BARRON & ASSOCIATES, P.C.

Geotechnical Consulting and Special Inspections

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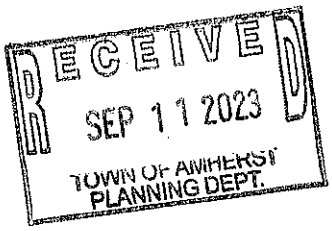
Clarence, NY 14031

(716) 759-7821
www.barronandassociatespc.com

August 31, 2023

Job No: 23-568

Mr. Joseph Rubino
5462 Sheridan Drive, Suite 1
Williamsville, New York 14221



RE: Preliminary Geotechnical Engineering Report
Proposed Parcel Rezoning 420 NEW ROAD
Autumn Meadows Lane (90 ft. Lot and 150 ft. Lot)
Town of Amherst, Erie Co., New York 14051

Mr. Rubino:

This Barron & Associates, P.C. - Buffalo Drilling Company, Inc. (B&A-BDC) letter report presents the findings of the subsurface investigation program and the geotechnical engineering recommendations for the above referenced project. The geographic orientation of the site is illustrated on the U.S. Geologic Survey (USGS) site location map in Figure No. 1. The project site is illustrated in Figure No. 2 and entitled "Test Boring Location Plan". The test boring logs are shown in Appendix A. Refer to Appendix B entitled, "Geotechnical Reference Standards", for an explanation of the terminology that is used for soil and rock descriptions.

SITE AND SUBSURFACE CONDITIONS

SITE CONDITIONS: The proposed project site is currently addressed as 420 New Road in the Town of Amherst, New York and will involve subdividing this parcel into three. The two new parcels will be single-family residential lots, one with 95 of feet frontage and one with 150 feet of frontage along Autumn Meadows Lane. The site topography is generally flat with ground surface elevations between test boring locations varying by less than one foot.

PREDOMINATE SUBSURFACE CONDITIONS: A synopsis of the subsurface fill, soil, bedrock and groundwater conditions is as follows:

- Topsoil: A three-inch-thick layer of topsoil exists at each boring location.
- Random Fill Materials: No random fill materials were encountered during subsurface exploration.
- Organic Materials: No buried topsoil or peat layers were encountered within the natural soil layers. Organic materials are unacceptable for foundation and load bearing purposes.
- Naturally Deposited Soils: The natural soil deposits in this area of the Town of Amherst are predominately composed of lacustrine silty clay that mantles cohesive or granular glacial till. Beneath the topsoil, lacustrine silty clay exists and extends approximately 22 feet below existing ground surface. This moderately plastic soil ranges from moist and stiff to hard within the upper portions of the unit to soft and wet below a depth of eight to 10 feet. Beneath the lacustrine silty clay, cohesive glacial till soils where encountered and extend the remaining depth drilled. The retrieved till samples are noted to be very stiff to hard and moist. Based on regional geology the till soils transition to auger refusal approximately 45 to 50 feet below ground surface.
- Bedrock: Auger refusal, generally inferred to be the top of competent bedrock, was not encountered during subsurface exploration of the site. Based upon our experience and knowledge of regional geology bedrock beneath the site is expected to be the Camillus Shale Formation.

- Groundwater Measurements: At the completion of drilling, groundwater was not encountered. The static groundwater level is believed to be below the assumed bearing elevations and no other severe groundwater condition was encountered during the subsurface exploration.

SEISMIC/EARTHQUAKE CONSIDERATIONS: For the given site conditions, the most applicable site definition is Site Class E which corresponds to Seismic Design Category B, for residential construction (Seismic Risk Category II). The design spectral response acceleration parameters S_{DS}, at 0.2 seconds, and S_{D1}, at one second, are 0.28g and 0.13g (g = 32.2 feet/sec^2), respectively.

FOUNDATION AND CONSTRUCTION RECOMMENDATIONS

BUILDING(S): Proposed development of the site is to include rezoning of the existing parcel and the construction of two, single-family residential lots. Top of finish first floor elevations and maximum design loads are not known at the time of this preliminary report.

FOOTINGS: For adequate frost protection, foundation excavations must extend at least 42 inches below finished exterior grade, or as required by local code. All excavation efforts should be monitored by experienced construction personnel. Bearing surfaces that are soft or in any manner unacceptable, must be undercut to a stable grade. All undercut areas beneath proposed shallow foundations must extend laterally beyond each vertically projected edge of the foundation by a minimum distance equal to one-half the total depth of the undercut or equating to a slope of two vertical to one horizontal. Undercuts shall be backfilled with granular fill that is placed in loose lifts not exceeding 12 inches deep and compacted to a minimum 95 percent of maximum dry density as determined by ASTM D1557. All footings for proposed buildings are recommended to be designed at/near the same contact pressure.

The footings should bear directly on the approved very stiff or better natural inorganic silty clay or on a thoroughly compacted (i.e., 95 percent minimum of ASTM D1557 maximum dry density) select/approved granular fill or other approved fill (i.e., fill used for a raised subgrade) section that extends to the approved stiff or better natural inorganic soil. Refer to Appendix C entitled "Engineering Computations, Schematics, and Profile", for additional details and notes on foundation bearing depth and capacity.

The maximum net allowable bearing capacity for continuous strip and spread footings is preliminarily recommended not to exceed 1,500 pounds per square foot (psf) of footing area on approved natural soils or compacted select granular fill. Total and differential settlements of less than one inch and three-fourths of an inch, respectively, may be expected.

BACKFILL MATERIALS: Imported granular fill material may be used for foundation backfill material in accordance with the provisions stipulated in the RCNYS. On-site excavated soils may also be considered for placement as wall backfill and for raising site grades, providing that the following conditions are met:

- Upper silty and clay lacustrine soils are estimated to have an Expansion Index ranging between 10 and 20 (1-2%) with a low to medium swell potential. Properly conditioned on-site soils should be acceptable for placement as wall backfill above the perimeter drainage material. In accordance with the RCNYS, however, additional laboratory testing may be required at the discretion of the Code Enforcement Officer, to quantify the Expansion Index of on-site clay backfill materials.

