KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, N.Y. 12550
845 275-7732 PATTONGEOTECH.COM

CLIENT:	JM Development LLC 2975 Route 9W New Windsor, NY 12553	PROJECT: PROJ. No.: DATE:	Newburgh Waterfront Newburgh, N.Y. 25311 October 22, 2025

GEOTECHNICAL INVESTIGATION REPORT

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1. PROJECT DESCRIPTION AND SITE GEOLOGY

A geotechnical investigation using soil borings was performed and this report was prepared, to evaluate the subgrade conditions in the proposed building area and to provide recommendations for construction of a new mixed-use on a previously-developed lot, as shown on the attached plan. The site is located between the Hudson River and the West Shore (CSX) rail line, north of Washington Street and south from the south end of Front Street. Most of the lot was used as a rail yard, from circa 1850 to 1980. It appears that only a few small buildings were previously present in the project area. There are two one-story metal buildings of modern construction on the east side of the proposed building area.

The proposed building will be approximately 625 feet long, north to south, and 140 to 190 feet wide, and will include a ground-floor parking level, below five multi-story towers. The garage slab elevation is expected to be approximately ten feet above sea level. Existing elevations are approximately +10 to +14.5 feet along the west side and +3.5 to +9 feet along the east side.

The Surficial Geologic Map of New York State (N.Y. State Museum, 1989,) indicates that the site is in an area which is mostly covered by deposits of relatively deep glacial till. The USDA Soil Survey shows 'urban land' along the river, changing to Mardin gravelly silt loam on the west side of the site. Mardin soils typically form over deep deposits of glacial till composed of clay with little gravel and little sand, with few cobbles and boulders, however the till is sometimes very gravelly, and cobbles and boulders can be abundant. Mardin soil is the native soil type indicated in most of the City of Newburgh, however the Heights section, in the southeast part of the city and southwest to south from the project, is a kame deposit of stratified sand and gravel, not till.

This location has a long history of human activity. Just to the south is the end of Washington Street, which was originally a Native American trailhead and was a river crossing point, to the beginning of a trail leading from Denning's Point, on the south side of Beacon. In the 1850's the project site became the terminus of the Erie Railroad's Newburgh Branch, and piers were installed to load freight cars onto barges and float them to Denning's Point. The piers extended northeast into the river behind the two existing modern buildings, and were abandoned prior to 1913. This small rail yard remained in use until at least 1980; historic Sanborn Fire Insurance maps indicate that a small freight house extended into the middle of the north end of the proposed north building section, a freight platform ran down the middle of the proposed building, and a handful of other small railroad buildings were present over the years, but no significant structures are indicated. The buildings are unlikely to have had basements, due to the low elevation of the site. The maps show a large coal yard immediately to the southeast, covering the area of the present public boat ramp and parking area; significant amounts of sand-size coal, a waste material, were encountered in the borings on the river side of the project area, where it was apparently dumped as fill.

The native soils encountered in the borings were not consistent with the Geologic Map or the Soil Survey data. While glacial till was present, it was deep, and was covered by deposits of river clay and/or sandy alluvium or outwash. Fill was encountered in all of the borings; it was thin in the west borings and was up to sixteen feet thick in the borings near the river.

The Bedrock Geologic Map of New York (N.Y. State Museum, 1970,) indicates that the local bedrock is concealed by recent (Quaternary) sediment deposits, but was identified by the project rock cores as gray Ordovician-age siltstone, fine greywacke sandstone and shale. It is probably bedrock of the Austin Glen formation, rather than the closely-related Normanskill and Mount Merino units, which are shaley. It also appears to be part of the allochthonous sequence of bedrock, thrust-faulted into place from the east during the Taconic Orogeny, over the existing bedrock. Several of the borings met refusal on the top of probable bedrock, at 33 to 45 feet in the west borings and 47 to 77 feet in the east borings. Cores were obtained from two of the borings.

2. SOIL INVESTIGATION AND TEST RESULTS

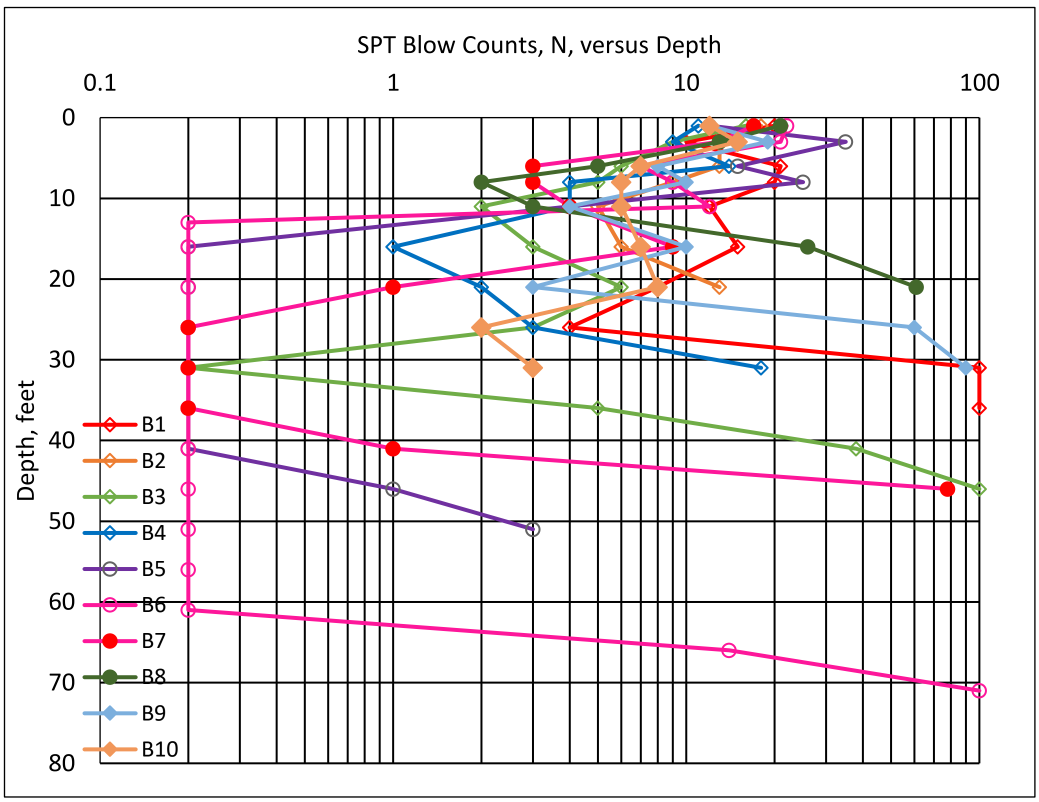
Ten soil borings were drilled on September 3-5 and 8-10, 2025. Borings were drilled by both the hollow-stem auger method and the wash-rotary method, using a truck-mounted drill rig. Drilling was performed by General Borings, Inc. of Prospect, Connecticut. The subsurface investigation was supervised and witnessed by Warren Patton, under the direction of Kevin Patton, P.E. Sampling from and inspection of the soil boring samples were also performed by a representative of C.T. Male Associates, for use in their environmental analysis.

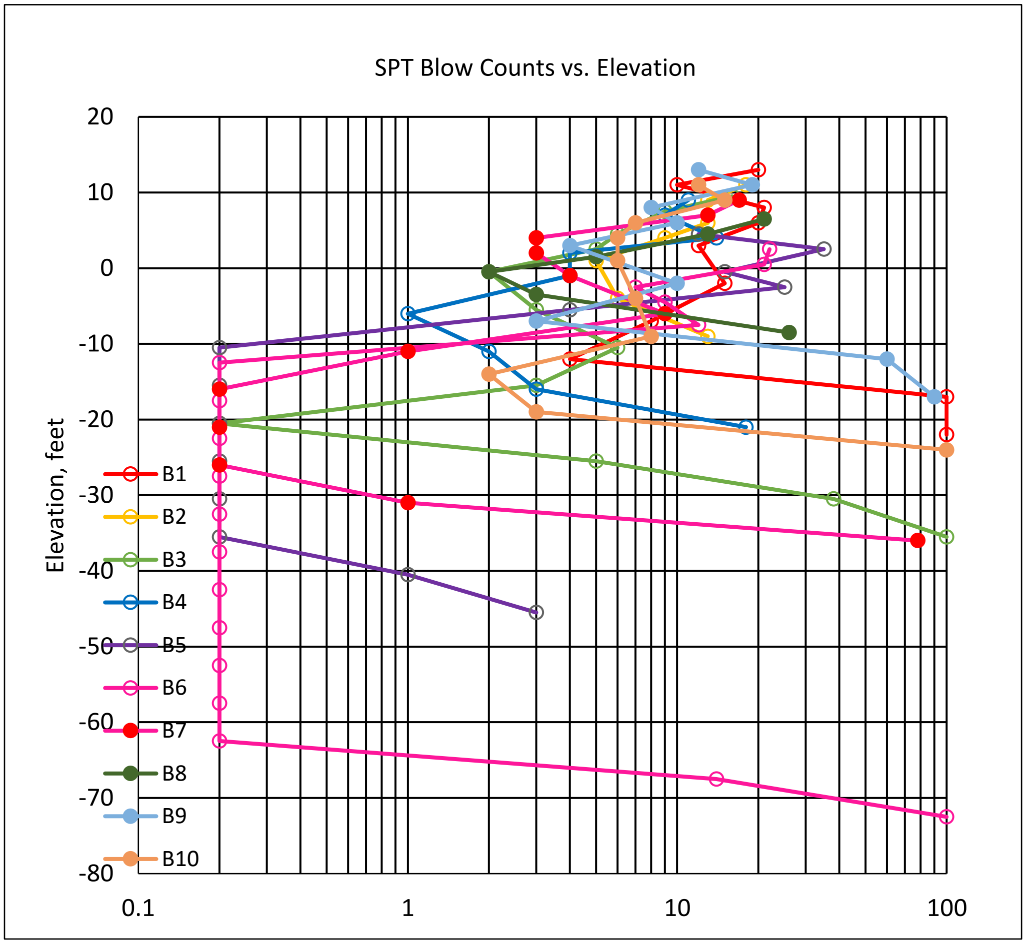
Soil sampling and testing were performed by the Standard Penetration Test (SPT,) using an Automatic Hammer, in accordance with ASTM D1586 (Standard Method for Penetration Test and Split-Barrel Sampling of Soils.) The SPT provides the Blow Count "N" Value, equal to the number of blows of the 140-pound steel hammer that were required to drive the 2-inch outside diameter split-spoon sampling tube into the soil, over a twelve-inch increment. Soil samples are also recovered by this method, and additional tests were performed in the field and lab, as noted on the soil boring log, using a hand penetrometer to test bearing capacity; some of the samples were also tested in the lab for shear strength, using a Torvane gauge.

Laboratory testing was performed on representative soil samples for particle size distribution and for Atterberg Limits. All suitable samples were tested for moisture content. USCS classifications of the soil, per ASTM D2487 and D2488, are provided on the logs and on the subsurface profile drawing. Soil density and drying shrinkage tests were performed on two samples of river clay.

2.1. Soil Boring Blow Count and Laboratory Data

SPT Blow Count Values, N										
Boring Number	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Approx. Elevation	14.0	12.0	10.5	10.0	5.5	3.5	10.0	7.5	14.0	12.0
Depth, feet: 1	20	18	16	11	12	22	17	21	12	12
3	10	13	9	9	35	21	13	13	19	15
6	21	13	6	14	15	7	3	5	8	7
8	20	9	5	4	25	9	3	2	10	6
11	12	5	2	4	4	12	4	3	4	6
16	15	6	3	1	0	0	9	26	10	7
21	8	13	6	2	0	0	1	61	3	8
26	4		3	3	0	0	0		60	2
31	50/3″		0	18	0	0	0		90	3
36	50/1″		5		0	0	0			75/11″
41			38		0	0	1			
46			50/2″		1	0	78			
51					3	0				
56						0				
61						0				
66						0				
71						14				
76						60/5″				
Refusal, feet	36.5	-	45	-	-	77	47	21.75	33	37
Cored			45-50						33-43	
Notes	All tests with N=0 had split-spoon penetration under the weight-of-hammer load. Boring B8 met refusal in wood.									





Hand Penetrometer Resistance, kips/sq ft									
Boring Number	B1	B3	B4	B5	B6	B7	B8	B9	B10
Depth, feet: 1	4.7								
11		1.9						1.7	
16				0.25		0.6	0.7		
21	1.9			0.3	0.7	0.7		1.9	
26	1.5	1.3	2.5	0.6	0.9	0.75		9	1.2
31	10	1.2		0.8	0.9	0.3		13	1.8
36		0.8		1.0	0.9	1.1			
41				0.8	0.4	0.9			
46				0.25	0.6				
51				0.35	0.6				
56					0.8				
61					1.0				
66					2.0				

Torvane Shear Strength, lbs/sq ft						
Boring Number	B1	B3	B5	B6	B7	B10
Depth, feet: 16			200			
26	800	750	350		450	
31				500		700
36		250		400	650	
41				300	550	
46			350	450		
51			350	450		
56				650		
66				1150		

The Standard Penetration Test results (blow counts) mostly indicated loose (N=4 to N=10) conditions in the existing fill and in the upper native soils. Very loose consistencies (N=1 to 3) were indicated in boring B3 at approximately 10 to 18 feet depth, in boring B4 at about 13 to 23 feet depth and in boring B7 at 18 to 23 feet. All of the borings, however, encountered a medium-dense (N=10 to 30) layer at the surface. In boring B1 all of the upper soils were medium-dense, over river clay at 20 feet depth.

Seven of the ten borings encountered river clay. Borings B2 and B8 apparently stopped above the clay, with B8 ending in a timber. The northwest boring, B4, indicated that the clay is absent at that location. The west borings mostly indicated a soft consistency in the clay (N=2 to 4,) and the borings near the river mostly indicated very soft clay (N=0 to 2.) Many of the clay samples had an SPT value of N=0, but the soils did have some strength; the split-spoon did not penetrate under the weight of the drill rods, but it did penetrate when the 140-pound hammer was placed on top of the rods. This weight-of-hammer penetration was assigned an N-value of 0.2 to enable plotting on the semi-log charts; there were no samples with weight-of-rods penetration, which would have been assigned a 0.1 N-value. The greatest thickness of soil with this consistency was encountered in boring B6, where weight-of-hammer penetration occurred from 15 feet to 67 feet depth. From the estimated finished grade elevation of ten feet, these soft to very soft clays were encountered at depths of approximately 15 to 20 feet near the proposed southwest building corner, and from roughly 22 feet to about 30 to 45 feet deep along the west side, while on the east side they began at about 16 to 18 feet depth and extended to depths of 42 to 75 feet, in the borings that reached the bottom of the layer. Some stiffer clay was also encountered. In boring B1 the clay was firm (N=4 to 8,) and in boring B6 the bottom of the thick clay stratum was stiff (N=14.) In the borings that penetrated through the river clay, a few feet of mostly very dense (N>50) glacial till was encountered, with minor dense till (N=30 to 50,) prior to refusal on bedrock, which is assumed to have an N=100 blow count value.

Hand penetrometer tests were performed in the field and in the lab on many of the samples, and several samples were also tested in the lab with a Torvane gauge, for shear strength; these tests can only be performed on relatively undisturbed samples containing little or no gravel, and the test results are affected by the moisture contents of the samples. These test results are most significant in respect to the soft river clays, providing strength measurements for samples that mostly had blow counts of zero. Test results for the clay samples are summarized below. Plotting the hand penetrometer and Torvane test results vs. moisture content generally indicated decreasing strength with increasing water content, but the data was very scattered, with R^2=0.12 for both plots. A total of 33 hand penetrometer tests were performed on samples of the river clay; six tests indicated a very soft consistency (PEN<500 psf,) with test results ranging from 250 to 400 psf. Sixteen samples had soft consistencies (PEN = 500 to 1000 psf,) ten were firm (PEN = 1 to 2 ksf) and one was stiff, with PEN = 2.5 ksf. The overall average was 0.94 ksf and the modal value was 0.8 ksf. The eighteen Torvane test results in the river clays ranged from 200 to 1150 psf, with an average of 520 psf. Ten tests indicated very soft consistencies (TOR <500psf,) six tests indicated soft soils (TOR = 500 to 750 psf,) one indicated firm soil (TOR = 750 to 1000 psf) and one indicated stiff soil (TOR = 1 to 2 ksf.) The mode of the Torvane tests was 450 psf.

Comparison of Blow Counts, Penetrometer and Torvane Tests
and Moisture Content in River Clays

Boring	Depth	USCS	SPT N	PEN	TOR	%m
B1	21	CH	8	1.9		67.8
	26	CH	4	1.5	800	68.2
B3	26	MH	3	1.3	750	54.0
	31	MH	0	1.2		39.4
	36	ML	5	0.8	250	30.6
B5	16	CH	0	0.25	200	72.4
	21	CH	0	0.3		79.8
	26	CH	0	0.6	350	83.0
	31	CH	0	0.8		66.8
	36	CH	0	1.0		72.7
	41	CH	0	0.8		65.4
	46	CH	1	0.25	350	63.4
	51	CH	3	0.35	350	46.4
B6	21	CH	0	0.7		67.8
	26	CH	0	0.9		68.2
	31	CH	0	0.9	500	65.4
	36	CH	0	0.9	400	53.2
	41	CH	0	0.4	300	68.0
	46	CH	0	0.6	450	59.3
	51	CH	0	0.6	450	56.3
	56	CH	0	0.8	650	46.3
	61	CH	0	1.0		48.3
	66	CH	0	2.0	1150	34.5
B7	16	CH	9	0.6		
	21	CH	1	0.7		71.2
	26	CH	0	0.75	450	74.1
	31	CH	0	0.3		73.9
	36	CH	0	1.1	650	65.7
	41	CH	0	0.9	550	49.4
B8	16	ML	26*	0.7		64.9*
B9	21	CH	3	1.9		64.6
B10	26	CH	2	2.5		54.2
	31	CH	3	1.8	700	41.9

PEN values in kips per square foot, TOR values in pounds per square foot.
All N-values of zero were 'weight-of-hammer.'
*With wood (B8, 16ft depth.)

Natural Moisture Content, Percent										
Depth, feet	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1	12.6	13.6	6.3	13.8	**47.8**	8.3	13.6	12.0	22.6	9.9
3	10.3	7.2	8.9	7.2	**75.3***	28.6	15.6	5.6	9.4	4.2
6	7.1	5.2	7.1	11.4	28.1	**43.8**	22.1	18.1	7.1	
8	4.5	4.7	13.6	5.6	**110.0**	39.3	15.4	**64.9***	11.8	4.2
11	3.5	13.1	22.0	19.1	**57.5***	28.2	**46.1**	16.5	17.2	14.4
16	12.2	16.7	21.0	17.7	**72.4**			**68.8**	19.3	15.7
21	**56.7**	13.8	14.5	18.2	**79.8**	**67.8**	**71.2**	**143.0***	**64.6**	14.8
26	**52.8**		**54.0**		**83.0**	**68.2**	**74.1**		9.3	**52.4**
31	9.4		39.4	12.1	**66.8**	**65.4**	**73.9**			**41.9**
36			30.6		**72.7**	**53.2**	**65.7**			11.6
41					**65.4**	**68.0**	**49.4**			
46					**63.4**	**59.3**	8.9			
51					**46.4**	**56.3**				
56						**46.3**				
61						**48.3**				
66						34.5				
71						**55.5**				
76						11.8				

Test results of 40% and greater are shown in bold font.
*Sample contained a significant amount of timber or other wood.
**Approximate, from hydrometer test sample prep.

SOIL TEXTURE										
Particle Size Analysis										
Sample		B3-S8	B4-S8	B5-S13	B6-S15	B7-S6	B9-S8	B10-S2	B10-S4	B10-S9
Depth		26 ft	26 ft	46 ft	61 ft	16 ft	26 ft	3 feet	8 ft	31 ft
USCS Class		MH	SW-SM	CH	CH	CH	SC	SM	SP	CH
Sieve	mm	Percent Passing by Weight								
¾″	19.0	100	100	100	100		88	100	100	
#4	4.75	100	84	100	100		71	78	81	
#10	2.00	98	71	100	100		57	62	68	
#40	0.425	96	45	100	100	±100	37	39	31	±100
#200	0.075	93	12	98	99	±100	21	17	4	±100
Hydro-meter	0.050	87	10	96	95		20	16	-	
	0.005	27	4	40	43		10	9	-	
	0.002	13	3	21	28		7	7	-	
Atterberg Limits										
Liquid Limit, LL		55	-	72	61	79	-	-	-	62
Plastic Limit, PL		30	-	26	28	31	-	-	-	26
Plasticity Index, PI		25	NP	46	33	48	-	-	NP	36
Percent Moisture		54.0		63.4	48.3	68.2	9.3	4.2	4.2	41.9
Liquidity Index, LI		0.96	-	0.81	0.62	0.78	-	-	-	0.44

NP = Non-plastic.

Many of the moisture content test results were greater than forty percent, indicating relatively weak soils. Four samples contained wood, and had test results of 57.5 to 143% moisture. The sample from eight feet depth in boring B5 was loose silty muck with cinder and coal, with a moisture content of 110% of the weight of the dry constituents. The other samples with test results greater than forty percent were of the river clays, with moisture contents of 41.9 to 83.0%, averaging 61.6%.

The particle size analyses were performed on representative soil samples from the borings. The size ranges are summarized in the table below. The river clays typically contained only a trace amount of sand, as seen in the test results for the USCS Class MH and CH soils. The shallow soils, as represented by B4-S8, B10-S2 and B10-S4, were typically sandy to gravelly-sandy, with traces to little silt. Sample B9-S8 is from the till below the river clay. Note that the split-spoon sampling method which was used to collect the samples excludes particles that are medium gravel-size or larger. The gravel fraction may be under-represented in some of the samples.

Sample Composition Summary (USCS Size Categories)									
Sample	B3-S8	B4-S8	B5-S13	B6-S15	B7-S6	B9-S8	B10-S2	B10-S4	B10-S9
Depth	26 ft	26 ft	46 ft	61 ft	16 ft	26 ft	3 feet	8 ft	31 ft
USCS Class	MH	SW-SM	CH	CH	CH	SC	SM	SP	CH
Gravel, %	0	16	0	0	0	29	22	19	0
Sand, %	7	72	2	1	±0	50	61	77	±0
Silt and Clay, %	93	12	98	99	±100	21	17	4	±100

The Atterberg Limits tests were performed on samples of the river clay. Most of the river clays were classified visually-manually or by test as 'fat clay,' USCS Class CH, with some 'elastic silt,' Class MH, of slightly lower plasticity. A small amount of USCS Class ML silt was also present, but it had high plasticity for this soil type, and is described in the logs as 'clayey silt.' For the samples tested, the liquidity index (LI) was also calculated. An LI greater than one indicates that the soil is likely to be in a condition that is fully-softened. The sample of Class MH soil had an LI of 0.96, while the Class CH soils had LI values of 0.44 to 0.81. The consistencies of the fine fractions of the soils other than the river clays, were estimated, using the ASTM D2488 method, to have silty or low-plasticity clay textures.

Soil Density and Shrinkage		
Sample	B3-S9	B5-S13
Depth	31 feet	46 feet
USCS Class	MH	CH
Moist Density, pcf	109.0	105.8
Dry Density, pcf	72.3	66.9
Percent Moisture	50.7	58.0
Volumetric Shrinkage	18.0	22.5
Shrinkage Potential	High	High

Two samples of the river clays were measured and tested to determine their natural density and shrinkage potential. The samples had normal wet densities of 106 and 109 pcf, but their dry densities were low for inorganic soils, at 67 and 72 pcf. These soils have high shrinkage potential if exposed to wetting and drying cycles and are classified as expansive. In their in-situ condition they are soft, but stable.

2.2. Subsurface Profile and Summary of Subgrade Conditions

Subsurface conditions encountered in the borings are described in the boring logs and are summarized in the drawing attached to this report. The following strata were encountered in the subsurface profile.

Subsurface Profile – West Side			
Stratum	Thickness	Bottom Elevation	Description
Fill	2 to 7 ft	+5 to +10 ft	Sand with little silt, Sand and coal fines. Traces to little gravel. USCS Class SM, minor SC. Medium dense, becoming loose. Very old fill.
Sandy Soils	17 to 21 ft (12 ft in B9.)	-12.5 to -14 ft (-4.5 ft in B9.)	Sand and Silty Sand, trace to little gravel. Lower half gravelly in B1. Clay, Sandy clay and Clayey sand layers in B9. USCS Classes SW-SM, SM, SW and SP, with GM, GC, SC and CL. Loose to medium dense, with some very loose in the north borings.
River Clays	5 to 17 ft, thickens to north, then absent at north end.	-10.5 to -29.5 ft	Fat Clay, Elastic Silt and high-plasticity Silt, USCS Classes CH, MH and ML. Boring B3 had soft Elastic silt, over very soft Fat clay, then soft high-plasticity Silt. The other borings had Fat clay, soft.
Till	2 ft to 9+ ft	-18.5 to -34.5 ft	Clayey sand, Gravelly silty sand, Sandy gravel with little to some clay, silt or silty clay. USCS Classes SC, SM, GC, GM, GC-GM. Dense to very dense, except B4, which was loose, becoming medium-dense.
Bedrock	-	-	Gray shale bedrock, medium-hard, with hard layers of greywacke sandstone.

