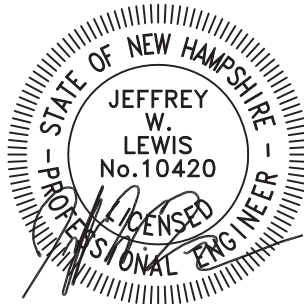


STORMWATER MANAGEMENT REPORT

Prepared For

ROUTE 106 SELF-STORAGE
MAP 226 LOT 3
CANTERBURY, NEW HAMPSHIRE

May 23, 2022



Prepared for:

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Project No. 21093

TABLE OF CONTENTS

- I. Project Narrative**
 - Project Description
 - Methodology
 - Pre-Developed Conditions
 - Post-Developed Conditions
 - Summary of Results
- II. USGS Map Exhibit**
- III. Web Soil Survey Map**
- IV. Aerial Photograph**
- V. NHDES AoT BMP Worksheets**
- VI. Rip Rap Calculations**
- VII. Drainage Analysis**
 - Extreme Precipitation Table from National Regional Climate Center
 - HydroCAD Output Data – Pre-Developed
 - HydroCAD Output Data – Post-Developed
- VIII. Soils Area Exhibits**
 - Pre-Developed Soils Area Exhibit
 - Post-Developed Soils Area Exhibit
- IX. Drainage Area Exhibits**
 - Pre-Developed Drainage Area Exhibit
 - Post-Developed Drainage Area Exhibit

I. PROJECT NARRATIVE

Project Description

The subject parcel is located on the east side of NH Route 106, directly north of the New Hampshire Motor Speedway. It is 19.81-acres in size and it straddles the municipal boundary between Canterbury and Loudon with 12.54-acres being located within Canterbury which is the subject area of development.

The subject parcel is currently developed as a gravel parking lot that serves events at the adjacent speedway. It has an existing driveway entrance onto Route 106. The back portion of the parcel is wooded. At this time, the plan is to build a new self-storage facility on the gravel parking lot that consists of three separate 13,000-sf buildings with paved access drives. As part of the site improvements, a new stormwater management system will be constructed that includes a closed drainage system and a surface infiltration basin.

Methodology

In accordance with the provisions and requirements of the Town of Canterbury Site Plan Regulations and in compliance with general industry standards, the 2, 10 and 50-year, (24-hour) return frequency storms were used in all aspects of analysis and design for stormwater management improvements at the subject site, as further documented in this report

The methodology of the U.S.D.A–S.C.S publication Urban Hydrology for Small Watersheds – Technical Release No. 55 (TR-55) and Computer Program – Project Formulation Hydrology (TR-20) was selected for use in the design of segments of the drainage system in order to estimate peak stormwater discharge volumes. In implementing the methodology of TR-55 and TR-20 a HYDROCAD (Version 10.00) stormwater modeling, hydrograph generating, and routing computer program was utilized.

Estimates for Time of Concentration, used in the analysis were made using the methodology contained within U.S.D.A–S.C.S publication Urban Hydrology for Small Watersheds – Technical Release No. 55 (TR-55). In implementing the TR-55 Method, a minimum Time of Concentration of 5 minutes was utilized for urbanized areas.

All design and analysis calculations performed using the referenced methodologies are attached to this report. These calculations document the subcatchment area, breakdown of surface type, time of concentration, rainfall intensity, peak discharge volume, peak velocity, and other descriptive design data for each watershed and pipe segment evaluated. In addition, the attached “Drainage Areas Plans” graphically define and illustrate the real extent of each watershed or subcatchment area investigated.

Existing Drainage Conditions

The entire subject parcel drains to a large wetland complex adjacent to Route 106 which flows southerly and onto the adjacent Speedway property to the south. The existing gravel parking lot is relatively flat and it sheets drains to the west and south where runoff is discharged into the large wetland. The undeveloped, wooded, portion of the parcel contains steep slopes which also drain into the wetland complex

The southwest corner of the parcel where the wetland complex discharges from the site has been identified as the single point of comparison (POC#1) in the pre-developed HydroCAD analysis. POC#1 is modeled as Reach 80R in the analysis.

A Site Specific Soil Survey was performed for the development area of the subject parcel. The predominant soil type on the upland portion of the parcel is Udipsamments, sandy or gravelly (similar to Hinkley) which is an HSG "A" soil. The USDA-NRCS Web Soils Survey was utilized to identify soil types in the remaining watershed area.

Post-Development Drainage Conditions

The proposed project will disturb approximately 5.3-acres of terrain and result in approximately 31,503-sf of new impervious surface areas. Stormwater runoff from the all of proposed impervious surface area (roofs and pavement) will be collected in a closed drainage system and conveyed to a stormwater management basin (SWMB#1) which will provide treatment of the collected stormwater in accordance with NHDES AoT requirements and will be equipped with outlet control devices to ensure that the post-developed peaks flows from the site do not exceed the pre-developed peak flows.

The POC described in the above section was analyzed in the post-developed condition to ensure that there would not be any adverse effects experienced by the adjacent downstream properties or receiving drainage channels. The following sections describe in greater detail the treatment methods, groundwater recharge requirements and peak runoff control criteria.

Groundwater Recharge:

The proposed stormwater management system has been designed to comply with the NHDES Alteration of Terrain (AoT) Regulations with regards to groundwater recharge requirements as outlined in Env-Wq 1507.04. These regulations are intended to protect groundwater resources by reducing the amount of water diverted offsite by proposed developments. The current NHDES AoT BMP Spreadsheet was utilized to calculate the required recharge volume.

The proposed site improvements will result in a net increase of 31,503-sf of impervious surface area. Of that net increase, approximately 27,305-sf will be on HSG "C" soils and 4,198-sf will be on HSG "A" soils. Plugging these values into the AoT BMP Spreadsheet reveals a required Groundwater Recharge Volume (GRV) of 368-cf.

Proposed SWMB#1 (infiltration basin) will provide well in excess of this required amount. The volume of the infiltration basin, below the lowest outlet orifice, is 12,896-cf. All of this volume will be infiltrated. Therefore, the site exceeds the groundwater recharge requirements of Env-Wq 1507.04

Stormwater Treatment:

The site has been designed to provide permanent stormwater treatment in compliance with NHDES Alteration of Terrain Regulation Env-Wq 1507.03 for all runoff generated from the proposed site improvements. Stormwater runoff from the proposed buildings and paved areas will be collected in a closed and drainage system comprised of catch basins and storm drain culvert and it will directed to a single stormwater management basin (SWMB#1) which is a surface infiltration basin.

SWMB#1 is equipped with a sediment forebay that will provide pre-treatment of the collected runoff which enters the basin. Permanent treatment is then accomplished through infiltration through the basin floor in compliance with Env-Wq 1508.06 for the water quality volume (WQV). Additional storage above the WQV will allow SWMB #1 to help attenuate the larger storm events.

Channel Protection:

The site has been designed to provide downstream Channel Protection in compliance with NHDES Alteration of Terrain Regulation Env-Wq 1507.05 through the implementation of the Stormwater Management Basin. Point of Comparison was analyzed to demonstrate compliance at the location where concentrated runoff is discharged from the site. The 2-year, 24-hour post-developed peak flow rate at POC#1 is less than or equal to the 2-year, 24-hour pre-developed peak flow rate. And the 2-year, 24-hour post-developed storm volume at POC#1 has not increased over the pre-developed volume. See Table 1 in the Summary of Results below for actual values. This meets the criteria of Env-Wq 1507.05 and will ensure that downstream stream channels and receiving waters are protected from erosion-causing volumes and flows.

Peak Runoff Control:

The site has been designed to provide Peak Runoff Control requirements in compliance with NHDES Alteration of Terrain Regulation Env-Wq 1507.06 through the implementation of the Stormwater Management Basin. POC#1 was analyzed to demonstrate compliance with the peak runoff control requirements. The site has been designed such that both the 10-year and 50-year 24-hour post-developed peak flow rates do not exceed those of the pre-developed condition, thus ensuring that downstream properties will not be adversely affected by the development. See Table 2 in the Summary of Results below for actual values.

Summary of Results

Table 1. Channel Protection Summary

Location	Node	Volumes & Peak Rates of Runoff at Points of Comparison					
		Volume (2-Year, 24-Hour)			Peak Runoff (2-Year, 24-Hour)		
		Pre-Develop	Post-Develop	+ Increase/ (Decrease)	Pre-Develop	Post-Develop	+ Increase/ (Decrease)
P.O.C. #1	Reach 80R	33,655 cf	22,483 cf	(11,172 cf)	4.95 cfs	2.52 cfs	(2.43 cfs)

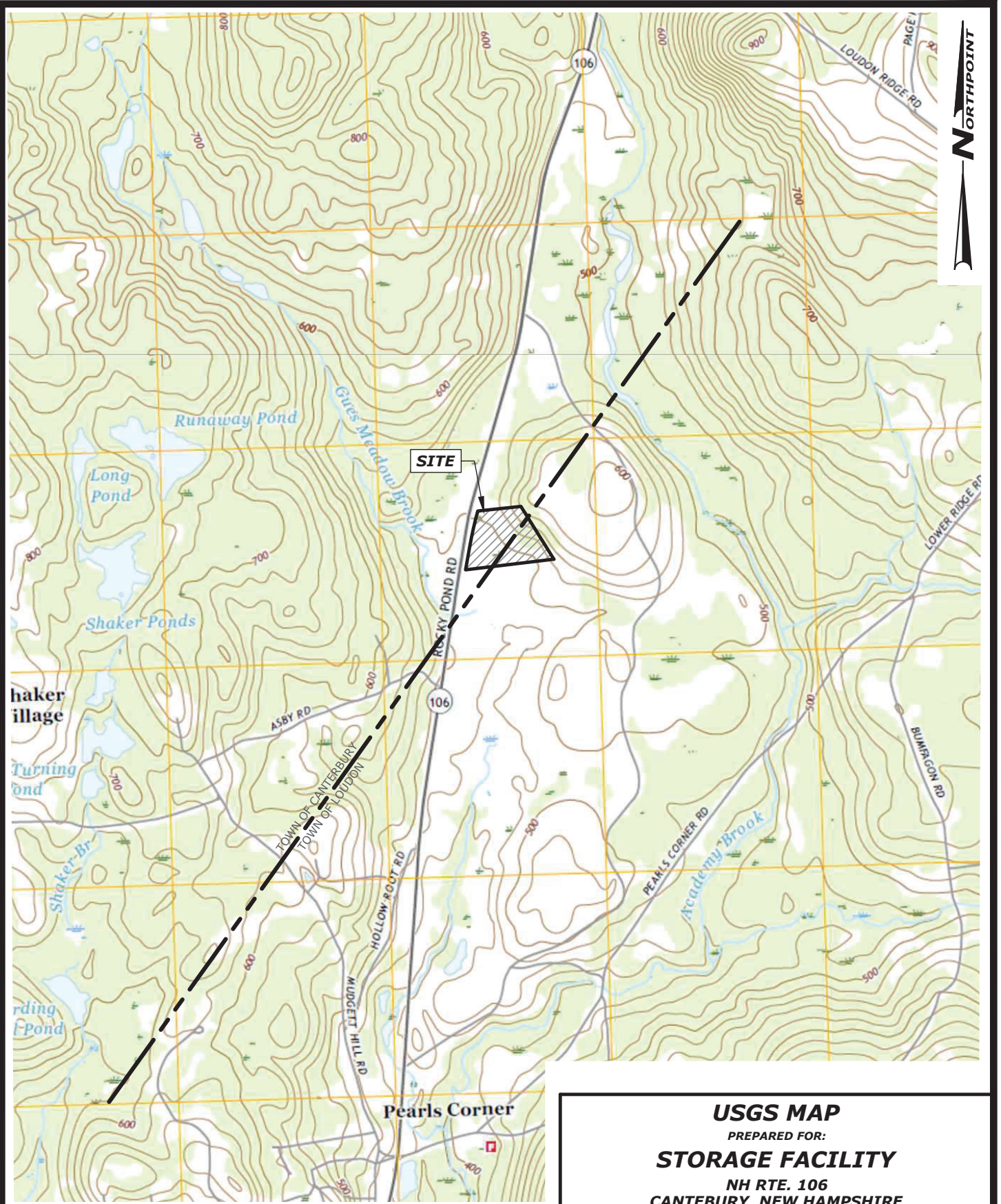
Table 2. Peak Runoff Control Summary

Location	Node	Peak Rates of Runoff at Points of Comparison					
		(10-Year, 24-Hour)			(50-Year, 24-Hour)		
		Pre-Develop	Post-Develop	+ Increase/ (Decrease)	Pre-Develop	Post-Develop	+ Increase/ (Decrease)
P.O.C. #1	Reach 80R	15.81 cfs	10.09 cfs	(5.72 cfs)	41.89 cfs	41.87 cfs	(0.02 cfs)

**Table 3. SWMB Summary
(50-Year, 24-Storm)**

SWMB# / Node	Peak In-Flow (cfs)	Peak Out-Flow (cfs)	High Water Elevation	Berm Elevation	Free Board
SWMB #1 / 10P	24.61 cfs	13.89 cfs	498.57	499.00	0.43 ft

II. USGS MAP EXHIBIT



USGS MAP
 PREPARED FOR:
STORAGE FACILITY
 NH RTE. 106
 CANTEBURY, NEW HAMPSHIRE

SCALE: 1"=2000'