- Based on experience with similar soils, excavated materials are expected to be near or slightly wet of optimum moisture content needed to achieve satisfactory compaction. If excavated soils become wet (i.e. during stockpiling), some drying efforts may be necessary for soils to be reused as compacted structural fill.

- If the excavated materials are substantially contaminated with organic or other deleterious matter, cannot be properly moisture conditioned, or are in a wet to saturated state, these materials are only acceptable for use in green or non-structural areas.

FLOOR SLABS: Prior to fill placement, the exposed subgrade surface would be thoroughly compacted and proofrolled. Typically, any encountered soft/medium stiff soils/fills would be removed for subsequent replacement with a select or approved compacted (i.e., minimum 92 percent of the maximum dry density from ASTM D1557) granular fill. If suitable for reuse on-site, the in-place or excavated existing fills/natural soft/medium stiff soils would be conditioned (i.e., sorted, dried, blended) and thoroughly compacted. Where required to raise the subgrade, an approved soil/fill will be placed and thoroughly compacted in thin lifts.

A geotextile fabric that separates the subgrade or raised subgrade and the select granular base layer is recommended. The use of a thin gravel cushion, as a capillary break, or a thin sand cushion over a vapor barrier that is placed beneath the concrete slabs are at the discretion of the design architect/engineer or as required by local code.

Above the approved subgrade, a minimum six-inch thick select granular fill (i.e., number two crusher run stone or equal) layer is preliminarily recommended as the base course for a concrete floor slabs. The recommended subgrade modulus at the top of the base layer for a concrete floor slab bearing on a thoroughly compacted (i.e., minimum 95 percent compaction) base layer and prepared soil/fill subgrade (i.e., minimum 92 percent compaction) is recommended not to exceed 100 pounds per cubic inch with a Poisson Ratio of 0.40. The actual design thickness, application of reinforcement, and use of a vapor barrier is at the discretion of the design architect or structural engineer.

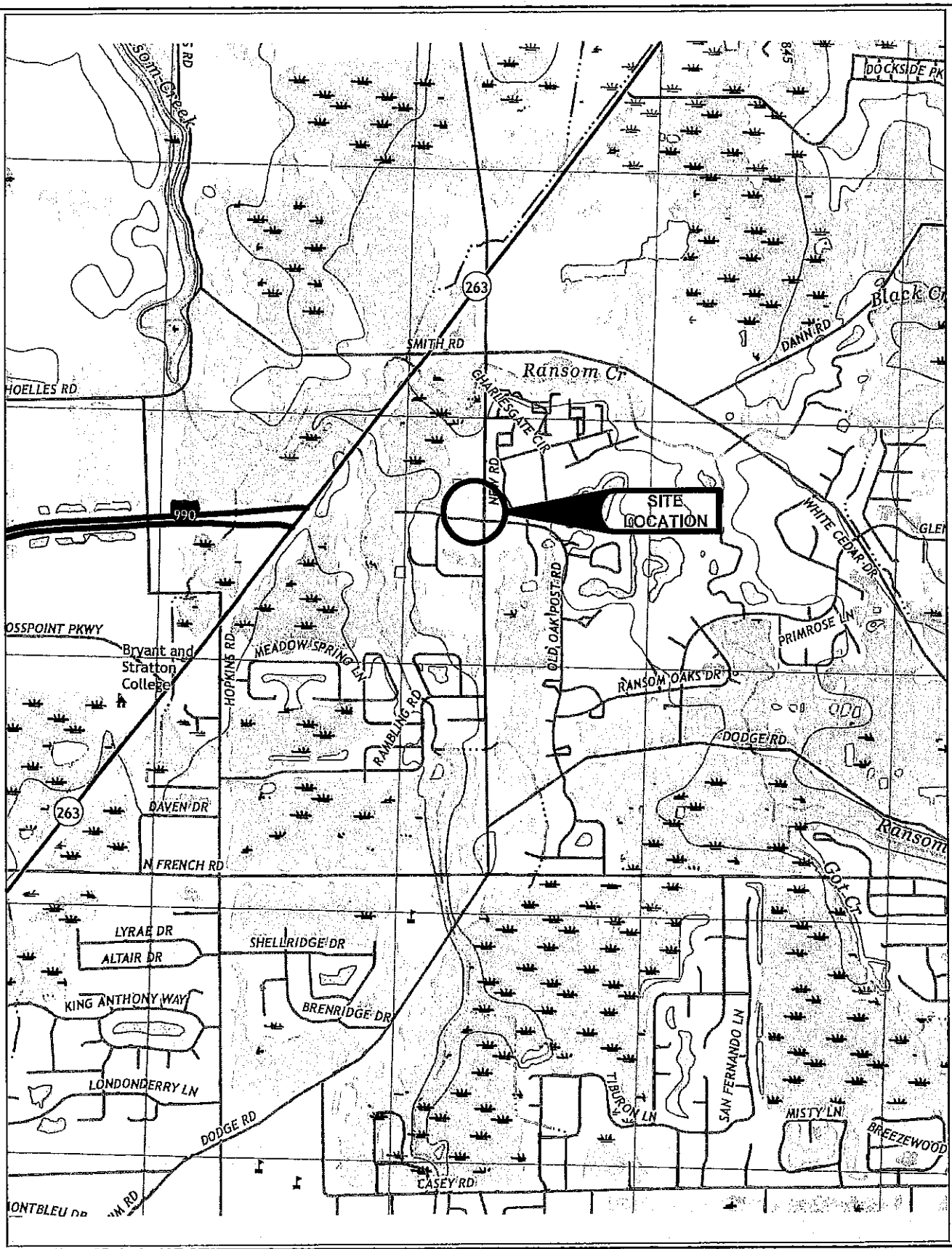
LIMITATIONS: This report is based on the information that is provided by project representatives and the subsurface conditions that were encountered at the test boring locations. Due to the nature of the investigation method, additional test borings and/or test pit excavations will provide a greater level of delineation of the subsurface soil/fill/rock conditions than can be defined by the single test boring data alone. As detailed in Appendix D "Limitations, modification regarding proposed building/structure locations and other site developments can result in changes to the provided recommendations.

