



# STORMWATER MANAGEMENT SYSTEM REPORT

FOR

RAED HERTEL FAMILY TRUST  
VAN HERTEL, SR, TRUSTEE  
SCOTLAND AND PUDDING HILL ROADS  
WINCHESTER NH  
TAX MAP 3 LOT 9

FEBRUARY 5, 2024

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The peak volumes for the pre- and post-development conditions are as follows:

	<u>PRE1</u>	<u>POST1</u>
2-year	2.911 af	2.548 af
10-year	7.162 af	5.952 af
25-year	11.069 af	9.433 af

The peak volumes in the post-development condition are less than the peak volumes in the pre-development condition.

#### WATER QUALITY

The stormwater management system is designed to protect water quality. Total suspended solids (TSS), total nitrogen (TN), and total phosphorus (TP) from the proposed improvements will be reduced.

The proposed stormwater management measures reduce nutrient loading as follows:

	<u>TSS</u>	<u>TN</u>	<u>TP</u>
Stormwater pond (as inf. trench $\geq$ 75 ft from surface water)	90%	55%	60%

The total suspended solids removal rate is 90%. The total nitrogen removal rate is 55%. The total phosphorus removal rate is 60%.

#### RECHARGE TO GROUNDWATER

The stormwater management system is designed to maintain the annual average pre-development groundwater recharge volume (GRV).

The groundwater recharge volume is calculated as follows:

$$\begin{aligned} &(\text{new impervious cover}) \times ((\text{groundwater recharge depth})/12) = \text{GRV} \\ &(43,560 \text{ sf}) \times ((0.10 \text{ in})/12) = 1,150 \text{ cf} \end{aligned}$$

The groundwater recharge depth used for calculation is a weighted average based on the hydrologic soil groups as determined from Web Soil Survey.

The total groundwater recharge provided in the 2-year design storm is 38,202 cf. The required groundwater recharge is met.

# STORMWATER POND

RESPONSIBLE PARTY Owner of Tax Map 3 Lot 9 -

INSPECTOR \_\_\_\_\_

YEAR \_\_\_\_\_

	DATE										
AS NEEDED/ POST-STORM	Inspect after storm to ensure proper drainage; water should not pond for more than 72 hours										
	DON'T stockpile mulch, sand, salt, soil, or yard waste on surface										

	MARCH	JUNE	SEPTEMBER	DECEMBER
SEASONALLY/ QUARTERLY	Remove trash, sediment, debris, leaves, weeds			
	Inspect stone surface; replace stone as needed			

INSPECTION NOTES (DATE EACH COMMENT)

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WINTER MAINTENANCE NOTES Remove leaves and other debris prior to winter

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# 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	New Hampshire
Location	New Hampshire, United States
Latitude	42.751 degrees North
Longitude	72.354 degrees West
Elevation	180 feet
Date/Time	Sat Feb 03 2024 11:08:29 GMT-0500 (Eastern Standard Time)

### Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr
1yr	0.28	0.44	0.54	0.71	0.89	1.11	1yr	0.77	1.04	1.27	1.58	1.95	2.40	2.90
2yr	0.35	0.53	0.66	0.88	1.10	1.37	2yr	0.95	1.23	1.57	1.92	2.34	2.84	3.40
5yr	0.41	0.64	0.80	1.08	1.38	1.73	5yr	1.19	1.54	1.98	2.42	2.92	3.50	4.10
10yr	0.46	0.73	0.92	1.25	1.63	2.06	10yr	1.41	1.83	2.36	2.88	3.45	4.11	4.70
25yr	0.55	0.88	1.12	1.54	2.04	2.59	25yr	1.76	2.28	2.98	3.61	4.31	5.08	5.90
50yr	0.62	1.00	1.28	1.80	2.42	3.10	50yr	2.09	2.71	3.56	4.31	5.11	5.97	7.00
100yr	0.72	1.16	1.50	2.12	2.88	3.68	100yr	2.48	3.21	4.24	5.11	6.03	7.01	8.10
200yr	0.82	1.33	1.73	2.48	3.42	4.39	200yr	2.95	3.81	5.05	6.08	7.14	8.24	10.00
500yr	0.99	1.62	2.11	3.07	4.29	5.53	500yr	3.70	4.78	6.37	7.63	8.91	10.21	12.00

### Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr
1yr	0.24	0.36	0.44	0.60	0.73	0.83	1yr	0.63	0.81	0.91	1.22	1.59	2.24	2.80
2yr	0.33	0.51	0.63	0.86	1.05	1.21	2yr	0.91	1.18	1.37	1.73	2.21	2.78	3.30
5yr	0.37	0.57	0.71	0.97	1.24	1.43	5yr	1.07	1.39	1.60	2.05	2.55	3.32	3.90
10yr	0.40	0.62	0.77	1.08	1.39	1.59	10yr	1.20	1.55	1.80	2.30	2.85	3.79	4.40
25yr	0.46	0.69	0.86	1.23	1.62	1.81	25yr	1.40	1.77	2.12	2.64	3.27	4.54	5.20
50yr	0.50	0.75	0.94	1.35	1.82	1.99	50yr	1.57	1.95	2.39	2.92	3.63	5.19	6.00
100yr	0.54	0.82	1.02	1.48	2.03	2.19	100yr	1.75	2.14	2.73	3.24	4.03	5.93	7.00
200yr	0.59	0.89	1.13	1.63	2.28	2.39	200yr	1.97	2.33	3.09	3.57	4.47	6.79	8.00
500yr	0.67	1.00	1.29	1.88	2.67	2.68	500yr	2.30	2.62	3.70	4.07	5.10	8.13	9.00

### Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr
1yr	0.30	0.51	0.60	0.80	1.00	1.10	1yr	0.80	1.10	1.30	1.60	2.10	2.60	3.10
2yr	0.39	0.59	0.70	0.90	1.10	1.30	2yr	1.00	1.30	1.60	2.00	2.50	3.10	3.70
5yr	0.43	0.64	0.75	1.00	1.30	1.60	5yr	1.10	1.40	1.70	2.20	2.80	3.50	4.20
10yr	0.46	0.67	0.78	1.00	1.30	1.60	10yr	1.20	1.50	1.80	2.30	2.90	3.60	4.30
25yr	0.52	0.73	0.84	1.00	1.30	1.60	25yr	1.40	1.70	2.10	2.60	3.20	4.00	4.70
50yr	0.56	0.77	0.88	1.00	1.30	1.60	50yr	1.50	1.80	2.30	2.90	3.60	4.50	5.20
100yr	0.60	0.81	0.92	1.00	1.30	1.60	100yr	1.70	2.10	2.70	3.20	4.00	5.00	6.00
200yr	0.65	0.86	0.97	1.00	1.30	1.60	200yr	1.90	2.30	3.00	3.50	4.40	5.50	6.50
500yr	0.73	1.00	1.11	1.00	1.30	1.60	500yr	2.30	2.60	3.50	4.00	5.10	6.20	7.20



Hydrologic Soil Group—Cheshire County, New Hampshire



Soil Map may not be valid at this scale.

Map Scale: 1:9,080 if printed on A portrait (8.5" x 11") sheet.

0 100 200 400 600 Meters

0 400 800 1600 2400 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84





## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
4	Pootatuck fine sandy loam	B	1.0	0.2%
6	Saco mucky silt loam	B/D	30.8	7.1%
10B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	52.0	12.0%
22B	Colton gravelly sandy loam, 3 to 8 percent slopes	A	13.5	3.1%
22C	Colton gravelly sandy loam, 8 to 15 percent slopes	A	1.0	0.2%
22E	Colton gravelly sandy loam, 15 to 60 percent slopes	A	16.2	3.7%
24A	Agawam fine sandy loam, 0 to 3 percent slopes	B	1.9	0.4%
26A	Windsor loamy sand, 0 to 3 percent slopes	A	14.0	3.2%
60B	Tunbridge-Berkshire complex, 0 to 8 percent slopes, very stony	C	2.5	0.6%
60C	Tunbridge-Berkshire complex, 8 to 15 percent slopes, very stony	C	6.3	1.4%
61C	Tunbridge-Lyman-Rock outcrop complex, 8 to 15 percent slopes	C	5.1	1.2%
61D	Tunbridge-Lyman-Rock outcrop complex, 15 to 25 percent slopes	C	50.8	11.7%
73D	Berkshire fine sandy loam, 15 to 25 percent slopes, very stony	B	2.4	0.6%
142B	Monadnock fine sandy loam, 3 to 8 percent slopes	B	14.6	3.4%
142C	Monadnock fine sandy loam, 8 to 15 percent slopes	B	12.4	2.8%
143C	Monadnock fine sandy loam, 8 to 15 percent slopes, very stony	B	1.1	0.3%

## Description

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

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

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

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

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

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

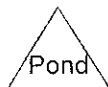
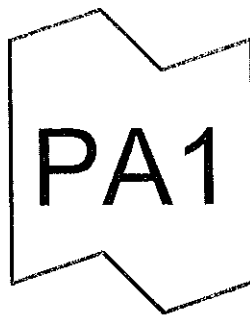
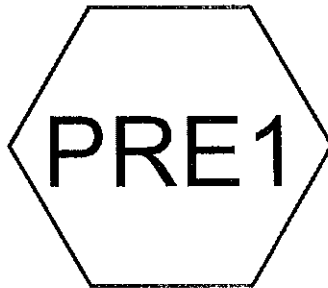
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher





Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
8.017	HSG A	PRE1
6.074	HSG B	PRE1
35.448	HSG C	PRE1
29.800	HSG D	PRE1
0.000	Other	
<b>79.339</b>		<b>TOTAL AREA</b>

