

**NOTICE OF PUBLIC HEARING  
SUDBURY CONSERVATION COMMISSION  
Monday, December 18, 2022 at 7:00 PM  
Virtual Meeting**

The Sudbury Conservation Commission will hold a public hearing to review the Notice of Intent filing to construct a new single-family home with associated pool, shed, stormwater management system, yard and landscaping within the 100-foot Buffer Zone and 200-foot Riverfront Area, pursuant to the Wetlands Protection Act and Sudbury Wetlands Administration Bylaw, at Lot 2 Brimstone Lane, Sudbury, MA. Carrie Maciel, Applicant. The hearing will be held on Monday, December 18, 2023 at 7:00 pm, via remote participation.

Please see the Conservation Commission web page for further information.

<https://sudbury.ma.us/conservationcommission/meeting/conservation-commission-meeting-monday-december-18-2023/>

SUDBURY CONSERVATION COMMISSION  
11/27/23



# CONNORSTONE ENGINEERING, INC.

10 SOUTHWEST CUTOFF, SUITE #1  
NORTHBOROUGH, MASSACHUSETTS 01532  
T: (508) 393-9121

121 BOSTON POST ROAD  
SUDBURY, MASSACHUSETTS 01776  
T: (978) 443-9566

Sudbury Conservation Commission  
275 Old Lancaster Road  
Sudbury, MA 01776

November 16, 2023

**Subject: Notice of Intent  
Lot 2 Brimstone Lane, Sudbury, MA**

Dear Members of the Commission;

On behalf of the applicant, Carrie Maciel, please find the enclosed Notice of Intent and supporting documentation for the proposed project at Lot 2 Brimstone Lane, including:

1. The Notice of Intent application package including:
  - Completed NOI Form 3 – Notice of Intent
  - Wetland Delineation Report
  - Locus mapping
  - List of abutters and notification forms;
2. "Proposed Stormwater Plan" of Lot 2 Brimstone Lane, in Sudbury, MA, Prepared by Connorstone Engineering, Inc. dated November 6, 2023.
3. "Stormwater Management Documentation," for Lot 2 Brimstone Lane, Sudbury, MA dated November 6, 2023.
4. Checks in the amount of \$95.00 for the town portion of the NOI fee and \$250 for the local Wetland Bylaw fee. The State share of the NOI fee has been forward to MassDEP.

## **Project Summary:**

**Existing Site Conditions:** The site consists of a 3.77 acre lot located off Brimstone lane, and is shown as Assessors Map L04, Parcel 8. The lot was formerly part of #137 Brimstone, and was recently divided off through an ANR plan endorsed by the Planning Board on May 26, 2022 (shown as Lot 2 on said plan). A copy of the recorded plan has been included for reference.

The existing site is currently undeveloped with wooded uplands along the easterly half of the site abutting Brimstone Lane, and then transitioning to regulated wetlands along the westerly half of the site in the areas of lower elevation. The site topography slopes down away from Brimstone Lane toward the wetland areas at moderately steep slopes of approximately 20%.

**Wetland Resource Areas:** Wetland resource areas onsite have been delineated on site by Oxbow Associates in March of 2023. Those resource areas include an perennial stream flowing through the rear of the site, along with associated bordering vegetated wetlands. The stream is an unnamed stream flowing from Carding Mill Pond through the project site and the crossing the town line into Framingham, and does not have any associated flood hazard areas. The buffer zone and riverfront areas on-site currently consist of undeveloped woodlands.

The Natural Heritage and Endangered Species Program (NHESP) has identified an area on-site as lying within a reported Priority and Estimated Habitat Area. This area has been shown on the plans based upon the most recent mapping. All of the proposed work has been maintained outside of the mapped areas.

Proposed Use & Site Changes: The project consists of a new single family home with associated site work including a paved driveway, septic system, pool/patio areas, detached shed, stormwater management features, well, yard and landscaping, and associated site work.

The site layout includes a driveway entrance off Brimstone Lane and the new home would be located in the front right corner of the lot. The proposed house, driveway and septic systems would all be maintained outside the buffer zone and riverfront areas. Work within the regulated areas would be limited to include:

- Site grading for the rear yard.
- Stormwater Management features including the roof drywell and rain garden
- Portions of the proposed pool/patio (within riverfront area only).

The total alteration within those areas includes:

- 100 foot Buffer Zone  
Disturbance Area = 4,360 square feet  
Closest point of disturbance = 45'
- 200 Foot Riverfront Area  
Total on-site Riverfront Area = 134,106 square feet  
10% Riverfront Area allowable under 10.58(4)(d)(1) = 134,410 square feet  
Proposed Disturbance Area = 3,615 square feet (2.7%)

The proposed project is also subject to the Sudbury Stormwater Bylaw, and would then be required to comply with the MassDEP Stormwater Standards. As part of this design a proposed roof drain drywell and rain garden have been proposed to mitigate the increased impervious areas and conversion of woodlands to lawn. The systems have been designed to provide detention of flow rates, recharge to groundwater, and treatment prior to discharge. A complete summary of the stormwater standards has been provided in the Stormwater Report.

The proposed drywell is a typical subsurface structure consisting of plastic chambers within a crushed stone bed located to the rear of the house. The location was selected to be downgradient of the roof areas and to be located in an area of fill to allow the elevation of the system to be sufficiently above the seasonal high groundwater elevation.

The plans have also proposed a rain garden located in the lower elevations of the lot to collect and treat runoff from the driveway and a portion of the lawn areas. The layout of the rain garden was intended to be a low impact design to work with the natural topography and vegetation. The design essentially includes an 3+/- foot tall earthen berm through the wooded areas with a sump area and outlet near the low point, and the upgradient natural vegetation would be maintained to create a naturalized area.

If you have any questions or require any additional information please contact this office at (508) 393-9727.

Sincerely,  
Connorstone Engineering, Inc.



Vito Colonna, P.E.



Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands

Provided by MassDEP:

**WPA Form 3 – Notice of Intent**

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

MassDEP File Number

Document Transaction Number

Sudbury

City/Town

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



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

**A. General Information**

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

Lot 2 Brimstone Lane  
a. Street Address  
Sudbury  
b. City/Town  
01776  
c. Zip Code  
Latitude and Longitude: 42.35271 -71.45703  
d. Latitude e. Longitude  
Map L04  
f. Assessors Map/Plat Number  
Parcel 8  
g. Parcel /Lot Number

2. Applicant:

Carrie  
a. First Name  
Maciel  
b. Last Name  
c. Organization  
6 Baldwin Drive  
d. Street Address  
Stow  
e. City/Town  
Ma  
f. State  
01775  
g. Zip Code  
617-515-2343  
h. Phone Number  
i. Fax Number  
carriemaciel@gmail.com  
j. Email Address

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

Same as applicant  
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):

Vito  
a. First Name  
Colonna  
b. Last Name  
Connorstone Engineering  
c. Company  
10 Southwest Cutoff, Suite #7  
d. Street Address  
Northborough  
e. City/Town  
Ma  
f. State  
01532  
g. Zip Code  
508-393-9727  
h. Phone Number  
i. Fax Number  
vc@csei.net  
j. Email address

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

\$165.00  
a. Total Fee Paid  
\$70.00  
b. State Fee Paid  
\$95.00  
c. City/Town Fee Paid



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**A. General Information** (continued)

6. General Project Description:

Construction of new single family home. work within the buffer zone and/or Riverfront Area includes Site grading for the rear yard, Stormwater Management features, and portions the proposed pool/patio.

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

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

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

- 1.  Yes  No If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

2. Limited Project Type

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

8. Property recorded at the Registry of Deeds for:

Middlesex South

a. County

81361

c. Book

b. Certificate # (if registered land)

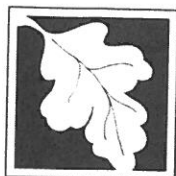
347

d. Page Number

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

- 1.  Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
- 2.  Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

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



**Massachusetts Department of Environmental Protection**  
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**B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)**

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

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
a. <input type="checkbox"/> Bank	1. linear feet _____	2. linear feet _____
b. <input type="checkbox"/> Bordering Vegetated Wetland	1. square feet _____	2. square feet _____
c. <input type="checkbox"/> Land Under Waterbodies and Waterways	1. square feet _____ 3. cubic yards dredged _____	2. square feet _____

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
d. <input type="checkbox"/> Bordering Land Subject to Flooding	1. square feet _____ 3. cubic feet of flood storage lost _____	2. square feet _____ 4. cubic feet replaced _____
e. <input type="checkbox"/> Isolated Land Subject to Flooding	1. square feet _____ 2. cubic feet of flood storage lost _____	3. cubic feet replaced _____
f. <input checked="" type="checkbox"/> Riverfront Area	<u>Unnamed - Inland</u> 1. Name of Waterway (if available) - <b>specify coastal or inland</b> _____	

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: 134,106 +/-  
square feet

4. Proposed alteration of the Riverfront Area:

3,615 a. total square feet      0 b. square feet within 100 ft.      3,615 c. square feet between 100 ft. and 200 ft.

5. Has an alternatives analysis been done and is it attached to this NOI?       Yes  No

6. Was the lot where the activity is proposed created prior to August 1, 1996?       Yes  No

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

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



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

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

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

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

	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
f. <input type="checkbox"/> Coastal Banks	_____	
	1. linear feet	
g. <input type="checkbox"/> Rocky Intertidal Shores	_____	
	1. square feet	
h. <input type="checkbox"/> Salt Marshes	_____	
	1. square feet	
i. <input type="checkbox"/> Land Under Salt Ponds	_____	_____
	1. square feet	2. sq ft restoration, rehab., creation
	_____	
	2. cubic yards dredged	
j. <input type="checkbox"/> Land Containing Shellfish	_____	
	1. square feet	
k. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above	
	_____	
	1. cubic yards dredged	
l. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	_____	
	1. square feet	

4.  Restoration/Enhancement

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



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## C. Other Applicable Standards and Requirements

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

### Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to [http://maps.massgis.state.ma.us/PRI\\_EST\\_HAB/viewer.htm](http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm).

- a.  Yes  No

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

**Natural Heritage and Endangered Species Program  
Division of Fisheries and Wildlife  
1 Rabbit Hill Road  
Westborough, MA 01581**

08/01/2021

b. Date of map

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

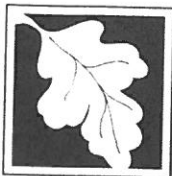
- c. Submit Supplemental Information for Endangered Species Review\*
  1.  Percentage/acreage of property to be altered:
    - (a) within wetland Resource Area \_\_\_\_\_ percentage/acreage
    - (b) outside Resource Area \_\_\_\_\_ percentage/acreage
  2.  Assessor's Map or right-of-way plan of site
2.  Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work \*\*
  - (a)  Project description (including description of impacts outside of wetland resource area & buffer zone)
  - (b)  Photographs representative of the site

\* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see <https://www.mass.gov/mass-endangered-species-act-mesa-regulatory-review>).

Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

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





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

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

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

(d)  Vegetation cover type map of site

(e)  Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1.  Project is exempt from MESA review.  
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, <https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat>; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2.  Separate MESA review ongoing. a. NHESP Tracking # \_\_\_\_\_ b. Date submitted to NHESP \_\_\_\_\_

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

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

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

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

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

North Shore - Hull to New Hampshire border:

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

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

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

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

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



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

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

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?
- a.  Yes  No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.
- b. ACEC
5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?
- a.  Yes  No
6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?
- a.  Yes  No
7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?
- a.  Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:
1.  Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)
  2.  A portion of the site constitutes redevelopment
  3.  Proprietary BMPs are included in the Stormwater Management System.
- b.  No. Check why the project is exempt:
1.  Single-family house
  2.  Emergency road repair
  3.  Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

**D. Additional Information**

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

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

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

1.  USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)
2.  Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.



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**D. Additional Information (cont'd)**

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

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

Proposed Stormwater Plan of Lot 2 Brimstone Lane, Sudbury, MA

a. Plan Title

Connorstone Engineering, Inc.

Vito Colonna PE

b. Prepared By

c. Signed and Stamped by

11/06/2023

1"=20'

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:

# 105  
2. Municipal Check Number

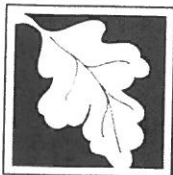
11/25/23  
3. Check date

# 107  
4. State Check Number

11/28/23  
5. Check date

ROGERIO  
6. Payor name on check: First Name

CLIVEIRA  
7. Payor name on check: Last Name



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

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

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**F. Signatures and Submittal Requirements**

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

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

1. Signature of Applicant

2. Date

3. Signature of Property Owner (if different)

4. Date

5. Signature of Representative (if any)

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.



Massachusetts Department of Environmental Protection  
 Bureau of Resource Protection - Wetlands  
**NOI Wetland Fee Transmittal Form**  
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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



**A. Applicant Information**

1. Location of Project:

Lot 2 Brimstone Lane  
 a. Street Address  
 #167  
 c. Check number  
 Sudbury  
 b. City/Town  
 \$70,00  
 d. Fee amount

2. Applicant Mailing Address:

Carrie  
 a. First Name  
 Maciel  
 b. Last Name  
 c. Organization  
 6 Baldwin Drive  
 d. Mailing Address  
 Stow  
 e. City/Town  
 MA  
 f. State  
 01775  
 g. Zip Code  
 617-515-2343  
 h. Phone Number  
 i. Fax Number  
 carriemaciel@gmail.com  
 j. Email Address

3. Property Owner (if different):

same as applicant  
 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

**B. Fees**

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

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

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

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

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

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

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

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



Massachusetts Department of Environmental Protection  
 Bureau of Resource Protection - Wetlands  
**NOI Wetland Fee Transmittal Form**  
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

**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 - Work on Single Family Lot	1	\$110	\$110
50% Riverfront Area Fee	50%	\$55	\$55

**Step 5/Total Project Fee:** \$165

**Step 6/Fee Payments:**

Total Project Fee:	\$165
State share of filing Fee:	\$70.00
City/Town share of filling Fee:	\$95.00
	a. Total Fee from Step 5
	b. 1/2 Total Fee <b>less</b> \$12.50
	c. 1/2 Total Fee <b>plus</b> \$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.)

***WETLAND DELINEATION REPORT***

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April 24, 2023

Deborah S. Mayo  
Connorstone Engineering, Inc.  
121 Boston Post Road  
Sudbury, MA 01776  
Tel: (978) 443-9566  
[dsm@csei.net](mailto:dsm@csei.net)

**Re: Wetland Resource Area Evaluation  
137 Brimstone Lane  
Sudbury, MA**

Dear Ms. Mayo:

In response to your request, Oxbow Associates, Inc. (OA: specifically, K. Cormier) reviewed the above-referenced site with specific regard to wetland resource areas on March 24, 2023. This evaluation was conducted in accordance with standard methodology for delineating vegetated wetlands under the Massachusetts Wetlands Protection Act (the "Act"; MGL Ch. 131, §40) and the Sudbury Wetlands Administration Bylaw (Article XXII) and its Regulations.

### **Existing Conditions and Wetland Resource Areas**

The site is located east of Bigelow Drive, south of Boston Post Road, and west of Brimstone Lane. The parcel is undeveloped and is forested. Topography slopes steeply down to the west towards a perennial stream. Based on our observations, OA believes that the resource areas located on and near the site are Bordering Vegetated Wetland (BVW; 310 CMR 10.55), and Riverfront (Bank: 310 CMR 10.54).

OA flagged the edge of the Bordering Vegetated Wetland with blue plastic flags in a series labeled B1-B8 and Bank with pink plastic flags in a series labeled A1-A15. Flags were placed based on topography, hydric soils, predominance of wetland vegetation, and other indicators of hydrology including limit of standing water, silt-stained leaves, and buttressed tree roots.

Vegetation associated with the wetland habitat includes red maple (*Acer rubrum*) highbush blueberry (*Vaccinium corymbosum*), sweet pepperbush (*Clethra alnifolia*)



glossy buckthorn (*Frangula alnus*), cinnamon fern (*Osmunda cinnamomea*), sensitive fern (*Onoclea sensibilis*), sedges (*Carex* sp.), rushes (*Juncus* sp.), Sphagnum moss (*Sphagnum* sp.), and Japanese pachysandra (*Pachysandra terminalis*). Vegetation associated with the upland portions of the site consists of eastern white pine (*Pinus strobus*), oaks (*Quercus* spp.), burning bush (*Euonymus alatus*), *Rhododendron* sp., Japanese pachysandra, princess pine (*Lycopodium obscurum*), and eastern teaberry (*Gaultheria procumbens*).

According to the Massachusetts Natural Heritage and Endangered Species Program Atlas (MassGIS 2021), there are no rare wildlife species' habitats or certified vernal pools on the site.

### **Regulatory Implications and Recommendations**

It is OA's opinion that the areas identified on the attached figure are subject to jurisdiction under the Wetlands Protection Act and the Town of Sudbury Wetlands Administration Bylaw as BVW. The delineated boundaries are our professional opinion of the limit of resource areas and must be confirmed by the Sudbury Conservation Commission (SCC) before they are considered a legal boundary.

The B-series BVW has a 100-foot buffer zone extending horizontally from the delineated flags under the Act, and under the Bylaw; the latter which protects "Adjacent Upland Resource Areas" adjacent to wetlands. Any activity proposed within 100 feet of the BVW boundary (A-series flags) would be subject to review by the SCC and the Massachusetts Department of Environmental Protection (DEP). In addition, the Bylaw gives wide latitude to the SCC to determine "No Disturbance, Temporary, Limited, and Permanent Disturbance" Areas on the property.

In certain zones, work may be prohibited or curtailed to protect resource area values. A minimum of 25 feet of natural vegetation is typically desirable between the edge of wetland resources and proposed activities and/or disturbance. The amount of work approved under the Bylaw in the remaining zones may increase the further it is from a resource or ecologically sensitive area.

Any activity proposed *within* any of the wetland boundaries, including the 200 foot Riverfront Area and 100 foot BVW bufferzone, is subject to review by the local Conservation Commission and potentially subject to review by the Army Corps of Engineers (5,000 square feet of fill or more), and may require filing a 401 Water Quality Certificate with the Department of Environmental Protection (DEP).

The Rivers Protection Act Regulations generally prohibit work within the 100-foot Inner Riparian Zone unless work is performed within a previously "degraded" area. Work within the Riparian Zone may be allowed, but is limited to 5,000 square feet of disturbance, or 10% of the total Riverfront Area on each lot, whichever is greater.

A perennial stream can be proven to be intermittent if the stream has a watershed size less than  $\frac{1}{2}$  (0.50) square mile and has a predicted flow rate less than 0.01 cubic feet per second at the 99% flow duration using the USGS StreamStats method.

When the USGS StreamStats method cannot be used because the stream does not have a mapped and digitized centerline and the stream has a watershed size of at least  $\frac{1}{2}$  (0.50) square mile, and the surficial geology of the contributing drainage area to the stream at the project site contains 75% or more stratified drift, the issuing authority shall find such streams to be perennial.

In addition, if a stream is observed for 4 consecutive days during a non-drought advisory period it is intermittent up until there is observable flow.

Individual sewage treatment systems must be offset from surface wetlands as required by the Sudbury Board of Health Regulations and Massachusetts Title V.

The GIS/GPS map we have provided can be used as a planning tool, however, a Professional Land Surveyor or Engineer will need to complete a survey and plan of the existing and proposed conditions. Any SCC filing must include a site plan illustrating the proposed installation design and limit of work.

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

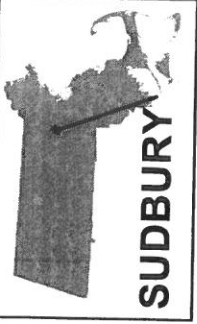
Sincerely,



Kyle Cormier, PWS  
Environmental Scientist II

Encl.

