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February 16, 2023

Town of Ledyard
Inland Wetlands and Watercourses Commission
741 Colonel Ledyard Highway
Ledyard, CT 06339

RE: Avery Brook Homes, LLC Affordable Housing Subdivision
94-100 Stoddards Wharf Road, Ledyard, Connecticut

Dear Commissioners:

In accordance with your request, I am forwarding herewith three (3) copies of the Avery Brook Homes Septic System Effluent Renovation Analysis for the above referenced project prepared by Angus McDonald / Gary Sharpe & Associates, Inc. dated February 3, 2023. The enclosed report evaluates the characteristics of concern to the Commission identified by Dr. Magule in the prior public hearing session with respect to this application.

Stuart J. Fairbank, author of the report, will be available at the continued public hearing on this application scheduled for March 7, 2023 to present the report and address any Commission questions.

Should you require any further information in the interim, please feel free to contact the undersigned.

Very truly yours,

Harry B. Heller

cc: Mr. Peter C. Gardner
Stephen W. Studer, Esquire
Peter Gelderman, Esquire

Z:\Avery Brook Homes, LLC\Wetlands\ltr.Town Angus MacDonald report.docx

LAND & MARINE
ENGINEERING
SURVEYING
PLANNING

ANGUS McDONALD
GARY SHARPE
& ASSOCIATES, INC.
SINCE 1966

Avery Brook Homes

Septic System Effluent Renovation Analysis

94-100 Stoddards Wharf Road
Ledyard, Connecticut

February 3, 2023

STATE OF CONNECTICUT
STUART J. FAIRBANK
20206
LICENSED
PROFESSIONAL ENGINEER

Table of Contents

Overview

The proposed Avery Brook Homes project is a 26 lot, single family residential development submitted for consideration under the Affordable Housing Appeals Act (8-30g) . The property is approximately 9.21 acres, located on the North side of Stoddards Wharf Road -CT Route 214. Each lot will be served by a drilled bedrock cased well and subsurface sewage disposal system (SSDS) reviewed and approved by Ledge Light Health District (LLHD). Conceptual well and SSDS locations are depicted on the subdivision plan prepared by Dieter and Gardner, Inc. and last revised February 3, 2023, and have been approved for subdivision purposes by LLHD based on 3 bedroom homes.

The property is currently undeveloped, with surface cover consisting of partially overgrown agricultural fields with hardwood forest around the perimeter. The general slope of the land is from Northwest to Southeast, the lowest point being a wetland along the easterly boundary. We are not able to ascertain original slopes or drainage patterns northerly, easterly or westerly of the site because it appears that a significant volume of earth materials have been removed 50 or more years ago, in some places to a depth of approximately 25'. It is likely that the excavation was a sand and gravel operation, since much of the subject site is underlain by sand and gravel.

Soils on the site mapped by the USDA Soil Conservation Service consist primarily of Agawam fine sandy loams and Hinckley gravelly sandy loams, with small areas of other soils mapped around the perimeter. Agawam fine sandy loam is a stratified drift sandy soil, typically exhibiting moderate-high soil permeabilities and deep depth to groundwater. Hinckley gravelly sandy loams are glacial outwash soils with high soil permeabilities and deep depth to groundwater.

The site lies within the public water supply watershed of the City of Groton. The city owns Billings Avery Pond, located to the Northwest of the subject site. Billings Avery Pond is connected to the City of Groton reservoir system by a canal (Stoddards Brook) constructed by the city. This canal diverts water on demand from the pond, which would otherwise discharge to the Thames River via Billings Avery Brook.

Scope of report

The Avery Brook Homes Affordable Housing subdivision application is currently being reviewed by the Ledyard Inland Wetland and Watercourses Commission. Commission members requested effluent renovation analysis of the proposed Subsurface Sewage Disposal Systems (SSDS) relative to impacts to inland wetlands around the periphery of the site. The three specific renovation parameters requested are Nitrogenous compound concentrations, effluent plume travel time and exposure from viruses. The analysis presented focuses on these parameters, but of necessity touches on other aspects of effluent movement and renovation in soil and groundwater. The methodology presented is based on the Connecticut Department of Energy and Environmental Protection (DEEP) publication "Guidance for Large-Scale on-site wastewater Renovation Systems" dated February 2006. This report will refer to this

publication as the *Manual.* All single-family residential SSDS on the site are permitted for construction and discharge by the local Health District (Ledge Light Health District) under Connecticut Public Health Code regulations. There are no discharge permits required by DEEP for single-family residential SSDS design and construction on any proposed lot on the site.

Soil Testing

Ref: Appendix A – Site Development Plan Set
Appendix D - 12-8-2022 Test Hole Logs

Soil testing for subdivision approval was performed by Dieter & Gardner in cooperation with the Ledge Light Health District (LLHD). Subsequent soil testing was performed under the supervision of Angus McDonald/Gary Sharpe and Assoc. for the purpose of gathering soil samples for permeability determination, and installing groundwater level observation wells. Test hole locations are depicted on the map in **Appendix A** of this report. The soil logs for test holes 100-109 can be found in **Appendix D** of this report.

Soil Permeability

Ref: Appendix B – Washed Sieve Analysis Results

The permeability of the soil on the site was determined using core tubes and washed sieve analysis from bag samples that were collected during each of the rounds of testing. The core tubes were analyzed using falling head permeability tests, and the bag samples were examined using grain size analysis. The results from all of the soil tests were compiled into the following tables that show the permeability average and geometric mean.

For reference, the majority of the site is mapped as either Agawam Fine sandy loam or Hinckley gravelly sandy loam by the United States Department of Agriculture, Soil Conservation Service. Udorthent soils mapped by SCS to the North, West and East of the site, on the adjacent property of City of Groton, appear to be the result of historical gravel mining, and are assumed to have been Agawam or Hinckley soils. The permeability range given for Agawam soils is 12-40 ft/day, for Hinckley >40 ft/day.

Test Hole	Description	Depth, in	Tube, in (T)	T-L	L in	H1 in	H2 in	H1-H2 in	T min	H1+H2/2	K ft/min	K ft/day
100	C-Horizon	47	12	9.75	2.25	11.875	8.25	3.625	90	10.1	0.0008	1.1
101	D-Horizon	38	11.75	8.75	3	11.625	11.25	0.375	90	11.4	0.0001	0.1
102	C-Horizon	46	11.875	9	2.875	11.75	5.625	6.125	11	8.7	0.0154	22.1
103	C-Horizon	48	11.75	9.5	2.25	11.625	6.5	5.125	0.33	9.1	0.3213	462.7
104	C-Horizon	48	12	8.75	3.25	11.875	4.875	7	1	8.4	0.2264	326.0
105	C-Horizon	48	12	7.875	4.125	11.875	6.625	5.25	2	9.3	0.0976	140.5
106	C-Horizon	57	11.375	9.25	2.125	11.75	4.5	7.25	1	8.1	0.2	227.5
108	C-Horizon	48	12	9.5	2.5	11.875	6.875	5	1.5	9.4	0.1	106.7
109	C-Horizon	52	12	9.5	2.5	11.875	7.75	4.125	3	9.8	0.0	42.0
Recompacted Samples (1/10/23)												
102*	recompacted	172	12	8.25	3.75	11.87	7.25	4.62	3	9.6	0.0503	72.5
103*	recompacted	168	12	7.12	4.88	11.75	7	4.75	1.5	9.4	0.1374	197.8
111*	recompacted	190	12	6.38	5.62	11.87	7.495	4.375	1.5	9.7	0.1411	203.2
	*All three samples recompacted in tubes from bag samples											

NOTE: Samples 100 & 101 removed from analysis as outliers

Overall Arithmetic Mean =	180	ft/day
Overall Geometric Mean =	130	ft/day
In Situ Arithmetic Mean =	190	ft/day
In Situ Geometric Mean =	125	ft/day
Recompacted Arithmetic Mean =	158	ft/day
Recompacted Geometric Mean =	143	ft/day

Table 1 – Falling Head Permeability Calculations

The grain size sieve analysis results can be found in **Appendix B**.

Test Hole	Split	Depth	Permeability Range		
100	1	42-48"	Dense	2	ft/day
			Loose	7	ft/day
100	2	42-48"	Dense	3	ft/day
			Loose	10	ft/day
101	1	30-36"	Dense	125	ft/day
			Loose	374	ft/day
101	2	30-36"	Dense	184	ft/day
			Loose	552	ft/day
102	1	42-48"	Dense	329	ft/day
			Loose	986	ft/day
102	2	42-48"	Dense	199	ft/day
			Loose	596	ft/day
102	1	180-186"	Dense	119	ft/day
			Loose	356	ft/day
102	2	180-186"	Dense	123	ft/day
			Loose	368	ft/day
103	1	42-48"	Dense	227	ft/day
			Loose	831	ft/day
103	2	42-48"	Dense	218	ft/day
			Loose	655	ft/day
103	1	165-171"	Dense	242	ft/day
			Loose	726	ft/day
103	2	165-171"	Dense	214	ft/day
			Loose	642	ft/day
104	1	42-48"	Dense	510	ft/day
			Loose	1531	ft/day
104	2	42-48"	Dense	371	ft/day
			Loose	1114	ft/day
105	1	42-48"	Dense	130	ft/day
			Loose	389	ft/day
105	2	42-48"	Dense	145	ft/day
			Loose	436	ft/day
106	1	55-60"	Dense	374	ft/day
			Loose	1123	ft/day
106	2	55-60"	Dense	258	ft/day
			Loose	775	ft/day
108	1	46-50"	Dense	162	ft/day
			Loose	485	ft/day
108	2	46-50"	Dense	155	ft/day
			Loose	465	ft/day
109	1	46-52"	Dense	260	ft/day
			Loose	779	ft/day
109	2	46-52"	Dense	196	ft/day
			Loose	588	ft/day
		Overall Arithmetic Mean		417	ft/day
		Overall Geometric Mean		244	ft/day
		Dense Arithmetic Mean		207	ft/day
		Dense Geometric Mean		139	ft/day
		Loose Arithmetic Mean		627	ft/day
		Loose Geometric Mean		427	ft/day

Table 2 – Washed Sieve Analysis Summary

For the purposes of effluent renovation calculations, core tube values will be utilized because they represent more closely in-situ soil conditions. In reviewing the various average values of core tube permeabilities and grain size permeability estimates, there is a close correlation between the core tube values and the dense grain size analysis (dense soil values most closely represent in-situ soil conditions). This provides a cross-check to insure that the values utilized in the analysis are reasonable.

Ground Water Monitoring and Ground Water Contours

Ref: Appendix A – Site Development Plan Set
Appendix C – Ground Water Monitoring

The groundwater observation wells #100-115 were installed on two dates in December, 2022 and January, 2023 and monitored on five dates. Wells # 100-109 and the existing dug well on the property were monitored on December 20th and 27th, 2022 and January 3, 2023. Because some of those wells did not penetrate the groundwater table, wells #110-115 were installed on January 3rd, then all wells were monitored on January 5th and 12th, 2023. Groundwater contours mapped as a result of the groundwater elevations measured in the monitoring wells on those dates indicate that the gradient across the entire site is toward the west-northwest. The groundwater contour maps confirm that there is no groundwater flow to the two wetland and watercourse systems identified by Ian Cole, Certified Soil Scientist, that are located along the easterly periphery of, and easterly of, the project site (wetlands flags 1-8 and 1A-8A).
It appears that a groundwater boundary condition exists in the southeast portion of the site as evidenced by the warped groundwater contours between wells 100-101 and down gradient wells to the west. Based on the observation of bedrock in test holes in the southerly and easterly portion of the site, it is likely that groundwater is perched on bedrock in those areas, resulting in the warping.

The groundwater monitoring results can be found in **Appendix C** of this report.
A ground water contour map can be found in **Appendix A** of this report, based on January 5th & 12th, 2023 monitoring.

Hydraulic Gradients

Ref: Appendix A – Site Development Plan Set

The hydraulic gradient of the water table across the site was determined using the ground water contour map. The gradient varies from about 0.6% to 1.3%. Because this report is concerned with potential impacts to inland wetlands, the groundwater gradient in the area closest to mapped inland wetlands was selected. This is in the area of lots 6 & 7, which has a gradient of 1.3%. Utilizing the highest gradients on site will yield the most conservative values for travel time to down gradient wetlands.

Unsaturated Soil Thickness

Ref: Appendix C – Ground Water Monitoring
Appendix D – 12-8-22 Test Hole Logs

The observed unsaturated soil thickness of the soil horizon was estimated by comparing the calculated ground water contours to the ground surface contours and test hole logs. With the exception of lots 1, 2, 17 & 20 the unsaturated soil thickness

exceeds 10 feet. Most of the remaining lots on the site enjoy exceptionally deep, well drained soils with a water table as deep as 25' below grade in the central and westerly portion of the site. These deep unsaturated soils provide considerably more separation distance than recommended by the *Manual* between the bottom of leachfields and the mounded water table. (mounded water table calculated at 1.2', see mound calculation in Travel Time Analysis) The purpose of the separation, recommended at 3', is to insure the removal of viruses from the effluent prior to it contacting groundwater. The deep soils provide adequate depth to groundwater from the bottom of the leachfields to meet or exceed the recommended separation.

The groundwater monitoring results can be found in **Appendix C** of this report.
Test hole logs can be found in **Appendix D** of this Report.

Leaching Field Sizing and Type

Ref: *Appendix E – Onsite Wastewater Technology Testing Report*
Appendix A – Site Development Plan Set

The proposed septic tank/leaching systems for each lot were sized by Dieter and Gardner for three bedroom houses based on percolation rates as described in the *Connecticut Public Health Code, On-site Sewage Disposal Regulations and Technical Standards for Subsurface Sewage Disposal Systems.*

The leachfields proposed consist of Geomatrix GST 6212, 6218 and 6236. The Geomatrix GST products consist of a crushed stone core with alternating fingers of crushed stone and ASTM C-33 sand extending horizontally for a total unit width of 5.17'. (See details on Sketch Map A in **Appendix A**)

This report is concerned with the renovation of wastewater within and after it leaves the leachfield. The leachfield type may affect the quality of effluent treatment in the biomat at the stone/soil interface, as well as in the select fill directly below the crushed stone leachfield. (See Massachusetts Alternative Septic System Test Center report on Geomatrix GST products in **Appendix E** and discussion page 16.)

Effluent Travel Time to Wetlands

Ref: *Appendix A – Site Development Plan Set*
Appendix E – Onsite Wastewater Technology Testing Report

Travel Time determination

The equation V=Ki/n can be utilized to determine the velocity of the effluent plume down gradient of the leachfield. The objective of this calculation is to determine the elapsed time between the discharge of effluent from the leachfield and its arrival at any specified point of concern (POC). For purposes of this analysis, the POC is the nearest down gradient inland wetland boundary. The minimum travel time recommended by the *Manual,* and normally required by DEEP, is 21 days. The 21 day minimum is considered sufficient to remove pathogenic bacteria in the effluent to acceptable levels. It should be noted that this guidance far exceeds the requirements of the Connecticut Public Health Code for a septic system serving a single family dwelling: i.e. 75' between any component of the septic system and a potable water supply well.

V = effluent plume movement in groundwater, ft/day
K = Soil permeability as determined by sample analysis, ft/day
i = hydraulic gradient, dimensionless
n= effective porosity, dimensionless

For the travel time analysis we have utilized the following values:

K = 180 ft/day. This value represents the arithmetic mean of permeability core tube values, minus very low outliers. Removing the outliers increases the permeability, providing a more conservative analysis.
i = .013 (1.3%)
n = .25 (value from *Manual*)

Calculated horizontal plume velocity in the groundwater = 9.36 ft/day
21 day travel time distance = 197' (see calculation page 10)

Refer to *Sketch Map A* in **Appendix A** for a setback line corresponding to 197', from proposed leachfields along the northerly and westerly site boundaries.

3 Bedroom House	450	gal/day	60	ft^3/day	Based on typical CT regulatory value of 150 gpd/bed

Hydraulic Conductivity (K)	130	ft/day	(Overall Geometric Mean of core tubes)
Hydraulic Gradient (i)	1.3%		(TH 114-112, 1/12/22) 1.8'/140'
Leaching Bed Length	30	ft	Representative length of proposed leachfields- proposed lengths on plan vary
Leaching Bed Width	5.17	ft	

Cross-Sectional Area A=Q/ki	36	ft^2	Mound height = 36'/30' = 1.2'
Area of Proposed Leaching Bed	155.1	ft^2	

Area of Proposed Leaching Bed	155.1	ft^2

21 Day Bacteria Travel Time	$V = \frac{Ki}{n}$

Hydraulic Conductivity (K)	180	ft/day	(Overall Arithmetic Mean of core tubes)
Hydraulic Gradient (i)	1.3%		
Porosity (n)	0.25		(Effective Porosity of Sand per *Manual)*

Velocity (V)	9.36	ft/day
21 Travel Time (T_{21})	196.56	ft

Figure 1 – Hydraulic Analysis and 21 Day Travel Time

Note that in the Figure 1 calculations, an estimate of mounded water table under a leachfield on lot 6 or 7 is estimated. The estimated mound is calculated based on Darcy's Law (Q = KiA).

Q = discharge, cubic ft/day
K = 130 ft/day
i = .013 (1.3%)
A = hydraulic window, L x H

The value of K has been reduced to 130 ft/day, corresponding to the Geometric mean of the permeability core tubes. The reduced value provides a conservative estimate of the hydraulics under the leachfield. The mounded water table is estimated to be 1.2', which means that the bottom of the lot 6 & 7 leachfields are 18-20' above the water table. Note that there is a linear relationship of leachfield length to mound height, so substituting a leachfield of 20' in length results in a mound of (1.2' x (30/20)) = 1.8'. Conversely, a longer leachfield reduces mound height. Either way, the difference is negligible on these lots. The Manual recommends a minimum separating distance of 3' above mounded water table, primarily for virus removal. As stated previously, the depth from the bottom of the leachfields to mounded groundwater exceeds this recommendation, thereby maximizing virus removal prior to effluent contacting the water table.

The unsaturated zone is also where continued nitrification of remaining N compounds occurs after effluent leaves the leachfield, converting these compounds to NO_2 and NO_3 in that order. On this site, installation of the Geomatrix GST leachfield is expected to provide high levels of nitrification (conversion to NO3) prior to the effluent leaving the leachfield. (See Massachusetts Alternative Septic System Test Center report on Geomatrix GST products in **Appendix E**)

Nitrogen Analysis –

Ref: Appendix A – Site Development Plan Set

The objective of this analysis is to determine the concentration of Nitrogenous compounds in the groundwater as a result of the proposed SSDS construction. The target concentration is 10 mg/l, which is the EPA drinking water standard for Total Nitrogen (TN).

The methodology recommended by DEEP in the *Manual*, has remained essentially the same since the original DEEP (then DEP) design manual was introduced in 1982. Certain updates to input variables have been made, but the basic concept is that the TN concentration is governed by the volume of effluent + infiltrating rainwater.

On most sites where a large central leachfield is proposed, the rainfall contributing area is limited to the area of the site directly up gradient and down gradient from the proposed leachfield. Gradient in this context refers to groundwater gradient, not surface topography.

On the Avery Brook site, residential lots and their corresponding SSDS are spread relatively uniformly around the property. It is our opinion that groundwater on the entire site intersect one or more plumes from the proposed 26 SSDS, therefore the entire area of the subject site can be considered as contributing to infiltrated rainfall for dilution.

As part of our review of the site we have recommended that gutter outlets be collected and infiltrated on each lot. A detail of the proposed infiltration structure is depicted on *Sketch Map A in* **Appendix A**. The applicant has adopted this proposal and incorporated it into the design of the project.

Figures 2-5 below depict the steps in determining infiltrated rainfall and the resulting TN concentration.

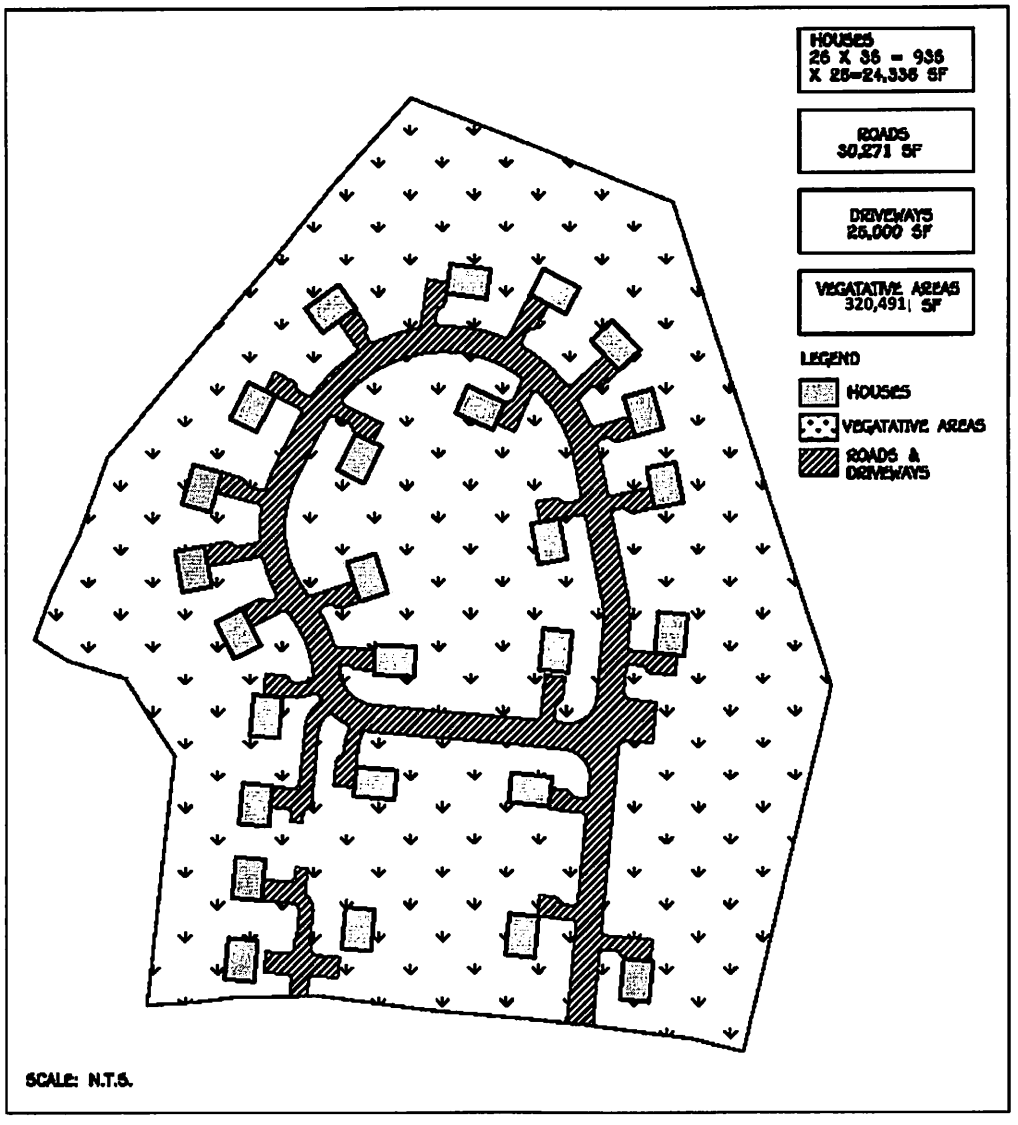


Figure 2 – Site Coverage Map

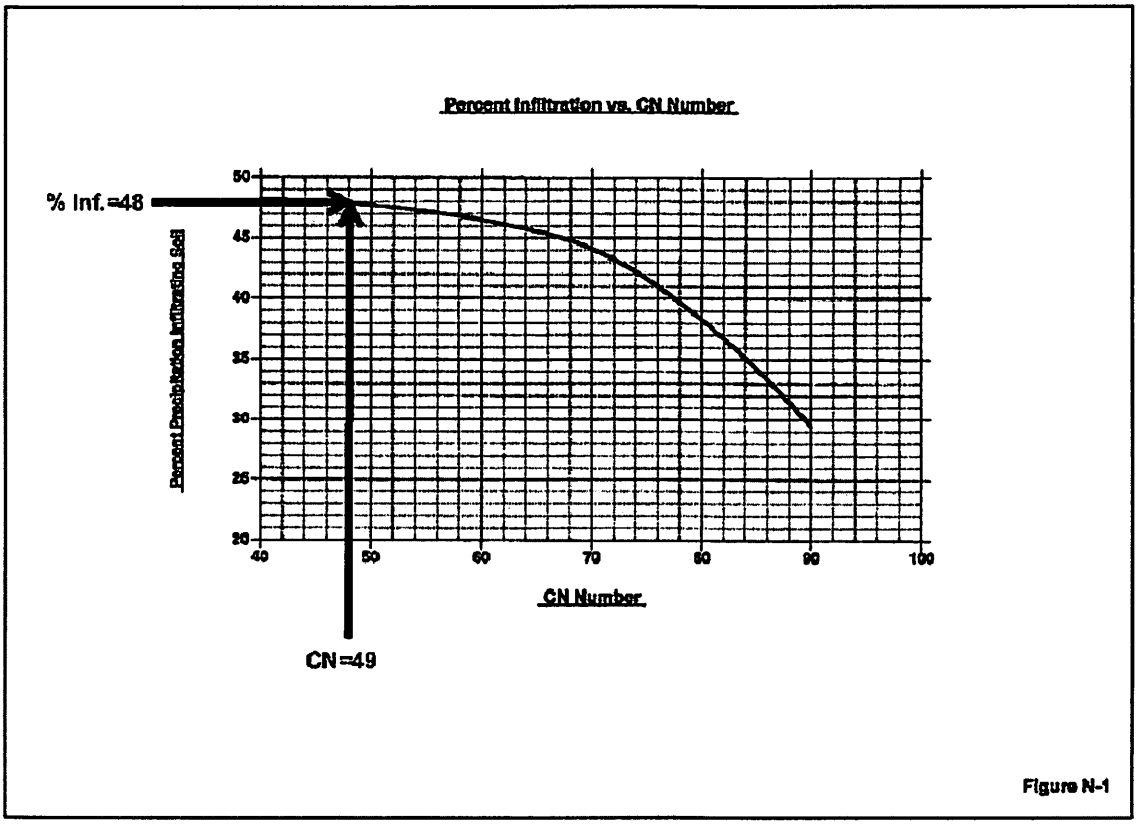
Figure 2 breaks out the various ground cover features. It is similar to a drainage area map commonly used for runoff calculations as a result of development, as it will be used to calculate a TR-55 composite curve number (CN). We have elected to calculate all vegetated areas at the same CN because doing so is conservative, assigning the wooded areas the same higher CN that lawns are assigned. Note that only rainwater infiltrating on the subject site is considered for TN dilution.

Avery Brook Homes	Total (ft^2)	Total (Acres)	% of Total Area	Hydraulic Soil Group	Cover Type	Curve Number	Product CN x Area
Roads	30,271	0.69	7.55%	A	Impervious (Paved)	98	68.1
Roofs	24,336	0.56	6.07%	A	Roofs	95	53.1
Vegetated Areas	320,491	7.36	79.90%	A	Grass (Good)	39	286.9
Driveways	26,000	0.60	6.48%	A	Impervious (Gravel)	76	45.4
	401,098	9.21	1.00				453

$$CN\ (Weighted) = \frac{453}{9.21} = \mathbf{49}$$

Figure 3 – Average Runoff Coefficient Calculation

Figure 3 calculates the composite CN, note that roof areas have been assigned a CN of 95 even though they will ultimately be infiltrated at a rate of 90%. This is conservative in that it elevates the CN somewhat, which would typically reduce the infiltrated rainwater volume. The composite CN is calculated as 49.



Connecticut Department of Environmental Protection
Bureau of Materials Management and Compliance Assurance
Guidance for Design Of Large-Scale On-Site Wastewater Renovation Systems

Section X - Subsurface Wastewater Absorption System Design

Figure 4 – Infiltration Rate Determination

Figure 4 is copied from the *Manual,* the graph yields an infiltration rate of 48%. In the calculation of infiltrated rainwater for dilution in Figure 5 below, the yards, roads and drives are calculated at 48%, but the roofs are now calculated at 90% (See detail of gutter downspout collection and infiltration structure on plans).

Lot Size:	401,098	ft^2	9.21	Acres

House Size: 3 beds, 24' x 36' Number of Bedrooms: 78

CALCULATE NITROGEN LOAD

Discharge per bedroom/day (DPB) =	45	gal/day
Design Flow = *# Bedrooms x DPB x 3.8 l/g* =	13338	L/day
Raw Total Nitrogen from house	80	mg/L
Nitrogen Concentration discharge to ground	48	mg/L

Daily Nitrogen Concentration = *Design Flow x Nitrogen Concentration*

Nitrogen Load in Effluent = 640224 mg/Day

CALCULATE DILUTION WATER VOLUME

Daily Effluent Volume 13338 L/day

Rain to the Site 0.01 ft/Day x Lot Area = 4011 ft^3/day = 114008 L/day

	% Precipitation Infiltrating	***Area ft^2***
Impervious Area	0.48	30,271
Roofs	0.9	24,336
Grass Area	0.48	320,491
Driveways	0.48	26,000
		401,098
Infiltration Rate =	0.51	
Rain Infiltrating =	57,629 L/Day	

Notes : CN_{AVE} of Impervious, Grass and Driveways = **49**
% Precipitation Infiltrating = **48%** taken from *Manual Fig. N-1*
90% infiltration due to use of roof runoff infiltration structure

TOTAL DILUTION WATER

Rain Infiltrating + Effluent = 70,967 L/Day

NITROGEN CONCENTRATION = *640224 mg/Day ÷ 70,967 L/Day = 9.02 mg/L*

ALLOWABLE DISCHARGE = 10 mg/L

DISCHARGE IS ACCEPTABLE

Figure 5 – Nitrogen Concentration Analysis

For estimating the TN load to the groundwater in Figure 5 above, the following discharge and TN concentrations are what we would utilize in preparing a discharge permit application to DEEP, if such were required:

Discharge per house: 135 gpd (45 gpd/bedroom) considered to be an average discharge from a 3-bedroom house in CT.

