Geotechnical Report
111 W57 Street Project
New York, New York

JDS Development Group
104 Fifth Avenue
New York, NY 10011

Mueser Rutledge Consulting Engineers
14 Penn Plaza - 225 West 34th Street
New York, NY 10122

January 26, 2014

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February 26, 2014

JDS Development Group
104 Fifth Avenue, 9th Floor
New York, NY 10011

Attn: Mr. Simon Koster

Re: Geotechnical Report
111 W57 Street Project
New York, New York
MRCE File P13-401

Dear Simon:

As per your request, Mueser Rutledge Consulting Engineers (MRCE) has completed a supplemental subsurface investigation for the referenced project. This report presents a summary of all subsurface investigations performed at the site, our interpretation of subsurface conditions encountered in borings, and foundation recommendations for the proposed construction.

SITE AND PROJECT DESCRIPTION

A new high-rise tower is planned to be constructed on an open empty lot at 111 West 57th Street, New York City. The new structure will incorporate the existing Steinway Building (see Figure 1). The lot is relatively flat with elevations ranging from Elev. +60 to Elev. +62 with about an eight foot depression in the northeast corner. Adjacent sidewalk elevations on W57th Street range between Elev. +62 and Elev. +64. Sidewalk elevations on W58th Street range between Elev. +58 and Elev. +62. Elevations in this report are in feet and refer to the Borough President of Manhattan Datum, in which Elev. 0.0 is equal to 2.75 feet above Mean Sea Level at Sandy Hook, New Jersey, 1929.

The empty lot was previously occupied by a four-story Ritz Furs building with two cellars. That building was demolished in 2006 and its cellars were filled with fill and demolition debris. The foundation walls were left in place. Borings drilled at the site encountered concrete slabs at a depth of about 20 feet, just above the rock surface.

The Ritz Furs building had a two-level vault extending south under W57th Street. This vault was not demolished or filled in (see Figure 2). The bottom slab of its lower level is at a depth similar to the assumed lowest cellar slab of the demolished Ritz Furs building, with the top of slab (TOS) at approximately Elev. +40.5.

The new high-rise tower will interconnect with the Steinway Building structure which is up to 16 stories high. The southern portion of the Steinway Building facing West 57th Street has one cellar level at Elev. +47.5 and the northern portion facing West 58th Street has two cellar levels with TOS at Elev. +47.5 and +29, respectively. One cellar level will be constructed underneath the new tower. The proposed cellar will be constructed to the same elevation as the single cellar within the southern portion of the Steinway Building, with TOS at Elev. +47.5 as shown on Figure 2.

The TOS elevations of the lowest cellar slab at existing adjacent buildings to the east, 100 West 58th Street, 1409 6th Avenue, and 1401 6th Avenue, are Elev. +28.9, Elev. +45.1, and Elev. +25.3, respectively (see Figure 2).

EXHIBITS

The following exhibits are attached:

Exhibit	Description
Figure 1	Site Location Plan
Figure 2	Cellar Elevations
Drawing No. B-1	Boring Location Plan
Drawing No. GS-R	Geotechnical Reference Standards
Drawing No. RC-1	Rock Classification Criteria
Appendix A	MRCE Boring Logs – 2013 Investigation
Appendix B	2013 MRCE Laboratory Testing Results
Appendix C	April 2012 Geotechnical Study
Appendix D	Boring Logs – 2013 Phase II ESA

SUBSURFACE INVESTIGATIONS

Previous Investigations In August 2006, an initial geotechnical investigation was performed by Langan to define the subsurface conditions at the site and comprised three test borings. The borings penetrated to depths ranging from 33 to 36 ft and cored 10 to 15 feet of bedrock. In March 2012, another geotechnical study that included three borings was performed. We understand that the purpose of these additional borings was to confirm top of rock depths. Groundwater observation wells were not installed in either investigation. The geotechnical report summarizing both investigations is attached as Appendix C.

In addition to the above geotechnical studies, Environmental Site Assessments (ESAs) were performed in 2013. The Phase II ESA included a geophysical survey, completion of three environmental borings, and installation of one groundwater monitoring well. The three borings drilled included one boring for soil sample collection. Logs for the environmental borings and monitoring well are attached in Appendix D.

Supplemental Investigation Foundation elements for the proposed tower will extend deep into rock, well below the depth of Langan borings discussed above. Therefore, MRCE performed two supplemental borings extending about 50 feet into bedrock in order to define the bedrock at greater depth as needed for design. Boring M-1P and M-2 were drilled by Jersey Boring and Drilling of Newark, New Jersey (JBD) between December 23, 2013 and January 6, 2014 under continuous inspection by our resident engineers, Ms. Alexandra Patrone and Mr. Edward Phelps, who prepared field logs for each boring. Upon completion of the drilling, as-drilled boring locations were tape measured from existing site features by our engineers, and the as-drilled boring locations are shown on Drawing No. B-1.

The supplemental borings were made with a truck mounted drill rig using wash-rotary methods with casing and drilling mud to stabilize the borehole. Soil samples were obtained at intervals not exceeding five feet throughout the borehole. Samples were obtained using a 2-inch O.D. split-spoon sampler driven with an automatic 140-pound hammer falling 30 inches. The number of hammer blows required to advance the split-spoon sampler through each of four six-inch drive intervals was recorded. The Standard Penetration Test (SPT) resistance or N-value, expressed in blows per foot, is an indication of the relative density of the material sampled and is calculated by summing the blows from the second and third six-inch intervals. In some instances where the sampler was unable to penetrate the full 24 inches due to the presence of dense soils, large gravel, cobbles, boulders, or other obstructions, the sampler was driven until 50 to 100 blows were administered and the actual penetration of the sampler was measured and recorded. Recovered soil samples were classified in the field and placed in jars for preservation and transport to our in-house laboratory.

The supplemental borings cored 50 to 52 feet of bedrock. Bedrock was sampled using an NX-size, double-tube core barrel equipped with a diamond bit, recovering a nominal 2-inch diameter core. Percent recovery and Rock Quality Designation (RQD) were determined for each core run. RQD is defined as the sum of the lengths of recovered core pieces greater than four inches in length between natural breaks expressed as a percentage of the total core run. RQD is an indication of the relative frequency of jointing or natural fracturing of the bedrock. Sketches of recovered cores prepared in the field are attached to the boring logs. Rock cores were stored in wooden boxes for shipment to our laboratory.

After completion of the boring program, all soil samples and rock cores were delivered to our soils laboratory for verification of field classification. Individual soil sample and rock core descriptions, and rock core sketches are provided on the typed logs in Appendix A. The terminology used in MRCE soil descriptions is shown on Drawing No. GS-R. Rock core classification terminology and criteria used on the boring logs are shown on Drawing No. RC-1.

A piezometer was installed in the completed borehole of Boring M-1P to monitor groundwater levels. The piezometer consists of a two-inch diameter PVC standpipe extending to a depth of 30 feet. The bottom ten feet of the standpipe is slotted and surrounded by filter sand to allow free water movement without movement of soil particles. A cap flush with the surrounding ground surface was installed at the well for protection and to facilitate future readings. Following installation, water level readings were taken at the beginning and end of each work day.

Piezometer construction details and water level readings are recorded on the piezometer record accompanying the boring log in Appendix A.

SUBSURFACE CONDITIONS

The general subsurface profile in the borings comprises miscellaneous fill over bedrock, locally with a thin layer of decomposed to highly weathered rock atop the bedrock. Our interpretation of the subsurface strata is shown on individual boring logs. General descriptions of the materials encountered are summarized below in order of their occurrence with depth:

Stratum F - Fill (NYC Class 7) The uppermost material encountered in both borings is fill, ranging in thickness from 18 to 23 feet. The fill consists of loose to very compact gray - brown coarse to fine sand, some gravel, trace silt and clay, with various concentrations of debris (brick and concrete), and possibly larger debris. Remnants of old below-grade structures (sub-cellar slab, footings, and foundation walls) are also present within the fill. The SPT N-values range widely from 4 to more than 100 blows per foot (bpf).

Stratum DR and WR - Decomposed and Weathered Rock (NYC Class 3a and 1c) A thin layer of decomposed and weathered rock was encountered in some borings. In Boring M-2, this stratum consisted of brown and pink, coarse to fine sand with some rock fragments and trace silt and mica. In Boring M-1P, no soil was recovered from this layer but the presence of decomposed and weathered rock was inferred from easy drilling, indicative of soft material.

Bedrock (NYC Class 1a and 1b) The 2006 and 2012 subsurface investigations encountered bedrock immediately below the concrete sub-cellar slab of the demolished building, where present. The bedrock generally consisted of gray to black, slightly to moderately weathered and fractured, medium to hard micaceous schist. Rock core recoveries ranged from 68 to 100 percent, and RQD values ranged from 43 to 97 percent.

The bedrock cored during the supplemental borings ranged in recovery from 92 to 100 percent and RQD from 78 to 100 percent. The results between both investigations generally agree, however previous investigations by Langan produced slightly lower Recovery and RQD at shallow depths, as seen in Figure 2, below.

It should also be expected that bedrock near its surface is disturbed by previous excavations and may contain lower quality, disturbed rock.

The top of rock elevations range from Elev. +36.5 to +42, as shown on Drawing No. B-1.

Laboratory testing was performed on rock core samples recovered during the supplemental investigation to obtain strength parameters. Seven samples were tested for unconfined compressive strength (UCS). The test results are attached in Appendix B. A summary of those test results is shown in Table 1 below.

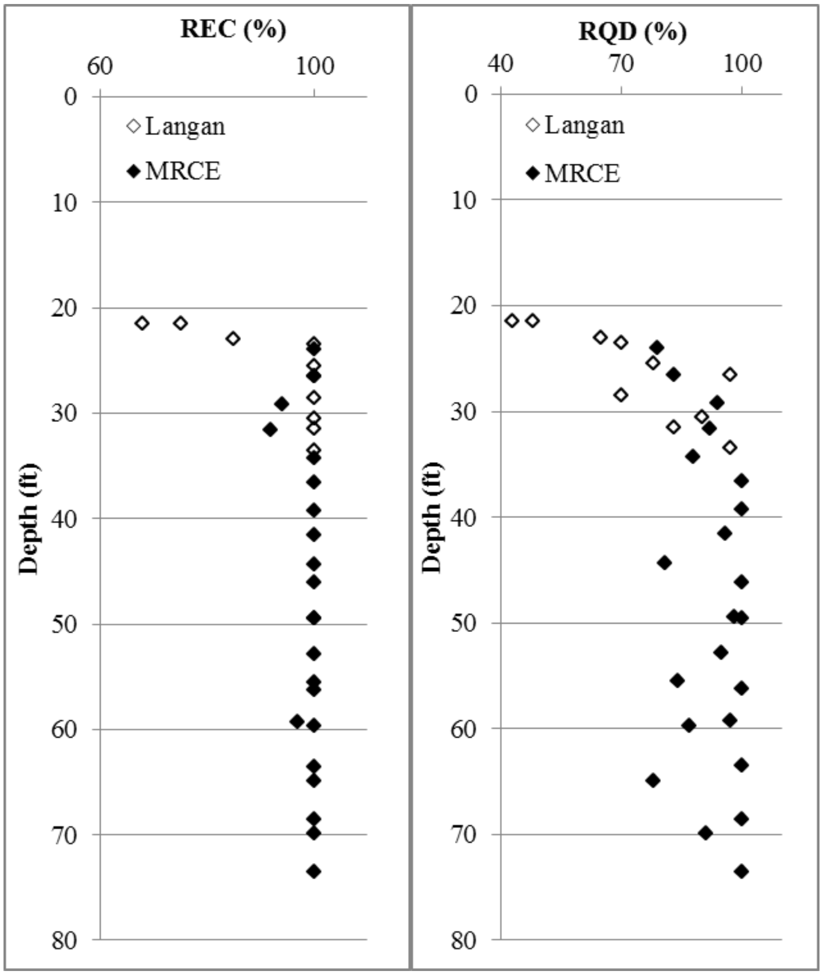


Figure 1: Recovery and RQD with depth, from Langan (2006 and 2012) and present MRCE inspections

Table 1: Summary and Comparison of Rock Strengths

		Unconfined Compressive Strength, psi		
Rock Type	No. of Tests	Minimum	Average	Maximum
Schistose Gneiss	3	10,187	11,093	11,562
Gneissic Schist	4	6,584	7,315	8,317

The rock strength obtained in tests tends to decrease with depth, as shown in Figure 1 below. This is due to the increasing mica content, or schistosity, with depth.

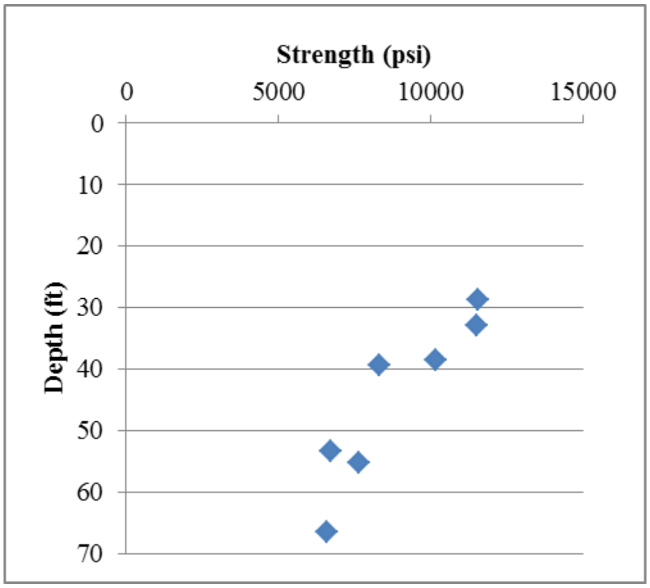


Figure 2: Rock strength with depth

Groundwater Water level readings were taken in piezoemeters (groundwater monitoring wells) installed in Boring M-1P and in the previously drilled environmental boring, Boring B-1. Groundwater levels measured in the piezometers are considered more indicative of the true water table than measurements in boreholes. Groundwater levels ranged from Elev. +31.5 to Elev. +42.0 during our investigation. In general groundwater likely follows the top of rock surface and maybe locally depressed (such as the lower range of our readings in Boring M-1P) due to adjacent cellar underdrainage systems. The groundwater table is expected to vary seasonally throughout the year depending on precipitation levels and surface water runoff.

FOUNDATION RECOMMENDATIONS

Foundations We understand that the new tower loads will mainly be carried by four large interior columns and two shear walls along the east and west limits of the tower. Other columns, with relatively small loads, will need to be supported outside of the tower footprint. We recommend that two foundation alternatives be considered:

> ***Footings or Piers to Rock with Tiedowns*** Footings and piers to rock should be used where adequate space for such foundations is available and loads do not need to be transferred too far below adjacent building foundations. Footings or piers to rock maybe feasible for all but the east shear wall foundations. Tiedowns can be used in combination with footings to resist uplift loads. We recommend that the tiedowns, if used, be sized assuming a side friction of 100 psi in tension.
>
> The footings/piers will need to extend to sound rock where lower quality rock is present at rock surface and embedded to provide lateral restraint. A minimum embedment of about 2 feet will likely be required. The footings and piers should be sized for 40 tons per

square foot (tsf) to 60 tsf depending on space constraints and loading conditions. The 60tsf bearing may locally require deeper embedment where lower quality rock is present. Where higher capacity bearing is needed, the foundations can be deepened and their capacity increased to up to 120 tsf according to criteria defined in the Code. Adjacent to the existing buildings, the potential for future deeper excavation at those sites has to be considered.

Deep Foundations Along the east property line, underneath the east shear wall, the new tower loads may need to be transferred to below the adjacent cellars and building foundations. Considering the significant depth of the adjacent cellar spaces (see Figure 2), drilled caissons could be used. The caisson's permanent casing will need to extend to below the adjacent building foundations. The compression and tension capacity of the caissons will be developed within a rock socket below the permanent casing. We recommend that the caisson rock sockets be sized assuming a side friction of 200 psi in compression and 100 psi in tension. The tension capacity check will also need to consider "cone" pullout evaluations and combined effect of the caissons loads (and tiedowns). The pullout cones should not consider rock beyond the property lines as that might be removed during future adjacent development.

We understand that compression load capacities of about 1,500 kips to 3,000 kips per caisson are needed along the east shear wall. Such capacities are typically achieved with caissons constructed using casings with outside diameters ranging from 16 inches to 24 inches (or higher). The 16-inch casing represents the largest diameter threaded casing available and would likely be the most economical. This is due to the smaller size drilling equipment needed and easier installation in restricted headroom conditions. Additionally, the smaller the caisson diameter, the closer it can be installed to the existing walls of adjacent buildings. For instance, the center of the 16-inch caisson would need to be only about 2 feet from the adjacent walls (plus some installation tolerance allowance).

Considering the presently considered depth of the new cellar, lateral forces should be assumed and designed to be resisted by the footings and piers to bedrock. Footings and piers to bedrock will require significantly smaller displacement to mobilize lateral resistance when compared to the caissons.

A compressible layer should be installed below any caisson caps in rock adjacent to an existing cellar to ensure load transfer into the caissons.

Foundation Slab and Walls The cellar walls and slab should be designed as structural elements able to resist both soil and hydrostatic pressures. The long term groundwater should be assumed to be at the highest rock surface elevation of about Elev. +42. The walls and slab should be checked for a short term loading conditions with groundwater at Elev. +50 representing utility leak conditions. At-rest earth pressures should be used for design of foundation walls, assuming a friction angle of 32 degrees and total unit weight of 120 pounds per cubic foot. Seismic earth pressures do not need to be considered.

We recommend that the new cellar spaces be fully protected to grade with sheet waterproofing, such as, Grace products (Preprufe and Bituthene) or approved equals. Hydrophylic waterstops

(Swellseal) should be used. Both material and labor warranties should be obtained for the waterproofing system.

Seismic Design Based on our review of the subsurface profile, the site can be classified as Site Class B, resulting in Seismic Design Category B (assuming the proposed building will be in Use Group II). The seismic parameters including the design acceleration spectrum can be derived directly from the Code. Liquefaction of the existing fill materials does not need to be considered in design.

Foundation Construction Considerations Deep excavation will be required to construct the proposed cellar and new foundations. The general excavation will not extend below cellars of existing adjacent buildings with possible exception along Lot 32 (1049 Avenue of Americas) where minor underpinning might be required. On the south side of the excavation, along W57th Street, the excavation will be shallower than the existing vault which will be reconstructed prior to the excavation.

The excavations will encounter sandy fill, demolition debris, and remnants of old foundations, including thick foundation walls along the buildings lines. Local excavation of rock will be required for construction of footings and foundation piers. In areas of low quality rock, this excavation may be significant to reach bedrock of adequate quality for bearing. Any excavations must be made in a controlled manner to minimize the potential risk of affecting adjacent structures. Foundation subgrade for footings and piers to rock will need to be undisturbed by the excavation, cleaned of all loose materials and inspected by an experienced geotechnical engineer.

Monitoring of Adjacent Buildings A pre-construction condition survey of all adjacent buildings should be performed to document their conditions. Based on the survey results, a monitoring program should be designed to observe potential impact of the construction. This should include vibration monitoring, crack gauges, and displacement monitoring.

Both the NYC Water tunnel and NYCT subway tunnel are too far from the proposed construction to be affected. However, as the subway tunnel is within 200 feet of the site, NYCT will need to review and approve the building design and proposed construction.

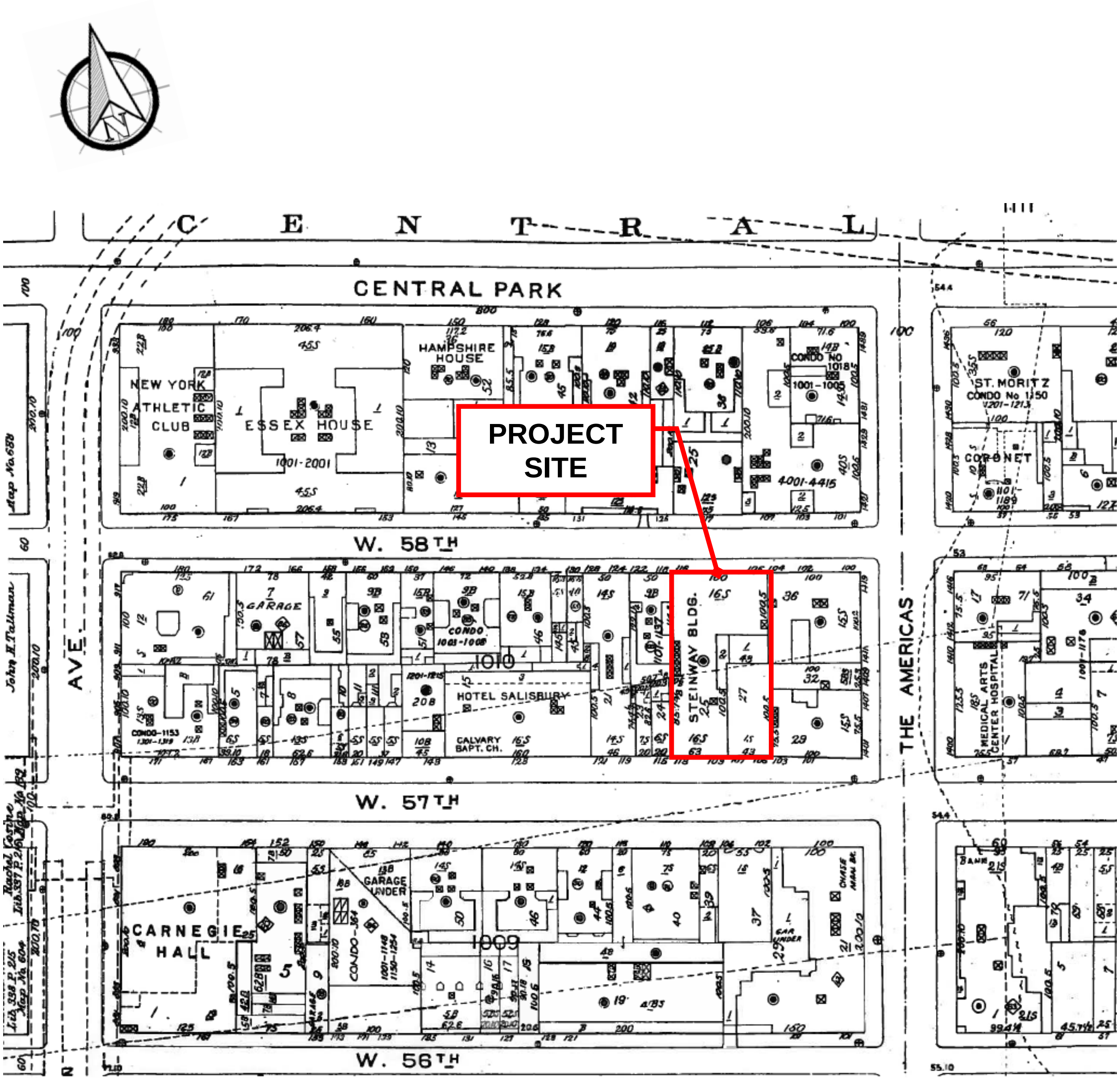
Please do not hesitate to call us with any questions.

MUESER RUTLEDGE CONSULTING ENGINEERS

By: Jan Cermak
Jan Cermak, P.E.

AEP:JC:AHB: F:\120\12087\Geotech Report

EXHIBITS



NOTE: BASE PLAN OBTAINED FROM MANHATTAN LANDBOOK, 2003.

105-111 WEST 57TH STREET

NEW YORK NEW YORK

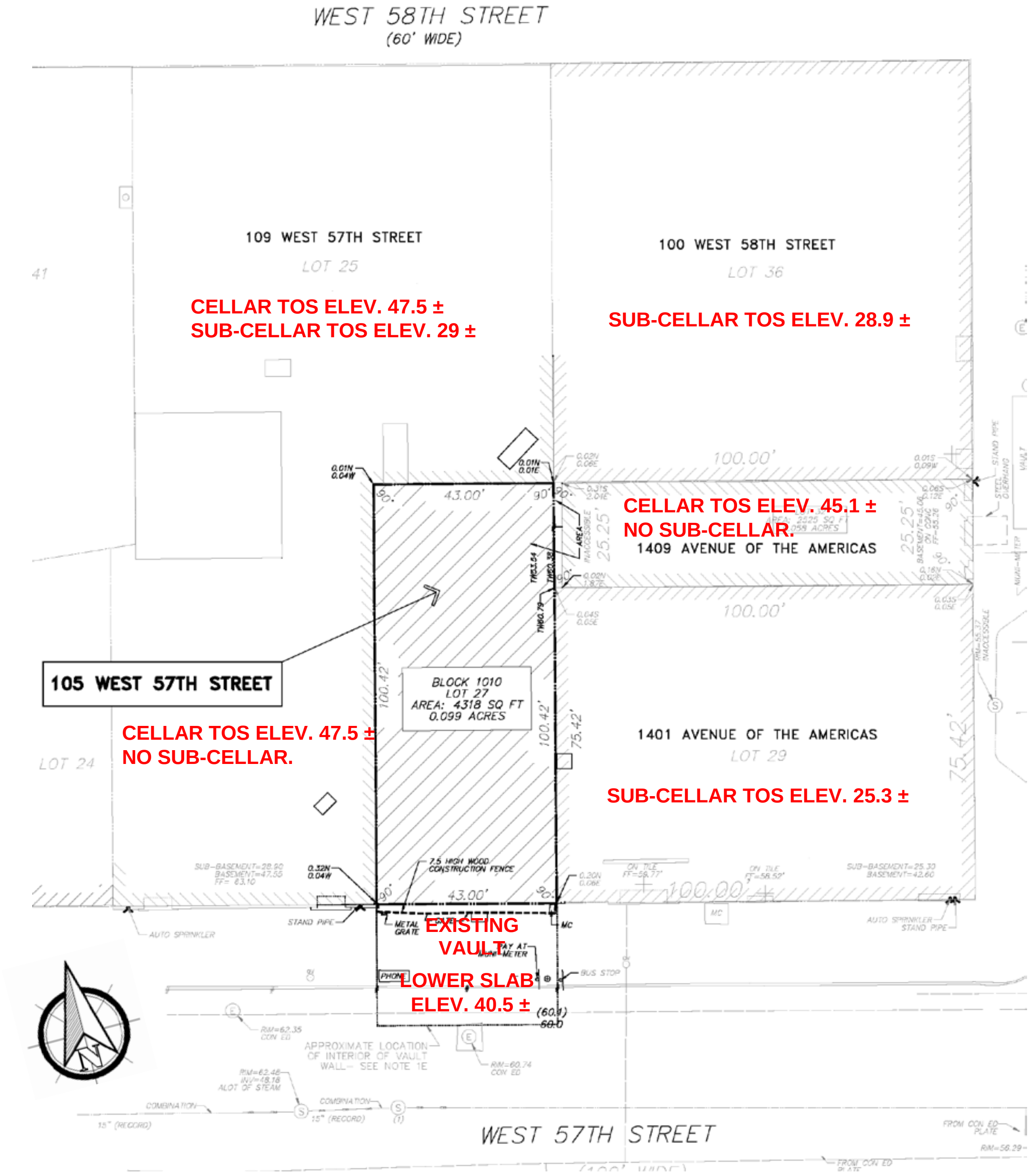
MUESER RUTLEDGE CONSULTING ENGINEERS

225 WEST 34TH STREET, NEW YORK NY 10122

SCALE N/A	MADE BY: JEC CH'KD BY: JC	DATE: 10-02-13 DATE: 10-02-13	FILE No. 12087

SITE LOCATION PLAN

FIGURE 1



NOTES:

1. BASE PLAN OBTAINED FROM PROPERTY SURVEY PLAN, DWG. X-002, DATED 8/6/12, BY BEPC.

2. ALL SHOWN ELEVATIONS ARE APPROXIMATE AND REFER TO BORO PORESIDENT OF MANHATTAN DATUM.

105-111 WEST 57TH STREET
NEW YORK NEW YORK

MUESER RUTLEDGE CONSULTING ENGINEERS
225 WEST 34TH STREET, NEW YORK NY 10122

SCALE N/A	MADE BY: JC CH'KD BY:	DATE: 10-02-13 DATE: 10-02-13	FILE No. 12087

CELLAR ELEVATIONS

FIGURE
2

P L A N

NOTES:

1. BASE PLAN BY LANGAN, DATED 04-05-2013.
2. AS-DRILLED LOCATIONS FOR BORINGS M-1 AND M-2 WERE OBTAINED BY MRCE RESIDENT ENGINEER.
3. BORINGS B-1 THROUGH B-3 WERE MADE BY LANGAN BETWEEN 05-04-2006 AND 05-05-2006. BORINGS B-4 THROUGH B-6 WERE MADE BY LANGAN ON 03-23-2012. BORINGS B-1, SV-1A, SV-2 WERE MADE BY LANGAN ON 03-23-2012.
4. ELEVATIONS ARE IN FEET AND REFERENCED TO BOROUGH PRESIDENT OF MANHATTAN DATUM.

