NOTICE OF INTENT

Prepared For:
Claudio Sena
146 Georgetown Road
Boxford, MA 01921

Prepared By:

MF Engineering & Design
966 Hyde Park Avenue #303
Boston, MA 02136

Submitted to:
Town of Boxford
Conservation Commission
7A Spofford Road
Boxford, MA 01921

Date:
September 27, 2021

TRANSMITTAL LETTER

Project No. B05377

September 16, 2021
Ross Povenmire, Director
Conservation Commission
Town of Boxford
7 A Spofford Road
Boxford, MA 01921

Subject: 146 Georgetown Road Stormwater Permit Application
Claudio Sena. Owner/Applicant

Dear Mr. Povenmire,

On behalf of the Applicant, please consider our written application for a Stormwater Permit regarding the existing and proposed alteration at 146 Georgetown Road according to the requirements outlined in Chapter 160, Stormwater Management of the Boxford Code.

We include five (5) full sets of the complete package for the Commission and one (1) for the Superintendent of Public Works as required in Chapter 295, Stormwater Management Regulations of the Boxford Code. We are also emailing the complete application package to you for you to distribute electronically to your members.

The total amount of alteration on the site shown for the Stormwater Pollution Prevention Plan (SWPPP) that will be prepared prior to land disturbance equals approximately 2.55 acres. Based on the $200.00 per quarter acre of the proposed alteration, the permit filing fee will be [(2.55/0.25) (200)] =$2,040.00 according to Chapter 295.

Please feel free to contact me directly if you have any questions about any information presented above.

Very truly yours,

Carlos Ferreira, MSc, PE

CC: Claudion Sena

966 Hyde Park Ave. #303 | Boston, MA 02136
Tel: 508-331-7261 | www.mf-eng.com

Table of Contents

List of Appendices

1 Documents Summary

In accordance with the Massachusetts Wetlands Protection Act (WPA), which relates to the protection of wetlands and water bodies, the filing of Notice of Intent (NOI) WPA Form 3 was completed shown in Appendix A – WPA Form 3 – Notice of Intent along with the following documents requirements:

- Appendix B – NOI Transmittal Form and Photocopies of Checks
- Appendix C – MassDEP Filing Number
- Appendix E – Abutters Certified List, Notification and Certified Receipts

2 Project Site

The project site is a corner vacant land lot at the intersection of Georgetown Road and Ipswich Road with 3.16 Acres alongside Stevens Pond. The northern portion of the site is where contains the majority of wooded area and the southern portion of the site is mostly lawn area with some woods along Stevens Pond. There is a bordering vegetated wetland (BVW) located along southwest portion of the site bordering Stevens Pond. The project site is bounded by residential properties to the east and south directions located within the Residence-Agricultural (RA) zoning district, refer to Appendix D – Figure 1 – USGS Locus Map.

The project site topography is generally flat with elevations ranging from 124 on the northeast part of the lot to 119 on the south part of the lot and lowest elevation of 112 on back of the lot near Steven Pond, elevations referenced to the North American Vertical Datum of 1988 (NAVD88). Stormwater runoff from the site predominantly flows from northeast to the south eventually reaching Stevens Pond without any stormwater management practice.

The project site is partially within a rare species habitat. The rare species habitat is identified as PH-1999 on the Natural Heritage and Endangered Species Program (NHESP).

3 Wetland Delineation and Methodology

Matthew S. Mario Environmental Consulting preformed in the field delineation of the bordering vegetated wetland resource. The flagging was completed with a series WF-1 to WF-22 consisting of pink flagging material with the words “wetland boundary” imprinted on the flagging material. Using the methodology provided by DEP policy 95-1, as the wetland bordering the pond was a thin strip, soils were not deemed necessary as the edge of the wetland was also at the terminus of a sloped area, although, mild was pronounced to the degree it was apparent vegetation and hydrology was sufficient for the delineation, further analysis is provided on Appendix F – Project Summary by Environmental Consultant.

In accordance with Boxford Stormwater bylaw the actual wetland buffer zones are from the Base Flood Elevation (BFE) in along with the wetland delineation. The site is located on FEMA Flood Insurance Map (FIRM), map number 25009C0261F, as Zone A. Zone AH for base flood elevation is given between 1-3 ft in areas of ponding. Given Zone AH is at higher risk than Zone A, therefore BFE estimated at 114 ft using the maximum depth of 3', refer to Appendix I – Notice of Intent Plans.

4 Summary of Impacts

The design of the proposed stormwater management system is to collect, treat and infiltrate runoff from the impervious areas. Impervious areas on site are the driveway, roof and patio areas. The total impervious area will only occupy approximately 0.37 Acres which is less than 12% of the project site.

Impervious areas runoffs are effectively managed by a vegetated drainage swale, rain garden, driveway infiltration trench and infiltration system from Cultec. Runoff from the driveway near Georgetown Road will be collected on the infiltration trenches, as the driveway approaches the new home the runoff will sheet flow to the sides, and near the home as approaches the garage entrance the runoff will be collected at a garage drain which will eventually reach the infiltration system with an overflow pipe to the rain garden. Vegetated swales will collect the project site sheet flow runoff to discharge to the rain garden. Roof runoff is collected in gutters and downspouts and are all directed to the rain garden. The rain garden has an overflow discharge with stone protection to the BVW.

The majority of impact is temporary within the buffer zones surface vegetation that will likely occur during construction. This will only be a temporary impact, because all disturbed areas will be repaired, and vegetative cover re-established prior to completion of the project. Appendix I - Notice of Intent Plans and Appendix H - Stormwater Management Report provides details of proposed measures that will be employed to prevent migration of sediments into protected areas as well as inspection and maintenance responsibilities necessary to maintain temporary construction controls.

4.1 Conformance with MassDEP Stormwater Standards

The ten (10) MassDEP Stormwater Management Standards provided in the Stormwater Management Policy and Massachusetts Wetlands Protection Act relate to the protection of wetlands and water bodies, control of water volume, recharge to groundwater, water quality and protection of critical areas, erosion/sedimentation control and stormwater maintenance. The following summarizes the Project's compliance with each of the Stormwater Management Standards, and additional information detailing compliance is provided on Appendix H - Stormwater Management Report.

4.1.1 Standard 1 – No New Untreated Discharges

The Project complies with Standard 1. No new point source discharges of untreated stormwater to or causing erosion in resource areas are proposed as part of the project. Stormwater quality control for project includes vegetated drainage swale, infiltration trench, infiltration system and rain garden. Stormwater discharge velocities for the project are mitigated by stone for pipe ends at various locations.

4.1.2 Standard 2 – Peak Rate Attenuation

The Project complies with Standard 2. The Project's stormwater management systems are designed so that post-development peak discharge rates do not exceed nor impact pre-development discharge rates for 2-, 10-, 25-, 50- and 100-year, 24-hour storm events.

4.1.3 Standard 3 – Recharge

The Project complies with Standard 3. The proposed stormwater management system incorporates the use of Rain Garden to provide the required groundwater recharge.

4.1.4 Standard 4 – Water Quality

The Project complies with Standard 4. The incorporation of the designed stormwater best management practices (BMPs) will achieve a cumulative Total Suspended Solids (TSS) removal rate greater than 80%. Designed BMPs are treating the total proposed impervious area. Additionally, Long-Term Pollution Prevention and Stormwater Operation & Maintenance Plan which provides practices on for sediment and pollution control.

4.1.5 Standard 5 – Land Uses with Higher Potential Pollutant Loads

Standard 5 is not applicable to the Project. The Project is not considered a Land Use with Higher Potential for Pollutant Loads (LUHPPL) as defined in the Massachusetts Stormwater Handbook.

4.1.6 Standard 6 – Critical Areas

The project complies with Standard 6. The Project does not discharge stormwater within the Zone II or Interim Wellhead Protection Area of a public water supply. In overflow scenarios from the rain garden discharge will occur near a Critical Area as defined in the Massachusetts Stormwater Handbook. As a result of this location, a copy of the Notice of Intent and supporting documentation was sent to NHESP and has been approved as refer to Appendix H - Stormwater Management Report.

4.1.7 Standard 7 – Redevelopment Projects

Standard 7 is not applicable to the Project. The Project does not qualify as a redevelopment project or other project subject to the Standards only to the maximum extent practicable.

4.1.8 Standard 8 – Construction Period Pollution Prevention and Erosion and Sedimentation Control

The project complies with Standard 8. The Project will result in the disturbance of greater than one (1) acre of land and requires coverage under the U.S. EPA National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Construction Activities (CGP). Prior to commencement of earth disturbing activities, a project-specific Storm Water Pollution Prevention Plan (SWPPP) will be prepared, and a Notice of Intent will be submitted to the EPA.

4.1.9 Standard 9 – Operations and Maintenance Plan

The Project complies with Standard 9. An Operations and Maintenance Plan to be implemented by the owner and its staff to ensure that stormwater management systems function as designed.

4.1.10 Standard 10 – Prohibition of Illicit Discharges

The Project complies with Standard 10. There are no known or designed illicit discharges on the project site.

4.2 Compliance with Boxford Bylaw for Bordering Vegetated Wetland

The project is located near Stevens Pond BVW and in compliance with the town of Boxford Bylaw no-disturbance will occur on the 25 ft buffer zone with the exception of the dead/poor trees removals, refer to Appendix G – Project Tree Narrative for further details and Appendix I – Notice of Intent Plans for locations. Site stormwater features and grading within the buffer zone limits, and building (permanent structure) placement outside the buffer zone were strategically designed to avoid permanent or temporary impacts to the BVW. Construction period erosion and sedimentation controls as shown on Appendix I – Notice of Intent Plans, will be installed prior to construction to prevent unintended impacts to BVW during construction and dead/poor removal.

The Project proposes no impacts to BVW and as such meets BVW performance standards listed at 310 CMR 10.55 and Article II of the Boxford Regulations for Resource Areas and Buffer Zones.

5 Conclusion

Potential migration of sediments during construction will be controlled using linear sedimentation controls placed downgradient of any land disturbance activities and stabilized construction entrances to limit tracking of sediments offsite from construction vehicle tires. Refer to Appendix I - Notice of Intent Plans and Appendix H - Stormwater Management Report for details and location of proposed controls. The proposed site improvements will be designed and constructed in compliance with MassDEP Stormwater Management Standards and construction activities will be performed in compliance with a site specific construction Stormwater Pollution Prevention Plan (SWPPP) which will be developed per the requirements of the United States Environmental Protection Agency (USEPA) National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Construction Activities (CGP). No negative stormwater impacts are anticipated during construction or operations.

APPENDIX A

WPA Form 3 - Notice of Intent

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

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):

146 Georgetown Road — a. Street Address
Boxford — b. City/Town
01921 — c. Zip Code

Latitude and Longitude:
42.405646 — d. Latitude
70.5943224 — e. Longitude

25 — f. Assessors Map/Plat Number
04-08 — g. Parcel /Lot Number

2. Applicant:

Claudio — a. First Name
Sena — b. Last Name
c. Organization
146 Gerogetown Road — d. Street Address
Boxford — e. City/Town
Ma — f. State
01921 — g. Zip Code
see representative — h. Phone Number
i. Fax Number
see representative — j. Email Address

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

a. First Name
b. Last Name
c. Organization
d. Street Address
e. City/Town
f. State
g. Zip Code
h. Phone Number
i. Fax Number
j. Email address

4. Representative (if any):

Matthew — a. First Name
Marro — b. Last Name
Matthew S. Marro Environmental Consulting — c. Company
45 Lisa Drive — d. Street Address
Leomintser — e. City/Town
MA — f. State
01453 — g. Zip Code
978-314-7858 — h. Phone Number
775-521-7083 — i. Fax Number
matt@marro-consulting.com/irene@marro-consulting.com — j. Email address

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

330.00 — a. Total Fee Paid
152.50 — b. State Fee Paid
177.50 + 600 local — c. City/Town Fee Paid

A. General Information (continued)

6. General Project Description:

See attached narrative

7a. Project Type Checklist:

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

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

1. ☐ Yes ☒ No If yes, describe which limited project applies to this project:

2. Limited Project

8. Property recorded at the Registry of Deeds for:

Southern Essex	
a. County	b. Certificate # (if registered land)
36422	7
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.

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	2. square feet
	3. cubic yards dredged	

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

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☐ Bordering Land Subject to Flooding	1. square feet	2. square feet
	3. cubic feet of flood storage lost	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)	

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)

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

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

		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

C. Other Applicable Standards and Requirements

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/priority_habitat/online_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
Route 135, North Drive
Westborough, MA 01581

May 2021 MASS GIS

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

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.1.d, 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).*

1. 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 — 0.7 ac (percentage/acreage)

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

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

      (c) ☒ MESA filing fee (fee information available at: http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_fee_schedule.htm). 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

   d. OR Check One of the Following

   1. ☐ Project is exempt from MESA review.
      Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_exemptions.htm; 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

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see http://www.mass.gov/dfwele/dfw/nhesp/nhesp.htm, regulatory review tab). 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.

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

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

2. 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 or hand delivery of NOI to either:

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

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
1213 Purchase Street – 3rd Floor
New Bedford, MA 02740-6694

North Shore - Hull to New Hampshire:

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

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.

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

a. ☐ Yes ☒ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

b. ACEC

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 designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

a. ☐ Yes ☒ No

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

a. ☐ Yes ☒ No

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

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

1. ☐ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)

2. ☐ A portion of the site constitutes redevelopment

3. ☐ Proprietary BMPs are included in the Stormwater Management System.

b. ☒ No. Check why the project is exempt:

1. ☒ Single-family house

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

2. ☐ Emergency road repair

3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

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

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

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.

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.

Noitice of Intent Plan
a. Plan Title

MF Engineering and Designs
b. Prepared By

Carlos Ferreira
c. Signed and Stamped by

June 11, 2021
d. Final Revision Date

20
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:

5055 2. Municipal Check Number	6.24.21 3. Check date
5054 4. State Check Number	6.24.21 5. Check date
Matthew 6. Payor name on check: First Name	Marro 7. Payor name on check: Last Name

F. Signatures and Submittal Requirements

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

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

1. Signature of Applicant See Next Page	2. Date
3. Signature of Property Owner (if different)	4. Date
5. Signature of Representative (if any)	June 21, 2021 6. Date

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

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

Other:
If the applicant has checked the "yes" box in 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.

d. Final Revision Date | 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:

5055 2. Municipal Check Number	6.24.21 3. Check date
5054 4. State Check Number	6.24.21 5. Check date
Matthew 6. Payor name on check: First Name	Marro 7. Payor name on check: Last Name

F. Signatures and Submittal Requirements

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

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

1. Signature of Applicant	06/24/21 2. Date
3. Signature of Property Owner (if different)	4. Date
5. Signature of Representative (if any)	June 21, 2021 6. Date

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

APPENDIX B

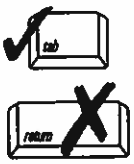
NOI Transmittal Form and Photocopies of Checks

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. Applicant:

a. First Name	b. Last Name
Claudio	Sivla

c. Organization

d. Mailing Address: 146 Georgetown Road

e. City/Town	f. State	g. Zip Code
Boxford	MA	01921

h. Phone Number	i. Fax Number	j. Email Address
978-314-7858 (REP)	775-521-7083 (REP)	matt@marro-consulting.com

2. Property Owner (if different):

a. First Name	b. Last Name

c. Organization

d. Mailing Address

e. City/Town	f. State	g. Zip Code

h. Phone Number	i. Fax Number	j. Email Address

3. Project Location:

a. Street Address	b. City/Town
146 Gerogetown Road	Boxford

B. Fees

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

The fee should be calculated using the following six-step process and 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
cat 1 steps to Dock , Rain Garden and patio/pool	3	330	330

Step 5/Total Project Fee: 330+600 local

Step 6/Fee Payments:

Total Project Fee:	330 — a. Total Fee from Step 5
State share of filing Fee:	152.50 — b. 1/2 Total Fee **less** $12.50
City/Town share of filling Fee:	177.50 — 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.)

APPENDIX C

MassDEP Filing Number

Gmail

Matthew Marro <matt@marro-consulting.com>

146 Georgetown Rd Boxford

Freeley, James (DEP) <james.freeley@state.ma.us> Thu, Jul 29, 2021 at 5:26 PM
To: "Geilen, Alicia (DEP)" <alicia.geilen@state.ma.us>, Matthew Marro <matt@marro-consulting.com>, "Lally, Kyle (DEP)" <kyle.lally@state.ma.us>

Hi all.
file number for 146 Georgetown Road, Boxford is # 114-1331.
Analyst is Kyle Lally.

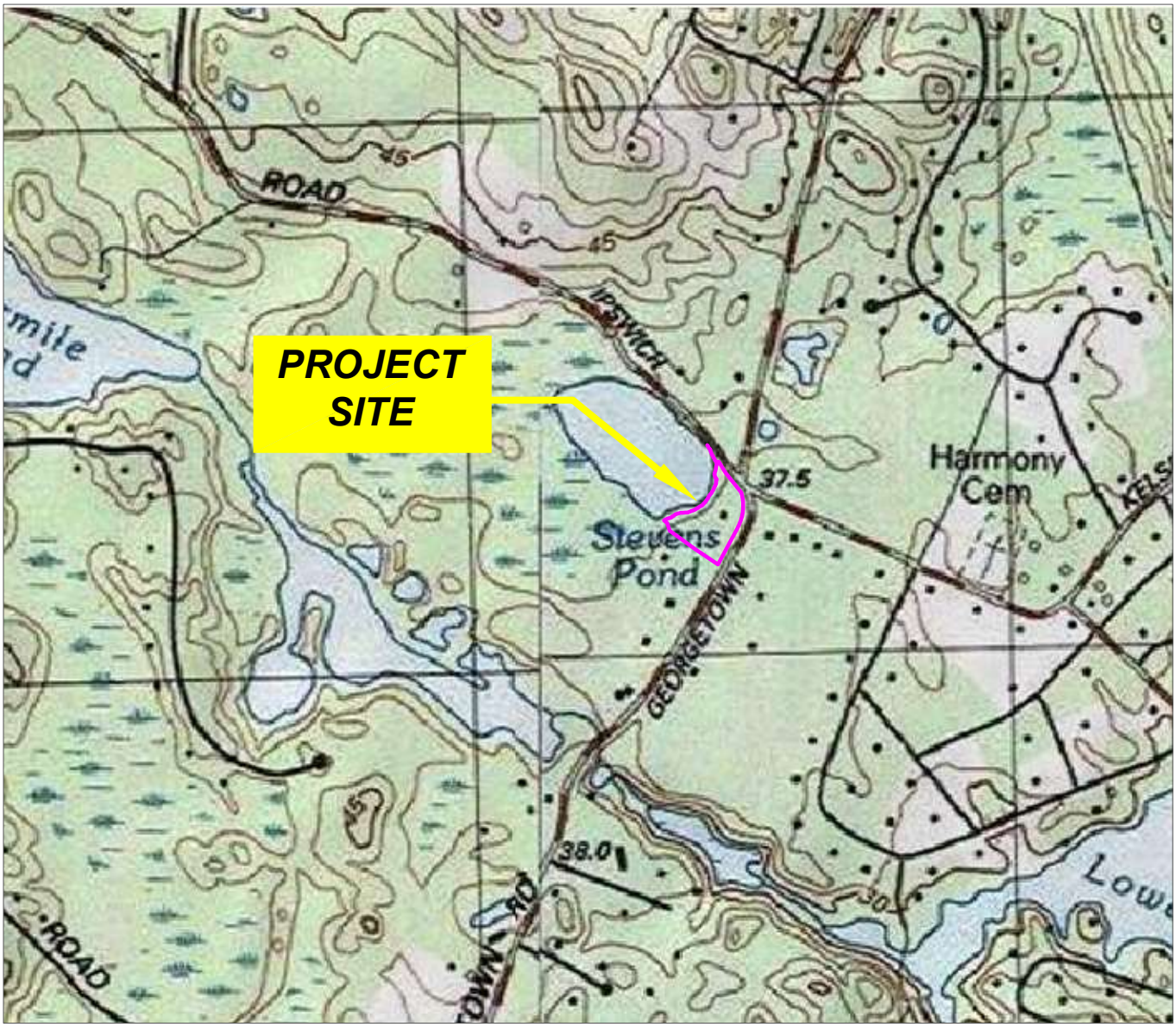
THanks
Jim Freeley

From: Geilen, Alicia (DEP) <Alicia.Geilen@mass.gov>
Sent: Thursday, July 29, 2021 12:36 PM
To: Matthew Marro <matt@marro-consulting.com>
Cc: Freeley, James (DEP) <james.freeley@mass.gov>
[Quoted text hidden]

[Quoted text hidden]

APPENDIX D

Figure 1 - USGS Locus Map



0 500 1000 2000

SCALE: 1'' = 1000'

ENGINEERING & DESIGNS

146 Georgetown Road – Boxford MA

USGS Locus Map

Project No.: B053577

Date: 09/24/2021

Designed By: AWA

Figure 1

APPENDIX E

Abutters Certified List, Notification and Certified Receipts

25-04-08 - 146 GEORGETOWN RD, BOXFORD ABUTTERS LIST
CONSERVATION COMMISSION 250' PONDS

Parcel ID	Location	Owner	Owner 2	Owner Address	Owner City/Town	Owner State	Zip Code
19-02-20	IPSWICH RD	BTA/BOLT INC		P O BOX 95	BOXFORD	MA	01921
20-14-11	150 GEORGETOWN RD	GILBERT JUNE E TR	JUNE E GILBERT 1996 TRUST	150 GEORGETOWN RD	BOXFORD	MA	01921
25-03-11	127 GEORGETOWN RD	SPILLANE SARAH		127 GEORGETOWN RD	BOXFORD	MA	01921
25-03-12	135 GEORGETOWN RD	EHLERS PAMELA		135 GEORGETOWN RD	BOXFORD	MA	01921
25-03-13	145 GEORGETOWN RD	OSTRER JEFFREY E		145 GEORGETOWN RD	BOXFORD	MA	01921
25-04-10	128 GEORGETOWN RD	BURKE ROBERT G TE	BURKE DONNA L	128 GEORGETOWN RD	BOXFORD	MA	01921
25-04-07-4	12 AZALEA WAY	SCHROER PETER	SCHROER KAREN E	12 AZALEA WAY	BOXFORD	MA	01921
25-04-07-5	14 AZALEA WAY	DREW MICHAEL A	DREW CHRISTINE A	14 AZALEA WAY	BOXFORD	MA	01921
25-04-08	146 GEORGETOWN RD	PONTES-JUNIOR, CLAUDIO SENA		35 MANSION DRIVE	TOPSFIELD	MA	01983
25-04-09	134 GEORGETOWN RD	EVANS ANDREW W TE	EVANS KAREN A	134 GEORGETOWN RD	BOXFORD	MA	01921

CERTIFIED COPY
9/3/21

Notification to Abutters Under the Massachusetts Wetlands Protection Act And the Boxford Wetlands 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 Claudio Sena

B. The applicant has filed a

_____ Determination of Applicability
X Notice of Intent
_____ Abbreviated Notice of Resource Area Delintation

with the Conservation Commission of the Town of Boxford seeking permission to remove, fill, dredge or alter an area subject to protection under the wetland protection act (General Laws Chapter 131, Section 40).

C. The address where the activity is proposed is 146 Georgetown Road

D. The activity consists of grading, tree removal, a rain garden and an in-ground swimming pool within the buffer zone of Stevens Pond.

E. Copies of the filing may be examined at the Conservation Commission Office, Town Hall, between the hours of 8:30 am and 2 PM on Monday to Thursday. For more information, call (978) 887-6000 x181

The meeting date is to be set. The meeting details will be posted on the agenda issue by the commission.

F. Copies of the application may be obtained from the Conservation Commission by calling (978) 887-6000 ext. 181 during the hours 8:20am-2pm, Monday to Thursday.

G. Information regarding the date, time and place of the public hearing may be obtained from the Conservation Commission Office by calling (978) 877-6000 x181 during the hours listed above.

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

NOTE: Notice of the public hearing, including its date, time and place will be posted in the Town Hall not less than forty-eight (48) hours in advance.

NOTE: You also may contact The Boxford Conservation Commission or the Department of Environmental Protection (DEP) Regional Office for more information about this application or the Wetlands Protection Act. To contact DEP call the Northeast Regional Office at (978) 694-3200.

A PDF of the notice of Intent may also be obtained via email to contact@mf-eng.com

7020 1290 0000 6548 1654

For delivery information, visit our website at www.usps.com®.

Boxford, MA 01921

OFFICIAL USE

Certified Mail Fee	$3.75	0432 14
Extra Services & Fees (check box, add fee as appropriate)	$3.05	
☐ Return Receipt (hardcopy)	$0.00	
☐ Return Receipt (electronic)	$0.00	Postmark Here
☐ Certified Mail Restricted Delivery	$0.00	
☐ Adult Signature Required	$0.00	
☐ Adult Signature Restricted Delivery	$	
Postage	$0.58	
Total Postage and Fees	$7.38	09/10/2021

Sent To: GILBERT, JUNE

Street and Apt. No., or PO Box No.: 170 GEORGETOWN RD

City, State, ZIP+4®: BOXFORD, MA 01921

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7020 1290 0000 6548 1661

For delivery information, visit our website at www.usps.com®.

Boxford, MA 01921

OFFICIAL USE

Certified Mail Fee	$3.75	0432 14
Extra Services & Fees (check box, add fee as appropriate)	$3.05	
☐ Return Receipt (hardcopy)	$0.00	
☐ Return Receipt (electronic)	$0.00	Postmark Here
☐ Certified Mail Restricted Delivery	$0.00	
☐ Adult Signature Required	$0.00	
☐ Adult Signature Restricted Delivery	$	
Postage	$0.58	
Total Postage and Fees	$7.38	09/10/2021

Sent To: BTA / BOLT INC

Street and Apt. No., or PO Box No.: P O BOX 95

City, State, ZIP+4®: BOXFORD, MA 01921

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7020 1290 0000 6548 1708

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Boxford, MA 01921

OFFICIAL USE

Certified Mail Fee	$3.75	0432 14
Extra Services & Fees (check box, add fee as appropriate)	$3.05	
☐ Return Receipt (hardcopy)	$0.00	
☐ Return Receipt (electronic)	$0.00	Postmark Here
☐ Certified Mail Restricted Delivery	$0.00	
☐ Adult Signature Required	$0.00	
☐ Adult Signature Restricted Delivery	$0.00	
Postage	$0.58	
Total Postage and Fees	$7.38	09/10/2021

Sent To: DREW, CHRISTINE

Street and Apt. No., or PO Box No.: 14 AZALEA WAY

City, State, ZIP+4®: BOXFORD, MA 01921

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7020 1290 0000 6548 1685

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Boxford, MA 01921

OFFICIAL USE

Certified Mail Fee	$3.75	0432 14
Extra Services & Fees (check box, add fee as appropriate)	$3.05	
☐ Return Receipt (hardcopy)	$0.00	
☐ Return Receipt (electronic)	$0.00	Postmark Here
☐ Certified Mail Restricted Delivery	$0.00	
☐ Adult Signature Required	$0.00	
☐ Adult Signature Restricted Delivery	$	
Postage	$0.58	
Total Postage and Fees	$7.38	09/10/2021

Sent To: OSTLER, JEFFREY

Street and Apt. No., or PO Box No.: 195 GEORGETOWN RD.

City, State, ZIP+4®: BOXFORD, MA 01921

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Boxford, MA 01921

OFFICIAL USE

Certified Mail Fee $3.75

Extra Services & Fees (check box, add fee as appropriate)
- Return Receipt (hardcopy) $3.05 $0.00
- Return Receipt (electronic) $ $0.00
- Certified Mail Restricted Delivery $ $0.00
- Adult Signature Required $ $0.00
- Adult Signature Restricted Delivery $

Postage $0.58

Total Postage and Fees $7.38

0432
14

Postmark Here

09/10/2021

Sent To SCHROER, KAREN

Street and Apt. No., or PO Box No. 17 AZALEA WAY

City, State, ZIP+4® BOXFORD, MA 01921

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7020 1290 0000 6548 1661

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Boxford, MA 01921

OFFICIAL USE

Certified Mail Fee $3.75

Extra Services & Fees (check box, add fee as appropriate)
- Return Receipt (hardcopy) $3.05 $0.00
- Return Receipt (electronic) $ $0.00
- Certified Mail Restricted Delivery $ $0.00
- Adult Signature Required $ $0.00
- Adult Signature Restricted Delivery $

Postage $0.58

Total Postage and Fees $7.38

0432
14

Postmark Here

09/10/2021

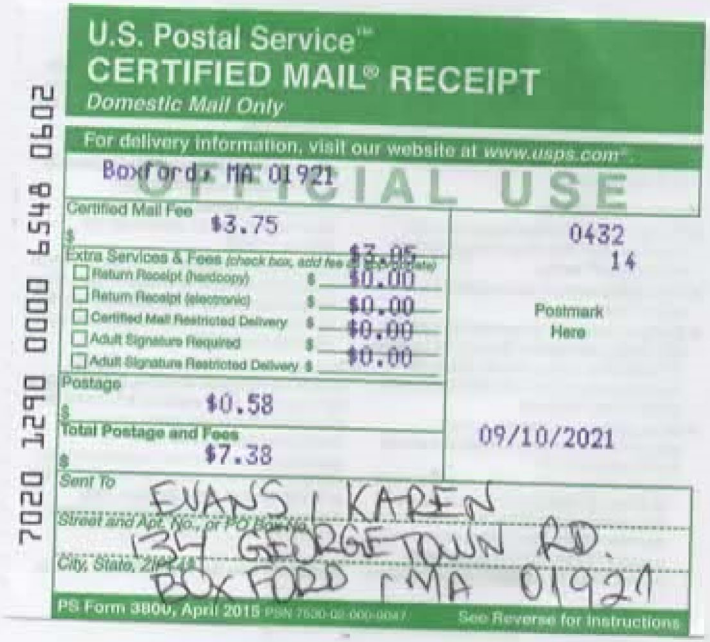
Sent To FILLERS, PAMELA

Street and Apt. No., or PO Box No. 135 GEORGETOWN RD

City, State, ZIP+4® BOXFORD MA 01921

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7020 1290 0000 6548 1678



U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Boxford, MA 01921

OFFICIAL USE

Certified Mail Fee $3.75

Extra Services & Fees (check box, add fee as appropriate)
- Return Receipt (hardcopy) $3.05 $0.00
- Return Receipt (electronic) $ $0.00
- Certified Mail Restricted Delivery $ $0.00
- Adult Signature Required $ $0.00
- Adult Signature Restricted Delivery $

Postage $0.58

Total Postage and Fees $7.38

0432
14

Postmark Here

09/10/2021

Sent To EVANS, KAREN

Street and Apt. No., or PO Box No. 134 GEORGETOWN RD.

City, State, ZIP+4® BOXFORD, MA 01921

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7020 1290 0000 6548 0602

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only

For delivery information, visit our website at www.usps.com®.

Boxford, MA 01921

OFFICIAL USE

Certified Mail Fee $3.75

Extra Services & Fees (check box, add fee as appropriate)
- Return Receipt (hardcopy) $3.05 $0.00
- Return Receipt (electronic) $ $0.00
- Certified Mail Restricted Delivery $ $0.00
- Adult Signature Required $ $0.00
- Adult Signature Restricted Delivery $

Postage $0.58

Total Postage and Fees $7.38

0432
14

Postmark Here

09/10/2021

Sent To SPILLANE, SARAH

Street and Apt. No., or PO Box No. 127 GEORGE TOWN RD

City, State, ZIP+4® BOXFORD, MA 01921

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7020 1290 0000 6548 1661

APPENDIX F

Project Summary by Environmental Consultant

MATTHEW S. MARRO ENVIRONMENTAL CONSULTING

45 Lisa Drive
Leominster, Ma
Phone (978) 314-7858
Fax (888) 435-5999
www.marro-consulting.com

The following is a narrative to accompany the enclosed Notice of Intent:

Summary:

The lot in question is a 3.1 acre developed residential lot.[1] The lot has a bordering vegetated wetland That abuts the rear property line and is bordering Steven's Pond. The lot, formerly had a single family home structure that is no longer on this lot. The majority of the lot and the adjacent upland portion is cleared land, the majority of such is field. The proposal is for the construction of a single family home, a rain garden and landscaping, a swimming pool and patio area. The house structure, driveway and septic system is not located within the buffer zone. The rear yard, swimming pool and grading to accommodate such is within the outer 50 feet of the 100-foot buffer zone.

The site is also partially within a rare species habitat. As a result of the location, a copy of this Notice of Intent and supporting documentation has been copied as required to the Natural Heritage and Endangered Species program for their review as well.

Defined wetland edge:

Matthew S. Marro Environmental Consulting preformed in the field delineation of the bordering vegetated wetland resource. The flagging was completed with a series WF 1 to WF 22 consisting of pink flagging material with the words "wetland boundary" imprinted on the flagging material. In accordance with DEP policy 95-1, as the wetland bordering the pond was a thin strip, soils were not deemed necessary as the edge of the wetland was also at the terminus of a sloped area, although, mild was pronounced to the degree it was apparent vegetation and hydrology was sufficient for the delineation.

The following table was the consistent makeup of vegetation along the border of the wetland resource area:

Botanical Name	Common Name	Wetland Indicator Status[i]
Onoclea sensibilis	Sensitive Fern	FACW
Osmundastrum cinnamomeum	Cinnamon Fern	FACW
Ambrosia Artemisiifolia	Rag weed	UP

[1] As per Oliver mass GIS 2021

Acer Rubrum	Red Maple	FAC
Pinus Strobus	White Pine	FACUP
Toxicodendron Radican	Poison Ivy	FAC
Osmunda regalis	Royal Fern	OBL
Solidago virgaurea	Golden Road	FACUP
Hemlock	Tsuga canadensis	FACUP
Canada Mayflower	Maianthemum canadense	FACUP
Norther Red Oak	Quercus rubra	FACUP
European White Birch	Betula pendula	FACUP

Environmental Attributes

Mass GIS Overlay Evaluation:[ii]

Examination of the lot on the Commonwealth's MassGIS database revealed the following:

1. **There is a portion of the lot within habitat polygon 1994. A copy of this Notice of Intent has been sent to MESA.**
2. **There is no portion of the lot area within an Area of Critical Environmental Concern or within the near vicinity.**
3. **There is a noted area at the rear of the lot at the shoreline only that is within flood zone A overlay on the property according to both FEMA and Mass GIS. This should be accounted for to ensure work proposals within the rear yard are considered or are not within the boundaries of**
4. **There are no certified vernal pools nor potential vernal pools that are either located on the lot or the lot abutting.**

(SEE EXHIBIT -NEXT PAGE)

MASS GIS OVERLAYS FOR 146 GEORGETOWN ROAD, BOXFORD, MA (June 2021)

Sincerely,

Matthew S. Marro

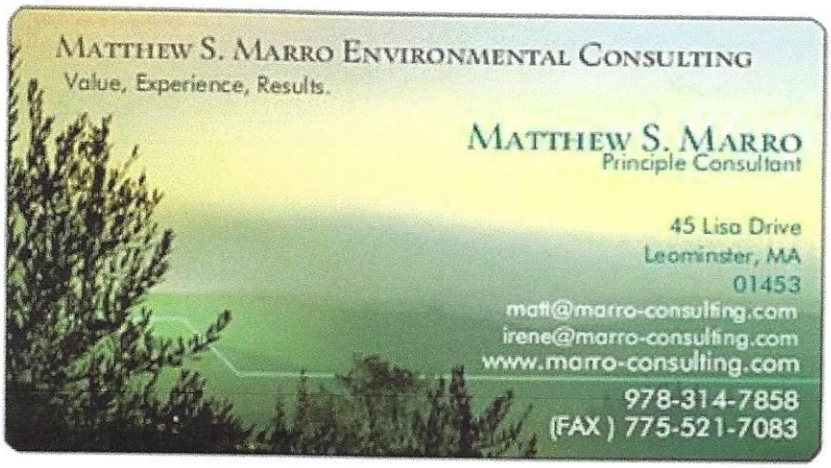
Principle Consultant

---

[i] Obl= Obligate. Fac= Facultative. Up (or FACUP) = Upland
Notation: FACW = Facultative wetland species
[ii] Per Mass GIS online, June 2020

APPENDIX G

Project Tree Narrative



NOTICE OF INTENT

Tree Narrative.

146 Georgetown Road, Boxford, MA

Matthew S. Marro Environmental Consulting

September 2021

The following is an analysis of tree removal and replantation within the 100-foot buffer zone of proposed construction at 146 Georgetown Road. Construction activity proposed is one single family home. This narrative is based on a plan by MF Engineering entitled:

"Landscape Plan "by MF Engineering with a revision date of September 27, 2021, plan number 146-0521.

Please refer to the plan for detail concerning this narrative. The Notice of Intent submitted proposes the removal and replanting of trees within the buffer zone to replace trees that are in good condition and at the same time continue to provide the tree canopy value for the maintenance of wildlife habitat and shade value for runoff afforded by a well-maintained canopy.

Analysis of tree removal within the 100 foot buffer zone

The entire site had 245 trees located and noted in the submitted plan. Within the buffer zone, there are a total of 152 trees itemized with locations noted on the site plan. Within the 100-foot buffer zone there are a total of 22 trees that are dead and noted for removal. This leaves the total amount of trees that are in good condition within the buffer zone totaling 132. Because of construction and grading to accommodate the single-family home, the rear yard, and the proposed rain garden a total of 26 live trees will be removed to accommodate construction. Removing from the total, the trees that are on site that are dead and only considering those trees in total that are alive and in good condition, the proposed removal of trees within the buffer zone total 19.6 % of the total inventory. (Noteworthy is the total of viable trees to the entire site including the area of lot not within the buffer zone, the entire total of the site of trees in good condition to be removed also total to a 19% range).

The species of viable trees that are noted to be removed are White Pine, Black Oak, Black Cherry, Red Maple and Cedar. The diameters of the majority of the trees average 12 inches with two of the White Pine and one Black Oak having much larger diameters (please refer to the enclosed tree inventory list which corresponds to the enclosed plans for the details of the variety of species and diameter)

Overstory Planting Narrative:

All trees to be utilized are native. The proposed replacement of trees allows for the continuity of the values of the trees currently within the buffer zone to be maintained.

The following overstory layer planting plan assumes establishment of contiguous overstory to replace the overstory altered by proposed construction.

The proposal for the planting plan is to plant the following:

1. Black Oak.
2. Red Maple.

Based on the density required for good growth that will not result in a situation where the trees are competing with each other for survival, it is assumed a planting grid pattern as noted on the referenced plans, is the standard to be used in the replanting areas.

The locations of the trees are maximized to provide both a vegetative buffer between the proposed construction and the wetland resource area and to maintain the canopy value to the resource area that is important to protect. It is important to note that the plantings within the south east corner of the property within the buffer zone actually will provide an increased canopy, enhancing the canopy value within that portion of the buffer zone that currently does not exist.

Thank you for the opportunity to contribute to the protection of the wetland resource area. Please feel free to call on me to clarify this proposal.

Respectfully Submitted,

Matthew S. Marro,
Consulting Agent/Principle

Tree #	Species	Diameter(inches)	Condition
1	Pin Oak	36	Good
2	Sugar Maple	24	Good
3	Hemlock	24	Good
4	Red Maple	16	Good
5	Blue Spruce	12	Good
6	White Pine	36	Good
7	White Pine	36	Good
8	White Pine	36	Good
9	White Oak	12	Good
10	Black Oak	10	Good
11	Black Oak	24	Good
12	White Pine	36	Good
13	Black Oak	24	Good
14	Black Oak	12	Good
15	White Pine	48	Good
16	Multi Stemmed Holly	7	Good
17	Black Locus	12	Good
18	Crab Apple	12	Good
19	Crab Apple	10	Good
20	Needle Leaf Pine	24	Good
21	Black Oak	12	Dead
22	Quacking Aspen	36	Good
23	White Pine	36	Good
24	White Pine	60	Good
25	White Pine	64	Good
26	White Pine	60	Good
27	White Pine	64	Good
28	Red Maple	24	Good
29	Cedar	36	Good
30	Cedar	12	Good
31	Cedar	24	Good
32	Cedar	24	Good
33	Black Oak	12	Good
34	White Pine	16	Good
35	Black Oak	36	Good
36	Red Maple	24	Good
37	White Pine	48	Dead
38	Cedar	6	Good
39	Black Cherry	6	Good
40	White Pine	48	Good
41	White Oak	48	Good
42	White Pine	48	Good
43	Black Oak	12	Good
44	Black Oak	32	Good
45	White Pine	24	Good
46	Black Oak	10	Good

47	White Pine		48	Good
48	Cedar		10	Good
49	White Pine		36	Good
50	Twin Cedars	10 total		Good
51	Gray Birch		6	Good
52	Black Oak		24	Good
53	White Pine		36	Good
54	White Pine		36	Good
55	White Pine		48	Good
56	White Pine		64	Good
57	Black Oak		12	Good
58	Black Oak		24	Good
59	Cedar		12	Good
60	Cedar		12	Good
61	White Pine		48	Good
62	Red Maple		12	Good
63	Cedar		12	Good
64	Honey Locus		12	Good
65	White Pine		48	Good
66	Gray Birch		24	Good
67	White Pine		18	Good
68	White Pine		12	Good
69	Red Maple		24	Good
70	White Pine		60	Good
71	White Pine		48	Good
72	Black Cherry		10	Good
73	White Pine		48	Good
74	White Pine		36	Good
75	White Oak		36	Good
76	White Ash		36	Poor
77	White Ash		36	Dead
78	White Pine		36	fair
79	Red Maple		24	Good
80	Red Maple		12	Good
81	Red Maple		36	Fair (Bark Girdled)
82	Red Maple		24	Good
83	White Ash		24	Dead
84	Red Maple		24	Good
85	Cedar		12	Good
86	Cedar		12	Poor
87	Cedar		12	Dead
88	Cedar		10	Fair
89	White Pine		18	Good
90	Cedar		12	Good
91	Cedar		18	Good
92	Cedar		12	Good
93	Red Maple Double	36 and 24		Good

94	Black Cherry		18	Good
95	Black Oak		12	Good
96	Cedar		10	Good
97	Cedar		6	Good
98	Black Cherry		18	Good
99	Black Cherry		12	Good
100	Red Maple		24	Poor
101	White Ash		24	Dead
102	Red Maple		24	Good
103	White Pine		24	Good
104	White Pine		24	Good
105	Cedar		10	Good
106	White Pine		18	Good
107	Black Oak		12	Good
108	Black oak		12	Good
109	Black Oak		12	Good
110	Black Oak		18	Good
111	Cedar		12	Good
112	Cedar		12	Good
113	Cedar		6	Good
114	Cedar		6	Good
115	Black Oak		12	Good
116	Cedar		6	Good
117	Cedar		6	Good
118	White Ash		36	Poor
119	Black Cherry		12	Good
120	White Pine		16	Dead
121	Red Maple		16	Good
122	Black Oak		12	Good
123	Crab Apple		12	Good
124	White PIne		24	Good
125	White Pine		24	Good
126	Cedar		12	Good
127	Cedar		12	Good
128	Cedar		12	Good
129	White Ash		36	Dead
130	White Ash		24	Dead
131	Double Hemlock	12 and 24		Fair
132	Cedar		12	Good
133	Cedar		10	Good
134	Red Maple Double	12 and 24		Good
135	Cedar		10	Good
136	Sugar Maple		18	Good
137	Hemlock		18	Good
138	White Ash		24	Dead
139	Double White Ash	36 and 36		Dead
140	Black Oak		18	Good

141	Black Oak		12 Good
142	Sugar Maple		18 Good
143	White Pine		36 Good
144	White Ash		24 Dead
145	Black Oak		12 Good
146	Cedar		18 Good
147	Cedar		18 Good
148	Sugar Maple		18 Good
149	Black Oak		12 Good
150	White Ash		18 Dead
151	Cedar		12 Good
152	White Pine		36 Good
153	Cedar		12 Good
154	White Pine		24 Good
155	Black Oak		16 Good
156	Black Oak		10 Good
157	White Pine		18 Good
158	Black oak		10 Good
159	White Pine		12 Good
160	White Pine		12 Dead
161	Black Oak		48 Good
162	Telephone Pole	97-2	reference shot
163	White Ash		24 Poor
164	White Ash		18 Dead
165	Black Oak		6 Good
166	White Ash		24 Poor
167	White Pine		24 Good
168	Black Cherry		12 Fair
169	White PIne		18 Good
170	Hemlock		18 Good
171	White Pine		24 Poor
172	Sugar Maple		10 Good
173	White Pine		36 Good
174	White Ash		10 Dead
175	White Pine		32 Good
176	White Pine		24 Good
177	White Oak		10 Good
178	Cedar		10 Good
179	White Pine		24 Good
180	White Pine		24 poor
181	White Pine		24 Good
182	White Pine		24 Good
183	White Pine		36 Good
184	Black Cherry		6 Dead
185	White Pine		24 Good
186	White Pine		24 Good
187	White Pine		48 Good

188	Cedar		10	Good
189	White Pine		12	Good
190	Red Maple		36	Poor
191	White Ash		10	Dead
192	Cedar		6	Good
193	Cedar		12	Good
194	Red Maple Double	12 and 12		Good
195	White Pine		12	Good
196	Black Cherry		6	Good
197	White Ash		6	Dead
198	White Ash		6	Dead
199	Black Cherry		6	good
200	White Pine		12	Good
201	Cedar		12	Good
202	Black Cherry		12	Good
203	White Ash		12	Dead
204	White Ash		6	Dead
205	Red Maple		16	Good
206	White Pine		32	Good
207	White Oak		24	Good
208	White Pine		36	Good
209	White Pine		36	Good
210	Cedar		10	Good
211	Black Cherry		6	Good
212	White Pine		36	Good
213	Cedar		12	Good
214	Cedar		12	Good
215	White Pine		36	Good
216	White Pine		36	Good
217	White Pine		12	Good
218	White Pine		36	Good
219	White Pine		36	Good
220	White Pine		42	Good
221	White Pine		36	Good
222	White Pine		18	Good
223	White Pine		36	Good
224	Cedar		10	Good
225	White Pine Double	48 Total		Good
226	Black Cherry		8	Good
227	Cedar		6	Good
228	White Ash		10	Poor
229	Crab Apple		12	Good
230	White Pine		24	Dead
231	White Pine Double	48 Total		Good
232	Black Oak		12	Good
233	Black Oak		10	Good
234	Black Cherry		10	Good

235	Black Cherry	18	Good
236	Black Locust	18	Good
237	White Pine	36	Good
238	Cedar	6	Good
239	Cedar	6	Good
240	White Pine	42	Good
241	White Pine	36	Good
242	White Pine	24	Good
243	White Pine	24	Good
244	White Pine	36	Good
245	White Pine	18	Dead
246	White Ash	12	Dead

APPENDIX H

Stormwater Management Report

STORMWATER MANAGEMENT REPORT

Prepared For:
Claudio Sena
146 Georgetown Road
Boxford, MA 01921

Prepared By:

MF Engineering & Design
966 Hyde Park Avenue #303
Boston, MA 02136

Date:
September 27, 2021

Table of Contents

List of Tables

List of Appendices

1 Introduction

This Stormwater Management Report, prepared in accordance with Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards and the Town of Boxford Stormwater Management Standards, summarizes the Stormwater Management Plan and associated analyses for the proposed single home residence located at 146 Georgetown Road in Boxford, Massachusetts. A United States Geological Survey (USGS) Locus Map is provided as Figure 1 in Appendix A.

This stormwater report provides an analysis comparing the pre-development watershed condition to the post development, watershed figures provided as Figure 2 Pre-development and Figure 3 Post-development in Appendix A. This analysis is achieved through the surface runoff rates and volumes calculations described further in the comparison tables. Post-development calculations are accomplished through the implementation of stormwater managements strategies to address all of stormwater standards.

The following sections describe the existing and proposed stormwater management strategies. The report will further analyze the stormwater implementation and summarize compliance with applicable stormwater regulations.

1.1 Existing Conditions

The project site is a corner vacant land lot at the intersection of Georgetown Road and Ipswich Road with 3.16 Acres alongside Stevens Pond. The northern portion of the site is where contains the majority of wooded area and the southern portion of the site is mostly lawn area with some woods along Stevens Pond. There is a bordering vegetated wetland (BVW) located along southwest portion of the site bordering Stevens Pond. The project site is bounded by residential properties to the east and south directions located within the Residence-Agricultural (RA) zoning district.

The project site topography is generally flat with elevations ranging from 124 on the northeast part of the lot to 119 on the south part of the lot and lowest elevation of 112 on back of the lot near Steven Pond, elevations referenced to the North American Vertical Datum of 1988 (NAVD88). Stormwater runoff from the site predominantly flows from northeast to the south eventually reaching Stevens Pond without any stormwater management practice.

The project site is partially within a rare species habitat. The rare species habitat is identified as PH-1999 on the Natural Heritage and Endangered Species Program (NHESP).

1.2 Proposed Conditions

The design of the proposed stormwater management system is to collect, treat and infiltrate runoff from the impervious areas. Impervious areas on site are the driveway, roof and patio areas. The total impervious area will only occupy approximately 0.37 Acres which is less than 12% of the project site.

Impervious areas runoffs are effectively managed by a vegetated drainage swale, rain garden, driveway infiltration trench and infiltration system from Cultec. Runoff from the driveway near Georgetown Road will be collected on the infiltration trenches, as the driveway approaches the new home the runoff will sheet flow to the sides, and near the home as approaches the garage entrance the runoff will be collected at a garage drain which will eventually reach the infiltration system with an overflow pipe to the rain garden. Vegetated swales will collect the project site sheet flow runoff to discharge to the rain garden. Roof runoff is collected in gutters and downspouts and are all directed to the rain garden. The rain garden have an overflow discharge with stone protection to the BVW.

2 Stormwater Management

2.1 Method of Calculation

The hydrologic model was created and calculated with HydroCAD®, Version 10.0 software, developed by HydroCAD® Software Solutions LLC, to analyze the hydrology of the Project Site. Hydraulic calculations were performed utilizing the Rational Method to determine contributing flows, and the Manning's Equation to determine pipe flows.

2.2 Sources of Data

The following sources of data were used for the hydrologic and hydraulic calculations:

- Soil Conservation Service (SCS) Technical Release No. 20 (TR-20)
- NRCS Soil Survey of Essex County, Massachusetts, Northern Part
- ASB Design Group subsurface exploration
- NOAA Precipitation Frequency Estimates

2.3 Rainfall Depths

In accordance with MassDEP Stormwater Management Policy and the Town of Boxford Stormwater Management Regulations Chapter 295, the 2-, 10-, 25-, 50- and 100-year, 24-hour storm events were analyzed. Table 1 indicates the rainfall depths used for each storm event, taken from Boxford Stormwater Management Regulations.

Table 1 **Rainfall Depths**

Storm Event	NOAA
2-Year, 24-Hour	3.24"
10-Year, 24-Hour	5.12"
25-Year, 24-Hour	6.29"
50-Year, 24-Hour	7.15"
100-Year, 24-Hour	8.10"

2.4 Soil Conditions

Natural Resources Conservation Service (NRCS) Essex County Soil Survey indicates that soils onsite consist of the following Hydrologic Soil Groups (HSG):

- 253A – Hinckley loamy sand, 0-3% slopes, HSG A
- 253B – Hinckley loamy sand, 3-8% slopes, HSG A

Subsurface exploration consisting of test pits have been performed by ASB Design Group LLC. Based on subsurface explorations, soil conditions at these locations consist of loamy sand and gravel sand. The NRCS Web Soil Survey and Stormwater Infiltration Data Report prepared by ASB Design Group LLC is provided in Appendix G.

2.5 Existing Stormwater Management

The current project site does not provide any naturally shaped stormwater treatment areas.

2.5.1 Existing Watershed

Under existing conditions, the site is divided into 1 Subcatchment area, Drainage Area P-1A. (refer to Appendix A - Figure 2 Pre-Development).

There is 1 point of analysis from the site:

- Design Point 1 – Southwestern portion of land at Steven Pond at a point that captures stormwater flow from the entire project site and parcel.

Drainage Area P-1A: Consists of a residential parcel along Georgetown Road with a mix of lawns, wooded area, roof and gravel drive. Within the drainage area the lowest elevation is 118 and the bottom elevation of pond is at 112.

2.6 Proposed Stormwater Management

The proposed project incorporates a stormwater management system that meets the guidelines in the 2008 MassDEP Stormwater Management Policy. Stormwater quality and quantity on the Site will be managed by implementing a series of best management practices (BMPs) that will include. The proposed BMPs are anticipated to remove a minimum of 99 percent of total suspended solids (TSS) from stormwater runoff, maintain the peak flow rates of stormwater runoff, and maintain the recharge rates to groundwater, as described in the MassDEP Stormwater Standards section of this report.

2.6.1 Proposed Watershed

Under existing conditions, the site is divided into 4 Subcatchment areas, Drainage Areas P-1, P-2, P-3 and P-4. (refer to Appendix A - Figure 3 Post-Development).

There is 1 point of analysis from the site:

- Design Point 1 – Southwestern portion of land at Steven Pond at a point that captures stormwater flow from the entire project site and parcel.

Drainage Area P-1: Consist of the driveway as approaches the downhill ramp into the garage and the proposed residence. Stormwater from this drainage area is directed to drainage inlet which directs flow to the infiltration system from Cultec and in overflow scenarios discharges to the Rain Garden.

Drainage Area P-2: Consist of lawn and wooded areas. Stormwater from this drainage area is directed to vegetated drainage swale which eventually reaches the rain garden.

Drainage Area P-3: Consist of the driveway area from the street as approaches the residence and lawn area. Stormwater from this drainage area is directed to the driveway infiltration trench.

Drainage Area P-4: Consist of lawn and wooded areas. Stormwater from this drainage area is directed to the driveway infiltration trench, rain garden through a vegetated swale and sheet flow directly to the Rain Garden.

3 MassDEP Stormwater Management Standards

The ten (10) MassDEP Stormwater Management Standards provided in the Stormwater Management Policy and Massachusetts Wetlands Protection Act relate to the protection of wetlands and water bodies, control of water quantity, recharge to groundwater, water quality and protection of critical areas, erosion/sedimentation control and stormwater maintenance. The MassDEP Checklist for Stormwater Report is provided in Appendix C, and the following sections summarize the Project's compliance with the Stormwater Management Standards.

3.1 Standard 1 – No New Untreated Discharges

The Project complies with Standard 1. No new point source discharges of untreated stormwater to or causing erosion in resource areas are proposed as part of the project. Stormwater discharge velocities for the project are mitigated by stone for pipe ends at various locations.

3.2 Standard 2 – Peak Rate Attenuation

The Project complies with Standard 2. The Project's stormwater management systems are designed so that post-development peak discharge rates do not exceed pre-development discharge rates for the 2-, 10-, 25-, 50- and 100-year, 24-hour storm events, and so that there will not be increased flooding impacts nor to the BVW and Stevens Pond. Post-development peak runoff and peak runoff volume are all 0, because our stormwater management strategy is attenuating all the proposed impervious area. Refer to Appendix D – Hydrocad Reports for further detail information.

Table 2 **Comparison of Peak Runoff Rates – Design Point 1**

Storm Event (years)	Peak Runoff (cfs)		
	Pre-Development	Post-Development	Δ
2	0	0	0
10	0.08	0	-0.08
25	0.48	0	-0.48
50	0.97	0	-0.97
100	1.95	0	-1.95

Table 3 **Comparison of Peak Runoff Volumes – Design Point 1**

Storm Event (years)	Peak Runoff Volume (af)		
	Pre-Development	Post-Development	Δ
2	0.000	0.000	0.000
10	0.040	0.000	-0.040
25	0.101	0.000	-0.101
50	0.159	0.000	-0.159
100	0.235	0.000	-0.235

3.3 Standard 3 – Recharge

The Project complies with Standard 3. The proposed stormwater management system incorporates the use of Rain Garden to provide the required groundwater recharge. Refer to Appendix E for Recharge Calculations.

3.4 Standard 4 – Water Quality

The Project complies with Standard 4. The incorporation of the described stormwater best management practices (BMPs) will achieve a cumulative Total Suspended Solids (TSS) removal rate greater than 80%, refer to Appendix G – TSS Removal Calculations. Refer to Appendix F for Water Quality Calculations and Appendix I for a copy of the Long-Term Pollution Prevention and Stormwater Operation & Maintenance Plan.

3.5 Standard 5 – Land Uses with Higher Potential Pollutant Loads

Standard 5 is not applicable to the Project. The Project is not considered a Land Use with Higher Potential for Pollutant Loads (LUHPPL) as defined in the Massachusetts Stormwater Handbook.

3.6 Standard 6 – Critical Areas

The project complies with Standard 6. The Project does not discharge stormwater within the Zone II or Interim Wellhead Protection Area of a public water supply, but in overflow scenarios form the rain garden will discharge near a Critical Area as defined in the Massachusetts Stormwater Handbook. As a result of this location, a copy of the Notice of Intent and supporting documentation (dated 05/21/21, revised 06/11/21) has been sent to NHESP and has been approved as shown on Appendix H.

3.7 Standard 7 – Redevelopment Projects

Standard 7 is not applicable to the Project. The Project does not qualify as a redevelopment project or other project subject to the Standards only to the maximum extent practicable.

3.8 Standard 8 – Construction Period Pollution Prevention and Erosion and Sedimentation Control

The project complies with Standard 8. The Project will result in the disturbance of greater than one (1) acre of land and requires coverage under the U.S. EPA National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Construction Activities (CGP). Prior to commencement of earth disturbing activities, a project-specific Storm Water Pollution Prevention Plan (SWPPP) will be prepared, and a Notice of Intent will be submitted to the EPA.

3.9 Standard 9 – Operations and Maintenance Plan

The Project complies with Standard 9. An Operations and Maintenance Plan to be implemented by the owner and its staff to ensure that stormwater management systems function as designed is provided in Appendix I.

