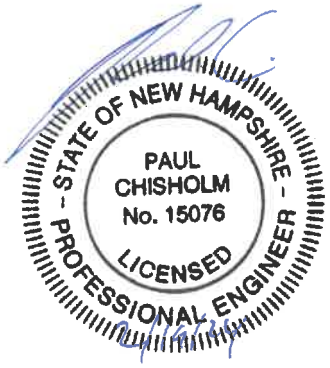
Alteration of Terrain Application

Milford Rashid Gas Station
Tax Map 43, Lot 20-2
South Street
Milford, New Hampshire

February 19, 2024



KNA Project No. 21-0526-1A

Prepared For: 689 North Main Street LLC
689 North Main Street
Leominster, Massachusetts 01453

Prepared By: Keach-Nordstrom Associates, Inc.
10 Commerce Park North, Suite 3
Bedford, New Hampshire 03110
(603) 627-2881
(603) 627-2915 (fax)

KNA KEACH-NORDSTROM ASSOCIATES, INC.

Civil Engineering *Land Surveying* *Landscape Architecture*

Table of Contents

1. SIGNED OWNER & APPLICANT AFFIDAVITS

Owner Affidavit

I, Steven Desmarais, authorized representative of Salt Creek Properties LLC and owner of the properties referenced on Tax Map 43 as Lots 20-2 & 20, located on South Street in Milford, New Hampshire, hereby verify that I have authorized Keach-Nordstrom Associates, Inc. to submit on my behalf, any and all applicable State and local permit applications as they pertain to improvements on said property.

Additionally, I authorize Keach-Nordstrom Associates, Inc. to aid in the representation of these applications throughout the approval process.

Signature of Owner: Steven Desmarais

Printed Name of Owner: Steven A Desmarais

Address of Owner: PO Box 967
Amherst NH 03031

Date: 2/15/24

Applicant Affidavit

I, Rashid Amin, authorized representative of 689 North Main Street LLC and applicant for the project referenced on Tax Map 43 as Lots 20-2 & 20, located on South Street in Milford, New Hampshire, hereby verify that I have authorized Keach-Nordstrom Associates, Inc. to submit on my behalf, any and all applicable State and local permit applications as they pertain to improvements on said property.

Additionally, I authorize Keach-Nordstrom Associates, Inc. to aid in the representation of these applications throughout the approval process.

Signature of Applicant: Rashid

Printed Name of Applicant: Rashid Amin

Address of Applicant: 689 North main St
Leominster ma 01453

Date: 02/15/2024

2. AOT APPLICATION

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

ALTERATION OF TERRAIN PERMIT APPLICATION

Water Division / Land Resources Management

Check the status of your application

RSA / Rule: RSA 485-A:17, Env-Wq 1500

Administrative Use Only	Administrative Use Only	Administrative Use Only	File Number:
			Check No:
			Amount:
			Initials:

1. APPLICANT INFORMATION (INTENDED PERMIT HOLDER)		
Applicant Name: 689 North Main Street LLC	Contact Name: Rashid Amin	
Email: rashidamin246@gmail.com	Daytime Telephone: (978) 549-2222	
Mailing Address: 689 North Main Street		
Town/City: Leominster	State: MA	ZIP Code: 01453
2. APPLICANT'S AGENT INFORMATION If none, check here: ■		
Agent's Name:	Contact Name:	
Email:	Daytime Telephone:	
Address:		
Town/City:	State:	ZIP Code:
3. PROPERTY OWNER INFORMATION (IF DIFFERENT FROM APPLICANT) Check here if more than one property owner, and attach additional sheets as necessary: ☐		
Owner's Name: Salt Creek Properties LLC	Contact Name: Steve Desmaris	
Email: nhcustombuilder@gmail.com	Daytime Telephone: (603) 554-1749	
Mailing Address: PO Box 967		
Town/City: Amherst	State: NH	ZIP Code: 03031
4. PROPERTY OWNER'S AGENT INFORMATION If none, check here: ■		
Business Name:	Contact Name:	
Email:	Daytime Telephone:	
Address:		
Town/City:	State:	ZIP Code:
5. CONSULTANT INFORMATION If none, check here: ☐		
Engineering Firm: Keach-Nordstrom Associates, Inc.	Contact Name: Bridget Souza	
Email: bsouza@keachnordstrom.com	Daytime Telephone: 603-627-2881	
Address: 10 Commerce Park North, Suite 3		
Town/City: Bedford	State: NH	ZIP Code: 03110

6. PROJECT TYPE

☐ Excavation Only ☐ Residential ■ Commercial ☐ Golf Course ☐ School ☐ Municipal
☐ Agricultural ☐ Land Conversion ☐ Other:

7. PROJECT LOCATION INFORMATION

Project Name: Milford Rashid Gas Station

Street/Road Address: South Street

Town/City: Milford	County: Hillsborough

Tax Map: 43	Block:	Lot Number: 20-2 & 20	Unit:

Post-development, will the proposed project withdraw from or directly discharge to any of the following? If yes, identify the purpose.

1. Stream or Wetland Purpose:	☐ Yes ☐ Withdrawal ☐ Discharge ■ No
2. Artificial pond created by impounding a stream or wetland Purpose:	☐ Yes ☐ Withdrawal ☐ Discharge ■ No
3. Unlined pond dug into the water table Purpose:	☐ Yes ☐ Withdrawal ☐ Discharge ■ No

Post-development, will the proposed project discharge to:

- Within one-quarter mile of a surface water impaired for phosphorus and/or nitrogen? ■ No ☐ **Yes**
- Within one-quarter mile of a Class A surface water or within the watershed area of an Outstanding Resource Water? ■ No ☐ **Yes**
- Within one-quarter mile of a lake or pond not covered previously? ■ No ☐ **Yes**

Is the project a High Load area? ■ Yes ☐ No
If yes, specify the type of high load land use or activity: Automotive Service Facility

Is the project within a Water Supply Intake Protection Area (WSIPA)? ☐ Yes ■ No
Is the project within a Groundwater Protection Area (GPA)? ■ Yes ☐ No
Will the well setbacks identified in Env-Wq 1508.02 be met? ■ Yes ☐ No
For more details on the restrictions in these areas, read Chapter 3.1 in Volume 2 of the NH Stormwater Manual.

Is any part of the property within the 100-year floodplain? ☐ Yes ■ No
If yes: Cut volume: cubic feet within the 100-year floodplain.
Fill volume: cubic feet within the 100-year floodplain.

☐ Project *is* within **¼ mile of a designated river** Name of River:
■ Project *is not* within ¼ mile of a designated river.

☐ Project *is* within a Coastal/Great Bay Region community.
■ Project *is not* within a Coastal/Great Bay Region community.

8. BRIEF PROJECT DESCRIPTION (PLEASE DO NOT REPLY "SEE ATTACHED")

The project proposes to construct a gas station with 6 fueling islands and a convenience store with drive-thru and all associated site improvements including stormwater management provisions, parking/access, and utility connections.

9. IF APPLICABLE, DESCRIBE ANY WORK STARTED PRIOR TO RECEIVING PERMIT.

N/A

10. ADDITIONAL REQUIRED INFORMATION

A. Date a copy of the application was sent to the municipality, as required by Env-Wq 1503.05(e) (Env-Wq 1503.05(c)(6), requires proof that a completed application form, checklist, plans and specifications, and all other supporting materials have been sent or delivered to the governing body of each municipality in which the project is proposed): 2-16-2024

(Attach proof of delivery)

B. Date a copy of the application was sent to the local river advisory committee, if required by Env-Wq 1503.05(e) (Env-Wq 1503.05(c)(6), requires proof that a completed application form, checklist, plans and specifications, and all other supporting materials have been sent or delivered to the Local River Advisory Committee, if the project is within ¼ mile of a designated river):

(Attach proof of delivery)

C. Type of plan required: ☐ Land Conversion ■ Detailed Development ☐ Excavation, Grading and Reclamation ☐ Steep Slope

D. Additional plans required: ■ Stormwater Drainage and Hydrologic Soil Groups ■ Source Control ☐ Chloride Management

E. Total area of disturbance, in square feet 120,605 sf

F. Additional impervious cover as a result of the project, in square feet (use "-"to indicate a net reduction in impervious coverage).

Total final impervious cover, in square feet 59,460 sf

G. Total undisturbed cover, in square feet 57,400 sf

H. Number of lots proposed: N/A

I. Total length of roadway, in linear feet: N/A

J. Name(s) of receiving water(s): Great Brook

K. Identify all other NHDES permits required for the project. For each, indicate whether an application has been filed and is pending. If the required approval has been issued, provide the permit number, registration date, or approval letter number, as applicable.

Type of Approval	Application Filed?	Pending?	If Issued
1. Water Supply Approval	☐ Yes ☐ No ■ N/A	☐	Permit number:
2. Wetlands Permit	■ Yes ☐ No ☐ N/A	☒	Permit number:
3. Shoreland Permit	☐ Yes ☐ No ■ N/A	☐	Registration date:
4. UIC Registration	☐ Yes ☐ No ■ N/A	☐	Approval letter date:
5. Large/Small Community Well Approval	☐ Yes ☐ No ■ N/A	☐	Permit number:
6. Large Groundwater Withdrawal Permit	☐ Yes ☐ No ■ N/A	☐	Permit number:
7. Other:	☐ Yes ☐ No		

L. List all species identified by the Natural Heritage Bureau as threatened or endangered or of concern:

N/A

M. Using the NHDES OneStop Data Mapper with the Surface Water Impairment layer turned on, list the impairments identified for each receiving water. If no pollutants are listed, enter "N/A."

N/A

N. Did the applicant or applicant's agent have a pre-application meeting with Alteration of Terrain Bureau staff?

☐ Yes ■ No If yes, name of staff member:

O. Will blasting of bedrock be required? ☐ Yes ■ No If yes, estimated quantity of blast rock in cubic yards:
If yes, standard blasting Best Management Practices notes must be placed on the plans.

NOTE: If greater than 5,000 cubic yards of blast rock will be generated, a groundwater monitoring program must be developed and submitted to NHDES. Contact Alteration of Terrain Bureau staff for additional detail.

11. CHECK ALL APPLICATION ATTACHMENTS THAT APPLY (SUBMIT WITH APPLICATION IN THE ORDER LISTED BELOW)

LOOSE:

- ■ Signed application form, with attached proof(s) of delivery.
- ■ Check for the application fee, calculated using the fee schedule available on the NHDES Land Development page.
- ■ Color copy of a USGS map with the property boundaries outlined (1" = 2,000' scale).
- ■ If the applicant is not the property owner, proof that the applicant will have a legal right to undertake the project on the property if a permit is issued to the applicant.

BOUND, IN A REPORT, IN THE FOLLOWING ORDER:

- ■ Copy of the signed application form and application checklist.
- ■ Copy of the check.
- ■ Copy of the USGS map with the property boundaries outlined (1" = 2,000' scale).
- ■ Narrative of the project with a summary table of the peak discharge rate for the off-site discharge points.
- ■ Printout of NHDES OneStop Mapper with "Surface Water Impairments" layer turned on.
- ■ Printout of NHDES OneStop Mapper with Alteration of Terrain screening layers turned on.
- ■ Printout of Natural Heritage Bureau DataCheck Tool letter and any relevant correspondence with New Hampshire Fish and Game.
- ■ USDA Web Soil Survey Map with project's watershed outlined.
- ■ Aerial photograph (1" = 2,000' scale with the site boundaries outlined).
- ■ Photographs representative of the site.
- ☐ Groundwater recharge volume calculations (include one Best Management Practices worksheet per permit application).
- ■ Drainage analysis, stamped by a professional engineer (see "Application Checklist" at the end of this document).
- ■ Riprap apron or other energy dissipation or stability calculations.
- ■ Site Specific Soil Survey report, stamped and with a certification note prepared by the soil scientist that the survey was done in accordance with the Site Specific Soil Mapping standards of the Society of Soil Scientists of Northern New England.
- ☐ Infiltration Feasibility Report (example online) [Env-Wq 1503.08(f)(3)].
- ☐ Registration and Notification Form for Stormwater Infiltration to Groundwater (UIC Registration-for underground systems only, including drywells and trenches).
- ■ Inspection and maintenance manual with, if applicable, long term maintenance agreements [Env-Wq 1503.08(g)].
- ■ Source control plan.

PLANS:

- ■ One set of design plans on 34 - 36" by 22 - 24" white paper (see Application Checklist for details).
- ■ Pre- and post-development color-coded soil plans on 11" x 17" (see Application Checklist for details).
- ■ Pre- and post-construction drainage area plans on 34 - 36" by 22 - 24" white paper (see Application Checklist for details).

100-YEAR FLOODPLAIN REPORT:

- ☐ All information required in Env-Wq 1503.09, submitted as a separate report.

ADDITIONAL INFORMATION RE: NUTRIENTS, CLIMATE

- ☐ See Application Checklist (Attachment A) for details.

■ **REVIEW APPLICATION FOR COMPLETENESS. CONFIRM INFORMATION LISTED ON THE APPLICATION IS INCLUDED WITH SUBMITTAL.**

12. REQUIRED SIGNATURES

By signing below, I certify that:

- The information contained in or otherwise submitted with this application is true, complete, and not misleading to the best of my knowledge and belief;
- I understand that the submission of false, incomplete, or misleading information constitutes grounds for the department to deny the application, revoke any permit that is granted based on the information, and/or refer the matter to the board of professional engineers established by RSA 310-A:3 if I am a professional engineer; and
- I understand that I am subject to the penalties specified in New Hampshire law for falsification in official matters, currently RSA 641:3.

☐ **APPLICANT** ☐ **APPLICANT'S AGENT:**

Signature: _____ Date:

Name (print or type): Title:

☒ PROPERTY OWNER ☐ PROPERTY OWNER'S AGENT:

Signature: Steven A Desmarais Date: 2/15/24

Name (print or type): Steven A Desmarais Title: Manager

3. AOT APPLICATION CHECKLIST

ALTERATION OF TERRAIN PERMIT ATTACHMENT A: APPLICATION CHECKLIST

Check each box to indicate the item has been provided, or indicate why it does not apply.

DESIGN PLANS

- [x] Plans printed on 34 - 36" by 22 - 24" white paper.
- [x] Professional Engineer stamp.
- [x] Wetland delineation.
- [x] Temporary erosion control measures.
- [x] Treatment for all stormwater runoff from impervious surfaces such as roadways (including gravel roadways), parking areas, and nonresidential roof runoff. Guidance on treatment BMPs can be found in Volume 2, Chapter 4 of the New Hampshire Stormwater Management Manual.
- [x] Pre-existing 2-foot contours.
- [x] Proposed 2-foot contours.
- [ ] Drainage easements protecting the drainage/treatment structures.
- [x] Compliance with state statute governing fill and dredge in wetlands, RSA 482- A. Note that artificial detention in wetlands is prohibited.
- [ ] Compliance with the New Hampshire Shoreland Protection Act, RSA 483-B.
- [x] Benching – needed if you have more than 20 feet change in elevation on a 2:1 slope, 30 feet change in elevation on a 3:1 slope, 40 feet change in elevation on a 4:1 slope.
- [ ] Check to see if any proposed ponds require state dam permits.

DETAILS

- [ ] Typical roadway cross-section.
- [x] Detention basin with inverts noted on the outlet structure.
- [ ] Stone berm level spreader.
- [x] Outlet protection – riprap aprons.
- [x] A general installation detail for an erosion control blanket.
- [x] Silt fences or mulch berm.
- [x] Storm drain inlet protection. Note that since hay bales must be embedded 4 inches into the ground, they are not to be used on hard surfaces such as pavement.
- [x] Hay bale barriers.
- [x] Stone check dams.
- [x] Gravel construction exit.
- [x] Temporary sediment trap.
- [x] The treatment BMPs proposed.
- [ ] Any innovative BMPs proposed.

CONSTRUCTION SEQUENCE / EROSION CONTROL

☐ Note that the project must be managed to meet the requirements and intent of RSA 430:53 and Agr 3800 relative to invasive species.

☐ Note that perimeter controls shall be installed prior to earth moving operations.

☐ Note that temporary water diversion (swales, basins, etc.) must be used as necessary until areas are stabilized.

☐ Note that ponds and swales shall be installed early on in the construction sequence (before rough grading the site).

☐ Note that all ditches and swales shall be stabilized prior to directing runoff to them.

☐ Note that all roadways and parking lots shall be stabilized within 72 hours of achieving finished grade.

☐ Note that all cut and fill slopes shall be seeded or loamed within 72 hours of achieving finished grade

☐ Note that all erosion controls shall be inspected weekly AND after every half-inch of rainfall.

☐ Note the limits on the open area allowed, see Env-Wq 1505.02 for detailed information.

Example note: The smallest practical area shall be disturbed during construction, but in no case shall exceed 5 acres at any one time before disturbed areas are stabilized.

☐ Note the definition of the word "stable."

Example note: An area shall be considered stable if one of the following has occurred:

- Base course gravels have been installed in areas to be paved.
- A minimum of 85 percent vegetated growth has been established.
- A minimum of 3 inches of non-erosive material such stone or riprap has been installed.
- Or, erosion control blankets have been properly installed.

☐ Note the limit of time an area may be exposed.

Example note: All areas shall be stabilized within 45 days of initial disturbance.

☐ Provide temporary and permanent seeding specifications. Note that although reed canary grass is listed in the Green Book; it is a problematic species according to the Wetlands Bureau and therefore should not be specified.

☐ Provide winter construction notes that meet or exceed our standards.

Standard Winter Notes:

- All proposed vegetated areas that do not exhibit a minimum of 85 percent vegetative growth by October 15, or which are disturbed after October 15, shall be stabilized by seeding and installing erosion control blankets on slopes greater than 3:1, and seeding and placing 3 to 4 tons of mulch per acre, secured with anchored netting, elsewhere. The installation of erosion control blankets or mulch and netting shall not occur over accumulated snow or on frozen ground and shall be completed in advance of thaw or spring melt events.
- All ditches or swales which do not exhibit a minimum of 85 percent vegetative growth by October 15, or which are disturbed after October 15, shall be stabilized temporarily with stone or erosion control blankets appropriate for the design flow conditions.
- After October 15, incomplete road or parking surfaces where work has stopped for the winter season shall be protected with a minimum of 3 inches of crushed gravel per NHDOT item 304.3.

☐ Note at the end of the construction sequence that "Lot disturbance, other than that shown on the approved plans, shall not commence until after the roadway has the base course to design elevation and the associated drainage is complete and stable." – This note is applicable to single/duplex family subdivisions, when lot development is not part of the permit.

DRAINAGE ANALYSES

Please provide double-side 8 ½" × 11" sheets where possible but, **do not** reduce the text such that more than one page fits on one side.

☐ Professional Engineer stamp.

☐ Rainfall amount obtained from the Northeast Regional Climate Center. Include extreme precipitation table as obtained from this source.

☐ Drainage analyses, in the following order:

- Pre-development analysis: Drainage diagram.
- Pre-development analysis: Area Listing and Soil Listing.
- Pre-development analysis: Node listing 1-year (if applicable), 2-year, 10-year and 50-year.
- Pre-development analysis: Full summary of the 10-year storm.
- Post-development analysis: Drainage diagram.
- Post-development analysis: Area Listing and Soil Listing.
- Post-development analysis: Node listing for the 2-year, 10-year and 50-year.
- Post-development analysis: Full summary of the 10-year storm.

☐ Review the Area Listing and Soil Listing reports

- Hydrologic Soil Groups (HSG) match the HSGs on the soil maps provided.
- There is the same or less HSG A soil area after development (check for each HSG).
- There is the same or less "woods" cover in the post-development.
- Undeveloped land was assumed to be in "good" condition.
- The amount of impervious cover in the analyses is correct.

Note: A good check is to subtract the total impervious area used in the pre-analysis from the total impervious area used in the post-analysis. For residential projects without demolition occurring, a good check is to take this change in impervious area, subtract out the roadway and divide the remaining by the number of houses or units proposed. Do these numbers make sense?

☐ Check the storage input used to model the ponds.

☐ Check to see if the artificial berms pass the 50-year storm, i.e., make sure the constructed berms on ponds are not overtopped.

☐ Check the outlet structure proposed and make sure it matches that modeled.

☐ Check to see if the total areas in the pre and post analyses are same.

☐ Confirm the correct NRCS storm type was modeled (Coos, Carroll and Grafton counties are Type II, all others Type III).

PRE- AND POST-CONSTRUCTION DRAINAGE AREA PLANS

☐ Plans printed on 34 - 36" by 22 - 24" on white paper.

☐ Submit these plans separate from the soil plans.

☐ A north arrow.

☐ A scale.

☐ Labeled subcatchments, reaches and ponds.

- [x] Tc lines.
- [x] A clear delineation of the subcatchment boundaries.
- [ ] Roadway station numbers.
- [x] Culverts and other conveyance structures.

PRE- AND POST-CONSTRUCTION COLOR-CODED SOIL PLANS

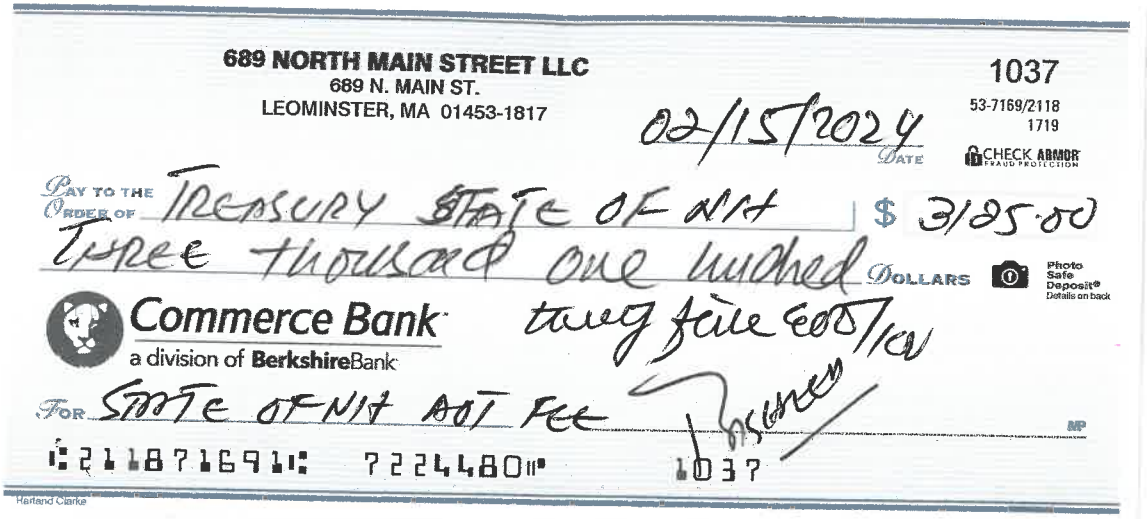
- [x] 11" × 17" sheets suitable, as long as it is readable.
- [x] Submit these plans separate from the drainage area plans.
- [x] A north arrow.
- [x] A scale.
- [x] Name of the soil scientist who performed the survey and date the soil survey took place.
- [x] 2-foot contours (5-foot contours if application is for a gravel pit) as well as other surveyed features.
- [x] Delineation of the soil boundaries and wetland boundaries.
- [x] Delineation of the subcatchment boundaries.
- [x] Soil series symbols (e.g., 26).
- [x] A key or legend identifying each soil series symbol and its associated soil series name (for example: 26 = Windsor).
- [x] The hydrologic soil group color coding (A = Green, B = yellow, C= orange, D=red, Water=blue, and Impervious = gray).

Please note that excavation projects (including gravel pits) have similar requirements to those above, with the following common exceptions or additions:

- [ ] Drainage report is not needed if site does not have off-site flow.
- [ ] 5-foot contours are allowed rather than 2-foot.
- [ ] No Professional Engineer stamp is needed on the plans.
- [ ] Add a note to the plans that the applicant must provide NHDES a written update of the project and revised plans documenting the project status every five years from the date of the Alteration of Terrain permit.
- [ ] Add reclamation notes.
- [ ] A description of the subsurface conditions to the planned depth of excavation, including the elevation of the location of the Seasonal High Water Table (SHWT), as observed and described by a certified soil scientist, or an individual holding a valid permit as a permitted designer as issued by the department's Subsurface Systems Bureau.

For more resources, refer to the Natural Resources Conservation Service's Vegetating New Hampshire Sand and Gravel Pits publication.

4. COPY OF AOT APPLICATION CHECK



689 NORTH MAIN STREET LLC
689 N. MAIN ST.
LEOMINSTER, MA 01453-1817

1037
53-7169/2118
1719

02/15/2024
DATE

CHECK ARMOR FRAUD PROTECTION

PAY TO THE ORDER OF Treasury State of NH $ 3125.00

Three thousand one hundred twenty five 00/100 DOLLARS

Photo Safe Deposit® Details on back

Commerce Bank
a division of BerkshireBank

FOR State of NH DOT Fee

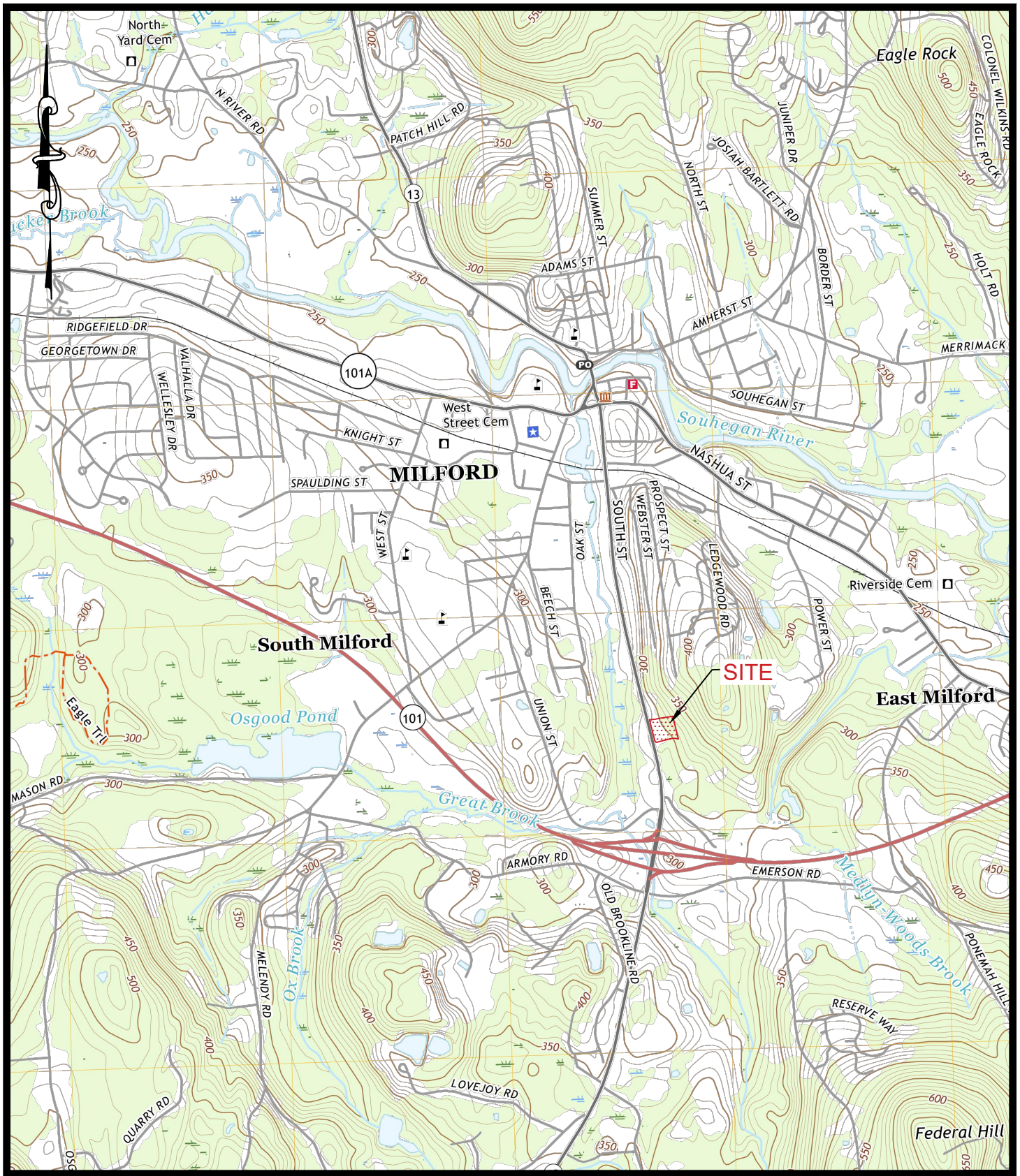
MP

⑆211871691⑆ 7224480⑈ 1037

Harland Clarke

5. MUNICIPAL SUBMISSION: CITY OF MANCHESTER

6. USGS LOCATION MAP



KEACH–NORDSTROM ASSOCIATES, INC.
Civil Engineering Land Surveying Landscape Architecture
10 Commerce Park North, Suite 3B, Bedford, NH 03110
Phone (603) 627-2881

TITLE:

USGS EXHIBIT PREPARED FOR:

MILFORD RASHID GAS STATION

MAP 43; LOT 20-2

SOUTH STREET - MILFORD, NEW HAMPSHIRE

DATE: 02-19-2024	JOB. NO. 21-0526-1A
SCALE: 1" = 2,000'	SHEET 1 OF 1

7. PROJECT NARRATIVE

I. INTRODUCTION

A. Project Description

The project proposes to clear and grub the existing site to construct a 6,675 gas station convenience store. The store will be equipped with a drive-thru. The gas station will have 6 fueling islands. Other site improvements will include parking and access, stormwater management provisions, and utility connections. The total area of disturbance for construction exceeds 100,000 square feet and therefore does require an Alteration of Terrain Permit.

B. Existing Site Conditions

The subject property, referenced on Milford Tax Map 43 as Lot 20-2, is situated in both the Commercial and Limited Commercial Zoning Districts. The parcel is approximately 2.001 acres and will be 2.687 acres after a proposed Lot Line Adjustment with Lot 20. The property is undeveloped. An isolated wetland is located on site and will be filled. An application has been submitted for the wetland disturbance.

According to the Natural Resources Conservation Service (NRCS) web soil survey, the predominant soil type onsite is Canton fine sand loam, with slopes ranging from 0 -25%. The soils are classified as Hydrologic Soil Groups (HSG) 'A' and 'B' soils. According to the Site-Specific Soil Survey Report, performed in February of 2024 by certified soil scientist, Cynthia Balcius, the area of development consists of Wareham fine sandy loam, Deerfield loamy sand, Newfields fine sandy loam, and Udorthents, of varying slopes ranging from 0-25%.

II. STORM DRAINAGE ANALYSIS & DESIGN

A. Methodology

In accordance with the provisions of the NHDES, Town of Milford, and generally accepted engineering practice, the 2-year, 10-year, 25-year & 50-year frequency storms have each been used in the various aspects of analysis and design of stormwater management considerations for the subject site. All closed drainage systems and Stormwater BMPs have been designed for the 25-year frequency storm, and all proposed stormwater ponds do not overtop in the 50-year frequency storm.

KNA utilizes HydroCAD version 10.0 to analyze both pre and post-development watershed characteristics. This computer software system is based largely on hydrology techniques (TR-20) developed by the Soil Conservation Service (now the Natural Resources Conservation Service). In addition, the software derives Time of Concentration values using the methodology contained within USDA-S.C.S. publication Urban Hydrology for Small Watersheds Technical Release No. 55 (TR 55).

All design and analysis calculations performed using the referenced methodologies are attached to this report. The minimum time of concentrations used for the analysis is 6 minutes. These calculations document each catchment area, a breakdown of surface type, time of concentration, rainfall intensity, peak discharge volume, Manning's "n" value, peak velocity, and other descriptive design data for each watershed and pipe segment evaluated. In addition, the "Pre/Post Development Drainage Area Plans" graphically define and illustrate the extent of each watershed or catchment area investigated.

B. Pre-Development Drainage Conditions

In the pre-development scenario, two (2) points of analysis (POA) were identified as the appropriate points to compare pre vs. post development rates of stormwater discharge. This point of analysis reflects the main discharge point of the site and were analyzed to show the impact of the proposed improvements.

The pre-development drainage model's POA is further described as follows:

- A South Street Drainage to Great Brook
- B Nathaniel Dr Catch Basin

In general, the site slopes in a westerly direction toward South Street. Stormwater is collected in a depression with an outlet pipe. The pipe connects to an existing catch basin in South Street.

For a more visual description of the information presented in this section, please refer to the attached "Pre-Development Drainage Areas Plan" attached in the appendix of this report.

C. Post-Development Drainage Conditions:

The same POAs that were identified in the pre-development scenario has been analyzed in the post-development scenario.

The proposed stormwater management system utilizes both open and closed drainage practices for the collection, storage, and treatment of runoff. Stormwater runoff generated from the proposed development is collected by one of four proposed bioretention ponds. The ponds are lined and treated stormwater is collected by underdrains. Three of the ponds are routed to a pipe detention system to mitigate runoff rates. Discharge is then directed to the existing drainage system in South Street.

The proposed use is considering High-Load use, as defined in Env-Wq 1500 and infiltration is not proposed.

The peak stormwater runoff rates for the specific storm frequencies are presented and analyzed in the subsequent summary section of this report (Table 1). For a more visual description of the information presented in this section, please refer to the attached "Post-Development Drainage Areas Plan" attached in the appendix of this report.

Channel Protection Requirements for the Site is met, per Env-Wq 1507.05 (b)(1)b as shown in Table 1.

D. Summary:

The subject site complies with both the City of Manchester Site Plan Review Regulations and NHDES regulations Env-wq 1500 regarding stormwater mitigation. Proposed stormwater best management practices (BMP) are designed in accordance with the New Hampshire Stormwater Manual Volume 2: Post-Construction Best Management Practices Selection and Design and BMP worksheets provided by NHDES. In addition, stormwater discharges, in terms of peak rate of runoff, are consistent with the City of Manchester Stormwater Regulations and NHDES Regulations Env-Wq 1500. The results are reported below in Table 1.

Table 1: Peak Flow Discharge Rate

Site Pre-Development vs. Post-Development (cfs)								
Description	**2-Year**		**10-Year**		**25-Year**		**50-Year**	
24-hr Rainfall	2.96 in/hr		4.41 in/hr		5.53 in/hr		6.57 in/hr	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
A	0.98	0.98	5.84	5.74	11.60	10.78	17.82	16.16
B	0.00	0.00	0.02	0.01	0.03	0.02	0.04	0.04

III. EROSION & SEDIMENTATION CONTROL PROVISIONS

A. Temporary Erosion Control Measures

As an integral part of the engineering design of this site, an erosion and sedimentation control plan has been developed with the intent of limiting the potential for soil loss and associated receiving water quality degradation, both during and after the construction period. As the project plans indicate, traditional temporary erosion and sedimentation control devices and practices, such as siltation fencing and temporary block and sediment barriers at. In preparation of these provisions, reference was made to the New Hampshire Stormwater Manual; Volume 3: Erosion and Sediment Temporary Controls During Construction. Construction details for each temporary erosion control measure and practice specified have been added to the project plans. These plans also contain a number of erosion control notes, which are offered to the selected contractor in order to supplement the specified measures and practices to the extent practical.

B. Construction Sequence

A site-specific construction sequence sensitive to limiting soil loss due to erosion and associated water quality degradation was prepared specifically for this project and is shown on the project plans. As pointed out in the erosion control notes, it is important for the contractor to recognize that proper judgment in the implementation of work will be essential if erosion is to be limited and protection of completed work is to be realized. Moreover, any specific changes in sequence and/or field conditions affecting the ability of specific erosion control measures to adequately serve their intended purpose should be reported to this office by the contractor. Further, the contractor is encouraged to supplement specified erosion control measures during the construction period where and when in his/ her best judgment additional protection is warranted.

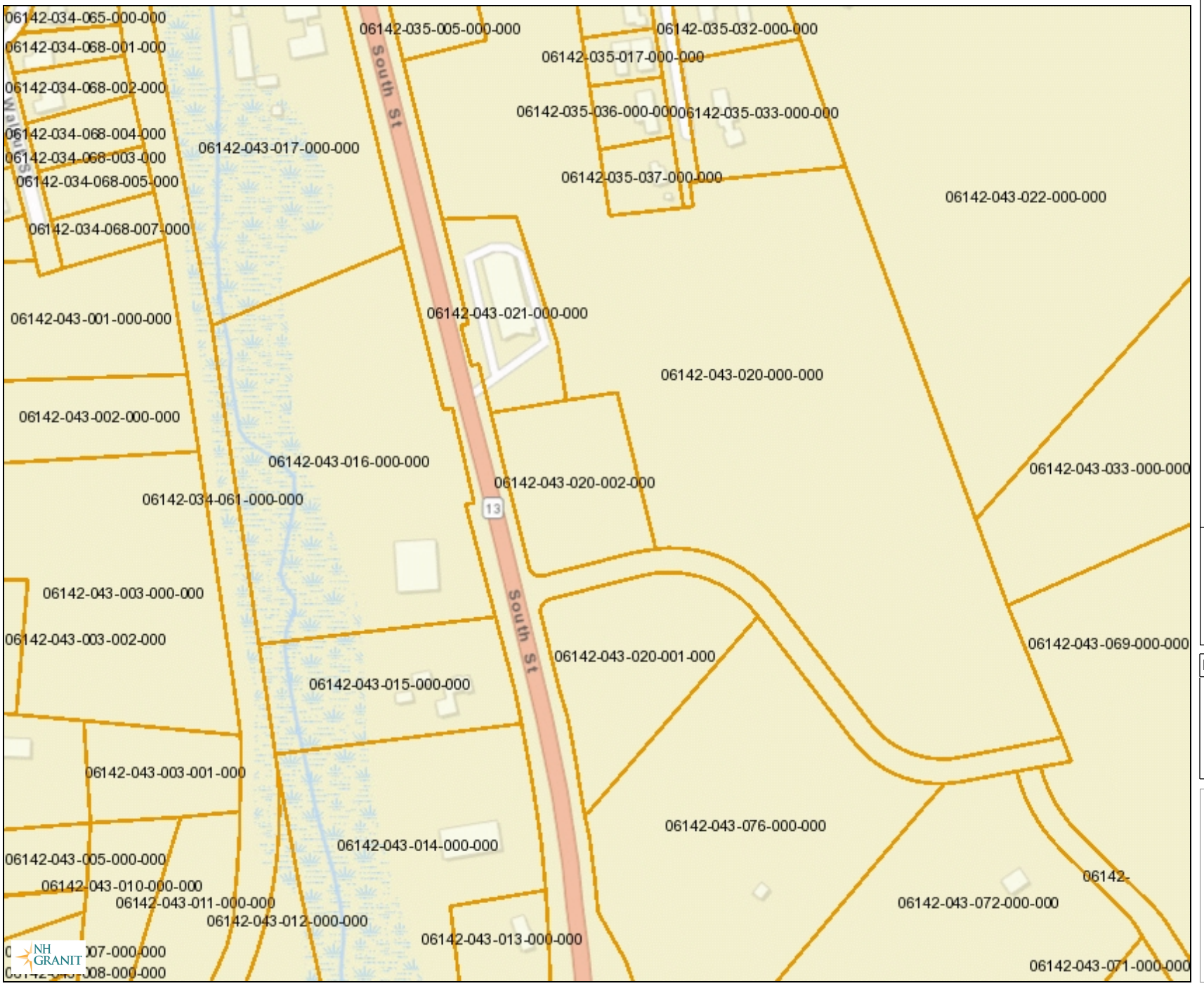
C. Permanent Erosion Control Measures

In the design of this site, consideration was given to limiting the potential for long-term erosion of completed improvements. As a result, several permanent erosion control measures were incorporated into the site design. These provisions include:

1) Specification of a turf establishment schedule and seed mixture, utilizing materials and workmanship recognized as appropriate for the site conditions at hand; and
2) Bituminous paved parking lots; and
3) Construction of rip-rap at the outlet of the stormwater management areas; and
4) Four bioretention ponds and a subsurface detention system were designed to reduce runoff rates.