Thank you for the opportunity to assist on this project. If questions should arise, please call either of the undersigned at your earliest convenience.

Very truly yours,
BARRON & ASSOCIATES, INC.
and
BUFFALO DRILLING COMPANY, INC.

Andrew J. Camping, PG
Senior Geologist

James S. Barron, PE
President



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DRAWN: DAN KASPROWICZ

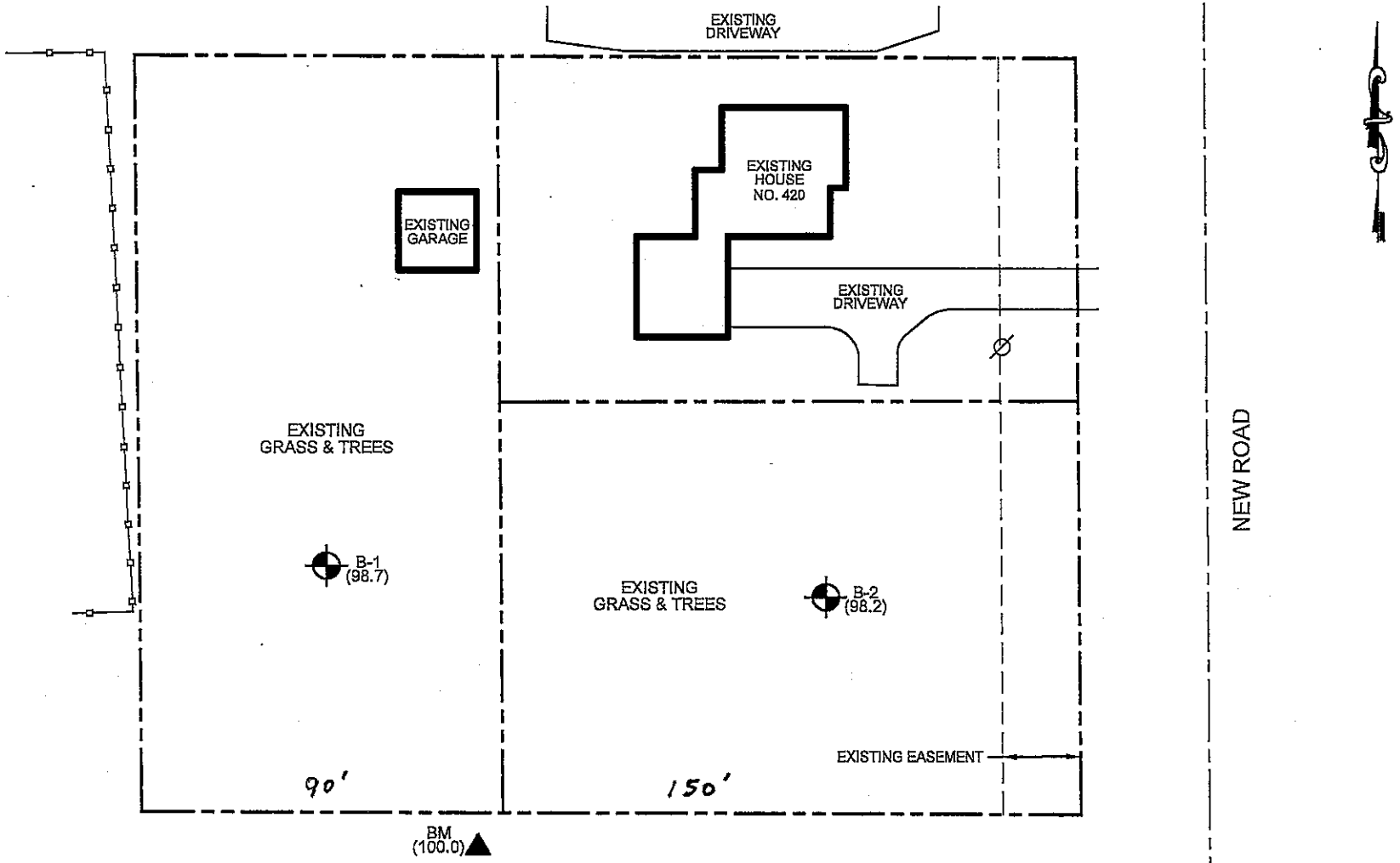
CLIENT: MR. JOSEPH RUBINO
5452 SHERIDAN DRIVE, SUITE 1
WILLIAMSVILLE, NEW YORK 14221

PROJECT: PROPOSED PARCEL REZONING
AUTUMN MEADOWS LANE (90FT. & 150FT.)
TOWN OF AMHERST, NEW YORK 14051

NEW YORK STATE SITE LOCATION

USGS SITE LOCATION PLAN
CLARENCE CENTER
2019

JOB NO.: 23-568	SCALE: N.T.S.
DATE: 8/15/2023	FIGURE NO. 1



LEGEND	
B-2	= TEST BORING & NO.
(98.2)	= RELATIVE GROUND SURFACE ELEVATION (FT.)
BM	= BENCH MARK (NORTH RIM OF MAN HOLE)

NOTES:

1. BORINGS, BUILDINGS, SITE FEATURES, PROPERTY LINE LOCATIONS, AND SCALE OF DRAWING ARE APPROXIMATE.
2. BASE MAP REFERENCE PROVIDED BY NUSSBAUMER & CLARKE, INC., TITLED "BOUNDARY SURVEY NO. 420 NEW ROAD", PROJECT NO. 23J4-0176, UNDATED.