Wetland Delineation Figure













137 Brimstone Lane  
Sudbury, MA  
2021 MASSGIS Imagery

1:1,200

1 inch = 100 feet



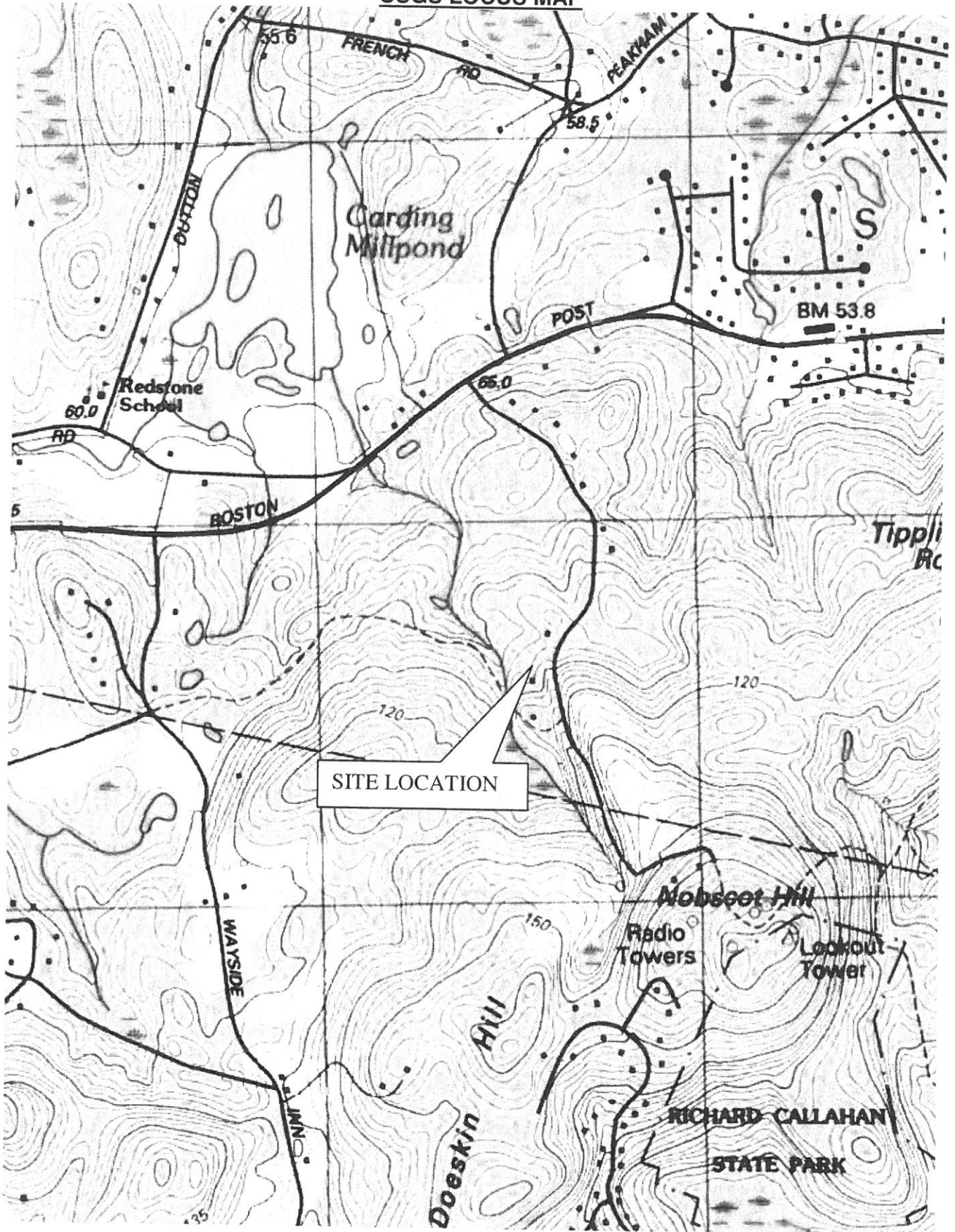
-  A - Series (Bank/ MAHW)
-  B - Series (BVW)
-  Bank/MAHW Line
-  BVW Line
-  200 Foot RFA
-  100 Foot RFA
-  100 Foot BVW
-  50 Foot BVW
-  Property Boundaries
-  Sudbury Parcels



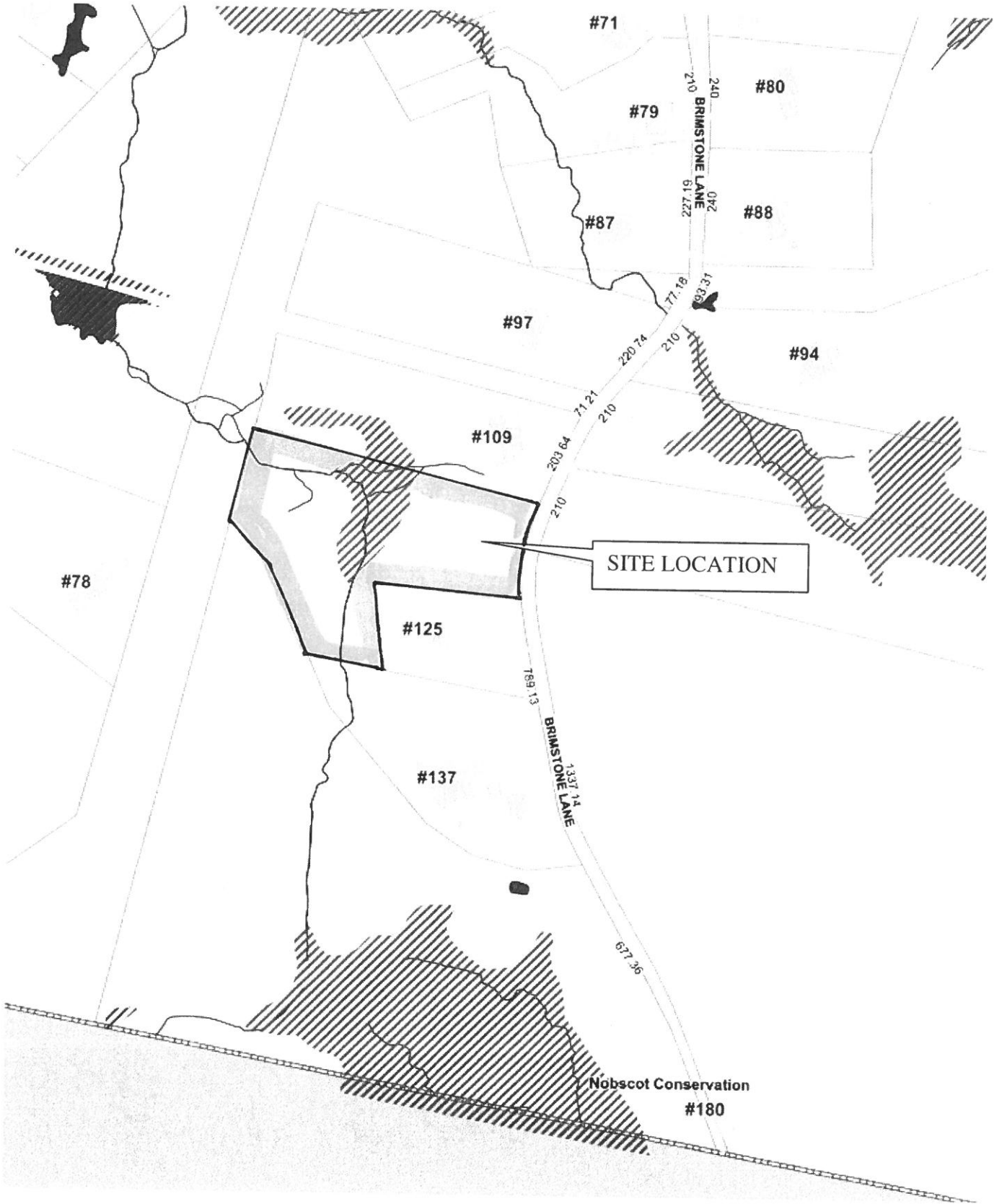
## ***LOCUS MAPPING***

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USGS LOCUS MAP



**SUDBURY GIS MAPPING**



**NHESP MAPPING**

Enter a loc...

109  
BRIMSTONE  
LN

137  
BRIMSTONE  
LN

SITE LOCATION

PH 1291

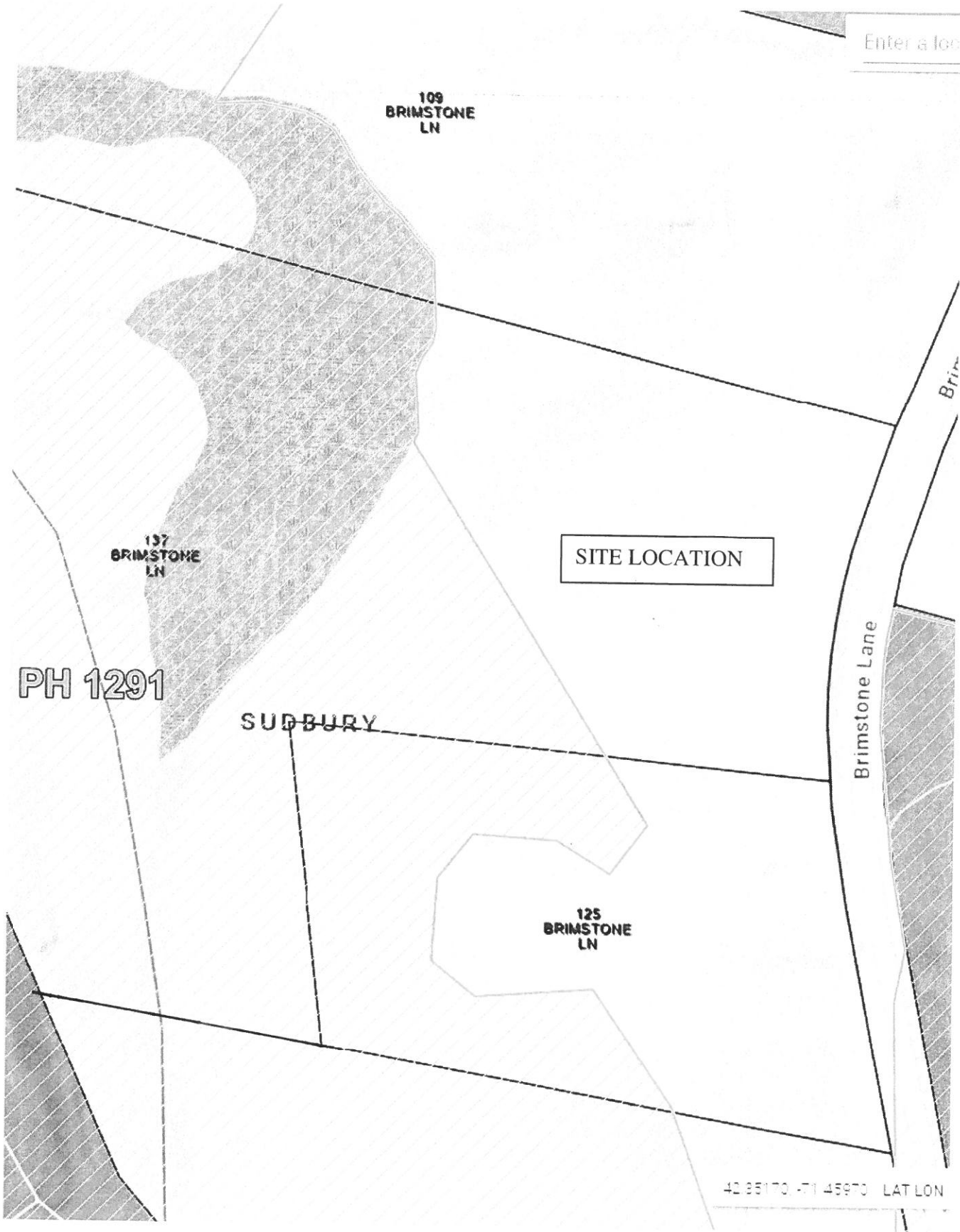
SUBBURY

125  
BRIMSTONE  
LN

Brimstone Lane

Brin

42.85170 -71.45970 LAT LON



APPROVAL UNDER THE  
SUBDIVISION CONTROL LAW,  
IS NOT REQUIRED.  
SUDBURY PLANNING BOARD  
DATE: May 26, 2022

THIS ENCLOSURE OF THE PLANNING BOARD SHOULD NOT BE CONSIDERED AS A DETERMINATION OF CONFORMANCE WITH ZONING REGULATIONS

Middlesex Registry of Deeds,  
Southern District  
Cambridge, Massachusetts  
Plan No. 567  
Map No. 1 of 20  
Scale: 1" = 20'  
L.S.N. GEM Z. PLAN 17  
TAX MAP  
Assessor  
Signature

GENERAL NOTES:  
1. THE INFORMATION SHOWN HEREON IS FOR INFORMATIONAL PURPOSES ONLY AND IS NOT A GUARANTEE OF ACCURACY. THE USER SHALL BE RESPONSIBLE FOR VERIFYING THE ACCURACY OF THE INFORMATION SHOWN HEREON.  
2. THE PLAN IS BASED ON AN ASSUMPTION THAT THE PROPERTY SHOWN IS ACCURATELY LOCATED AS SHOWN ON THE MAP AND THAT THE BOUNDARIES SHOWN ARE THE TRUE AND CORRECT BOUNDARIES OF THE PROPERTY.  
3. LEGAL BOUNDARIES OF THE PROPERTY AND THE LOCATION OF THE PROPERTY SHALL BE DETERMINED BY THIS SURVEY.  
4. PARCELS ARE INTENDED TO BE CONVEYED AS SEPARATE PLOTS OF LAND TO THE TOWN OF SUDBURY, MASSACHUSETTS, FOR THE TOWN OF SUDBURY TO ANNEX FROM THE TOWN OF SUDBURY TO ANNEXION.  
5. THE PLAN IS BASED ON THE PLAN OF SUDBURY TO ANNEXION APPROVED BY THE BOARD OF SUPERVISORS OF THE TOWN OF SUDBURY, MASSACHUSETTS, ON APRIL 1, 2022, AND THE PLAN IS INTENDED TO BE CONVEYED TO THE TOWN OF SUDBURY TO ANNEXION TO PROVIDE THE REQUIRED FRONTAGE.

OWNERS:  
THE DAVID ARONSON 2003  
REVOCABLE TRUST  
137 BRIMSTONE LANE  
SUDBURY, MA 01776

CONNORSTONE  
ENGINEERING INC  
CIVIL ENGINEERS AND LAND SURVEYORS  
10 SOUTHWEST CUTOFF SUITE 203  
NORTHBROOK, MASSACHUSETTS 01532  
PHONE: 508-393-9774 FAX: 508-393-3242

DATE	APRIL 8, 2022
DRAWN BY	MM
CHECKED BY	MM
SCALE	1" = 40'



PLAN NO. 1449 OF 1974



ROBERT & VIVE FISH  
MAP LOT, PARCEL 2  
DEED BK. 25178, PG. 268

N/T  
NORMAN & SARAL ZODIOP  
DEED BK. 26483, PG. 126

N/T  
TOWN OF SUDBURY  
PARCEL 300  
DEED BK. 17445, PG. 207

N/T  
TOWN OF SUDBURY  
PARCEL 511  
DEED BK. 16653, PG. 289

- LEGEND
- Iron Pin
  - Iron Pin Found
  - Concrete Band w/ Drill Hole Found
  - Stone Wall



I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED IN CONFORMANCE WITH THE RULES AND REGULATIONS OF THE REGISTER OF DEEDS.

VARGENT H. ACOOPIN, P.L.S. 49865

TOWN ASSESSOR MAP LOT, PARCEL 6  
DEED BOOK 67657, PAGE 34  
PLAN NUMBER 1449 OF 1974  
PLAN NUMBER 1520 OF 1985  
PLAN NUMBER 1754 OF 1985  
PLAN NUMBER 866 OF 1985  
PLAN NUMBER 1531 OF 1983  
LAND COURT PLAN 4885H  
ZONED: RESIDENCE C  
FRONTAGE: 505.00' OF  
FRONTAGE: FRONT = 40 feet  
SIDE = 20 feet  
REAR = 30 feet

# 2022 - ANR PLAN

5-7-22 Jall



**CERTIFIED LIST OF ABUTTERS & NOTIFICATION FORMS**

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

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

- A. The name of the **Applicant** is Carrie Maciel
- B. The Applicant has filed a Notice of Intent with the Sudbury Conservation Commission seeking permission to work in an Area Subject to Protection (Wetland Resource Area and/or Buffer Zone) under the Massachusetts Wetlands Protection Act (General Laws Chapter 131, Sec.40) and the Town of Sudbury Wetlands Administrative Bylaw.
- C. The **address** of the lot where the activity is proposed: Lot 2 Brimstone Lane
- D. The **proposed activity** is: Construction of a new single family home
- E. A **Public Hearing** regarding this Notice of Intent will be held on:  
**Monday, December 18, 2023 at 7:00 PM.**
- F. **Public Participation will be via Virtual Means Only** - In light of the ongoing COVID-19 coronavirus outbreak, Governor Baker issued an emergency Order on March 12, 2020, allowing public bodies greater flexibility in utilizing technology in the conduct of meetings under the Open Meeting Law. The Town of Sudbury Conservation Commission greatly values the participation of its citizens in the public meeting process, but given the current circumstances and recommendations at both the state and federal levels to limit or avoid public gatherings, including Governor Baker's ban on gatherings of more than 10 people, together with the present closure of Sudbury Town Hall and other public buildings to the public, the Town has decided to implement the "remote participation" procedures allowed under Governor Baker's emergency Order for all boards, committees, and commissions.
- G. **The public may participate in this meeting via Remote Participation:**
- From your computer, smart phone or tablet:
- https://zoom.us/j/98803339162
  - Meeting ID: 988 0333 9162
  - From your phone: **978-639-3366** or **470 250 9358**
- H. Copies of the Notice of Intent may be examined by visiting this Website:  
<https://sudbury.ma.us/conservationcommission/meetings/>
- I. Copies of the Notice of Intent may be obtained from either the Applicant, or the Applicant's representative Connorstone Engineering, Inc, by calling this telephone number: 508-393-9727 between the hours of 10:00 and 4:00

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

**AFFIDAVIT OF SERVICE**  
**Under the Massachusetts Wetlands Protection Act**  
**&**  
**Sudbury Wetlands Administration Bylaw**

I, Vito Colonna of Connorstone Engineering, Inc., hereby certify under the pains and penalties of perjury that on November 21, 2023 I gave notification to abutters in compliance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40, and the DEP Guide to Abutter Notification dated April 8, 1994, in connection with the following matter:

A Notice of Intent filed under the Sudbury Wetlands Administration Bylaw and Massachusetts Wetlands Protection Act by Carrie Maciel with the Sudbury Conservation Commission on November 21, 2023 for property located at Lot 2 Brimstone Lane in Sudbury Ma.

The form of the notification, and a list of the abutters to whom it was given and their addresses are attached to this Affidavit of Service.

  
\_\_\_\_\_  
Name

11/21/23  
\_\_\_\_\_  
Date

Abutters to L04-0008 Lot 2

abutters_id_field	abutters_owner1	abutters_owner2	abutters_address	abutters_town	abutters_state	abutters_zip	abutters_bookpage	abutters_location
L04-0005	FUSHI ROBERT A & DENISE DUNNE-	109 BRIMSTONE LN	109 BRIMSTONE LN	SUDBURY	MA	01776	25219-368	109 BRIMSTONE LN
L04-0006	BUSCH KENNETH & GADICK JASON	137 BRIMSTONE LANE	137 BRIMSTONE LANE	SUDBURY	MA	01776	81460-434	137 BRIMSTONE LN
L04-0007	ZOCHER NORMAN & ABIGAIL	125 BRIMSTONE LANE	125 BRIMSTONE LANE	SUDBURY	MA	01776	56485-128	125 BRIMSTONE LN
L04-0200	TOWN OF SUDBURY	278 OLD SUDBURY ROAD	278 OLD SUDBURY ROAD	SUDBURY	MA	01776	12745-207	BRIMSTONE LN
L04-0300	TOWN OF SUDBURY	278 OLD SUDBURY ROAD	278 OLD SUDBURY ROAD	SUDBURY	MA	01776	12745-207	BRIMSTONE LN
L04-0400	TOWN OF SUDBURY	278 OLD SUDBURY ROAD	278 OLD SUDBURY ROAD	SUDBURY	MA	01776	16663-589	BRIMSTONE LN
L04-0613	FAIRBAIRN SCOTT T & CATHERINE	112 BRIMSTONE LN	112 BRIMSTONE LN	SUDBURY	MA	01776	22112-38	BOSTON POST RD
L04-0009	TOWN OF SUDBURY	278 OLD SUDBURY ROAD	278 OLD SUDBURY ROAD	SUDBURY	MA	01776	81248-536	OFF BRIMSTONE LN
L04-0008	MACIEL CARRIE GOMES & DEOLIVEIRA ROGERIO EFIGENIO	6 BALDWIN DR	6 BALDWIN DR	STOW	MA	01775	81361-347	Lt 2 BRIMSTONE LN

Cynthia Gerry



***STORMWATER REPORT***

---

# Stormwater Management Permit Documentation

Brimstone Lane (map L04 parcel 8)  
Sudbury, Massachusetts

*November 6, 2023*

Prepared by:  
Connorstone Engineering, Inc.  
121 Boston Post Road  
Sudbury, MA

The purpose of this analysis is to summarize the design calculations, and design a stormwater management system in accordance with the Sudbury Stormwater Management Permit.

## **Site Description**

The subject site consists of a 164,100 SF +/- parcel located at Lot 2 Brimstone Lane, formerly part of the lot located at 137 Brimstone Lane (between #109 and #125 Brimstone Lane). The parcel is currently undeveloped and in a wooded condition. Site topography slopes from southeast to northwest (away from Brimstone Lane) with an average grade of 15% to 25%. The project site is abutted on all three sides (side lines and rear line) by existing residential homes and reservation land.

The available soil mapping classifies the on-site soils mostly as Hollis-Rock outcrop-Charlton Complex which is a hydrologic soil group D soil due to shallow depth to ledge. Soil testing and site observations agree with this mapping. Areas of shallow rock and rock outcroppings are visible at the surface. Soil testing was performed in the area of the septic system, stormwater system, and development area. The testing showed the soil substratum consists of a mix of sandy loam or loamy sand, areas of shallow rock, and evidence of groundwater (mottling) 42 to 68 inches below grade. Percolation rates within the septic area ranged from 6 to 13 minutes per inch.

The existing site is currently undeveloped with wooded uplands along the easterly half of the site abutting Brimstone Lane, and then transitioning to regulated wetlands along the westerly half of the site in the areas of lower elevation. The site topography slopes down away from Brimstone Lane toward the wetland areas at moderately steep slopes of approximately 20%. Under the existing conditions stormwater flows overland from the high point along Brimstone Lane toward the wetlands in the rear. No stormwater controls or collection currently exist on-site.

Wetland resource areas onsite have been delineated on site by Oxbow Associates in March of 2023. Those resource areas include an perennial stream flowing through the rear of the site, along with associated bordering vegetated wetlands. The stream is an unnamed stream flowing from Carding Mill Pond through the project site and the crossing the town line into Framingham, and does not have any associated flood hazard areas. The buffer zone and riverfront areas on-site currently consist of undeveloped woodlands.

## **Proposed Project:**

The proposed project includes construction of a five bedroom single-family residential dwelling including driveway access, septic system, utility connections, pool/patio, shed, drainage, landscaping, and associated site work. The proposed project will result in a total impervious area of approximately 7,850 sq. ft., and the total disturbed area on-site is 32,000 square feet. The existing slopes on-site are generally greater than 10%, and this disturbance on slopes has triggered the need for a Major Stormwater Permit. The site has been designed to match the existing conditions for recharge, peak rate of runoff, and volume of runoff that may discharge from the property. Mitigation has been provided through a large rain garden system located to the rear of the house as well as a roof drain drywell system off the back of the house.