8. SURFACE WATER IMPAIRMENTS

Map by NH GRANIT



Legend

- Surface Waters with Impa Mile Buffer
- Parcels

Map Scale

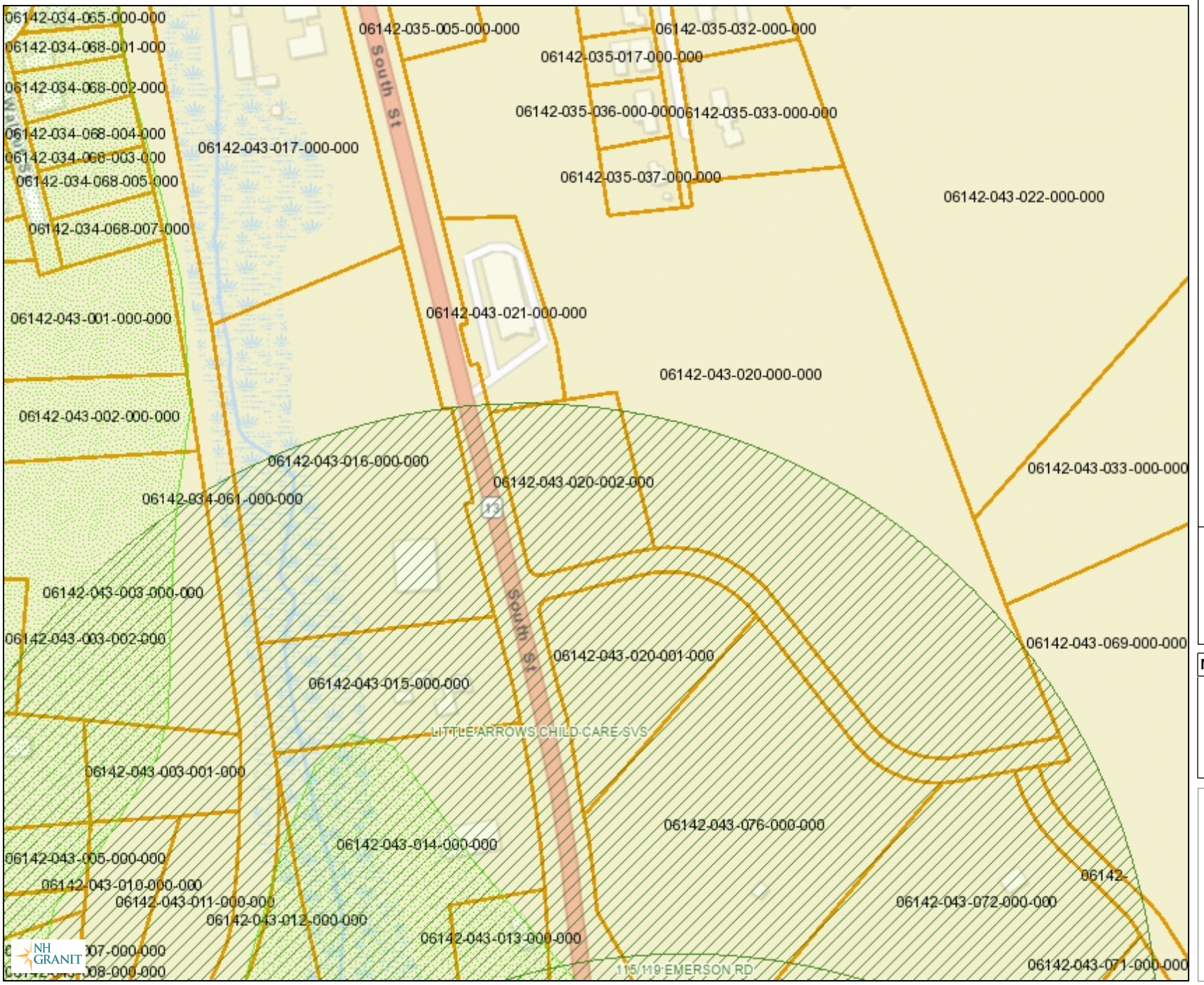
1: 3,247

Map Generated: 2/12/2024

Notes

9. SCREENING LAYERS

Map by NH GRANIT



Legend

- Remediation Sites
- Coastal and Great Bay Re
- Designated Rivers Quarte
- Public Water Supply Well
- Groundwater Classificatio
- Groundwater Classificatio
- Water Supply Intake Prote
- Wellhead Protection Area
- Class A Lakes with a Qua
- Class A - All Features
- All Lakes, with a Quarter I
- Outstanding Resource Wa
- Surface Waters with Impa Mile Buffer
- Watersheds with Chloride
- Parcels

Map Scale

1: 3,247

Map Generated: 2/12/2024

Notes

10. NEW HAMPSHIRE NATURAL HERITAGE INVENTORY LETTER

New Hampshire Natural Heritage Bureau
NHB DataCheck Results Letter

To: Audrey Carr
10 Commerce Park North
Bedford, NH 03110

From: NH Natural Heritage Bureau

Date: 9/27/2022 (This letter is valid through 9/27/2023)

Re: Review by NH Natural Heritage Bureau of request dated 9/27/2022

Permit Types: Wetland Standard Dredge & Fill - Minor
General Permit

NHB ID: NHB22-3156

Applicant: Audrey Carr

Location: Milford
Tax Map: 43, Tax Lot: 20-2
Address: South St

Proj. Description: The project proposes a gas station with convenience store

The NH Natural Heritage database has been checked for records of rare species and exemplary natural communities near the area mapped below. The species considered include those listed as Threatened or Endangered by either the state of New Hampshire or the federal government. We currently have no recorded occurrences for sensitive species near this project area.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

Based on the information submitted, no further consultation with the NH Fish and Game Department pursuant to Fis 1004 is required.

Department of Natural and Cultural Resources
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DNCR/NHB
172 Pembroke Rd.
Concord NH 03301

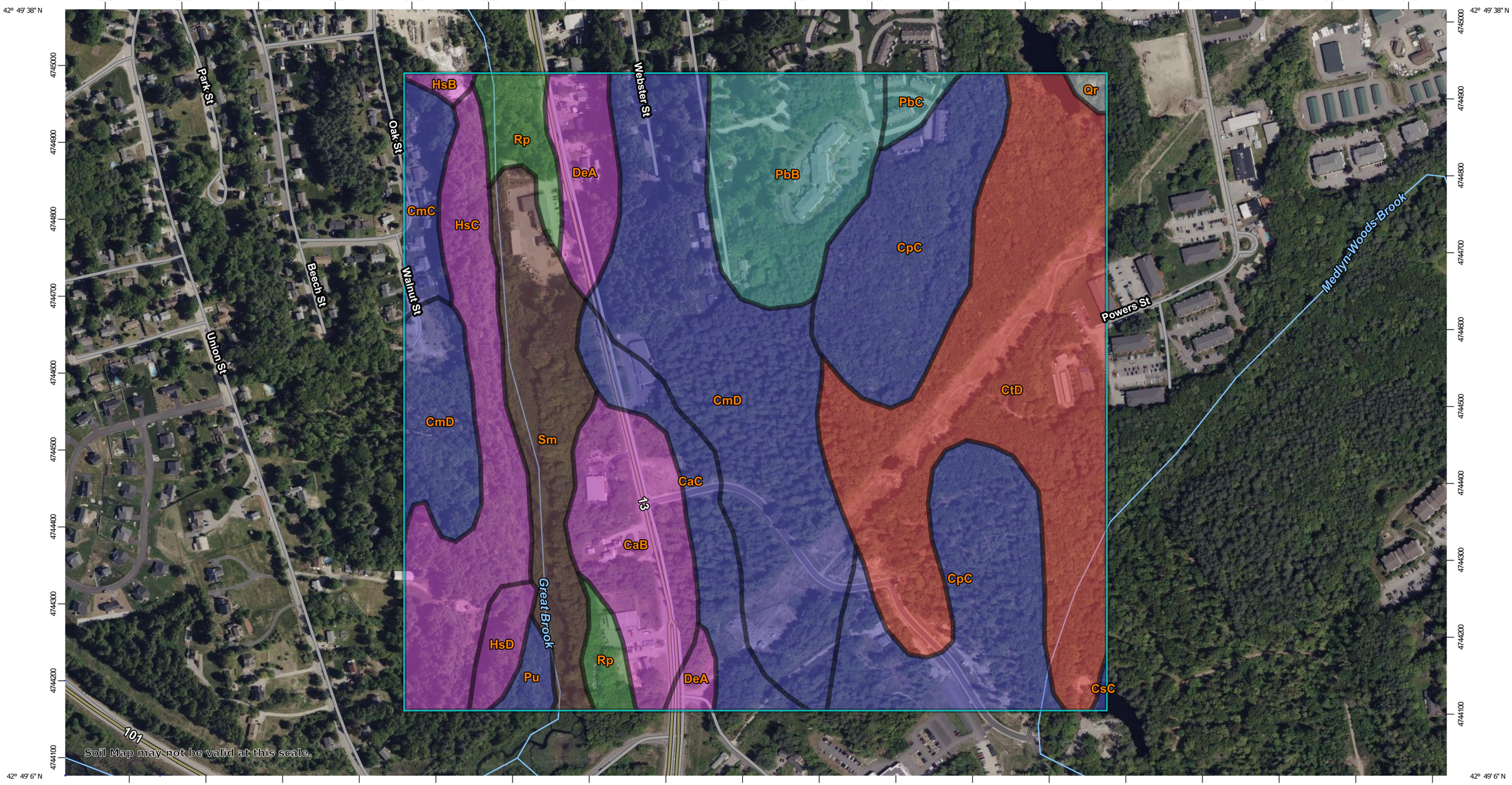
MAP OF PROJECT BOUNDARIES FOR: NHB22-3156

Department of Natural and Cultural Resources
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DNCR/NHB
172 Pembroke Rd.
Concord NH 03301

11. WEB SOIL SURVEY

Hydrologic Soil Group—Hillsborough County, New Hampshire, Eastern Part



71° 39' 19" W — 71° 38' 0" W

42° 49' 38" N — 42° 49' 6" N

283000 283100 283200 283300 283400 283500 283600 283700 283800 283900 284000 284100 284200 284300 284400 284500 284600 284700

4745000 4744900 4744800 4744700 4744600 4744500 4744400 4744300 4744200 4744100

Map Scale: 1:4,850 if printed on B landscape (17" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hillsborough County, New Hampshire, Eastern Part
Survey Area Data: Version 25, Sep 12, 2022

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CaB	Canton fine sandy loam, 0 to 8 percent slopes	A	11.4	6.0%
CaC	Canton fine sandy loam, 8 to 15 percent slopes	B	7.8	4.2%
CmC	Canton fine sandy loam, 8 to 15 percent slopes, very stony	B	3.8	2.0%
CmD	Canton fine sandy loam, 15 to 25 percent slopes, very stony	B	37.0	19.6%
CpC	Chatfield-Hollis-Canton complex, 8 to 15 percent slopes	B	30.8	16.4%
CsC	Chatfield-Hollis complex, 8 to 15 percent slopes, rocky	B	0.2	0.1%
CtD	Chatfield-Hollis-Rock outcrop complex, 15 to 35 percent slopes	D	38.3	20.3%
DeA	Deerfield loamy fine sand, 0 to 3 percent slopes	A	6.3	3.3%
HsB	Hinckley loamy sand, 3 to 8 percent slopes	A	0.6	0.3%
HsC	Hinckley loamy sand, 8 to 15 percent slopes	A	14.8	7.9%
HsD	Hinckley loamy sand, 15 to 35 percent slopes	A	2.1	1.1%
PbB	Paxton fine sandy loam, 3 to 8 percent slopes	C	14.1	7.5%
PbC	Paxton fine sandy loam, 8 to 15 percent slopes	C	1.4	0.8%
Pu	Pootatuck fine sandy loam	B	1.3	0.7%
Qr	Quarries		0.5	0.3%
Rp	Rippowam fine sandy loam	A/D	5.3	2.8%
Sm	Saco variant silt loam	B/D	12.7	6.7%
Totals for Area of Interest			**188.4**	**100.0%**

Description

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

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

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

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

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

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

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

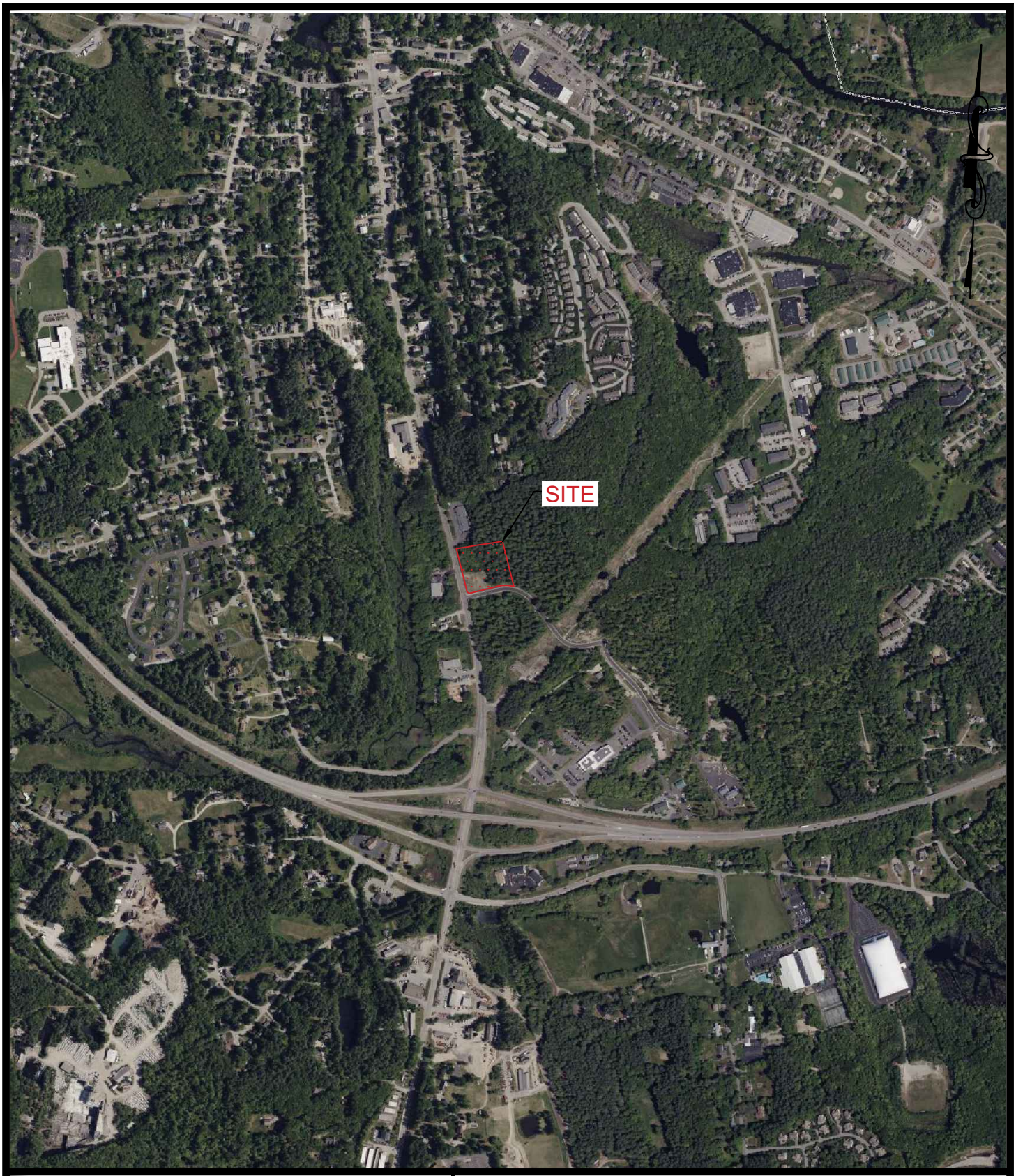
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

12. AERIAL



KEACH–NORDSTROM ASSOCIATES, INC.
Civil Engineering Land Surveying Landscape Architecture
10 Commerce Park North, Suite 3B, Bedford, NH 03110
Phone (603) 627–2881

TITLE:

AERIAL EXHIBIT PREPARED FOR:

MILFORD RASHID GAS STATION

MAP 43; LOT 20-2

SOUTH STREET - MILFORD, NEW HAMPSHIRE

DATE: 02-19-2024	JOB. NO. 21-0526-1A
SCALE: 1" = 1000'	SHEET 1 OF 1

13. SITE PHOTOGRAPHS

Photo No. 1: Looking South, along South Street, project site on the left.

Photo No. 2: Looking North, along South Street, project site on the right.

Photo No. 3: Looking East at the property.

Photo No. 4: Looking Northeast toward the area of stormwater discharge.

14. BMP WORKSHEETS

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

FILTRATION PRACTICE DESIGN CRITERIA (Env-Wq 1508.07)

Type/Node Name: **Bioretention Pond #1**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a).	
0.85	ac	A = Area draining to the practice	
0.16	ac	A_I = Impervious area draining to the practice	
0.19	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.22	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.19	ac-in	WQV= 1" x Rv x A	
677	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
169	cf	25% x WQV (check calc for sediment forebay volume)	
508	cf	75% x WQV (check calc for surface sand filter volume)	
Forebay		Method of Pretreatment? (not required for clean or roof runoff)	
765	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	≥ 25%WQV
Calculate time to drain if system IS NOT underdrained:			
	sf	A_{SA} = Surface area of the practice	
	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
		If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
	Yes/No	(Use the calculations below)	
-	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	≤ 72-hrs
Calculate time to drain if system IS underdrained:			
293.50	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
0.14	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
2.69	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	≤ 72-hrs
290.50	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
289.50	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
295.00	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
293.00	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1.00	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	≥ 1'
(2.50)	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	≥ 1'
(4.50)	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	≥ 1'
293.64	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
294.70	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	← yes
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	< 10 ac
	cf	V = Volume of storage[3] (attach a stage-storage table)	≥ 75%WQV
	inches	D_{FC} = Filter course thickness	18", or 24" if within GPA
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	← yes

If a bioretention area is proposed:			
YES	ac	Drainage Area no larger than 5 ac?	**← yes**
1,238	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ WQV**
18.0	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet	17	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	**> 3:1**
Sheet	9	Note what sheet in the plan set contains the planting plans and surface cover	
If porous pavement is proposed:			
		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
	acres	A_{SA} = Surface area of the pervious pavement	
	:1	Ratio of the contributing area to the pervious surface area	**≤ 5:1**
	inches	D_{FC} = Filter course thickness	**12", or 18" if within GPA mod. 304.1 (see spec)**
Sheet		Note what sheet in the plan set contains the filter course spec.	

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes:

Bioretention Pond is to be lined with 30 mil impermeable liner.

Stage-Discharge for Pond 2P: Bioretention Pond 1

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
292.00	0.00	293.04	0.11	294.08	7.13
292.02	0.04	293.06	0.11	294.10	7.14
292.04	0.04	293.08	0.11	294.12	7.15
292.06	0.05	293.10	0.11	294.14	7.16
292.08	0.05	293.12	0.12	294.16	7.18
292.10	0.05	293.14	0.12	294.18	7.19
292.12	0.05	293.16	0.12	294.20	7.20
292.14	0.05	293.18	0.12	294.22	7.21
292.16	0.05	293.20	0.12	294.24	7.22
292.18	0.05	293.22	0.12	294.26	7.23
292.20	0.06	293.24	0.12	294.28	7.24
292.22	0.06	293.26	0.12	294.30	7.26
292.24	0.06	293.28	0.13	294.32	7.27
292.26	0.06	293.30	0.13	294.34	7.28
292.28	0.06	293.32	0.13	294.36	7.29
292.30	0.06	293.34	0.13	294.38	7.30
292.32	0.07	293.36	0.13	294.40	7.31
292.34	0.07	293.38	0.13	294.42	7.32
292.36	0.07	293.40	0.13	294.44	7.33
292.38	0.07	293.42	0.13	294.46	7.35
292.40	0.07	293.44	0.14	294.48	7.36
292.42	0.07	293.46	0.14	294.50	7.37
292.44	0.08	293.48	0.14	294.52	7.38
292.46	0.08	293.50	0.14	294.54	7.39
292.48	0.08	293.52	0.21	294.56	7.40
292.50	0.08	293.54	0.35	294.58	7.41
292.52	0.08	293.56	0.53	294.60	7.42
292.54	0.08	293.58	0.74	294.62	7.43
292.56	0.08	293.60	0.97	294.64	7.44
292.58	0.08	293.62	1.23	294.66	7.46
292.60	0.09	293.64	1.52	294.68	7.47
292.62	0.09	293.66	1.82	294.70	**7.48**
292.64	0.09	293.68	2.15		
292.66	0.09	293.70	2.49		
292.68	0.09	293.72	2.85		
292.70	0.09	293.74	3.23		
292.72	0.09	293.76	3.62		
292.74	0.09	293.78	4.03		
292.76	0.09	293.80	4.46		
292.78	0.10	293.82	4.90		
292.80	0.10	293.84	5.35		
292.82	0.10	293.86	5.81		
292.84	0.10	293.88	6.29		
292.86	0.10	293.90	6.78		
292.88	0.10	293.92	7.04		
292.90	0.10	293.94	7.05		
292.92	0.10	293.96	7.06		
292.94	0.11	293.98	7.07		
292.96	0.11	294.00	7.08		
292.98	0.11	294.02	7.10		
293.00	0.11	294.04	7.11		
293.02	0.11	294.06	7.12		

Stage-Area-Storage for Pond 2P: Bioretention Pond 1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
292.00	599	0
292.05	647	31
292.10	697	65
292.15	748	101
292.20	802	140
292.25	857	181
292.30	914	225
292.35	973	272
292.40	1,034	323
292.45	1,097	376
292.50	1,161	432
292.55	1,199	491
292.60	1,238	552
292.65	1,277	615
292.70	1,317	680
292.75	1,357	747
292.80	1,398	816
292.85	1,440	887
292.90	1,482	960
292.95	1,525	1,035
293.00	1,569	1,112
293.05	1,610	1,192
293.10	1,652	1,273
293.15	1,694	1,357
293.20	1,737	1,443
293.25	1,780	1,531
293.30	1,824	1,621
293.35	1,868	1,713
293.40	1,913	1,807
293.45	1,958	1,904
293.50	2,004	2,003
293.55	2,050	2,105
293.60	2,097	2,208
293.65	2,145	2,314
293.70	2,193	2,423
293.75	2,241	2,534
293.80	2,290	2,647
293.85	2,340	2,763
293.90	2,390	2,881
293.95	2,441	3,002
294.00	2,492	3,125
294.05	2,541	3,251
294.10	2,591	3,379
294.15	2,641	3,510
294.20	2,691	3,643
294.25	2,743	3,779
294.30	2,794	3,918
294.35	2,846	4,059
294.40	2,899	4,202
294.45	2,952	4,348
294.50	**3,005**	**4,497**
294.55	3,005	4,497
294.60	3,005	4,497
294.65	3,005	4,497
294.70	3,005	4,497

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

FILTRATION PRACTICE DESIGN CRITERIA (Env-Wq 1508.07)

Type/Node Name: **Bioretention Pond #2**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a).	
0.57	ac	A = Area draining to the practice	
0.41	ac	A_I = Impervious area draining to the practice	
0.72	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.70	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.40	ac-in	WQV= 1" x Rv x A	
1,443	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
361	cf	25% x WQV (check calc for sediment forebay volume)	
1,082	cf	75% x WQV (check calc for surface sand filter volume)	
Forebay		Method of Pretreatment? (not required for clean or roof runoff)	
593	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	≥ 25%WQV
Calculate time to drain if system IS NOT underdrained:			
	sf	A_{SA} = Surface area of the practice	
	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
		If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
	Yes/No	(Use the calculations below)	
-	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	≤ 72-hrs
Calculate time to drain if system IS underdrained:			
290.65	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
0.14	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
5.73	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	≤ 72-hrs
287.50	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
286.50	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
290.00	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
288.00	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1.00	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	≥ 1'
(0.50)	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	≥ 1'
(2.50)	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	≥ 1'
290.87	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
291.50	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	← yes
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	< 10 ac
	cf	V = Volume of storage[3] (attach a stage-storage table)	≥ 75%WQV
	inches	D_{FC} = Filter course thickness	18", or 24" if within GPA
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	← yes

If a bioretention area is proposed:			
YES	ac	Drainage Area no larger than 5 ac?	**← yes**
1,530	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ WQV**
18.0	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet	17	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	**≥ 3:1**
Sheet	9	Note what sheet in the plan set contains the planting plans and surface cover	
If porous pavement is proposed:			
		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
	acres	A_{SA} = Surface area of the pervious pavement	
	:1	Ratio of the contributing area to the pervious surface area	**≤ 5:1**
	inches	D_{FC} = Filter course thickness	**12", or 18" if within GPA mod. 304.1 (see spec)**
Sheet		Note what sheet in the plan set contains the filter course spec.	

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes:

Bioretention Pond is to be lined with 30 mil impermeable liner.

Stage-Discharge for Pond 3P: Bioretention Pond 2

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
289.00	0.00	290.04	0.10	291.08	7.38
289.02	0.04	290.06	0.10	291.10	7.40
289.04	0.04	290.08	0.10	291.12	7.42
289.06	0.05	290.10	0.11	291.14	7.44
289.08	0.05	290.12	0.11	291.16	7.46
289.10	0.05	290.14	0.11	291.18	7.47
289.12	0.05	290.16	0.11	291.20	7.49
289.14	0.05	290.18	0.11	291.22	7.51
289.16	0.05	290.20	0.11	291.24	7.53
289.18	0.05	290.22	0.11	291.26	7.55
289.20	0.05	290.24	0.11	291.28	7.56
289.22	0.05	290.26	0.11	291.30	7.58
289.24	0.06	290.28	0.12	291.32	7.60
289.26	0.06	290.30	0.12	291.34	7.62
289.28	0.06	290.32	0.12	291.36	7.63
289.30	0.06	290.34	0.12	291.38	7.65
289.32	0.06	290.36	0.12	291.40	7.67
289.34	0.06	290.38	0.12	291.42	7.69
289.36	0.06	290.40	0.12	291.44	7.70
289.38	0.06	290.42	0.12	291.46	7.72
289.40	0.06	290.44	0.12	291.48	7.74
289.42	0.07	290.46	0.13	291.50	**7.76**
289.44	0.07	290.48	0.13		
289.46	0.07	290.50	0.13		
289.48	0.07	290.52	0.13		
289.50	0.07	290.54	0.13		
289.52	0.07	290.56	0.13		
289.54	0.07	290.58	0.13		
289.56	0.07	290.60	0.13		
289.58	0.08	290.62	0.13		
289.60	0.08	290.64	0.14		
289.62	0.08	290.66	0.16		
289.64	0.08	290.68	0.27		
289.66	0.08	290.70	0.43		
289.68	0.08	290.72	0.62		
289.70	0.08	290.74	0.85		
289.72	0.08	290.76	1.10		
289.74	0.08	290.78	1.37		
289.76	0.09	290.80	1.66		
289.78	0.09	290.82	1.98		
289.80	0.09	290.84	2.31		
289.82	0.09	290.86	2.67		
289.84	0.09	290.88	3.03		
289.86	0.09	290.90	3.42		
289.88	0.09	290.92	3.82		
289.90	0.09	290.94	4.24		
289.92	0.10	290.96	4.67		
289.94	0.10	290.98	5.11		
289.96	0.10	291.00	5.57		
289.98	0.10	291.02	6.04		
290.00	0.10	291.04	6.53		
290.02	0.10	291.06	7.02		

Stage-Area-Storage for Pond 3P: Bioretention Pond 2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
289.00	598	0
289.05	640	31
289.10	682	64
289.15	724	99
289.20	766	136
289.25	808	176
289.30	850	217
289.35	892	261
289.40	934	306
289.45	976	354
289.50	1,018	404
289.55	1,059	456
289.60	1,101	510
289.65	1,143	566
289.70	1,185	624
289.75	1,227	684
289.80	1,269	747
289.85	1,311	811
289.90	1,353	878
289.95	1,395	947
290.00	1,437	1,018
290.05	1,478	1,090
290.10	1,518	1,165
290.15	1,559	1,242
290.20	1,599	1,321
290.25	1,640	1,402
290.30	1,680	1,485
290.35	1,721	1,570
290.40	1,761	1,657
290.45	1,802	1,746
290.50	1,843	1,837
290.55	1,883	1,931
290.60	1,924	2,026
290.65	1,964	2,123
290.70	2,005	2,222
290.75	2,045	2,323
290.80	2,086	2,427
290.85	2,126	2,532
290.90	2,167	2,639
290.95	2,207	2,749
291.00	**2,248**	**2,860**
291.05	2,248	2,860
291.10	2,248	2,860
291.15	2,248	2,860
291.20	2,248	2,860
291.25	2,248	2,860
291.30	2,248	2,860
291.35	2,248	2,860
291.40	2,248	2,860
291.45	2,248	2,860
291.50	2,248	2,860

FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.07)

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Type/Node Name: **Bioretention Pond #3**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a).	
0.56	ac	A = Area draining to the practice	
0.27	ac	A_I = Impervious area draining to the practice	
0.48	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.48	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.27	ac-in	WQV= 1" x Rv x A	
984	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
246	cf	25% x WQV (check calc for sediment forebay volume)	
738	cf	75% x WQV (check calc for surface sand filter volume)	
Forebay		Method of Pretreatment? (not required for clean or roof runoff)	
265	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
Calculate time to drain if system IS NOT underdrained:			
	sf	A_{SA} = Surface area of the practice	
	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
		If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
	Yes/No	(Use the calculations below)	
-	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
Calculate time to drain if system IS underdrained:			
293.35	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
0.07	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
7.81	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**≤ 72-hrs**
289.50	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
288.50	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
307.00	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
304.00	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1.00	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**≥ 1'**
(14.50)	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	**≥ 1'**
(17.50)	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	**≥ 1'**
293.57	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
294.25	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	**← yes**
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	**< 10 ac**
	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ 75%WQV**
	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	**← yes**

If a bioretention area is proposed:			
YES	ac	Drainage Area no larger than 5 ac?	**← yes**
1,328	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ WQV**
18.0	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet	17	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	**> 3:1**
Sheet	9	Note what sheet in the plan set contains the planting plans and surface cover	
If porous pavement is proposed:			
		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
	acres	A_{SA} = Surface area of the pervious pavement	
	:1	Ratio of the contributing area to the pervious surface area	**≤ 5:1**
	inches	D_{FC} = Filter course thickness	**12", or 18" if within GPA mod. 304.1 (see spec)**
Sheet		Note what sheet in the plan set contains the filter course spec.	

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes:

Bioretention Pond is to be lined with 30 mil impermeable liner.

Stage-Discharge for Pond 5P: Bioretention Pond 3

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
291.00	0.00	292.04	0.03	293.08	0.06	294.12	12.51
291.02	0.01	292.06	0.03	293.10	0.06	294.14	12.53
291.04	0.01	292.08	0.03	293.12	0.06	294.16	12.55
291.06	0.01	292.10	0.03	293.14	0.06	294.18	12.57
291.08	0.01	292.12	0.03	293.16	0.06	294.20	12.59
291.10	0.01	292.14	0.03	293.18	0.06	294.22	12.62
291.12	0.01	292.16	0.04	293.20	0.06	294.24	**12.64**
291.14	0.01	292.18	0.04	293.22	0.07		
291.16	0.02	292.20	0.04	293.24	0.07		
291.18	0.02	292.22	0.04	293.26	0.07		
291.20	0.02	292.24	0.04	293.28	0.07		
291.22	0.02	292.26	0.04	293.30	0.07		
291.24	0.02	292.28	0.04	293.32	0.07		
291.26	0.02	292.30	0.04	293.34	0.07		
291.28	0.02	292.32	0.04	293.36	0.10		
291.30	0.02	292.34	0.04	293.38	0.21		
291.32	0.02	292.36	0.04	293.40	0.36		
291.34	0.02	292.38	0.04	293.42	0.56		
291.36	0.02	292.40	0.04	293.44	0.78		
291.38	0.02	292.42	0.04	293.46	1.03		
291.40	0.02	292.44	0.04	293.48	1.30		
291.42	0.02	292.46	0.04	293.50	1.59		
291.44	0.02	292.48	0.04	293.52	1.91		
291.46	0.02	292.50	0.04	293.54	2.24		
291.48	0.02	292.52	0.04	293.56	2.59		
291.50	0.02	292.54	0.05	293.58	2.96		
291.52	0.02	292.56	0.05	293.60	3.35		
291.54	0.02	292.58	0.05	293.62	3.75		
291.56	0.02	292.60	0.05	293.64	4.16		
291.58	0.02	292.62	0.05	293.66	4.59		
291.60	0.02	292.64	0.05	293.68	5.04		
291.62	0.02	292.66	0.05	293.70	5.50		
291.64	0.02	292.68	0.05	293.72	5.97		
291.66	0.02	292.70	0.05	293.74	6.45		
291.68	0.02	292.72	0.05	293.76	6.95		
291.70	0.02	292.74	0.05	293.78	7.46		
291.72	0.03	292.76	0.05	293.80	7.98		
291.74	0.03	292.78	0.05	293.82	8.51		
291.76	0.03	292.80	0.05	293.84	9.06		
291.78	0.03	292.82	0.05	293.86	9.61		
291.80	0.03	292.84	0.05	293.88	10.18		
291.82	0.03	292.86	0.05	293.90	10.76		
291.84	0.03	292.88	0.06	293.92	11.35		
291.86	0.03	292.90	0.06	293.94	11.94		
291.88	0.03	292.92	0.06	293.96	12.33		
291.90	0.03	292.94	0.06	293.98	12.35		
291.92	0.03	292.96	0.06	294.00	12.38		
291.94	0.03	292.98	0.06	294.02	12.40		
291.96	0.03	293.00	0.06	294.04	12.42		
291.98	0.03	293.02	0.06	294.06	12.44		
292.00	0.03	293.04	0.06	294.08	12.46		
292.02	0.03	293.06	0.06	294.10	12.49		

Stage-Area-Storage for Pond 5P: Bioretention Pond 3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
291.00	185	0
291.05	195	10
291.10	206	20
291.15	217	30
291.20	228	41
291.25	240	53
291.30	252	65
291.35	264	78
291.40	276	92
291.45	289	106
291.50	302	121
291.55	315	136
291.60	329	152
291.65	343	169
291.70	358	186
291.75	372	205
291.80	387	224
291.85	403	243
291.90	418	264
291.95	434	285
292.00	450	307
292.05	467	330
292.10	484	354
292.15	502	379
292.20	520	404
292.25	538	431
292.30	557	458
292.35	575	486
292.40	595	516
292.45	614	546
292.50	634	577
292.55	654	609
292.60	674	642
292.65	695	677
292.70	716	712
292.75	737	748
292.80	759	786
292.85	781	824
292.90	803	864
292.95	826	904
293.00	849	946
293.05	870	989
293.10	891	1,033
293.15	913	1,078
293.20	935	1,125
293.25	957	1,172
293.30	979	1,220
293.35	1,002	1,270
293.40	1,025	1,321
293.45	1,048	1,372
293.50	1,072	1,425
293.55	1,095	1,480
293.60	1,119	1,535
293.65	1,143	1,592
293.70	1,168	1,649
293.75	1,193	1,708
293.80	1,218	1,769
293.85	1,243	1,830
293.90	1,268	1,893
293.95	1,294	1,957
294.00	**1,320**	**2,022**
294.05	1,320	2,022
294.10	1,320	2,022
294.15	1,320	2,022
294.20	1,320	2,022
294.25	1,320	2,022

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

FILTRATION PRACTICE DESIGN CRITERIA (Env-Wq 1508.07)

Type/Node Name: **Bioretention Pond #4**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a).	
0.70	ac	A = Area draining to the practice	
0.59	ac	A_I = Impervious area draining to the practice	
0.85	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.81	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.57	ac-in	WQV= 1" x Rv x A	
2,061	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
515	cf	25% x WQV (check calc for sediment forebay volume)	
1,546	cf	75% x WQV (check calc for surface sand filter volume)	
Forebay		Method of Pretreatment? (not required for clean or roof runoff)	
686	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	≥ 25%WQV
Calculate time to drain if system IS NOT underdrained:			
	sf	A_{SA} = Surface area of the practice	
	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
		If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
	Yes/No	(Use the calculations below)	
-	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	≤ 72-hrs
Calculate time to drain if system IS underdrained:			
289.35	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
0.18	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
6.36	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	≤ 72-hrs
286.50	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
285.50	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
286.00	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
282.00	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1.00	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	≥ 1'
4.50	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	≥ 1'
0.50	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	≥ 1'
289.62	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
290.25	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	← yes
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	< 10 ac
	cf	V = Volume of storage[3] (attach a stage-storage table)	≥ 75%WQV
	inches	D_{FC} = Filter course thickness	18", or 24" if within GPA
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	← yes

If a bioretention area is proposed:			
YES	ac	Drainage Area no larger than 5 ac?	**← yes**
2,167	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ WQV**
18.0	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet	17	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	**≥ 3:1**
Sheet	9	Note what sheet in the plan set contains the planting plans and surface cover	
If porous pavement is proposed:			
		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
	acres	A_{SA} = Surface area of the pervious pavement	
	:1	Ratio of the contributing area to the pervious surface area	**≤ 5:1**
	inches	D_{FC} = Filter course thickness	**12", or 18" if within GPA mod. 304.1 (see spec)**
Sheet		Note what sheet in the plan set contains the filter course spec.	

