DRAINAGE ANALYSIS

FOR

Site Expansion
for
Yates Electric

88A Dover Road
Durham, New Hampshire

Tax Map 4, Lot 2

April 7, 2021

Prepared For:

Coyote Court, LLC
82 Chestnut Hill Road
Farmington, NH 03855

Prepared By:

ALTUS ENGINEERING, INC.
133 Court Street
Portsmouth, NH 03801
Phone: (603) 433-2335

ALTUS ENGINEERING, INC.

Altus Project 5183

Table of Contents

ALTUS
ENGINEERING, INC.

Section 1

Narrative

ALTUS
ENGINEERING, INC.

PROJECT DESCRIPTION

Coyote Court, LLC and Yates Electric are proposing to construct an 1,800 sf storage building at their existing site located at 88A Dover Road in Durham, NH. The property is identified as Assessor's Map 4, Lot 2, is approximately 1.97 acres in size and is located in the Town's Office and Research (OR) district. The site is currently developed with a ±2,950sf building, a shed, several storage containers and paved parking areas and accessways, including a shared driveway with the Durham Police Department. The site is served by private water and septic services and no structural stormwater measures are evident.

The proposed project will construct a new storage building, an associated paved driveway and install new stormwater treatment measures. These measures will include a vegetated swale, underdrained stone drip strip and a raingarden.

Although impervious surfaces will be increased from the existing conditions by 3,632 sf., the stormwater management system proposed for the site will reduce peak flows and treat runoff from 74% of the site's total impervious areas, including the entirety of new impervious surfaces resulting from the new building and driveway.

Site Soils

The NRCS indicates that the subject property consists of two primary soil classifications:

HcB – Hollis-Charlton fine sandy loam, 3-8% slopes HSG A/D
ScA – Scantic silt loam, 0-3% slopes, HSG C
ScB – Scantic silt loam, 3-8% slopes, HSG C

For the purposes of this analysis, the range of possible HSG values in the HcB series soils was addressed by classifying all HcB uplands as HSG B and HcB wetlands as HSG C.

Pre-Development (Existing Conditions)

The Pre-Development Watershed Plan (Sheet WS-1) reflects the current conditions of the site which include the existing building and parking areas. The current site can be divided into two (2) subcatchments which discharge to the east to Point of Analysis (POA) #1 (HydroCAD Reach 100) and to the west to Point of Analysis (POA) #2 (HydroCAD Reach 200).

Post-Development (Proposed Conditions)

The proposed project will construct a new building, drainage system and associated site improvements.

As shown on the attached Post-Development Watershed Plan (Sheet WS-2), the site was divided into three (3) subcatchment areas in the post-development conditions. The same points of analysis that were used in the Pre-Development model (POA #'s 1 and 2) were used for comparison of the Pre- and Post-development conditions.

CALCULATION METHODS

The drainage study was completed using the USDA SCS TR-20 Method within the HydroCAD Stormwater Modeling System. Reservoir routing was performed with the Dynamic Storage Indication method with automated calculation of tailwater conditions. A Type III 24-hour rainfall distribution was utilized in analyzing the data for the 1", 2, 10 and 25 year - 24-hour storm events using rainfall data provided by the Northeast Regional Climate Center (NRCC).

Disclaimer

Altus Engineering, Inc. notes that stormwater modeling is limited in its capacity to precisely predict peak rates of runoff and flood elevations. Results should not be considered to represent actual storm events due to the number of variables and assumptions involved in the modeling effort. Surface roughness coefficients (n), entrance loss coefficients (ke), velocity factors (kv) and times of concentration (Tc) are based on subjective field observations and engineering judgment using available data. For design purposes, curve numbers (Cn) describe the average conditions. However, curve numbers will vary from storm to storm depending on the antecedent runoff conditions (ARC) including saturation and frozen ground. Also, higher water elevations than predicted by modeling could occur if drainage channels, closed drain systems or culverts are not maintained and/or become blocked by debris before and/or during a storm event as this will impact flow capacity of the structures. Structures should be re-evaluated if future changes occur within relevant drainage areas in order to assess any required design modifications.

Drainage Analysis

A complete summary of the drainage model is included in the appendix of this report. The following table compares pre- and post-development peak rates at the Point of Analysis identified on the plans for the 1", 2, 10 and 25-year storm events:

Stormwater Modeling Summary
Peak Q (cfs) for Type III 24-Hour Storm Events

	1" Storm (1.00 inch)	2-Yr Storm (3.14 inch)	10-Yr Storm (4.75 inch)	25-Yr Storm (6.02 inch)
POA #1 (Reach #100)				
Pre	0.00	0.19	0.48	0.74
Post	0.00	0.17	0.44	0.67
Change	**0.00**	**-0.02**	**-0.04**	**-0.07**
POA #2 (Reach #200)				
Pre	0.04	2.84	5.91	8.49
Post	0.01	1.73	5.44	7.98
Change	**-0.03**	**-1.11**	**-0.47**	**-0.51**

As the above table demonstrates, the proposed peak rates of runoff will be decreased from the existing conditions for all analyzed storm events.

Water Quality Volume and Groundwater Recharge Volume

Pursuant to the Durham Site Plan Regulations, runoff from impervious surfaces is required to be filtered or infiltrated using a weighted calculation of Water Quality Volume (WQV) based on hydrologic soil group. As shown in Section 5, the area contributing to the proposed raingarden generates a WQV of 198 cf. The summary for Pond 3 indicates that the proposed raingarden will provide 1,432 cf of available storage between the surface of the filter media and the lowest outlet of the pond, well in excess of the minimum requirement.

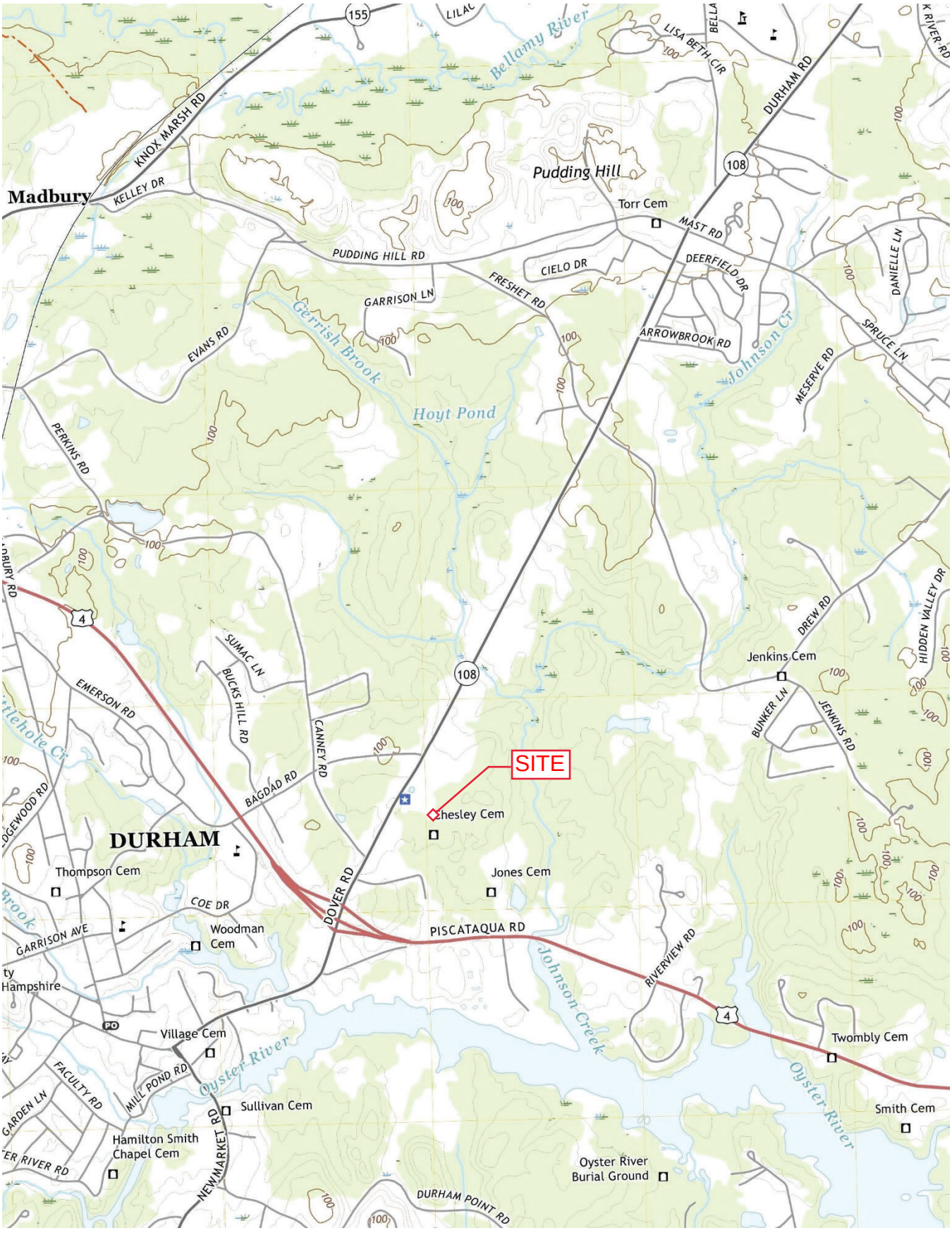
CONCLUSION

This proposed addition of a storage building to the Yates Electric site off Dover Road in Durham, NH will have minimal adverse effect on abutting properties and infrastructure as a result of stormwater runoff or siltation. Post-construction peak rates of runoff from the site will be lower than the existing conditions for all analyzed storm events. The new stormwater management system will also provide appropriate treatment to runoff from the proposed and a significant portion of the existing impervious surfaces. Appropriate steps will be taken to properly mitigate erosion and sedimentation through the use of temporary and permanent Best Management Practices for sediment and erosion control, including a vegetated swale, underdrained drip strip and a raingarden.

Section 2

Aerial Photo and USGS Map

ALTUS
ENGINEERING, INC.


SITE
Madbury
Pudding Hill
DURHAM
Bellamy River
Gerrish Brook
Hoyt Pond
Johnson Cr
Johnson Creek
Oyster River
Oyster River
Torr Cem
Chesley Cem
Jones Cem
Jenkins Cem
Thompson Cem
Woodman Cem
Village Cem
Sullivan Cem
Hamilton Smith Chapel Cem
Oyster River Burial Ground
Twombly Cem
Smith Cem
KNOX MARSH RD
KELLEY DR
PUDDING HILL RD
MAST RD
DURHAM RD
LISA BETH CIR
CIELO DR
DEERFIELD DR
DANIELLE LN
FRESHET RD
GARRISON LN
EVANS RD
ARROWBROOK RD
SPRUCE LN
MESERVE RD
PERKINS RD
DREW RD
HIDDEN VALLEY DR
BUNKER LN
JENKINS RD
SUMAC LN
BUCKS HILL RD
CANNEY RD
EMERSON RD
BAGDAD RD
DOVER RD
PISCATAQUA RD
RIVERVIEW RD
COE DR
GARRISON AVE
FACULTY RD
MILL POND RD
NEWMARKET RD
DURHAM POINT RD
GARDEN LN
155
108
4
PO

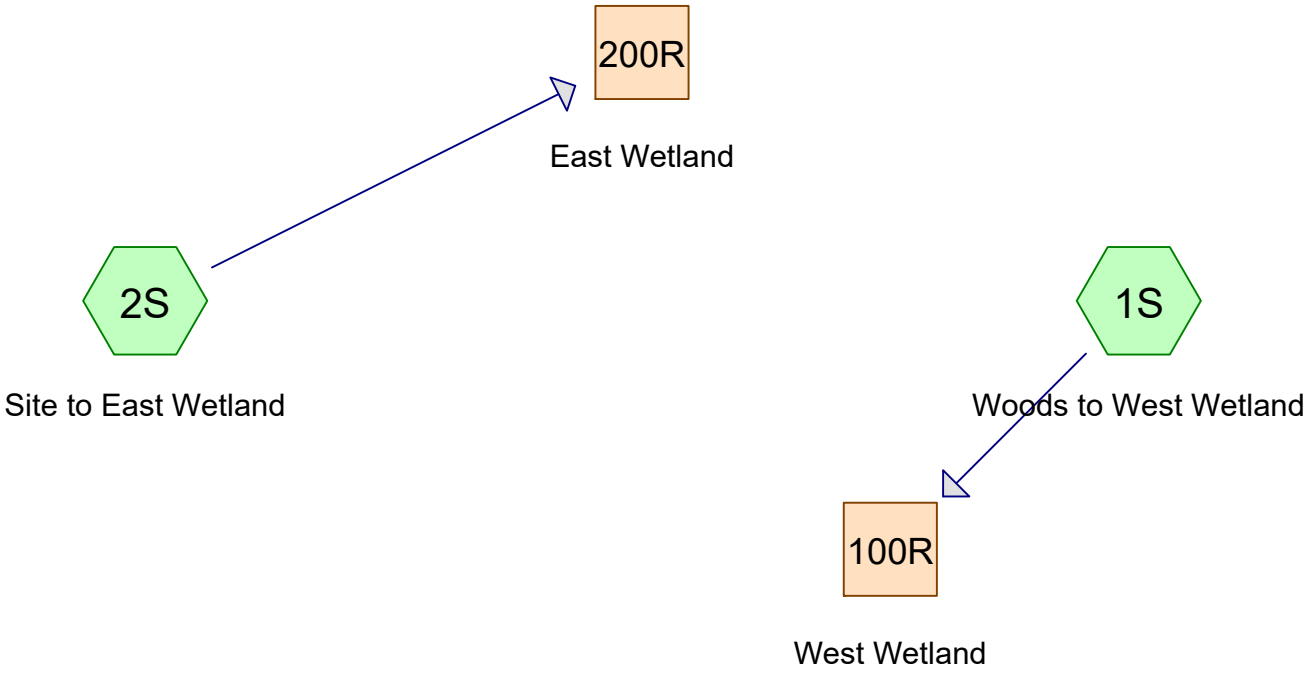

Gerrish Dr
Ambler Way
Canney Rd
Ambler Way
Ambler Way
Durham
Evangelical Church
Sophie Ln
Bagdad Rd
Bagdad Rd
Dover Rd
Bagdad Rd
Canney Rd
Durham Police
Department
SITE
Canney Rd
Canney Rd
Stone Quarry Dr
Stone Quarry Dr
Stone Quarry Dr
RiverWoods Durham
Piscataqua Rd
Piscataqua Rd
Oyster River
Community Trail
Google
Durham Wastewater
Bagg's Way

Section 4

Drainage Calculations

Post-Development
1”, 24-Hour Summary
2-Year, 24-Hour Summary
10-Year, 24-Hour Complete
25-Year, 24-Hour Summary
100-Year, 24-Hour Pond Data

ALTUS
ENGINEERING, INC.



PRE-DEVELOPMENT

Subcat Reach Pond Link

Routing Diagram for 5183-Pre-040721
Prepared by Altus Engineering, Inc., Printed 3/29/2021

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

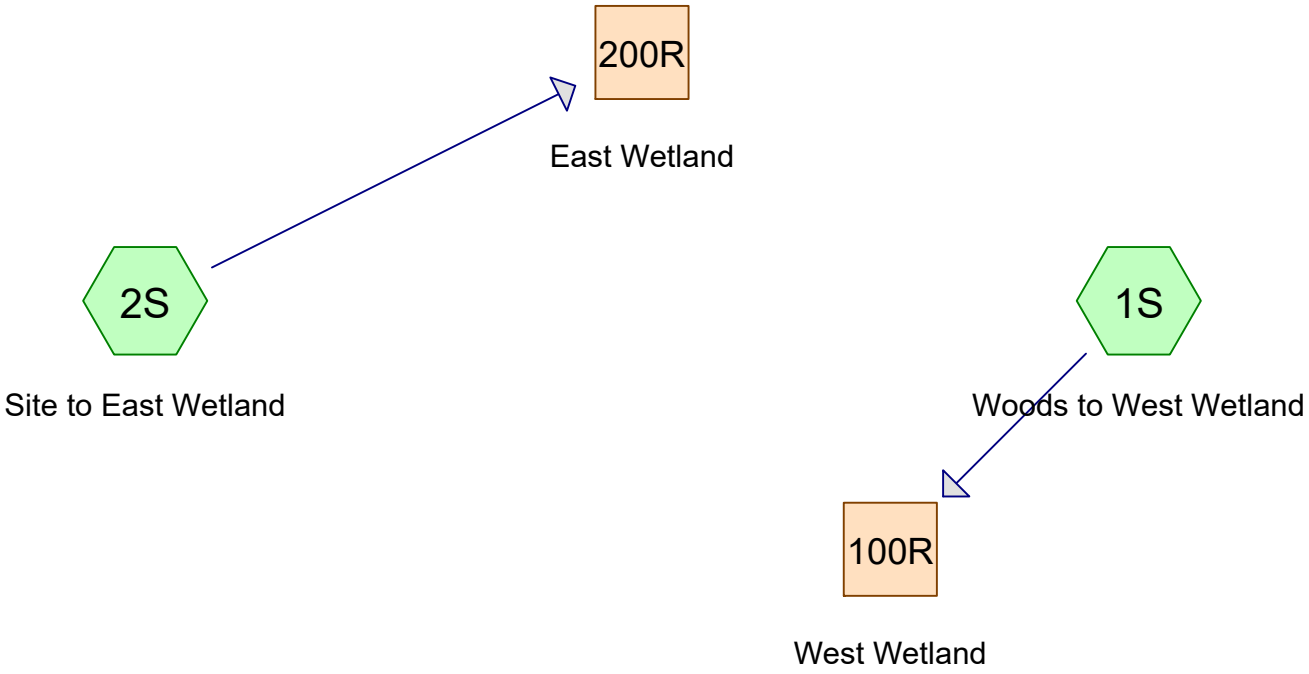
Subcatchment 1S: Woods to West Wetland Runoff Area=11,643 sf 0.94% Impervious Runoff Depth>0.01"
Flow Length=177' Tc=12.5 min CN=71 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: Site to East Wetland Runoff Area=87,798 sf 29.11% Impervious Runoff Depth>0.06"
Flow Length=370' Tc=6.0 min CN=78 Runoff=0.04 cfs 0.010 af