LEGEND:

M-1 (*) – 2013 MRCE BORING
TOP OF ROCK (CLASS 1c OR BETTER) ELEVATION

B-1 – 2013 ESA SOIL BORING/MONITORING WELL LOCATION

SV-1A – 2013 ESA SOIL VAPOR SAMPLE LOCATION

B-1 (*) – 2006 BORING BY OTHERS
TOP OF ROCK ELEVATION

B-4 – 2012 BORING BY OTHERS

60 – EXISTING GROUND SURFACE CONTOUR

REV.	DATE	BY	DESCRIPTION

WEST 57 STREET TOWER
NEW YORK NEW YORK

JDS DEVELOPMENT GROUP
NEW YORK NEW YORK

MUESER RUTLEDGE CONSULTING ENGINEERS
14 PENN PLAZA – 225 W. 34TH STREET, NY, NY 10122

SCALE			FILE NUMBER
GRAPHIC	MADE BY: L.R.	DATE: 12-30-2013	12087
	CH'KD BY: A.E.P.	DATE: 12-30-2013	DRAWING NUMBER
	BORING LOCATION PLAN		B-1

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Last saved by: lreva on Friday, Jan 03, 2014 – 12:28:30 PM
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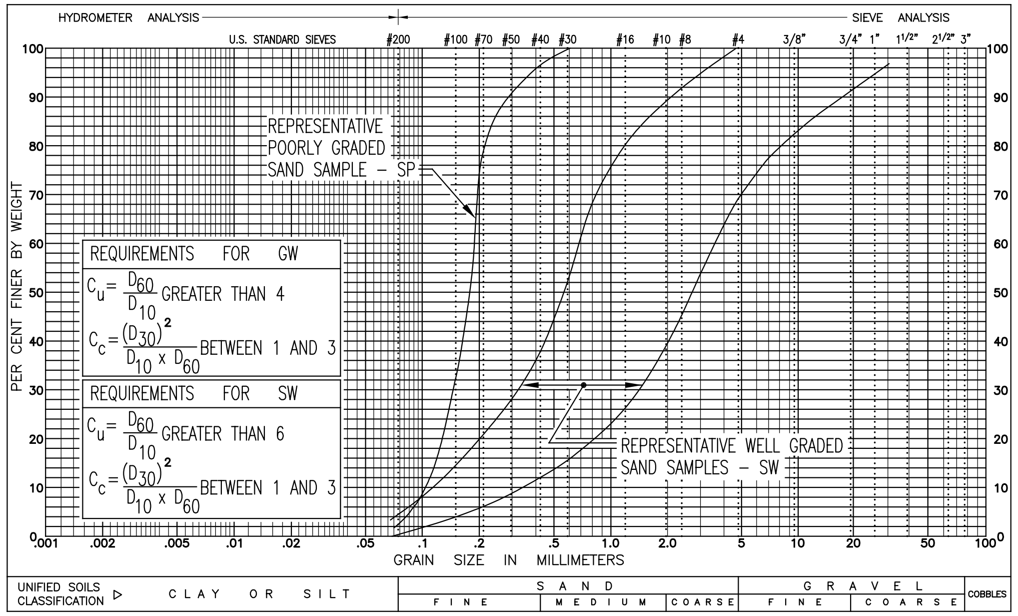
UNIFIED SOIL CLASSIFICATION (INCLUDING IDENTIFICATION AND DESCRIPTION)

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	FIELD IDENTIFICATION PROCEDURES (EXCLUDING PARTICLES LARGER THAN 3 IN. AND BASING FRACTIONS ON ESTIMATED WEIGHTS)		
1	2		3	4	5		
COARSE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE THE NO. 200 SIEVE SIZE IS ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE. (FOR VISUAL CLASSIFICATION, THE 1/4 -IN. SIZE MAY BE USED AS EQUIVALENT TO THE NO. 4 SIEVE SIZE)	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.	WIDE RANGE IN GRAIN SIZES AND SUBSTANTIAL AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZES.		
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.	PREDOMINANTLY ONE SIZE OR A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING.		
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT-MIXTURES.	NONPLASTIC FINES OR FINES WITH LOW PLASTICITY (FOR IDENTIFICATION PROCEDURES SEE ML BELOW)		
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES.	PLASTIC FINES (FOR IDENTIFICATION PROCEDURES SEE CL BELOW)		
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE.	CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES.	WIDE RANGE IN GRAIN SIZES AND SUBSTANTIAL AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZES.		
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES.	PREDOMINANTLY ONE SIZE OR A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING.		
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT-MIXTURES.	NONPLASTIC FINES OR FINES WITH LOW PLASTICITY (FOR IDENTIFICATION PROCEDURES SEE ML BELOW)		
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES.	PLASTIC FINES (FOR IDENTIFICATION PROCEDURES SEE CL BELOW)		
FINE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE					IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN NO. 40 SIEVE SIZE		
					DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PL)
	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50		ML	INORGANIC SILTS, SANDY SILTS, ROCK FLOUR, OR CLAYEY SILTS WITH SLIGHT PLASTICITY.	NONE TO SLIGHT	QUICK TO SLOW	NONE
			CL	INORGANIC CLAYS, OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.	MEDIUM TO HIGH	NONE TO VERY SLOW	MEDIUM
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.	SLIGHT TO MEDIUM	SLOW	SLIGHT
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.	SLIGHT TO MEDIUM	SLOW TO NONE	SLIGHT TO MEDIUM
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.	HIGH TO VERY HIGH	NONE	HIGH
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.	MEDIUM TO HIGH	NONE TO VERY SLOW	SLIGHT TO MEDIUM
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS.	READILY IDENTIFIED BY COLOR, ODOR, SPONGY FEEL AND FREQUENTLY BY FIBROUS TEXTURE.		

BOUNDARY CLASSIFICATIONS: SOILS POSSESSING CHARACTERISTICS OF TWO GROUPS ARE DESIGNATED BY COMBINATIONS OF GROUP SYMBOLS, I.E.: SP-SC POORLY GRADED SAND WITH CLAY BINDER.

LABORATORY CLASSIFICATION CRITERIA



REQUIREMENTS FOR GW

$C_u = \frac{D_{60}}{D_{10}}$ GREATER THAN 4

$C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ BETWEEN 1 AND 3

REQUIREMENTS FOR SW

$C_u = \frac{D_{60}}{D_{10}}$ GREATER THAN 6

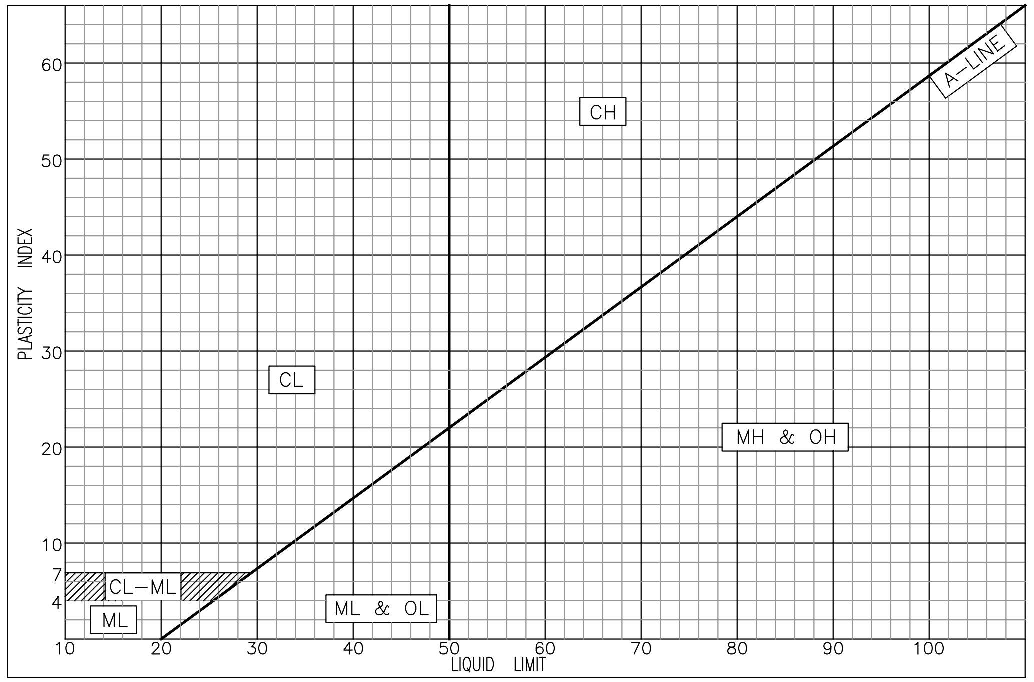
$C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ BETWEEN 1 AND 3

GRAIN SIZE PLOT

COBBLE 3-12 "
BOULDER > 12 "

DEPENDING ON PERCENTAGE OF FINES (FRACTION SMALLER THAN NO. 200 SIEVE SIZE) COARSE GRAINED SOILS ARE CLASSIFIED AS FOLLOWS:

LESS THAN 5%	GW, GP, SW, SP
MORE THAN 12%	GM, GC, SM, SC
5% TO 12%	BORDERLINE CASES REQUIRING USE OF DUAL SYMBOLS, I.E.: SP-SM, GP-GM.



PLASTICITY CHART FOR CLASSIFICATION OF FINE GRAINED SOILS

TERMINOLOGY USED IN MRCE SOIL DESCRIPTIONS

DEGREE OF COMPACTION FOR NON-PLASTIC SOIL	
DEGREE OF COMPACTION	BLOWS* PER FOOT
LOOSE	0 TO 10
MEDIUM COMPACT	11 TO 29
COMPACT	30 TO 50
VERY COMPACT	GREATER THAN 50

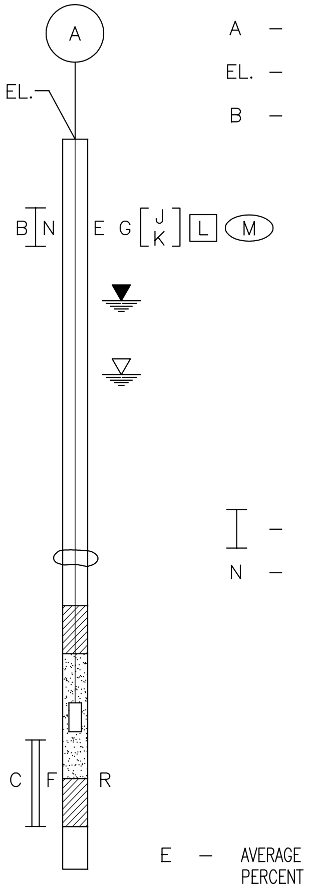
* STANDARD PENETRATION RESISTANCE USING 140 LB. HAMMER FREE FALLING 30 INCHES TO DRIVE A 2 INCH O.D. SPLIT-SPOON SAMPLER.

CONSISTENCY OF CLAY AND CLAYEY SILT +		
CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TSF)	IDENTIFICATION CHARACTERISTICS
SOFT	LESS THAN 0.5	EASILY REMOLDED WITH SLIGHT FINGER PRESSURE
MEDIUM	0.5 TO 1.0	REQUIRES SUBSTANTIAL PRESSURE FOR REMOLDING
STIFF	1.0 TO 4.0	DIFFICULT TO REMOLD WITH FINGERS
HARD	GREATER THAN 4.0	CANNOT BE REMOLDED WITH FINGERS

\+ NONPLASTIC SILTS ARE DESCRIBED USING DEGREE OF COMPACTION AS PRESENTED FOR NON-PLASTIC SOIL.

DESCRIPTION OF CONSTITUENT PERCENTAGES AS USED IN SOIL SAMPLE CLASSIFICATIONS	
1% TO 12%	"TRACE"
13% TO 30%	"SOME"
31% TO 49%	ADJECTIVE FORM OF SOIL GROUP (EG. SANDY)
EQUAL AMOUNT	"AND" (EG. SAND AND GRAVEL)

BORING LEGEND



A — NUMBER, TYPE AND LOCATION OF BORING
EL. — GROUND SURFACE ELEVATION AT BORING
B — NUMBER AND TYPE OF SAMPLE
- D — DRY SAMPLE TAKEN WITH 2 INCH O.D. SPLIT SPOON
- U — UNDISTURBED SAMPLE TAKEN WITH 3 INCH O.D. FIXED PISTON TYPE SAMPLER
- UD — UNDISTURBED SAMPLE EXTRUDED IN FIELD AND PLACED IN JAR DUE TO POOR RECOVERY OR DISTURBANCE
- S — THIN TUBE SAMPLE TAKEN WITH SHELBY TUBE SAMPLER
- W — WASH SAMPLE
- NR — NO RECOVERY

I — LENGTH OF SAMPLE ATTEMPT
N — STANDARD PENETRATION RESISTANCE. NUMBER OF BLOWS FROM 140 LB. HAMMER FREE FALLING 30 INCHES REQUIRED TO DRIVE 2 INCH O.D. SPLIT SPOON SAMPLER ONE FOOT AFTER INITIAL PENETRATION OF 6 INCHES, UNLESS A SPECIFIC PENETRATION IS INDICATED.
- P — PRESSED OR PUSH SAMPLE
- WH — SAMPLE TAKEN UNDER WEIGHT OF HAMMER AND RODS
- WR — SAMPLE TAKEN UNDER WEIGHT OF RODS

E — AVERAGE NATURAL WATER CONTENT OF SAMPLE, IN PERCENT OF DRY WEIGHT
G — UNIFIED SOIL CLASSIFICATON GROUP SYMBOL OF SAMPLE
[J] = ATTERBERG LIQUID LIMIT VALUE
[K] = ATTERBERG PLASTIC LIMIT VALUE
L — COMPRESSIVE STRENGTH IN TSF DETERMINED FROM UNCONFINED COMPRESSION TEST
M — COMPRESSIVE STRENGTH IN TSF DETERMINED FROM UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST
▼ — GROUNDWATER LEVEL OBSERVED IN BORING ∗ - MUD LEVEL
▽ — GROUNDWATER LEVEL OBSERVED IN PIEZOMETER
C — ROCK CORE NUMBER
‖ — LENGTH OF CORE RUN
F — LENGTH OF CORE RECOVERED EXPRESSED AS A PERCENT OF THE LENGTH OF CORE RUN
R — ROCK QUALITY DESIGNATION-THE SUM OF THE LENGTHS OF PIECES OF RECOVERED CORE WHICH ARE EQUAL TO OR GREATER THAN FOUR INCHES IN LENGTH, EXPRESSED AS A PERCENTAGE OF THE TOTAL LENGTH OF CORE RUN. LENGTHS ARE MEASURED BETWEEN IN-SITU SEPARATIONS AND MECHANICAL BREAKS RESULTING FROM CORING ARE IGNORED.
▨ IMPERVIOUS SEAL
░ SAND FILTER SURROUNDING PIEZOMETER INTAKE ELEMENT
▯ INTAKE ELEMENT
⬭ COBBLE OR BOULDER

MUESER RUTLEDGE CONSULTING ENGINEERS
225 WEST 34th STREET - 14 PENN PLAZA
NEW YORK, NY 10122

GEOTECHNICAL REFERENCE STANDARDS
DRAWING NO. GS-R

TABLE R–1 ROCK CORE CLASSIFICATION CRITERIA

HARDNESS/SOUNDNESS CLASSIFICATION	TYPICAL GEOLOGIC CLASSIFICATION	IDENTIFICATION CHARACTERISTICS	GENERAL MINIMUM CORING CHARACTERISTICS				INTACT SPECIMEN TYPICAL MINIMUM COMPRESSIVE STRENGTH
			NX OR LARGER		BX OR SMALLER		
			REC	RQD	REC	RQD	PSI
HARD ROCK UNWEATHERED MAY BE JOINTED	–CRYSTALLINE IGNEOUS, OR METAMORPHIC ROCKS –HIGHLY SILICEOUS SEDIMENTARY ROCKS	– UNWEATHERED FABRIC – RINGS WHEN STRUCK WITH BAR – SHARP AND HARD FRACTURE SURFACE WHEN BROKEN MECHANICALLY – MAY BE JOINTED, BUT JOINTS ARE GENERALLY TIGHT. JOINTS MAY BE IRON STAINED. – DOES NOT DISINTEGRATE UPON EXPOSURE – DOES NOT SLAKE IN WATER	95 OR MORE	85 OR MORE	85 OR MORE	75 OR MORE	3000
MEDIUM HARD ROCK SLIGHTLY WEATHERED MAY BE CLOSELY JOINTED	AS FOR HARD ROCKS AND: – MODERATELY SILICEOUS SEDIMENTARY ROCKS – CERTAIN CALCAREOUS ROCKS	AS FOR HARD ROCK, EXCEPT: – FABRIC MAY BE IRON STAINED – MAY BE CLOSELY JOINTED, BUT JOINTS ARE GENERALLY TIGHT. JOINTS HAVE SLIGHT WEATHERING OR MAY BE IRON STAINED.	70	50	50	40	1500
INTERMEDIATE ROCK MODERATELY WEATHERED MAY BE CLOSELY JOINTED	AS FOR MEDIUM HARD ROCKS AND: – MOST SEDIMENTARY ROCKS OTHER THAN COMPACTION SHALES – MOST CALCAREOUS ROCKS WHICH ARE NOT POROUS	AS FOR MEDIUM HARD ROCK, EXCEPT: – MODERATELY WEATHERED FABRIC – WEATHERED JOINTS – THUDS WHEN STRUCK BY BAR – CAN BE INDENTED WITH A STEEL NAIL – BREAKS READILY WITH HAMMER – PIECES OF WEATHERED SURFACE CAN BE BROKEN OFF BY HAND – DOES NOT DISINTEGRATE UPON EXPOSURE – UNWEATHERED PIECES DO NOT SLAKE	50	35	35	25	500
WEATHERED ROCK HIGHLY WEATHERED MAY BE BROKEN	AS FOR INTERMEDIATE ROCKS AND: – COMPACTION SEDIMENTARIES – CALCAREOUS ROCKS WITH SOIL–FILLED CAVITIES	AS FOR INTERMEDIATE ROCK, EXCEPT: – HIGHLY WEATHERED FABRIC – CAN BE BROKEN EASILY, CRUMBLES WITH DIFFICULTY BY HAND – CAN BE SCRAPED BY KNIFE – MAY SOFTEN UPON EXPOSURE – MAY SLAKE IN WATER – STANDARD PENETRATION RESISTANCE EXCEEDS 50 BLOWS/FOOT	LESS THAN 50	LESS THAN 35	LESS THAN 35	LESS THAN 25	150
			WHEN RECOVERED WITH SOIL SAMPLING TECHNIQUES, DESCRIBED AS FOR SOILS INCLUDING USC GROUP SYMBOLS. (WTHD ROCK) ADDED TO DESCRIPTION.				
DECOMPOSED ROCK (RESIDUAL SOILS)	ALL ROCK TYPES	– ROCK TEXTURE AND STRUCTURE OFTEN PRESERVED – GENERALLY SOIL–LIKE IN CONSISTENCY – CAN BE CRUMPLED BY SLIGHT HAND PRESSURE – CAN BE PEELED WITH A KNIFE – STANDARD PENETRATION RESISTANCE LESS THAN 50 BLOWS/FOOT	GENERALLY RECOVERED WITH SOIL SAMPLING TECHNIQUES AND DESCRIBED AS FOR SOILS INCLUDING USC GROUP SYMBOLS. (DEC ROCK) ADDED TO DESCRIPTION.				

TABLE R–2 WEATHERING AND JOINTING DEFINITIONS

DEGREE OF FABRIC WEATHERING

FABRIC WEATHERING		CHARACTERISTIC
Unweathered	UnW	No decomposition or discoloration rings when struck
Slightly Weathered	SlW	Iron Stained Rings when struck
Moderately Weathered	MdW	Deteriorated fabric Thuds when struck
Highly Weathered	HiW	Friable, easily broken by hand
Decomposed	Dec	Soil–like

DEGREE OF JOINT WEATHERING

JOINT WEATHERING		CHARACTERISTIC
Iron stained joints	FeJtS	Indicates movement of water along joints
Weathered joints	WJts	Joints are not tight and do not match. Joints have friable edges.

DEGREE OF JOINTING

JOINTING		JOINT FREQUENCY
Massive	Mssv	Less than 1 joint in 4 feet
Blocky	Blky	1 joint every 2 to 4 feet
Moderately Jointed	MdJtd	1 joint every foot to 2 feet
Jointed	Jtd	1 to 2 joints per foot
Closely Jointed	ClJtd	2 to 4 joints per foot
Broken	Bkn	More than 4 joints per foot

Vertical joints are ignored in RQD and joint frequency evaluations, but are noted in written descriptions and and on core sketches.

TABLE R–3 ABBREVIATIONS FOR ROCK CORE CLASSIFICATION

Blocky	Blky	Intermediate	Int
Broken	Bkn	Light	Lt
Brown	brn	Lignite	lign
Calcareous or Calcite	calc	Limestone	lms
Cavities	cvts	Jointed	Jtd
Chlorite	chl	Joints	Jts
Clay, Clayey	cl	Massive	Mssv
Closely Jointed	ClJtd	Medium Hard	MdHd
Coating on joint surface	coat	Mica, Micaceous	Mic
Crushed	crsh	Moderately Jointed	MdJtd
Dark	dk	Moderately Weathered	MdW
Decomposed	Dec	Pockets	pkts
Ditto	do	Quartz	qtz
Dolomite, Dolomitic	Dol	Recovery	Rec
Iron stained Joints	FeJts	Rock Quality Designation	RQD
Iron Stained	FeStn	Sand	sa
Feldspar	feld	Sandstone	ss
Foliation	Fol	Schist, Schistose	sch
Fractured	frct	Shale	sh
Fragments	fgmts	Shear zone	Sz
Gneiss, Gneissic	gns	Siliceous	sil
Gouge	gog	Silt	si
Granite, Granitic	gr	Slickensided	slks
Gray	gry	Slightly Weathered	SlW
Hard	Hd	Unweathered	UnW
Highly Weathered	HiW	Weathered	Wthd
Hornblende	Hbl	Weathered Joints	WJts
Injected	inj	Vein	Vn
Interbedded	Intrbd	Vertical Joints	VJts

NOTES:

1. ROCK CORE DESCRIPTIONS REPRESENT ONLY THE MATERIAL RECOVERED IN THE CORING OPERATIONS.
2. GENERAL MINIMUM CORING CHARACTERISTICS ASSUME ROCK CORING WITH A DOUBLE TUBE SERIES "M" OR EQUIVALENT CORE BARREL USING GOOD CORING TECHNIQUES AND EQUIPMENT.
3. REC – RECOVERY IS THE LENGTH OF CORE RECOVERED, EXPRESSED AS A PERCENTAGE OF THE LENGTH OF CORE RUN.
4. RQD – ROCK QUALITY DESIGNATION IS THE SUM OF THE LENGTHS OF CORE PIECES FOUR INCHES OR LONGER EXPRESSED AS A PERCENTAGE OF THE TOTAL LENGTH OF CORE RUN. LENGTHS ARE MEASURED BETWEEN IN–STU SEPARATIONS; MECHANICAL BREAKS RESULTING FROM CORING AND VERTICAL JOINTS ARE IGNORED.