Effluent TN concentration: 80 mg/l from house, 48 mg/l to leachfield (corresponds to TN raw sewage discharge from combined 26 houses of 858 lbs/N/year.) The 48 mg/l figure is a standard 60% of the raw sewage concentration, as used in the *Manual.* In the *Manual*, it is accepted that approximately 40% of the raw sewage TN is removed in the septic tank/leachfield system.

Based on the above, the calculated TN concentration exiting the site is below the EPA drinking water standard of 10 mg/l. There are no inland wetlands mapped within the effluent plume on-site, since the only on-site wetlands are at the easterly/hydraulic up gradient side of the site.

Massachusetts Alternative Septic System Test Center report on Geomatrix GST

Ref: Appendix E – Onsite Wastewater Technology Testing Report

The MASSTC report conducted on Geomatrix GST units is included herein because Geomatrix GST units are proposed as leachfields serving dwellings on the site. It is our opinion that this is a sound engineering choice, in part because GST units are constructed using a specific sand mix as part of the leachfield cross section (ASTM C-33 sand). Installation quality control is managed by the use of forms, rented from the manufacturer for each installation. The advantage to the GST cross section is that the crushed stone-soil interface, where the biological mat forms, is uniform as compared to other crushed stone leachfields where the crushed stone is in direct contact with potentially variable site soils. The biological mat, which is the primary area of the septic system where effluent treatment occurs, responds to differences in soil grain size at the crushed stone-soil interface. The mat will tend to be more or less vigorous as natural soil variations occur across the leachfield, possibly resulting in areas of saturated flow. In contrast, the C-33 sand provides a relatively uniform surface for the mat, resulting in a more evenly distributed discharge through the mat. This maximizes unsaturated percolation of the effluent through the sand, which in turn provides the time and environment for effective nitrification of the effluent, as well as virus removal.

The reason nitrification is important is that in the nitrogen cycle, the preferred nitrogen compound in ground or surface water is nitrate (NO_3). The very basic progression of nitrification in wastewater treatment is as follows:

Organic N + NH_3/NH_4 $\rightarrow$ NO_2 $\rightarrow$ NO_3

In general, the primary constituent in the household waste stream is Organic N plus NH_3/NH_4 (ammonia/ammonium respectively), sometimes referred to as Total Kjeldahl Nitrogen (TKN). As treatment progresses through the septic tank/leachfield

system, autotrophic bacteria convert (oxidize) the N compounds first to NO_2 and then NO_3 (nitrification). When a leachfield is first installed, it takes some time (3-6 months) for the biological mat to fully develop. During that time, treatment efficiency in the system increases, the results of which can be determined through effluent sampling under the leachfield.

In the MASSTC report (found in **Appendix E**), one can visualize the increase in treatment, and accompanying nitrification, by reviewing the raw sample data in the TKN, TN, NO_2 & NO_3 columns. Refer to the data appendices in the MASSTC report for definitions.

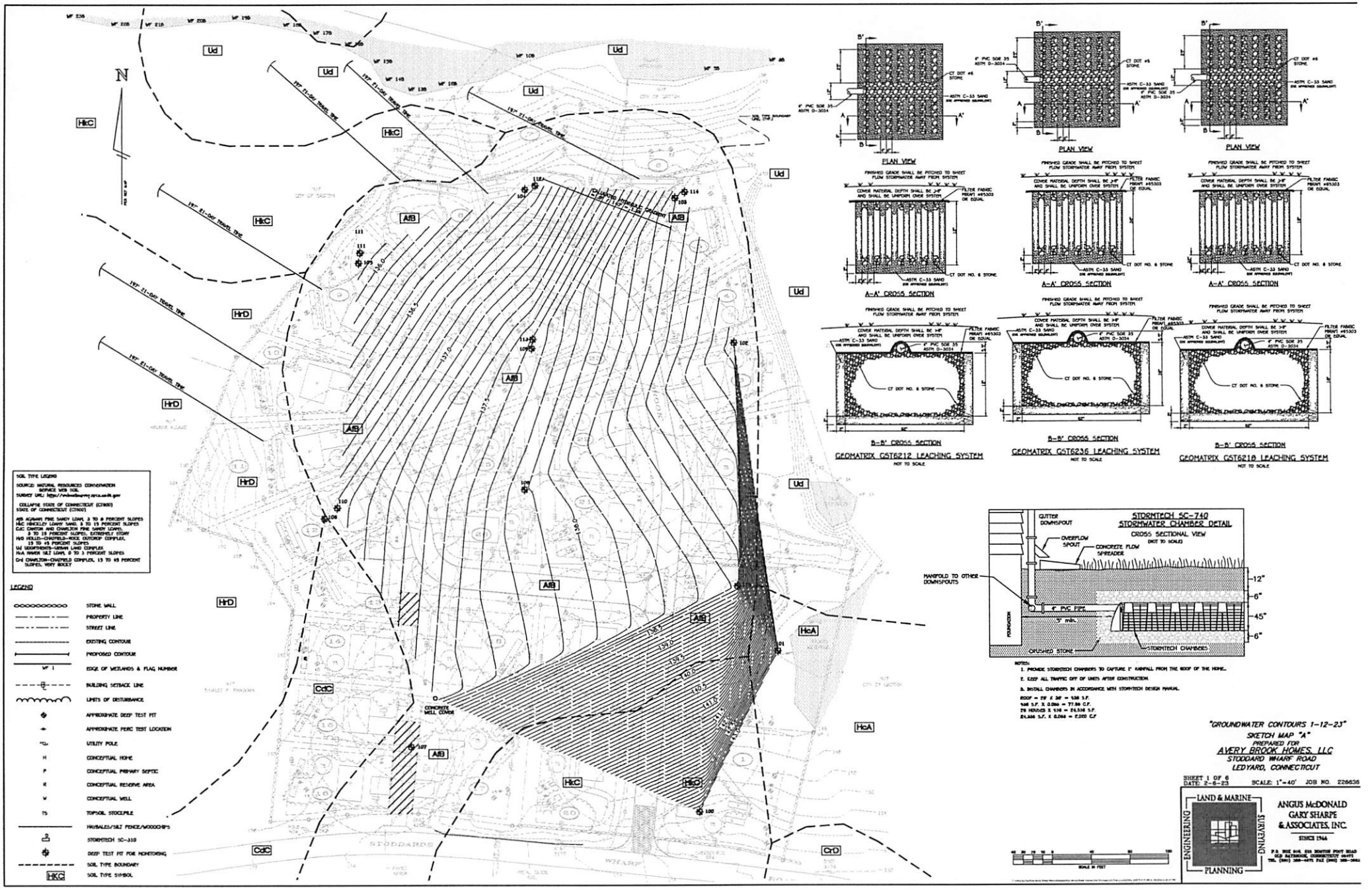
As mentioned above the objective in nitrification is to get the value of NO3 to be as close to 100% of the TN value as possible. Reviewing the sampling data columns starting from day 1, 1-31-2019, through 8-14-2019, there is a progressive increase in nitrification efficiency. By the 8-14-2019 date, the nitrification rate is as high as 94%. This rate may be expected to vary over time as seen in the continuing test data, but demonstrates the potential performance of the GST in nitrification. Additional nitrification can still be expected below the leachfield, for N compounds not yet converted to NO_3.

Conclusion

It is our opinion that the development of the proposed 26 single family homes on the site with onsite septic systems will not adversely impact wetland or watercourse systems located on or adjacent to the site, based upon the pollutant renovation analysis conducted in this study. In particular, and for the reasons stated herein, it is our opinion that there is sufficient travel time between the SSDS proposed on the site and the nearest hydraulically receiving wetland or watercourse system to remove bacteria based upon the guidance contained in the *Manual*, and there is sufficient dilution available based on the project design to reduce total nitrogen concentration from the site to a level which meets the standard for drinking water prior to encountering a hydraulically down gradient wetland. Vertical separation above the mounded groundwater exceeds the recommended separation in the *Manual*, and should therefore provide virus removal to the standards described therein. The Geomatrix GST leachfield proposed on the subdivision plan are effective at nitrifying TN in the effluent, converting a high percentage of the TN to NO_3 prior to effluent leaving the leachfield package.

Appendix A

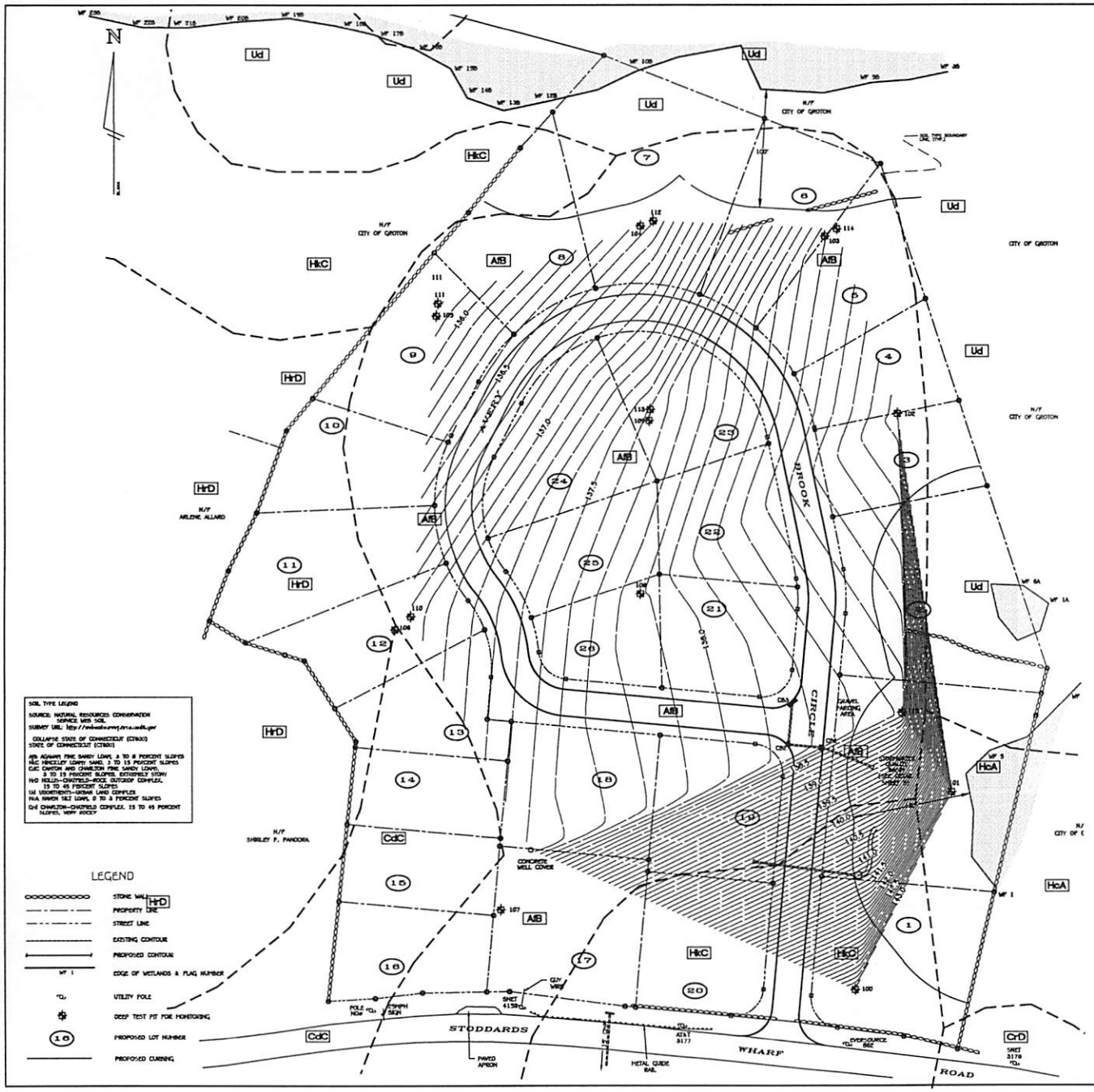
Site Development Plan Set



"GROUNDWATER CONTOURS 1-12-23"
SKETCH MAP "A"
PREPARED FOR
AVERY BROOK HOMES, LLC
STODDARD WHARF ROAD
LEDYARD, CONNECTICUT

SHEET 1 OF 6
DATE: 2-6-23 SCALE: 1"=40' JOB NO. 228636

ANGUS McDONALD
GARY SHARPE
& ASSOCIATES, INC.
SINCE 1966
P.O. BOX 849, 529 NEWTOWN POST ROAD
OLD LYME, CONNECTICUT 06371
TEL. (860) 388-4695 FAX (860) 388-3662



FALLING HEAD PERMEABILITY TEST RESULTS

Project Name: Avery Brook Homes LLC — Project Number: 226636 — Date: 12/14/2022

Test Hole	Description	Depth, in	Tube, in (T)	T-L	L in	H1 in	H2 in	H1-H2 in	T min	H1+H2/2	K ft/min	K ft/day
100	C-Horizon	47	12	9.75	2.25	11.875	8.25	3.625	90	10.1	0.0008	1.1
101	D-Horizon	38	11.75	8.75	3	11.625	11.25	0.375	90	11.4	0.0001	0.1
102	C-Horizon	46	11.875	9	2.875	11.75	5.625	6.125	11	8.7	0.0154	22.1
103	C-Horizon	48	11.75	9.5	2.25	11.625	6.5	5.125	0.33	9.1	0.2213	462.7
104	C-Horizon	48	12	8.75	3.25	11.875	4.875	7	1	8.4	0.2264	326.0
105	C-Horizon	48	12	7.875	4.125	11.875	6.625	5.25	2	9.3	0.0676	140.5
106	C-Horizon	57	11.375	9.25	2.125	11.75	4.5	7.25	1	8.1	0.2	337.9
108	C-Horizon	48	12	9.5	2.5	11.875	6.875	5	1.5	9.4	0.1	106.7
109	C-Horizon	52	12	9.5	2.5	11.875	7.75	4.125	3	9.8	0.0	42.0
Recompacted Samples (1/19/23)												
102*	recompacted	172	12	8.25	3.75	11.87	7.25	4.62	3	9.6	0.0503	72.5
103*	recompacted	168	12	7.12	4.88	11.75	7	4.75	1.5	9.4	0.1374	197.8
111*	recompacted	190	12	8.38	3.62	11.87	7.495	4.375	1.5	9.7	0.1411	203.2
	*All three samples recompacted in tubes from bag samples											

NOTE: Samples 100 & 101 removed from analysis as outliers

Overall Arithmetic Mean = 190 ft/day
Overall Geometric Mean = 130 ft/day

In Situ Arithmetic Mean = 190 ft/day
In Situ Geometric Mean = 125 ft/day

Recompacted Arithmetic Mean = 158 ft/day
Recompacted Geometric Mean = 143 ft/day

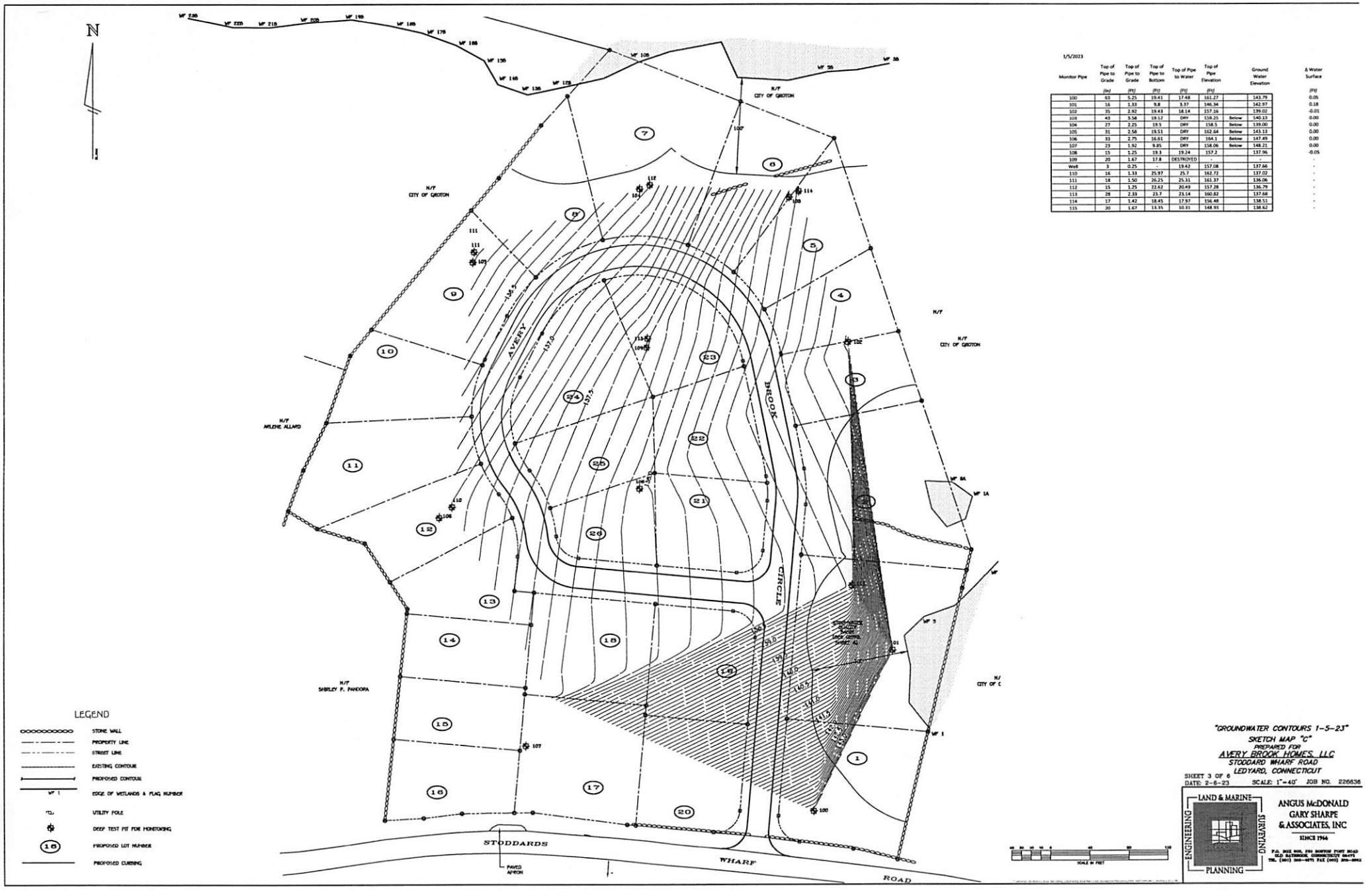
1/12/2023

Monitor Pipe	Top of Pipe to Grade (in)	Top of Pipe to Grade (Ft)	Top of Pipe to Bottom (Ft)	Top of Pipe to Water (Ft)	Top of Pipe Elevation (Ft)		Ground Water Elevation	Δ Water Surface (Ft)
100	63	5.25	19.41	17.61	161.27		143.66	-0.13
101	16	1.33	9.8	3.87	146.34		142.47	-0.50
102	35	2.92	19.43	18.21	157.16		138.95	-0.07
103	43	3.58	19.12	DRY	159.25	Below	140.13	0.00
104	27	2.25	19.5	DRY	158.5	Below	139.00	0.00
105	31	2.58	19.51	DRY	162.64	Below	143.13	0.00
106	33	2.75	16.61	DRY	164.1	Below	147.49	0.00
107	23	1.92	9.85	DRY	158.06	Below	148.21	0.00
108	15	1.25	19.3	19.32	157.2		137.88	-0.08
109	20	1.67	17.8	DESTROYED	-		-	-
Well	3	0.25	-	19.56	157.08		137.52	-0.14
110	16	1.33	25.97	25.78	162.72		136.94	-0.08
111	18	1.50	26.25	25.59	161.37		135.78	-0.28
112	15	1.25	22.62	20.69	157.28		136.59	-0.20
113	28	2.33	23.7	23.21	160.82		137.61	-0.07
114	17	1.42	18.45	18.03	156.48		138.45	-0.06
115	20	1.67	13.35	10.51	148.93		138.42	-0.20

"GROUNDWATER CONTOURS 1-12-23"
SKETCH MAP "B"
PREPARED FOR
AVERY BROOK HOMES, LLC
STODDARD WHARF ROAD
LEDYARD, CONNECTICUT

SHEET 2 OF 6
DATE: 2-6-23 SCALE: 1"=40' JOB NO. 226636

LAND & MARINE ENGINEERING SURVEYING PLANNING
ANGUS McDONALD GARY SHARPE & ASSOCIATES, INC
SINCE 1966
P.O. BOX 600, 590 BOSTON POST ROAD OLD SAYBROOK, CONNECTICUT 06475 TEL. (860) 388-4071 FAX (860) 388-3862



1/5/2023

Monitor Pipe	Top of Pipe to Grade	Top of Pipe to Grade	Top of Pipe to Bottom	Top of Pipe to Water	Top of Pipe Elevation		Ground Water Elevation	Δ Water Surface
	(in)	(Ft)	(Ft)	(Ft)	(Ft)			(Ft)
100	63	5.25	19.41	17.48	161.27		143.79	0.05
101	16	1.33	9.8	3.37	146.34		142.97	0.18
102	35	2.92	19.43	18.14	157.16		139.02	-0.01
103	43	3.58	19.12	DRY	159.25	Below	140.13	0.00
104	27	2.25	19.5	DRY	158.5	Below	139.00	0.00
105	31	2.58	19.51	DRY	162.64	Below	143.13	0.00
106	33	2.75	16.61	DRY	164.1	Below	147.49	0.00
107	23	1.92	9.85	DRY	158.06	Below	148.21	0.00
108	15	1.25	19.1	19.24	157.2		137.96	-0.05
109	20	1.67	17.8	DESTROYED	-		-	-
Well	3	0.25	-	19.42	157.08		137.66	-
110	16	1.33	25.97	25.7	162.72		137.02	-
111	18	1.50	26.25	25.31	161.37		136.06	-
112	15	1.25	22.62	20.49	157.28		136.79	-
113	28	2.33	23.7	23.14	160.82		137.68	-
114	17	1.42	18.45	17.97	156.48		138.51	-
115	20	1.67	18.95	10.31	148.93		138.62	-

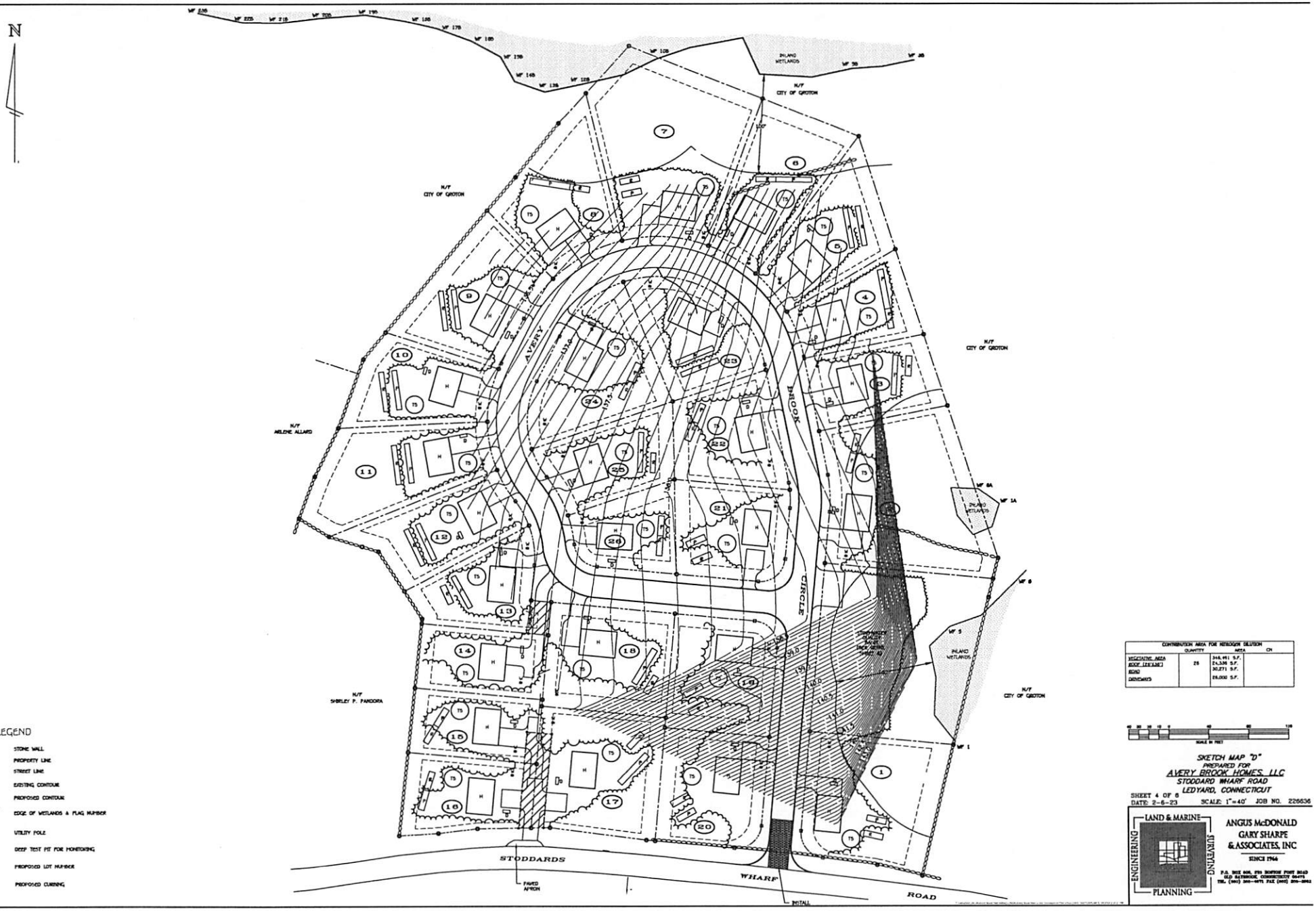
LEGEND

- STONE WALL
- PROPERTY LINE
- STREET LINE
- EXISTING CONTOUR
- PROPOSED CONTOUR
- WF 1 — EDGE OF WETLANDS & FLAG NUMBER
- UTILITY POLE
- DEEP TEST PIT FOR MONITORING
- (18) — PROPOSED LOT NUMBER
- PROPOSED CURBING

"GROUNDWATER CONTOURS 1-5-23"
SKETCH MAP "C"
PREPARED FOR
AVERY BROOK HOMES, LLC
STODDARD WHARF ROAD
LEDYARD, CONNECTICUT

SHEET 3 OF 6
DATE: 2-6-23
SCALE: 1"=40'
JOB NO. 226636

ANGUS McDONALD
GARY SHARPE
& ASSOCIATES, INC
SINCE 1964
LAND & MARINE
ENGINEERING
SURVEYING
PLANNING
P.O. BOX 606, 590 SHENNECOSSETT ROAD
OLD LYME, CONNECTICUT 06371
TEL. (860) 434-0671 FAX (860) 434-0672



LEGEND

- STONE WALL
- PROPERTY LINE
- STREET LINE
- EXISTING CONTOUR
- PROPOSED CONTOUR
- WF 1 — EDGE OF WETLANDS & FLAG NUMBER
- UTILITY POLE
- DEEP TEST PIT FOR MONITORING
- (10) — PROPOSED LOT NUMBER
- PROPOSED CURBING

CONTRIBUTION AREA FOR NITROGEN DILUTION			
	QUANTITY	AREA	CN
NEGATIVE AREA (EXCEPT ROAD)	26	348,491 S.F. 214,326 S.F. 30,271 S.F.	
ROAD		28,000 S.F.	
DEVELOPED			

SCALE IN FEET

SKETCH MAP "D"
PREPARED FOR
AVERY BROOK HOMES, LLC
STODDARD WHARF ROAD
LEDYARD, CONNECTICUT

SHEET 4 OF 6
DATE: 2-6-23 SCALE: 1"=40' JOB NO. 226636

LAND & MARINE SURVEYING ENGINEERING PLANNING

ANGUS McDONALD
GARY SHARPE
& ASSOCIATES, INC
SINCE 1966

P.O. BOX 606, 293 BOSTON POST ROAD
OLD SAYBROOK, CONNECTICUT 06475
TEL. (860) 388-4071 FAX (860) 388-3042

DEEP TEST PIT DATA

WITNESSED AND RECORDED BY WENDY BROWN-ARNOLD RS,REHS AND ALEX WILBOUR LEDGE LIGHT HEALTH DISTRICT ON 5/2/22, 5/3/22 AND 5/23/22ZZ AND WENDY BROWN-ARNOLD RS,REHS ON JUNE 14, 2022.

