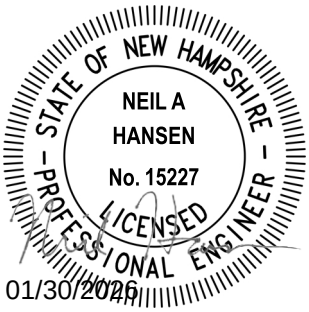
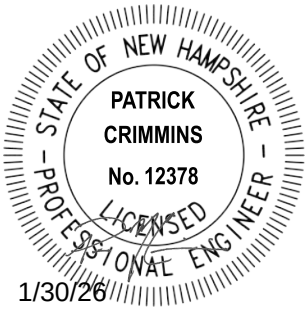
Tighe & Bond





33 White Oaks Subdivision
Laconia, NH

Drainage Analysis

Scott Buonopane

January 30, 2026

Table of Contents

Appendices

SECTION 1 | Narrative

The proposed project is located along White Oaks Road on a parcel of land identified as Tax Map 278 Block 241 Lot 29 on the City of Laconia Tax Maps. The project includes the subdivision of the existing parcel into twenty-five (25) lots, consisting of twenty-four (24) single-family residential building lots and one (1) lot for the remainder of the existing parcel. The proposed work includes the construction of two (2) new public roadways and associated infrastructure improvements, including stormwater management and utilities. The proposed lots and roadway have been designed to meet or exceed applicable zoning and subdivision requirements.

1.1 On-Site Soil Description

The site consists of terrain that generally slopes from the north of the property to the south. The existing parcel has an approximate high point elevation of 592 along the norther parcel limits and a low point with a low point of approximately 554 to the south.

A Web Soil Survey for the subject parcel as obtained from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) website and can be found in Appendix A of this report. The runoff analyzed within these studies has been modeled using Hydrologic Soil Group C soils. The site is comprised of Canterbury Soils with drainage classifications of moderate-drained soils.

1.2 Pre- & Post-Development Flow Comparison

For the purposes of this analysis, runoff generated by the site has been analyzed at two (2) distinct points of analysis (PA-1 & PA-2). These points of analysis were chosen to compare the Pre and Post-development flows. PA-1 is located along White Oaks Rd to the west of the proposed development lot. PA-2 is located at the on-site forested wetland to the east of the proposed work. Runoff from this wetland generally flows to the southwest along the abutting commercial property and ultimately to White Oaks Rd.

The peak discharge rates at this point of analysis were determined by analyzing Type III 24-hour storm events. The rainfall data for these storm events were obtained from the data published by the Northeast Regional Climate Center (NRCC) at Cornell University, which can be found in Appendix B.

TABLE 1-1 Comparison of Pre and Post Development Flows

Point of Analysis	Pre/**Post** 2-Year Storm (cfs)	Pre/**Post** 10-Year Storm (cfs)	Pre/**Post** 25-Year Storm (cfs)	Pre/**Post** 50-Year Storm (cfs)
PA-1	1.15/**0.76**	2.90/**1.91**	4.44/**2.83**	5.93/**4.91**
PA-2	3.12/**1.98**	8.42/**7.17**	13.18/**9.63**	17.87/**12.09**

1.3 Best Management Practices

All soil erosion and sediment control measures have been designed in accordance with the New Hampshire Stormwater Manual. The intent of the outlined measures is to minimize erosion and sedimentation during construction, stabilize and protect the site from erosion after construction is complete and improve stormwater quality from the site. Best Management Practices for this project include:

- Temporary erosion and sediment control practices to be implemented during construction;
- Permanent stabilization practices to be implemented prior to the completion of construction;
- Stormwater treatment practices including Sediment Forebays and Pretreatment Swales;
- Stormwater detention practices including Bioretention Rain Gardens;

SECTION 2 | Drainage Analysis

2.1 Calculation Methods

The design storms analyzed in this study are the 2-year, 10-year, 25-year and 50-year 24-hour duration storm events. The stormwater modeling system, HydroCAD 10.0 was utilized to predict the peak runoff rates from these storm events. A Type III storm pattern was used in the model.

The time of concentration was computed using the TR-55 Method, which provides a means of determining the time for an entire watershed to contribute runoff to a specific location via sheet flows, shallow concentrated flow and channel flow. Runoff curve numbers were calculated by estimating the coverage areas and then summing the curve number for the coverage area as a percent of the entire watershed.

References:

1. HydroCAD Stormwater Modeling System, by HydroCAD Software Solutions LLC, Chocorua, New Hampshire.
2. New Hampshire Stormwater Management Manual, Volume 2, Post-Construction Best Management Practices Selection and Design, December 2008.
3. "Extreme Precipitation in New York & New England." Extreme Precipitation in New York & New England by Northeast Regional Climate Center (NRCC), 26 June 2012.

2.2 Pre-Development Conditions

To analyze the pre-development condition, the site has been modeled utilizing two distinct points of analysis (PA-1 & PA-2). These points of analysis and watersheds are depicted on the plan entitled "Pre-Development Watershed Plan", Sheet C-801.

The points of analysis and their contributing watershed areas are described below:

Point of Analysis One (PA-1)

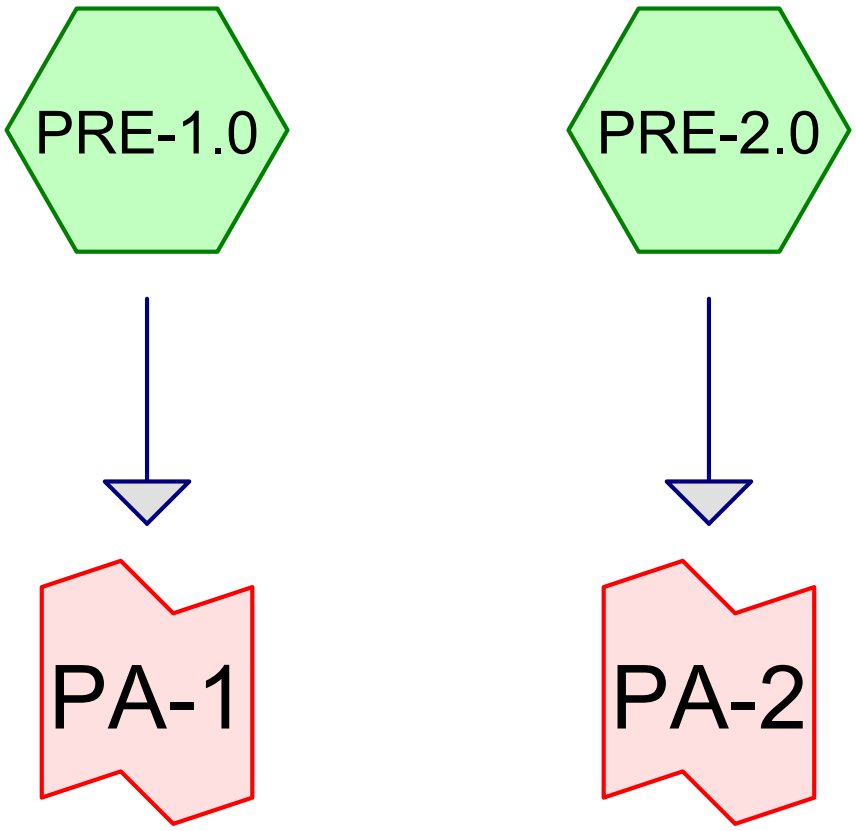
Point of Analysis 1 is comprised of one subcatchment area (PRE-1.0). This area includes two existing buildings, various residential driveways, a small portions of grass, and woods. Runoff from this area travels southwest via overland flow to Point of Analysis 1.

Point of Analysis One (PA-2)

Point of Analysis 2 is comprised of one subcatchment area (PRE-2.0). This area includes portions of an existing residential building to the north of the subject parcel and is comprised mainly of woodland and small portions of grass. Runoff from this area travels south via overland flow to Point of Analysis 2.

2.2.1 Pre-Development Calculations

2.2.2 Pre-Development Watershed Plan



Subcat Reach Pond Link

Routing Diagram for R5089-0278_PRE
Prepared by Tighe & Bond, Printed 1/29/2026

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.856	74	>75% Grass cover, Good, HSG C (PRE-1.0, PRE-2.0)
0.029	98	Unconnected pavement, HSG C (PRE-1.0)
0.077	98	Unconnected roofs, HSG C (PRE-1.0, PRE-2.0)
8.164	70	Woods, Good, HSG C (PRE-1.0, PRE-2.0)
9.125	**71**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
9.125	HSG C	PRE-1.0, PRE-2.0
0.000	HSG D	
0.000	Other	
9.125		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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

SubcatchmentPRE-1.0: Runoff Area=89,588 sf 3.29% Impervious Runoff Depth>0.66"
Flow Length=561' Tc=11.1 min CN=72 Runoff=1.15 cfs 0.113 af

SubcatchmentPRE-2.0: Runoff Area=307,898 sf 0.53% Impervious Runoff Depth>0.58"
Flow Length=698' Slope=0.0700 '/' Tc=13.1 min CN=70 Runoff=3.12 cfs 0.340 af

Link PA-1: Inflow=1.15 cfs 0.113 af
Primary=1.15 cfs 0.113 af

Link PA-2: Inflow=3.12 cfs 0.340 af
Primary=3.12 cfs 0.340 af

Total Runoff Area = 9.125 ac Runoff Volume = 0.454 af Average Runoff Depth = 0.60"
98.85% Pervious = 9.020 ac 1.15% Impervious = 0.105 ac

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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

SubcatchmentPRE-1.0: Runoff Area=89,588 sf 3.29% Impervious Runoff Depth>1.48"
Flow Length=561' Tc=11.1 min CN=72 Runoff=2.90 cfs 0.254 af

SubcatchmentPRE-2.0: Runoff Area=307,898 sf 0.53% Impervious Runoff Depth>1.35"
Flow Length=698' Slope=0.0700 '/' Tc=13.1 min CN=70 Runoff=8.42 cfs 0.797 af

Link PA-1: Inflow=2.90 cfs 0.254 af
Primary=2.90 cfs 0.254 af

Link PA-2: Inflow=8.42 cfs 0.797 af
Primary=8.42 cfs 0.797 af

Total Runoff Area = 9.125 ac Runoff Volume = 1.051 af Average Runoff Depth = 1.38"
98.85% Pervious = 9.020 ac 1.15% Impervious = 0.105 ac

Summary for Subcatchment PRE-1.0:

Runoff = 2.90 cfs @ 12.16 hrs, Volume= 0.254 af, Depth> 1.48"
Routed to Link PA-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.04"

Area (sf)	CN	Description
1,703	98	Unconnected roofs, HSG C
33,291	74	>75% Grass cover, Good, HSG C
53,346	70	Woods, Good, HSG C
1,248	98	Unconnected pavement, HSG C
89,588	72	Weighted Average
86,637		96.71% Pervious Area
2,951		3.29% Impervious Area
2,951		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	25	0.0500	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.75"
1.1	73	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	60	0.0700	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	100	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	140	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	163	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.1	561	Total			

Summary for Subcatchment PRE-2.0:

Runoff = 8.42 cfs @ 12.20 hrs, Volume= 0.797 af, Depth> 1.35"
Routed to Link PA-2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.04"

Area (sf)	CN	Description
1,632	98	Unconnected roofs, HSG C
4,003	74	>75% Grass cover, Good, HSG C
302,263	70	Woods, Good, HSG C
307,898	70	Weighted Average
306,266		99.47% Pervious Area
1,632		0.53% Impervious Area
1,632		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	25	0.0700	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.75"
8.5	673	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	698	Total			

Summary for Link PA-1:

Inflow Area = 2.057 ac, 3.29% Impervious, Inflow Depth > 1.48" for 10-YR event
Inflow = 2.90 cfs @ 12.16 hrs, Volume= 0.254 af
Primary = 2.90 cfs @ 12.16 hrs, Volume= 0.254 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link PA-2:

Inflow Area = 7.068 ac, 0.53% Impervious, Inflow Depth > 1.35" for 10-YR event
Inflow = 8.42 cfs @ 12.20 hrs, Volume= 0.797 af
Primary = 8.42 cfs @ 12.20 hrs, Volume= 0.797 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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

SubcatchmentPRE-1.0: Runoff Area=89,588 sf 3.29% Impervious Runoff Depth>2.22"
Flow Length=561' Tc=11.1 min CN=72 Runoff=4.44 cfs 0.380 af

SubcatchmentPRE-2.0: Runoff Area=307,898 sf 0.53% Impervious Runoff Depth>2.05"
Flow Length=698' Slope=0.0700 '/' Tc=13.1 min CN=70 Runoff=13.18 cfs 1.209 af

Link PA-1: Inflow=4.44 cfs 0.380 af
Primary=4.44 cfs 0.380 af

Link PA-2: Inflow=13.18 cfs 1.209 af
Primary=13.18 cfs 1.209 af

Total Runoff Area = 9.125 ac Runoff Volume = 1.589 af Average Runoff Depth = 2.09"
98.85% Pervious = 9.020 ac 1.15% Impervious = 0.105 ac

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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

SubcatchmentPRE-1.0: Runoff Area=89,588 sf 3.29% Impervious Runoff Depth>2.94"
Flow Length=561' Tc=11.1 min CN=72 Runoff=5.93 cfs 0.504 af

SubcatchmentPRE-2.0: Runoff Area=307,898 sf 0.53% Impervious Runoff Depth>2.75"
Flow Length=698' Slope=0.0700 '/' Tc=13.1 min CN=70 Runoff=17.87 cfs 1.620 af