3.10 Standard 10 – Prohibition of Illicit Discharges

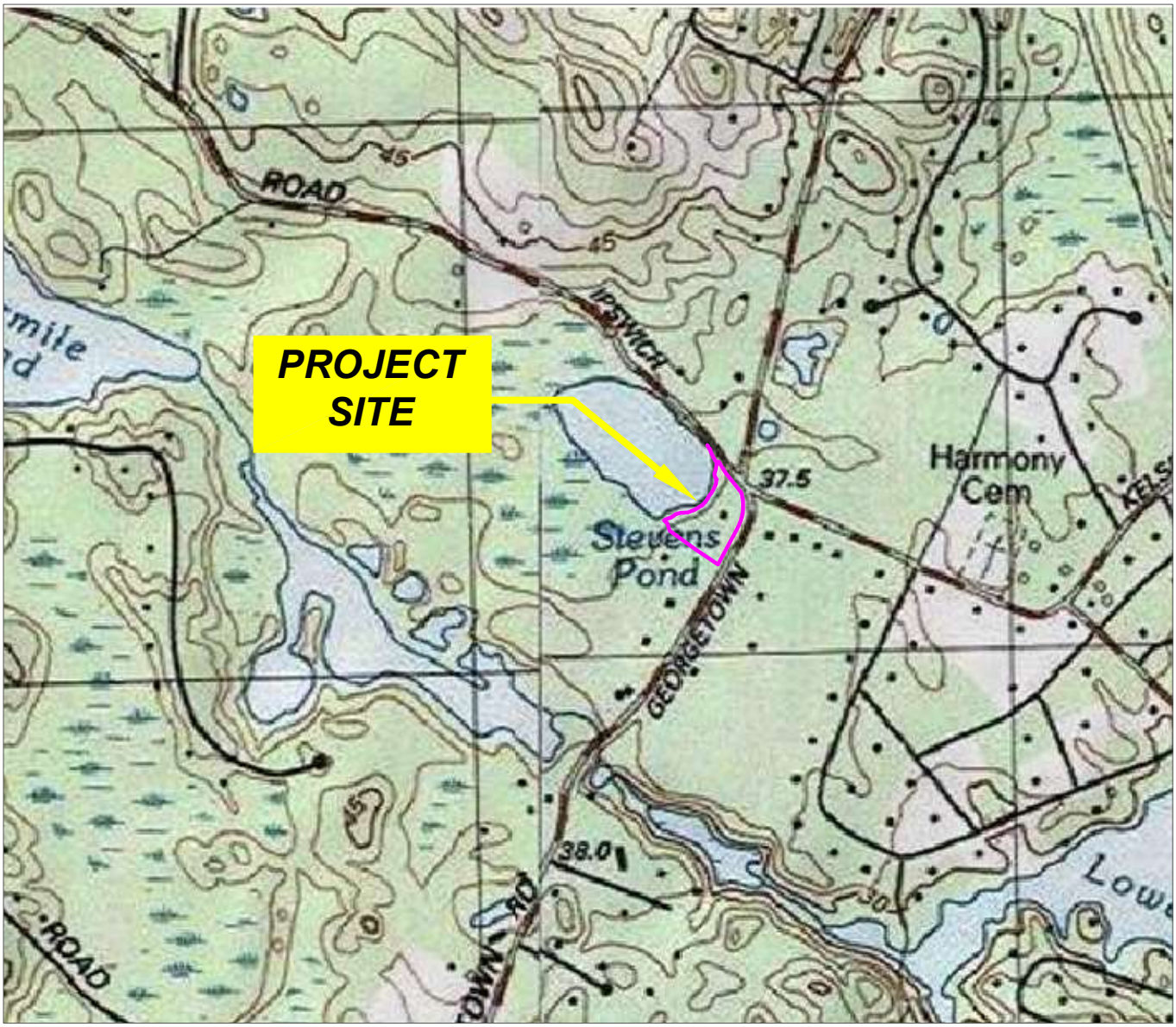
The Project complies with Standard 10. There are no known or designed illicit discharges on the project site. An Illicit Discharge Compliance Statement is provided in Appendix H.

4 Conclusion

The Stormwater Management Plan addresses both the quantity and quality of stormwater runoff from the Project Site and conforms to the ten (10) MassDEP Stormwater Management Standards and Town of Boxford Stormwater Regulations. The Project will not have a negative impact on the surrounding areas, will be constructed in compliance with the U.S. EPA NPDES GCP, and will install stormwater BMPs to mitigate peak runoff rates while providing adequate recharge and treatment of stormwater runoff.

APPENDIX A

Figures



0 500 1000 2000

SCALE: 1'' = 1000'

ENGINEERING & DESIGNS

146 Georgetown Road – Boxford MA

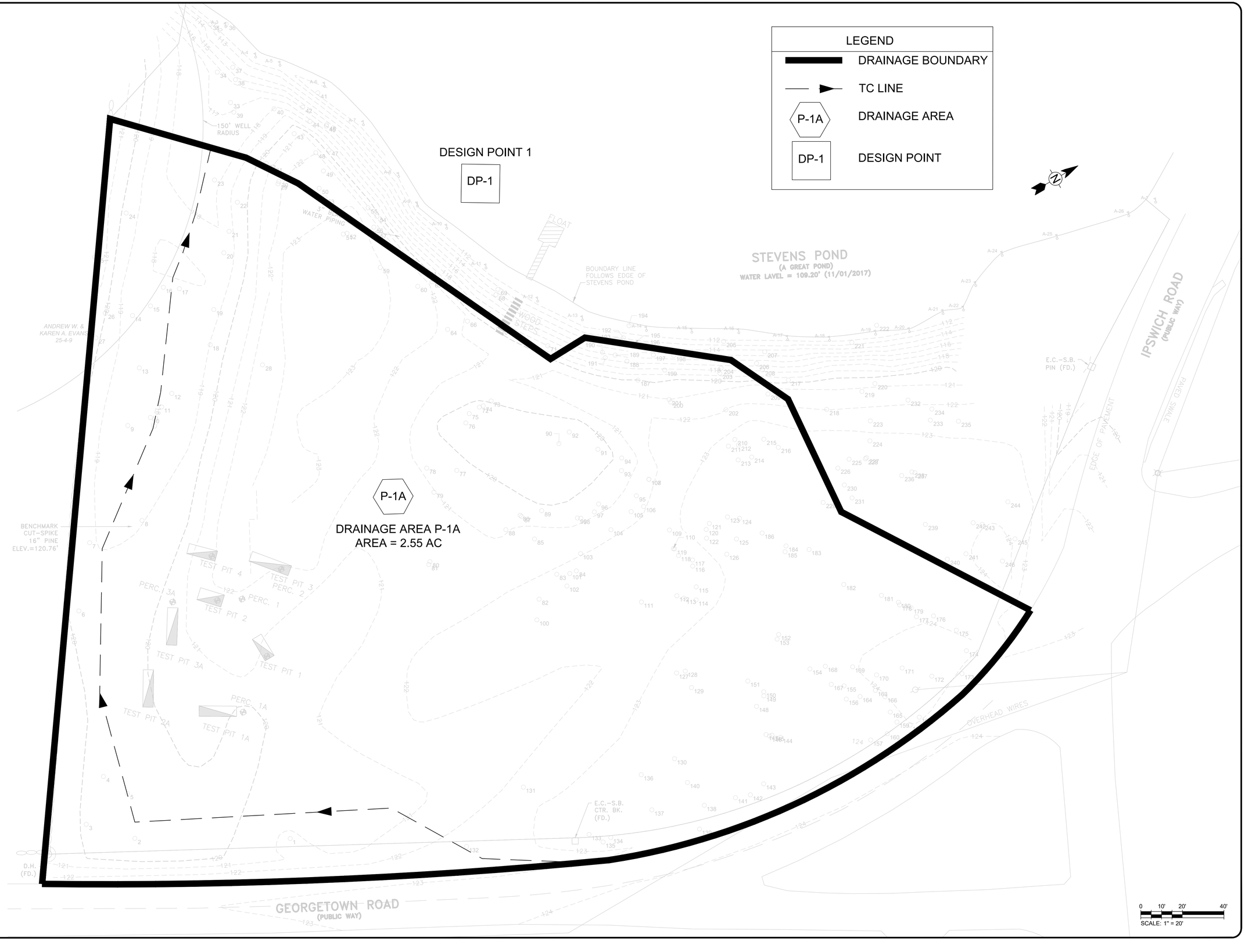
USGS Locus Map

Project No.: B053577

Date: 09/24/2021

Designed By: AWA

Figure 1



Prepared for:
CLAUDIO SENA
146 GEORGETOWN ROAD
BOXFORD, MA, 01921

Property of:
142 FISHER STREET LLC
142 FISHER STREET
WESTBOROUGH, MA 01581

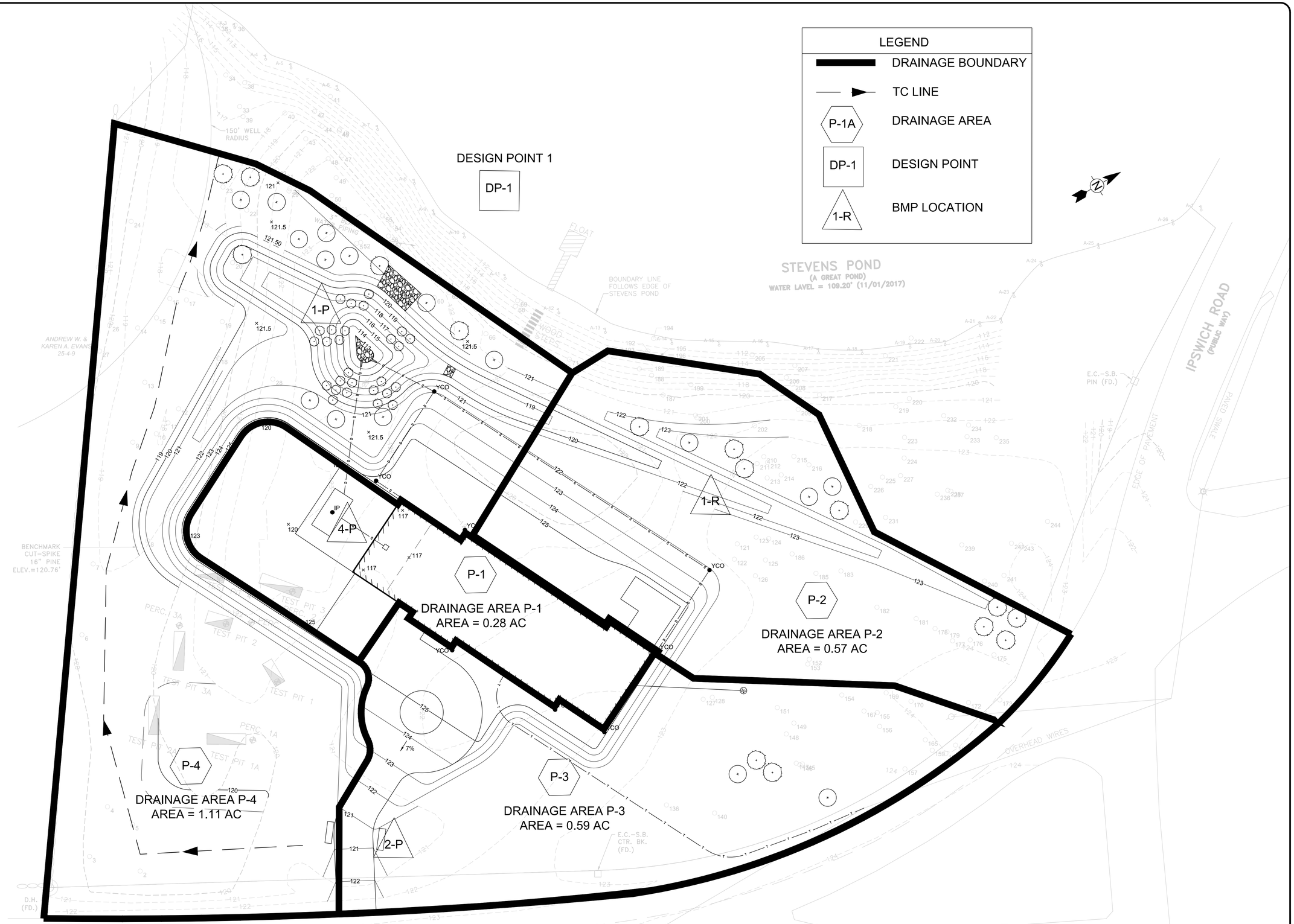
Prepared By:
MF ENGINEERING & DESIGNS
Structural Engineering / Building Design
Civil Engineering / Management Services
CARLOS FERREIRA PROFESSIONAL ENGINEER
PHONE: 508-331-7261 SITE: WWW.MF-ENG.COM
EMAIL: CARLOS.FERREIRA@MF-ENG.COM
Carlos E. Ferreira P.E. #41,423
Date:

Project Title
NOTICE OF INTENT
SENA RESIDENCE

Sheet Title
PRE-DEVELOPMENT

SCALE	1"=20'
DRAWN	CEF
CHECKED	CEF
FILE NAME	146 GEORGETOWN
PROJECT	146 GEORGETOWN RD
ISSUE DATE	05/21/2021
JOB NO.	146-0521

FIGURE 2



Prepared for:
CLAUDIO SENA
146 GEORGETOWN ROAD
BOXFORD, MA, 01921

Property of:
142 FISHER STREET LLC
142 FISHER STREET
WESTBOROUGH, MA 01581

Prepared By:

ENGINEERING & DESIGNS
Structural Engineering / Building Design
Civil Engineering / Management Services
CARLOS FERREIRA PROFESSIONAL ENGINEER
PHONE: 508-331-7261 SITE: WWW.MF-ENG.COM
EMAIL: CARLOS.FERREIRA@MF-ENG.COM

Carlos E. Ferreira P.E. #41,423

Date:

Project Title

NOTICE OF INTENT
SENA RESIDENCE

Sheet Title

POST-DEVELOPMENT

SCALE	1"=20'
DRAWN	CEF
CHECKED	CEF
FILE NAME	146 GEORGETOWN
PROJECT	146 GEORGETOWN RD
ISSUE DATE	05/21/2021
JOB NO.	146-0521

FIGURE 3

APPENDIX B

Subsurface Exploration Data

Hydrologic Soil Group—Essex County, Massachusetts, Northern Part
(146 Georgetown Road, Boxford MA)

Map Scale: 1:1,120 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 16, 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: Sep 13, 2019—Oct 5, 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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
253A	Hinckley loamy sand, 0 to 3 percent slopes	A	1.3	47.4%
253B	Hinckley loamy sand, 3 to 8 percent slopes	A	1.4	52.6%
Totals for Area of Interest			**2.6**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOTES

1. EXISTING CONDITIONS INFORMATION IS BASED ON SURVEY FROM "ASB DESIGN GROUP LLC" FOR PROJECT TITLED "146 GEORGETOWN ROAD - SEPTIC SYSTEM". THIS DESIGNED SEPTIC SYSTEM HAD BEEN APPROVED BY THE BOXFORD CONSERVATION COMMISSION.
2. ALL AREAS DISTURBED BY PROPOSED WORK SHALL BE LOAMED AND SEEDED PER DETAIL "STABILIZATION MULCHING AND SEEDING DETAIL"
3. PROJECT LOCATED ON FEMA FLOOD INSURANCE RATE MAP (FIRM) , MAP NUMBER 25009C0261F. AS ZONE A. ZONE AH FOR BASE FLOOD ELEVATION IS GIVEN BETWEEN 1-3 FT IN AREAS OF PONDING. GIVEN ZONE AH IS AT HIGHER RISK THAN ZONE A THEREFORE BASE FLOOD ELEVATION ESTIMATED AT 114' USING THE MAXIMUM DEPTH OF 3'.

LEGEND

EXISTING CONTOUR

EXISTING TREE 247

ZONING SETBACK

STEVENS POND
(AKA GREAT POND)
WATER LAVEL = 109.20' (11/01/2017)

BOUNDARY LINE FOLLOWS EDGE OF STEVENS POND

DWLLING #146

3" BLACK WATER PIPING

150' WELL RADIUS

APPROX. EXISTING CESS POOL

ANDREW W. & KAREN A. EVANS 25-4-9

GRAVEL

GARAGE

25' NO DISTURB

75' LON BUILD ZONE

100' BUFFER ZONE

IPSWICH ROAD
(PUBLIC WAY)

PAVED SWALE

E.C.-S.B. PIN (FD.)

EDGE OF PAVEMENT

OVERHEAD WIRES

BENCHMARK
CUT-SPIKE
16" PINE
ELEV.=120.76'

SUBSURFACE EXPLORATION AREA

TEST PIT 4
TEST PIT 3
PERC. 2
PERC. 3A
PERC. 1
TEST PIT 2
TEST PIT 3A
TEST PIT 1
PERC. 1A
TEST PIT 2A
TEST PIT 1A

E.C.-S.B. CTR. BK. (FD.)

D.H. (FD.)

GEORGETOWN ROAD
(PUBLIC WAY)

SCALE: 1" = 20'

No.	Date	Description

Revisions

Prepared for:
CLAUDIO SENA
146 GEORGETOWN ROAD
BOXFORD, MA, 01921

Property of:
142 FISHER STREET LLC
142 FISHER STREET
WESTBOROUGH, MA 01581

Prepared By:

ENGINEERING & DESIGNS
Structural Engineering / Building Design
Civil Engineering / Management Services
CARLOS FERREIRA PROFESSIONAL ENGINEER
PHONE: 508-331-7261 SITE: WWW.MF-ENG.COM
EMAIL: CARLOS.FERREIRA@MF-ENG.COM

Carlos E. Ferreira P.E. #41.423

Date:

Project Title

NOTICE OF INTENT
SENA RESIDENCE

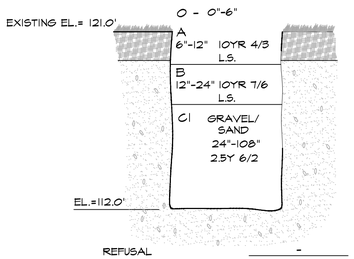
Sheet Title

EXISTING CONDITIONS AND EROSION CONTROL

SCALE	1"=20'
DRAWN	CMS
CHECKED	CEF
FILE NAME	146 GEORGETOWN
PROJECT	146 GEORGETOWN RD
ISSUE DATE	05/21/2021
JOB NO.	146-0521

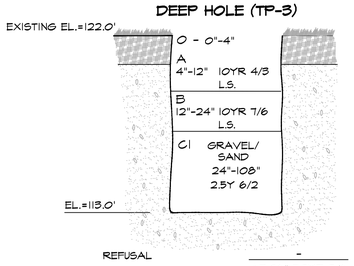
SHEET C-101

DEEP HOLE (TP-1)



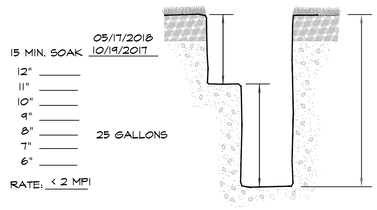
REFUSAL	-
ESTIMATED HIGH WATER	AT 102" 7.5YR 5/6
WATER KEEPING	-
STANDING WATER	-

DEEP HOLE (TP-3)



REFUSAL	-
ESTIMATED HIGH WATER	AT 96" 7.5YR 5/6
WATER KEEPING	-
STANDING WATER	-

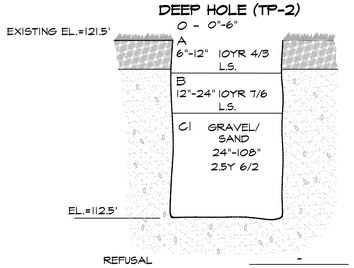
PERC TEST 1 AND 1A



DEEP HOLE / PERC. TESTING

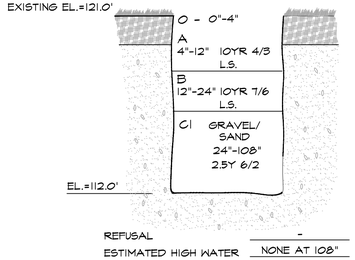
PERFORMED BY: THAD BERRY, P.E., ASB DESIGN GROUP, LLC
WITNESSED BY: BOXFORD BOARD OF HEALTH - KENDELL LONGO
DATE: OCTOBER 19, 2017 AND MAY 17, 2018

DEEP HOLE (TP-2)



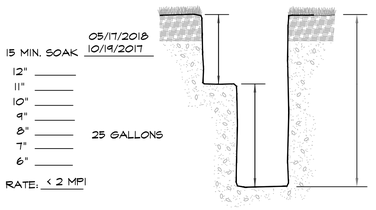
REFUSAL	-
ESTIMATED HIGH WATER	NONE AT 108"
WATER KEEPING	-
STANDING WATER	-

DEEP HOLE (TP-4)

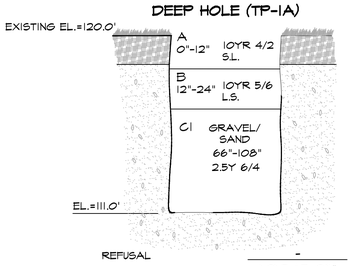


REFUSAL	-
ESTIMATED HIGH WATER	NONE AT 108"
WATER KEEPING	-
STANDING WATER	-

PERC TEST 2 AND 2A

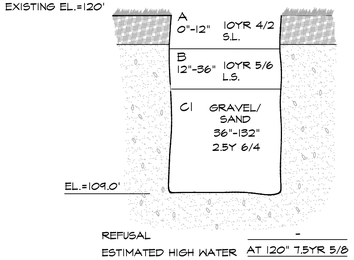


DEEP HOLE (TP-1A)



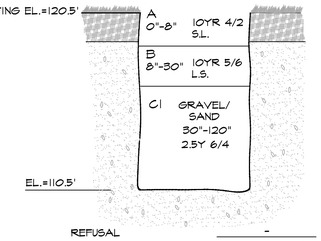
REFUSAL	-
ESTIMATED HIGH WATER	NONE AT 108"
WATER KEEPING	-
STANDING WATER	-

DEEP HOLE (TP-2A)

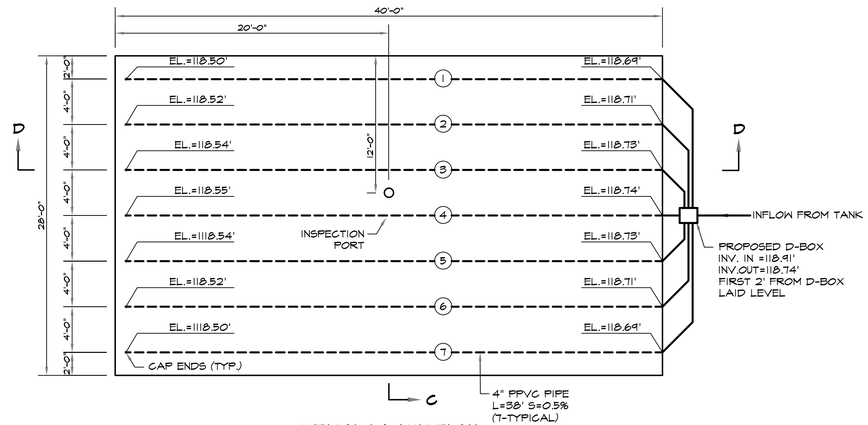


REFUSAL	-
ESTIMATED HIGH WATER	AT 120" 7.5YR 5/8
WATER KEEPING	-
STANDING WATER	AT 126"

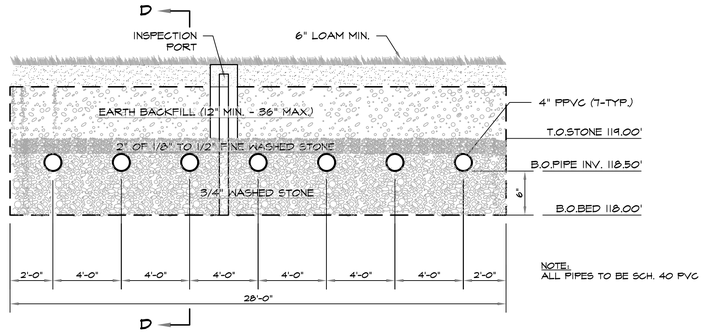
DEEP HOLE (TP-3A)



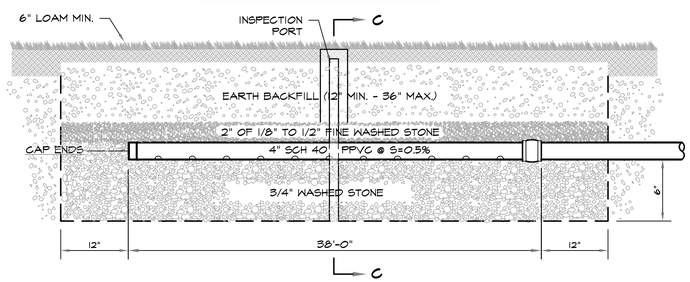
REFUSAL	-
ESTIMATED HIGH WATER	NONE AT 120"
WATER KEEPING	-
STANDING WATER	-



TYPICAL LAYOUT PLAN



TYPICAL CROSS SECTION C-C



TYPICAL LONGITUDINAL SECTION D-D

LEACHING BED DETAILS

NOT TO SCALE

SOIL DATA

SOIL CLASS:

- X CLASS I: SANDS, LOAMY SANDS
- ___ CLASS II: SANDY LOAMS, LOAM
- ___ CLASS III: SILTY LOAMS
- CLASS IV: CLAYS, SILTY CLAY, LOAM
- SOIL UNSUITABLE FOR SUBSURFACE DISPOSAL SYSTEM.

PERC. RATE: < 2 MIN/IN DESIGN RATE: USE 10 MIN/IN

EFFLUENT LOADING RATE (GPD/SQ.FT)

PERC. RATE (MIN./INCH)	CLASS I	CLASS II	CLASS III	CLASS IV
<5	0.74(3.0)	0.60(2.5)	-	-
6	0.70(2.9)	0.60(2.5)	-	-
7	0.68(2.8)	0.60(2.5)	-	-
8	0.66(2.7)	0.60(2.5)	-	-
10	-	0.60(2.5)	-	-
15	-	0.56(2.3)	0.37(1.5)	-
20	-	0.53(2.2)	0.34(1.4)	-
25	-	0.40(1.6)	0.33(1.3)	-
30	-	0.33(1.3)	0.29(1.2)	-

LOADING RATE CRITERIA LISTED BELOW APPLY TO THE UPGRADE OF EXISTING SYSTEMS PURSUANT TO 310 CMR 15.405(1)(C), OR SYSTEMS CONSTRUCTED PURSUANT TO 310 CMR 15.417

40	-	-	0.25 (1.0)	-
50	-	-	0.20(0.8)	0.20(0.8)
60	-	-	0.15 (0.6)	0.15 (0.6)

SIZING CALCULATIONS

- DESIGN FLOW: 5 BEDROOMS X 110 GAL/BEDROOM = 550 GPD
- ADD GARBAGE DISPOSAL: 825 GPD
- * LEACHING AREA REQUIRED: 825 GPD / 0.74 GPD/SF = 1,115 SF
- * SYSTEM AREA PROVIDED: 28' WIDE x 40' LONG = 1,120 SF
- RESERVE AREA PROVIDED: 28' WIDE x 40' LONG = 1,120 SF

CALCULATIONS

LEACHING AREA SIZING

NO. OF BEDROOMS	5
GALLONS PER. DAY/BEDROOM	110
BASE DESIGN FLOW	550 GPD
ADD GARBAGE DISPOSAL	825 GPD
PERCOLATION RATE	5 MIN/IN
CLASS I SOIL	0.74 G/D/SF
* TOTAL AREA REQUIRED	1,115 S.F.
* LEACHING AREA PROVIDED	1,120 S.F.
RESERVE AREA PROVIDED	1,120 S.F.

SEPTIC TANK SIZING

200% DESIGN FLOW

TOTAL DESIGN FLOW 825 GPD

200% x 825 GALS/DAY = 1,650 GPD (MIN. REQUIRED)

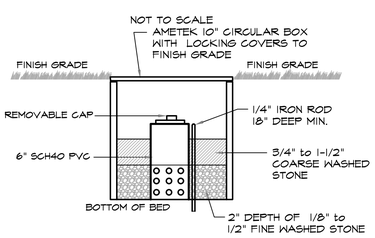
* SEPTIC TANK USED 2000 GAL 2-COMPARTMENT

DESIGN ELEVATIONS

(ALSO SEE PROFILE, CROSS-SECTIONS & PLANS)

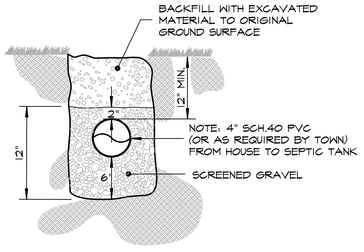
	BED
EXISTING DESIGN ELEVATION	120.5'
S.H.W.T (NONE @ 9')	111.50'
BOTTOM OF BED (+6.5' MIN.)	118.00'
BOTTOM OF PIPE (MIN. +0.5')	118.50' (PIPES 1&7)
TOP OF STONE (+0.5')	119.00'
D-BOX OUT	118.74'
D-BOX IN (+0.17')	118.91'
SEPTIC TANK OUT	119.63'
SEPTIC TANK IN (+0.25')	119.88'
INV AT HOUSE	120.92
TOP OF FOUNDATION	125.00'

NOTE: CONTRACTOR SHALL EXCAVATE AND CONFIRM INVERT AT BUILDING. CONTRACTOR SHALL REPORT ANY DISCREPANCY TO THE BOARD OF HEALTH AND THE DESIGN ENGINEER. CONTRACTOR SHALL UPON APPROVAL MAKE ALL NECESSARY FIELD ADJUSTMENTS THAT MAY BE REQUIRED.



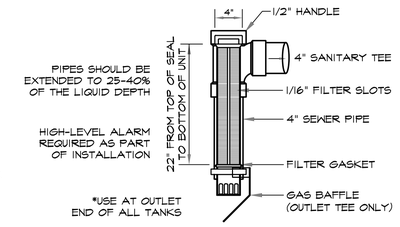
INSPECTION PORT DETAIL

NOT TO SCALE



TYPICAL CONNECTION TRENCH

NOT TO SCALE



ZABEL ENVIRONMENTAL MODEL A1800 4x22 OR EQUAL

OUTLET EFFLUENT FILTER

NOT TO SCALE

NOTE: THIS SHEET WAS DESIGNED BY ASB DESIGN GROUP LLC AND PREVISOULY APPROVED BY BOXFORD BOARD OF HEALTH DATED 7/2/18.

DATE:

No.	Date	Description
1	06/11/21	NOI SUBMITTAL

Revisions

Prepared for:
CLAUDIO SENA
146 GEORGETOWN ROAD
BOXFORD, MA, 01921

Property of:
142 FISHER STREET LLC
142 FISHER STREET
WESTBOROUGH, MA 01581

Prepared By:
MF ENGINEERING & DESIGNS
Structural Engineering / Building Design
Civil Engineering / Management Services
CARLOS FERREIRA PROFESSIONAL ENGINEER
PHONE: 508-331-7261 SITE: WWW.MF-ENG.COM
EMAIL: CARLOS.FERREIRA@MF-ENG.COM
Carlos E. Ferreira P.E. #41,423
Date:

Project Title
NOTICE OF INTENT
SENA RESIDENCE

Sheet Title
SEPTIC SYSTEM DESIGN AND CALCULATIONS

SCALE	1"=20'
DRAWN	CMS
CHECKED	CEF
FILE NAME	146 GEORGETOWN
PROJECT	146 GEORGETOWN RD
ISSUE DATE	05/21/2021
JOB NO.	146-0521

SHEET C-103

APPENDIX C

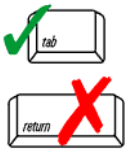
MassDEP Checklist for Stormwater Report

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.

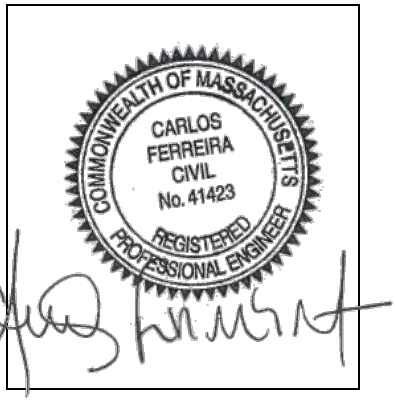
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



09/27/2021

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): _____

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

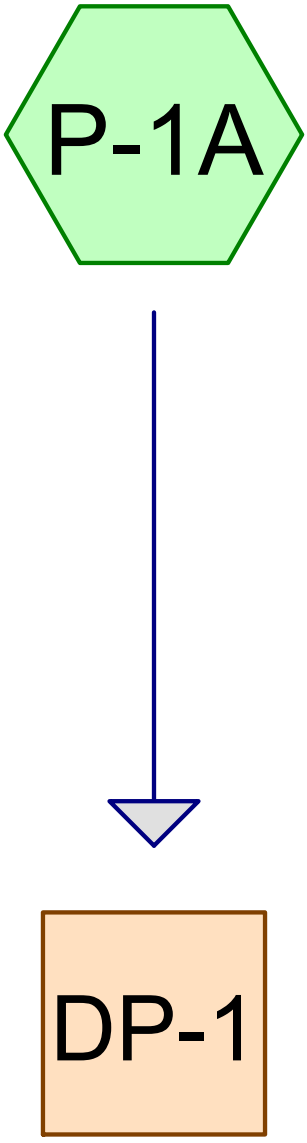
☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☑ 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.

APPENDIX D

Hydrocad Reports



DESIGN POINT 1
(STEVENS POND)

Subcat Reach Pond Link

Routing Diagram for Pre-Development_146 Georgetown Rd, Boxford MA
Prepared by Tetra Tech Inc, Printed 9/27/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.340	39	>75% Grass cover, Good, HSG A (P-1A)
0.120	96	Gravel surface, HSG A (P-1A)
0.010	98	Roofs, HSG B (P-1A)
1.080	30	Woods, Good, HSG A (P-1A)
2.550	**38**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.540	HSG A	P-1A
0.010	HSG B	P-1A
0.000	HSG C	
0.000	HSG D	
0.000	Other	
2.550		**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
1.340	0.000	0.000	0.000	0.000	1.340	>75% Grass cover, Good	P-1A
0.120	0.000	0.000	0.000	0.000	0.120	Gravel surface	P-1A
0.000	0.010	0.000	0.000	0.000	0.010	Roofs	P-1A
1.080	0.000	0.000	0.000	0.000	1.080	Woods, Good	P-1A
2.540	**0.010**	**0.000**	**0.000**	**0.000**	**2.550**	**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 P-1A: Runoff Area=2.550 ac 0.39% Impervious Runoff Depth=0.00"
Flow Length=647' Tc=6.4 min CN=38 Runoff=0.00 cfs 0.000 af

Reach DP-1: DESIGN POINT 1 (STEVENS POND) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 2.550 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
99.61% Pervious = 2.540 ac 0.39% Impervious = 0.010 ac

Summary for Subcatchment P-1A:

[45] Hint: Runoff=Zero

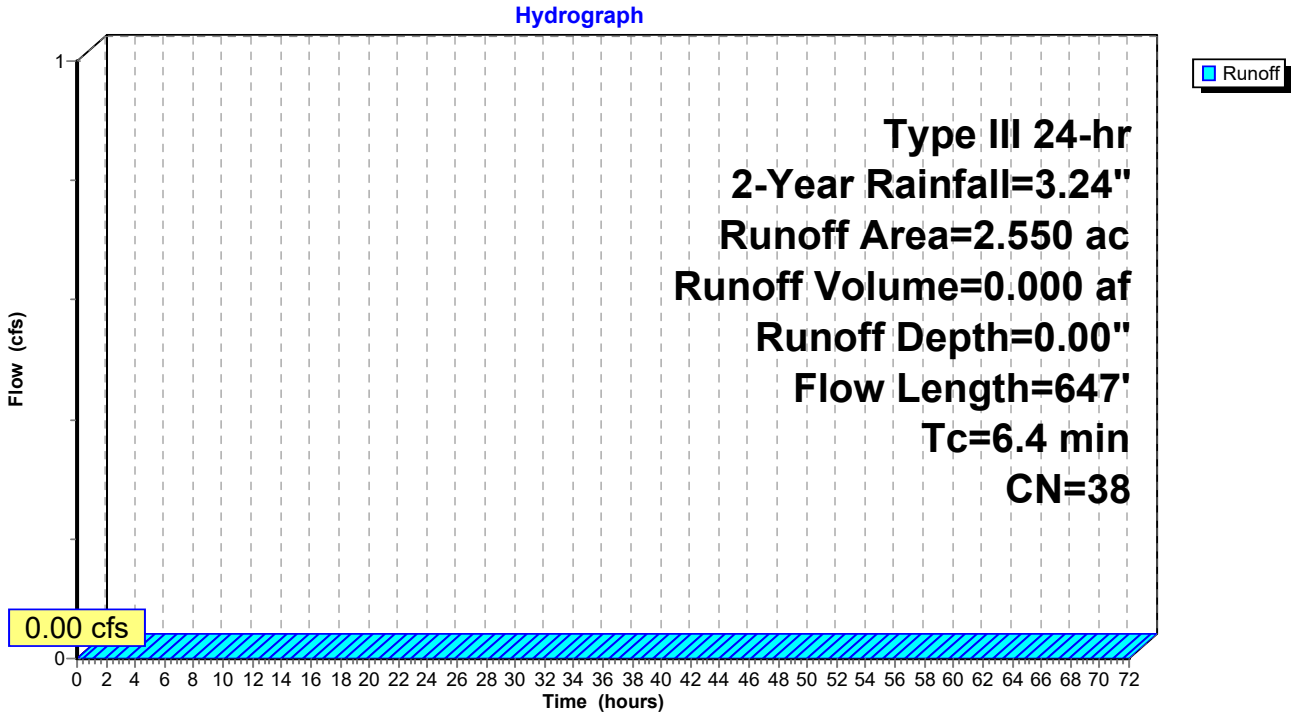
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

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 2-Year Rainfall=3.24"

Area (ac)	CN	Description
0.010	98	Roofs, HSG B
1.340	39	>75% Grass cover, Good, HSG A
1.080	30	Woods, Good, HSG A
0.120	96	Gravel surface, HSG A
2.550	38	Weighted Average
2.540		99.61% Pervious Area
0.010		0.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	32	0.0480	1.61		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
6.0	578	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	37	0.1400	5.61		**Shallow Concentrated Flow, Shallow Concentrated** Grassed Waterway Kv= 15.0 fps
6.4	647	Total			

Subcatchment P-1A:



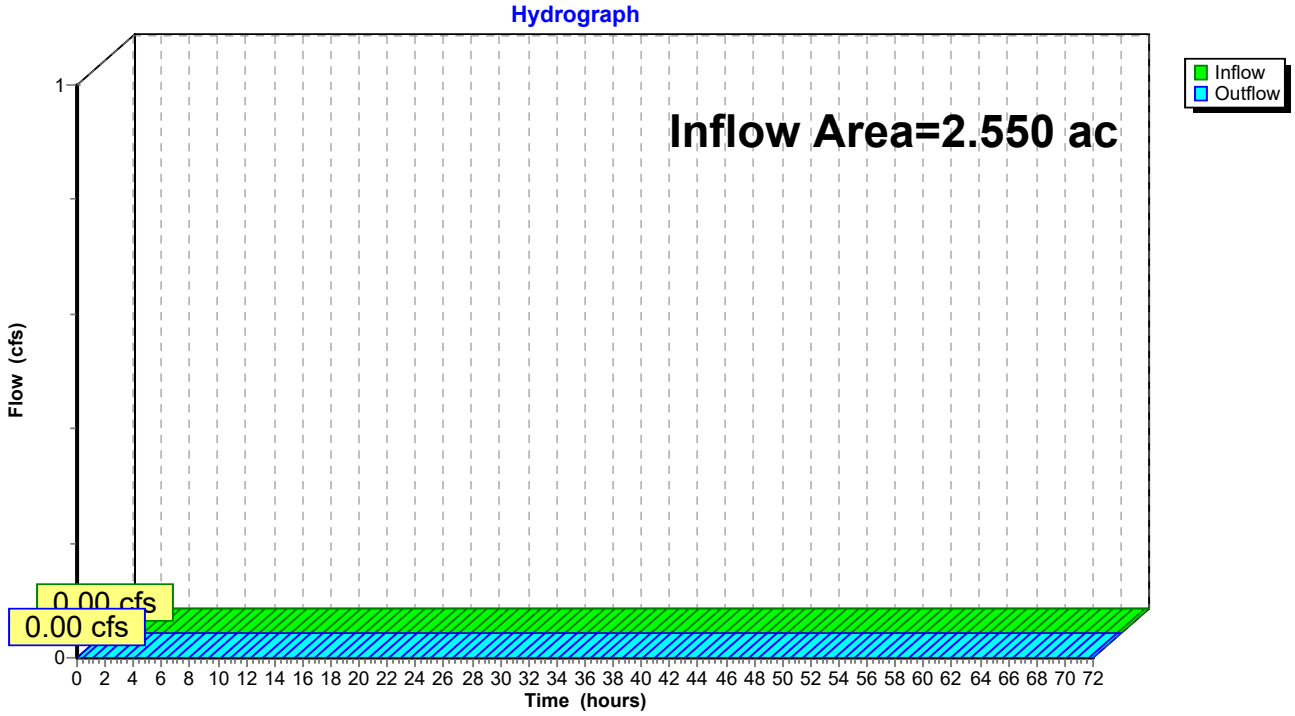
Summary for Reach DP-1: DESIGN POINT 1 (STEVENS POND)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.550 ac, 0.39% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 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 DP-1: DESIGN POINT 1 (STEVENS POND)



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 P-1A: Runoff Area=2.550 ac 0.39% Impervious Runoff Depth=0.19"
Flow Length=647' Tc=6.4 min CN=38 Runoff=0.08 cfs 0.040 af

Reach DP-1: DESIGN POINT 1 (STEVENS POND) Inflow=0.08 cfs 0.040 af
Outflow=0.08 cfs 0.040 af

Total Runoff Area = 2.550 ac Runoff Volume = 0.040 af Average Runoff Depth = 0.19"
99.61% Pervious = 2.540 ac 0.39% Impervious = 0.010 ac

Summary for Subcatchment P-1A:

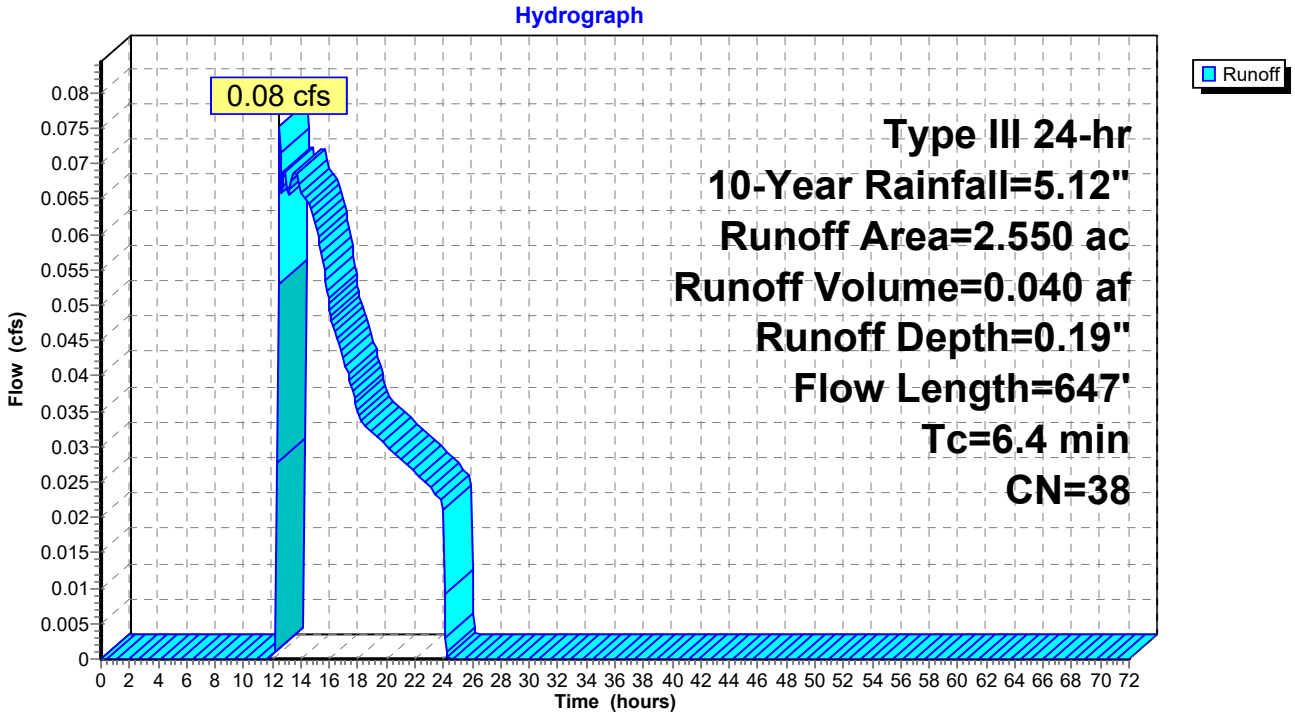
Runoff = 0.08 cfs @ 12.51 hrs, Volume= 0.040 af, Depth= 0.19"

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=5.12"

Area (ac)	CN	Description
0.010	98	Roofs, HSG B
1.340	39	>75% Grass cover, Good, HSG A
1.080	30	Woods, Good, HSG A
0.120	96	Gravel surface, HSG A
2.550	38	Weighted Average
2.540		99.61% Pervious Area
0.010		0.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	32	0.0480	1.61		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
6.0	578	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	37	0.1400	5.61		**Shallow Concentrated Flow, Shallow Concentrated** Grassed Waterway Kv= 15.0 fps
6.4	647	Total			

Subcatchment P-1A:



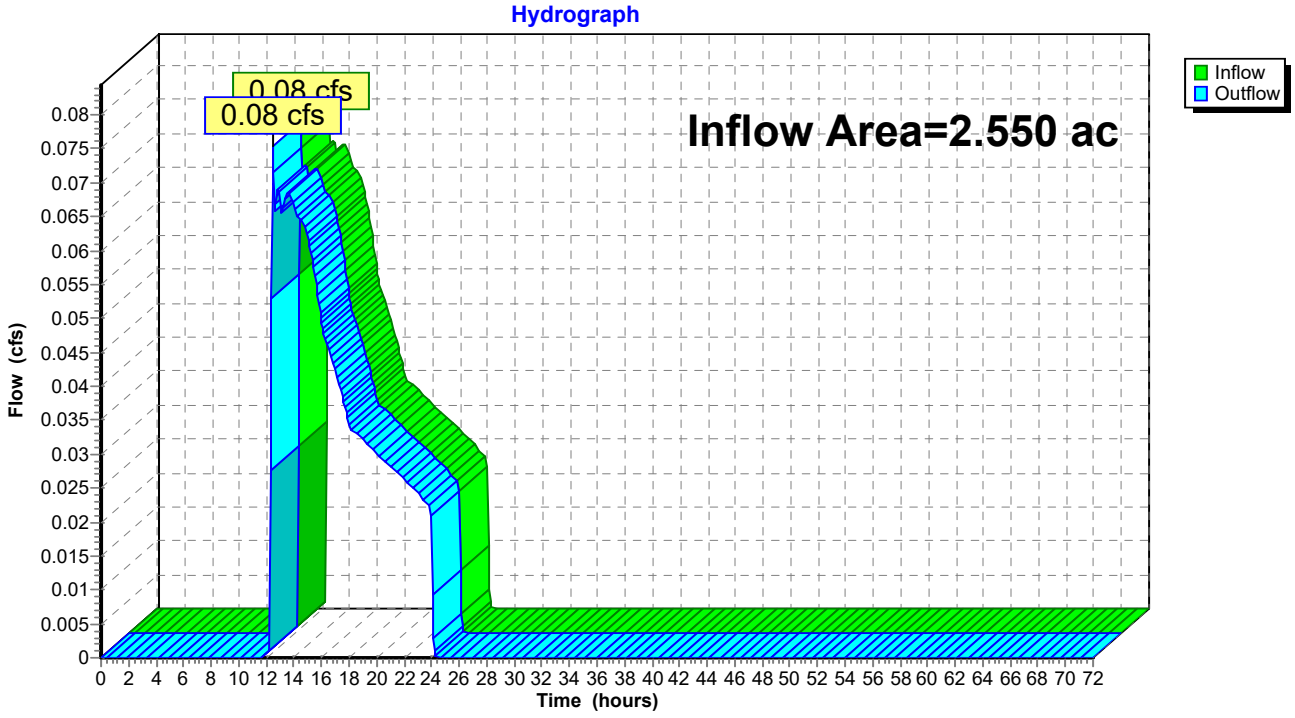
Summary for Reach DP-1: DESIGN POINT 1 (STEVENS POND)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.550 ac, 0.39% Impervious, Inflow Depth = 0.19" for 10-Year event
Inflow = 0.08 cfs @ 12.51 hrs, Volume= 0.040 af
Outflow = 0.08 cfs @ 12.51 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 DP-1: DESIGN POINT 1 (STEVENS POND)



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 P-1A: Runoff Area=2.550 ac 0.39% Impervious Runoff Depth=0.47"
Flow Length=647' Tc=6.4 min CN=38 Runoff=0.48 cfs 0.101 af

Reach DP-1: DESIGN POINT 1 (STEVENS POND) Inflow=0.48 cfs 0.101 af
Outflow=0.48 cfs 0.101 af

Total Runoff Area = 2.550 ac Runoff Volume = 0.101 af Average Runoff Depth = 0.47"
99.61% Pervious = 2.540 ac 0.39% Impervious = 0.010 ac

Summary for Subcatchment P-1A:

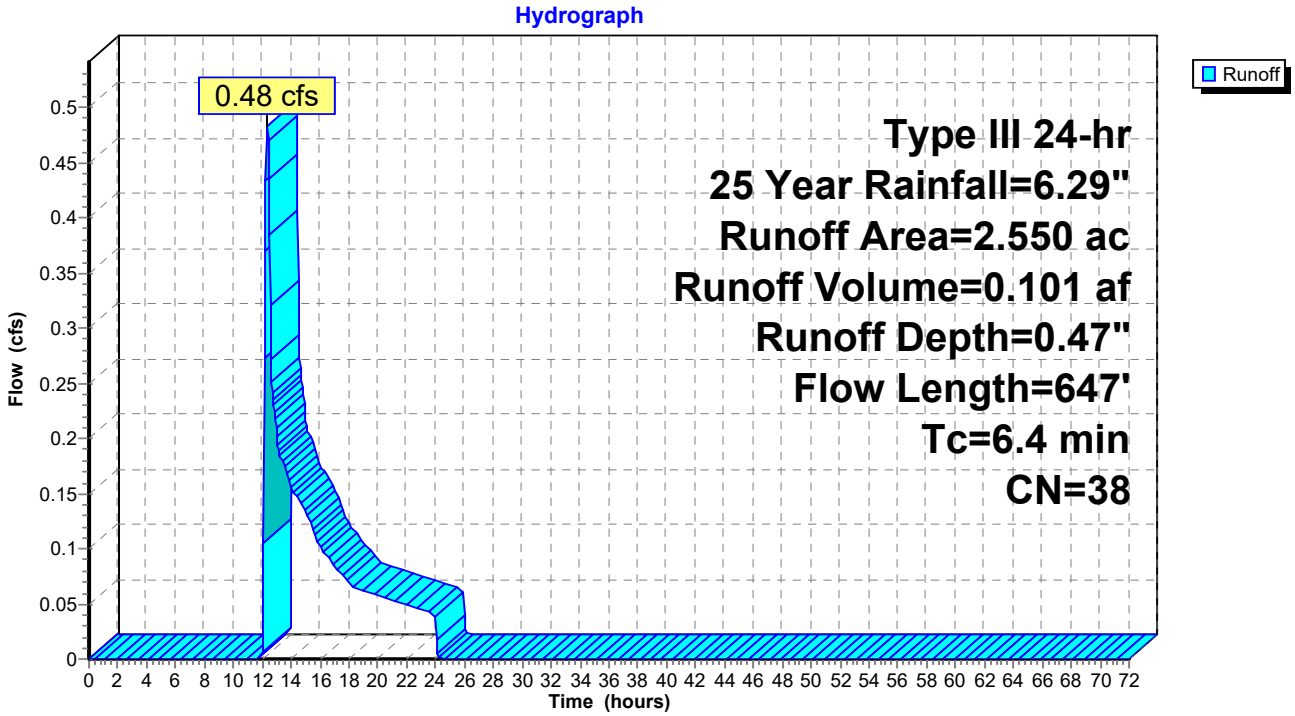
Runoff = 0.48 cfs @ 12.35 hrs, Volume= 0.101 af, Depth= 0.47"

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=6.29"

Area (ac)	CN	Description
0.010	98	Roofs, HSG B
1.340	39	>75% Grass cover, Good, HSG A
1.080	30	Woods, Good, HSG A
0.120	96	Gravel surface, HSG A
2.550	38	Weighted Average
2.540		99.61% Pervious Area
0.010		0.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	32	0.0480	1.61		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
6.0	578	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	37	0.1400	5.61		**Shallow Concentrated Flow, Shallow Concentrated** Grassed Waterway Kv= 15.0 fps
6.4	647	Total			

Subcatchment P-1A:



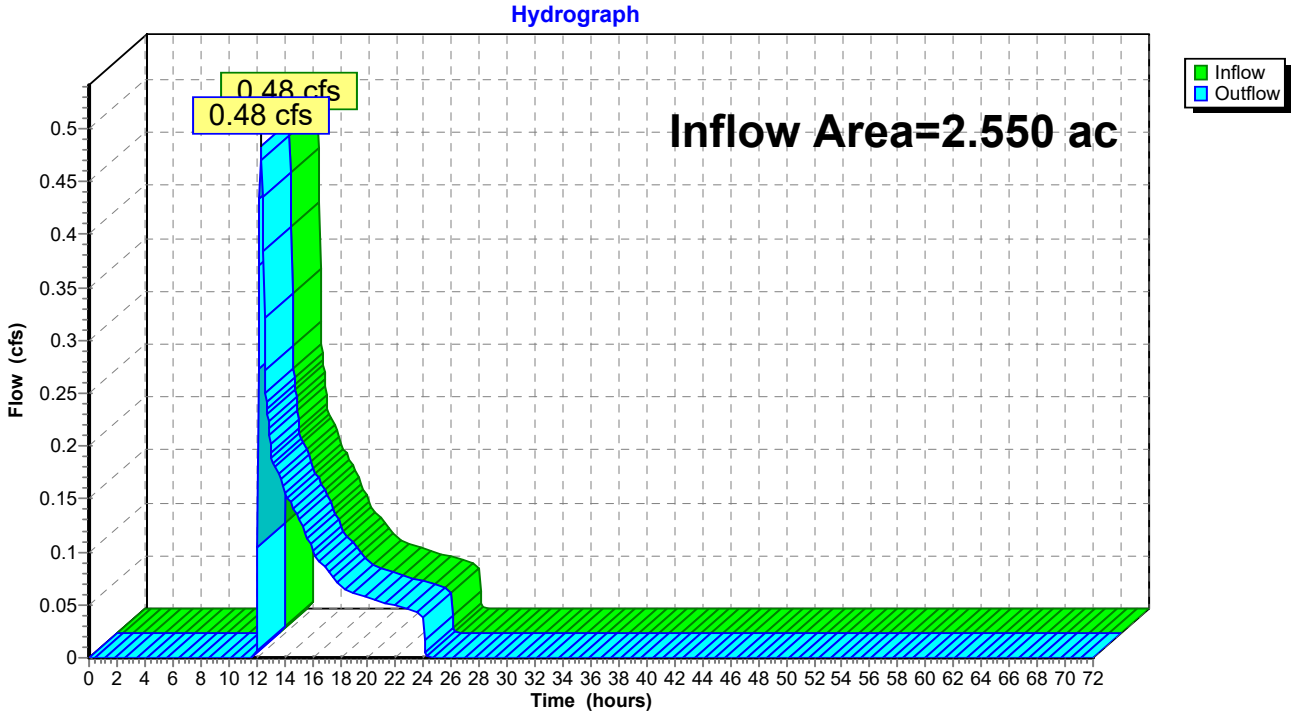
Summary for Reach DP-1: DESIGN POINT 1 (STEVENS POND)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.550 ac, 0.39% Impervious, Inflow Depth = 0.47" for 25 Year event
Inflow = 0.48 cfs @ 12.35 hrs, Volume= 0.101 af
Outflow = 0.48 cfs @ 12.35 hrs, Volume= 0.101 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 DP-1: DESIGN POINT 1 (STEVENS POND)



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 P-1A: Runoff Area=2.550 ac 0.39% Impervious Runoff Depth=0.75"
Flow Length=647' Tc=6.4 min CN=38 Runoff=0.97 cfs 0.159 af

Reach DP-1: DESIGN POINT 1 (STEVENS POND) Inflow=0.97 cfs 0.159 af
Outflow=0.97 cfs 0.159 af

Total Runoff Area = 2.550 ac Runoff Volume = 0.159 af Average Runoff Depth = 0.75"
99.61% Pervious = 2.540 ac 0.39% Impervious = 0.010 ac

Summary for Subcatchment P-1A:

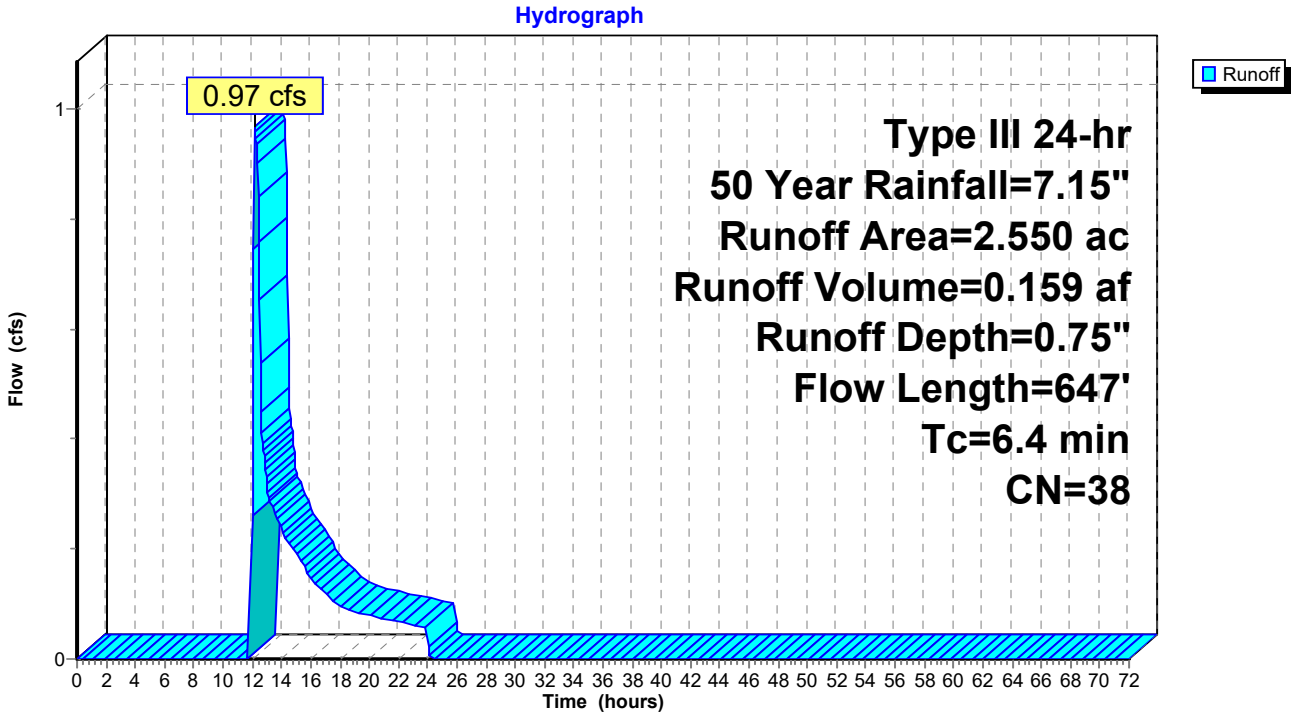
Runoff = 0.97 cfs @ 12.15 hrs, Volume= 0.159 af, Depth= 0.75"