TP 1
0-19" FILL-DISTURBED
LOAM, ROCKS, BRICK
NO MOTTLING
NO WATER
LEDGE @ 19"

TP 2
0-18" DISTURBED SOIL & FILL
18-50" LIGHT TAN FINE SAND W/GRAVEL & ROCKS
NO MOTTLING
NO WATER
LEDGE @ 50"

TP 3
0-12" TOPSOIL
12-28" LIGHT BROWN FINE SANDY LOAM
28-97" LIGHT TAN FINE SAND W/GRAVEL COBBLES, LARGE STONES
NO MOTTLING
NO WATER
NO LEDGE

TP 4
0-11" TOPSOIL
11-34" LIGHT BROWN FINE SANDY LOAM
34-90" LIGHT TAN/GRAY FINE SAND W/ GRAVEL, SOME COBBLES
MOTTLING @ 84"
WATER @ 90"
NO LEDGE

TP 5
0-16" TOPSOIL
16-49" LIGHT BROWN SILT LOAM, SOME FINE SAND
49-94" TAN/GRAY FINE TO MED. SAND W/ GRAVEL
MOTTLING @ 33"?
WATER @ 33"
NO LEDGE

TP 6
0-6" TOPSOIL
6-37" BROWN FINE TO VERY FINE SANDY LOAM
37-94" TAN/GRAY FINE TO MED. SAND W/ GRAVEL, FEW COBBLES
MOTTLING @ 48"
WATER @ 90"
NO LEDGE

TP 7
0-7" TOPSOIL
7-30" BROWN FINE TO MED. SANDY LOAM
30-77" TAN COARSE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 8
0-10" TOPSOIL
10-34" LIGHT BROWN FINE SANDY LOAM
34-64" ORANGE/TAN COARSE SAND W/GRAVEL
64-93" TAN/GRAY FINE TO MED. SAND
MOTTLING @ 73"
WATER @ 80"
NO LEDGE

TP 9
0-12" TOPSOIL
12-31" BROWN FINE SANDY LOAM
31-98" TAN MED. TO COARSE SAND AND GRAVEL, FEW COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 10
0-11" TOPSOIL
11-32" BROWN FINE SANDY LOAM
32-84" TAN TO GRAY MED. TO COARSE SAND W/ GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 11
0-11" TOPSOIL
11-36" BROWN FINE TO MED. SANDY LOAM
36-98" TAN TO GRAY MED. TO COARSE SAND W/ GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 12
0-12" TOPSOIL
12-29" BROWN FINE TO MED. SANDY LOAM
29-97" BROWN TO TAN MED. TO COARSE SAND W/ GRAVEL, SOME COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 13
0-17" TOPSOIL
17-29" BROWN FINE TO MED. SANDY LOAM
29-91" TAN TO BROWN MED. TO COARSE SAND AND GRAVEL, SOME COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 14
0-8" TOPSOIL
8-28" BROWN FINE TO MED. SANDY LOAM
28-91" TAN MED. TO FINE SAND/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 15
0-12" TOPSOIL
12-39" BROWN FINE SANDY LOAM
39-99" TAN TO OLIVE MED. TO COARSE SAND/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 16
0-11" TOPSOIL
11-37" BROWN FINE TO MED. SANDY LOAM
37-98" TAN TO GRAY MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 17
0-12" TOPSOIL
11-37" BROWN FINE TO MED. SANDY LOAM
37-98" TAN TO GRAY MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 18
0-9" TOPSOIL
9-29" YELLOW TO BROWN FINE SANDY LOAM
29-109" TAN TO OLIVE MED. TO COARSE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 19
0-16" TOPSOIL
16-36" BROWN FINE SANDY LOAM W/SILT
36-94" TAN/GRAY COARSE SAND W/GRAVEL
MOTTLING @ 60"
WATER @ 63"
NO LEDGE

TP 20
0-17" TOPSOIL
17-31" BROWN FINE SANDY LOAM W/SILT
31-80" TAN/GRAY COARSE SAND W/GRAVEL AND FEW COBBLES
MOTTLING @ 43"
WATER @ 68"
NO LEDGE

TP 21
0-17" SANDY FILL & DISTURBED
17-24" TOPSOIL
24-33" BROWN MED. SANDY LOAM
33-88" TAN/BROWN FINE MED. SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 22
0-19" FILL
19-53" BROWN MED. SANDY LOAM
53-103" TAN TO BROWN MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 23
0-17" SANDY FILL AND DISTURBED
17-24" TOPSOIL
24-33" BROWN MED. SANDY LOAM
33-88" TAN TO BROWN MED. SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 24
0-8" TOPSOIL
8-48" BROWN FINE TO MED. SANDY LOAM, SOME COBBLES
48-92" TAN TO GRAY COARSE SAND W/GRAVEL AND COBBLES
MOTTLING @ 60"
WATER 84" UPHILL 32" DOWNHILL
NO LEDGE

TP 25
0-12" TOPSOIL
12-29" BROWN FINE TO MED. SANDY LOAM, SOME SILT
29-79" BROWN TO GRAY MED. TO COARSE SAND W/GRAVEL AND COBBLES
MOTTLING @ 33"
WATER 33", 30" DOWNHILL
NO LEDGE

TP 26
0-9" TOPSOIL
9-36" YELLOW TO BROWN FINE TO MED SILTY LOAM W/TRACE FINE SAND
36-82" BROWN TO GRAY FINE TO MED. SAND W/GRAVEL AND COBBLES, SOME SILT
MOTTLING @ 29"
WATER @ 29"
NO LEDGE

TP 27
0-11" TOPSOIL
11-24" BROWN FINE TO MED. SANDY LOAM
24-39" TAN FINE TO MED. SAND
39-87" TAN TO GRAY MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 28
0-12" TOPSOIL
12-36" LIGHT BROWN FINE TO MED. SANDY LOAM
36-98" LIGHT TAN FINE TO MED. SAND W/ GRAVEL AND COBBLES STRATIFIED
NO MOTTLING
NO WATER
NO LEDGE

TP 29
0-12" TOPSOIL
12-36" BROWN FINE TO MED. SANDY LOAM
36-99" TAN TO GRAY MED. TO FINE SAND W/ GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 30
0-12" TOPSOIL
12-34" BROWN FINE SANDY LOAM (DEPTH VARIES)
34-98" TAN TO GRAY MED. TO FINE SAND W/GRAVEL AND COBBLES STRATIFIED
NO MOTTLING
NO WATER
NO LEDGE

TP 31
0-7" TOPSOIL
7-31" YELLOW TO BROWN FINE TO VERY FINE SANDY LOAM
31-100" TAN FINE TO MED. SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 32
0-8" TOPSOIL
8-34" BROWN FINE SANDY LOAM
34-82" TAN TO GRAY MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 33
0-10" TOPSOIL
10-34" BROWN FINE SANDY LOAM
34-77" TAN TO GRAY MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 34
0-12" TOPSOIL
12-46" YELLOW TO BROWN FINE TO VERY FINE SANDY LOAM
46-89" TAN TO GRAY MED. SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 35
0-10" TOPSOIL
9-21" BROWN FINE SANDY LOAM
21-69" TAN TO BROWN MED. SAND W/GRAVEL, FEW COBBLES
69-110" TAN TO BROWN, MED. SAND W/GRAVEL, FEW COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 36
0-9" TOPSOIL
9-34" BROWN FINE SANDY LOAM
34-94" TAN TO GRAY MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 37
0-9" TOPSOIL
9-39" LIGHT BROWN TO TAN, FINE TO VERY FINE, SANDY LOAM
39-100" LIGHT TAN FINE TO MED. SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 38
0-8" TOPSOIL
8-34" BROWN FINE SANDY LOAM
34-90" TAN TO GRAY MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 39
0-9" TOPSOIL
9-41" LIGHT BROWN FINE SANDY LOAM
41-89" TAN TO GRAY MED. SAND W/GRAVEL AND COBBLES
89"-104" OLIVE TO BROWN FINE SAND,SOME GRAVEL
NO MOTTLING
NO WATER
NO LEDGE

TP 40
0-8" TOPSOIL
8-30" BROWN FINE TO MED. SANDY LOAM
30-56" TAN TO GRAY SILT WITH PATCHY ORANGE IRROR INCONSISTENT AROUND
56-99" TAN TO GRAY MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 41
0-9" TOPSOIL
9-34" BROWN FINE TO MED. SANDY LOAM
34-92" TAN TO GRAY SILT FINE SAND, STAINED
92-107" TAN TO GRAY, FINE TO MED. SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 42
0-9" TOPSOIL
9-14" LIGHT BROWN FINE TO VERY FINE SANDY LOAM
14-50" ORANGE TO GRAY SILT
50-109" TAN TO BROWN FINE TO MED. SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 43
0-9" TOPSOIL
9-34" BROWN FINE SANDY LOAM
34-49" TAN TO GRAY SILT INCONSISTENT AROUND HOLE
49-80" TAN TO MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 44
0-9" TOPSOIL
9-16" BROWN FINE TO MED. SANDY LOAM
16-42" TAN TO GRAY SILT INCONSISTENT AROUND HOLE
42-107" TAN TO GRAY MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 45
0-19" TOPSOIL
17"-23 BROWN FINE TO VERY FINE SANDY LOAM
23-37" GRAY TO TAN VERY FINE SAND W/SILT
37-55" BROWN TO GRAY COARSE SAND W/ GRAVEL AND SOME COBBLES
MOTTLING @ 37"
NO WATER
NO LEDGE

TP 46
0-19" TOPSOIL
19-99" GRAY TO TAN VERY FINE SANDY W/SILT
99-51" GRAY FINE TO MED. SAND W/SILT & HEAVILY MOTTLED THROUGHOUT
51-109" BROWN TO TAN COARSE SAND W/ GRAVEL AND SOME COBBLES
OLD FILTER FABRIC AND GRAVEL @ 72"
MOTTLING @ 99"
WATER @ 98"
NO LEDGE

TP 47
0-10" TOPSOIL
10-66" BROWN FINE TO MED. SANDY LOAM W/SILT
66-41" LIGHT BROWN TO ORANGE SILTY LOAM, STAINED TO GRAY
41-99" BROWN TO GRAY COARSE SAND W/GRAVEL AND SOME COBBLES
NO MOTTLING
WATER @ 98"
NO LEDGE

TP 48
0-10" TOPSOIL
10-24" BROWN FINE TO VERY FINE SANDY LOAM TO SILT
24-108" BROWN TO GRAY FINE TO COARSE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER-WET AT BOTTOM
NO LEDGE

TP 49
0-10" TOPSOIL
10-24" BROWN FINE TO VERY FINE SANDY LOAM
24-41" LIGHT YELLOW TO BROWN VERY FINE SAND W/SILT
92-99" BROWN TO GRAY COARSE SAND WITH GRAVEL, FEW COBBLES
POSSIBLE MOTTLING @ 56"
WATER @ 90"
NO LEDGE

TP 50
0-10" TOPSOIL
10-24" BROWN FINE TO VERY FINE SANDY LOAM
24-41" LIGHT YELLOW TO TAN VERY FINE SAND, W/SILT
41-111" TAN TO BROWN COARSE SAND W/GRAVEL AND SOME COBBLES
NO MOTTLING
WATER @ 109"
NO LEDGE

TP 51
0-10" TOPSOIL
10-20" LIGHT BROWN FINE TO VERY FINE SANDY LOAM
20-42" LIGHT YELLOW TO BROWN VERY FINE SAND W/TRACE SILT
42-101" BROWN TO TAN COARSE SAND WITH GRAVEL, SOME COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 52
0-10" TOPSOIL
10-38" BROWN FINE TO VERY FINE SANDY LOAM
38-90" BROWN TO TAN COARSE TO MED. SAND WITH SOME GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 53
0-13" TOPSOIL
13-38" BROWN FINE TO MED. SANDY LOAM W/GRAVEL AND COBBLES
38-98" BROWN TO TAN COARSE TO FINE, SAND W/GRAVEL AND MANY COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 54
0-11" TOPSOIL
11-36" BROWN FINE TO VERY FINE SANDY LOAM
36-99" BROWN TO TAN COARSE TO MED. SAND W/GRAVEL AND SOME COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 55
0-14" TOPSOIL
14-25" BROWN FINE TO VERY FINE SANDY LOAM
25-37" LIGHT BROWN FINE TO VERY FINE SAND W/SILT
37-110" TAN MED. SAND W/GRAVEL, FEW COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 56
0-19" TOPSOIL
19-48" LIGHT BROWN SILT LOAM ,SOME FINE SAND
48-110" TAN MED. SAND SOME GRAVEL FEW COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 57
0-9" TOPSOIL
9-27" LIGHT BROWN FINE TO VERY FINE SANDY LOAM
27-104" TAN TO BROWN MED. TO COARSE SAND W/GRAVEL, SOME COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 58
0-12" TOPSOIL
12"-36" LIGHT BROWN FINE TO VERY FINE SANDY LOAM
36-98" TAN TO GRAY SILT INCONSISTENT AROUND HOLE WITH SOME GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 59
0-13" TOPSOIL
13-30" BROWN FINE TO MED. SANDY LOAM
30-98" BROWN TO TAN COARSE TO MED. SAND W/GRAVEL AND SOME COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 60
0-10" TOPSOIL
10-23" BROWN FINE TO VERY FINE SANDY LOAM
23-37" BROWN TO TAN COARSE TO MED. SAND WITH GRAVEL, SOME COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 61
0-8" TOPSOIL
8-26" BROWN VERY FINE SANDY LOAM
26-99" TAN TO BROWN COARSE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 62
0-7" TOPSOIL
7-24" LIGHT BROWN VERY FINE SANDY LOAM
24-99" BROWN TO TAN COARSE TO MED. SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 63
0-8" TOPSOIL
8-28" BROWN FINE TO MED. SANDY LOAM
28-98" BROWN TO TAN COARSE TO MED. SAND, W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 64
0-10" TOPSOIL
10-31" BROWN FINE SANDY LOAM
31-91" BROWN TO TAN COARSE TO MED. SAND W/SOME SILT GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 65
0-13" TOPSOIL
13-30" LIGHT BROWN FINE TO VERY FINE SANDY LOAM
30-100" TAN TO BROWN COARSE SAND WITH GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 66
0-10" TOPSOIL
10-28" BROWN FINE SANDY LOAM
28-90" TAN TO GRAY MED. TO COARSE SAND W/SOME GRAVEL
NO MOTTLING
NO WATER
NO LEDGE

TP 67
0-14" TOPSOIL
14-25" LIGHT BROWN FINE TO VERY FINE SANDY LOAM
25-108" TAN TO BROWN FINE TO COARSE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 68
0-11" TOPSOIL
11-29" BROWN FINE TO MED. SANDY LOAM
29-86" TAN TO GRAY MED. TO COARSE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 69
0-12" TOPSOIL
12-34" YELLOW TAN FINE TO VERY FINE SANDY LOAM
34-93" TAN TO BROWN MED. TO FINE SAND W/GRAVEL SOME COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 70
0-14" TOPSOIL
14-34" BROWN FINE TO MED. SANDY LOAM
34-91" TAN MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 71
0-8" TOPSOIL
8-34" BROWN FINE TO MED. SANDY LOAM
34-96" TAN TO GRAY MED. TO FINE SAND W/ GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 72
0-8" TOPSOIL
8-36" BROWN FINE TO MED. SANDY LOAM
36-91" TAN TO GRAY MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
LEDGE-NONE TO 104"

TP 73
0-13" TOPSOIL
13-29" BROWN FINE SANDY LOAM
29-37" YELLOW TAN FINE TO VERY FINE SANDY LOAM
37-90" TAN TO BROWN FINE TO MED. SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 74
0-8" TOPSOIL
8-36" BROWN FINE SANDY LOAM
36-99" TAN TO BROWN FINE TO MED. SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 75
0-12" TOPSOIL
12-29" LIGHT BROWN FINE SANDY LOAM
29-98" TAN TO OLIVE/BROWN FINE TO MED. SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 76
0-12" TOPSOIL
10-34" LIGHT BROWN FINE SANDY LOAM
34-98" TAN TO OLIVE/BROWN FINE TO MED. SAND W/GRAVEL AND COBBLES STRATIFIED
NO MOTTLING
NO WATER
NO LEDGE

TP 77
0-11" TOPSOIL
11-36" BROWN FINE TO MED. SANDY LOAM
36-101" BROWN TO TAN MED. TO FINE SAND WITH GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 78
0-13" TOPSOIL
13-56" BROWN FINE TO MED. SANDY LOAM
48-108" BROWN TO TAN MED. FINE SAND W/ SOME GRAVEL
NO MOTTLING
NO WATER
NO LEDGE

TP 79
0-14" TOPSOIL
11-36" BROWN FINE TO MED. SANDY LOAM
36-90" TAN TO GRAY MED. TO FINE SAND WITH GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 80
0-12" TOPSOIL
12-32" BROWN FINE TO MED. SANDY LOAM
33-99" TAN TO GRAY MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 81
0-12" TOPSOIL
12-36" BROWN FINE TO MED. SANDY LOAM
36-93" TAN TO GRAY MED. TO FINE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 82
0-12" TOPSOIL
13-40" BROWN FINE TO MED. SANDY LOAM
40-98" TAN TO GRAY MED. SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
NO LEDGE

TP 83
0-9" SAND AND GRAVEL FILL
9-18" TOPSOIL
18-52" LIGHT BROWN FINE TO VERY FINE SANDY LOAM, SOME SILT
52-101" TAN TO BROWN FINE TO MED. SAND, SOME GRAVEL
NO MOTTLING
NO WATER
NO LEDGE

TP 84
0-9" TOPSOIL
9-30" BROWN FINE SANDY LOAM
30-99" TAN COARSE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
LEDGE-NONE TO 99"

TP 85
0-9" TOPSOIL
9-31" BROWN FINE SANDY LOAM
31-104" TAN-BROWN COARSE SAND WITH GRAVEL AND COBBLES
NO MOTTLING
NO WATER
LEDGE-NONE TO 104"

TP 86
0-11" TOPSOIL
11-36" BROWN FINE SANDY LOAM
TRACE SILT
36-98" TAN TO BROWN MED-COARSE SAND W/GRAVEL AND COBBLES
NO MOTTLING
WATER @ 79"
LEDGE-NONE TO 98"

TP 87
0-12" TOPSOIL
12-32" BROWN FINE SANDY LOAM
32-98" TAN COARSE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
LEDGE-NONE TO 98"

TP 88
0-8" TOPSOIL
8-30" BROWN FINE SANDY LOAM
30-99" TAN COARSE SAND W/GRAVEL AND COBBLES
NO MOTTLING
NO WATER
LEDGE-NONE TO 99"

TEST HOLE DATA
DATE: 12-8-2022
PRESENT: STUART FAIRBANKS (ALM/GPI)
PETER GAVENDER (OWNER)

TP 100
0-9" TOPSOIL
9-34" ORANGE BROWN FINE SILTY LOAM
34-177" LIGHT GRAY BROWN MEDIUM LOAMY SAND W/ GRAVEL & ROCKS
TUBE @ 47'
BAG @ 42'-48'
NO MOTTLING NO WATER NO LEDGE

TP 101
0-9" TOPSOIL
9-18" TAN FINE SILTY LOAM
18-36" DARK BROWN MEDIUM-COARSE LOAMY SAND & GRAVEL
36-99" GRAY BROWN MEDIUM LOAMY SAND MIXLET OF FINE GRAY SAND 36-45" NORTH SIDE OF TEST HOLE
TUBE @ 36'
BAG @ 30'-36'
MOTTLING @21" WATER @ 28" NO LEDGE

TP 102
0-9" TOPSOIL
9-34" ORANGE BROWN FINE SILTY LOAM
34-177" LIGHT BROWN MEDIUM-COARSE SAND & GRAVEL W/ STONES
TUBE @ 48'
BAG @ 42'-48'
BAG @180-186'
NO MOTTLING WATER @ 204' NO LEDGE

TP 103
0-10" TOPSOIL
10-31" ORANGE BROWN FINE SILTY LOAM
31-196" LIGHT BROWN BANDED MEDIUM-COARSE SAND & GRAVEL W/ STONES
TUBE @ 66'
BAG @ 60'-66'
BAG @ 185'-171'
NO MOTTLING NO WATER NO LEDGE

TP 104
0-7" TOPSOIL
7-37" ORANGE BROWN FINE SILTY LOAM
37-210" LIGHT BROWN BANDED MEDIUM-COARSE SAND & GRAVEL W/ STONES
TUBE @ 66'
BAG @ 60'-66'
NO MOTTLING NO WATER NO LEDGE

TP 105
0-9" TOPSOIL
9-36" ORANGE BROWN FINE SILTY LOAM
36-218" LIGHT BROWN BANDED MEDIUM-COARSE SAND & GRAVEL W/ STONES
TUBE @ 66'
BAG @ 60'-66'
NO MOTTLING NO WATER NO LEDGE

TP 106
0-9" TOPSOIL
9-23" ORANGE BROWN FINE SILTY LOAM
23-204" LIGHT BROWN BANDED MEDIUM-COARSE SAND & GRAVEL W/ STONES
TUBE @ 57'
BAG @ 93-80'
NO MOTTLING NO WATER NO LEDGE

TP 107
0-12" TOPSOIL
12-39" DARK BROWN FINE SILTY LOAM
39-91" BROWN MEDIUM-COARSE BANDED SAND & GRAVEL W/ STONES
NO MOTTLING NO WATER LEDGE @91'

TP 108
0-12" TOPSOIL
13-39" ORANGE BROWN FINE SILTY LOAM
39-210" LIGHT BROWN BANDED MEDIUM-COARSE SAND & GRAVEL W/ STONES
TUBE @ 66'
BAG @ 48-50'
NO MOTTLING NO WATER NO LEDGE

WELL
72" DEEP (30" MONTH TP 107)
WET @ 19'

TP 109
0-11" TOPSOIL
11-36" ORANGE BROWN FINE SILTY LOAM
36-196" LIGHT BROWN BANDED MEDIUM-COARSE SAND & GRAVEL W/ STONES
TUBE @ 56'
BAG @ 48-56'
NO MOTTLING NO WATER NO LEDGE

DETAIL SHEET "A"
PREPARED FOR
AVERY BROOK HOMES, LLC
STODDARD WHARF ROAD
LEDYARD, CONNECTICUT

SHEET 5 OF 6
DATE: 2-6-23 SCALE: AS SHOWN JOB NO. 228636

LAND & MARINE ENGINEERING SURVEYING PLANNING
ANGUS McDONALD GARY SHARPE & ASSOCIATES, INC
SINCE 1966
P.O. BOX 609, 270 BOSTON POST ROAD OLD SAYBROOK, CONNECTICUT 06475 TEL. (860) 388-4071 FAX (860) 388-3961

PERCOLATION TESTS PERFORMED ON MAY 26 & 27, JUNE 3 AND JUNE 10, 2022 BY DIETER & GARDINER, INC. (JODY TERRY AND MATT EMILYA)

LOT 1
27" DEEP

TIME	READING
8:59	2"
9:04	6 3/4"
9:09	9"
9:14	11"
9:19	12 1/2"
9:24	14"
9:29	15 1/2"
9:34	17"
9:39	18 1/4"
9:44	19 1/4"
9:49	20 1/4"

PERC RATE: 1"/5 MINS.

WATER QUALITY BASIN
29" DEEP

TIME	READING
8:51	4"
8:56	10"
9:01	13 3/4"
9:06	18"
9:11	18"
9:16	20"
9:21	21"
9:26	22"
9:31	23"
9:36	24"
9:41	25"

PERC RATE: 1"/5 MINS.

WATER QUALITY BASIN
30" DEEP

TIME	READING
9:00	2 1/2"
9:05	7 1/2"
9:10	12"
9:15	15 1/2"
9:20	18"
9:25	17 1/2"
9:30	19 1/2"
9:35	20 1/2"
9:40	21 1/2"
9:45	22 1/2"

PERC RATE: 1"/5 MINS.

LOT 2
28" DEEP

TIME	READING
9:02	2 1/2"
9:07	13 1/2"
9:12	19"
9:17	22 1/2"
9:22	24 1/2"
9:27	25"
9:32	DRY

PERC RATE: 1"/3.3 MINS.

LOT 2
28" DEEP

TIME	READING
9:55	2"
10:00	6 1/2"
10:05	13"
10:10	17"
10:15	19 1/2"
10:20	22"
10:25	24"
10:30	25"
10:35	26"
10:40	DRY

PERC RATE: 1"/ 5 MINS.

LOT 2
29" DEEP

TIME	READING
1:30	4"
1:35	22"
1:40	23"
1:45	24 1/2"
1:50	25 1/2"
1:55	26 1/2"
2:00	27 1/2"
2:05	28 1/2"
2:10	DRY

PERC RATE: 1"/5 MINS.

LOT 3
30" DEEP

TIME	READING
1:32	4"
1:37	13"
1:42	18"
1:47	20 1/2"
1:52	23"
1:57	24"
2:02	25"
2:07	25 3/4"
2:12	26 3/4"
2:17	27 3/4"

PERC RATE: 1"/5 MINS.

LOT 4
30" DEEP

TIME	READING
1:24	3"
1:29	9 1/2"
1:44	13"
1:49	15 1/2"
1:54	18"
1:59	20"
2:04	21 1/2"
2:09	23"
2:14	24 1/2"
2:19	26"

PERC RATE: 1"/3.3 MINS.

LOT 5
29" DEEP

TIME	READING
1:41	4"
1:46	10"
1:51	13"
1:56	15 1/2"
2:01	17 1/2"
2:06	19"
2:11	20 1/2"
2:16	22"
2:21	23 1/2"
2:26	25"
2:31	26 1/2"

PERC RATE: 1"/3.3 MINS.

LOT 6
27" DEEP

TIME	READING
9:13	4"
9:18	11 1/2"
9:23	16"
9:28	18"
9:33	20"
9:38	21 1/2"
9:43	22"
9:48	23 1/2"
9:53	24 1/2"
9:58	25 1/2"
10:03	DRY

PERC RATE: 1"/5 MINS.

LOT 7
27" DEEP

TIME	READING
9:10	4"
9:15	14 1/2"
9:20	17 1/2"
9:25	21"
9:30	22"
9:35	23"
9:40	24"
9:45	25"
9:50	26"
9:55	DRY

PERC RATE: 1"/5 MINS.

LOT 7
27" DEEP

TIME	READING
9:18	3"
9:23	7"
9:28	10"
9:33	11 3/4"
9:38	13"
9:43	14 1/4"
9:48	15 1/2"
9:53	16 1/2"
9:58	17 7/8"
10:03	19 1/2"

PERC RATE: 1"/3 MINS.

LOT 8
30" DEEP

TIME	READING
11:28	4"
11:33	10"
11:38	12 1/2"
11:43	14 1/2"
11:48	16 1/2"
11:53	17 1/4"
11:58	19"
12:03	20 1/2"
12:08	21 1/8"

PERC RATE: 1"/3 MINS.

LOT 9
32" DEEP

TIME	READING
11:24	3 1/2"
11:29	17 1/2"
11:34	21"
11:39	23 1/2"
11:44	25 1/2"
11:49	27 1/2"
11:54	28"
11:59	30 1/2"
12:04	DRY

PERC RATE: 1"/3.3 MINS.

LOT 9
30" DEEP

TIME	READING
10:41	9"
10:46	12 1/2"
10:51	15"
10:56	17"
11:01	19"
11:06	19 1/2"
11:11	20 1/2"
11:16	21 1/2"
11:21	22 1/2"
11:26	23 1/2"

PERC RATE: 1"/5 MINS.

LOT 10
32" DEEP

TIME	READING
10:39	7"
10:44	11"
10:49	13"
10:54	16 1/2"
10:59	20 1/2"
11:04	22"
11:09	23"
11:14	24"
11:19	25"
11:24	25 3/4"

PERC RATE: 1"/6.7 MINS.

LOT 11
28" DEEP

TIME	READING
10:45	3"
10:50	12"
10:55	14 1/4"
11:00	15 1/4"
11:05	17 1/4"
11:10	19 1/4"
11:15	21"
11:20	22 1/4"
11:25	23 1/4"
11:30	24 1/2"
11:35	25 3/4"

PERC RATE: 1"/4 MINS.

LOT 12
28" DEEP

TIME	READING
10:37	3"
10:42	6 3/4"
10:47	9 1/4"
10:52	12 1/2"
10:57	15"
11:02	17"
11:07	19"
11:12	20"
11:17	21"
11:22	22 1/8"
11:27	23 1/8"

PERC RATE: 1"/5 MINS.

LOT 13
27" DEEP

TIME	READING
8:48	2"
8:53	9"
8:58	14"
9:03	18"
9:08	20"
9:13	22"
9:18	23"
9:23	24"
9:28	25"
9:33	26"
9:38	DRY

PERC RATE: 1"/5 MINS.

LOT 14
30" DEEP

TIME	READING
8:41	4"
8:46	8 1/4"
8:51	10 1/4"
8:56	12 1/2"
9:01	15"
9:06	17"
9:11	18"
9:16	19"
9:21	20"
9:26	21"
9:31	22"

PERC RATE: 1"/5 MINS.

LOT 15
29" DEEP

TIME	READING
8:43	3"
8:48	10 3/4"
8:53	15"
8:58	17 1/2"
9:03	19 1/2"
9:08	21"
9:13	22"
9:18	23"
9:23	23 3/4"
9:28	24 1/2"
9:33	25 1/2"

PERC RATE: 1"/5 MINS.

LOT 16
28" DEEP

TIME	READING
8:40	5 1/2"
8:45	9 1/2"
8:50	11 1/2"
8:55	14"
9:00	15 1/2"
9:05	16 1/2"
9:10	17 3/4"
9:15	18 1/2"
9:20	19 1/2"
9:25	20 1/2"
9:30	21 1/2"

PERC RATE: 1"/5 MINS.

LOT 17
29" DEEP

TIME	READING
1:50	4 1/4"
1:55	11 7/8"
2:00	15 1/2"
2:05	18"
2:10	21"
2:15	23"
2:20	25"
2:25	27"
2:30	28 7/8"
2:35	DRY

PERC RATE: 1"/2.7 MINS.

LOT 18
30" DEEP

TIME	READING
1:30	2 1/2"
1:35	9 1/2"
1:40	13 1/2"
1:45	17"
1:50	17 1/2"
1:55	20"
2:00	21 1/2"
2:05	22 1/2"
2:10	23 1/2"
2:15	24 1/2"

PERC RATE: 1"/5 MINS.