Reach 100R: West Wetland Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach 200R: East Wetland Inflow=0.04 cfs 0.010 af
Outflow=0.04 cfs 0.010 af

Total Runoff Area = 2.283 ac Runoff Volume = 0.010 af Average Runoff Depth = 0.05"
74.19% Pervious = 1.694 ac 25.81% Impervious = 0.589 ac



PRE-DEVELOPMENT

Subcat Reach Pond Link

Routing Diagram for 5183-Pre-040721
Prepared by Altus Engineering, Inc., Printed 3/29/2021

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

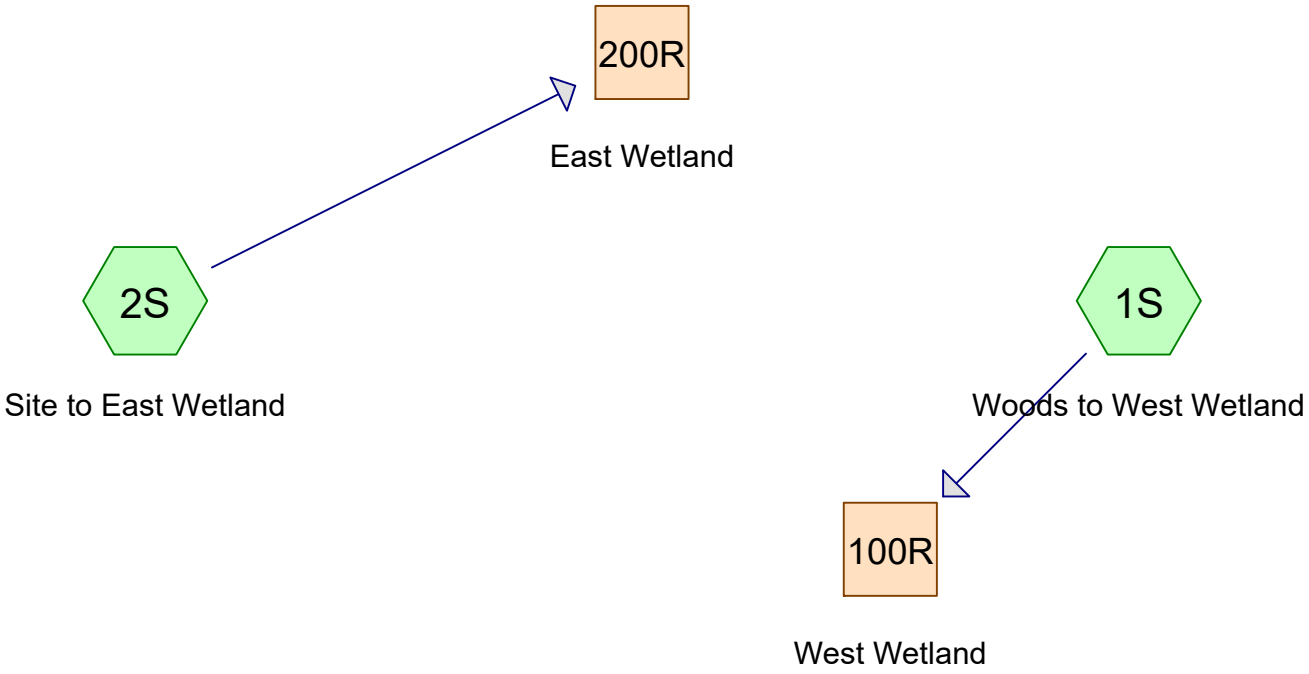
Subcatchment 1S: Woods to West Wetland Runoff Area=11,643 sf 0.94% Impervious Runoff Depth>0.84"
Flow Length=177' Tc=12.5 min CN=71 Runoff=0.19 cfs 0.019 af

Subcatchment 2S: Site to East Wetland Runoff Area=87,798 sf 29.11% Impervious Runoff Depth>1.23"
Flow Length=370' Tc=6.0 min CN=78 Runoff=2.84 cfs 0.206 af

Reach 100R: West Wetland Inflow=0.19 cfs 0.019 af
Outflow=0.19 cfs 0.019 af

Reach 200R: East Wetland Inflow=2.84 cfs 0.206 af
Outflow=2.84 cfs 0.206 af

Total Runoff Area = 2.283 ac Runoff Volume = 0.225 af Average Runoff Depth = 1.18"
74.19% Pervious = 1.694 ac 25.81% Impervious = 0.589 ac



PRE-DEVELOPMENT

Subcat Reach Pond Link

Routing Diagram for 5183-Pre-040721
Prepared by Altus Engineering, Inc., Printed 3/29/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.163	61	>75% Grass cover, Good, HSG B (2S)
0.360	74	>75% Grass cover, Good, HSG C (1S, 2S)
0.029	98	Gravel, HSG C (1S, 2S)
0.129	98	Paved parking, HSG B (2S)
0.318	98	Paved parking, HSG C (2S)
0.040	98	Roofs, HSG B (2S)
0.073	98	Roofs, HSG C (2S)
0.032	55	Woods, Good, HSG B (2S)
1.139	70	Woods, Good, HSG C (1S, 2S)
2.283	**77**	**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Woods to West Wetland Runoff Area=11,643 sf 0.94% Impervious Runoff Depth>1.92"
Flow Length=177' Tc=12.5 min CN=71 Runoff=0.48 cfs 0.043 af

Subcatchment 2S: Site to East Wetland Runoff Area=87,798 sf 29.11% Impervious Runoff Depth>2.50"
Flow Length=370' Tc=6.0 min CN=78 Runoff=5.91 cfs 0.420 af

Reach 100R: West Wetland Inflow=0.48 cfs 0.043 af
Outflow=0.48 cfs 0.043 af

Reach 200R: East Wetland Inflow=5.91 cfs 0.420 af
Outflow=5.91 cfs 0.420 af

Total Runoff Area = 2.283 ac Runoff Volume = 0.462 af Average Runoff Depth = 2.43"
74.19% Pervious = 1.694 ac 25.81% Impervious = 0.589 ac

Summary for Subcatchment 1S: Woods to West Wetland

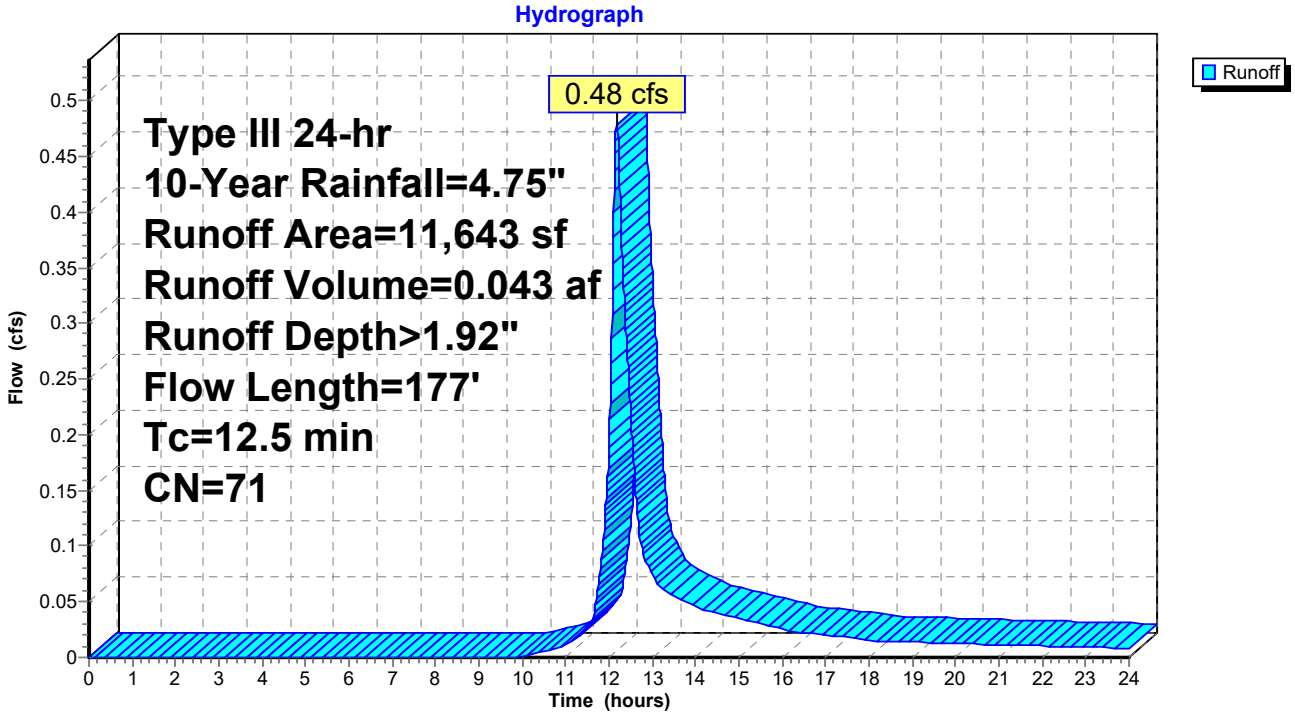
Runoff = 0.48 cfs @ 12.18 hrs, Volume= 0.043 af, Depth> 1.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.75"

	Area (sf)	CN	Description
*	110	98	Gravel, HSG C
	1,106	74	>75% Grass cover, Good, HSG C
	10,427	70	Woods, Good, HSG C
	11,643	71	Weighted Average
	11,533		99.06% Pervious Area
	110		0.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.25"
2.1	127	0.0404	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.5	177	Total			

Subcatchment 1S: Woods to West Wetland



Summary for Subcatchment 2S: Site to East Wetland

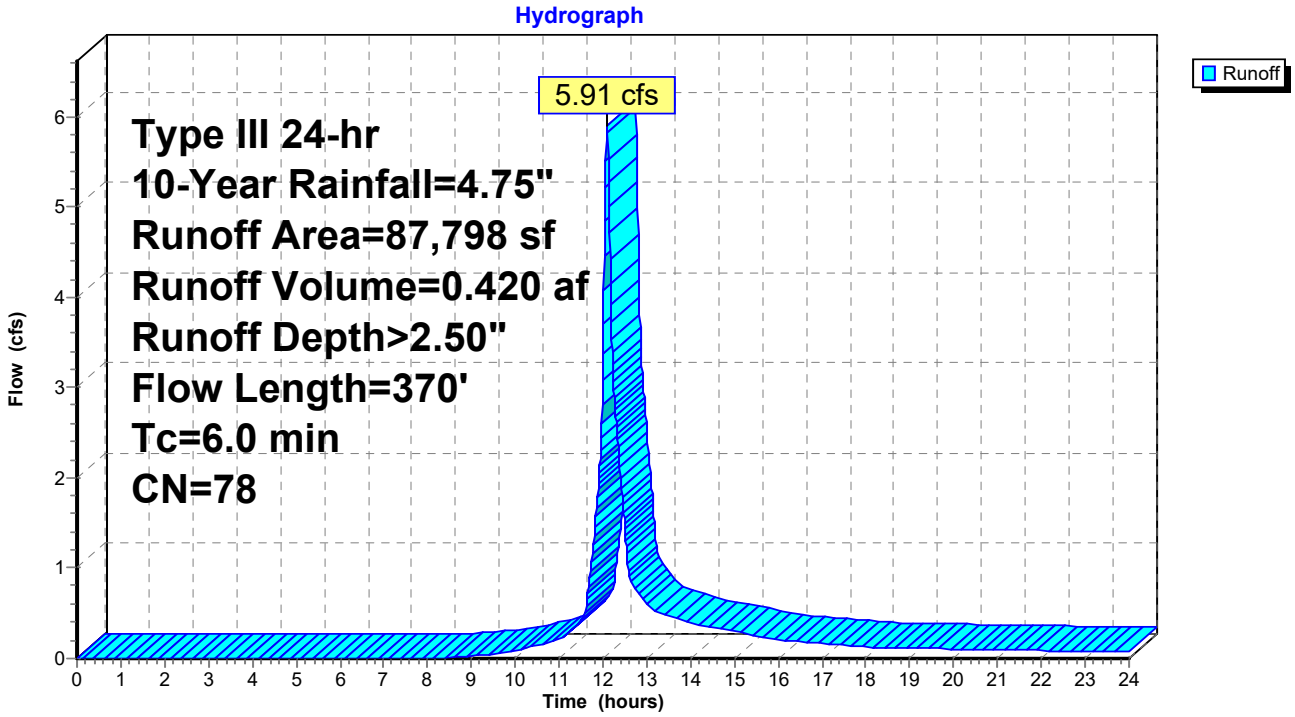
Runoff = 5.91 cfs @ 12.09 hrs, Volume= 0.420 af, Depth> 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.75"

	Area (sf)	CN	Description
	13,838	98	Paved parking, HSG C
	5,637	98	Paved parking, HSG B
*	1,146	98	Gravel, HSG C
	3,192	98	Roofs, HSG C
	1,741	98	Roofs, HSG B
	14,573	74	>75% Grass cover, Good, HSG C
	39,186	70	Woods, Good, HSG C
	7,109	61	>75% Grass cover, Good, HSG B
	1,376	55	Woods, Good, HSG B
	87,798	78	Weighted Average
	62,244		70.89% Pervious Area
	25,554		29.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.21		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.25"
0.3	97	0.0571	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	156	0.0522	3.43		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.6	67	0.0188	0.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.4	370	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Site to East Wetland

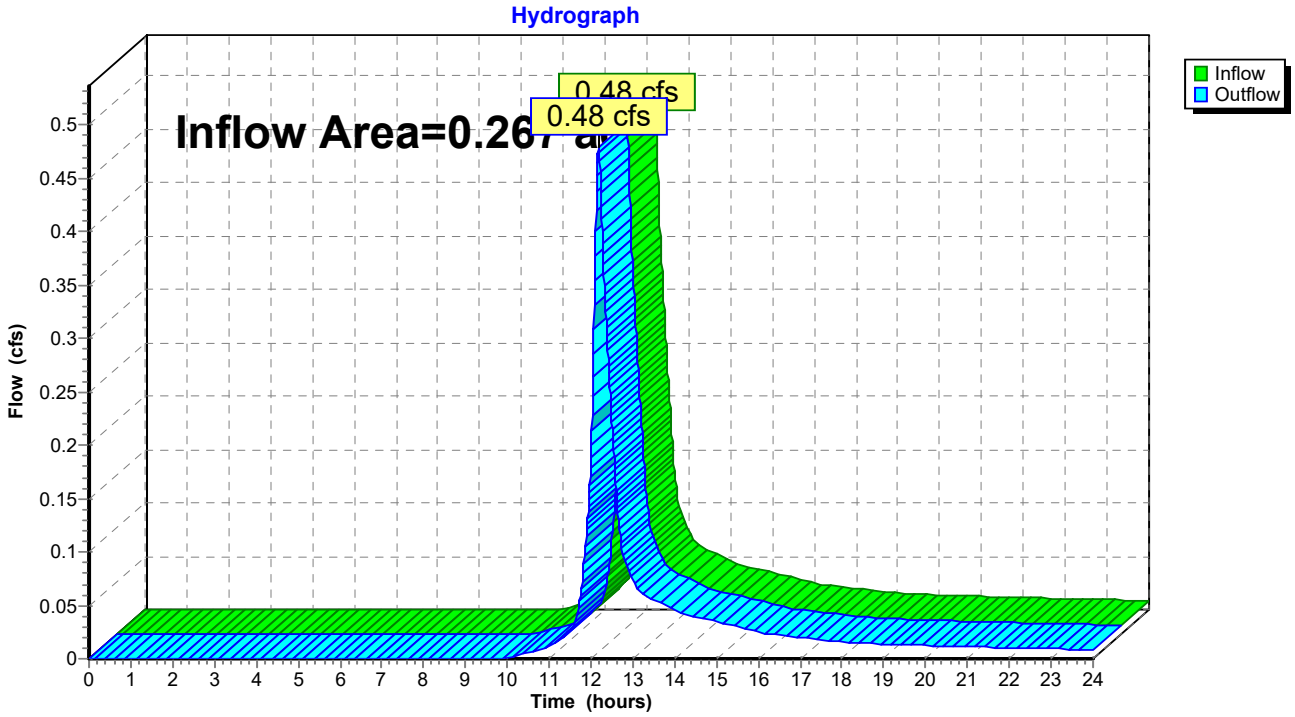


Summary for Reach 100R: West Wetland

Inflow Area = 0.267 ac, 0.94% Impervious, Inflow Depth > 1.92" for 10-Year event
Inflow = 0.48 cfs @ 12.18 hrs, Volume= 0.043 af
Outflow = 0.48 cfs @ 12.18 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach 100R: West Wetland