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes:

Bioretention Pond is to be lined with 30 mil impermeable liner.

Stage-Discharge for Pond 7P: Bioretention Pond 4

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
288.00	0.00	289.04	0.17	290.08	7.64
288.02	0.11	289.06	0.17	290.10	7.66
288.04	0.11	289.08	0.17	290.12	7.68
288.06	0.11	289.10	0.17	290.14	7.69
288.08	0.11	289.12	0.17	290.16	7.71
288.10	0.12	289.14	0.17	290.18	7.73
288.12	0.12	289.16	0.17	290.20	7.75
288.14	0.12	289.18	0.17	290.22	7.77
288.16	0.12	289.20	0.18	290.24	**7.79**
288.18	0.12	289.22	0.18		
288.20	0.12	289.24	0.18		
288.22	0.12	289.26	0.18		
288.24	0.12	289.28	0.18		
288.26	0.12	289.30	0.18		
288.28	0.13	289.32	0.18		
288.30	0.13	289.34	0.18		
288.32	0.13	289.36	0.21		
288.34	0.13	289.38	0.32		
288.36	0.13	289.40	0.48		
288.38	0.13	289.42	0.67		
288.40	0.13	289.44	0.90		
288.42	0.13	289.46	1.15		
288.44	0.13	289.48	1.42		
288.46	0.13	289.50	1.71		
288.48	0.14	289.52	2.03		
288.50	0.14	289.54	2.36		
288.52	0.14	289.56	2.71		
288.54	0.14	289.58	3.08		
288.56	0.14	289.60	3.47		
288.58	0.14	289.62	3.87		
288.60	0.14	289.64	4.29		
288.62	0.14	289.66	4.72		
288.64	0.14	289.68	5.16		
288.66	0.15	289.70	5.62		
288.68	0.15	289.72	6.09		
288.70	0.15	289.74	6.58		
288.72	0.15	289.76	7.08		
288.74	0.15	289.78	7.35		
288.76	0.15	289.80	7.37		
288.78	0.15	289.82	7.39		
288.80	0.15	289.84	7.41		
288.82	0.15	289.86	7.43		
288.84	0.16	289.88	7.45		
288.86	0.16	289.90	7.47		
288.88	0.16	289.92	7.49		
288.90	0.16	289.94	7.51		
288.92	0.16	289.96	7.53		
288.94	0.16	289.98	7.54		
288.96	0.16	290.00	7.56		
288.98	0.16	290.02	7.58		
289.00	0.16	290.04	7.60		
289.02	0.17	290.06	7.62		

Stage-Area-Storage for Pond 7P: Bioretention Pond 4

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
288.00	1,583	0
288.05	1,622	80
288.10	1,661	162
288.15	1,700	246
288.20	1,739	332
288.25	1,779	420
288.30	1,818	510
288.35	1,857	602
288.40	1,896	696
288.45	1,935	792
288.50	1,974	889
288.55	2,013	989
288.60	2,052	1,091
288.65	2,091	1,194
288.70	2,130	1,300
288.75	2,170	1,407
288.80	2,209	1,517
288.85	2,248	1,628
288.90	2,287	1,741
288.95	2,326	1,857
289.00	2,365	1,974
289.05	2,407	2,093
289.10	2,448	2,215
289.15	2,490	2,338
289.20	2,532	2,464
289.25	2,573	2,591
289.30	2,615	2,721
289.35	2,657	2,853
289.40	2,698	2,987
289.45	2,740	3,123
289.50	2,782	3,261
289.55	2,823	3,401
289.60	2,865	3,543
289.65	2,906	3,687
289.70	2,948	3,834
289.75	2,990	3,982
289.80	3,031	4,133
289.85	3,073	4,285
289.90	3,115	4,440
289.95	3,156	4,597
290.00	**3,198**	**4,756**
290.05	3,198	4,756
290.10	3,198	4,756
290.15	3,198	4,756
290.20	3,198	4,756
290.25	3,198	4,756

15. EXTREME PRECIPITATION TABLE

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New Hampshire
Location	
Longitude	71.646 degrees West
Latitude	42.822 degrees North
Elevation	0 feet
Date/Time	Mon, 16 Jan 2023 14:31:17 -0500

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.42	0.52	0.69	0.86	1.08	**1yr**	0.74	1.01	1.25	1.56	1.97	2.48	2.75	**1yr**	2.20	2.64	3.04	3.79	4.37	**1yr**
2yr	0.33	0.51	0.64	0.84	1.05	1.32	**2yr**	0.91	1.21	1.53	1.91	2.38	2.96	3.32	**2yr**	2.62	3.19	3.70	4.42	5.03	**2yr**
5yr	0.39	0.61	0.77	1.03	1.31	1.67	**5yr**	1.13	1.51	1.93	2.41	3.00	3.71	4.22	**5yr**	3.29	4.06	4.69	5.55	6.21	**5yr**
10yr	0.44	0.69	0.88	1.19	1.55	1.98	**10yr**	1.34	1.78	2.31	2.88	3.57	4.41	5.07	**10yr**	3.90	4.88	5.63	6.58	7.29	**10yr**
25yr	0.52	0.83	1.06	1.46	1.94	2.50	**25yr**	1.67	2.23	2.91	3.64	4.51	5.53	6.47	**25yr**	4.89	6.22	7.15	8.27	9.01	**25yr**
50yr	0.59	0.94	1.21	1.70	2.30	2.99	**50yr**	1.98	2.64	3.49	4.37	5.39	6.57	7.79	**50yr**	5.82	7.49	8.58	9.82	10.59	**50yr**
100yr	0.68	1.09	1.41	2.00	2.72	3.56	**100yr**	2.35	3.13	4.16	5.21	6.42	7.81	9.38	**100yr**	6.91	9.02	10.30	11.68	12.45	**100yr**
200yr	0.77	1.25	1.63	2.33	3.23	4.25	**200yr**	2.78	3.72	4.98	6.23	7.66	9.29	11.31	**200yr**	8.22	10.87	12.37	13.89	14.63	**200yr**
500yr	0.92	1.52	1.98	2.88	4.04	5.36	**500yr**	3.49	4.66	6.30	7.88	9.67	11.70	14.49	**500yr**	10.35	13.93	15.76	17.47	18.14	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.21	0.32	0.39	0.53	0.65	0.77	**1yr**	0.56	0.75	1.00	1.34	1.67	2.28	2.27	**1yr**	2.02	2.19	2.57	3.32	3.55	**1yr**
2yr	0.32	0.49	0.60	0.81	1.00	1.19	**2yr**	0.87	1.17	1.36	1.75	2.25	2.89	3.22	**2yr**	2.55	3.10	3.59	4.29	4.89	**2yr**
5yr	0.35	0.55	0.68	0.93	1.19	1.40	**5yr**	1.02	1.37	1.62	2.09	2.68	3.50	3.91	**5yr**	3.10	3.76	4.35	5.16	5.79	**5yr**
10yr	0.39	0.60	0.74	1.04	1.34	1.57	**10yr**	1.15	1.53	1.77	2.38	3.03	4.04	4.54	**10yr**	3.58	4.37	5.02	5.89	6.56	**10yr**
25yr	0.44	0.67	0.83	1.19	1.56	1.82	**25yr**	1.35	1.78	2.05	2.82	3.54	4.92	5.54	**25yr**	4.36	5.33	6.06	7.04	7.73	**25yr**
50yr	0.47	0.72	0.90	1.29	1.73	2.05	**50yr**	1.50	2.01	2.31	3.22	4.00	5.73	6.46	**50yr**	5.07	6.21	6.99	8.04	8.76	**50yr**
100yr	0.51	0.77	0.96	1.39	1.90	2.31	**100yr**	1.64	2.26	2.60	3.26	4.52	6.68	7.53	**100yr**	5.91	7.24	8.05	9.19	9.92	**100yr**
200yr	0.55	0.82	1.04	1.51	2.11	2.60	**200yr**	1.82	2.54	2.90	3.64	5.15	7.81	8.81	**200yr**	6.91	8.47	9.26	10.49	11.22	**200yr**
500yr	0.61	0.90	1.16	1.69	2.40	3.06	**500yr**	2.07	2.99	3.39	4.23	6.13	9.63	10.86	**500yr**	8.52	10.45	11.15	12.47	13.20	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.31	0.48	0.59	0.79	0.97	1.16	**1yr**	0.84	1.13	1.29	1.68	2.09	2.63	2.97	**1yr**	2.33	2.85	3.43	4.26	4.77	**1yr**
2yr	0.36	0.55	0.68	0.92	1.14	1.32	**2yr**	0.98	1.29	1.49	1.91	2.45	3.04	3.44	**2yr**	2.69	3.31	3.84	4.57	5.20	**2yr**
5yr	0.43	0.67	0.83	1.14	1.45	1.67	**5yr**	1.25	1.64	1.87	2.37	2.97	3.95	4.53	**5yr**	3.50	4.35	5.04	5.97	6.64	**5yr**
10yr	0.52	0.79	0.98	1.37	1.77	2.04	**10yr**	1.53	2.00	2.31	2.83	3.50	4.80	5.61	**10yr**	4.25	5.40	6.21	7.28	8.01	**10yr**
25yr	0.66	1.00	1.24	1.78	2.34	2.66	**25yr**	2.02	2.60	2.99	3.55	4.34	6.22	7.40	**25yr**	5.51	7.12	8.22	9.53	10.27	**25yr**
50yr	0.79	1.20	1.50	2.15	2.89	3.25	**50yr**	2.50	3.18	3.64	4.23	5.10	7.56	9.14	**50yr**	6.69	8.79	10.19	11.70	12.43	**50yr**
100yr	0.95	1.44	1.80	2.60	3.57	3.98	**100yr**	3.08	3.89	4.43	5.56	6.01	9.19	11.28	**100yr**	8.13	10.85	12.62	14.38	15.03	**100yr**
200yr	1.15	1.73	2.19	3.17	4.42	4.85	**200yr**	3.81	4.74	5.38	6.73	7.08	11.15	13.93	**200yr**	9.87	13.39	15.64	17.68	18.21	**200yr**
500yr	1.48	2.21	2.84	4.12	5.86	6.29	**500yr**	5.06	6.15	6.97	8.68	8.77	14.34	18.41	**500yr**	12.69	17.71	20.80	23.25	23.48	**500yr**

Powered by ACIS
Northeast Regional Climate Center

16. RIP RAP CALCULATIONS

KEACH-NORDSTROM ASSOCIATES, INC.

RIP RAP OUTLET PROTECTION APRON CALCULATIONS

2/15/2024

The purpose of this spreadsheet is to calculate the dimensions of
rip rap required to help prevent soil loss for the 25 year storm event.

Required input to the spreadsheet is

Q	peak flow in CFS
Do	diameter in feet of outlet or width of channel
Tw	tail water at end of apron

Depending on the tail water conditions either column 1 or column 2 is used for calculations

Column One where Tw<1/2Do	Column One where Tw>1/2Do
La = (1.8Q/Do^3/2)+7Do	La = 3*Q/Do^3/2+7Do
W1=3*Do	W1=3*Do
W2 = 3Do + La	W2=3Do+0.4*La

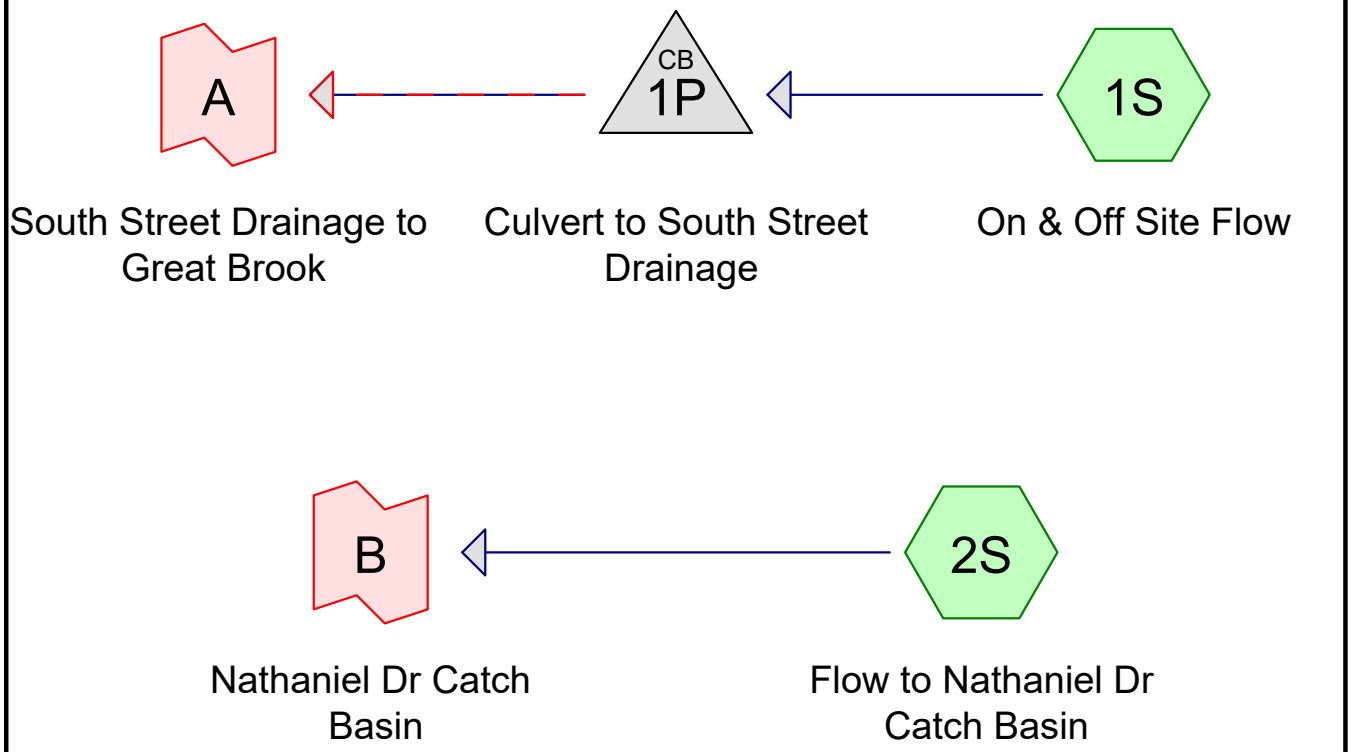
If defined channel use channel width for W1 and W2

Rock Rip Rap

d50 = (0.02*Q^4/3)/(Tw*Do)	Same

Input to Chart Description	(Optional)	Q 25 (cfs)	Do (ft)	Tw (ft)	Calculated Output La	W1	W2 no channel	d50, ft	d50 in	USE d50 in.	RIRAP GRADATION ENVELOPE d100 FROM in	d100 TO in	d85 FROM in	d85 TO in	d50 FROM in	d50 TO in	d15 FROM in	d15 TO in	depth in	USE depth in.
POND#1	Pond #1 Forebay	1.77	1.00	1.00	12	3	8	0.0	0.51	4	6	8	5	7	4	6	1	2	10	10
POND#2	Pond #2 Forebay	2.53	1.00	1.00	15	3	9	0.1	0.83	4	6	8	5	7	4	6	1	2	10	10
POND#3	Pond #3 Forebay	2.24	1.00	1.00	14	3	8	0.1	0.70	4	6	8	5	7	4	6	1	2	10	10
POND#4	Pond #4 Forebay	3.61	1.00	1.00	18	3	10	0.1	1.33	4	6	8	5	7	4	6	1	2	10	10
HW#32	Headwall #32 outlet	4.36	1.00	0.50	15	3	18	0.3	3.42	4	6	8	5	7	4	6	1	2	10	10
HW#51	Headwall #51 outlet	1.23	1.00	0.50	9	3	12	0.1	0.63	4	6	8	5	7	4	6	1	2	10	10

17. HYDROCAD DRAINAGE ANALYSIS



Subcat Reach Pond Link

Routing Diagram for 2105261A-PRE
Prepared by Keach-Nordstrom Associates, Inc, Printed 2/19/2024

Project Notes

Rainfall events imported from "2112161-PRE-DEVELOPMENT.hcp"

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	Type III 24-hr		Default	24.00	1	2.96	2
2	10-yr	Type III 24-hr		Default	24.00	1	4.41	2
3	25-yr	Type III 24-hr		Default	24.00	1	5.53	2
4	50-yr	Type III 24-hr		Default	24.00	1	6.57	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.335	39	>75% Grass cover, Good, HSG A (1S)
0.502	61	>75% Grass cover, Good, HSG B (1S, 2S)
0.163	98	Paved parking, HSG A (1S)
0.071	98	Paved parking, HSG B (1S)
0.042	30	Woods, Good, HSG A (1S)
10.040	55	Woods, Good, HSG B (1S)
0.381	70	Woods, Good, HSG C (1S)
0.259	77	Woods, Good, HSG D (1S)
11.795	**57**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.541	HSG A	1S
10.614	HSG B	1S, 2S
0.381	HSG C	1S
0.259	HSG D	1S
0.000	Other	
11.795		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.335	0.502	0.000	0.000	0.000	0.837	>75% Grass cover, Good	1S, 2S
0.163	0.071	0.000	0.000	0.000	0.235	Paved parking	1S
0.042	10.040	0.381	0.259	0.000	10.723	Woods, Good	1S
0.541	**10.614**	**0.381**	**0.259**	**0.000**	**11.795**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: On & Off Site Flow Runoff Area=513,083 sf 1.99% Impervious Runoff Depth>0.23"
Flow Length=1,360' Tc=19.4 min CN=57 Runoff=0.98 cfs 0.228 af

Subcatchment2S: Flow to Nathaniel Dr Catch Runoff Area=708 sf 0.00% Impervious Runoff Depth>0.35"
Flow Length=53' Slope=0.2500 '/' Tc=6.0 min CN=61 Runoff=0.00 cfs 0.000 af

Pond 1P: Culvert to South Street Drainage Peak Elev=284.95' Inflow=0.98 cfs 0.228 af
Primary=0.98 cfs 0.228 af Secondary=0.00 cfs 0.000 af Outflow=0.98 cfs 0.228 af

Link A: South Street Drainage to Great Brook Inflow=0.98 cfs 0.228 af
Primary=0.98 cfs 0.228 af

Link B: Nathaniel Dr Catch Basin Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 11.795 ac Runoff Volume = 0.228 af Average Runoff Depth = 0.23"
98.01% Pervious = 11.560 ac 1.99% Impervious = 0.235 ac

Summary for Subcatchment 1S: On & Off Site Flow

Runoff = 0.98 cfs @ 12.53 hrs, Volume= 0.228 af, Depth> 0.23"
Routed to Pond 1P : Culvert to South Street Drainage

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=2.96"

Area (sf)	CN	Description
7,122	98	Paved parking, HSG A
3,105	98	Paved parking, HSG B
14,601	39	>75% Grass cover, Good, HSG A
21,172	61	>75% Grass cover, Good, HSG B
1,849	30	Woods, Good, HSG A
437,354	55	Woods, Good, HSG B
16,614	70	Woods, Good, HSG C
11,266	77	Woods, Good, HSG D
513,083	57	Weighted Average
502,856		98.01% Pervious Area
10,227		1.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
10.6	1,192	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.1	118	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.4	1,360	Total			

Summary for Subcatchment 2S: Flow to Nathaniel Dr Catch Basin

Runoff = 0.00 cfs @ 12.14 hrs, Volume= 0.000 af, Depth> 0.35"
Routed to Link B : Nathaniel Dr Catch Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=2.96"

Area (sf)	CN	Description
708	61	>75% Grass cover, Good, HSG B
708		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.0	3	0.2500	2.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.1	53	Total, Increased to minimum Tc = 6.0 min			

Summary for Pond 1P: Culvert to South Street Drainage

Inflow Area = 11.779 ac, 1.99% Impervious, Inflow Depth > 0.23" for 2-yr event
Inflow = 0.98 cfs @ 12.53 hrs, Volume= 0.228 af
Outflow = 0.98 cfs @ 12.53 hrs, Volume= 0.228 af, Atten= 0%, Lag= 0.0 min
Primary = 0.98 cfs @ 12.53 hrs, Volume= 0.228 af
Routed to Link A : South Street Drainage to Great Brook
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link A : South Street Drainage to Great Brook

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 284.95' @ 12.53 hrs
Flood Elev= 290.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	284.48'	**15.0" Round Culvert** L= 75.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 284.48' / 282.66' S= 0.0243 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Secondary	288.00'	**20.0' long x 1.00' rise Sharp-Crested Rectangular Weir X 2.00** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.98 cfs @ 12.53 hrs HW=284.95' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.98 cfs @ 2.33 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=284.48' TW=0.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link A: South Street Drainage to Great Brook

Inflow Area = 11.779 ac, 1.99% Impervious, Inflow Depth > 0.23" for 2-yr event
Inflow = 0.98 cfs @ 12.53 hrs, Volume= 0.228 af
Primary = 0.98 cfs @ 12.53 hrs, Volume= 0.228 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Summary for Link B: Nathaniel Dr Catch Basin

Inflow Area = 0.016 ac, 0.00% Impervious, Inflow Depth > 0.35" for 2-yr event
Inflow = 0.00 cfs @ 12.14 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 12.14 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: On & Off Site Flow Runoff Area=513,083 sf 1.99% Impervious Runoff Depth>0.80"
Flow Length=1,360' Tc=19.4 min CN=57 Runoff=5.84 cfs 0.786 af

Subcatchment2S: Flow to Nathaniel Dr Catch Runoff Area=708 sf 0.00% Impervious Runoff Depth>1.03"
Flow Length=53' Slope=0.2500 '/' Tc=6.0 min CN=61 Runoff=0.02 cfs 0.001 af

Pond 1P: Culvert to South Street Drainage Peak Elev=286.08' Inflow=5.84 cfs 0.786 af
Primary=5.84 cfs 0.786 af Secondary=0.00 cfs 0.000 af Outflow=5.84 cfs 0.786 af

Link A: South Street Drainage to Great Brook Inflow=5.84 cfs 0.786 af
Primary=5.84 cfs 0.786 af

Link B: Nathaniel Dr Catch Basin Inflow=0.02 cfs 0.001 af
Primary=0.02 cfs 0.001 af

Total Runoff Area = 11.795 ac Runoff Volume = 0.787 af Average Runoff Depth = 0.80"
98.01% Pervious = 11.560 ac 1.99% Impervious = 0.235 ac

Summary for Subcatchment 1S: On & Off Site Flow

Runoff = 5.84 cfs @ 12.34 hrs, Volume= 0.786 af, Depth> 0.80"
Routed to Pond 1P : Culvert to South Street Drainage

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-yr Rainfall=4.41"

Area (sf)	CN	Description
7,122	98	Paved parking, HSG A
3,105	98	Paved parking, HSG B
14,601	39	>75% Grass cover, Good, HSG A
21,172	61	>75% Grass cover, Good, HSG B
1,849	30	Woods, Good, HSG A
437,354	55	Woods, Good, HSG B
16,614	70	Woods, Good, HSG C
11,266	77	Woods, Good, HSG D
513,083	57	Weighted Average
502,856		98.01% Pervious Area
10,227		1.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
10.6	1,192	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.1	118	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.4	1,360	Total			

Summary for Subcatchment 2S: Flow to Nathaniel Dr Catch Basin

Runoff = 0.02 cfs @ 12.10 hrs, Volume= 0.001 af, Depth> 1.03"
Routed to Link B : Nathaniel Dr Catch Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-yr Rainfall=4.41"

Area (sf)	CN	Description
708	61	>75% Grass cover, Good, HSG B
708		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.0	3	0.2500	2.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.1	53	Total, Increased to minimum Tc = 6.0 min			

Summary for Pond 1P: Culvert to South Street Drainage

Inflow Area = 11.779 ac, 1.99% Impervious, Inflow Depth > 0.80" for 10-yr event
Inflow = 5.84 cfs @ 12.34 hrs, Volume= 0.786 af
Outflow = 5.84 cfs @ 12.34 hrs, Volume= 0.786 af, Atten= 0%, Lag= 0.0 min
Primary = 5.84 cfs @ 12.34 hrs, Volume= 0.786 af
Routed to Link A : South Street Drainage to Great Brook
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link A : South Street Drainage to Great Brook

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 286.08' @ 12.34 hrs
Flood Elev= 290.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	284.48'	**15.0" Round Culvert** L= 75.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 284.48' / 282.66' S= 0.0243 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Secondary	288.00'	**20.0' long x 1.00' rise Sharp-Crested Rectangular Weir X 2.00** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=5.83 cfs @ 12.34 hrs HW=286.08' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 5.83 cfs @ 4.75 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=284.48' TW=0.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link A: South Street Drainage to Great Brook

Inflow Area = 11.779 ac, 1.99% Impervious, Inflow Depth > 0.80" for 10-yr event
Inflow = 5.84 cfs @ 12.34 hrs, Volume= 0.786 af
Primary = 5.84 cfs @ 12.34 hrs, Volume= 0.786 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Summary for Link B: Nathaniel Dr Catch Basin

Inflow Area = 0.016 ac, 0.00% Impervious, Inflow Depth > 1.03" for 10-yr event
Inflow = 0.02 cfs @ 12.10 hrs, Volume= 0.001 af
Primary = 0.02 cfs @ 12.10 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: On & Off Site Flow Runoff Area=513,083 sf 1.99% Impervious Runoff Depth>1.39"
Flow Length=1,360' Tc=19.4 min CN=57 Runoff=11.60 cfs 1.365 af

Subcatchment2S: Flow to Nathaniel Dr Catch Runoff Area=708 sf 0.00% Impervious Runoff Depth>1.70"
Flow Length=53' Slope=0.2500 '/' Tc=6.0 min CN=61 Runoff=0.03 cfs 0.002 af

Pond 1P: Culvert to South Street Drainage Peak Elev=288.05' Inflow=11.60 cfs 1.365 af
Primary=10.14 cfs 1.347 af Secondary=1.46 cfs 0.018 af Outflow=11.60 cfs 1.365 af

Link A: South Street Drainage to Great Brook Inflow=11.60 cfs 1.365 af
Primary=11.60 cfs 1.365 af

Link B: Nathaniel Dr Catch Basin Inflow=0.03 cfs 0.002 af
Primary=0.03 cfs 0.002 af

Total Runoff Area = 11.795 ac Runoff Volume = 1.367 af Average Runoff Depth = 1.39"
98.01% Pervious = 11.560 ac 1.99% Impervious = 0.235 ac

Summary for Subcatchment 1S: On & Off Site Flow

Runoff = 11.60 cfs @ 12.30 hrs, Volume= 1.365 af, Depth> 1.39"
Routed to Pond 1P : Culvert to South Street Drainage

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-yr Rainfall=5.53"

Area (sf)	CN	Description
7,122	98	Paved parking, HSG A
3,105	98	Paved parking, HSG B
14,601	39	>75% Grass cover, Good, HSG A
21,172	61	>75% Grass cover, Good, HSG B
1,849	30	Woods, Good, HSG A
437,354	55	Woods, Good, HSG B
16,614	70	Woods, Good, HSG C
11,266	77	Woods, Good, HSG D
513,083	57	Weighted Average
502,856		98.01% Pervious Area
10,227		1.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
10.6	1,192	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.1	118	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.4	1,360	Total			

Summary for Subcatchment 2S: Flow to Nathaniel Dr Catch Basin

Runoff = 0.03 cfs @ 12.10 hrs, Volume= 0.002 af, Depth> 1.70"
Routed to Link B : Nathaniel Dr Catch Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-yr Rainfall=5.53"

Area (sf)	CN	Description
708	61	>75% Grass cover, Good, HSG B
708		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.0	3	0.2500	2.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.1	53	Total, Increased to minimum Tc = 6.0 min			

Summary for Pond 1P: Culvert to South Street Drainage

Inflow Area = 11.779 ac, 1.99% Impervious, Inflow Depth > 1.39" for 25-yr event
Inflow = 11.60 cfs @ 12.30 hrs, Volume= 1.365 af
Outflow = 11.60 cfs @ 12.30 hrs, Volume= 1.365 af, Atten= 0%, Lag= 0.0 min
Primary = 10.14 cfs @ 12.30 hrs, Volume= 1.347 af
Routed to Link A : South Street Drainage to Great Brook
Secondary = 1.46 cfs @ 12.30 hrs, Volume= 0.018 af
Routed to Link A : South Street Drainage to Great Brook

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 288.05' @ 12.30 hrs
Flood Elev= 290.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	284.48'	**15.0" Round Culvert** L= 75.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 284.48' / 282.66' S= 0.0243 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Secondary	288.00'	**20.0' long x 1.00' rise Sharp-Crested Rectangular Weir X 2.00** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=10.14 cfs @ 12.30 hrs HW=288.05' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 10.14 cfs @ 8.26 fps)

Secondary OutFlow Max=1.45 cfs @ 12.30 hrs HW=288.05' TW=0.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.45 cfs @ 0.73 fps)

Summary for Link A: South Street Drainage to Great Brook

Inflow Area = 11.779 ac, 1.99% Impervious, Inflow Depth > 1.39" for 25-yr event
Inflow = 11.60 cfs @ 12.30 hrs, Volume= 1.365 af
Primary = 11.60 cfs @ 12.30 hrs, Volume= 1.365 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Summary for Link B: Nathaniel Dr Catch Basin

Inflow Area = 0.016 ac, 0.00% Impervious, Inflow Depth > 1.70" for 25-yr event
Inflow = 0.03 cfs @ 12.10 hrs, Volume= 0.002 af
Primary = 0.03 cfs @ 12.10 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: On & Off Site Flow Runoff Area=513,083 sf 1.99% Impervious Runoff Depth>2.02"
Flow Length=1,360' Tc=19.4 min CN=57 Runoff=17.82 cfs 1.984 af

Subcatchment2S: Flow to Nathaniel Dr Catch Runoff Area=708 sf 0.00% Impervious Runoff Depth>2.39"
Flow Length=53' Slope=0.2500 '/' Tc=6.0 min CN=61 Runoff=0.04 cfs 0.003 af

Pond 1P: Culvert to South Street Drainage Peak Elev=288.15' Inflow=17.82 cfs 1.984 af
Primary=10.31 cfs 1.801 af Secondary=7.52 cfs 0.183 af Outflow=17.82 cfs 1.984 af

Link A: South Street Drainage to Great Brook Inflow=17.82 cfs 1.984 af
Primary=17.82 cfs 1.984 af

Link B: Nathaniel Dr Catch Basin Inflow=0.04 cfs 0.003 af
Primary=0.04 cfs 0.003 af

Total Runoff Area = 11.795 ac Runoff Volume = 1.988 af Average Runoff Depth = 2.02"
98.01% Pervious = 11.560 ac 1.99% Impervious = 0.235 ac

Summary for Subcatchment 1S: On & Off Site Flow

Runoff = 17.82 cfs @ 12.29 hrs, Volume= 1.984 af, Depth> 2.02"
Routed to Pond 1P : Culvert to South Street Drainage

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 50-yr Rainfall=6.57"

Area (sf)	CN	Description
7,122	98	Paved parking, HSG A
3,105	98	Paved parking, HSG B
14,601	39	>75% Grass cover, Good, HSG A
21,172	61	>75% Grass cover, Good, HSG B
1,849	30	Woods, Good, HSG A
437,354	55	Woods, Good, HSG B
16,614	70	Woods, Good, HSG C
11,266	77	Woods, Good, HSG D
513,083	57	Weighted Average
502,856		98.01% Pervious Area
10,227		1.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
10.6	1,192	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.1	118	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.4	1,360	Total			

Summary for Subcatchment 2S: Flow to Nathaniel Dr Catch Basin

Runoff = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Depth> 2.39"
Routed to Link B : Nathaniel Dr Catch Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 50-yr Rainfall=6.57"

Area (sf)	CN	Description
708	61	>75% Grass cover, Good, HSG B
708		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.0	3	0.2500	2.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.1	53	Total, Increased to minimum Tc = 6.0 min			

Summary for Pond 1P: Culvert to South Street Drainage

Inflow Area = 11.779 ac, 1.99% Impervious, Inflow Depth > 2.02" for 50-yr event
Inflow = 17.82 cfs @ 12.29 hrs, Volume= 1.984 af
Outflow = 17.82 cfs @ 12.29 hrs, Volume= 1.984 af, Atten= 0%, Lag= 0.0 min
Primary = 10.31 cfs @ 12.29 hrs, Volume= 1.801 af
Routed to Link A : South Street Drainage to Great Brook
Secondary = 7.52 cfs @ 12.29 hrs, Volume= 0.183 af
Routed to Link A : South Street Drainage to Great Brook

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 288.15' @ 12.29 hrs
Flood Elev= 290.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	284.48'	**15.0" Round Culvert** L= 75.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 284.48' / 282.66' S= 0.0243 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Secondary	288.00'	**20.0' long x 1.00' rise Sharp-Crested Rectangular Weir X 2.00** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=10.31 cfs @ 12.29 hrs HW=288.15' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 10.31 cfs @ 8.40 fps)

Secondary OutFlow Max=7.49 cfs @ 12.29 hrs HW=288.15' TW=0.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 7.49 cfs @ 1.28 fps)

Summary for Link A: South Street Drainage to Great Brook

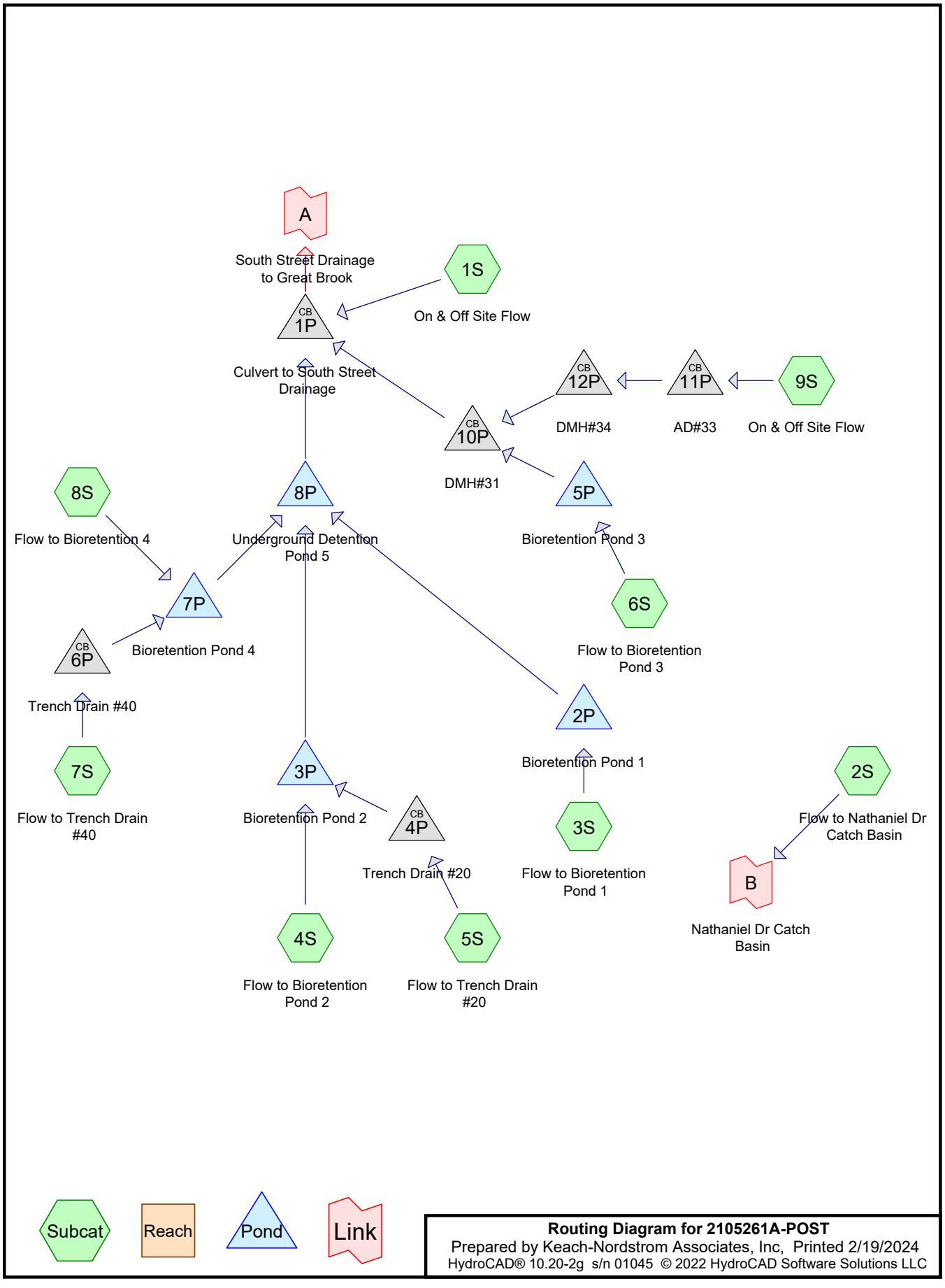
Inflow Area = 11.779 ac, 1.99% Impervious, Inflow Depth > 2.02" for 50-yr event
Inflow = 17.82 cfs @ 12.29 hrs, Volume= 1.984 af
Primary = 17.82 cfs @ 12.29 hrs, Volume= 1.984 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Summary for Link B: Nathaniel Dr Catch Basin

Inflow Area = 0.016 ac, 0.00% Impervious, Inflow Depth > 2.39" for 50-yr event
Inflow = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af
Primary = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs



Routing Diagram for 2105261A-POST

Prepared by Keach-Nordstrom Associates, Inc, Printed 2/19/2024

Project Notes

Rainfall events imported from "2112161-PRE-DEVELOPMENT.hcp"