DATE: APRIL 2022

PROJ.: 21093

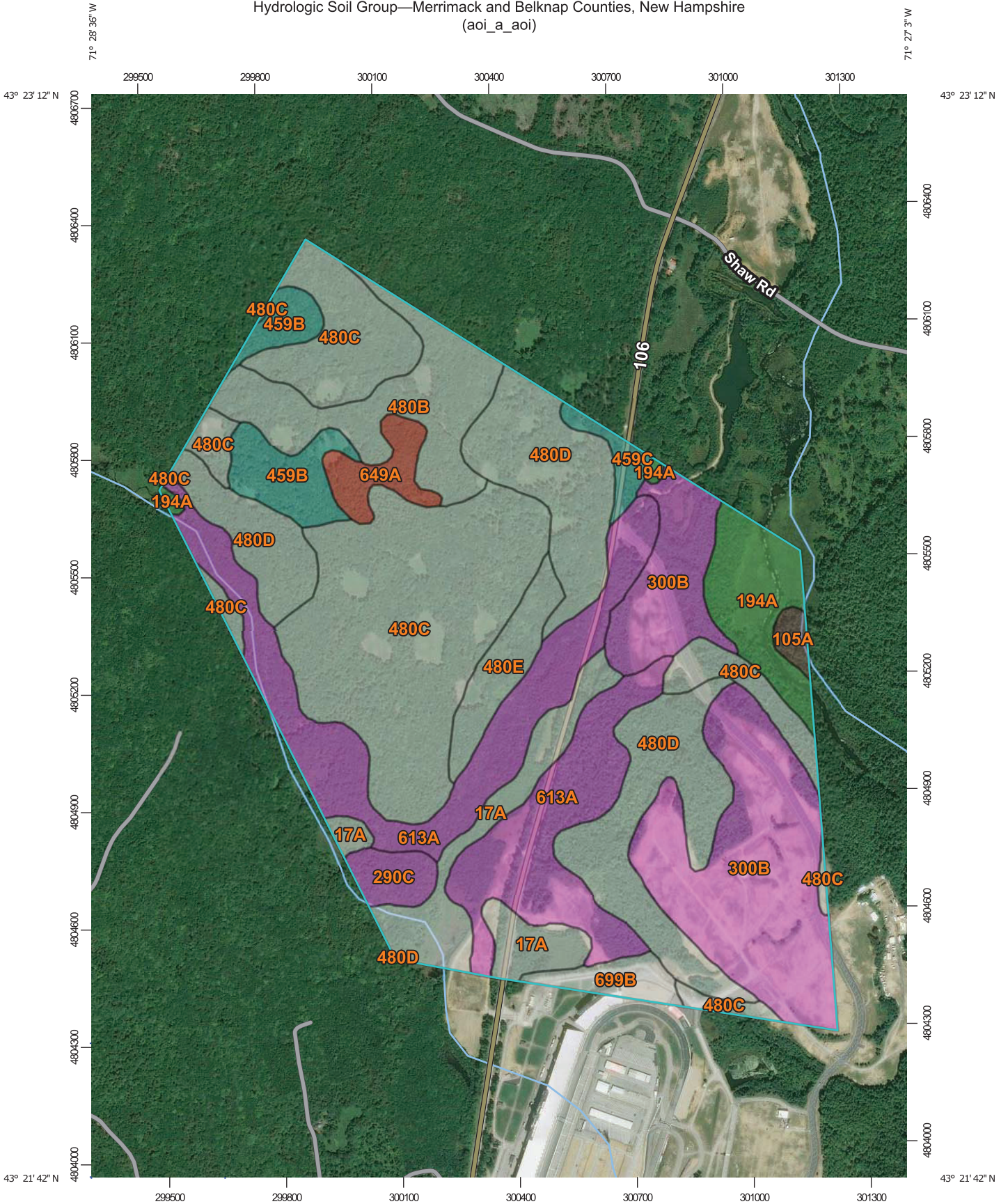
SHEET: 1 OF 1

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III. Web Soil Survey Map

Hydrologic Soil Group—Merrimack and Belknap Counties, New Hampshire
(aoi_a_aoi)



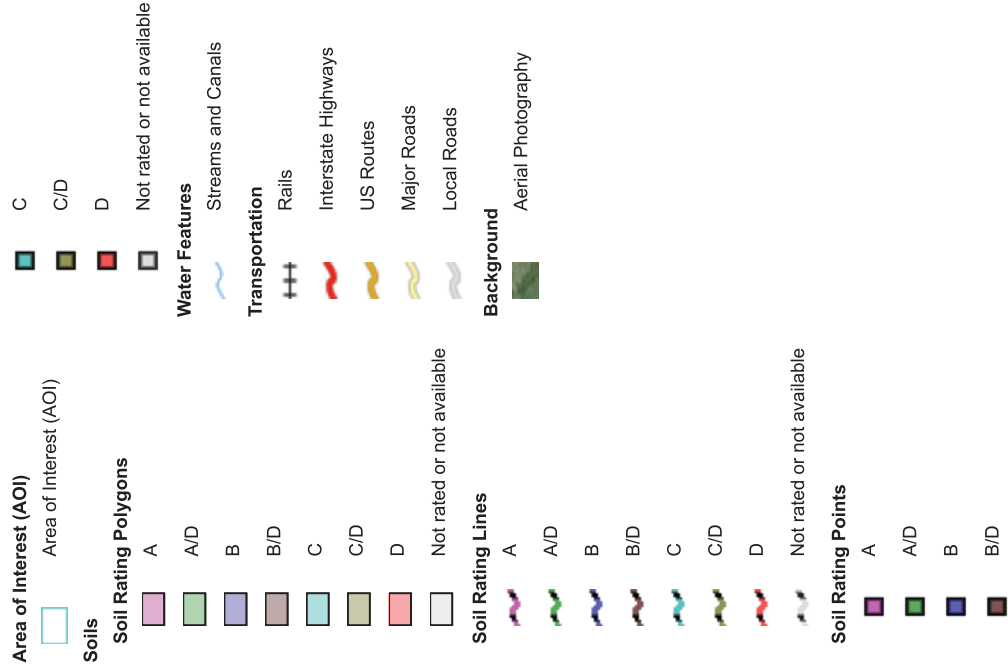
Map Scale: 1:13,500 if printed on A portrait (8.5" x 11") sheet.



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



MAP LEGEND



MAP INFORMATION

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

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 27, Aug 31, 2021

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

Date(s) aerial images were photographed: May 31, 2019—Nov 1, 2021

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
17A	Searsport-Chocorua-Naumburg complex, 0 to 1 percent slopes		30.5	5.6%
105A	Rumney fine sandy loam, 0 to 3 percent slopes, frequently flooded	B/D	2.9	0.5%
194A	Catden mucky peat, 0 to 1 percent slopes, ponded	A/D	21.7	4.0%
290C	Champlain-Woodstock complex, 8 to 15 percent slopes	A	6.9	1.3%
300B	Udipsamments, 0 to 6 percent slopes	A	85.8	15.8%
459B	Metacomet fine sandy loam, 3 to 8 percent slopes, very stony	C	18.9	3.5%
459C	Metacomet fine sandy loam, 8 to 15 percent slopes, very stony	C	4.7	0.9%
480B	Millsite-Woodstock-Henniker complex, 3 to 8 percent slopes, very stony		35.1	6.5%
480C	Millsite-Woodstock-Henniker complex, 8 to 15 percent slopes, very stony		129.1	23.8%
480D	Millsite-Woodstock-Henniker complex, 15 to 25 percent slopes, very stony		84.9	15.7%
480E	Millsite-Woodstock-Henniker complex, 25 to 60 percent slopes, very stony		13.0	2.4%
613A	Croghan loamy fine sand, 0 to 8 percent slopes, wooded	A	91.7	16.9%
649A	Peacham mucky peat, 0 to 8 percent slopes, very stony	D	9.5	1.8%
699B	Urban land, 0 to 8 percent slopes		7.4	1.4%
Totals for Area of Interest			541.9	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: 50

Tie-break Rule: Higher

IV. Aerial Photograph



AERIAL VIEW
PREPARED FOR:
STORAGE FACILITY
NH RTE. 106
CANTEBURY, NEW HAMPSHIRE

SCALE: 1"=400'

DATE: APRIL 2022

PROJ.: 21093

SHEET: 1 OF 1



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V. NHDES AoT BMP Worksheets



INFILTRATION PRACTICE CRITERIA (Env-Wq 1508.06)

Type/Node Name: Reach 80R

Enter the type of infiltration practice (e.g., basin, trench) and the node name in the drainage analysis, if applicable.

Yes		Have you reviewed Env-Wq 1508.06(a) to ensure that infiltration is allowed?	← yes
4.05	ac	A = Area draining to the practice	
3.70	ac	A _i = Impervious area draining to the practice	
0.91	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.87	unitless	R _v = Runoff coefficient = 0.05 + (0.9 x I)	
3.53	ac-in	WQV = 1" x R _v x A	
12,831	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
3,208	cf	25% x WQV (check calc for sediment forebay volume)	
<u>Sed. Forebay</u>		Method of pretreatment? (not required for clean or roof runoff)	
3,316	cf	V _{SED} = Sediment forebay volume, if used for pretreatment	≥ 25%WQV
12,896	cf	V = Volume ¹ (attach a stage-storage table)	≥ WQV
3,533	sf	A _{SA} = Surface area of the bottom of the pond	
3.00	iph	K _{sat} _{DESIGN} = Design infiltration rate ²	
14.5	hours	I _{DRAIN} = Drain time = V / (A _{SA} * I _{DESIGN})	≤ 72-hrs
495.00	feet	E _{BTM} = Elevation of the bottom of the basin	
492.00	feet	E _{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
489.00	feet	E _{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
3.00	feet	D _{SHWT} = Separation from SHWT	≥ *³
6.0	feet	D _{ROCK} = Separation from bedrock	≥ *³
	ft	D _{amend} = Depth of amended soil, if applicable due high infiltration rate	≥ 24"
	ft	D _T = Depth of trench, if trench proposed	4 - 10 ft
No	Yes/No	If a trench or underground system is proposed, has observation well been provided?	← yes
		If a trench is proposed, does material meet Env-Wq 1508.06(k)(2) requirements. ⁴	← yes
Yes	Yes/No	If a basin is proposed, Is the perimeter curvilinear, and basin floor flat?	← yes
3.0	:1	If a basin is proposed, pond side slopes.	≥ 3:1
498.13	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
498.57	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
499.00	ft	Elevation of the top of the practice (if a basin, this is the elevation of the berm)	
YES		10 peak elevation ≤ Elevation of the top of the trench? ⁵	← yes
YES		If a basin is proposed, 50-year peak elevation ≤ Elevation of berm?	← yes

1. Volume below the lowest invert of the outlet structure and excludes forebay volume
2. K_{sat}_{DESIGN} includes a factor of safety. See Env-Wq 1504.14 for requirements for determining the infiltr. rate
3. 1' separation if treatment not required; 4' for treatment in GPAs & WSIPAs; & 3' in all other areas.
4. Clean, washed well graded diameter of 1.5 to 3 inches above the in-situ soil.
5. If 50-year peak elevation exceeds top of trench, the overflow must be routed in HydroCAD as secondary discharge.

Designer's Notes: WQV Elev = 497.40 (Lowest Orifice Elevation)

Attached Stage-Storage Table: Volume at Elev 497.40 = 16,212-cf

Sediment Forebay Volume at Elev 497.39 = 3,316 cf

WQV = 16,212 cf = 3,316 cf = 12,896 cf

VI. Rip Rap Calculations

RIP RAP OUTLET PROTECTION APRON CALCULATIONS

Route 106 Self Storage 5/23/2022

Northpoint Project # 21093

The purpose of this spreadsheet is to calculate the dimensions of rip rap required to help prevent soil loss for the 10 year storm event.