LOT 19
29" DEEP

TIME	READING
10:49	3"
10:54	11"
10:59	15"
11:04	18 1/2"
11:09	20 1/2"
11:14	22"
11:19	23 1/2"
11:24	25"
11:29	26 1/2"

PERC RATE: 1"/3.3 MINS.

LOT 19
30" DEEP

TIME	READING
1:27	2 1/2"
1:32	8 1/2"
1:37	13"
1:42	15 1/2"
1:47	18"
1:52	19 1/2"
1:57	21 1/2"
2:02	23"
2:07	24 1/2"
2:12	26"

PERC RATE: 1"/3.3 MINS.

LOT 20
28" DEEP

TIME	READING
1:38	3"
1:43	12"
1:48	13 1/2"
1:53	16"
1:58	18"
2:03	19"
2:08	20 1/8"
2:13	21 1/2"
2:18	22 1/2"
2:23	23 1/2"
2:28	24 1/2"

PERC RATE: 1"/5 MINS.

LOT 21
30" DEEP

TIME	READING
10:18	2 1/2"
10:23	12"
10:28	15 1/2"
10:33	19 1/2"
10:38	21"
10:43	22 1/2"
10:48	24"
10:53	25"
10:58	25 3/4"
11:03	26 3/4"

PERC RATE: 1"/6 MINS.

LOT 22
29" DEEP

TIME	READING
11:48	3"
11:51	8 1/2"
11:56	9"
12:01	12"
12:06	13 1/2"
12:11	14 1/2"
12:16	16"
12:21	17 1/2"
12:26	18 1/2"
12:31	19 1/2"
12:36	20 1/2"

PERC RATE: 1"/5 MINS.

LOT 22
28" DEEP

TIME	READING
10:15	3"
10:20	11 1/2"
10:25	18 1/2"
10:30	22"
10:35	24"
10:40	25 1/2"
10:45	27"
10:50	DRY

PERC RATE: 1"/3.3 MINS.

LOT 23
28" DEEP

TIME	READING
11:23	3"
11:28	11 3/4"
11:33	17"
11:38	18"
11:43	21 1/2"
11:48	24"
11:53	26"
11:58	DRY

PERC RATE: 1"/2.5 MINS.

LOT 23
29" DEEP

TIME	READING
11:49	3"
11:50	7 3/4"
11:55	11 1/2"
12:00	13 3/4"
12:05	16"
12:10	18"
12:15	20"
12:20	21"
12:25	22 1/2"
12:30	23 1/2"
12:35	25"

PERC RATE: 1"/4 MINS.

LOT 24
28" DEEP

TIME	READING
12:27	3"
12:32	7 1/2"
12:37	11 1/2"
12:42	14"
12:47	16"
12:52	18"
12:57	19"
1:02	20"
1:07	21"
1:12	22"

PERC RATE: 1"/5 MINS.

LOT 25
29" DEEP

TIME	READING
12:30	3"
12:35	12"
12:40	17 1/2"
12:45	20"
12:50	23"
12:55	25"
1:00	26 1/2"
1:05	28"
1:10	DRY

PERC RATE: 1"/3.3 MINS.

LOT 26
30" DEEP

TIME	READING
11:43	3 1/2"
11:48	8"
11:53	10"
10:58	13"
12:03	14 1/2"
12:08	16"
12:13	17"
12:18	18 1/2"
12:23	20"
12:28	21"

PERC RATE: 1"/5 MINS.

MLSS TABLE

LOT NUMBER	DESIGN PDS	GRADIENT	RESTRICTION	HF	FF	PF	MLSS	SYSTEM
1	1, 2, 3 & 4	MLSS	NOT	APPLICABLE	1.5	1.0		ED L.F. GST 6236
2	9, 10, 11 & 12	MLSS	NOT	APPLICABLE	1.5	1.0		ED L.F. GST 6236
3	13 & 14	MLSS	NOT	APPLICABLE	1.5	1.0		40 L.F. GST 6212
4	15 & 16	MLSS	NOT	APPLICABLE	1.5	1.0		40 L.F. GST 6212
5	17 & 18	MLSS	NOT	APPLICABLE	1.5	1.0		40 L.F. GST 6212
6	21 & 22	MLSS	NOT	APPLICABLE	1.5	1.0		36 L.F. GST 6218
7	85 & 86	MLSS	NOT	APPLICABLE	1.5	1.0		ED L.F. GST 6236
8	27 & 28	MLSS	NOT	APPLICABLE	1.5	1.0		40 L.F. GST 6212
9	29, 30, 31 & 32	MLSS	NOT	APPLICABLE	1.5	1.0		40 L.F. GST 6212
10	33 & 34	MLSS	NOT	APPLICABLE	1.5	1.0		40 L.F. GST 6212
11	35 & 36	MLSS	NOT	APPLICABLE	1.5	1.0		40 L.F. GST 6212
12	37 & 38	MLSS	NOT	APPLICABLE	1.5	1.0		40 L.F. GST 6212
13	81 & 82	MLSS	NOT	APPLICABLE	1.5	1.0		36 L.F. GST 6218
14	39 & 40	MLSS	NOT	APPLICABLE	1.5	1.0		ED L.F. GST 6236
15	41 & 42	MLSS	NOT	APPLICABLE	1.5	1.0		ED L.F. GST 6236
16	43 & 44	MLSS	NOT	APPLICABLE	1.5	1.0		ED L.F. GST 6236
17	51 & 52	MLSS	NOT	APPLICABLE	1.5	1.0		40 L.F. GST 6212
18	53 & 54	MLSS	NOT	APPLICABLE	1.5	1.0		40 L.F. GST 6212
19	55 & 56	MLSS	NOT	APPLICABLE	1.5	1.0		ED L.F. GST 6236
20	47 & 48	MLSS	NOT	APPLICABLE	1.5	1.0		ED L.F. GST 6236
21	81 & 82	MLSS	NOT	APPLICABLE	1.5	1.0		ED L.F. GST 6236
22	69 & 70	MLSS	NOT	APPLICABLE	1.5	1.0		ED L.F. GST 6236
23	75 & 76	MLSS	NOT	APPLICABLE	1.5	1.0		40 L.F. GST 6212
24	73 & 74	MLSS	NOT	APPLICABLE	1.5	1.0		ED L.F. GST 6236
25	85, 86, 87 & 72	MLSS	NOT	APPLICABLE	1.5	1.0		40 L.F. GST 6212
26	83 & 84	MLSS	NOT	APPLICABLE	1.5	1.0		ED L.F. GST 6236

DETAIL SHEET "B"
PREPARED FOR
AVERY BROOK HOMES, LLC
STODDARD WHARF ROAD
LEDYARD, CONNECTICUT

SHEET 6 OF 6
DATE: 2-6-23 SCALE: AS SHOWN JOB NO. 226636

LAND & MARINE ENGINEERING SURVEYING PLANNING
ANGUS McDONALD
GARY SHARPE
& ASSOCIATES, INC
SINCE 1966
P.O. BOX 849, 333 BOSTON POST ROAD
OLD SAYBROOK, CONNECTICUT 06475
TEL. (860) 388-4971 FAX (860) 388-3662

Appendix B

Washed Sieve Analysis Results

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 100 42-48", Split 1 of 2

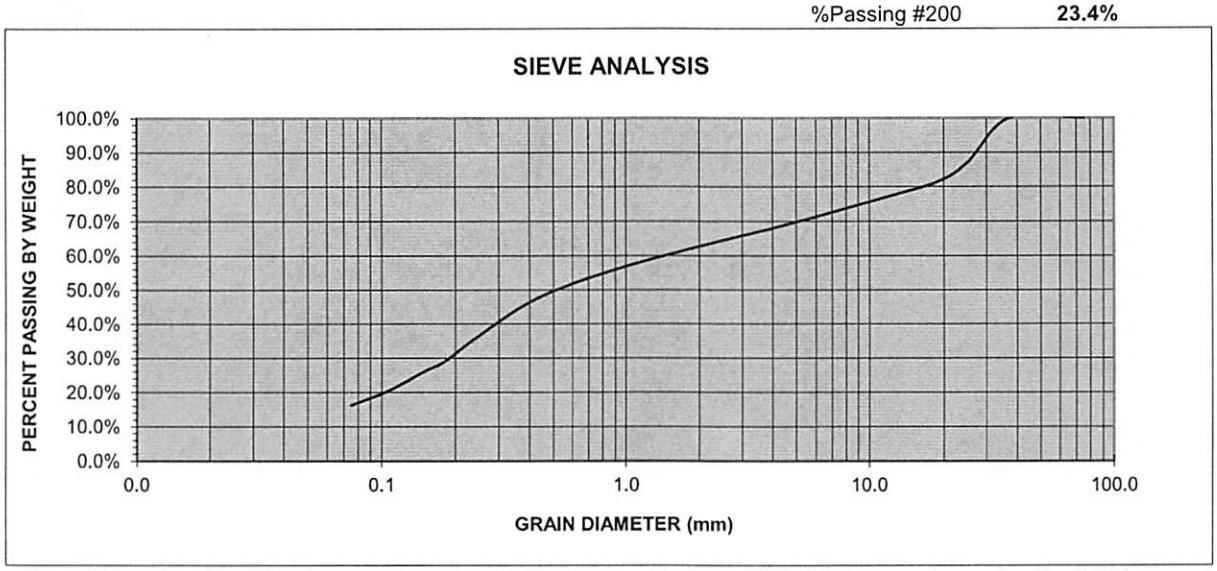
MOIST WEIGHT	=	**0.764 Kg**
TOTAL DRY WEIGHT	=	**0.728 Kg**
DRY WEIGHT AFTER WASH	=	**0.610 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.000	0.0%	100.0%
1"	25.0	0.096	13.2%	86.8%
3/4"	19.0	0.040	5.5%	81.3%
1/2"	12.5	0.028	3.8%	77.5%
#4	4.75	0.060	8.2%	69.2%
#10	2.00	0.048	6.6%	62.6%
#20	0.850	0.054	7.4%	55.2%
#40	0.425	0.058	8.0%	47.3%
#60	0.250	0.078	10.7%	36.5%
#80	0.180	0.056	7.7%	28.8%
#100	0.150	0.020	2.7%	26.1%
#140	0.106	0.042	5.8%	20.3%
#200	0.075	0.030	4.1%	16.2%
Passing #200		0.118	16.2%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**4.95%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**18.7%**
Fine Gravel	**12.1%**
Coarse Sand	**6.6%**
Medium Sand	**15.4%**
Fine Sand	**31.0%**
Silt & Clay	**16.2%**
Uniformity Coeff.	**34.39**
Permeability Range **	
Dense	2 ft/day
Loose	7 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**30.8%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**90.5%**	**70%-100%**
%Passing #40	**68.3%**	***10%-50%**
%Passing #100	**37.7%**	**0%-20%**
%Passing #200	**23.4%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 100 42-48", Split 2 of 2

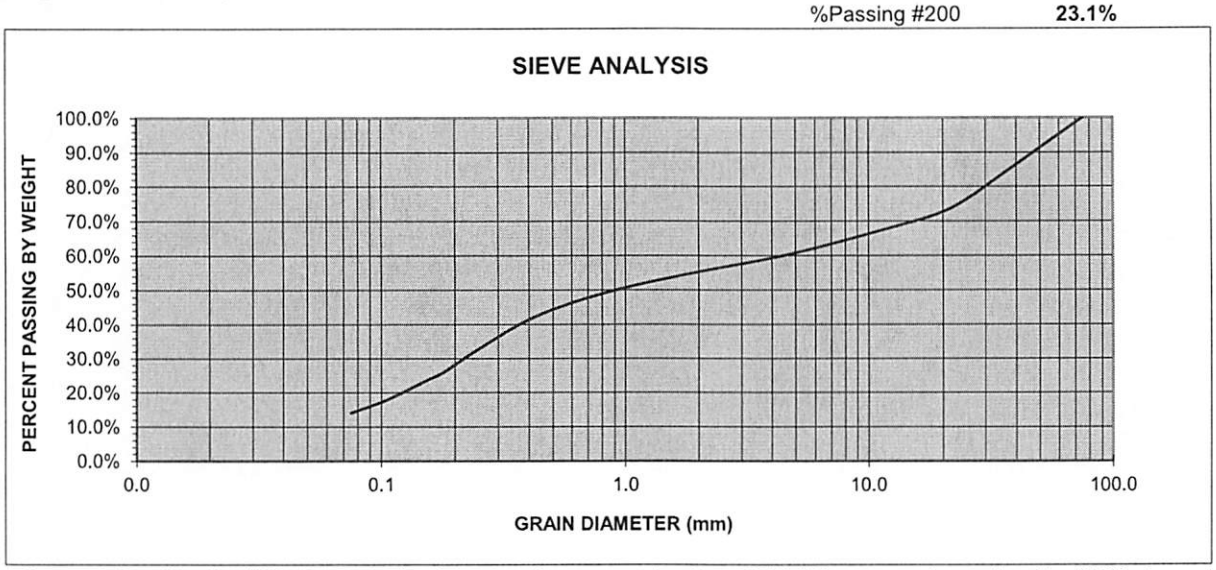
MOIST WEIGHT	=	**0.858 Kg**
TOTAL DRY WEIGHT	=	**0.82 Kg**
DRY WEIGHT AFTER WASH	=	**0.706 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.124	15.1%	84.9%
1"	25.0	0.072	8.8%	76.1%
3/4"	19.0	0.034	4.1%	72.0%
1/2"	12.5	0.032	3.9%	68.0%
#4	4.75	0.064	7.8%	60.2%
#10	2.00	0.042	5.1%	55.1%
#20	0.850	0.048	5.9%	49.3%
#40	0.425	0.058	7.1%	42.2%
#60	0.250	0.078	9.5%	32.7%
#80	0.180	0.056	6.8%	25.9%
#100	0.150	0.022	2.7%	23.2%
#140	0.106	0.044	5.4%	17.8%
#200	0.075	0.032	3.9%	13.9%
Passing #200		0.114	13.9%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**4.63%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**28.0%**
Fine Gravel	**11.7%**
Coarse Sand	**5.1%**
Medium Sand	**12.9%**
Fine Sand	**28.3%**
Silt & Clay	**13.9%**
Uniformity Coeff.	**85.62**
Permeability Range **	
Dense	3 ft/day
Loose	10 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**39.8%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**91.5%**	**70%-100%**
%Passing #40	**70.0%**	***10%-50%**
%Passing #100	**38.5%**	**0%-20%**
%Passing #200	**23.1%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size. Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day. Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 101 30-36", Split 1 of 2

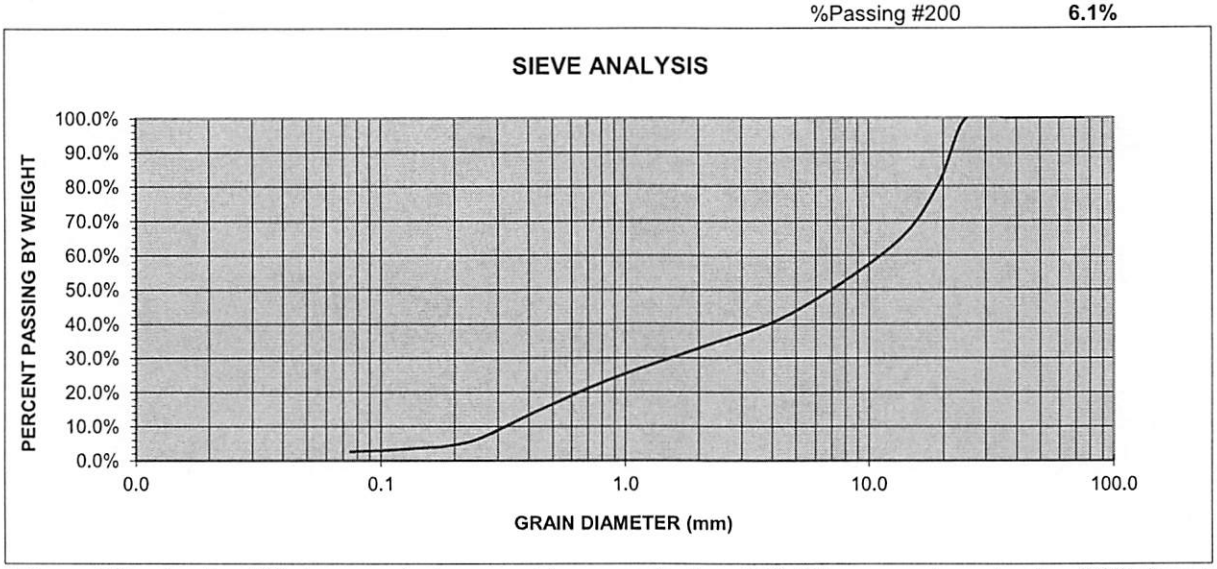
MOIST WEIGHT	=	**0.594 Kg**
TOTAL DRY WEIGHT	=	**0.536 Kg**
DRY WEIGHT AFTER WASH	=	**0.522 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.000	0.0%	100.0%
1"	25.0	0.000	0.0%	100.0%
3/4"	19.0	0.108	20.1%	79.9%
1/2"	12.5	0.092	17.2%	62.7%
#4	4.75	0.106	19.8%	42.9%
#10	2.00	0.054	10.1%	32.8%
#20	0.850	0.050	9.3%	23.5%
#40	0.425	0.050	9.3%	14.2%
#60	0.250	0.042	7.8%	6.3%
#80	0.180	0.012	2.2%	4.1%
#100	0.150	0.002	0.4%	3.7%
#140	0.106	0.004	0.7%	3.0%
#200	0.075	0.002	0.4%	2.6%
Passing #200		0.014	2.6%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**10.82%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**20.1%**
Fine Gravel	**36.9%**
Coarse Sand	**10.1%**
Medium Sand	**18.7%**
Fine Sand	**11.6%**
Silt & Clay	**2.6%**
Uniformity Coeff.	**34.51**
Permeability Range **	
Dense	125 ft/day
Loose	374 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**57.1%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**76.5%**	**70%-100%**
%Passing #40	**33.0%**	***10%-50%**
%Passing #100	**8.7%**	**0%-20%**
%Passing #200	**6.1%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 101 30-36", Split 2 of 2

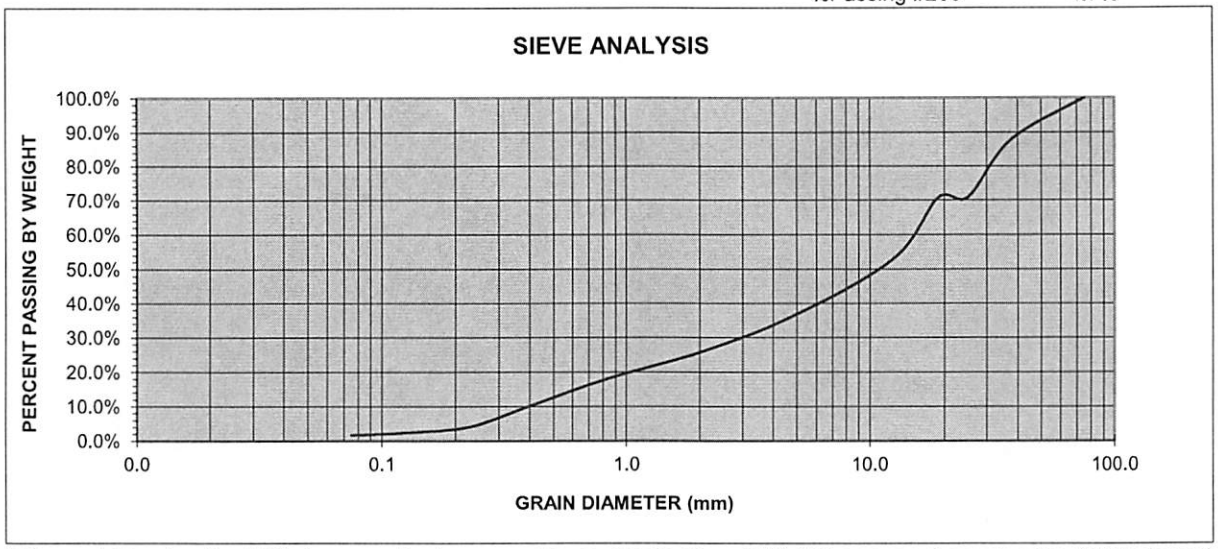
MOIST WEIGHT	=	**0.648 Kg**
TOTAL DRY WEIGHT	=	**0.594 Kg**
DRY WEIGHT AFTER WASH	=	**0.584 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.074	12.5%	87.5%
1"	25.0	0.100	16.8%	70.7%
3/4"	19.0	0.000	0.0%	70.7%
1/2"	12.5	0.106	17.8%	52.9%
#4	4.75	0.100	16.8%	36.0%
#10	2.00	0.062	10.4%	25.6%
#20	0.850	0.044	7.4%	18.2%
#40	0.425	0.044	7.4%	10.8%
#60	0.250	0.036	6.1%	4.7%
#80	0.180	0.010	1.7%	3.0%
#100	0.150	0.002	0.3%	2.7%
#140	0.106	0.004	0.7%	2.0%
#200	0.075	0.002	0.3%	1.7%
Passing #200		0.010	1.7%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**9.09%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**29.3%**
Fine Gravel	**34.7%**
Coarse Sand	**10.4%**
Medium Sand	**14.8%**
Fine Sand	**9.1%**
Silt & Clay	**1.7%**
Uniformity Coeff.	**37.50**
Permeability Range **	
Dense	184 ft/day
Loose	552 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**64.0%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**71.0%**	**70%-100%**
%Passing #40	**29.9%**	***10%-50%**
%Passing #100	**7.5%**	**0%-20%**
%Passing #200	**4.7%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 102 42-48", Split 1 of 2

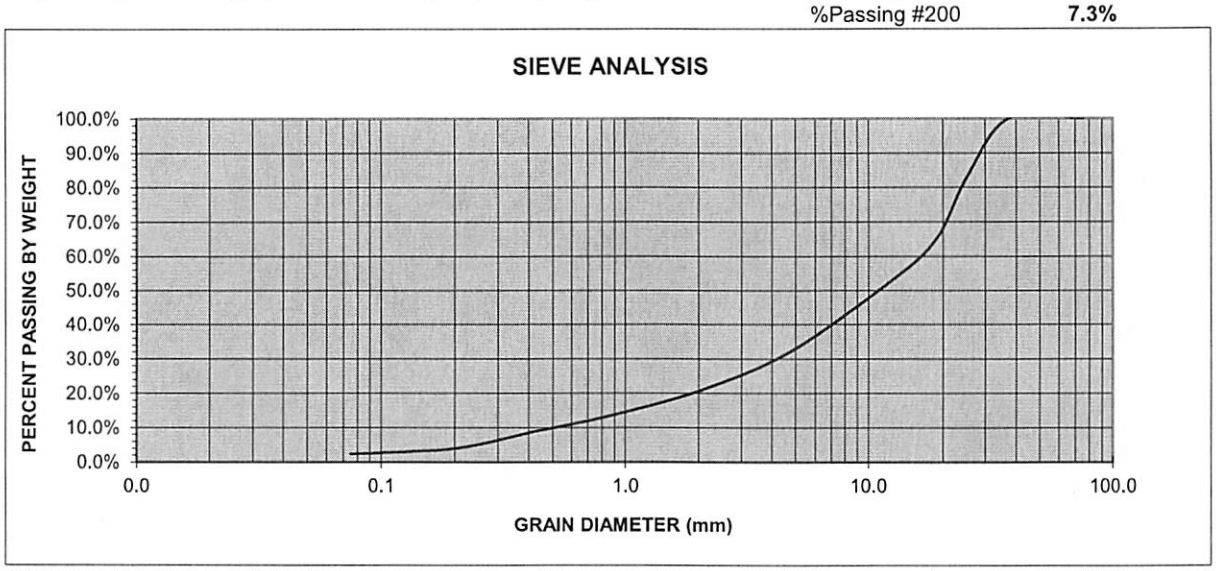
MOIST WEIGHT	=	**0.7 Kg**
TOTAL DRY WEIGHT	=	**0.68 Kg**
DRY WEIGHT AFTER WASH	=	**0.664 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.000	0.0%	100.0%
1"	25.0	0.118	17.4%	82.6%
3/4"	19.0	0.118	17.4%	65.3%
1/2"	12.5	0.084	12.4%	52.9%
#4	4.75	0.142	20.9%	32.1%
#10	2.00	0.078	11.5%	20.6%
#20	0.850	0.050	7.4%	13.2%
#40	0.425	0.030	4.4%	8.8%
#60	0.250	0.026	3.8%	5.0%
#80	0.180	0.010	1.5%	3.5%
#100	0.150	0.002	0.3%	3.2%
#140	0.106	0.004	0.6%	2.6%
#200	0.075	0.002	0.3%	2.4%
Passing #200		0.016	2.4%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**2.94%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**34.7%**
Fine Gravel	**33.2%**
Coarse Sand	**11.5%**
Medium Sand	**11.8%**
Fine Sand	**6.5%**
Silt & Clay	**2.4%**
Uniformity Coeff.	**30.12**
Permeability Range **	
Dense	329 ft/day
Loose	986 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**67.9%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**64.2%**	**70%-100%**
%Passing #40	**27.5%**	***10%-50%**
%Passing #100	**10.1%**	**0%-20%**
%Passing #200	**7.3%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size. Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day. Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 102 42-48", Split 2 of 2

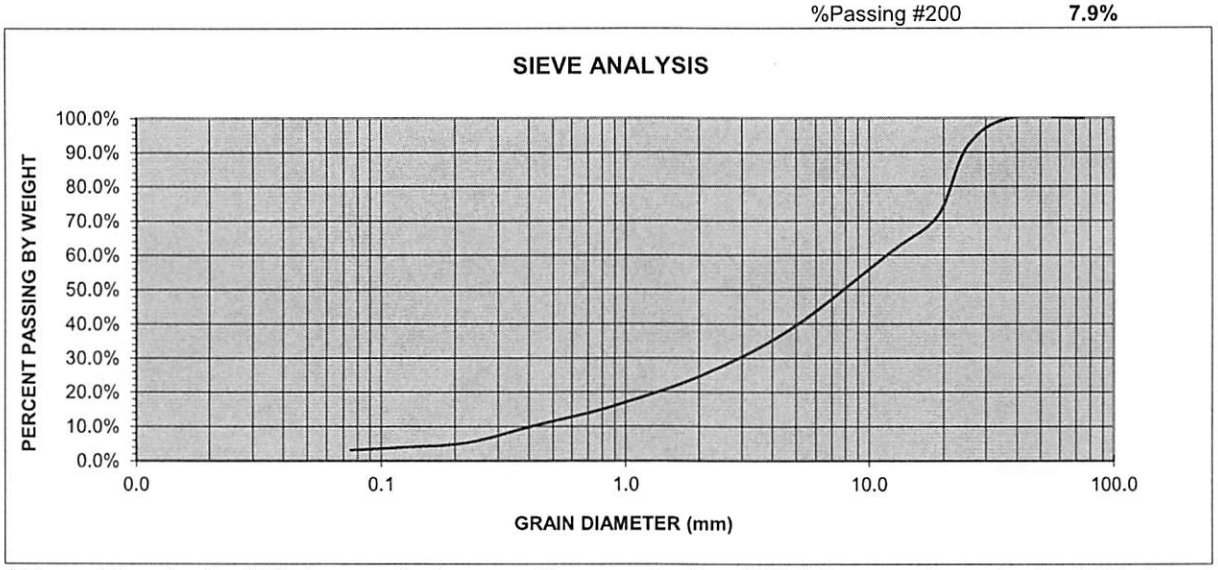
MOIST WEIGHT	=	**0.75 Kg**
TOTAL DRY WEIGHT	=	**0.728 Kg**
DRY WEIGHT AFTER WASH	=	**0.706 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.000	0.0%	100.0%
1"	25.0	0.062	8.5%	91.5%
3/4"	19.0	0.146	20.1%	71.4%
1/2"	12.5	0.074	10.2%	61.3%
#4	4.75	0.166	22.8%	38.5%
#10	2.00	0.102	14.0%	24.5%
#20	0.850	0.066	9.1%	15.4%
#40	0.425	0.038	5.2%	10.2%
#60	0.250	0.032	4.4%	5.8%
#80	0.180	0.010	1.4%	4.4%
#100	0.150	0.002	0.3%	4.1%
#140	0.106	0.004	0.5%	3.6%
#200	0.075	0.004	0.5%	3.0%
Passing #200		0.022	3.0%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**3.02%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**28.6%**
Fine Gravel	**33.0%**
Coarse Sand	**14.0%**
Medium Sand	**14.3%**
Fine Sand	**7.1%**
Silt & Clay	**3.0%**
Uniformity Coeff.	**28.85**
Permeability Range **	
Dense	199 ft/day
Loose	596 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**61.5%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**63.6%**	**70%-100%**
%Passing #40	**26.4%**	***10%-50%**
%Passing #100	**10.7%**	**0%-20%**
%Passing #200	**7.9%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 102 180-186", Split 1 of 2