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	Type III 24-hr		Default	24.00	1	2.96	2
2	10-yr	Type III 24-hr		Default	24.00	1	4.41	2
3	25-yr	Type III 24-hr		Default	24.00	1	5.53	2
4	50-yr	Type III 24-hr		Default	24.00	1	6.57	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.282	39	>75% Grass cover, Good, HSG A (1S, 4S)
1.200	61	>75% Grass cover, Good, HSG B (1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S)
0.036	74	>75% Grass cover, Good, HSG C (7S, 8S)
0.259	98	Paved parking, HSG A (1S, 4S)
1.280	98	Paved parking, HSG B (1S, 3S, 4S, 5S, 6S, 7S)
0.153	98	Roofs, HSG B (3S, 5S, 6S, 7S)
7.977	55	Woods, Good, HSG B (1S, 3S, 9S)
0.345	70	Woods, Good, HSG C (1S)
0.259	77	Woods, Good, HSG D (9S)
11.792	**62**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.541	HSG A	1S, 4S
10.610	HSG B	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S
0.381	HSG C	1S, 7S, 8S
0.259	HSG D	9S
0.000	Other	
11.792		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.282	1.200	0.036	0.000	0.000	1.518	>75% Grass cover, Good	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S
0.259	1.280	0.000	0.000	0.000	1.539	Paved parking	1S, 3S, 4S, 5S, 6S, 7S
0.000	0.153	0.000	0.000	0.000	0.153	Roofs	3S, 5S, 6S, 7S
0.000	7.977	0.345	0.259	0.000	8.581	Woods, Good	1S, 3S, 9S
0.541	**10.610**	**0.381**	**0.259**	**0.000**	**11.792**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: On & Off Site Flow Runoff Area=260,268 sf 4.85% Impervious Runoff Depth>0.26"
Flow Length=1,333' Tc=17.5 min CN=58 Runoff=0.62 cfs 0.129 af

Subcatchment2S: Flow to Nathaniel Dr Catch Runoff Area=570 sf 0.00% Impervious Runoff Depth>0.35"
Flow Length=53' Slope=0.2500 '/' Tc=6.0 min CN=61 Runoff=0.00 cfs 0.000 af

Subcatchment3S: Flow to Bioretention Runoff Area=36,791 sf 17.43% Impervious Runoff Depth>0.49"
Flow Length=380' Tc=8.4 min CN=65 Runoff=0.32 cfs 0.034 af

Subcatchment4S: Flow to Bioretention Runoff Area=17,403 sf 62.38% Impervious Runoff Depth>1.28"
Flow Length=20' Slope=0.0050 '/' Tc=6.0 min CN=81 Runoff=0.59 cfs 0.043 af

Subcatchment5S: Flow to Trench Drain #20 Runoff Area=7,328 sf 96.70% Impervious Runoff Depth>2.62"
Flow Length=81' Tc=6.0 min CN=97 Runoff=0.47 cfs 0.037 af

Subcatchment6S: Flow to Bioretention Runoff Area=24,188 sf 54.89% Impervious Runoff Depth>1.28"
Flow Length=60' Tc=6.0 min CN=81 Runoff=0.82 cfs 0.059 af

Subcatchment7S: Flow to Trench Drain Runoff Area=26,204 sf 89.60% Impervious Runoff Depth>2.31"
Flow Length=169' Tc=6.0 min CN=94 Runoff=1.57 cfs 0.116 af

Subcatchment8S: Flow to Bioretention 4 Runoff Area=3,808 sf 0.00% Impervious Runoff Depth>0.45"
Flow Length=10' Slope=0.2500 '/' Tc=6.0 min CN=64 Runoff=0.03 cfs 0.003 af

Subcatchment9S: On & Off Site Flow Runoff Area=137,078 sf 0.00% Impervious Runoff Depth>0.23"
Flow Length=1,012' Tc=18.7 min CN=57 Runoff=0.26 cfs 0.061 af

Pond 1P: Culvert to South Street Drainage Peak Elev=284.95' Inflow=0.98 cfs 0.367 af
Primary=0.98 cfs 0.367 af Secondary=0.00 cfs 0.000 af Outflow=0.98 cfs 0.367 af

Pond 2P: Bioretention Pond 1 Peak Elev=292.42' Storage=344 cf Inflow=0.32 cfs 0.034 af
Outflow=0.07 cfs 0.034 af

Pond 3P: Bioretention Pond 2 Peak Elev=290.22' Storage=1,353 cf Inflow=1.07 cfs 0.079 af
Outflow=0.11 cfs 0.079 af

Pond 4P: Trench Drain #20 Peak Elev=290.79' Inflow=0.47 cfs 0.037 af
12.0" Round Culvert n=0.013 L=15.0' S=0.0300 '/' Outflow=0.47 cfs 0.037 af

Pond 5P: Bioretention Pond 3 Peak Elev=293.27' Storage=1,187 cf Inflow=0.82 cfs 0.059 af
Outflow=0.07 cfs 0.053 af

Pond 6P: Trench Drain #40 Peak Elev=290.29' Inflow=1.57 cfs 0.116 af
12.0" Round Culvert n=0.013 L=8.0' S=0.0200 '/' Outflow=1.57 cfs 0.116 af

Pond 7P: Bioretention Pond 4 Peak Elev=288.99' Storage=1,942 cf Inflow=1.60 cfs 0.119 af
Outflow=0.16 cfs 0.119 af

Pond 8P: Underground Detention Pond 5 Peak Elev=287.35' Storage=5,174 cf Inflow=0.35 cfs 0.233 af
Outflow=0.26 cfs 0.124 af

Pond 10P: DMH#31 Peak Elev=286.61' Inflow=0.33 cfs 0.114 af
15.0" Round Culvert n=0.013 L=135.0' S=0.0100 '/' Outflow=0.33 cfs 0.114 af

Pond 11P: AD#33 Peak Elev=308.23' Inflow=0.26 cfs 0.061 af
15.0" Round Culvert n=0.013 L=41.0' S=0.0800 '/' Outflow=0.26 cfs 0.061 af

Pond 12P: DMH#34 Peak Elev=303.03' Inflow=0.26 cfs 0.061 af
15.0" Round Culvert n=0.013 L=135.0' S=0.0800 '/' Outflow=0.26 cfs 0.061 af

Link A: South Street Drainage to Great Brook Inflow=0.98 cfs 0.367 af
Primary=0.98 cfs 0.367 af

Link B: Nathaniel Dr Catch Basin Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 11.792 ac Runoff Volume = 0.482 af Average Runoff Depth = 0.49"
85.65% Pervious = 10.099 ac 14.35% Impervious = 1.692 ac

Summary for Subcatchment 1S: On & Off Site Flow

Runoff = 0.62 cfs @ 12.49 hrs, Volume= 0.129 af, Depth> 0.26"
Routed to Pond 1P : Culvert to South Street Drainage

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=2.96"

Area (sf)	CN	Description
8,992	98	Paved parking, HSG A
3,620	98	Paved parking, HSG B
10,053	39	>75% Grass cover, Good, HSG A
11,033	61	>75% Grass cover, Good, HSG B
211,534	55	Woods, Good, HSG B
15,036	70	Woods, Good, HSG C
260,268	58	Weighted Average
247,656		95.15% Pervious Area
12,612		4.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
8.8	986	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	297	0.1200	2.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,333	Total			

Summary for Subcatchment 2S: Flow to Nathaniel Dr Catch Basin

Runoff = 0.00 cfs @ 12.14 hrs, Volume= 0.000 af, Depth> 0.35"
Routed to Link B : Nathaniel Dr Catch Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=2.96"

Area (sf)	CN	Description
570	61	>75% Grass cover, Good, HSG B
570		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.0	3	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	53	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: Flow to Bioretention Pond 1

Runoff = 0.32 cfs @ 12.15 hrs, Volume= 0.034 af, Depth> 0.49"
Routed to Pond 2P : Bioretention Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=2.96"

Area (sf)	CN	Description
1,782	98	Roofs, HSG B
4,630	98	Paved parking, HSG B
13,628	61	>75% Grass cover, Good, HSG B
16,751	55	Woods, Good, HSG B
36,791	65	Weighted Average
30,379		82.57% Pervious Area
6,412		17.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1400	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
2.3	271	0.1587	1.99		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	59	0.3500	4.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.4	380	Total			

Summary for Subcatchment 4S: Flow to Bioretention Pond 2

Runoff = 0.59 cfs @ 12.09 hrs, Volume= 0.043 af, Depth> 1.28"
Routed to Pond 3P : Bioretention Pond 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=2.96"

Area (sf)	CN	Description
2,308	98	Paved parking, HSG A
8,548	98	Paved parking, HSG B
2,217	39	>75% Grass cover, Good, HSG A
4,330	61	>75% Grass cover, Good, HSG B
17,403	81	Weighted Average
6,547		37.62% Pervious Area
10,856		62.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	20	0.0050	0.07		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
4.9	20	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: Flow to Trench Drain #20

Runoff = 0.47 cfs @ 12.08 hrs, Volume= 0.037 af, Depth> 2.62"
Routed to Pond 4P : Trench Drain #20

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=2.96"

Area (sf)	CN	Description
1,583	98	Roofs, HSG B
242	61	>75% Grass cover, Good, HSG B
5,503	98	Paved parking, HSG B
7,328	97	Weighted Average
242		3.30% Pervious Area
7,086		96.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	11	0.0100	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.4	70	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	81	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 6S: Flow to Bioretention Pond 3

Runoff = 0.82 cfs @ 12.09 hrs, Volume= 0.059 af, Depth> 1.28"
Routed to Pond 5P : Bioretention Pond 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=2.96"

Area (sf)	CN	Description
1,754	98	Roofs, HSG B
11,522	98	Paved parking, HSG B
10,912	61	>75% Grass cover, Good, HSG B
24,188	81	Weighted Average
10,912		45.11% Pervious Area
13,276		54.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	20	0.0100	0.09		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.2	40	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.9	60	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 7S: Flow to Trench Drain #40

Runoff = 1.57 cfs @ 12.08 hrs, Volume= 0.116 af, Depth> 2.31"
Routed to Pond 6P : Trench Drain #40

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=2.96"

Area (sf)	CN	Description
21,923	98	Paved parking, HSG B
394	74	>75% Grass cover, Good, HSG C
1,557	98	Roofs, HSG B
2,143	61	>75% Grass cover, Good, HSG B
187	74	>75% Grass cover, Good, HSG C
26,204	94	Weighted Average
2,724		10.40% Pervious Area
23,480		89.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0800	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.5	19	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	100	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.5	169	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: Flow to Bioretention 4

Runoff = 0.03 cfs @ 12.12 hrs, Volume= 0.003 af, Depth> 0.45"
Routed to Pond 7P : Bioretention Pond 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=2.96"

Area (sf)	CN	Description
2,812	61	>75% Grass cover, Good, HSG B
996	74	>75% Grass cover, Good, HSG C
3,808	64	Weighted Average
3,808		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	10	0.2500	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.6	10	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 9S: On & Off Site Flow

Runoff = 0.26 cfs @ 12.52 hrs, Volume= 0.061 af, Depth> 0.23"
Routed to Pond 11P : AD#33

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=2.96"

Area (sf)	CN	Description
6,611	61	>75% Grass cover, Good, HSG B
119,201	55	Woods, Good, HSG B
11,266	77	Woods, Good, HSG D
137,078	57	Weighted Average
137,078		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
7.4	803	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	25	0.2800	3.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	134	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.7	1,012	Total			

Summary for Pond 1P: Culvert to South Street Drainage

Inflow Area = 11.778 ac, 14.37% Impervious, Inflow Depth > 0.37" for 2-yr event
Inflow = 0.98 cfs @ 12.50 hrs, Volume= 0.367 af
Outflow = 0.98 cfs @ 12.50 hrs, Volume= 0.367 af, Atten= 0%, Lag= 0.0 min
Primary = 0.98 cfs @ 12.50 hrs, Volume= 0.367 af
Routed to Link A : South Street Drainage to Great Brook
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link A : South Street Drainage to Great Brook

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 284.95' @ 12.50 hrs
Flood Elev= 290.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	284.48'	**15.0" Round Culvert** L= 75.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 284.48' / 282.66' S= 0.0243 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Secondary	288.50'	**20.0' long x 1.00' rise Sharp-Crested Rectangular Weir X 2.00** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.98 cfs @ 12.50 hrs HW=284.95' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.98 cfs @ 2.33 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=284.48' TW=0.00' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2P: Bioretention Pond 1

Inflow Area = 0.845 ac, 17.43% Impervious, Inflow Depth > 0.49" for 2-yr event
Inflow = 0.32 cfs @ 12.15 hrs, Volume= 0.034 af
Outflow = 0.07 cfs @ 12.89 hrs, Volume= 0.034 af, Atten= 77%, Lag= 44.4 min
Primary = 0.07 cfs @ 12.89 hrs, Volume= 0.034 af
Routed to Pond 8P : Underground Detention Pond 5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 292.42' @ 12.89 hrs Surf.Area= 1,059 sf Storage= 344 cf
Flood Elev= 294.70' Surf.Area= 3,005 sf Storage= 4,497 cf

Plug-Flow detention time= 41.9 min calculated for 0.034 af (100% of inflow)
Center-of-Mass det. time= 41.4 min (945.7 - 904.2)

Volume	Invert	Avail.Storage	Storage Description
#1	292.00'	4,497 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.00	599	166.3	0	0	599
292.50	1,161	259.1	432	432	3,742
293.00	1,569	280.6	680	1,112	4,675
294.00	2,492	326.1	2,013	3,125	6,893
294.50	3,005	317.9	1,372	4,497	7,343

Device	Routing	Invert	Outlet Devices
#1	Device 2	292.00'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	289.00'	**12.0" Round Culvert** L= 107.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 289.00' / 286.86' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	293.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.07 cfs @ 12.89 hrs HW=292.42' TW=286.37' (Dynamic Tailwater)
└**2=Culvert** (Passes 0.07 cfs of 6.11 cfs potential flow)
├**1=Exfiltration** (Exfiltration Controls 0.07 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 3P: Bioretention Pond 2

Inflow Area = 0.568 ac, 72.55% Impervious, Inflow Depth > 1.68" for 2-yr event
Inflow = 1.07 cfs @ 12.09 hrs, Volume= 0.079 af
Outflow = 0.11 cfs @ 12.94 hrs, Volume= 0.079 af, Atten= 89%, Lag= 51.1 min
Primary = 0.11 cfs @ 12.94 hrs, Volume= 0.079 af
Routed to Pond 8P : Underground Detention Pond 5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 290.22' @ 12.94 hrs Surf.Area= 1,615 sf Storage= 1,353 cf
Flood Elev= 291.50' Surf.Area= 2,248 sf Storage= 2,860 cf

Plug-Flow detention time= 119.3 min calculated for 0.079 af (100% of inflow)
Center-of-Mass det. time= 118.9 min (926.8 - 808.0)

Volume	Invert	Avail.Storage	Storage Description
#1	289.00'	2,860 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
289.00	598	0	0
290.00	1,437	1,018	1,018
291.00	2,248	1,843	2,860

Device	Routing	Invert	Outlet Devices
#1	Primary	286.50'	**12.0" Round Culvert** L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 286.50' / 286.04' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	289.00'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#3	Device 1	290.65'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.11 cfs @ 12.94 hrs HW=290.22' TW=286.39' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.11 cfs of 6.55 cfs potential flow)
  ├─**2=Exfiltration** (Exfiltration Controls 0.11 cfs)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 4P: Trench Drain #20

Inflow Area = 0.168 ac, 96.70% Impervious, Inflow Depth > 2.62" for 2-yr event
Inflow = 0.47 cfs @ 12.08 hrs, Volume= 0.037 af
Outflow = 0.47 cfs @ 12.08 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
Primary = 0.47 cfs @ 12.08 hrs, Volume= 0.037 af
Routed to Pond 3P : Bioretention Pond 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 290.79' @ 12.08 hrs
Flood Elev= 294.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	290.45'	**12.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 290.45' / 290.00' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.47 cfs @ 12.08 hrs HW=290.79' TW=289.71' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.47 cfs @ 1.99 fps)

Summary for Pond 5P: Bioretention Pond 3

Inflow Area = 0.555 ac, 54.89% Impervious, Inflow Depth > 1.28" for 2-yr event
Inflow = 0.82 cfs @ 12.09 hrs, Volume= 0.059 af
Outflow = 0.07 cfs @ 13.70 hrs, Volume= 0.053 af, Atten= 92%, Lag= 96.2 min
Primary = 0.07 cfs @ 13.70 hrs, Volume= 0.053 af
Routed to Pond 10P : DMH#31

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 293.27' @ 13.70 hrs Surf.Area= 964 sf Storage= 1,187 cf
Flood Elev= 294.25' Surf.Area= 1,320 sf Storage= 2,022 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 174.7 min (1,017.5 - 842.7)

Volume	Invert	Avail.Storage	Storage Description
#1	291.00'	2,022 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
291.00	185	54.6	0	0	185
291.50	302	84.9	121	121	523
292.00	450	108.1	187	307	883
293.00	849	153.3	639	946	1,832
294.00	1,320	148.3	1,076	2,022	2,025

Device	Routing	Invert	Outlet Devices
#1	Primary	288.50'	**15.0" Round Culvert** L= 90.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 288.50' / 287.15' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	291.00'	**3.000 in/hr Exfiltration over Surface area**
#3	Device 1	293.35'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.07 cfs @ 13.70 hrs HW=293.27' TW=286.54' (Dynamic Tailwater)
├─**1=Culvert** (Passes 0.00 cfs of 11.45 cfs potential flow)
│ └─**3=Orifice/Grate** (Controls 0.00 cfs)
└─**2=Exfiltration** (Exfiltration Controls 0.07 cfs)

Summary for Pond 6P: Trench Drain #40

Inflow Area = 0.602 ac, 89.60% Impervious, Inflow Depth > 2.31" for 2-yr event
Inflow = 1.57 cfs @ 12.08 hrs, Volume= 0.116 af
Outflow = 1.57 cfs @ 12.08 hrs, Volume= 0.116 af, Atten= 0%, Lag= 0.0 min
Primary = 1.57 cfs @ 12.08 hrs, Volume= 0.116 af
Routed to Pond 7P : Bioretention Pond 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 290.29' @ 12.09 hrs
Flood Elev= 291.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	289.56'	**12.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 289.56' / 289.40' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.56 cfs @ 12.08 hrs HW=290.29' TW=288.52' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 1.56 cfs @ 3.56 fps)

Summary for Pond 7P: Bioretention Pond 4

Inflow Area = 0.689 ac, 78.24% Impervious, Inflow Depth > 2.07" for 2-yr event
Inflow = 1.60 cfs @ 12.09 hrs, Volume= 0.119 af
Outflow = 0.16 cfs @ 12.88 hrs, Volume= 0.119 af, Atten= 90%, Lag= 47.7 min
Primary = 0.16 cfs @ 12.88 hrs, Volume= 0.119 af
Routed to Pond 8P : Underground Detention Pond 5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 288.99' @ 12.88 hrs Surf.Area= 2,354 sf Storage= 1,942 cf
Flood Elev= 290.25' Surf.Area= 3,198 sf Storage= 4,756 cf

Plug-Flow detention time= 100.0 min calculated for 0.119 af (100% of inflow)
Center-of-Mass det. time= 99.7 min (892.1 - 792.4)

Volume	Invert	Avail.Storage	Storage Description
#1	288.00'	4,756 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
288.00	1,583	0	0
289.00	2,365	1,974	1,974
290.00	3,198	2,782	4,756

Device	Routing	Invert	Outlet Devices
#1	Primary	285.50'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 285.50' / 285.35' S= 0.0075 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	288.00'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

#3 Device 1 289.35' **24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600
Limited to weir flow at low heads

Primary OutFlow Max=0.16 cfs @ 12.88 hrs HW=288.99' TW=286.37' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.16 cfs of 6.12 cfs potential flow)
├─**2=Exfiltration** (Exfiltration Controls 0.16 cfs)
└─**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 8P: Underground Detention Pond 5

Inflow Area = 2.101 ac, 52.26% Impervious, Inflow Depth > 1.33" for 2-yr event
Inflow = 0.35 cfs @ 12.90 hrs, Volume= 0.233 af
Outflow = 0.26 cfs @ 17.19 hrs, Volume= 0.124 af, Atten= 26%, Lag= 257.3 min
Primary = 0.26 cfs @ 17.19 hrs, Volume= 0.124 af
Routed to Pond 1P : Culvert to South Street Drainage

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 287.35' @ 17.19 hrs Surf.Area= 3,661 sf Storage= 5,174 cf
Flood Elev= 290.40' Storage= 11,458 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 124.5 min (1,036.3 - 911.8)

Volume	Invert	Avail.Storage	Storage Description
#1	285.25'	11,458 cf	**ADS N-12 48" @ 220.00' L** x 4 Inside= 47.7"W x 47.7"H => 12.40 sf x 220.00'L = 2,728.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 220.00'L = 3,266.8 cf 4 Chambers in 4 Rows 22.00' Header x 12.40 sf x 2 = 545.6 cf Inside

Device	Routing	Invert	Outlet Devices
#1	Primary	285.25'	**12.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 285.25' / 284.75' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	285.25'	**2.5" W x 0.5" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	287.25'	**24.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	289.00'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.26 cfs @ 17.19 hrs HW=287.35' TW=284.80' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.26 cfs of 4.33 cfs potential flow)
├─**2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 6.94 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.20 cfs @ 1.01 fps)
└─**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 10P: DMH#31

Inflow Area = 3.702 ac, 8.23% Impervious, Inflow Depth > 0.37" for 2-yr event
Inflow = 0.33 cfs @ 12.53 hrs, Volume= 0.114 af
Outflow = 0.33 cfs @ 12.53 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min
Primary = 0.33 cfs @ 12.53 hrs, Volume= 0.114 af
Routed to Pond 1P : Culvert to South Street Drainage

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 286.61' @ 12.53 hrs
Flood Elev= 298.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	286.35'	**15.0" Round Culvert** L= 135.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 286.35' / 285.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.33 cfs @ 12.53 hrs HW=286.61' TW=284.95' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.33 cfs @ 1.74 fps)

Summary for Pond 11P: AD#33

Inflow Area = 3.147 ac, 0.00% Impervious, Inflow Depth > 0.23" for 2-yr event
Inflow = 0.26 cfs @ 12.52 hrs, Volume= 0.061 af
Outflow = 0.26 cfs @ 12.52 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min
Primary = 0.26 cfs @ 12.52 hrs, Volume= 0.061 af
Routed to Pond 12P : DMH#34

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 308.23' @ 12.52 hrs
Flood Elev= 313.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	308.00'	**15.0" Round Culvert** L= 41.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 308.00' / 304.72' S= 0.0800 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.26 cfs @ 12.52 hrs HW=308.23' TW=303.03' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.26 cfs @ 1.65 fps)

Summary for Pond 12P: DMH#34

Inflow Area = 3.147 ac, 0.00% Impervious, Inflow Depth > 0.23" for 2-yr event
Inflow = 0.26 cfs @ 12.52 hrs, Volume= 0.061 af
Outflow = 0.26 cfs @ 12.52 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min
Primary = 0.26 cfs @ 12.52 hrs, Volume= 0.061 af
Routed to Pond 10P : DMH#31

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Peak Elev= 303.03' @ 12.52 hrs
Flood Elev= 318.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	302.80'	**15.0" Round Culvert** L= 135.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 302.80' / 292.00' S= 0.0800 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.26 cfs @ 12.52 hrs HW=303.03' TW=286.61' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.26 cfs @ 1.65 fps)

Summary for Link A: South Street Drainage to Great Brook

Inflow Area = 11.778 ac, 14.37% Impervious, Inflow Depth > 0.37" for 2-yr event
Inflow = 0.98 cfs @ 12.50 hrs, Volume= 0.367 af
Primary = 0.98 cfs @ 12.50 hrs, Volume= 0.367 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Summary for Link B: Nathaniel Dr Catch Basin

Inflow Area = 0.013 ac, 0.00% Impervious, Inflow Depth > 0.35" for 2-yr event
Inflow = 0.00 cfs @ 12.14 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 12.14 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: On & Off Site Flow Runoff Area=260,268 sf 4.85% Impervious Runoff Depth>0.85"
Flow Length=1,333' Tc=17.5 min CN=58 Runoff=3.39 cfs 0.426 af

Subcatchment2S: Flow to Nathaniel Dr Catch Runoff Area=570 sf 0.00% Impervious Runoff Depth>1.03"
Flow Length=53' Slope=0.2500 '/' Tc=6.0 min CN=61 Runoff=0.01 cfs 0.001 af

Subcatchment3S: Flow to Bioretention Runoff Area=36,791 sf 17.43% Impervious Runoff Depth>1.27"
Flow Length=380' Tc=8.4 min CN=65 Runoff=1.07 cfs 0.089 af

Subcatchment4S: Flow to Bioretention Runoff Area=17,403 sf 62.38% Impervious Runoff Depth>2.47"
Flow Length=20' Slope=0.0050 '/' Tc=6.0 min CN=81 Runoff=1.16 cfs 0.082 af

Subcatchment5S: Flow to Trench Drain #20 Runoff Area=7,328 sf 96.70% Impervious Runoff Depth>4.06"
Flow Length=81' Tc=6.0 min CN=97 Runoff=0.72 cfs 0.057 af

Subcatchment6S: Flow to Bioretention Runoff Area=24,188 sf 54.89% Impervious Runoff Depth>2.47"
Flow Length=60' Tc=6.0 min CN=81 Runoff=1.61 cfs 0.114 af

Subcatchment7S: Flow to Trench Drain Runoff Area=26,204 sf 89.60% Impervious Runoff Depth>3.72"
Flow Length=169' Tc=6.0 min CN=94 Runoff=2.46 cfs 0.187 af

Subcatchment8S: Flow to Bioretention 4 Runoff Area=3,808 sf 0.00% Impervious Runoff Depth>1.21"
Flow Length=10' Slope=0.2500 '/' Tc=6.0 min CN=64 Runoff=0.11 cfs 0.009 af

Subcatchment9S: On & Off Site Flow Runoff Area=137,078 sf 0.00% Impervious Runoff Depth>0.80"
Flow Length=1,012' Tc=18.7 min CN=57 Runoff=1.58 cfs 0.210 af

Pond 1P: Culvert to South Street Drainage Peak Elev=286.05' Inflow=5.74 cfs 1.045 af
Primary=5.74 cfs 1.045 af Secondary=0.00 cfs 0.000 af Outflow=5.74 cfs 1.045 af

Pond 2P: Bioretention Pond 1 Peak Elev=293.22' Storage=1,484 cf Inflow=1.07 cfs 0.089 af
Outflow=0.12 cfs 0.089 af

Pond 3P: Bioretention Pond 2 Peak Elev=290.72' Storage=2,262 cf Inflow=1.87 cfs 0.139 af
Outflow=0.63 cfs 0.136 af

Pond 4P: Trench Drain #20 Peak Elev=290.88' Inflow=0.72 cfs 0.057 af
12.0" Round Culvert n=0.013 L=15.0' S=0.0300 '/' Outflow=0.72 cfs 0.057 af

Pond 5P: Bioretention Pond 3 Peak Elev=293.48' Storage=1,400 cf Inflow=1.61 cfs 0.114 af
Outflow=1.24 cfs 0.102 af

Pond 6P: Trench Drain #40 Peak Elev=290.55' Inflow=2.46 cfs 0.187 af
12.0" Round Culvert n=0.013 L=8.0' S=0.0200 '/' Outflow=2.46 cfs 0.187 af

Pond 7P: Bioretention Pond 4 Peak Elev=289.43' Storage=3,067 cf Inflow=2.57 cfs 0.195 af
Outflow=0.78 cfs 0.195 af

Pond 8P: Underground Detention Pond 5 Peak Elev=287.40' Storage=5,361 cf Inflow=1.51 cfs 0.421 af
Outflow=0.43 cfs 0.307 af

Pond 10P: DMH#31 Peak Elev=287.16' Inflow=2.34 cfs 0.312 af
15.0" Round Culvert n=0.013 L=135.0' S=0.0100 '/' Outflow=2.34 cfs 0.312 af

Pond 11P: AD#33 Peak Elev=308.61' Inflow=1.58 cfs 0.210 af
15.0" Round Culvert n=0.013 L=41.0' S=0.0800 '/' Outflow=1.58 cfs 0.210 af

Pond 12P: DMH#34 Peak Elev=303.41' Inflow=1.58 cfs 0.210 af
15.0" Round Culvert n=0.013 L=135.0' S=0.0800 '/' Outflow=1.58 cfs 0.210 af

Link A: South Street Drainage to Great Brook Inflow=5.74 cfs 1.045 af
Primary=5.74 cfs 1.045 af

Link B: Nathaniel Dr Catch Basin Inflow=0.01 cfs 0.001 af
Primary=0.01 cfs 0.001 af

Total Runoff Area = 11.792 ac Runoff Volume = 1.175 af Average Runoff Depth = 1.20"
85.65% Pervious = 10.099 ac 14.35% Impervious = 1.692 ac

Summary for Subcatchment 1S: On & Off Site Flow

Runoff = 3.39 cfs @ 12.29 hrs, Volume= 0.426 af, Depth> 0.85"
Routed to Pond 1P : Culvert to South Street Drainage

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-yr Rainfall=4.41"

Area (sf)	CN	Description
8,992	98	Paved parking, HSG A
3,620	98	Paved parking, HSG B
10,053	39	>75% Grass cover, Good, HSG A
11,033	61	>75% Grass cover, Good, HSG B
211,534	55	Woods, Good, HSG B
15,036	70	Woods, Good, HSG C
260,268	58	Weighted Average
247,656		95.15% Pervious Area
12,612		4.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
8.8	986	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	297	0.1200	2.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,333	Total			

Summary for Subcatchment 2S: Flow to Nathaniel Dr Catch Basin

Runoff = 0.01 cfs @ 12.10 hrs, Volume= 0.001 af, Depth> 1.03"
Routed to Link B : Nathaniel Dr Catch Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-yr Rainfall=4.41"

Area (sf)	CN	Description
570	61	>75% Grass cover, Good, HSG B
570		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.0	3	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	53	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: Flow to Bioretention Pond 1

Runoff = 1.07 cfs @ 12.13 hrs, Volume= 0.089 af, Depth> 1.27"
Routed to Pond 2P : Bioretention Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-yr Rainfall=4.41"

Area (sf)	CN	Description
1,782	98	Roofs, HSG B
4,630	98	Paved parking, HSG B
13,628	61	>75% Grass cover, Good, HSG B
16,751	55	Woods, Good, HSG B
36,791	65	Weighted Average
30,379		82.57% Pervious Area
6,412		17.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1400	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
2.3	271	0.1587	1.99		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	59	0.3500	4.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.4	380	Total			

Summary for Subcatchment 4S: Flow to Bioretention Pond 2

Runoff = 1.16 cfs @ 12.09 hrs, Volume= 0.082 af, Depth> 2.47"
Routed to Pond 3P : Bioretention Pond 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-yr Rainfall=4.41"

Area (sf)	CN	Description
2,308	98	Paved parking, HSG A
8,548	98	Paved parking, HSG B
2,217	39	>75% Grass cover, Good, HSG A
4,330	61	>75% Grass cover, Good, HSG B
17,403	81	Weighted Average
6,547		37.62% Pervious Area
10,856		62.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	20	0.0050	0.07		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
4.9	20	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: Flow to Trench Drain #20

Runoff = 0.72 cfs @ 12.08 hrs, Volume= 0.057 af, Depth> 4.06"
Routed to Pond 4P : Trench Drain #20

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-yr Rainfall=4.41"

Area (sf)	CN	Description
1,583	98	Roofs, HSG B
242	61	>75% Grass cover, Good, HSG B
5,503	98	Paved parking, HSG B
7,328	97	Weighted Average
242		3.30% Pervious Area
7,086		96.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	11	0.0100	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.4	70	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	81	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 6S: Flow to Bioretention Pond 3

Runoff = 1.61 cfs @ 12.09 hrs, Volume= 0.114 af, Depth> 2.47"
Routed to Pond 5P : Bioretention Pond 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-yr Rainfall=4.41"

Area (sf)	CN	Description
1,754	98	Roofs, HSG B
11,522	98	Paved parking, HSG B
10,912	61	>75% Grass cover, Good, HSG B
24,188	81	Weighted Average
10,912		45.11% Pervious Area
13,276		54.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	20	0.0100	0.09		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.2	40	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.9	60	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 7S: Flow to Trench Drain #40

Runoff = 2.46 cfs @ 12.08 hrs, Volume= 0.187 af, Depth> 3.72"
Routed to Pond 6P : Trench Drain #40

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-yr Rainfall=4.41"

Area (sf)	CN	Description
21,923	98	Paved parking, HSG B
394	74	>75% Grass cover, Good, HSG C
1,557	98	Roofs, HSG B
2,143	61	>75% Grass cover, Good, HSG B
187	74	>75% Grass cover, Good, HSG C
26,204	94	Weighted Average
2,724		10.40% Pervious Area
23,480		89.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0800	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.5	19	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	100	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.5	169	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: Flow to Bioretention 4

Runoff = 0.11 cfs @ 12.10 hrs, Volume= 0.009 af, Depth> 1.21"
Routed to Pond 7P : Bioretention Pond 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-yr Rainfall=4.41"

Area (sf)	CN	Description
2,812	61	>75% Grass cover, Good, HSG B
996	74	>75% Grass cover, Good, HSG C
3,808	64	Weighted Average
3,808		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	10	0.2500	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.6	10	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 9S: On & Off Site Flow

Runoff = 1.58 cfs @ 12.32 hrs, Volume= 0.210 af, Depth> 0.80"
Routed to Pond 11P : AD#33

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-yr Rainfall=4.41"

Area (sf)	CN	Description
6,611	61	>75% Grass cover, Good, HSG B
119,201	55	Woods, Good, HSG B
11,266	77	Woods, Good, HSG D
137,078	57	Weighted Average
137,078		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
7.4	803	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	25	0.2800	3.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	134	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.7	1,012	Total			

Summary for Pond 1P: Culvert to South Street Drainage

Inflow Area = 11.778 ac, 14.37% Impervious, Inflow Depth > 1.06" for 10-yr event
Inflow = 5.74 cfs @ 12.29 hrs, Volume= 1.045 af
Outflow = 5.74 cfs @ 12.29 hrs, Volume= 1.045 af, Atten= 0%, Lag= 0.0 min
Primary = 5.74 cfs @ 12.29 hrs, Volume= 1.045 af
Routed to Link A : South Street Drainage to Great Brook
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link A : South Street Drainage to Great Brook

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 286.05' @ 12.29 hrs
Flood Elev= 290.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	284.48'	**15.0" Round Culvert** L= 75.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 284.48' / 282.66' S= 0.0243 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Secondary	288.50'	**20.0' long x 1.00' rise Sharp-Crested Rectangular Weir X 2.00** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=5.74 cfs @ 12.29 hrs HW=286.05' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 5.74 cfs @ 4.67 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=284.48' TW=0.00' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2P: Bioretention Pond 1

Inflow Area = 0.845 ac, 17.43% Impervious, Inflow Depth > 1.27" for 10-yr event
Inflow = 1.07 cfs @ 12.13 hrs, Volume= 0.089 af
Outflow = 0.12 cfs @ 13.55 hrs, Volume= 0.089 af, Atten= 89%, Lag= 85.0 min
Primary = 0.12 cfs @ 13.55 hrs, Volume= 0.089 af
Routed to Pond 8P : Underground Detention Pond 5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 293.22' @ 13.55 hrs Surf.Area= 1,757 sf Storage= 1,484 cf
Flood Elev= 294.70' Surf.Area= 3,005 sf Storage= 4,497 cf

Plug-Flow detention time= 139.8 min calculated for 0.089 af (100% of inflow)
Center-of-Mass det. time= 139.3 min (1,009.3 - 870.0)

Volume	Invert	Avail.Storage	Storage Description
#1	292.00'	4,497 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.00	599	166.3	0	0	599
292.50	1,161	259.1	432	432	3,742
293.00	1,569	280.6	680	1,112	4,675
294.00	2,492	326.1	2,013	3,125	6,893
294.50	3,005	317.9	1,372	4,497	7,343

Device	Routing	Invert	Outlet Devices
#1	Device 2	292.00'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	289.00'	**12.0" Round Culvert** L= 107.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 289.00' / 286.86' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	293.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.12 cfs @ 13.55 hrs HW=293.22' TW=287.34' (Dynamic Tailwater)
└**2=Culvert** (Passes 0.12 cfs of 6.62 cfs potential flow)
  ├**1=Exfiltration** (Exfiltration Controls 0.12 cfs)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 3P: Bioretention Pond 2

Inflow Area = 0.568 ac, 72.55% Impervious, Inflow Depth > 2.94" for 10-yr event
Inflow = 1.87 cfs @ 12.09 hrs, Volume= 0.139 af
Outflow = 0.63 cfs @ 12.39 hrs, Volume= 0.136 af, Atten= 67%, Lag= 18.1 min
Primary = 0.63 cfs @ 12.39 hrs, Volume= 0.136 af
Routed to Pond 8P : Underground Detention Pond 5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 290.72' @ 12.39 hrs Surf.Area= 2,021 sf Storage= 2,262 cf
Flood Elev= 291.50' Surf.Area= 2,248 sf Storage= 2,860 cf

Plug-Flow detention time= 153.5 min calculated for 0.136 af (98% of inflow)
Center-of-Mass det. time= 141.3 min (938.1 - 796.9)

Volume	Invert	Avail.Storage	Storage Description
#1	289.00'	2,860 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
289.00	598	0	0
290.00	1,437	1,018	1,018
291.00	2,248	1,843	2,860

Device	Routing	Invert	Outlet Devices
#1	Primary	286.50'	**12.0" Round Culvert** L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 286.50' / 286.04' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	289.00'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#3	Device 1	290.65'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.62 cfs @ 12.39 hrs HW=290.72' TW=286.58' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.62 cfs of 7.05 cfs potential flow)
  ├─**2=Exfiltration** (Exfiltration Controls 0.14 cfs)
  └─**3=Orifice/Grate** (Weir Controls 0.48 cfs @ 0.86 fps)

Summary for Pond 4P: Trench Drain #20

Inflow Area = 0.168 ac, 96.70% Impervious, Inflow Depth > 4.06" for 10-yr event
Inflow = 0.72 cfs @ 12.08 hrs, Volume= 0.057 af
Outflow = 0.72 cfs @ 12.08 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min
Primary = 0.72 cfs @ 12.08 hrs, Volume= 0.057 af
Routed to Pond 3P : Bioretention Pond 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 290.88' @ 12.08 hrs
Flood Elev= 294.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	290.45'	**12.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 290.45' / 290.00' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.71 cfs @ 12.08 hrs HW=290.88' TW=290.23' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.71 cfs @ 2.23 fps)