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 50 Year Rainfall=7.15"

Area (ac)	CN	Description
0.010	98	Roofs, HSG B
1.340	39	>75% Grass cover, Good, HSG A
1.080	30	Woods, Good, HSG A
0.120	96	Gravel surface, HSG A
2.550	38	Weighted Average
2.540		99.61% Pervious Area
0.010		0.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	32	0.0480	1.61		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
6.0	578	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	37	0.1400	5.61		**Shallow Concentrated Flow, Shallow Concentrated** Grassed Waterway Kv= 15.0 fps
6.4	647	Total			

Subcatchment P-1A:



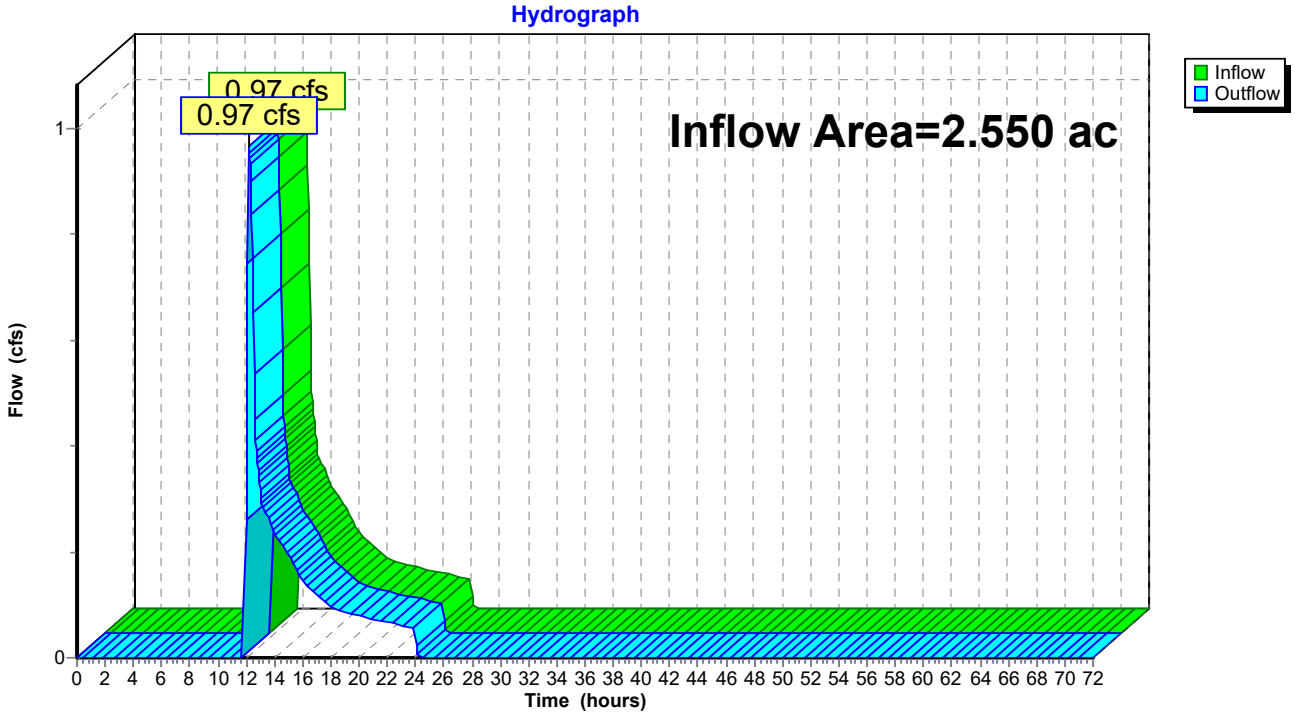
Summary for Reach DP-1: DESIGN POINT 1 (STEVENS POND)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.550 ac, 0.39% Impervious, Inflow Depth = 0.75" for 50 Year event
Inflow = 0.97 cfs @ 12.15 hrs, Volume= 0.159 af
Outflow = 0.97 cfs @ 12.15 hrs, Volume= 0.159 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 DP-1: DESIGN POINT 1 (STEVENS POND)



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 P-1A: Runoff Area=2.550 ac 0.39% Impervious Runoff Depth=1.11"
Flow Length=647' Tc=6.4 min CN=38 Runoff=1.95 cfs 0.235 af

Reach DP-1: DESIGN POINT 1 (STEVENS POND) Inflow=1.95 cfs 0.235 af
Outflow=1.95 cfs 0.235 af

Total Runoff Area = 2.550 ac Runoff Volume = 0.235 af Average Runoff Depth = 1.11"
99.61% Pervious = 2.540 ac 0.39% Impervious = 0.010 ac

Summary for Subcatchment P-1A:

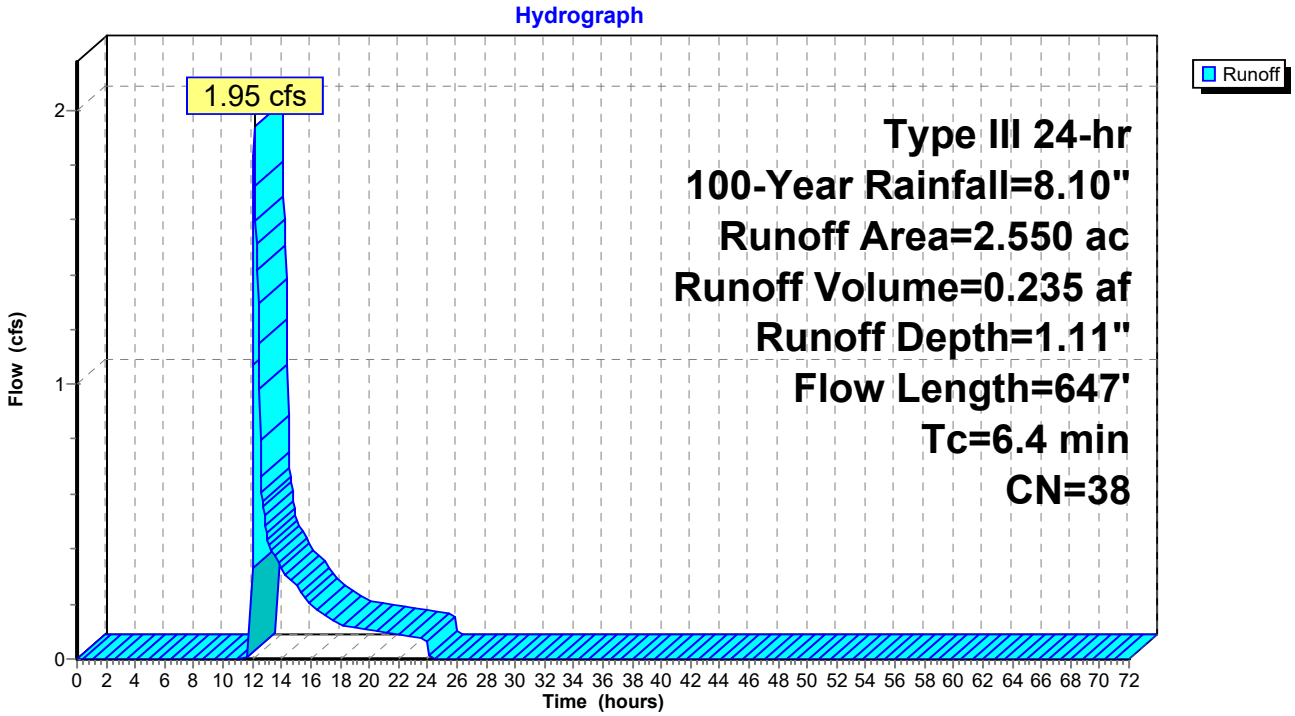
Runoff = 1.95 cfs @ 12.14 hrs, Volume= 0.235 af, Depth= 1.11"

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=8.10"

Area (ac)	CN	Description
0.010	98	Roofs, HSG B
1.340	39	>75% Grass cover, Good, HSG A
1.080	30	Woods, Good, HSG A
0.120	96	Gravel surface, HSG A
2.550	38	Weighted Average
2.540		99.61% Pervious Area
0.010		0.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	32	0.0480	1.61		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.43"
6.0	578	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	37	0.1400	5.61		**Shallow Concentrated Flow, Shallow Concentrated** Grassed Waterway Kv= 15.0 fps
6.4	647	Total			

Subcatchment P-1A:



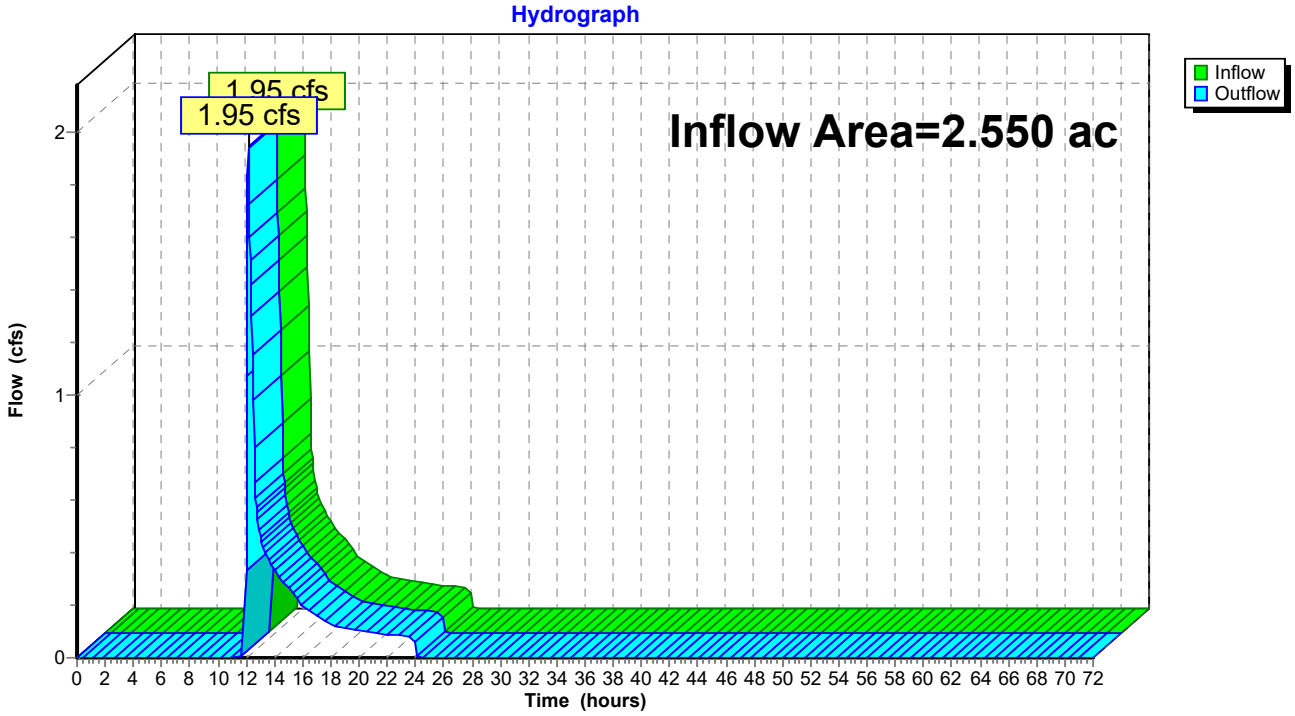
Summary for Reach DP-1: DESIGN POINT 1 (STEVENS POND)

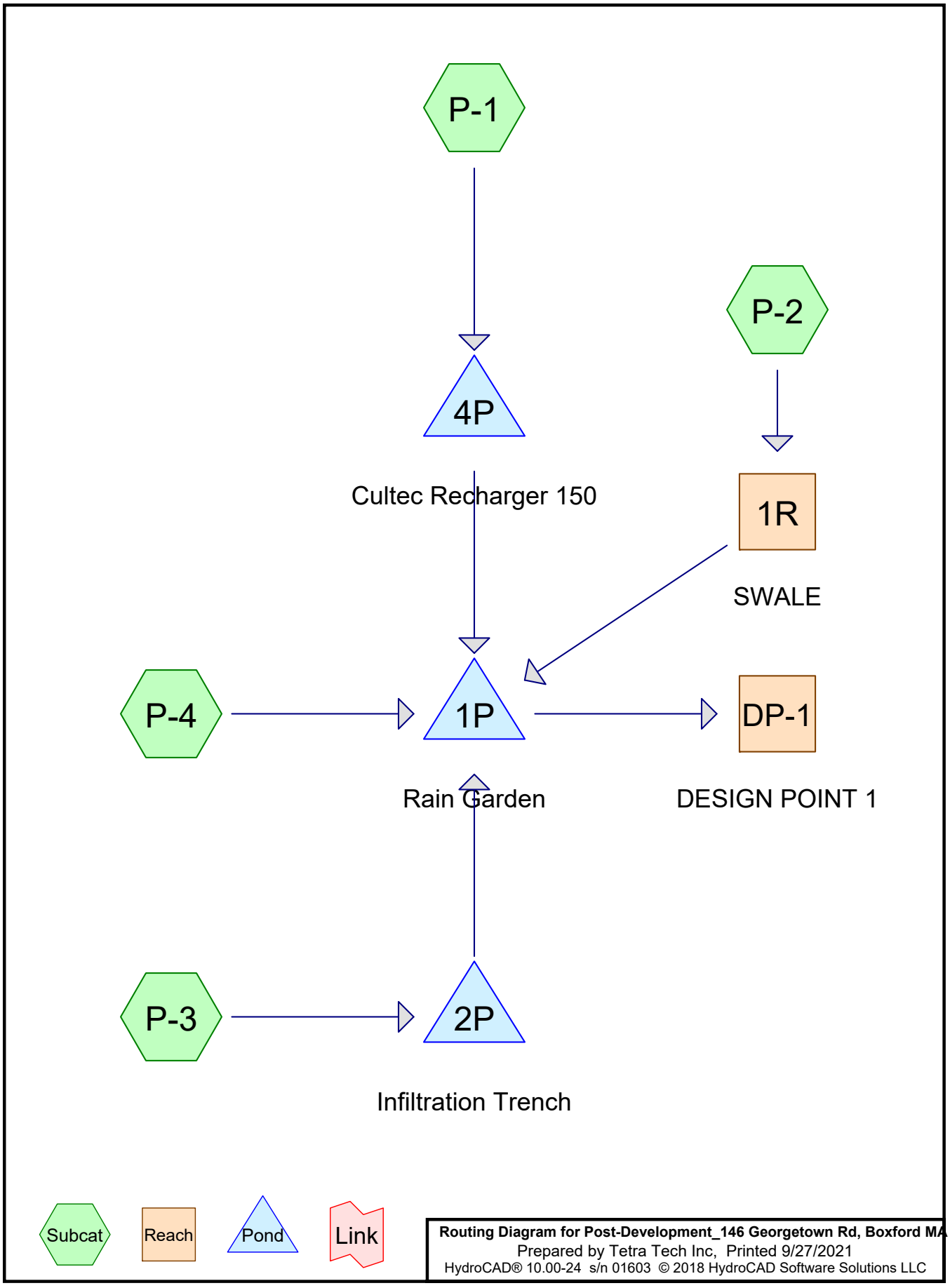
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.550 ac, 0.39% Impervious, Inflow Depth = 1.11" for 100-Year event
Inflow = 1.95 cfs @ 12.14 hrs, Volume= 0.235 af
Outflow = 1.95 cfs @ 12.14 hrs, Volume= 0.235 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 DP-1: DESIGN POINT 1 (STEVENS POND)





Routing Diagram for Post-Development_146 Georgetown Rd, Boxford MA
Prepared by Tetra Tech Inc, Printed 9/27/2021
HydroCAD® 10.00-24 s/n 01603 © 2018 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.140	39	>75% Grass cover, Good, HSG A (P-2, P-3, P-4)
0.230	98	Paved parking, HSG A (P-1, P-3)
0.150	98	Roofs, HSG A (P-1, P-2)
0.990	30	Woods, Good, HSG A (P-2, P-4)
2.510	**44**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.510	HSG A	P-1, P-2, P-3, P-4
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
2.510		**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
1.140	0.000	0.000	0.000	0.000	1.140	>75% Grass cover, Good	P-2, P-3, P-4
0.230	0.000	0.000	0.000	0.000	0.230	Paved parking	P-1, P-3
0.150	0.000	0.000	0.000	0.000	0.150	Roofs	P-1, P-2
0.990	0.000	0.000	0.000	0.000	0.990	Woods, Good	P-2, P-4
2.510	**0.000**	**0.000**	**0.000**	**0.000**	**2.510**	**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	4P	114.50	113.00	69.0	0.0217	0.012	12.0	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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Runoff Area=0.280 ac 100.00% Impervious Runoff Depth=3.01"
Tc=5.0 min CN=98 Runoff=0.89 cfs 0.070 af

Subcatchment P-2: Runoff Area=0.520 ac 1.92% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=37 Runoff=0.00 cfs 0.000 af

Subcatchment P-3: Runoff Area=0.590 ac 15.25% Impervious Runoff Depth=0.10"
Tc=5.0 min CN=48 Runoff=0.01 cfs 0.005 af

Subcatchment P-4: Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=32 Runoff=0.00 cfs 0.000 af

Reach 1R: SWALE Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.150 L=310.0' S=0.0065 '/' Capacity=5.81 cfs Outflow=0.00 cfs 0.000 af

Reach DP-1: DESIGN POINT 1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1P: Rain Garden Peak Elev=116.78' Storage=1,593 cf Inflow=0.87 cfs 0.060 af
Discarded=0.05 cfs 0.060 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.060 af

Pond 2P: Infiltration Trench Peak Elev=119.08' Storage=0.000 af Inflow=0.01 cfs 0.005 af
Discarded=0.01 cfs 0.005 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.005 af

Pond 4P: Cultec Recharger 150 Peak Elev=115.44' Storage=67 cf Inflow=0.89 cfs 0.070 af
Discarded=0.01 cfs 0.011 af Primary=0.87 cfs 0.060 af Outflow=0.88 cfs 0.070 af

Total Runoff Area = 2.510 ac Runoff Volume = 0.075 af Average Runoff Depth = 0.36"
84.86% Pervious = 2.130 ac 15.14% Impervious = 0.380 ac

Summary for Subcatchment P-1:

[49] Hint: Tc<2dt may require smaller dt

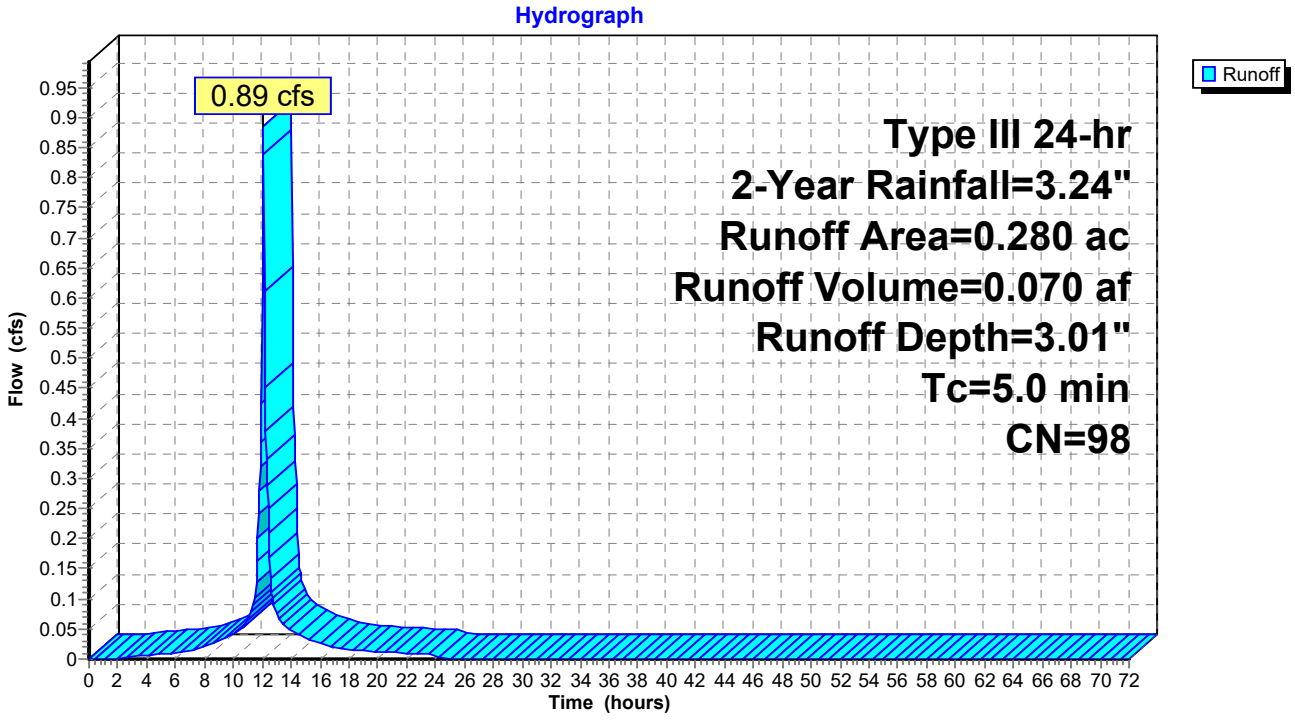
Runoff = 0.89 cfs @ 12.07 hrs, Volume= 0.070 af, Depth= 3.01"

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=3.24"

Area (ac)	CN	Description
0.140	98	Paved parking, HSG A
0.140	98	Roofs, HSG A
0.280	98	Weighted Average
0.280		100.00% Impervious Area

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

Subcatchment P-1:



Summary for Subcatchment P-2:

[49] Hint: Tc<2dt may require smaller dt
[45] Hint: Runoff=Zero

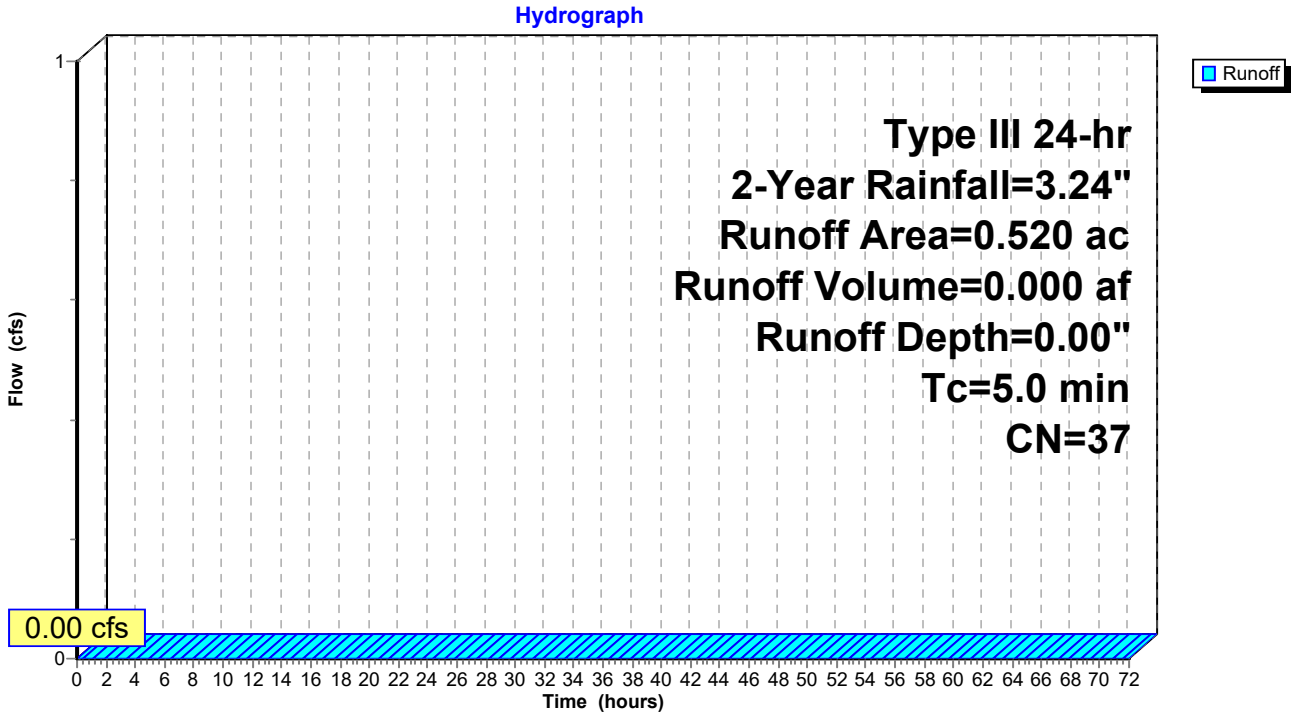
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

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 2-Year Rainfall=3.24"

Area (ac)	CN	Description
0.340	39	>75% Grass cover, Good, HSG A
0.010	98	Roofs, HSG A
0.170	30	Woods, Good, HSG A
0.520	37	Weighted Average
0.510		98.08% Pervious Area
0.010		1.92% Impervious Area

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

Subcatchment P-2:



Summary for Subcatchment P-3:

[49] Hint: Tc<2dt may require smaller dt

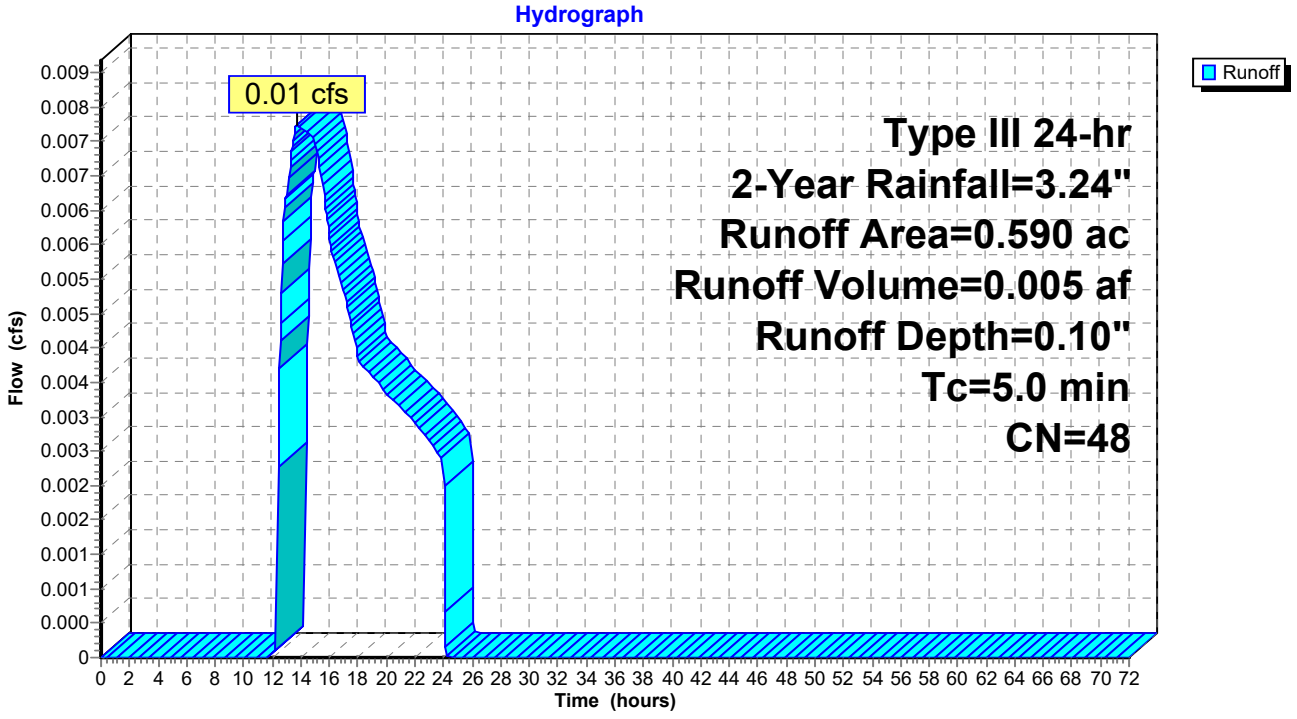
Runoff = 0.01 cfs @ 13.76 hrs, Volume= 0.005 af, Depth= 0.10"

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=3.24"

Area (ac)	CN	Description
0.090	98	Paved parking, HSG A
0.500	39	>75% Grass cover, Good, HSG A
0.590	48	Weighted Average
0.500		84.75% Pervious Area
0.090		15.25% Impervious Area

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

Subcatchment P-3:



Summary for Subcatchment P-4:

[49] Hint: Tc<2dt may require smaller dt
[45] Hint: Runoff=Zero

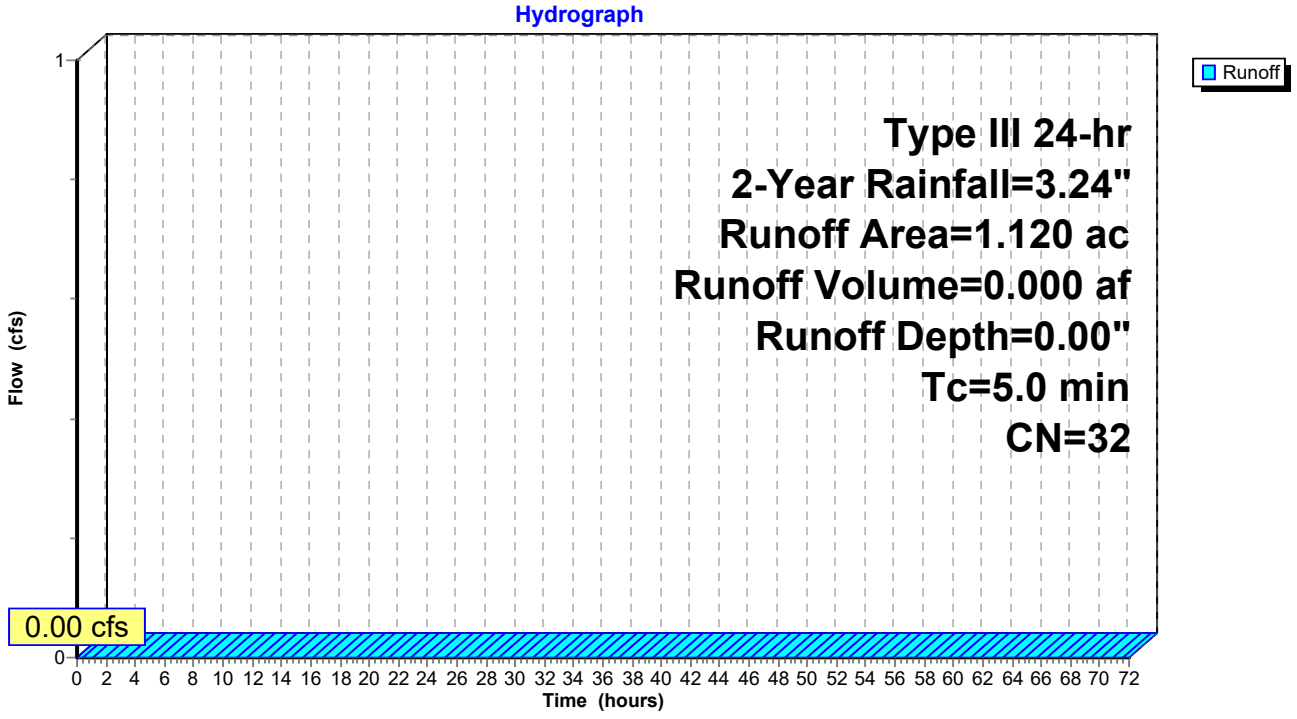
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

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 2-Year Rainfall=3.24"

Area (ac)	CN	Description
0.300	39	>75% Grass cover, Good, HSG A
0.820	30	Woods, Good, HSG A
1.120	32	Weighted Average
1.120		100.00% Pervious Area

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

Subcatchment P-4:



Summary for Reach 1R: SWALE

Inflow Area = 0.520 ac, 1.92% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

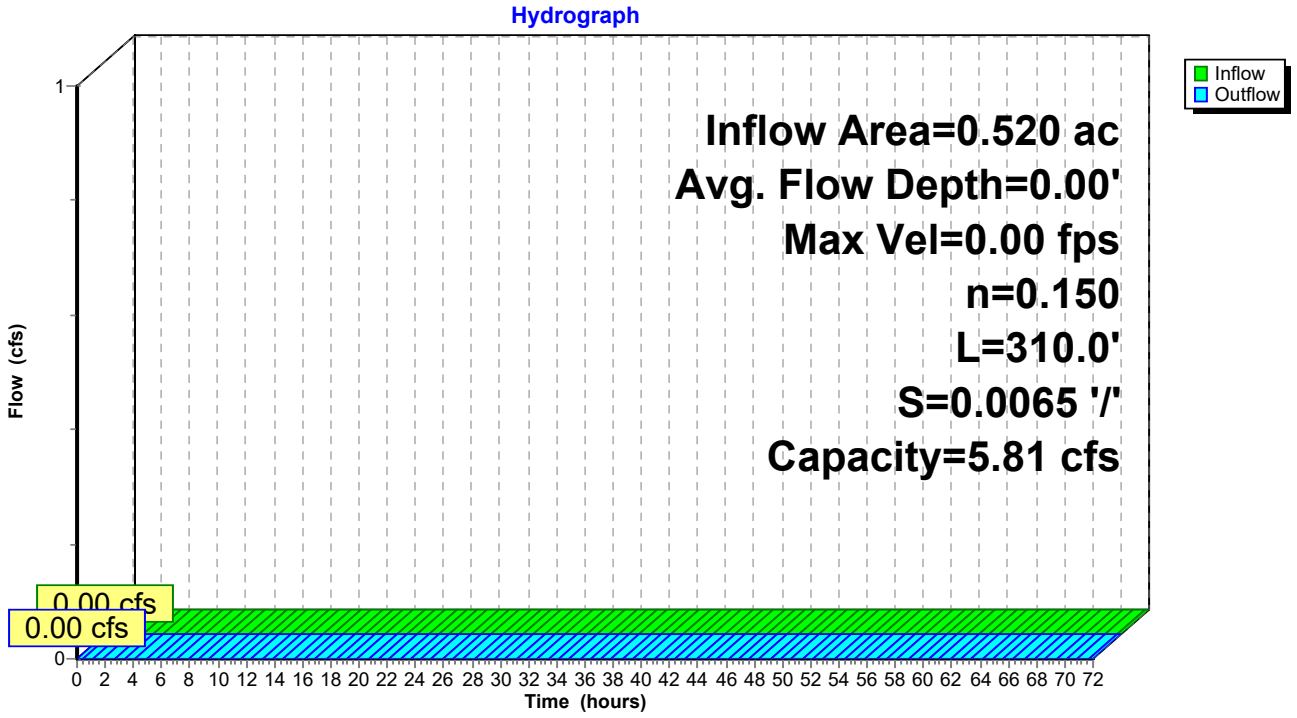
Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 5.81 cfs

6.00' x 1.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 310.0' Slope= 0.0065 '/'
Inlet Invert= 124.00', Outlet Invert= 122.00'

‡

Reach 1R: SWALE



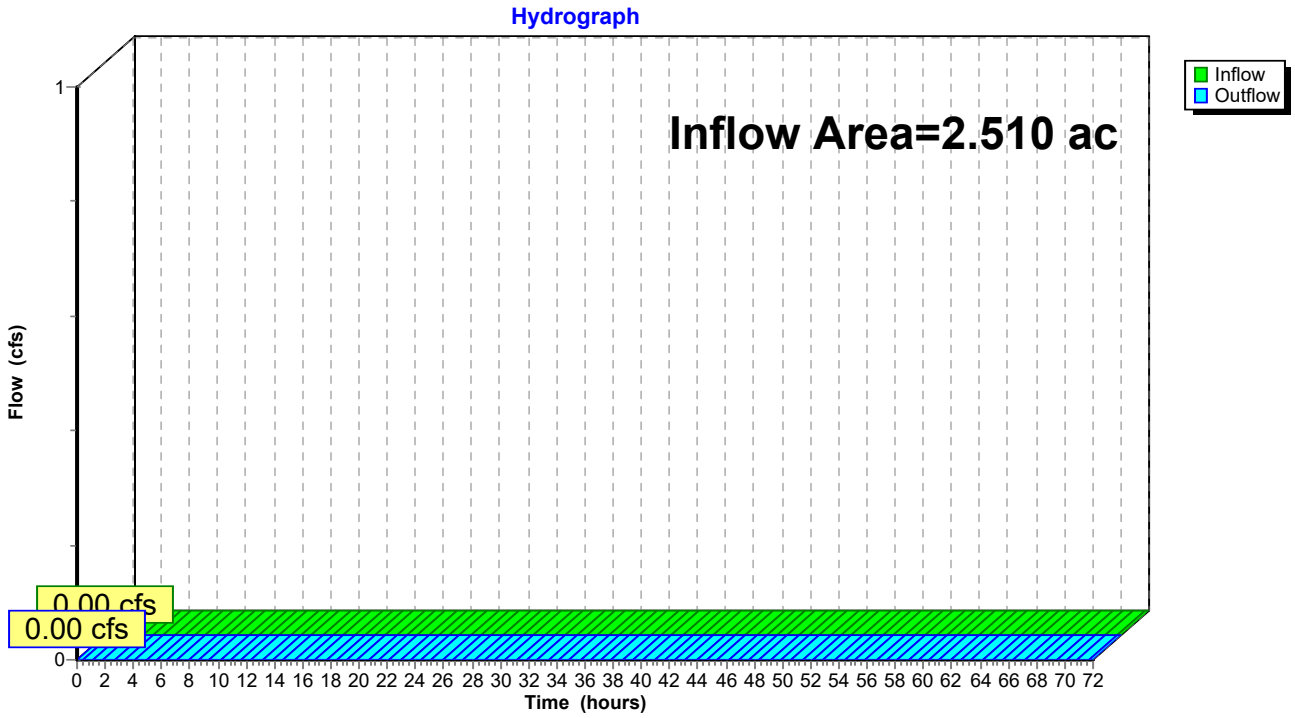
Summary for Reach DP-1: DESIGN POINT 1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.510 ac, 15.14% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 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 DP-1: DESIGN POINT 1



Summary for Pond 1P: Rain Garden

Used more restrictive B layer

[81] Warning: Exceeded Pond 4P by 1.71' @ 13.75 hrs

Inflow Area = 2.510 ac, 15.14% Impervious, Inflow Depth = 0.28" for 2-Year event
Inflow = 0.87 cfs @ 12.07 hrs, Volume= 0.060 af
Outflow = 0.05 cfs @ 13.49 hrs, Volume= 0.060 af, Atten= 94%, Lag= 85.3 min
Discarded = 0.05 cfs @ 13.49 hrs, Volume= 0.060 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 116.78' @ 13.49 hrs Surf.Area= 932 sf Storage= 1,593 cf

Plug-Flow detention time= 392.9 min calculated for 0.060 af (100% of inflow)
Center-of-Mass det. time= 392.7 min (1,147.8 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1	113.00'	22,053 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

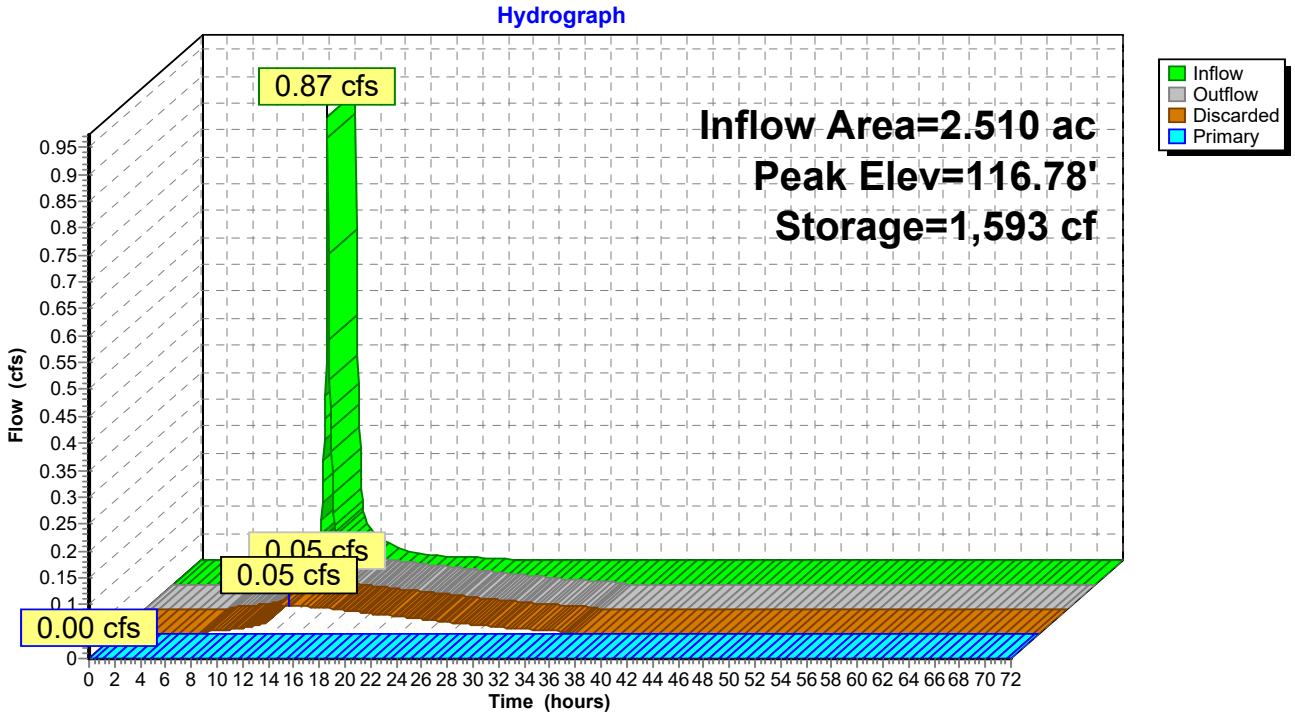
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
113.00	60	0	0
114.00	200	130	130
115.00	404	302	432
116.00	672	538	970
117.00	1,007	840	1,810
118.00	1,415	1,211	3,021
119.00	2,202	1,809	4,829
120.00	3,427	2,815	7,644
121.00	4,655	4,041	11,685
122.00	5,007	4,831	16,516
123.00	6,068	5,538	22,053

Device	Routing	Invert	Outlet Devices
#1	Primary	122.00'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	113.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 13.49 hrs HW=116.78' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=113.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Rain Garden



Summary for Pond 2P: Infiltration Trench

Inflow Area = 0.590 ac, 15.25% Impervious, Inflow Depth = 0.10" for 2-Year event
Inflow = 0.01 cfs @ 13.76 hrs, Volume= 0.005 af
Outflow = 0.01 cfs @ 15.62 hrs, Volume= 0.005 af, Atten= 13%, Lag= 111.2 min
Discarded = 0.01 cfs @ 15.62 hrs, Volume= 0.005 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 119.08' @ 15.62 hrs Surf.Area= 0.003 ac Storage= 0.000 af

Plug-Flow detention time= 13.6 min calculated for 0.005 af (100% of inflow)
Center-of-Mass det. time= 13.6 min (1,048.9 - 1,035.3)

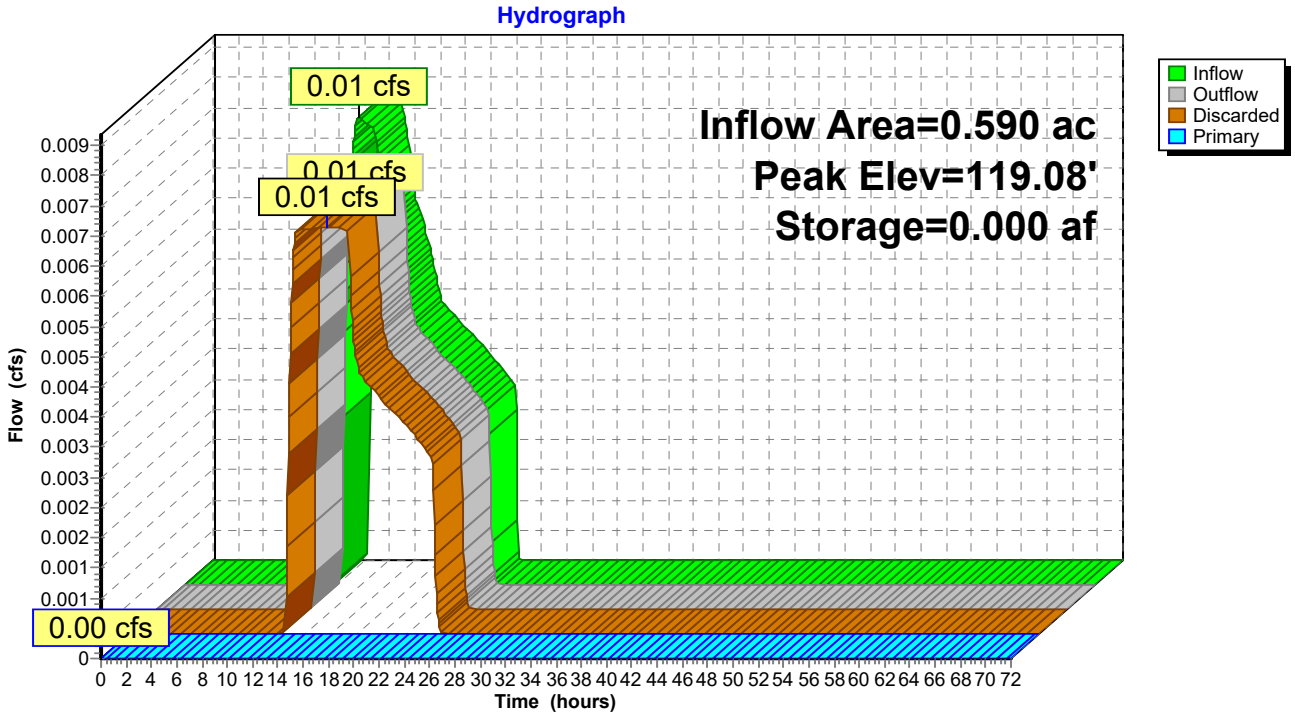
Volume	Invert	Avail.Storage	Storage Description
#1	119.00'	0.008 af	**36.0" W x 36.0" H Box Pipe Storage/Trenches** x 2 L= 20.0'
#2	119.00'	0.001 af	**18.0" Round Pipe Storage** L= 18.0' S= 0.0500 '/'
		0.009 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	120.50'	**72.0" x 120.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Discarded	119.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 15.62 hrs HW=119.08' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=119.00' (Free Discharge)
↑**1=Orifice/Grate** (Controls 0.00 cfs)

Pond 2P: Infiltration Trench



Summary for Pond 4P: Cultec Recharger 150

Inflow Area = 0.280 ac,100.00% Impervious, Inflow Depth = 3.01" for 2-Year event
Inflow = 0.89 cfs @ 12.07 hrs, Volume= 0.070 af
Outflow = 0.88 cfs @ 12.07 hrs, Volume= 0.070 af, Atten= 1%, Lag= 0.1 min
Discarded = 0.01 cfs @ 12.07 hrs, Volume= 0.011 af
Primary = 0.87 cfs @ 12.07 hrs, Volume= 0.060 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 115.44' @ 12.07 hrs Surf.Area= 62 sf Storage= 67 cf

Plug-Flow detention time= 20.1 min calculated for 0.070 af (100% of inflow)
Center-of-Mass det. time= 20.4 min (775.6 - 755.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.00'	51 cf	**4.75'W x 13.00'L x 2.54'H Field A** 157 cf Overall - 29 cf Embedded = 128 cf x 40.0% Voids
#2A	114.50'	29 cf	**Cultec R-150XLHD** Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	114.00'	18 cf	**12.0" Round Pipe Storage**-Impervious L= 23.0' S= 0.0100 '/'
		98 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	114.50'	**12.0" Round Culvert** L= 69.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 114.50' / 113.00' S= 0.0217 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Discarded	114.00'	**2.410 in/hr Exfiltration over Wetted area**
#3	Device 1	115.00'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 12.07 hrs HW=115.43' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.84 cfs @ 12.07 hrs HW=115.43' (Free Discharge)
↑**1=Culvert** (Passes 0.84 cfs of 2.51 cfs potential flow)
↑**3=Broad-Crested Rectangular Weir** (Weir Controls 0.84 cfs @ 1.94 fps)

Pond 4P: Cultec Recharger 150 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 1 rows

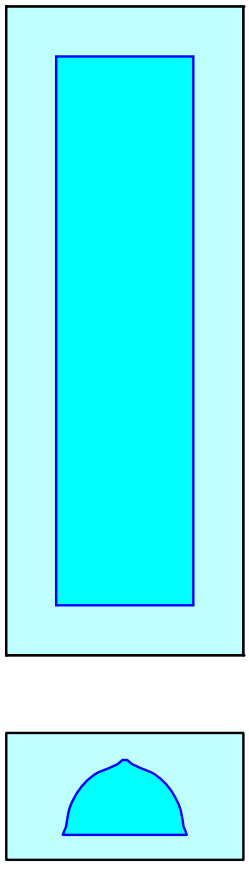
1 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 11.00' Row Length +12.0" End Stone x 2 = 13.00' Base Length
1 Rows x 33.0" Wide + 12.0" Side Stone x 2 = 4.75' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

1 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 1 Rows = 29.1 cf Chamber Storage

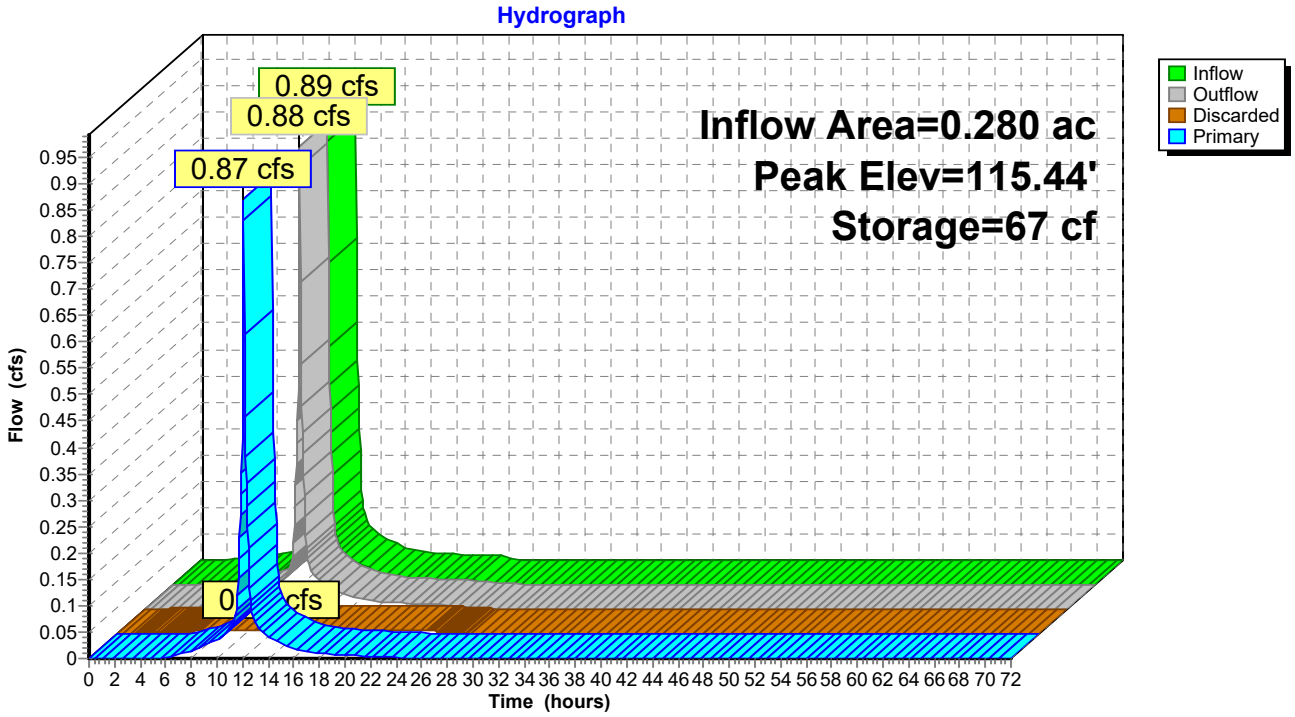
156.9 cf Field - 29.1 cf Chambers = 127.8 cf Stone x 40.0% Voids = 51.1 cf Stone Storage

Chamber Storage + Stone Storage = 80.3 cf = 0.002 af
Overall Storage Efficiency = 51.1%
Overall System Size = 13.00' x 4.75' x 2.54'

1 Chambers
5.8 cy Field
4.7 cy Stone



Pond 4P: Cultec Recharger 150



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 P-1: Runoff Area=0.280 ac 100.00% Impervious Runoff Depth=4.88"
Tc=5.0 min CN=98 Runoff=1.41 cfs 0.114 af

Subcatchment P-2: Runoff Area=0.520 ac 1.92% Impervious Runoff Depth=0.16"
Tc=5.0 min CN=37 Runoff=0.01 cfs 0.007 af

Subcatchment P-3: Runoff Area=0.590 ac 15.25% Impervious Runoff Depth=0.63"
Tc=5.0 min CN=48 Runoff=0.25 cfs 0.031 af

Subcatchment P-4: Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=0.03"
Tc=5.0 min CN=32 Runoff=0.00 cfs 0.003 af

Reach 1R: SWALE Avg. Flow Depth=0.02' Max Vel=0.07 fps Inflow=0.01 cfs 0.007 af
n=0.150 L=310.0' S=0.0065 '/' Capacity=5.81 cfs Outflow=0.01 cfs 0.007 af

Reach DP-1: DESIGN POINT 1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1P: Rain Garden Peak Elev=118.05' Storage=3,089 cf Inflow=1.39 cfs 0.129 af
Discarded=0.08 cfs 0.129 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.129 af

Pond 2P: Infiltration Trench Peak Elev=120.50' Storage=0.005 af Inflow=0.25 cfs 0.031 af
Discarded=0.01 cfs 0.013 af Primary=0.08 cfs 0.017 af Outflow=0.08 cfs 0.029 af

Pond 4P: Cultec Recharger 150 Peak Elev=115.59' Storage=73 cf Inflow=1.41 cfs 0.114 af
Discarded=0.01 cfs 0.011 af Primary=1.39 cfs 0.103 af Outflow=1.40 cfs 0.114 af

Total Runoff Area = 2.510 ac Runoff Volume = 0.155 af Average Runoff Depth = 0.74"
84.86% Pervious = 2.130 ac 15.14% Impervious = 0.380 ac

Summary for Subcatchment P-1:

[49] Hint: Tc<2dt may require smaller dt

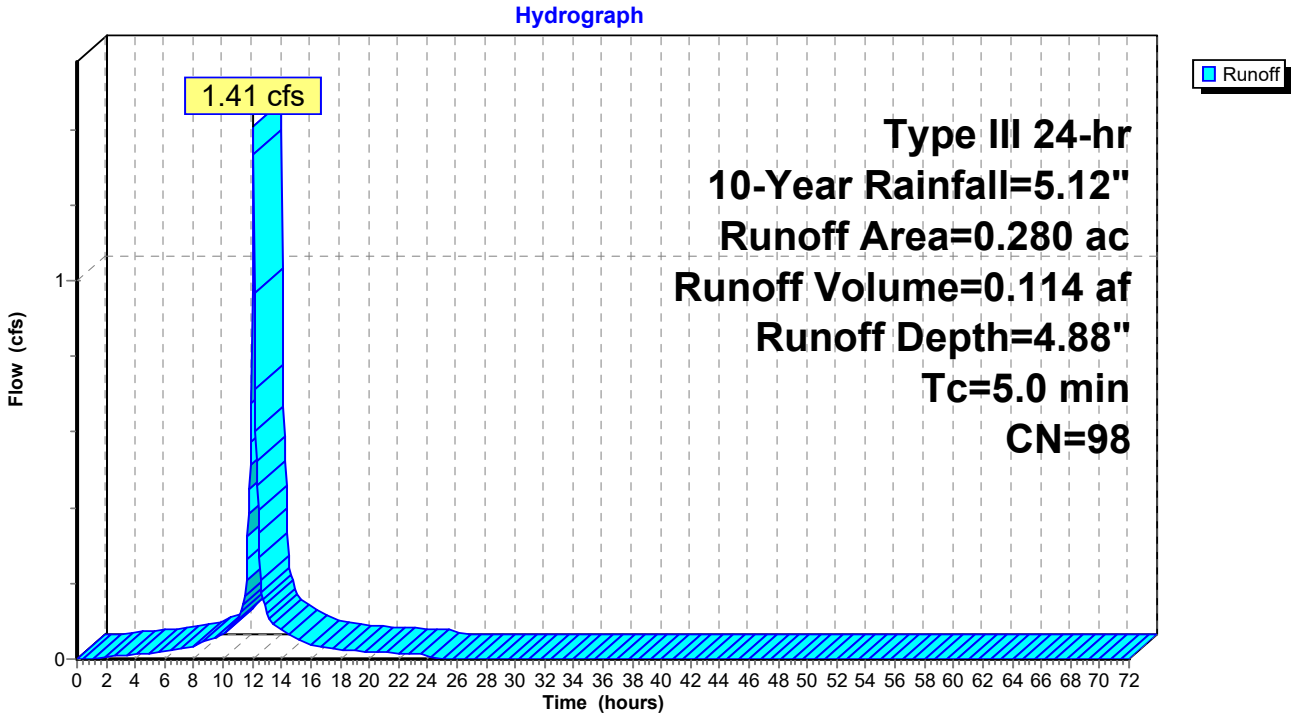
Runoff = 1.41 cfs @ 12.07 hrs, Volume= 0.114 af, Depth= 4.88"