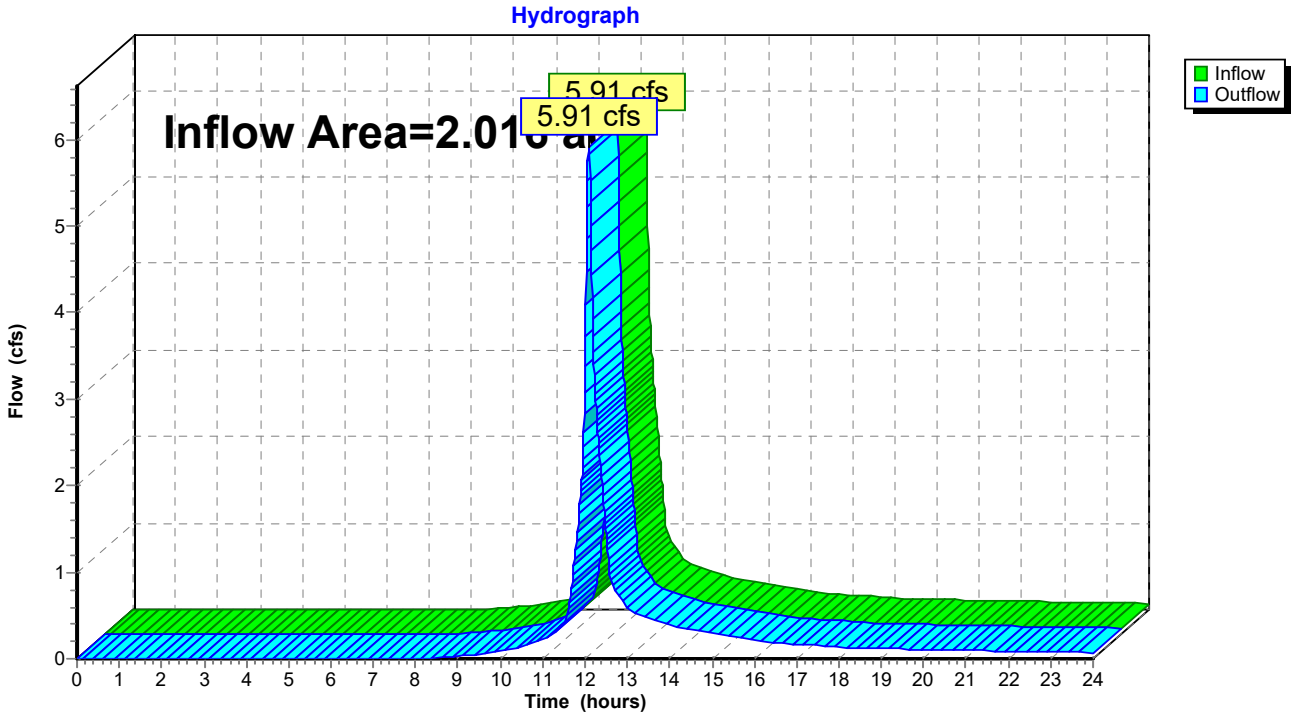


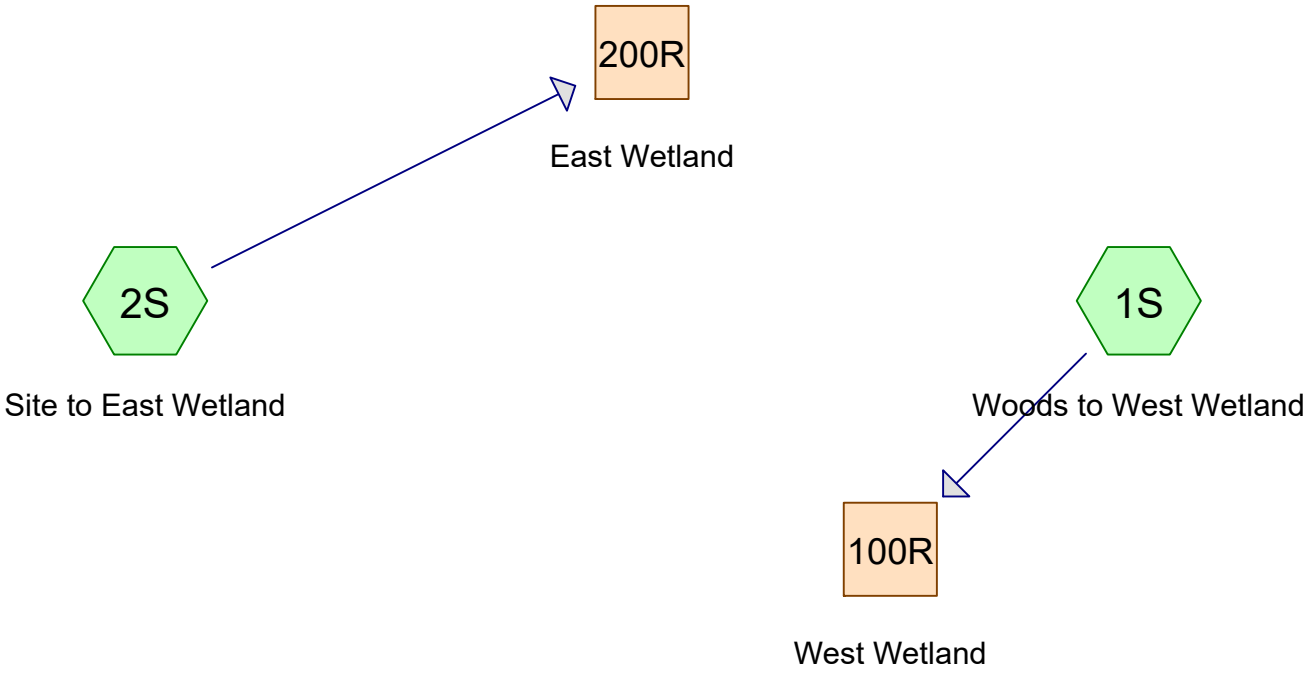
Summary for Reach 200R: East Wetland

Inflow Area = 2.016 ac, 29.11% Impervious, Inflow Depth > 2.50" for 10-Year event
Inflow = 5.91 cfs @ 12.09 hrs, Volume= 0.420 af
Outflow = 5.91 cfs @ 12.09 hrs, Volume= 0.420 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach 200R: East Wetland





PRE-DEVELOPMENT

Subcat Reach Pond Link

Routing Diagram for 5183-Pre-040721
Prepared by Altus Engineering, Inc., Printed 3/29/2021

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Woods to West Wetland Runoff Area=11,643 sf 0.94% Impervious Runoff Depth>2.91"
Flow Length=177' Tc=12.5 min CN=71 Runoff=0.74 cfs 0.065 af

Subcatchment 2S: Site to East Wetland Runoff Area=87,798 sf 29.11% Impervious Runoff Depth>3.59"
Flow Length=370' Tc=6.0 min CN=78 Runoff=8.49 cfs 0.603 af

Reach 100R: West Wetland Inflow=0.74 cfs 0.065 af
Outflow=0.74 cfs 0.065 af

Reach 200R: East Wetland Inflow=8.49 cfs 0.603 af
Outflow=8.49 cfs 0.603 af

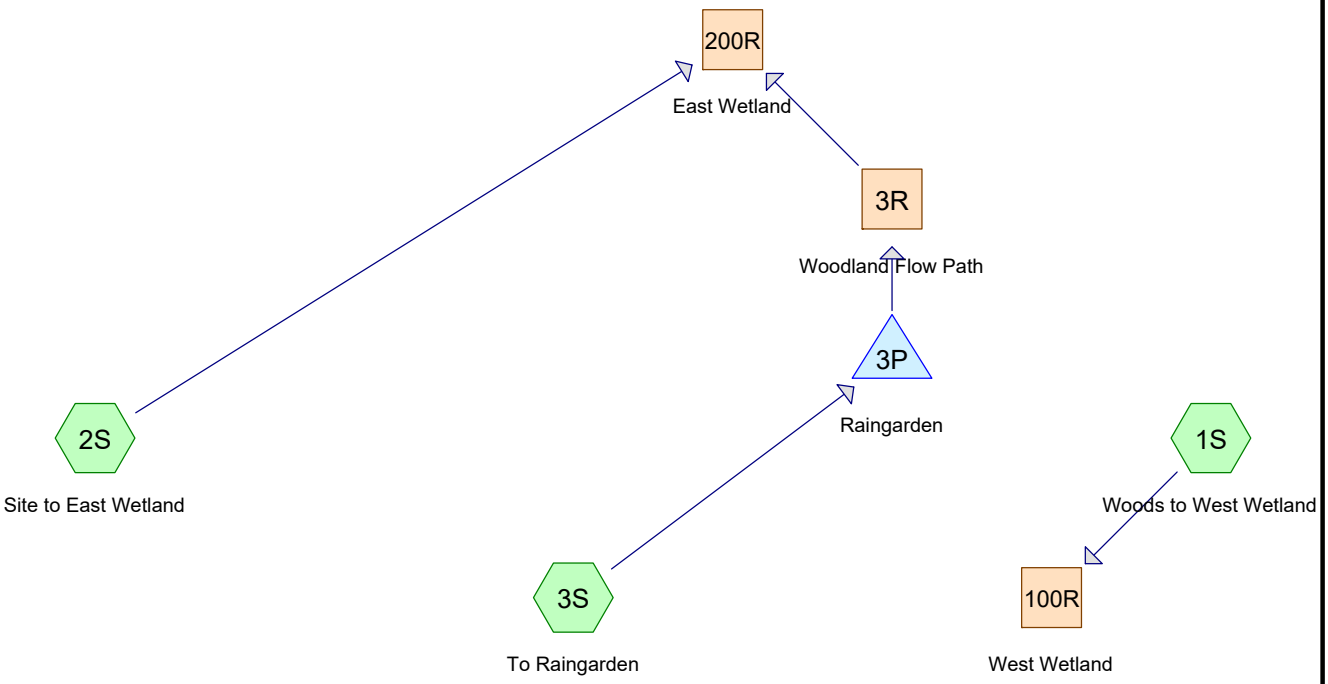
Total Runoff Area = 2.283 ac Runoff Volume = 0.668 af Average Runoff Depth = 3.51"
74.19% Pervious = 1.694 ac 25.81% Impervious = 0.589 ac

Section 3

Drainage Calculations

Pre-Development
1”, 24-Hour Summary
2-Year, 24-Hour Summary
10-Year, 24-Hour Complete
25-Year, 24-Hour Summary

ALTUS
ENGINEERING, INC.



POST-DEVELOPMENT

Subcat Reach Pond Link

Routing Diagram for 5183-Post-040721
Prepared by Altus Engineering, Inc., Printed 3/29/2021

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Woods to West Wetland Runoff Area=10,611 sf 1.04% Impervious Runoff Depth>0.01"
Flow Length=177' Tc=12.5 min CN=71 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: Site to East Wetland Runoff Area=64,103 sf 20.43% Impervious Runoff Depth>0.03"
Flow Length=370' Tc=6.0 min CN=75 Runoff=0.01 cfs 0.004 af

Subcatchment 3S: To Raingarden Runoff Area=24,727 sf 65.07% Impervious Runoff Depth>0.28"
Flow Length=305' Tc=6.0 min CN=89 Runoff=0.17 cfs 0.013 af

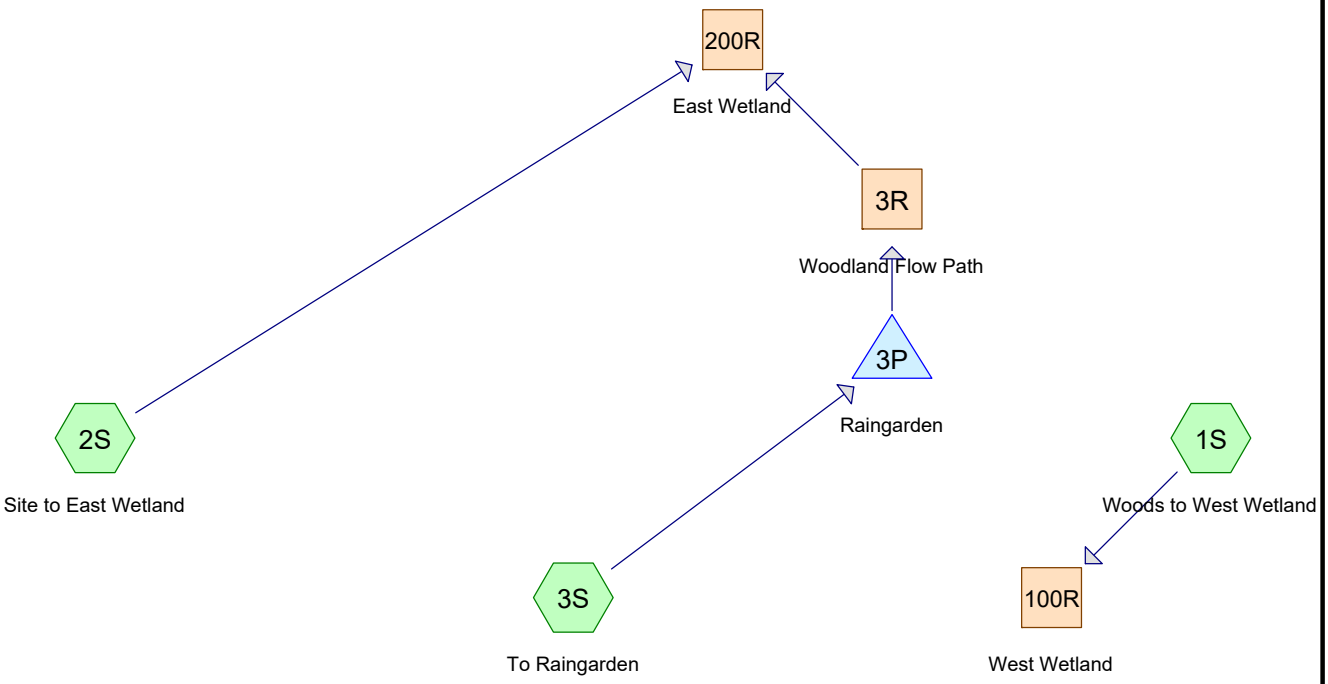
Reach 3R: Woodland Flow Path Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.070 L=99.0' S=0.0364 '/' Capacity=15.76 cfs Outflow=0.00 cfs 0.000 af

Reach 100R: West Wetland Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach 200R: East Wetland Inflow=0.01 cfs 0.004 af
Outflow=0.01 cfs 0.004 af

Pond 3P: Raingarden Peak Elev=66.65' Storage=781 cf Inflow=0.17 cfs 0.013 af
Discarded=0.01 cfs 0.010 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.010 af

Total Runoff Area = 2.283 ac Runoff Volume = 0.017 af Average Runoff Depth = 0.09"
70.54% Pervious = 1.610 ac 29.46% Impervious = 0.673 ac



POST-DEVELOPMENT

Subcat Reach Pond Link

Routing Diagram for 5183-Post-040721
Prepared by Altus Engineering, Inc., Printed 3/29/2021

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Woods to West Wetland Runoff Area=10,611 sf 1.04% Impervious Runoff Depth>0.84"
Flow Length=177' Tc=12.5 min CN=71 Runoff=0.17 cfs 0.017 af

Subcatchment 2S: Site to East Wetland Runoff Area=64,103 sf 20.43% Impervious Runoff Depth>1.05"
Flow Length=370' Tc=6.0 min CN=75 Runoff=1.73 cfs 0.129 af

Subcatchment 3S: To Raingarden Runoff Area=24,727 sf 65.07% Impervious Runoff Depth>2.02"
Flow Length=305' Tc=6.0 min CN=89 Runoff=1.34 cfs 0.096 af

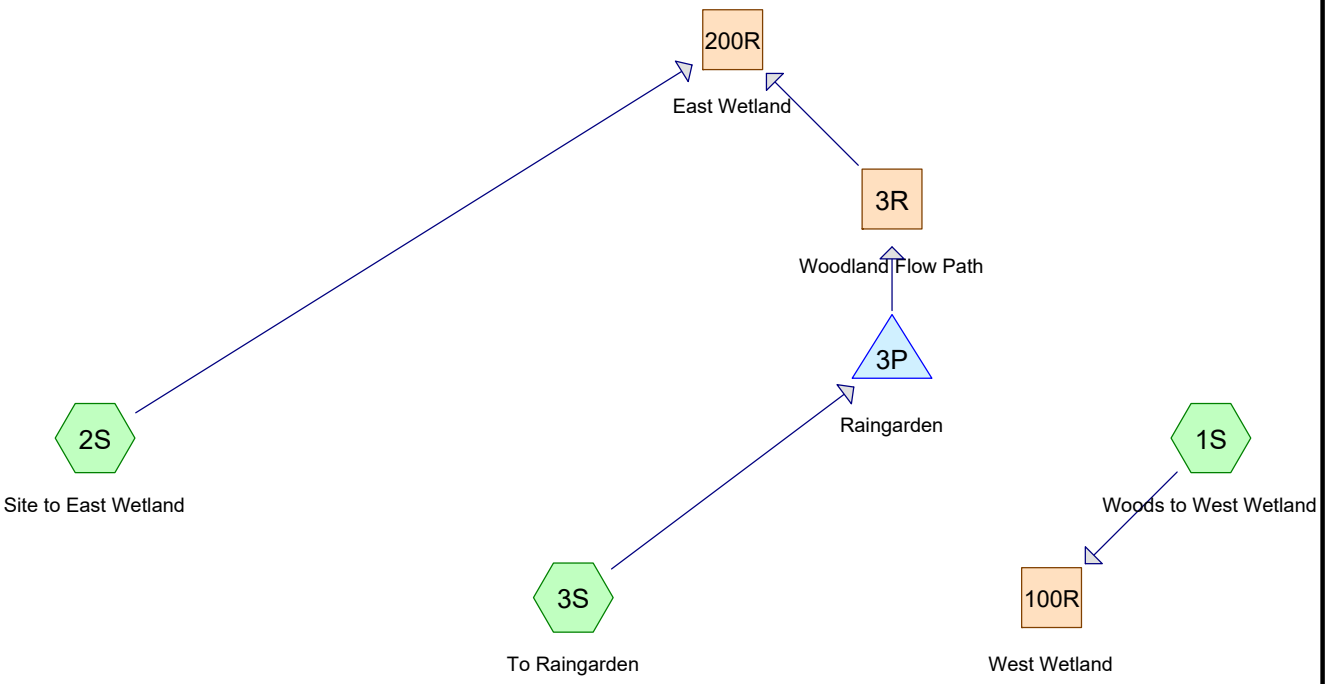
Reach 3R: Woodland Flow Path Avg. Flow Depth=0.07' Max Vel=0.66 fps Inflow=0.50 cfs 0.049 af
n=0.070 L=99.0' S=0.0364 '/' Capacity=15.76 cfs Outflow=0.49 cfs 0.049 af