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TOWN OF AMHERST, NEW YORK 14051

TEST BORING LOCATION PLAN

0 20 40 80

JOB NO.: 23-568	SCALE: 1" = 40'±
DATE: 8/15/2023	FIGURE NO. 2

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B&A JOB NO: 23-568
CLIENT: Mr. Joseph Rubino
PROJECT: Proposed Parcel Rezoning
Autumn Meadows Lane (90 ft. Lot and 150 ft. Lot)
Town of Amherst, New York 14051

TABLE NO. 1
LABORATORY PHYSICAL SOIL TEST RESULTS

Boring No.	Sample No.	Depth	Moisture Content ASTM D2216	Organic Matter Content ASTM D2974	Unconfined Compressive Strength ASTM D2166	Wet Density ASTM D2166	Grain Size Analysis ASTM D422				Atterberg Limits ASTM D4318			USCS Soil Classification ASTM D2487 / ASTM D2488 *
							Gravel	Sand	Silt	Clay	LL	PL	PI	
		(ft.)	(%)	(%)	(psf)	(pcf)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(-)
B-1	S-1	0-2	20.0	-	-	-	-	-	-	-	-	-	-	CL
	S-2	2-4	21.1	-	-	-	-	-	-	-	-	-	-	CL
	S-3	4-6	23.5	-	-	-	-	-	-	-	-	-	-	CL
	S-4	6-8	24.7	-	-	-	-	-	-	-	-	-	-	CL
	S-5	8-10	36.3	-	-	-	-	-	-	-	50	22	28	CL
	S-6	10-12	34.6	-	-	-	-	-	-	-	-	-	-	CL
	S-7	14-16	40.3	-	-	-	-	-	-	-	-	-	-	CL
	S-8	19-21	44.1	-	-	-	-	-	-	-	-	-	-	CL
	S-9	23-25	10.3	-	-	-	-	-	-	-	-	-	-	CL-Till
	S-10	28-30	8.2	-	-	-	-	-	-	-	-	-	-	CL-Till

* Soil classification based on visual identification and soil classification of adjacent samples (as applicable).

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APPENDIX A

TEST BORING LOG

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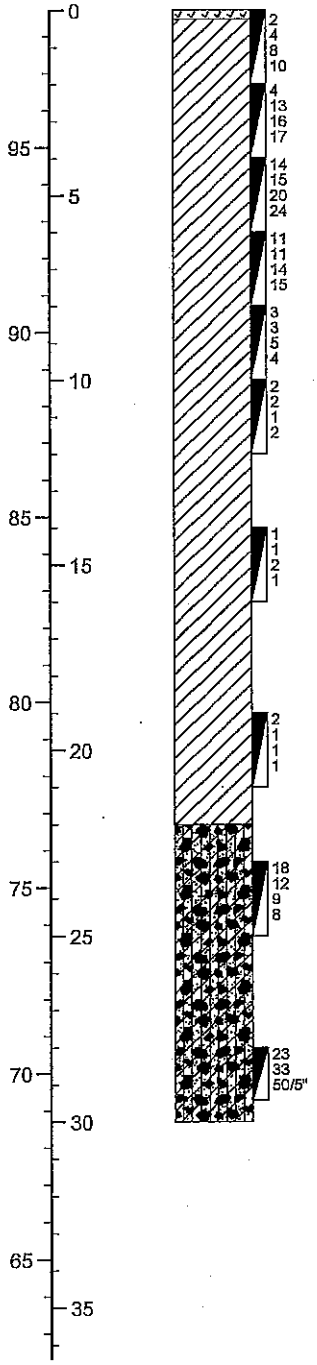
TEST BORING LOG

JOB No.: 23-568 **BORING No.:** B-1

PROJECT: Proposed Parcel Rezoning
Autumn Meadows Lane (90 ft. Lot & 150 ft. Lot), Town of Amherst, New York 14051

DRILLER:	A. Lobur	**TYPE OF DRILL RIG:**	CME-55
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	2 1/4" I.D. H.S.A.
DATE STARTED:	8/18/23	**SURFACE ELEVATION (ft.):**	98.7
DATE COMPLETED:	8/18/23	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None



Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
			Topsoil (3")
S-1 : 0.0'- 2.0'	12	40	Dk. brown, stiff CLAY, some Silt, little f/c Sand, tr. Gravel, tr. Roots, mod. plastic, moist (CL)
S-2 : 2.0'- 4.0'	29	90	...grade: Brown, v. stiff
S-3 : 4.0'- 6.0'	35	80	...grade: hard
S-4 : 6.0'- 8.0'	25	70	...grade: v. stiff
S-5 : 8.0'- 10.0'	8	100	...grade: stiff, wet
S-6 : 10.0'- 12.0'	3	80	...grade: soft
S-7 : 14.0'- 16.0'	3	100	Same as S-6
S-8 : 19.0'- 21.0'	2	100	Same as S-6
S-9 : 23.0'- 25.0'	21	90	Brown, v. stiff CLAY, some Silt, little Gravel, little f/c Sand, mod. plastic, moist (CL-Till)
S-10 : 28.0'- 29.4'	83+	60	...grade: hard
			Depth to Bottom of Hole: 30.0 feet

Logged by: E. Zinni

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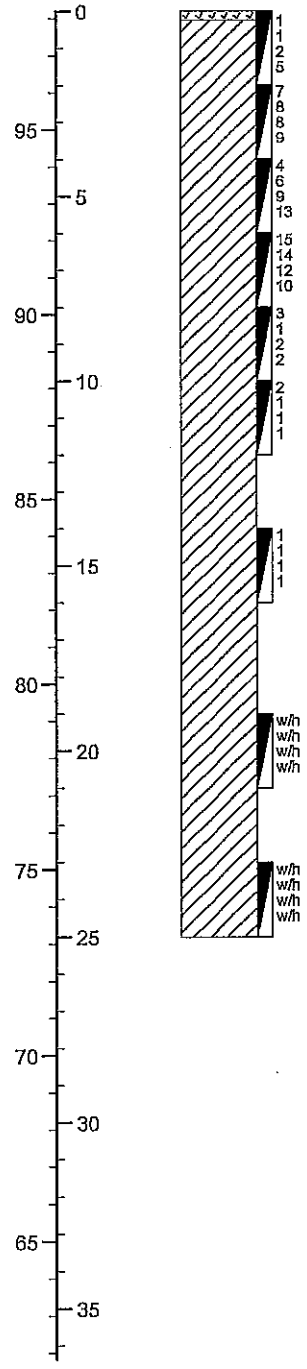
TEST BORING LOG

JOB No.: 23-568 **BORING No.:** B-2

PROJECT: Proposed Parcel Rezoning
Autumn Meadows Lane (90 ft. Lot & 150 ft. Lot), Town of Amherst, New York 14051

