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ALLEN & MAJOR ASSOCIATES, INC.

May 17, 2021

Kent Ruesswick
Planning Board Chairman
Town of Canterbury
P.O. Box 500
Canterbury, NH 03224

Re: A&M Project #2915-01
Proposed Development
Hall Road, Canterbury NH
Drainage Summary

Dear Mr. Ruesswick and Members of the Board,

On behalf of our Client, Station Meadow, LLC, Allen & Major Associates (A&M) is pleased to provide this letter in support of the site plan review application for the proposed commercial project located at Hall Road. The purpose of this drainage summary is to provide a detailed review of the stormwater runoff, both quality and quantity, as it pertains to the existing and proposed developed conditions. The report will show by means of narrative, calculations and exhibits that appropriate best management practices have been used to mitigate the impacts from the proposed development. The report will demonstrate that there is no increase in total peak rate of runoff from the site for all design storm events.

Existing Conditions

The site is located on the along Hall Road, which is off to the east of West Road. The property is identified as Tax Map 251, Lot 18. Elevations onsite range from elevation 370 to elevation 380. Elevation 370 is the low point on-site located at the existing culvert crossing long Hall Road. Elevation 380 is the high point on-site located at the center of the parcel. The majority of the stormwater from the site discharges through an existing culvert crossing under Hall Road. However, as the site is undeveloped with vegetation and well-draining soils, there is no runoff existing the site at the two-year storm event and minimal runoff at the ten-year storm event. A review of the NRCS soil report for Merrimack and Belknap Counties indicates that the soil onsite is considered Champlain loamy fine sand which has a Hydrologic Soil Group rating of an "A". A copy of the Existing Watershed Plan is included herewith.

Proposed Conditions

The proposed development consists of two buildings. The phase 1 building which is 6,000 square feet, and a phase 2 building which is 6,500 square feet. Drive aisles and turning areas are proposed to be compacted gravel surface per NHDOT standard. The stormwater management system to service the proposed development has been designed to include low impact development techniques. Best management practices (BMPs) utilized within the deign consist of the installation of conveyance swales, sediment forebay, and an infiltration basin. The quantity of stormwater runoff will be reduced with the installation of these BMPs that there is no increase in total peak rate of runoff from the site for all design storm events. The infiltration basin was designed in accordance with the New Hampshire Stormwater Manual. The basin was designed to hold the required Water Quality Volume (WQV), and infiltrate the 50-year storm event without overtopping. Before the stormwater enters the infiltration basin it will be pre-treated by a sediment forebay. This sediment forebay has also been designed in accordance with the New Hampshire Stormwater Manual, and the required Water Quality Volume (WQV) was designed to be treated.

Although, there is an increase in impervious cover for the site, the peak rate of runoff from the site will be mitigated through the installation of Best management practices (BMPs) consisting of the installation of conveyance swales, sediment forebay, and an infiltration basin.

Runoff flows were estimated for both pre and post development conditions using HydroCAD 10.00 software, at two specific "Study Points" (SP-1 & SP-2). Study Point 1 is the flows that will enter the existing culvert under Hall Road. Study Point 2 is the flows that will concentrate to a low point along Interstate 93. The table below shows that the project causes a reduction in the peak rate of runoff and volume of stormwater leaving the site at the Study Points. Copies of the HydroCAD worksheets and Watershed Plans are included herewith.

STUDY POINT #1			
	2-Year	10-Year	100-Year
Existing Flow (CFS)	0.00	0.01	0.32
Proposed Flow (CFS)	0.00	0.01	0.15
Decrease (CFS)	**0.00**	**0.00**	**0.17**
Existing Volume (CF)	0	425	3,502
Proposed Volume (CF)	0	197	1,621
Change (CF)	**0**	**228**	**-1,881**

STUDY POINT #2			
	2-Year	10-Year	100-Year
Existing Flow (CFS)	0.00	0.02	0.34
Proposed Flow (CFS)	0.00	0.01	0.21
Decrease (CFS)	**0.00**	**0.01**	**0.13**
Existing Volume (CF)	0	535	4,408
Proposed Volume (CF)	0	303	2,491
Change (CF)	**0**	**232**	**-1,917**

TOTAL			
	2-Year	10-Year	100-Year
Existing Flow (CFS)	0.00	0.03	0.66
Proposed Flow (CFS)	0.00	0.02	0.36
Decrease (CFS)	**0.00**	**0.01**	**0.30**
Existing Volume (CF)	0	960	7,910
Proposed Volume (CF)	0	500	4,112
Change (CF)	**0**	**460**	**-3,798**

Summary

As shown in the table above, the proposed development will have a positive impact on the stormwater management system by reducing the rate and volume of stormwater runoff from the site.

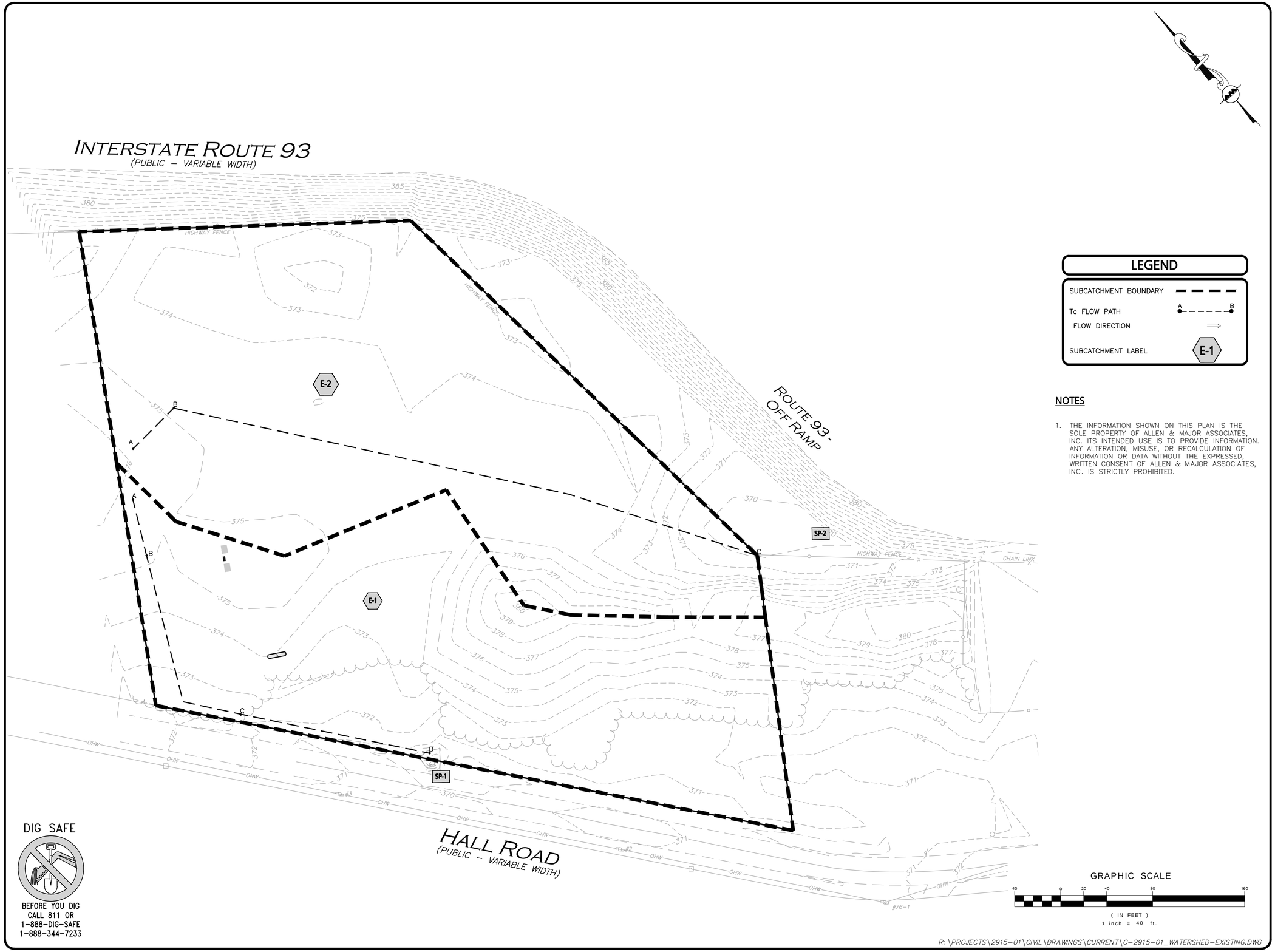
Very truly yours,

ALLEN & MAJOR ASSOCIATES, INC.

