hrs, Volume= 0.012 af
Outflow = 0.17 cfs @ 12.10 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD2: BOSTON POST RD



Hydrograph for Reach PD2: BOSTON POST RD

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.00		0.00	64.00	0.00		0.00
12.00	**0.09**		**0.09**	65.00	0.00		0.00
13.00	**0.02**		**0.02**	66.00	0.00		0.00
14.00	0.01		0.01	67.00	0.00		0.00
15.00	0.01		0.01	68.00	0.00		0.00
16.00	0.01		0.01	69.00	0.00		0.00
17.00	0.01		0.01	70.00	0.00		0.00
18.00	0.00		0.00	71.00	0.00		0.00
19.00	0.00		0.00	72.00	0.00		0.00
20.00	0.00		0.00				
21.00	0.00		0.00				
22.00	0.00		0.00				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

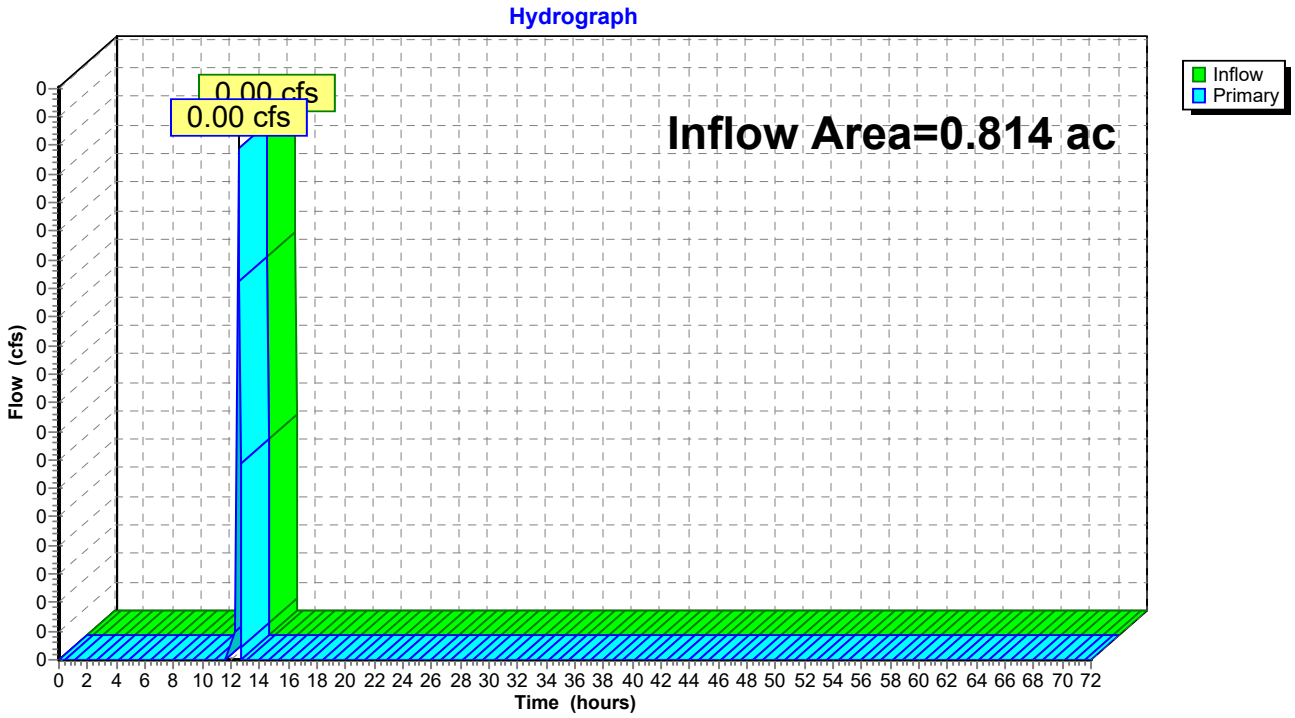
Summary for Pond 1P: FES

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

Inflow Area = 0.814 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 12.56 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 12.56 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 1P: FES



Hydrograph for Pond 1P: FES

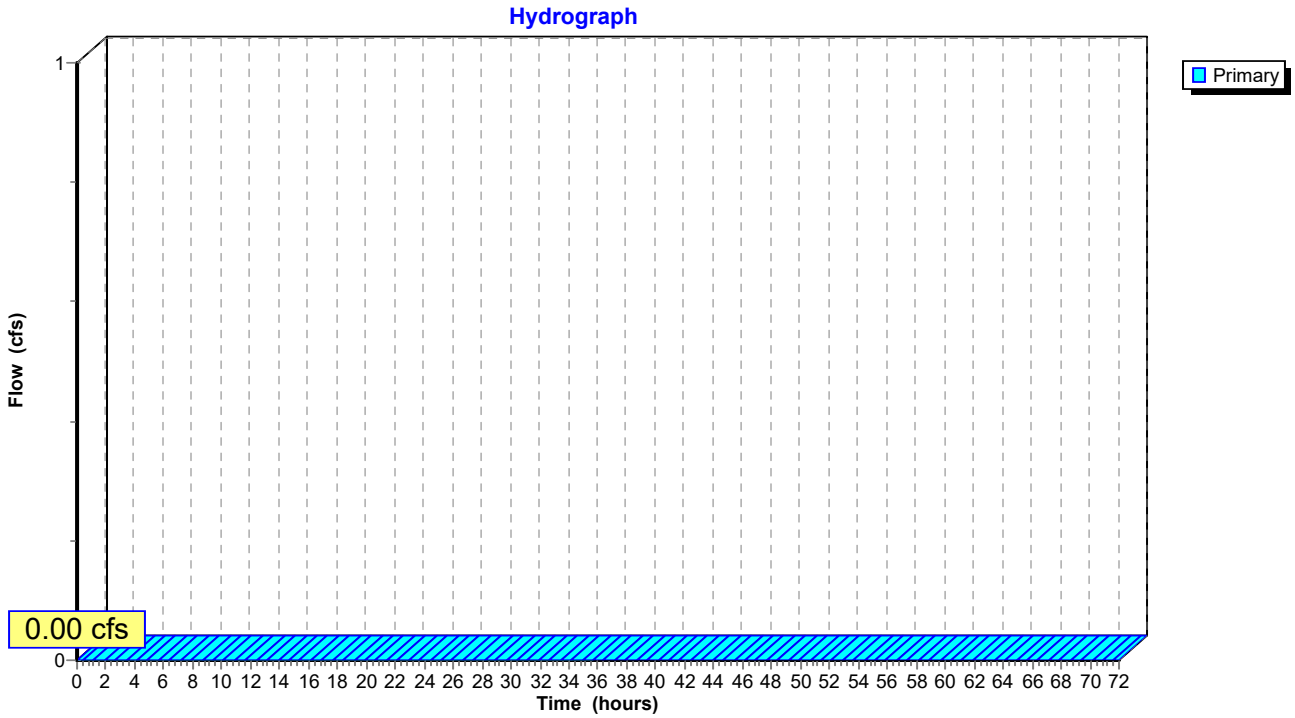
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.00		0.00	64.00	0.00		0.00
12.00	**0.00**		**0.00**	65.00	0.00		0.00
13.00	**0.00**		**0.00**	66.00	0.00		0.00
14.00	0.00		0.00	67.00	0.00		0.00
15.00	0.00		0.00	68.00	0.00		0.00
16.00	0.00		0.00	69.00	0.00		0.00
17.00	0.00		0.00	70.00	0.00		0.00
18.00	0.00		0.00	71.00	0.00		0.00
19.00	0.00		0.00	72.00	0.00		0.00
20.00	0.00		0.00				
21.00	0.00		0.00				
22.00	0.00		0.00				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Summary for Pond 2P: FES w/ HEADWALL

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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Pond 2P: FES w/ HEADWALL



Summary for Pond 3P: Permeable Pavement

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=89)

Inflow Area =	0.814 ac,	0.00% Impervious,	Inflow Depth =	2.64"	for 2-Year event
Inflow =	2.33 cfs @	12.09 hrs,	Volume=	0.179 af	
Outflow =	0.39 cfs @	12.56 hrs,	Volume=	0.180 af,	Atten= 83%, Lag= 28.2 min
Discarded =	0.39 cfs @	11.90 hrs,	Volume=	0.180 af	
Primary =	0.00 cfs @	12.56 hrs,	Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.01' @ 12.56 hrs Surf.Area= 32,578 sf Storage= 2,125 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 31.1 min (812.1 - 781.0)

Volume	Invert	Avail.Storage	Storage Description
#1	122.85'	11,044 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

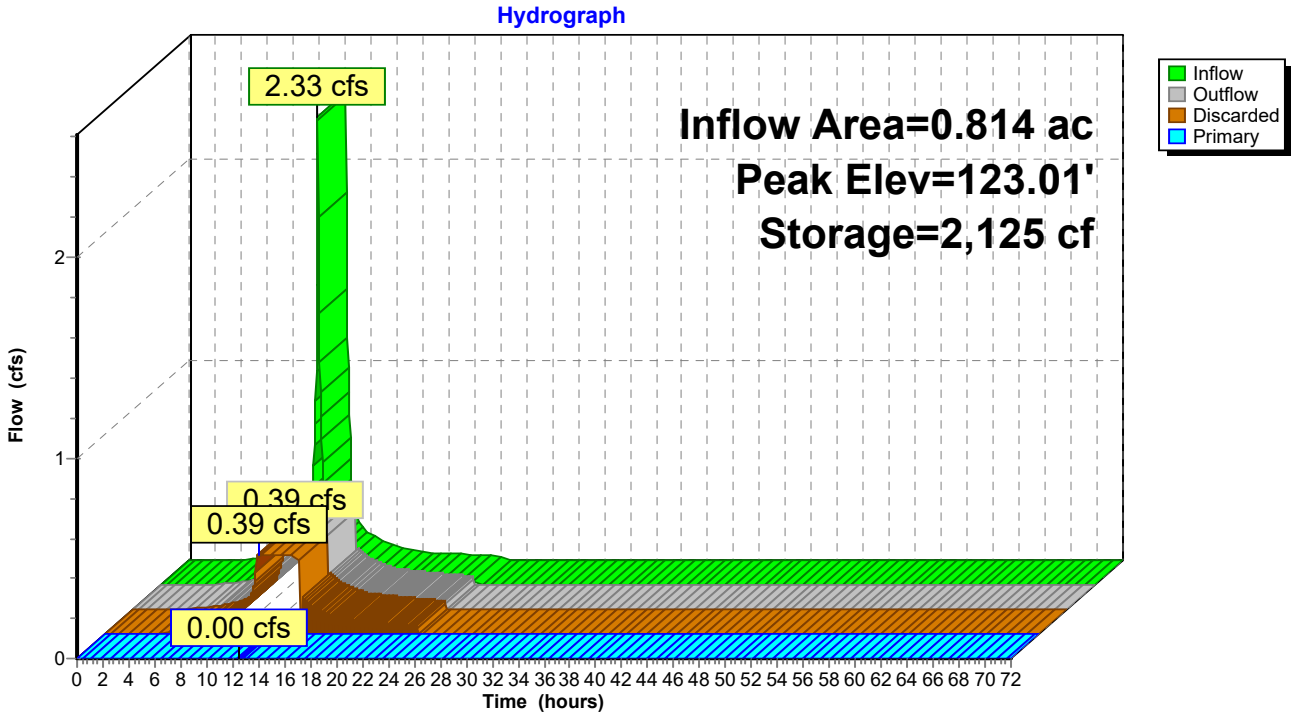
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
122.85	32,578	0.0	0	0
123.51	32,578	40.0	8,601	8,601
123.76	32,578	30.0	2,443	11,044

Device	Routing	Invert	Outlet Devices
#1	Discarded	122.85'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	123.01'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.01' / 122.90' S= 0.0055 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

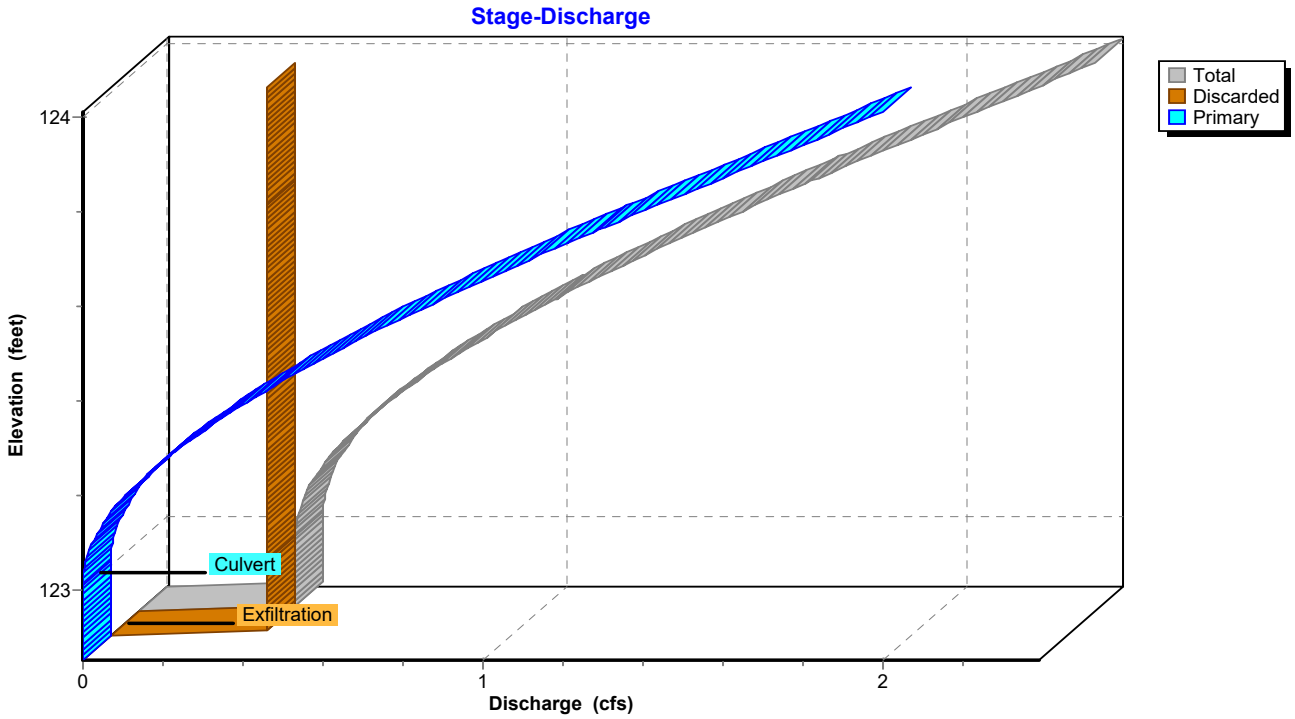
Discarded OutFlow Max=0.39 cfs @ 11.90 hrs HW=122.87' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=0.00 cfs @ 12.56 hrs HW=123.01' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Barrel Controls 0.00 cfs @ 0.12 fps)

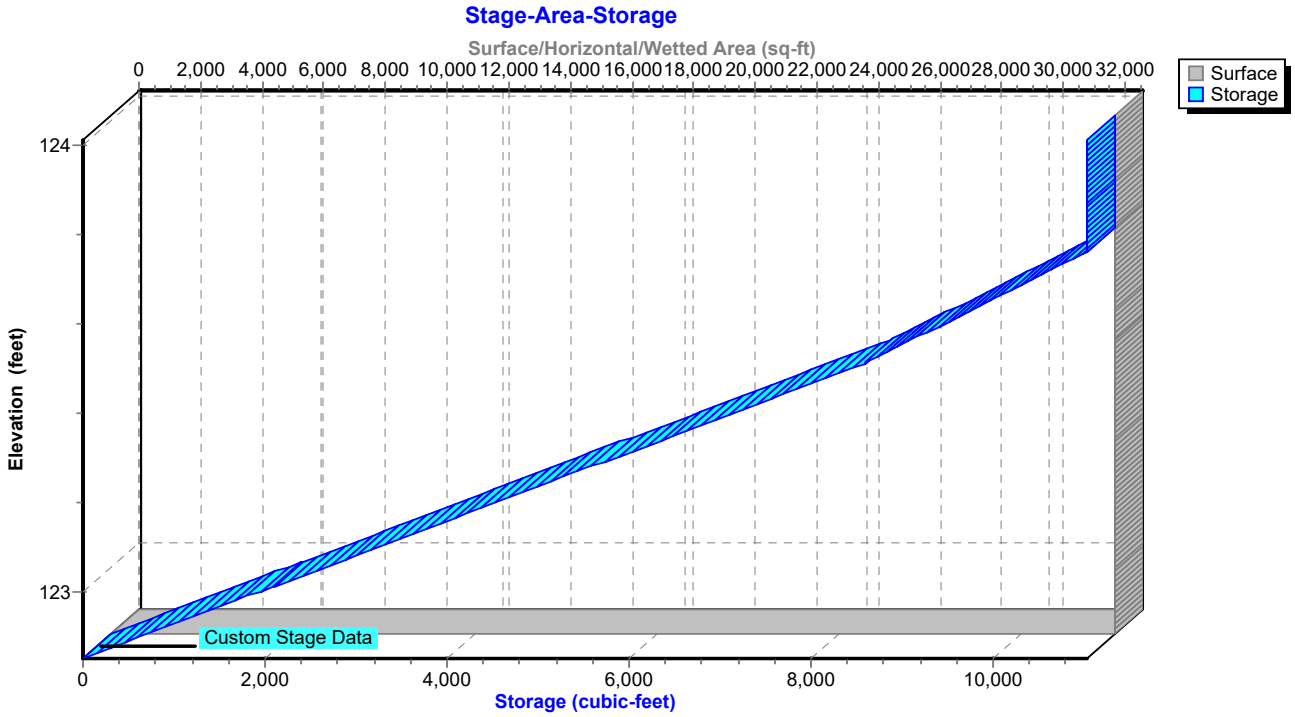
Pond 3P: Permeable Pavement



Pond 3P: Permeable Pavement



Pond 3P: Permeable Pavement



Hydrograph for Pond 3P: Permeable Pavement

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	122.85	0.00	0.00	0.00
2.50	0.00	0	122.85	0.00	0.00	0.00
5.00	0.01	0	122.85	0.01	0.01	0.00
7.50	0.03	0	122.85	0.03	0.03	0.00
10.00	**0.09**	0	122.85	0.09	**0.09**	0.00
12.50	**0.51**	**2,114**	**123.01**	**0.39**	**0.39**	**0.00**
15.00	0.10	**89**	**122.86**	**0.39**	0.39	**0.00**
17.50	0.05	0	122.85	0.10	0.10	0.00
20.00	0.03	0	122.85	0.07	0.07	0.00
22.50	0.03	0	122.85	0.05	0.05	0.00
25.00	0.00	0	122.85	0.00	0.00	0.00
27.50	0.00	0	122.85	0.00	0.00	0.00
30.00	0.00	0	122.85	0.00	0.00	0.00
32.50	0.00	0	122.85	0.00	0.00	0.00
35.00	0.00	0	122.85	0.00	0.00	0.00
37.50	0.00	0	122.85	0.00	0.00	0.00
40.00	0.00	0	122.85	0.00	0.00	0.00
42.50	0.00	0	122.85	0.00	0.00	0.00
45.00	0.00	0	122.85	0.00	0.00	0.00
47.50	0.00	0	122.85	0.00	0.00	0.00
50.00	0.00	0	122.85	0.00	0.00	0.00
52.50	0.00	0	122.85	0.00	0.00	0.00
55.00	0.00	0	122.85	0.00	0.00	0.00
57.50	0.00	0	122.85	0.00	0.00	0.00
60.00	0.00	0	122.85	0.00	0.00	0.00
62.50	0.00	0	122.85	0.00	0.00	0.00
65.00	0.00	0	122.85	0.00	0.00	0.00
67.50	0.00	0	122.85	0.00	0.00	0.00
70.00	0.00	0	122.85	0.00	0.00	0.00

Stage-Discharge for Pond 3P: Permeable Pavement

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
122.85	0.00	**0.00**	0.00
122.87	0.39	**0.39**	0.00
122.89	0.39	0.39	0.00
122.91	0.39	0.39	0.00
122.93	0.39	0.39	0.00
122.95	0.39	0.39	0.00
122.97	0.39	0.39	0.00
122.99	0.39	0.39	0.00
123.01	0.39	0.39	0.00
123.03	0.39	0.39	0.00
123.05	0.40	0.39	0.00
123.07	0.40	0.39	0.01
123.09	0.41	0.39	0.02
123.11	0.42	0.39	0.03
123.13	0.44	0.39	0.04
123.15	0.45	0.39	0.06
123.17	0.47	0.39	0.08
123.19	0.49	0.39	0.10
123.21	0.51	0.39	0.12
123.23	0.54	0.39	0.14
123.25	0.56	0.39	0.17
123.27	0.59	0.39	0.20
123.29	0.62	0.39	0.23
123.31	0.65	0.39	0.26
123.33	0.68	0.39	0.29
123.35	0.72	0.39	0.32
123.37	0.75	0.39	0.36
123.39	0.79	0.39	0.40
123.41	0.83	0.39	0.44
123.43	0.87	0.39	0.48
123.45	0.91	0.39	0.52
123.47	0.95	0.39	0.56
123.49	1.00	0.39	0.60
123.51	1.04	0.39	0.65
123.53	1.09	0.39	0.69
123.55	1.13	0.39	0.74
123.57	1.18	0.39	0.79
123.59	1.23	0.39	0.84
123.61	1.28	0.39	0.89
123.63	1.33	0.39	0.94
123.65	1.38	0.39	0.99
123.67	1.44	0.39	1.04
123.69	1.49	0.39	1.10
123.71	1.54	0.39	1.15
123.73	1.60	0.39	1.21
123.75	1.65	0.39	1.26
123.77	1.71	0.39	1.32
123.79	1.77	0.39	1.37
123.81	1.82	0.39	1.43
123.83	1.88	0.39	1.49
123.85	1.94	0.39	1.54
123.87	1.99	0.39	1.60
123.89	2.05	0.39	1.66
123.91	2.11	0.39	1.71
123.93	2.16	0.39	1.77
123.95	2.22	0.39	1.83
123.97	2.28	0.39	1.89
123.99	2.33	0.39	1.94
124.01	**2.39**	0.39	**2.00**

Stage-Area-Storage for Pond 3P: Permeable Pavement

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
122.85	**32,578**	0
122.87	32,578	261
122.89	32,578	521
122.91	32,578	782
122.93	32,578	1,042
122.95	32,578	1,303
122.97	32,578	1,564
122.99	32,578	1,824
123.01	32,578	2,085
123.03	32,578	2,346
123.05	32,578	2,606
123.07	32,578	2,867
123.09	32,578	3,127
123.11	32,578	3,388
123.13	32,578	3,649
123.15	32,578	3,909
123.17	32,578	4,170
123.19	32,578	4,431
123.21	32,578	4,691
123.23	32,578	4,952
123.25	32,578	5,212
123.27	32,578	5,473
123.29	32,578	5,734
123.31	32,578	5,994
123.33	32,578	6,255
123.35	32,578	6,516
123.37	32,578	6,776
123.39	32,578	7,037
123.41	32,578	7,297
123.43	32,578	7,558
123.45	32,578	7,819
123.47	32,578	8,079
123.49	32,578	8,340
123.51	32,578	8,601
123.53	32,578	8,796
123.55	32,578	8,992
123.57	32,578	9,187
123.59	32,578	9,382
123.61	32,578	9,578
123.63	32,578	9,773
123.65	32,578	9,969
123.67	32,578	10,164
123.69	32,578	10,360
123.71	32,578	10,555
123.73	32,578	10,751
123.75	32,578	**10,946**
123.77	32,578	**11,044**
123.79	32,578	11,044
123.81	32,578	11,044
123.83	32,578	11,044
123.85	32,578	11,044
123.87	32,578	11,044
123.89	32,578	11,044
123.91	32,578	11,044
123.93	32,578	11,044
123.95	32,578	11,044
123.97	32,578	11,044
123.99	32,578	11,044
124.01	32,578	11,044

Summary for Pond UG-1: RETAIN_IT

Inflow Area = 2.219 ac, 85.49% Impervious, Inflow Depth = 2.45" for 2-Year event
Inflow = 6.02 cfs @ 12.09 hrs, Volume= 0.452 af
Outflow = 4.22 cfs @ 12.17 hrs, Volume= 0.452 af, Atten= 30%, Lag= 5.2 min
Primary = 4.22 cfs @ 12.17 hrs, Volume= 0.452 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.86' @ 12.17 hrs Surf.Area= 3,444 sf Storage= 3,488 cf

Plug-Flow detention time= 46.2 min calculated for 0.452 af (100% of inflow)
Center-of-Mass det. time= 47.0 min (839.7 - 792.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	122.40'	1,095 cf	**42.00'W x 82.00'L x 4.67'H Field A** 16,072 cf Overall - 13,333 cf Embedded = 2,739 cf x 40.0% Voids
#2A	122.90'	9,855 cf	**retain_it retain_it 3.5'** x 50 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 5 Rows adjusted for 184.2 cf perimeter wall
		10,950 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	122.40'	**15.0" Round Culvert** L= 212.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 122.40' / 121.25' S= 0.0054 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.23 sf
#2	Device 1	122.40'	**2.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	122.90'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=4.15 cfs @ 12.17 hrs HW=123.85' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 4.15 cfs of 4.24 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.19 cfs @ 5.58 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 3.96 cfs @ 3.19 fps)

Pond UG-1: RETAIN_IT - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it®)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
5 Rows adjusted for 184.2 cf perimeter wall

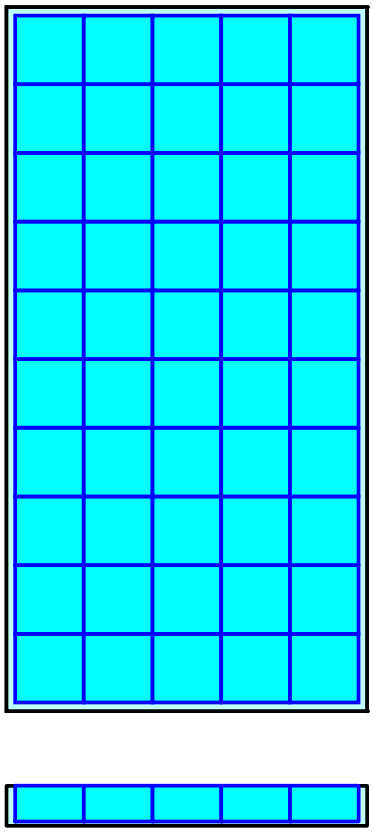
10 Chambers/Row x 8.00' Long = 80.00' Row Length +12.0" End Stone x 2 = 82.00' Base Length
5 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 42.00' Base Width
6.0" Base + 50.0" Chamber Height = 4.67' Field Height

6.1 cf Sidewall x 10 x 2 + 6.1 cf Endwall x 5 x 2 = 184.2 cf Perimeter Wall
50 Chambers x 200.8 cf - 184.2 cf Perimeter wall = 9,854.8 cf Chamber Storage
50 Chambers x 266.7 cf = 13,333.3 cf Displacement

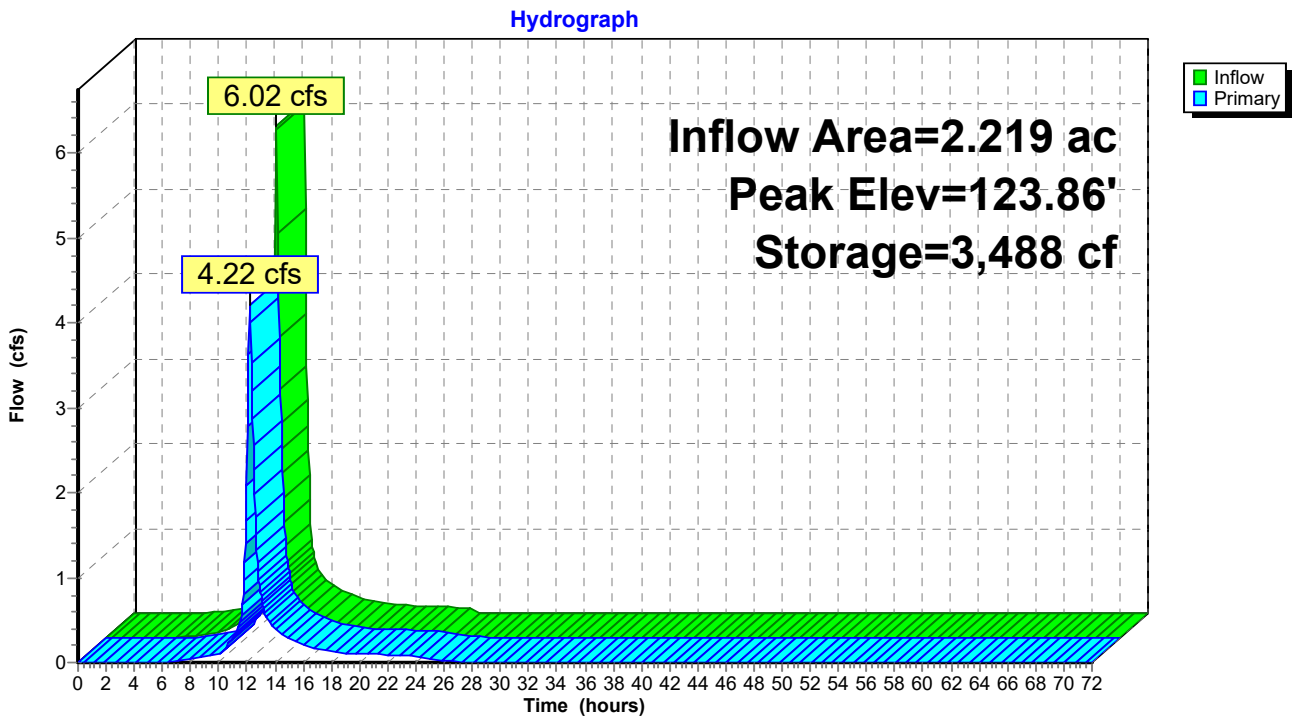
16,072.0 cf Field - 13,333.3 cf Chambers = 2,738.7 cf Stone x 40.0% Voids = 1,095.5 cf Stone Storage

Chamber Storage + Stone Storage = 10,950.3 cf = 0.251 af
Overall Storage Efficiency = 68.1%
Overall System Size = 82.00' x 42.00' x 4.67'

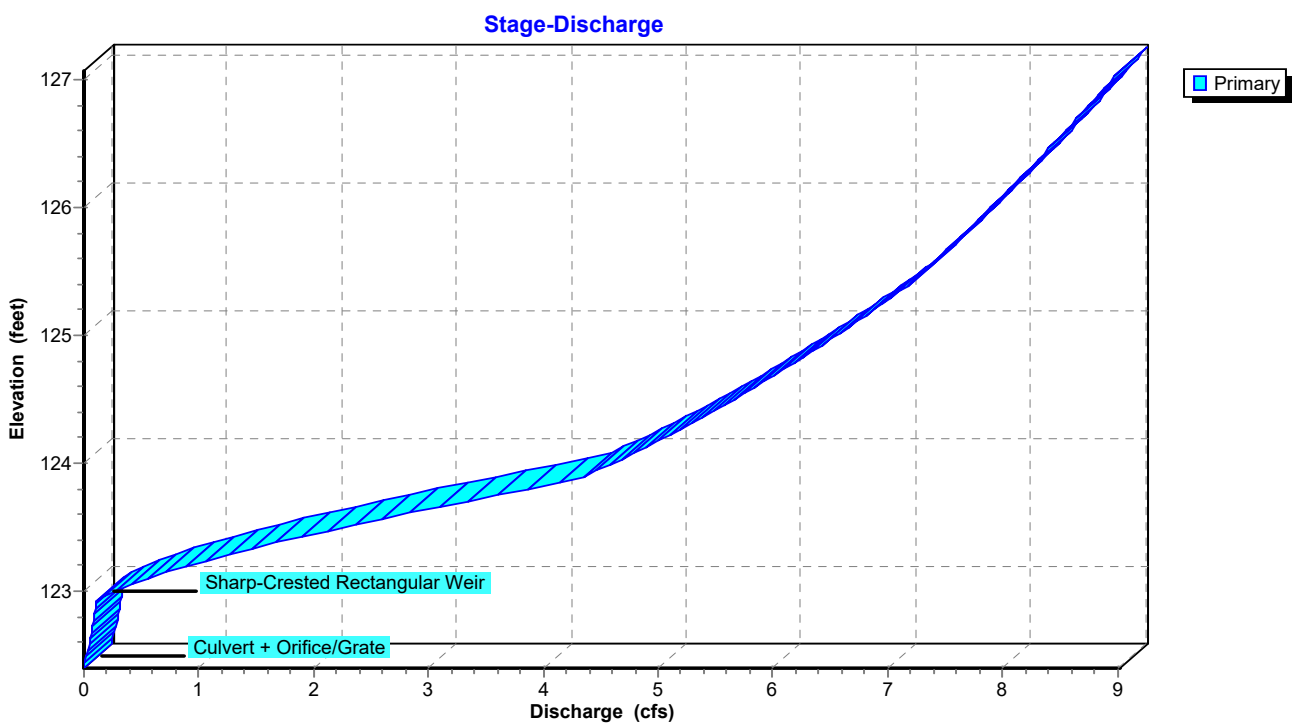
50 Chambers
595.3 cy Field
101.4 cy Stone



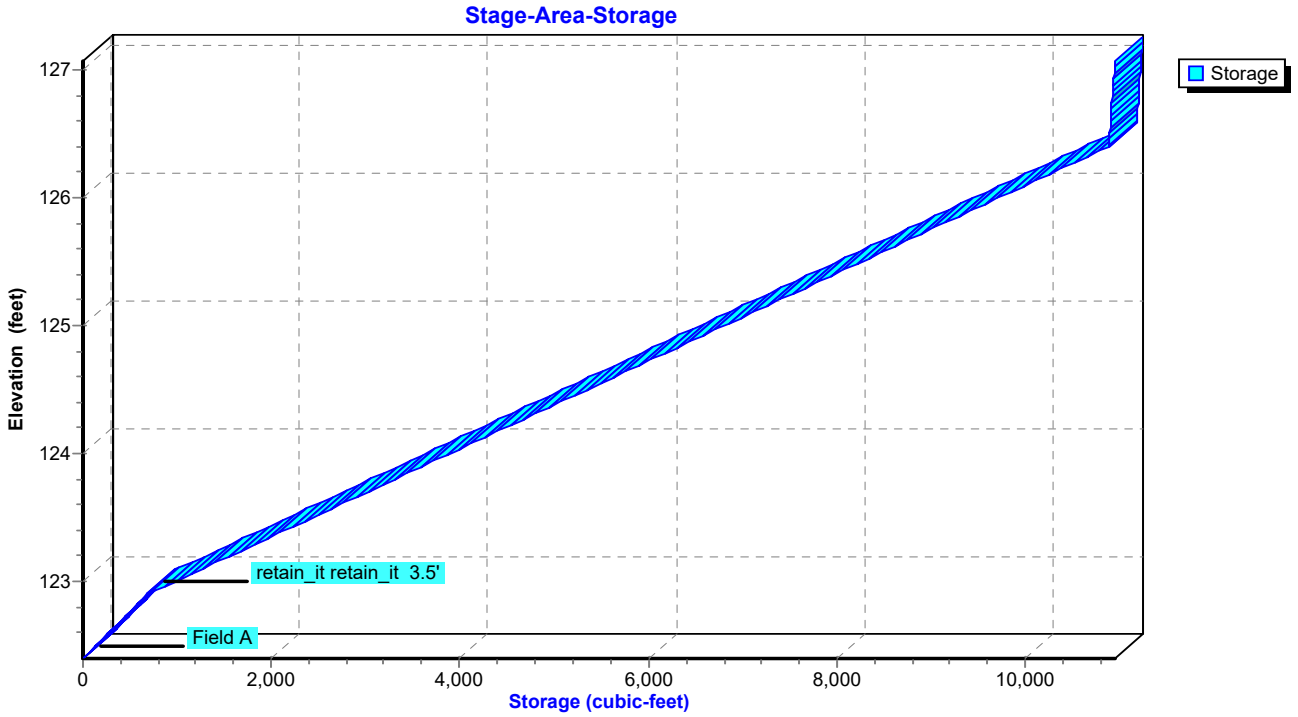
Pond UG-1: RETAIN_IT



Pond UG-1: RETAIN_IT



Pond UG-1: RETAIN_IT



Hydrograph for Pond UG-1: RETAIN_IT

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	122.40	0.00
2.50	0.00	0	122.40	0.00
5.00	0.01	7	122.41	0.00
7.50	0.05	177	122.53	0.03
10.00	**0.21**	**677**	**122.89**	**0.10**
12.50	**1.33**	**2,438**	**123.50**	**2.26**
15.00	0.26	1,003	123.01	0.29
17.50	0.13	803	122.94	0.15
20.00	0.09	683	122.90	0.10
22.50	0.07	542	122.79	0.09
25.00	0.00	243	122.58	0.04
27.50	0.00	81	122.46	0.01
30.00	0.00	46	122.43	0.00
32.50	0.00	32	122.42	0.00
35.00	0.00	25	122.42	0.00
37.50	0.00	20	122.41	0.00
40.00	0.00	17	122.41	0.00
42.50	0.00	14	122.41	0.00
45.00	0.00	13	122.41	0.00
47.50	0.00	11	122.41	0.00
50.00	0.00	10	122.41	0.00
52.50	0.00	9	122.41	0.00
55.00	0.00	8	122.41	0.00
57.50	0.00	8	122.41	0.00
60.00	0.00	7	122.41	0.00
62.50	0.00	7	122.40	0.00
65.00	0.00	6	122.40	0.00
67.50	0.00	6	122.40	0.00
70.00	0.00	6	122.40	0.00

Stage-Discharge for Pond UG-1: RETAIN_IT

Elevation (feet)	Primary (cfs)
122.40	0.00
122.45	0.00
122.50	0.02
122.55	0.03
122.60	0.05
122.65	0.06
122.70	0.07
122.75	0.08
122.80	0.09
122.85	0.10
122.90	0.10
122.95	0.16
123.00	0.27
123.05	0.40
123.10	0.55
123.15	0.72
123.20	0.91
123.25	1.11
123.30	1.32
123.35	1.54
123.40	1.77
123.45	2.01
123.50	2.26
123.55	2.52
123.60	2.78
123.65	3.04
123.70	3.31
123.75	3.59
123.80	3.87
123.85	4.16
123.90	4.36
123.95	4.49
124.00	4.61
124.05	4.72
124.10	4.84
124.15	4.95
124.20	5.06
124.25	5.16
124.30	5.27
124.35	5.37
124.40	5.47
124.45	5.57
124.50	5.67
124.55	5.76
124.60	5.85
124.65	5.95
124.70	6.04
124.75	6.13
124.80	6.21
124.85	6.30
124.90	6.39
124.95	6.47
125.00	6.56
125.05	6.64
125.10	6.72
125.15	6.80
125.20	6.88
125.25	6.96
125.30	7.04
125.35	7.11
125.40	7.19
125.45	7.25
125.50	7.31
125.55	7.37
125.60	7.43
125.65	7.49
125.70	7.55
125.75	7.61
125.80	7.67
125.85	7.73
125.90	7.79
125.95	7.84
126.00	7.90
126.05	7.96
126.10	8.01
126.15	8.07
126.20	8.12
126.25	8.18
126.30	8.23
126.35	8.29
126.40	8.34
126.45	8.39
126.50	8.45
126.55	8.50
126.60	8.55
126.65	8.60
126.70	8.65
126.75	8.70
126.80	8.76
126.85	8.81
126.90	8.86
126.95	8.91
127.00	8.96
127.05	**9.01**

Stage-Area-Storage for Pond UG-1: RETAIN_IT

Elevation (feet)	Storage (cubic-feet)
122.40	0
122.45	69
122.50	138
122.55	207
122.60	276
122.65	344
122.70	413
122.75	482
122.80	551
122.85	620
122.90	689
122.95	834
123.00	980
123.05	1,126
123.10	1,271
123.15	1,417
123.20	1,563
123.25	1,708
123.30	1,854
123.35	2,000
123.40	2,145
123.45	2,291
123.50	2,437
123.55	2,582
123.60	2,728
123.65	2,874
123.70	3,019
123.75	3,165
123.80	3,311
123.85	3,456
123.90	3,602
123.95	3,748
124.00	3,893
124.05	4,039
124.10	4,185
124.15	4,330
124.20	4,476
124.25	4,622
124.30	4,767
124.35	4,913
124.40	5,059
124.45	5,204
124.50	5,350
124.55	5,496
124.60	5,641
124.65	5,787
124.70	5,933
124.75	6,078
124.80	6,224
124.85	6,370
124.90	6,515
124.95	6,661
125.00	6,807
125.05	6,952
125.10	7,098
125.15	7,244
125.20	7,389
125.25	7,535
125.30	7,681
125.35	7,826
125.40	7,972
125.45	8,118
125.50	8,263
125.55	8,409
125.60	8,555
125.65	8,700
125.70	8,846
125.75	8,992
125.80	9,137
125.85	9,283
125.90	9,429
125.95	9,574
126.00	9,720
126.05	9,866
126.10	10,011
126.15	10,157
126.20	10,303
126.25	10,448
126.30	10,594
126.35	10,740
126.40	10,885
126.45	10,890
126.50	10,895
126.55	10,900
126.60	10,905
126.65	10,910
126.70	10,915
126.75	10,919
126.80	10,924
126.85	10,929
126.90	10,934
126.95	10,939
127.00	10,944
127.05	**10,949**

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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

Subcatchment P-1A: P-1A Runoff Area=96,664 sf 85.49% Impervious Runoff Depth=3.12"
Tc=6.0 min CN=93 Runoff=7.59 cfs 0.577 af

Subcatchment P-1B: P-1B (PERMEABLE Runoff Area=35,462 sf 0.00% Impervious Runoff Depth=3.33"
Tc=6.0 min CN=95 Runoff=2.90 cfs 0.226 af

Subcatchment P-1U: P-1U (UNDETAINED) Runoff Area=13,343 sf 0.00% Impervious Runoff Depth=0.62"
Tc=6.0 min CN=58 Runoff=0.15 cfs 0.016 af

Subcatchment P-2: P-2 Runoff Area=5,081 sf 46.53% Impervious Runoff Depth=1.81"
Tc=6.0 min CN=78 Runoff=0.24 cfs 0.018 af

Reach PD1: WETLAND Inflow=4.99 cfs 0.594 af
Outflow=4.99 cfs 0.594 af

Reach PD2: BOSTON POST RD Inflow=0.24 cfs 0.018 af
Outflow=0.24 cfs 0.018 af

Pond 1P: FES Inflow=0.01 cfs 0.001 af
Primary=0.01 cfs 0.001 af

Pond 2P: FES w/ HEADWALL
Primary=0.00 cfs 0.000 af

Pond 3P: Permeable Pavement Peak Elev=123.08' Storage=2,964 cf Inflow=2.90 cfs 0.226 af
Discarded=0.39 cfs 0.226 af Primary=0.01 cfs 0.001 af Outflow=0.41 cfs 0.227 af

Pond UG-1: RETAIN_IT Peak Elev=124.11' Storage=4,217 cf Inflow=7.59 cfs 0.577 af
Outflow=4.86 cfs 0.577 af

Total Runoff Area = 3.456 ac Runoff Volume = 0.837 af Average Runoff Depth = 2.91"
43.54% Pervious = 1.505 ac 56.46% Impervious = 1.951 ac

Summary for Subcatchment P-1A: P-1A

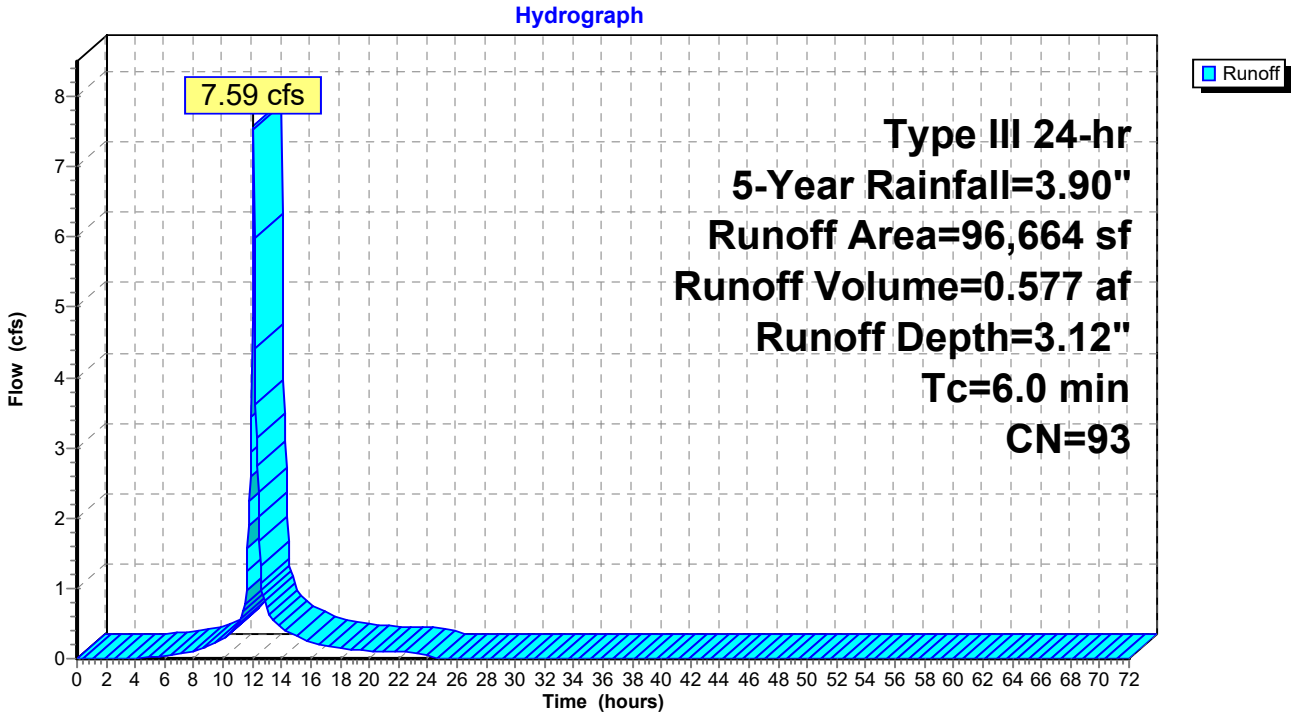
Runoff = 7.59 cfs @ 12.09 hrs, Volume= 0.577 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-Year Rainfall=3.90"

	Area (sf)	CN	Description
*	1,394	61	>75% Grass cover, Good, HSG B- ISLANDS
	75,402	98	Paved parking, HSG B
*	4,922	73	Existing Woods/grass comb., Poor, HSG B
	7,710	58	Woods/grass comb., Good, HSG B
	7,236	98	Unconnected roofs, HSG B
	96,664	93	Weighted Average
	14,026	64	14.51% Pervious Area
	82,638	98	85.49% Impervious Area
	7,236		8.76% Unconnected

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

Subcatchment P-1A: P-1A



Hydrograph for Subcatchment P-1A: P-1A

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.04	0.00	0.00
2.00	0.08	0.00	0.00
3.00	0.12	0.00	0.00
4.00	0.17	0.00	0.00
5.00	0.22	0.01	0.02
6.00	0.28	0.02	0.04
7.00	0.35	0.04	0.07
8.00	0.44	0.08	0.11
9.00	0.57	0.15	0.18
10.00	0.74	0.26	0.28
11.00	0.98	0.43	0.47
12.00	1.95	1.27	**4.83**
13.00	2.92	2.18	**0.68**
14.00	3.16	2.41	0.43
15.00	3.33	2.57	0.32
16.00	3.46	2.69	0.23
17.00	3.55	2.78	0.18
18.00	3.62	2.85	0.14
19.00	3.68	2.91	0.12
20.00	3.73	2.96	0.11
21.00	3.78	3.01	0.10
22.00	3.82	3.05	0.09
23.00	3.86	3.09	0.08
24.00	**3.90**	**3.12**	0.07
25.00	3.90	3.12	0.00
26.00	3.90	3.12	0.00
27.00	3.90	3.12	0.00
28.00	3.90	3.12	0.00
29.00	3.90	3.12	0.00
30.00	3.90	3.12	0.00
31.00	3.90	3.12	0.00
32.00	3.90	3.12	0.00
33.00	3.90	3.12	0.00
34.00	3.90	3.12	0.00
35.00	3.90	3.12	0.00
36.00	3.90	3.12	0.00
37.00	3.90	3.12	0.00
38.00	3.90	3.12	0.00
39.00	3.90	3.12	0.00
40.00	3.90	3.12	0.00
41.00	3.90	3.12	0.00
42.00	3.90	3.12	0.00
43.00	3.90	3.12	0.00
44.00	3.90	3.12	0.00
45.00	3.90	3.12	0.00
46.00	3.90	3.12	0.00
47.00	3.90	3.12	0.00
48.00	3.90	3.12	0.00
49.00	3.90	3.12	0.00
50.00	3.90	3.12	0.00
51.00	3.90	3.12	0.00
52.00	3.90	3.12	0.00
53.00	3.90	3.12	0.00
54.00	3.90	3.12	0.00
55.00	3.90	3.12	0.00
56.00	3.90	3.12	0.00
57.00	3.90	3.12	0.00
58.00	3.90	3.12	0.00
59.00	3.90	3.12	0.00
60.00	3.90	3.12	0.00
61.00	3.90	3.12	0.00
62.00	3.90	3.12	0.00
63.00	3.90	3.12	0.00
64.00	3.90	3.12	0.00
65.00	3.90	3.12	0.00
66.00	3.90	3.12	0.00
67.00	3.90	3.12	0.00
68.00	3.90	3.12	0.00
69.00	3.90	3.12	0.00
70.00	3.90	3.12	0.00
71.00	3.90	3.12	0.00
72.00	3.90	3.12	0.00

Summary for Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)

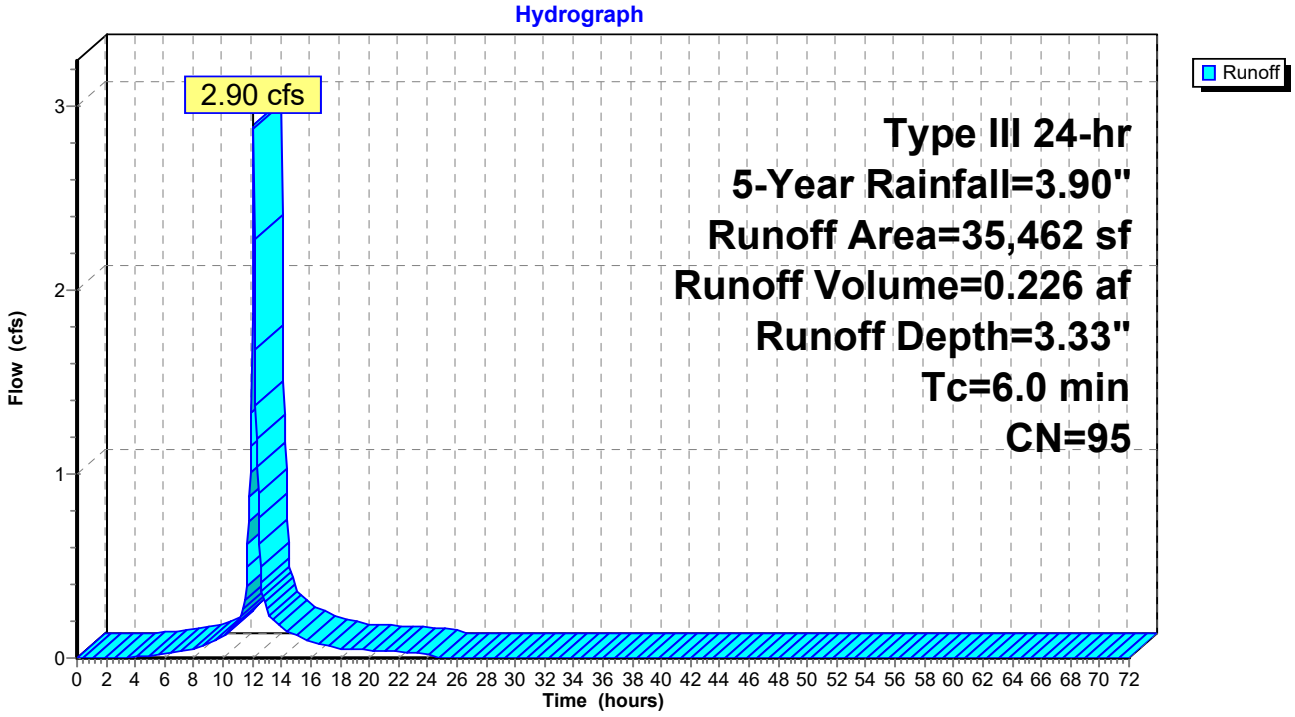
Runoff = 2.90 cfs @ 12.09 hrs, Volume= 0.226 af, Depth= 3.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-Year Rainfall=3.90"

	Area (sf)	CN	Description
*	32,606	98	Perm. Pavement, 0% imp, HSG B
	2,856	61	>75% Grass cover, Good, HSG B
	35,462	95	Weighted Average
	35,462	95	100.00% Pervious Area

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

Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)



Hydrograph for Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.04	0.00	0.00
2.00	0.08	0.00	0.00
3.00	0.12	0.00	0.00
4.00	0.17	0.01	0.01
5.00	0.22	0.02	0.01
6.00	0.28	0.04	0.02
7.00	0.35	0.08	0.03
8.00	0.44	0.13	0.05
9.00	0.57	0.22	0.08
10.00	0.74	0.34	0.12
11.00	0.98	0.54	0.19
12.00	1.95	1.44	**1.86**
13.00	2.92	2.38	**0.25**
14.00	3.16	2.61	0.16
15.00	3.33	2.77	0.12
16.00	3.46	2.90	0.09
17.00	3.55	2.99	0.07
18.00	3.62	3.06	0.05
19.00	3.68	3.11	0.05
20.00	3.73	3.17	0.04
21.00	3.78	3.22	0.04
22.00	3.82	3.26	0.03
23.00	3.86	3.30	0.03
24.00	**3.90**	**3.33**	0.03
25.00	3.90	3.33	0.00
26.00	3.90	3.33	0.00
27.00	3.90	3.33	0.00
28.00	3.90	3.33	0.00
29.00	3.90	3.33	0.00
30.00	3.90	3.33	0.00
31.00	3.90	3.33	0.00
32.00	3.90	3.33	0.00
33.00	3.90	3.33	0.00
34.00	3.90	3.33	0.00
35.00	3.90	3.33	0.00
36.00	3.90	3.33	0.00
37.00	3.90	3.33	0.00
38.00	3.90	3.33	0.00
39.00	3.90	3.33	0.00
40.00	3.90	3.33	0.00
41.00	3.90	3.33	0.00
42.00	3.90	3.33	0.00
43.00	3.90	3.33	0.00
44.00	3.90	3.33	0.00
45.00	3.90	3.33	0.00
46.00	3.90	3.33	0.00
47.00	3.90	3.33	0.00
48.00	3.90	3.33	0.00
49.00	3.90	3.33	0.00
50.00	3.90	3.33	0.00
51.00	3.90	3.33	0.00
52.00	3.90	3.33	0.00
53.00	3.90	3.33	0.00
54.00	3.90	3.33	0.00
55.00	3.90	3.33	0.00
56.00	3.90	3.33	0.00
57.00	3.90	3.33	0.00
58.00	3.90	3.33	0.00
59.00	3.90	3.33	0.00
60.00	3.90	3.33	0.00
61.00	3.90	3.33	0.00
62.00	3.90	3.33	0.00
63.00	3.90	3.33	0.00
64.00	3.90	3.33	0.00
65.00	3.90	3.33	0.00
66.00	3.90	3.33	0.00
67.00	3.90	3.33	0.00
68.00	3.90	3.33	0.00
69.00	3.90	3.33	0.00
70.00	3.90	3.33	0.00
71.00	3.90	3.33	0.00
72.00	3.90	3.33	0.00

Summary for Subcatchment P-1U: P-1U (UNDETAINED)

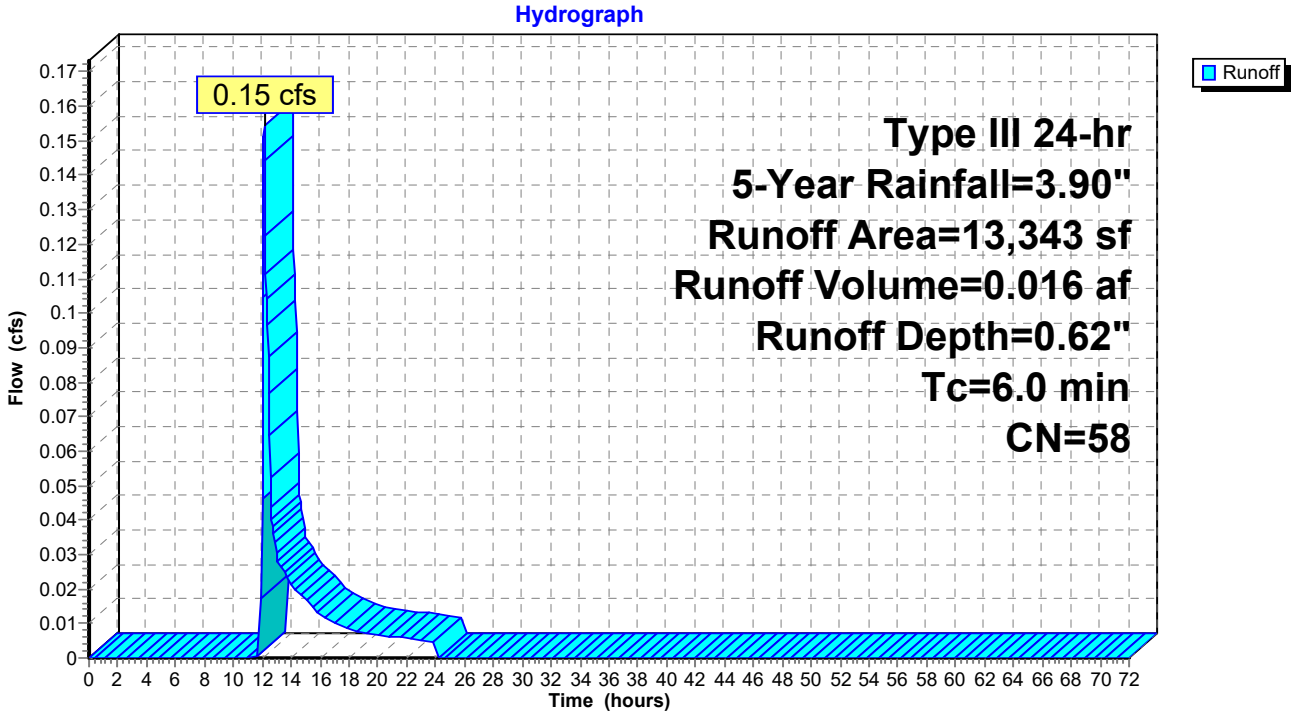
Runoff = 0.15 cfs @ 12.12 hrs, Volume= 0.016 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-Year Rainfall=3.90"

Area (sf)	CN	Description
13,343	58	Woods/grass comb., Good, HSG B
13,343	58	100.00% Pervious Area

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

Subcatchment P-1U: P-1U (UNDETAINED)



Hydrograph for Subcatchment P-1U: P-1U (UNDETAINED)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.04	0.00	0.00
2.00	0.08	0.00	0.00
3.00	0.12	0.00	0.00
4.00	0.17	0.00	0.00
5.00	0.22	0.00	0.00
6.00	0.28	0.00	0.00
7.00	0.35	0.00	0.00
8.00	0.44	0.00	0.00
9.00	0.57	0.00	0.00
10.00	0.74	0.00	0.00
11.00	0.98	0.00	0.00
12.00	1.95	0.03	**0.05**
13.00	2.92	0.25	**0.03**
14.00	3.16	0.33	0.02
15.00	3.33	0.39	0.02
16.00	3.46	0.44	0.01
17.00	3.55	0.47	0.01
18.00	3.62	0.50	0.01
19.00	3.68	0.53	0.01
20.00	3.73	0.55	0.01
21.00	3.78	0.57	0.01
22.00	3.82	0.59	0.01
23.00	3.86	0.60	0.01
24.00	**3.90**	**0.62**	0.00
25.00	3.90	0.62	0.00
26.00	3.90	0.62	0.00
27.00	3.90	0.62	0.00
28.00	3.90	0.62	0.00
29.00	3.90	0.62	0.00
30.00	3.90	0.62	0.00
31.00	3.90	0.62	0.00
32.00	3.90	0.62	0.00
33.00	3.90	0.62	0.00
34.00	3.90	0.62	0.00
35.00	3.90	0.62	0.00
36.00	3.90	0.62	0.00
37.00	3.90	0.62	0.00
38.00	3.90	0.62	0.00
39.00	3.90	0.62	0.00
40.00	3.90	0.62	0.00
41.00	3.90	0.62	0.00
42.00	3.90	0.62	0.00
43.00	3.90	0.62	0.00
44.00	3.90	0.62	0.00
45.00	3.90	0.62	0.00
46.00	3.90	0.62	0.00
47.00	3.90	0.62	0.00
48.00	3.90	0.62	0.00
49.00	3.90	0.62	0.00
50.00	3.90	0.62	0.00
51.00	3.90	0.62	0.00
52.00	3.90	0.62	0.00
53.00	3.90	0.62	0.00
54.00	3.90	0.62	0.00
55.00	3.90	0.62	0.00
56.00	3.90	0.62	0.00
57.00	3.90	0.62	0.00
58.00	3.90	0.62	0.00
59.00	3.90	0.62	0.00
60.00	3.90	0.62	0.00
61.00	3.90	0.62	0.00
62.00	3.90	0.62	0.00
63.00	3.90	0.62	0.00
64.00	3.90	0.62	0.00
65.00	3.90	0.62	0.00
66.00	3.90	0.62	0.00
67.00	3.90	0.62	0.00
68.00	3.90	0.62	0.00
69.00	3.90	0.62	0.00
70.00	3.90	0.62	0.00
71.00	3.90	0.62	0.00
72.00	3.90	0.62	0.00

Summary for Subcatchment P-2: P-2

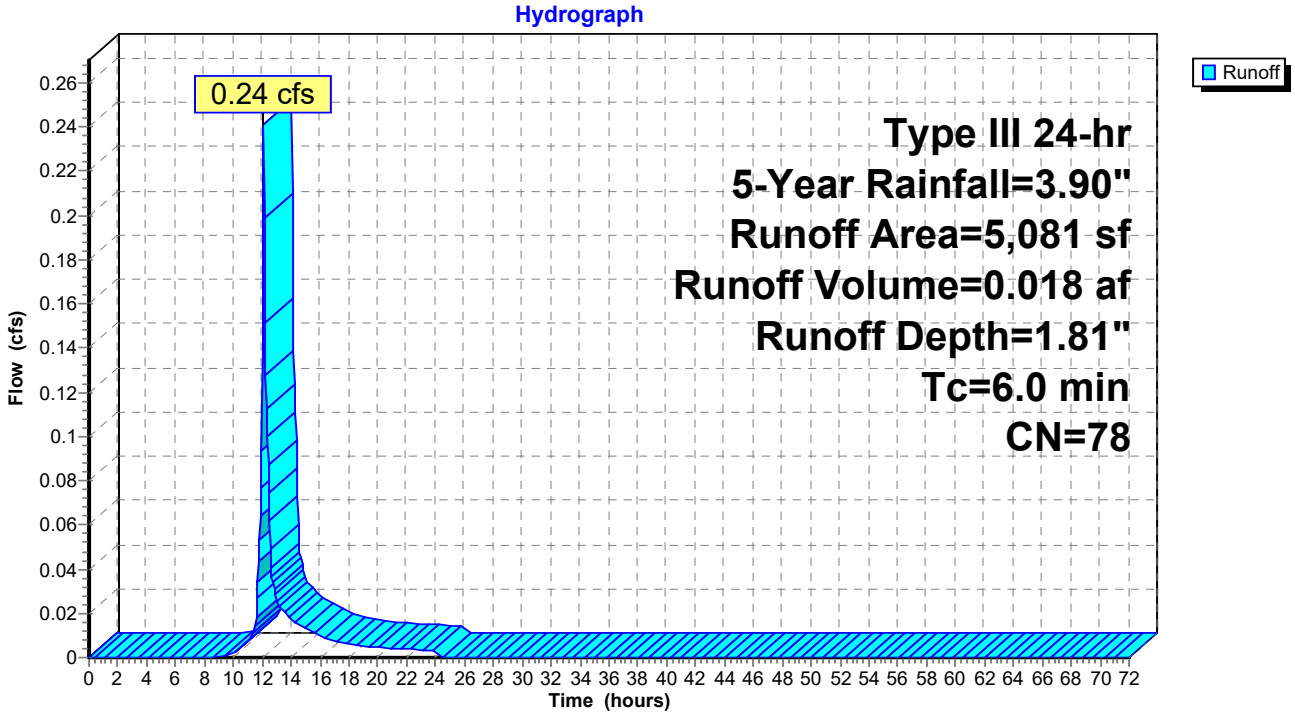
Runoff = 0.24 cfs @ 12.10 hrs, Volume= 0.018 af, Depth= 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-Year Rainfall=3.90"

Area (sf)	CN	Description
2,364	98	Paved parking, HSG B
2,717	61	>75% Grass cover, Good, HSG B
5,081	78	Weighted Average
2,717	61	53.47% Pervious Area
2,364	98	46.53% Impervious Area

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

Subcatchment P-2: P-2



Hydrograph for Subcatchment P-2: P-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	53.00	3.90	1.81	0.00
1.00	0.04	0.00	0.00	54.00	3.90	1.81	0.00
2.00	0.08	0.00	0.00	55.00	3.90	1.81	0.00
3.00	0.12	0.00	0.00	56.00	3.90	1.81	0.00
4.00	0.17	0.00	0.00	57.00	3.90	1.81	0.00
5.00	0.22	0.00	0.00	58.00	3.90	1.81	0.00
6.00	0.28	0.00	0.00	59.00	3.90	1.81	0.00
7.00	0.35	0.00	0.00	60.00	3.90	1.81	0.00
8.00	0.44	0.00	0.00	61.00	3.90	1.81	0.00
9.00	0.57	0.00	0.00	62.00	3.90	1.81	0.00
10.00	0.74	0.01	0.00	63.00	3.90	1.81	0.00
11.00	0.98	0.05	0.01	64.00	3.90	1.81	0.00
12.00	1.95	0.46	**0.14**	65.00	3.90	1.81	0.00
13.00	2.92	1.08	**0.03**	66.00	3.90	1.81	0.00
14.00	3.16	1.25	0.02	67.00	3.90	1.81	0.00
15.00	3.33	1.37	0.01	68.00	3.90	1.81	0.00
16.00	3.46	1.46	0.01	69.00	3.90	1.81	0.00
17.00	3.55	1.53	0.01	70.00	3.90	1.81	0.00
18.00	3.62	1.59	0.01	71.00	3.90	1.81	0.00
19.00	3.68	1.63	0.01	72.00	3.90	1.81	0.00
20.00	3.73	1.68	0.00				
21.00	3.78	1.71	0.00				
22.00	3.82	1.75	0.00				
23.00	3.86	1.78	0.00				
24.00	**3.90**	**1.81**	0.00				
25.00	3.90	1.81	0.00				
26.00	3.90	1.81	0.00				
27.00	3.90	1.81	0.00				
28.00	3.90	1.81	0.00				
29.00	3.90	1.81	0.00				
30.00	3.90	1.81	0.00				
31.00	3.90	1.81	0.00				
32.00	3.90	1.81	0.00				
33.00	3.90	1.81	0.00				
34.00	3.90	1.81	0.00				
35.00	3.90	1.81	0.00				
36.00	3.90	1.81	0.00				
37.00	3.90	1.81	0.00				
38.00	3.90	1.81	0.00				
39.00	3.90	1.81	0.00				
40.00	3.90	1.81	0.00				
41.00	3.90	1.81	0.00				
42.00	3.90	1.81	0.00				
43.00	3.90	1.81	0.00				
44.00	3.90	1.81	0.00				
45.00	3.90	1.81	0.00				
46.00	3.90	1.81	0.00				
47.00	3.90	1.81	0.00				
48.00	3.90	1.81	0.00				
49.00	3.90	1.81	0.00				
50.00	3.90	1.81	0.00				
51.00	3.90	1.81	0.00				
52.00	3.90	1.81	0.00				