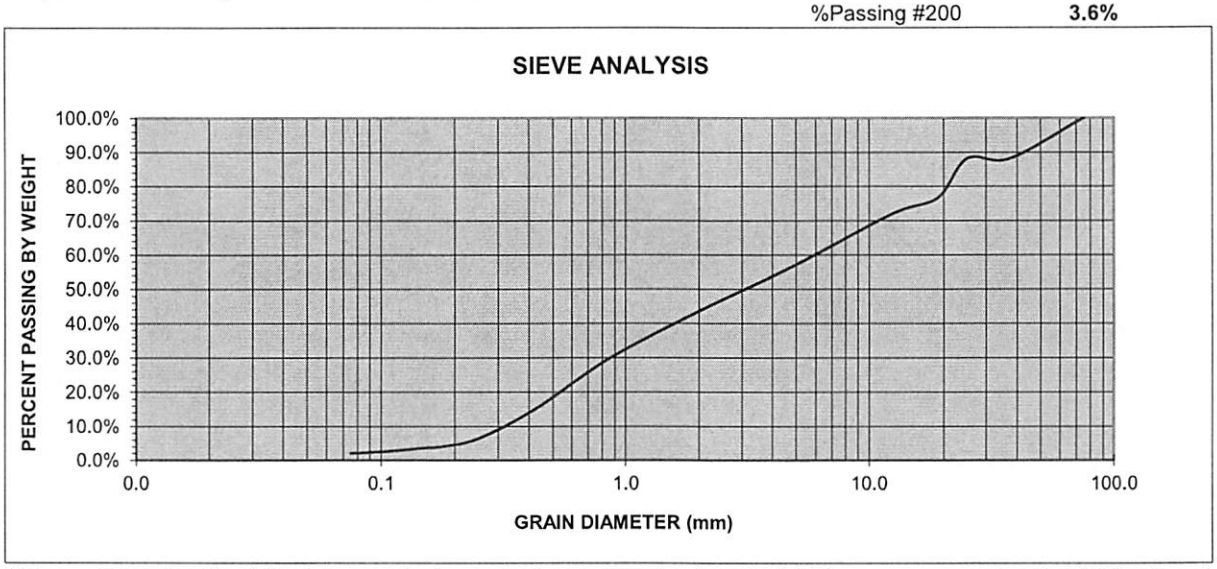
MOIST WEIGHT	=	**0.802 Kg**
TOTAL DRY WEIGHT	=	**0.786 Kg**
DRY WEIGHT AFTER WASH	=	**0.770 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.094	12.0%	88.0%
1"	25.0	0.000	0.0%	88.0%
3/4"	19.0	0.090	11.5%	76.6%
1/2"	12.5	0.036	4.6%	72.0%
#4	4.75	0.124	15.8%	56.2%
#10	2.00	0.100	12.7%	43.5%
#20	0.850	0.110	14.0%	29.5%
#40	0.425	0.114	14.5%	15.0%
#60	0.250	0.068	8.7%	6.4%
#80	0.180	0.018	2.3%	4.1%
#100	0.150	0.004	0.5%	3.6%
#140	0.106	0.008	1.0%	2.5%
#200	0.075	0.004	0.5%	2.0%
Passing #200		0.016	2.0%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**2.04%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**23.4%**
Fine Gravel	**20.4%**
Coarse Sand	**12.7%**
Medium Sand	**28.5%**
Fine Sand	**13.0%**
Silt & Clay	**2.0%**
Uniformity Coeff.	**20.40**
Permeability Range **	
Dense	119 ft/day
Loose	356 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**43.8%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**77.4%**	**70%-100%**
%Passing #40	**26.7%**	***10%-50%**
%Passing #100	**6.3%**	**0%-20%**
%Passing #200	**3.6%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 102 180-186", Split 2 of 2

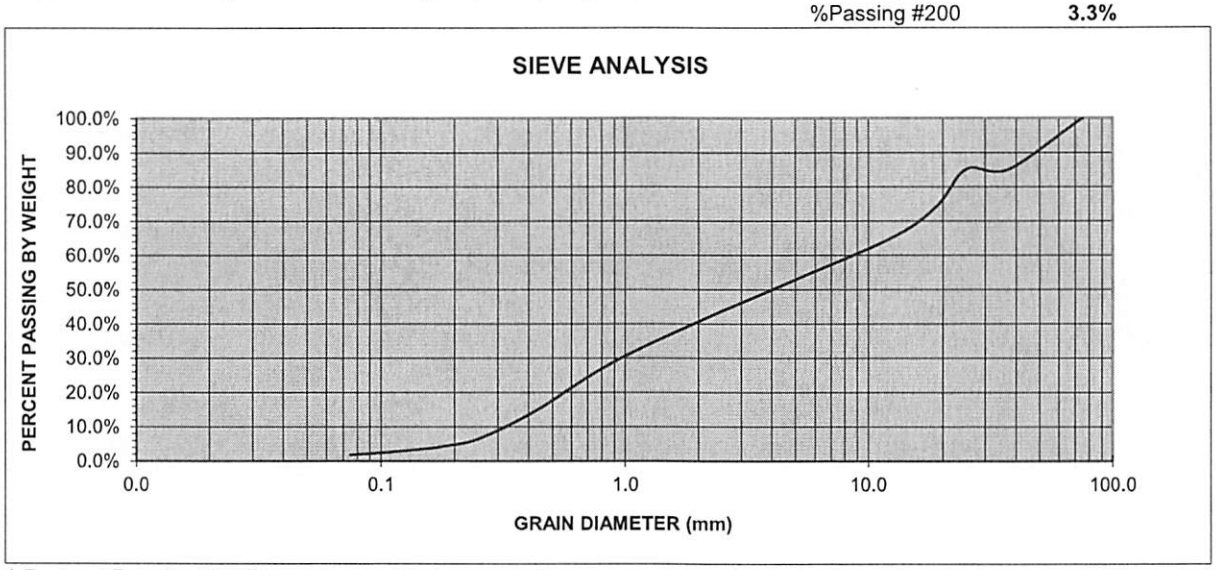
MOIST WEIGHT	=	**0.832 Kg**
TOTAL DRY WEIGHT	=	**0.818 Kg**
DRY WEIGHT AFTER WASH	=	**0.804 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.122	14.9%	85.1%
1"	25.0	0.000	0.0%	85.1%
3/4"	19.0	0.088	10.8%	74.3%
1/2"	12.5	0.076	9.3%	65.0%
#4	4.75	0.106	13.0%	52.1%
#10	2.00	0.094	11.5%	40.6%
#20	0.850	0.104	12.7%	27.9%
#40	0.425	0.110	13.4%	14.4%
#60	0.250	0.066	8.1%	6.4%
#80	0.180	0.018	2.2%	4.2%
#100	0.150	0.006	0.7%	3.4%
#140	0.106	0.008	1.0%	2.4%
#200	0.075	0.006	0.7%	1.7%
Passing #200		0.014	1.7%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**1.71%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**25.7%**
Fine Gravel	**22.2%**
Coarse Sand	**11.5%**
Medium Sand	**26.2%**
Fine Sand	**12.7%**
Silt & Clay	**1.7%**
Uniformity Coeff.	**28.84**
Permeability Range **	
Dense	123 ft/day
Loose	368 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**47.9%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**77.9%**	**70%-100%**
%Passing #40	**27.7%**	***10%-50%**
%Passing #100	**6.6%**	**0%-20%**
%Passing #200	**3.3%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size. Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day. Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 103 42-48", Split 1 of 2

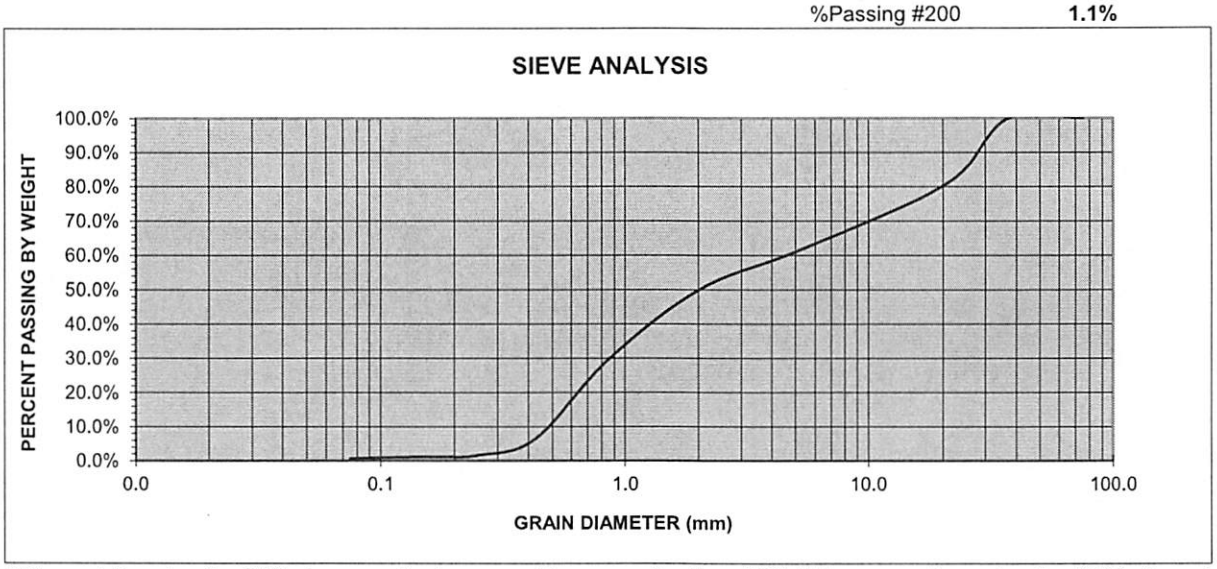
MOIST WEIGHT	=	**0.958 Kg**
TOTAL DRY WEIGHT	=	**0.932 Kg**
DRY WEIGHT AFTER WASH	=	**0.926 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.000	0.0%	100.0%
1"	25.0	0.136	14.6%	85.4%
3/4"	19.0	0.058	6.2%	79.2%
1/2"	12.5	0.060	6.4%	72.7%
#4	4.75	0.116	12.4%	60.3%
#10	2.00	0.098	10.5%	49.8%
#20	0.850	0.190	20.4%	29.4%
#40	0.425	0.216	23.2%	6.2%
#60	0.250	0.044	4.7%	1.5%
#80	0.180	0.004	0.4%	1.1%
#100	0.150	0.000	0.0%	1.1%
#140	0.106	0.002	0.2%	0.9%
#200	0.075	0.002	0.2%	0.6%
Passing #200		0.006	0.6%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**2.79%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**20.8%**
Fine Gravel	**18.9%**
Coarse Sand	**10.5%**
Medium Sand	**43.6%**
Fine Sand	**5.6%**
Silt & Clay	**0.6%**
Uniformity Coeff.	**9.45**
Permeability Range **	
Dense	277 ft/day
Loose	831 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**39.7%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**82.6%**	**70%-100%**
%Passing #40	**10.3%**	***10%-50%**
%Passing #100	**1.8%**	**0%-20%**
%Passing #200	**1.1%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size. Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day. Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 103 42-48", Split 2 of 2

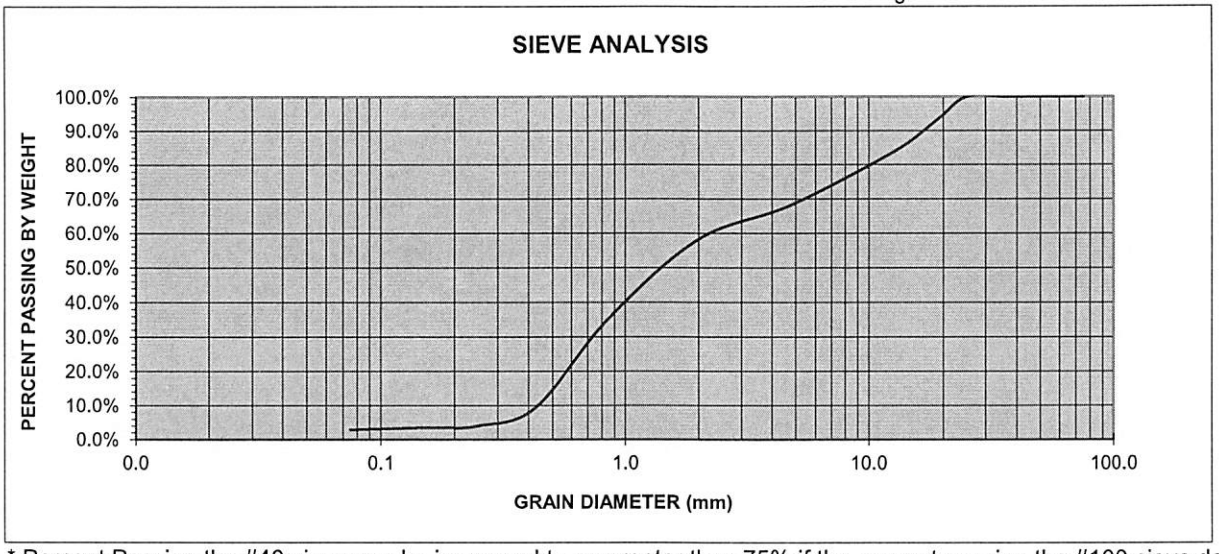
MOIST WEIGHT	=	**0.79 Kg**
TOTAL DRY WEIGHT	=	**0.764 Kg**
DRY WEIGHT AFTER WASH	=	**0.742 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.000	0.0%	100.0%
1"	25.0	0.000	0.0%	100.0%
3/4"	19.0	0.052	6.8%	93.2%
1/2"	12.5	0.074	9.7%	83.5%
#4	4.75	0.118	15.4%	68.1%
#10	2.00	0.076	9.9%	58.1%
#20	0.850	0.176	23.0%	35.1%
#40	0.425	0.198	25.9%	9.2%
#60	0.250	0.040	5.2%	3.9%
#80	0.180	0.004	0.5%	3.4%
#100	0.150	0.000	0.0%	3.4%
#140	0.106	0.002	0.3%	3.1%
#200	0.075	0.002	0.3%	2.9%
Passing #200		0.022	2.9%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**3.40%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**6.8%**
Fine Gravel	**25.1%**
Coarse Sand	**9.9%**
Medium Sand	**49.0%**
Fine Sand	**6.3%**
Silt & Clay	**2.9%**
Uniformity Coeff.	**5.75**
Permeability Range **	
Dense	218 ft/day
Loose	655 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**31.9%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**85.4%**	**70%-100%**
%Passing #40	**13.5%**	***10%-50%**
%Passing #100	**5.0%**	**0%-20%**
%Passing #200	**4.2%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 103 165-171", Split 1 of 2

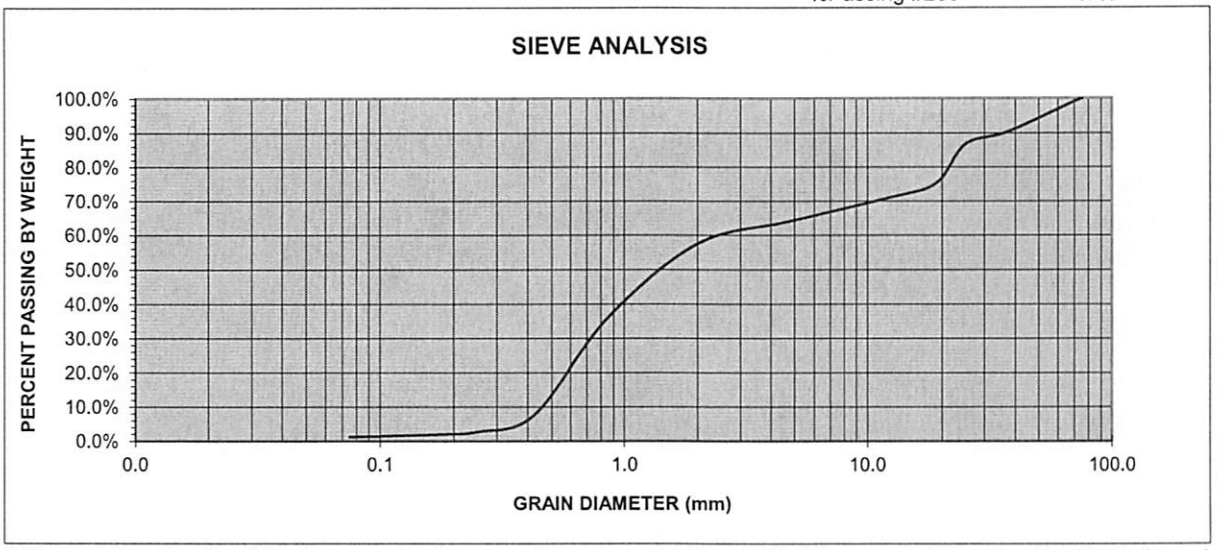
MOIST WEIGHT	=	**0.85 Kg**
TOTAL DRY WEIGHT	=	**0.822 Kg**
DRY WEIGHT AFTER WASH	=	**0.812 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.080	9.7%	90.3%
1"	25.0	0.030	3.6%	86.6%
3/4"	19.0	0.094	11.4%	75.2%
1/2"	12.5	0.034	4.1%	71.0%
#4	4.75	0.058	7.1%	64.0%
#10	2.00	0.054	6.6%	57.4%
#20	0.850	0.178	21.7%	35.8%
#40	0.425	0.232	28.2%	7.5%
#60	0.250	0.040	4.9%	2.7%
#80	0.180	0.006	0.7%	1.9%
#100	0.150	0.002	0.2%	1.7%
#140	0.106	0.002	0.2%	1.5%
#200	0.075	0.002	0.2%	1.2%
Passing #200		0.010	1.2%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**3.41%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**24.8%**
Fine Gravel	**11.2%**
Coarse Sand	**6.6%**
Medium Sand	**49.9%**
Fine Sand	**6.3%**
Silt & Clay	**1.2%**
Uniformity Coeff.	**6.67**
Permeability Range **	
Dense	242 ft/day
Loose	726 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**36.0%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**89.7%**	**70%-100%**
%Passing #40	**11.8%**	***10%-50%**
%Passing #100	**2.7%**	**0%-20%**
%Passing #200	**1.9%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 103 165-171", Split 2 of 2

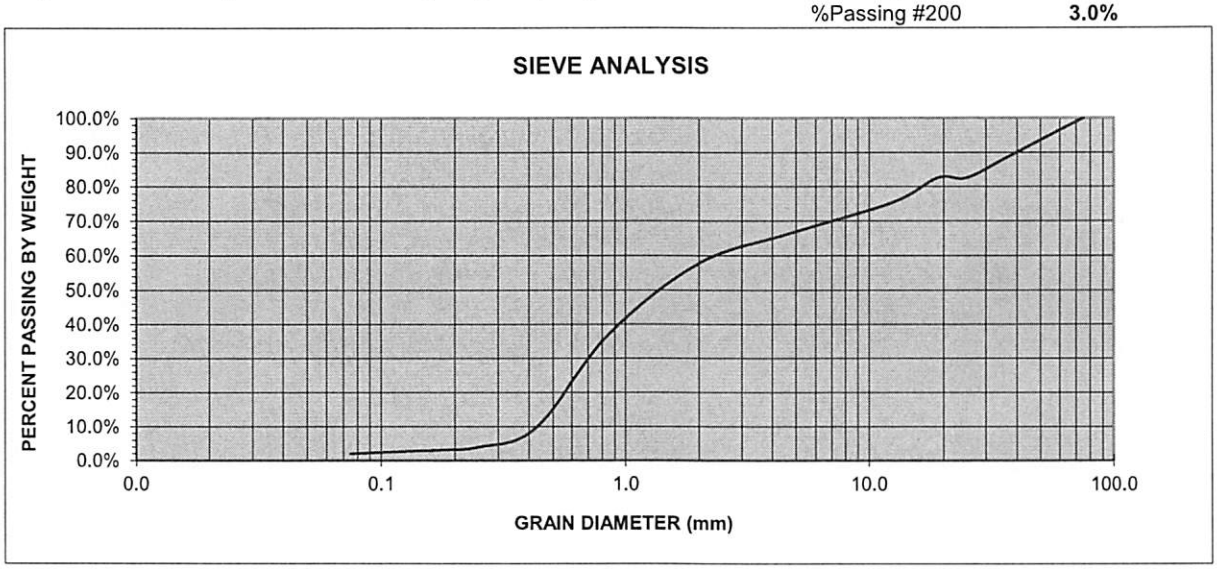
MOIST WEIGHT	=	**0.948 Kg**
TOTAL DRY WEIGHT	=	**0.916 Kg**
DRY WEIGHT AFTER WASH	=	**0.898 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.102	11.1%	88.9%
1"	25.0	0.058	6.3%	82.5%
3/4"	19.0	0.000	0.0%	82.5%
1/2"	12.5	0.066	7.2%	75.3%
#4	4.75	0.082	9.0%	66.4%
#10	2.00	0.080	8.7%	57.6%
#20	0.850	0.190	20.7%	36.9%
#40	0.425	0.252	27.5%	9.4%
#60	0.250	0.050	5.5%	3.9%
#80	0.180	0.008	0.9%	3.1%
#100	0.150	0.002	0.2%	2.8%
#140	0.106	0.004	0.4%	2.4%
#200	0.075	0.004	0.4%	2.0%
Passing #200		0.018	2.0%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**3.49%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**17.5%**
Fine Gravel	**16.2%**
Coarse Sand	**8.7%**
Medium Sand	**48.3%**
Fine Sand	**7.4%**
Silt & Clay	**2.0%**
Uniformity Coeff.	**6.31**
Permeability Range **	
Dense	214 ft/day
Loose	642 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**33.6%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**86.8%**	**70%-100%**
%Passing #40	**14.1%**	***10%-50%**
%Passing #100	**4.3%**	**0%-20%**
%Passing #200	**3.0%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 104 42-48", Split 1 of 2

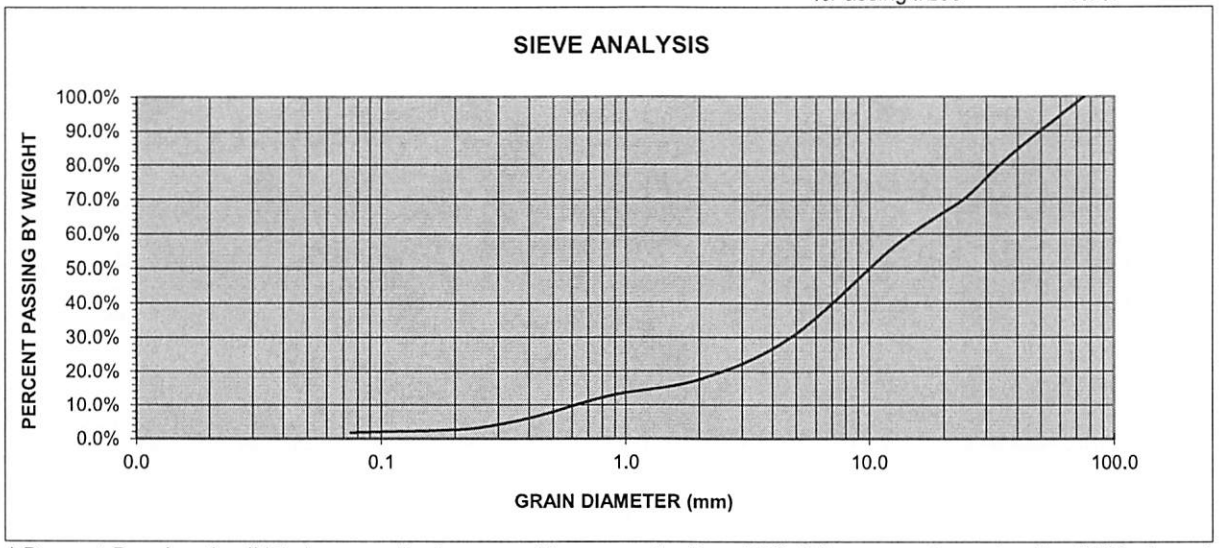
MOIST WEIGHT	=	**0.918 Kg**
TOTAL DRY WEIGHT	=	**0.904 Kg**
DRY WEIGHT AFTER WASH	=	**0.888 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.156	17.3%	82.7%
1"	25.0	0.108	11.9%	70.8%
3/4"	19.0	0.052	5.8%	65.0%
1/2"	12.5	0.082	9.1%	56.0%
#4	4.75	0.236	26.1%	29.9%
#10	2.00	0.112	12.4%	17.5%
#20	0.850	0.044	4.9%	12.6%
#40	0.425	0.056	6.2%	6.4%
#60	0.250	0.030	3.3%	3.1%
#80	0.180	0.006	0.7%	2.4%
#100	0.150	0.002	0.2%	2.2%
#140	0.106	0.002	0.2%	2.0%
#200	0.075	0.002	0.2%	1.8%
Passing #200		0.016	1.8%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**1.55%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**35.0%**
Fine Gravel	**35.2%**
Coarse Sand	**12.4%**
Medium Sand	**11.1%**
Fine Sand	**4.6%**
Silt & Clay	**1.8%**
Uniformity Coeff.	**22.93**
Permeability Range **	
Dense	510 ft/day
Loose	1531 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**70.1%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**58.5%**	**70%-100%**
%Passing #40	**21.5%**	***10%-50%**
%Passing #100	**7.4%**	**0%-20%**
%Passing #200	**5.9%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 104 42-48", Split 2 of 2

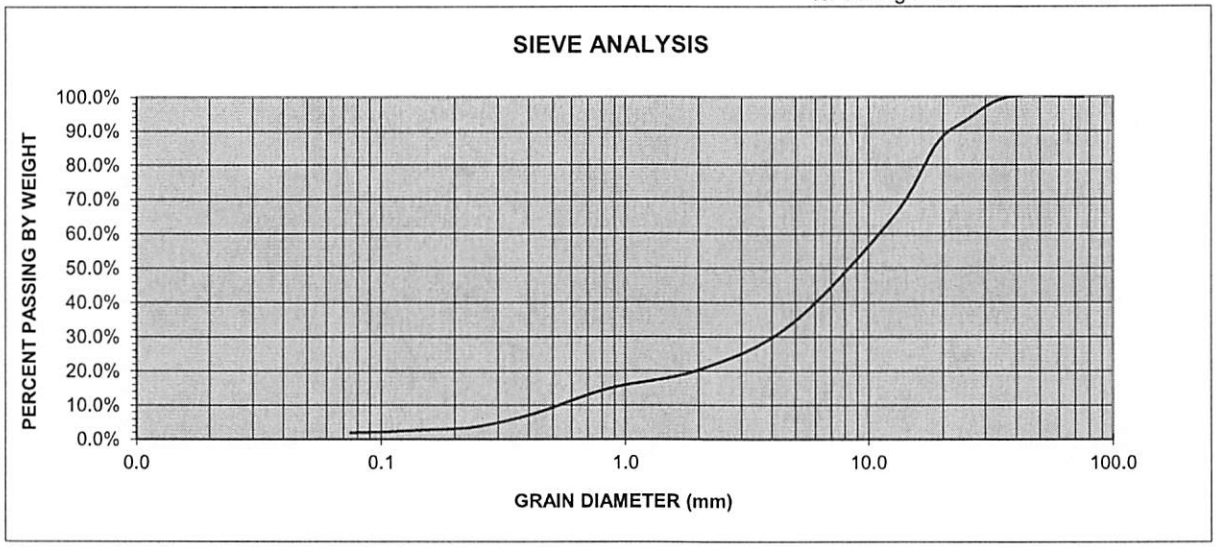
MOIST WEIGHT	=	**0.786 Kg**
TOTAL DRY WEIGHT	=	**0.774 Kg**
DRY WEIGHT AFTER WASH	=	**0.760 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.000	0.0%	100.0%
1"	25.0	0.054	7.0%	93.0%
3/4"	19.0	0.052	6.7%	86.3%
1/2"	12.5	0.170	22.0%	64.3%
#4	4.75	0.240	31.0%	33.3%
#10	2.00	0.102	13.2%	20.2%
#20	0.850	0.042	5.4%	14.7%
#40	0.425	0.056	7.2%	7.5%
#60	0.250	0.030	3.9%	3.6%
#80	0.180	0.006	0.8%	2.8%
#100	0.150	0.002	0.3%	2.6%
#140	0.106	0.004	0.5%	2.1%
#200	0.075	0.002	0.3%	1.8%
Passing #200		0.014	1.8%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**1.55%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**13.7%**
Fine Gravel	**53.0%**
Coarse Sand	**13.2%**
Medium Sand	**12.7%**
Fine Sand	**5.7%**
Silt & Clay	**1.8%**
Uniformity Coeff.	**19.95**
Permeability Range **	
Dense	371 ft/day
Loose	1114 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**66.7%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**60.5%**	**70%-100%**
%Passing #40	**22.5%**	***10%-50%**
%Passing #100	**7.8%**	**0%-20%**
%Passing #200	**5.4%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size. Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day. Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 105 42-48", Split 1 of 2