Summary for Pond 5P: Bioretention Pond 3

Inflow Area = 0.555 ac, 54.89% Impervious, Inflow Depth > 2.47" for 10-yr event
Inflow = 1.61 cfs @ 12.09 hrs, Volume= 0.114 af
Outflow = 1.24 cfs @ 12.16 hrs, Volume= 0.102 af, Atten= 23%, Lag= 4.2 min
Primary = 1.24 cfs @ 12.16 hrs, Volume= 0.102 af
Routed to Pond 10P : DMH#31

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 293.48' @ 12.16 hrs Surf.Area= 1,060 sf Storage= 1,400 cf
Flood Elev= 294.25' Surf.Area= 1,320 sf Storage= 2,022 cf

Plug-Flow detention time= 148.1 min calculated for 0.102 af (90% of inflow)
Center-of-Mass det. time= 99.0 min (922.8 - 823.8)

Volume	Invert	Avail.Storage	Storage Description
#1	291.00'	2,022 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
291.00	185	54.6	0	0	185
291.50	302	84.9	121	121	523
292.00	450	108.1	187	307	883
293.00	849	153.3	639	946	1,832
294.00	1,320	148.3	1,076	2,022	2,025

Device	Routing	Invert	Outlet Devices
#1	Primary	288.50'	**15.0" Round Culvert** L= 90.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 288.50' / 287.15' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	291.00'	**3.000 in/hr Exfiltration over Surface area**
#3	Device 1	293.35'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.24 cfs @ 12.16 hrs HW=293.48' TW=287.08' (Dynamic Tailwater)
├─**1=Culvert** (Passes 1.17 cfs of 11.70 cfs potential flow)
│ └─**3=Orifice/Grate** (Weir Controls 1.17 cfs @ 1.16 fps)
└─**2=Exfiltration** (Exfiltration Controls 0.07 cfs)

Summary for Pond 6P: Trench Drain #40

Inflow Area = 0.602 ac, 89.60% Impervious, Inflow Depth > 3.72" for 10-yr event
Inflow = 2.46 cfs @ 12.08 hrs, Volume= 0.187 af
Outflow = 2.46 cfs @ 12.08 hrs, Volume= 0.187 af, Atten= 0%, Lag= 0.0 min
Primary = 2.46 cfs @ 12.08 hrs, Volume= 0.187 af
Routed to Pond 7P : Bioretention Pond 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 290.55' @ 12.08 hrs
Flood Elev= 291.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	289.56'	**12.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 289.56' / 289.40' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.45 cfs @ 12.08 hrs HW=290.55' TW=288.94' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 2.45 cfs @ 3.93 fps)

Summary for Pond 7P: Bioretention Pond 4

Inflow Area = 0.689 ac, 78.24% Impervious, Inflow Depth > 3.40" for 10-yr event
Inflow = 2.57 cfs @ 12.08 hrs, Volume= 0.195 af
Outflow = 0.78 cfs @ 12.41 hrs, Volume= 0.195 af, Atten= 70%, Lag= 19.4 min
Primary = 0.78 cfs @ 12.41 hrs, Volume= 0.195 af
Routed to Pond 8P : Underground Detention Pond 5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 289.43' @ 12.41 hrs Surf.Area= 2,723 sf Storage= 3,067 cf
Flood Elev= 290.25' Surf.Area= 3,198 sf Storage= 4,756 cf

Plug-Flow detention time= 131.0 min calculated for 0.195 af (100% of inflow)
Center-of-Mass det. time= 130.7 min (911.5 - 780.8)

Volume	Invert	Avail.Storage	Storage Description
#1	288.00'	4,756 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
288.00	1,583	0	0
289.00	2,365	1,974	1,974
290.00	3,198	2,782	4,756

Device	Routing	Invert	Outlet Devices
#1	Primary	285.50'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 285.50' / 285.35' S= 0.0075 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	288.00'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

#3 Device 1 289.35' **24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600
Limited to weir flow at low heads

Primary OutFlow Max=0.77 cfs @ 12.41 hrs HW=289.43' TW=286.61' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.77 cfs of 6.35 cfs potential flow)
├─**2=Exfiltration** (Exfiltration Controls 0.19 cfs)
└─**3=Orifice/Grate** (Weir Controls 0.58 cfs @ 0.92 fps)

Summary for Pond 8P: Underground Detention Pond 5

Inflow Area = 2.101 ac, 52.26% Impervious, Inflow Depth > 2.40" for 10-yr event
Inflow = 1.51 cfs @ 12.40 hrs, Volume= 0.421 af
Outflow = 0.43 cfs @ 14.73 hrs, Volume= 0.307 af, Atten= 71%, Lag= 139.6 min
Primary = 0.43 cfs @ 14.73 hrs, Volume= 0.307 af
Routed to Pond 1P : Culvert to South Street Drainage

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 287.40' @ 14.73 hrs Surf.Area= 3,667 sf Storage= 5,361 cf
Flood Elev= 290.40' Storage= 11,458 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 98.4 min (1,039.3 - 940.9)

Volume	Invert	Avail.Storage	Storage Description
#1	285.25'	11,458 cf	**ADS N-12 48" @ 220.00' L** x 4 Inside= 47.7"W x 47.7"H => 12.40 sf x 220.00'L = 2,728.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 220.00'L = 3,266.8 cf 4 Chambers in 4 Rows 22.00' Header x 12.40 sf x 2 = 545.6 cf Inside

Device	Routing	Invert	Outlet Devices
#1	Primary	285.25'	**12.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 285.25' / 284.75' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	285.25'	**2.5" W x 0.5" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	287.25'	**24.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	289.00'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.43 cfs @ 14.73 hrs HW=287.40' TW=285.01' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.43 cfs of 4.40 cfs potential flow)
├─**2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 7.03 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.37 cfs @ 1.24 fps)
└─**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 10P: DMH#31

Inflow Area = 3.702 ac, 8.23% Impervious, Inflow Depth > 1.01" for 10-yr event
Inflow = 2.34 cfs @ 12.27 hrs, Volume= 0.312 af
Outflow = 2.34 cfs @ 12.27 hrs, Volume= 0.312 af, Atten= 0%, Lag= 0.0 min
Primary = 2.34 cfs @ 12.27 hrs, Volume= 0.312 af
Routed to Pond 1P : Culvert to South Street Drainage

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 287.16' @ 12.29 hrs
Flood Elev= 298.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	286.35'	**15.0" Round Culvert** L= 135.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 286.35' / 285.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.31 cfs @ 12.27 hrs HW=287.16' TW=286.04' (Dynamic Tailwater)
1=Culvert (Outlet Controls 2.31 cfs @ 3.91 fps)

Summary for Pond 11P: AD#33

Inflow Area = 3.147 ac, 0.00% Impervious, Inflow Depth > 0.80" for 10-yr event
Inflow = 1.58 cfs @ 12.32 hrs, Volume= 0.210 af
Outflow = 1.58 cfs @ 12.32 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.0 min
Primary = 1.58 cfs @ 12.32 hrs, Volume= 0.210 af
Routed to Pond 12P : DMH#34

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 308.61' @ 12.32 hrs
Flood Elev= 313.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	308.00'	**15.0" Round Culvert** L= 41.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 308.00' / 304.72' S= 0.0800 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.58 cfs @ 12.32 hrs HW=308.61' TW=303.41' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.58 cfs @ 2.66 fps)

Summary for Pond 12P: DMH#34

Inflow Area = 3.147 ac, 0.00% Impervious, Inflow Depth > 0.80" for 10-yr event
Inflow = 1.58 cfs @ 12.32 hrs, Volume= 0.210 af
Outflow = 1.58 cfs @ 12.32 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.0 min
Primary = 1.58 cfs @ 12.32 hrs, Volume= 0.210 af
Routed to Pond 10P : DMH#31

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Peak Elev= 303.41' @ 12.32 hrs
Flood Elev= 318.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	302.80'	**15.0" Round Culvert** L= 135.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 302.80' / 292.00' S= 0.0800 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.58 cfs @ 12.32 hrs HW=303.41' TW=287.16' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 1.58 cfs @ 2.66 fps)

Summary for Link A: South Street Drainage to Great Brook

Inflow Area = 11.778 ac, 14.37% Impervious, Inflow Depth > 1.06" for 10-yr event
Inflow = 5.74 cfs @ 12.29 hrs, Volume= 1.045 af
Primary = 5.74 cfs @ 12.29 hrs, Volume= 1.045 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Summary for Link B: Nathaniel Dr Catch Basin

Inflow Area = 0.013 ac, 0.00% Impervious, Inflow Depth > 1.03" for 10-yr event
Inflow = 0.01 cfs @ 12.10 hrs, Volume= 0.001 af
Primary = 0.01 cfs @ 12.10 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: On & Off Site Flow Runoff Area=260,268 sf 4.85% Impervious Runoff Depth>1.46"
Flow Length=1,333' Tc=17.5 min CN=58 Runoff=6.55 cfs 0.729 af

Subcatchment2S: Flow to Nathaniel Dr Catch Runoff Area=570 sf 0.00% Impervious Runoff Depth>1.70"
Flow Length=53' Slope=0.2500 '/' Tc=6.0 min CN=61 Runoff=0.02 cfs 0.002 af

Subcatchment3S: Flow to Bioretention Runoff Area=36,791 sf 17.43% Impervious Runoff Depth>2.01"
Flow Length=380' Tc=8.4 min CN=65 Runoff=1.77 cfs 0.142 af

Subcatchment4S: Flow to Bioretention Runoff Area=17,403 sf 62.38% Impervious Runoff Depth>3.45"
Flow Length=20' Slope=0.0050 '/' Tc=6.0 min CN=81 Runoff=1.61 cfs 0.115 af

Subcatchment5S: Flow to Trench Drain #20 Runoff Area=7,328 sf 96.70% Impervious Runoff Depth>5.17"
Flow Length=81' Tc=6.0 min CN=97 Runoff=0.90 cfs 0.072 af

Subcatchment6S: Flow to Bioretention Runoff Area=24,188 sf 54.89% Impervious Runoff Depth>3.45"
Flow Length=60' Tc=6.0 min CN=81 Runoff=2.24 cfs 0.160 af

Subcatchment7S: Flow to Trench Drain Runoff Area=26,204 sf 89.60% Impervious Runoff Depth>4.83"
Flow Length=169' Tc=6.0 min CN=94 Runoff=3.14 cfs 0.242 af

Subcatchment8S: Flow to Bioretention 4 Runoff Area=3,808 sf 0.00% Impervious Runoff Depth>1.93"
Flow Length=10' Slope=0.2500 '/' Tc=6.0 min CN=64 Runoff=0.19 cfs 0.014 af

Subcatchment9S: On & Off Site Flow Runoff Area=137,078 sf 0.00% Impervious Runoff Depth>1.39"
Flow Length=1,012' Tc=18.7 min CN=57 Runoff=3.14 cfs 0.365 af

Pond 1P: Culvert to South Street Drainage Peak Elev=288.43' Inflow=10.78 cfs 1.694 af
Primary=10.78 cfs 1.694 af Secondary=0.00 cfs 0.000 af Outflow=10.78 cfs 1.694 af

Pond 2P: Bioretention Pond 1 Peak Elev=293.57' Storage=2,143 cf Inflow=1.77 cfs 0.142 af
Outflow=0.62 cfs 0.136 af

Pond 3P: Bioretention Pond 2 Peak Elev=290.80' Storage=2,425 cf Inflow=2.52 cfs 0.188 af
Outflow=1.65 cfs 0.181 af

Pond 4P: Trench Drain #20 Peak Elev=290.97' Inflow=0.90 cfs 0.072 af
12.0" Round Culvert n=0.013 L=15.0' S=0.0300 '/' Outflow=0.90 cfs 0.072 af

Pond 5P: Bioretention Pond 3 Peak Elev=293.54' Storage=1,465 cf Inflow=2.24 cfs 0.160 af
Outflow=2.18 cfs 0.145 af

Pond 6P: Trench Drain #40 Peak Elev=290.77' Inflow=3.14 cfs 0.242 af
12.0" Round Culvert n=0.013 L=8.0' S=0.0200 '/' Outflow=3.14 cfs 0.242 af

Pond 7P: Bioretention Pond 4 Peak Elev=289.51' Storage=3,294 cf Inflow=3.33 cfs 0.256 af
Outflow=1.90 cfs 0.256 af

Pond 8P: Underground Detention Pond 5 Peak Elev=287.67' Storage=6,365 cf Inflow=3.63 cfs 0.573 af
Outflow=1.35 cfs 0.456 af

Pond 10P: DMH#31 Peak Elev=289.28' Inflow=4.24 cfs 0.509 af
15.0" Round Culvert n=0.013 L=135.0' S=0.0100 '/' Outflow=4.24 cfs 0.509 af

Pond 11P: AD#33 Peak Elev=308.92' Inflow=3.14 cfs 0.365 af
15.0" Round Culvert n=0.013 L=41.0' S=0.0800 '/' Outflow=3.14 cfs 0.365 af

Pond 12P: DMH#34 Peak Elev=303.72' Inflow=3.14 cfs 0.365 af
15.0" Round Culvert n=0.013 L=135.0' S=0.0800 '/' Outflow=3.14 cfs 0.365 af

Link A: South Street Drainage to Great Brook Inflow=10.78 cfs 1.694 af
Primary=10.78 cfs 1.694 af

Link B: Nathaniel Dr Catch Basin Inflow=0.02 cfs 0.002 af
Primary=0.02 cfs 0.002 af

Total Runoff Area = 11.792 ac Runoff Volume = 1.840 af Average Runoff Depth = 1.87"
85.65% Pervious = 10.099 ac 14.35% Impervious = 1.692 ac

Summary for Subcatchment 1S: On & Off Site Flow

Runoff = 6.55 cfs @ 12.27 hrs, Volume= 0.729 af, Depth> 1.46"
Routed to Pond 1P : Culvert to South Street Drainage

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-yr Rainfall=5.53"

Area (sf)	CN	Description
8,992	98	Paved parking, HSG A
3,620	98	Paved parking, HSG B
10,053	39	>75% Grass cover, Good, HSG A
11,033	61	>75% Grass cover, Good, HSG B
211,534	55	Woods, Good, HSG B
15,036	70	Woods, Good, HSG C
260,268	58	Weighted Average
247,656		95.15% Pervious Area
12,612		4.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
8.8	986	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	297	0.1200	2.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,333	Total			

Summary for Subcatchment 2S: Flow to Nathaniel Dr Catch Basin

Runoff = 0.02 cfs @ 12.10 hrs, Volume= 0.002 af, Depth> 1.70"
Routed to Link B : Nathaniel Dr Catch Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-yr Rainfall=5.53"

Area (sf)	CN	Description
570	61	>75% Grass cover, Good, HSG B
570		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.0	3	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	53	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: Flow to Bioretention Pond 1

Runoff = 1.77 cfs @ 12.13 hrs, Volume= 0.142 af, Depth> 2.01"
Routed to Pond 2P : Bioretention Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-yr Rainfall=5.53"

Area (sf)	CN	Description
1,782	98	Roofs, HSG B
4,630	98	Paved parking, HSG B
13,628	61	>75% Grass cover, Good, HSG B
16,751	55	Woods, Good, HSG B
36,791	65	Weighted Average
30,379		82.57% Pervious Area
6,412		17.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1400	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
2.3	271	0.1587	1.99		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	59	0.3500	4.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.4	380	Total			

Summary for Subcatchment 4S: Flow to Bioretention Pond 2

Runoff = 1.61 cfs @ 12.09 hrs, Volume= 0.115 af, Depth> 3.45"
Routed to Pond 3P : Bioretention Pond 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-yr Rainfall=5.53"

Area (sf)	CN	Description
2,308	98	Paved parking, HSG A
8,548	98	Paved parking, HSG B
2,217	39	>75% Grass cover, Good, HSG A
4,330	61	>75% Grass cover, Good, HSG B
17,403	81	Weighted Average
6,547		37.62% Pervious Area
10,856		62.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	20	0.0050	0.07		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
4.9	20	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: Flow to Trench Drain #20

Runoff = 0.90 cfs @ 12.08 hrs, Volume= 0.072 af, Depth> 5.17"
Routed to Pond 4P : Trench Drain #20

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-yr Rainfall=5.53"

Area (sf)	CN	Description
1,583	98	Roofs, HSG B
242	61	>75% Grass cover, Good, HSG B
5,503	98	Paved parking, HSG B
7,328	97	Weighted Average
242		3.30% Pervious Area
7,086		96.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	11	0.0100	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.4	70	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	81	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 6S: Flow to Bioretention Pond 3

Runoff = 2.24 cfs @ 12.09 hrs, Volume= 0.160 af, Depth> 3.45"
Routed to Pond 5P : Bioretention Pond 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-yr Rainfall=5.53"

Area (sf)	CN	Description
1,754	98	Roofs, HSG B
11,522	98	Paved parking, HSG B
10,912	61	>75% Grass cover, Good, HSG B
24,188	81	Weighted Average
10,912		45.11% Pervious Area
13,276		54.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	20	0.0100	0.09		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.2	40	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.9	60	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 7S: Flow to Trench Drain #40

Runoff = 3.14 cfs @ 12.08 hrs, Volume= 0.242 af, Depth> 4.83"
Routed to Pond 6P : Trench Drain #40

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-yr Rainfall=5.53"

Area (sf)	CN	Description
21,923	98	Paved parking, HSG B
394	74	>75% Grass cover, Good, HSG C
1,557	98	Roofs, HSG B
2,143	61	>75% Grass cover, Good, HSG B
187	74	>75% Grass cover, Good, HSG C
26,204	94	Weighted Average
2,724		10.40% Pervious Area
23,480		89.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0800	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.5	19	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	100	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.5	169	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: Flow to Bioretention 4

Runoff = 0.19 cfs @ 12.10 hrs, Volume= 0.014 af, Depth> 1.93"
Routed to Pond 7P : Bioretention Pond 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-yr Rainfall=5.53"

Area (sf)	CN	Description
2,812	61	>75% Grass cover, Good, HSG B
996	74	>75% Grass cover, Good, HSG C
3,808	64	Weighted Average
3,808		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	10	0.2500	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.6	10	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 9S: On & Off Site Flow

Runoff = 3.14 cfs @ 12.29 hrs, Volume= 0.365 af, Depth> 1.39"
Routed to Pond 11P : AD#33

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-yr Rainfall=5.53"

Area (sf)	CN	Description
6,611	61	>75% Grass cover, Good, HSG B
119,201	55	Woods, Good, HSG B
11,266	77	Woods, Good, HSG D
137,078	57	Weighted Average
137,078		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
7.4	803	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	25	0.2800	3.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	134	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.7	1,012	Total			

Summary for Pond 1P: Culvert to South Street Drainage

[80] Warning: Exceeded Pond 8P by 1.41' @ 12.24 hrs (2.46 cfs 0.043 af)

Inflow Area = 11.778 ac, 14.37% Impervious, Inflow Depth > 1.73" for 25-yr event
Inflow = 10.78 cfs @ 12.27 hrs, Volume= 1.694 af
Outflow = 10.78 cfs @ 12.27 hrs, Volume= 1.694 af, Atten= 0%, Lag= 0.0 min
Primary = 10.78 cfs @ 12.27 hrs, Volume= 1.694 af
Routed to Link A : South Street Drainage to Great Brook
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link A : South Street Drainage to Great Brook

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 288.43' @ 12.27 hrs
Flood Elev= 290.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	284.48'	**15.0" Round Culvert** L= 75.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 284.48' / 282.66' S= 0.0243 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Secondary	288.50'	**20.0' long x 1.00' rise Sharp-Crested Rectangular Weir X 2.00** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=10.77 cfs @ 12.27 hrs HW=288.43' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 10.77 cfs @ 8.78 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=284.48' TW=0.00' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)

Summary for Pond 2P: Bioretention Pond 1

Inflow Area = 0.845 ac, 17.43% Impervious, Inflow Depth > 2.01" for 25-yr event
Inflow = 1.77 cfs @ 12.13 hrs, Volume= 0.142 af
Outflow = 0.62 cfs @ 12.50 hrs, Volume= 0.136 af, Atten= 65%, Lag= 22.2 min
Primary = 0.62 cfs @ 12.50 hrs, Volume= 0.136 af
Routed to Pond 8P : Underground Detention Pond 5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 293.57' @ 12.50 hrs Surf.Area= 2,068 sf Storage= 2,143 cf
Flood Elev= 294.70' Surf.Area= 3,005 sf Storage= 4,497 cf

Plug-Flow detention time= 157.5 min calculated for 0.136 af (96% of inflow)
Center-of-Mass det. time= 136.4 min (992.3 - 855.9)

Volume	Invert	Avail.Storage	Storage Description
#1	292.00'	4,497 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.00	599	166.3	0	0	599
292.50	1,161	259.1	432	432	3,742
293.00	1,569	280.6	680	1,112	4,675
294.00	2,492	326.1	2,013	3,125	6,893
294.50	3,005	317.9	1,372	4,497	7,343

Device	Routing	Invert	Outlet Devices
#1	Device 2	292.00'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	289.00'	**12.0" Round Culvert** L= 107.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 289.00' / 286.86' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	293.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.62 cfs @ 12.50 hrs HW=293.57' TW=287.60' (Dynamic Tailwater)
└**2=Culvert** (Passes 0.62 cfs of 6.83 cfs potential flow)
  ├**1=Exfiltration** (Exfiltration Controls 0.14 cfs)
  └**3=Orifice/Grate** (Weir Controls 0.47 cfs @ 0.86 fps)

Summary for Pond 3P: Bioretention Pond 2

Inflow Area = 0.568 ac, 72.55% Impervious, Inflow Depth > 3.96" for 25-yr event
Inflow = 2.52 cfs @ 12.09 hrs, Volume= 0.188 af
Outflow = 1.65 cfs @ 12.18 hrs, Volume= 0.181 af, Atten= 34%, Lag= 5.7 min
Primary = 1.65 cfs @ 12.18 hrs, Volume= 0.181 af
Routed to Pond 8P : Underground Detention Pond 5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 290.80' @ 12.18 hrs Surf.Area= 2,085 sf Storage= 2,425 cf
Flood Elev= 291.50' Surf.Area= 2,248 sf Storage= 2,860 cf

Plug-Flow detention time= 132.7 min calculated for 0.180 af (96% of inflow)
Center-of-Mass det. time= 111.4 min (902.0 - 790.6)

Volume	Invert	Avail.Storage	Storage Description
#1	289.00'	2,860 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
289.00	598	0	0
290.00	1,437	1,018	1,018
291.00	2,248	1,843	2,860

Device	Routing	Invert	Outlet Devices
#1	Primary	286.50'	**12.0" Round Culvert** L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 286.50' / 286.04' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	289.00'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#3	Device 1	290.65'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.65 cfs @ 12.18 hrs HW=290.80' TW=286.76' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.65 cfs of 7.12 cfs potential flow)
  ├─**2=Exfiltration** (Exfiltration Controls 0.14 cfs)
  └─**3=Orifice/Grate** (Weir Controls 1.50 cfs @ 1.26 fps)

Summary for Pond 4P: Trench Drain #20

Inflow Area = 0.168 ac, 96.70% Impervious, Inflow Depth > 5.17" for 25-yr event
Inflow = 0.90 cfs @ 12.08 hrs, Volume= 0.072 af
Outflow = 0.90 cfs @ 12.08 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.0 min
Primary = 0.90 cfs @ 12.08 hrs, Volume= 0.072 af
Routed to Pond 3P : Bioretention Pond 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 290.97' @ 12.14 hrs
Flood Elev= 294.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	290.45'	**12.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 290.45' / 290.00' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.83 cfs @ 12.08 hrs HW=290.94' TW=290.60' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.83 cfs @ 3.19 fps)

Summary for Pond 5P: Bioretention Pond 3

Inflow Area = 0.555 ac, 54.89% Impervious, Inflow Depth > 3.45" for 25-yr event
Inflow = 2.24 cfs @ 12.09 hrs, Volume= 0.160 af
Outflow = 2.18 cfs @ 12.11 hrs, Volume= 0.145 af, Atten= 2%, Lag= 1.2 min
Primary = 2.18 cfs @ 12.11 hrs, Volume= 0.145 af
Routed to Pond 10P : DMH#31

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 293.54' @ 12.11 hrs Surf.Area= 1,089 sf Storage= 1,465 cf
Flood Elev= 294.25' Surf.Area= 1,320 sf Storage= 2,022 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 68.0 min (882.2 - 814.2)

Volume	Invert	Avail.Storage	Storage Description
#1	291.00'	2,022 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
291.00	185	54.6	0	0	185
291.50	302	84.9	121	121	523
292.00	450	108.1	187	307	883
293.00	849	153.3	639	946	1,832
294.00	1,320	148.3	1,076	2,022	2,025

Device	Routing	Invert	Outlet Devices
#1	Primary	288.50'	**15.0" Round Culvert** L= 90.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 288.50' / 287.15' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	291.00'	**3.000 in/hr Exfiltration over Surface area**
#3	Device 1	293.35'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.17 cfs @ 12.11 hrs HW=293.54' TW=287.47' (Dynamic Tailwater)
├─**1=Culvert** (Passes 2.09 cfs of 11.76 cfs potential flow)
│ └─**3=Orifice/Grate** (Weir Controls 2.09 cfs @ 1.41 fps)
└─**2=Exfiltration** (Exfiltration Controls 0.08 cfs)

Summary for Pond 6P: Trench Drain #40

Inflow Area = 0.602 ac, 89.60% Impervious, Inflow Depth > 4.83" for 25-yr event
Inflow = 3.14 cfs @ 12.08 hrs, Volume= 0.242 af
Outflow = 3.14 cfs @ 12.08 hrs, Volume= 0.242 af, Atten= 0%, Lag= 0.0 min
Primary = 3.14 cfs @ 12.08 hrs, Volume= 0.242 af
Routed to Pond 7P : Bioretention Pond 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 290.77' @ 12.08 hrs
Flood Elev= 291.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	289.56'	**12.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 289.56' / 289.40' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.13 cfs @ 12.08 hrs HW=290.77' TW=289.27' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 3.13 cfs @ 4.18 fps)

Summary for Pond 7P: Bioretention Pond 4

Inflow Area = 0.689 ac, 78.24% Impervious, Inflow Depth > 4.46" for 25-yr event
Inflow = 3.33 cfs @ 12.08 hrs, Volume= 0.256 af
Outflow = 1.90 cfs @ 12.20 hrs, Volume= 0.256 af, Atten= 43%, Lag= 7.1 min
Primary = 1.90 cfs @ 12.20 hrs, Volume= 0.256 af
Routed to Pond 8P : Underground Detention Pond 5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 289.51' @ 12.20 hrs Surf.Area= 2,791 sf Storage= 3,294 cf
Flood Elev= 290.25' Surf.Area= 3,198 sf Storage= 4,756 cf

Plug-Flow detention time= 117.6 min calculated for 0.256 af (100% of inflow)
Center-of-Mass det. time= 117.2 min (892.1 - 774.9)

Volume	Invert	Avail.Storage	Storage Description
#1	288.00'	4,756 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
288.00	1,583	0	0
289.00	2,365	1,974	1,974
290.00	3,198	2,782	4,756

Device	Routing	Invert	Outlet Devices
#1	Primary	285.50'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 285.50' / 285.35' S= 0.0075 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	288.00'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

#3	Device 1	289.35'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.89 cfs @ 12.20 hrs HW=289.51' TW=286.84' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.89 cfs of 6.18 cfs potential flow)
  ├─**2=Exfiltration** (Exfiltration Controls 0.19 cfs)
  └─**3=Orifice/Grate** (Weir Controls 1.70 cfs @ 1.31 fps)

Summary for Pond 8P: Underground Detention Pond 5

Inflow Area = 2.101 ac, 52.26% Impervious, Inflow Depth > 3.27" for 25-yr event
Inflow = 3.63 cfs @ 12.19 hrs, Volume= 0.573 af
Outflow = 1.35 cfs @ 12.67 hrs, Volume= 0.456 af, Atten= 63%, Lag= 28.5 min
Primary = 1.35 cfs @ 12.67 hrs, Volume= 0.456 af
Routed to Pond 1P : Culvert to South Street Drainage

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 287.67' @ 12.65 hrs Surf.Area= 3,657 sf Storage= 6,365 cf
Flood Elev= 290.40' Storage= 11,458 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 72.5 min (991.5 - 919.0)

Volume	Invert	Avail.Storage	Storage Description
#1	285.25'	11,458 cf	**ADS N-12 48" @ 220.00' L** x 4 Inside= 47.7"W x 47.7"H => 12.40 sf x 220.00'L = 2,728.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 220.00'L = 3,266.8 cf 4 Chambers in 4 Rows 22.00' Header x 12.40 sf x 2 = 545.6 cf Inside

Device	Routing	Invert	Outlet Devices
#1	Primary	285.25'	**12.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 285.25' / 284.75' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	285.25'	**2.5" W x 0.5" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	287.25'	**24.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	289.00'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=1.35 cfs @ 12.67 hrs HW=287.67' TW=286.24' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.35 cfs of 4.10 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 5.76 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 1.30 cfs @ 2.61 fps)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 10P: DMH#31

Inflow Area = 3.702 ac, 8.23% Impervious, Inflow Depth > 1.65" for 25-yr event
Inflow = 4.24 cfs @ 12.25 hrs, Volume= 0.509 af
Outflow = 4.24 cfs @ 12.25 hrs, Volume= 0.509 af, Atten= 0%, Lag= 0.0 min
Primary = 4.24 cfs @ 12.25 hrs, Volume= 0.509 af
Routed to Pond 1P : Culvert to South Street Drainage

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 289.28' @ 12.28 hrs
Flood Elev= 298.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	286.35'	**15.0" Round Culvert** L= 135.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 286.35' / 285.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.98 cfs @ 12.25 hrs HW=289.16' TW=288.40' (Dynamic Tailwater)
1=Culvert (Outlet Controls 3.98 cfs @ 3.25 fps)

Summary for Pond 11P: AD#33

Inflow Area = 3.147 ac, 0.00% Impervious, Inflow Depth > 1.39" for 25-yr event
Inflow = 3.14 cfs @ 12.29 hrs, Volume= 0.365 af
Outflow = 3.14 cfs @ 12.29 hrs, Volume= 0.365 af, Atten= 0%, Lag= 0.0 min
Primary = 3.14 cfs @ 12.29 hrs, Volume= 0.365 af
Routed to Pond 12P : DMH#34

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 308.92' @ 12.29 hrs
Flood Elev= 313.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	308.00'	**15.0" Round Culvert** L= 41.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 308.00' / 304.72' S= 0.0800 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.14 cfs @ 12.29 hrs HW=308.92' TW=303.72' (Dynamic Tailwater)
1=Culvert (Inlet Controls 3.14 cfs @ 3.26 fps)

Summary for Pond 12P: DMH#34

Inflow Area = 3.147 ac, 0.00% Impervious, Inflow Depth > 1.39" for 25-yr event
Inflow = 3.14 cfs @ 12.29 hrs, Volume= 0.365 af
Outflow = 3.14 cfs @ 12.29 hrs, Volume= 0.365 af, Atten= 0%, Lag= 0.0 min
Primary = 3.14 cfs @ 12.29 hrs, Volume= 0.365 af
Routed to Pond 10P : DMH#31

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Peak Elev= 303.72' @ 12.29 hrs
Flood Elev= 318.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	302.80'	**15.0" Round Culvert** L= 135.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 302.80' / 292.00' S= 0.0800 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.14 cfs @ 12.29 hrs HW=303.72' TW=289.26' (Dynamic Tailwater)
1=Culvert (Inlet Controls 3.14 cfs @ 3.26 fps)

Summary for Link A: South Street Drainage to Great Brook

Inflow Area = 11.778 ac, 14.37% Impervious, Inflow Depth > 1.73" for 25-yr event
Inflow = 10.78 cfs @ 12.27 hrs, Volume= 1.694 af
Primary = 10.78 cfs @ 12.27 hrs, Volume= 1.694 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Summary for Link B: Nathaniel Dr Catch Basin

Inflow Area = 0.013 ac, 0.00% Impervious, Inflow Depth > 1.70" for 25-yr event
Inflow = 0.02 cfs @ 12.10 hrs, Volume= 0.002 af
Primary = 0.02 cfs @ 12.10 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Time span=0.00-24.00 hrs, dt=0.02 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: On & Off Site Flow Runoff Area=260,268 sf 4.85% Impervious Runoff Depth>2.11"
Flow Length=1,333' Tc=17.5 min CN=58 Runoff=9.93 cfs 1.052 af

Subcatchment2S: Flow to Nathaniel Dr Catch Runoff Area=570 sf 0.00% Impervious Runoff Depth>2.39"
Flow Length=53' Slope=0.2500 '/' Tc=6.0 min CN=61 Runoff=0.04 cfs 0.003 af

Subcatchment3S: Flow to Bioretention Runoff Area=36,791 sf 17.43% Impervious Runoff Depth>2.77"
Flow Length=380' Tc=8.4 min CN=65 Runoff=2.49 cfs 0.195 af

Subcatchment4S: Flow to Bioretention Runoff Area=17,403 sf 62.38% Impervious Runoff Depth>4.40"
Flow Length=20' Slope=0.0050 '/' Tc=6.0 min CN=81 Runoff=2.04 cfs 0.147 af

Subcatchment5S: Flow to Trench Drain #20 Runoff Area=7,328 sf 96.70% Impervious Runoff Depth>6.21"
Flow Length=81' Tc=6.0 min CN=97 Runoff=1.08 cfs 0.087 af

Subcatchment6S: Flow to Bioretention Runoff Area=24,188 sf 54.89% Impervious Runoff Depth>4.40"
Flow Length=60' Tc=6.0 min CN=81 Runoff=2.84 cfs 0.204 af

Subcatchment7S: Flow to Trench Drain Runoff Area=26,204 sf 89.60% Impervious Runoff Depth>5.86"
Flow Length=169' Tc=6.0 min CN=94 Runoff=3.77 cfs 0.294 af

Subcatchment8S: Flow to Bioretention 4 Runoff Area=3,808 sf 0.00% Impervious Runoff Depth>2.67"
Flow Length=10' Slope=0.2500 '/' Tc=6.0 min CN=64 Runoff=0.27 cfs 0.019 af

Subcatchment9S: On & Off Site Flow Runoff Area=137,078 sf 0.00% Impervious Runoff Depth>2.02"
Flow Length=1,012' Tc=18.7 min CN=57 Runoff=4.84 cfs 0.530 af

Pond 1P: Culvert to South Street Drainage Peak Elev=288.61' Inflow=16.16 cfs 2.364 af
Primary=11.07 cfs 2.256 af Secondary=5.09 cfs 0.108 af Outflow=16.16 cfs 2.364 af

Pond 2P: Bioretention Pond 1 Peak Elev=293.64' Storage=2,289 cf Inflow=2.49 cfs 0.195 af
Outflow=1.49 cfs 0.184 af

Pond 3P: Bioretention Pond 2 Peak Elev=290.86' Storage=2,564 cf Inflow=3.12 cfs 0.234 af
Outflow=2.75 cfs 0.223 af

Pond 4P: Trench Drain #20 Peak Elev=291.08' Inflow=1.08 cfs 0.087 af
12.0" Round Culvert n=0.013 L=15.0' S=0.0300 '/' Outflow=1.08 cfs 0.087 af

Pond 5P: Bioretention Pond 3 Peak Elev=293.57' Storage=1,502 cf Inflow=2.84 cfs 0.204 af
Outflow=2.78 cfs 0.185 af

Pond 6P: Trench Drain #40 Peak Elev=291.05' Inflow=3.77 cfs 0.294 af
12.0" Round Culvert n=0.013 L=8.0' S=0.0200 '/' Outflow=3.77 cfs 0.294 af

Pond 7P: Bioretention Pond 4 Peak Elev=289.59' Storage=3,512 cf Inflow=4.04 cfs 0.313 af
Outflow=3.26 cfs 0.309 af

Pond 8P: Underground Detention Pond 5 Peak Elev=288.90' Storage=10,412 cf Inflow=6.11 cfs 0.716 af
Outflow=2.86 cfs 0.597 af

Pond 10P: DMH#31 Peak Elev=290.48' Inflow=6.24 cfs 0.716 af
15.0" Round Culvert n=0.013 L=135.0' S=0.0100 '/' Outflow=6.24 cfs 0.716 af

Pond 11P: AD#33 Peak Elev=309.29' Inflow=4.84 cfs 0.530 af
15.0" Round Culvert n=0.013 L=41.0' S=0.0800 '/' Outflow=4.84 cfs 0.530 af

Pond 12P: DMH#34 Peak Elev=304.09' Inflow=4.84 cfs 0.530 af
15.0" Round Culvert n=0.013 L=135.0' S=0.0800 '/' Outflow=4.84 cfs 0.530 af

Link A: South Street Drainage to Great Brook Inflow=16.16 cfs 2.364 af
Primary=16.16 cfs 2.364 af

Link B: Nathaniel Dr Catch Basin Inflow=0.04 cfs 0.003 af
Primary=0.04 cfs 0.003 af

Total Runoff Area = 11.792 ac Runoff Volume = 2.530 af Average Runoff Depth = 2.57"
85.65% Pervious = 10.099 ac 14.35% Impervious = 1.692 ac

Summary for Subcatchment 1S: On & Off Site Flow

Runoff = 9.93 cfs @ 12.26 hrs, Volume= 1.052 af, Depth> 2.11"
Routed to Pond 1P : Culvert to South Street Drainage

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 50-yr Rainfall=6.57"

Area (sf)	CN	Description
8,992	98	Paved parking, HSG A
3,620	98	Paved parking, HSG B
10,053	39	>75% Grass cover, Good, HSG A
11,033	61	>75% Grass cover, Good, HSG B
211,534	55	Woods, Good, HSG B
15,036	70	Woods, Good, HSG C
260,268	58	Weighted Average
247,656		95.15% Pervious Area
12,612		4.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
8.8	986	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	297	0.1200	2.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,333	Total			

Summary for Subcatchment 2S: Flow to Nathaniel Dr Catch Basin

Runoff = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Depth> 2.39"
Routed to Link B : Nathaniel Dr Catch Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 50-yr Rainfall=6.57"