Aaron Mackey, P.E.
Project Engineer

Enclosures:

1) Existing Watershed Plan – EWS
2) Proposed Watershed Plan – PWS
3) Pre-Development HydroCAD Calculations
4) Post-Development HydoCAD Calculations
5) Extreme Precipitation Tables
6) NRCS Soil Report



LEGEND

- SUBCATCHMENT BOUNDARY
- Tc FLOW PATH (A – B)
- FLOW DIRECTION
- SUBCATCHMENT LABEL (E-1)

NOTES

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GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

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REV	DATE	DESCRIPTION
1	5-17-2021	ISSUED FOR REVIEW

APPLICANT\OWNER:

STATION MEADOW, LLC
4 DUNLAP ROAD
BURLINGTON, MA 01803

PROJECT:

TAX MAP 251, LOT 18
HALL ROAD
CANTERBURY, NH

PROJECT NO.	2915-01	DATE:	5/17/2021
SCALE:	1" = 40'	DWG. NAME:	C2915-01
DESIGNED BY:	ARM	CHECKED BY:	MAM

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
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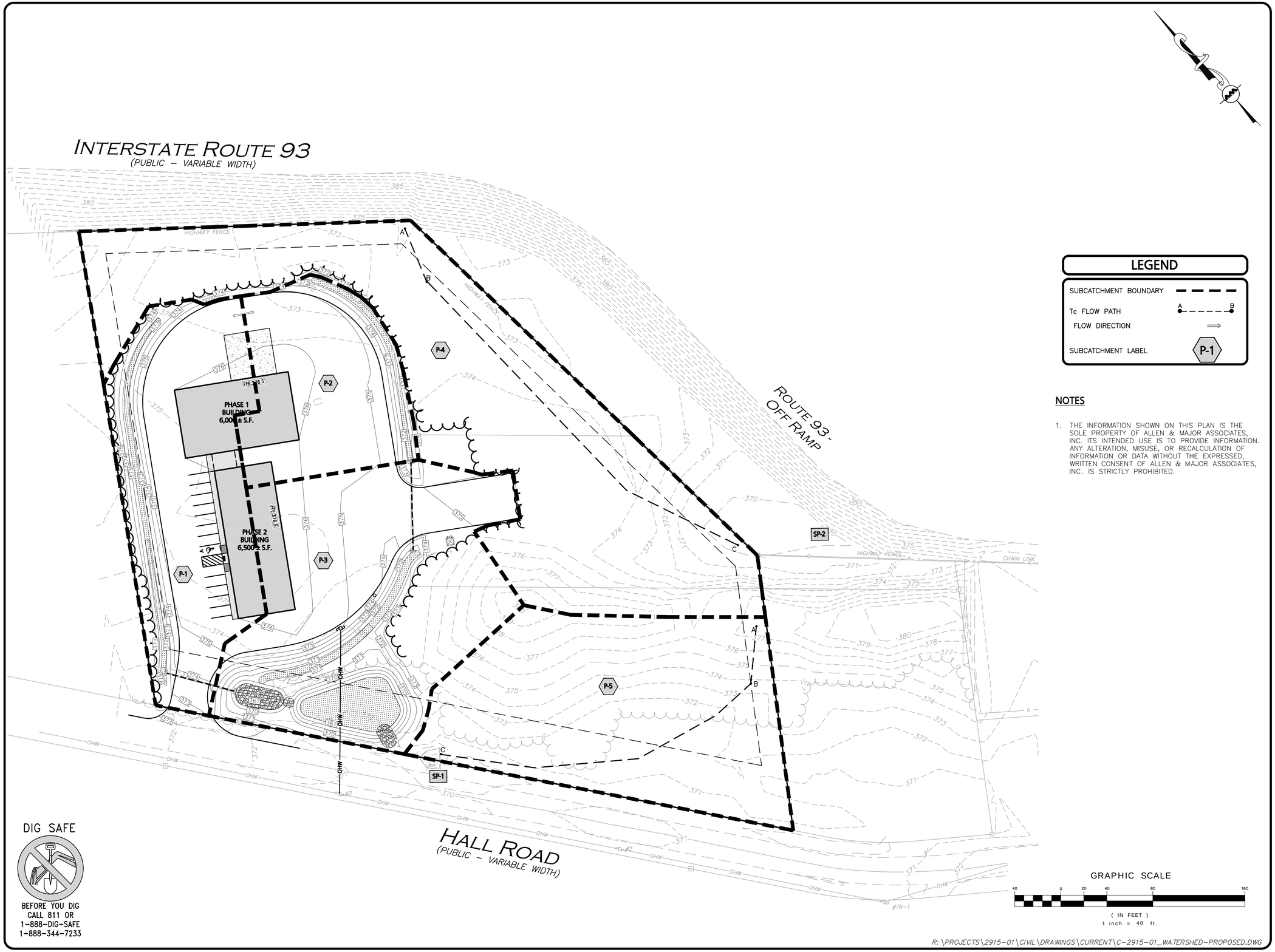
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:

EXISTING WATERSHED PLAN

SHEET No.

EWS-1



LEGEND

- SUBCATCHMENT BOUNDARY
- Tc FLOW PATH (A – B)
- FLOW DIRECTION
- SUBCATCHMENT LABEL (P-1)

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REV	DATE	DESCRIPTION
1	5-17-2021	ISSUED FOR REVIEW

APPLICANT\OWNER:

STATION MEADOW, LLC
4 DUNLAP ROAD
BURLINGTON, MA 01803

PROJECT:

TAX MAP 251, LOT 18
HALL ROAD
CANTERBURY, NH

PROJECT NO.	2915-01	DATE:	5/17/2021
SCALE:	1" = 40'	DWG. NAME:	C2915-01
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PREPARED BY:

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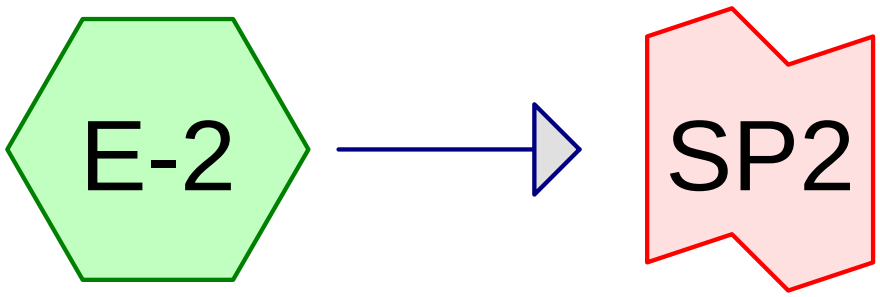
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:

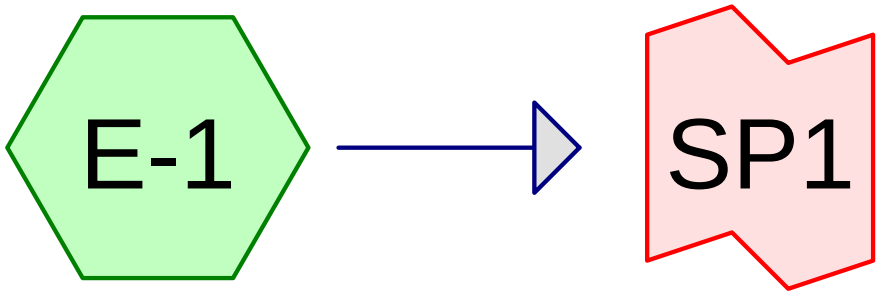
PROPOSED WATERSHED PLAN

SHEET No.

PWS-1



Subcat E-2 STUDY POINT #2



Subcat E-1 STUDY POINT #1

Subcat Reach Pond Link

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
220,093	39	>75% Grass cover, Good, HSG A (E-1, E-2)
220,093	**39**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
220,093	HSG A	E-1, E-2
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
220,093		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
220,093	0	0	0	0	220,093	>75% Grass cover, Good	E-1, E-2
220,093	**0**	**0**	**0**	**0**	**220,093**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 E-1: Subcat E-1 Runoff Area=97,436 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=390' Tc=18.6 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment E-2: Subcat E-2 Runoff Area=122,657 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=570' Tc=29.5 min CN=39 Runoff=0.00 cfs 0 cf

Link SP1: STUDY POINT #1 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP2: STUDY POINT #2 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 220,093 sf Runoff Volume = 0 cf Average Runoff Depth = 0.00"
100.00% Pervious = 220,093 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E-1: Subcat E-1

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=2.78"

Area (sf)	CN	Description
97,436	39	>75% Grass cover, Good, HSG A
97,436		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.28"
4.0	180	0.0220	0.74		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
2.4	160	0.0250	1.11		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
18.6	390	Total			

Summary for Subcatchment E-2: Subcat E-2

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=2.78"

Area (sf)	CN	Description
122,657	39	>75% Grass cover, Good, HSG A
122,657		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.28"
17.3	520	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
29.5	570	Total			

Summary for Link SP1: STUDY POINT #1

Inflow Area = 97,436 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Link SP2: STUDY POINT #2

Inflow Area = 122,657 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 E-1: Subcat E-1 Runoff Area=97,436 sf 0.00% Impervious Runoff Depth=0.05"
Flow Length=390' Tc=18.6 min CN=39 Runoff=0.01 cfs 425 cf

Subcatchment E-2: Subcat E-2 Runoff Area=122,657 sf 0.00% Impervious Runoff Depth=0.05"
Flow Length=570' Tc=29.5 min CN=39 Runoff=0.02 cfs 535 cf

Link SP1: STUDY POINT #1 Inflow=0.01 cfs 425 cf
Primary=0.01 cfs 425 cf

Link SP2: STUDY POINT #2 Inflow=0.02 cfs 535 cf
Primary=0.02 cfs 535 cf

Total Runoff Area = 220,093 sf Runoff Volume = 961 cf Average Runoff Depth = 0.05"
100.00% Pervious = 220,093 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E-1: Subcat E-1

Runoff = 0.01 cfs @ 15.62 hrs, Volume= 425 cf, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.06"

Area (sf)	CN	Description
97,436	39	>75% Grass cover, Good, HSG A
97,436		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.28"
4.0	180	0.0220	0.74		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
2.4	160	0.0250	1.11		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
18.6	390	Total			

Summary for Subcatchment E-2: Subcat E-2

Runoff = 0.02 cfs @ 15.79 hrs, Volume= 535 cf, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.06"

Area (sf)	CN	Description
122,657	39	>75% Grass cover, Good, HSG A
122,657		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.28"
17.3	520	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
29.5	570	Total			

Summary for Link SP1: STUDY POINT #1

Inflow Area = 97,436 sf, 0.00% Impervious, Inflow Depth = 0.05" for 10-year event
Inflow = 0.01 cfs @ 15.62 hrs, Volume= 425 cf
Primary = 0.01 cfs @ 15.62 hrs, Volume= 425 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Link SP2: STUDY POINT #2

Inflow Area = 122,657 sf, 0.00% Impervious, Inflow Depth = 0.05" for 10-year event
Inflow = 0.02 cfs @ 15.79 hrs, Volume= 535 cf
Primary = 0.02 cfs @ 15.79 hrs, Volume= 535 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 E-1: Subcat E-1 Runoff Area=97,436 sf 0.00% Impervious Runoff Depth=0.43"
Flow Length=390' Tc=18.6 min CN=39 Runoff=0.32 cfs 3,502 cf