Subsurface Profile – East Side			
Stratum	Thickness	Bottom Elevation	Description
Fill	7 to 16 ft	-6 to -8.5 ft +0.5 ft at B8	USCS Classes SM and SW-SM, with CL, SC, GC Medium-dense, becoming loose. Some layers composed of fine coal.
River Clays	26 to 62 ft	-32 to -71 ft	Fat Clay, USCS Class CL. Very soft, becoming soft to stiff in the bottoms of borings B5 and B6.
Till	3 to 5 ft	-37 to -74 ft	Sandy gravel with silt, Sand and gravel with clay. USCS Classes GM, SC. Very dense.
Bedrock	-	-	Gray shale bedrock, medium-hard, with hard layers of greywacke sandstone.

Most of the existing fill, with the exception of recent excavations for utilities, foundations, etc., is believed to have been in place for about 175 years. The current shoreline does not differ significantly from the semi-scale drawings in the 1950, 1913 or 1884 Sanborn maps, which all show the rail yard fully developed across the project site. The rail yard was initially developed in 1850, and most of the existing fill was probably placed around that time. Photographs and engravings from the late 1800s indicate that wood piles and lagging were probably installed to contain the edge of the fill and create a wharf along the waterfront. The seawall has rotted away, although some of the submerged wood likely remains. The edge of the fill has been eroded by the waves in the river. Rail, auto traffic and time have consolidated the surface of the fill, making it very stiff, but the deeper fill is mostly loose. Railcars, although heavy, only produce a net load of about 300 psf in a crowded rail yard, thus this use would not have significantly consolidated the deep soils. On the river side much of the fill consists of sand-size coal and cinder, which are lightweight materials; when the fill was placed this had the advantage that less immediate and long-term settlement of the underlying clay occurred, but for the current project it means less surcharging has occurred, with more remaining potential for settlement of the river clays. The coal and cinder particles are also a bit fragile, and will crush and settle under load; for the proposed work, the magnitude of this settlement would be very small, and it would reach completion almost immediately after each load increment is applied.

The sandy stratum below the fill appears to mostly be early post-glacial alluvium, possibly eroded from the kame deposit immediately to the south and southwest. Some of the deeper soils may be late-glacial outwash. These soils were probably deposited in a delta along the riverbank, with the stream disappearing as the topography stabilized.

The river clays are believed to have been deposited in Glacial Lake Albany, which was impounded between the melting glacier and a moraine blocking the valley to the south, either in or below the Hudson Highlands. Most of the sediment was likely derived from the local gray shale bedrock, especially from the bedrock of the Wallkill Valley. Mollusk shells, almost all less than 3mm across, and rarely tiny pieces of plant matter, were occasionally present in the clay, but no other biological features were noted. The tiny clam shells are interesting, as the lake would have impounded fresh water, and their potential origin is unknown.

The till encountered between the lake clays and the bedrock appears to mostly be lodgment till, packed against the bedrock by the mass of the glacier. This differs from the 'typical' condition as described by Robert Dineen et al, in 'Glacial Lake Albany and its Successors in the Hudson Lowlands,' (Field Trip Guidebook, AMQUA 1988, UMass Amherst,) who report that the clays are typically underlain by alluvial fans of outwash sand and gravel, with occasional flow-tills. The loose to medium-dense till encountered in the bottom of boring B4 was likely flow-till, deposited as a sandy mudflow from the melting ice.

The river clays encountered in the borings are potentially expansive if exposed to wetting and drying cycles, and if they are excavated, such as for the installation of drilled shafts, they should not be reused as fill, except in landscaped areas or in locations where they will remain constantly wet. Expansive soils appear to be absent at the depths of any expected shallow excavations, with the shallowest expansive soils encountered at approximately minus-5 feet elevation.

The site is situated a few feet above sea level, next to the Hudson River, a tidal estuary. There are thick layers of free-draining soils in the upper subgrade and the groundwater elevation will fluctuate in response to the tides. It was indicated at elevations of minus-1 foot to plus-3 feet in the boreholes at the time of drilling.

Most of the shallow on-site soils are slightly to moderately susceptible to frost heave. Frost heave can be minimized by providing good drainage and by thoroughly compacting the soil. Well-graded granular fill should be used and good drainage should be provided in areas where frost heave could result in damage.

3. SITEWORK RECOMMENDATIONS

3.1. Subgrade Preparation

The borings encountered significant thicknesses of loose to very loose granular soils and soft to very soft clays. A deep foundation using driven steel piles bearing on bedrock and/or basal till is considered to be the most practical option for support of the structure. Additional subsurface exploration, by probe-drilling and/or geophysical methods, will be needed to determine the lengths of the piles required. Acceptable end-bearing conditions are expected at approximately elevation -20 near the southwest building corner, minus-35 to -40 feet in the west and south parts of the building, and at -75 feet or greater in the northeast part. The pile lengths required for these depths would be about 30 feet, 45 to 50 feet, and 85 feet, respectively.

Potential alternatives to a pile-supported foundation include the use of drilled shafts (piers,) or ground improvement using rigid inclusions or deep-soil mixing. Construction using piers would be slower and more costly than piles; it would be favored if the proposed loads were very high or if there were lateral stability concerns, but neither condition applies. Rigid inclusions or deep soil mixing would create stiff columns down to bedrock, and would be capped by a geosynthetic-reinforced granular fill pad, upon which a conventional foundation would be constructed. These methods may be cost-competitive with pile driving, but would require additional excavation, may require the disposal of spoils produced by the drilling operations, and require the use of a specialty contractor.

Prior to driving piles, the existing pavement, slabs and foundations, utilities, old rails and ties, and other interferences should be removed or relocated as needed, with the excavations backfilled with controlled fill. Prior to placing fill, all other areas should be excavated to at least one foot below existing grade, or should be scarified and loosened at the surface, to promote vertical drainage. The building pad should be prepared up to the nominal subgrade elevation, to provide a level, stable, all-weather platform for the pile-driving crane. A suitable lay-down area will also be required for the piles. Some of the piles will be more than fifty feet long, and will require splicing, unless they can be brought to the facility by barge, which may be a practical option. As each pile is driven, a gap will develop between the soil and the upper part of the pile; this should be filled promptly after driving, by pouring clean, dry sand into the gap. Vibrations from pile driving are not expected to adversely affect any nearby structures or utilities. The borings indicate conditions of ordinary corrosion potential for embedded steel piles, and normal protection should be provided. Little or no corrosion should occur below the water table, where little oxygen is available, and the shallow coal, cinders and sandy, free-draining soils present a low corrosion risk.

Remove all loose soil prior to placing concrete in pile caps or grade beams. Compact the slab subgrade as needed after fine-grading. The water in the Hudson River is brackish, however the shallow soils at the site are not expected to have unusually high sulfate contents, and are expected to be of Sulfate Class 0 or 1. Conventional ASTM C150 Type II or Type I/II cement with normal sulfate resistance should be used in concrete elements that will be permanently exposed to soil.

The anticipated garage floor elevation is approximately ten feet above sea level; the net change from existing grade will be approximately zero to minus-four feet along the west side of the proposed building, and plus-one to plus-6.5 feet along the east side. In the fill areas, fill of relatively low unit weight should be used, both below the building an in the adjacent exterior areas, to minimize settlement of the deep clays; the stress from five feet of ordinary granular fill would be about 675 psf, from sand fill it would be about

525 psf, and from lightweight concrete aggregate fill it would be about 350 psf. By using very lightweight fill, such as foamed glass aggregate, the load could be reduced to little more than that of the slab or turf, i.e. about 100 to 150 psf, which should produce no measurable settlement. A structural slab could also be provided under the portion of the building that might be affected by settlement, however the combination lower-density fill, pinning the edges of the slab to the foundation, reinforcing the slab, and providing properly-spaced control joints, should minimize the effects of settlement so that it is not objectionable, and if some consolidated-related settlement did occur, the cost of remediation (slab-jacking by injection) would be far less than the cost of prevention.

Dewatering and draining of the excavations might be required to some extent during and after excavation, however most of the shallow soils were free-draining, and stormwater is expected to infiltrate naturally into excavated surfaces. The water table is shallow and is influenced by the tide, with the site only a few feet above sea level. Excavations extending below or close to sea level are likely to require shoring and/or special controls, but none are expected to be required for the building itself.

When excavating, trim to the required subgrade elevation using excavation methods that minimize disturbance of the final soil surface. Compact the surface as needed to consolidate any soil that was loosened during excavation. Remove any pockets or small zones of unsuitable materials that are encountered, and replace them with controlled compacted fill. Contact the Engineer prior to performing any significant extra excavation. Where old foundations are removed, or where other over-excavation work is performed to prepare subgrade areas, the removed material shall be replaced with soil similar to the adjacent existing soils, with the sides of the excavation trimmed back to stable soil as each lift of backfill is placed. The fill shall be placed in lifts with a maximum thickness of twelve inches, thoroughly compacted with the excavator bucket or with a mechanical tamper.

Protect the prepared subgrade surfaces from erosion, from excessive drying, wetting or frost and from construction damage. Traffic from dump trucks and similar heavy vehicles should be minimized on the exposed surface of the subgrade and on compacted fills. Surfaces to receive concrete shall be dense and stable, free from frost, mud and loose soil or standing water, when concrete is placed.

3.2. Excavation

The borings indicate that the existing fill and native soils may be excavated using conventional heavy equipment, such as tracked excavators and bulldozers. Backhoes and mini-excavators should be suitable for the excavation of shallow trenches. N*o rock excavation is expected in the project area.*

The investigation indicates that the soils which will be encountered in the building excavations are likely to predominately be OSHA Type B, requiring a minimum slope of 1-to-1 in shallow excavations, with benching permitted, and OSHA Type C, requiring a minimum slope of 1.5 horizontal to one vertical in shallow excavations, with benching not permitted. Soil types and excavation requirements must be confirmed by a qualified representative of the Contractor during construction.

No shoring of excavations should be required, as there appears to be sufficient clearance around the anticipated foundation work areas to allow the use of conventional excavation slopes. Trench boxes or other temporary shoring will be required for work in deep trenches and may be required when excavating trenches in wet areas, regardless of depth. The design of any necessary shoring or other support-of-excavation is the responsibility of the Contractor and is not included in this report.

Stormwater should be removed promptly from the excavations, if it does not naturally infiltrate, and the groundwater must be maintained at a sufficient depth below the soil surface to maintain stable surface conditions in active construction areas. When dewatering flooded excavations, the water level should be drawn down at a controlled rate to minimize sloughing, allowing the water to drain from the soil in the sides of the excavation. It is expected that the building excavations will be at least a few feet above sea level, such that groundwater will only be a potential concern during unusually high tides or major storm events.

3.3. Fill Materials and CLSM

All fill placed below foundations and slabs shall consist of Structural Fill or suitable well-graded granular site-borrow soil, as described below, or shall be other imported fill of a quality at least equal to that of the site-borrow fill. All fill materials shall be composed of sound, durable particles, shall be free from frost or snow, garbage, construction debris or other deleterious material, and shall be substantially free from organic matter and roots. Imported fill materials shall be obtained only from licensed or otherwise approved sources. Recycled crushed concrete and masonry may be acceptable for some applications above the water table, subject to approval by the Designer of Record.

Most of the soils excavated from the site are expected to be of suitable quality for re-use as fill and backfill for foundations, slabs and pavement areas. Only select, well-graded granular material should be used under the structure, to minimize the potential for settlement during flooding. Exclude topsoil and wet, organic or otherwise deficient soils from all borrow fill. The soils are layered and vary both laterally and with depth, thus it will be important to blend the material to obtain the best average quality of the fill material. The site-borrow soils may require some drying or moistening prior to compaction. Boulders and large cobbles, if encountered, must be removed from the borrow fill. Clumps of clayey soil should be excluded from the fill, but if included they must be thoroughly broken up and mixed in.

Structural Fill, if imported for use below foundations and slabs, shall be good-quality bank-run sand and gravel or crushed stone, and should be a locally-available well-graded product complying with or substantially similar to the specifications provided below. Structural Fill may also be used as foundation backfill. Structure Fill HD (Heavy Duty) should be used in areas to be protected from heavy construction traffic and where subgrade stabilization is needed. Structure Fill HD and Structure Fill NFS (non-frost susceptible) provide enhanced drainage; they are suitable for use as fill for frost-protected shallow foundations and for placement during winter conditions. Fill produced from natural sand and gravel is usually easier to compact than crushed fill, making it advantageous for winter work and for compaction with manual equipment. Crushed fill products are typically more suitable for use during wet weather and provide better stability over poor soils or under heavy construction traffic.

Pipe bedding in utility trenches should consist of well-graded sand or sand and gravel. If open-graded stone is used as pipe bedding, a layer of geotextile or a filter zone of well-graded fill may be required between the pipe bedding and the soils, particularly if erodible soils such as fine sand or cohesionless silt are present.

Structural Fill Materials					
Sieve Size		Percent Passing by Weight			
Inch	mm	Structure Fill	Fine Structure Fill	Structure Fill NFS	Structure Fill HD
4″	100	100	100	100	100
1½″	37.5	70-100	100	70-100	50-95
#4	4.75	30-80	80-100	30-80	20-50
#40	0.425	5-40	15-40	5-35	5-25
#200	0.075	2-20	2-15	0-8	0-8
Plasticity Index		4 max.	4 max.	Non-plastic	Non-plastic

CLSM (Controlled Low-Strength Material, or ‘flowable fill,’) may be used under footings and foundations when specifically approved by the Engineer, and may also be used to backfill trenches or other excavations, typically where rapid fill placement is required, fill areas are narrow, or the use of conventional compaction methods is not practical. For support of footings, a CLSM mix consisting of sand, cement and water, with a 56-day compressive strength of 75 to 200 psi, is appropriate. CLSM may produce high fluid pressures during placement, and caution must be used for placements against foundation walls, near unbraced cuts, etc. Pipes or tanks can also float if not properly restrained during placement. CLSM should not be placed against unprotected aluminum; CLSM containing flyash should not be used in contact with cast iron or ductile iron. Hardened CLSM masses may also adversely affect groundwater flow, possibly causing erosion under or along the CLSM, particularly in sloping trenches.

Crushed stone base course for slabs-on-grade or for footing drains should consist of ASTM C33 #5, #56 or #57 stone (¾-inch or ⅜-¾-inch size.) Well-graded granular subbase material (Structure Fill NFS, NYSDOT Item 733-04 ‘Item 4’, or similar types,) should be used under sidewalks and exterior slabs.

3.4. Fill Placement and Compaction

Soil surfaces, including the surface of the subgrade and of previously-placed fill materials, shall be prepared to a dense and essentially unyielding condition prior to placing each new lift of fill. Fill shall not be placed over frozen or unstable soil, unless approved by the Engineer. Use mid-size equipment to compact the site-borrow fill or similar materials. Vibratory trench rollers, and single-drum soil rollers with a nominal size of three to five tons, should be appropriate for the anticipated site conditions. Larger rollers may be used when compacting well-graded granular fill over essentially unyielding surfaces. In areas with limited access, vibratory plate tampers or jumping-jack tampers may be used. Avoid over-compacting the shallow soils in landscaped areas. Use smaller-size equipment and/or use non-vibratory compaction methods when compacting near existing structures or sensitive features.

Backfill placed against foundation walls should be compacted with trench rollers or with similar equipment which will not produce damaging stresses on the wall. Place backfill equally on opposite sides of the foundation unless otherwise indicated by the specifications or drawings.

Fill shall be placed in controlled lifts, with each lift compacted to the required density at a moisture content close to optimum moisture, as determined by testing, or estimated, as appropriate for the placement conditions. When the moisture content of fill which will support structures or slabs is within two percent of optimum, fill may be placed in lifts with compacted thicknesses of up to eight inches. If the moisture content is two to 2.5 percent from optimum, reduce the maximum thickness to six inches, and if it is more than 2.5 percent from optimum, discontinue compaction. In roadway, embankment and other non-structural locations, fill may be placed in lifts with a compacted thickness of up to twelve inches when the moisture content of the fill is within two percent of optimum, and up to eight inches thick when it is two to 2.5 percent from optimum. Use a reduced lift thickness if required to obtain the specified percent compaction and when using small compaction equipment.

When fill is placed and compacted without testing, an acceptable moisture content for compaction of most granular fill materials is indicated when a sample holds together after being squeezed in the hand, without visible wetness. Most fine-grained soils are at a suitable moisture content for compaction when the particles are moist enough to be molded together when squeezed, but dry enough that the molded mass can still be crumbled. In either case, an unacceptable moisture content is indicated if the fill is unstable during compaction.

Where fill will be placed against the sides of excavations, bench the fill into the bank as it is placed, to create a stair-step interface for improved stability and groundwater control. Lightly scarify the surface of the existing soil prior to placing the fill, and key the fill into the subgrade at the toe of the slope.

When placing fill during winter weather, use Structure Fill NFS, Structure Fill HD, or similar fill material containing less than eight percent non-plastic fines. Compact the fill with a maximum lift thickness of six inches and do not compact fill whose moisture content is more than two percent above or below optimum. Do not place or compact fill when the air temperature is less than 25ºF. Do not place frozen fill materials.

Compact each lift of fill supporting slabs or foundations with at least six one-way compaction passes, even if passing test results are obtained with fewer passes, or if testing is not being performed. Each compaction pass shall be made at a slow walking speed (less than four feet per second,) and the equipment shall pass completely over all areas of the fill. Fill materials shall be compacted to at least the following percentage of the maximum dry density, as determined by the Modified Proctor method, ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort. For coarse-graded fill materials with more than thirty percent retained on the ¾-inch sieve, the maximum dry density value may be determined per ASTM D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table; the acceptable moisture range for compaction must be estimated if this method is used.

Location	Required Percent Compaction
Below Footings and Foundations	95% minimum
Below Slabs	95% minimum
Embankment Fill for Roadways and Hardscaping	92% minimum
Exterior Foundation Backfill in Landscaped Areas	90% minimum

Open-graded stone base course material for slabs-on-grade should be graded level and seated with one or more compaction passes, to help resist displacement during slab area preparation and concrete placement.

3.5. Testing

The subgrade shall be inspected to verify that it has been prepared in conformance with the requirements of this report, prior to placing fill or structural elements. Recommended test procedures and frequencies are provided below.

PROOF-ROLLING: Proof-rolling of the subgrade soils should be avoided, as it reduces surface permeability, which can promote wet conditions during or after construction. It may be performed to determine the limits of a soft area; use an appropriately–sized vehicle, to avoid damaging wet and/or fine-grained, but otherwise acceptable soils. Observe the effects of the moving vehicle; if the soil exhibits excessive deflection, rutting or cracking, additional excavation or drying of the subgrade may be required.

PILE DRIVING: Continuous inspection is required during pile driving. Acceptable bearing shall be based on the driving criteria determined for the pile sizes and hammer type(s.) Pile tip elevations shall be recorded and piles shall be checked for centering and alignment after driving.

BEARING CAPACITY: Prior to placing fill or concrete, the prepared subgrade surface throughout the foundation and slab areas area shall be probed thoroughly to check for soft spots. The subgrade shall be in a dense and unyielding condition, substantially free from soft areas and/or loose material. If these conditions are not encountered, the conditions shall be corrected and/or, if approved by the Engineer, the excavation depth may be increased to reach acceptable soil. The slab subgrade areas shall be densely consolidated and sufficiently stiff to prevent rutting or displacement during slab base course and concrete placement operations.

COMPACTION TESTING: The building is expected to be supported by a deep foundation; compaction testing will not be required by Code, but is recommended for fill supporting the garage slab and for similar critical locations. If fill with a total thickness exceeding twelve inches will be placed, compaction testing should be performed for each lift, while the work is in progress. Compaction tests of fill and backfill in the building area should be performed in at least one location per 50 linear feet or per 1000 square feet of fill surface, per lift. At least one test per 100 linear feet or per 2500 square feet should be performed for each lift of fill in embankment, roadway and other non-structural areas. Compaction tests should be performed with a nuclear moisture-density gauge, per ASTM Test Method D6938, unless otherwise approved. Required percent compaction values are provided above.

CLSM: When flowable fill is used to support footings or foundations, at least one set of three 6x12-inch test cylinders shall be cast from each day's placement, per ASTM D4832. Test the cylinders for unit weight and for compliance with the specified strength requirements. Cast additional cylinders if early tests are needed.

3.6. Geosynthetic Materials

Geosynthetic materials are expected to be used for reinforcement and drainage applications at the site on an as-needed basis, or where required by Code, such as for footing drains. Geosynthetic materials shall be installed against smooth and evenly shaped surfaces, to avoid 'tenting' of the material over voids or high points. The geosynthetics shall be installed substantially free from wrinkles, and fill materials shall be placed and spread in a manner which pushes out the wrinkles toward the free end, but which does not otherwise displace the geosynthetic material. Avoid placing coarse-graded angular fill directly over the geosynthetic materials, unless specifically directed. Vehicles shall not drive on the exposed geosynthetics.

Woven Reinforcement Geotextiles: These fabrics should typically be used only between the subgrade soil and the granular base course of an asphalt or concrete pavement, in relatively level areas. In this application the geotextile protects against rutting during paving operations, can reduce long-term pothole development, and, because of its tight weave, retains water seepage from the pavement within the granular base layer, where it can drain toward the curbs, rather than softening the subgrade.

Woven Drainage Geotextiles: Similar to woven reinforcement geotextiles, but with an open weave that allows water to flow through them, these geotextiles are available with high strengths and should be used instead of reinforcement geotextiles for subgrade reinforcement where groundwater movement is to be allowed. They are also the most suitable geotextile for installation between the native soils and the drainage medium (stone or sand) in footing drains and underdrains, as discussed below.

Geogrids: Biaxial or multi-axial geogrid should be used for road base stabilization on steep grades, as sliding or erosion of fill placed on top of a woven geotextile layer may occur during construction. They can also be used for base stabilization in level areas, but typically are more costly than geotextiles.

Non-Woven Geotextiles: These fabrics are suitable to keep fine-graded soils from mixing into open-graded soils, such as in stone-filled trenches passing through silt or fine sand. They can also be used in footing drain and underdrain construction, but are susceptible to clogging if used incorrectly, as discussed below.

Footing Drains and Underdrains: For these applications, the drainage trench should be carefully graded to the pipe invert elevation, the geotextile should be draped into the trench, the pipe installed, the trench backfilled with the drainage medium, and the geotextile wrapped over the top and capped with soil backfill. The drainage medium may be clean gravel or stone, or coarse sand, of a size compatible with the slots or perforations in the pipe. For most applications, Woven Drainage Geotextile may be installed directly against the native soils. However, if the native soils consist of cohesionless silt or fine sand, which may erode through the drainage geotextile, a layer of clean well-graded sand at least four inches thick should be installed between the geotextile and the soil; this may not be practical for underdrains, and if erodible fine soils are abundant, sand-filled trenches (clean concrete sand) without a geotextile wrap, equipped with a drain pipe wrapped with a layer of drainage or non-woven geotextile may be more suitable. Non-woven geotextiles may be used for footing drains, when they are covered on the top and outside by at least six inches of concrete sand, to act as a filter to prevent clogging.

4. DESIGN VALUES AND RECOMMENDATIONS

Soil engineering properties and recommendations for design are provided in this section; additional important design considerations are also discussed in the other sections of this report.

4.1. Bearing Capacity and Subgrade Properties

The proposed building is expected to be supported by end-bearing piles, driven to bedrock, consisting of medium-hard shale with some hard layers of fine greywacke sandstone. Driven H-piles would probably all penetrate through the very dense glacial till immediately above the bedrock; if driven pipe piles are used, some of these would probably reach full capacity (refusal) in the till layer. Either pile type would be suitable for use at this site. The pile size(s) can be selected so that the per-pile capacity is optimized to the desired spacing and layout. The preliminary estimated allowable capacities are 150 to 300 kips per pile for HP10x42 to HP14x89-size driven H-piles; concrete-filled 8-inch to 12-inch pipe piles driven to rock would provide approximately the same range of capacity, with about 50 to 75% of this capacity if bearing in the till. While a lower capacity should be assumed for the pipe piles, this may be sufficient in combination with the optimum pile spacing under foundation walls and with the Code requirements for minimum pile quantity and pile group geometry.

The bedrock encountered in the rock cores consists of siltstone, fine greywacke sandstone and shale, sometimes finely-interlayered and sometimes individually. The unconfined compressive strength of this rock is estimated to range from about 3,000 to 5,000 psi for the shale, up to 15,000 to 18,000 psi for the greywacke. The typical strength of the rock is estimated as 7,500 psi, for intact samples without fractures. The estimated range of the Rock Mass Rating (RMR) of the bedrock is 39 to 59, which is Class III, 'Fair Rock.'