Area (sf)	CN	Description
570	61	>75% Grass cover, Good, HSG B
570		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.0	3	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	53	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: Flow to Bioretention Pond 1

Runoff = 2.49 cfs @ 12.12 hrs, Volume= 0.195 af, Depth> 2.77"
Routed to Pond 2P : Bioretention Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 50-yr Rainfall=6.57"

Area (sf)	CN	Description
1,782	98	Roofs, HSG B
4,630	98	Paved parking, HSG B
13,628	61	>75% Grass cover, Good, HSG B
16,751	55	Woods, Good, HSG B
36,791	65	Weighted Average
30,379		82.57% Pervious Area
6,412		17.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1400	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
2.3	271	0.1587	1.99		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	59	0.3500	4.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.4	380	Total			

Summary for Subcatchment 4S: Flow to Bioretention Pond 2

Runoff = 2.04 cfs @ 12.09 hrs, Volume= 0.147 af, Depth> 4.40"
Routed to Pond 3P : Bioretention Pond 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 50-yr Rainfall=6.57"

Area (sf)	CN	Description
2,308	98	Paved parking, HSG A
8,548	98	Paved parking, HSG B
2,217	39	>75% Grass cover, Good, HSG A
4,330	61	>75% Grass cover, Good, HSG B
17,403	81	Weighted Average
6,547		37.62% Pervious Area
10,856		62.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	20	0.0050	0.07		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
4.9	20	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: Flow to Trench Drain #20

Runoff = 1.08 cfs @ 12.08 hrs, Volume= 0.087 af, Depth> 6.21"
Routed to Pond 4P : Trench Drain #20

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 50-yr Rainfall=6.57"

Area (sf)	CN	Description
1,583	98	Roofs, HSG B
242	61	>75% Grass cover, Good, HSG B
5,503	98	Paved parking, HSG B
7,328	97	Weighted Average
242		3.30% Pervious Area
7,086		96.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	11	0.0100	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.4	70	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	81	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 6S: Flow to Bioretention Pond 3

Runoff = 2.84 cfs @ 12.09 hrs, Volume= 0.204 af, Depth> 4.40"
Routed to Pond 5P : Bioretention Pond 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 50-yr Rainfall=6.57"

Area (sf)	CN	Description
1,754	98	Roofs, HSG B
11,522	98	Paved parking, HSG B
10,912	61	>75% Grass cover, Good, HSG B
24,188	81	Weighted Average
10,912		45.11% Pervious Area
13,276		54.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	20	0.0100	0.09		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.2	40	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.9	60	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 7S: Flow to Trench Drain #40

Runoff = 3.77 cfs @ 12.08 hrs, Volume= 0.294 af, Depth> 5.86"
Routed to Pond 6P : Trench Drain #40

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 50-yr Rainfall=6.57"

Area (sf)	CN	Description
21,923	98	Paved parking, HSG B
394	74	>75% Grass cover, Good, HSG C
1,557	98	Roofs, HSG B
2,143	61	>75% Grass cover, Good, HSG B
187	74	>75% Grass cover, Good, HSG C
26,204	94	Weighted Average
2,724		10.40% Pervious Area
23,480		89.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0800	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.5	19	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	100	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.5	169	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: Flow to Bioretention 4

Runoff = 0.27 cfs @ 12.09 hrs, Volume= 0.019 af, Depth> 2.67"
Routed to Pond 7P : Bioretention Pond 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 50-yr Rainfall=6.57"

Area (sf)	CN	Description
2,812	61	>75% Grass cover, Good, HSG B
996	74	>75% Grass cover, Good, HSG C
3,808	64	Weighted Average
3,808		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	10	0.2500	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.96"
0.6	10	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 9S: On & Off Site Flow

Runoff = 4.84 cfs @ 12.28 hrs, Volume= 0.530 af, Depth> 2.02"
Routed to Pond 11P : AD#33

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 50-yr Rainfall=6.57"

Area (sf)	CN	Description
6,611	61	>75% Grass cover, Good, HSG B
119,201	55	Woods, Good, HSG B
11,266	77	Woods, Good, HSG D
137,078	57	Weighted Average
137,078		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.96"
7.4	803	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	25	0.2800	3.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.5	134	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.7	1,012	Total			

Summary for Pond 1P: Culvert to South Street Drainage

[80] Warning: Exceeded Pond 8P by 1.61' @ 12.10 hrs (2.61 cfs 0.059 af)

Inflow Area = 11.778 ac, 14.37% Impervious, Inflow Depth > 2.41" for 50-yr event
Inflow = 16.16 cfs @ 12.26 hrs, Volume= 2.364 af
Outflow = 16.16 cfs @ 12.26 hrs, Volume= 2.364 af, Atten= 0%, Lag= 0.0 min
Primary = 11.07 cfs @ 12.26 hrs, Volume= 2.256 af
Routed to Link A : South Street Drainage to Great Brook
Secondary = 5.09 cfs @ 12.26 hrs, Volume= 0.108 af
Routed to Link A : South Street Drainage to Great Brook

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 288.61' @ 12.26 hrs
Flood Elev= 290.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	284.48'	**15.0" Round Culvert** L= 75.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 284.48' / 282.66' S= 0.0243 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Secondary	288.50'	**20.0' long x 1.00' rise Sharp-Crested Rectangular Weir X 2.00** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=11.07 cfs @ 12.26 hrs HW=288.61' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 11.07 cfs @ 9.02 fps)

Secondary OutFlow Max=5.07 cfs @ 12.26 hrs HW=288.61' TW=0.00' (Dynamic Tailwater)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 5.07 cfs @ 1.12 fps)

Summary for Pond 2P: Bioretention Pond 1

Inflow Area = 0.845 ac, 17.43% Impervious, Inflow Depth > 2.77" for 50-yr event
Inflow = 2.49 cfs @ 12.12 hrs, Volume= 0.195 af
Outflow = 1.49 cfs @ 12.28 hrs, Volume= 0.184 af, Atten= 40%, Lag= 9.5 min
Primary = 1.49 cfs @ 12.28 hrs, Volume= 0.184 af
Routed to Pond 8P : Underground Detention Pond 5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 293.64' @ 12.28 hrs Surf.Area= 2,133 sf Storage= 2,289 cf
Flood Elev= 294.70' Surf.Area= 3,005 sf Storage= 4,497 cf

Plug-Flow detention time= 130.1 min calculated for 0.184 af (94% of inflow)
Center-of-Mass det. time= 100.9 min (947.3 - 846.4)

Volume	Invert	Avail.Storage	Storage Description
#1	292.00'	4,497 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.00	599	166.3	0	0	599
292.50	1,161	259.1	432	432	3,742
293.00	1,569	280.6	680	1,112	4,675
294.00	2,492	326.1	2,013	3,125	6,893
294.50	3,005	317.9	1,372	4,497	7,343

Device	Routing	Invert	Outlet Devices
#1	Device 2	292.00'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	289.00'	**12.0" Round Culvert** L= 107.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 289.00' / 286.86' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	293.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.49 cfs @ 12.28 hrs HW=293.64' TW=287.92' (Dynamic Tailwater)
└**2=Culvert** (Passes 1.49 cfs of 6.84 cfs potential flow)
  ├**1=Exfiltration** (Exfiltration Controls 0.15 cfs)
  └**3=Orifice/Grate** (Weir Controls 1.34 cfs @ 1.21 fps)

Summary for Pond 3P: Bioretention Pond 2

Inflow Area = 0.568 ac, 72.55% Impervious, Inflow Depth > 4.94" for 50-yr event
Inflow = 3.12 cfs @ 12.09 hrs, Volume= 0.234 af
Outflow = 2.75 cfs @ 12.13 hrs, Volume= 0.223 af, Atten= 12%, Lag= 2.6 min
Primary = 2.75 cfs @ 12.13 hrs, Volume= 0.223 af
Routed to Pond 8P : Underground Detention Pond 5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 290.86' @ 12.13 hrs Surf.Area= 2,138 sf Storage= 2,564 cf
Flood Elev= 291.50' Surf.Area= 2,248 sf Storage= 2,860 cf

Plug-Flow detention time= 117.6 min calculated for 0.223 af (95% of inflow)
Center-of-Mass det. time= 91.7 min (877.7 - 786.0)

Volume	Invert	Avail.Storage	Storage Description
#1	289.00'	2,860 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
289.00	598	0	0
290.00	1,437	1,018	1,018
291.00	2,248	1,843	2,860

Device	Routing	Invert	Outlet Devices
#1	Primary	286.50'	**12.0" Round Culvert** L= 46.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 286.50' / 286.04' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	289.00'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#3	Device 1	290.65'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.73 cfs @ 12.13 hrs HW=290.86' TW=287.07' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.73 cfs of 7.16 cfs potential flow)
  ├─**2=Exfiltration** (Exfiltration Controls 0.15 cfs)
  └─**3=Orifice/Grate** (Weir Controls 2.58 cfs @ 1.51 fps)

Summary for Pond 4P: Trench Drain #20

Inflow Area = 0.168 ac, 96.70% Impervious, Inflow Depth > 6.21" for 50-yr event
Inflow = 1.08 cfs @ 12.08 hrs, Volume= 0.087 af
Outflow = 1.08 cfs @ 12.08 hrs, Volume= 0.087 af, Atten= 0%, Lag= 0.0 min
Primary = 1.08 cfs @ 12.08 hrs, Volume= 0.087 af
Routed to Pond 3P : Bioretention Pond 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 291.08' @ 12.11 hrs
Flood Elev= 294.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	290.45'	**12.0" Round Culvert** L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 290.45' / 290.00' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.99 cfs @ 12.08 hrs HW=291.07' TW=290.83' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.99 cfs @ 2.77 fps)

Summary for Pond 5P: Bioretention Pond 3

Inflow Area = 0.555 ac, 54.89% Impervious, Inflow Depth > 4.40" for 50-yr event
Inflow = 2.84 cfs @ 12.09 hrs, Volume= 0.204 af
Outflow = 2.78 cfs @ 12.10 hrs, Volume= 0.185 af, Atten= 2%, Lag= 1.0 min
Primary = 2.78 cfs @ 12.10 hrs, Volume= 0.185 af
Routed to Pond 10P : DMH#31

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 293.57' @ 12.10 hrs Surf.Area= 1,105 sf Storage= 1,502 cf
Flood Elev= 294.25' Surf.Area= 1,320 sf Storage= 2,022 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 51.1 min (858.5 - 807.4)

Volume	Invert	Avail.Storage	Storage Description
#1	291.00'	2,022 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
291.00	185	54.6	0	0	185
291.50	302	84.9	121	121	523
292.00	450	108.1	187	307	883
293.00	849	153.3	639	946	1,832
294.00	1,320	148.3	1,076	2,022	2,025

Device	Routing	Invert	Outlet Devices
#1	Primary	288.50'	**15.0" Round Culvert** L= 90.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 288.50' / 287.15' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	291.00'	**3.000 in/hr Exfiltration over Surface area**
#3	Device 1	293.35'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.77 cfs @ 12.10 hrs HW=293.57' TW=289.33' (Dynamic Tailwater)
├─**1=Culvert** (Passes 2.69 cfs of 10.68 cfs potential flow)
│ └─**3=Orifice/Grate** (Weir Controls 2.69 cfs @ 1.53 fps)
└─**2=Exfiltration** (Exfiltration Controls 0.08 cfs)

Summary for Pond 6P: Trench Drain #40

[58] Hint: Peaked 0.05' above defined flood level

Inflow Area = 0.602 ac, 89.60% Impervious, Inflow Depth > 5.86" for 50-yr event
Inflow = 3.77 cfs @ 12.08 hrs, Volume= 0.294 af
Outflow = 3.77 cfs @ 12.08 hrs, Volume= 0.294 af, Atten= 0%, Lag= 0.0 min
Primary = 3.77 cfs @ 12.08 hrs, Volume= 0.294 af
Routed to Pond 7P : Bioretention Pond 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 291.05' @ 12.08 hrs
Flood Elev= 291.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	289.56'	**12.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 289.56' / 289.40' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.75 cfs @ 12.08 hrs HW=291.05' TW=289.52' (Dynamic Tailwater)
1=Culvert (Inlet Controls 3.75 cfs @ 4.78 fps)

Summary for Pond 7P: Bioretention Pond 4

Inflow Area = 0.689 ac, 78.24% Impervious, Inflow Depth > 5.45" for 50-yr event
Inflow = 4.04 cfs @ 12.08 hrs, Volume= 0.313 af
Outflow = 3.26 cfs @ 12.14 hrs, Volume= 0.309 af, Atten= 19%, Lag= 3.6 min
Primary = 3.26 cfs @ 12.14 hrs, Volume= 0.309 af
Routed to Pond 8P : Underground Detention Pond 5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 289.59' @ 12.14 hrs Surf.Area= 2,856 sf Storage= 3,512 cf
Flood Elev= 290.25' Surf.Area= 3,198 sf Storage= 4,756 cf

Plug-Flow detention time= 109.4 min calculated for 0.309 af (99% of inflow)
Center-of-Mass det. time= 100.8 min (871.5 - 770.7)

Volume	Invert	Avail.Storage	Storage Description
#1	288.00'	4,756 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
288.00	1,583	0	0
289.00	2,365	1,974	1,974
290.00	3,198	2,782	4,756

Device	Routing	Invert	Outlet Devices
#1	Primary	285.50'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 285.50' / 285.35' S= 0.0075 '/' Cc= 0.900

			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	288.00'	**3.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#3	Device 1	289.35'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads

Primary OutFlow Max=3.24 cfs @ 12.14 hrs HW=289.59' TW=287.16' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.24 cfs of 5.90 cfs potential flow)
  ├─**2=Exfiltration** (Exfiltration Controls 0.20 cfs)
  └─**3=Orifice/Grate** (Weir Controls 3.04 cfs @ 1.60 fps)

Summary for Pond 8P: Underground Detention Pond 5

Inflow Area = 2.101 ac, 52.26% Impervious, Inflow Depth > 4.09" for 50-yr event
Inflow = 6.11 cfs @ 12.14 hrs, Volume= 0.716 af
Outflow = 2.86 cfs @ 12.74 hrs, Volume= 0.597 af, Atten= 53%, Lag= 36.0 min
Primary = 2.86 cfs @ 12.74 hrs, Volume= 0.597 af
Routed to Pond 1P : Culvert to South Street Drainage

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 288.90' @ 12.60 hrs Surf.Area= 2,599 sf Storage= 10,412 cf
Flood Elev= 290.40' Storage= 11,458 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 62.5 min (955.4 - 892.9)

Volume	Invert	Avail.Storage	Storage Description
#1	285.25'	11,458 cf	**ADS N-12 48" @ 220.00' L** x 4
			Inside= 47.7"W x 47.7"H => 12.40 sf x 220.00'L = 2,728.0 cf
			Outside= 54.0"W x 54.0"H => 14.85 sf x 220.00'L = 3,266.8 cf
			4 Chambers in 4 Rows
			22.00' Header x 12.40 sf x 2 = 545.6 cf Inside

Device	Routing	Invert	Outlet Devices
#1	Primary	285.25'	**12.0" Round Culvert**
			L= 60.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 285.25' / 284.75' S= 0.0083 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	285.25'	**2.5" W x 0.5" H Vert. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads
#3	Device 1	287.25'	**24.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads
#4	Device 1	289.00'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir**
			2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=2.87 cfs @ 12.74 hrs HW=288.74' TW=287.18' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.87 cfs of 4.29 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 6.03 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 2.82 cfs @ 5.63 fps)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 10P: DMH#31

Inflow Area = 3.702 ac, 8.23% Impervious, Inflow Depth > 2.32" for 50-yr event
Inflow = 6.24 cfs @ 12.24 hrs, Volume= 0.716 af
Outflow = 6.24 cfs @ 12.24 hrs, Volume= 0.716 af, Atten= 0%, Lag= 0.0 min
Primary = 6.24 cfs @ 12.24 hrs, Volume= 0.716 af
Routed to Pond 1P : Culvert to South Street Drainage

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 290.48' @ 12.25 hrs
Flood Elev= 298.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	286.35'	**15.0" Round Culvert** L= 135.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 286.35' / 285.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=6.23 cfs @ 12.24 hrs HW=290.47' TW=288.61' (Dynamic Tailwater)
1=Culvert (Outlet Controls 6.23 cfs @ 5.08 fps)

Summary for Pond 11P: AD#33

Inflow Area = 3.147 ac, 0.00% Impervious, Inflow Depth > 2.02" for 50-yr event
Inflow = 4.84 cfs @ 12.28 hrs, Volume= 0.530 af
Outflow = 4.84 cfs @ 12.28 hrs, Volume= 0.530 af, Atten= 0%, Lag= 0.0 min
Primary = 4.84 cfs @ 12.28 hrs, Volume= 0.530 af
Routed to Pond 12P : DMH#34

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs
Peak Elev= 309.29' @ 12.28 hrs
Flood Elev= 313.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	308.00'	**15.0" Round Culvert** L= 41.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 308.00' / 304.72' S= 0.0800 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=4.83 cfs @ 12.28 hrs HW=309.29' TW=304.09' (Dynamic Tailwater)
1=Culvert (Inlet Controls 4.83 cfs @ 3.94 fps)

Summary for Pond 12P: DMH#34

Inflow Area = 3.147 ac, 0.00% Impervious, Inflow Depth > 2.02" for 50-yr event
Inflow = 4.84 cfs @ 12.28 hrs, Volume= 0.530 af
Outflow = 4.84 cfs @ 12.28 hrs, Volume= 0.530 af, Atten= 0%, Lag= 0.0 min
Primary = 4.84 cfs @ 12.28 hrs, Volume= 0.530 af
Routed to Pond 10P : DMH#31

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Peak Elev= 304.09' @ 12.28 hrs
Flood Elev= 318.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	302.80'	**15.0" Round Culvert** L= 135.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 302.80' / 292.00' S= 0.0800 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=4.83 cfs @ 12.28 hrs HW=304.09' TW=290.44' (Dynamic Tailwater)
1=Culvert (Inlet Controls 4.83 cfs @ 3.94 fps)

Summary for Link A: South Street Drainage to Great Brook

Inflow Area = 11.778 ac, 14.37% Impervious, Inflow Depth > 2.41" for 50-yr event
Inflow = 16.16 cfs @ 12.26 hrs, Volume= 2.364 af
Primary = 16.16 cfs @ 12.26 hrs, Volume= 2.364 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

Summary for Link B: Nathaniel Dr Catch Basin

Inflow Area = 0.013 ac, 0.00% Impervious, Inflow Depth > 2.39" for 50-yr event
Inflow = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af
Primary = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.02 hrs

18. SITE SPECIFIC SOIL SURVEY REPORT

February 15, 2024

Stoney Ridge ENVIRONMENTAL LLC

Matt Peterson
Keach-Nordstrom Associates, Inc.
mpeterson@keachnordstrom.com

RE: Map 43 Lot 20-2
South St. Milford, NH

SUBJECT: Site-Specific Soil Map Report

Dear Mr. Peterson,

The purpose of this soil report and accompanying soil map is to document the soil characteristics for the project location referenced above in the Town of Milford, NH.

This soil map was prepared by Stoney Ridge Environmental (SRE) utilizing the Site-Specific Soil Mapping Standards for New Hampshire and Vermont (SSSMS), SSSNNE Special Publication No. 3, Version 7, July 2021. The soil map units were identified using the New Hampshire State-Wide Numerical Soils Legend, Issue #10, January 2011. Further references used in the process of developing the soil map, soil legend and soil report are listed below:

1 *For disturbed soils, the January 4, 2011 Draft Proposal for Disturbed Soil Mapping Unit Supplement for AoT Site Specific Soil Maps was utilized.*

2 *Soil Science Division Staff. 2017. Soil Survey Manual. C. Ditzer, K. Scheffe and H.C. Monger (editors) USDA Handbook 18. Government Printing Office, Washington, D.C.*

3 *Field Indicators for Identifying Hydric Soils in New England. Version 4, June 2020.*

4 *Field Book for Describing and Sampling Soils. Version 3.0, National Survey Center. Natural Resources Conservation Services (NRCS). September 2012.*

5 *United States Department of Agriculture. Natural Resources Conservation Services. Official Series Descriptions. US Department of Agriculture, (NRCS).*

6 *Ksat Values for New Hampshire Soils. SSSNNE Special Publication No.5, September 2009.*

7 *Chapter 7. USDA NRCS Engineering Handbook.*

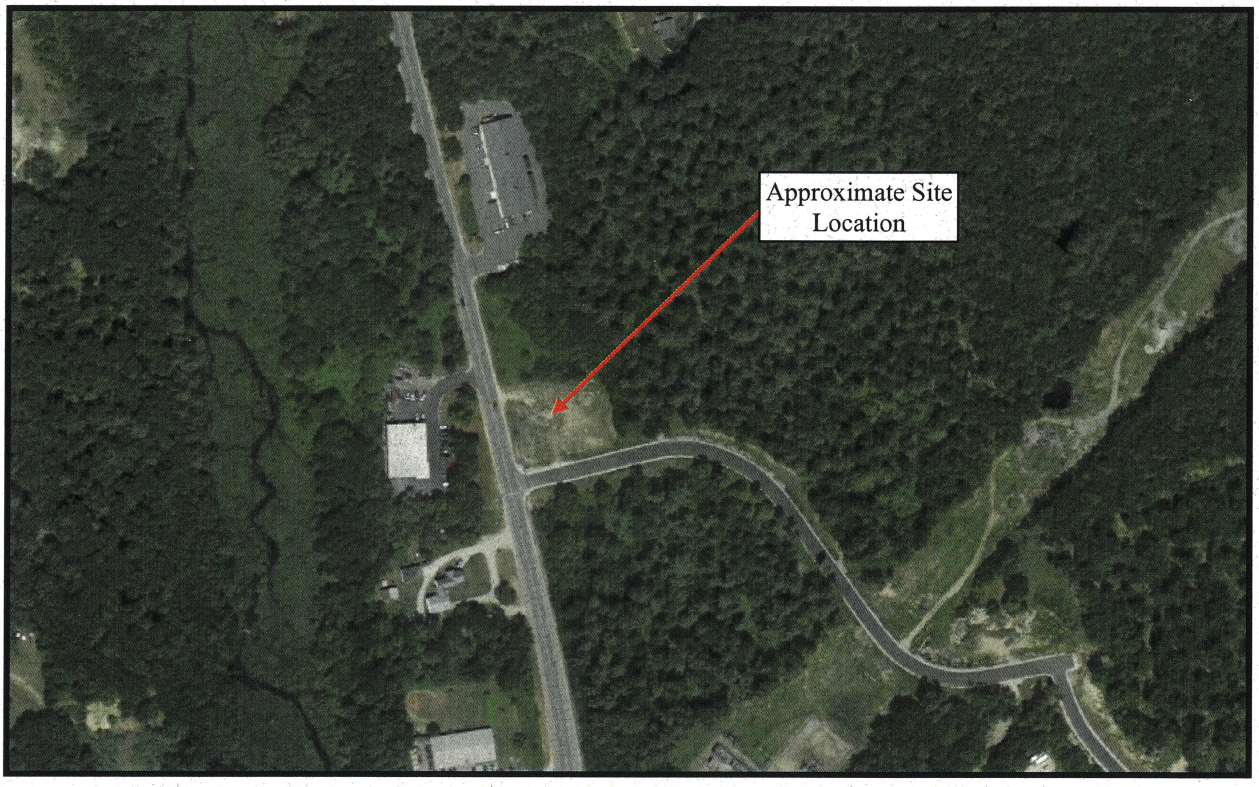
8 *The Site-Specific Soil Mapping Standards For New Hampshire And Vermont. SSSNNE Special Publication No.3, Version 7. July 2021.*

The Site-Specific Soil Mapping Standards apply the latest up to date knowledge of soils and provide the public with the most advanced soil resource information available today. The Site-Specific Standards are based on a universally recognized taxonomic system of soil classification

and are supported by national soil mapping standards established by the USDA National Cooperative Soil Survey. They allow for the development of multi-purpose soil map products, which are carefully controlled and monitored through a state, regional, and national quality assessment program. The Site-Specific Standards are backed by the most advanced soil research program in the world. The Site-Specific Standards have been developed by the Society of Soil Scientists of Northern New England in cooperation with the USDA Natural Resources Conservation Service in response to the need to provide regulatory agencies, local officials, and land use planners with consistent, high quality, large scale soil resource information.

The accompanying soil map was developed on a base map of 1" = 30', with contour intervals of 2 feet. The base existing conditions plan was supplied by Keach-Nordstrom Associates, Inc. The soils fieldwork for the Site-Specific Soils Map was performed on February 8, 2024. Test pit data was recorded by Keach Nordstom Associates, Inc and used by SRE for final soil classifications in addition to SRE field work. All field work and soil mapping was completed by Cynthia M. Balcius CSS, CWS & CPESC of SRE.

Location Description



The site is located at the corner of South Street and Nathaniel Drive, Milford, NH. This lot is partially disturbed with stockpiles of soil and sand located in some re-graded areas in the front southern corner of the lot. The site is vegetated with gray birch, poplar, rosa multi-flora, sumac, golden rod and raspberry in the disturbed areas. The un-disturbed areas were wooded with red oak, red maple and various ferns. There are no buildings or structures on site presently.

A view of the corner lot.

General Soil Conditions

The overall soil conditions on site find soils developed in glacial outwash sands and fine sands while in the transitional sloping areas to the back of the lot the soils have developed in sandy glacial till. The southern corner of the lot has been disturbed by grubbing, grading and some limited sandy loam fill.

Site Soil Descriptions

Deerfield loamy sand (313A,B,C): The Deerfield sandy loam and loamy sands dominate the entire front of the site. These moderately well drained soils have formed on deep glacial outwash sands. Seasonal highwater tables were found between 19 and 36 inches below the surface. Slopes on site were relatively level. The K_{sat} rates for this soil series range from 6.0 to 20.0 inches per hour in the upper horizons and 20.0 to 100.0 inches per hour in the lower substratum.

Newfields fine sandy loam (444B,C&D): Newfield soils are moderately well drained and have developed in sandy glacial till. This soil series was observed in the transitional slope areas rising in elevation in the back of this small lot marking the transition from glacial outwash to glacial till. Seasonal highwater tables were found between 15 and 40 inches. Slopes were generally moderately steep. The K_{sat} rates for this soil series range from 0.6 to 2.0 inches per hour in the upper horizons and 0.6 to 2.0 inches per hour in the lower substratum.

A view of the relatively level topography of the site.

Wareham fine sandy loam (34A/PD): Wareham fine sandy loam is a poorly drained soil and is found in the northwest corner of the site. This soil has developed in sandy wet glacial outwash materials in a low depressional area on site. Seasonal highwater tables are found at the surface. The K_{sat} rates for this soil type range from 6.0 to 20.0 inches per hour in the upper horizons and 6.0 to 20.0 inches per hour in the lower substratum.

A view of the wetland pocket found on site.

Udorthents, smoothed (200B&D): This disturbed soil map unit is mostly comprised of Deerfield sandy soils that have been regraded with additions of some fine sandy loams. The soil characteristics still are represented by Deerfield Series. The seasonal highwater table can be found between 19-37 inches below the surface. This map unit was observed in the southern corner of the lot. The disturbed map unit symbols for this soil is (d)Moderately Well Drained (b) glaciofluvial materials (a) no restrictive layers (a) high Ksat and (a) Group A. (dbaaa).

A view of the Newfield Soil Series observed on-site.

Test pit profiles from Keach-Nordstrom Associates, Inc. have been included in this report. A Site-Specific Soil Map Unit legend for the site-specific soil map symbols used in the preparation of this map is also attached to this report.

This completes the narrative report that accompanies the site-specific soil map prepared for the site identified as Map 43 Lot 20-2, Milford, New Hampshire. If there are any questions regarding the soil map or the report, please feel free to contact me at 776-5825.

Sincerely,

Stoney Ridge Environmental, LLC

STATE OF NEW HAMPSHIRE CYNTHIA M. BALCIUS No. 088 CERTIFIED SOIL SCIENTIST

Cynthia M. Balcius, CSS, CWS, CPESC
Senior Soil & Wetland Scientist 2/4/24

Stoney Ridge ENVIRONMENTAL LLC

TP #1

LOGGED BY TEC
DATE: 11/21/2022
E.S.H.W.T. @ 36"
ROOTS @ 18"
SEEPS NONE @ 70"
REFUSAL NONE @ 70"

0"	
	10YR 3/3 DARK BROWN, SANDY LOAM, SUB ANGULAR BLOCKY, FRIABLE
8"	
	10YR 5/6 YELLOWISH BROWN, GRAVELY SAND, SINGLE GRAIN LOOSE, 20% FINE GRAVEL
14"	
	2.5Y 5/4 LIGHT OLIVE BROWN, GRAVELY SAND, SINGLE GRAIN, LOOSE, 25% FINE GRAVEL
70" BOTTOM OF HOLE	

TP #2

LOGGED BY TEC
DATE: 11/21/2022
E.S.H.W.T. @ 51"
ROOTS NONE @ 60"
SEEPS NONE @ 60"
REFUSAL NONE @ 60"

0"	
	MIXED SANDY FILL
18"	
	10YR 3/3 DARK BROWN, SANDY LOAM, MASSIVE, FRIABLE
21"	
	10YR 5/6 YELLOWISH BROWN, FINE SANDY LOAM, MASSIVE, FRIABLE
26"	
	2.5Y 5/4 LIGHT OLIVE BROWN, FINE SANDY LOAM, MASSIVE, FRIABLE
34"	
	2.5Y 6/4 LIGHT YELLOWISH BROWN, GRAVELY COARSE SAND, SINGLE GRAIN, LOOSE, 20% FINE GRAVEL
44"	
	2.5Y 6/3 LIGHT YELLOWISH BROWN, FINE TO MEDIUM SAND, SINGLE GRAIN, LOOSE, 5% FINE GRAVEL
60" BOTTOM OF HOLE	

TP #3

LOGGED BY TEC
DATE: 11/21/2022
E.S.H.W.T. @ 19"
ROOTS NONE @ 62"
SEEPS NONE @ 62"
REFUSAL NONE @ 62"

0"	
	10YR 3/3 DARK BROWN, GRAVELY FINE SANDY LOAM, GRANULAR, FRIABLE
6"	
	2.5Y 5/6 LIGHT OLIVE BROWN, LOAMY FINE SAND, SUB ANGULAR BLOCKY, FRIABLE
13"	
	2.5Y 5/4 LIGHT OLIVE BROWN, LOAMY VERY FINE SAND, ANGULAR BLOCKY, VERY FRIABLE
22"	
	2.5Y 6/3 LIGHT YELLOWISH BROWN, VERY GRAVELY COARSE SAND, SINGLE GRAIN, LOOSE, 40% FINE GRAVEL
27"	
	2.5Y 6/3 LIGHT YELLOWISH BROWN, SAND WITH ALTERNATING LENSES OF 5Y 5/2 LIGHT GRAY, SILT
62" BOTTOM OF HOLE	

TP #4

LOGGED BY TEC
DATE: 11/21/2022
E.S.H.W.T. @ 28"
ROOTS NONE @ 42"
SEEPS NONE @ 63"
REFUSAL NONE @ 63"

0"	
	10YR 3/3 DARK BROWN, SANDY LOAM, GRANULAR, FRIABLE
3"	
	10YR 5/6 YELLOWISH BROWN, LOAMY SAND, WEAK FINE, GRANULAR, VERY FRIABLE
9"	
	2.5Y 6/4 LIGHT YELLOWISH BROWN, COARSE SAND, SINGLE GRAIN, LOOSE, 10% FINE GRAVEL
14"	
	2.5Y 7/2 LIGHT GRAY, VERY FINE SAND, ANGULAR, BLOCKY
24"	
	2.5Y 6/3 LIGHT YELLOWISH BROWN, GRAVELY MEDIUM TO FINE SAND, MASSIVE, FRIABLE
33"	
	2.5Y 5/2 GRAYISH BROWN STONY LOAMY SAND, MASSIVE, FRIABLE
63" BOTTOM OF HOLE	

TP #5

LOGGED BY TEC
DATE: 11/21/2022
E.S.H.W.T. @ 37"
ROOTS NONE @ 38"
SEEPS NONE @ 60"
REFUSAL NONE @ 60"

0"	
	10YR 3/3 DARK BROWN, FINE SANDY LOAM, GRANULAR, FRIABLE
8"	
	10YR 5/6 YELLOWISH BROWN, GRAVELY SANDY LOAM, GRANULAR, FRIABLE
15"	
	10YR 5/8 YELLOWISH BROWN, GRAVELY LOAMY SAND, SUB ANGULAR BLOCKY, FRIABLE
24"	
	2.5Y 6/4 LIGHT YELLOWISH BROWN, STONY LOAMY SAND, MASSIVE, FRIABLE
60" BOTTOM OF HOLE	

TP #6

LOGGED BY TEC
DATE: 11/21/2022
E.S.H.W.T. @ 32"
ROOTS NONE @ 33"
SEEPS NONE @ 60"
REFUSAL NONE @ 60"

0"	
	10YR 3/3 DARK BROWN, FINE SANDY LOAM, GRANULAR, FRIABLE
12"	
	10YR 4/6 DARK YELLOWISH BROWN, FINE SANDY LOAM, GRANULAR, FRIABLE
20"	
	2.5Y 5/6 LIGHT OLIVE BROWN, GRAVELY FINE SANDY LOAM, SUB ANGULAR BLOCKY, FRIABLE
26"	
	2.5Y 5/3 LIGHT OLIVE BROWN, STONY LOAMY SAND, MASSIVE, FRIABLE
60" BOTTOM OF HOLE	

KNA
South Street, Milford, NH
SRE# 24-006
February 10, 2024

SITE-SPECIFIC SOIL MAP UNIT KEY

Symbol	Map Unit	Slope Class %	Drainage Class	HSG/Group
34A/PD	Wareham fine sandy loam	0-3%	Poorly Drained	C/5
313A	Deerfield loamy sand	3-8%	Moderately Well Drained	B/3
313B	Deerfield loamy sand	3-8%	Moderately Well Drained	B/3
313C	Deerfield loamy sand	8-15%	Moderately Well Drained	B/3
444B	Newfields fine sandy loam	3-8%	Moderately Well Drained	B/3
444C	Newfields fine sandy loam	8-15%	Moderately Well Drained	B/3
444D	Newfields fine sandy loam	15-25%	Moderately Well Drained	B/3
200B/dbaab	Udorthents, smoothed	3-8%	Moderately Well Drained	B/3
200D/dbaab	Udorthents, smoothed	15-25%	Moderately Well Drained	B/3

"This map product is within the technical standards of the National Cooperative Soil Survey. It is a special purpose product, produced by a certified soil scientist, and is not a product of the USDA Natural Resources Conservation Service. There is a narrative report that accompanies this map and map key."

LEGEND

- GB–F GRANITE BOUND FOUND
- IP–F IRON PIPE FOUND
- IR–F IRON ROD FOUND
- DH–F DRILL HOLE FOUND
- DH–S DRILL HOLE SET
- UTILITY POLE
- WATER VALVE
- HYDRANT
- SEWER MANHOLE
- CATCH BASIN
- FLARED END SECTION
- ABUTTER LINE
- PROPERTY LINE
- WETLAND
- OHU OVERHEAD UTILITIES
- W WATER LINE
- DRAINAGE LINE
- TREELINE
- EOP EDGE OF PAVEMENT
- 10' CONTOUR
- 2' CONTOUR
- STONEWALL
- SOIL LINE
- SETBACK
- EASEMENT

SCS SOILS LEGEND

CaB	CANTON FINE SANDY LOAM 0 TO 8 PERCENT SLOPES
CaC	CANTON FINE SANDY LOAM 8 TO 15 PERCENT SLOPES
CmD	CANTON FINE SANDY LOAM 15 TO 25 PERCENT SLOPES

SOURCE: USDA–SCS WEB SOIL SURVEY HILLSBOROUGH COUNTY

SITE SPECIFIC SOIL MAP UNIT KEY

SYMBOL	MAP UNIT	DRAINAGE CLASS	HSG
34A/PD	WAREHAM	POORLY DRAINED	C
313	DEERFIELD FINE SANDY LOAM	MODERATELY WELL DRAINED	B
444	NEWFIELDS FINE SANDY LOAM	MODERATELY WELL DRAINED	B
299	UDORTHENTS SMOOTHED	WELL DRAINED	B

SOIL SLOPE BREAKDOWN:
A 0–3% B 3–8% C 8–15% D 15–25%

THIS MAP PRODUCT IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOILS SURVEY. IT IS A SPECIAL PURPOSE PRODUCT, PRODUCED BY A CERTIFIED SOIL SCIENTIST, AND IS NOT A PRODUCT OF THE USDA NATURAL RESOURCE CONSERVATION SERVICE. THERE IS A NARRATIVE REPORT THAT ACCOMPANIES THIS MAP AND MAP KEY.