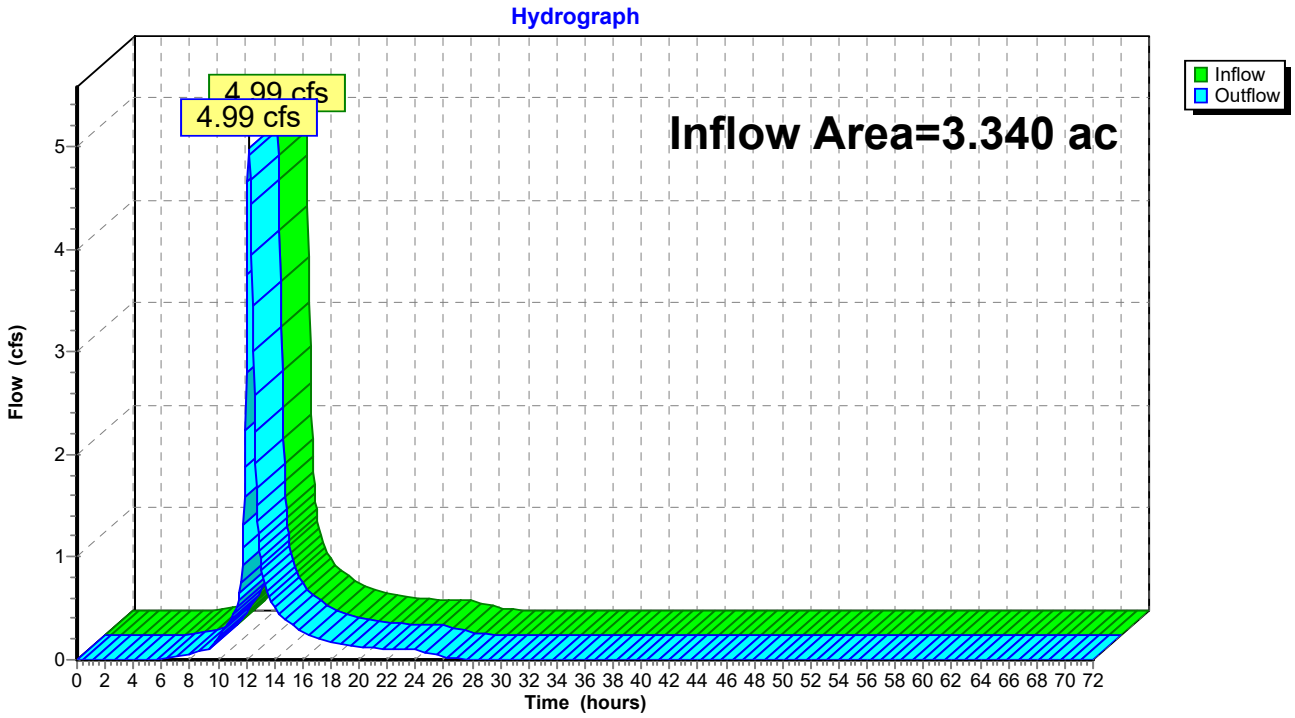
Summary for Reach PD1: WETLAND

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

Inflow Area = 3.340 ac, 56.81% Impervious, Inflow Depth = 2.13" for 5-Year event
Inflow = 4.99 cfs @ 12.18 hrs, Volume= 0.594 af
Outflow = 4.99 cfs @ 12.18 hrs, Volume= 0.594 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD1: WETLAND



Hydrograph for Reach PD1: WETLAND

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.01		0.01	59.00	0.00		0.00
7.00	0.04		0.04	60.00	0.00		0.00
8.00	0.06		0.06	61.00	0.00		0.00
9.00	0.09		0.09	62.00	0.00		0.00
10.00	0.22		0.22	63.00	0.00		0.00
11.00	0.41		0.41	64.00	0.00		0.00
12.00	**2.80**		**2.80**	65.00	0.00		0.00
13.00	**0.99**		**0.99**	66.00	0.00		0.00
14.00	0.50		0.50	67.00	0.00		0.00
15.00	0.37		0.37	68.00	0.00		0.00
16.00	0.27		0.27	69.00	0.00		0.00
17.00	0.21		0.21	70.00	0.00		0.00
18.00	0.17		0.17	71.00	0.00		0.00
19.00	0.14		0.14	72.00	0.00		0.00
20.00	0.13		0.13				
21.00	0.12		0.12				
22.00	0.11		0.11				
23.00	0.10		0.10				
24.00	0.10		0.10				
25.00	0.06		0.06				
26.00	0.03		0.03				
27.00	0.01		0.01				
28.00	0.01		0.01				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

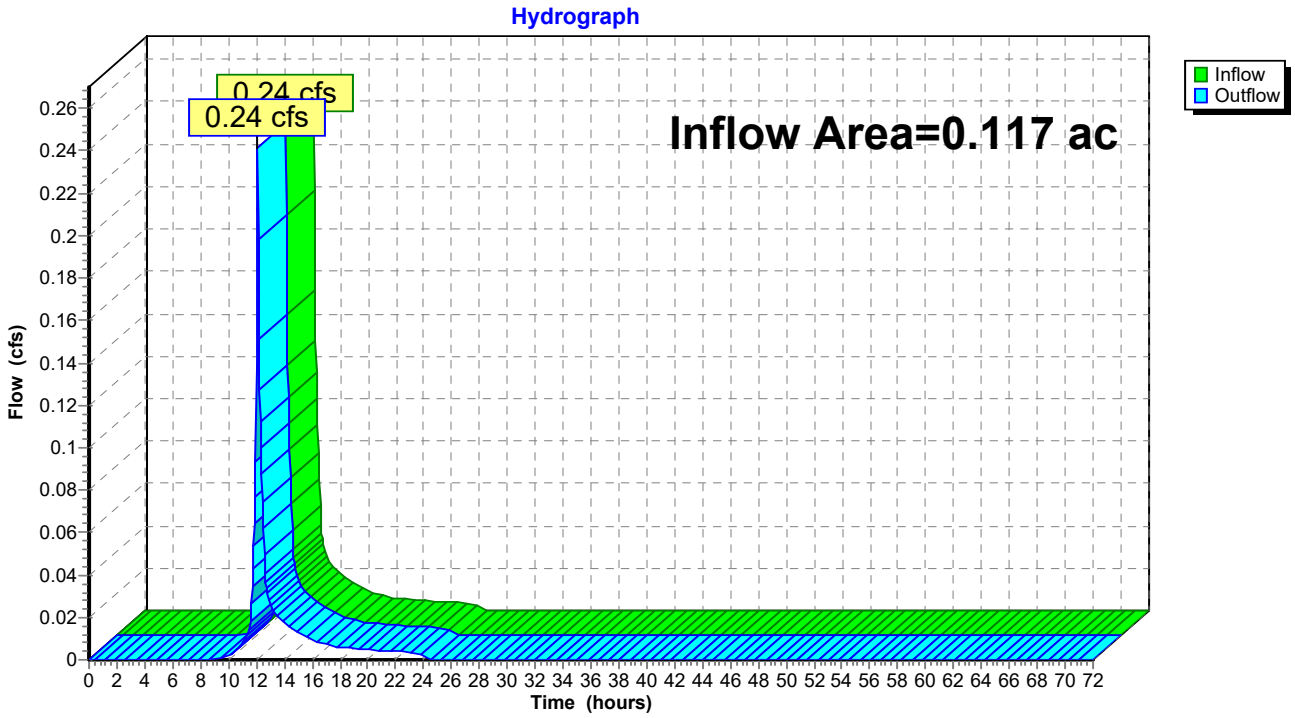
Summary for Reach PD2: BOSTON POST RD

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

Inflow Area = 0.117 ac, 46.53% Impervious, Inflow Depth = 1.81" for 5-Year event
Inflow = 0.24 cfs @ 12.10 hrs, Volume= 0.018 af
Outflow = 0.24 cfs @ 12.10 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD2: BOSTON POST RD



Hydrograph for Reach PD2: BOSTON POST RD

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.01		0.01	64.00	0.00		0.00
12.00	**0.14**		**0.14**	65.00	0.00		0.00
13.00	**0.03**		**0.03**	66.00	0.00		0.00
14.00	0.02		0.02	67.00	0.00		0.00
15.00	0.01		0.01	68.00	0.00		0.00
16.00	0.01		0.01	69.00	0.00		0.00
17.00	0.01		0.01	70.00	0.00		0.00
18.00	0.01		0.01	71.00	0.00		0.00
19.00	0.01		0.01	72.00	0.00		0.00
20.00	0.00		0.00				
21.00	0.00		0.00				
22.00	0.00		0.00				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

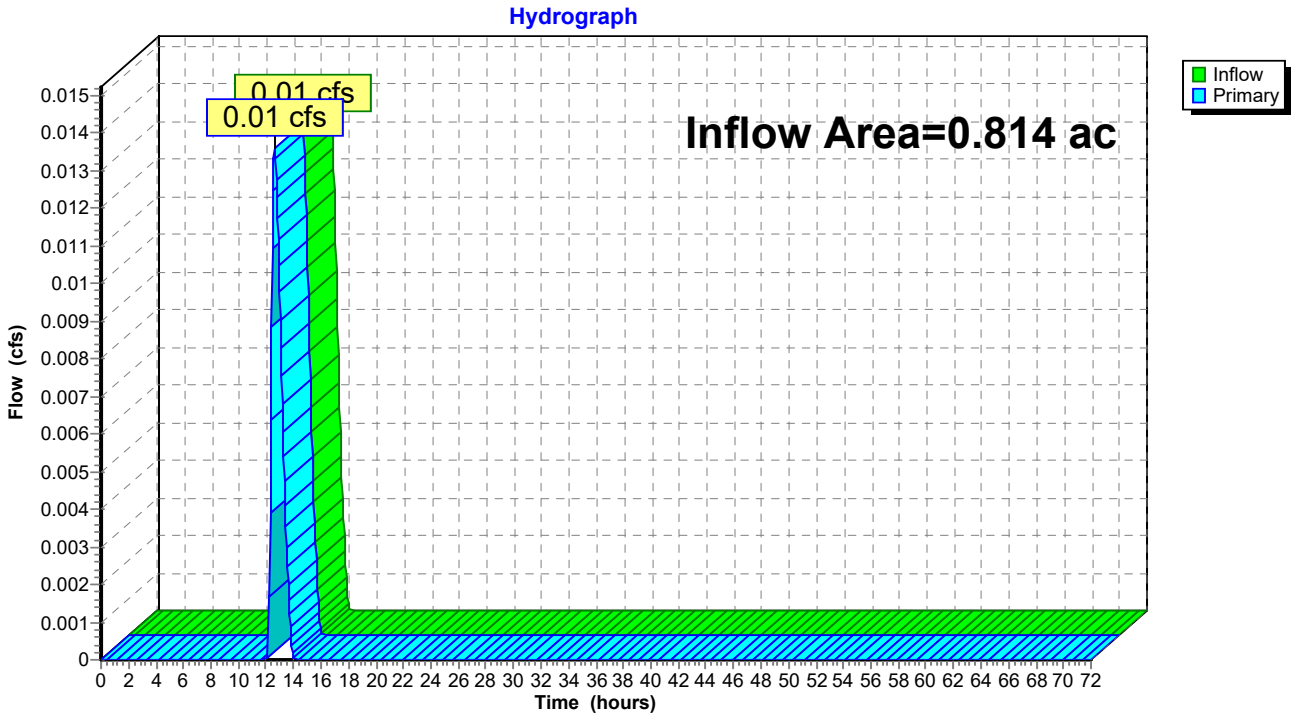
Summary for Pond 1P: FES

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

Inflow Area = 0.814 ac, 0.00% Impervious, Inflow Depth = 0.01" for 5-Year event
Inflow = 0.01 cfs @ 12.61 hrs, Volume= 0.001 af
Primary = 0.01 cfs @ 12.61 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 1P: FES



Hydrograph for Pond 1P: FES

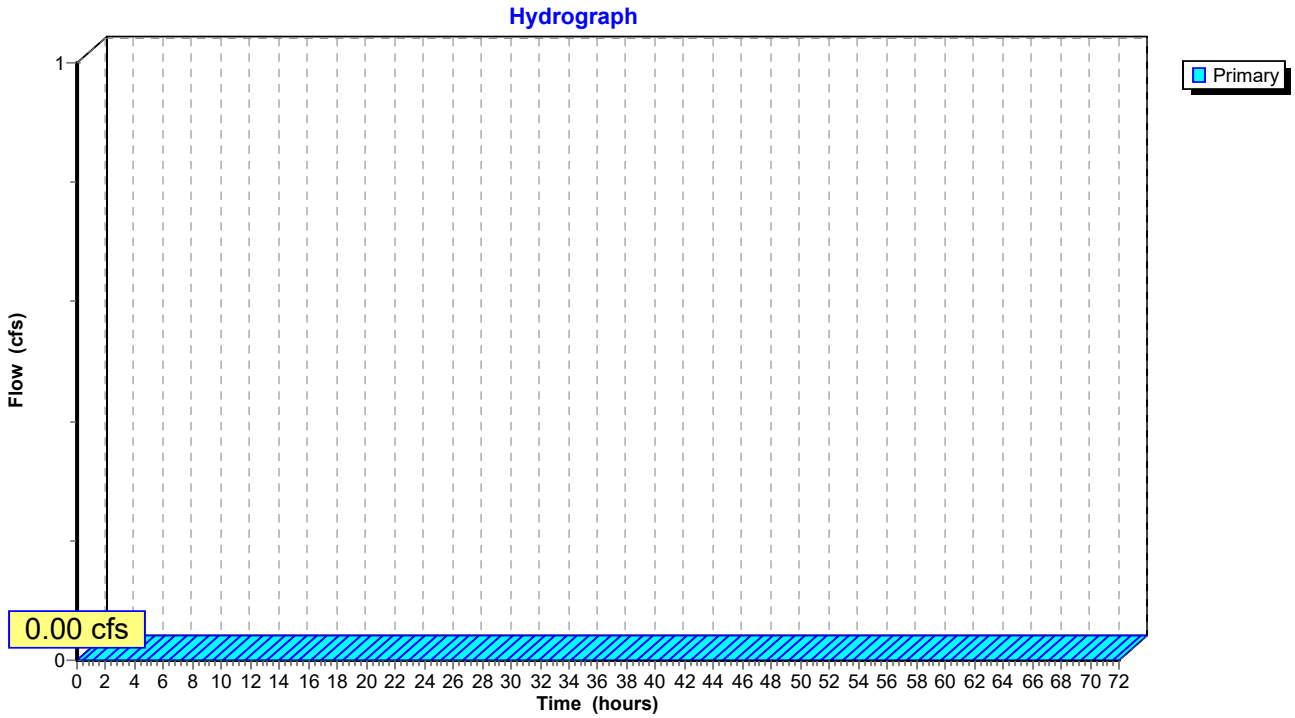
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.00		0.00	64.00	0.00		0.00
12.00	**0.00**		**0.00**	65.00	0.00		0.00
13.00	**0.01**		**0.01**	66.00	0.00		0.00
14.00	0.00		0.00	67.00	0.00		0.00
15.00	0.00		0.00	68.00	0.00		0.00
16.00	0.00		0.00	69.00	0.00		0.00
17.00	0.00		0.00	70.00	0.00		0.00
18.00	0.00		0.00	71.00	0.00		0.00
19.00	0.00		0.00	72.00	0.00		0.00
20.00	0.00		0.00				
21.00	0.00		0.00				
22.00	0.00		0.00				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Summary for Pond 2P: FES w/ HEADWALL

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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Pond 2P: FES w/ HEADWALL



Summary for Pond 3P: Permeable Pavement

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=78)

Inflow Area =	0.814 ac,	0.00% Impervious,	Inflow Depth =	3.33"	for 5-Year event
Inflow =	2.90 cfs @	12.09 hrs,	Volume=	0.226 af	
Outflow =	0.41 cfs @	12.61 hrs,	Volume=	0.227 af,	Atten= 86%, Lag= 31.3 min
Discarded =	0.39 cfs @	11.80 hrs,	Volume=	0.226 af	
Primary =	0.01 cfs @	12.61 hrs,	Volume=	0.001 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.08' @ 12.61 hrs Surf.Area= 32,578 sf Storage= 2,964 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 46.6 min (821.6 - 775.1)

Volume	Invert	Avail.Storage	Storage Description
#1	122.85'	11,044 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

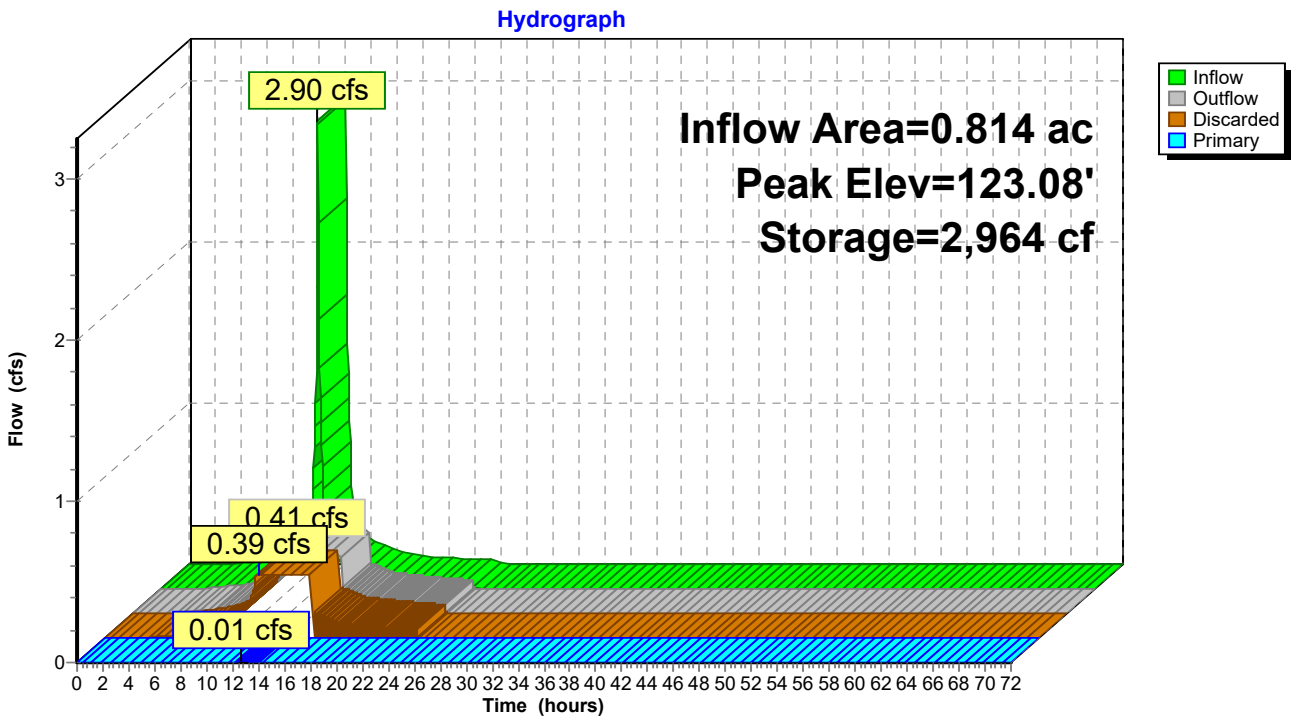
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
122.85	32,578	0.0	0	0
123.51	32,578	40.0	8,601	8,601
123.76	32,578	30.0	2,443	11,044

Device	Routing	Invert	Outlet Devices
#1	Discarded	122.85'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	123.01'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.01' / 122.90' S= 0.0055 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

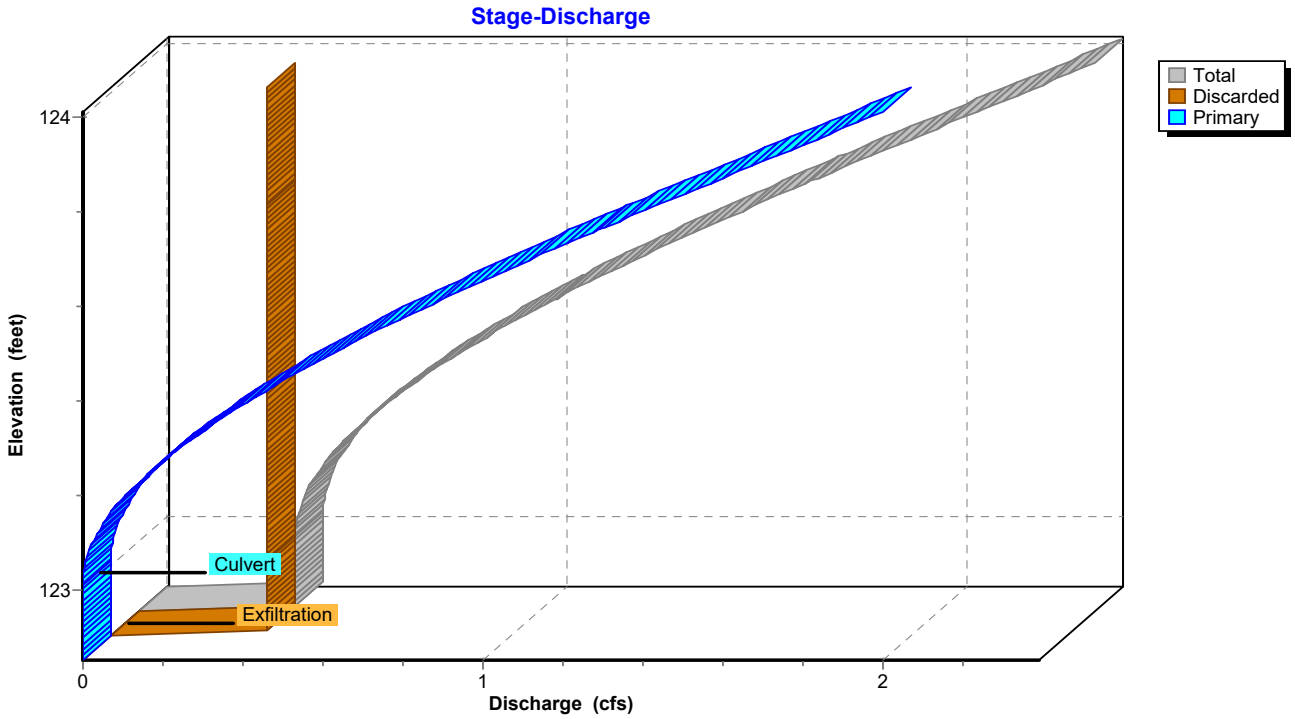
Discarded OutFlow Max=0.39 cfs @ 11.80 hrs HW=122.86' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=0.01 cfs @ 12.61 hrs HW=123.08' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Barrel Controls 0.01 cfs @ 0.91 fps)

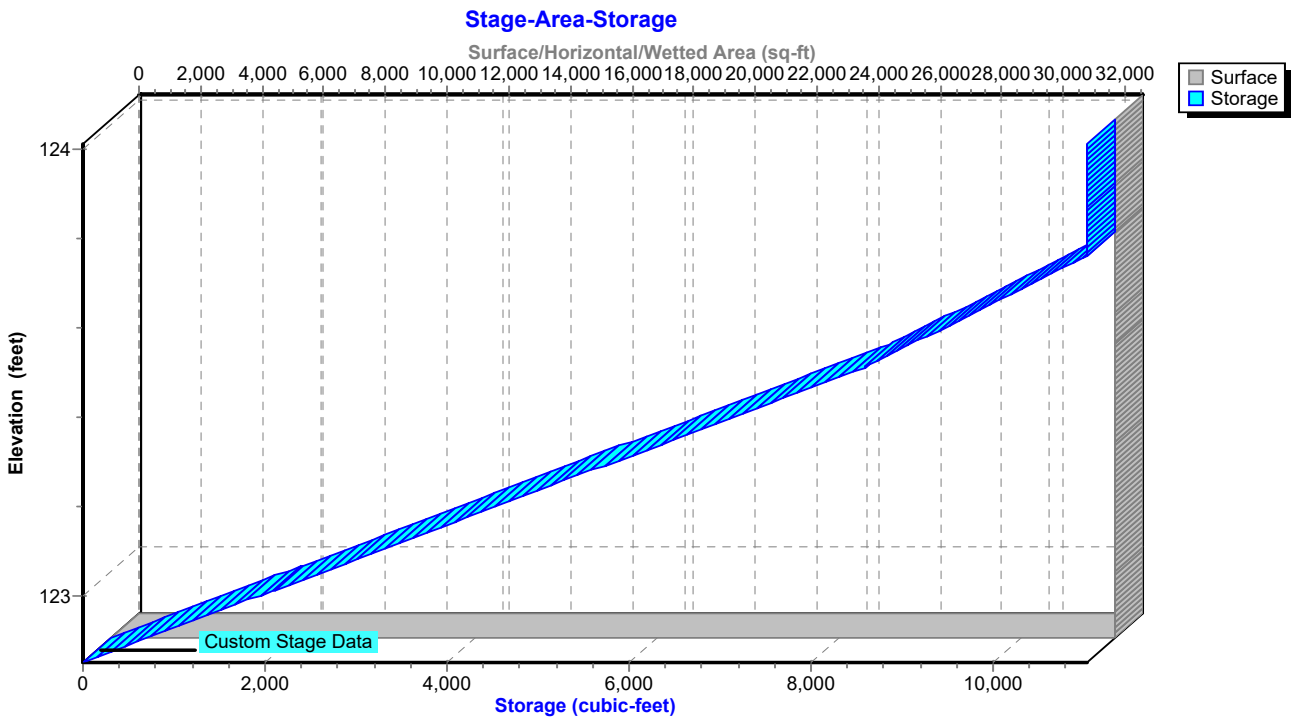
Pond 3P: Permeable Pavement



Pond 3P: Permeable Pavement



Pond 3P: Permeable Pavement



Hydrograph for Pond 3P: Permeable Pavement

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	122.85	0.00	0.00	0.00
2.50	0.00	0	122.85	0.00	0.00	0.00
5.00	0.01	0	122.85	0.01	0.01	0.00
7.50	0.04	0	122.85	0.04	0.04	0.00
10.00	**0.12**	0	122.85	0.12	**0.12**	0.00
12.50	**0.62**	**2,929**	**123.07**	**0.40**	**0.39**	**0.01**
15.00	0.12	**1,216**	**122.94**	**0.39**	0.39	**0.00**
17.50	0.06	0	122.85	0.00	0.00	0.00
20.00	0.04	0	122.85	0.00	0.00	0.00
22.50	0.03	0	122.85	0.00	0.00	0.00
25.00	0.00	0	122.85	0.00	0.00	0.00
27.50	0.00	0	122.85	0.00	0.00	0.00
30.00	0.00	0	122.85	0.00	0.00	0.00
32.50	0.00	0	122.85	0.00	0.00	0.00
35.00	0.00	0	122.85	0.00	0.00	0.00
37.50	0.00	0	122.85	0.00	0.00	0.00
40.00	0.00	0	122.85	0.00	0.00	0.00
42.50	0.00	0	122.85	0.00	0.00	0.00
45.00	0.00	0	122.85	0.00	0.00	0.00
47.50	0.00	0	122.85	0.00	0.00	0.00
50.00	0.00	0	122.85	0.00	0.00	0.00
52.50	0.00	0	122.85	0.00	0.00	0.00
55.00	0.00	0	122.85	0.00	0.00	0.00
57.50	0.00	0	122.85	0.00	0.00	0.00
60.00	0.00	0	122.85	0.00	0.00	0.00
62.50	0.00	0	122.85	0.00	0.00	0.00
65.00	0.00	0	122.85	0.00	0.00	0.00
67.50	0.00	0	122.85	0.00	0.00	0.00
70.00	0.00	0	122.85	0.00	0.00	0.00

Stage-Discharge for Pond 3P: Permeable Pavement

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
122.85	0.00	**0.00**	0.00
122.87	0.39	**0.39**	0.00
122.89	0.39	0.39	0.00
122.91	0.39	0.39	0.00
122.93	0.39	0.39	0.00
122.95	0.39	0.39	0.00
122.97	0.39	0.39	0.00
122.99	0.39	0.39	0.00
123.01	0.39	0.39	0.00
123.03	0.39	0.39	0.00
123.05	0.40	0.39	0.00
123.07	0.40	0.39	0.01
123.09	0.41	0.39	0.02
123.11	0.42	0.39	0.03
123.13	0.44	0.39	0.04
123.15	0.45	0.39	0.06
123.17	0.47	0.39	0.08
123.19	0.49	0.39	0.10
123.21	0.51	0.39	0.12
123.23	0.54	0.39	0.14
123.25	0.56	0.39	0.17
123.27	0.59	0.39	0.20
123.29	0.62	0.39	0.23
123.31	0.65	0.39	0.26
123.33	0.68	0.39	0.29
123.35	0.72	0.39	0.32
123.37	0.75	0.39	0.36
123.39	0.79	0.39	0.40
123.41	0.83	0.39	0.44
123.43	0.87	0.39	0.48
123.45	0.91	0.39	0.52
123.47	0.95	0.39	0.56
123.49	1.00	0.39	0.60
123.51	1.04	0.39	0.65
123.53	1.09	0.39	0.69
123.55	1.13	0.39	0.74
123.57	1.18	0.39	0.79
123.59	1.23	0.39	0.84
123.61	1.28	0.39	0.89
123.63	1.33	0.39	0.94
123.65	1.38	0.39	0.99
123.67	1.44	0.39	1.04
123.69	1.49	0.39	1.10
123.71	1.54	0.39	1.15
123.73	1.60	0.39	1.21
123.75	1.65	0.39	1.26
123.77	1.71	0.39	1.32
123.79	1.77	0.39	1.37
123.81	1.82	0.39	1.43
123.83	1.88	0.39	1.49
123.85	1.94	0.39	1.54
123.87	1.99	0.39	1.60
123.89	2.05	0.39	1.66
123.91	2.11	0.39	1.71
123.93	2.16	0.39	1.77
123.95	2.22	0.39	1.83
123.97	2.28	0.39	1.89
123.99	2.33	0.39	1.94
124.01	**2.39**	0.39	**2.00**

Stage-Area-Storage for Pond 3P: Permeable Pavement

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
122.85	**32,578**	0
122.87	32,578	261
122.89	32,578	521
122.91	32,578	782
122.93	32,578	1,042
122.95	32,578	1,303
122.97	32,578	1,564
122.99	32,578	1,824
123.01	32,578	2,085
123.03	32,578	2,346
123.05	32,578	2,606
123.07	32,578	2,867
123.09	32,578	3,127
123.11	32,578	3,388
123.13	32,578	3,649
123.15	32,578	3,909
123.17	32,578	4,170
123.19	32,578	4,431
123.21	32,578	4,691
123.23	32,578	4,952
123.25	32,578	5,212
123.27	32,578	5,473
123.29	32,578	5,734
123.31	32,578	5,994
123.33	32,578	6,255
123.35	32,578	6,516
123.37	32,578	6,776
123.39	32,578	7,037
123.41	32,578	7,297
123.43	32,578	7,558
123.45	32,578	7,819
123.47	32,578	8,079
123.49	32,578	8,340
123.51	32,578	8,601
123.53	32,578	8,796
123.55	32,578	8,992
123.57	32,578	9,187
123.59	32,578	9,382
123.61	32,578	9,578
123.63	32,578	9,773
123.65	32,578	9,969
123.67	32,578	10,164
123.69	32,578	10,360
123.71	32,578	10,555
123.73	32,578	10,751
123.75	32,578	**10,946**
123.77	32,578	**11,044**
123.79	32,578	11,044
123.81	32,578	11,044
123.83	32,578	11,044
123.85	32,578	11,044
123.87	32,578	11,044
123.89	32,578	11,044
123.91	32,578	11,044
123.93	32,578	11,044
123.95	32,578	11,044
123.97	32,578	11,044
123.99	32,578	11,044
124.01	32,578	11,044

Summary for Pond UG-1: RETAIN_IT

Inflow Area = 2.219 ac, 85.49% Impervious, Inflow Depth = 3.12" for 5-Year event
Inflow = 7.59 cfs @ 12.09 hrs, Volume= 0.577 af
Outflow = 4.86 cfs @ 12.19 hrs, Volume= 0.577 af, Atten= 36%, Lag= 6.2 min
Primary = 4.86 cfs @ 12.19 hrs, Volume= 0.577 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 124.11' @ 12.19 hrs Surf.Area= 3,444 sf Storage= 4,217 cf

Plug-Flow detention time= 42.0 min calculated for 0.577 af (100% of inflow)
Center-of-Mass det. time= 42.7 min (828.8 - 786.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	122.40'	1,095 cf	**42.00'W x 82.00'L x 4.67'H Field A** 16,072 cf Overall - 13,333 cf Embedded = 2,739 cf x 40.0% Voids
#2A	122.90'	9,855 cf	**retain_it retain_it 3.5'** x 50 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 5 Rows adjusted for 184.2 cf perimeter wall
		10,950 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	122.40'	**15.0" Round Culvert** L= 212.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 122.40' / 121.25' S= 0.0054 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.23 sf
#2	Device 1	122.40'	**2.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	122.90'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=4.85 cfs @ 12.19 hrs HW=124.11' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 4.85 cfs @ 3.95 fps)
  ├─**2=Orifice/Grate** (Passes < 0.21 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Passes < 5.45 cfs potential flow)

Pond UG-1: RETAIN_IT - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it®)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
5 Rows adjusted for 184.2 cf perimeter wall

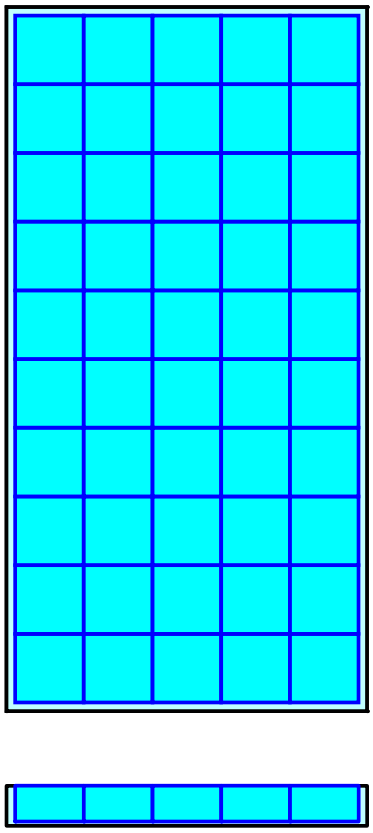
10 Chambers/Row x 8.00' Long = 80.00' Row Length +12.0" End Stone x 2 = 82.00' Base Length
5 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 42.00' Base Width
6.0" Base + 50.0" Chamber Height = 4.67' Field Height

6.1 cf Sidewall x 10 x 2 + 6.1 cf Endwall x 5 x 2 = 184.2 cf Perimeter Wall
50 Chambers x 200.8 cf - 184.2 cf Perimeter wall = 9,854.8 cf Chamber Storage
50 Chambers x 266.7 cf = 13,333.3 cf Displacement

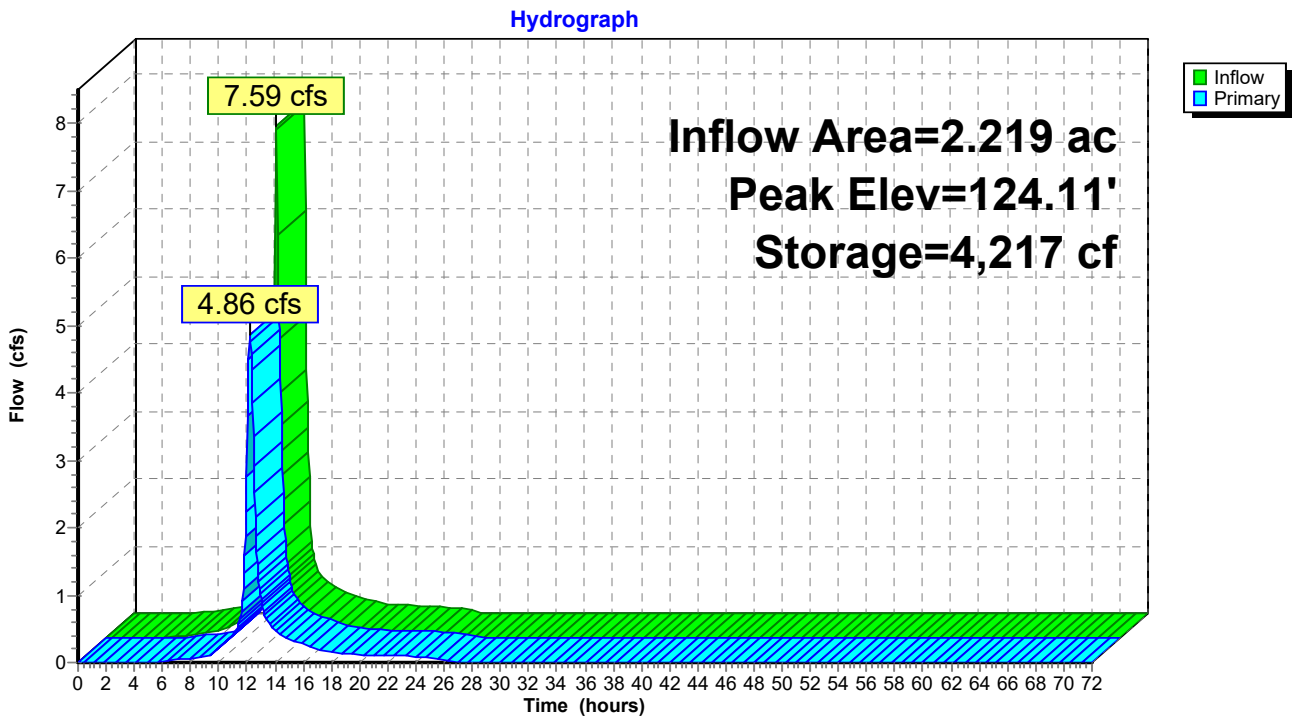
16,072.0 cf Field - 13,333.3 cf Chambers = 2,738.7 cf Stone x 40.0% Voids = 1,095.5 cf Stone Storage

Chamber Storage + Stone Storage = 10,950.3 cf = 0.251 af
Overall Storage Efficiency = 68.1%
Overall System Size = 82.00' x 42.00' x 4.67'

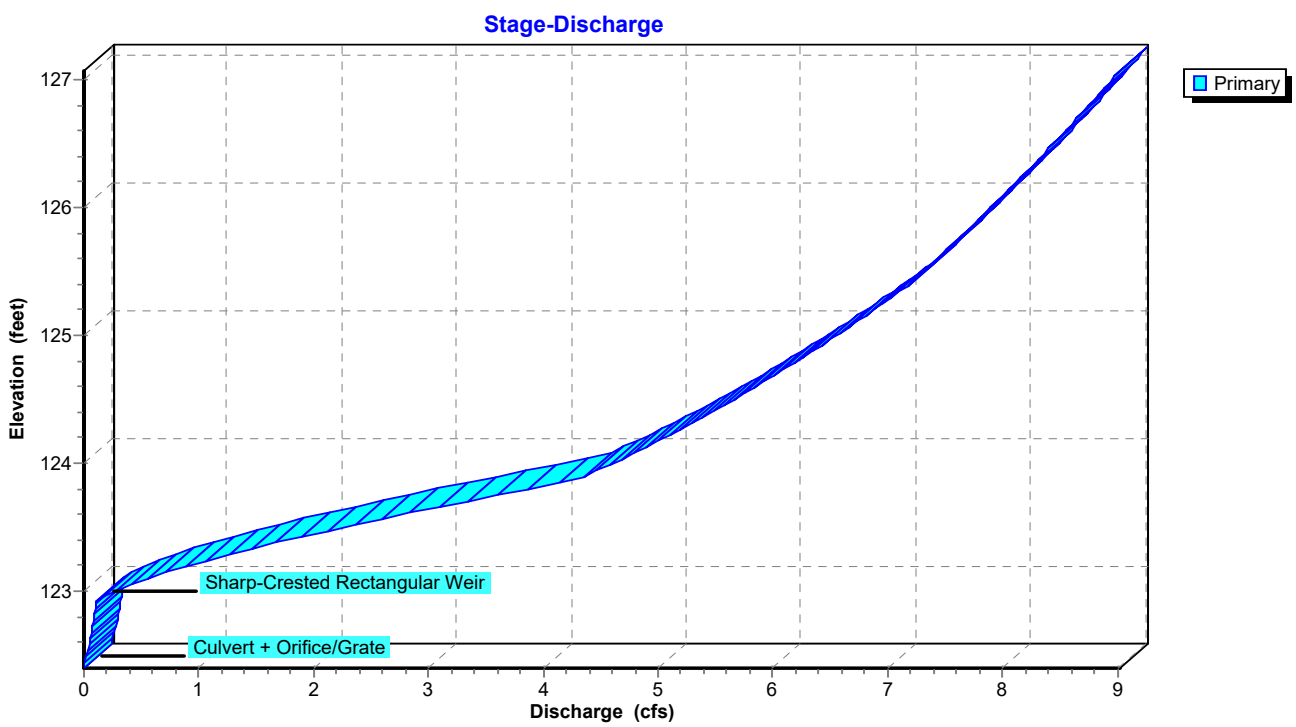
50 Chambers
595.3 cy Field
101.4 cy Stone



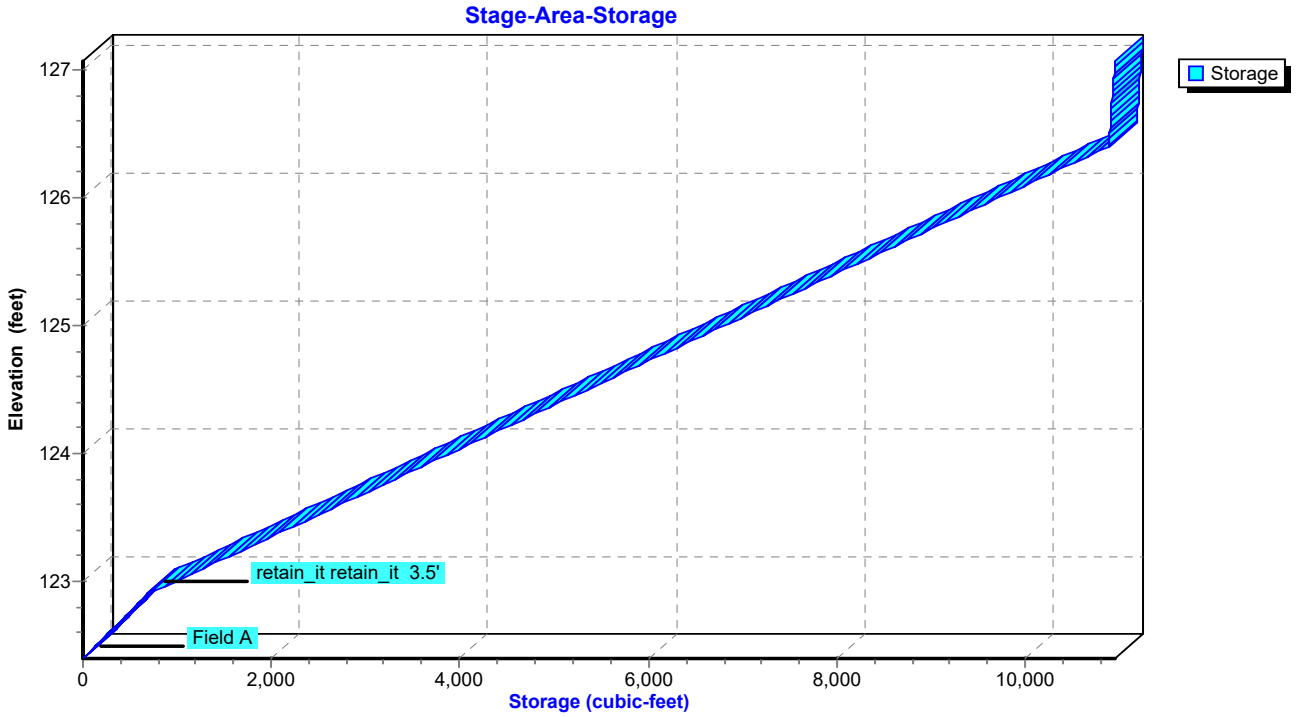
Pond UG-1: RETAIN_IT



Pond UG-1: RETAIN_IT



Pond UG-1: RETAIN_IT



Hydrograph for Pond UG-1: RETAIN_IT

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	122.40	0.00
2.50	0.00	0	122.40	0.00
5.00	0.02	41	122.43	0.00
7.50	0.08	270	122.60	0.05
10.00	**0.28**	**915**	**122.98**	**0.22**
12.50	**1.66**	**2,809**	**123.63**	**2.92**
15.00	0.32	1,076	123.03	0.35
17.50	0.16	857	122.96	0.18
20.00	0.11	747	122.92	0.12
22.50	0.09	663	122.88	0.10
25.00	0.00	323	122.63	0.06
27.50	0.00	92	122.47	0.01
30.00	0.00	50	122.44	0.00
32.50	0.00	34	122.42	0.00
35.00	0.00	26	122.42	0.00
37.50	0.00	21	122.41	0.00
40.00	0.00	17	122.41	0.00
42.50	0.00	15	122.41	0.00
45.00	0.00	13	122.41	0.00
47.50	0.00	11	122.41	0.00
50.00	0.00	10	122.41	0.00
52.50	0.00	9	122.41	0.00
55.00	0.00	9	122.41	0.00
57.50	0.00	8	122.41	0.00
60.00	0.00	7	122.41	0.00
62.50	0.00	7	122.40	0.00
65.00	0.00	6	122.40	0.00
67.50	0.00	6	122.40	0.00
70.00	0.00	6	122.40	0.00

Stage-Discharge for Pond UG-1: RETAIN_IT

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
122.40	0.00	125.05	6.64
122.45	0.00	125.10	6.72
122.50	0.02	125.15	6.80
122.55	0.03	125.20	6.88
122.60	0.05	125.25	6.96
122.65	0.06	125.30	7.04
122.70	0.07	125.35	7.11
122.75	0.08	125.40	7.19
122.80	0.09	125.45	7.25
122.85	0.10	125.50	7.31
122.90	0.10	125.55	7.37
122.95	0.16	125.60	7.43
123.00	0.27	125.65	7.49
123.05	0.40	125.70	7.55
123.10	0.55	125.75	7.61
123.15	0.72	125.80	7.67
123.20	0.91	125.85	7.73
123.25	1.11	125.90	7.79
123.30	1.32	125.95	7.84
123.35	1.54	126.00	7.90
123.40	1.77	126.05	7.96
123.45	2.01	126.10	8.01
123.50	2.26	126.15	8.07
123.55	2.52	126.20	8.12
123.60	2.78	126.25	8.18
123.65	3.04	126.30	8.23
123.70	3.31	126.35	8.29
123.75	3.59	126.40	8.34
123.80	3.87	126.45	8.39
123.85	4.16	126.50	8.45
123.90	4.36	126.55	8.50
123.95	4.49	126.60	8.55
124.00	4.61	126.65	8.60
124.05	4.72	126.70	8.65
124.10	4.84	126.75	8.70
124.15	4.95	126.80	8.76
124.20	5.06	126.85	8.81
124.25	5.16	126.90	8.86
124.30	5.27	126.95	8.91
124.35	5.37	127.00	8.96
124.40	5.47	127.05	**9.01**
124.45	5.57		
124.50	5.67		
124.55	5.76		
124.60	5.85		
124.65	5.95		
124.70	6.04		
124.75	6.13		
124.80	6.21		
124.85	6.30		
124.90	6.39		
124.95	6.47		
125.00	6.56		

Stage-Area-Storage for Pond UG-1: RETAIN_IT

Elevation (feet)	Storage (cubic-feet)
122.40	0
122.45	69
122.50	138
122.55	207
122.60	276
122.65	344
122.70	413
122.75	482
122.80	551
122.85	620
122.90	689
122.95	834
123.00	980
123.05	1,126
123.10	1,271
123.15	1,417
123.20	1,563
123.25	1,708
123.30	1,854
123.35	2,000
123.40	2,145
123.45	2,291
123.50	2,437
123.55	2,582
123.60	2,728
123.65	2,874
123.70	3,019
123.75	3,165
123.80	3,311
123.85	3,456
123.90	3,602
123.95	3,748
124.00	3,893
124.05	4,039
124.10	4,185
124.15	4,330
124.20	4,476
124.25	4,622
124.30	4,767
124.35	4,913
124.40	5,059
124.45	5,204
124.50	5,350
124.55	5,496
124.60	5,641
124.65	5,787
124.70	5,933
124.75	6,078
124.80	6,224
124.85	6,370
124.90	6,515
124.95	6,661
125.00	6,807
125.05	6,952
125.10	7,098
125.15	7,244
125.20	7,389
125.25	7,535
125.30	7,681
125.35	7,826
125.40	7,972
125.45	8,118
125.50	8,263
125.55	8,409
125.60	8,555
125.65	8,700
125.70	8,846
125.75	8,992
125.80	9,137
125.85	9,283
125.90	9,429
125.95	9,574
126.00	9,720
126.05	9,866
126.10	10,011
126.15	10,157
126.20	10,303
126.25	10,448
126.30	10,594
126.35	10,740
126.40	10,885
126.45	10,890
126.50	10,895
126.55	10,900
126.60	10,905
126.65	10,910
126.70	10,915
126.75	10,919
126.80	10,924
126.85	10,929
126.90	10,934
126.95	10,939
127.00	10,944
127.05	**10,949**

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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

Subcatchment P-1A: P-1A Runoff Area=96,664 sf 85.49% Impervious Runoff Depth=4.00"
Tc=6.0 min CN=93 Runoff=9.59 cfs 0.740 af

Subcatchment P-1B: P-1B (PERMEABLE Runoff Area=35,462 sf 0.00% Impervious Runoff Depth=4.22"
Tc=6.0 min CN=95 Runoff=3.62 cfs 0.286 af

Subcatchment P-1U: P-1U (UNDETAINED) Runoff Area=13,343 sf 0.00% Impervious Runoff Depth=1.06"
Tc=6.0 min CN=58 Runoff=0.32 cfs 0.027 af

Subcatchment P-2: P-2 Runoff Area=5,081 sf 46.53% Impervious Runoff Depth=2.54"
Tc=6.0 min CN=78 Runoff=0.34 cfs 0.025 af

Reach PD1: WETLAND Inflow=5.89 cfs 0.775 af
Outflow=5.89 cfs 0.775 af

Reach PD2: BOSTON POST RD Inflow=0.34 cfs 0.025 af
Outflow=0.34 cfs 0.025 af

Pond 1P: FES Inflow=0.07 cfs 0.008 af
Primary=0.07 cfs 0.008 af

Pond 2P: FES w/ HEADWALL
Primary=0.00 cfs 0.000 af

Pond 3P: Permeable Pavement Peak Elev=123.16' Storage=4,026 cf Inflow=3.62 cfs 0.286 af
Discarded=0.39 cfs 0.279 af Primary=0.07 cfs 0.008 af Outflow=0.46 cfs 0.287 af

Pond UG-1: RETAIN_IT Peak Elev=124.49' Storage=5,322 cf Inflow=9.59 cfs 0.740 af
Outflow=5.65 cfs 0.740 af

Total Runoff Area = 3.456 ac Runoff Volume = 1.078 af Average Runoff Depth = 3.74"
43.54% Pervious = 1.505 ac 56.46% Impervious = 1.951 ac

Summary for Subcatchment P-1A: P-1A

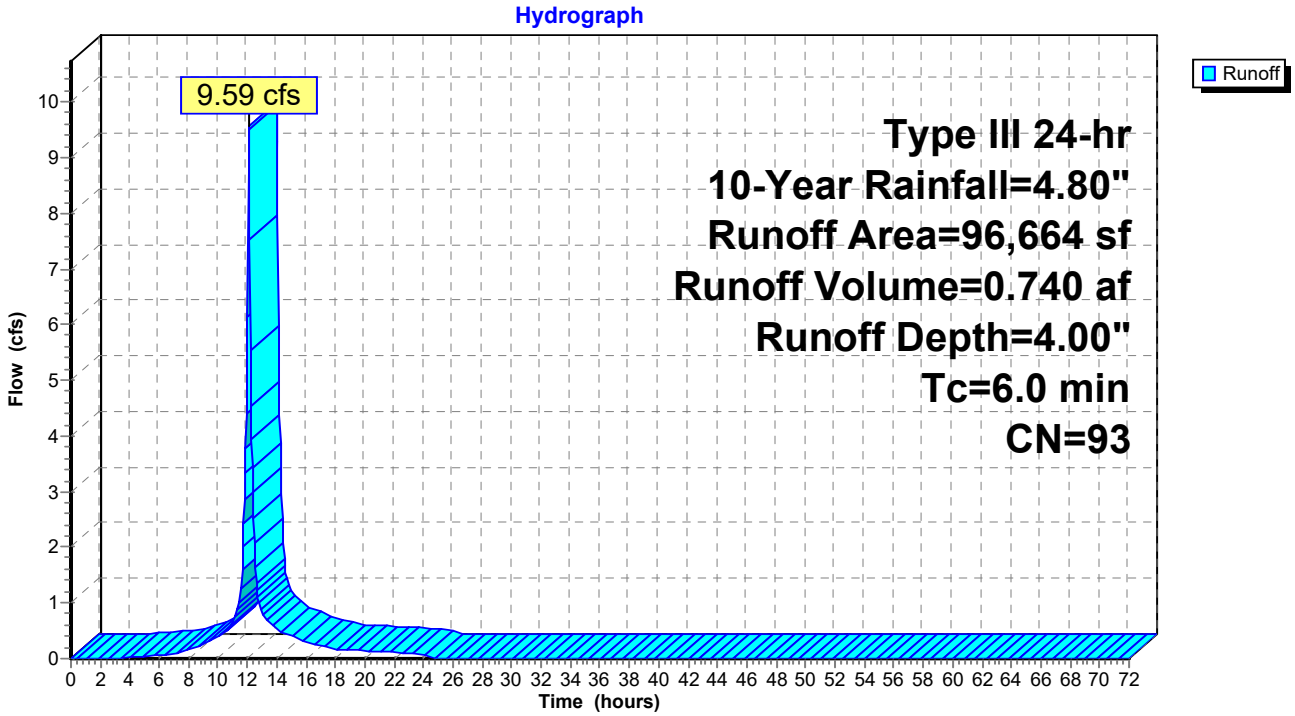
Runoff = 9.59 cfs @ 12.09 hrs, Volume= 0.740 af, Depth= 4.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
*	1,394	61	>75% Grass cover, Good, HSG B- ISLANDS
	75,402	98	Paved parking, HSG B
*	4,922	73	Existing Woods/grass comb., Poor, HSG B
	7,710	58	Woods/grass comb., Good, HSG B
	7,236	98	Unconnected roofs, HSG B
	96,664	93	Weighted Average
	14,026	64	14.51% Pervious Area
	82,638	98	85.49% Impervious Area
	7,236		8.76% Unconnected

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

Subcatchment P-1A: P-1A



Hydrograph for Subcatchment P-1A: P-1A

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.00	0.00
3.00	0.15	0.00	0.00
4.00	0.21	0.00	0.02
5.00	0.27	0.02	0.04
6.00	0.35	0.04	0.06
7.00	0.43	0.08	0.10
8.00	0.55	0.14	0.15
9.00	0.70	0.23	0.26
10.00	0.91	0.38	0.38
11.00	1.20	0.61	0.62
12.00	2.40	1.69	**6.14**
13.00	3.60	2.83	**0.85**
14.00	3.89	3.12	0.53
15.00	4.10	3.32	0.40
16.00	4.25	3.47	0.28
17.00	4.37	3.58	0.23
18.00	4.45	3.66	0.17
19.00	4.53	3.73	0.15
20.00	4.59	3.80	0.14
21.00	4.65	3.86	0.13
22.00	4.71	3.91	0.11
23.00	4.76	3.96	0.10
24.00	**4.80**	**4.00**	0.09
25.00	4.80	4.00	0.00
26.00	4.80	4.00	0.00
27.00	4.80	4.00	0.00
28.00	4.80	4.00	0.00
29.00	4.80	4.00	0.00
30.00	4.80	4.00	0.00
31.00	4.80	4.00	0.00
32.00	4.80	4.00	0.00
33.00	4.80	4.00	0.00
34.00	4.80	4.00	0.00
35.00	4.80	4.00	0.00
36.00	4.80	4.00	0.00
37.00	4.80	4.00	0.00
38.00	4.80	4.00	0.00
39.00	4.80	4.00	0.00
40.00	4.80	4.00	0.00
41.00	4.80	4.00	0.00
42.00	4.80	4.00	0.00
43.00	4.80	4.00	0.00
44.00	4.80	4.00	0.00
45.00	4.80	4.00	0.00
46.00	4.80	4.00	0.00
47.00	4.80	4.00	0.00
48.00	4.80	4.00	0.00
49.00	4.80	4.00	0.00
50.00	4.80	4.00	0.00
51.00	4.80	4.00	0.00
52.00	4.80	4.00	0.00
53.00	4.80	4.00	0.00
54.00	4.80	4.00	0.00
55.00	4.80	4.00	0.00
56.00	4.80	4.00	0.00
57.00	4.80	4.00	0.00
58.00	4.80	4.00	0.00
59.00	4.80	4.00	0.00
60.00	4.80	4.00	0.00
61.00	4.80	4.00	0.00
62.00	4.80	4.00	0.00
63.00	4.80	4.00	0.00
64.00	4.80	4.00	0.00
65.00	4.80	4.00	0.00
66.00	4.80	4.00	0.00
67.00	4.80	4.00	0.00
68.00	4.80	4.00	0.00
69.00	4.80	4.00	0.00
70.00	4.80	4.00	0.00
71.00	4.80	4.00	0.00
72.00	4.80	4.00	0.00

Summary for Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)

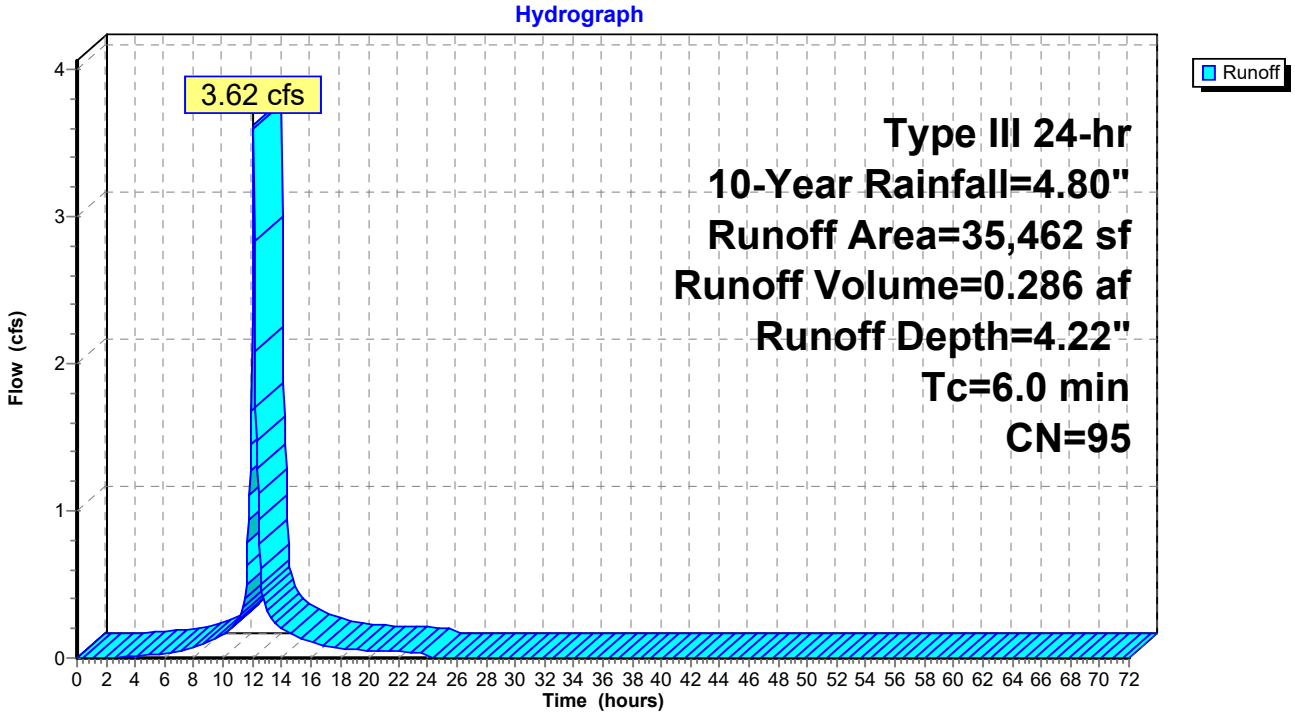
Runoff = 3.62 cfs @ 12.09 hrs, Volume= 0.286 af, Depth= 4.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
*	32,606	98	Perm. Pavement, 0% imp, HSG B
	2,856	61	>75% Grass cover, Good, HSG B
	35,462	95	Weighted Average
	35,462	95	100.00% Pervious Area

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

Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)



Hydrograph for Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.00	0.00
3.00	0.15	0.00	0.01
4.00	0.21	0.02	0.01
5.00	0.27	0.04	0.02
6.00	0.35	0.08	0.03
7.00	0.43	0.13	0.05
8.00	0.55	0.20	0.07
9.00	0.70	0.32	0.11
10.00	0.91	0.48	0.16
11.00	1.20	0.74	0.25
12.00	2.40	1.87	**2.34**
13.00	3.60	3.04	**0.32**
14.00	3.89	3.33	0.20
15.00	4.10	3.53	0.15
16.00	4.25	3.68	0.11
17.00	4.37	3.79	0.08
18.00	4.45	3.88	0.06
19.00	4.53	3.95	0.06
20.00	4.59	4.02	0.05
21.00	4.65	4.08	0.05
22.00	4.71	4.13	0.04
23.00	4.76	4.18	0.04
24.00	**4.80**	**4.22**	0.03
25.00	4.80	4.22	0.00
26.00	4.80	4.22	0.00
27.00	4.80	4.22	0.00
28.00	4.80	4.22	0.00
29.00	4.80	4.22	0.00
30.00	4.80	4.22	0.00
31.00	4.80	4.22	0.00
32.00	4.80	4.22	0.00
33.00	4.80	4.22	0.00
34.00	4.80	4.22	0.00
35.00	4.80	4.22	0.00
36.00	4.80	4.22	0.00
37.00	4.80	4.22	0.00
38.00	4.80	4.22	0.00
39.00	4.80	4.22	0.00
40.00	4.80	4.22	0.00
41.00	4.80	4.22	0.00
42.00	4.80	4.22	0.00
43.00	4.80	4.22	0.00
44.00	4.80	4.22	0.00
45.00	4.80	4.22	0.00
46.00	4.80	4.22	0.00
47.00	4.80	4.22	0.00
48.00	4.80	4.22	0.00
49.00	4.80	4.22	0.00
50.00	4.80	4.22	0.00
51.00	4.80	4.22	0.00
52.00	4.80	4.22	0.00
53.00	4.80	4.22	0.00
54.00	4.80	4.22	0.00
55.00	4.80	4.22	0.00
56.00	4.80	4.22	0.00
57.00	4.80	4.22	0.00
58.00	4.80	4.22	0.00
59.00	4.80	4.22	0.00
60.00	4.80	4.22	0.00
61.00	4.80	4.22	0.00
62.00	4.80	4.22	0.00
63.00	4.80	4.22	0.00
64.00	4.80	4.22	0.00
65.00	4.80	4.22	0.00
66.00	4.80	4.22	0.00
67.00	4.80	4.22	0.00
68.00	4.80	4.22	0.00
69.00	4.80	4.22	0.00
70.00	4.80	4.22	0.00
71.00	4.80	4.22	0.00
72.00	4.80	4.22	0.00

Summary for Subcatchment P-1U: P-1U (UNDETAINED)

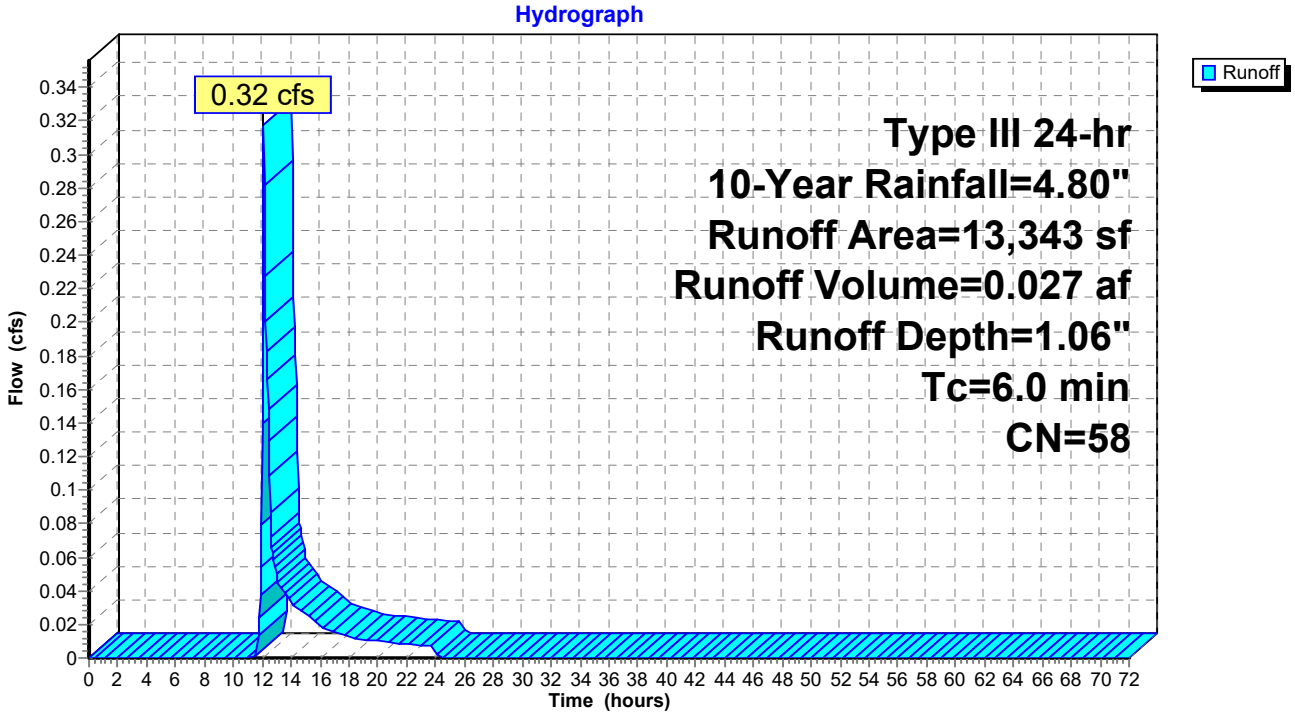
Runoff = 0.32 cfs @ 12.11 hrs, Volume= 0.027 af, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
13,343	58	Woods/grass comb., Good, HSG B
13,343	58	100.00% Pervious Area

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

Subcatchment P-1U: P-1U (UNDETAINED)



Hydrograph for Subcatchment P-1U: P-1U (UNDETAINED)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.00	0.00
3.00	0.15	0.00	0.00
4.00	0.21	0.00	0.00
5.00	0.27	0.00	0.00
6.00	0.35	0.00	0.00
7.00	0.43	0.00	0.00
8.00	0.55	0.00	0.00
9.00	0.70	0.00	0.00
10.00	0.91	0.00	0.00
11.00	1.20	0.00	0.00
12.00	2.40	0.11	**0.14**
13.00	3.60	0.49	**0.05**
14.00	3.89	0.62	0.03
15.00	4.10	0.71	0.03
16.00	4.25	0.78	0.02
17.00	4.37	0.84	0.02
18.00	4.45	0.88	0.01
19.00	4.53	0.92	0.01
20.00	4.59	0.95	0.01
21.00	4.65	0.98	0.01
22.00	4.71	1.01	0.01
23.00	4.76	1.04	0.01
24.00	**4.80**	**1.06**	0.01
25.00	4.80	1.06	0.00
26.00	4.80	1.06	0.00
27.00	4.80	1.06	0.00
28.00	4.80	1.06	0.00
29.00	4.80	1.06	0.00
30.00	4.80	1.06	0.00
31.00	4.80	1.06	0.00
32.00	4.80	1.06	0.00
33.00	4.80	1.06	0.00
34.00	4.80	1.06	0.00
35.00	4.80	1.06	0.00
36.00	4.80	1.06	0.00
37.00	4.80	1.06	0.00
38.00	4.80	1.06	0.00
39.00	4.80	1.06	0.00
40.00	4.80	1.06	0.00
41.00	4.80	1.06	0.00
42.00	4.80	1.06	0.00
43.00	4.80	1.06	0.00
44.00	4.80	1.06	0.00
45.00	4.80	1.06	0.00
46.00	4.80	1.06	0.00
47.00	4.80	1.06	0.00
48.00	4.80	1.06	0.00
49.00	4.80	1.06	0.00
50.00	4.80	1.06	0.00
51.00	4.80	1.06	0.00
52.00	4.80	1.06	0.00
53.00	4.80	1.06	0.00
54.00	4.80	1.06	0.00
55.00	4.80	1.06	0.00
56.00	4.80	1.06	0.00
57.00	4.80	1.06	0.00
58.00	4.80	1.06	0.00
59.00	4.80	1.06	0.00
60.00	4.80	1.06	0.00
61.00	4.80	1.06	0.00
62.00	4.80	1.06	0.00
63.00	4.80	1.06	0.00
64.00	4.80	1.06	0.00
65.00	4.80	1.06	0.00
66.00	4.80	1.06	0.00
67.00	4.80	1.06	0.00
68.00	4.80	1.06	0.00
69.00	4.80	1.06	0.00
70.00	4.80	1.06	0.00
71.00	4.80	1.06	0.00
72.00	4.80	1.06	0.00