The following additional values are recommended for use in design and analysis.

Recommended Design Properties	Fill/Upper Sandy Soils	Coal Fines	River Clays	Basal Till	Bedrock
Moist Density, γ, lbs/cu ft	120	65	107	140	165
Effective Internal Angle of Friction, $\emptyset$	30º	30º	14º	36º	54º
Coefficient of Active Earth Pressure, k_a	0.33	0.33	0.61	0.23	0.11
Coefficient of Passive Earth Pressure, k_p	3.00	3.00	1.64	3.85	9.5
Coefficient of At-Rest Earth Pressure, k_o	0.50	0.50	0.76	0.41	0.19
Lateral Bearing Capacity (psf/ft below grade)	180	100	85	270	780
Coefficient of Friction vs. Concrete, Rough	0.40	0.35	0.30	0.50	0.70
" vs. Concrete, Formed	0.35	0.30	0.25	0.45	0.50
" vs. Steel	0.30	0.25	0.15	0.40	0.40
Modulus of Subgrade Reaction, k, psi per inch	125	100	15	400	1000+

No measurable settlement is expected for foundations supported by piles driven to bedrock or into the very dense basal till immediately above the bedrock. If fill is placed over a wide area, using conventional fill with a moist unit weight of approximately 135 pcf, the expected settlement is zero from the initial foot of fill, then approximately one quarter inch per foot of additional fill, thus up to about 1.4 inches of settlement is expected in the area of maximum grade increase at the building, which will be about 6.5 feet. If lighter-weight fill materials are used, the magnitude of settlement would be reduced in direct proportion to the reduction in stress. This settlement will occur slowly, as some water slowly migrates out of the river clays.

This area could be surcharged by stockpiling a few feet of soil on it for a few months, to speed the settlement toward completion.

4.2. Control of Groundwater and Soil Gases

Groundwater is shallow at the site and its elevation fluctuates with the tide. Excavations extending down to the river (sea level) elevation should be avoided in the design and in the construction; if necessary, shoring and dewatering will likely be required, and may be difficult to perform in the sandy soils. It is understood that the ground floor of the building will be used for parking, at grade, and there will be no potential for hydrostatic uplift of the slab. Adequate drainage must be provided to maintain the groundwater at an elevation below the slab base course during normal conditions. Footing drains are not required by Code for the above-grade slab conditions, and would not provide any significant benefit in the shallow free-draining soils.

The soil gases most likely to impact the structure are water vapor and radon. The interior spaces can be protected from these gases by providing conventional moisture protection of the floor slabs, and by sealing all slab and wall-to-slab joints, concrete cracks, pipe penetrations and other openings, as well as by designing against negative-pressure conditions caused by excessive ventilation and/or by the operation of boilers or other equipment. Below the garage slab, tidal fluctuations in the groundwater depth will tend to cause cyclic negative/positive air pressure conditions, and ventilation of the slab base is recommended, with small-diameter PVC pipes stubbed into an open-graded base course layer under the slab and vented to the atmosphere, one per contained area. The potential for these gases to adversely impact the use of the building is estimated to be low, if these practices are used, and normal interior ventilation is provided.

4.3. Seismic Evaluation

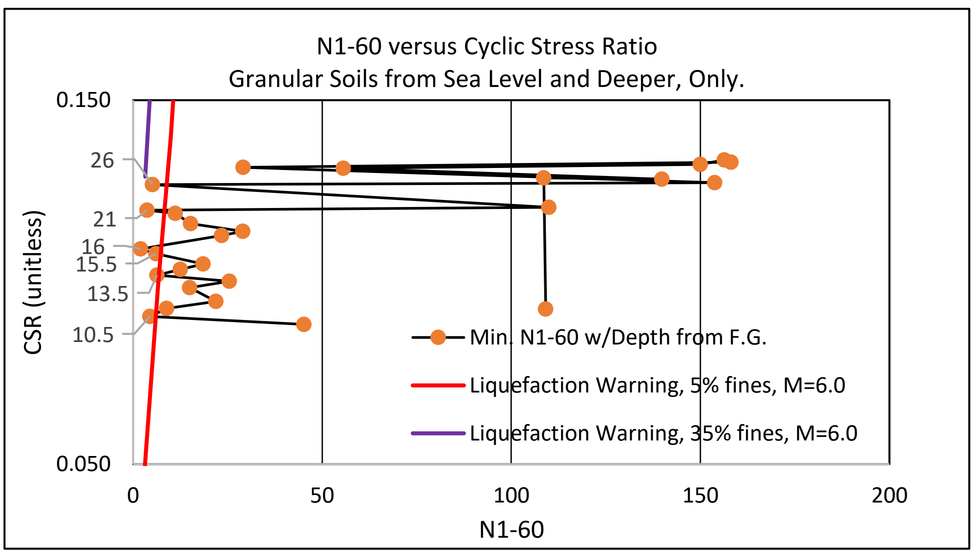
The Seismic Site Class and Seismic Design Category for the proposed construction were determined per section 1613 of the New York State Building Code and ASCE 7-22. Seismic acceleration values for the site were obtained from the American Society of Civil Engineers 'ASCE Hazard Tool' web application. The design values are provided in the table below.

The Seismic Site Class is based the conditions in the upper 100 feet of the subsurface; the presence of thick river clay and loose sand dictate that the Site Class will be E or F; Class F would apply here only if a potential for liquefaction exists. Evaluation of liquefaction susceptibility was performed using the methods in NYSDOT Geotechnical Design Procedure GDP-9, 'Liquefaction Potential of Cohesionless Soils,' for the granular soils, and the fine-grained soils were analyzed using the recommendations of the publication 'Evaluating the Potential for Liquefaction or Cyclic Failure of Silts and Clays,' by Boulanger and Idriss (UC Davis, 2004.)

The GDP-9 method found that, at this site, a liquefaction risk is indicated for soils with SPT blow counts of N=3 or less, down to about 14 feet depth; for N=4 or less at 14 to 20 feet, N=5 or less for 20 to 25 feet, and N=6 for 25 to 30 feet. The following samples of granular soil were identified as possibly liquefiable, based on blow counts.

Granular Soil Samples with Low Blow Counts Indicating Increased Liquefaction Potential					
Sample	SPT N	Elevation	From F.G.	Description	NOTE
B3-S5	2	-0.5 feet	10.5 feet	SM, Silty sand, cohesionless, trace clay lumps.	2
B3-S6	3	-5.5	15.5	SM, same.	2
B4-S4	4	+2	8	SW-SM, Sand with traces silt, trace fine gravel, some silty clayey lumps.	1
B4-S5	4	-1	11	SW-SM, same, few silty clay lumps.	1
B4-S6	1	-6	16	SW-SM, same, few clay lumps.	1
B4-S7	2	-11	21	SW, Sand with trace silt, traces fine gravel, trace silt lumps.	1
B4-S8	3	-16	26	SW-SM, Till. Sand with little silt, little gravel	2
B5-S5	4	-5.5	15.5	SM, Sand and hard cinder with little silt.	2
B7-S3	3	+4	6	SW-SM, Coal fines with little hard cinder, traces silt.	3
B7-S4	3	+2	8	SW-SM, same.	3
B7-S5	4	-1	11	SW-SM, same, traces sand, little gravel-size.	3
B8-S4	2	-0.5	10.5	SC, Sand and clay with traces gravel, many sticks, roots.	2
B8-S5	3	-3.5	13.5	GC, Clayey gravel with sand.	2
B9-S5	4	+3	7	SC, Sand and clay with traces gravel.	2
NOTES	1.	Potentially liquefiable.			
	2.	Not a liquefaction-susceptible texture.			
	3.	Coal fines – not believed to be liquefaction-susceptible, due to high angularity and brittleness.			

Samples of low-blow count granular soils from boring B4 were identified as potentially-liquefiable during the design seismic event. Boring B4 was near the northwest corner of the proposed structure, with the loose zone at approximately +3 feet to -13 feet elevation. Factors mitigating the risk of liquefaction from this layer are the sand's well-graded texture and the shapes of the individual sand and fine gravel particles, which are mostly subangular, with some subrounded and some angular. If the sand was in fact deposited during the early post-glacial period, it would be of sufficient age that no liquefaction should occur, but the deposit could be much younger.



Evaluation of the river clays indicated that they are unlikely to undergo liquefaction-like movement during the design seismic event. These soils were high-plasticity clays and silts, with tests indicating Liquid Limit (LL) values of 55 to 79 and Plasticity Index (PI) values of 25 to 48. The Boulanger & Idriss study reports that fine-grained soils with LL=37 or less and PI=12 or less are the most potentially liquefiable, while those with LL>47 or PI>20 are unlikely to liquefy. The river clays are liquefaction-resistant due to their high plasticity and well as their age; as late-glacial to early post-glacial deposits, they have been subjected to multiple seismic events of equal or greater magnitude than the design event, which should have brought them into a state of equilibrium.

In summary, one boring at the proposed northwest building corner identified a 16-foot layer of potentially-liquefiable sand. This layer was also encountered in borings B2, B3 and B10, where the blow counts were a little higher. Based on the limited extent of the potentially-liquefiable zone, and the better overall results for this layer as a whole, the assignment of Site Class F is not justified for this site. While the risk of damaging liquefaction occurring is low, there is a general risk of settlement of the existing loose fill during a major seismic event, particularly on the river side of the building, where the fill is relatively thick. This would not affect a pile-supported foundation, but slabs-on-grade could settle and crack and some underground utilities could be damaged; this would be similar to the damage caused by liquefaction, but the mechanism is different.

The appropriate seismic classification is Site Class E, which is defined as any soil profile with more than ten feet of soft clay, defined as having PI>20, moisture content >40% and shear strength of <500 psf. The samples of river clay all had LL values much greater than 20, nearly all had moisture contents greater than 40%, and many had shear strengths of less than 500 psf, as indicated by the Torvane test. The following seismic design values are applicable.

Seismic Design Values		
Occupancy Category	I/II/III	
Seismic Site Class	E – Soft Clay Soil	
IBC Seismic Design Category	SDC - A	
Maximum Acceleration, MCE_R	0.2 sec S_S 1.0 sec S_1	0.230 g 0.049 g
Site-modified Spectral Acceleration Value	0.2 sec S_{MS} 1.0 sec S_{M1}	0.240 g 0.098 g
Numeric Design Value	0.2 sec S_{DS} 1.0 sec S_{D1}	0.160 g 0.065 g
Peak Ground Acceleration, Site-Modified	PGA_M	0.140 g

The seismic design values are based on the "risk adjusted maximum probable earthquake." These are not the maximum values that *could* occur, they are values that are not likely to be exceeded during the service life of a typical structure.

The analysis indicates that there is some risk of settlement of the existing fill and loose sandy soils, which could damage pavements and other soil-supported items, but that would not affect a pile-supported foundation. The potential for settlement should be taken into consideration in the design of underground utilities, particularly those with a life-safety role.

5. NOTES AND LIMITATIONS

Please see the attached pages for additional information. Subsurface conditions encountered during construction shall be compared to the soil boring logs and this report; any significant variations from anticipated conditions must be evaluated for their effect on the design. This report summarizes the results of a limited investigation and does not purport to predict every variation in subsurface conditions. Elevations, slopes, contours, project layout and similar or related data provided in this report were interpreted from the drawings, from field data or from other information which was provided, unless otherwise noted.

This geotechnical investigation was conducted to evaluate the engineering properties of the soils at the site, to aid in the design and construction of the proposed work. The investigation did not include evaluation of the potential effects of the proposed construction on other properties, nor did it include inspection of, or sampling for, items of environmental concern such as the presence of soil contaminants or of regulated wetlands, and did not include review of local zoning regulations, codes, floodplain boundaries or similar matters, unless specifically referenced in the report. This investigation was conducted solely for the use of the Client, the Client's Project Designers and Agents and the Authorities Having Jurisdiction; this report should not be used by others, nor for any use other than its stated purpose, without contacting the Engineer. Any such use is solely at the user's risk.

October 22, 2025

Prepared by Kevin L. Patton, P.E.

KEVIN L. PATTON, P.E.
36 PATTON ROAD ↗ NEWBURGH, N.Y. 12550
845 275-7732 PATTONGEOTECH.COM

Technical Notes:
Soil Descriptive Terms

SOIL CONSISTENCY: Correlation to Soil Boring SPT Blow Counts and other Tests or Estimates of Soil Strength

Granular Soils	SPT N	Penetrometer		Cohesive Soils	SPT N	Penetrometer	Torvane
Very Loose	0-4	0-750 psf		Very Soft	0-2	0-500 psf	<500 psf
Loose	4-10	0.75-1.5 ksf		Soft	2-4	0.5-1 ksf	500-750 psf
Medium-Dense	10-30	1.5-4 ksf		Firm	4-8	1-2 ksf	750-1000 psf
Dense	30-50	4-10 ksf		Stiff	8-16	2-4 ksf	1000-1500 psf
Very Dense	>50	>10 ksf		Very Stiff	16-32	4-8 ksf	1500-2500 psf
				Hard	>32	>8 ksf	>2500 psf

Particle Size (USCS)

Boulders >12 inches (>300mm)
Cobbles 12 to 3 in. (300 to 75mm)
Gravel 3 in. to #4 (75 to 4.75mm)
Sand #4 to #200 (4.75 to 0.075mm)
Silt and Clay <#200 (<0.075mm)

FMC: These letters are used to indicate the relative abundance of fine, medium and coarse particles. The most abundant size(s) are capitalized: Fmc = fine-graded, fmC = coarse-graded, etc.

Relative Quantities

Estimated percentages in descriptions:
<5% - Trace
5-10% - Traces
10-25% - Little
25-40% - Some
'And' - Approx. equal amounts
Cobbles and Boulders: 'Few' indicates rare or occasional.
'Some' indicates frequently encountered.
'Many' indicates common or abundant.

Soil Moisture

Moisture is visually-manually estimated. Soil moisture capacity varies with texture and compaction. 'Wet' indicates soil that is fully or nearly saturated. 'Very Moist' soil is drained, but free water is present. Clay described as 'very moist' is typically at a moisture content between its Plastic Limit and Liquid Limit, resulting in minor to moderate softening. When described as wet it is typically at a moisture higher than its Liquid Limit, with moderate to significant softening.

Soil Color

Color are described in the moist to wet condition, using standard Munsell color names. 'Pale' indicates a less intense or less saturated color. 'Moderate' indicates a somewhat darker shade. Mottling indicates variations in soil environment and/or composition, and may indicate seasonal groundwater conditions. Mottling occurs in fills as well as in natural soils. Color variations tend to be more pronounced in fine-grained soils.

Roots, Trace Organics, Mineral Deposits

Traces of organic matter and roots may be present to ten feet depth or more in undisturbed soils and are not significant unless abundant. Roots are an indicator of soil density and water table variations.

Deposits of or cementation by iron or other oxides, or by calcite, are indicators of the water table elevation and chemistry.

Organic Soils

Highly organic soils such as peat are visually classified. Partly organic soils, consisting primarily of mineral matter, are classified visually and/or by Atterberg Limits tests. These soils are often compressible to some extent and may be prone to settlement under relatively light loads.

USCS Soil Classes (Unified Soil Classification System for Material Passing the 3-inch Sieve.)

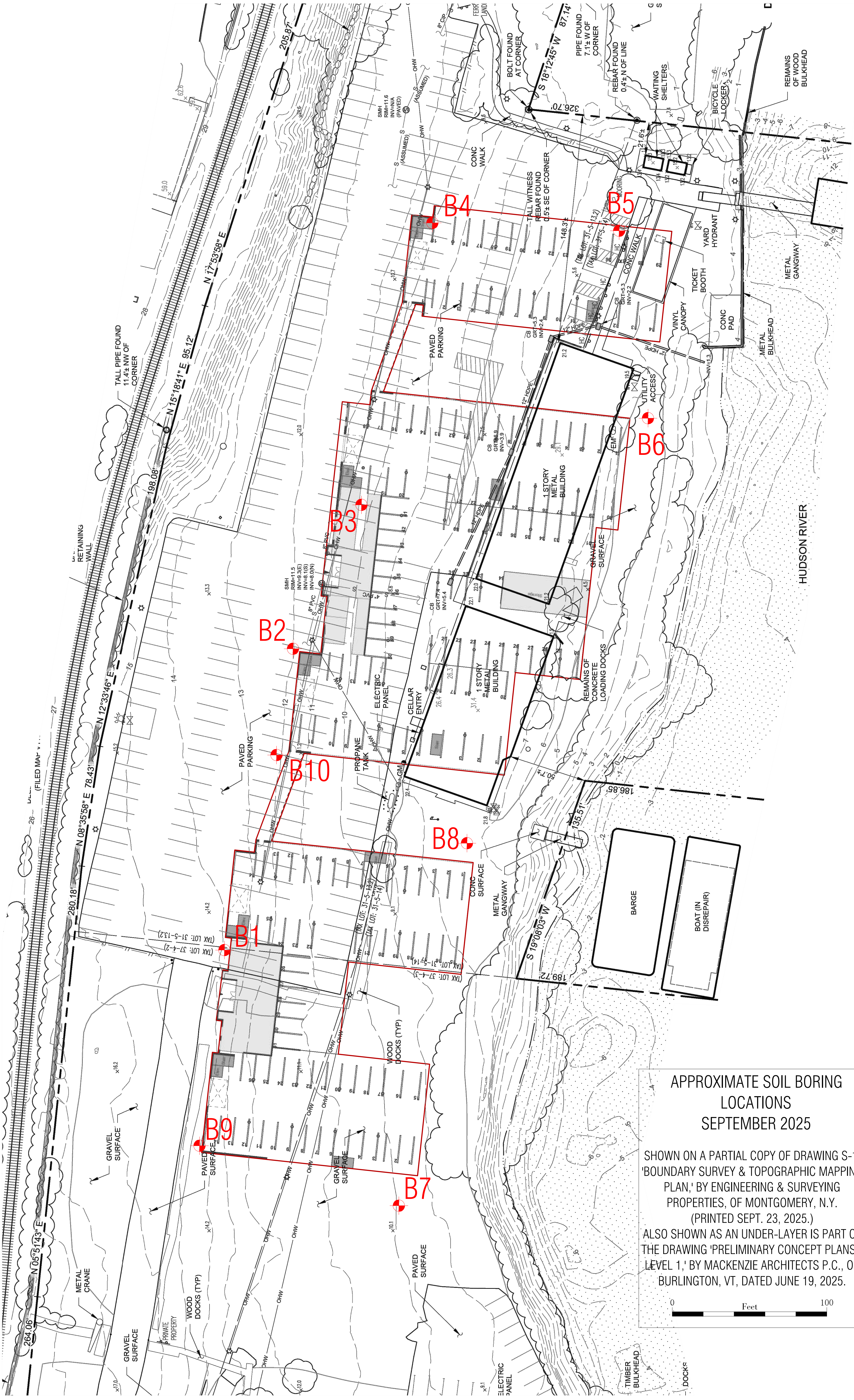
Coarse-Grained Soils (Gravelly and Sandy Soils): May contain up to 50% silt and/or clay. When the soil contains more than about one third clay, it may behave more like a fine-grained soil. When most of the plus-#200 material passes the #4 sieve the general soil type is sand, and if most is coarser than the #4 sieve, it is gravel.
<u>Soils with less than 5% passing the #200 sieve</u>: GW, GP, SW, SP – Well-graded gravel, Poorly-graded gravel, Well-graded sand, Poorly-graded sand.
<u>Soils with 12% to 50% passing the #200 sieve</u>: GC, GM, GC-GM, SC, SM, SC-SM – Clayey gravel, Silty gravel, Silty clayey gravel, Clayey sand, Silty sand, Silty clayey sand.
<u>Soils with 5% to 12% passing the #200 sieve</u> use a dual symbol, such as SW-SC (Well-graded sand with clay.)

Fine-Grained Soils (Silty and Clayey Soils): These soils may contain up to 50% sand and/or gravel, coarser than the #200 sieve. These are mostly Cohesive Soils, but include some cohesionless Fine Granular Soils.They are classified by the Atterberg Limits test, which is performed on the soil fraction finer than the #40 sieve, or by estimation.

The term 'sandy' or 'gravelly' (whichever is predominate) is added if the soil contains more than 30% retained on the #200 sieve, e.g., Sandy Lean Clay. If it contains 15 to 30% plus-#200, the term 'with sand' or 'with gravel' is added to the description, e.g., Lean Clay with Sand.
These soils include:

CH, Fat Clay. Likely to be expansive (shrinks and swells if subjected to drying and wetting.) Often hard in-situ.
MH, Elastic Silt. Likely to be expansive under varying moisture conditions.
CL, Lean Clay. Mid- to high-plasticity lean clays (PI≥15) are considered to be potentially expansive, those with low PI values are not.
CL-ML, Silty Clay. Sensitive to small changes in moisture content, due to its low Plasticity Index.
ML, Silt. Easily eroded. May settle after compaction, especially if it is cohesionless.
OL, OH, Organic Silt and Organic Clay.
PT, Peat. Highly organic, may contain significant silt, sand or clay. May be fibrous, pasty, massive, etc.

Very Soft and Soft Silts, Clays and Organic Soils (any of the above USCS Fine-Grained Soil Classes): These soils tend to be weak and compressible. They may be determinative of the Seismic Site Class as well as the foundation type. Soft clay with a total thickness of more than ten feet will result in a Site Class E determination. A Site Class F designation will result if there is more than 25 feet of very high plasticity clay, more than ten feet of peat, or more than 120 feet of soft to medium-stiff clay, or if liquefiable or other weak soils are present.



APPROXIMATE SOIL BORING LOCATIONS SEPTEMBER 2025

SHOWN ON A PARTIAL COPY OF DRAWING S-1, 'BOUNDARY SURVEY & TOPOGRAPHIC MAPPING PLAN,' BY ENGINEERING & SURVEYING PROPERTIES, OF MONTGOMERY, N.Y. (PRINTED SEPT. 23, 2025.)
ALSO SHOWN AS AN UNDER-LAYER IS PART OF THE DRAWING 'PRELIMINARY CONCEPT PLANS - LEVEL 1,' BY MACKENZIE ARCHITECTS P.C., OF BURLINGTON, VT, DATED JUNE 19, 2025.

0 Feet 100

REV.	DATE	BY
1	10/22/2025	KLP
0	10/7/2025	KLP

PROJECT NUMBER 25311

NEWBURGH WATERFRONT

CITY OF NEWBURGH, ORANGE COUNTY, N.Y.

SOIL BORING LOCATIONS

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
845 275-7732
PATTONGEOTECH.COM

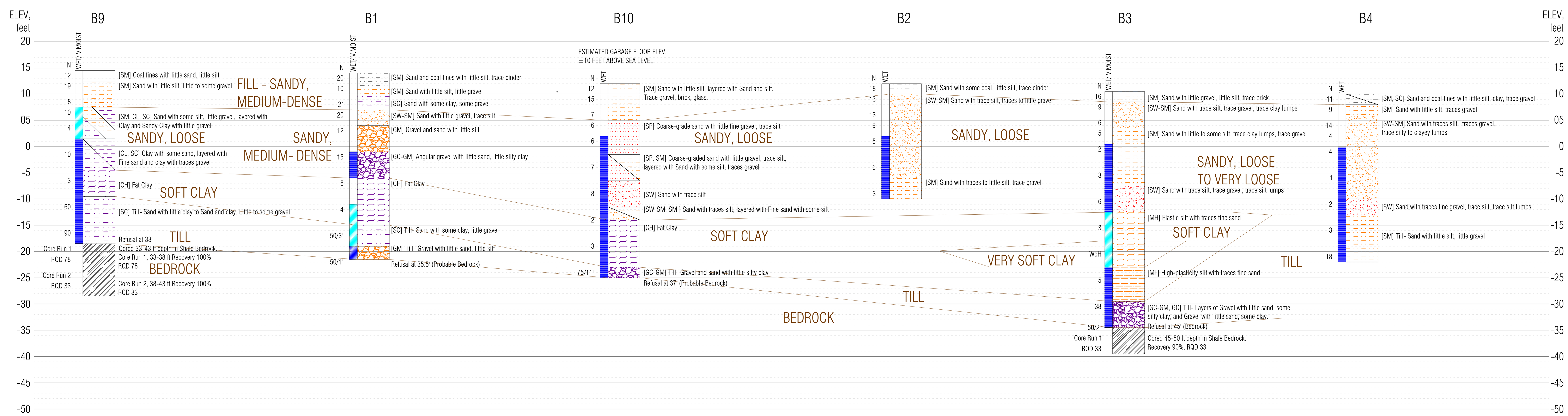
NO HORIZONTAL SCALE.
USCS SOIL CLASSIFICATIONS ARE IN BRACKETS.