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=5.12"

Area (ac)	CN	Description
0.140	98	Paved parking, HSG A
0.140	98	Roofs, HSG A
0.280	98	Weighted Average
0.280		100.00% Impervious Area

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

Subcatchment P-1:



Summary for Subcatchment P-2:

[49] Hint: Tc<2dt may require smaller dt

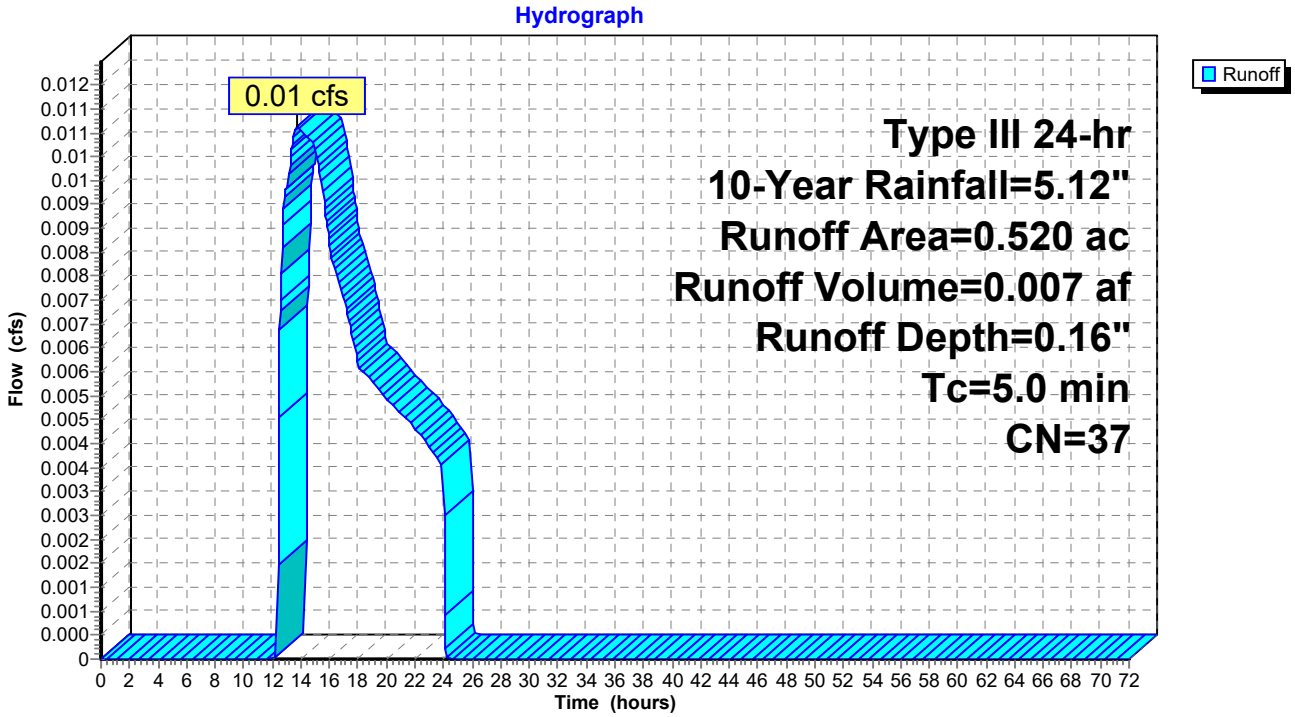
Runoff = 0.01 cfs @ 13.74 hrs, Volume= 0.007 af, Depth= 0.16"

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=5.12"

Area (ac)	CN	Description
0.340	39	>75% Grass cover, Good, HSG A
0.010	98	Roofs, HSG A
0.170	30	Woods, Good, HSG A
0.520	37	Weighted Average
0.510		98.08% Pervious Area
0.010		1.92% Impervious Area

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

Subcatchment P-2:



Summary for Subcatchment P-3:

[49] Hint: Tc<2dt may require smaller dt

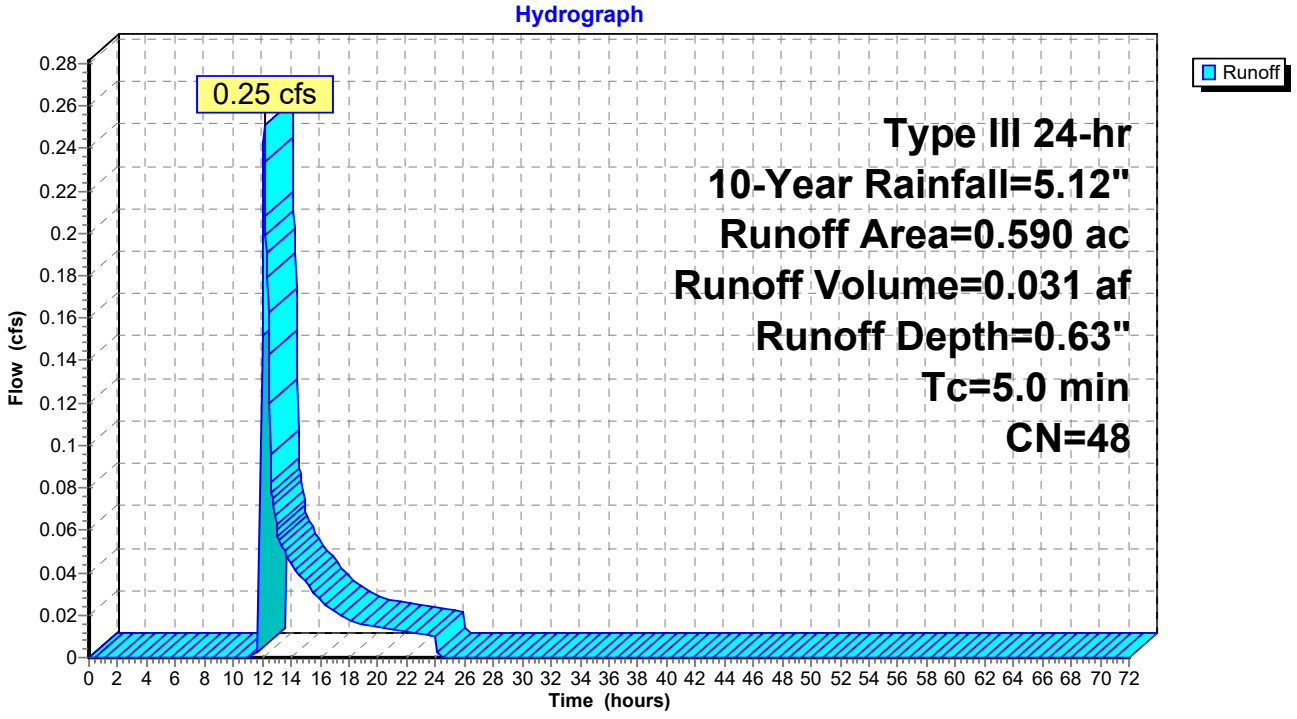
Runoff = 0.25 cfs @ 12.12 hrs, Volume= 0.031 af, Depth= 0.63"

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=5.12"

Area (ac)	CN	Description
0.090	98	Paved parking, HSG A
0.500	39	>75% Grass cover, Good, HSG A
0.590	48	Weighted Average
0.500		84.75% Pervious Area
0.090		15.25% Impervious Area

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

Subcatchment P-3:



Summary for Subcatchment P-4:

[49] Hint: Tc<2dt may require smaller dt

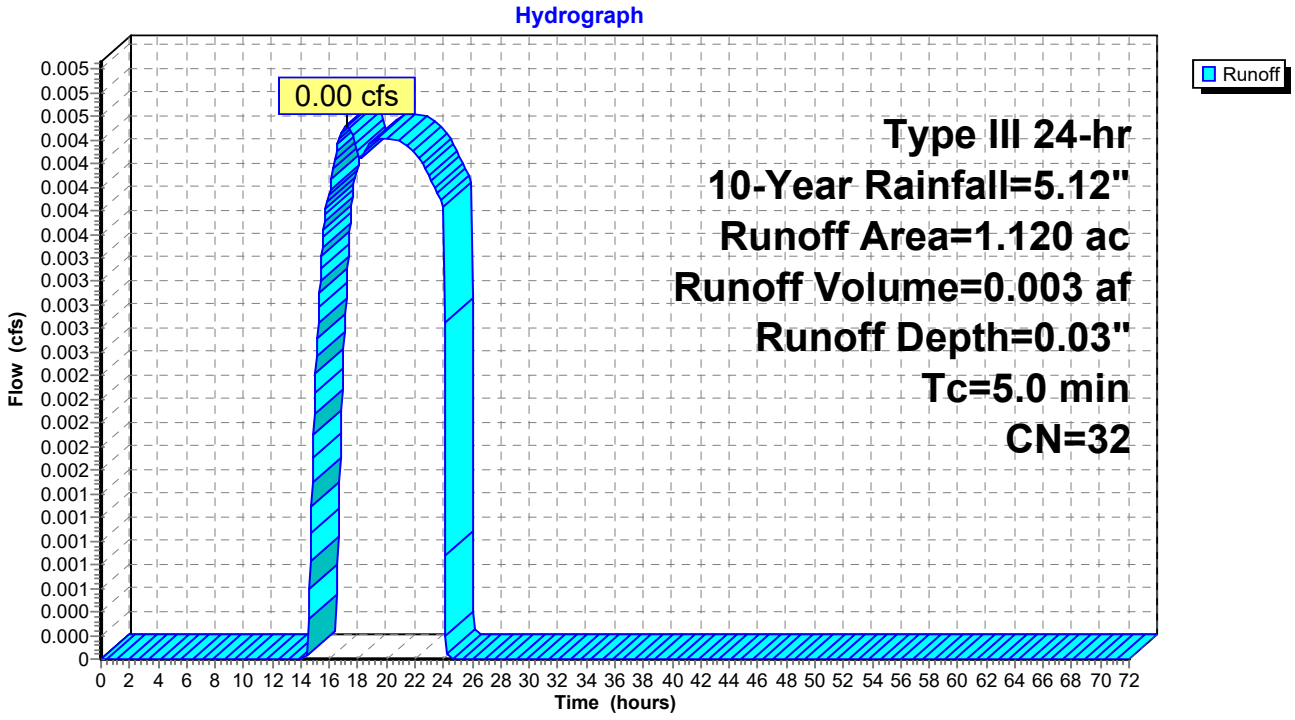
Runoff = 0.00 cfs @ 17.17 hrs, Volume= 0.003 af, Depth= 0.03"

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=5.12"

Area (ac)	CN	Description
0.300	39	>75% Grass cover, Good, HSG A
0.820	30	Woods, Good, HSG A
1.120	32	Weighted Average
1.120		100.00% Pervious Area

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

Subcatchment P-4:



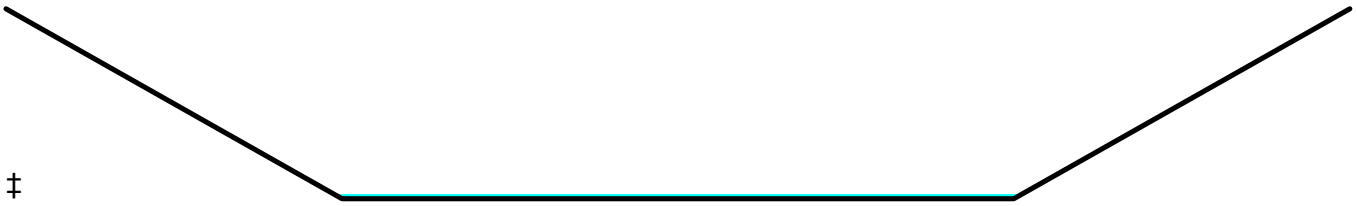
Summary for Reach 1R: SWALE

Inflow Area = 0.520 ac, 1.92% Impervious, Inflow Depth = 0.16" for 10-Year event
Inflow = 0.01 cfs @ 13.74 hrs, Volume= 0.007 af
Outflow = 0.01 cfs @ 16.67 hrs, Volume= 0.007 af, Atten= 10%, Lag= 175.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.07 fps, Min. Travel Time= 76.2 min
Avg. Velocity = 0.05 fps, Avg. Travel Time= 114.0 min

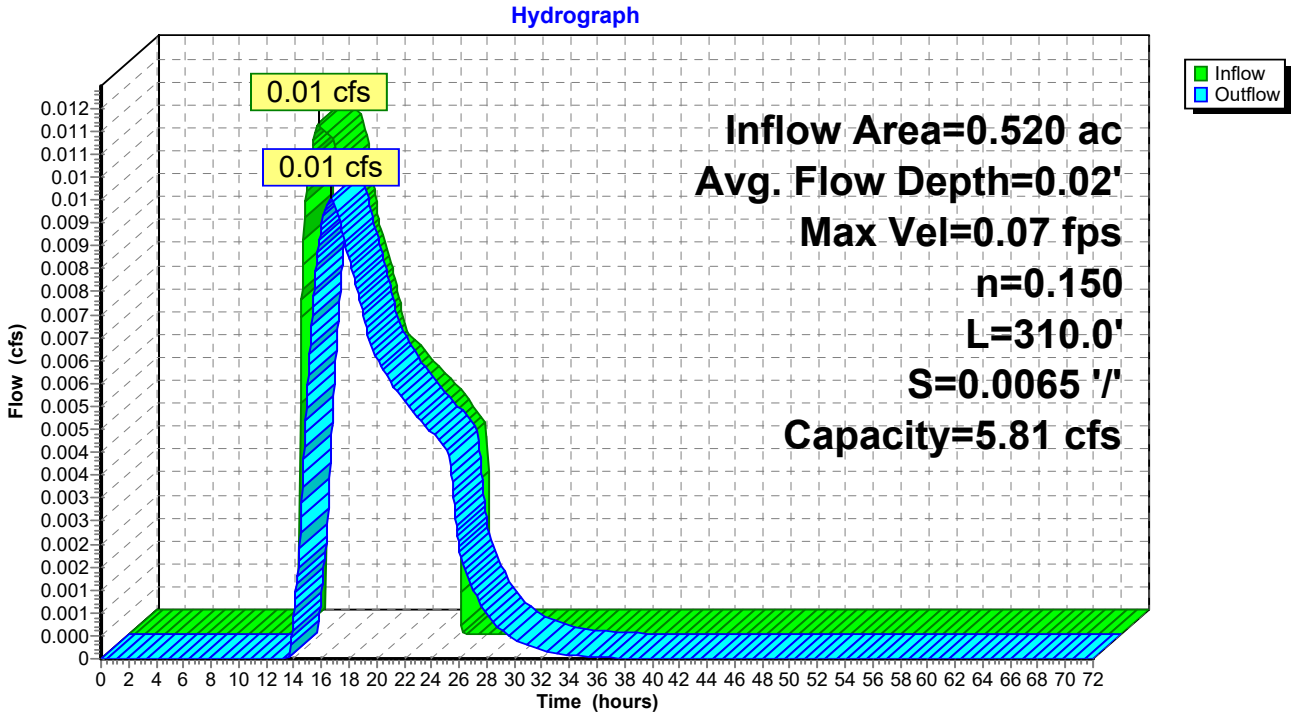
Peak Storage= 46 cf @ 15.40 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 5.81 cfs

6.00' x 1.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 310.0' Slope= 0.0065 '/'
Inlet Invert= 124.00', Outlet Invert= 122.00'



‡

Reach 1R: SWALE



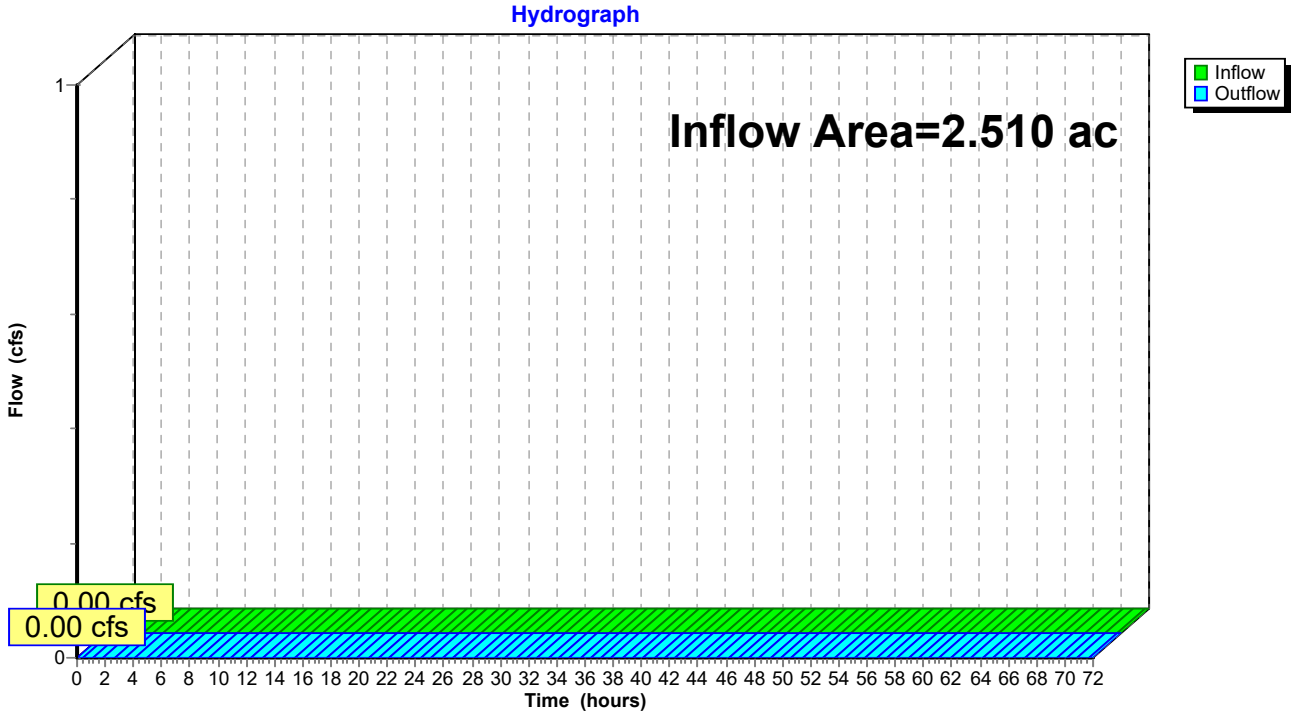
Summary for Reach DP-1: DESIGN POINT 1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.510 ac, 15.14% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 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 DP-1: DESIGN POINT 1



Summary for Pond 1P: Rain Garden

Used more restrictive B layer

[81] Warning: Exceeded Pond 4P by 2.99' @ 15.65 hrs

Inflow Area = 2.510 ac, 15.14% Impervious, Inflow Depth = 0.62" for 10-Year event
Inflow = 1.39 cfs @ 12.07 hrs, Volume= 0.129 af
Outflow = 0.08 cfs @ 15.29 hrs, Volume= 0.129 af, Atten= 94%, Lag= 193.4 min
Discarded = 0.08 cfs @ 15.29 hrs, Volume= 0.129 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 118.05' @ 15.29 hrs Surf.Area= 1,453 sf Storage= 3,089 cf

Plug-Flow detention time= 512.6 min calculated for 0.129 af (100% of inflow)
Center-of-Mass det. time= 512.8 min (1,319.0 - 806.2)

Volume	Invert	Avail.Storage	Storage Description
#1	113.00'	22,053 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

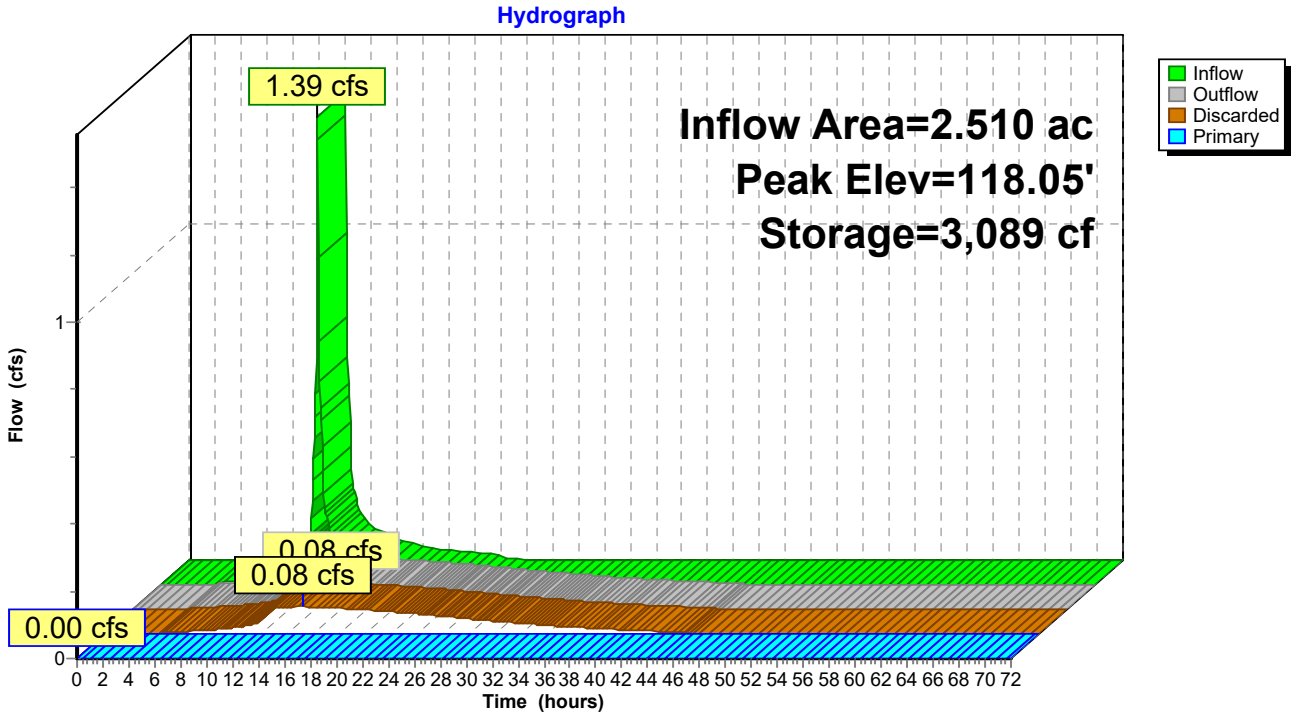
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
113.00	60	0	0
114.00	200	130	130
115.00	404	302	432
116.00	672	538	970
117.00	1,007	840	1,810
118.00	1,415	1,211	3,021
119.00	2,202	1,809	4,829
120.00	3,427	2,815	7,644
121.00	4,655	4,041	11,685
122.00	5,007	4,831	16,516
123.00	6,068	5,538	22,053

Device	Routing	Invert	Outlet Devices
#1	Primary	122.00'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	113.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.08 cfs @ 15.29 hrs HW=118.05' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=113.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: Rain Garden



Summary for Pond 2P: Infiltration Trench

Inflow Area = 0.590 ac, 15.25% Impervious, Inflow Depth = 0.63" for 10-Year event
Inflow = 0.25 cfs @ 12.12 hrs, Volume= 0.031 af
Outflow = 0.08 cfs @ 12.45 hrs, Volume= 0.029 af, Atten= 66%, Lag= 19.5 min
Discarded = 0.01 cfs @ 25.59 hrs, Volume= 0.013 af
Primary = 0.08 cfs @ 12.45 hrs, Volume= 0.017 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 120.50' @ 12.45 hrs Surf.Area= 0.003 ac Storage= 0.005 af

Plug-Flow detention time= 192.5 min calculated for 0.029 af (94% of inflow)
Center-of-Mass det. time= 161.3 min (1,082.9 - 921.6)

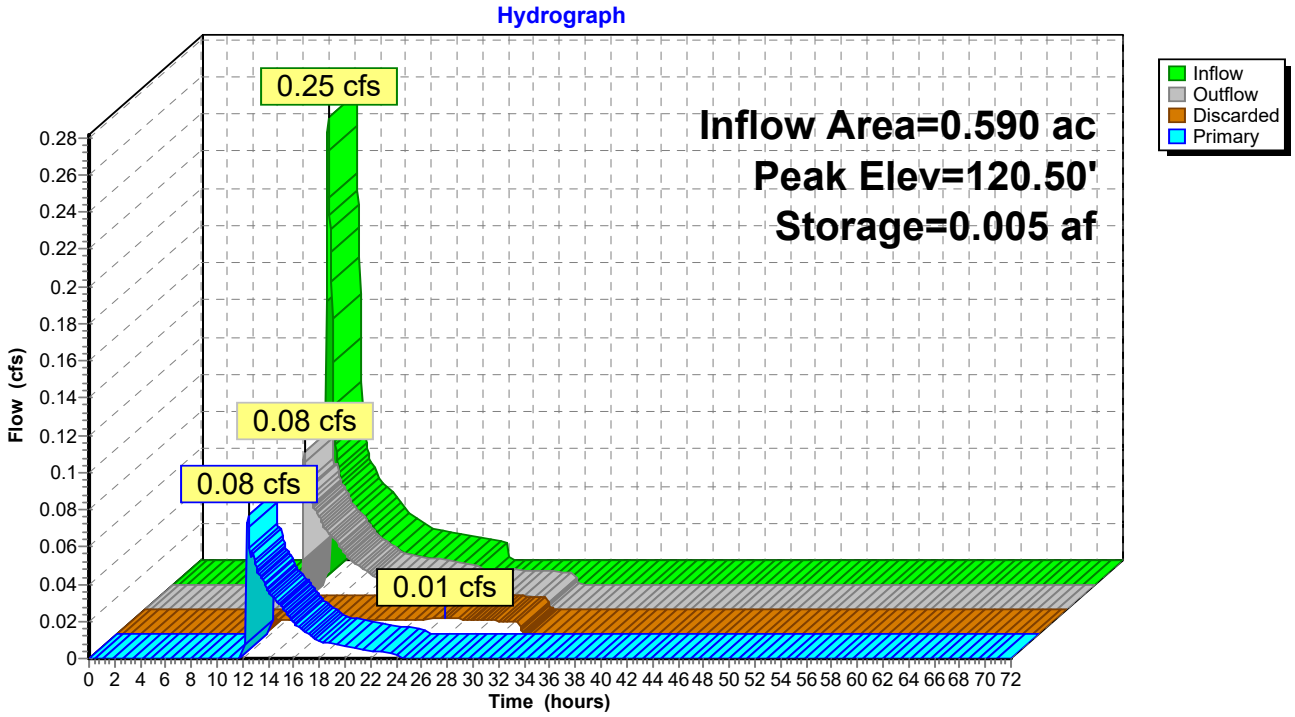
Volume	Invert	Avail.Storage	Storage Description
#1	119.00'	0.008 af	**36.0" W x 36.0" H Box Pipe Storage/Trenches** x 2 L= 20.0'
#2	119.00'	0.001 af	**18.0" Round Pipe Storage** L= 18.0' S= 0.0500 '/'
		0.009 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	120.50'	**72.0" x 120.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Discarded	119.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 25.59 hrs HW=120.20' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.02 cfs @ 12.45 hrs HW=120.50' (Free Discharge)
↑**1=Orifice/Grate** (Weir Controls 0.02 cfs @ 0.15 fps)

Pond 2P: Infiltration Trench



Summary for Pond 4P: Cultec Recharger 150

Inflow Area = 0.280 ac,100.00% Impervious, Inflow Depth = 4.88" for 10-Year event
Inflow = 1.41 cfs @ 12.07 hrs, Volume= 0.114 af
Outflow = 1.40 cfs @ 12.07 hrs, Volume= 0.114 af, Atten= 1%, Lag= 0.1 min
Discarded = 0.01 cfs @ 12.07 hrs, Volume= 0.011 af
Primary = 1.39 cfs @ 12.07 hrs, Volume= 0.103 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 115.59' @ 12.07 hrs Surf.Area= 62 sf Storage= 73 cf

Plug-Flow detention time= 13.7 min calculated for 0.114 af (100% of inflow)
Center-of-Mass det. time= 14.0 min (760.7 - 746.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.00'	51 cf	**4.75'W x 13.00'L x 2.54'H Field A** 157 cf Overall - 29 cf Embedded = 128 cf x 40.0% Voids
#2A	114.50'	29 cf	**Cultec R-150XLHD** Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	114.00'	18 cf	**12.0" Round Pipe Storage**-Impervious L= 23.0' S= 0.0100 '/'
		98 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	114.50'	**12.0" Round Culvert** L= 69.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 114.50' / 113.00' S= 0.0217 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Discarded	114.00'	**2.410 in/hr Exfiltration over Wetted area**
#3	Device 1	115.00'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 12.07 hrs HW=115.58' (Free Discharge)
↑└**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.34 cfs @ 12.07 hrs HW=115.58' (Free Discharge)
↑└**1=Culvert** (Passes 1.34 cfs of 2.87 cfs potential flow)
↑└**3=Broad-Crested Rectangular Weir** (Weir Controls 1.34 cfs @ 2.33 fps)

Pond 4P: Cultec Recharger 150 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 1 rows

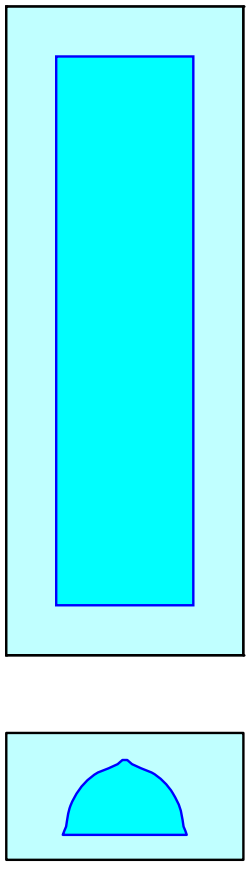
1 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 11.00' Row Length +12.0" End Stone x 2 = 13.00' Base Length
1 Rows x 33.0" Wide + 12.0" Side Stone x 2 = 4.75' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

1 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 1 Rows = 29.1 cf Chamber Storage

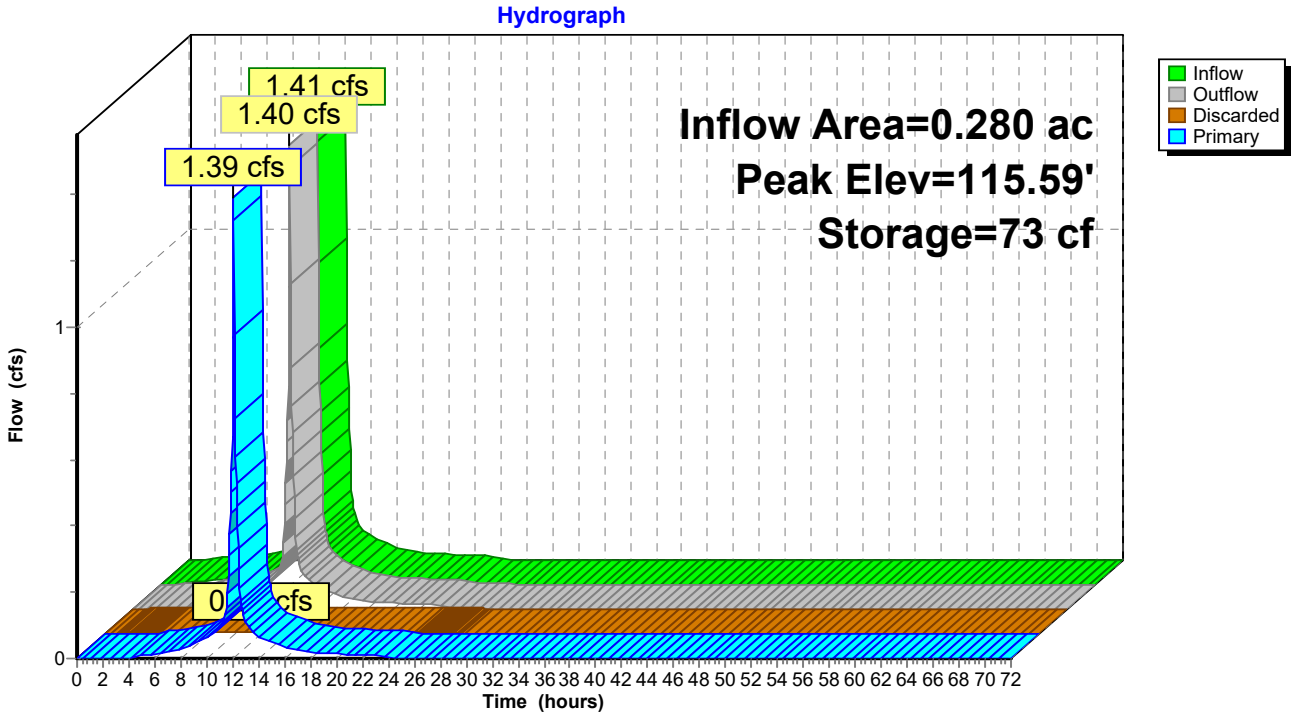
156.9 cf Field - 29.1 cf Chambers = 127.8 cf Stone x 40.0% Voids = 51.1 cf Stone Storage

Chamber Storage + Stone Storage = 80.3 cf = 0.002 af
Overall Storage Efficiency = 51.1%
Overall System Size = 13.00' x 4.75' x 2.54'

1 Chambers
5.8 cy Field
4.7 cy Stone



Pond 4P: Cultec Recharger 150



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 P-1: Runoff Area=0.280 ac 100.00% Impervious Runoff Depth=6.05"
Tc=5.0 min CN=98 Runoff=1.74 cfs 0.141 af

Subcatchment P-2: Runoff Area=0.520 ac 1.92% Impervious Runoff Depth=0.42"
Tc=5.0 min CN=37 Runoff=0.08 cfs 0.018 af

Subcatchment P-3: Runoff Area=0.590 ac 15.25% Impervious Runoff Depth=1.14"
Tc=5.0 min CN=48 Runoff=0.61 cfs 0.056 af

Subcatchment P-4: Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=0.18"
Tc=5.0 min CN=32 Runoff=0.03 cfs 0.017 af

Reach 1R: SWALE Avg. Flow Depth=0.05' Max Vel=0.11 fps Inflow=0.08 cfs 0.018 af
n=0.150 L=310.0' S=0.0065 '/' Capacity=5.81 cfs Outflow=0.03 cfs 0.018 af

Reach DP-1: DESIGN POINT 1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1P: Rain Garden Peak Elev=119.04' Storage=4,925 cf Inflow=2.13 cfs 0.207 af
Discarded=0.13 cfs 0.207 af Primary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.207 af

Pond 2P: Infiltration Trench Peak Elev=120.51' Storage=0.005 af Inflow=0.61 cfs 0.056 af
Discarded=0.01 cfs 0.013 af Primary=0.54 cfs 0.042 af Outflow=0.55 cfs 0.055 af

Pond 4P: Cultec Recharger 150 Peak Elev=115.67' Storage=75 cf Inflow=1.74 cfs 0.141 af
Discarded=0.01 cfs 0.012 af Primary=1.72 cfs 0.130 af Outflow=1.73 cfs 0.141 af

Total Runoff Area = 2.510 ac Runoff Volume = 0.232 af Average Runoff Depth = 1.11"
84.86% Pervious = 2.130 ac 15.14% Impervious = 0.380 ac

Summary for Subcatchment P-1:

[49] Hint: Tc<2dt may require smaller dt

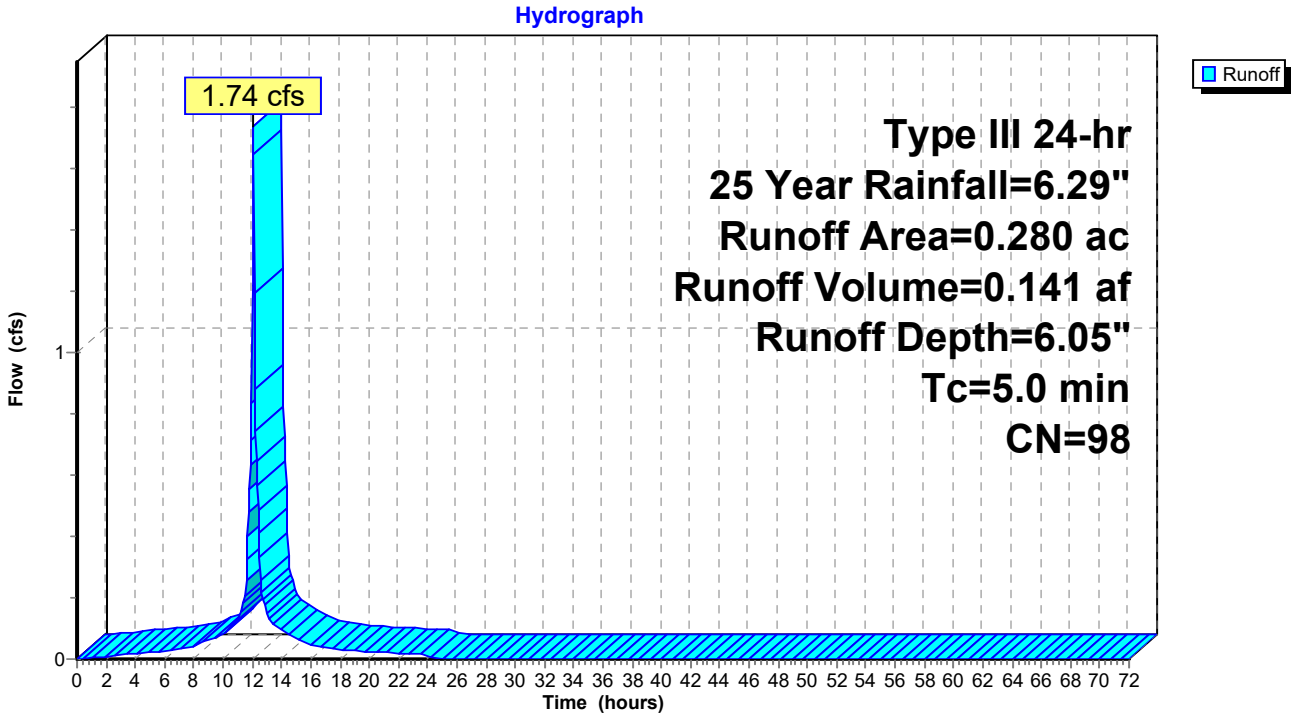
Runoff = 1.74 cfs @ 12.07 hrs, Volume= 0.141 af, Depth= 6.05"

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=6.29"

Area (ac)	CN	Description
0.140	98	Paved parking, HSG A
0.140	98	Roofs, HSG A
0.280	98	Weighted Average
0.280		100.00% Impervious Area

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

Subcatchment P-1:



Summary for Subcatchment P-2:

[49] Hint: Tc<2dt may require smaller dt

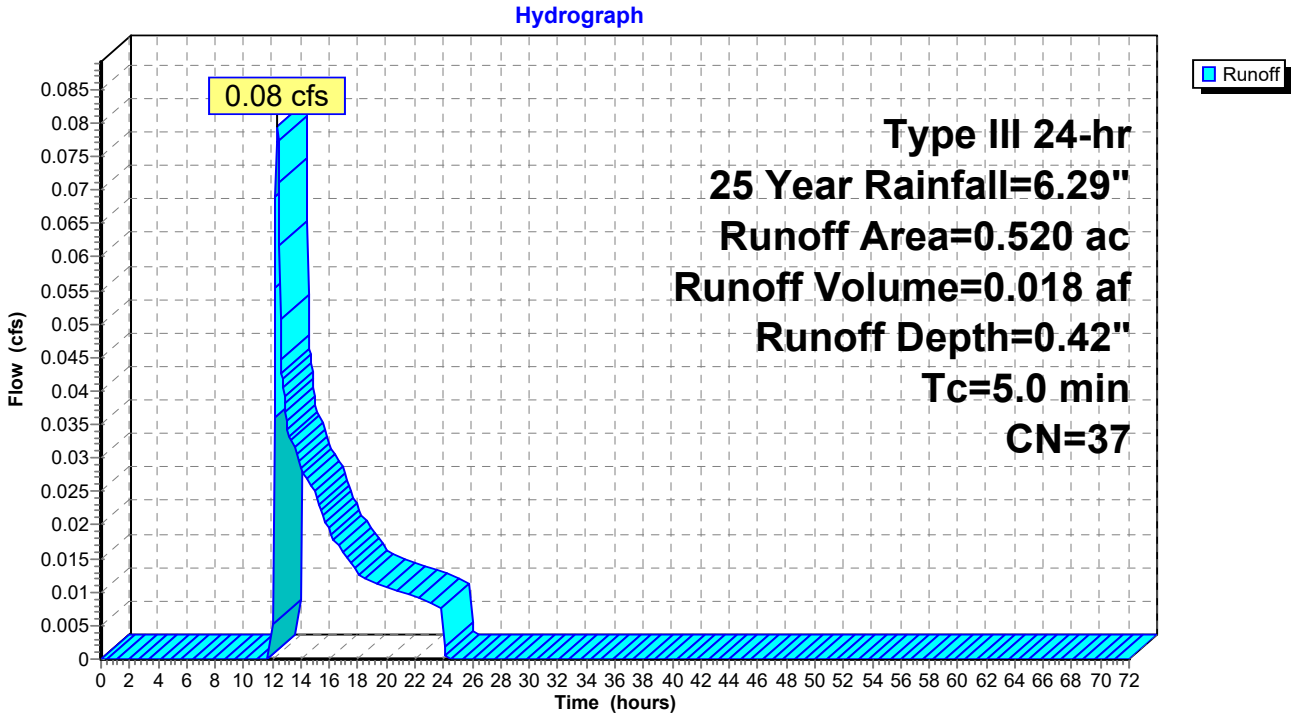
Runoff = 0.08 cfs @ 12.35 hrs, Volume= 0.018 af, Depth= 0.42"

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=6.29"

Area (ac)	CN	Description
0.340	39	>75% Grass cover, Good, HSG A
0.010	98	Roofs, HSG A
0.170	30	Woods, Good, HSG A
0.520	37	Weighted Average
0.510		98.08% Pervious Area
0.010		1.92% Impervious Area

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

Subcatchment P-2:



Summary for Subcatchment P-3:

[49] Hint: Tc<2dt may require smaller dt

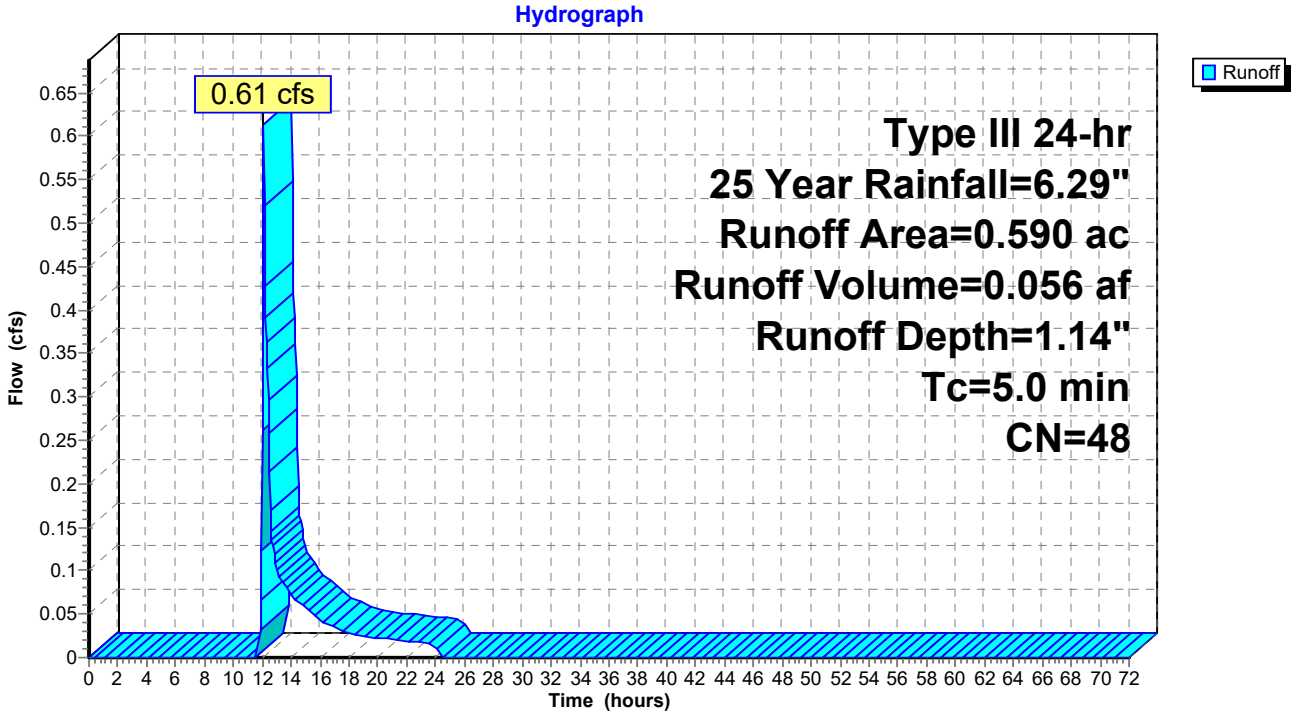
Runoff = 0.61 cfs @ 12.10 hrs, Volume= 0.056 af, Depth= 1.14"

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=6.29"

Area (ac)	CN	Description
0.090	98	Paved parking, HSG A
0.500	39	>75% Grass cover, Good, HSG A
0.590	48	Weighted Average
0.500		84.75% Pervious Area
0.090		15.25% Impervious Area

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

Subcatchment P-3:



Summary for Subcatchment P-4:

[49] Hint: Tc<2dt may require smaller dt

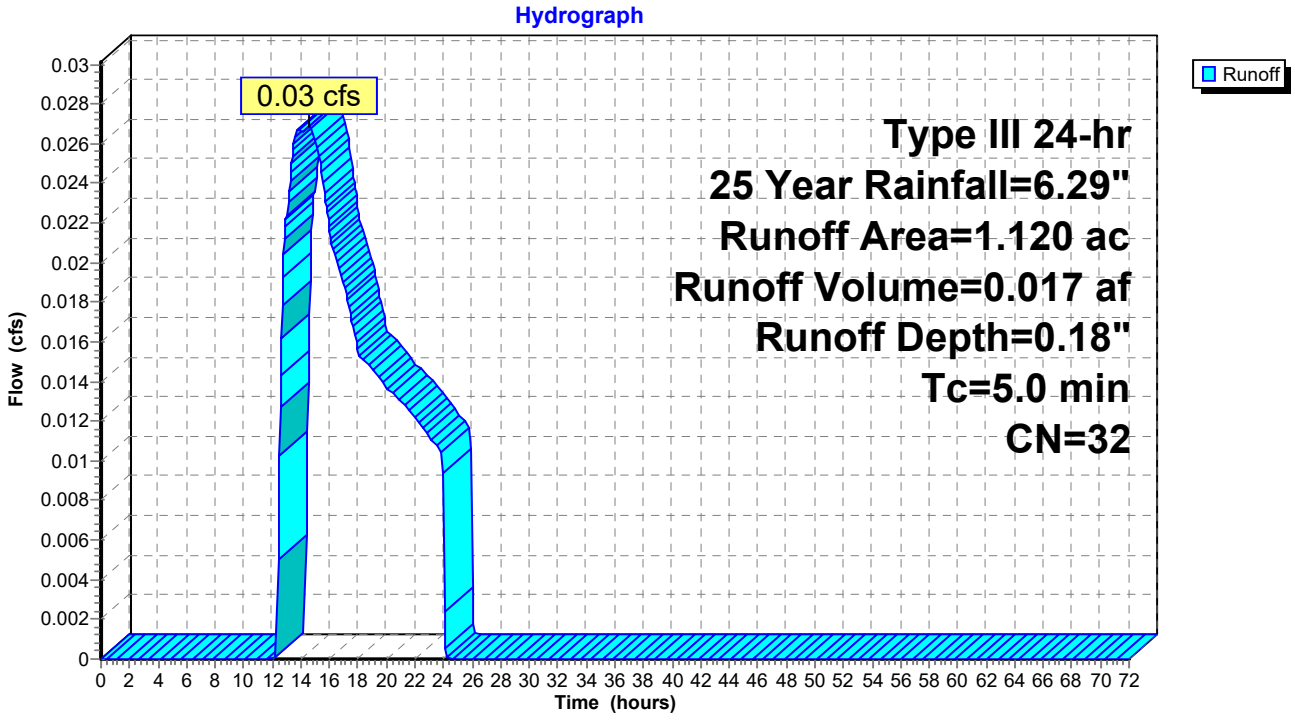
Runoff = 0.03 cfs @ 14.53 hrs, Volume= 0.017 af, Depth= 0.18"

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=6.29"

Area (ac)	CN	Description
0.300	39	>75% Grass cover, Good, HSG A
0.820	30	Woods, Good, HSG A
1.120	32	Weighted Average
1.120		100.00% Pervious Area

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

Subcatchment P-4:



Summary for Reach 1R: SWALE

Inflow Area = 0.520 ac, 1.92% Impervious, Inflow Depth = 0.42" for 25 Year event
Inflow = 0.08 cfs @ 12.35 hrs, Volume= 0.018 af
Outflow = 0.03 cfs @ 13.83 hrs, Volume= 0.018 af, Atten= 57%, Lag= 88.8 min

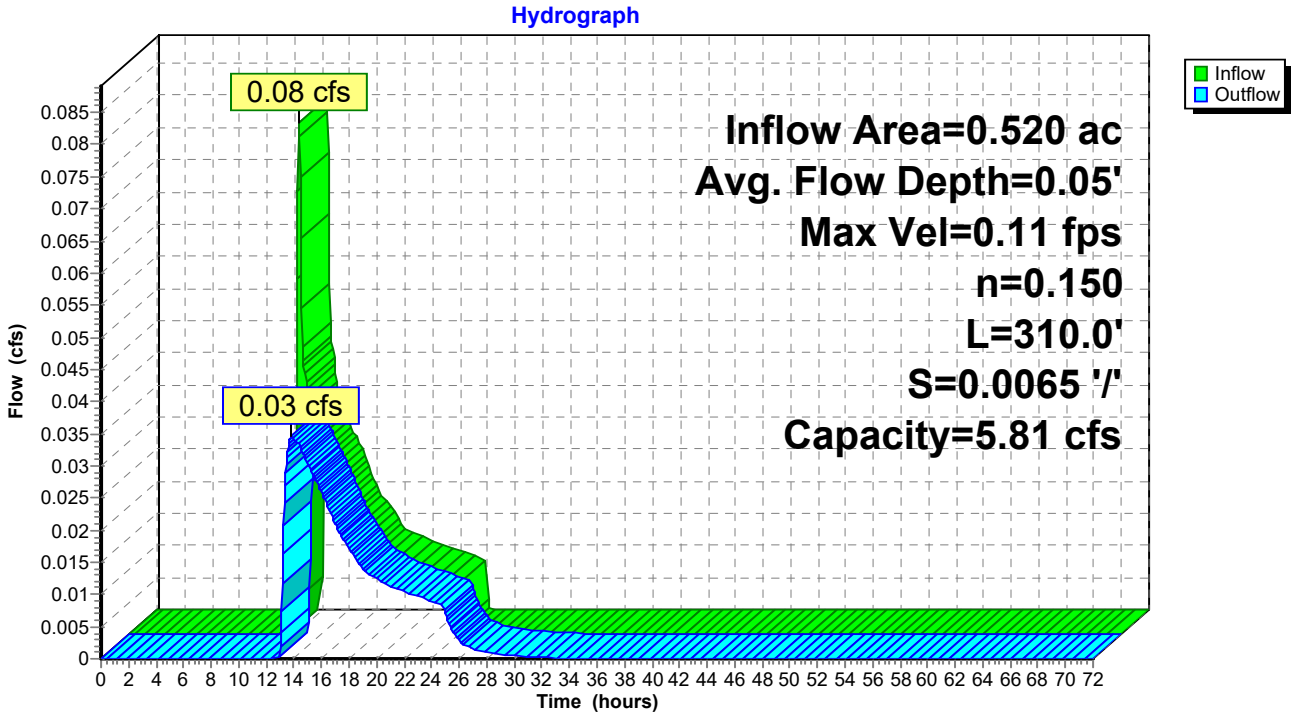
Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.11 fps, Min. Travel Time= 47.5 min
Avg. Velocity = 0.06 fps, Avg. Travel Time= 92.1 min

Peak Storage= 99 cf @ 13.04 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 5.81 cfs

6.00' x 1.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 310.0' Slope= 0.0065 '/'
Inlet Invert= 124.00', Outlet Invert= 122.00'

‡

Reach 1R: SWALE



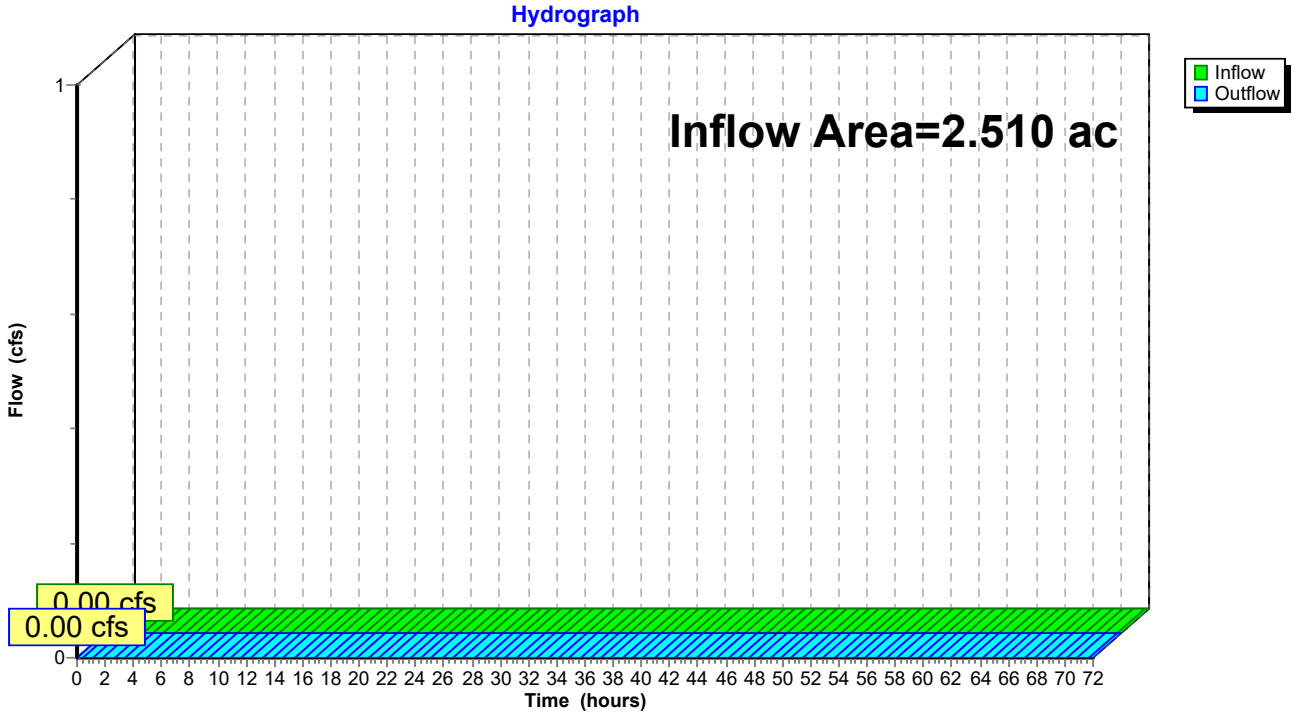
Summary for Reach DP-1: DESIGN POINT 1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.510 ac, 15.14% Impervious, Inflow Depth = 0.00" for 25 Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 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 DP-1: DESIGN POINT 1



Summary for Pond 1P: Rain Garden

Used more restrictive B layer

[81] Warning: Exceeded Pond 4P by 3.98' @ 16.15 hrs

Inflow Area = 2.510 ac, 15.14% Impervious, Inflow Depth = 0.99" for 25 Year event
Inflow = 2.13 cfs @ 12.10 hrs, Volume= 0.207 af
Outflow = 0.13 cfs @ 15.97 hrs, Volume= 0.207 af, Atten= 94%, Lag= 232.3 min
Discarded = 0.13 cfs @ 15.97 hrs, Volume= 0.207 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 119.04' @ 15.97 hrs Surf.Area= 2,255 sf Storage= 4,925 cf

Plug-Flow detention time= 564.7 min calculated for 0.207 af (100% of inflow)
Center-of-Mass det. time= 565.2 min (1,393.2 - 828.0)

Volume	Invert	Avail.Storage	Storage Description
#1	113.00'	22,053 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