Subcatchment E-2: Subcat E-2 Runoff Area=122,657 sf 0.00% Impervious Runoff Depth=0.43"
Flow Length=570' Tc=29.5 min CN=39 Runoff=0.34 cfs 4,408 cf

Link SP1: STUDY POINT #1 Inflow=0.32 cfs 3,502 cf
Primary=0.32 cfs 3,502 cf

Link SP2: STUDY POINT #2 Inflow=0.34 cfs 4,408 cf
Primary=0.34 cfs 4,408 cf

Total Runoff Area = 220,093 sf Runoff Volume = 7,910 cf Average Runoff Depth = 0.43"
100.00% Pervious = 220,093 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E-1: Subcat E-1

Runoff = 0.32 cfs @ 12.54 hrs, Volume= 3,502 cf, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-year Rainfall=5.95"

Area (sf)	CN	Description
97,436	39	>75% Grass cover, Good, HSG A
97,436		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.28"
4.0	180	0.0220	0.74		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
2.4	160	0.0250	1.11		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
18.6	390	Total			

Summary for Subcatchment E-2: Subcat E-2

Runoff = 0.34 cfs @ 12.70 hrs, Volume= 4,408 cf, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-year Rainfall=5.95"

Area (sf)	CN	Description
122,657	39	>75% Grass cover, Good, HSG A
122,657		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.28"
17.3	520	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
29.5	570	Total			

Summary for Link SP1: STUDY POINT #1

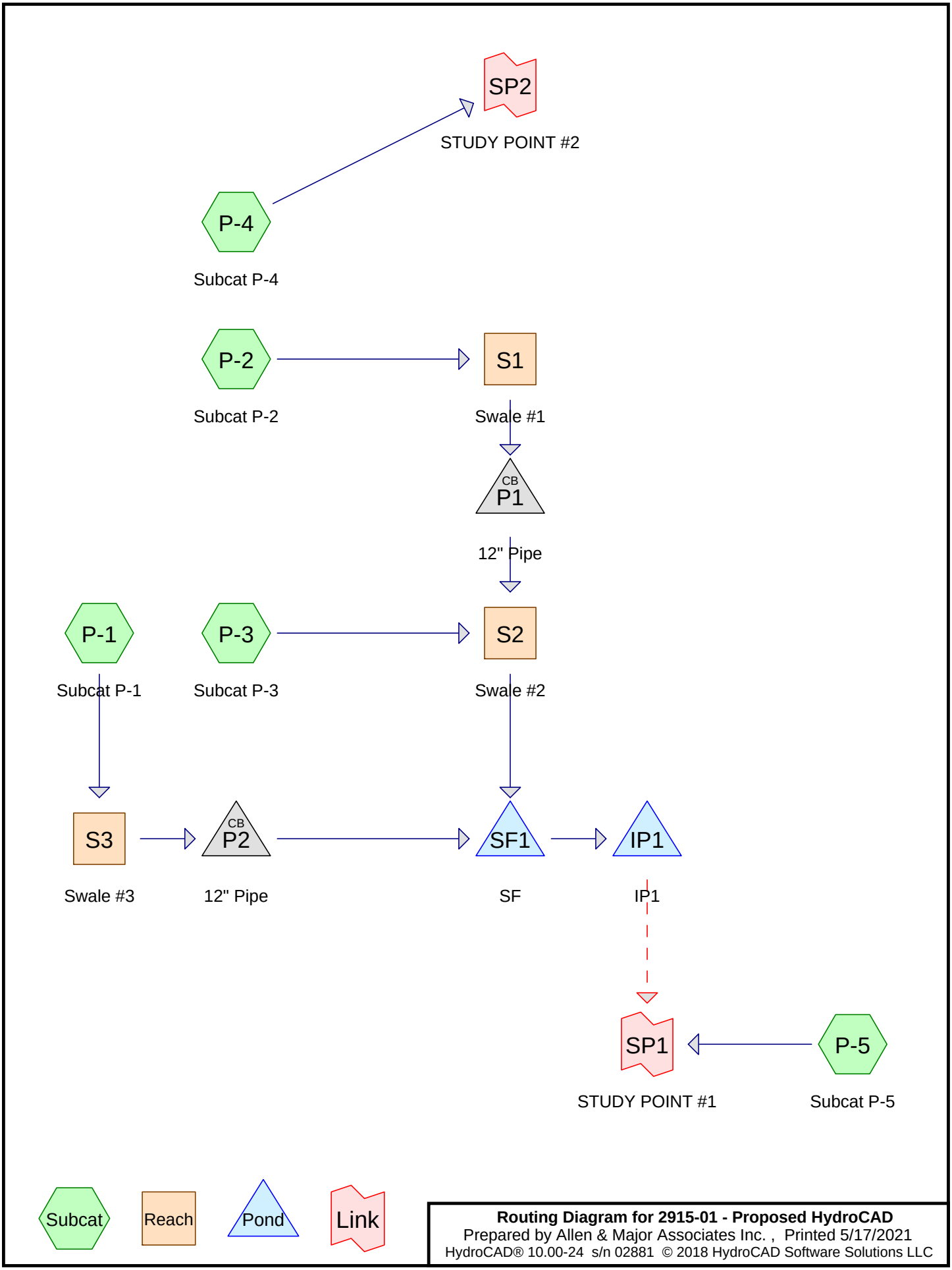
Inflow Area = 97,436 sf, 0.00% Impervious, Inflow Depth = 0.43" for 50-year event
Inflow = 0.32 cfs @ 12.54 hrs, Volume= 3,502 cf
Primary = 0.32 cfs @ 12.54 hrs, Volume= 3,502 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Link SP2: STUDY POINT #2

Inflow Area = 122,657 sf, 0.00% Impervious, Inflow Depth = 0.43" for 50-year event
Inflow = 0.34 cfs @ 12.70 hrs, Volume= 4,408 cf
Primary = 0.34 cfs @ 12.70 hrs, Volume= 4,408 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs



Routing Diagram for 2915-01 - Proposed HydroCAD
Prepared by Allen & Major Associates Inc. , Printed 5/17/2021

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
156,623	39	>75% Grass cover, Good, HSG A (P-1, P-2, P-3, P-4, P-5)
48,721	96	Gravel surface, HSG A (P-1, P-2, P-3)
2,250	98	Paved parking, HSG A (P-1, P-2)
12,500	98	Roofs, HSG A (P-1, P-2, P-3)
220,093	**56**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
220,093	HSG A	P-1, P-2, P-3, P-4, P-5
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
220,093		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
156,623	0	0	0	0	156,623	>75% Grass cover, Good	P-1, P-2, P-3, P-4, P-5
48,721	0	0	0	0	48,721	Gravel surface	P-1, P-2, P-3
2,250	0	0	0	0	2,250	Paved parking	P-1, P-2
12,500	0	0	0	0	12,500	Roofs	P-1, P-2, P-3
220,093	**0**	**0**	**0**	**0**	**220,093**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	P1	371.80	371.36	80.0	0.0055	0.013	12.0	0.0	0.0
2	P2	371.41	369.00	62.0	0.0389	0.013	12.0	0.0	0.0

Notes Listing (all nodes)

Line#	Node Number	Notes
1	IP1	Champlain Loamy Sand 131.965 mm/s = 18.70 in./hr. /2 = 9.35 in/hr
2	SF1	Champlain Loamy Sand 131.965 mm/s = 18.70 in./hr. /2 = 9.35 in/hr

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Subcat P-1 Runoff Area=35,669 sf 23.10% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=79 Runoff=0.94 cfs 3,062 cf

Subcatchment P-2: Subcat P-2 Runoff Area=21,763 sf 17.14% Impervious Runoff Depth=1.48"
Tc=6.0 min CN=86 Runoff=0.85 cfs 2,676 cf

Subcatchment P-3: Subcat P-3 Runoff Area=48,245 sf 5.76% Impervious Runoff Depth=0.34"
Tc=6.0 min CN=63 Runoff=0.24 cfs 1,386 cf

Subcatchment P-4: Subcat P-4 Runoff Area=69,324 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=410' Slope=0.0150 '/' Tc=23.5 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment P-5: Subcat P-5 Runoff Area=45,093 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=340' Tc=16.7 min CN=39 Runoff=0.00 cfs 0 cf

Reach S1: Swale #1 Avg. Flow Depth=0.17' Max Vel=1.00 fps Inflow=0.85 cfs 2,676 cf
n=0.030 L=194.0' S=0.0050 '/' Capacity=18.92 cfs Outflow=0.77 cfs 2,676 cf

Reach S2: Swale #2 Avg. Flow Depth=0.16' Max Vel=0.95 fps Inflow=1.00 cfs 4,062 cf
n=0.030 L=177.0' S=0.0049 '/' Capacity=25.20 cfs Outflow=0.96 cfs 4,062 cf

Reach S3: Swale #3 Avg. Flow Depth=0.18' Max Vel=1.01 fps Inflow=0.94 cfs 3,062 cf
n=0.030 L=318.0' S=0.0050 '/' Capacity=18.92 cfs Outflow=0.79 cfs 3,062 cf

Pond IP1: IP1 Peak Elev=367.18' Storage=561 cf Inflow=1.92 cfs 5,880 cf
Discarded=0.86 cfs 5,880 cf Secondary=0.00 cfs 0 cf Outflow=0.86 cfs 5,880 cf

Pond P1: 12" Pipe Peak Elev=372.32' Inflow=0.77 cfs 2,676 cf
12.0" Round Culvert n=0.013 L=80.0' S=0.0055 '/' Outflow=0.77 cfs 2,676 cf

Pond P2: 12" Pipe Peak Elev=371.93' Inflow=0.79 cfs 3,062 cf
12.0" Round Culvert n=0.013 L=62.0' S=0.0389 '/' Outflow=0.79 cfs 3,062 cf