Required input to the spreadsheet is

Q peak flow in CFS
 Do diameter in feet of outlet or width of channel
 Tw tail water at end of apron (minimum of 0.5')

Depending on the tail water conditions either column 1 or column 2 is used for calculations
 Column One where $Tw < 1/2Do$ Column One where $Tw > 1/2Do$

Length of Apron

$La = (1.8Q/Do^{3/2}) + 7Do$ $La = 3*Q/Do^{3/2} + 7Do$

Width of Apron at outfall

$W1 = 3*Do$ $W1 = 3*Do$
 $W2 = 3Do + La$ $W2 = 3Do + 0.4*La$

If defined channel use channel width for W1 and W2

Rock Rip Rap

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

Input to Chart		RIRAP GRADATION ENVELOPE										depth in		USE depth in.						
		d100		d85		d50		d15												
Description (Optional)	Q (cfs)	Do (ft)	Tw (ft)	Calculated Output			d50, ft	d50 in	USE d50 in.	FROM in	TO in	FROM in	TO in	FROM in	TO in	FROM in	TO in	depth in	USE depth in.	
HW#1	15" Outlet from CB#2	15.85	1.50	0.50	26	5	31	1.1	12.74	13	20	26	17	23	13	20	4	7	32.5	33
HW#2	15" Outlet from CB#5	7.78	1.25	0.50	19	4	23	0.5	5.92	6	9	12	8	11	6	9	2	3	15	15
HW#3	15" Outlet from OS#1	3.06	1.25	0.50	13	4	16	0.1	1.71	6	9	12	8	11	6	9	2	3	15	15

VII. Drainage Analysis

- Extreme Precipitation Table from National Regional Climate Center

- HydroCAD Output Data – Pre-Developed
 - Drainage Diagram
 - Area Listing and Soil Listing
 - Node Listing: 2, 10 and 50-year storms
 - Full Summary: 10-year storm

- HydroCAD Output Data – Post-Developed
 - Drainage Diagram
 - Area Listing and Soil Listing
 - Node Listing: 2, 10 and 50-year storms
 - Full Summary: 10-year storm

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	71.462 degrees West
Latitude	43.367 degrees North
Elevation	0 feet
Date/Time	Tue, 17 May 2022 14:52:40 -0400

Extreme Precipitation Estimates

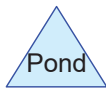
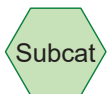
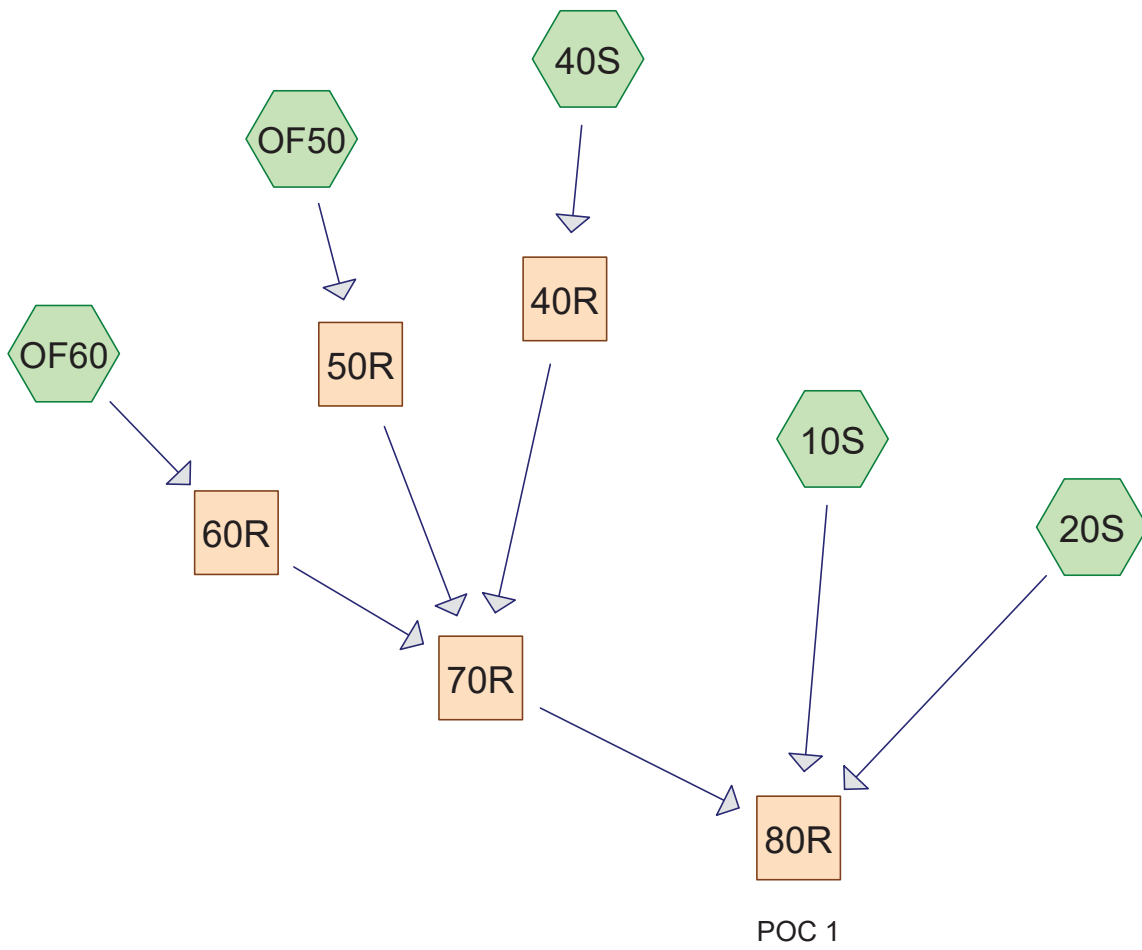
	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.39	0.49	0.64	0.80	1.00	1yr	0.69	0.96	1.16	1.47	1.85	2.35	2.58	1yr	2.08	2.48	2.92	3.60	4.14	1yr
2yr	0.31	0.48	0.60	0.80	1.00	1.26	2yr	0.86	1.15	1.45	1.81	2.25	2.80	3.14	2yr	2.48	3.02	3.51	4.20	4.79	2yr
5yr	0.37	0.58	0.73	0.97	1.25	1.58	5yr	1.08	1.45	1.83	2.29	2.84	3.51	3.97	5yr	3.11	3.82	4.43	5.20	5.91	5yr
10yr	0.42	0.66	0.83	1.13	1.47	1.89	10yr	1.27	1.72	2.19	2.74	3.39	4.17	4.75	10yr	3.69	4.57	5.30	6.12	6.93	10yr
25yr	0.50	0.79	1.00	1.39	1.84	2.37	25yr	1.59	2.17	2.76	3.46	4.28	5.24	6.02	25yr	4.63	5.79	6.70	7.58	8.55	25yr
50yr	0.56	0.91	1.16	1.62	2.18	2.83	50yr	1.88	2.59	3.30	4.13	5.10	6.22	7.20	50yr	5.51	6.93	8.01	8.93	10.03	50yr
100yr	0.64	1.04	1.34	1.89	2.58	3.38	100yr	2.23	3.09	3.95	4.94	6.08	7.40	8.62	100yr	6.55	8.29	9.58	10.51	11.77	100yr
200yr	0.73	1.20	1.55	2.22	3.06	4.02	200yr	2.64	3.69	4.71	5.90	7.25	8.81	10.33	200yr	7.79	9.93	11.47	12.39	13.82	200yr
500yr	0.88	1.45	1.89	2.74	3.83	5.07	500yr	3.31	4.67	5.96	7.46	9.16	11.09	13.12	500yr	9.82	12.62	14.54	15.40	17.09	500yr

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.23	0.35	0.43	0.58	0.71	0.88	1yr	0.61	0.86	0.99	1.32	1.54	2.00	2.36	1yr	1.77	2.27	2.55	3.15	3.78	1yr
2yr	0.30	0.47	0.58	0.78	0.97	1.15	2yr	0.83	1.12	1.31	1.72	2.19	2.73	3.04	2yr	2.41	2.93	3.41	4.09	4.67	2yr
5yr	0.35	0.53	0.66	0.91	1.16	1.38	5yr	1.00	1.35	1.56	2.01	2.60	3.26	3.68	5yr	2.89	3.54	4.11	4.87	5.55	5yr
10yr	0.38	0.59	0.73	1.02	1.32	1.56	10yr	1.14	1.52	1.76	2.27	2.92	3.74	4.24	10yr	3.31	4.08	4.73	5.56	6.33	10yr
25yr	0.44	0.67	0.84	1.20	1.57	1.85	25yr	1.36	1.81	2.10	2.64	3.39	4.47	5.10	25yr	3.95	4.91	5.68	6.62	7.50	25yr
50yr	0.49	0.75	0.93	1.34	1.80	2.12	50yr	1.55	2.07	2.39	2.97	3.77	5.10	5.87	50yr	4.52	5.65	6.50	7.55	8.60	50yr
100yr	0.55	0.83	1.04	1.50	2.05	2.42	100yr	1.77	2.36	2.73	3.33	4.22	5.83	6.76	100yr	5.16	6.50	7.45	8.61	9.79	100yr
200yr	0.61	0.92	1.16	1.69	2.35	2.76	200yr	2.03	2.70	3.11	3.74	4.71	6.65	7.76	200yr	5.89	7.46	8.52	9.81	11.17	200yr
500yr	0.71	1.06	1.36	1.97	2.81	3.29	500yr	2.42	3.22	3.70	4.37	5.46	7.89	9.29	500yr	6.98	8.93	10.14	11.68	13.31	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	0.88	1.07	1yr	0.76	1.04	1.21	1.58	1.97	2.52	2.79	1yr	2.23	2.68	3.19	3.85	4.40	1yr
2yr	0.33	0.50	0.62	0.84	1.04	1.23	2yr	0.90	1.21	1.39	1.83	2.36	2.90	3.25	2yr	2.57	3.13	3.63	4.32	4.93	2yr
5yr	0.40	0.61	0.76	1.04	1.33	1.59	5yr	1.15	1.55	1.81	2.37	3.01	3.78	4.28	5yr	3.35	4.11	4.75	5.53	6.28	5yr
10yr	0.48	0.73	0.91	1.27	1.64	1.93	10yr	1.41	1.88	2.17	2.79	3.54	4.64	5.28	10yr	4.10	5.07	5.85	6.68	7.57	10yr
25yr	0.61	0.93	1.15	1.65	2.17	2.53	25yr	1.87	2.47	2.82	3.58	4.51	6.08	6.98	25yr	5.38	6.72	7.70	8.61	9.68	25yr
50yr	0.73	1.11	1.39	1.99	2.68	3.10	50yr	2.31	3.04	3.44	4.32	5.43	7.48	8.64	50yr	6.62	8.31	9.49	10.43	11.67	50yr
100yr	0.89	1.34	1.68	2.42	3.32	3.81	100yr	2.87	3.73	4.21	5.20	6.53	9.22	10.69	100yr	8.16	10.28	11.73	12.64	14.07	100yr
200yr	1.07	1.61	2.04	2.95	4.11	4.69	200yr	3.55	4.59	5.14	6.28	7.87	11.36	13.26	200yr	10.06	12.75	14.49	15.33	16.96	200yr
500yr	1.38	2.05	2.64	3.83	5.45	6.19	500yr	4.70	6.05	6.71	8.07	10.09	15.02	17.65	500yr	13.29	16.97	19.22	19.80	21.74	500yr



Routing Diagram for 21093_HydroCAD_Pre
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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
633,257	96	Gravel surface, HSG A (10S, 20S, 40S, OF50)
24,443	96	Gravel surface, HSG C (10S, 40S)
125,840	83	Paved roads w/open ditches, 50% imp, HSG A (OF50, OF60)
4,895,750	30	Woods, Good, HSG A (10S, 20S, 40S, OF50, OF60)
1,501,667	70	Woods, Good, HSG C (10S, 40S, OF50, OF60)
7,180,957	45	TOTAL AREA

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Page 3

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
5,654,847	HSG A	10S, 20S, 40S, OF50, OF60
0	HSG B	
1,526,110	HSG C	10S, 40S, OF50, OF60
0	HSG D	
0	Other	
7,180,957		TOTAL AREA

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Type III 24-hr 2-YR Rainfall=2.80"

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Page 1

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 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 10S: Runoff Area=403,653 sf 0.00% Impervious Runoff Depth=0.65"
 Flow Length=1,273' Tc=11.8 min CN=71 Runoff=4.95 cfs 21,802 cf

Subcatchment 20S: Runoff Area=495,197 sf 0.00% Impervious Runoff Depth=0.11"
 Flow Length=1,239' Tc=11.8 min CN=53 Runoff=0.18 cfs 4,394 cf

Subcatchment 40S: Runoff Area=124,609 sf 0.00% Impervious Runoff Depth=0.01"
 Flow Length=656' Tc=21.9 min CN=45 Runoff=0.00 cfs 104 cf

Subcatchment OF50: Runoff Area=2,641,044 sf 1.19% Impervious Runoff Depth=0.00"
 Flow Length=4,199' Tc=68.1 min CN=38 Runoff=0.00 cfs 0 cf

Subcatchment OF60: Runoff Area=3,516,454 sf 0.89% Impervious Runoff Depth=0.03"
 Flow Length=4,048' Tc=74.1 min CN=47 Runoff=0.24 cfs 7,354 cf

Reach 40R: Avg. Flow Depth=0.01' Max Vel=1.09 fps Inflow=0.00 cfs 104 cf
 24.0" Round Pipe n=0.012 L=82.0' S=0.0245 '/' Capacity=38.37 cfs Outflow=0.00 cfs 104 cf

Reach 50R: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0 cf
 15.0" Round Pipe n=0.012 L=64.0' S=0.0267 '/' Capacity=11.44 cfs Outflow=0.00 cfs 0 cf

Reach 60R: Avg. Flow Depth=0.14' Max Vel=2.41 fps Inflow=0.24 cfs 7,354 cf
 24.0" Round Pipe n=0.012 L=132.0' S=0.0092 '/' Capacity=23.56 cfs Outflow=0.24 cfs 7,354 cf

Reach 70R: Avg. Flow Depth=0.02' Max Vel=1.26 fps Inflow=0.24 cfs 7,459 cf
 n=0.030 L=444.0' S=0.1194 '/' Capacity=621.76 cfs Outflow=0.24 cfs 7,459 cf

Reach 80R: POC 1 Inflow=4.95 cfs 33,655 cf
 Outflow=4.95 cfs 33,655 cf

Total Runoff Area = 7,180,957 sf Runoff Volume = 33,655 cf Average Runoff Depth = 0.06"
99.12% Pervious = 7,118,037 sf 0.88% Impervious = 62,920 sf

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Type III 24-hr 10-YR Rainfall=4.17"