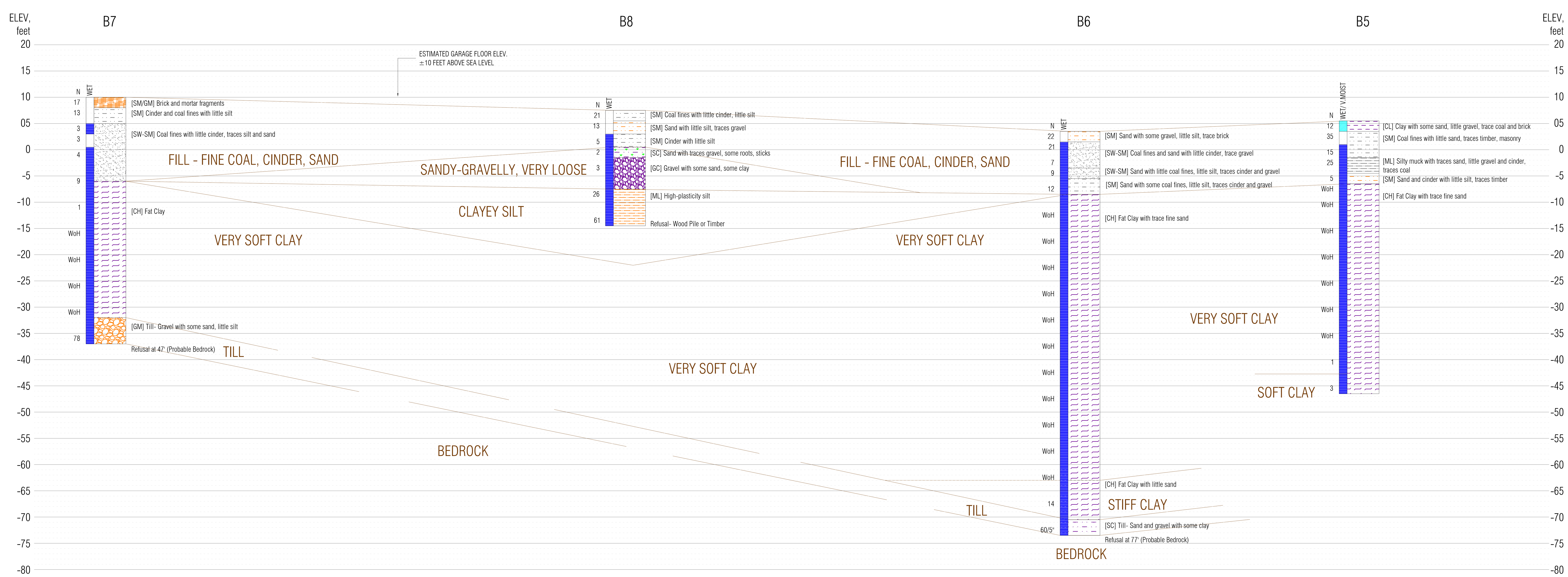
VERY MOIST
WET

IN GENERAL, RED PATTERNS INDICATE RELATIVELY CLEAN SANDY OR GRAVELLY SOILS, PURPLE PATTERNS INDICATE SOILS WITH SIGNIFICANT CLAY CONTENT AND ORANGE PATTERNS INDICATE SOILS WITH A SIGNIFICANT SILT CONTENT.

GENERALIZED SUBSURFACE PROFILE

THESE SECTIONS ARE GENERALIZED REPRESENTATIONS OF THE SUBSURFACE PROFILE, BASED ON THE SUBSURFACE EXPLORATION DATA, OBSERVATIONS, RESEARCH, AND OTHER RELEVANT INFORMATION. THE SOILS INFORMATION PRESENTED HEREIN SHOULD BE INTERPRETED IN CONJUNCTION WITH THE INFORMATION FROM THE BORING LOGS AND THE GEOTECHNICAL INVESTIGATION REPORT. SITE CONDITIONS MAY DIFFER FROM THOSE ENCOUNTERED AT THE BORING LOCATIONS.





KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
845 275-7732 PATTONGEOTECH.COM

NEWBURGH WATERFRONT

CITY OF NEWBURGH, ORANGE COUNTY, N.Y.

SUBSURFACE PROFILE

PROJECT NUMBER
25311

REV.	DATE	BY
1	10/21/2025	KLP
0	10/7/2025	KLP

SCALE AS NOTED

B-101

KEVIN L. PATTON, P.E. 36 PATTON ROAD NEWBURGH, NY 12550 PATTONGEOTECH.COM 845 275-7732				
	CLIENT:	JM Development LLC		
	PROJECT:	Newburgh Waterfront		
	DATE:	9/3/2025	Project No.:	25311
	WEATHER:	Clear, 75°		

SOIL BORING LOG

DRILLING COMPANY:	General Borings Inc., Prospect, Conn.	LOCATION:	South Building - NW	BORING NO. B1
DRILLER AND HELPER:	Tom McGovern, Johnny			
HAMMER TYPE:	Automatic Hammer	APPROX. ELEV.:	14.0 ft above sea level	
INSPECTOR:	Warren Patton	WATER DEPTH:		

Feet	SAMPLE #	SAMPLE Type	SAMPLE Rec.	USCS SOIL CLASS	SPT 0-6	SPT 6-12	SPT 12-18	SPT 18-24	MOISTURE	DESCRIPTION	NOTES
0-2	**S1**	SS	6	SM	44	**13**	**7**	4	Moist	Sand and coal fines with little silt, trace gravel	PEN 4.7ksf
										Black and dusky brown	
2-4	**S2**	SS	10	SM	3	**5**	**5**	6	Moist	Sand with little coal, traces silt, trace cinder, to	
										Sand with little silt, little gravel. Dusky brown	
5										and yellowish brown.	
5-7	**S3**	SS	14	SC	16	**12**	**9**	11	Moist	Sand with some clay, some gravel	
										Yellowish brown and pale brown	
7-9	**S4**	SS	14	SW-SM	11	**9**	**11**	9	Moist	Sand (Fmc) with little fine gravel, trace silt	
										Yellowish brown	
10											
10-12	**S5**	SS	4	GM	8	**7**	**5**	11	Moist	Gravel and sand with little silt. Shaley.	
										Cohesionless. Yellowish grey.	
15											
15-17	**S6**	SS	8	GC-GM	3	**4**	**11**	11	Wet	Angular gravel with little sand, little silty clay	
										Brown	
20											
20-22	**S7**	SS	19	CH	29	**5**	**3**	4	Moist	Fat clay. Massive.	PEN 1.9ksf
										Trace mottling. Grey and brown	
25											
25-27	**S8**	SS	20	CH	4	**2**	**2**	4	Very Moist	Fat clay. Faintly/finely layered.	PEN 1.5ksf
										Brownish grey	TOR 800 psf
30											
30-32	**S9**	SS	10	SC	50/3				Very Moist	Till- Sand with some clay, little gravel	PEN 10ksf
										Yellowish brown	
35											
35-37	**S10**	SS	3	GM	50/1				Wet	Till- Angular gravel with little sand, little silt.	Refusal at 35.5'
										Slightly cohesive. Grey.	
40											
45											

COMMENTS:

DRILLING METHOD: HSA - Hollow-Stem Auger   MR - Mud-Rotary   MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES: SS - SPLIT SPOON   C - CORE   T - UNDISTURBED TUBE   AUG - AUGER CUTTINGS
PEN - HAND PENETROMETER   TOR - TORVANE   V - VANE SHEAR

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
PATTONGEOTECH.COM 845 275-7732

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront		
DATE:	9/3/2025	Project No.:	25311
WEATHER:	Clear, 75°		

SOIL BORING LOG

DRILLING COMPANY:	General Borings Inc., Prospect, Conn.	LOCATION:	Middle Building - west middle	**BORING NO.**	**B2**
DRILLER AND HELPER:	Tom McGovern, Johnny				
HAMMER TYPE:	Automatic Hammer	APPROX. ELEV.:	12.0 FT		
INSPECTOR:	Warren Patton	WATER DEPTH:			

Feet	SAMPLE			USCS SOIL	SPT TEST, BLOWS/6"				MOISTURE	DESCRIPTION	NOTES
	#	Type	Rec.	CLASS	0-6	6-12	12-18	18-24			
0-2	**S1**	SS	8	SM	7	**10**	**8**	9	Moist	Sand with some coal, little silt, trace cinder	
										Dusky brown	
2-4	**S2**	SS	14	SW-SM	9	**5**	**8**	7	Moist	Sand (Fmc) with traces silt, traces gravel, traces	
										clay lumps. Yellowish brown	
5											
5-7	**S3**	SS	12	SW-SM	13	**7**	**6**	6	Moist	Sand with trace silt, traces gravel	
										Yellowish brown	
7-9	**S4**	SS	19	SW-SM	5	**4**	**5**	5	Moist	Sand with trace silt, little gravel	
										Yellowish brown	
10											
10-12	**S5**	SS	8	SW-SM	3	**2**	**3**	2	Wet	Same	
										Yellowish brown	
15											
15-17	**S6**	SS	8	SW-SM	1	**3**	**3**	3	Wet	Sand with trace silt, traces gravel	
										Moderate brown	
20											
20-22	**S7**	SS	24	SM	15	**4**	**9**	19	Wet	Sand with traces to little silt, trace gravel	
										Brownish grey	
25											
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD:	HSA - Hollow-Stem Auger	MR - Mud-Rotary		MEASUREMENTS IN FEET AND INCHES
SAMPLE/TEST TYPES	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.	CLIENT:	JM Development LLC		
36 PATTON ROAD	PROJECT:	Newburgh Waterfront		
NEWBURGH, NY 12550	DATE:	9/4/2025	Project No.:	25311
PATTONGEOTECH.COM 845 275-7732	WEATHER:	Clear, 78°		

SOIL BORING LOG

DRILLING COMPANY:	General Borings Inc., Prospect, Conn.	LOCATION:	Middle Building - NW	BORING NO.	B3
DRILLER AND HELPER:	Tom McGovern, Johnny				
HAMMER TYPE:	Automatic Hammer	APPROX. ELEV.:	10.5 FT		
INSPECTOR:	Warren Patton	WATER DEPTH:			Pg. 1 of 2

Feet	SAMPLE #	SAMPLE Type	SAMPLE Rec.	USCS SOIL CLASS	SPT 0-6	SPT 6-12	SPT 12-18	SPT 18-24	MOISTURE	DESCRIPTION	NOTES
0-2	**S1**	SS	24	SM	6	**5**	**11**	14	Moist	Sand with little gravel, little silt, trace brick	
										Moderate yellowish brown, grey	
2-4	**S2**	SS	13	SW-SM	9	**5**	**4**	3	Moist	Sand with trace silt, trace gravel, few lumps of	
										clay. Yellowish brown	
5											
5-7	**S3**	SS	14	SW-SM	2	**3**	**3**	4	Moist	Same	
										Yellowish brown	
7-9	**S4**	SS	12	SM	4	**2**	**3**	3	Moist	Sand (Fmc) with little silt, trace gravel, few clay	
										lumps. Yellowish brown.	
10											
10-12	**S5**	SS	12	SM	1	**1**	**1**	1	Wet	Sand (Fmc) with some silt, trace clay lumps	PEN 1.9 ksf (field)
										Cohesionless. Yellowish brown.	
15											
15-17	**S6**	SS	8	SM	1	**1**	**2**	2	Wet	Sand and silt. Cohesionless. Layer of soft grey	
										clay (1.5") Yellowish brown	
20											
20-22	**S7**	SS	20	SW	1	**2**	**4**	5	Wet	Sand with trace silt, trace gravel, trace silt lumps	
										Moderate yellowish brown	
25											
25-27	**S8**	SS	18	MH	1	**1**	**2**	4	Very Moist	Elastic silt with traces sand. Fine/faint layers.	PEN 1.3 ksf
										Massive structure.	TOR 750 psf
										Faintly mottled grey with brownish grey.	
30											
30-32	**S9**	SS	24	MH	WoH	**WoH**	**WoH**	WoH	Very Moist	Elastic silt with traces fine sand.	PEN 1.2ksf (field)
										Brownish grey	
35											
35-37	**S10**	SS	24	ML	WoH	**3**	**2**	7	Wet	Clayey silt* with traces fine sand. Thin layer silty	PEN 0.8ksf
										fine sand. Brownish grey.	TOR 250 psf
										*Class ML silt with high plasticity. "Clayey silt"	Harder drilling at
										is not a USCS term.	37.5 feet.
40											
40-42	**S11**	SS	12	GC-GM	15	**20**	**18**	34	Wet	Till- Layers Gravel with little sand, some silty	
				GC						clay, Gravel with little sand, some clay.	
										Grey and yellowish brown layers.	
45										(Continued)	

COMMENTS:

DRILLING METHOD:	HSA - Hollow-Stem Auger	MR - Mud-Rotary		MEASUREMENTS IN FEET AND INCHES
SAMPLE/TEST TYPES	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.	CLIENT:	JM Development LLC	
36 PATTON ROAD	PROJECT:	Newburgh Waterfront	
NEWBURGH, NY 12550	DATE:	9/4/2025	Project No.: 25311
PATTONGEOTECH.COM 845 275-7732	WEATHER:	Clear, 78°	

SOIL BORING LOG

DRILLING COMPANY:	General Borings Inc., Prospect, Conn.	LOCATION:	Middle Building - NW	**BORING NO. B3**
DRILLER AND HELPER:	Tom McGovern, Johnny			
HAMMER TYPE:	Automatic Hammer	APPROX. ELEV.:	10.5 FT	
INSPECTOR:	Warren Patton	WATER DEPTH:		**Pg. 2 of 2**

Feet	SAMPLE #	SAMPLE Type	SAMPLE Rec.	USCS SOIL CLASS	SPT 0-6	SPT 6-12	SPT 12-18	SPT 18-24	MOISTURE	DESCRIPTION	NOTES
45	**S12**	SS/C	1"/	-	50/2				Wet	Piece of angular gravel (greywacke) with silt	Refusal at 45'
45-50	**Run 1**	C	90%	Rock						and fine sand. Grey. Small sample.	Cored 45-50'
		C								Shale Bedrock.	
		C								Core Run 1, 45 to 50 feet. Recovery 90%	
50		C								RQD 33	

COMMENTS:

DRILLING METHOD: HSA - Hollow-Stem Auger MR - Mud-Rotary MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES: SS - SPLIT SPOON C - CORE T - UNDISTURBED TUBE AUG - AUGER CUTTINGS
PEN - HAND PENETROMETER TOR - TORVANE V - VANE SHEAR

KEVIN L. PATTON, P.E. **36 PATTON ROAD** **NEWBURGH, NY 12550** **PATTONGEOTECH.COM 845 275-7732**				
	CLIENT:	JM Development LLC		
	PROJECT:	Newburgh Waterfront		
	DATE:	9/4/2025	Project No.:	25311
	WEATHER:	Clear, 78°		

SOIL BORING LOG

DRILLING COMPANY:	General Borings Inc., Prospect, Conn.	LOCATION:	North Building - NW	**BORING NO.**	**B4**
DRILLER AND HELPER:	Tom McGovern, Johnny				
HAMMER TYPE:	Automatic Hammer	APPROX. ELEV.:	10.0 FT		
INSPECTOR:	Warren Patton	WATER DEPTH:			

Feet	SAMPLE #	SAMPLE Type	SAMPLE Rec.	USCS SOIL CLASS	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	MOISTURE	DESCRIPTION	NOTES
0-2	**S1**	SS	14	SM, SC	7	**6**	**5**	3	Moist	Sand and coal fines with little silt or clay (layers,) trace gravel, tr. brick. Dusky brown.	
2-4	**S2**	SS	11	SM	5	**5**	**4**	4	Moist	Sand with little silt, traces fine gravel, few lumps of silty clayey sand. Yellowish brown	
5											
5-7	**S3**	SS	20	SW-SM	9	**7**	**7**	6	Moist	Sand w/traces silt, traces fine gravel, some lumps of silty clayey sand. Mod. yellow-brown.	
7-9	**S4**	SS	19	SW-SM	4	**2**	**2**	3	Moist	Same, 2" layer of Silt with thin layer of Sand. Yellowish brown	
10											
10-12	**S5**	SS	14	SW-SM	3	**2**	**2**	2	Wet	Sand (Fmc) with traces fine gravel, traces silt, few lumps of silty clay. Moderate yellowish brown.	
15											
15-17	**S6**	SS	24	SW-SM	1	**1/12"**		2	Wet	Sand with traces silt, traces fine gravel, few lumps of clay. Moderate yellowish brown.	
20											
20-22	**S7**	SS	9	SW	1/12"		**2**	3	Wet	Sand with traces fine gravel, trace silt, trace silt lumps. Brownish grey.	
25											
25-27	**S8**	SS	12	SW-SM	2	**1**	**2**	4	Wet	Till- Sand with little silt, little gravel. Cohesionless. Grey.	PEN 2.5ksf (field)
30											
30-32	**S9**	SS	16	SW-SM	4	**8**	**10**	10	Wet	Same, Cohesionless to slightly cohesive. Grey	
35											
40											
45											

COMMENTS:

DRILLING METHOD: HSA - Hollow-Stem Auger MR - Mud-Rotary MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES: SS - SPLIT SPOON C - CORE T - UNDISTURBED TUBE AUG - AUGER CUTTINGS
PEN - HAND PENETROMETER TOR - TORVANE V - VANE SHEAR

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
PATTONGEOTECH.COM 845 275-7732

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront		
DATE:	9/5/2025	Project No.:	25311
WEATHER:	Cloudy, 77°		

SOIL BORING LOG

DRILLING COMPANY:	General Borings Inc., Prospect, Conn.	LOCATION:	North Building - NE	BORING NO.	B5
DRILLER AND HELPER:	Tom McGovern, Johnny				
HAMMER TYPE:	Automatic Hammer	APPROX. ELEV.:	5.5 FT		
INSPECTOR:	Warren Patton	WATER DEPTH:			Pg. 1 of 2

Feet	SAMPLE #	Type	Rec.	USCS SOIL CLASS	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	MOISTURE	DESCRIPTION	NOTES
0-2	**S1**	SS	14	CL	6	**7**	**5**	3	Very Moist	Clay with some sand, little gravel, traces coal fines,	PEN 4.2ksf
										trace brick. Yellowish brown.	
2-4	**S2**	SS	10	SM	5	**7**	**28**	15	Moist	Coal fines with traces soil, few mortar	
										fragments. Drove through timber. Black and	
5										dusky brown.	
5-7	**S3**	SS	8	SM	19	**8**	**7**	25	Wet	Coal fines with little sand	
										Dark grey	
7-9	**S4**	SS	14	ML	13	**17**	**8**	7	Wet	Silty muck with traces sand, little gravel and	
										hard cinder, traces coal. Dark grey and	
10										moderate yellowish brown.	
10-12	**S5**	SS	3	SM	3	**4**	**1/12"**	-	Wet	Sand and hard fine cinder with little silt.	
										Fragments of timber. Dark grey.	
12-14	**S6**	SS	0	-	WoH	**WoH**	**WoH**	WoH	-	No Recovery	
15											
15-17	**S7**	SS	9	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay with trace fine sand, trace fine organics	PEN 0.25 ksf
										in 1mm layer. Fine, faintly layered grey.	TOR 200 psf
20											
20-22	**S8**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay. Massive.	PEN 0.3ksf
										Faintly mottled dark grey and brownish grey	
25											
25-27	**S9**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay. Coarse blocky structure, weakly	PEN 0.6ksf
										developed. Faintly mottled brownish grey.	TOR 350 psf
30											
30-32	**S10**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay, faintly layered, weak blocky structure.	PEN 0.8ksf
										Traces very fine root hairs, leaf fragments, less	
										than 0.1% of the soil volume. Brownish grey.	
35											
35-37	**S11**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay. Same, no organics. Weak medium	PEN 1.0 ksf (field)
										blocky structure. Brownish grey.	
40											
40-42	**S12**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay. Fine/ faint layers. Massive structure.	PEN 0.8ksf
										Thin (1-2mm) layer of fine sand.	
										Brownish grey.	
45										(Continued)	

COMMENTS:

DRILLING METHOD: HSA - Hollow-Stem Auger MR - Mud-Rotary MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES: SS - SPLIT SPOON C - CORE T - UNDISTURBED TUBE AUG - AUGER CUTTINGS
PEN - HAND PENETROMETER TOR - TORVANE V - VANE SHEAR

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
PATTONGEOTECH.COM 845 275-7732

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront		
DATE:	9/5/2025	Project No.:	25311
WEATHER:	Clear, 77°		

SOIL BORING LOG

DRILLING COMPANY:	General Borings Inc., Prospect, Conn.	LOCATION:	North Building - NE	BORING NO.	B5
DRILLER AND HELPER:	Tom McGovern, Johnny				
HAMMER TYPE:	Automatic Hammer	APPROX. ELEV.:	5.5 FT		
INSPECTOR:	Warren Patton	WATER DEPTH:			Pg. 2 of 2

Feet	SAMPLE #	Type	Rec.	USCS SOIL CLASS	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	MOISTURE	DESCRIPTION	NOTES
45-47	**S13**	SS	24	CH	2	**1**	**1/12"**	-	Wet	Fat clay. Fine/faint layers, massive structure.	TOR 350 psf
										Brownish grey	PEN 0.25 ksf
50											
50-52	**S14**	SS	23	CH	2	**2**	**1**	2	Wet	Fat clay. Massive structure. Small shell	TOR 350 psf
										fragment (2mm.) Brownish grey.	PEN 0.35 ksf
										Stopped in soil at 52 feet	
55											

COMMENTS:

DRILLING METHOD: HSA - Hollow-Stem Auger MR - Mud-Rotary MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES: SS - SPLIT SPOON C - CORE T - UNDISTURBED TUBE AUG - AUGER CUTTINGS
PEN - HAND PENETROMETER TOR - TORVANE V - VANE SHEAR

KEVIN L. PATTON, P.E.	CLIENT:	JM Development LLC		
36 PATTON ROAD	PROJECT:	Newburgh Waterfront		
NEWBURGH, NY 12550	DATE:	9/5,8/2025	Project No.:	25311
PATTONGEOTECH.COM 845 275-7732	WEATHER:	Clear, 78°		

SOIL BORING LOG

DRILLING COMPANY:	General Borings Inc., Prospect, Conn.	LOCATION:	Middle Building - NE	BORING NO.	B6
DRILLER AND HELPER:	Tom McGovern, Johnny				
HAMMER TYPE:	Automatic Hammer	APPROX. ELEV.:	3.5 FT		
INSPECTOR:	Warren Patton	WATER DEPTH:			Pg. 1 of 2

Feet	SAMPLE #	SAMPLE Type	SAMPLE Rec.	USCS SOIL CLASS	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	MOISTURE	DESCRIPTION	NOTES
0-2	**S1**	SS	18	SM	7	**14**	**18**	19	Moist	Sand with some shaley gravel, little silt, some	
										brick fragments. Grey with pale brown.	
2-4	**S2**	SS	8	SW-SM	16	**11**	**10**	7	Wet	Coal fines and sand with little fine cinder,	
										traces silt. Dark grey.	
5											
5-7	**S3**	SS	24	SW-SM	3	**3**	**4**	5	Wet	Same, trace fine gravel.	
										Dark grey	
7-9	**S4**	SS	20	SW-SM	6	**4**	**5**	5	Wet	Sand with little coal fines, traces fine cinder, trace	
										fine gravel, traces silt. Dark grey	
10											
10-12	**S5**	SS	18	SM	4	**4**	**8**	6	Wet	Sand with some coal fines, traces fine cinder,	
										traces gravel, little silt. Dark grey	
15											
15-17	**S6**	SS	0	-	WoH	**WoH**	**WoH**	WoH	-	No Recovery	
20											
20-22	**S7**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay. Coarse blocky structure. (weak.)	PEN 0.7ksf (field
										Brownish grey	and lab)
25											
25-27	**S8**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay. Massive to slightly blocky.	PEN 0.9ksf
										Faintly mottled brownish grey.	
30											
30-32	**S9**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay, with trace fine sand in a few layers	PEN 1.1 ksf (field,)
										<1 mm thick. Brownish grey.	0.9ksf lab)
											TOR 500 psf
35											
35-37	**S10**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay, trace organics (fine, thin, tiny leaf	PEN 1.1 ksf (field,)
										fragments, scattered or in < 1mm layers), trace	0.9ksf lab)
										tiny shells. Massive to slightly blocky.	TOR 400 psf
										Brownish grey.	
40											
40-42	**S11**	SS	22	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay, trace fine sand in layers <1mm thick.	PEN 0.4 ksf
										Massive to slightly blocky.	TOR 300 psf
45										(Continued)	

COMMENTS:				
DRILLING METHOD:	HSA - Hollow-Stem Auger	MR - Mud-Rotary		MEASUREMENTS IN FEET AND INCHES
SAMPLE/TEST TYPES	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
PATTONGEOTECH.COM 845 275-7732