TABLE R–4 ROCK CORE SKETCH KEY

SKETCH SYMBOLS

⧄	Joint
⧄	Healed Joint
▩	Broken
◨	Part of Core Not Recovered
▣	Cavities or Vugs in Core
▤	Clay
▒	Sand

JOINT ORIENTATION AND CONDITION

Parallel	–	//	
Crossing	–	X	
Foliation	–	F	
Stratification	–	S	
Unfoliated or Unstratified	–	U	
Mechanical Break	–	MB	

SURFACE		–	CONDITION		
Curved	– C		Slick	–	1
Irregular	– I		Smooth	–	2
Straight	– S		Rough	–	3

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225 WEST 34th STREET – 14 PENN PLAZA
NEW YORK, NY 10122

ROCK CORE CLASSIFICATION CRITERIA

DRAWING NO.
RC–1

APPENDIX A

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. M-1
SHEET 1 OF 8
FILE NO. 12087
SURFACE ELEV. +60.5±
RES. ENGR. ALEXANDRA PATRONE

PROJECT: 105-113 WEST 57TH STREET TOWER
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	**SAMPLE DESCRIPTION**	STRATA	DEPTH	CASING BLOWS	**REMARKS**
08:30	1D	0.0	2-14	Brown fine to coarse sand, some gravel, trace			DRILLED	
12-23-13		2.0	12-6	brick, clay pockets, silt (Fill) (SP-SM)			AHEAD	
Monday							4"	
Rain								
60°F					**F**	**5**		
	2D	5.0	14-7	Brown red fine to coarse sand, some gravel,				REC=4"
		7.0	7-5	brick, silt (Fill) (SM)				
						9		
						10		
	3D	10.0	7-7	Gray brown fine to coarse sand, some gravel,				
		12.0	6-7	silt, trace bricks (Fill) (SM)				
						15		
	4D	15.0	5-7	Dark gray gravelly coarse to fine sand, some	**F**			
		17.0	6-4	silt, trace brick (Fill) (SM)				
						20		
	5D	20.0	2-2	Gray red coarse to fine sand, some gravel,				REC=4"
		22.0	2-4	brick, trace silt (Fill) (GP-GM)				Easy drilling from 23'
						23		to 23.2'.
	6NR	23.0	50/0"	No recovery	**WR**			Roller bit to 23.5'.
	1C	24.0	REC=100%	Top 1.7': Hard unweathered to slightly weathered		**24.5**	8*	Casing refusal at 24'.
		29.1	RQD=83%	pink & gray pegmatite, jointed			4*	
				Bot 3.4': Hard unweathered to slightly weathered			6*	White return/white
				gray schistose gneiss, moderately jointed to			7*	gravel in return at
				blocky			8*	24.5'.
	2C	29.1	REC-92%	Hard unweathered to slightly weathered gray		**30**	7*	*Coring time in
		34.1	RQD=92%	schistose gneiss, moderately jointed			7*	minutes per foot.
							7*	
							4*	
							8*	
	3C	34.1	REC=100%	Hard unweathered gray schistose gneiss,		**35**	6*	
		39.1	RQD=100%	massive			8*	
							7*	
							6*	
13:30					**R**		6*	
07:55	4C	39.1	REC=100%	Hard slightly weathered gray schistose gneiss,		**40**	4*	1' Left in bottom of
12-24-13		44.1	RQD=96%	blocky to massive			3*	hole, confirmed by
Tuesday							3*	dropping tape.
Overcast							3*	
40°F							3*	
	5C	44.1	REC=100%	Hard unweathered to slightly weathered gray		**45**	5*	
		48.1	RQD=100%	schistose gneiss, massive			5*	
							5*	
							5*	
	6C	48.1	REC=100%	Do 5C			4*	1.3' Left in bottom of
		50.8	RQD=100%			**50**	4*	hole, confirmed by
	7C	50.8	REC=100%	Do 5C			5*	dropping tape.
		54.8	RQD=95%					

MRCE Form BL-1

BORING NO. M-1

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. M-1
SHEET 2 OF 8
FILE NO. 12087
SURFACE ELEV. +60.5±
RES. ENGR. ALEXANDRA PATRONE

PROJECT: 105-113 WEST 57TH STREET TOWER
LOCATION: NEW YORK, NEW YORK

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	**SAMPLE DESCRIPTION**	STRATA	DEPTH	CASING BLOWS	**REMARKS**
Cont'd							4*	7C: Core barrel
12-24-13							4*	advances 4', recover
Tuesday							4*	2.75', left 1.3' in hole,
Overcast							4*	confirmed with tape.
40°F	8C	54.8	REC=100%	Do 5C		**55**	5*	Bottom 1.3' left in
		57.6	RQD=100%				4*	hole recover with Run
							3*	9C.
	9C	57.6	REC=97%	Do 5C			6*	
		60.9	RQD=97%				5*	
						60	4*	
	10C	60.9	REC=100%	Hard unweathered gray gneiss, blocky to			4*	
		66.1	RQD=100%	massive			4*	
							4*	
					R		3*	
						65	5*	
							4*	
	11C	66.1	REC=100%	Do 5C			7*	
		70.9	RQD=100%				4*	
							6*	
						70	4*	
	12C	70.9	REC=100%	Do 5C			8*	
		76.2	RQD=100%				6*	
							7*	
							6*	
						75	5*	
							4*	
13:15						**76.2**		End of Boring at 76.2'.
						80		
						85		
						90		
						95		
						100		

MUESER RUTLEDGE CONSULTING ENGINEERS

ROCK CORE SKETCH

BORING NO. M-1
SHEET 3 OF 8
FILE NO. 12087
SURFACE ELEVATION +60.5 ±
RESIDENT ENGINEER A PATRONE

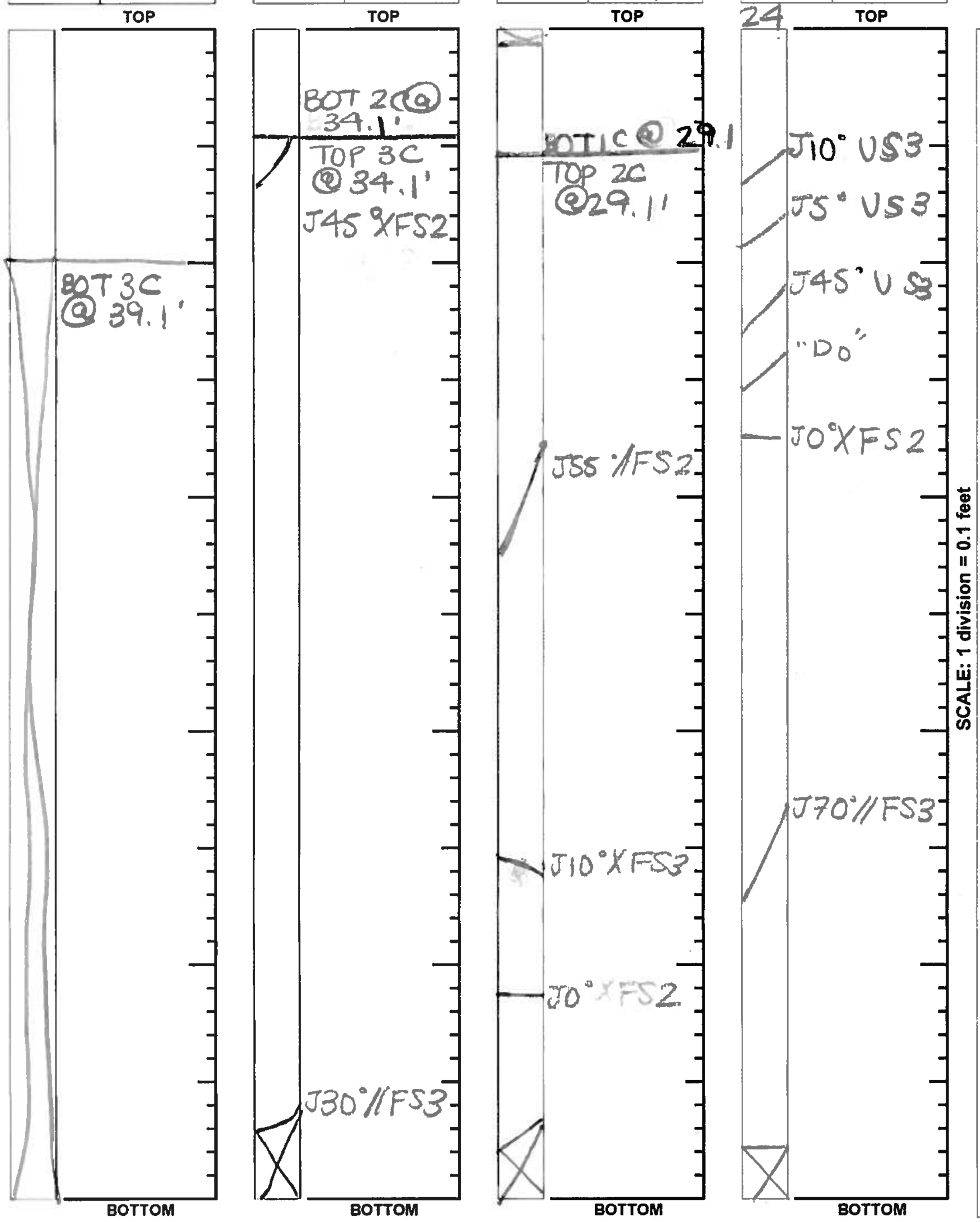
PROJECT: W 57th ST
LOCATION: NEW YORK, NY

Run No.	REC/RQD
3C	100/100

Run No.	REC/RQD
2C	92/92
3C	100/100

Run No.	REC/RQD
1C	100/83
2C	92/92

Run No.	REC/RQD
1C	100 83



ROCK CORE SKETCH
LEGEND

JOINTING
J - Joint
MB - Mechanical Break
∡ - Angle w/ Horizontal
// - Parallel
X - Crossing
F - Foliation
S - Stratification
U - Unfoliated or Unstratified

JOINT SURFACE
C - Curved
I - Irregular
S - Straight

JOINT CONDITION
1 - Slick
2 - Smooth
3 - Rough

SKETCH SYMBOLS
◿ Joint
▧ Healed Joint
▩ Broken
▨ Part of Core Not Recovered
◌ Cavities or Vugs in Core
▤ Clay
░ Sand
☒ Empty Space

NOTES

MUESER RUTLEDGE CONSULTING ENGINEERS

ROCK CORE SKETCH

BORING NO. H-1
SHEET 4 OF 8
FILE NO. 12087
SURFACE ELEVATION +60.5+/-
RESIDENT ENGINEER A PATRONE

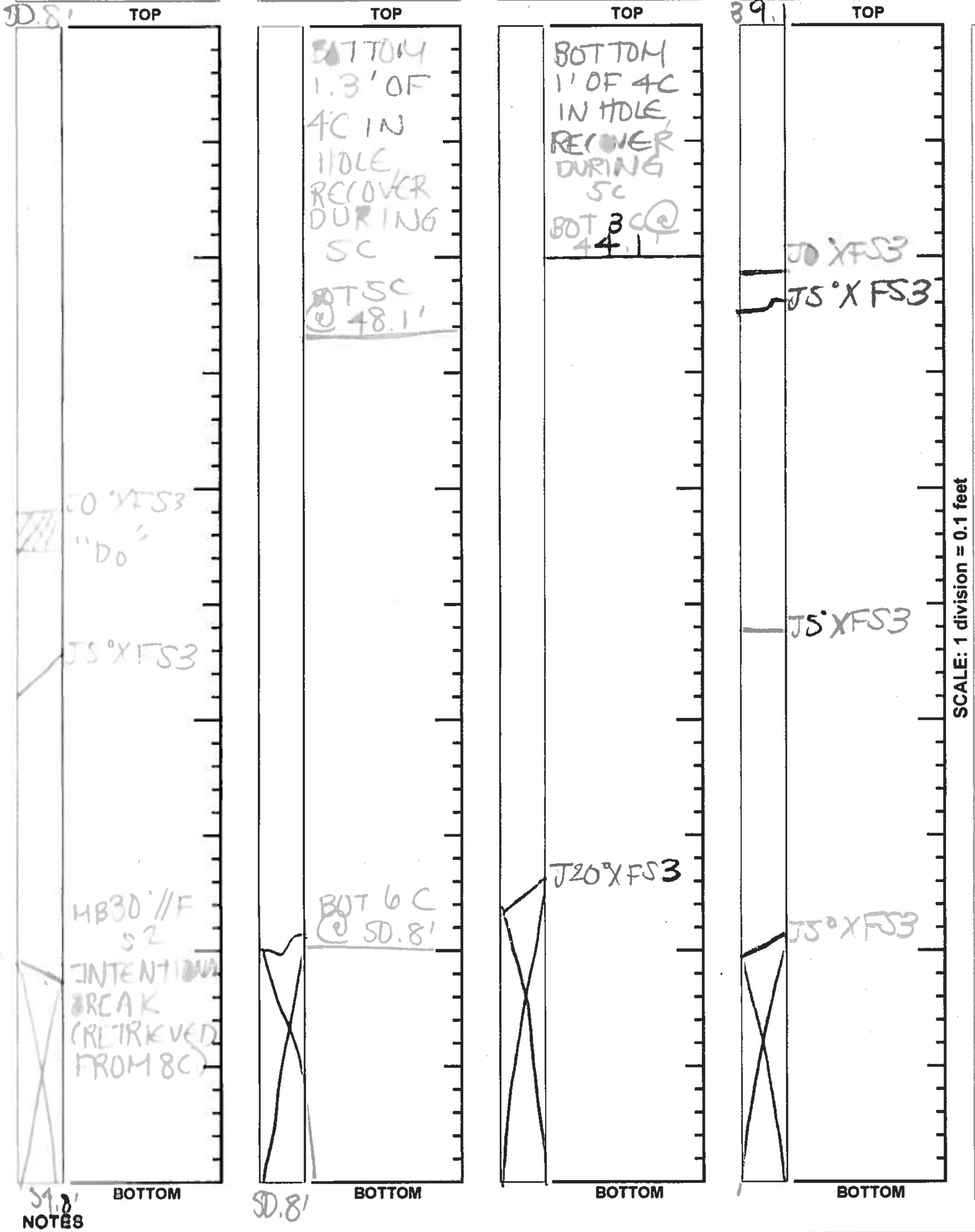
PROJECT: W 57th ST
LOCATION: NEW YORK, NY

Run No.	REC/RQD
7C	100/95

Run No.	REC/RQD
5C	100/100
6C	100/100

Run No.	REC/RQD
4C	100/96
5C	100/100

Run No.	REC/RQD
4C	100/96



ROCK CORE SKETCH
LEGEND

JOINTING
J - Joint
MB - Mechanical Break
∡ - Angle w/ Horizontal
// - Parallel
X - Crossing
F - Foliation
S - Stratification
U - Unfoliated or Unstratified

JOINT SURFACE
C - Curved
I - Irregular
S - Straight

JOINT CONDITION
1 - Slick
2 - Smooth
3 - Rough

SKETCH SYMBOLS
◿ Joint
▧ Healed Joint
▩ Broken
▨ Part of Core Not Recovered
○ Cavities or Vugs in Core
▤ Clay
░ Sand
☒ Empty Space

NOTES

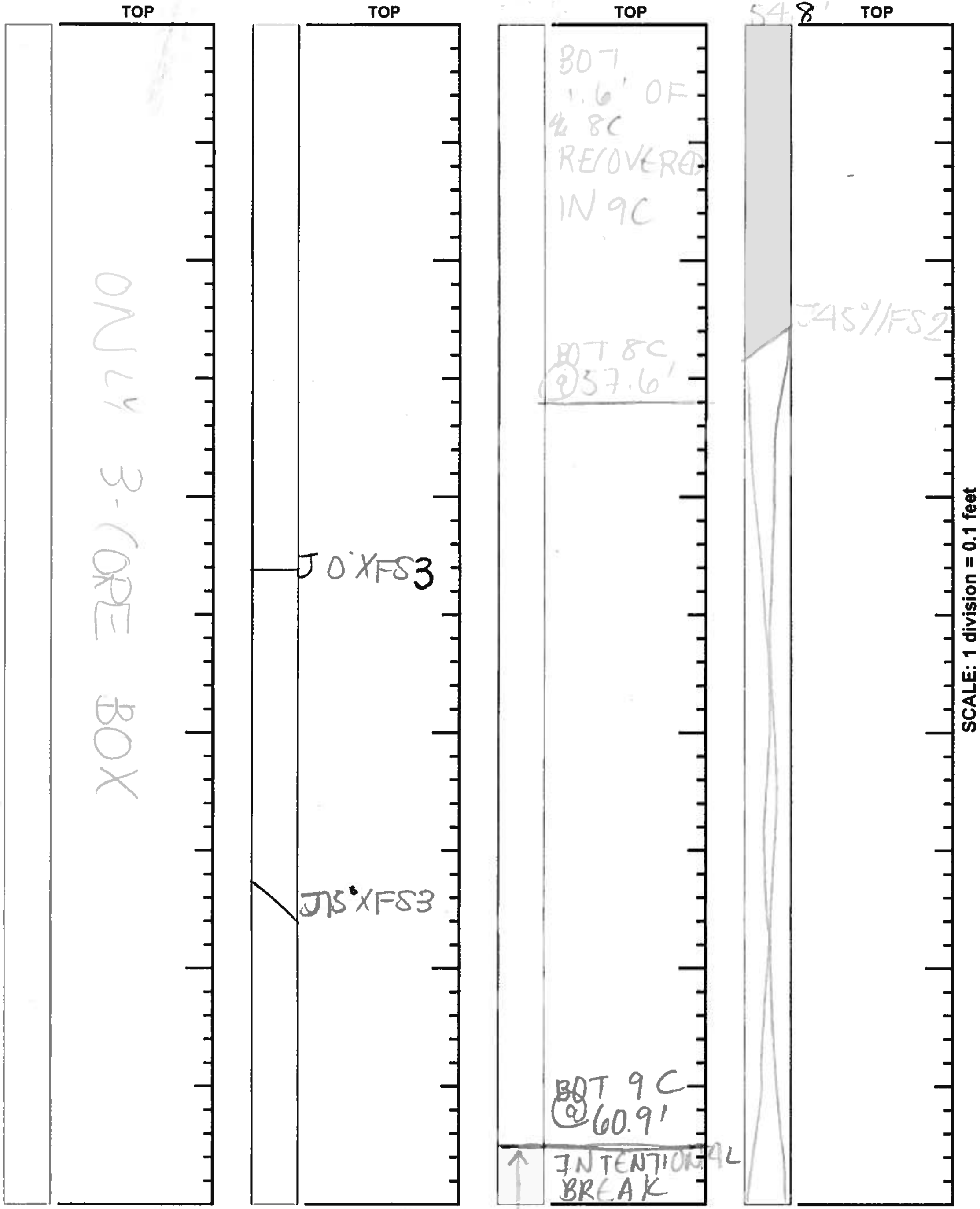
MUESER RUTLEDGE CONSULTING ENGINEERS

ROCK CORE SKETCH

BORING NO. M-1
SHEET 5 OF 8
FILE NO. 12087
SURFACE ELEVATION +60.5 +/-
RESIDENT ENGINEER A PATRONE

PROJECT: W. 57th ST
LOCATION: NEW YORK NY

Run No.	REC/RQD	Run No	REC/RQD	Run No.	REC/RQD	Run No.	REC/RQD
		10C	100/100	8C	100/100	8C	100/100
				9C	97/97		



66.1

ROCK CORE SKETCH
LEGEND

JOINTING
J - Joint
MB - Mechanical Break
∡ - Angle w/ Horizontal
// - Parallel
X - Crossing
F - Foliation
S - Stratification
U - Unfoliated or Unstratified

JOINT SURFACE
C - Curved
I - Irregular
S - Straight

JOINT CONDITION
1 - Slick
2 - Smooth
3 - Rough

SKETCH SYMBOLS
◿ Joint
⧅ Healed Joint
▩ Broken
▨ Part of Core Not Recovered
⬭ Cavities or Vugs in Core
▤ Clay
░ Sand
☒ Empty Space

NOTES TOP 10C @ 100.9 -1.6
(J0°//FS2)

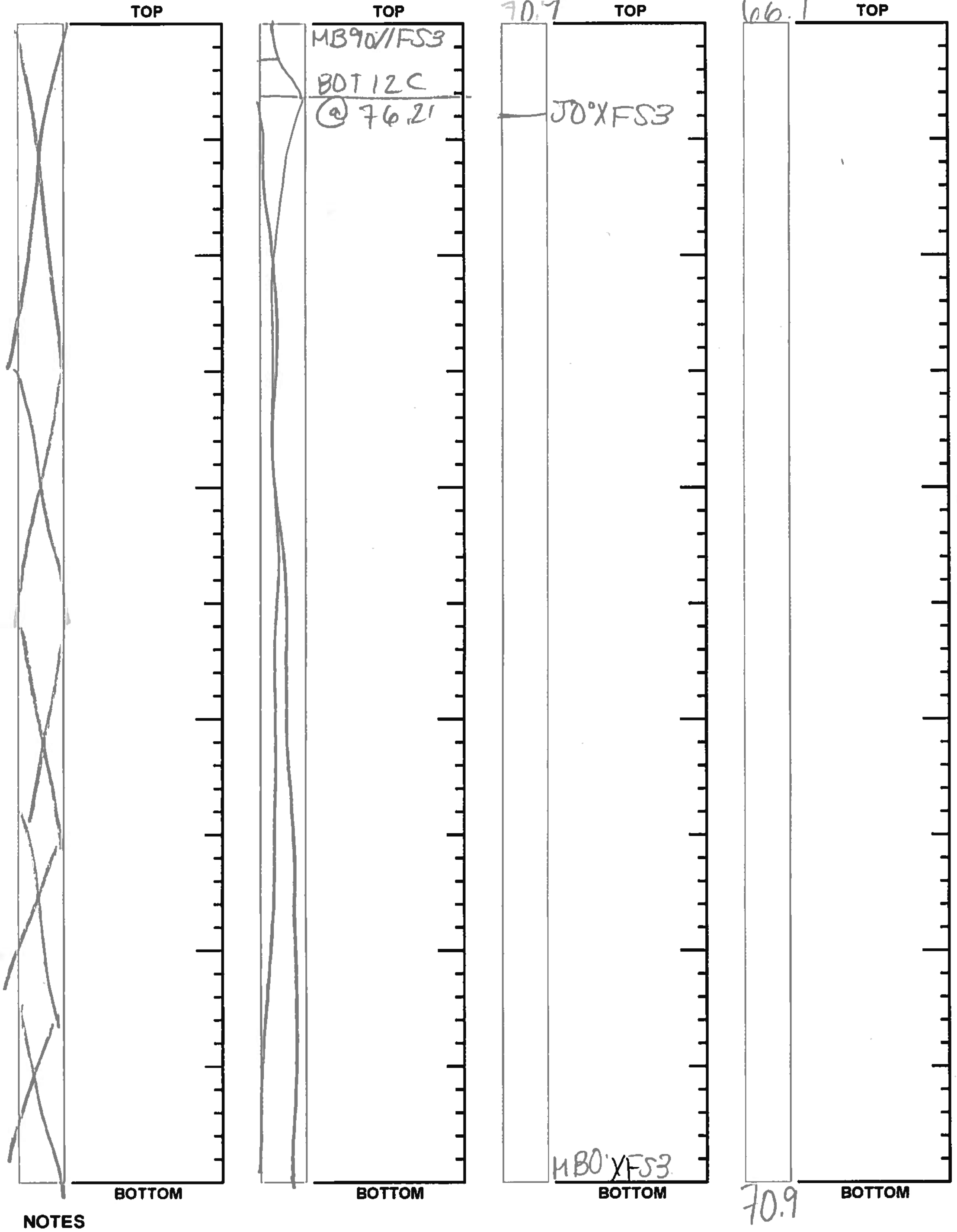
MUESER RUTLEDGE CONSULTING ENGINEERS

ROCK CORE SKETCH

BORING NO. M-1
SHEET 6 OF 8
FILE NO. 12087
SURFACE ELEVATION +60.5+/-
RESIDENT ENGINEER A PATRONE

PROJECT: W. 57th ST
LOCATION: NEW YORK, NY

Run No.	REC/RQD	Run No.	REC/RQD	Run No.	REC/RQD	Run No.	REC/RQD
		12C	100/100	12C	100/100	11C	100/100



ROCK CORE SKETCH LEGEND

JOINTING
J - Joint
MB - Mechanical Break
∡ - Angle w/ Horizontal
// - Parallel
X - Crossing
F - Foliation
S - Stratification
U - Unfoliated or Unstratified

JOINT SURFACE
C - Curved
I - Irregular
S - Straight

JOINT CONDITION
1 - Slick
2 - Smooth
3 - Rough

SKETCH SYMBOLS
⧄ Joint
▧ Healed Joint
▩ Broken
▤ Part of Core Not Recovered
○ Cavities or Vugs in Core
☰ Clay
⁘ Sand
☒ Empty Space

NOTES

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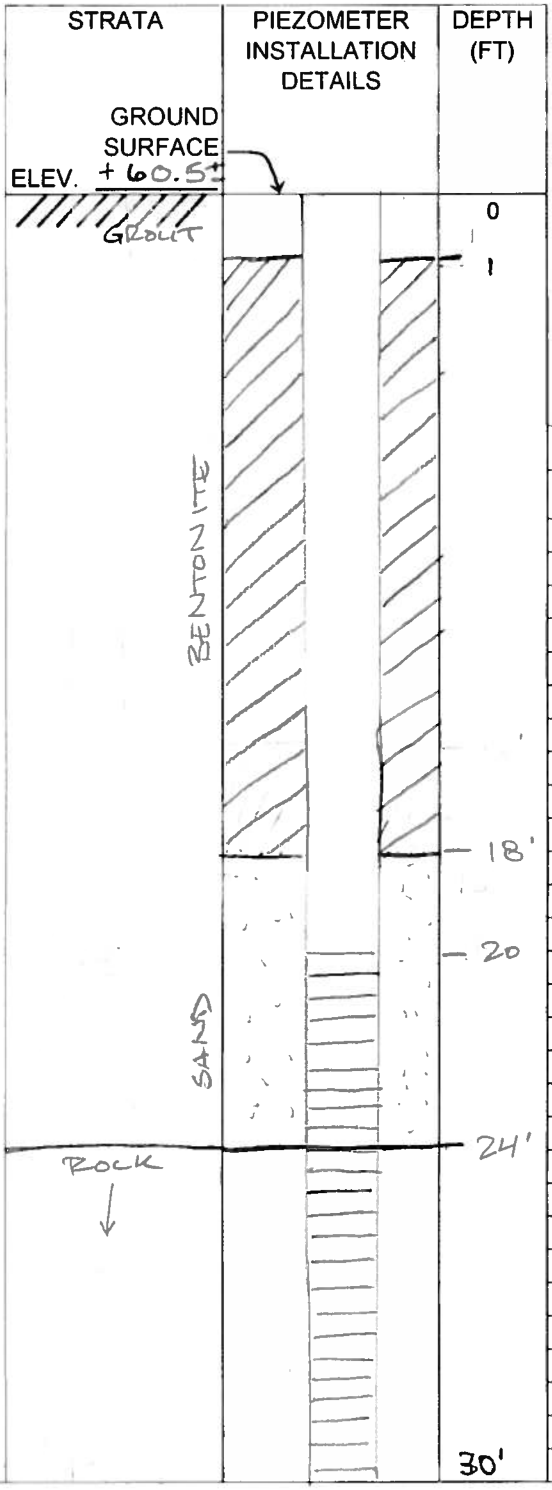
14 Penn Plaza - 225 W. 34th St.
New York, NY 10122

SHEET 7 OF 8
FILE NO. 12087
SUBCODE

PIEZOMETER RECORD

PROJECT: W. 57th ST.
LOCATION: NEW YORK, NY
PIEZOMETER LOCATION: SEE BLP
☐ SEE SKETCH ON BACK

PIEZOMETER NO. M-1
DATE OF INSTALLATION 12/30/13
RESIDENT ENG. E. PHELPS



PIEZOMETER TYPE 2" SLOTTED PVC

INTAKE POINT
depth to bottom, ft = 30
depth to top, ft = 18
length, ft = 12 = L
diameter, in = 4 , ft = 0.333 = 2R

STANDPIPE/RISER
elevation of rim, ft = + 60.5+/-
diameter, in = 2 , ft = 0.167 = 2r

READING TIME		DEPTH – RIM TO WATER	ELEVATION OF WATER	REMARKS
DATE	CLOCK			
12/31/13	0715	19.3	+41.2+/-	OVER NIGHT
12/31/13	0725	22.9	+36.1+/-	B-1 (LANGAN 2013)
12/31/13	1400	19.3	+41.2+/-	
1/6/14	07 30	19.5	+41+/-	
1/6/14	0758	21.8	+37.2+/-	B-1
1/6/14	0945	19.5	+41.0+/-	BEFORE T
1/6/14	0955	18.5	+42.0+/-	AFTER ATTEMP
				TO FILL FOR
				FIIT.
1/6/14	10:00	20.0	+39.0+/-	B-1
12/30/13	07 45	29.1	+31.4+/-	
12/30/13	07 30	23.4	+35.6+/-	B-1

⋰⋰ SAND
△▽ GRAVEL
○○ BENTONITE
▨ GROUT

GROUND SURFACE ELEV. 00
PIEZOMETER NO. M 1

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. M-1
SHEET 8 **OF** 8
PROJECT 105-113 WEST 57TH STREET TOWER
FILE NO. 12087
LOCATION NEW YORK, NEW YORK
SURFACE ELEV. +60.5±
BORING LOCATION SEE BORING LOCATION PLAN
DATUM BPMD

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED		☒ YES	☐ NO		
TRUCK	X	MECHANICAL		DIA., IN.	4	DEPTH, FT. FROM	0	TO	24.5
SKID		HYDRAULIC	X	DIA., IN.		DEPTH, FT. FROM		TO	
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM		TO	
OTHER									

TYPE AND SIZE OF:

D-SAMPLER 2" O. D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL NX DOUBLE BARREL
CORE BIT NX DIAMOND BIT
DRILL RODS NWJ

DRILLING MUD USED ☐ YES ☒ NO
DIAMETER OF ROTARY BIT, IN. 2-7/8, 3-7/8
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☒ NO
TYPE AND DIAMETER, IN.