Reach 100R: West Wetland Inflow=0.17 cfs 0.017 af
Outflow=0.17 cfs 0.017 af

Reach 200R: East Wetland Inflow=1.73 cfs 0.178 af
Outflow=1.73 cfs 0.178 af

Pond 3P: Raingarden Peak Elev=67.62' Storage=2,279 cf Inflow=1.34 cfs 0.096 af
Discarded=0.01 cfs 0.014 af Primary=0.50 cfs 0.049 af Outflow=0.51 cfs 0.063 af

Total Runoff Area = 2.283 ac Runoff Volume = 0.242 af Average Runoff Depth = 1.27"
70.54% Pervious = 1.610 ac 29.46% Impervious = 0.673 ac



POST-DEVELOPMENT

Subcat Reach Pond Link

Routing Diagram for 5183-Post-040721
Prepared by Altus Engineering, Inc., Printed 3/29/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.161	61	>75% Grass cover, Good, HSG B (2S)
0.336	74	>75% Grass cover, Good, HSG C (1S, 2S, 3S)
0.025	98	Gravel, HSG C (1S, 3S)
0.129	98	Paved parking, HSG B (2S)
0.362	98	Paved parking, HSG C (2S, 3S)
0.040	98	Roofs, HSG B (2S)
0.116	98	Roofs, HSG C (2S, 3S)
0.034	55	Woods, Good, HSG B (2S, 3S)
1.079	70	Woods, Good, HSG C (1S, 2S, 3S)
2.283	**78**	**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Woods to West Wetland Runoff Area=10,611 sf 1.04% Impervious Runoff Depth>1.92"
Flow Length=177' Tc=12.5 min CN=71 Runoff=0.44 cfs 0.039 af

Subcatchment 2S: Site to East Wetland Runoff Area=64,103 sf 20.43% Impervious Runoff Depth>2.25"
Flow Length=370' Tc=6.0 min CN=75 Runoff=3.86 cfs 0.275 af

Subcatchment 3S: To Raingarden Runoff Area=24,727 sf 65.07% Impervious Runoff Depth>3.53"
Flow Length=305' Tc=6.0 min CN=89 Runoff=2.29 cfs 0.167 af

Reach 3R: Woodland Flow Path Avg. Flow Depth=0.15' Max Vel=1.06 fps Inflow=1.89 cfs 0.120 af
n=0.070 L=99.0' S=0.0364 '/' Capacity=15.76 cfs Outflow=1.86 cfs 0.119 af

Reach 100R: West Wetland Inflow=0.44 cfs 0.039 af
Outflow=0.44 cfs 0.039 af

Reach 200R: East Wetland Inflow=5.44 cfs 0.395 af
Outflow=5.44 cfs 0.395 af

Pond 3P: Raingarden Peak Elev=67.79' Storage=2,637 cf Inflow=2.29 cfs 0.167 af
Discarded=0.01 cfs 0.014 af Primary=1.89 cfs 0.120 af Outflow=1.90 cfs 0.134 af

Total Runoff Area = 2.283 ac Runoff Volume = 0.481 af Average Runoff Depth = 2.53"
70.54% Pervious = 1.610 ac 29.46% Impervious = 0.673 ac

Summary for Subcatchment 1S: Woods to West Wetland

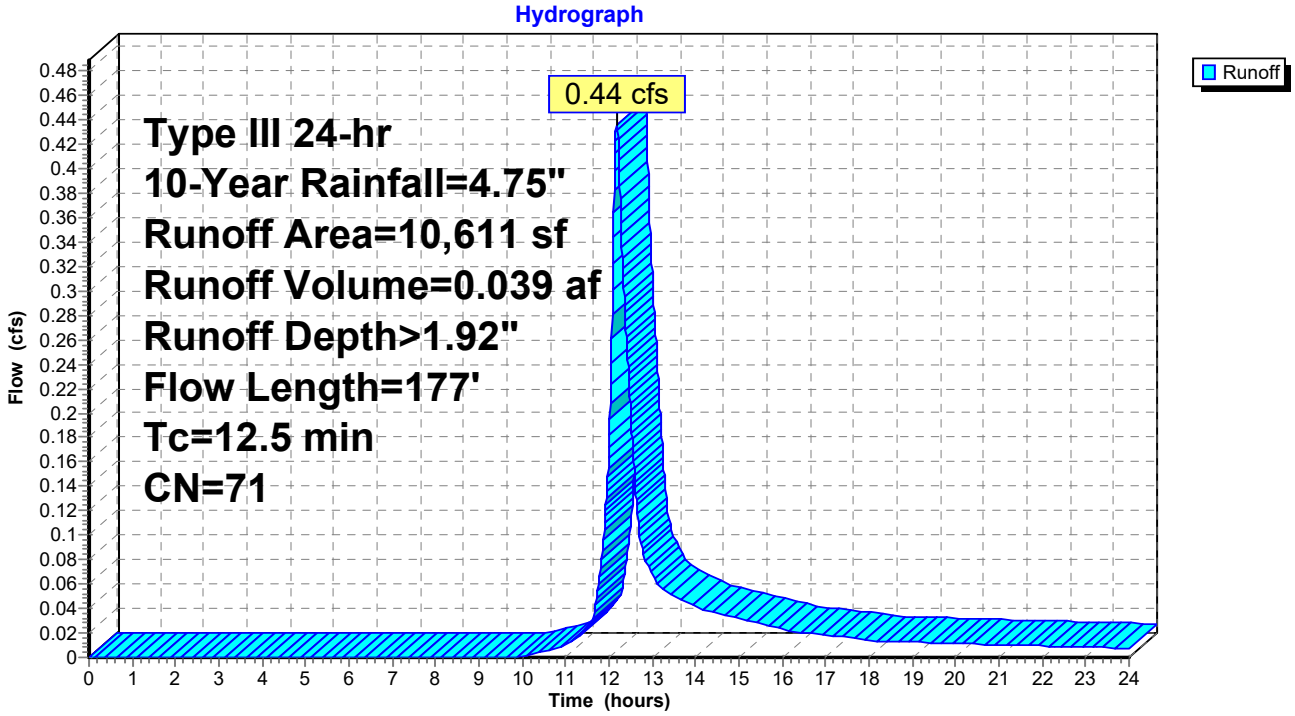
Runoff = 0.44 cfs @ 12.18 hrs, Volume= 0.039 af, Depth> 1.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.75"

	Area (sf)	CN	Description
*	110	98	Gravel, HSG C
	1,007	74	>75% Grass cover, Good, HSG C
	9,494	70	Woods, Good, HSG C
	10,611	71	Weighted Average
	10,501		98.96% Pervious Area
	110		1.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.25"
2.1	127	0.0404	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.5	177	Total			

Subcatchment 1S: Woods to West Wetland



Summary for Subcatchment 2S: Site to East Wetland

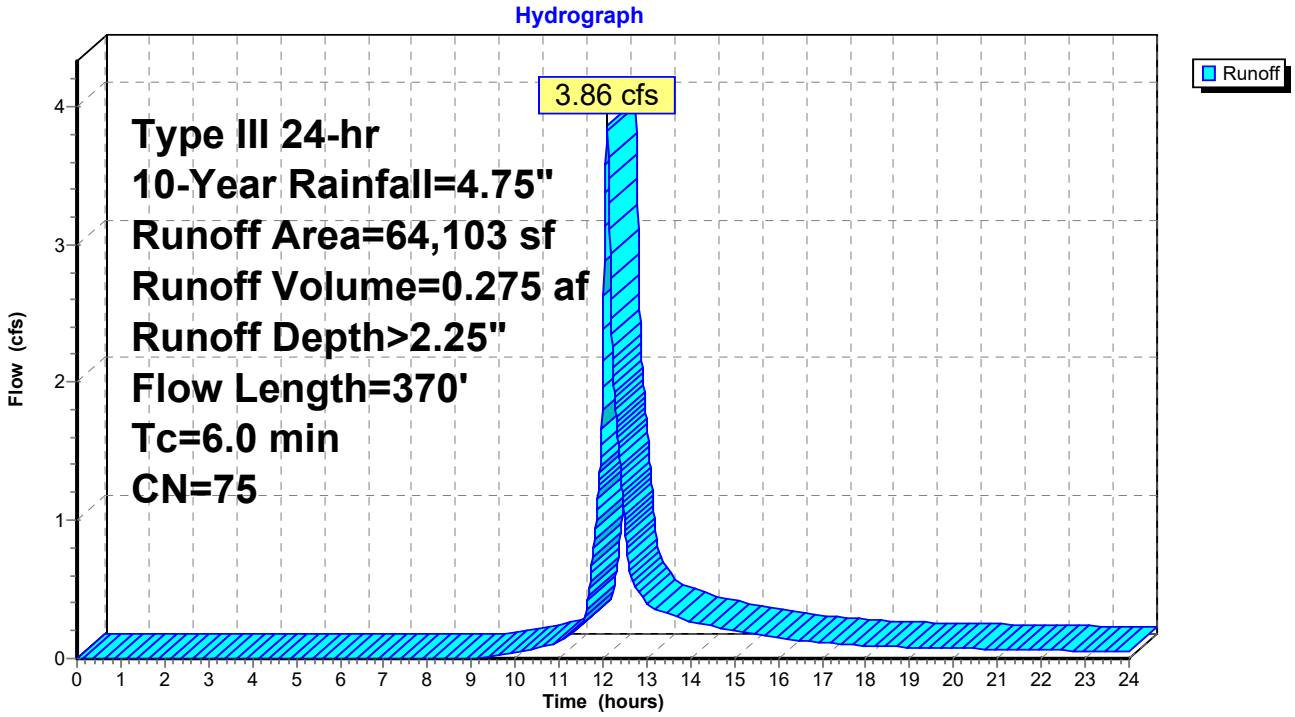
Runoff = 3.86 cfs @ 12.09 hrs, Volume= 0.275 af, Depth> 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.75"

Area (sf)	CN	Description
4,238	98	Paved parking, HSG C
5,637	98	Paved parking, HSG B
1,479	98	Roofs, HSG C
1,741	98	Roofs, HSG B
11,238	74	>75% Grass cover, Good, HSG C
31,377	70	Woods, Good, HSG C
7,017	61	>75% Grass cover, Good, HSG B
1,376	55	Woods, Good, HSG B
64,103	75	Weighted Average
51,008		79.57% Pervious Area
13,095		20.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.21		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.25"
0.3	97	0.0571	4.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	156	0.0522	3.43		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.6	67	0.0188	0.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.4	370	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Site to East Wetland



Summary for Subcatchment 3S: To Raingarden

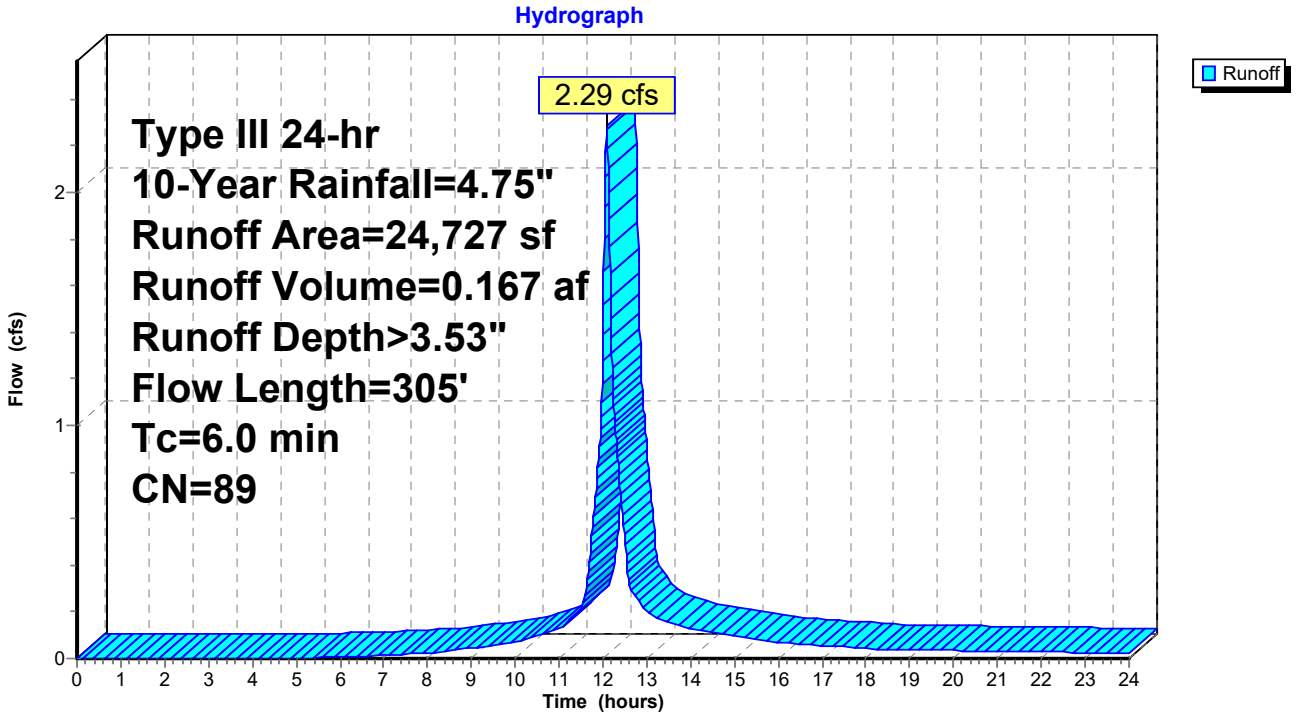
Runoff = 2.29 cfs @ 12.09 hrs, Volume= 0.167 af, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.75"

	Area (sf)	CN	Description
	11,550	98	Paved parking, HSG C
	3,554	98	Roofs, HSG C
*	987	98	Gravel, HSG C
	6,133	70	Woods, Good, HSG C
	2,411	74	>75% Grass cover, Good, HSG C
	92	55	Woods, Good, HSG B
	24,727	89	Weighted Average
	8,636		34.93% Pervious Area
	16,091		65.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	49	0.0555	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.25"
1.4	199	0.0134	2.35		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	57	0.0050	1.06		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
6.0	305	Total			

Subcatchment 3S: To Raingarden



Summary for Reach 3R: Woodland Flow Path

Inflow Area = 0.568 ac, 65.07% Impervious, Inflow Depth > 2.53" for 10-Year event
Inflow = 1.89 cfs @ 12.13 hrs, Volume= 0.120 af
Outflow = 1.86 cfs @ 12.15 hrs, Volume= 0.119 af, Atten= 1%, Lag= 1.1 min

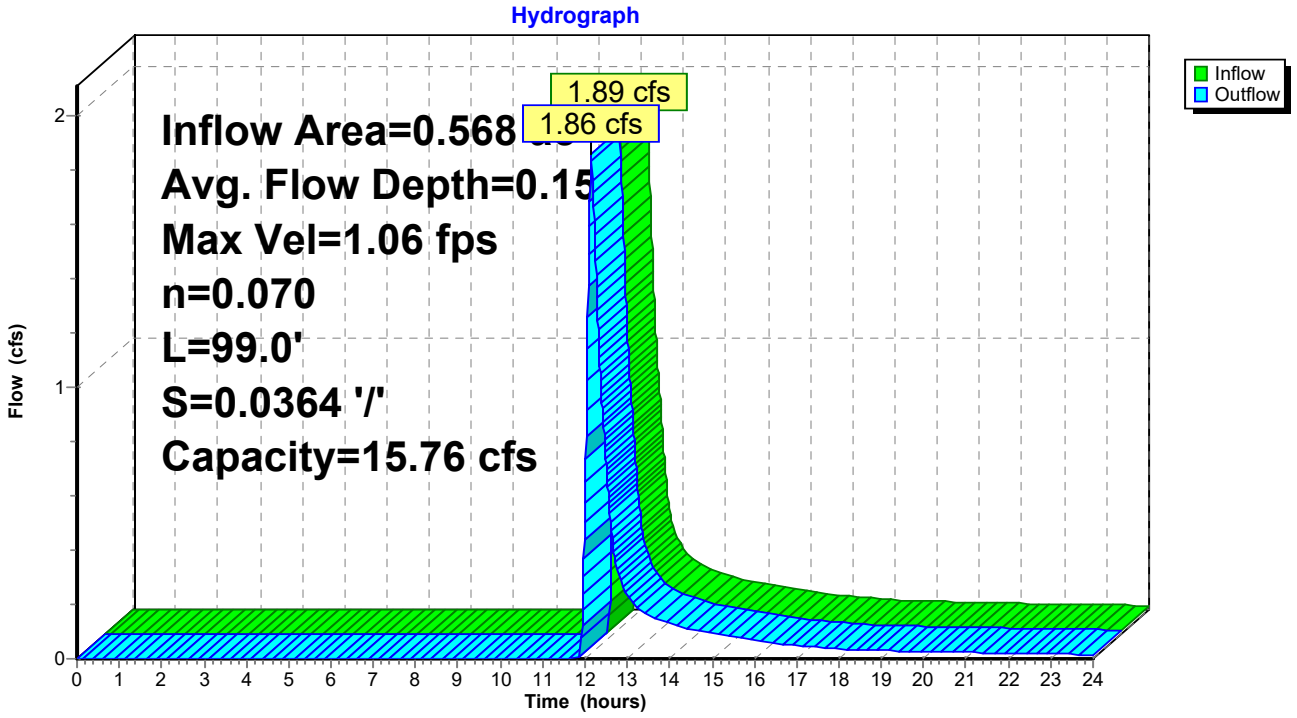
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.06 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.31 fps, Avg. Travel Time= 5.4 min

