DM ROMA
CONSULTING ENGINEERS

April 1, 2019

Amanda Lessard, Town Planner
Town of Windham
8 School Road
Windham, ME 04062

Re: Preliminary Major Subdivision Review
Anglers Road Commons Apartments
Timothy Clinton - Applicant

Dear Amanda:

We have received the review comments from the Town and Peer Review Consulting Engineer regarding the above referenced project and offer the following response and supplemental information:

Buildings, Signs, Mailboxes, Landscaping & Lighting

The total number of dwellings has been reduced from 44 units to 42 units. This is primarily due to an expansion in the footprint size of the 2-bedroom units. Architectural plans for the 3-bedroom units and 4-bedroom units are enclosed for review. The buildings are not intended to have sprinkler systems installed. The intent is to utilize 2 different colors for the buildings to create some variation. We have met with the Post Office to discuss the location of a common cluster mailbox, and have included a gang mailbox at the second entrance based on our discussion. We have included a note indicating that a cobra head light will be installed on the existing utility pole nearest to the southerly project driveway. Street trees have been added

Ownership Organization

The project has been designed so that the roadway will be offered to the Town for public acceptance, as required by the Town's Land Use Ordinance. The road will contain sewer and storm drain utilities that are intended to remain privately owned and maintained by the Applicant. The water line will be considered a Main to be owned and maintained by the Portland Water District. If the Town accepts ownership of the proposed roadway, the property will effectively be split into two parcels by the roadway, so we will work with the Town to determine if these need to be defined as two separate parcels in the subdivision. All the units are intended to be owned by a common entity and rented as apartments. At some point in the future it is possible that some or all of the units could be converted to condominium ownership.

Septic System Design

We have completed the septic system design in coordination with Summit Geoengineering. An Engineered Subsurface Wastewater Disposal System Application will be filed with the Maine Department of Health and Human Services for approval. The application will include a Minimum Lot Size Variance request. Attached for review are the HHE-200 Septic System design, technical specifications of the Advanced Treatment Units, a Preliminary Soils Investigation Report, a Nitrate-Nitrogen Impact Assessment and a Mounding/Transmission Analysis for the proposed leach field and associated septic system components.

Vehicle Traffic

A Vehicle Traffic Assessment was performed by Bill Bray, PE. The attached report indicates that the project is expected to generate 293 average daily vehicle trips and 27 vehicle trips in the PM Peak Hour.

Stormwater Managagement, MDEP Permitting & Potential Significant Wildlife Habitat

A revised Stormwater Management Report is included for review. We received review comments from the MDEP and the enclosed plans have been revised to reflect their comments. We have performed a peak-flow analysis of the project and have determined that the proposed Stormwater BMPs will effectively manage the post-development peak flows so that a waiver from the Flooding Standard is not required. Enclosed is a "Beginning with Habitat" map which did not include any mapped significant wildlife habitat in the project vicinity.

Upon your review of this information, please let us know if you have any questions or require any additional information.

Sincerely,

DM ROMA CONSULTING ENGINEERS

Dustin Roma

Dustin M. Roma, P.E.
President

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WESTCHESTER MODULAR HOMES, INC.

AN EMPLOYEE OWNED COMPANY

30 REAGANS MILL RD. WINGDALE, NY 12594

Tel (845)832-9400 Fax (845)832-6698

www.westchestermodular.com

THIRD PARTY INSPECTION AGENCY

PE/RA

SERIAL No

PRODUCTION No

DATE

REVISION

HOME OWNER

SITE WINDHAM, ME

BUILDER TIM CLINTON

27'2 X 44' DUPLEX

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USE GROUP R3

CONST TYPE WOOD FRAME (VB)

DESIGNER DWW

DATE 3/31/2019

SCALE AS NOTED

PAGE: 1

FRONT ELEVATION
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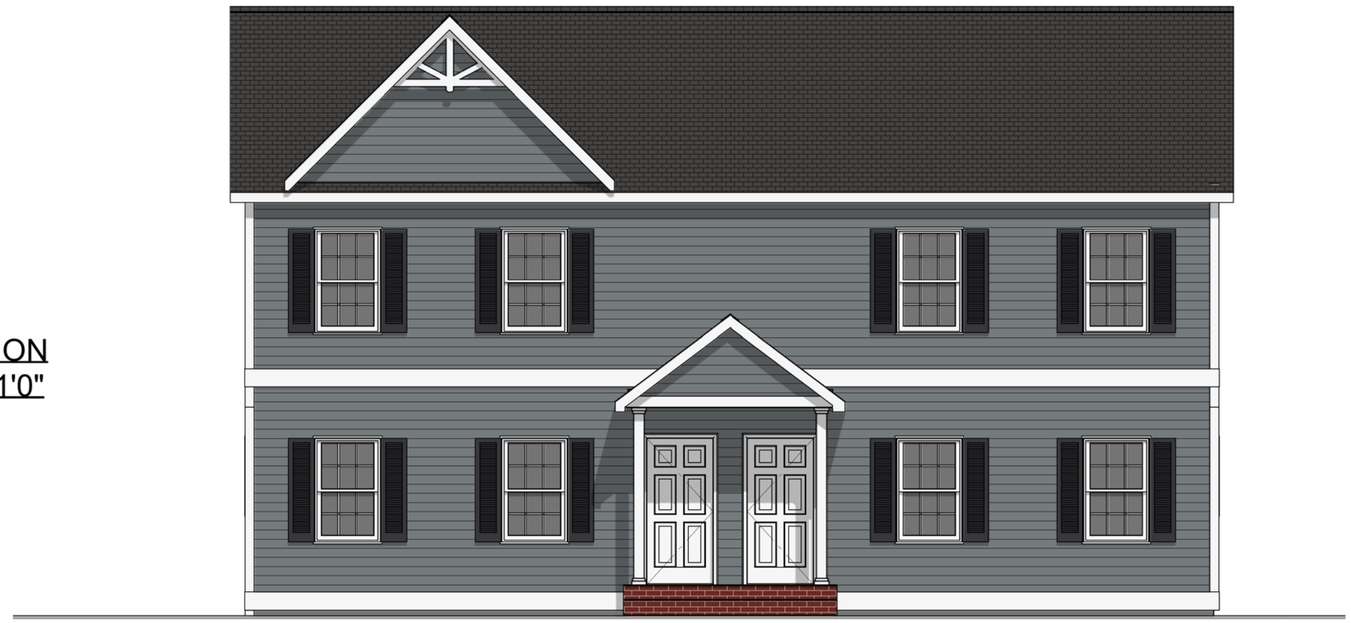

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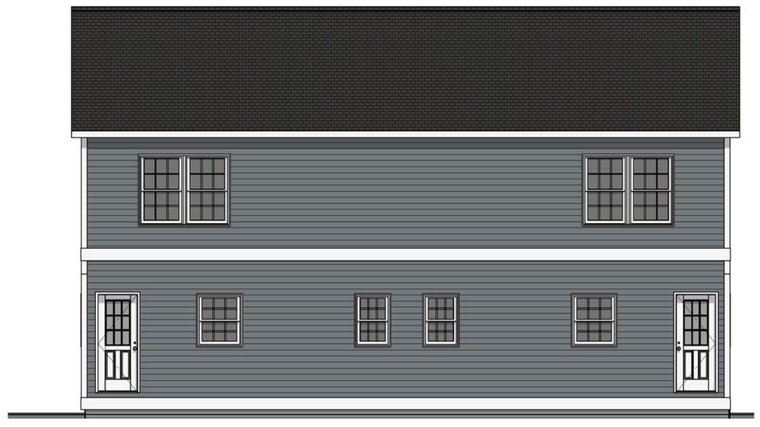

LEFT ELEVATION
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RIGHT ELEVATION
SCALE: 1/8" = 1'0"

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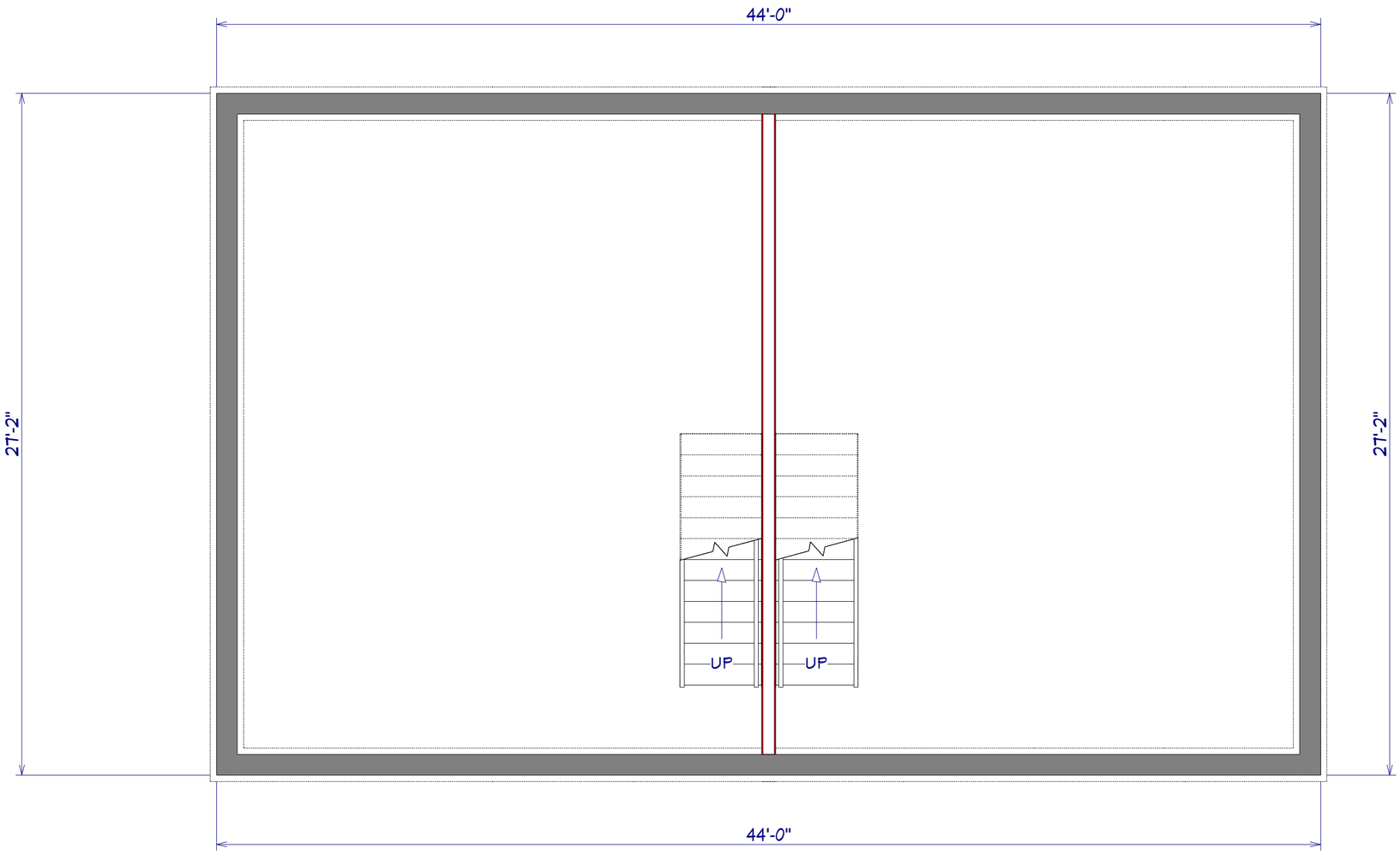

FOUNDATION NOTES:

1) THE FOUNDATION PLAN IS PROVIDED FOR FOUNDATION DESIGN PARAMETERS ONLY. COMPLETE FOUNDATION ENGINEERING BASED ON SPECIFIC SITE CONDITIONS, APPLICABLE LOCAL AND STATE CODES, TO BE REVIEWED AND APPROVED BY A REGISTERED ARCHITECT OR ENGINEER IN THE STATE OF HOUSE DESIGNATION.
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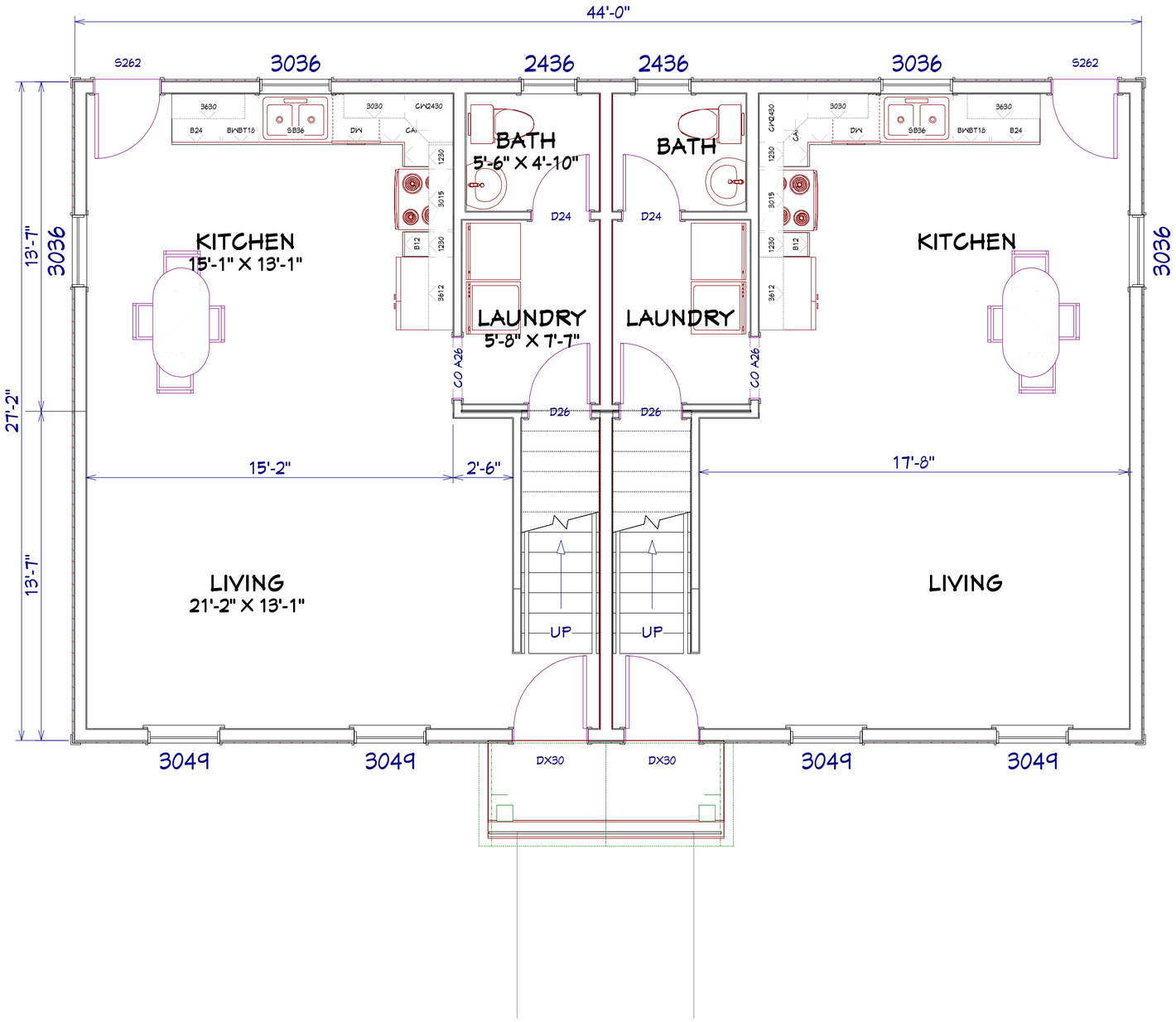

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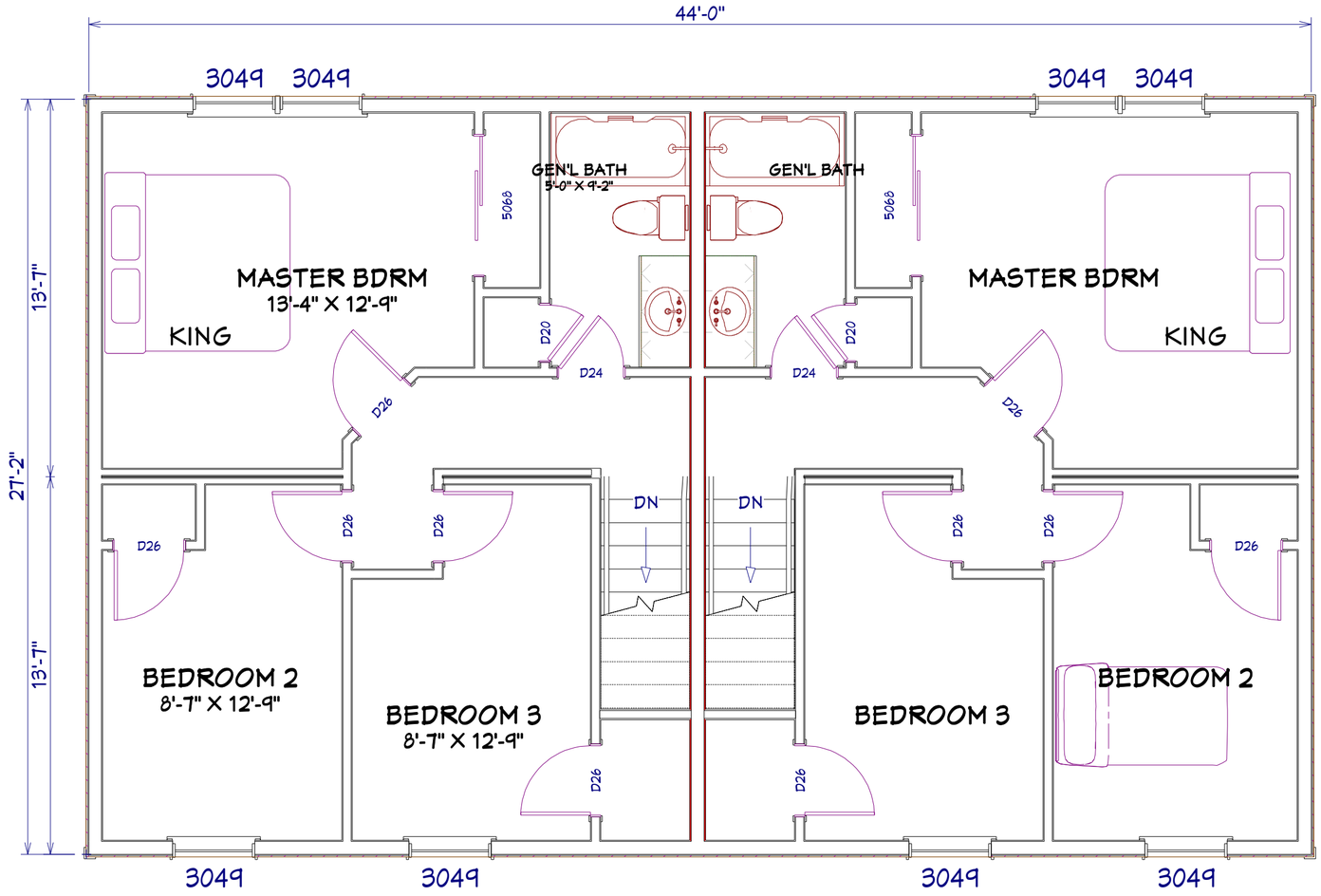

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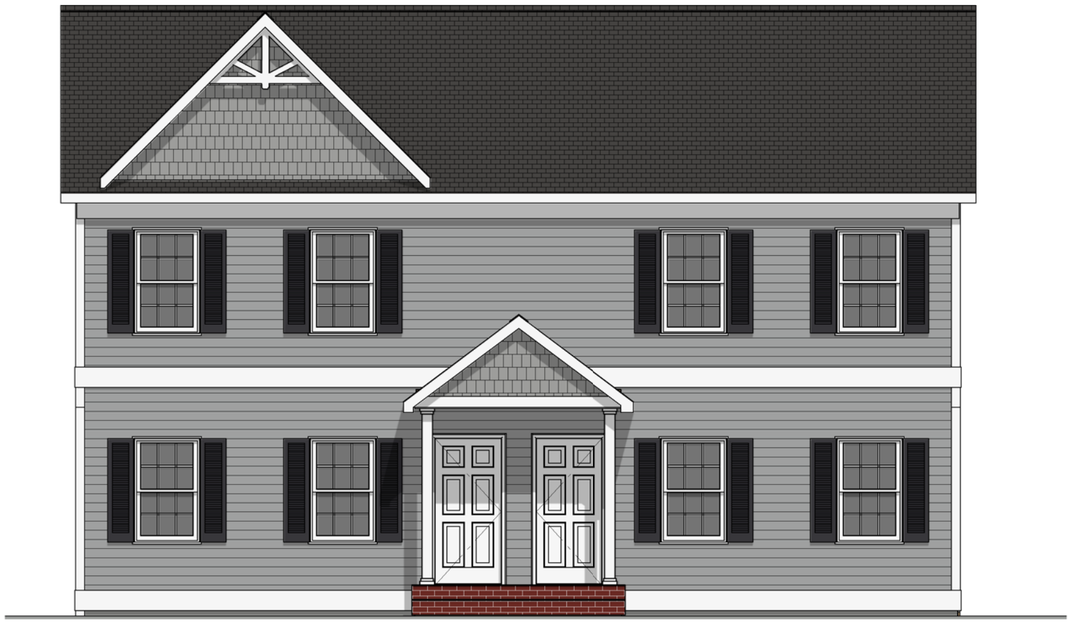

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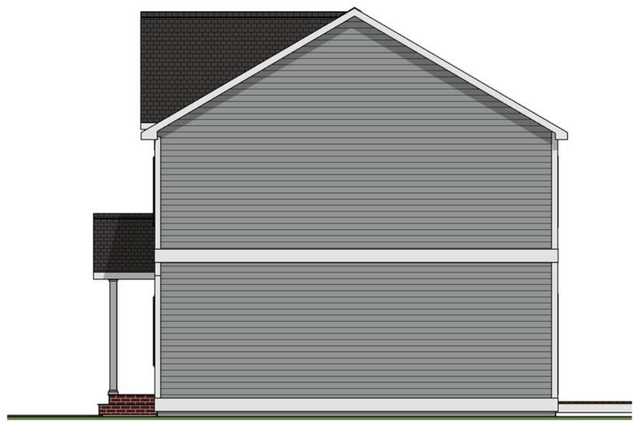

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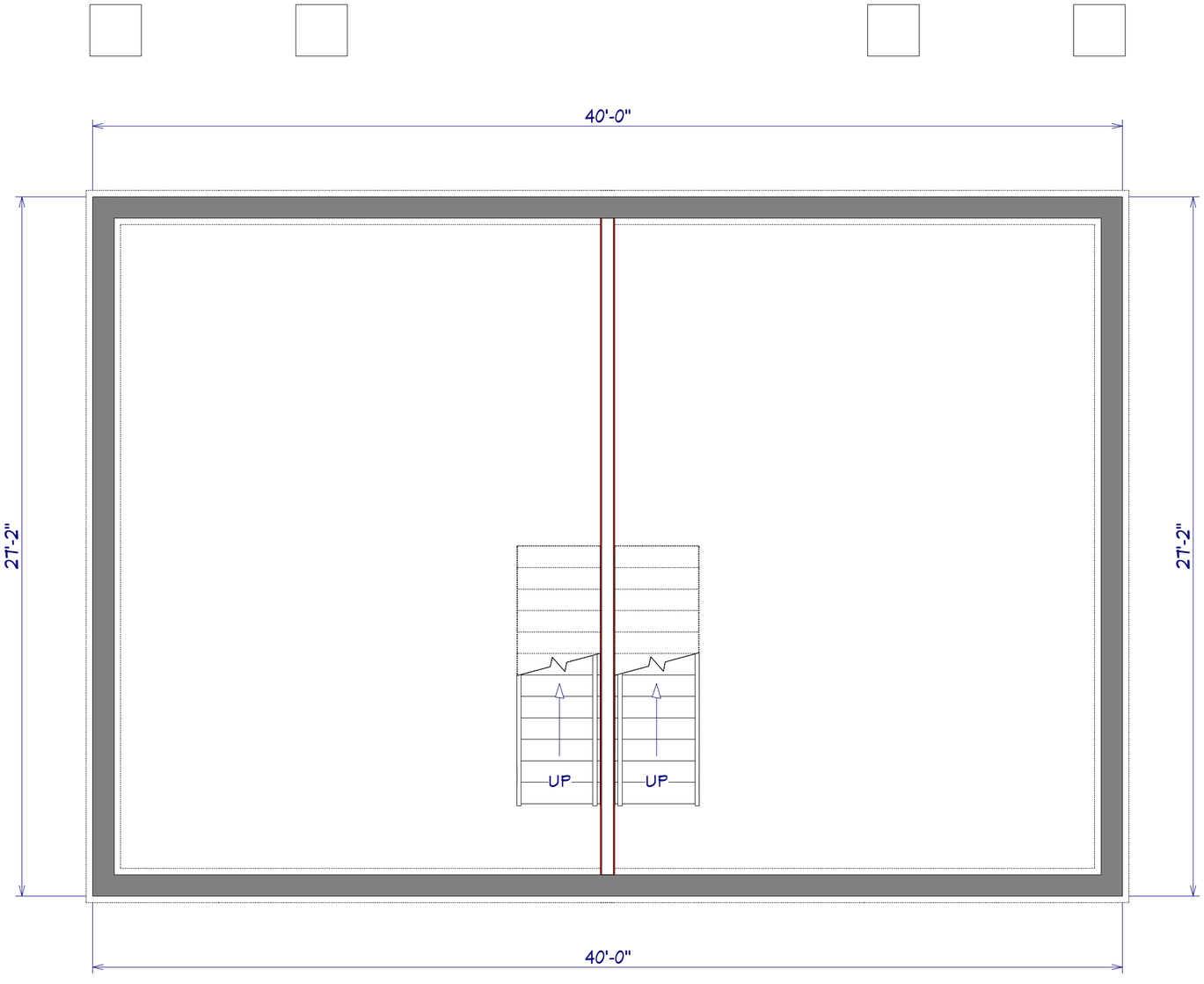

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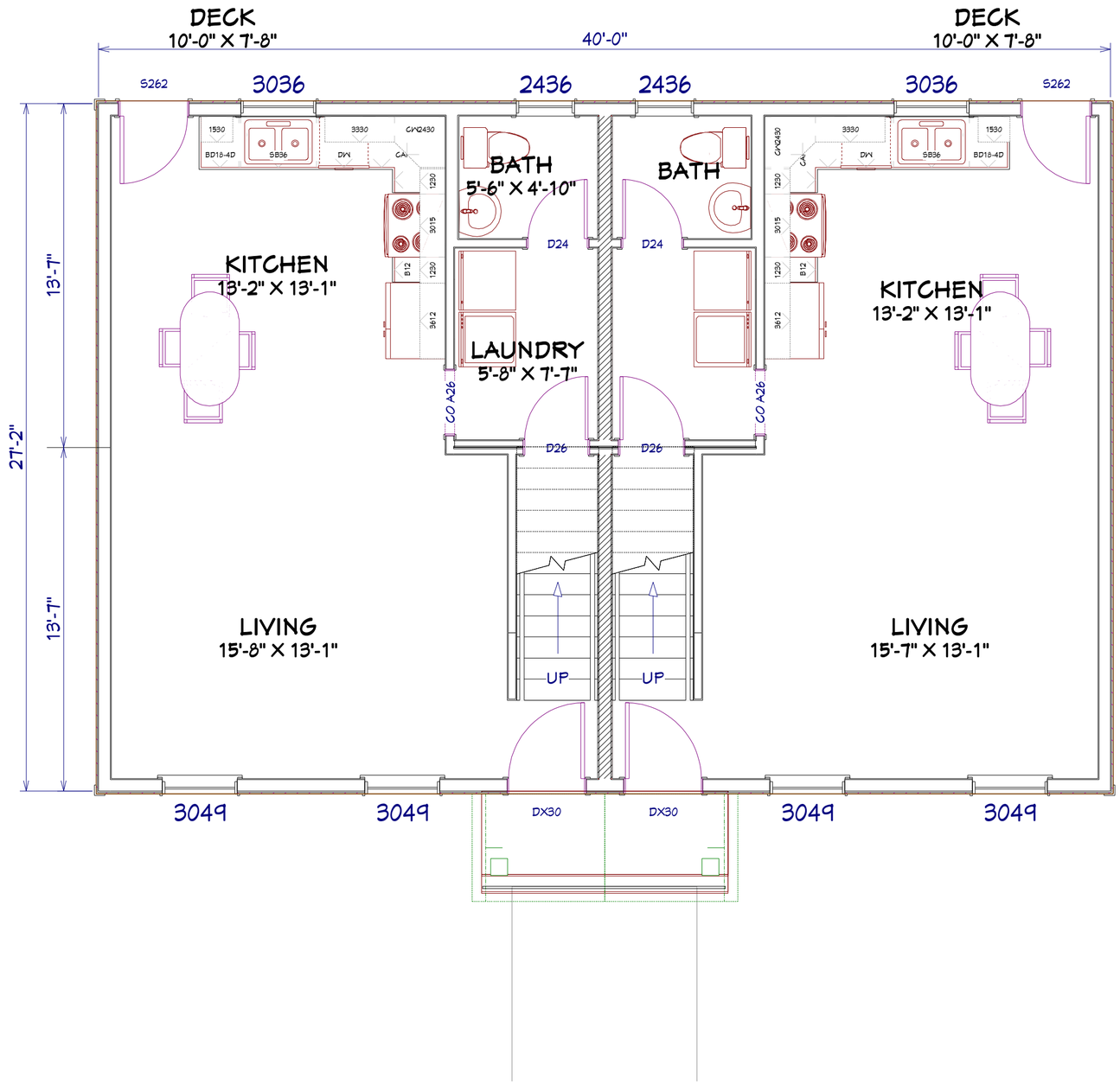

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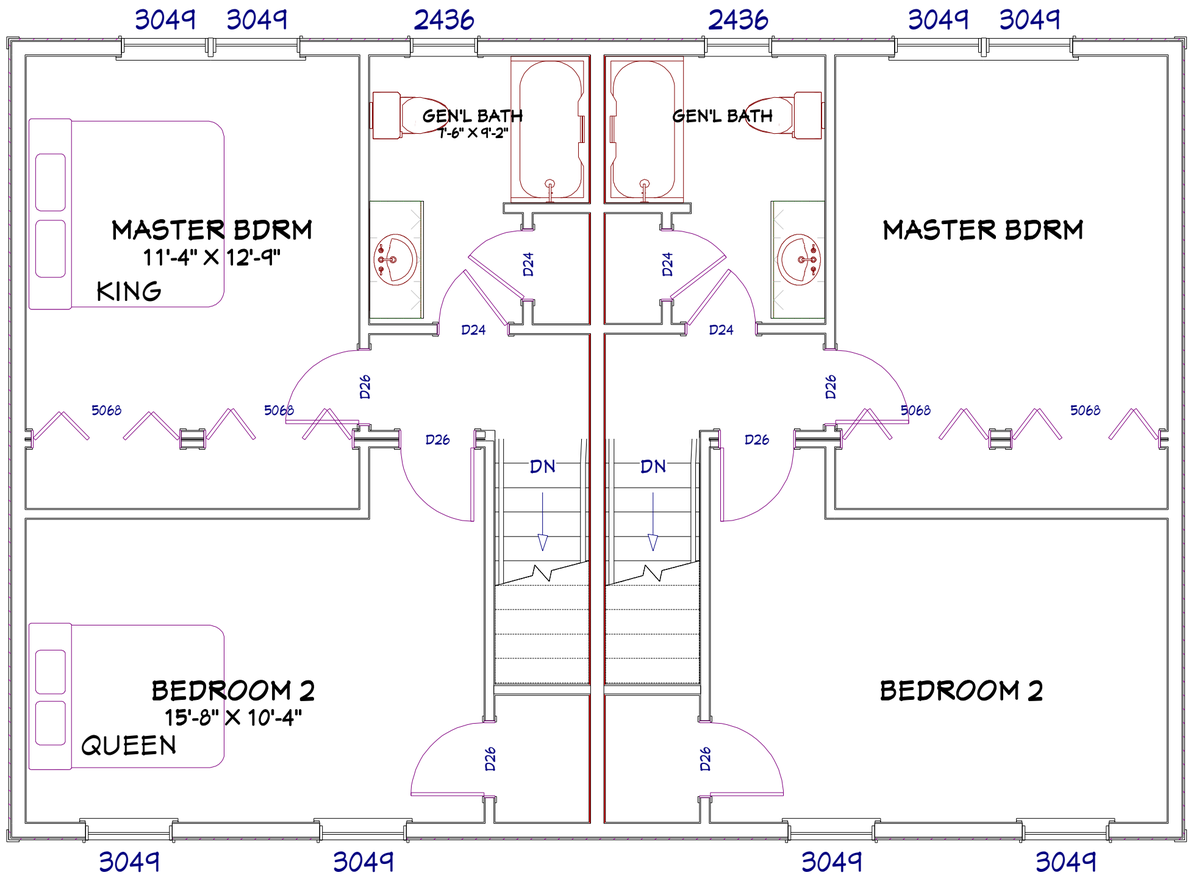

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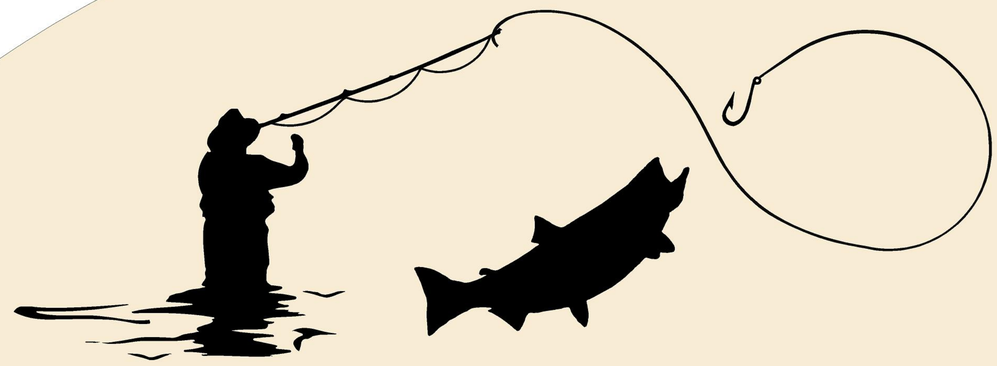


Anglers Road

COMMONS

Anglers Road Commons, LLC

207-655-5431

NO VACANCY

VACANCY

Gorham
SAVINGS BANK
Banking is believing℠

March 22, 2019

RE: Anglers Road Development Project

To Windham Planning Board,

Anglers Road Commons, LLC and its owner, Tim Clinton have an established paid as agreed relationship with Gorham Savings Bank. Mr. Clinton has demonstrated the experience and capability to complete the 44-unit project being developed at Angler Road, Windham ME. Final approval is subject to full underwriting. Should you have any additional questions I can assist with, I can be reached at 222-1499.

Sincerely,

Kimberly A. Donnelly
Senior Vice President
Gorham Savings Bank

DM ROMA
CONSULTING ENGINEERS

STORMWATER MANAGEMENT REPORT

ANGLERS ROAD COMMONS
WINDHAM, MAINE

A. Narrative

Anglers Road Commons LLC is proposing to develop property located on Anglers Road in Windham as a 42-unit residential apartment development. The property is approximately 6.09 acres, is located in the Commercial 1 Zoning District and is identified as Lot 66 on the Town of Windham Assessors Map 80.

The project consists of twenty-one (21) duplex style structures containing twelve (12) three-bedroom residential apartments and thirty (30) two-bedroom residential apartments for a total of 42 units. The development will also include the construction of approximately 860 linear feet of paved roadway, reconstruction of a portion of the exiting Anglers Road, paved driveways and parking area, utility services and stormwater infrastructure. The development will be served by public water, common subsurface septic, natural gas and underground electric, telephone and cable.

The property was previously developed as a gravel pit which has been partially reclaimed. In general, the site drains southeasterly across Town owned land to Chaffin Pond located approximately 265 feet from the southerly property boundary. The Chaffin Pond watershed is defined by the Maine Department of Environmental Protection (MDEP) as a Lake Watershed Most at Risk from Development.

B. Alterations to Land Cover

The 6.09-acre parcel was previously developed as a gravel pit. The site currently consists of approximately 2.7 acres of un-revegetated surface. The remaining property is undeveloped woods.

The proposed development will generate approximately 65,787 square feet (1.51± acres) of new impervious surface consisting of the proposed buildings, paved roadway and driveways and paved path within the open space. The development also proposes approximately 110,354 square feet (2.53± acres) of new landscaped area, which considers approximately 6,168 square feet (0.14± acres) of disturbed area associated with berm of the proposed underdrained soil filter basin “FB” being allowed to revert to natural meadow, resulting in a total new developed area of approximately 176,141 square feet (4.04 acres).

Since the project is within a Lake Watershed Most at Risk from Development and will generate over 20,000 square feet of new impervious surface, a Stormwater Permit will need to be obtained from the MDEP. The stormwater design will be required to meet the Basic and General Standards of the MDEP Chapter 500 Stormwater Management Rules. Since the project will generate less than three (3) acres of new impervious surface and less than five (5) acres of new developed area and Chaffin Pond is not indicated as severely blooming, the MDEP allows the project to meet the General Standards as an acceptable alternative to the Phosphorous Standards.

In addition, the development will require Subdivision approval from the Town of Windham Planning Board. The Town's Land Use Ordinance requires the project to implement Best Management Practices (BMPs) to provide both stormwater quality and quantity control.

The site is relatively flat within the limits of the previously developed gravel pit (1-3%) with steeper slopes located within the undeveloped portion of the property with some slopes steeper than 3H:1V. The onsite soils as identified on the Medium Intensity Soil Maps for Cumberland County, Maine published by the Natural Resources Conservation Service are primarily Hinckley loamy sand. The soils within the proposed development are in the hydrologic soils group "A". The soils map has been included as Attachment 1 of this report.

C. Methodology and Modeling Assumptions

The proposed stormwater management system has been designed utilizing Best Management Practices (BMPs) to maintain existing drainage patterns while providing stormwater quality improvement measures. The goal of the storm drainage design is to remove potential pollutants while promoting infiltration and filtration of runoff generated by the development. The method utilized to predict the surface water runoff rates in this analysis is a computer program entitled HydroCAD, which is based on the same methods that were originally developed by the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service, and utilized in the TR-20 modeling program. Peak rates of runoff are forecasted based upon land use, hydrologic soil conditions, vegetative cover, contributing watershed area, time of concentration, rainfall data, storage volumes of detention basins and the hydraulic capacity of structures. The computer model predicts the amount of runoff as a function of time, with the ability to include the attenuation effect due to dams, lakes, large wetlands, floodplains and constructed stormwater management basins. The input data for rainfalls with statistical recurrence frequencies of 2-, 10- and 25 years was obtained from Appendix H of the MDEP, Chapter 500 Stormwater Management, last revised in 2015. The National Weather Service developed four synthetic storm types to simulate rainfall patterns around the country. For analysis in Cumberland County, Maine, the type III rainfall pattern with a 24-hour duration is appropriate.

D. Basic Standards

The project is required by the Town and the Maine Department of Environmental Protection (MDEP) to provide permanent and temporary Erosion Control Best Management Practices. These methods are outlined in detail in the plan set.

E. General Standard

The project is required by the MDEP and the Town of Windham to comply with Section 4B-General Standards of the MDEP Chapter 500 Stormwater Management Rules. This document outlines the requirement of the project to provide stormwater quality treatment for no less than 95% of the new impervious surface and 80% of the total new developed area associated with the project. The water quality requirements will be met with the utilization of an underdrained filter basin and roof dripedges installed around each of the apartment buildings. As a result of the proposed stormwater infrastructure, the project provides water quality treatment for over 99% of the site's new impervious surfaces and over 80% of the new developed areas. Calculations can be found on the Stormwater Treatment Plan and included as Attachment 2 of this report.