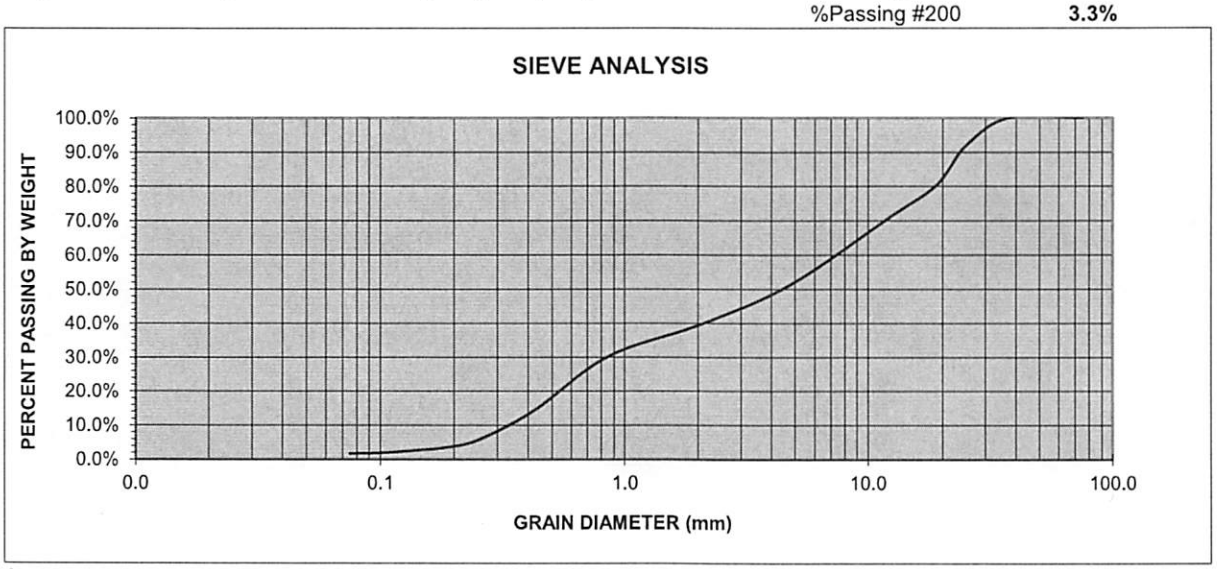
MOIST WEIGHT	=	**0.728 Kg**
TOTAL DRY WEIGHT	=	**0.712 Kg**
DRY WEIGHT AFTER WASH	=	**0.700 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.000	0.0%	100.0%
1"	25.0	0.058	8.1%	91.9%
3/4"	19.0	0.082	11.5%	80.3%
1/2"	12.5	0.064	9.0%	71.3%
#4	4.75	0.144	20.2%	51.1%
#10	2.00	0.084	11.8%	39.3%
#20	0.850	0.066	9.3%	30.1%
#40	0.425	0.112	15.7%	14.3%
#60	0.250	0.062	8.7%	5.6%
#80	0.180	0.016	2.2%	3.4%
#100	0.150	0.004	0.6%	2.8%
#140	0.106	0.006	0.8%	2.0%
#200	0.075	0.002	0.3%	1.7%
Passing #200		0.012	1.7%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**2.25%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**19.7%**
Fine Gravel	**29.2%**
Coarse Sand	**11.8%**
Medium Sand	**25.0%**
Fine Sand	**12.6%**
Silt & Clay	**1.7%**
Uniformity Coeff.	**24.11**
Permeability Range **	
Dense	130 ft/day
Loose	389 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**48.9%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**76.9%**	**70%-100%**
%Passing #40	**28.0%**	***10%-50%**
%Passing #100	**5.5%**	**0%-20%**
%Passing #200	**3.3%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size. Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day. Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 105 42-48", Split 2 of 2

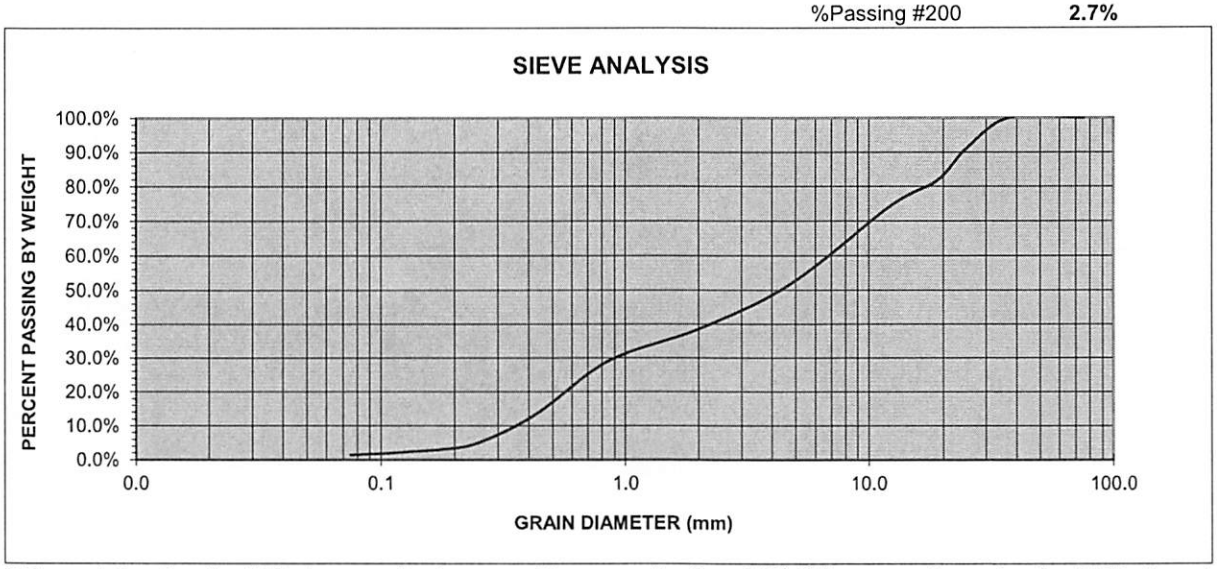
MOIST WEIGHT	=	**0.872 Kg**
TOTAL DRY WEIGHT	=	**0.852 Kg**
DRY WEIGHT AFTER WASH	=	**0.840 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.000	0.0%	100.0%
1"	25.0	0.076	8.9%	91.1%
3/4"	19.0	0.080	9.4%	81.7%
1/2"	12.5	0.060	7.0%	74.6%
#4	4.75	0.196	23.0%	51.6%
#10	2.00	0.112	13.1%	38.5%
#20	0.850	0.082	9.6%	28.9%
#40	0.425	0.134	15.7%	13.1%
#60	0.250	0.070	8.2%	4.9%
#80	0.180	0.016	1.9%	3.1%
#100	0.150	0.004	0.5%	2.6%
#140	0.106	0.006	0.7%	1.9%
#200	0.075	0.004	0.5%	1.4%
Passing #200		0.012	1.4%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**2.35%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**18.3%**
Fine Gravel	**30.0%**
Coarse Sand	**13.1%**
Medium Sand	**25.4%**
Fine Sand	**11.7%**
Silt & Clay	**1.4%**
Uniformity Coeff.	**21.13**
Permeability Range **	
Dense	145 ft/day
Loose	436 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**48.4%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**74.5%**	**70%-100%**
%Passing #40	**25.5%**	***10%-50%**
%Passing #100	**5.0%**	**0%-20%**
%Passing #200	**2.7%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 106 55-60", Split 1 of 2

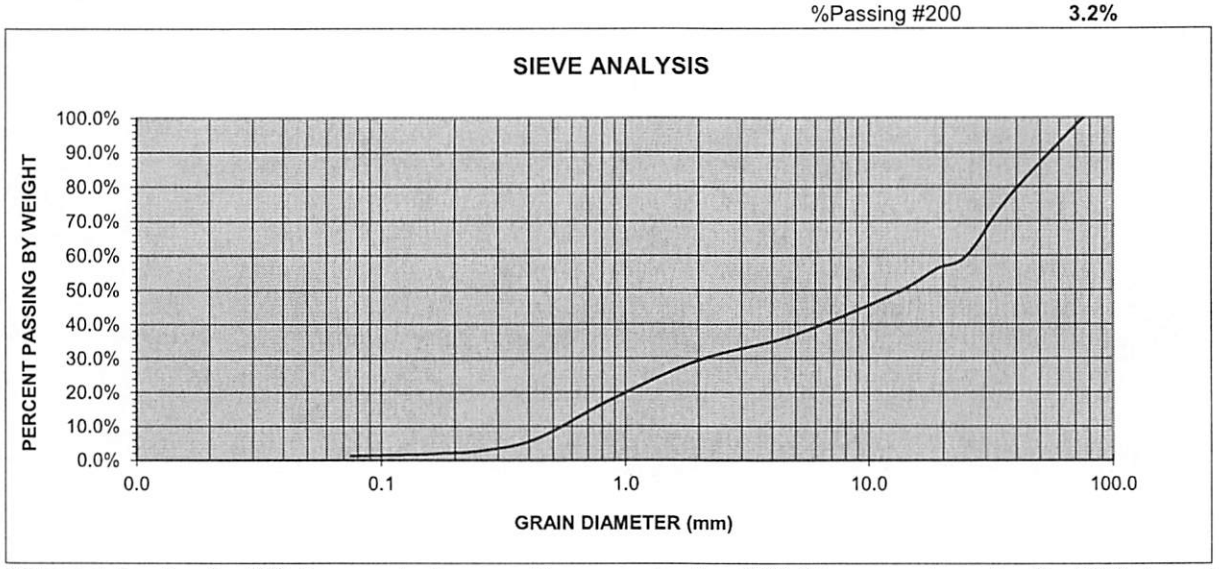
MOIST WEIGHT	=	**1.042 Kg**
TOTAL DRY WEIGHT	=	**1.028 Kg**
DRY WEIGHT AFTER WASH	=	**1.016 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.236	23.0%	77.0%
1"	25.0	0.178	17.3%	59.7%
3/4"	19.0	0.038	3.7%	56.0%
1/2"	12.5	0.078	7.6%	48.4%
#4	4.75	0.124	12.1%	36.4%
#10	2.00	0.072	7.0%	29.4%
#20	0.850	0.124	12.1%	17.3%
#40	0.425	0.116	11.3%	6.0%
#60	0.250	0.036	3.5%	2.5%
#80	0.180	0.006	0.6%	1.9%
#100	0.150	0.004	0.4%	1.6%
#140	0.106	0.002	0.2%	1.4%
#200	0.075	0.002	0.2%	1.2%
Passing #200		0.012	1.2%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**1.36%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**44.0%**
Fine Gravel	**19.6%**
Coarse Sand	**7.0%**
Medium Sand	**23.3%**
Fine Sand	**4.9%**
Silt & Clay	**1.2%**
Uniformity Coeff.	**43.86**
Permeability Range **	
Dense	374 ft/day
Loose	1123 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**63.6%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**80.7%**	**70%-100%**
%Passing #40	**16.6%**	***10%-50%**
%Passing #100	**4.3%**	**0%-20%**
%Passing #200	**3.2%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 106 55-60", Split 2 of 2

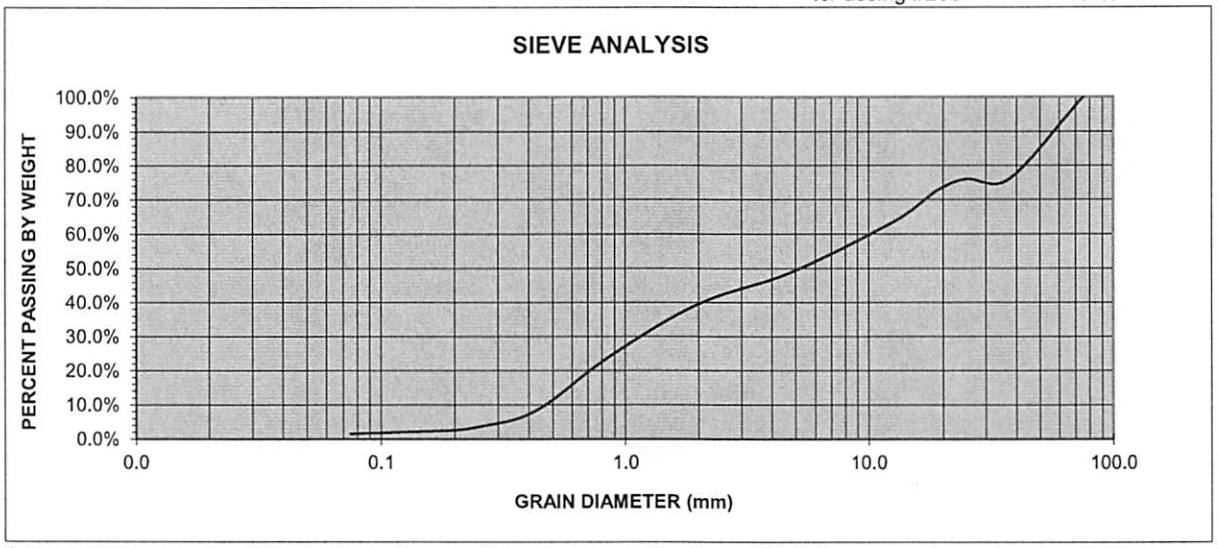
MOIST WEIGHT	=	**1.136 Kg**
TOTAL DRY WEIGHT	=	**1.114 Kg**
DRY WEIGHT AFTER WASH	=	**1.098 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.268	24.1%	75.9%
1"	25.0	0.000	0.0%	75.9%
3/4"	19.0	0.038	3.4%	72.5%
1/2"	12.5	0.104	9.3%	63.2%
#4	4.75	0.162	14.5%	48.7%
#10	2.00	0.102	9.2%	39.5%
#20	0.850	0.176	15.8%	23.7%
#40	0.425	0.174	15.6%	8.1%
#60	0.250	0.052	4.7%	3.4%
#80	0.180	0.012	1.1%	2.3%
#100	0.150	0.002	0.2%	2.2%
#140	0.106	0.004	0.4%	1.8%
#200	0.075	0.004	0.4%	1.4%
Passing #200		0.016	1.4%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**1.97%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**27.5%**
Fine Gravel	**23.9%**
Coarse Sand	**9.2%**
Medium Sand	**31.4%**
Fine Sand	**6.6%**
Silt & Clay	**1.4%**
Uniformity Coeff.	**22.62**
Permeability Range **	
Dense	258 ft/day
Loose	775 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**51.3%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**81.2%**	**70%-100%**
%Passing #40	**16.6%**	***10%-50%**
%Passing #100	**4.4%**	**0%-20%**
%Passing #200	**3.0%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size. Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day. Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 108 46-50", Split 1 of 2

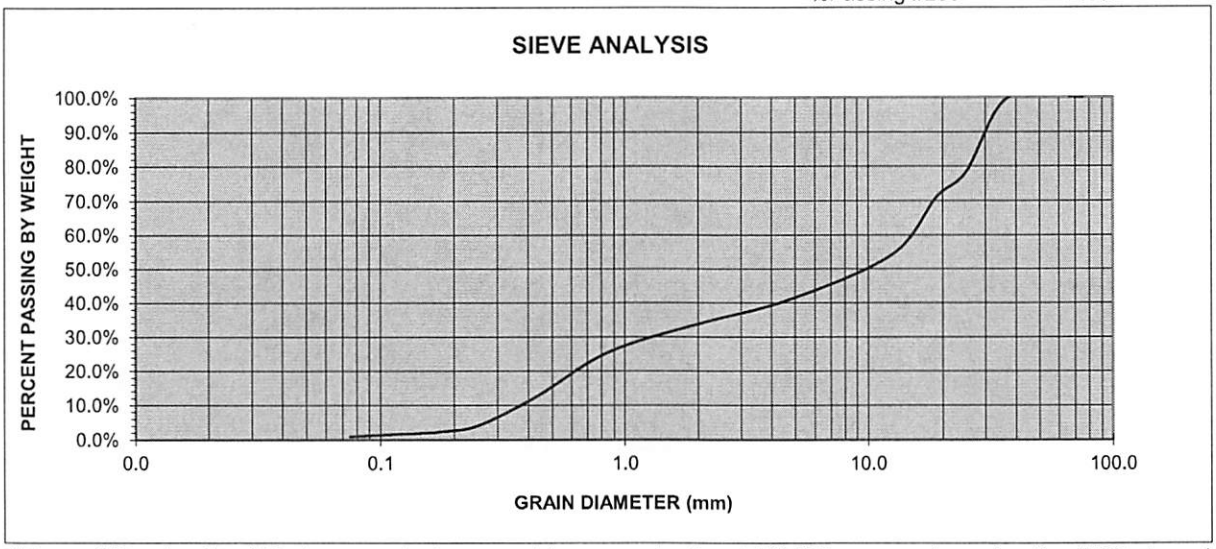
MOIST WEIGHT	=	**0.85 Kg**
TOTAL DRY WEIGHT	=	**0.836 Kg**
DRY WEIGHT AFTER WASH	=	**0.828 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.000	0.0%	100.0%
1"	25.0	0.182	21.8%	78.2%
3/4"	19.0	0.060	7.2%	71.1%
1/2"	12.5	0.142	17.0%	54.1%
#4	4.75	0.110	13.2%	40.9%
#10	2.00	0.060	7.2%	33.7%
#20	0.850	0.070	8.4%	25.4%
#40	0.425	0.110	13.2%	12.2%
#60	0.250	0.068	8.1%	4.1%
#80	0.180	0.014	1.7%	2.4%
#100	0.150	0.004	0.5%	1.9%
#140	0.106	0.004	0.5%	1.4%
#200	0.075	0.004	0.5%	1.0%
Passing #200		0.008	1.0%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**1.67%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**28.9%**
Fine Gravel	**30.1%**
Coarse Sand	**7.2%**
Medium Sand	**21.5%**
Fine Sand	**11.2%**
Silt & Clay	**1.0%**
Uniformity Coeff.	**39.11**
Permeability Range **	
Dense	162 ft/day
Loose	485 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**59.1%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**82.5%**	**70%-100%**
%Passing #40	**29.8%**	***10%-50%**
%Passing #100	**4.7%**	**0%-20%**
%Passing #200	**2.3%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 108 46-50", Split 2 of 2

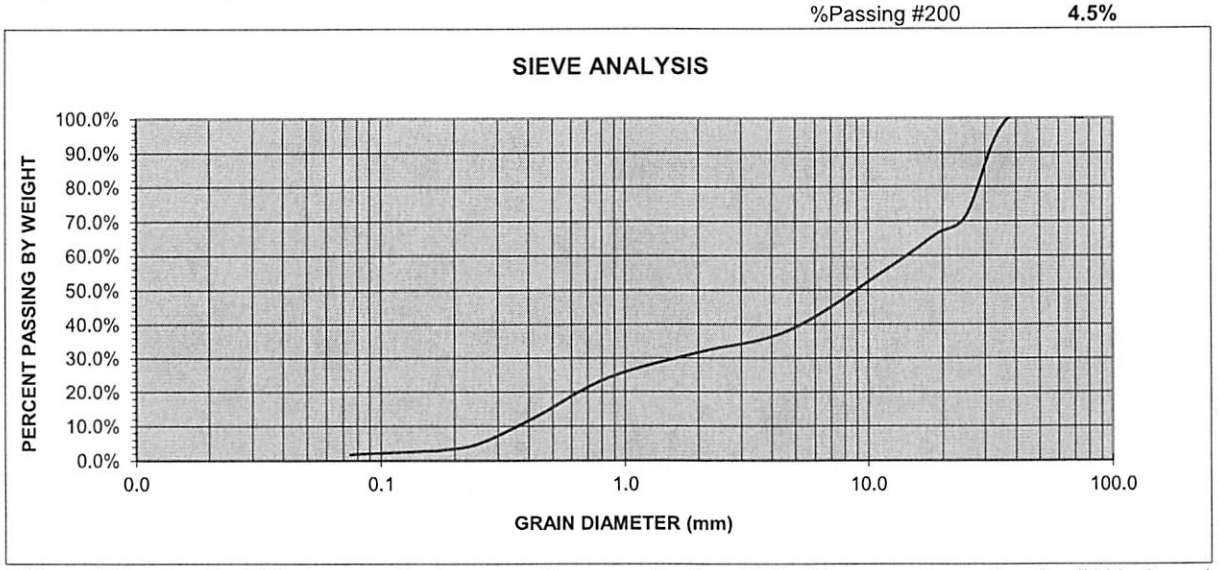
MOIST WEIGHT	=	**0.95 Kg**
TOTAL DRY WEIGHT	=	**0.932 Kg**
DRY WEIGHT AFTER WASH	=	**0.916 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.000	0.0%	100.0%
1"	25.0	0.266	28.5%	71.5%
3/4"	19.0	0.048	5.2%	66.3%
1/2"	12.5	0.088	9.4%	56.9%
#4	4.75	0.174	18.7%	38.2%
#10	2.00	0.062	6.7%	31.5%
#20	0.850	0.070	7.5%	24.0%
#40	0.425	0.108	11.6%	12.4%
#60	0.250	0.072	7.7%	4.7%
#80	0.180	0.016	1.7%	3.0%
#100	0.150	0.004	0.4%	2.6%
#140	0.106	0.004	0.4%	2.1%
#200	0.075	0.004	0.4%	1.7%
Passing #200		0.016	1.7%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**1.93%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**33.7%**
Fine Gravel	**28.1%**
Coarse Sand	**6.7%**
Medium Sand	**19.1%**
Fine Sand	**10.7%**
Silt & Clay	**1.7%**
Uniformity Coeff.	**39.66**
Permeability Range **	
Dense	155 ft/day
Loose	465 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**61.8%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**82.6%**	**70%-100%**
%Passing #40	**32.6%**	***10%-50%**
%Passing #100	**6.7%**	**0%-20%**
%Passing #200	**4.5%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 109 46-52", Split 1 of 2

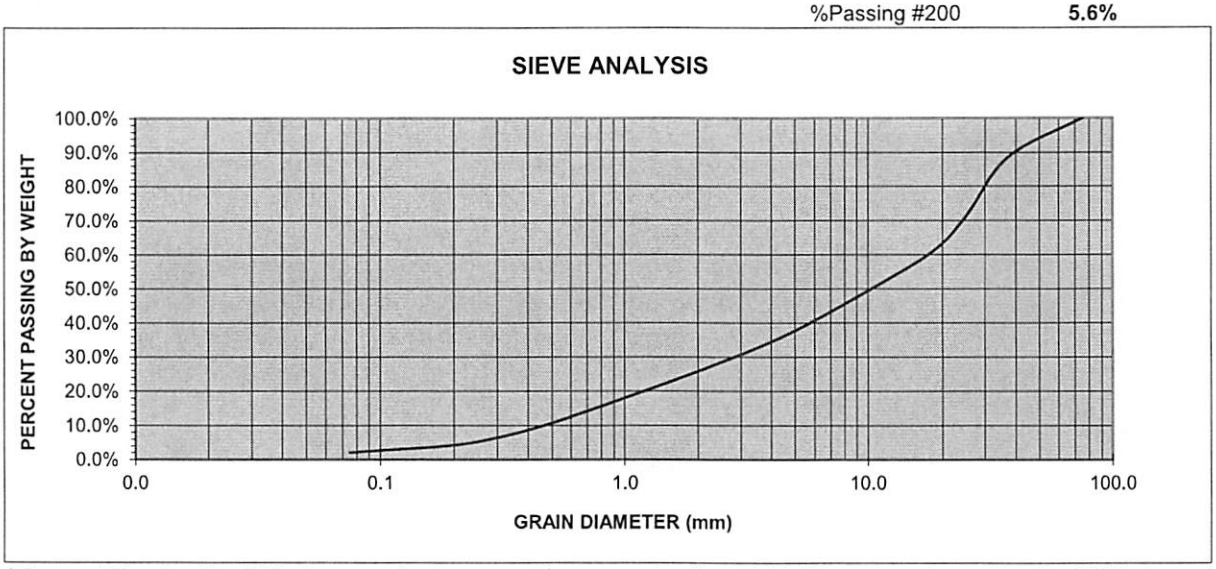
MOIST WEIGHT	=	**0.9 Kg**
TOTAL DRY WEIGHT	=	**0.878 Kg**
DRY WEIGHT AFTER WASH	=	**0.860 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.100	11.4%	88.6%
1"	25.0	0.154	17.5%	71.1%
3/4"	19.0	0.082	9.3%	61.7%
1/2"	12.5	0.074	8.4%	53.3%
#4	4.75	0.144	16.4%	36.9%
#10	2.00	0.098	11.2%	25.7%
#20	0.850	0.084	9.6%	16.2%
#40	0.425	0.062	7.1%	9.1%
#60	0.250	0.034	3.9%	5.2%
#80	0.180	0.012	1.4%	3.9%
#100	0.150	0.004	0.5%	3.4%
#140	0.106	0.006	0.7%	2.7%
#200	0.075	0.006	0.7%	2.1%
Passing #200		0.018	2.1%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**2.51%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**38.3%**
Fine Gravel	**24.8%**
Coarse Sand	**11.2%**
Medium Sand	**16.6%**
Fine Sand	**7.1%**
Silt & Clay	**2.1%**
Uniformity Coeff.	**36.92**
Permeability Range **	
Dense	260 ft/day
Loose	779 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**63.1%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**69.8%**	**70%-100%**
%Passing #40	**24.7%**	***10%-50%**
%Passing #100	**9.3%**	**0%-20%**
%Passing #200	**5.6%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

WASHED SIEVE ANALYSIS

CLIENT: Avery Brook LLC
DATE: 12/14/2022
SAMPLE: TH 109 46-52", Split 2 of 2

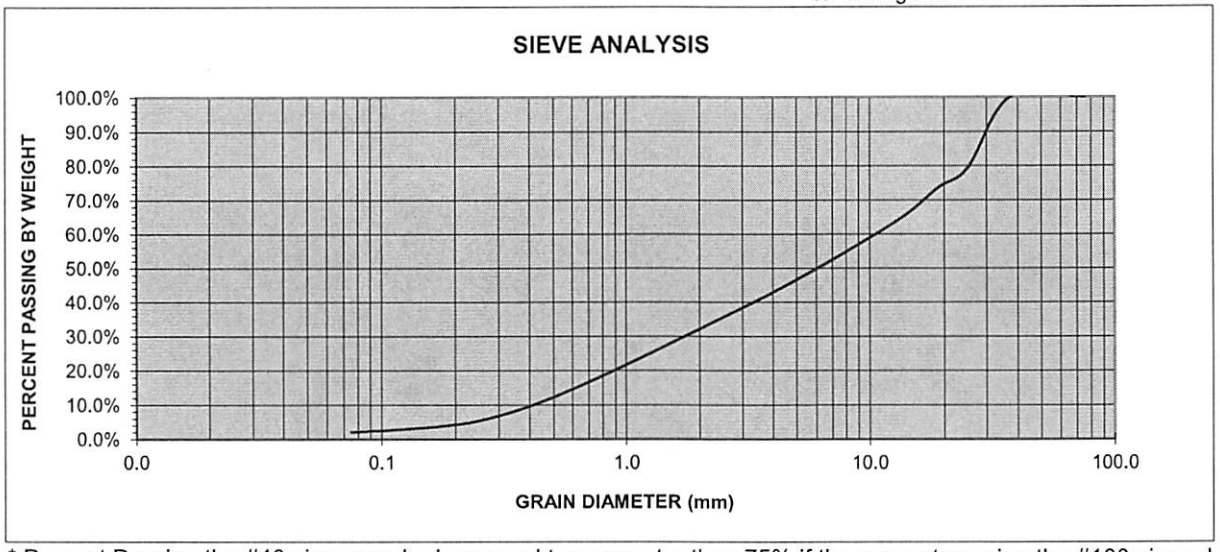
MOIST WEIGHT	=	**0.8 Kg**
TOTAL DRY WEIGHT	=	**0.78 Kg**
DRY WEIGHT AFTER WASH	=	**0.764 Kg**

Sieve Size	(mm)	Weight Retained	% Retained	% Passing
3"	75.0	0.000	0.0%	100.0%
1 1/2"	37.5	0.000	0.0%	100.0%
1"	25.0	0.162	20.8%	79.2%
3/4"	19.0	0.044	5.6%	73.6%
1/2"	12.5	0.082	10.5%	63.1%
#4	4.75	0.136	17.4%	45.6%
#10	2.00	0.106	13.6%	32.1%
#20	0.850	0.100	12.8%	19.2%
#40	0.425	0.070	9.0%	10.3%
#60	0.250	0.038	4.9%	5.4%
#80	0.180	0.012	1.5%	3.8%
#100	0.150	0.004	0.5%	3.3%
#140	0.106	0.006	0.8%	2.6%
#200	0.075	0.004	0.5%	2.1%
Passing #200		0.016	2.1%	

Weight of Material Passing #200 Sieve = Total Dry Weight - Dry Weight After Wash

Water Content	**2.56%**
Unified Soil Classification System	
Grain Size Comparison	
Cobbles	**0.0%**
Coarse Gravel	**26.4%**
Fine Gravel	**27.9%**
Coarse Sand	**13.6%**
Medium Sand	**21.8%**
Fine Sand	**8.2%**
Silt & Clay	**2.1%**
Uniformity Coeff.	**26.77**
Permeability Range **	
Dense	196 ft/day
Loose	588 ft/day

2000 CT. Health Code Septic Fill Specs		
%Retained on #4	**54.4%**	
% Passing #4-#200 (Fill less Gravel)		**Permitted**
%Passing #4	**100.0%**	**100%**
%Passing #10	**70.2%**	**70%-100%**
%Passing #40	**22.5%**	***10%-50%**
%Passing #100	**7.3%**	**0%-20%**
%Passing #200	**4.5%**	**0%-5%**



* Percent Passing the #40 sieve can be increased to no greater than 75% if the percent passing the #100 sieve does not exceed 10% and the #200 does not exceed 5%.