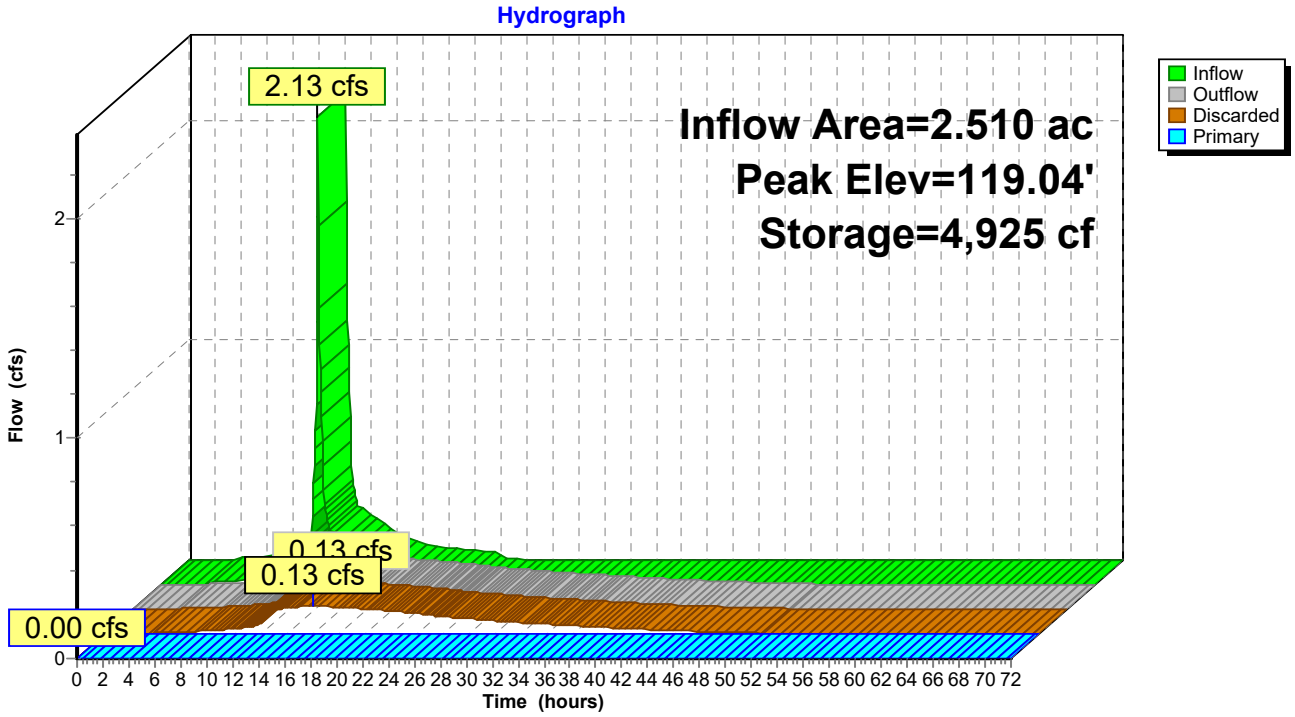
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
113.00	60	0	0
114.00	200	130	130
115.00	404	302	432
116.00	672	538	970
117.00	1,007	840	1,810
118.00	1,415	1,211	3,021
119.00	2,202	1,809	4,829
120.00	3,427	2,815	7,644
121.00	4,655	4,041	11,685
122.00	5,007	4,831	16,516
123.00	6,068	5,538	22,053

Device	Routing	Invert	Outlet Devices
#1	Primary	122.00'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	113.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.13 cfs @ 15.97 hrs HW=119.04' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=113.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Rain Garden



Summary for Pond 2P: Infiltration Trench

Inflow Area = 0.590 ac, 15.25% Impervious, Inflow Depth = 1.14" for 25 Year event
Inflow = 0.61 cfs @ 12.10 hrs, Volume= 0.056 af
Outflow = 0.55 cfs @ 12.12 hrs, Volume= 0.055 af, Atten= 11%, Lag= 1.1 min
Discarded = 0.01 cfs @ 25.60 hrs, Volume= 0.013 af
Primary = 0.54 cfs @ 12.12 hrs, Volume= 0.042 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 120.51' @ 12.10 hrs Surf.Area= 0.003 ac Storage= 0.005 af

Plug-Flow detention time= 89.5 min calculated for 0.055 af (98% of inflow)
Center-of-Mass det. time= 82.1 min (978.9 - 896.8)

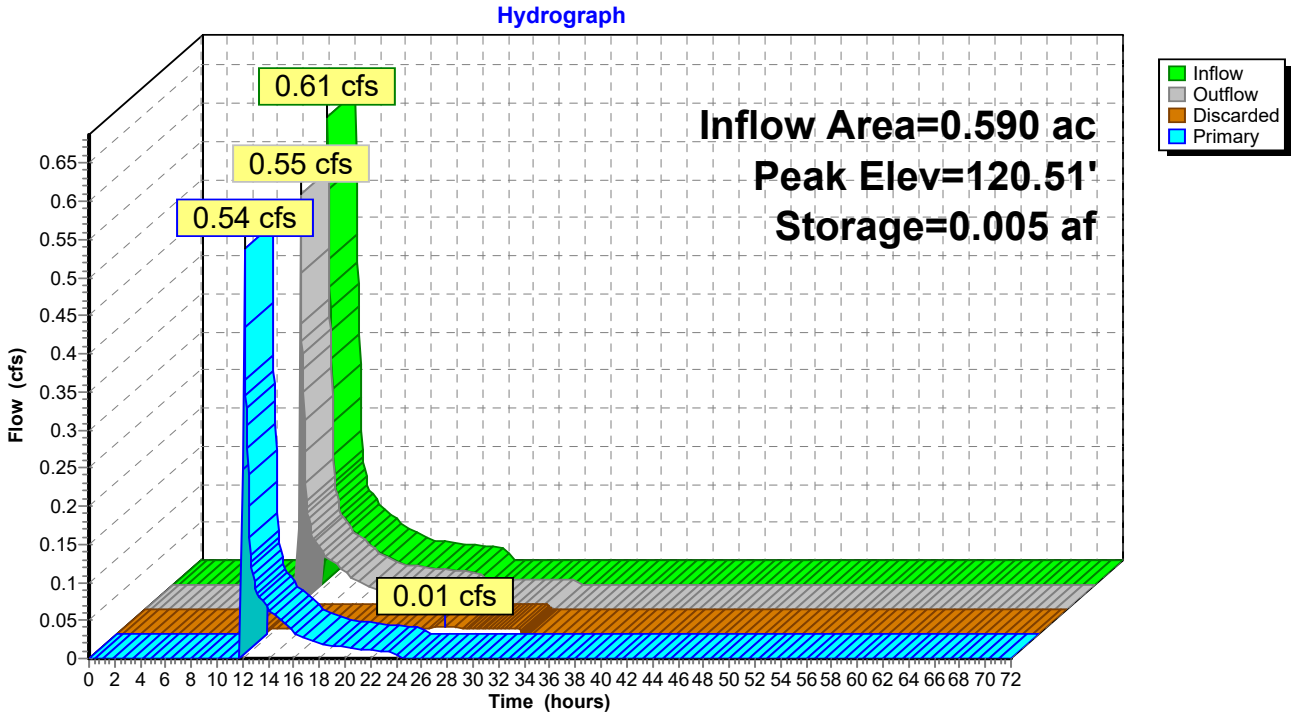
Volume	Invert	Avail.Storage	Storage Description
#1	119.00'	0.008 af	**36.0" W x 36.0" H Box Pipe Storage/Trenches** x 2 L= 20.0'
#2	119.00'	0.001 af	**18.0" Round Pipe Storage** L= 18.0' S= 0.0500 '/'
		0.009 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	120.50'	**72.0" x 120.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Discarded	119.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 25.60 hrs HW=120.20' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.31 cfs @ 12.12 hrs HW=120.51' (Free Discharge)
↑**1=Orifice/Grate** (Weir Controls 0.31 cfs @ 0.37 fps)

Pond 2P: Infiltration Trench



Summary for Pond 4P: Cultec Recharger 150

Inflow Area = 0.280 ac,100.00% Impervious, Inflow Depth = 6.05" for 25 Year event
Inflow = 1.74 cfs @ 12.07 hrs, Volume= 0.141 af
Outflow = 1.73 cfs @ 12.07 hrs, Volume= 0.141 af, Atten= 1%, Lag= 0.0 min
Discarded = 0.01 cfs @ 12.07 hrs, Volume= 0.012 af
Primary = 1.72 cfs @ 12.07 hrs, Volume= 0.130 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 115.67' @ 12.07 hrs Surf.Area= 62 sf Storage= 75 cf

Plug-Flow detention time= 11.3 min calculated for 0.141 af (100% of inflow)
Center-of-Mass det. time= 11.7 min (755.2 - 743.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.00'	51 cf	**4.75'W x 13.00'L x 2.54'H Field A** 157 cf Overall - 29 cf Embedded = 128 cf x 40.0% Voids
#2A	114.50'	29 cf	**Cultec R-150XLHD** Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	114.00'	18 cf	**12.0" Round Pipe Storage**-Impervious L= 23.0' S= 0.0100 '/'
		98 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	114.50'	**12.0" Round Culvert** L= 69.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 114.50' / 113.00' S= 0.0217 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Discarded	114.00'	**2.410 in/hr Exfiltration over Wetted area**
#3	Device 1	115.00'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 12.07 hrs HW=115.65' (Free Discharge)
↑└**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.66 cfs @ 12.07 hrs HW=115.65' (Free Discharge)
↑└**1=Culvert** (Passes 1.66 cfs of 3.06 cfs potential flow)
↑└**3=Broad-Crested Rectangular Weir** (Weir Controls 1.66 cfs @ 2.54 fps)

Pond 4P: Cultec Recharger 150 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 1 rows

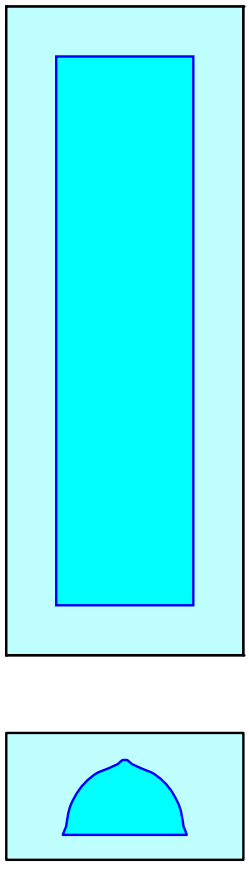
1 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 11.00' Row Length +12.0" End Stone x 2 = 13.00' Base Length
1 Rows x 33.0" Wide + 12.0" Side Stone x 2 = 4.75' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

1 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 1 Rows = 29.1 cf Chamber Storage

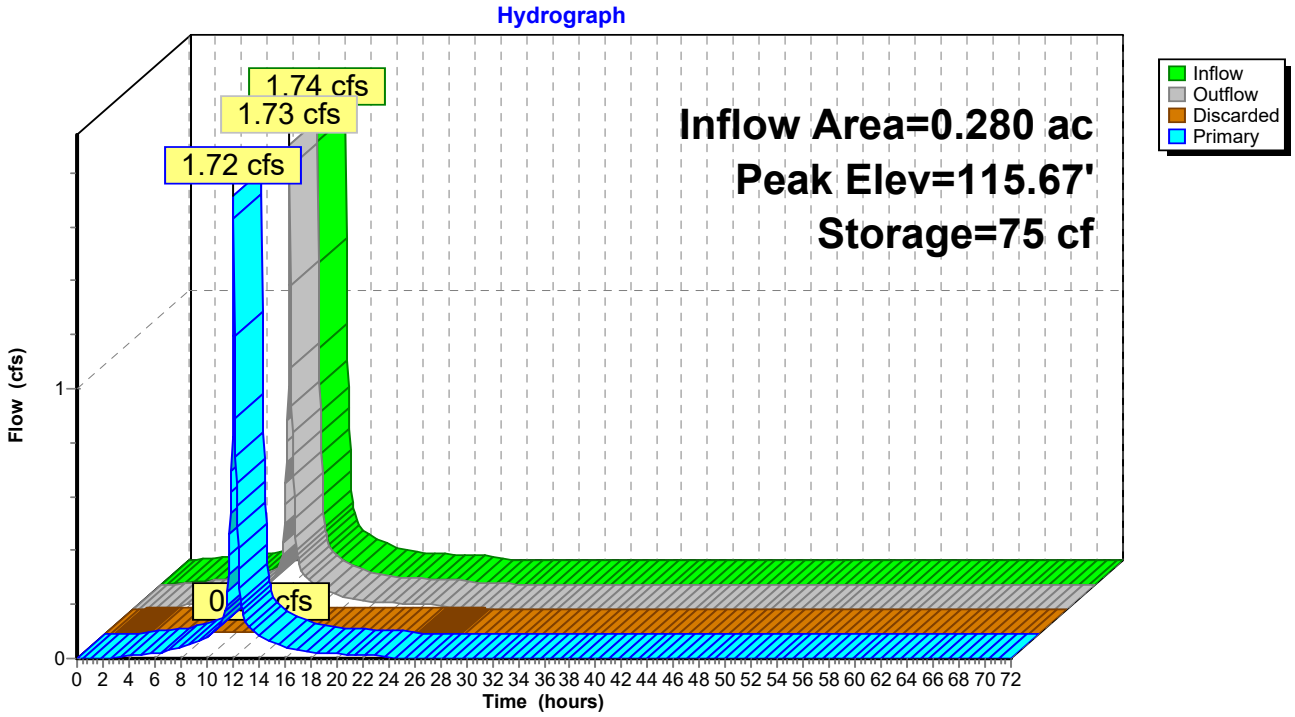
156.9 cf Field - 29.1 cf Chambers = 127.8 cf Stone x 40.0% Voids = 51.1 cf Stone Storage

Chamber Storage + Stone Storage = 80.3 cf = 0.002 af
Overall Storage Efficiency = 51.1%
Overall System Size = 13.00' x 4.75' x 2.54'

1 Chambers
5.8 cy Field
4.7 cy Stone



Pond 4P: Cultec Recharger 150



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 P-1: Runoff Area=0.280 ac 100.00% Impervious Runoff Depth=6.91"
Tc=5.0 min CN=98 Runoff=1.98 cfs 0.161 af

Subcatchment P-2: Runoff Area=0.520 ac 1.92% Impervious Runoff Depth=0.68"
Tc=5.0 min CN=37 Runoff=0.16 cfs 0.029 af

Subcatchment P-3: Runoff Area=0.590 ac 15.25% Impervious Runoff Depth=1.57"
Tc=5.0 min CN=48 Runoff=0.93 cfs 0.077 af

Subcatchment P-4: Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=0.35"
Tc=5.0 min CN=32 Runoff=0.10 cfs 0.033 af

Reach 1R: SWALE Avg. Flow Depth=0.09' Max Vel=0.15 fps Inflow=0.16 cfs 0.029 af
n=0.150 L=310.0' S=0.0065 '/' Capacity=5.81 cfs Outflow=0.09 cfs 0.029 af

Reach DP-1: DESIGN POINT 1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1P: Rain Garden Peak Elev=119.75' Storage=6,837 cf Inflow=3.37 cfs 0.283 af
Discarded=0.17 cfs 0.283 af Primary=0.00 cfs 0.000 af Outflow=0.17 cfs 0.283 af

Pond 2P: Infiltration Trench Peak Elev=120.53' Storage=0.005 af Inflow=0.93 cfs 0.077 af
Discarded=0.01 cfs 0.013 af Primary=1.42 cfs 0.071 af Outflow=1.43 cfs 0.084 af

Pond 4P: Cultec Recharger 150 Peak Elev=115.72' Storage=77 cf Inflow=1.98 cfs 0.161 af
Discarded=0.01 cfs 0.012 af Primary=1.96 cfs 0.150 af Outflow=1.96 cfs 0.161 af

Total Runoff Area = 2.510 ac Runoff Volume = 0.300 af Average Runoff Depth = 1.44"
84.86% Pervious = 2.130 ac 15.14% Impervious = 0.380 ac

Summary for Subcatchment P-1:

[49] Hint: Tc<2dt may require smaller dt

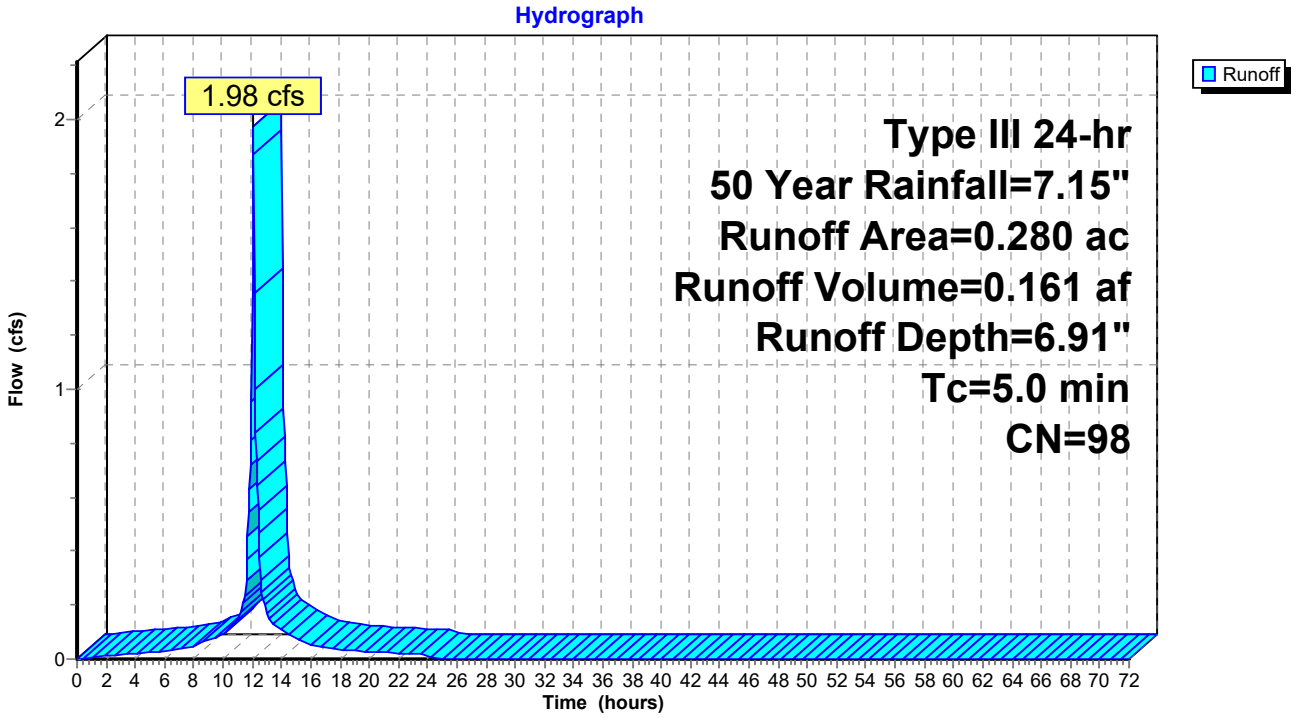
Runoff = 1.98 cfs @ 12.07 hrs, Volume= 0.161 af, Depth= 6.91"

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 50 Year Rainfall=7.15"

Area (ac)	CN	Description
0.140	98	Paved parking, HSG A
0.140	98	Roofs, HSG A
0.280	98	Weighted Average
0.280		100.00% Impervious Area

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

Subcatchment P-1:



Summary for Subcatchment P-2:

[49] Hint: Tc<2dt may require smaller dt

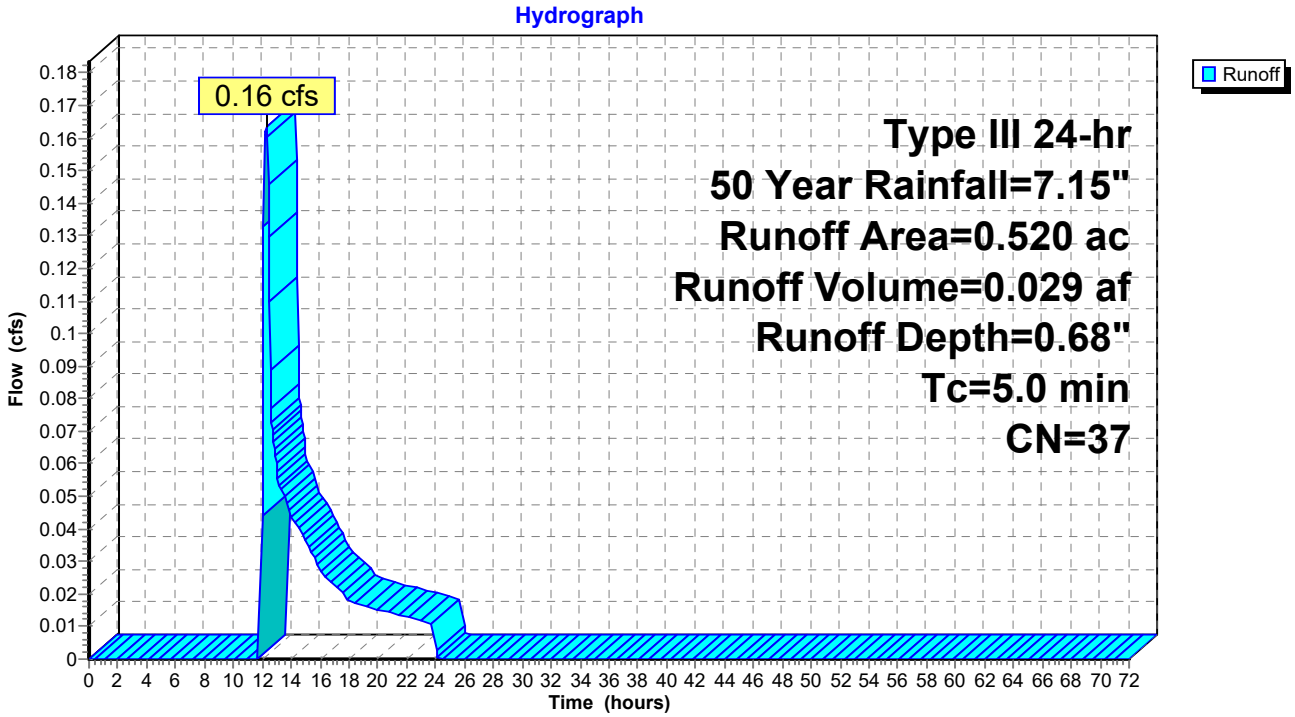
Runoff = 0.16 cfs @ 12.27 hrs, Volume= 0.029 af, Depth= 0.68"

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 50 Year Rainfall=7.15"

Area (ac)	CN	Description
0.340	39	>75% Grass cover, Good, HSG A
0.010	98	Roofs, HSG A
0.170	30	Woods, Good, HSG A
0.520	37	Weighted Average
0.510		98.08% Pervious Area
0.010		1.92% Impervious Area

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

Subcatchment P-2:



Summary for Subcatchment P-3:

[49] Hint: Tc<2dt may require smaller dt

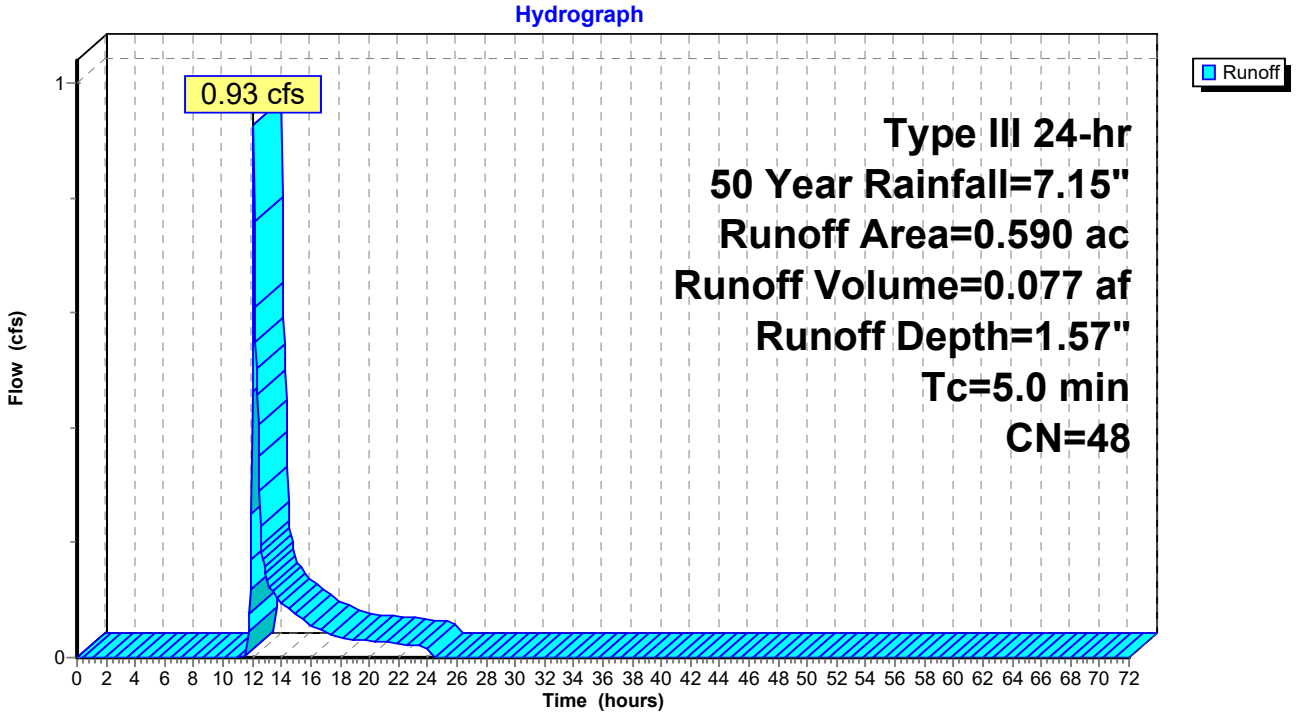
Runoff = 0.93 cfs @ 12.10 hrs, Volume= 0.077 af, Depth= 1.57"

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 50 Year Rainfall=7.15"

Area (ac)	CN	Description
0.090	98	Paved parking, HSG A
0.500	39	>75% Grass cover, Good, HSG A
0.590	48	Weighted Average
0.500		84.75% Pervious Area
0.090		15.25% Impervious Area

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

Subcatchment P-3:



Summary for Subcatchment P-4:

[49] Hint: Tc<2dt may require smaller dt

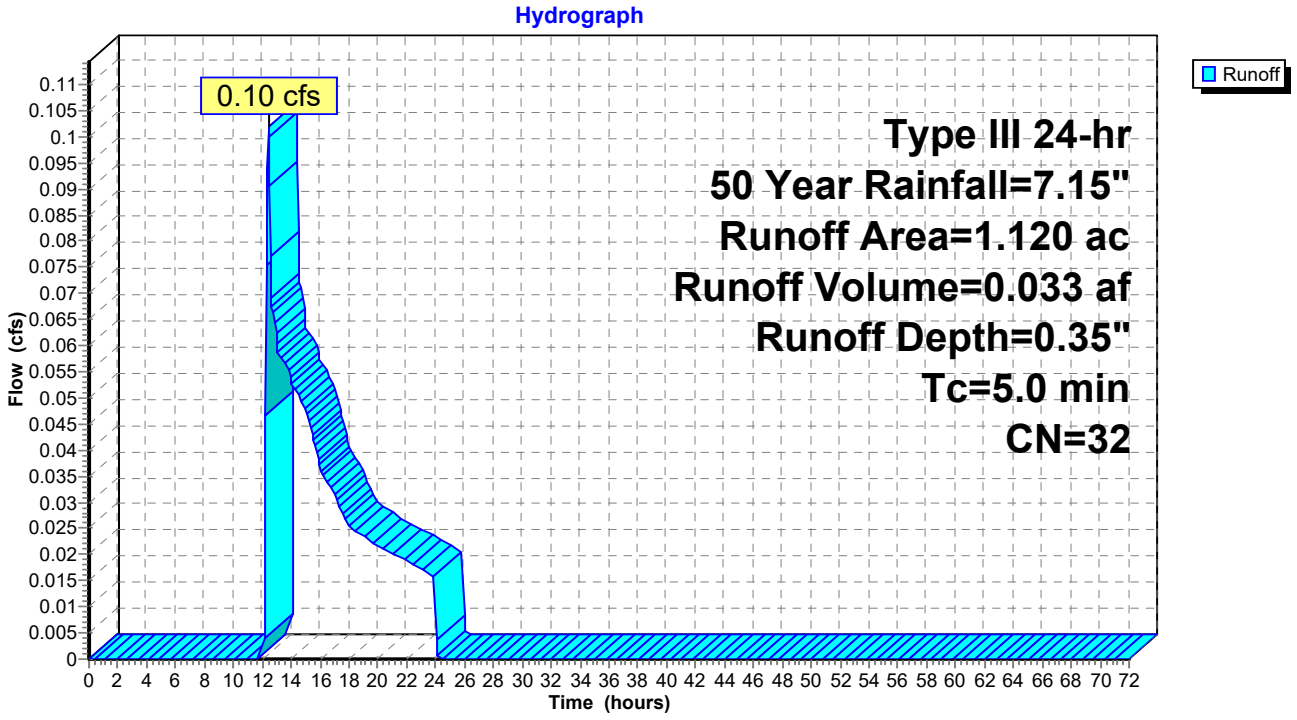
Runoff = 0.10 cfs @ 12.42 hrs, Volume= 0.033 af, Depth= 0.35"

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 50 Year Rainfall=7.15"

Area (ac)	CN	Description
0.300	39	>75% Grass cover, Good, HSG A
0.820	30	Woods, Good, HSG A
1.120	32	Weighted Average
1.120		100.00% Pervious Area

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

Subcatchment P-4:



Summary for Reach 1R: SWALE

Inflow Area = 0.520 ac, 1.92% Impervious, Inflow Depth = 0.68" for 50 Year event
Inflow = 0.16 cfs @ 12.27 hrs, Volume= 0.029 af
Outflow = 0.09 cfs @ 13.12 hrs, Volume= 0.029 af, Atten= 47%, Lag= 51.2 min

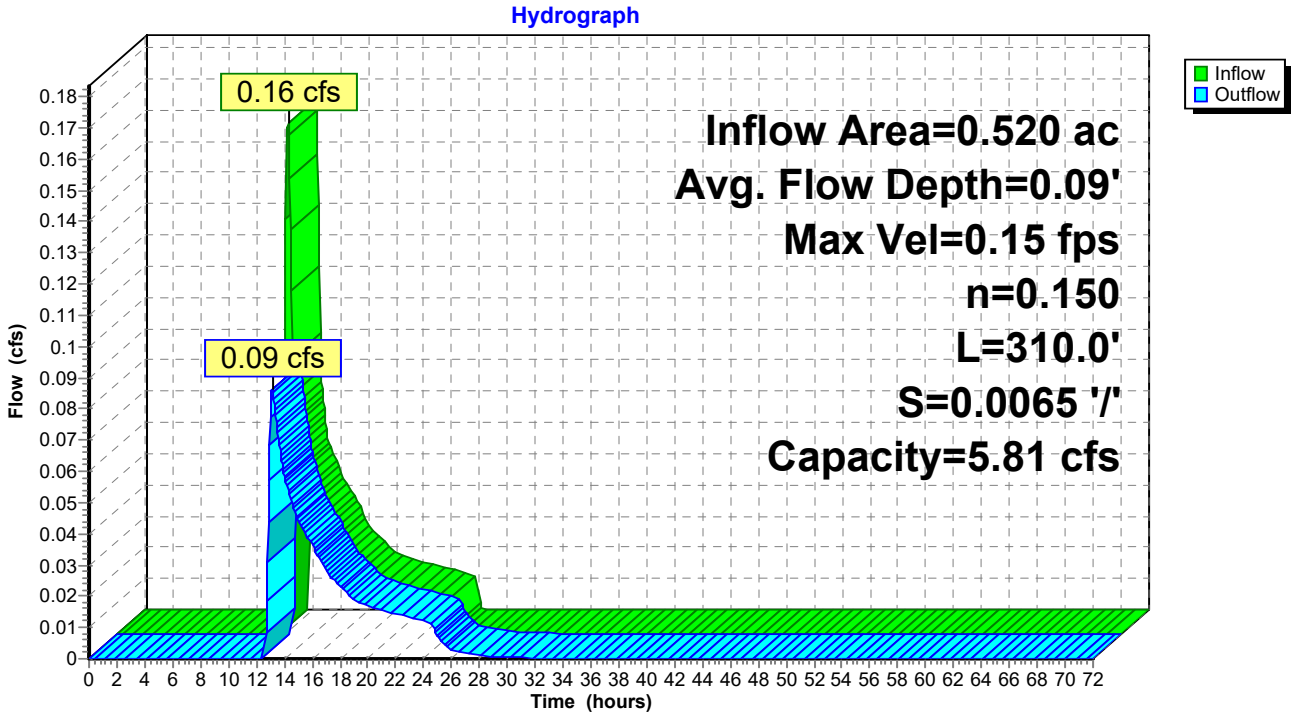
Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.15 fps, Min. Travel Time= 33.5 min
Avg. Velocity = 0.06 fps, Avg. Travel Time= 82.6 min

Peak Storage= 174 cf @ 12.57 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 5.81 cfs

6.00' x 1.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 310.0' Slope= 0.0065 '/'
Inlet Invert= 124.00', Outlet Invert= 122.00'

‡

Reach 1R: SWALE



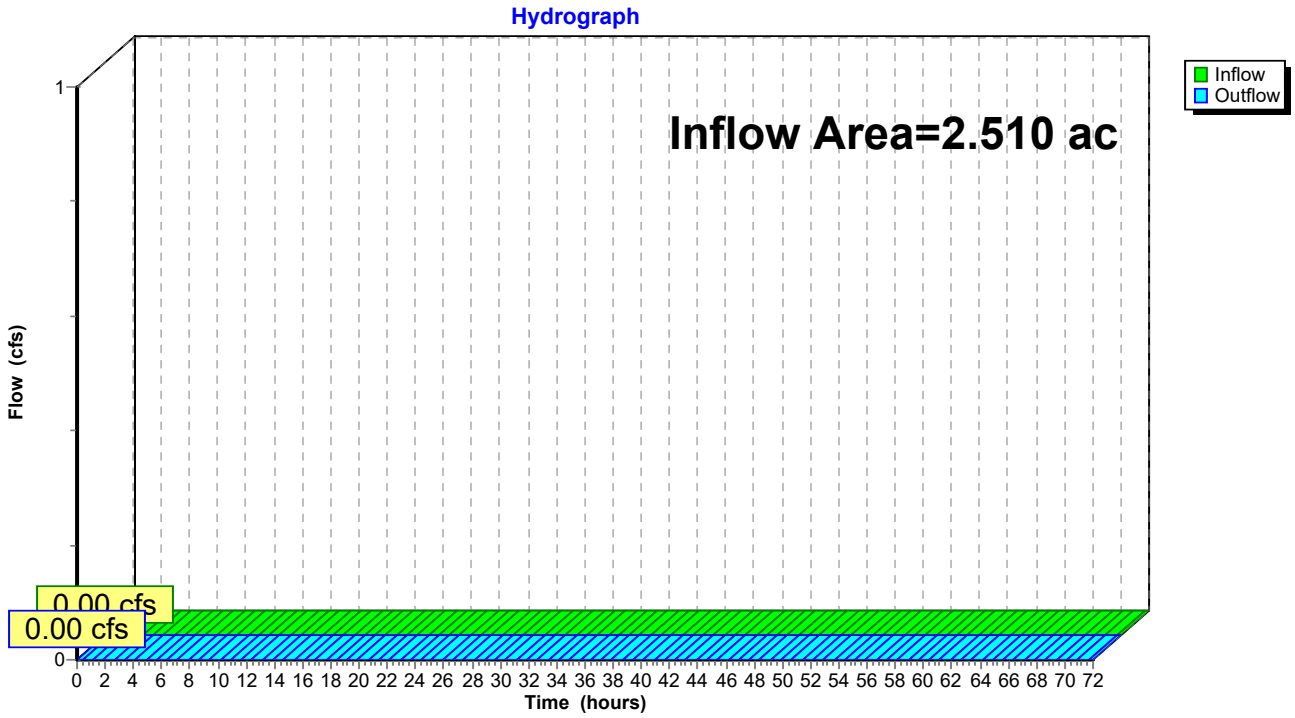
Summary for Reach DP-1: DESIGN POINT 1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.510 ac, 15.14% Impervious, Inflow Depth = 0.00" for 50 Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 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 DP-1: DESIGN POINT 1



Summary for Pond 1P: Rain Garden

Used more restrictive B layer

[81] Warning: Exceeded Pond 4P by 4.69' @ 16.10 hrs

Inflow Area = 2.510 ac, 15.14% Impervious, Inflow Depth = 1.35" for 50 Year event
Inflow = 3.37 cfs @ 12.07 hrs, Volume= 0.283 af
Outflow = 0.17 cfs @ 15.92 hrs, Volume= 0.283 af, Atten= 95%, Lag= 230.7 min
Discarded = 0.17 cfs @ 15.92 hrs, Volume= 0.283 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 119.75' @ 15.92 hrs Surf.Area= 3,126 sf Storage= 6,837 cf

Plug-Flow detention time= 586.8 min calculated for 0.283 af (100% of inflow)
Center-of-Mass det. time= 587.2 min (1,418.8 - 831.6)

Volume	Invert	Avail.Storage	Storage Description
#1	113.00'	22,053 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

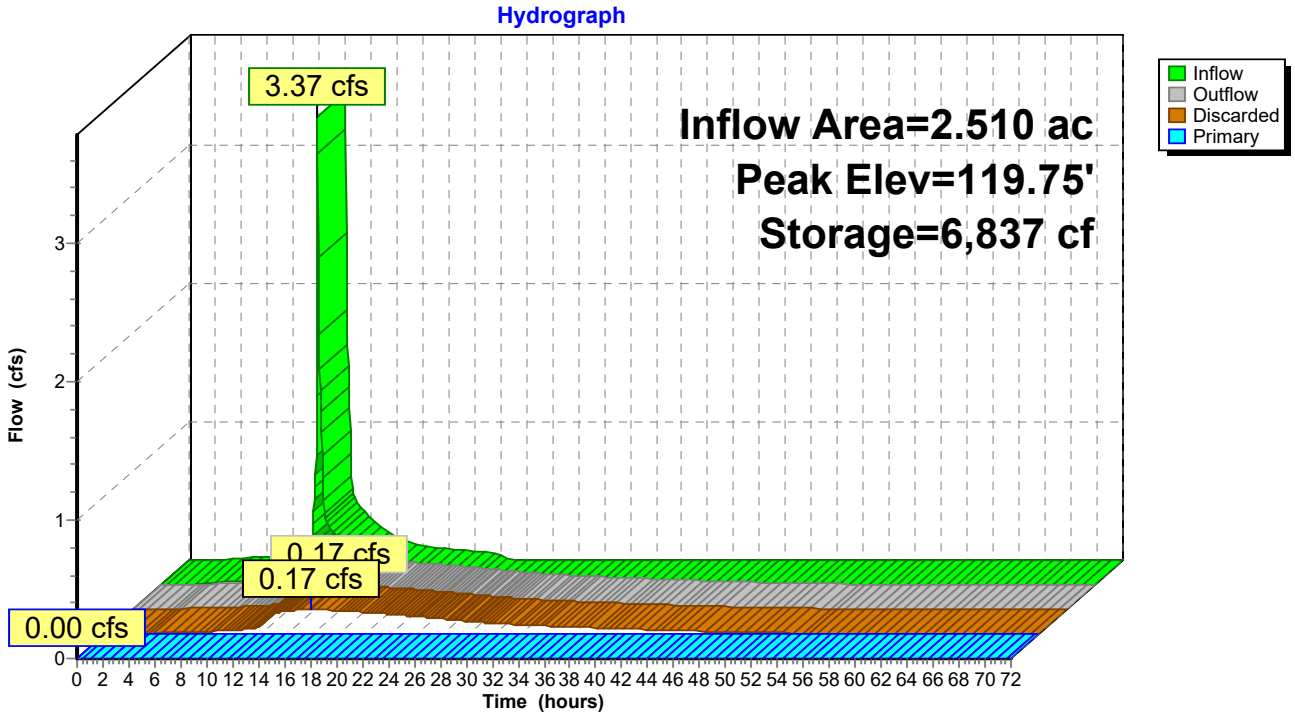
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
113.00	60	0	0
114.00	200	130	130
115.00	404	302	432
116.00	672	538	970
117.00	1,007	840	1,810
118.00	1,415	1,211	3,021
119.00	2,202	1,809	4,829
120.00	3,427	2,815	7,644
121.00	4,655	4,041	11,685
122.00	5,007	4,831	16,516
123.00	6,068	5,538	22,053

Device	Routing	Invert	Outlet Devices
#1	Primary	122.00'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	113.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.17 cfs @ 15.92 hrs HW=119.75' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=113.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Rain Garden



Summary for Pond 2P: Infiltration Trench

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.590 ac, 15.25% Impervious, Inflow Depth = 1.57" for 50 Year event
Inflow = 0.93 cfs @ 12.10 hrs, Volume= 0.077 af
Outflow = 1.43 cfs @ 12.07 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.01 cfs @ 25.61 hrs, Volume= 0.013 af
Primary = 1.42 cfs @ 12.07 hrs, Volume= 0.071 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 120.53' @ 12.05 hrs Surf.Area= 0.003 ac Storage= 0.005 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 39.9 min (924.6 - 884.7)

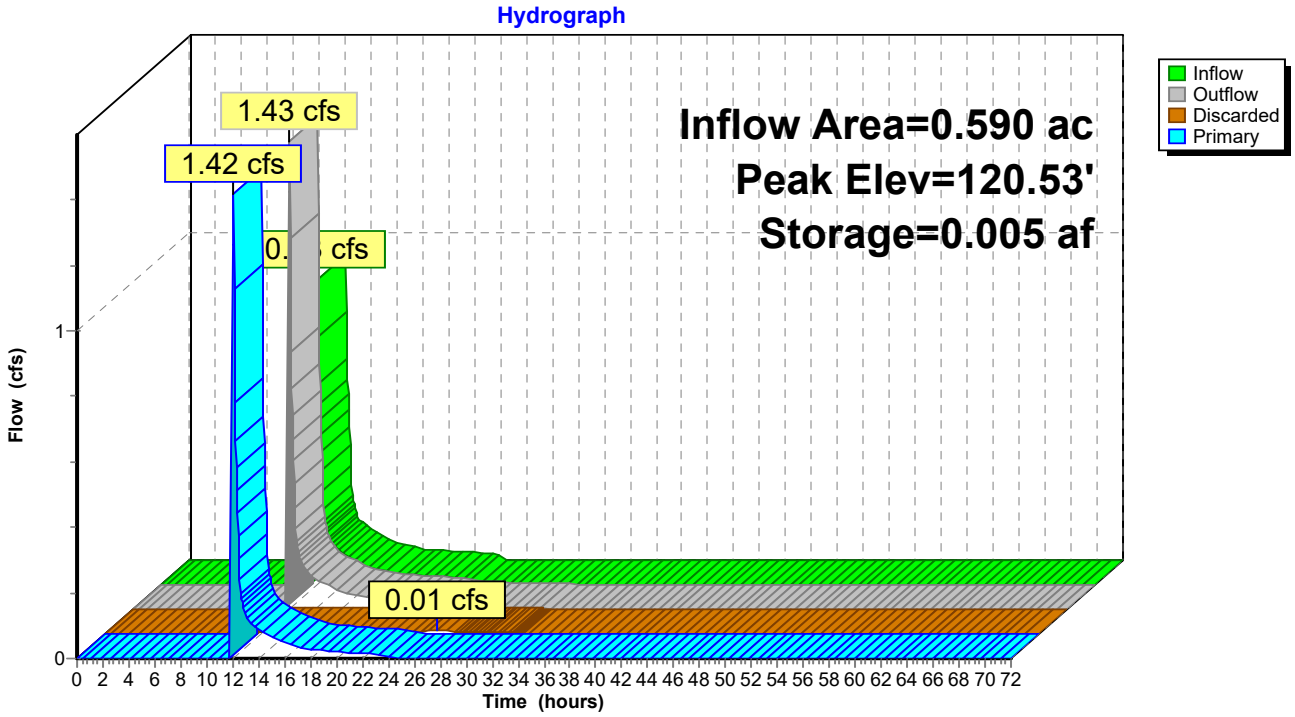
Volume	Invert	Avail.Storage	Storage Description
#1	119.00'	0.008 af	**36.0" W x 36.0" H Box Pipe Storage/Trenches** x 2 L= 20.0'
#2	119.00'	0.001 af	**18.0" Round Pipe Storage** L= 18.0' S= 0.0500 '/'
		0.009 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	120.50'	**72.0" x 120.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Discarded	119.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 25.61 hrs HW=120.20' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.23 cfs @ 12.07 hrs HW=120.53' (Free Discharge)
↑—**1=Orifice/Grate** (Weir Controls 1.23 cfs @ 0.59 fps)

Pond 2P: Infiltration Trench



Summary for Pond 4P: Cultec Recharger 150

Inflow Area = 0.280 ac,100.00% Impervious, Inflow Depth = 6.91" for 50 Year event
Inflow = 1.98 cfs @ 12.07 hrs, Volume= 0.161 af
Outflow = 1.96 cfs @ 12.07 hrs, Volume= 0.161 af, Atten= 1%, Lag= 0.0 min
Discarded = 0.01 cfs @ 12.07 hrs, Volume= 0.012 af
Primary = 1.96 cfs @ 12.07 hrs, Volume= 0.150 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 115.72' @ 12.07 hrs Surf.Area= 62 sf Storage= 77 cf

Plug-Flow detention time= 10.2 min calculated for 0.161 af (100% of inflow)
Center-of-Mass det. time= 10.5 min (752.2 - 741.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.00'	51 cf	**4.75'W x 13.00'L x 2.54'H Field A** 157 cf Overall - 29 cf Embedded = 128 cf x 40.0% Voids
#2A	114.50'	29 cf	**Cultec R-150XLHD** Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	114.00'	18 cf	**12.0" Round Pipe Storage**-Impervious L= 23.0' S= 0.0100 '/'
		98 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	114.50'	**12.0" Round Culvert** L= 69.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 114.50' / 113.00' S= 0.0217 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Discarded	114.00'	**2.410 in/hr Exfiltration over Wetted area**
#3	Device 1	115.00'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 12.07 hrs HW=115.70' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.89 cfs @ 12.07 hrs HW=115.70' (Free Discharge)
↑**1=Culvert** (Passes 1.89 cfs of 3.17 cfs potential flow)
↑**3=Broad-Crested Rectangular Weir** (Weir Controls 1.89 cfs @ 2.68 fps)

Pond 4P: Cultec Recharger 150 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 1 rows

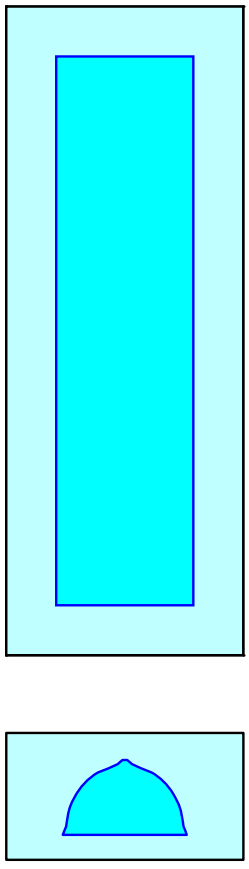
1 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 11.00' Row Length +12.0" End Stone x 2 = 13.00' Base Length
1 Rows x 33.0" Wide + 12.0" Side Stone x 2 = 4.75' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

1 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 1 Rows = 29.1 cf Chamber Storage

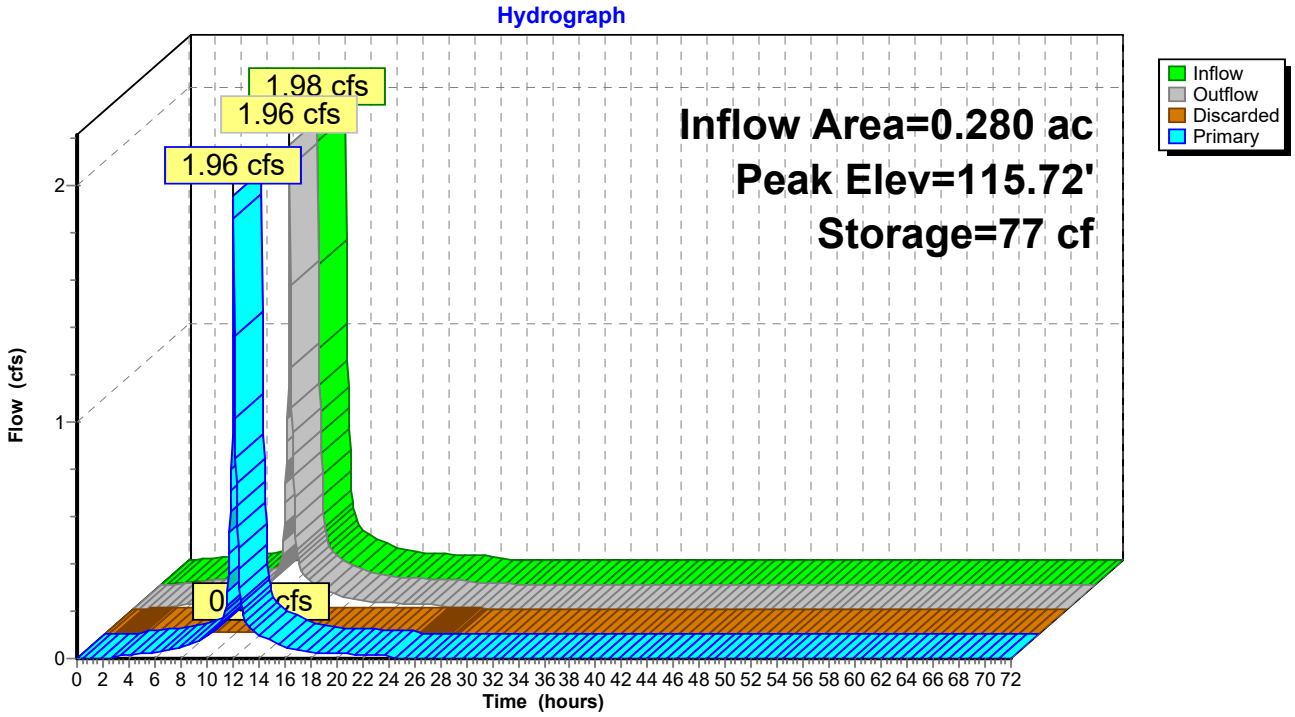
156.9 cf Field - 29.1 cf Chambers = 127.8 cf Stone x 40.0% Voids = 51.1 cf Stone Storage

Chamber Storage + Stone Storage = 80.3 cf = 0.002 af
Overall Storage Efficiency = 51.1%
Overall System Size = 13.00' x 4.75' x 2.54'

1 Chambers
5.8 cy Field
4.7 cy Stone



Pond 4P: Cultec Recharger 150



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 P-1: Runoff Area=0.280 ac 100.00% Impervious Runoff Depth=7.86"
Tc=5.0 min CN=98 Runoff=2.24 cfs 0.183 af

Subcatchment P-2: Runoff Area=0.520 ac 1.92% Impervious Runoff Depth=1.01"
Tc=5.0 min CN=37 Runoff=0.36 cfs 0.044 af

Subcatchment P-3: Runoff Area=0.590 ac 15.25% Impervious Runoff Depth=2.10"
Tc=5.0 min CN=48 Runoff=1.31 cfs 0.103 af

Subcatchment P-4: Runoff Area=1.120 ac 0.00% Impervious Runoff Depth=0.59"
Tc=5.0 min CN=32 Runoff=0.26 cfs 0.055 af

Reach 1R: SWALE Avg. Flow Depth=0.14' Max Vel=0.20 fps Inflow=0.36 cfs 0.044 af
n=0.150 L=310.0' S=0.0065 '/' Capacity=5.81 cfs Outflow=0.18 cfs 0.044 af

Reach DP-1: DESIGN POINT 1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1P: Rain Garden Peak Elev=120.31' Storage=8,762 cf Inflow=3.44 cfs 0.359 af
Discarded=0.21 cfs 0.359 af Primary=0.00 cfs 0.000 af Outflow=0.21 cfs 0.359 af

Pond 2P: Infiltration Trench Peak Elev=120.53' Storage=0.005 af Inflow=1.31 cfs 0.103 af
Discarded=0.01 cfs 0.013 af Primary=1.22 cfs 0.088 af Outflow=1.22 cfs 0.101 af

Pond 4P: Cultec Recharger 150 Peak Elev=115.77' Storage=79 cf Inflow=2.24 cfs 0.183 af
Discarded=0.01 cfs 0.012 af Primary=2.22 cfs 0.172 af Outflow=2.23 cfs 0.183 af

Total Runoff Area = 2.510 ac Runoff Volume = 0.386 af Average Runoff Depth = 1.84"
84.86% Pervious = 2.130 ac 15.14% Impervious = 0.380 ac

Summary for Subcatchment P-1:

[49] Hint: Tc<2dt may require smaller dt

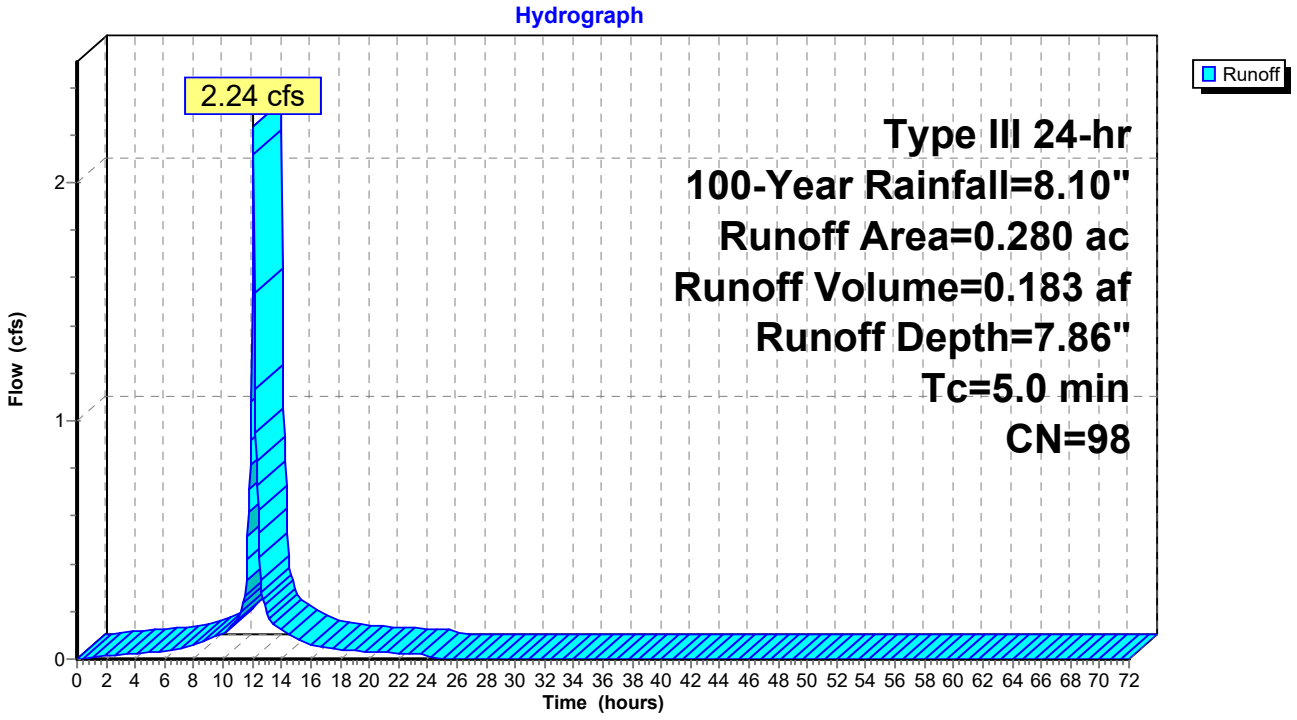
Runoff = 2.24 cfs @ 12.07 hrs, Volume= 0.183 af, Depth= 7.86"

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=8.10"

Area (ac)	CN	Description
0.140	98	Paved parking, HSG A
0.140	98	Roofs, HSG A
0.280	98	Weighted Average
0.280		100.00% Impervious Area

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

Subcatchment P-1:



Summary for Subcatchment P-2:

[49] Hint: Tc<2dt may require smaller dt

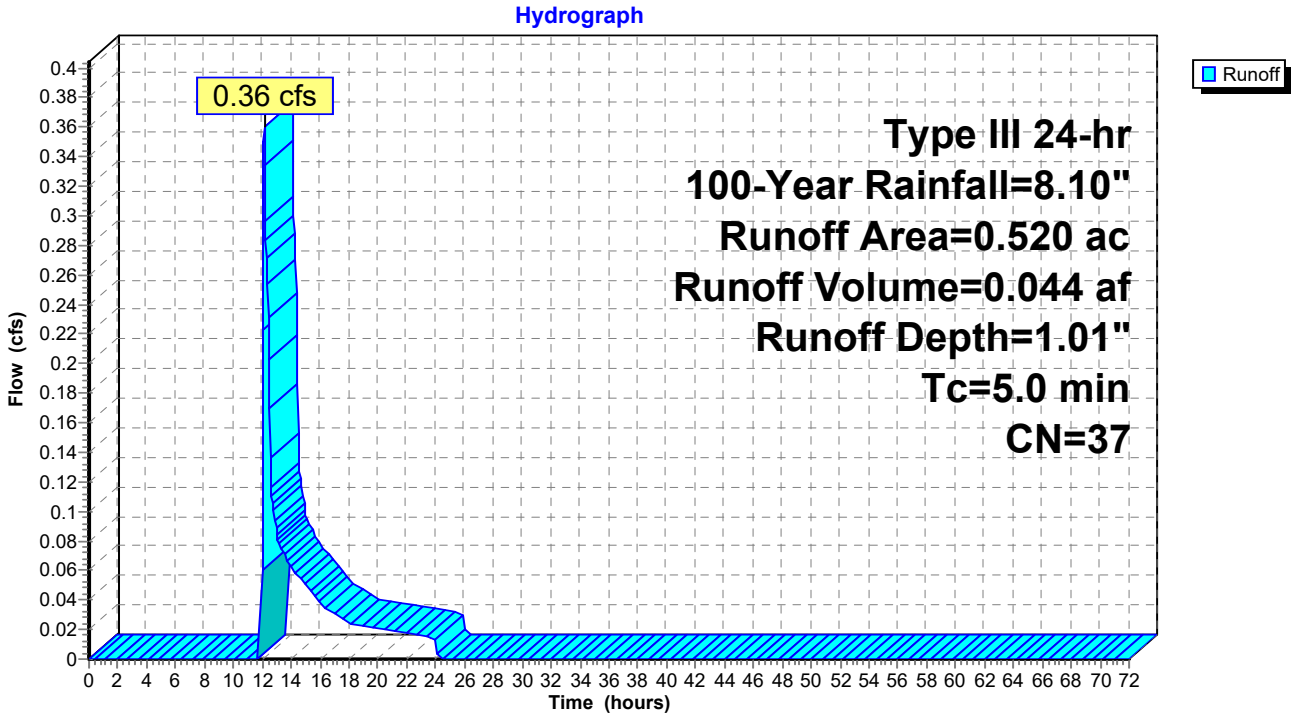
Runoff = 0.36 cfs @ 12.12 hrs, Volume= 0.044 af, Depth= 1.01"

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=8.10"

Area (ac)	CN	Description
0.340	39	>75% Grass cover, Good, HSG A
0.010	98	Roofs, HSG A
0.170	30	Woods, Good, HSG A
0.520	37	Weighted Average
0.510		98.08% Pervious Area
0.010		1.92% Impervious Area

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

Subcatchment P-2:



Summary for Subcatchment P-3:

[49] Hint: Tc<2dt may require smaller dt

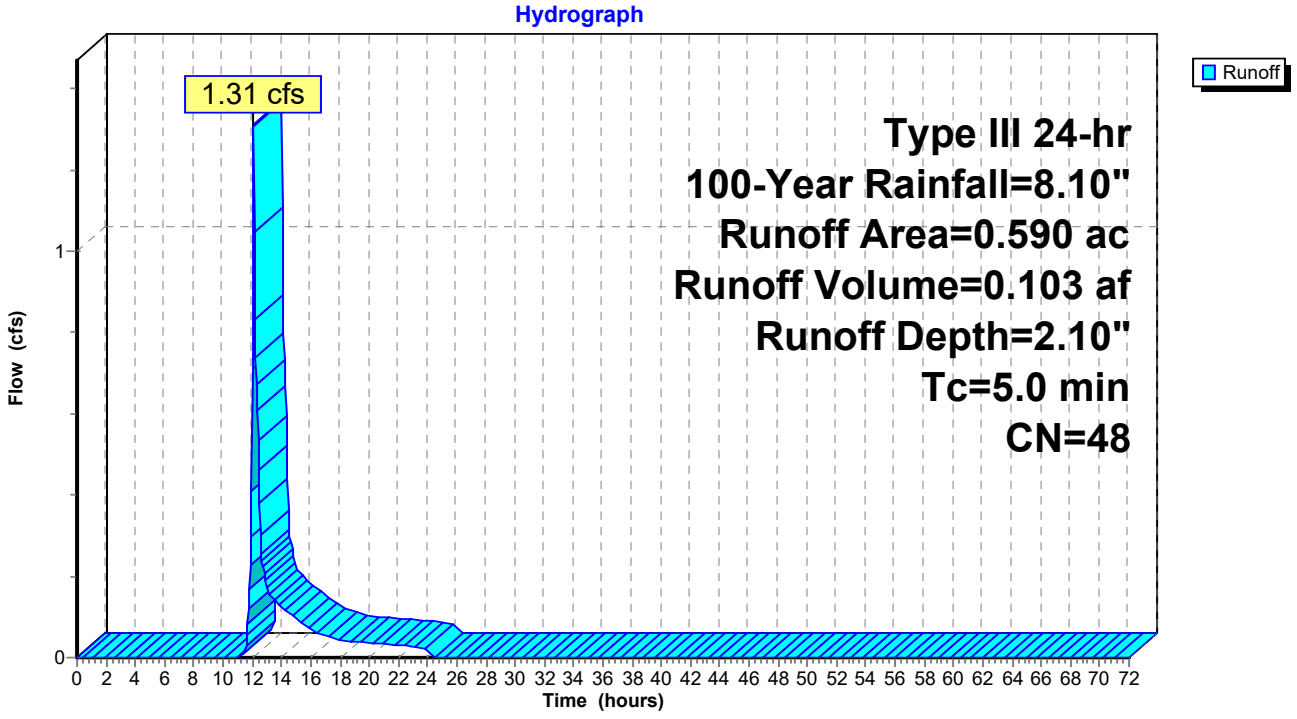
Runoff = 1.31 cfs @ 12.09 hrs, Volume= 0.103 af, Depth= 2.10"

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=8.10"

Area (ac)	CN	Description
0.090	98	Paved parking, HSG A
0.500	39	>75% Grass cover, Good, HSG A
0.590	48	Weighted Average
0.500		84.75% Pervious Area
0.090		15.25% Impervious Area

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

Subcatchment P-3:



Summary for Subcatchment P-4:

[49] Hint: Tc<2dt may require smaller dt

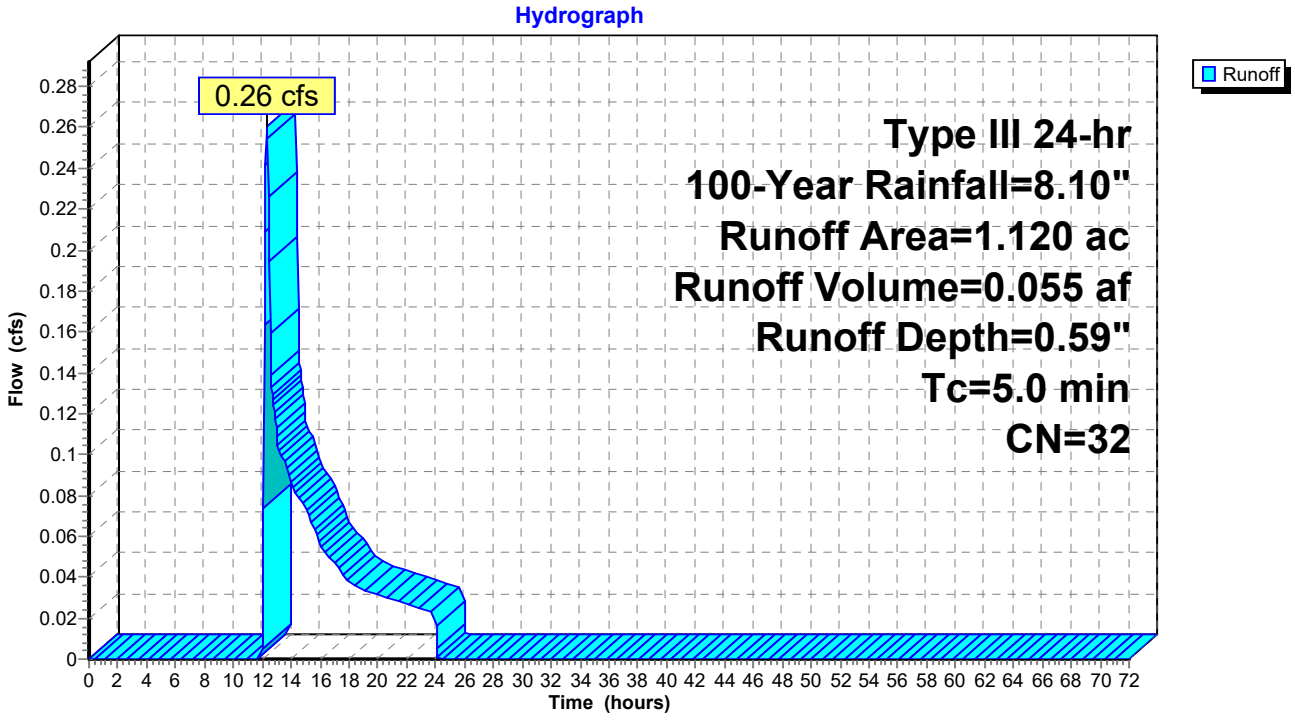
Runoff = 0.26 cfs @ 12.33 hrs, Volume= 0.055 af, Depth= 0.59"

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=8.10"

Area (ac)	CN	Description
0.300	39	>75% Grass cover, Good, HSG A
0.820	30	Woods, Good, HSG A
1.120	32	Weighted Average
1.120		100.00% Pervious Area

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

Subcatchment P-4:



Summary for Reach 1R: SWALE

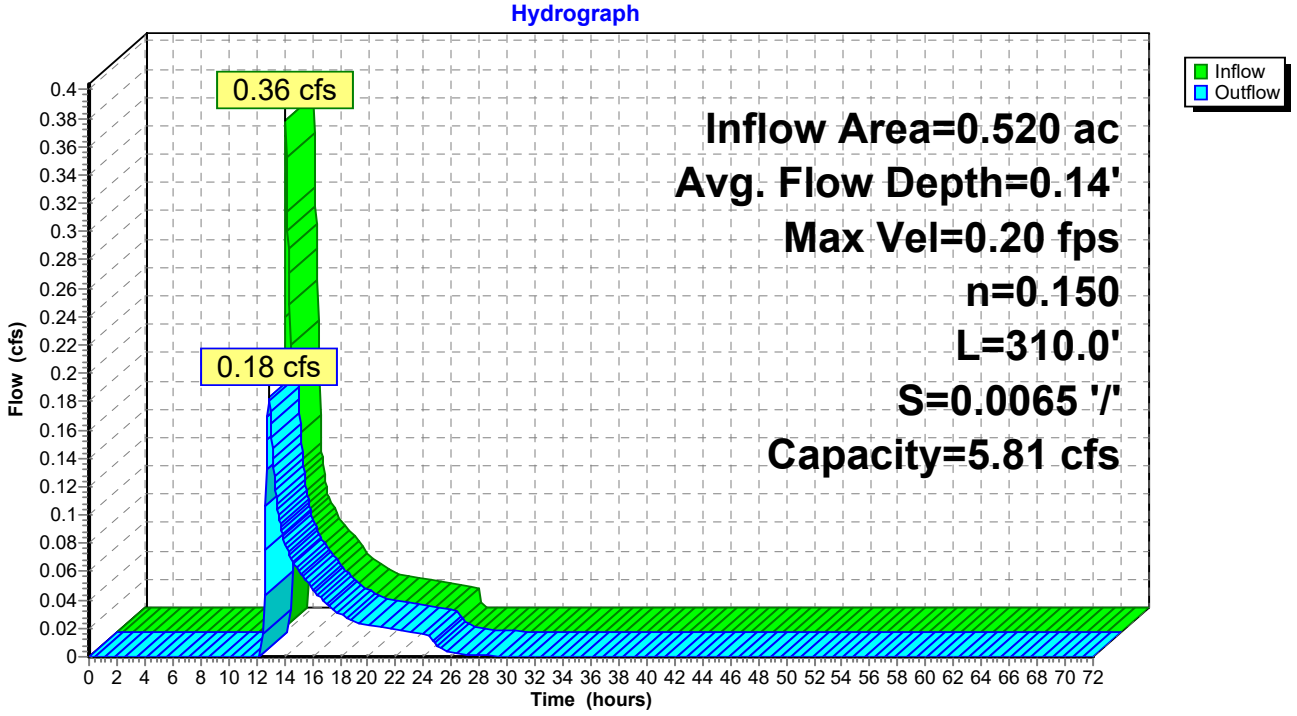
Inflow Area = 0.520 ac, 1.92% Impervious, Inflow Depth = 1.01" for 100-Year event
Inflow = 0.36 cfs @ 12.12 hrs, Volume= 0.044 af
Outflow = 0.18 cfs @ 12.90 hrs, Volume= 0.044 af, Atten= 49%, Lag= 47.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.20 fps, Min. Travel Time= 25.3 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 75.2 min

Peak Storage= 278 cf @ 12.48 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 5.81 cfs

6.00' x 1.00' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 310.0' Slope= 0.0065 '/'
Inlet Invert= 124.00', Outlet Invert= 122.00'

‡



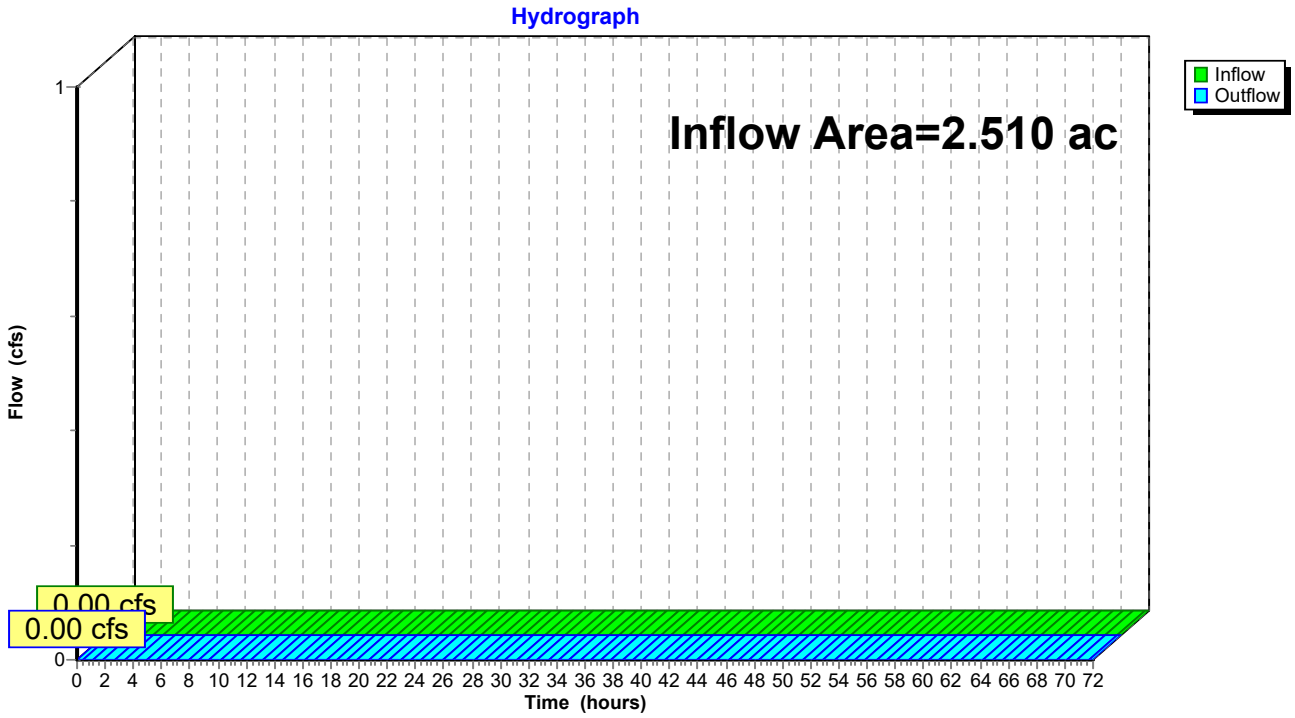
Summary for Reach DP-1: DESIGN POINT 1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.510 ac, 15.14% Impervious, Inflow Depth = 0.00" for 100-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 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 DP-1: DESIGN POINT 1



Summary for Pond 1P: Rain Garden

Used more restrictive B layer

[81] Warning: Exceeded Pond 4P by 5.24' @ 16.40 hrs

Inflow Area = 2.510 ac, 15.14% Impervious, Inflow Depth = 1.71" for 100-Year event
Inflow = 3.44 cfs @ 12.08 hrs, Volume= 0.359 af
Outflow = 0.21 cfs @ 16.13 hrs, Volume= 0.359 af, Atten= 94%, Lag= 243.0 min
Discarded = 0.21 cfs @ 16.13 hrs, Volume= 0.359 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 120.31' @ 16.13 hrs Surf.Area= 3,807 sf Storage= 8,762 cf

Plug-Flow detention time= 610.8 min calculated for 0.358 af (100% of inflow)
Center-of-Mass det. time= 611.5 min (1,449.4 - 837.9)

Volume	Invert	Avail.Storage	Storage Description
#1	113.00'	22,053 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

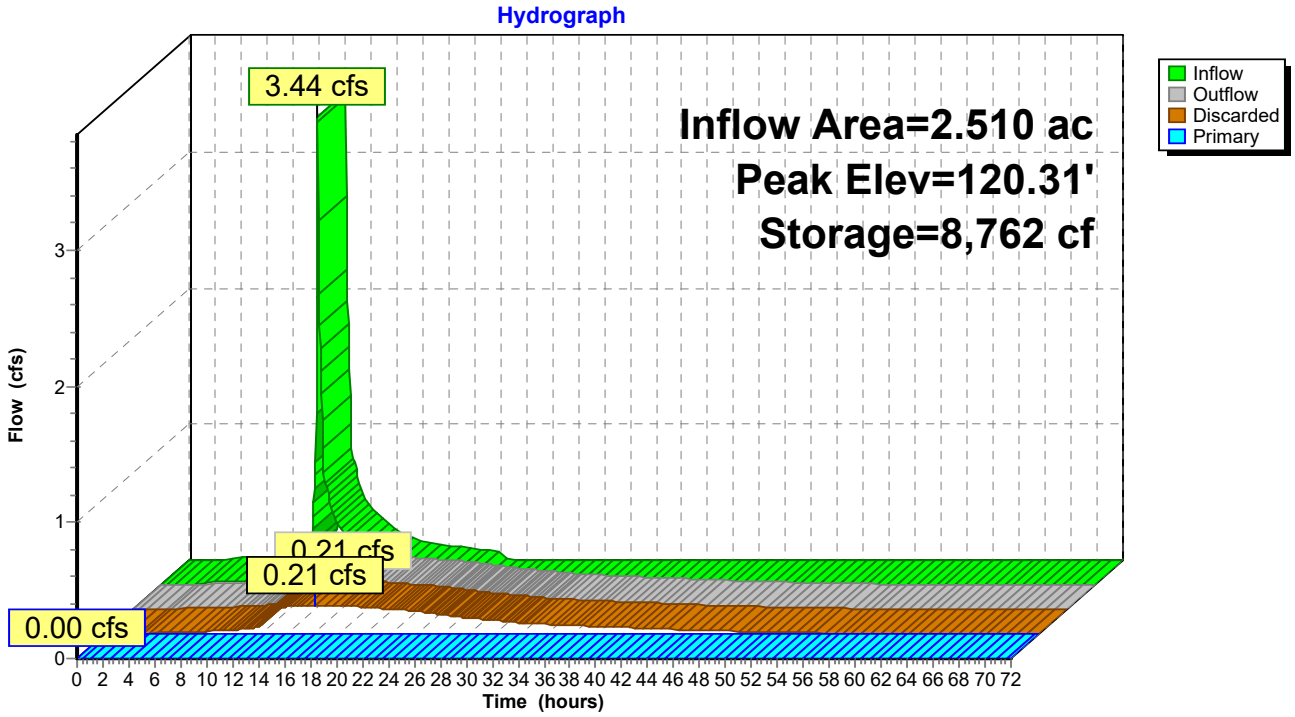
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
113.00	60	0	0
114.00	200	130	130
115.00	404	302	432
116.00	672	538	970
117.00	1,007	840	1,810
118.00	1,415	1,211	3,021
119.00	2,202	1,809	4,829
120.00	3,427	2,815	7,644
121.00	4,655	4,041	11,685
122.00	5,007	4,831	16,516
123.00	6,068	5,538	22,053

Device	Routing	Invert	Outlet Devices
#1	Primary	122.00'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	113.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.21 cfs @ 16.13 hrs HW=120.31' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=113.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Rain Garden



Summary for Pond 2P: Infiltration Trench

Inflow Area = 0.590 ac, 15.25% Impervious, Inflow Depth = 2.10" for 100-Year event
Inflow = 1.31 cfs @ 12.09 hrs, Volume= 0.103 af
Outflow = 1.22 cfs @ 12.09 hrs, Volume= 0.101 af, Atten= 7%, Lag= 0.1 min
Discarded = 0.01 cfs @ 25.61 hrs, Volume= 0.013 af
Primary = 1.22 cfs @ 12.09 hrs, Volume= 0.088 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 120.53' @ 12.09 hrs Surf.Area= 0.003 ac Storage= 0.005 af

Plug-Flow detention time= 61.1 min calculated for 0.101 af (97% of inflow)
Center-of-Mass det. time= 48.0 min (922.7 - 874.7)

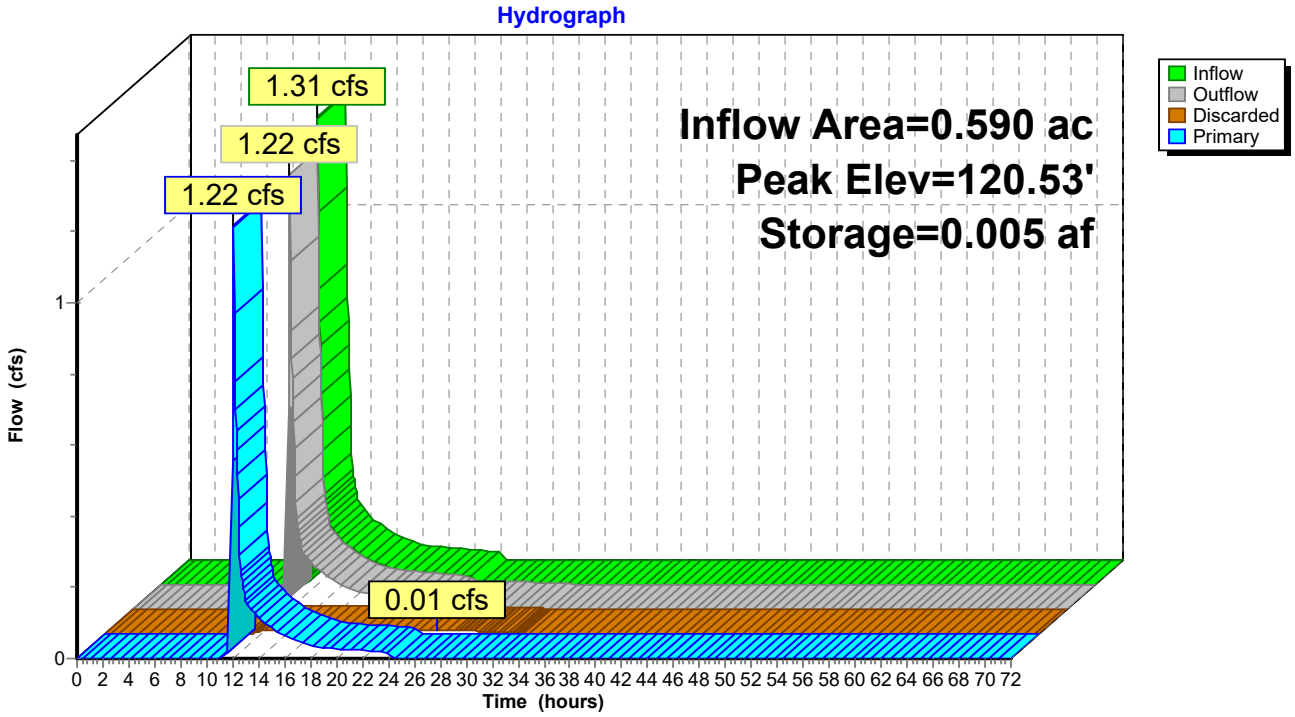
Volume	Invert	Avail.Storage	Storage Description
#1	119.00'	0.008 af	**36.0" W x 36.0" H Box Pipe Storage/Trenches** x 2 L= 20.0'
#2	119.00'	0.001 af	**18.0" Round Pipe Storage** L= 18.0' S= 0.0500 '/'
		0.009 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	120.50'	**72.0" x 120.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#2	Discarded	119.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 25.61 hrs HW=120.20' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.17 cfs @ 12.09 hrs HW=120.53' (Free Discharge)
↑**1=Orifice/Grate** (Weir Controls 1.17 cfs @ 0.58 fps)

Pond 2P: Infiltration Trench



Summary for Pond 4P: Cultec Recharger 150

Inflow Area = 0.280 ac,100.00% Impervious, Inflow Depth = 7.86" for 100-Year event
Inflow = 2.24 cfs @ 12.07 hrs, Volume= 0.183 af
Outflow = 2.23 cfs @ 12.07 hrs, Volume= 0.183 af, Atten= 1%, Lag= 0.0 min
Discarded = 0.01 cfs @ 12.07 hrs, Volume= 0.012 af
Primary = 2.22 cfs @ 12.07 hrs, Volume= 0.172 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 115.77' @ 12.07 hrs Surf.Area= 62 sf Storage= 79 cf

Plug-Flow detention time= 9.0 min calculated for 0.183 af (100% of inflow)
Center-of-Mass det. time= 9.4 min (749.5 - 740.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.00'	51 cf	**4.75'W x 13.00'L x 2.54'H Field A** 157 cf Overall - 29 cf Embedded = 128 cf x 40.0% Voids
#2A	114.50'	29 cf	**Cultec R-150XLHD** Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	114.00'	18 cf	**12.0" Round Pipe Storage**-Impervious L= 23.0' S= 0.0100 '/'
		98 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	114.50'	**12.0" Round Culvert** L= 69.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 114.50' / 113.00' S= 0.0217 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Discarded	114.00'	**2.410 in/hr Exfiltration over Wetted area**
#3	Device 1	115.00'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 12.07 hrs HW=115.76' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=2.14 cfs @ 12.07 hrs HW=115.76' (Free Discharge)
↑**1=Culvert** (Passes 2.14 cfs of 3.29 cfs potential flow)
↑**3=Broad-Crested Rectangular Weir** (Weir Controls 2.14 cfs @ 2.83 fps)

Pond 4P: Cultec Recharger 150 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 1 rows

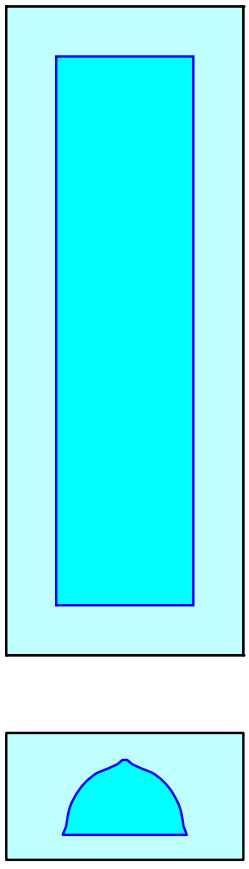
1 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 11.00' Row Length +12.0" End Stone x 2 = 13.00' Base Length
1 Rows x 33.0" Wide + 12.0" Side Stone x 2 = 4.75' Base Width
6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

1 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 1 Rows = 29.1 cf Chamber Storage

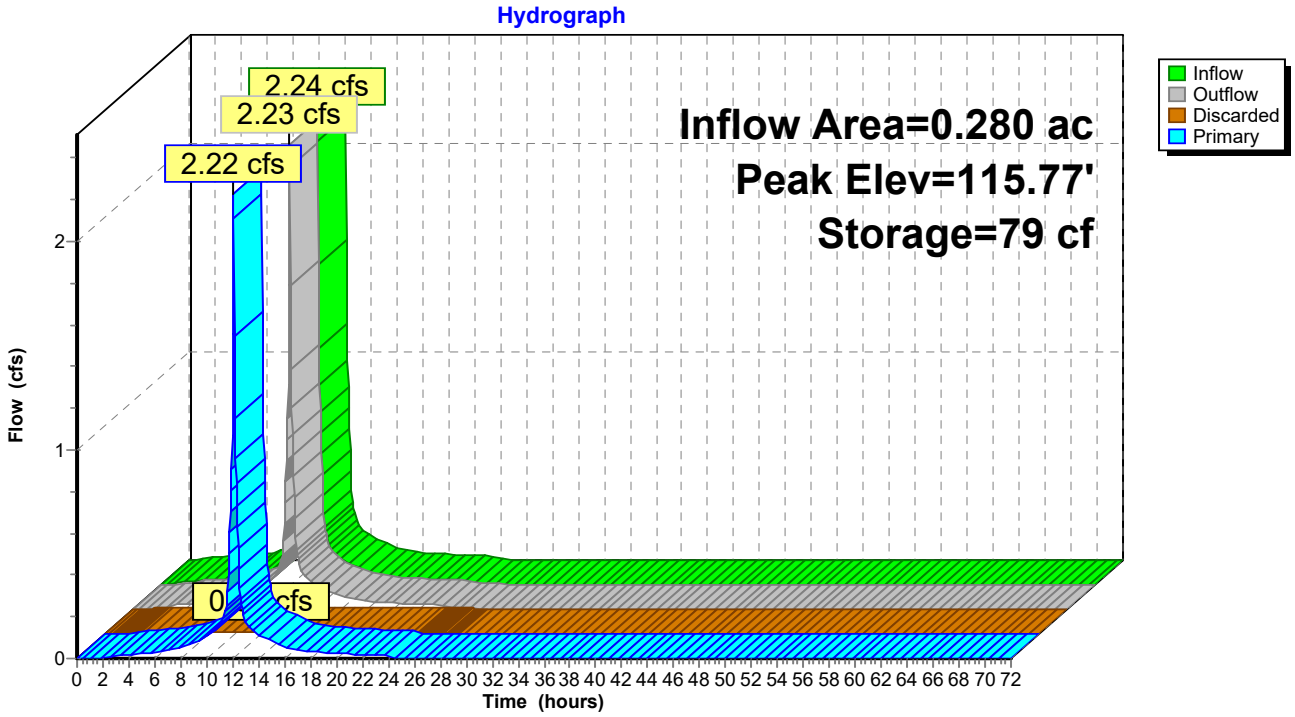
156.9 cf Field - 29.1 cf Chambers = 127.8 cf Stone x 40.0% Voids = 51.1 cf Stone Storage

Chamber Storage + Stone Storage = 80.3 cf = 0.002 af
Overall Storage Efficiency = 51.1%
Overall System Size = 13.00' x 4.75' x 2.54'

1 Chambers
5.8 cy Field
4.7 cy Stone



Pond 4P: Cultec Recharger 150



APPENDIX E

Recharge Calculations

146 Georgetown Road
Boxford, MA

MassDEP Standard No. 3 - Groundwater Recharge Calculations

Minimum Required Recharge Volume *(if 100% of impervious area discharging to recharge BMP)*					
NRCS Hydrologic Soil Type	**Approx. Soil Texture**	**Target Depth Factor (inches)**	**Impervious Area (acres)**	**Required Recharge (ac-ft)**	**(cf)**
A	sand	0.60	0.00	0.000	0
B	loam	0.35	0.38	0.011	483
C	silty loam	0.25	0.00	0.000	0
D	clay	0.10	0.00	0.000	0
		Totals =	**0.38**	**0.011**	**483**

MassDEP Standard No. 3 - Groundwater Recharge Calculations

Recharge Rain Garden	**Static Storage Volume (cf)**
1	16,516
	16,516

Rv = F x impervious area x ratio of impervious area

Where: Rv = required recharge volume (acre-feet)
F = target depth factor associated with each hydrologic soil group (feet)
Impervious Area = pavement and rooftop area on site (acres)
Ratio of Impervious Area = total impervious area / impervious area discharging to recharge BMP

Notes:
1.) A minimum of 65% of impervious area is required to drain to recharge BMP.
2.) Refer to the 2008 Massachusetts Stormwater Handbook Volume 3, Chapter 1, pages 27-28 for required recharge requirement.

APPENDIX F

Water Quality Calculations

146 Georgetown Road
Boxford, MA

MassDEP Standard No. 4 - Water Quality Volume Calculations

BMP Water Quality Volume Calculations Summary				
Description	**Impervious Tributary Area (acres)**	**WQ Runoff Depth (inches)**	**Required WQVr Volume (cubic feet)**	**Provided WQVp Volume (cubic feet)**
Rain Garden	0.38	1.0	1,379	16,516

Recharge Rain Garden	**Static Storage Volume (cf)**
1	16,516
	16,516

Water Quality Volume (WQVr) = WQ * A
Where:
WQVr = water quality volume required
A = impervious surface drainage area
WQ = water quality run off depth
WQVp = water quality provided

APPENDIX G

TSS Removal Calculations

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

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

Location: 146 Georgetown Road, Boxford MA

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Rain Garden	**0.90**	**1.00**	**0.90**	**0.10**
Water Quality Swale - Dry	**0.70**	**0.10**	**0.07**	**0.03**
Subsurface Infiltration Structure	**0.80**	**0.03**	**0.02**	**0.01**
	0.00	**0.01**	**0.00**	**0.01**
	0.00	**0.01**	**0.00**	**0.01**

Total TSS Removal = **99%**

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

Project: **Sena Home**

Prepared By: **CFM**

Date: **9/13/2021**

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

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

1. From MassDEP Stormwater Handbook Vol. 1

APPENDIX H

MassDEP Critical Area Discharge Authorization

MASSWILDLIFE

DIVISION OF
FISHERIES & WILDLIFE

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

August 4, 2021

Claudio Sena
146 Georgetown Road
Boxford MA 01921

Boxford Conservation Commission
7A Spofford Rd
Boxford MA 01921

RE: Applicant: Claudio Sena
Project Location: 146 Georgetown Road
Project Description: Single Family Home, Rain Garden, Landscaping, Swimming Pool, Patio
DEP Wetlands File No.: Not Issued
NHESP File No.: 21-40371

Dear Commissioners & Applicant:

The Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the "Division") received a Notice of Intent with site plans (dated 5/21/21, revised 6/11/21) in compliance with the rare wildlife species section of the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.59). The Division also received the MESA Review Checklist and supporting documentation for review pursuant to the MA Endangered Species Act Regulations (321 CMR 10.18).

WETLANDS PROTECTION ACT (WPA)

Based on a review of the information that was provided and the information that is currently contained in our database, the Division has determined that this project, as currently proposed, **will not adversely affect** the actual Resource Area Habitat of state-protected rare wildlife species. Therefore, it is our opinion that this project meets the state-listed species performance standard for the issuance of an Order of Conditions.

Please note that this determination addresses only the matter of **rare** wildlife habitat and does not pertain to other wildlife habitat issues that may be pertinent to the proposed project.

MASSACHUSETTS ENDANGERED SPECIES ACT (MESA)

Based on a review of the information that was provided and the information that is currently contained in our database, the Division has determined that this project, as currently proposed, **will not result in a prohibited Take** of state-listed rare species. This determination is a final decision of the Division of Fisheries and Wildlife pursuant to 321 CMR 10.18. Any changes to the proposed project or any additional work beyond that shown on the site plans may require an additional filing with the Division pursuant to the MESA. This project may be subject to further review if no physical work is commenced within five years from the date of issuance of this determination, or if there is a change to the project.

Please note that this determination addresses only the matter of state-listed species and their habitats. If you have any questions regarding this letter please contact Emily Holt, Endangered Species Review Assistant, at (508) 389-6385.

Sincerely,

Everose Schlüter, Ph.D.
Assistant Director

cc: Matthew Marro, Matthew S. Marro Environmental Consulting
MA DEP Northeast Region

APPENDIX F

Long-Term Pollution Prevention
And Stormwater Operation & Maintenance Plan

LONG-TERM POLLUTION PREVENTION AND STORMWATER OPERATION & MAINTENANCE PLAN

Prepared For:
Claudio Sena
146 Georgetown Road
Boxford, MA 01921

Prepared By:

MF Engineering & Design
966 Hyde Park Avenue #303
Boston, MA 02136

Date:
September 27, 2021

Table of Contents

List of Appendices

1 Introduction

The Long-Term Pollution Prevention (LTPP) and Stormwater Operation and Maintenance (O&M) Plan, filed with the Town of Boxford, shall be implemented at Sena Residence development located at 146 Georgetown Road to ensure long-term functioning of the stormwater management system (System), and to provide suitable practices for source control of pollutants.

The System has been designed in accordance with the ten (10) MassDEP Stormwater Management Standards provided in the Stormwater Management Policy and Massachusetts Wetlands Protection Act, which relate to the protection of wetlands and water bodies, control of water quantity, recharge to groundwater, water quality and protection of critical areas, erosion/sedimentation control and stormwater maintenance. Preventative maintenance of the System is essential in the protection of these interests.

1.1 Responsible Party

The Owner possesses the primary responsibility for overseeing and implementing the LTPP and Stormwater O&M Plan. When necessary the Owner shall designate responsibility to a professional engineer or other technical professional with expertise and experience with stormwater management facilities for the proper operation and maintenance of the System. In case of transfer of property ownership, future property owners shall be notified of the presence of the stormwater management system and the requirements for proper implementation of the LTPP and Stormwater O&M Plan.

Operator Name and Address:
Claudio Sena
146 Georgetown Road
Boxford, MA 01921

1.2 Documentation

An Inspection and Maintenance Log and Schedule shall be kept by the Owner or designated responsible party summarizing inspections, maintenance, repairs and any corrective actions taken. At a minimum, the Inspection and Maintenance Log Forms shall include the date on which each inspection or maintenance task was performed, date and the amount of the last storm event in excess of 0.1 inches of rain in a 24-hour period, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task.

1.3 References

The LTPP and Stormwater O&M Plan references the following documents:

Notice of Intent Plans:

Plans titled “Notice of Intent, Sena Residence” dated September 25, 2021 (or as amended), prepared by MF Engineering and Design.

Stormwater Management Report:

Report titled “Stormwater Management Report” prepared for Sena Residence dated September 27, 2021 (or as amended), prepared by MF Engineering and Design.

2 Operations and Maintenance Program

The Owner or designated responsible party shall conduct the Stormwater O&M Program set forth in this document, ensure that inspections and record keeping are timely and accurate, and that cleaning and maintenance are performed in accordance with the recommended frequency for each System component. The Owner or designated responsible party shall also maintain all System components to function as they were designed to. Estimated annual cost of the Maintenance Program is $3,000.

Inspection and Maintenance Log Forms shall include the date on which each inspection or maintenance task was performed, date and the amount of the last storm event in excess of 0.1 inches of rain in a 24-hour period, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. Inspection findings shall include items such as physical conditions of the System components, depth of sediment in structures, evidence of overtopping or debris blockage, and maintenance required for each System component. Refer to Appendix A, Inspection and Maintenance Log Form for a sample form.

2.1 Inspection and Maintenance Frequency

The following areas and System components shall be inspected by the Owner or designated responsible party and maintained as specified below. The inspection and maintenance frequencies described below may be adjusted based on results gathered during inspections. Any adjustments to the below-mentioned inspection and maintenance schedule shall be relayed to proper authorities to ensure reporting requirements are met. Any deficiencies to the following areas and systems shall be corrected upon discovery.

2.1.1 Paved Site Access Drive

Street sweeping of paved site access drives and parking areas shall be performed quarterly, with sweeping scheduled primarily in spring, after winter snowmelt, and fall to control the amount of sediment that enter the System.

2.1.2 Yard Cleanout

Yard Cleanouts shall be inspected on an annual basis and cleaned or maintained as necessary. Inspections shall include ensuring the cleanout and cover are in good condition and checking if litter or accumulated sediment is obstructing flow through the structure. Common corrective actions include removal of litter and accumulated sediment.

2.1.3 Storm Drain Piping

Storm drain piping shall be inspected on an annual basis and cleaned or maintained as necessary. Inspection shall include checking if litter or accumulated sediment is obstructing flow. Typical observations that would indicate the storm drain piping is not functioning properly are roof gutter overflows or no discharge of runoff into the detention areas during a storm event. Common corrective actions include removal of litter and accumulated sediment.

2.1.4 Flared End Section and Stone Apron

Flared end sections and stone aprons shall be inspected on a quarterly basis and cleaned or maintained as necessary. Inspection shall include checking if litter or accumulated sediment is obstructing flow, and if there are signs of soil erosion or dislodged stone. Common corrective actions include removal of litter and accumulated sediment, replenishing of stone, and restabilization of eroded areas.

2.1.5 Drainage Inlet

Drainage Inlets will be inspected quarterly and cleaned to ensure that the pipe connections are working in their intended fashion and that they are free of debris. Sediments and hydrocarbons will be properly handled and disposed of off-site, in accordance with local, state, and federal guidelines and regulations. The method of sediment removal will be by hand or vacuum and disposal must be documented.

2.1.6 Vegetated Drainage Swale

Vegetated drainage swales shall be inspected bi-annually and mowed, cleaned, or restabilized as necessary. Inspections shall include ensuring vegetation is adequate, checking for woody vegetation, litter or accumulated sediment is obstructing flow, and checking if there are signs of erosion. Common corrective actions include removal of litter and accumulated sediment, mowing, removal of woody vegetation, and re-stabilization of eroded areas.

2.1.7 Infiltration Trench

Infiltration trenches shall be inspected bi-annually and mowed, cleaned, or restabilized as necessary. Inspections shall include ensuring vegetation is adequate, checking exposed stones, accumulated sediment is obstructing flow, and checking if there are signs of erosion. Common corrective actions include removal of accumulated sediment, mowing, and re-stabilization of eroded areas.

2.1.8 Infiltration System

The stormwater management system includes subsurface recharge areas constructed of Cultec® Chambers. Inlets to the chambers will be inspected a least bi-annually to ensure the chambers are functioning properly. Cultec® has defined the appropriate inspection and maintenance procedures. Refer to Appendix B Operation & Maintenance Cultec Infiltration System for the procedures.

2.1.9 Rain Garden

The Rain Garden area shall be inspected bi-annually and mowed, cleaned, or restabilized as necessary. Inspections shall include ensuring vegetation is adequate, if litter or accumulated sediment is obstructing the overflow path and checking if there are signs of erosion. Common corrective actions include removal of litter and accumulated sediment, mowing, and re-stabilization of eroded areas.

3 Practices for Long-Term Pollution Prevention (LTPP)

The Owner or designated responsible party shall implement the LTPP practices set forth in this document.

3.1 Good Housekeeping Measures

The Owner or designated responsible party shall implement the following good housekeeping measures to ensure long-term pollution prevention and provide suitable practices for source control of pollutants.

3.1.1 Vehicles Washing Controls

The washing of vehicles is not anticipated at this site. In the event that vehicle washing is conducted at the site, it will be performed in a location where runoff can be collected in the closed stormwater collection system and directed to a stormwater quality unit. Runoff resulting from vehicle washing will not be directly discharged to a wetland.

3.1.2 Snow Management Guidelines

Snow shall not be dumped directly into water bodies, wetlands and surrounding buffer zones, or stormwater BMPs. Snow pile sites shall be in areas with relatively level slopes with stabilized groundcover, and a linear sedimentation control barrier shall be placed securely on the downgradient side of a snow pile. At the end of the snow season, debris accumulated sediment shall be cleared from the snow pile site and properly disposed of in accordance with local, state and federal guidelines and regulations.

3.1.3 Mosquito Control Guidelines

If evidence of mosquitos is found in any of the sediment forebays, larvicide may be applied by a licensed pesticide applicator in compliance with all pesticide label requirements, as well as any applicable local, state, or federal guidelines and regulations.

3.1.4 Pet Waste Management

Scoop up and seal pet waste in a plastic bag and dispose of properly in a closed solid waste container.

3.1.5 Solid Waste Management

Dispose of or recycle solid waste in closed containers and in accordance with any applicable local, state and federal guidelines and regulations.

3.1.6 Material Storage and Spill Prevention

Deicing chemicals, fertilizers, herbicides, pesticides, or other hazardous materials shall be stored under a roof or other structure and shall be kept in original containers unless they are not resealable. Manufacturer's labels and material safety data sheets shall be retained. Try to store only enough product required for the job, and when possible all of a product shall be used before disposing of the container. Manufacturer, local, state and federal guidelines and regulations for proper use and disposal shall be followed.

Manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel shall be made aware of the procedures and the location of the information and cleanup supplies. Materials and equipment necessary for spill cleanup shall be kept in the material storage area on-site. Equipment and materials shall include, but not be limited to, brooms, dustpans, mops, rags, gloves, goggles, kitty litter, sand or sawdust, as well as plastic and metal containers specifically for this purpose. All spills shall be cleaned up immediately after discovery.

3.1.7 Routine Inspection and Maintenance of Stormwater BMPs

Conduct inspection and maintenance of the stormwater BMPs in accordance with the Stormwater O&M Program discussed above.

3.1.8 Maintenance of Landscaped Areas

Routine mowing shall be conducted on a consistent basis with grass cut to an adequate height to maintain a healthy and full vegetative cover. Bare areas, areas of sparse growth, and signs of erosion shall be addressed in accordance with the Stormwater O&M Program discussed above.

3.1.9 Prohibition of Illicit Discharges

Illicit discharges are discharges that do not entirely consist of stormwater, except for certain specified non-stormwater discharges such as firefighting activities, water line flushing, irrigation systems, lawn watering, and wash water from buildings without detergents. There are no known or proposed illicit connections associated with the Project, however if a potential illicit discharge is detected it shall be investigated to determine the nature and source of the discharge, and if required action shall be taken to eliminate the illicit discharge.

APPENDIX A

Inspection and Maintenance Log

Sena Residence

SAMPLE Inspection and Maintenance Log Form

Inspector or Maintenance Personnel Name: _____
Date: _____

☐ Routine
☐ Response to Rainfall Event (_____ inches)
☐ Other (describe) _____

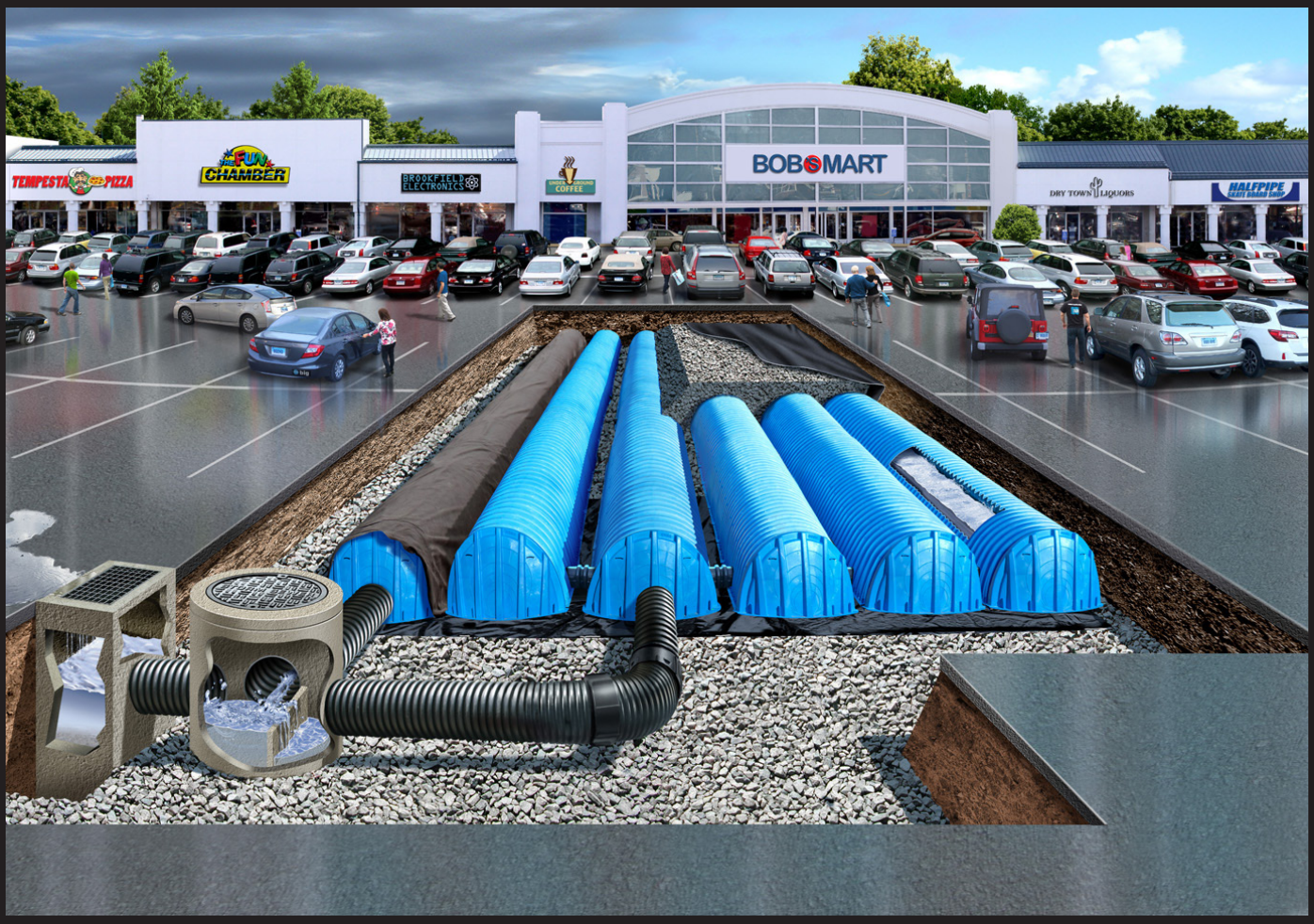
BMP	Required Inspection Frequency	Maintenance Frequency	Comments	Follow-up Action Required (Yes / No)
Street Sweeping	Not Applicable	Quarterly; Primarily in spring, after winter snowmelt, and fall		
Yard Cleanout	Annually	As Needed		
Storm Drain Piping	Annually	As Needed		
Flared End Section and Stone Apron	Quarterly	As Needed		
Drainage Inlet	Quarterly	As Needed		
Vegetated Drainage Swale	Bi-annually	As Needed		
Infiltration Trench	Bi-annually	As Needed		
Rain Garden	Bi-annually	As Needed		

APPENDIX B

Operation & Maintenance Cultec Infiltration System

CULTEC SEPARATOR™ ROW

WATER QUALITY SYSTEM



OPERATION & MAINTENANCE GUIDE

FOR CULTEC STORMWATER MANAGEMENT SYSTEMS

CULTEC®

STORMWATER MANAGEMENT SOLUTIONS

Published by
CULTEC, Inc.
P.O. Box 280
878 Federal Road
Brookfield, Connecticut 06804 USA
www.cultec.com

Copyright Notice

Disclaimers:

The drawings, photographs and illustrations shown in this document are for illustrative purposes only and are not necessarily to scale.
Actual designs may vary.

CULTEC reserves the right to make design and/or specification changes at any time without notice at CULTEC's sole discretion.

CULTEC is not responsible for typographical errors.

Protected by one or more of the following patents:

Protected by one or more of the following patents:
U.S. Patents 6,129,482; 6,322,288; 6,854,925; 7,226,241; 7,806,627; 8,366,346; 8,425,148; and others; U.S. Designs D613819; D638,095; D668,318 and others; Canadian Patent 2,591,255 and others; Community Designs 1092191; 1745209; and others.

Contact Information:

For general information on our other products and services, please contact our offices within the United States at (800)428-5832, (203)775-4416 ext. 202, or e-mail us at custservice@cultec.com.

For technical support, please call (203)775-4416 ext. 203 or e-mail tech@cultec.com.

Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

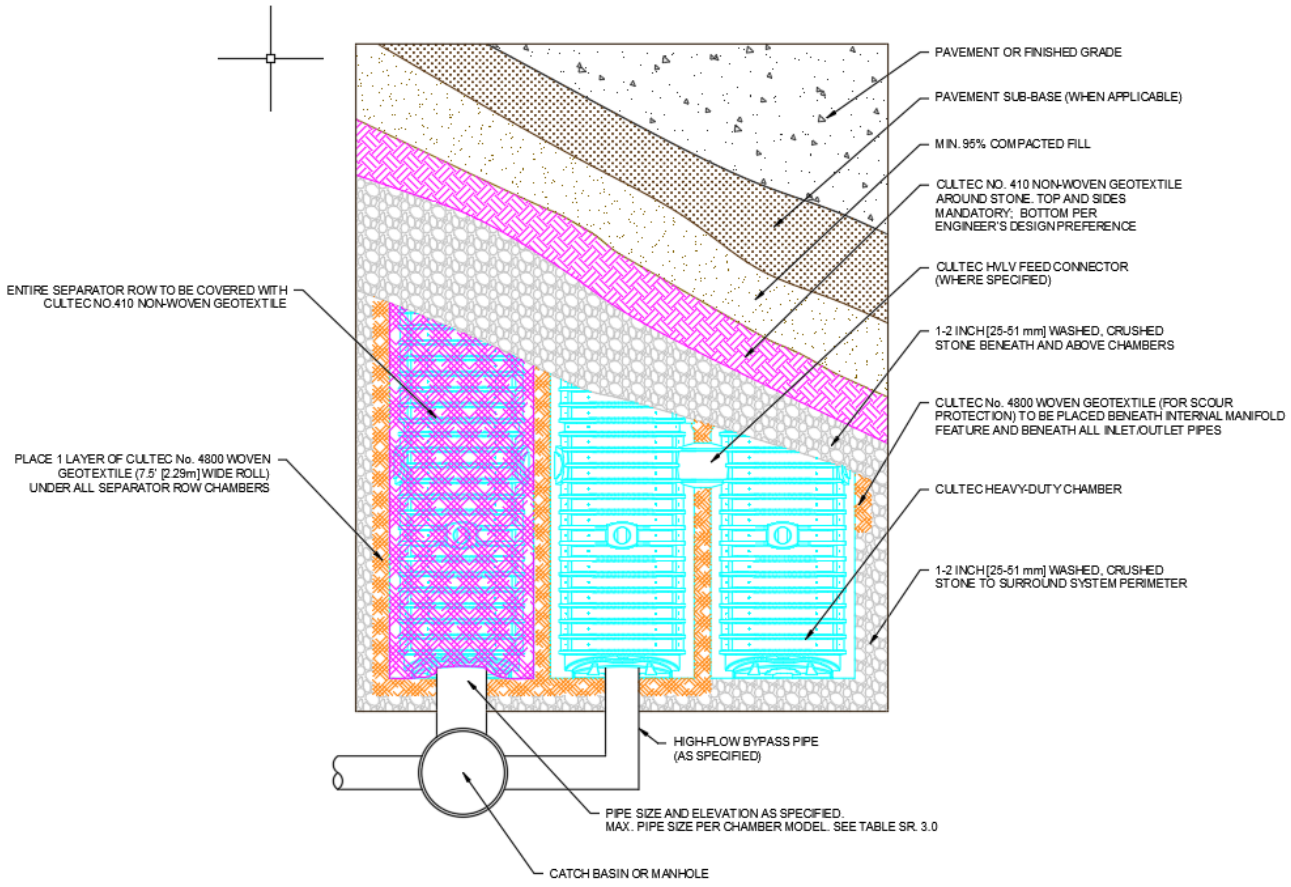
Doc ID: CLT043 12-19
December 2019

Introduction

CULTEC's Separator™ Row is an inexpensive means of removing Total Suspended Solids from the CULTEC chamber system, as well as providing easier access for inspection and maintenance. The Separator Row is designed to capture the First Flush of a rain event and is typically included as part of the "Treatment Train" for water quality.

The CULTEC Separator Row is a row of CULTEC Contactor or Recharger Chambers that are surrounded on all sides by filter fabric. One layer of CULTEC No. 4800™ Woven Geotextile are placed between the clean foundation stone and the chamber feet. The chambers are then completely wrapped with CULTEC No. 410™ non-woven geotextile. This configuration is designed to trap any sediment and/or debris that may pass through the upstream water-quality structures and into the chamber system.

A manhole is typically located adjacent to the separator row for ease of inspection and maintenance. This manhole is placed upstream of the system and can include a high-flow bypass pipe to pass peak-flows onto adjacent rows of chambers. The upstream manhole is designed with a sump to trap heavier sediment and allow for proper cleaning of the Separator Row. A JetVac process with a high pressure water nozzle is introduced down the Separator Row via the access manhole to clean all sediment and debris from the Separator Row. Captured pollutants are flushed into the sumped access manhole for vacuuming, and the process is repeated until the Separator Row is completely free of sediment and debris.



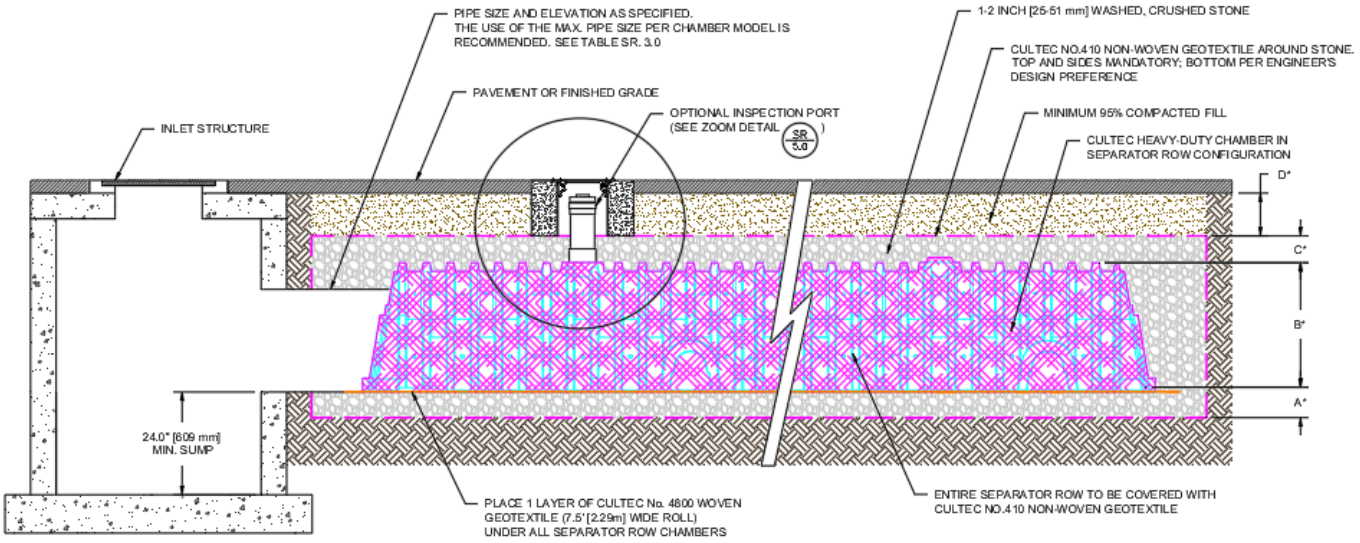
Design

There is no single design to achieve a high level of water quality. The CULTEC Separator Row should be designed as part of an overall best management practices water quality system. Pre-treatment devices such as sump catch basins, inlet baffles and proprietary oil-grit separators and filter systems can all be incorporated upstream of the CULTEC Separator Row. Sumped access/diversion manholes should be installed directly upstream of the Separator Row.