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Page 2

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 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 10S: Runoff Area=403,653 sf 0.00% Impervious Runoff Depth=1.51"
 Flow Length=1,273' Tc=11.8 min CN=71 Runoff=13.05 cfs 50,849 cf

Subcatchment 20S: Runoff Area=495,197 sf 0.00% Impervious Runoff Depth=0.51"
 Flow Length=1,239' Tc=11.8 min CN=53 Runoff=3.11 cfs 21,039 cf

Subcatchment 40S: Runoff Area=124,609 sf 0.00% Impervious Runoff Depth=0.21"
 Flow Length=656' Tc=21.9 min CN=45 Runoff=0.13 cfs 2,217 cf

Subcatchment OF50: Runoff Area=2,641,044 sf 1.19% Impervious Runoff Depth=0.05"
 Flow Length=4,199' Tc=68.1 min CN=38 Runoff=0.34 cfs 10,509 cf

Subcatchment OF60: Runoff Area=3,516,454 sf 0.89% Impervious Runoff Depth=0.28"
 Flow Length=4,048' Tc=74.1 min CN=47 Runoff=4.00 cfs 81,438 cf

Reach 40R: Avg. Flow Depth=0.08' Max Vel=2.83 fps Inflow=0.13 cfs 2,217 cf
 24.0" Round Pipe n=0.012 L=82.0' S=0.0245 '/' Capacity=38.37 cfs Outflow=0.13 cfs 2,217 cf

Reach 50R: Avg. Flow Depth=0.15' Max Vel=4.16 fps Inflow=0.34 cfs 10,509 cf
 15.0" Round Pipe n=0.012 L=64.0' S=0.0267 '/' Capacity=11.44 cfs Outflow=0.34 cfs 10,509 cf

Reach 60R: Avg. Flow Depth=0.56' Max Vel=5.59 fps Inflow=4.00 cfs 81,438 cf
 24.0" Round Pipe n=0.012 L=132.0' S=0.0092 '/' Capacity=23.56 cfs Outflow=4.00 cfs 81,438 cf

Reach 70R: Avg. Flow Depth=0.11' Max Vel=3.78 fps Inflow=4.09 cfs 94,164 cf
 n=0.030 L=444.0' S=0.1194 '/' Capacity=621.76 cfs Outflow=4.09 cfs 94,164 cf

Reach 80R: POC 1 Inflow=15.81 cfs 166,052 cf
 Outflow=15.81 cfs 166,052 cf

Total Runoff Area = 7,180,957 sf Runoff Volume = 166,052 cf Average Runoff Depth = 0.28"
99.12% Pervious = 7,118,037 sf 0.88% Impervious = 62,920 sf

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Type III 24-hr 50-YR Rainfall=6.22"

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Page 3

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 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 10S: Runoff Area=403,653 sf 0.00% Impervious Runoff Depth=3.08"
 Flow Length=1,273' Tc=11.8 min CN=71 Runoff=27.51 cfs 103,504 cf

Subcatchment 20S: Runoff Area=495,197 sf 0.00% Impervious Runoff Depth=1.48"
 Flow Length=1,239' Tc=11.8 min CN=53 Runoff=14.09 cfs 61,277 cf

Subcatchment 40S: Runoff Area=124,609 sf 0.00% Impervious Runoff Depth=0.89"
 Flow Length=656' Tc=21.9 min CN=45 Runoff=1.31 cfs 9,253 cf

Subcatchment OF50: Runoff Area=2,641,044 sf 1.19% Impervious Runoff Depth=0.45"
 Flow Length=4,199' Tc=68.1 min CN=38 Runoff=5.41 cfs 99,841 cf

Subcatchment OF60: Runoff Area=3,516,454 sf 0.89% Impervious Runoff Depth=1.03"
 Flow Length=4,048' Tc=74.1 min CN=47 Runoff=25.13 cfs 302,217 cf

Reach 40R: Avg. Flow Depth=0.25' Max Vel=5.69 fps Inflow=1.31 cfs 9,253 cf
 24.0" Round Pipe n=0.012 L=82.0' S=0.0245 '/ Capacity=38.37 cfs Outflow=1.31 cfs 9,253 cf

Reach 50R: Avg. Flow Depth=0.60' Max Vel=9.19 fps Inflow=5.41 cfs 99,841 cf
 15.0" Round Pipe n=0.012 L=64.0' S=0.0267 '/ Capacity=11.44 cfs Outflow=5.41 cfs 99,841 cf

Reach 60R: Avg. Flow Depth=1.80' Max Vel=8.55 fps Inflow=25.13 cfs 302,217 cf
 24.0" Round Pipe n=0.012 L=132.0' S=0.0092 '/ Capacity=23.56 cfs Outflow=25.12 cfs 302,217 cf

Reach 70R: Avg. Flow Depth=0.35' Max Vel=8.13 fps Inflow=30.80 cfs 411,311 cf
 n=0.030 L=444.0' S=0.1194 '/ Capacity=621.76 cfs Outflow=30.80 cfs 411,311 cf

Reach 80R: POC 1 Inflow=41.89 cfs 576,092 cf
 Outflow=41.89 cfs 576,092 cf

Total Runoff Area = 7,180,957 sf Runoff Volume = 576,092 cf Average Runoff Depth = 0.96"
99.12% Pervious = 7,118,037 sf 0.88% Impervious = 62,920 sf

Summary for Subcatchment 10S:

Runoff = 13.05 cfs @ 12.17 hrs, Volume= 50,849 cf, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.17"

Area (sf)	CN	Description
18,246	96	Gravel surface, HSG C
17,982	70	Woods, Good, HSG C
224,195	96	Gravel surface, HSG A
143,230	30	Woods, Good, HSG A
403,653	71	Weighted Average
403,653		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0300	1.51		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.80"
9.5	708	0.0621	1.25		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.2	465	0.0989	6.38		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.8	1,273	Total			

Summary for Subcatchment 20S:

Runoff = 3.11 cfs @ 12.26 hrs, Volume= 21,039 cf, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.17"

Area (sf)	CN	Description
173,633	96	Gravel surface, HSG A
321,564	30	Woods, Good, HSG A
495,197	53	Weighted Average
495,197		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0300	1.51		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.80"
1.8	285	0.0175	2.69		Shallow Concentrated Flow, Paved Kv= 20.3 fps
8.9	854	0.1030	1.60		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.8	1,239	Total			

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Type III 24-hr 10-YR Rainfall=4.17"

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Page 2

Summary for Subcatchment 40S:

Runoff = 0.13 cfs @ 12.67 hrs, Volume= 2,217 cf, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.17"

Area (sf)	CN	Description
6,197	96	Gravel surface, HSG C
13,366	96	Gravel surface, HSG A
14,221	70	Woods, Good, HSG C
90,825	30	Woods, Good, HSG A
124,609	45	Weighted Average
124,609		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1600	0.17		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.80"
1.8	176	0.1023	1.60		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.1	380	0.0158	0.63		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
21.9	656	Total			

Summary for Subcatchment OF50:

Runoff = 0.34 cfs @ 16.87 hrs, Volume= 10,509 cf, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.17"

Area (sf)	CN	Description
62,920	83	Paved roads w/open ditches, 50% imp, HSG A
222,063	96	Gravel surface, HSG A
52,935	70	Woods, Good, HSG C
2,303,126	30	Woods, Good, HSG A
2,641,044	38	Weighted Average
2,609,584		98.81% Pervious Area
31,460		1.19% Impervious Area

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Type III 24-hr 10-YR Rainfall=4.17"

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Page 3

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0500	1.86		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.80"
16.4	1,344	0.0744	1.36		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
44.0	951	0.0052	0.36		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
6.8	1,804	0.0061	4.42	48.65	Channel Flow, Area= 11.0 sf Perim= 9.0' r= 1.22' n= 0.030 Earth, grassed & winding
68.1	4,199	Total			

Summary for Subcatchment OF60:

Runoff = 4.00 cfs @ 13.58 hrs, Volume= 81,438 cf, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.17"

Area (sf)	CN	Description
62,920	83	Paved roads w/open ditches, 50% imp, HSG A
2,037,005	30	Woods, Good, HSG A
1,416,529	70	Woods, Good, HSG C
3,516,454	47	Weighted Average
3,484,994		99.11% Pervious Area
31,460		0.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	100	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.80"
23.6	2,053	0.0840	1.45		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
23.5	630	0.0080	0.45		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
4.0	1,265	0.0087	5.28	58.10	Channel Flow, Area= 11.0 sf Perim= 9.0' r= 1.22' n= 0.030 Earth, grassed & winding
74.1	4,048	Total			

Summary for Reach 40R:

Inflow Area = 124,609 sf, 0.00% Impervious, Inflow Depth = 0.21" for 10-YR event
 Inflow = 0.13 cfs @ 12.67 hrs, Volume= 2,217 cf
 Outflow = 0.13 cfs @ 12.69 hrs, Volume= 2,217 cf, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Max. Velocity= 2.83 fps, Min. Travel Time= 0.5 min
 Avg. Velocity = 2.03 fps, Avg. Travel Time= 0.7 min

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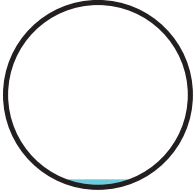
Type III 24-hr 10-YR Rainfall=4.17"

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Page 4

Peak Storage= 4 cf @ 12.68 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 38.37 cfs

24.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 82.0' Slope= 0.0245 '/'
Inlet Invert= 495.26', Outlet Invert= 493.25'



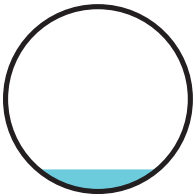
Summary for Reach 50R:

Inflow Area = 2,641,044 sf, 1.19% Impervious, Inflow Depth = 0.05" for 10-YR event
Inflow = 0.34 cfs @ 16.87 hrs, Volume= 10,509 cf
Outflow = 0.34 cfs @ 16.88 hrs, Volume= 10,509 cf, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.16 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.27 fps, Avg. Travel Time= 0.3 min

Peak Storage= 5 cf @ 16.88 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 11.44 cfs

15.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 64.0' Slope= 0.0267 '/'
Inlet Invert= 497.05', Outlet Invert= 495.34'



Summary for Reach 60R:

Inflow Area = 3,516,454 sf, 0.89% Impervious, Inflow Depth = 0.28" for 10-YR event
Inflow = 4.00 cfs @ 13.58 hrs, Volume= 81,438 cf
Outflow = 4.00 cfs @ 13.58 hrs, Volume= 81,438 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.59 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 3.66 fps, Avg. Travel Time= 0.6 min

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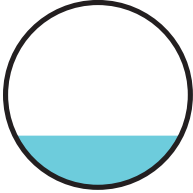
Type III 24-hr 10-YR Rainfall=4.17"

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Page 5

Peak Storage= 94 cf @ 13.58 hrs
Average Depth at Peak Storage= 0.56'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 23.56 cfs

24.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 132.0' Slope= 0.0092 '/'
Inlet Invert= 493.53', Outlet Invert= 492.31'



Summary for Reach 70R:

Inflow Area = 6,282,107 sf, 1.00% Impervious, Inflow Depth = 0.18" for 10-YR event
Inflow = 4.09 cfs @ 13.58 hrs, Volume= 94,164 cf
Outflow = 4.09 cfs @ 13.62 hrs, Volume= 94,164 cf, Atten= 0%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.78 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 2.49 fps, Avg. Travel Time= 3.0 min

Peak Storage= 480 cf @ 13.59 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 621.76 cfs

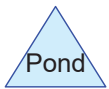
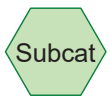
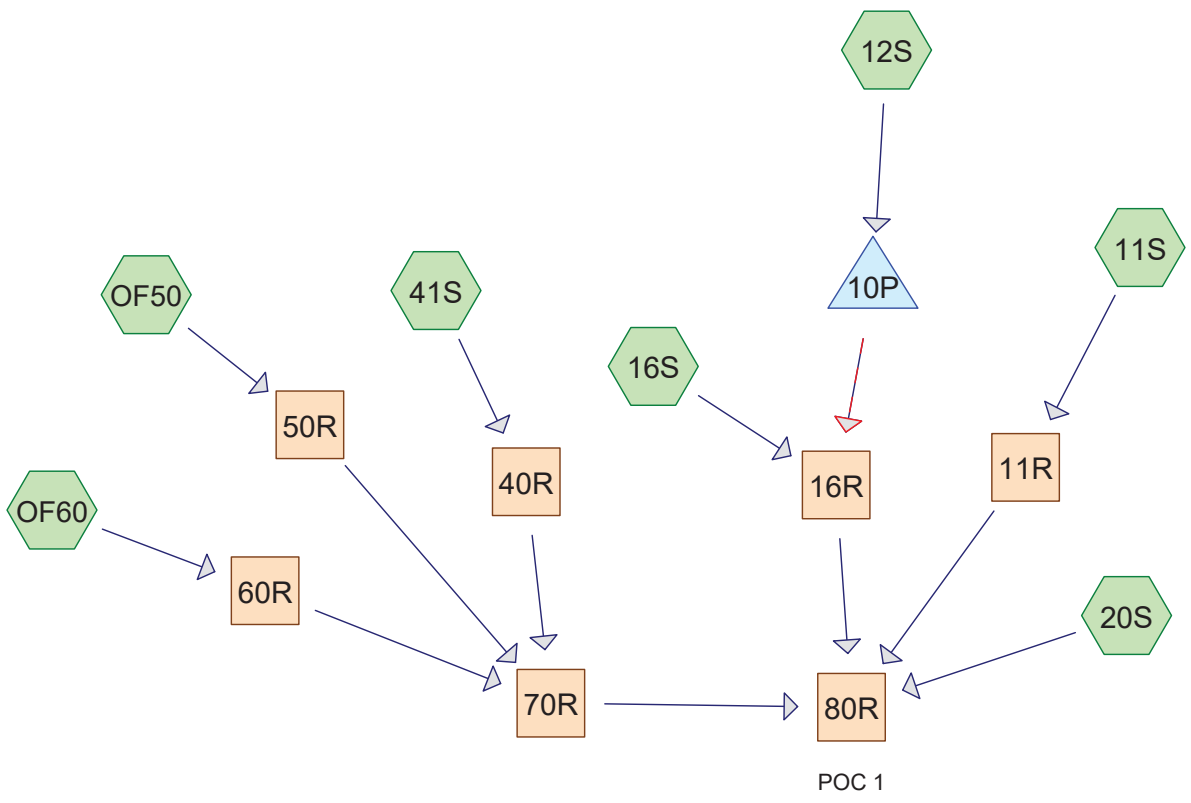
10.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 444.0' Slope= 0.1194 '/'
Inlet Invert= 492.00', Outlet Invert= 439.00'