*CASING HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*USED AUTOMATIC HAMMER.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
12-24-13	07:50	39.1	24.5	29.1	OVERNIGHT WATER LEVEL READING.
12-30-13	07:45	76.2	24.5	19.1	OVER WEEKEND, BEFORE PIEZOMETER INSTALLED.
12-31-13	14:00	76.2	24.5	19.3	
01-06-14	07:30	76.2	24.5	19.5	OVER WEEKEND (PIEZOMETER).
01-06-14	09:45	76.2	24.5	19.5	BEFORE FALLING HEAD TEST.
01-06-14	09:55	76.2	24.5	18.5	AFTER ATTEMPTING TO FILL WITH WATER.

PIEZOMETER INSTALLED ☒ YES ☐ NO SKETCH SHOWN ON SEE SHEET NO. 8

STANDPIPE:	TYPE	OPEN 2"	ID, IN.	1-3/4	LENGTH, FT.	20	TOP ELEV.	+60.5±
INTAKE ELEMENT:	TYPE	2" SLOTTED	OD, IN.	2	LENGTH, FT.	10	TIP ELEV.	+42.5±
FILTER:	MATERIAL	SAND	OD, IN.	4	LENGTH, FT.	12	BOT. ELEV.	+30.5±

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	24	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.	51.7	OTHER:	

BORING CONTRACTOR JERSEY BORING & DRILLING CO., INC.
DRILLER MANUEL CARIRE HELPERS MIGUEL TRABAL
REMARKS PIEZOMETER INSTALLED.
RESIDENT ENGINEER ALEXANDRA PATRONE DATE 12-31-13
CLASSIFICATION CHECK: FABIAN WEBB TYPING CHECK: ALEXANDRA PATRONE

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. M-2
SHEET 1 OF 6
PROJECT: 105-113 WEST 57TH STREET TOWER
FILE NO. 12087
LOCATION: NEW YORK, NEW YORK
SURFACE ELEV. +61±
RES. ENGR. E. PHELPS/A. PATRONE

DAILY PROGRESS	SAMPLE			**SAMPLE DESCRIPTION**	STRATA	DEPTH	CASING BLOWS	**REMARKS**
	NO.	DEPTH	BLOWS/6"					
09:50	1D	0.0	26-34	Gray fine to coarse sand, some gravel, trace			DRILLED	
12-30-13		2.0	20-14	silt, bricks, concrete (Fill) (SP-SM)			AHEAD	
Monday							4"	
Overcast								
35°F						**5**		
	2D	5.0	4-4	Gray brown fine to coarse sand, some gravel,				
		7.0	5-4	silt, trace bricks (Fill) (SM)				
					F	**10**		
	3D	10.0	8-10	Gray coarse to fine sandy gravel, trace bricks,				
		12.0	22-10	silt (Fill) (GP-GM)				
						15		
	4D	15.0	1-1	Black & gray coarse to fine sandy gravel, trace				REC=4"
		17.0	14-22	silt, brick (Fill) (GP-GM)				
						18.5		
					DR	**20**		
	5D	20.0	3-6	Brn & pink coarse to fine sand, some rock fgmts,				
		21.5	29-50/0"	tr silt, mica (Decomposed Rock) (SP-SM)		**21.5**	10*	
07:00	1C	21.5	REC=100%	Hard slightly weathered pink & gray pegmatite,			6*	
12-31-13		26.5	RQD=79%	jointed to closely jointed			7*	*Coring time in
Tuesday						**25**	5*	minutes per foot.
Overcast							6*	Loss of water & no
25°F	2C	26.5	REC=94%	Hard unweathered to slightly weathered pink			7*	return from 28' through
		31.8	RQD=94%	& gray pegmatite, blocky			5*	31.5'.
							5*	Difficult coring at 28.5'.
						30	6*	Water loss from 27.3'
							5*	to 34'.
	3C	31.8	REC=100%	Hard unweathered to slightly weathered pink &			4*	
		36.8	RQD=88%	gray pegmatite, jointed to moderately jointed			4*	
							7*	
						35	5*	
							4*	
	4C	36.8	REC=100%	Top 2.1': Hard unweathered to slightly weathered	**R**		7*	
		41.8	RQD=100%	pink & gray pegmatite, jointed			6*	
				Bot 2.9': Hard unweathered to slightly weathered			6*	
				gray gneiss, jointed		**40**	5*	
							5*	
	5C	41.8	REC=100%	Hard slightly weathered gray schistose gneiss,			6*	
		46.8	RQD=81%	jointed to moderately jointed			5*	
							5*	
						45	6*	
							6*	
	6C	46.8	REC=100%	Hard unweatherd to slightly weathered gray			5*	
		52.0	RQD=98%	schistose gneiss, moderately jointed			5*	
							4*	
						50	4*	
							5*	

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

BORING NO. M-2
SHEET 2 OF 6
PROJECT: 105-113 WEST 57TH STREET TOWER
FILE NO. 12087
LOCATION: NEW YORK, NEW YORK
SURFACE ELEV. +61±
RES. ENGR. E. PHELPS/A. PATRONE

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	**SAMPLE DESCRIPTION**	STRATA	DEPTH	CASING BLOWS	**REMARKS**
Cont'd								
12-31-13								
Tuesday	7C	52.0	REC=100%	Hard unweathered to slightly weathered gray				
Overcast		57.0	RQD=84%	schistose gneiss, moderately jointed to ClJtd				
25°F	8C	57.0	REC=100%	Medium hard to hard gray schistose gneiss,		**55**		8C-9C: Losing water.
07:30		62.4	RQD=84%	blocky				
01-06-14								
Monday							8*	
Rain							5*	
50°F						**60**	7*	
							9*	
					R		7/13"*	7 Minutes for 1' 3'.
	9C	62.4	REC=100%	Medium hard to hard gray schistose gneiss,			6*	
		67.4	RQD=78%	jointed to closely jointed			3*	
						65	8*	
							8*	
							8*	
	10C	67.4	REC=100%	Do 9C			10*	Top 0.3' of Run 9C
		72.4	RQD=91%				3*	recovered in Run 10C.
						70	5*	
							3*	
09:45						**72**	5*	End of Boring at 72'.
						75		
						80		
						85		
						90		
						95		
						100		

MRCE Form BL-1

BORING NO. M-2

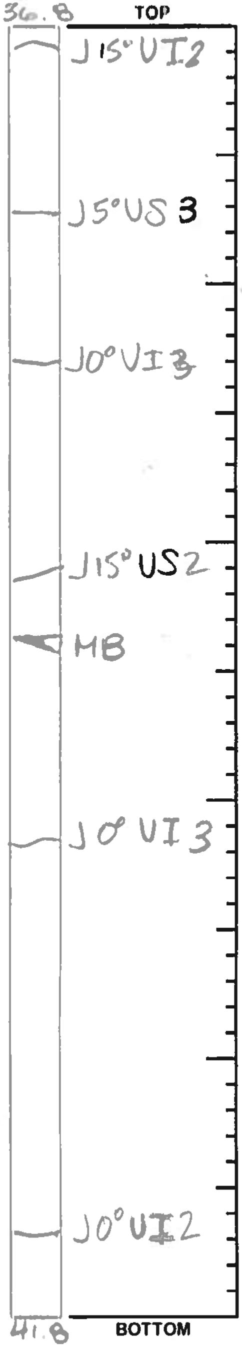
MUESER RUTLEDGE CONSULTING ENGINEERS

ROCK CORE SKETCH

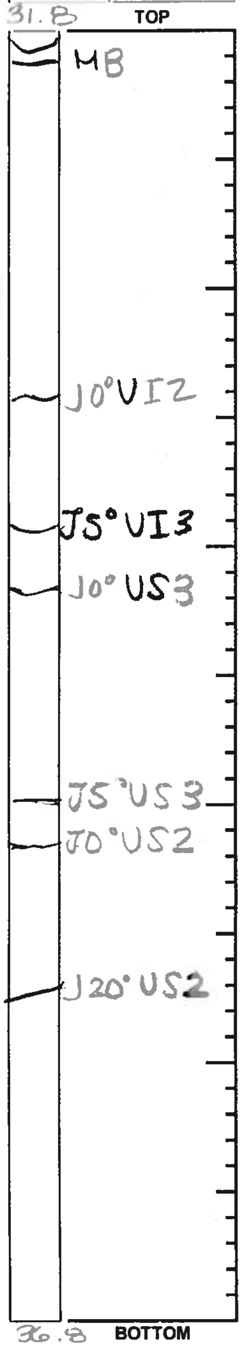
BORING NO. M-2
SHEET 3 OF 6
FILE NO. 120877
SURFACE ELEVATION + 61 ±
RESIDENT ENGINEER Emily Phillips

PROJECT: West 57th Street Tower
LOCATION: New York, NY

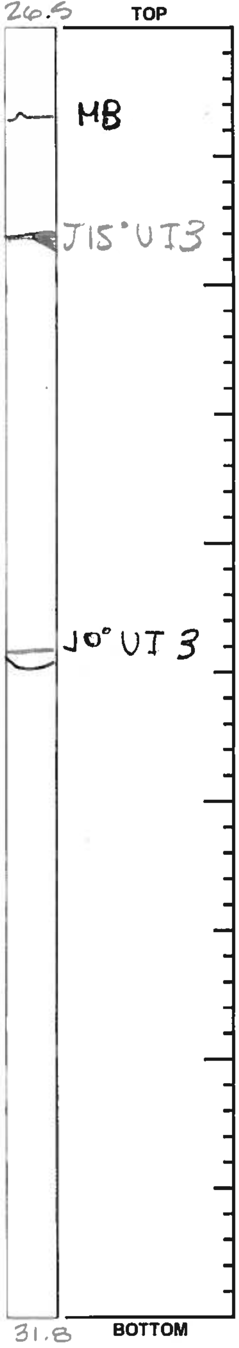
Run No.	REC/RQD
4C	REC: 100% RQD: 100%



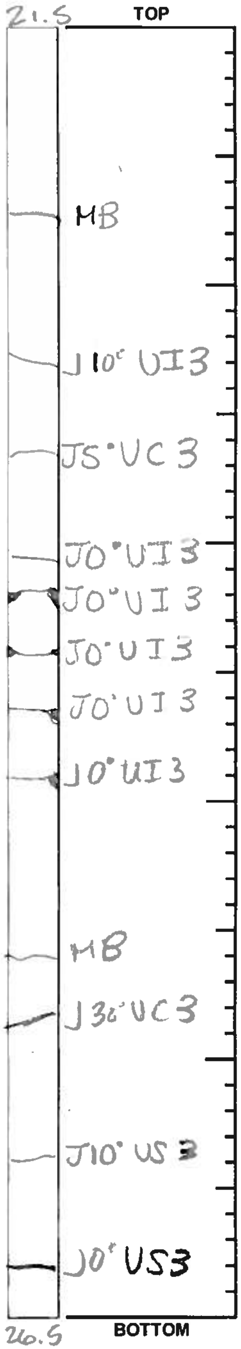
Run No.	REC/RQD
3C	REC: 100% RQD: 88%



Run No.	REC/RQD
2C	REC: 94% RQD: 94%



Run No.	REC/RQD
1C	REC: 100% RQD: 79%



SCALE: 1 division = 0.1 feet

ROCK CORE SKETCH
LEGEND

JOINTING
J - Joint
MB - Mechanical Break
∡ - Angle w/ Horizontal
// - Parallel
X - Crossing
F - Foliation
S - Stratification
U - Unfoliated or Unstratified

JOINT SURFACE
C - Curved
I - Irregular
S - Straight

JOINT CONDITION
1 - Slick
2 - Smooth
3 - Rough

SKETCH SYMBOLS
◿ Joint
▨ Healed Joint
▩ Broken
▤ Part of Core Not Recovered
○ Cavities or Vugs in Core
▤ Clay
▦ Sand
☒ Empty Space

NOTES Some rock washed away at 2C, 27.3' BGS. Tape shows hole is 31.8' instead of 31.5'.

MUESER RUTLEDGE CONSULTING ENGINEERS

ROCK CORE SKETCH

BORING NO. M-2
SHEET 4 OF 6
FILE NO. 12087
SURFACE ELEVATION +61 +/-
RESIDENT ENGINEER E. PHELPS

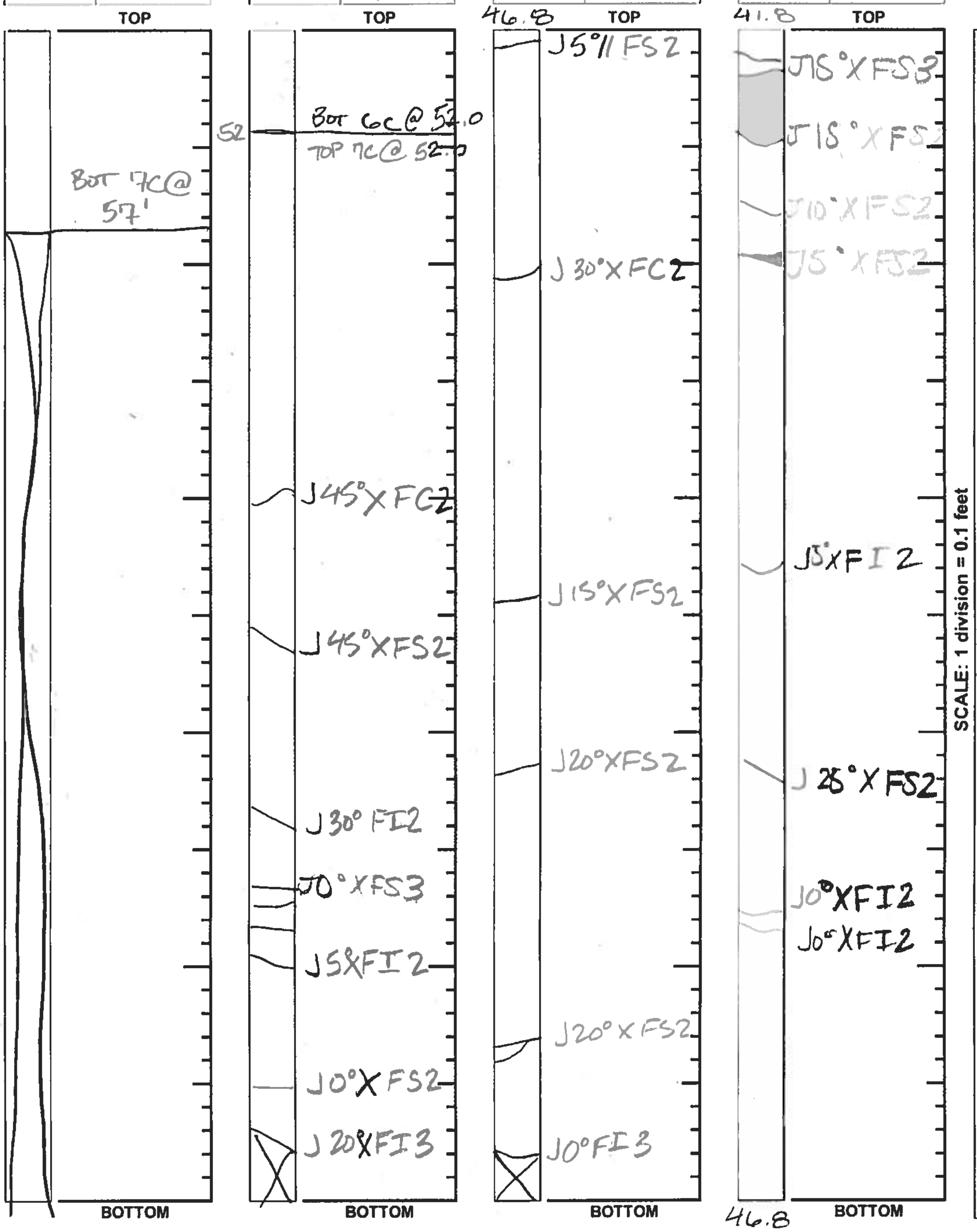
PROJECT: W. 57th Street
LOCATION: New York, NY

Run No.	REC/RQD
7C	100/84

Run No.	REC/RQD
6C	100/98
7C	100/84

Run No.	REC/RQD
6C	100% 98%

Run No.	REC/RQD
5C	100% 81%



ROCK CORE SKETCH
LEGEND

JOINTING
J - Joint
MB - Mechanical Break
∡ - Angle w/ Horizontal
// - Parallel
X - Crossing
F - Foliation
S - Stratification
U - Unfoliated or Unstratified

JOINT SURFACE
C - Curved
I - Irregular
S - Straight

JOINT CONDITION
1 - Slick
2 - Smooth
3 - Rough

SKETCH SYMBOLS
◿ Joint
▨ Healed Joint
▩ Broken
▤ Part of Core Not Recovered
○ Cavities or Vugs in Core
☰ Clay
░ Sand
☒ Empty Space

NOTES

MUESER RUTLEDGE CONSULTING ENGINEERS

ROCK CORE SKETCH

BORING NO. M-2
SHEET 5 OF 6
FILE NO. 12087
SURFACE ELEVATION +61+/-
RESIDENT ENGINEER A PATRONE

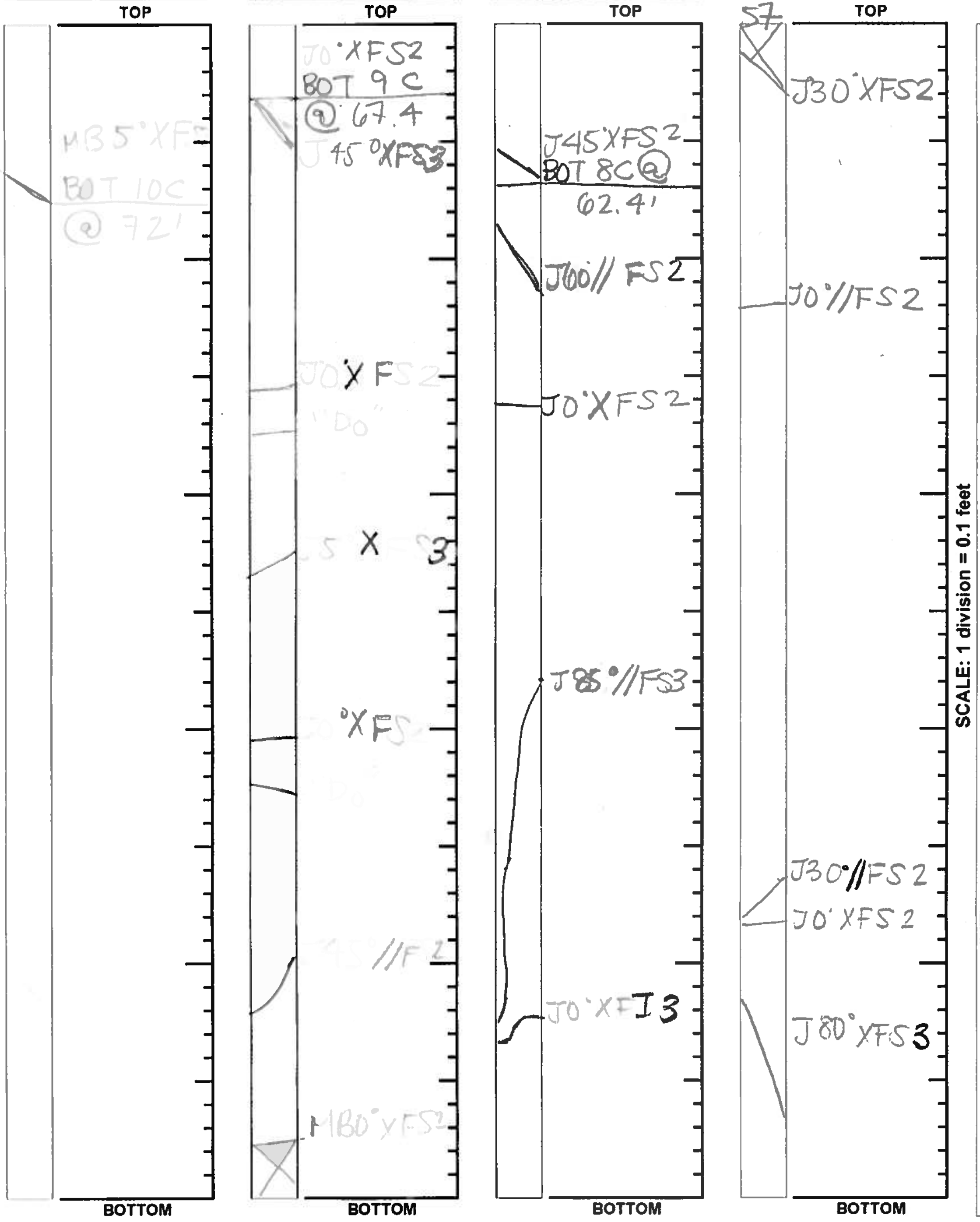
PROJECT W. 57th ST.
LOCATION NEW YORK, NY

Run No	REC/RQD
10C	100/91

Run No.	REC/RQD
9C	94/78
10C	100/91

Run No.	REC/RQD
8C	100/84
9C	94/78

Run No.	REC/RQD
8C	100/84



ROCK CORE SKETCH
LEGEND

JOINTING
J - Joint
MB - Mechanical Break
∡ - Angle w/ Horizontal
// - Parallel
X - Crossing
F - Foliation
S - Stratification
U - Unfoliated or Unstratified

JOINT SURFACE
C - Curved
I - Irregular
S - Straight

JOINT CONDITION
1 - Slick
2 - Smooth
3 - Rough

SKETCH SYMBOLS
◿ Joint
▨ Healed Joint
▩ Broken
▤ Part of Core Not Recovered
○ Cavities or Vugs in Core
☰ Clay
⁙ Sand
☒ Empty Space

NOTES

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. M-2
SHEET 6 **OF** 6
PROJECT 105-113 WEST 57TH STREET TOWER
FILE NO. 12087
LOCATION NEW YORK, NEW YORK
SURFACE ELEV. +61±
BORING LOCATION SEE BORING LOCATION PLAN
DATUM BPMD

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK X
SKID
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC X
OTHER

CASING USED ☒ YES ☐ NO
DIA., IN. 4 DEPTH, FT. FROM 0 TO 21.5
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER 2" O. D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL NX DOUBLE BARREL
CORE BIT NX DIAMOND BIT
DRILL RODS NWJ

DRILLING MUD USED ☐ YES ☒ NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD

AUGER USED ☐ YES ☒ NO
TYPE AND DIAMETER, IN.

*CASING HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*USED AUTOMATIC HAMMER.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
01-06-14	07:15	57	21.5	22.7	OVER WEEKEND.