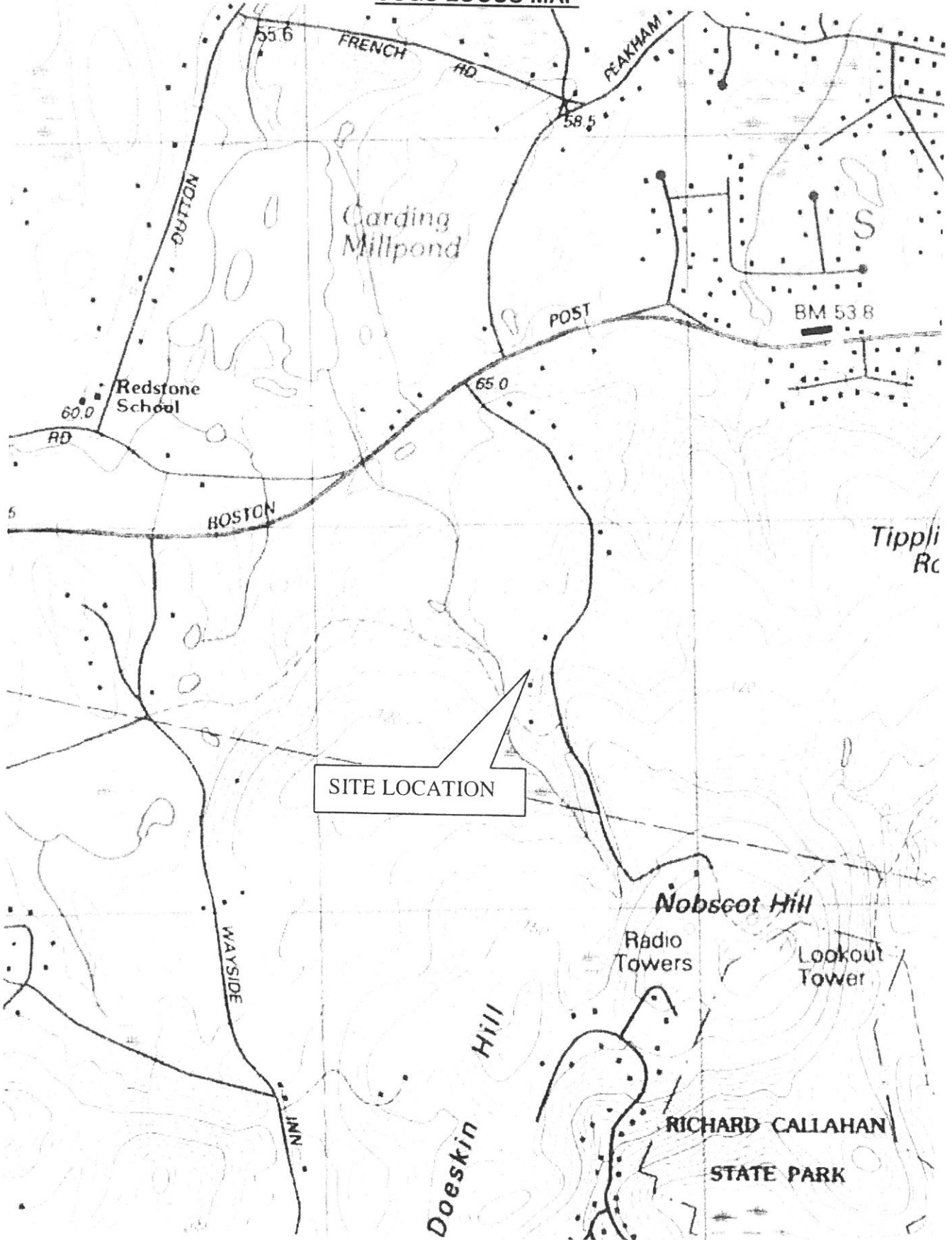
The proposed drywell is a typical subsurface structure consisting of plastic chambers within a crushed stone bed located to the rear of the house. The location was selected to be downgradient of the roof areas and to be located in an area of fill to allow the elevation of the system to be sufficiently above the seasonal high groundwater elevation and/or ledge.

The plans have also proposed a rain garden located in the lower elevations of the lot to collect and treat runoff from the driveway and a portion of the lawn areas. The driveway area would either sheet flow overland (disconnected impervious surface), or be collected through a trench drain along the entrance and conveyed through a grass swale. The layout of the rain garden was intended to be a low impact design to work with the natural topography and vegetation. The design essentially includes an 3+/- foot tall earthen berm through the wooded areas with a sump area and outlet near the low point, and the upgradient natural vegetation would be maintained to create a naturalized area.

Per the Stormwater bylaw, low impact techniques have been implemented as recommended in Appendix E including the use of Grass Swales and a Rain Garden.

As required under the Permit Standards and Requirements, the proposed project has been designed in compliance with MassDEP Stormwater Standards and the additional criteria under the regulations. A detailed summary of each standard is provided with this report.

**USGS LOCUS MAP**







# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

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

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

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

### Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



  
Signature and Date

### 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<sup>1</sup>
- 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.

<sup>1</sup> 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 -- *X/A*

- 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; - Site Plan
  - 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.

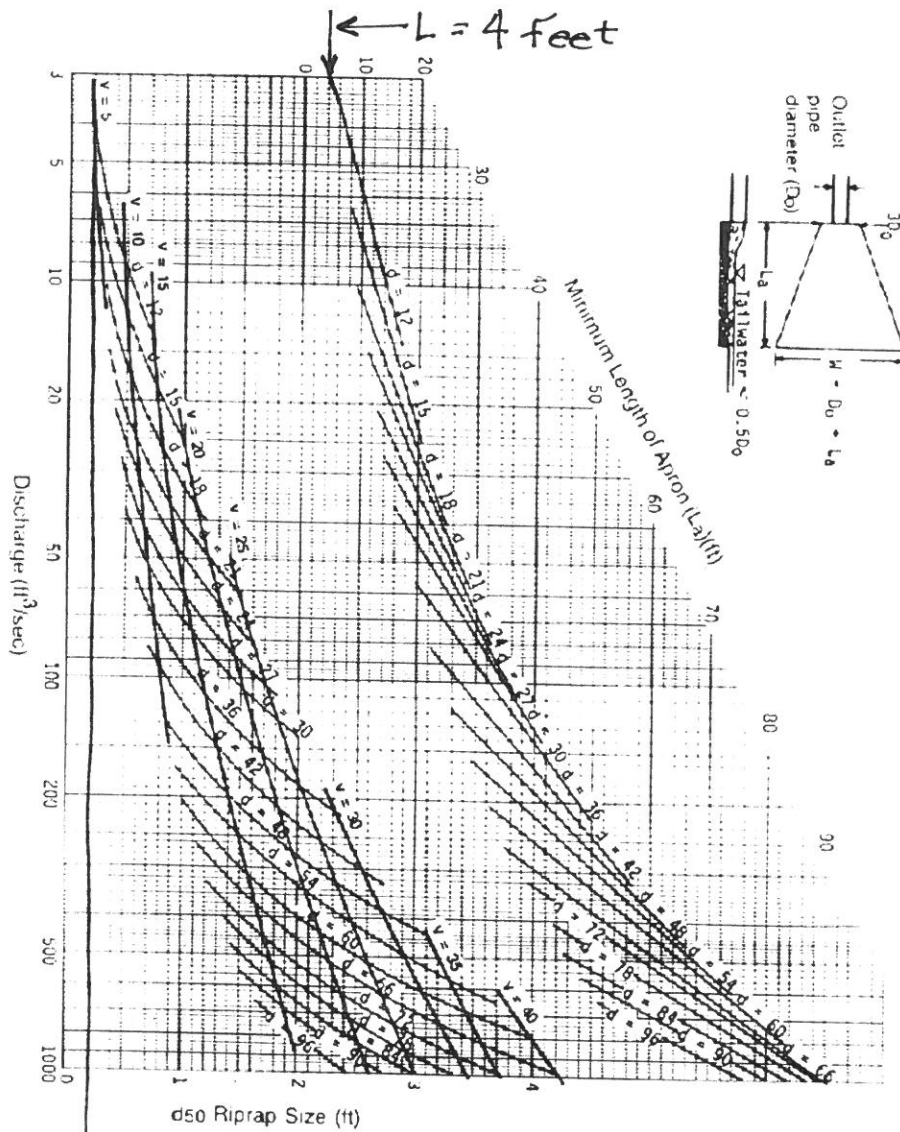
### Standard 10: Prohibition of Illicit Discharges

- 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.

## MA D.E.P. STORMWATER STANDARDS

### Standard 1: No New Untreated Discharges

1. There are no new untreated discharges to any wetland resource areas. The discharge locations are to upland areas with stabilized outlets.
2. The overflow discharge outlets from the trench drain, roof drain, and rain garden have been protected with stone aprons to prevent scour. 2'(W)x4'(L) stone pad of 3-6" stone.
3. Riprap sizing: Use: Maximum pipe diameter = 8" (100 yr = 1.8 cfs / 5.1 fps)  
 Required Riprap Size = 3" to 6"  
 Required Length = 4 feet (min.)



←  $D_{50} = 2$ -inches minimum.



## Standard 2: Peak Rate Attenuation

The project has been designed to mitigate the increase in impervious surfaces through the use of a large rain garden. The pre- and post-development stormwater runoff has been analyzed using HydroCAD 9.10, which is a stormwater modeling computer program utilizing a collection of techniques for the generation and routing of hydrographs, including Soil Conservation Service (SCS) Technical Release No. 20 (TR-20) and SCS Technical Release 55 (TR-55), *Urban Hydrology for Small Watersheds*.

Runoff from the development area flows westerly toward the wetlands delineated on-site. This point was used as the analysis point in the analysis. The results are as follows:

### Analysis Point 1 – Flow to Wetland on-site

Storm Event	Peak Rate of Runoff Existing (Proposed)	Volume of Runoff Existing (Proposed)
1-inch	0.0 cfs (0.0 cfs)	0.00 ac-ft (0.00 ac-ft)
2-year (3.2 inches)	1.4 cfs (1.3 cfs)	0.11 ac-ft (0.09 ac-ft)
10-year (4.8 inches)	2.8 cfs (2.7 cfs)	0.22 ac-ft (0.19 ac-ft)
25-year (6.0 inches)	4.0 cfs (3.5 cfs)	0.31 ac-ft (0.28 ac-ft)
100-year (8.6 inches)	6.7 cfs (6.5 cfs)	0.52 ac-ft (0.49 ac-ft)

## Standard 3: Stormwater Recharge

The proposed Stormwater management system has been designed to provide recharge of stormwater in excess of that required by Standard 3. Recharge has been provided through the rain garden, and roof drywell in full compliance with the standard.

### Recharge Volume Summary:

Total Post development impervious area = 7,850 S.F.

Onsite hydrologic soil group = D (0.25 inches x impervious area)

Recharge volume required =  $(7,850 \times 0.25 / 12) = 164 \text{ C.F.}$

Recharge volume proposed = 370 C.F. (Rain Garden) + 470 C.F. (Roof Drain) = 840 C.F.

### Soil Conditions:

The soil testing showed the soil substratum consists of Loamy Sand, with percolation rates between 12 minutes per inch and 14 minutes per inch. Evidence of groundwater (mottling) was observed 42-65 inches below grade near the rain garden. The rain garden has been set within the loamy sand layer and greater than 2 feet above seasonal high groundwater elevation.

### Draw down Time (maximum 72 hours allowable):

Proposed Rain Garden (370 cubic feet) /  $(2.42 \text{ in/hr} \times 1/12 \times 200 \text{ sq. ft.}) = 9.2 \text{ hours}$

Proposed Roof Drain (470 cubic feet) /  $(2.42 \text{ in/hr} \times 1/12 \times 280 \text{ sq. ft.}) = 8.3 \text{ hours}$   
(rawles rate for Loamy Sand = 2.42 in/hr)

### Mounding Analysis

The proposed system will provide 2.5 feet of separation to groundwater and a mounding analysis has been attached to the report.

**Standard 4: Water Quality**

The proposed project has been designed to collect as much impervious surfaces as practical. The roof areas have been collected through the use of roof drains and will be directed to the rain garden for infiltration. The driveway area will be directed to the rain garden for infiltration as well. Also, a minimum 100 foot buffer has been provided between driveway areas and the resource areas.

**Area 1: Driveway East**

The easterly portion of the driveway closest to Brimstone Lane would be collected by a trench drain placed along the driveway entrance. The trench drain would direct the runoff to the rain garden through the use of a water quality swale.

*TSS removal = 90%*

Standard removal provided by rain garden and water quality swale.

**Water Quality Volume:**

2,190 S.F. (impervious) X 1 foot / 12 inches = 182.5 C.F.

Volume provided above outlet = 285 C.F.

**Standard 5: Land Uses With Higher pollutant Loads**

Not applicable - The proposed use is not classified as a land use with higher pollutant loads.

**Standard 6: Critical Areas**

Not applicable – The site does not contain any critical areas.

**Standard 7: Redevelopment**

Not applicable – The proposed project is new development

**Standard 8: Construction Period Controls**

Erosion controls have been provided in accordance with the latest edition of the MassDEP Stormwater Handbook and Mass Sedimentation and Erosion Control Guidelines. Silt fence has been provided down-gradient of all proposed work, and detailed sedimentation and erosion control notes are provided on the plans. The project disturbance is less than 1 acre of disturbance and would not fall under the NPDES General Construction Permit.

**Standard 9: Operation and Maintenance Plan**

The homeowner will be responsible for all future operation and maintenance of the proposed stormwater management system. A recommended Operation and Maintenance Plan has been provided with this report.

**Standard 10: Illicit Discharges**

To the best of my knowledge, the attached plans, computations and specifications meet the requirements of Standard 10 of the Massachusetts Stormwater Handbook regarding illicit discharges to the stormwater management system. Based upon site observations no detectable illicit discharges exist on the site, and future Illicit discharges are prohibited. The proposed facility is serviced by an on-site subsurface sewerage disposal system per Board of Health requirements. All current documents and attachments were prepared under my direction and qualified personnel properly gathered and evaluated the information submitted.

Name: Uto Calanna

Organization: Comoros Engineering

Signature: [Handwritten Signature]

Date: 4/10/23

# **EROSION AND SEDIMENTATION CONTROL REPORT**

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# **EROSION AND SEDIMENT CONTROL REPORT**

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**(Construction Period Erosion and Sedimentation Control Plan)**

**Lot 2 Brimstone Lane (L04-8)**  
**Sudbury, MA**

***November 6, 2023***

## **Estimated Disturbance Area**

The site has been designed to minimize the limit of clearing and disturbance resulting in a total estimated disturbance area of 32,000 S.F.

## **Erosion and Sediment Control Practices**

**Sedimentation Barrier** – Prior to the commencement of work, Straw Wattles and Silt Fence shall be installed along the edge of proposed development indicated on the plans, and remain in place until all upgradient areas are stabilized. Additional barriers shall be located as conditions warrant or as directed by the owner, his representatives, or the local authority.

**Permanent Stabilization** – Disturbed portion of the site where construction activity ceases shall be stabilized with permanent seed no later than 14 days after the last construction activity. The permanent seed mix consists of Kentucky bluegrass, tall fescue, and annual rye. Prior to seeding, ground agricultural limestone and fertilizer shall be applied as required.

**Dust Control** – Dust control measures shall be implemented and maintained properly throughout dry weather periods until all disturbed areas have been permanently stabilized. Methods for dust control shall include water sprinkling and/or other methods approved by the engineer.

**Soil Stockpiles** – Soil stockpiles shall be stabilized to prevent erosion along with perimeter sedimentation controls. No materials subject to erosion shall be stockpiled overnight within 100 feet of a wetland unless covered.

**Dewatering Operations** – Dewatering operations, if required, shall discharge onto stabilized areas. All discharge water is to pass through sedimentation control devices to prevent impacts upon water bodies, bordering vegetated wetlands, drainage systems and abutting properties. Dewatering BMP's shall include geotextile filter bags or haybale corrals. No discharges from dewatering operations shall be discharged directly to the drainage system.

**Street Sweeping** – Street sweeping in the vicinity of the project area shall be performed as needed until the project limits have been stabilized. All sediment tracked outside the limit of work shall be swept at the end of each working day.

**Additional Controls** - This plan depicts the minimum required sedimentation and erosion controls. The contractor shall employ additional sedimentation and erosion control measures as necessitated by site conditions, or as directed by the owner, the owner's representative, or the conservation commission to ensure protection of all wetland resources and control sediment transport.

**Construction Entrance** - All vehicles shall enter and exit the site via a stabilized construction entrance consisting of 1-1/2" to 3" crushed stone to a depth of 6" for the first 30 feet from existing paved streets. The contractor shall inspect the construction entrance each working day.

### **General Construction Sequencing of Major Activities**

1. Clearly delineate limit of clearing, utilities and vegetation to be protected.
2. Install sediment control barriers and construction entrance.
3. Clear and grub limit of work.
4. Install rear retaining wall along property line, and begin importing fill as required.
5. Begin construction of foundations and house.
6. Install drywell.
7. Install retaining walls adjacent to house foundation.
8. Install septic system and utility connections.
9. Construct driveway.
10. Perform final landscaping and stabilization.
11. Remove the remaining siltation devices as the area becomes stable.

### **Construction Period Operation and Maintenance Schedule**

The responsible party shall be responsible for maintaining all temporary and permanent sedimentation and erosion controls until work is complete and all areas have been permanently stabilized. At such time all sedimentation and erosion control measures shall be removed. These are the inspection and maintenance practices that will be used to maintain erosion and sediment controls during construction.

#### Schedule:

- All control measures will be inspected at least *once each week*.
- All erosion components shall be inspected both following any precipitation event of 0.5 inches and before any forecasted events of more than 0.5 inches.

#### Maintenance Practices:

- All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report of any deficiencies.
- Built up sediment shall be removed from the silt fence when it reaches a depth equal to one-third the height of the fence.
- Any diversion dikes will be inspected for breaches and promptly repaired.
- Temporary and permanent seeding and planting will be inspected for bare spots, washouts and healthy growth.
- Contractor to maintain a supply of erosion control devices on site at all times to repair any broken or damaged materials.

## **OPERATION AND MAINTENANCE PLAN**

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# STORMWATER OPERATION AND MAINTENANCE PLAN

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Lot 2 Brimstone Lane (L04-8)  
Sudbury, MA

November 6, 2023

Stormwater Management System Owner:  
and Responsible Party

Name: \_\_\_\_\_

Lot 2 Brimstone Lane  
Sudbury, MA

Signature: \_\_\_\_\_

This Operation and Maintenance Plan has been prepared in accordance with the Sudbury stormwater standards and recommendations outlined in the DEP stormwater handbook. This plan outlines the minimum efforts necessary to ensure that the stormwater collection and treatment system and sedimentation and erosion control system for this site operates in accordance with the design. Efforts in addition to the minimum listed herein may be required to ensure adequate stormwater management.

This plan includes general site restrictions, routing/non-routine operation and maintenance; reporting and record keeping; and an estimated budget.

## General Site Conditions

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The following conditions are imposed as part of this Plan per the Sudbury Stormwater Management Bylaw.

- The Stormwater Permitting Authority or its designee shall be able to enter the property, with notice to the property owner, at reasonable times and in a reasonable manner for the purpose of inspection.
- Illicit discharges into stormwater management system are perpetually prohibited.
- Store lawn and deicing chemicals under cover
- Apply fertilizers and pesticides sparingly to prevent wash-off
- Use of slow release nitrogen and low phosphorus fertilizers is encouraged
- No fertilization or pesticide application in or near any wetland resource area
- Dispose of pet waste properly
- Store, use and dispose of household hazardous wastes properly
- Limit exterior washing of vehicles to locations that drain to pervious surfaces and away from storm drains
- Maintain vehicles and clean up fluid spills/drips from pavement areas
- Pump and maintain septic systems
- Use alternative deicers such as calcium chloride and magnesium chloride in lieu of sodium based deicers
- No coal tar-based pavement sealants are to be used on any site subject to the smp.

## Operation and Maintenance:

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Schedule: The entire stormwater management system should be inspected twice per year.

Specific inspection and maintenance practices are listed under each component below. Upon completion of inspection, the inspector should specify any necessary corrective actions to be taken by ownership of the facility. The items to be inspected and maintained are described in the following sections.

Based on the observed conditions, the Responsible Party shall immediately schedule the appropriate maintenance. Some minor maintenance, such as the removal of blockages, debris and saplings in the basins may be conducted at the time of the inspection. More difficult maintenance activities, requiring special equipment, will have to be scheduled, such as the removal of excessive sediment or the repair of eroded areas. All sediment must be removed at least once per year.

### Vegetation

The initial vegetation inspection shall occur four (4) weeks after final stabilization of the site; vegetation shall be dense (and aesthetically acceptable on all portions of the project, including the side slopes, buffer strips and the embankments). The inspector shall determine and document: (1) whether fertilizing is required (2) the areas where grass shall be mowed, and (3) the areas which shall be protected against erosion. In addition, recently seeded areas shall be inspected for failures.

Eroded areas shall be filled and compacted, if necessary, and reseeded as soon as possible. If an area erodes twice, then a geotextile fabric is to be installed to stabilize the area to allow vegetation to be established. These maintenance activities shall take place during the planting season. Areas affected by lack of rainfall shall be watered. If the stand is more than 60% damaged, it shall be reestablished, following the original preparation and seeding instructions. Areas of repeated erosion/scour problems shall be lined with riprap only after twice attempting to stabilize the area with geotextile fabric.

### Driveway Surfaces

Paved driveway surfaces shall be inspected for settlement, cracking, potholes, and sediment/sand accumulation on the surface. Surfaces shall be swept a minimum of twice per year (spring and fall). Any structural deficiencies shall be reported to the Owner and repaired as required.

### Trench Drain

The trench drain should be inspected for structural condition. Any noted damage to the grate or concrete should be noted. Debris or sediment within drain should be removed as necessary to maintain proper flow.

### Drainage Outlets / Outfalls:

The rain garden, roof drain, and trench drain have overflow pipes with riprap (crushed stone) pads to prevent erosion. The outlets should be inspected a minimum of twice per year. The outlets should be inspected for (1) sediment/debris accumulation (2) displacement of riprap pad (3) downgradient scour or erosion.

Any sediment or debris should be removed at the time of inspection. Stone displacement should be repaired. Areas of repeated displacement should be replaced with larger stone size. Guidance on sizing can be provided by the design engineer. If any evidence of downgradient scour is noted, a qualified engineer should be contacted for recommendations and/or guidance.

### Roof Drain Drywell:

The roof drywell is located within rear yard approximately 20 feet from the rear of the house. The location is shown on the attached map.

Drywells shall be inspected after every major storm in the first few months after construction. After this initial period, the systems should be inspected at least twice annually (spring and fall) with one inspection performed after a major storm (1-inch or greater). The inspection port within the drywell and the overflow manhole should be opened at the inspection. The system should be checked for sediment and/or debris and to verify the system is fully draining after a storm event. If the infiltration system does not drain within 72 hours of the end of a storm, then remediation may be necessary including replacement of the system. A qualified engineer should be contacted to recommend mitigation measures.

Heavy Machinery should not operate near, or over, the drywell. The outlet shall be inspected for functionality, debris and scour. Roof drains at each building corner and area drains within the driveway shall be inspected to verify connection to the system, area drains cleaned of any debris, and checked for any evidence of overflow, which could indicate potential blockages. Roof gutters should be cleaned twice per year, or whenever debris is noted.