THIS SITE–SPECIFIC SOIL MAP WAS COMPLETED BY CYNTHIA M. BALCIUS, NEW HAMPSHIRE CERTIFIED SOIL SCIENTIST #82 OF STONEY RIDGE ENVIRONMENTAL LLC. FIELD WORK WAS COMPLETED ON THE FOLLOWING DATE(S): FEBRUARY 2024

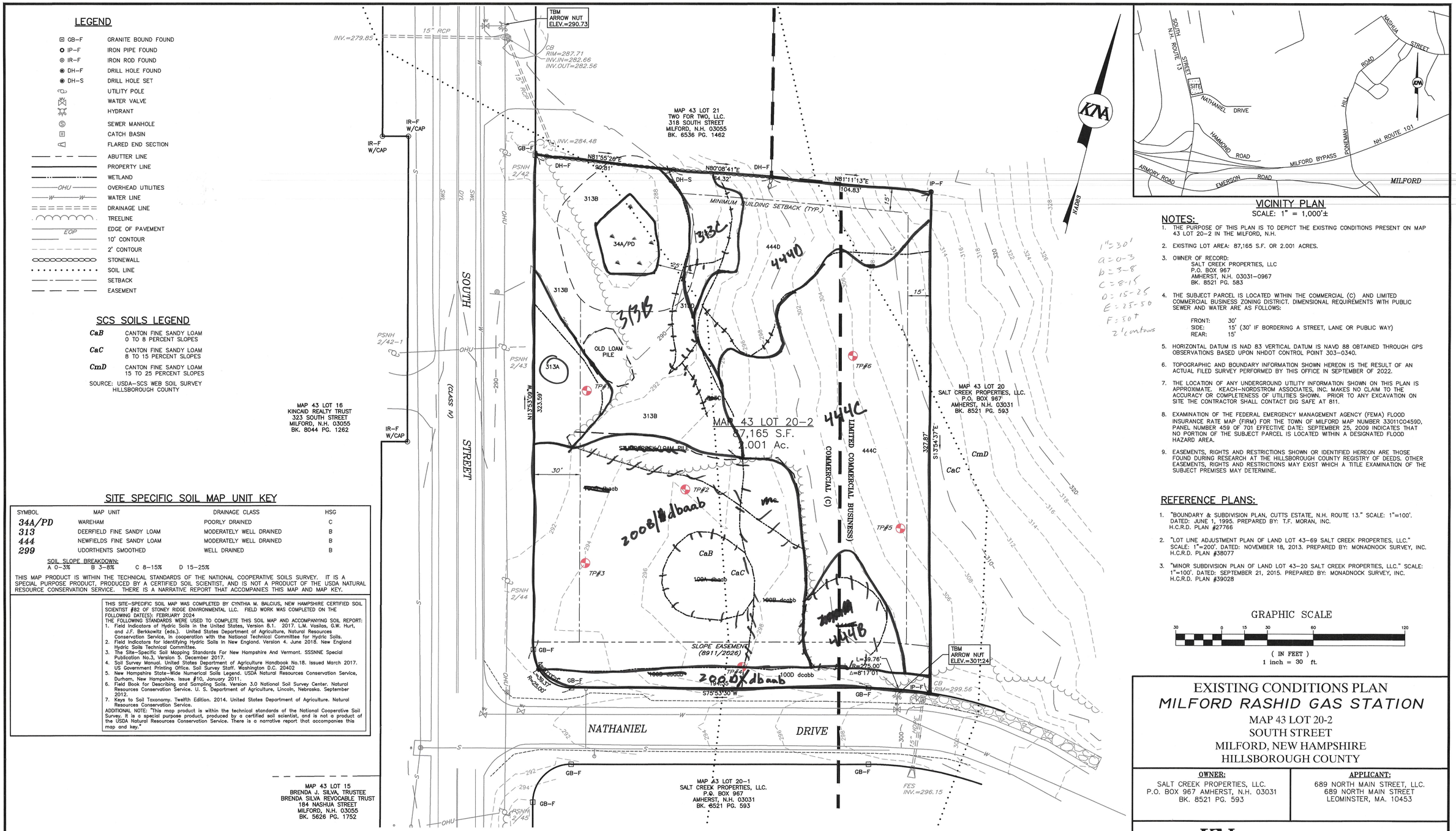
THE FOLLOWING STANDARDS WERE USED TO COMPLETE THIS SOIL MAP AND ACCOMPANYING SOIL REPORT:

1. Field Indicators of Hydric Soils in the United States, Version 8.1. 2017. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz (eds.). United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the National Technical Committee for Hydric Soils.
2. Field Indicators for Identifying Hydric Soils in New England. Version 4. June 2018. New England Hydric Soils Technical Committee.
3. The Site–Specific Soil Mapping Standards For New Hampshire And Vermont. SSSNNE Special Publication No.3, Version 5. December 2017.
4. Soil Survey Manual. United States Department of Agriculture Handbook No.18. Issued March 2017. US Government Printing Office. Soil Survey Staff. Washington D.C. 20402
5. New Hampshire State–Wide Numerical Soils Legend. USDA Natural Resources Conservation Service, Durham, New Hampshire. Issue #10, January 2011.
6. Field Book for Describing and Sampling Soils. Version 3.0 National Soil Survey Center. Natural Resources Conservation Service. U. S. Department of Agriculture, Lincoln, Nebraska. September 2012.
7. Keys to Soil Taxonomy. Twelfth Edition. 2014. United States Department of Agriculture. Natural Resources Conservation Service.

ADDITIONAL NOTE: "This map product is within the technical standards of the National Cooperative Soil Survey. It is a special purpose product, produced by a certified soil scientist, and is not a product of the USDA Natural Resources Conservation Service. There is a narrative report that accompanies this map and key."

JURISDICTIONAL WETLANDS WERE DELINEATED BY CYNTHIA M. BALCIUS, CWS #061, CSS & CPESC OF STONEY RIDGE ENVIRONMENTAL LLC. IN FEBRUARY 2024, UTILIZING THE FOLLOWING STANDARDS:

1. United States Department of Agriculture, Natural Resources Conservation Service. 2018. *Field Indicators of Hydric Soils in the United States*, version 8.2. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.
2. *Field Indicators for Identifying Hydric Soils in New England*. Version 4. April 2019. New England Hydric Soils Technical Committee.
3. *U.S. Army Corps of Engineers 2020: National Wetland Plant List, version 3.5 (http://wetland_plants.usace.army.mil).* U.S. Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH.
4. *The National Wetland Plant List: 2016 wetland ratings.* Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. Phytoneuron 2016–30: 1–17. Published 28 April 2016. ISSN 2153 733X.
5. *Corps of Engineers Wetlands Delineation Manual.* January 1987. Wetlands Research Program Technical Report Y–87–1.
6. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual:* Northcentral and Northeast Region. January 2012, Version 2. U.S. Army Corps of Engineers. Environmental Laboratory ERDC/EL TR–12–1.
7. *Classification of Wetlands and Deepwater Habitats of the United States.* December 1979. L. Cowardin, V. Carter, F. Golet, and E. LaRoe. US Department of the Interior. Fish and Wildlife Service. FWS/OBS–79/31.



VICINITY PLAN

SCALE: 1" = 1,000'±

NOTES:

1. THE PURPOSE OF THIS PLAN IS TO DEPICT THE EXISTING CONDITIONS PRESENT ON MAP 43 LOT 20–2 IN THE MILFORD, N.H.
2. EXISTING LOT AREA: 87,165 S.F. OR 2.001 ACRES.
3. OWNER OF RECORD:
   SALT CREEK PROPERTIES, LLC
   P.O. BOX 967
   AMHERST, N.H. 03031–0967
   BK. 8521 PG. 583
4. THE SUBJECT PARCEL IS LOCATED WITHIN THE COMMERCIAL (C) AND LIMITED COMMERCIAL BUSINESS ZONING DISTRICT. DIMENSIONAL REQUIREMENTS WITH PUBLIC SEWER AND WATER ARE AS FOLLOWS:

FRONT:	30'
SIDE:	15' (30' IF BORDERING A STREET, LANE OR PUBLIC WAY)
REAR:	15'

5. HORIZONTAL DATUM IS NAD 83 VERTICAL DATUM IS NAVD 88 OBTAINED THROUGH GPS OBSERVATIONS BASED UPON NHDOT CONTROL POINT 303–0340.
6. TOPOGRAPHIC AND BOUNDARY INFORMATION SHOWN HEREON IS THE RESULT OF AN ACTUAL FILED SURVEY PERFORMED BY THIS OFFICE IN SEPTEMBER OF 2022.
7. THE LOCATION OF ANY UNDERGROUND UTILITY INFORMATION SHOWN ON THIS PLAN IS APPROXIMATE. KEACH–NORDSTROM ASSOCIATES, INC. MAKES NO CLAIM TO THE ACCURACY OR COMPLETENESS OF UTILITIES SHOWN. PRIOR TO ANY EXCAVATION ON SITE THE CONTRACTOR SHALL CONTACT DIG SAFE AT 811.
8. EXAMINATION OF THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP (FIRM) FOR THE TOWN OF MILFORD MAP NUMBER 33011C0459D, PANEL NUMBER 459 OF 701 EFFECTIVE DATE: SEPTEMBER 25, 2009 INDICATES THAT NO PORTION OF THE SUBJECT PARCEL IS LOCATED WITHIN A DESIGNATED FLOOD HAZARD AREA.
9. EASEMENTS, RIGHTS AND RESTRICTIONS SHOWN OR IDENTIFIED HEREON ARE THOSE FOUND DURING RESEARCH AT THE HILLSBOROUGH COUNTY REGISTRY OF DEEDS. OTHER EASEMENTS, RIGHTS AND RESTRICTIONS MAY EXIST WHICH A TITLE EXAMINATION OF THE SUBJECT PREMISES MAY DETERMINE.

1"=30'
a=0–3
b=3–8
C=8–15
D=15–25
E=25–50
F=50+
2' contours

REFERENCE PLANS:

1. "BOUNDARY & SUBDIVISION PLAN, CUTTS ESTATE, N.H. ROUTE 13." SCALE: 1"=100'. DATED: JUNE 1, 1995. PREPARED BY: T.F. MORAN, INC. H.C.R.D. PLAN #27766
2. "LOT LINE ADJUSTMENT PLAN OF LAND LOT 43–69 SALT CREEK PROPERTIES, LLC." SCALE: 1"=200'. DATED: NOVEMBER 18, 2013. PREPARED BY: MONADNOCK SURVEY, INC. H.C.R.D. PLAN #38077
3. "MINOR SUBDIVISION PLAN OF LAND LOT 43–20 SALT CREEK PROPERTIES, LLC." SCALE: 1"=100'. DATED: SEPTEMBER 21, 2015. PREPARED BY: MONADNOCK SURVEY, INC. H.C.R.D. PLAN #39028

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

UTILITY NOTE

THE UNDERGROUND UTILITIES DEPICTED HEREON HAVE BEEN DRAWN FROM FIELD SURVEY INFORMATION AND OR PLOTTED FROM EXISTING DRAWINGS. KEACH–NORDSTROM ASSOCIATES, INC. MAKES NO GUARANTEES THAT THE UNDERGROUND UTILITIES DEPICTED COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. FURTHER, KEACH–NORDSTROM ASSOCIATES, INC. DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM THE INFORMATION AVAILABLE. KEACH–NORDSTROM ASSOCIATES, INC. HAS NOT PHYSICALLY LOCATED THE UNDERGROUND PORTIONS OF THE UTILITIES.

DIG SAFE — UTILITIES UNDERGROUND PLANT DAMAGE PREVENTION SYSTEM — 811 — CALL TOLL FREE

CERTIFICATION:

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR THOSE UNDER MY DIRECT SUPERVISION. FURTHER, THAT THIS PLAN IS BASED ON AN ACTUAL FIELD SURVEY MADE BY THIS OFFICE DURING SEPTEMBER OF 2022. SAID SURVEY HAS A RELATIVE ERROR OF CLOSURE OF ONE PART IN TEN THOUSAND (1:10,000) OR BETTER.

LICENSED LAND SURVEYOR — DATE

EXISTING CONDITIONS PLAN
MILFORD RASHID GAS STATION

MAP 43 LOT 20-2
SOUTH STREET
MILFORD, NEW HAMPSHIRE
HILLSBOROUGH COUNTY

OWNER:	APPLICANT:
SALT CREEK PROPERTIES, LLC. P.O. BOX 967 AMHERST, N.H. 03031 BK. 8521 PG. 593	689 NORTH MAIN STREET, LLC. 689 NORTH MAIN STREET LEOMINSTER, MA. 10453

KEACH–NORDSTROM ASSOCIATES, INC.
Civil Engineering Land Surveying Landscape Architecture
10 Commerce Park North, Suite 3B, Bedford, NH 03110 Phone (603) 627–2881

REVISIONS

No.	DATE	DESCRIPTION	BY

DATE: FEBRUARY 15, 2024 — SCALE: 1" = 30'
PROJECT NO: 21–0526–1A — SHEET 2 OF 21

19. OPERATION and MAINTENANCE PLAN with CHECKLIST

STORMWATER

OPERATION & MAINTENANCE PLAN

Milford Rashid Gas Station
South Street
Milford, New Hampshire

Map 43; Lot 20-2

February 19, 2024

KEACH-NORDSTROM ASSOCIATES, INC.

TABLE OF CONTENTS:

I. General

Introduction

The project owner or their assigned heirs will maintain the stormwater treatment facilities after construction is completed. The applicant of the project is 689 North Main Street LCC, 689 North Main Street, Leominster, MA 01453.

The subject property is referenced on Map 43; Lot 20-2 in Milford, New Hampshire. Any transfer of responsibility for inspection and maintenance activities or transfer of ownership shall be documented to the New Hampshire Department of Environmental Services and Town of Milford in writing. The contract documents will require the contractor to designate a person responsible for maintenance of the sedimentation control features during construction. Long-term operation and maintenance for the stormwater management facilities are presented below.

Maintenance will be performed as described and required in the Alteration of Terrain Permit unless and until the system is formally accepted by a municipality or quasi-municipal district, or is placed under the jurisdiction of a legally created association that will be responsible for the maintenance of the system.

Post Construction:

The following standards will be met after construction is complete:

Documentation:

A maintenance log will be kept summarizing inspections, maintenance, and any corrective actions taken. The log will include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. A photo must be included. If a maintenance task requires the clean out of any sediments or debris, the location where the sediment and debris was disposed after removal will be indicated. The log will be made accessible to department and/or Town staff and NHDES staff and a copy provided upon request.

Maintenance Requirements

Subsurface Detention Systems:

- Removal of accumulated sediment.
- Systems should be inspected at least twice annually with maintenance or rehabilitation conducted as warranted by such inspection.
- Trash and debris should be removed at each inspection.

Catch Basins and Closed Drainage Network:

- Catch basins may require frequent maintenance. This may require several cleanings of the sumps each year. At a minimum, it is recommended that catch basins be inspected at least twice annually.
- Sediment should be removed when it approaches half of the sump depth.
- If floating hydrocarbons are observed during an inspection, the material should be removed immediately by skimming, absorbent materials, or other methods and disposed in conformance with the applicable state and federal regulations.

Bioretention Ponds:

- Systems should be inspected at least twice annually, and following any rainfall event exceeding 2.5 inches in a 24-hour period, with maintenance or rehabilitation conducted as warranted by such inspection.
- Pre-treatment measures should be inspected at least twice annually, and cleaned of accumulated sediment as warranted by inspection, but no less than once annually.
- Trash and debris should be removed at each inspection.
- At least once annually, the system should be inspected for drawdown time. If the pond does not drain within 72-hours following a rainfall event, a qualified professional should assess the condition of the facility to determine measures required to restore filtration function, including but not limited to the removal of accumulated sediments or reconstruction of the filter media.
- Vegetation should be inspected at least annually, and maintained in healthy condition, including pruning, removal and replacement of dead or diseased vegetation, and removal of invasive species.

Outlet Protection:

- Inspect the outlet protection annually for damage and deterioration. Repair damages immediately.

General:

- If any invasive species begin to grow in the stormwater management practices the species shall be disposed of in an appropriate manner that will not allow the pest to survive or spread. The disposal of such species shall be witnessed or approved by a state inspector. Methods for disposal may include, but not be limited to:

- Encapsulating the plant(s) in plastic bags and disposing of the plant material in one of the following ways:
    - Trash pickup;
    - Discarding;
    - Open burning;
    - Incineration; or
    - Burial of infested nursery.

II. Supporting Documents

Annual Inspection and Maintenance Reporting Form
for
Milford Rashid Gas Station
Milford, New Hampshire

Date: _____

To: 689 North Main Street LLC

Re: Certification of Inspection and Maintenance; Submittal of Forms

Property Name: _____

Property Address: _____

Contact Name: _____

Contact Phone #: _____

Contact Email Address: _____

I verify that the required stormwater facility inspections and required maintenance have been completed in accordance with the Operation & Maintenance Plan associated with the above referenced property.

The required Long-Term Inspection & Maintenance Plan Checklist is attached to this form.

_____ _____
Name of Party Responsible for Inspection & Maintenance — Property Owner

_____ _____
Authorized Signature — Signature

Long-Term Inspection & Maintenance Plan Checklist
Milford Rashid Gas Station – Milford, NH

Current Owner Name:	Date:
Business Address:	Inspector:
Weather:	
Date of Last Rainfall:	Amount: Inches:

Best Management Practice

Subsurface Detention Systems	Reason for Inspection		
	Spring ☐	Fall/Yearly ☐	After Major Storm ☐

Maintenance Required? Yes ☐ No ☐
Corrective Action Needed & Notes:

Catch Basins & Closed Drainage Network	Reason for Inspection		
	Spring ☐	Fall/Yearly ☐	After Major Storm ☐

Maintenance Required? Yes ☐ No ☐
Corrective Action Needed & Notes:

Bioretention Ponds	Reason for Inspection		
	Spring ☐	Fall/Yearly ☐	After Major Storm ☐

Maintenance Required? Yes ☐ No ☐
Corrective Action Needed & Notes:

Visual inspection of drawdown time Yes ☐ No ☐

Drawdown time less than 72 hours? Yes ☐ No ☐
(if no, call a qualified professional for inspection)

General	Reason for Inspection		
	Spring ☐	Fall/Yearly ☐	After Major Storm ☐

Maintenance Required? Yes ☐ No ☐
Corrective Action Needed & Notes:

Long-Term Inspection & Maintenance Log
Milford Rashid Gas Station – Milford, NH

Date	Inspection (Yes or No)	Maintenance (Yes or No)	List BMPs Inspected and/or Provide Comments	Inspected By:

Anti-icing Route Data Form
Milford Rashid Gas Station – Milford, NH

Truck Station:				
Date:				
Temperature:	Pavement Temperature:	Relative Humidity:	Dew Point:	Sky:
Reason For Applying:				
Route:				
Chemical:				
Application Time:				
Application Amount:				
Observation (first day):				
Observation (after event):				
Observation (before next application):				
Name:				

III. Control of Invasive Plants

Invasive plants are introduced, alien, or non-native plants, which have been moved by people from their native habitat to a new area. Some Exotic plants are imported for human use such as landscaping, erosion control, or food crops. They also can arrive as “hitchhikers” among shipments of other plants, seeds, packing materials, or fresh produce. Some exotic plants become invasive and cause harm by:

- becoming weedy and overgrown;
- killing established shade trees;
- obstructing pipes and drainage systems;
- forming dense beds in water;
- lowering water levels in lakes, streams, and wetlands;
- destroying natural communities;
- promoting erosion on stream banks and hillsides; and
- resisting control except by hazardous chemical.

During maintenance activities, check for the presence of invasive plants and suitably remove according to the methods provided in the table below. The following table, based on the “Control of Invasive Plants” published by the New Hampshire Department of Agriculture, describes the most common invasive plants in this region and proper methods of disposal.

Name	Description	Invasive Qualities	Control Methods
Invasive Trees			
Norway Maple	- Large leaves - Will exude milky white sap when leaves are broken - Leaves turn color in Late October (fall foliage is yellow)	- Suppresses growth of grass, garden plants, and forest understory -Wind-borne seeds can germinate and grow in deep shade	- Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out plants, including the root systems. Use a forked spade or weed wrench. - Cut down the tree. Grind out the stump, or clip off re-growth. - Girdle[1] - Frill[2] - Cut stem/ cut stump with glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Foliar spray with glyphosate [3]* (mid-October to early November).
Tree of Heaven	- Long compound leaves with 11-25 lance shaped leaflets - Smell like peanut butter or burnt coffee when crushed	- Tough, can grow in poor conditions - Produces large quantities of wind-borne seeds - Grows rapidly - Secretes a toxin that kills other plants - Cannot be removed by mechanical means alone	- Pull seedlings when soil is moist. - Frill[2] (no more than 1” gap between cuts). Use Garlon 3a herbicide. - Cut stem/ cut stump with Garlon 3a. Follow label directions for cut stump application. Clip off sucker sprouts or paint with Garlon 3a.* - Foliar spray[3]* (on regrowth) - Paint bottom 12” of bark with Garlon 4 Ultra (February/March). Use maximum strength specified on label for all herbicide applications.
Invasive Shrubs			
Autumn Olive	- Formerly recommended for erosion control and wildlife value	- Highly invasive, diminishes the overall quality of wildlife habitat	- Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs (up to 4” diameter trunks). - Cut down the tree. Grind out the stump, or clip off re-growth. - Cut stem/ cut stump with glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Bury stump - Do not mow

Invasive Shrubs (continued)			
Multiflora Rose	- Formerly recommended for erosion control, hedges, and wildlife habitat - Covered in white flowers in June - Very hard, curved thorns - Fringed edge to leaf stalk	- Huge shrub that chokes out all other vegetation - Too dense for most birds to nest in - Grows up trees like a vine in Shade	- Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems (at least 6" from the crown and 6" down). Use a forked spade or weed wrench for trees or shrubs. - Controlled burning[4] (on extensive infestations) - Cut stem/ cut stump with glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Foliar spray[3]* (mix Rodeo with extra sticker-spreader, or use Roundup Sure Shot Foam on small plants) - Herbicide may be applied in winter when other plants are dormant.
Bush Honeysuckles	- Includes Belle, Amur, Morrow's, and Tatarian Honeysuckle	- Creates dense shade reducing plant diversity and eliminating nest sites in forest interior spaces	- Deadhead to prevent spread of seeds (on ornamentals). Cut off seeds or fruits before they ripen. Bag and burn, or send to a landfill. - Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs. - Mow or cutting at least 4 times a season to deplete plants' store of nutrients and carbohydrates, reduce seed formation, and kill or minimize spread of plants. If necessary, repeat each year (on shady sites only, brush cut in early spring and fall). - Controlled burning[4] (during growing season) - Cut down the tree. Grind out the stump, or clip off re-growth. - Cut stem/ cut stump with Glyphosate (late in the growing season). Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.*

Invasive Shrubs (continued)			
Blunt-Leaved Privet	- Medium sized shrub - Simple, oblong, dark green leaves 1-2” in length - Fragrant white flowers (spring) - Blackish-purple fruit (late summer)	- Toxic to mammals - Loss of valuable habitat	- Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs. - Cut down the tree. Grind out the stump, or clip off re-growth. - Cut stem/ cut stump with Glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Trim off all flowers - Do not cut back or mow
Burning Bush, Winged Euonymus	- Wide, corky wings on the Branches - Brilliant red autumn leaves - Fruit	- High seed production	- Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs. - Cut down the tree. Grind out the stump, or clip off re-growth. - Cut stem/ cut stump with Glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Trim off all flowers
Japanese Barberry	- Spiny deciduous shrub - Small leaves	- Very dense, displaces native plants - Can change chemistry of soil	- Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs. - Cut down the tree. Grind out the stump, or clip off re-growth. - Cut stem/ cut stump with Glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Trim off all flowers

Invasive Woody Vines			
Japanese Honeysuckle	- Gold and White flowers - Heavy scent and sweet nectar in June	- Shade shrubs and young trees of the forest understory, eventually killing them, and changing the open structure of the forest into a dense tangle - Rampant grower - Spirals around trees, often strangling them	- Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs. - Mow or cutting at least 4 times a season to deplete plants' store of nutrients and carbohydrates, reduce seed formation, and kill or minimize spread of plants. If necessary, repeat each year. - Cut stem/ cut stump with Glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Foliar spray[3]* (fall or early spring when native vegetation is dormant) Plan to re-treat repeatedly
Oriental Bittersweet	- Bright orange seed capsules in clusters all along the stem - Flowers	- Shade shrubs and young trees of the forest understory, eventually killing them, and changing the open structure of the forest into a dense tangle	- Pull seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs. - Keep ornamental plants cut back, remove all fruits as soon as they open, and bag or burn fruits. - Cut stem/ cut stump with Garlon 3a. Follow label directions for cut stump application. Clip off sucker sprouts or paint with Garlon 3a.*
Japanese Knotweed, Mexican Bamboo	- The stems have knotty joints, similar to bamboo - Grows 6-10’ tall - Large, pointed oval or triangular leaves	- Shade shrubs and young trees of the forest understory, eventually killing them, and changing the open structure of the forest into a dense tangle - Can grow in shade	- Cut stem/ cut stump with Glyphosate (at least 3 times each during growing season). Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Foliar spray[3]* - Treat with Rodeo - In gardens, heavy mulch or dense shade may kill it.

Invasive Herbaceous Plants			
Garlic Mustard	- White-flowered biennial - Rough scalloped leaves (kidney, heart, or arrow shaped) - Garlic smell, mustard taste when its leaves are crushed	- Shade shrubs and young trees of the forest understory, eventually killing them, and changing the open structure of the forest into a dense tangle - Rampant grower - Spirals around trees, often strangling them	- Pull seedlings and small or shallow-rooted plants when soil is moist (before it flowers in spring). Dig out larger plants, including the crown and root systems. Use a forked spade or weed wrench for trees or shrubs. Tamp down soil afterwards. - Deadhead to prevent spread of seeds. Cut off seeds or fruits before they ripen. Bag and burn or send to a landfill. - Foliar spray[3]* (may be appropriate in some settings)
Japanese Stilt Grass	- Lime green color - Line of silvery hairs down the middle of the 2-3” long blade	- Tolerates sun or dense shade -Quickly invades areas left bare or disturbed by tilling or flooding - Builds a large seed bank in the soil	- Pull seedlings and small or shallow-rooted plants when soil is moist (pulled easily in early to mid-summer).Dig out larger plants, including root systems. Use a forked spade or weed wrench for trees or shrubs. Be sure to pull before it goes to seed. If seeds have formed, bag and burn or send to a landfill. - Mow or cutting at least 4 times a season to deplete plants’ store of nutrients and carbohydrates, reduce seed formation, and kill or minimize spread of plants. If necessary, repeat each year. Mowing weekly or when it has just begun to flower may prevent it from setting seed. - Foliar spray[3]* (use glyphosate or herbicidal soap on large infestations. - Use a corn-based pre-emergence herbicide on annual weeds (spring). This product is also an organic fertilizer, i.e., it can stimulate growth of existing plants, including weeds, so it is appropriate for lawns and gardens but may not be appropriate in woodlands.

Invasive Herbaceous Plants (continued)			
Mile-A-Minute Vine, Devil's Tail Tearthumb	- Triangular leaves - Barbed stems - Turquoise berries	- Rapid growth - Quickly covers and shades out herbaceous plants	- Pull seedlings and small or shallow-rooted plants when soil is moist (pulled easily in early to mid-summer).Dig out larger plants, including root systems. Use a forked spade or weed wrench for trees or shrubs. Be sure to pull before it goes to seed. If seeds have formed, bag and burn or send to a landfill. - Mow or cutting at least 4 times a season to deplete plants' store of nutrients and carbohydrates, reduce seed formation, and kill or minimize spread of plants. If necessary, repeat each year. Mowing weekly or when it has just begun to flower may prevent it from setting seed. - Foliar spray[3]* (use glyphosate or herbicidal soap on large infestations. - Use a corn-based pre-emergence herbicide on annual weeds (spring). This product is also an organic fertilizer, i.e., it can stimulate growth of existing plants, including weeds, so it is appropriate for lawns and gardens but may not be appropriate in woodlands.
Spotted Knapweed	- Thistle-like flowers	- Dense, crowds out native species	- Do not pull unless the plant is young and the ground is very soft. The root will break and produce several new plants. - Wear sturdy gloves - Deadhead to prevent spread of seeds. Cut off seeds or fruits before they ripen. Bag and burn, or send to a landfill. - In lawns, spot treat with broad-leaf weed killer. Good lawn care practices (test soil; use lime and fertilizer only when soil test shows a need; mow high and frequently; leave clippings on lawn) reduce weed infestations. - Cut stem/ cut stump with Glyphosate. Follow label directions for cut stump application. Clip off sucker sprouts or paint with glyphosate.* - Foliar spray[3]*

[1]Girdle: Cut through the bark and growing layer all around the trunk, about 6" above the ground. Girdling is most effective in spring (when the sap is rising) & middle-late summer (when the tree is sending food to the roots). Clip off sucker sprouts.

[2]Frill: Using a machete, hatchet, or similar device, hack scars (several holes in larger trees) downward into the growing layer, and squirt in glyphosate (or triclopyr if specified in table). Follow label directions for injection and frill applications. This is most effective from middle to late summer. Clip off any sucker sprouts or treat with glyphosate.

[3]Foliar Spray: Use a backpack or garden sprayer or mist blower, following label directions. Avoid overspray and/or dripping onto non-target plants, because glyphosate kills most plants except moss. If it rolls off waxy or grass-like foliage, use additional sticker-spreader. Deciduous trees, shrubs, and perennials move nutrients down to the roots in late summer. Glyphosate is particularly effective at this time and when plants have just gone out of flowering. Several invasive species retain their foliage after native plants have lost theirs, and resume growth earlier in spring than most natives. This allows you to treat them without harming the natives. However, the plant must be actively growing for the herbicide to work. Retreatments may be necessary the following year if suckering occurs or the plant hasn't been entirely killed.

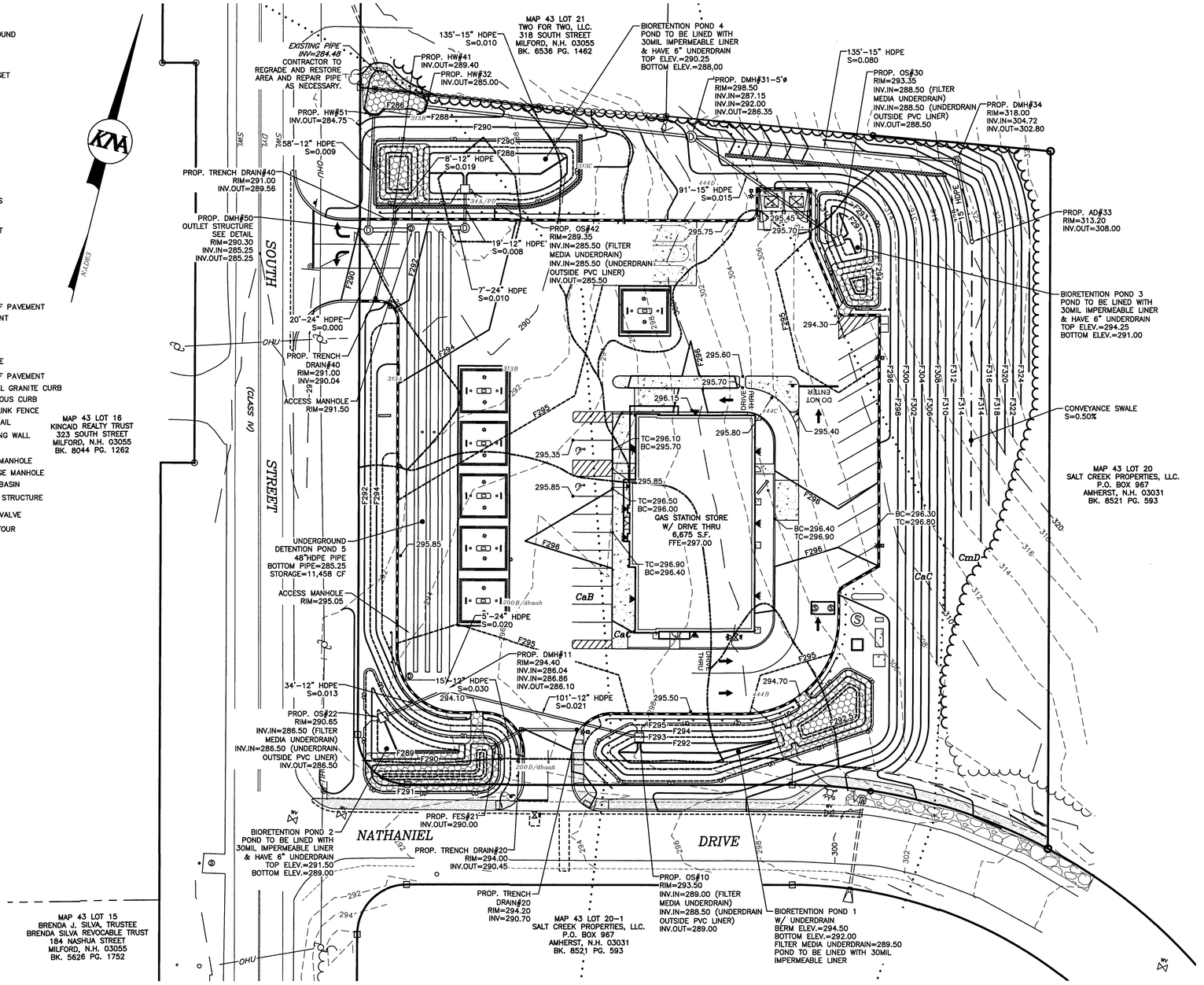
[4]Controlled Burning: Burning during the spring (repeated over several years) will allow native vegetation to compete more effectively with the invasive species. This requires a permit. Spot treatment with glyphosate in late fall can be used to make this method more effective

*Herbicides: It is highly recommended that small populations try to be controlled using non-chemical methods where feasible. However, for large infestations, and for a few plants herbicide use is essential. Apply herbicides carefully to avoid non-target plants, glyphosate is the least environmentally damaging herbicide in most cases. Add food coloring for visibility, and a soap-based sticker such as Cide-Kick. Glyphosate is ineffective on some plants; for these, triclopyr or Garlon 3a may be indicated. When using herbicides read the entire label and observe all precautions listed, including proper disposal. If in doubt, call your local Cooperative Extension Service.

IV. Stormwater Practice Location Plan

LEGEND

GB–F	GRANITE BOUND FOUND
IP–F	IRON PIPE FOUND
IR–F	IRON ROD FOUND
IP–TBS	IRON PIPE TO BE SET
	UTILITY POLE
	WATER VALVE
	HYDRANT
S	SEWER MANHOLE
	CATCH BASIN
	ABUTTER LINE
	PROPERTY LINE
	WETLAND
OHU	OVERHEAD UTILITIES
	TREELINE
EOP	EDGE OF PAVEMENT
	STONEWALL
	SETBACK
	EASEMENT
	ZONE LINE
	PROPOSED EDGE OF PAVEMENT
	PROPOSED EASEMENT
	PROPOSED SIGN
	PROPOSED LIGHT
	PROPOSED TREELINE
	PROPOSED EDGE OF PAVEMENT
	PROPOSED VERTICAL GRANITE CURB
	PROPOSED BITUMINOUS CURB
	PROPOSED CHAIN LINK FENCE
	PROPOSED GUARDRAIL
	PROPOSED RETAINING WALL
	PROPOSED SWALE
S	PROPOSED SEWER MANHOLE
D	PROPOSED DRAINAGE MANHOLE
	PROPOSED CATCH BASIN
	PROPOSED OUTLET STRUCTURE
W	PROPOSED WATER VALVE
	PROPOSED 2' CONTOUR
	10' CONTOUR
	2' CONTOUR



CONSTRUCTION NOTES:

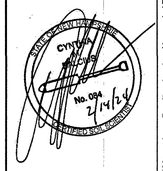
1. THE PURPOSE OF THIS PLAN IS TO SHOW THE PROPOSED GRADING AND DRAINAGE SYSTEMS FOR THIS SITE.
2. ALL WORK SHALL CONFORM TO THE APPLICABLE REGULATIONS AND STANDARDS OF THE TOWN OF MILFORD, AND SHALL BE BUILT IN A WORKMANLIKE MANNER IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS. ALL WORK PERFORMED IN THE NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION RIGHT-OF-WAY SHALL CONFORM TO THE STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, STATE OF NEW HAMPSHIRE, DEPARTMENT OF TRANSPORTATION, APPROVED AND ADOPTED 2010 ARE HEREBY INCORPORATED BY REFERENCE.
3. SEE DETAILS FOR DRAINAGE SPECIFICATIONS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING AND DETERMINING THE LOCATION, SIZE AND ELEVATION OF ALL EXISTING UTILITIES, SHOWN OR NOT SHOWN ON THESE PLANS, PRIOR TO THE START OF ANY CONSTRUCTION. THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY UTILITIES FOUND INTERFERING WITH THE PROPOSED CONSTRUCTION, AND APPROPRIATE REMEDIAL ACTION TAKEN BEFORE PROCEEDING WITH THE WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING "DIG SAFE" AT 811 AT LEAST 72 HOURS BEFORE DIGGING.
5. ALL DRAINAGE PIPE SHALL BE INSTALLED FOLLOWING MANUFACTURER'S INSTALLATION INSTRUCTIONS.

SITE SPECIFIC SOIL MAP UNIT KEY

SYMBOL	MAP UNIT	DRAINAGE CLASS	HSG/GROUP
34A/PD	WAREHAM FINE SANDY LOAM	POORLY DRAINED	C/5
313	DEERFIELD FINE SANDY LOAM	MODERATELY WELL DRAINED	B/3
444	NEWFIELDS FINE SANDY LOAM	MODERATELY WELL DRAINED	B/3
200	UDORTHENTS SMOOTHED	MODERATELY WELL DRAINED	B/3

SOIL SLOPE BREAKDOWN:
A 0–3% B 3–8% C 8–15% D 15–25%

THIS MAP PRODUCT IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOILS SURVEY. IT IS A SPECIAL PURPOSE PRODUCT, PRODUCED BY A CERTIFIED SOIL SCIENTIST, AND IS NOT A PRODUCT OF THE USDA NATURAL RESOURCE CONSERVATION SERVICE. THERE IS A NARRATIVE REPORT THAT ACCOMPANIES THIS MAP AND MAP KEY.



THIS SITE–SPECIFIC SOIL MAP WAS COMPLETED BY CYNTHIA M. BALCIUS, NEW HAMPSHIRE CERTIFIED SOIL SCIENTIST #82 OF STONEY RIDGE ENVIRONMENTAL LLC. FIELD WORK WAS COMPLETED ON THE FOLLOWING DATE(S): FEBRUARY 2024
THE FOLLOWING STANDARDS WERE USED TO COMPLETE THIS SOIL MAP AND ACCOMPANYING SOIL REPORT:
1. Field Indicators of Hydric Soils in the United States, Version 8.1. 2017. L.M. Vasilas, G.W. Hurt, and J.F. Berkbowitz (eds.). United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the National Technical Committee for Hydric Soils.
2. Field Indicators for Identifying Hydric Soils in New England. Version 4. June 2018. New England Hydric Soils Technical Committee.
3. The Site–Specific Soil Mapping Standards For New Hampshire And Vermont. SSSNNE Special Publication No.3, Version 5. December 2017.
4. Soil Survey Manual. United States Department of Agriculture Handbook No.18. Issued March 2017. US Government Printing Office. Soil Survey Staff. Washington D.C. 20402
5. New Hampshire State–Wide Numerical Soils Legend. USDA Natural Resources Conservation Service, Durham, New Hampshire. Issue #10, January 2011.
6. Field Book for Describing and Sampling Soils. Version 3.0 National Soil Survey Center. Natural Resources Conservation Service. U. S. Department of Agriculture, Lincoln, Nebraska. September 2012.
7. Keys to Soil Taxonomy. Twelfth Edition. 2014. United States Department of Agriculture. Natural Resources Conservation Service.