PIEZOMETER INSTALLED ☐ YES ☒ NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT. 21.5
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT. 50.5
NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR JERSEY BORING & DRILLING CO., INC.
DRILLER MANUEL CARIRE HELPERS MIGUEL TRABAL
REMARKS BOREHOLE GROUTED UPON COMPLETION.
RESIDENT ENGINEER EDWARD PHELPS/ALEXANDRA PATRONE DATE 12-30-13
CLASSIFICATION CHECK: FABIAN WEBB TYPING CHECK: ALEXANDRA PATRONE

MRCE Form BS-1 **BORING NO.** M-2

APPENDIX B

MUESER RUTLEDGE CONSULTING ENGINEERS

COMPRESSIVE STRENGTH (ASTM D7012: METHOD C)

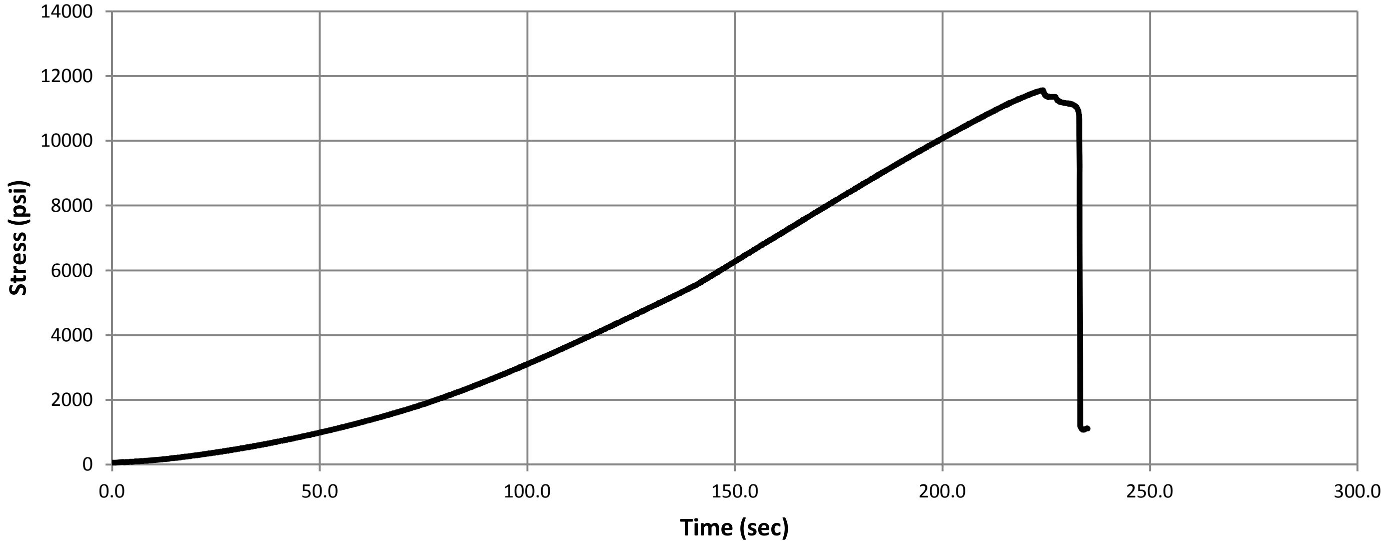
File	12087
Boring No.	M-1
Sample No.	1C
Depth	28.8

Project Name	111 W. 57th Street
Location	NEW YORK, NY
Sample Description	GRAY SCHISTOSE GNEISS

Perf by:	ARK	Date:	01/08/14
Calc by:	ARK	Date:	01/08/14
Ch'kd by:	YO	Date:	01/13/14

D (in)	2.05	L (in)	4.29	L/D	2.09

Sampling Date:	12/23/13
Storage Environment	Core Box
Failure Load (lbf)	38160
Temperature Condition	Ambient
Pressure Condition	Unconfined
Moisture Condition	Air Dry
Failure Type (Structural / Non-Structural)	STRUCTURAL
Dimensional Conformance	YES ASTM D4543
Direction of Loading, if Anisotropic	N/A
Uniaxial Compressive Strength	**11562 psi** **79.7 MPa**



ALL TEST METHODS / RESULTS CONFORM TO ASTM STANDARD D 7012:
"STANDARD TEST METHOD FOR COMPRESSIVE STRENGTH AND ELASTIC MODULI OF INTACT ROCK CORE SPECIMENS UNDER VARYING STATES OF STRESS AND TEMPERATURES."

MUESER RUTLEDGE CONSULTING ENGINEERS

COMPRESSIVE STRENGTH (ASTM D7012: METHOD C)

File: 12087
Boring No.: M-1
Sample No.: 2C
Depth (ft): 33.0

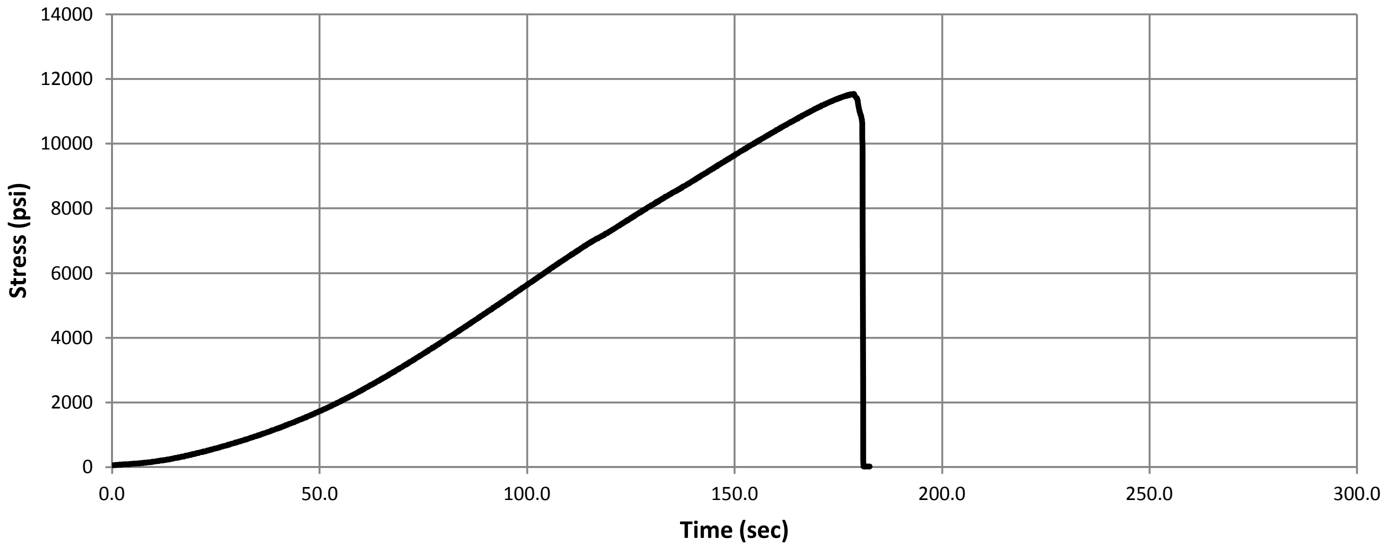
Project Name: 111 W. 57th Street
Location: NEW YORK, NY

Sample Description: GRAY SCHISTOSE GNEISS

Perf by:	ARK	Date:	01/08/14
Calc by:	ARK	Date:	01/08/14
Ch'kd by:	YO	Date:	01/13/14

D (in): 2.05
L (in): 4.49
L/D: 2.19
Sampling Date: 12/23/13

Storage Environment: Core Box
Failure Load (lbf): 38061
Temperature Condition: Ambient
Pressure Condition: Unconfined
Moisture Condition: Air Dry
Failure Type (Structural / Non-Structural): STRUCTURAL
Dimensional Conformance: NO ASTM D4543
Direction of Loading, if Anisotropic: N/A
Uniaxial Compressive Strength **11531 psi** **79.5 MPa**



ALL TEST METHODS / RESULTS CONFORM TO ASTM STANDARD D 7012:
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MUESER RUTLEDGE CONSULTING ENGINEERS

File 12087
Boring No. M-1
Sample No. 3C
Depth (ft) 38.6

COMPRESSIVE STRENGTH (ASTM D7012: METHOD C)

Project Name 111 W. 57th Street
Location NEW YORK, NY

Sample Description GRAY SCHISTOSE GNEISS

Perf by: ARK Date: 01/08/14
Calc by: ARK Date: 01/08/14
Ch'kd by: YO Date: 01/13/14

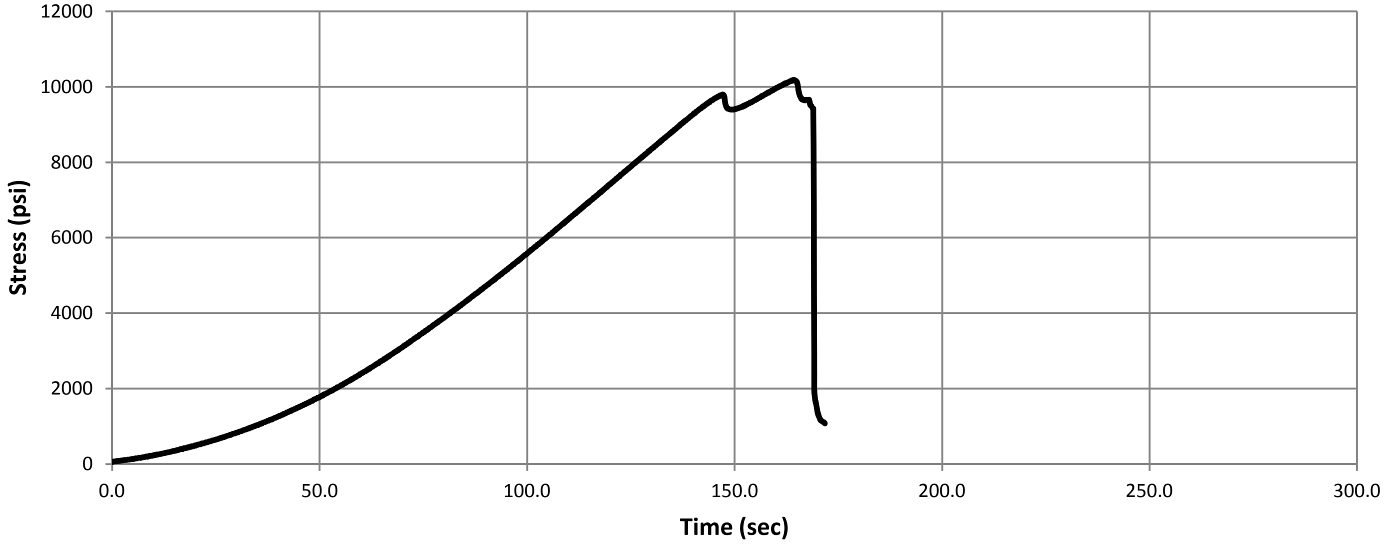
D (in) 2.05 L (in) 5.00 L/D 2.44

Sampling Date: 12/23/13

Storage Environment Core Box
Failure Load (lbf) 33623
Temperature Condition Ambient
Pressure Condition Unconfined
Moisture Condition Air Dry

Failure Type (Structural / Non-Structural) STRUCTURAL
Dimensional Conformance NO ASTM D4543

Direction of Loading, if Anisotropic N/A
Uniaxial Compressive Strength **10187 psi** **70.2 MPa**



ALL TEST METHODS / RESULTS CONFORM TO ASTM STANDARD D 7012:
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MUESER RUTLEDGE CONSULTING ENGINEERS

COMPRESSIVE STRENGTH (ASTM D7012: METHOD C)

File 12087
Boring No. M-1
Sample No. 4C
Depth (ft) 39.4

Project Name 111 W. 57th Street
Location NEW YORK, NY

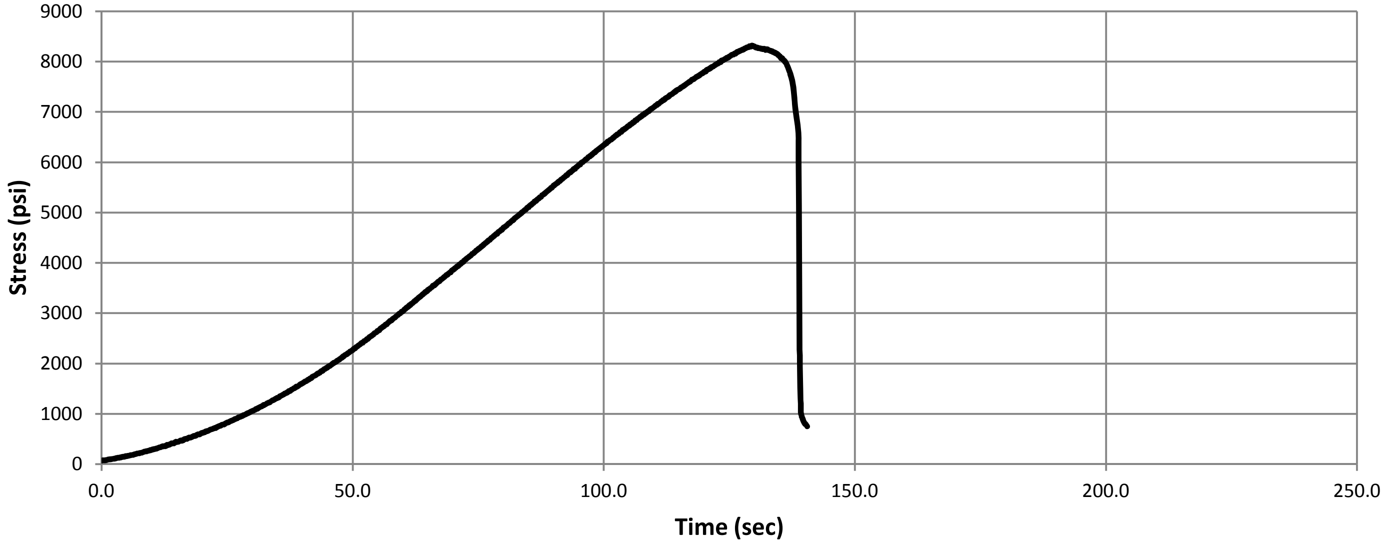
Sample Description GRAY GNEISSIC SCHIST

Perf by: ARK Date: 01/08/14
Calc by: ARK Date: 01/08/14
Ch'kd by: YO Date: 01/13/14

D (in) 2.05 L (in) 5.02 L/D 2.45

Sampling Date: 12/24/13

Storage Environment Core Box
Failure Load (lbf) 27451
Temperature Condition Ambient
Pressure Condition Unconfined
Moisture Condition Air Dry
Failure Type (Structural / Non-Structural) STRUCTURAL
Dimensional Conformance YES ASTM D4543
Direction of Loading, if Anisotropic N/A
Uniaxial Compressive Strength **8317 psi** **57.3 MPa**



ALL TEST METHODS / RESULTS CONFORM TO ASTM STANDARD D 7012:
"STANDARD TEST METHOD FOR COMPRESSIVE STRENGTH AND ELASTIC MODULI OF INTACT ROCK CORE SPECIMENS UNDER VARYING STATES OF STRESS AND TEMPERATURES."

MUESER RUTLEDGE CONSULTING ENGINEERS

COMPRESSIVE STRENGTH (ASTM D7012: METHOD C)

File: 12087
Boring No.: M-1
Sample No.: 7C
Depth (ft): 53.3

Project Name: 111 W. 57th Street
Location: NEW YORK, NY

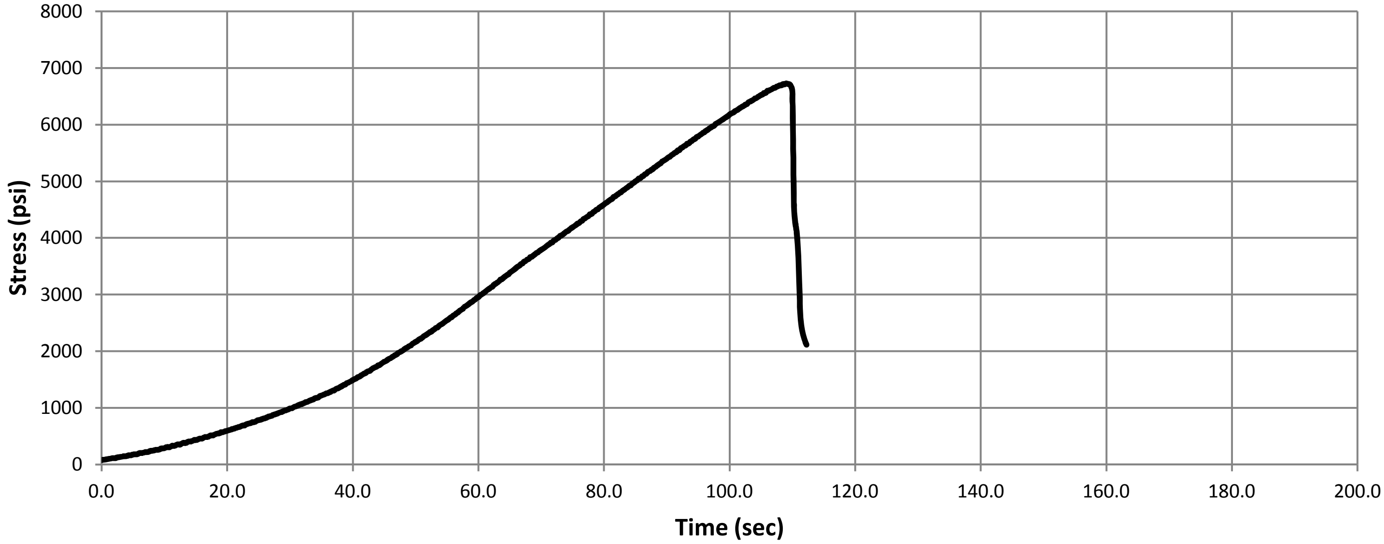
Sample Description: GRAY GNEISSIC SCHIST

Perf by: ARK Date: 01/08/14
Calc by: ARK Date: 01/08/14
Ch'kd by: YO Date: 01/13/14

D (in): 2.05
L (in): 4.97
L/D: 2.42
Sampling Date: 12/24/13

Storage Environment: Core Box
Failure Load (lbf): 22195
Temperature Condition: Ambient
Pressure Condition: Unconfined
Moisture Condition: Air Dry

Failure Type (Structural / Non-Structural): STRUCTURAL
Dimensional Conformance: YES ASTM D4543
Direction of Loading, if Anisotropic: N/A
Uniaxial Compressive Strength **6724 psi** **46.4 MPa**



ALL TEST METHODS / RESULTS CONFORM TO ASTM STANDARD D 7012:
"STANDARD TEST METHOD FOR COMPRESSIVE STRENGTH AND ELASTIC MODULI OF INTACT ROCK CORE SPECIMENS UNDER VARYING STATES OF STRESS AND TEMPERATURES."

MUESER RUTLEDGE CONSULTING ENGINEERS

COMPRESSIVE STRENGTH (ASTM D7012: METHOD C)

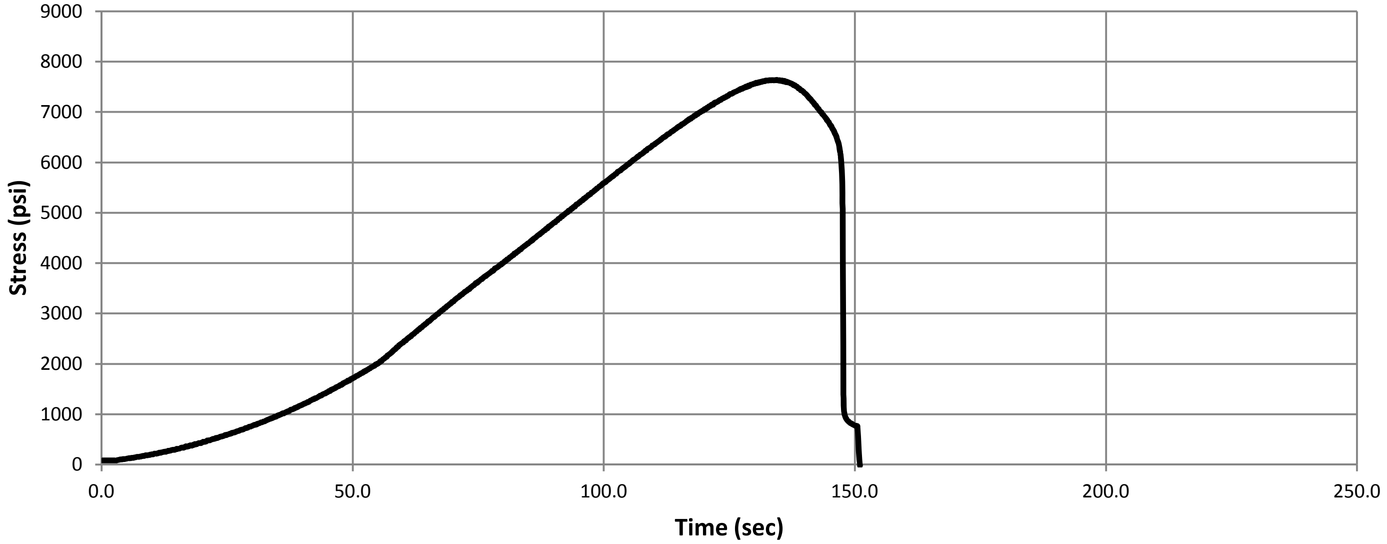
File	12087
Boring No.	M-1
Sample No.	8C
Depth (ft)	55.3

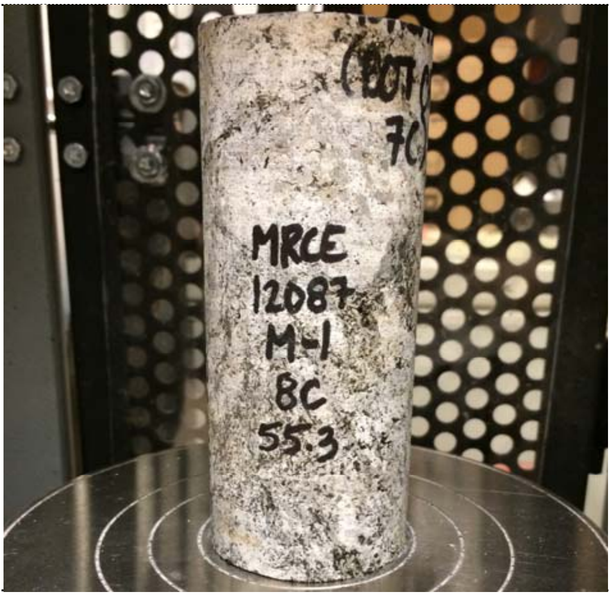
Project Name	111 W. 57th Street
Location	NEW YORK, NY
Sample Description	GRAY GNEISSIC SCHIST

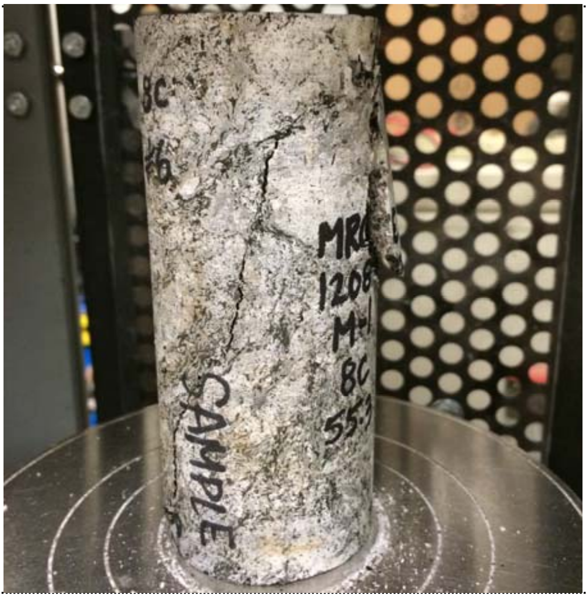
Perf by:	ARK	Date:	01/08/14
Calc by:	ARK	Date:	01/08/14
Ch'kd by:	YO	Date:	01/13/14

D (in)	2.05	L (in)	5.02	L/D	2.45

Sampling Date:	12/24/13
Storage Environment	Core Box
Failure Load (lbf)	25202
Temperature Condition	Ambient
Pressure Condition	Unconfined
Moisture Condition	Air Dry
Failure Type (Structural / Non-Structural)	STRUCTURAL
Dimensional Conformance	YES ASTM D4543
Direction of Loading, if Anisotropic	N/A
Uniaxial Compressive Strength	**7636 psi** **52.6 MPa**







ALL TEST METHODS / RESULTS CONFORM TO ASTM STANDARD D 7012:
"STANDARD TEST METHOD FOR COMPRESSIVE STRENGTH AND ELASTIC MODULI OF INTACT ROCK CORE SPECIMENS UNDER VARYING STATES OF STRESS AND TEMPERATURES."