Summary for Reach 80R: POC 1

Inflow Area = 7,180,957 sf, 0.88% Impervious, Inflow Depth = 0.28" for 10-YR event
Inflow = 15.81 cfs @ 12.18 hrs, Volume= 166,052 cf
Outflow = 15.81 cfs @ 12.18 hrs, Volume= 166,052 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs



Routing Diagram for 21093_HydroCAD_Post
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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
15,109	39	>75% Grass cover, Good, HSG A (12S)
527,909	96	Gravel surface, HSG A (11S, 20S, OF50)
28,989	39	Pasture/grassland/range, Good, HSG A (16S)
125,840	83	Paved roads w/open ditches, 50% imp, HSG A (OF50, OF60)
124,272	98	Prop. Impervious, HSG A (12S)
37,022	98	Prop. Impervious, HSG C (12S)
4,832,728	30	Woods, Good, HSG A (11S, 20S, 41S, OF50, OF60)
1,489,088	70	Woods, Good, HSG C (11S, 41S, OF50, OF60)
7,180,957	46	TOTAL AREA

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Page 3

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
5,654,847	HSG A	11S, 12S, 16S, 20S, 41S, OF50, OF60
0	HSG B	
1,526,110	HSG C	11S, 12S, 41S, OF50, OF60
0	HSG D	
0	Other	
7,180,957		TOTAL AREA

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Type III 24-hr 2-YR Rainfall=2.80"

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Page 1

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 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 11S: Runoff Area=244,746 sf 0.00% Impervious Runoff Depth=0.53"
 Flow Length=882' Tc=7.3 min CN=68 Runoff=2.58 cfs 10,735 cf

Subcatchment 12S: Runoff Area=176,403 sf 91.43% Impervious Runoff Depth=2.06"
 Tc=5.0 min CN=93 Runoff=9.91 cfs 30,331 cf

Subcatchment 16S: Runoff Area=28,989 sf 0.00% Impervious Runoff Depth=0.00"
 Tc=5.0 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment 20S: Runoff Area=495,197 sf 0.00% Impervious Runoff Depth=0.11"
 Flow Length=1,239' Tc=11.8 min CN=53 Runoff=0.18 cfs 4,394 cf

Subcatchment 41S: Runoff Area=78,124 sf 0.00% Impervious Runoff Depth=0.00"
 Flow Length=497' Tc=20.6 min CN=31 Runoff=0.00 cfs 0 cf

Subcatchment OF50: Runoff Area=2,641,044 sf 1.19% Impervious Runoff Depth=0.00"
 Flow Length=4,199' Tc=68.1 min CN=38 Runoff=0.00 cfs 0 cf

Subcatchment OF60: Runoff Area=3,516,454 sf 0.89% Impervious Runoff Depth=0.03"
 Flow Length=4,048' Tc=74.1 min CN=47 Runoff=0.24 cfs 7,354 cf

Reach 11R: Avg. Flow Depth=0.57' Max Vel=3.44 fps Inflow=2.58 cfs 10,735 cf
 24.0" Round Pipe n=0.012 L=292.0' S=0.0034 '/ Capacity=14.34 cfs Outflow=2.52 cfs 10,735 cf

Reach 16R: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0 cf
 n=0.030 L=331.0' S=0.1601 '/ Capacity=720.11 cfs Outflow=0.00 cfs 0 cf

Reach 40R: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0 cf
 24.0" Round Pipe n=0.012 L=82.0' S=0.0245 '/ Capacity=38.37 cfs Outflow=0.00 cfs 0 cf

Reach 50R: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0 cf
 15.0" Round Pipe n=0.012 L=64.0' S=0.0267 '/ Capacity=11.44 cfs Outflow=0.00 cfs 0 cf

Reach 60R: Avg. Flow Depth=0.14' Max Vel=2.41 fps Inflow=0.24 cfs 7,354 cf
 24.0" Round Pipe n=0.012 L=132.0' S=0.0092 '/ Capacity=23.56 cfs Outflow=0.24 cfs 7,354 cf

Reach 70R: Avg. Flow Depth=0.02' Max Vel=1.26 fps Inflow=0.24 cfs 7,354 cf
 n=0.030 L=444.0' S=0.1194 '/ Capacity=621.76 cfs Outflow=0.23 cfs 7,354 cf

Reach 80R: POC 1 Inflow=2.52 cfs 22,483 cf
 Outflow=2.52 cfs 22,483 cf

Pond 10P: Peak Elev=497.31' Storage=15,404 cf Inflow=9.91 cfs 30,331 cf
 Discarded=0.60 cfs 30,331 cf Primary=0.00 cfs 0 cf Outflow=0.60 cfs 30,331 cf

Total Runoff Area = 7,180,957 sf Runoff Volume = 52,814 cf Average Runoff Depth = 0.09"
96.88% Pervious = 6,956,743 sf 3.12% Impervious = 224,214 sf

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Type III 24-hr 10-YR Rainfall=4.17"

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Page 1

Summary for Subcatchment 11S:

Runoff = 7.78 cfs @ 12.11 hrs, Volume= 26,797 cf, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.17"

Area (sf)	CN	Description
16,717	70	Woods, Good, HSG C
132,213	96	Gravel surface, HSG A
95,816	30	Woods, Good, HSG A
244,746	68	Weighted Average
244,746		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0300	1.51		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.80"
1.3	230	0.0220	3.01		Shallow Concentrated Flow, Paved Kv= 20.3 fps
4.9	552	0.1400	1.87		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
7.3	882	Total			

Summary for Subcatchment 12S:

Runoff = 15.85 cfs @ 12.07 hrs, Volume= 49,768 cf, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.17"

Area (sf)	CN	Description
15,109	39	>75% Grass cover, Good, HSG A
* 37,022	98	Prop. Impervious, HSG C
* 124,272	98	Prop. Impervious, HSG A
176,403	93	Weighted Average
15,109		8.57% Pervious Area
161,294		91.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Summary for Subcatchment 16S:

Runoff = 0.01 cfs @ 15.19 hrs, Volume= 157 cf, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.17"

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Type III 24-hr 10-YR Rainfall=4.17"

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Page 2

Area (sf)	CN	Description
28,989	39	Pasture/grassland/range, Good, HSG A
28,989		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Summary for Subcatchment 20S:

Runoff = 3.11 cfs @ 12.26 hrs, Volume= 21,039 cf, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.17"

Area (sf)	CN	Description
173,633	96	Gravel surface, HSG A
321,564	30	Woods, Good, HSG A
495,197	53	Weighted Average
495,197		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0300	1.51		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.80"
1.8	285	0.0175	2.69		Shallow Concentrated Flow, Paved Kv= 20.3 fps
8.9	854	0.1030	1.60		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.8	1,239	Total			

Summary for Subcatchment 41S:

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= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.17"

Area (sf)	CN	Description
2,907	70	Woods, Good, HSG C
75,217	30	Woods, Good, HSG A
78,124	31	Weighted Average
78,124		100.00% Pervious Area

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Type III 24-hr 10-YR Rainfall=4.17"

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Page 3

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.1700	0.17		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.80"
10.8	397	0.0151	0.61		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
20.6	497	Total			

Summary for Subcatchment OF50:

Runoff = 0.34 cfs @ 16.87 hrs, Volume= 10,509 cf, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.17"

Area (sf)	CN	Description
62,920	83	Paved roads w/open ditches, 50% imp, HSG A
222,063	96	Gravel surface, HSG A
52,935	70	Woods, Good, HSG C
2,303,126	30	Woods, Good, HSG A
2,641,044	38	Weighted Average
2,609,584		98.81% Pervious Area
31,460		1.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0500	1.86		Sheet Flow, Smooth surfaces n= 0.011 P2= 2.80"
16.4	1,344	0.0744	1.36		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
44.0	951	0.0052	0.36		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
6.8	1,804	0.0061	4.42	48.65	Channel Flow, Area= 11.0 sf Perim= 9.0' r= 1.22' n= 0.030 Earth, grassed & winding
68.1	4,199	Total			

Summary for Subcatchment OF60:

Runoff = 4.00 cfs @ 13.58 hrs, Volume= 81,438 cf, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.17"

Area (sf)	CN	Description
62,920	83	Paved roads w/open ditches, 50% imp, HSG A
2,037,005	30	Woods, Good, HSG A
1,416,529	70	Woods, Good, HSG C
3,516,454	47	Weighted Average
3,484,994		99.11% Pervious Area
31,460		0.89% Impervious Area

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Type III 24-hr 10-YR Rainfall=4.17"

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Page 4

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	100	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.80"
23.6	2,053	0.0840	1.45		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
23.5	630	0.0080	0.45		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
4.0	1,265	0.0087	5.28	58.10	Channel Flow, Area= 11.0 sf Perim= 9.0' r= 1.22' n= 0.030 Earth, grassed & winding
74.1	4,048	Total			

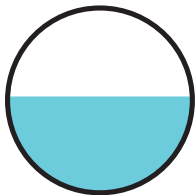
Summary for Reach 11R:

Inflow Area = 244,746 sf, 0.00% Impervious, Inflow Depth = 1.31" for 10-YR event
 Inflow = 7.78 cfs @ 12.11 hrs, Volume= 26,797 cf
 Outflow = 7.68 cfs @ 12.14 hrs, Volume= 26,797 cf, Atten= 1%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Max. Velocity= 4.64 fps, Min. Travel Time= 1.0 min
 Avg. Velocity = 1.81 fps, Avg. Travel Time= 2.7 min

Peak Storage= 483 cf @ 12.13 hrs
 Average Depth at Peak Storage= 1.04'
 Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 14.34 cfs

24.0" Round Pipe
 n= 0.012 Corrugated PP, smooth interior
 Length= 292.0' Slope= 0.0034 '/'
 Inlet Invert= 496.00', Outlet Invert= 495.00'



Summary for Reach 16R:

Inflow Area = 205,392 sf, 78.53% Impervious, Inflow Depth = 0.54" for 10-YR event
 Inflow = 3.06 cfs @ 12.45 hrs, Volume= 9,302 cf
 Outflow = 3.04 cfs @ 12.49 hrs, Volume= 9,302 cf, Atten= 1%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Max. Velocity= 3.68 fps, Min. Travel Time= 1.5 min
 Avg. Velocity = 1.58 fps, Avg. Travel Time= 3.5 min

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Type III 24-hr 10-YR Rainfall=4.17"

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Page 5

Peak Storage= 273 cf @ 12.47 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 720.11 cfs

10.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 331.0' Slope= 0.1601 '/'
Inlet Invert= 492.00', Outlet Invert= 439.00'



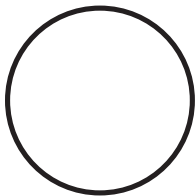
Summary for Reach 40R:

Inflow Area = 78,124 sf, 0.00% Impervious, Inflow Depth = 0.00" for 10-YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 38.37 cfs

24.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 82.0' Slope= 0.0245 '/'
Inlet Invert= 495.26', Outlet Invert= 493.25'



Summary for Reach 50R:

Inflow Area = 2,641,044 sf, 1.19% Impervious, Inflow Depth = 0.05" for 10-YR event
Inflow = 0.34 cfs @ 16.87 hrs, Volume= 10,509 cf
Outflow = 0.34 cfs @ 16.88 hrs, Volume= 10,509 cf, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.16 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.27 fps, Avg. Travel Time= 0.3 min

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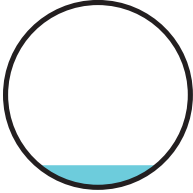
Type III 24-hr 10-YR Rainfall=4.17"

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Page 6

Peak Storage= 5 cf @ 16.88 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 11.44 cfs

15.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 64.0' Slope= 0.0267 '/'
Inlet Invert= 497.05', Outlet Invert= 495.34'



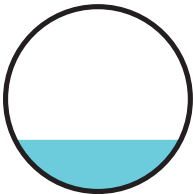
Summary for Reach 60R:

Inflow Area = 3,516,454 sf, 0.89% Impervious, Inflow Depth = 0.28" for 10-YR event
Inflow = 4.00 cfs @ 13.58 hrs, Volume= 81,438 cf
Outflow = 4.00 cfs @ 13.58 hrs, Volume= 81,438 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.59 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 3.66 fps, Avg. Travel Time= 0.6 min