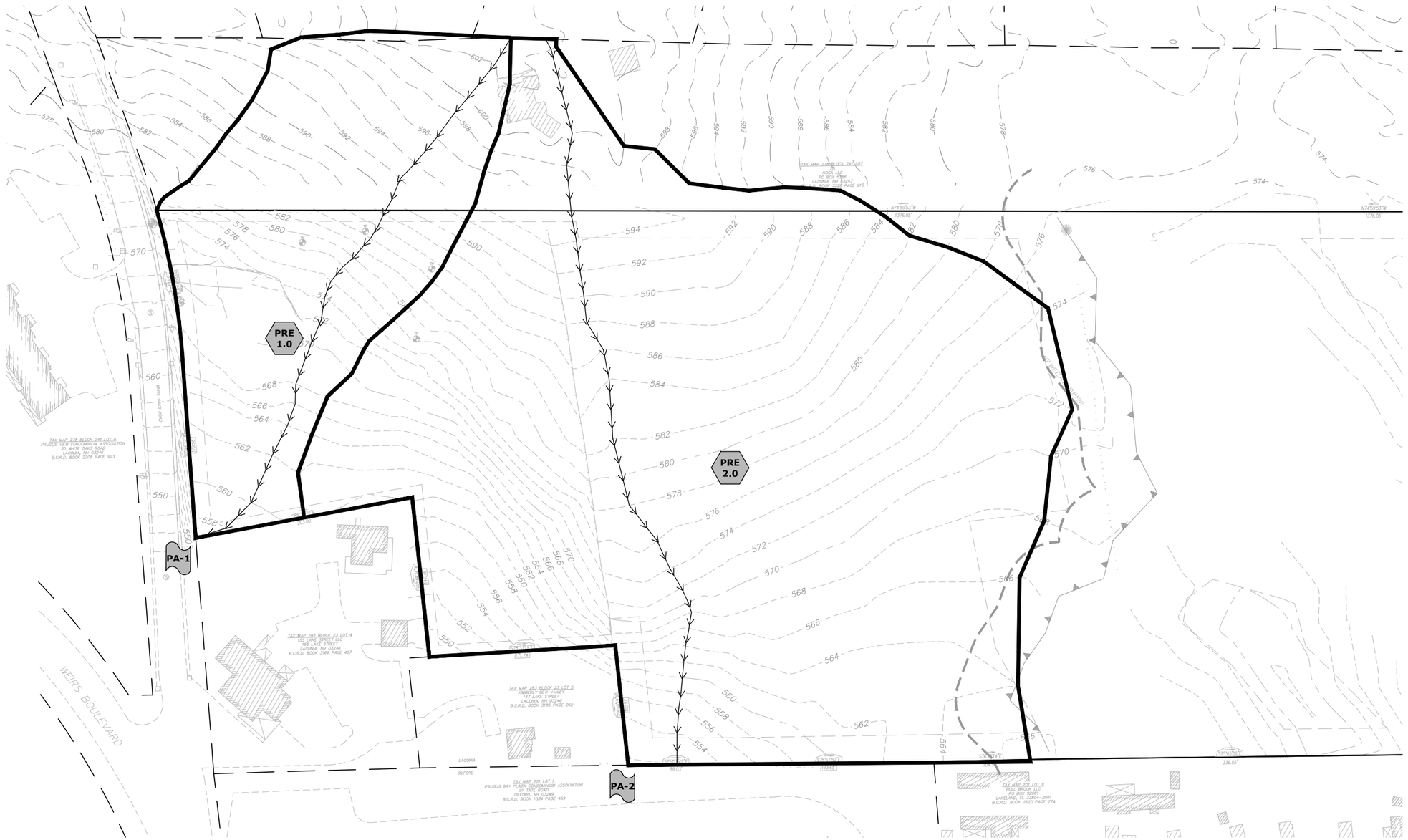
Link PA-1: Inflow=5.93 cfs 0.504 af
Primary=5.93 cfs 0.504 af

Link PA-2: Inflow=17.87 cfs 1.620 af
Primary=17.87 cfs 1.620 af

Total Runoff Area = 9.125 ac Runoff Volume = 2.124 af Average Runoff Depth = 2.79"
98.85% Pervious = 9.020 ac 1.15% Impervious = 0.105 ac

PRE-DEVELOPMENT WATERSHED LEGEND

- PRE-DEVELOPMENT WATERSHED BOUNDARY
- LONGEST FLOW PATH
- PRE 1.0 — PRE DEVELOPMENT WATERSHED AREA DESIGNATION
- PRE POND 1 — PRE-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS



0 50' 100'

SCALE: 1" = 50'

Tighe&Bond

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Portsmouth, NH 03801
T 603.433.8818

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33 WHITE OAKS SUBDIVISION

33 White Oaks Road

Laconia, New Hampshire

MARK	DATE	DESCRIPTION
1	1/30/2026	TRC Submission

PROJECT NO:	R5089-027B
DATE:	01/30/2026
FILE:	R5089-0278-C-HYDRO.dwg
DRAWN BY:	M.CURRIER/C.KRZCUIK
DESIGNED BY:	C.KRZCUIK
CHECKED BY:	N.HANSEN
APPROVED BY:	P.CRIMMINS

PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C-801

Last Saved: 1/29/2026
Plotted: 01/30/2026 3:46pm By: MCurrier
Tighe & Bond J:\R\R5089 Residential\0278 - 33 White Oaks Rd. Laconia, NH\Drawings\AutoCAD\Sheet\R5089-0278-C-HYDRO.dwg

2.3 Post-Development Conditions

To analyze the post-development condition, the site has been modeled utilizing the same two distinct points of analysis (PA-1 & PA-2) as the pre-development conditions. These points of analysis and watersheds are depicted on the plan entitled "Post-Development Watershed Plan", Sheet C-802.

The points of analysis and their contributing watershed areas are described below:

Point of Analysis One (PA-1)

Point of Analysis 1 is comprised of two Subcatchment area (POST-1.0 & POST-1.1) POST-1.0 includes a combination of grassed, wooded areas to the north and west of the proposed work along White Oaks Rd. Runoff from this area travels southwest via overland flow to Point of Analysis 1.

POST-1.1 is comprised of a portion of the proposed street, proposed residential houses and the surrounding grassed lawn area. Additionally this area captures runoff from the neighboring residential lot consisting of the residential building, woods, and grass cover. Runoff from this subcatchment travels via overland flow to a closed drainage system ultimately discharging to a surface sediment forebay and Rain Garden (RG-1). This treated stormwater is discharged to the ground surface adjacent to White Oaks Rd.

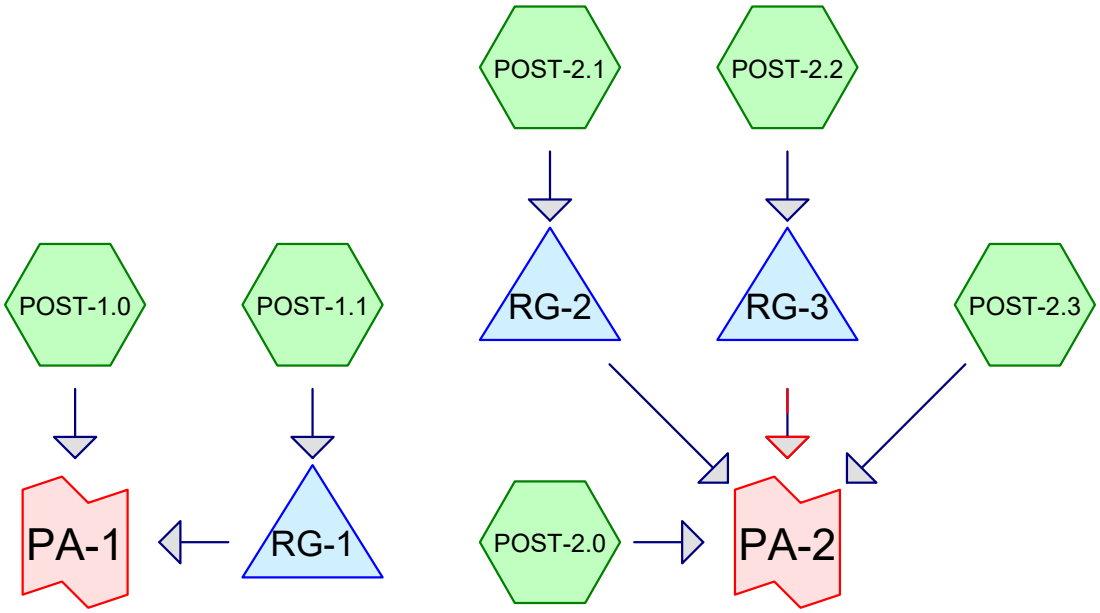
Point of Analysis One (PA-2)

Point of Analysis 2 is comprised of four subcatchment areas (POST-2.0, POST-2.1, POST-2.2, & POST-2.3). POST-2.0 and POST-2.3 are very similar in nature and include the area surrounding the proposed development which comprise of residential buildings, grass, and wooded areas. Runoff from these areas travels via overland flow to either the southeast or southwest to Point of Analysis 2.

POST-2.1 and POST-2.2 are very similar in nature to POST-1.1 and are comprised of the main project area including the proposed streets, residential buildings, driveways and surrounding grassed lawns. Runoff from these areas travels via grass lines swales along the proposed streets to a closed drainage system and ultimately their own bioretention rain gardens (RG-2 & RG-3). A sediment forebay is proposed for RG-2 for the purposes of pre treatment, whereas RG-3 proposes a pretreatment swale between the subject parcels. Runoff from these rain gardens discharges to the southwest and southeast to Point of Analysis 2.

2.3.1 Post-Development Calculations

2.3.2 Post-Development Watershed Plan



Subcat Reach Pond Link

Routing Diagram for R5089-0278_POST
Prepared by Tighe & Bond, Printed 1/29/2026

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
6.161	74	>75% Grass cover, Good, HSG C (POST-1.0, POST-1.1, POST-2.0, POST-2.1, POST-2.2, POST-2.3)
1.247	98	Unconnected pavement, HSG C (POST-1.0, POST-1.1, POST-2.1, POST-2.2)
1.034	98	Unconnected roofs, HSG C (POST-1.1, POST-2.0, POST-2.1, POST-2.2, POST-2.3)
0.683	70	Woods, Good, HSG C (POST-1.0, POST-2.0, POST-2.3)
9.125	**80**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
9.125	HSG C	POST-1.0, POST-1.1, POST-2.0, POST-2.1, POST-2.2, POST-2.3
0.000	HSG D	
0.000	Other	
9.125		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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

SubcatchmentPOST-1.0: Runoff Area=9,807 sf 5.62% Impervious Runoff Depth>0.75"
Flow Length=329' Tc=6.5 min CN=74 Runoff=0.18 cfs 0.014 af

SubcatchmentPOST-1.1: Runoff Area=136,983 sf 23.52% Impervious Runoff Depth>0.90"
Flow Length=404' Tc=7.9 min UI Adjusted CN=77 Runoff=2.91 cfs 0.236 af

SubcatchmentPOST-2.0: Runoff Area=29,499 sf 11.75% Impervious Runoff Depth>0.80"
Flow Length=145' Tc=6.0 min UI Adjusted CN=75 Runoff=0.58 cfs 0.045 af

SubcatchmentPOST-2.1: Runoff Area=69,620 sf 44.00% Impervious Runoff Depth>1.38"
Flow Length=308' Tc=6.0 min CN=85 Runoff=2.53 cfs 0.184 af

SubcatchmentPOST-2.2: Runoff Area=77,713 sf 41.08% Impervious Runoff Depth>1.31"
Flow Length=197' Tc=6.0 min CN=84 Runoff=2.68 cfs 0.195 af

SubcatchmentPOST-2.3: Runoff Area=73,864 sf 0.74% Impervious Runoff Depth>0.71"
Flow Length=486' Tc=9.8 min CN=73 Runoff=1.09 cfs 0.100 af

Pond RG-1: Peak Elev=558.03' Storage=3,843 cf Inflow=2.91 cfs 0.236 af
Outflow=0.72 cfs 0.196 af

Pond RG-2: Peak Elev=559.99' Storage=3,183 cf Inflow=2.53 cfs 0.184 af
Outflow=0.85 cfs 0.157 af

Pond RG-3: Peak Elev=573.73' Storage=4,442 cf Inflow=2.68 cfs 0.195 af
Primary=0.23 cfs 0.140 af Secondary=0.00 cfs 0.000 af Outflow=0.23 cfs 0.140 af

Link PA-1: Inflow=0.76 cfs 0.210 af
Primary=0.76 cfs 0.210 af

Link PA-2: Inflow=1.98 cfs 0.442 af
Primary=1.98 cfs 0.442 af

Total Runoff Area = 9.125 ac Runoff Volume = 0.774 af Average Runoff Depth = 1.02"
75.01% Pervious = 6.844 ac 24.99% Impervious = 2.281 ac

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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

SubcatchmentPOST-1.0: Runoff Area=9,807 sf 5.62% Impervious Runoff Depth>1.62"
Flow Length=329' Tc=6.5 min CN=74 Runoff=0.41 cfs 0.030 af

SubcatchmentPOST-1.1: Runoff Area=136,983 sf 23.52% Impervious Runoff Depth>1.84"
Flow Length=404' Tc=7.9 min UI Adjusted CN=77 Runoff=6.23 cfs 0.482 af

SubcatchmentPOST-2.0: Runoff Area=29,499 sf 11.75% Impervious Runoff Depth>1.69"
Flow Length=145' Tc=6.0 min UI Adjusted CN=75 Runoff=1.30 cfs 0.096 af

SubcatchmentPOST-2.1: Runoff Area=69,620 sf 44.00% Impervious Runoff Depth>2.49"
Flow Length=308' Tc=6.0 min CN=85 Runoff=4.56 cfs 0.332 af

SubcatchmentPOST-2.2: Runoff Area=77,713 sf 41.08% Impervious Runoff Depth>2.40"
Flow Length=197' Tc=6.0 min CN=84 Runoff=4.93 cfs 0.357 af

SubcatchmentPOST-2.3: Runoff Area=73,864 sf 0.74% Impervious Runoff Depth>1.55"
Flow Length=486' Tc=9.8 min CN=73 Runoff=2.62 cfs 0.219 af

Pond RG-1: Peak Elev=559.35' Storage=7,593 cf Inflow=6.23 cfs 0.482 af
Outflow=1.79 cfs 0.428 af

Pond RG-2: Peak Elev=560.84' Storage=4,843 cf Inflow=4.56 cfs 0.332 af
Outflow=1.98 cfs 0.298 af

Pond RG-3: Peak Elev=574.10' Storage=6,017 cf Inflow=4.93 cfs 0.357 af
Primary=1.70 cfs 0.294 af Secondary=0.00 cfs 0.000 af Outflow=1.70 cfs 0.294 af

Link PA-1: Inflow=1.91 cfs 0.459 af
Primary=1.91 cfs 0.459 af

Link PA-2: Inflow=7.17 cfs 0.907 af
Primary=7.17 cfs 0.907 af

Total Runoff Area = 9.125 ac Runoff Volume = 1.517 af Average Runoff Depth = 2.00"
75.01% Pervious = 6.844 ac 24.99% Impervious = 2.281 ac

Summary for Subcatchment POST-1.0:

Runoff = 0.41 cfs @ 12.10 hrs, Volume= 0.030 af, Depth> 1.62"
Routed to Link PA-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.04"

Area (sf)	CN	Description
0	98	Unconnected roofs, HSG C
7,158	74	>75% Grass cover, Good, HSG C
2,098	70	Woods, Good, HSG C
551	98	Unconnected pavement, HSG C
9,807	74	Weighted Average
9,256		94.38% Pervious Area
551		5.62% Impervious Area
551		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	25	0.0885	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.75"
0.3	23	0.0885	1.49		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	97	0.0927	2.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	49	0.0612	1.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	30	0.2333	3.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	105	0.0952	4.63		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
6.5	329	Total			

Summary for Subcatchment POST-1.1:

Runoff = 6.23 cfs @ 12.12 hrs, Volume= 0.482 af, Depth> 1.84"
Routed to Pond RG-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.04"

Area (sf)	CN	Adj	Description
17,066	98		Unconnected roofs, HSG C
104,758	74		>75% Grass cover, Good, HSG C
0	70		Woods, Good, HSG C
15,159	98		Unconnected pavement, HSG C
136,983	80	77	Weighted Average, UI Adjusted
104,758			76.48% Pervious Area
32,225			23.52% Impervious Area
32,225			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	25	0.0689	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.75"
0.8	62	0.0689	1.31		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	82	0.0823	2.01		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	58	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	39	0.2307	3.36		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	138	0.0289	2.55		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.9	404	Total			

Summary for Subcatchment POST-2.0:

Runoff = 1.30 cfs @ 12.10 hrs, Volume= 0.096 af, Depth> 1.69"
Routed to Link PA-2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.04"

Area (sf)	CN	Adj	Description
3,465	98		Unconnected roofs, HSG C
23,163	74		>75% Grass cover, Good, HSG C
2,871	70		Woods, Good, HSG C
0	98		Unconnected pavement, HSG C
29,499	76	75	Weighted Average, UI Adjusted
26,034			88.25% Pervious Area
3,465			11.75% Impervious Area
3,465			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	36	0.1940	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.75"
0.3	39	0.0890	2.09		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	45	0.2889	3.76		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0847	1.46		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.7	145	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment POST-2.1:

Runoff = 4.56 cfs @ 12.09 hrs, Volume= 0.332 af, Depth> 2.49"
Routed to Pond RG-2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.04"

Area (sf)	CN	Description
8,418	98	Unconnected roofs, HSG C
38,989	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
22,213	98	Unconnected pavement, HSG C
69,620	85	Weighted Average
38,989		56.00% Pervious Area
30,631		44.00% Impervious Area
30,631		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	15	0.3850	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.75"
2.1	293	0.0247	2.36		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.8	308	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment POST-2.2:

Runoff = 4.93 cfs @ 12.09 hrs, Volume= 0.357 af, Depth> 2.40"
Routed to Pond RG-3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.04"

Area (sf)	CN	Description
15,535	98	Unconnected roofs, HSG C
45,787	74	>75% Grass cover, Good, HSG C
0	70	Woods, Good, HSG C
16,391	98	Unconnected pavement, HSG C
77,713	84	Weighted Average
45,787		58.92% Pervious Area
31,926		41.08% Impervious Area
31,926		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0714	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.75"
0.4	48	0.0714	1.87		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	99	0.0050	1.06		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
5.6	197	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment POST-2.3:

Runoff = 2.62 cfs @ 12.15 hrs, Volume= 0.219 af, Depth> 1.55"
Routed to Link PA-2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.04"

Area (sf)	CN	Description
550	98	Unconnected roofs, HSG C
48,519	74	>75% Grass cover, Good, HSG C
24,795	70	Woods, Good, HSG C
0	98	Unconnected pavement, HSG C
73,864	73	Weighted Average
73,314		99.26% Pervious Area
550		0.74% Impervious Area
550		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	25	0.0964	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.75"
0.6	51	0.0764	1.38		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.3	358	0.0391	1.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	52	0.0519	1.14		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.8	486	Total			

Summary for Pond RG-1:

Inflow Area = 3.145 ac, 23.52% Impervious, Inflow Depth > 1.84" for 10-YR event
Inflow = 6.23 cfs @ 12.12 hrs, Volume= 0.482 af
Outflow = 1.79 cfs @ 12.52 hrs, Volume= 0.428 af, Atten= 71%, Lag= 24.1 min
Primary = 1.79 cfs @ 12.52 hrs, Volume= 0.428 af
Routed to Link PA-1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 559.35' @ 12.52 hrs Surf.Area= 3,654 sf Storage= 7,593 cf
Flood Elev= 562.50' Surf.Area= 6,132 sf Storage= 20,801 cf

Plug-Flow detention time= 114.4 min calculated for 0.428 af (89% of inflow)
Center-of-Mass det. time= 61.7 min (902.5 - 840.9)

Volume	Invert	Avail.Storage	Storage Description
#1	553.17'	20,801 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
553.17	1,107	0.0	0	0
554.25	1,107	40.0	478	478
556.00	1,107	10.0	194	672
558.00	1,995	100.0	3,102	3,774
560.00	4,450	100.0	6,445	10,219
562.00	6,132	100.0	10,582	20,801

Device	Routing	Invert	Outlet Devices
#1	Primary	553.17'	**12.0" Round Culvert** L= 41.0' Ke= 0.500 Inlet / Outlet Invert= 553.17' / 552.25' S= 0.0224 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	553.17'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	556.00'	**10.000 in/hr Exfiltration over Surface area above 556.00'** Excluded Surface area = 1,107 sf
#4	Device 1	557.50'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	560.00'	**15.0" W x 18.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.78 cfs @ 12.52 hrs HW=559.35' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 1.78 cfs of 9.01 cfs potential flow)
  - **2=Orifice/Grate** (Passes 0.59 cfs of 2.30 cfs potential flow)
    - **3=Exfiltration** (Exfiltration Controls 0.59 cfs)
  - **4=Orifice/Grate** (Orifice Controls 1.20 cfs @ 6.09 fps)
- **5=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond RG-2:

Inflow Area = 1.598 ac, 44.00% Impervious, Inflow Depth > 2.49" for 10-YR event
Inflow = 4.56 cfs @ 12.09 hrs, Volume= 0.332 af
Outflow = 1.98 cfs @ 12.31 hrs, Volume= 0.298 af, Atten= 57%, Lag= 12.9 min
Primary = 1.98 cfs @ 12.31 hrs, Volume= 0.298 af
Routed to Link PA-2 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 560.84' @ 12.31 hrs Surf.Area= 2,175 sf Storage= 4,843 cf
Flood Elev= 562.50' Surf.Area= 2,781 sf Storage= 7,711 cf

Plug-Flow detention time= 120.4 min calculated for 0.298 af (90% of inflow)
Center-of-Mass det. time= 71.4 min (887.0 - 815.5)

Volume	Invert	Avail.Storage	Storage Description
#1	555.17'	7,711 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
555.17	911	0.0	0	0
556.25	911	40.0	394	394
558.00	911	10.0	159	553
560.00	1,733	100.0	2,644	3,197
562.00	2,781	100.0	4,514	7,711

Device	Routing	Invert	Outlet Devices
#1	Primary	555.17'	**12.0" Round Culvert** L= 37.0' Ke= 0.500 Inlet / Outlet Invert= 555.17' / 554.50' S= 0.0181 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	555.17'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	558.00'	**10.000 in/hr Exfiltration over Surface area above 558.00'** Excluded Surface area = 911 sf
#4	Device 1	559.50'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	561.50'	**15.0" W x 18.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.98 cfs @ 12.31 hrs HW=560.84' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 1.98 cfs of 8.60 cfs potential flow)
- **2=Orifice/Grate** (Passes 0.29 cfs of 2.20 cfs potential flow)
  - **3=Exfiltration** (Exfiltration Controls 0.29 cfs)
- **4=Orifice/Grate** (Orifice Controls 1.69 cfs @ 4.83 fps)
- **5=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond RG-3:

[92] Warning: Device #5 is above defined storage

Inflow Area = 1.784 ac, 41.08% Impervious, Inflow Depth > 2.40" for 10-YR event
Inflow = 4.93 cfs @ 12.09 hrs, Volume= 0.357 af
Outflow = 1.70 cfs @ 12.39 hrs, Volume= 0.294 af, Atten= 65%, Lag= 18.1 min
Primary = 1.70 cfs @ 12.39 hrs, Volume= 0.294 af
Routed to Link PA-2 :
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link PA-2 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 574.10' @ 12.39 hrs Surf.Area= 4,614 sf Storage= 6,017 cf
Flood Elev= 576.25' Surf.Area= 6,526 sf Storage= 11,045 cf

Plug-Flow detention time= 167.8 min calculated for 0.294 af (82% of inflow)
Center-of-Mass det. time= 96.7 min (915.5 - 818.7)

Volume	Invert	Avail.Storage	Storage Description
#1	570.17'	11,045 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
570.17	3,048	0.0	0	0
571.25	3,048	40.0	1,317	1,317
573.00	3,048	10.0	533	1,850
574.00	4,408	100.0	3,728	5,578
575.00	6,526	100.0	5,467	11,045

Device	Routing	Invert	Outlet Devices
#1	Primary	570.17'	**6.0" Round Culvert** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 570.17' / 569.50' S= 0.0223 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.20 sf
#2	Device 1	570.17'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	573.00'	**10.000 in/hr Exfiltration over Surface area above 573.00'** Excluded Surface area = 3,048 sf
#4	Device 1	573.75'	**15.0" W x 18.0" H Vert. Orifice/Grate X 104.00** C= 0.600 Limited to weir flow at low heads
#5	Secondary	576.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.50 Width (feet) 4.00 7.00

Primary OutFlow Max=1.70 cfs @ 12.39 hrs HW=574.10' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Barrel Controls 1.70 cfs @ 8.66 fps)
  - **2=Orifice/Grate** (Passes < 1.81 cfs potential flow)
    - **3=Exfiltration** (Passes < 0.36 cfs potential flow)
  - **4=Orifice/Grate** (Passes < 85.19 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=570.17' TW=0.00' (Dynamic Tailwater)
- **5=Custom Weir/Orifice** (Controls 0.00 cfs)

Summary for Link PA-1:

Inflow Area = 3.370 ac, 22.33% Impervious, Inflow Depth > 1.63" for 10-YR event
Inflow = 1.91 cfs @ 12.43 hrs, Volume= 0.459 af
Primary = 1.91 cfs @ 12.43 hrs, Volume= 0.459 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link PA-2:

Inflow Area = 5.755 ac, 26.55% Impervious, Inflow Depth > 1.89" for 10-YR event
Inflow = 7.17 cfs @ 12.15 hrs, Volume= 0.907 af
Primary = 7.17 cfs @ 12.15 hrs, Volume= 0.907 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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

SubcatchmentPOST-1.0: Runoff Area=9,807 sf 5.62% Impervious Runoff Depth>2.39"
Flow Length=329' Tc=6.5 min CN=74 Runoff=0.61 cfs 0.045 af

SubcatchmentPOST-1.1: Runoff Area=136,983 sf 23.52% Impervious Runoff Depth>2.64"
Flow Length=404' Tc=7.9 min UI Adjusted CN=77 Runoff=9.02 cfs 0.693 af

SubcatchmentPOST-2.0: Runoff Area=29,499 sf 11.75% Impervious Runoff Depth>2.47"
Flow Length=145' Tc=6.0 min UI Adjusted CN=75 Runoff=1.92 cfs 0.139 af

SubcatchmentPOST-2.1: Runoff Area=69,620 sf 44.00% Impervious Runoff Depth>3.39"
Flow Length=308' Tc=6.0 min CN=85 Runoff=6.16 cfs 0.452 af

SubcatchmentPOST-2.2: Runoff Area=77,713 sf 41.08% Impervious Runoff Depth>3.30"
Flow Length=197' Tc=6.0 min CN=84 Runoff=6.70 cfs 0.490 af

SubcatchmentPOST-2.3: Runoff Area=73,864 sf 0.74% Impervious Runoff Depth>2.30"
Flow Length=486' Tc=9.8 min CN=73 Runoff=3.95 cfs 0.325 af

Pond RG-1: Peak Elev=560.20' Storage=11,140 cf Inflow=9.02 cfs 0.693 af
Outflow=2.66 cfs 0.631 af

Pond RG-2: Peak Elev=561.47' Storage=6,315 cf Inflow=6.16 cfs 0.452 af
Outflow=2.52 cfs 0.413 af

Pond RG-3: Peak Elev=574.60' Storage=8,630 cf Inflow=6.70 cfs 0.490 af
Primary=1.80 cfs 0.421 af Secondary=0.00 cfs 0.000 af Outflow=1.80 cfs 0.421 af

Link PA-1: Inflow=2.83 cfs 0.675 af
Primary=2.83 cfs 0.675 af

Link PA-2: Inflow=9.63 cfs 1.298 af
Primary=9.63 cfs 1.298 af

Total Runoff Area = 9.125 ac Runoff Volume = 2.144 af Average Runoff Depth = 2.82"
75.01% Pervious = 6.844 ac 24.99% Impervious = 2.281 ac

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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

SubcatchmentPOST-1.0: Runoff Area=9,807 sf 5.62% Impervious Runoff Depth>3.13"
Flow Length=329' Tc=6.5 min CN=74 Runoff=0.80 cfs 0.059 af

SubcatchmentPOST-1.1: Runoff Area=136,983 sf 23.52% Impervious Runoff Depth>3.42"
Flow Length=404' Tc=7.9 min UI Adjusted CN=77 Runoff=11.68 cfs 0.897 af

SubcatchmentPOST-2.0: Runoff Area=29,499 sf 11.75% Impervious Runoff Depth>3.23"
Flow Length=145' Tc=6.0 min UI Adjusted CN=75 Runoff=2.52 cfs 0.182 af

SubcatchmentPOST-2.1: Runoff Area=69,620 sf 44.00% Impervious Runoff Depth>4.24"
Flow Length=308' Tc=6.0 min CN=85 Runoff=7.64 cfs 0.565 af

SubcatchmentPOST-2.2: Runoff Area=77,713 sf 41.08% Impervious Runoff Depth>4.14"
Flow Length=197' Tc=6.0 min CN=84 Runoff=8.35 cfs 0.615 af

SubcatchmentPOST-2.3: Runoff Area=73,864 sf 0.74% Impervious Runoff Depth>3.03"
Flow Length=486' Tc=9.8 min CN=73 Runoff=5.24 cfs 0.429 af

Pond RG-1: Peak Elev=560.65' Storage=13,295 cf Inflow=11.68 cfs 0.897 af
Outflow=4.62 cfs 0.831 af

Pond RG-2: Peak Elev=561.86' Storage=7,331 cf Inflow=7.64 cfs 0.565 af
Outflow=3.68 cfs 0.521 af

Pond RG-3: Peak Elev=574.99' Storage=10,975 cf Inflow=8.35 cfs 0.615 af
Primary=1.88 cfs 0.542 af Secondary=0.00 cfs 0.000 af Outflow=1.88 cfs 0.542 af

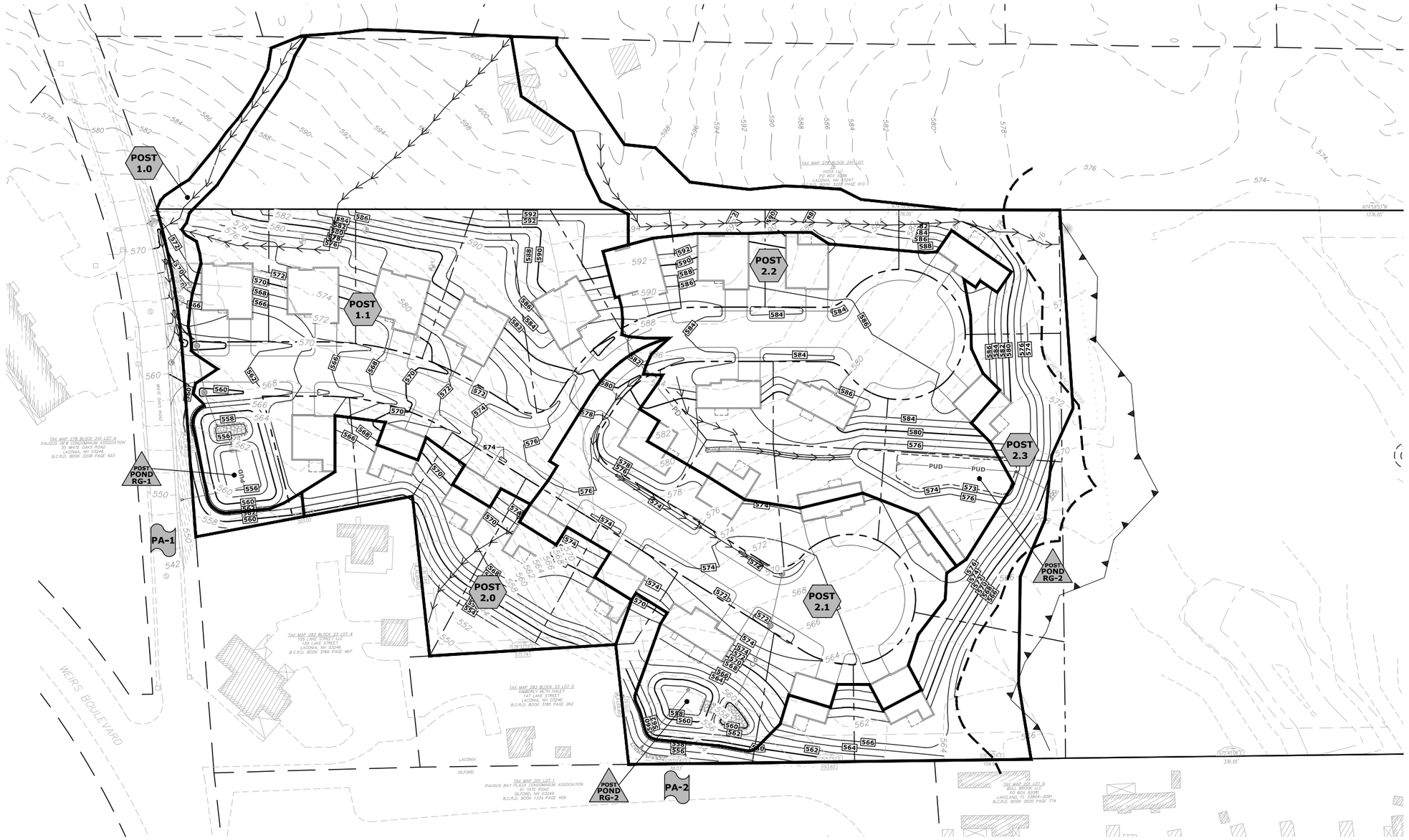
Link PA-1: Inflow=4.91 cfs 0.889 af
Primary=4.91 cfs 0.889 af