DRILLER:	A. Lobur	**TYPE OF DRILL RIG:**	CME-55
SAMPLING METHODS:	ASTM D1586	**SIZE AND TYPE OF BIT:**	2 1/4" I.D. H.S.A.
DATE STARTED:	8/21/23	**SURFACE ELEVATION (ft.):**	98.2
DATE COMPLETED:	8/21/23	**GROUNDWATER DEPTH (ft.):** (measured at completion unless indicated below)	None



Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
S-1 : 0.0'- 2.0'	3	15	Topsoil (3") Dk. brown, soft CLAY, some Silt, little f/c Sand, tr. Gravel, tr. Roots, mod. plastic, moist (CL)
S-2 : 2.0'- 4.0'	16	50	...grade: Brown, v. stiff
S-3 : 4.0'- 6.0'	15	95	Same as S-2
S-4 : 6.0'- 8.0'	26	90	Same as S-2
S-5 : 8.0'- 10.0'	3	100	...grade: soft, wet
S-6 : 10.0'- 12.0'	2	100	Same as S-5
S-7 : 14.0'- 16.0'	2	100	Same as S-5
S-8 : 19.0'- 21.0'	1	100	...grade: v. soft
S-9 : 23.0'- 25.0'	1	100	Same as S-8
			Depth to Bottom of Hole: 25.0 feet

Logged by: E. Zinni

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APPENDIX B

GEOTECHNICAL REFERENCE STANDARDS

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Column Header Descriptions

BARRON & ASSOCIATES, P.C. &
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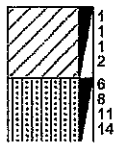
TEST BORING LOG

JOB No.: **BORING No.:**

PROJECT: EXAMPLE

DRILLER:
SAMPLING METHODS:
DATE STARTED:
DATE COMPLETED:

TYPE OF DRILL RIG:
SIZE AND TYPE OF BIT:
SURFACE ELEVATION (ft.):
GROUNDWATER DEPTH (ft.):
(measured at completion unless indicated below)

Elevation/ Depth (feet)	Soil Symbols Sampler Symbols Field Test Data	Sample No. : Range	N-Value	% REC (RQD)	Soil and Rock Description / Remarks
100 — 0		S-1 : 0.0'- 2.0'	2	50	Dk. brown, soft, CLAY, some Silt, little f. Sand, tr. Gravel, tr. Roots, tr. Organic matter, mod. plastic, wet (CL)
		S-2 : 2.0'- 4.0'	19	50	Brown, m. dense f. SAND, some Silt, tr. Gravel, tr. Clay, tr. Roots, non-plastic, moist (SM)

Elevation/Depth: The depth column provides the vertical scale of the boring log in feet below ground surface.

Sample No. : Range: Disturbed samples are identified with "S" preceding the sample number. Undisturbed (Shelby-tube) samples are identified with "U" preceding the sample number. Rock core samples identified with "C" preceding the core run. The range of elevation/depth where the sample was taken is identified in one-tenth foot increments.

N-value: The Standard Penetration Test N-value, as specified by ASTM D1586, is defined as the number of blows required by a 140-pound hammer falling 30 inches, each blow, to drive a 2-in outside diameter split-spoon sampler 12 inches.

% REC (RQD): "Percent Recovery" is the length of samples recovered divided by the total length sampled. The result is numerically expressed as a percent. The Rock Quality Designation (RQD) is the total length of places >4 inches divided by the total length of core run.

Soil and Rock Description / Remarks: This column denotes the exact depth of recovery and general documentation of drilling efforts. Description and classification are based on visual inspection of samples and boring operations. The stratum lines shown on the boring logs are based upon interpretation and may not represent precise subsurface conditions. Water-level readings have been made in the drill holes at time under conditions stated on the boring logs. Fluctuations in the water level may occur due to other factors than those present the time measurement was taken. See attached sheet.

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Soil and Rock Description / Remarks: Terminology Used for Soil Description

Density Description of Granular Soil

Number of Blows per ft., N	*Relative Density*
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium
30 - 50	Dense
Over 50	Very Dense

Abbreviations Used in Soil Sample Classification

f - fine	v - very
m - medium	gr - gray
c - coarse	bn - brown
f/m - fine to medium	yel - yellow
f/c - fine to coarse	sl - slight
tr - trace	dk - dark

Consistency Description of Cohesive Soil

Number of Blows per ft., N	*Consistency*
Below 2	Very Soft
2 - 4	Soft
4 - 8	Medium
8 - 15	Stiff
15 - 30	Very Stiff
Over 30	Hard

Bedding

Parting	Less than 0.02 ft.
Band	0.02 - 0.2 ft.
Thin bed	0.2 - 0.5 ft.
Medium bed	0.5 - 1.0 ft.
Thick bed	1.0 - 2.0 ft.
Massive	Over 2.0 ft.

Grain Size

	Passing / Retained on
Boulder	LARGE / 12-in sieve
Cobble	12-in / 3-in sieve
Gravel	3-in sieve / No. 4 sieve
	No. 4 sieve / No. 10 sieve
Sand	No. 10 sieve / No. 40 sieve
	No. 40 sieve / No. 200 sieve
Silt	No. 200 sieve / 0.005 mm sieve
Clay	Smaller than 0.005 mm

Hardness

Very Soft or Plastic	Can be indented with thumb
Soft	Can be scratched with fingernail
Moderately Hard	Can be scratched with knife
Hard	Difficulty to scratch with knife
Very hard	Cannot be scratched with knife

Percentage Terminology Used in Soil Classification

Trace	0 - 10 %	Some	20 - 35 %
Little	10 - 20 %	And	35 - 50 %

Moisture

Dry	Absence of moisture, dusty, dry to the touch.
Moisture	Small quantity of moisture. Soil usually above groundwater level.
Wet	Moisture noticeable to the touch. Soil may be below groundwater level.
Saturated	Visible free water, usually soil is below groundwater level.