F. Flooding Standards

The proposed project is required by the Town of Windham to also meet the Flooding Standard outlined in the MDEP Chapter 500 requiring the project to detain, retain or result in the infiltration of stormwater from the 24-hour storms of the 2-year, 10-year and 25-year frequencies such that the peak flows of stormwater from the project site do not exceed the peak flows of stormwater prior to undertaking the project. To maintain these rates, the stormwater design incorporates a closed drainage system discharging to an underdrained filter basin.

Study Point 1 (SP-1) analyzes the flow tributary to the northern property corner along Angler's Road. This flow is conveyed onto the abutting property to the north and into the Angler's Road right of way. Study Point 2 (SP-2) investigates the flow crossing the southeastern property boundary onto the Town of Windham's property. This flow will drain across the publicly owned land and within 265 feet of the property line, discharge into Chaffin Ponds.

The following table summarizes the analysis:

Table 1 – Peak Rates of Stormwater Runoff						
Study Point	**2-Year (cfs)**		**10-Year (cfs)**		**25-Year (cfs)**	
	Pre	Post	Pre	Post	Pre	Post
SP-1	0.21	0.16	0.42	0.24	0.60	0.30
SP-2	4.12	0.72	8.26	3.46	11.82	6.61

As a result of the installation of the underdrained filter basin, the reduction in tributary area to SP-1, and re-vegetation of existing excavated bare soils on-site, the site effectively reduces the peak rates of runoff at the study point for all storm events. The watershed maps showing pre-development and post-development drainage patterns are included in the plan set and the computations performed with the HydroCAD software program are included as Attachment 3 in this report.

G. Maintenance of common facilities or property

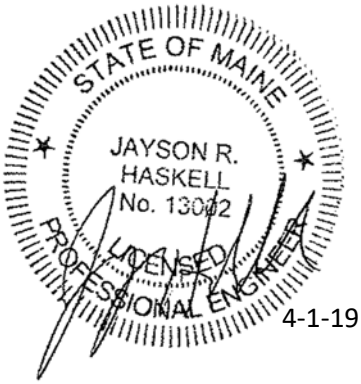
The owner/applicant will be responsible for the maintenance of the stormwater facilities. Enclosed is an Inspection, Maintenance and Housekeeping Plan for the project.

H. Amendment to Previous MDEP Stormwater Permit

This project proposes changes to an existing stormwater infiltration basin that was constructed as part of the Angler's Road Reconstruction Project, which included a MDEP Stormwater Permit with the Town of Windham listed as the applicant in 2014. The intent is to amend the previously approved permit order to include the impervious area that was tributary to the infiltration basin as part of the stormwater management design for the proposed project.

Prepared by:

DM ROMA CONSULTING ENGINEERS

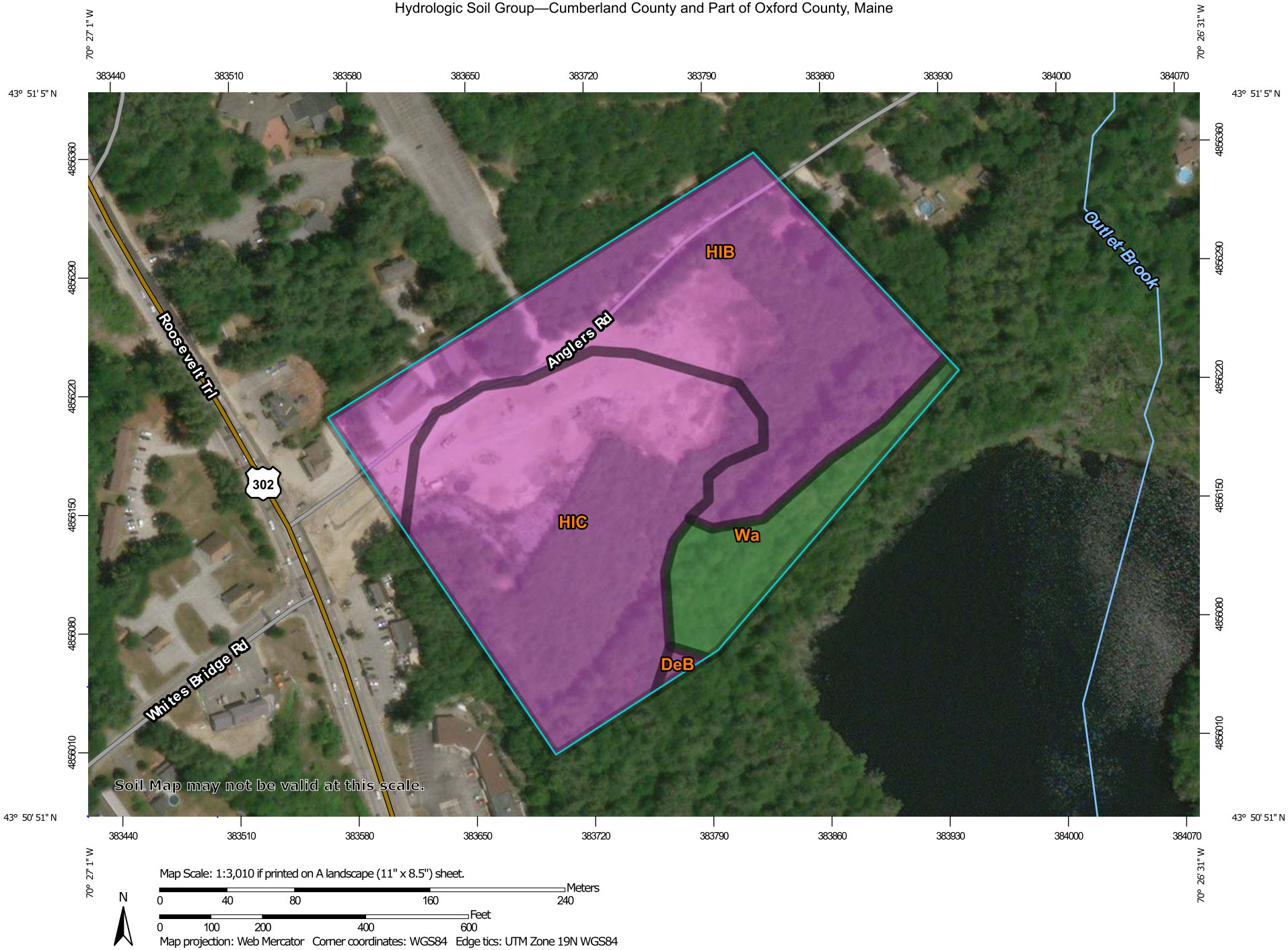


Jayson R. Haskell, P.E.
Southern Maine Regional Manager

4-1-19

ATTACHMENT 1

SOILS MAP



Map Scale: 1:3,010 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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: Cumberland County and Part of Oxford County, Maine
Survey Area Data: Version 15, Sep 6, 2018

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

Date(s) aerial images were photographed: Apr 29, 2012—Jun 26, 2016

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
DeB	Deerfield loamy fine sand, 3 to 8 percent slopes	A	0.1	0.5%
HlB	Hinckley loamy sand, 3 to 8 percent slopes	A	7.6	44.8%
HlC	Hinckley loamy sand, 8 to 15 percent slopes	A	7.5	44.5%
Wa	Walpole fine sandy loam	A/D	1.7	10.3%
Totals for Area of Interest			**16.9**	**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: None Specified

Tie-break Rule: Higher

ATTACHMENT 2

STORMWATER TREATMENT CALCULATIONS

Stormwater Treatment Table

Anglers Road Commons Apartments

	Total Watershed Area (SF)	New Paved Impervious Area (SF)	New Building Area (SF)*	New Landscaped Area (SF)	Existing/Offsite Impervious Area (SF)**	Existing/Offsite Landscaped Area (SF)**	Existing Undeveloped Area (SF)	Treatment Provided	New Impervious Area Treated In Treatment Device (SF)	New Landscaped Area Treated In Treatment Device (SF)	Treatment Device
WS-10	10,178	206	1,541	7,411	909	110	0	No	0	0	None
WS-20	15,156	0	0	63	0	0	15,093	No	0	0	None
WS-21	135,586	274	6,034	27,029	0	62,322	39,927	No	0	0	FB
WS-22	12,525	937	567	11,022	0	0	0	YES	937	11,022	FB
WS-23	4,825	3,780	0	1,045	0	0	0	YES	3,780	1,045	FB
WS-24	19,789	9,270	3,466	7,054	0	0	0	YES	9,270	7,054	FB
WS-25	17,710	5,320	1,515	10,874	0	0	0	YES	5,320	10,874	FB
WS-26	12,441	1,703	276	1,003	8,887	572	0	YES	1,703	1,003	FB
WS-27	15,482	3,942	1,104	7,768	2,048	621	0	YES	3,942	7,768	FB
WS-28	24,838	0	3,885	20,952	0	0	0	YES	0	20,952	FB
WS-29	4,490	0	81	4,409	0	0	0	YES	0	4,409	FB
WS-31	12,139	6,197	1,797	4,146	0	0	0	YES	6,197	4,146	FB
WS-32	21,471	10,015	3,878	7,577	0	0	0	YES	10,015	7,577	FB
Total		**41,643**	**24,144**	**110,354**					**41,163**	**75,850**	

* All new buildings shall install a roofline drip edge to provide treatment for the rooftop impervious surface. The building's impervious area is included in the watershed and overall treatment calculations below, but not included in the BMP sizing calculations for each treatment device.

** The project is not taking credit for the Existing or Offsite impervious and landscaped areas, but are included in the BMP sizing calculations for each treatment device.

New Impervious Area =	65,787	sf
Impervious Area Requiring Treatment (95%) =	62,498	sf
Impervious Area Treatment Provided =	65,307	sf
	99%	New Impervious Area Treated

New Developed Area =	176,141	sf
Developed Area Requiring Treatment (80%) =	140,913	sf
Developed Area Treatment Provided =	141,157	sf
	80%	New Developed Area Treated

Filter Basin FB-1

Tributary Impervious Area=	41,163 sf	(WS-21 ~ 28 Impervious Area)
Tributary Landscaped Area=	75,850 sf	(WS-21 ~ 28 Landscaped Area)

Water Quality Volume (WQV) Calculation

WQV (Required) = 1.0"xImpervious Area + 0.4"xLandscaped Area

WQV (Required) = 5,959 cf

Stage Storage Volume

Elevation	Area (sf)	Storage (cf)
298.25	3,633	0
300	5,676	8,328
301.5	7,193	17,957

Outlet Elevation = 299.75

Storage Volume Provided= 6,940 cf > Required

Filter Bottom Calculation

Filter Area (Required) = 5%xImpervious Area + 2%xLandscaped Area

Filter Area (Required) = 3,575 sf

Filter Area Provided = 3,633 sf > Required

Typical Drip Edge Sizing Calculations

Tributary Impervious Area=	626	sf
Tributary Landscaped Area=	0	sf

Water Quality Volume (WQV) Calculation

WQV (Required) = 1.0"xImpervious Area + 0.4"xLandscaped Area

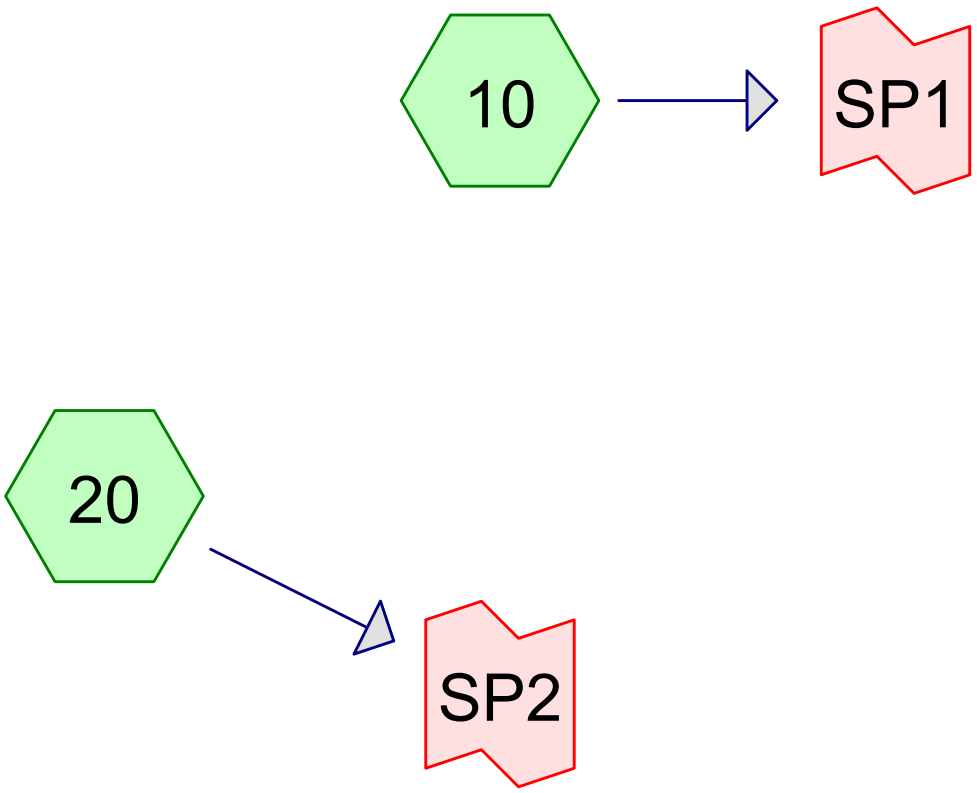
WQV (Required) = 52 cf

Drip Edge sizing:

Width	2	feet
Depth	2	feet
Effective Area	72	sf
% Void (crushed stone	40%	
Total Volume Provided:	**58**	**cf > Required**

ATTACHMENT 3

HYDROCAD OUTPUT



Subcat Reach Pond Link

Routing Diagram for 18093-PRE
Prepared by DM Roma Consulting Engineers, Printed 4/1/2019

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Runoff Area=7,377 sf 0.00% Impervious Runoff Depth=1.27"
Flow Length=77' Slope=0.0134 '/' Tc=9.5 min CN=WQ Runoff=0.21 cfs 780 cf

Subcatchment20: Runoff Area=299,234 sf 3.37% Impervious Runoff Depth=0.74"
Flow Length=378' Tc=16.7 min CN=WQ Runoff=4.12 cfs 18,545 cf

Link SP1: Inflow=0.21 cfs 780 cf
Primary=0.21 cfs 780 cf

Link SP2: Inflow=4.12 cfs 18,545 cf
Primary=4.12 cfs 18,545 cf

Total Runoff Area = 306,611 sf Runoff Volume = 19,325 cf Average Runoff Depth = 0.76"
96.71% Pervious = 296,529 sf 3.29% Impervious = 10,082 sf

Summary for Subcatchment 10:

Runoff = 0.21 cfs @ 12.14 hrs, Volume= 780 cf, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
	6,753	77	Newly graded area, HSG A
	0	32	Woods/grass comb., Good, HSG A
*	624	96	Existing Anglers Road, gravel
	7,377		Weighted Average
	7,377		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	77	0.0134	0.14		**Sheet Flow, Seg A to B** Grass: Short n= 0.150 P2= 3.10"

Summary for Subcatchment 20:

Runoff = 4.12 cfs @ 12.24 hrs, Volume= 18,545 cf, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
	168,533	77	Newly graded area, HSG A
	120,111	32	Woods/grass comb., Good, HSG A
*	10,082	98	Existing paved roads, Anglers Road
*	508	96	Existing gravel surface, Anglers Road
	299,234		Weighted Average
	289,152		96.63% Pervious Area
	10,082		3.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	150	0.1226	0.17		**Sheet Flow, Seg A to B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.2	172	0.2131	2.31		**Shallow Concentrated Flow, Seg B to C** Woodland Kv= 5.0 fps
0.9	56	0.0410	1.01		**Shallow Concentrated Flow, Seg C to D** Woodland Kv= 5.0 fps
16.7	378	Total			

Summary for Link SP1:

Inflow Area = 7,377 sf, 0.00% Impervious, Inflow Depth = 1.27" for 2-Year event
Inflow = 0.21 cfs @ 12.14 hrs, Volume= 780 cf
Primary = 0.21 cfs @ 12.14 hrs, Volume= 780 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link SP2:

Inflow Area = 299,234 sf, 3.37% Impervious, Inflow Depth = 0.74" for 2-Year event
Inflow = 4.12 cfs @ 12.24 hrs, Volume= 18,545 cf
Primary = 4.12 cfs @ 12.24 hrs, Volume= 18,545 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Runoff Area=7,377 sf 0.00% Impervious Runoff Depth=2.45"
Flow Length=77' Slope=0.0134 '/' Tc=9.5 min CN=WQ Runoff=0.42 cfs 1,505 cf

Subcatchment20: Runoff Area=299,234 sf 3.37% Impervious Runoff Depth=1.45"
Flow Length=378' Tc=16.7 min CN=WQ Runoff=8.26 cfs 36,089 cf

Link SP1: Inflow=0.42 cfs 1,505 cf
Primary=0.42 cfs 1,505 cf

Link SP2: Inflow=8.26 cfs 36,089 cf
Primary=8.26 cfs 36,089 cf

Total Runoff Area = 306,611 sf Runoff Volume = 37,594 cf Average Runoff Depth = 1.47"
96.71% Pervious = 296,529 sf 3.29% Impervious = 10,082 sf

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

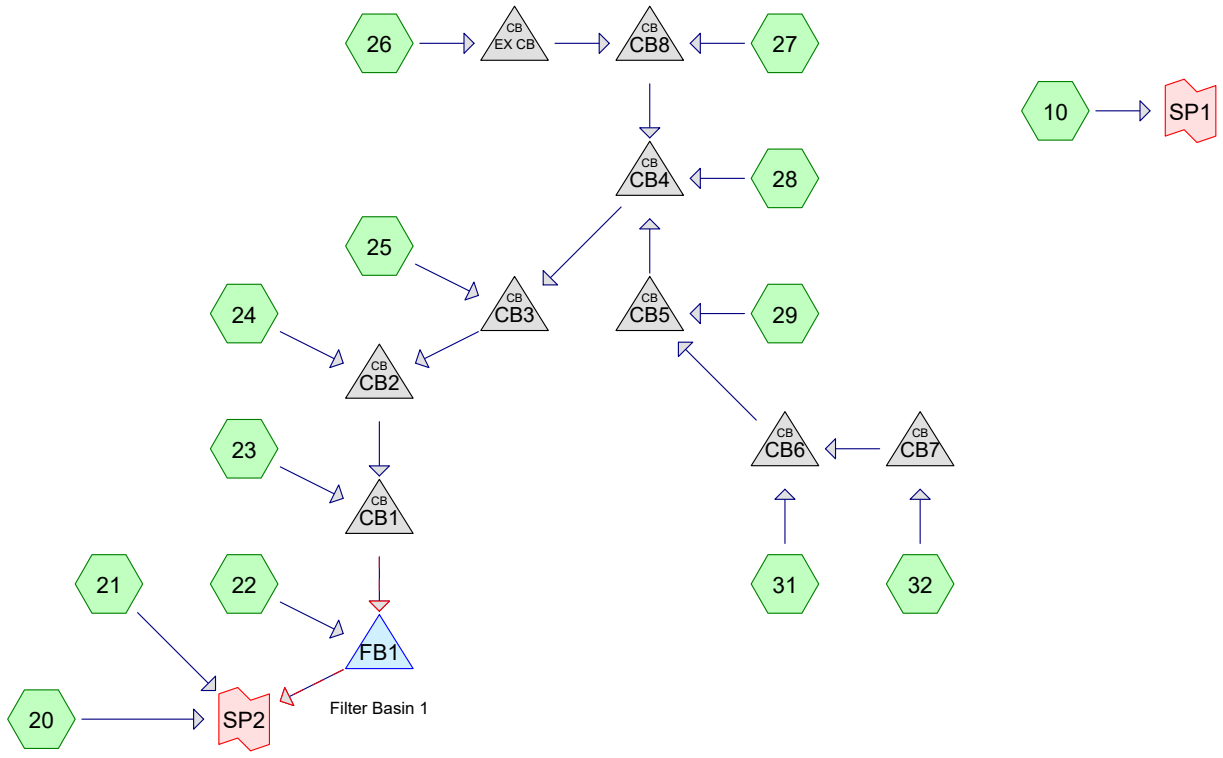
Subcatchment10: Runoff Area=7,377 sf 0.00% Impervious Runoff Depth=3.48"
Flow Length=77' Slope=0.0134 '/' Tc=9.5 min CN=WQ Runoff=0.60 cfs 2,137 cf

Subcatchment20: Runoff Area=299,234 sf 3.37% Impervious Runoff Depth=2.10"
Flow Length=378' Tc=16.7 min CN=WQ Runoff=11.82 cfs 52,371 cf

Link SP1: Inflow=0.60 cfs 2,137 cf
Primary=0.60 cfs 2,137 cf

Link SP2: Inflow=11.82 cfs 52,371 cf
Primary=11.82 cfs 52,371 cf

Total Runoff Area = 306,611 sf Runoff Volume = 54,508 cf Average Runoff Depth = 2.13"
96.71% Pervious = 296,529 sf 3.29% Impervious = 10,082 sf



Subcat Reach Pond Link

Routing Diagram for 18093-POST

Prepared by DM Roma Consulting Engineers, Printed 4/1/2019

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Runoff Area=10,177 sf 21.63% Impervious Runoff Depth=0.74"
Flow Length=75' Slope=0.0292 '/' Tc=9.9 min UI Adjusted CN=WQ Runoff=0.16 cfs 627 cf

Subcatchment20: Runoff Area=15,156 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=343' Tc=15.7 min CN=WQ Runoff=0.00 cfs 0 cf

Subcatchment21: Runoff Area=135,586 sf 4.65% Impervious Runoff Depth=0.13"
Flow Length=630' Tc=10.5 min UI Adjusted CN=WQ Runoff=0.37 cfs 1,508 cf

Subcatchment22: Runoff Area=12,526 sf 12.01% Impervious Runoff Depth=0.34"
Tc=6.0 min UI Adjusted CN=WQ Runoff=0.10 cfs 359 cf

Subcatchment23: Runoff Area=4,825 sf 78.34% Impervious Runoff Depth=2.25"
Tc=6.0 min CN=WQ Runoff=0.25 cfs 903 cf

Subcatchment24: Runoff Area=19,790 sf 64.36% Impervious Runoff Depth=1.85"
Flow Length=233' Tc=6.0 min CN=WQ Runoff=0.86 cfs 3,044 cf

Subcatchment25: Runoff Area=17,709 sf 38.60% Impervious Runoff Depth=1.11"
Flow Length=202' Tc=16.2 min CN=WQ Runoff=0.35 cfs 1,633 cf

Subcatchment26: Runoff Area=12,441 sf 87.34% Impervious Runoff Depth=2.50"
Flow Length=283' Tc=6.0 min CN=WQ Runoff=0.73 cfs 2,597 cf

Subcatchment27: Runoff Area=15,483 sf 45.82% Impervious Runoff Depth=1.31"
Flow Length=160' Tc=6.0 min CN=WQ Runoff=0.48 cfs 1,695 cf

Subcatchment28: Runoff Area=24,837 sf 15.64% Impervious Runoff Depth=0.45"
Flow Length=150' Slope=0.0393 '/' Tc=15.3 min UI Adjusted CN=WQ Runoff=0.20 cfs 928 cf

Subcatchment29: Runoff Area=4,490 sf 1.80% Impervious Runoff Depth=0.05"
Tc=6.0 min CN=WQ Runoff=0.01 cfs 19 cf

Subcatchment31: Runoff Area=12,140 sf 65.85% Impervious Runoff Depth=1.89"
Flow Length=214' Tc=7.1 min CN=WQ Runoff=0.52 cfs 1,910 cf

Subcatchment32: Runoff Area=21,470 sf 64.71% Impervious Runoff Depth=1.86"
Flow Length=206' Tc=7.1 min CN=WQ Runoff=0.91 cfs 3,320 cf

Pond CB1: Peak Elev=299.71' Inflow=4.17 cfs 16,051 cf
Primary=2.03 cfs 7,794 cf Secondary=2.13 cfs 8,258 cf Outflow=4.17 cfs 16,051 cf

Pond CB2: Peak Elev=299.86' Inflow=3.91 cfs 15,148 cf
18.0" Round Culvert n=0.013 L=85.0' S=0.0041 '/' Outflow=3.91 cfs 15,148 cf

Pond CB3: Peak Elev=300.07' Inflow=3.06 cfs 12,104 cf
18.0" Round Culvert n=0.013 L=18.0' S=0.0056 '/' Outflow=3.06 cfs 12,104 cf

Pond CB4: Peak Elev=300.48' Inflow=2.80 cfs 10,471 cf
15.0" Round Culvert n=0.013 L=98.0' S=0.0046 '/' Outflow=2.80 cfs 10,471 cf

Pond CB5: Peak Elev=300.71' Inflow=1.44 cfs 5,250 cf
15.0" Round Culvert n=0.013 L=99.0' S=0.0045 '/' Outflow=1.44 cfs 5,250 cf

Pond CB6: Peak Elev=300.97' Inflow=1.44 cfs 5,231 cf
15.0" Round Culvert n=0.013 L=61.0' S=0.0049 '/' Outflow=1.44 cfs 5,231 cf

Pond CB7: Peak Elev=301.09' Inflow=0.91 cfs 3,320 cf
12.0" Round Culvert n=0.013 L=18.0' S=0.0056 '/' Outflow=0.91 cfs 3,320 cf

Pond CB8: Peak Elev=301.32' Inflow=1.21 cfs 4,292 cf
12.0" Round Culvert n=0.013 L=210.0' S=0.0057 '/' Outflow=1.21 cfs 4,292 cf

Pond EX CB: Peak Elev=301.66' Inflow=0.73 cfs 2,597 cf
12.0" Round Culvert n=0.013 L=74.0' S=0.0054 '/' Outflow=0.73 cfs 2,597 cf

Pond FB1: Filter Basin 1 Peak Elev=299.70' Storage=6,691 cf Inflow=4.27 cfs 16,411 cf
Primary=0.41 cfs 16,415 cf Secondary=0.00 cfs 0 cf Outflow=0.41 cfs 16,415 cf

Link SP1: Inflow=0.16 cfs 627 cf
Primary=0.16 cfs 627 cf

Link SP2: Inflow=0.72 cfs 17,923 cf
Primary=0.72 cfs 17,923 cf

Total Runoff Area = 306,630 sf Runoff Volume = 18,545 cf Average Runoff Depth = 0.73"
74.83% Pervious = 229,453 sf 25.17% Impervious = 77,177 sf

Summary for Subcatchment 10:

Runoff = 0.16 cfs @ 12.14 hrs, Volume= 627 cf, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Adj	Description
	7,521	39	39	>75% Grass cover, Good, HSG A
	0	32		Woods/grass comb., Good, HSG A
*	1,541	98	98	Proposed unconnected roofs
*	82	98	98	Proposed path, unconnected pavement
*	578	98	98	Proposed access and parking, paved
*	455	96	96	Existing Anglers Road, gravel
	10,177			Weighted Average
	7,976			78.37% Pervious Area
	2,201			21.63% Impervious Area
	1,623			73.74% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	75	0.0292	0.13		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"

Summary for Subcatchment 20:

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

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
	63	39	>75% Grass cover, Good, HSG A
	15,093	32	Woods/grass comb., Good, HSG A
*	0	98	Proposed unconnected roofs
*	0	98	Proposed path, unconnected pavement
	15,156		Weighted Average
	15,156		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	150	0.1320	0.18		**Sheet Flow, Seg A to B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.5	193	0.1856	2.15		**Shallow Concentrated Flow, Seg B to C** Woodland Kv= 5.0 fps
15.7	343	Total			

Summary for Subcatchment 21:

Runoff = 0.37 cfs @ 12.14 hrs, Volume= 1,508 cf, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Adj	Description
	89,351	39	39	>75% Grass cover, Good, HSG A
	39,927	32	32	Woods/grass comb., Good, HSG A
*	6,034	98	98	Proposed unconnected roofs
*	274	98	98	Proposed path, unconnected pavement
	135,586			Weighted Average
	129,278			95.35% Pervious Area
	6,308			4.65% Impervious Area
	6,308			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	129	0.3333	0.54		**Sheet Flow, Seg A to B** Grass: Short n= 0.150 P2= 3.10"
2.0	21	0.0476	0.17		**Sheet Flow, Seg B to C** Grass: Short n= 0.150 P2= 3.10"
2.7	304	0.0131	1.84		**Shallow Concentrated Flow, Seg C to D** Unpaved Kv= 16.1 fps
1.5	67	0.0010	0.74	4.93	**Trap/Vee/Rect Channel Flow, Seg D to E** Bot.W=0.00' D=0.50' Z= 50.0 & 3.0 '/' Top.W=26.50' n= 0.025 Earth, clean & winding
0.2	81	0.0415	7.77	31.07	**Trap/Vee/Rect Channel Flow, Seg E to F** Bot.W=0.50' D=1.00' Z= 4.0 & 3.0 '/' Top.W=7.50' n= 0.025 Earth, clean & winding
0.1	19	0.0383	3.97		**Shallow Concentrated Flow, Seg F to G** Paved Kv= 20.3 fps
0.0	9	0.3135	9.01		**Shallow Concentrated Flow, Seg G to H** Unpaved Kv= 16.1 fps
10.5	630	Total			

Summary for Subcatchment 22:

Runoff = 0.10 cfs @ 12.09 hrs, Volume= 359 cf, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Adj	Description
	11,022	39	39	>75% Grass cover, Good, HSG A
	0	32		Woods/grass comb., Good, HSG A
*	567	98	98	Proposed unconnected roofs
*	937	98	98	Proposed path, unconnected pavement
	12,526			Weighted Average
	11,022			87.99% Pervious Area
	1,504			12.01% Impervious Area
	1,504			100.00% Unconnected

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

Summary for Subcatchment 23:

Runoff = 0.25 cfs @ 12.09 hrs, Volume= 903 cf, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
	1,045	39	>75% Grass cover, Good, HSG A
	0	32	Woods/grass comb., Good, HSG A
*	0	98	Proposed unconnected roofs
*	3,780	98	Proposed path, unconnected pavement
	4,825		Weighted Average
	1,045		21.66% Pervious Area
	3,780		78.34% Impervious Area
	3,780		100.00% Unconnected

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

Summary for Subcatchment 24:

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 3,044 cf, Depth= 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	7,054	39	Proposed >75% Grass cover, Good, HSG A
	0	32	Woods/grass comb., Good, HSG A
*	3,466	98	Proposed unconnected roofs
*	0	98	Proposed path, unconnected pavement
*	9,270	98	Proposed access and parking, paved
*	0	98	Existing Anglers Road, paved
*	0	96	Existing Anglers Road, gravel
	19,790		Weighted Average
	7,054		35.64% Pervious Area
	12,736		64.36% Impervious Area
	3,466		27.21% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	23	0.0263	0.10		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
0.3	20	0.0200	0.98		**Sheet Flow, Seg B to C** Smooth surfaces n= 0.011 P2= 3.10"
0.7	190	0.0089	4.23	26.56	**Trap/Vee/Rect Channel Flow, Seg C to D** Bot.W=0.00' D=0.50' Z= 50.0 & 0.2 '/' Top.W=25.10' n= 0.013 Asphalt, smooth
5.0	233	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 25:

Runoff = 0.35 cfs @ 12.21 hrs, Volume= 1,633 cf, Depth= 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	10,874	39	Proposed >75% Grass cover, Good, HSG A
	0	32	Woods/grass comb., Good, HSG A
*	1,515	98	Proposed unconnected roofs
*	0	98	Proposed path, unconnected pavement
*	5,320	98	Proposed access and parking, paved
	17,709		Weighted Average
	10,874		61.40% Pervious Area
	6,835		38.60% Impervious Area
	1,515		22.17% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	97	0.0435	0.16		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
5.5	36	0.0293	0.11		**Sheet Flow, Seg B to C** Grass: Dense n= 0.240 P2= 3.10"
0.3	69	0.0093	4.33	27.15	**Trap/Vee/Rect Channel Flow, Seg C to D** Bot.W=0.00' D=0.50' Z= 50.0 & 0.2 '/' Top.W=25.10' n= 0.013 Asphalt, smooth

16.2 202 Total

Summary for Subcatchment 26:

Runoff = 0.73 cfs @ 12.09 hrs, Volume= 2,597 cf, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
	1,575	39	>75% Grass cover, Good, HSG A
	0	32	Woods/grass comb., Good, HSG A
*	276	98	Proposed unconnected roofs
*	0	98	Proposed path, unconnected pavement
*	1,703	98	Proposed access and parking, paved
*	8,887	98	Existing Anglers Road, paved
	12,441		Weighted Average
	1,575		12.66% Pervious Area
	10,866		87.34% Impervious Area
	276		2.54% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	150	0.0047	0.82		**Sheet Flow, Seg A to B** Smooth surfaces n= 0.011 P2= 3.10"
0.3	49	0.0045	3.01	18.89	**Trap/Vee/Rect Channel Flow, Seg B to C** Bot.W=0.00' D=0.50' Z= 50.0 & 0.2 '/' Top.W=25.10' n= 0.013 Asphalt, smooth
0.2	52	0.0103	3.49	19.00	**Trap/Vee/Rect Channel Flow, Seg C to D** Bot.W=0.00' D=0.33' Z= 50.0 '/' Top.W=33.00' n= 0.013 Asphalt, smooth
0.1	32	0.0065	3.62	22.70	**Trap/Vee/Rect Channel Flow, Seg D to E** Bot.W=0.00' D=0.50' Z= 50.0 & 0.2 '/' Top.W=25.10' n= 0.013 Asphalt, smooth
3.6	283	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 27:

Runoff = 0.48 cfs @ 12.09 hrs, Volume= 1,695 cf, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	8,389	39	Proposed >75% Grass cover, Good, HSG A
	0	32	Woods/grass comb., Good, HSG A
*	1,104	98	Proposed unconnected roofs
*	0	98	Proposed path, unconnected pavement
*	3,942	98	Proposed access and parking, paved
*	2,048	98	Existing Anglers Road, paved
	15,483		Weighted Average
	8,389		54.18% Pervious Area
	7,094		45.82% Impervious Area
	1,104		15.56% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	26	0.0163	0.08		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
0.0	7	0.0210	2.94		**Shallow Concentrated Flow, Seg B to C** Paved Kv= 20.3 fps
0.2	42	0.0073	3.83	24.06	**Trap/Vee/Rect Channel Flow, Seg C to D** Bot.W=0.00' D=0.50' Z= 50.0 & 0.2 '/' Top.W=25.10' n= 0.013 Asphalt, smooth
0.1	53	0.0933	10.50	57.18	**Trap/Vee/Rect Channel Flow, Seg D to E** Bot.W=0.00' D=0.33' Z= 50.0 '/' Top.W=33.00' n= 0.013 Asphalt, smooth
0.1	32	0.0075	3.89	24.38	**Trap/Vee/Rect Channel Flow, Seg E to F** Bot.W=0.00' D=0.50' Z= 50.0 & 0.2 '/' Top.W=25.10' n= 0.013 Asphalt, smooth
5.8	160	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 28:

Runoff = 0.20 cfs @ 12.20 hrs, Volume= 928 cf, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Adj	Description
*	20,952	39	39	Proposed >75% Grass cover, Good, HSG A
	0	32		Woods/grass comb., Good, HSG A
*	3,885	98	98	Proposed unconnected roofs
*	0	98		Proposed path, unconnected pavement
*	0	98		Proposed access and parking, paved
*	0	98		Existing Anglers Road, paved
*	0	96		Existing Anglers Road, gravel
	24,837			Weighted Average
	20,952			84.36% Pervious Area
	3,885			15.64% Impervious Area
	3,885			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.3	150	0.0393	0.16		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"

Summary for Subcatchment 29:

Runoff = 0.01 cfs @ 12.09 hrs, Volume= 19 cf, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	4,409	39	Proposed >75% Grass cover, Good, HSG A
	0	32	Woods/grass comb., Good, HSG A
*	81	98	Proposed unconnected roofs
*	0	98	Proposed path, unconnected pavement
	4,490		Weighted Average
	4,409		98.20% Pervious Area
	81		1.80% Impervious Area
	81		100.00% Unconnected

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

Summary for Subcatchment 31:

Runoff = 0.52 cfs @ 12.10 hrs, Volume= 1,910 cf, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	4,146	39	Proposed >75% Grass cover, Good, HSG A
	0	32	Woods/grass comb., Good, HSG A
*	1,797	98	Proposed unconnected roofs
*	0	98	Proposed path, unconnected pavement
*	6,197	98	Proposed access and parking, paved
*	0	98	Existing Anglers Road, paved
*	0	96	Existing Anglers Road, gravel
	12,140		Weighted Average
	4,146		34.15% Pervious Area
	7,994		65.85% Impervious Area
	1,797		22.48% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	45	0.0263	0.11		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
0.2	169	0.0873	14.30	112.54	**Trap/Vee/Rect Channel Flow, Seg B to C** Bot.W=0.00' D=0.56' Z= 50.0 & 0.2 '/' Top.W=28.11' n= 0.013 Asphalt, smooth
7.1	214	Total			

Summary for Subcatchment 32:

Runoff = 0.91 cfs @ 12.10 hrs, Volume= 3,320 cf, Depth= 1.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	7,577	39	Proposed >75% Grass cover, Good, HSG A
	0	32	Woods/grass comb., Good, HSG A
*	3,878	98	Proposed unconnected roofs
*	0	98	Proposed path, unconnected pavement
*	10,015	98	Proposed access and parking, paved
*	0	98	Existing Anglers Road, paved
*	0	96	Existing Anglers Road, gravel
	21,470		Weighted Average
	7,577		35.29% Pervious Area
	13,893		64.71% Impervious Area
	3,878		27.91% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	46	0.0293	0.11		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
0.2	11	0.0233	0.93		**Sheet Flow, Seg B to C** Smooth surfaces n= 0.011 P2= 3.10"
0.2	149	0.0864	13.19	82.76	**Trap/Vee/Rect Channel Flow, Seg C to D** Bot.W=0.00' D=0.50' Z= 50.0 & 0.2 '/' Top.W=25.10' n= 0.013 Asphalt, smooth
7.1	206	Total			

Summary for Pond CB1:

Inflow Area = 133,185 sf, 50.43% Impervious, Inflow Depth = 1.45" for 2-Year event
Inflow = 4.17 cfs @ 12.10 hrs, Volume= 16,051 cf
Outflow = 4.17 cfs @ 12.10 hrs, Volume= 16,051 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.03 cfs @ 12.10 hrs, Volume= 7,794 cf
Secondary = 2.13 cfs @ 12.10 hrs, Volume= 8,258 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 299.71' @ 13.04 hrs
Flood Elev= 302.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	298.30'	**15.0" Round Culvert - SD-1** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 298.30' / 298.25' S= 0.0013 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Secondary	298.30'	**15.0" Round Culvert - SD-2** L= 28.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 298.30' / 298.25' S= 0.0018 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.71 cfs @ 12.10 hrs HW=299.29' TW=299.08' (Dynamic Tailwater)
└**1=Culvert - SD-1** (Outlet Controls 1.71 cfs @ 2.25 fps)

Secondary OutFlow Max=1.79 cfs @ 12.10 hrs HW=299.29' TW=299.08' (Dynamic Tailwater)
└**2=Culvert - SD-2** (Outlet Controls 1.79 cfs @ 2.36 fps)

Summary for Pond CB2:

Inflow Area = 128,360 sf, 49.38% Impervious, Inflow Depth = 1.42" for 2-Year event
Inflow = 3.91 cfs @ 12.10 hrs, Volume= 15,148 cf
Outflow = 3.91 cfs @ 12.10 hrs, Volume= 15,148 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.91 cfs @ 12.10 hrs, Volume= 15,148 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 299.86' @ 12.11 hrs
Flood Elev= 304.04'

Device	Routing	Invert	Outlet Devices
#1	Primary	298.65'	**18.0" Round Culvert - SD-3** L= 85.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 298.65' / 298.30' S= 0.0041 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.68 cfs @ 12.10 hrs HW=299.85' TW=299.29' (Dynamic Tailwater)
└**1=Culvert - SD-3** (Outlet Controls 3.68 cfs @ 3.33 fps)

Summary for Pond CB3:

Inflow Area = 108,570 sf, 46.65% Impervious, Inflow Depth = 1.34" for 2-Year event
Inflow = 3.06 cfs @ 12.10 hrs, Volume= 12,104 cf
Outflow = 3.06 cfs @ 12.10 hrs, Volume= 12,104 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.06 cfs @ 12.10 hrs, Volume= 12,104 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 300.07' @ 12.14 hrs
Flood Elev= 304.04'