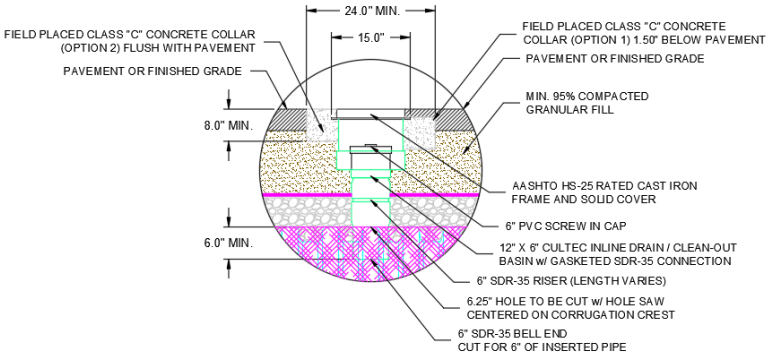
The following is a list of recommended design practices to ensure proper maintenance for the life of the system:

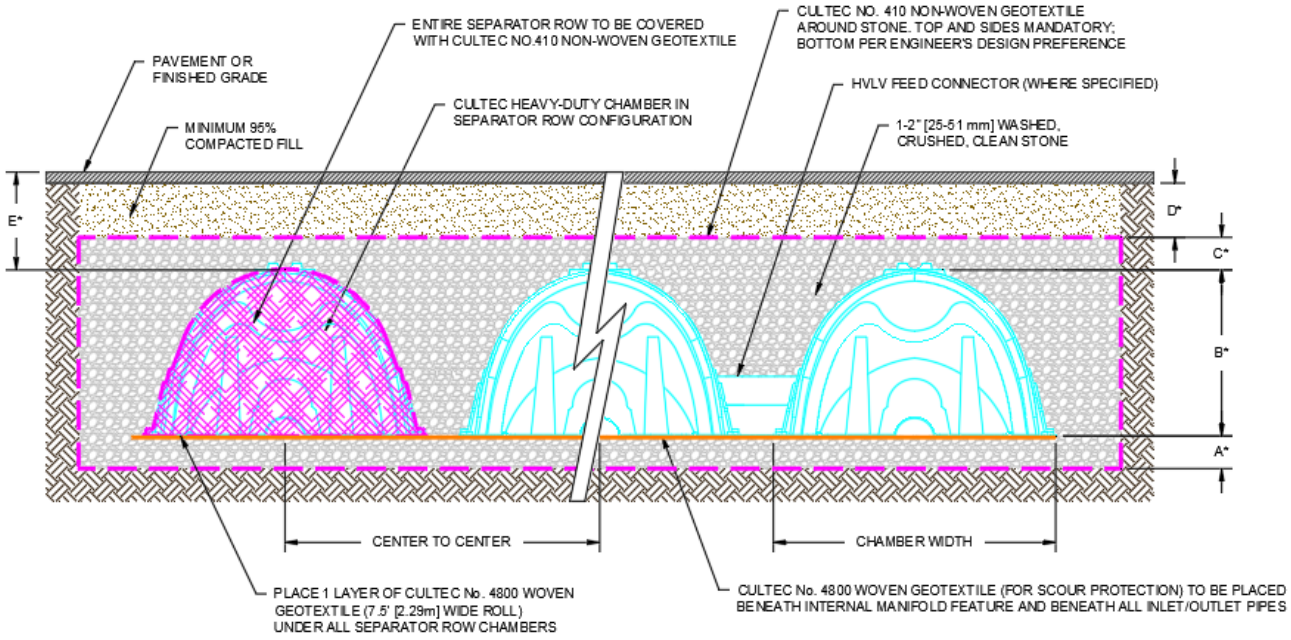
- Install sumped access/diversion manholes, including a minimum 24” (600 mm) sump, directly upstream of the Separator Row.
- Include a high-flow bypass pipe to divert peak flows that exceed the capacity of the Separator Row to adjacent rows.
- Connect the access manhole to the Separator Row with the largest diameter pipe allowable based on the CULTEC chamber model used.
- Maintain a minimum distance between the access manhole and the Separator Row to promote efficient maintenance.
- Include at least one inspection port per Separator Row for periodic inspection.

Note: Typical JetVac maintenance reels have a maximum of 400 feet (121.9 m) of available hose. Consider this when designing the length of the CULTEC Separator Rows.



*SEE SR 3.0 - CROSS SECTION TABLE REFERENCE





*SEE SR 3.0 - CROSS SECTION TABLE REFERENCE

Table SR 3.0

	Description	Contactor 100HD	Recharger 150XLHD	Recharger 280HD	Recharger 330XLHD	Recharger 902HD
A	Min. depth of stone base	6″ 152 mm	6″ 152 mm	6″ 152 mm	6″ 152 mm	9″ 229 m
B	Chamber height	12.5″ 318 mm	18.5″ 470 mm	26.5″ 673 mm	30.5″ 775 mm	48″ 1219 mm
C	Min. depth of stone required above units for traffic applications	6″ 152 mm	6″ 152 mm	6″ 152 mm	6″ 152 mm	12″ 305 mm
D	Min. depth required of 95% compacted fill for paved traffic application	8″ 203 mm	8″ 203 mm	8″ 203 mm	10″ 254 mm	12″ 3305 mm
E	Max. depth of cover allowed above crown of chamber	12′ 3.65 m	12′ 3.65 m	12′ 3.65 m	12′ 3.65 m	8.5′ 2.59 m
	Max. allowable pipe size into chamber end wall/end cap	10″ 250 mm	12″ 300 mm	18″ 450 mm	24″ 600 mm	24″ 600 mm

Inspection and Maintenance

CULTEC recommends inspection of the Separator Row to be performed every six months for the first year of service. Future inspection frequency can be adjusted based upon previous inspection observations. However annual inspections are recommended. Inspection of the Separator Row can be achieved via an inspection port riser installed during construction. This inspection port riser will connect the top of the Separator Row chambers to finished grade with a removable lid. Alternatively the Separator Row may be inspected via the manhole(s) located at the end(s) of the Separator Row. However this method of inspection requires confined space entry. If entry into the manhole is required, all local and OSHA rules for confined space entries must be strictly followed.

To inspect:

- Remove the inspection port lid from the floor box frame.
- Remove the riser pipe cap.
- With a flashlight and stadia rod, measure the depth of sediment.
- Record results in a maintenance log.
- When depth of sediment exceeds 3” (76 mm), use the JetVac procedure described below.

The JetVac process utilizes a high pressure water nozzle controlled from the surface. The high pressure nozzle is introduced down the Separator Row via the access manhole(s). The high pressure water cleans all sediment and debris from the Separator Row as the nozzle is retrieved. Captured pollutants are flushed into the sumped access manhole for vacuuming. This process is repeated until the Separator Row is completely free of sediment and debris. A small diameter culvert cleaning nozzle is recommended for this procedure.

High pressure water nozzle

Cleaning Separator Row and pipes with high pressure water nozzle

SEPARATOR ROW: Separator Row prior to cleaning

ADJACENT ROW: When the Separator Row is working properly, the adjacent rows will not show signs of sediment.

Inspection and Maintenance Record

Date	Mode of Access	Frequency	Depth of Sediment	Actions	Expenses	Inspector	Notes
Ex.	Inspection Port	Semi-annually	2”	Measure sediment depth with stadia rod. Visually inspect	$100	DPG	Depth of Sediment was measured via Northeast Inspection Port Adjacent to MH-1. Sediment depth was found to be 2”. No further action required at this time.
Ex.	Access Manhole	Annually					

CULTEC, Inc.
878 Federal Road • P.O. Box 280 • Brookfield, CT 06804 USA
P: (203) 775-4416 • Toll Free: 1(800) 4-CULTEC • www.cultec.com

RETENTION • DETENTION • INFILTRATION • WATER QUALITY

CULTEC, Inc.
878 Federal Road • P.O. Box 280 • Brookfield, CT 06804 USA
P: (203) 775-4416 • Toll Free: 1(800) 4-CULTEC • www.cultec.com

RETENTION • DETENTION • INFILTRATION • WATER QUALITY

APPENDIX A

Inspection and Maintenance Log

Sena Residence

SAMPLE Inspection and Maintenance Log Form

Inspector or Maintenance Personnel Name: _____
Date: _____

☐ Routine
☐ Response to Rainfall Event (_____ inches)
☐ Other (describe) _____

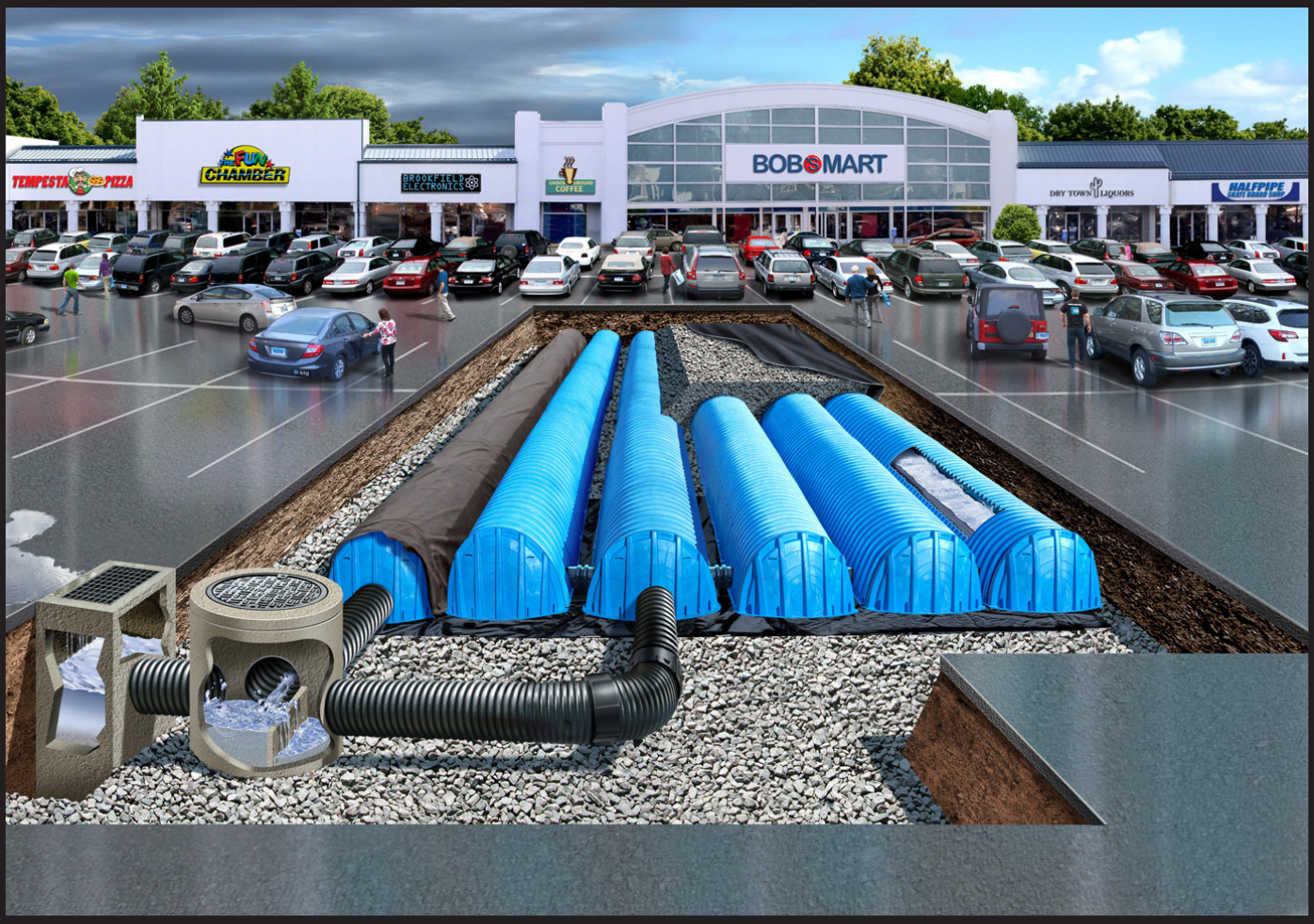
BMP	Required Inspection Frequency	Maintenance Frequency	Comments	Follow-up Action Required (Yes / No)
Street Sweeping	Not Applicable	Quarterly; Primarily in spring, after winter snowmelt, and fall		
Yard Cleanout	Annually	As Needed		
Storm Drain Piping	Annually	As Needed		
Flared End Section and Stone Apron	Quarterly	As Needed		
Drainage Inlet	Quarterly	As Needed		
Vegetated Drainage Swale	Bi-annually	As Needed		
Infiltration Trench	Bi-annually	As Needed		
Rain Garden	Bi-annually	As Needed		

APPENDIX B

Operation & Maintenance Cultec Infiltration System

CULTEC SEPARATOR™ ROW

WATER QUALITY SYSTEM



OPERATION & MAINTENANCE GUIDE

FOR CULTEC STORMWATER MANAGEMENT SYSTEMS

CULTEC®

STORMWATER MANAGEMENT SOLUTIONS

Published by
CULTEC, Inc.
P.O. Box 280
878 Federal Road
Brookfield, Connecticut 06804 USA
www.cultec.com

Copyright Notice

Disclaimers:

The drawings, photographs and illustrations shown in this document are for illustrative purposes only and are not necessarily to scale.
Actual designs may vary.

CULTEC reserves the right to make design and/or specification changes at any time without notice at CULTEC's sole discretion.

CULTEC is not responsible for typographical errors.

Protected by one or more of the following patents:

Protected by one or more of the following patents:
U.S. Patents 6,129,482; 6,322,288; 6,854,925; 7,226,241; 7,806,627; 8,366,346; 8,425,148; and others; U.S. Designs D613819; D638,095; D668,318 and others; Canadian Patent 2,591,255 and others; Community Designs 1092191; 1745209; and others.

Contact Information:

For general information on our other products and services, please contact our offices within the United States at (800)428-5832, (203)775-4416 ext. 202, or e-mail us at custservice@cultec.com.

For technical support, please call (203)775-4416 ext. 203 or e-mail tech@cultec.com.

Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

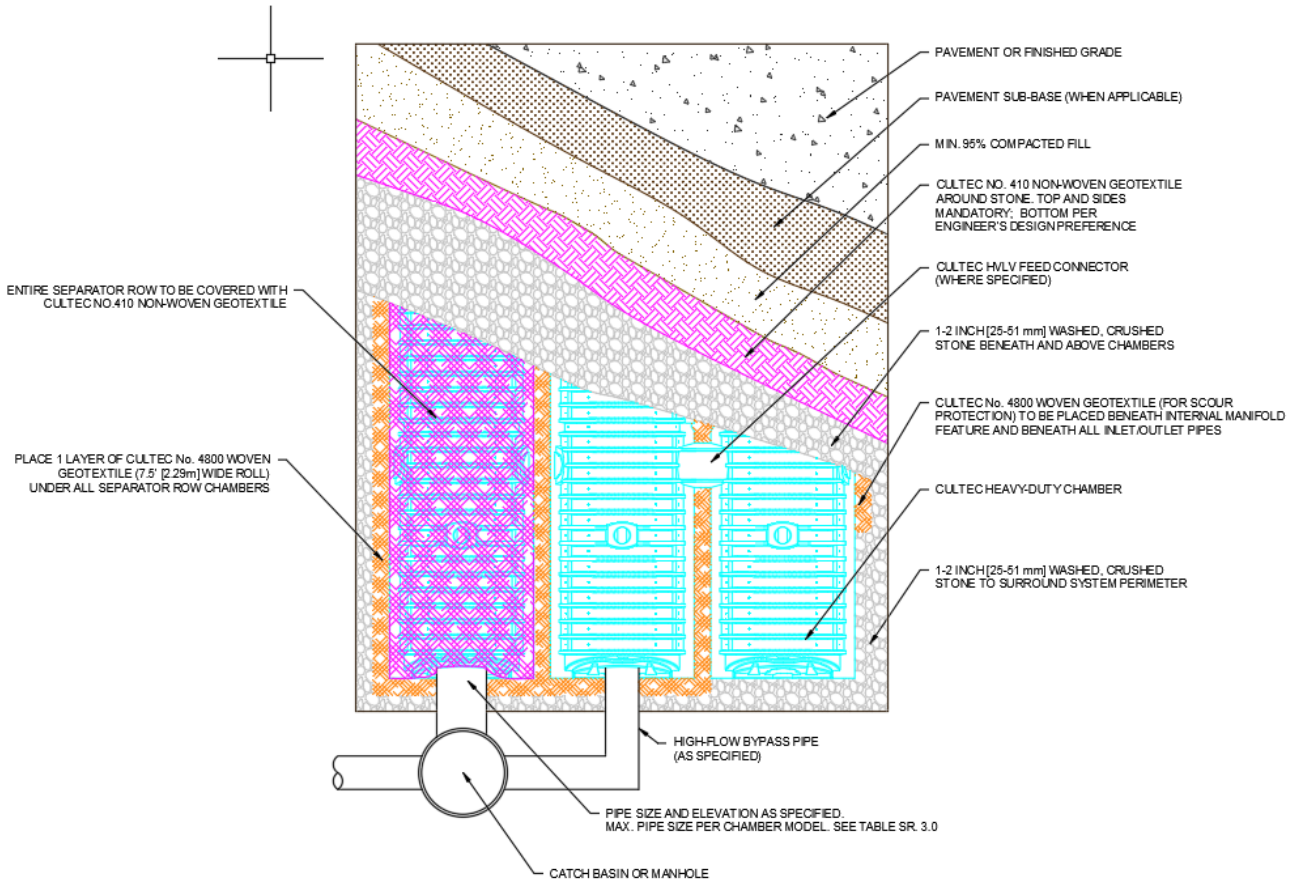
Doc ID: CLT043 12-19
December 2019

Introduction

CULTEC's Separator™ Row is an inexpensive means of removing Total Suspended Solids from the CULTEC chamber system, as well as providing easier access for inspection and maintenance. The Separator Row is designed to capture the First Flush of a rain event and is typically included as part of the "Treatment Train" for water quality.

The CULTEC Separator Row is a row of CULTEC Contactor or Recharger Chambers that are surrounded on all sides by filter fabric. One layer of CULTEC No. 4800™ Woven Geotextile are placed between the clean foundation stone and the chamber feet. The chambers are then completely wrapped with CULTEC No. 410™ non-woven geotextile. This configuration is designed to trap any sediment and/or debris that may pass through the upstream water-quality structures and into the chamber system.

A manhole is typically located adjacent to the separator row for ease of inspection and maintenance. This manhole is placed upstream of the system and can include a high-flow bypass pipe to pass peak-flows onto adjacent rows of chambers. The upstream manhole is designed with a sump to trap heavier sediment and allow for proper cleaning of the Separator Row. A JetVac process with a high pressure water nozzle is introduced down the Separator Row via the access manhole to clean all sediment and debris from the Separator Row. Captured pollutants are flushed into the sumped access manhole for vacuuming, and the process is repeated until the Separator Row is completely free of sediment and debris.



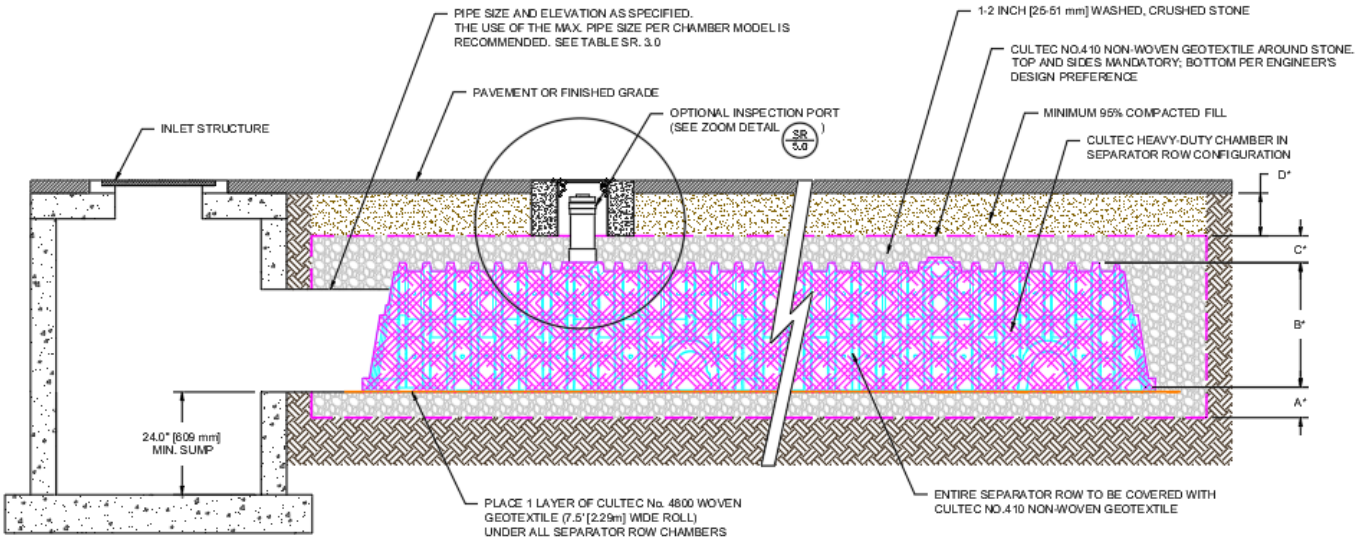
Design

There is no single design to achieve a high level of water quality. The CULTEC Separator Row should be designed as part of an overall best management practices water quality system. Pre-treatment devices such as sump catch basins, inlet baffles and proprietary oil-grit separators and filter systems can all be incorporated upstream of the CULTEC Separator Row. Sumped access/diversion manholes should be installed directly upstream of the Separator Row.

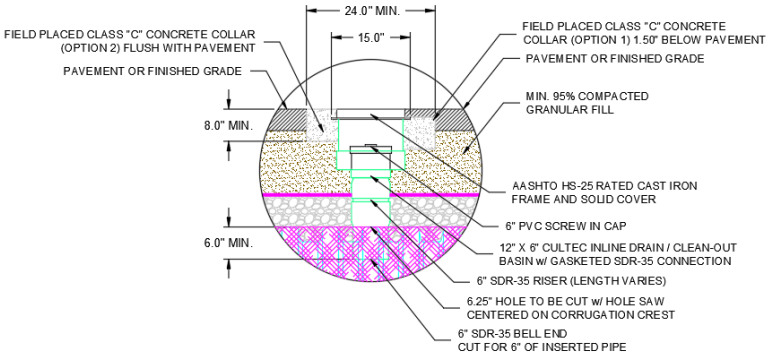
The following is a list of recommended design practices to ensure proper maintenance for the life of the system:

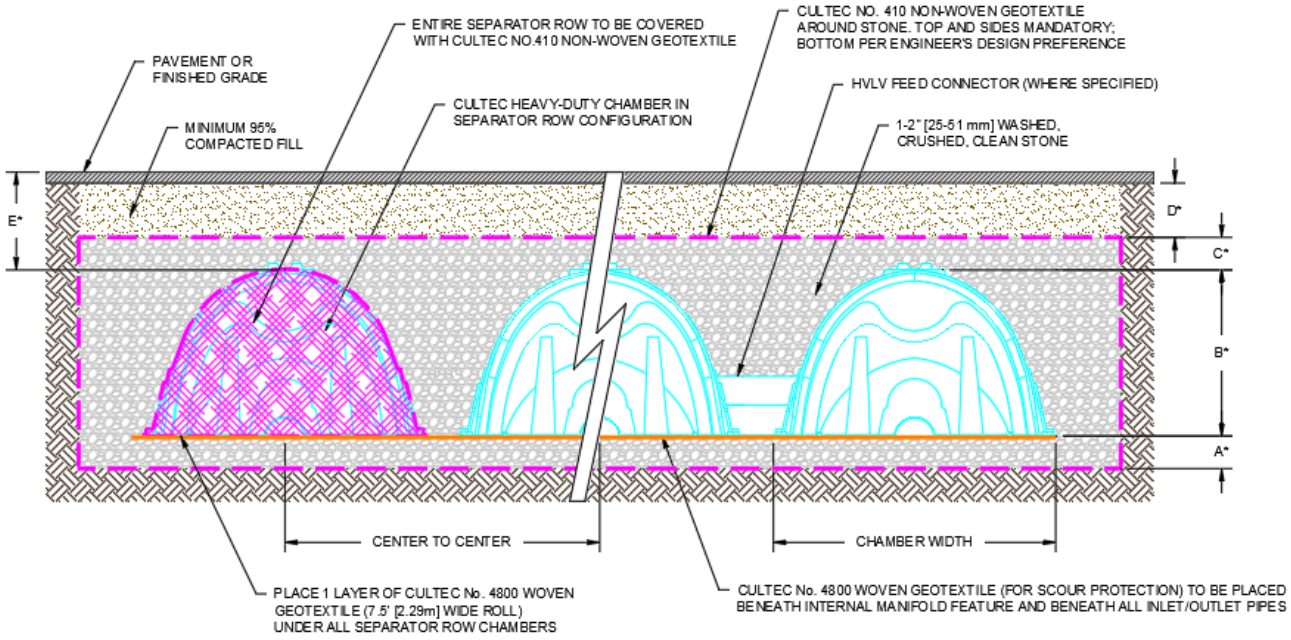
- Install sumped access/diversion manholes, including a minimum 24” (600 mm) sump, directly upstream of the Separator Row.
- Include a high-flow bypass pipe to divert peak flows that exceed the capacity of the Separator Row to adjacent rows.
- Connect the access manhole to the Separator Row with the largest diameter pipe allowable based on the CULTEC chamber model used.
- Maintain a minimum distance between the access manhole and the Separator Row to promote efficient maintenance.
- Include at least one inspection port per Separator Row for periodic inspection.

Note: Typical JetVac maintenance reels have a maximum of 400 feet (121.9 m) of available hose. Consider this when designing the length of the CULTEC Separator Rows.



*SEE SR 3.0 - CROSS SECTION TABLE REFERENCE





*SEE SR 3.0 - CROSS SECTION TABLE REFERENCE

Table SR 3.0

	Description	Contactor 100HD	Recharger 150XLHD	Recharger 280HD	Recharger 330XLHD	Recharger 902HD
A	Min. depth of stone base	6″ 152 mm	6″ 152 mm	6″ 152 mm	6″ 152 mm	9″ 229 m
B	Chamber height	12.5″ 318 mm	18.5″ 470 mm	26.5″ 673 mm	30.5″ 775 mm	48″ 1219 mm
C	Min. depth of stone required above units for traffic applications	6″ 152 mm	6″ 152 mm	6″ 152 mm	6″ 152 mm	12″ 305 mm
D	Min. depth required of 95% compacted fill for paved traffic application	8″ 203 mm	8″ 203 mm	8″ 203 mm	10″ 254 mm	12″ 3305 mm
E	Max. depth of cover allowed above crown of chamber	12′ 3.65 m	12′ 3.65 m	12′ 3.65 m	12′ 3.65 m	8.5′ 2.59 m
	Max. allowable pipe size into chamber end wall/end cap	10″ 250 mm	12″ 300 mm	18″ 450 mm	24″ 600 mm	24″ 600 mm

Inspection and Maintenance

CULTEC recommends inspection of the Separator Row to be performed every six months for the first year of service. Future inspection frequency can be adjusted based upon previous inspection observations. However annual inspections are recommended. Inspection of the Separator Row can be achieved via an inspection port riser installed during construction. This inspection port riser will connect the top of the Separator Row chambers to finished grade with a removable lid. Alternatively the Separator Row may be inspected via the manhole(s) located at the end(s) of the Separator Row. However this method of inspection requires confined space entry. If entry into the manhole is required, all local and OSHA rules for confined space entries must be strictly followed.

To inspect:

- Remove the inspection port lid from the floor box frame.
- Remove the riser pipe cap.
- With a flashlight and stadia rod, measure the depth of sediment.
- Record results in a maintenance log.
- When depth of sediment exceeds 3” (76 mm), use the JetVac procedure described below.

The JetVac process utilizes a high pressure water nozzle controlled from the surface. The high pressure nozzle is introduced down the Separator Row via the access manhole(s). The high pressure water cleans all sediment and debris from the Separator Row as the nozzle is retrieved. Captured pollutants are flushed into the sumped access manhole for vacuuming. This process is repeated until the Separator Row is completely free of sediment and debris. A small diameter culvert cleaning nozzle is recommended for this procedure.

High pressure water nozzle

Cleaning Separator Row and pipes with high pressure water nozzle

SEPARATOR ROW: Separator Row prior to cleaning

ADJACENT ROW: When the Separator Row is working properly, the adjacent rows will not show signs of sediment.

Inspection and Maintenance Record

Date	Mode of Access	Frequency	Depth of Sediment	Actions	Expenses	Inspector	Notes
Ex.	Inspection Port	Semi-annually	2”	Measure sediment depth with stadia rod. Visually inspect	$100	DPG	Depth of Sediment was measured via Northeast Inspection Port Adjacent to MH-1. Sediment depth was found to be 2”. No further action required at this time.
Ex.	Access Manhole	Annually					

CULTEC, Inc.
878 Federal Road • P.O. Box 280 • Brookfield, CT 06804 USA
P: (203) 775-4416 • Toll Free: 1(800) 4-CULTEC • www.cultec.com

RETENTION • DETENTION • INFILTRATION • WATER QUALITY

CULTEC, Inc.
878 Federal Road • P.O. Box 280 • Brookfield, CT 06804 USA
P: (203) 775-4416 • Toll Free: 1(800) 4-CULTEC • www.cultec.com

RETENTION • DETENTION • INFILTRATION • WATER QUALITY

APPENDIX J

Illicit Discharge Statement
Standard 10

ILLICIT DISCHARGE COMPLIANCE STATEMENT

Project No. B05377

Owner Name: Claudio Sena

Site Address: 146 Georgetown Road, Boxford MA

Date: 09/20/2021

Dear Mr. Povenmire,

This statement is provided in accordance with the provisions of Massachusetts Stormwater Management Standards (the Standards), Standard 10, and the Massachusetts Stormwater Handbook.

To the best of the Owners and Engineers knowledge, no illicit discharges exist on the Project Site and no illicit discharges are proposed as part of the Project. The facility's Operation & Maintenance Plans are designed to prevent non-stormwater discharge to on-site stormwater Best Management Practices. Any illicit discharges identified during or after construction will be immediately disconnected in accordance with the Standards.

Carlos Ferreira, MSc, PE

966 Hyde Park Ave. #303 | Boston, MA 02136
Tel: 508-331-7261 | www.mf-eng.com

APPENDIX I

Notice of Intent Plans

General Notes

1. THE GENERAL CONTRACTOR IS TO BE RESPONSIBLE FOR THE HORIZONTAL AND VERTICAL CONTROL OF ALL SYSTEM COMPONENTS.

2. THIS PLAN IS TO SHOW THE DESIGN OF THE SUBSURFACE DISPOSAL THIS PLAN IS TO SHOW THE DESIGN OF THE SUBSURFACE DISPOSAL SYSTEM ONLY. THE SYSTEM IS DESIGNED FOR FLOWS ESTIMATED UNDER DESIGN CONDITIONS.

3. THE SYSTEM IS DESIGNED ONLY TO ACCOMMODATE SANITARY SEWAGE ASSOCIATED WITH NORMAL DOMESTIC USAGE AND CONSISTING OF WATER-CARRIED PUTRESCIBLE WASTE.

4. THIS SYSTEM IS NOT DESIGNED FOR GARBAGE GRINDERS.

5. THE SYSTEM SHALL BE VENTED THROUGH THE BUILDING PLUMBING AS REQUIRED BY BUILDING CODE.

6. PROPERTY LINES AND BUILDING LOCATIONS ARE GRAPHIC ONLY. PROPERTY LINES NOT HAVING BEEN VERIFIED, NO REPRESENTATION OR CERTIFICATION AS TO THE ACCURACY OF THOSE SHOWN IS IMPLIED OR INTENDED.

7. APPLICABLE ZONING REGULATIONS SHALL BE CONFIRMED BY THE OWNER PRIOR TO CONSTRUCTION.

8. THE PLAN SHOWS ONLY THOSE FEATURES THAT WERE VISUALLY APPARENT ON THE DATE OF SURVEY AND THE ABSENCE OF SUBSURFACE STRUCTURES, UTILITIES, ETC., IS NOT INTENDED OR IMPLIED.

9. THE INSTALLER OF THE SYSTEM MUST BE LICENSED BY THE LOCAL BOARD OF HEALTH.

10. THERE ARE NO EXISTING WELLS WITHIN 150' FEET OF THE PROPOSED SEWAGE DISPOSAL SYSTEM OR WITHIN 50' OF THE SEPTIC TANK.

11. DISPOSAL SYSTEM AREA IS TO BE RAKED (SCARIFIED) BEFORE DISPOSAL SYSTEM AREA IS TO BE RAKED (SCARIFIED) BEFORE INSTALLATION OF STONE. ALL STONES EXCEEDING 2-INCHES IN DIAMETER, ALL LOAM OR FOREIGN MATERIAL ENCOUNTERED DURING EXCAVATION SHALL BE REMOVED FROM THE LEACHING AREA BED SURFACE.

12. FINISHED SURFACE OF THE LEACHING AREA SHALL BE GRADED TO ASSURE WATER RUN-OFF.

13. ALL DISTURBED AREAS SHALL BE LOOMED, SEEDED, AND MAINTAINED TO PREVENT EROSION.

14. THE SEPTIC TANK SHOULD BE PERIODICALLY INSPECTED AND MAINTAINED AND SHOULD BE PUMPED WHEN SLUDGE IN THE BOTTOM EXCEEDS 1/4 OF DEPTH.

15. ALTERNATE MANUFACTURERS FOR CONCRETE STRUCTURES AND EQUIPMENT SHOWN ON THESE PLANS MAY BE USED UPON THE WRITTEN APPROVAL OF THE DESIGN ENGINEER. ALTERNATE MANUFACTURERS SHALL NOT BE USED IF THE USE OF THE EQUIPMENT REQUIRES DESIGN CHANGES.

16. IF ANY PART OF THE DESIGN IS TO BE ALTERED IN ANY WAY, THE DESIGN ENGINEER, AS WELL AS THE APPROVING AUTHORITIES SHALL BE NOTIFIED IN WRITING PRIOR TO CONSTRUCTION.

17. ALL WORK SHALL COMPLY WITH THE COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION - STATE SANITARY CODE TITLE 5 AND ANY BOARD OF HEALTH SUPPLEMENTAL REGULATIONS.

18. THE LOCAL BOARD OF HEALTH WILL CONDUCT PERIODIC INSPECTIONS AS NEEDED.

19. A RESIDENT INSPECTOR FROM MF ENGINEERING SHALL BE ON SITE TO: (a) INSPECT THE INSTALLATION OF ALL CONCRETE STRUCTURES PRIOR TO BEING BACKFILLED, (b) INSPECT THE BOTTOM OF THE LEACH BED AT THE TIME IT IS SCARIFIED, AND (c) INSPECT THE LEACH BED AREA PRIOR TO BEING BACKFILLED. THE DESIGN ENGINEER AND THE LOCAL BOARD OF HEALTH SHALL BE GIVEN AT LEAST 48 HOURS NOTICE BY THE GENERAL CONTRACTOR PRIOR TO COMMENCEMENT OF THE ABOVE CONSTRUCTION OPERATIONS. THE DESIGN ENGINEER SHALL SUBMIT AN AS-BUILT SKETCH OF THE SYSTEM TO THE BOARD OF HEALTH WITHIN 2 WEEKS OF COMPLETION.

20. THESE PLANS AND SPECIFICATIONS ARE INTENDED TO ENCOMPASS THE PROPOSED WORK. SHOULD ANY OMISSIONS, ERRORS, OR DISCREPANCIES OCCUR, THE ENGINEER MUST BE NOTIFIED IMMEDIATELY AND THESE PLANS AND SPECIFICATIONS SHALL BE SUBJECT TO CORRECTION AND INTERPRETATION BY THE DESIGN ENGINEER, THEREBY DEFINING AND FULFILLING THE INTENT OF THE DESIGN.

21. THERE ARE NO SURFACE WATER SUPPLIES OR TRIBUTARIES TO RESERVOIRS WITHIN 100' OF THE PROPOSED LEACHING AREA AND OF THE PROPOSED SEPTIC TANK.

22. THERE ARE NO EXISTING OR PROPOSED CATCH BASINS, SUBSURFACE DRAINS, INCLUDING FOUNDATION DRAINS OR DRYWALLS WITHIN 25' OF THE 25' OF THE OF THE PROPOSED LEACHING AREA AND SEPTIC TANK.

23. ALL CONNECTIONS AND JOINTS SHALL BE MECHANICALLY SOUND AND TIGHT.

24. EFFLUENT DISTRIBUTION LINE OUTLET ORIFICES SHALL BE EVENLY SPACED ALONG TWO ROWS RUNNING THE LENGTH OF THE LINE, ON EACH SIDE, MIDWAY BETWEEN THE INVERT AND CENTERLINE WHICH SEPARATES THE UPPER AND LOWER HALVES OF THE PIPE. FOR GRAVITY DISTRIBUTION, ORIFICES SHALL BE NO SMALLER THAN 3/8-INCH AND NO LARGER THAN 5/8-INCH DIAMETER.

25. EFFLUENT DISTRIBUTION LINES SHALL HAVE A SLOPE OF 0.005 FEET PER FOOT AND SHALL HAVE ENDS CAPPED OR CONNECTED TOGETHER BY UNPERFORATED PIPE OF THE SAME MATERIAL SPECIFICATIONS.

26. DISTRIBUTION LINES CONNECTING THE DISTRIBUTION BOX OR PUMP CHAMBER TO THE SOIL ABSORPTION SYSTEM SHALL BE UNPERFORATED WITH WATER TIGHT CONNECTIONS AND JOINTS.

27. DISTRIBUTION LINES EXCEEDING 50-FEET IN LENGTH SHALL BE CONNECTED AND VENTING PROVIDED IN ACCORDANCE WITH 310 CMR 15.241.

28. THE 15' DISTANCE FOR BREAKOUT IS MEASURED HORIZONTALLY FROM THE TOP OF STONE. *SEE PLAN & PROFILE.

29. BOTTOM AND SIDEWALL AREA TO BE SCARIFIED TO A DEPTH OF 1-INCH PRIOR TO PLACEMENT OF STONE.

30. THE CONTRACTOR IS RESPONSIBLE FOR ALL PLUMBING FOR THE PROPOSED DWELLING AND IS TO ASSURE THAT ALL INTERIOR PLUMBING IS PROPERLY CONNECTED TO THE PROPOSED SEPTIC TANK. IN CASES OF REPAIRS, CONTRACTOR SHALL CONFIRM THAT ALL INTERIOR PLUMBING WILL BE ABLE TO FLOW TO THE PROPOSED SEPTIC TANK PRIOR TO CONSTRUCTION. AT A MINIMUM, THE CONTRACTOR SHALL USE A DYE TEST OR CAMERA TO CONFIRM EXISTING PLUMBING. CONTRACTOR SHALL REPORT ANY DISCREPANCY TO THE LOCAL BOARD OF HEALTH AND DESIGN ENGINEER PRIOR TO CONSTRUCTION.

31. WETLANDS: FLAGGED BY RIMMER ENVIRONMENTAL CONSULTING INC. AND APPROVED BY THE BOXFORD CONSERVATION COMMISSION.

NOTICE OF INTENT (NOI)
SENA RESIDENCE
146 GEORGETOWN ROAD
BOXFORD, MA

SHEET NO.	SHEET TITLE
- -	COVER SHEET
C-101	EXISTING CONDITIONS AND EROSION CONTROL PLAN
C-102	GRADING AND DRAINAGE PLAN
C-103	SEPTIC SYSTEM DESIGN AND CALCULATIONS
C-104	SEPTIC SYSTEM PROFILES AND DETAILS
C-105	EXISTING LANDSCAPE PLAN
C-106	PROPOSED LANDSCAPE PLAN
C-501-502	CONSTRUCTION DETAILS

SYSTEM AS-BUILT REQUIREMENTS

CONTRACTOR SHALL COORDINATE WITH THE DESIGN ENGINEER AND AT A MINIMUM MAKE THE FOLLOWING SYSTEM COMPONENTS OPEN & ACCESSIBLE FOR HORIZONTAL AND VERTICAL LOCATION FOR AS-BUILT PLANS:

ALL PIPES LEACHING FIELD, TRENCHES AND OR GALLERIES D-BOX SEPTIC TANK VENTS PUMP CHAMBER, ELECTRICAL HAND-HOLE IMPERVIOUS BARRIER (40 MIL HDPE POLYVINYL CHLORIDE FLEXIBLE MEMBRANE) - IF APPLICABLE. INVERT AT BUILDING ANY OTHER APPLICABLE SYSTEM COMPONENTS

AS-BUILT NOTES: WHEN AN IMPERVIOUS BARRIER (40 MIL HDPE POLYVINYL CHLORIDE FLEXIBLE MEMBRANE) IS INSTALLED CONTRACTOR SHALL LEAVE TOP EXPOSED FOR HORIZONTAL AND VERTICAL LOCATION. WHEN PRESSURE DOSING, CONTRACTOR SHALL HAVE ALL ELECTRICAL CONNECTIONS INCLUDING ALARM COMPLETED PRIOR TO AS-BUILT. PUMPS SHALL BE TESTED AND PUMP DRAW DOWN CONFIRMED. WHERE APPLICABLE, THE SQUIRT HEIGHT SHALL BE MEASURED AND RECORDED.

Material Notes

1. LEACH BEDDING A. CLEAN DOUBLE WASHED STONE SHALL BE FREE OF IRONS, FINES, DUST AND ORGANIC MATTER AS LAID. DOUBLE WASHED STONE SHALL CONFORM TO AASHO T-11-70. B. BOTTOM STONE IN LEACH SYSTEM SHALL BE 3/4" TO 1 1/2" DOUBLE WASHED STONE AS INDICATED IN NOTE 'A' ABOVE. C. TOP STONE IN LEACH SYSTEM SHALL BE 1/8" TO 3/8" DOUBLE WASHED STONE AS INDICATED IN NOTE 'A' ABOVE.

2. CONCRETE STRUCTURES: CONCRETE STRUCTURES SHALL BE 4000 PSI AT 28 DAYS WITH A 6" x 6" x 10" GAUGE STEEL WIRE MESH. USE HYDRAULIC COMPOUND CONNECTIONS TO PROVIDE WATER TIGHTNESS AT SEPTIC TANK AND DISTRIBUTION BOX INLET & OUTLETS. SEPTIC TANK CONSTRUCTION JOINTS SHALL BE SEALED WITH ASPHALT CEMENTS.

3. PIPE MATERIALS: PIPE MATERIALS: DISTRIBUTION LINES FOR LEACHING TRENCHES SHALL BE CONSTRUCTED OF POLYVINYL CHLORIDE (PVC) PLASTIC (ASTM 26655), SCHEDULE 40 NSF. FORCEMAIN LINES SHALL BE INSTALLED TO GUARD AGAINST FREEZING.

4. SYSTEM FILL: SYSTEM FILL: FILL MATERIAL FOR SYSTEMS CONSTRUCTED IN FILL SHALL CONSIST OF ON-SITE OR IMPORTED SOIL MATERIAL. THE FILL SHALL BE COMPRISED OF CLEAN GRANULAR SAND, FREE FROM ORGANIC MATTER AND DELETERIOUS SUBSTANCES. MIXTURES AND DIFFERENT CLASSES OF SOIL SHALL NOT BE USED. THE FILL SHALL NOT CONTAIN ANY MATERIAL LARGER THAN 2 INCHES. A SIEVE ANALYSIS, USING A #4 SIEVE, SHALL BE PERFORMED ON A REPRESENTATIVE SAMPLE OF THE FILL. UP TO 45% BY WEIGHT OF THE FILL SAMPLE MAY BE RETAINED ON THE #4 SIEVE. SIEVE ANALYSIS ALSO SHALL BE PERFORMED ON THE FRACTION OF THE FILL SAMPLE PASSING THE #4 SIEVE, SUCH ANALYSES MUST DEMONSTRATE THAT THE MATERIAL MEETS EACH OF THE FOLLOWING SPECIFICATIONS.

SIEVE SIZE PARTICLE SIZE	PASS SIEVE EFFECTIVE	
#4	4.75 MM	100%
#50	0.30 MM	10%-100%
#100	0.15 MM	0%-20%
#200	0.075 MM	0%-5%

PRIOR TO PLACEMENT OF THE FILL, WHICH SHALL BE STOCKPILED AT THE EDGE OF THE EXCAVATION AND FILLED IN GRADUALLY, THE BOTTOM SURFACE OF THE EXCAVATION SHALL BE SCARIFIED AND RELATIVELY DRY. FILL SHALL NOT BE PLACED DURING RAIN OR SHOW STORMS. IF THE WATER TABLE ELEVATION IS ABOVE THE ELEVATION OF THE BOTTOM OF THE EXCAVATION, THE EXCAVATION SHALL BE DEWATERED AS NECESSARY.

SUBSURFACE DISPOSAL SYSTEM & MAINTENANCE

A SEPTIC SYSTEM IS USED TO DISPOSE AND TREAT HOUSEHOLD SEWAGE. IT CONSISTS OF A RECTANGULAR WATER TIGHT BOX (THE SEPTIC TANK) AND A LEACHING AREA. WASTE WATER FROM THE HOUSE FLOWS DIRECTLY INTO THE SEPTIC TANK. THERE THE LARGER SOLIDS SETTLE TO THE BOTTOM, FORMING A LAYER OF SLUDGE. THE LIGHTER PARTICLES RISE TO THE SURFACE, FORMING A LAYER OF SCUM. BACTERIA IN THE TANK WORK TO DECOMPOSE THE SOLIDS IN THESE LAYERS. IN SPITE OF THIS DECOMPOSITION, REGULAR REMOVAL OF THE SLUDGE LAYER IS NECESSARY, EVEN UNDER NORMAL CONDITIONS, AS IT WILL EVENTUALLY BUILD UP TO THE POINT WHERE SLUDGE OVERFLOWS THROUGH THE OUTLET PIPE AND INTO THE LEACHING AREA. THIS MAY BLOCK THE ENTIRE LEACHING AREA, THUS CAUSING SYSTEM FAILURE. THEREFORE, A REGULAR SEPTIC TANK PUMPING SCHEDULE IS RECOMMENDED TO AVOID LEACHING AREA PROBLEMS. CONTACT THE LOCAL BOARD OF HEALTH FOR RECOMMENDED PUMPING SCHEDULE. THE LIQUID PORTION OF THE SEWAGE FLOWS FROM THE SEPTIC TANK TO THE LEACHING SYSTEM, WHICH CONSISTS OF A SERIES OF PERFORATED PIPES OR A PRECAST PIT PLACED IN TRENCHES OR BEDS OF WASHED STONE. THIS SYSTEM DISTRIBUTES THE LIQUID SEWAGE INTO THE SURROUNDING SOIL, WHERE IT IS FILTERED AND TREATED.

1. IN ACCORDANCE WITH CHAPTER 82 SECTION 40 IN ACCORDANCE WITH CHAPTER 82 SECTION 40 INCLUDING AMENDMENTS, THE CONTRACTOR SHALL NOTIFY IN WRITING ALL UTILITY COMPANIES AND GOVERNMENT AGENCIES PRIOR TO EXCAVATION WORK AND CALL DIG-SAFE AT 1-800-DIG-SAFE PRIOR TO COMMENCING WORK.

2. THE LOCATION OF EXISTING UNDERGROUND UTILITIES THE LOCATION OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVES. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTORS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

3. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATIONS, AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.

4. CONTRACTOR SHALL FIELD VERIFY AND LOCATE ALL CONTRACTOR SHALL FIELD VERIFY AND LOCATE ALL EXISTING UTILITIES AND REPORT ANY DISCREPANCIES TO THE ENGINEER PRIOR TO COMMENCING WORK.

COMMONWEALTH OF MASSACHUSETTS
CARLOS FERREIRA
CIVIL
No. 41423
REGISTERED PROFESSIONAL ENGINEER

No.	Date	Revisions
4	09/27/21	COMMISSION COMMENTS
3	08/17/21	STORMWATER MANAGEMENT
2	07/15/21	BORING TEST AND WETLAND LINE
1	06/11/21	NOI SUBMITTAL

Prepared for:
CLAUDIO SENA
146 GEORGETOWN ROAD
BOXFORD, MA, 01921

Property at:
MF ENGINEERING
142 FISHER STREET
WESTBOROUGH, MA 01581

Prepared By:
ENGINEERING & DESIGNS
Structural Engineering / Building Design
Civil Engineering / Management Services
CARLOS FERREIRA PROFESSIONAL ENGINEER
PHONE: 508-331-7281 SITE: WWW.MF-ENG.COM
EMAIL: CARLOS.FERREIRA@MF-ENG.COM

Carlos E. Ferreira P.E. #41.423

Date:

Project Title
NOTICE OF INTENT
SENA RESIDENCE

Sheet Title
COVER SHEET

SCALE	1"=20'
DRAWN	CMS
CHECKED	CEF
FILE NAME	146 GEORGETOWN
PROJECT	146 GEORGETOWN ROAD
ISSUE DATE	05/21/21
JOB NO.	146-0521

NOTES

1. EXISTING CONDITIONS INFORMATION IS BASED ON SURVEY FROM "ASB DESIGN GROUP LLC" FOR PROJECT TITLED "146 GEORGETOWN ROAD - SEPTIC SYSTEM". THIS DESIGNED SEPTIC SYSTEM HAD BEEN APPROVED BY THE BOXFORD CONSERVATION COMMISSION.
2. ALL AREAS DISTURBED BY PROPOSED WORK SHALL BE LOAMED AND SEEDED PER DETAIL "STABILIZATION MULCHING AND SEEDING DETAIL"
3. PROJECT LOCATED ON FEMA FLOOD INSURANCE RATE MAP (FIRM) , MAP NUMBER 25009C0261F. AS ZONE A. ZONE AH FOR BASE FLOOD ELEVATION IS GIVEN BETWEEN 1-3 FT IN AREAS OF PONDING. GIVEN ZONE AH IS AT HIGHER RISK THAN ZONE A THEREFORE BASE FLOOD ELEVATION ESTIMATED AT 114' USING THE MAXIMUM DEPTH OF 3'.

LEGEND

EXISTING CONTOUR

EXISTING TREE 247

ZONING SETBACK

DEMO EXISTING STRUCTURES

APPROX. EXISTING CESS POOL

ANDREW W. & KAREN A. EVANS 25-4-9

150' WELL RADIUS

3" BLACK WATER PIPING

FLOAT

BOUNDARY LINE FOLLOWS EDGE OF STEVENS POND

STEVENS POND
(A GREAT POND)
WATER LAVEL = 109.20' (11/01/2017)

BASE FLOOD ELEVATION

LIMIT OF WETLAND

WETLAND FLAGS (TYP)

25' NO DISTURB

150' BUILD ZONE

100' BUFFER ZONE

PROPOSED COMPOST FILTER TUBE

LIMIT OF DISTURBANCE ±2.55 ACRES

ZONING SETBACK

REMOVE EXISTING GRAVEL DRIVE AND ENTRANCE

BENCHMARK CUT-SPIKE 16" PINE ELEV.=120.76'

TEST PIT 4
TEST PIT 3
PERC. 2
PERC. 1
PERC. 3A
TEST PIT 2
TEST PIT 3A
TEST PIT 1
PERC. 1A
TEST PIT 1A

CONSTRUCTION STOCKPILING AND LAYDOWN AREA

CONSTRUCTION ENTRANCE 50 L X 18 W

GEORGETOWN ROAD (PUBLIC WAY)

IPSWICH ROAD (PUBLIC WAY)

E.C.-S.B. PIN (FD.)

E.C.-S.B. CTR. BK. (FD.)

D.H. (FD.)

EDGE OF PAVEMENT

PAVED SWALE

GRAVEL

OVERHEAD WIRES

0 10' 20' 40'
SCALE: 1" = 20'

COMMONWEALTH OF MASSACHUSETTS
CARLOS FERREIRA
CIVIL
No. 41423
REGISTERED PROFESSIONAL ENGINEER

No.	Date	Description
4	09/27/21	COMMISSION COMMENTS
3	08/17/21	STORMWATER MANAGEMENT
2	07/15/21	EXISTING TREES AND WETLAND LINE
1	06/11/21	NOI SUBMITTAL

Revisions

Prepared for:
CLAUDIO SENA
146 GEORGETOWN ROAD
BOXFORD, MA, 01921

Property of:
142 FISHER STREET LLC
142 FISHER STREET
WESTBOROUGH, MA 01581

Prepared By:
MF ENGINEERING & DESIGNS
Structural Engineering / Building Design
Civil Engineering / Management Services
CARLOS FERREIRA PROFESSIONAL ENGINEER
PHONE: 508-331-7261 SITE: WWW.MF-ENG.COM
EMAIL: CARLOS.FERREIRA@MF-ENG.COM

Carlos E. Ferreira P.E. #41.423

Date:

Project Title

NOTICE OF INTENT
SENA RESIDENCE

Sheet Title

EXISTING CONDITIONS AND EROSION CONTROL

SCALE	1"=20'
DRAWN	CMS
CHECKED	CEF
FILE NAME	146 GEORGETOWN
PROJECT	146 GEORGETOWN RD
ISSUE DATE	05/21/2021
JOB NO.	146-0521

SHEET C-101

LEGEND

- EXISTING CONTOUR
- EXISTING TREE
- ZONING SETBACK
- BUILDING
- MINOR CONTOUR
- MAJOR CONTOUR
- SPOT GRADE

NOTES

1. EXISTING CONDITIONS INFORMATION IS BASED ON SURVEY FROM "ASB DESIGN GROUP LLC" FOR PROJECT TITLED "146 GEORGETOWN ROAD - SEPTIC SYSTEM". THIS DESIGNED SEPTIC SYSTEM HAD BEEN APPROVED BY THE BOXFORD CONSERVATION COMMISSION.
2. ALL AREAS DISTURBED BY PROPOSED WORK SHALL BE LOAMED AND SEEDED PER DETAIL "STABILIZATION MULCHING AND SEEDING DETAIL"
3. PROJECT LOCATED ON FEMA FLOOD INSURANCE RATE MAP (FIRM) , MAP NUMBER 25009C0261F. AS ZONE A. ZONE AH FOR BASE FLOOD ELEVATION IS GIVEN BETWEEN 1-3 FT IN AREAS OF PONDING. GIVEN ZONE AH IS AT HIGHER RISK THAN ZONE A THEREFORE BASE FLOOD ELEVATION ESTIMATED AT 114' USING THE MAXIMUM DEPTH OF 3'.

STONE FOR PIPE ENDS (TYP)
RAIN GARDEN
FOUNDATION DRAIN FLARED END AND GARAGE INFILTRATION SYSTEM OVERFLOW FLARED END SECTION WITH STONE FOR PIPE ENDS OUTLET INVERT = 113.0+/-
3:1 SLOPE
GARAGE ENTRANCE RETAINING WALL
12" HDPE PIPE
INFILTRATION SYSTEM
INSPECTION PORT
PROP GARAGE DRAIN (RIM =116.8')
GARAGE ENTRANCE (10' BELOW GRADE)
CAR PORT
TOC = 127'
OUTDOOR POOL (DECK ELEV. = 125')
28' X 40' RESERVE AREA
28' (10' MIN)
15'
D-BOX
INSPECTION PORT
15' TOP OF STONE ELEVATION = 119.0
PROP 28' X 40' SEPTIC SYSTEM
DRIVEWAY INFILTRATION TRENCH (TYPICAL 1 OF 2)
2,000 GALLON 2-COMPARTMENT SEPTIC TANK
YARD CLEANOUT (TYP)
4" FOUNDATION DRAIN CORRUGATED HDPE SLOPE = 0.5% MIN (TYP)
PROP WELL
PROP ELECTRIC AND TELECOM SERVICE
250' STOPPING SIGHT DISTANCE
PROPOSED COMPOST FILTER TUBE
LIMIT OF DISTURBANCE ±2.55 ACRES
ZONING SETBACK
VEGETATED SWALE
100' BUFFER ZONE
75' NO BUILD ZONE
35' NO DISTURB
BASE FLOOD ELEVATION
LIMIT OF WETLAND
WETLAND FLAGS (TYP)
STEVENS POND
(A GREAT POND)
WATER LAVEL = 109.20' (11/01/2017)
BOUNDARY LINE FOLLOWS EDGE OF STEVENS POND
IPSWICH ROAD (PUBLIC WAY)
GEORGETOWN ROAD (PUBLIC WAY)
ANDREW W. & KAREN A. EVANS 25-4-9
BENCHMARK CUT-SPIKE 16" PINE ELEV.=120.76'
TEST PIT 1
TEST PIT 2
TEST PIT 3
TEST PIT 3A
PERC. 1
PERC. 2
PERC. 3A
PERC. 4A
E.C.-S.B. PIN (FD.)
E.C.-S.B. CTR. BK.
D.H. (FD.)
OVERHEAD WIRES
EDGE OF PAVEMENT
PAVED SWALE
150' WELL RADIUS
3" BLACK PIPING
FLOAT
HEDGE SLOPE
DRIVEWAY

0 10' 20' 40'
SCALE: 1" = 20'

No.	Date	Description
4	09/27/21	COMMISSION COMMENTS
3	08/17/21	STORMWATER MANAGEMENT
2	07/15/21	EXISTING TREES AND WETLAND LINE
1	06/11/21	NOI SUBMITTAL

Revisions

Prepared for:
CLAUDIO SENA
146 GEORGETOWN ROAD
BOXFORD, MA, 01921

Property of:
142 FISHER STREET LLC
142 FISHER STREET
WESTBOROUGH, MA 01581

Prepared By:
MF ENGINEERING & DESIGNS
Structural Engineering / Building Design
Civil Engineering / Management Services
CARLOS FERREIRA PROFESSIONAL ENGINEER
PHONE: 508-331-7261 SITE: WWW.MF-ENG.COM
EMAIL: CARLOS.FERREIRA@MF-ENG.COM

Carlos E. Ferreira P.E. #41.423
Date:

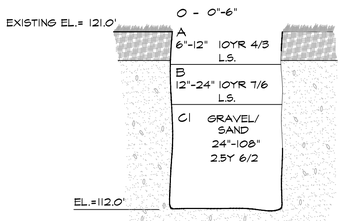
Project Title
NOTICE OF INTENT
SENA RESIDENCE

Sheet Title
SITE PLAN

SCALE	1"=20'
DRAWN	CEF
CHECKED	CEF
FILE NAME	146 GEORGETOWN
PROJECT	146 GEORGETOWN RD
ISSUE DATE	05/21/2021
JOB NO.	146-0521

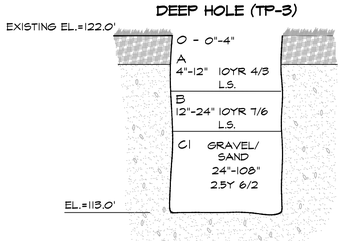
SHEET C-102

DEEP HOLE (TP-1)



REFUSAL	-
ESTIMATED HIGH WATER	AT 102" 7.5YR 5/6
WATER KEEPING	-
STANDING WATER	-

DEEP HOLE (TP-3)

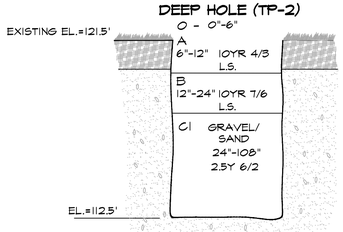


REFUSAL	-
ESTIMATED HIGH WATER	AT 96" 7.5YR 5/6
WATER KEEPING	-
STANDING WATER	-

DEEP HOLE / PERC. TESTING

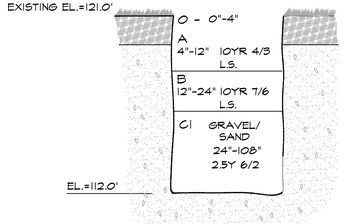
PERFORMED BY: THAD BERRY, P.E., ASB DESIGN GROUP, LLC
WITNESSED BY: BOXFORD BOARD OF HEALTH - KENDELL LONGO
DATE: OCTOBER 19, 2017 AND MAY 17, 2018

DEEP HOLE (TP-2)



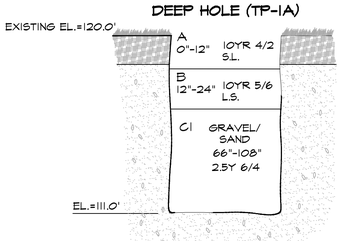
REFUSAL	-
ESTIMATED HIGH WATER	NONE AT 108"
WATER KEEPING	-
STANDING WATER	-

DEEP HOLE (TP-4)



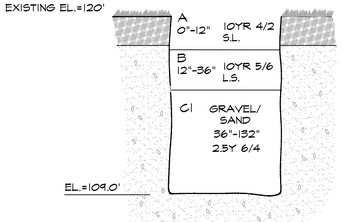
REFUSAL	-
ESTIMATED HIGH WATER	NONE AT 108"
WATER KEEPING	-
STANDING WATER	-

DEEP HOLE (TP-1A)



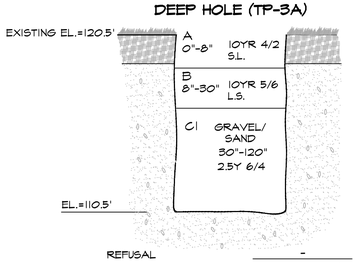
REFUSAL	-
ESTIMATED HIGH WATER	NONE AT 108"
WATER KEEPING	-
STANDING WATER	-

DEEP HOLE (TP-2A)



REFUSAL	-
ESTIMATED HIGH WATER	AT 120" 7.5YR 5/8
WATER KEEPING	-
STANDING WATER	AT 126"

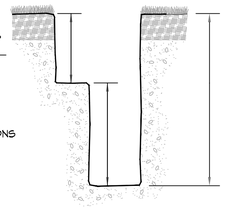
DEEP HOLE (TP-3A)



REFUSAL	-
ESTIMATED HIGH WATER	NONE AT 120"
WATER KEEPING	-
STANDING WATER	-

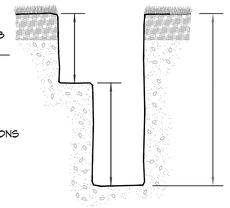
PERC TEST 1 AND 1A

15 MIN. SOAK	05/17/2018	
	10/19/2017	
12"		
11"		
10"		
9"		
8"		25 GALLONS
7"		
6"		
RATE:	< 2 MPI	



PERC TEST 2 AND 2A

15 MIN. SOAK	05/17/2018	
	10/19/2017	
12"		
11"		
10"		
9"		
8"		25 GALLONS
7"		
6"		
RATE:	< 2 MPI	



SOIL DATA

SOIL CLASS:

- X CLASS I: SANDS, LOAMY SANDS
- ___ CLASS II: SANDY LOAMS, LOAM
- ___ CLASS III: SILTY LOAMS
- CLASS IV: CLAYS, SILTY CLAY, LOAM
- SOIL UNSUITABLE FOR SUBSURFACE DISPOSAL SYSTEM.