Plasticity

Non-plastic	An 1/8-in thread cannot be rolled at any water content.
Slight plasticity	Thread can be barley rolled.
Moderate plasticity	Thread is easy to roll and little time is required to reach the plastic limit (PL).
Plasticity	Considerable time is required to reach PL. Thread can be re-rolled several times after reaching the PL.

Crystallinity or Texture

Dense	Crystals are to small they cannot be distinguished with the naked eye.
Very Fine Crystalline	Crystals barely discernable with the naked eye.
Crystalline	Crystals are medium size, up to 1/8-in diameter.
Very Coarsely Crystalline	Crystals larger than 1/8-in diameter.

Voids

Porous	Smaller than pinhead. Their presence is indicated by the degree of absorbency.
Pitted	Pinhead size to 1/4 in. If thin walls separate the individuals pits, the core may be described as honeycomb.
Vug	1/4 inch to the diameter of the core. The upper limit will vary with core size.
Cavity	Larger than the diameter of the core.

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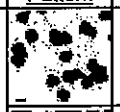
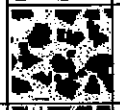
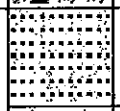
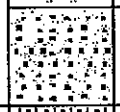
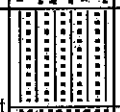
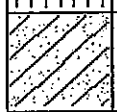
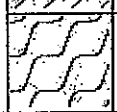
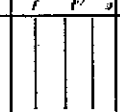
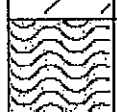
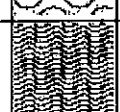
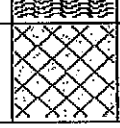
Soil Classification Chart: Unified Soil Classification System (USCS)

Major Divisions			Pattern	USCS ID	Typical Descriptions
Coarse-Grained Soils: More than 50% of material larger than No. 200 sieve	**Gravels:** More than 50% of coarse fraction larger than No. 4 sieve	Clean Gravels (little or no fines)		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
				GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
		Gravels with appreciable amounts of fines		GM	Silty gravels, gravel-sand-silt mixtures
				GC	Clayey gravels, gravel-sand-silt mixtures
	Sands: Less than 50% of coarse fraction larger than No. 4 sieve	Clean sands (little or no fines)		SW	Well-graded sands, gravelly sands, little or no fines
				SP	Poorly-graded sands, gravelly sands, little or no fines
		Sand with appreciable amount of fines		SM	Silty sands, silt-sand mixtures
				SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils: Less than 50% of material larger than No. 200 sieve	**Silts and Clays, Low plasticity:** Liquid Limit < 50%			ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
				CL	Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays
				OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays, High plasticity: Liquid Limit > 50%			MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic clays of medium to high plasticity, organic silts
Highly Organic Soils				Pt	Peat, humus, swamp soils with organic contents
Miscellaneous Fill				FILL	Miscellaneous fill may belong in any division but is identified as FILL

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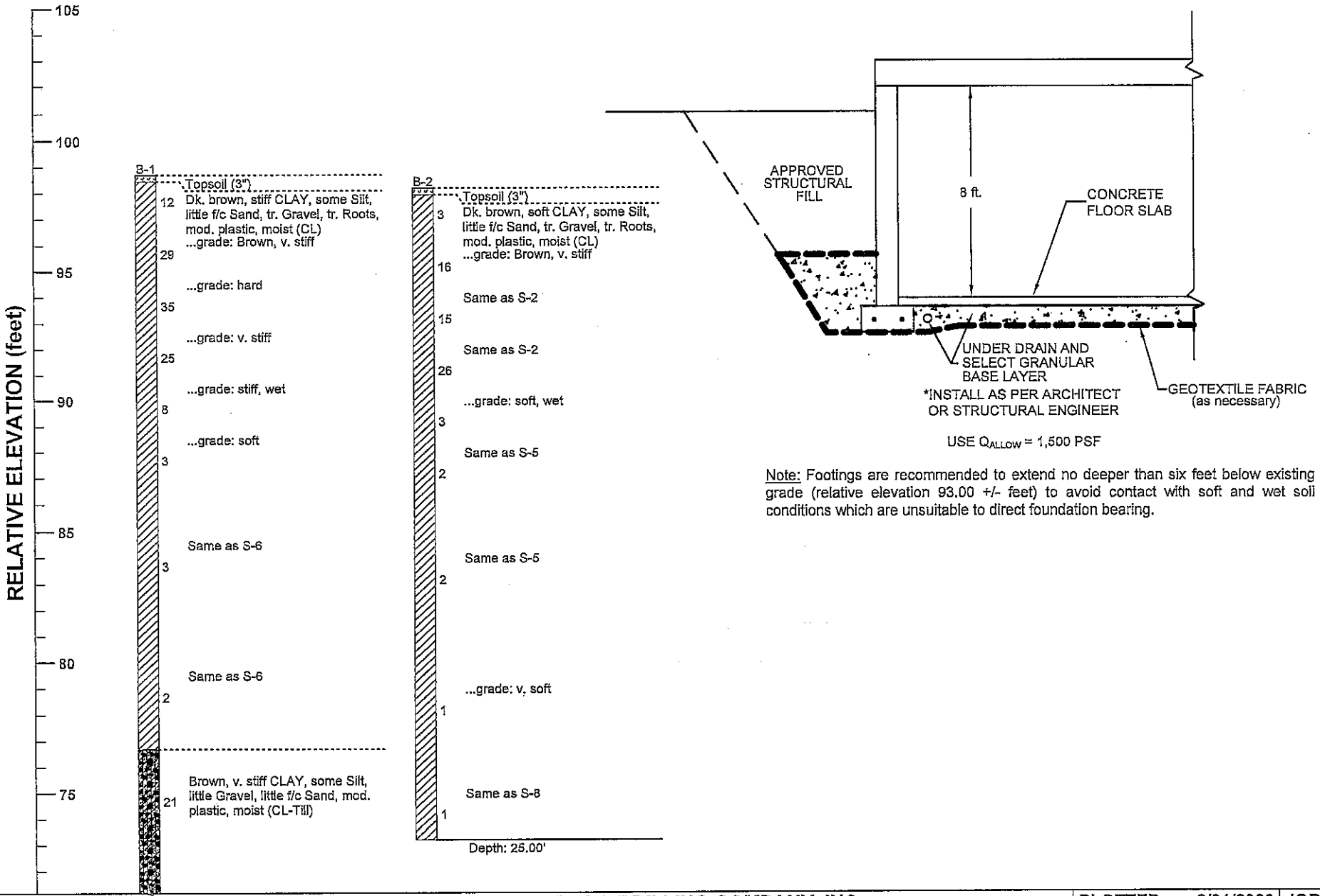
APPENDIX C

ENGINEERING COMPUTATIONS, SCHEMATICS AND PROFILE

"PROFILE OF BORINGS"



Note: Footings are recommended to extend no deeper than six feet below existing grade (relative elevation 93.00 +/- feet) to avoid contact with soft and wet soil conditions which are unsuitable to direct foundation bearing.