Device	Routing	Invert	Outlet Devices
#1	Primary	298.85'	**18.0" Round Culvert - SD-4** L= 18.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 298.85' / 298.75' S= 0.0056 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.47 cfs @ 12.10 hrs HW=300.04' TW=299.85' (Dynamic Tailwater)
↑—**1=Culvert - SD-4** (Inlet Controls 2.47 cfs @ 1.64 fps)

Summary for Pond CB4:

Inflow Area = 90,861 sf, 48.22% Impervious, Inflow Depth = 1.38" for 2-Year event
Inflow = 2.80 cfs @ 12.10 hrs, Volume= 10,471 cf
Outflow = 2.80 cfs @ 12.10 hrs, Volume= 10,471 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.80 cfs @ 12.10 hrs, Volume= 10,471 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 300.48' @ 12.13 hrs
Flood Elev= 303.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	299.35'	**15.0" Round Culvert - SD-5** L= 98.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 299.35' / 298.90' S= 0.0046 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.33 cfs @ 12.10 hrs HW=300.45' TW=300.03' (Dynamic Tailwater)
↑—**1=Culvert - SD-5** (Outlet Controls 2.33 cfs @ 2.70 fps)

Summary for Pond CB5:

Inflow Area = 38,100 sf, 57.66% Impervious, Inflow Depth = 1.65" for 2-Year event
Inflow = 1.44 cfs @ 12.10 hrs, Volume= 5,250 cf
Outflow = 1.44 cfs @ 12.10 hrs, Volume= 5,250 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.44 cfs @ 12.10 hrs, Volume= 5,250 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 300.71' @ 12.14 hrs
Flood Elev= 304.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	299.85'	**15.0" Round Culvert - SD-6** L= 99.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 299.85' / 299.40' S= 0.0045 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.16 cfs @ 12.10 hrs HW=300.69' TW=300.46' (Dynamic Tailwater)
↑—**1=Culvert - SD-6** (Outlet Controls 1.16 cfs @ 1.87 fps)

Summary for Pond CB6:

Inflow Area = 33,610 sf, 65.12% Impervious, Inflow Depth = 1.87" for 2-Year event
Inflow = 1.44 cfs @ 12.10 hrs, Volume= 5,231 cf
Outflow = 1.44 cfs @ 12.10 hrs, Volume= 5,231 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.44 cfs @ 12.10 hrs, Volume= 5,231 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 300.97' @ 12.13 hrs
Flood Elev= 303.99'

Device	Routing	Invert	Outlet Devices
#1	Primary	300.20'	**15.0" Round Culvert - SD-7** L= 61.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 300.20' / 299.90' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.20 cfs @ 12.10 hrs HW=300.95' TW=300.69' (Dynamic Tailwater)
1=Culvert - SD-7 (Outlet Controls 1.20 cfs @ 2.22 fps)

Summary for Pond CB7:

Inflow Area = 21,470 sf, 64.71% Impervious, Inflow Depth = 1.86" for 2-Year event
Inflow = 0.91 cfs @ 12.10 hrs, Volume= 3,320 cf
Outflow = 0.91 cfs @ 12.10 hrs, Volume= 3,320 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.91 cfs @ 12.10 hrs, Volume= 3,320 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 301.09' @ 12.14 hrs
Flood Elev= 303.99'

Device	Routing	Invert	Outlet Devices
#1	Primary	300.40'	**12.0" Round Culvert - SD-8** L= 18.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 300.40' / 300.30' S= 0.0056 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.68 cfs @ 12.10 hrs HW=301.07' TW=300.95' (Dynamic Tailwater)
1=Culvert - SD-8 (Outlet Controls 0.68 cfs @ 1.72 fps)

Summary for Pond CB8:

Inflow Area = 27,924 sf, 64.32% Impervious, Inflow Depth = 1.84" for 2-Year event
Inflow = 1.21 cfs @ 12.09 hrs, Volume= 4,292 cf
Outflow = 1.21 cfs @ 12.09 hrs, Volume= 4,292 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.21 cfs @ 12.09 hrs, Volume= 4,292 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 301.32' @ 12.10 hrs
Flood Elev= 304.24'

Device	Routing	Invert	Outlet Devices
#1	Primary	300.60'	**12.0" Round Culvert - SD-9** L= 210.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 300.60' / 299.40' S= 0.0057 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.10 cfs @ 12.09 hrs HW=301.30' TW=300.43' (Dynamic Tailwater)
↑—**1=Culvert - SD-9** (Outlet Controls 1.10 cfs @ 2.61 fps)

Summary for Pond EX CB:

Inflow Area = 12,441 sf, 87.34% Impervious, Inflow Depth = 2.50" for 2-Year event
Inflow = 0.73 cfs @ 12.09 hrs, Volume= 2,597 cf
Outflow = 0.73 cfs @ 12.09 hrs, Volume= 2,597 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.73 cfs @ 12.09 hrs, Volume= 2,597 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 301.66' @ 12.10 hrs
Flood Elev= 304.72'

Device	Routing	Invert	Outlet Devices
#1	Primary	301.10'	**12.0" Round Culvert - SD-10** L= 74.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 301.10' / 300.70' S= 0.0054 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.65 cfs @ 12.09 hrs HW=301.64' TW=301.30' (Dynamic Tailwater)
↑—**1=Culvert - SD-10** (Outlet Controls 0.65 cfs @ 2.16 fps)

Summary for Pond FB1: Filter Basin 1

Inflow Area = 145,711 sf, 47.13% Impervious, Inflow Depth = 1.35" for 2-Year event
Inflow = 4.27 cfs @ 12.10 hrs, Volume= 16,411 cf
Outflow = 0.41 cfs @ 13.01 hrs, Volume= 16,415 cf, Atten= 90%, Lag= 54.6 min
Primary = 0.41 cfs @ 13.01 hrs, Volume= 16,415 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 299.70' @ 13.01 hrs Surf.Area= 5,389 sf Storage= 6,691 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 145.3 min (904.1 - 758.8)

Volume	Invert	Avail.Storage	Storage Description
#1	298.25'	17,957 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
298.25	3,633	375.7	0	0	3,633
299.00	4,736	304.1	3,129	3,129	7,515
300.00	5,676	322.9	5,199	8,328	8,504
301.50	7,193	351.2	9,629	17,957	10,104

Device	Routing	Invert	Outlet Devices
#1	Primary	296.08'	**4.0" Round Culvert** L= 37.4' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 296.08' / 295.90' S= 0.0048 '/' Cc= 0.900 n= 0.013, Flow Area= 0.09 sf
#2	Device 1	298.25'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 295.00'
#3	Secondary	299.75'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.41 cfs @ 13.01 hrs HW=299.70' TW=0.00' (Dynamic Tailwater)
↑└**1=Culvert** (Passes 0.41 cfs of 0.51 cfs potential flow)
↑└**2=Exfiltration** (Controls 0.41 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=298.25' TW=0.00' (Dynamic Tailwater)
↑└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link SP1:

Inflow Area = 10,177 sf, 21.63% Impervious, Inflow Depth = 0.74" for 2-Year event
Inflow = 0.16 cfs @ 12.14 hrs, Volume= 627 cf
Primary = 0.16 cfs @ 12.14 hrs, Volume= 627 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link SP2:

Inflow Area = 296,453 sf, 25.29% Impervious, Inflow Depth = 0.73" for 2-Year event
Inflow = 0.72 cfs @ 12.15 hrs, Volume= 17,923 cf
Primary = 0.72 cfs @ 12.15 hrs, Volume= 17,923 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Runoff Area=10,177 sf 21.63% Impervious Runoff Depth=1.22"
Flow Length=75' Slope=0.0292 '/' Tc=9.9 min UI Adjusted CN=WQ Runoff=0.24 cfs 1,037 cf

Subcatchment20: Runoff Area=15,156 sf 0.00% Impervious Runoff Depth=0.01"
Flow Length=343' Tc=15.7 min CN=WQ Runoff=0.00 cfs 8 cf

Subcatchment21: Runoff Area=135,586 sf 4.65% Impervious Runoff Depth=0.29"
Flow Length=630' Tc=10.5 min UI Adjusted CN=WQ Runoff=0.56 cfs 3,255 cf

Subcatchment22: Runoff Area=12,526 sf 12.01% Impervious Runoff Depth=0.64"
Tc=6.0 min UI Adjusted CN=WQ Runoff=0.15 cfs 663 cf

Subcatchment23: Runoff Area=4,825 sf 78.34% Impervious Runoff Depth=3.45"
Tc=6.0 min CN=WQ Runoff=0.38 cfs 1,386 cf

Subcatchment24: Runoff Area=19,790 sf 64.36% Impervious Runoff Depth=2.85"
Flow Length=233' Tc=6.0 min CN=WQ Runoff=1.28 cfs 4,706 cf

Subcatchment25: Runoff Area=17,709 sf 38.60% Impervious Runoff Depth=1.76"
Flow Length=202' Tc=16.2 min CN=WQ Runoff=0.52 cfs 2,600 cf

Subcatchment26: Runoff Area=12,441 sf 87.34% Impervious Runoff Depth=3.83"
Flow Length=283' Tc=6.0 min CN=WQ Runoff=1.10 cfs 3,968 cf

Subcatchment27: Runoff Area=15,483 sf 45.82% Impervious Runoff Depth=2.07"
Flow Length=160' Tc=6.0 min CN=WQ Runoff=0.71 cfs 2,668 cf

Subcatchment28: Runoff Area=24,837 sf 15.64% Impervious Runoff Depth=0.79"
Flow Length=150' Slope=0.0393 '/' Tc=15.3 min UI Adjusted CN=WQ Runoff=0.30 cfs 1,634 cf

Subcatchment29: Runoff Area=4,490 sf 1.80% Impervious Runoff Depth=0.20"
Tc=6.0 min CN=WQ Runoff=0.01 cfs 76 cf

Subcatchment31: Runoff Area=12,140 sf 65.85% Impervious Runoff Depth=2.92"
Flow Length=214' Tc=7.1 min CN=WQ Runoff=0.78 cfs 2,951 cf

Subcatchment32: Runoff Area=21,470 sf 64.71% Impervious Runoff Depth=2.87"
Flow Length=206' Tc=7.1 min CN=WQ Runoff=1.36 cfs 5,132 cf

Pond CB1: Peak Elev=300.07' Inflow=6.23 cfs 25,121 cf
Primary=3.11 cfs 12,302 cf Secondary=3.11 cfs 12,818 cf Outflow=6.23 cfs 25,121 cf

Pond CB2: Peak Elev=300.44' Inflow=5.85 cfs 23,735 cf
18.0" Round Culvert n=0.013 L=85.0' S=0.0041 '/' Outflow=5.85 cfs 23,735 cf

Pond CB3: Peak Elev=300.75' Inflow=4.58 cfs 19,029 cf
18.0" Round Culvert n=0.013 L=18.0' S=0.0056 '/' Outflow=4.58 cfs 19,029 cf

Pond CB4: Peak Elev=301.14' Inflow=4.19 cfs 16,429 cf
15.0" Round Culvert n=0.013 L=98.0' S=0.0046 '/' Outflow=4.19 cfs 16,429 cf

Pond CB5: Peak Elev=301.23' Inflow=2.16 cfs 8,159 cf
15.0" Round Culvert n=0.013 L=99.0' S=0.0045 '/' Outflow=2.16 cfs 8,159 cf

Pond CB6: Peak Elev=301.33' Inflow=2.15 cfs 8,083 cf
15.0" Round Culvert n=0.013 L=61.0' S=0.0049 '/' Outflow=2.15 cfs 8,083 cf

Pond CB7: Peak Elev=301.38' Inflow=1.36 cfs 5,132 cf
12.0" Round Culvert n=0.013 L=18.0' S=0.0056 '/' Outflow=1.36 cfs 5,132 cf

Pond CB8: Peak Elev=301.60' Inflow=1.81 cfs 6,636 cf
12.0" Round Culvert n=0.013 L=210.0' S=0.0057 '/' Outflow=1.81 cfs 6,636 cf

Pond EX CB: Peak Elev=301.85' Inflow=1.10 cfs 3,968 cf
12.0" Round Culvert n=0.013 L=74.0' S=0.0054 '/' Outflow=1.10 cfs 3,968 cf

Pond FB1: Filter Basin 1 Peak Elev=299.97' Storage=8,165 cf Inflow=6.38 cfs 25,784 cf
Primary=0.45 cfs 21,016 cf Secondary=2.68 cfs 4,784 cf Outflow=3.13 cfs 25,800 cf

Link SP1: Inflow=0.24 cfs 1,037 cf
Primary=0.24 cfs 1,037 cf

Link SP2: Inflow=3.46 cfs 29,063 cf
Primary=3.46 cfs 29,063 cf

Total Runoff Area = 306,630 sf Runoff Volume = 30,084 cf Average Runoff Depth = 1.18"
74.83% Pervious = 229,453 sf 25.17% Impervious = 77,177 sf

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10: Runoff Area=10,177 sf 21.63% Impervious Runoff Depth=1.73"
Flow Length=75' Slope=0.0292 '/' Tc=9.9 min UI Adjusted CN=WQ Runoff=0.30 cfs 1,467 cf

Subcatchment20: Runoff Area=15,156 sf 0.00% Impervious Runoff Depth=0.11"
Flow Length=343' Tc=15.7 min CN=WQ Runoff=0.00 cfs 135 cf

Subcatchment21: Runoff Area=135,586 sf 4.65% Impervious Runoff Depth=0.55"
Flow Length=630' Tc=10.5 min UI Adjusted CN=WQ Runoff=0.74 cfs 6,177 cf

Subcatchment22: Runoff Area=12,526 sf 12.01% Impervious Runoff Depth=1.01"
Tc=6.0 min UI Adjusted CN=WQ Runoff=0.19 cfs 1,055 cf

Subcatchment23: Runoff Area=4,825 sf 78.34% Impervious Runoff Depth=4.44"
Tc=6.0 min CN=WQ Runoff=0.48 cfs 1,786 cf

Subcatchment24: Runoff Area=19,790 sf 64.36% Impervious Runoff Depth=3.72"
Flow Length=233' Tc=6.0 min CN=WQ Runoff=1.62 cfs 6,132 cf

Subcatchment25: Runoff Area=17,709 sf 38.60% Impervious Runoff Depth=2.39"
Flow Length=202' Tc=16.2 min CN=WQ Runoff=0.67 cfs 3,521 cf

Subcatchment26: Runoff Area=12,441 sf 87.34% Impervious Runoff Depth=4.91"
Flow Length=283' Tc=6.0 min CN=WQ Runoff=1.38 cfs 5,088 cf

Subcatchment27: Runoff Area=15,483 sf 45.82% Impervious Runoff Depth=2.76"
Flow Length=160' Tc=6.0 min CN=WQ Runoff=0.91 cfs 3,561 cf

Subcatchment28: Runoff Area=24,837 sf 15.64% Impervious Runoff Depth=1.20"
Flow Length=150' Slope=0.0393 '/' Tc=15.3 min UI Adjusted CN=WQ Runoff=0.39 cfs 2,481 cf

Subcatchment29: Runoff Area=4,490 sf 1.80% Impervious Runoff Depth=0.48"
Tc=6.0 min CN=WQ Runoff=0.02 cfs 181 cf

Subcatchment31: Runoff Area=12,140 sf 65.85% Impervious Runoff Depth=3.80"
Flow Length=214' Tc=7.1 min CN=WQ Runoff=0.99 cfs 3,840 cf

Subcatchment32: Runoff Area=21,470 sf 64.71% Impervious Runoff Depth=3.74"
Flow Length=206' Tc=7.1 min CN=WQ Runoff=1.72 cfs 6,686 cf

Pond CB1: Peak Elev=300.56' Inflow=7.88 cfs 33,276 cf
Primary=3.94 cfs 16,363 cf Secondary=3.94 cfs 16,912 cf Outflow=7.88 cfs 33,276 cf

Pond CB2: Peak Elev=301.46' Inflow=7.40 cfs 31,490 cf
18.0" Round Culvert n=0.013 L=85.0' S=0.0041 '/' Outflow=7.40 cfs 31,490 cf

Pond CB3: Peak Elev=302.01' Inflow=5.79 cfs 25,357 cf
18.0" Round Culvert n=0.013 L=18.0' S=0.0056 '/' Outflow=5.79 cfs 25,357 cf

Pond CB4: Peak Elev=302.57' Inflow=5.30 cfs 21,836 cf
15.0" Round Culvert n=0.013 L=98.0' S=0.0046 '/' Outflow=5.30 cfs 21,836 cf

Pond CB5: Peak Elev=302.68' Inflow=2.73 cfs 10,706 cf
15.0" Round Culvert n=0.013 L=99.0' S=0.0045 '/' Outflow=2.73 cfs 10,706 cf

Pond CB6: Peak Elev=302.76' Inflow=2.72 cfs 10,526 cf
15.0" Round Culvert n=0.013 L=61.0' S=0.0049 '/' Outflow=2.72 cfs 10,526 cf

Pond CB7: Peak Elev=302.82' Inflow=1.72 cfs 6,686 cf
12.0" Round Culvert n=0.013 L=18.0' S=0.0056 '/' Outflow=1.72 cfs 6,686 cf

Pond CB8: Peak Elev=302.86' Inflow=2.29 cfs 8,648 cf
12.0" Round Culvert n=0.013 L=210.0' S=0.0057 '/' Outflow=2.29 cfs 8,648 cf

Pond EX CB: Peak Elev=302.90' Inflow=1.38 cfs 5,088 cf
12.0" Round Culvert n=0.013 L=74.0' S=0.0054 '/' Outflow=1.38 cfs 5,088 cf

Pond FB1: Filter Basin 1 Peak Elev=300.10' Storage=8,907 cf Inflow=8.08 cfs 34,331 cf
Primary=0.47 cfs 24,075 cf Secondary=5.42 cfs 10,273 cf Outflow=5.89 cfs 34,348 cf

Link SP1: Inflow=0.30 cfs 1,467 cf
Primary=0.30 cfs 1,467 cf

Link SP2: Inflow=6.61 cfs 40,659 cf
Primary=6.61 cfs 40,659 cf

Total Runoff Area = 306,630 sf Runoff Volume = 42,109 cf Average Runoff Depth = 1.65"
74.83% Pervious = 229,453 sf 25.17% Impervious = 77,177 sf

ATTACHMENT 4

INSPECTION, MAINTENANCE & HOUSEKEEPING PLAN

DM ROMA
CONSULTING ENGINEERS

INSPECTION, MAINTENANCE, AND HOUSEKEEPING PLAN

ANGLERS ROAD COMMONS APARTMENTS
ANGLERS ROAD
WINDHAM, MAINE

Responsible Party

Owner: Anglers Road Commons LLC
7 Fay Road
Scituate, MA 02066

The owner is responsible for the maintenance of all stormwater management structures and related site components and the keeping of a maintenance log book with service records. Records of all inspections and maintenance work performed must be kept on file with the owner and retained for a minimum of five years. The maintenance log will be made available to the Town and Maine Department of Environmental Protection (MDEP) upon request. At a minimum, the maintenance of stormwater management systems will be performed on the prescribed schedule.

The procedures outlined in this plan are provided as a general overview of the anticipated practices to be utilized on this site. In some instances, additional measures may be required due to unexpected conditions. *The Maine Erosion and Sedimentation Control BMP* and *Stormwater Management for Maine: Best Management Practices* Manuals published by the MDEP should be referenced for additional information.

During Construction

1. **Inspection and Corrective Action:** It is the contractor's responsibility to comply with the inspection and maintenance procedures outlined in this section. Inspection shall occur on all disturbed and impervious areas, erosion control measures, material storage areas that are exposed to precipitation, and locations where vehicles enter or exit the site. These areas shall be inspected at least once a week as well as 24 hours before and after a storm event and prior to completing permanent stabilization measures. A person with knowledge of erosion and stormwater control, including the standards and conditions in the permit, shall conduct the inspections.

2. **Maintenance:** Erosion controls shall be maintained in effective operating condition until areas are permanently stabilized. If best management practices (BMPs) need to be repaired, the repair work should be initiated upon discovery of the problem but no later than the end of the next workday. If BMPs need to be maintained or modified, additional

BMPs are necessary, or other corrective action is needed, implementation must be completed within seven calendar days and prior to any rainfall event.

3. **Construction vehicles and equipment:** Construction vehicles and equipment shall not be driven or stored within the underdrained filter basins. To ensure the basins function as designed perpetually, prohibiting vehicles and equipment from these areas will limit the risk of inhibiting the function of the basins due to compaction.

4. **Snow Storage:** The proposed underdrained filter basins (FB) shall not be utilized for snow storage. Snow storage areas shall be located away from the basins, and in areas that will direct snow melt runoff into one of the basins on site.

5. **Documentation:** A report summarizing the inspections and any corrective action taken must be maintained on site. The log must include the name(s) and qualifications of the person making the inspections; the date(s) of the inspections; and the major observations about the operation and maintenance of erosion and sedimentation controls, materials storage areas, and vehicle access points to the parcel. Major observations must include BMPs that need maintenance, BMPs that failed to operate as designed or proved inadequate for a particular location, and location(s) where additional BMPs are needed. For each BMP requiring maintenance, BMP needing replacement, and location needing additional BMPs, note in the log the corrective action taken and when it was taken. The log must be made accessible to Town staff, and a copy must be provided upon request. The owner shall retain a copy of the log for a period of at least three years from the completion of permanent stabilization.

Housekeeping

1. **Spill prevention:** Controls must be used to prevent pollutants from construction and waste materials on site to enter stormwater, which includes storage practices to minimize exposure of the materials to stormwater. The site contractor or operator must develop, and implement as necessary, appropriate spill prevention, containment, and response planning measures.

2. **Groundwater protection:** During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An "infiltration area" is any area of the site that by design or as a result of soils, topography and other relevant factors accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposes of storage and handling of these materials. Any project proposing infiltration of stormwater must provide adequate pre-treatment of stormwater prior to discharge of stormwater to the infiltration area, or provide for treatment within the infiltration area, in order to prevent the accumulation of fines, reduction in infiltration rate, and consequent flooding and destabilization.

3. **Fugitive sediment and dust:** Actions must be taken to ensure that activities do not result in noticeable erosion of soils or fugitive dust emissions during or after construction. Oil may not be used for dust control, but other water additives may be considered as needed. A stabilized construction entrance (SCE) should be included to minimize tracking of mud and sediment. If off-site tracking occurs, public roads should be swept immediately and no less than once a week and prior to significant storm events. Operations during dry months, that experience fugitive dust problems, should wet down unpaved access roads once a week or more frequently as needed with a water additive to suppress fugitive sediment and dust.

4. **Debris and other materials:** Minimize the exposure of construction debris, building and landscaping materials, trash, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials to precipitation and stormwater runoff. These materials must be prevented from becoming a pollutant source.

5. **Excavation de-watering:** Excavation de-watering is the removal of water from trenches, foundations, coffer dams, ponds, and other areas within the construction area that retain water after excavation. In most cases the collected water is heavily silted and hinders correct and safe construction practices. The collected water removed from the ponded area, either through gravity or pumping, must be spread through natural wooded buffers or removed to areas that are specifically designed to collect the maximum amount of sediment possible, like a cofferdam sedimentation basin. Avoid allowing the water to flow over disturbed areas of the site. Equivalent measures may be taken if approved by the Department.

6. **Authorized Non-stormwater discharges:** Identify and prevent contamination by non-stormwater discharges. Where allowed non-stormwater discharges exist, they must be identified and steps should be taken to ensure the implementation of appropriate pollution prevention measures for the non-stormwater component(s) of the discharge. Authorized non-stormwater discharges are:
   (a) Discharges from firefighting activity;
   (b) Fire hydrant flushings;
   (c) Vehicle washwater if detergents are not used and washing is limited to the exterior of vehicles (engine, undercarriage and transmission washing is prohibited);
   (d) Dust control runoff in accordance with permit conditions and Appendix (C)(3);
   (e) Routine external building washdown, not including surface paint removal, that does not involve detergents;
   (f) Pavement washwater (where spills/leaks of toxic or hazardous materials have not occurred, unless all spilled material had been removed) if detergents are not used;
   (g) Uncontaminated air conditioning or compressor condensate;
   (h) Uncontaminated groundwater or spring water;
   (i) Foundation or footer drain-water where flows are not contaminated;

(j) Uncontaminated excavation dewatering (see requirements in Appendix C(5));
(k) Potable water sources including waterline flushings; and
(l) Landscape irrigation.

7. **Unauthorized non-stormwater discharges:** Approval from the MDEP does not authorize a discharge that is mixed with a source of non-stormwater, other than those discharges in compliance with Section 6 above. Specifically, the MDEP's approval does not authorize discharges of the following:
(a) Wastewater from the washout or cleanout of concrete, stucco, paint, form release oils, curing compounds or other construction materials;
(b) Fuels, oils or other pollutants used in vehicle and equipment operation and maintenance;
(c) Soaps, solvents, or detergents used in vehicle and equipment washing; and
(d) Toxic or hazardous substances from a spill or other release.

Post construction

1. **Inspection and Corrective Action:** All measures must be maintained by the owner in effective operating condition. A qualified third party inspector hired by the owner shall at least annually inspect the stormwater management facilities. This person should have knowledge of erosion and stormwater control including the standards and conditions of the site's approvals. The inspector shall be certified through the MDEP to inspect the stormwater infrastructure. The following areas, facilities, and measures must be inspected, and identified deficiencies must be corrected. Areas, facilities, and measures other than those listed below may also require inspection on a specific site.

   A. **Vegetated Areas:** Inspect vegetated areas, particularly slopes and embankments, early in the growing season or after heavy rains to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where rill is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

   B. **Ditches, Swales, and Open Channels:** Inspect ditches, swales, and other open channels in the spring, late fall, and after heavy rains to remove any obstructions to flow, remove accumulated sediments and debris, control vegetative growth that could obstruct flow, and repair any erosion of the ditch lining. Vegetated ditches must be mowed at least annually or otherwise maintained to control the growth of woody vegetation and maintain flow capacity. Any woody vegetation growing through riprap linings must also be removed. Repair any slumping side slopes as soon as practicable. If the ditch has a riprap lining, replace riprap on areas where any underlying filter fabric or underdrain gravel is showing through the stone or where stones have dislodged. The channel must receive adequate routine maintenance to maintain capacity and prevent or correct any erosion of the channel's bottom or side slopes.

C. **Culverts:** Inspect culverts in the spring, late fall, and after heavy rains to remove any obstructions to flow; remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit; and to repair any erosion damage at the culvert's inlet and outlet.

D. **Catch Basins:** Inspect and, if required, clean out catch basins at least once a year, preferably in early spring. Clean out must include the removal and legal disposal of any accumulated sediments and debris at the bottom of the basin, at any inlet grates, at any inflow channels to the basin, and at any pipes between basins. If the basin outlet is designed to trap floatable materials, then remove the floating debris and any floating oils (using oil-absorptive pads).

E. **Underdrained Filter Basins:** Underdrained filter basins are not intended to function as snow storage areas, and winter plowing operations shall ensure that snow is not plowed or dumped into the basins. The basins should be inspected semi-annually and following major storm events for the first year and every six months thereafter. The basin should drain within 48 hours following a one-inch storm and if a larger storm fills the system to overflow, it shall drain within 36 to 60 hours. If ponding exceeds 48 hours, the top of the filter bed must be rototilled to reestablish the soil's filtration capacity. If water ponds on the surface of the bed for more than 72 hours, the top several inches of the filter shall be replaced with fresh material. Inspect for debris and sediment build up in the forebay and basin and remove as needed. Mowing of the basin can only occur semi-annually to a height of no less than 6 inches utilizing a hand-held string trimmer or push-mower. Any bare areas or erosion rills shall be repaired with new filter media or sandy loam then seeded and mulched. The basin should also be inspected annually for destabilization of side slopes, embankment settling and other signs of structural failure.

F. **Roofline Drip edges:** The drip edges should be inspected semi-annually and following major storm events for the first year and every six months thereafter. The reservoir crushed stone should drain within 48 hours following a one-inch storm and if a larger storm fills the system to overflow, it shall drain within 36 to 60 hours. If ponding exceeds 48 hours, the stone reservoir course shall be removed and the filter bed be rototilled to reestablish the soil's filtration capacity. If water ponds in the reservoir course for more than 72 hours, the top several inches of the filter shall be replaced with fresh material. Inspect for debris and sediment build up at surface and remove as needed. The drip edges are part of the stormwater management plan and cannot be paved over or altered in anyway.

G. **Regular Maintenance:** Clear accumulations of winter sand along roadway once a year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping. Accumulations of sand along pavement shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader.

H. Documentation: Keep a log (report) summarizing inspections, maintenance, and any corrective actions taken. The log must include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean-out of any sediments or debris, indicate where the sediment and debris was disposed after removal. The log must be made accessible to Town staff upon request. The permittee shall retain a copy of the log for a period of at least five years from the completion of permanent stabilization. Attached is a sample log.

Re-certification

Submit a certification of the following to the MDEP within three months of the expiration of each five-year interval from the date of issuance of the permit.

(a) **Identification and repair of erosion problems**. All areas of the project site have been inspected for areas of erosion, and appropriate steps have been taken to permanently stabilize these areas.

(b) **Inspection and repair of stormwater control system**. All aspects of the stormwater control system have been inspected for damage, wear, and malfunction, and appropriate steps have been taken to repair or replace the system, or portions of the system.

(c) **Maintenance**. The erosion and stormwater maintenance plan for the site is being implemented as written, or modifications to the plan have been submitted to and approved by the Department, and the maintenance log is being maintained.

Municipalities with separate storm sewer systems regulated under the Maine Pollutant Discharge Elimination System (MPDES) Program may report on all regulated systems under their control as part of their required annual reporting in lieu of separate certification of each system. Municipalities not regulated by the MPDES Program, but that are responsible for maintenance of permitted stormwater systems, may report on multiple stormwater systems in one report.

Duration of Maintenance

Perform maintenance as described.

STORMWATER MAINTENANCE LOG

(SHEET 1 OF 2)

ANGLERS ROAD COMMONS APARTMENTS
ANGLERS ROAD
WINDHAM, MAINE

The following stormwater management and erosion control items shall be inspected and maintained as prescribed in the Maintenance Plan with recommended frequencies as identified below. The owner is responsible for keeping this maintenance log on file for a minimum of five years and shall provide a copy to the Town and MDEP upon request. Inspections are to be performed by a qualified third-party inspector and all corrective actions shall be performed by personnel familiar with stormwater management systems and erosion controls.

Maintenance Item	Maintenance Event	Date Performed	Responsible Personnel	Comments
Vegetated Areas	Inspect slopes and embankments early in Spring.			
Ditches, swales, and other open channels	Inspect after major rainfall event producing 1" of rain in two hours.			
	Inspect for erosion or slumping & repair			
	Mowed at least annually.			
Culverts	Inspect semiannually and after major rainfall.			
	Repair erosion at inlet or outlet of pipe.			
	Repair displaced riprap.			
	Clean accumulated sediment in culverts when >20% full.			
Catch Basins	Inspect to ensure that structure is properly draining.			
	Remove accumulated sediment semiannually.			
	Inspect grates/inlets and remove debris as needed.			

STORMWATER MAINTENANCE LOG

(SHEET 2 OF 2)

ANGLERS ROAD COMMONS APARTMENTS
ANGLERS ROAD
WINDHAM, MAINE

Maintenance Item	Maintenance Event	Date Performed	Responsible Personnel	Comments
Underdrained Filter Basins And Roofline Drip edges	Check after each rainfall event to ensure that pond drains within 24-48 hours.			
	Replace top several inches of filter if pond does not drain within 72 hours.			
	Mow grass no more than twice a year to no less than 6 inches in height.			
	Inspect semi-annually for erosion or sediment accumulation and repair as necessary.			
Regular Maintenance	Clear accumulation of winter sand in paved areas annually.			

Traffic Solutions
William J. Bray, P.E.
17 Mountview Drive
Gorham, ME 04038
(207) 400-6890
trafficsolutions@maine.rr.com

March 26, 2019

Traffic Assessment

For Proposed

Anglers Road Commons Apartments

Windham, Maine

INTRODUCTION

Anglers Road Commons, LLC is proposing to construct a total of 44 apartments on a 6.09-acre parcel of property located on Angler Road in the Town of Windham. Access to the site is provided through two driveway entrances that connect directly to Angler Road.

This document determines daily and peak hour trip generation of the proposed project for both peak commuter time periods, examines current roadway safety trends in the general vicinity of the proposed project, and reviews vehicle sight distance.

SITE TRAFFIC

Site Trip Generation: Daily and peak hour trip generation was determined for the proposed project based upon trip tables presented in the ninth edition of the Institute of Transportation Engineers (ITE) "**TRIP GENERATION**" handbook. The ITE publication provides numerous land use categories and the average volume of trips generated by each category.

The following trip rate was used to calculate trip generation for the proposed project:

Land Use #220 – Apartment

Weekday	= 6.65 trips per dwelling unit
AM Peak Hour	= 0.51 trips per dwelling unit
PM Peak Hour	= 0.62 trips per dwelling unit

Accordingly, the proposed 44 apartment units can be expected to generate a total of 293 trips during a typical weekday; 22 trips in the morning peak hour and 27 trips in the evening peak hour.

Site Trip Distribution: The Institute of Transportation Engineers handbook also provides the following directional distribution rates for an apartment unit:

AM Peak Hour	= 20% enter site and 80% exit site
PM Peak Hour	= 65% enter site and 35% exit site

Based upon the noted directional distribution patterns, 4 trips during the morning peak hour and 18 trips in the evening peak hour enter the site and the remaining trips (18 AM trips and 9 PM trips) exit the site.

EXISTING SAFETY CONDITIONS

The Maine Department of Transportation's (MaineDOT) Accident Records Section provided the latest three-year (2015 through 2017) crash data for the full length of Angler Road, a distance of approximately 0.28 miles. Their report is presented as follows:

2015 -2017 Traffic Accident Summary

Location	Total Crashes	Critical Rate Factor
1. Roosevelt Trail @ Anglers Road	15	0.50
2. Anglers Road btw. Roosevelt Trail and Gordan Place	1	0.65
3. Anglers Road btw. Gordan Place and Road End	2	1.19

The MaineDOT considers any roadway intersection or segment a high crash location if both of the following criteria are met:

- ***8 or more accidents***
- ***A Critical Rate Factor greater than 1.00***

As the data presented in the chart shows, there are no high crash locations on Anglers Road.

SIGHT DISTANCE

The Maine Department of Transportation's Highway Entrance and Driveway Rules require the following sight distances for a non-mobility roadway:

Sight Distance Standards

Speed Limit	Sight Distance
25 mph	**200 feet**
30	250
35	305
40	360
45	425
50	495
55	570

Anglers Road is currently not posted; this report has assumed a 25mph speed limit for evaluating vehicle sight distance. MaineDOT's regulations require an unobstructed sightline of 200 feet for a posted road speed limit of 25mph. Field measurements were determined for both directions of travel from each proposed site driveway entrance onto Anglers Road, consistent with MaineDOT's standard practices. A clear line-of-site in excess of 300-feet plus was measured in each direction at both proposed driveways.

CONCLUSIONS

- The 44 apartment units can be expected to generate **293** daily trips; twenty-two (**22**) trips in the morning peak hour and **27** trips during the afternoon peak commuter hour.

- The Maine Department of Transportation's most recent three-year (2015 to 2017) accident safety audit for the full length of Anglers Road shows the vehicle crash history is well below MaineDOT's criteria for identification of a high crash location.

- Vehicle sightlines measured in each direction at both proposed site driveways meet and exceed the non-mobility highway sight distance standard for a posted speed limit of 25mph.


16924
Search...
Pettingill Pond
SHORE RD
SPEAR AVE
SUMMER AVE
18759
ANGLERS RD
302
16923
ROOSEVELT TRL
35
WINDHAM
GORDON PL
10131
18758
Lowells Corner (historical)
16922
TES BRIDGE RD
Scale: 1:4500
300ft

Maine Department Of Transportation - Traffic Engineering, Crash Records Section

Crash Summary Report

Report Selections and Input Parameters

REPORT SELECTIONS

☑ Crash Summary I ☐ Section Detail ☑ Crash Summary II ☐ 1320 Public ☐ 1320 Private ☐ 1320 Summary

REPORT DESCRIPTION

Windham - Angler's Rd from Rte 302 (node 16922) to Shore Rd (18759)

REPORT PARAMETERS

Year 2015, Start Month 1 through Year 2017 End Month: 12

Route: **0501006**	Start Node: **16922**	Start Offset: **0**	☐ **Exclude First Node**
	End Node: **18759**	End Offset: **0**	☐ **Exclude Last Node**

Crash Summary I

Nodes

Node	Route - MP	Node Description	U/R	Total Crashes	Injury Crashes K	A	B	C	PD	Percent Injury	Annual M Ent-Veh	Crash Rate	Critical Rate	CRF
18759	0501006 - 0.28	0509179 WIN,ANGLERS RD,SHORE RD	1	0	0	0	0	0	0	0.0	0.398	0.00	0.56	0.00
												Statewide Crash Rate:	0.13	
10131	0501006 - 0.09	Non Int ANGLERS RD	2	0	0	0	0	0	0	0.0	0.354	0.00	0.60	0.00
												Statewide Crash Rate:	0.14	
P16922	0501006 - 0	Int of ANGLERS RD ROOSEVELT TRL WHITES BRIDGE RI	9	15	0	0	0	4	11	26.7	8.659	0.58	1.16	0.00
												Statewide Crash Rate:	0.74	
Study Years:	3.00	**NODE TOTALS:**		15	0	0	0	4	11	26.7	9.411	0.53	1.08	0.49

Crash Summary I

Sections

Start Node	End Node	Element	Offset Begin - End	Route - MP	Section Length	U/R	Total Crashes	Injury Crashes K	A	B	C	PD	Percent Injury	Annual HMVM	Crash Rate	Critical Rate	CRF
10131	16922	4334555	0 - 0.09	0501006 - 0	0.09	2	1	0	0	0	0	1	0.0	0.00033	1012.69	1556.93	0.00
Non Int ANGLERS RD				RD INV 05 01006											Statewide Crash Rate: 407.82		
10131	18759	183527	0 - 0.19	0501006 - 0.09	0.19	1	2	0	0	0	1	1	50.0	0.00065	1025.94	863.86	1.19
Non Int ANGLERS RD				RD INV 05 01006											Statewide Crash Rate: 231.89		
Study Years: 3.00				**Section Totals:**	0.28		3	0	0	0	1	2	33.3	0.00098	1021.49	931.72	1.10
				Grand Totals:	0.28		18	0	0	0	5	13	27.8	0.00098	6128.91	1050.53	5.83

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

Maine Department of Human Services
Division of Health Engineering, 10 SHS
(207) 287-5672 Fax: (207) 287-3165

PROPERTY LOCATION

City, Town, or Plantation	Windham
Street or Road	Anglers Road
Subdivision, Lot #	Anglers Road Commons

OWNER/APPLICANT INFORMATION

Name (last, first, MI): Clinton, Timothy — ■ Owner ☐ Applicant

Mailing Address of Owner/Applicant: 7 Fay Road, Scituate, MA 02066

Daytime Tel. #: 617-590-5746

OWNER OR APPLICANT STATEMENT

I state and acknowledge that the information submitted is correct to the best of my knowledge and understand that any falsification is reason for the Department and/or Local Plumbing Inspector to deny a Permit.

Signature of Owner or Applicant _____ Date _____

>> CAUTION: LPI APPROVAL REQUIRED <<

Town/City _____ Permit # _____

Date Permit Issued ____/____/____ Fee: $ _____ Double Fee Charged ☐

Local Plumbing Inspector Signature _____ L.P.I. # _____

☐ Owner ☐ Town ☐ State

The Subsurface Wastewater Disposal System shall not be installed until a Permit is issued by the Local Plumbing Inspector. This Permit shall authorize the owner or installer to install the disposal system in accordance with this application and the Maine Subsurface Wastewater Disposal Rules.

Municipal Tax Map # _____ Lot # _____

CAUTION: INSPECTION REQUIRED

I have inspected the installation authorized above and found it to be in compliance with the Subsurface Wastewater Disposal Rules Application.