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront		
DATE:	9/5,8/2025	Project No.:	25311
WEATHER:	Clear, 78˚		

SOIL BORING LOG

DRILLING COMPANY:	General Borings Inc., Prospect, Conn.	LOCATION:	Middle Building - NE	**BORING NO.**	**B6**
DRILLER AND HELPER:	Tom McGovern, Johnny				
HAMMER TYPE:	Automatic Hammer	APPROX. ELEV.:	3.5 FT		
INSPECTOR:	Warren Patton	WATER DEPTH:			**Pg. 2 of 2**

Feet	SAMPLE #	Type	Rec.	USCS SOIL CLASS	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	MOISTURE	DESCRIPTION	NOTES
45-47	**S12**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay, faintly/ finely layered, some very thin	PEN 0.6 ksf
										layers of silt. Massive. Brownish grey, trace	TOR 450 psf
										black streaks.	
50											
50-52	**S13**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat Clay. Trace tiny shell fragments. Massive.	PEN 0.8 ksf (field,
										Brownish grey	0.6 ksf lab)
											TOR 450 psf
55											
55-57	**S14**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat Clay, massive	PEN 1.0 ksf (field,
										Brownish grey	0.8 ksf lab)
											TOR 650 psf
60											
60-62	**S15**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat Clay, massive	PEN 1.0 ksf (field,
										Brownish grey	1.3 ksf lab)
65											
65-67	**S16**	SS	24	CH	WoH	**WoH**	**WoH**	8	Wet	Fat Clay with <1% pebbles (drop-stones.)	PEN 2.0, 3.0 ksf
										Massive structure. Brownish grey.	(field, 1.6 ksf lab)
											TOR 1150 psf
70											
70-72	**S17**	SS	6	CH	6	**8**	**6**	8	Wet	Fat clay with little sand	
										Brownish grey	
75											
75-77	**S18**	SS	12	SC	23	**60/5**			Wet	Angular sand and gravel with some clay.	
										Grey.	Refusal at 77'

COMMENTS:

DRILLING METHOD: HSA - Hollow-Stem Auger MR - Mud-Rotary MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES: SS - SPLIT SPOON C - CORE T - UNDISTURBED TUBE AUG - AUGER CUTTINGS
PEN - HAND PENETROMETER TOR - TORVANE V - VANE SHEAR

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
PATTONGEOTECH.COM 845 275-7732

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront		
DATE:	9/8/2025	Project No.:	25311
WEATHER:	Clear, 78˚		

SOIL BORING LOG

DRILLING COMPANY:	General Borings Inc., Prospect, Conn.	LOCATION:	South Building - SE	**BORING NO.** **B7**
DRILLER AND HELPER:	Tom McGovern, Johnny			
HAMMER TYPE:	Automatic Hammer	APPROX. ELEV.:	10.0 FT	
INSPECTOR:	Warren Patton	WATER DEPTH:		**Pg. 1 of 2**

Feet	SAMPLE #	Type	Rec.	USCS SOIL CLASS	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	MOISTURE	DESCRIPTION	NOTES
0-2	**S1**	SS	20	SM/GM	15	**9**	**8**	14	Moist	Pulverized mortar with brick fragments.	
										Texture of Sand with some silt, traces gravel.	Light grey.
2-4	**S2**	SS	10	SM	9	**7**	**6**	4	Moist	Hard cinder and coal fines with traces soil-	
										Texture of Sand with some gravel, little silt	
5										Dusky brown.	
5-7	**S3**	SS	7	SW-SM	3	**2**	**1**	2	Wet	Coal fines with little hard cinder, traces silt	
										Dark grey	
7-9	**S4**	SS	7	SW-SM	2	**1**	**2**	1	Moist	Coal fines with little cinder, trace silt	
										Dark grey	
10											
10-12	**S5**	SS	14	SW-SM	2	**2**	**2**	2	Wet	Coal fines with some cinder, traces sand, little	
										gravel-size. Dark grey	
15											
15-17	**S6**	SS	12	SW-SM	5	**4**	**5**	1	Wet	Sand with little gravel to 16 ft, then Fat clay	
				CH						Finely/faintly layered. 2mm layer of fine sand.	PEN 0.6ksf (CH)
										Dark grey to brownish grey	
20											
20-22	**S7**	SS	12	CH	2	**1**	**WoH**	WoH	Wet	Fat clay. Fine blocky structure.	PEN 0.8 ksf (field,
										Moderate yellowish brown	0.7 ksf lab)
25											
25-27	**S8**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay. Same.	PEN 0.9 ksf (field,
										Moderate yellowish brown	0.75 ksf lab)
											TOR 450 psf
30											
30-32	**S9**	SS	6	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay. Fine/faint layers. Massive structure.	PEN 0.3ksf
										Brownish grey with dark grey	
35											
35-37	**S10**	SS	24	CH	WoH	**WoH**	**WoH**	WoH	Wet	Fat clay. Trace tiny, thin shell fragments.	PEN 1.1, 1.4 ksf
										Fine/faint layers. Massive. Brownish grey	(field, 1.1 ksf lab)
											TOR 650 psf
40											
40-42	**S11**	SS	24	CH	1/12"		**WoH**	WoH	Wet	Clayey silt. Trace thin shell fragments up to	PEN 1.5 ksf (field,
										10mm across. 2mm layer fine sand.	0.9 ksf lab)
										Fine, weak blocky structure. Brownish grey.	TOR 550 psf
											Soil becoming stiff
45										(Continued)	at 44 feet depth.

COMMENTS:

DRILLING METHOD:	HSA - Hollow-Stem Auger	MR - Mud-Rotary		MEASUREMENTS IN FEET AND INCHES
SAMPLE/TEST TYPES	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
PATTONGEOTECH.COM 845 275-7732

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront		
DATE:	9/8/2025	Project No.:	25311
WEATHER:	Clear, 78°		

SOIL BORING LOG

DRILLING COMPANY:	General Borings Inc., Prospect, Conn.	LOCATION:	South Building - SE	**BORING NO.**	**B7**
DRILLER AND HELPER:	Tom McGovern, Johnny				
HAMMER TYPE:	Automatic Hammer	APPROX. ELEV.:	10.0 FT		
INSPECTOR:	Warren Patton	WATER DEPTH:			**Pg. 2 of 2**

Feet	SAMPLE			USCS SOIL CLASS	SPT TEST, BLOWS/6"				MOISTURE	DESCRIPTION	NOTES
	#	Type	Rec.		0-6	6-12	12-18	18-24			
45-47	**S12**	SS	20	GM	17	**22**	**56**	50/1	Wet	Till- angular gravel with some sand, little silt.	
										Slightly cohesive. All grey shale and fine	Refusal at 47'
										sandstone particles. Grey.	
50											

COMMENTS:

DRILLING METHOD: HSA - Hollow-Stem Auger MR - Mud-Rotary MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES: SS - SPLIT SPOON C - CORE T - UNDISTURBED TUBE AUG - AUGER CUTTINGS
PEN - HAND PENETROMETER TOR - TORVANE V - VANE SHEAR

KEVIN L. PATTON, P.E. 36 PATTON ROAD NEWBURGH, NY 12550 PATTONGEOTECH.COM 845 275-7732	CLIENT:	JM Development LLC		
	PROJECT:	Newburgh Waterfront		
	DATE:	9/9/2025	Project No.:	25311
	WEATHER:	Clear, 68°		

SOIL BORING LOG

DRILLING COMPANY:	General Borings Inc., Prospect, Conn.	LOCATION:	South Building - NE	BORING NO.	B8
DRILLER AND HELPER:	Tom McGovern, Johnny				
HAMMER TYPE:	Automatic Hammer	APPROX. ELEV.:	7.5 FT		
INSPECTOR:	Warren Patton	WATER DEPTH:			

Feet	SAMPLE			USCS SOIL	SPT TEST, BLOWS/6"				MOISTURE	DESCRIPTION	NOTES
	#	Type	Rec.	CLASS	0-6	6-12	12-18	18-24			
0-2	**S1**	SS	20	SM	12	**13**	**8**	8	Moist	Coal fines with little hard cinder, little silt	
										Traces gravel-size. Black.	
2-4	**S2**	SS	14	SM	4	**6**	**7**	5	Moist	Fmc sand with little silt, traces fine gravel	
										Yellowish brown	
5											
5-7	**S3**	SS	10	SM	3	**1**	**4**	3	Wet	Hard cinder, sand and gravel size with little silt	
										Lump of clayey till. Dark grey.	
7-9	**S4**	SS	14	SC	2	**1**	**1**	5	Wet	Sand (Fmc) and clay with traces gravel, many	
										sticks and small roots (old and soft). Grey with	
10										yellowish brown.	
10-12	**S5**	SS	5	GC	1	**2**	**1**	3	Wet	Gravel with some sand, some clay, some fine	
										roots (till-fill.) Grey with yellowish brown.	
15											
15-17	**S6**	SS	12	ML	18	**22**	**4**	2	Wet	Clayey silt. Weak fine blocky structure.	PEN 0.7 ksf
										Brownish grey	
20											
20-22	**S7**	SS	10	ML	3	**27**	**34**	50/3	Wet	Clayey silt. Same. Fragments of timber.	Refusal at 20'
										Brownish grey	Spoon refusal at
										Auger Refusal at 20ft due to a wood pile or	21.75 ft
										other vertical timber.	
25											
30											
35											
40											
45											

COMMENTS:

DRILLING METHOD:	HSA - Hollow-Stem Auger	MR - Mud-Rotary		MEASUREMENTS IN FEET AND INCHES
SAMPLE/TEST TYPES	SS - SPLIT SPOON	C - CORE	T - UNDISTURBED TUBE	AUG - AUGER CUTTINGS
	PEN - HAND PENETROMETER		TOR - TORVANE	V - VANE SHEAR

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
PATTONGEOTECH.COM 845 275-7732

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront		
DATE:	9/9/2025	Project No.:	25311
WEATHER:	Clear, 68°		

SOIL BORING LOG

DRILLING COMPANY:	General Borings Inc., Prospect, Conn.	LOCATION:	South Building - SW	BORING NO. B9
DRILLER AND HELPER:	Tom McGovern, Johnny			
HAMMER TYPE:	Automatic Hammer	APPROX. ELEV.:	14.0 FT	
INSPECTOR:	Warren Patton	WATER DEPTH:		

Feet	SAMPLE #	Type	Rec.	USCS SOIL CLASS	SPT TEST, BLOWS/6" 0-6	6-12	12-18	18-24	MOISTURE	DESCRIPTION	NOTES
0-2	**S1**	SS	12	SM	9	**8**	**4**	6	Moist	Coal fines with little sand, traces cinder, little silt	
										Black	
2-4	**S2**	SS	3	SM	8	**9**	**10**	8	Moist	Sand with some angular gravel, little silt	
										Layers yellowish brown, pale brown	
5											
5-7	**S3**	SS	13	SM	3	**3**	**5**	4	Moist	Sand (Fmc) with little silt, little fine gravel	
										Yellowish brown	
7-9	**S4**	SS	8	SM, CL	5	**5**	**5**	12	Very Moist	Sand (Fmc) with some silt, little gravel, layered	
										with sandy clay with little gravel. Yellowish	
10										brown, light brown.	
10-12	**S5**	SS	12	SC, CL	3	**1**	**3**	3	Very Moist	Fmc sand and clay with traces gravel, layer of	PEN 4.4 ksf (field)
										finely-layered clay. Layers of yellowish brown	Lab PEN 3.3 ksf in
										and light brown	SM, 1.7 ksf in CL.
15											
15-17	**S6**	SS	8	CL,SC	1	**4**	**6**	9	Wet	Clay with some sand, layered with Fine sand	
										and clay with traces gravel. Piece of timber.	
										Grey and dark grey.	
20											
20-22	**S7**	SS	24	CH	2	**1**	**2**	4	Wet	Fat clay, trace tiny shell fragments.	PEN 2.4 ksf (field,
										Brownish grey	1.9 ksf lab.)
25											
25-27	**S8**	SS	24	SC	10	**28**	**32**	60	Wet	Till- Sand with little clay, some gravel.	PEN 9 ksf (field)
										Grey	
30											
30-32	**S9**	SS	12	SC	22	**52**	**38**	50/3	Wet	Till- Sand and clay with little shale gravel	PEN 13 ksf
										(angular.) Grey.	
											Refusal at 33'
33-38	**Run 1**	C	100%	Rock					-	Shale Bedrock.	Cored 33-43'
35		C								Core Run 1, 33 to 38 feet. Recovery 100%	
		C								RQD 78	
		C									
		C									
38-43	**Run 2**	C	100%	Rock						Shale Bedrock.	
40		C								Core Run 2, 38 to 43feet. Recovery 100%	
		C								RQD 33	
		C									
		C									
										Stopped at 43 feet, in bedrock.	
45											

COMMENTS:

DRILLING METHOD: HSA - Hollow-Stem Auger MR - Mud-Rotary MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES: SS - SPLIT SPOON C - CORE T - UNDISTURBED TUBE AUG - AUGER CUTTINGS
PEN - HAND PENETROMETER TOR - TORVANE V - VANE SHEAR

KEVIN L. PATTON, P.E.	CLIENT:	JM Development LLC			
36 PATTON ROAD	PROJECT:	Newburgh Waterfront			
NEWBURGH, NY 12550	DATE:	9/10/2025	Project No.:	25311	
PATTONGEOTECH.COM 845 275-7732	WEATHER:	Cloudy, 70°			

SOIL BORING LOG

DRILLING COMPANY:	General Borings Inc., Prospect, Conn.	LOCATION:	Middle Building - SW	**BORING NO.**	**B10**
DRILLER AND HELPER:	Tom McGovern, Johnny				
HAMMER TYPE:	Automatic Hammer	APPROX. ELEV.:	12.0 FT		
INSPECTOR:	Warren Patton	WATER DEPTH:			

Feet	SAMPLE			USCS SOIL CLASS	SPT TEST, BLOWS/6"				MOISTURE	DESCRIPTION	NOTES
	#	Type	Rec.		0-6	6-12	12-18	18-24			
0-2	**S1**	SS	9	SM	10	**5**	**7**	6	Moist	Layers Sand with little silt, Sand and silt. Trace gravel. Layers yellowish brown, pale brown.	
2-4	**S2**	SS	5	SM	8	**9**	**6**	5	Moist	Sand with little silt, little fine gravel, trace brick, glass. Yellowish brown.	
5											
5-7	**S3**	SS	<1	SM	3	**4**	**3**	4	Moist	Same. Yellowish brown	Small Sample
7-9	**S4**	SS	12	SP	4	**3**	**3**	3	Moist	CMf sand with little fine gravel, trace silt Yellowish brown	
10											
10-12	**S5**	SS	8	SP	3	**3**	**3**	2	Wet	Same. Pale brown	
15											
15-17	**S6**	SS	11	SP, SM	1	**2**	**5**	6	Wet	Same, layered with Sand with some silt, traces gravel. Layered pale grey, yellowish brown.	
20											
20-22	**S7**	SS	18	SW	1	**3**	**5**	8	Wet	Sand with trace silt Pale brown	
25											
25-27	**S8**	SS	20	SW-SM, SM CH	6	**1**	**1**	2	Wet	Sand with traces silt, layered with Fine sand with some silt, yellowish grey, change to brownish grey Fat clay with trace pebbles and sand, with massive structure.	PEN 2.5 ksf (field) PEN 1.2 ksf lab, CH layer.
30											
30-32	**S9**	SS	20	CH	3	**2**	**1**	2	Wet	Fat clay. Massive. Few old fine roots Brownish grey	PEN 1.8 ksf (field, 1.4 ksf lab.) TOR 700 psf
35											
35-37	**S10**	SS	12	GC-GM	19	**25**	**50/5**		Wet	Till-Angular shale gravel and sand with little silty clay. Grey.	Refusal at 37'
40											
45											

COMMENTS:

DRILLING METHOD: HSA - Hollow-Stem Auger MR - Mud-Rotary MEASUREMENTS IN FEET AND INCHES

SAMPLE/TEST TYPES: SS - SPLIT SPOON C - CORE T - UNDISTURBED TUBE AUG - AUGER CUTTINGS
PEN - HAND PENETROMETER TOR - TORVANE V - VANE SHEAR

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, N.Y. 12550
845 275-7732 PATTONGEOTECH.COM

CLIENT:	JM Development		
PROJECT:	Newburgh Waterfront		
PROJECT NO.	25311	DATE CORED:	9/4/2025

ROCK CORE LOG

SURFACE ELEV.:	±10.5 feet	TOTAL DEPTH:	50 feet	CORE SIZE:	BORING NO.	**B3**
LOGGED BY:	Warren Patton, Kevin Patton	DATE LOGGED:	10/14/2025	NX (2.0 inch diameter)		**2 pages.**

Depth, ft.	Run No.	% Rec.	RQD	Fractures	Description
0-45	---	---	---	---	Drilled through soil.
45-50	1	90	37	Mostly parallel fractures with dip angles between 44º and 55º. Fracture surfaces nearly smooth, some coated.	Austin Glen Formation, Ordovician age, probably from the Allochthonous Series (thrust-faulted into place.) Medium grey fine greywacke sandstone with layers of dark medium grey siltstone and dark grey to black shale. Finely-laminated, with layers typically 0.1mm to 1.5mm thick. Fine calcite veins are scattered throughout the core, mostly perpendicular or oblique to the bedding. Most of the fractures in the core were parallel to the bedding. The rock was fresh and unweathered and was free from staining. When split longitudinally the rock had medium to medium-high strength across the bedding, but tended to separate easily along the bedding, on parallel thin lamina of shale. 45.0-45.2: Broken into <1″ pieces. Piece of buff fine quartzite (cobble or bedrock,) then grey siltstone. Irregular slickenside surface at top of siltstone. 45.5-45.9: 2″, 4″ pieces. Fractures dip about 44̊. 45.2-45.6: Fine sandstone and thin siltstone layers. 45.6-45.9: Irregular fracture and calcite vein 2-20mm thick, then shale. 45.9-48.0: Interbedded sandstone and siltstone, trace shale. ¼″ to 7″ long pieces. Parallel fractures dip about 55̊. Very thin coating of cohesionless silt on joints (possibly from drilling.) Irregular fracture at 46.8 feet, showing sandstone and shale layering. 48.0-49.1: Pieces 2″-7″ long. Parallel fractures dip about 55̊. No soil on joints. 48.0-48.7: Mostly siltstone, traces sandstone and shale. 48.7-49.1: Interbedded sandstone and siltstone, trace shale. 49.1-49.5: Siltstone layer 3″ thick, then interbedded sandstone and siltstone. Pieces 2″ long. Irregular fractures. Very thin silt coating on joints. 49.5-50.0: Missing.

Photographs are provided on the next page.
% Rec: Percent Recovery, recovered length of core divided by length drilled.
RQD: Rock Quality Designation. The sum of the lengths of unbroken core sections at least four inches in length, divided by the length drilled (percent.)

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CLIENT:	JM Development		
PROJECT:	Newburgh Waterfront		
PROJECT NO.	25311	DATE CORED:	9/4/2025

ROCK CORE LOG

SURFACE ELEV.:	±10.5 feet	TOTAL DEPTH:	50 feet	CORE SIZE:		BORING NO.	**B3**
LOGGED BY:	Warren Patton, Kevin Patton	DATE LOGGED:	10/14/2025	NX (2.0 inch diameter)			**2 pages.**

Photos of the rock core, with the core in a moist condition. Scale in feet and tenths.

TOP: Core from 45 to 46.7 feet.

MIDDLE: Segment from 46.7 to 48.3 feet.

BOTTOM: Segment from 48.3 to 50.0 feet.

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36 PATTON ROAD
NEWBURGH, N.Y. 12550
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CLIENT:	JM Development		
PROJECT:	Newburgh Waterfront		
PROJECT NO.	25311	DATE CORED:	9/9/2025

ROCK CORE LOG

SURFACE ELEV.:	±14.5 feet	TOTAL DEPTH:	43 feet	CORE SIZE:	BORING NO.	**B9**
LOGGED BY:	Warren Patton, Kevin Patton	DATE LOGGED:	10/14/2025	NX (2.0 inch diameter)		**2 Pages.**

Depth, ft.	Run No.	% Rec.	RQD	Fractures	Description
0-33	---	---	---	---	Drilled through soil.
33-38	1	100	78	Both Runs: Fractures were mostly parallel to beds, with some intersecting. Fracture surfaces were hard and mostly irregular, smoother in the shale. Several slickensides, indicating movement on a fracture due to folding or faulting, were observed. Run 1: Fractures typically dip 45-48˚	Austin Glen Formation, Ordovician age, probably from the Allochthonous Series (thrust-faulted into place.) Medium grey fine greywacke sandstone with layers of dark medium grey siltstone and dark grey to black shale. Coarse beds indistinctly laminated, others finely-laminated, with layers typically 0.5 to 1.5mm thick. Fine calcite veins are common throughout the core, mostly perpendicular or oblique to the bedding, and there were several wider veins, both parallel and oblique to the fine veins. Most of the fractures in the core were parallel to the bedding. The rock was fresh and unweathered and was free from staining. When split longitudinally, the thick sandstone beds had high strength; the other layers were had medium to medium-high strength but separated easily on parallel thin lamina of shale. 33.0-34.3: Fine sandstone. Beds indistinct. mostly vertical fractures. Irregular fracture near calcite vein at 33.5. Calcite vein at 34.2. 34.3-34.6: Shale with fine sandstone and siltstone, fractured, slickenside. 34.6-36.2: Very fine sandstone and siltstone. 36.2-37.4: Siltstone and very fine sandstone. Calcite vein ¼” thick at 37.1. 37.4-38.0: Shale with few beds of siltstone and fine sandstone. Broken into 0.5”-2.5” pieces. Irregular fractures.
38-43	2	100	33	Typical dip 45-55˚.	38.0-39.5: Shale with few beds of siltstone and fine sandstone. Broken into 0.5”-2.5” pieces. Irregular fractures, some almost vertical. Soil in joint at 38.4. 39.5-41.1: Breccia of shale fragments in calcite, ½-inch thick, then shale with some siltstone and sandstone, with features of both soft-sediment deformation and hard rock folding-faulting. With some slickensides and calcite veins. Some fractures dip 30˚, increasing to 45-53˚. Slickenside at 40.7. 41.1-42.0: Fine sandstone with traces siltstone and shale. Several intersecting calcite veins, 3mm-10mm wide, plus fine veins. Shale layer 5mm thick at and slickenside at joint at 41.4. 42.0-42.6: Fine sandstone with little siltstone and shale. 42.6-43.0: Siltstone, shale and fine sandstone.

Photographs are provided on the next page. % Rec: Percent Recovery, recovered length of core divided by length drilled.
RQD: Rock Quality Designation. The sum of the lengths of unbroken core sections at least four inches in length, divided by the length drilled (percent.)

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36 PATTON ROAD
NEWBURGH, N.Y. 12550
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CLIENT:	JM Development		
PROJECT:	Newburgh Waterfront		
PROJECT NO.	25311	DATE CORED:	9/9/2025

ROCK CORE LOG

SURFACE ELEV.:	±14.5 feet	TOTAL DEPTH:	43 feet	CORE SIZE:	BORING NO.	**B9**
LOGGED BY:	Warren Patton, Kevin Patton	DATE LOGGED:	10/14/2025	NX (2.0 inch diameter)		**2 Pages.**

Photos of the rock core, with the core in a moist condition. Scale in feet and tenths.

TOP: Core from 33 to 34.5 feet in top row, 38 to 39.5 feet in bottom row.

MIDDLE: Segments from 34.3-36.2 and 39.3-41.2 feet.

BOTTOM: Segments from 35.3-38. And 40.3-43.0 feet.

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
845 275-7732 PATTONGEOTECH.COM

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/12-19/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

MOISTURE CONTENT OF SOIL

TEST METHOD: ASTM D2216

SAMPLE NO.	DEPTH,FT.	% MOISTURE
B1 S1	1	12.6
B1 S2	3	10.3
B1 S3	6	7.1
B1 S4	8	4.5
B1 S5	11	3.5
B1 S6	16	12.2
B1 S7	21	56.7
B1 S8	26	52.8
B1 S9	31	9.4
B2 S1	1	13.6
B2 S2	3	7.2
B2 S3	6	5.2
B2 S4	8	4.7
B2 S5	11	13.1
B2 S6	16	16.7
B2 S7	21	13.8
B3 S1	1	6.3
B3 S2	3	8.9
B3 S3	6	7.1
B3 S4	8	13.6
B3 S5	11	22.0
B3 S6	16	21.0
B3 S7	21	14.5
B3 S8	26	54.0
B3 S10	31	39.4
B3 S11	36	30.6

Moisture content is expressed as a percent of the dry mass of the soil.

Reviewed by: *Kevin Patton*

KEVIN L. PATTON, P.E.