### Rain Garden

Rain gardens should be maintained similar to site landscaping and planting beds. The following is a typical maintenance schedule

<u>Activity</u>	<u>Time of Year</u>
Inspect & remove trash	Year round
Mulch	Spring
Remove dead vegetation	Spring or Fall
Replace dead vegetation	Spring or Fall
Prune	Spring or Fall
Remove sediment deposits	Spring or Fall

Paying careful attention to pretreatment and operation & maintenance can extend the life of the rain garden. In many cases, during routine landscaping the maintenance tasks can be completed. Inspect regularly for sediment build-up, structural damage, and standing water. If the rain garden has not drained within 72 hours of the end of a storm event, or if continued overflow occurs, then a qualified engineer should be contacted.

Inspect soil and repair eroded areas monthly. Re-mulch void areas as needed. Remove litter and debris. Treat diseased vegetation as needed. Remove and replace dead vegetation twice per year (spring and fall). Remove invasive species as needed to prevent these species from spreading into the area. Replace mulch every two years, in the early spring. A summary of maintenance activities can be found above.

Cold Climate Considerations - Never store snow in rain garden areas.

### **Drainage Easements:**

No drainage easements are currently proposed or required.

### **Changes to Operation and Maintenance Plans**

The owner(s) of the stormwater management system must notify the Stormwater Permitting Authority or its designated Reviewing Agent of changes in ownership or assignment of financial responsibility.

### **Reporting and Record Keeping**

The responsible party will be responsible for maintaining accurate Maintenance Logs for all maintenance, inspections, repairs, replacements, and disposal (for disposal, the log shall indicate the type of material and the disposal location). The logs shall be kept on site be available for inspection by the Town municipal departments or other auditing authority. This will be a perpetual requirement of the Owners or their Designated Party.

The Site Maintenance Log will be completed as described above, and at a minimum will include:

- a. The date of inspection or activity;
- b. Name of inspector;
- c. The condition of each BMP, including components such as:
  - i. Pretreatment devices
  - ii. Vegetation
  - iii. Inlets and outlets
  - iv. Swales
  - v. Underground drainage
  - vi. Sediment and debris accumulation.
  - vii. Any nonstructural practices
  - viii. Pavement condition
  - ix. Roof drains and gutter conditions
  - ix. Any other item that could affect the proper function of the stormwater management system
- d. Description of the need for maintenance; and
- e. For disposal include type of material and the disposal location;

## **Emergency Response Plan / Spill Control Practices**

On-site storage of hazardous materials shall not be allowed.

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In the event of an accident in the driveway where a significant amount of gasoline or other petroleum product is released, the following procedure should be followed:

1. Immediately contact the following agencies:

Sudbury Fire Department	(508)443-2239
MassDEP Emergency response	(888) 304-1133
  
2. Provide support to agencies listed above, which may include contacting an outside contractor to provide clean-up or contacting a Licensed Site Professional (LSP) to lead the clean-up.

The outlet to the drainage system should be inspected. If there is evidence of discharge from the drainage system, additional corrective actions must be taken extending to the receiving water or beyond.

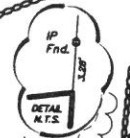


## **HYDROCAD CALCULATIONS**

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**1-inch, 2-, 10-, 25-, and 100-Year Storm  
Calculation Sheets**

N/F  
ROBERT & DENISE FUSHI  
MAP L04, PARCEL 5  
DEED BK. 25219, PG. 368



BENCHMARK  
NAIL - S. 18" OAK  
ELEV. = 335.49  
(NAVD 1988)

**BRIMSTONE LANE**

BENCHMARK  
NAIL - S. 18" MAPLE  
ELEV. = 321.92  
(NAVD 1988)

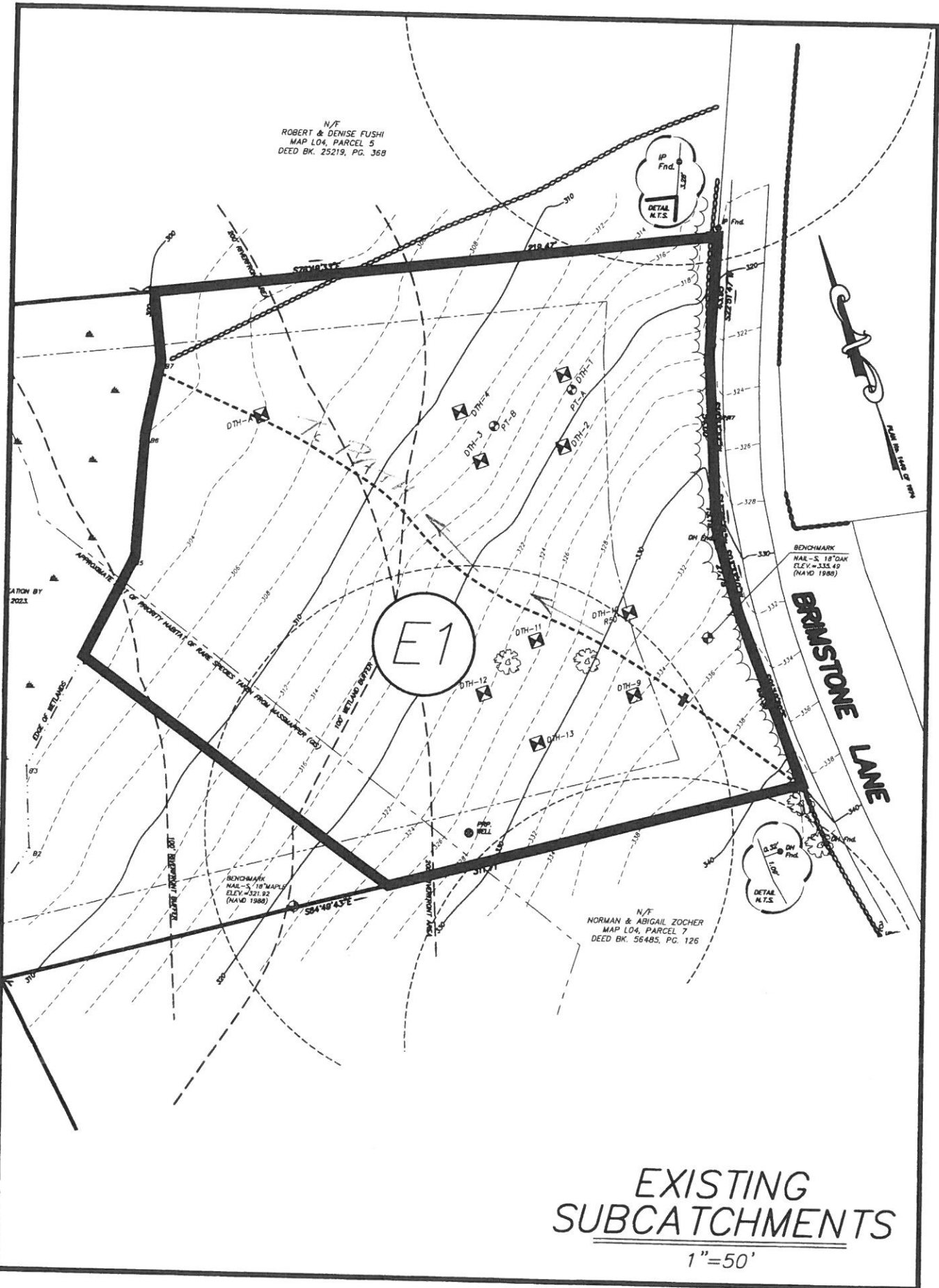
N/F  
NORMAN & ABIGAIL ZOCHER  
MAP L04, PARCEL 7  
DEED BK. 56485, PG. 126



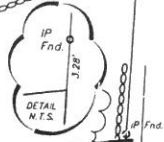
**E1**

# EXISTING SUBCATCHMENTS

1" = 50'



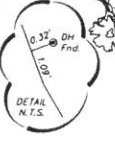
N/T  
 ROBERT & DENISE FUSHI  
 MAP L04, PARCEL 5  
 DEED BK. 25219, PG. 368



GRASS SWALE  
 FE-1 & RIP-RAP PAD  
 6" INVERT=325.0  
 TRENCH DRAIN  
 GRATE INV.=327.2  
 6" INV. OUT= 326.0  
 REMOVE AND RE-USE  
 WALL STONES TO SUPPLEMENT  
 EXISTING WALL

BENCHMARK  
 NAIL-S, 18" OAK  
 ELEV.=325.49  
 (NAVD 1988)

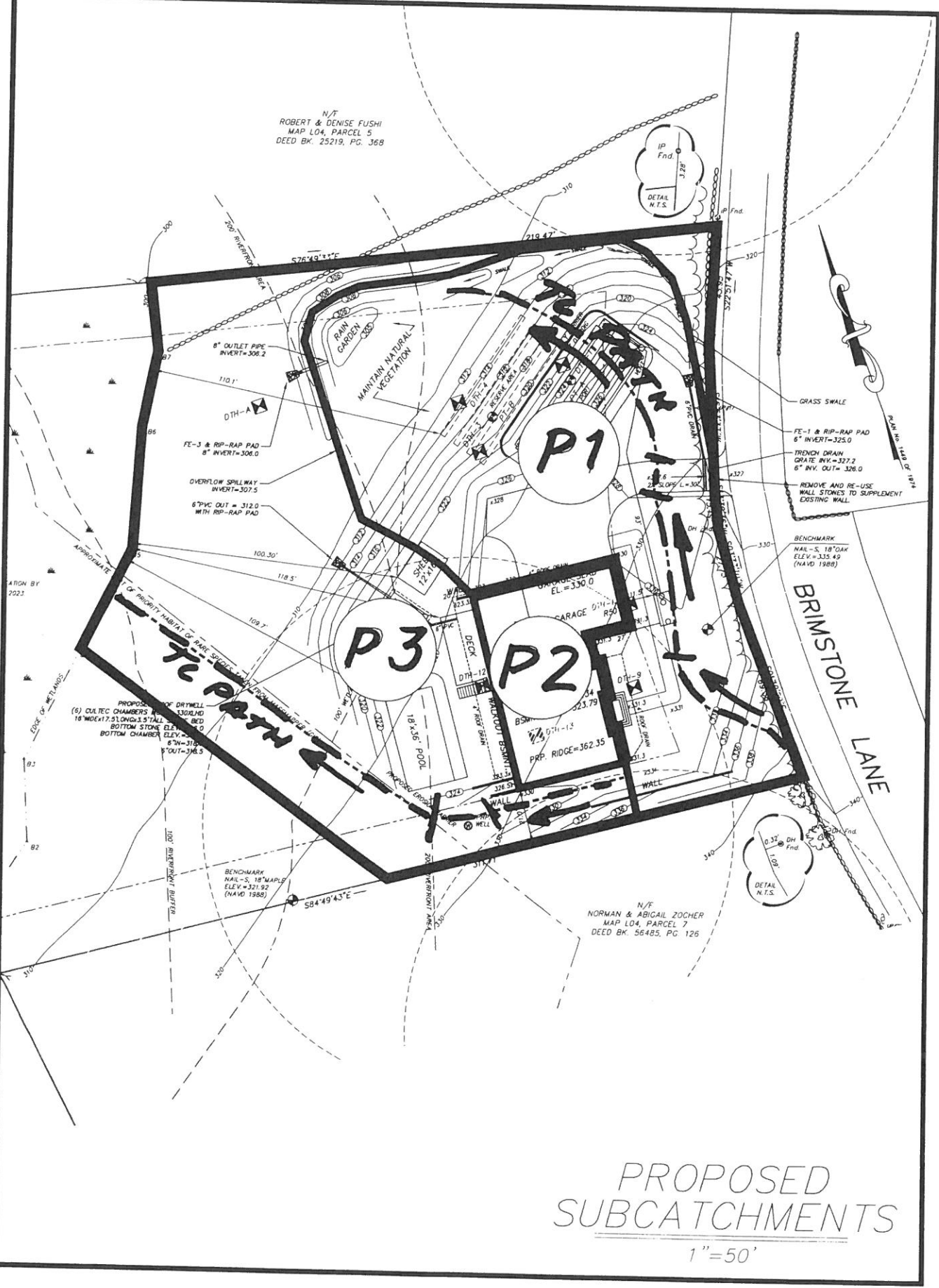
BRIMSTONE LANE

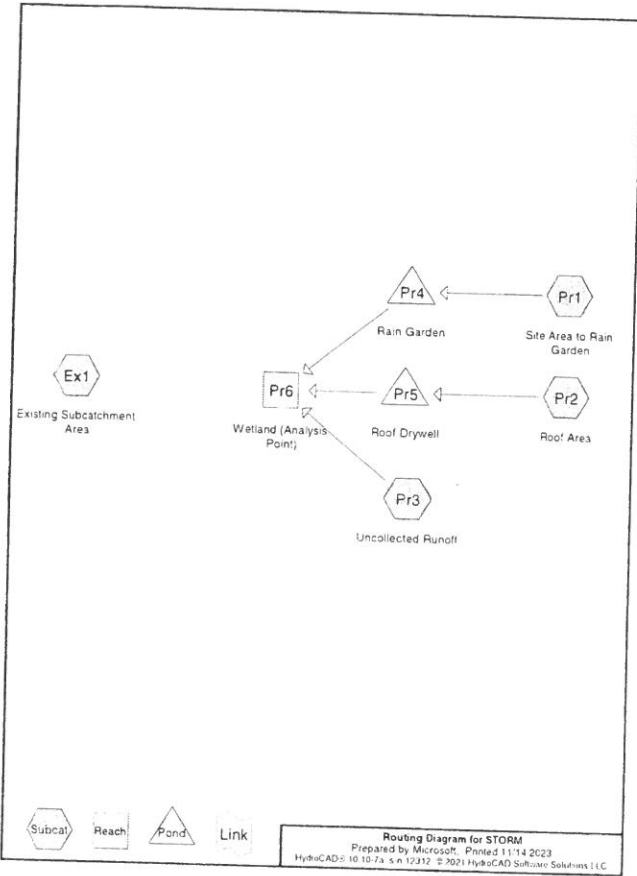


N/T  
 NORMAN & ABIGAIL ZOCHER  
 MAP L04, PARCEL 7  
 DEED BK. 56485, PG. 126

# PROPOSED SUBCATCHMENTS

1"=50'





Summary for Subcatchment Ex1: Existing Subcatchment Area

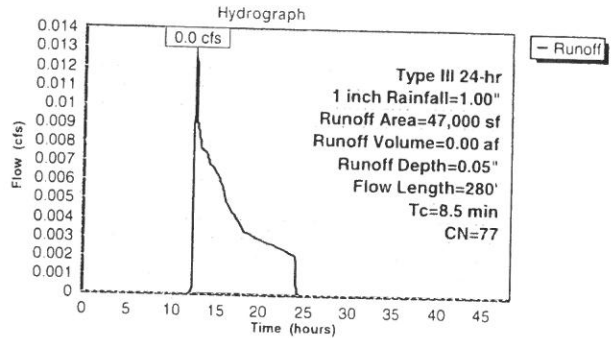
Runoff = 0.0 cfs @ 12.48 hrs. Volume= 0.00 af. Depth= 0.05"  
 Runoff by SCS TR-20 method. UH=SCS. Weighted-CN. Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
47,000	77	Woods, Good, HSG D
47,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		Sheet Flow, Woods Light underbrush n= 0.400 P2= 3.20"
2.0	230	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.5	280				Total

Subcatchment Ex1: Existing Subcatchment Area



Summary for Subcatchment Pr1: Site Area to Rain Garden

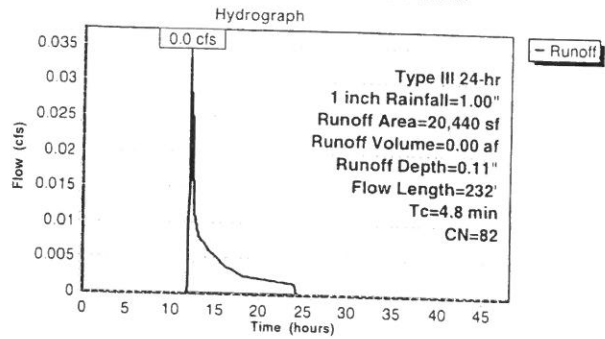
Runoff = 0.0 cfs @ 12.12 hrs. Volume= 0.00 af. Depth= 0.11"  
 Routed to Pond Pr4: Rain Garden  
 Runoff by SCS TR-20 method. UH=SCS. Weighted-CN. Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
2,190	98	Paved parking, HSG D
18,250	80	>75% Grass cover, Good, HSG D
20,440	82	Weighted Average
18,250		69.29% Pervious Area
2,190		10.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.1800	0.24		Sheet Flow, Grass Dense n= 0.240 P2= 3.20"
0.7	60	0.0400	1.40		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.6	110	0.1800	2.97		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.8	232				Total

Subcatchment Pr1: Site Area to Rain Garden



Summary for Subcatchment Pr2: Roof Area

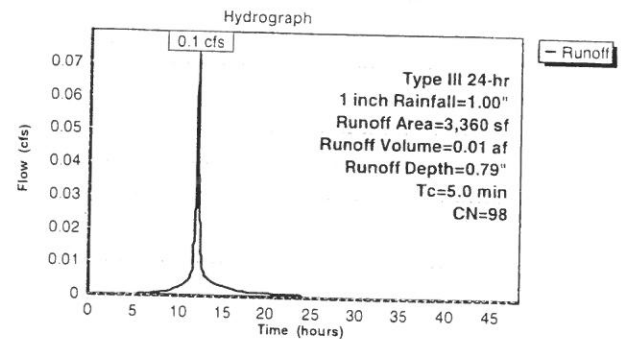
Runoff = 0.1 cfs @ 12.07 hrs. Volume= 0.01 af. Depth= 0.79"  
 Routed to Pond Pr5: Roof Drywell  
 Runoff by SCS TR-20 method. UH=SCS. Weighted-CN. Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
3,360	98	Roofs, HSG D
3,360		100.00% Impervious Area

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

Subcatchment Pr2: Roof Area



Summary for Subcatchment Pr3: Uncollected Runoff

Runoff = 0.0 cfs @ 12.37 hrs. Volume= 0.00 af. Depth= 0.07"  
 Routed to Reach Pr6: Wetland (Analysis Point)

Runoff by SCS TR-20 method. UH=SCS. Weighted-CN. Time Span= 0:00-48:00 hrs. dt= 0.01 hrs  
 Type III 24-hr 1 inch Rainfall=1.00"

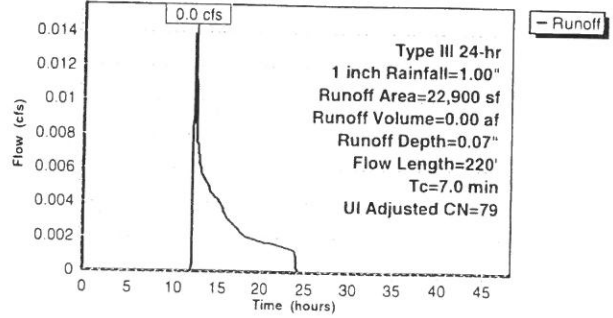
Area (sf)	CN	Adj	Description
13,500	77		Woods, Good, HSG D
1,800	98		Unconnected pavement, HSG D
7,400	80		>75% Grass cover, Good, HSG D
200	98		Unconnected roofs, HSG D
22,900	80	79	Weighted Average, UI Adjusted
20,900			91.27% Pervious Area
2,000			8.73% Impervious Area
2,000			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0500	0.15		Sheet Flow, Grass Dense, n= 0.240, P2= 3.20"
0.1	25	0.1600	2.80		Shallow Concentrated Flow, Short Grass Pasture, Kv= 7.0 fps
1.2	145	0.1500	1.94		Shallow Concentrated Flow, Woodland, Kv= 5.0 fps
7.0	220	Total			

Subcatchment Pr3: Uncollected Runoff

Hydrograph



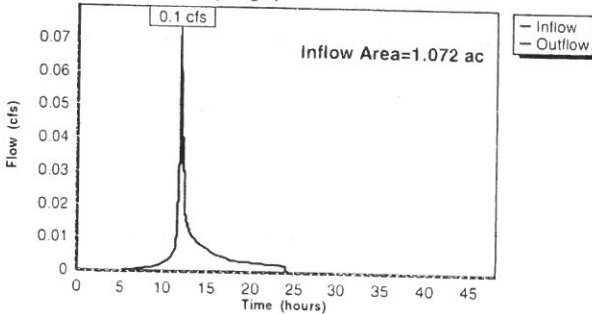
Summary for Reach Pr6: Wetland (Analysis Point)

Inflow Area = 1.072 ac, 16.17% Impervious. Inflow Depth = 0.09" for 1 inch event  
 Inflow = 0.1 cfs @ 12.07 hrs. Volume= 0.01 af  
 Outflow = 0.1 cfs @ 12.07 hrs. Volume= 0.01 af. Atten= 0%. Lag= 0.0 min

Routing by Stor-Ind+Trans method. Time Span= 0:00-48:00 hrs. dt= 0.01 hrs

Reach Pr6: Wetland (Analysis Point)

Hydrograph



Summary for Pond Pr4: Rain Garden

Inflow Area = 0.469 ac, 10.71% Impervious. Inflow Depth = 0.11" for 1 inch event  
 Inflow = 0.0 cfs @ 12.12 hrs. Volume= 0.00 af  
 Outflow = 0.0 cfs @ 12.58 hrs. Volume= 0.00 af. Atten= 63%. Lag= 27.5 min  
 Discarded = 0.0 cfs @ 12.58 hrs. Volume= 0.00 af  
 Primary = 0.0 cfs @ 0.00 hrs. Volume= 0.00 af  
 Routed to Reach Pr6: Wetland (Analysis Point)

Routing by Stor-Ind method. Time Span= 0:00-48:00 hrs. dt= 0.01 hrs / 2  
 Peak Elev= 305.12' @ 12.58 hrs. Surf Area= 219 sf. Storage= 26 cf

Plug-Flow detention time= 15.7 min calculated for 0.00 af (100% of inflow)  
 Center-of-Mass det. time= 15.7 min (942.6 - 926.9)

Volume	Invert	Avail Storage	Storage Description	
#1	305.00'	2,125 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf Area (sq ft)	Inc Store (cubic feet)	Cum Store (cubic feet)	Wet Area (sq ft)
305.00	200	0	0	200
306.00	380	285	285	390
308.00	1,600	1,840	2,125	1,628