Link PA-2: Inflow=12.09 cfs 1.673 af
Primary=12.09 cfs 1.673 af

Total Runoff Area = 9.125 ac Runoff Volume = 2.747 af Average Runoff Depth = 3.61"
75.01% Pervious = 6.844 ac 24.99% Impervious = 2.281 ac

POST-DEVELOPMENT WATERSHED LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- POST-DEVELOPMENT LONGEST FLOW PATH
- POST 1.0 — POST-DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS



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33 WHITE OAKS SUBDIVISION

33 White Oaks Road

Laconia, New Hampshire

MARK	DATE	DESCRIPTION
1	1/30/2026	TRC Submission

PROJECT NO:	R5089-027B
DATE:	01/30/2026
FILE:	R5089-0278-C-HYDRO.dwg
DRAWN BY:	M.CURLEY/C.KRZCUIK
DESIGNED BY:	C.KRZCUIK
CHECKED BY:	N.HANSEN
APPROVED BY:	P.CRIMMINS

POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C-803

Last Saved: 1/29/2026
Printed: Jan 29, 2026 - 3:47pm By: MCurley
Tighe & Bond J:\R\R5089 Residential\0278 - 33 White Oaks Rd. Laconia, NH\Drawings\AutoCAD\Sheet\R5089-0278-C-HYDRO.dwg

2.4 Peak Rate Comparisons

The following table summarizes and compares the pre- and post-development peak runoff rates from the 2-year, 10-year, 25- year, and 50-year storm events at each point of analysis.

TABLE 2-1 Comparison of Pre and Post Development Flows

Point of Analysis	Pre/**Post** 2-Year Storm (cfs)	Pre/**Post** 10-Year Storm (cfs)	Pre/**Post** 25-Year Storm (cfs)	Pre/**Post** 50-Year Storm (cfs)
PA-1	1.15/**0.76**	2.90/**1.91**	4.44/**2.83**	5.93/**4.91**
PA-2	3.12/**1.98**	8.42/**7.17**	13.18/**9.63**	17.87/**12.09**

2.5 Mitigation Description

2.5.1 Mitigation Calculations

The proposed project area has been evaluated to treat the required water quality volume (WQV) per the requirements of Env-Wq 1500. These calculations have been provided in Section 3 of this report (BMP Worksheets).

2.5.2 Pre-Treatment Methods for Protecting Water Quality

Pretreatment methods for protecting water quality on this site include sediment forebays and pretreatment swales.

2.5.3 Treatment Methods for Protecting Water Quality

Treatment for the site is provided by means of three surface bioretention rain gardens. Each rain garden has been sized to treat the required Water Quality Volume for its respective subcatchment areas. The BMP Worksheets for these treatment practices have been included in Section 3 of this report.

SECTION 3 | BMP Worksheets

FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.08)

Type/Node Name: **RG 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 1508.08(a).	
3.15	ac	A = Area draining to the practice	
0.73	ac	A_I = Impervious area draining to the practice	
0.23	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.26	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.81	ac-in	WQV= 1" x Rv x A	
2,956	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
739	cf	25% x WQV (check calc for sediment forebay volume)	
2,217	cf	75% x WQV (check calc for surface sand filter volume)	
		Method of Pretreatment? (not required for clean or roof runoff)	
1,036	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
Calculate time to drain if system IS NOT underdrained:			
1,107	sf	A_{SA} = Surface area of the practice	
N/A	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
		If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
Yes	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:			
557.47	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
0.15	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
10.95	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**≤ 72-hrs**
554.25	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
553.17	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1.08	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**≥ 1'**
554.25	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	**≥ 1'**
554.25	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	**≥ 1'**
560.65	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
562.50	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**
2,299	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	C-605	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	**≥ 3:1**
Sheet	C-605	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:

Stage-Area-Storage for Pond RG-1:

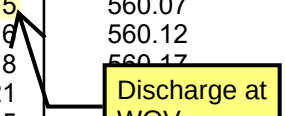
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
553.17	1,107	0
553.27	1,107	44
553.37	1,107	89
553.47	1,107	133
553.57	1,107	177
553.67	1,107	221
553.77	1,107	266
553.87	1,107	310
553.97	1,107	354
554.07	1,107	399
554.17	1,107	443
554.27	1,107	480
554.37	1,107	492
554.47	1,107	503
554.57	1,107	514
554.67	1,107	525
554.77	1,107	536
554.87	1,107	547
554.97	1,107	558
555.07	1,107	569
555.17	1,107	580
555.27	1,107	591
555.37	1,107	602
555.47	1,107	613
555.57	1,107	624
555.67	1,107	635
555.77	1,107	646
555.87	1,107	658
555.97	1,107	669
556.07	1,138	751
556.17	1,182	867
556.27	1,227	987
556.37	1,271	1,112
556.47	1,316	1,241
556.57	1,360	1,375
556.67	1,404	1,513
556.77	1,449	1,656
556.87	1,493	1,803
556.97	1,538	1,955
557.07	1,582	2,111
557.17	1,626	2,271
557.27	1,671	2,436
557.37	1,715	2,605
557.47	1,760	2,779
557.57	1,804	2,957
557.67	1,848	3,140
557.77	1,893	3,327
557.87	1,937	3,518
557.97	1,982	3,714
558.07	2,081	3,917
558.17	2,204	4,131
558.27	2,326	4,357
558.37	2,449	4,596
558.47	2,572	4,847
558.57	2,695	5,111
558.67	2,817	5,386
558.77	2,940	5,674
[illegible]	[illegible]063	5,974
[illegible]	[illegible]186	6,287
[illegible]	[illegible]308	6,611
559.17	3,431	6,948
559.27	3,554	7,298
559.37	3,677	7,659
559.47	3,799	8,033
559.57	3,922	8,419
559.67	4,045	8,817
559.77	4,168	9,228
559.87	4,290	9,651
559.97	4,413	10,086
560.07	4,509	10,533
560.17	4,593	10,988
560.27	4,677	11,451
560.37	4,761	11,923
560.47	4,845	12,403
560.57	4,929	12,892
560.67	5,013	13,389
560.77	5,098	13,895
560.87	5,182	14,409
560.97	5,266	14,931
561.07	5,350	15,462
561.17	5,434	16,001
561.27	5,518	16,549
561.37	5,602	17,105
561.47	5,686	17,669
561.57	5,770	18,242
561.67	5,854	18,823
561.77	5,939	19,413
561.87	6,023	20,011
561.97	**6,107**	**20,617**
562.07	**6,132**	**20,801**
562.17	6,132	20,801
562.27	6,132	20,801
562.37	6,132	20,801
562.47	6,132	20,801

Volume below Filter Media

Volume at Lowest Outlet

Stage-Discharge for Pond RG-1:

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
553.17	0.00	555.77	0.00	558.37	1.06	560.97	6.49
553.22	0.00	555.82	0.00	558.42	1.10	561.02	6.82
553.27	0.00	555.87	0.00	558.47	1.14	561.07	7.15
553.32	0.00	555.92	0.00	558.52	1.18	561.12	7.48
553.37	0.00	555.97	0.00	558.57	1.22	561.17	7.83
553.42	0.00	556.02	0.00	558.62	1.26	561.22	8.18
553.47	0.00	556.07	0.01	558.67	1.30	561.27	8.54
553.52	0.00	556.12	0.01	558.72	1.34	561.32	8.90
553.57	0.00	556.17	0.02	558.77	1.38	561.37	9.27
553.62	0.00	556.22	0.02	558.82	1.42	561.42	9.65
553.67	0.00	556.27	0.03	558.87	1.45	561.47	10.03
553.72	0.00	556.32	0.03	558.92	1.49	561.52	10.41
553.77	0.00	556.37	0.04	558.97	1.53	561.57	10.75
553.82	0.00	556.42	0.04	559.02	1.56	561.62	11.06
553.87	0.00	556.47	0.05	559.07	1.60	561.67	11.35
553.92	0.00	556.52	0.05	559.12	1.63	561.72	11.63
553.97	0.00	556.57	0.06	559.17	1.66	561.77	11.90
554.02	0.00	556.62	0.06	559.22	1.70	561.82	12.16
554.07	0.00	556.67	0.07	559.27	1.73	561.87	12.41
554.12	0.00	556.72	0.07	559.32	1.77	561.92	12.66
554.17	0.00	556.77	0.08	559.37	1.80	561.97	12.90
554.22	0.00	556.82	0.08	559.42	1.83	562.02	13.13
554.27	0.00	556.87	0.09	559.47	1.86	562.07	13.35
554.32	0.00	556.92	0.09	559.52	1.90	562.12	13.57
554.37	0.00	556.97	0.10	559.57	1.93	562.17	13.78
554.42	0.00	557.02	0.10	559.62	1.96	562.22	13.98
554.47	0.00	557.07	0.11	559.67	1.99	562.27	14.19
554.52	0.00	557.12	0.12	559.72	2.02	562.32	14.38
554.57	0.00	557.17	0.12	559.77	2.05	562.37	14.58
554.62	0.00	557.22	0.13	559.82	2.08	562.42	14.77
554.67	0.00	557.27	0.13	559.87	2.11	562.47	**14.96**
554.72	0.00	557.32	0.14	559.92	2.14		
554.77	0.00	557.37	0.14	559.97	2.17		
554.82	0.00	557.42	0.15	560.02	2.21		
554.87	0.00	557.47	0.15	560.07	2.30		
554.92	0.00	557.52	0.16	560.12	2.42		
554.97	0.00	557.57	0.18	560.17	2.56		
555.02	0.00	557.62	0.21	560.22	2.72		
555.07	0.00	557.67	0.25	560.27	2.89		
555.12	0.00	557.72	0.31	560.32	3.08		
555.17	0.00	557.77	0.37	560.37	3.28		
555.22	0.00	557.82	0.44	560.42	3.49		
555.27	0.00	557.87	0.51	560.47	3.72		
555.32	0.00	557.92	0.59	560.52	3.95		
555.37	0.00	557.97	0.65	560.57	4.20		
555.42	0.00	558.02	0.70	560.62	4.46		
555.47	0.00	558.07	0.76	560.67	4.72		
555.52	0.00	558.12	0.81	560.72	4.99		
555.57	0.00	558.17	0.87	560.77	5.28		
555.62	0.00	558.22	0.92	560.82	5.57		
555.67	0.00	558.27	0.96	560.87	5.87		
555.72	0.00	558.32	1.01	560.92	6.18		



FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.08)

Type/Node Name: **RG 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 1508.08(a).	
1.60	ac	A = Area draining to the practice	
0.70	ac	A_I = Impervious area draining to the practice	
0.44	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.44	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.71	ac-in	WQV= 1" x Rv x A	
2,577	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
644	cf	25% x WQV (check calc for sediment forebay volume)	
1,933	cf	75% x WQV (check calc for surface sand filter volume)	
		Method of Pretreatment? (not required for clean or roof runoff)	
1,022	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
Calculate time to drain if system IS NOT underdrained:			
911	sf	A_{SA} = Surface area of the practice	
N/A	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
		If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
Yes	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:			
559.47	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
0.14	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
10.23	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**≤ 72-hrs**
556.25	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
555.17	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1.08	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**≥ 1'**
556.25	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	**≥ 1'**
556.25	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	**≥ 1'**
561.86	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
562.50	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**
1,941	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	C-605	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	**≥ 3:1**
Sheet	C-605	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:

Stage-Area-Storage for Pond RG-2:

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
555.17	911	0
555.27	911	36
555.37	911	73
555.47	911	109
555.57	911	146
555.67	911	182
555.77	911	219
555.87	911	255
555.97	911	292
556.07	911	328
556.17	911	364
556.27	911	395
556.37	911	404
556.47	911	414
556.57	911	423
556.67	911	432
556.77	911	441
556.87	911	450
556.97	911	459
557.07	911	468
557.17	911	477
557.27	911	486
557.37	911	496
557.47	911	505
557.57	911	514
557.67	911	523
557.77	911	532
557.87	911	541
557.97	911	550
558.07	940	618
558.17	981	714
558.27	1,022	814
558.37	1,063	918
558.47	1,104	1,027
558.57	1,145	1,139
558.67	1,186	1,256
558.77	1,227	1,376
558.87	1,269	1,501
558.97	1,310	1,630
559.07	1,351	1,763
559.17	1,392	1,900
559.27	1,433	2,041
559.37	1,474	2,187
559.47	1,515	2,336
559.57	1,556	2,490
559.67	1,597	2,647
559.77	1,638	2,809
559.87	1,680	2,975
559.97	1,721	3,145
560.07	1,770	3,320
560.17	1,822	3,499
560.27	1,874	3,684

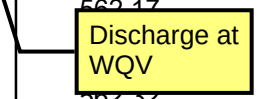
Volume below Filter Media

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
560.37	1,927	3,874
560.47	1,979	4,069
560.57	2,032	4,270
560.67	2,084	4,476
560.77	2,136	4,687
[illegible]	[illegible]189	4,903
[illegible]	[illegible]241	5,125
[illegible]	[illegible]294	5,351
561.17	2,346	5,583
561.27	2,398	5,820
561.37	2,451	6,063
561.47	2,503	6,311
561.57	2,556	6,564
561.67	2,608	6,822
561.77	2,660	7,085
561.87	2,713	7,354
561.97	**2,765**	**7,628**
562.07	**2,781**	**7,711**
562.17	2,781	7,711
562.27	2,781	7,711
562.37	2,781	7,711
562.47	2,781	7,711
562.57	2,781	7,711
562.67	2,781	7,711
562.77	2,781	7,711
562.87	2,781	7,711
562.97	2,781	7,711

Volume at Lowest Outlet

Stage-Discharge for Pond RG-2:

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
555.17	0.00	557.77	0.00	560.37	1.47	562.97	**10.22**
555.22	0.00	557.82	0.00	560.42	1.53		
555.27	0.00	557.87	0.00	560.47	1.59		
555.32	0.00	557.92	0.00	560.52	1.65		
555.37	0.00	557.97	0.00	560.57	1.70		
555.42	0.00	558.02	0.00	560.62	1.76		
555.47	0.00	558.07	0.01	560.67	1.81		
555.52	0.00	558.12	0.01	560.72	1.86		
555.57	0.00	558.17	0.02	560.77	1.91		
555.62	0.00	558.22	0.02	560.82	1.96		
555.67	0.00	558.27	0.03	560.87	2.01		
555.72	0.00	558.32	0.03	560.92	2.05		
555.77	0.00	558.37	0.04	560.97	2.10		
555.82	0.00	558.42	0.04	561.02	2.14		
555.87	0.00	558.47	0.04	561.07	2.19		
555.92	0.00	558.52	0.05	561.12	2.23		
555.97	0.00	558.57	0.05	561.17	2.28		
556.02	0.00	558.62	0.06	561.22	2.32		
556.07	0.00	558.67	0.06	561.27	2.36		
556.12	0.00	558.72	0.07	561.32	2.40		
556.17	0.00	558.77	0.07	561.37	2.44		
556.22	0.00	558.82	0.08	561.42	2.48		
556.27	0.00	558.87	0.08	561.47	2.52		
556.32	0.00	558.92	0.09	561.52	2.57		
556.37	0.00	558.97	0.09	561.57	2.67		
556.42	0.00	559.02	0.10	561.62	2.80		
556.47	0.00	559.07	0.10	561.67	2.95		
556.52	0.00	559.12	0.11	561.72	3.12		
556.57	0.00	559.17	0.11	561.77	3.31		
556.62	0.00	559.22	0.12	561.82	3.51		
556.67	0.00	559.27	0.12	561.87	3.72		
556.72	0.00	559.32	0.13	561.92	3.94		
556.77	0.00	559.37	0.13	561.97	4.18		
556.82	0.00	559.42	0.14	562.02	4.42		
556.87	0.00	559.47	0.14	562.07	4.67		
556.92	0.00	559.52	0.15	562.12	4.93		
556.97	0.00	559.57	0.17	562.17	5.20		
557.02	0.00	559.62	0.20	562.22	5.48		
557.07	0.00	559.67	0.26	562.27	5.77		
557.12	0.00	559.72	0.32	562.32	6.06		
557.17	0.00	559.77	0.40	562.37	6.37		
557.22	0.00	559.82	0.49	562.42	6.68		
557.27	0.00	559.87	0.59	562.47	7.00		
557.32	0.00	559.92	0.69	562.52	7.32		
557.37	0.00	559.97	0.80	562.57	7.65		
557.42	0.00	560.02	0.91	562.62	7.99		
557.47	0.00	560.07	1.02	562.67	8.34		
557.52	0.00	560.12	1.11	562.72	8.70		
557.57	0.00	560.17	1.19	562.77	9.06		
557.62	0.00	560.22	1.26	562.82	9.42		
557.67	0.00	560.27	1.33	562.87	9.80		
557.72	0.00	560.32	1.40	562.92	10.18		



FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.08)

Type/Node Name: **RG 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 1508.08(a).	
1.78	ac	A = Area draining to the practice	
0.73	ac	A_I = Impervious area draining to the practice	
0.41	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.42	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.75	ac-in	WQV= 1" x Rv x A	
2,709	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
677	cf	25% x WQV (check calc for sediment forebay volume)	
2,032	cf	75% x WQV (check calc for surface sand filter volume)	
		Method of Pretreatment? (not required for clean or roof runoff)	
N/A	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
Calculate time to drain if system IS NOT underdrained:			
3,048	sf	A_{SA} = Surface area of the practice	
N/A	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
		If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
Yes	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:			
573.77	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
0.21	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
7.17	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**≤ 72-hrs**
571.25	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
570.17	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1.08	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**≥ 1'**
571.25	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	**≥ 1'**
571.25	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	**≥ 1'**
574.99	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
576.00	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**
3,277	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	C-606	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	**≥ 3:1**
Sheet	C-605	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:

Stage-Area-Storage for Pond RG-3:

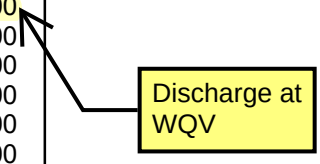
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
570.17	3,048	0
570.27	3,048	122
570.37	3,048	244
570.47	3,048	366
570.57	3,048	488
570.67	3,048	610
570.77	3,048	732
570.87	3,048	853
570.97	3,048	975
571.07	3,048	1,097
571.17	3,048	1,219
571.27	3,048	1,323
571.37	3,048	1,353
571.47	3,048	1,384
571.57	3,048	1,414
571.67	3,048	1,445
571.77	3,048	1,475
571.87	3,048	1,506
571.97	3,048	1,536
572.07	3,048	1,567
572.17	3,048	1,597
572.27	3,048	1,628
572.37	3,048	1,658
572.47	3,048	1,689
572.57	3,048	1,719
572.67	3,048	1,750
572.77	3,048	1,780
572.87	3,048	1,811
572.97	3,048	1,841
573.07	3,143	2,067
573.17	3,279	2,388
573.27	3,415	2,723
573.37	3,551	3,071
573.47	3,687	3,433
573.57	3,823	3,808
573.67	3,959	4,198
573.77	4,095	4,600
573.87	4,231	5,017
573.97	4,367	5,447
574.07	4,556	5,892
574.17	4,768	6,358
574.27	4,980	6,845
574.37	5,192	7,354
574.47	5,403	7,884
574.57	5,615	8,435
574.67	5,827	9,007
574.77	6,039	9,600
574.87	6,251	10,215
574.97	**6,462**	**10,850**
575.07	**6,526**	**11,045**
575.17	6,526	11,045
575.27	6,526	11,045
575.37	6,526	11,045
575.47	6,526	11,045
575.57	6,526	11,045
575.67	6,526	11,045
575.77	6,526	11,045
575.87	6,526	11,045
575.97	6,526	11,045
[illegible]	[illegible]26	11,045
[illegible]	[illegible]26	11,045
[illegible]	[illegible]26	11,045
576.37	6,526	11,045
576.47	6,526	11,045

Volume below Filter Media

Volume at Lowest Outlet

Stage-Discharge for Pond RG-3:

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
570.17	0.00	0.00	0.00
570.27	0.00	0.00	0.00
570.37	0.00	0.00	0.00
570.47	0.00	0.00	0.00
570.57	0.00	0.00	0.00
570.67	0.00	0.00	0.00
570.77	0.00	0.00	0.00
570.87	0.00	0.00	0.00
570.97	0.00	0.00	0.00
571.07	0.00	0.00	0.00
571.17	0.00	0.00	0.00
571.27	0.00	0.00	0.00
571.37	0.00	0.00	0.00
571.47	0.00	0.00	0.00
571.57	0.00	0.00	0.00
571.67	0.00	0.00	0.00
571.77	0.00	0.00	0.00
571.87	0.00	0.00	0.00
571.97	0.00	0.00	0.00
572.07	0.00	0.00	0.00
572.17	0.00	0.00	0.00
572.27	0.00	0.00	0.00
572.37	0.00	0.00	0.00
572.47	0.00	0.00	0.00
572.57	0.00	0.00	0.00
572.67	0.00	0.00	0.00
572.77	0.00	0.00	0.00
572.87	0.00	0.00	0.00
572.97	0.00	0.00	0.00
573.07	0.02	0.02	0.00
573.17	0.05	0.05	0.00
573.27	0.08	0.08	0.00
573.37	0.12	0.12	0.00
573.47	0.15	0.15	0.00
573.57	0.18	0.18	0.00
573.67	0.21	0.21	0.00
573.77	1.42	1.42	0.00
573.87	1.65	1.65	0.00
573.97	1.67	1.67	0.00
574.07	1.69	1.69	0.00
574.17	1.71	1.71	0.00
574.27	1.73	1.73	0.00
574.37	1.76	1.76	0.00
574.47	1.78	1.78	0.00
574.57	1.79	1.79	0.00
574.67	1.81	1.81	0.00
574.77	1.83	1.83	0.00
574.87	1.85	1.85	0.00
574.97	1.87	1.87	0.00
575.07	1.89	1.89	0.00
575.17	1.91	1.91	0.00
575.27	1.93	1.93	0.00
575.37	1.95	1.95	0.00
575.47	1.96	1.96	0.00
575.57	1.98	1.98	0.00
575.67	2.00	2.00	0.00
575.77	2.02	2.02	0.00
575.87	2.03	2.03	0.00
575.97	2.05	2.05	0.00
576.07	2.32	2.07	0.25
576.17	3.10	2.09	1.01
576.27	4.24	2.10	2.14
576.37	5.72	2.12	3.60
576.47	**7.55**	**2.14**	**5.41**



Tighe & Bond

Appendix A:
NRCS Web Soil Survey

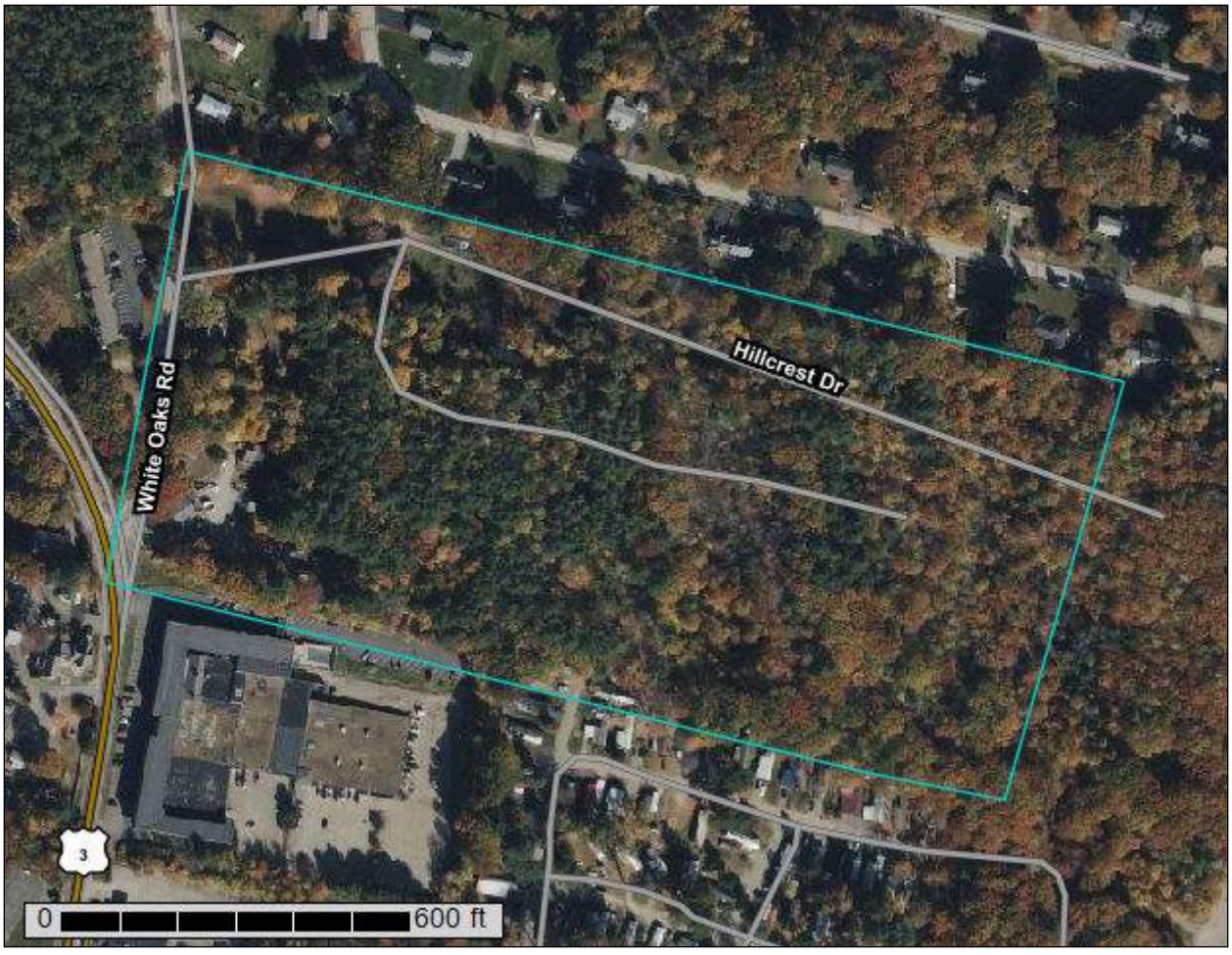
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Merrimack and Belknap Counties, New Hampshire



December 8, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,940 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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: Merrimack and Belknap Counties, New Hampshire
Survey Area Data: Version 31, Sep 10, 2025

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

Date(s) aerial images were photographed: Oct 6, 2022—Oct 22, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
166B	Canterbury fine sandy loam, 3 to 8 percent slopes	6.2	21.9%
167C	Canterbury fine sandy loam, 8 to 15 percent slopes, very stony	8.3	29.3%
167D	Canterbury fine sandy loam, 15 to 25 percent slopes, very stony	8.2	28.8%
479B	Gilmanton fine sandy loam, 3 to 8 percent slopes, very stony	4.1	14.4%
680C	Henniker-Urban land complex, 0 to 15 percent slopes	0.9	3.2%
789B	Champlain-Urban land complex, 0 to 8 percent slopes	0.7	2.4%
Totals for Area of Interest		**28.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit

descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Merrimack and Belknap Counties, New Hampshire

166B—Canterbury fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9dnr
Elevation: 250 to 2,940 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 90 to 135 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Canterbury and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canterbury

Setting

Landform: Drumlins
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lodgement till derived from granite, gneiss, or schist

Typical profile

Oe - 0 to 2 inches: slightly decomposed plant material
H1 - 2 to 6 inches: fine sandy loam
H2 - 6 to 28 inches: fine sandy loam
H3 - 28 to 65 inches: fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F144BY501ME - Loamy Slope (Northern Hardwoods), F144BY601ME - Dry Sand
Hydric soil rating: No

Minor Components

Gilmanton

Percent of map unit: 5 percent
Landform: Hillslopes

Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Henniker
Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Metacomet
Percent of map unit: 3 percent
Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Pillsbury
Percent of map unit: 3 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: Yes

Marlow
Percent of map unit: 2 percent
Landform: Drumlins
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Pillsbury
Percent of map unit: 2 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: Yes

167C—Canterbury fine sandy loam, 8 to 15 percent slopes, very stony

Map Unit Setting
National map unit symbol: 9dnv
Elevation: 250 to 2,940 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 90 to 135 days
Farmland classification: Farmland of local importance

Map Unit Composition
Canterbury and similar soils: 75 percent

Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canterbury

Setting
Landform: Drumlins
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lodgement till derived from granite, gneiss, or schist

Typical profile
Oe - 0 to 2 inches: slightly decomposed plant material
H1 - 2 to 6 inches: fine sandy loam
H2 - 6 to 28 inches: fine sandy loam
H3 - 28 to 65 inches: fine sandy loam

Properties and qualities
Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: F144BY501ME - Loamy Slope (Northern Hardwoods), F144BY601ME - Dry Sand
Hydric soil rating: No