Peak Storage= 173 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 0.50' Flow Area= 7.5 sf, Capacity= 15.76 cfs

10.00' x 0.50' deep channel, n= 0.070 Medium-dense brush, winter
Side Slope Z-value= 10.0 '/' Top Width= 20.00'
Length= 99.0' Slope= 0.0364 '/'
Inlet Invert= 67.50', Outlet Invert= 63.90'

‡

Reach 3R: Woodland Flow Path

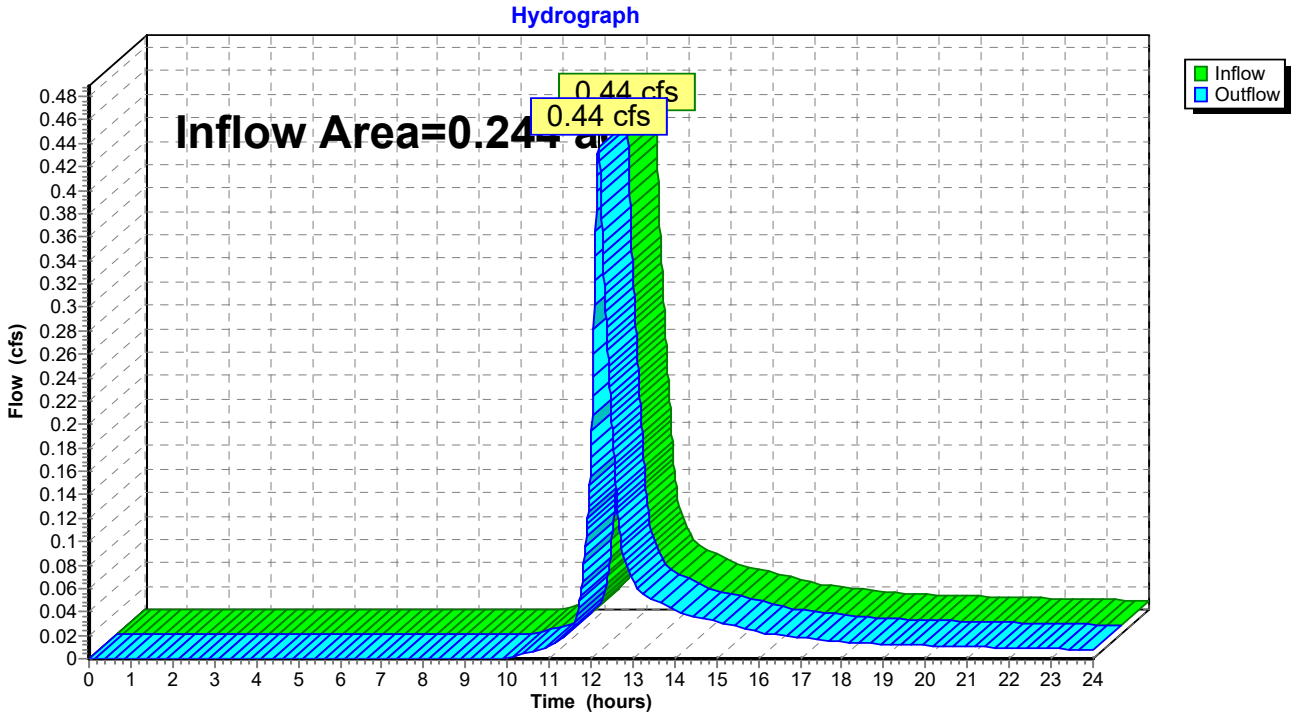


Summary for Reach 100R: West Wetland

Inflow Area = 0.244 ac, 1.04% Impervious, Inflow Depth > 1.92" for 10-Year event
Inflow = 0.44 cfs @ 12.18 hrs, Volume= 0.039 af
Outflow = 0.44 cfs @ 12.18 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach 100R: West Wetland

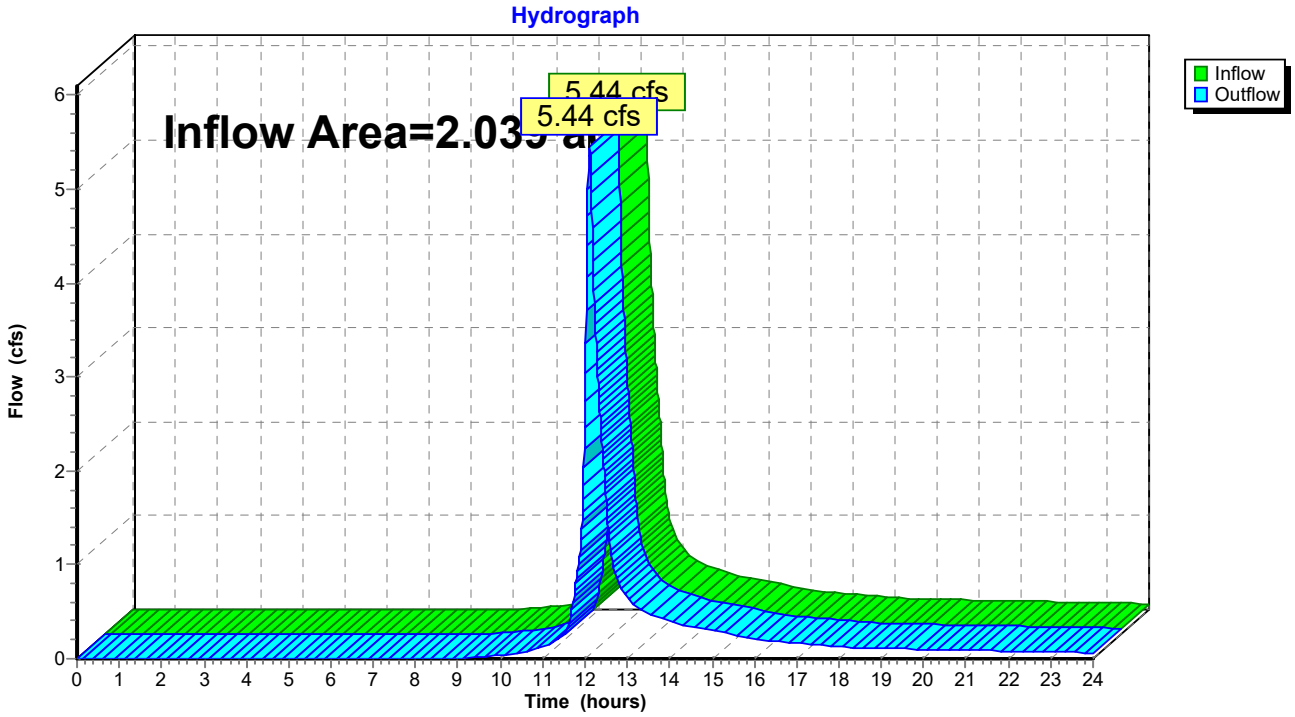


Summary for Reach 200R: East Wetland

Inflow Area = 2.039 ac, 32.86% Impervious, Inflow Depth > 2.32" for 10-Year event
Inflow = 5.44 cfs @ 12.11 hrs, Volume= 0.395 af
Outflow = 5.44 cfs @ 12.11 hrs, Volume= 0.395 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach 200R: East Wetland



Summary for Pond 3P: Raingarden

Inflow Area = 0.568 ac, 65.07% Impervious, Inflow Depth > 3.53" for 10-Year event
Inflow = 2.29 cfs @ 12.09 hrs, Volume= 0.167 af
Outflow = 1.90 cfs @ 12.13 hrs, Volume= 0.134 af, Atten= 17%, Lag= 2.9 min
Discarded = 0.01 cfs @ 12.14 hrs, Volume= 0.014 af
Primary = 1.89 cfs @ 12.13 hrs, Volume= 0.120 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 66.50' Surf.Area= 1,061 sf Storage= 610 cf
Peak Elev= 67.79' @ 12.14 hrs Surf.Area= 2,310 sf Storage= 2,637 cf (2,027 cf above start)
Flood Elev= 68.00' Surf.Area= 2,664 sf Storage= 3,167 cf (2,557 cf above start)

Plug-Flow detention time= 153.9 min calculated for 0.120 af (72% of inflow)
Center-of-Mass det. time= 36.4 min (832.0 - 795.6)

Volume	Invert	Avail.Storage	Storage Description
#1	63.75'	3,167 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

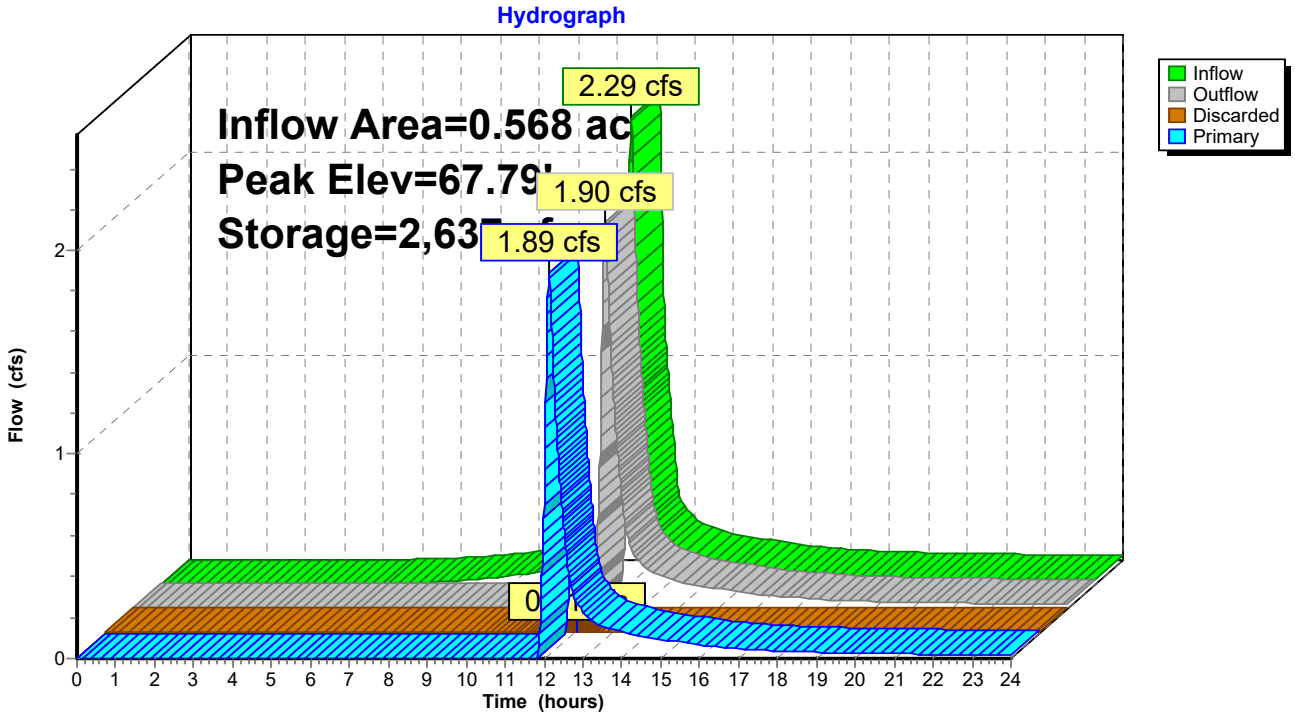
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
63.75	1,061	0.0	0	0
64.75	1,061	40.0	424	424
65.00	1,061	40.0	106	531
66.50	1,061	5.0	80	610
67.00	1,417	100.0	620	1,230
67.50	1,834	100.0	813	2,042
68.00	2,664	100.0	1,125	3,167

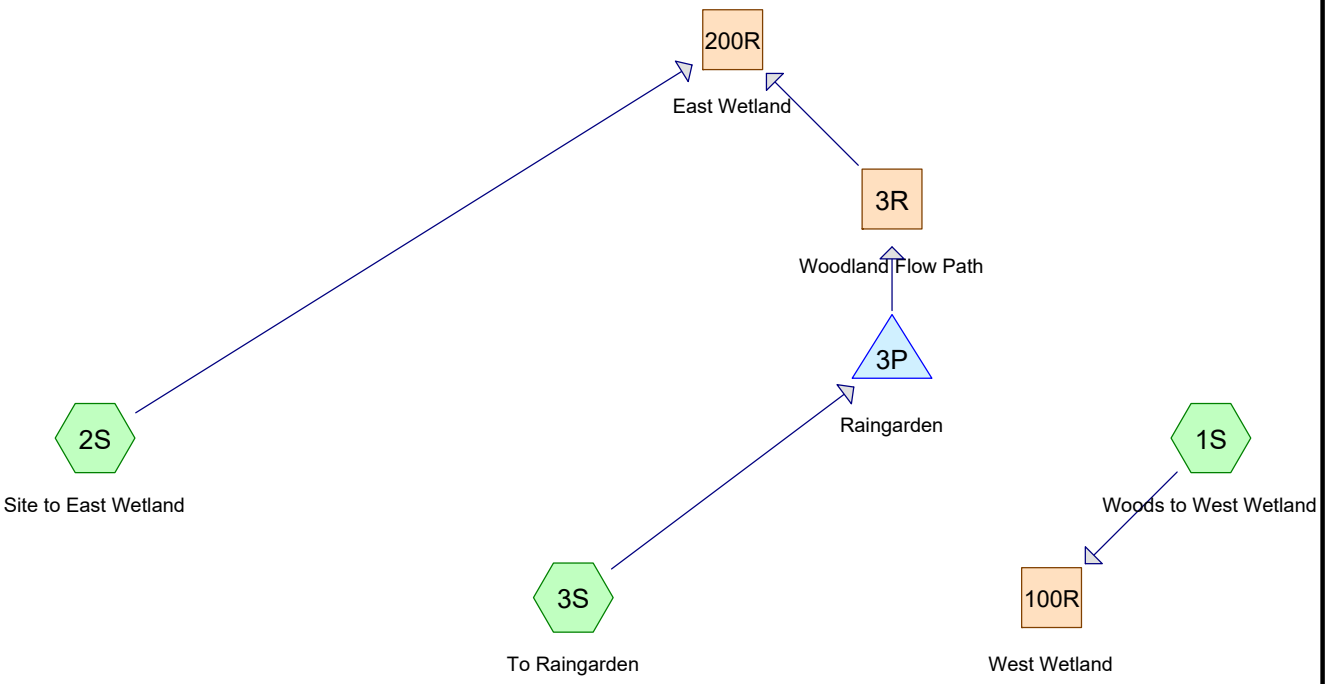
Device	Routing	Invert	Outlet Devices
#1	Primary	67.50'	**6.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	63.75'	**0.200 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.14 hrs HW=67.79' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.87 cfs @ 12.13 hrs HW=67.79' TW=67.65' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.87 cfs @ 1.09 fps)

Pond 3P: Raingarden





POST-DEVELOPMENT

Subcat Reach Pond Link

Routing Diagram for 5183-Post-040721
Prepared by Altus Engineering, Inc., Printed 3/29/2021

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Woods to West Wetland Runoff Area=10,611 sf 1.04% Impervious Runoff Depth>2.91"
Flow Length=177' Tc=12.5 min CN=71 Runoff=0.67 cfs 0.059 af

Subcatchment 2S: Site to East Wetland Runoff Area=64,103 sf 20.43% Impervious Runoff Depth>3.30"
Flow Length=370' Tc=6.0 min CN=75 Runoff=5.70 cfs 0.404 af

Subcatchment 3S: To Raingarden Runoff Area=24,727 sf 65.07% Impervious Runoff Depth>4.75"
Flow Length=305' Tc=6.0 min CN=89 Runoff=3.04 cfs 0.225 af

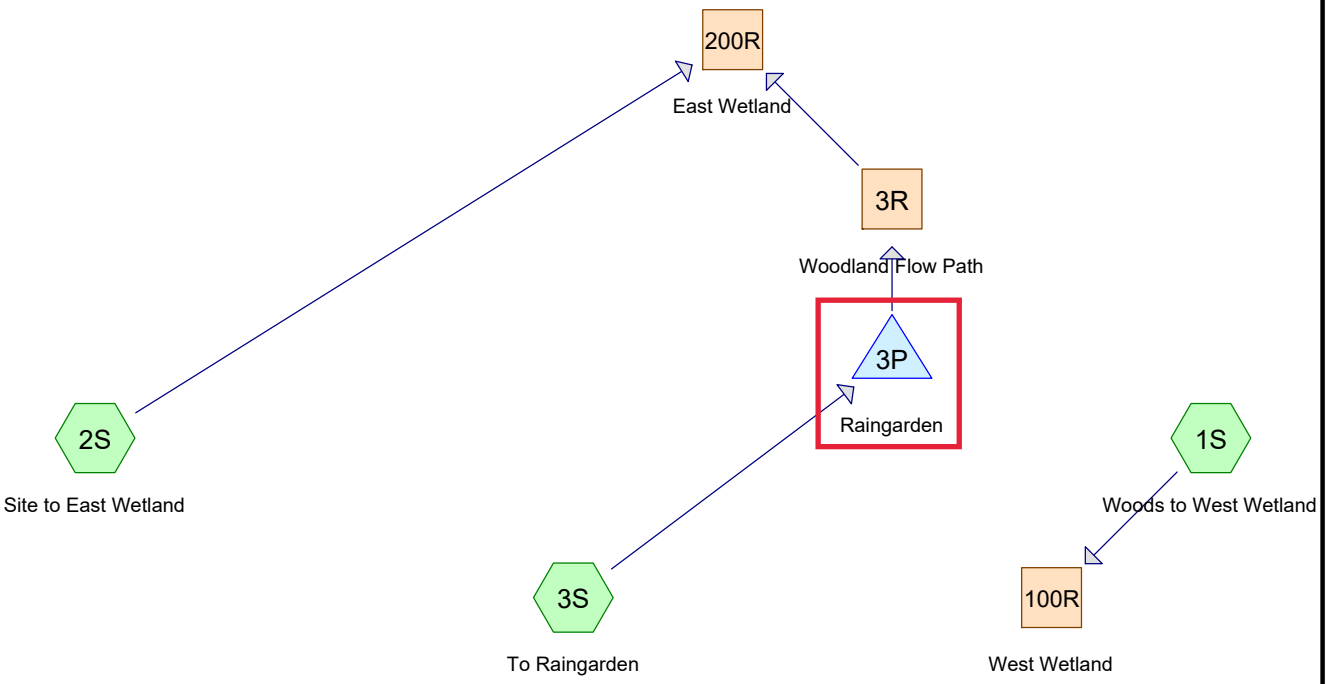
Reach 3R: Woodland Flow Path Avg. Flow Depth=0.18' Max Vel=1.19 fps Inflow=2.61 cfs 0.177 af
n=0.070 L=99.0' S=0.0364 '/' Capacity=15.76 cfs Outflow=2.58 cfs 0.177 af