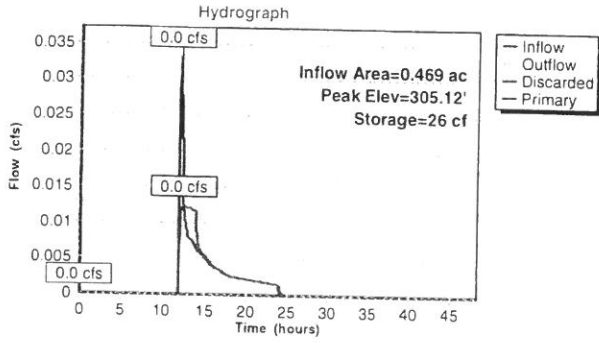
Device	Routing	Invert	Outlet Devices
#1	Discarded	305.00'	2,420 in/hr Exfiltration over Wetted area
#2	Primary	306.20'	8.0' Vert. Outlet C= 0.600 Limited to weir flow at low heads
#3	Primary	307.50'	5.0' long x 5.0' breadth Broad-Crested Rectangular Weir
Head (feet): 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00			
2.50 3.00 3.50 4.00 4.50 5.00 5.50			
Coef. (English): 2.34 2.50 2.70 2.68 2.66 2.65 2.65 2.65			
2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88			

Discarded OutFlow Max=0.0 cfs @ 12.58 hrs HW=305.12' (Free Discharge)  
 1=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=305.00' (Free Discharge)  
 2=Outlet (Controls 0.0 cfs)  
 3=Broad-Crested Rectangular Weir (Controls 0.0 cfs)



**Pond Pr4: Rain Garden**



**Summary for Pond Pr5: Roof Drywell**

Inflow Area = 0.077 ac, 100.00% Impervious, Inflow Depth = 0.79" for 1 inch event  
 Inflow = 0.1 cfs @ 12.07 hrs, Volume = 0.01 af  
 Outflow = 0.1 cfs @ 12.07 hrs, Volume = 0.01 af, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.0 cfs @ 12.07 hrs, Volume = 0.00 af  
 Primary = 0.1 cfs @ 12.07 hrs, Volume = 0.01 af  
 Routed to Reach Pr6 : Wetland (Analysis Point)

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs dt= 0.01 hrs  
 Peak Elev= 316.00' @ 12.07 hrs Surf Area= 280 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 0.01 af (100% of inflow)  
 Center-of-Mass det. time= 0.0 min ( 786.9 - 786.9 )

Volume	Invert	Avail Storage	Storage Description
#1A	316.00'	258 cf	16.00' W x 17.50' L x 3.54 H Field A 932 cf Overall - 346 cf Embedded = 645 cf x 40.0% Voids
#2A	316.50'	346 cf	Cultec R-330XLHD x 5 Inside #1 Cultec Size= 47.8' W x 30.0' H => 7.45 sf x 7.00' L = 52.2 cf Overall Size= 52.0' W x 30.5' H x 8.50' L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
			605 cf Total Available Storage

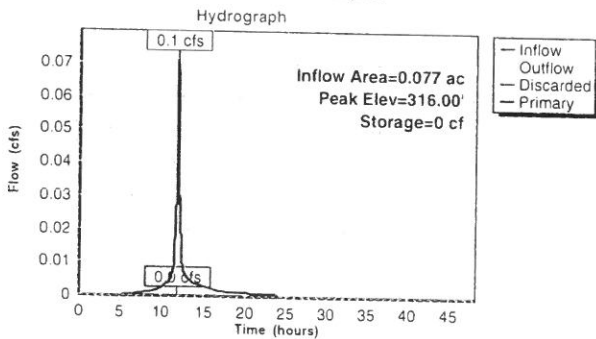
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	2.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Discarded	316.00'	2.420 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.0 cfs @ 12.07 hrs HW=316.00' (Free Discharge)  
 2=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=16.7 cfs @ 12.07 hrs HW=316.00' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 16.7 cfs @ 85.22 fps)

**Pond Pr5: Roof Drywell**



**Summary for Subcatchment Ex1: Existing Subcatchment Area**

Runoff = 1.4 cfs @ 12.13 hrs Volume= 0.11 af, Depth= 1.21"

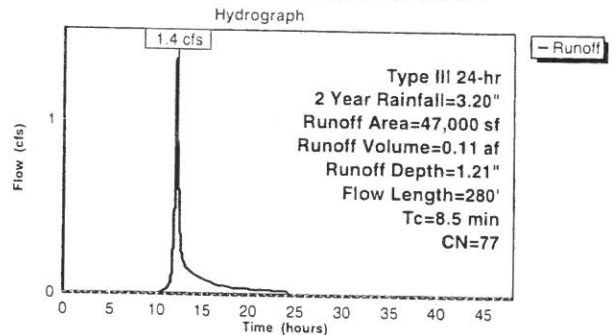
Runoff by SCS TR-20 method, UH=SCS, Weighted, CN Time Span= 0.00-48.00 hrs dt= 0.01 hrs  
 Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
47,000	77	Woods, Good, HSG D
47,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		Sheet Flow, Woods Light underbrush, n= 0.400 P2= 3.20'
2.0	230	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.5	280	Total			

**Subcatchment Ex1: Existing Subcatchment Area**



**Summary for Subcatchment Pr1: Site Area to Rain Garden**

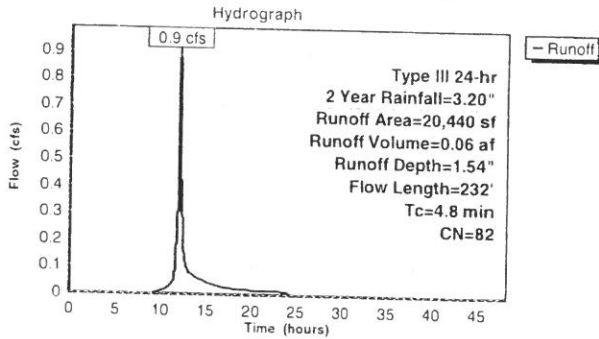
Runoff = 0.9 cfs @ 12.07 hrs. Volume= 0.06 af. Depth= 1.54"  
 Routed to Pond Pr4 : Rain Garden  
 Runoff by SCS TR-20 method. UH=SCS. Weighted-CN. Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
2.190	98	Paved parking HSG D
18.250	80	>75% Grass cover Good HSG D
20.440	82	Weighted Average
18.250		89.29% Pervious Area
2.190		10.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.1800	0.24		Sheet Flow, Grass Dense n= 0.240 P2= 3.20'
0.7	60	0.0400	1.40		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.6	110	0.1800	2.97		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.8	232				Total

**Subcatchment Pr1: Site Area to Rain Garden**



**Summary for Subcatchment Pr2: Roof Area**

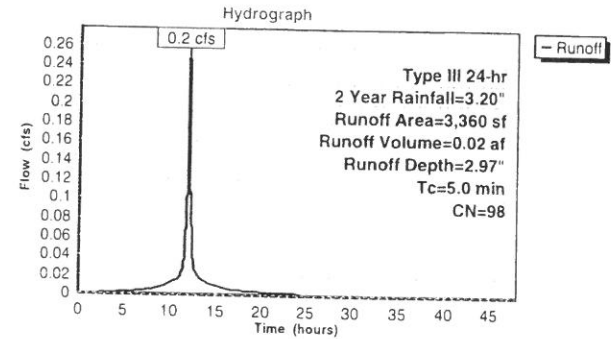
Runoff = 0.2 cfs @ 12.07 hrs. Volume= 0.02 af. Depth= 2.97"  
 Routed to Pond Pr5 : Roof Drywell  
 Runoff by SCS TR-20 method. UH=SCS. Weighted-CN. Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
3.360	98	Roofs HSG D
3.360		100.00% Impervious Area

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

**Subcatchment Pr2: Roof Area**



**Summary for Subcatchment Pr3: Uncollected Runoff**

Runoff = 0.8 cfs @ 12.11 hrs. Volume= 0.06 af. Depth= 1.34"  
 Routed to Reach Pr6 : Wetland (Analysis Point)  
 Runoff by SCS TR-20 method. UH=SCS. Weighted-CN. Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Type III 24-hr 2 Year Rainfall=3.20"

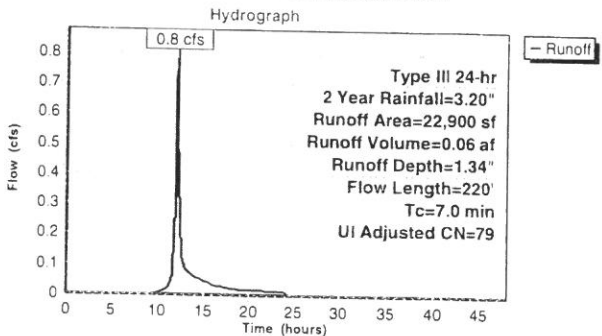
Area (sf)	CN	Adj	Description
13.500	77		Woods, Good, HSG D
1.800	98		Unconnected pavement, HSG D
7.400	80		>75% Grass cover, Good, HSG D
200	98		Unconnected roofs, HSG D
22.900	80	79	Weighted Average, UI Adjusted
20.900			91.27% Pervious Area
2.000			8.73% Impervious Area
2.000			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0500	0.15		Sheet Flow, Grass Dense n= 0.240 P2= 3.20'
0.1	25	0.1600	2.80		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.2	145	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
7.0	220				Total

**Subcatchment Pr3: Uncollected Runoff**

**Subcatchment Pr3: Uncollected Runoff**

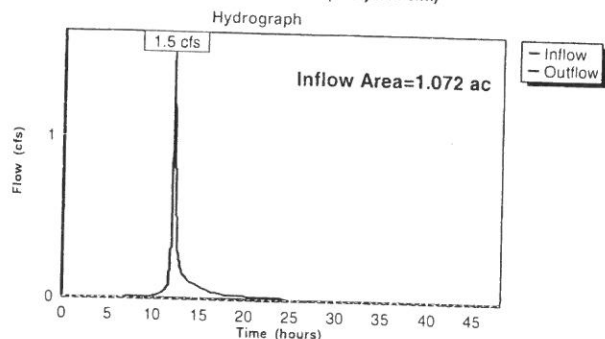


Summary for Reach Pr6: Wetland (Analysis Point)

Inflow Area = 1.072 ac. 16.17% Impervious. Inflow Depth = 1.18" for 2 Year event  
 Inflow = 1.5 cfs @ 12.12 hrs. Volume= 0.11 af  
 Outflow = 1.5 cfs @ 12.12 hrs. Volume= 0.11 af. Atten= 0%. Lag= 0.0 min

Routing by Stor-Ind+Trans method. Time Span= 0.00-48.00 hrs. dt= 0.01 hrs

Reach Pr6: Wetland (Analysis Point)



Summary for Pond Pr4: Rain Garden

Inflow Area = 0.469 ac. 10.71% Impervious. Inflow Depth = 1.54" for 2 Year event  
 Inflow = 0.9 cfs @ 12.07 hrs. Volume= 0.06 af  
 Outflow = 0.6 cfs @ 12.16 hrs. Volume= 0.06 af. Atten= 34%. Lag= 5.1 min  
 Discarded = 0.0 cfs @ 12.16 hrs. Volume= 0.03 af  
 Primary = 0.5 cfs @ 12.16 hrs. Volume= 0.03 af  
 Routed to Reach Pr6: Wetland (Analysis Point)

Routing by Stor-Ind method. Time Span= 0.00-48.00 hrs. dt= 0.01 hrs / 2  
 Peak Elev= 306.63' @ 12.16 hrs. Surf Area= 676 sf. Storage= 615 cf

Plug-Flow detention time= 106.3 min calculated for 0.06 af (100% of inflow)  
 Center-of-Mass det. time= 106.3 min ( 941.5 - 835.1 )

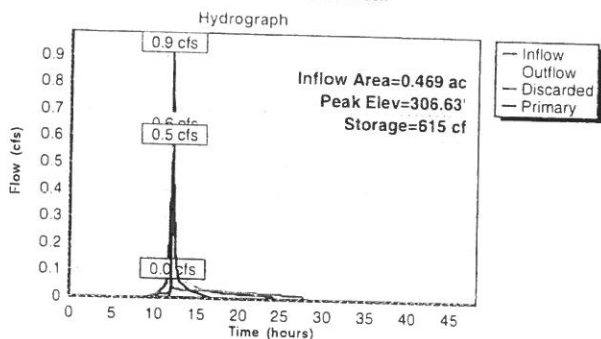
Volume	Invert	Avail Storage	Storage Description
#1	305.00'	2.125 cf	Custom Stage Data (Conic) Listed below (Recalc)
Elevation (feet)	Surf Area (sq ft)	Inc Store (cubic-feet)	Cum Store (cubic-feet)
305.00	200	0	0
306.00	380	285	285
308.00	1.600	1.840	2.125
			Wet Area (sq ft)
			200
			390
			1.628

Device	Routing	Invert	Outlet Devices
#1	Discarded	305.00'	2.420 in/hr Exfiltration over Wetted area
#2	Primary	306.20'	8.0" Vert. Outlet C=0.600 Limited to weir flow at low heads
#3	Primary	307.50'	5.0' long x 5.0' 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			
Coef. (English): 2.34 2.50 2.70 2.68 2.68 2.65 2.65 2.65 2.65			
2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88			

Discarded OutFlow Max=0.0 cfs @ 12.16 hrs HW=306.63' (Free Discharge)  
 1=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.5 cfs @ 12.16 hrs HW=306.63' (Free Discharge)  
 2=Outlet (Orifice Controls 0.5 cfs @ 2.24 fps)  
 3=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond Pr4: Rain Garden



Summary for Pond Pr5: Roof Drywell

Inflow Area = 0.077 ac. 100.00% Impervious. Inflow Depth = 2.97" for 2 Year event  
 Inflow = 0.2 cfs @ 12.07 hrs. Volume= 0.02 af  
 Outflow = 0.2 cfs @ 12.07 hrs. Volume= 0.02 af. Atten= 0%. Lag= 0.0 min  
 Discarded = 0.0 cfs @ 12.07 hrs. Volume= 0.00 af  
 Primary = 0.2 cfs @ 12.07 hrs. Volume= 0.02 af  
 Routed to Reach Pr6: Wetland (Analysis Point)

Routing by Stor-Ind method. Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Peak Elev= 316.00' @ 12.07 hrs. Surf Area= 280 sf. Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 0.02 af (100% of inflow)  
 Center-of-Mass det. time= 0.0 min ( 755.5 - 755.5 )

Volume	Invert	Avail Storage	Storage Description
#1A	316.00'	258 cf	16.00'W x 17.50'L x 3.54'H Field A
#2A	316.50'	346 cf	992 cf Overall - 346 cf Embedded = 645 cf x 40.0% Voids
Cultec R-330XLHD x 6 Inside #1			
Effective Size= 47.8'W x 30.0'H => 7.45 sf x 7.00'L = 52.2 cf			
Overall Size= 52.0'W x 30.5'H x 8.50'L with 1.50' Overlap			
Row Length Adjustment= +1.50' x 7.45 sf x 3 rows			
605 cf Total Available Storage			

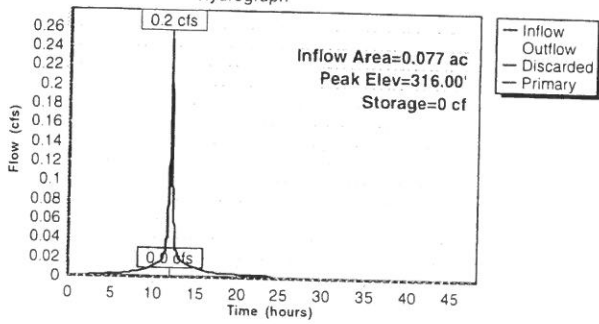
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	2.50'	6.0" Vert. Orifice/Grate C=0.600 Limited to weir flow at low heads
#2	Discarded	316.00'	2.420 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.0 cfs @ 12.07 hrs HW=316.00' (Free Discharge)  
 2=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=16.7 cfs @ 12.07 hrs HW=316.00' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 16.7 cfs @ 85.22 fps)

Pond Pr5: Roof Drywell



Summary for Subcatchment Ex1: Existing Subcatchment Area

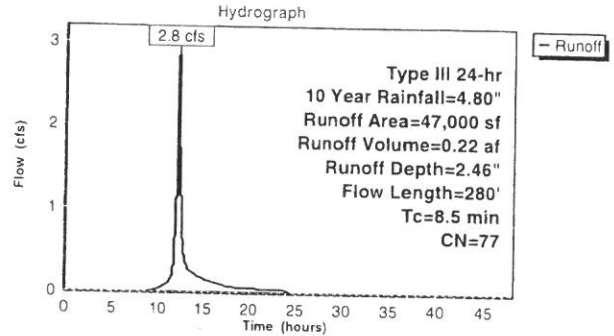
Runoff = 2.8 cfs @ 12.12 hrs. Volume= 0.22 af. Depth= 2.46"  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Type III 24-hr 10 Year Rainfall=4.80"

Area (sf)	CN	Description
47,000	77	Woods, Good HSG D
47,000	100	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		Sheet Flow, Woods: Light underbrush, n= 0.400 P2= 3.20"
2.0	230	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.5	280	Total			

Subcatchment Ex1: Existing Subcatchment Area



Summary for Subcatchment Pr1: Site Area to Rain Garden

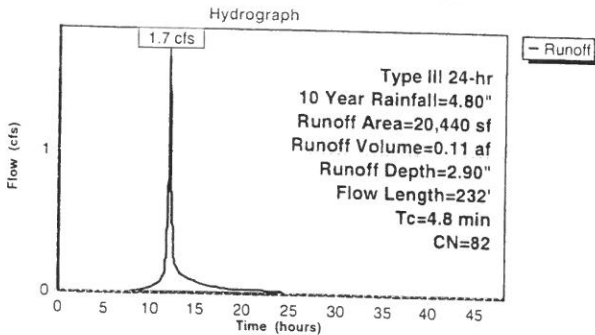
Runoff = 1.7 cfs @ 12.07 hrs. Volume= 0.11 af. Depth= 2.90"  
 Routed to Pond Pr4 - Rain Garden  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Type III 24-hr 10 Year Rainfall=4.80"

Area (sf)	CN	Description
2,190	98	Paved parking HSG D
18,250	80	>75% Grass cover, Good HSG D
20,440	82	Weighted Average
18,250	89	29% Pervious Area
2,190	10	71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.1800	0.24		Sheet Flow, Grass Dense n= 0.240 P2= 3.20"
0.7	60	0.0400	1.40		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0200	2.87		Shallow Concentrated Flow, Paved, Kv= 20.3 fps
0.6	110	0.1800	2.97		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.8	232	Total			

Subcatchment Pr1: Site Area to Rain Garden



Summary for Subcatchment Pr2: Roof Area

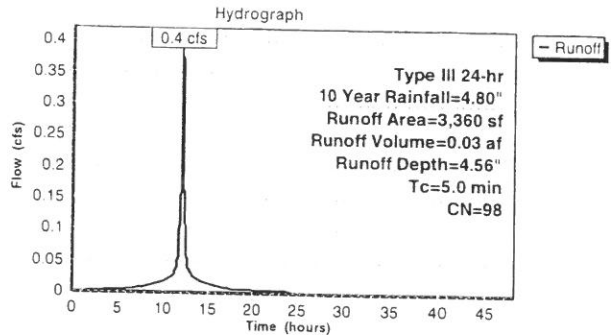
Runoff = 0.4 cfs @ 12.07 hrs. Volume= 0.03 af. Depth= 4.56"  
 Routed to Pond Pr5 - Roof Drywell  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Type III 24-hr 10 Year Rainfall=4.80"

Area (sf)	CN	Description
3,360	98	Roofs HSG D
3,360	100	100.00% Impervious Area

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

Subcatchment Pr2: Roof Area



**Summary for Subcatchment Pr3: Uncollected Runoff**

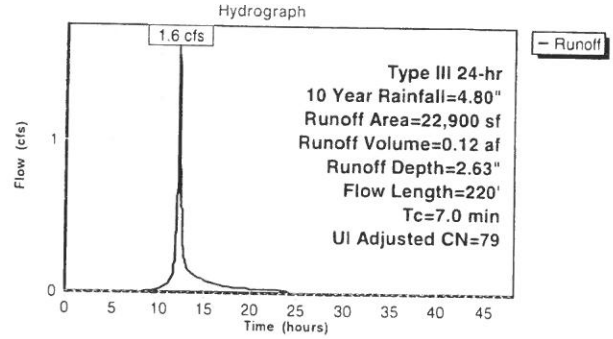
Runoff = 1.6 cfs @ 12.10 hrs. Volume= 0.12 af. Depth= 2.63"  
 Routed to Reach Pr6 : Wetland (Analysis Point)  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0 00-48 00 hrs. dt= 0.01 hrs  
 Type III 24-hr 10 Year Rainfall=4.80"

Area (sf)	CN	Adj	Description
13,500	77		Woods, Good, HSG D
1,800	98		Unconnected pavement, HSG D
7,400	80		>75% Grass cover, Good, HSG D
200	98		Unconnected roofs, HSG D
22,900	80	79	Weighted Average, UI Adjusted
20,900			91.27% Pervious Area
2,000			8.73% Impervious Area
2,000			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0500	0.15		Sheet Flow, Grass Dense n= 0.240 P2= 3.20"
0.1	25	0.1600	2.80		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 f/s
1.2	145	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 f/s
7.0	220	Total			

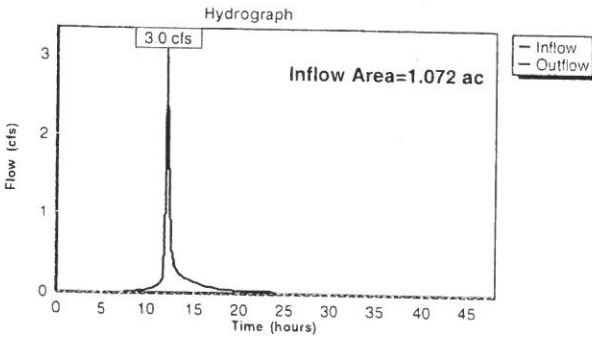
**Subcatchment Pr3: Uncollected Runoff**