Summary for Subcatchment P-2: P-2

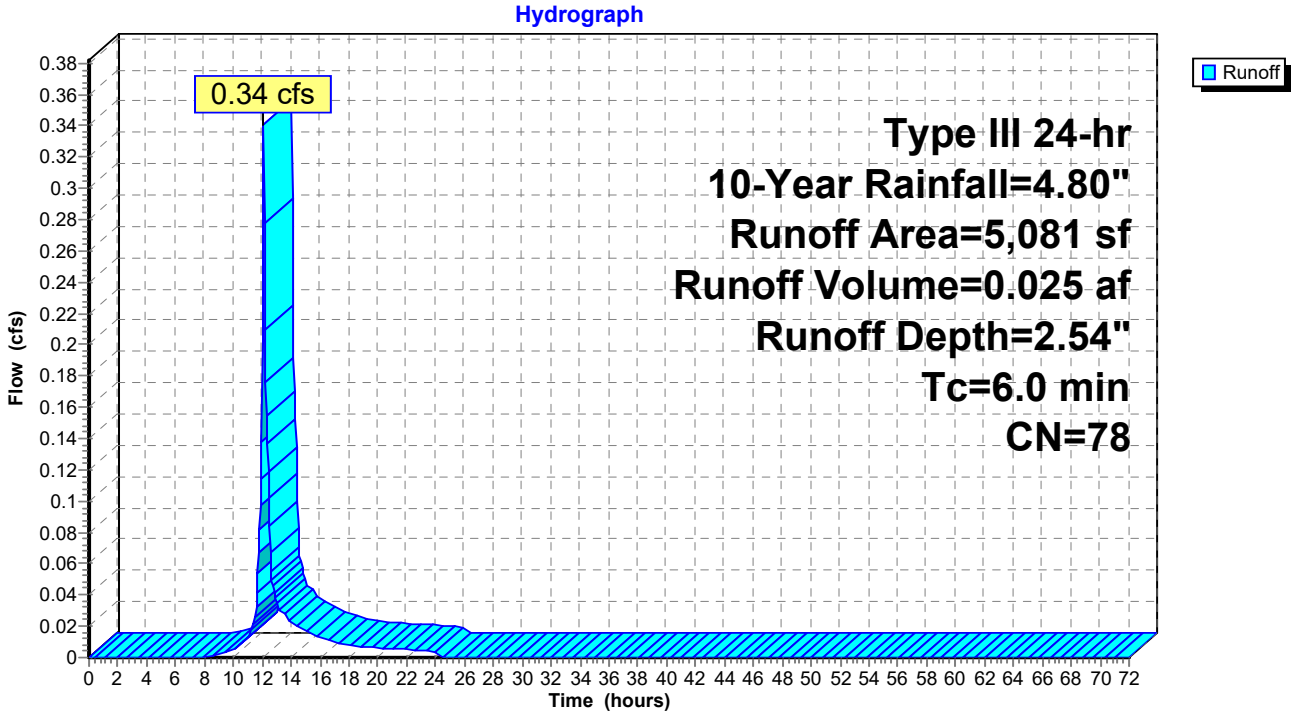
Runoff = 0.34 cfs @ 12.09 hrs, Volume= 0.025 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
2,364	98	Paved parking, HSG B
2,717	61	>75% Grass cover, Good, HSG B
5,081	78	Weighted Average
2,717	61	53.47% Pervious Area
2,364	98	46.53% Impervious Area

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

Subcatchment P-2: P-2



Hydrograph for Subcatchment P-2: P-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.05	0.00	0.00
2.00	0.10	0.00	0.00
3.00	0.15	0.00	0.00
4.00	0.21	0.00	0.00
5.00	0.27	0.00	0.00
6.00	0.35	0.00	0.00
7.00	0.43	0.00	0.00
8.00	0.55	0.00	0.00
9.00	0.70	0.01	0.00
10.00	0.91	0.04	0.01
11.00	1.20	0.12	0.01
12.00	2.40	0.72	**0.20**
13.00	3.60	1.57	**0.04**
14.00	3.89	1.80	0.02
15.00	4.10	1.97	0.02
16.00	4.25	2.09	0.01
17.00	4.37	2.18	0.01
18.00	4.45	2.26	0.01
19.00	4.53	2.32	0.01
20.00	4.59	2.37	0.01
21.00	4.65	2.42	0.01
22.00	4.71	2.47	0.01
23.00	4.76	2.51	0.00
24.00	**4.80**	**2.54**	0.00
25.00	4.80	2.54	0.00
26.00	4.80	2.54	0.00
27.00	4.80	2.54	0.00
28.00	4.80	2.54	0.00
29.00	4.80	2.54	0.00
30.00	4.80	2.54	0.00
31.00	4.80	2.54	0.00
32.00	4.80	2.54	0.00
33.00	4.80	2.54	0.00
34.00	4.80	2.54	0.00
35.00	4.80	2.54	0.00
36.00	4.80	2.54	0.00
37.00	4.80	2.54	0.00
38.00	4.80	2.54	0.00
39.00	4.80	2.54	0.00
40.00	4.80	2.54	0.00
41.00	4.80	2.54	0.00
42.00	4.80	2.54	0.00
43.00	4.80	2.54	0.00
44.00	4.80	2.54	0.00
45.00	4.80	2.54	0.00
46.00	4.80	2.54	0.00
47.00	4.80	2.54	0.00
48.00	4.80	2.54	0.00
49.00	4.80	2.54	0.00
50.00	4.80	2.54	0.00
51.00	4.80	2.54	0.00
52.00	4.80	2.54	0.00
53.00	4.80	2.54	0.00
54.00	4.80	2.54	0.00
55.00	4.80	2.54	0.00
56.00	4.80	2.54	0.00
57.00	4.80	2.54	0.00
58.00	4.80	2.54	0.00
59.00	4.80	2.54	0.00
60.00	4.80	2.54	0.00
61.00	4.80	2.54	0.00
62.00	4.80	2.54	0.00
63.00	4.80	2.54	0.00
64.00	4.80	2.54	0.00
65.00	4.80	2.54	0.00
66.00	4.80	2.54	0.00
67.00	4.80	2.54	0.00
68.00	4.80	2.54	0.00
69.00	4.80	2.54	0.00
70.00	4.80	2.54	0.00
71.00	4.80	2.54	0.00
72.00	4.80	2.54	0.00

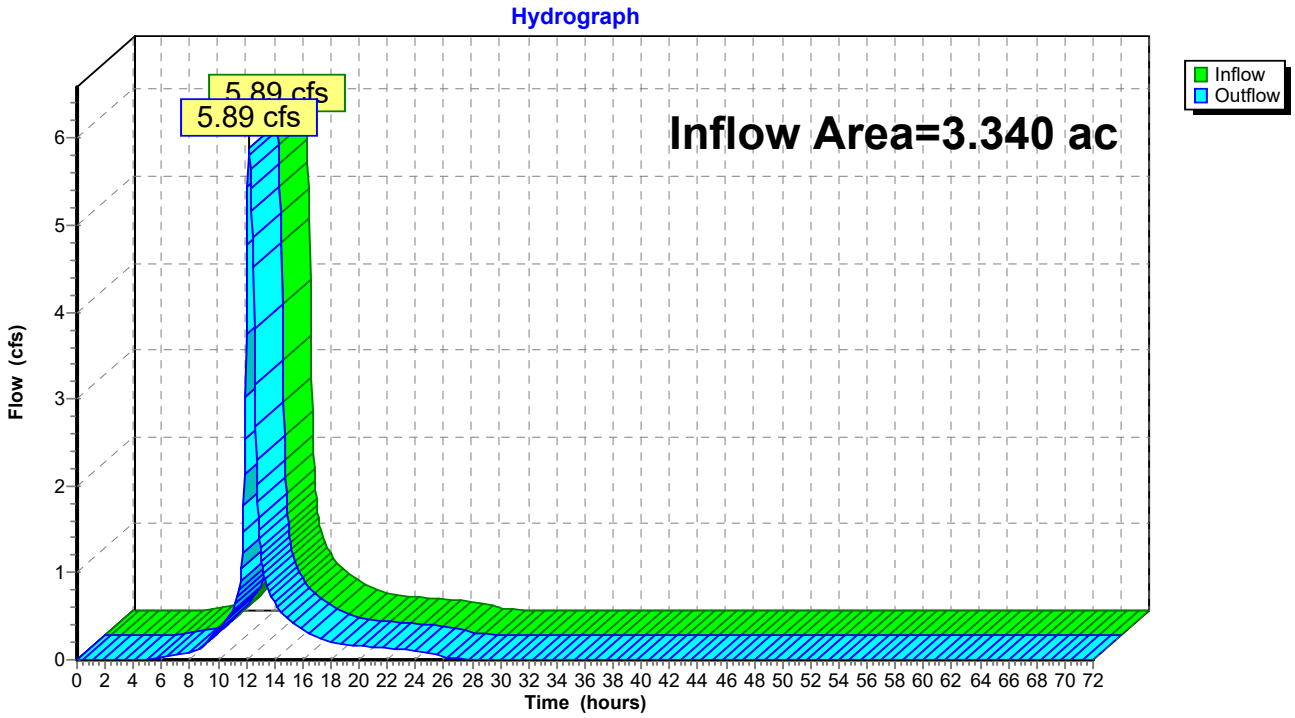
Summary for Reach PD1: WETLAND

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

Inflow Area = 3.340 ac, 56.81% Impervious, Inflow Depth = 2.79" for 10-Year event
Inflow = 5.89 cfs @ 12.20 hrs, Volume= 0.775 af
Outflow = 5.89 cfs @ 12.20 hrs, Volume= 0.775 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD1: WETLAND



Hydrograph for Reach PD1: WETLAND

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.01		0.01	58.00	0.00		0.00
6.00	0.03		0.03	59.00	0.00		0.00
7.00	0.06		0.06	60.00	0.00		0.00
8.00	0.09		0.09	61.00	0.00		0.00
9.00	0.17		0.17	62.00	0.00		0.00
10.00	0.34		0.34	63.00	0.00		0.00
11.00	0.56		0.56	64.00	0.00		0.00
12.00	**3.75**		**3.75**	65.00	0.00		0.00
13.00	**1.29**		**1.29**	66.00	0.00		0.00
14.00	0.65		0.65	67.00	0.00		0.00
15.00	0.46		0.46	68.00	0.00		0.00
16.00	0.34		0.34	69.00	0.00		0.00
17.00	0.26		0.26	70.00	0.00		0.00
18.00	0.21		0.21	71.00	0.00		0.00
19.00	0.17		0.17	72.00	0.00		0.00
20.00	0.16		0.16				
21.00	0.14		0.14				
22.00	0.13		0.13				
23.00	0.12		0.12				
24.00	0.11		0.11				
25.00	0.07		0.07				
26.00	0.04		0.04				
27.00	0.01		0.01				
28.00	0.01		0.01				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

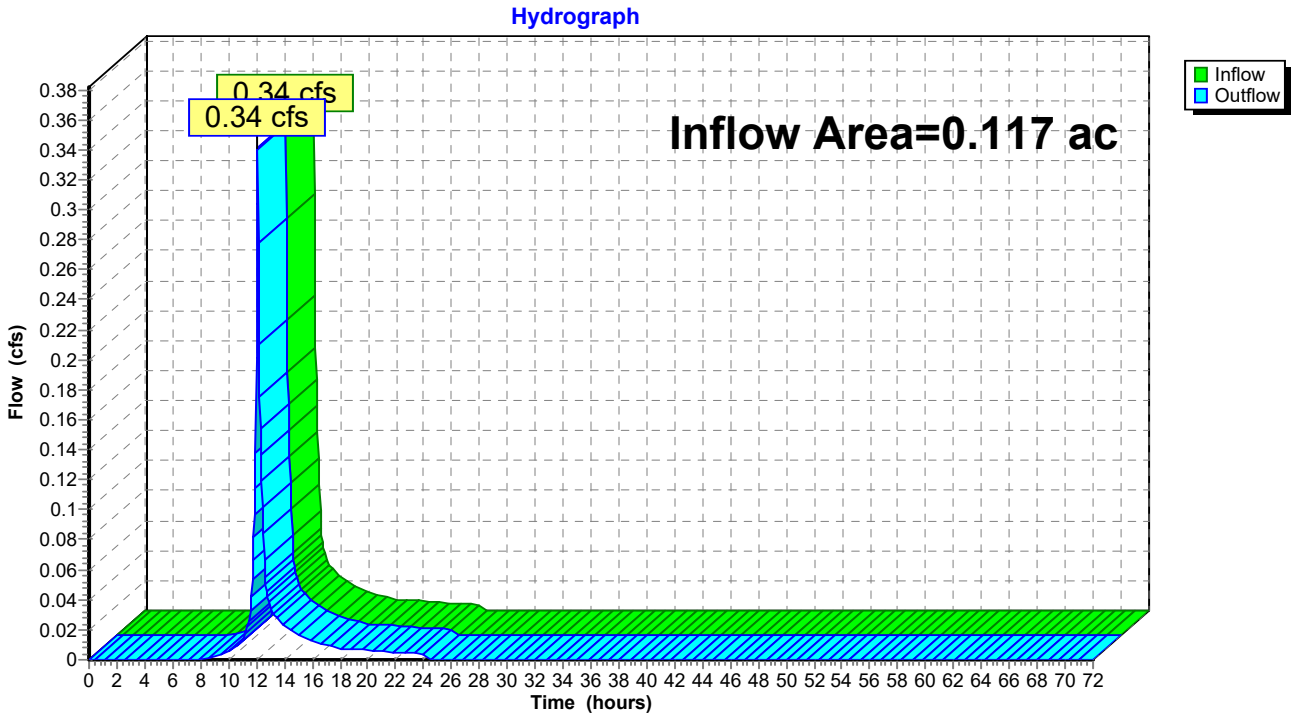
Summary for Reach PD2: BOSTON POST RD

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

Inflow Area = 0.117 ac, 46.53% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 0.34 cfs @ 12.09 hrs, Volume= 0.025 af
Outflow = 0.34 cfs @ 12.09 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD2: BOSTON POST RD



Hydrograph for Reach PD2: BOSTON POST RD

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.01		0.01	63.00	0.00		0.00
11.00	0.01		0.01	64.00	0.00		0.00
12.00	**0.20**		**0.20**	65.00	0.00		0.00
13.00	**0.04**		**0.04**	66.00	0.00		0.00
14.00	0.02		0.02	67.00	0.00		0.00
15.00	0.02		0.02	68.00	0.00		0.00
16.00	0.01		0.01	69.00	0.00		0.00
17.00	0.01		0.01	70.00	0.00		0.00
18.00	0.01		0.01	71.00	0.00		0.00
19.00	0.01		0.01	72.00	0.00		0.00
20.00	0.01		0.01				
21.00	0.01		0.01				
22.00	0.01		0.01				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

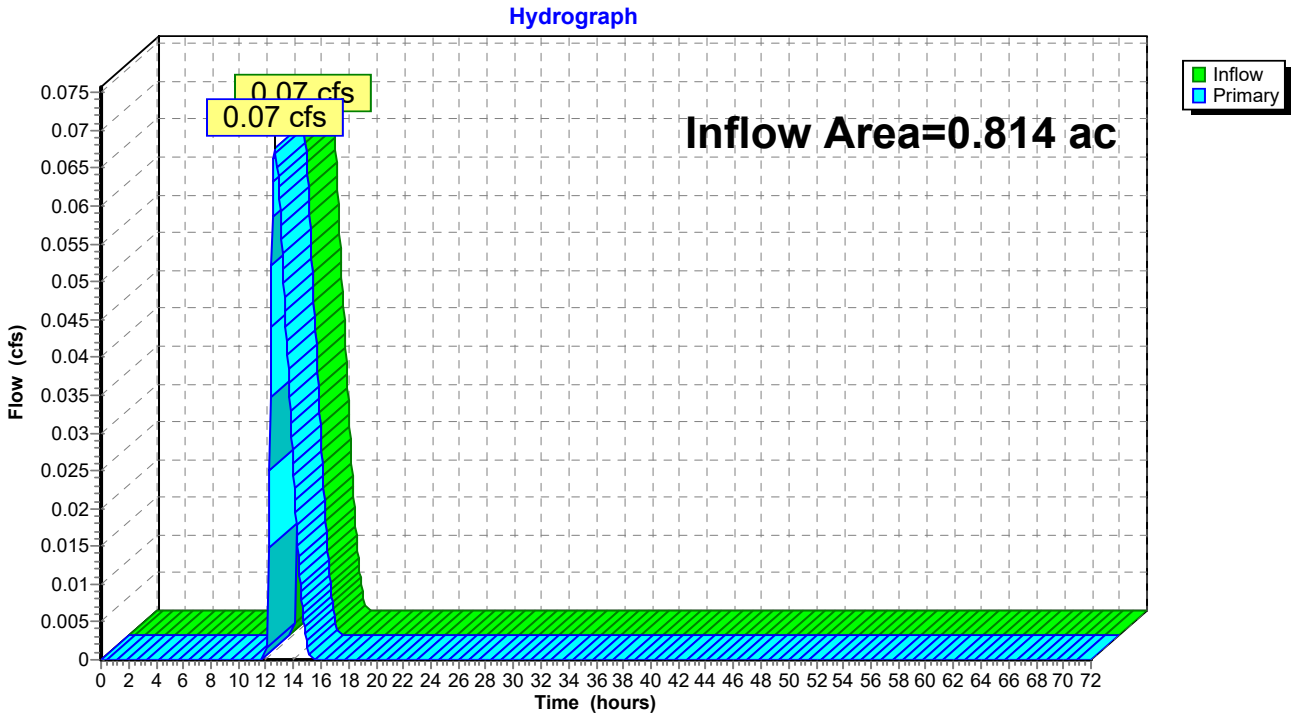
Summary for Pond 1P: FES

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

Inflow Area = 0.814 ac, 0.00% Impervious, Inflow Depth = 0.12" for 10-Year event
Inflow = 0.07 cfs @ 12.65 hrs, Volume= 0.008 af
Primary = 0.07 cfs @ 12.65 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 1P: FES



Hydrograph for Pond 1P: FES

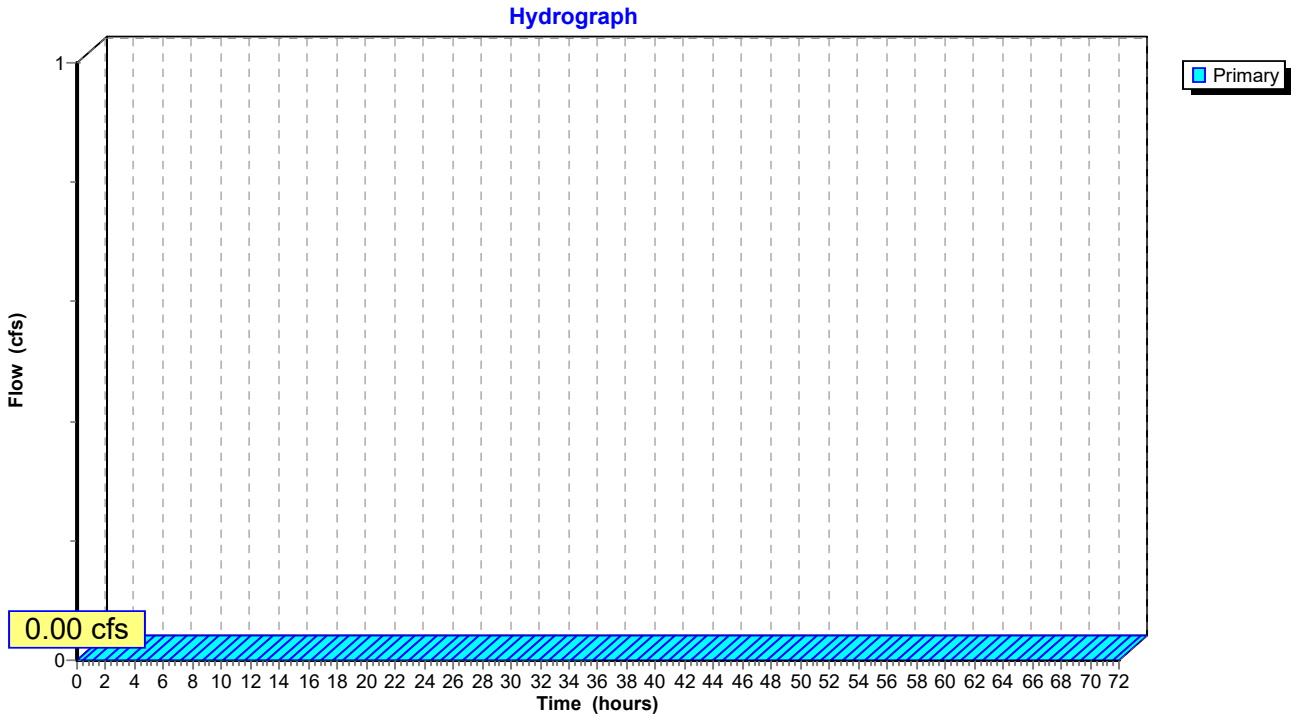
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.00		0.00	64.00	0.00		0.00
12.00	**0.00**		**0.00**	65.00	0.00		0.00
13.00	**0.06**		**0.06**	66.00	0.00		0.00
14.00	0.02		0.02	67.00	0.00		0.00
15.00	0.00		0.00	68.00	0.00		0.00
16.00	0.00		0.00	69.00	0.00		0.00
17.00	0.00		0.00	70.00	0.00		0.00
18.00	0.00		0.00	71.00	0.00		0.00
19.00	0.00		0.00	72.00	0.00		0.00
20.00	0.00		0.00				
21.00	0.00		0.00				
22.00	0.00		0.00				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Summary for Pond 2P: FES w/ HEADWALL

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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Pond 2P: FES w/ HEADWALL



Summary for Pond 3P: Permeable Pavement

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=66)

Inflow Area =	0.814 ac,	0.00% Impervious,	Inflow Depth =	4.22"	for 10-Year event
Inflow =	3.62 cfs @	12.09 hrs,	Volume=	0.286 af	
Outflow =	0.46 cfs @	12.65 hrs,	Volume=	0.287 af,	Atten= 87%, Lag= 33.7 min
Discarded =	0.39 cfs @	11.75 hrs,	Volume=	0.279 af	
Primary =	0.07 cfs @	12.65 hrs,	Volume=	0.008 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.16' @ 12.65 hrs Surf.Area= 32,578 sf Storage= 4,026 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 63.4 min (832.7 - 769.3)

Volume	Invert	Avail.Storage	Storage Description
#1	122.85'	11,044 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

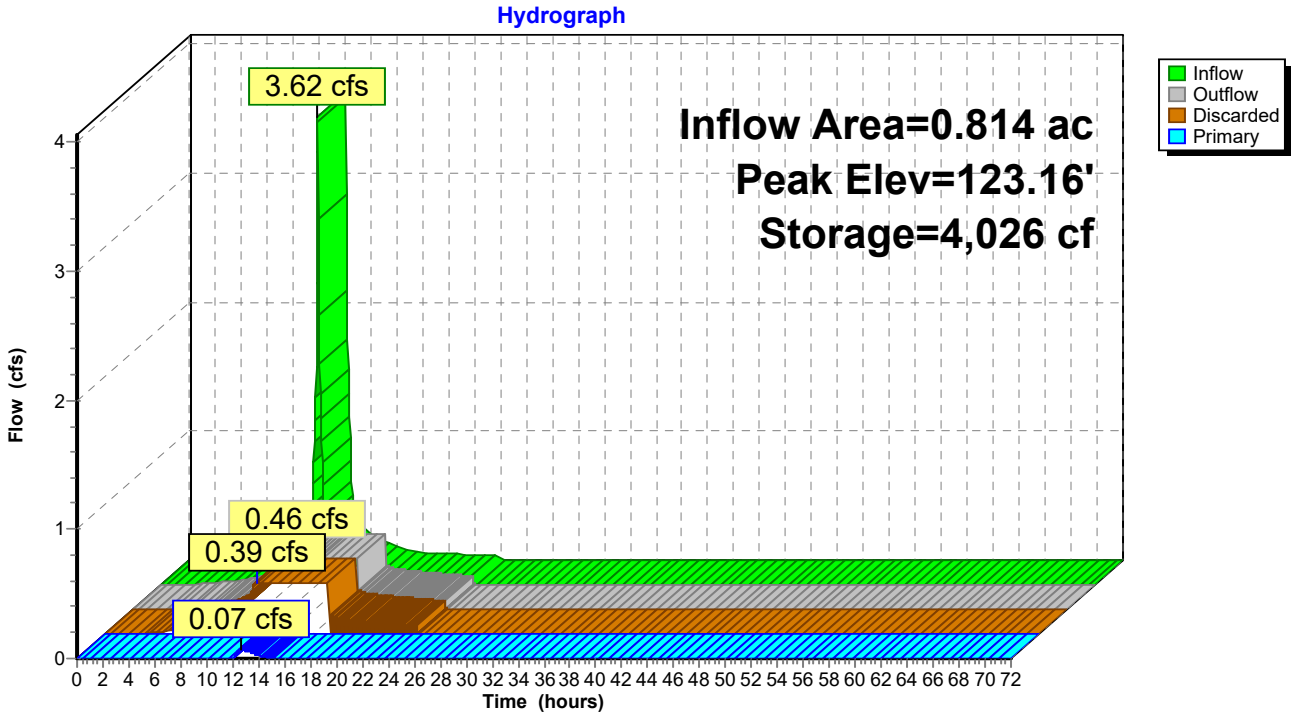
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
122.85	32,578	0.0	0	0
123.51	32,578	40.0	8,601	8,601
123.76	32,578	30.0	2,443	11,044

Device	Routing	Invert	Outlet Devices
#1	Discarded	122.85'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	123.01'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.01' / 122.90' S= 0.0055 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

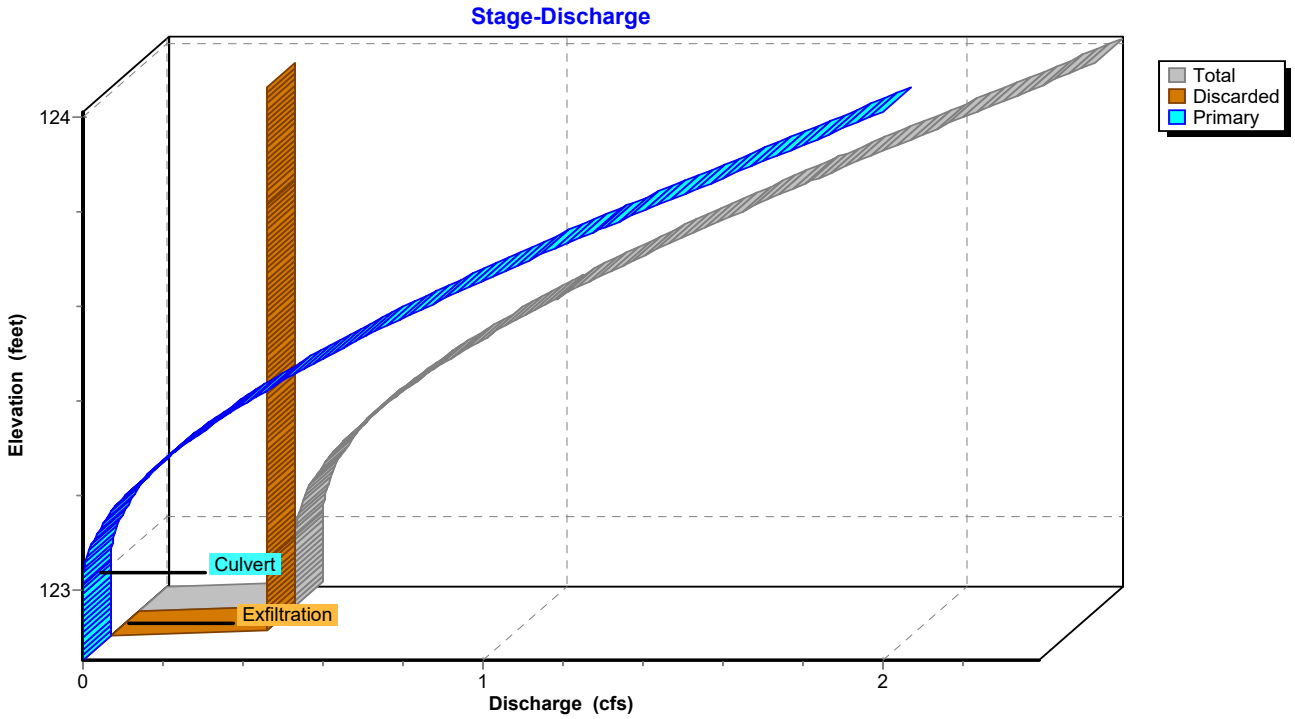
Discarded OutFlow Max=0.39 cfs @ 11.75 hrs HW=122.86' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=0.07 cfs @ 12.65 hrs HW=123.16' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Barrel Controls 0.07 cfs @ 1.41 fps)

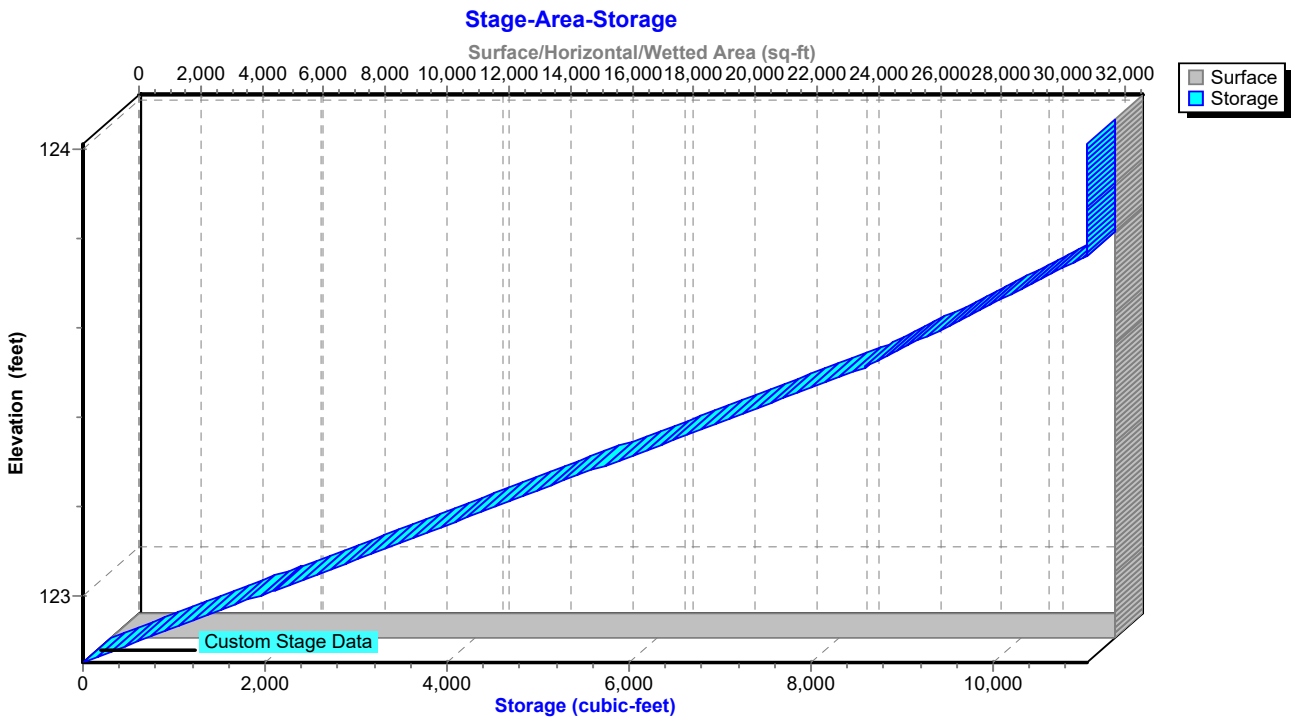
Pond 3P: Permeable Pavement



Pond 3P: Permeable Pavement



Pond 3P: Permeable Pavement



Hydrograph for Pond 3P: Permeable Pavement

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	122.85	0.00	0.00	0.00
2.50	0.00	0	122.85	0.00	0.00	0.00
5.00	0.02	0	122.85	0.02	0.02	0.00
7.50	0.06	0	122.85	0.06	0.06	0.00
10.00	**0.16**	0	122.85	0.16	**0.16**	0.00
12.50	**0.77**	**3,962**	**123.15**	**0.46**	**0.39**	**0.06**
15.00	0.15	**2,420**	**123.04**	**0.39**	0.39	**0.00**
17.50	0.07	0	122.85	0.00	0.00	0.00
20.00	0.05	0	122.85	0.00	0.00	0.00
22.50	0.04	0	122.85	0.00	0.00	0.00
25.00	0.00	0	122.85	0.00	0.00	0.00
27.50	0.00	0	122.85	0.00	0.00	0.00
30.00	0.00	0	122.85	0.00	0.00	0.00
32.50	0.00	0	122.85	0.00	0.00	0.00
35.00	0.00	0	122.85	0.00	0.00	0.00
37.50	0.00	0	122.85	0.00	0.00	0.00
40.00	0.00	0	122.85	0.00	0.00	0.00
42.50	0.00	0	122.85	0.00	0.00	0.00
45.00	0.00	0	122.85	0.00	0.00	0.00
47.50	0.00	0	122.85	0.00	0.00	0.00
50.00	0.00	0	122.85	0.00	0.00	0.00
52.50	0.00	0	122.85	0.00	0.00	0.00
55.00	0.00	0	122.85	0.00	0.00	0.00
57.50	0.00	0	122.85	0.00	0.00	0.00
60.00	0.00	0	122.85	0.00	0.00	0.00
62.50	0.00	0	122.85	0.00	0.00	0.00
65.00	0.00	0	122.85	0.00	0.00	0.00
67.50	0.00	0	122.85	0.00	0.00	0.00
70.00	0.00	0	122.85	0.00	0.00	0.00

Stage-Discharge for Pond 3P: Permeable Pavement

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
122.85	0.00	**0.00**	0.00
122.87	0.39	**0.39**	0.00
122.89	0.39	0.39	0.00
122.91	0.39	0.39	0.00
122.93	0.39	0.39	0.00
122.95	0.39	0.39	0.00
122.97	0.39	0.39	0.00
122.99	0.39	0.39	0.00
123.01	0.39	0.39	0.00
123.03	0.39	0.39	0.00
123.05	0.40	0.39	0.00
123.07	0.40	0.39	0.01
123.09	0.41	0.39	0.02
123.11	0.42	0.39	0.03
123.13	0.44	0.39	0.04
123.15	0.45	0.39	0.06
123.17	0.47	0.39	0.08
123.19	0.49	0.39	0.10
123.21	0.51	0.39	0.12
123.23	0.54	0.39	0.14
123.25	0.56	0.39	0.17
123.27	0.59	0.39	0.20
123.29	0.62	0.39	0.23
123.31	0.65	0.39	0.26
123.33	0.68	0.39	0.29
123.35	0.72	0.39	0.32
123.37	0.75	0.39	0.36
123.39	0.79	0.39	0.40
123.41	0.83	0.39	0.44
123.43	0.87	0.39	0.48
123.45	0.91	0.39	0.52
123.47	0.95	0.39	0.56
123.49	1.00	0.39	0.60
123.51	1.04	0.39	0.65
123.53	1.09	0.39	0.69
123.55	1.13	0.39	0.74
123.57	1.18	0.39	0.79
123.59	1.23	0.39	0.84
123.61	1.28	0.39	0.89
123.63	1.33	0.39	0.94
123.65	1.38	0.39	0.99
123.67	1.44	0.39	1.04
123.69	1.49	0.39	1.10
123.71	1.54	0.39	1.15
123.73	1.60	0.39	1.21
123.75	1.65	0.39	1.26
123.77	1.71	0.39	1.32
123.79	1.77	0.39	1.37
123.81	1.82	0.39	1.43
123.83	1.88	0.39	1.49
123.85	1.94	0.39	1.54
123.87	1.99	0.39	1.60
123.89	2.05	0.39	1.66
123.91	2.11	0.39	1.71
123.93	2.16	0.39	1.77
123.95	2.22	0.39	1.83
123.97	2.28	0.39	1.89
123.99	2.33	0.39	1.94
124.01	**2.39**	0.39	**2.00**

Stage-Area-Storage for Pond 3P: Permeable Pavement

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
122.85	**32,578**	0
122.87	32,578	261
122.89	32,578	521
122.91	32,578	782
122.93	32,578	1,042
122.95	32,578	1,303
122.97	32,578	1,564
122.99	32,578	1,824
123.01	32,578	2,085
123.03	32,578	2,346
123.05	32,578	2,606
123.07	32,578	2,867
123.09	32,578	3,127
123.11	32,578	3,388
123.13	32,578	3,649
123.15	32,578	3,909
123.17	32,578	4,170
123.19	32,578	4,431
123.21	32,578	4,691
123.23	32,578	4,952
123.25	32,578	5,212
123.27	32,578	5,473
123.29	32,578	5,734
123.31	32,578	5,994
123.33	32,578	6,255
123.35	32,578	6,516
123.37	32,578	6,776
123.39	32,578	7,037
123.41	32,578	7,297
123.43	32,578	7,558
123.45	32,578	7,819
123.47	32,578	8,079
123.49	32,578	8,340
123.51	32,578	8,601
123.53	32,578	8,796
123.55	32,578	8,992
123.57	32,578	9,187
123.59	32,578	9,382
123.61	32,578	9,578
123.63	32,578	9,773
123.65	32,578	9,969
123.67	32,578	10,164
123.69	32,578	10,360
123.71	32,578	10,555
123.73	32,578	10,751
123.75	32,578	**10,946**
123.77	32,578	**11,044**
123.79	32,578	11,044
123.81	32,578	11,044
123.83	32,578	11,044
123.85	32,578	11,044
123.87	32,578	11,044
123.89	32,578	11,044
123.91	32,578	11,044
123.93	32,578	11,044
123.95	32,578	11,044
123.97	32,578	11,044
123.99	32,578	11,044
124.01	32,578	11,044

Summary for Pond UG-1: RETAIN_IT

Inflow Area = 2.219 ac, 85.49% Impervious, Inflow Depth = 4.00" for 10-Year event
Inflow = 9.59 cfs @ 12.09 hrs, Volume= 0.740 af
Outflow = 5.65 cfs @ 12.21 hrs, Volume= 0.740 af, Atten= 41%, Lag= 7.1 min
Primary = 5.65 cfs @ 12.21 hrs, Volume= 0.740 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 124.49' @ 12.21 hrs Surf.Area= 3,444 sf Storage= 5,322 cf

Plug-Flow detention time= 38.0 min calculated for 0.739 af (100% of inflow)
Center-of-Mass det. time= 38.6 min (818.2 - 779.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	122.40'	1,095 cf	**42.00'W x 82.00'L x 4.67'H Field A** 16,072 cf Overall - 13,333 cf Embedded = 2,739 cf x 40.0% Voids
#2A	122.90'	9,855 cf	**retain_it retain_it 3.5'** x 50 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 5 Rows adjusted for 184.2 cf perimeter wall
		10,950 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	122.40'	**15.0" Round Culvert** L= 212.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 122.40' / 121.25' S= 0.0054 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.23 sf
#2	Device 1	122.40'	**2.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	122.90'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=5.64 cfs @ 12.21 hrs HW=124.48' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 5.64 cfs @ 4.59 fps)
  ├─**2=Orifice/Grate** (Passes < 0.23 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Passes < 7.72 cfs potential flow)

Pond UG-1: RETAIN_IT - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it®)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
5 Rows adjusted for 184.2 cf perimeter wall

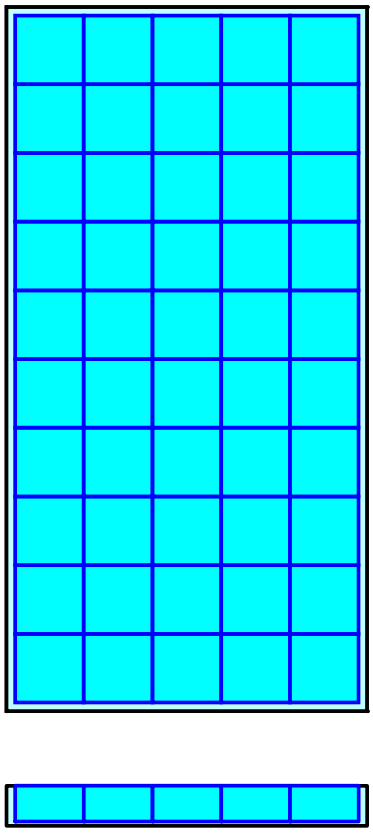
10 Chambers/Row x 8.00' Long = 80.00' Row Length +12.0" End Stone x 2 = 82.00' Base Length
5 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 42.00' Base Width
6.0" Base + 50.0" Chamber Height = 4.67' Field Height

6.1 cf Sidewall x 10 x 2 + 6.1 cf Endwall x 5 x 2 = 184.2 cf Perimeter Wall
50 Chambers x 200.8 cf - 184.2 cf Perimeter wall = 9,854.8 cf Chamber Storage
50 Chambers x 266.7 cf = 13,333.3 cf Displacement

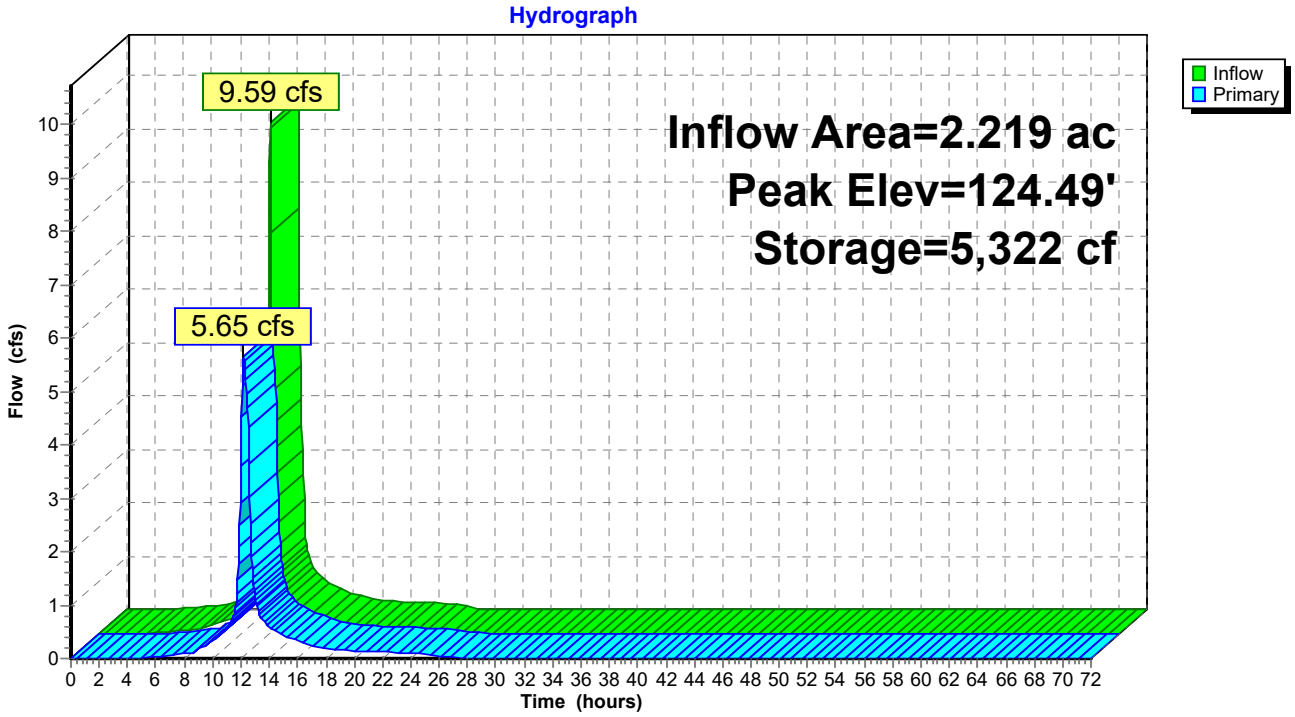
16,072.0 cf Field - 13,333.3 cf Chambers = 2,738.7 cf Stone x 40.0% Voids = 1,095.5 cf Stone Storage

Chamber Storage + Stone Storage = 10,950.3 cf = 0.251 af
Overall Storage Efficiency = 68.1%
Overall System Size = 82.00' x 42.00' x 4.67'

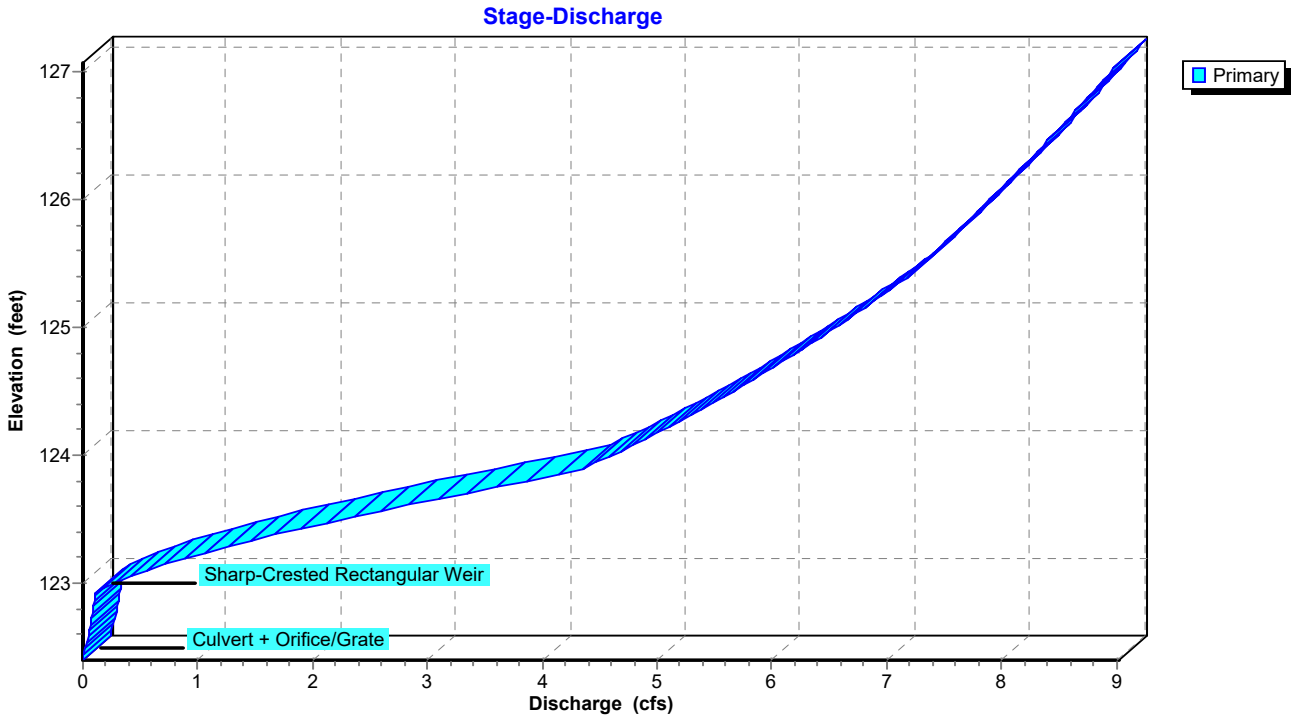
50 Chambers
595.3 cy Field
101.4 cy Stone



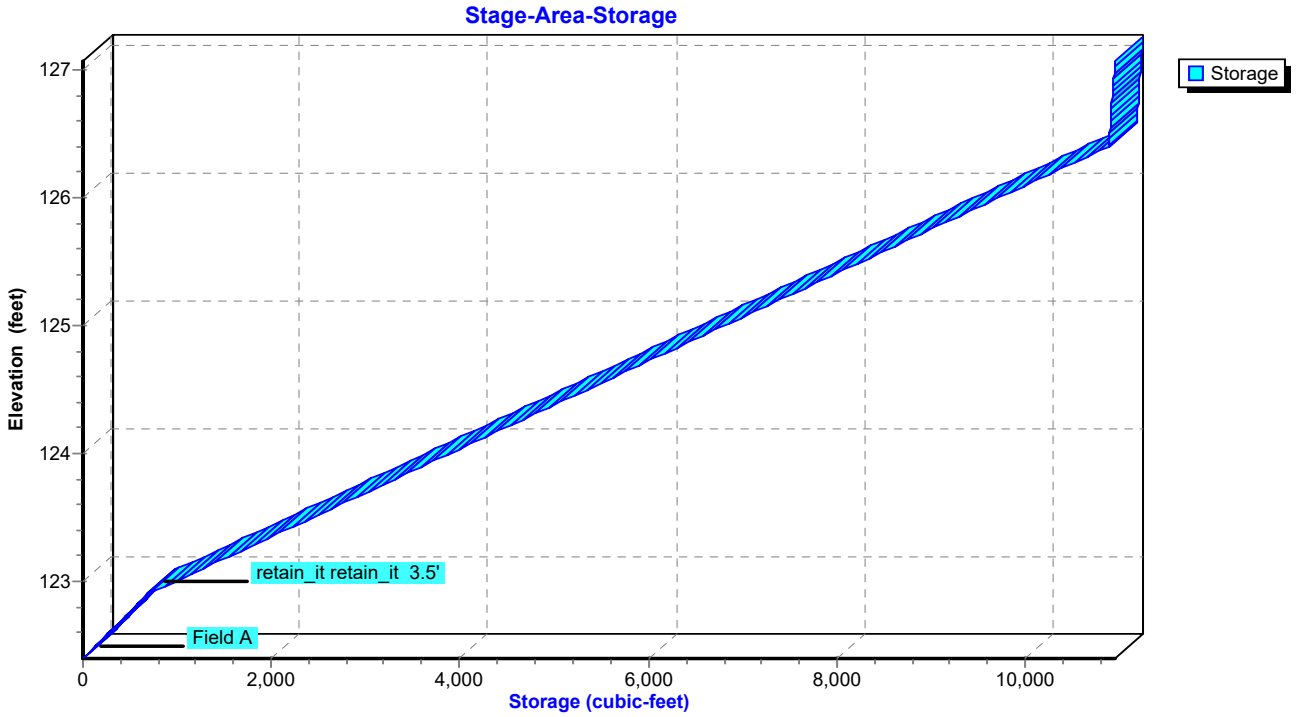
Pond UG-1: RETAIN_IT



Pond UG-1: RETAIN_IT



Pond UG-1: RETAIN_IT



Hydrograph for Pond UG-1: RETAIN_IT

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	122.40	0.00
2.50	0.00	0	122.40	0.00
5.00	0.04	107	122.48	0.01
7.50	0.13	412	122.70	0.07
10.00	**0.38**	**1,061**	**123.03**	**0.34**
12.50	**2.07**	**3,587**	**123.89**	**4.35**
15.00	0.40	1,161	123.06	0.44
17.50	0.20	916	122.98	0.22
20.00	0.14	803	122.94	0.15
22.50	0.11	738	122.92	0.12
25.00	0.00	400	122.69	0.07
27.50	0.00	103	122.47	0.01
30.00	0.00	53	122.44	0.00
32.50	0.00	36	122.43	0.00
35.00	0.00	27	122.42	0.00
37.50	0.00	21	122.42	0.00
40.00	0.00	18	122.41	0.00
42.50	0.00	15	122.41	0.00
45.00	0.00	13	122.41	0.00
47.50	0.00	12	122.41	0.00
50.00	0.00	10	122.41	0.00
52.50	0.00	9	122.41	0.00
55.00	0.00	9	122.41	0.00
57.50	0.00	8	122.41	0.00
60.00	0.00	7	122.41	0.00
62.50	0.00	7	122.41	0.00
65.00	0.00	6	122.40	0.00
67.50	0.00	6	122.40	0.00
70.00	0.00	6	122.40	0.00

Stage-Discharge for Pond UG-1: RETAIN_IT

Elevation (feet)	Primary (cfs)
122.40	0.00
122.45	0.00
122.50	0.02
122.55	0.03
122.60	0.05
122.65	0.06
122.70	0.07
122.75	0.08
122.80	0.09
122.85	0.10
122.90	0.10
122.95	0.16
123.00	0.27
123.05	0.40
123.10	0.55
123.15	0.72
123.20	0.91
123.25	1.11
123.30	1.32
123.35	1.54
123.40	1.77
123.45	2.01
123.50	2.26
123.55	2.52
123.60	2.78
123.65	3.04
123.70	3.31
123.75	3.59
123.80	3.87
123.85	4.16
123.90	4.36
123.95	4.49
124.00	4.61
124.05	4.72
124.10	4.84
124.15	4.95
124.20	5.06
124.25	5.16
124.30	5.27
124.35	5.37
124.40	5.47
124.45	5.57
124.50	5.67
124.55	5.76
124.60	5.85
124.65	5.95
124.70	6.04
124.75	6.13
124.80	6.21
124.85	6.30
124.90	6.39
124.95	6.47
125.00	6.56
125.05	6.64
125.10	6.72
125.15	6.80
125.20	6.88
125.25	6.96
125.30	7.04
125.35	7.11
125.40	7.19
125.45	7.25
125.50	7.31
125.55	7.37
125.60	7.43
125.65	7.49
125.70	7.55
125.75	7.61
125.80	7.67
125.85	7.73
125.90	7.79
125.95	7.84
126.00	7.90
126.05	7.96
126.10	8.01
126.15	8.07
126.20	8.12
126.25	8.18
126.30	8.23
126.35	8.29
126.40	8.34
126.45	8.39
126.50	8.45
126.55	8.50
126.60	8.55
126.65	8.60
126.70	8.65
126.75	8.70
126.80	8.76
126.85	8.81
126.90	8.86
126.95	8.91
127.00	8.96
127.05	**9.01**

Stage-Area-Storage for Pond UG-1: RETAIN_IT

Elevation (feet)	Storage (cubic-feet)
122.40	0
122.45	69
122.50	138
122.55	207
122.60	276
122.65	344
122.70	413
122.75	482
122.80	551
122.85	620
122.90	689
122.95	834
123.00	980
123.05	1,126
123.10	1,271
123.15	1,417
123.20	1,563
123.25	1,708
123.30	1,854
123.35	2,000
123.40	2,145
123.45	2,291
123.50	2,437
123.55	2,582
123.60	2,728
123.65	2,874
123.70	3,019
123.75	3,165
123.80	3,311
123.85	3,456
123.90	3,602
123.95	3,748
124.00	3,893
124.05	4,039
124.10	4,185
124.15	4,330
124.20	4,476
124.25	4,622
124.30	4,767
124.35	4,913
124.40	5,059
124.45	5,204
124.50	5,350
124.55	5,496
124.60	5,641
124.65	5,787
124.70	5,933
124.75	6,078
124.80	6,224
124.85	6,370
124.90	6,515
124.95	6,661
125.00	6,807
125.05	6,952
125.10	7,098
125.15	7,244
125.20	7,389
125.25	7,535
125.30	7,681
125.35	7,826
125.40	7,972
125.45	8,118
125.50	8,263
125.55	8,409
125.60	8,555
125.65	8,700
125.70	8,846
125.75	8,992
125.80	9,137
125.85	9,283
125.90	9,429
125.95	9,574
126.00	9,720
126.05	9,866
126.10	10,011
126.15	10,157
126.20	10,303
126.25	10,448
126.30	10,594
126.35	10,740
126.40	10,885
126.45	10,890
126.50	10,895
126.55	10,900
126.60	10,905
126.65	10,910
126.70	10,915
126.75	10,919
126.80	10,924
126.85	10,929
126.90	10,934
126.95	10,939
127.00	10,944
127.05	**10,949**

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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

Subcatchment P-1A: P-1A Runoff Area=96,664 sf 85.49% Impervious Runoff Depth=5.18"
Tc=6.0 min CN=93 Runoff=12.23 cfs 0.958 af

Subcatchment P-1B: P-1B (PERMEABLE Runoff Area=35,462 sf 0.00% Impervious Runoff Depth=5.41"
Tc=6.0 min CN=95 Runoff=4.58 cfs 0.367 af

Subcatchment P-1U: P-1U (UNDETAINED) Runoff Area=13,343 sf 0.00% Impervious Runoff Depth=1.76"
Tc=6.0 min CN=58 Runoff=0.58 cfs 0.045 af

Subcatchment P-2: P-2 Runoff Area=5,081 sf 46.53% Impervious Runoff Depth=3.58"
Tc=6.0 min CN=78 Runoff=0.48 cfs 0.035 af

Reach PD1: WETLAND Inflow=7.08 cfs 1.034 af
Outflow=7.08 cfs 1.034 af

Reach PD2: BOSTON POST RD Inflow=0.48 cfs 0.035 af
Outflow=0.48 cfs 0.035 af

Pond 1P: FES Inflow=0.19 cfs 0.031 af
Primary=0.19 cfs 0.031 af

Pond 2P: FES w/ HEADWALL
Primary=0.00 cfs 0.000 af

Pond 3P: Permeable Pavement Peak Elev=123.27' Storage=5,425 cf Inflow=4.58 cfs 0.367 af
Discarded=0.39 cfs 0.337 af Primary=0.19 cfs 0.031 af Outflow=0.58 cfs 0.368 af

Pond UG-1: RETAIN_IT Peak Elev=125.05' Storage=6,938 cf Inflow=12.23 cfs 0.958 af
Outflow=6.63 cfs 0.958 af

Total Runoff Area = 3.456 ac Runoff Volume = 1.405 af Average Runoff Depth = 4.88"
43.54% Pervious = 1.505 ac 56.46% Impervious = 1.951 ac

Summary for Subcatchment P-1A: P-1A

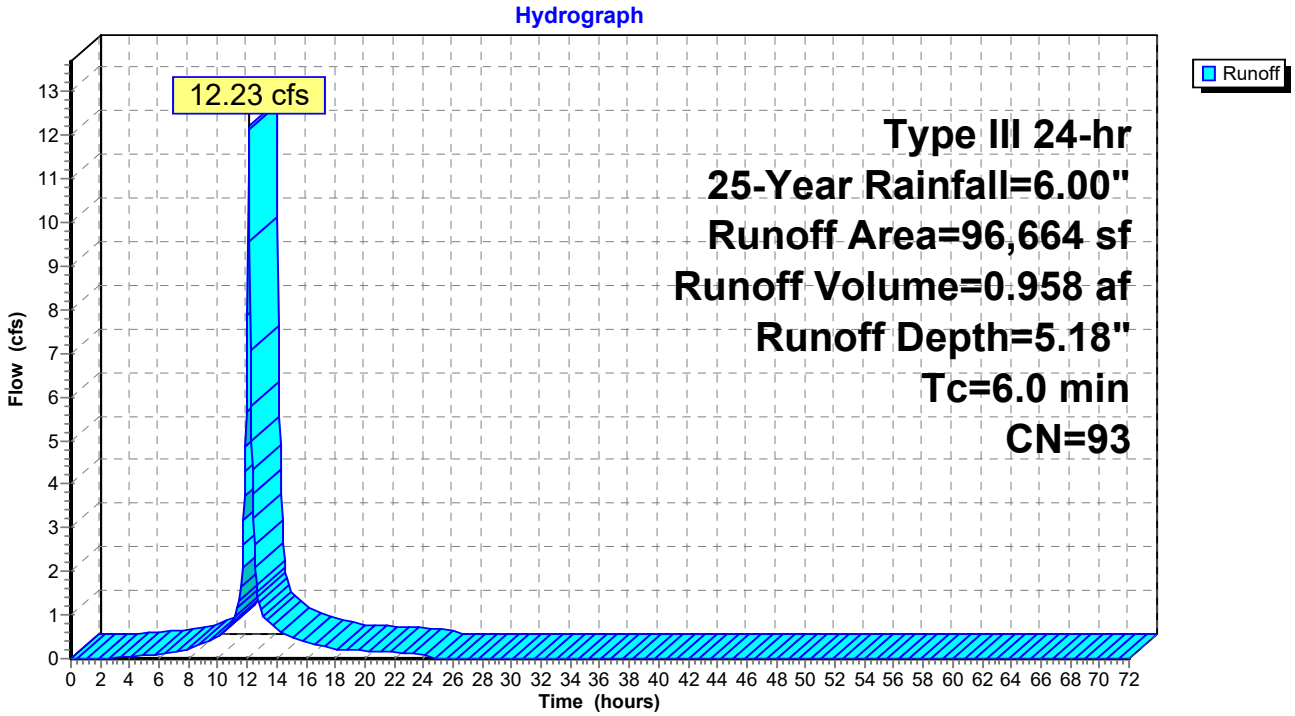
Runoff = 12.23 cfs @ 12.09 hrs, Volume= 0.958 af, Depth= 5.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.00"

	Area (sf)	CN	Description
*	1,394	61	>75% Grass cover, Good, HSG B- ISLANDS
	75,402	98	Paved parking, HSG B
*	4,922	73	Existing Woods/grass comb., Poor, HSG B
	7,710	58	Woods/grass comb., Good, HSG B
	7,236	98	Unconnected roofs, HSG B
	96,664	93	Weighted Average
	14,026	64	14.51% Pervious Area
	82,638	98	85.49% Impervious Area
	7,236		8.76% Unconnected

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

Subcatchment P-1A: P-1A



Hydrograph for Subcatchment P-1A: P-1A

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.06	0.00	0.00
2.00	0.12	0.00	0.00
3.00	0.18	0.00	0.01
4.00	0.26	0.01	0.04
5.00	0.34	0.04	0.07
6.00	0.43	0.08	0.10
7.00	0.54	0.13	0.15
8.00	0.68	0.22	0.22
9.00	0.87	0.35	0.36
10.00	1.13	0.56	0.52
11.00	1.50	0.87	0.82
12.00	3.00	2.25	**7.87**
13.00	4.50	3.71	**1.07**
14.00	4.87	4.07	0.67
15.00	5.13	4.32	0.51
16.00	5.32	4.51	0.36
17.00	5.46	4.65	0.28
18.00	5.57	4.76	0.22
19.00	5.66	4.85	0.19
20.00	5.74	4.93	0.17
21.00	5.82	5.00	0.16
22.00	5.88	5.07	0.14
23.00	5.95	5.13	0.13
24.00	**6.00**	**5.18**	0.11
25.00	6.00	5.18	0.00
26.00	6.00	5.18	0.00
27.00	6.00	5.18	0.00
28.00	6.00	5.18	0.00
29.00	6.00	5.18	0.00
30.00	6.00	5.18	0.00
31.00	6.00	5.18	0.00
32.00	6.00	5.18	0.00
33.00	6.00	5.18	0.00
34.00	6.00	5.18	0.00
35.00	6.00	5.18	0.00
36.00	6.00	5.18	0.00
37.00	6.00	5.18	0.00
38.00	6.00	5.18	0.00
39.00	6.00	5.18	0.00
40.00	6.00	5.18	0.00
41.00	6.00	5.18	0.00
42.00	6.00	5.18	0.00
43.00	6.00	5.18	0.00
44.00	6.00	5.18	0.00
45.00	6.00	5.18	0.00
46.00	6.00	5.18	0.00
47.00	6.00	5.18	0.00
48.00	6.00	5.18	0.00
49.00	6.00	5.18	0.00
50.00	6.00	5.18	0.00
51.00	6.00	5.18	0.00
52.00	6.00	5.18	0.00
53.00	6.00	5.18	0.00
54.00	6.00	5.18	0.00
55.00	6.00	5.18	0.00
56.00	6.00	5.18	0.00
57.00	6.00	5.18	0.00
58.00	6.00	5.18	0.00
59.00	6.00	5.18	0.00
60.00	6.00	5.18	0.00
61.00	6.00	5.18	0.00
62.00	6.00	5.18	0.00
63.00	6.00	5.18	0.00
64.00	6.00	5.18	0.00
65.00	6.00	5.18	0.00
66.00	6.00	5.18	0.00
67.00	6.00	5.18	0.00
68.00	6.00	5.18	0.00
69.00	6.00	5.18	0.00
70.00	6.00	5.18	0.00
71.00	6.00	5.18	0.00
72.00	6.00	5.18	0.00

Summary for Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)

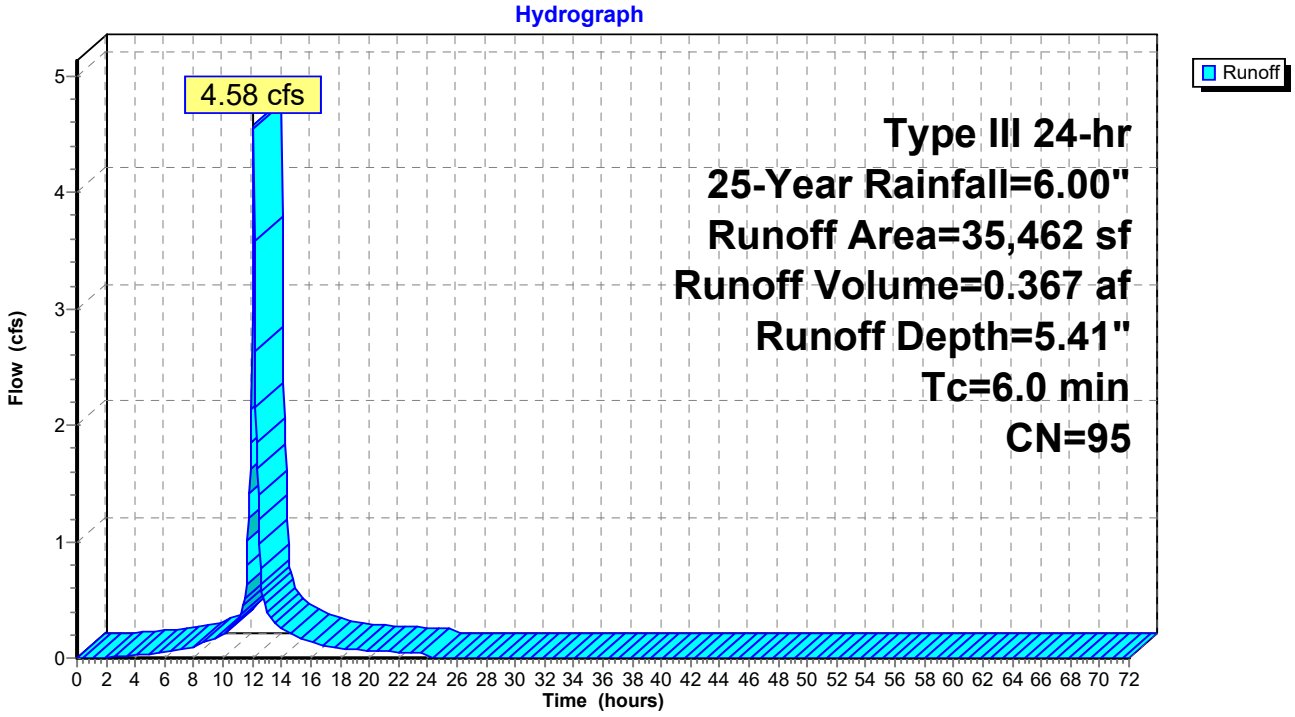
Runoff = 4.58 cfs @ 12.09 hrs, Volume= 0.367 af, Depth= 5.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.00"

	Area (sf)	CN	Description
*	32,606	98	Perm. Pavement, 0% imp, HSG B
	2,856	61	>75% Grass cover, Good, HSG B
	35,462	95	Weighted Average
	35,462	95	100.00% Pervious Area

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

Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)



Hydrograph for Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.06	0.00	0.00
2.00	0.12	0.00	0.00
3.00	0.18	0.01	0.01
4.00	0.26	0.03	0.02
5.00	0.34	0.07	0.04
6.00	0.43	0.13	0.05
7.00	0.54	0.20	0.07
8.00	0.68	0.30	0.10
9.00	0.87	0.46	0.15
10.00	1.13	0.68	0.21
11.00	1.50	1.01	0.32
12.00	3.00	2.45	**2.96**
13.00	4.50	3.92	**0.40**
14.00	4.87	4.29	0.25
15.00	5.13	4.54	0.19
16.00	5.32	4.73	0.13
17.00	5.46	4.87	0.10
18.00	5.57	4.98	0.08
19.00	5.66	5.07	0.07
20.00	5.74	5.16	0.06
21.00	5.82	5.23	0.06
22.00	5.88	5.30	0.05
23.00	5.95	5.36	0.05
24.00	**6.00**	**5.41**	0.04
25.00	6.00	5.41	0.00
26.00	6.00	5.41	0.00
27.00	6.00	5.41	0.00
28.00	6.00	5.41	0.00
29.00	6.00	5.41	0.00
30.00	6.00	5.41	0.00
31.00	6.00	5.41	0.00
32.00	6.00	5.41	0.00
33.00	6.00	5.41	0.00
34.00	6.00	5.41	0.00
35.00	6.00	5.41	0.00
36.00	6.00	5.41	0.00
37.00	6.00	5.41	0.00
38.00	6.00	5.41	0.00
39.00	6.00	5.41	0.00
40.00	6.00	5.41	0.00
41.00	6.00	5.41	0.00
42.00	6.00	5.41	0.00
43.00	6.00	5.41	0.00
44.00	6.00	5.41	0.00
45.00	6.00	5.41	0.00
46.00	6.00	5.41	0.00
47.00	6.00	5.41	0.00
48.00	6.00	5.41	0.00
49.00	6.00	5.41	0.00
50.00	6.00	5.41	0.00
51.00	6.00	5.41	0.00
52.00	6.00	5.41	0.00
53.00	6.00	5.41	0.00
54.00	6.00	5.41	0.00
55.00	6.00	5.41	0.00
56.00	6.00	5.41	0.00
57.00	6.00	5.41	0.00
58.00	6.00	5.41	0.00
59.00	6.00	5.41	0.00
60.00	6.00	5.41	0.00
61.00	6.00	5.41	0.00
62.00	6.00	5.41	0.00
63.00	6.00	5.41	0.00
64.00	6.00	5.41	0.00
65.00	6.00	5.41	0.00
66.00	6.00	5.41	0.00
67.00	6.00	5.41	0.00
68.00	6.00	5.41	0.00
69.00	6.00	5.41	0.00
70.00	6.00	5.41	0.00
71.00	6.00	5.41	0.00
72.00	6.00	5.41	0.00

Summary for Subcatchment P-1U: P-1U (UNDETAINED)