ADDITIONAL NOTE: "This map product is within the technical standards of the National Cooperative Soil Survey. It is a special purpose product, produced by a certified soil scientist, and is not a product of the USDA Natural Resources Conservation Service. There is a narrative report that accompanies this map and key."

SCS SOILS LEGEND

CaB	CANTON FINE SANDY LOAM 0 TO 8 PERCENT SLOPES
CaC	CANTON FINE SANDY LOAM 8 TO 15 PERCENT SLOPES
CmD	CANTON FINE SANDY LOAM 15 TO 25 PERCENT SLOPES

SOURCE: USDA–SCS WEB SOIL SURVEY HILLSBOROUGH COUNTY

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

DIG SAFE
811
UTILITIES UNDERGROUND PLANT DAMAGE PREVENTION SYSTEM

NPDES NOTE

THIS PROJECT DISTURBS IN EXCESS OF 1–ACRE OF LAND. THEREFORE IT WILL BE REQUIRED TO OBTAIN NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT COVERAGE AS ISSUED BY THE ENVIRONMENTAL PROTECTION AGENCY (EPA). THE OWNER/DEVELOPER AND "OPERATOR" (GENERAL CONTRACTOR) SHALL EACH BE REQUIRED TO PREPARE AND SUBMIT A NOTICE OF INTENT (NOI) TO THE EPA PRIOR TO THE START OF CONSTRUCTION AND SHALL BE RESPONSIBLE FOR THE PREPARATION AND IMPLEMENTATION OF A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) MEETING THE REQUIREMENTS OF THE CURRENT CONSTRUCTION GENERAL PERMIT.

GRADING & DRAINAGE PLAN
MILFORD RASHID GAS STATION
MAP 43 LOT 20-2
SOUTH STREET
MILFORD, NEW HAMPSHIRE
HILLSBOROUGH COUNTY

OWNER:
SALT CREEK PROPERTIES, LLC
P.O. BOX 967
AMHERST, NH 03031
BK. 8521 PG. 593

APPLICANT:
689 NORTH MAIN STREET LLC
689 NORTH MAIN STREET
LEOMINSTER, MA 10453

KEACH–NORDSTROM ASSOCIATES, INC.
Civil Engineering Land Surveying Landscape Architecture
10 Commerce Park North, Suite 3B, Bedford, NH 03110 Phone (603) 627–2881

REVISIONS			
No.	DATE	DESCRIPTION	BY

DATE: FEBRUARY 19, 2024	SCALE: 1" = 30'
PROJECT NO: 21–0526–1A	SHEET 5 OF 20

20. APPENDICES

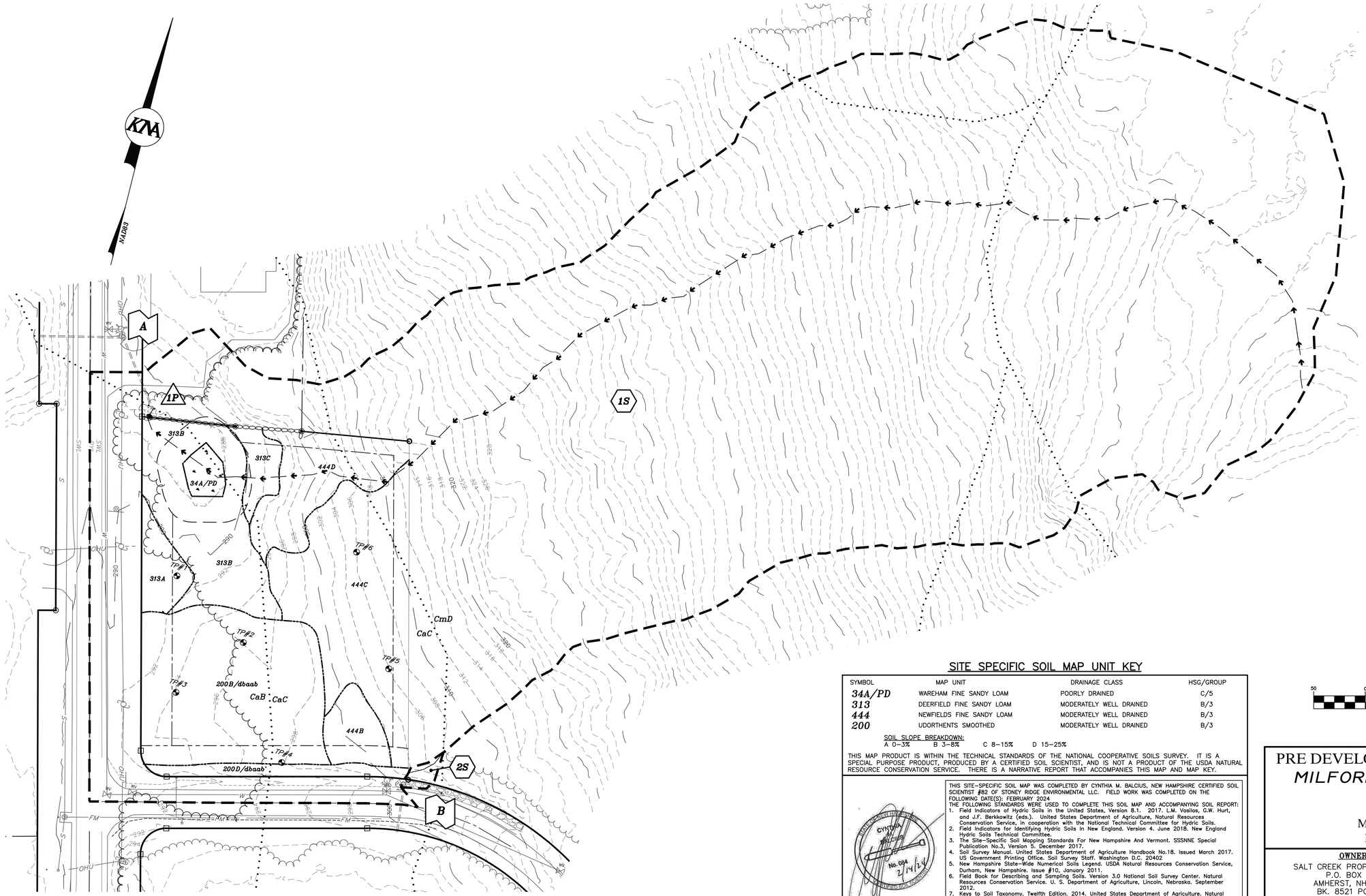
NON-RESIDENTIAL SITE PLAN SET (22" X 34" – COLORLESS)

PRE-DEVELOPMENT DRAIN AREA PLAN (22" X 34" – COLORLESS)

POST-DEVELOPMENT DRAIN AREA PLAN (22" X 34" – COLORLESS)

PRE-DEVELOPMENT DRAIN AREA PLAN (22" X 34" – COLOR)

POST-DEVELOPMENT DRAIN AREA PLAN (22" X 34" – COLOR)



DRAINAGE LEGEND:

THE LEGEND BELOW REFLECTS THE HYDROCAD MODEL USED FOR DRAINAGE CALCULATIONS.

- SCS SOIL LINES
- SITE SPECIFIC SOIL LINES
- 400B — DENOTES SOIL TYPE
- P — DENOTES POND
- S — DENOTES SUBCATCHMENT AREA
- R — DENOTES REACH
- L — DENOTES POINT OF INTEREST
- LIMIT OF SUBCATCHMENT AREA
- TIME OF CONCENTRATION
- REACH

SITE SPECIFIC SOIL MAP UNIT KEY

SYMBOL	MAP UNIT	DRAINAGE CLASS	HSG/GROUP
34A/PD	WAREHAM FINE SANDY LOAM	POORLY DRAINED	C/5
313	DEERFIELD FINE SANDY LOAM	MODERATELY WELL DRAINED	B/3
444	NEWFIELDS FINE SANDY LOAM	MODERATELY WELL DRAINED	B/3
200	UDORTHENTS SMOOTHED	MODERATELY WELL DRAINED	B/3

SOIL SLOPE BREAKDOWN:
A 0–3% B 3–8% C 8–15% D 15–25%

THIS MAP PRODUCT IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOILS SURVEY. IT IS A SPECIAL PURPOSE PRODUCT, PRODUCED BY A CERTIFIED SOIL SCIENTIST, AND IS NOT A PRODUCT OF THE USDA NATURAL RESOURCE CONSERVATION SERVICE. THERE IS A NARRATIVE REPORT THAT ACCOMPANIES THIS MAP AND MAP KEY.

THIS SITE–SPECIFIC SOIL MAP WAS COMPLETED BY CYNTHIA M. BALCIUS, NEW HAMPSHIRE CERTIFIED SOIL SCIENTIST #82 OF STONEY RIDGE ENVIRONMENTAL LLC. FIELD WORK WAS COMPLETED ON THE FOLLOWING DATE(S): FEBRUARY 2024
THE FOLLOWING STANDARDS WERE USED TO COMPLETE THIS SOIL MAP AND ACCOMPANYING SOIL REPORT:

1. Field Indicators of Hydric Soils in the United States, Version 8.1. 2017. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz (eds.). United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the National Technical Committee for Hydric Soils.
2. Field Indicators for Identifying Hydric Soils In New England. Version 4. June 2018. New England Hydric Soils Technical Committee.
3. The Site–Specific Soil Mapping Standards For New Hampshire And Vermont. SSSNNE Special Publication No.3, Version 5. December 2017.
4. Soil Survey Manual. United States Department of Agriculture Handbook No.18. Issued March 2017. US Government Printing Office. Soil Survey Staff. Washington D.C. 20402
5. New Hampshire State–Wide Numerical Soils Legend. USDA Natural Resources Conservation Service, Durham, New Hampshire. Issue #10, January 2011.
6. Field Book for Describing and Sampling Soils. Version 3.0 National Soil Survey Center. Natural Resources Conservation Service. U. S. Department of Agriculture, Lincoln, Nebraska. September 2012.
7. Keys to Soil Taxonomy. Twelfth Edition. 2014. United States Department of Agriculture. Natural Resources Conservation Service.

ADDITIONAL NOTE: "This map product is within the technical standards of the National Cooperative Soil Survey. It is a special purpose product, produced by a certified soil scientist, and is not a product of the USDA Natural Resources Conservation Service. There is a narrative report that accompanies this map and key."

SCS SOILS LEGEND

CaB	CANTON FINE SANDY LOAM 0 TO 8 PERCENT SLOPES
CaC	CANTON FINE SANDY LOAM 8 TO 15 PERCENT SLOPES
CmD	CANTON FINE SANDY LOAM 15 TO 25 PERCENT SLOPES

SOURCE: USDA–SCS WEB SOIL SURVEY HILLSBOROUGH COUNTY

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

PRE DEVELOPMENT DRAINAGE AREA PLAN
MILFORD RASHID GAS STATION

MAP 43 LOT 20-2
SOUTH STREET
MILFORD, NEW HAMPSHIRE
HILLSBOROUGH COUNTY

OWNER:
SALT CREEK PROPERTIES, LLC
P.O. BOX 967
AMHERST, NH 03031
BK. 8521 PG. 593

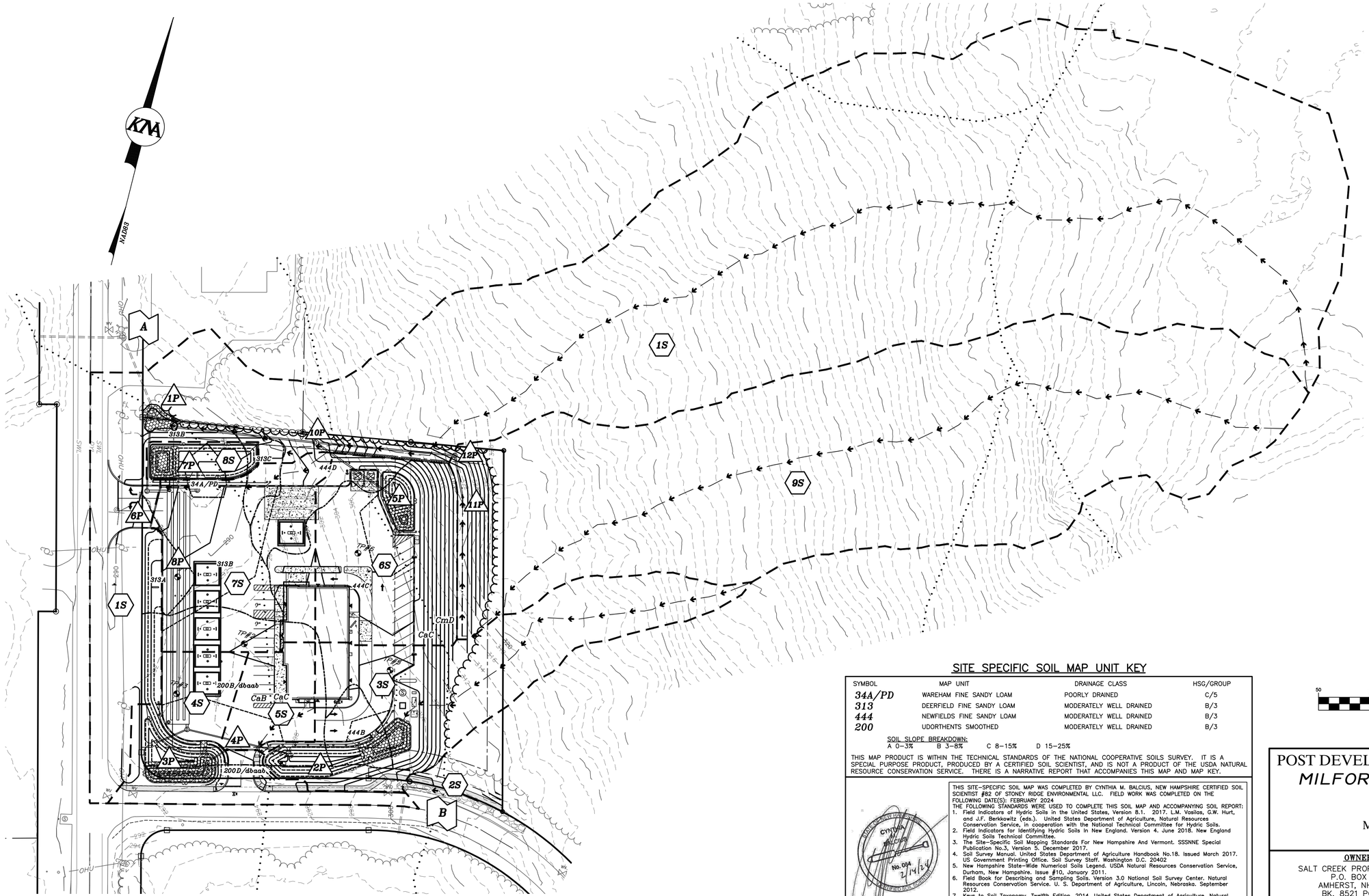
APPLICANT:
689 NORTH MAIN STREET LLC
689 NORTH MAIN STREET
LEOMINSTER, MA 10453

KEACH–NORDSTROM ASSOCIATES, INC.
Civil Engineering Land Surveying Landscape Architecture
10 Commerce Park North, Suite 3B, Bedford, NH 03110 Phone (603) 627–2881

DIG SAFE
811 CALL TOLL FREE
UTILITIES UNDERGROUND PLANT DAMAGE PREVENTION SYSTEM

REVISIONS			
No.	DATE	DESCRIPTION	BY

DATE: FEBRUARY 19, 2024	SCALE: 1" = 50'
PROJECT NO: 21–0526–1A	SHEET 1 OF 4



DRAINAGE LEGEND:

THE LEGEND BELOW REFLECTS THE HYDROCAD MODEL USED FOR DRAINAGE CALCULATIONS.

- SCS SOIL LINES
- SITE SPECIFIC SOIL LINES
- 400B — DENOTES SOIL TYPE
- P — DENOTES POND
- S — DENOTES SUBCATCHMENT AREA
- R — DENOTES REACH
- L — DENOTES POINT OF INTEREST
- LIMIT OF SUBCATCHMENT AREA
- TIME OF CONCENTRATION
- REACH

SITE SPECIFIC SOIL MAP UNIT KEY

SYMBOL	MAP UNIT	DRAINAGE CLASS	HSG/GROUP
34A/PD	WAREHAM FINE SANDY LOAM	POORLY DRAINED	C/5
313	DEERFIELD FINE SANDY LOAM	MODERATELY WELL DRAINED	B/3
444	NEWFIELDS FINE SANDY LOAM	MODERATELY WELL DRAINED	B/3
200	UDORTHENTS SMOOTHED	MODERATELY WELL DRAINED	B/3

SOIL SLOPE BREAKDOWN:
A 0–3% B 3–8% C 8–15% D 15–25%

THIS MAP PRODUCT IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOILS SURVEY. IT IS A SPECIAL PURPOSE PRODUCT, PRODUCED BY A CERTIFIED SOIL SCIENTIST, AND IS NOT A PRODUCT OF THE USDA NATURAL RESOURCE CONSERVATION SERVICE. THERE IS A NARRATIVE REPORT THAT ACCOMPANIES THIS MAP AND MAP KEY.

THIS SITE–SPECIFIC SOIL MAP WAS COMPLETED BY CYNTHIA M. BALCIUS, NEW HAMPSHIRE CERTIFIED SOIL SCIENTIST #82 OF STONEY RIDGE ENVIRONMENTAL LLC. FIELD WORK WAS COMPLETED ON THE FOLLOWING DATE(S): FEBRUARY 2024
THE FOLLOWING STANDARDS WERE USED TO COMPLETE THIS SOIL MAP AND ACCOMPANYING SOIL REPORT:
1. Field Indicators of Hydric Soils in the United States, Version 8.1. 2017. L.M. Vasilas, G.W. Hurt, and J.F. Berkkowitz (eds.). United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the National Technical Committee for Hydric Soils.
2. Field Indicators for Identifying Hydric Soils in New England. Version 4. June 2018. New England Hydric Soils Technical Committee.
3. The Site–Specific Soil Mapping Standards For New Hampshire And Vermont. SSSNNE Special Publication No.3, Version 5. December 2017.
4. Soil Survey Manual. United States Department of Agriculture Handbook No.18. Issued March 2017. US Government Printing Office. Soil Survey Staff. Washington D.C. 20402
5. New Hampshire State–Wide Numerical Soils Legend. USDA Natural Resources Conservation Service, Durham, New Hampshire. Issue #10, January 2011.
6. Field Book for Describing and Sampling Soils. Version 3.0 National Soil Survey Center. Natural Resources Conservation Service. U. S. Department of Agriculture, Lincoln, Nebraska. September 2012.
7. Keys to Soil Taxonomy. Twelfth Edition. 2014. United States Department of Agriculture. Natural Resources Conservation Service.

ADDITIONAL NOTE: "This map product is within the technical standards of the National Cooperative Soil Survey. It is a special purpose product, produced by a certified soil scientist, and is not a product of the USDA Natural Resources Conservation Service. There is a narrative report that accompanies this map and key."

SCS SOILS LEGEND

CaB	CANTON FINE SANDY LOAM 0 TO 8 PERCENT SLOPES
CaC	CANTON FINE SANDY LOAM 8 TO 15 PERCENT SLOPES
CmD	CANTON FINE SANDY LOAM 15 TO 25 PERCENT SLOPES

SOURCE: USDA–SCS WEB SOIL SURVEY HILLSBOROUGH COUNTY

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

DIG SAFE
UTILITIES UNDERGROUND. PLANT DAMAGE PREVENTION IS YOUTH
811 CALL TOLL FREE

POST DEVELOPMENT DRAINAGE AREA PLAN

MILFORD RASHID GAS STATION

MAP 43 LOT 20-2
SOUTH STREET
MILFORD, NEW HAMPSHIRE
HILLSBOROUGH COUNTY

OWNER:
SALT CREEK PROPERTIES, LLC
P.O. BOX 967
AMHERST, NH 03031
BK. 8521 PG. 593

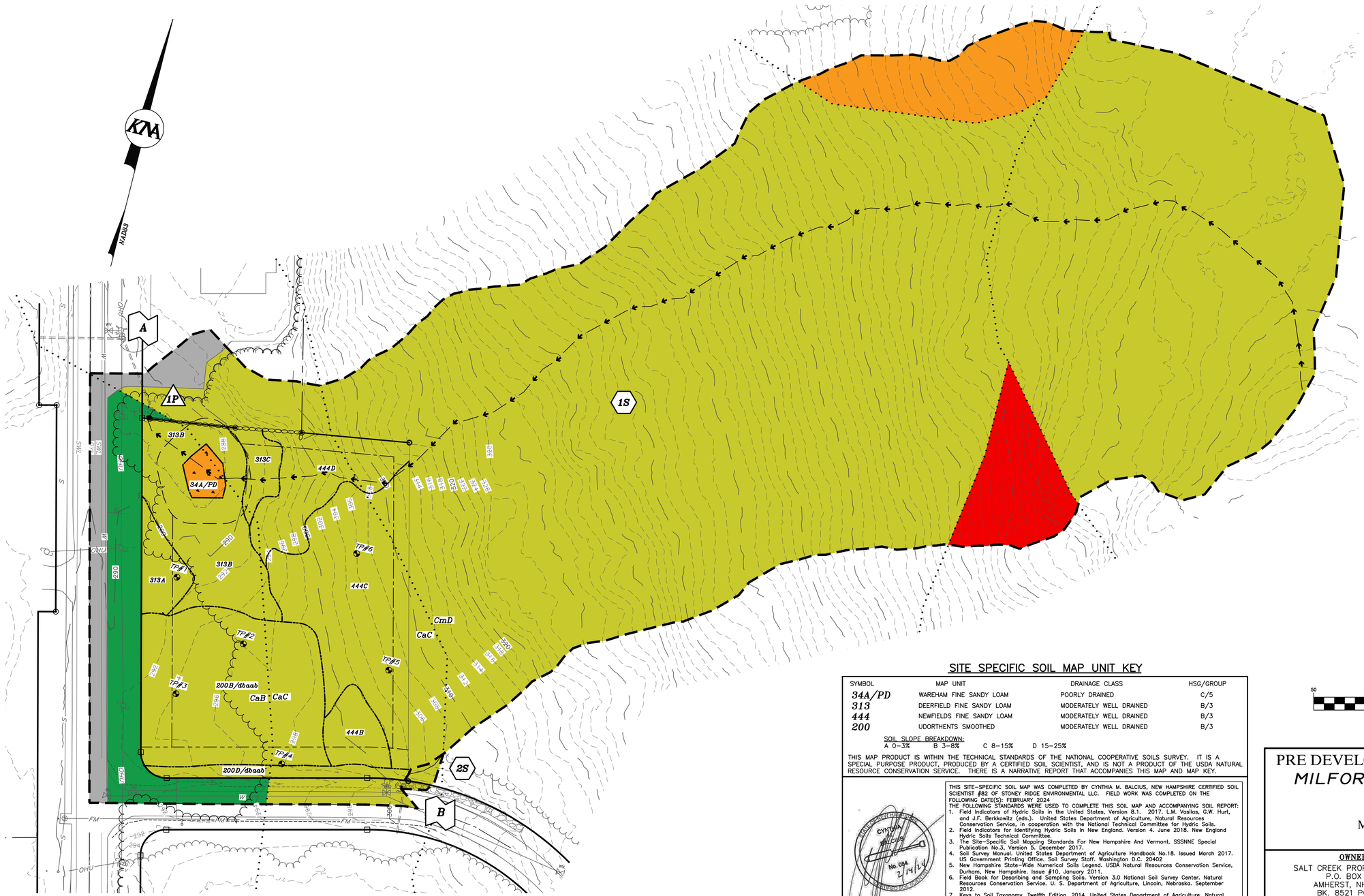
APPLICANT:
689 NORTH MAIN STREET LLC
689 NORTH MAIN STREET
LEOMINSTER, MA 10453

KEACH–NORDSTROM ASSOCIATES, INC.
Civil Engineering Land Surveying Landscape Architecture
10 Commerce Park North, Suite 3B, Bedford, NH 03110 Phone (603) 627–2881

REVISIONS

No.	DATE	DESCRIPTION	BY

DATE: FEBRUARY 19, 2024 **SCALE:** 1" = 50'
PROJECT NO: 21–0526–1A **SHEET** 2 OF 4



DRAINAGE LEGEND:

THE LEGEND BELOW REFLECTS THE HYDROCAD MODEL USED FOR DRAINAGE CALCULATIONS.

- SCS SOIL LINES
- SITE SPECIFIC SOIL LINES
- 400B — DENOTES SOIL TYPE
- P — DENOTES POND
- S — DENOTES SUBCATCHMENT AREA
- R — DENOTES REACH
- L — DENOTES POINT OF INTEREST
- LIMIT OF SUBCATCHMENT AREA
- TIME OF CONCENTRATION
- REACH
- SOIL GROUP A
- SOIL GROUP B
- SOIL GROUP C
- SOIL GROUP D
- IMPERVIOUS AREA

SITE SPECIFIC SOIL MAP UNIT KEY

SYMBOL	MAP UNIT	DRAINAGE CLASS	HSG/GROUP
34A/PD	WAREHAM FINE SANDY LOAM	POORLY DRAINED	C/5
313	DEERFIELD FINE SANDY LOAM	MODERATELY WELL DRAINED	B/3
444	NEWFIELDS FINE SANDY LOAM	MODERATELY WELL DRAINED	B/3
200	UDORTHENTS SMOOTHED	MODERATELY WELL DRAINED	B/3

SOIL SLOPE BREAKDOWN:
A 0–3% B 3–8% C 8–15% D 15–25%

THIS MAP PRODUCT IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOILS SURVEY. IT IS A SPECIAL PURPOSE PRODUCT, PRODUCED BY A CERTIFIED SOIL SCIENTIST, AND IS NOT A PRODUCT OF THE USDA NATURAL RESOURCE CONSERVATION SERVICE. THERE IS A NARRATIVE REPORT THAT ACCOMPANIES THIS MAP AND MAP KEY.

CYNTHIA M. BALCIUS — No. 084 — 2/19/24

THIS SITE-SPECIFIC SOIL MAP WAS COMPLETED BY CYNTHIA M. BALCIUS, NEW HAMPSHIRE CERTIFIED SOIL SCIENTIST #82 OF STONEY RIDGE ENVIRONMENTAL LLC. FIELD WORK WAS COMPLETED ON THE FOLLOWING DATE(S): FEBRUARY 2024
THE FOLLOWING STANDARDS WERE USED TO COMPLETE THIS SOIL MAP AND ACCOMPANYING SOIL REPORT:

1. Field Indicators of Hydric Soils in the United States, Version 8.1. 2017. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz (eds.). United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the National Technical Committee for Hydric Soils.
2. Field Indicators for Identifying Hydric Soils in New England. Version 4. June 2018. New England Hydric Soils Technical Committee.
3. The Site-Specific Soil Mapping Standards For New Hampshire And Vermont. SSSNNE Special Publication No.3, Version 5. December 2017.
4. Soil Survey Manual. United States Department of Agriculture Handbook No.18. Issued March 2017. US Government Printing Office. Soil Survey Staff. Washington D.C. 20402
5. New Hampshire State-Wide Numerical Soils Legend. USDA Natural Resources Conservation Service, Durham, New Hampshire. Issue #10, January 2011.
6. Field Book for Describing and Sampling Soils. Version 3.0 National Soil Survey Center. Natural Resources Conservation Service. U. S. Department of Agriculture, Lincoln, Nebraska. September 2012.
7. Keys to Soil Taxonomy. Twelfth Edition. 2014. United States Department of Agriculture. Natural Resources Conservation Service.

ADDITIONAL NOTE: "This map product is within the technical standards of the National Cooperative Soil Survey. It is a special purpose product, produced by a certified soil scientist, and is not a product of the USDA Natural Resources Conservation Service. There is a narrative report that accompanies this map and key."

SCS SOILS LEGEND

CaB	CANTON FINE SANDY LOAM 0 TO 8 PERCENT SLOPES
CaC	CANTON FINE SANDY LOAM 8 TO 15 PERCENT SLOPES
CmD	CANTON FINE SANDY LOAM 15 TO 25 PERCENT SLOPES

SOURCE: USDA-SCS WEB SOIL SURVEY HILLSBOROUGH COUNTY

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

DIG SAFE — UTILITIES UNDERGROUND PLANT DAMAGE PREVENTION SYSTEM — CALL TOLL FREE 811

PRE DEVELOPMENT DRAINAGE AREA PLAN

MILFORD RASHID GAS STATION

MAP 43 LOT 20-2
SOUTH STREET
MILFORD, NEW HAMPSHIRE
HILLSBOROUGH COUNTY

OWNER:
SALT CREEK PROPERTIES, LLC
P.O. BOX 967
AMHERST, NH 03031
BK. 8521 PG. 593

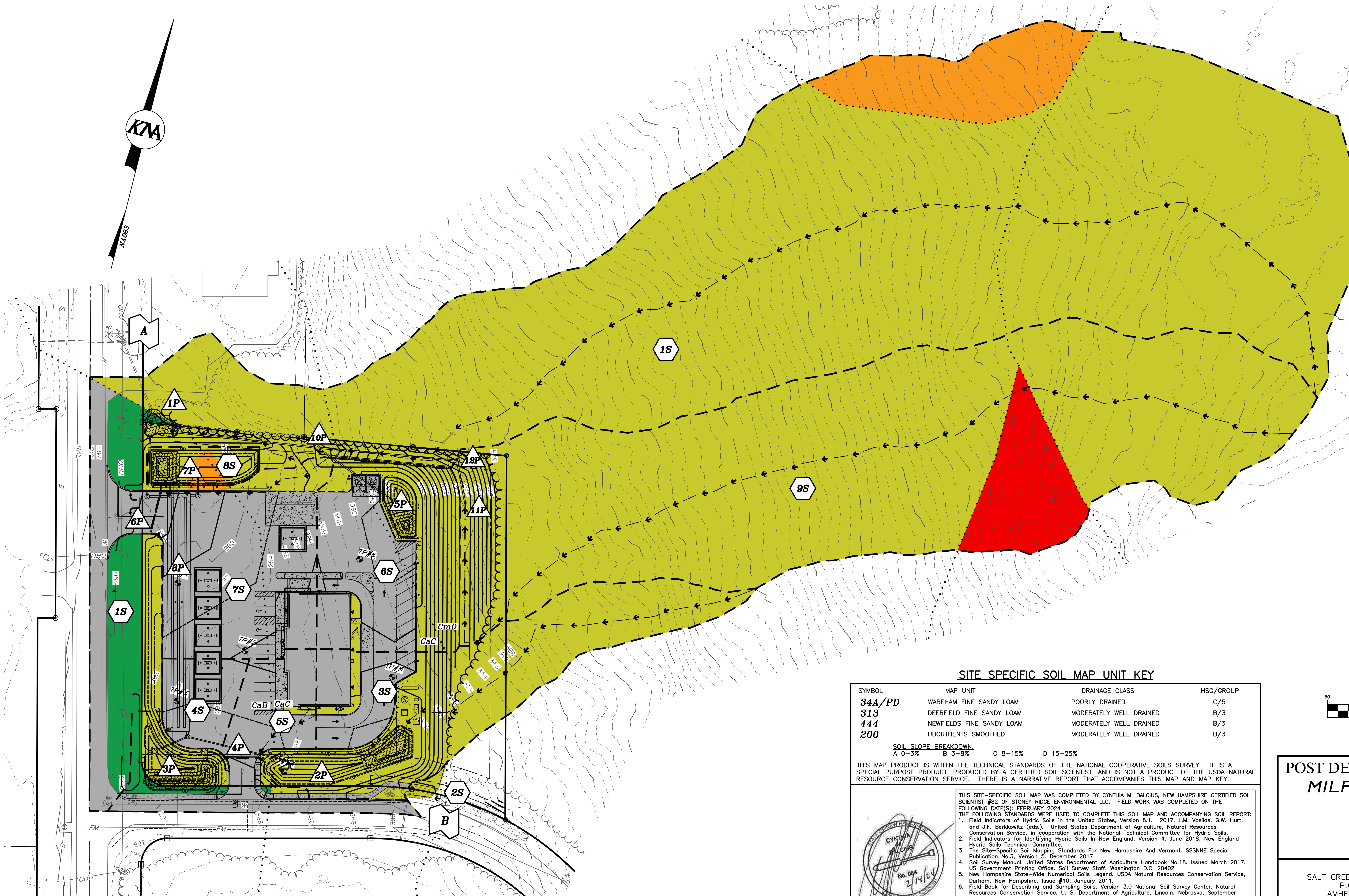
APPLICANT:
689 NORTH MAIN STREET LLC
689 NORTH MAIN STREET
LEOMINSTER, MA 10453

KEACH-NORDSTROM ASSOCIATES, INC.
Civil Engineering Land Surveying Landscape Architecture
10 Commerce Park North, Suite 3B, Bedford, NH 03110 Phone (603) 627-2881

REVISIONS

No.	DATE	DESCRIPTION	BY

DATE: FEBRUARY 19, 2024	SCALE: 1" = 50'
PROJECT NO: 21-0526-1A	SHEET 3 OF 4



DRAINAGE LEGEND:

THE LEGEND BELOW REFLECTS THE HYDROCAD MODEL USED FOR DRAINAGE CALCULATIONS.

- SCS SOIL LINES
- SITE SPECIFIC SOIL LINES
- 400B — DENOTES SOIL TYPE
- P — DENOTES POND
- S — DENOTES SUBCATCHMENT AREA
- R — DENOTES REACH
- L — DENOTES POINT OF INTEREST
- LIMIT OF SUBCATCHMENT AREA
- TIME OF CONCENTRATION
- REACH
- SOIL GROUP A
- SOIL GROUP B
- SOIL GROUP C
- SOIL GROUP D
- IMPERVIOUS AREA

SITE SPECIFIC SOIL MAP UNIT KEY

SYMBOL	MAP UNIT	DRAINAGE CLASS	HSG/GROUP
34A/PD	WAREHAM FINE SANDY LOAM	POORLY DRAINED	C/5
313	DEERFIELD FINE SANDY LOAM	MODERATELY WELL DRAINED	B/3
444	NEWFIELDS FINE SANDY LOAM	MODERATELY WELL DRAINED	B/3
200	UDORTHENTS SMOOTHED	MODERATELY WELL DRAINED	B/3

SOIL SLOPE BREAKDOWN:
A 0–3% B 3–8% C 8–15% D 15–25%

THIS MAP PRODUCT IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOILS SURVEY. IT IS A SPECIAL PURPOSE PRODUCT, PRODUCED BY A CERTIFIED SOIL SCIENTIST, AND IS NOT A PRODUCT OF THE USDA NATURAL RESOURCE CONSERVATION SERVICE. THERE IS A NARRATIVE REPORT THAT ACCOMPANIES THIS MAP AND MAP KEY.

THIS SITE–SPECIFIC SOIL MAP WAS COMPLETED BY CYNTHIA M. BALCIUS, NEW HAMPSHIRE CERTIFIED SOIL SCIENTIST #82 OF STONEY RIDGE ENVIRONMENTAL LLC. FIELD WORK WAS COMPLETED ON THE FOLLOWING DATE(S): FEBRUARY 2024

THE FOLLOWING STANDARDS WERE USED TO COMPLETE THIS SOIL MAP AND ACCOMPANYING SOIL REPORT:

1. Field Indicators of Hydric Soils in the United States, Version 8.1. 2017. L.M. Vasilas, G.W. Hurt, and J.F. Berkkowitz (eds.). United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the National Technical Committee for Hydric Soils.
2. Field Indicators for Identifying Hydric Soils In New England. Version 4. June 2018. New England Hydric Soils Technical Committee.
3. The Site–Specific Soil Mapping Standards For New Hampshire And Vermont. SSSNNE Special Publication No.3, Version 5. December 2017.
4. Soil Survey Manual. United States Department of Agriculture Handbook No.18. Issued March 2017. US Government Printing Office. Soil Survey Staff. Washington D.C. 20402
5. New Hampshire State–Wide Numerical Soils Legend. USDA Natural Resources Conservation Service, Durham, New Hampshire. Issue #10, January 2011.
6. Field Book for Describing and Sampling Soils. Version 3.0 National Soil Survey Center. Natural Resources Conservation Service. U. S. Department of Agriculture, Lincoln, Nebraska. September 2012.
7. Keys to Soil Taxonomy. Twelfth Edition. 2014. United States Department of Agriculture. Natural Resources Conservation Service.

ADDITIONAL NOTE: "This map product is within the technical standards of the National Cooperative Soil Survey. It is a special purpose product, produced by a certified soil scientist, and is not a product of the USDA Natural Resources Conservation Service. There is a narrative report that accompanies this map and key."

CYNTHIA M. BALCIUS No. 084 2/14/24 — NEW HAMPSHIRE CERTIFIED SOIL SCIENTIST

SCS SOILS LEGEND

CaB	CANTON FINE SANDY LOAM 0 TO 8 PERCENT SLOPES
CaC	CANTON FINE SANDY LOAM 8 TO 15 PERCENT SLOPES
CmD	CANTON FINE SANDY LOAM 15 TO 25 PERCENT SLOPES

SOURCE: USDA–SCS WEB SOIL SURVEY HILLSBOROUGH COUNTY

DIG SAFE
RI–ME–NH–VT–MA 811 CALL TOLL FREE
UTILITIES UNDERGROUND PLANT DAMAGE PREVENTION SYSTEM

GRAPHIC SCALE
50 0 25 50 100 200
(IN FEET)
1 inch = 50 ft.

POST DEVELOPMENT DRAINAGE AREA PLAN

MILFORD RASHID GAS STATION

MAP 43 LOT 20-2
SOUTH STREET
MILFORD, NEW HAMPSHIRE
HILLSBOROUGH COUNTY

OWNER:
SALT CREEK PROPERTIES, LLC
P.O. BOX 967
AMHERST, NH 03031
BK. 8521 PG. 593

APPLICANT:
689 NORTH MAIN STREET LLC
689 NORTH MAIN STREET
LEOMINSTER, MA 10453

KNA KEACH–NORDSTROM ASSOCIATES, INC.
Civil Engineering Land Surveying Landscape Architecture
10 Commerce Park North, Suite 3B, Bedford, NH 03110 Phone (603) 627–2881

REVISIONS

No.	DATE	DESCRIPTION	BY

DATE: FEBRUARY 19, 2024 | SCALE: 1" = 50'
PROJECT NO: 21–0526–1A | SHEET 4 OF 4