Local Plumbing Inspector Signature _____ (1st) date approved _____ (2nd) date approved _____

PERMIT INFORMATION

TYPE OF APPLICATION

■ 1. First Time System
☐ 2. Replacement System
Type replaced: _____
Year installed: _____
☐ 3. Expanded System
☐ a. <25% Expansion
☐ b. >= 25% Expansion
☐ 4. Experimental System
☐ 5. Seasonal Conversion

THIS APPLICATION REQUIRES

■ 1. No Rule Variance
☐ 2. First Time System Variance
☐ a. Local Plumbing Inspector Approval
☐ b. State & Local Plumbing Inspector
☐ 3. Replacement System Variance
☐ a. Local Plumbing Inspector Approval
☐ b. State & Local Plumbing Inspector
☐ 4. Minimum Lot Size Variance
☐ 5. Seasonal Conversion Permit

DISPOSAL SYSTEM COMPONENTS

☐ 1. Complete Non-engineered System
☐ 2. Primitive System (graywater & alt. toilet)
☐ 3. Alternative Toilet, specify: _____
☐ 4. Non-engineered Treatment Tank (only)
☐ 5. Holding Tank, _____ gallons
☐ 6. Non-engineered Disposal Field (only)
☐ 7. Separated Laundry System
■ 8. Complete Engineered System (2000 gpd or more)
☐ 9. Engineered Treatment Tank (only)
☐ 10. Engineered Disposal Field (only)
■ 11. Pre-treatment, specify: Fuji CE-series
☐ 12. Miscellaneous Components

SIZE OF PROPERTY

±6.09 ☐ SQ. FT. ■ ACRES

SHORELAND ZONING

☐ Yes ■ No

DISPOSAL SYSTEM TO SERVE

☐ 1. Single Family Dwelling Unit, No. of Bedrooms: ____
■ 2. Multiple Family Dwelling, No. of Units: (44) 2-bedroom & 3-bedroom units
☐ 3. Other: _____ (specify)

Current Use ☐ Seasonal ☐ Year Round ■ Undeveloped

TYPE OF WATER SUPPLY

☐ 1. Drilled Well ☐ 2. Dug Well ☐ 3. Private
■ 4. Public ☐ 5. Other

DESIGN DETAILS (SYSTEM LAYOUT SHOWN ON PAGE 3)

TREATMENT TANK

■ 1. Concrete
■ a. Regular
☐ b. Low Profile
☐ 2. Plastic
☐ 3. Other: _____
CAPACITY: 1,000 GAL

DISPOSAL FIELD TYPE & SIZE

☐ 1. Stone Bed ■ 2. Stone Trench
☐ (10) Stone Trenches each 3 ft wide x 2.5 ft high x 82 ft long w/ 2 ft sidewall below invert Total infiltrative area is 5,860 sf
☐ _____
SIZE: 820 ☐ sq. ft. ■ lin. ft.

GARBAGE DISPOSAL UNIT

■ 1. No ☐ 2. Yes ☐ 3. Maybe
If Yes or Maybe, specify one below:
☐ a. multi-compartment tank
☐ b. ___ tanks in series
☐ c. increase in tank capacity
☐ d. Filter on Tank Outlet

DESIGN FLOW

9,000 gallons per day
BASED ON:
■ 1. Table 4A (dwelling unit(s))
☐ 2. Table 4C (other facilities)
SHOW CALCULATIONS
— for other facilities —
90 gpd X 100 bedrooms
☐ 3. Section 4G (meter readings)
ATTACH WATER METER DATA

SOIL DATA

PROFILE: 6 CONDITION: B
at Observation Hole # TP-5
Depth Est. Seasonal High @ 60"
of Most Limiting Soil Factor
Groundwater

DISPOSAL FIELD SIZING

■ 1. Medium---2.6 sq. ft. / gpd
☐ 2. Medium---Large 3.3 sq. f.
☐ 3. Large---4.1 sq. ft. / gpd
☐ 4. Extra Large---5.0 sq. ft. / gpd
w/ 75% reduction for Stone Trenches

EFFLUENT/EJECTOR PUMP

☐ 1. Not Required
☐ 2. May Be Required
■ 3. Required
Specify only for engineered systems:
DOSE: varies gallons

LATITUDE AND LONGITUDE
at center of disposal area

Lat. N43 d 50 m 59.65 s
Lon. W70 d 48 m 48.10 s
if g.p.s. state margin of error: 3 feet

SITE EVALUATOR STATEMENT

I certify that on _____ (date) I completed a site evaluation on this property and state that the data reported are accurate and that the proposed system is in compliance with the State of Maine Subsurface Wastewater Disposal Rules (10-144A CMR 241).

Professional Engineer Signature _____ PE # _____ Date _____

Professional Engineer Name Printed _____ Telephone Number _____ Email Address _____

Note: Changes to or deviations from the design should be confirmed with the Engineer.

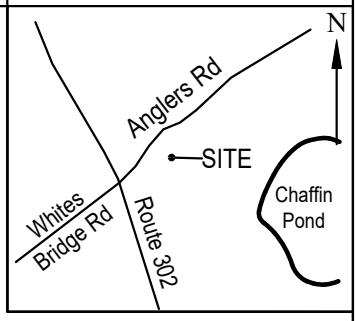
SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

Maine Department of Human Services
Division of Health Engineering, Station 10
(207) 287-5672 Fax: (207) 287-3165

Town, City, Plantation	Street, Road, Subdivision	Owner or Applicant Name
Windham	Anglers Road (Anglers Road Commons)	Timothy Clinton

SITE PLAN Scale 1" = _____ ft.

SITE LOCATION PLAN



SEE ENGINEERED SYSTEM PLANS

SOIL PROFILE DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole # _____ ☐ Test Pit ☐ Boring

_____" Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0				
6				
12				
18				
24				
30				
36				
42				
48				

SEE ENGINEERED SYSTEM APPLICATION

Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	
				☐ Groundwater ☐ Restrictive Layer ☐ Bedrock

Observation Hole # _____ ☐ Test Pit ☐ Boring

_____" Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0				
6				
12				
18				
24				
30				
36				
42				
48				

SEE ENGINEERED SYSTEM APPLICATION

Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	
				☐ Groundwater ☐ Restrictive Layer ☐ Bedrock

_____ Site Evaluator Signature

_____ SE #

_____ Date

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION		Maine Department of Human Services Division of Health Engineering, Station 10 (207) 287-5672 Fax: (207) 287-3165
Town, City, Plantation Windham	Street, Road, Subdivision Anglers Road (Anglers Road Commons)	Owner or Applicant Name Timothy Clinton

SUBSURFACE WASTEWATER DISPOSAL PLAN

Scale: 1" = ____ ft

SEE ENGINEERED SYSTEM PLANS

BACKFILL REQUIREMENTS		CONSTRUCTION ELEVATIONS		ELEVATION REFERENCE POINT
		Finished Grade Elevation (at Row 1)		Location & Description:
		Top of Stone Trench (at Row 1)	Refer to Plan Set	Site datum established by surveyor
Depth of Backfill (upslope)	Refer to Plan Set	Top of Perforated Pipe (at Row 1)		
Depth of Backfill (downslope)		Bottom of Stone Trench (at Row 1)		Reference Elevation:

DISPOSAL FIELD CROSS SECTION

Scales:
Verticle: 1" = ____
Horizontal: 1" = ____

SEE ENGINEERED SYSTEM PLANS

Site Evaluator Signature | SE # | Date

Maine Center for Disease Control and Prevention
An Office of the Department of Health and Human Services
Paul R. LePage, Governor Mary C. Mayhew, Commissioner
Tel. (207) 287-2070

Department of Health and Human Services
Maine Center for Disease Control and Prevention
286 Water Street
11 State House Station
Augusta, Maine 04333-0011
Tel. (207) 287-8016
Fax (207) 287-9058; TTY (800) 606-0215
Fax (207) 287-4172

October 12, 2016

Fuji Clean, LLC
Attn.: Bennette D. Burkes, P.E.
1518 Willow Lawn Drive, Suite 300
Hnerico, VA 23230

Subject: Modified Approval for General Use, Fuji Clean System, CE and CEN Series

Dear Mr. Burkes:

The Division of Environmental and Community Health has reviewed your proposal for reductions in disposal field sizing and reduced separation form limiting factors for systems which incorporate the Fuji Clean System, CE and CEN Series (Fuji Clean) wastewater treatment systems. This request is predicated upon the ability of the Fuji Clean system to produce BOD5 and TSS levels below 10 mg/l, each.

The Division approves the request for reduced disposal field area and reduced separation distances as follows:

1. A minimum separation distance of 12 inches shall be maintained between the seasonal high groundwater table and the lowest elevation of the system's disposal field;

2. A minimum separation distance of 12 inches shall be maintained between bedrock and the lowest elevation of the system's disposal field;

3. Stone beds and trenches are allowed a 75 percent reduction in size, based upon the standard sizing requirements of the Rules;

4. Proprietary devices such as but not limited to plastic chambers and gravel-less pipe trenches are allowed a 50 percent reduction in size based upon the standard sizing requirements of the Rules, absent prohibitions by manufacturers;

5. Eljen GSF units may be used with Fuji Clean systems, but with no reduction in size; and

6. Maintenance agreement contracts must be included with all system installations. Terms and duration of the contracts shall be in accordance with Fuji Clean's company policies.

Because installation and maintenance has a significant effect on the working order of onsite sewage disposal systems, including their components, the Division makes no representation or guarantee as to the efficiency and/or operation of this system. Further, the Division strongly recommends that property owners enter into long term maintenance contracts with Fuji Clean, in accordance with Fuji Clean's company policies.

Should you have any questions, please feel free to contact me.

Sincerely,

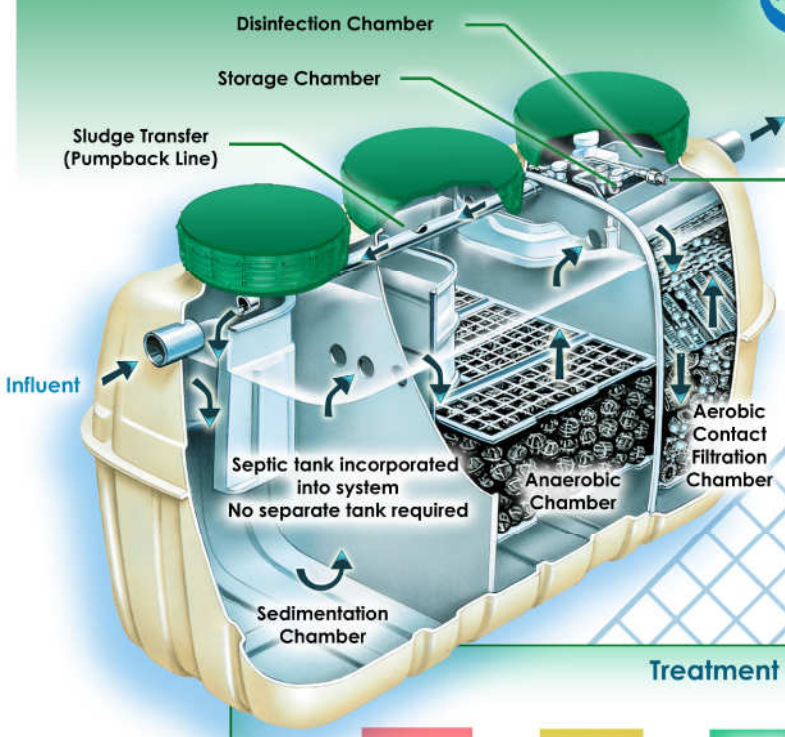
James A. Jacobsen
Project Manager, Webmaster
Division of Environmental Health
Drinking Water Program
Engineering Review Team
e-mail: james.jacobsen@maine.gov

/jaj

xc: File

MODEL CE & CEN SERIES *Technical Specification Sheet*

MaineSepticSolution
FujiClean TowardCleanWater



FujiMac RII Linear Diaphragm Blower
- 40-300L/min Blower Options
- US & CAN UL Listed

Fuji Clean Advantages

- Over 2 million installed systems worldwide
- 1-tank system – no septic tank necessary
- No moving parts in tank
- Built-in equalization - levels variable inflow
- NSF 40 and 40/245 certified
- TN removal to 70+% with CEN models
- Phosphorous reduction technology
- Smallest footprint vs. competitors
- Lowest power use vs. competitors
- Lightweight tank - easy installation
- Quick and easy O&M - no mess
- Rapid startup and restart for seasonal homes

Treatment Process

Design Specification Table	CE Series BOD, TSS, TN							CEN Series BOD, TSS, Enhanced TN			
MODEL:	CE5	CE7	CE10	CE14	CE21	CE30	CE6KG	CEN5	CEN7	CEN10	CEN21
Load Hydraulic (GPD)	360	540	720	1,000	1,900	2,700	6,000	360	540	720	1,900
EFFLUENT (assumes domestic strength influent):											
BOD – Effluent (mg/L)	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10	10	10	10
BOD (removal pounds/day)	.52	.73	1.04	1.46	2.08	3.12	6.93	.69	.97	1.38	2.9
TSS (mg/L)	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10	10	10	10
TN (mg/L)	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10	10	10	10
BLOWER DETAIL:											
Blower Model	MAC80R	MAC80R	MAC100R	MAC100R	MAC150R	MAC200R	MAC200R (3)	MAC80R	MAC100R	MAC100R	MAC200R
Normal Pressure (kPa)	15	15	18	18	20	20	20	15	18	18	20
Airflow Volume (CFM; L/Min.)	2.8 CFM 80 L/MIN	2.8 CFM 80 L/MIN	3.5 CFM 100 L/MIN	3.5 CFM 100 L/MINJ	5.3 CFM 150 L/MIN	7.0 CFM 200 L/MIN	21.0 CFM 600 L/MIN	2.8 CFM 80 L/MIN	3.5 CFM 100 L/MIN	3.5 CFM 100 L/MIN	7.0 CFM 200 L/MIN
Power Use (kWh/day)	1.1	1.1	1.6	1.6	2.4	3.4	10.2	1.1	1.6	1.6	3.4
Weight (lbs.)	11	11	11	11	13	13	13 x 3	11	11	11	13
Outlet Diameter (OD, inches)	0.70	0.70	0.70	0.70	1.0	1.0	1.0 x 3	.070	0.70	0.70	1.0
TANK DETAIL:											
Material	Fibre-Reinforced Plastic							Fibre-Reinforced Plastic			
Height (inches)	61.8	65.7	73.6	77.4	81.3	87.2	87.2	65.7	73.6	77.4	87.2
Length (inches)	85	95.7	98.8	118.9	152.8	183.7	434.7	95.7	98.8	118.9	183.7
Width (inches)	43.7	49.2	56.7	68.9	72.4	78.3	115.3	49.2	56.7	68.9	78.3
Weight (lbs.)	397	463	705	926	1,168	1,543	2,900	463	705	926	1,543
Inlet Invert (inches)	49	53	61	62	65	71	67	53	61	62	71
Outlet Invert (inches)	47	51	59	59.5	63	69	64	51	59	59.5	69
Access Ports Quantity & Diameter (inches)	3@20"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"	4@24"x24" 3@24"x48"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"	2@20" 1@24"
Tank Volume Total (gallons)	545	749	1,069	1,498	2,252	3,199	7,267	749	1,069	1,498	3,199

March 29, 2019

Summit #18417

Dustin M. Roma, P.E.
DM Roma Consulting Engineers
PO Box 1116
Windham, ME 04062

Reference: Nitrate-Nitrogen Assessment
Anglers Commons – Anglers Road, Windham, Maine

Dear Dustin:

Summit Geoengineering Services (SGS) performed this nitrate-nitrogen assessment to estimate the groundwater quality impact caused by the proposed common subsurface wastewater disposal system serving the Anglers Commons residential development. A location map showing the site and vicinity, and a site plan shown the proposed development area provided in Attachment 1.

Information used for our evaluation includes a digital existing conditions and proposed development plan prepared by DM Roma Consulting Engineers (DM Roma), published geologic maps and literature, and subsurface information from test pits, soil borings, and observations wells completed by SGS in February 2019.

Wastewater Disposal and Water Supply

The site and vicinity are served by individual on-site subsurface wastewater disposal systems (septic systems). The proposed development will be served by common engineered on-site subsurface wastewater disposal system. Wastewater from each of the residential unit will be treatment with a septic tank and a Fuji Clean CE-series advance treatment unit prior to being conveyed to common disposal field. The proposed disposal field consists of 10 rows of stone trenches arranged in two pods and in plan-view measures approximately 82 feet long by 64 feet wide. The proposed design flow is 9,000 gallon per day (GPD) and the average loading rate over the disposal field area is 1.7 GPD per square foot (0.23 feet/day).

The site and surrounding area are served by public water, with the exception of one private drilled bedrock water supply located on the adjoining property to the northeast (21 Anglers Road). The proposed disposal field is located over 300 feet from this well. The well on the 21 Anglers Road property was located by SGS using a mapping grade Trimble Geo7x GPS and incorporated into the plan for the development being prepared by DM Roma. Well construction data for the 21 Anglers Road property was obtained from the Maine Geological Survey's water well information database and is as follows:

Date of Installation:	4/8/2018
Property Address:	21 Angler Road, Windham, Maine
Type:	6-inch diameter bedrock well
Total Depth	380 feet
Length of Casing:	180 feet
Overburden Thickness:	165 feet
Yield:	4 gallons per minute, vein at 350 feet

145 Lisbon Street (PO Box 7216) Lewiston, Maine 04243 | (207) 576-3313
173 Pleasant Street Rockland, Maine 04841 | (207) 318-7761
www.summitgeoeng.com

Site Setting

The site is located on the south side of Anglers Road approximately 500 feet northeast of Route 302, and within the southern extent of a broad sand plain plateau situated between Pettengill Pond and Chaffin Pond. A prominent knoll is located between the property and development along the Route 302 corridor. Portions of this knoll have been partially excavated along Anglers Road and Route 302 revealing dense glacial till and granite bedrock.

Properties uses in the site vicinity include residential, commercial and undeveloped forestland. Properties uses to the north include a condominium complex (Gordon Place), and a parking lot and undeveloped forest associated with a church property on Route 302. Property to the south is undeveloped forest around Chaffin Pond. A medical office is located on the adjoining property (21 Anglers Road) to the east beyond which are residences.

Maine Geological Survey maps showing the surficial geology of the site and vicinity are provided in Attachment 1. The site is located on a glaciomarine delta consisting of sand and gravel deposited in the sea at the glacier margin during marine submergence. Locally the delta deposits overly or are interstratified with the Presumpscot Formation which is comprised of fine-grained glaciomarine silt and clay with local sandy beds and lenses. The site is located on the western margin of a regionally extensive significant sand and gravel aquifer that extends westward to Little Sebago Lake and southward into North Windham.

On-site Subsurface Investigation

A subsurface investigation was completed by SGS to obtain soils and groundwater information to support the design for the proposed subsurface wastewater disposal field. Exploration logs and photographic documentation is provided in SGS' Preliminary Soils Report included in Attachment 2. Explorations performed included:

- Twelve (12) test pit (TP-1 thru TP-12) were completed with an excavator on February 20, 2019.
- Four (4) test borings (B-1 thru B-4) were completed on February 22, 2019.
- Observation wells (MW-1 thru MW-4) were installed at each boring location.
- A piezometer (PZ-1) was installed near MW-1 to measure the vertical hydraulic gradient.

A very dense silty sand to sandy gravel lodgment till is exposed at the ground surface in the parking area and knoll on the east side of the property. Portions of the knoll were previously excavated to create the parking area north of the knoll, and it is our understanding that excavation ceased because bedrock was encountered. A blasted bedrock outcrop is visible on the west side of the knoll along Route 302.

The till deposit slopes into the subsurface moderately downward to the north and steeply downward to the east, forming a glacially streamlined hill which is covered by stratified drift deposits along Anglers Road and throughout the interior of the site. In the vicinity of the proposed disposal field, central and eastern portion of the property the stratified drift deposits consists of 8 to 10 feet of cross-bedded gravelly coarse sand and medium-fine sands (proximal delta deposits) that overlying stratified sand, silt, and silty-clay (distal delta deposits). Stratified drift deposits are approximately 40 feet thick in the area of the proposed disposal field and increase in thickness to the east, with approximately 170 feet overburden present near the eastern site boundary.

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Groundwater was encountered at a depth of approximately 7.5 feet below the ground surface in central areas of the property in the disposal field vicinity. Depth to water level measurements collected on March 4, 2019 were used to prepare groundwater elevation contour map included in Attachment 1. Groundwater elevation data show that flow is southeasterly towards Chaffin Pond along a hydraulic gradient of 0.5%.

A groundwater sample was collected from MW-1 on March 4, 2019 and submitted to a state-certified laboratory for analysis of nitrate-nitrogen to determine a background concentration in groundwater. The laboratory reported a nitrate-nitrogen concentration of 0.36 milligrams per liter (mg/L). A copy of the laboratory report is provided as Attachment 3.

Nitrate-Nitrogen Assessment

A nitrate-nitrogen assessment was performed to estimate the distance from the disposal fields at which the concentration in groundwater would reach the Federal National Primary Drinking Water Standard and the Maine Maximum Exposure Guideline of 10 milligrams nitrogen per liter (mg-N/L). The average concentration of nitrate-nitrogen in pretreated septic tank effluent discharged from the disposal field used in this assessment is 20 mg-N/L.[1]

Based on our understanding of site geology, septic tank effluent will drain to the disposal field and infiltrate downward through unsaturated soil until the water table is encountered. Thereupon flow is lateral with a component of downward flow and in a southeasterly direction towards Chaffin Pond.

The distance at which groundwater downgradient of the disposal field reaches 10 mg-N/L (plume length) was estimated using a three-dimensional analytical solution[2,3] for a point source in a uniform flow field. Variables used for the calculations include the permeability and effective porosity of soils, groundwater seepage velocity, and the daily mass of nitrate-nitrogen applied to groundwater. No allowance for nitrogen removal by soil microbes, vegetation or sorption is included in the plume length calculations as a conservative measure. Input parameters for the analytical point source solution are summarized in the table below.

Analytical Solution Input Parameters

Parameter	Value	Source Reference
Permeability	30 ft/day	The equivalent hydraulic conductive of 2 feet of saturated sands with a permeability of 150 feet/day and 10 feet of saturated fine sands / silt with a permeability of 5 feet/day.
Effective Porosity	0.21	Published average value for fine sand [4]
Hydraulic Gradient	0.005	Determined using on-site observation wells

[1] Fuji Clean NSF 245 certification for advanced wastewater treatment system with nitrogen removal.
[2] Baetsle, L.H. (1969), Migration of Radionuclides in Porous Media; Progress in Nuclear Energy, Series SIL, Health Physics. Pergamon Press, pp. 707-730.
[3] Chang, et al. (1998). Utilizing Baetsle's Equation to Model the Fate and Transport of MTBE in Groundwater, Proceedings of the Petroleum Hydrocarbons and Organic Chemicals in Ground Water Prevention, Detection, and Remediation Conference, Houston, TX.
[4] Fetter, C.W. (1994). Applied Hydrogeology, 3rd Edition, Prentice Hall

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The three-dimensional analytical solution was adapted to simulate a 80-foot-long linear source area (disposal field) by assuming the direction of groundwater flow is perpendicular to the length of the field and calculating the additive effects of injecting nitrate-nitrogen into groundwater at 9-point sources located 10 feet apart along the downgradient side of the disposal field. For each point source, the steady state nitrate concentration was calculated for a regularly-spaced grid of points (point cloud) extending 5 feet apart along the plume center line to a distance of 350 feet, and at points located 5 feet apart extending cross gradient from the plume center line to a distance of 125 feet. The additive effects of each point source were then calculated by superimposing the point clouds, adding concentration values, and using data for points along the plume center line to determine the estimated plume length. The 10 mg-N/L nitrate plume lengths were calculated based on a background nitrate concentration of 0.5 mg-N/L.

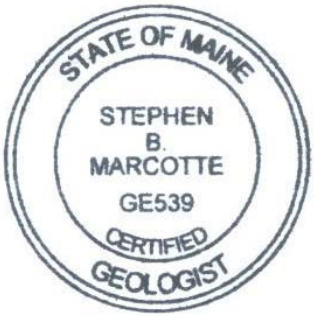
The estimate 10 mg-N/L plume length for the proposed disposal field is 165 feet, as shown on the enclosed Site Plan provided as Attachment 3.

Conclusion:

Results of our analysis indicate the proposed subsurface wastewater disposal system will not result in an increase of nitrate-nitrogen above 10 mg/L in groundwater at the property boundary.

Our findings are based on our interpretation of site conditions and the information provided to us. If there are changes in lot layout or proposed septic system design flows, we request the opportunity to review the changes and conduct further analysis as necessary to confirm the changes do not alter our conclusions.

Sincerely yours,
Summit Geoengineering Services



Stephen B. Marcotte, C.G., L.S.E.
Senior Geologist

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Attachment 1
Figures and Geological Maps

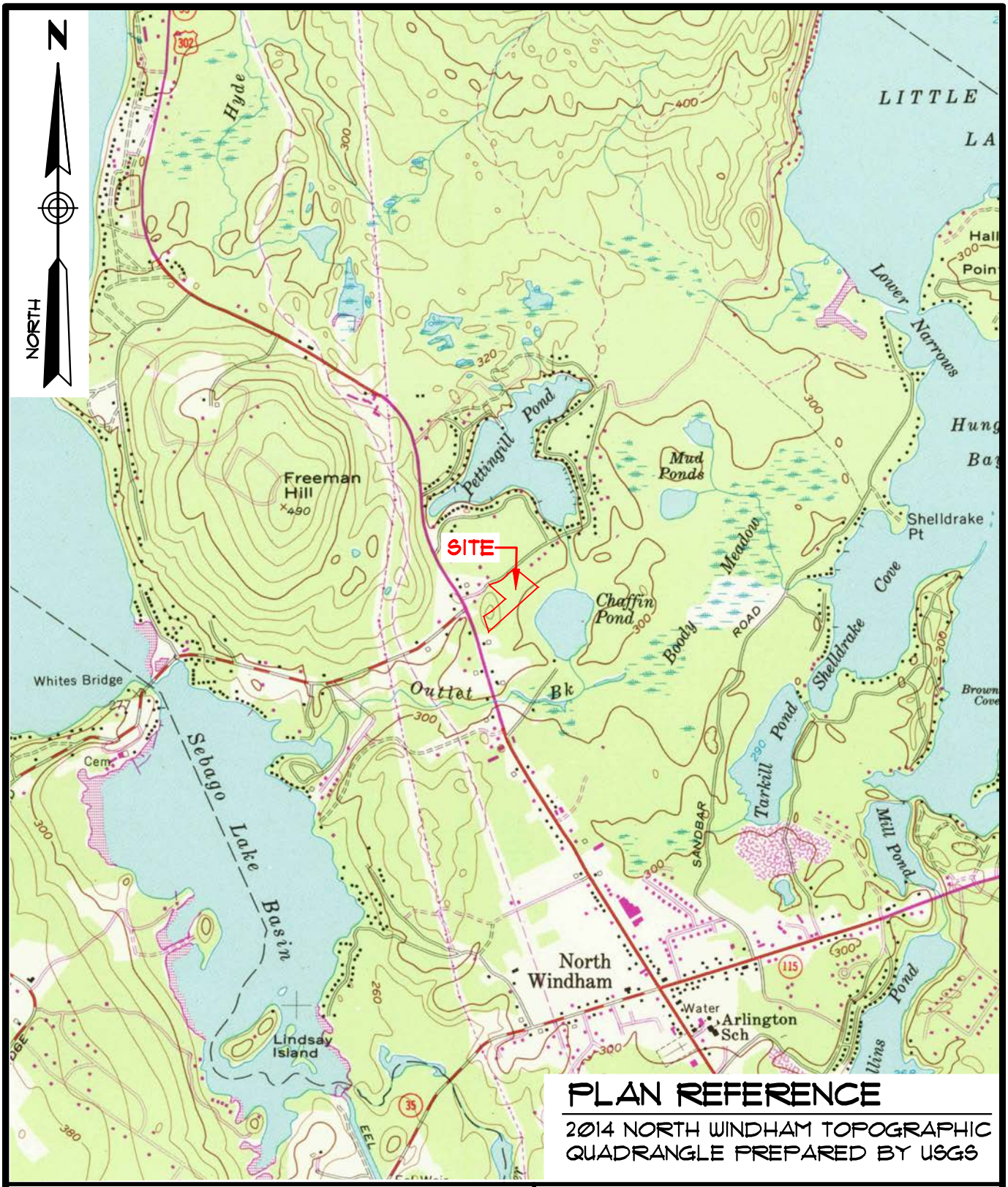

FIGURE 1: SITE LOCATION MAP
ANGLERS ROAD COMMONS

ANGLERS ROAD - WINDHAM, MAINE
PREPARED FOR
TIM CLINTON

DATE: 3-28-2019	DRAWN BY: KRF	CHECKED BY: SBM
JOB: 18417	SCALE: 1" = 2000'	FILE: 18417 MAPS

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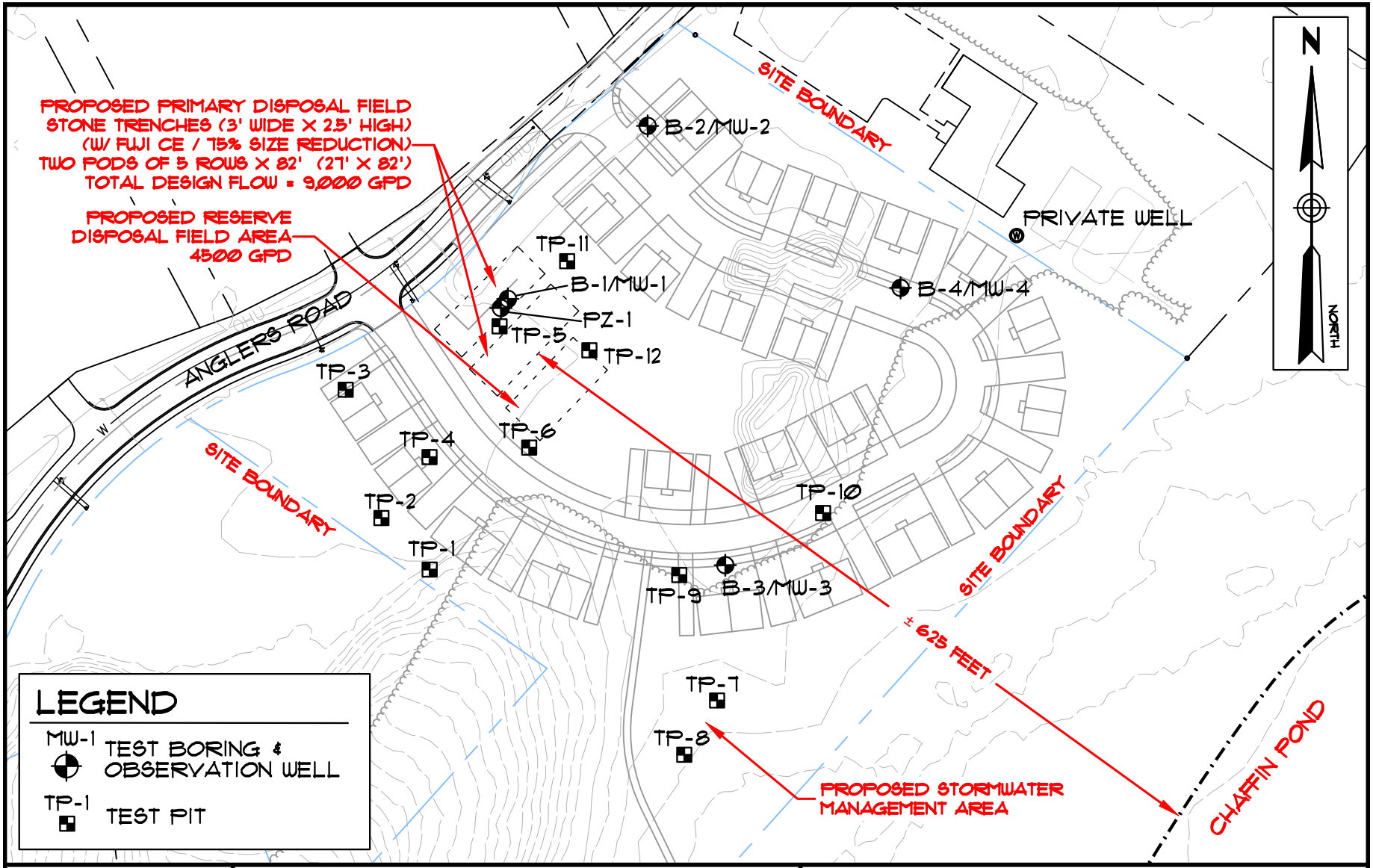

DATE: MARCH 28, 2019
JOB: 18417
FILE: 18417 EX
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SCALE: 1" = 100'

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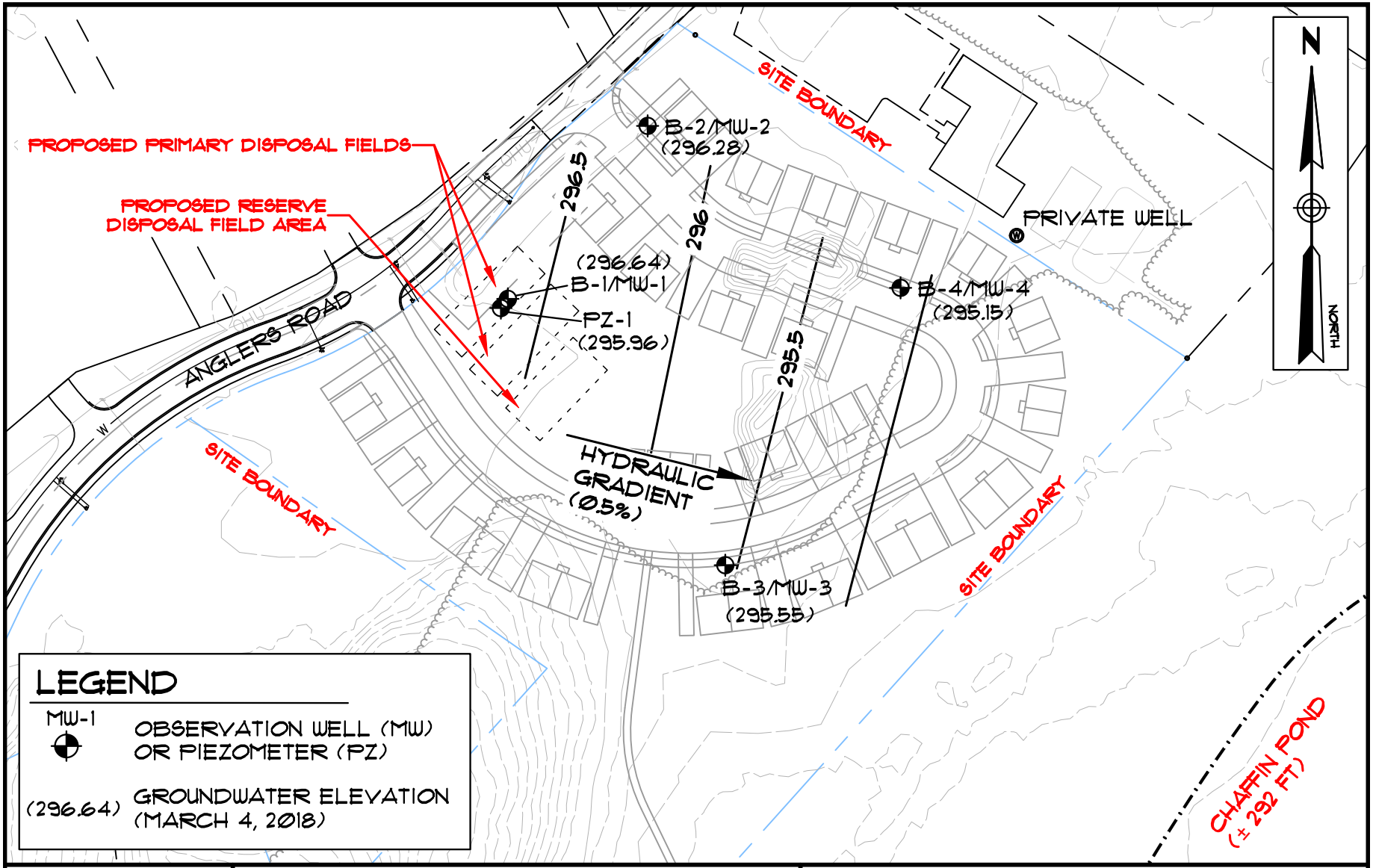
FIGURE 2: SITE PLAN
ANGLERS ROAD COMMONS

ANGLERS ROAD, WINDHAM MAINE
PREPARED FOR
TIM CLINTON



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JOB: 18417
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FIGURE 3: GROUNDWATER CONTOUR MAP
ANGLERS ROAD COMMONS

ANGLERS ROAD, WINDHAM MAINE
PREPARED FOR
TIM CLINTON

N

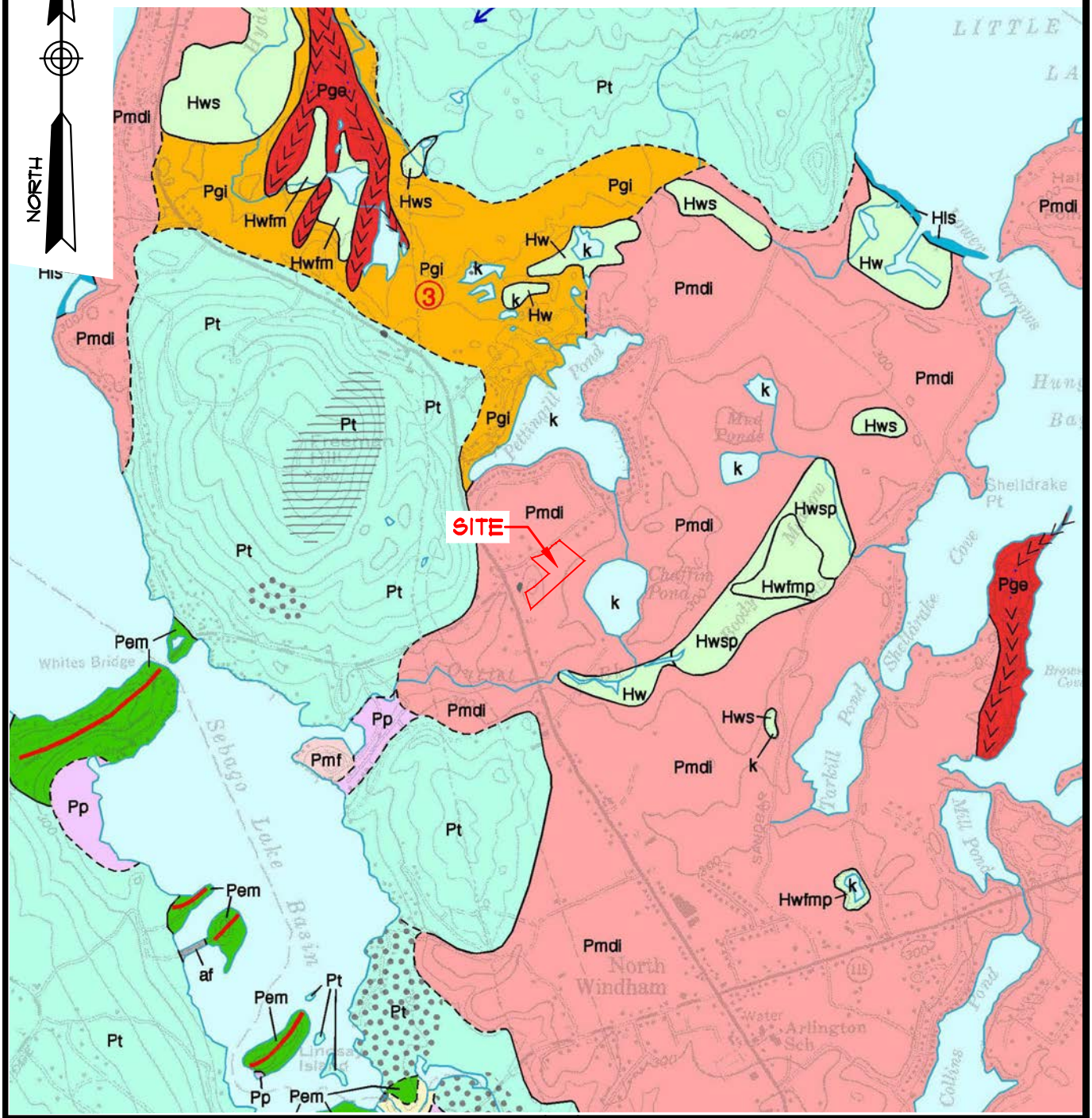
NORTH

LEGEND

Pmdi	GLACIOMARINE DELTA
Pt	TILL

PLAN REFERENCE

SURFICIAL GEOLOGY OF THE NORTH WINDHAM QUADRANGLE, DATED 1997, PREPARED BY MAINE GEOLOGICAL SURVEY.