MUESER RUTLEDGE CONSULTING ENGINEERS

File: 12087
Boring No.: M-1
Sample No.: 11C
Depth (ft): 66.5

COMPRESSIVE STRENGTH (ASTM D7012: METHOD C)

Project Name: 111 W. 57th Street
Location: NEW YORK, NY

Perf by: ARK   Date: 01/08/14
Calc by: ARK   Date: 01/08/14
Ch'kd by: YO   Date: 01/13/14

Sample Description: GRAY GNEISSIC SCHIST

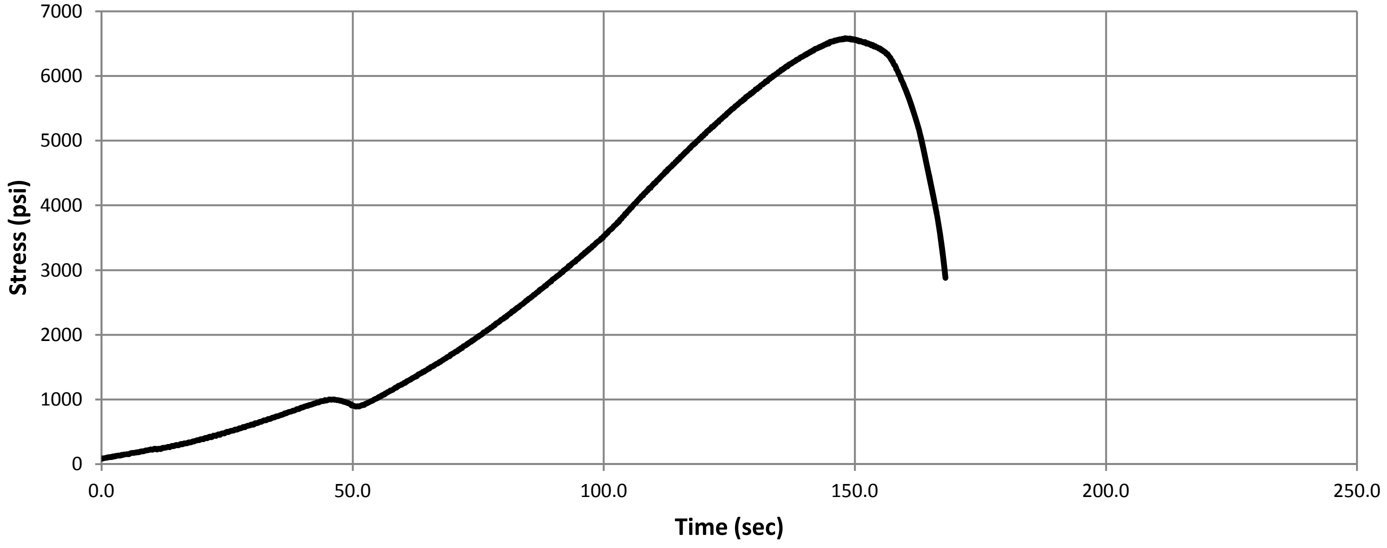
D (in): 2.05   L (in): 4.99   L/D: 2.43

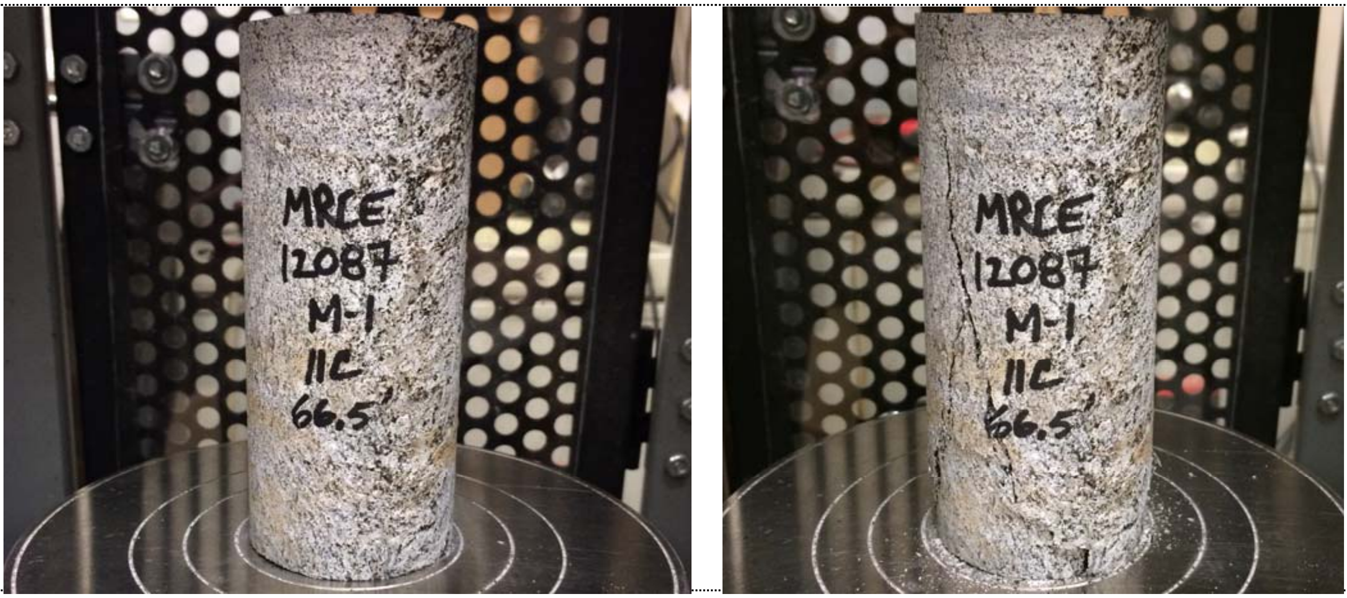
Sampling Date: 12/24/13

Storage Environment: Core Box
Failure Load (lbf): 21732
Temperature Condition: Ambient
Pressure Condition: Unconfined
Moisture Condition: Air Dry

Failure Type (Structural / Non-Structural): STRUCTURAL
Dimensional Conformance: YES ASTM D4543

Direction of Loading, if Anisotropic: N/A
Uniaxial Compressive Strength **6584 psi** **45.4 MPa**





ALL TEST METHODS / RESULTS CONFORM TO ASTM STANDARD D 7012:
"STANDARD TEST METHOD FOR COMPRESSIVE STRENGTH AND ELASTIC MODULI OF INTACT ROCK CORE SPECIMENS UNDER VARYING STATES OF STRESS AND TEMPERATURES."

APPENDIX C

Geotechnical Engineering Study

for

105 West 57th Street
New York, New York

Prepared For:

JDS Development Group
5 East 17th Street, 2nd Floor
New York, New York 10003

Prepared By:

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5 April 2012
170173001

Geotechnical Engineering Study

for

105 West 57th Street
New York, New York

Prepared For:

JDS Development Group
5 East 17th Street, 2nd Floor
New York, New York 10003

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5 April 2012
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FIGURES

APPENDICES

INTRODUCTION

We are pleased to submit this geotechnical engineering study for the proposed development located at 105 West 57th Street, New York, New York. The purpose of this study was to explore the subsurface conditions underlying, the site and provide geotechnical design recommendations for foundations and other geotechnical aspects of design and construction. A summary of our exploration, findings, and recommendations are provided herein.

Recommendations have been prepared based on input and coordination with WSP Cantor Seinuk (Cantor, Project Structural Engineer) and Cetra/Ruddy, Inc. (Cetra/Ruddy, Project Architect).

Our geotechnical study included the following:

1) A review of available information including: geologic mapping, aerial photographs, topographic surveys, and subsurface information from previous investigations at nearby sites.
2) A field exploration which included three test borings completed in 2006 and three additional borings completed in 2012. The borings were performed in accordance with the requirements of the 2008 New York City Building Code (Building Code).
3) An evaluation of the interpreted subsurface conditions with respect to feasible foundation systems.
4) Preparation of this report documenting the subsurface conditions and providing geotechnical recommendations for design.

All elevations referred to in this report are with respect to the Borough President of Manhattan Datum (BPMD)[1].

All work was performed in general accordance with our proposal dated 19 August 2011.

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[1] BPMD is 2.75 ft above the U.S. Coast and Geodetic Survey Datum mean sea level at Sandy Hook, New Jersey, 1929, (NGVD). BPMD=NGVD – 2.75 ft.

PROJECT DESCRIPTION

Site Description

The project site has a 43-foot frontage on the northern side of West 57th Street, between Avenue of the Americas and Seventh Avenue, with an estimated site footprint of about 4,300 sq. ft. The site is presently a vacant lot. There is an 18-story building and a 4-story building adjacent to the east, a 17-story building adjacent to the northeast, a 15-story building adjacent to the northwest and west, and West 57th Street to the south. The site location is shown as Figure 1.

The 18-story building to the east has basement and sub-basement levels at about el 42.6 and el 25.3, respectively. The 4-story building to the east has a single basement level at about el 45.1. The 15-story building to the northwest and west has basement and sub-basement levels at about el 47.6 and el 28.9, respectively. Both adjacent sub-basements levels are below the bedrock level at the site.

The building to the northwest and west (the Manhattan Life Building, 109 W 57th Street) is a landmark structure as designated by the New York City Landmark Preservation Commission (NYCLPC). Additionally, water tunnel No. 1 and NYCT subway tunnels currently lie beneath Sixth Avenue, about 100 feet to the east.

The site was formerly occupied by a four-story brick masonry building (the "Ritz Furs Building"). The building contained two basement levels extending to a depth of about 20 ft below existing grade. In additional, a vault is present below the sidewalk extending south roughly to the curb-line at West 57th Street. The vault is reportedly present at both the basement and sub-basement levels, but cannot currently be verified as the building was recently demolished and the basement levels were backfilled with soil and demolition debris.

Proposed Construction

The development plans have not been finalized; however, the current concept consists of a 40-story tower with one basement level. The estimated footprint of the building is about 4,300 square feet. A preliminary foundation layout has been developed by Cantor. The preliminary foundations consist of load bearing shear walls at the perimeter, and a structural core located near the center of the building. The service wall loads (live plus dead) provided by Cantor range from about 135 kips per linear foot (kpf) to 255 kpf. The uplift loads were provided as 360 kip point loads spaced evenly at about 6 to 8 feet along the east and west perimeter walls. The lateral loads included a total base shear of about 700 to 1700 kips for the design seismic and wind events, respectively. Our geotechnical recommendations are based on the preliminary structural and architectural information provided by Cantor and Cetra/Ruddy.

SUBSURFACE INVESTIGATION

Review of Available Information

We reviewed available information including published geologic and topographic maps, aerial photography, and subsurface soils data obtained during previous investigations in the general vicinity of the project site.

According to the historic Viele map of Manhattan from 1865, a stream ran beneath Sixth Avenue in the vicinity of the site. The Viele map is shown as Figure 2.

The USGS "Bedrock and Engineering Geologic Maps of Bronx County and Parts of New York and Queens Counties, New York" indicates that the bedrock underlying the site consists of Manhattan Schist, part of the Hartland Formation. The bedrock elevations vary from about el. 40 ft to el. 60 ft (less than 20 ft below-grade) in the vicinity of the site, typically decreasing from west to east. The referenced bedrock geology map is shown as Figure 3.

The previous building appears to be founded directly on bedrock based on field observations from our subsurface exploration.

Subsurface Exploration

The geotechnical exploration included drilling six test borings. Three borings, designated as B-1 to B-3, were drilled between 2006, and an additional three borings, designated as B-4 to B-6, were drilled in 2012. The location of the borings is shown on the attached boring location plan, Figure 4. The borings were located in the field by our inspecting engineer by measuring from existing site features.

The test borings B-1, B-2, and B-3 were drilled on 4 and 5 May 2006 by Craig Test Boring, Inc. of Mays Landing, New Jersey. The test borings were advanced to depths of about 33 ft to 36 ft below existing grade using a CME-55 track-mounted drill rig.

The test borings B-4, B-5, and B-6 were drilled on 23 March 2012 by Warren George, Inc. of Jersey City, New Jersey. The test borings were advanced to depths of about 24 ft to 25 ft below existing grade using a Mobile B53 truck-mounted drill rig. The purpose of these borings was to confirm the top of rock elevation.

The borings were drilled using mud rotary drilling techniques with a tri-cone roller bit. A combination of drilling fluid and steel casing were used to stabilize the boreholes during drilling. Soil sampling was not performed within the demolition debris. Rock samples were cored in all of the borings using a Type NX Rock Core Barrel. Percent recovery (REC)[2] and Rock Quality Designation (RQD)[3] values were measured based on the length and quality of the rock core retrieved from each core run.

All borings were performed under the full-time inspection of a Langan engineer.

Additional details are provided on the attached boring logs as Appendix A.

SUBSURFACE CONDITIONS

The general subsurface stratigraphy consists of a layer of miscellaneous fill material overlying the existing concrete sub-basement floor slab which in turn bears directly on bedrock. Based on our observations during drilling, the existing concrete slab may not be continuous within the site as two of the borings did not encounter concrete. Portions of the slab may have been removed or broken up during demolition. We estimate that the concrete sub-basement floor slab is about 12 to 18 inches thick. The following presents more information on each layer encountered.

Fill [Class 7]

The fill was encountered throughout the site and was recently placed within the former basement during demolition. This fill was placed within the basement levels during building demolition to provide temporary stabilization of the site. The borings were advanced through obstructions, fill material, and in some locations the former sub-basement concrete floor slab. The fill generally consists of coarse to fine sand and gravel with variable concentrations of wood, bricks, and concrete fragments. The fill likely contains large debris including former foundation elements, concrete slabs, etc.

The fill layer is classified as Building Code Class 7 – Uncontrolled Fill.

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[2] The percent recovery is the ratio of the length of rock recovered over the total rock core length, expressed as a percentage.

[3] The RQD is defined as the ratio of the summation of each rock piece greater than 4 inches over the total core length, expressed as a percentage.

Bedrock [Class 1c to 1b]

Bedrock was encountered immediately below the concrete floor slab, where present, and was cored 5 to 15 ft. The recovered rock cores were visually examined and classified in the field in accordance with the Building Code. Bedrock was encountered in each of the six borings performed. The bedrock generally consists of gray to black, slightly to moderately weathered, slightly to moderately fractured, medium to hard, micaceous schist.

Rock core recoveries ranged from 68% to 100%. Rock Quality Designation (RQD) values were determined from the recovered rock cores and vary from about 43% to 98%.

The bedrock generally classifies as Building Code Class 1c - Medium Rock to Class 1a - Very Hard Rock.

Subsurface profiles beneath the site are shown as Figures 5 and 6.

Groundwater

Groundwater elevations could not be determined at the completion of drilling due to the introduction of drilling fluids. However, we expect that groundwater will generally be located at or above the bedrock contact. Zones of perched water may also be present at higher elevations in areas containing soils adjacent to the site.

SEISMIC EVALUATION

This section presents the results of our seismic evaluation for the site relative to the provisions outlined in the Building Code. Then following subsections provide recommended parameters for use in the seismic design of the proposed structure.

Mapped Spectral Accelerations

Per Section 1615.1 of the Building Code, the mapped spectral accelerations for the short period S_s and 1-second period S_1 are 0.365g and 0.071g, respectively.

Site Class

The Building Code requires assignment of a Site Class in accordance with the procedures outlined in Section 1615.1.1. The Site Class is estimated based on the type, thickness, and engineering properties of all soils and bedrock to a depth of 100 feet below the ground surface. In accordance with FEMA 450 – NEHRP Recommended Provisions and Commentary for Seismic Regulations for New Buildings and Other Structures (2003), the site class should reflect the soil conditions which affect the ground motion input to the structure. Therefore, because this site is founded on bedrock and will not be significantly influenced by the surrounding soils, the site class is based on the condition of the bedrock beneath the foundation. This site classifies as Site Class B – "Rock."

Design Spectral Response Accelerations and Seismic Design Category

Design spectral accelerations were determined in accordance with Section 1615.1.3 of the Building Code. The design spectral acceleration at short period S_{DS} is 0.243g and 1-second period S_{D1} is 0.047g.

Based on the above design spectral accelerations and the assumed use group/occupancy category of the structure (Use Group II), the corresponding seismic design category is identified as SDC B, in accordance with Section 1616.3 of the Building Code.

The assumed structural occupancy category should be confirmed by the Architect and Structural Engineer.

Peak Ground Acceleration

The peak ground acceleration (PGA) for use in design is 0.097g (i.e. $S_{DS}/2.5$) as recommended in Section 1802.2.3 of the Building Code.

Liquefaction Potential

The Building Code requires an evaluation of the liquefaction potential of non-cohesive soils below the groundwater table and up to 50 feet below the ground surface. The building will bear directly on bedrock; therefore, liquefaction does not need to be considered for design.

FOUNDATION RECOMMENDATIONS

The following sections provide our geotechnical recommendations for foundation design and constructability issues.

Foundation System

The preliminary structural design transfers the majority of the loads to the perimeter shear walls along the east and west foundation walls. Therefore, we recommend a combination of both shallow and deep foundations for the proposed building. Specific recommendations for each foundation type (e.g. location, capacity, etc.) are discussed in detail in the following sections.

The building loads should be transferred below the adjacent building foundations to prevent any increase in load on the adjacent buildings.

Deep Foundations

The majority of the gravity, uplift, and lateral building loads will be transferred to the perimeter walls located adjacent to the existing buildings. We recommend using caissons socketed in rock to transfer the perimeter loads to the bedrock below the adjacent building foundations. Caissons are also capable of supporting the required uplift and lateral loads.

Caissons consist of an upper (cased) grouted portion encased in steel, and a lower (socket) portion grouted to bond with the rock. The casing will extend to about the foundation level of the adjacent building. The cased portion allows the loads to transfer directly to the socket, without adding load to the adjacent building. Caissons develop the majority of their capacity from the socket via friction between the rock and the grout. Typically the bearing capacity at the bottom of the caisson is neglected because relatively large deflections, compared to friction, are required to fully mobilize the bearing capacity.

Based on preliminary structural loads, we developed a preliminary caisson design capable of supporting about 1,600 kips in compression, 360 kips in tension, and 70 kips laterally. The following sections summarize the design requirements for the caissons. Table 1 includes a summary of a feasible caisson design for the loads described above.

Axial Capacity

Axial capacity of the caissons includes both compressive and tensile loads. The caisson should transfer the gravity loads below the adjacent buildings. To limit loads on the foundations and the rock mass beneath the adjacent buildings, the cased portion should extend a minimum of five (5) feet below the adjacent building foundations.

The total axial compression under the 1600-kip compressive load is estimated to be less than about ½ inch. The total elongation under the 360-kip tensile is estimated to be less than about ½ inch.

The caisson caps must be placed over a minimum 4-inch-thick rigid Styrofoam filler to prevent load transfer to the rock surface.

The preliminary caisson design is summarized in Table 1.

Table 1. Preliminary Caisson Design for Perimeter Foundation Walls

Preliminary Caisson Design: 24-inch, 1600 kips (Compression), 360 kips (Tension), 72 kips (Lateral)						
Casing Diameter (in)	**Wall Thickness (in)**	**Casing Yield Stress (ksi)**	**Reinforcing Bars**	**Bar Yield Stress (ksi)**	**Grout Compressive Strength (ksi)**	**Min. Required Rock Socket Length (ft)**
24	0.75	45	8 - #20	75	8	16

Lateral capacity

The governing lateral loads for the foundation elements are a result of wind loads. The caissons must be designed to prevent overstressing the caisson and the rock (particularly next to adjacent buildings). During the design wind loading, the structure will distribute the lateral loads to certain areas of the foundation. As the top of the caissons are loaded, the load is transferred to the rock mass. To limit loading the rock mass adjacent to the existing buildings, the socket should be drilled at a larger diameter than the casing to provide an annulus of about 1-inch around the casing. This annulus will allow the caisson to deflect laterally up to ½ inch without loading the rock mass. The annulus must be sealed at the top of the rock surface prior to backfilling to prevent intrusion of surficial debris and construction materials.

Because of the relatively high lateral loads estimated at the top of the caissons, the caissons should be designed for a "fixed-head" condition (zero rotation during loading at the top of the caisson). Table 2 provides the results of our lateral load analysis for the base shear associated with the design wind event. These results are based on the assumption that a "fixed-head" condition is imposed and that the caisson shaft provides a 1-inch annulus in the top 15 ft of bedrock.

Table 2. Preliminary Lateral Capacity Analysis of 24-inch Caisson

Lateral Capacity Results: 24-inch, 1600 kips (Compression), 360 kips (Tension), 72 kips (Lateral)						
Fixity	**Shear Force at Pile Head (kips)**	**Displacement at Pile Head (in)**	**Maximum Bending Moment (kip-ft)**	**Maximum Shear (kips)**	**Depth to Maximum Bending Moment (ft)**	**Depth to Maximum Shear (ft)**
100%	72	< 0.5	790	82.0	0.0	19.0

Shallow Foundations

The proposed foundation layout includes several interior columns and a structural core at the center of the building. These areas can be supported by spread footings and grade beams bearing on Building Code Class 1b bedrock. Footings should be limited to areas greater than 10 feet from the adjacent buildings to prevent loading the existing foundations. Shallow foundations (e.g. spread footings, grade beams, etc.) should be sized for an allowable bearing capacity of 40 tons per square foot (tsf). Additionally, we recommend embedding all interior shallow foundations a minimum of two (2) feet into Building Code Class 1b Rock or better.

Slab Support

We reviewed two options for the basement slab: (1) a structural pressure slab above a drainage layer bearing directly on bedrock, and (2) a concrete slab on grade with an underdrain system. Based on our review, we recommend the use of a structural pressure slab bearing on a minimum 6-inch gravel layer above Building Code Class 1b bedrock or better.

The structural slab should be designed to resist a design groundwater level at el 42.5 (about five (5) feet above the bedrock elevation). Additionally, the structural slab should provide a rigid connection to the foundation walls to provide additional foundation support.

Permanent Groundwater Control

The foundation should be waterproofed using a continuous membrane such as those manufactured by Grace Construction Products (Preprufe, Bituthene, etc.). The use of bentonite waterproofing or negative side crystalline waterproofing is not recommended. Waterproofing should also be installed along all foundation walls up to sidewalk grades along the perimeter of the buildings.

For all waterproofing applications, diligent inspection of waterproofing materials is critical, especially during placement of reinforcement for the floor slabs and foundation walls. Holes or rips should be repaired in accordance with the manufacturer's recommendations. The vertical waterproofing should be protected with a rigid barrier or drainage composite to prevent damage during backfilling operations. Horizontal waterproofing for below-grade floors, pile caps, etc. can be installed on a lean concrete mud mat or compacted crushed stone.

We recommend that a warrantee be obtained from the manufacturer and installer to cover materials and workmanship; only certified installers should be used to perform the work. Detailed daily inspections should be performed to document any damage resulting from the contractor's activities. Repairs should be made as soon as possible and should be made per the manufacturer's recommendations.

Permanent Below-grade Walls

Permanent below-grade walls should be designed to resist static earth pressures, surcharge loads, and hydrostatic pressures. Additional recommendations on support of below-grade walls may be required by the structural engineer.

Static Earth Pressures

Lateral pressures from earth, surcharge loads, and hydrostatic pressures should be considered. The recommended design lateral earth-pressure diagram has a triangular distribution using an equivalent fluid weight of 55 psf per foot of depth of soil. We recommend that a vertical surcharge load of 600 psf be considered for all below-grade perimeter walls. Lateral pressures from surcharge should have a uniform distribution based on a pressure equal to 50 percent of the vertical pressure acting against the full height of the wall. Hydrostatic pressures should be considered below the design groundwater elevation (el 42.5).

Dynamic Earth Pressures

In accordance with Section 1802.2 of the Building Code, dynamic earth pressures need not be considered in design for structures assigned to SDC B.

CONSTRUCTION ISSUES AND RECOMMENDATIONS

The following sections discuss typical geotechnical related construction issues including excavation, excavation support, and underpinning.

Excavation

Construction of the proposed below-grade levels will require about 20 ft to 25 ft of excavation through the demolition debris and removal of the previous slab to reach bedrock. Large obstructions and demolition debris should be anticipated. Site excavation within the fill can likely be performed using conventional earth-moving equipment (e.g. backhoes, excavators, etc.). However, large debris and former foundation elements may require heavier excavation equipment.

Excavation in rock may be required to achieve satisfactory bearing conditions. Excavation of rock will likely require rock excavation equipment (e.g. chipping guns, hammers, etc.). Rock blasting is not recommended at this site.

All excavation operations should be performed in accordance with the Occupational Safety and Health Administration (OSHA) requirements, including but not limited to, use of temporary shoring, trench boxes, and proper benching.

Rock Subgrade Preparation and Protection

Subgrades for pressure slabs, bearing walls, and spread footings should be prepared by removing materials loosened by machine excavation and cleaning rock of all soil and material not satisfying the bearing capacity criteria. Subgrade preparation should be performed under the observation and direction of the geotechnical engineer. Subgrades should be protected until concrete is cast. Remedial work should be performed as directed by the geotechnical engineer.

The caisson caps must be placed over a minimum 4-inch-thick rigid Styrofoam filler to prevent load transfer to the rock surface.

Subgrade preparation is subject to special inspection by a Professional Engineer licensed in the State of New York in accordance with the Building Code requirements.

Excavation Support

We anticipate that earth support will be required at the south side of the site in the event that the existing vault is to be removed or replaced. The existing vault and/or foundation walls may be suitable for temporary earth support where required. The applicability of using the existing walls and the necessity for internal shoring and bracing should be determined by the Contractor’s Engineer prior to construction.

All excavation support systems should be designed by a Professional Engineer licensed in the State of New York

Fill Materials, Placement, and Compaction

Structural Fill is defined as any compacted fill placed for the support of a structure such as footings, slabs, walls, or pavements. We do not recommend using the existing demolition debris as fill.

Structural fill placed as backfill behind walls should consist of a well-graded durable granular material having no more than 10 percent fines passing the No. 200 sieve. All fill materials should be free of trash, debris, roots, vegetation, peat, or other deleterious materials, have a particle size no greater than 4-inches, and should be approved by the Geotechnical Engineer prior to placement. Lean concrete or controlled low strength material (CLSM) are considered a suitable substitution for structural fill. Free draining gravel or crushed stone for use below floor slabs and for foundation drainage should conform to the requirements of AASHTO #57, or equivalent.

Grain size distributions, maximum dry density and optimum water content determinations should be made on representative samples of proposed structural fill materials prior to construction activities to determine suitability for use as structural fill.

Fill should be placed in uniform loose lifts not exceeding 8-inches in open areas and 4-inches in confined areas. All fill should be compacted to at least 92% of its maximum dry density as determined by ASTM D1557. Compaction within 5-ft of foundation walls should be performed using hand operated equipment. The water content at the time of compaction should be within a two percent of the optimum value determined by ASTM D 1557.

No fill should be placed on areas where free water is standing, on frozen subsoil areas, or on surfaces which have not been approved by the project engineer. Fill materials and compacted fill should be protected from the effects of frost, freezing, construction traffic, groundwater and surface water runoff. Care should be taken to protect the foundations, walls and waterproofing during placement and compaction of fill.

Backfill operations are subject to controlled inspection by a Professional Engineer licensed in the State of New York in accordance with the Building Code requirements.

Underpinning

Underpinning may be required along the northeast corner of the site if the adjacent 4-story structure's foundation level is higher than the proposed foundations. The purpose of underpinning is to transfer the foundation loads of the adjacent structure to at least the subgrade level of the proposed development or bedrock, whichever is deeper. Underpinning piers should bear on Building Code Class 1b rock or better. Undermining of any structure adjacent to the proposed excavation must be avoided.

Underpinning design must be performed by the Contractor's Professional Engineer licensed in the State of New York.

Monitoring of Adjacent Structures

Landmark structures, as designated by the New York City Landmark Preservation Commission (NYCLPC), must be monitored in accordance with Technical Policies and Procedure Notice

(TPPN) 10/88. Monitoring requirements include optical survey monitoring, vibration monitoring, and crack monitoring via crack gages within the building.

We recommend that a preconstruction conditions documentation of the neighboring buildings be performed prior to construction. The purpose of a preconstruction conditions documentation is to document the conditions of the neighboring structures prior to construction. These documents can be effective in mitigating damage claims arising from construction activities. On the basis of this survey, an observational and instrumentation program should be designed for monitoring the performance of adjacent structures and evaluating construction procedures.

Additionally, NYCT subway tunnels currently lie beneath Sixth Avenue, less than 200 feet to the east. All foundation plans should be submitted to the NYCT for approval prior to construction. Additional monitoring requirements may be required by NYCT.

Special Inspection

Excavations and foundation construction are subject to various controlled engineering inspections as per the Building Code. Construction activities that require quality control inspections include excavation, sheeting and shoring, underpinning, waterproofing, backfilling and compaction, and foundation bearing surfaces.