Minor Components

Gilmanton
Percent of map unit: 5 percent
Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Henniker
Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Chichester
Percent of map unit: 5 percent
Landform: Hillslopes
Down-slope shape: Linear

Across-slope shape: Linear
Hydric soil rating: No

Marlow
Percent of map unit: 5 percent
Landform: Drumlins
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Metacomet
Percent of map unit: 3 percent
Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Metacomet
Percent of map unit: 2 percent
Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

167D—Canterbury fine sandy loam, 15 to 25 percent slopes, very stony

Map Unit Setting
National map unit symbol: 9dnt
Elevation: 250 to 2,940 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 90 to 135 days
Farmland classification: Farmland of local importance

Map Unit Composition
Canterbury and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canterbury

Setting
Landform: Drumlins
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lodgement till derived from granite, gneiss, or schist

Typical profile
Oe - 0 to 2 inches: slightly decomposed plant material
H1 - 2 to 6 inches: fine sandy loam
H2 - 6 to 28 inches: fine sandy loam

H3 - 28 to 65 inches: fine sandy loam

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: F144BY501ME - Loamy Slope (Northern Hardwoods), F144BY601ME - Dry Sand
Hydric soil rating: No

Minor Components

Gilmanton

Percent of map unit: 5 percent
Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Henniker

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Marlow

Percent of map unit: 5 percent
Landform: Drumlins
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Metacomet

Percent of map unit: 4 percent
Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Chichester

Percent of map unit: 3 percent
Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear

Hydric soil rating: No

Millsite

Percent of map unit: 3 percent
Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

479B—Gilmanton fine sandy loam, 3 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: bpmj
Elevation: 250 to 2,940 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 90 to 135 days
Farmland classification: Farmland of local importance

Map Unit Composition

Gilmanton and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilmanton

Setting

Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lodgement till derived from granite, gneiss, or schist; lodgement till derived from granite, gneiss, or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
Oa - 2 to 3 inches: slightly decomposed plant material
H1 - 3 to 8 inches: fine sandy loam
H2 - 8 to 24 inches: fine sandy loam
H3 - 24 to 65 inches: fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 16 to 30 inches
Frequency of flooding: None
Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Ecological site: F144BY501ME - Loamy Slope (Northern Hardwoods), F144BY602ME - Sandy Toeslope
Hydric soil rating: No

Minor Components

Pillsbury

Percent of map unit: 10 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: Yes

Canterbury

Percent of map unit: 5 percent
Landform: Drumlins
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Metacomet

Percent of map unit: 4 percent
Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Peacham

Percent of map unit: 2 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Henniker

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Peru

Percent of map unit: 2 percent
Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

680C—Henniker-Urban land complex, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9dql
Elevation: 200 to 2,940 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 90 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Henniker and similar soils: 41 percent
Urban land: 39 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Henniker

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Basal melt-out till derived from granite, gneiss, or schist

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
H1 - 1 to 4 inches: fine sandy loam
H2 - 4 to 34 inches: fine sandy loam
H3 - 34 to 65 inches: fine sandy loam

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 18 to 38 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F144BY501ME - Loamy Slope (Northern Hardwoods)
Hydric soil rating: No

Description of Urban Land

Typical profile

H1 - 0 to 6 inches: variable

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Minor Components

Becket

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Canterbury

Percent of map unit: 5 percent
Landform: Drumlins
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Metacomet

Percent of map unit: 4 percent
Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Moosilauke

Percent of map unit: 4 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: Yes

Chichester

Percent of map unit: 2 percent
Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

789B—Champlain-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 1hb2y
Elevation: 200 to 2,940 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 80 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Champlain and similar soils: 41 percent
Urban land: 39 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Champlain

Setting

Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy outwash derived mainly from granite, gneiss and schist

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
H1 - 1 to 6 inches: loamy fine sand
H2 - 6 to 22 inches: loamy fine sand
H3 - 22 to 65 inches: loamy fine sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F144BY601ME - Dry Sand
Hydric soil rating: No

Description of Urban Land

Typical profile

H1 - 0 to 6 inches: variable

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Minor Components

Croghan

Percent of map unit: 5 percent
Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Naumburg

Percent of map unit: 5 percent
Landform: Depressions
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: Yes

Ondawa

Percent of map unit: 3 percent
Landform: Flood plains
Hydric soil rating: No

Adams

Percent of map unit: 3 percent
Landform: Outwash terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Rumney

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: Yes

Colton

Percent of map unit: 2 percent
Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

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Appendix B:
NRCC Rainfall Data

Extreme Precipitation Tables

Northeast Regional Climate Center

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

Metadata for Point

Smoothing	Yes
State	
Location	
Latitude	43.569 degrees North
Longitude	71.447 degrees West
Elevation	170 feet
Date/Time	Tue Dec 16 2025 09:52:32 GMT-0500 (Eastern Standard Time)

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.39	0.49	0.64	0.80	1.01	**1yr**	0.69	0.95	1.16	1.46	1.83	2.31	2.59	**1yr**	2.05	2.49	2.90	3.54	4.12	**1yr**
2yr	0.31	0.48	0.60	0.79	0.99	1.25	**2yr**	0.86	1.14	1.44	1.79	2.22	2.75	3.10	**2yr**	2.44	2.98	3.45	4.16	4.75	**2yr**
5yr	0.37	0.58	0.72	0.97	1.23	1.56	**5yr**	1.07	1.43	1.81	2.25	2.78	3.42	3.89	**5yr**	3.03	3.74	4.32	5.11	5.80	**5yr**
10yr	0.41	0.65	0.82	1.12	1.46	1.86	**10yr**	1.26	1.71	2.16	2.68	3.30	4.04	4.62	**10yr**	3.57	4.45	5.12	5.97	6.75	**10yr**
25yr	0.49	0.78	0.99	1.37	1.82	2.34	**25yr**	1.57	2.15	2.71	3.37	4.14	5.03	5.81	**25yr**	4.45	5.59	6.42	7.34	8.25	**25yr**
50yr	0.56	0.89	1.14	1.60	2.15	2.78	**50yr**	1.86	2.57	3.24	4.02	4.91	5.94	6.92	**50yr**	5.25	6.65	7.63	8.58	9.61	**50yr**
100yr	0.63	1.02	1.32	1.87	2.55	3.32	**100yr**	2.20	3.07	3.87	4.79	5.83	7.02	8.23	**100yr**	6.21	7.92	9.06	10.04	11.20	**100yr**
200yr	0.72	1.18	1.53	2.19	3.02	3.94	**200yr**	2.60	3.67	4.60	5.70	6.93	8.29	9.81	**200yr**	7.34	9.43	10.77	11.75	13.06	**200yr**
500yr	0.87	1.42	1.86	2.70	3.78	4.97	**500yr**	3.26	4.65	5.80	7.18	8.69	10.36	12.37	**500yr**	9.17	11.89	13.54	14.48	16.01	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.23	0.35	0.43	0.58	0.71	0.90	**1yr**	0.61	0.88	0.97	1.27	1.53	1.97	2.26	**1yr**	1.74	2.17	2.36	2.91	3.67	**1yr**
2yr	0.30	0.47	0.57	0.78	0.96	1.14	**2yr**	0.83	1.12	1.30	1.72	2.21	2.67	3.00	**2yr**	2.37	2.89	3.35	4.04	4.61	**2yr**
5yr	0.34	0.53	0.66	0.90	1.15	1.37	**5yr**	0.99	1.34	1.55	2.02	2.61	3.15	3.59	**5yr**	2.79	3.46	3.97	4.78	5.42	**5yr**
10yr	0.38	0.58	0.72	1.01	1.30	1.55	**10yr**	1.12	1.52	1.77	2.26	2.92	3.57	4.10	**10yr**	3.16	3.94	4.52	5.41	6.11	**10yr**
25yr	0.43	0.66	0.82	1.16	1.53	1.85	**25yr**	1.32	1.81	2.10	2.65	3.37	4.20	4.86	**25yr**	3.71	4.67	5.35	6.30	7.11	**25yr**
50yr	0.47	0.72	0.90	1.29	1.74	2.10	**50yr**	1.50	2.06	2.39	2.98	3.74	4.72	5.53	**50yr**	4.18	5.32	6.07	7.10	8.02	**50yr**
100yr	0.52	0.79	0.99	1.43	1.97	2.39	**100yr**	1.70	2.33	2.74	3.48	4.16	5.30	6.28	**100yr**	4.69	6.04	6.87	8.01	8.99	**100yr**
200yr	0.58	0.87	1.10	1.60	2.23	2.71	**200yr**	1.93	2.65	3.13	3.96	4.59	5.93	7.11	**200yr**	5.25	6.84	7.76	8.99	10.11	**200yr**
500yr	0.67	0.99	1.27	1.85	2.63	3.20	**500yr**	2.27	3.13	3.75	4.70	5.23	6.82	8.33	**500yr**	6.04	8.01	9.10	10.50	11.80	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.71	0.87	1.04	**1yr**	0.75	1.02	1.19	1.57	1.98	2.53	2.83	**1yr**	2.24	2.72	3.17	3.79	4.42	**1yr**
2yr	0.33	0.50	0.62	0.84	1.03	1.22	**2yr**	0.89	1.19	1.39	1.83	2.42	2.86	3.23	**2yr**	2.54	3.10	3.58	4.30	4.89	**2yr**
5yr	0.40	0.61	0.76	1.04	1.32	1.59	**5yr**	1.14	1.55	1.80	2.35	2.99	3.72	4.20	**5yr**	3.29	4.04	4.64	5.47	6.19	**5yr**
10yr	0.47	0.73	0.90	1.26	1.63	1.95	**10yr**	1.40	1.91	2.21	2.80	3.55	4.55	5.15	**10yr**	4.03	4.95	5.68	6.59	7.42	**10yr**
25yr	0.60	0.91	1.14	1.62	2.14	2.58	**25yr**	1.84	2.52	2.90	3.63	4.55	5.98	6.77	**25yr**	5.29	6.51	7.43	8.56	9.44	**25yr**
50yr	0.72	1.09	1.36	1.95	2.63	3.19	**50yr**	2.27	3.12	3.56	4.38	5.51	7.37	8.35	**50yr**	6.52	8.03	9.11	10.38	11.44	**50yr**
100yr	0.87	1.31	1.64	2.37	3.25	3.96	**100yr**	2.80	3.87	4.38	5.56	6.66	9.10	10.28	**100yr**	8.05	9.88	11.19	12.59	13.75	**100yr**
200yr	1.04	1.57	1.99	2.88	4.01	4.92	**200yr**	3.46	4.81	5.38	6.77	8.81	11.26	12.71	**200yr**	9.96	12.22	13.75	15.29	16.56	**200yr**
500yr	1.33	1.98	2.55	3.70	5.26	6.60	**500yr**	4.54	6.45	7.07	8.78	11.53	14.96	16.87	**500yr**	13.24	16.22	18.13	19.81	21.21	**500yr**

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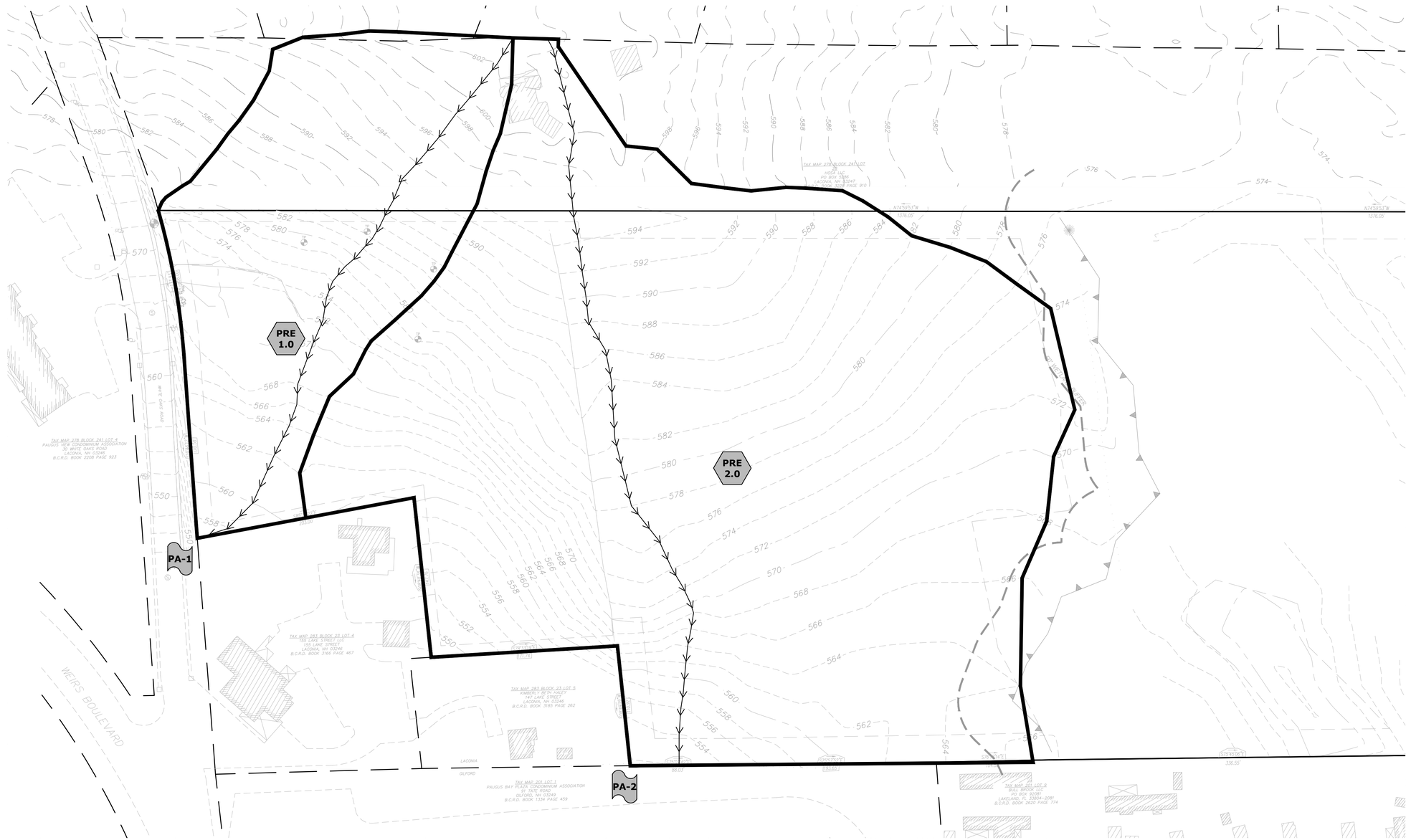
Appendix C:
Full-Size Watershed Plans

PRE-DEVELOPMENT WATERSHED LEGEND

- PRE-DEVELOPMENT WATERSHED BOUNDARY
- LONGEST FLOW PATH
- PRE 1.0 — PRE DEVELOPMENT WATERSHED AREA DESIGNATION
- PRE POND 1 — PRE-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS



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Tighe & Bond:J:\R\R5089 Residential\0278 - 33 White Oaks Rd, Laconia, NH\Drawings\AutoCAD\Sheet\R5089-0278-C-HYDRO.dwg