Pond SF1: SF Peak Elev=369.69' Storage=1,413 cf Inflow=1.75 cfs 7,124 cf
Outflow=1.92 cfs 5,880 cf

Link SP1: STUDY POINT #1 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP2: STUDY POINT #2 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 220,093 sf Runoff Volume = 7,124 cf Average Runoff Depth = 0.39"
93.30% Pervious = 205,343 sf 6.70% Impervious = 14,750 sf

Summary for Subcatchment P-1: Subcat P-1

Runoff = 0.94 cfs @ 12.10 hrs, Volume= 3,062 cf, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=2.78"

Area (sf)	CN	Description
10,701	39	>75% Grass cover, Good, HSG A
16,727	96	Gravel surface, HSG A
1,450	98	Paved parking, HSG A
6,790	98	Roofs, HSG A
35,669	79	Weighted Average
27,429		76.90% Pervious Area
8,240		23.10% Impervious Area

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

Summary for Subcatchment P-2: Subcat P-2

Runoff = 0.85 cfs @ 12.09 hrs, Volume= 2,676 cf, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=2.78"

Area (sf)	CN	Description
3,892	39	>75% Grass cover, Good, HSG A
14,141	96	Gravel surface, HSG A
800	98	Paved parking, HSG A
2,930	98	Roofs, HSG A
21,763	86	Weighted Average
18,033		82.86% Pervious Area
3,730		17.14% Impervious Area

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

Summary for Subcatchment P-3: Subcat P-3

Runoff = 0.24 cfs @ 12.15 hrs, Volume= 1,386 cf, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=2.78"

Area (sf)	CN	Description
27,612	39	>75% Grass cover, Good, HSG A
17,853	96	Gravel surface, HSG A
2,780	98	Roofs, HSG A
48,245	63	Weighted Average
45,465		94.24% Pervious Area
2,780		5.76% Impervious Area

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

Summary for Subcatchment P-4: Subcat P-4

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=2.78"

Area (sf)	CN	Description
69,324	39	>75% Grass cover, Good, HSG A
69,324		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	50	0.0150	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.28"
9.8	360	0.0150	0.61		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
23.5	410	Total			

Summary for Subcatchment P-5: Subcat P-5

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=2.78"

Area (sf)	CN	Description
45,093	39	>75% Grass cover, Good, HSG A
45,093		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.28"
9.7	290	0.0100	0.50		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.7	340	Total			

Summary for Reach S1: Swale #1

Inflow Area = 21,763 sf, 17.14% Impervious, Inflow Depth = 1.48" for 2-year event
Inflow = 0.85 cfs @ 12.09 hrs, Volume= 2,676 cf
Outflow = 0.77 cfs @ 12.18 hrs, Volume= 2,676 cf, Atten= 9%, Lag= 5.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.00 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 0.28 fps, Avg. Travel Time= 11.5 min

Peak Storage= 151 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 1.00' Flow Area= 7.0 sf, Capacity= 18.92 cfs

4.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 10.00'
Length= 194.0' Slope= 0.0050 '/'
Inlet Invert= 372.77', Outlet Invert= 371.80'

‡

Summary for Reach S2: Swale #2

Inflow Area = 70,008 sf, 9.30% Impervious, Inflow Depth = 0.70" for 2-year event
Inflow = 1.00 cfs @ 12.18 hrs, Volume= 4,062 cf
Outflow = 0.96 cfs @ 12.27 hrs, Volume= 4,062 cf, Atten= 4%, Lag= 5.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.95 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.28 fps, Avg. Travel Time= 10.4 min

Peak Storage= 179 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 25.20 cfs

6.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 177.0' Slope= 0.0049 '/'
Inlet Invert= 371.36', Outlet Invert= 370.50'

‡

Summary for Reach S3: Swale #3

Inflow Area = 35,669 sf, 23.10% Impervious, Inflow Depth = 1.03" for 2-year event
Inflow = 0.94 cfs @ 12.10 hrs, Volume= 3,062 cf
Outflow = 0.79 cfs @ 12.25 hrs, Volume= 3,062 cf, Atten= 16%, Lag= 8.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.01 fps, Min. Travel Time= 5.2 min
Avg. Velocity = 0.30 fps, Avg. Travel Time= 17.8 min

Peak Storage= 253 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 1.00' Flow Area= 7.0 sf, Capacity= 18.92 cfs

4.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 10.00'
Length= 318.0' Slope= 0.0050 '/'
Inlet Invert= 373.00', Outlet Invert= 371.41'

‡

Summary for Pond IP1: IP1

Champlain Loamy Sand 131.965 mm/s = 18.70 in./hr. /2 = 9.35 in/hr

Inflow Area = 105,676 sf, 13.96% Impervious, Inflow Depth = 0.67" for 2-year event
Inflow = 1.92 cfs @ 12.32 hrs, Volume= 5,880 cf
Outflow = 0.86 cfs @ 12.57 hrs, Volume= 5,880 cf, Atten= 55%, Lag= 15.3 min
Discarded = 0.86 cfs @ 12.57 hrs, Volume= 5,880 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 367.18' @ 12.57 hrs Surf.Area= 2,929 sf Storage= 561 cf
Flood Elev= 370.00' Surf.Area= 4,995 sf Storage= 11,580 cf

Plug-Flow detention time= 4.5 min calculated for 5,880 cf (100% of inflow)
Center-of-Mass det. time= 4.5 min (915.9 - 911.4)

Volume	Invert	Avail.Storage	Storage Description
#1	367.00'	11,580 cf	**Custom Stage Data (Irregular)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
367.00	2,809	367.0	0	0	2,809
368.00	3,483	233.0	3,140	3,140	9,214
369.00	4,212	252.0	3,842	6,982	9,986
370.00	4,995	271.0	4,598	11,580	10,819

Device	Routing	Invert	Outlet Devices
#1	Secondary	369.00'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Discarded	367.00'	**9.350 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 110.00'

Discarded OutFlow Max=0.85 cfs @ 12.57 hrs HW=367.18' (Free Discharge)
└**2=Exfiltration** (Controls 0.85 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=367.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond P1: 12" Pipe

Inflow Area = 21,763 sf, 17.14% Impervious, Inflow Depth = 1.48" for 2-year event
Inflow = 0.77 cfs @ 12.18 hrs, Volume= 2,676 cf
Outflow = 0.77 cfs @ 12.18 hrs, Volume= 2,676 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.77 cfs @ 12.18 hrs, Volume= 2,676 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 372.32' @ 12.18 hrs
Flood Elev= 374.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	371.80'	**12.0" Round 12"RCP** L= 80.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 371.80' / 371.36' S= 0.0055 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.76 cfs @ 12.18 hrs HW=372.32' (Free Discharge)
↑**1=12"RCP** (Barrel Controls 0.76 cfs @ 2.69 fps)

Summary for Pond P2: 12" Pipe

Inflow Area = 35,669 sf, 23.10% Impervious, Inflow Depth = 1.03" for 2-year event
Inflow = 0.79 cfs @ 12.25 hrs, Volume= 3,062 cf
Outflow = 0.79 cfs @ 12.25 hrs, Volume= 3,062 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.79 cfs @ 12.25 hrs, Volume= 3,062 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 371.93' @ 12.25 hrs
Flood Elev= 374.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	371.41'	**12.0" Round 12"RCP** L= 62.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 371.41' / 369.00' S= 0.0389 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.79 cfs @ 12.25 hrs HW=371.92' (Free Discharge)
↑—**1=12"RCP** (Inlet Controls 0.79 cfs @ 1.93 fps)

Summary for Pond SF1: SF

Champlain Loamy Sand 131.965 mm/s = 18.70 in./hr. /2 = 9.35 in/hr

Inflow Area = 105,676 sf, 13.96% Impervious, Inflow Depth = 0.81" for 2-year event
Inflow = 1.75 cfs @ 12.26 hrs, Volume= 7,124 cf
Outflow = 1.92 cfs @ 12.32 hrs, Volume= 5,880 cf, Atten= 0%, Lag= 3.5 min
Primary = 1.92 cfs @ 12.32 hrs, Volume= 5,880 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 369.69' @ 12.32 hrs Surf.Area= 937 sf Storage= 1,413 cf
Flood Elev= 370.00' Surf.Area= 1,053 sf Storage= 1,725 cf

Plug-Flow detention time= 113.7 min calculated for 5,880 cf (83% of inflow)
Center-of-Mass det. time= 36.6 min (911.4 - 874.8)

Volume	Invert	Avail.Storage	Storage Description
#1	367.00'	1,725 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
367.00	186	68.0	0	0	186
368.00	418	88.0	294	294	446
369.00	707	105.0	556	850	725
370.00	1,053	124.0	874	1,725	1,089

Device	Routing	Invert	Outlet Devices
#1	Primary	369.50'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=1.71 cfs @ 12.32 hrs HW=369.67' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 1.71 cfs @ 1.00 fps)

Summary for Link SP1: STUDY POINT #1

Inflow Area = 45,093 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Link SP2: STUDY POINT #2

Inflow Area = 69,324 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Subcat P-1 Runoff Area=35,669 sf 23.10% Impervious Runoff Depth=2.01"
Tc=6.0 min CN=79 Runoff=1.89 cfs 5,981 cf

Subcatchment P-2: Subcat P-2 Runoff Area=21,763 sf 17.14% Impervious Runoff Depth=2.60"
Tc=6.0 min CN=86 Runoff=1.48 cfs 4,717 cf

Subcatchment P-3: Subcat P-3 Runoff Area=48,245 sf 5.76% Impervious Runoff Depth=0.95"
Tc=6.0 min CN=63 Runoff=1.05 cfs 3,822 cf

Subcatchment P-4: Subcat P-4 Runoff Area=69,324 sf 0.00% Impervious Runoff Depth=0.05"
Flow Length=410' Slope=0.0150 '/' Tc=23.5 min CN=39 Runoff=0.01 cfs 303 cf

Subcatchment P-5: Subcat P-5 Runoff Area=45,093 sf 0.00% Impervious Runoff Depth=0.05"
Flow Length=340' Tc=16.7 min CN=39 Runoff=0.01 cfs 197 cf