SURFICIAL GEOLOGY MAP
ANGLERS ROAD COMMONS

ANGLERS ROAD - WINDHAM, MAINE

PREPARED FOR

TIM CLINTON

DATE: 3-28-2019	DRAWN BY: KRF	CHECKED BY: SBM
JOB: 18417	SCALE: 1" =2000'	FILE: 18417 MAPS

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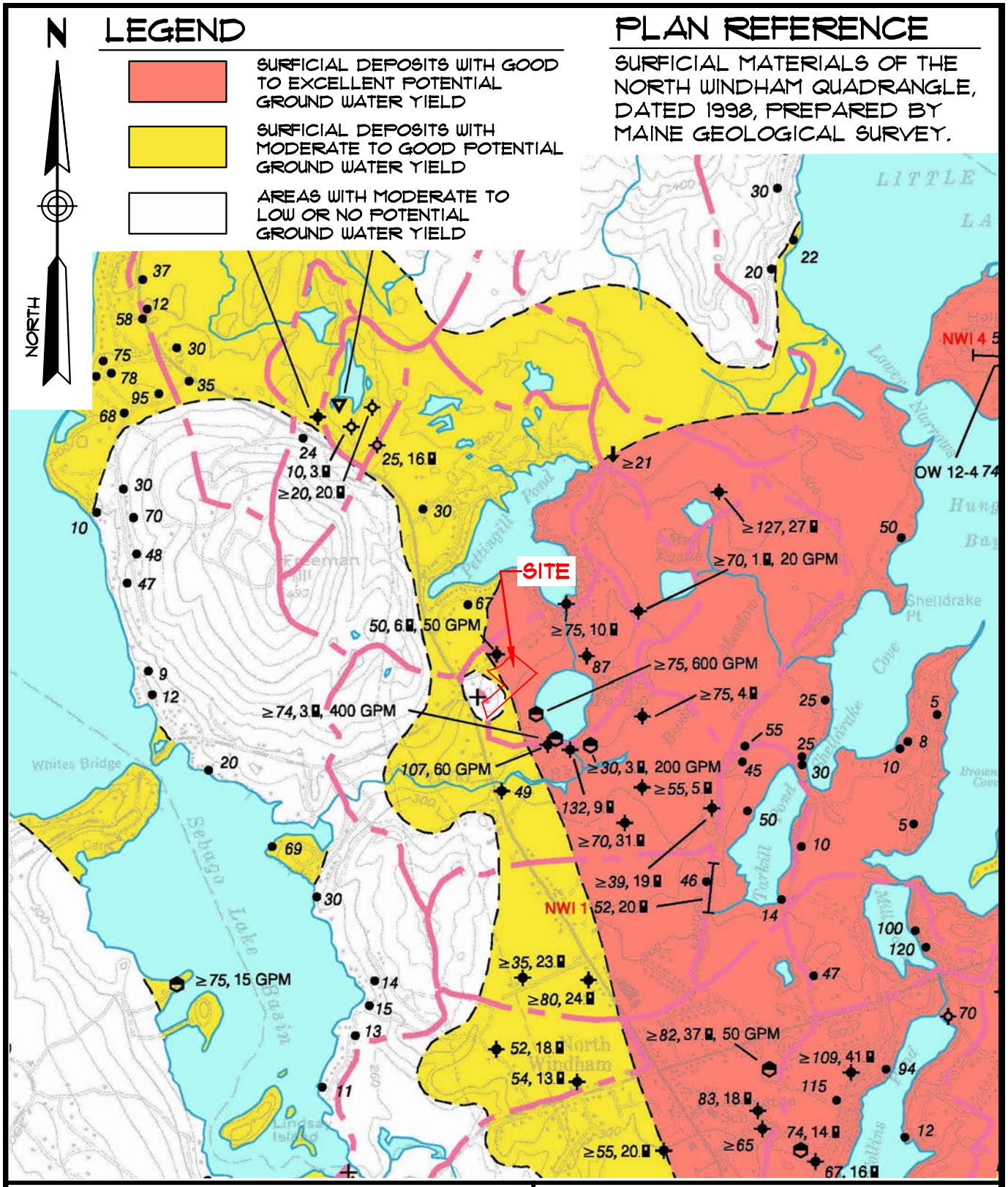

SIGNIFICANT SAND & GRAVEL AQUIFER MAP
ANGLERS ROAD COMMONS

ANGLERS ROAD - WINDHAM, MAINE
PREPARED FOR
TIM CLINTON

DATE: 3-28-2019	DRAWN BY: KRF	CHECKED BY: SBM
JOB: 18417	SCALE: 1" =2000'	FILE: 18417 MAPS

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N

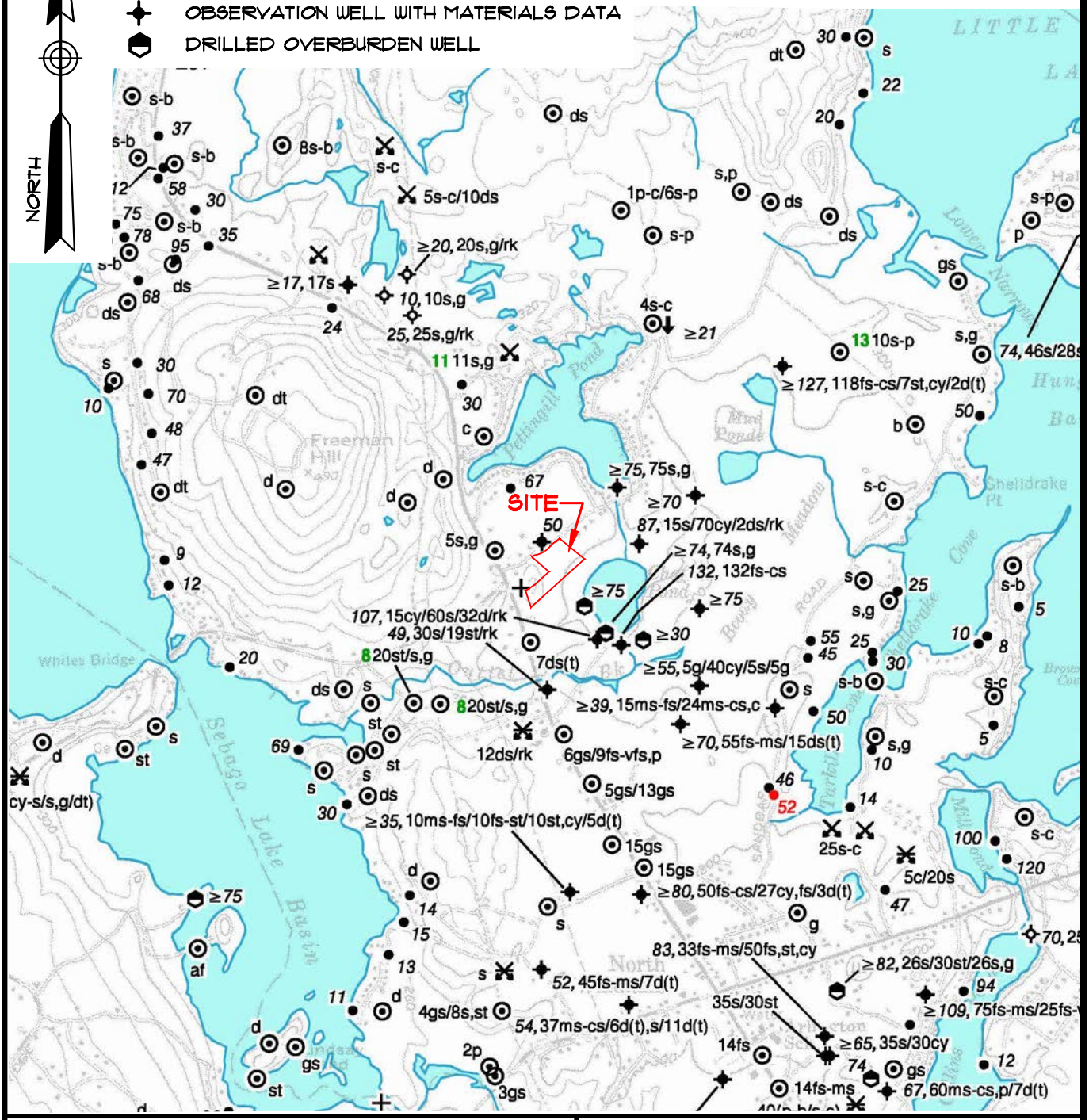
NORTH

LEGEND

- BEDROCK OUTCROP
- 37 ● BEDROCK WELL WITH DEPTH TO BEDROCK
- MATERIALS DATA FROM SHOVEL HOLE
- OBSERVATION WELL WITH MATERIALS DATA
- DRILLED OVERBURDEN WELL

PLAN REFERENCE

SURFICIAL MATERIALS OF THE NORTH WINDHAM QUADRANGLE, DATED 1998, PREPARED BY MAINE GEOLOGICAL SURVEY.



SURFICIAL MATERIALS MAP
ANGLERS ROAD COMMONS

ANGLERS ROAD - WINDHAM, MAINE
PREPARED FOR
TIM CLINTON

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Attachment 2
Summit Geoengineering Services
Subsurface Investigation Report

March 29, 2019
Summit #18417

Timothy Clinton
7 Fay Road
Scituate, MA 02066

Reference: Preliminary Soils Investigation Report
Anglers Road Commons, Anglers Road, Windham, Maine

Dear Mr. Clinton:

Summit Geoengineering Services (SGS) completed a Preliminary Soils Investigation at the above referenced 6.09-acre property located on Anglers Road in Windham, Maine. The purpose of the investigation was to evaluate soils and site conditions for septic system suitability in accordance with the State of Maine Subsurface Waste Water Disposal Rules (August 3, 2015) for first-time systems. In addition, soil test pits were complete at the proposed stormwater management area.

Anglers Road Commons is a proposed 44-unit residential development. Each unit will have two to three bedrooms and there will be 100-bedrooms in total. The development will be served by a common subsurface wastewater disposal field with a design flow of 9,000 gallons per day. Work performed as part the preliminary soils investigation included:

- Twelve (12) test pit (TP-1 thru TP-12) were completed with an excavator on February 20, 2019.
- Four (4) test borings (B-1 thru B-4) were completed on February 22, 2019.
- Observation wells (MW-1 thru MW-4) were installed at each boring location.
- A piezometer (PZ-1) was installed near B-1 to assess the vertical hydraulic gradient at the proposed disposal field location.

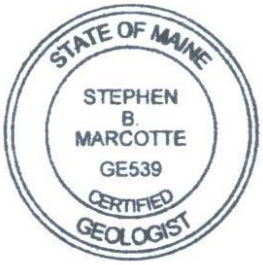
Explorations were located with a Trimble Pro 7x mapping-grade GPS. A site plan showing exploration locations is provided as Attachment 1. Exploration logs and photographs are provided as Attachment 2.

Results of our field investigation indicate that the area shown on the enclosed site plan meets first-time system criteria listed in the Maine Subsurface Wastewater Disposal Rules (August 3, 2015).

If you have any questions concerning this letter, please feel free to contact me.

Sincerely yours,
Summit Geoengineering Services

Stephen B. Marcotte, C.G., L.S.E.
Senior Geologist



cc. Dustin Roma, DM Roma Consulting Engineers

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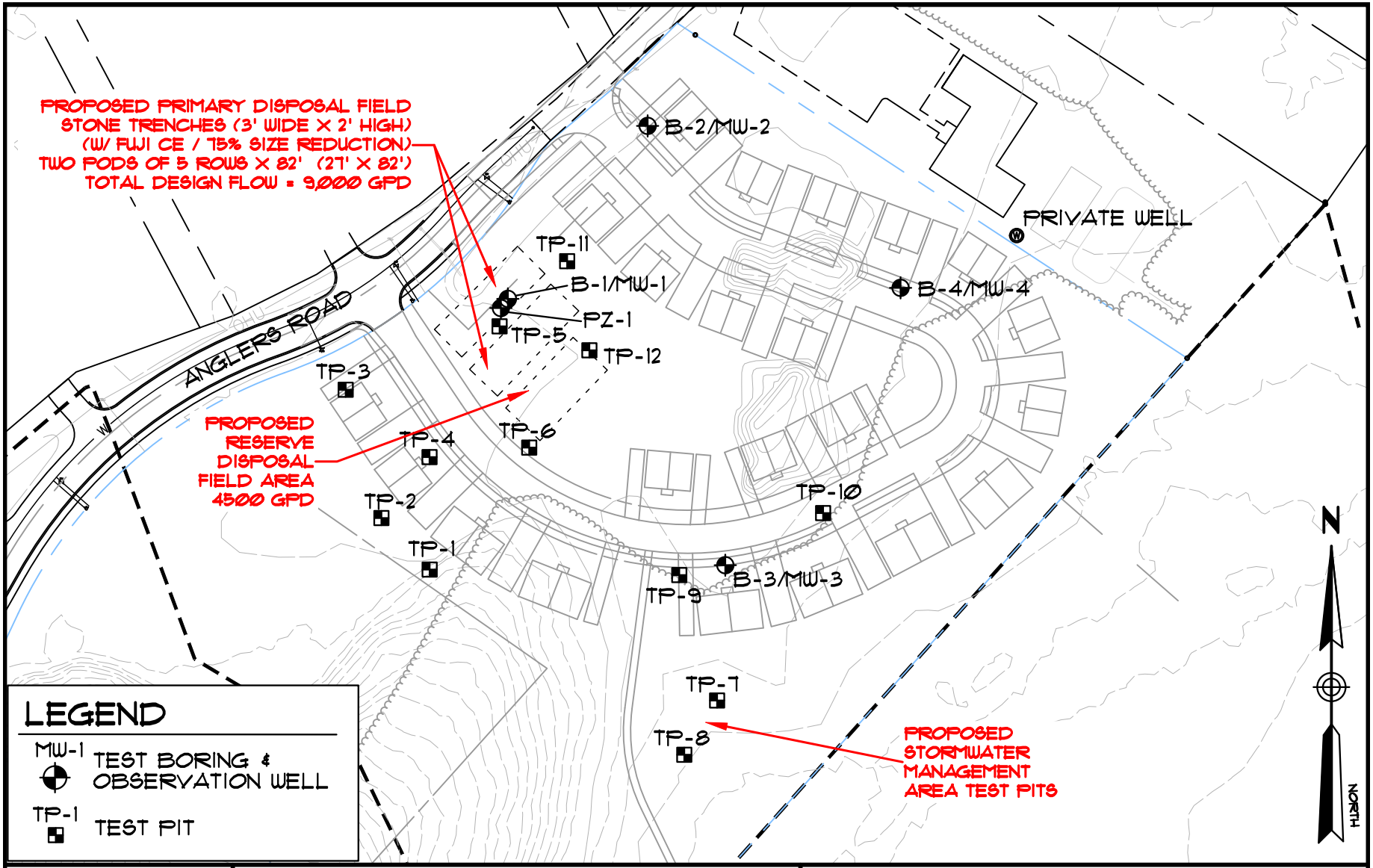
Attachment 1

Explorations Location Map



DATE: MARCH 2019
JOB: 18417
FILE: 18417 EX
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SCALE: 1" = 100'

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EXPLORATION LOCATION PLAN
ANGLERS ROAD COMMONS

ANGLERS ROAD, WINDHAM MAINE
PREPARED FOR
TIMOTHY CLINTON

Attachment 2

Exploration Logs and Photographs

SOIL PROFILE / CLASSIFICATION INFORMATION

DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES

Project Name & Location:	Project Location	Equipment	Proj. #
ANGLERS ROAD COMMONS	ANGLERS ROAD, WINDHAM, MAINE	CAT 316F	18417

Observation Hole # TP-1 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)

Depth	Texture	Consistency	Color	Mottling
0–6	RIPRAP (FILL)	LOOSE	GRAY	
6–12	STONY GRAVELLY LOAMY SAND (STRIPPED)	FROZEN	GRAY TO LIGHT GRAY	COMMON & DISTINCT
12–18		FIRM TO VERY FIRM		
18–48				
48–120	LIMIT OF EXCAVATION AT 4 FEET (NORTH SIDE) & 10 FEET (SOUTH SIDE) (DUG INTO SIDE OF CUT SLOPE) REFUSAL IN STONES			

Soil Data by L.S.E.	Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	
	3/12	E	0%-33%	0"	☐ Groundwater ■ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Data by C.G. — Geological Classification: LODGEMENT TILL (STRIPPED)

Observation Hole # TP-2 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)

Depth	Texture	Consistency	Color	Mottling
0–6	STONY LOAMY SAND (FILL)	FROZEN	GRAY	
6–12		LOOSE		
12–18				
18–24	SILT - FROM PUDDLING PRIOR TO FILL PLACEMENT			
24–30	GRAVELLY LOAMY SAND (STRIPPED)	SOMEWHAT FIRM TO FIRM	OLIVE BROWN TO YELLOW BROWN	COMMON & DISTINCT
30–48				
48–120	LIMIT OF EXCAVATION AT 4 FEET REFUSAL IN STONES			

Soil Data by L.S.E.	Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	
	3/12	C	0-3%	24"	☐ Groundwater ■ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Data by C.G. — Geological Classification: LODGEMENT TILL (STRIPPED) NOT SUITABLE FOR SEPTIC

INVESTIGATOR INFORMATION AND SIGNATURE

Signature:	Date: 2/20/2019
Name Printed/typed: STEPHEN B. MARCOTTE	Cert/Lic/Reg.# GE539/SE387
Title: Maine Certified Geologist / Licensed Site Evaluator	

STATE OF MAINE — STEPHEN MARCOTTE #S387 — LICENSED SITE EVALUATOR

SOIL PROFILE / CLASSIFICATION INFORMATION

DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES

Project Name & Location:	Project Location	Equipment	Proj. #
ANGLERS ROAD COMMONS	ANGLERS ROAD, WINDHAM, MAINE	CAT 316F	18417

Observation Hole # TP-3 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)

Depth	Texture	Consistency	Color	Mottling
0–6	GRAVELLY LOAMY SAND (FILL)	FROZEN	GRAY	
6–12		LOOSE		
12–18				
18–24	MEDIUM TO COARSE SAND WITH TRACE GRAVEL (CROSS-BEDDED	LOOSE	YELLOW BROWN	NONE NOTED
24–30				
30–36				
36–42				
42–48				
48–54				
54–60				
60–66	CONTACT DIPS TO NORTH AND EAST			
66–72	GRAVELLY LOAMY SAND (LODGMENT TILL)	VERY FIRM	OLIVE & GRAY	COMMON & DISTINCT
72–78				
78–84				
84–90				
90–96				
96–102	LIMIT OF EXCAVATION AT 8 FEET (NO REFUSAL)			
102–108				
108–114				
114–120				

Soil Data by L.S.E.	Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	
	6	B	0-3%	66"	☐ Groundwater ■ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Data by C.G. — Geological Classification: STRATIED GLACIAL DRIFT OVER LODGEMENT TILL

Observation Hole # TP-4 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)

Depth	Texture	Consistency	Color	Mottling
0–6	GRAVELLY LOAMY SAND (FILL)	FROZEN	OLIVE BROWN	
6–12				
12–18	BURN PILE & SAND(FILL)		GRAY/BLACK	
18–24				
24–30	MEDIUM TO COARSE SAND WITH LENSES OF GRAVELLY LOAMY SAND	FRIABLE	YELLOW BROWN	NONE NOTED
30–36				
36–42				
42–48				
48–54	GRAVELLY LOAMY SAND (LODGMENT TILL)	FIRM	OLIVE BROWN	COMMON & DISTINCT
54–60				
60–66	LIMIT OF EXCAVATION AT 5 FEET (NO REFUSAL)			
66–72				
72–78				
78–84				
84–90				
90–96				
96–102				
102–108				
108–114				
114–120				

Soil Data by L.S.E.	Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	
	5/7	B	0-3%	48"	☐ Groundwater ■ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Data by C.G. — Geological Classification: STRATIED GLACIAL DRIFT OVER LODGEMENT TILL

INVESTIGATOR INFORMATION AND SIGNATURE

Signature:	Date: 2/20/2019
Name Printed/typed: STEPHEN B. MARCOTTE	Cert/Lic/Reg.# GE539/SE387
Title: Maine Certified Geologist / Licensed Site Evaluator	

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SOIL PROFILE / CLASSIFICATION INFORMATION

DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES

Project Name & Location:	Project Location	Equipment	Proj. #
ANGLERS ROAD COMMONS	ANGLERS ROAD, WINDHAM, MAINE	CAT 316F	18417

Observation Hole # TP-5 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–12	GRAVELLY LOAMY SAND (FILL)	FROZEN	GRAY	
12–24	STRATIFIED LOAMY SAND TO COARSE SAND	FRIABLE	YELLOW BROWN	
24–60	MEDIUM TO COARSE SAND WITH TRACE GRAVEL (CROSS-BEDDED	LOOSE	BROWNISH YELLOW TO GRAY	NONE NOTED
90				7.5 FT FREE WATER @ MW-1
102	LIMIT OF EXCAVATION AT 8.5 FEET (CAVING)			

Soil Data by L.S.E.	Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	
	6	B	0-3%	±60"	■ Groundwater ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Data by C.G. — Geological Classification: STRATIFIED GLACIAL DRIFT (EST. SEASONAL HIGH AT 5 FEET)

Observation Hole # TP-6 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–12	GRAVELLY LOAMY SAND (FILL)	FROZEN	BROWN	
12–24				NONE NOTED
24–30	LOAMY SAND		YELLOW BROWN	
30–60	STRATIFIED FINE TO MEDIUM SAND	LOOSE TO FRIABLE	BROWNISH YELLOW TO GRAY	
60	LIMIT OF EXCAVATION AT 5 FEET (ON ROCKS, ASSUMED LODGEMENT TILL)			

Soil Data by L.S.E.	Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	
	5	B	0-3%	60"	☐ Groundwater ■ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Data by C.G. — Geological Classification: STRATIFIED GLACIAL DRIFT OVER LODGEMENT TILL

INVESTIGATOR INFORMATION AND SIGNATURE

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SOIL PROFILE / CLASSIFICATION INFORMATION

DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES

Project Name & Location:	Project Location	Equipment	Proj. #
ANGLERS ROAD COMMONS	ANGLERS ROAD, WINDHAM, MAINE	CAT 316F	18417

Observation Hole # TP-7 ■ Test Pit ☐ Boring

2 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6	STRATIFIED FINE/MED. SAND TO FINE SAND	FRIABLE	BROWN	
6–12			YELLOW BROWN	
12–18				
18–24				
24–30				FEW & DISTINCT
30–36			LIGHT OLIVE BROWN	
36–42				COMMON & DISTINCT
42–48				
48–54	VERY FINE SAND AND SILT	SOMEWHAT FIRM TO FIRM	PALE OLIVE	FREE WATER (SLOW SEEPAGE)
54–60				
60–66	LIMIT OF EXCAVATION AT 8 FEET (CAVING)			
66–72				
72–78				
78–84				
84–90				
90–96				
96–102				
102–108				
108–114				
114–120				

Soil Data by L.S.E.	Soil	Classification	Slope	Limiting Factor	
	5 Profile	C Condition	0-3% Percent	26" Depth	■ Groundwater ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Data by C.G.	Geological Classification
	STRATIFIED GLACIAL DRIFT

Observation Hole # TP-8 ■ Test Pit ☐ Boring

2 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6	FINE SAND	FRIABLE	BROWN	
6–12			YELLOW BROWN	
12–18				
18–24	VERY FINE SAND AND SILT	SOMEWHAT FIRM TO FIRM	LIGHT OLIVE BROWN	COMMON & DISTINCT
24–30				
30–36			PALE OLIVE	
36–42				
42–48				
48–54				
54–60				
60–66	LIMIT OF EXCAVATION AT 5 FEET (NO REFUSAL)			
66–72				
72–78				
78–84				
84–90				
90–96				
96–102				
102–108				
108–114				
114–120				

Soil Data by L.S.E.	Soil	Classification	Slope	Limiting Factor	
	7 Profile	C Condition	0-3% Percent	16" Depth	■ Groundwater ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Data by C.G.	Geological Classification
	STRATIFIED GLACIAL DRIFT

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#S387
LICENSED
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SOIL PROFILE / CLASSIFICATION INFORMATION

DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES

Project Name & Location:	Project Location	Equipment	Proj. #
ANGLERS ROAD COMMONS	ANGLERS ROAD, WINDHAM, MAINE	CAT 316F	18417

Observation Hole # TP-9 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6	LOAMY SAND	FROZEN	BROWN	
6–12	MEDIUM TO COARSE SAND WITH TRACE GRAVEL (CROSS-BEDDED	LOOSE	YELLOW BROWN	
12–48				
48–60	FINE-MEDIUM SAND GRADING DOWNWARD TO VERY FINE SAND & SILT	LOOSE	PALE OLIVE BROWN	FEW & FAINT
60–78				SEEPAGE
78–96				
96	LIMIT OF EXCAVATION AT 8 FEET (CAVING)			
102–120				

Soil Data by L.S.E.	Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	
	6	B	0-3%	60"	■ Groundwater ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Data by C.G. — Geological Classification: STRATIFIED GLACIAL DRIFT

Observation Hole # TP-10 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6	LOAMY SAND	FROZEN	BROWN	
6–12	MEDIUM TO COARSE SAND WITH TRACE GRAVEL (CROSS-BEDDED	LOOSE	YELLOW BROWN	
12–66				
66–90				NONE NOTED
90				SEEPAGE
96	LIMIT OF EXCAVATION AT 8 FEET (CAVING)			
102–120				

Soil Data by L.S.E.	Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	
	6	B	0-3%	±60"	■ Groundwater ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Data by C.G. — Geological Classification: STRATIFIED GLACIAL DRIFT (EST. SEASONAL HIGH AT 5 FEET)

INVESTIGATOR INFORMATION AND SIGNATURE

Signature:	Date: 2/20/2019
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SOIL PROFILE / CLASSIFICATION INFORMATION

DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES

Project Name & Location:	Project Location	Equipment	Proj. #
ANGLERS ROAD COMMONS	ANGLERS ROAD, WINDHAM, MAINE	CAT 316F	18417

Observation Hole # TP-11 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6	LOAMY SAND	FROZEN	BROWN	
6–18	MEDIUM TO COARSE SAND WITH TRACE GRAVEL (CROSS-BEDDED	LOOSE	YELLOW BROWN	
18–84				NONE NOTED
84				SEEPAGE
96	LIMIT OF EXCAVATION AT 8 FEET (CAVING)			

Soil Data by L.S.E.	Soil	Classification	Slope	Limiting Factor	
	6 Profile	B Condition	0-3% Percent	±60" Depth	■ Groundwater ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Data by C.G. — Geological Classification: STRATIFIED GLACIAL DRIFT (EST. SEASONAL HIGH AT 5 FEET)

Observation Hole # TP-12 ■ Test Pit ☐ Boring

0 " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6	LOAMY SAND	FROZEN	BROWN	
6–12	MEDIUM TO FINE SAND			
12–18		LOOSE	YELLOW BROWN	
18–24	MEDIUM TO COARSE SAND WITH LITTLE GRAVEL			
24–84				NONE NOTED
84				SEEPAGE
54–60	MEDIUM TO FINE SAND			
96	LIMIT OF EXCAVATION AT 8 FEET (CAVING)			

Soil Data by L.S.E.	Soil	Classification	Slope	Limiting Factor	
	6 Profile	B Condition	0-3% Percent	±60" Depth	■ Groundwater ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Soil Data by C.G. — Geological Classification: STRATIFIED GLACIAL DRIFT (EST. SEASONAL HIGH AT 5 FEET)

INVESTIGATOR INFORMATION AND SIGNATURE

Signature:	Date: 2/20/2019
Name Printed/typed: STEPHEN B. MARCOTTE	Cert/Lic/Reg.# GE539/SE387
Title: Maine Certified Geologist / Licensed Site Evaluator	

STATE OF MAINE — STEPHEN MARCOTTE #S387 — LICENSED SITE EVALUATOR

SUMMIT GEOENGINEERING SERVICES

SOIL BORING LOG

Project:	Anglers Commons Development	Boring #:	**B-1**
Location:	Anglers Road	Project #:	18417
City, State:	Windham, Maine	Sheet:	1 of 1
		Chkd by:	SBM

Drilling Co:	Summit Geoengineering Services, Inc.	Boring Elevation:	304.30
Driller:	S. Floyd	Reference:	Elevations based on laser level survey by SGS on 3/4/2018. See Report
Summit Staff:	Steve Marcotte, CG/LSE	Date started:	2/22/2019 Date Completed: 2/22/2019

DRILLING METHOD		SAMPLER	
Vehicle:	AMS	Length:	24" SS
Model:	9500 VTR	Diameter:	2"OD/1.5"ID
Method:	3¼" HSA	Hammer:	140 lb
Hammer Style:	Auto	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
3/4/2019	7.66	296.64	Monitoring well MW-1

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	blows/6"	Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
1						Drill ahead to 10 feet		FILL
						0-8.5 foot interval observed at TP-5		
2								
								PROXIMAL DELTA OUTWASH (CLEAN SANDS)
3								
4								
5								
6								
7								
8								
9								
10								
	S-1	24/4	10-12	5		Loose, saturated, yellow brown med-coarse sand		
11				4				
				7				
12				6				
13								
	S-2	24/22	13-15	1		7" loose saturated yellow brown med-coarse sand		
14				1	+/-290	over very soft stratified silty sand to silty clay		+/-290'
				1				
15				1				DISTAL DELTA OUTWASH (SAND, SILT & SILTY CLAY)
	S-3	24/20	15-17	1		soft/loose saturated olive silty clay with 4" seam		
16				3		fine-med sand		
				5				
17				3				
18								
19								
20								
	S-4	24/24	20-22	1		6" med to coarse sand		
21				3		1" silt		
				8		8" med-crs sand		
22				8		laminated silty clay and very fine sand to silt		
23								
24								
25								
	S-5	24/24	25-27	1		stratified very fine sand, silt and silty clay		
26				4				
				6				ASSUMED TILL @ 35 FEET
27				8				
						Spear-tip probe thru HSa, 27-35 feet (easy drive)		
						at 35 feet became denser, refusal at 42 feet		

Granular Soils		Cohesive Soils		% Composition
Blows/ft.	Density	Blows/ft.	Consistency	ASTM D2487
0-4	V. Loose	<2	V. soft	
5-10	Loose	2-4	Soft	< 5% Trace
11-30	Compact	5-8	Firm	5-15% Little
31-50	Dense	9-15	Stiff	15-30% Some
>50	V. Dense	16-30	V. Stiff	> 30% With
		>30	Hard	

NOTES: PZ-1 INSTALLED W/ 1 FOOT SCREEN AT 24-25 FT
STEP OVER, DRILL TO 14 FEET AND INSTALL MW-1

PP = Pocket Penetrometer, MC = Moisture Content
LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test
Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength

Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches
Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200

Soil Moisture Condition
Dry: S = 0%
Humid: S = 1 to 25%
Damp: S = 26 to 50%
Moist: S = 51 to 75%
Wet: S = 76 to 99%
Saturated: S = 100%

SUMMIT GEOENGINEERING SERVICES

SOIL BORING LOG

Boring #: **B-2**

Project:	Anglers Commons Development	Project #:	18417
Location:	Anglers Road	Sheet:	1 of 1
City, State:	Windham, Maine	Chkd by:	SBM

Drilling Co:	Summit Geoengineering Services, Inc.	Boring Elevation:	303.89
Driller:	S. Floyd	Reference:	Elevations based on laser level survey by SGS on 3/4/2018. See Report
Summit Staff:	Steve Marcotte, CG/LSE	Date started: 2/22/2019	Date Completed: 2/22/2019

DRILLING METHOD		SAMPLER	
Vehicle:	AMS	Length:	24" SS
Model:	9500 VTR	Diameter:	2"OD/1.5"ID
Method:	3¼" HSA	Hammer:	140 lb
Hammer Style:	Auto	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
3/4/2019	7.61	296.28	Monitoring well MW-2

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	blows/6"	Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
1						Drill ahead to 10 feet No test pit in vicinity		TOPSOIL
2								PROXIMAL DELTA OUTWASH (CLEAN SANDS) GRADING DOWNWARD TO FINE SANDS
3								
4								
5								
6								
7								
8								CONTACT +/- 8 FT (elv = +/- 296 FT)
9								
10								
	S-1	24/4	10-12	1		10-11: Fine-med SAND, trace to little silt, mica layers		DISTAL DELTA OUTWASH (SAND, SILT & SILTY CLAY)
11				3		11-11.5: silty clayey sand		
				1		11.5-12: fine sandy silt		
12				3		very loose to soft, saturated		
13								
	S-2	24/22	13-15	1		Fine-med sand with 1" layer of silt at 15'		
14				2		very loose to loose, saturated		
				2				
15				5				
16						Bottom of Boring at 15 feet Set MW-2		
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								

Granular Soils		Cohesive Soils		% Composition
Blows/ft.	Density	Blows/ft.	Consistency	ASTM D2487
0-4	V. Loose	<2	V. soft	
5-10	Loose	2-4	Soft	< 5% Trace
11-30	Compact	5-8	Firm	5-15% Little
31-50	Dense	9-15	Stiff	15-30% Some
>50	V. Dense	16-30	V. Stiff	> 30% With
		>30	Hard	

NOTES: PZ-1 INSTALLED W/ 1 FOOT SCREEN AT 24-25 FT
STEP OVER, DRILL TO 14 FEET AND INSTALL MW-1

PP = Pocket Penetrometer, MC = Moisture Content
LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test
Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength

Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches
Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200

Soil Moisture Condition
Dry: S = 0%
Humid: S = 1 to 25%
Damp: S = 26 to 50%
Moist: S = 51 to 75%
Wet: S = 76 to 99%
Saturated: S = 100%

SUMMIT GEOENGINEERING SERVICES

SOIL BORING LOG

Project:	Anglers Commons Development	Boring #:	**B-3**
Location:	Anglers Road	Project #:	18417
City, State:	Windham, Maine	Sheet:	1 of 1
		Chkd by:	SBM

Drilling Co:	Summit Geoengineering Services, Inc.	Boring Elevation:	303.05
Driller:	S. Floyd	Reference:	Elevations based on laser level survey by SGS on 3/4/2018. See Report
Summit Staff:	Steve Marcotte, CG/LSE	Date started:	2/22/2019 Date Completed: 2/22/2019

DRILLING METHOD		SAMPLER	
Vehicle:	AMS	Length:	24" SS
Model:	9500 VTR	Diameter:	2"OD/1.5"ID
Method:	3¼" HSA	Hammer:	140 lb
Hammer Style:	Auto	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
3/4/2019	7.5	295.55	Monitoring well MW-3

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	blows/6"	Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
1						Drill ahead to 10 feet		TOPSOIL
						0-8 foot interval observed at TP-9		
2								
								PROXIMAL DELTA OUTWASH (CLEAN SANDS) GRADING DOWNWARD TO FINE SANDS
3								
4								
5								
6								
7								
8								CONTACT +/- 8 FT (elv = +/- 296 FT)
9								
10								
	S-1	24/20	10-12	2		Fine sand with trace silt, with occasional silt partings		DISTAL DELTA OUTWASH (SAND, SILT & SILTY CLAY)
11				1		very loose to soft, saturated		
				2				
12				3				
13								
	S-2	24/20	13-15	1		stratified fine sand and silty clay		
14				1		very loose to soft, saturated		
				1				
15				3				
						Bottom of Boring at 15 feet		
16						Set MW-3		
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								

Granular Soils		Cohesive Soils		% Composition
Blows/ft.	Density	Blows/ft.	Consistency	ASTM D2487
0-4	V. Loose	<2	V. soft	
5-10	Loose	2-4	Soft	< 5% Trace
11-30	Compact	5-8	Firm	5-15% Little
31-50	Dense	9-15	Stiff	15-30% Some
>50	V. Dense	16-30	V. Stiff	> 30% With
		>30	Hard	

NOTES: PZ-1 INSTALLED W/ 1 FOOT SCREEN AT 24-25 FT
STEP OVER, DRILL TO 14 FEET AND INSTALL MW-1

PP = Pocket Penetrometer, MC = Moisture Content
LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test
Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength

Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches
Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200

Soil Moisture Condition
Dry: S = 0%
Humid: S = 1 to 25%
Damp: S = 26 to 50%
Moist: S = 51 to 75%
Wet: S = 76 to 99%
Saturated: S = 100%

SOIL BORING LOG

SUMMIT GEOENGINEERING SERVICES

Project:	Anglers Commons Development	Boring #:	**B-4**
Location:	Anglers Road	Project #:	18417
City, State:	Windham, Maine	Sheet:	1 of 1
		Chkd by:	SBM

Drilling Co:	Summit Geoengineering Services, Inc.	Boring Elevation:	303.09
Driller:	S. Floyd	Reference:	Elevations based on laser level survey by SGS on 3/4/2018. See Report
Summit Staff:	Steve Marcotte, CG/LSE	Date started:	2/22/2019 Date Completed: 2/22/2019

DRILLING METHOD		SAMPLER	
Vehicle:	AMS	Length:	24" SS
Model:	9500 VTR	Diameter:	2"OD/1.5"ID
Method:	3¼" HSA	Hammer:	140 lb
Hammer Style:	Auto	Method:	ASTM D1586

ESTIMATED GROUND WATER DEPTH

Date	Depth	Elevation	Reference
3/4/2019	7.94	295.15	Monitoring well MW-4

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	blows/6"	Elev. (ft.)	SAMPLE DESCRIPTION	Geological/ Test Data	Geological Stratum
1						Drill ahead to 10 feet		TOPSOIL
						No test pit in vicinity		
2								PROXIMAL DELTA OUTWASH (CLEAN SANDS) GRADING DOWNWARD TO FINE SANDS
3								
4								
5								
6								
7								
8								CONTACT +/- 8 FT (elv = +/- 296 FT)
9								
10								
	S-1	24/24	10-12	1		fine sand with trace silt		DISTAL DELTA OUTWASH (SAND, SILT & SILTY CLAY)
11				1		very loose, saturated		
				1				
12				2				
13								
	S-2	24/24	13-15	1		fine sand with trace silt		
14				1		very loose, saturated		
				2				
15				3				
	S-3	24/24	15-17	1		fine sand with trace silt		
16				2		very loose, saturated		
				3				
17				3				
18						Bottom of Boring at 15 feet, split-spoon to 17 feet		
						Set MW-4, difficulty with running sands, set bottom		
19						at 13 feet bgs.		
20								
21								
22								
23								
24								
25								
26								
27								

Granular Soils		Cohesive Soils		% Composition
Blows/ft.	Density	Blows/ft.	Consistency	ASTM D2487
0-4	V. Loose	<2	V. soft	
5-10	Loose	2-4	Soft	< 5% Trace
11-30	Compact	5-8	Firm	5-15% Little
31-50	Dense	9-15	Stiff	15-30% Some
>50	V. Dense	16-30	V. Stiff	> 30% With
		>30	Hard	

NOTES: PZ-1 INSTALLED W/ 1 FOOT SCREEN AT 24-25 FT
STEP OVER, DRILL TO 14 FEET AND INSTALL MW-1

PP = Pocket Penetrometer, MC = Moisture Content
LL = Liquid Limit, PI = Plastic Index, FV = Field Vane Test
Su = Undrained Shear Strength, Su(r) = Remolded Shear Strength

Boulders = diameter > 12 inches, Cobbles = diameter < 12 inches and > 3 inches
Gravel = < 3 inch and > No 4, Sand = < No 4 and >No 200, Silt/Clay = < No 200

Soil Moisture Condition
Dry: S = 0%
Humid: S = 1 to 25%
Damp: S = 26 to 50%
Moist: S = 51 to 75%
Wet: S = 76 to 99%
Saturated: S = 100%

SUMMIT
GEOENGINEERING SERVICES

WELL COMPLETION LOG

Well #: **MW-1**

Project: Anglers Commons Development | Project #: 18417
Location: Anglers Road | Sheet: 1 of 1
Windham, Maine | Chkd by: SBM

Drilling Co: Summit Geoengineering Services
Driller: Shawn Floyd
Summit Staff: Steve Marcotte, CG, LSE

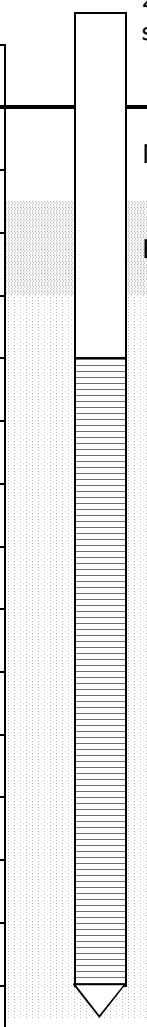
Well Location: N43.850007636, W70.446587901 (WGS1984)

Date started: 2/22/2019 Date Completed: 2/22/2019

REFERENCE ELEVATIONS
Surveyor: Summit Geoenginering
Reference (MSL or TBM): see rpt
Top of Protective Casing: n/a
Top of inner casing: 307.25
Ground Surface: 304.30

GW ELEVATIONS

Date	Elevation
3/4/2019	296.64



Depth (ft.)	Stratum from soil boring log
1	FILL
2	
3	MED-CRS SAND
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	FINE SAND SILT & SILTY CLAY
16	
17	
18	
19	
20	
21	
22	

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING

Type (Standpipe or roadbox):	None
Diameter (in.):	N/A
Length (in.):	N/A
Concrete Seal (gal):	None

WELL CASING AND SCREEN

	Riser	Screen
Material:	PVC	PVC
Schedule:	40	40
Diameter (in.):	2	2
Length (ft):	4	10
Interval below ground surface (ft):	0 to 4	4 to 14
Slot size (in.):		0.02

FILTER AND SEAL MATERIALS

	Filter	Seal
Type:	Native	Bentonite
Size:	N/A	chips
Quantity (lbs.):	N/A	20
Interval below ground surface (ft):	3 to 14	1 to 3

GROUT

Type (filter sand, bentonite, etc.):	None
Quantity (gal. or lbs.):	N/A
Interval below ground surface (ft.):	N/A

WELL DEVELOPMENT DETAILS

Water level from measuring point (ft):	N/A
Depth of well from measuring point (ft):	N/A
Total feet of water:	N/A
Volume of water (gal):	N/A
Volume of water evacuated (gal):	N/A
Method of development:	Pumped and surged w/ Whale Pump for 15 min.