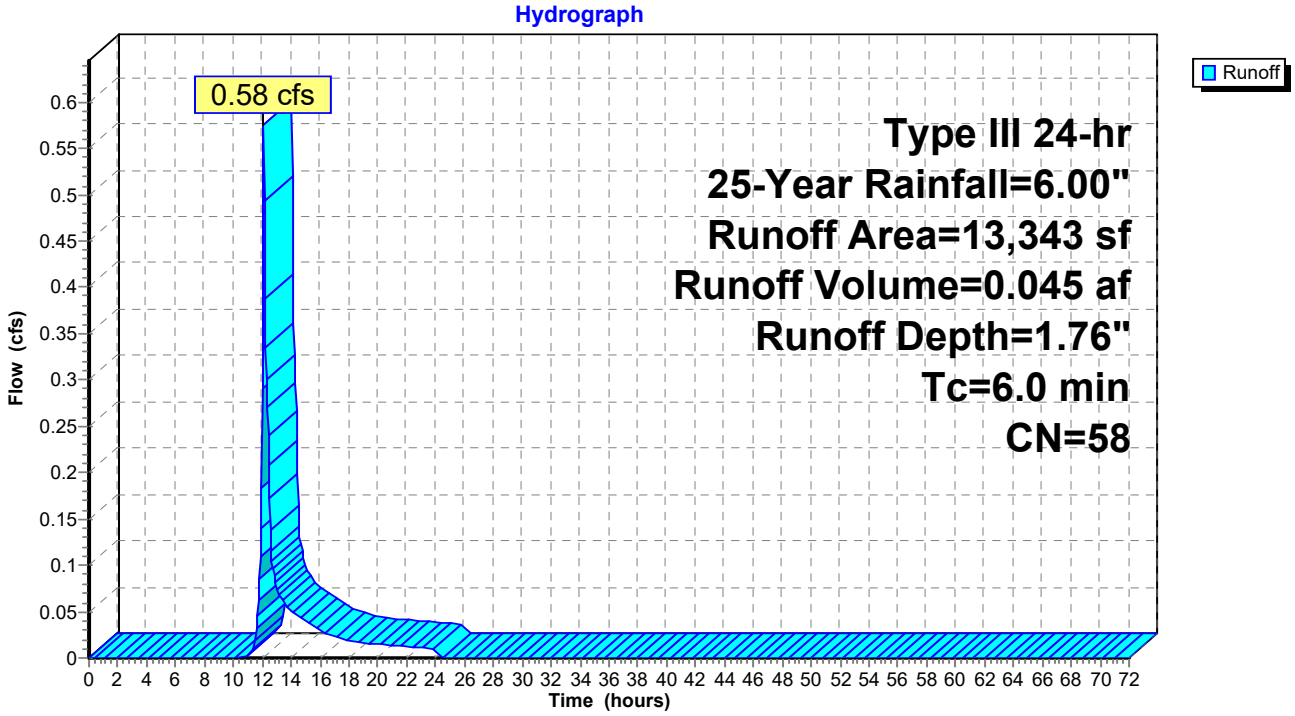
Runoff = 0.58 cfs @ 12.10 hrs, Volume= 0.045 af, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
13,343	58	Woods/grass comb., Good, HSG B
13,343	58	100.00% Pervious Area

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

Subcatchment P-1U: P-1U (UNDETAINED)



Hydrograph for Subcatchment P-1U: P-1U (UNDETAINED)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.06	0.00	0.00
2.00	0.12	0.00	0.00
3.00	0.18	0.00	0.00
4.00	0.26	0.00	0.00
5.00	0.34	0.00	0.00
6.00	0.43	0.00	0.00
7.00	0.54	0.00	0.00
8.00	0.68	0.00	0.00
9.00	0.87	0.00	0.00
10.00	1.13	0.00	0.00
11.00	1.50	0.00	0.00
12.00	3.00	0.27	**0.29**
13.00	4.50	0.90	**0.08**
14.00	4.87	1.10	0.05
15.00	5.13	1.24	0.04
16.00	5.32	1.35	0.03
17.00	5.46	1.43	0.02
18.00	5.57	1.49	0.02
19.00	5.66	1.55	0.02
20.00	5.74	1.60	0.01
21.00	5.82	1.64	0.01
22.00	5.88	1.69	0.01
23.00	5.95	1.72	0.01
24.00	**6.00**	**1.76**	0.01
25.00	6.00	1.76	0.00
26.00	6.00	1.76	0.00
27.00	6.00	1.76	0.00
28.00	6.00	1.76	0.00
29.00	6.00	1.76	0.00
30.00	6.00	1.76	0.00
31.00	6.00	1.76	0.00
32.00	6.00	1.76	0.00
33.00	6.00	1.76	0.00
34.00	6.00	1.76	0.00
35.00	6.00	1.76	0.00
36.00	6.00	1.76	0.00
37.00	6.00	1.76	0.00
38.00	6.00	1.76	0.00
39.00	6.00	1.76	0.00
40.00	6.00	1.76	0.00
41.00	6.00	1.76	0.00
42.00	6.00	1.76	0.00
43.00	6.00	1.76	0.00
44.00	6.00	1.76	0.00
45.00	6.00	1.76	0.00
46.00	6.00	1.76	0.00
47.00	6.00	1.76	0.00
48.00	6.00	1.76	0.00
49.00	6.00	1.76	0.00
50.00	6.00	1.76	0.00
51.00	6.00	1.76	0.00
52.00	6.00	1.76	0.00
53.00	6.00	1.76	0.00
54.00	6.00	1.76	0.00
55.00	6.00	1.76	0.00
56.00	6.00	1.76	0.00
57.00	6.00	1.76	0.00
58.00	6.00	1.76	0.00
59.00	6.00	1.76	0.00
60.00	6.00	1.76	0.00
61.00	6.00	1.76	0.00
62.00	6.00	1.76	0.00
63.00	6.00	1.76	0.00
64.00	6.00	1.76	0.00
65.00	6.00	1.76	0.00
66.00	6.00	1.76	0.00
67.00	6.00	1.76	0.00
68.00	6.00	1.76	0.00
69.00	6.00	1.76	0.00
70.00	6.00	1.76	0.00
71.00	6.00	1.76	0.00
72.00	6.00	1.76	0.00

Summary for Subcatchment P-2: P-2

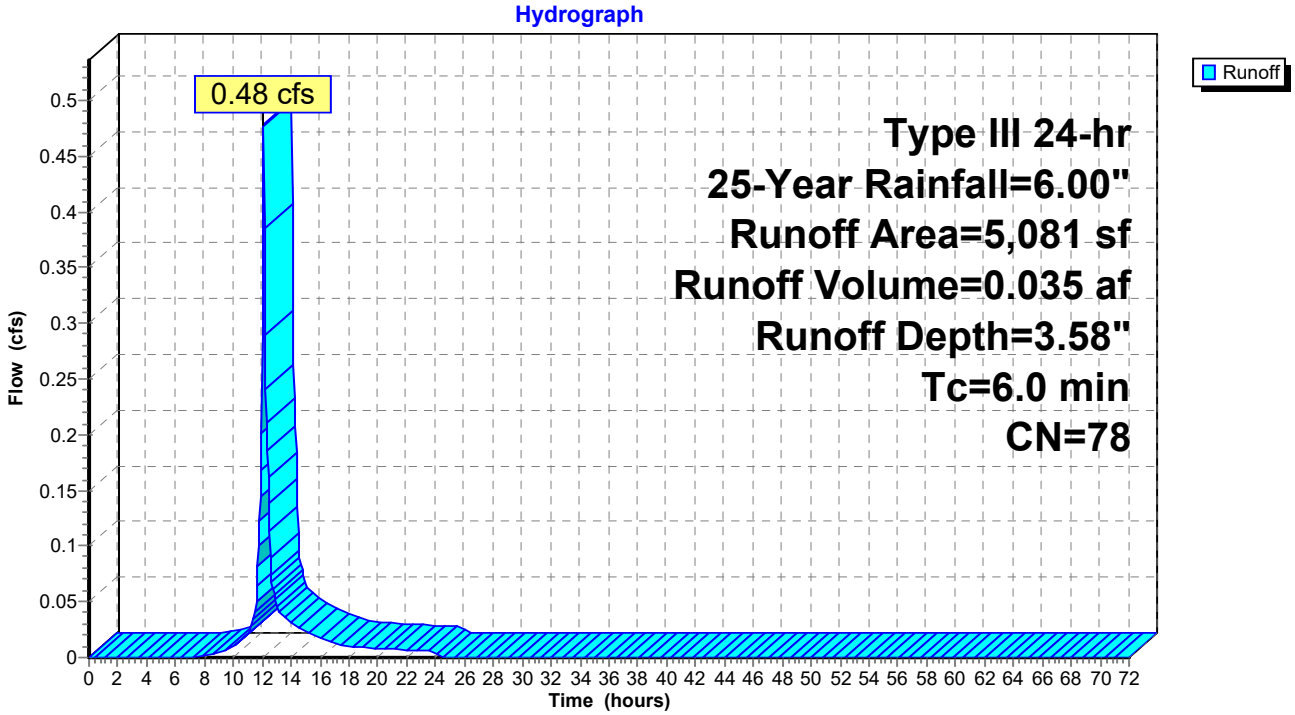
Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.035 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
2,364	98	Paved parking, HSG B
2,717	61	>75% Grass cover, Good, HSG B
5,081	78	Weighted Average
2,717	61	53.47% Pervious Area
2,364	98	46.53% Impervious Area

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

Subcatchment P-2: P-2



Hydrograph for Subcatchment P-2: P-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.06	0.00	0.00
2.00	0.12	0.00	0.00
3.00	0.18	0.00	0.00
4.00	0.26	0.00	0.00
5.00	0.34	0.00	0.00
6.00	0.43	0.00	0.00
7.00	0.54	0.00	0.00
8.00	0.68	0.00	0.00
9.00	0.87	0.03	0.00
10.00	1.13	0.10	0.01
11.00	1.50	0.23	0.02
12.00	3.00	1.13	**0.29**
13.00	4.50	2.29	**0.05**
14.00	4.87	2.60	0.03
15.00	5.13	2.82	0.02
16.00	5.32	2.98	0.02
17.00	5.46	3.10	0.01
18.00	5.57	3.20	0.01
19.00	5.66	3.28	0.01
20.00	5.74	3.35	0.01
21.00	5.82	3.42	0.01
22.00	5.88	3.48	0.01
23.00	5.95	3.53	0.01
24.00	**6.00**	**3.58**	0.01
25.00	6.00	3.58	0.00
26.00	6.00	3.58	0.00
27.00	6.00	3.58	0.00
28.00	6.00	3.58	0.00
29.00	6.00	3.58	0.00
30.00	6.00	3.58	0.00
31.00	6.00	3.58	0.00
32.00	6.00	3.58	0.00
33.00	6.00	3.58	0.00
34.00	6.00	3.58	0.00
35.00	6.00	3.58	0.00
36.00	6.00	3.58	0.00
37.00	6.00	3.58	0.00
38.00	6.00	3.58	0.00
39.00	6.00	3.58	0.00
40.00	6.00	3.58	0.00
41.00	6.00	3.58	0.00
42.00	6.00	3.58	0.00
43.00	6.00	3.58	0.00
44.00	6.00	3.58	0.00
45.00	6.00	3.58	0.00
46.00	6.00	3.58	0.00
47.00	6.00	3.58	0.00
48.00	6.00	3.58	0.00
49.00	6.00	3.58	0.00
50.00	6.00	3.58	0.00
51.00	6.00	3.58	0.00
52.00	6.00	3.58	0.00
53.00	6.00	3.58	0.00
54.00	6.00	3.58	0.00
55.00	6.00	3.58	0.00
56.00	6.00	3.58	0.00
57.00	6.00	3.58	0.00
58.00	6.00	3.58	0.00
59.00	6.00	3.58	0.00
60.00	6.00	3.58	0.00
61.00	6.00	3.58	0.00
62.00	6.00	3.58	0.00
63.00	6.00	3.58	0.00
64.00	6.00	3.58	0.00
65.00	6.00	3.58	0.00
66.00	6.00	3.58	0.00
67.00	6.00	3.58	0.00
68.00	6.00	3.58	0.00
69.00	6.00	3.58	0.00
70.00	6.00	3.58	0.00
71.00	6.00	3.58	0.00
72.00	6.00	3.58	0.00

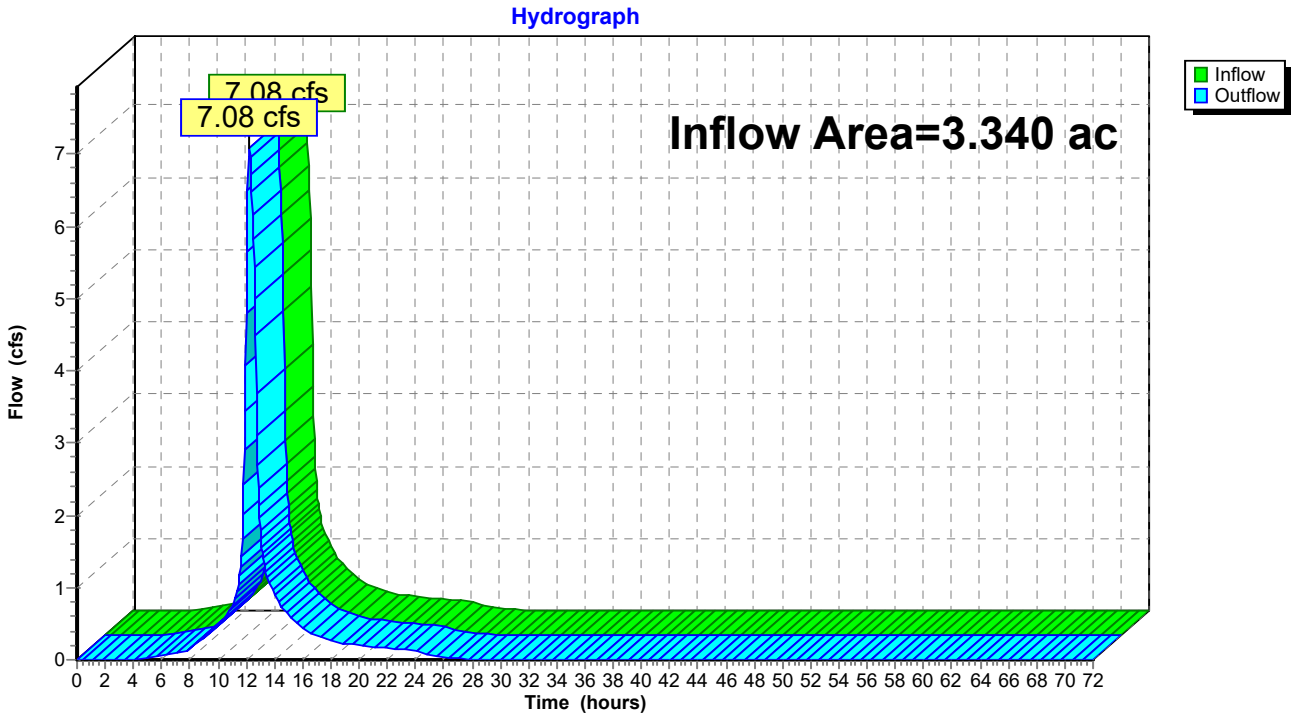
Summary for Reach PD1: WETLAND

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

Inflow Area = 3.340 ac, 56.81% Impervious, Inflow Depth = 3.72" for 25-Year event
Inflow = 7.08 cfs @ 12.21 hrs, Volume= 1.034 af
Outflow = 7.08 cfs @ 12.21 hrs, Volume= 1.034 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD1: WETLAND



Hydrograph for Reach PD1: WETLAND

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.01		0.01	57.00	0.00		0.00
5.00	0.03		0.03	58.00	0.00		0.00
6.00	0.06		0.06	59.00	0.00		0.00
7.00	0.09		0.09	60.00	0.00		0.00
8.00	0.15		0.15	61.00	0.00		0.00
9.00	0.31		0.31	62.00	0.00		0.00
10.00	0.47		0.47	63.00	0.00		0.00
11.00	0.75		0.75	64.00	0.00		0.00
12.00	**4.80**		**4.80**	65.00	0.00		0.00
13.00	**1.80**		**1.80**	66.00	0.00		0.00
14.00	0.90		0.90	67.00	0.00		0.00
15.00	0.63		0.63	68.00	0.00		0.00
16.00	0.43		0.43	69.00	0.00		0.00
17.00	0.33		0.33	70.00	0.00		0.00
18.00	0.26		0.26	71.00	0.00		0.00
19.00	0.22		0.22	72.00	0.00		0.00
20.00	0.20		0.20				
21.00	0.18		0.18				
22.00	0.16		0.16				
23.00	0.15		0.15				
24.00	0.13		0.13				
25.00	0.08		0.08				
26.00	0.04		0.04				
27.00	0.02		0.02				
28.00	0.01		0.01				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

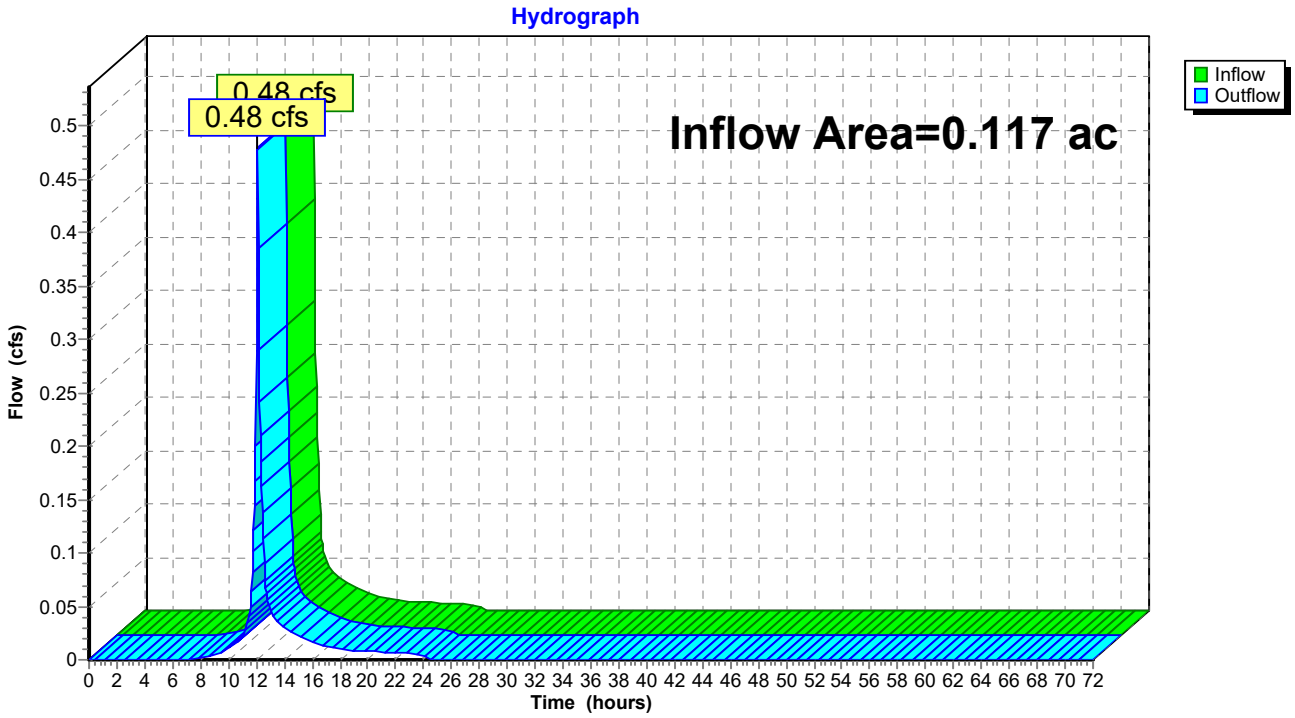
Summary for Reach PD2: BOSTON POST RD

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

Inflow Area = 0.117 ac, 46.53% Impervious, Inflow Depth = 3.58" for 25-Year event
Inflow = 0.48 cfs @ 12.09 hrs, Volume= 0.035 af
Outflow = 0.48 cfs @ 12.09 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD2: BOSTON POST RD



Hydrograph for Reach PD2: BOSTON POST RD

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.01		0.01	63.00	0.00		0.00
11.00	0.02		0.02	64.00	0.00		0.00
12.00	**0.29**		**0.29**	65.00	0.00		0.00
13.00	**0.05**		**0.05**	66.00	0.00		0.00
14.00	0.03		0.03	67.00	0.00		0.00
15.00	0.02		0.02	68.00	0.00		0.00
16.00	0.02		0.02	69.00	0.00		0.00
17.00	0.01		0.01	70.00	0.00		0.00
18.00	0.01		0.01	71.00	0.00		0.00
19.00	0.01		0.01	72.00	0.00		0.00
20.00	0.01		0.01				
21.00	0.01		0.01				
22.00	0.01		0.01				
23.00	0.01		0.01				
24.00	0.01		0.01				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

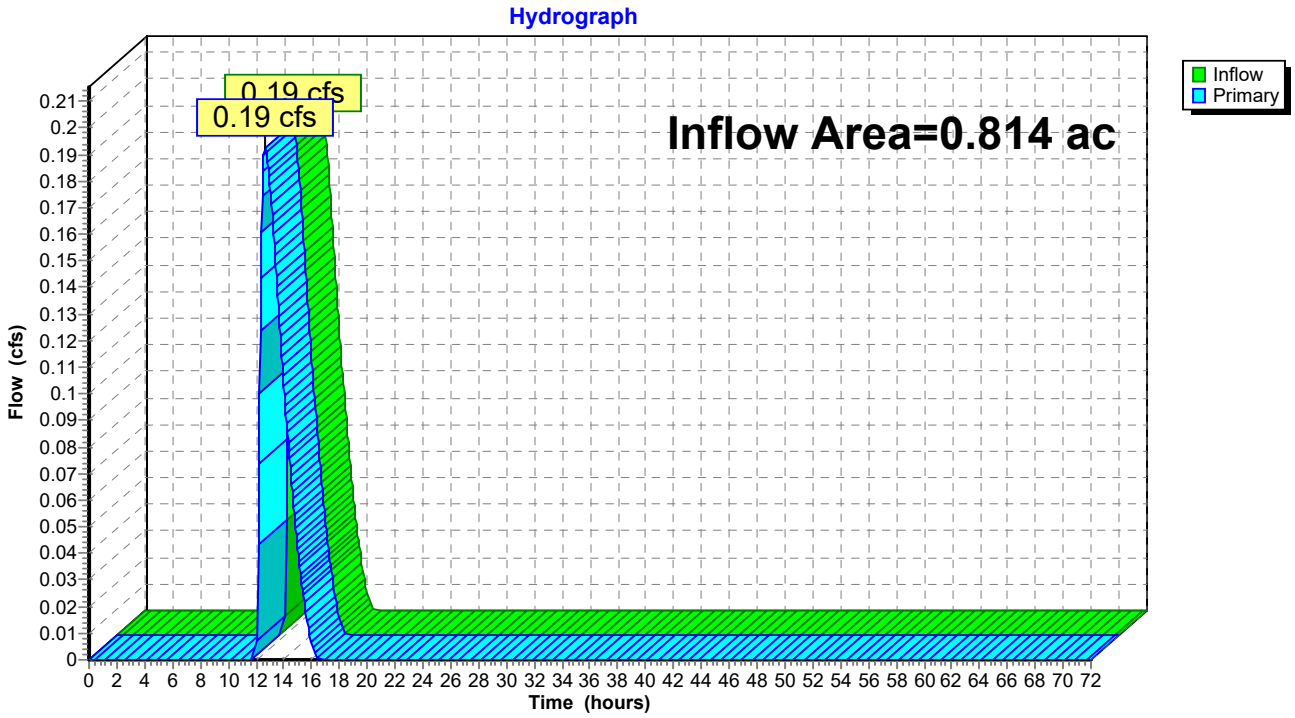
Summary for Pond 1P: FES

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

Inflow Area = 0.814 ac, 0.00% Impervious, Inflow Depth = 0.46" for 25-Year event
Inflow = 0.19 cfs @ 12.64 hrs, Volume= 0.031 af
Primary = 0.19 cfs @ 12.64 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 1P: FES



Hydrograph for Pond 1P: FES

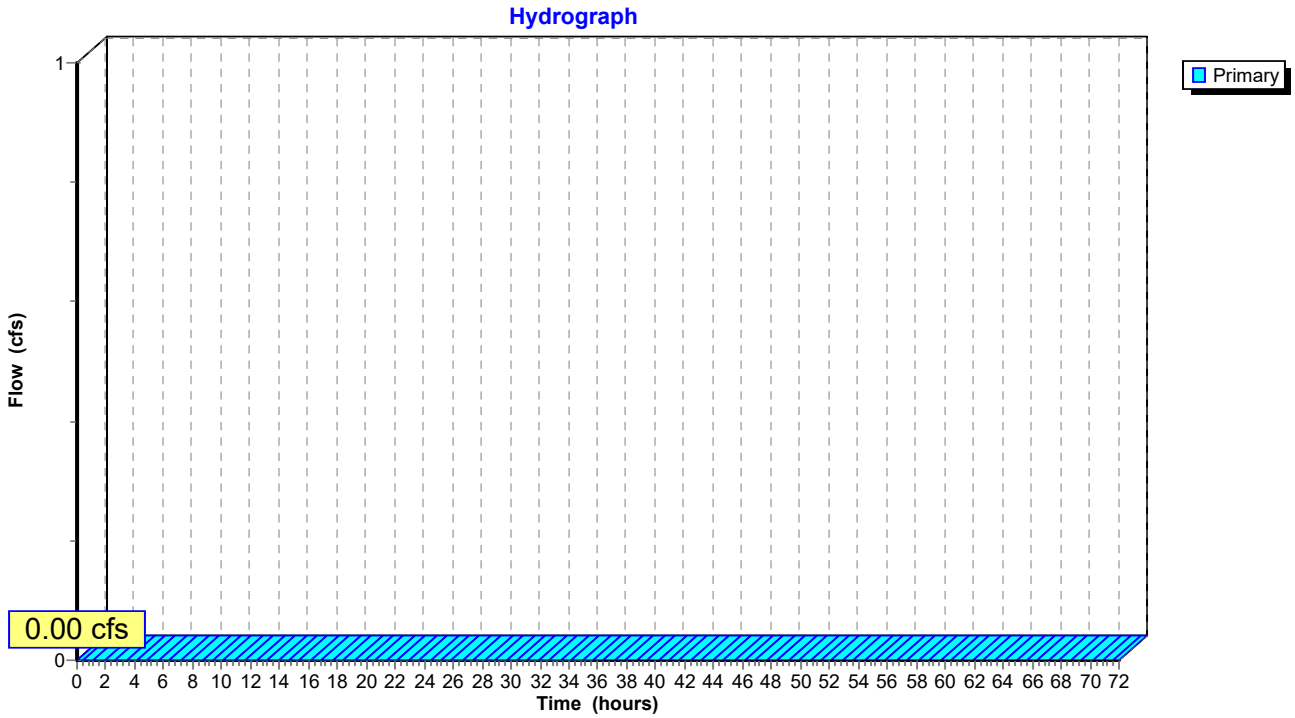
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.00		0.00	64.00	0.00		0.00
12.00	**0.00**		**0.00**	65.00	0.00		0.00
13.00	**0.18**		**0.18**	66.00	0.00		0.00
14.00	0.10		0.10	67.00	0.00		0.00
15.00	0.04		0.04	68.00	0.00		0.00
16.00	0.01		0.01	69.00	0.00		0.00
17.00	0.00		0.00	70.00	0.00		0.00
18.00	0.00		0.00	71.00	0.00		0.00
19.00	0.00		0.00	72.00	0.00		0.00
20.00	0.00		0.00				
21.00	0.00		0.00				
22.00	0.00		0.00				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Summary for Pond 2P: FES w/ HEADWALL

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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Pond 2P: FES w/ HEADWALL



Summary for Pond 3P: Permeable Pavement

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=54)

Inflow Area =	0.814 ac,	0.00% Impervious,	Inflow Depth =	5.41"	for 25-Year event
Inflow =	4.58 cfs @	12.09 hrs,	Volume=	0.367 af	
Outflow =	0.58 cfs @	12.64 hrs,	Volume=	0.368 af,	Atten= 87%, Lag= 33.3 min
Discarded =	0.39 cfs @	11.65 hrs,	Volume=	0.337 af	
Primary =	0.19 cfs @	12.64 hrs,	Volume=	0.031 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.27' @ 12.64 hrs Surf.Area= 32,578 sf Storage= 5,425 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 78.2 min (841.8 - 763.6)

Volume	Invert	Avail.Storage	Storage Description
#1	122.85'	11,044 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

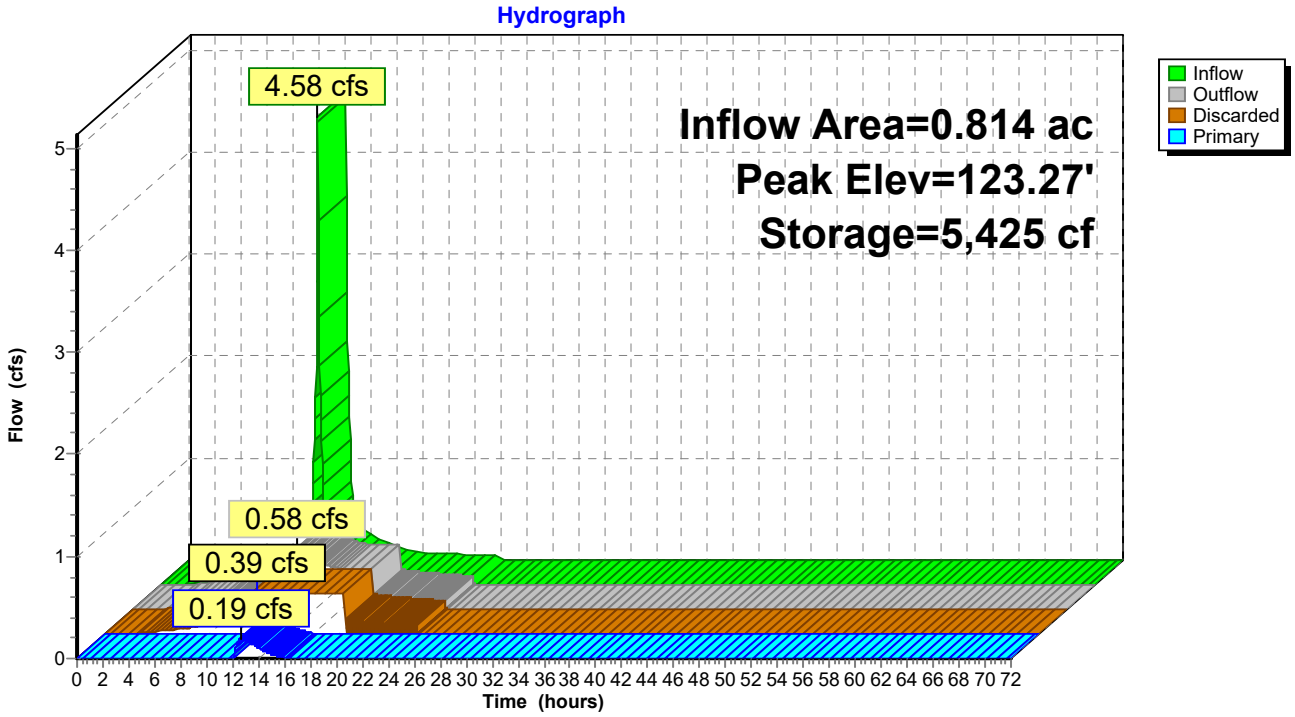
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
122.85	32,578	0.0	0	0
123.51	32,578	40.0	8,601	8,601
123.76	32,578	30.0	2,443	11,044

Device	Routing	Invert	Outlet Devices
#1	Discarded	122.85'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	123.01'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.01' / 122.90' S= 0.0055 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

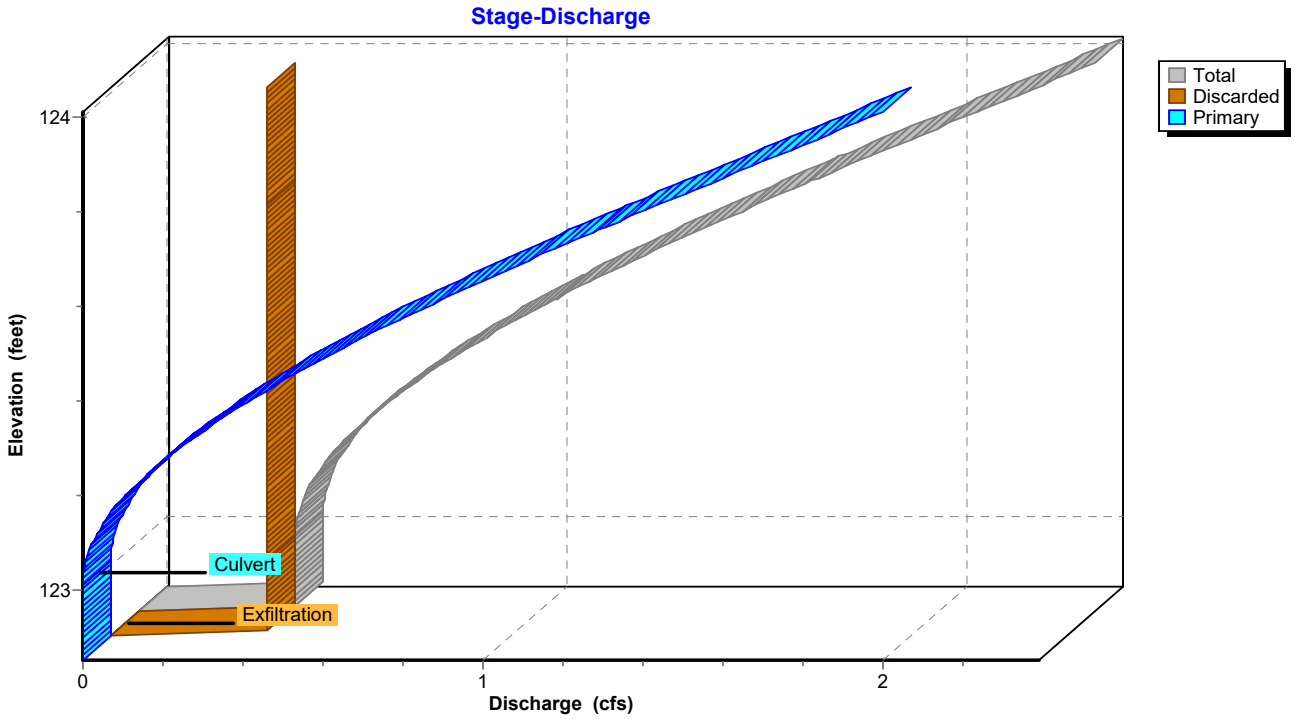
Discarded OutFlow Max=0.39 cfs @ 11.65 hrs HW=122.86' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=0.19 cfs @ 12.64 hrs HW=123.27' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Barrel Controls 0.19 cfs @ 1.82 fps)

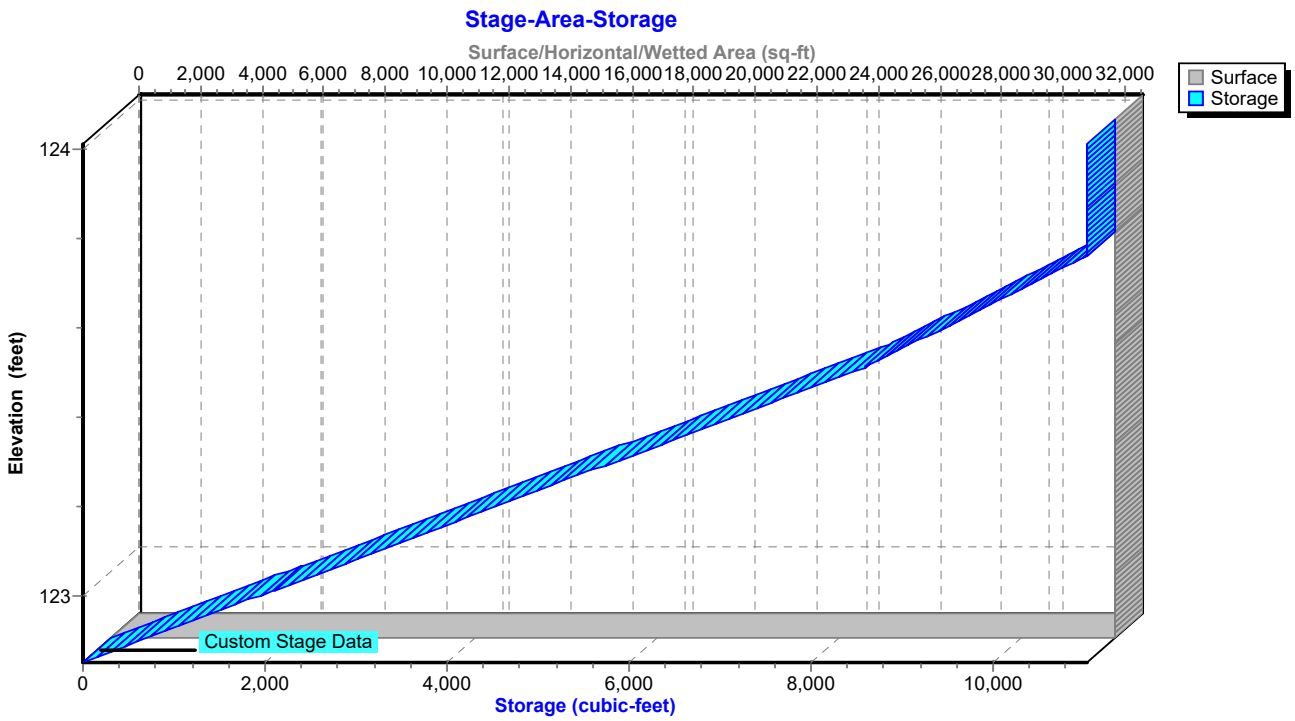
Pond 3P: Permeable Pavement



Pond 3P: Permeable Pavement



Pond 3P: Permeable Pavement



Hydrograph for Pond 3P: Permeable Pavement

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	122.85	0.00	0.00	0.00
2.50	0.01	0	122.85	0.01	0.01	0.00
5.00	0.04	0	122.85	0.04	0.04	0.00
7.50	0.08	0	122.85	0.08	0.08	0.00
10.00	**0.21**	0	122.85	0.21	**0.21**	0.00
12.50	**0.97**	**5,347**	**123.26**	**0.58**	**0.39**	**0.18**
15.00	0.19	**3,608**	**123.13**	**0.43**	0.39	**0.04**
17.50	0.09	1,172	122.94	0.39	0.39	0.00
20.00	0.06	0	122.85	0.00	0.00	0.00
22.50	0.05	0	122.85	0.00	0.00	0.00
25.00	0.00	0	122.85	0.00	0.00	0.00
27.50	0.00	0	122.85	0.00	0.00	0.00
30.00	0.00	0	122.85	0.00	0.00	0.00
32.50	0.00	0	122.85	0.00	0.00	0.00
35.00	0.00	0	122.85	0.00	0.00	0.00
37.50	0.00	0	122.85	0.00	0.00	0.00
40.00	0.00	0	122.85	0.00	0.00	0.00
42.50	0.00	0	122.85	0.00	0.00	0.00
45.00	0.00	0	122.85	0.00	0.00	0.00
47.50	0.00	0	122.85	0.00	0.00	0.00
50.00	0.00	0	122.85	0.00	0.00	0.00
52.50	0.00	0	122.85	0.00	0.00	0.00
55.00	0.00	0	122.85	0.00	0.00	0.00
57.50	0.00	0	122.85	0.00	0.00	0.00
60.00	0.00	0	122.85	0.00	0.00	0.00
62.50	0.00	0	122.85	0.00	0.00	0.00
65.00	0.00	0	122.85	0.00	0.00	0.00
67.50	0.00	0	122.85	0.00	0.00	0.00
70.00	0.00	0	122.85	0.00	0.00	0.00

Stage-Discharge for Pond 3P: Permeable Pavement

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
122.85	0.00	**0.00**	0.00
122.87	0.39	**0.39**	0.00
122.89	0.39	0.39	0.00
122.91	0.39	0.39	0.00
122.93	0.39	0.39	0.00
122.95	0.39	0.39	0.00
122.97	0.39	0.39	0.00
122.99	0.39	0.39	0.00
123.01	0.39	0.39	0.00
123.03	0.39	0.39	0.00
123.05	0.40	0.39	0.00
123.07	0.40	0.39	0.01
123.09	0.41	0.39	0.02
123.11	0.42	0.39	0.03
123.13	0.44	0.39	0.04
123.15	0.45	0.39	0.06
123.17	0.47	0.39	0.08
123.19	0.49	0.39	0.10
123.21	0.51	0.39	0.12
123.23	0.54	0.39	0.14
123.25	0.56	0.39	0.17
123.27	0.59	0.39	0.20
123.29	0.62	0.39	0.23
123.31	0.65	0.39	0.26
123.33	0.68	0.39	0.29
123.35	0.72	0.39	0.32
123.37	0.75	0.39	0.36
123.39	0.79	0.39	0.40
123.41	0.83	0.39	0.44
123.43	0.87	0.39	0.48
123.45	0.91	0.39	0.52
123.47	0.95	0.39	0.56
123.49	1.00	0.39	0.60
123.51	1.04	0.39	0.65
123.53	1.09	0.39	0.69
123.55	1.13	0.39	0.74
123.57	1.18	0.39	0.79
123.59	1.23	0.39	0.84
123.61	1.28	0.39	0.89
123.63	1.33	0.39	0.94
123.65	1.38	0.39	0.99
123.67	1.44	0.39	1.04
123.69	1.49	0.39	1.10
123.71	1.54	0.39	1.15
123.73	1.60	0.39	1.21
123.75	1.65	0.39	1.26
123.77	1.71	0.39	1.32
123.79	1.77	0.39	1.37
123.81	1.82	0.39	1.43
123.83	1.88	0.39	1.49
123.85	1.94	0.39	1.54
123.87	1.99	0.39	1.60
123.89	2.05	0.39	1.66
123.91	2.11	0.39	1.71
123.93	2.16	0.39	1.77
123.95	2.22	0.39	1.83
123.97	2.28	0.39	1.89
123.99	2.33	0.39	1.94
124.01	**2.39**	0.39	**2.00**

Stage-Area-Storage for Pond 3P: Permeable Pavement

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
122.85	**32,578**	0
122.87	32,578	261
122.89	32,578	521
122.91	32,578	782
122.93	32,578	1,042
122.95	32,578	1,303
122.97	32,578	1,564
122.99	32,578	1,824
123.01	32,578	2,085
123.03	32,578	2,346
123.05	32,578	2,606
123.07	32,578	2,867
123.09	32,578	3,127
123.11	32,578	3,388
123.13	32,578	3,649
123.15	32,578	3,909
123.17	32,578	4,170
123.19	32,578	4,431
123.21	32,578	4,691
123.23	32,578	4,952
123.25	32,578	5,212
123.27	32,578	5,473
123.29	32,578	5,734
123.31	32,578	5,994
123.33	32,578	6,255
123.35	32,578	6,516
123.37	32,578	6,776
123.39	32,578	7,037
123.41	32,578	7,297
123.43	32,578	7,558
123.45	32,578	7,819
123.47	32,578	8,079
123.49	32,578	8,340
123.51	32,578	8,601
123.53	32,578	8,796
123.55	32,578	8,992
123.57	32,578	9,187
123.59	32,578	9,382
123.61	32,578	9,578
123.63	32,578	9,773
123.65	32,578	9,969
123.67	32,578	10,164
123.69	32,578	10,360
123.71	32,578	10,555
123.73	32,578	10,751
123.75	32,578	**10,946**
123.77	32,578	**11,044**
123.79	32,578	11,044
123.81	32,578	11,044
123.83	32,578	11,044
123.85	32,578	11,044
123.87	32,578	11,044
123.89	32,578	11,044
123.91	32,578	11,044
123.93	32,578	11,044
123.95	32,578	11,044
123.97	32,578	11,044
123.99	32,578	11,044
124.01	32,578	11,044

Summary for Pond UG-1: RETAIN_IT

Inflow Area = 2.219 ac, 85.49% Impervious, Inflow Depth = 5.18" for 25-Year event
Inflow = 12.23 cfs @ 12.09 hrs, Volume= 0.958 af
Outflow = 6.63 cfs @ 12.22 hrs, Volume= 0.958 af, Atten= 46%, Lag= 8.0 min
Primary = 6.63 cfs @ 12.22 hrs, Volume= 0.958 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 125.05' @ 12.22 hrs Surf.Area= 3,444 sf Storage= 6,938 cf

Plug-Flow detention time= 35.4 min calculated for 0.958 af (100% of inflow)
Center-of-Mass det. time= 34.8 min (807.8 - 773.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	122.40'	1,095 cf	**42.00'W x 82.00'L x 4.67'H Field A** 16,072 cf Overall - 13,333 cf Embedded = 2,739 cf x 40.0% Voids
#2A	122.90'	9,855 cf	**retain_it retain_it 3.5'** x 50 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 5 Rows adjusted for 184.2 cf perimeter wall
		10,950 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	122.40'	**15.0" Round Culvert** L= 212.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 122.40' / 121.25' S= 0.0054 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.23 sf
#2	Device 1	122.40'	**2.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	122.90'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=6.61 cfs @ 12.22 hrs HW=125.03' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 6.61 cfs @ 5.38 fps)
  ├─**2=Orifice/Grate** (Passes < 0.26 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Passes < 10.92 cfs potential flow)

Pond UG-1: RETAIN_IT - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it®)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
5 Rows adjusted for 184.2 cf perimeter wall

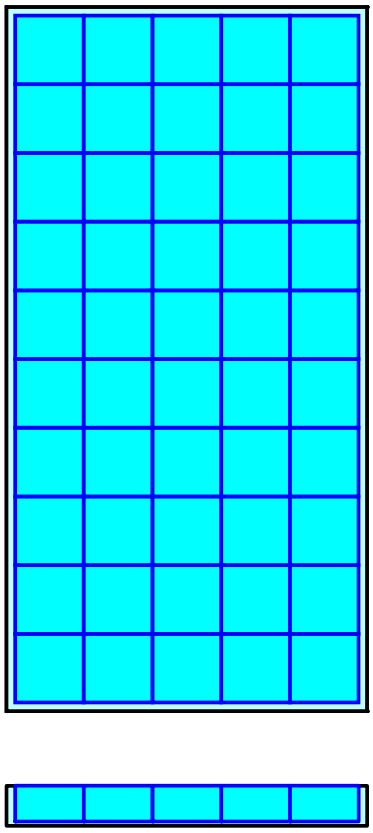
10 Chambers/Row x 8.00' Long = 80.00' Row Length +12.0" End Stone x 2 = 82.00' Base Length
5 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 42.00' Base Width
6.0" Base + 50.0" Chamber Height = 4.67' Field Height

6.1 cf Sidewall x 10 x 2 + 6.1 cf Endwall x 5 x 2 = 184.2 cf Perimeter Wall
50 Chambers x 200.8 cf - 184.2 cf Perimeter wall = 9,854.8 cf Chamber Storage
50 Chambers x 266.7 cf = 13,333.3 cf Displacement

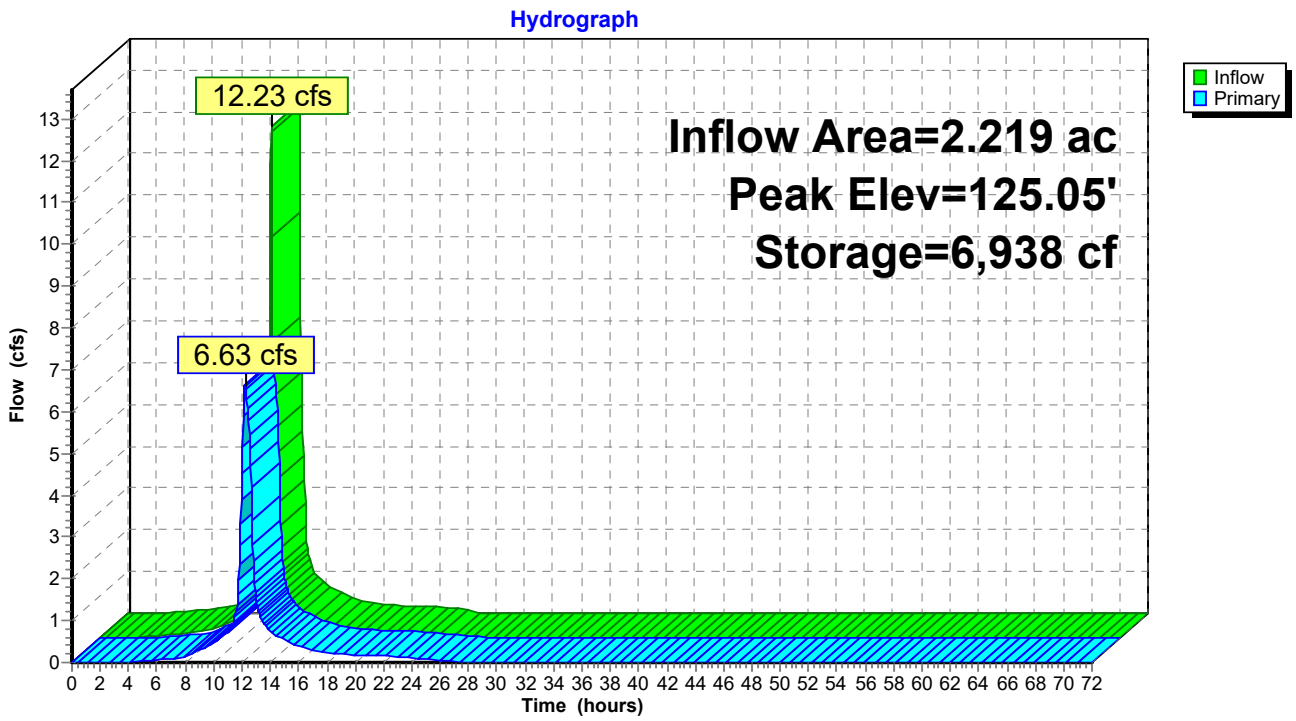
16,072.0 cf Field - 13,333.3 cf Chambers = 2,738.7 cf Stone x 40.0% Voids = 1,095.5 cf Stone Storage

Chamber Storage + Stone Storage = 10,950.3 cf = 0.251 af
Overall Storage Efficiency = 68.1%
Overall System Size = 82.00' x 42.00' x 4.67'

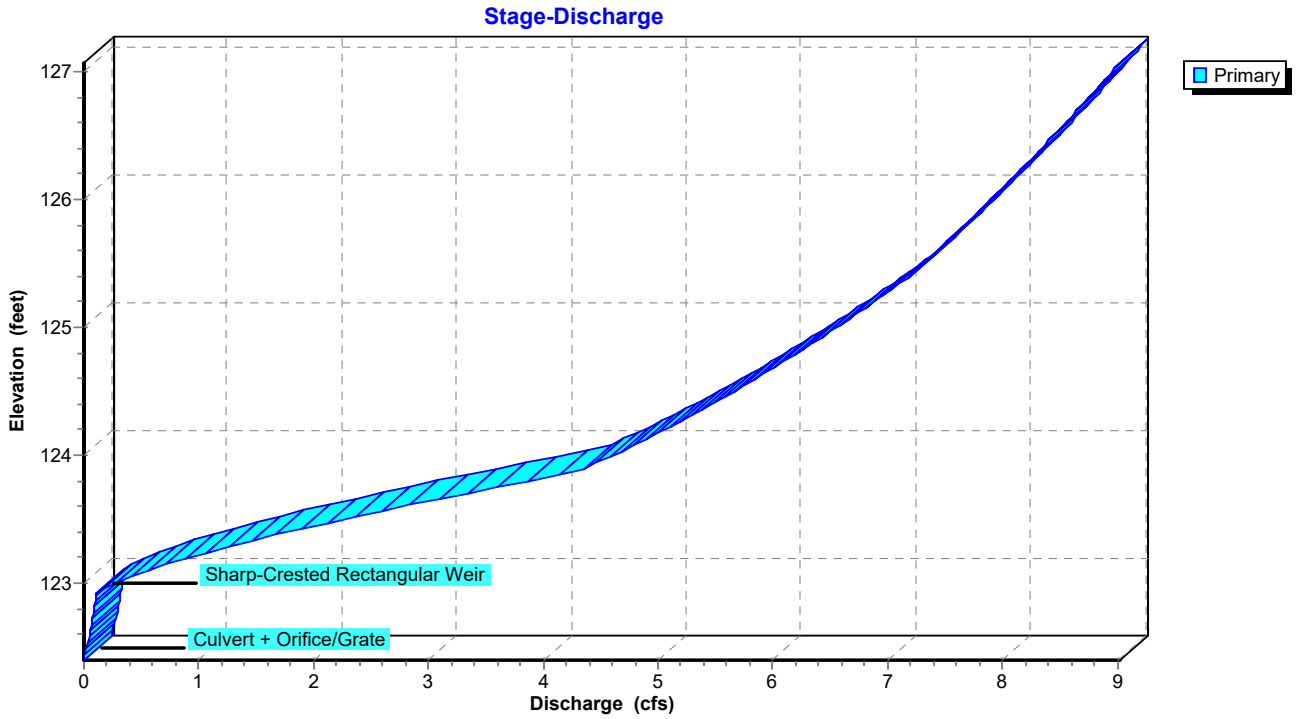
50 Chambers
595.3 cy Field
101.4 cy Stone



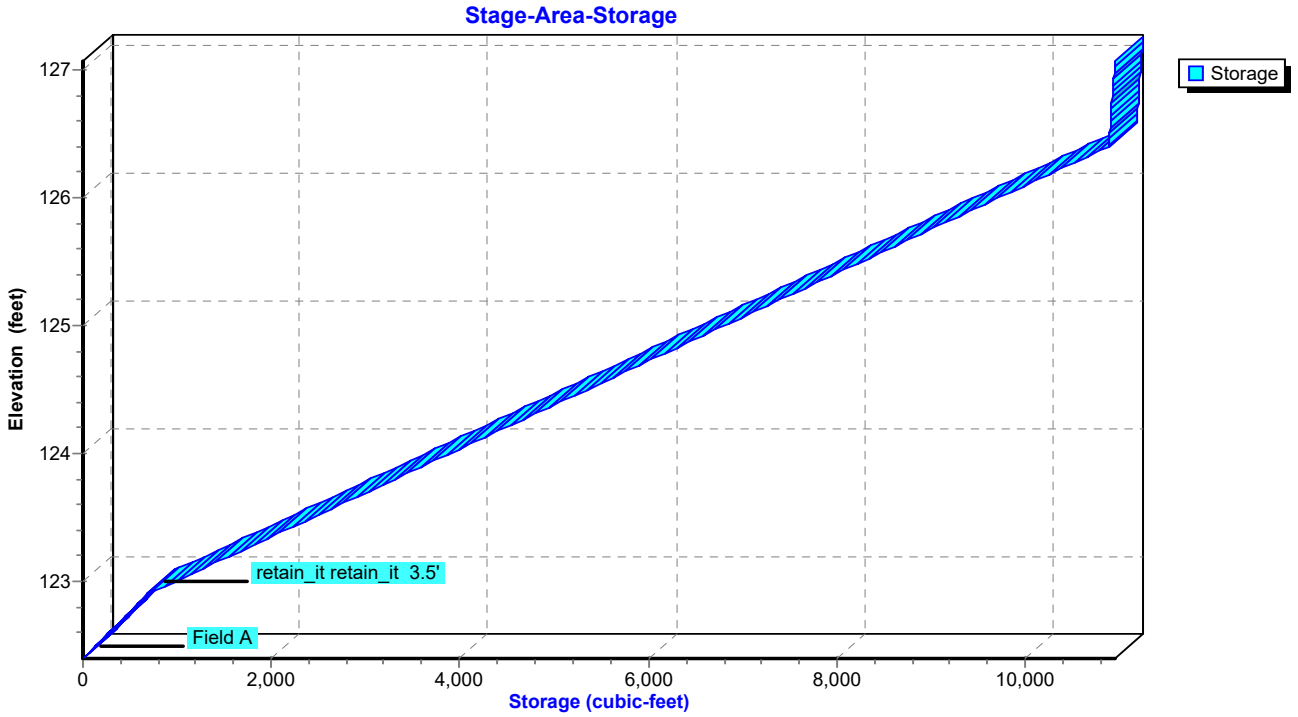
Pond UG-1: RETAIN_IT



Pond UG-1: RETAIN_IT



Pond UG-1: RETAIN_IT



Hydrograph for Pond UG-1: RETAIN_IT

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	122.40	0.00
2.50	0.00	0	122.40	0.00
5.00	0.07	206	122.55	0.03
7.50	0.19	657	122.88	0.10
10.00	**0.52**	**1,198**	**123.07**	**0.47**
12.50	**2.62**	**5,050**	**124.40**	**5.46**
15.00	0.51	1,265	123.10	0.55
17.50	0.25	985	123.00	0.27
20.00	0.17	863	122.96	0.18
22.50	0.14	799	122.94	0.14
25.00	0.00	446	122.72	0.08
27.50	0.00	110	122.48	0.01
30.00	0.00	55	122.44	0.00
32.50	0.00	36	122.43	0.00
35.00	0.00	27	122.42	0.00
37.50	0.00	22	122.42	0.00
40.00	0.00	18	122.41	0.00
42.50	0.00	15	122.41	0.00
45.00	0.00	13	122.41	0.00
47.50	0.00	12	122.41	0.00
50.00	0.00	11	122.41	0.00
52.50	0.00	10	122.41	0.00
55.00	0.00	9	122.41	0.00
57.50	0.00	8	122.41	0.00
60.00	0.00	7	122.41	0.00
62.50	0.00	7	122.41	0.00
65.00	0.00	7	122.40	0.00
67.50	0.00	6	122.40	0.00
70.00	0.00	6	122.40	0.00

Stage-Discharge for Pond UG-1: RETAIN_IT

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
122.40	0.00	125.05	6.64
122.45	0.00	125.10	6.72
122.50	0.02	125.15	6.80
122.55	0.03	125.20	6.88
122.60	0.05	125.25	6.96
122.65	0.06	125.30	7.04
122.70	0.07	125.35	7.11
122.75	0.08	125.40	7.19
122.80	0.09	125.45	7.25
122.85	0.10	125.50	7.31
122.90	0.10	125.55	7.37
122.95	0.16	125.60	7.43
123.00	0.27	125.65	7.49
123.05	0.40	125.70	7.55
123.10	0.55	125.75	7.61
123.15	0.72	125.80	7.67
123.20	0.91	125.85	7.73
123.25	1.11	125.90	7.79
123.30	1.32	125.95	7.84
123.35	1.54	126.00	7.90
123.40	1.77	126.05	7.96
123.45	2.01	126.10	8.01
123.50	2.26	126.15	8.07
123.55	2.52	126.20	8.12
123.60	2.78	126.25	8.18
123.65	3.04	126.30	8.23
123.70	3.31	126.35	8.29
123.75	3.59	126.40	8.34
123.80	3.87	126.45	8.39
123.85	4.16	126.50	8.45
123.90	4.36	126.55	8.50
123.95	4.49	126.60	8.55
124.00	4.61	126.65	8.60
124.05	4.72	126.70	8.65
124.10	4.84	126.75	8.70
124.15	4.95	126.80	8.76
124.20	5.06	126.85	8.81
124.25	5.16	126.90	8.86
124.30	5.27	126.95	8.91
124.35	5.37	127.00	8.96
124.40	5.47	127.05	**9.01**
124.45	5.57		
124.50	5.67		
124.55	5.76		
124.60	5.85		
124.65	5.95		
124.70	6.04		
124.75	6.13		
124.80	6.21		
124.85	6.30		
124.90	6.39		
124.95	6.47		
125.00	6.56		

Stage-Area-Storage for Pond UG-1: RETAIN_IT

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
122.40	0	125.05	6,952
122.45	69	125.10	7,098
122.50	138	125.15	7,244
122.55	207	125.20	7,389
122.60	276	125.25	7,535
122.65	344	125.30	7,681
122.70	413	125.35	7,826
122.75	482	125.40	7,972
122.80	551	125.45	8,118
122.85	620	125.50	8,263
122.90	689	125.55	8,409
122.95	834	125.60	8,555
123.00	980	125.65	8,700
123.05	1,126	125.70	8,846
123.10	1,271	125.75	8,992
123.15	1,417	125.80	9,137
123.20	1,563	125.85	9,283
123.25	1,708	125.90	9,429
123.30	1,854	125.95	9,574
123.35	2,000	126.00	9,720
123.40	2,145	126.05	9,866
123.45	2,291	126.10	10,011
123.50	2,437	126.15	10,157
123.55	2,582	126.20	10,303
123.60	2,728	126.25	10,448
123.65	2,874	126.30	10,594
123.70	3,019	126.35	10,740
123.75	3,165	126.40	10,885
123.80	3,311	126.45	10,890
123.85	3,456	126.50	10,895
123.90	3,602	126.55	10,900
123.95	3,748	126.60	10,905
124.00	3,893	126.65	10,910
124.05	4,039	126.70	10,915
124.10	4,185	126.75	10,919
124.15	4,330	126.80	10,924
124.20	4,476	126.85	10,929
124.25	4,622	126.90	10,934
124.30	4,767	126.95	10,939
124.35	4,913	127.00	10,944
124.40	5,059	127.05	**10,949**
124.45	5,204		
124.50	5,350		
124.55	5,496		
124.60	5,641		
124.65	5,787		
124.70	5,933		
124.75	6,078		
124.80	6,224		
124.85	6,370		
124.90	6,515		
124.95	6,661		
125.00	6,807		

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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

Subcatchment P-1A: P-1A Runoff Area=96,664 sf 85.49% Impervious Runoff Depth=7.76"
Tc=6.0 min CN=93 Runoff=17.90 cfs 1.435 af

Subcatchment P-1B: P-1B (PERMEABLE Runoff Area=35,462 sf 0.00% Impervious Runoff Depth=8.00"
Tc=6.0 min CN=95 Runoff=6.64 cfs 0.543 af

Subcatchment P-1U: P-1U (UNDETAINED) Runoff Area=13,343 sf 0.00% Impervious Runoff Depth=3.55"
Tc=6.0 min CN=58 Runoff=1.23 cfs 0.091 af

Subcatchment P-2: P-2 Runoff Area=5,081 sf 46.53% Impervious Runoff Depth=5.95"
Tc=6.0 min CN=78 Runoff=0.79 cfs 0.058 af

Reach PD1: WETLAND Inflow=9.77 cfs 1.640 af
Outflow=9.77 cfs 1.640 af

Reach PD2: BOSTON POST RD Inflow=0.79 cfs 0.058 af
Outflow=0.79 cfs 0.058 af

Pond 1P: FES Inflow=0.61 cfs 0.114 af
Primary=0.61 cfs 0.114 af

Pond 2P: FES w/ HEADWALL
Primary=0.00 cfs 0.000 af

Pond 3P: Permeable Pavement Peak Elev=123.49' Storage=8,395 cf Inflow=6.64 cfs 0.543 af
Discarded=0.39 cfs 0.429 af Primary=0.61 cfs 0.114 af Outflow=1.01 cfs 0.543 af

Pond UG-1: RETAIN_IT Peak Elev=126.73' Storage=10,918 cf Inflow=17.90 cfs 1.435 af
Outflow=8.69 cfs 1.435 af

Total Runoff Area = 3.456 ac Runoff Volume = 2.126 af Average Runoff Depth = 7.38"
43.54% Pervious = 1.505 ac 56.46% Impervious = 1.951 ac

Summary for Subcatchment P-1A: P-1A

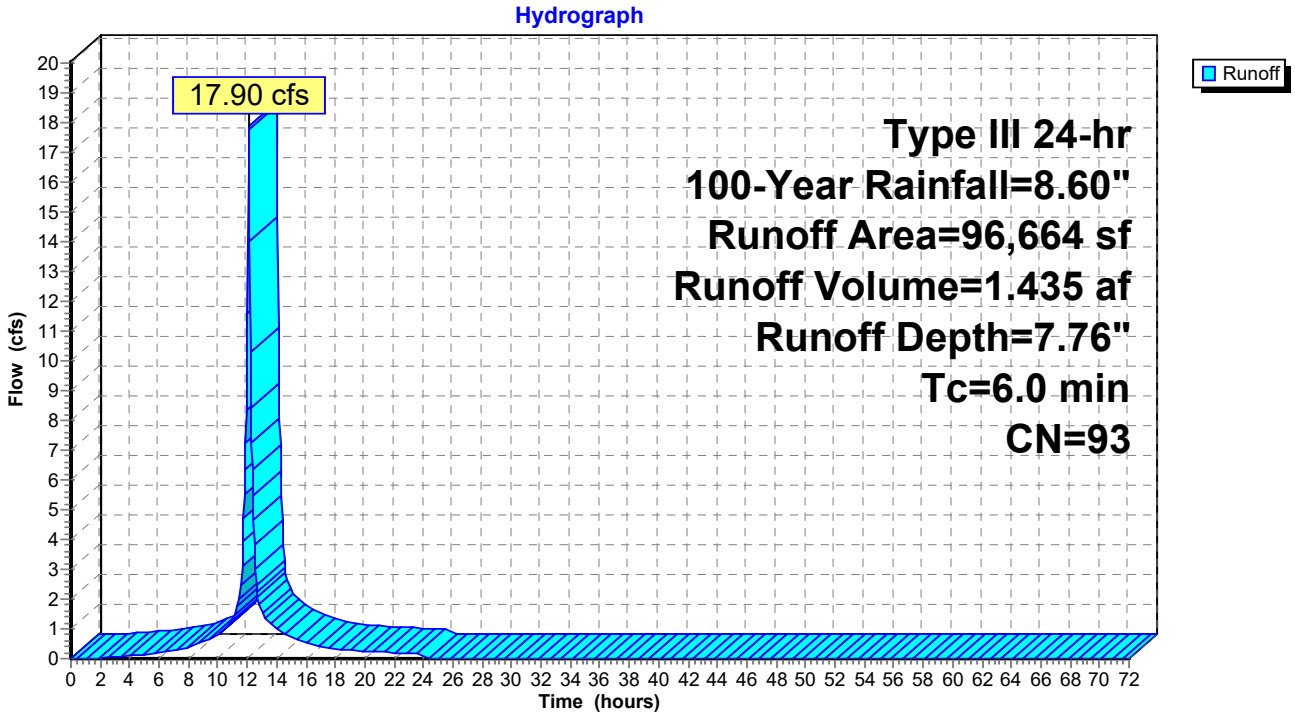
Runoff = 17.90 cfs @ 12.09 hrs, Volume= 1.435 af, Depth= 7.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

	Area (sf)	CN	Description
*	1,394	61	>75% Grass cover, Good, HSG B- ISLANDS
	75,402	98	Paved parking, HSG B
*	4,922	73	Existing Woods/grass comb., Poor, HSG B
	7,710	58	Woods/grass comb., Good, HSG B
	7,236	98	Unconnected roofs, HSG B
	96,664	93	Weighted Average
	14,026	64	14.51% Pervious Area
	82,638	98	85.49% Impervious Area
	7,236		8.76% Unconnected

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

Subcatchment P-1A: P-1A



Hydrograph for Subcatchment P-1A: P-1A

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.00	0.00
2.00	0.17	0.00	0.01
3.00	0.26	0.01	0.05
4.00	0.37	0.05	0.10
5.00	0.49	0.10	0.14
6.00	0.62	0.18	0.19
7.00	0.78	0.29	0.27
8.00	0.98	0.44	0.38
9.00	1.25	0.66	0.58
10.00	1.63	0.98	0.81
11.00	2.15	1.45	1.26
12.00	4.30	3.51	**11.59**
13.00	6.45	5.63	**1.55**
14.00	6.97	6.15	0.98
15.00	7.35	6.51	0.74
16.00	7.62	6.79	0.52
17.00	7.82	6.99	0.41
18.00	7.98	7.14	0.31
19.00	8.11	7.27	0.28
20.00	8.23	7.39	0.25
21.00	8.34	7.50	0.23
22.00	8.43	7.59	0.21
23.00	8.52	7.68	0.19
24.00	**8.60**	**7.76**	0.16
25.00	8.60	7.76	0.00
26.00	8.60	7.76	0.00
27.00	8.60	7.76	0.00
28.00	8.60	7.76	0.00
29.00	8.60	7.76	0.00
30.00	8.60	7.76	0.00
31.00	8.60	7.76	0.00
32.00	8.60	7.76	0.00
33.00	8.60	7.76	0.00
34.00	8.60	7.76	0.00
35.00	8.60	7.76	0.00
36.00	8.60	7.76	0.00
37.00	8.60	7.76	0.00
38.00	8.60	7.76	0.00
39.00	8.60	7.76	0.00
40.00	8.60	7.76	0.00
41.00	8.60	7.76	0.00
42.00	8.60	7.76	0.00
43.00	8.60	7.76	0.00
44.00	8.60	7.76	0.00
45.00	8.60	7.76	0.00
46.00	8.60	7.76	0.00
47.00	8.60	7.76	0.00
48.00	8.60	7.76	0.00
49.00	8.60	7.76	0.00
50.00	8.60	7.76	0.00
51.00	8.60	7.76	0.00
52.00	8.60	7.76	0.00
53.00	8.60	7.76	0.00
54.00	8.60	7.76	0.00
55.00	8.60	7.76	0.00
56.00	8.60	7.76	0.00
57.00	8.60	7.76	0.00
58.00	8.60	7.76	0.00
59.00	8.60	7.76	0.00
60.00	8.60	7.76	0.00
61.00	8.60	7.76	0.00
62.00	8.60	7.76	0.00
63.00	8.60	7.76	0.00
64.00	8.60	7.76	0.00
65.00	8.60	7.76	0.00
66.00	8.60	7.76	0.00
67.00	8.60	7.76	0.00
68.00	8.60	7.76	0.00
69.00	8.60	7.76	0.00
70.00	8.60	7.76	0.00
71.00	8.60	7.76	0.00
72.00	8.60	7.76	0.00