Reach S1: Swale #1 Avg. Flow Depth=0.24' Max Vel=1.22 fps Inflow=1.48 cfs 4,717 cf
n=0.030 L=194.0' S=0.0050 '/' Capacity=18.92 cfs Outflow=1.39 cfs 4,717 cf

Reach S2: Swale #2 Avg. Flow Depth=0.26' Max Vel=1.29 fps Inflow=2.30 cfs 8,538 cf
n=0.030 L=177.0' S=0.0049 '/' Capacity=25.20 cfs Outflow=2.22 cfs 8,538 cf

Reach S3: Swale #3 Avg. Flow Depth=0.27' Max Vel=1.30 fps Inflow=1.89 cfs 5,981 cf
n=0.030 L=318.0' S=0.0050 '/' Capacity=18.92 cfs Outflow=1.65 cfs 5,981 cf

Pond IP1: IP1 Peak Elev=367.81' Storage=2,551 cf Inflow=3.84 cfs 13,275 cf
Discarded=1.74 cfs 13,275 cf Secondary=0.00 cfs 0 cf Outflow=1.74 cfs 13,275 cf

Pond P1: 12" Pipe Peak Elev=372.54' Inflow=1.39 cfs 4,717 cf
12.0" Round Culvert n=0.013 L=80.0' S=0.0055 '/' Outflow=1.39 cfs 4,717 cf

Pond P2: 12" Pipe Peak Elev=372.22' Inflow=1.65 cfs 5,981 cf
12.0" Round Culvert n=0.013 L=62.0' S=0.0389 '/' Outflow=1.65 cfs 5,981 cf

Pond SF1: SF Peak Elev=369.79' Storage=1,511 cf Inflow=3.87 cfs 14,520 cf
Outflow=3.84 cfs 13,275 cf

Link SP1: STUDY POINT #1 Inflow=0.01 cfs 197 cf
Primary=0.01 cfs 197 cf

Link SP2: STUDY POINT #2 Inflow=0.01 cfs 303 cf
Primary=0.01 cfs 303 cf

Total Runoff Area = 220,093 sf Runoff Volume = 15,019 cf Average Runoff Depth = 0.82"
93.30% Pervious = 205,343 sf 6.70% Impervious = 14,750 sf

Summary for Subcatchment P-1: Subcat P-1

Runoff = 1.89 cfs @ 12.09 hrs, Volume= 5,981 cf, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.06"

Area (sf)	CN	Description
10,701	39	>75% Grass cover, Good, HSG A
16,727	96	Gravel surface, HSG A
1,450	98	Paved parking, HSG A
6,790	98	Roofs, HSG A
35,669	79	Weighted Average
27,429		76.90% Pervious Area
8,240		23.10% Impervious Area

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

Summary for Subcatchment P-2: Subcat P-2

Runoff = 1.48 cfs @ 12.09 hrs, Volume= 4,717 cf, Depth= 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.06"

Area (sf)	CN	Description
3,892	39	>75% Grass cover, Good, HSG A
14,141	96	Gravel surface, HSG A
800	98	Paved parking, HSG A
2,930	98	Roofs, HSG A
21,763	86	Weighted Average
18,033		82.86% Pervious Area
3,730		17.14% Impervious Area

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

Summary for Subcatchment P-3: Subcat P-3

Runoff = 1.05 cfs @ 12.11 hrs, Volume= 3,822 cf, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.06"

Area (sf)	CN	Description
27,612	39	>75% Grass cover, Good, HSG A
17,853	96	Gravel surface, HSG A
2,780	98	Roofs, HSG A
48,245	63	Weighted Average
45,465		94.24% Pervious Area
2,780		5.76% Impervious Area

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

Summary for Subcatchment P-4: Subcat P-4

Runoff = 0.01 cfs @ 15.70 hrs, Volume= 303 cf, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.06"

Area (sf)	CN	Description
69,324	39	>75% Grass cover, Good, HSG A
69,324		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	50	0.0150	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.28"
9.8	360	0.0150	0.61		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
23.5	410	Total			

Summary for Subcatchment P-5: Subcat P-5

Runoff = 0.01 cfs @ 15.58 hrs, Volume= 197 cf, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.06"

Area (sf)	CN	Description
45,093	39	>75% Grass cover, Good, HSG A
45,093		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.28"
9.7	290	0.0100	0.50		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.7	340	Total			

Summary for Reach S1: Swale #1

Inflow Area = 21,763 sf, 17.14% Impervious, Inflow Depth = 2.60" for 10-year event
Inflow = 1.48 cfs @ 12.09 hrs, Volume= 4,717 cf
Outflow = 1.39 cfs @ 12.17 hrs, Volume= 4,717 cf, Atten= 7%, Lag= 4.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.22 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.33 fps, Avg. Travel Time= 9.9 min

Peak Storage= 222 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 1.00' Flow Area= 7.0 sf, Capacity= 18.92 cfs

4.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 10.00'
Length= 194.0' Slope= 0.0050 '/'
Inlet Invert= 372.77', Outlet Invert= 371.80'

‡

Summary for Reach S2: Swale #2

Inflow Area = 70,008 sf, 9.30% Impervious, Inflow Depth = 1.46" for 10-year event
Inflow = 2.30 cfs @ 12.14 hrs, Volume= 8,538 cf
Outflow = 2.22 cfs @ 12.21 hrs, Volume= 8,538 cf, Atten= 4%, Lag= 4.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.29 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.35 fps, Avg. Travel Time= 8.5 min

Peak Storage= 309 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 25.20 cfs

6.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 177.0' Slope= 0.0049 '/'
Inlet Invert= 371.36', Outlet Invert= 370.50'

‡

Summary for Reach S3: Swale #3

Inflow Area = 35,669 sf, 23.10% Impervious, Inflow Depth = 2.01" for 10-year event
Inflow = 1.89 cfs @ 12.09 hrs, Volume= 5,981 cf
Outflow = 1.65 cfs @ 12.21 hrs, Volume= 5,981 cf, Atten= 13%, Lag= 6.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.30 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.36 fps, Avg. Travel Time= 14.8 min

Peak Storage= 412 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 1.00' Flow Area= 7.0 sf, Capacity= 18.92 cfs

4.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 10.00'
Length= 318.0' Slope= 0.0050 '/'
Inlet Invert= 373.00', Outlet Invert= 371.41'

‡

Summary for Pond IP1: IP1

Champlain Loamy Sand 131.965 mm/s = 18.70 in./hr. /2 = 9.35 in/hr

Inflow Area = 105,676 sf, 13.96% Impervious, Inflow Depth = 1.51" for 10-year event
Inflow = 3.84 cfs @ 12.22 hrs, Volume= 13,275 cf
Outflow = 1.74 cfs @ 12.52 hrs, Volume= 13,275 cf, Atten= 55%, Lag= 17.7 min
Discarded = 1.74 cfs @ 12.52 hrs, Volume= 13,275 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 367.81' @ 12.52 hrs Surf.Area= 3,357 sf Storage= 2,551 cf
Flood Elev= 370.00' Surf.Area= 4,995 sf Storage= 11,580 cf

Plug-Flow detention time= 11.8 min calculated for 13,257 cf (100% of inflow)
Center-of-Mass det. time= 11.8 min (883.7 - 871.9)

Volume	Invert	Avail.Storage	Storage Description
#1	367.00'	11,580 cf	**Custom Stage Data (Irregular)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
367.00	2,809	367.0	0	0	2,809
368.00	3,483	233.0	3,140	3,140	9,214
369.00	4,212	252.0	3,842	6,982	9,986
370.00	4,995	271.0	4,598	11,580	10,819

Device	Routing	Invert	Outlet Devices
#1	Secondary	369.00'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Discarded	367.00'	**9.350 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 110.00'

Discarded OutFlow Max=1.74 cfs @ 12.52 hrs HW=367.81' (Free Discharge)
└**2=Exfiltration** (Controls 1.74 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=367.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond P1: 12" Pipe

Inflow Area = 21,763 sf, 17.14% Impervious, Inflow Depth = 2.60" for 10-year event
Inflow = 1.39 cfs @ 12.17 hrs, Volume= 4,717 cf
Outflow = 1.39 cfs @ 12.17 hrs, Volume= 4,717 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.39 cfs @ 12.17 hrs, Volume= 4,717 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 372.54' @ 12.17 hrs
Flood Elev= 374.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	371.80'	**12.0" Round 12"RCP** L= 80.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 371.80' / 371.36' S= 0.0055 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.35 cfs @ 12.17 hrs HW=372.53' (Free Discharge)
↑—**1=12"RCP** (Barrel Controls 1.35 cfs @ 3.08 fps)

Summary for Pond P2: 12" Pipe

Inflow Area = 35,669 sf, 23.10% Impervious, Inflow Depth = 2.01" for 10-year event
Inflow = 1.65 cfs @ 12.21 hrs, Volume= 5,981 cf
Outflow = 1.65 cfs @ 12.21 hrs, Volume= 5,981 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.65 cfs @ 12.21 hrs, Volume= 5,981 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 372.22' @ 12.21 hrs
Flood Elev= 374.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	371.41'	**12.0" Round 12"RCP** L= 62.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 371.41' / 369.00' S= 0.0389 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.63 cfs @ 12.21 hrs HW=372.21' (Free Discharge)
↑**1=12"RCP** (Inlet Controls 1.63 cfs @ 2.41 fps)

Summary for Pond SF1: SF

Champlain Loamy Sand 131.965 mm/s = 18.70 in./hr. /2 = 9.35 in/hr

Inflow Area = 105,676 sf, 13.96% Impervious, Inflow Depth = 1.65" for 10-year event
Inflow = 3.87 cfs @ 12.21 hrs, Volume= 14,520 cf
Outflow = 3.84 cfs @ 12.22 hrs, Volume= 13,275 cf, Atten= 1%, Lag= 0.8 min
Primary = 3.84 cfs @ 12.22 hrs, Volume= 13,275 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 369.79' @ 12.22 hrs Surf.Area= 974 sf Storage= 1,511 cf
Flood Elev= 370.00' Surf.Area= 1,053 sf Storage= 1,725 cf