SUMMIT
GEOENGINEERING SERVICES

WELL COMPLETION LOG

Well #: **MW-2**

Project: Anglers Commons Development | Project #: 18417
Location: Anglers Road | Sheet: 1 of 1
Windham, Maine | Chkd by: SBM

Drilling Co: Summit Geoengineering Services
Driller: Shawn Floyd
Summit Staff: Steve Marcotte, CG, LSE

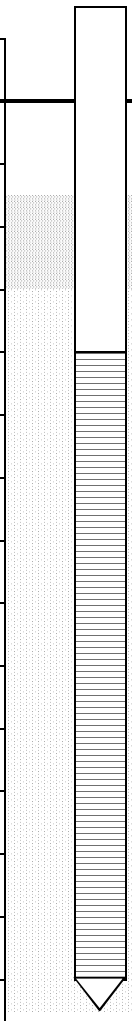
Well Location: N43.850338359, W70.446220457 (WGS1984)

Date started: 2/22/2019 Date Completed: 2/22/2019

REFERENCE ELEVATIONS
Surveyor: Summit Geoenginering
Reference (MSL or TBM): see rpt
Top of Protective Casing: n/a
Top of inner casing: 306.79
Ground Surface: 303.89

GW ELEVATIONS

Date	Elevation
3/4/2019	296.28



Depth (ft.)	Stratum from soil boring log
1	TOPSOIL
2–3	MED-CRS SAND GRADING DOWNWARD TO FINE SANDS
10	+/-
11–14	FINE SAND SILT & SILTY CLAY

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING

Type (Standpipe or roadbox):	None
Diameter (in.):	N/A
Length (in.):	N/A
Concrete Seal (gal):	None

WELL CASING AND SCREEN

	Riser	Screen
Material:	PVC	PVC
Schedule:	40	40
Diameter (in.):	2	2
Length (ft):	4	10
Interval below ground surface (ft):	0 to 4	4 to 14
Slot size (in.):		0.02

FILTER AND SEAL MATERIALS

	Filter	Seal
Type:	Native	Bentonite
Size:	N/A	chips
Quantity (lbs.):	N/A	20
Interval below ground surface (ft):	3 to 14	1 to 3

GROUT

Type (filter sand, bentonite, etc.):	None
Quantity (gal. or lbs.):	N/A
Interval below ground surface (ft.):	N/A

WELL DEVELOPMENT DETAILS

Water level from measuring point (ft):	N/A
Depth of well from measuring point (ft):	N/A
Total feet of water:	N/A
Volume of water (gal):	N/A
Volume of water evacuated (gal):	N/A
Method of development:	Pumped and surged w/ Whale Pump for 15 min.

SUMMIT
GEOENGINEERING SERVICES

WELL COMPLETION LOG

Well #: **MW-3**

Project: Anglers Commons Development | Project #: 18417
Location: Anglers Road | Sheet: 1 of 1
Windham, Maine | Chkd by: SBM

Drilling Co: Summit Geoengineering Services
Driller: Shawn Floyd
Summit Staff: Steve Marcotte, CG, LSE

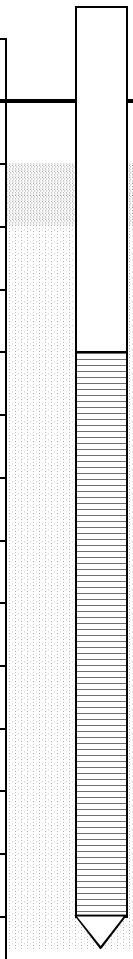
Well Location: N43.849499582, W70.446010870 (WGS1984)

Date started: 2/22/2019 Date Completed: 2/22/2019

REFERENCE ELEVATIONS
Surveyor: Summit Geoenginering
Reference (MSL or TBM): see rpt
Top of Protective Casing: n/a
Top of inner casing: 305.25
Ground Surface: 303.05

GW ELEVATIONS

Date	Elevation
3/4/2019	295.55



Depth (ft.)	Stratum from soil boring log
1	TOPSOIL
2	
3	MED-CRS SAND
4	
5	FN-MED SAND GRADING DOWNWARD TO FINE SANDS
6	
7	
8	
9	
10	+/-
11	FINE SAND SILT & SILTY CLAY
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING

Type (Standpipe or roadbox):	None
Diameter (in.):	N/A
Length (in.):	N/A
Concrete Seal (gal):	None

WELL CASING AND SCREEN

	Riser	Screen
Material:	PVC	PVC
Schedule:	40	40
Diameter (in.):	2	2
Length (ft):	3	10
Interval below ground surface (ft):	0 to 3	3 to 13
Slot size (in.):		0.01

FILTER AND SEAL MATERIALS

	Filter	Seal
Type:	Native	Bentonite
Size:	N/A	chips
Quantity (lbs.):	N/A	20
Interval below ground surface (ft):	2 to 13	1 to 2

GROUT

Type (filter sand, bentonite, etc.):	None
Quantity (gal. or lbs.):	N/A
Interval below ground surface (ft.):	N/A

WELL DEVELOPMENT DETAILS

Water level from measuring point (ft):	N/A
Depth of well from measuring point (ft):	N/A
Total feet of water:	N/A
Volume of water (gal):	N/A
Volume of water evacuated (gal):	N/A
Method of development:	Pumped and surged w/ Whale Pump for 15 min.

SUMMIT
GEOENGINEERING SERVICES

WELL COMPLETION LOG

Well #: **MW-4**

Project: Anglers Commons Development | Project #: 18417
Location: Anglers Road | Sheet: 1 of 1
Windham, Maine | Chkd by: SBM

Drilling Co: Summit Geoengineering Services
Driller: Shawn Floyd
Summit Staff: Steve Marcotte, CG, LSE

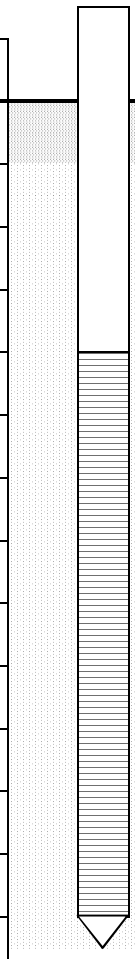
Well Location: N43.850031276, W70.445550169 (WGS1984)

Date started: 2/22/2019 Date Completed: 2/22/2019

REFERENCE ELEVATIONS
Surveyor: Summit Geoenginering
Reference (MSL or TBM): see rpt
Top of Protective Casing: n/a
Top of inner casing: 305.54
Ground Surface: 304.33

GW ELEVATIONS

Date	Elevation
3/4/2019	295.15



Depth (ft.)	Stratum from soil boring log
1	TOPSOIL
2	
3	FN-MED SAND GRADING DOWNWARD TO FINE SANDS
4	
5	
6	
7	
8	
9	
10	+/-
11	FINE SAND SILT & SILTY CLAY
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING

Type (Standpipe or roadbox):	None
Diameter (in.):	N/A
Length (in.):	N/A
Concrete Seal (gal):	None

WELL CASING AND SCREEN

	Riser	Screen
Material:	PVC	PVC
Schedule:	40	40
Diameter (in.):	2	2
Length (ft):	1.5	10
Interval below ground surface (ft):	0 to 1.5	1.5 to 11.5
Slot size (in.):		0.01

FILTER AND SEAL MATERIALS

	Filter	Seal
Type:	Native	Bentonite
Size:	N/A	chips
Quantity (lbs.):	N/A	20
Interval below ground surface (ft):	1 to 11.5	0 to 1

GROUT

Type (filter sand, bentonite, etc.):	None
Quantity (gal. or lbs.):	N/A
Interval below ground surface (ft.):	N/A

WELL DEVELOPMENT DETAILS

Water level from measuring point (ft):	N/A
Depth of well from measuring point (ft):	N/A
Total feet of water:	N/A
Volume of water (gal):	N/A
Volume of water evacuated (gal):	N/A
Method of development:	Pumped and surged w/ Whale Pump for 15 min.

SUMMIT
GEOENGINEERING SERVICES

WELL COMPLETION LOG

Well #: **PZ-1**

Project: Anglers Commons Development | Project #: 18417
Location: Anglers Road | Sheet: 1 of 1
Windham, Maine | Chkd by: SBM

Drilling Co: Summit Geoengineering Services
Driller: Shawn Floyd
Summit Staff: Steve Marcotte, CG, LSE

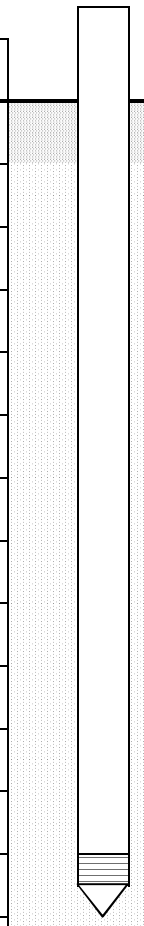
Well Location: N43.849989973, W70.446606345 (WGS1984)

Date started: 2/22/2019 Date Completed: 2/22/2019

REFERENCE ELEVATIONS
Surveyor: Summit Geoenginering
Reference (MSL or TBM): see rpt
Top of Protective Casing: n/a
Top of inner casing: 306.38
Ground Surface: 304.33

GW ELEVATIONS

Date	Elevation
3/4/2019	295.96



Depth (ft.) | Stratum from soil boring log

2 — FILL
4
6 — MED-CRS SAND
8
10
12
14
16 — FINE SAND SILT & SILTY CLAY
18
20
22
24
26
28 — ASSUMED SAME AS ABOVE VIA PROBE TO REFUSAL
30
32
34
36 — DENSE MATERIAL ASSUMED TILL
38
40
42 — REFUSAL 42'
44

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING

Type (Standpipe or roadbox):	None
Diameter (in.):	N/A
Length (in.):	N/A
Concrete Seal (gal):	None

WELL CASING AND SCREEN

	Riser	Screen
Material:	PVC	PVC
Schedule:	40	40
Diameter (in.):	2	2
Length (ft):	24	1
Interval below ground surface (ft):	0 to 24	24 to 25
Slot size (in.):		0.01

FILTER AND SEAL MATERIALS

	Filter	Seal
Type:	Native	Bentonite
Size:	N/A	chips
Quantity (lbs.):	N/A	20
Interval below ground surface (ft):	3 to 25	1 to 3

GROUT

Type (filter sand, bentonite, etc.):	None
Quantity (gal. or lbs.):	N/A
Interval below ground surface (ft.):	N/A

WELL DEVELOPMENT DETAILS

Water level from measuring point (ft):	N/A
Depth of well from measuring point (ft):	N/A
Total feet of water:	N/A
Volume of water (gal):	N/A
Volume of water evacuated (gal):	N/A
Method of development:	Pumped dry 3 times w/ Whale Pump (low yield).

Observation Well Construction Information and Depth to Water Survey Data

Anglers Commons Development

Anglers Road, Windham, Maine

	Well Constructon			Elevation Survey			Groundwater Depth/Elevation		
Well	Total Depth (ft)	Stickup (ft)	Bottom of Well (ft BGS)	Elevation Top of PVC Casing (ft)	Elevation Existing Grade (ft)	Elevation Bottom of Well (ft)	Depth to Water Level on 3-4-2019 (ft below Top of PVC)	Elevation Water Level (ft)	Depth Below Ground Surface (ft)
MW-1	17.4	2.95	14.45	307.25	304.30	289.85	10.61	296.64	7.66
MW-2	17.5	2.90	14.60	306.79	303.89	289.29	10.51	296.28	7.61
MW-3	15.4	2.20	13.20	305.25	303.05	289.85	9.7	295.55	7.50
MW-4	14.5	2.45	12.05	305.54	303.09	291.04	10.39	295.15	7.94
PZ-1	26.5	2.05	24.45	306.38	304.33	279.88	10.42	295.96	8.37

Notes:

1. Elevations based on laser level survey by SGS on 3/4/2018. Elevations based on assumed elevatIon of Anglers Road centerline of 305 feet at utility pole CMP #3 (church parking lot entrance).
2. Depth to water level and well depth measurements collected on 3/4/2019 with an electronic depth to water level meter (+/-0.01 feet)

SUMMIT
GEOENGINEERING SERVICES

PHOTOGRAPHIC LOG

Project Name: Anglers Commons Development | **Project No. 18417**

Photo No. 1

Date: 2/8/2019

Site Location:
Anglers Road
Windham, Maine

Description:

View of excavated lodgement till knoll from Anglers Road

Photo No. 2

Date: 2/8/2019

Site Location:
Anglers Road
Windham, Maine

Description:

View of interior of site from Anglers Road.

SUMMIT
GEOENGINEERING SERVICES

PHOTOGRAPHIC LOG

Project Name: Anglers Commons Development | **Project No. 18417**

Photo No. 3

Date: 2/22/2019

Site Location:
Anglers Road
Windham, Maine

Description:

TP-1

Photo No. 4

Date: 2/22/2019

Site Location:
Anglers Road
Windham, Maine

Description:

TP-2

SUMMIT
GEOENGINEERING SERVICES

PHOTOGRAPHIC LOG

Project Name: Anglers Commons Development

Project No. 18417

Photo No. 5

Date: 2/22/2019

Site Location:
Anglers Road
Windham, Maine

Description:

TP-3

(gray till exposed at bottom)

Photo No. 6

Date: 2/22/2019

Site Location:
Anglers Road
Windham, Maine

Description:

TP-4

Burn pile area is dark area, underlain by thin layer of native sands.

Gray at bottom is lodgment till.

SUMMIT
GEOENGINEERING SERVICES

PHOTOGRAPHIC LOG

Project Name: Anglers Commons Development | **Project No. 18417**

Photo No. 7

Date: 2/22/2019

Site Location:
Anglers Road
Windham, Maine

Description:

TP-5

Photo No. 8

Date: 2/22/2019

Site Location:
Anglers Road
Windham, Maine

Description:

TP-6

SUMMIT
GEOENGINEERING SERVICES

PHOTOGRAPHIC LOG

Project Name: Anglers Commons Development | **Project No. 18417**

Photo No. 9

Date: 2/22/2019

Site Location:
Anglers Road
Windham, Maine

Description:

TP-7

Conditions at proposed soil underdrain filter

Photo No. 10

Date: 2/22/2019

Site Location:
Anglers Road
Windham, Maine

Description:

TP-9

SUMMIT
GEOENGINEERING SERVICES

PHOTOGRAPHIC LOG

Project Name: Anglers Commons Development | **Project No. 18417**

Photo No. 11

Date: 2/22/2019

Site Location:
Anglers Road
Windham, Maine

Description:

TP-10

Photo No. 12

Date: 2/22/2019

Site Location:
Anglers Road
Windham, Maine

Description:

TP-11

SUMMIT
GEOENGINEERING SERVICES

PHOTOGRAPHIC LOG

Project Name: Anglers Commons Development | **Project No. 18417**

Photo No. 13

Date: 2/22/2019

Site Location:
Anglers Road
Windham, Maine

Description:

TP-12

Med-coarse sand (3 ft) & Med-fine sand (5 ft) samples collected for grain size analysis.

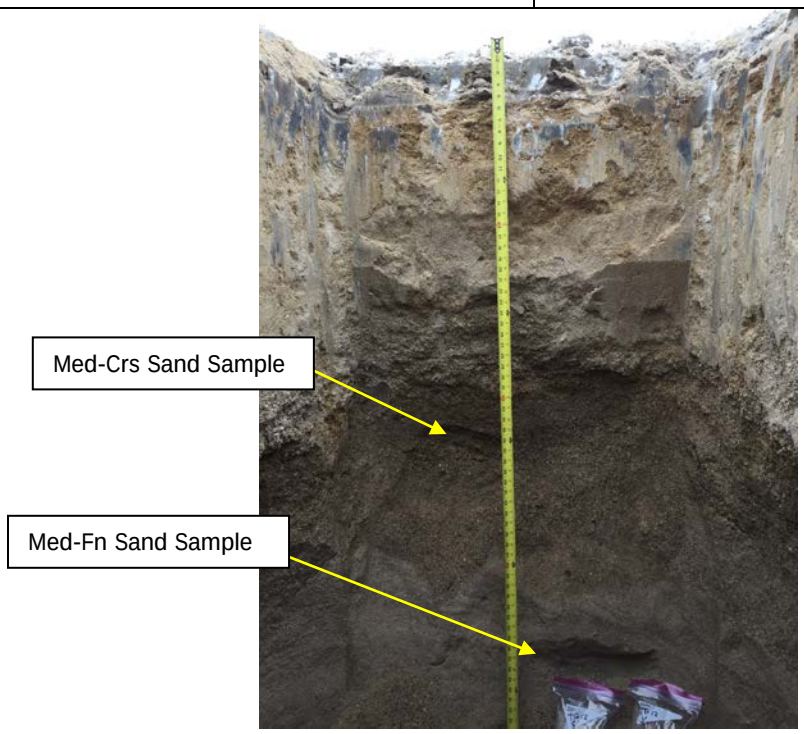


Photo No. 14

Date: 2/24/2019

Site Location:
Anglers Road
Windham, Maine

Description:

Boring B-1 split spoon (13-15 foot interval).

Transition from medium coarse sand (right) to stratified sands and silts (left) at 14 feet under proposed leachfield area.

Attachment 3
Analytical Laboratory Report

A & L LABORATORY
A DIVISION OF GRANITE STATE ANALYTICAL SERVICES, LLC
155 Center Street, Building C Auburn, Maine 04210
Phone: 207-784-5354 | website: www.allaboratory.com

CERTIFICATE OF ANALYSIS FOR DRINKING WATER

DATE PRINTED: 03/06/2019
CLIENT NAME: Steve Marcotte
CLIENT ADDRESS: 145 Lisbon Street Suite 701
Lewiston, ME 04240
SAMPLE ID#: 1903-00251-001
SAMPLED BY: S. Marcotte
SAMPLE ADDRESS: Marcotte
Anglers Road
Windham ME 04062
MORE LOC INFO: Mon Well

Legend
Passes ✓
Fails EPA Primary ⊗
Fails EPA Secondary ▽
Fails State Guideline ✕
Attention ⚠

DATE AND TIME COLLECTED: 03/04/2019 4:00PM
DATE AND TIME RECEIVED: 03/05/2019 11:56AM
ANALYSIS PACKAGE: A & L-IC-Nitrates-ME
RECEIPT TEMPERATURE: 17° CELSIUS
CLIENT JOB #

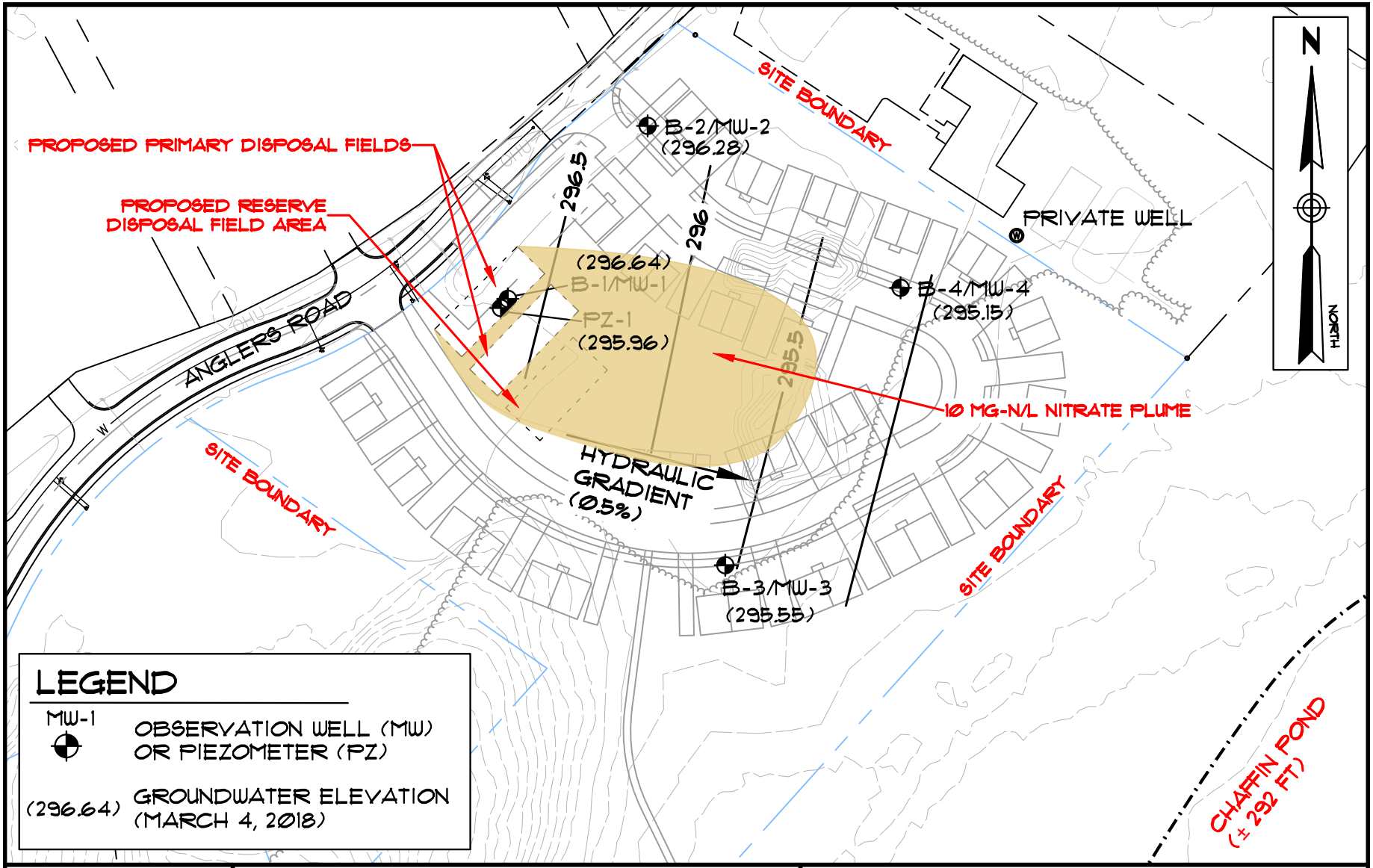
Test Description	Results	Test Units	Pass /Fail	DQ Flag	RL	Limit	Method	Analyst	Date-Time Analyzed
Nitrate as N*	0.36	mg/L	✓		0.2	10 mg/L	EPA 300.0	JR-ME	03/05/19 5:23PM

The results presented in this report relate to the samples listed above in the condition in which they were received.
RL: "Reporting limit" means the lowest level of an analyte that can be accurately recovered from the matrix of interest.
The thermal preservation requirement of 4ºC for nitrate & nitrite has been waived by the Maine CDC for all samples submitted to the Drinking Water Program.
Data Qualifier (DQ) Flags: None

*** ME Certified Analysis**

Rebecca L. Labranche
Laboratory Director

Attachment 4
Nitrate-Nitrogen Assessment Site Plan



DATE: MARCH 28, 2019
JOB: 18417
FILE: 18417 EX
DRAWN BY: SBM
CHECKED BY: SBM
SCALE: 1" = 100'

145 LISBON ST. - SUITE 701
LEWISTON, ME 04240
Tel.: (207) 576-3313

SUMMIT
GEOENGINEERING SERVICES
www.summitgeoeng.com

173 PLEASANT STREET
ROCKLAND, ME 04841
Tel.: (207) 318-7761

FIGURE 4: NITRATE ASSESSMENT MAP
ANGLERS ROAD COMMONS

ANGLERS ROAD, WINDHAM MAINE
PREPARED FOR
TIM CLINTON

The key to success starts with a solid foundation.
ENGINEERING | EXPLORATION | EXPERIENCE

Mounding & Transmission Analysis

Anglers Road Commons

Anglers Road, Windham, Maine

Client

Timothy Clinton
7 Fay Road
Scituate, MA 02066

Project #: 18417
Date: 3/29/2019

SUMMIT
GEOENGINEERING SERVICES

145 Lisbon Street (PO Box 7216) Lewiston, Maine 04243 | (207) 576-3313
173 Pleasant Street Rockland, Maine 04841 | (207) 318-7761
www.summitgeoeng.com

Table of Contents

Tables

Appendices

145 Lisbon Street (PO Box 7216) Lewiston, Maine 04243 | (207) 576-3313
173 Pleasant Street Rockland, Maine 04841 | (207) 318-7761
www.summitgeoeng.com

1.0 INTRODUCTION

Summit Geoengineering Services (SGS) completed a mounding and transmission analysis for an engineered subsurface wastewater disposal field to serve the proposed Anglers Road Commons residential development (the site). The site is located on approximately 6.09-acres land on the south side of Anglers Road in Windham, Maine. A locus map showing the site and vicinity is provided as Figure 1 (Appendix A).

Anglers Road Commons is a proposed 44-unit residential development. Each unit will have two to three bedrooms and there will be 100-bedrooms in total. The development will be served by a common subsurface wastewater disposal field with a design flow of 9,000 gallons per day. A site plan is provided as Figure 2 (Appendix B).

Information used for our evaluation includes a digital existing conditions and proposed development plan prepared by DM Roma Consulting Engineers (DM Roma), published geologic maps and literature, and subsurface information from test pits, soil borings, and observations wells completed by SGS in February 2019.

2.0 SITE SETTING

The site is located on the south side of Anglers Road approximately 500 feet northeast of Route 302, and within the southern extent of a broad sand plain plateau situated between Pettengill Pond and Chaffin Pond. A prominent knoll is located between the property and development along the Route 302 corridor. Portions of this knoll have been partially excavated along Anglers Road and Route 302 revealing dense glacial till and granite bedrock.

Properties uses in the site vicinity include residential, commercial and undeveloped forestland. Properties uses to the north include a condominium complex (Gordon Place), and a parking lot and undeveloped forest associated with a church property on Route 302. Property to the south is undeveloped forest around Chaffin Pond. A medical office is located on the adjoining property (21 Anglers Road) to the east beyond which are residences.

2.1 Geological Setting

Maine Geological Survey maps showing the surficial geology of the site and vicinity are provided in Appendix B. The site is located on a glaciomarine delta consisting of sand and gravel deposited in the sea at the glacier margin during marine submergence. Locally the delta deposits overly or are interstratified with the Presumpscot Formation which is comprised of fine-grained glaciomarine silt and clay with local sandy beds and lenses. The site is located on the western margin of a regionally extensive significant sand and gravel aquifer that extends westward to Little Sebago Lake and southward into North Windham.

Site specific data obtained by SGS to support the design and siting of the proposed disposal field was obtained as part of this investigation and is described in Section 3.0.

2.2 Water Supply

The proposed development will be served by a public water supply main that extends from Route 302 along Anglers Road and terminate near the eastern property boundary.

SGS completed a water well survey to identify all wells within 350 feet of the proposed engineered leachfield and 75 feet of the property boundary (for septic tank setbacks). The survey included visual observations of

adjoining properties from public areas, and discussions with Portland Water District regarding known service connections. Results of the well survey indicate that properties within the survey area are served by public water, with the exception of the adjoining property to the northeast (21 Anglers Road). The well on the 21 Anglers Road property was located by SGS using a mapping grade Trimble Geo7x GPS and incorporated into the plan for the development being prepared by DM Roma.

Well construction data for the 21 Anglers Road property was obtained from the Maine Geological Survey's water well information database and is as follows:

Date of Installation:	4/8/2018
Property Address:	21 Angler Road, Windham, Maine
Type:	6-inch diameter bedrock well
Total Depth	380 feet
Length of Casing:	180 feet
Overburden Thickness:	165 feet
Yield:	4 gallons per minute, vein at 350 feet

2.3 Wastewater Disposal

The site and vicinity are served by individual on-site subsurface wastewater disposal systems (septic systems). The proposed development will be served by common engineered on-site subsurface wastewater disposal system. Wastewater from each of the residential unit will be treatment with a septic tank and a Fuji Clean CE-series advance treatment unit prior to being conveyed to common disposal field. The proposed disposal field consists of 10 rows of stone trenches arranged in two pods and in plan-view measures approximately 82 feet long by 64 feet wide. The proposed design flow is 9,000 gallon per day (GPD) and the average loading rate over the disposal field area is 1.7 GPD per square foot (0.23 feet/day).

3.0 SUBSURFACE INVESTIGATION

A subsurface investigation was completed by SGS to obtain soils and groundwater information to support the design for the proposed subsurface wastewater disposal field. Explorations performed included:

- Twelve (12) test pit (TP-1 thru TP-12) were completed with an excavator on February 20, 2019.
- Four (4) test borings (B-1 thru B-4) were completed on February 22, 2019.
- Observation wells (MW-1 thru MW-4) were installed at each boring location.
- A piezometer (PZ-1) was installed near MW-1 to measure the vertical hydraulic gradient.

Exploration logs and photographic documentation is provided in SGS' Preliminary Soils Report included in Appendix C.

3.1 Subsurface Materials

Very dense silty sand to sandy gravel lodgment till is exposed at the ground surface in the parking area and knoll on the east side of the property. Portions of the knoll were previously excavated to create the parking area north of the knoll, and it is our understanding that excavation ceased because bedrock was encountered. A blasted bedrock outcrop is visible on the west side of the knoll along Route 302.

The till deposit slopes into the subsurface moderately downward to the north and steeply downward to the east, forming a glacially streamlined hill which is covered by stratified drift deposits along Anglers Road and throughout the interior of the site. In the vicinity of the proposed disposal field, central and eastern portion of the property the stratified drift deposits consists of 8 to 10 feet of cross-bedded gravelly coarse sand and medium-fine sands (proximal delta deposits) that overlying stratified sand, silt, and silty-clay (distal delta deposits). Stratified drift deposits are approximately 40 feet thick in the area of the proposed disposal field and increase in thickness to the east, with approximately 170 feet overburden present near the eastern site boundary.

3.2 Groundwater Elevation

Groundwater was encountered at a depth of approximately 7.5 feet below the ground surface in central areas of the property in the disposal field vicinity. Construction information for observation wells, elevation survey measurements, and depth to water level measurement are provided in Appendix D.

Depth to water level measurements collected on March 4, 2019 were used to prepare groundwater elevation contour map included as Figure 3. Groundwater elevation data show that flow is southeasterly towards Chaffin Pond along a hydraulic gradient of 0.5%. The vertical hydraulic gradient is estimated to be approximately 5% based upon groundwater elevations determine at MW-1 (screened across water table to 14.5 feet) and PZ-1 (1-foot screen at ±24 feet below ground surface).

The surficial materials observed near the proposed disposal field and in central areas of the property are too well drained and aerated for redoximorphic mottles to form, therefore an alternative means is required to estimate the seasonable highwater table (e.g., monitoring well data). The United States Geological Survey maintains a network of monitoring wells in aquifers across the state, including records of daily water level measurements for a shallow monitoring well located near the Route 302 / Route 115 intersection. This well is screen across the water table and is in the same regional aquifer system as the site and is therefore considered representative of onsite condition. A time series plot of continuous monitoring data from 2005 to March 5, 2019 is provided in Appendix D. Based on data from this USGS well, we estimate the seasonal high

groundwater elevations onsite in the area of the proposed disposal field are approximately 2.5 feet high than those observed on March 4, 2019.

3.3 Aquifer and Material Testing

The hydraulic conductivity (permeability) of onsite shallow subsurface materials was estimated by completing grain sizes analysis on unsaturated materials, and by performed slug tests at observation wells. Grain size analysis results, slug test data, and calculation are provided in Appendix E. Results are summarized below in Table 1.

Table 1
Hydraulic Conductivity Estimates

Exploration	Method of Estimation	Hydrogeologic Unit	Estimated Horizontal Hydraulic Conductivity (K_H) (feet per day)
TP-12	Grain size analysis	Proximal Delta Deposits (unsaturated) typical med-coarse sand	140
TP-12	Grain size analysis	Proximal Delta Deposits (unsaturated) typical coarse sand	325
MW-1	Slug Test	Proximal Delta Deposits (saturated) Bottom of screen in transitional materials	51 to 78
MW-2	Slug Test	Distal Delta Deposits (saturated) stratified sand, silt, clay	4.8 to 6.6
MW-3	Slug Test	Distal Delta Deposits (saturated) stratified sand, silt, clay	9.4 to 15.2
MW-4	Slug Test	Distal Delta Deposits (saturated) stratified sand, silt, clay	4.0 to 6.3

Notes:
1. Grain size analysis estimated using the geometric mean of multiple methods calculated by Hydrogeo Sieve XL v2.2. Slug tests analyzed using Bouwer-Rice and Hvorslev methods with AQTESSOLV 4.5.

4.0 GROUNDWATER MOUNDING AND TRANSMISSION ANALYSIS

The elevation of groundwater table will rise in response to wastewater infiltration under the proposed disposal field. The horizontal and vertical extent of groundwater mounding is dependent of the hydraulic properties of the aquifer materials, initial groundwater elevation, proximity to locations where infiltration or exfiltration occurs (e.g. stream, lake, wells), and proximity to low permeability material materials (e.g., bedrock or clay).

The extent of groundwater mounding was estimated using AnAqSIM developed by Fitts Geosolutions, LLC. AnAqSIM is an analytical element software package for simulating groundwater flow in three dimensions in multilevel aquifer systems under both steady-state and transient conditions.

The AnAqSIM model was constructed for the watershed area and consists of two vertical levels and four domains. The eastern and western boundaries of the model are drainage/watershed divides simulated using a no flux / no flow line boundaries. The northern and southern boundaries of the model are constant head boundaries associated with Pettengill Pond (elevation 298 feet) to the north and Chaffin Pond (elevation 292 feet) to the south. The stream connecting Pettengill Pond to Chaffin Pond was simulated using a line (river) boundary. The larger watershed (far-field) area was assigned to a single level domain of uniform thickness and permeability ("All" domain). Interdomain boundaries were used to simulate near-field multilevel conditions in the area of interest near the proposed disposal field. The till/bedrock knoll immediately southwest of the proposed disposal field was modeled as a region of low permeability within the "All" domain.

Model input parameters were assigned initial values based on onsite aquifer testing, and our understanding hydrogeologic conditions at and in the vicinity of the site. Model material properties and recharge conditions used for the steady state simulation are provided in Appendix E and summarized in Table 2 below.

Table 2
Summary of Domain and Recharge Parameters

Parameter/Domain	"All" Domain	"Upper 3D" Interdomain	"Lower 3D" Interdomain	"Rock" Interdomain
Top Elevation	305 feet	305 feet	294 feet	320 feet
Bottom Elevation	294 feet	294 feet	270 feet	270 feet
K_X	20 ft/day	150 ft/day	5 ft/day	0.001 ft/day
K_Y	10 ft/day	100 ft/day	2.5 ft/day	0.001 ft/day
K_Z (top half)	20 ft/day	150 ft/day	0.5 ft/day	0.001 ft/day
K_Z (bottom half)	0.2 ft/day	75 ft/day	0.05 ft/day	0.001 ft/day
Recharge	0.0025 ft/day	0.0025 ft/day	0.001 ft/day	0.000001 ft/day
Specific Yield	0.2	0.25	0.15	0.05

Uniform area source/sinks were used to simulate recharge to the "All" and "Rock" domains. Spatially variable area source/sinks (SVAS) were used to simulate multi-level portions of the model located in the area of interest, and increased loading at the proposed disposal field area.

The groundwater model was calibrated by slightly adjusting aquifer parameters and recharge rates, and iteratively solving for steady-state conditions until groundwater elevations were similar to those predicted by SGS for seasonal high groundwater table conditions (groundwater elevation under disposal field is ±299 feet).

The extent of groundwater mounding at the proposed disposal field location was simulated using a transient solution using initial heads from the steady-state solution. Model parameters for transient simulations were the same as those used for the steady state solution, with the exception that recharge at the proposed septic system was assigned a value of 0.23 feet/day.

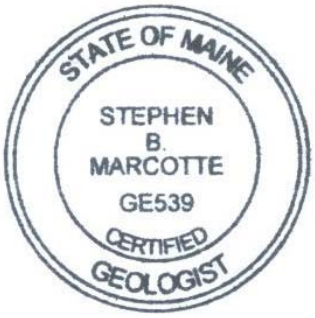
Model calculations were performed assuming a worst-case condition with continuous loading at the maximum design flow for approximately 2 months during seasonal high groundwater (spring-time) conditions. The model predicts a maximum groundwater mound height of 1.7 feet and a maximum groundwater mound elevation of ±300.7 feet. Model results demonstrate that the site soils have sufficient capacity to prevent wastewater from surfacing downgradient of the disposal field.

5.0 CONCLUSIONS

Results of our analyses indicate a 1.7-foot groundwater mound will develop under the proposed subsurface wastewater disposal field during seasonal high groundwater table conditions, and site soils have sufficient capacity to prevent wastewater from surfacing downgradient of the disposal field. The top of the groundwater mound under the disposal field is at elevation ±300.7 feet, therefore the bottom of the proposed disposal field should be at elevation ±302 feet or higher.

Our findings are based on our interpretation of site conditions and the information provided to us. If there are changes in the proposed disposal field design or location, we request the opportunity to review the changes and conduct further analysis as necessary to confirm the changes do not alter our conclusions.