36 PATTON ROAD

NEWBURGH, NY 12550

845 275-7732 PATTONGEOTECH.COM

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/12-19/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

MOISTURE CONTENT OF SOIL

TEST METHOD: ASTM D2216

SAMPLE NO.	DEPTH,FT.	% MOISTURE
B4 S1	1	13.8
B4 S2	3	7.2
B4 S3	6	11.4
B4 S4	8	5.6
B4 S5	11	19.1
B4 S6	16	17.7
B4 S7	21	18.2
B4 S9	31	12.1
B5 S1	1	47.8
B5 S2	3	75.3
B5 S3	6	28.1
B5 S4	8	109.9
B5 S5	11	57.5
B5 S7	16	72.4
B5 S8	21	79.7
B5 S9	26	83.0
B5 S10	31	66.8
B5 S11	36	72.7
B5 S12	41	65.4
B5 S13	46	50.0
B5 S14	51	46.4

Moisture content is expressed as a percent of the dry mass of the soil.

Reviewed by: *Kevin Patton*

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
845 275-7732 PATTONGEOTECH.COM

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/12-19/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

MOISTURE CONTENT OF SOIL

TEST METHOD: ASTM D2216

SAMPLE NO.	DEPTH,FT.	% MOISTURE
B6 S1	1	8.3
B6 S2	3	28.6
B6 S3	6	43.8
B6 S4	8	39.3
B6 S5	11	28.2
B6 S7	21	67.8
B6 S8	26	68.2
B6 S9	31	65.4
B6 S10	36	53.2
B6 S11	41	68.0
B6 S12	46	59.3
B6 S13	51	56.3
B6 S14	56	46.3
B6 S16	66	34.5
B6 S17	71	55.5
B6 S18	76	11.8
B7 S1	1	13.6
B7 S2	3	15.6
B7 S3	6	22.1
B7 S4	8	15.4
B7 S5	11	46.1
B7 S7	21	71.2
B7 S8	26	74.1
B7 S9	31	73.9
B7 S10	36	65.7
B7 S11	41	49.4
B7 S12	46	8.9

Moisture content is expressed as a percent of the dry mass of the soil.

Reviewed by: *Kevin Patton*

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CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/12-19/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

MOISTURE CONTENT OF SOIL

TEST METHOD: ASTM D2216

SAMPLE NO.	DEPTH,FT.	% MOISTURE
B8 S1	1	12.0
B8 S2	3	5.6
B8 S3	6	18.1
B8 S4	8	64.9
B8 S5	11	16.5
B8 S6	16	68.8
B8 S7	21	143.0
B9 S1	1	22.5
B9 S2	3	9.4
B9 S3	6	7.1
B9 S4	8	11.8
B9 S5	11	17.2
B9 S6	16	19.3
B9 S7	21	64.6
B9 S9	31	9.3
B10 S1	1	9.9
B10 S4	3	4.1
B10 S5	11	14.4
B10 S6	16	15.7
B10 S7	21	14.8
B10 S8	26	52.4
B10 S10	36	11.6

Moisture content is expressed as a percent of the dry mass of the soil.

Reviewed by: *Kevin Patton*

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CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/15/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

MOISTURE CONTENT OF SOIL

TEST METHOD: ASTM D2216

SAMPLE NO.	DEPTH,FT.	% MOISTURE
B5 S13	46	63.4
B6 S15	61	48.3
B7 S6	16	68.2
B10 S9	31	41.9

Moisture content is expressed as a percent of the dry mass of the soil.

Reviewed by: *Kevin Patton*

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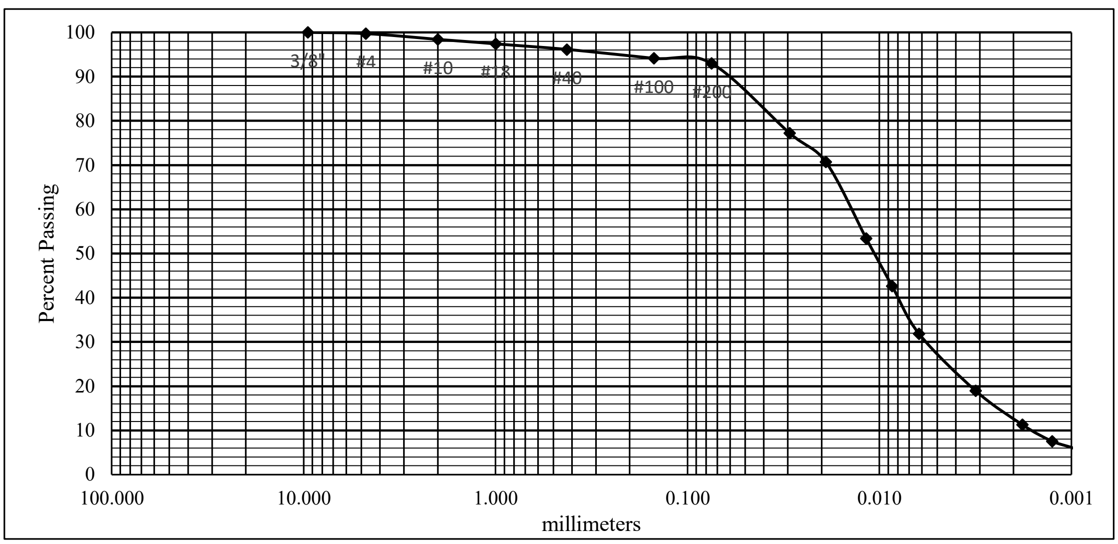
CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/24/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

SIEVE-AND-HYDROMETER ANALYSIS TEST REPORT

TEST METHOD(s): ASTM D422, AASHTO T88

Sample Location	B3-S8
Depth	26 feet

Sieve Size		Percent Retained	Percent Passing	Size Categories	
inches	mm			USCS	USDA
3/8"	9.5	0	100	Gravel, 3" to #4	Gravel, 3" to #10
#4	4.75	0	100		
#10	2.00	2	98	Sand, #4 to #200	
#18	1.00	1	97		Sand, #10 to 0.050mm
#40	0.425	1	96		
#100	0.150	2	94		
#200	0.075	1	93		
Hydrometer Analysis	0.050	6	87	Silt and Clay, pass #200	
	0.020	15	72		Silt, 0.050 to 0.002mm
	0.010	25	47		
	0.005	20	27		
	0.002	14	13		
	0.001	7	6		Clay <0.002



USDA Particle Size Classification:	
Gravel, 3" to 2.00mm	2
Sand, 2.00 to 0.050mm:	11
Silt, 0.050 to 0.002mm:	74
Clay, <0.002mm	13
Total	100

USDA Textural Class: Silt Loam

USCS Classification (ASTM D2487/D2488):
MH, Elastic Silt

Atterberg Limits were determined by: Test

Reviewed by: *Kevin Patton*

Form HYD

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
845 275-7732 PATTONGEOTECH.COM

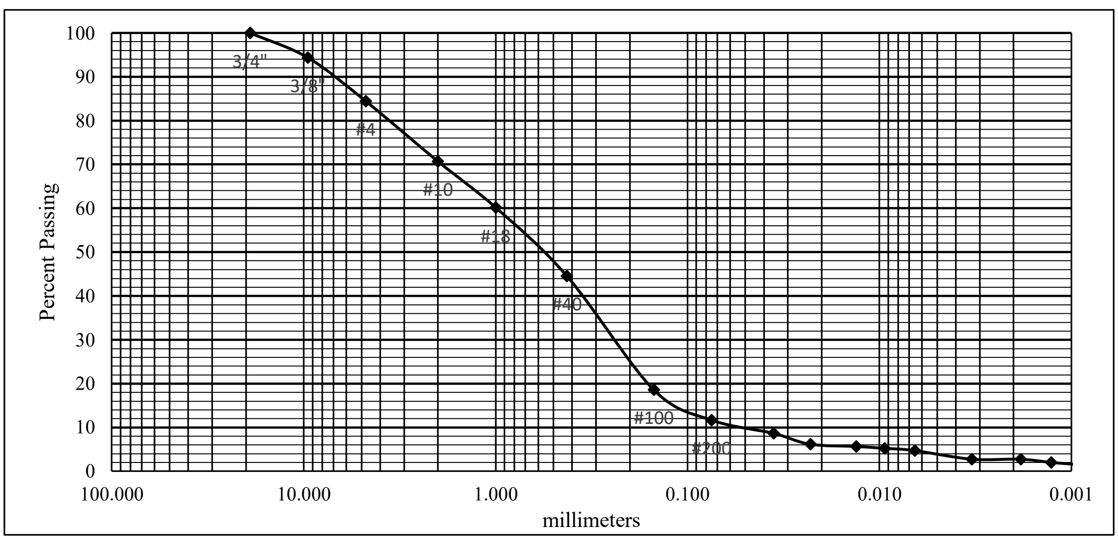
CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/15/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

SIEVE-AND-HYDROMETER ANALYSIS TEST REPORT

TEST METHOD(s): ASTM D422, AASHTO T88

Sample Location	B4-S8
Depth	26 feet

Sieve Size		Percent Retained	Percent Passing	Size Categories	
inches	mm			USCS	USDA
3/4"	19.0	0	100	Gravel, 3" to #4	Gravel, 3" to #10
3/8"	9.5	6	94		
#4	4.75	10	84		
#10	2.00	13	71	Sand, #4 to #200	
#18	1.00	11	60		Sand, #10 to 0.050mm
#40	0.425	15	45		
#100	0.150	26	19		
#200	0.075	7	12		
Hydrometer Analysis	0.050	2	10	Silt and Clay, pass #200	
	0.020	4	6		Silt, 0.050 to 0.002mm
	0.010	1	5		
	0.005	1	4		
	0.002	1	3		
	0.001	1	2		Clay <0.002



USDA Particle Size Classification:	
Gravel, 3" to 2.00mm	29
Sand, 2.00 to 0.050mm:	61
Silt, 0.050 to 0.002mm:	7
Clay, <0.002mm	3
Total	100

USDA Textural Class: Gravelly Loamy Sand

USCS Classification (ASTM D2487/D2488):
SW-SM, Well-graded sand with silt and gravel

Atterberg Limits were determined by: Estimated (ASTM D2488)

Reviewed by: *Kevin Patton*

Form HYD

KEVIN L. PATTON, P.E.

36 PATTON ROAD

NEWBURGH, NY 12550

845 275-7732 PATTONGEOTECH.COM

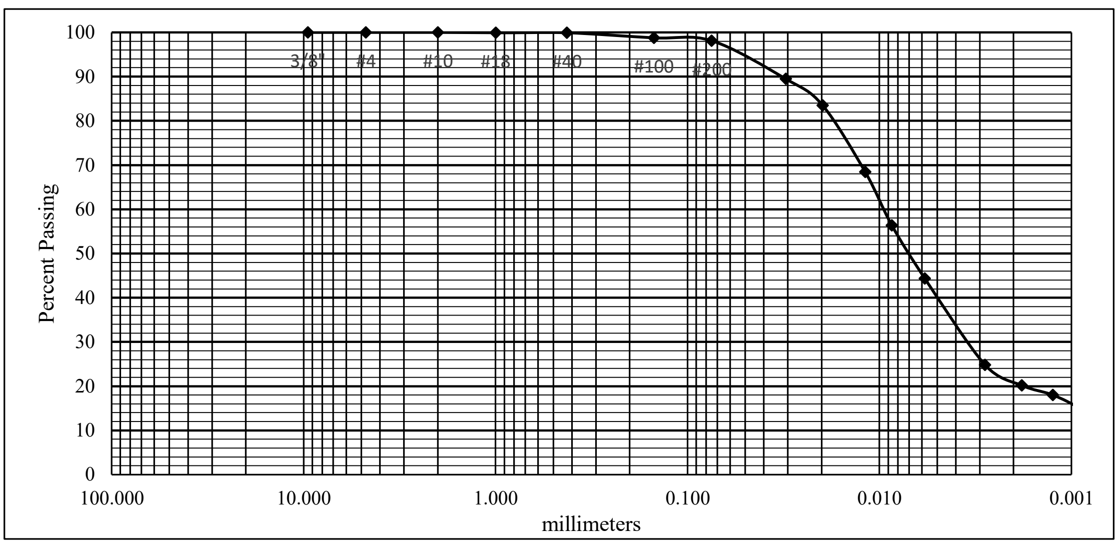
CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/24/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

SIEVE-AND-HYDROMETER ANALYSIS TEST REPORT

TEST METHOD(s): ASTM D422, AASHTO T88

Sample Location	B5-S13
Depth	46 feet

Sieve Size		Percent Retained	Percent Passing	Size Categories	
inches	mm			USCS	USDA
3/8"	9.5	0	100	Gravel, 3" to #4	Gravel, 3" to #10
#4	4.75	0	100		
#10	2.00	0	100	Sand, #4 to #200	
#18	1.00	0	100		Sand, #10 to 0.050mm
#40	0.425	0	100		
#100	0.150	1	99		
#200	0.075	1	98		
Hydrometer Analysis	0.050	2	96	Silt and Clay, pass #200	
	0.020	12	84		Silt, 0.050 to 0.002mm
	0.010	22	62		
	0.005	22	40		
	0.002	19	21		
	0.001	5	16		Clay <0.002



USDA Particle Size Classification:	
Gravel, 3" to 2.00mm	0
Sand, 2.00 to 0.050mm:	4
Silt, 0.050 to 0.002mm:	75
Clay, <0.002mm	21
Total	100

USDA Textural Class: Silt Loam

USCS Classification (ASTM D2487/D2488):

CH, Fat Clay

Atterberg Limits were determined by: Test

Reviewed by: *Kevin Patton*

Form HYD

KEVIN L. PATTON, P.E.

36 PATTON ROAD

NEWBURGH, NY 12550

845 275-7732 PATTONGEOTECH.COM

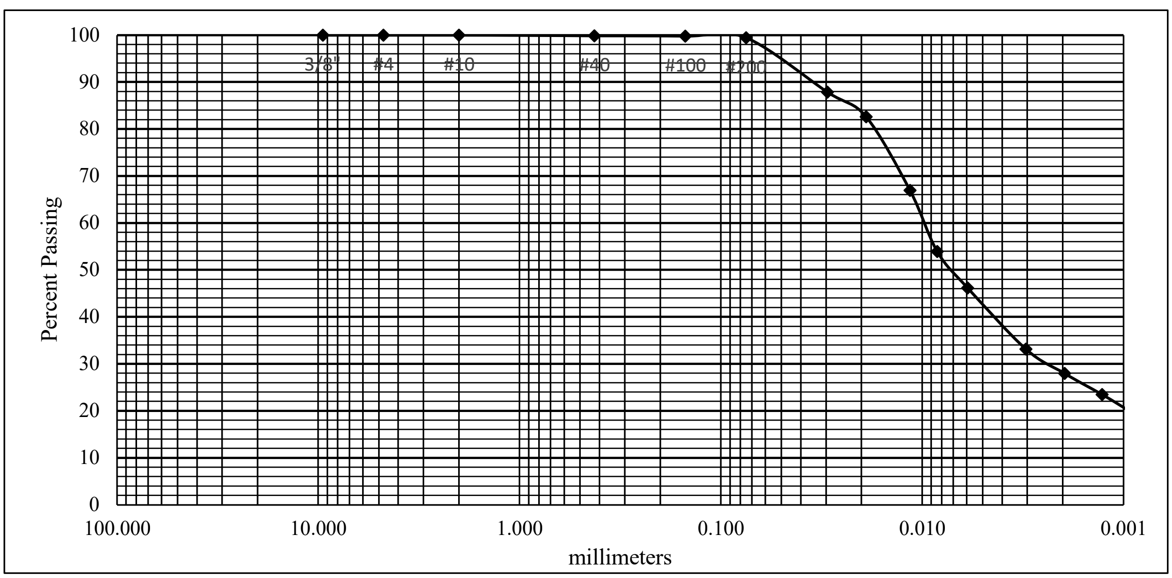
CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/15/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

SIEVE-AND-HYDROMETER ANALYSIS TEST REPORT

TEST METHOD(s): ASTM D422, AASHTO T88

Sample Location	B6-S15
Depth	61 feet

Sieve Size		Percent Retained	Percent Passing	Size Categories	
3/8"	9.5	0	100	Gravel, 3" to #4	Gravel, 3" to #10
#4	4.75	0	100		
#10	2.00	0	100	Sand, #4 to #200	
#40	0.425	0	100		Sand, #10 to 0.050mm
#100	0.150	0	100		
#200	0.075	1	99		
Hydrometer Analysis	0.050	4	95	Silt and Clay, pass #200	
	0.020	11	84		Silt, 0.050 to 0.002mm
	0.010	23	61		
	0.005	18	43		
	0.002	15	28		
	0.001	7	21		Clay <0.002



USDA Particle Size Classification:		
Gravel, 3" to 2.00mm	0	**USDA Textural Class:** Silty Clay Loam
Sand, 2.00 to 0.050mm:	5	**USCS Classification (ASTM D2487/D2488):**
Silt, 0.050 to 0.002mm:	67	CH. Fat Clay
Clay, <0.002mm	28	
Total	100	Atterberg Limits were determined by: Test

Reviewed by: *Kevin Patton*

Form HYD

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
845 275-7732 PATTONGEOTECH.COM

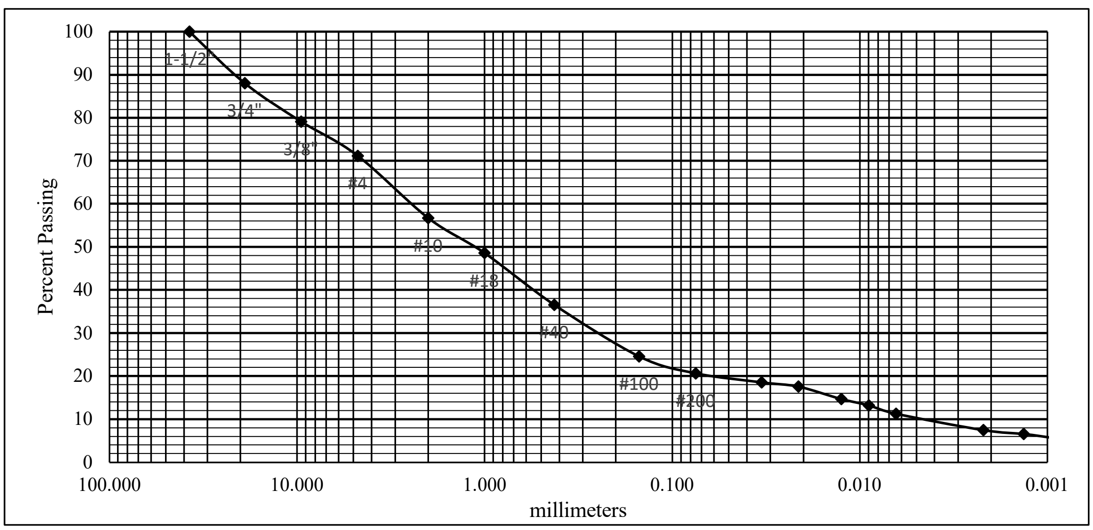
CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/22/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

SIEVE-AND-HYDROMETER ANALYSIS TEST REPORT

TEST METHOD(s): ASTM D422, AASHTO T88

Sample Location	B9-S8
Depth	26 feet

Sieve Size		Percent Retained	Percent Passing	Size Categories	
inches	mm			USCS	USDA
1-1/2"	37.5	0	100	Gravel, 3" to #4	Gravel, 3" to #10
3/4"	19.0	12	88		
3/8"	9.5	9	79		
#4	4.75	8	71		
#10	2.00	14	57	Sand, #4 to #200	
#18	1.00	8	49		Sand, #10 to 0.050mm
#40	0.425	12	37		
#100	0.150	12	25		
#200	0.075	4	21		
Hydrometer Analysis	0.050	1	20	Silt and Clay, pass #200	
	0.020	3	17		Silt, 0.050 to 0.002mm
	0.010	3	14		
	0.005	4	10		
	0.002	3	7		
	0.001	1	6		Clay <0.002



USDA Particle Size Classification:	
Gravel, 3" to 2.00mm	43
Sand, 2.00 to 0.050mm:	37
Silt, 0.050 to 0.002mm:	13
Clay, <0.002mm	7
Total	100

USDA Textural Class: Very Gravelly Sandy Loam

USCS Classification (ASTM D2487/D2488):
SC, Clayey Sand with Gravel

Atterberg Limits were determined by: Estimated (ASTM D2488)

Reviewed by: *Kevin Patton*

Form HYD

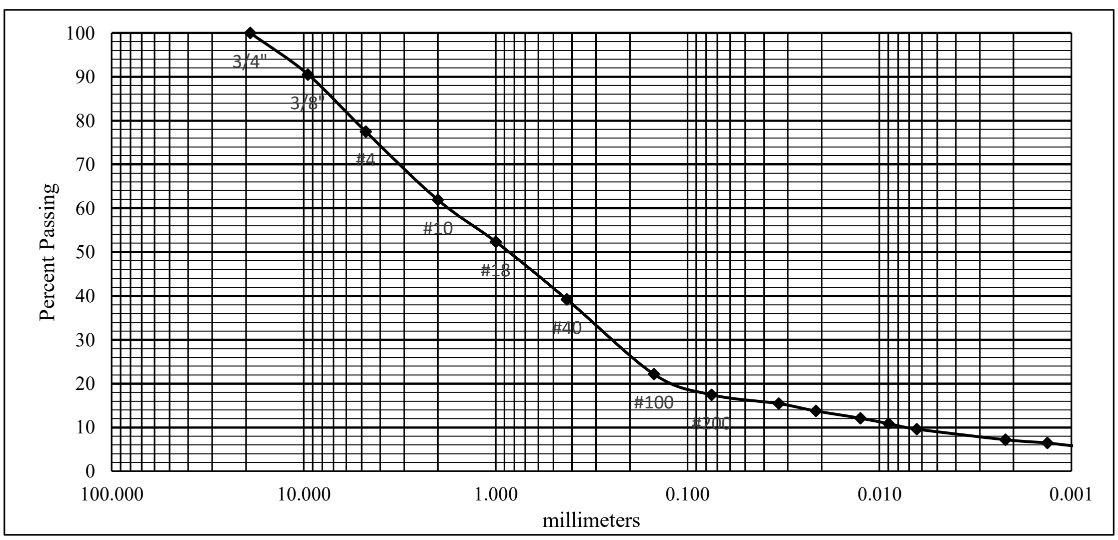
KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
845 275-7732 PATTONGEOTECH.COM

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/24/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

SIEVE-AND-HYDROMETER ANALYSIS TEST REPORT
TEST METHOD(s): ASTM D422, AASHTO T88

Sample Location	B10-S2
Depth	3 feet

Sieve Size		Percent Retained	Percent Passing	Size Categories	
inches	mm			USCS	USDA
3/4"	19.0	0	100	Gravel, 3" to #4	Gravel, 3" to #10
3/8"	9.5	9	91		
#4	4.75	13	78		
#10	2.00	16	62	Sand, #4 to #200	
#18	1.00	10	52		Sand, #10 to 0.050mm
#40	0.425	13	39		
#100	0.150	17	22		
#200	0.075	5	17		
Hydrometer Analysis	0.050	1	16	Silt and Clay, pass #200	
	0.020	2	14		Silt, 0.050 to 0.002mm
	0.010	3	11		
	0.005	2	9		
	0.002	2	7		
	0.001	1	6		Clay <0.002



USDA Particle Size Classification:		**USDA Textural Class:** Very Gravelly Sandy Loam
Gravel, 3" to 2.00mm	38	
Sand, 2.00 to 0.050mm:	46	**USCS Classification (ASTM D2487/D2488):**
Silt, 0.050 to 0.002mm:	9	SM, Silty Sand with Gravel
Clay, <0.002mm	7	
Total	100	Atterberg Limits were determined by: Estimated (ASTM D2488)

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PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/22/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

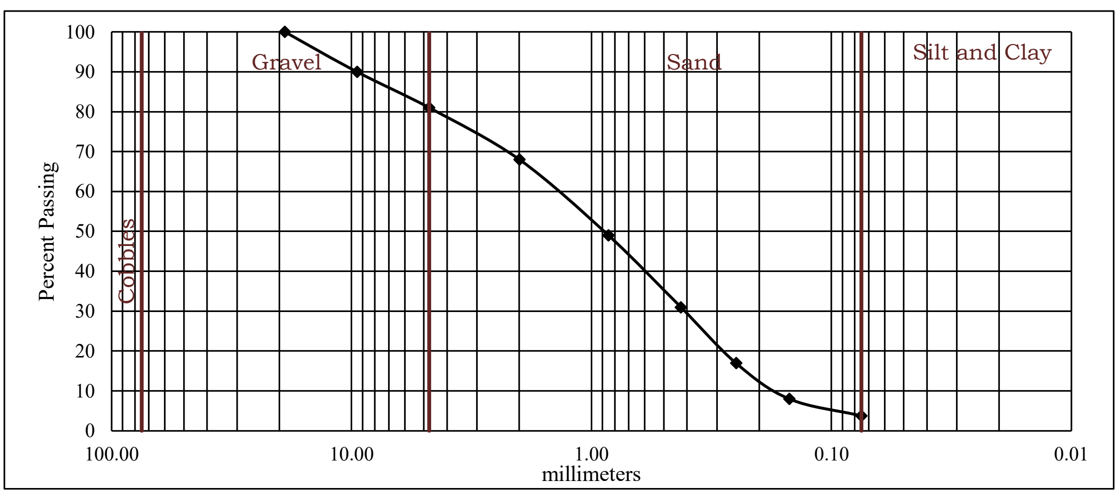
GRADATION ANALYSIS TEST REPORT

TEST METHOD(s): ASTM D422, D1140, AASHTO T311

Sample Location	B10-S4
Depth	8 feet

Sieve Size		Percent Retained	Percent Passing	Specification
inches	mm			
3/4"	19.0	0	100	
3/8"	9.5	10	90	
#4	4.75	9	81	
#10	2.00	13	68	
#20	0.850	19	49	
#40	0.425	18	31	
#60	0.250	14	17	
#100	0.150	9	8	
#200	0.075	4	3.8	
Pan		3.8	---	
Total		100	---	

Percent passing #200 by wash-sieve method.