Tighe&Bond
177 Corporate Drive
Portsmouth, NH 03801
T 603.433.8818

33 WHITE OAKS SUBDIVISION

33 White Oaks Road

Laconia, New Hampshire

MARK	DATE	DESCRIPTION
1	1/30/2026	TRC Submission

PROJECT NO:	R5089-027B
DATE:	01/30/2026
FILE:	R5089-0278-C-HYDRO.dwg
DRAWN BY:	M.CURLEY/K.KRZCUIK
DESIGNED BY:	C.KRZCUIK
CHECKED BY:	N.HANSEN
APPROVED BY:	P.CRIMMINS

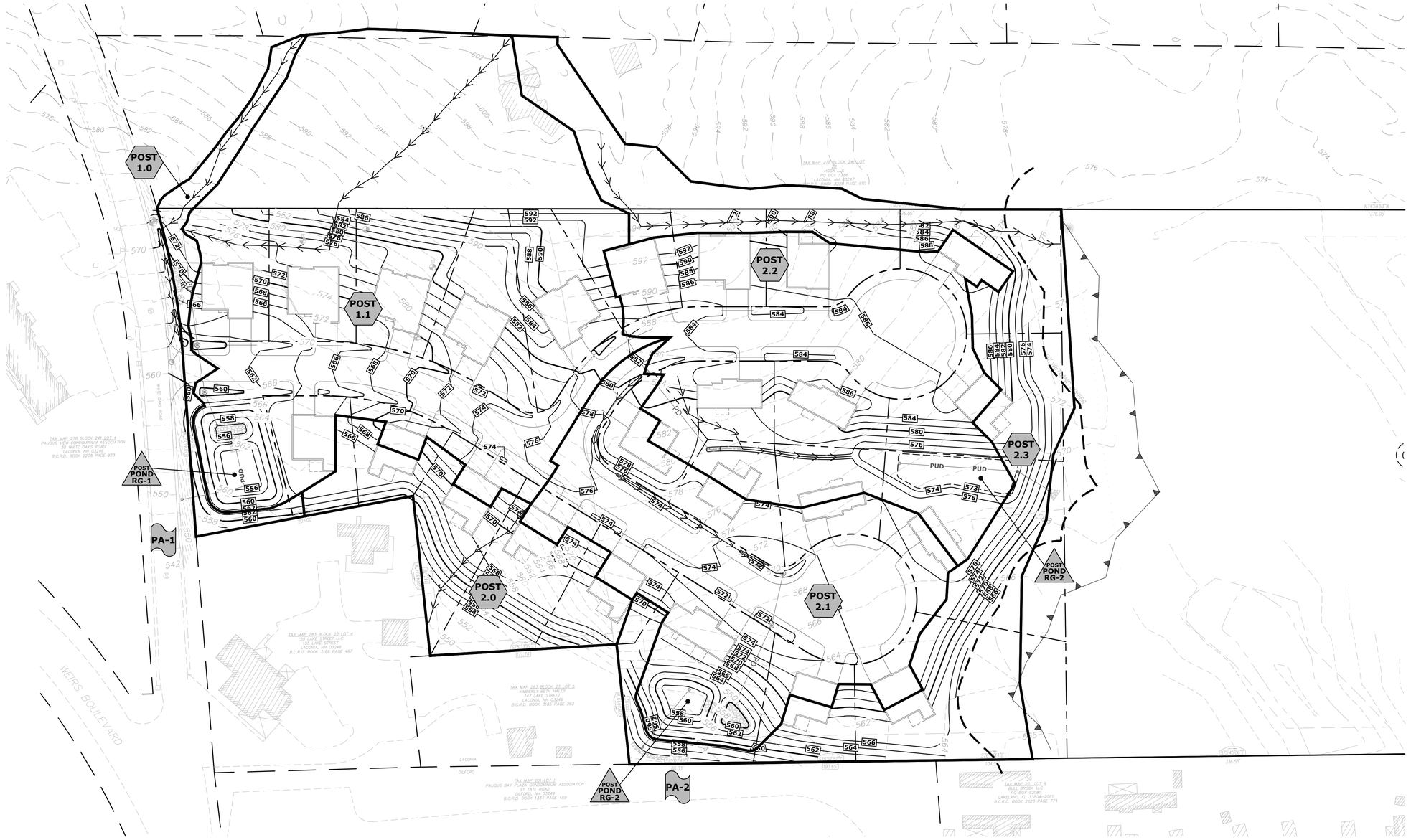
PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C-801

POST-DEVELOPMENT WATERSHED LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- POST-DEVELOPMENT LONGEST FLOW PATH
- POST 1.0 — POST-DEVELOPMENT WATERSHED AREA DESIGNATION
- POST POND 1 — POST-DEVELOPMENT POND DESIGNATION
- PA-1 — POINT OF ANALYSIS



0 50' 100'

SCALE: 1" = 50'

Tighe&Bond

177 Corporate Drive
Portsmouth, NH 03801
T 603.433.8818

33 WHITE OAKS SUBDIVISION

33 White Oaks Road

Laconia, New Hampshire

MARK	DATE	DESCRIPTION
1	1/30/2026	TRC Submission

PROJECT NO:	R5089-027B
DATE:	01/30/2026
FILE:	R5089-0278-C-HYDRO.dwg
DRAWN BY:	M.CURLEY/C.KRZCUIK
DESIGNED BY:	C.KRZCUIK
CHECKED BY:	N.HANSEN
APPROVED BY:	P.CRIMMINS

POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

C-803

Last Saved: 1/29/2026
Plotted: Jan 29, 2026-3:47pm By: MCurley
Tighe & Bond:J:\R\R5089 Residential\0278 - 33 White Oaks Rd, Laconia, NH\Drawings\AutoCAD\Sheet\R5089-0278-C-HYDRO.dwg

R5089-0278
January 30, 2026

Mr. Rob Mora
Director of Planning Department
City of Laconia Planning Department
45 Beacon Street E
Laconia, NH 03246

Re: Trip Generation Analysis
33 White Oaks Subdivision – 33 White Oaks Road, Laconia, NH

Dear Rob:

Tighe & Bond has performed a trip generation analysis related to the proposed White Oaks Rise Subdivision located at 33 White Oaks Road in Laconia, New Hampshire. The project consists of a 25-lot subdivision, including 24 single-family residential building lots and one lot dedicated to drainage improvements.

The project site is located in an area characterized by single-family residential development. The surrounding roadway network includes White Oaks Road, a local residential roadway providing one lane of travel in each direction with a posted speed limit of 35 miles per hour. There are no existing sidewalks or pedestrian facilities in the vicinity of the project site, and sidewalks are not proposed as part of this subdivision, consistent with existing roadway conditions and development patterns in the area. No signalized intersections are located immediately adjacent to the site.

Vehicular access to the proposed subdivision will be provided via a new public roadway constructed within a dedicated public right-of-way, as shown on the proposed site plan. The new public street will intersect White Oaks Road and provide access to all proposed residential lots within the subdivision.

Based on the posted speed limit of 35 mph on White Oaks Road, a minimum stopping sight distance of 250 feet is required in accordance with the American Association of State Highway and Transportation Officials (AASHTO) Policy on Geometric Design of Highways and Streets. Adequate stopping sight distance will be provided at the proposed roadway intersection to meet or exceed this requirement.

This analysis was performed utilizing the Institute of Transportation Engineers (ITE) Trip Generation Manual, latest edition. For the purposes of analysis, trip generation was calculated using ITE Land Use Code 210 – Single-Family Detached Housing. Average weekday AM and PM peak hour trip generation rates were used to estimate the number of vehicle trips anticipated to be generated by the proposed development.

Proposed 24 Residential Units – LUC 210

Weekday AM Peak Hour		
	Trips Entering	6
	Trips Exiting	16
	Total Vehicle Trips	**22**
Weekday PM Peak Hour		
	Trips Entering	16
	Trips Exiting	10
	Total Vehicle Trips	**26**
Saturday Peak Hour		
	Trips Entering	17
	Trips Exiting	16
	Total Vehicle Trips	**33**

Source: Institute of Transportation Engineers, Trip Generation, 12th Edition, 2025

Based on the relatively low number of peak-hour vehicle trips anticipated to be generated by the proposed subdivision, traffic impacts to White Oaks Road and nearby intersections are expected to be minimal. The projected increase in traffic is not anticipated to result in a noticeable change in overall traffic operations within the surrounding roadway network.

Given the residential nature of the surrounding area, low existing traffic volumes, and limited peak-hour trip generation associated with the proposed development, the subdivision is not anticipated to result in adverse impacts to traffic operations or roadway safety in the project vicinity.

Sincerely,
Tighe & Bond, Inc.

Patrick M. Crimmins, PE
Vice President

Neil A. Hansen, PE
Project Manager

Copy: Scot Buonopane (via email)

33 White Oaks Road, Laconia, New Hampshire
Wetland Delineation Memorandum

TO: Scott Buonopane

FROM: Jeremy Degler CWB, CWS, PWS, Project Environmental Scientist, Tighe & Bond

COPY: Neil Hansen, PE, Project Manager, Tighe & Bond; Stefanie Tetreault, CWS, PWS, Project Manager, Tighe & Bond

DATE: December 2, 2025

The following technical memorandum describes the wetland delineation conducted by Tighe & Bond on November 7, 2025, in support of the initial Feasibility Study being conducted for a proposed multi-family development project at 33 White Oaks Road in Laconia, New Hampshire. A topographic site location map and wetland delineation map are provided in Attachment 1, site photographs are provided in Attachment 2, and US Army Corps of Engineers (USACE) wetland delineation datasheets are provided in Attachment 3.

Site Location and Project Background

The subject property is located at 33 White Oaks Road in the Town of Laconia, New Hampshire (Tax Map 278, Block 241, Lot 29). Tighe & Bond has been requested to provide services related to an initial Feasibility Study for a proposed multi-family development project. As part of this assessment, a wetland delineation was conducted to identify potential jurisdictional resource areas within the proposed project area, as well as classification and assessment to allow for strategic planning and informed decision making. This delineation effort encompassed approximately 10 acres surrounding the anticipated project area within the western half of the subject parcel.

The western portion of the parcel is in the Commercial Resort (CR) district, while the eastern portion of the parcel is located in the Rural Residential (RR1) district. The parcel currently consists of a single-family residential home. The proposed project would subdivide the western portion of the parcel into individual single family home lots, with appurtenant access, parking, pedestrian connections, stormwater management, utilities, and landscaping.

Local, state, and federal jurisdictions may apply to delineated wetlands and established buffer areas. Pursuant to the City of Laconia's Wetlands Conservation and Water Quality Overlay District (Zoning Ordinance, Chapter 235, Article IV, Section 235-17), the only buffer applicable to this site is the 50-foot setback from non-prime wetlands exceeding 3,000 square feet, although additional buffer requirements apply to other wetland types elsewhere in the city. Dredge and fill activities within jurisdictional wetlands are regulated by the New Hampshire Department of Environmental Services (NHDES) under RSA 482-A and by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act.

Wetland Delineation

On November 7, 2025, a NH Certified Wetland Scientist (CWS) from Tighe & Bond delineated jurisdictional resource areas within the western portion of the subject property. Weather during the delineation was overcast with a high temperature of approximately 37°F. Local

weather yielded 0.22 inches of rain in the week prior to the field delineation.[1] The site conditions were considered atypical and/or problematic at the time due to the status of Severe Drought (D2). The New Hampshire Department of Environmental Services (NHDES) declared a State of Severe Drought in Belknap County effective as of September 2025.[2]

The wetland delineation followed the methodologies outlined in NH Administrative Rule Env-Wt 406, the *US Army Corps of Engineers Wetland Delineation Manual Technical Report* (Y-87-1; January 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (Version 2.0, January 2012). Wetlands were classified based on the *Classification of Wetlands and Deepwater Habitats of the United States.*[3]

The wetland boundaries were located using a hand-held Eos Skadi GPS unit with sub-meter accuracy and were marked within the delineation area using sequentially numbered pink flagging tape.

Summary of Delineated Natural Resource Areas

Flag Series 1A demarcates the limits of one palustrine wetland located within the delineation area. A summary of the delineated resource area is provided below. No other jurisdictional wetland resource areas were identified during the site investigation or desktop review.

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM; Panel No. 3300050002B, effective August 15, 1980) was consulted to evaluate the presence of floodplains within the vicinity of the proposed project; no portion of the subject property is within a FEMA-mapped floodplain.

Wetland 1

Wetland 1 (Flag Series 1A; Photographs 4 and 5) bisects the subject property from north to south near the parcel's east-west midpoint. The central portion of the wetland boundary generally follows the alignment of an adjacent stone wall and extends onto both neighboring properties. The western boundary of Wetland 1 was delineated in the field with pink flagging labeled 1A-1 through 1A-14. Representative wetland and upland data plots were taken near Wetland Flag 1A-8. The eastern wetland boundary was not field delineated as it is outside the scope of the delineation area.

[1] Weather Station ID: KNHGILFO37 (43.55° N, 71.42° W; Gilford, NH). Accessed via Weather Underground on September 12, 2025; https://www. https://www.wunderground.com/weather/us/nh/gilford/KNHGILFO37.

[2] National Integrated Drought Information System: https://www.drought.gov/states/new-hampshire/county/belknap

[3] Federal Geographic Data Committee. 2013. Classification of wetlands and deepwater habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC.

Dominant wetland vegetation consisted of winterberry (*Ilex verticillata*; FACW), sensitive fern (*Onoclea sensibilis*; FACW), several hydrophytic species of sedge (*Carex* spp.), and purpleleaf willowherb (*Epilobium coloratum*; OBL). The plant community also passes the FAC-neutral test, which is an indicator of wetland hydrology.[4] Soils within the wetland consisted of thin organic (10YR 2/1) and depleted mineral horizons (10YR 4/1) with prominent redox concentrations throughout (5YR 3/4), overlying a restrictive layer of stony subsoils on a hummock-and-hollow landform. Observed indicators of hydrology included areas of sparsely vegetated concave surface, water-stained leaves, drainage patterns, stunted or stressed plants, geomorphic position, and microtopographic relief. Based on the prevalence of a hydrophytic plant community and observed indicators of hydrology, soil saturation is likely present during wetter months and when not in a state of Severe Drought. This wetland is classified as a mixture of palustrine emergent (persistent), scrub-shrub (broad-leaved deciduous), and forested (broad-leaved deciduous), with a seasonally flooded/saturated hydroperiod (PEM1E/PSS1E/PFO1E).[2] Wetland 1 is less than 3,000 square feet in size, does not contain a stream, and based on aerial imagery and site review, is not contiguous to public surface waters. The delineation occurred outside the vernal pool amphibian breeding season; however, no physical features indicative of potential vernal pools were observed during the field delineation.

Priority Resource Areas

Priority Resource Areas (PRAs) are defined in Env-Wt 103.68 (effective April 27, 2024) as bogs; wetlands located in a river floodplain with a drainage area of at least one square mile or in a tidal area; designated prime wetlands or duly-established 100-foot buffers to prime wetlands; and sand dunes, tidal wetlands, tidal waters, or undeveloped tidal buffer zones.

The delineation confirmed that none of these PRA categories apply. There are no bogs located on-site; the wetland is not situated in a river floodplain with a drainage area of at least one square mile and is not in a tidal area; the site is neither a designated prime wetland nor within a duly-established 100-foot buffer to a prime wetland; and the site does not include any sand dune, tidal wetland, tidal water, or undeveloped tidal buffer zone.