Sincerely yours,
Summit Geoengineering Services



Stephen B. Marcotte, C.G., L.S.E.
Senior Geologist

Enclosures

Appendix D

Well Construction Information & Depth to Water Level Data
USGS Monitoring Well Data for Windham, Maine

Observation Well Construction Information and Depth to Water Survey Data

Anglers Commons Development

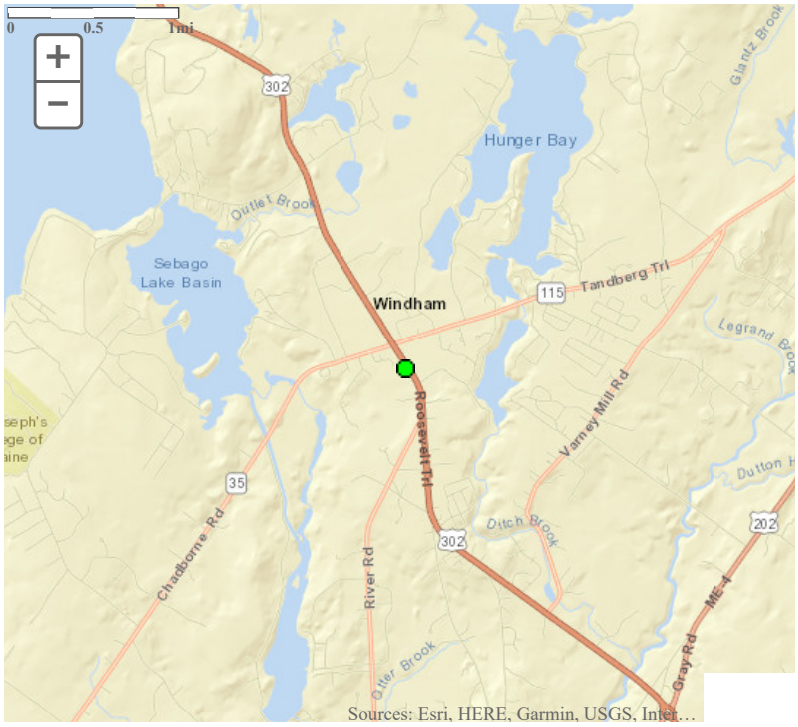
Anglers Road, Windham, Maine

	Well Constructon			Elevation Survey			Groundwater Depth/Elevation		
Well	Total Depth (ft)	Stickup (ft)	Bottom of Well (ft BGS)	Elevation Top of PVC Casing (ft)	Elevation Existing Grade (ft)	Elevation Bottom of Well (ft)	Depth to Water Level on 3-4-2019 (ft below Top of PVC)	Elevation Water Level (ft)	Depth Below Ground Surface (ft)
MW-1	17.4	2.95	14.45	307.25	304.30	289.85	10.61	296.64	7.66
MW-2	17.5	2.90	14.60	306.79	303.89	289.29	10.51	296.28	7.61
MW-3	15.4	2.20	13.20	305.25	303.05	289.85	9.7	295.55	7.50
MW-4	14.5	2.45	12.05	305.54	303.09	291.04	10.39	295.15	7.94
PZ-1	26.5	2.05	24.45	306.38	304.33	279.88	10.42	295.96	8.37

Notes:

1. Elevations based on laser level survey by SGS on 3/4/2018. Elevations based on assumed elevatIon of Anglers Road centerline of 305 feet at utility pole CMP #3 (church parking lot entrance).
2. Depth to water level and well depth measurements collected on 3/4/2019 with an electronic depth to water level meter (+/-0.01 feet)

Site Number: 434955070261401 - ME-CW 2026 North Windham, Maine



Groundwater Watch Help Page

DESCRIPTION:
Latitude 43°49'55", Longitude 70°26'14" NAD27
Cumberland County, Maine, Hydrologic Unit 01060001
Well depth: 22.5 feet
Land surface altitude: 305.09feet above NAVD88.
Well completed in "Sand and gravel aquifers (glaciated regions)" (N100GLCIAL) national aquifer.
Well completed in "Outwash" (112OTSH) local aquifer

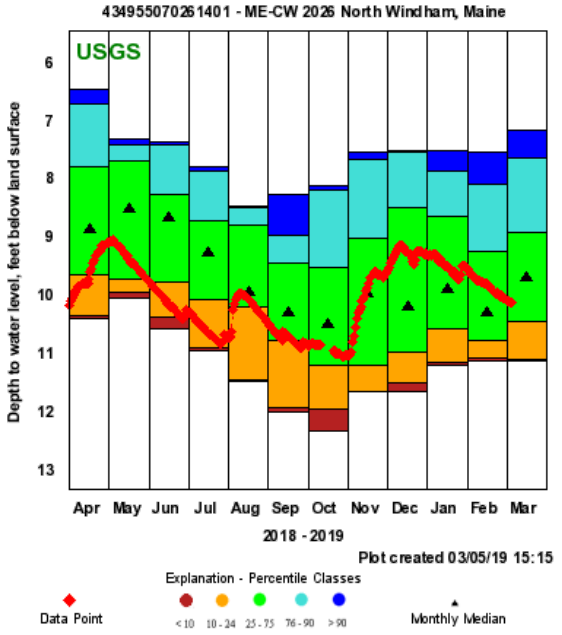
AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
Current / Historical Observations	2007-10-01	2019-03-02	
Daily Data			
Depth to water level, feet below land surface	2005-06-17	2019-03-01	4989
Daily Statistics			
Depth to water level, feet below land surface	2005-06-17	2018-10-08	4856
Monthly Statistics			
Depth to water level, feet below land surface	2005-06	2018-10	
Annual Statistics			
Depth to water level, feet below land surface	2005	2019	
Field groundwater-level measurements	2003-09-05	2018-10-19	70
Field/Lab water-quality samples			
Water-Year Summary	2006	2018	13

Additional Data Sources		Begin Date	End Date	Count
Groundwater Watch	**offsite**	2003	2019	5051

OPERATION:
Record for this site is maintained by the USGS Maine Water Science Center
Email questions about this site toMaine Water Science Center Water-Data Inquiries

Site Statistics



Most recent data value: 10.15 on 3/5/2019
Period of Record Monthly Statistics for 434955070261401
Depth to water level, feet below land surface
All Approved Continuous & Periodic Data Used In Analysis
Note: Highlighted values in the table indicate closest statistic to the most recent data value.

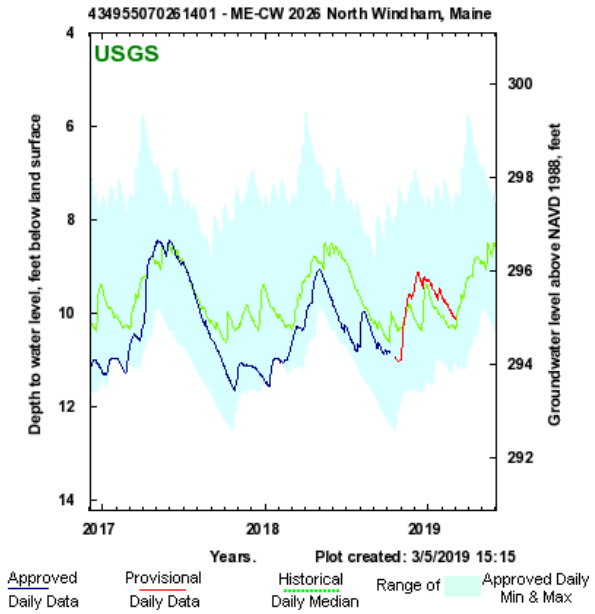
Month	Lowest Median	10th %ile	25th %ile	50th %ile	75th %ile	90th %ile	Highest Median	Number of Years
Jan	11.19	11.14	10.56	9.89	8.65	7.87	7.52	13
Feb	11.11	11.07	10.76	10.28	9.25	8.10	7.54	13
Mar	11.11	11.09	10.43	9.68	8.91	7.64	7.15	13
Apr	10.39	10.33	9.63	8.87	7.80	6.72	6.46	13
May	10.04	9.94	9.71	8.51	7.68	7.41	7.31	13
Jun	10.57	10.37	9.76	8.67	8.26	7.41	7.36	14
Jul	10.93	10.88	10.06	9.27	8.72	7.86	7.80	14
Aug	11.48	11.44	10.18	9.93	8.80	8.49	8.46	14
Sep	12.00	11.92	10.77	10.3	9.44	8.96	8.26	16
Oct	12.32	11.94	11.19	10.50	9.52	8.18	8.12	14
Nov	11.65	11.64	11.18	9.96	9.02	7.67	7.53	13
Dec	11.65	11.49	10.97	10.18	8.50	7.55	7.52	13

.As of 3/1/2019 18:58-2

Statistics Options

View month/year statistics

Daily Groundwater Data



Most recent Provisional daily data value: 10.15 on 03/05/19

Summary for Period of Continuous Record

Depth to water level, feet below land surface

Approved Daily Mean Values Data Used in Analysis

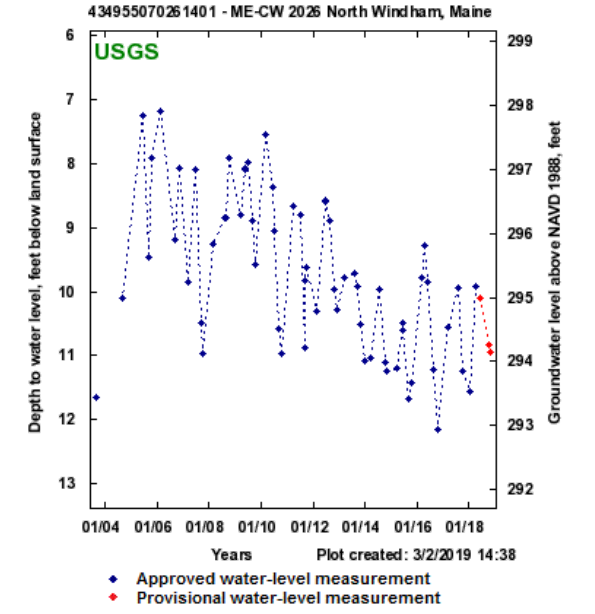
Begin Date	End Date	Days	% Complete
06/17/05	10/08/18	4,856	99

Lowest Level	5th %ile	10th %ile	25th %ile	50th %ile	75th %ile	90th %ile	95th %ile	Highest Level
12.52	11.49	11.12	10.47	9.70	8.70	7.81	7.48	5.70

Daily Data Options

- View latest data on NWISWeb
- View data in calendar format
- Download data in text format
- View daily medians
- View Daily Value Moving Averages

Periodic Groundwater Data



Summary for Period of Record Periodic Water Levels

Depth to water level, feet below land surface

Approved Periodic Water Level Values

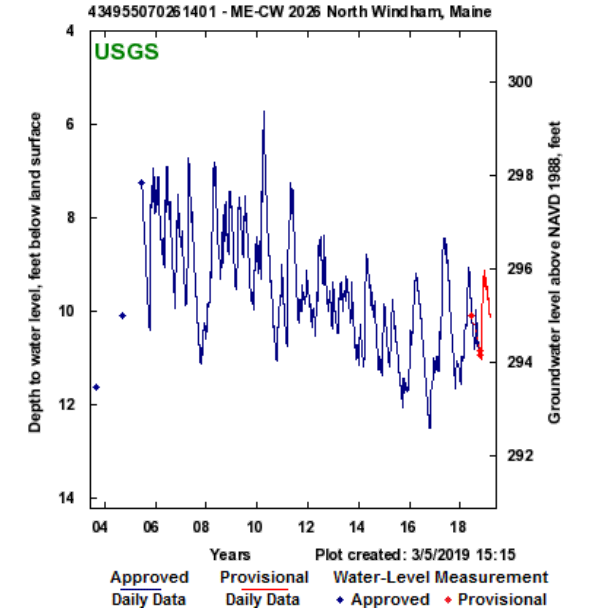
Begin Date	End Date	Number of Values
09/05/03	10/19/18	70

Highest WL	Date of Highest WL	Lowest WL	Date of Lowest WL
7.17	02/09/06	12.14	10/24/16

Groundwater Levels Options

- View latest data on NWISWeb
- Download groundwater levels in text format

Period of Record - All Data Types



Summary for Period of Record - All Data Types

Depth to water level, feet below land surface

Begin Date	End Date	Number of Values
09/05/03	03/05/19	5,783

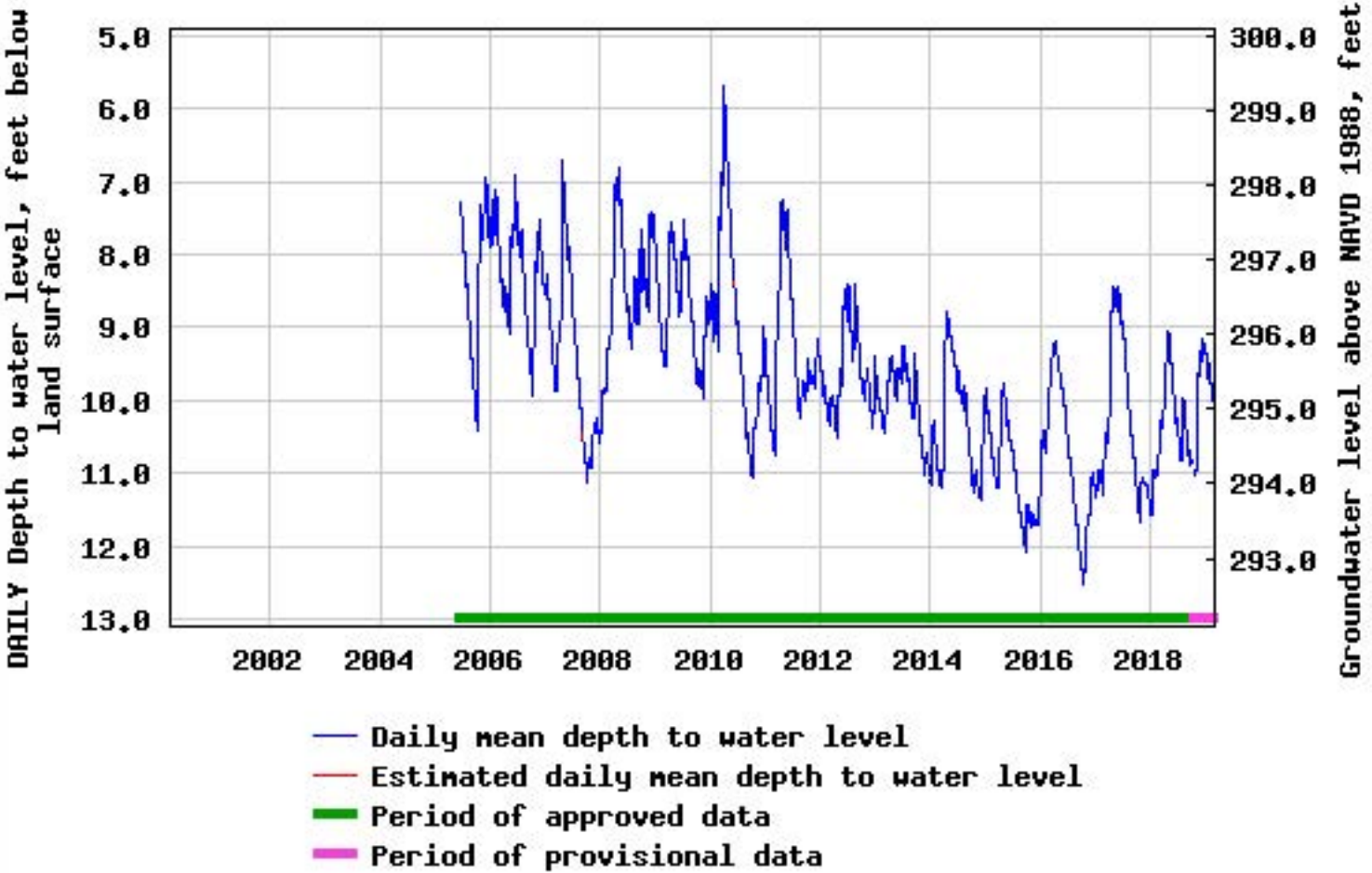
Highest WL	Date of Highest WL	Lowest WL	Date of Lowest WL
5.7	04/01/10	12.52	10/20/16

Period of Record Options

- View latest data on NWISWeb for all data types
- View month/year statistics
- Download groundwater levels in text format of all data types

USGS

USGS 434955070261401 ME-CW 2026 North Windham, Maine



Appendix E

Material/Aquifer Testing Results

Summary of Hydraulic Conductivity Estimates

Anglers Road Commons

Anglers Road, Windham, Maine

Exploration	Method of Estimation	Hydrogeologic Unit	Estimated Horizontal Hydraulic Conductivity (Kh) (feet per day)
TP-12	Grain size analysis (Hydrogeo Sieve XL v2.2)	Proximal Delta Deposits (unsaturated) typical med-coarse sand	140
TP-12	Grain size analysis (Hydrogeo Sieve XL v2.2)	Proximal Delta Deposits (unsaturated) typical coarse sand	325
MW-1	Slug Test (Bouwer-Rice / Hvorslev)	Proximal Delta Deposits (saturated) Bottom of screen in transitional materials	51 to 78
MW-2	Slug Test (Bouwer-Rice / Hvorslev)	Distal Delta Deposits (saturated) stratified sand, silt, clay	4.8 to 6.6
MW-3	Slug Test (Bouwer-Rice / Hvorslev)	Distal Delta Deposits (saturated) stratified sand, silt, clay	9.4 to 15.2
MW-4	Slug Test (Bouwer-Rice / Hvorslev)	Distal Delta Deposits (saturated) stratified sand, silt, clay	4.0 to 6.3

SUMMIT
GEOENGINEERING SERVICES

GRAIN SIZE ANALYSIS - ASTM D6913

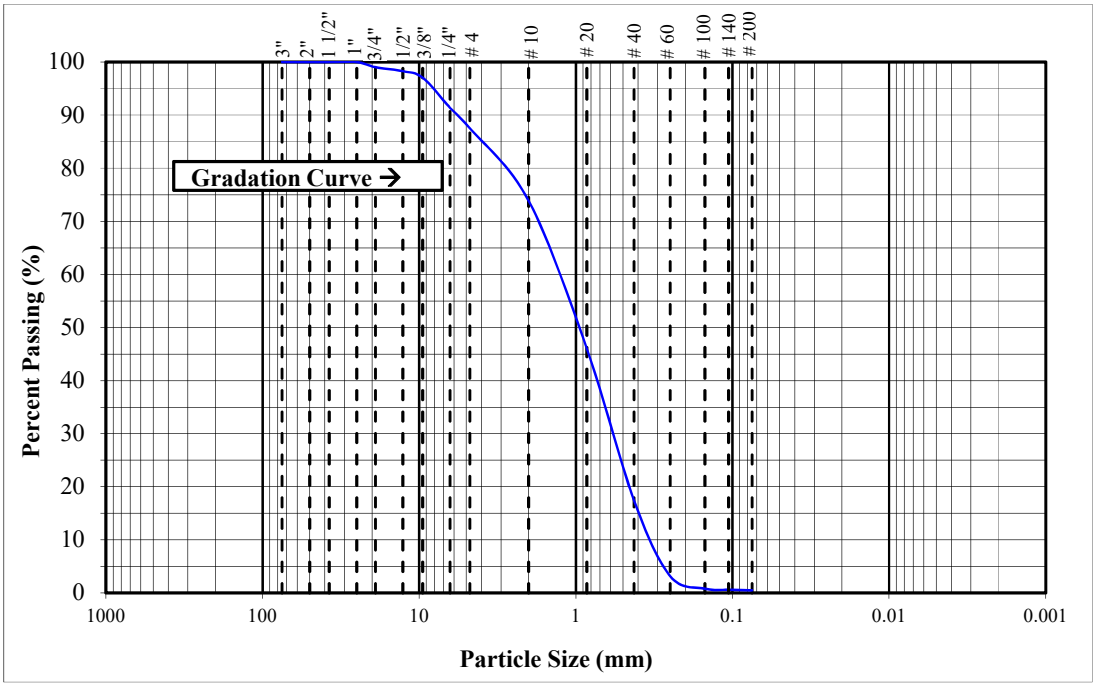
PROJECT NAME:	Anglers Road Common Development	PROJECT #:	18417
PROJECT LOCATION:	Anglers Road, Windham, Maine	EXPLORATION #:	TP-12
CLIENT:	Timothy Clinton	SAMPLE #:	S-1
TECHNICIAN:	Erika Stewart, P.E.	SAMPLE DEPTH:	3 ft
SOIL DESCRIPTION:	SAND, little Gravel, trace to no Silt, SP	TEST DATE:	3/4/2019

TEST PROCEDURE

Sample Source: Test Pit	**Sieve Stack:** Composite	**Specimen Procedure:** Moist
Test Method: Method A	**Separating Sieve(s):** 3/8 Inch	**Dispersion Type:** Tap Water

DATA

STANDARD SIEVE DESIGNATION (mm)	ALTERNATIVE SIEVE DESIGNATION (in)	PERCENT PASSING (%)
75	(3 in)	100
50	(2 in)	100
37.5	(1-1/2 in)	100
25.0	(1 in)	100
19.0	(3/4 in)	99
12.7	(1/2 in)	98
9.5	(3/8 in)	97
6.35	(1/4 in)	91
4.75	(No. 4)	88
2.00	(No. 10)	74
0.850	(No. 20)	46
0.425	(No. 40)	17
0.250	(No. 60)	3
0.150	(No. 100)	1
0.106	(No. 140)	1
0.075	(No. 200)	0



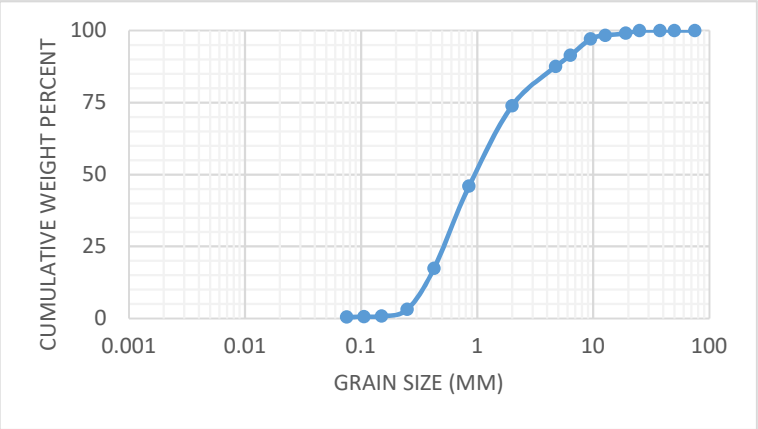
REMARKS: Moisture Content = 2.5%.

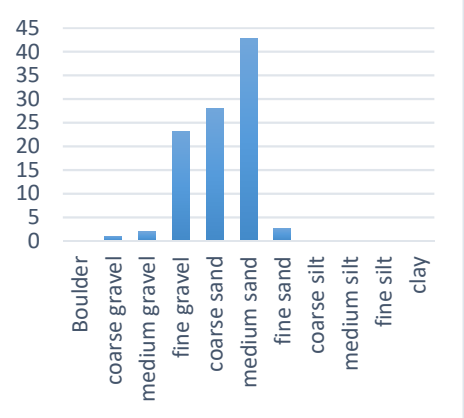
Grain Size Analysis Report Date: 3/7/2019

Sample Name: Anglers Road - TP-12, 3 foot interval, typical coarse sand

Mass Sample (g): 100 T (oC) 20

Moderately well sorted gravelly sand low in fines





Sieve opening (ps) di (mm)	Mass of retained (mr) (g)	mass fraction (mf)	Percent Passing (pp)
75	0	0	100
50	0	0	100
37.5	0	0	100
25	0	0	100
19	0.971015	0.00971	99.02898
12.7	0.754271	0.007543	98.27471
9.5	1.205099	0.012051	97.06961
6.35	5.691378	0.056914	91.37824
4.75	3.84695	0.038469	87.53129
2	13.64877	0.136488	73.88252
0.85	27.92991	0.279299	45.95261
0.425	28.56229	0.285623	17.39032
0.25	14.22845	0.142284	3.161877
0.15	2.371408	0.023714	0.790469
0.106	0.210792	0.002108	0.579677
0.075	0.105396	0.001054	0.474282

Effective Grain Diameters (mm)		Other Useful Parameters	
d10	0.334	Uniformity Coef.	4.28
d17	0.420	n computed	0.37
d20	0.464	g (cm/s^2)	980.00
d50	1.017	ρ (g/cm^3)	0.9981
d60	1.428	μ (g/cm s)	0.0098
de (Kruger)	0.788	ρg/μ (1/cm s)	9.9327E+04
de (Kozeny)	0.709	tau (Sauerbrei)	1.053
de (Zunker)	0.734	$d_{geometric\ mean}$	1.149
de (Zamarin)	0.761	σ_ϕ	1.575
lo (Alyameni)	0.163		

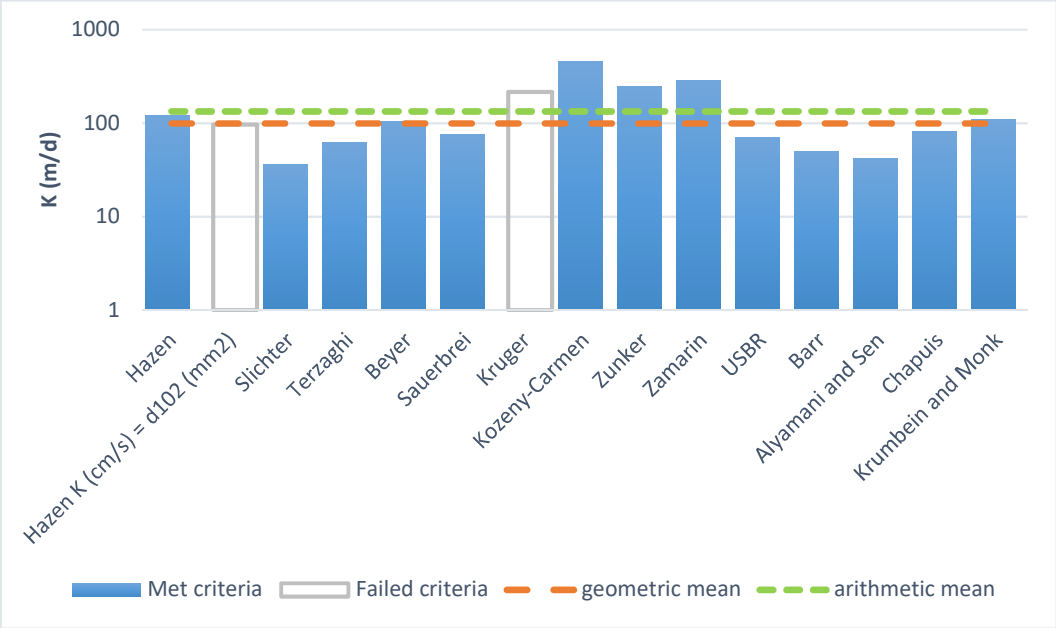
mm	0	% in sample
>64	Boulder	0
16 - 64	coarse gravel	0.971015396
8 - 16	medium gravel	1.959370353
2 - 8	fine gravel	23.1870957
0.5 - 2	coarse sand	27.92991072
0.25 - 0.5	medium sand	42.79073115
0.063 - 0.25	fine sand	2.687595183
0.016 - 0.063	coarse silt	
0.008 - 0.016	medium silt	
0.002 - 0.008	fine silt	
<0.002	clay	

K from Grain Size Analysis Report Date: 3/7/2019

Sample Name: Anglers Road - TP-12, 3 foot interval, typical coarse sand

Mass Sample (g): 100 T (oC) 20

Moderately well sorted gravelly sand low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	.140E+00	.140E-02	120.68	
Hazen K (cm/s) = d_{10} (mm)	.112E+00	.112E-02	96.44	
Slichter	.422E-01	.422E-03	36.47	
Terzaghi	.730E-01	.730E-03	63.05	
Beyer	.119E+00	.119E-02	103.01	
Sauerbrei	.884E-01	.884E-03	76.34	
Kruger	.250E+00	.250E-02	216.11	
Kozeny-Carmen	.529E+00	.529E-02	456.64	
Zunker	.286E+00	.286E-02	247.32	
Zamarin	.329E+00	.329E-02	284.46	
USBR	.815E-01	.815E-03	70.38	
Barr	.569E-01	.569E-03	49.13	
Alyamani and Sen	.490E-01	.490E-03	42.37	
Chapuis	.950E-01	.950E-03	82.11	
Krumbein and Monk	.125E+00	.125E-02	107.91	
geometric mean	.115E+00	.115E-02	99.28	
arithmetic mean	.155E+00	.155E-02	133.84	

SUMMIT
GEOENGINEERING SERVICES

GRAIN SIZE ANALYSIS - ASTM D6913

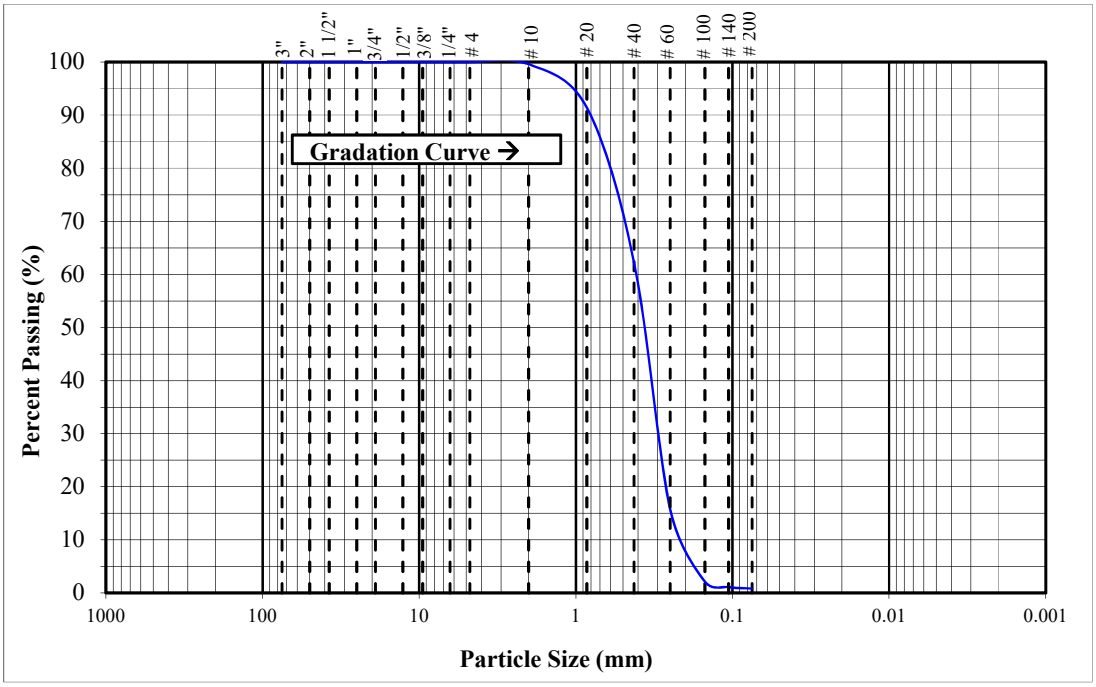
PROJECT NAME:	Anglers Road Common Development	PROJECT #:	18417
PROJECT LOCATION:	Anglers Road, Windham, Maine	EXPLORATION #:	TP-12
CLIENT:	Timothy Clinton	SAMPLE #:	S-2
TECHNICIAN:	Erika Stewart, P.E.	SAMPLE DEPTH:	5 ft
SOIL DESCRIPTION:	Medium-fine SAND, trace Silt, SP	TEST DATE:	3/4/2019

TEST PROCEDURE

Sample Source: Test Pit	**Sieve Stack:** Single	**Specimen Procedure:** Moist
Test Method: Method B	**Separating Sieve(s):** N/A	**Dispersion Type:** Tap Water

DATA

STANDARD SIEVE DESIGNATION (mm)	ALTERNATIVE SIEVE DESIGNATION (in)	PERCENT PASSING (%)
75	(3 in)	100.0
50	(2 in)	100.0
37.5	(1-1/2 in)	100.0
25.0	(1 in)	100.0
19.0	(3/4 in)	100.0
12.7	(1/2 in)	100.0
9.5	(3/8 in)	100.0
6.35	(1/4 in)	100.0
4.75	(No. 4)	100.0
2.00	(No. 10)	99.6
0.850	(No. 20)	91.4
0.425	(No. 40)	62.3
0.250	(No. 60)	15.8
0.150	(No. 100)	2.1
0.106	(No. 140)	1.1
0.075	(No. 200)	0.8



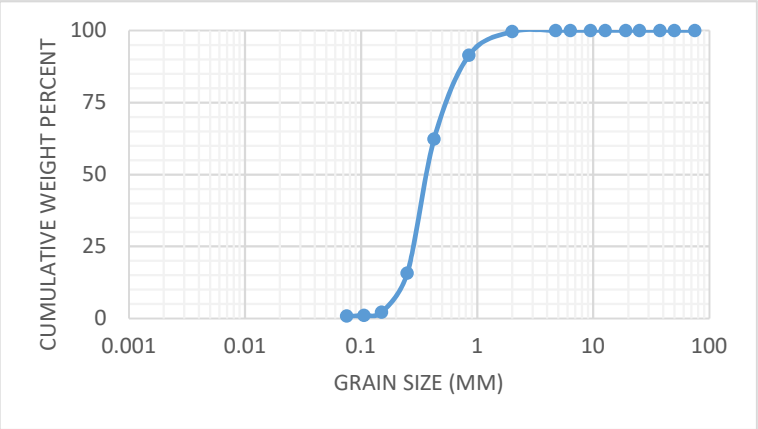
REMARKS: Moisture Content = 3.6%.

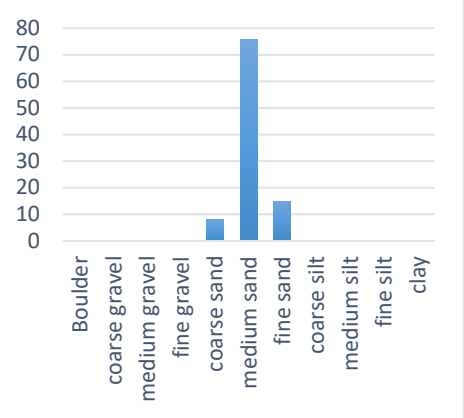
Grain Size Analysis Report Date: 3/7/2019

Sample Name: Anglers Road - TP-12, 5 foot interval, typical Med-Fine sand

Mass Sample (g): 100 T (oC) 20

Moderately well sorted sand low in fines





Sieve opening (ps) di (mm)	Mass of retained (mr) (g)	mass fraction (mf)	Percent Passing (pp)
75	0	0	100
50	0	0	100
37.5	0	0	100
25	0	0	100
19	0	0	100
12.7	0	0	100
9.5	0	0	100
6.35	0	0	100
4.75	0	0	100
2	0.403924	0.004039	99.59608
0.85	8.193883	0.081939	91.40219
0.425	29.14022	0.291402	62.26197
0.25	46.50894	0.465089	15.75303
0.15	13.618	0.13618	2.135026
0.106	1.038661	0.010387	1.096365
0.075	0.288517	0.002885	0.807848

Effective Grain Diameters (mm)		Other Useful Parameters	
d10	0.208	Uniformity Coef.	2.00
d17	0.255	n computed	0.43
d20	0.266	g (cm/s^2)	980.00
d50	0.379	ρ (g/cm^3)	0.9981
d60	0.416	μ (g/cm s)	0.0098
de (Kruger)	0.372	ρg/μ (1/cm s)	9.9327E+04
de (Kozeny)	0.344	tau (Sauerbrei)	1.053
de (Zunker)	0.353	$d_{geometric\ mean}$	0.408
de (Zamarin)	0.363	σ_ϕ	0.843
lo (Alyameni)	0.165		

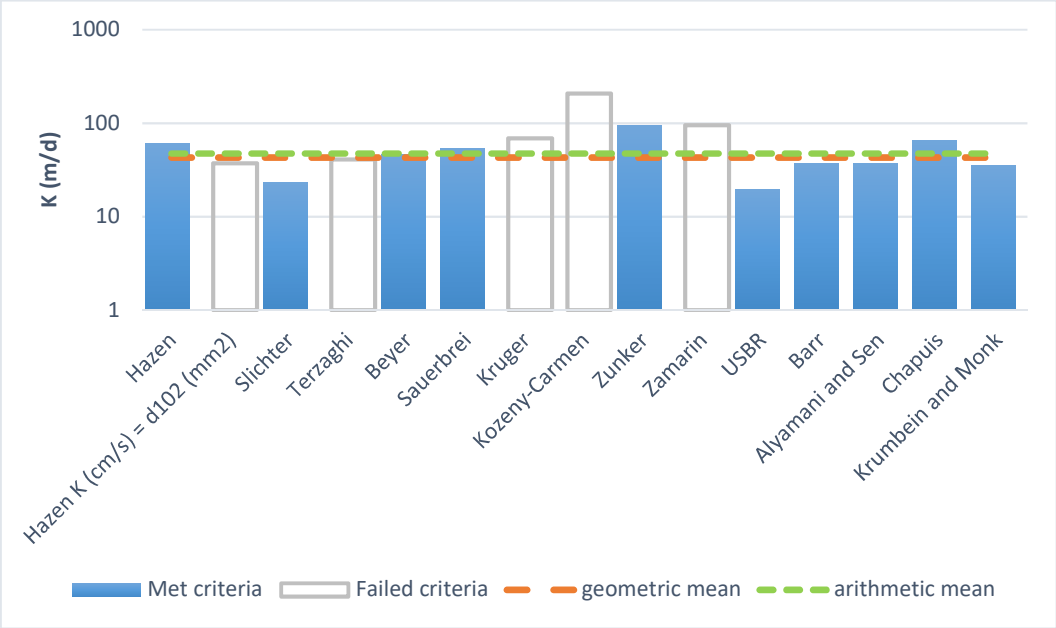
mm	0	% in sample
>64	Boulder	0
16 - 64	coarse gravel	0
8 - 16	medium gravel	0
2 - 8	fine gravel	0.403923832
0.5 - 2	coarse sand	8.193883439
0.25 - 0.5	medium sand	75.6491633
0.063 - 0.25	fine sand	14.94518177
0.016 - 0.063	coarse silt	
0.008 - 0.016	medium silt	
0.002 - 0.008	fine silt	
<0.002	clay	

K from Grain Size Analysis Report Date: 3/7/2019

Sample Name: Anglers Road - TP-12, 5 foot interval, typical Med-Fine sar

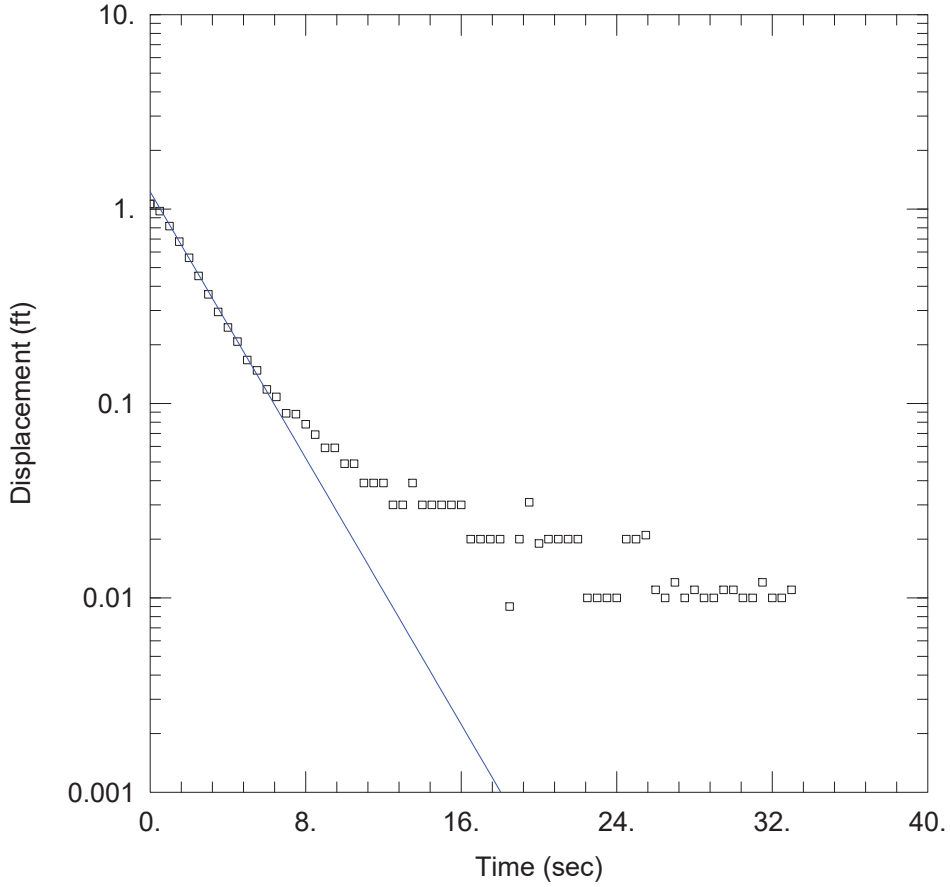
Mass Sample (g): 100 T (oC) 20

Moderately well sorted sand low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	.696E-01	.696E-03	60.12	
Hazen K (cm/s) = d_{10} (mm)	.432E-01	.432E-03	37.29	
Slichter	.269E-01	.269E-03	23.21	
Terzaghi	.473E-01	.473E-03	40.90	
Beyer	.534E-01	.534E-03	46.17	
Sauerbrei	.626E-01	.626E-03	54.09	
Kruger	.794E-01	.794E-03	68.60	
Kozeny-Carmen	.240E+00	.240E-02	207.75	
Zunker	.110E+00	.110E-02	94.88	
Zamarin	.110E+00	.110E-02	95.10	
USBR	.227E-01	.227E-03	19.59	
Barr	.424E-01	.424E-03	36.64	
Alyamani and Sen	.431E-01	.431E-03	37.24	
Chapuis	.757E-01	.757E-03	65.37	
Krumbein and Monk	.412E-01	.412E-03	35.56	
geometric mean	.495E-01	.495E-03	42.78	
arithmetic mean	.547E-01	.547E-03	47.29	

ɹd



WELL TEST ANALYSIS

Data Set: C:\...\MW-1 (bouwerRice).aqt
Date: 03/06/19 Time: 09:01:12

PROJECT INFORMATION

Company: Summit Geoengineering Services
Client: DM Roma Consulting Engineers
Project: 18417
Location: Anglers Road Commons
Test Well: MW-1
Test Date: 3/4/2019

AQUIFER DATA

Saturated Thickness: 6.79 ft Anisotropy Ratio (Kz/Kr): 1.