Plug-Flow detention time= 62.9 min calculated for 13,257 cf (91% of inflow)
Center-of-Mass det. time= 19.4 min (871.9 - 852.5)

Volume	Invert	Avail.Storage	Storage Description
#1	367.00'	1,725 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
367.00	186	68.0	0	0	186
368.00	418	88.0	294	294	446
369.00	707	105.0	556	850	725
370.00	1,053	124.0	874	1,725	1,089

Device	Routing	Invert	Outlet Devices
#1	Primary	369.50'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=3.75 cfs @ 12.22 hrs HW=369.78' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 3.75 cfs @ 1.32 fps)

Summary for Link SP1: STUDY POINT #1

Inflow Area = 45,093 sf, 0.00% Impervious, Inflow Depth = 0.05" for 10-year event
Inflow = 0.01 cfs @ 15.58 hrs, Volume= 197 cf
Primary = 0.01 cfs @ 15.58 hrs, Volume= 197 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Link SP2: STUDY POINT #2

Inflow Area = 69,324 sf, 0.00% Impervious, Inflow Depth = 0.05" for 10-year event
Inflow = 0.01 cfs @ 15.70 hrs, Volume= 303 cf
Primary = 0.01 cfs @ 15.70 hrs, Volume= 303 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Subcat P-1 Runoff Area=35,669 sf 23.10% Impervious Runoff Depth=3.64"
Tc=6.0 min CN=79 Runoff=3.41 cfs 10,805 cf

Subcatchment P-2: Subcat P-2 Runoff Area=21,763 sf 17.14% Impervious Runoff Depth=4.36"
Tc=6.0 min CN=86 Runoff=2.44 cfs 7,911 cf

Subcatchment P-3: Subcat P-3 Runoff Area=48,245 sf 5.76% Impervious Runoff Depth=2.14"
Tc=6.0 min CN=63 Runoff=2.64 cfs 8,610 cf

Subcatchment P-4: Subcat P-4 Runoff Area=69,324 sf 0.00% Impervious Runoff Depth=0.43"
Flow Length=410' Slope=0.0150 '/' Tc=23.5 min CN=39 Runoff=0.21 cfs 2,491 cf

Subcatchment P-5: Subcat P-5 Runoff Area=45,093 sf 0.00% Impervious Runoff Depth=0.43"
Flow Length=340' Tc=16.7 min CN=39 Runoff=0.15 cfs 1,621 cf

Reach S1: Swale #1 Avg. Flow Depth=0.32' Max Vel=1.45 fps Inflow=2.44 cfs 7,911 cf
n=0.030 L=194.0' S=0.0050 '/' Capacity=18.92 cfs Outflow=2.29 cfs 7,911 cf

Reach S2: Swale #2 Avg. Flow Depth=0.39' Max Vel=1.65 fps Inflow=4.69 cfs 16,521 cf
n=0.030 L=177.0' S=0.0049 '/' Capacity=25.20 cfs Outflow=4.46 cfs 16,521 cf

Reach S3: Swale #3 Avg. Flow Depth=0.38' Max Vel=1.58 fps Inflow=3.41 cfs 10,805 cf
n=0.030 L=318.0' S=0.0050 '/' Capacity=18.92 cfs Outflow=3.08 cfs 10,805 cf

Pond IP1: IP1 Peak Elev=368.98' Storage=6,915 cf Inflow=7.54 cfs 26,081 cf
Discarded=2.17 cfs 26,081 cf Secondary=0.00 cfs 0 cf Outflow=2.17 cfs 26,081 cf

Pond P1: 12" Pipe Peak Elev=372.89' Inflow=2.29 cfs 7,911 cf
12.0" Round Culvert n=0.013 L=80.0' S=0.0055 '/' Outflow=2.29 cfs 7,911 cf

Pond P2: 12" Pipe Peak Elev=372.97' Inflow=3.08 cfs 10,805 cf
12.0" Round Culvert n=0.013 L=62.0' S=0.0389 '/' Outflow=3.08 cfs 10,805 cf

Pond SF1: SF Peak Elev=369.94' Storage=1,663 cf Inflow=7.53 cfs 27,325 cf
Outflow=7.54 cfs 26,081 cf

Link SP1: STUDY POINT #1 Inflow=0.15 cfs 1,621 cf
Primary=0.15 cfs 1,621 cf

Link SP2: STUDY POINT #2 Inflow=0.21 cfs 2,491 cf
Primary=0.21 cfs 2,491 cf

Total Runoff Area = 220,093 sf Runoff Volume = 31,437 cf Average Runoff Depth = 1.71"
93.30% Pervious = 205,343 sf 6.70% Impervious = 14,750 sf

Summary for Subcatchment P-1: Subcat P-1

Runoff = 3.41 cfs @ 12.09 hrs, Volume= 10,805 cf, Depth= 3.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-year Rainfall=5.95"

Area (sf)	CN	Description
10,701	39	>75% Grass cover, Good, HSG A
16,727	96	Gravel surface, HSG A
1,450	98	Paved parking, HSG A
6,790	98	Roofs, HSG A
35,669	79	Weighted Average
27,429		76.90% Pervious Area
8,240		23.10% Impervious Area

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

Summary for Subcatchment P-2: Subcat P-2

Runoff = 2.44 cfs @ 12.09 hrs, Volume= 7,911 cf, Depth= 4.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-year Rainfall=5.95"

Area (sf)	CN	Description
3,892	39	>75% Grass cover, Good, HSG A
14,141	96	Gravel surface, HSG A
800	98	Paved parking, HSG A
2,930	98	Roofs, HSG A
21,763	86	Weighted Average
18,033		82.86% Pervious Area
3,730		17.14% Impervious Area

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

Summary for Subcatchment P-3: Subcat P-3

Runoff = 2.64 cfs @ 12.10 hrs, Volume= 8,610 cf, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-year Rainfall=5.95"

Area (sf)	CN	Description
27,612	39	>75% Grass cover, Good, HSG A
17,853	96	Gravel surface, HSG A
2,780	98	Roofs, HSG A
48,245	63	Weighted Average
45,465		94.24% Pervious Area
2,780		5.76% Impervious Area

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

Summary for Subcatchment P-4: Subcat P-4

Runoff = 0.21 cfs @ 12.61 hrs, Volume= 2,491 cf, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-year Rainfall=5.95"

Area (sf)	CN	Description
69,324	39	>75% Grass cover, Good, HSG A
69,324		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	50	0.0150	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.28"
9.8	360	0.0150	0.61		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
23.5	410	Total			

Summary for Subcatchment P-5: Subcat P-5

Runoff = 0.15 cfs @ 12.51 hrs, Volume= 1,621 cf, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-year Rainfall=5.95"

Area (sf)	CN	Description
45,093	39	>75% Grass cover, Good, HSG A
45,093		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.28"
9.7	290	0.0100	0.50		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.7	340	Total			

Summary for Reach S1: Swale #1

Inflow Area = 21,763 sf, 17.14% Impervious, Inflow Depth = 4.36" for 50-year event
Inflow = 2.44 cfs @ 12.09 hrs, Volume= 7,911 cf
Outflow = 2.29 cfs @ 12.15 hrs, Volume= 7,911 cf, Atten= 6%, Lag= 3.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.45 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.38 fps, Avg. Travel Time= 8.6 min

Peak Storage= 313 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 1.00' Flow Area= 7.0 sf, Capacity= 18.92 cfs

4.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 10.00'
Length= 194.0' Slope= 0.0050 '/'
Inlet Invert= 372.77', Outlet Invert= 371.80'

‡

Summary for Reach S2: Swale #2

Inflow Area = 70,008 sf, 9.30% Impervious, Inflow Depth = 2.83" for 50-year event
Inflow = 4.69 cfs @ 12.12 hrs, Volume= 16,521 cf
Outflow = 4.46 cfs @ 12.18 hrs, Volume= 16,521 cf, Atten= 5%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.65 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 7.1 min

Peak Storage= 493 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 25.20 cfs

6.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 177.0' Slope= 0.0049 '/'
Inlet Invert= 371.36', Outlet Invert= 370.50'

‡

Summary for Reach S3: Swale #3

Inflow Area = 35,669 sf, 23.10% Impervious, Inflow Depth = 3.64" for 50-year event
Inflow = 3.41 cfs @ 12.09 hrs, Volume= 10,805 cf
Outflow = 3.08 cfs @ 12.19 hrs, Volume= 10,805 cf, Atten= 10%, Lag= 5.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.58 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 12.6 min

Peak Storage= 623 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 1.00' Flow Area= 7.0 sf, Capacity= 18.92 cfs

4.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 10.00'
Length= 318.0' Slope= 0.0050 '/'
Inlet Invert= 373.00', Outlet Invert= 371.41'

‡

Summary for Pond IP1: IP1

Champlain Loamy Sand 131.965 mm/s = 18.70 in./hr. /2 = 9.35 in/hr

Inflow Area = 105,676 sf, 13.96% Impervious, Inflow Depth = 2.96" for 50-year event
Inflow = 7.54 cfs @ 12.19 hrs, Volume= 26,081 cf
Outflow = 2.17 cfs @ 12.61 hrs, Volume= 26,081 cf, Atten= 71%, Lag= 24.7 min
Discarded = 2.17 cfs @ 12.61 hrs, Volume= 26,081 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 368.98' @ 12.61 hrs Surf.Area= 4,199 sf Storage= 6,915 cf
Flood Elev= 370.00' Surf.Area= 4,995 sf Storage= 11,580 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 23.5 min (870.7 - 847.3)