**Summary for Reach Pr6: Wetland (Analysis Point)**

Inflow Area = 1.072 ac. 16.17% Impervious. Inflow Depth = 2.43" for 10 Year event  
 Inflow = 3.0 cfs @ 12.10 hrs. Volume= 0.22 af  
 Outflow = 3.0 cfs @ 12.10 hrs. Volume= 0.22 af. Atten= 0%. Lag= 0.0 min  
 Routing by Stor-Ind+Trans method. Time Span= 0 00-48 00 hrs. dt= 0.01 hrs

**Reach Pr6: Wetland (Analysis Point)**



**Summary for Pond Pr4: Rain Garden**

Inflow Area = 0.469 ac. 10.71% Impervious. Inflow Depth = 2.90" for 10 Year event  
 Inflow = 1.7 cfs @ 12.07 hrs. Volume= 0.11 af  
 Outflow = 1.2 cfs @ 12.14 hrs. Volume= 0.11 af. Atten= 29%. Lag= 4.4 min  
 Discarded = 0.0 cfs @ 12.14 hrs. Volume= 0.04 af  
 Primary = 1.1 cfs @ 12.14 hrs. Volume= 0.07 af  
 Routed to Reach Pr6 : Wetland (Analysis Point)

Routing by Stor-Ind method. Time Span= 0 00-48 00 hrs. dt= 0.01 hrs / 2  
 Peak Elev= 306.98' @ 12.14 hrs Surf Area= 873 sf Storage= 883 cf  
 Plug-Flow detention time= 74.9 min calculated for 0.11 af (100% of inflow)  
 Center-of-Mass det. time= 74.8 min ( 891.7 - 816.9 )

Volume	Invert	Avail Storage	Storage Description	
#1	305.00'	2.125 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf Area (sq-ft)	Inc Store (cubic-feet)	Cum Store (cubic-feet)	Wet Area (sq-ft)
305.00	200	0	0	200
306.00	380	285	285	390
308.00	1,600	1,840	2,125	1,628

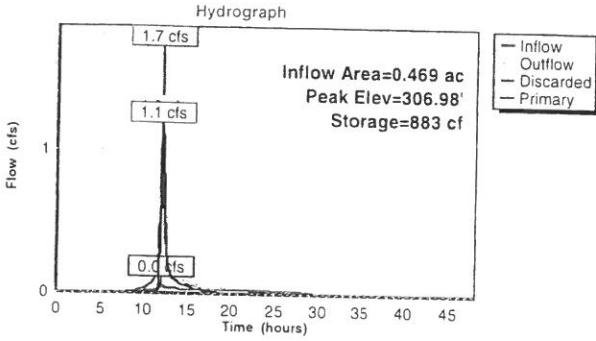
Device	Routing	Invert	Outlet Devices
#1	Discarded	305.00'	2.420 in/hr Exfiltration over Wetted area
#2	Primary	306.20	8.0" Vert. Outlet C= 0.600 Limited to weir flow at low heads
#3	Primary	307.50	5.0' long x 5.0' breadth Broad-Crested Rectangular Weir

Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00  
 2.50 3.00 3.50 4.00 4.50 5.00 5.50  
 Coef (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65  
 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.0 cfs @ 12.14 hrs HW=306.98' (Free Discharge)  
 1=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=1.1 cfs @ 12.14 hrs HW=306.98' (Free Discharge)  
 2=Outlet (Orifice Controls 1.1 cfs @ 3.22 f/s)  
 3=Broad-Crested Rectangular Weir ( Controls 0.0 cfs)

Pond Pr4: Rain Garden



Summary for Pond Pr5: Roof Drywell

Inflow Area = 0.077 ac, 100.00% Impervious, Inflow Depth = 4.56" for 10 Year event  
Inflow = 0.4 cfs @ 12.07 hrs. Volume= 0.03 af  
Outflow = 0.4 cfs @ 12.07 hrs. Volume= 0.03 af. Atten= 0%. Lag= 0.0 min  
Discarded = 0.0 cfs @ 12.07 hrs. Volume= 0.00 af  
Primary = 0.4 cfs @ 12.07 hrs. Volume= 0.03 af  
Routed to Reach Pr6: Wetland (Analysis Point)

Routing by Stor-Ind method. Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
Peak Elev= 316.00' @ 12.07 hrs Surf Area= 280 sf Storage= 0 cf  
Plug-Flow detention time= 0.0 min calculated for 0.03 af (100% of inflow)  
Center-of-Mass det. time= 0.0 min ( 747.8 - 747.8 )

Volume	Invert	Avail Storage	Storage Description
#1A	316.00'	258 cf	16.00' W x 17.50' L x 3.54' H Field A 992 cf Overall - 346 cf Embedded = 645 cf x 40.0% Voids
#2A	316.50'	346 cf	Cultec R-330XLHD x 6 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
			605 cf Total Available Storage

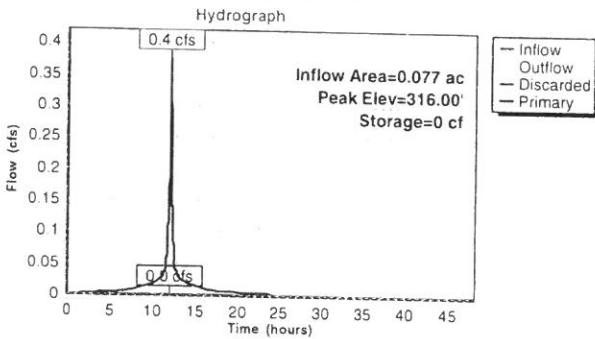
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	2.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Discarded	316.00'	2.420 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.0 cfs @ 12.07 hrs HW=316.00' (Free Discharge)  
2-Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=16.7 cfs @ 12.07 hrs HW=316.00' (Free Discharge)  
1-Orifice/Grate (Orifice Controls 16.7 cfs @ 85.22 fps)

Pond Pr5: Roof Drywell



Summary for Subcatchment Ex1: Existing Subcatchment Area

Runoff = 4.0 cfs @ 12.12 hrs. Volume= 0.31 af. Depth= 3.48"

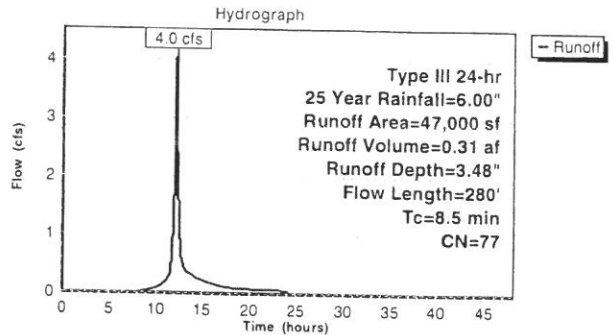
Runoff by SCS TR-20 method, LH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
Type III 24-hr 25 Year Rainfall=6.00"

Area (sf)	CN	Description
47,000	77	Woods, Good HSG D
47,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		Sheet Flow, Woods Light underbrush n= 0.400 P2= 3.20'
2.0	230	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 f/s
8.5	280		Total		

Subcatchment Ex1: Existing Subcatchment Area



Summary for Subcatchment Pr1: Site Area to Rain Garden

Runoff = 2.3 cfs @ 12.07 hrs. Volume= 0.16 af. Depth= 3.99"  
 Routed to Pond Pr4 : Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Type III 24-hr 25 Year Rainfall=6.00"

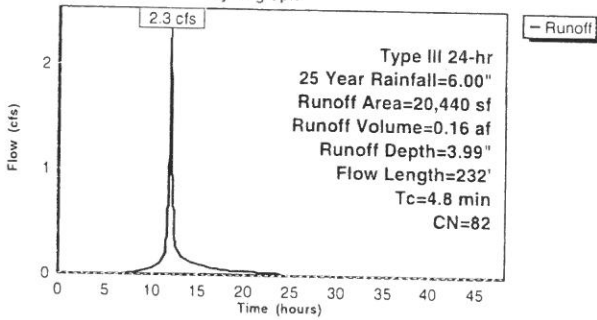
Area (sf)	CN	Description
2,190	98	Paved parking, HSG D
18,250	80	>75% Grass cover, Good, HSG D
20,440	82	Weighted Average
18,250		89.29% Pervious Area
2,190		10.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.1800	0.24		Sheet Flow, Grass, Dense n= 0.240 P2= 3.20'
0.7	60	0.0400	1.40		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.6	110	0.1800	2.97		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.8	232	Total			

Subcatchment Pr1: Site Area to Rain Garden

Hydrograph



Summary for Subcatchment Pr2: Roof Area

Runoff = 0.5 cfs @ 12.07 hrs. Volume= 0.04 af. Depth= 5.76"  
 Routed to Pond Pr5 : Roof Drywell

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Type III 24-hr 25 Year Rainfall=6.00"

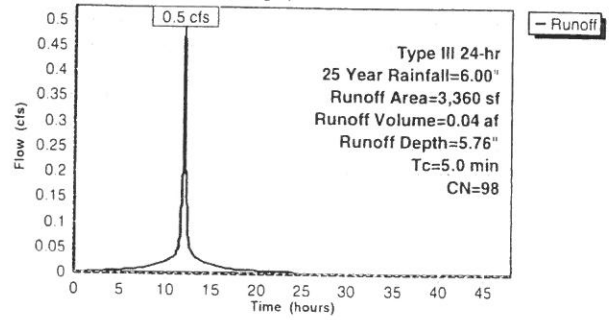
Area (sf)	CN	Description
3,360	98	Roofs, HSG D
3,360		100.00% Impervious Area

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

Subcatchment Pr2: Roof Area

Hydrograph



Summary for Subcatchment Pr3: Uncollected Runoff

Runoff = 2.2 cfs @ 12.10 hrs. Volume= 0.16 af. Depth= 3.68"  
 Routed to Reach Pr6 : Wetland (Analysis Point)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Type III 24-hr 25 Year Rainfall=6.00"

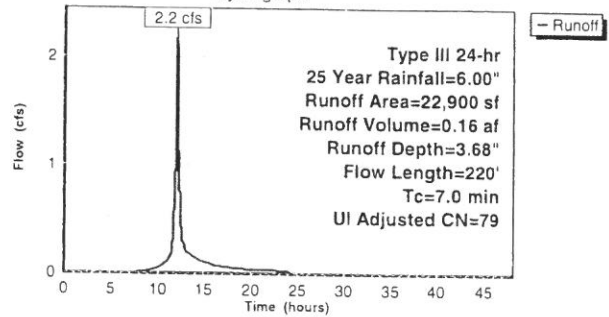
Area (sf)	CN	Adj	Description
13,500	77		Woods, Good, HSG D
1,800	98		Unconnected pavement, HSG D
7,400	80		>75% Grass cover, Good, HSG D
200	98		Unconnected roofs, HSG D
22,900	80	79	Weighted Average, UI Adjusted
20,900			91.27% Pervious Area
2,000			8.73% Impervious Area
2,000			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0500	0.15		Sheet Flow, Grass, Dense n= 0.240 P2= 3.20'
0.1	25	0.1600	2.80		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.2	145	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
7.0	220	Total			

Subcatchment Pr3: Uncollected Runoff

Hydrograph

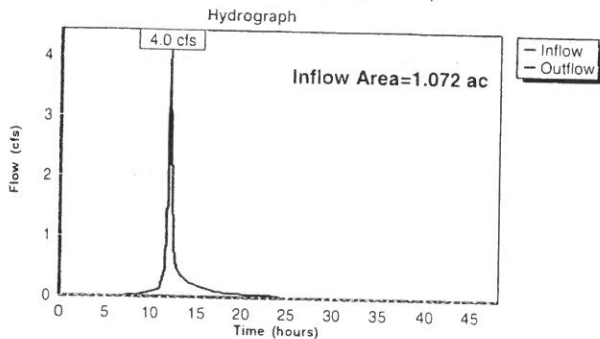


Summary for Reach Pr6: Wetland (Analysis Point)

Inflow Area = 1.072 ac, 16.17% Impervious, Inflow Depth = 3.46" for 25 Year event  
 Inflow = 4.0 cfs @ 12.10 hrs. Volume= 0.31 af  
 Outflow = 4.0 cfs @ 12.10 hrs. Volume= 0.31 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method. Time Span= 0 00:48 00 hrs. dt= 0.01 hrs

Reach Pr6: Wetland (Analysis Point)



Summary for Pond Pr4: Rain Garden

Inflow Area = 0.469 ac, 10.71% Impervious, Inflow Depth = 3.99" for 25 Year event  
 Inflow = 2.3 cfs @ 12.07 hrs. Volume= 0.16 af  
 Outflow = 1.5 cfs @ 12.15 hrs. Volume= 0.16 af, Atten= 36%, Lag= 5.1 min  
 Discarded = 0.1 cfs @ 12.15 hrs. Volume= 0.05 af  
 Primary = 1.4 cfs @ 12.15 hrs. Volume= 0.11 af  
 Routed to Reach Pr6: Wetland (Analysis Point)

Routing by Stor-Ind method. Time Span= 0 00:48 00 hrs. dt= 0.01 hrs / 2  
 Peak Elev= 307.23' @ 12.15 hrs Surf Area= 1.031 sf Storage= 1,120 cf

Plug-Flow detention time= 61.7 min calculated for 0.16 af (100% of inflow)  
 Center-of-Mass det. time= 61.8 min ( 869.6 / 807.8 )

Volume	Invert	Avail Storage	Storage Description
#1	305.00'	2,125 cf	Custom Stage Data (Conic) Listed below (Recalc)

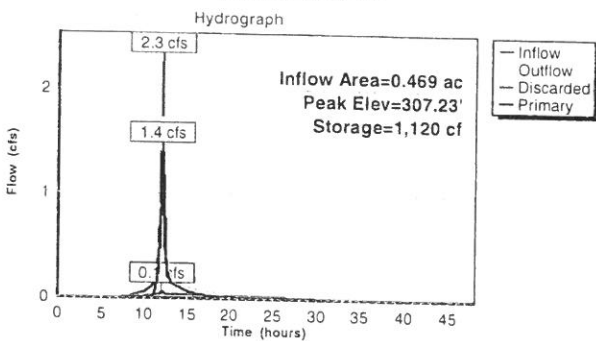
Elevation (feet)	Surf Area (sq-ft)	Inc Store (cubic-feet)	Cum Store (cubic-feet)	Wet Area (sq-ft)
305.00	200	0	0	200
306.00	380	285	285	390
308.00	1,600	1,840	2,125	1,628

Device	Routing	Invert	Outlet Devices
#1	Discarded	305.00'	2,420 in/hr Exfiltration over Wetted area
#2	Primary	306.20'	8.0" Vert. Outlet C= 0.600 Limited to weir flow at low heads
#3	Primary	307.50'	5.0' long x 5.0' breadth Broad-Crested Rectangular Weir

Discarded OutFlow Max=0.1 cfs @ 12.15 hrs HW=307.23' (Free Discharge)  
 1=Exfiltration (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=1.4 cfs @ 12.15 hrs HW=307.23' (Free Discharge)  
 2=Outlet (Orifice Controls 1.4 cfs @ 4.02 fps)  
 3=Broad-Crested Rectangular Weir ( Controls 0.0 cfs)

Pond Pr4: Rain Garden



Summary for Pond Pr5: Roof Drywell

Inflow Area = 0.077 ac 100.00% Impervious, Inflow Depth = 5.76" for 25 Year event  
 Inflow = 0.5 cfs @ 12.07 hrs. Volume= 0.04 af  
 Outflow = 0.5 cfs @ 12.07 hrs. Volume= 0.04 af  
 Discarded = 0.0 cfs @ 12.07 hrs. Volume= 0.00 af, Atten= 0%, Lag= 0.0 min  
 Primary = 0.5 cfs @ 12.07 hrs. Volume= 0.04 af  
 Routed to Reach Pr6: Wetland (Analysis Point)

Routing by Stor-Ind method. Time Span= 0 00:48 00 hrs. dt= 0.01 hrs  
 Peak Elev= 316.00' @ 12.07 hrs Surf Area= 280 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 0.04 af (100% of inflow)  
 Center-of-Mass det. time= 0.0 min ( 744.2 / 744.2 )

Volume	Invert	Avail Storage	Storage Description
#1A	316.00'	258 cf	16.00'W x 17.50'L x 3.54'H Field A 992 cf Overall - 346 cf Embedded = 645 cf x 40.0% Voids
#2A	316.50'	346 cf	Cultec R-330XLHD x 6 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows

605 cf Total Available Storage

Storage Group A created with Chamber Wizard

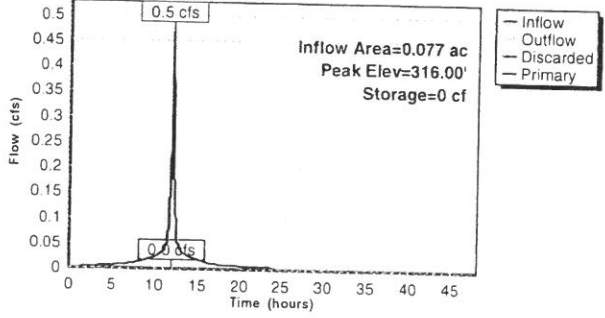
Device	Routing	Invert	Outlet Devices
#1	Primary	2.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Discarded	316.00'	2,420 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.0 cfs @ 12.07 hrs HW=316.00' (Free Discharge)  
 2=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=16.7 cfs @ 12.07 hrs HW=316.00' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 16.7 cfs @ 85.22 fps)



Pond Pr5: Roof Drywell  
 Hydrograph



Summary for Subcatchment Ex1: Existing Subcatchment Area

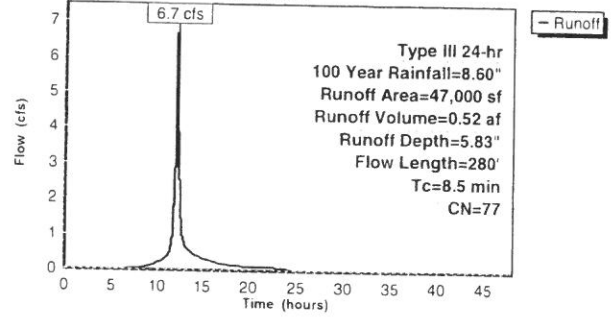
Runoff = 6.7 cfs @ 12.12 hrs. Volume= 0.52 af. Depth= 5.83"  
 Runoff by SCS TR-20 method. UH=SCS. Weighted-CN. Time Span= 0 00-48 00 hrs. dt= 0.01 hrs  
 Type III 24-hr 100 Year Rainfall=8.60"

Area (sf)	CN	Description
47,000	77	Woods, Good, HSG D
47,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
2.0	230	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.5	280				Total

Subcatchment Ex1: Existing Subcatchment Area  
 Hydrograph



Summary for Subcatchment Pr1: Site Area to Rain Garden

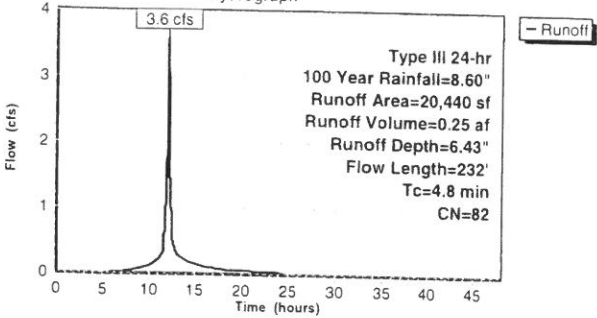
Runoff = 3.6 cfs @ 12.07 hrs. Volume= 0.25 af. Depth= 6.43"  
 Routed to Pond Pr4: Rain Garden  
 Runoff by SCS TR-20 method. UH=SCS. Weighted-CN. Time Span= 0 00-48 00 hrs. dt= 0.01 hrs  
 Type III 24-hr 100 Year Rainfall=8.60"

Area (sf)	CN	Description
2,190	98	Paved parking, HSG D
18,250	80	>75% Grass cover, Good, HSG D
20,440	82	Weighted Average
18,250		89.29% Pervious Area
2,190		10.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.1800	0.24		Sheet Flow, Grass Dense n= 0.240 P2= 3.20"
0.7	60	0.0400	1.40		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.6	110	0.1800	2.97		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
4.8	232				Total

Subcatchment Pr1: Site Area to Rain Garden  
 Hydrograph



Summary for Subcatchment Pr2: Roof Area

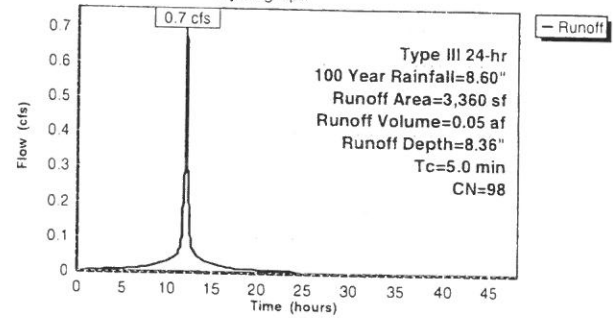
Runoff = 0.7 cfs @ 12.07 hrs. Volume= 0.05 af. Depth= 8.36"  
 Routed to Pond Pr5: Roof Drywell  
 Runoff by SCS TR-20 method. UH=SCS. Weighted-CN. Time Span= 0 00-48 00 hrs. dt= 0.01 hrs  
 Type III 24-hr 100 Year Rainfall=8.60"

Area (sf)	CN	Description
3,360	98	Roofs, HSG D
3,360		100.00% Impervious Area

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

Subcatchment Pr2: Roof Area  
 Hydrograph



**Summary for Subcatchment Pr3: Uncollected Runoff**

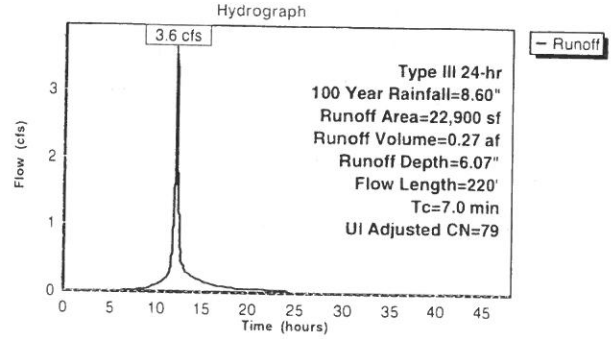
Runoff = 3.6 cfs @ 12.10 hrs. Volume= 0.27 af. Depth= 6.07"  
 Routed to Reach Pr6: Wetland (Analysis Point)  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Type III 24-hr 100 Year Rainfall=8.60"