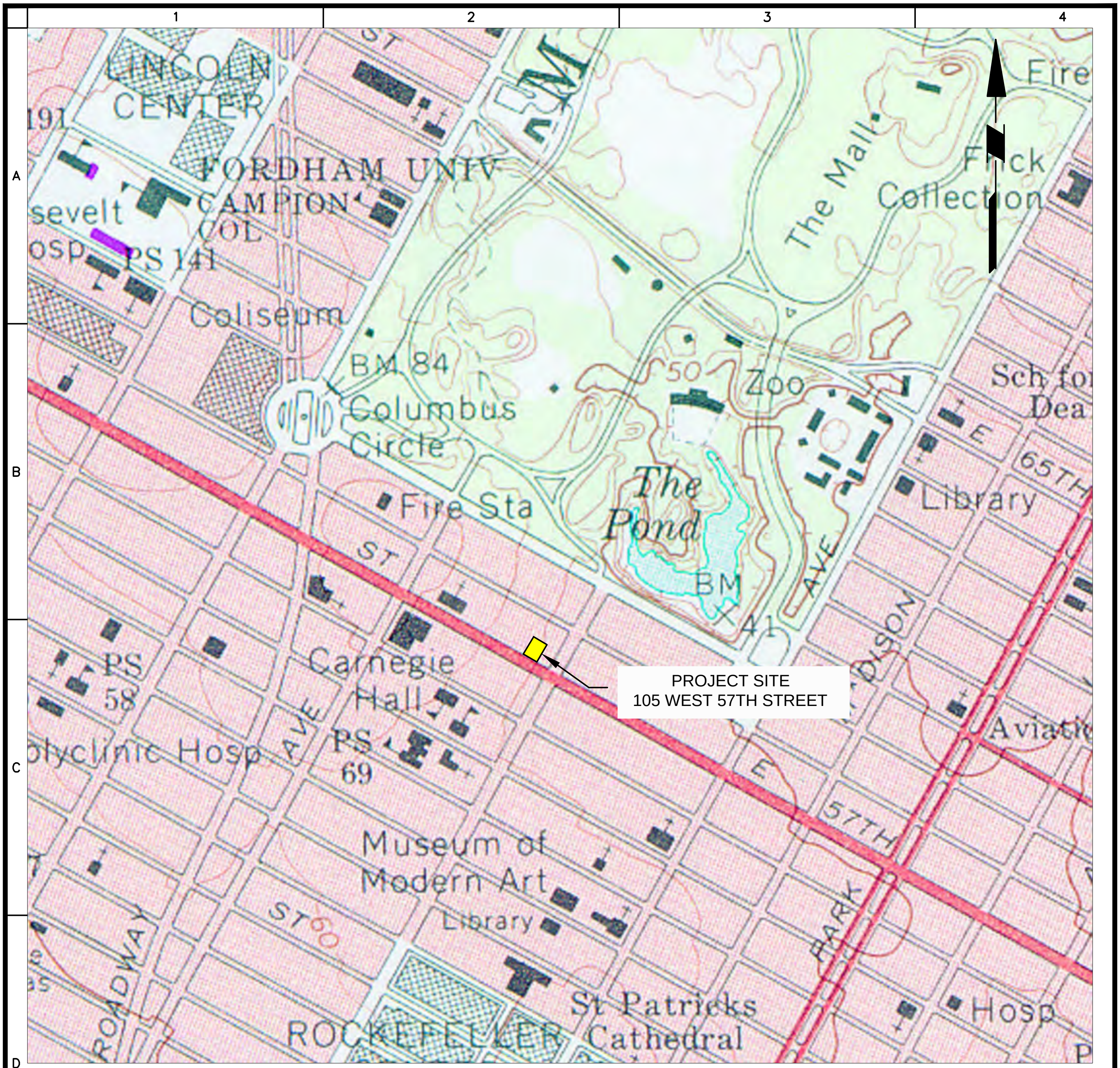
LIMITATIONS

The conclusions and recommendations given in this report are based on subsurface conditions inferred from a limited number of test borings, information provided to us, and a generic building layout. Additional investigation and analyses are warranted prior to final design. Environmental aspects of the project have not been considered in this study and will be addressed under separate cover as a Phase 1 Environmental Assessment.

This report has been prepared to assist the Owner in the evaluation of the site. It is intended for use with regard to the given information and any changes in structures or locations should be brought to our attention so that we may determine how such changes may affect our recommendations.

This report has been prepared expressly for the proposed redevelopment of 105 West 57th Street in Manhattan, New York. Langan cannot assume responsibility for its use at any other site.

FIGURES



REFERENCE: USGS QUADRANGLE MAP, CENTRAL PARK QUADRANGLE (1966, REV. 1979)

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Project

105 WEST 57TH STREET

MANHATTAN NY

Drawing Title

SITE LOCATION PLAN

Project No.
170173001

Date
04/05/2012

Scale
NTS

Drawn By
SKM

Submission Date
04/05/2012

Drawing No.

1

Sheet 1 of 7

Filename: \\langan.com\data\NY\data0\170173001\Cadd Data - 170173001\Dwg\Geotech Report Figures\Figure 1 - Site Location Plan.dwg Date: 4/5/2012 Time: 14:36 User: smartin Style Table: Langan.stb Layout: A Size Sheet (Bottom) (1)

REFERENCE: PORTION OF SANITARY AND TOPOGRAPHY MAP OF THE CITY AND ISLAND OF NEW YORK, DATED 1865, BY EGBERT L. VIELE.

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Project

105 WEST 57TH STREET

MANHATTAN NY

Drawing Title

VIELE MAP

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Scale
NTS

Drawn By
SKM

Submission Date
04/05/2012

Drawing No.

2

Sheet 2 of 7

OЄh OЄhm	**Hartland Formation (Middle Ordovician to Lower Cambrian)**— *West of the East River*—Interbedded units of the following:

1. Gray and gray-weathering, fine-grained quartz-feldspar granulite containing minor biotite and garnet;
2. Fine- to coarse-grained, gray- to tan-weathering, quartzofeldspathic, muscovite-biotite-garnet schist. The muscovite flakes are commonly large and may give outcrops a "spangled" or shiny metallic look; some outcrops have knotty kyanite surfaces;
3. Dark-greenish-black quartz-biotite-hornblende amphibolite; weathers black or rusty along fractures.

Much of the schist is magnetic. The Hartland here is in thrust-fault contact with the underlying Manhattan Schist on the Cameron's Line thrust, which goes beneath the Jurassic and Triassic Newark basin sediments (see sections *C–C′* and *D–D′*).

REFERENCE: BEDROCK AND ENGINEERING GEOLOGIC MAPS OF NEW YORK COUNTY AND PARTS OF KINGS AND QUEENS COUNTIES, NEW YORK, AND PARTS OF BERGEN AND HUDSON COUNTIES, NEW JERSEY (1994).

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Project

105 WEST 57TH STREET

MANHATTAN NY

Drawing Title

BEDROCK MAP

Project No.
170173001

Date
04/05/2012

Scale
NTS

Drawn By
SKM

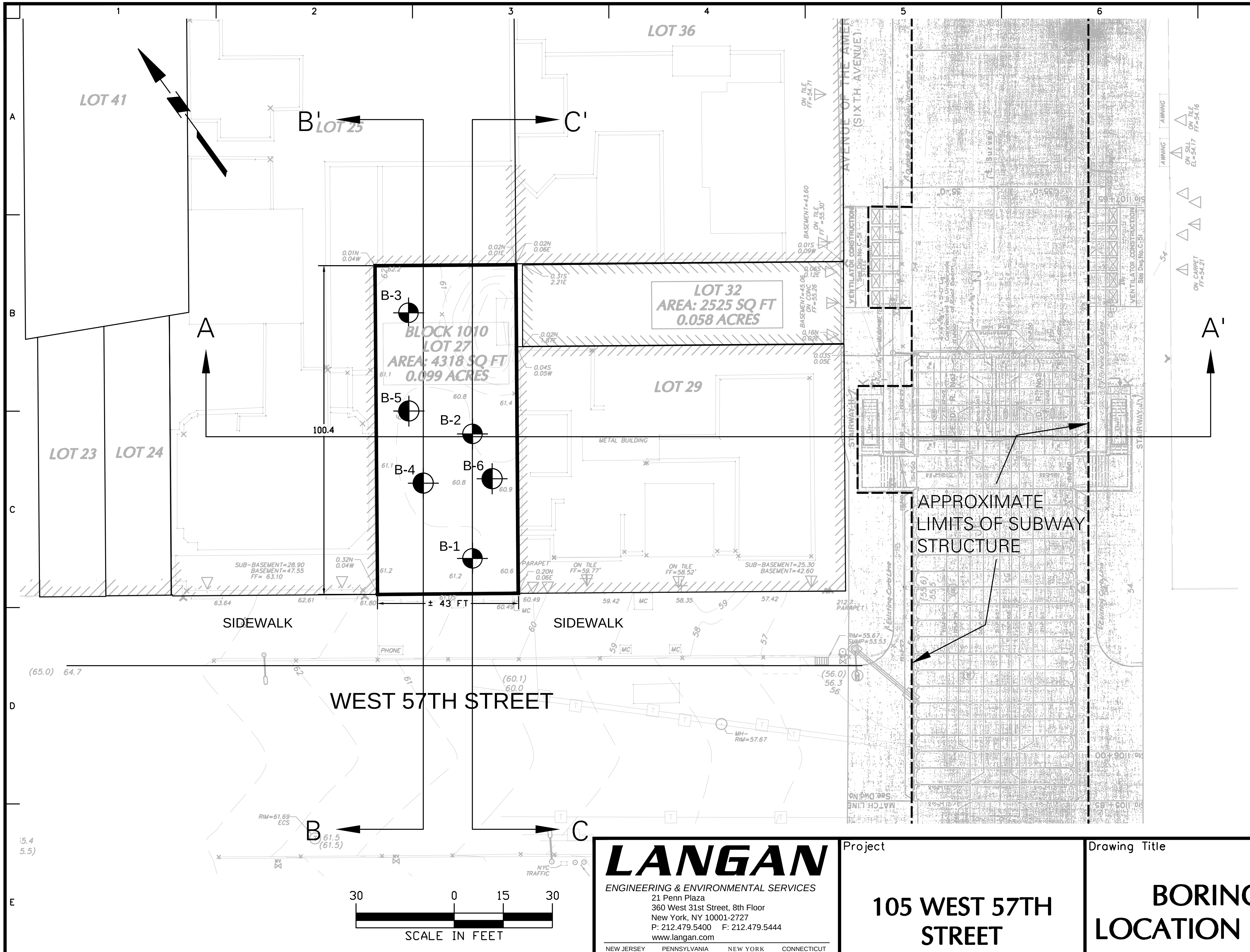
Submission Date
04/05/2012

Drawing No.

3

Sheet 3 of 7

Filename: \\langan.com\data\NY\data0\170173001\Cadd Data - 170173001\Dwg\Geotech Report Figures\Figure 3 - Bedrock Map.dwg Date: 4/5/2012 Time: 14:38 User: smartin Style Table: Langan.stb Layout: A Size Sheet (Bottom) (1)



LEGEND

B-4 ◐	2012 TEST BORING LOCATION
B-1 ◐	2006 TEST BORING LOCATION

NOTES:

1. BORINGS B-1 THROUGH B-3 WERE DRILLED BY CRAIG TEST BORING OF MAYS LANDING, NEW JERSEY ON 4 AND 5 MAY 2006.
2. BORINGS B-4 THROUGH B-6 WERE DRILLED BY WARREN GEORGE, INC. OF JERSEY CITY, NEW JERSEY ON 23 MARCH 2012.
3. ALL BORINGS WERE PERFORMED UNDER THE FULL TIME INSPECTION OF A LANGAN ENGINEER IN ACCORDANCE WITH THE REQUIREMENT OF THE NEW YORK CITY BUILDING CODE.
4. SURVEY COMPLETED BY LANGAN ENGINEERING & ENVIRONMENTAL SERVICES, LAST REVISED 20 MARCH 2012.
5. ALL BORING LOCATIONS ARE BASED ON FIELD MEASUREMENTS AND ARE CONSIDERED APPROXIMATE.
6. ALL ELEVATIONS REFER TO BOROUGH PRESIDENT OF MANHATTAN DATUM AND NEW YORK CITY TRANSIT DATUM (NYCT).

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Project

105 WEST 57TH STREET

MANHATTAN NY

Drawing Title

BORING LOCATION PLAN

Project No.
170173001

Date
04/05/2012

Scale
1" = 30'

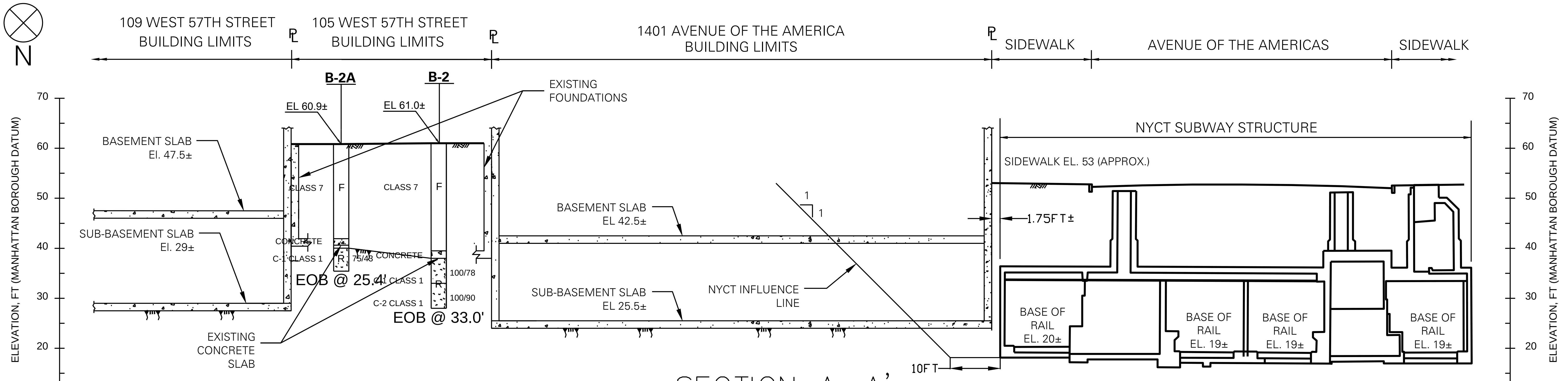
Drawn By
SKM

Submission Date
04/05/2012

Drawing No.

4

Sheet 4 of 7



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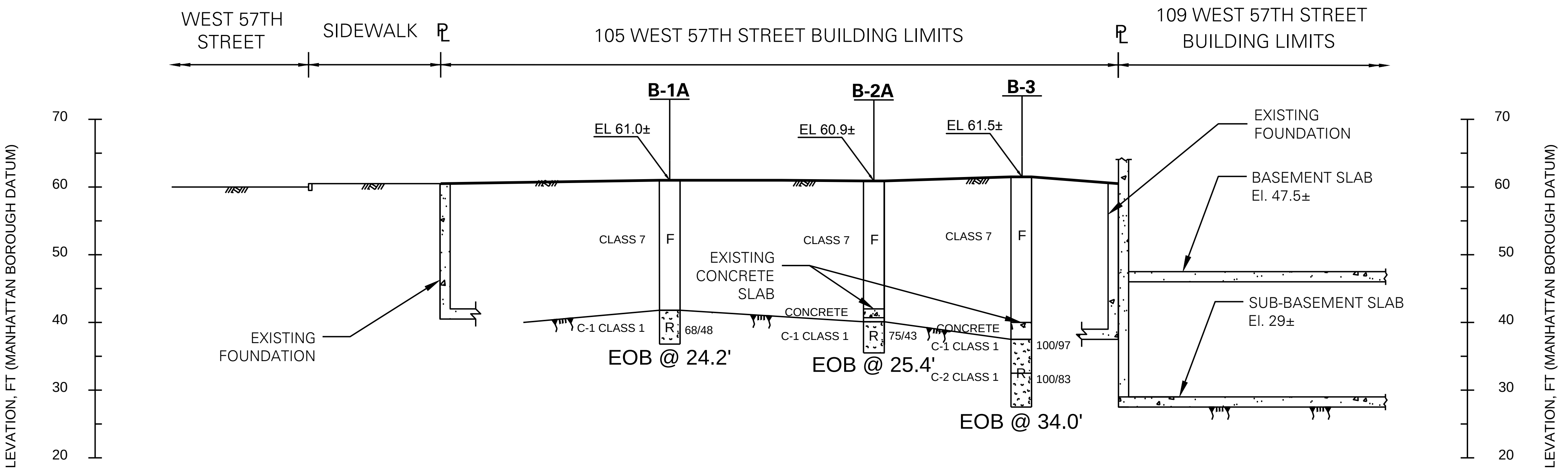
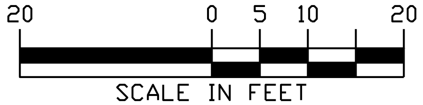


SECTION B–B'



SCALE IN FEET

LANGAN

ENGINEERING & ENVIRONMENTAL SERVICES

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ABU DHABI DUBAI ATHENS DOHA ISTANBUL

Project

105 WEST 57TH STREET

MANHATTAN NY

Drawing Title

SUBSURFACE PROFILES A-A' & B-B'

Project No. 170173001

Date 04/05/2012

Scale 1" = 20'

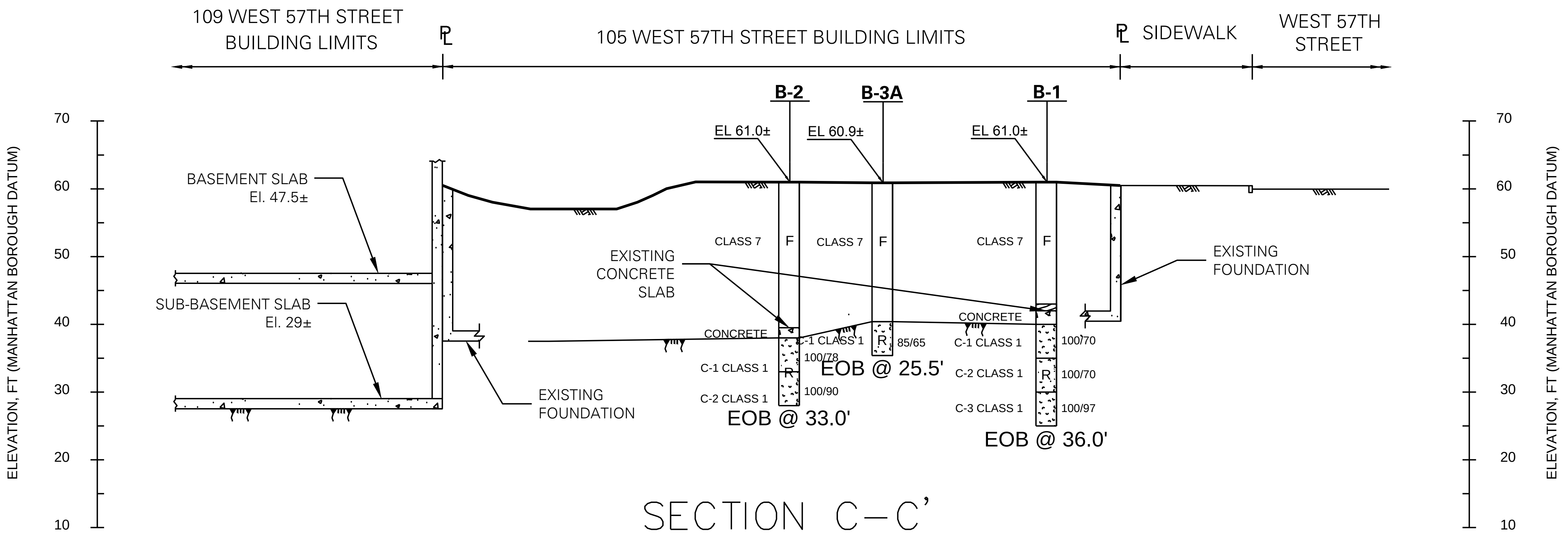
Drawn By SKM

Submission Date 04/05/2012

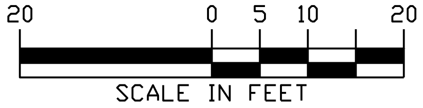
Drawing No. 5

Sheet 5 of 7

Filename: \\langan.com\data\NY\data0\170173001\Cadd Data - 170173001\Dwg\Geotech Report Figures\Figure 5 - BLP.dwg Date: 4/5/2012 Time: 14:41 User: smartin Style Table: Langan.stb Layout: FIGURE 5 - A & B



SECTION C–C'



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Project

105 WEST 57TH STREET

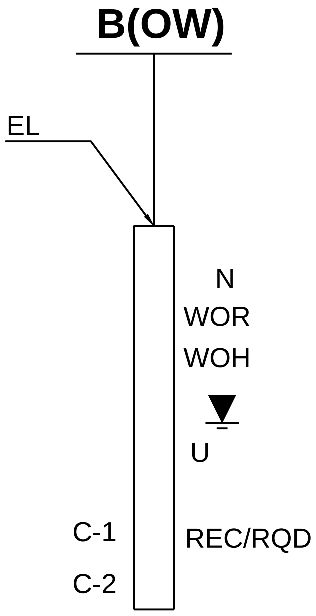
MANHATTAN NY

Drawing Title

SUBSURFACE PROFILE C-C'

Project No. 170173001
Date 04/05/2012
Scale 1" = 20'
Drawn By SKM
Submission Date 04/05/2012
Drawing No. 6
Sheet 6 of 7

BORING KEY



B	BORING IDENTIFICATION
EL	GROUNDSURFACE ELEVATION AT TIME OF BORING
N	STANDARD PENETRATION RESISTANCE; NUMBER OF BLOWS OFA 140 LB. HAMMER FREE FALLING 30 IN. TO DRIVE A 2 IN O.D. SPLIT SPOON SAMPLER 12 IN. AFTER 6 INCHES OF INITIAL PENETRATION.
REC	(LENGTH OF ROCK RETRIVED)/ (LENGTH OF ROCK CORED) * 100 %
RQD	ROCK QUALITY DESIGNATION (LENGTH OF ROCK PIECES 4 INCHES OR LONGER)/ (LENGTH OF ROCK CORED) * 100 %
(OW)	GROUNDWATER OBSERVATION WELL
▼	MEASURED GROUNDWATER LEVEL
C1	ROCK CORE RUN IDENTIFICATION
WOR	2 FT PENETRATION OF THE SPLIT SPOON SAMPLER UNDER THE OWN WEIGHT OF RODS
WOH	2 FT PENETRATION OF THE SPLIT SPOON SAMPLER UNDER THE STATIC WEIGHT OF THE DRIVING HAMMER
U	UNDISTURBED SAMPLE

MATERIAL SYMBOLS

⁙	CONCRETE	☐	FILL
▨	TIMBER	⁘	BEDROCK

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Project
105 WEST 57TH STREET
MANHATTAN NY

Drawing Title
LANGAN STANDARDS

Project No. 170173001
Date 04/05/2012
Scale NTS
Drawn By SKM
Submission Date 04/05/2012

Drawing No.
7

Sheet 7 of 7

APPENDIX A

TEST BORING LOGS

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Log of Boring **B-1** Sheet 1 of 2

Project: 105 West 57th Street			Project No.: 170173001		
Location: New York, NY			Elevation and Datum: Approx. EL. 61 BPMD		
Drilling Company: Craig Test Boring, Inc.			Date Started: 5/5/06	Date Finished: 5/5/06	
Drilling Equipment: CME-55 Track Rig			Completion Depth: 36 ft	Rock Depth: 21 ft	
Size and Type of Bit: 3 7/8" tricone roller bit			Number of Samples	Disturbed: 0	Undisturbed: 0 / Core: 3
Casing Diameter (in): 4-in O.D. Steel Pipe		Casing Depth (ft): 18'	Water Level (ft.)	First ▽ -	Completion ▼ - / 24 HR. ▼ -
Casing Hammer: Auto	Weight (lbs): 140 lb	Drop (in): 30 "	Drilling Foreman: Rob Dollar		
Sampler: N/A					
Sampler Hammer: N/A	Weight (lbs): N/A	Drop (in): N/A	Inspecting Engineer: Claudia Castro		

MATERIAL SYMBOL	Elev. (ft) +61.0	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		NO SAMPLES TAKEN **BC: Class 7**		0						Start drilling at 12:30 pm
		c-m SAND, gravel and concrete fragments, red brick fragments [FILL] **BC: Class 7**		2						
				5						Roller bit to 5 ft Rig chatters
				10						Roller bit to 10 ft
				11						Smooth drilling
				12						Loss of water in hole
				15						Roller bit to 15 ft
				16						Hammer down 4-in O.D. casing (3 sections @ 5 ft each) Rig chatters
	+43.0	Timber		18						Timber in wash
	+42.0	Concrete Slab		19						
				20						

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Log of Boring **B-1** Sheet 2 of 2

Project 105 West 57th Street	Project No. 170173001
Location New York, NY	Elevation and Datum Approx. EL. 61 BPMD

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
			20						Roller bit to 20 ft Hammer down 4-in O.D. casing (1 section @ 3 ft)
+40.0	gray mica SCHIST, slightly weathered **BC: Class 1**	5	21	C-1	NX CORE BARREL	REC=60"/60" =100%	RQD=42"/60" =70%		Start core run C-1 at 1:20 pm
		5	22						
		4	23						
		5	24						
+36.0	gray mica SCHIST, weathered **BC: Class 1**	5	25						
		4	26	C-2	NX CORE BARREL	REC=60"/60" =100%	RQD=42"/60" =70%		End core run C-1 at 1:44 pm Start core run C-2 at 1:52 pm
		6	27						
		4	28						
		4	29						
		4	30						
+30.0	gray mica SCHIST **BC: Class 1**	6	31	C-3	NX CORE BARREL	REC=60"/60" =100%	RQD=58"/60" =97%		End core run C-2 at 2:14 pm Start core run C-3 at 2:26 pm
		6	32						
		5	33						
		6	34						
		5	35						
+25.0	End of boring at 36 ft		36						End core run C-3 at 3:05 pm End of boring at 36 ft
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

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Log of Boring **B-2** Sheet 1 of 2

Project 105 West 57th Street		Project No. 170173001	
Location New York, NY		Elevation and Datum Approx. EL. 61 BPMD	
Drilling Company Craig Test Boring, Inc.		Date Started 5/5/06	Date Finished 5/5/06
Drilling Equipment CME-55 Track Rig		Completion Depth 33 ft	Rock Depth 23 ft
Size and Type of Bit 3 7/8" tricone roller bit		Number of Samples: Disturbed 0	Undisturbed 0; Core 2
Casing Diameter (in) 4-in O.D. Steel Pipe	Casing Depth (ft) 23'	Water Level (ft.): First ▽ -	Completion ▼ -; 24 HR. ▼ -
Casing Hammer: Auto; Weight (lbs) 140 lb	Drop (in) 30 "	Drilling Foreman Rob Dollar	
Sampler N/A			
Sampler Hammer: N/A; Weight (lbs) N/A	Drop (in) N/A	Inspecting Engineer Claudia Castro	