Summary for Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)

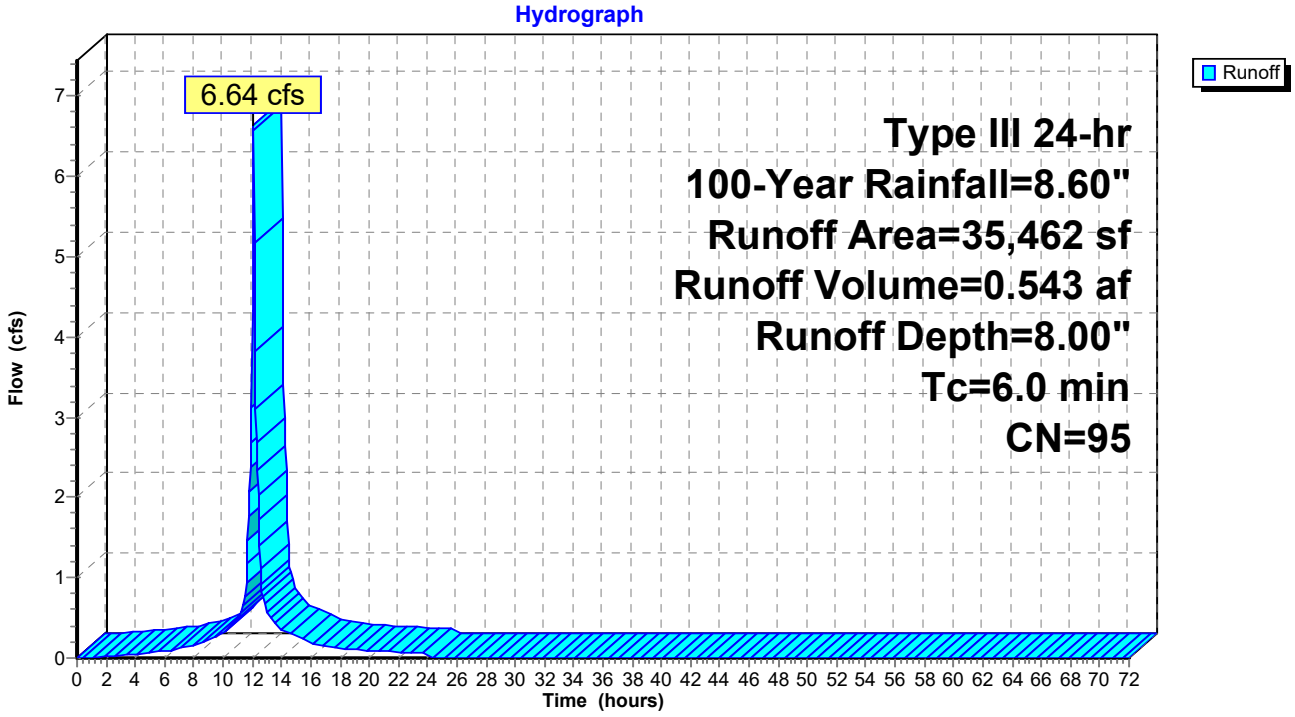
Runoff = 6.64 cfs @ 12.09 hrs, Volume= 0.543 af, Depth= 8.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

	Area (sf)	CN	Description
*	32,606	98	Perm. Pavement, 0% imp, HSG B
	2,856	61	>75% Grass cover, Good, HSG B
	35,462	95	Weighted Average
	35,462	95	100.00% Pervious Area

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

Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)



Hydrograph for Subcatchment P-1B: P-1B (PERMEABLE PAVEMENT)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.00	0.00
2.00	0.17	0.01	0.01
3.00	0.26	0.04	0.03
4.00	0.37	0.09	0.05
5.00	0.49	0.16	0.07
6.00	0.62	0.25	0.08
7.00	0.78	0.38	0.12
8.00	0.98	0.55	0.15
9.00	1.25	0.79	0.23
10.00	1.63	1.13	0.32
11.00	2.15	1.63	0.48
12.00	4.30	3.73	**4.31**
13.00	6.45	5.86	**0.57**
14.00	6.97	6.38	0.36
15.00	7.35	6.75	0.27
16.00	7.62	7.02	0.19
17.00	7.82	7.22	0.15
18.00	7.98	7.38	0.12
19.00	8.11	7.51	0.10
20.00	8.23	7.63	0.09
21.00	8.34	7.74	0.08
22.00	8.43	7.83	0.08
23.00	8.52	7.92	0.07
24.00	**8.60**	**8.00**	0.06
25.00	8.60	8.00	0.00
26.00	8.60	8.00	0.00
27.00	8.60	8.00	0.00
28.00	8.60	8.00	0.00
29.00	8.60	8.00	0.00
30.00	8.60	8.00	0.00
31.00	8.60	8.00	0.00
32.00	8.60	8.00	0.00
33.00	8.60	8.00	0.00
34.00	8.60	8.00	0.00
35.00	8.60	8.00	0.00
36.00	8.60	8.00	0.00
37.00	8.60	8.00	0.00
38.00	8.60	8.00	0.00
39.00	8.60	8.00	0.00
40.00	8.60	8.00	0.00
41.00	8.60	8.00	0.00
42.00	8.60	8.00	0.00
43.00	8.60	8.00	0.00
44.00	8.60	8.00	0.00
45.00	8.60	8.00	0.00
46.00	8.60	8.00	0.00
47.00	8.60	8.00	0.00
48.00	8.60	8.00	0.00
49.00	8.60	8.00	0.00
50.00	8.60	8.00	0.00
51.00	8.60	8.00	0.00
52.00	8.60	8.00	0.00
53.00	8.60	8.00	0.00
54.00	8.60	8.00	0.00
55.00	8.60	8.00	0.00
56.00	8.60	8.00	0.00
57.00	8.60	8.00	0.00
58.00	8.60	8.00	0.00
59.00	8.60	8.00	0.00
60.00	8.60	8.00	0.00
61.00	8.60	8.00	0.00
62.00	8.60	8.00	0.00
63.00	8.60	8.00	0.00
64.00	8.60	8.00	0.00
65.00	8.60	8.00	0.00
66.00	8.60	8.00	0.00
67.00	8.60	8.00	0.00
68.00	8.60	8.00	0.00
69.00	8.60	8.00	0.00
70.00	8.60	8.00	0.00
71.00	8.60	8.00	0.00
72.00	8.60	8.00	0.00

Summary for Subcatchment P-1U: P-1U (UNDETAINED)

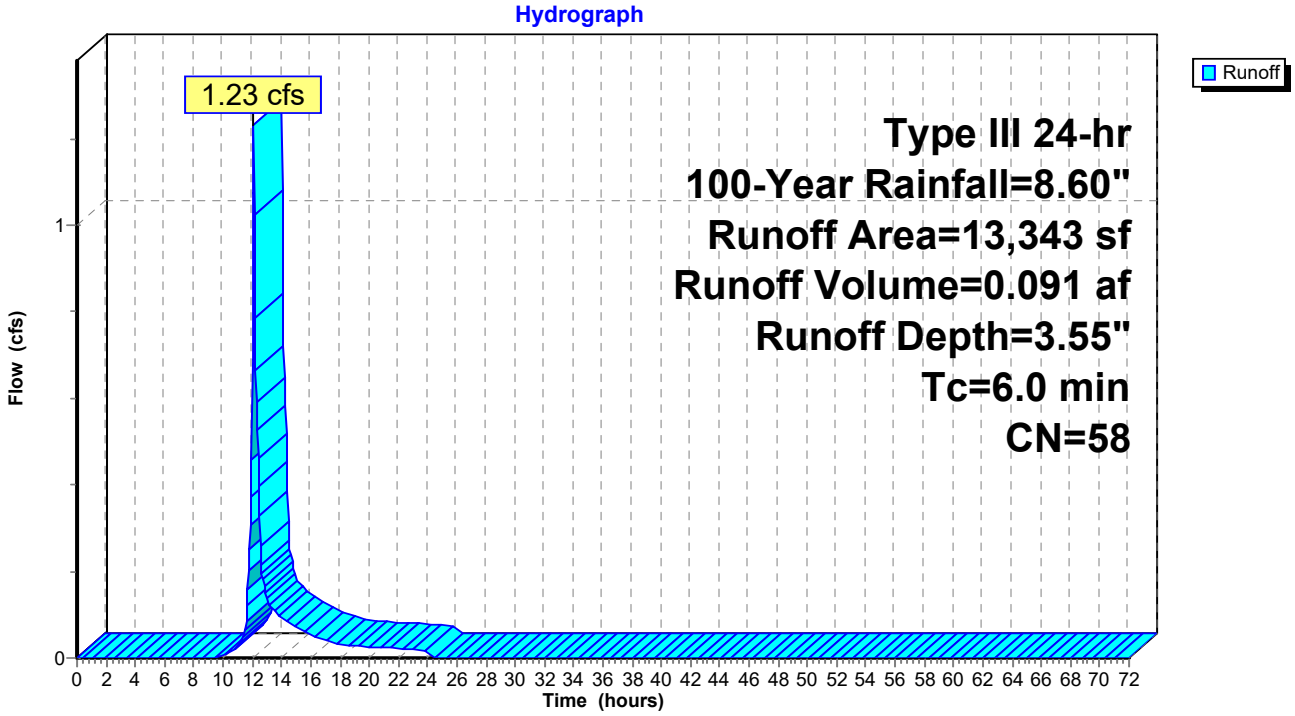
Runoff = 1.23 cfs @ 12.10 hrs, Volume= 0.091 af, Depth= 3.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
13,343	58	Woods/grass comb., Good, HSG B
13,343	58	100.00% Pervious Area

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

Subcatchment P-1U: P-1U (UNDETAINED)



Hydrograph for Subcatchment P-1U: P-1U (UNDETAINED)

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.00	0.00
2.00	0.17	0.00	0.00
3.00	0.26	0.00	0.00
4.00	0.37	0.00	0.00
5.00	0.49	0.00	0.00
6.00	0.62	0.00	0.00
7.00	0.78	0.00	0.00
8.00	0.98	0.00	0.00
9.00	1.25	0.00	0.00
10.00	1.63	0.00	0.00
11.00	2.15	0.06	0.03
12.00	4.30	0.81	**0.69**
13.00	6.45	2.04	**0.14**
14.00	6.97	2.39	0.09
15.00	7.35	2.65	0.07
16.00	7.62	2.84	0.05
17.00	7.82	2.98	0.04
18.00	7.98	3.10	0.03
19.00	8.11	3.19	0.03
20.00	8.23	3.28	0.03
21.00	8.34	3.36	0.02
22.00	8.43	3.43	0.02
23.00	8.52	3.50	0.02
24.00	**8.60**	**3.55**	0.02
25.00	8.60	3.55	0.00
26.00	8.60	3.55	0.00
27.00	8.60	3.55	0.00
28.00	8.60	3.55	0.00
29.00	8.60	3.55	0.00
30.00	8.60	3.55	0.00
31.00	8.60	3.55	0.00
32.00	8.60	3.55	0.00
33.00	8.60	3.55	0.00
34.00	8.60	3.55	0.00
35.00	8.60	3.55	0.00
36.00	8.60	3.55	0.00
37.00	8.60	3.55	0.00
38.00	8.60	3.55	0.00
39.00	8.60	3.55	0.00
40.00	8.60	3.55	0.00
41.00	8.60	3.55	0.00
42.00	8.60	3.55	0.00
43.00	8.60	3.55	0.00
44.00	8.60	3.55	0.00
45.00	8.60	3.55	0.00
46.00	8.60	3.55	0.00
47.00	8.60	3.55	0.00
48.00	8.60	3.55	0.00
49.00	8.60	3.55	0.00
50.00	8.60	3.55	0.00
51.00	8.60	3.55	0.00
52.00	8.60	3.55	0.00
53.00	8.60	3.55	0.00
54.00	8.60	3.55	0.00
55.00	8.60	3.55	0.00
56.00	8.60	3.55	0.00
57.00	8.60	3.55	0.00
58.00	8.60	3.55	0.00
59.00	8.60	3.55	0.00
60.00	8.60	3.55	0.00
61.00	8.60	3.55	0.00
62.00	8.60	3.55	0.00
63.00	8.60	3.55	0.00
64.00	8.60	3.55	0.00
65.00	8.60	3.55	0.00
66.00	8.60	3.55	0.00
67.00	8.60	3.55	0.00
68.00	8.60	3.55	0.00
69.00	8.60	3.55	0.00
70.00	8.60	3.55	0.00
71.00	8.60	3.55	0.00
72.00	8.60	3.55	0.00

Summary for Subcatchment P-2: P-2

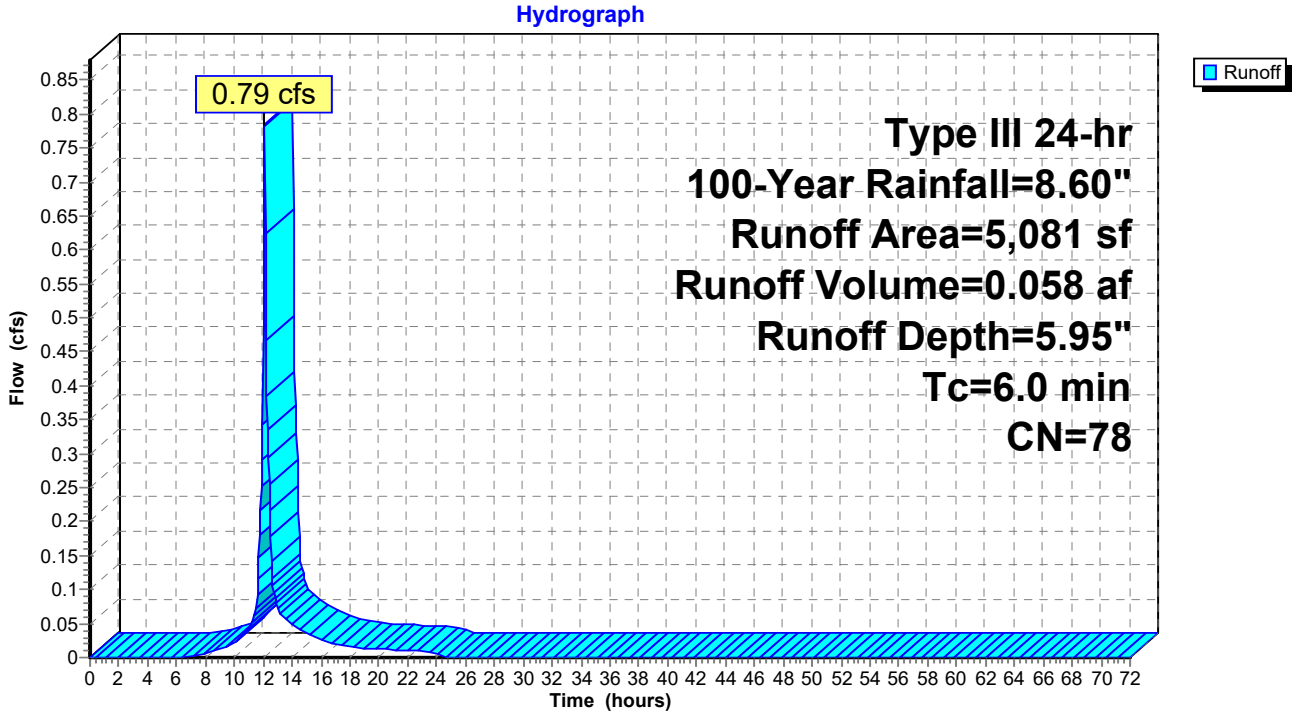
Runoff = 0.79 cfs @ 12.09 hrs, Volume= 0.058 af, Depth= 5.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
2,364	98	Paved parking, HSG B
2,717	61	>75% Grass cover, Good, HSG B
5,081	78	Weighted Average
2,717	61	53.47% Pervious Area
2,364	98	46.53% Impervious Area

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

Subcatchment P-2: P-2



Hydrograph for Subcatchment P-2: P-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
1.00	0.09	0.00	0.00
2.00	0.17	0.00	0.00
3.00	0.26	0.00	0.00
4.00	0.37	0.00	0.00
5.00	0.49	0.00	0.00
6.00	0.62	0.00	0.00
7.00	0.78	0.02	0.00
8.00	0.98	0.05	0.01
9.00	1.25	0.14	0.01
10.00	1.63	0.29	0.02
11.00	2.15	0.57	0.04
12.00	4.30	2.13	**0.49**
13.00	6.45	3.98	**0.07**
14.00	6.97	4.45	0.05
15.00	7.35	4.79	0.04
16.00	7.62	5.04	0.03
17.00	7.82	5.23	0.02
18.00	7.98	5.37	0.02
19.00	8.11	5.49	0.01
20.00	8.23	5.60	0.01
21.00	8.34	5.70	0.01
22.00	8.43	5.79	0.01
23.00	8.52	5.88	0.01
24.00	**8.60**	**5.95**	0.01
25.00	8.60	5.95	0.00
26.00	8.60	5.95	0.00
27.00	8.60	5.95	0.00
28.00	8.60	5.95	0.00
29.00	8.60	5.95	0.00
30.00	8.60	5.95	0.00
31.00	8.60	5.95	0.00
32.00	8.60	5.95	0.00
33.00	8.60	5.95	0.00
34.00	8.60	5.95	0.00
35.00	8.60	5.95	0.00
36.00	8.60	5.95	0.00
37.00	8.60	5.95	0.00
38.00	8.60	5.95	0.00
39.00	8.60	5.95	0.00
40.00	8.60	5.95	0.00
41.00	8.60	5.95	0.00
42.00	8.60	5.95	0.00
43.00	8.60	5.95	0.00
44.00	8.60	5.95	0.00
45.00	8.60	5.95	0.00
46.00	8.60	5.95	0.00
47.00	8.60	5.95	0.00
48.00	8.60	5.95	0.00
49.00	8.60	5.95	0.00
50.00	8.60	5.95	0.00
51.00	8.60	5.95	0.00
52.00	8.60	5.95	0.00
53.00	8.60	5.95	0.00
54.00	8.60	5.95	0.00
55.00	8.60	5.95	0.00
56.00	8.60	5.95	0.00
57.00	8.60	5.95	0.00
58.00	8.60	5.95	0.00
59.00	8.60	5.95	0.00
60.00	8.60	5.95	0.00
61.00	8.60	5.95	0.00
62.00	8.60	5.95	0.00
63.00	8.60	5.95	0.00
64.00	8.60	5.95	0.00
65.00	8.60	5.95	0.00
66.00	8.60	5.95	0.00
67.00	8.60	5.95	0.00
68.00	8.60	5.95	0.00
69.00	8.60	5.95	0.00
70.00	8.60	5.95	0.00
71.00	8.60	5.95	0.00
72.00	8.60	5.95	0.00

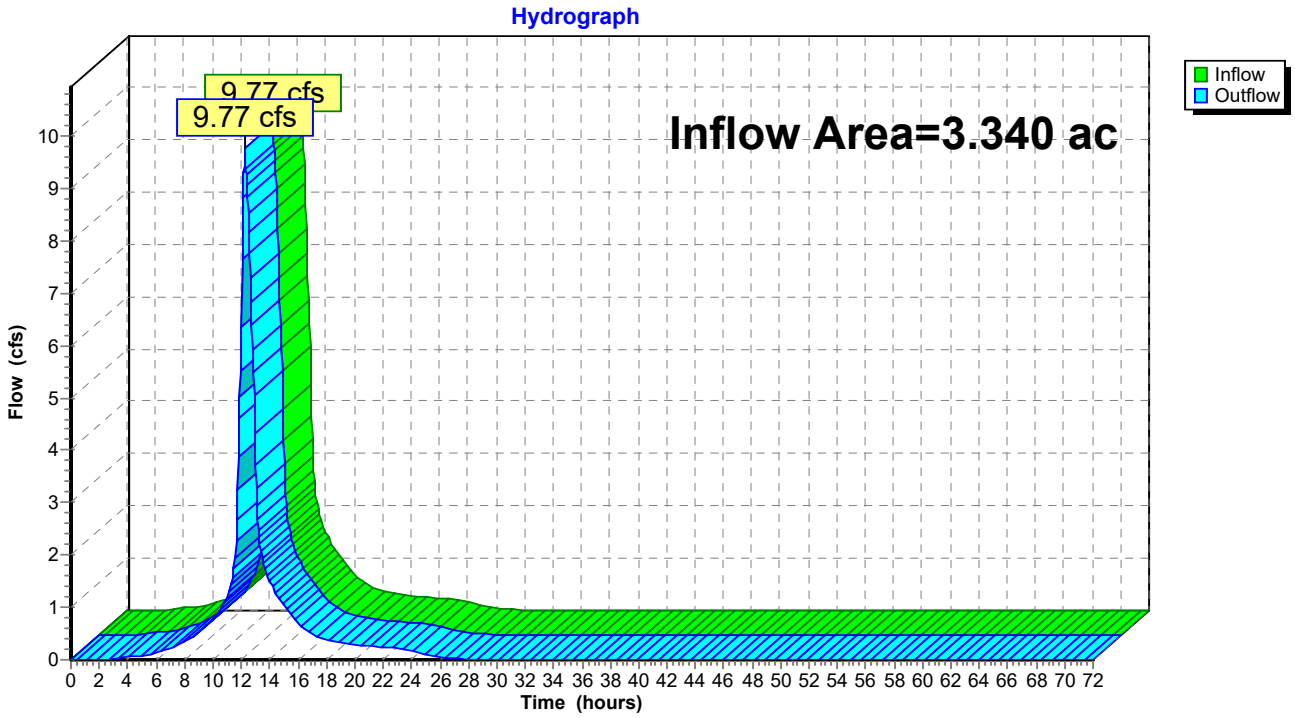
Summary for Reach PD1: WETLAND

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

Inflow Area = 3.340 ac, 56.81% Impervious, Inflow Depth = 5.89" for 100-Year event
Inflow = 9.77 cfs @ 12.25 hrs, Volume= 1.640 af
Outflow = 9.77 cfs @ 12.25 hrs, Volume= 1.640 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD1: WETLAND



Hydrograph for Reach PD1: WETLAND

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.01		0.01	56.00	0.00		0.00
4.00	0.05		0.05	57.00	0.00		0.00
5.00	0.08		0.08	58.00	0.00		0.00
6.00	0.11		0.11	59.00	0.00		0.00
7.00	0.23		0.23	60.00	0.00		0.00
8.00	0.34		0.34	61.00	0.00		0.00
9.00	0.52		0.52	62.00	0.00		0.00
10.00	0.76		0.76	63.00	0.00		0.00
11.00	1.19		1.19	64.00	0.00		0.00
12.00	**6.35**		**6.35**	65.00	0.00		0.00
13.00	**3.71**		**3.71**	66.00	0.00		0.00
14.00	1.50		1.50	67.00	0.00		0.00
15.00	1.04		1.04	68.00	0.00		0.00
16.00	0.71		0.71	69.00	0.00		0.00
17.00	0.50		0.50	70.00	0.00		0.00
18.00	0.38		0.38	71.00	0.00		0.00
19.00	0.32		0.32	72.00	0.00		0.00
20.00	0.29		0.29				
21.00	0.26		0.26				
22.00	0.24		0.24				
23.00	0.21		0.21				
24.00	0.19		0.19				
25.00	0.08		0.08				
26.00	0.05		0.05				
27.00	0.02		0.02				
28.00	0.01		0.01				
29.00	0.01		0.01				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

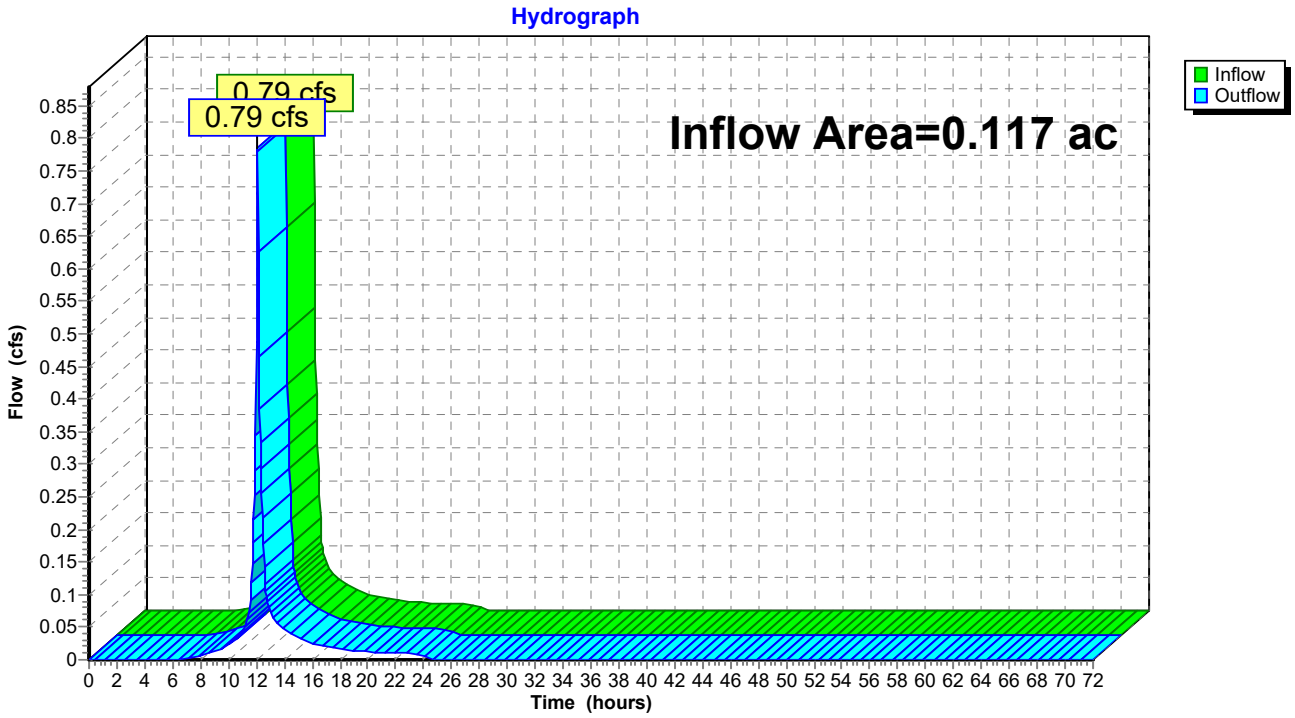
Summary for Reach PD2: BOSTON POST RD

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

Inflow Area = 0.117 ac, 46.53% Impervious, Inflow Depth = 5.95" for 100-Year event
Inflow = 0.79 cfs @ 12.09 hrs, Volume= 0.058 af
Outflow = 0.79 cfs @ 12.09 hrs, Volume= 0.058 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach PD2: BOSTON POST RD



Hydrograph for Reach PD2: BOSTON POST RD

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.01		0.01	61.00	0.00		0.00
9.00	0.01		0.01	62.00	0.00		0.00
10.00	0.02		0.02	63.00	0.00		0.00
11.00	0.04		0.04	64.00	0.00		0.00
12.00	**0.49**		**0.49**	65.00	0.00		0.00
13.00	**0.07**		**0.07**	66.00	0.00		0.00
14.00	0.05		0.05	67.00	0.00		0.00
15.00	0.04		0.04	68.00	0.00		0.00
16.00	0.03		0.03	69.00	0.00		0.00
17.00	0.02		0.02	70.00	0.00		0.00
18.00	0.02		0.02	71.00	0.00		0.00
19.00	0.01		0.01	72.00	0.00		0.00
20.00	0.01		0.01				
21.00	0.01		0.01				
22.00	0.01		0.01				
23.00	0.01		0.01				
24.00	0.01		0.01				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

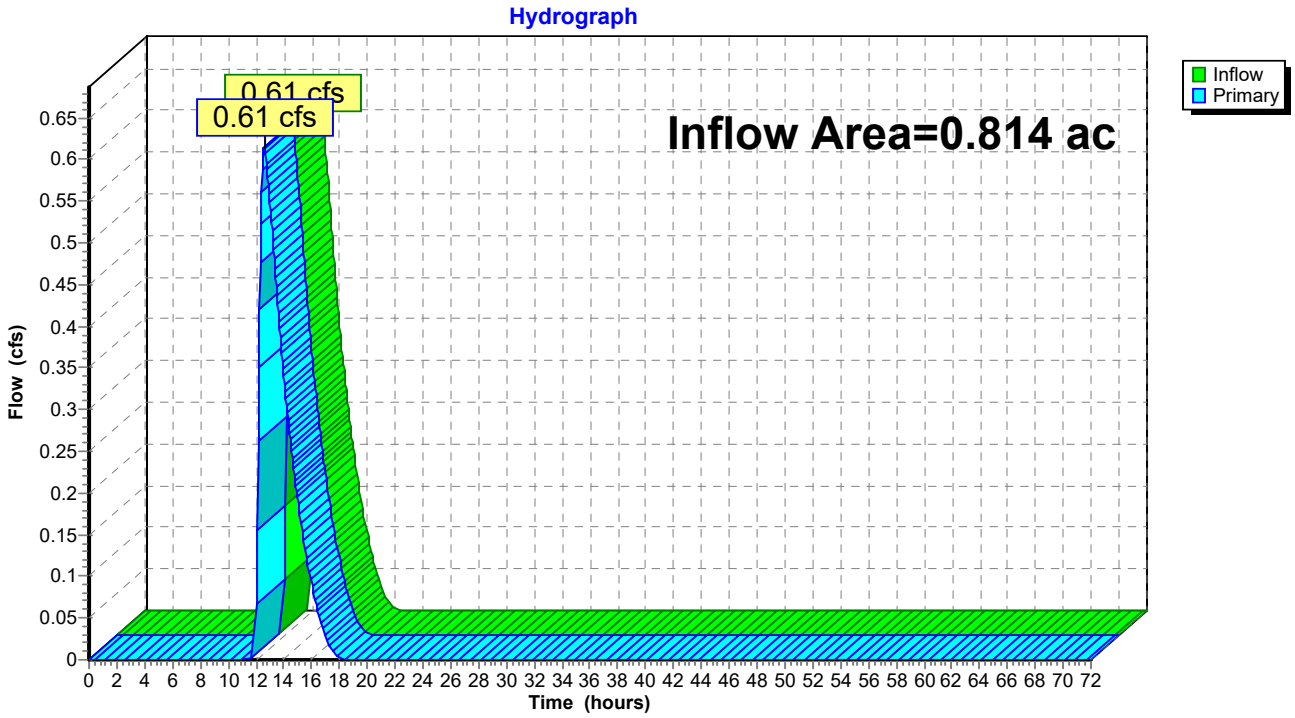
Summary for Pond 1P: FES

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

Inflow Area = 0.814 ac, 0.00% Impervious, Inflow Depth = 1.69" for 100-Year event
Inflow = 0.61 cfs @ 12.58 hrs, Volume= 0.114 af
Primary = 0.61 cfs @ 12.58 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Pond 1P: FES



Hydrograph for Pond 1P: FES

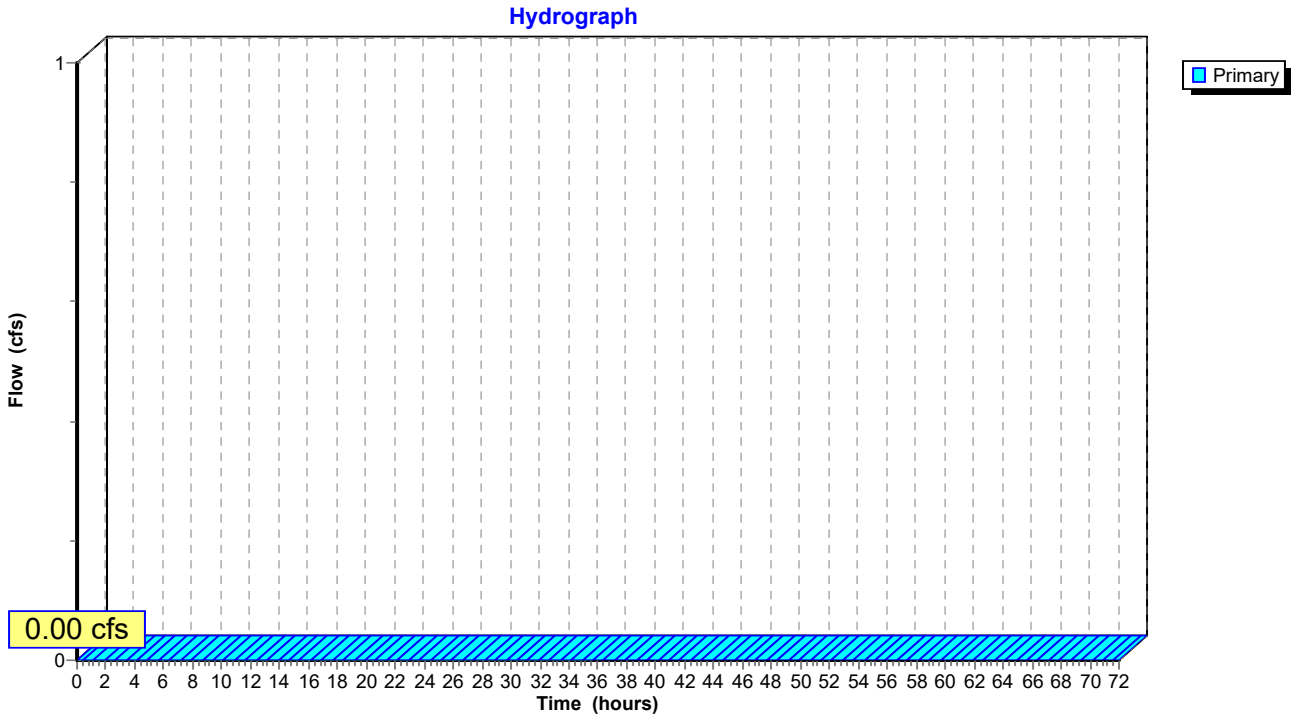
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00	53.00	0.00		0.00
1.00	0.00		0.00	54.00	0.00		0.00
2.00	0.00		0.00	55.00	0.00		0.00
3.00	0.00		0.00	56.00	0.00		0.00
4.00	0.00		0.00	57.00	0.00		0.00
5.00	0.00		0.00	58.00	0.00		0.00
6.00	0.00		0.00	59.00	0.00		0.00
7.00	0.00		0.00	60.00	0.00		0.00
8.00	0.00		0.00	61.00	0.00		0.00
9.00	0.00		0.00	62.00	0.00		0.00
10.00	0.00		0.00	63.00	0.00		0.00
11.00	0.00		0.00	64.00	0.00		0.00
12.00	**0.02**		**0.02**	65.00	0.00		0.00
13.00	**0.55**		**0.55**	66.00	0.00		0.00
14.00	0.34		0.34	67.00	0.00		0.00
15.00	0.19		0.19	68.00	0.00		0.00
16.00	0.09		0.09	69.00	0.00		0.00
17.00	0.03		0.03	70.00	0.00		0.00
18.00	0.00		0.00	71.00	0.00		0.00
19.00	0.00		0.00	72.00	0.00		0.00
20.00	0.00		0.00				
21.00	0.00		0.00				
22.00	0.00		0.00				
23.00	0.00		0.00				
24.00	0.00		0.00				
25.00	0.00		0.00				
26.00	0.00		0.00				
27.00	0.00		0.00				
28.00	0.00		0.00				
29.00	0.00		0.00				
30.00	0.00		0.00				
31.00	0.00		0.00				
32.00	0.00		0.00				
33.00	0.00		0.00				
34.00	0.00		0.00				
35.00	0.00		0.00				
36.00	0.00		0.00				
37.00	0.00		0.00				
38.00	0.00		0.00				
39.00	0.00		0.00				
40.00	0.00		0.00				
41.00	0.00		0.00				
42.00	0.00		0.00				
43.00	0.00		0.00				
44.00	0.00		0.00				
45.00	0.00		0.00				
46.00	0.00		0.00				
47.00	0.00		0.00				
48.00	0.00		0.00				
49.00	0.00		0.00				
50.00	0.00		0.00				
51.00	0.00		0.00				
52.00	0.00		0.00				

Summary for Pond 2P: FES w/ HEADWALL

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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Pond 2P: FES w/ HEADWALL



Summary for Pond 3P: Permeable Pavement

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=37)

Inflow Area =	0.814 ac,	0.00% Impervious,	Inflow Depth =	8.00"	for 100-Year event
Inflow =	6.64 cfs @	12.09 hrs,	Volume=	0.543 af	
Outflow =	1.01 cfs @	12.58 hrs,	Volume=	0.543 af,	Atten= 85%, Lag= 29.5 min
Discarded =	0.39 cfs @	11.20 hrs,	Volume=	0.429 af	
Primary =	0.61 cfs @	12.58 hrs,	Volume=	0.114 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 123.49' @ 12.58 hrs Surf.Area= 32,578 sf Storage= 8,395 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 91.2 min (846.7 - 755.5)

Volume	Invert	Avail.Storage	Storage Description
#1	122.85'	11,044 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

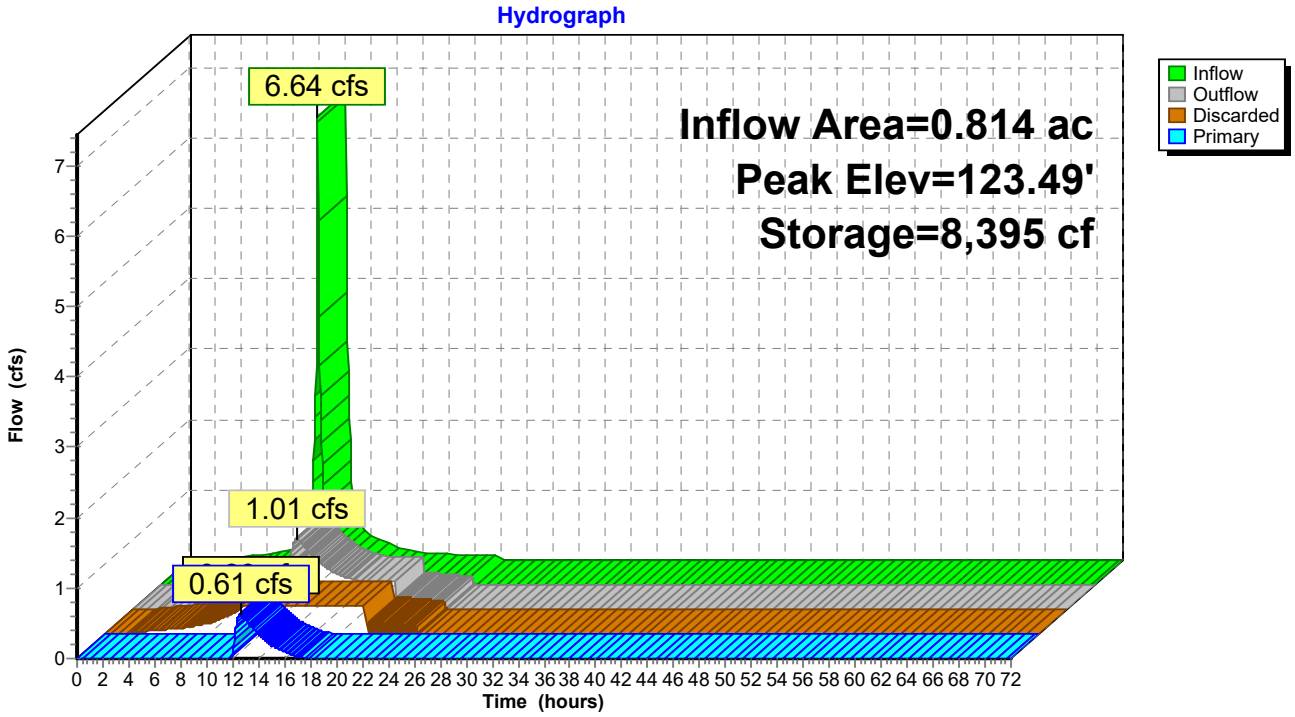
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
122.85	32,578	0.0	0	0
123.51	32,578	40.0	8,601	8,601
123.76	32,578	30.0	2,443	11,044

Device	Routing	Invert	Outlet Devices
#1	Discarded	122.85'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	123.01'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.01' / 122.90' S= 0.0055 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

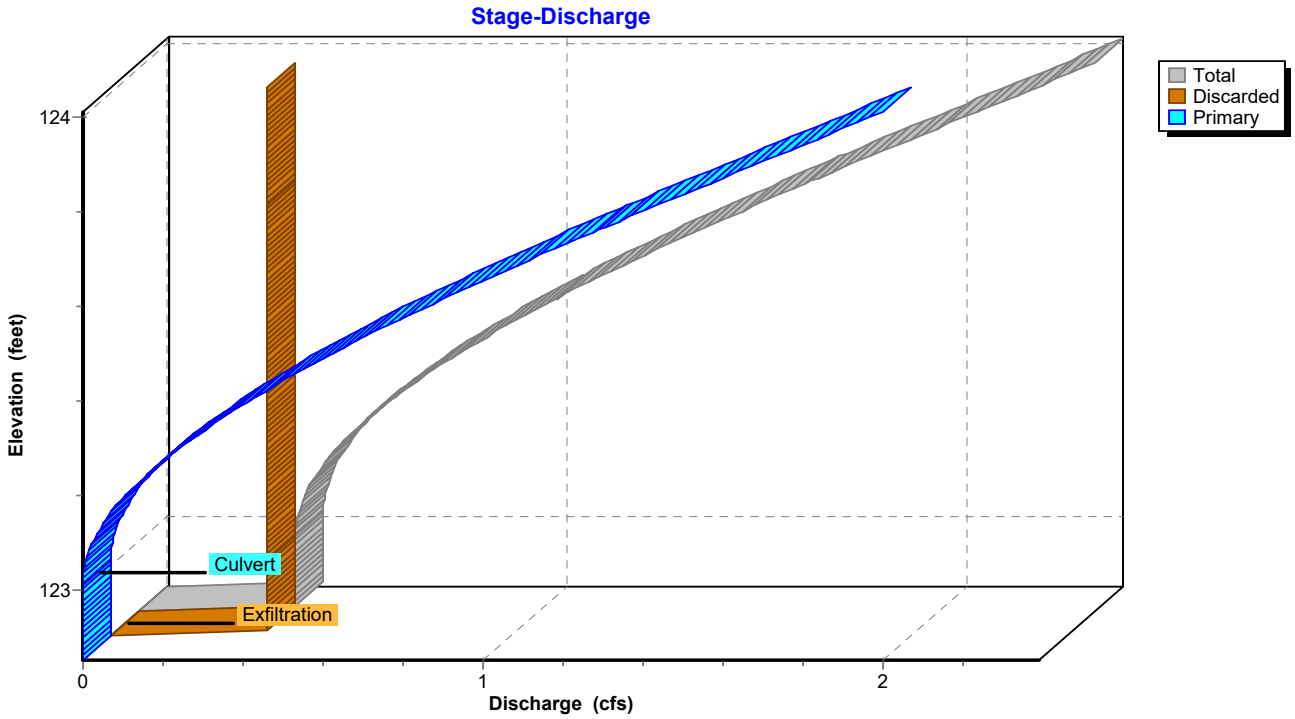
Discarded OutFlow Max=0.39 cfs @ 11.20 hrs HW=122.86' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=0.61 cfs @ 12.58 hrs HW=123.49' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Barrel Controls 0.61 cfs @ 2.38 fps)

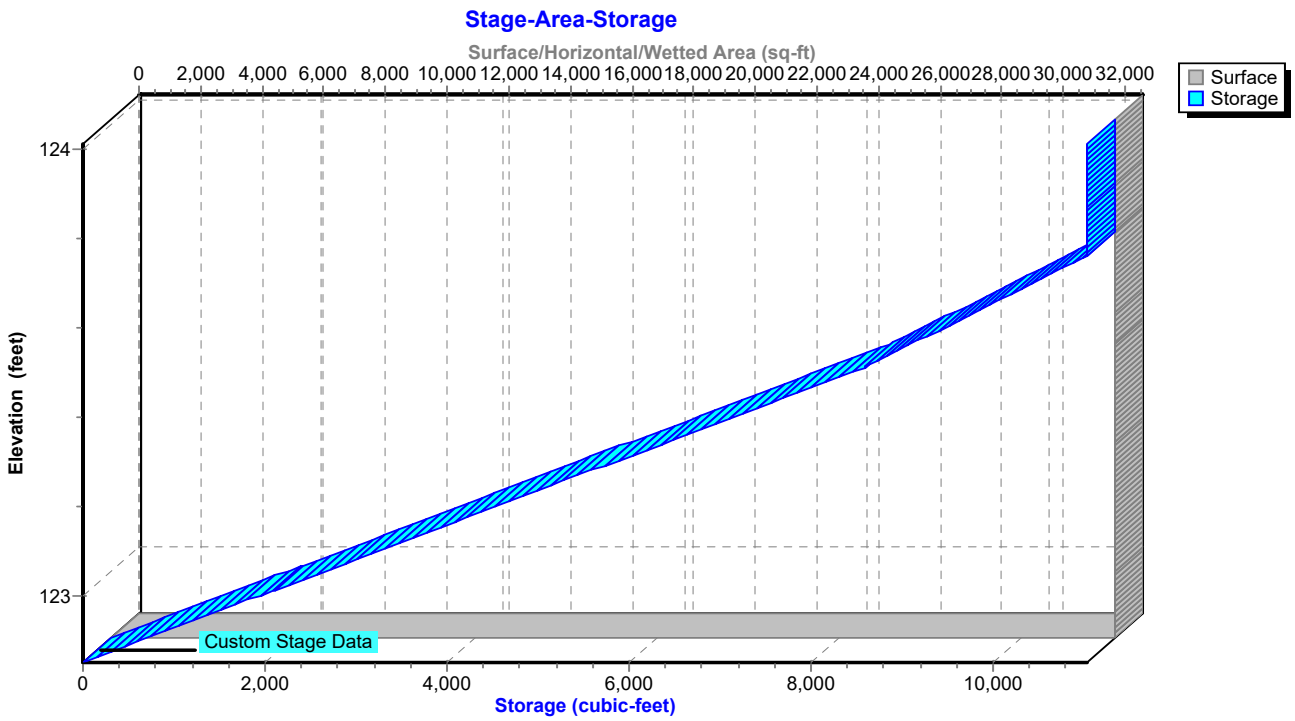
Pond 3P: Permeable Pavement



Pond 3P: Permeable Pavement



Pond 3P: Permeable Pavement



Hydrograph for Pond 3P: Permeable Pavement

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	122.85	0.00	0.00	0.00
2.50	0.02	0	122.85	0.02	0.02	0.00
5.00	0.07	0	122.85	0.07	0.07	0.00
7.50	0.13	0	122.85	0.13	0.13	0.00
10.00	**0.32**	0	122.85	0.32	**0.32**	0.00
12.50	**1.41**	**8,344**	**123.49**	**1.00**	**0.39**	**0.60**
15.00	0.27	**5,400**	**123.26**	**0.58**	0.39	**0.19**
17.50	0.13	2,841	123.07	0.40	0.39	0.01
20.00	0.09	268	122.87	0.39	0.39	0.00
22.50	0.07	0	122.85	0.00	0.00	0.00
25.00	0.00	0	122.85	0.00	0.00	0.00
27.50	0.00	0	122.85	0.00	0.00	0.00
30.00	0.00	0	122.85	0.00	0.00	0.00
32.50	0.00	0	122.85	0.00	0.00	0.00
35.00	0.00	0	122.85	0.00	0.00	0.00
37.50	0.00	0	122.85	0.00	0.00	0.00
40.00	0.00	0	122.85	0.00	0.00	0.00
42.50	0.00	0	122.85	0.00	0.00	0.00
45.00	0.00	0	122.85	0.00	0.00	0.00
47.50	0.00	0	122.85	0.00	0.00	0.00
50.00	0.00	0	122.85	0.00	0.00	0.00
52.50	0.00	0	122.85	0.00	0.00	0.00
55.00	0.00	0	122.85	0.00	0.00	0.00
57.50	0.00	0	122.85	0.00	0.00	0.00
60.00	0.00	0	122.85	0.00	0.00	0.00
62.50	0.00	0	122.85	0.00	0.00	0.00
65.00	0.00	0	122.85	0.00	0.00	0.00
67.50	0.00	0	122.85	0.00	0.00	0.00
70.00	0.00	0	122.85	0.00	0.00	0.00

Stage-Discharge for Pond 3P: Permeable Pavement

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
122.85	0.00	**0.00**	0.00
122.87	0.39	**0.39**	0.00
122.89	0.39	0.39	0.00
122.91	0.39	0.39	0.00
122.93	0.39	0.39	0.00
122.95	0.39	0.39	0.00
122.97	0.39	0.39	0.00
122.99	0.39	0.39	0.00
123.01	0.39	0.39	0.00
123.03	0.39	0.39	0.00
123.05	0.40	0.39	0.00
123.07	0.40	0.39	0.01
123.09	0.41	0.39	0.02
123.11	0.42	0.39	0.03
123.13	0.44	0.39	0.04
123.15	0.45	0.39	0.06
123.17	0.47	0.39	0.08
123.19	0.49	0.39	0.10
123.21	0.51	0.39	0.12
123.23	0.54	0.39	0.14
123.25	0.56	0.39	0.17
123.27	0.59	0.39	0.20
123.29	0.62	0.39	0.23
123.31	0.65	0.39	0.26
123.33	0.68	0.39	0.29
123.35	0.72	0.39	0.32
123.37	0.75	0.39	0.36
123.39	0.79	0.39	0.40
123.41	0.83	0.39	0.44
123.43	0.87	0.39	0.48
123.45	0.91	0.39	0.52
123.47	0.95	0.39	0.56
123.49	1.00	0.39	0.60
123.51	1.04	0.39	0.65
123.53	1.09	0.39	0.69
123.55	1.13	0.39	0.74
123.57	1.18	0.39	0.79
123.59	1.23	0.39	0.84
123.61	1.28	0.39	0.89
123.63	1.33	0.39	0.94
123.65	1.38	0.39	0.99
123.67	1.44	0.39	1.04
123.69	1.49	0.39	1.10
123.71	1.54	0.39	1.15
123.73	1.60	0.39	1.21
123.75	1.65	0.39	1.26
123.77	1.71	0.39	1.32
123.79	1.77	0.39	1.37
123.81	1.82	0.39	1.43
123.83	1.88	0.39	1.49
123.85	1.94	0.39	1.54
123.87	1.99	0.39	1.60
123.89	2.05	0.39	1.66
123.91	2.11	0.39	1.71
123.93	2.16	0.39	1.77
123.95	2.22	0.39	1.83
123.97	2.28	0.39	1.89
123.99	2.33	0.39	1.94
124.01	**2.39**	0.39	**2.00**

Stage-Area-Storage for Pond 3P: Permeable Pavement

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
122.85	**32,578**	0
122.87	32,578	261
122.89	32,578	521
122.91	32,578	782
122.93	32,578	1,042
122.95	32,578	1,303
122.97	32,578	1,564
122.99	32,578	1,824
123.01	32,578	2,085
123.03	32,578	2,346
123.05	32,578	2,606
123.07	32,578	2,867
123.09	32,578	3,127
123.11	32,578	3,388
123.13	32,578	3,649
123.15	32,578	3,909
123.17	32,578	4,170
123.19	32,578	4,431
123.21	32,578	4,691
123.23	32,578	4,952
123.25	32,578	5,212
123.27	32,578	5,473
123.29	32,578	5,734
123.31	32,578	5,994
123.33	32,578	6,255
123.35	32,578	6,516
123.37	32,578	6,776
123.39	32,578	7,037
123.41	32,578	7,297
123.43	32,578	7,558
123.45	32,578	7,819
123.47	32,578	8,079
123.49	32,578	8,340
123.51	32,578	8,601
123.53	32,578	8,796
123.55	32,578	8,992
123.57	32,578	9,187
123.59	32,578	9,382
123.61	32,578	9,578
123.63	32,578	9,773
123.65	32,578	9,969
123.67	32,578	10,164
123.69	32,578	10,360
123.71	32,578	10,555
123.73	32,578	10,751
123.75	32,578	**10,946**
123.77	32,578	**11,044**
123.79	32,578	11,044
123.81	32,578	11,044
123.83	32,578	11,044
123.85	32,578	11,044
123.87	32,578	11,044
123.89	32,578	11,044
123.91	32,578	11,044
123.93	32,578	11,044
123.95	32,578	11,044
123.97	32,578	11,044
123.99	32,578	11,044
124.01	32,578	11,044

Summary for Pond UG-1: RETAIN_IT

Inflow Area = 2.219 ac, 85.49% Impervious, Inflow Depth = 7.76" for 100-Year event
Inflow = 17.90 cfs @ 12.09 hrs, Volume= 1.435 af
Outflow = 8.69 cfs @ 12.25 hrs, Volume= 1.435 af, Atten= 51%, Lag= 9.8 min
Primary = 8.69 cfs @ 12.25 hrs, Volume= 1.435 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 126.73' @ 12.25 hrs Surf.Area= 3,444 sf Storage= 10,918 cf

Plug-Flow detention time= 31.1 min calculated for 1.435 af (100% of inflow)
Center-of-Mass det. time= 30.5 min (794.1 - 763.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	122.40'	1,095 cf	**42.00'W x 82.00'L x 4.67'H Field A** 16,072 cf Overall - 13,333 cf Embedded = 2,739 cf x 40.0% Voids
#2A	122.90'	9,855 cf	**retain_it retain_it 3.5'** x 50 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 5 Rows adjusted for 184.2 cf perimeter wall
		10,950 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	122.40'	**15.0" Round Culvert** L= 212.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 122.40' / 121.25' S= 0.0054 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 1.23 sf
#2	Device 1	122.40'	**2.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	122.90'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=8.68 cfs @ 12.25 hrs HW=126.73' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 8.68 cfs @ 7.07 fps)
  ├─**2=Orifice/Grate** (Passes < 0.34 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Passes < 18.37 cfs potential flow)

Pond UG-1: RETAIN_IT - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it®)
Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf
Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf
5 Rows adjusted for 184.2 cf perimeter wall

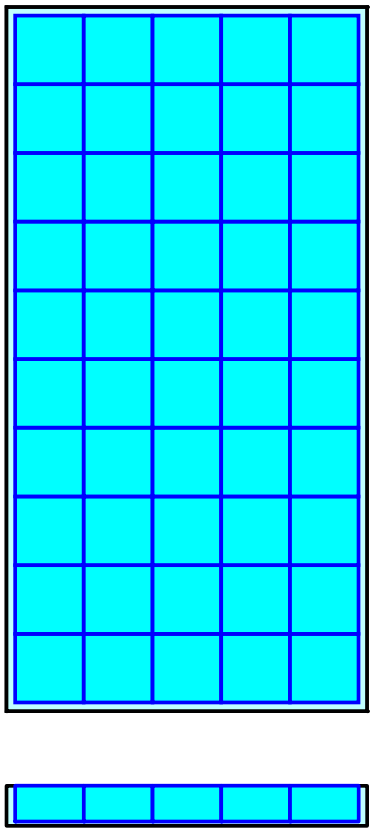
10 Chambers/Row x 8.00' Long = 80.00' Row Length +12.0" End Stone x 2 = 82.00' Base Length
5 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 42.00' Base Width
6.0" Base + 50.0" Chamber Height = 4.67' Field Height

6.1 cf Sidewall x 10 x 2 + 6.1 cf Endwall x 5 x 2 = 184.2 cf Perimeter Wall
50 Chambers x 200.8 cf - 184.2 cf Perimeter wall = 9,854.8 cf Chamber Storage
50 Chambers x 266.7 cf = 13,333.3 cf Displacement

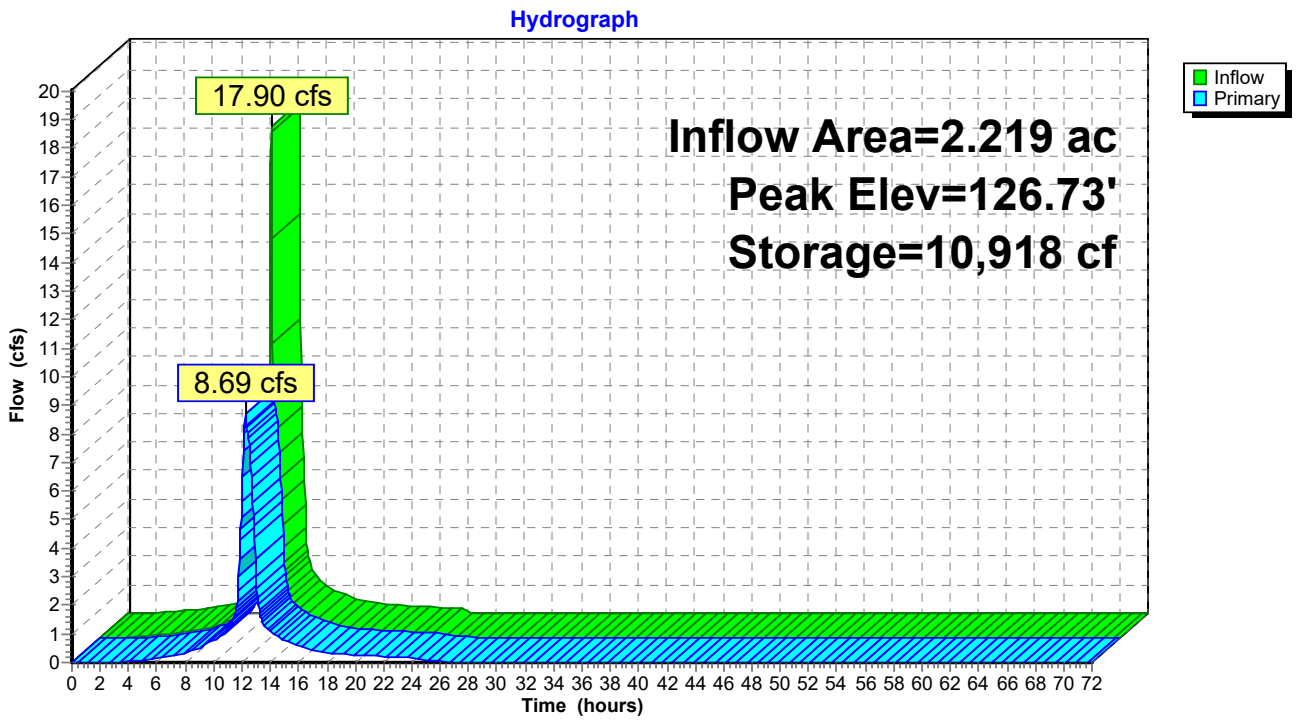
16,072.0 cf Field - 13,333.3 cf Chambers = 2,738.7 cf Stone x 40.0% Voids = 1,095.5 cf Stone Storage

Chamber Storage + Stone Storage = 10,950.3 cf = 0.251 af
Overall Storage Efficiency = 68.1%
Overall System Size = 82.00' x 42.00' x 4.67'

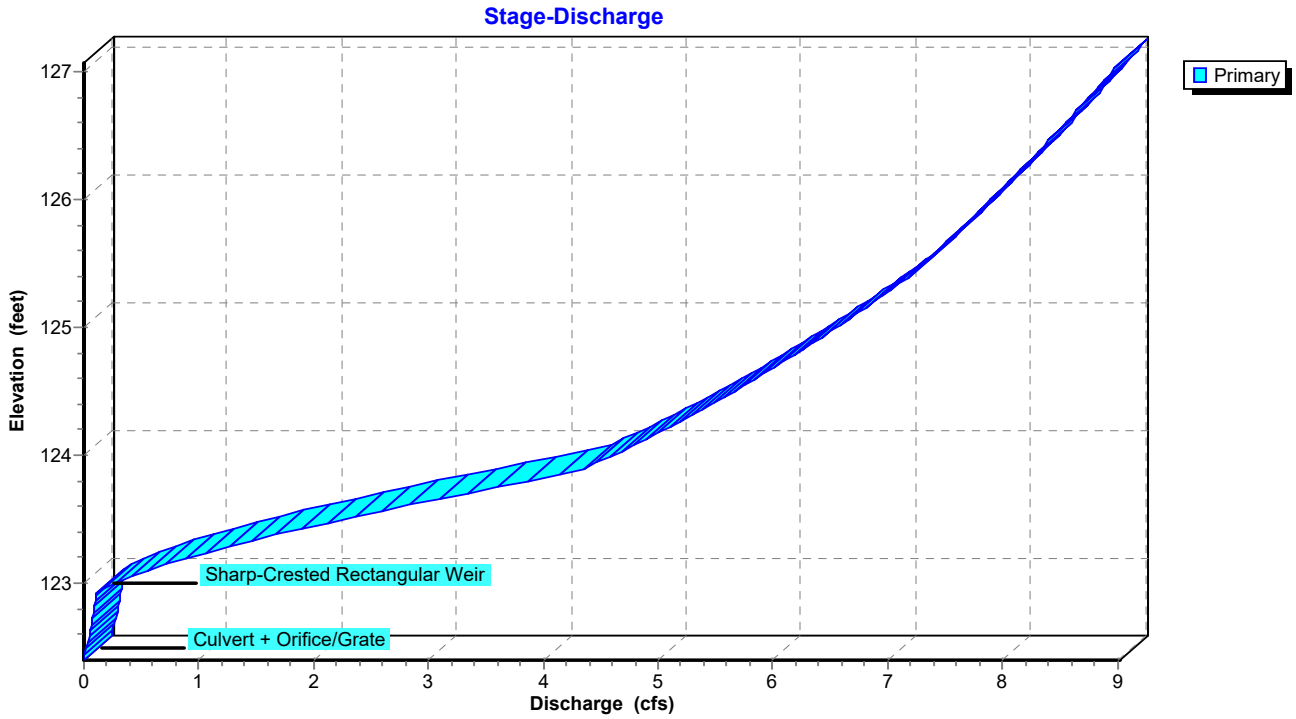
50 Chambers
595.3 cy Field
101.4 cy Stone



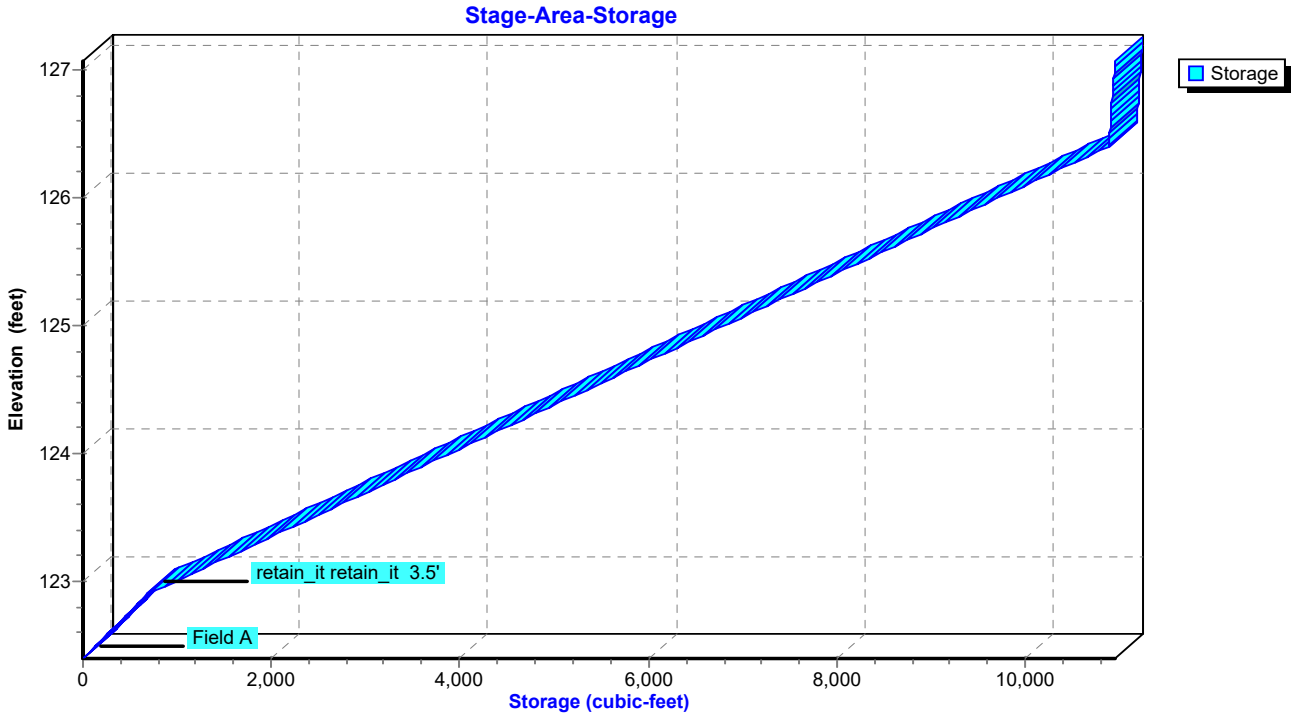
Pond UG-1: RETAIN_IT



Pond UG-1: RETAIN_IT



Pond UG-1: RETAIN_IT



Hydrograph for Pond UG-1: RETAIN_IT

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	122.40	0.00
2.50	0.03	33	122.42	0.00
5.00	0.14	459	122.73	0.08
7.50	0.33	1,004	123.01	0.29
10.00	**0.81**	**1,446**	**123.16**	**0.76**
12.50	**3.81**	**8,981**	**125.75**	**7.61**
15.00	0.74	1,464	123.17	0.78
17.50	0.36	1,114	123.05	0.39
20.00	0.25	970	123.00	0.26
22.50	0.20	897	122.97	0.20
25.00	0.00	500	122.76	0.08
27.50	0.00	118	122.49	0.01
30.00	0.00	57	122.44	0.00
32.50	0.00	37	122.43	0.00
35.00	0.00	28	122.42	0.00
37.50	0.00	22	122.42	0.00
40.00	0.00	18	122.41	0.00
42.50	0.00	15	122.41	0.00
45.00	0.00	13	122.41	0.00
47.50	0.00	12	122.41	0.00
50.00	0.00	11	122.41	0.00
52.50	0.00	10	122.41	0.00
55.00	0.00	9	122.41	0.00
57.50	0.00	8	122.41	0.00
60.00	0.00	8	122.41	0.00
62.50	0.00	7	122.41	0.00
65.00	0.00	7	122.40	0.00
67.50	0.00	6	122.40	0.00
70.00	0.00	6	122.40	0.00

Stage-Discharge for Pond UG-1: RETAIN_IT

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
122.40	0.00	125.05	6.64
122.45	0.00	125.10	6.72
122.50	0.02	125.15	6.80
122.55	0.03	125.20	6.88
122.60	0.05	125.25	6.96
122.65	0.06	125.30	7.04
122.70	0.07	125.35	7.11
122.75	0.08	125.40	7.19
122.80	0.09	125.45	7.25
122.85	0.10	125.50	7.31
122.90	0.10	125.55	7.37
122.95	0.16	125.60	7.43
123.00	0.27	125.65	7.49
123.05	0.40	125.70	7.55
123.10	0.55	125.75	7.61
123.15	0.72	125.80	7.67
123.20	0.91	125.85	7.73
123.25	1.11	125.90	7.79
123.30	1.32	125.95	7.84
123.35	1.54	126.00	7.90
123.40	1.77	126.05	7.96
123.45	2.01	126.10	8.01
123.50	2.26	126.15	8.07
123.55	2.52	126.20	8.12
123.60	2.78	126.25	8.18
123.65	3.04	126.30	8.23
123.70	3.31	126.35	8.29
123.75	3.59	126.40	8.34
123.80	3.87	126.45	8.39
123.85	4.16	126.50	8.45
123.90	4.36	126.55	8.50
123.95	4.49	126.60	8.55
124.00	4.61	126.65	8.60
124.05	4.72	126.70	8.65
124.10	4.84	126.75	8.70
124.15	4.95	126.80	8.76
124.20	5.06	126.85	8.81
124.25	5.16	126.90	8.86
124.30	5.27	126.95	8.91
124.35	5.37	127.00	8.96
124.40	5.47	127.05	**9.01**
124.45	5.57		
124.50	5.67		
124.55	5.76		
124.60	5.85		
124.65	5.95		
124.70	6.04		
124.75	6.13		
124.80	6.21		
124.85	6.30		
124.90	6.39		
124.95	6.47		
125.00	6.56		

Stage-Area-Storage for Pond UG-1: RETAIN_IT

Elevation (feet)	Storage (cubic-feet)
122.40	0
122.45	69
122.50	138
122.55	207
122.60	276
122.65	344
122.70	413
122.75	482
122.80	551
122.85	620
122.90	689
122.95	834
123.00	980
123.05	1,126
123.10	1,271
123.15	1,417
123.20	1,563
123.25	1,708
123.30	1,854
123.35	2,000
123.40	2,145
123.45	2,291
123.50	2,437
123.55	2,582
123.60	2,728
123.65	2,874
123.70	3,019
123.75	3,165
123.80	3,311
123.85	3,456
123.90	3,602
123.95	3,748
124.00	3,893
124.05	4,039
124.10	4,185
124.15	4,330
124.20	4,476
124.25	4,622
124.30	4,767
124.35	4,913
124.40	5,059
124.45	5,204
124.50	5,350
124.55	5,496
124.60	5,641
124.65	5,787
124.70	5,933
124.75	6,078
124.80	6,224
124.85	6,370
124.90	6,515
124.95	6,661
125.00	6,807
125.05	6,952
125.10	7,098
125.15	7,244
125.20	7,389
125.25	7,535
125.30	7,681
125.35	7,826
125.40	7,972
125.45	8,118
125.50	8,263
125.55	8,409
125.60	8,555
125.65	8,700
125.70	8,846
125.75	8,992
125.80	9,137
125.85	9,283
125.90	9,429
125.95	9,574
126.00	9,720
126.05	9,866
126.10	10,011
126.15	10,157
126.20	10,303
126.25	10,448
126.30	10,594
126.35	10,740
126.40	10,885
126.45	10,890
126.50	10,895
126.55	10,900
126.60	10,905
126.65	10,910
126.70	10,915
126.75	10,919
126.80	10,924
126.85	10,929
126.90	10,934
126.95	10,939
127.00	10,944
127.05	**10,949**

SECTION 4 – STORMWATER MANAGEMENT CALCS

4.1 STANDARD 3: RECHARGE CALCULATIONS

The Required Recharge Volume is computed using the equation provided in the 2008 Massachusetts Stormwater Handbook. The volume is computed as an equivalent depth of rainfall over the proposed impervious areas in accordance with a Target Depth Factor based on the soil classifications. The Calculations is as follows:

Rv = (F) X (Impervious Area)
(Equation 1) Volume 3, Ch 1, page 15

- Rv = Required Recharge Volume, expressed in cubic feet, cubic yards, or acre-feet
- F = Target Depth Factor associated with each Hydrologic Soil Group (HSG)
- Impervious Area = new pavement and new rooftop area
- The Target Depth Factor "F" per Table 2.3.2, Volume 3, Chapter 1 for each soil classification is as follows:
    - A soils = 0.60 inches
    - B soils = 0.35 inches
    - C soils = 0.25 inches
    - D soils = 0.10 inches

The existing impervious area within limit of work is 95,135 SF (pavement, buildings, compacted gravel parking) and the total proposed impervious area within limit of work is 117,603 SF (pavement, buildings and including permeable pavement, which per the MA Stormwater Standards must be considered impervious for this calculation). Therefore, there is an increase in impervious area of 22,477 SF.