** Based on empirical relationship by Hazen (1911) relating permeability to the D_{10} grain size.
Accuracy diminishes with >5% passing the #200 Sieve or permeability values <.3 ft/day.
Relationship invalid when D_{10} < .1mm or D_{10} > 3mm

Appendix C

Ground Water Monitoring

Avery Brook Homes, LLC
94, 96, 98, 100 Stoddards Wharf Road, Ledyard CT
12/20/2022

	12/20/2022		12/27/2022		1/3/2023		1/5/2023		1/12/2023	
Monitor Pipe	Top of Pipe to Water *(Ft)*	Ground Water Elevation	Top of Pipe to Water *(Ft)*	Ground Water Elevation	Top of Pipe to Water *(Ft)*	Ground Water Elevation	Top of Pipe to Water *(Ft)*	Ground Water Elevation	Top of Pipe to Water *(Ft)*	Ground Water Elevation
100	18.07	143.20	16.78	18.07	18.07	16.78	18.07	18.07	17.61	143.66
101	3.75	142.59	3.86	3.75	3.75	3.86	3.75	3.75	3.87	142.47
102	18.16	139.00	17.97	18.16	18.16	17.97	18.16	18.16	18.21	138.95
103	DRY	-	DRY	-	DRY	-	DRY	-	DRY	-
104	DRY	-	DRY	-	DRY	-	DRY	-	DRY	-
105	DRY	-	DRY	-	DRY	-	DRY	-	DRY	-
106	DRY	-	DRY	-	DRY	-	DRY	-	DRY	-
107	DRY	-	DRY	-	DRY	-	DRY	-	DRY	-
108	19.24	137.96	18.99	19.24	19.24	18.99	19.24	19.24	19.32	137.88
109	DRY	-	DRY	-	DRY	-	DRY	-	DESTROYED	-
Well	19.48	137.60	19.15	19.48	19.48	19.15	19.48	19.48	19.56	137.52
110									25.78	136.94
111									25.59	135.78
112									20.69	136.59
113									23.21	137.61
114									18.03	138.45
115									10.51	138.42

Appendix D

12-8-2022 Test Hole Logs

TEST HOLE DATA
DATE: 12-8-2022
PRESENT: STUART FAIRBANK (ALMGPS)
FERN TREMBLAY (ALM/GPS)
PETER GARDNER (OWNER)

TP 100
0-9" TOPSOIL
9-34" ORANGE BROWN FINE SILTY LOAM
34-175" LIGHT GRAY BROWN MEDIUM LOAMY SAND
W/ GRAVEL & ROCKS

TUBE @ 47"
BAG @ 42-48"

NO MOTTLING NO WATER NO LEDGE

TP 101
0-9" TOPSOIL
9-16" TAN FINE SILTY LOAM
16-36" DARK BROWN MEDIUM-COARSE LOAMY
SAND & GRAVEL
36-96" GRAY BROWN MEDIUM LOAMY SAND
POCKET OF FINE GRAY SAND 36-45"
NORTH SIDE OF TEST HOLE

TUBE @ 38"
BAG @ 30-36"

MOTTLING @21" WATER @ 26" NO LEDGE

TP 102
0-9" TOPSOIL
9-34" ORANGE BROWN FINE SILTY LOAM
34-175" LIGHT BROWN MEDIUM-COARSE
SAND & GRAVEL W/ STONES

TUBE @ 48"
BAG @ 42-48"
BAG @180-186"

NO MOTTLING WATER @ 204" NO LEDGE

TP 103
0-10" TOPSOIL
10-31" ORANGE BROWN FINE SILTY LOAM
31-198" LIGHT BROWN BANDED MEDIUM-COARSE
SAND & GRAVEL W/ STONES

TUBE @ 48"
BAG @ 42-48"
BAG @ 165-171"

NO MOTTLING NO WATER NO LEDGE

TP 104
0-17" TOPSOIL
7-37" ORANGE BROWN FINE SILTY LOAM
37-210" LIGHT BROWN BANDED MEDIUM-COARSE
SAND & GRAVEL W/ STONES

TUBE @ 48"
BAG @ 42-48"

NO MOTTLING NO WATER NO LEDGE

TP 105
0-9" TOPSOIL
9-32" ORANGE BROWN FINE SILTY LOAM
32-216" LIGHT BROWN BANDED MEDIUM-COARSE
SAND & GRAVEL W/ STONES

TUBE @ 48"
BAG @ 42-48"

NO MOTTLING NO WATER NO LEDGE

TP 106
0-9" TOPSOIL
9-23" ORANGE BROWN FINE SILTY LOAM
23-204" LIGHT BROWN BANDED MEDIUM-COARSE
SAND & GRAVEL W/ STONES

TUBE @ 57"
BAG @ 55-60"

NO MOTTLING NO WATER NO LEDGE

TP 107
0-12" TOPSOIL
12-35" DARK BROWN FINE SILTY LOAM
35-91" BROWN MEDIUM-COARSE BANDED
SAND & GRAVEL W/ STONES

NO MOTTLING NO WATER LEDGE @ 91"

TP 108
0-13" TOPSOIL
13-39" ORANGE BROWN FINE SILTY LOAM
39-210" LIGHT BROWN BANDED MEDIUM-COARSE
SAND & GRAVEL W/ STONES

TUBE @ 48"
BAG @ 46-50"

NO MOTTLING NO WATER NO LEDGE

WELL
22' DEEP (30' NORTH TP 107)
WATER @ 19'

TP 109
0-11" TOPSOIL
11-36" ORANGE BROWN FINE SILTY LOAM
36-194" LIGHT BROWN BANDED MEDIUM-COARSE
SAND & GRAVEL W/ STONES

TUBE @ 52"
BAG @ 46-52"

NO MOTTLING NO WATER NO LEDGE

Appendix E

Onsite Wastewater Technology Testing Report

Onsite Wastewater Technology Testing Report

Massachusetts Alternative Septic System Test Center
Air Station Cape Cod, Massachusetts 02542
Telephone: 508-563-6757
MASSTC@barnstablecounmty.org

Massachusetts
Alternative
Septic
System
Test
Center

-- May 2021—

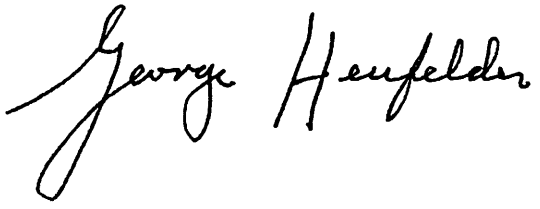
Performance Evaluation
Geomatrix™ GST 6212

January 2019 – March 2021

Technology Vendor

Geomatrix™ Systems LLC
114 Mill Rock Road East
Old Saybrook, CT 06475
geomatrixsystems.com

I certify that I represent the Massachusetts Alternative Septic System Test Center, a project of the Barnstable County Department of Health and Environment, Barnstable County Massachusetts. I further certify that I am authorized to report the testing results for this proprietary treatment product. I attest that the details described in this report regarding the test protocol and results are true and accurate to the best of my knowledge.



George Heufelder, M.S., R.S.
Barnstable County Department of Health and Environment
Massachusetts Alternative Septic System Test Center

Section 1.0 Introduction

The Massachusetts Alternative Septic System Test Center (MASSTC) is located at the Otis Air National guard military base in Falmouth, Massachusetts. The Test Center is operated by the Barnstable County Department of Health and Environment.

The mission of MASSTC is to provide a location for the verification and testing of onsite wastewater treatment technologies and components. MASSTC conducts testing under various protocols, some of which are widely recognized. Of note, the National Sanitation Foundation International (NSF) has employed MASSTC to conduct its standard protocol ANSI/NSF Standard 40 on a number of onsite septic system technologies. In addition, MASSTC has performed a number of verification tests in accordance with a nutrient testing protocol jointly developed with industry, NSF, and the United States Environmental Protection Agency (USEPA) known as the Environmental Technology Verification Program (ETV). Finally, MASSTC has been used to conduct the nitrogen reduction standard NSF/ANSI Standard 245. The Center also conducts independent research for the Commonwealth of Massachusetts and assists the onsite industry by providing a platform and facility for research and development of wastewater treatment products.

This report describes the GST 6212 product hydraulic response and treatment performance over 109 weeks (testing continues through to the date of this report). For this evaluation, the same influent and discharge parameter requirements specified in NSF/ANSI Standard 40 were used and more data points were collected, additionally the present test was conducted over a more extensive time period than required in the NSF/ANSI Standard 40. A comparison of the present test metrics, the NSF/ANSI Standard 40, and the USEPA ETV Program are provided in Table 1. Of particular note is that the duration of this reported test was four times that of the aforementioned standard and allowed the evaluation of the system to span all seasons. In addition, stress test laundry loads specified in the ANSI/NSF 40 Standard were added instead of being substituted to daily hydraulic loads and the present test included a period of extended stress representing two types of added stress compared with Standard 40.

Section 2.0 Test Cell Construction

The GST Leaching System (GST) was installed using patented removable forms that create three-dimensional leaching "fingers" along the side of a central distribution channel. Each finger is filled with washed stone aggregate, alternating, and then surrounded by ASTM C-33 sand (Figure 1). Once the form was filled to 12 inches, it was removed, and a distribution pipe was positioned down the central channel to distribute effluent to the GST. The GST was placed above 12 inches of ASTM C33 sand. The entire system was constructed within a lined test cell such that all percolate passing through the system could be sampled.

Observation ports were installed at the stone-sand interface for monitoring the ponding depth throughout the study period. A 1500-gallon septic tank was installed with a distribution box which conveyed the septic tank effluent to the GST. A central underdrain within the containment liner served as a sample collection point and was flushed weekly on Fridays to avoid compromising regular samples (since no samples were taken for the two following days). This flushing schedule was modified as necessary during stress loading to avoid sampling days required during those events.

Table 1: Differences between ANSI/NSF Standard 40, USEPA ETV, and the present test;

	ANSI/NSF 40	USEPA ETV	MASSTC Test
Testing duration	26-34 weeks	52 weeks	109 weeks
Data days	96 (5x per week)	16 (12 samples taken each calendar month no less than ten days after the preceding sample and 4 supplemental samples immediately preceding or following one of the monthly samples)	100 (1x per week for 17 weeks, every other week for 11 weeks, and 1x per month for 40 weeks, <5x per week for 8 weeks (stress test), approx. 2x per month for 24 weeks, and 5x per week for 9 weeks)
Start-up	3 weeks if requested	Vendor-specified	None (results do not change when first 3 weeks excluded)
Timeframe requirements	May occur in any seasons spanning the 6-month test- not prescribed by protocol.	Spanned all seasons for cold weather performance verification.	Spanned all seasons for cold weather performance verification.
Stress Test	Four phases: wash days, working parent, and power failure.	Not performed	Five phases: wash days (added in addition to design load), working parent, power failure, and extended stress (loading at twice the hydraulic loading rate every day for three months)
Analytic parameters	TSS, $BOD_{5\text{-day}}$, $cBOD_{5\text{-day}}$, pH, temperature, Dissolved Oxygen	TSS, $cBOD_{5\text{-day}}$, COD, temperature, pH, FOG, TKN, NO_3^-+NO_2^-, NH_3, Alkalinity, TP, SP, Fecal coliform, *E. coli*	TSS, $BOD_{5\text{-day}}$/$cBOD_{5\text{-day}}$, pH, Fecal coliform, NH_4^+, NO_2^-, NO_3^-, TKN, TN (by calculation), TP, Dissolved Oxygen, temperature
Hydraulic analysis	Visual inspection for surface breakout; no hydraulic function analysis	None specified	Ponding measurements collected twice weekly from a proximal and distal observation port

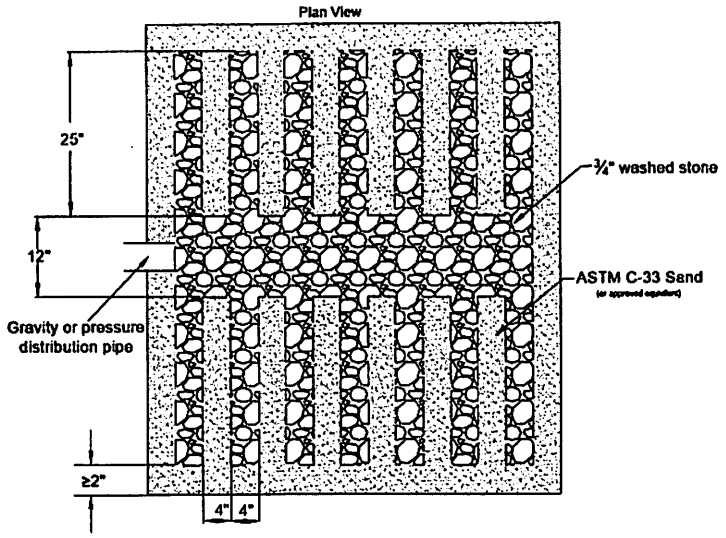


Figure 1. Plan view of the GST (series 62) product. Twelve-inch height of system was used in the test (source Geomatrix™ LLC)

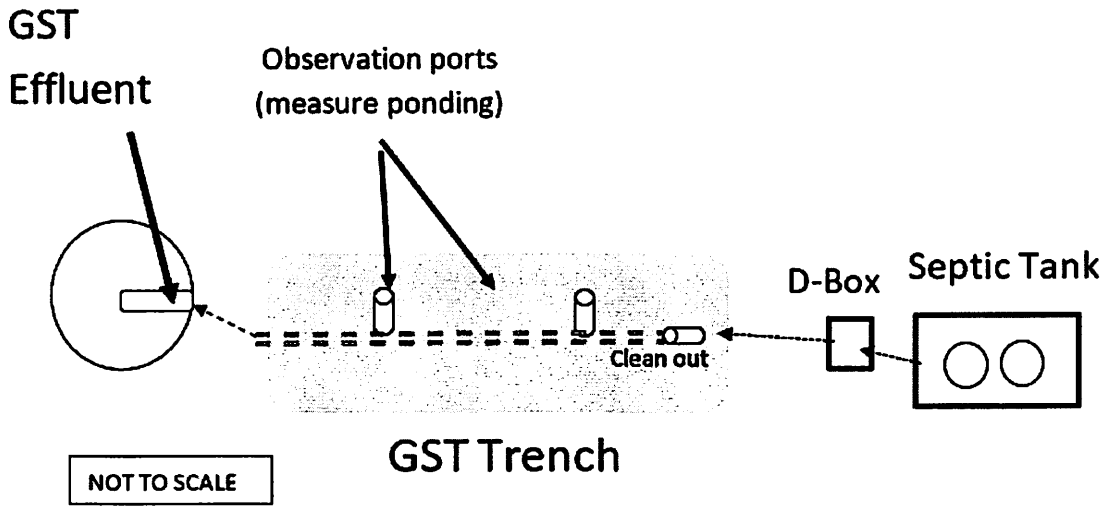


Figure 2 Experimental design of GST trench. Ports indicate location of ponding observations.

Section 3.0 Sampling protocol and schedule

Raw wastewater was supplied in thirty discrete doses totaling 300 gallons per day to the septic tank in accordance with the following schedule: 0600 – 0900h 35% of daily flow, 1100 – 1400 25% of daily flow, and 1700 – 2000 h 40% of daily flow. The GST component received 150 gallons per day from the septic tank, while the other 150 gallons was diverted elsewhere. Each dose to the septic tank during these periods did not exceed 10 gallons which follows the ANSI/NSF Standard 40 requirement; we define this as the "normal" hydraulic load. Wastewater treatment performance was evaluated using parameters of ANSI/NSF Standard 40 tests (cBOD $_{5\text{-day}}$ and TSS) and supplemental tests for nutrients, as described in the introduction. Final effluent was collected from the bottom drain over a 24-hour period using an ISCO™ composite sampler. Hydraulic performance was determined using ponding observations from two ports in the GST (Figure 2). All sample collection and ponding measurements were taken by staff of MASSTC/Barnstable County Department of Health and Environment. All analyses were performed using Standard Methods at laboratories certified by the Commonwealth of Massachusetts including the Barnstable County Department of Health and Environment Laboratory.

Twenty-four-hour composite samples were taken weekly for five-day Carbonaceous Biological Oxygen Demand ($cBOD_{5\text{-day}}$), Total Suspended Solids) TSS, NH_4^+, NO_2^-, NO_3^-, Total Kjeldahl Nitrogen (TKN), and Total Phosphorus (TP) from January 31, 2019 through May 22, 2019. From June through August of 2019, sampling was reduced to every two weeks. The system was sampled once a month from October 2019 through May 2020. Total nitrogen values reported are by calculation of TKN plus nitrate-nitrite. Fecal coliform concentrations were collected from the system twice a week from January 31 through May 22, 2019 and was reduced to approximately once per week from May 28 through October 16, 2019 and further reduced to twice a month from November through January 2020. Fecal coliform was analyzed at least once a month from February through May of 2020. Fecal coliform and field parameters including temperature, pH and dissolved oxygen were taken as grab samples, while all other chemical parameters and biochemical oxygen demands ($BOD_{5\text{-day}}$and $cBOD_{5\text{-day}}$) were obtained from 24-hour composites samples. For any samples indicating levels of $cBOD_{5\text{-day}}$ or TSS below the detection limit of 2 mg/L, one-half of the detection limit (1.0 mg/L) was reported and used in calculations.

Four stress tests were performed from June through August of 2020. The first stress test was a wash day stress occurring from June 2 through June 6, 2020 and consisted of three wash days with 24 hours between each wash day for a total of five consecutive days. During the wash days, the system was dosed normally plus three wash loads (one wash cycle and two rinse cycles each) in the first two daily doses. This differs from the stress tests performed under NSF STD 40 in that, for NSF STD 40, the normal hydraulic load is discontinued and the wash loads are *substituted* for the normal hydraulic loads. The second stress test was the working parent stress test performed June 15 through June 20, 2020. During this stress, the system was dosed with 40% of its daily hydraulic capacity between 6:00 am and 9:00 am. Between 5:00 pm and 8:00 pm, the system is dosed with the remaining 60% of its daily hydraulic capacity, which included one wash load. The third stress test was the power/equipment failure test which was performed from July 3 through July 6, 2020. The power failure test as described in the standard was originally designed for mechanical units requiring electric power. Since the GST requires no power, the test is simply comprised of turning flow to the system off as prescribed in the test. Accordingly, flow was turned off on July 3, 2020 at 8 p.m. for 48 hours. Flow was restored to the system on July 6, 2020 and was dosed with 60% of the daily load between 6 a.m. and 9 a.m. The vacation stress test was the final stress and was performed from July 20 through July 27, 2020. For this stress, flow to the system is discontinued for eight consecutive days and then flow is restored and 60% of the daily load (including

three wash loads) is delivered to the system between 5 p.m. and 8 p.m. During the stress test in the summer of 2020, final effluent was analyzed for fecal coliform, TSS, and $cBOD_{5\text{-day}}$ concentrations on June 2, June 8-12, June 15, June 24-26, June 29, July 8-10, July 13-14, July 28-30. Samples were also analyzed for nutrients on June 25, July 14, and July 29, 2020.

After the four stress test phases, the system was loaded with twice the normal design flow from August 26, 2020 through December 29, 2020 to simulate extended stress. During the extended stress test, effluent was analyzed nine times for fecal coliform and five times for $cBOD_{5\text{-day}}$ and TSS. From January 4 through March 3, 2021, effluent from the GST was analyzed each week for Fecal coliforms and 5 days a week for $cBOD_{5\text{-day}}$ and TSS.

Ponding observations were taken from each of the two ports twice weekly from February 2019 through March 2021 by measuring the liquid level with a measuring tape. We translated ponding measurements into the amount of area hydraulically in use by determining what portion of the system would be in use/wetted given the level of ponding. We have reported hydraulic function using raw ponding level data and the amount of surface area in use during a ponding observation.

Section 4.0 Results

Section 4.1 Influent Characteristics

Wastewater influent levels were measured throughout the effluent sampling period, however at a greater sampling frequency than effluent. During the non-stress period, January 2019 – March 2021, over 350 influent samples were taken. Biochemical Oxygen Demand Levels ($BOD_{5\text{-day}}$) averaged 192 mg/L (185–199 mg/L, p=.05, n=359). TSS level averaged 157 mg/L (149 – 165 mg/L, p=.05, n=359). The range in pH was 6.6 – 7.4 pH units. The geometric mean fecal coliform density was 2.7×10^6 cfu/100 ml. Influent temperatures varied seasonally and ranged from 5.5 – 22.9 C°. Other chemical parameters measured included TN (calculated by the addition of nitrate-nitrite + Total Kjeldahl Nitrogen), ammonia, TP, dissolved oxygen (mg/L), and alkalinity. All influent parameters met the requirements specified in national testing protocols.

Section 4.2 Treatment performance results

The GST test was initiated during the winter months to simulate worst possible conditions for start-up performance. The system was loaded at non stress levels (full design loading) from January 2019 through May 2020 and January through March 2021. A stress test in four phases (wash day, power failure, vacation, and working parent) was performed during June and July 2020. In August 2020, and extended stress test was started and the system was loaded at twice the daily load every day through December 2020.

A summary of all data is presented in Table 2 and all data points are presented in the appendices. There were no data exclusions; that is no data were excluded from the statistical analyses.

Table 2 Summary of GST water quality analysis collected by MASSTC (2019-01-30 through 2021-03-03).

	cBOD/BOD (mg/L)	TSS (mg/L)	Ammonia (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Fecal coliform (cfu)
GST product trench (n=)	2.0 (101)	2.4 (100)	15.6 (41)	35.5 (41)	3.2 (41)	2.2×10^3 (109)
confidence limits p=0.05	1.9 - 2.2	1.8 – 2.7	14.2 – 16.9	34.6 – 36.4	3.1 – 3.3	Geometric Mean
Influent (n=)	192 (359)	157 (359)	29.7 (297)	43.1 (262)	4.8 (86)	2.7×10^6 (359)
confidence limits p=0.05	185 – 199	149 – 165	29.0 – 30.0	42.6 – 44.0	4.5 – 5.2	Geometric Mean

The GST product removed ~98% of the secondary wastewater constituents of $BOD_{5\text{-day}}$ and TSS. In addition, there was a three $\log_{10}$ removal (99.9 %) of fecal coliform, the commonly accepted surrogate for human pathogen removal.

Section 4.2 Treatment Performance following wash days, working parent, power failure, and vacation stress testing

Sample data taken following the above-referenced stress tests show no significant difference when compared with non-stress periods (Table 3). In addition to the secondary treatment contaminants, nutrient concentrations from the GST were analyzed once following each stress event (Table 3).

Table 3. Summary of influent and discharge data taken following four stress events. Data from all samples following the stress events are combined.

	cBOD/BOD (mg/L)	TSS (mg/L)	Ammonia (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus mg/L	Fecal coliform (cfu)
GST product trench (n=)	1.0 (24)	1.5 (24)	3.7 (4)	40.7 (4)	1.5 (4)	**3.9×10^2 (24)**
confidence limits p=.05	0.8 - 1.2	1.0 - 2.0	0.0 - 8.5	31.1 - 50.3	1.0 - 2.0	Geometric Mean
Influent (n=)	186 (37)	160 (37)	28.6 (23)	43.7 (24)	1.5 (10)	**1.8×10^6 (32)**
confidence limits p=.05	166 - 206	126 -194	26.1 - 31.1	41.7 - 45.7	1.2 - 1.8	Geometric Mean

TSS were not detected from the GST during the first three stress tests and only increased to 4 mg/L after the vacation stress test (Figure 3). Coincident TSS concentrations in the influent wastewater source ranged from 82-330 mg/L. Changes in fecal coliform concentrations from the GST during the stress test showed a similar pattern as the TSS concentrations. The peak density of fecal coliform following the first four phases of the stress tests was 16,000 cfu/100 ml, with a geometric mean of all 23 post-stress observations equal to 390 cfu/ 100ml During the stress tests, fecal coliform concentration in the raw wastewater had a geometric mean of 1.8×10^6 cfu/100 ml.

The $cBOD_{(5\text{-day})}$ levels were below detection levels in the GST for all portions of the stress test except for after the vacation portion of the stress test when the concentration was 3 mg/L (Figure 3). During the stress test, the BOD in the wastewater source ranged from 100 to 250 mg/L, BOD.

Section 4.3 Treatment Performance during extended stress

Table 4. Summary of GST water quality analysis collected by MASSTC during a period of extended stress (2020-08-26 through 2020-12-30).

	cBOD/BOD (mg/L)	TSS (mg/L)	Ammonia (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Fecal coliform (cfu)
GST product trench (n=)	2.0 (5)	1.7 (5)	3.8 (5)	29.2 (5)	4.0 (5)	3.0×10^4 (9)
confidence limits p=0.05	3.1 – 4.5	1.5 – 1.9	3.1 – 4.5	27.9 – 30.5	3.8 – 4.2	Geometric Mean
Influent (n=)	161(83)	123(83)	27.0(60)	41.4(45)	5.4(19)	2.8×10^6 (83)
confidence limits p=0.05	152 – 171	115 – 130	25.8 – 28.4	39.0 – 43.8	5.7 – 5.7	Geometric Mean

There were no significant differences in Total Nitrogen, $cBOD_{5\text{-Day}}$, or Fecal coliform concentrations between normal use and this period of extended stress. Ammonia and TSS concentrations were significantly lower during extended stress than during normal use, and Total Phosphorus is significantly higher during extended stress than during the periods of normal use.

Section 4.4 Hydraulic performance results

No breakout of effluent was observed during the test. The ponding in the GST ranged from no observed ponding to 6.8 inches of ponded water. We estimate that less than 25% of the effective soil absorption surface was used during the normal use and first four stress test phases of this test. After the period of extended stress, ponding increased and we estimate that less than 60% of the effective soil absorption was used.

Section 5.0 Summary

Under the conditions of this test, the GST produced a percolate that exceeds secondary treatment standards (30 mg/L Carbonaceous Biochemical Oxygen Demand and Total Suspended Solids). Throughout the test, which included five stress periods, the percolate did not exceed 10 mg/L $cBOD_{5\text{-day}}$, or 20 mg/L TSS. For the entire test period including the five stress events, less than 25% of the effective soil absorption area was utilized.

Data Appendices

Key

NH_4 – ammonium (mg/L)

BOD – 5-day Biochemical Oxygen Demand (mg/L)

cBOD – 5-day Carbonaceous Biochemical Oxygen Demand (mg/L)

DO – Dissolved Oxygen (mg/L)

NO_2 – Nitrite nitrogen (mg/L)

NO_3 – Nitrate nitrogen (mg/L)

Fecal Coli – Fecal coliform (colony forming units/100 mL)

pH – pH units

Temp – Temperature in degrees Celsius

TKN – Total Kjeldahl nitrogen

TP – Total Phosphorus

TSS – Total Suspended Solids (mg/L)

Sample Date		Alkalinity	NH_4	$cBOD_5$	DO	Fecal Coli	NO_3	NO_2	pH	Temp	TKN	TN	TP	TSS
2019-01-31	GST		50	6.5	10.3	210,000	0.74	0.46	7.5	0.62	47	48.2	1.5	7
2019-02-05	GST					340,000								
2019-02-07	GST	220	29	10	8.73	770,000	0.05	0.03	7.3	2.99	34	34.1	2.7	9
2019-02-11	GST				8.92	32,000			7.06	3.37				
2019-02-14	GST		23	7.2	8.23	200,000	0.67	0.03	7.04	3.15	30	30.7	2.5	7
2019-02-19	GST					30,000								
2019-02-20	GST		36	4.7	8.21	13,000	0.79	0.03	6.96	3.26	35	35.8	3.6	8
2019-02-25	GST				10.7	5,600			6.06	3.46				
2019-02-27	GST		31	4.9	5.75	2,500	4.1	0.03	6.7	3.2	32	36.1	3.2	5
2019-03-04	GST				4.47	13,000			6.83	3.13				
2019-03-06	GST		35	4.9	6.58	4,500	1.6	0.03	6.72	2.84	36	37.6	3.8	6
2019-03-11	GST				4.05	4,700			6.41	2.78				
2019-03-13	GST		27	5.7	9.19	2,800	1.9	0.03	6.41	2.81	27	28.9	3.2	6
2019-03-18	GST				6.68	7,700			6.98	4.17				
2019-03-20	GST		32	6.5	4.84	4,000	1.3	0.11	6.69	3.62	32	33.4	3.8	3
2019-03-25	GST				6.28	730			6.56	4.51				
2019-03-27	GST		33	3.3	7.02	1,200	1.9	0.13	6.84	4.69	30	32	3.9	4
2019-04-01	GST				7.72	8,900			7.05	5.49				
2019-04-03	GST		36	3.6	5.72	5,300	0.98	0.11	6.85	5.81	36	37.1	4	7
2019-04-03	GST				5.72				6.85	5.81				
2019-04-08	GST				5.22	600			6.71	6.32				
2019-04-10	GST		35	7.8	4.06	450	5	0.16	6.72	7.8	33	38.2	4.3	4
2019-04-16	GST				5.34	72			6.63	8.6				
2019-04-18	GST		23	1	4.13	120	9.4	0.44	6.67	8.9	32	41.8	4.3	2
2019-04-22	GST				3.64	54			6.5	9.8				
2019-04-24	GST		30	1	3.66	2,300	8.6	0.68	6.42	10.1	31	40.3	4.7	4
2019-04-29	GST				5.78	3,800			6.4	10.6				
2019-05-01	GST		20	1	4.2	8,500	16	0.82	6.47	10.4	24	40.8	3.8	1
2019-05-06	GST				3.55	38,000			6.42	10.7				
2019-05-09	GST		15	1	4.62	4,100	19	1.2	6.38	10.8	16	36.2	3.3	1
2019-05-14	GST				4.61	32,000			6.25	11.5				
2019-05-15	GST		12	3.4	2.66	140,000	20	3	6.34	11.4	14	37	3.8	3
2019-05-20	GST				2.77	2,700			6.14	12.1				
2019-05-22	GST		11	6.2	3.73	20,000	20	4.9	6.22	12.8	16	40.9	3.8	0.75
2019-05-28	GST				5.66	3,900			6.71	14.1				
2019-06-05	GST		17	6.1	1.87	9,200	14	2.4	6.46	15.2	15	31.4	3.1	8
2019-06-12	GST				4.37	11,000			6.45	16.8				
2019-06-19	GST		13	6.1	2.89	6,600	22	3.2	6.26	17.1	16	41.2	3.7	11
2019-06-26	GST				3.52	3,000			6.16	18				
2019-07-02	GST		12	8.5	3.8	33,000	23	0.32	6.16	19.3	16	39.3	2.1	7.5
2019-07-10	GST				3.32	14,000			6.11	20.8				