PRAs also include rare, threatened, or endangered species, or protected habitats. As a next step, we recommend completing a DataCheck request with the NHDES Ecological Review Section to determine if any of these species have been identified within or surrounding the subject property.

Summary

In November 2025, a Tighe & Bond NH Certified Wetland Scientist delineated wetlands and jurisdictional areas within the vicinity of the project area, including one palustrine wetland. Pending review for protected species or habitat by NHDES, this wetland is not classified as a Priority Resource Area, but the proposed development activities may be subject to federal, state, and local permitting jurisdiction if dredging or filling is proposed to occur within the wetland or within 50-feet of the delineated boundary.

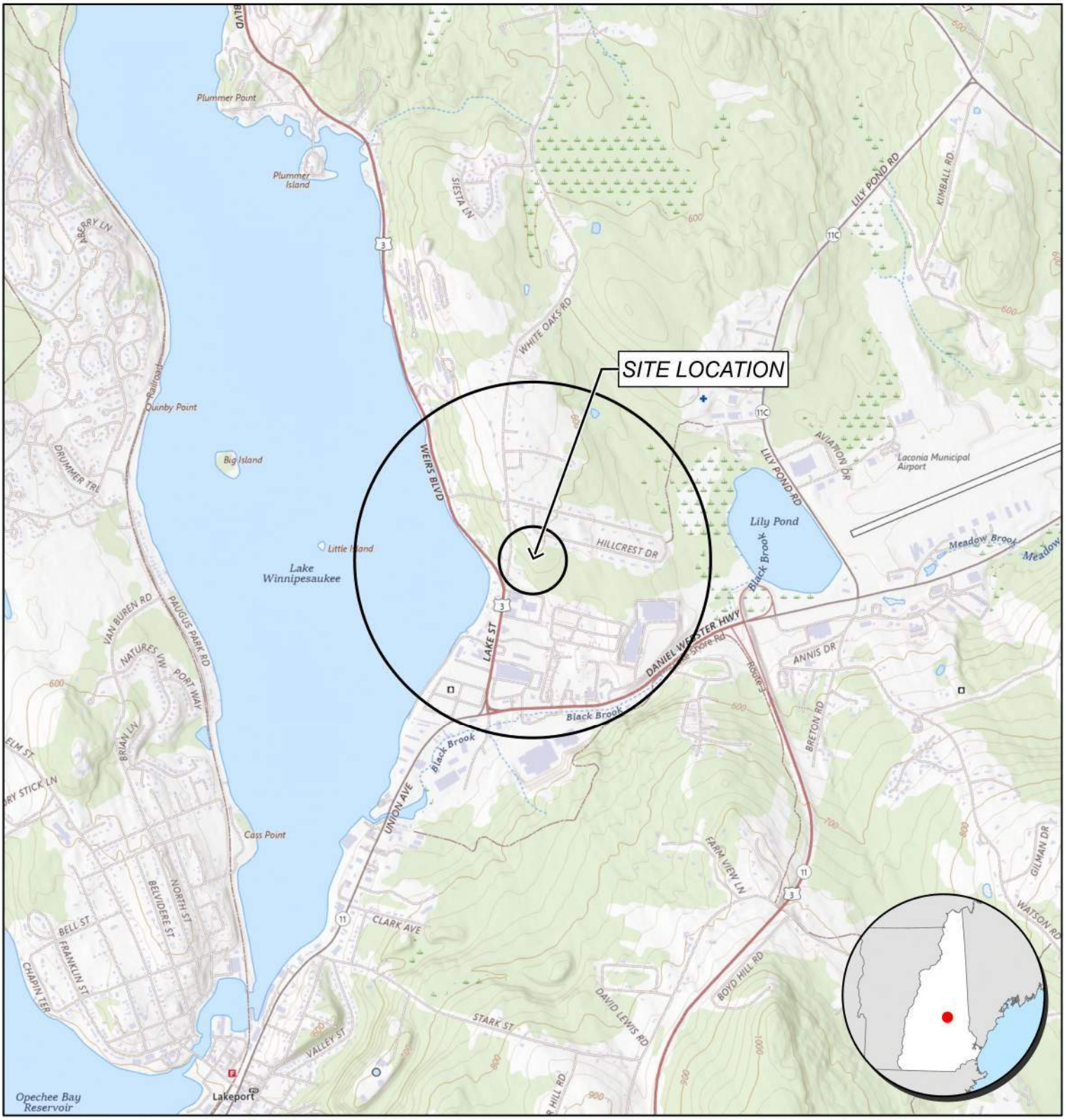
[4] Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0, January 2012).

Tighe&Bond

ATTACHMENT 1

FIGURE 1
SITE LOCATION
November 2025

33 White Oaks Road
Laconia, New Hampshire



Tighe&Bond

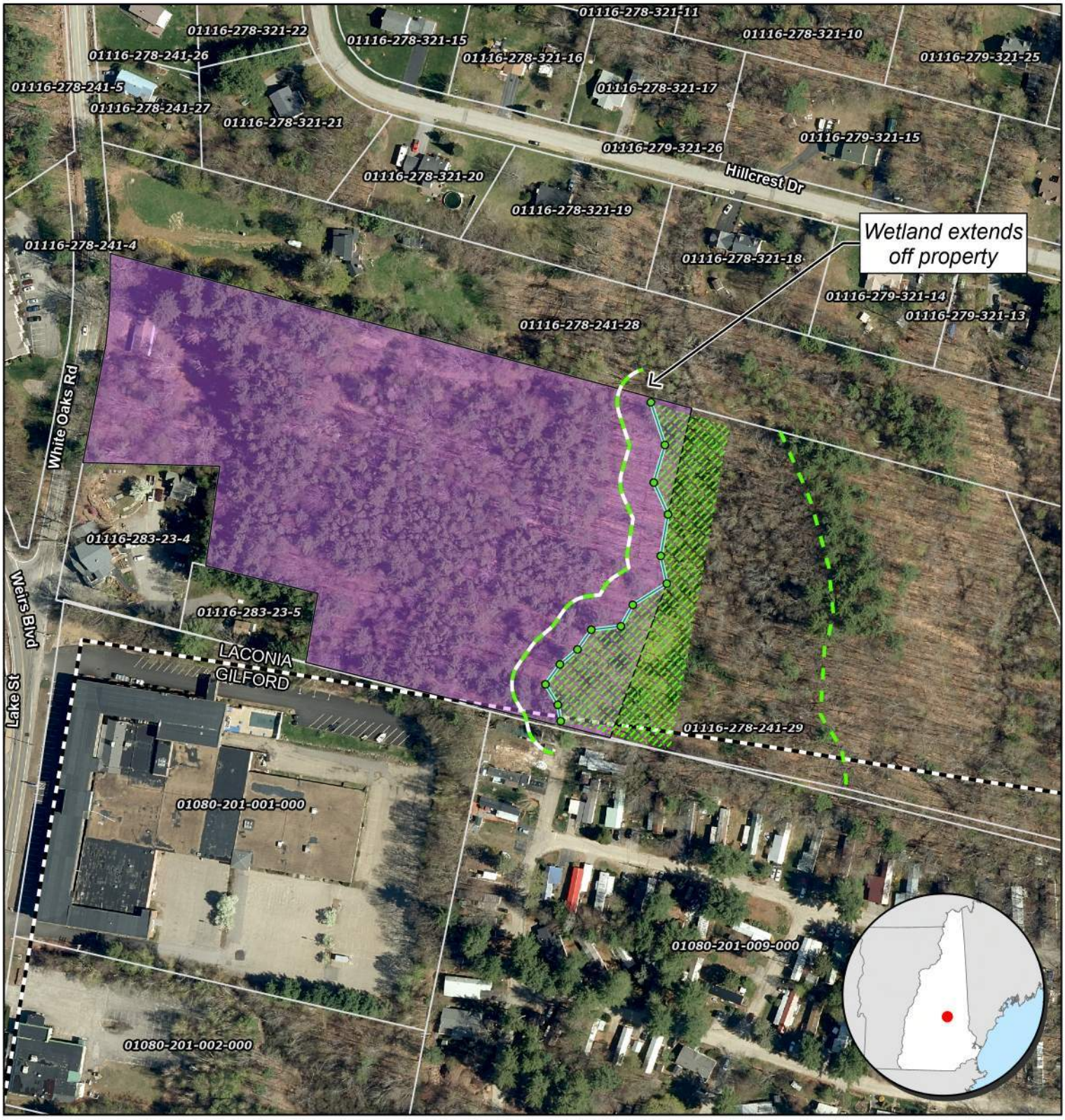
Based on USGS The National Map Topo Basemap.
Contour Interval Equals 10 Feet.
Circles indicate 500-foot and half-mile radii.

N

1:24,000
0 1,000 2,000
Feet

FIGURE 2
AERIAL
November 2025

33 White Oaks Road
Laconia, New Hampshire



- Wetland Flag
- Delineated Wetland Boundary
- Approximate Wetland Boundary (Not Field Delienated)
- 50-Foot Buffer Zone
- Delineated Wetland
- Limit of Delineation Area
- Approximate Parcel Boundary
- Town Boundary

N

1:2,400
0 100 200
Feet

Tighe&Bond

Based on NH GRANIT Color Orthophotography (2021-2022).

Tighe&Bond

ATTACHMENT 2

Photographic Log

Client: Scott Buonopane
Job Number: R5089-0278
Site: 33 White Oaks Road, Laconia, New Hampshire

Photograph No.: 1	**Date:** 11/07/2025	**Direction Taken:** Southeast
Description: Overview of the western portion of the delineation area within the subject property, where the existing single-family residential home is located.		

Photograph No.: 2	**Date:** 11/07/2025	**Direction Taken:** South
Description: Representative overview of the upland forest located within the central portion of the delineation area, behind (east of) the existing single-family residential home.		

Photographic Log

Client: Scott Buonopane
Job Number: R5089-0278
Site: 33 White Oaks Road, Laconia, New Hampshire

Photograph No.: 3	**Date:** 11/07/2025	**Direction Taken:** West
Description: Representative overview of the upland forest located within the central portion of the delineation area, behind (east of) the existing single-family residential home.		

Photograph No.: 4	**Date:** 11/07/2025	**Direction Taken:** Northeast
Description: Overview of Wetland 1 (PEM1E/PSS1E/PFO1E), located at the eastern edge of the delineation area.		

Photographic Log

Client: Scott Buonopane **Job Number:** R5089-0278

Site: 33 White Oaks Road, Laconia, New Hampshire

Photograph No.: 5	**Date:** 11/07/2025	**Direction Taken:** Southeast
Description: Overview of Wetland 1 (PEM1E/PSS1E/PFO1E), located at the eastern edge of the delineation area.		

Tighe&Bond

ATTACHMENT 3

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: 33 White Oaks Road City/County: Laconia / Belknap Sampling Date: 11/7/2025

Applicant/Owner: Scott Buonopane State: NH Sampling Point: W1-Wet

Investigator(s): Jeremy Degler, CWB, CWS, PWS - Tighe & Bond Section, Township, Range: N/A

Landform (hillside, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope %: 8-15

Subregion (LRR or MLRA): LRR R, MLRA 144B Lat: 43.567890 Long: -71.444215 Datum: NAD83

Soil Map Unit Name: Canterbury fine sandy loam, 8 to 15 percent slopes, very stony (167C) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ____	**within a Wetland?** **Yes** X **No** ____
Wetland Hydrology Present?	Yes X	No ____	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

This datapoint was taken within the boundaries of Wetland 1, near flagging point 1A-8.

The site conditions were considered atypical and/or problematic at the time due to the status of Severe Drought (D2). The New Hampshire Department of Environmental Services (NHDES) declared a State of Severe Drought in Belknap County effective as of September 2025.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- X Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Mulitple wetland hydrology indicators were observed at the time of the site assessment. Soil saturation is likely present during wetter months and when not in Severe Drought status.

VEGETATION – Use scientific names of plants.

Sampling Point: W1-Wet

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. *Ilex verticillata*	20	Yes	FACW
2. *Euonymus alatus*	10	Yes	UPL
3.			
4.			
5.			
6.			
7.			
	30 =Total Cover		
Herb Stratum (Plot size:)			
1. *Onoclea sensibilis*	40	Yes	FACW
2. *Tiarella stolonifera*	30	Yes	FACU
3. *Carex spp.*	10	No	FACW
4. *Pinus strobus (seedlings)*	10	No	FACU
5. *Epilobium coloratum*	5	No	OBL
6. Unknown scenesced aster	5	No	
7.			
8.			
9.			
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	5	x 1 =	5
FACW species	70	x 2 =	140
FAC species	0	x 3 =	0
FACU species	40	x 4 =	160
UPL species	10	x 5 =	50
Column Totals:	125 (A)		355 (B)

Prevalence Index = B/A = 2.84

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Hydrophytic vegetation was prevalent but not dominant at the time of the site assessment.

SOIL

Sampling Point W1-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2/1	100					Mucky Loam/Clay	Highly organic.
2-11	10YR 4/1	90	5YR 3/4	10	C	PL/M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
X Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ High Chroma Sands (S11) (**LRR K, L)**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Stone

Depth (inches): 11

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hummock/hollow landform with very stony subsoils. Multiple hydric soil indicators were observed at the time of the site assessment.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: 33 White Oaks Road City/County: Laconia / Belknap Sampling Date: 11/7/2025

Applicant/Owner: Scott Buonopane State: NH Sampling Point: W1-Upl

Investigator(s): Jeremy Degler, CWB, CWS, PWS - Tighe & Bond Section, Township, Range: N/A

Landform (hillside, terrace, etc.): Terrace Local relief (concave, convex, none): None Slope %: 15-25

Subregion (LRR or MLRA): LRR R, MLRA 144B Lat: 43.567991 Long: -71.444243 Datum: NAD83

Soil Map Unit Name: Canterbury fine sandy loam, 15 to 25 percent slopes, very stony (167D) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area**
Hydric Soil Present?	Yes ____	No X	**within a Wetland?** **Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

This datapoint was taken upslope and outside of the boundaries of Wetland 1, near flagging point 1A-8.

The site conditions were considered atypical and/or problematic at the time due to the status of Severe Drought (D2). The New Hampshire Department of Environmental Services (NHDES) declared a State of Severe Drought in Belknap County effective as of September 2025.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ? Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No wetland hydrology indicators were observed at the time of the site assessment.

VEGETATION – Use scientific names of plants. Sampling Point: W1-Upl

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fagus grandifolia*	40	Yes	FACU
2. *Pinus strobus*	15	Yes	FACU
3. *Quercus rubra*	10	No	FACU
4.			
5.			
6.			
7.			
	65	=Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Herb Stratum (Plot size:)			
1. *Pinus strobus (seedlings)*	10	Yes	FACU
2. *Onoclea sensibilis*	5	Yes	FACW
3. *Carex spp.*	5	Yes	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	20	=Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 40.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	0	x 3 =	0
FACU species	75	x 4 =	300
UPL species	0	x 5 =	0
Column Totals:	85 (A)		320 (B)

Prevalence Index = B/A = 3.76

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

Hydrophytic vegetation was not dominant nor prevalent at the time of the site assessment. Approximately 80% of the plot surface was unvegetated and covered with leaf litter.

SOIL

Sampling Point W1-Upl

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/3	100					Loamy/Clayey	Very friable soils.

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Stone

Depth (inches): 8

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

Hummock/hollow landform with very stony subsoils. No hydric soil indicators were observed at the time of the site assessment.