Based on the above formula, the minimum required recharge volume for the site is as follows:

Per Section 1.3, the onsite soils are considered "B" soils:

- F (B soils) = 0.35 inches
- Impervious Area (New Impervious) =22,477 SF

Rv = (F) X (Impervious Area)
Rv= (0.35 inches) x (1in/12 ft) x 22,477 SF = 655 CF

TOTAL RECHARGE VOLUME REQUIRED = 655 CF

<u>Capture Area Adjustment:</u>

Capture Area Adjustment = Surface Are of Inf. BMP/0.65
Capture Area Adjustment = 32,578 SF/0.65
Capture Area Adjustment = 50,120 SF

Adjusted Recharge Volume = Capture Area Adjustment * Depth of BMP * Voids
Adjusted Recharge Volume = 50,120 SF * (8in/12in)FT * 0.40
Adjusted Recharge Volume = 8,687 CF

Recharge Volume BMP Table

Infiltration BMP	Infiltration Rate (in/hr) k	Storage (Recharge) Volume (CF) Rv
Permeable Pavement	0.52	8,687
Totals		**8,687**
k = saturated hydraulic conductivity (in/hr) *Rv = storage volume (CF)* *Volume 3, Chapter 1 of the MA Stormwater Handbook*		

TOTAL RECHARGE VOLUME PROVIDED = 8,687 CF

Conclusion:
The porous pavement can be credited for the 22,477 SF of increased impervious area as well as 27,643 SF of the existing pavement area. This amounts to 42.6% of the proposed site impervious. Due to groundwater depth restricting infiltration BMPs elsewhere on the site, we feel that this design recharges to the maximum extent practicable.

4.2 DRAWDOWN TIME

Below are the drawdown time calculations for the infiltration systems proposed on the site. The calculation uses estimated hydraulic conductivity values "*K*" in accordance with the Rawls Rates table. The formula below utilized the recommended formula per the MA Stormwater Handbook as follows:

Drawdown Time = Rv / [(K*Bottom Area)*(1FT/12IN)]

- Rv = Storage Volume (CF)
- K = Saturated Hydraulic Conductivity per Rawls Rate Table
- Bottom Area = Area of Bottom of Proposed Recharge Structure

Below is a summary table of the drawdown calculations:

BASIN DRAWDOWN CALCULATIONS				
Infiltration BMP	**Infiltration Rate (IN/HR) k**	**Storage (Recharge) Volume Provided (CF) Rv**	**Bottom Area (SF)**	**Draw Down Time (HR)**
Permeable Pavement	0.52	8,687	32,578	6.15
Totals		**8,687**		
k = saturated hydraulic conductivity (IN/HR) *Rv = storage volume (CF)* *Bottom Area (SF)* *Volume 3, Chapter 1 of the MA Stormwater Handbook*				

Conclusion:
The calculations show that the infiltration BMP draws down in less than 72 hours, as required.

4.3 STANDARD 4: WATER QUALITY

Although the site is not considered a critical area, BMP's have been designed to treat 1" of water quality volume (WQV). A table has been provided below that provides the sizing of the proprietary water quality units selected. All of the proprietary BMP's have been sized to treat 1" WQV of the contributing tributary area.

Water Quality Unit Sizing Using Equivalent Flow from 1" Rainfall Depth

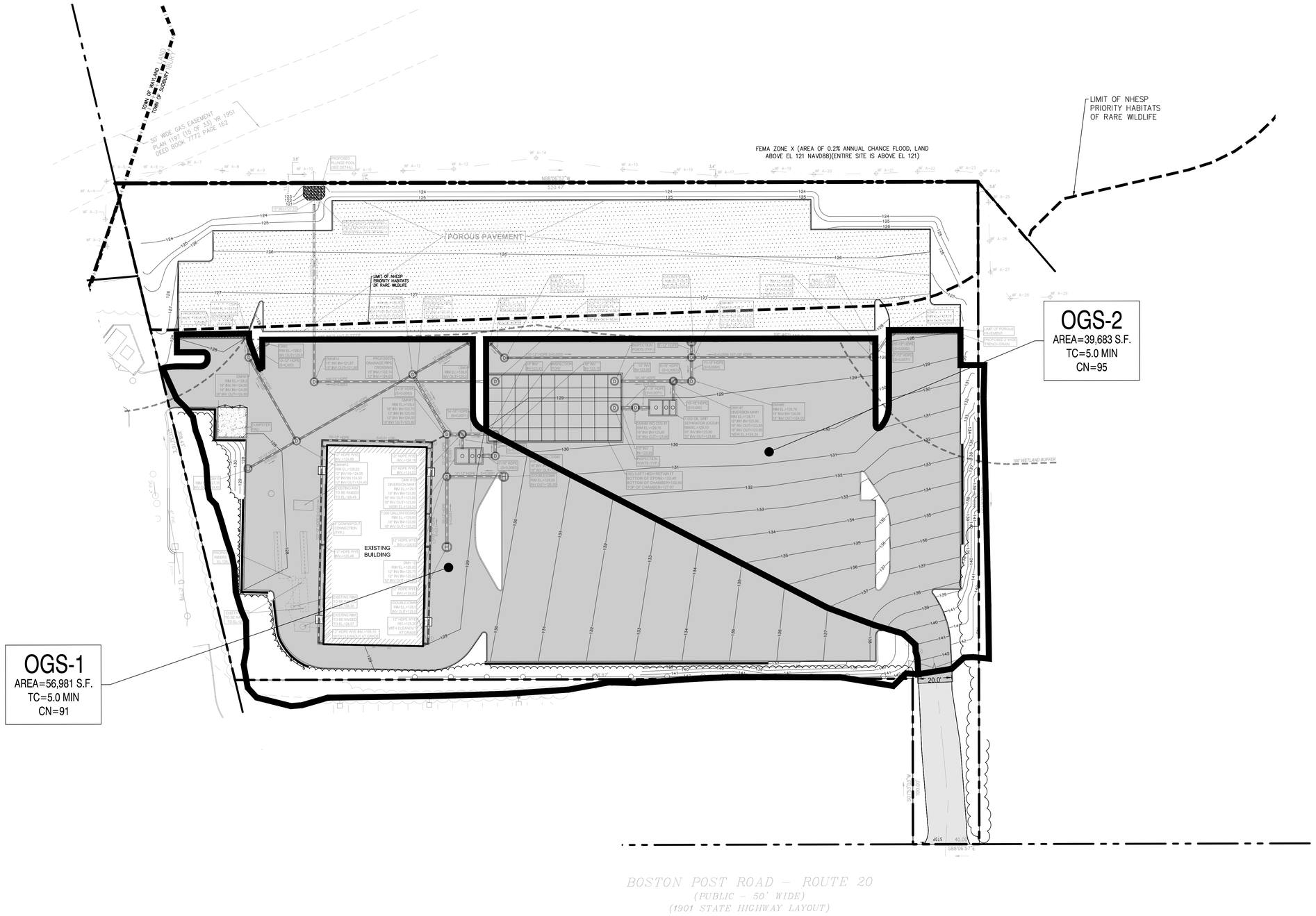
Basin / WQ structure	Tributary Area (acres)	Tributary Area (sq miles)	Pervious (sf)	Impervious %	CN Value (Estimated)	WQV (In)	Tc (min)	qu (csm/in)	WQF = qu A Q (cfs)	Unit	REQUIRED VOLUME FOR OGS IN FIRST CHAMBER 400 cf / AC of imperv (GAL)	PROPOSED OIL/GRIT UNIT SIZE (GAL)
OSG-1	1.07	0.0017	8,655	81%	91	1.00	5	795	1.08		2607.0	7,000
OSG-2	0.96	0.0015	3,537	92%	95	1.00	5	795	1.09		2629.4	7,000
WQ-CDS #1	1.07	0.0017	8,665	81%	91	1.00	5	795	1.08	SC-6		
WQ-CDS #2	0.96	0.0015	3,537	92%	95	1.00	5	795	1.09	SC-6		

*Based on MASS DEP: The pool storage in the first chamber of the Oil/Grit has to accommodate 400 cubic feet per acre of impervious surface.
First chamber is considered, at minimum, half of storage volume of the entire structure
formula used is : IMPERVIOUS (AC) X 400 (CF) X 7.48 to get the minimum storage volume in the FIRST CHAMBER of Oil/Grit structure

There is an existing 12-inch RCP drainage pipe that discharges near the BVW to the south of the site. In its existing state, the 12-inch RCP pipe appears to discharge roof runoff from the existing buildings, and the resto of the site overland flows towards the wetland without treatment or attenuation. The applicant is proposing to replace this outlet with a 15-inch HDPE pipe and install a flared end section and properly sized riprap scour hole. Before discharging from the pipe, stormwater will be collected by deep sump catch basins, and then entering an offline treatment system that includes an oil/grit separator, a diversion manhole, a proprietary treatment unit and an underground detention chamber system.

The diversion manhole will have a weir elevation that will direct the water quality flow into the CDS unit. The larger flows will pass over the weir. The elevation of the weir was calculated using the Manning's equation. Please see the following spread sheet for the calculation. A flow of 1.08-1.09 CFS in an 18" RCP pipe with a slope of 0.5% will develop a water depth in the pipe of approximate 4.7 inches. The weir elevation is proposed to be 4.7 inches higher than the invert in to ensure that the 1" WQV is treated in the Oil/Grit Separator and the proprietary treatment unit. The water quality calculated flow was used to size the unit. The SciClone, model SC-6, by BioClean is the proposed proprietary treatment device.

The SciClone Hydrodynamic Separator by BioClean Environmental Services, Inc. applied for and was granted a 50% TSS removal rate which has been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and certified by the New Jersey Department of Environmental Protection (NJDEP). In fact, the testing report, which is enclosed in this section, provides a removal efficiency of 65%. NJDEP only certifies for 50% and 80%; however, the testing completed by NJCAT resulted in a removal efficiency of 65%. Please refer to page 22 of the NJCAT Certification, enclosed in this section of the report. Based on the results of the NJCAT testing, 65% was used in the TSS Treatment Calculations enclosed in Section 4.5. The units were sized per NJDEP design criteria, which is enclosed.



40 20 0 40 80

Date	Description	No.

Revisions

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-919-0808

Project
105 BOSTON POST ROAD
SUDBURY, MA

Prepared for
HERB CHAMBERS OF SUDBURY, INC.
259 MCGRATH HWY
SOMERVILE, MA 02143

Drawing Title
PROPOSED WATER QUALITY CATCHMENT AREA MAP

Project No.	100-108
Date	3/22/2021
Scale	1"=40'
Drawn By	DJN
Approved By	GC

Drawing No.
PH-3

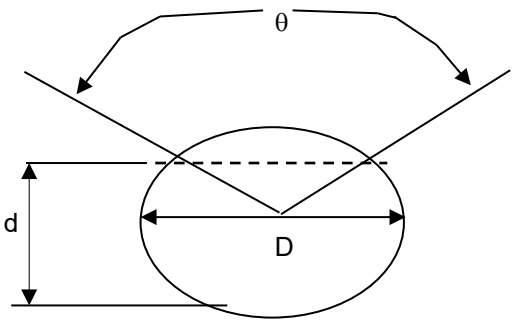
C:\CDG\Crocker Design Group, LLC\Gabriel Crocker - Projects\100-108 Sudbury - Herb Chambers Mass DOT\dwg\Plot Sheets\Site Plan Application_11 PROP WATERSHED MAP.dwg, DX-PROP WQUALITY MAP, Mar 12, 2021 13:23

MANNING'S EQUATION FOR PIPE FLOW - 18" PIPE MINIMUM SLOPE CALC FOR DVM OGS1

Project:	HERB CHAMB. PARKING LOT EX	Location:	105 BOSTON POST RD- SUDBURY
By:	MJL	Date:	1/13/2021
Chk. By:	GRC	Date:	1/13/2021

mdo version 12.8.00

Clear Data Entry Cells



INPUT

D=	12	inches
d=	5.7	inches
n=	0.013	mannings coeff
θ=	174.3	degrees
S=	0.005	slope in/in

Mannings Formula

$Q=(1.486/n)AR_h^{2/3}S^{1/2}$

R=A/P

A=cross sectional area

P=wetted perimeter

S=slope of channel

n=Manning's roughness coefficient

$V=(1.49/n)R_h^{2/3}S^{1/2}$

Q=V x A

Area,ft^2	Wetted Perimeter, ft	Hydraulic Radius, ft	Solution to Mannings Equation: velocity ft/s	flow, cfs
0.37	1.52	0.24	3.14	1.15

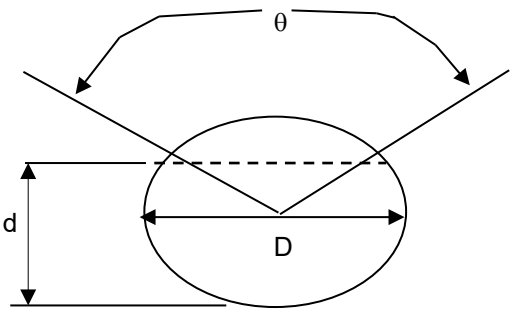
Manning's n-values	
PVC	0.01
PE (<9"dia)	0.015
PE (>12"dia)	0.02
PE(9-12"dia)	0.017
CMP	0.025
ADS N12	0.012
HCMP	0.023
Conc	0.013

MANNING'S EQUATION FOR PIPE FLOW - 18" PIPE MINIMUM SLOPE CALC FOR DVM OGS2

Project:	HERB CHAMB. PARKING LOT EX	Location:	105 BOSTON POST RD- SUDBURY
By:	MJL	Date:	1/13/2021
Chk. By:	GRC	Date:	1/13/2021

mdo version 12.8.00

Clear Data Entry Cells



INPUT

D=	18	inches
d=	4.7	inches
n=	0.013	mannings coeff
θ=	122.9	degrees
S=	0.005	slope in/in

Mannings Formula

$Q=(1.486/n)AR_h^{2/3}S^{1/2}$

R=A/P

A=cross sectional area

P=wetted perimeter

S=slope of channel

n=Manning's roughness coefficient

$V=(1.49/n)R_h^{2/3}S^{1/2}$

Q=V x A

Area,ft^2	Wetted Perimeter, ft	Hydraulic Radius, ft	Solution to Mannings Equation: velocity ft/s	flow, cfs
0.37	1.61	0.23	3.02	1.11

Manning's n-values	
PVC	0.01
PE (<9"dia)	0.015
PE (>12"dia)	0.02
PE(9-12"dia)	0.017
CMP	0.025
ADS N12	0.012
HCMP	0.023
Conc	0.013

KIM GUADAGNO

CHRIS CHRISTIE
Governor

Lt. Governor

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
401-02B
Post Office Box 420
Trenton, New Jersey 08625-0420
609-633-7021 Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bnpc_home.htm

BOB MARTIN
Commissioner

December 21, 2017

Zachariha J. Kent
Director of Research & Development
BioClean Environmental Services, Inc.
P O Box 869
Oceanside, CA 92049

Re: MTD Lab Certification
SciClone™ Hydrodynamic Separator by BioClean Environmental Services, Inc.
On-line Installation

TSS Removal Rate 50%

Dear Mr. Kent:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7 (c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). BioClean Environmental Services, Inc. has requested an MTD Laboratory Certification for the SciClone™ Hydrodynamic Separator (SciClone).

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated December 2017) for this device is published online at http://www.njcat.org/verification-process/technology-verification-database.html.

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The NJDEP certifies the use of the SciClone by BioClean Environmental Services, Inc. at a TSS removal rate of 50% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5.

2. The SciClone shall be installed using the same configuration reviewed by NJCAT and shall be sized in accordance with the criteria specified in item 6 below.

3. This SciClone cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the SciClone. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at http://www.biocleanenvironmental.com/wp-content/uploads/2017/07/Operations-Maintenance-SciClone-1.pdf for any changes to the maintenance requirements.

6. Sizing Requirement:

   The example below demonstrates the sizing procedure for the SciClone:

   Example: A 0.25-acre impervious site is to be treated to 50% TSS removal using a SciClone. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

   Maximum Treatment Flow Rate (MTFR) Evaluation:

   The site runoff (Q) was based on the following:
   time of concentration = 10 minutes
   i = 3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
   c = 0.99 (runoff coefficient for impervious)
   Q = ciA = 0.99 x 3.2 x 0.25 = 0.79 cfs

   Given the site runoff is 0.79 cfs and based on Table 1 below, the SciClone Model SC-5 with a MTFR of 1.09 cfs could be used for this site to remove 50% of the TSS from the impervious area without exceeding the MTFR.

   The sizing table corresponding to the available system models is noted below. Additional specifications regarding each model can be found in the Verification Appendix under Tables A-1 and A-2.

Table 1 SciClone Sizing Information

SciClone Model	Maximum Treatment Flow Rate (cfs)	Treatment Area (ft^2)	Hydraulic Loading Rate (gpm/ft^2)	50% Maximum Sediment Storage (ft^3)
SC-3	0.39	7.1	25	5.3
SC-4	0.70	12.6	25	9.4
SC-5	1.09	19.6	25	14.7
SC-6	1.57	28.3	25	21.2
SC-7	2.14	38.5	25	28.9
SC-8	2.80	50.2	25	37.7
SC-9	3.54	63.6	25	47.7
SC-10	4.37	78.5	25	58.9
SC-11	5.29	95.0	25	71.2
SC-12	6.30	113.0	25	84.8
SC-13	7.39	132.7	25	99.5
SC-14	8.57	153.9	25	115.4

A detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Mr. Shashi Nayak of my office at (609) 633-7021.

Sincerely,

James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP - DLUR
Ravi Patraju, NJDEP - BES
Gabriel Mahon, NJDEP - BNPC
Shashi Nayak, NJDEP - BNPC

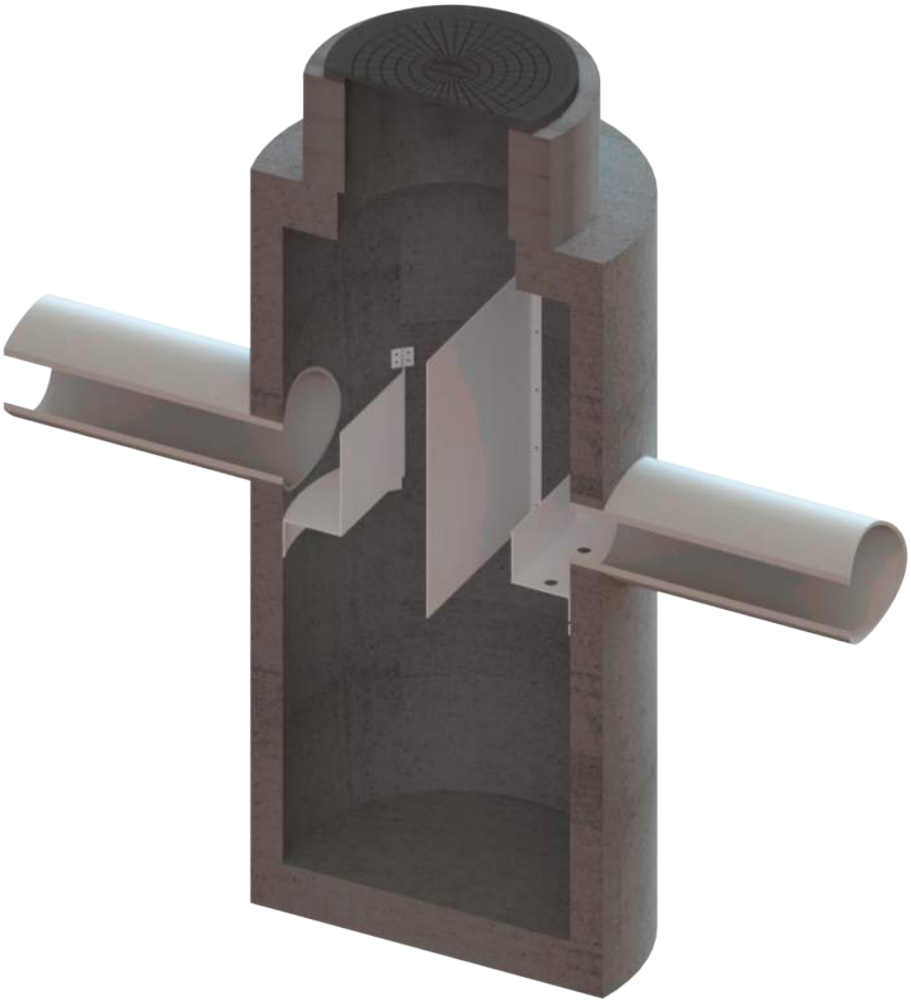
SciCLONE™

Hydrodynamic Separation

Bio Clean

A Forterra Company

OPERATION & MAINTENANCE



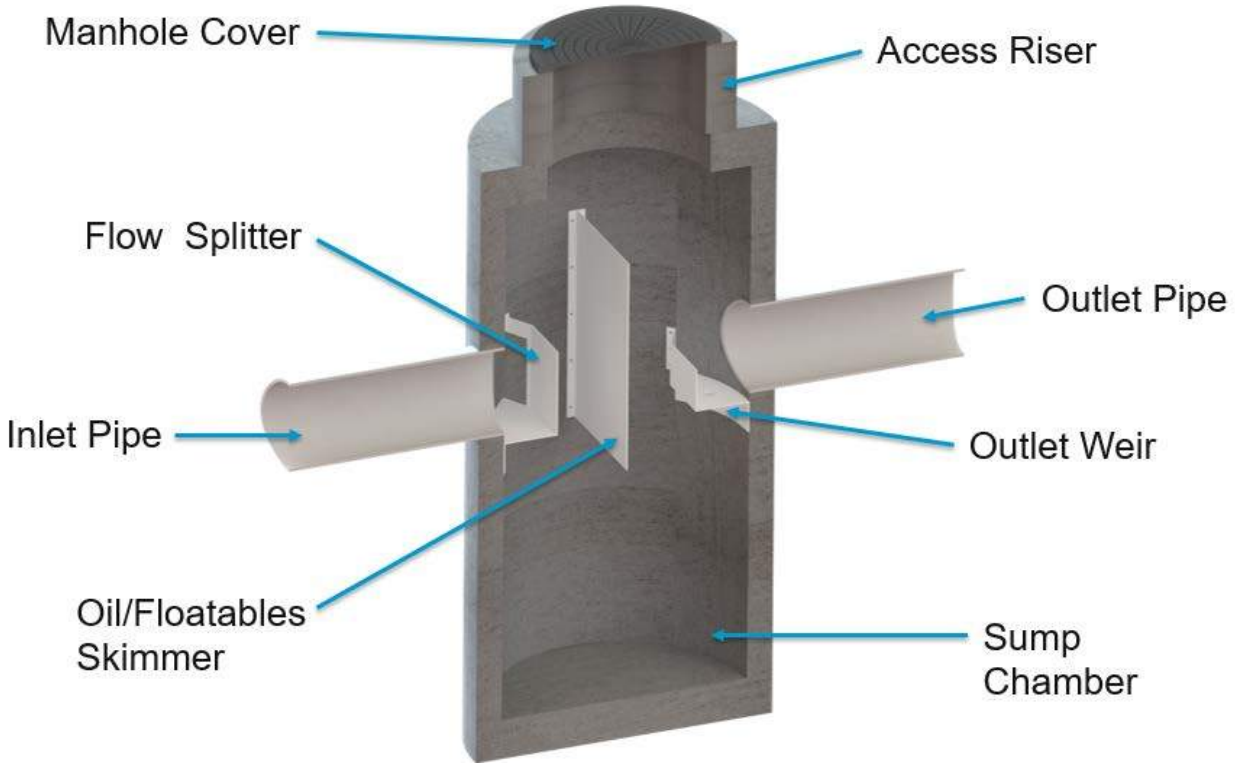
Bio Clean Environmental Services, Inc.
398 Via El Centro
Oceanside, CA 92058

www.BioCleanEnvironmental.com
p: 760.433.7640
f: 760.433.3176

OPERATION & MAINTENANCE

The SciCLONE™ Hydrodynamic Separator is designed to remove high levels of trash, debris, sediments and hydrocarbons. Its efficient design and construction maximize longevity and minimize maintenance requirements. The simple design of the system allows for unimpeded access for quick and easy maintenance. The SciCLONE™ is able to effectively capture and store sediment with no maintenance or loss of treatment capacity for a several years based on annual average loading in most regions.

Yet, as with all stormwater BMPs inspection and maintenance on the SciCLONE™ Hydrodynamic Separator is necessary. Stormwater regulations require that all BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the SciCLONE™ Separator:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Flashlight.
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Measuring pole and/or tape measure.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the SciCLONE™ Separator are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The SciCLONE™ Separator can be inspected though visual observation without entry into the system. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and near-by pedestrians from any dangers associated with an open access hatch or manhole. Once these access covers have been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the system through the access hatches. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the system.
- Look for any out of the ordinary obstructions in the inflow pipe, sump chamber, or outflow pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of floatable debris accumulated on the influent side of the oil/floatables skimmer. Record this information on the inspection form. Next utilizing a tape measure or measuring stick estimate the amount of sediment accumulated in the sump. Record this depth on the inspection form.

- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the system or its inlet or outlet.
- Excessive accumulation of floatable in the sump chambers in which the length and width of the chambers behind oil/floatables skimmer is fully impacted extending down more than 9”.
- Excessive accumulation of sediment in the sump chamber of more than 18” in depth.

Maintenance Equipment

It is recommended that a vacuum truck be utilized to minimize the time required to maintain the SciCLONE™ Separator:

- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Flashlight.
- Manhole hook or appropriate tools to access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system.
- Vacuum truck (with pressure washer attachment preferred).

Maintenance Procedures

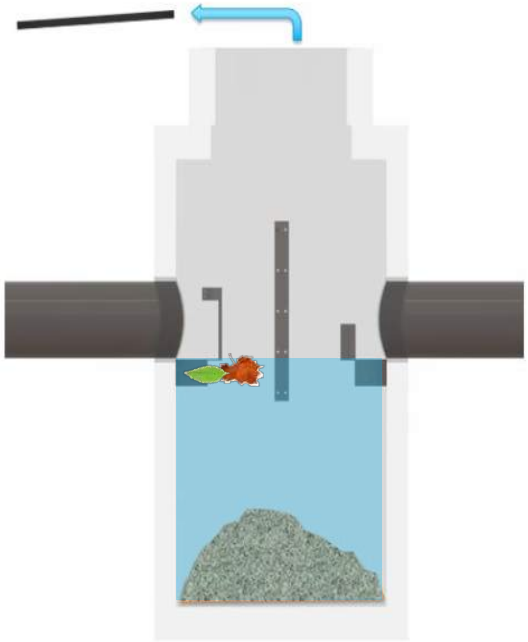
It is recommended that maintenance occurs at least three days after the most recent rain event to allow for drain down of any associated upstream detention systems. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the sump chamber can be performed from finish surface without entry into the vault utilizing a vacuum truck. Once all safety measures have been set up cleaning of the sump chamber can proceed as followed:

- Remove all access hatches (requires traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck position the hose over the opened access hatch and lower into the center of the sump chamber on the inlet side of the oil/floatables skimmer.

Remove all floating debris, standing water and sediment from the sump chamber. Access to the bottom of the sump chamber is unimpeded. The vac hose can be moved from side-to-side to fully remove sediments at the corners. A power washer can be used to assist if sediments have become hardened and stuck to the walls or the floor of the chamber. Repeat the same procedure on the effluent side of the oil/floatables skimmer to remove any remaining sediment. This completes the maintenance procedure required on the sump chamber and the SciCLONE™ Separator.

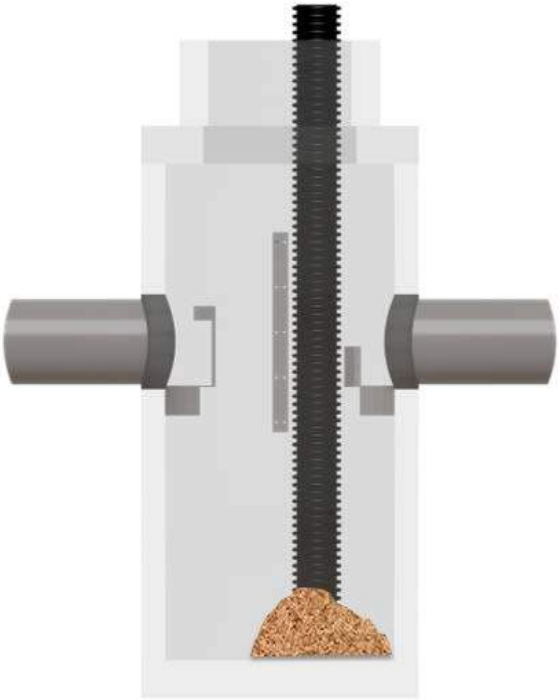
- The last step is to close up and replace all access hatches and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered by the manufacture.

Maintenance Sequence

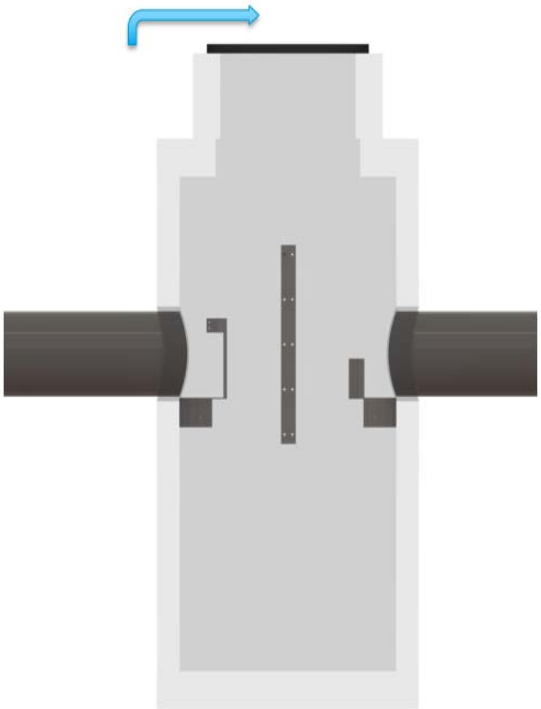


Remove Access Hatches Set Up Vacuum Truck to Clean the Sump Chamber.

Insert Vacuum Hose On the Inlet Side of the Oil/Floatables Skimmer and Vacuum Out All Trash, Sediment and Standing Water.



Insert Vacuum Hose On the Outlet Side of the Oil/Floatables Skimmer and Vacuum Out Any Remaining Sediment.



Replace Access Hatches and Remove Traffic Control and Safety Equipment.

For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email: info@biocleanenvironmental.com

Inspection and Maintenance Report
Bio Clean SciCLONE™ Separator

Bio Clean
A Forterra Company

SciCLONE™

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/_____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Stor Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Vault	Model #	Oils and Floatables Accumilation on Inlet Side of Oil/Floatables Skimmers (lbs)	Sediment Accumulation In Sump Chamber (lbs) & Depth (inches)	Structural Notes	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:					
	Lat: Long:					
	Lat: Long:					

Comments:

398 Via El Centro, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

KIM GUADAGNO

CHRIS CHRISTIE
Governor

Lt. Governor

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
401-02B
Post Office Box 420
Trenton, New Jersey 08625-0420
609-633-7021 Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bnpc_home.htm

BOB MARTIN
Commissioner

December 21, 2017

Zachariha J. Kent
Director of Research & Development
BioClean Environmental Services, Inc.
P O Box 869
Oceanside, CA 92049

Re: MTD Lab Certification
SciClone™ Hydrodynamic Separator by BioClean Environmental Services, Inc.
On-line Installation

TSS Removal Rate 50%

Dear Mr. Kent:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7 (c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). BioClean Environmental Services, Inc. has requested an MTD Laboratory Certification for the SciClone™ Hydrodynamic Separator (SciClone).

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated December 2017) for this device is published online at http://www.njcat.org/verification-process/technology-verification-database.html.

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The NJDEP certifies the use of the SciClone by BioClean Environmental Services, Inc. at a TSS removal rate of 50% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5.

2. The SciClone shall be installed using the same configuration reviewed by NJCAT and shall be sized in accordance with the criteria specified in item 6 below.

3. This SciClone cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the SciClone. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at http://www.biocleanenvironmental.com/wp-content/uploads/2017/07/Operations-Maintenance-SciClone-1.pdf for any changes to the maintenance requirements.

6. Sizing Requirement:

   The example below demonstrates the sizing procedure for the SciClone:

   Example: A 0.25-acre impervious site is to be treated to 50% TSS removal using a SciClone. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

   Maximum Treatment Flow Rate (MTFR) Evaluation:

   The site runoff (Q) was based on the following:
   time of concentration = 10 minutes
   i = 3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
   c = 0.99 (runoff coefficient for impervious)
   Q = ciA = 0.99 x 3.2 x 0.25 = 0.79 cfs

   Given the site runoff is 0.79 cfs and based on Table 1 below, the SciClone Model SC-5 with a MTFR of 1.09 cfs could be used for this site to remove 50% of the TSS from the impervious area without exceeding the MTFR.

   The sizing table corresponding to the available system models is noted below. Additional specifications regarding each model can be found in the Verification Appendix under Tables A-1 and A-2.

Table 1 SciClone Sizing Information

SciClone Model	Maximum Treatment Flow Rate (cfs)	Treatment Area (ft^2)	Hydraulic Loading Rate (gpm/ft^2)	50% Maximum Sediment Storage (ft^3)
SC-3	0.39	7.1	25	5.3
SC-4	0.70	12.6	25	9.4
SC-5	1.09	19.6	25	14.7
SC-6	1.57	28.3	25	21.2
SC-7	2.14	38.5	25	28.9
SC-8	2.80	50.2	25	37.7
SC-9	3.54	63.6	25	47.7
SC-10	4.37	78.5	25	58.9
SC-11	5.29	95.0	25	71.2
SC-12	6.30	113.0	25	84.8
SC-13	7.39	132.7	25	99.5
SC-14	8.57	153.9	25	115.4

A detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Mr. Shashi Nayak of my office at (609) 633-7021.

Sincerely,

James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP - DLUR
Ravi Patraju, NJDEP - BES
Gabriel Mahon, NJDEP - BNPC
Shashi Nayak, NJDEP - BNPC

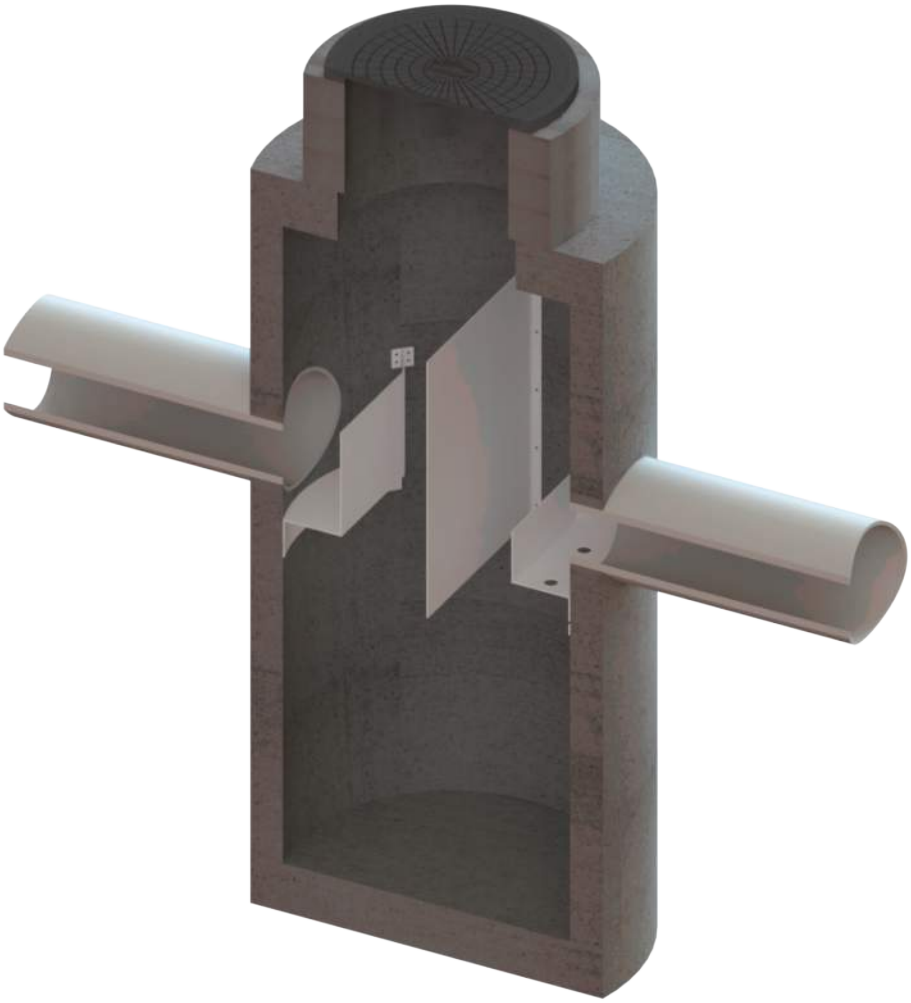
SciCLONE™

Hydrodynamic Separation

Bio Clean

A Forterra Company

OPERATION & MAINTENANCE



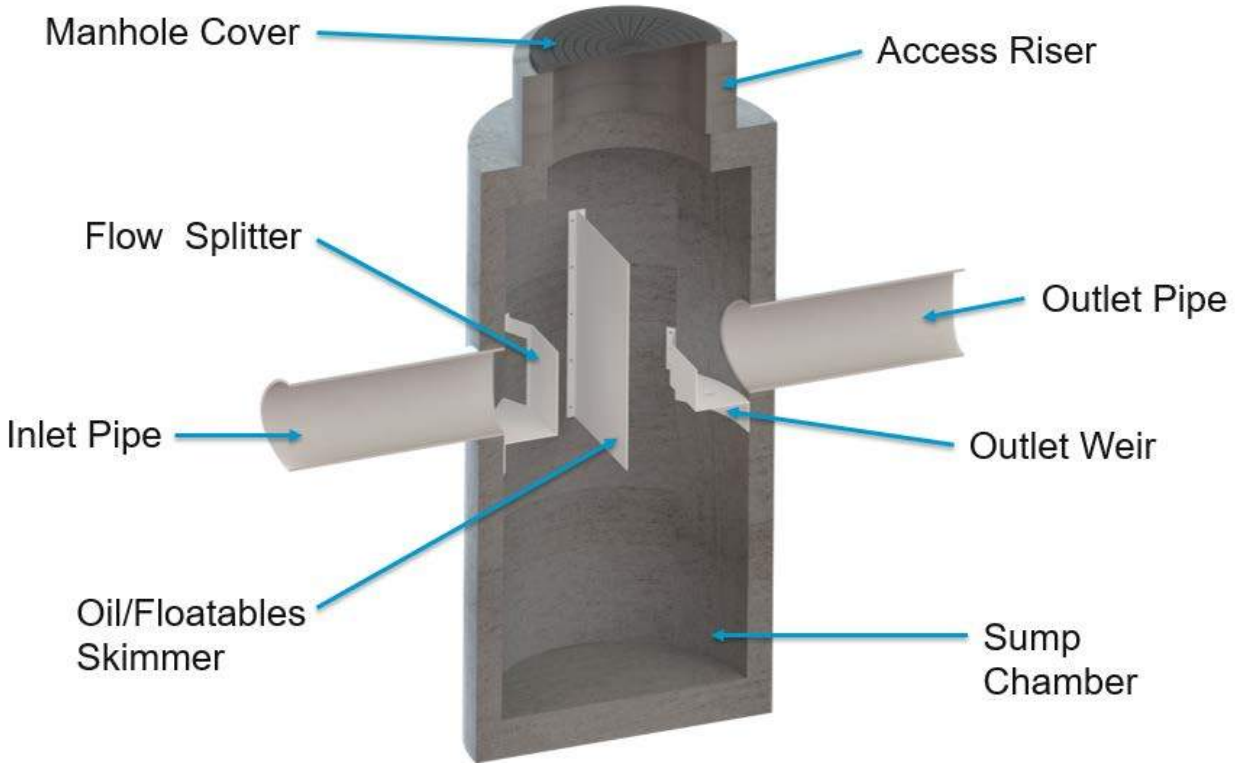
Bio Clean Environmental Services, Inc.
398 Via El Centro
Oceanside, CA 92058

www.BioCleanEnvironmental.com
p: 760.433.7640
f: 760.433.3176

OPERATION & MAINTENANCE

The SciCLONE™ Hydrodynamic Separator is designed to remove high levels of trash, debris, sediments and hydrocarbons. Its efficient design and construction maximize longevity and minimize maintenance requirements. The simple design of the system allows for unimpeded access for quick and easy maintenance. The SciCLONE™ is able to effectively capture and store sediment with no maintenance or loss of treatment capacity for a several years based on annual average loading in most regions.

Yet, as with all stormwater BMPs inspection and maintenance on the SciCLONE™ Hydrodynamic Separator is necessary. Stormwater regulations require that all BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the SciCLONE™ Separator:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Flashlight.
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Measuring pole and/or tape measure.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the SciCLONE™ Separator are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The SciCLONE™ Separator can be inspected though visual observation without entry into the system. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and near-by pedestrians from any dangers associated with an open access hatch or manhole. Once these access covers have been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the system through the access hatches. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the system.
- Look for any out of the ordinary obstructions in the inflow pipe, sump chamber, or outflow pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of floatable debris accumulated on the influent side of the oil/floatables skimmer. Record this information on the inspection form. Next utilizing a tape measure or measuring stick estimate the amount of sediment accumulated in the sump. Record this depth on the inspection form.

- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the system or its inlet or outlet.
- Excessive accumulation of floatable in the sump chambers in which the length and width of the chambers behind oil/floatables skimmer is fully impacted extending down more than 9”.
- Excessive accumulation of sediment in the sump chamber of more than 18” in depth.

Maintenance Equipment

It is recommended that a vacuum truck be utilized to minimize the time required to maintain the SciCLONE™ Separator:

- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Flashlight.
- Manhole hook or appropriate tools to access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system.
- Vacuum truck (with pressure washer attachment preferred).

Maintenance Procedures

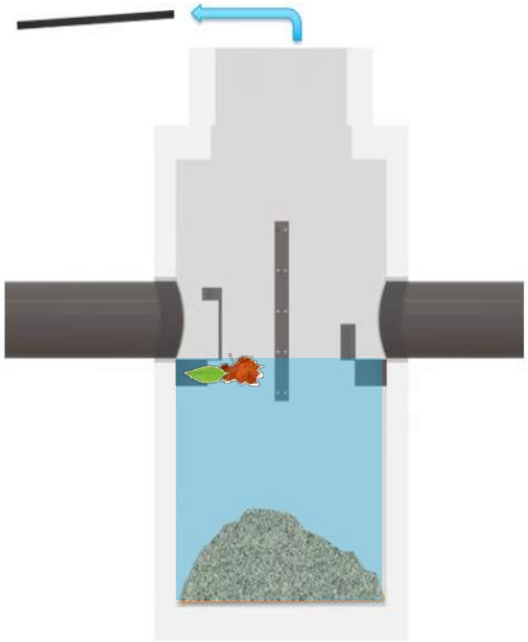
It is recommended that maintenance occurs at least three days after the most recent rain event to allow for drain down of any associated upstream detention systems. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the sump chamber can be performed from finish surface without entry into the vault utilizing a vacuum truck. Once all safety measures have been set up cleaning of the sump chamber can proceed as followed:

- Remove all access hatches (requires traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck position the hose over the opened access hatch and lower into the center of the sump chamber on the inlet side of the oil/floatables skimmer.

Remove all floating debris, standing water and sediment from the sump chamber. Access to the bottom of the sump chamber is unimpeded. The vac hose can be moved from side-to-side to fully remove sediments at the corners. A power washer can be used to assist if sediments have become hardened and stuck to the walls or the floor of the chamber. Repeat the same procedure on the effluent side of the oil/floatables skimmer to remove any remaining sediment. This completes the maintenance procedure required on the sump chamber and the SciCLONE™ Separator.

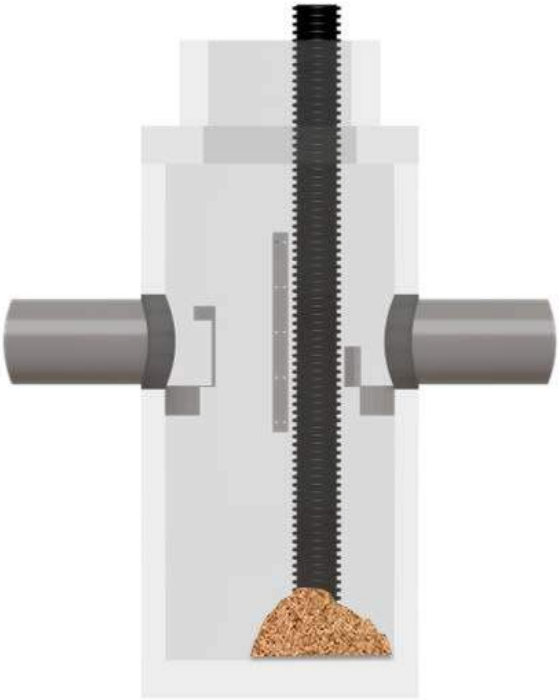
- The last step is to close up and replace all access hatches and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered by the manufacture.

Maintenance Sequence

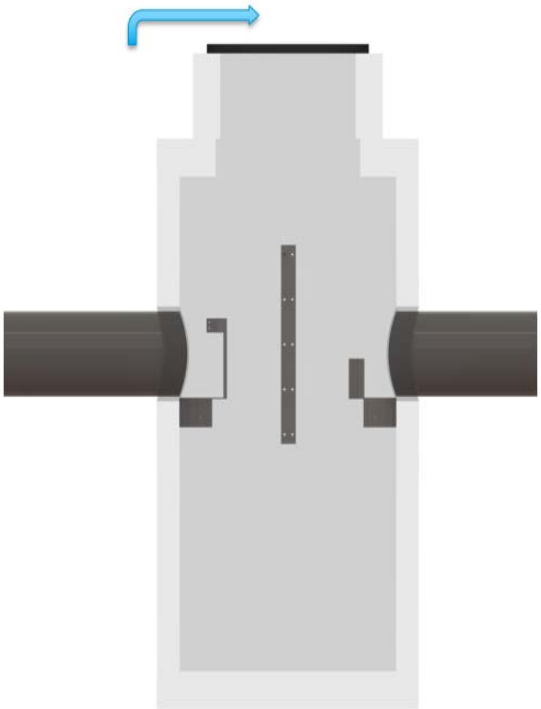


Remove Access Hatches Set Up Vacuum Truck to Clean the Sump Chamber.

Insert Vacuum Hose On the Inlet Side of the Oil/Floatables Skimmer and Vacuum Out All Trash, Sediment and Standing Water.



Insert Vacuum Hose On the Outlet Side of the Oil/Floatables Skimmer and Vacuum Out Any Remaining Sediment.



Replace Access Hatches and Remove Traffic Control and Safety Equipment.

For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email: info@biocleanenvironmental.com

Inspection and Maintenance Report
Bio Clean SciCLONE™ Separator

Bio Clean
A Forterra Company

SciCLONE™

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/_____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Stor Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Vault	Model #	Oils and Floatables Accumilation on Inlet Side of Oil/Floatables Skimmers (lbs)	Sediment Accumulation In Sump Chamber (lbs) & Depth (inches)	Structural Notes	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:					
	Lat: Long:					
	Lat: Long:					

Comments:

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4.4 RIP RAP SPLASH PAD

Rip rap splash pads are designed to dissipate energy, prevent scour at the stormwater outlet, and minimize the potential for downstream erosion. A LEVEL SPREADER / PLUNGE POOLE was sized for each of the outlets of the drainage system. The calculations below are in accordance with the methodology of the "2002 Connecticut Guidelines for Soil Erosion and Sediment Control" produced by The Connecticut Council on Soil and Water Conservation.

Preformed Scour Hole

Preformed Scour Hole Calculations										
	Q (25Y)	Do	TW	Depression	C	3Sp	B	2Sp	d50	
	(cfs)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(in.)
15" HDPE Pipe	7.00	1.0	0.30	0.50	6.00	3.00	5.00	2.00	0.55	6.65

Conclusion:

As identified above, the discharge points have been designed to accommodate and exceed the required minimum rip-rap stone sizing.

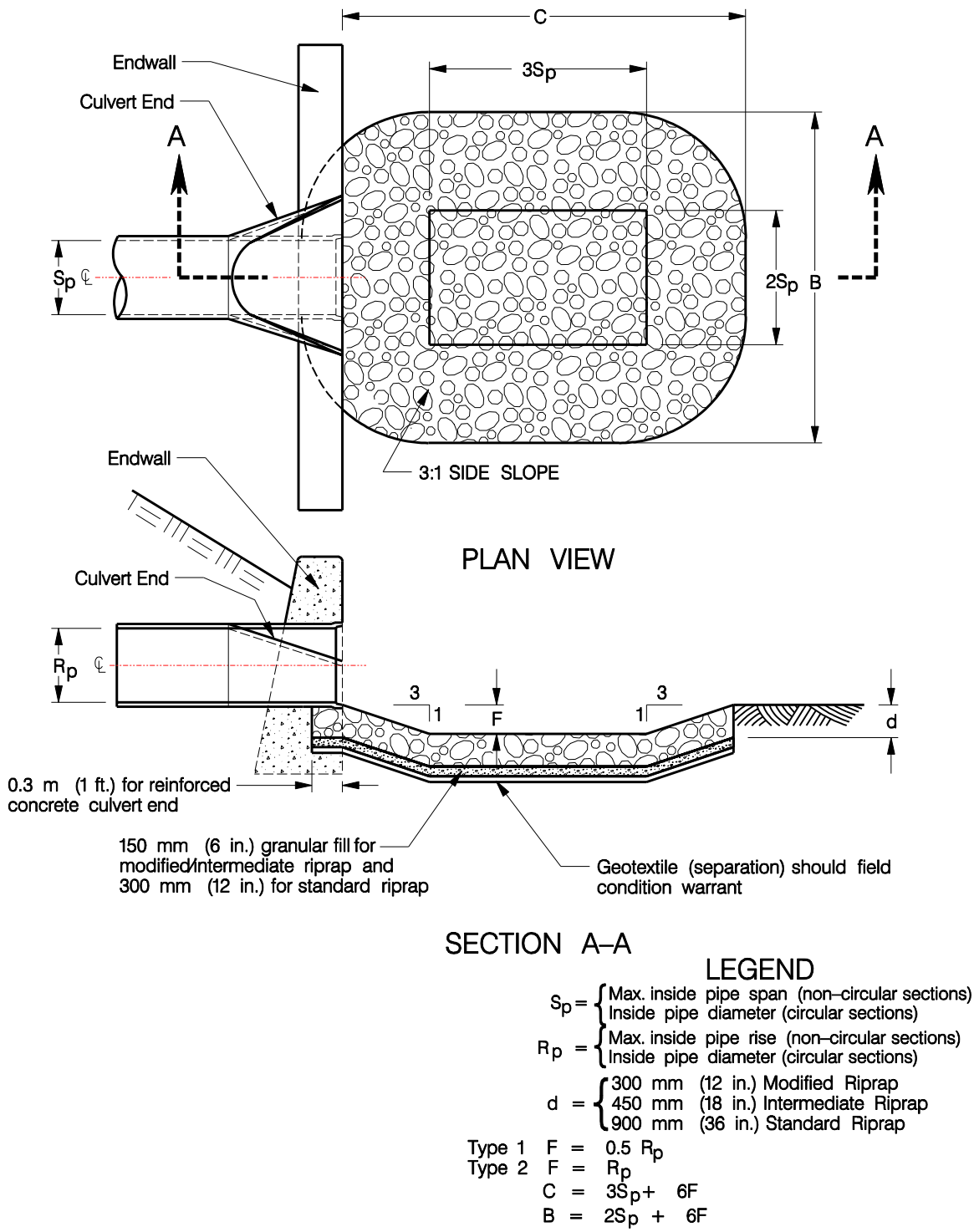


Figure 11-15 Preformed Scour Hole Type 1 and Type 2

4.5 TSS REMOVAL

The project has been designed to comply with the required 80% TSS (minimum) removal per the Massachusetts Stormwater Regulations. Various combinations of stormwater BMPs including deep sump hooded catch basins, oil/grit separators, proprietary water quality units and subsurface detention chambers are utilized.

Please refer to the attached TSS calculation sheets that follow:

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: **UNDERGROUND DETENTION BASIN UG-1 (via CB, OGS, SciClone)**

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Oil-Grit Seperator	**0.25**	**0.75**	**0.19**	**0.56**
SciClone	**0.65**	**0.56**	**0.37**	**0.20**
DET. BASIN UG-1 (Retain It System)	**0.00**	**0.00**	**0.00**	**0.20**
	0.00	**0.00**	**0.00**	**0.20**

Total TSS Removal = **80%**

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

Project: **105 BP Rd, Sudbury**

Prepared By: **MJL**

Date: **3/12/2021**

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

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: **Permeable Pavement**

TSS Removal Calculation Worksheet

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

Total TSS Removal = **80%**

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

Project: **105 BP Rd, Sudbury**

Prepared By: **MJL**

Date: **3/12/2021**

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

SECTION 5 – LONG TERM OPERATION & MAINTENANCE

LONG-TERM STORMWATER OPERATION & MAINTENANCE PLAN

HERB CHAMBERS OF SUDBURY, INC.

105 BOSTON POST ROAD
SUDBURY, MA 01776

PROJECT OVERVIEW:

The proposed project consists of the construction of an inventory lot for the Herb Chambers of Sudbury, Inc. at the former MA DOT site in Sudbury, Massachusetts. Proposed work also includes the renovation of the existing 2-story metal structure to a vehicle service building, as well as designated parking for employees and vehicle service customers. The project has been designed to comply with the Massachusetts Stormwater Management Regulations.

Appended to this document is a sample maintenance form and a chart describing the anticipated frequency of tasks.

OWNER AND RESPONSIBLE PARTY:

Current Land Owners:
Herb Chambers 83 Boston Post
83 Boston Post Road
Sudbury, MA 01776

Proposed Site Contractor:
TBD

For any service beyond the service ability of staff on site for Herb Chambers, there will be subcontracting to the appropriate vendors such as street sweeping, catch basin and water quality unit cleaning, etc.

CONSTRUCTION MANAGEMENT:

A construction manager with adequate knowledge and experience on projects of similar size and scope shall be employed to oversee all site work related construction. The contractor shall incorporate the appropriate techniques to control sediment and erosion pollution during construction in accordance with the *Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas* and any conditions of approval from the local conservation commission.

Care should be taken when constructing stormwater control structures. Light earth-moving equipment shall be used to excavate in the vicinity of the infiltration areas. Use of heavy-equipment causes excessive compaction of the soils beneath the basin resulting in reduced

infiltration capacity. At no time shall temporary infiltration areas or settling basins be constructed in the vicinity of the proposed infiltration basins in order to prevent the soils from becoming clogged with sediment.

ON-GOING MAINTENANCE CONTRACT

The non-structural and structural approaches recommended below, as well as the required BMP maintenance, will be completed by the selected contractor. In Adequate personnel with appropriate training and access to proper equipment will be available to complete the tasks. Future responsible parties must be notified of their responsibility to operate and maintain the system in perpetuity.

MAINTENANCE LOG

The Responsible Party shall develop and maintain a log of inspections, maintenance, repairs, and disposal (including location of disposal) during the life of the project. Records will be maintained for at least 3 years and be made available to the Massachusetts Department of Environmental Protection or the Town of Sudbury in accordance with the provisions of the Massachusetts Stormwater Handbook. A sample of such a maintenance log is provided.

STORMWATER BMP MAINTENANCE

The proposed stormwater management system has been designed with appropriate BMPs aimed at reducing the pollutants discharge based upon the intended use of the property. All BMPs require regular maintenance to function as intended. Some management measures have simple maintenance requirements; others are more involved. The Responsible Party must have all BMPs regularly inspected to ensure they are operating properly on an as needed basis, including during runoff events exceeding 0.5 inches of rainfall.

A description of the non-structural and structural approaches to be incorporated is indicated below. The following best management practices are proposed to be incorporated into the stormwater management design to reduce source runoff and improve stormwater runoff discharge quality. The Responsible Party will regularly inspect all BMPs to ensure they are operating properly. If any deficiencies are identified during these inspections, action to resolve it will be initiated and documented on the maintenance log.

STRUCTURAL BMPs

<u>Deep Sump Hooded Catch Basins and Area/Yard Drains</u>

On a regular basis the inlet pipe and outlet pipe shall be checked for debris and removed as necessary to ensure unobstructed flow of water. Inspections shall occur at least four times per year, and at the end of the foliage and snow removal seasons. Inspections shall verify the tees are secure and free flowing. Sediments must also be removed four times per year or whenever the depth of deposits is greater than or equal

to one half the depth from the bottom of the invert of the lowest pipe in the basin. Basins shall be cleaned using a vacuum pump. All liquid shall be pumped from the sump of each basin at least once per year. All sediments and hydrocarbons should be properly handled and disposed of in accordance with local, state and federal guidelines and regulations.

Oil/Grit Separators

At a minimum, oil grit separators should be inspected monthly and sediment, trash and pollutants shall be cleaned out at least twice per year. In areas of high sediment loading, inspect and clean inlets and outlets after every major storm. Basins shall be cleaned using a vacuum pump. All sediments and hydrocarbons should be properly handled and disposed of in accordance with local, state and federal guidelines and regulations.

Subsurface Detention System

The subsurface system (retain-it, 3.5' tall) has been designed with an access manhole to aid in the removal of sediment and debris. Preventative maintenance shall be performed in accordance with manufacturer's instructions, which is enclosed in this section. Retain-it suggests periodic inspections with a greater number occurring during the systems start-up to identify any issues of concern as they may arise. Cleaning will take place at the completion of construction and as deemed necessary based on the inspections. Retain-it recommends use of a vacuum truck to suction the accumulated sediment, oils and greases, and trash and debris from the system. Oils and greases may additionally be handled by on-site staff utilizing absorbent products to soak up the oils. Refer to the enclosed "retain-it Owners Maintenance Manual."

Proprietary Water Quality Units

Hydrodynamic Separators shall be maintained in accordance with the manufacturer's recommendations. Refer to the enclosed "SciClone Operation & Maintenance" guide. Typically, a vacuum truck removes accumulated sediment and oil most efficiently. See maintenance documentation from the manufacturer. Inspection should occur at least twice annually, once in the fall and then in the spring after the snow melts. Ideally the unit should be checked frequently throughout the first year, and that will dictate the schedule going forward. All sediment and hydrocarbons should be properly handled and disposed of in accordance with local, state and federal guidelines and regulations. Cleaning will take place at the completion of construction and as deemed necessary based on the inspections and manufacturer's requirements.

NON-STRUCTURAL BMPs

Pavement Sweeping

As street sweeping is a BMP under DEP guidelines, this non-structural BMP is an effective removal of Total Suspended Solids (TSS) in a comprehensive stormwater management program. Litter and debris is to be regularly picked up and removed from the pavement and porous pavers. Paved areas are to be swept a minimum of quarterly per year.

Pervious Areas and Slopes

Runoff from pervious areas and slopes shall be directed over vegetated areas to promote settlement of suspended solids before entering a wetland or resource area. Steep pervious slopes will be permanently vegetated to dissipate energy and reduce potential erosion. No constructed vegetated slopes should exceed 2H:1V. Slopes exceeding 2:1 shall be stabilized with rip-rap, jute netting or other similar measures to minimize the potential for future erosion.

Drainage Control Structures, Flared End Sections, Trash Racks, Riprap Pads, Swales, and Level Spreader Splash Pads

Basin control structures and flared end sections shall be inspected and any debris or growth surrounding or within these structures shall be removed. Any/all debris or vegetation encroaching on the control structures our outfall components shall be removed or appropriately trimmed back to maintain the designed control elevation and flow patterns/cross section without impediment. Inspection should occur twice annually, once in the fall and then in the spring after the snow melts. Cleaning will take place at the completion of construction and as deemed necessary based on the inspections and manufacturer's requirements.

Porous Pavement

Porous pavement sections on site shall be monitored annually and following any storms to ensure proper drainage and note any deterioration. The surface shall be cleaned using power washers to dislodge any trapped particles followed by a vacuum sweep of the area. Exfiltration capability shall be assessed minimum once a year and as needed if capacity is found to decline. Repair as necessary and reseed grass pavers if bare spots arise.

Pest and Insect Control

- As a first-line defense against pests/insects and weeds (the "First-Line Defense"), the party responsible for maintenance shall avoid the use of non-organic pesticides, herbicides, fungicides and insecticides unless spot treatment is required for a specific control application. The owner shall not

be required to undertake extraordinary measures or incur unreasonable cost to locate, purchase or apply non-organic products.

- If the First-Line Defense fails, as determined by the owner or party responsible for maintenance, in its sole but reasonable discretion, non-organic approaches to pest/insect control may be used, the same to be applied by a professional licensed in the Commonwealth of Massachusetts, where required. But in no event shall such non-organic approaches be used within the 50ft. buffer zone to the wetlands, or within the Zone A.

Waste Management

Solid waste and recycling will be contained in dumpsters for routine and regular trash pickup.

Snow Removal

There shall be no plowing of stockpiling of snow within any resource areas. Deicing compounds must be stored or sheltered on impervious pads (i.e. in the maintenance facility). No de-icing compounds shall be stored or utilized in wetland resource areas nor the 50-foot buffer. Snow that is plowed from the paved driveway surfaces shall be plowed to the edges of the pavement. When capacity of these areas is exceeded, accumulated snow shall be removed or a sector of designated trailer parking spaces shall be utilized to stockpile snow on-site. Refer to the enclosed O&M Map which identifies location of BMPs and provides additional Snow Removal information.

It is anticipated the Sudbury Conservation Commission will include a condition of approval regarding prohibition of the use of de-icing chemicals except for magnesium acetate or an alternate approved by the Commission. Refer to the Order of Conditions issued by the Commission. Further approvals may be required should the Applicant wish to propose the use of alternate deicing materials other than what is ultimately conditioned in the Order

Hazardous Waste and Spill Control Containment

In the event of a discharge or spill of oil or another hazardous material, outlets to stormwater management facilities immediately downstream of the spill shall be plugged so that hazardous materials do not enter the system. In the event of a discharge of oil or other hazardous material, responsible facility personnel shall notify the appropriate state agencies, the Town of Sudbury DPW and the EPA National Response Center 1-800-424-8802 shall be notified. All hazardous waste materials will be disposed of in a manner specified by local, state and/or federal regulations and by the manufacturer of such products.

Stormwater BMP Inspection and Maintenance Log

Facility Name	
Address	
Begin Date	End Date

Date	BMP ID#	BMP Description	Inspected by:	Cause for Inspection	Exceptions Noted	Comments and Actions Taken

Instructions: Record all inspections and maintenance for all treatment BMPs on this form. Use additional log sheets and/or attach extended comments or documentation as necessary. Submit a copy of the completed log with the annual independent inspectors' report to the municipality and start a new log at that time.

BMP ID# — Always use ID# from the Operation and Maintenance Manual.

Inspected by — Note all inspections and maintenance on this form, including the required independent annual inspection.

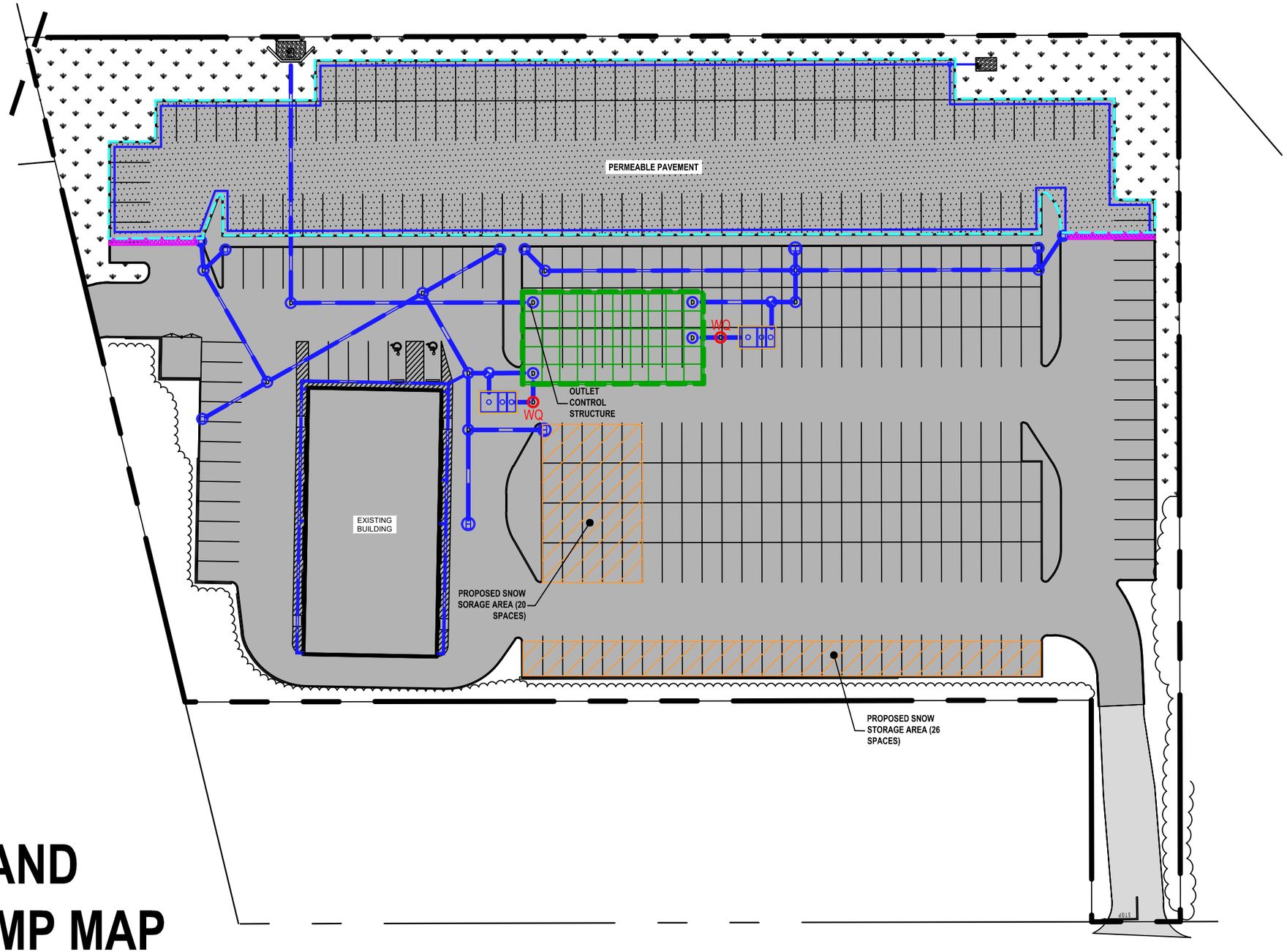
Cause for inspection — Note if the inspection is routine, pre-rainy-season, post-storm, annual, or in response to a noted problem or complaint.

Exceptions noted — Note any condition that requires correction or indicates a need for maintenance.

Comments and actions taken — Describe any maintenance done and need for follow-up.