Area (sf)	CN	Adj	Description
13 500	77		Woods, Good, HSG D
1 800	98		Unconnected pavement, HSG D
7 400	80		>75% Grass cover, Good, HSG D
200	98		Unconnected roofs, HSG D
22 900	80	79	Weighted Average, UI Adjusted
20 900			91.27% Pervious Area
2 000			8.73% Impervious Area
2 000			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0500	0.15		Sheet Flow, Grass Dense n= 0.240 P2= 3.20"
0.1	25	0.1600	2.80		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.2	145	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
7.0	220	Total			

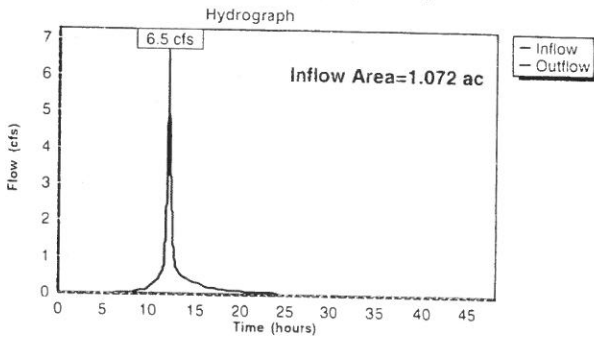
**Subcatchment Pr3: Uncollected Runoff**



**Summary for Reach Pr6: Wetland (Analysis Point)**

Inflow Area = 1.072 ac, 16.17% Impervious, Inflow Depth = 5.81' for 100 Year event  
 Inflow = 6.5 cfs @ 12.12 hrs. Volume= 0.52 af  
 Outflow = 6.5 cfs @ 12.12 hrs. Volume= 0.52 af, Atten= 0%, Lag= 0.0 min  
 Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs. dt= 0.01 hrs

**Reach Pr6: Wetland (Analysis Point)**



**Summary for Pond Pr4: Rain Garden**

Inflow Area = 0.469 ac, 10.71% Impervious, Inflow Depth = 6.43' for 100 Year event  
 Inflow = 3.6 cfs @ 12.07 hrs. Volume= 0.25 af  
 Outflow = 2.6 cfs @ 12.14 hrs. Volume= 0.25 af, Atten= 27%, Lag= 4.1 min  
 Discarded = 0.1 cfs @ 12.14 hrs. Volume= 0.05 af  
 Primary = 2.5 cfs @ 12.14 hrs. Volume= 0.20 af  
 Routed to Reach Pr6: Wetland (Analysis Point)

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs. dt= 0.01 hrs / 2  
 Peak Elev= 307.66' @ 12.14 hrs Surf Area= 1.333 sf Storage= 1.626 cf

Plug-Flow detention time= 45.3 min calculated for 0.25 af (100% of inflow)  
 Center-of-Mass det. time= 45.4 min. ( 839.8 - 794.4 )

Volume Invert Avail Storage Storage Description  
 #1 305.00' 2.125 cf Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf Area (sq-ft)	Inc Store (cubic-feet)	Cum Store (cubic-feet)	Wet Area (sq-ft)
305.00	200	0	0	200
306.00	380	285	285	390
308.00	1 600	1 840	2 125	1 628

Device	Routing	Invert	Outlet Devices
#1	Discarded	305.00'	2.420 in/hr Exfiltration over Wetted area
#2	Primary	306.20'	8.0' Vert. Outlet C= 0.600 Limited to weir flow at low heads
#3	Primary	307.50'	5.0' long x 5.0' breadth Broad-Crested Rectangular Weir

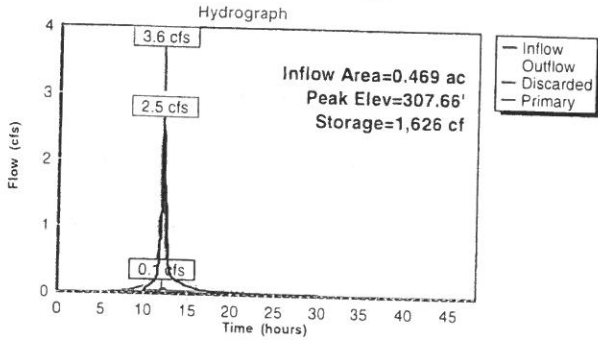
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00  
 2.50 3.00 3.50 4.00 4.50 5.00 5.50  
 Coef (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65  
 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.1 cfs @ 12.14 hrs HW=307.66' (Free Discharge)  
 1=Exfiltration (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=2.5 cfs @ 12.14 hrs HW=307.66' (Free Discharge)  
 2=Outlet (Orifice Controls 1.8 cfs @ 5.11 fps)

3=Broad-Crested Rectangular Weir (Weir Controls 0.7 cfs @ 0.93 fps)

Pond Pr4: Rain Garden



Summary for Pond Pr5: Roof Drywell

Inflow Area = 0.077 ac 100.00% Impervious Inflow Depth = 8.36" for 100 Year event  
 Inflow = 0.7 cfs @ 12.07 hrs. Volume= 0.05 af  
 Outflow = 0.7 cfs @ 12.07 hrs. Volume= 0.05 af. Atten= 0%. Lag= 0.0 min  
 Discarded = 0.0 cfs @ 12.07 hrs. Volume= 0.00 af  
 Primary = 0.7 cfs @ 12.07 hrs. Volume= 0.05 af  
 Routed to Reach Pr6 : Wetland (Analysis Point)

Routing by Stor-Ind method. Time Span= 0.00-48.00 hrs. dt= 0.01 hrs  
 Peak Elev= 316.00' @ 12.07 hrs Surf Area= 280 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 0.05 af (100% of inflow)  
 Center-of-Mass det. time= 0.0 min ( 739.4 - 739.4 )

Volume	Invert	Avail Storage	Storage Description
#1A	316.00'	258 cf	16.00'W x 17.50'L x 3.54'H Field A 992 cf Overall - 346 cf Embedded = 645 cf x 40.0% Voids
#2A	316.50'	346 cf	Cultec R-330XLHD x 6 Inside #1 Effective Size= 47.8'W x 30.0'H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0'W x 30.5'H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
		605 cf	Total Available Storage

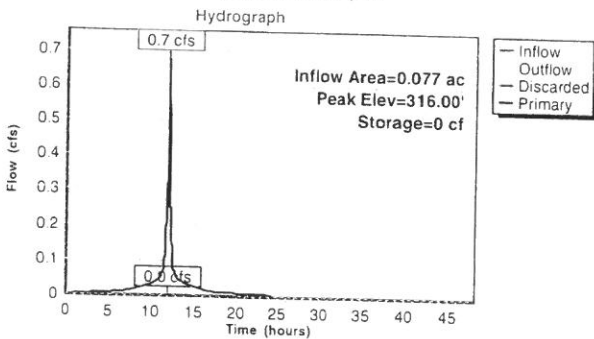
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	2.50'	6.0' Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Discarded	316.00'	2.420 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.0 cfs @ 12.07 hrs HW=316.00' (Free Discharge)  
 2=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=16.7 cfs @ 12.07 hrs HW=316.00' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 16.7 cfs @ 85.22 fps)

Pond Pr5: Roof Drywell



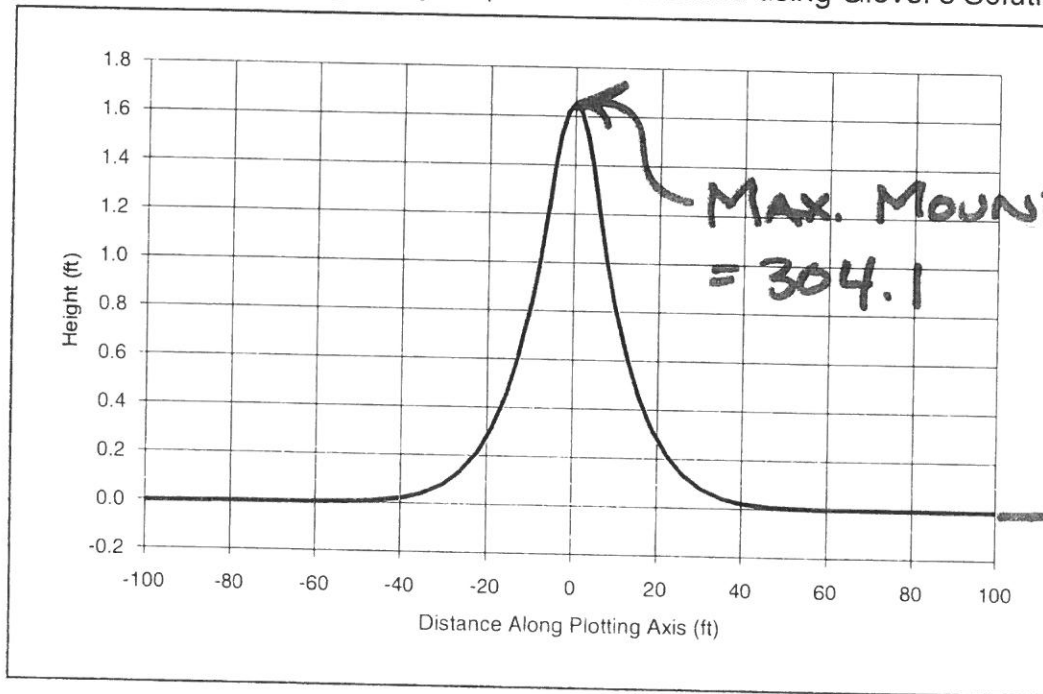
## **MOUNDING SUMMARY**

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# MOUNDING SUMMARY

## BOTTOM RAIN GARD

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution) = 305 ✓



COMPANY: csei

PROJECT: Brimstone Lane

ANALYST: vc

DATE: 11/16/2023 TIME: 1:41:44 PM

### INPUT PARAMETERS

Application rate: 1.85 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 4.84 ft/day

Initial saturated thickness: 10 ft

Length of application area: 20 ft

Width of application area: 10 ft

No constant head boundary used

Plotting axis from Y-Axis: 90 degrees

Edge of recharge area:

positive X: 5 ft

positive Y: 0 ft

Total volume applied: 370 c.ft ✓

WQV.

### MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-100	0	-100	0
-84.1	0	-84	0
-68.2	0	-68	0
-52.3	0	-52	0
-39.8	0	-40	0.02
-30.1	0	-30	0.08
-22.2	0	-22	0.21
-15.5	0	-15	0.45
-9.7	0	-10	0.83
-5.8	0	-6	1.23
-3.2	0	-3	1.52
0	0	0	1.65
3.2	0	3	1.52
5.8	0	6	1.23
9.7	0	10	0.83
15.5	0	15	0.45
22.2	0	22	0.21
30.1	0	30	0.08
39.8	0	40	0.02
52.3	0	52	0
68.2	0	68	0
84.1	0	84	0
100	0	100	0

## SOIL MAPPING

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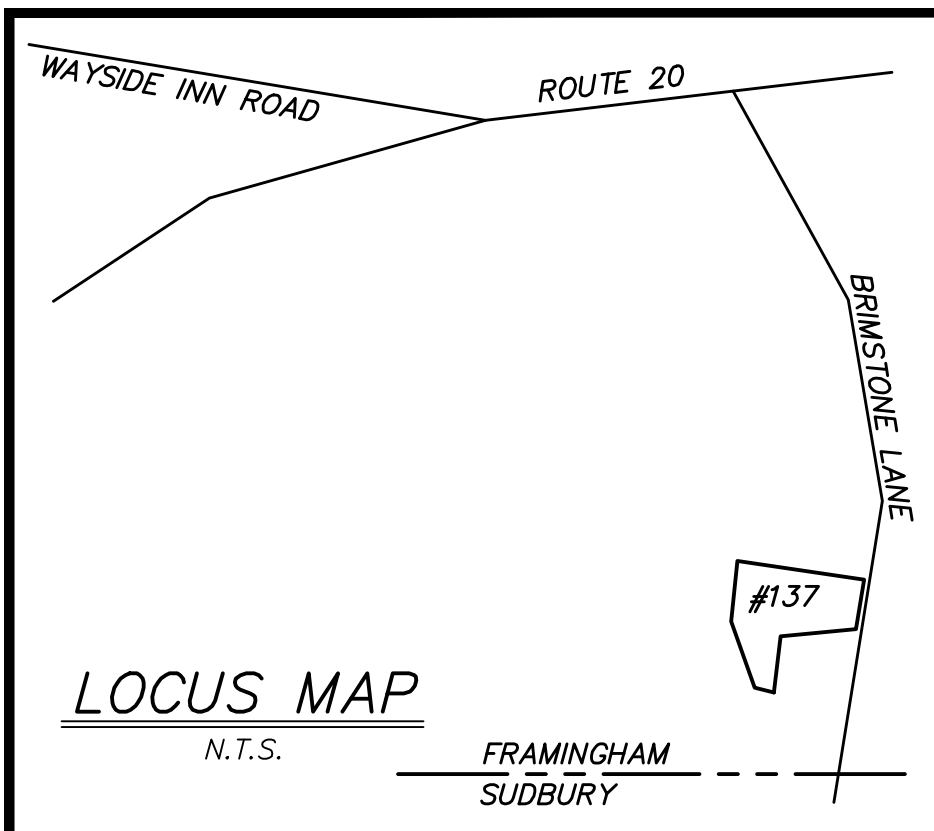
Soil Map—Middlesex County, Massachusetts  
(137 Brimstone Lane (Lot 2))



## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	1.7	11.9%
73B	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	3.4	23.8%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	3.6	25.3%
104D	Hollis-Rock outcrop-Charlton complex, 15 to 25 percent slopes	3.0	20.9%
106C	Narragansett-Hollis-Rock outcrop complex, 3 to 15 percent slopes	1.8	12.8%
341D	Broadbrook very fine sandy loam, 15 to 25 percent slopes, very stony	0.8	5.4%
<b>Totals for Area of Interest</b>		<b>14.2</b>	<b>100.0%</b>



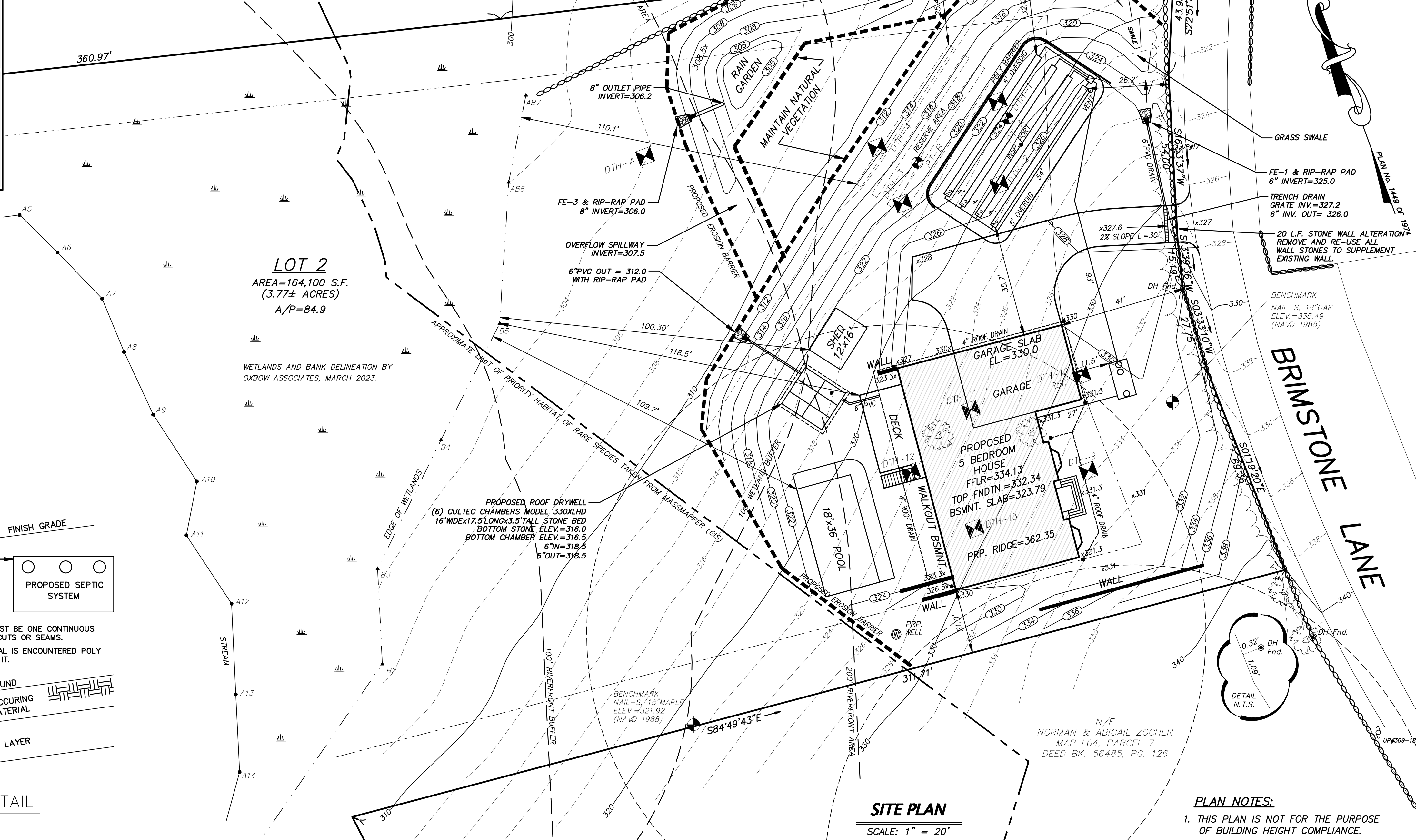


**SCHEDULE OF ELEVATIONS**

TOP OF FOUNDATION T.C. =	FFLR.=334.13
BASEMENT FLOOR FIN. C.F. =	323.8
INVERT OF PIPE AT FOUNDATION =	327.0
INVERT AT SEPTIC TANK INLET =	326.25
INVERT AT SEPTIC TANK OUTLET =	326.0
INVERT AT DISTRIBUTION BOX INLET =	323.9
INVERT AT DISTRIBUTION BOX OUTLET =	323.7
INVERT AT LEACHING LINES (BEGINNING) =	L-1 L-2 L-3 L-4
INVERT AT LEACHING LINES (END) =	323.25 321.75 320.25 319.0
ELEVATION OF TRENCH BOTTOM =	321.25 319.75 318.25 317.0
FINISH GRADE OVER LEACHING AREA =	326-323

**DESIGN CRITERIA**

- ESTIMATED FLOW = 5 BDRMS X 110 GPD/BR=550 GPD
- DESIGN PERCOLATION RATE = 15 MPI
- LEACHING AREA CALCULATION =  
 LOCAL BYLAW: 170 S.F. OF SIDEWALL PER BEDROOM (5x170=850 S.F.)  
 SA=8(2'x5') = 864 SF > 1296 SF(0.56 GPD/SF)=725 GPD  
 BA=4(2'x5') = 432 SF



- GENERAL NOTES:**
- Contractor shall call Digsafe at (888) 344-7233 a minimum of 72 hours prior to commencing any construction activities on site.
  - Inspections by Design Engineer and Board of Health are as required by the Board of Health.
  - This plan was prepared for the design of the subsurface sewage disposal system only and is based on the subsurface explorations and percolation tests listed below.
  - System was designed only to accommodate sanitary sewage associated with normal domestic usage, consisting of water carried putrescible waste, and for flows indicated in the design criteria.
  - The system must be vented through the buildings plumbing in accordance with the state building code.
  - Plans show only features that were visually apparent on the date of the topographic survey, and the absence of subsurface structures, utilities, etc. is not guaranteed.
  - Contractor to determine if site conditions are suitable for construction of proposed system, and must promptly notify the Design Engineer and Owner, in writing, of any plan deficiencies, unforeseen subsurface conditions, or required changes.
  - There are no wells located within 100 feet of the proposed leaching area or within 100 feet of the proposed septic tank (except as shown).
  - The subject property, 18.00± located within a Zone II of a public drinking water supply well.
  - All construction is to conform to the requirements of the Massachusetts Environmental Code, Title V, and the town of SUDBURY Board of Health regulations.
  - There are no bordering vegetated wetlands, inland banks, or surface waters within 100' of the proposed system.
  - There are no surface or subsurface drains which are used to lower the ground water.
  - All elevations refer to T.M. 18" OAK, NAIL=335.49
  - For proper performance, septic tank should be pumped annually.
  - System cannot be backfilled or concealed until design firm and board of health have inspected the system and permission to backfill has been given.
  - Design firm must prepare and submit "As-Built" plan to Board of Health. This plan must certify that the system was installed in accordance with state and local regulations and that it complies with the proposed plan.
  - Property lines are approximate and are not to be used for boundary survey purposes. Surface features and topography outside of work area are approximate.
  - System is not designed to accommodate a garbage grinder.

- TECHNICAL NOTES:**
- Building sewer shall be in accordance with state plumbing code and have a minimum of 4" of cover in landscaped areas. A minimum of 12" of cover and/or appropriate sleeving shall be used in areas subject to vehicular traffic.
  - All tanks, including septic tanks, distribution boxes, dosing chambers, and grease traps shall be either watertight through manufacturer's specification and warranty, or made watertight by the manufacturer or other individual by means and persons as approved in 310 CMR 15.221. Septic tank shall be constructed and placed in accordance with 310 CMR 15.223 through 310 CMR 15.228.
  - Septic tanks shall have at least three (3) 20" manholes with at least one (1) of these manholes located no more than 6" below finish grade. (Systems over 1,000 gpd shall have access ports at both the inlet and outlet tees.)
  - Distribution box ("d-box") shall be of watertight construction, installed level on a firm base, and installed in accordance with 310 CMR 15.232.
  - Septic tank covers and d-box are to be brought within 6" and 9" of finish grade respectively by the use of riser sections.
  - When the soil absorption system (SAS) is to be dosed or the slope of the inlet pipe exceeds 0.08 feet per foot, an inlet tee, baffle or splash plate extending to one inch above the outlet invert elevation shall be provided to dissipate velocity of the influent.
  - When the SAS is installed within the top and subsoil layers or above natural grade, all topsoil and subsoil shall be removed below and laterally a minimum of 5 feet surrounding the SAS. Removed material shall be replaced with clean granular material in accordance with 310 CMR 15.255(3).
  - All disturbed areas shall be loamed, seeded, and maintained so as to prevent erosion.
  - All native soil interfaces which will contact the SAS shall be scarified prior to placement of stone.