Particle type size ranges are per USCS Classification.

D60 (millimeters)	1.25	Uniformity Coefficient (Cu)		7.35
D30	0.41	Coefficient of Curvature (Cc)		0.79
D10 (Effective Size)	0.17	USCS Class	SP, Poorly-Graded Sand with Gravel	

Reviewed by: *Kevin Patton*

Form GRW

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36 PATTON ROAD
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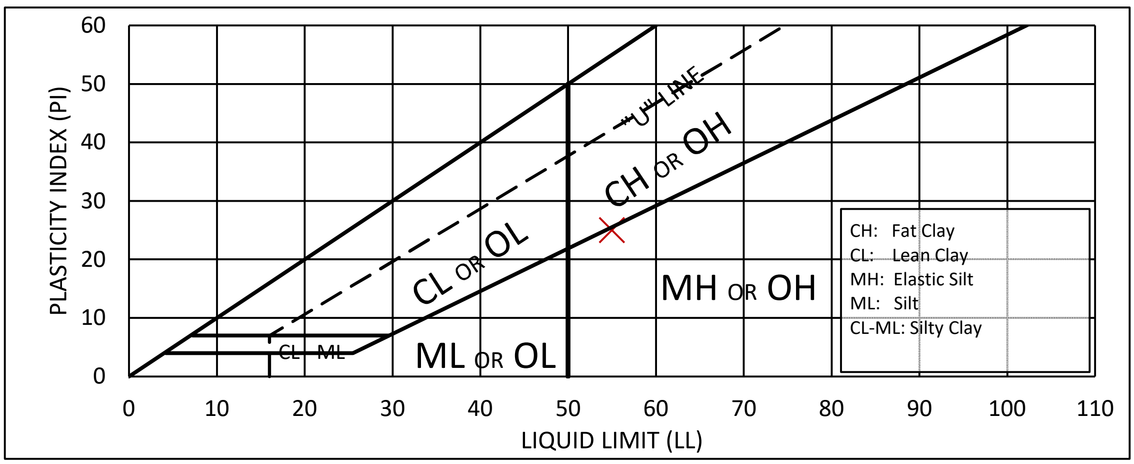
CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/24/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

ATTERBERG LIMITS TEST

TEST METHODS: ASTM D4318/ AASHTO T89, T90

Sample Location	B3-S8
Depth	26 feet
Percent Passing #40	96
Liquid Limit (LL)	**55**
Plastic Limit (PL)	**30**
Plasticity Index (PI)	**25**
USCS Class of -#40	MH, Elastic Silt



LL, PL and PI values are moisture contents, expressed as percents of the dry soil mass.

Test is performed on the 'matrix' fraction of the soil, finer than the #40 (0.425mm) sieve.

The Liquid Limit is the moisture content at which the matrix fraction of the soil changes from a stiff to a flowing consistency. The plastic limit is the moisture content at which it changes from cohesive to crumbly. The Plasticity Index is the Liquid Limit minus the Plastic Limit. Test results plotting to the left of the U line (except non-plastic results) are unusual.

Reviewed by: *Kevin Patton*

Form ABL

KEVIN L. PATTON, P.E.

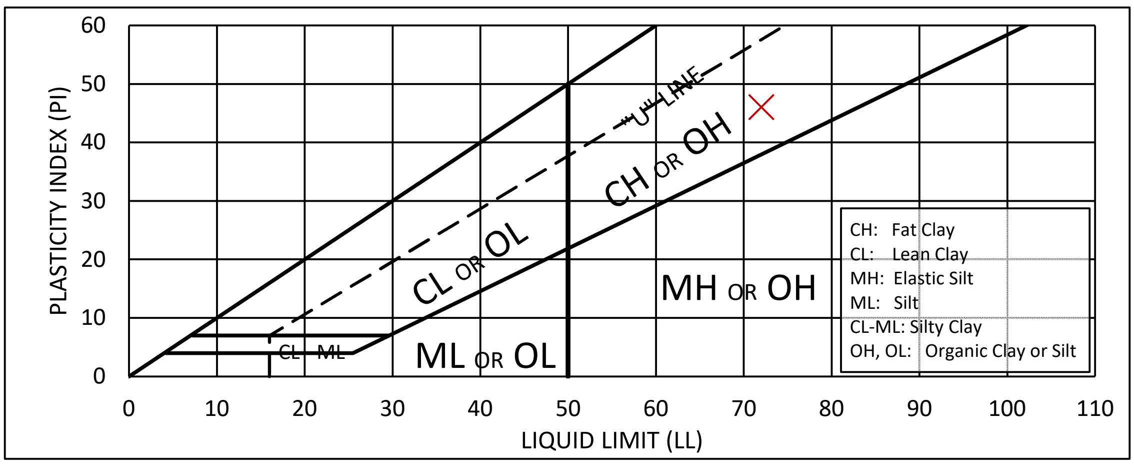
36 PATTON ROAD
NEWBURGH, NY 12550
845 275-7732 PATTONGEOTECH.COM

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/15/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

ATTERBERG LIMITS TEST

TEST METHODS: ASTM D4318/ AASHTO T89, T90

Sample Location	B5-S13
Depth	46 feet
Percent Passing #40	100
Liquid Limit (LL)	**72**
Plastic Limit (PL)	**26**
Plasticity Index (PI)	**46**
USCS Class of -#40	CH, Fat Clay



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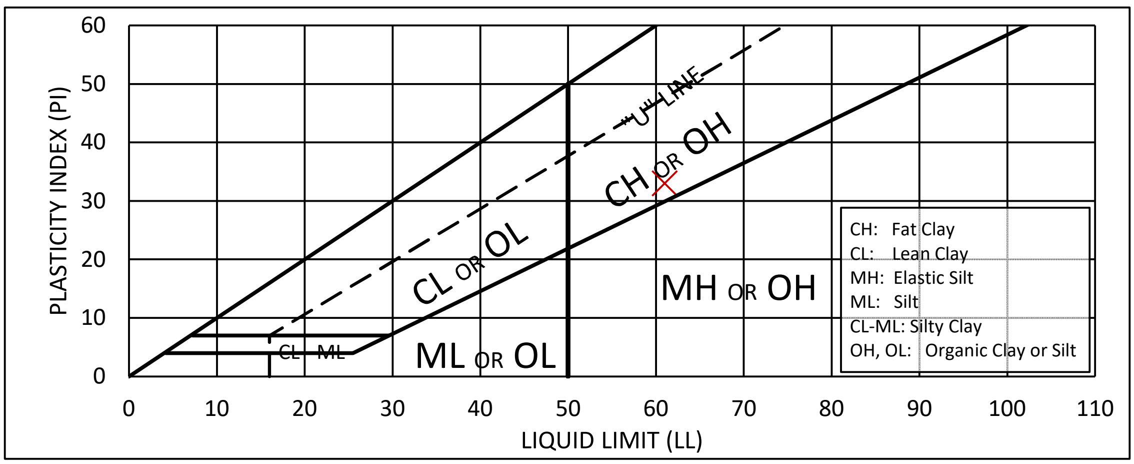
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/15/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

ATTERBERG LIMITS TEST

TEST METHODS: ASTM D4318/ AASHTO T89, T90

Sample Location	B6-S15
Depth	61 feet
Percent Passing #40	100
Liquid Limit (LL)	**61**
Plastic Limit (PL)	**28**
Plasticity Index (PI)	**33**
USCS Class of -#40	CH, Fat Clay



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36 PATTON ROAD

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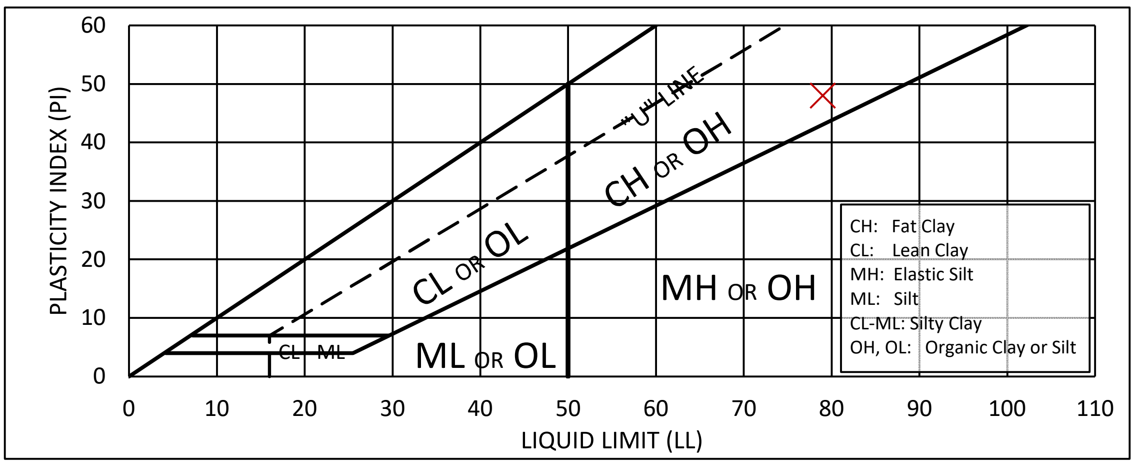
845 275-7732 PATTONGEOTECH.COM

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/22/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

ATTERBERG LIMITS TEST

TEST METHODS: ASTM D4318/ AASHTO T89, T90

Sample Location	B7-S6
Depth	16 feet
Percent Passing #40	±100
Liquid Limit (LL)	**79**
Plastic Limit (PL)	**31**
Plasticity Index (PI)	**48**
USCS Class of -#40	CH, Fat Clay



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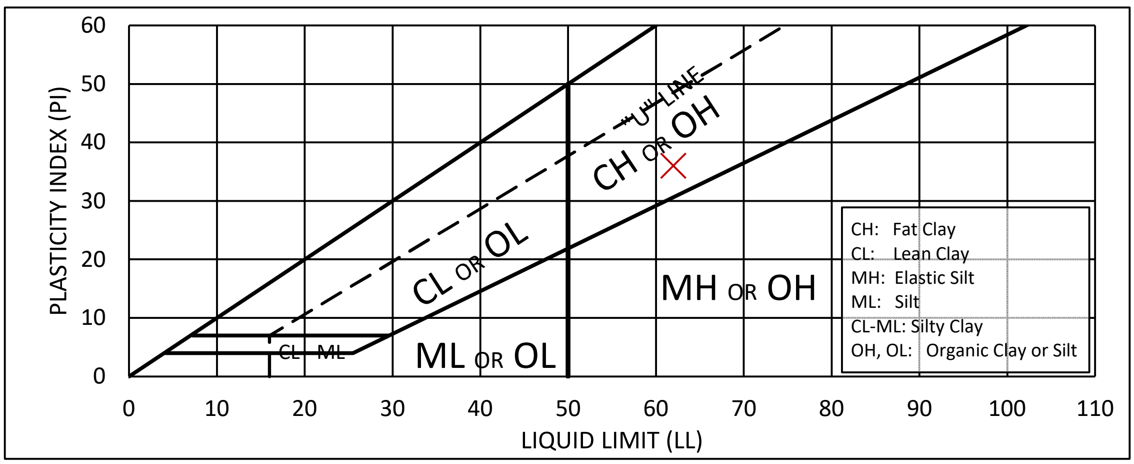
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/22/2025
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

ATTERBERG LIMITS TEST

TEST METHODS: ASTM D4318/ AASHTO T89, T90

Sample Location	B10-S9
Depth	31 feet
Percent Passing #40	±100
Liquid Limit (LL)	**62**
Plastic Limit (PL)	**26**
Plasticity Index (PI)	**36**
USCS Class of -#40	CH, Fat Clay



LL, PL and PI values are moisture contents, expressed as percents of the dry soil mass.

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Form ABL

KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
845 275-7732 kevin@pattongeotech.com

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/12-29/25
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

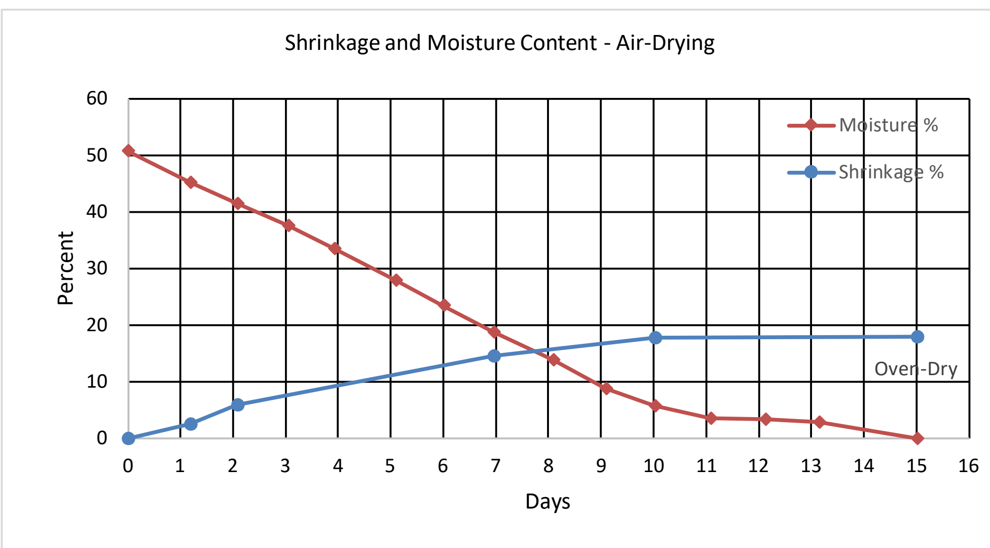
DENSITY AND DRYING SHRINKAGE OF SOIL

Sample No.	B3-S9	Conditions during drying:
Location	31 feet	Air-Drying, 68-71°F, 60-82% Rel. Humidity, except 86% on Day 6 and 92% on Day 12.
Sample Type	Split-spoon	
Moisture Condition	Very Moist	Final oven drying to constant mass at 230°F.

Condition	Moisture Content, % of Dry Weight	Moist Density*, lbs/cu ft	Volumetric Shrinkage, Percent
Initial	50.7	109.0	0.0
Air-Dried, 1 day	45.2	105.0	2.6
Air-Dried, 7 days	18.8	85.9	14.5
Air-Dry, Final	5.8	76.5	17.7
Oven-Dry, 230°F	0.0	72.3	18.0

*Density is calculated using the original sample volume.

Shrinkage Ratings (From Wet Condition to Dry):
Very Low, <3%. Low, 3-9%. Moderate, 9-17%. High, 17-25%. Very High, >25%



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KEVIN L. PATTON, P.E.
36 PATTON ROAD
NEWBURGH, NY 12550
845 275-7732 kevin@pattongeotech.com

CLIENT:	JM Development LLC		
PROJECT:	Newburgh Waterfront Development		
PROJECT No.:	25311	SAMPLE LOT No.:	250910-01
DATE SAMPLED:	9/3-5,8-10/2025	DATE TESTED:	9/17-10/4/25
SAMPLED BY:	Warren Patton	TESTED BY:	Wyeth Patton

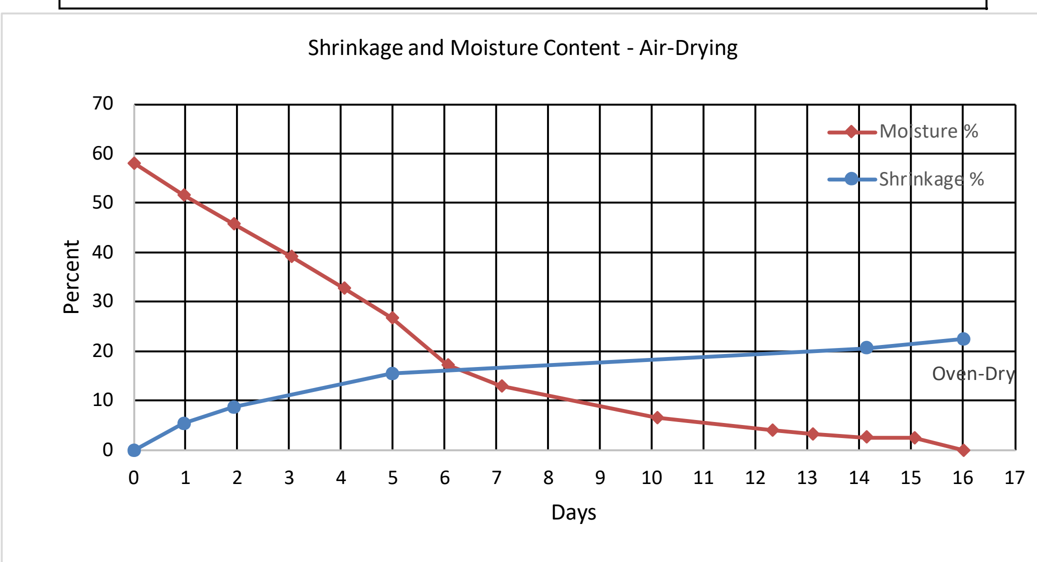
DENSITY AND DRYING SHRINKAGE OF SOIL

Sample No.	B5-S13	Conditions during drying: Air-Drying, 68-71ºF, 59-77% Rel. Humidity, except 86% on Day 2 and 92% on Day 7. Final oven drying to constant mass at 230°F.
Location	46 feet	
Sample Type	Split-spoon	
Moisture Condition	Wet	

Condition	Moisture Content, % of Dry Weight	Moist Density*, lbs/cu ft	Volumetric Shrinkage, Percent
Initial	58.0	105.8	0.0
Air-Dried, 1 day	51.5	101.4	5.4
Air-Dried, 7 days	12.9	75.6	15.5
Air-Dry, Final	3.2	69.1	20.6
Oven-Dry, 230ºF	0.0	66.9	22.5

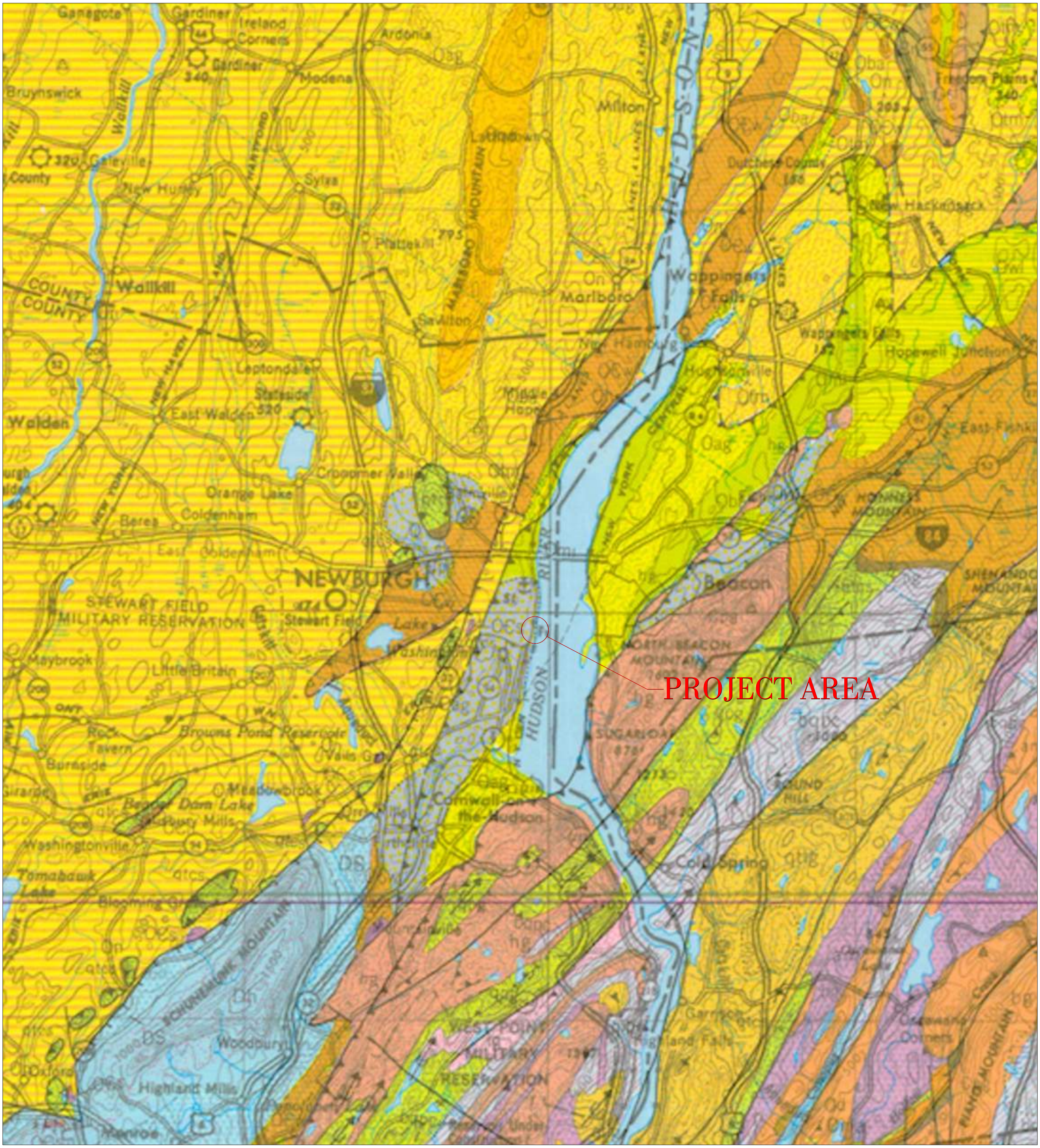
*Density is calculated using the original sample volume.

Shrinkage Ratings (From Wet Condition to Dry):
Very Low, <3%. Low, 3-9%. Moderate, 9-17%. High, 17-25%. Very High, >25%



Reviewed by: *Kevin Patton*

BEDROCK GEOLOGIC MAP



Approximate location of the project site, shown on part of the Bedrock Geologic Map of New York (1970,) which indicates that the local bedrock is concealed by deep soil cover. The bedrock recovered in rock cores from the site appears to be rock from the Ordovician-age Austin Glen formation, composed of medium-gray fine-grained greywacke sandstone and siltstone with little dark gray shale. At this location it is probably allochthonous bedrock, thrust-faulted into place during the Taconic Orogeny. This unit also occurs as autochthonous bedrock, affected by minor faulting and folding, but not significantly displaced from its original stratigraphic position.

BEDROCK GEOLOGIC MAP KEY (PARTIAL)

CENOZOIC — Quaternary

Q — GLACIAL AND ALLUVIAL DEPOSITS
Q Underlying bedrock geology unknown.
Map Unit at Project Site. See below, right.

Lower Devonian

HELDERBERG GROUP
400-500 ft. (120-150 m.)
Dhg — Port Ewen, Alsen, Becraft, New Scotland, Kalkberg, Coeymans, and Manlius Limestones.

UNDIFFERENTIATED LOWER DEVONIAN AND SILURIAN ROCKS
400-1,000 ft. (120-300 m.)
DS — In northern Ulster County: Port Ewen thru Manlius Limestones; Rondout Dolostone; Binnewater Sandstone; High Falls Shale. In Orange County: Kanouse Sandstone; Woodbury Creek Formation—shale, sandstone; Esopus Shale; Connelly Conglomerate; Central Valley Sandstone; New Scotland Limestone thru Rondout Dolostone; Decker Limestone; Poxono Island Formation—shale, dolostone; Longwood Shale; Green Pond Conglomerate.

PALEOZOIC — Upper Silurian

UNDIFFERENTIATED SILURIAN ROCKS I
0-400 ft. (0-120 m.)
Srp — Rondout Formation—dolostone, limestone; Binnewater Sandstone; High Falls Shale; Warwarsing Limestone; Decker Limestone; Bossardville Limestone; Poxono Island Formation—shale, dolostone.