Reach 100R: West Wetland Inflow=0.67 cfs 0.059 af
Outflow=0.67 cfs 0.059 af

Reach 200R: East Wetland Inflow=7.98 cfs 0.581 af
Outflow=7.98 cfs 0.581 af

Pond 3P: Raingarden Peak Elev=67.85' Storage=2,788 cf Inflow=3.04 cfs 0.225 af
Discarded=0.01 cfs 0.014 af Primary=2.61 cfs 0.177 af Outflow=2.62 cfs 0.191 af

Total Runoff Area = 2.283 ac Runoff Volume = 0.688 af Average Runoff Depth = 3.62"
70.54% Pervious = 1.610 ac 29.46% Impervious = 0.673 ac



POST-DEVELOPMENT

Subcat Reach Pond Link

Routing Diagram for 5183-Post-040721
Prepared by Altus Engineering, Inc., Printed 3/29/2021

Summary for Pond 3P: Raingarden

Inflow Area = 0.568 ac, 65.07% Impervious, Inflow Depth > 7.30" for 100-Year event
Inflow = 4.55 cfs @ 12.08 hrs, Volume= 0.345 af
Outflow = 4.02 cfs @ 12.12 hrs, Volume= 0.311 af, Atten= 12%, Lag= 2.3 min
Discarded = 0.01 cfs @ 12.13 hrs, Volume= 0.015 af
Primary = 4.00 cfs @ 12.12 hrs, Volume= 0.297 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 66.50' Surf.Area= 1,061 sf Storage= 610 cf
Peak Elev= 67.96' @ 12.13 hrs Surf.Area= 2,590 sf Storage= 3,050 cf (2,439 cf above start)
Flood Elev= 68.00' Surf.Area= 2,664 sf Storage= 3,167 cf (2,557 cf above start)

Plug-Flow detention time= 105.3 min calculated for 0.297 af (86% of inflow)
Center-of-Mass det. time= 32.1 min (808.4 - 776.2)

Volume	Invert	Avail.Storage	Storage Description
#1	63.75'	3,167 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

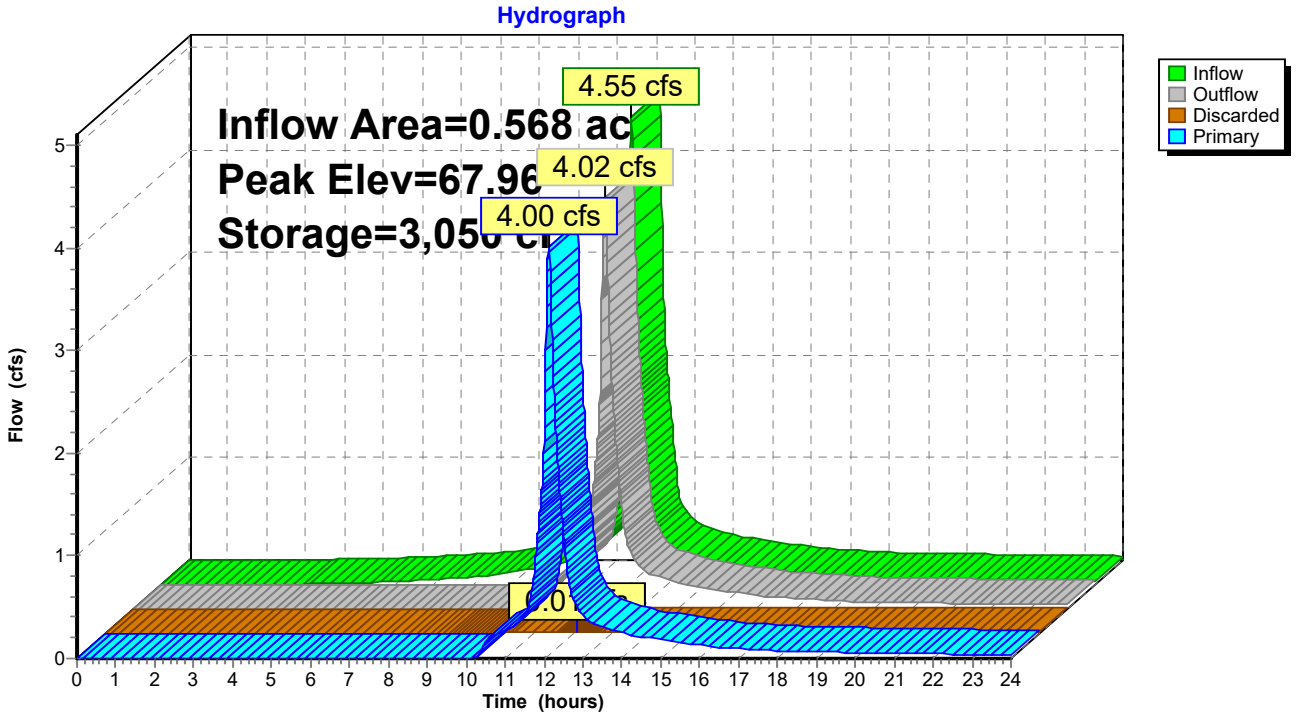
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
63.75	1,061	0.0	0	0
64.75	1,061	40.0	424	424
65.00	1,061	40.0	106	531
66.50	1,061	5.0	80	610
67.00	1,417	100.0	620	1,230
67.50	1,834	100.0	813	2,042
68.00	2,664	100.0	1,125	3,167

Device	Routing	Invert	Outlet Devices
#1	Primary	67.50'	**6.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	63.75'	**0.200 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.13 hrs HW=67.96' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=3.98 cfs @ 12.12 hrs HW=67.95' TW=67.73' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 3.98 cfs @ 1.46 fps)

Pond 3P: Raingarden



Section 5

Water Quality Volume and Groundwater Recharge Volume Calculations

ALTUS
ENGINEERING, INC.

Water Quality Volume for Groundwater Recharge Calculations (Durham, NH)

Yates Electric
88A Dover Road
Durham, NH
Altus Project 5183

To Raingarden (HydroCAD Pond 3P)

HSG	Area (ac)	Ratio (Rd)	GRV		
A	0	1	0.000	in	Area*Ratio
B	0	0.75	0.000	in	Area*Ratio
C	0.369	0.4	0.148	in	Area*Ratio
D	0	0.16	0.000	in	Area*Ratio
Area (Al):	0.369		0.148	in	Weighted Rd = Sum of GRV's
			0.054	ac-in	GRV = Al*Rd
			197.70	cf	GRV Conversion (ac-in x 43560sf/ac x 1'/12")

ALTUS ENGINEERING, INC.

Summary for Pond 3P: Raingarden

Inflow Area = 0.568 ac, 65.07% Impervious, Inflow Depth > 3.53" for 10-Year event
Inflow = 2.29 cfs @ 12.09 hrs, Volume= 0.167 af
Outflow = 1.90 cfs @ 12.13 hrs, Volume= 0.134 af, Atten= 17%, Lag= 2.9 min
Discarded = 0.01 cfs @ 12.14 hrs, Volume= 0.014 af
Primary = 1.89 cfs @ 12.13 hrs, Volume= 0.120 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Starting Elev= 66.50' Surf.Area= 1,061 sf Storage= 610 cf
Peak Elev= 67.79' @ 12.14 hrs Surf.Area= 2,310 sf Storage= 2,637 cf (2,027 cf above start)
Flood Elev= 68.00' Surf.Area= 2,664 sf Storage= 3,167 cf (2,557 cf above start)

Plug-Flow detention time= 153.9 min calculated for 0.120 af (72% of inflow)
Center-of-Mass det. time= 36.4 min (832.0 - 795.6)

Volume	Invert	Avail.Storage	Storage Description
#1	63.75'	3,167 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
63.75	1,061	0.0	0	0
64.75	1,061	40.0	424	424
65.00	1,061	40.0	106	531
66.50	1,061	5.0	80	610
67.00	1,417	100.0	620	1,230
67.50	1,834	100.0	813	2,042
68.00	2,664	100.0	1,125	3,167

66.50 = Surface Elev.
67.50 = Lowest Outlet
2,042 cf - 610 cf
= 1,432 cf for WQV

Device	Routing	Invert	Outlet Devices
#1	Primary	67.50'	**6.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	63.75'	**0.200 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.14 hrs HW=67.79' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.87 cfs @ 12.13 hrs HW=67.79' TW=67.65' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.87 cfs @ 1.09 fps)

Section 6

Precipitation Table

ALTUS
ENGINEERING, INC.

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	70.906 degrees West
Latitude	43.143 degrees North
Elevation	0 feet
Date/Time	Fri, 26 Mar 2021 12:40:01 -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	0.50	0.65	0.81	1.03	**1yr**	0.70	0.98	1.20	1.55	2.09	2.61	3.15	**1yr**	2.31	2.74	3.14	3.86	4.44	**1yr**
2yr	0.32	0.49	0.61	0.81	1.01	1.29	**2yr**	0.88	1.17	1.50	1.91	2.45	3.14	3.78	**2yr**	2.78	3.35	3.85	4.58	5.21	**2yr**
5yr	0.37	0.57	0.72	0.96	1.23	1.58	**5yr**	1.06	1.44	1.85	2.38	3.07	3.98	4.77	**5yr**	3.52	4.29	4.91	5.79	6.55	**5yr**
10yr	0.40	0.63	0.80	1.09	1.42	1.84	**10yr**	1.22	1.69	2.18	2.82	3.65	4.75	5.69	**10yr**	4.21	5.18	5.91	6.92	7.80	**10yr**
25yr	0.46	0.74	0.94	1.29	1.72	2.27	**25yr**	1.48	2.09	2.69	3.53	4.61	6.02	7.22	**25yr**	5.33	6.65	7.55	8.77	9.82	**25yr**
50yr	0.51	0.83	1.06	1.48	1.99	2.66	**50yr**	1.72	2.46	3.17	4.18	5.50	7.21	8.66	**50yr**	6.38	8.04	9.08	10.49	11.69	**50yr**
100yr	0.58	0.93	1.20	1.70	2.31	3.11	**100yr**	2.00	2.89	3.74	4.96	6.55	8.63	10.41	**100yr**	7.64	9.72	10.94	12.56	13.93	**100yr**
200yr	0.64	1.04	1.35	1.94	2.69	3.66	**200yr**	2.32	3.40	4.42	5.90	7.82	10.33	12.53	**200yr**	9.14	11.76	13.18	15.03	16.61	**200yr**
500yr	0.75	1.24	1.61	2.34	3.28	4.52	**500yr**	2.83	4.21	5.48	7.38	9.85	13.12	15.72	**500yr**	11.61	15.12	16.87	19.09	20.96	**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	0.37	0.45	0.60	0.74	0.90	**1yr**	0.64	0.88	0.91	1.26	1.57	2.06	2.50	**1yr**	1.82	2.40	2.90	3.29	4.01	**1yr**
2yr	0.31	0.49	0.60	0.81	1.00	1.18	**2yr**	0.86	1.16	1.36	1.83	2.36	3.04	3.39	**2yr**	2.69	3.26	3.74	4.46	5.05	**2yr**
5yr	0.35	0.54	0.67	0.91	1.16	1.40	**5yr**	1.00	1.37	1.62	2.15	2.78	3.72	4.13	**5yr**	3.29	3.97	4.59	5.42	6.13	**5yr**
10yr	0.38	0.59	0.73	1.02	1.32	1.60	**10yr**	1.14	1.56	1.82	2.45	3.13	4.29	4.80	**10yr**	3.80	4.62	5.33	6.28	7.06	**10yr**
25yr	0.44	0.66	0.83	1.18	1.55	1.91	**25yr**	1.34	1.87	2.11	2.85	3.66	4.99	5.84	**25yr**	4.41	5.61	6.51	7.63	8.51	**25yr**
50yr	0.48	0.73	0.91	1.31	1.76	2.18	**50yr**	1.52	2.13	2.36	3.20	4.11	5.71	6.75	**50yr**	5.05	6.49	7.58	8.84	9.80	**50yr**
100yr	0.54	0.81	1.02	1.47	2.01	2.50	**100yr**	1.74	2.45	2.64	3.59	4.59	6.52	7.81	**100yr**	5.77	7.51	8.83	10.24	11.26	**100yr**
200yr	0.60	0.90	1.14	1.65	2.29	2.86	**200yr**	1.98	2.80	2.94	4.01	5.13	7.44	9.04	**200yr**	6.59	8.69	10.29	11.87	12.96	**200yr**
500yr	0.70	1.03	1.33	1.93	2.75	3.44	**500yr**	2.37	3.36	3.41	4.65	5.96	8.83	10.96	**500yr**	7.82	10.53	12.59	14.45	15.55	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.71	0.87	1.08	**1yr**	0.75	1.05	1.24	1.75	2.22	2.85	3.05	**1yr**	2.53	2.93	3.40	4.19	4.80	**1yr**
2yr	0.33	0.51	0.62	0.85	1.04	1.25	**2yr**	0.90	1.22	1.48	1.96	2.51	3.27	3.59	**2yr**	2.90	3.45	3.96	4.72	5.41	**2yr**
5yr	0.39	0.60	0.75	1.03	1.31	1.58	**5yr**	1.13	1.55	1.86	2.50	3.20	4.23	4.80	**5yr**	3.75	4.61	5.24	6.18	6.95	**5yr**
10yr	0.46	0.70	0.87	1.21	1.57	1.92	**10yr**	1.35	1.88	2.23	3.05	3.85	5.21	5.98	**10yr**	4.61	5.75	6.53	7.58	8.47	**10yr**
25yr	0.55	0.84	1.05	1.50	1.97	2.48	**25yr**	1.70	2.42	2.88	3.97	4.95	7.08	8.01	**25yr**	6.27	7.70	8.69	9.97	11.05	**25yr**
50yr	0.64	0.97	1.21	1.74	2.34	2.99	**50yr**	2.02	2.93	3.49	4.84	6.01	8.76	10.01	**50yr**	7.76	9.63	10.80	12.26	13.51	**50yr**
100yr	0.74	1.12	1.41	2.03	2.79	3.62	**100yr**	2.41	3.53	4.23	5.93	7.31	10.85	12.52	**100yr**	9.60	12.04	13.40	15.09	16.53	**100yr**
200yr	0.86	1.30	1.64	2.38	3.31	4.38	**200yr**	2.86	4.29	5.15	7.25	8.86	13.47	15.67	**200yr**	11.92	15.07	16.65	18.56	20.26	**200yr**
500yr	1.05	1.56	2.01	2.92	4.16	5.63	**500yr**	3.59	5.51	6.65	9.50	11.48	17.97	21.08	**500yr**	15.90	20.27	22.19	24.44	26.52	**500yr**

Powered by ACIS
Northeast Regional Climate Center

Section 7

NRCS Soils Report

ALTUS
ENGINEERING, INC.