2019-07-17	GST		12	1	3.54	3,200	30	1.2	6.09	22	14	45.2	3.7	5
2019-07-24	GST				5.18	6,100			5.95	22.6				
2019-07-31	GST		1.7	1	3.77	10,000	43	0.93	5.27	22.9	3.4	47.3	3.6	4.7
2019-08-07	GST				4.16	3,200			5.65	23.6				
2019-08-14	GST		2.3	1	4.69	690	47	0.22	5.16	23.2	3.2	50.4	3.6	5
2019-08-14	GST				4.67				6.28	21.3				
2019-08-21	GST				4.48	2,100			4.96	23.4				
2019-08-28	GST				5.5	2,200			4.77	22.7				
2019-09-04	GST				8.04	1,300			6.27	21.9				
2019-09-18	GST				7.98	9,400			5.5	19.2				
2019-09-25	GST				7.71	1,100			5.33	20.2				
2019-10-02	GST				3.87	11,000			5.79	19.7				
2019-10-09	GST		3.8	1	8.11	7,600	27	0.21	5.96	16.6	5.3	32.5	4.2	2
2019-10-09	GST				8.11				5.96	16.6				
2019-10-16	GST				6.95	430			5.48	16.5				
2019-10-16	GST				7.78				5.62	15.8				
2019-11-07	GST				8.37	130			5.18	14.4				
2019-11-14	GST		0.36	1	6.99	310	0.38	0.03	4.41	12.6	1.1	1.51	3.1	1
2019-12-05	GST				7.12	870			6.23	8.9				
2019-12-12	GST		5.3	1	6.56	99	15	0.23	6.03	8.5	5	20.2	1.6	1
2019-12-19	GST				5.13	3,700			5.99	8				
2020-01-09	GST		13	6.6	3.78	29,000	11	0.29	6.37	6.5	15	26.3	3.1	3.6
2020-01-30	GST				6.3	990			6	5.4				
2020-02-11	GST		7.1	1	6.19	9	25	0.29	5.83	5.4	8.7	34	3.8	1
2020-02-25	GST				6.17	250			6.25	5.3				
2020-03-10	GST		10	1	5.21	680	23	0.23	6.09	6.1	12	35.2	1.5	1
2020-04-29	GST		7.8	1	5.59	1,200	19	0.16	5.65	8.3	8.5	27.7	3	2.4
2020-05-13	GST				5.75	310			4.98	10.4				
2020-05-27	GST		5.6	1	3.31	100	32	0.16	5	13.3	7.6	39.8	1	2
STRESS TEST DATA														
2020-06-02	GST			1	4.37	5			3.57	15.1				1
2020-06-08	GST			1	6.97	31			5.01	16.6				1
2020-06-09	GST			1	6.17	130			5.13	16.4				1
2020-06-10	GST			1	5.92	270			4.91	16.7				1
2020-06-11	GST		0.27	1	7.09	120	46	0.17	5.47	16.9	2.4	48.6	1.2	1
2020-06-12	GST			1	8.62	30			5.28	17.4				1
2020-06-15	GST			1	5.18	370			4.22	17				1
2020-06-22	GST			1	7.45	220			3.45	19.3				1
2020-06-23	GST			1	5.32	500			3.47	18.9				1
2020-06-24	GST			1	4.32	110			3.87	19				1
2020-06-25	GST		2.1	1	4.62	400	23	0.2	4.07	19.3	4.3	27.5	1.4	1
2020-06-26	GST			1	4.4	260			3.99	19.3				1
2020-06-29	GST			1	4.25	510			4.63	19.7				1

2020-07-08	GST			1	5.02				3.42	20.1				1
2020-07-09	GST			1	4.66	1,500			3.69	20.1				1
2020-07-10	GST			1	4.64	380			3.3	20.2				1
2020-07-13	GST			1	5.34	540			3.3	20.8				1
2020-07-14	GST		1.4	1	4.46	120	34	0.15	3.39	21	4.9	39.1	1.4	1
2020-07-28	GST			3	3.46	16,000			5.11	22.4				4
2020-07-29	GST		11	1	3.33	14,000	34	0.6	5.5	22.5	13	47.6	1.4	4
2020-07-30	GST			1	3.04	4,100			5.27	22.8				3.2
2020-07-31	GST			1	3.16	390			5.23	22.9				5.2
2020-08-03	GST			1	3.26	2,200			3.99	22.8				1
2020-08-04	GST			1	3.71	2,900			3.84	22.9				1
2020-08-19	GST				4.7	2,700			5.11	22.5				
2020-09-02	GST		10	4	2.78	20,000	30	0.41	5.78	22.2	12	42.4	4.8	1
2020-09-16	GST				2.5	140,000			6.25	21.5				
2020-09-30	GST		1.5	1	3.2	2,800	32	0.57	5.98	20.3	2.7	35.3	4.5	2
2020-10-14	GST				3.25	1,200			5.66	18.6				
2020-10-28	GST		2.3	1	2.67	8,800	26	0.82	5.93	17.3	3.5	30.3	4.5	1
2020-11-12	GST				2.66	2,900			5.69	15.2				
2020-11-23	GST				3.39	2,200			5.71	13.4				
2020-11-24	GST		3.5	1	3.48		23	0.54	5.57	13.2	4.5	28	3.7	1
2020-12-09	GST				3.1	87,000			6.12	11.3				
12/22/2020	GST		7.9	5	2.48	41,000	13	0.58	6.34	9.2	9.6	23.2	3.3	2.8
NORMAL LOADING RESTARTED														
2021-01-04	GST			1	3.09				6.12	8.3				1
2021-01-05	GST			1	2.98				6.05	8.2				1
2021-01-06	GST			1	3.19	980			5.98	8.2				20
2021-01-07	GST			1	3.11				6.12	7.8				1
2021-01-08	GST			1	3.04				6.14	8				1
2021-01-11	GST			1	2.44				6.26	7.5				1
2021-01-12	GST			1	2.46				6.21	7.4				1
2021-01-13	GST			1	3.97	6,500			6.22	7				1
2021-01-14	GST			1	2.32				6.22	7.1				1
2021-01-15	GST			1	2.46				6.1	7.1				1
2021-01-19	GST			1	4.66				6	7.3				1
2021-01-20	GST		8.8	1	3.94	3,900	21	0.55	5.9	6.9	10	31.6	4.1	1
2021-01-21	GST			1	4.33				5.91	7.1				1
2021-01-22	GST			1	3.72				5.89	7				1
2021-01-25	GST			1	3.35				6.03	6.6				1
2021-01-26	GST			1	2.76				5.89	6.1				1
2021-01-27	GST			1	2.78	1,200			5.84	6.3				1
2021-01-28	GST			1	6.45				5.83	5.9				1
2021-01-29	GST			1	4.23				5.61	5.8				2
2021-02-01	GST			1	3.13				5.84	5.7				2.4

2021-02-02	GST			3	3.71				5.89	5.4				1
2021-02-03	GST			1	2.95				5.9	5.4				
2021-02-04	GST			1	3.81				5.84	5.3				1
2021-02-05	GST			1	7.95				5.83	4.4				1
2021-02-08	GST			1	2.95				6.04	5.3				1
2021-02-09	GST			3	3.54				5.94	5.3				1
2021-02-10	GST			3	3.01	6,500			6	5.3				1
2021-02-11	GST			3	3.51				6.29	5.1				1
2021-02-12	GST			3	2.84				6.01	5.2				1
2021-02-16	GST			1	2.85				6.22	5.1				1
2021-02-17	GST			1	3.15	3,100			6.23	4.9				1
2021-02-18	GST			1	2.94				6.15	5				1
2021-02-19	GST			1	7.49				6.53	4.6				1
2021-02-22	GST			1	8.46				6.31	4.2				1
2021-02-23	GST			1	3.63				6	4.8				1
2021-02-24	GST			1	5	560			5.95	4.6				1
2021-02-25	GST			1	3.04				5.96	4.8				1
2021-02-26	GST			1	7.68				6.19	4.7				1
2021-03-01	GST			1	4.13				6.19	5.3				1
2021-03-02	GST			1	3.56				6.15	5.3				1
2021-03-03	GST			1	5.02	480			5.89	5.3				1
2021-03-18	GST				3.64	850			6.14	5.7				
2021-04-01	GST				2.72	840			5.99	7.9				
2021-04-15	GST				3.65				5.95	9.2				
						GEOMEAN								
Count		1	41	101	147	109	41	41	147	147	41	41	41	100
Average		220.0	15.6	2.0	4.8	2187.2	17.7	0.6	5.8	11.5	17.1	35.5	3.2	2.4
standard deviation		0	12.793	2.04	1.9		13.3	0.99	0.87	6.74	12.3	8.78	1.06	2.81
confidence interval (95%)			1.3476	0.14	0.11		1.4	0.1	0.05	0.37	1.3	0.92	0.11	0.19
Upper limit			16.9	2.2	4.9		19.1	0.8	5.9	11.9	18.4	36.4	3.3	2.6
Lower limit			14.2	1.9	4.7		16.3	0.5	5.8	11.2	15.8	34.6	3.1	2.2

Sample Date	Alkalinity	NH4	BOD5	DO	Fecal Coli	pH	Temp	TKN	TN	TP	TSS
2019-01-30	140	33	74	2.9	4600000	7.23	7.56	39	39	4.2	53
2019-01-31	140	30	110	1.6	4600000	7.16	6.87	40	40	5.5	190
2019-02-01	150	31	120	3.11		7.4	6.05	45	45	5.3	130
2019-02-02	150	29	160	2.15		7.29	7.16	42	42	5.1	160
2019-02-04			150	1.79	9900000	7.17	6.92				150
2019-02-05		27	230	1.78	9400000	7.22	7.04	40	40		150
2019-02-06			180	3.45	7500000	7.13	7.2				180
2019-02-07	220	31	180	4.3	5800000	7.04	6.52	45	45	4.5	190
2019-02-11			240	1.86	5200000	6.93	6.79				170
2019-02-12		30	270	1.96	7200000	7.05	6.48	54	54		220
2019-02-13			200	3.98	6700000	7.31	6.28				220
2019-02-14	170	28	110	2.31	11000000	7.15	6.39	45	45	5.3	150
2019-02-19		32	190	2.47	5000000	7.08	6.52	49	49		200
2019-02-20	180	27	160	1.77	3800000	7.22	6.58	49	49	6.9	220
2019-02-21		31	410	2.22	5200000	7.35	6.89	57	57		430
2019-02-25			250	2.14	2300000	7.07	6.94				260
2019-02-26			200	2.01	3800000	6.97	6.52				230
2019-02-27		33	200	1.74	2600000	6.97	6.01	47	47	5.8	230
2019-02-28		37	180	0.62	4300000	7.27	6.38	47	47		240
2019-03-04			220	2.7	1400000	6.75	5.81				130
2019-03-05		23	170	1.9	1500000	6.62	5.98	30	30		160
2019-03-06	100	23	150	0.76	1200000	7.21	5.87	33	33	4.1	110
2019-03-07		22	140	0.33	960000	6.85	6.02	31	31		210
2019-03-11			270	0.2	3300000	7.21	6.3				250
2019-03-12		29	130	0.74	3400000	7.02	5.93	42	42		280
2019-03-13	170	31	410	0.82	5000000	6.91	5.95	48	48	6.3	330
2019-03-14		33	200	0.34	4700000	6.94	6.09	38	38		310
2019-03-18			430	0.35	4400000	6.97	6.43				350
2019-03-19	150	34	270	0.39	4700000	6.92	5.51	47	47		
2019-03-20	190	39	250	0.58	7000000	7.35	6.39	51	51	7.1	170
2019-03-21		35	190	0.54	520000	7.25	6.12	48	48		140
2019-03-25			330	1.22	3900000	6.82	6.77				240
2019-03-26		35	350	0.59		6.77	6.64	46	46		260
2019-03-27	190	35	330	0.47	4000000	6.8	6.86	42	42	6.6	220
2019-03-28		32	360	0.58	2300000	6.77	7.28	52	52		270
2019-04-01	170	35	350		6900000			54	54	5.8	350
2019-04-02			260	0.07		7.03	7.1				150
2019-04-03	160	35	160	0.26	1300000	6.93	7.29	50	50	6	290
2019-04-04			180	0.28	2500000	6.91	7.44				230
2019-04-05	200	35	350	0.63		6.67	7.33	45	45	6.8	330
2019-04-08	180	41	330	1.69	2300000	6.97	7.18	53	53	8	250
2019-04-09	180	30	150	0.14		6.92	7.45	41	41	5.5	110
2019-04-10	230	31	130	0.93	2700000	7.43	8.5	42	42	4.8	120
2019-04-11	220	31	240	0.11	3800000	7.01	9	42	42	5.6	120
2019-04-16	160	31	190	-0.02	3500000	6.72	9.8	39	39		140
2019-04-17			320	-0.03	3100000	7.17	10.5				300
2019-04-18	190	29	220	-0.02	2400000	7.17	9.9	42	42		240
2019-04-22			260	0.08	2800000	6.81					270
2019-04-23	150	22	380	0.08	3800000	6.93	10.7	39	39		250
2019-04-24				0.04		7.1	10.3				
2019-04-25	280	24	270	-0.04	4400000	6.8	11.06	42	42		250
2019-04-29				0.02	670000	7.01	11.3				
2019-04-30	170	26	220	0.07	3700000	6.96	11.2	38	38		220
2019-05-01		18	170	-0.01	3900000	7.07	11.4	24	24	3	120
2019-05-02	150	19	200		3000000			28	28		60
2019-05-06					5300000						
2019-05-07	190	31	410		4900000			52	52		390
2019-05-09	180	33	240		7500000			47	47	5.4	210
2019-05-14	220	35	320		4800000			54	54		290

Raw Wastewater Influent

Sample Date	Alkalinity	NH4	BOD5	DO	Fecal Coli	pH	Temp	TKN	TN	TP	TSS
2019-05-15		33	220		2000000			51	51	5.8	170
2019-05-16	230	36	250		2400000			58	58		310
2019-05-20					5300000						
2019-05-21	170	28	260		5000000			42	42		60
2019-05-22		31	290		7700000			52	52	4.8	220
2019-05-23	160	28	280		7200000			46	46		210
2019-05-28	160	26	170		5900000			42	42		250
2019-05-30	160	29	180		7500000			48	48		320
2019-06-04	190	34	160		17000000			46	46		72
2019-06-05		44	280		8000000			58	58	6.9	190
2019-06-11	180	31	210		7700000			51	51		270
2019-06-12	160	28	190		5300000			43	43		220
2019-06-13	190	31	150		6500000			47	47		200
2019-06-18	180	27	190		6500000			46	46		220
2019-06-19	190	30	151		6400000			46	46	4.9	190
2019-06-20	190	27	150		3600000			43	43		200
2019-06-25	190	28	240		3900000			46	46		220
2019-06-26					4600000						
2019-06-27	190	32	130		9400000			39	39		130
2019-07-02	180	29	230		5700000			43	43	6.7	290
2019-07-09	130	25	150		5700000			39	39		120
2019-07-10	150	29	140		2500000			18	18		110
2019-07-11	160	27			2200000			42	42		
2019-07-16		27	94		14000000			43	43		
2019-07-17	220	34	76		5700000			48	48	4.8	150
2019-07-18		28	134		4400000			44	44		97
2019-07-23		35	190		9300000			46	46		20
2019-07-25		26	82		6600000			38	38		66
2019-07-30		39	170		11000000			60	60		380
2019-07-31	220	34	120		9900000			55	55	5.2	210
2019-08-01		32	110		9300000			47	47		210
2019-08-06		36	167		8500000			53	53		220
2019-08-07	220	32	110		9000000			49	49		140
2019-08-08					11000000						
2019-08-13	210	38	140		630000			45	45		100
2019-08-14	210	37	140		9900000			51	51	5.5	190
2019-08-15	220	33	135		3000000			52	52		360
2019-08-20	190	28	210		11000000			44	44		130
2019-08-21	200	31	0		5100000			41	41		120
2019-08-22	180	28			6300000			46	46		130
2019-08-27	160	28	200		2000000			44	44		250
2019-08-28	170	15	120		6000000			46	46		240
2019-08-29	170	22	86		3500000			34	34		180
2019-09-03					4200000						
2019-09-04	180	30	240		1300000			44	44		140
2019-09-05	140	26	260		3500000			45	45		210
2019-09-10	150	28	200		4600000			40	40		230
2019-09-12	170	28			3200000			42	42		240
2019-09-16	180	34	170		7500000			43	43		
2019-09-17	170	31	240		9800000			43	43		18
2019-09-18	160	34	150		6800000			47	47		140
2019-09-19	150	35			11000000			48	48		260
2019-09-24	180	28	140		5300000			38	38		79
2019-09-25					10000000						
2019-09-26	200	29	190		6100000			48	48		280
2019-10-01	150	24	400		5900000			49	49		500
2019-10-02	170	30	170		3200000			46	46		120
2019-10-03	160	31	270		4900000			45	45		210

Sample Date	Alkalinity	NH4	BOD5	DO	Fecal Coli	pH	Temp	TKN	TN	TP	TSS
2019-10-07	180	40	300					58	58		120
2019-10-08	150	27	101		3100000			40	40		60
2019-10-09	150	27	120		3600000			40	40	5.2	130
2019-10-10			130								
2019-10-11	150	29	120					41	41		110
2019-10-14	120	26	130					40	40		130
2019-10-15	150	27	95		3300000			35	35		83
2019-10-16	140	25	200		4400000			43	43		190
2019-10-17	160	27	110					40	40		160
2019-10-22	180	27	150		5700000			38	38		190
2019-10-24	140	26	160		7700000			40	40		160
2019-10-29		18	84		4700000			26	26		130
2019-10-31	180	29	180		5400000			37	37		150
2019-11-05	170	29	240		8500000			47	47		260
2019-11-07		24	240		7200000			40	40		180
2019-11-12		29	270		5100000			43	43		46
2019-11-14	120	28	260		5500000			38	38	4.6	76
2019-11-19	93	17	170		7400000			26	26		25
2019-11-21	190	28	130		8900000			38	37		100
2019-11-26	150	22	310		2400000			39	39		180
2019-12-02					1300000						
2019-12-03	170	20	160		1900000			32	32		180
2019-12-04					2000000						
2019-12-05	150	24	160		4200000			34	34		150
2019-12-09					1900000						
2019-12-10	160	23	180		1600000			34	34		170
2019-12-11					1300000						
2019-12-12	110	25	197		2500000			34	34	3	130
2019-12-17	160	25	270		2800000			39	39		200
2019-12-18					1100000						
2019-12-19	190	27	100		1900000			36	34		100
2019-12-23	99	26	400		700000			41	41		200
2019-12-26	130	24	150		1400000			36	36		170
2019-12-30	150	29	140		300000			40	40		140
2020-01-02	98	21	130					36	36		220
2020-01-07	180	27	110		2800000			37	37		88
2020-01-09	250	36	140		2700000			44	44	4.8	120
2020-01-14	210	30	150		2000000			42	42		120
2020-01-16	210	35			4200000			46	46		170
2020-01-21	180	29	200		2500000			37	37		210
2020-01-23	140	28	160		1700000			39	39		120
2020-01-24	220	27	190					41	42.13		140
2020-01-28	140	33	200		820000			40	40		130
2020-01-30	150	34	410		1300000			44	44		170
2020-02-04	130	31	150		1100000			45	45		190
2020-02-06	140	30	280		640000			43	43		44
2020-02-11	140	29	110		1100000			45	45	4.6	230
2020-02-13	140	28	180		940000			44	44		170
2020-02-18	150	33	320		1700000			50	50		170
2020-02-20	140	33	200		4200000			44	44		84
2020-02-25	140	31	180		5200000			45	45		160
2020-02-27	160	32	300		3900000			45	45		110
2020-03-03	120	30	250		2600000			45	45		200
2020-03-05	130	34	220		2800000			45	45		96
2020-03-10	140	36	240		2900000			54	54	1.9	130
2020-03-12	160	37	250		6500000			55	55		190
2020-03-17	130	30	230		1400000			46	46		150
2020-03-19	140	24	12		600000			43	43		130
2020-04-16								43	43.1		
2020-04-28			200					39	39		130

Sample Date	Alkalinity	NH4	BOD5	DO	Fecal Coli	pH	Temp	TKN	TN	TP	TSS
2020-04-29		31	150		860000			45	45	3.5	170
2020-04-30	150	32	160		1600000			48	48		180
2020-05-05	140	31	200					50	50		280
2020-05-07	160	34	150		1100000			54	54		170
2020-05-12	150	30	180					47	47		200
2020-05-13	150	33	210		1000000			53	53.34		220
2020-05-14	150	33	180		1100000			53	53		210
2020-05-19	140	31	150					48	48		140
2020-05-21			170								90
2020-05-26			150					42	42		68
2020-05-27	130										
2020-06-02			250		1700000			43	43		170
2020-06-03										1.1	
2020-06-04		29	260		1500000			44	44		140
2020-06-08			200		420000						190
2020-06-09			200		1600000			40	40		150
2020-06-10		24	220		990000			42	42	1.3	310
2020-06-11	130	5.5	150		1500000			36	36		130
2020-06-12			250		3800000						200
2020-06-15			200		2200000						330
2020-06-16			230					40	40		300
2020-06-17										1.4	
2020-06-18		27	410		5200000			55	55		530
2020-06-22			160		1000000						170
2020-06-23		23	110		1400000			37	37		68
2020-06-24	140	24	100		1600000			35	35	1.4	96
2020-06-25		29	150		2000000			40	41.77	1.4	64
2020-06-26			200		800000						82
2020-06-29			140		3300000						140
2020-06-30			180					45	45		140
2020-07-01		28	160		1100000			39	39	2.8	110
2020-07-07			170					47	47		170
2020-07-08		28	180		3600000			45	45	1.4	140
2020-07-09	150	29	150		1400000			42	42.6		140
2020-07-10			160		2700000						110
2020-07-13			200		680000						240
2020-07-14		28	210		1700000			48	48	1.5	240
2020-07-15		29	360		1900000			51	51		420
2020-07-20	190	32	160					41	43.1		72
2020-07-21			180								36
2020-07-22	180	30	170		1900000			40	42.02	1.5	70
2020-07-23	190	28	100		2500000			40	40		56
2020-07-24	170	32	190		2500000			46	47.22		160
2020-07-27	190	30	120		1600000			43	44.98		86
2020-07-28		32	150		3100000						160
2020-07-29		35	170		2500000			49	49	1.6	130
2020-07-30		33	150		2900000						62
2020-07-31		37	210		1400000						150
2020-08-03		36	130		3900000			50	50		120
2020-08-04		29	150		1600000						56
2020-08-05		20	120		1200000			28	28	1	60
2020-08-06	170	25	130		2200000			34	35.23		62
2020-08-07		25	140		2200000						74
2020-08-10		40	190		2500000			53	53		120
2020-08-11		35	170		5200000						110
2020-08-12		39	200		2700000					1.5	120
2020-08-13		43	190		2400000						140
2020-08-14		43	190		3300000						120
2020-08-17		45	210		1400000						140

Sample Date	Alkalinity	NH4	BOD5	DO	Fecal Coli	pH	Temp	TKN	TN	TP	TSS
2020-08-18		41	190		960000						98
2020-08-19		38	180		1200000			46	46	1.4	86
2020-08-20		39	160		4600000						150
2020-08-21		42	190		4900000						160
2020-08-24	230	37	170		2600000			52	53.18		150
2020-08-25		39	190		1400000						140
2020-08-26	240	38	210		6400000			55	62.26	6.2	240
2020-08-27		41	220		5900000						190
2020-08-28	230	38	220					60	61.1		190
2020-08-31	220	33	150		5400000			47	47.31		100
2020-09-01		33	97		8700000						52
2020-09-02	230	36	180		6100000			50	50.86	6.6	130
2020-09-03		32	160		5900000						140
2020-09-04	180	26	150		3500000			39	40.06		76
2020-09-07			140								110
2020-09-08		21	150		5800000			33	33		120
2020-09-09		24	140		4000000			36	38.46	4.9	130
2020-09-10		24	180		6400000						110
2020-09-11		20	140		3300000						74
2020-09-14	260	44	260		4700000			62	64.83		150
2020-09-15		31	290		5400000						210
2020-09-16	200	30	310		8200000			48	50.4	6.5	250
2020-09-17		30	150		2700000						180
2020-09-18	200	29	170		2800000			44	46.86		160
2020-09-21		19	120		3000000			30	30		82
2020-09-22		17	120		2600000						100
2020-09-23	190	19	130		3400000			31	32.16	4.1	120
2020-09-24	200	30	130		3400000			45	46.11		160
2020-09-25		30	120		1600000						140
2020-09-28	190	26	110		4300000			39	40.06		110
2020-09-29		26	130		4000000						130
2020-09-30	190	26	150		2900000			39	40.82	5.8	160
2020-10-01	200	27	110		1900000			38	39.3		120
2020-10-02		26	87		2100000						110
2020-10-05	190	27	93		2500000			36	37.26		98
2020-10-06		26	140		1900000						100
2020-10-07		26	120		2100000			38	39.44	5.2	130
2020-10-08		26	110		2200000						96
2020-10-09		26	140		2900000						130
2020-10-12			98								96
2020-10-13		24	110		3900000			37	37		94
2020-10-14		23	120		3600000			34	35.15	5.6	110
2020-10-15		25	140		3200000						110
2020-10-16		25	170		2800000						120
2020-10-19		41	200		11000000			60	60		180
2020-10-20		26	190		5800000						140
2020-10-21		25	110		4500000			36	37.18	5.2	87
2020-10-22		29	120		8300000						100
2020-10-23		30	160		1800000						110
2020-10-26		30	160		5500000			42	42		130
2020-10-27		27	170		11000000						110
2020-10-28	190	28	130		8200000			37	38.34	5.2	110
2020-10-29	180	26	170		1400000			37	38.22		130
2020-10-30		21	210		2500000						74
2020-11-02		24	110		4300000			30	30		62
2020-11-03		25	120		5400000						90
2020-11-04		24	100		6600000			32	33.3	4.7	100
2020-11-05		23	91		4400000						98

Sample Date	Alkalinity	NH4	BOD5	DO	Fecal Coli	pH	Temp	TKN	TN	TP	TSS
2020-11-09			150		3700000			45	45		160
2020-11-10		27	130					39	40.01	5.4	86
2020-11-11			200								130
2020-11-12			140		1900000						110
2020-11-13			160								120
2020-11-16			150					52	52		110
2020-11-17			190		1800000						96
2020-11-18	160	26	250		2500000			40	40.97	5.9	150
2020-11-19			210		2600000						150
2020-11-20	170	25	160					37	37.92		130
2020-11-23			190		1100000			37	37		150
2020-11-24		23	200					39	39.87	5.1	140
2020-11-25			160								120
2020-11-30			200					37	37		130
2020-12-01					1200000						
2020-12-02		19	160		2400000			36	36.99	4.5	110
2020-12-03					1800000						
2020-12-04			200								120
2020-12-07			140					30	30		82
2020-12-08			160		720000						100
2020-12-09		23	260		930000			42	44.55	5.6	130
2020-12-10			160		1100000						98
2020-12-11			200								130
2020-12-12			180								94
2020-12-14								39	39		
2020-12-15					560000						
2020-12-16	180	25	180		1700000			41	42.725	5.2	120
2020-12-17					830000						
2020-12-18			180								120
2020-12-19			210								160
2020-12-20			180								140
2020-12-21			190		500000			36	36		110
2020-12-22		23	220					38	39.278	5.6	120
2020-12-28					320000			37	37		
2020-12-29		24	180		500000			36	36		100
2020-12-30		24	180		650000			37	39.06	5.1	140
2021-01-03			150								100
2021-01-04			210		280000			38	38		140
2021-01-05			140								80
2021-01-06		28	140		410000			40	42.04	5.3	96
2021-01-07			220								150
2021-01-08			180								60
2021-01-11			260		480000			46	46		120
2021-01-12		29	200		600000			39	39		120
2021-01-13	200	32	170		480000			42	43.125	5.7	100
2021-01-14	210	34	130					44	45.41		88
2021-01-16			360								170
2021-01-17			240								120
2021-01-18											100
2021-01-19			220		310000			40	40		90
2021-01-20		28	170		480000			40	41.98	5.6	84
2021-01-21			160								76
2021-01-22			160								78
2021-01-25		23	180		2500000			37	37		100
2021-01-26		25	230		1200000						110
2021-01-27		26	180		1900000			40	41.14	5.4	86
2021-01-28		27	180		290000						120
2021-01-29		28	160		48000						68

Sample Date	Alkalinity	NH4	BOD5	DO	Fecal Coli	pH	Temp	TKN	TN	TP	TSS
2021-02-02		36	190		900000			50	51.46	5.8	110
2021-02-03		31	110		2600000			41	42.41	4.6	66
2021-02-04		39	310		2000000						250
2021-02-05		41	330		590000						160
2021-02-08		43	200		1300000			56	56		66
2021-02-09		39	220		1800000			57	59.12	6.7	92
2021-02-10		43	250		2800000			59	60.78	7	120
2021-02-11		43	220		2500000						130
2021-02-12			120								
2021-02-16		26	280		1100000			40	41.19	5.5	150
2021-02-17		22	210		1600000			33	34.86	4.2	96
2021-02-18		26	200		1300000						110
2021-02-19		26	180		790000						100
2021-02-22		27	120		1900000			37	37		80
2021-02-23		29	170		1900000			36	37.31	4.9	100
2021-02-24	170	26	260		3000000			42	43.75	5.3	150
2021-02-25		30	250		1600000						280
2021-02-26		28	230		700000						200
2021-03-01		29	250		2300000			46	46		170
2021-03-02		26	220		2700000			38	39.15	5.4	150
2021-03-03		30	260		4300000			45	46.18	5.9	170
2021-03-04		29	250		3100000						200
2021-03-05		33	310		800000						110
2021-03-08		39	270		2900000						170
2021-03-09		29	240		4000000			49	50.18	6.6	180
2021-03-10		32	240		1600000			51	52.26	6.2	160
2021-03-11		36	330		3600000						260
2021-03-12		32	260		450000						220
2021-03-15		36	340		4000000			54	54		220
2021-03-16		37	260		3800000			52	53.31	6.9	180
2021-03-17	170	34	230		3100000			46	47.23	6.2	170
2021-03-18		35	330		1800000						340
2021-03-19		32	240		1000000						210
2021-03-22		25	110		1100000			36	36		100