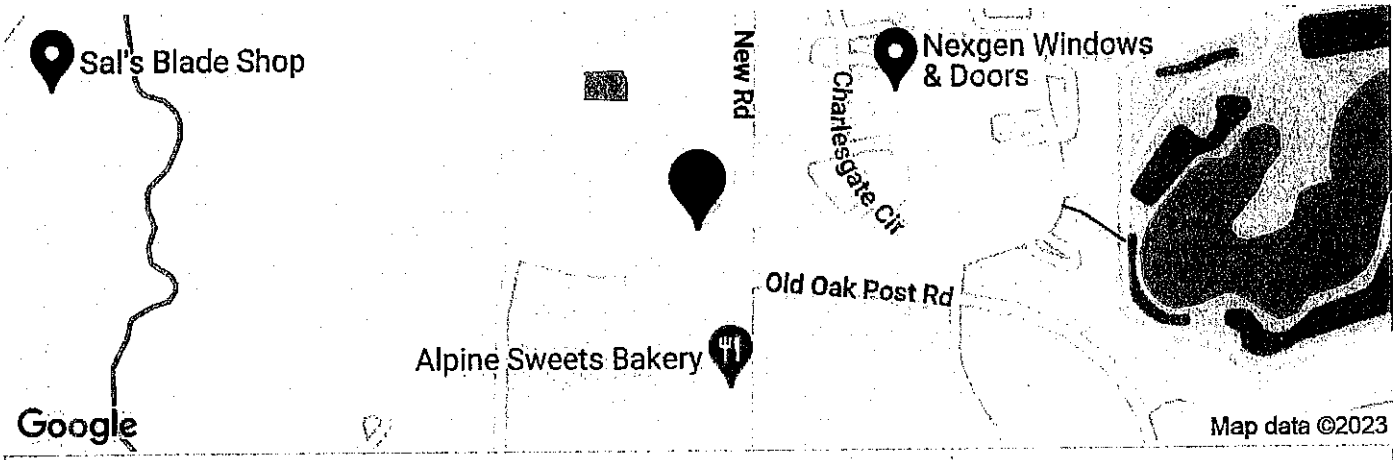
BARRON & ASSOCIATES, P.C. & BUFFALO DRILLING COMPANY, INC. 10440 MAIN STREET, CLARENCE, NEW YORK 14031	PLOTTED: 8/31/2023 BY: A. Camping	JOB NO.: 23-568
PROJECT: Proposed Parcel Rezoning Autumn Meadows Lane (90 ft. Lot & 150 ft. Lot), Town of Amherst, New York 14051	PAGE NO.: 1 of 3	FIGURE NO.: P-1

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.

OSHPD

Parcel Rezoning, Autumn Meadows Ln., Amherst, NY 14051

Latitude, Longitude: 43.0477, -78.7251



Date	8/31/2023, 12:06:37 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	E - Soft Clay Soil

Type	Value	Description
S_S	0.172	MCE_R ground motion. (for 0.2 second period)
S_1	0.046	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.414	Site-modified spectral acceleration value
S_{M1}	0.192	Site-modified spectral acceleration value
S_{DS}	0.276	Numeric seismic design value at 0.2 second SA
S_{D1}	0.128	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	B	Seismic design category
F_a	2.4	Site amplification factor at 0.2 second
F_v	4.2	Site amplification factor at 1.0 second
PGA	0.097	MCE_G peak ground acceleration
F_{PGA}	2.4	Site amplification factor at PGA
PGA_M	0.233	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
SsRT	0.172	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.18	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.046	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.049	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.097	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.958	Mapped value of the risk coefficient at short periods
C_{R1}	0.934	Mapped value of the risk coefficient at a period of 1 s

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B&A JOB NO.: 23-568

DATE: 08/31/23

LATERAL EARTH PRESSURE ON GENERIC BLOCK FOUNDATIONS FOR SIGNS, FREE-STANDING RETAINING WALLS, OR BELOW GRADE/BASEMENT/TANK/POOL RETAINING WALLS (Less Than 20 Feet High)

a) Porous filter media, in contact with the basement/below grade foundation wall or retaining walls, protects and is in contact with a minimum 4 inch diameter perforated drainage pipes at the footing/base of the foundation/structural wall (exterior backfill side and interior basement side) and/or weep pipes through the wall, as needed and as applicable.

b) Where recommended, a geotextile filter fabric will protect the gravel filter media from the earth backfill. Overlap unsewn seams as per the manufacturer's recommendations.

c) Waterproof earth side of wall, as is customarily provided in practice.

d) Drainage pipes are connected to an appropriately designed collector pipe, conveyance, and/or sump pump system as is applicable for the intended purpose of the wall and as customarily provided/installed in practice.

e) For potential groundwater table conditions above the top of the basement slab-on-grade condition, install continuous waterstops (with no joints in stop) at wall and floor construction joints, as is customarily provided in practice. Interior intermediate drainage pipes beneath the slab, that are spaced on-center and in both directions, do appear to be needed.