Volume	Invert	Avail.Storage	Storage Description
#1	367.00'	11,580 cf	**Custom Stage Data (Irregular)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
367.00	2,809	367.0	0	0	2,809
368.00	3,483	233.0	3,140	3,140	9,214
369.00	4,212	252.0	3,842	6,982	9,986
370.00	4,995	271.0	4,598	11,580	10,819

Device	Routing	Invert	Outlet Devices
#1	Secondary	369.00'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Discarded	367.00'	**9.350 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 110.00'

Discarded OutFlow Max=2.17 cfs @ 12.61 hrs HW=368.98' (Free Discharge)
└**2=Exfiltration** (Controls 2.17 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=367.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond P1: 12" Pipe

Inflow Area = 21,763 sf, 17.14% Impervious, Inflow Depth = 4.36" for 50-year event
Inflow = 2.29 cfs @ 12.15 hrs, Volume= 7,911 cf
Outflow = 2.29 cfs @ 12.15 hrs, Volume= 7,911 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.29 cfs @ 12.15 hrs, Volume= 7,911 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 372.89' @ 12.15 hrs
Flood Elev= 374.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	371.80'	**12.0" Round 12"RCP** L= 80.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 371.80' / 371.36' S= 0.0055 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.26 cfs @ 12.15 hrs HW=372.87' (Free Discharge)
↑—**1=12"RCP** (Inlet Controls 2.26 cfs @ 2.88 fps)

Summary for Pond P2: 12" Pipe

Inflow Area = 35,669 sf, 23.10% Impervious, Inflow Depth = 3.64" for 50-year event
Inflow = 3.08 cfs @ 12.19 hrs, Volume= 10,805 cf
Outflow = 3.08 cfs @ 12.19 hrs, Volume= 10,805 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.08 cfs @ 12.19 hrs, Volume= 10,805 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 372.97' @ 12.19 hrs
Flood Elev= 374.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	371.41'	**12.0" Round 12"RCP** L= 62.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 371.41' / 369.00' S= 0.0389 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.02 cfs @ 12.19 hrs HW=372.93' (Free Discharge)
↑—**1=12"RCP** (Inlet Controls 3.02 cfs @ 3.85 fps)

Summary for Pond SF1: SF

Champlain Loamy Sand 131.965 mm/s = 18.70 in./hr. /2 = 9.35 in/hr

Inflow Area = 105,676 sf, 13.96% Impervious, Inflow Depth = 3.10" for 50-year event
Inflow = 7.53 cfs @ 12.18 hrs, Volume= 27,325 cf
Outflow = 7.54 cfs @ 12.19 hrs, Volume= 26,081 cf, Atten= 0%, Lag= 0.8 min
Primary = 7.54 cfs @ 12.19 hrs, Volume= 26,081 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 369.94' @ 12.19 hrs Surf.Area= 1,031 sf Storage= 1,663 cf
Flood Elev= 370.00' Surf.Area= 1,053 sf Storage= 1,725 cf

Plug-Flow detention time= 38.8 min calculated for 26,045 cf (95% of inflow)
Center-of-Mass det. time= 13.5 min (847.3 - 833.8)

Volume	Invert	Avail.Storage	Storage Description
#1	367.00'	1,725 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
367.00	186	68.0	0	0	186
368.00	418	88.0	294	294	446
369.00	707	105.0	556	850	725
370.00	1,053	124.0	874	1,725	1,089

Device	Routing	Invert	Outlet Devices
#1	Primary	369.50'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=7.46 cfs @ 12.19 hrs HW=369.94' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 7.46 cfs @ 1.70 fps)

Summary for Link SP1: STUDY POINT #1

Inflow Area = 45,093 sf, 0.00% Impervious, Inflow Depth = 0.43" for 50-year event
Inflow = 0.15 cfs @ 12.51 hrs, Volume= 1,621 cf
Primary = 0.15 cfs @ 12.51 hrs, Volume= 1,621 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Summary for Link SP2: STUDY POINT #2

Inflow Area = 69,324 sf, 0.00% Impervious, Inflow Depth = 0.43" for 50-year event
Inflow = 0.21 cfs @ 12.61 hrs, Volume= 2,491 cf
Primary = 0.21 cfs @ 12.61 hrs, Volume= 2,491 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Extreme Precipitation Tables

Northeast Regional Climate Center

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

Smoothing	Yes
State	New Hampshire
Location	
Longitude	71.610 degrees West
Latitude	43.332 degrees North
Elevation	0 feet
Date/Time	Wed, 07 Apr 2021 13:15:58 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.40	0.49	0.65	0.81	1.02	**1yr**	0.70	0.97	1.18	1.48	1.86	2.35	2.56	**1yr**	2.08	2.46	2.89	3.57	4.09	**1yr**
2yr	0.32	0.49	0.60	0.80	1.00	1.26	**2yr**	0.87	1.15	1.45	1.80	2.24	2.78	3.10	**2yr**	2.46	2.98	3.46	4.14	4.73	**2yr**
5yr	0.37	0.58	0.73	0.98	1.25	1.58	**5yr**	1.08	1.46	1.83	2.27	2.80	3.44	3.91	**5yr**	3.05	3.76	4.36	5.12	5.82	**5yr**
10yr	0.42	0.66	0.84	1.14	1.49	1.89	**10yr**	1.28	1.75	2.19	2.72	3.33	4.06	4.67	**10yr**	3.59	4.50	5.20	6.01	6.82	**10yr**
25yr	0.50	0.80	1.02	1.40	1.86	2.38	**25yr**	1.61	2.22	2.76	3.42	4.18	5.05	5.91	**25yr**	4.47	5.69	6.55	7.45	8.41	**25yr**
50yr	0.56	0.91	1.16	1.63	2.21	2.85	**50yr**	1.91	2.65	3.31	4.09	4.97	5.95	7.07	**50yr**	5.27	6.80	7.81	8.76	9.86	**50yr**
100yr	0.65	1.05	1.36	1.92	2.62	3.40	**100yr**	2.26	3.17	3.95	4.87	5.89	7.03	8.45	**100yr**	6.22	8.13	9.32	10.31	11.55	**100yr**
200yr	0.75	1.22	1.58	2.26	3.11	4.05	**200yr**	2.69	3.81	4.71	5.80	7.00	8.31	10.11	**200yr**	7.35	9.72	11.12	12.14	13.55	**200yr**
500yr	0.90	1.48	1.93	2.79	3.91	5.12	**500yr**	3.37	4.84	5.96	7.32	8.78	10.37	12.83	**500yr**	9.18	12.33	14.05	15.08	16.73	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.24	0.36	0.44	0.60	0.73	0.88	**1yr**	0.63	0.86	1.00	1.34	1.58	2.08	2.38	**1yr**	1.84	2.29	2.68	3.29	3.83	**1yr**
2yr	0.30	0.47	0.58	0.78	0.97	1.15	**2yr**	0.84	1.12	1.31	1.71	2.20	2.71	3.01	**2yr**	2.39	2.90	3.37	4.03	4.60	**2yr**
5yr	0.34	0.53	0.66	0.90	1.15	1.37	**5yr**	0.99	1.34	1.55	1.99	2.58	3.24	3.64	**5yr**	2.87	3.50	4.07	4.79	5.45	**5yr**
10yr	0.38	0.58	0.72	1.01	1.31	1.54	**10yr**	1.13	1.51	1.74	2.24	2.90	3.73	4.18	**10yr**	3.30	4.02	4.69	5.45	6.18	**10yr**
25yr	0.43	0.66	0.82	1.17	1.54	1.82	**25yr**	1.33	1.78	2.07	2.60	3.39	4.48	5.02	**25yr**	3.97	4.83	5.67	6.48	7.31	**25yr**
50yr	0.48	0.73	0.91	1.31	1.76	2.05	**50yr**	1.52	2.01	2.35	2.90	3.80	5.17	5.76	**50yr**	4.58	5.54	6.53	7.38	8.32	**50yr**
100yr	0.53	0.80	1.01	1.45	1.99	2.33	**100yr**	1.72	2.27	2.66	3.25	4.28	5.97	6.63	**100yr**	5.28	6.37	7.55	8.40	9.44	**100yr**
200yr	0.59	0.88	1.12	1.62	2.26	2.62	**200yr**	1.95	2.56	3.01	3.63	4.82	6.92	7.63	**200yr**	6.13	7.34	8.72	9.59	10.72	**200yr**
500yr	0.68	1.01	1.29	1.88	2.67	3.06	**500yr**	2.31	2.99	3.55	4.21	5.65	8.41	9.22	**500yr**	7.45	8.86	10.55	11.43	12.67	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.29	0.44	0.54	0.72	0.89	1.09	**1yr**	0.77	1.06	1.21	1.56	1.94	2.52	2.73	**1yr**	2.23	2.63	3.09	3.84	4.35	**1yr**
2yr	0.33	0.51	0.63	0.85	1.05	1.24	**2yr**	0.91	1.22	1.41	1.83	2.34	2.85	3.21	**2yr**	2.53	3.09	3.58	4.26	4.89	**2yr**
5yr	0.41	0.63	0.78	1.07	1.36	1.62	**5yr**	1.17	1.59	1.84	2.38	3.00	3.65	4.18	**5yr**	3.23	4.02	4.68	5.43	6.22	**5yr**
10yr	0.49	0.75	0.93	1.30	1.68	1.98	**10yr**	1.45	1.94	2.22	2.78	3.51	4.40	5.13	**10yr**	3.90	4.93	5.76	6.54	7.48	**10yr**
25yr	0.64	0.97	1.20	1.72	2.26	2.64	**25yr**	1.95	2.58	2.91	3.55	4.44	5.64	6.72	**25yr**	4.99	6.47	7.55	8.36	9.57	**25yr**
50yr	0.77	1.17	1.46	2.10	2.82	3.28	**50yr**	2.44	3.21	3.57	4.28	5.31	6.80	8.26	**50yr**	6.02	7.94	9.27	10.08	11.54	**50yr**
100yr	0.94	1.42	1.78	2.58	3.53	4.09	**100yr**	3.05	3.99	4.39	5.15	6.35	8.19	10.15	**100yr**	7.25	9.76	11.40	12.16	13.92	**100yr**
200yr	1.15	1.73	2.19	3.17	4.42	5.09	**200yr**	3.81	4.98	5.41	6.20	7.61	9.88	12.47	**200yr**	8.74	11.99	14.03	14.66	16.80	**200yr**
500yr	1.50	2.24	2.88	4.19	5.95	6.83	**500yr**	5.14	6.68	7.14	7.95	9.66	12.64	16.37	**500yr**	11.19	15.74	18.46	18.80	21.54	**500yr**

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Northeast Regional Climate Center

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

April 7, 2021

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.