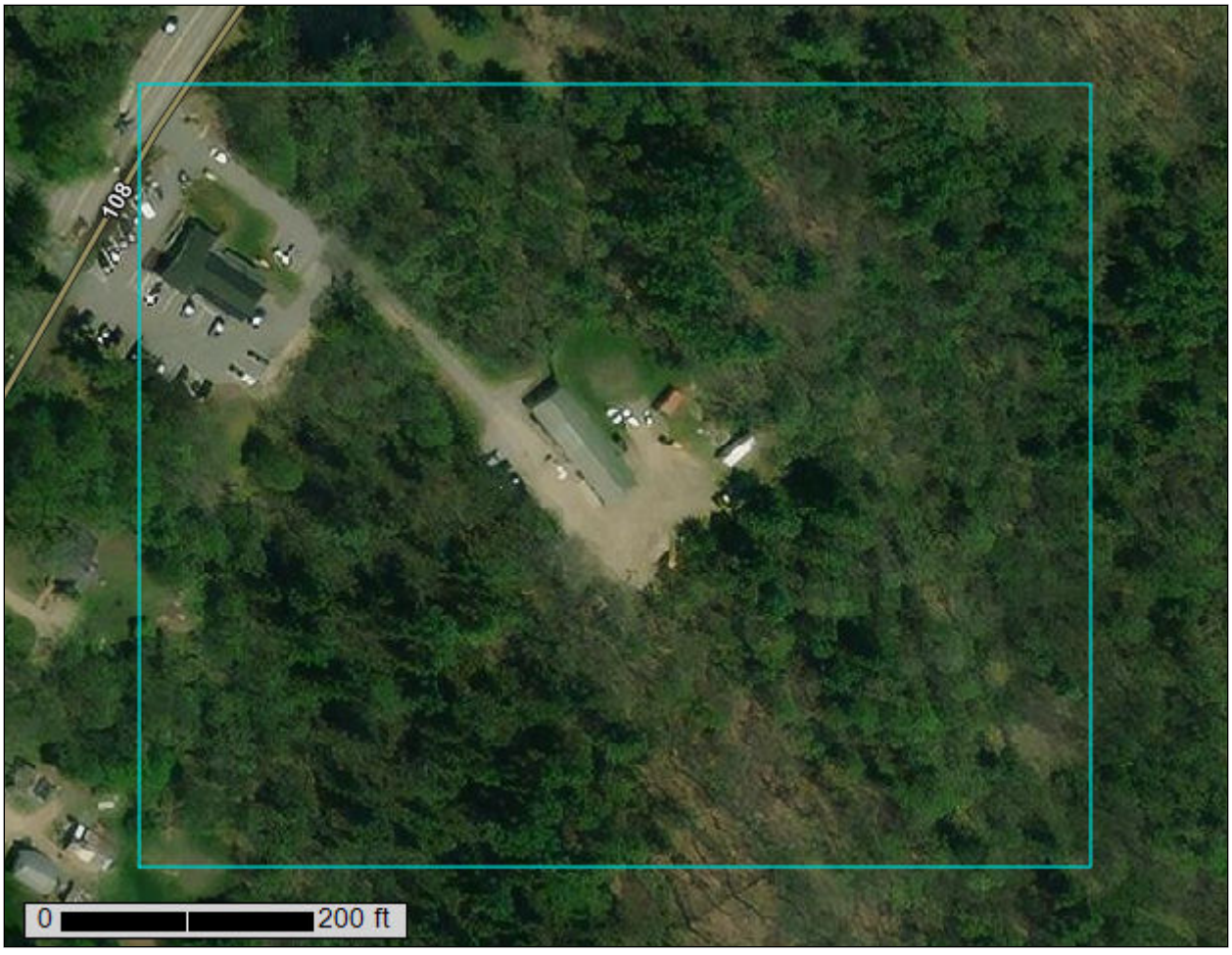
United States Department of Agriculture

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 Strafford County, New Hampshire



March 12, 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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

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: 1:1,600 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

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 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Strafford County, New Hampshire
Survey Area Data: Version 20, 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: Dec 31, 2009—Sep 9, 2017

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BzB	Buxton silt loam, 3 to 8 percent slopes	1.4	12.6%
HcB	Hollis-Charlton fine sandy loams, 3 to 8 percent slopes	3.0	28.1%
ScA	Scantic silt loam, 0 to 3 percent slopes	5.5	50.8%
ScB	Scantic silt loam, 3 to 8 percent slopes	0.5	5.0%
W	Water	0.4	3.6%
Totals for Area of Interest		**10.8**	**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.

Strafford County, New Hampshire

BzB—Buxton silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9d6p
Elevation: 0 to 260 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Buxton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Buxton

Setting

Parent material: Glaciomarine

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 28 inches: silty clay loam
H3 - 28 to 43 inches: silty clay

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Ecological site: F145XY006CT - Semi-Rich Moist Lake Plain
Hydric soil rating: No

Minor Components

Elmwood

Percent of map unit: 10 percent
Hydric soil rating: No

Not named

Percent of map unit: 5 percent
Hydric soil rating: No

HcB—Hollis-Charlton fine sandy loams, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9d7j
Elevation: 0 to 1,020 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 120 to 240 days
Farmland classification: Farmland of local importance

Map Unit Composition

Hollis and similar soils: 55 percent
Charlton and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis

Setting

Parent material: Till

Typical profile

H1 - 0 to 14 inches: fine sandy loam
H2 - 14 to 18 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Charlton

Setting

Parent material: Till

Typical profile

H1 - 0 to 13 inches: fine sandy loam

H2 - 13 to 36 inches: fine sandy loam
H3 - 36 to 40 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Not named

Percent of map unit: 5 percent
Hydric soil rating: No

Buxton

Percent of map unit: 5 percent
Hydric soil rating: No

ScA—Scantic silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9d8s
Elevation: 0 to 260 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of local importance

Map Unit Composition

Scantic and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scantic

Setting

Landform: Marine terraces

Typical profile

H1 - 0 to 13 inches: silt loam
H2 - 13 to 23 inches: silty clay loam
H3 - 23 to 40 inches: silty clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Not named wet

Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

Biddeford

Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

Swanton

Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

ScB—Scantic silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9d8t
Elevation: 0 to 260 feet
Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of local importance

Map Unit Composition

Scantic and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scantic

Setting

Landform: Marine terraces

Typical profile

H1 - 0 to 13 inches: silt loam
H2 - 13 to 23 inches: silty clay loam
H3 - 23 to 40 inches: silty clay

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Swanton

Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

Not named wet

Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

Buxton

Percent of map unit: 5 percent
Hydric soil rating: No

W—Water

Map Unit Composition

Water (less than 40 acres): 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Section 8

Stormwater Operations & Maintenance Plan

ALTUS
ENGINEERING, INC.

STORMWATER INSPECTION AND MAINTENANCE MANUAL

Yates Electric
88A Dover Road
Durham, NH
Assessor's Map 4, Lot 2

OWNER AT TIME OF APPROVAL:
Coyote Court, LLC
82 Chestnut Hill Road
Farmington, NH 03855

Proper inspection, maintenance, and repair are key elements in maintaining a successful stormwater management program on a developed property. Routine inspections ensure permit compliance and reduce the potential for deterioration of infrastructure or reduced water quality. The following responsible parties shall be in charge of managing the stormwater facilities:

RESPONSIBLE PARTIES:

Owner:	*Coyote Court, LLC / Yates Electric*		*(603) 868-8295*
	Name	*Company*	*Phone*
Inspection:	*Coyote Court, LLC / Yates Electric*		*(603) 868-8295*
	Name	*Company*	*Phone*
Maintenance:	*Coyote Court, LLC / Yates Electric*		*(603) 868-8295*
	Name	*Company*	*Phone*

NOTES:

Inspection and maintenance responsibilities shall transfer to any future property owner(s).

This manual shall be updated as needed to reflect any changes related to any transfer of ownership and/or any delegation of inspection and maintenance responsibilities to any entity other than those listed above.

ALTUS ENGINEERING, INC.

RAINGARDENS

Function – Raingardens and infiltration ponds provide treatment to runoff prior to directing it to stormwater systems by filtering sediment and suspended solids, trapping them in the bottom of the garden and in the filter media itself. Additional treatment is provided by the native water-tolerant vegetation which removes nutrients and other pollutants through bio-uptake. Stormwater detention and infiltration can also be provided as the filtering process slows runoff, decreases the peak rate of discharge and promotes groundwater recharge.

Raingardens shall be managed to: prevent and control the spread of invasive plant, insect, and fungal species; minimize the adverse environmental and economic effects invasive species cause to agriculture, forests, wetlands, wildlife, and other natural resources of the state; and protect the public from potential health problems attributed to certain invasive species.

Maintenance

- Inspect annually and after significant rainfall events.
- If a raingarden does not completely drain within 72-hours following a rainfall event, then a qualified professional shall be retained to assess the condition of the facility to determine measures required to restore its filtration and/or infiltration function(s), including, but not limited to, removal of accumulated sediments and/or replacement or reconstruction of the filter media. Filter media shall be replaced with material matching the specification on the design drawings or the MDEP Stormwater Best Practices Manual.
- Replace any riprap dislodged from spillways, inlets and outlets.
- Remove any obstructions, litter and accumulated sediment or debris as warranted but no less than once a year.
- Mowing of any grassed area in or adjacent to a raingarden, including its berm, shall be performed at least twice per year (when areas are not inundated) to keep the vegetation in vigorous condition. The cut grass shall be removed to prevent the decaying organic litter from clogging the filter media or choking other vegetation.
- Select vegetation should be maintained in healthy condition. This may include pruning, removal and replacement of dead or diseased vegetation.
- Remove any invasive species.
- Remove any hard wood growth from raingardens.

CULVERTS AND DRAINAGE PIPES

Function – Culverts and drainage pipes convey stormwater away from buildings, walkways, and parking areas and to surface waters or closed drainage systems.

Maintenance

- Culverts and drainage pipes shall be inspected semi-annually, or more often as needed, for accumulation of debris and structural integrity. Leaves and other debris shall be removed from the inlet and outlet to insure the functionality of drainage structures. Debris shall be disposed of on site where it will not concentrate back at the drainage structures or at a solid waste disposal facility.
- Riprap Areas - Culvert outlets and inlets shall be inspected during annual maintenance and operations for erosion and scour. If scour or erosion is identified, the owner shall take appropriate means to prevent further erosion.

LEVEL SPREADERS AND RIP RAP OUTLETS

Function – Level spreaders and rip rap outlets covert concentrated stormwater flows into less-erosive sheet flow, minimizing erosion and maximizing the treatment capabilities of associated buffers. Vegetated buffers, either forested or meadow, slow runoff which promotes and reduces peak rates of runoff. The reduced velocities and the presence of vegetation encourage the filtration of sediment and the limited bio-uptake of nutrients.

Maintenance

- Inspect level spreaders and buffers at least annually for signs of erosion, sediment buildup, or vegetation loss.
- Inspect level for signs of condensed flows. Level spreader and rip rap shall be maintained to disperse flows evenly over level spreader.
- If a meadow buffer, provide periodic mowing as needed to maintain a healthy stand of herbaceous vegetation.
- If a forested buffer, then the buffer should be maintained in an undisturbed condition, unless erosion occurs.
- If erosion of the buffer (forested or meadow) occurs, eroded areas should be repaired and replanted with vegetation similar to the remaining buffer. Corrective action should include eliminating the source of the erosion problem and may require retrofit or reconstruction of the level spreader.
- Remove debris and accumulated sediment and dispose of properly.

LANDSCAPED AREAS - FERTILIZER MANAGEMENT

Function – Fertilizer management involves controlling the rate, timing and method of fertilizer application so that the nutrients are taken up by the plants thereby reducing the chance of polluting the surface and ground waters. Fertilizer management can be effective in reducing the amounts of phosphorus and nitrogen in runoff from landscaped areas, particularly lawns.

Maintenance

- Have the soil tested by your landscaper or local Soil Conservation Service for nutrient requirements and follow the recommendations.
- Do not apply fertilizer to frozen ground.
- Clean up any fertilizer spills.
- Do not allow fertilizer to be broadcast into water bodies.
- When fertilizing a lawn, water thoroughly, but do not create a situation where water runs off the surface of the lawn.

LANDSCAPED AREAS - LITTER CONTROL

Function – Landscaped areas tend to filter debris and contaminates that may block drainage systems and pollute the surface and ground waters.

Maintenance

- Litter Control and lawn maintenance involves removing litter such as trash, leaves, lawn clippings, pet wastes, oil and chemicals from streets, parking lots, and lawns before materials are transported into surface waters.
- Litter control shall be implemented as part of the grounds maintenance program.

VEGETATIVE SWALES

Function – Vegetative swales filter sediment from stormwater, promote infiltration, and the uptake of contaminates. They are designed to treat runoff and dispose of it safely into the natural drainage system.

Maintenance

- Timely maintenance is important to keep a swale in good working condition. Mowing of grassed swales shall be monthly to keep the vegetation in vigorous condition. The cut vegetation shall be removed to prevent the decaying organic litter from adding pollutants to the discharge from the swale.
- Fertilizing shall be bi-annual or as recommended from soil testing.
- Inspect swales following significant rainfall events.
- Woody vegetation shall not be allowed to become established in the swales or rock riprap outlet protection and if present shall be removed.
- Accumulated debris disrupts flow and leads to clogging and erosion. Remove debris and litter as necessary.
- Inspect for eroded areas. Determine cause of erosion and correct deficiency as required. Monitor repaired areas.

GENERAL CLEAN UP

- Upon completion of the project, the contractor shall remove all temporary stormwater structures (i.e., temporary stone check dams, silt fence, temporary diversion swales, catch basin inlet filter, etc.). Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required shall be dressed to conform to the existing grade, prepared, and seeded. Remove any sediment in catch basins and clean drain pipes that may have accumulated during construction.
- Once in operation, all paved areas of the site should be swept at least once annually at the end of winter/early spring prior to significant spring rains.

APPPENDIX

A. Stormwater System Operations and Maintenance Report
B. Site Grading and Drainage Plan

STORM WATER SYSTEM OPERATION AND MAINTENANCE REPORT

General Information			
Project Name			
Owner			
Inspector's Name(s)			
Inspector's Contact Information			
Date of Inspection		**Start Time:**	**End Time:**
Type of Inspection: ☐ Annual Report ☐ Post-storm event ☐ Due to a discharge of significant amounts of sediment			
Notes:			

General Site Questions and Discharges of Significant Amounts of Sediment			
Subject		**Status**	**Notes**
A discharge of significant amounts of sediment may be indicated by (but is not limited to) observations of the following. Note whether any are observed during this inspection:			*Notes/ Action taken:*
1	Do the current site conditions reflect the attached site plan?	❑Yes ❑No	
2	Is the site permanently stabilized, temporary erosion and sediment controls are removed, and stormwater discharges from construction activity are eliminated?	❑Yes ❑No	
3	Is there evidence of the discharge of significant amounts of sediment to surface waters, or conveyance systems leading to surface waters?	❑Yes ❑No	

Permit Coverage and Plans				
#	**BMP/Facility**	**Inspected**	**Corrective Action Needed and Notes**	**Date Corrected**
	Rain Gardens	❑Yes ❑No		
	Vegetated Swales	❑Yes ❑No		
	Drainage Pipes	❑Yes ❑No		
	Riprap Aprons	❑Yes ❑No		
		❑Yes ❑No		
		❑Yes ❑No		

GRADING AND DRAINAGE NOTES

1. DO NOT BEGIN CONSTRUCTION UNTIL ALL STATE AND LOCAL PERMITS HAVE BEEN APPLIED FOR AND RECEIVED.
2. CONTRACTOR SHALL OBTAIN A "DIGSAFE" NUMBER AT LEAST 72 HOURS PRIOR TO COMMENCING CONSTRUCTION.
3. ALL CONSTRUCTION SHALL MEET THE MINIMUM CONSTRUCTION STANDARDS OF THE CITY OF PORTSMOUTH AND NHDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION. THE MORE STRINGENT SPECIFICATION SHALL GOVERN.
4. ALL BENCHMARKS AND TOPOGRAPHY SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO INITIATING CONSTRUCTION.
5. UNLESS OTHERWISE AGREED IN WRITING, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING AND MAINTAINING TEMPORARY BENCHMARKS (TBM) AND PERFORMING ALL CONSTRUCTION SURVEY LAYOUT.
6. PROTECTION OF SUBGRADE: THE CONTRACTOR SHALL BE REQUIRED TO MAINTAIN STABLE, DEWATERED SUBGRADES FOR FOUNDATIONS, PAVEMENT AREAS, UTILITY TRENCHES, AND OTHER AREAS DURING CONSTRUCTION. SUBGRADE DISTURBANCE MAY BE INFLUENCED BY EXCAVATION METHODS, MOISTURE, PRECIPITATION, GROUNDWATER CONTROL, AND CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL TAKE PRECAUTIONS TO PREVENT SUBGRADE DISTURBANCE. SUCH PRECAUTIONS MAY INCLUDE DIVERTING STORMWATER RUNOFF AWAY FROM CONSTRUCTION AREAS, REDUCING TRAFFIC IN SENSITIVE AREAS, AND MAINTAINING AN EFFECTIVE DEWATERING PROGRAM. SOILS EXHIBITING HEAVING OR INSTABILITY SHALL BE OVER EXCAVATED TO MORE COMPETENT BEARING SOIL AND REPLACED WITH FREE DRAINING STRUCTURAL FILL. IF THE EARTHWORK IS PERFORMED DURING FREEZING WEATHER, EXPOSED SUBGRADES ARE SUSCEPTIBLE TO FROST. NO FILL OR UTILITIES SHALL BE PLACED ON FROZEN GROUND. THIS WILL LIKELY REQUIRE REMOVAL OF A FROZEN SOIL CRUST AT THE COMMENCEMENT OF EACH DAY'S OPERATIONS. THE FINAL SUBGRADE ELEVATION WOULD ALSO REQUIRE AN APPROPRIATE DEGREE OF INSULATION AGAINST FREEZING.
7. IF SUITABLE, EXCAVATED MATERIALS SHALL BE PLACED AS FILL WITHIN UPLAND AREAS ONLY AND SHALL NOT BE PLACED WITHIN WETLANDS. PLACEMENT OF BORROW MATERIALS SHALL BE PERFORMED IN A MANNER THAT PREVENTS LONG TERM DIFFERENTIAL SETTLEMENT. EXCESSIVELY WET MATERIALS SHALL BE STOCKPILED AND ALLOWED TO DRAIN BEFORE PLACEMENT. FROZEN MATERIAL SHALL NOT BE USED FOR CONSTRUCTION.
8. ALL SPOT GRADES ARE AT FINISH GRADE AND BOTTOM OF CURB WHERE APPLICABLE.
9. ALL ROOF DRAIN RISERS SHALL BE LOCATED IN COORDINATION WITH THE ARCHITECTURAL PLANS TO MATCH GUTTER DOWNSPOUTS. RISERS SHALL BE SET TO FINISH GRADE PLUS 1' (MIN.).
10. IN ORDER TO PROVIDE VISUAL CLARITY ON THE PLANS, DRAINAGE AND OTHER UTILITY STRUCTURES MAY NOT BE DRAWN TO SCALE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER SIZING AND LOCATION OF ALL STRUCTURES AND IS DIRECTED TO RESOLVE ANY POTENTIAL DISCREPANCY WITH THE ENGINEER PRIOR TO CONSTRUCTION.