Stormwater BMP Inspection Matrix

Conventional & LID Best Management Practices	**Inspection & Maint. Frequency**	**Erosion& Scour**	**Obstructions**	**Trash & Debris**	**Sediment Build-Up Removal**	**Vegetation Cover**	**Remove/Reset Filter Fabric & Stone As Required**	**Vac Truck Sediment & Contaminants**	**Remove/Reset Riprap as Required**
Catch Basins/Area & Yard Drains	Four times per year								
Pavement Sweeping	Four times per year								
Oil Grit Separators	Monthly								
Proprietary Water Quality Units	Twice-Annually (Spring and Fall)								
Subsurface Detention Structure	Annually								
Outlets (FES, Rip Rap Pad, Level Spreaders)	Twice-Annually (Spring and Fall)								
Permeable Pavement	Annually								



WQ SCICLONE WATER QUALITY UNIT

SUBSURFACE DETENTION SYSTEM

DRAINAGE SYSTEM

OIL/GRIT SEPARATOR

TRENCH DRAIN

SNOW STORAGE

PERMEABLE PAVEMENT

OPERATION AND MAINTENANCE BMP MAP

WAREHOUSE BUILDING

105 BOSTON POST ROAD,
SUDBURY, MA

50 25 0 50 100

SNOW STORAGE:

1. DRIVE AISLE TO BE PLOWED TO EACH EDGE OF PAVEMENT MAINTAINING MIN 20' WIDE ACCESS AT ALL TIMES
2. NO SNOW STORAGE SHALL OCCUR WITHIN WETLAND RESOURCE AREAS.

C:\CDG\Crocker Design Group, LLC\Gabriel Crocker - Projects\100-108 Sudbury - Herb Chambers Mass DOT\Permitting\Stormwater Report\5- Long-Term Pollution Prevention Plan_ O & M MAP - svp.dwg, C-3 LAYOUT OVERALL, Mar 18, 2021 14:07

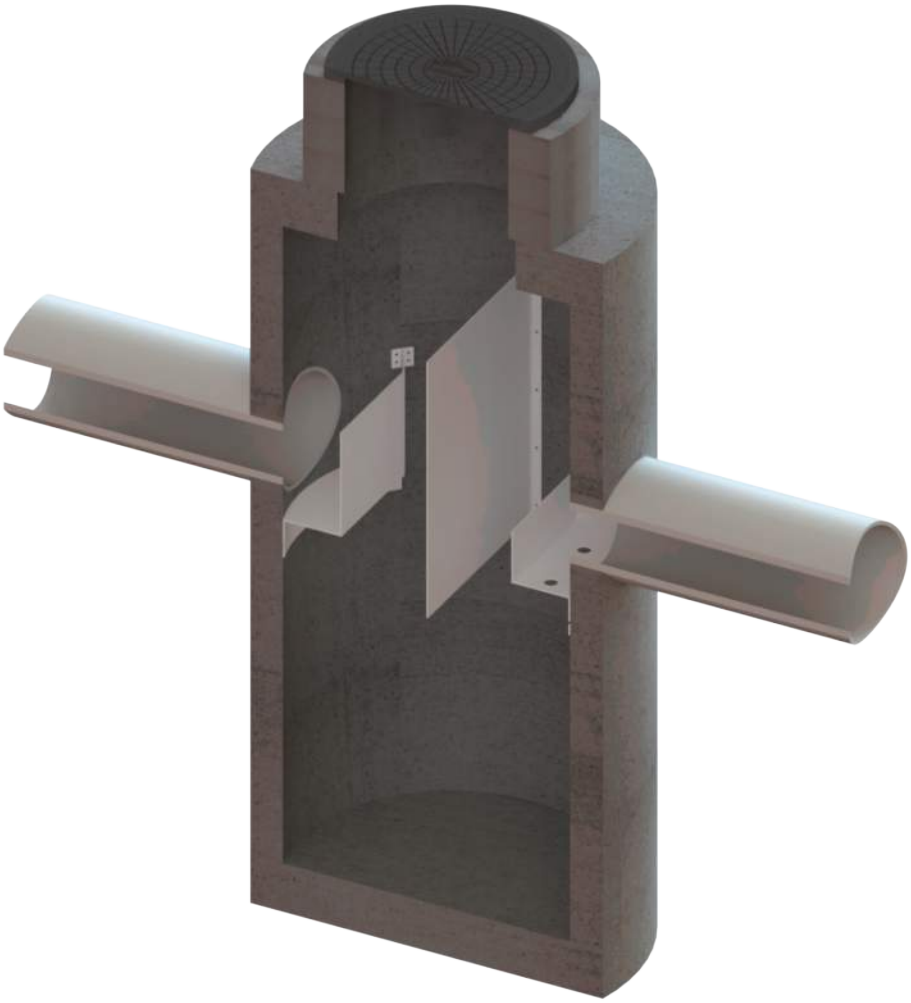
SciCLONE™

Hydrodynamic Separation

Bio Clean

A Forterra Company

OPERATION & MAINTENANCE



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Oceanside, CA 92058

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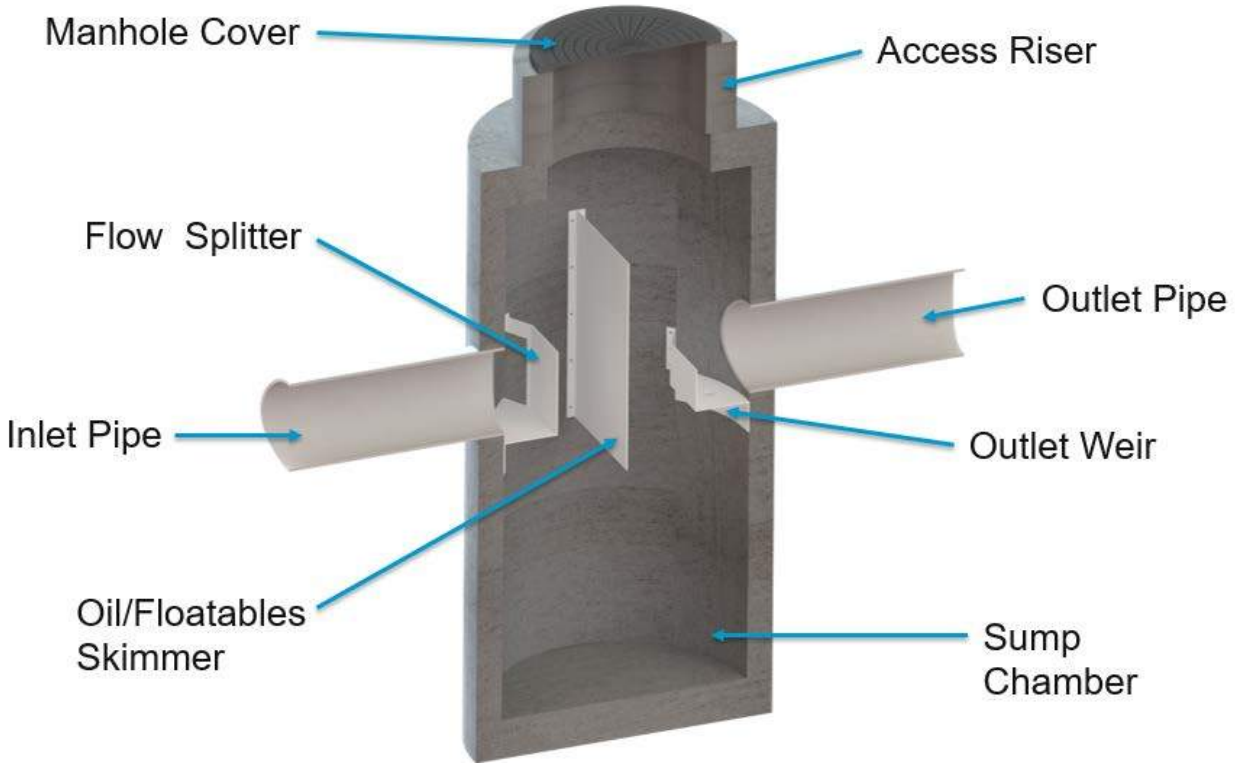
OPERATION & MAINTENANCE

The SciCLONE™ Hydrodynamic Separator is designed to remove high levels of trash, debris, sediments and hydrocarbons. Its efficient design and construction maximize longevity and minimize maintenance requirements. The simple design of the system allows for unimpeded access for quick and easy maintenance. The SciCLONE™ is able to effectively capture and store sediment with no maintenance or loss of treatment capacity for a several years based on annual average loading in most regions.

Yet, as with all stormwater BMPs inspection and maintenance on the SciCLONE™ Hydrodynamic Separator is necessary. Stormwater regulations require that all BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the SciCLONE™ Separator:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Flashlight.
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Measuring pole and/or tape measure.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the SciCLONE™ Separator are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The SciCLONE™ Separator can be inspected though visual observation without entry into the system. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and near-by pedestrians from any dangers associated with an open access hatch or manhole. Once these access covers have been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the system through the access hatches. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the system.
- Look for any out of the ordinary obstructions in the inflow pipe, sump chamber, or outflow pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of floatable debris accumulated on the influent side of the oil/floatables skimmer. Record this information on the inspection form. Next utilizing a tape measure or measuring stick estimate the amount of sediment accumulated in the sump. Record this depth on the inspection form.

- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the system or its inlet or outlet.
- Excessive accumulation of floatable in the sump chambers in which the length and width of the chambers behind oil/floatables skimmer is fully impacted extending down more than 9”.
- Excessive accumulation of sediment in the sump chamber of more than 18” in depth.

Maintenance Equipment

It is recommended that a vacuum truck be utilized to minimize the time required to maintain the SciCLONE™ Separator:

- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Flashlight.
- Manhole hook or appropriate tools to access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system.
- Vacuum truck (with pressure washer attachment preferred).

Maintenance Procedures

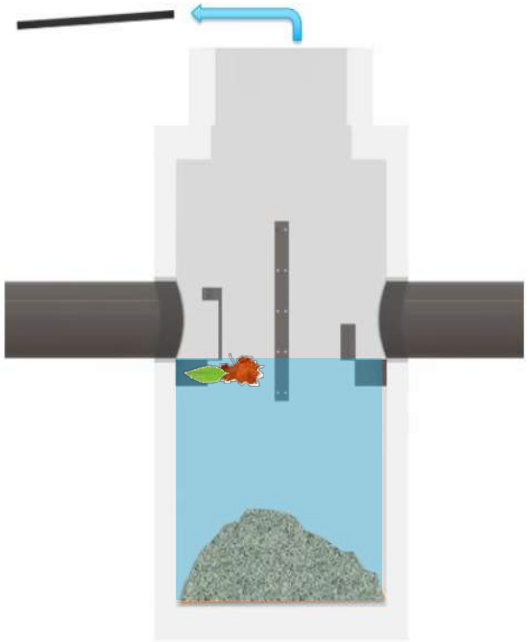
It is recommended that maintenance occurs at least three days after the most recent rain event to allow for drain down of any associated upstream detention systems. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the sump chamber can be performed from finish surface without entry into the vault utilizing a vacuum truck. Once all safety measures have been set up cleaning of the sump chamber can proceed as followed:

- Remove all access hatches (requires traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck position the hose over the opened access hatch and lower into the center of the sump chamber on the inlet side of the oil/floatables skimmer.

Remove all floating debris, standing water and sediment from the sump chamber. Access to the bottom of the sump chamber is unimpeded. The vac hose can be moved from side-to-side to fully remove sediments at the corners. A power washer can be used to assist if sediments have become hardened and stuck to the walls or the floor of the chamber. Repeat the same procedure on the effluent side of the oil/floatables skimmer to remove any remaining sediment. This completes the maintenance procedure required on the sump chamber and the SciCLONE™ Separator.

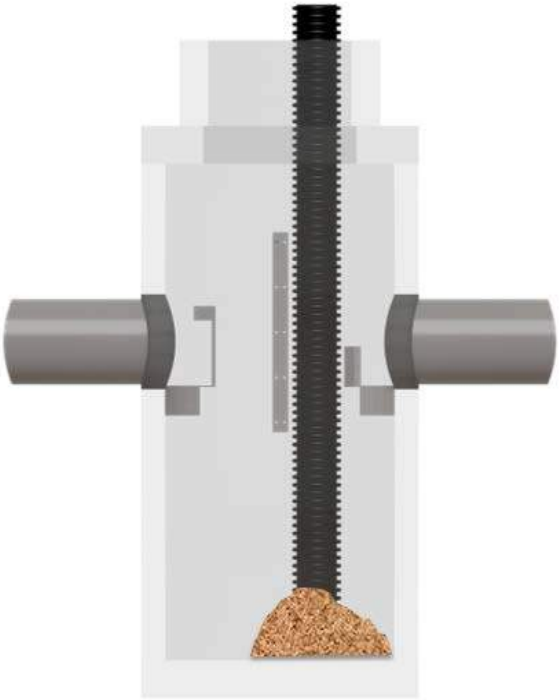
- The last step is to close up and replace all access hatches and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered by the manufacture.

Maintenance Sequence

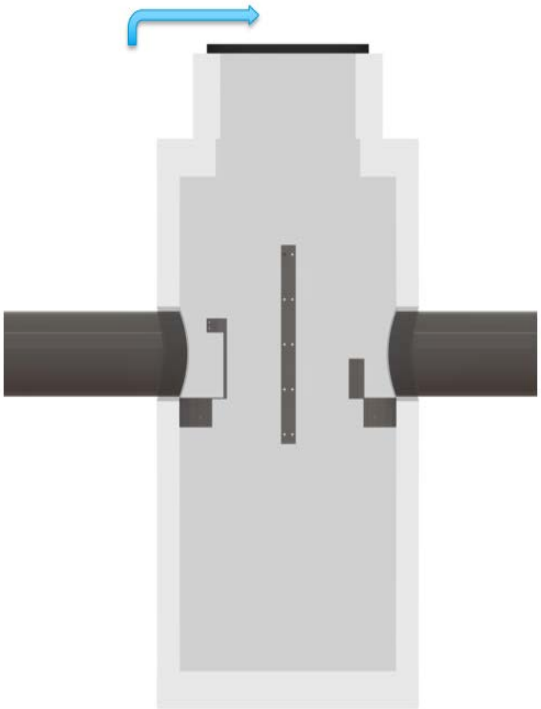


Remove Access Hatches Set Up Vacuum Truck to Clean the Sump Chamber.

Insert Vacuum Hose On the Inlet Side of the Oil/Floatables Skimmer and Vacuum Out All Trash, Sediment and Standing Water.



Insert Vacuum Hose On the Outlet Side of the Oil/Floatables Skimmer and Vacuum Out Any Remaining Sediment.



Replace Access Hatches and Remove Traffic Control and Safety Equipment.

For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email: info@biocleanenvironmental.com

Inspection and Maintenance Report
Bio Clean SciCLONE™ Separator

Bio Clean
A Forterra Company

SciCLONE™

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/_____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Stor Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Vault	Model #	Oils and Floatables Accumilation on Inlet Side of Oil/Floatables Skimmers (lbs)	Sediment Accumulation In Sump Chamber (lbs) & Depth (inches)	Structural Notes	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:					
	Lat: Long:					
	Lat: Long:					

Comments:

398 Via El Centro, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

OWNERS MAINTENANCE MANUAL

retain-it, LLC
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Granby, CT 06035
(860) 413-3050

retain-it ®

Owners Maintenance Manual

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Description

Engineering Design Specifications

Daily Operation and Long Term Maintenance
- System Operation
- Periodic Inspection
- Visual Inspection Guide
  - Internal Flow Evaluation
    - Low, Medium and High Flow
  - Pollution Storage Capacities
    - Oil and Grease
    - Sediments
    - Trash and Debris
- Standard Maintenance
- Emergency Spill Conditions

Sample Maintenance Log

Description

retain-it ® is a subsurface Storm Water Management system constructed of precast concrete structures. They are installed in a side by side configuration creating a continuous internal flow channel integrated throughout the system. Systems are constructed with designated inlet and outlet modules, some with multiple inlets and outlets depending on the site storm water system layout. Infiltration systems typically have an inlet and sidewalls/ base constructed on a stone infiltration blanket with geofabric installed at the native soil interface. Other systems incorporate outlet flow control devices. Detention systems are typically lined with a watertight membrane and have inlet and outlet control devices.

The retain-it ® system can consist of multiple varying layouts, with no two the same. Given this, it should be noted that the operation and maintenance requirements are very similar regardless of the intended layout. It is important that the end user know the specific elements of each system so as to understand how best to optimize it's operation.

Installation per Design: Operation is simple to follow where the installation was performed in accordance with the design specifications, drawings and calculations. Specifics shall be identified in the design drawings. As-built drawings will benefit the locating of specific design modules where the system has been buried below a parking lot area. Optional access manholes or removable grates may be installed above every inlet/outlet pipe and at critical design elements designated by the design.

Daily Operation and Long Term Maintenance: In general, daily usage of the system is self sufficient and will operate without requiring any outside assistance, except for periodic inspection to verify optimal performance and maintenance for removal of collected pollutants. A longer term maintenance program should incorporate a more thorough inspection of the all elements of the system to verify proper operating condition. This is more important with the infiltration type of systems where the soil infiltration surface may become restricted due to fine particle build up. Long term maintenance should include provisions for cleaning and removal of collected solids, oils and debris from the system.

System Operation: The system operational function is initiated according to rainfall runoff flows entering the structure. Internally, the runoff flows in a set pattern or sequence throughout the module layout in accordance with the hydraulic design conditions. The flows primarily operate on system head derived from the changes in

elevation from the internal water surface and the outlet invert elevation. Some designs incorporate internal flow controls to satisfy hydraulic conditions that enhance water quality treatment or other intended purposes. Modified systems may incorporate a pump, but in general there are no mechanical apparatus required.

End user operations primarily consist of inspection and maintenance of the system over time.

Periodic Inspection: Important note - All storm water management systems react differently depending on the conditions that are characteristic to the contributing water shed. Variables such as storm intensity, runoff flow rates, site geology, surface stabilization and pollution load will affect the system operation. As does the inspection and maintenance frequency to ensure optimum effectiveness.

Inspections should be done periodically, with a greater number scheduled during the system start up and less frequently as the operator becomes familiar with the system performance characteristics. It is recommended that the end user keep records of the performance using the inspection log record sheet found in the back of this manual. These records shall identify the cycle of maintenance “system calibration” required for the specific applications based on the contributing water shed variables operating under “normal” conditions.

Please note that immediate maintenance may be required during “non-normal” events such as during adverse weather conditions or emergency fuel spills. See information on emergency spills in this manual.

Visual inspection of all assessable components shall be performed throughout the lifetime of the system. Access has been supplied at critical points to monitor hydraulic performance and removed pollutants buildup.

Standard Maintenance:

After construction has been completed and all disturbed surfaces have been stabilized by means of vegetation, asphalt or concrete surfaces, and all drainage system components have been constructed and are free of construction debris and sediments; then the storm water management system can be considered in an operational status.

Periodic visual inspections will help to identify issues of concern.The usual indicators are signs of slow flows, backed up water, visible oil, trash and debris or an excessive amount of sediment in the storage area.

Normal operational flows can be observed to flow freely at the predicted design elevations, from the inlet to the outlet module, following a serpintine path thru the storage and attenuation modules. Note that some modules are designed to permanently

retain water where others may hold water and slowly release it over a typical 24 hour period. During a storm water event, the flows and water surface elevations will fluctuate from a low flow to a high flow/ storage status. The storage modules should fill during the event and drain down within a 24 hour period after the event has stopped. All pipes, orifices, weirs and standpipes should pass flows freely and at optimum capacity.

Standard maintenance is performed using a vacuum truck to suction the accumulated sediments, oils and greases and trash and debris from the system. Whereas an on-site maintenance staff can remove these items by hand, it is preferred that the vacuum truck be used as dictated by specific system conditions. When a specialized module designed to have a permanent water level is used, the vacuum truck should pump the liquid level down to inspect the below water elevation structures and sump storage areas.

Oils and greases can be handled by on-site staff by utilizing absorbent products that soak up the oils (and not) converting the oils from a liquid into a manageable solid form. These oil soaked absorbent materials should be disposed of in an approved manner.

Sediments, trash and debris shall be removed and disposed of in an approved manner.

Any indications of hazardous material, determined by visual inspection, testing, smell or abnormality, should be reported and handled per appropriate regulations.

Flow Conditions

System operators should familiarize themselves with proper hydraulic flow condition indicators, acceptable depths of sedimentation, debris and trash build up, and concentrations of oils and greases.

Hydraulic flow conditions are those that are established by the design as either a flow/storage or as a water quality treatment function. Both have performance characteristics that can be visually identified so as to determine the effective and efficient operation of the system.

The engineering design drawings should note the various expected water surface level elevations that are achieved during different design storms within the various modules. Since it is difficult for a visual inspection to coincide with the exact time given water elevations are predicted, the following guidelines are given for evaluation.

Visual Inspection Guide:

<u>Internal Flow Evaluation</u>

Low flow: water should flow freely from the inlet to the outlet, travelling the intended attenuation path thru the system with the water surface elevation below the structure

beam height (12” deep), the system should drain completely 24 hours after a storm event,

Medium flow: the system should hold and maintain a water level during the 24 hour storm event and yet continually fill as the storm increases or drain downward as the event recedes. Flow within the system should occur freely from inlet to outlet only being restricted when a flow control structure has been integrally designed in place. Flow control devices may result in a water level backing up either temporarily or permanently; noting devices such as water quality modules may require a permanent water level to operate properly (see water quality treatment). Other system applications should drain completely 24 hours after a storm event.

High flow: the system should fill to the maximum design storm water level elevation (hydraulic grade line) per design. In most cases, that is the highest storage elevation available in the system, at the underside of the module top slab, or the invert of the overflow pipe. As the storm event recedes, the water level should begin to drain down via flow thru the system and discharge. The system should drain completely within 24 hours after a storm event.

Pollutant Storage Capacities

<u>Oil and Grease</u>

Oil and Grease Collection (with optional Oil water separator module specified) - Oil and grease accumulation is generally a function related to vehicle parking lot and drive areas, oil generating land uses or emergency spill conditions. It is important to maintain the system from accumulating excessive volumes of oils in that they may wash over into other sections of the system potentially clogging and reducing the infiltration capacity, blocking control devices and contaminating the overall system. The following standards apply.

Oil should not accumulate more than a visible sheen on the water surface in the oil water separation module only. A sheen is described as a fine, thin oil layer on the water surface identified by the glossy rainbow colors. A dipstick (dry wooden stick) can be used as a probe to determine the thickness of oil on the surface.

Accumulated oils could be associated with insufficient maintenance or a potential large volume oil resource. Any accumulation of oil should be promptly maintained by an experienced waste handler. Emergency spills such as those generated by an accidental spill shall be contained and removed immediately before the next storm event. Spills shall be handled in accordance with local environmental regulations. See spill and accumulated oil maintenance procedures.

Sediments

Sediments (with optional primary grit module or sedimentation modules specified) - Sediments shall be periodically removed from the system as they accumulate within the designated storage modules. The inlet modules are generally equipped with a sediment storage sump located in the base of the inlet structure. Inspection should be performed after major storm events or a minimum of annually, unless a different inspection cycle has been determined to be sufficient. Inspection shall consist of using a probe to determine the presence of and depth of the accumulated solids. Access is via the 24" manhole.

Note that excessive volumes of sediments will reduce the performance and efficiency of the system. Regional accumulations of solids such as those associated with ice and snow, may result in large springtime volumes of sand and gravels used for traction and ice control.

Trash and Debris

Trash and Debris (with optional trash and debris module specified) - Trash and debris accumulates in the inlet module in three forms; floating debris, neutrally buoyant, and heavy material. The floating debris is visible from the access manhole floating on the water surface in the form of but not limited to wood, paper, plastic, foam, bottles and cans. The neutrally buoyant material resides below the surface and combines with the natural flow regime of the system. It is hard to detect and can only be recognized when at a high concentration appears as a thickening of the water viscosity. Heavier material will simply settle to the sump base and combine with the sediments.

Note that trash and debris typically cause the most problems when they become lodged in a flow control device such as an outlet elbow, riser pipe, and orifice or weir structure. This can be detected visibly when the system is pumped down during maintenance. It can also be evaluated as a condition when flow is impeded and the water level backs up higher than the design elevations.

Emergency Spill Conditions (with optional emergency spill control module specified):

Emergency spill conditions are defined as an excessive accumulation of hydrocarbons such as oil, gasoline, diesel fuel, transmission oil or antifreeze usually resulting from an accidental discharge. Excessive accumulation is described as any amount larger than a thin "sheen" visible on the water surface.

Care should be given in handling these types of fluids. The incident should be reported to the appropriate authorities and should be mitigated by a hazardous waste consultant approved for such matters.

retain-it ®

Maintenance Log

Storm Water Management System

Location: ID #:

Date	Inspection Notes	Inspector

Note the following conditions:

Inlet Module

Outlet Module

Water Quality Module

Oil Elbow

Oil Accumulation

Sedimentation Accumulation

Trash and Debris Quantity

Flow Conditions

Flow Control Outlet Structure

Overflow Pipe

SECTION 6 – SOILS TESTING DATA

Map Scale: 1:814 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 35 70 140 210

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Jul 28, 2019—Aug 15, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
656	Udorthents-Urban land complex	3.4	100.0%
Totals for Area of Interest		**3.4**	**100.0%**

Middlesex County, Massachusetts

656—Udorthents-Urban land complex

Map Unit Setting

National map unit symbol: 995k
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 45 percent
Urban land: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Canton

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landform: Plains, terraces
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Paxton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

HALEY ALDRICH

TEST PIT LOG

Test Pit No. TP-105

Page 1 of 1

PROJECT	Herb Chambers ~~Mercedes of Sudbury~~ Farmer Toy Lot	H&A FILE NO.	135627-002
LOCATION	Sudbury, MA	PROJECT MGR.	B. Grunert
CLIENT	The Herb Chambers Companies	FIELD REP	S. Shay
CONTRACTOR	Earthwork Industries, Inc., Plainville, MA	DATE	7 Dec 2020
EQUIPMENT	Doosan Dx50 Small Excavator	WEATHER	Bright Sun, 30's °F

Ground El. ft. | Location: See Plan | Groundwater depths/entry rates (in./min.): 3.0' with wet sand during excavation

El. Datum

Depth (ft.)	Sample ID (Zip-lock bag)	Stratum Change Depth (ft.)	USCS Symbol	Visual Identification (Color, GROUP NAME & SYMBOL, % oversized, maximum particle size, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0														
			SM	Brown, silty SAND (SM). No oversized, MPS 3". No structure, no odor, moist. 10% leaf debris.	5	5	20	20	30	20				
				- FILL -										
2		2.0												
4	(3-6)		SW	Brown well-graded SAND (SW). 8-10% oversized. MPS 4" as well-rounded cobbles, single-grain structure, no odor, wet at 3', well stratified.	5	5	30	30	30					
				- GLACIOFLUVIAL DEPOSITS -										
6				Bottom of Exploration at 6.0'.										

Obstructions:	Remarks:	Field Tests	
None		Dilatancy:	R - Rapid S - Slow N- None
		Toughness:	L - Low M - Medium H - High
		Plasticity:	N - Nonplastic L - Low M - Medium H - High
	Standard test pit backfill	Dry Strength:	N - None L - Low M - Medium H - High V - Very High

Standing water in completed pit:
at depth 5.2 ft.
measured after 0.5 hrs. elapsed

Boulders:

Diameter (in.)	Number	Approx. vol. (cu. ft.)
12 to 24	None	=
over 24		=

Test Pit Dimensions (ft.):
Pit Depth 6.0
Pit Length X Width 9x3

NOTE: Soil identifications based on visual/manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

Form 2006

HALEY ALDRICH

TEST PIT LOG

Test Pit No. TP-104

Page 1 of 1

PROJECT	Herb Chambers Inventory Lot	H&A FILE NO.	135627-002
LOCATION	Sudbury, MA	PROJECT MGR.	B. Grunert
CLIENT	The Herb Chambers Companies	FIELD REP	S. Shay
CONTRACTOR	Earthwork Industries, Inc., Plainville, MA	DATE	7 Dec 2020
EQUIPMENT	Doosan Dx50 Small Excavator	WEATHER	Bright Sun, 30's °F

Ground El. ____ ft. Location: See Plan

El. Datum ____

Groundwater depths/entry rates (in./min.): 4.0'/moderately

Depth (ft.)	Sample ID	Stratum Change Depth (ft.)	USCS Symbol	Visual Identification (Color, GROUP NAME & SYMBOL, % oversized, maximum particle size, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Toughness	Plasticity	Strength
0														
			SM	Brown, silty SAND (SM). No oversized, mps 1/2" no structure. no odor, moist.			15	25	45	15				
		0.8												
1			SP-SM	Red brown to brown, poorly-graded SAND with silt and gravel (SP-SM). No structure, no odor, moist. Appears to be disturbed.	5	10	15	40	20	10				
2														
		2.7												
			OL/OH	Black ORGANIC SOIL (OL/OH). No oversized, mps 0.1". No structure, slight organic odor, wet. 5% fibers - ORGANIC DEPOSITS -						100				
3		3.0												
			SM	Dark orange brown, silty SAND (SM). No oversized mps 1/2". No structure, no odor, moist. Trace roots - SUBSOIL -				15	55	30				
4		4.0												
			ML	Olive gray with weak orange brown irregular mottling SILT with sand (ML). No oversize mps 0.1". No structure, no odor, wet. GLACIOLACUSTRINE DEPOSITS			5	5	5	85				
5				Bottom of EXPLORATION AT 4.0'										

Obstructions: None

Remarks:

Standard test pit backfill

Field Tests

Dilatancy:	R - Rapid S - Slow N- None
Toughness:	L - Low M - Medium H - High
Plasticity:	N - Nonplastic L - Low M - Medium H - High
Dry Strength:	N - None L - Low M - Medium H - High V - Very High

Standing water in completed pit:

at depth 4.3 ft.

measured after 0.5 hrs. elapsed

Boulders:

Diameter (in.)	Number	Approx. vol. (cu. ft.)
12 to 24	None	
over 24		

Test Pit Dimensions (ft.):

Pit Depth 4.0

Pit Length X Width 9 x 3

NOTE: Soil identifications based on visual/manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

Form 2006

HALEY ALDRICH

TEST PIT LOG

Test Pit No. TP-103

Page 1 of 1

PROJECT	Herb Chambers Inventory Lot	H&A FILE NO.	135627-002
LOCATION	Sudbury, MA	PROJECT MGR.	B. Grunert
CLIENT	The Herb Chambers Companies	FIELD REP	S. Shay
CONTRACTOR	Earthwork Industries, Inc., Plainville, MA	DATE	4 Dec 2020
EQUIPMENT	Doosan Dx50 Small Excavator	WEATHER	sun, 50's °F

Ground El. 125 +/- ft. Location: See Plan

El. Datum: NGVD 29

Groundwater depths/entry rates (in./min.): 3.2 rapidly

Depth (ft.)	Sample ID (zip-lock bag)	Stratum Change Depth (ft.)	USCS Symbol	Visual Identification (Color, GROUP NAME & SYMBOL, % oversized, maximum particle size, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0			SP	Gray brown, poorly-graded SAND with gravel (SP). No oversized, mps 2", no structure, no odor, moist. 10% leaf debris		10	15	40	30	5				
		0.8												
1	(1-3')		SP	Brown, poorly graded SAND (SP). 2% oversized, mps 3", ~~single-grain structure~~ no odor, wet.	5	–	15	40	40					
2				– fill –										
3														
		3.6												
4			OL/OH	Dark brown, ORGANIC SOIL with sand (OL/OH) no oversized, mps 1", semi-fibrous slight petroleum odor, wet.			5	5	5	85				
		4.8												
5	(5-5.5)		ML											
				BOTTOM OF EXPLORATION AT 5.5'										

Obstructions: None

Remarks: Standard test pit backfill

Field Tests

Dilatancy:	R - Rapid S - Slow N- None
Toughness:	L - Low M - Medium H - High
Plasticity:	N - Nonplastic L - Low M - Medium H - High
Dry Strength:	N - None L - Low M - Medium H - High V - Very High

Standing water in completed pit: at depth 5.0 ft. measured after 0.5 hrs. elapsed

Boulders:

Diameter (in.)	Number		Approx. vol. (cu. ft.)
12 to 24	2	=	2.5
over 24	Ø	=	—

Test Pit Dimensions (ft.): Pit Depth 5.5; Pit Length X Width 9 x 3

NOTE: Soil identifications based on visual/manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

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HALEY ALDRICH

TEST PIT LOG

Test Pit No. TP-102

Page 1 of 1

PROJECT	Herb Chambers Inventory Lot	H&A FILE NO.	135627-002
LOCATION	Sudbury, MA	PROJECT MGR.	B. Grunert
CLIENT	The Herb Chambers Companies	FIELD REP	S. Shay
CONTRACTOR	Earthwork Industries, Inc., Plainville, MA	DATE	7 Dec 2020
EQUIPMENT	Doosan Dx50 Small Excavator	WEATHER	Bright sun 30's °F

Ground El. _____ ft. Location: See Plan

El. Datum _____

Groundwater depths/entry rates (in./min.): 4.5' rapidly

Depth (ft.)	Sample ID	Stratum Change Depth (ft.)	USCS Symbol	Visual Identification (Color, GROUP NAME & SYMBOL, % oversized, maximum particle size, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0	21P-lock Bag			Brown silty SAND (SM). No oversized MPS 2".			15	20	50	15				
			SM	No structure, no odor, moist. 10% leaf debris.										
		1.0												
		1.2	–	Asphalt layer										
2	(2-4)		SP	Red brown poorly-graded SAND (SP). 15% oversized as well-rounded cobbles. MPS 6". Single grain structure, no odor, moist. Appears to be disturbed.	5	5	10	50	30					
4				Fill										
		4.6												
			OL/OH	Black, ORGANIC SILT (OL, H), No oversized, MPS 0.1". Slight organic odor, wet. 10% fibers. ORGANIC DEPOSITS						100				
		6.0												
6	(6-7.5)		ML	Olive gray SILT with sand (ML). No oversized, MPS 0.1". No structure, no odor, wet. GLACIOLACUSTRINE DEPOSITS –					15	85				
8				BOTTOM OF EXPLORATION AT 7.5'										

Obstructions: None

Remarks:

Standard test pit backfill

Field Tests

Dilatancy: R - Rapid S - Slow N- None

Toughness: L - Low M - Medium H - High

Plasticity: N - Nonplastic L - Low M - Medium H - High

Dry Strength: N - None L - Low M - Medium H - High V - Very High

Standing water in completed pit:

at depth 6.0 ft.

measured after 0.5 hrs. elapsed

Boulders:

Diameter (in.)	Number	Approx. vol. (cu. ft.)
12 to 24	None =	
over 24	=	

Test Pit Dimensions (ft.):

Pit Depth 7.5

Pit Length X Width 9 x 3

NOTE: Soil identifications based on visual/manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

Form 2006

Form 2006 USCS Geo.

HALEY ALDRICH

TEST PIT LOG

Test Pit No. TP-101

Page 1 of 1

PROJECT	Herb Chambers Inventory Lot	H&A FILE NO.	135627-002
LOCATION	Sudbury, MA	PROJECT MGR.	B. Grunert
CLIENT	The Herb Chambers Companies	FIELD REP	S. Shay
CONTRACTOR	Earthwork Industries, Inc., Plainville, MA	DATE	7 Dec 2020
EQUIPMENT	Doosan Dx50 Small Excavator	WEATHER	Bright sun 30's °F

Ground El. _____ ft. Location: See Plan

El. Datum _____

Groundwater depths/entry rates (in./min.): 4.6/rapidly

Depth (ft.)	Sample ID (Zip lock Bag)	Stratum Change Depth (ft.)	USCS Symbol	Visual Identification (Color, GROUP NAME & SYMBOL, % oversized, maximum particle size, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Toughness	Plasticity	Strength
0			SM	Brown, silty SAND (SM). No oversized, MPS 2" No structure, no odor, moist. 10% roots and leaf mat			15	20	50	15				
		1.0												
2			SP	Red brown, poorly-graded SAND (SP). 12% oversized MPS 3". Angle grain structure, no odor, moist. Appears to be disturbed. - Fill -	5	5	10	40	35	5				
4		4.6	OL/OH	Black, ORGANIC SOIL (OL/OH). No oversized, MPS 0.1". No structure, organic odor, wet. Trace fibers. - ORGANIC DEPOSITS -						100				
		5.8												
6	(6-7.5)		SP	Gray poorly graded SAND with gravel (SP). 2% oversized, MPS 3.5". No structure, no odor, wet. - GLACIOFLUVIAL DEPOSITS -	10	10	20	35	25					
8				BOTTOM OF EXPLORATION AT 7.5'										

Obstructions: None

Remarks: Difficult to characterize Glaciofluvial structure beneath water table

Standard test pit backfill

Field Tests

Dilatancy: R - Rapid S - Slow N- None

Toughness: L - Low M - Medium H - High

Plasticity: N - Nonplastic L - Low M - Medium H - High

Dry Strength: N - None L - Low M - Medium H - High V - Very High

Standing water in completed pit: at depth 4.6 ft. measured after 0.5 hrs. elapsed

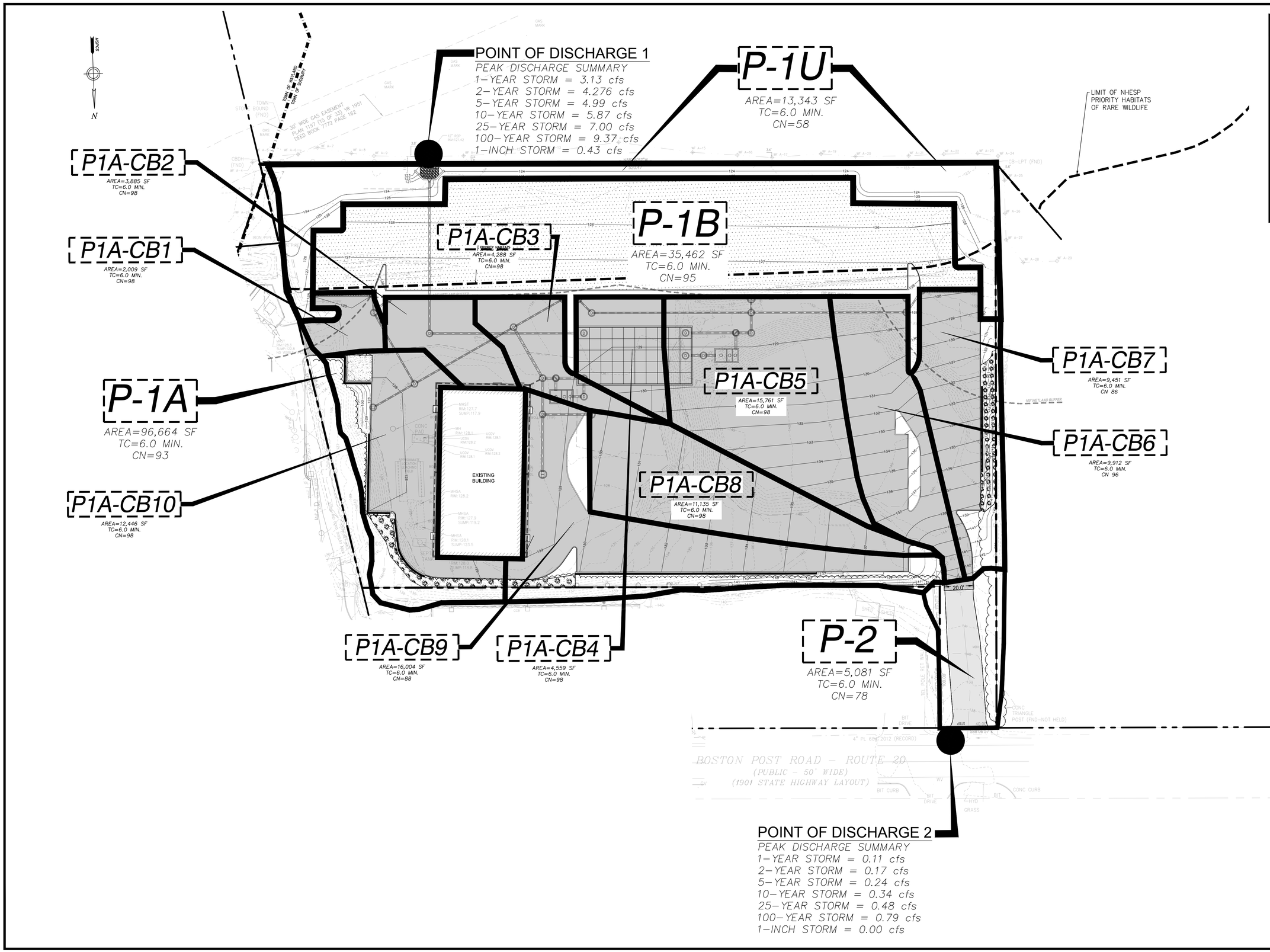
Boulders: Diameter (in.) / Number / Approx. vol. (cu. ft.) — 12 to 24 = ; over 24 = None

Test Pit Dimensions (ft.): Pit Depth 7.5; Pit Length X Width 9 x 3

NOTE: Soil identifications based on visual/manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

Form 2006

SECTION 7 – HYDRAULIC PIPE SIZING



Date	Description	No.

Revisions

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043
P: 781-919-0808

Project
105 BOSTON POST ROAD
SUDBURY, MA

Prepared for
HERB CHAMBERS OF SUDBURY, INC.
259 MCGRATH HWY
SOMERVILE, MA 02143

Drawing Title
PROPOSED CONDITIONS SUB-CATCHMENT MAP

Project No.	100-108
Date	3/22/2021
Scale	1"=30'
Drawn By	DJN
Approved By	GC

Drawing No.
PH-2

Project Name:	105 Boston Post Road																							
Project Location:	Sudbury, MA																**DESIGN YEAR:**	**2**						
																	K=	106	B=	17				
LOCATION			**LAND USE**						**FLOW TIME (MIN)**				**FLOW**								**PIPE DESIGN**			
Description	**From**	**To**	**Cover**	**Increm.**	Total	**C**	**CA**	**Total CA**	**To Inlet**	**In Pipe**	**Tc**	**I (iph)**	**Q (cfs)**	**Pipe**	**Sz (in)**	**L (ft)**	**Slope**	**n**	**Q(f) (cfs)**	**V(f) (fps)**	**Q/Q(f)**	**V/V(f)**	**V (fps)**	**L/V (min)**
											CLOSED DRAINAGE													
CLOSED DRAINAGE AREA- TO WEST OF UG-1																								
	Area #CB-7		Grass	0.03		0.40																		
			Pave	0.19		0.90																		
	CB-7				0.22	0.83	0.18		5		5	4.82	0.87											
	CB-7	DMH 5												HDPE	12	16	0.0063	0.01	3.66	4.66	0.24	0.69	3.22	0.08
	Area #CB-6		Grass	0.01		0.40																		
			Pave	0.21		0.90																		
	CB-6				0.23	0.87	0.20		5		5	4.82	0.95											
	CB-6	DMH 5												HDPE	12	7	0.0070	0.01	3.88	4.93	0.25	0.70	3.44	0.03
	DMH-5				0.45			0.38	5.00	0.12	5.12	4.79	1.81											
	DMH-5	DMH-4												HDPE	18	107	0.0056	0.01	10.22	5.78	0.18	0.63	3.67	0.49
	Area #CB-5		Grass	0.00		0.40																		
			Pave	0.36		0.90																		
	CB-5				0.36	0.90	0.32		5		5	4.82	1.56											
	CB-5	DMH-4												HDPE	12	19	0.0100	0.01	4.63	5.90	0.34	0.76	4.50	0.07
	Area #CB-4		Grass	0.00		0.40																		
			Pave	0.11		0.90																		
	CB-5				0.11	0.90	0.09		5		5	4.82	0.46											
	CB-5	DMH-3												HDPE	18	10	0.0050	0.01	9.66	5.46	0.05	0.43	2.36	0.07
	DMH-3				0.11			0.09	5.00	0.07	5.07	4.80	0.45											
	DMH-3	DMH-4												HDPE	12	110	0.0055	0.01	3.43	4.37	0.13	0.58	2.55	0.72
	DMH-4				0.91			0.80	5.00	1.28	6.28	4.55	3.62											
	DMH-4	DMH-6												HDPE	18	11	0.0064	0.01	10.92	6.18	0.33	0.76	4.70	0.04
	DMH-6				0.91			0.80	6.28	0.04	6.32	4.55	3.62											
	DMH-6	DMH-7												HDPE	18	8	0.0063	0.01	10.84	6.13	0.33	0.76	4.67	0.03
	DMH-7				0.91			0.80	6.32	0.03	6.34	4.54	3.61											
	DMH-7	UG-1												HDPE	18	30	0.0050	0.01	9.66	5.46	0.37	0.79	4.30	0.12
	DMH-7				0.91			0.80	6.34	0.03	6.37	4.54	3.61											
	DMH-7	OGS-1												HDPE	18	10	0.0050	0.01	9.66	5.46	0.37	0.79	4.30	0.04
	OGS-1				0.91			0.80	6.37	0.04	6.41	4.53	3.60											
	OGS-1	DMH-8												HDPE	18	7	0.0071	0.01	11.51	6.51	0.31	0.75	4.87	0.02
	DMH-8				0.91			0.80	6.41	0.02	6.44	4.52	3.60											
	DMH-8	UG-1												HDPE	18	7	0.0071	0.01	11.51	6.51	0.31	0.75	4.87	0.02

Project Location:	Sudbury, MA																	DESIGN YEAR:	2						
																		K=	106	B=	17				
LOCATION			LAND USE						FLOW TIME (MIN)				FLOW							PIPE DESIGN					
Description	From	To	Cover	Increm.	Total	C	CA	Total CA	To Inlet	In Pipe	Tc	I (iph)	Q (cfs)	Pipe	Sz (in)	L (ft)	Slope	n	Q(f) (cfs)	V(f) (fps)	Q/Q(f)	V/V(f)	V (fps)	L/V (min)
CLOSED DRAINAGE AREA- TO EAST OF UG-1																									
	Area #CB-9		Grass	0.10		0.40																			
			Pave	0.18		0.90																			
	CB-9				0.29	0.72	0.21		5		5	4.82	0.99												
	CB-9	DMH 12												HDPE	12	30	0.0050	0.01	3.28	4.17	0.30	0.74	3.09	0.16
	Area #CB-1		Grass	0.00		0.40																			
			Pave	0.05		0.90																			
	CB-1				0.05	0.90	0.04		5		5	4.82	0.20												
	CB-1	DMH 1												HDPE	12	10	0.0050	0.01	3.28	4.17	0.06	0.47	1.94	0.09
	Area #CB-2		Grass	0.00		0.40																			
			Pave	0.09		0.90																			
	CB-1				0.09	0.90	0.08		5		5	4.82	0.39												
	CB-1	DMH 1												HDPE	12	10	0.0050	0.01	3.28	4.17	0.12	0.56	2.35	0.07
	DMH-1				0.14			0.12	5.00	0.16	5.16	4.78	0.58												
	DMH-1	DMH-12												HDPE	12	55	0.0050	0.01	3.28	4.17	0.18	0.63	2.64	0.35
	DMH-12				0.42			0.33	5.16	0.51	5.67	4.68	1.53												
	DMH-12	DMH-2												HDPE	12	77	0.0052	0.01	3.34	4.25	0.46	0.83	3.55	0.36
	Area #CB-3		Grass	0.00		0.40																			
			Pave	0.13		0.90																			
	CB-3				0.13	0.90	0.12		5		5	6.00	0.70												
	CB-3	DMH-2												HDPE	12	37	0.0095	0.01	4.51	5.75	0.16	0.61	3.51	0.18
	DMH-2				0.55			0.44	5.00	0.54	5.54	4.70	2.09												
	DMH-2	DMH-11												HDPE	18	38	0.0022	0.01	6.41	3.62	0.33	0.76	2.74	0.23
	Area #CB-8		Grass	0.12		0.40																			
			Pave	0.47		0.90																			
	CB-8				0.59	0.80	0.47		5		5	6.00	2.82												
	CB-8	DMH-11												HDPE	12	37	0.0095	0.01	4.51	5.75	0.62	0.91	5.25	0.12
	DMH-11				1.14			0.91	5.00	0.35	5.35	4.74	4.33												
	DMH-11	DMH-10												HDPE	18	6	0.0083	0.01	12.44	7.04	0.35	0.77	5.43	0.02
	DMH-10				1.14			0.91	5.00	0.02	5.02	4.81	4.40												
	DMH-10	OGS-2												HDPE	18	7	0.0071	0.01	11.51	6.51	0.38	0.79	5.16	0.02
	OGS-2				1.14			0.91	5.00	0.02	5.02	4.81	4.40												
	OGS-2	UG-1												HDPE	18	7	0.0071	0.01	11.51	6.51	0.38	0.79	5.16	0.02
	DMH-10				1.14			0.91	5.00	0.02	5.02	4.81	4.40												
	DMH-10	UG-1												HDPE	18	14	0.0071	0.01	11.51	6.51	0.38	0.79	5.16	0.05

Project Name:	105 Boston Post Road																							
Project Location:	Sudbury, MA																**DESIGN YEAR:**	**10**						
																	K=	170	B=	23				
LOCATION			**LAND USE**						**FLOW TIME (MIN)**				**FLOW**								**PIPE DESIGN**			
Description	**From**	**To**	**Cover**	**Increm.**	Total	**C**	**CA**	**Total CA**	**To Inlet**	**In Pipe**	**Tc**	**I (iph)**	**Q (cfs)**	**Pipe**	**Sz (in)**	**L (ft)**	**Slope**	**n**	**Q(f) (cfs)**	**V(f) (fps)**	**Q/Q(f)**	**V/V(f)**	**V (fps)**	**L/V (min)**
											CLOSED DRAINAGE													
CLOSED DRAINAGE AREA- TO WEST OF UG-1																								
	Area #CB-7		Grass	0.03		0.40																		
			Pave	0.19		0.90																		
	CB-7				0.22	0.83	0.18		5		5	6.07	1.09											
	CB-7	DMH 5												HDPE	12	16	0.0063	0.01	3.66	4.66	0.30	0.74	3.44	0.08
	Area #CB-6		Grass	0.01		0.40																		
			Pave	0.21		0.90																		
	CB-6				0.23	0.87	0.20		5		5	6.07	1.20											
	CB-6	DMH 5												HDPE	12	7	0.0070	0.01	3.88	4.93	0.31	0.75	3.68	0.03
	DMH-5				0.45			0.38	5.00	0.11	5.11	6.05	2.29											
	DMH-5	DMH-4												HDPE	18	107	0.0056	0.01	10.22	5.78	0.22	0.68	3.92	0.45
	Area #CB-5		Grass	0.00		0.40																		
			Pave	0.36		0.90																		
	CB-5				0.36	0.90	0.32		5		5	6.07	1.96											
	CB-5	DMH-4												HDPE	12	19	0.0100	0.01	4.63	5.90	0.42	0.82	4.81	0.07
	Area #CB-4		Grass	0.00		0.40																		
			Pave	0.11		0.90																		
	CB-5				0.11	0.90	0.09		5		5	6.07	0.57											
	CB-5	DMH-3												HDPE	18	10	0.0050	0.01	9.66	5.46	0.06	0.46	2.52	0.07
	DMH-3				0.11			0.09	5.00	0.07	5.07	6.06	0.57											
	DMH-3	DMH-4												HDPE	12	110	0.0055	0.01	3.43	4.37	0.17	0.62	2.72	0.67
	DMH-4				0.91			0.80	5.00	1.19	6.19	5.82	4.63											
	DMH-4	DMH-6												HDPE	18	11	0.0064	0.01	10.92	6.18	0.42	0.82	5.05	0.04
	DMH-6				0.91			0.80	6.19	0.04	6.23	5.82	4.63											
	DMH-6	DMH-7												HDPE	18	8	0.0063	0.01	10.84	6.13	0.43	0.82	5.02	0.03
	DMH-7				0.91			0.80	6.23	0.03	6.26	5.81	4.62											
	DMH-7	UG-1												HDPE	18	30	0.0050	0.01	9.66	5.46	0.48	0.85	4.62	0.11
	DMH-7				0.91			0.80	6.26	0.03	6.28	5.81	4.62											
	DMH-7	OGS-1												HDPE	18	10	0.0050	0.01	9.66	5.46	0.48	0.85	4.62	0.04
	OGS-1				0.91			0.80	6.28	0.04	6.32	5.80	4.61											
	OGS-1	DMH-8												HDPE	18	7	0.0071	0.01	11.51	6.51	0.40	0.80	5.23	0.02
	DMH-8				0.91			0.80	6.32	0.02	6.34	5.79	4.61											
	DMH-8	UG-1												HDPE	18	7	0.0071	0.01	11.51	6.51	0.40	0.80	5.23	0.02

Project Location:	Sudbury, MA																	DESIGN YEAR:	10					
																		K=	170	B=	23			
LOCATION			LAND USE						FLOW TIME (MIN)				FLOW							PIPE DESIGN				
Description	From	To	Cover	Increm.	Total	C	CA	Total CA	To Inlet	In Pipe	Tc	I (iph)	Q (cfs)	Pipe	Sz (in)	L (ft)	Slope	n	Q(f) (cfs)	V(f) (fps)	Q/Q(f)	V/V(f)	V (fps)	L/V (min)
CLOSED DRAINAGE AREA- TO EAST OF UG-1																								
	Area #CB-9		Grass	0.10		0.40																		
			Pave	0.18		0.90																		
	CB-9				0.29	0.72	0.21		5		5	6.07	1.25											
	CB-9	DMH 12												HDPE	12	30	0.0050	0.01	3.28	4.17	0.38	0.79	3.30	0.15
	Area #CB-1		Grass	0.00		0.40																		
			Pave	0.05		0.90																		
	CB-1				0.05	0.90	0.04		5		5	6.07	0.25											
	CB-1	DMH 1												HDPE	12	10	0.0050	0.01	3.28	4.17	0.08	0.50	2.07	0.08
	Area #CB-2		Grass	0.00		0.40																		
			Pave	0.09		0.90																		
	CB-1				0.09	0.90	0.08		5		5	6.07	0.49											
	CB-1	DMH 1												HDPE	12	10	0.0050	0.01	3.28	4.17	0.15	0.60	2.51	0.07
	DMH-1				0.14			0.12	5.00	0.15	5.15	6.04	0.73											
	DMH-1	DMH-12												HDPE	12	55	0.0050	0.01	3.28	4.17	0.22	0.68	2.83	0.32
	DMH-12				0.42			0.33	5.15	0.48	5.62	5.94	1.94											
	DMH-12	DMH-2												HDPE	12	77	0.0052	0.01	3.34	4.25	0.58	0.89	3.80	0.34
	Area #CB-3		Grass	0.00		0.40																		
			Pave	0.13		0.90																		
	CB-3				0.13	0.90	0.12		5		5	6.00	0.70											
	CB-3	DMH-2												HDPE	12	37	0.0095	0.01	4.51	5.75	0.16	0.61	3.51	0.18
	DMH-2				0.55			0.44	5.00	0.51	5.51	5.96	2.65											
	DMH-2	DMH-11												HDPE	18	38	0.0022	0.01	6.41	3.62	0.41	0.81	2.94	0.22
	Area #CB-8		Grass	0.12		0.40																		
			Pave	0.47		0.90																		
	CB-8				0.59	0.80	0.47		5		5	6.00	2.82											
	CB-8	DMH-11												HDPE	12	37	0.0095	0.01	4.51	5.75	0.62	0.91	5.25	0.12
	DMH-11				1.14			0.91	5.00	0.33	5.33	6.00	5.48											
	DMH-11	DMH-10												HDPE	18	6	0.0083	0.01	12.44	7.04	0.44	0.83	5.81	0.02
	DMH-10				1.14			0.91	5.00	0.02	5.02	6.07	5.54											
	DMH-10	OGS-2												HDPE	18	7	0.0071	0.01	11.51	6.51	0.48	0.85	5.52	0.02
	OGS-2				1.14			0.91	5.00	0.02	5.02	6.07	5.54											
	OGS-2	UG-1												HDPE	18	7	0.0071	0.01	11.51	6.51	0.48	0.85	5.52	0.02
	DMH-10				1.14			0.91	5.00	0.02	5.02	6.07	5.54											
	DMH-10	UG-1												HDPE	18	14	0.0071	0.01	11.51	6.51	0.48	0.85	5.52	0.04

Project Name:	105 Boston Post Road																							
Project Location:	Sudbury, MA																**DESIGN YEAR:**	**25**						
																	K=	230	B=	30				
LOCATION			**LAND USE**						**FLOW TIME (MIN)**				**FLOW**								**PIPE DESIGN**			
Description	**From**	**To**	**Cover**	**Increm.**	Total	**C**	**CA**	**Total CA**	**To Inlet**	**In Pipe**	**Tc**	**I (iph)**	**Q (cfs)**	**Pipe**	**Sz (in)**	**L (ft)**	**Slope**	**n**	**Q(f) (cfs)**	**V(f) (fps)**	**Q/Q(f)**	**V/V(f)**	**V (fps)**	**L/V (min)**
													CLOSED DRAINAGE											
CLOSED DRAINAGE AREA- TO WEST OF UG-1																								
	Area #CB-7		Grass	0.03		0.40																		
			Pave	0.19		0.90																		
	CB-7				0.22	0.83	0.18		5		5	6.57	1.18											
	CB-7	DMH 5												HDPE	12	16	0.0063	0.01	3.66	4.66	0.32	0.75	3.52	0.08
	Area #CB-6		Grass	0.01		0.40																		
			Pave	0.21		0.90																		
	CB-6				0.23	0.87	0.20		5		5	6.57	1.30											
	CB-6	DMH 5												HDPE	12	7	0.0070	0.01	3.88	4.93	0.34	0.76	3.76	0.03
	DMH-5				0.45			0.38	5.00	0.11	5.11	6.55	2.48											
	DMH-5	DMH-4												HDPE	18	107	0.0056	0.01	10.22	5.78	0.24	0.69	4.01	0.44
	Area #CB-5		Grass	0.00		0.40																		
			Pave	0.36		0.90																		
	CB-5				0.36	0.90	0.32		5		5	6.57	2.12											
	CB-5	DMH-4												HDPE	12	19	0.0100	0.01	4.63	5.90	0.46	0.84	4.92	0.06
	Area #CB-4		Grass	0.00		0.40																		
			Pave	0.11		0.90																		
	CB-5				0.11	0.90	0.09		5		5	6.57	0.62											
	CB-5	DMH-3												HDPE	18	10	0.0050	0.01	9.66	5.46	0.06	0.47	2.58	0.06
	DMH-3				0.11			0.09	5.00	0.06	5.06	6.56	0.62											
	DMH-3	DMH-4												HDPE	12	110	0.0055	0.01	3.43	4.37	0.18	0.64	2.79	0.66
	DMH-4				0.91			0.80	5.00	1.17	6.17	6.36	5.06											
	DMH-4	DMH-6												HDPE	18	11	0.0064	0.01	10.92	6.18	0.46	0.84	5.18	0.04
	DMH-6				0.91			0.80	6.17	0.04	6.20	6.35	5.05											
	DMH-6	DMH-7												HDPE	18	8	0.0063	0.01	10.84	6.13	0.47	0.84	5.15	0.03
	DMH-7				0.91			0.80	6.20	0.03	6.23	6.35	5.05											
	DMH-7	UG-1												HDPE	18	30	0.0050	0.01	9.66	5.46	0.52	0.87	4.74	0.11
	DMH-7				0.91			0.80	6.23	0.03	6.25	6.34	5.05											
	DMH-7	OGS-1												HDPE	18	10	0.0050	0.01	9.66	5.46	0.52	0.87	4.74	0.04
	OGS-1				0.91			0.80	6.25	0.04	6.29	6.34	5.04											
	OGS-1	DMH-8												HDPE	18	7	0.0071	0.01	11.51	6.51	0.44	0.82	5.37	0.02
	DMH-8				0.91			0.80	6.29	0.02	6.31	6.33	5.04											
	DMH-8	UG-1												HDPE	18	7	0.0071	0.01	11.51	6.51	0.44	0.82	5.37	0.02

Project Location:	Sudbury, MA																	DESIGN YEAR:	25						
																		K=	230	B=	30				
LOCATION			LAND USE						FLOW TIME (MIN)				FLOW							PIPE DESIGN					
Description	From	To	Cover	Increm.	Total	C	CA	Total CA	To Inlet	In Pipe	Tc	I (iph)	Q (cfs)	Pipe	Sz (in)	L (ft)	Slope	n	Q(f) (cfs)	V(f) (fps)	Q/Q(f)	V/V(f)	V (fps)	L/V (min)
CLOSED DRAINAGE AREA- TO EAST OF UG-1																									
	Area #CB-9		Grass	0.10		0.40																			
			Pave	0.18		0.90																			
	CB-9				0.29	0.72	0.21		5		5	6.57	1.35												
	CB-9	DMH 12												HDPE	12	30	0.0050	0.01	3.28	4.17	0.41	0.81	3.38	0.15
	Area #CB-1		Grass	0.00		0.40																			
			Pave	0.05		0.90																			
	CB-1				0.05	0.90	0.04		5		5	6.57	0.27												
	CB-1	DMH 1												HDPE	12	10	0.0050	0.01	3.28	4.17	0.08	0.51	2.12	0.08
	Area #CB-2		Grass	0.00		0.40																			
			Pave	0.09		0.90																			
	CB-1				0.09	0.90	0.08		5		5	6.57	0.53												
	CB-1	DMH 1												HDPE	12	10	0.0050	0.01	3.28	4.17	0.16	0.62	2.57	0.06
	DMH-1				0.14			0.12	5.00	0.14	5.14	6.54	0.80												
	DMH-1	DMH-12												HDPE	12	55	0.0050	0.01	3.28	4.17	0.24	0.69	2.90	0.32
	DMH-12				0.42			0.33	5.14	0.46	5.61	6.46	2.11												
	DMH-12	DMH-2												HDPE	12	77	0.0052	0.01	3.34	4.25	0.63	0.92	3.90	0.33
	Area #CB-3		Grass	0.00		0.40																			
			Pave	0.13		0.90																			
	CB-3				0.13	0.90	0.12		5		5	6.00	0.70												
	CB-3	DMH-2												HDPE	12	37	0.0095	0.01	4.51	5.75	0.16	0.61	3.51	0.18
	DMH-2				0.55			0.44	5.00	0.51	5.51	6.48	2.88												
	DMH-2	DMH-11												HDPE	18	38	0.0022	0.01	6.41	3.62	0.45	0.83	3.01	0.21
	Area #CB-8		Grass	0.12		0.40																			
			Pave	0.47		0.90																			
	CB-8				0.59	0.80	0.47		5		5	6.00	2.82												
	CB-8	DMH-11												HDPE	12	37	0.0095	0.01	4.51	5.75	0.62	0.91	5.25	0.12
	DMH-11				1.14			0.91	5.00	0.33	5.33	6.51	5.95												
	DMH-11	DMH-10												HDPE	18	6	0.0083	0.01	12.44	7.04	0.48	0.85	5.95	0.02
	DMH-10				1.14			0.91	5.00	0.02	5.02	6.57	6.00												
	DMH-10	OGS-2												HDPE	18	7	0.0071	0.01	11.51	6.51	0.52	0.87	5.64	0.02
	OGS-2				1.14			0.91	5.00	0.02	5.02	6.57	6.00												
	OGS-2	UG-1												HDPE	18	7	0.0071	0.01	11.51	6.51	0.52	0.87	5.64	0.02
	DMH-10				1.14			0.91	5.00	0.02	5.02	6.57	6.00												
	DMH-10	UG-1												HDPE	18	14	0.0071	0.01	11.51	6.51	0.52	0.87	5.64	0.04

Project Name:	105 Boston Post Road																							
Project Location:	Sudbury, MA																**DESIGN YEAR:**	**50**						
																	K=	250	B=	27				
LOCATION			**LAND USE**						**FLOW TIME (MIN)**				**FLOW**								**PIPE DESIGN**			
Description	**From**	**To**	**Cover**	**Increm.**	Total	**C**	**CA**	**Total CA**	**To Inlet**	**In Pipe**	**Tc**	**I (iph)**	**Q (cfs)**	**Pipe**	**Sz (in)**	**L (ft)**	**Slope**	**n**	**Q(f) (cfs)**	**V(f) (fps)**	**Q/Q(f)**	**V/V(f)**	**V (fps)**	**L/V (min)**
													CLOSED DRAINAGE											
CLOSED DRAINAGE AREA- TO WEST OF UG-1																								
	Area #CB-7		Grass	0.03		0.40																		
			Pave	0.19		0.90																		
	CB-7				0.22	0.83	0.18		5		5	7.81	1.41											
	CB-7	DMH 5												HDPE	12	16	0.0063	0.01	3.66	4.66	0.38	0.79	3.70	0.07
	Area #CB-6		Grass	0.01		0.40																		
			Pave	0.21		0.90																		
	CB-6				0.23	0.87	0.20		5		5	7.81	1.55											
	CB-6	DMH 5												HDPE	12	7	0.0070	0.01	3.88	4.93	0.40	0.80	3.96	0.03
	DMH-5				0.45			0.38	5.00	0.10	5.10	7.79	2.94											
	DMH-5	DMH-4												HDPE	18	107	0.0056	0.01	10.22	5.78	0.29	0.73	4.22	0.42
	Area #CB-5		Grass	0.00		0.40																		
			Pave	0.36		0.90																		
	CB-5				0.36	0.90	0.32		5		5	7.81	2.52											
	CB-5	DMH-4												HDPE	12	19	0.0100	0.01	4.63	5.90	0.54	0.88	5.18	0.06
	Area #CB-4		Grass	0.00		0.40																		
			Pave	0.11		0.90																		
	CB-5				0.11	0.90	0.09		5		5	7.81	0.74											
	CB-5	DMH-3												HDPE	18	10	0.0050	0.01	9.66	5.46	0.08	0.50	2.71	0.06
	DMH-3				0.11			0.09	5.00	0.06	5.06	7.80	0.74											
	DMH-3	DMH-4												HDPE	12	110	0.0055	0.01	3.43	4.37	0.21	0.67	2.93	0.63
	DMH-4				0.91			0.80	5.00	1.11	6.11	7.55	6.01											
	DMH-4	DMH-6												HDPE	18	11	0.0064	0.01	10.92	6.18	0.55	0.88	5.44	0.03
	DMH-6				0.91			0.80	6.11	0.03	6.14	7.54	6.00											
	DMH-6	DMH-7												HDPE	18	8	0.0063	0.01	10.84	6.13	0.55	0.88	5.41	0.02
	DMH-7				0.91			0.80	6.14	0.02	6.17	7.54	6.00											
	DMH-7	UG-1												HDPE	18	30	0.0050	0.01	9.66	5.46	0.62	0.91	4.98	0.10
	DMH-7				0.91			0.80	6.17	0.02	6.19	7.53	5.99											
	DMH-7	OGS-1												HDPE	18	10	0.0050	0.01	9.66	5.46	0.62	0.91	4.98	0.03
	OGS-1				0.91			0.80	6.19	0.03	6.23	7.52	5.99											
	OGS-1	DMH-8												HDPE	18	7	0.0071	0.01	11.51	6.51	0.52	0.87	5.64	0.02
	DMH-8				0.91			0.80	6.23	0.02	6.25	7.52	5.98											
	DMH-8	UG-1												HDPE	18	7	0.0071	0.01	11.51	6.51	0.52	0.87	5.64	0.02

Project Location:	Sudbury, MA																	DESIGN YEAR:	50						
																		K=	250	B=	27				
LOCATION			LAND USE						FLOW TIME (MIN)				FLOW							PIPE DESIGN					
Description	From	To	Cover	Increm.	Total	C	CA	Total CA	To Inlet	In Pipe	Tc	I (iph)	Q (cfs)	Pipe	Sz (in)	L (ft)	Slope	n	Q(f) (cfs)	V(f) (fps)	Q/Q(f)	V/V(f)	V (fps)	L/V (min)
CLOSED DRAINAGE AREA- TO EAST OF UG-1																									
	Area #CB-9		Grass	0.10		0.40																			
			Pave	0.18		0.90																			
	CB-9				0.29	0.72	0.21		5		5	7.81	1.60												
	CB-9	DMH 12												HDPE	12	30	0.0050	0.01	3.28	4.17	0.49	0.85	3.55	0.14
	Area #CB-1		Grass	0.00		0.40																			
			Pave	0.05		0.90																			
	CB-1				0.05	0.90	0.04		5		5	7.81	0.32												
	CB-1	DMH 1												HDPE	12	10	0.0050	0.01	3.28	4.17	0.10	0.54	2.23	0.07
	Area #CB-2		Grass	0.00		0.40																			
			Pave	0.09		0.90																			
	CB-1				0.09	0.90	0.08		5		5	7.81	0.63												
	CB-1	DMH 1												HDPE	12	10	0.0050	0.01	3.28	4.17	0.19	0.65	2.70	0.06
	DMH-1				0.14			0.12	5.00	0.14	5.14	7.78	0.95												
	DMH-1	DMH-12												HDPE	12	55	0.0050	0.01	3.28	4.17	0.29	0.73	3.04	0.30
	DMH-12				0.42			0.33	5.14	0.44	5.58	7.67	2.51												
	DMH-12	DMH-2												HDPE	12	77	0.0052	0.01	3.34	4.25	0.75	0.96	4.10	0.31
	Area #CB-3		Grass	0.00		0.40																			
			Pave	0.13		0.90																			
	CB-3				0.13	0.90	0.12		5		5	6.00	0.70												
	CB-3	DMH-2												HDPE	12	37	0.0095	0.01	4.51	5.75	0.16	0.61	3.51	0.18
	DMH-2				0.55			0.44	5.00	0.49	5.49	7.69	3.42												
	DMH-2	DMH-11												HDPE	18	38	0.0022	0.01	6.41	3.62	0.53	0.87	3.16	0.20
	Area #CB-8		Grass	0.12		0.40																			
			Pave	0.47		0.90																			
	CB-8				0.59	0.80	0.47		5		5	6.00	2.82												
	CB-8	DMH-11												HDPE	12	37	0.0095	0.01	4.51	5.75	0.62	0.91	5.25	0.12
	DMH-11				1.14			0.91	5.00	0.32	5.32	7.74	7.07												
	DMH-11	DMH-10												HDPE	18	6	0.0083	0.01	12.44	7.04	0.57	0.89	6.26	0.02
	DMH-10				1.14			0.91	5.00	0.02	5.02	7.81	7.14												
	DMH-10	OGS-2												HDPE	18	7	0.0071	0.01	11.51	6.51	0.62	0.91	5.94	0.02
	OGS-2				1.14			0.91	5.00	0.02	5.02	7.81	7.13												
	OGS-2	UG-1												HDPE	18	7	0.0071	0.01	11.51	6.51	0.62	0.91	5.94	0.02
	DMH-10				1.14			0.91	5.00	0.02	5.02	7.81	7.14												
	DMH-10	UG-1												HDPE	18	14	0.0071	0.01	11.51	6.51	0.62	0.91	5.94	0.04