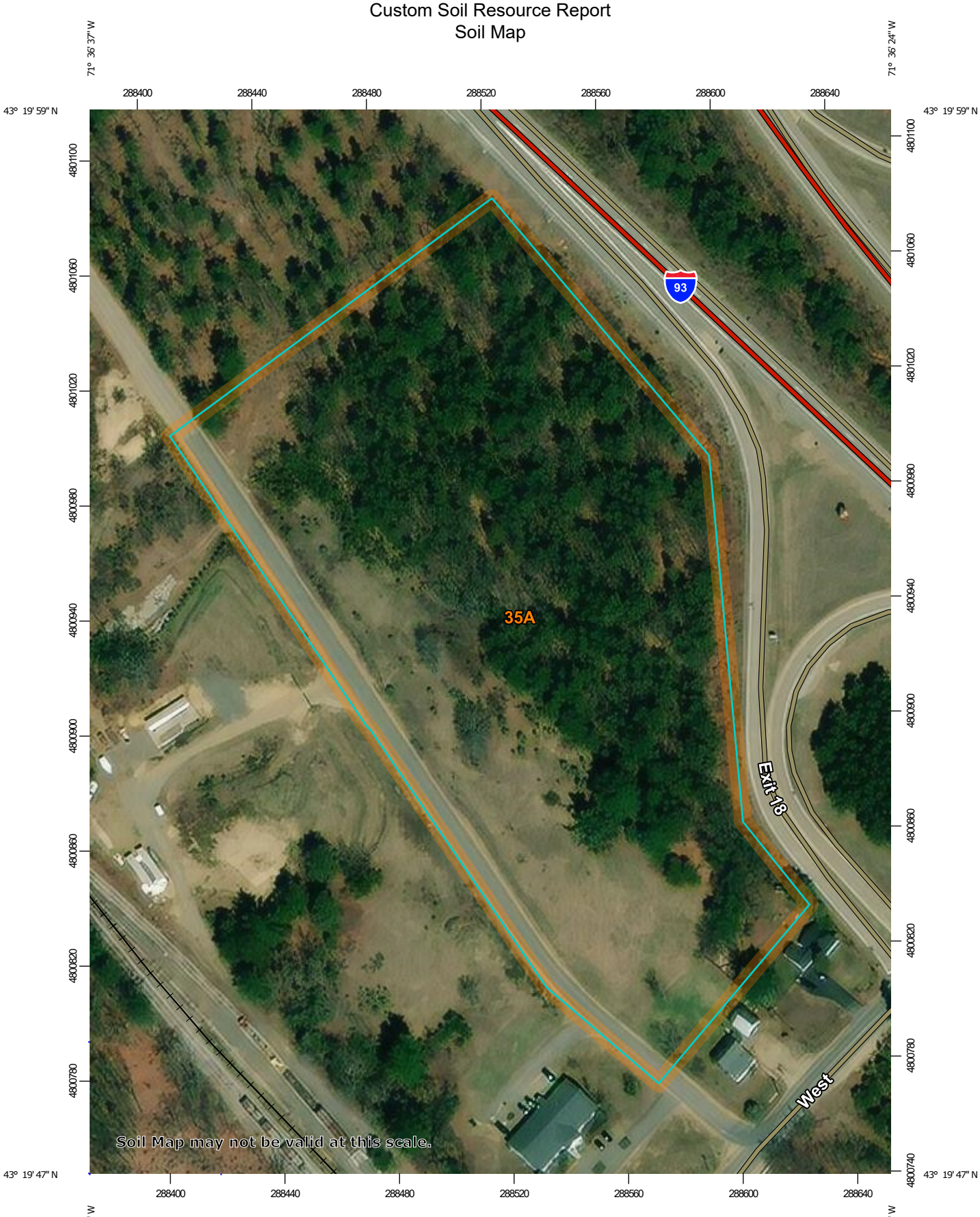
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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: 1:1,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

MAP LEGEND

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

Soils
- Soil 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 25, May 29, 2020

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

Date(s) aerial images were photographed: Aug 28, 2015—May 15, 2017

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
35A	Champlain loamy fine sand, 0 to 3 percent slopes	8.5	100.0%
Totals for Area of Interest		**8.5**	**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

35A—Champlain loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9dn9
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

Champlain and similar soils: 75 percent
Minor components: 25 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 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very 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 capacity: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Croghan

Percent of map unit: 10 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

Boscawen

Percent of map unit: 5 percent
Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear
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

Groveton

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

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Physical Properties

Soil Physical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Saturated Hydraulic Conductivity (Ksat)

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Custom Soil Resource Report
Map—Saturated Hydraulic Conductivity (Ksat)

Map Scale: 1:1,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

= 131.9650

Not rated or not available

Soil Rating Lines

= 131.9650

Not rated or not available

Soil Rating Points

= 131.9650

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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 25, May 29, 2020

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

Date(s) aerial images were photographed: Aug 28, 2015—May 15, 2017

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.

Table—Saturated Hydraulic Conductivity (Ksat)

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
35A	Champlain loamy fine sand, 0 to 3 percent slopes	131.9650	8.5	100.0%
Totals for Area of Interest			**8.5**	**100.0%**

Rating Options—Saturated Hydraulic Conductivity (Ksat)

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

Top Depth: 12

Bottom Depth: 120

Units of Measure: Inches

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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.

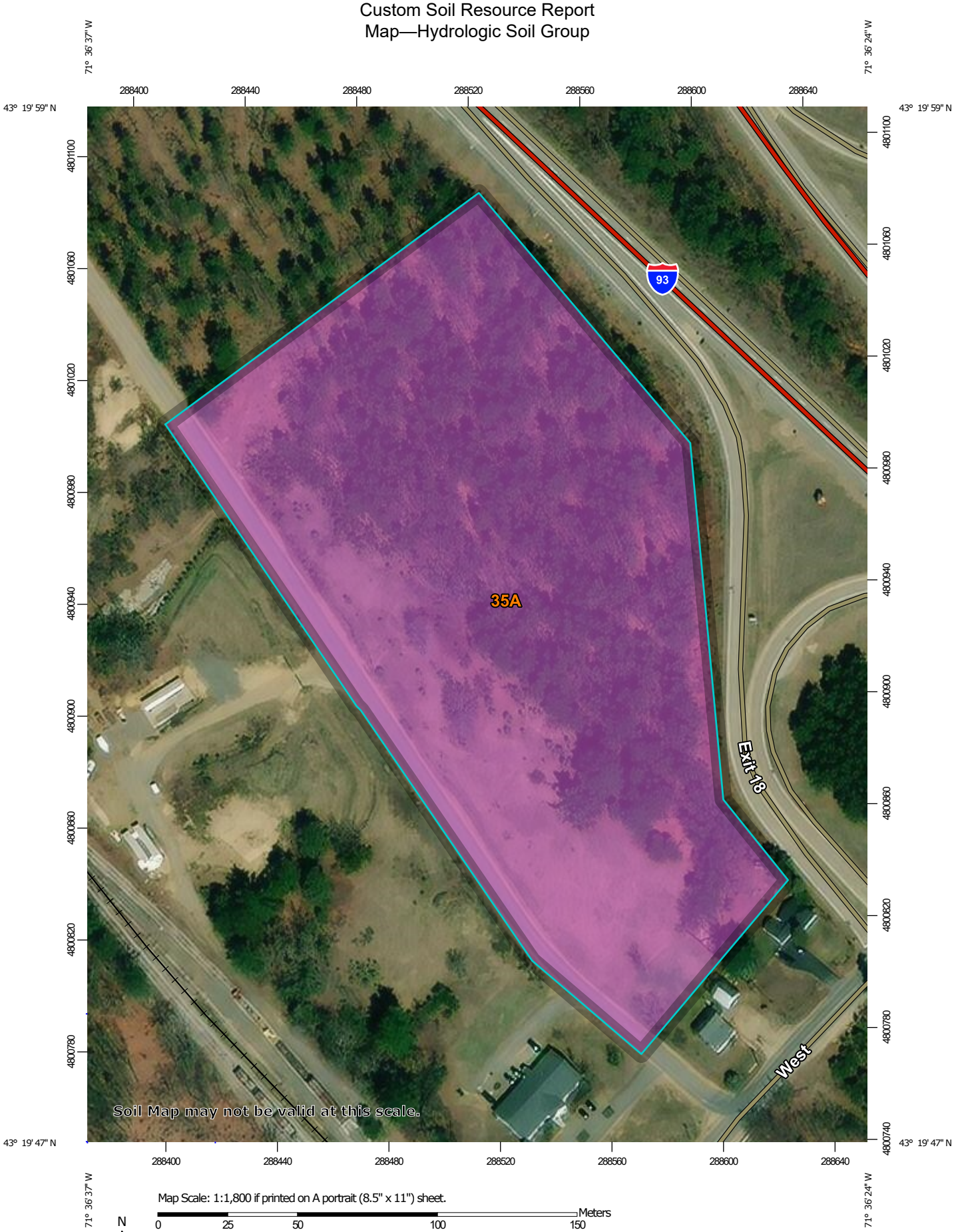
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:1,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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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 25, May 29, 2020

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

Date(s) aerial images were photographed: Aug 28, 2015—May 15, 2017

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
35A	Champlain loamy fine sand, 0 to 3 percent slopes	A	8.5	100.0%
Totals for Area of Interest			**8.5**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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