UNDIFFERENTIATED SILURIAN ROCKS II
0-1,800 ft. (0-550 m.)
Sbs — Bloomsburg Formation—shale, sandstone; Guymard Quartzite; Otisville Shale; Shawangunk Conglomerate—sandstone, conglomerate.

Upper Ordovician

CORTLANDT AND SMALLER MAFIC COMPLEXES
(Oban, Od, Ohn, Oh, Oopx, Opx, Ogb)
Oban — Biotite augite norite.
Od — Diorite with hornblende and/or biotite.
Ohn — Hornblende norite; hornblende is poikilitic.
Oh — Hornblendite.
Oopx — Olivine pyroxenite, in part with poikilitic hornblende; local peridotite.
Opx — Pyroxenite.
Ogb — Rock complex ranging in composition from gabbro or norite to hornblende diorite, with minor pyroxenite; Croton Falls and Peach Lake complexes in New York, and Mt. Prospect Complex in Connecticut.

Middle Ordovician

TRENTON GROUP AND METAMORPHIC EQUIVALENTS
up to 8,000 ft. (2400 m.)
(Oqu, Oag, On, Owl, Oma + ?Om, Otm, Obs, OЄs)
Oqu — Quassaic Quartzite — quartzite, sandstone, conglomerate.
Oag — Austin Glen Formation—graywacke, shale.
On — Normanskill Formation—shale, argillite, siltstone.
Owl — Walloomsac Formation—phyllite, schist, metagraywacke.
?Om — Manhattan Formation, undivided — pelitic schists, amphibolite; Units ?Omb, ?Omc, and ?Omd may be Cambrian eugeosynclinal rocks thrust upon Oma; ?Omd — sillimanite - garnet - muscovite - biotite - plagioclase - quartz gneiss; ?Omc — sillimanite - garnet - muscovite - biotite - quartz - plagioclase schistose gneiss, sillimanite nodules, local quartz - rich layers; ?Omb — discontinuous unit of amphibolite and ?Omc - type schist; Oma — sillimanite - garnet - muscovite - biotite - quartz - plagioclase schists; calcite marble and calcsilicate rock at base.
Oba — Balmville Limestone.
Otm — Taconic Mélange—chaotic mixture of Early Cambrian thru Middle Ordovician pebble—to block-size clasts in a pelitic matrix of Middle Ordovician (Barneveld) age. Rims and floors earlier submarine gravity slides of Taconian Orogeny.
OЄs — Cambrian thru Middle Ordovician (Barneveld) carbonate rocks occurring as slivers along thrusts of later allochthones, or carbonate blocks in Taconic Mélange.

Lower Ordovician

LOWER ORDOVICIAN INTRUSIVE
?Os — Serpentinite.

Map symbols

Observed or approximately located contact. In Proterozoic terranes, direction of dip of bedding and/or foliation indicated by triangle.

Conjectural contact; includes projections beneath extensive Quaternary cover and many contacts based on reconnaissance mapping.

Hypothetical contact; projection across unmapped area.

Fault; where known to be a normal fault, hachures on relatively downthrown side.

Thrust or reverse fault, saw teeth on overthrust block.

Shear zone or topographic lineament. Where mapped in detail, such lineaments are commonly found to be high angle faults with associated fault breccia.

Contact, nature uncertain, the easternmost being possible root zone of Taconian nappes and the others probable Taconian thrusts.

Antiform, showing direction of plunge (in Proterozoic terranes only).

Synform, showing direction of plunge (in Proterozoic terranes only).

Direction of plunge of fold axis or other linear element (in Proterozoic terranes only)

Boundary between areas having bedrock outcrops and areas of extensive Quaternary cover.

almandine
Isograd, dashed where inferred.

PALEOZOIC — Lower Ordovician / Cambrian

WAPPINGER AND STOCKBRIDGE GROUPS, POUGHQUAG QUARTZITE, AND METAMORPHIC EQUIVALENTS
up to 4,000 ft. (1200 m.)
(Ow, Єw, Єs, ЄPg, Єc, OЄw, OЄst, OЄi, OЄs)
Ow — Copake Formation—limestone, dolostone, siltstone; Rochdale Formation—limestone, dolostone; Halcyon Lake Dolostone — locally cherty.
OЄw — Wappinger Group (including Fishkill limestone and dolostone): Copake Formation ?—limestone, dolostone, Rochdale Formation—limestone, dolostone; Halcyon Lake Dolostone—locally cherty; Briarcliff Dolostone; Pine Plains Formation—dolostone, shale, oolite; Stissing Formation—dolostone, shale.
OЄst — Stockbridge Marble.
OЄi — Inwood Marble—dolomite marble, calc-schist, granulite, and quartzite, overlain by calcite marble; grades into underlying patchy Lowerre Quartzite of Early Cambrian age.
OЄs — Slivers, as OЄs above.
Єw — Briarcliff Dolostone—locally cherty; Pine Plains Formation—dolostone, shale, oolite.
Єs — Stissing Formation—dolostone, shale
ЄPg — Poughquag Quartzite (includes local Dalton Formation at base)—locally conglomeratic.
Єc — Cheshire Quartzite.

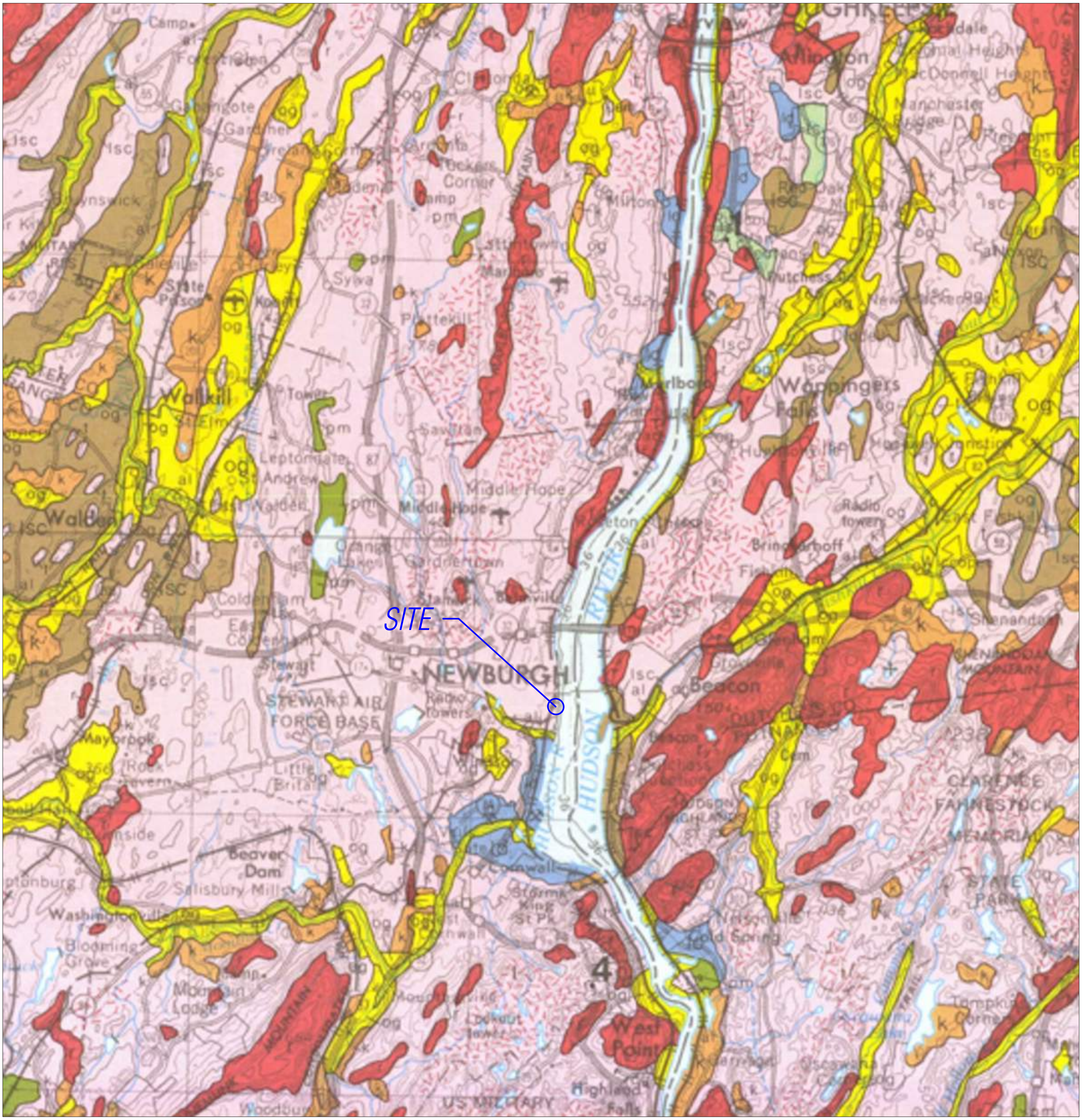
Ordovician / Cambrian

EUGEOSYNCLINAL (ALLOCHTHONOUS) SEQUENCE
up to 4,000 ? ft. (1200 m.)
(Oag, Omi, Osf, Єg, OЄe, ?Єn, ?Єev, ?Om d—b + ?Om, ?Ob, ?Ohr, ?Oht)
?Om — See ?Om above.
?Ob — Bedford Gneiss—biotite-quartz-plagioclase gneiss and interlayered amphibolite; in part with augen of andesine and microcline.
?Ohr — Harrison Gneiss in New York and Connecticut, Brookfield diorite gneiss in Connecticut, and Ravenswood Gneiss in Brooklyn—biotite-hornblende-quartz-plagioclase gneiss with accessory garnet and sphene; plagioclase commonly occurs as augen.
?Oht — Hartland Formation— basal amphibolite overlain by pelitic schists.
Probable Bedrock Type: Oag — Austin Glen Formation—graywacke, shale.
Omi — Mount Merino and Indian River Formations—shale, argillite, chert.
Osf — Stuyvesant Falls Formation—shale, siltstone.
OЄe — Elizaville Formation—shale, argillite, quartzite.
Єg — Germantown Formation—shale, limestone, conglomerate.
?Єn — Nassau Formation—shale, quartzite.
?Єev — Everett Schist—locally with minor meta-graywacke lenses.

Precambrian

qtcs — Garnet-biotite-quartz-feldspar gneiss, quartzite, quartz-feldspar gneiss, calcsilicate rock.
qtlg — Garnet-bearing gneiss and interlayered quartzite; contains varying amounts of biotite, garnet, sillimanite; minor marble, amphibolite, rusty paragneiss.
rg — Rusty and gray biotite-quartz-feldspar gneisses; rusty facies contains variable amounts of garnet, sillimanite, cordierite, graphite, sulfides; minor marble and calcsilicate rock.
hg — Hornblende granite and granitic gneiss, with subordinate leucogranite
lg — Leucogranitic gneiss.
qpg — Quartz plagioclase gneiss; may contain pyroxenes, hornblende, biotite; locally interlayered with amphibolite; subordinate biotite mesoperthite gneiss.

SURFICIAL GEOLOGIC MAP



Approximate location of the project site, shown on a partial copy of the Surficial Geologic Map of New York (N.Y. State Museum, 1989.) The map indicates that the soils at and near the site are predominately glacial till, shown in pink with the symbol 't'. Immediately to the south, alluvial deposits are indicated in yellow-green along the Quassaic Creek, and the blue-shaded area beyond that indicates a delta of glacial outwash deposited mostly by the Moodna Creek. On the opposite side of the river, deposits of lacustrine silt and clay are indicated aaround Denning's Point, extending south to Breakneck Mountain.

EXPLANATION

al – Recent deposits
Generally confined to floodplains within a valley,
oxidized, non-calcareous, fine sand to gravel,
in larger valleys may be overlain by silt,
subject to frequent flooding, thickness 1-10 meters.

alf – Alluvial fan
Generally confined to floodplains within a valley,
oxidized, non-calcareous, fine sand to gravel,
in larger valleys may be overlain by silt,
subject to frequent flooding, thickness 1-10 meters.

b – Beach
Sand and gravel deposit at marine shoreline,
thickness variable

bi – Barrier Island
Sand and gravel deposit as barrier island,
south shore of Long Island,
may have associated dunes,
thickness variable.

pm – Swamp deposits
Peat-muck, organic silt and sand in poorly drained areas,
un-oxidized,
may be overlying marl and lake silts,
potential land instability,
thickness generally 2-20 meters.

Ld – Lacastrine delta
Coarse to fine gravel and sand,
stratified, generally well sorted,
deposited at a lake shoreline,
thickness variable (up to 100 meters)

lsc – Lacustrine silt and clay
Generally laminated silt and clay,
deposited in proglacial lakes,
generally calcareous,
potential land instability,
thickness variable (up to 100 meters)

ls – Lacustrine sand
Sand deposits associated with large bodies of water,
generally a near-shore deposit or near a sand source,
well sorted, stratified,
generally quartz sand,
thickness variable (2-20 meters)

og – Outwash sand and gravel
Coarse to fine gravel with sand,
proglacial fluvial deposition,
well rounded and stratified,
generally finer texture away from ice border,
thickness variable (2-20 meters)

fg – Fluvial sand and gravel
Deposits of sand and gravel,
occasional laterally continuous lenses of silt,
deposition farther from glacier,
age uncertain.

k – Kame deposits
Includes kames, eskers, kame terraces, kame deltas,
coarse to fine gravel and/or sand,
deposition adjacent to ice,
lateral variability in sorting, coarseness and thickness,
locally firmly cemented with calcareous cement,
thickness variable (10-30 meters)

km – Kame moraine
Variable texture (size and sorting) from boulders to sand,
deposition at an ice margin during deglaciation,
positive constructional relief,
locally cemented with calcareous cement,
thickness variable (10-30 meters).

tm – Till moraine
More variable sorted than till,
generally more permeable than till,
deposition adjacent to ice,
more variably drained,
may include ablation till,
thickness variable (10-30 meters).

t - Till
Variable texture (e.g. clay, silt-clay, boulder clay),
usually poorly sorted diamict,
deposition beneath glacier ice,
relatively impermeable (loamy matrix),
variable clast content – ranging from abundant well-rounded
diverse lithologies in valley tills to relatively
angular, more limited lithologies in upland tills,
tends to be sandy in areas underlain by gneiss or sandstone,
potential land instability on steep slopes,
thickness variable (1-50 meters).

af – Artificial fill

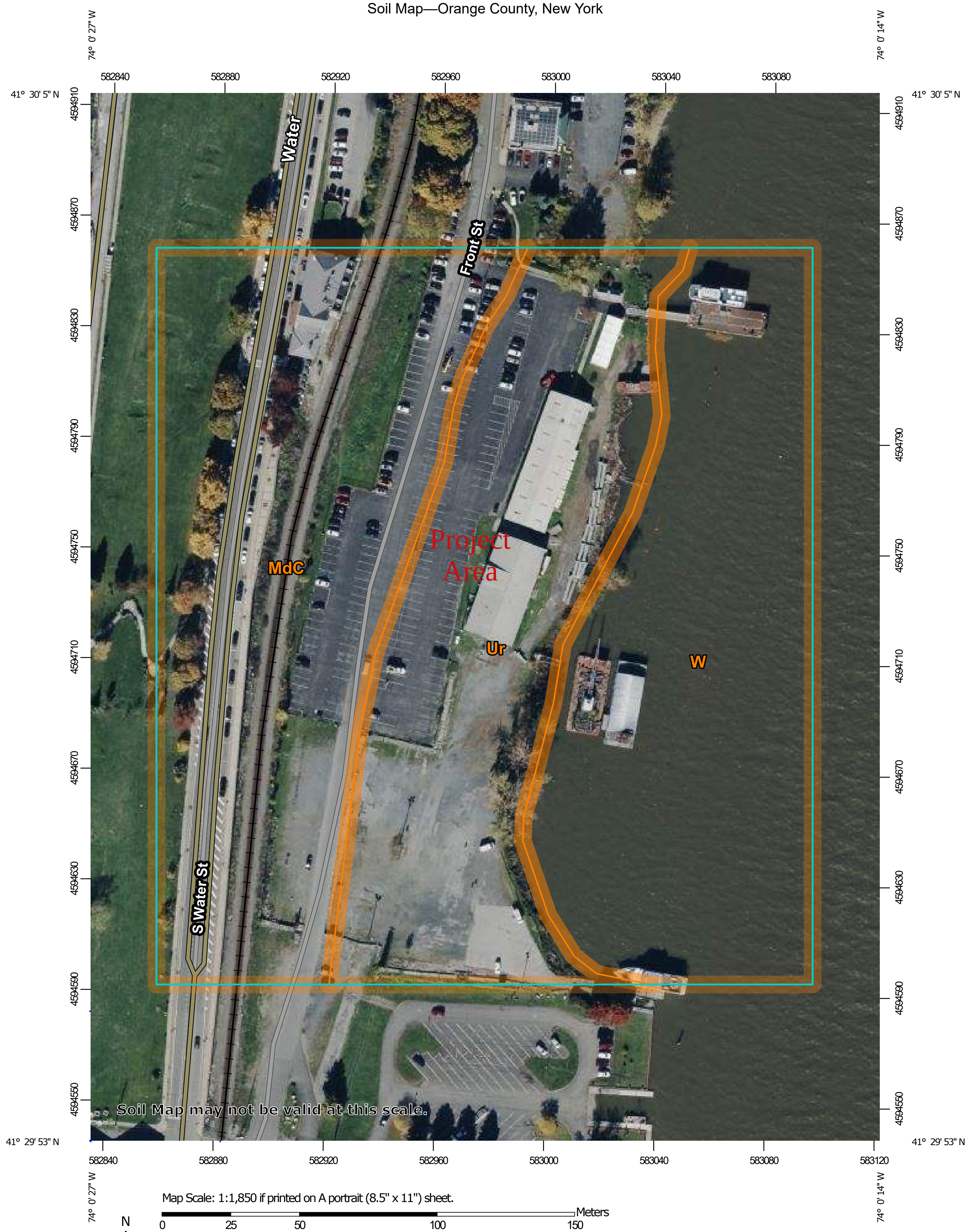
r – Bedrock
Exposed or generally within 1 meter of surface.

Bedrock stipple overprint
Bedrock may be within 1-3 meters of surface,
may sporadically crop out,
variable mantle of rock debris and glacial till.

MAP SYMBOLS

Contact

.3 Dated radiocarbon locality



Map Scale: 1:1,850 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 25, 50, 100, 150

Feet: 0, 50, 100, 200, 300

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

Soil Map—Orange County, New York

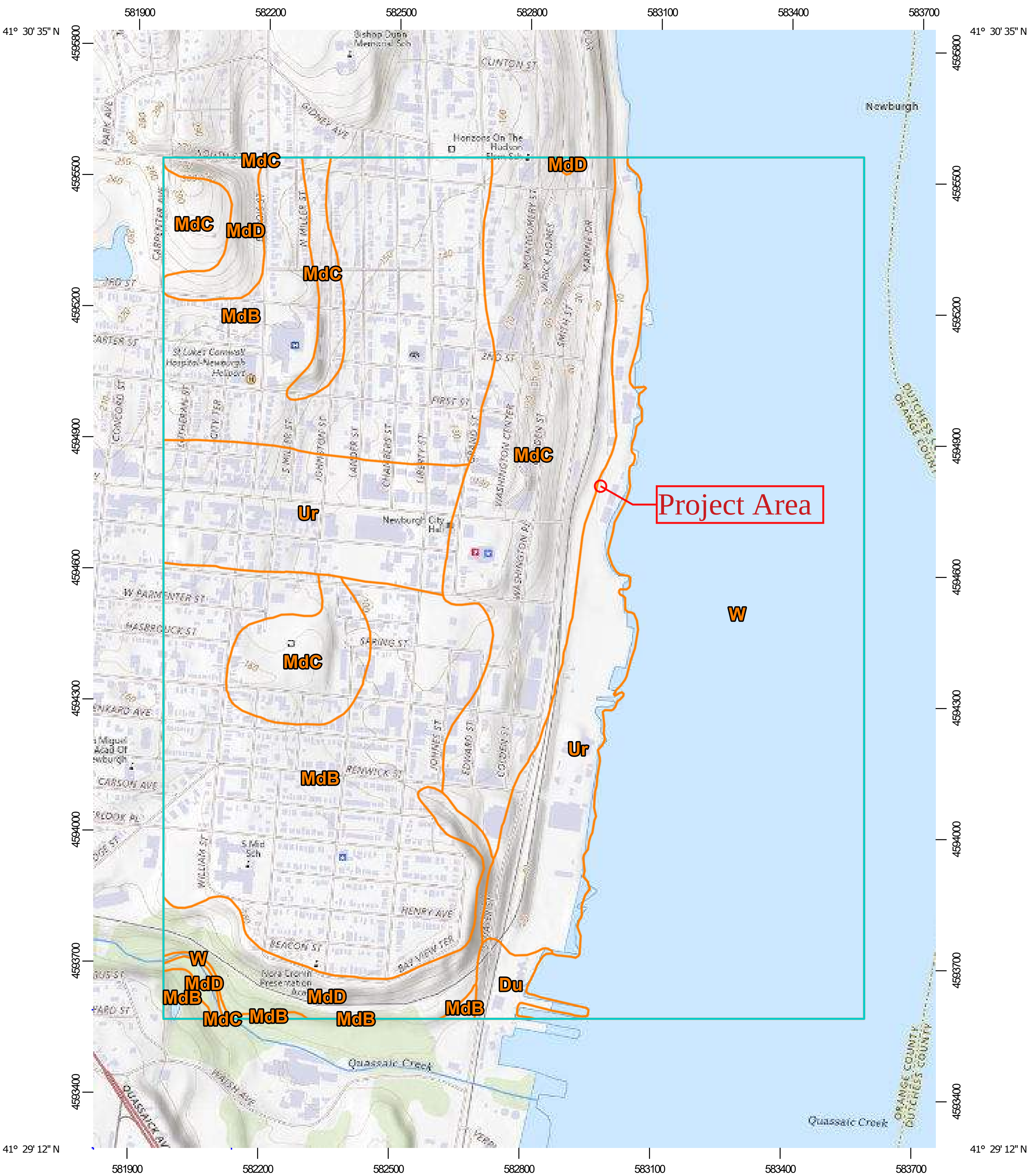
Map Scale: 1:12,500 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 150, 300, 600, 900

Feet: 0, 500, 1000, 2000, 3000

N

Map projection: Web Mercator   Corner coordinates: WGS84   Edge tics: UTM Zone 18N WGS84



Map Scale: 1:12,500 if printed on A portrait (8.5" x 11") sheet.

Meters	0	150	300	600	900
Feet	0	500	1000	2000	3000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Background

- Topographic Map

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

Soil Survey Area: Orange County, New York
Survey Area Data: Version 26, Sep 2, 2025

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Du	Dumps	5.8	0.7%
MdB	Mardin gravelly silt loam, 3 to 8 percent slopes	228.8	29.1%
MdC	Mardin gravelly silt loam, 8 to 15 percent slopes	132.4	16.8%
MdD	Mardin gravelly silt loam, 15 to 25 percent slopes	38.6	4.9%
Ur	Urban land	99.5	12.6%
W	Water	281.6	35.8%
Totals for Area of Interest		**786.7**	**100.0%**

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

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

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

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

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

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Report—Engineering Properties

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties–Orange County, New York															
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
MdC—Mardin gravelly silt loam, 8 to 15 percent slopes														
Mardin	85	D	0-8	Channery silt loam, silt loam, gravelly silt loam, channery loam	GC-GM, MH, ML	A-2-4, A-4, A-7-5	0- 0- 3	0- 4- 19	43-70-90	41-68-90	33-62-89	28-54-82	27-35-56	6-9 -16
			8-15	Flaggy silt loam, silt loam, channery loam, gravelly silt loam, loam, gravelly loam, channery silt loam	GC-GM, CL	A-2-4, A-4, A-6	0- 0- 3	0- 4- 18	44-71-91	41-69-90	34-61-88	28-54-81	22-27-38	6-9 -15
			15-20	Gravelly silt loam, loam, gravelly loam, channery silt loam, channery loam, silt loam	CL-ML, CL, GM	A-2-4, A-4, A-6	0- 0- 3	0- 4- 18	46-72-91	43-71-91	34-63-88	26-51-77	17-23-32	2-7 -12
			20-72	Very flaggy loam, very channery loam, channery silt loam, gravelly loam, very channery silt loam, channery loam, gravelly silt loam, very flaggy silt loam	CL, GM	A-1-b, A-6	0- 3- 17	3- 6- 40	33-74-82	30-73-81	23-63-80	18-55-73	16-28-35	2-12-17
Ur—Urban land														
Urban land	75		0-6	Variable	—	—	0- 0- 0	0- 0- 0	—	—	—	—	—	—

Data Source Information

Soil Survey Area: Orange County, New York
Survey Area Data: Version 26, Sep 2, 2025