PERC. RATE: < 2 MIN/IN DESIGN RATE: USE 10 MIN/IN

EFFLUENT LOADING RATE (GPD/SQ.FT)

PERC. RATE (MIN./INCH)	CLASS I	CLASS II	CLASS III	CLASS IV
<5	0.74(3.0)	0.60(2.5)	-	-
6	0.70(2.9)	0.60(2.5)	-	-
7	0.68(2.8)	0.60(2.5)	-	-
8	0.66(2.7)	0.60(2.5)	-	-
10	-	0.60(2.5)	-	-
15	-	0.56(2.3)	0.37(1.5)	-
20	-	0.53(2.2)	0.34(1.4)	-
25	-	0.40(1.6)	0.33(1.3)	-
30	-	0.33(1.3)	0.29(1.2)	-

LOADING RATE CRITERIA LISTED BELOW APPLY TO THE UPGRADE OF EXISTING SYSTEMS PURSUANT TO 310 CMR 15.405(1)(C), OR SYSTEMS CONSTRUCTED PURSUANT TO 310 CMR 15.417

40	-	-	0.25 (1.0)	-
50	-	-	0.20(0.8)	0.20(0.8)
60	-	-	0.15 (0.6)	0.15 (0.6)

SIZING CALCULATIONS

- DESIGN FLOW: 5 BEDROOMS X 110 GAL/BEDROOM = 550 GPD
- ADD GARBAGE DISPOSAL: 825 GPD
- * LEACHING AREA REQUIRED: 825 GPD / 0.74 GPD/SF = 1,115 SF
- * SYSTEM AREA PROVIDED: 28' WIDE x 40' LONG = 1,120 SF
- RESERVE AREA PROVIDED: 28' WIDE x 40' LONG = 1,120 SF

CALCULATIONS

LEACHING AREA SIZING

NO. OF BEDROOMS	5
GALLONS PER. DAY/BEDROOM	110
BASE DESIGN FLOW	550 GPD
ADD GARBAGE DISPOSAL	825 GPD
PERCOLATION RATE	5 MIN/IN
CLASS I SOIL	0.74 G/D/SF
* TOTAL AREA REQUIRED	1,115 S.F.
* LEACHING AREA PROVIDED	1,120 S.F.
RESERVE AREA PROVIDED	1,120 S.F.

SEPTIC TANK SIZING

200% DESIGN FLOW

TOTAL DESIGN FLOW 825 GPD

200% x 825 GALS/DAY = 1,650 GPD (MIN. REQUIRED)

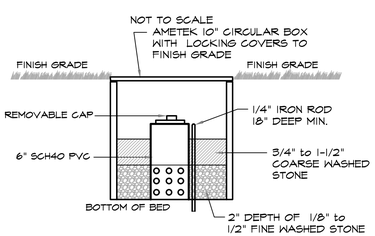
* SEPTIC TANK USED 2000 GAL 2-COMPARTMENT

DESIGN ELEVATIONS

(ALSO SEE PROFILE, CROSS-SECTIONS & PLANS)

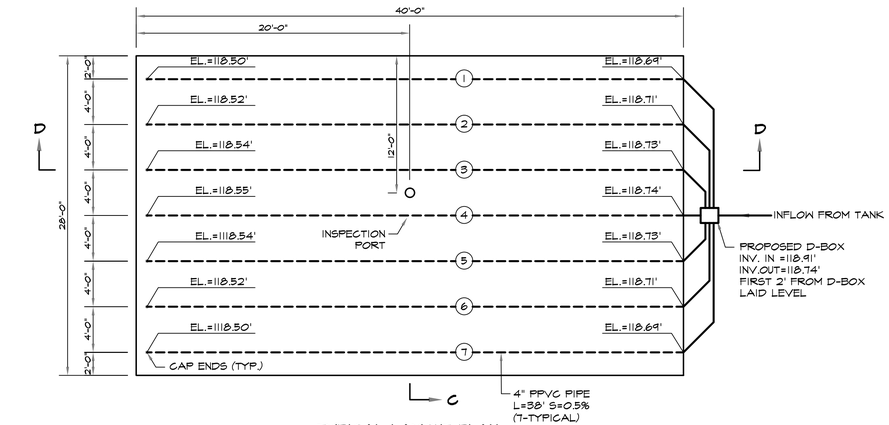
	BED
EXISTING DESIGN ELEVATION	120.5'
S.H.W.T (NONE @ 9')	111.50'
BOTTOM OF BED (+6.5' MIN.)	118.00'
BOTTOM OF PIPE (MIN. +0.5')	118.50' (PIPES 1&7)
TOP OF STONE (+0.5')	119.00'
D-BOX OUT	118.74'
D-BOX IN (+0.17')	118.91'
SEPTIC TANK OUT	119.63'
SEPTIC TANK IN (+0.25')	119.88'
INV AT HOUSE	120.92
TOP OF FOUNDATION	125.00'

NOTE: CONTRACTOR SHALL EXCAVATE AND CONFIRM INVERT AT BUILDING. CONTRACTOR SHALL REPORT ANY DISCREPANCY TO THE BOARD OF HEALTH AND THE DESIGN ENGINEER. CONTRACTOR SHALL UPON APPROVAL MAKE ALL NECESSARY FIELD ADJUSTMENTS THAT MAY BE REQUIRED.

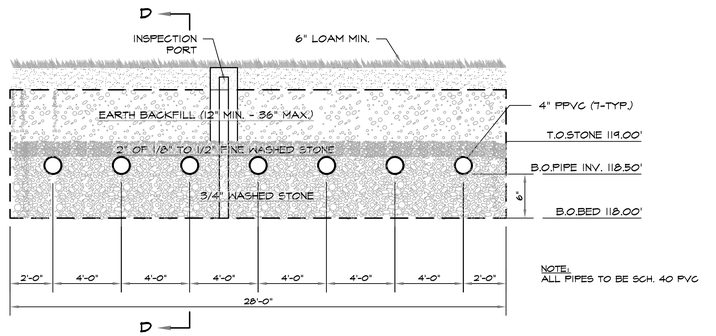


INSPECTION PORT DETAIL

NOT TO SCALE

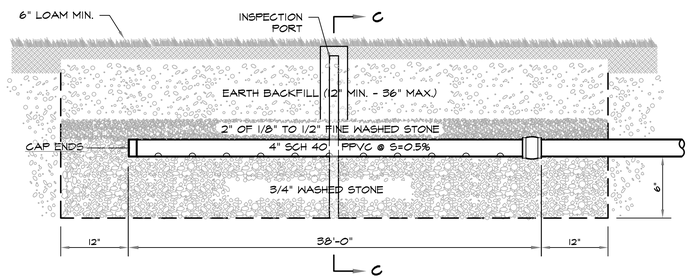


TYPICAL LAYOUT PLAN



NOTE:
ALL PIPES TO BE SCH. 40 PVC

TYPICAL CROSS SECTION C-C

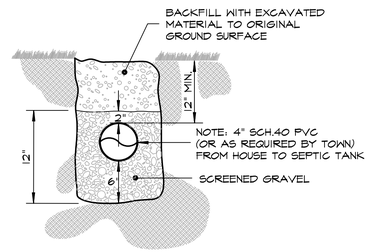


TYPICAL LONGITUDINAL SECTION D-D

NOTE:
ALL PIPES TO BE SCH. 40 PVC

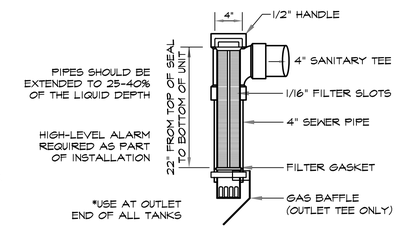
LEACHING BED DETAILS

NOT TO SCALE



TYPICAL CONNECTION TRENCH

NOT TO SCALE



ZABEL ENVIRONMENTAL MODEL A1800 4x22 OR EQUAL

OUTLET EFFLUENT FILTER

NOT TO SCALE

NOTE: THIS SHEET WAS DESIGNED BY ASB DESIGN GROUP LLC AND PREVISOULY APPROVED BY BOXFORD BOARD OF HEALTH DATED 7/2/18.

COMMONWEALTH OF MASSACHUSETTS
CARLOS FERREIRA
CIVIL
No. 41423
REGISTERED PROFESSIONAL ENGINEER

DATE:

No.	Date	Description
1	06/11/21	NOI SUBMITTAL

Revisions

Prepared for:
CLAUDIO SENA
146 GEORGETOWN ROAD
BOXFORD, MA, 01921

Property of:
142 FISHER STREET LLC
142 FISHER STREET
WESTBOROUGH, MA 01581

Prepared By:
MF ENGINEERING & DESIGNS
Structural Engineering / Building Design
Civil Engineering / Management Services
CARLOS FERREIRA PROFESSIONAL ENGINEER
PHONE: 508-331-7261 SITE: WWW.MF-ENG.COM
EMAIL: CARLOS.FERREIRA@MF-ENG.COM

Carlos E. Ferreira P.E. #41,423

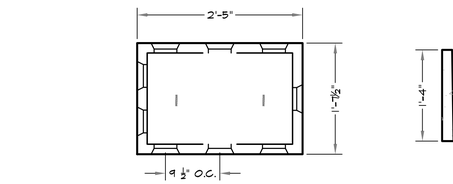
Date:

Project Title
NOTICE OF INTENT
SENA RESIDENCE

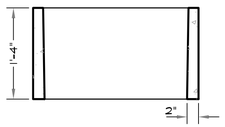
Sheet Title
SEPTIC SYSTEM DESIGN AND CALCULATIONS

SCALE	1"=20'
DRAWN	CMS
CHECKED	CEF
FILE NAME	146 GEORGETOWN
PROJECT	146 GEORGETOWN RD
ISSUE DATE	05/21/2021
JOB NO.	146-0521

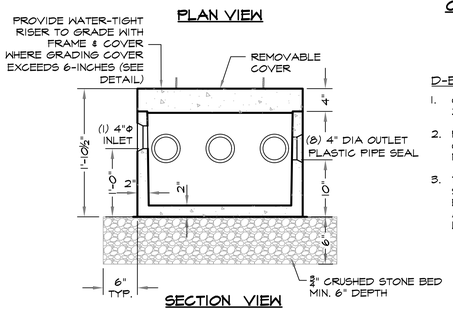
SHEET C-103



PLAN VIEW



OPTIONAL 12" RISER



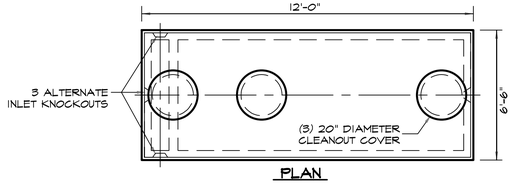
SECTION VIEW

D-BOX NOTES:

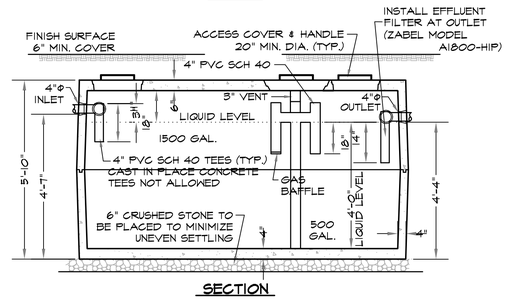
1. CONCRETE: 4,000 PSI MINIMUM AFTER 28 DAYS.
2. REINFORCEMENT SHALL BE ASTM A-165 GRADE 60, A-185 OR A-497 WITH A MINIMUM COVER OF 1-INCH.
3. THE D-BOX SHALL BE SET LEVEL ON A SOLID BASE. FLOW EQUALIZERS SHAL BE INSTALLED AT EACH OUTLETS AFTER THE DISTRIBUTION BOX IS SET LEVEL.

8-OUTLET DISTRIBUTION BOX (H-20)

NOT TO SCALE



PLAN



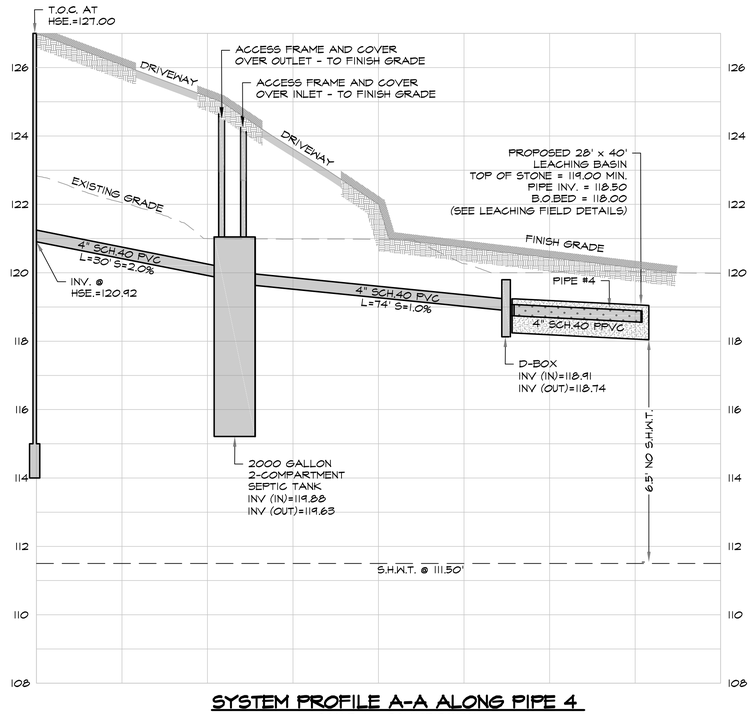
SECTION

NOTES:

1. PROVIDE A MINIMUM 2,000 GALLON MONOLITHIC TANK.
2. CONCRETE MINIMUM STRENGTH: 4,000 PSI AFTER 28 DAYS.
3. ALL JOINTS SHALL BE SEALED WITH 1"Ø BUTYL RUBBER OR EQUAL.
4. INSTALL LEVEL AND TRUE ON A LEVEL BASE THAT HAS BEEN MECHANICALLY COMPACTED.
5. USE SHEA CONCRETE MODEL 'TK-COMBO H-20' OR EQUAL.

SEPTIC TANK 2-COMPARTMENT 2,000 GALLON TANK

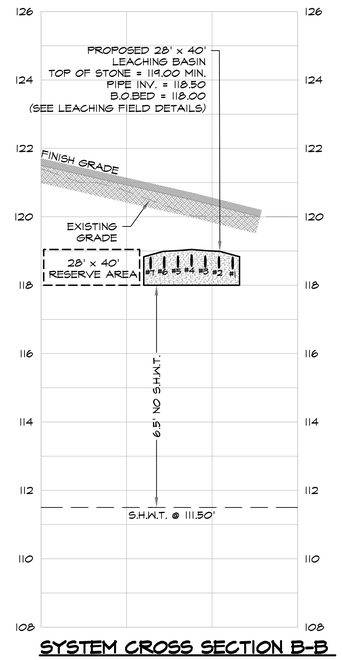
NOT TO SCALE



SYSTEM PROFILE A-A ALONG PIPE 4

SCALE: 1" = 20' HORIZONTAL
1" = 2' VERTICAL

NOTE:
ALL PIPES TO BE SCH. 40 PVC



SYSTEM CROSS SECTION B-B

SCALE: 1" = 20' HORIZONTAL
1" = 2' VERTICAL

NOTE:
ALL PIPES TO BE SCH. 40 PVC

GENERAL NOTES

1. CONTRACTOR SHALL INSTALL EROSION CONTROL SOCK PRIOR TO CONSTRUCTION.
2. CONTRACTOR SHALL STOCKPILE ALL LOAM AND SURROUND AREA WITH EROSION CONTROL SOCK.

LOAM & SEEDING NOTES

LOAMING, SEEDING AND FERTILIZING

1. IF REQUIRED THE CONTRACTOR SHALL FURNISH ALL TOPSOIL OR ADDITIONAL TOPSOIL NEEDED TO COMPLETE THE JOB. IF THE EXISTING TOPSOIL IS SUFFICIENT TO COMPLETE THE JOB, ANY EXCESS TOPSOIL WILL REMAIN ON SITE. AN AREA WILL BE PROVIDED ON SITE FOR FINAL STORAGE.
2. THE TOPSOIL SHALL BE UNIFORMLY DISTRIBUTED ON THE DESIGNATED AREAS AND IT SHALL BE A MINIMUM DEPTH OF SIX INCHES AFTER FIRMING, SPREADING SHALL BE PERFORMED IN SUCH A MANNER THAT SEEDING CAN PROCEED WITH A MINIMUM OF ADDITIONAL SOIL PREPARATION AND TILLAGE. ANY IRREGULARITIES IN THE SURFACE RESULTING FROM TOPSOILING OR OTHER OPERATIONS SHALL BE CORRECTED IN ORDER TO PREVENT THE FORMATION OF DEPRESSIONS OR WATER POCKETS. TOPSOIL SHALL NOT BE PLACED WHILE IN A FROZEN OR MUDDY CONDITION, WHEN THE SUBGRADE IS EXCESSIVLY WET, OR IN A CONDITION THAT MAY OTHERWISE BE DETRIMENTAL TO PROPER GRADING OR PROPOSED SEEDING.
3. AFTER LOAM HAS BEEN PLACED, LIME AND FERTILIZER SHALL BE UNIFORMLY MIXED INTO THE TOP FOUR INCHES OF SOIL BY DISCING, HARROWING OR USING OTHER APPROVED METHODS.
4. ANY UNDULATIONS OR IRREGULARITIES IN THE SURFACE RESULTING FROM FERTILIZING, LIMING, SURFACE ROUGHINING OR OTHER CAUSES SHALL BE LEVELED PRIOR TO SEEDING. FLOODED, WASHED-OUT OR OTHERWISE DAMAGED AREAS SHALL BE RECONSTRUCTED AND ALL GRADES RE-ESTABLISHED BY THE CONTRACTOR IN ACCORDANCE WITH THE DRAWINGS AND/ OR OTHER APPLICABLE SPECIFICATIONS.
5. PRIOR TO SEEDING THE SURFACE SHALL BE CLEARED OF ALL TRASH, DEBRIS AND STONES LARGER THAN ONE AND ONE-HALF INCHES IN DIAMETER, AND OF ALL ROOTS, BRUSH, WIRE, GRADE STAKES AND OTHER OBJECTS THAT WOULD INTERFERE WITH PLANTING OR MAINTENANCE OPERATIONS.
6. BROADCAST SEED AND MULCH. PLACE STRAW AND ANCHOR IT TO TOPSOIL. IF SOIL MOISTURE IS DEFICIENT, SUPPLY NEW SEEDLINGS WITH ADEQUATE WATER FOR PLANT GROWTH. (1/2"-1" EVERY 3-4 DAYS DEPENDING ON SOIL TEXTURE) UNTIL THEY ARE FIRMLY ESTABLISHED.

REPAIRS AND MAINTENANCE

INSPECT ALL SEEDED AREAS FOR FAILURES AND MAKE NECESSARY REPAIRS, REPLACEMENTS AND RESEEDINGS WITHIN THE PLANTING SEASON.

1. ONCE THE VEGETATION IS ESTABLISHED, THE SITE SHALL HAVE 95% GROUNDCOVER TO BE CONSIDERED ADEQUATELY STABILIZED.
2. IF THE STAND PROVIDES LESS THAN 40% GROUND COVERAGE, REESTABLISH FOLLOWING ORIGINAL LIME, FERTILIZER, SEEDBED PREPARATION AND SEEDING RECOMMENDATIONS.
3. IF THE STAND PROVIDES BETWEEN 40% AND 94% GROUND COVER AGE, OVERSEEDING AND FERTILIZING USING HALF OF THE RATES ORIGINALLY APPLIED MAY BE NECESSARY.

SURFACE PREPARATION

1. STRIP AND STOCKPILE ALL EXISTING LOAM FROM PROPOSED WORK AREAS. PROTECT LOAM FROM EROSION. ALL LOAM WILL REMAIN ON SITE UNLESS THE OWNER APPROVES OF OFF SITE REMOVAL.
2. SET FIELD GRADES IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. PROVIDE PROPER SURVEY CONTROL AND MAINTAIN THROUGHOUT CONSTRUCTION. PROVIDE ENGINEER WITH COPIES OF ALL SURVEY NOTES AND LOCATIONS OF BOTH VERTICAL AND HORIZONTAL CONTROL.
3. BRING BASE MATERIAL TO FINISH GRADE. PROVIDE ENGINEER WITH AS-BUILT DRAWINGS SHOWING FINISH ELEVATIONS AND CONTOURS PRIOR TO PLACEMENT OF LOAM.
4. SOIL TESTS SHALL BE MADE TO DETERMINE THE EXACT REQUIREMENTS FOR BOTH LIME AND FERTILIZER. SOIL TESTS SHALL BE CONDUCTED BY A STATE LABORATORY OR RECOGNIZED COMMERCIAL LABORATORY. PROVIDE ENGINEER WITH COPY OF TEST RESULTS AND RECOMENDATIONS FOR LIMING AND FERTILIZING.
5. AFTER THE AREAS TO BE TOPSOILED HAVE BEEN APPROVED BY THE OWNER OR ENGINEER, AND IMMEDIATLY PRIOR TO DUMPING AND SPREEDING THE TOPSOIL, THE SUBGRADE SHALL BE LOOSENED BY ROUGHENING TO THE DEPTH OF AT LEAST TWO INCHES TO PERMIT BONDING OF THE TOPSOIL TO THE SUBSOIL AND TO INCORPORATE THE LIME.
6. ACCEPTANCE SHALL BE GIVEN BY THE OWNER OR ENGINEER UPON SATISFACTORY COMPLETION OF EACH SECTION OR AREA AS INDICATED ON THE DRAWINGS OR AS OTHERWISE SPECIFIED BEFORE PLACEMENT OF TOPSOIL.

NOTE: THIS SHEET WAS DESIGNED BY ASB DESIGN GROUP LLC AND PREVISOULY APPROVED BY BOXFORD BOARD OF HEALTH DATED 7/2/18.

COMMONWEALTH OF MASSACHUSETTS
CARLOS FERREIRA
CIVIL
No. 41423
REGISTERED PROFESSIONAL ENGINEER

No.	Date	Description
1	06/11/21	NOI SUBMITTAL

Revisions

Prepared for:
CLAUDIO SENA
146 GEORGETOWN ROAD
BOXFORD, MA, 01921

Property of:
142 FISHER STREET LLC
142 FISHER STREET
WESTBOROUGH, MA 01581

Prepared By:

MF ENGINEERING & DESIGNS
Structural Engineering / Building Design
Civil Engineering / Management Services
CARLOS FERREIRA PROFESSIONAL ENGINEER
PHONE: 508-331-7261 SITE: WWW.MF-ENG.COM
EMAIL: CARLOS.FERREIRA@MF-ENG.COM

Carlos E. Ferreira P.E. #41.423

Date:

Project Title
NOTICE OF INTENT
SENA RESIDENCE

Sheet Title
SEPTIC SYSTEM PROFILES AND DETAILS

SCALE	1"=20'
DRAWN	CMS
CHECKED	CEF
FILE NAME	146 GEORGETOWN
PROJECT	146 GEORGETOWN RD
ISSUE DATE	05/21/2021
JOB NO.	146-0521

SHEET C-104

TREE COUNT TABLE

EXISTING TOTAL TREES	DEAD, POOR OR FAIR TREES	EXISTING REMAIN	DEVELOPMENT REMOVED	TOTAL TREES AFTER CLEARING
245	40	205	46	159

LANDSCAPE NOTES

1. SEE TREE NARRATIVE BY ENVIRONMENTAL CONSULTANT MATTHEW MARRO AS APPENDIX TO THE NOI DOCUMENT SUBMISSION DATE 09/27/2021. THIS TREE NARRATIVE PROVIDES FURTHER DETAILS ON EACH PROJECT SITE TREE ACCORDING TO THE POINT NUMBER ON THESE PLANS.

LEGEND

- EXISTING CONTOUR
- EXISTING TREES ALIVE — 64
- EXISTING TREES DEAD, POOR OR FAIR REMOVE — 77
- EXISTING TREES ALIVE REMOVE — 79
- ZONING SETBACK

NOTES

1. EXISTING CONDITIONS INFORMATION IS BASED ON SURVEY FROM "ASB DESIGN GROUP LLC" FOR PROJECT TITLED "146 GEORGETOWN ROAD - SEPTIC SYSTEM". THIS DESIGNED SEPTIC SYSTEM HAD BEEN APPROVED BY THE BOXFORD CONSERVATION COMMISSION.
2. ALL AREAS DISTURBED BY PROPOSED WORK SHALL BE LOAMED AND SEEDED PER DETAIL "STABILIZATION MULCHING AND SEEDING DETAIL"
3. PROJECT LOCATED ON FEMA FLOOD INSURANCE RATE MAP (FIRM) , MAP NUMBER 25009C0261F. AS ZONE A. ZONE AH FOR BASE FLOOD ELEVATION IS GIVEN BETWEEN 1-3 FT IN AREAS OF PONDING. GIVEN ZONE AH IS AT HIGHER RISK THAN ZONE A THEREFORE BASE FLOOD ELEVATION ESTIMATED AT 114' USING THE MAXIMUM DEPTH OF 3'.

STEVENS POND
(A GREAT POND)
WATER LAVEL = 109.20' (11/01/2017)

BOUNDARY LINE FOLLOWS EDGE OF STEVENS POND

BASE FLOOD ELEVATION
LIMIT OF WETLAND
WETLAND FLAGS (TYP)
PROPOSED COMPOST FILTER TUBE
LIMIT OF DISTURBANCE ±2.55 ACRES
ZONING SETBACK
25' NO DISTURB
75' NO BUILD ZONE
100' BUFFER ZONE
FLOAT
3 BLACK WATER PIPING
150' WELL RADIUS
OVERHEAD WIRES
EDGE OF PAVEMENT
PAVED SWALE
E.C.-S.B. PIN (FD.)
E.C.-S.B. CTR. BK. (FD.)
D.H. (FD.)
BENCHMARK CUT-SPIKE 16" PINE ELEV.=120.76'

ANDREW W. & KAREN A. EVANS 25-4-9

TEST PIT 1
TEST PIT 1A
TEST PIT 2
TEST PIT 2A
TEST PIT 3
TEST PIT 3A
TEST PIT 4
PERC. 1
PERC. 1A
PERC. 2
PERC. 3A

IPSWICH ROAD (PUBLIC WAY)

GEORGETOWN ROAD (PUBLIC WAY)

0 10' 20' 40'
SCALE: 1" = 20'

COMMONWEALTH OF MASSACHUSETTS
CARLOS FERREIRA
CIVIL
No. 41423
REGISTERED PROFESSIONAL ENGINEER

No.	Date	Description
4	09/27/21	COMMISSION COMMENTS
2	07/15/21	EXISTING TREES AND WETLAND LINE
1	06/11/21	NOI SUBMITTAL

Revisions

Prepared for:
CLAUDIO SENA
146 GEORGETOWN ROAD
BOXFORD, MA, 01921

Property of:
142 FISHER STREET LLC
142 FISHER STREET
WESTBOROUGH, MA 01581

Prepared By:

ENGINEERING & DESIGNS
Structural Engineering / Building Design
Civil Engineering / Management Services
CARLOS FERREIRA PROFESSIONAL ENGINEER
PHONE: 508-331-7261 SITE: WWW.MF-ENG.COM
EMAIL: CARLOS.FERREIRA@MF-ENG.COM

Carlos E. Ferreira P.E. #41.423

Date:

Project Title
NOTICE OF INTENT
SENA RESIDENCE

Sheet Title
LANDSCAPE PLAN EXISTING

SCALE	1"=20'
DRAWN	CEF
CHECKED	CEF
FILE NAME	146 GEORGETOWN
PROJECT	146 GEORGETOWN RD
ISSUE DATE	05/21/2021
JOB NO.	146-0521

SHEET C-105

TREE COUNT TABLE

EXISTING TOTAL TREES	DEAD AND POOR TREES	EXISTING REMAIN	DEVELOPMENT REMOVED	TOTAL TREES AFTER CLEARING	PROPOSED TREES	FINAL TOTAL TREES	FINAL TOTAL TREES AND SHRUBS
245	40	205	38	167	31	198	225

PLANT SCHEDULE

QUANTITY	KEY	BOTANICAL NAME	COMMON NAME
TREES			
16	AR	ACER RUBRUM	RED MAPLE
15	QV	QUERCUS VELUTINA	BLACK OAK
SHRUBS			
12	IV	ILEX VERTICILLATA	WINTERBERRY
14	SA	SPIRAEA ALBA	MEADOWSWEET

LEGEND

- EXISTING CONTOUR
- EXISTING TREE (247)
- ZONING SETBACK
- BUILDING
- MINOR CONTOUR
- MAJOR CONTOUR
- SPOT GRADE

LANDSCAPE NOTES

1. SEE TREE NARRATIVE BY ENVIRONMENTAL CONSULTANT MATTHEW MARRO AS APPENDIX TO THE NOI DOCUMENT SUBMISSION DATE 09/27/2021. THIS TREE NARRATIVE PROVIDES FURTHER DETAILS ON EACH PROJECT SITE TREE ACCORDING TO THE POINT NUMBER ON THESE PLANS.
2. NO IRRIGATION NOR MINOR LANDSCAPE FEATURES. DURING CONSTRUCTION IF ANYTHING CHANGES FROM THE SUBMITTED PLANS ADDITIONAL INFORMATION WILL BE PROVIDED BY THE CONTRACTOR AND APPROVED BY THE CONSERVATION COMMISSION.

NOTES

1. EXISTING CONDITIONS INFORMATION IS BASED ON SURVEY FROM "ASB DESIGN GROUP LLC" FOR PROJECT TITLED "146 GEORGETOWN ROAD - SEPTIC SYSTEM". THIS DESIGNED SEPTIC SYSTEM HAD BEEN APPROVED BY THE BOXFORD CONSERVATION COMMISSION.
2. ALL AREAS DISTURBED BY PROPOSED WORK SHALL BE LOAMED AND SEEDED PER DETAIL "STABILIZATION MULCHING AND SEEDING DETAIL"
3. PROJECT LOCATED ON FEMA FLOOD INSURANCE RATE MAP (FIRM) , MAP NUMBER 25009C0261F. AS ZONE A. ZONE AH FOR BASE FLOOD ELEVATION IS GIVEN BETWEEN 1-3 FT IN AREAS OF PONDING. GIVEN ZONE AH IS AT HIGHER RISK THAN ZONE A THEREFORE BASE FLOOD ELEVATION ESTIMATED AT 114' USING THE MAXIMUM DEPTH OF 3'.

STEVENS POND
(A GREAT POND)
WATER LAVEL = 109.20' (11/01/2017)

BASE FLOOD ELEVATION
LIMIT OF WETLAND
WETLAND FLAGS (TYP)
PROPOSED COMPOST FILTER TUBE
LIMIT OF DISTURBANCE ±2.55 ACRES
ZONING SETBACK
75' NO BUILD ZONE
25' NO DISTURB
100' BUFFER ZONE
BOUNDARY LINE FOLLOWS EDGE OF STEVENS POND
FLOAT
WOOD SLIDE
BLACK PIPING
150' WELL RADIUS
ANDREW W. & KAREN A. EVANS 25-4-9
IPSWICH ROAD (PUBLIC WAY)
GEORGETOWN ROAD (PUBLIC WAY)
BENCHMARK CUT-SPIKE 16" PINE ELEV.=120.76'
TEST PIT 4
TEST PIT 3
TEST PIT 2
TEST PIT 1
TEST PIT 3A
TEST PIT 1A
PERC. 4
PERC. 3
PERC. 2
PERC. 1
PERC. 3A
PERC. 1A
E.C.-S.B. PIN (FD.)
E.C.-S.B. CTR. BK.
250' STOPPING SIGHT DISTANCE
EDGE OF PAVEMENT
PAVED SWALE
OVERHEAD WIRES
D.H. (FD.)
IP
YCO
7%

0 10' 20' 40'
SCALE: 1" = 20'

No.	Date	Revisions
4	09/27/21	COMMISSION COMMENTS
2	07/15/21	EXISTING TREES AND WETLAND LINE
1	06/11/21	NOI SUBMITTAL

Prepared for:
CLAUDIO SENA
146 GEORGETOWN ROAD
BOXFORD, MA, 01921

Property of:
142 FISHER STREET LLC
142 FISHER STREET
WESTBOROUGH, MA 01581

Prepared By:
MF ENGINEERING & DESIGNS
Structural Engineering / Building Design
Civil Engineering / Management Services
CARLOS FERREIRA PROFESSIONAL ENGINEER
PHONE: 508-331-7261 SITE: WWW.MF-ENG.COM
EMAIL: CARLOS.FERREIRA@MF-ENG.COM

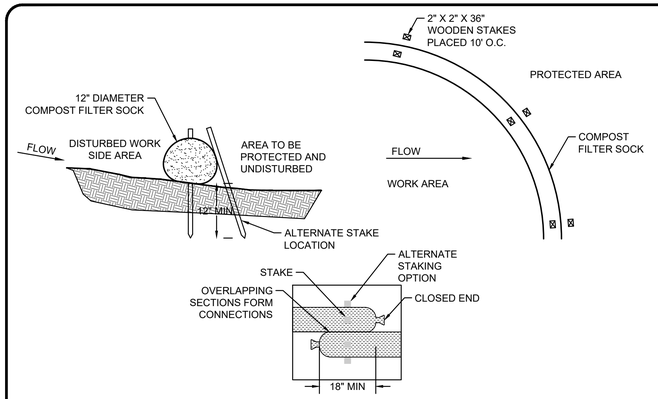
Carlos E. Ferreira P.E. #41.423
Date:

Project Title
NOTICE OF INTENT
SENA RESIDENCE

Sheet Title
LANDSCAPE PLAN PROPOSED

SCALE	1"=20'
DRAWN	CEF
CHECKED	CEF
FILE NAME	146 GEORGETOWN
PROJECT	146 GEORGETOWN RD
ISSUE DATE	05/21/2021
JOB NO.	146-0521

SHEET C-106

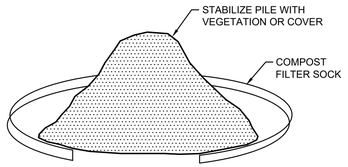


NOTES:

1. PREFABRICATED COMPOST SOCK SHALL BE FILTREXX SOXX OR APPROVED EQUAL.
2. MATERIAL FOR SOCKS SHALL CONSIST OF SANITIZED MATURE COMPOST, FREE OF VIABLE WEED SEEDS AND FOREIGN DEBRIS SUCH AS GLASS AND PLASTIC. COMPOST SHALL BE IN SHREDDED OR GRANULAR FORM AND FREE FROM HARD LUMPS. IN ADDITION, NO KILN-DRIED WOOD OR CONSTRUCTION DEBRIS SHALL BE ALLOWED. CONTRACTOR SHALL REFER TO MASSDOT SPECIFICATIONS M1.06.0 FOR MATERIAL SPECIFICATIONS.
3. SOCK SHALL CONSIST OF JUTE MESH OR OTHER APPROVED BIODEGRADABLE MATERIAL.

COMPOST FILTER TUBE

NOT TO SCALE



NOTE:
STOCKPILES MUST BE PHYSICALLY SEPARATED FROM OTHER STORMWATER CONTROLS.

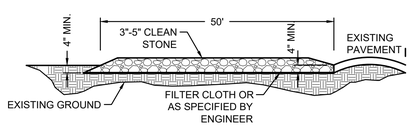
NOTE:
STOCKPILES MUST BE PHYSICALLY SEPARATED FROM OTHER STORMWATER CONTROLS.

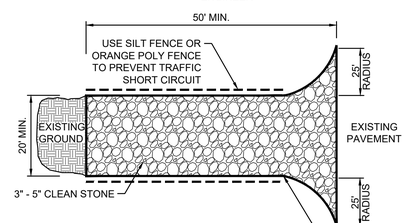
SOIL STOCKPILES: FOR ANY STOCKPILED OR LAND CLEARING DEBRIS COMPOSED, IN WHOLE OR IN PART, OF SEDIMENT OR SOIL, THE FOLLOWING MEASURES MUST BE FOLLOWED:

- LOCATE THE PILES OUTSIDE OF ANY NATURAL BUFFERS AND PHYSICALLY SEPARATED FROM OTHER STORMWATER CONTROLS.
- PROTECT FROM CONTACT WITH STORMWATER (INCLUDING RUN-ON) USING A TEMPORARY PERIMETER SEDIMENT BARRIER;
- PROVIDE COVER OR APPROPRIATE TEMPORARY STABILIZATION TO AVOID DIRECT CONTACT WITH PRECIPITATION OR TO MINIMIZE SEDIMENT DISCHARGE;
- DO NOT HOSE DOWN OR SWEEP SOIL OR SEDIMENT ACCUMULATED ON PAVEMENT OR OTHER IMPERVIOUS SURFACES INTO ANY STORMWATER CONVEYANCE (UNLESS CONNECTED TO A SEDIMENT BASIN, SEDIMENT TRAP, OR SIMILARLY EFFECTIVE CONTROL), STORM DRAIN INLET, OR SURFACE WATER;

SOIL STOCKPILING CONTROL

NOT TO SCALE



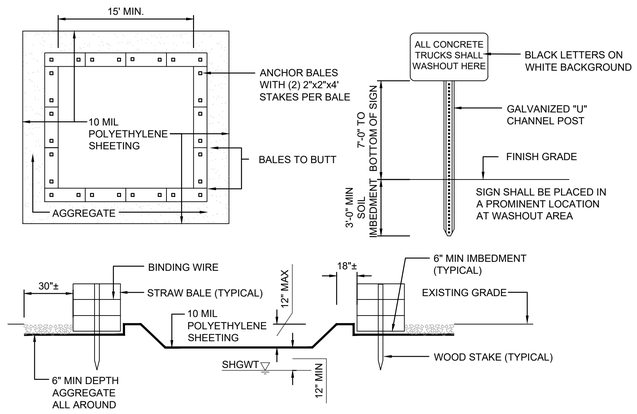


NOTES:

1. STONE - USE COARSE AGGREGATE (3"-5" STONE).
2. LENGTH - AS EFFECTIVE, BUT NOT LESS THAN 50 FEET.
3. THICKNESS - NOT LESS THAN EIGHT (8) INCHES.
4. WIDTH - NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS OR EGRESS.

STABILIZED CONSTRUCTION ENTRANCE

NOT TO SCALE

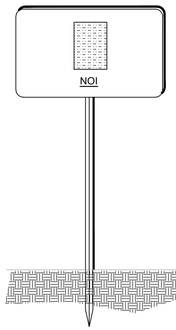


NOTES:

1. CONTAINMENT MUST BE STRUCTURALLY SOUND AND LEAK FREE AND CONTAIN ALL LIQUID WASTES.
2. CONTAINMENT DEVICES MUST BE OF SUFFICIENT QUANTITY OR VOLUME TO COMPLETELY CONTAIN THE LIQUID WASTES GENERATED.
3. WASHOUT MUST BE CLEANED OR NEW FACILITIES CONSTRUCTED AND READY TO USE ONCE WASHOUT IS 75% FULL.
4. WASHOUT AREA(S) SHALL BE INSTALLED IN A LOCATION EASILY ACCESSIBLE BY CONCRETE TRUCKS.
5. ONE OR MORE AREAS MAY BE INSTALLED ON THE CONSTRUCTION SITE AND MAY BE RELOCATED AS CONSTRUCTION PROGRESSES.
6. AT LEAST WEEKLY REMOVE ACCUMULATION OF SAND AND AGGREGATE AND DISPOSE OF PROPERLY.

CONCRETE WASHOUT AREA

NOT TO SCALE



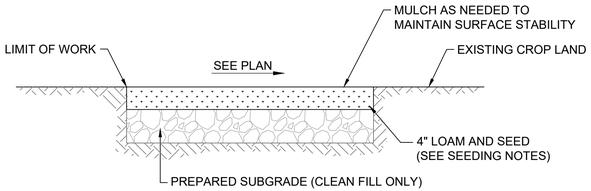
NOTES:

1. CONSTRUCTION SITE NOTICE SHALL BE POSTED.
2. POSTING IS TO BE AT JOB SITE ENTRANCE WHERE IT WILL BE VISIBLE AND LEGIBLE FROM THE PUBLIC WAY.
3. POSTING IS REQUIRED FROM THE DAY CONSTRUCTION ACTIVITIES START UNTIL THE NOTICE OF TERMINATION (NOT) IS FILED.

JOB SITE PERMIT POSTING DETAIL

NOT TO SCALE

SEEDING NOTES			
SPECIES	LBS/1000 S.F.	LBS/ACRE	RECOMMENDED SEEDING DATES
ANNUAL RYEGRASS	1	40	APRIL 1 TO JUNE 1 AUG 1 TO SEPT 15
FOXTAIL MILLET	0.7	30	MAY 1 TO JUNE 30
OATS	2	80	APRIL 1 TO JULY 1 AUG 15 TO SEPT 15
WINTER RYE	3	120	AUG 15 TO OCT 15

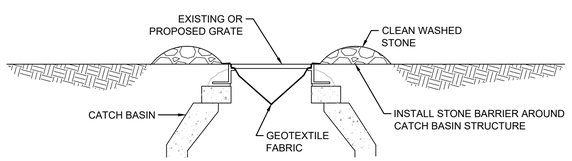


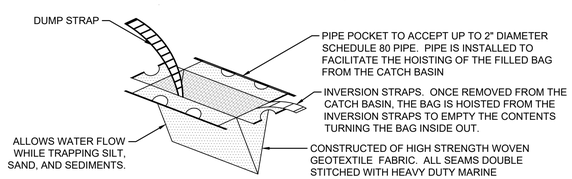
MULCHING AND SEEDING DETAIL

NOT TO SCALE

MULCH APPLICATION RATES:
HAY OR STRAW MULCH SHALL BE AIR-DRIED, FREE OF UNDESIRABLE SEEDS AND COARSE MATERIALS. APPLICATION RATE MUST BE 2 BALES (70-90 LBS) PER 1,000 SQUARE FEET OR 1.5 TO 2 TONS PER ACRE. NO BARE SPOTS SHOWING AND SHALL ONLY BE APPLIED TO SLOPES 3:1 OR FLATTER. ANCHORING METHODS INCLUDING NETTING WITH JUTE, WOOD FIBER OR PLASTIC; OR APPLY MULCH AND TRACK SURFACE UP AND DOWN THE SLOPE SO CLEAT MARKS ARE PARALLEL TO THE CONTOURS. FOR OVERWINTER APPLICATION, THE RATE SHALL BE 150 LBS PER 1,000 SQUARE FEET OR 3 TONS/ACRE. MULCH SHALL NOT BE SPREAD ON TOP OF SNOW; SNOW MUST BE REMOVED DOWN TO A ONE-INCH DEPTH OR LESS PRIOR TO APPLICATION.

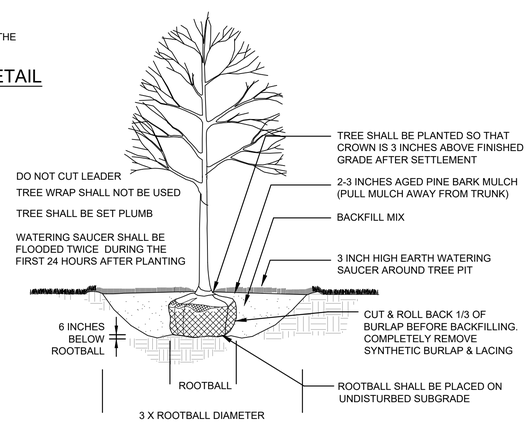
STABILIZATION MULCHING AND SEEDING





GEOTEXTILE FABRIC INLET PROTECTION

NOT TO SCALE



TREE PLANTING

NOT TO SCALE

CARLOS FERREIRA CIVIL No. 41423 REGISTERED PROFESSIONAL ENGINEER
COMMONWEALTH OF MASSACHUSETTS

No.	Date	Description
		Revisions
1	06/11/21	NOI SUBMITTAL

Prepared for:
CLAUDIO SENA
146 GEORGETOWN ROAD
BOXFORD, MA, 01921

Property of:
142 FISHER STREET LLC
142 FISHER STREET
WESTBOROUGH, MA 01581

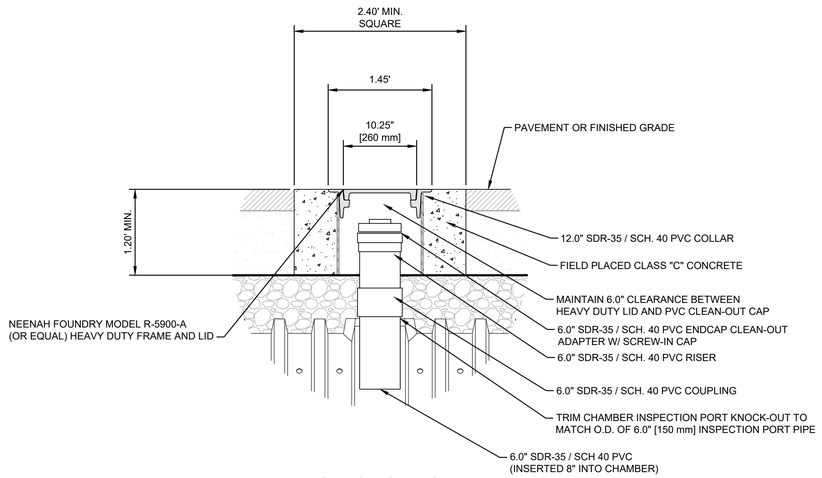
Prepared By:
ENGINEERING & DESIGNS
Structural Engineering / Building Design
Civil Engineering / Management Services
CARLOS FERREIRA PROFESSIONAL ENGINEER
PHONE: 508-331-7261 SITE: WWW.MF-ENC.COM
EMAIL: CARLOS.FERREIRA@MF-ENC.COM
Carlos E. Ferreira P.E. #41.423
Date:

Project Title
NOTICE OF INTENT
SENA RESIDENCE

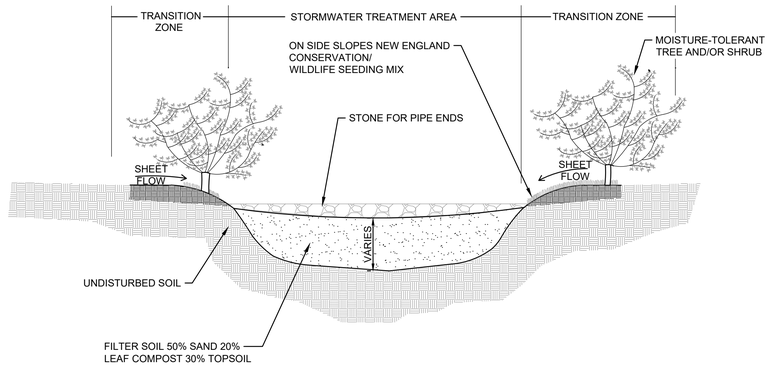
Sheet Title
CONSTRUCTION DETAILS

SCALE	1"=20'
DRAWN	CMS
CHECKED	CEF
FILE NAME	146 GEORGETOWN
PROJECT	146 GEORGETOWN RD
ISSUE DATE	05/21/2021
JOB NO.	146-0521

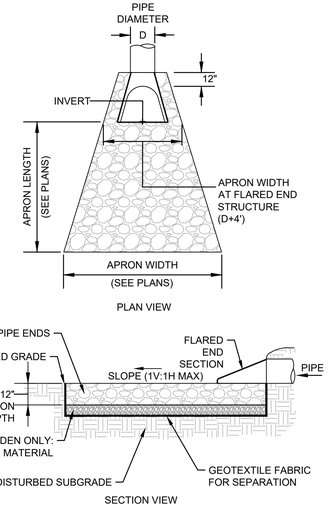
SHEET C-501



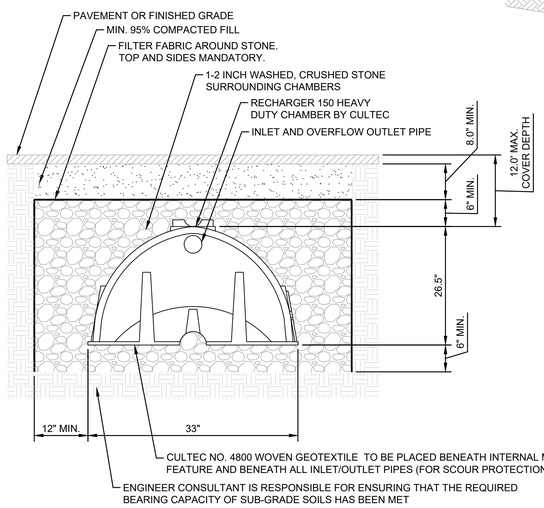
INSPECTION PORT
NOT TO SCALE



RAIN GARDEN
NOT TO SCALE

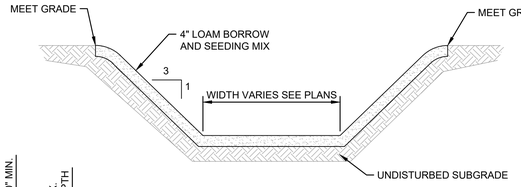


FOUNDATION FLARED END SECTION WITH STONE FOR PIPE ENDS
NOT TO SCALE



CROSS SECTION THROUGH LEACHING FIELD VIEW

INFILTRATION SYSTEM (CULTEC RECHARGER)
NOT TO SCALE



SECTION

VEGETATED DRAINAGE SWALE
NOT TO SCALE

NOTE:
LENGTH OF THE INFILTRATION TRENCH IS EQUAL TO 10 FEET.

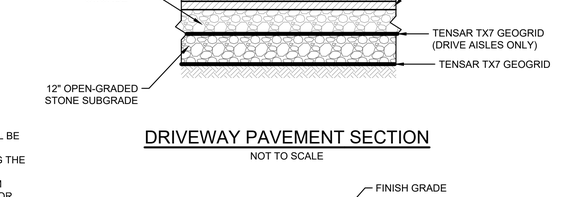
DRIVEWAY INFILTRATION TRENCH
NOT TO SCALE

NOT TO SCALE

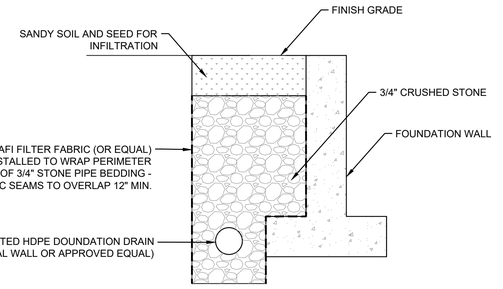
GRATE OPTIONS	LOAD RATING	PART #	DRAWING #
STANDARD	MEETS H-20	1899C GS	7001-110-213

NOTES:
1. GRATES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
2. FRAMES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
3. INFILTRATION SYSTEM FROM CULTEC RECAHRGER 280HD MANUFACTURED ACCORDING TO PLAN DETAILS.
4. DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS & HANCOR DUAL WALL) & SDR 35 PVC
5. ADAPTERS CAN BE MOUNTED ON ANY ANGLE 0° TO 360°. TO DETERMINE MINIMUM ANGLE BETWEEN ADAPTERS SEE DRAWING NO. 7001-110-013.

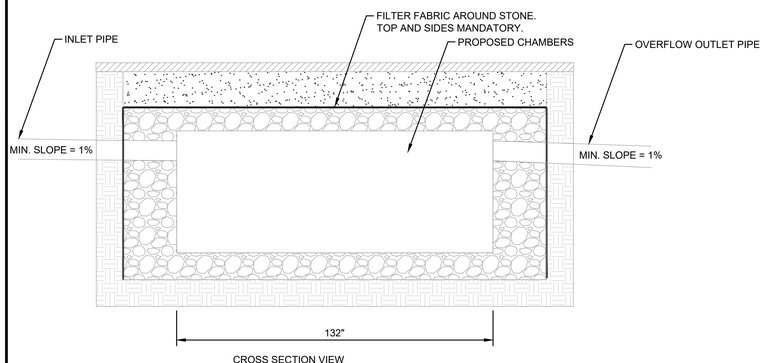
DRAINAGE INLET
NOT TO SCALE



DRIVEWAY PAVEMENT SECTION
NOT TO SCALE

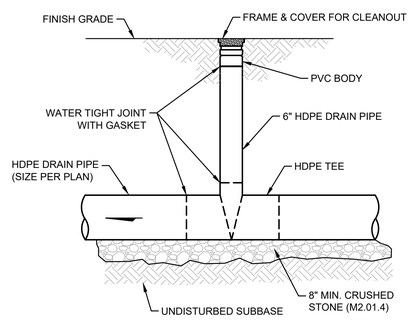


FOUNDATION DRAIN
NOT TO SCALE



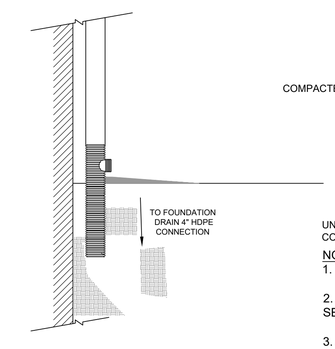
CROSS SECTION VIEW

INFILTRATION SYSTEM (CULTEC RECHARGER)
NOT TO SCALE

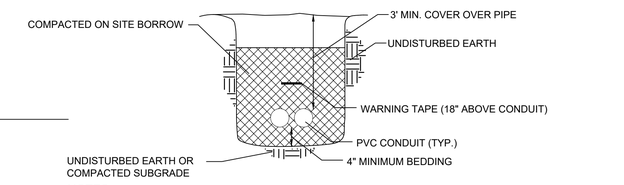


IN-LINE

YARD HDPE CLEANOUT
NOT TO SCALE



DOWNSPOUT CONNECTION
Not to Scale



NOTES:
1. TRENCH EXCAVATION WIDTH TO ALLOW FOR FREE TRAVEL OF COMPACTION EQUIPMENT.

2. ALL COMPACTION TO A MINIMUM 95 PERCENT DRY DENSITY DETERMINED BY ASTM D1557 SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

3. AVOID HEAVY EQUIPMENT LOADS OVER PIPE DURING CONSTRUCTION.

ELECTRIC/TELECOM TRENCH DETAIL
NOT TO SCALE

COMMONWEALTH OF MASSACHUSETTS
CARLOS FERREIRA
CIVIL
No. 41423
REGISTERED PROFESSIONAL ENGINEER

No.	Date	Description
4	09/27/21	COMMISSION COMMENTS
3	08/17/21	STORMWATER MANAGEMENT
1	06/11/21	NOI SUBMITTAL

Revisions

Prepared for:
CLAUDIO SENA
146 GEORGETOWN ROAD
BOXFORD, MA, 01921

Property of:
142 FISHER STREET LLC
142 FISHER STREET
WESTBOROUGH, MA 01581

Prepared By:
ENGINEERING & DESIGNS
Structural Engineering / Building Design
Civil Engineering / Management Services
CARLOS FERREIRA PROFESSIONAL ENGINEER
PHONE: 508-331-7261 SITE: WWW.MF-ENC.COM
EMAIL: CARLOS.FERREIRA@MF-ENC.COM

Carlos E. Ferreira P.E. #41.423

Date:

Project Title
NOTICE OF INTENT
SENA RESIDENCE

Sheet Title
CONSTRUCTION DETAILS

SCALE	1"=20'
DRAWN	CMS
CHECKED	CEF
FILE NAME	146 GEORGETOWN
PROJECT	146 GEORGETOWN RD
ISSUE DATE	05/21/2021
JOB NO.	146-0521

SHEET C-502