**PERCOLATION TESTS**

HOLE NO. & DATE	TOP ELEVATION	DEPTH (in.)	SATURATION (Min.)	12"-9" DROP (Min.)	9"-6" DROP (Min.)	PERC. RATE (Min./In.)
PT-A 6/21/23	318.0	55"	15 MIN	25 MIN	38 MIN	12 MIN/IN
PT-B 6/21/23	314.0	51"	15 MIN	26 MIN	42 MIN	14 MIN/IN

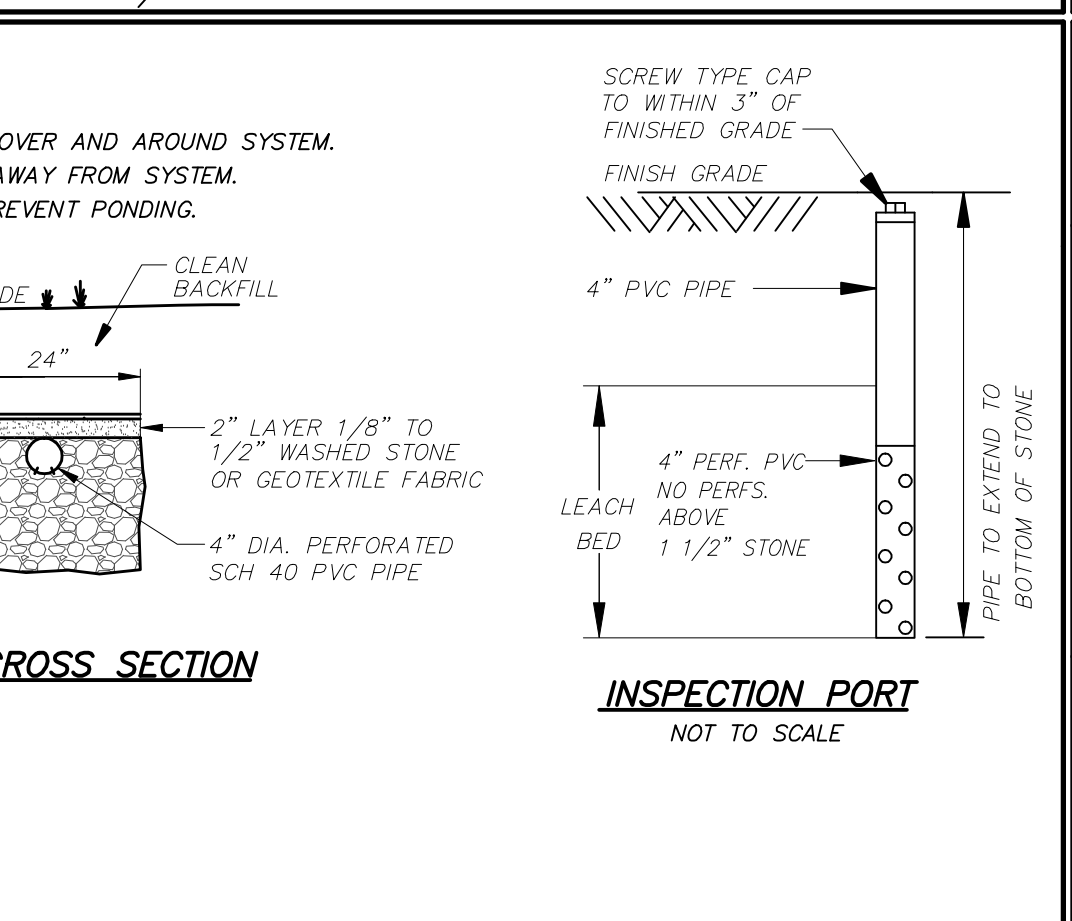
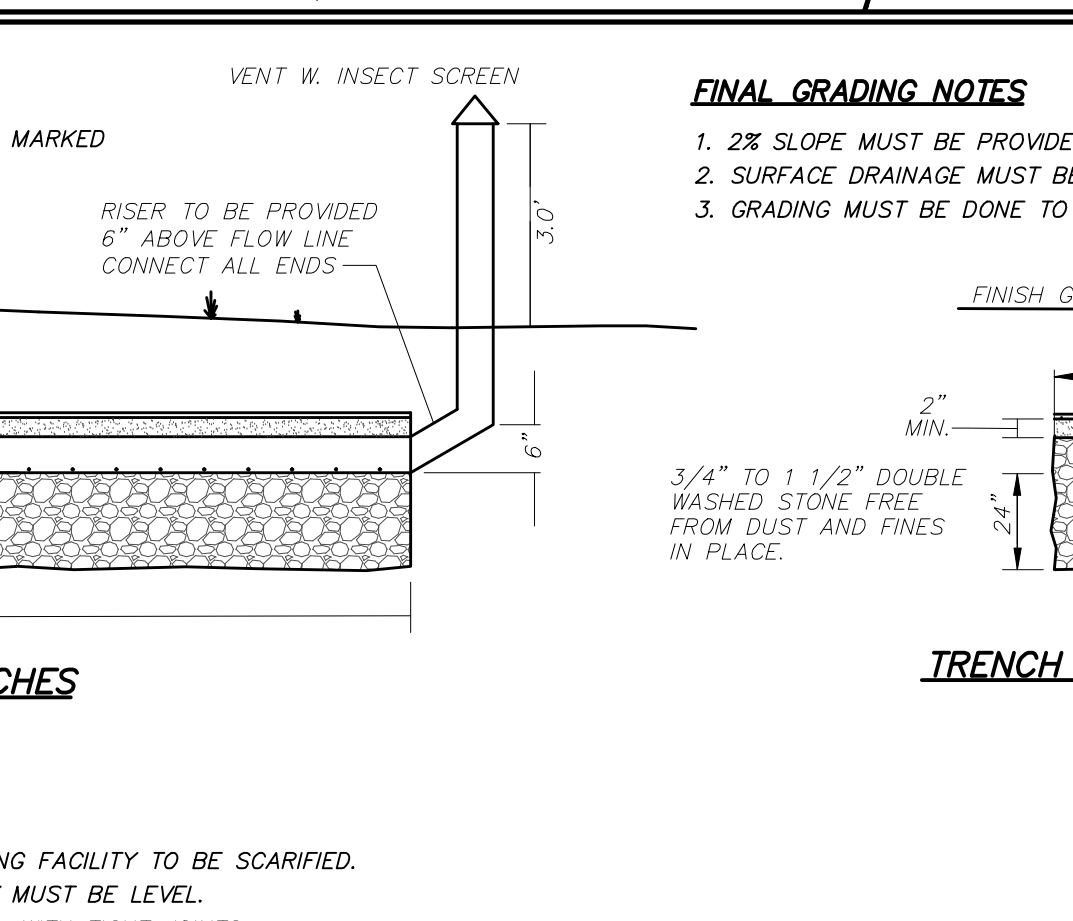
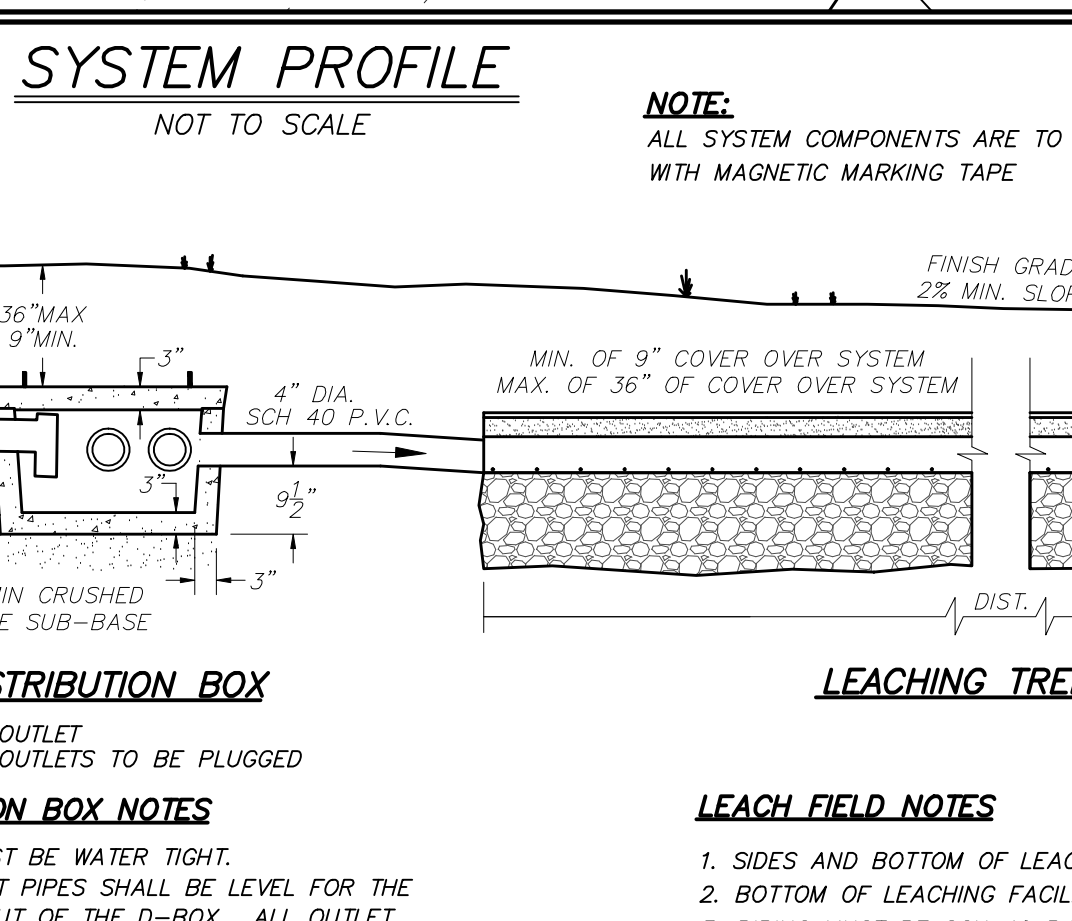
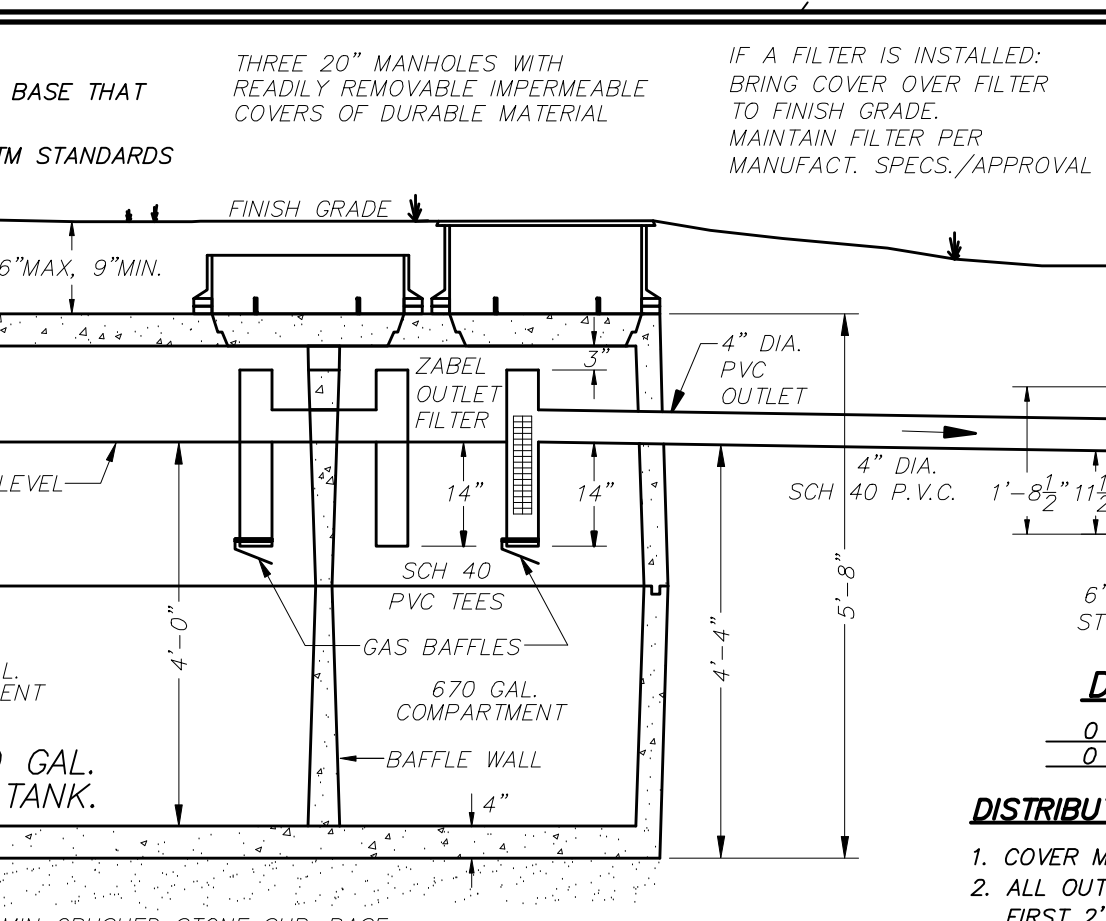
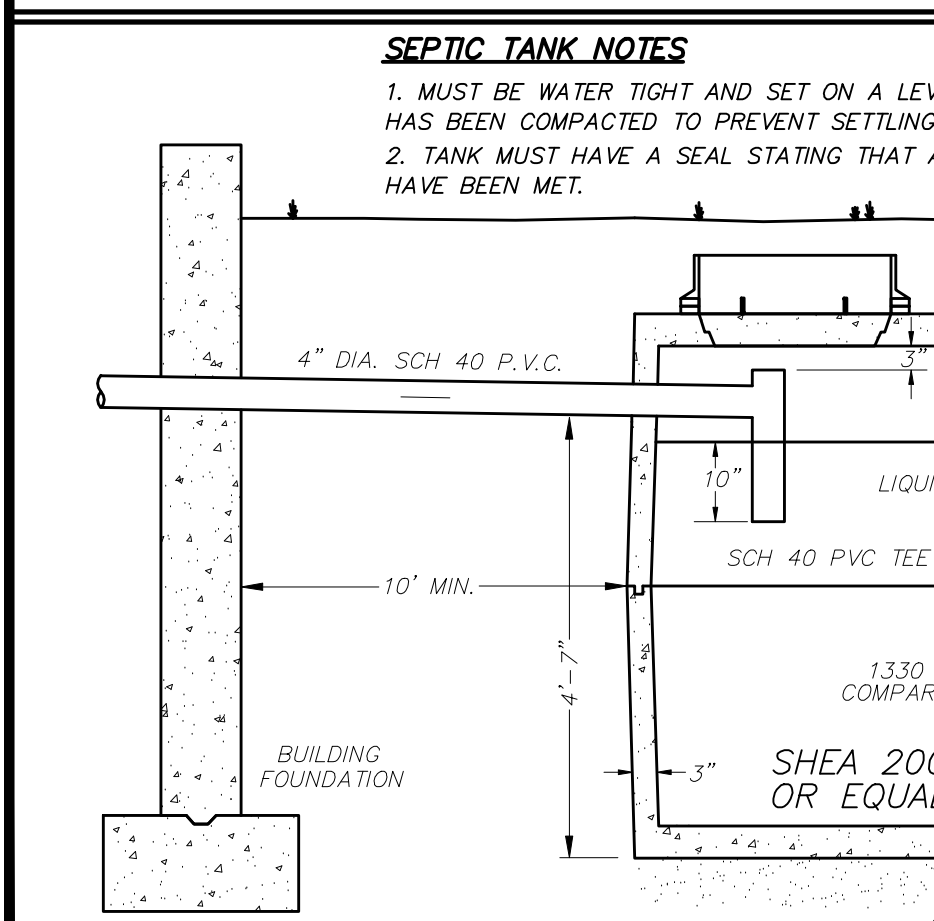
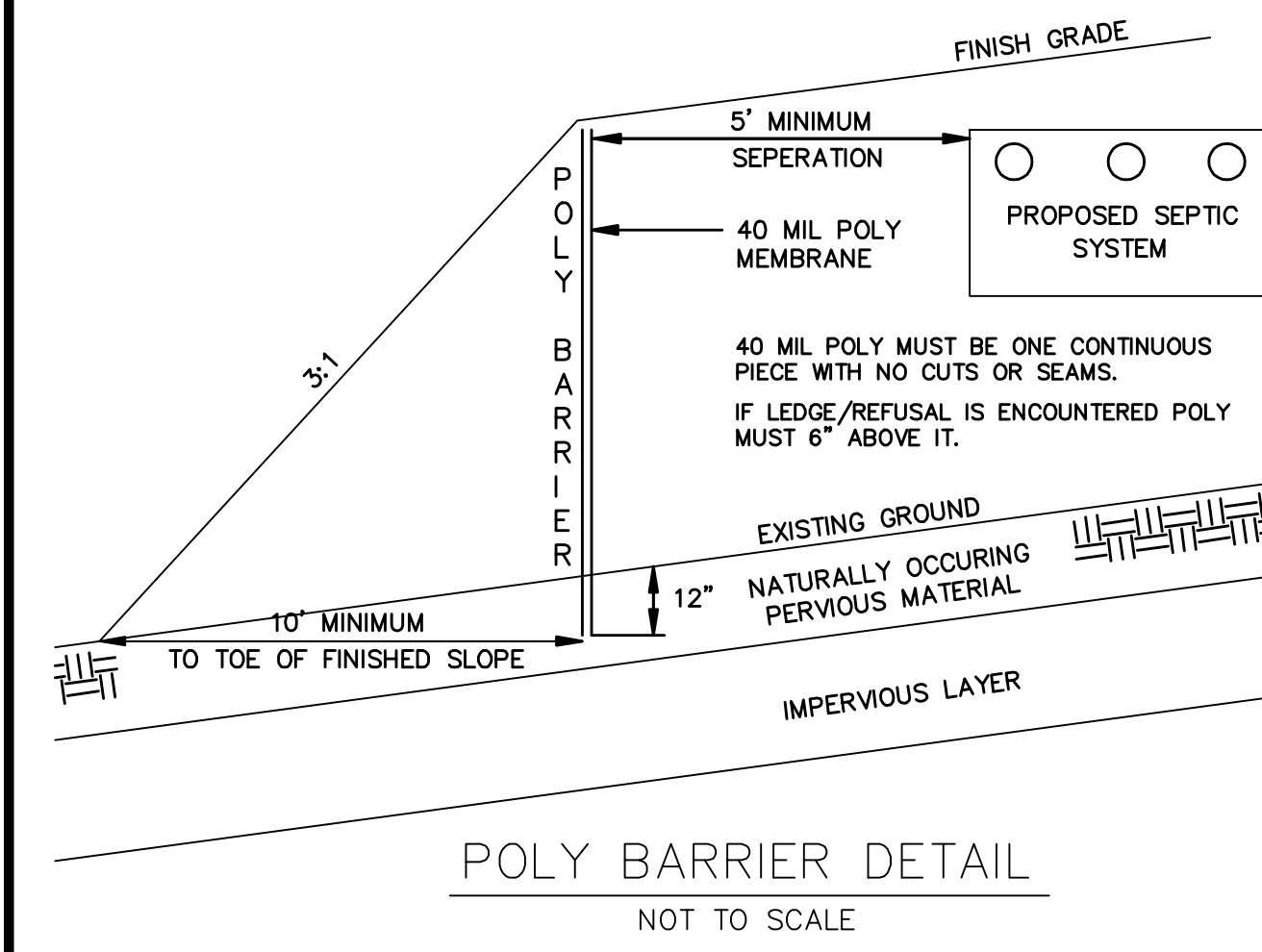
**DEEP OBSERVATION HOLE LOG**

NO. & ELEV.	DEPTH (in.)	SOIL HORIZON	TEXTURE (USDA)	COLOR (MUNSELL)	SOIL MOTTLING	OTHER
DTH-1	0-11"	Ap	SANDY LOAM	10YR3/2		
6/21/23	11-27"	Bw	LOAMY SAND	10YR6/8		
317.0	27-87"	C1	LOAMY SAND	10YR5/4	58"	BOULDERS AT BOTTOM
DEPTH TO BEDROCK: -- STANDING WATER: -- WEeping FROM PIT FACE: -- ESHWT: 312.2						
DTH-2	0-12"	Ap	SANDY LOAM	10YR3/2		
6/21/23	12-20"	Bw	LOAMY SAND	10YR6/8		
320.5	20-84"	C1	LOAMY SAND	10YR5/4	60"	BOULDERS AT BOTTOM
DEPTH TO BEDROCK: -- STANDING WATER: -- WEeping FROM PIT FACE: -- ESHWT: 315.5						
DTH-3	0-13"	Ap	SANDY LOAM	10YR3/2		
6/21/23	13-29"	Bw	LOAMY SAND	10YR6/8		
314.0	29-92"	C1	LOAMY SAND	10YR5/4	65"	
DEPTH TO BEDROCK: -- STANDING WATER: -- WEeping FROM PIT FACE: -- ESHWT: 308.6						
DTH-4	0-12"	Ap	SANDY LOAM	10YR3/2		
6/21/23	12-28"	Bw	LOAMY SAND	10YR6/8		
311.5	28-90"	C1	LOAMY SAND	10YR5/4	61"	
DEPTH TO BEDROCK: -- STANDING WATER: -- WEeping FROM PIT FACE: -- ESHWT: 306.4						

TESTS CONDUCTED BY: MIKE SULLIVAN  
 TESTS OBSERVED BY: ROB LAZZO  
 DATE: 6/21/23

I certify that I have passed the examination approved by the department of Environmental Protection and that the above analysis has been performed by me consistent with the required training, expertise, and experience described in 310 CMR 15.018(2).

Certified:



**APPLICANT**  
CARRIE MACIEL

**LOCATION**  
LOT 2 BRIMSTONE LANE  
SUDBURY, MA  
ASSESSORS MAP L04 & PARCEL 08

NO.	DATE	REVISION	BY

**PROPOSED SEWAGE DISPOSAL SYSTEM**

**CONNORSTONE ENGINEERING**  
 CONSULTING CIVIL ENGINEERS AND LAND SURVEYORS  
 10 SOUTHWEST CUTOFF, SUITE 7  
 NORTHBOROUGH, MASSACHUSETTS 01532  
 PHONE: 508-393-9727 WWW.CSEI.NET

121 BOSTON POST RD. SUDBURY, MA. 01776  
 PHONE: 978-443-9566 WWW.SULLIVANCONNORS.COM

DATE: 11/06/23 SHEET 1 OF 1