f) Assume a uniformly graded, clean coarse sand or sandy gravel backfills:
- * equivalent N-value in a dense state: $(N_1)_{60}$ = 40 blows/foot
- * friction angle: ϕ' = 38 degrees (Teng, pg. 12)
- * average in-place densities: moist - γ_m = 120 pcf; saturated - γ_{sat} = 132 pcf; submerged - $\gamma' = (\gamma_{sat} - \gamma_w)$ = 70 pcf

g) Assume at base of wall/footing, coefficient of friction against sliding (f_s) at base of wall (Refer to Teng, pg. 320-1):
f_s = tan (0.58 x ϕ') = 0.40 (AREA silty soil to silty coarse-grained soil)

h) Use equivalent fluid pressure design approach (Hough, pg. 249 and NAVFAC pg. 7.10-9):
- * at rest pressure coefficient - K_o = 1 - sin (ϕ') = 0.38
- * effective lateral pressure of soil - γ'_1 = K_o x γ' = 26.6 pcf
- * hydrostatic pressure - γ_w = 62.4 pcf
- * equivalent fluid pressure with water level at the top of the grade at the wall - γ_{eo} = $\gamma'_1 + \gamma_w$ = 89 pcf (say 90 pcf)
- * equivalent fluid pressure with compaction induced lateral stress increase (W&F, pg 409) γ_{eo} = 2 x K_o x γ_m = 91 pcf (say 90 pcf)
- * active pressure case - K_a = [1 - sin (ϕ')] / [1 + sin (ϕ')] = 0.24; γ_{ea} = K_a x γ_m = 29 pcf (say 30 pcf)
- * passive pressure case - K_p = [1 + sin (ϕ')] / [1 - sin (ϕ')] = 4.2; γ_{ep} = K_p x γ_m = 504 pcf (say 330 pcf with a F.S. = 1.5)

		Thoroughly Compacted ⇒	Uniformly Graded & Clean Coarse Sand or Sandy Gravel Fill	Non-Plastic Silty Sand or Sandy Silt Fill	
USE:	Earth Pressure Coefficient	Static Active =	0.24	0.33	
		Static At-Rest =	0.76	1.00	
		Static Passive =	2.80	2.00	(with F.S. = 1.5)
		Static Passive =	4.20	3.00	(with F.S. = 1.0)
USE:	Equivalent Fluid Pressure	Static Active =	30 pcf		
		Static At-Rest =	90 pcf (for rigid walls)		
		Static Passive =	330 pcf (with F.S. = 1.5)	[500 pcf with (with F.S. = 1.0)]	

[For earthquakes, structural engineer may elect to use the above Static Passive case instead of the below Earthquake Lateral Load for Non-Yielding Wall movement into the soil backfill.]

USE: Simplified Model for Earthquake Lateral Load/Ft. Wall Length @ 0.6 H_{bw} above base. Loads for Non-Yielding Wall. H_{bw} = Earth Height Behind Wall (feet)

Reduce load by 33% for Yielding Wall (active case) = (6.8 psf / foot) x H_{bw}^2 (NYS, S_{ds} = 0.25 g)

(γ_m = 120 pcf for S_{ds} value. Add to Static At Rest/ Active Pressure/Load for unsaturated backfill case) = (13.5 psf / foot) x H_{bw}^2 (NYS, S_{ds} = 0.50 g)

= (17.5 psf / foot) x H_{bw}^2 (NEern NYS, $S_{ds} \leq 0.65$ g)

[Above for Site Class C to E soils. Interpolate for other S_{ds} values.
Use 1.75 x values for walls on Class B/A rock or on rigid foundation base. (FEMA NEHRP Guidelines)]

Saturated/Liquified Soil During Earthquake = 132 pcf
(Equivalent Fluid Pressure. Add to inertial hydrodynamic pressure, not presented here.)
If looser/denser backfills, adjust above pressures by the ratio = new density / 120 pcf or / 132 pcf (for saturated case))

USE:	Coefficient of Friction Against Sliding (f_s)	= 0.45	(on compacted NYSDOT Item #304.12 or #304.14 gravels)
	(use lowest f_s with no underlying weaker layers)	= 0.35	(on compacted granular soil & non-plastic silt)
		= 0.20	(slab-on-grade on polyethylene on granular fill)
	[with a F.S. = 1.0]	= 0.60/0.50	(on clean, rough, & sound bedrock/smooth bedrock)
	Min. Factor of Safety Against Sliding	= 1.5	

[Rev.9-30-09]

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APPENDIX D

LIMITATIONS

LIMITATIONS

1. This report is based on the data that was obtained from the subsurface explorations and on the information submitted to the geotechnical engineer. A geotechnical engineer, who is experienced in foundation construction and earthwork, should be engaged to review the final design and specifications in order to determine whether any change in concept may have any effect on the validity of the conclusions presented herein, and whether these conclusions have, in fact, been implemented in the design and specifications.

2. The subsurface conditions, including thickness, between the exploration locations are approximate and simplified representations of the strata and transitions. There is the possibility that variations in soil and rock conditions and boundaries will be encountered during construction. In order to permit correlation between the exploratory soil data and the actual soil conditions encountered during construction and so as to assess conformance with the plans and specifications as originally contemplated, it is recommended that a geotechnical engineer, who is experienced in foundation construction and earthwork monitoring, should be retained to perform continuous construction review during the site preparation and foundation construction operations.

3. The subsurface exploration logs and subsurface conditions may aid in estimating material quality and quantities, such as topsoil/organic matter, fills, natural soils, and rock, but are not to be relied upon as the exclusive means for bid preparation purposes. It is the responsibility of the contractor to perform any additional site examinations and explorations and to prepare an accurate bid.

4. Disclaimers:
   a. In the event that any changes in the nature, design or location of the structure are planned, the conclusions that are contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report are modified or verified in writing.
   b. The geotechnical engineering report has been prepared for this project by Barron & Associates, P.C. This report is for assistance in design only and is not a sufficient basis on which to prepare an accurate bid.
   c. This report has been prepared for the exclusive use of Mr. Joseph Rubino and his designated design representatives, for specific application to the rezoning of a parcel to be developed as two residential lots along Autumn Meadows Lane, south/southwest of 420 New Road in the Town of Amherst, Erie County, New York and in accordance with generally accepted geotechnical engineering practice. No other warranty, expressed or implied, is made.