Project Name:	105 Boston Post Road																							
Project Location:	Sudbury, MA																**DESIGN YEAR:**	**100**						
																	K=	290	B=	31				
LOCATION			**LAND USE**						**FLOW TIME (MIN)**				**FLOW**								**PIPE DESIGN**			
Description	**From**	**To**	**Cover**	**Increm.**	Total	**C**	**CA**	**Total CA**	**To Inlet**	**In Pipe**	**Tc**	**I (iph)**	**Q (cfs)**	**Pipe**	**Sz (in)**	**L (ft)**	**Slope**	**n**	**Q(f) (cfs)**	**V(f) (fps)**	**Q/Q(f)**	**V/V(f)**	**V (fps)**	**L/V (min)**
													CLOSED DRAINAGE											
CLOSED DRAINAGE AREA- TO WEST OF UG-1																								
	Area #CB-7		Grass	0.03		0.40																		
			Pave	0.19		0.90																		
	CB-7				0.22	0.83	0.18		5		5	8.06	1.45											
	CB-7	DMH 5												HDPE	12	16	0.0063	0.01	3.66	4.66	0.40	0.80	3.73	0.07
	Area #CB-6		Grass	0.01		0.40																		
			Pave	0.21		0.90																		
	CB-6				0.23	0.87	0.20		5		5	8.06	1.59											
	CB-6	DMH 5												HDPE	12	7	0.0070	0.01	3.88	4.93	0.41	0.81	3.99	0.03
	DMH-5				0.45			0.38	5.00	0.10	5.10	8.03	3.04											
	DMH-5	DMH-4												HDPE	18	107	0.0056	0.01	10.22	5.78	0.30	0.74	4.26	0.42
	Area #CB-5		Grass	0.00		0.40																		
			Pave	0.36		0.90																		
	CB-5				0.36	0.90	0.32		5		5	8.06	2.60											
	CB-5	DMH-4												HDPE	12	19	0.0100	0.01	4.63	5.90	0.56	0.89	5.22	0.06
	Area #CB-4		Grass	0.00		0.40																		
			Pave	0.11		0.90																		
	CB-5				0.11	0.90	0.09		5		5	8.06	0.76											
	CB-5	DMH-3												HDPE	18	10	0.0050	0.01	9.66	5.46	0.08	0.50	2.74	0.06
	DMH-3				0.11			0.09	5.00	0.06	5.06	8.04	0.76											
	DMH-3	DMH-4												HDPE	12	110	0.0055	0.01	3.43	4.37	0.22	0.68	2.96	0.62
	DMH-4				0.91			0.80	5.00	1.10	6.10	7.82	6.22											
	DMH-4	DMH-6												HDPE	18	11	0.0064	0.01	10.92	6.18	0.57	0.89	5.50	0.03
	DMH-6				0.91			0.80	6.10	0.03	6.13	7.81	6.21											
	DMH-6	DMH-7												HDPE	18	8	0.0063	0.01	10.84	6.13	0.57	0.89	5.46	0.02
	DMH-7				0.91			0.80	6.13	0.02	6.16	7.80	6.21											
	DMH-7	UG-1												HDPE	18	30	0.0050	0.01	9.66	5.46	0.64	0.92	5.03	0.10
	DMH-7				0.91			0.80	6.16	0.02	6.18	7.80	6.21											
	DMH-7	OGS-1												HDPE	18	10	0.0050	0.01	9.66	5.46	0.64	0.92	5.03	0.03
	OGS-1				0.91			0.80	6.18	0.03	6.21	7.79	6.20											
	OGS-1	DMH-8												HDPE	18	7	0.0071	0.01	11.51	6.51	0.54	0.88	5.70	0.02
	DMH-8				0.91			0.80	6.21	0.02	6.24	7.79	6.20											
	DMH-8	UG-1												HDPE	18	7	0.0071	0.01	11.51	6.51	0.54	0.87	5.70	0.02

Project Location:	Sudbury, MA																	DESIGN YEAR:	100						
																		K=	290	B=	31				
LOCATION			LAND USE						FLOW TIME (MIN)				FLOW							PIPE DESIGN					
Description	From	To	Cover	Increm.	Total	C	CA	Total CA	To Inlet	In Pipe	Tc	I (iph)	Q (cfs)	Pipe	Sz (in)	L (ft)	Slope	n	Q(f) (cfs)	V(f) (fps)	Q/Q(f)	V/V(f)	V (fps)	L/V (min)
CLOSED DRAINAGE AREA- TO EAST OF UG-1																									
	Area #CB-9		Grass	0.10		0.40																			
			Pave	0.18		0.90																			
	CB-9				0.29	0.72	0.21		5		5	8.06	1.65												
	CB-9	DMH 12												HDPE	12	30	0.0050	0.01	3.28	4.17	0.51	0.86	3.58	0.14
	Area #CB-1		Grass	0.00		0.40																			
			Pave	0.05		0.90																			
	CB-1				0.05	0.90	0.04		5		5	8.06	0.33												
	CB-1	DMH 1												HDPE	12	10	0.0050	0.01	3.28	4.17	0.10	0.54	2.25	0.07
	Area #CB-2		Grass	0.00		0.40																			
			Pave	0.09		0.90																			
	CB-1				0.09	0.90	0.08		5		5	8.06	0.65												
	CB-1	DMH 1												HDPE	12	10	0.0050	0.01	3.28	4.17	0.20	0.65	2.73	0.06
	DMH-1				0.14			0.12	5.00	0.14	5.14	8.03	0.98												
	DMH-1	DMH-12												HDPE	12	55	0.0050	0.01	3.28	4.17	0.30	0.74	3.07	0.30
	DMH-12				0.42			0.33	5.14	0.44	5.57	7.93	2.59												
	DMH-12	DMH-2												HDPE	12	77	0.0052	0.01	3.34	4.25	0.78	0.97	4.14	0.31
	Area #CB-3		Grass	0.00		0.40																			
			Pave	0.13		0.90																			
	CB-3				0.13	0.90	0.12		5		5	6.00	0.70												
	CB-3	DMH-2												HDPE	12	37	0.0095	0.01	4.51	5.75	0.16	0.61	3.51	0.18
	DMH-2				0.55			0.44	5.00	0.49	5.49	7.95	3.53												
	DMH-2	DMH-11												HDPE	18	38	0.0022	0.01	6.41	3.62	0.55	0.88	3.19	0.20
	Area #CB-8		Grass	0.12		0.40																			
			Pave	0.47		0.90																			
	CB-8				0.59	0.80	0.47		5		5	6.00	2.82												
	CB-8	DMH-11												HDPE	12	37	0.0095	0.01	4.51	5.75	0.62	0.91	5.25	0.12
	DMH-11				1.14			0.91	5.00	0.32	5.32	7.99	7.30												
	DMH-11	DMH-10												HDPE	18	6	0.0083	0.01	12.44	7.04	0.59	0.90	6.31	0.02
	DMH-10				1.14			0.91	5.00	0.02	5.02	8.05	7.36												
	DMH-10	OGS-2												HDPE	18	7	0.0071	0.01	11.51	6.51	0.64	0.92	5.99	0.02
	OGS-2				1.14			0.91	5.00	0.02	5.02	8.05	7.36												
	OGS-2	UG-1												HDPE	18	7	0.0071	0.01	11.51	6.51	0.64	0.92	5.99	0.02
	DMH-10				1.14			0.91	5.00	0.02	5.02	8.05	7.36												
	DMH-10	UG-1												HDPE	18	14	0.0071	0.01	11.51	6.51	0.64	0.92	5.99	0.04

DRAFT

EPA Construction General Permit
Stormwater Pollution Prevention Plan (SWPPP)

Herb Chambers Jaguar/Land Rover of Sudbury

105 Boston Post Road – Route 20
Sudbury, Massachusetts

Prepared for:

Contactor TBD

Presented by:
Crocker Design Group
2 Sharp Street, Unit B
Hingham, MA. 02043

March 22, 2021

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1.0 CONTACT INFORMATION/RESPONSIBLE PARTIES

1.1 OPERATOR(S)/ SUBCONTRACTORS

Operator(s)

Company:	TBD				
Name:					
Address:					
City:		State:		ZIP Code:	
Telephone:		Email:			

Company:	TBD				
Name:					
Address:					
City:		State:		ZIP Code:	
Telephone:		Email:			

Subcontractor(s)

Company:	TBD				
Name:					
Address:					
City:		State:		ZIP Code:	
Telephone:		Email:			
Area of Control:		Site Work Contractor			

24-Hour Emergency Contact

Company:	
Name:	
Telephone:	

1.2 STORMWATER TEAM

SWPPP Preparer

Company:	Crocker Design Group				
Name:	Gabe Crocker				
Address:	2 Sharp Street Unit 2				
City:	Hingham	State:	MA	ZIP Code:	02043
Telephone:	781-919-0808	Email:	Gabecrocker@crockerdesigngroup.com		

Personnel Responsible for Installation & Maintenance of Stormwater BMPs

Company:	TBD				
Name:					
Address:					
City:		State:		ZIP Code:	
Telephone:		Email:			

Inspection Personnel

Company:	Herb Chambers				
Name:					
Address:	105 Boston Post Road – Route 20				
City:	Sudbury	State:	MA	ZIP Code:	01776
Telephone:		Email:			

Personnel Responsible for Taking Corrective Actions

Company:	Herb Chambers				
Name:					
Address:	105 Boston Post Road – Route 20				
City:	Sudbury	State:	MA	ZIP Code:	01776
Telephone:		Email:			

2.0 SITE EVALUATION, ASSESSMENT AND PLANNING

2.1 PROJECT/SITE INFORMATION

Project/Site Name:	Herb Chambers of Sudbury				
Project Street/Location:	105 Boston Post Road – Route 20				
City:	Sudbury	State:	MA	ZIP Code:	01776
County or Similar Subdivision:		Middlesex			

Latitude:	42.362550°	Longitude:	-71.392222°
Method for Determining Latitude/Longitude: ☐ USGS Topographic Map (specify scale: _____) ☐ EPA Website ☐ GPS ☒ Other (please specify): __Google Earth____			
Horizontal Reference Datum: ☐ NAD 27 ☐ WGS 84 ☒ NAD 83 ☐ Unknown			

Is the project located on Indian country lands, or located on a property of religious of cultural significance to an Indian tribe? ☐ Yes ☒ No

If yes, provide the name of the Indian tribe associated with the area of Indian country (including the name of Indian reservation if applicable), or if not in Indian country, provide the name of the Indian tribe associated with the property:

_____

Is this project considered a federal facility? ☐ Yes ☒ No

Are you applying for permit coverage as a "federal operator" as defined in Appendix A of the 2017 CGP? ☐ Yes ☒ No

NPDES project or permit tracking number: TBD

2.1.1 Emergency-Related Projects

Is this project in response to a public emergency? ☐ Yes ☒ No

If yes, document the cause of the public emergency *(e.g., natural disaster, extreme flooding conditions)*, information substantiating its occurrence *(e.g., state disaster declaration)*, and a description of the construction necessary to reestablish effective public services:

2.2 NATURE AND SEQUENCE OF CONSTRUCTION ACTIVITY

2.2.1 Function of the Construction Activity

Function of the construction activity:

☐ Single-Family Residential ☒ Commercial

☐ Multi-Family Residential ☐ Industrial

☐ Institutional ☐ Highway or Road Construction

☐ Utility ☐ Other (please specify): _____

2.2.2 Building Demolition

Will there be demolition of any structure built or renovated before January 1, 1980? ☐ Yes ☒ No

If yes, do any of the structures being demolished have at least 10,000 square feet of floor space? ☐ Yes ☒ No

2.2.3 Agricultural Land

Was the pre-development land use used for agriculture? ☐ Yes ☒ No

2.2.4 Estimated Project Dates

Estimated Project Start Date: TBD
Estimated Project Completion Date: TBD

Estimated Timeline of Activity	Construction Activity and BMP Descriptions
TBD 2021 – TBD 2021	***Before any site grading activities begin*** 1. Stake Limit of Construction. Workers shall be informed that no construction activity is to occur beyond this limit at any time. 2. Delineate the limit of the natural buffer to be maintained with flags, tape or other similar device. 3. Clear vegetation as necessary within the limits of construction. A stockpile of wood chips from tree cutting shall be left on site for stabilization. 4. Grub the areas where erosion controls are required, removing stumps and roots as necessary. The existing ground surface shall be disturbed as little as possible prior to the start of construction. 5. Install erosion controls as shown on the plans. 6. Install storm drain inlet protection. 7. Construct stabilized construction exits. 8. Install temporary sanitary facilities and trash facilities.
TBD 2021 – TBD 2021	***Site grading*** 1. Begin site clearing and grubbing operations. 2. Strip site to subsurface. All organics and subsoil shall be stripped and properly disposed of. 3. Install silt fences around any stockpile and cover stockpiles. 4. Disturbed areas where construction will cease for more than 14 days shall be stabilized with erosion controls. 5. Install retaining walls.
TBD 2021 – TBD 2021	***Parking Lot/Site Drainage Construction***. 1. Install underground utilities and their structures. 2. Install permanent drainage structures and piping. 3. Install subgrade and bituminous pavement. 4. Install subgrade and permeable pavement. 5. Plant trees and shrubs as noted on plans by (date TBD). 6. Seed and stabilize areas outside of pavement. 7. Remove all temporary control BMP's and stabilize any areas disturbed by the removal of erosion controls. 8. Monitor stabilized areas until final stabilization is reached.

2.3 SOILS, SLOPES, VEGETATION, AND CURRENT DRAINAGE PATTERNS

Soil type(s): The Natural Resources Conservation Service (NRCS) lists the entirety of on-site soil as Udorthents-Urban land complex.

Slopes: Slopes on site vary from 0% to 15%.

Drainage Patterns: Runoff from the site currently drains to two locations. The northern portion of the site (entryway) drains to the north towards the main roadway, and the remaining southern portion of the site drains to the south to an existing wetland system.

Vegetation: Vegetation on site consists of primarily native trees, shrubs, and grasses typical of woodland areas in Sudbury.

2.4 CONSTRUCTION SITE ESTIMATES

Total property area:	3.4 acres
Approximate construction site area to be disturbed for parking lot:	2.62 acres
Percentage impervious area before construction:	60.10%
Runoff coefficient before construction:	89
Percentage impervious area after construction of parking/inventory lot:	56.46 %
Runoff coefficient after construction:	90

2.5 DISCHARGE INFORMATION

2.5.1 Description of Receiving Storm Sewer Systems

Does your project/site discharge stormwater into a Municipal Separate Storm Sewer System (MS4)? ☐ Yes ☒ No

2.5.2 Receiving Waters

Off-site Wetlands

2.5.3 Impaired Waters/ TMDLs

Has the surface water been listed as “impaired?” ☐ Yes ☒ No

If yes, list the pollutant(s) causing the impairment:

Describe the method(s) used to determine whether or not your project site discharges to an impaired water:

Has a TMDL been completed? ☐ Yes ☒ No

If yes, list the title of the TMDL document:

List the pollutant(s) for which there is a TMDL:

2.5.4 Tier 2, 2.5, or 3 Waters

Is this surface water designated as a Tier 2, 2.5 or 3 water? ☐ Yes ☒ No

If yes specify which Tier the surface water is designated as:
☐ Tier 2 ☐ Tier 2.5 ☐ Tier 3

2.6 UNIQUE SITE FEATURES AND SENSITIVE AREAS

There is a Bordering Vegetated Wetland to the South of the proposed site, and the project is within the buffer zone. The NHESP also identifies a portion of the site as within an Estimated Habitat of Rare Wildlife that includes a potential vernal pool to the south of the site within the wetland area.

2.7 CONSTRUCTION SUPPORT ACTIVITIES

Construction support activities are not required for the project.

2.8 POTENTIAL SOURCES OF POLLUTION

2.8.1 Potential Sources of Sediment

- Clearing and grubbing operations
- Grading and site excavation operations
- Vehicle tracking
- Topsoil stripping and stockpiling
- Landscaping operations

2.8.2 Potential Sources of Non-Sediment Pollutants

- Combined Staging Area — small fueling activities, minor equipment maintenance, sanitary facilities, and hazardous waste storage.

- Materials Storage Area — general building materials, solvents, adhesives, paving materials, paints, aggregates, trash, and so on.
- Construction Activity — paving, curb/gutter installation, concrete pouring and building construction
- Concrete Washout Area

Material/ Chemical	Physical Description	Stormwater Pollutants	Location[1]
Pesticides	Various colored to colorless liquid, powder, pellets, or grains	Chlorinated hydrocarbons, organophosphates, carbamates, arsenic	Herbicides used for noxious weed control
[2]Fertilizer	Liquid or solid grains	Nitrogen, phosphorous	Newly seeded areas
Cleaning solvents	Colorless, blue, or yellow-green liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates	No equipment cleaning allowed in project limits
Asphalt	Black solid	Oil, petroleum distillates	Streets, parking areas, and roofing
Glue/ adhesives	White or yellow liquid	Polymers, epoxies	Building construction
Paints	Various colored liquids	Metal oxides, stoddard solvent, talc, calcium carbonate, arsenic	Building construction
Curing compounds	Creamy white liquid	Naphtha	Curb and gutter, walkways
Wood preservatives	Clear amber or dark brown liquid	Stoddard solvent, petroleum distillates, arsenic, copper, chromium	Timber pads and building construction
Hydraulic oil/fluids	Brown oily petroleum hydrocarbon	Mineral oil	Leaks or broken hoses from equipment
Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE	Secondary containment/staging area
Diesel Fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes	Secondary containment/staging area
Kerosene	Pale yellow liquid petroleum hydrocarbon	Coal oil, petroleum distillates	Secondary containment/staging area
Antifreeze/ coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)	Leaks or broken hoses from equipment
Sanitary toilets	Various colored liquid	Bacteria, parasites, and viruses	Staging area

[1] Area where material/chemical is used on-site.

[2] Use of fertilizers containing nitrogen and/ or phosphorus in ratios greater than recommended by the manufacture must be documented.

2.9 SITE PLANS

The Topographic Plan shows the undeveloped site and its current features. The Site Plans show the developed site.

These Site Plans include:

- ☐ Delineation of construction phasing, if applicable
- ☒ Areas of soil disturbance and areas that will not be disturbed
- ☒ Direction(s) of stormwater flow and approximate slopes before and after major grading activities
- ☒ Natural features to be preserved
- ☒ Locations of major structural and non-structural BMPs identified in the SWPPP
- ☒ Location(s) of sediment, soil or other construction materials will be stockpiled
- ☐ Locations of stabilization measures
- ☐ Locations of off-site material, waste, borrow, or equipment storage areas
- ☒ Location of all waters of the U.S., including wetlands on or near the site. Indicate if water bodies are listed as impaired, or are identified as Tier 2, 2.5 or 3 waters.
- ☒ Boundary lines of any natural buffers,
- ☒ Locations of stormwater discharges and/ or authorized non-stormwater will be discharged to surface water(s)
- ☒ Locations of storm drain inlets and stormwater control measures on the site and in the immediate vicinity of the site
- ☐ Locations of all pollutant-generating activities
- ☐ Locations where polymers, flocculants, or other treatment chemicals will be used and stored
- ☐ Areas of federally listed critical habitat for endangered or threatened species

See Appendix B: Site Plans

3.0 COMPLIANCE WITH APPLICABLE FEDERAL & STATE REQUIREMENTS

3.1 ENDANGERED SPECIES CERTIFICATION

Are endangered or threatened species and critical habitats on or near the project area?
☒ Yes ☐ No

Describe how this determination was made:

In a report filed from DGT Associates in November of 2020 the Natural Heritage Endangered Species was investigated. The following information was gathered. According to the latest Mass. Division of Fisheries and Wildlife – Natural Heritage Program mapping, the southeastern portion of the site is labeled as an area of "Priority Habitat of Rare Species" (PH 1434). This same area is identified as an area of "Estimated Habitat of Rare Wetland Wildlife".

There are no "Certified Vernal Pools" within the Habitat. The NHESP does identify the small ponding area on the abutting property off the site to the south within the wetland area as a "Potential Vernal Pool".

If yes, describe or refer to documentation that determines the likelihood of an impact on the identified species and/or habitat and the steps taken to address that impact.

The proposed site does not go beyond the limits of the existing developed boundaries of the property. Stormwater management and treatment is proposed to be improved through the use of water quality units, underground detention structures, and permeable pavement, The proposed project will not negatively impact, but will be an improvement to the Habitat.

3.2 HISTORIC PRESERVATION

Step 1

Will stormwater controls that require subsurface earth disturbance be installed on the site?
☒ Yes ☐ No

Step 2

If you answered yes in Step 1, have prior surveys or evaluations conducted on the site already determined that historic properties do not exist, or that prior disturbances at the site have precluded the existence of historic properties?
☒ Yes ☐ No

Step 3

If you answered no in Step 2, has it been determined that the installation of subsurface earth-disturbing stormwater controls will have no effect on historic properties?

☐ Yes ☐ No

If yes, provide documentation of the basis for your determination.

Step 4

If you answered no in Step 3, did the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Office (THPO), or other tribal representative (whichever applies) respond within 15 calendar days to indicate whether the subsurface earth disturbances caused by the installation of stormwater controls affect historic properties?

☐ Yes ☐ No

If no, no further documentation is required. If yes, describe the nature of their response and include documentation in the Appendix:

☐ Written indication that adverse effects to historic properties from the installation of stormwater controls can be mitigated by agreed upon actions.

☐ No agreement has been reached regarding measures to mitigate effects to historic properties from the installation of stormwater controls.

☐ Other:

3.3 SAFE DRINKING WATER ACT UNDERGROUND INJECTION CONTROL REQUIREMENTS

Do you plan to install any of the following controls?

☐ Infiltration trenches (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

☐ Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate stormwater flow

☐ Drywells, seepage pits, or improved sinkholes (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

If yes, attach documentation of contact between you and the applicable state agency or EPA Regional Office responsible for implementing the requirements for underground injection wells in the Safe Drinking Water Act and EPA's implementing regulations at 40 CFR Parts 144-147.

3.4 APPLICABLE STATE OR LOCAL PROGRAMS

This SWPPP complies with the requirements of Standard 8 of the Massachusetts Department of Environmental Protection Stormwater Handbook, which states:

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

4.0 EROSION AND SEDIMENT CONTROL BMPS

This SWPPP contains a listing of the erosion and sediment control best management practices (BMPs) that will be implemented to control pollutants in stormwater discharges. The BMPs are categorized under one of the areas of BMP activity as described below:

- Natural Buffers or Equivalent Sediment Controls
- Minimize disturbed area and protect natural features and soil
- Phased construction activity
- Control stormwater flowing onto and through the project
- Stabilize soils
- Protect slopes
- Protect storm drain inlets
- Establish perimeter controls and sediment barriers
- Retain sediment on-site and control dewatering practices
- Establish stabilized construction exits

4.1 NATURAL BUFFERS OR EQUIVALENT SEDIMENT CONTROLS

Are there any surface waters located within 50 feet of your construction disturbances that receive stormwater discharges from the site? ☐ Yes ☒ No

If yes, check the compliance alternative that applies:

☐ A 50-foot undisturbed natural buffer will be maintained. The 50-foot buffer is shown on the attached site plans and will be clearly marked off with flags, tape, or a similar marking device prior to the commencement of earth disturbing activities.

☐ An undisturbed natural buffer of 25-feet will be provided along with supplemental erosion and sediment controls, which in combination achieves the sediment load reduction equivalent to a 50-foot undisturbed natural buffer. The estimated sediment removal calculations are included in the appendixes of this report and have been calculated using the applicable tables included in Appendix G of the 2017 Construction General Permit **or** site-specific calculations were performed to estimate the sediment removal of a 50-buffer zone and the efficiency of the reduced buffer zone and supplemental erosion control measures.

Description of Controls:
Provide a description of the additional erosion and sediment controls proposed, including the model or other tool used to estimate the sediment load reductions and the results from the calculation.

Silt Sock and fence are proposed at the perimeter of parking lot disturbance. Silt sacks to be utilized for catch basins as a filtering mechanism. Silt fence barrier to be established around soil stockpile. Landscaping adjacent to wetland will be stabilized with plantings and seeding. Erosion controls will not be removed until landscaped areas are stabilized and stormwater management controls are complete.

☐ It is infeasible to provide and maintain an undisturbed natural buffer of any size, therefore erosion and sediment controls will be implemented that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer. The estimated sediment removal calculations are included in the appendixes of this report and have been calculated using the applicable tables included in Appendix G of the 2012 Construction General Permit **or** site-specific calculations were performed to estimate the sediment removal of a 50-buffer zone and the efficiency of the reduced buffer zone and supplemental erosion control measures.

Description:
Include rationale for why a natural buffer cannot be maintained. Provide a description of the additional erosion and sediment controls proposed, including the model or other tool used to estimate the sediment load reductions and the results from the calculation. Include the estimated sediment removal rate from a natural 50-buffer and the proposed controls.

☐ The project qualifies for one of the exceptions in Part G.2.2 of Appendix G of the 2017 Construction General Permit. Specifically:

- ☐ There is no discharge of stormwater to surface waters through the area between the disturbed portions of the site and any surface waters located within 50 feet of the site. This includes situations where control measures have been implemented such as a berm or other barrier that will prevent such discharges.

- ☐ No natural buffer exists due to preexisting development disturbances, such as impervious surfaces or structures that were constructed prior to the initiation of planning for this project.

- ☐ For a "linear project," site constraints (e.g., limited right-of-way) make it infeasible for the site to meet any of the CGP Part 2.2.1.a compliance alternatives

☐ The project qualifies as "small residential lot" construction, and complies with:

- ☐ Alternative 1: A 50-foot buffer has been provided with double perimeter controls has been provided.
- ☐ Alternative 2: A sediment discharge risk evaluation has been prepared and is included in the appendices of this report.
- ☐ Buffer disturbances are authorized under a CWA Section 404 permit.
- ☐ Buffer disturbances will occur for the construction of a water-dependent structure or water access area (e.g., pier, boat ramp, and trail).

4.2 MINIMIZE DISTURBED AREA AND PROTECT NATURAL FEATURES AND SOIL

4.2.1 Preserve Existing Vegetation

Description:	The preserved area of existing vegetation shall be as identified on the Site Plans and Sitework Specifications.
Installation Schedule:	The preserved area of existing vegetation shall be surrounded with the orange-colored plastic mesh fence, and trees shall be marked before construction begins at the site.
Maintenance and Inspection:	The area shall be inspected weekly to ensure the temporary fence is intact and the trees are clearly marked. During construction, preserved areas of existing vegetation shall be surrounded by the orange-colored mesh fence and clearly marked at all times.

4.2.2 Stockpiling Topsoil

Description:	Topsoil stripped from the immediate construction area shall be stockpiled as identified on the Site Plans and Sitework Specifications or as approved by the SWPPP preparer. Stockpiles shall be located outside of any natural buffers and away from any stormwater conveyances, drain inlets, and areas where stormwater flow is concentrated.
Installation Schedule:	Topsoil stockpiles shall be established during grading activities. The silt fence and temporary erosion controls shall be installed immediately after the stockpile has been established. For piles that will be unused for 14 or more days, provide cover over the stockpile or temporary stabilization to avoid direct contract with precipitation and wind. Install a sediment barrier along all downgradient perimeter areas of stockpiles.

Maintenance and Inspection:	The area shall be inspected weekly for erosion and immediately after storm events. Areas on or around the stockpile that have eroded shall be stabilized immediately with erosion controls.

4.3 PHASED CONSTRUCTION ACTIVITIY

The proposed site is too small for phased grading to be practical. To minimize erosion during grading activities, grading and site work shall be conducted after snowmelt and during periods of predicted dry weather. The areas of the site that will remain vegetated after construction shall be graded first and stabilized with hydromulch or seeding immediately after grading activities are completed. All other areas of the construction site shall be stabilized if site work is not planned for more than 14 days. To minimize potential erosion from the site, only areas necessary to construct the grass drainage channels, sediment basin, and construction entrances/exits shall be disturbed initially. These areas shall be cleared, grubbed, and graded and the above measures shall be installed. These areas shall be stabilized immediately after construction but no later than 14 days after construction ceases. Overall grubbing, clearing, grading shall be conducted over a 2-week period to limit erosion from the site. Areas graded during this time period shall be stabilized with hydromulch immediately after construction but no later than 14 days after construction ceases.

For a timeline of construction activity, see the Estimated Project Dates section of this report.

4.4 STABILIZE SOIL

4.4.1 Temporary Stabilization

Description:	Initiation of temporary vegetative cover shall occur immediately where construction will cease for more than 14 days. It shall be established using hydroseeding for areas of exposed soil (including stockpiles).
Installation Schedule:	Temporary stabilization measures shall be initiated immediately where construction activities will temporarily cease for more than 14 days. Stabilization will be completed as soon as practicable, as but no later than 14 calendar days after stabilization has been initiated.
Maintenance and Inspection:	Stabilized areas shall be inspected weekly and after storm events until a dense cover of vegetation has become established. If failure is noticed at the seeded area, the area shall be reseeded, fertilized, and mulched immediately.

4.4.1 Mulching

Description:	Wood chip mulch shall provide immediate protection to exposed soils during short periods of disturbance. Wood chip mulch shall also be applied in areas that have been seeded for temporary or permanent stabilization.
Installation Schedule:	Wood chip mulch shall be applied to exposed soils during short periods of construction and seeded areas.
Maintenance and Inspection:	Mulched areas shall be inspected weekly and after storm events to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, the surface shall be repaired, and new mulch shall be applied to the damaged area.

4.4.2 Permanent Stabilization

Description:	Initiation of permanent stabilization measures shall occur immediately after the final design grades are achieved and earth moving activities cease. Native species of plants shall be used to establish vegetative cover on exposed soils. Permanent stabilization shall be completed in accordance with the procedures outlined in the Final Stabilization section of this report.
Installation Schedule:	Portions of the site where construction activities have permanently ceased shall be stabilized as soon as possible, but no later than 14 calendar days after stabilization has been initiated.
Maintenance and Inspection:	All seeded areas shall be inspected weekly during construction activities and after storm events until a dense cover of vegetation has been established. If failure is noticed at the seeded area, the area shall be reseeded, fertilized, and mulched immediately. Care shall be taken to avoid compacting newly placed topsoil. After construction is completed at the site, permanently stabilized areas shall be monitored until final stabilization is reached.

4.4.3 Dust Control

Description:	Dust from the site shall be controlled by using a mobile pressure-type distributor truck to apply water to disturbed areas. The mobile unit shall apply water at a rate of 300 gallons per acre and minimized as necessary to prevent runoff and ponding.
Installation Schedule:	Dust control shall be implemented as needed once site grading has been initiated and during windy conditions (forecasted or actual wind conditions of 20 mph or greater) while site grading is occurring. Spraying of water shall be performed no more than three times a day during the months of May–September and once per day during the months of October–April or whenever the dryness of the soil warrants it.
Maintenance and Inspection:	At least one mobile unit shall be available at all times to distribute water to control dust on the project area. Each mobile unit shall be equipped with a positive shutoff valve to prevent over watering of the disturbed area.

4.5 PROTECT SLOPES

4.5.1 Erosion Control Blanket

Description:	Erosion control blankets shall be used to provide stabilization for the slopes in the grass drainage channels and sediment basins, and on slopes greater than 3:1 throughout the site.
Installation Schedule:	The erosion control blankets shall be installed once the slopes of the grass drainage channel and sediment basin have reached final grade.
Maintenance and Inspection:	The erosion control blanket shall be inspected weekly and immediately after storm events to determine if cracks, tears, or breaches have formed in the fabric; if so, the blanket shall be repaired or replaced immediately. Good contact with the soil shall be maintained and erosion shall not occur under the blanket. Any areas where the blanket is not in close contact with the ground shall be repaired or replaced.

4.6 PROTECT STORM DRAIN INLETS

4.6.1 Filter Bags

☐ Permanent ☒ Temporary

Description:	Filter bag manufactured specifically for controlling sediment flow into all storm drain inlets to prevent coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.
Installation Schedule:	Filter Bags shall be installed prior to clearing and grubbing, and following raising catch basin grates to binder grade.
Maintenance and Inspection:	Storm drain inlet protection shall be inspected weekly and following storms. Clogged filter bags shall be cleaned or replaced. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, you must remove the deposited sediment by the end of the same work day it is found or by the following work day if removal the same day is not feasible. Collected sediments shall NOT be washed into storm drains.

4.7 ESTABLISH PERIMETER CONTROLS AND SEDIMENT BARRIERS

4.7.1 Erosion Control Barrier

☐ Permanent ☒ Temporary

Description:	An erosion control barrier, consisting of entrenched straw wattles, compost socks and siltation fencing, shall be installed along the downgradient side of the proposed project to decrease the velocity of sheet flows and intercept and detain small amounts of sediment from disturbed areas.
Installation Schedule:	Erosion Control Barrier shall be installed prior to clearing and grubbing.
Maintenance and Inspection:	Erosion Control Barrier shall be inspected weekly, following storms, and daily during rainy periods. Damaged fencing shall be replaced. Concentrated flows shall be intercepted and rerouted. Sediment accumulations shall be removed when reaching a depth of 6-inches, or one-half of the above ground height of the barrier, whichever is less. Deteriorated fencing material shall be replaced. Used fencing shall be properly disposed of.

4.8 PREVENT SOIL COMPACTION

4.8.1 Protect Proposed Infiltration Areas

☐ Permanent ☒ Temporary

Description:	An erosion control barrier, consisting of straw bales, shall be installed around the perimeter of all proposed infiltration areas to prevent construction vehicles from impacting the area, to decrease the velocity of sheet flows and intercept, and detain small amounts of sediment from disturbed areas.
Installation Schedule:	The erosion control barrier shall be installed after clearing and grubbing.
Maintenance and Inspection:	Straw bales shall be inspected weekly, following storms, and daily during rainy periods. Damaged sections shall be replaced. Concentrated flows shall be intercepted and rerouted. Sediment accumulations shall be removed when reaching a depth of 6-inches. Deteriorated bale material shall be replaced. Used bales shall be properly disposed of.

4.9 RETAIN SEDIMENT ON-SITE

4.9.1 Temporary Sediment Basins

☐ Permanent ☒ Temporary

Description:	Temporary sediment basins are located throughout the site between construction and wetland resource areas. These basins provide 3,600 cubic feet of storage per acre drained, as required by the EPA. Refer to the Temporary Sediment Basin Sizing Calculation located in Appendix K. Several temporary sediment basins will be utilized as sediment forebays following construction.
Installation Schedule:	Temporary Sediment Basins shall be installed during grading activities.
Maintenance and Inspection:	Temporary Sediment Basins shall be inspected weekly and following storms. Sediment shall be removed when it reaches a depth of one foot, or half the design capacity whichever is less. Damage to basin embankments and slopes shall be repaired.

4.10 ESTABLISH STABILIZED CONSTRUCTION ENTRANCE/EXIT

☐ Permanent ☒ Temporary

Description:	Temporary gravel or crushed stone construction entrances/exits or other means shall be used to minimize off-site movement of soil with vehicles. Construction access points shall be maintained to minimize tracking of soil onto public roads and existing parking lots to remain. If the rock entrance is not working to keep streets clean, then install wheel wash, sweep streets, or wash streets if wash water can be collected.
Installation Schedule:	Stabilized construction entrance shall be installed prior to clearing and grubbing.
Maintenance and Inspection:	Stabilized construction entrances shall be inspected daily. Gravel or crushed stone shall be added if the pad is no longer in accordance with the specifications. If the rock entrance is not working to keep streets clean, then install wheel wash, sweep streets, or wash streets if wash water can be collected. When sediment has been tracked off of the site, it shall be removed by the end of the same working day, or by the end of the next working day if track-out occurs on a non work day. Remove sediment by sweeping, shoveling or vacuuming roadways were sediment has been tracked-out.

5.0 GOOD HOUSEKEEPING BMPS

This SWPPP contains a listing of the good housekeeping best management practices (BMPs) that shall be implemented to control pollutants in stormwater discharges during construction-related work. The BMPs are categorized below:

- Material Handling and Waste Management
- Establish Proper Building Material Staging Areas
- Designate Washout Areas
- Establish Proper Equipment/Vehicle Fueling and Maintenance Practices
- Allowable Non-Stormwater Discharges and Control Equipment/Vehicle Washing
- Spill Prevention and Control Plan

5.1 MATERIAL HANDLING AND WASTE MANAGEMENT

Several management procedures and practices are proposed to prevent and/or reduce the discharge of pollutants to stormwater from solid or liquid wastes that will be generated at the site. These measures are grouped into the following categories: (1) solid or construction waste disposal, (2) recycling, (3) sanitary and septic waste, and (4) hazardous materials.

5.1.1 Solid or Construction Waste Disposal

Description:	All waste materials shall be collected and disposed of into metal trash dumpsters in the materials storage area. Dumpsters shall have a secure watertight lid, be placed away from stormwater conveyances and drains, and meet all federal, state, and municipal regulations. Only trash and construction debris from the site shall be deposited in the dumpster. No construction materials shall be buried on-site unless authorized by a program for recycling/beneficial use. All personnel shall be instructed regarding the correct disposal of trash and construction debris. Notices that state these practices shall be posted in the office trailer and the individual who manages day-today site operations shall be responsible for seeing that these practices are followed.
Installation Schedule:	Trash dumpsters shall be installed once the materials storage area has been established.
Maintenance and Inspection:	The dumpsters shall be inspected weekly and immediately after storm events. The dumpsters shall be emptied weekly and taken to an approved landfill or recycling facility. If trash and construction debris are exceeding the dumpsters' capacity, the dumpsters shall be emptied more frequently. Waste container lids shall be closed when not in use and at the end of the business day. For waste containers that do not have lids, provide cover or a similarly effective means to minimize the discharge of pollutants.

5.1.2 Recycling

Description:	Wood pallets, cardboard boxes, and other recyclable construction scraps shall be disposed of in a designated dumpster for recycling. The dumpster shall have a secure watertight lid, be placed away from stormwater conveyances and drains and meet all local and state solid-waste management regulations. Only solid recyclable construction scraps from the site shall be deposited in the dumpster. All personnel shall be instructed regarding the correct procedure for disposal of recyclable construction scraps. Notices that state these procedures shall be posted in the office trailer, and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.
Installation Schedule:	Designated recycling dumpsters shall be installed once the area has been established.
Maintenance and Inspection:	The recycling dumpster shall be inspected weekly and immediately after storm events. The recycling dumpster shall be emptied weekly and taken to an approved recycling center. If recyclable construction wastes are exceeding the dumpsters' capacity, the dumpsters shall be emptied more frequently.

5.1.3 Sanitary and Septic Waste

Description:	Temporary sanitary facilities (portable toilets) shall be provided at the site throughout the construction phase. The portable toilets shall be located in the staging area, away from concentrated flow paths and traffic flow.
Installation Schedule:	The portable toilets shall be brought to the site once the staging area has been established.
Maintenance and Inspection:	All sanitary waste shall be collected from the portable facilities on a regular basis. The portable toilets shall be inspected weekly for evidence of leaking holding tanks. Toilets with leaking holding tanks shall be removed from the site and replaced with new portable toilets.

5.1.4 Hazardous Materials and Waste

Description:	All hazardous waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids shall be stored in structurally sound and sealed shipping containers, within the hazardous materials storage area. Hazardous waste materials shall be stored in appropriate and clearly marked containers and segregated from other non-waste materials. Secondary containment shall be provided for all waste materials in the hazardous materials storage area and shall consist of commercially available spill pallets. Additionally, all hazardous waste materials shall be disposed of in accordance with federal, state, and municipal regulations. Hazardous waste materials shall not be disposed of into the on-site dumpsters. All personnel shall be instructed regarding proper procedures for hazardous waste disposal. Notices that state these procedures shall be posted in the office trailer and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.
Installation Schedule:	Shipping containers used to store hazardous waste materials shall be installed once the site materials storage area has been installed.
Maintenance and Inspection:	The hazardous waste material storage areas shall be inspected weekly and after storm events. The storage areas shall be kept clean, well-organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Material safety data sheets, material inventory, and emergency contact numbers shall be maintained in the office trailer.

5.2 ESTABLISH PROPER BUILDING MATERIAL STAGING AREAS

Description:	Construction equipment and maintenance materials shall be stored at the combined staging area and materials storage areas. A watertight shipping container shall be used to store hand tools, small parts, and other construction materials. Nonhazardous building materials such as packaging material (wood, plastic, and glass), and construction scrap material (brick, wood, steel, metal scraps, and pipe cuttings) shall be stored in a separate covered storage facility adjacent to the shipping container. All hazardous-waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids shall be stored in structurally sound and sealed containers under cover within the storage area. All fertilizers, herbicides, insecticides and pesticides shall be stored in accordance with local, state, and federal regulations. At a minimum, these materials shall be covered with plastic sheeting or a temporary roof to prevent contact with rainwater. Very large items, such as framing materials and stockpiled lumber, shall be stored in the open in the materials storage area. Such materials shall be elevated on wood blocks to minimize contact with runoff.
Installation Schedule:	The materials storage area shall be installed after grading and before any infrastructure is constructed at the site.
Maintenance and Inspection:	The storage area shall be inspected weekly and after storm events. The storage area shall be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.

5.3 DESIGNATE WASHOUT AREAS

5.3.1 Concrete Washout

Description:	A designated temporary, above-grade concrete washout area shall be constructed. The temporary concrete washout area shall be constructed with a recommended minimum length and minimum width of 10 feet, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations. The washout area shall be lined with plastic sheeting at least 10 mils thick and free of any holes or tears. Signs shall be posted marking the location of the washout area to ensure that concrete equipment operators use the proper facility. Concrete pours shall not be conducted during or before an anticipated storm event. Concrete mixer trucks and chutes shall be washed in the designated area or concrete wastes shall be properly disposed of off-site. When the temporary washout area is no longer needed for the construction project, the hardened concrete and materials used to construct the area shall be removed and disposed of according to the maintenance section below, and the area shall be stabilized.
Installation Schedule:	The washout area shall be constructed before concrete pours occur at the site.
Maintenance and Inspection:	The washout areas shall be inspected daily to ensure that all concrete washing is being discharged into the washout area, no leaks or tears are present, and to identify when concrete wastes need to be removed. The washout areas shall be cleaned out once the area is filled to 75 percent of the holding capacity. Once the area's holding capacity has been reached, the concrete wastes shall be allowed to harden; the concrete shall be broken up, removed, and taken to an approved landfill for disposal or recycled on-site or off-site in accordance with applicable laws. The plastic sheeting shall be replaced if tears occur during removal of concrete wastes from the washout area.

Design Specifications:

1. Temporary concrete washout type Above Grade shall be constructed as shown above, with a recommended minimum length and minimum width of 10 feet.
2. The washout shall be a minimum of 50 feet from storm drain inlets.
3. Plastic lining shall be free of holes, tears, or other defects that compromise the impermeability of the material.

5.3.2 Applicators, Containers and Paint Washout

Description:	A designated temporary, above-grade washout area shall be constructed as needed for the washout and cleanout of stucco, paint, or other non-hazardous construction materials. The temporary washout area shall be a leak-proof container with sufficient volume to contain all liquid and waste generated by washout operations. The temporary washout shall be sited outside of all buffer zones.
Installation Schedule:	The washout area shall be constructed as needed.
Maintenance and Inspection:	The washout areas shall be inspected daily to ensure that all washing is being discharged into the washout area, no leaks or tears are present, and to identify when wastes need to be removed. The washout areas shall be cleaned out once the area is filled to 75 percent of the holding capacity. Liquid wastes shall be disposed of in accordance with applicable Federal and State requirements and shall not be discharged into drainage systems.

5.4 ESTABLISH PROPER EQUIPMENT/VEHICLE FUELING AND MAINTENANCE PRACTICES

Description:	Several types of vehicles and equipment will likely be used on-site throughout the project, including graders, scrapers, excavators, loaders, paving equipment, rollers, trucks and trailers, backhoes, and forklifts. All major equipment/vehicle fueling and maintenance shall be performed outside of wetland buffer zones. When vehicle fueling must occur on-site, the fueling activity shall occur in the staging area. Only minor equipment maintenance shall occur on-site. All equipment fluids generated from maintenance activities shall be disposed of into designated drums stored on spill pallets in accordance with the Material Handling and Waste Management Section. Absorbent, spill-cleanup materials and spill kits shall be available at the combined staging and materials storage area. Drip pans shall be placed under all equipment receiving maintenance and vehicles and equipment parked overnight.
Installation Schedule:	BMPs implemented for equipment and vehicle maintenance and fueling activities shall begin at the start of the project.
Maintenance and Inspection:	Inspect equipment/vehicle storage areas weekly and after storm events. Vehicles and equipment shall be inspected on each day of use. Leaks shall be repaired immediately, using dry cleanup measures where possible and eliminating the source of the discharge. Problem vehicle(s) or equipment shall be removed from the project site. Keep ample supply of spill-cleanup materials on-site and immediately clean up spills and dispose of materials properly. Do not clean surfaces by hosing-down the area

5.5 ALLOWABLE NON-STORMWATER DISCHARGES AND CONTROL EQUIPMENT / VEHICLE WASHING

Description:	All equipment and vehicle washing shall be performed off-site, except as required for wheel washes and concrete washout areas.
Installation Schedule:	N/A
Maintenance and Inspection:	N/A

5.6 SPILL PREVENTION AND CONTROL PROCEDURES

Description:	i. Employee Training: All employees shall be trained as detailed in the Inspection and Maintenance section of this report. ii. Vehicle Maintenance: Vehicles and equipment shall be maintained off-site. All vehicles and equipment including subcontractor vehicles shall be checked for leaking oil and fluids. Vehicles leaking fluids shall not be allowed on-site. iii. Hazardous Material Storage: Hazardous materials shall be stored in accordance with this report and federal and municipal regulations. iv. Spill Kits: Spill kits shall be kept within the materials storage area. Spills: All spills shall be cleaned up immediately upon discovery. Spent absorbent materials and rags shall be hauled off-site immediately after the spill is cleaned up for disposal at an approved landfill. Spills large enough to discharge to surface water shall be reported to the National Response Center at 1-800-424-8802 and MA DEP at 617-792-7653. v. Material safety data sheets: A material inventory and emergency contact information shall be maintained at the on-site project trailer.
Installation Schedule:	The spill prevention and control procedures shall be implemented once construction begins on-site.
Maintenance and Inspection:	All personnel shall be instructed the correct procedures for spill prevention and control. Notices that state these practices shall be posted in the office trailer, and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.

5.7 FERTILIZER DISCHARGE RESTRICTIONS

Description:	Discharges from fertilizers containing nitrogen and phosphorus shall be minimized. Fertilizers shall be applied at rates and amounts consistent with the manufacture's specification, and shall at no time exceed local, state, or federal specifications. See project landscape specifications for acceptable fertilizers that can be used for the project.
Installation Schedule:	Fertilizers shall be applied at an appropriate time of year, timed to coincide as closely as possible to the period of maximum vegetation uptake and growth. Avoid applying fertilizers before heavy rains. Do not apply fertilizers to frozen ground or stormwater conveyance channels flowing with water.
Maintenance and Inspection:	N/A

5.8 ANY ADDITIONAL BMPS

5.9 ALLOWABLE NON-STORMWATER DISCHARGE MANAGEMENT

Any changes in construction activities that produce other allowable non-stormwater discharges shall be identified, and the SWPPP shall be amended and the appropriate erosion and sediment control shall be implemented.

The following is a list of allowable non-stormwater discharges:

- Water Used to Control Dust
- Uncontaminated Excavation Dewatering
- Landscape Irrigation
- Fire Hydrant Flushing
- Firefighting
- Potable Water including uncontaminated waterline flushing
- Building Wash-Down provided soaps, solvents and detergents are not used and the external surface does not contain hazardous substances (i.e. paint or caulk containing PCBs)
- Pavement Wash-Down provided spills or leaks of toxic substances have not occurred and where soaps, solvents and detergents are not used.
- Non-Detergent Laden Vehicle Wash Water
- Foundation or Footing Drains
- Uncontaminated air conditioning or compressor condensate

Except for water used to control dust and irrigation water, the above discharges shall not be routed to areas of exposed soil.

6.0 POST-CONSTRUCTION BMPS

6.1 DEEP SUMP AND HOODED CATCH BASINS

Description:	Deep sump and hooded catch basins shall be located throughout paved areas on site. Catch basins shall collect, treat, and convey stormwater runoff from the proposed roadways.
Design Specifications:	Handle and install according to site work specifications. Filter bags shall be installed in all storm drain inlets.
Installation Schedule:	Catch basins shall be installed during utility construction.
Maintenance and Inspection:	Catch basins shall be inspected weekly and after major storm events during construction. See maintenance of Filter Bags for information on maintenance procedures. Following completion of site construction and final stabilization, maintenance and inspection responsibilities shall be taken over by the Owner in accordance with the Long-Term Pollution Prevention Plan and Long-Term Operation & Maintenance Plan.

6.2 SUBSURFACE INFILTRATION SYSTEM

Description:	Infiltration systems shall be protected from stormwater runoff from the disturbed site during construction.
Design Specifications:	Install according to sitework specifications and details.
Installation Schedule:	Infiltration system location shall be excavated during earthwork construction.
Maintenance and Inspection:	The inlet and outlet pipe of the subsurface infiltration system shall be inspected weekly and after storm events greater than 0.5 inches during construction. The area shall be checked for signs of slow flows, backed up water, visible oil, trash or debris or excessive amount sediment in the storage area. Following completion of site construction and final stabilization, maintenance and inspection responsibilities shall be taken over by the Owner in accordance with the Long-Term Pollution Prevention Plan and Long-Term Operation & Maintenance Plan.

6.3 SUBSURFACE DETENTION SYSTEM

Description:	Detention systems shall be protected from stormwater runoff from the disturbed site during construction.
Design Specifications:	Install according to sitework specifications and details.
Installation Schedule:	Detention system location shall be excavated during earthwork construction.

Maintenance and Inspection:	The inlet and outlet pipe of the subsurface detention system shall be inspected weekly and after storm events greater than 0.5 inches during construction. The area shall be checked for signs of slow flows, backed up water, visible oil, trash or debris or excessive amount sediment in the storage area. Following completion of site construction and final stabilization, maintenance and inspection responsibilities shall be taken over by the Owner in accordance with the Long-Term Pollution Prevention Plan and Long-Term Operation & Maintenance Plan.

6.4 PERMEABLE PAVEMENT

Description:	Permeable pavement shall be protected from stormwater runoff from the disturbed site during construction.
Design Specifications:	Install according to sitework specifications and details.
Installation Schedule:	Permeable pavement shall be paved following earthwork construction.
Maintenance and Inspection:	Permeable pavement should be monitored as needed following storms to ensure that the surface is draining properly. The surface should be cleaned as necessary using a power washer to dislodge any trapped particles followed by a vacuum sweep of the area. Following completion of site construction and final stabilization, maintenance and inspection responsibilities shall be taken over by the Owner in accordance with the Long-Term Pollution Prevention Plan and Long-Term Operation & Maintenance Plan.

7.0 FINAL STABILIZATION

In compliance with the Construction General Permit, soil stabilization measures must be implemented immediately whenever earth-disturbing activities are temporarily or permanently ceased on any portion of the site. Earth-disturbing activities are temporarily ceased when clearing, grading, and excavation within any area of a site that will not include a permanent structure will not resume for a period of 14 or more calendar days, but such activities will resume in the future.

In the context of this provision, “immediately” means as soon as practicable, but no later than the end of the next workday, following the day when the earth-disturbing activities have temporarily or permanently ceased. The following activities constitute the initiation of stabilization:

- Preparing the soil for vegetative or non-vegetative stabilization;
- applying mulch or other non-vegetative product to the exposed area;

- seeding or planting the exposed area;
- starting any of the activities in listed above on a portion of the area to be stabilized, but not on the entire area; and
- finalizing arrangements to have stabilization product fully installed in compliance with the applicable deadline for completing stabilization.

As soon as practicable, but no later than 14 calendar days after the initiation of soil stabilization measures the following activities are required to be completed:

- For vegetative stabilization, all activities necessary to initially seed or plant the area to be stabilized; and/or
- For non-vegetative stabilization, the installation or application of all such non-vegetative measures.

The following sections detail the management practices proposed to achieve final stabilization of the site.

7.1 PERMANENT SEEDING

Description:	Permanent seeding shall be applied immediately after the final design grades are achieved on portions of the site but no later than 14 days after construction activities have permanently ceased. After the entire site is stabilized, any sediment that has accumulated shall be removed and hauled off-site for disposal. Construction debris, trash and temporary BMPs (including silt fences, material storage areas, sanitary toilets, and inlet protection) shall also be removed and any areas disturbed during removal shall be seeded immediately. Seeding shall be performed in accordance to the Site Plans and Landscape Specifications for the project.
Installation Schedule:	Seeding shall occur at portions of the site where construction activities have permanently ceased shall be stabilized, as soon as possible but no later than 14 days after construction ceases.
Maintenance and Inspection:	All seeded areas shall be inspected weekly during construction activities for failure and after storm events until a dense cover of vegetation has been established. If failure is noticed at the seeded area, the area shall be reseeded, fertilized, and mulched immediately. After construction is completed at the site, permanently stabilized areas shall be monitored until final stabilization is reached.

8.0 INSPECTIONS AND MAINTENANCE

8.1 INSPECTIONS

8.1.1 Inspection Schedule and Procedures

Inspections of the site will be performed once every 7 days or 14 days and within 24 hours of the end of a storm event of 0.25-inch or greater unless otherwise specified. The inspections will verify that all BMPs required are implemented, maintained, and effectively minimizing erosion and preventing stormwater contamination from construction materials.

To determine if a storm event of 0.25 inches or greater has occurred on the site, either a properly maintained rain gauge will be kept on the site or the storm event information will be obtained from a weather station that is representative of the location. If an inspection is conducted because of rainfall measuring 0.25 inches or greater, the applicable rain gauge or weather station readings that triggered the inspection will be included in the inspection report.

Inspections shall include all areas of the site disturbed by construction activity and areas used for storage of materials that are exposed to precipitation. Inspectors shall look for evidence of, or the potential for, pollutants entering the storm water conveyance system. Sedimentation and erosion control measures identified in the SWPPP shall be observed to ensure proper operation. Discharge locations shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to waters of the United States, where accessible. Where discharge locations are inaccessible, nearby downstream locations shall be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site sediment tracking.

Utility line installation, pipeline construction, and other examples of long, narrow, linear construction activities may limit the access of inspection personnel to the areas described in the above paragraph. Inspection of these areas could require that vehicles compromise temporarily or even permanently stabilized areas, cause additional disturbance of soils, and increase the potential for erosion. In these circumstances, controls shall be inspected on the same frequencies as other construction projects, but representative inspections may be performed. For representative inspections, personnel shall inspect controls along the construction site for 0.25 mile above and below each access point where a roadway, undisturbed right-of-way, or other similar feature intersects the construction site and allows access to the areas described above. The conditions of the controls along each inspected 0.25 mile segment may be considered as representative of the condition

of controls along that reach extending from the end of the 0.25 mile segment to either the end of the next 0.25 mile inspected segment, or to the end of the project, whichever occurs first.

For detailed inspection procedures, see Sections 4 and 5.

All inspections shall be coordinated with a representative from the contractor (Owner). An Owner representative shall accompany the contractor (Inspector), when possible, during inspections.

Inspection reports are required to be completed within 24-hours of an inspection. If corrective actions are identified by the Inspector during the inspection, he/she shall notify and submit a copy of the inspection report to the Operator(s). For corrective actions identified, the project manager shall be responsible for initiating the corrective action within 24 hours of the report and completing maintenance as soon as possible or before the next storm event. For any corrective actions requiring a SWPPP amendment or change to a stormwater conveyance or control design, the project manager shall notify Owner, as soon as possible, before initiating the corrective action.

The business days for the project are ***9:00 am to 5:00 pm***, ***Monday through Friday***.

For a copy of the inspection report template, see Appendix E.

8.2 REDUCTIONS IN INSPECTION FREQUENCY

Once an area is stabilized, inspections may be reduced to twice per month for the first month, no more than 14 calendar days apart, then once per month. If construction resumes at the stabilized area the inspection frequency shall increase as outlined in section 8.1.

If earth-disturbing activities are suspended due to frozen conditions inspections can be temporarily suspended until a thaw occurs.

8.3 CORRECTIVE ACTION LOG

The corrective action log describes repairs, replacements, and maintenance of BMPs undertaken as a result of the inspections and maintenance procedures. Additionally, remedies of permit violations and clean and proper disposal of spills, releases other deposits should be recorded.

If it is determined the stormwater controls have not been installed as required, or that they are not functioning adequately corrective action is required within 7 calendar days.

The operator will document the completion of the corrective action within 24 hours.

See Appendix F – Corrective Action Log

9.0 RECORDKEEPING AND TRAINING

9.1 RECORDKEEPING

A copy of the SWPPP, along with all inspection reports and corrective action logs are required to be stored at an accessible location at the site, and shall be made available upon request of the EPA, or state or local agency approving stormwater management plans.

The following records shall be kept at the project site and shall be available for inspectors to review. These records shall be retained for a minimum period of at least 3 years after the permit is terminated.

Date(s) when major grading activities occur:
See Appendix I – Grading and Stabilization Activities Log

Date(s) when construction activities temporarily or permanently cease on a portion of the site:
See Appendix I – Grading and Stabilization Activities Log

Date(s) when an area is either temporarily or permanently stabilized:
See Appendix I – Grading and Stabilization Activities Log

9.2 LOG OF CHANGES TO THE SWPPP

The log of changes to the SWPPP is maintained in Appendix G and includes additions of new BMPs, replacement of failed BMPs, significant changes in the activities or their timing on the project, changes in personnel, changes in inspection and maintenance procedures and update to site plans.

9.3 TRAINING

Prior to the commencement of earth-disturbing activities or pollutant-generating activities, whichever occurs first, training on the pollution prevention measures outlined in this SWPPP shall be provided to staff and subcontractors.

9.3.1 Individual(s) Responsible for Training

Company/Organization: TBD

Name: TBD

9.3.2 Description of Training Conducted

Informal training shall be conducted for all staff, including subcontractors, on the site. The training shall be conducted primarily via tailgate sessions and shall focus on avoiding damage to stormwater BMPs and preventing illicit discharges. The tailgate sessions shall be conducted biweekly and shall address the following topics: Erosion Control BMPs, Sediment Control BMPs, Non-Stormwater BMPs, Waste Management and Materials Storage BMPs, and Emergency Procedures specific to the construction site. (See Appendix J – Training Log)

Formal training shall be provided to all staff and subcontractors with specific stormwater responsibilities, such as installing and maintaining BMPs. The formal training shall cover all design and construction specifications for installing the BMPs and proper procedures for maintaining each BMP. Training shall also cover inspection schedules and procedures for personnel whose job duties are related to inspections. Formal training shall occur before any BMPs are installed on the site. (See Appendix J – Training Log)

10.0 CERTIFICATION AND NOTIFICATION

10.1 SIGNATURE, PLAN REVIEW, AND MAKING PLANS AVAILABLE

A copy of the SWPPP (including a copy of the Construction General Permit, NOI, and acknowledgement letter from EPA shall be retained at the construction site (or other location easily accessible during normal business hours to EPA, a state, tribal or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; the operator of a municipal separate storm sewer receiving discharges from the site; and representatives of the U.S. Fish and Wildlife Service or the National Marine Fisheries Service) from the date of commencement of construction activities to the date of final stabilization. A copy of the SWPPP shall be available at a central location on-site for the use of all those identified as having responsibilities under the SWPPP. If an on-site location is unavailable to store the SWPPP when no personnel are present, notice of the plan's location shall be posted near the main entrance at the construction site.

10.2 NOTICE OF PERMIT COVERAGE

A sign must be posted at a safe, publicly accessible location in close proximity to the construction site detailing the permit coverage. The notice must be located so that it is visible from the public road that is nearest to the active part of the construction site, and it must use a font large enough to be readily viewed from a public right-of-way. At a minimum, the notice must include:

- The NPDES Permit Tracking Number,
- A contact name and phone number for obtaining additional construction site information,
- The Uniform Resource Locator (URL) for the SWPPP (if available), or the following statement: "If you would like to obtain a copy of the Stormwater Pollution Prevention Plan (SWPPP) for this site, contact the EPA Regional 1 Office at (617) 918-1038,
- The following statement "If you observe indicators of stormwater pollutants in the discharge or in the receiving waterbody, contact the EPA through the following website: https://www.epa.gov/enforcement/report-environmental-violations."

10.3 OWNER CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name:

Title: Owner

Signature: _____

Date:

10.4 OPERATOR CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Names:

Title: Project Manager

Signature: _____

Date:

APPENDICES

Appendix A

General Location Map

Appendix B

Site Plans (Included Under Separate Cover)

Appendix C

Construction General Permit (To be included with final SWPPP)

Appendix D

NOI and Acknowledgement Letter from EPA

Appendix E

Inspection Reports

Inspections under this SWPPP shall be conducted in accordance with each installed BMPs recommended maintenance requirements. This inspection frequency may be reduced to at least once every month if: a) the entire site is temporarily stabilized, b) runoff is unlikely due to winter conditions (e.g. site is covered with snow, ice, or the ground is frozen), or c) construction is occurring during seasonal arid periods in arid areas and semi-arid areas. If an inspection report is filed according to this modified schedule it shall be noted at the end of the report under the "NOTES" section.

The following four pages should be copied and completed for each inspection. All inspection forms should be compiled in a binder to prove compliance with this SWPPP.

Stormwater Pollution Prevention Plan: Inspection Checklist

General Information			
Project Name			
NPDES Tracking No.		**Location**	
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present phase of construction			
Type of Inspection: ❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event			
Weather Information			
Has there been a storm event since the last inspection? ❑Yes ❑No **If yes, provide:** Storm Start Date & Time: Storm Duration (hrs): Approx. Amount of Precipitation (in):			
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:			
Have any discharges occurred since the last inspection? ❑Yes ❑No **If yes, describe:**			
Are there any discharges at the time of inspection? ❑Yes ❑No **If yes, describe:**			

Site-specific BMPs

- *Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No	
Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No	
Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	
Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	
Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	

BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title:

TBD

Signature:_____ _____

Date:

Appendix F

Corrective Action Log

Corrective Action Log

Use this form to note the date and activity for accurate record keeping (make additional copies as necessary). Examples include the restaking or reinforcement of the erosion control barrier, site watering to prevent dust erosion, street sweeping, equipment and machinery repair, etc.

Date	Activity Description	Additional Action Items

Appendix G

SWPPP Amendment Log

The SWPPP, including the site plans, shall be amended whenever there is a change in design, construction, operation, or maintenance at the construction site that has or could have a significant effect on the discharge of pollutants to the waters of the United States that has not been previously addressed in the SWPPP.

The SWPPP shall be amended if during inspections or investigations by site staff, or by local, state, tribal or federal officials, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in storm water discharges from the construction site.

Based on the results of an inspection, the SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven (7) calendar days following the inspection. Implementation of these additional or modified BMPs shall be accomplished as described in Subpart 3.6B of the Construction General Permit (located in Appendix C).

SWPPP Amendment Log

Amendment No.	Description of the Amendment	Date of Amendment	Amendment Prepared by (Name(s) and Title)

Appendix H

Subcontractor Certifications/Agreements

Sample Subcontractor Certifications/Agreements

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Project Number: _____

Project Title: _____

Operator(s): _____

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company: _____

Address: _____

Telephone Number: _____

Type of construction service to be provided: _____

_____

_____

Signature: _____

Title: _____

Date: _____

Appendix I

Grading and Stabilization Activities Log

Site Plans in Appendix B should be annotated to indicate areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

The following records are to be kept by each Site Operator throughout the construction period and maintained in the SWPPP. Insert additional documentation for record keeping as necessary.

Grading and Stabilization Activities Log

Date	Location on Property	Description

Appendix J

Training Log

Training Log

Date	Training Topic	Attendee	Signature of Training Coordinator

Appendix K

Delegation of Authority

Sample Delegation of Authority Form

Delegation of Authority

I, _____ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the Herb Chambers Jaguar/Land Rover construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

_____ (name of person or position)
_____ (company)
_____ (address)
_____ (city, state, zip)
_____ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix I of EPA's Construction General Permit (CGP), and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix I.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name:

Company:

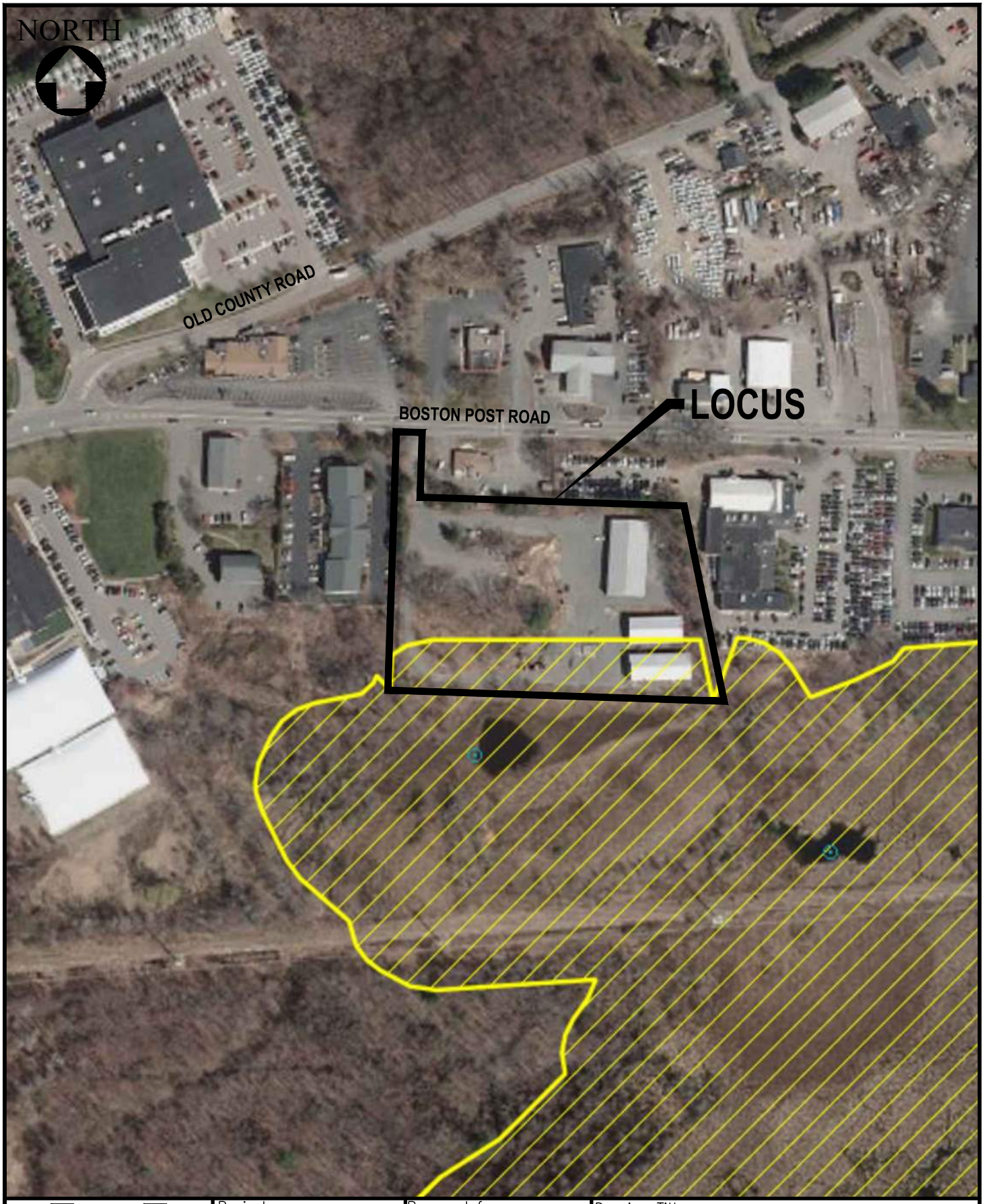
Title:

Signature: _____

Date:

Appendix L

Endangered Species Documentation



Crocker Design Group
2 SHARP STREET, UNIT B
HINGHAM, MA 02043

Project
PROPOSED PARKING EXPANSION
105 BOSTON POST ROAD, SUDBURY, MA

Prepared for
HERB CHAMBERS
83 BOSTON POST ROAD, SUDBURY, MA

Drawing Title **NHESP MAP**

DATE: 11.18.2020 | DRAWN: DJN
JOB NO.:100-108 | CHECK: ML
SCALE: 250 125 0 250

5

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Appendix M

Historic Preservation Documentation

SECTION 9 – PROJECT PLANS
(Under Separate Cover)