Peak Storage= 94 cf @ 13.58 hrs
Average Depth at Peak Storage= 0.56'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 23.56 cfs

24.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 132.0' Slope= 0.0092 '/'
Inlet Invert= 493.53', Outlet Invert= 492.31'



Summary for Reach 70R:

Inflow Area = 6,235,622 sf, 1.01% Impervious, Inflow Depth = 0.18" for 10-YR event
Inflow = 4.00 cfs @ 13.58 hrs, Volume= 91,947 cf
Outflow = 4.00 cfs @ 13.62 hrs, Volume= 91,947 cf, Atten= 0%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.75 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 2.47 fps, Avg. Travel Time= 3.0 min

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Type III 24-hr 10-YR Rainfall=4.17"

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Page 7

Peak Storage= 474 cf @ 13.59 hrs
 Average Depth at Peak Storage= 0.10'
 Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 621.76 cfs

10.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
 Side Slope Z-value= 2.0 '/' Top Width= 18.00'
 Length= 444.0' Slope= 0.1194 '/'
 Inlet Invert= 492.00', Outlet Invert= 439.00'



Summary for Reach 80R: POC 1

Inflow Area = 7,180,957 sf, 3.12% Impervious, Inflow Depth = 0.25" for 10-YR event
 Inflow = 10.09 cfs @ 12.16 hrs, Volume= 149,086 cf
 Outflow = 10.09 cfs @ 12.16 hrs, Volume= 149,086 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Pond 10P:

Inflow Area = 176,403 sf, 91.43% Impervious, Inflow Depth = 3.39" for 10-YR event
 Inflow = 15.85 cfs @ 12.07 hrs, Volume= 49,768 cf
 Outflow = 3.76 cfs @ 12.45 hrs, Volume= 49,768 cf, Atten= 76%, Lag= 22.7 min
 Discarded = 0.70 cfs @ 12.45 hrs, Volume= 40,622 cf
 Primary = 3.06 cfs @ 12.45 hrs, Volume= 9,145 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
 Peak Elev= 498.13' @ 12.45 hrs Surf.Area= 10,109 sf Storage= 23,161 cf

Plug-Flow detention time= 303.9 min calculated for 49,757 cf (100% of inflow)
 Center-of-Mass det. time= 303.9 min (1,086.9 - 783.0)

Volume	Invert	Avail.Storage	Storage Description
#1	495.00'	3,316 cf	Sed. Forebay (Prismatic) Listed below (Recalc) -Impervious
#2	495.00'	41,820 cf	Infiltration Basin (Prismatic) Listed below (Recalc)
		45,136 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
495.00	1,145	0	0
497.00	2,171	3,316	3,316

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Type III 24-hr 10-YR Rainfall=4.17"

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Page 8

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
495.00	3,533	0	0
496.00	4,734	4,134	4,134
497.00	6,022	5,378	9,512
497.01	8,159	71	9,582
498.00	9,872	8,925	18,508
499.00	11,642	10,757	29,265
500.00	13,469	12,556	41,820

Device	Routing	Invert	Outlet Devices
#1	Discarded	495.00'	3.000 in/hr Exfiltration over Surface area
#2	Primary	494.00'	15.0" Round Culvert L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 494.00' / 493.80' S= 0.0067 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#3	Device 2	497.40'	3.0" W x 7.2" H Vert. Orifice/Grate C= 0.600
#4	Device 2	498.00'	48.0" x 48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.70 cfs @ 12.45 hrs HW=498.13' (Free Discharge)
 ↳ **1=Exfiltration** (Exfiltration Controls 0.70 cfs)

Primary OutFlow Max=3.03 cfs @ 12.45 hrs HW=498.13' (Free Discharge)
 ↳ **2=Culvert** (Passes 3.03 cfs of 11.07 cfs potential flow)
 ↳ **3=Orifice/Grate** (Orifice Controls 0.47 cfs @ 3.10 fps)
 ↳ **4=Orifice/Grate** (Weir Controls 2.56 cfs @ 1.20 fps)

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Type III 24-hr 10-YR Rainfall=4.17"

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 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 11S: Runoff Area=244,746 sf 0.00% Impervious Runoff Depth=1.31"
 Flow Length=882' Tc=7.3 min CN=68 Runoff=7.78 cfs 26,797 cf

Subcatchment 12S: Runoff Area=176,403 sf 91.43% Impervious Runoff Depth=3.39"
 Tc=5.0 min CN=93 Runoff=15.85 cfs 49,768 cf

Subcatchment 16S: Runoff Area=28,989 sf 0.00% Impervious Runoff Depth=0.07"
 Tc=5.0 min CN=39 Runoff=0.01 cfs 157 cf

Subcatchment 20S: Runoff Area=495,197 sf 0.00% Impervious Runoff Depth=0.51"
 Flow Length=1,239' Tc=11.8 min CN=53 Runoff=3.11 cfs 21,039 cf

Subcatchment 41S: Runoff Area=78,124 sf 0.00% Impervious Runoff Depth=0.00"
 Flow Length=497' Tc=20.6 min CN=31 Runoff=0.00 cfs 0 cf

Subcatchment OF50: Runoff Area=2,641,044 sf 1.19% Impervious Runoff Depth=0.05"
 Flow Length=4,199' Tc=68.1 min CN=38 Runoff=0.34 cfs 10,509 cf

Subcatchment OF60: Runoff Area=3,516,454 sf 0.89% Impervious Runoff Depth=0.28"
 Flow Length=4,048' Tc=74.1 min CN=47 Runoff=4.00 cfs 81,438 cf

Reach 11R: Avg. Flow Depth=1.04' Max Vel=4.64 fps Inflow=7.78 cfs 26,797 cf
 24.0" Round Pipe n=0.012 L=292.0' S=0.0034 '/' Capacity=14.34 cfs Outflow=7.68 cfs 26,797 cf

Reach 16R: Avg. Flow Depth=0.08' Max Vel=3.68 fps Inflow=3.06 cfs 9,302 cf
 n=0.030 L=331.0' S=0.1601 '/' Capacity=720.11 cfs Outflow=3.04 cfs 9,302 cf

Reach 40R: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0 cf
 24.0" Round Pipe n=0.012 L=82.0' S=0.0245 '/' Capacity=38.37 cfs Outflow=0.00 cfs 0 cf

Reach 50R: Avg. Flow Depth=0.15' Max Vel=4.16 fps Inflow=0.34 cfs 10,509 cf
 15.0" Round Pipe n=0.012 L=64.0' S=0.0267 '/' Capacity=11.44 cfs Outflow=0.34 cfs 10,509 cf

Reach 60R: Avg. Flow Depth=0.56' Max Vel=5.59 fps Inflow=4.00 cfs 81,438 cf
 24.0" Round Pipe n=0.012 L=132.0' S=0.0092 '/' Capacity=23.56 cfs Outflow=4.00 cfs 81,438 cf

Reach 70R: Avg. Flow Depth=0.10' Max Vel=3.75 fps Inflow=4.00 cfs 91,947 cf
 n=0.030 L=444.0' S=0.1194 '/' Capacity=621.76 cfs Outflow=4.00 cfs 91,947 cf

Reach 80R: POC 1 Inflow=10.09 cfs 149,086 cf
 Outflow=10.09 cfs 149,086 cf

Pond 10P: Peak Elev=498.13' Storage=23,161 cf Inflow=15.85 cfs 49,768 cf
 Discarded=0.70 cfs 40,622 cf Primary=3.06 cfs 9,145 cf Outflow=3.76 cfs 49,768 cf

Total Runoff Area = 7,180,957 sf Runoff Volume = 189,708 cf Average Runoff Depth = 0.32"
96.88% Pervious = 6,956,743 sf 3.12% Impervious = 224,214 sf

21093_HydroCAD_Post

Type III 24-hr 50-YR Rainfall=6.22"

Prepared by Northpoint Engineering, LLC

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Page 3

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 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 11S: Runoff Area=244,746 sf 0.00% Impervious Runoff Depth=2.79"
 Flow Length=882' Tc=7.3 min CN=68 Runoff=17.42 cfs 56,921 cf

Subcatchment 12S: Runoff Area=176,403 sf 91.43% Impervious Runoff Depth=5.40"
 Tc=5.0 min CN=93 Runoff=24.61 cfs 79,379 cf

Subcatchment 16S: Runoff Area=28,989 sf 0.00% Impervious Runoff Depth=0.51"
 Tc=5.0 min CN=39 Runoff=0.15 cfs 1,233 cf

Subcatchment 20S: Runoff Area=495,197 sf 0.00% Impervious Runoff Depth=1.48"
 Flow Length=1,239' Tc=11.8 min CN=53 Runoff=14.09 cfs 61,277 cf

Subcatchment 41S: Runoff Area=78,124 sf 0.00% Impervious Runoff Depth=0.13"
 Flow Length=497' Tc=20.6 min CN=31 Runoff=0.03 cfs 847 cf

Subcatchment OF50: Runoff Area=2,641,044 sf 1.19% Impervious Runoff Depth=0.45"
 Flow Length=4,199' Tc=68.1 min CN=38 Runoff=5.41 cfs 99,841 cf

Subcatchment OF60: Runoff Area=3,516,454 sf 0.89% Impervious Runoff Depth=1.03"
 Flow Length=4,048' Tc=74.1 min CN=47 Runoff=25.13 cfs 302,217 cf

Reach 11R: Avg. Flow Depth=2.00' Max Vel=5.20 fps Inflow=17.42 cfs 56,921 cf
 24.0" Round Pipe n=0.012 L=292.0' S=0.0034 '/' Capacity=14.34 cfs Outflow=15.16 cfs 56,921 cf

Reach 16R: Avg. Flow Depth=0.18' Max Vel=6.24 fps Inflow=11.93 cfs 33,453 cf
 n=0.030 L=331.0' S=0.1601 '/' Capacity=720.11 cfs Outflow=11.93 cfs 33,453 cf

Reach 40R: Avg. Flow Depth=0.04' Max Vel=1.84 fps Inflow=0.03 cfs 847 cf
 24.0" Round Pipe n=0.012 L=82.0' S=0.0245 '/' Capacity=38.37 cfs Outflow=0.03 cfs 847 cf

Reach 50R: Avg. Flow Depth=0.60' Max Vel=9.19 fps Inflow=5.41 cfs 99,841 cf
 15.0" Round Pipe n=0.012 L=64.0' S=0.0267 '/' Capacity=11.44 cfs Outflow=5.41 cfs 99,841 cf

Reach 60R: Avg. Flow Depth=1.80' Max Vel=8.55 fps Inflow=25.13 cfs 302,217 cf
 24.0" Round Pipe n=0.012 L=132.0' S=0.0092 '/' Capacity=23.56 cfs Outflow=25.12 cfs 302,217 cf

Reach 70R: Avg. Flow Depth=0.35' Max Vel=8.09 fps Inflow=30.39 cfs 402,905 cf
 n=0.030 L=444.0' S=0.1194 '/' Capacity=621.76 cfs Outflow=30.39 cfs 402,905 cf

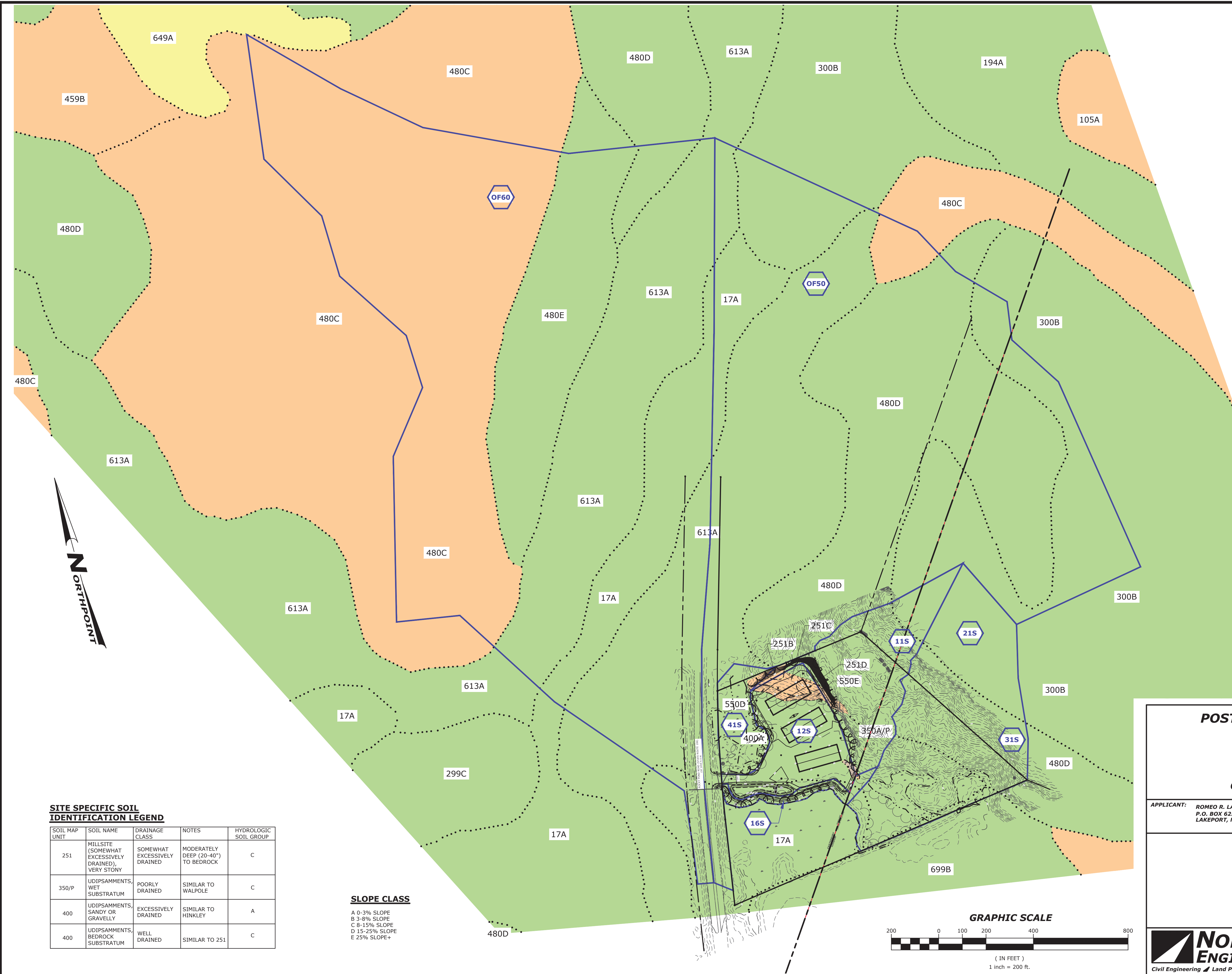
Reach 80R: POC 1 Inflow=40.53 cfs 554,557 cf
 Outflow=40.53 cfs 554,557 cf