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment PRE1:**

Runoff Area=3,456,000 sf 0.00% Impervious Runoff Depth>1.08"  
Flow Length=2,110' Slope=0.1600 '/' Tc=17.6 min CN=67 Runoff=106.92 cfs 7.162 af

**Link PA1:**

Inflow=106.92 cfs 7.162 af  
Primary=106.92 cfs 7.162 af

**Total Runoff Area = 79.339 ac Runoff Volume = 7.162 af Average Runoff Depth = 1.08"**  
**100.00% Pervious = 79.339 ac 0.00% Impervious = 0.000 ac**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PRE1:

Runoff Area=3,456,000 sf 0.00% Impervious Runoff Depth>2.28"  
Flow Length=2,110' Slope=0.1600 '/' Tc=17.6 min CN=67 Runoff=233.32 cfs 15.069 af

Link PA1:

Inflow=233.32 cfs 15.069 af  
Primary=233.32 cfs 15.069 af

Total Runoff Area = 79.339 ac Runoff Volume = 15.069 af Average Runoff Depth = 2.28"  
100.00% Pervious = 79.339 ac 0.00% Impervious = 0.000 ac

**Soil Listing (all nodes)**

Area (acres)	Soil Group	Subcatchment Numbers
7.329	HSG A	POST1, POST1-0, POST1-1, POST1-2, POST1-3
5.907	HSG B	POST1, POST1-0
35.448	HSG C	POST1
29.680	HSG D	POST1, POST1-0, POST1-1, POST1-2, POST1-3
0.975	Other	POST1, POST1-0, POST1-1, POST1-2, POST1-3
<b>79.339</b>		<b>TOTAL AREA</b>



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment POST1: Runoff Area=2,415,970 sf 0.18% Impervious Runoff Depth>1.26"  
Flow Length=2,110' Slope=0.1600 '/' Tc=17.6 min CN=70 Runoff=88.95 cfs 5.837 af

Subcatchment POST1-0: Runoff Area=260,310 sf 3.77% Impervious Runoff Depth>1.74"  
Tc=10.0 min CN=77 Runoff=17.18 cfs 0.866 af

Subcatchment POST1-1: Runoff Area=259,180 sf 3.36% Impervious Runoff Depth>1.53"  
Tc=10.0 min CN=74 Runoff=15.05 cfs 0.757 af

Subcatchment POST1-2: Runoff Area=260,270 sf 3.77% Impervious Runoff Depth>0.41"  
Tc=10.0 min CN=53 Runoff=2.93 cfs 0.206 af

Subcatchment POST1-3: Runoff Area=260,270 sf 3.77% Impervious Runoff Depth>0.41"  
Tc=10.0 min CN=53 Runoff=2.93 cfs 0.206 af

Pond POND1: Peak Elev=473.41' Storage=0.567 af Inflow=37.59 cfs 2.035 af  
Discarded=7.93 cfs 1.918 af Primary=6.65 cfs 0.115 af Outflow=14.58 cfs 2.033 af

Link PA1: Inflow=92.12 cfs 5.952 af  
Primary=92.12 cfs 5.952 af

Total Runoff Area = 79.339 ac Runoff Volume = 7.871 af Average Runoff Depth = 1.19"  
98.77% Pervious = 78.364 ac 1.23% Impervious = 0.975 ac

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment POST1: Runoff Area=2,415,970 sf 0.18% Impervious Runoff Depth>2.54"  
Flow Length=2,110' Slope=0.1600 '/' Tc=17.6 min CN=70 Runoff=182.32 cfs 11.744 af

Subcatchment POST1-0: Runoff Area=260,310 sf 3.77% Impervious Runoff Depth>3.20"  
Tc=10.0 min CN=77 Runoff=31.10 cfs 1.591 af

Subcatchment POST1-1: Runoff Area=259,180 sf 3.36% Impervious Runoff Depth>2.91"  
Tc=10.0 min CN=74 Runoff=28.45 cfs 1.444 af

Subcatchment POST1-2: Runoff Area=260,270 sf 3.77% Impervious Runoff Depth>1.19"  
Tc=10.0 min CN=53 Runoff=11.10 cfs 0.593 af

Subcatchment POST1-3: Runoff Area=260,270 sf 3.77% Impervious Runoff Depth>1.19"  
Tc=10.0 min CN=53 Runoff=11.10 cfs 0.593 af

Pond POND1: Peak Elev=474.36' Storage=0.845 af Inflow=81.36 cfs 4.221 af  
Discarded=9.86 cfs 2.985 af Primary=56.13 cfs 1.234 af Outflow=65.98 cfs 4.219 af

Link PA1: Inflow=237.96 cfs 12.978 af  
Primary=237.96 cfs 12.978 af

Total Runoff Area = 79.339 ac Runoff Volume = 15.965 af Average Runoff Depth = 2.41"  
98.77% Pervious = 78.364 ac 1.23% Impervious = 0.975 ac