SITE NOTES

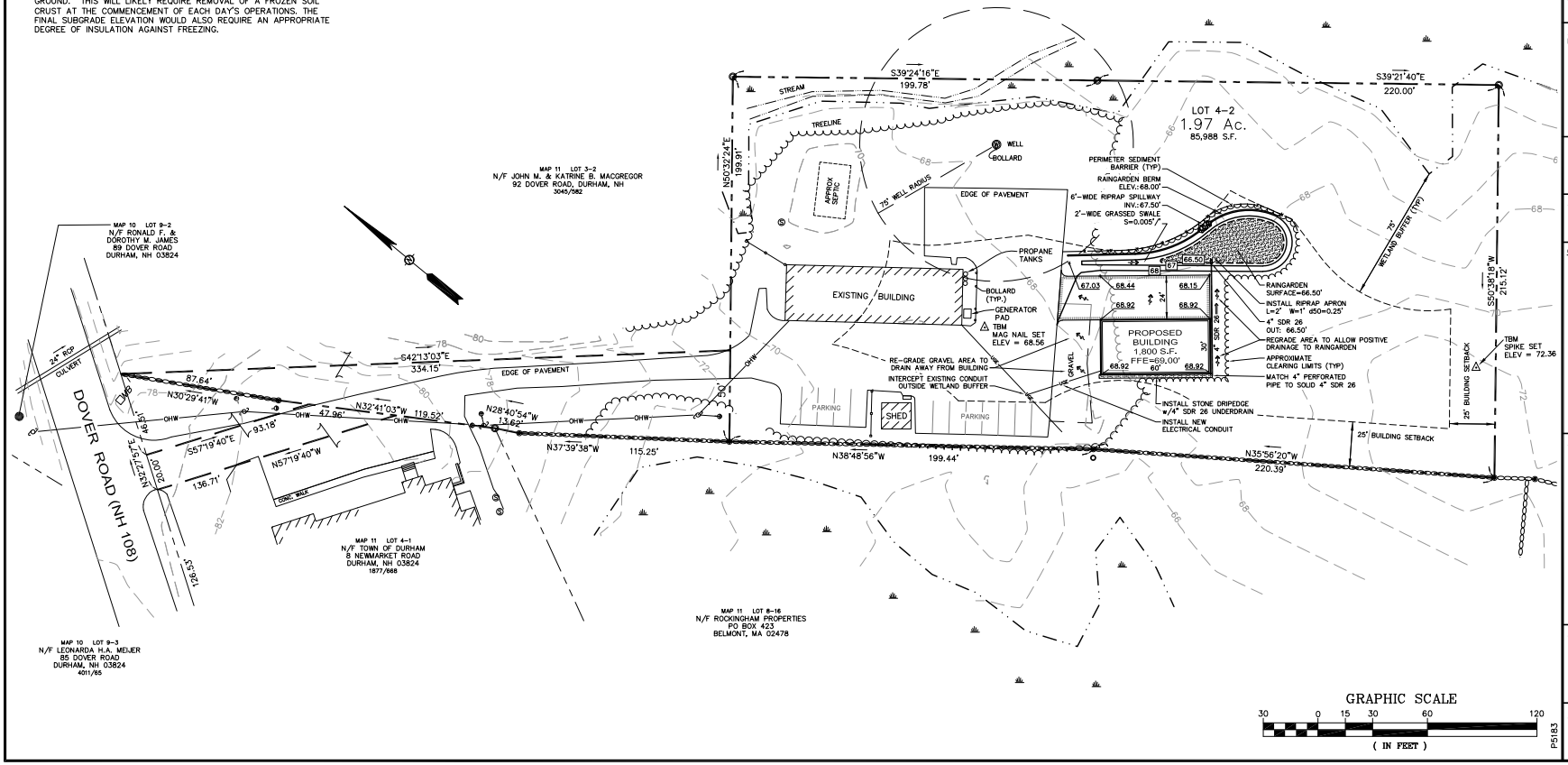
1. DESIGN INTENT – THIS PLAN SET IS INTENDED TO DEPICT A SITE PLAN FOR AN ADDITIONAL BUILDING AS AN ACCESSORY TO AN EXISTING BUSINESS.
2. PROPERTY REFERENCE: MAP 4 LOT 2
3. APPROXIMATE LOT AREA: ±85,988 S.F. (±1.97 AC.)
3. ZONE: OR (OFFICE AND RESEARCH – ROUTE 108)
4. DIMENSIONAL REQUIREMENTS:

MIN. LOT AREA:	80,000 S.F. (ALLOWED NONRESIDENTIAL)	
MIN. ROAD FRONTAGE:	200' (ARTERIAL STREET)	
MIN. FRONT SETBACK:	100' PLUS 2 FEET FOR EACH FOOT OF BUILDING HEIGHT IN EXCESS OF 25 FEET	
MIN. SIDE SETBACK:	25'	
MIN. REAR SETBACK:	25'	
MAX. BUILDING HEIGHT:	50'	
WETLAND SETBACK:	75' (WETLANDS GREATER THAN 3,000 SF)	
MAX. IMPERVIOUS SURFACE RATIO:	50%	24.5% PROVIDED
OPEN SPACE:	--	75.5% PROVIDED

5. WETLANDS NOTE: JURISDICTIONAL WETLANDS SHOWN WERE DERIVED FROM PLAN REFERENCE #1 AND CONFIRMED BY JOSEPH NOEL ON MARCH 20, 2021.
6. SITE SERVED BY ON-SITE PRIVATE WELL AND SEPTIC SYSTEM.
7. EXISTING CONDITIONS INFORMATION SHOWN WAS DERIVED FROM PLAN REFERENCE #1.
8. NO PROPOSED IMPACT TO WETLAND BUFFER, WETLAND CONDITIONAL USE PERMIT NOT REQUIRED.

PLAN REFERENCE:

1. "TOPOGRAPHIC PLAN, TAX MAP 11 LOTS 3-2 & 4-2, DOVER ROAD, DURHAM, NH" DATED FEBRUARY 14, 2020, BY ERIC C. MITCHELL & ASSOCIATES, INC.



GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)

P5183

ALTUS ENGINEERING, INC.
133 Court Street Portsmouth, NH 03801
(603) 433-2335 www.altus-eng.com

NOT FOR CONSTRUCTION

ISSUED FOR: PLANNING BOARD

ISSUE DATE: APRIL 7, 2021

REVISIONS

NO.	DESCRIPTION	BY	DATE
0	PLANNING BOARD	EBS	04/07/21

DRAWN BY: RLH
APPROVED BY: EBS
DRAWING FILE: 5183-SITE.dwg

SCALE: 22" x 34" – 1" = 30'
11" x 17" – 1" = 60'

OWNER/APPLICANT:
WILLIAM AND NANCY YATES
COYOTE COURT, LLC
82 CHESTNUT HILL ROAD
FARMINGTON, NH 03855

PROJECT:
PROPOSED STORAGE BUILDING
YATES ELECTRIC
TAX MAP 4 LOT 2
88A DOVER ROAD
DURHAM, NH

TITLE:
SITE AND STORMWATER MANAGEMENT PLAN

SHEET NUMBER:
C-1

Section 9

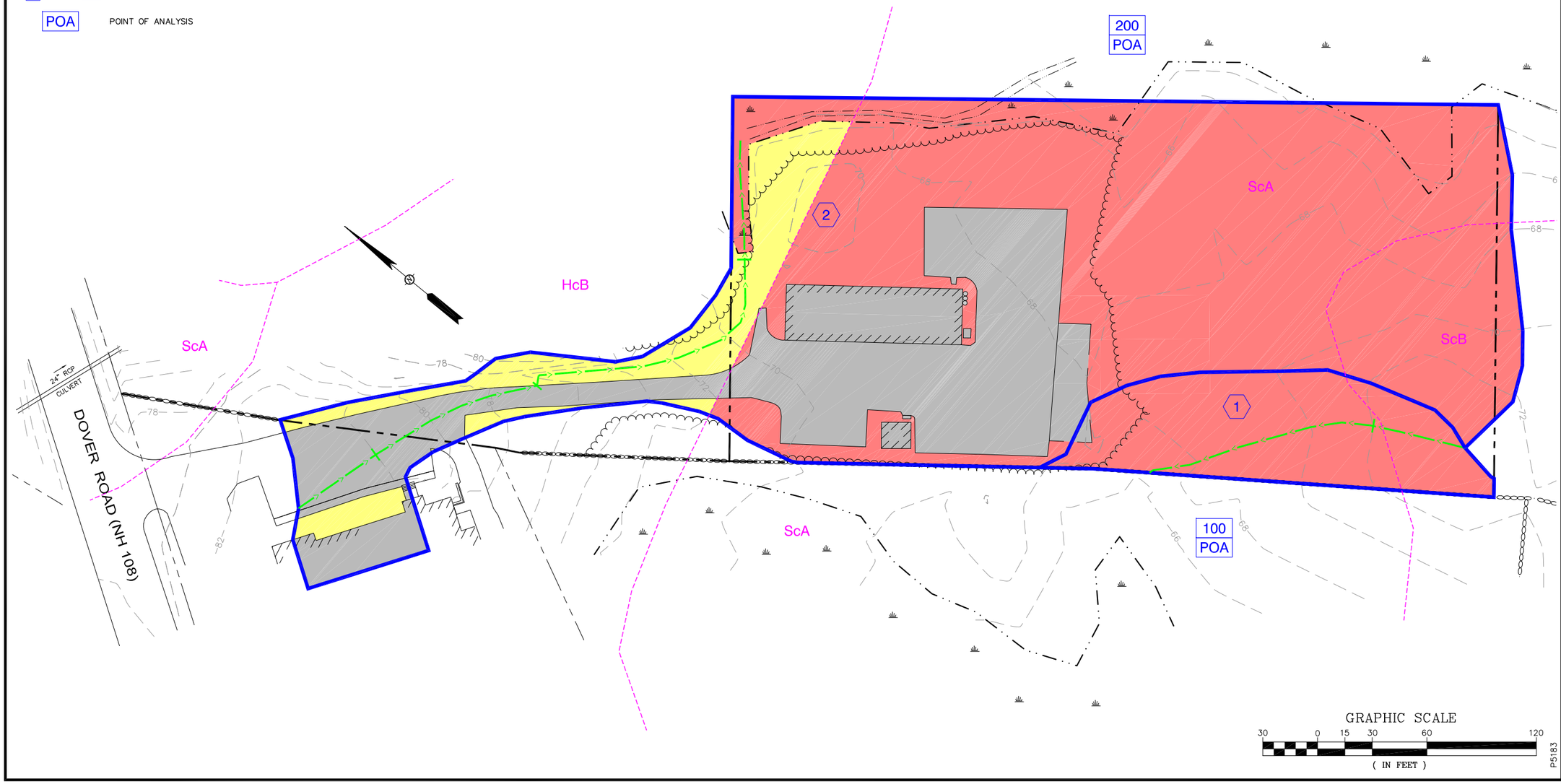
Watershed Plans

Pre-Development Drainage Area Plan
Post-Development Drainage Area Plan

ALTUS
ENGINEERING, INC.

LEGEND

- PROPERTY LINE
- TREELINE
- WETLAND
- NRCS SOILS BOUNDARY
- ScA — NRCS SOILS DESIGNATION
- 60 — EXISTING CONTOUR
- WATERSHED BOUNDARY
- Tc PATH
- PROPOSED GROUND SLOPE DIRECTION
- SOILS – HSG A
- SOILS – HSG B
- SOILS – HSG C
- SOILS – HSG D
- SOILS – IMPERVIOUS
- SOILS – WATER
- 1 1 1 — SUBCATCHMENT/POND/REACH
- POA — POINT OF ANALYSIS



ALTUS ENGINEERING, INC.

133 Court Street Portsmouth, NH 03801
(603) 433-2335 www.altus-eng.com

NOT FOR CONSTRUCTION

ISSUED FOR: PLANNING BOARD

ISSUE DATE: APRIL 7, 2021

REVISIONS

NO.	DESCRIPTION	BY	DATE
0	PLANNING BOARD	EBS	04/07/21

DRAWN BY: RLH
APPROVED BY: EBS
DRAWING FILE: 5183-SITE.dwg

SCALE:
22" x 34" – 1" = 30'
11" x 17" – 1" = 60'

OWNER/APPLICANT:

WILLIAM AND NANCY YATES
COYOTE COURT, LLC

82 CHESTNUT HILL ROAD
FARMINGTON, NH 03855

PROJECT:

PROPOSED STORAGE BUILDING

YATES ELECTRIC

TAX MAP 4 LOT 2

88A DOVER ROAD
DURHAM, NH

TITLE:

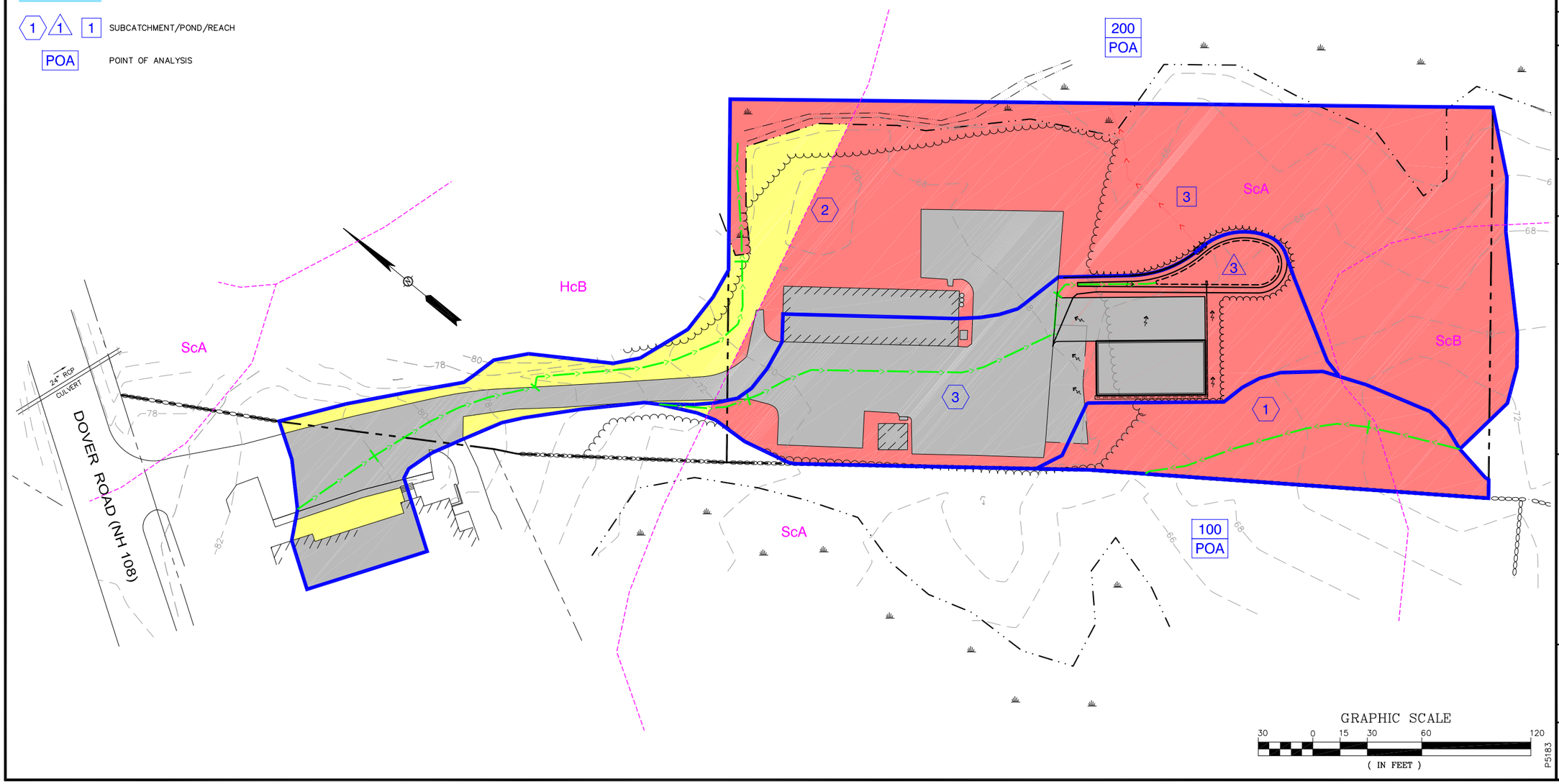
PRE-DEVELOPMENT WATERSHED PLAN

SHEET NUMBER:

WS-1

LEGEND

- PROPERTY LINE
- TREELINE
- WETLAND
- NRCS SOILS BOUNDARY
- ScA — NRCS SOILS DESIGNATION
- 60 — EXISTING CONTOUR
- 60 — PROPOSED CONTOUR
- WATERSHED BOUNDARY
- Tc PATH
- REACH PATH
- PROPOSED GROUND SLOPE DIRECTION
- SOILS – HSG A
- SOILS – HSG B
- SOILS – HSG C
- SOILS – HSG D
- SOILS – IMPERVIOUS
- SOILS – WATER
- 1 / 1 / 1 — SUBCATCHMENT/POND/REACH
- POA — POINT OF ANALYSIS



ALTUS ENGINEERING, INC.

133 Court Street Portsmouth, NH 03801
(603) 433-2335 www.altus-eng.com

NOT FOR CONSTRUCTION

ISSUED FOR: PLANNING BOARD

ISSUE DATE: APRIL 7, 2021

REVISIONS

NO.	DESCRIPTION	BY	DATE
0	PLANNING BOARD	EBS	04/07/21

DRAWN BY: RLH
APPROVED BY: EBS
DRAWING FILE: 5183-SITE.dwg

SCALE:
22" x 34" – 1" = 30'
11" x 17" – 1" = 60'

OWNER/APPLICANT:

WILLIAM AND NANCY YATES
COYOTE COURT, LLC

82 CHESTNUT HILL ROAD
FARMINGTON, NH 03855

PROJECT:

PROPOSED STORAGE BUILDING

YATES ELECTRIC

TAX MAP 4 LOT 2

88A DOVER ROAD
DURHAM, NH

TITLE:

POST-DEVELOPMENT WATERSHED PLAN

SHEET NUMBER:

WS-2