Pond 10P: Peak Elev=498.61' Storage=28,206 cf Inflow=24.61 cfs 79,379 cf
 Discarded=0.76 cfs 47,158 cf Primary=11.80 cfs 32,221 cf Outflow=12.56 cfs 79,379 cf

Total Runoff Area = 7,180,957 sf Runoff Volume = 601,715 cf Average Runoff Depth = 1.01"
96.88% Pervious = 6,956,743 sf 3.12% Impervious = 224,214 sf

VIII. Soils Area Exhibits

- Pre-Developed Soils Area Exhibit
- Post-Developed Soils Area Exhibit



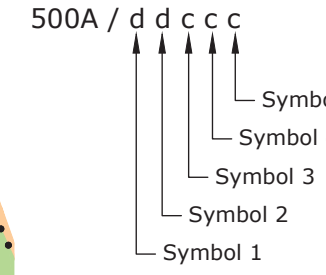
POST-SOILS DRAINAGE LEGEND:
 THIS LEGEND REFLECTS THE HYDROCAD MODEL USED FOR DRAINAGE CALCULATIONS.
 MODELED AS PROPOSED SUBCATCHMENT
 SUBCATCHMENT BOUNDARIES
 SITE SPECIFIC SOIL BOUNDARY & TYPE
 NRCS BOUNDARY & TYPE

HYDROLOGIC SOIL GROUP LEGEND:
 HSG A
 HSG B
 HSG C
 HSG D

NRCS SOILS LEGEND:
 Pr = PITS, GRAVEL HSG B
 Sm = SACO VARIANT SILT LOAM
 WdB = WINDSOR LOAMY SAND, 3 TO 8% SLOPES HSG A
 WdD = WINDSOR LOAMY SAND, 15 TO 35% SLOPES HSG A

MAP SYMBOL DENOMINATORS FOR DISTURBED SITES

SYMBOL	Drainage Class	Comments
SYMBOL 1	d	Moderately Well drained
SYMBOL 2	d	Glaciolacustrine very fine sand and silt deposits (glacial lake)
SYMBOL 3	c	Mineral restrictive layer less than 40 inches below the surface
SYMBOL 4	c	Low - due to very fine textured soils with restricted downward movement of soils at moderate to shallow depths.
SYMBOL 5	c	Group C



NOTES

- NRCS SOIL INFORMATION IS SHOWN FOR THE USDA-NRCS WEB SOIL SURVEY.
- SITE SPECIFIC SOILS INFORMATION IS SHOWN PER SITE SPECIFIC SOILS SURVEY REPORT FOR THIS PROJECT.
- THIS MAP PRODUCT IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOIL SURVEY. IT IS A SPECIAL PURPOSE PRODUCT, INTENDED FOR USE IN THE DESIGN OF A COMMERCIAL DEVELOPMENT AND APPLICATION TO NHDES. IT WAS PRODUCED BY A PROFESSIONAL SOIL SCIENTIST AND IS NOT A PRODUCT OF THE USDA NATURAL RESOURCES CONSERVATION SERVICE. THERE IS A REPORT THAT ACCOMPANIES THIS MAP.
- THIS MAP WAS PREPARED BY RANDALL SHUEY, NH CERTIFIED SOIL SCIENTIST #74, OF NORTHPOINT ENGINEERING.
- THE SITE-SPECIFIC MAPPING IS LIMITED TO THE PROPOSED AREA OF DEVELOPMENT AND DOES NOT INCLUDE THE ENTIRE LOT.
- WETLANDS WERE DELINEATED FOR THE ENTIRE PROPERTY.
- WETLANDS WERE DELINEATED BY EARLE CHASE, NH CERTIFIED WETLAND SCIENTIST AND RANDALL SHUEY, NH CERTIFIED WETLAND SCIENTIST OF NORTHPOINT ENGINEERING, LLC IN THE FALL OF 2021 UTILIZING THE FOLLOWING STANDARDS:
 - A. THE CORPS OF ENGINEERS FEDERAL MANUAL FOR IDENTIFYING AND DELINEATING JURISDICTIONAL WETLANDS.
 - B. U.S. ARMY CORPS OF ENGINEERS, 2016. REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: NORTH CENTRAL AND NORTHEAST REGION (VERSION 2.0), ED. J. S. WAKELEY, R. W. LICHVAR, C. V. NOBLE, AND J. F. BERKOWITZ. ERD/EL TR-12-1 VICKSBURG, MS: U.S. ARMY ENGINEER RESEARCH AND DEVELOPMENT CENTER.
 - C. FIELD INDICATORS FOR IDENTIFYING HYDRIC SOILS IN NEW ENGLAND, VERSION 4, MAY 2017 AS PUBLISHED BY THE NEW ENGLAND INTERSTATE WATER POLLUTION CONTROL COMMISSION AND/OR THE CURRENT VERSION OF THE FIELD INDICATORS OF HYDRIC SOILS IN THE UNITED STATES, AS PUBLISHED BY THE USDA, NRCS, AS APPROPRIATE.
 - D. LICHVAR, R.W., D.L. BANKS, W.N. KIRCHNER, AND N.C. MELVIN. 2016. THE NATIONAL WETLAND PLANT LIST: 2016 WETLAND RATINGS. PHYTONEURON 2016-30: 1-17. PUBLISHED 28 APRIL 2016. ISSN 2153 733X.

SITE SPECIFIC SOIL IDENTIFICATION LEGEND

SOIL MAP UNIT	SOIL NAME	DRAINAGE CLASS	NOTES	HYDROLOGIC SOIL GROUP
251	MILLSITE (SOMEWHAT EXCESSIVELY DRAINED), VERY STONY	SOMEWHAT EXCESSIVELY DRAINED	MODERATELY DEEP (20-40") TO BEDROCK	C
350/P	UDIPSAMMENTS, WET SUBSTRATUM	POORLY DRAINED	SIMILAR TO WALPOLE	C
400	UDIPSAMMENTS, SANDY OR GRAVELLY	EXCESSIVELY DRAINED	SIMILAR TO HINKLEY	A
400	UDIPSAMMENTS, BEDROCK SUBSTRATUM	WELL DRAINED	SIMILAR TO 251	C

SLOPE CLASS

- A 0-3% SLOPE
- B 3-8% SLOPE
- C 8-15% SLOPE
- D 15-25% SLOPE
- E 25% SLOPE+

POST-DEVELOPED SOILS EXHIBIT

PREPARED FOR:

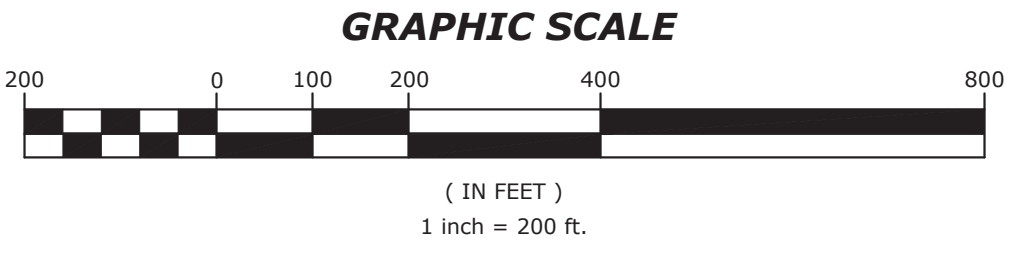
**STORAGE FACILITY
 MAP 226 LOT 3 (NH RTE. 106)
 CANTERBURY, NEW HAMPSHIRE**

APPLICANT: ROMEO R. LACASSE
 P.O. BOX 6252
 LAKEPORT, NH 03247

OWNER: 106 PARKING, LLC.
 340 GORBORO ROAD
 EPSOM, NH 03234

REVISIONS:

NO.	DATE	DESCRIPTION

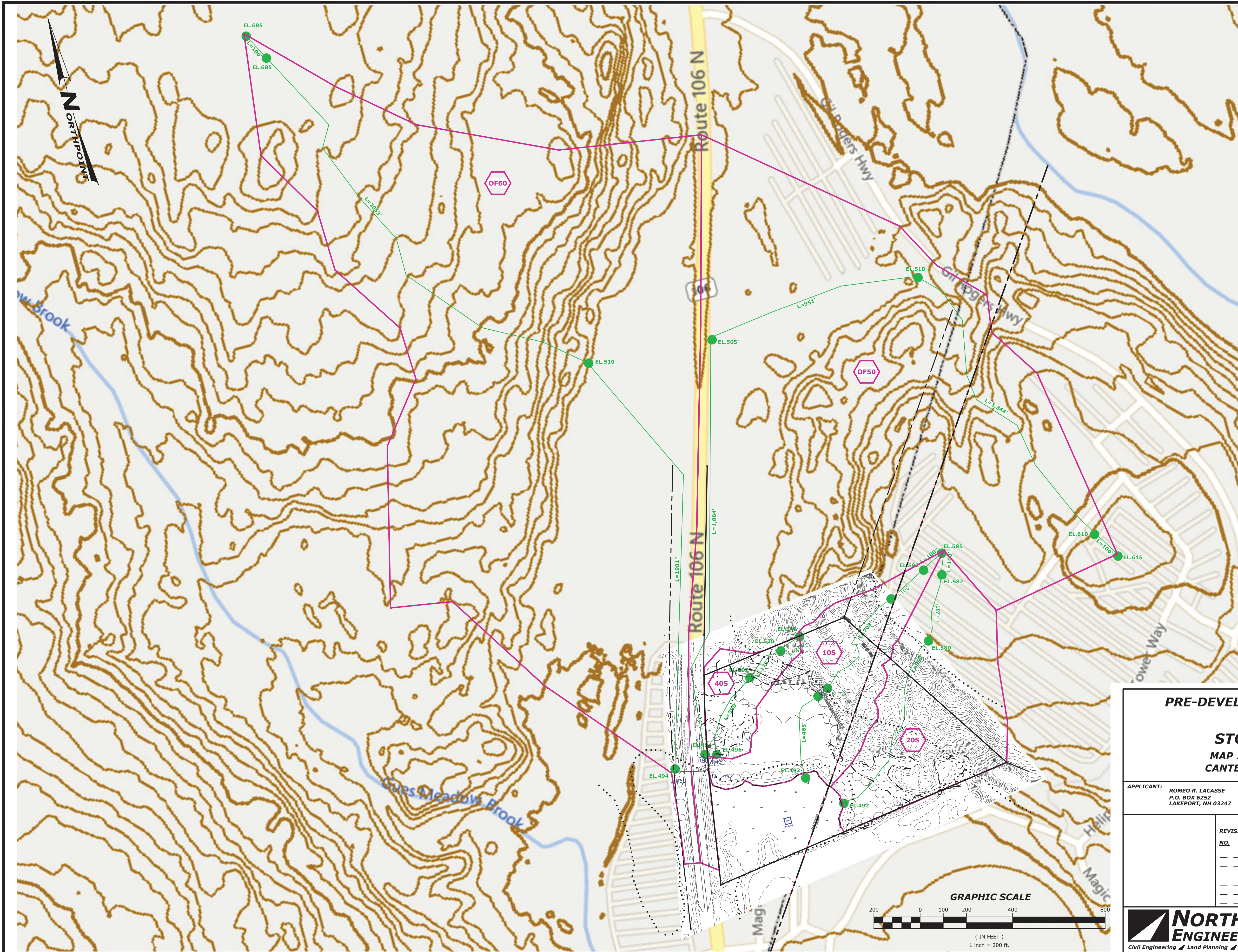


NORTHPOINT ENGINEERING, LLC
 Civil Engineering Land Planning Construction Services
 119 Storrs St, Ste 201
 Concord, NH 03301
 Tel 603-226-1166
 Fax 603-226-1160
 www.northpointeng.com
DATE: MAY 2022
PROJ.: 21093
SCALE: 1"=200'
SHEET: 1 OF 1

FILE: G:_projects\21093\Map\21093_HydroCAD.dwg BY: jmm Date: 23 May 2022 - 1:26pm

IX. Drainage Area Exhibits

- Pre-Developed Drainage Area Exhibit
- Post-Developed Drainage Area Exhibit



PRE-DRAINAGE LEGEND:
 THIS LEGEND REFLECTS THE HYDROCAD MODEL USED FOR DRAINAGE CALCULATIONS.