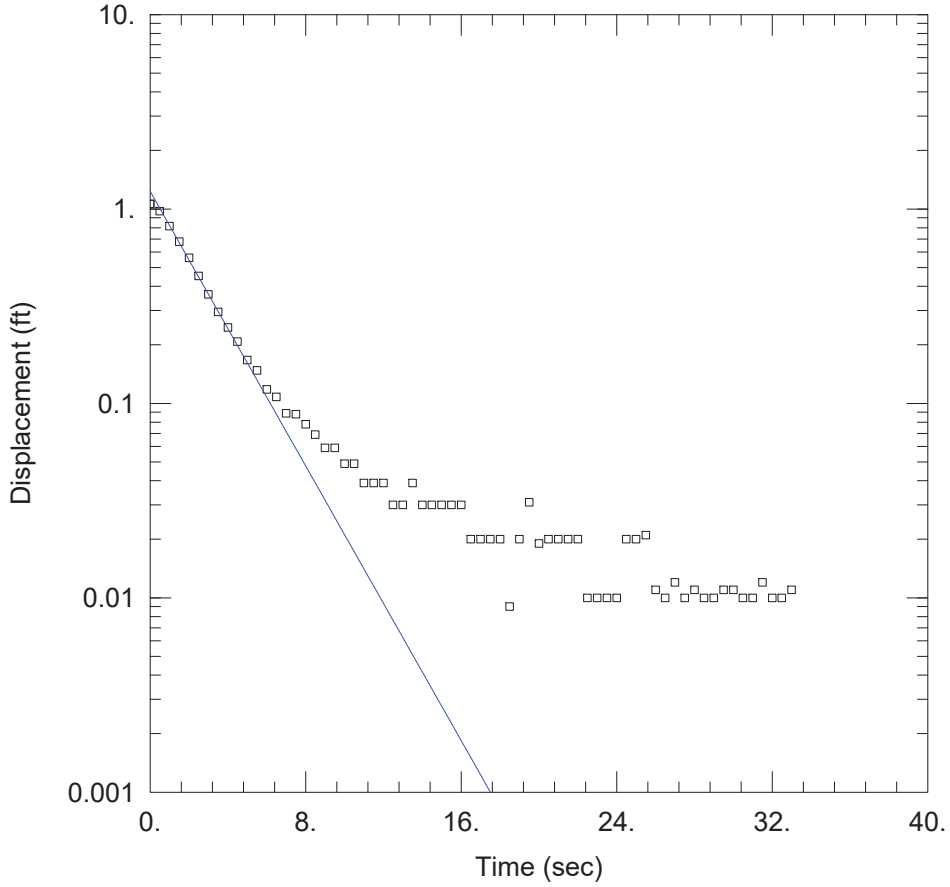
WELL DATA (MW-1)

Initial Displacement: 1.063 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.79 ft
Screen Length: 10. ft
Well Radius: 0.09 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 50.95 ft/day y0 = 1.226 ft



WELL TEST ANALYSIS

Data Set: C:\...\MW-1 (hvorslev).aqt
Date: 03/06/19 Time: 09:01:13

PROJECT INFORMATION

Company: Summit Geoengineering Services
Client: DM Roma Consulting Engineers
Project: 18417
Location: Anglers Road Commons
Test Well: MW-1
Test Date: 3/4/2019

AQUIFER DATA

Saturated Thickness: 6.79 ft Anisotropy Ratio (Kz/Kr): 1.

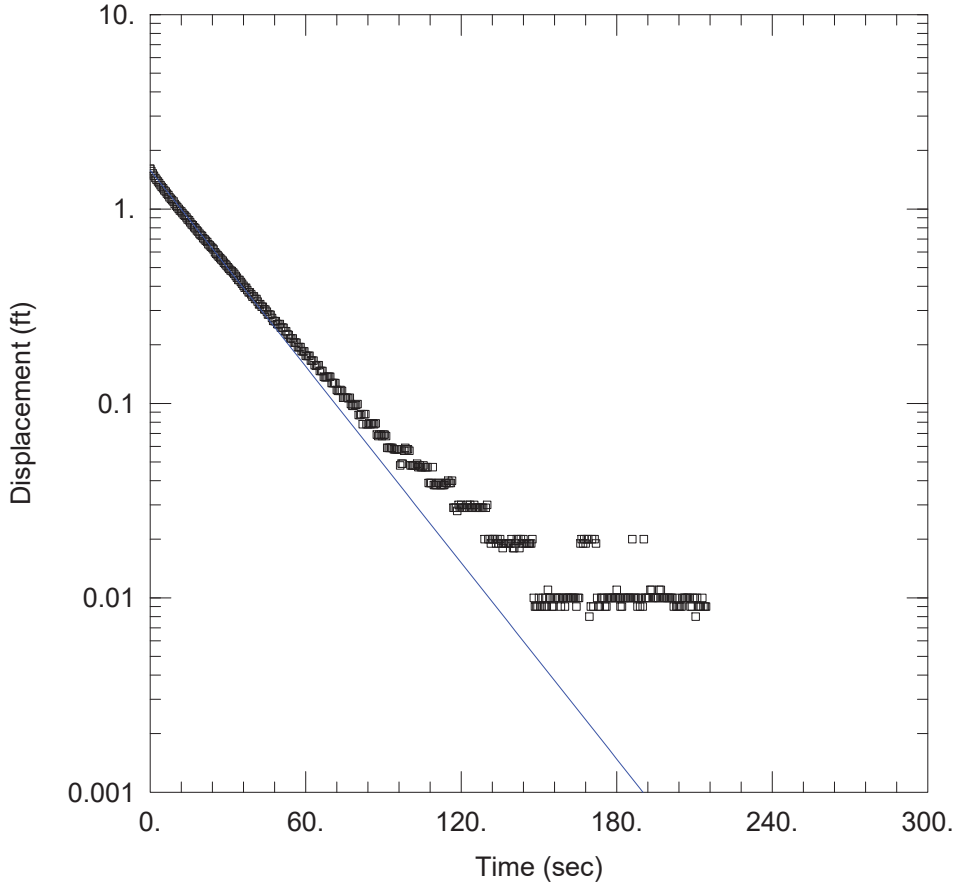
WELL DATA (MW-1)

Initial Displacement: 1.063 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 6.79 ft
Screen Length: 10. ft
Well Radius: 0.09 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 78.01 ft/day y0 = 1.232 ft



WELL TEST ANALYSIS

Data Set: C:\...\MW-2 (bouwerRice).aqt
Date: 03/06/19 Time: 09:01:13

PROJECT INFORMATION

Company: Summit Geoengineering Services
Client: DM Roma Consulting Engineers
Project: 18417
Location: Anglers Road Commons
Test Well: MW-2
Test Date: 3/4/2019

AQUIFER DATA

Saturated Thickness: 7.04 ft Anisotropy Ratio (Kz/Kr): 1.

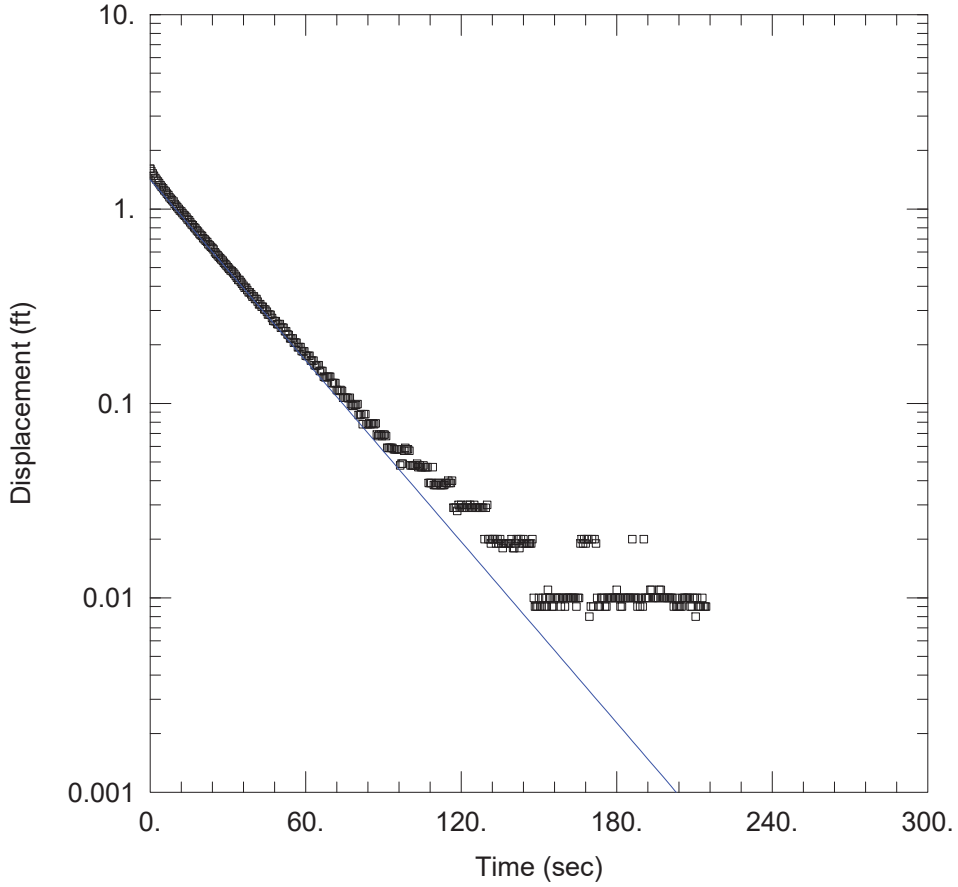
WELL DATA (MW-2)

Initial Displacement: 1.612 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 7.04 ft
Screen Length: 10. ft
Well Radius: 0.09 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 4.837 ft/day y0 = 1.583 ft



WELL TEST ANALYSIS

Data Set: C:\...\MW-2 (hvorslev).aqt
Date: 03/06/19 Time: 09:01:13

PROJECT INFORMATION

Company: Summit Geoengineering Services
Client: DM Roma Consulting Engineers
Project: 18417
Location: Anglers Road Commons
Test Well: MW-2
Test Date: 3/4/2019

AQUIFER DATA

Saturated Thickness: 7.04 ft Anisotropy Ratio (Kz/Kr): 1.

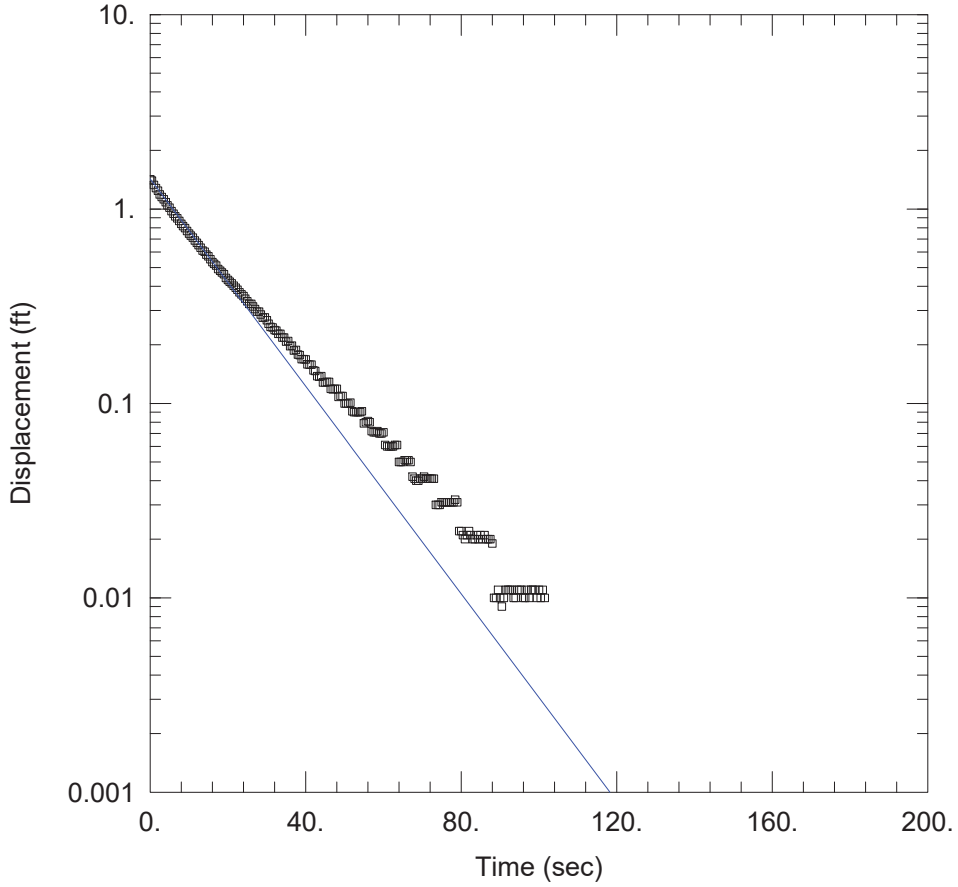
WELL DATA (MW-2)

Initial Displacement: 1.612 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 7.04 ft
Screen Length: 10. ft
Well Radius: 0.09 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 6.614 ft/day y0 = 1.416 ft



WELL TEST ANALYSIS

Data Set: C:\...\MW-3 (bouwerRice).aqt
Date: 03/06/19 Time: 09:01:41

PROJECT INFORMATION

Company: Summit Geoengineering Services
Client: DM Roma Consulting Engineers
Project: 18417
Location: Anglers Road Commons
Test Well: MW-3
Test Date: 3/4/2019

AQUIFER DATA

Saturated Thickness: 5.7 ft Anisotropy Ratio (Kz/Kr): 1.

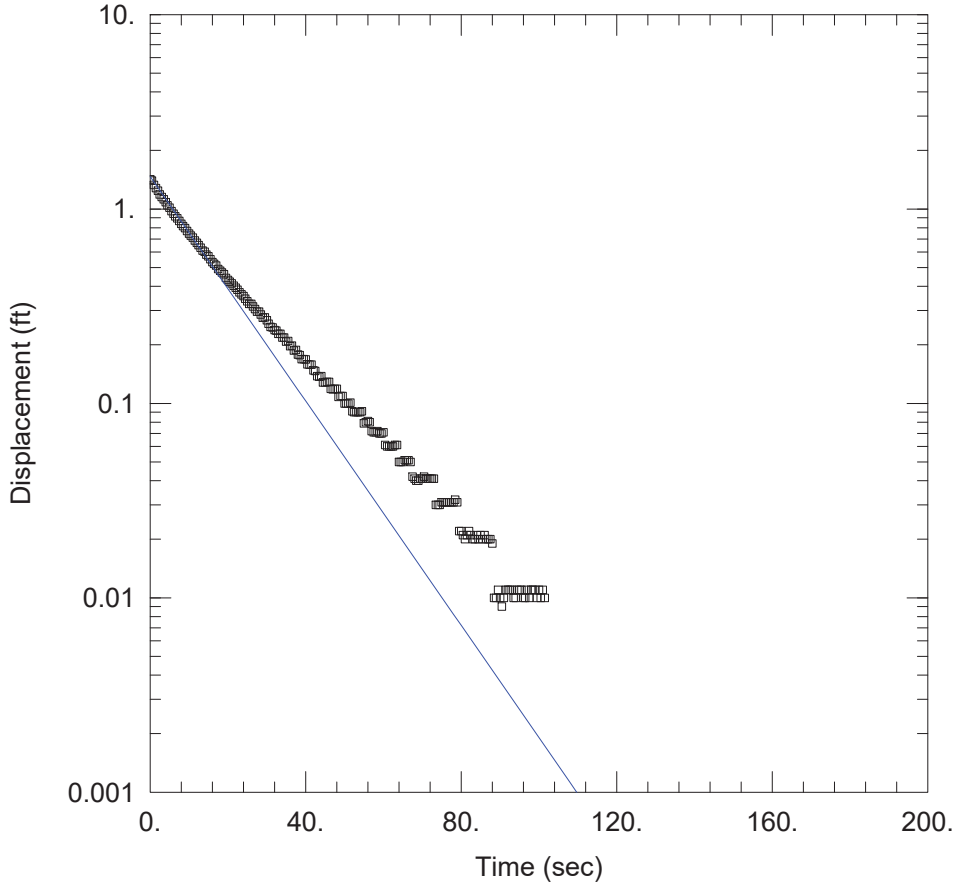
WELL DATA (MW-3)

Initial Displacement: 1.417 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 5.7 ft
Screen Length: 10. ft
Well Radius: 0.09 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 9.368 ft/day y0 = 1.427 ft



WELL TEST ANALYSIS

Data Set: C:\...\MW-3 (hvorslev).aqt
Date: 03/06/19 Time: 09:01:42

PROJECT INFORMATION

Company: Summit Geoengineering Services
Client: DM Roma Consulting Engineers
Project: 18417
Location: Anglers Road Commons
Test Well: MW-3
Test Date: 3/4/2019

AQUIFER DATA

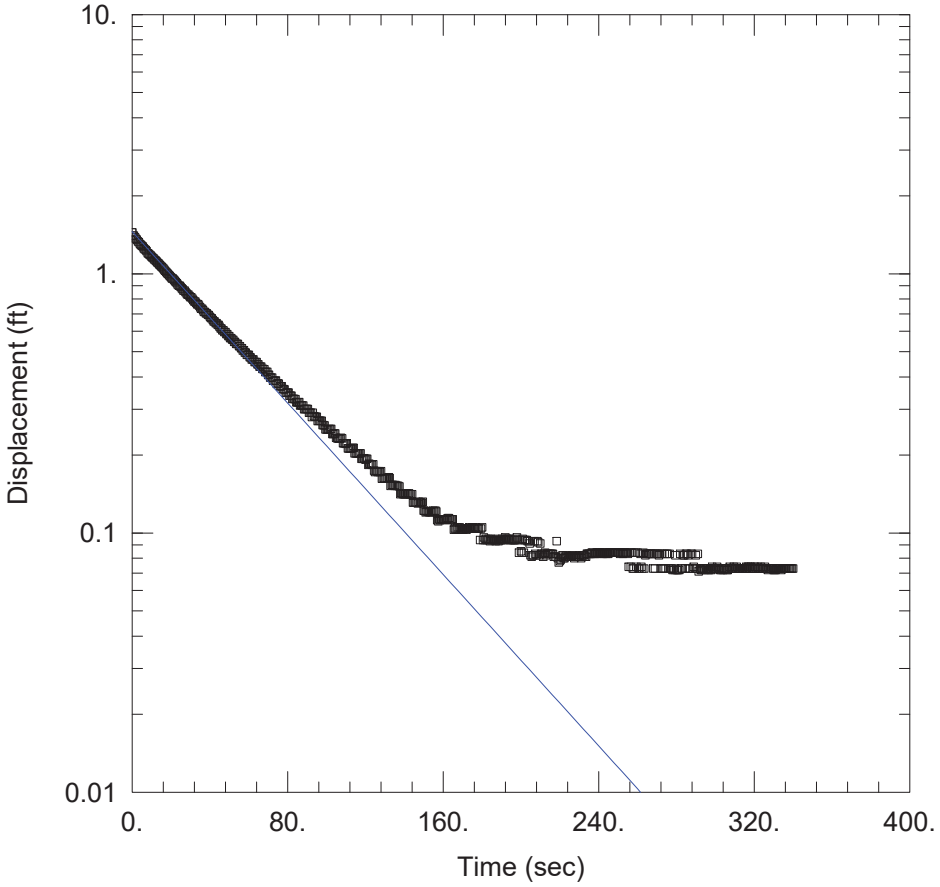
Saturated Thickness: 5.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-3)

Initial Displacement: 1.417 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 5.7 ft
Screen Length: 10. ft
Well Radius: 0.09 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 15.17 ft/day
y0 = 1.465 ft



WELL TEST ANALYSIS

Data Set: C:\...\MW-4 (bouwerRice).aqt
Date: 03/06/19 Time: 09:01:42

PROJECT INFORMATION

Company: Summit Geoengineering Services
Client: DM Roma Consulting Engineers
Project: 18417
Location: Anglers Road Commons
Test Well: MW-4
Test Date: 3/4/2019

AQUIFER DATA

Saturated Thickness: 4.11 ft Anisotropy Ratio (Kz/Kr): 1.

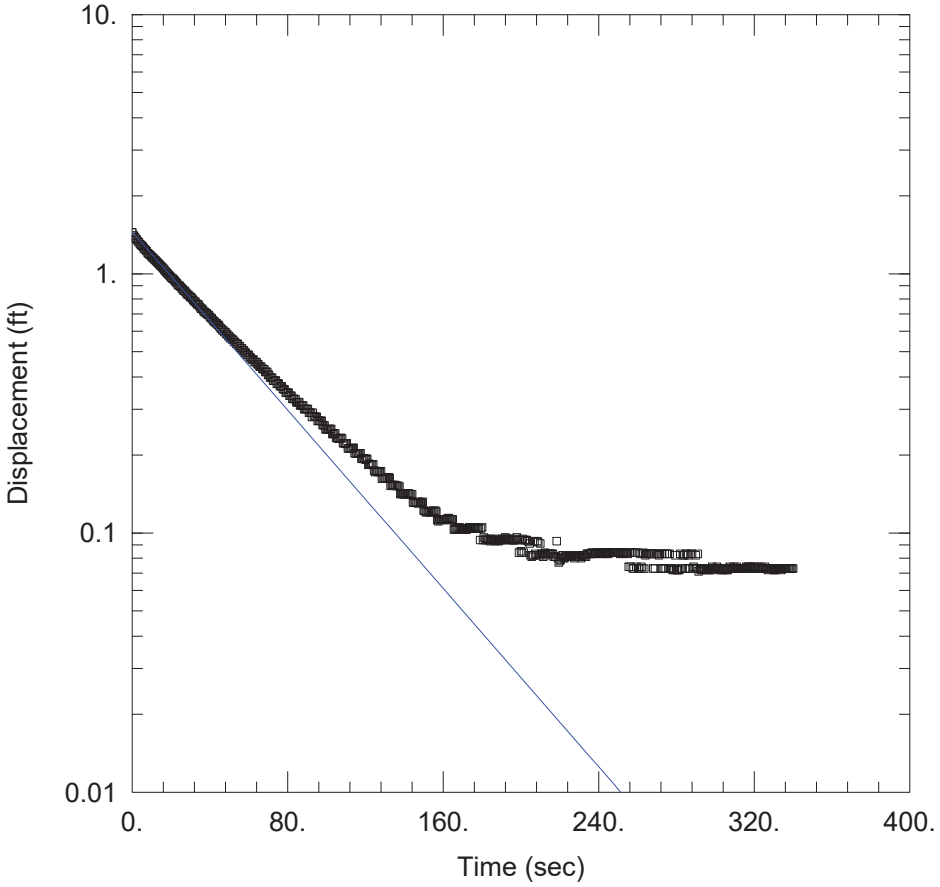
WELL DATA (MW-4)

Initial Displacement: 1.442 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 4.11 ft
Screen Length: 10. ft
Well Radius: 0.09 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 3.951 ft/day y0 = 1.454 ft



WELL TEST ANALYSIS

Data Set: C:\...\MW-4 (hvorslev).aqt
Date: 03/06/19 Time: 09:01:42

PROJECT INFORMATION

Company: Summit Geoengineering Services
Client: DM Roma Consulting Engineers
Project: 18417
Location: Anglers Road Commons
Test Well: MW-4
Test Date: 3/4/2019

AQUIFER DATA

Saturated Thickness: 4.11 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-4)

Initial Displacement: 1.442 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 4.11 ft
Screen Length: 10. ft
Well Radius: 0.09 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 6.273 ft/day y0 = 1.452 ft

Appendix F

AnAqSim Groundwater Model Results

AnAqSIM Model Parameter - Steady State Solution

General

Underrelaxation	Maximum_iterations	Starting_heads_source	Almost_dry_fraction	Interface_leakage_option
0.9	40	file	0.01	FALSE

Solution

Head_check_tolerance	Q_check_tolerance	Qn_check_tolerance	Extraction_check_tolerance
1.00E-03	1.00E-03	1.00E-04	1.00E-06

Timestep for Transient Solution

Period_length	Steps_in_period	Step_multiplier
1825	10	1.5

Domains

Level	Domain_Type	Top_elevation	Bottom_elevation	Average_head	Porosity	Storativity	Specific_yield	K1_horizontal	K2_horizontal	Angle_K1_to_x_axis	K3_vertical_top_half	K3_vertical_bottom_
1	unconfined	305	270	296	0.25	0.001	0.2	20	10	-75	=K1	=K1*0.01
1	unconfined	305	294	296	0.35	0.001	0.25	150	100	-45	=K1	=K1*0.5
2	confined/unconfined	294	270	295.5	0.2	0.001	0.15	5	2.5	-75	=K1*0.1	=K1*0.01
2	confined/unconfined	294	270	293	0.2	0.001	0.15	5	2.5	-75	=K1*0.1	=K1*0.01
2	confined/unconfined	320	270	300	0.1	0.001	0.05	0.001	0.001	0	=K1	=K1

Constant Head Boundaries

Label	Domain	Parameters_per_line	Domain_Boundary	h_start	h_end	Coordinates	Off_perio
PETTINGILL POND	ALL	10	TRUE	298	298		
CHAFFIN POND	ALL	10	TRUE	292	292		

River Boundaries

Label	Domain	Parameters_per_line	Dries_up	Stage_start	Stage_end	Conductance_start	Conductance_end	Base_resisting_layer_start	Base_resisting_layer_end	Coordinat
UPPER REACH	ALL	10	FALSE	298	294	10	10	296	292	
LOWER REACH	ALL	10	FALSE	294	292	10	10	292	290	

Interdomain Boundaries

Label	Domains_left	Domains_	Paramete	Coordinat
3D LIMITS	LOWER 3D,UPPER 3D	ALL	10	
3D NEAR LAKE	LOWER 3D LAKE	ALL	10	
ROCK	ROCK	ALL	10	

Uniform Recharge Area

Domain	Top_flux	Bottom_flux
ALL	0.0025	0.0005
ROCK	0.000001	0.000001

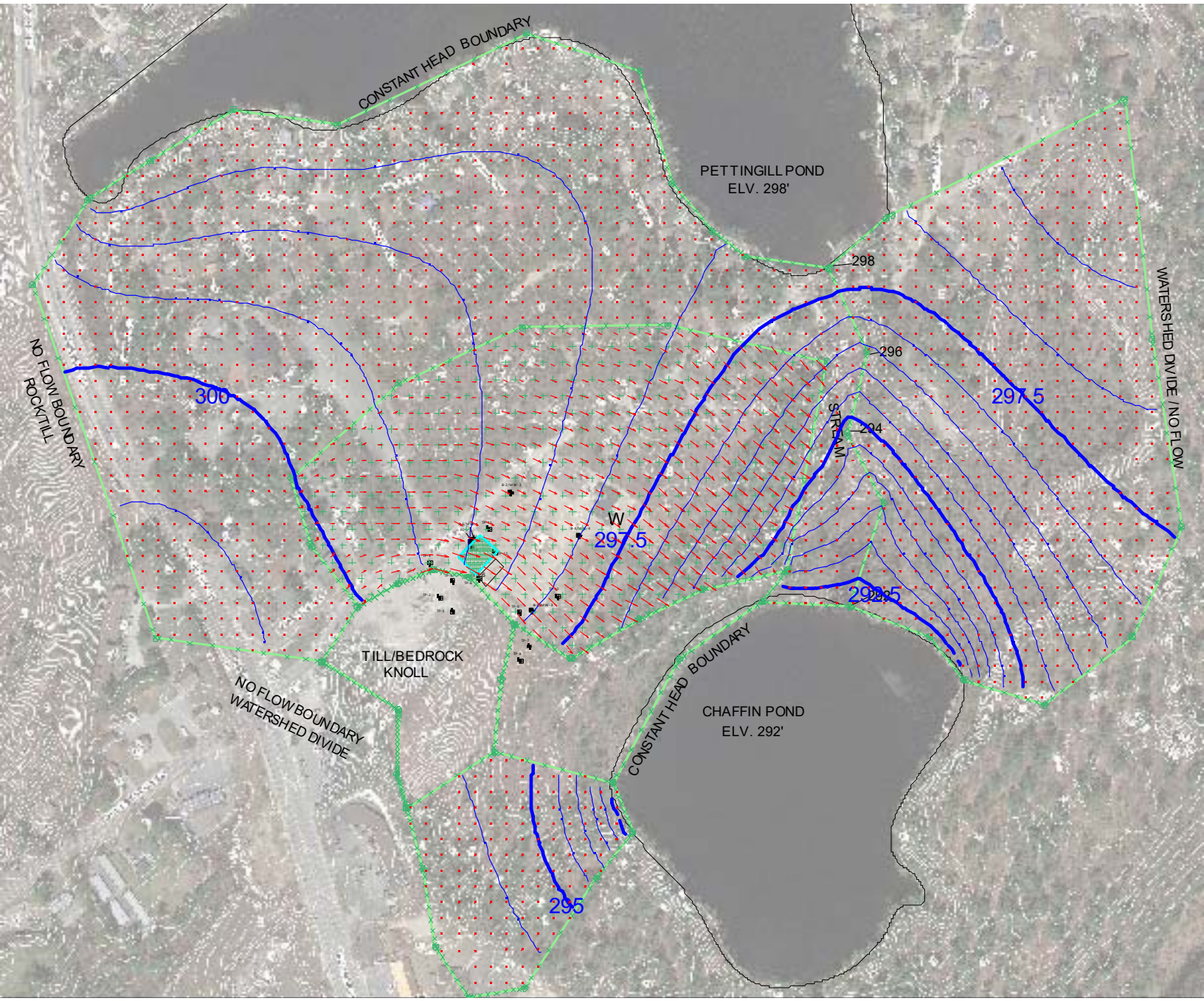
Spatially Variable Area Source/Sink by Domain

Domain	Condition_Top	Top_flux_or_head	Top_surface	Condition_Bottom	Bottom_flux_or_head	Bottom_surface	Node_spacing	
UPPER 3D	Flux	0.0025	none	Flux	0.0005	none	50	
LOWER 3D LAKE	Flux	0.001	none	Flux	0.0005	none	50	

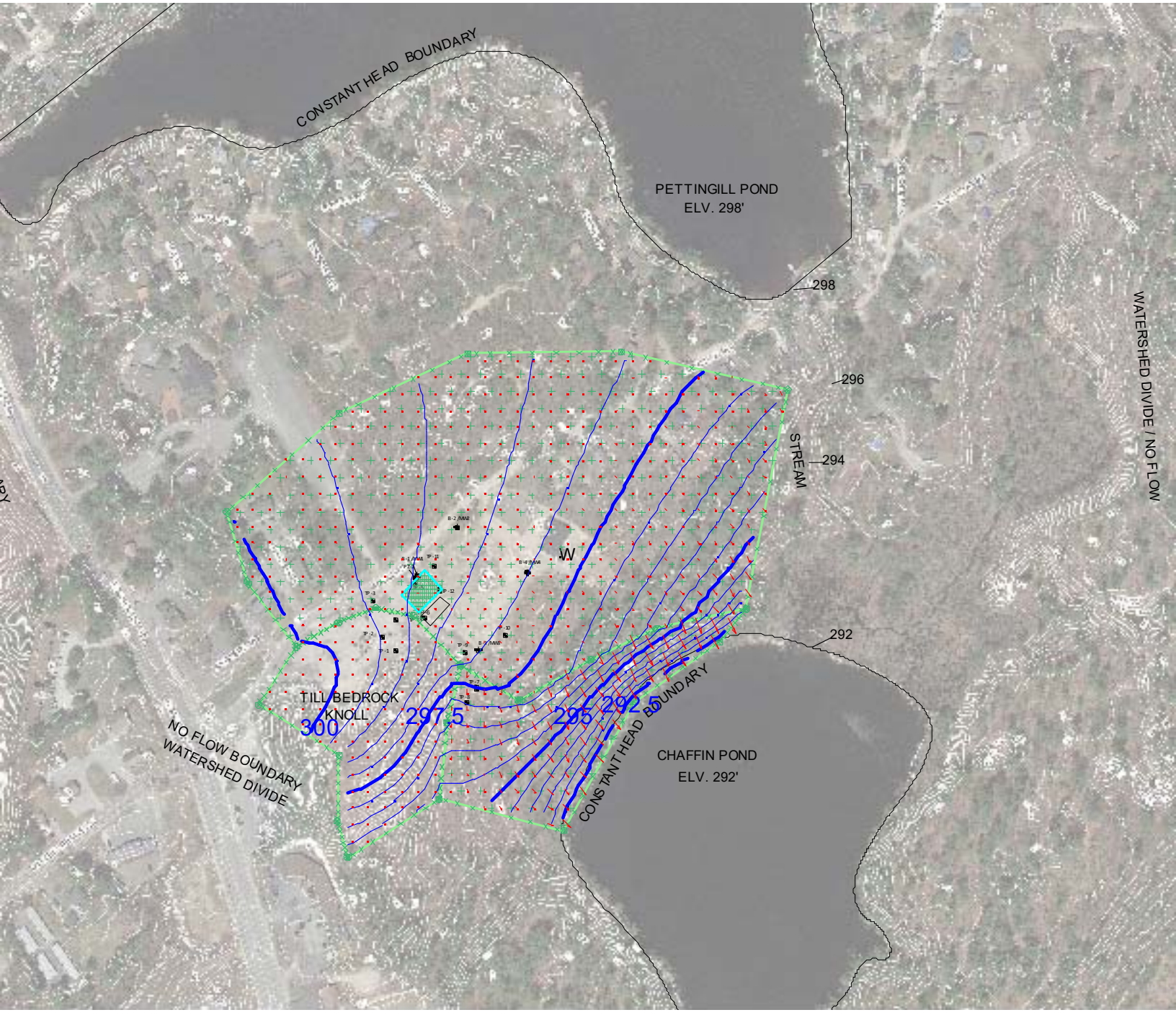
Spatially Variable Area Source/Sink by Polygon

Label	Nesting_level	Condition_Top	Top_flux_or_head	Top_surface	Condition_Bottom	Bottom_flux_or_head	Bottom_surface	Node_spacing	Coordinat
SEPTIC	1	Flux	0.0025	none	Flux	0.0005	none	10	

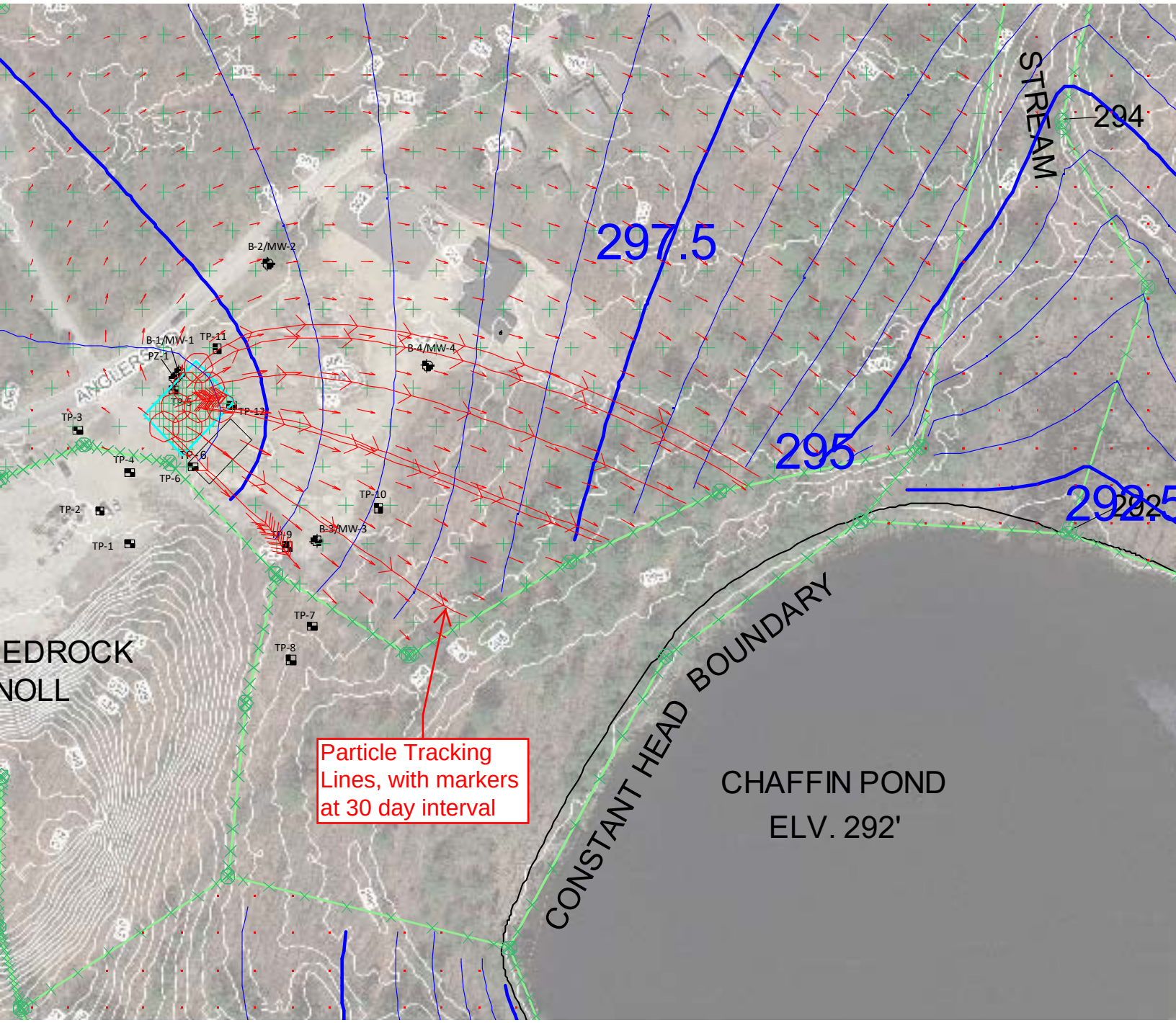
Steady State Solution
Level 1 (All Domain and Proximal Delta Sediments



Steady State Solution
Level 2 (Bedrock/Till Knob and distal delta sediments



Transient Solution at 76 days with disposal field loading at 9000 gpd



Transient Solution at 76 days with disposal field loading at 9000 gpd.
Contours are the predicted change in groundwater elevation