- 1S MODELED AS EXISTING SUBCATCHMENT
- SUBCATCHMENT BOUNDARIES
- EL — EL REACH PATH
- EL — EL TIME OF CONCENTRATION
- IR REACH
- IP POND

FILE: C:_projects\21093\Map\21093A_HydroCAD.dwg BY: JLM DATE: 23 May 2022 - 1:22pm

PRE-DEVELOPED DRAINAGE EXHIBIT

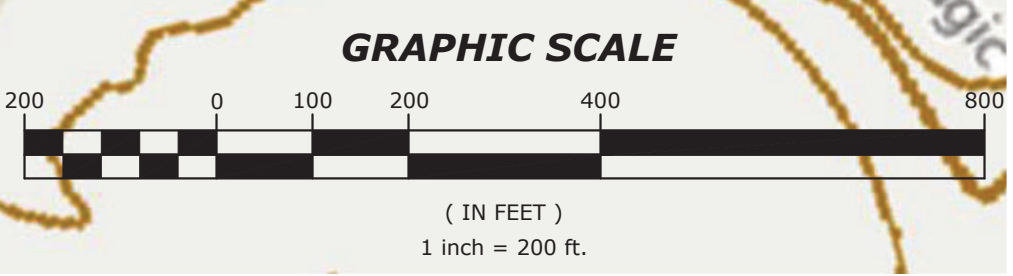
PREPARED FOR:

STORAGE FACILITY

MAP 226 LOT 3 (NH RTE. 106)

CANTERBURY, NEW HAMPSHIRE

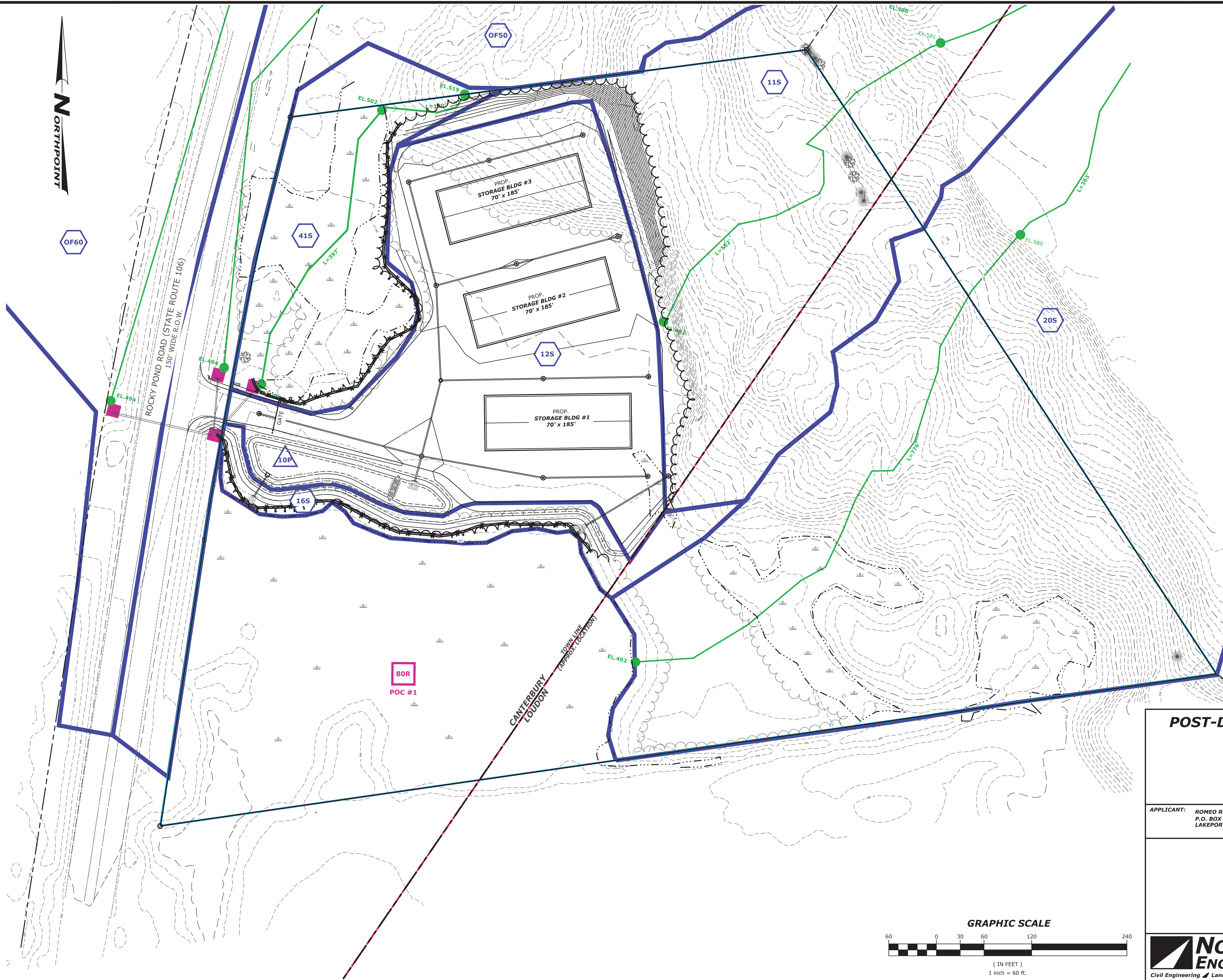
APPLICANT: ROMEO R. LACASSE P.O. BOX 6252 LAKEPORT, NH 03247	OWNER: 106 PARKING, LLC. 340 GOBORO ROAD EPSOM, NH 03234																		
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">NO.</th> <th style="width: 15%;">DATE</th> <th style="width: 80%;">DESCRIPTION</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table>		NO.	DATE	DESCRIPTION															
NO.	DATE	DESCRIPTION																	
<div style="display: flex; justify-content: space-between;"> <div style="font-weight: bold; font-size: 1.2em;">NORTHPOINT</div> <div style="font-size: 0.8em;"> 119 Storrs St, Ste 201 Concord, NH 03301 Tel 603-226-1166 Fax 603-226-1160 www.northpointeng.com </div> <div style="font-size: 0.8em;"> DATE: MAY 2022 PROJ.: 21093 SCALE: 1"=200' SHEET: 1 OF 2 </div> </div>																			





POST-DRAINAGE LEGEND:
 THIS LEGEND REFLECTS THE HYDROCAD MODEL USED FOR DRAINAGE CALCULATIONS.

- 1S MODELED AS PROPOSED SUBCATCHMENT
- SUBCATCHMENT BOUNDARIES
- EL. R1 EL. REACH PATH
- EL. L=XX' EL. TIME OF CONCENTRATION
- 1R REACH
- 1P POND



80R
 POC #1

POST-DEVELOPED DRAINAGE EXHIBIT

PREPARED FOR:

STORAGE FACILITY
 MAP 226 LOT 3 (NH RTE. 106)
 CANTERBURY, NEW HAMPSHIRE

APPLICANT: ROMEO R. LACASSE P.O. BOX 6252 LAKEPORT, NH 03247	OWNER: 106 PARKING, LLC. 340 GOBORO ROAD EPSOM, NH 03234																		
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%; padding: 2px;">NO.</th> <th style="width: 15%; padding: 2px;">DATE</th> <th style="padding: 2px;">DESCRIPTION</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table>		NO.	DATE	DESCRIPTION															
NO.	DATE	DESCRIPTION																	

GRAPHIC SCALE

(IN FEET)
 1 inch = 60 ft.

NORTHPOINT ENGINEERING, LLC
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DATE: MAY 2022
 PROJ.: 21093
 SCALE: 1"=60'
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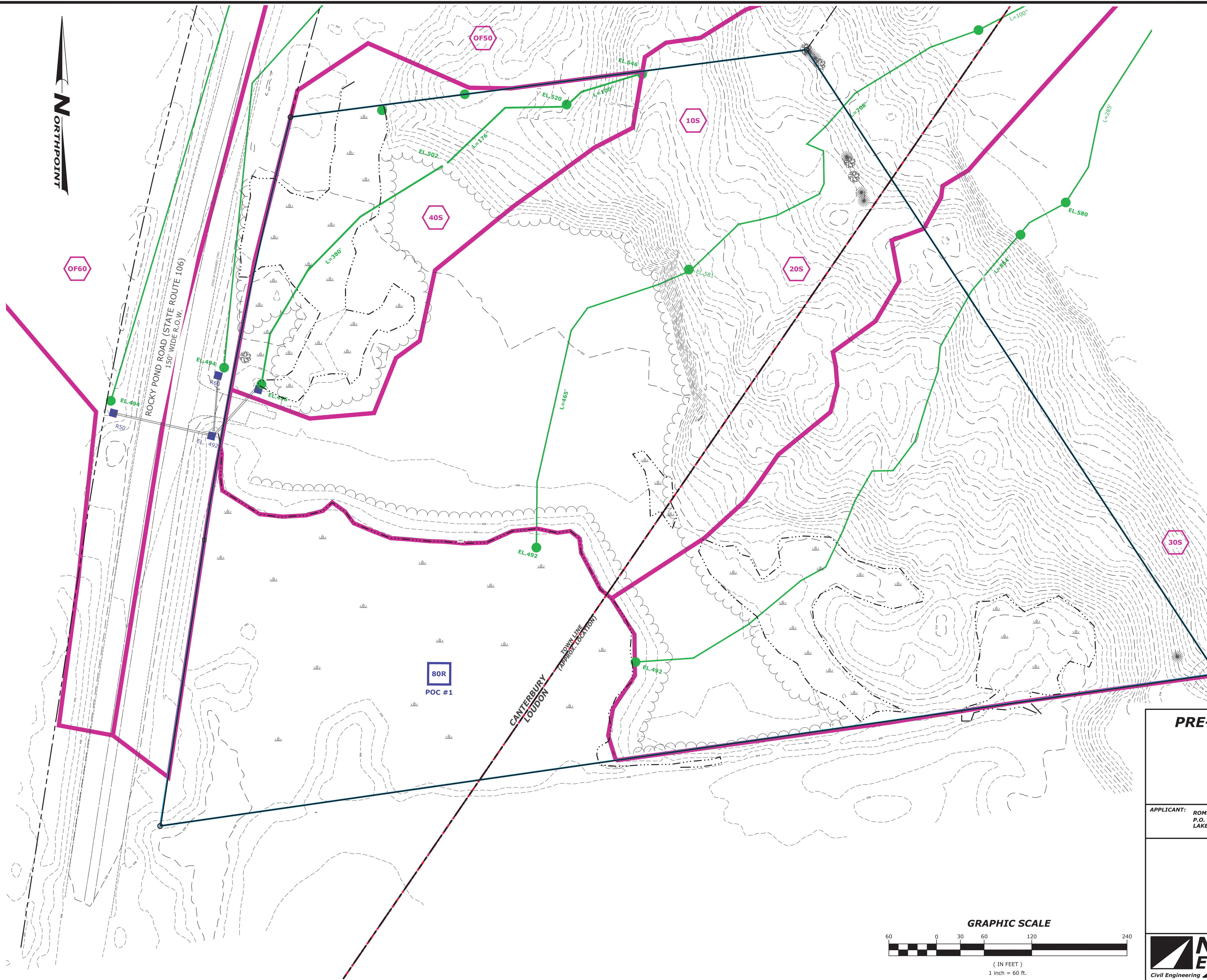
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PRE-DRAINAGE LEGEND:

THIS LEGEND REFLECTS THE HYDROCAD MODEL USED FOR DRAINAGE CALCULATIONS.

- 1S MODELED AS EXISTING SUBCATCHMENT
- SUBCATCHMENT BOUNDARIES
- EL R1 R=XX' REACH PATH
- EL L=XX' TIME OF CONCENTRATION
- 1R REACH
- 1P POND



PRE-DEVELOPED DRAINAGE EXHIBIT

PREPARED FOR:

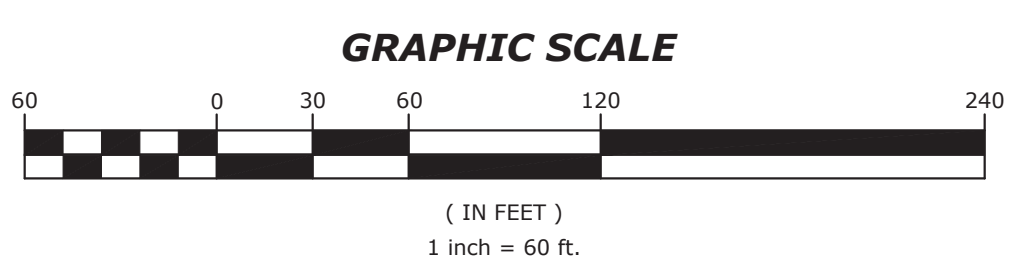
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REVISIONS:

NO.	DATE	DESCRIPTION



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DATE: MAY 2022
PROJ.: 21093
SCALE: 1"=60'
SHEET: 2 OF 2

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