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
▨	+61.0	NO SAMPLES TAKEN **BC: Class 7**		0						Start drilling at 8:35 am Roller bit to 5 ft
				1						Smooth drilling
		c-m SAND, gravel and concrete fragments, red brick fragments [FILL] (Class 7)		2						
				3						
				4						
				5						Hammer down 4-in O.D. casing (1 section @ 5 ft)
				6						
				7						
				8						
				9						Roller bit to 10 ft
				10						Hammer down 4-in O.D. casing (1 section @ 5 ft)
				11						
				12						
				13						
				14						Roller bit to 15 ft
				15						Hammer down 4-in O.D. casing (1 section @ 5 ft)
				16						
				17						
				18						
				19						Roller bit to 20 ft
				20						

Log of Boring **B-2** Sheet 2 of 2

Project	Project No.
105 West 57th Street	170173001
Location	Elevation and Datum
New York, NY	Approx. EL. 61 BPMD

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
			20						Hammer down 4-in O.D. casing (1 section @ 5 ft)
+39.5	Concrete Slab								
+38.0	gray mica SCHIST **BC: Class 1**	6 4 4 5 5	23	C-1	NX CORE BARREL	REC=60"/60" =100%	RQD=47"/60" =78%		Hammer down 4-in O.D. casing (1 section @ 3 ft) Start core run C-1 at 10:38 am End core run C-1 at 10:56 am
		5 3 4 4 4	28	C-2	NX CORE BARREL	REC=60"/60" =100%	RQD=54"/60" =90%		Start core run C-2 at 11:05 am
+28.0	End of boring at 33 ft		33						End core run C-2 at 11:25 am End of boring at 33 ft

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Log of Boring **B-3** Sheet 1 of 2

Project 105 West 57th Street			Project No. 170173001		
Location New York, NY			Elevation and Datum Approx. EL. 61.5 BPMD		
Drilling Company Craig Test Boring, Inc.			Date Started 5/4/06	Date Finished 5/5/06	
Drilling Equipment CME-55 Track Rig			Completion Depth 34 ft	Rock Depth 24 ft	
Size and Type of Bit 3 7/8" tricone roller bit			Number of Samples	Disturbed 0	Undisturbed 0	Core 2
Casing Diameter (in) 4-in O.D. Steel Pipe		Casing Depth (ft) 20'	Water Level (ft.)	First ▽ -	Completion ▼ -	24 HR. ▽ -
Casing Hammer Auto	Weight (lbs) 140 lb	Drop (in) 30 "	Drilling Foreman Rob Dollar		
Sampler N/A			Inspecting Engineer Claudia Castro		
Sampler Hammer N/A	Weight (lbs) N/A	Drop (in) N/A			

MATERIAL SYMBOL	Elev. (ft) +61.5	Sample Description	Coring (min)	Depth Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
▨		NO SAMPLES TAKEN **BC: Class 7**		0						5/4/06 Start drilling at 12:05 pm
				1						Roller bit to 5 ft Red wash
		c-m SAND, gravel and concrete fragments, red brick fragments [FILL] (Class 7)		2						Water loss in hole
				3						
				4						
				5						Push down 4-in O.D. casing (1 section @ 5 ft)
				6						Roller bit to 10 ft
				7						Smooth drilling
				8						
				9						
				10						Hammer down 4-in O.D. casing (1 section @ 5 ft)
				11						
				12						
				13						
				14						
				15						Roller bit to 15 ft Hammer down 4-in O.D. casing (1 section @ 5 ft)
				16						
				17						
				18						
				19						
				20						

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Log of Boring **B-3** Sheet 2 of 2

Project 105 West 57th Street	Project No. 170173001
Location New York, NY	Elevation and Datum Approx. EL. 61.5 BPMD

Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data Number	Sample Data Type	Sample Data Recov. (in)	Sample Data Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
			20						Roller bit to 20 ft
			21						Hammer down 4-in O.D. casing (1 section @ 5 ft)
+40.0	Concrete Slab								Refusal at 21.5 ft Concrete slab at 21.5 ft
			22						
			23						Roller bit to 25 ft
+37.5	gray mica SCHIST **BC: Class 1**	7	24	C-1	NX CORE BARREL	REC=60"/60" =100%	RQD=58"/60" =97%		Rig chatters Drive in core drill Start core run C-1 at 2:48 pm
		4	25						
		5	26						
		4	27						
		6	28						
		6	29	C-2	NX CORE BARREL	REC=60"/60" =100%	RQD=50"/60" =83%		End core run C-1 at 3:30 pm 5/5/06 Start core run C-2 at 7:15 am
		5	30						
		5	31						
		5	32						
		5	33						
+27.5	End of boring at 34 ft		34						End core run C-2 at 7:55 am End of boring at 34 ft
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

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Log of Boring **B-4** Sheet 1 of 2

Project 105 West 57th Street		Project No. 170173001	
Location New York, NY		Elevation and Datum Approx. EL. 61 BPMD	
Drilling Company Warren George Inc.		Date Started 3/23/12	Date Finished 3/23/12
Drilling Equipment Mobile B53 Truck Rig		Completion Depth 24.2 ft	Rock Depth 19.2 ft
Size and Type of Bit 3 7/8" tricone roller bit		Number of Samples: Disturbed 0	Undisturbed 0 Core 1
Casing Diameter (in) 4-in O.D. Steel Pipe	Casing Depth (ft) 20'	Water Level (ft.): First ▽ -	Completion ▼ 8 24 HR. ▼ -
Casing Hammer N/A	Weight (lbs) N/A Drop (in) N/A	Drilling Foreman Edwin Feliciano	
Sampler N/A			
Sampler Hammer N/A	Weight (lbs) N/A Drop (in) N/A	Inspecting Engineer Seth Martin	

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+61.0	NO SAMPLES TAKEN **BC: Class 7**		0						Spin casing to 15 ft (3 sections at 5 ft) Smooth advance, no major obstructions Clean out casing with roller bit to 15 ft Intermittent, slight to moderate rig chatter to 15 ft
		▼		8						
				15						Little to no wash return from 15 to 19 ft Roller bit to 19 ft Apparent top of slab or rock at approximately 19 ft
	+41.8	? ? ? ?		19						Spin casing to 19.2 ft
		black to gray, quartz mica SCHIST, some pegmatite and granite at top of core (potential boulder), fresh to slightly	1	20	C-1	▮				Clean out casing to 19.2 ft

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Log of Boring **B-4** Sheet 2 of 2

Project	Project No.
105 West 57th Street	170173001
Location	**Elevation and Datum**
New York, NY	Approx. EL. 61 BPMD

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data Number	Sample Data Type	Sample Data Recov. (in)	Sample Data Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		weathered, slight to moderately fractured, medium hard **BC: Class 1**	10 6.5 4 5	20 21 22 23 24	C-1	NX CORE BARREL	REC=41"/60" =68%	RQD=29"/60" =48%		Slight to moderate rig chatter No wash return Start core run C-1 at 1:40 pm Barrel jammed at approximately 20.2 ft Clean out casing with roller bit to 20.2 ft Re-insert core barrel and continue core C-1 to 24.2 ft
	+36.8	End of boring at 24.2 ft		25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45						End core run C-1 at 2:20 pm End of boring at 24.2 ft

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Log of Boring **B-5** Sheet 1 of 2

Project 105 West 57th Street		Project No. 170173001	
Location New York, NY		Elevation and Datum Approx. EL. 60.9 BPMD	
Drilling Company Warren George Inc.		Date Started 3/23/12	Date Finished 3/23/12
Drilling Equipment Mobile B53 Truck Rig		Completion Depth 25.4 ft	Rock Depth 20.8 ft
Size and Type of Bit 3 7/8" tricone roller bit		Number of Samples: Disturbed 0	Undisturbed 0 Core 1
Casing Diameter (in) 4-in O.D. Steel Pipe	Casing Depth (ft) 20'	Water Level (ft.): First ▽ -	Completion ▼ - 24 HR. ▽ -
Casing Hammer N/A	Weight (lbs) N/A Drop (in) N/A	Drilling Foreman Edwin Feliciano	
Sampler N/A		Inspecting Engineer Seth Martin	
Sampler Hammer N/A	Weight (lbs) N/A Drop (in) N/A		

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+60.9	NO SAMPLES TAKEN **BC: Class 7**		0						Driller on-site at 8:25 am Spin casing to 5 ft, no obstructions Clean out casing with roller bit to 5 ft Concrete, brick, cinders, and gravel in wash Light brown wash, good return
				1						
				2						
				3						
				4						
				5						
				6						
				7						
				8						
				9						Spin casing to 10 ft
				10						Clean out casing with roller bit to 10 ft
				11						Gravel, brick, and concrete fragments in wash Light brown wash
				12						
				13						
				14						Spin casing to 15 ft
				15						Clean out casing with roller bit to 15 ft, advance roller bit to 19 ft
				16						
				17						
				18						Light brown wash, intermittent loss of water to 19 ft
	+42.0	? ? ? ? Concrete Slab	5.5	19	C-1	■				Slight to moderate rig chatter between 15 and 19 ft
				20						

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Log of Boring **B-5** Sheet 2 of 2

Project	Project No.
105 West 57th Street	170173001
Location	**Elevation and Datum**
New York, NY	Approx. EL. 60.9 BPMD

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40
	+40.7	~6" Void Below Slab	1.5	20	C-1	NX CORE BARREL	REC=45"/60" =75%	RQD=26"/60" =43%	
	+40.1	~1.5 ft gray white pink black quartz mica PEGMATITE, fresh, slightly fractured, medium hard to hard **BC: Class 1**	5	21					
			5.5	22					
		~1 ft gray to black quartz mica SCHIST, freh to slightly weathered, slightly fracured, medium hard	9	23					
			7	24	C-2	NX CORE BARREL	0%	0%	
	+35.5		5	25					
				26					
				27					
				28					
				29					
				30					
				31					
				32					
				33					
				34					
				35					
				36					
				37					
				38					
				39					
				40					
				41					
				42					
				43					
				44					
				45					

Remarks
(Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)

Clean out casing with roller bit to 19 ft

Apparent top of concrete slab at 19 ft, concrete fragments in wash
Begin core C-1 at 10:50 am
Loss of water at about 20 ft
Core barrel dropped approximately 6 to 12 inches at about 20 ft, potential void below concrete slab
Intermittent loss of water from 19 to 22 ft
No wash return from 22 ft to end of boring at 25.4 ft
REC=0"/18" =0%
RQD=0"/18" =0%
Finished core C-1 at 11:18 am
No recovery. Cored additional 1.5 feet to recover core left in hole.
End of Boring at 25.4 ft

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Log of Boring **B-6** Sheet 1 of 2

Project	105 West 57th Street	Project No.	170173001
Location	New York, NY	Elevation and Datum	Approx. EL. 60.9 BPMD
Drilling Company	Warren George Inc.	Date Started	3/23/12
		Date Finished	3/23/12
Drilling Equipment	Mobile B53 Truck Rig	Completion Depth	25 ft
		Rock Depth	20.5 ft
Size and Type of Bit	3 7/8" tricone roller bit	Number of Samples	Disturbed 0 Undisturbed 0 Core 1
Casing Diameter (in)	4-in O.D. Steel Pipe	Water Level (ft.)	First ▽ - Completion ▼ - 24 HR. ▼ -
Casing Depth (ft)	22'		
Casing Hammer	N/A	Drilling Foreman	Edwin Feliciano
Weight (lbs)	N/A		
Drop (in)	N/A		
Sampler	N/A	Inspecting Engineer	Seth Martin
Sampler Hammer	N/A		
Weight (lbs)	N/A		
Drop (in)	N/A		

MATERIAL SYMBOL	Elev. (ft) +60.9	Sample Description	Coring (min)	Depth Scale	Sample Data Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
▨		NO SAMPLES TAKEN **BC: Class 7**		0						Roller bit to 5 ft Spin casing to 5 ft
				1						
				2						
				3						
				4						
				5						Clean out casing to 5 ft with roller bit
				6						
				7						
				8						
				9						
				10						Roller bit to 10 ft Light brown wash, good return Small obstructions in fill Spin casing to 10 ft
				11						
				12						
				13						
				14						
				15						Spin casing to 15 ft
				16						
				17						
				18						
				19						
				20						

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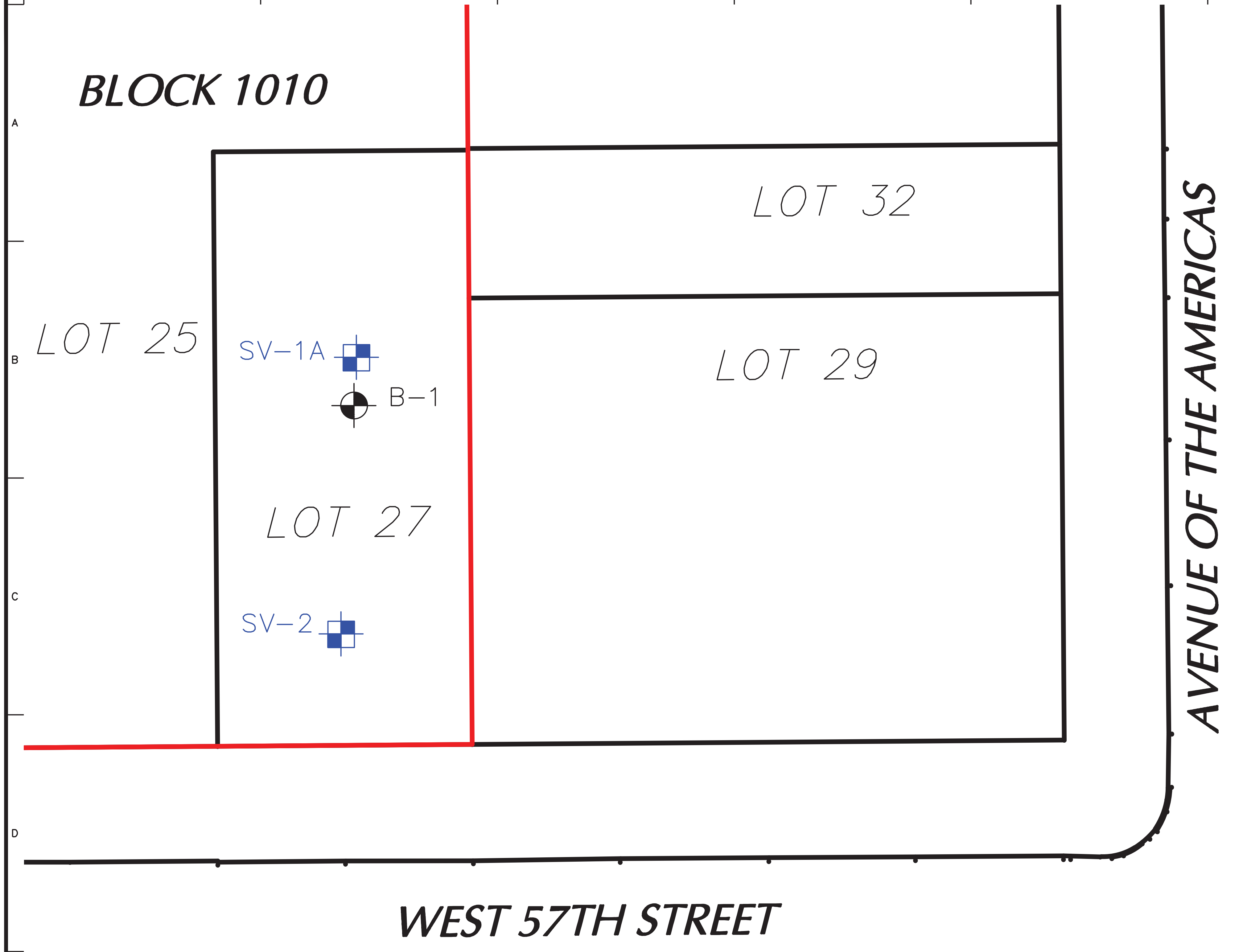
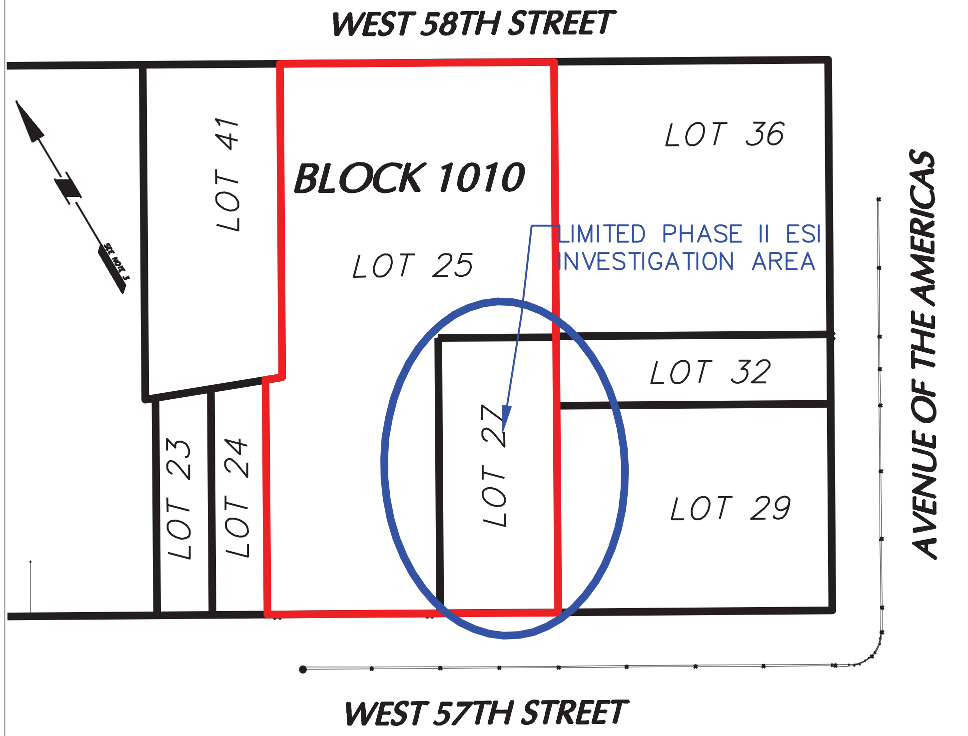
Log of Boring **B-6** Sheet 2 of 2

Project 105 West 57th Street	Project No. 170173001
Location New York, NY	Elevation and Datum Approx. EL. 60.9 BPMD

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Coring (min)	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
				20						Spin casing to approximately 20 ft Clean out casing with roller bit to 20 ft Brick and gravel in wash Apparent top of rock at 20.5 ft, rock/mica fragments in wash at 20.5 ft Potential decomposed/weather rock zone at about 20 to 20.5 ft Slight rig chatter at 20.5 ft Begin core C-1 at 4 pm from 20.5 ft Good wash return, wash is brownish transitioning to gray/clear Slow advance at about 25 ft. Boring terminated at 5:00 pm at 25 ft. Driller off-site at 5:15 pm
	+40.4	? ? ? ? black to gray, quartz mica SCHIST, slightly to moderately weathered, moderately fractured, some oxidation at fractures, medium hard **BC: Class 1**	8 6 6.5 9 7.5	21 22 23 24 25	C-1	NX CORE BARREL	REC=51"/60" =85%	RQD=39"/60" =65%		
	+35.4	End of boring at 25.5 ft		26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45						

APPENDIX D





KEY MAP

SCALE: 1" = 70'

LEGEND

🟥 – SITE BOUNDARY

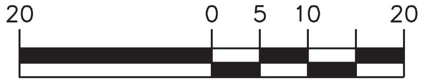
▬ – LOT LINES

B–1 ⊕ – SOIL BORING/MONITORING WELL LOCATION

SV–1A ▨ – SOIL VAPOR SAMPLE LOCATION

NOTES:

1. BASE MAP TAKEN FROM LANGAN'S TOPOGRAPHIC BOUNDARY & UTILITY SURVEY, DATED 02 FEBRUARY 2012.



SCALE IN FEET

LANGAN

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Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan International LLC
Collectively known as Langan

Project

105-109 WEST 57th St.

BLOCK 1010, LOT 27

MANHATTAN **NEW YORK**

Figure Title

SAMPLE LOCATION MAP

Project No.
170173001

Date
15 AUGUST 2013

Scale
1" = 20'

Drawn By
SPL

Submission Date
15 AUGUST 2013

Figure No.

2

Filename: \\langan.com\data\NY\data0\170173001\Cadd Data - 170173001\2D-DesignFiles\Environmental\170173001-N-EI0102.dwg Date: 8/19/2013 Time: 16:42 User: lmccartney Style Table: Langan.stb Layout: ANSIB-BL

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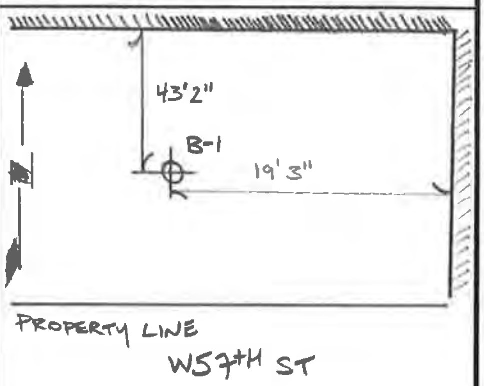
LOG OF BORING B-1 **SHEET** 1 **OF** 2

PROJECT 107 W57th STREET
PROJECT NO 170173001
LOCATION NEW YORK, NEW YORK
ELEVATION AND DATUM
DRILLING AGENCY ADT, INC
DATE STARTED 2013.07.22
DATE FINISHED 2013.07.22
DRILLING EQUIPMENT SONIC 17C (AMS COMPACT ROTO SONIC)
COMPLETION DEPTH 29'
ROCK DEPTH 23'
SIZE AND TYPE OF BIT 6" SONIC BIT
NO. SAMPLES DIST. UNDIST. CORE
CASING
WATER LEVEL FIRST COMPL. 24 HR.
CASING HAMMER WEIGHT DROP
FOREMAN T. SHEERIN
SAMPLER 3.5" SONIC SAMPLING BIT
SAMPLER HAMMER WEIGHT DROP
INSPECTOR D. CARRUS

SYMBOL	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO. LOC.	SAMPLES TYPE	SAMPLES RECOV. FT.	SAMPLES PENETR. RESIST BL/6in. PID	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
	brown m-f SAND Some Concrete tr. brick tr gravel					0.0	
		1				0.0	
		2				0.0	
		3	S-1	PLASTIC SAMPLE BAG	3.5'	0.0	
		4					
	Brown m-f SAND and COARSE GRAVEL brown m-f SAND some concrete tr. brick tr. trash, debris	5				0.0	
FILL		6				0.0	
						0.0	
		7				0.0	
		8	S-2	PLASTIC SAMPLE BAG	3.5'		
		9					
	brown SAND some gravel tr. brick tr. wood	10				0.0	
		11				0.0	
						0.0	
		12	S-3	PLASTIC SAMPLE BAG	4'	0.0	
		13				0.0	
		14					

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JOB NO. 170173001
DATE 2013.07.22

LOG OF BORING NO. B-1

SHEET 2 OF 2

Symbol	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			NO.LOC.	TYPE	RECOV. FT.	PENETR. RESIST BL/6 in.	
		14					
	WOOD, brick, little sand	15	S-4	PLASTIC SAMPLE BAG	0.5	0.0	14:10: VOID ENCOUNTERED @ 15'
		16					
		17					
		18					
		19					
	CONCRETE SLAB	20	S-5	PLASTIC SAMPLE BAG	4'	0.0	
	brown c-f SAND AND DECOMPOSED BEDROCK WET	21				0.0	
	▽	22				0.0	
	BROKEN & PULVARIZED BEDROCK	23				0.0	
						0.0	
		24				0.0	
	NO SAMPLES TAKEN	25					
		26					
		27					
		28					
	EOB @ 29 ft bg	29					

WELL CONSTRUCTION SUMMARY

Well No. B-1

PROJECT 107 W57th Street

PROJECT NO. 170173001

LOCATION New York, NY

ELEVATION AND DATUM

DRILLING AGENCY ADT

DATE STARTED 2013-07-22 **DATE FINISHED** 2013-07-22

DRILLING EQUIPMENT AMS Compact Roto Sonic 17C

DRILLER T. Sheerin

SIZE AND TYPE OF BIT 6" Sonic Bit

INSPECTOR D. Carrus

METHOD OF INSTALLATION

Boring was advanced to 29 feet using a Sonic 6" bit. A 2-inch diameter, 10-foot ten-slot screen, and 10-foot long PVC risers were installed. The total depth of the well below grade is 29 feet. The void space around the screen was backfilled with silica sand. An approximate 2-foot thick bentonite seal was installed above the clean sand. The remaining space was filled with sand. A flushmount cover grouted with concrete was installed at the well head.

METHOD OF WELL DEVELOPMENT

Well was overpumped.

TYPE OF CASING PVC **DIAMETER** 2"

TYPE OF BACKFILL MATERIAL Sand

TYPE OF SCREEN 10-slot PVC **DIAMETER** 2"

TYPE OF SEAL MATERIAL Bentonite

BOREHOLE DIAMETER 6"

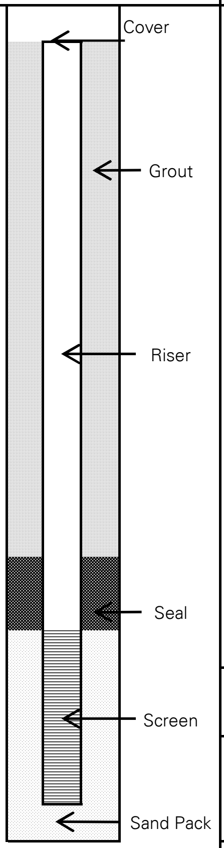
TYPE OF FILTER MATERIAL Sand

	ELEVATION	DEPTH (ft)
TOP OF CASING		
TOP OF SEAL		19
TOP OF FILTER		17
TOP OF SCREEN		19
BOTTOM OF BORING		65
SCREEN LENGTH		(ft) 10
SLOT SIZE		10

GROUNDWATER ELEVATIONS

ELEVATION	DATE	DEPTH TO WATER
	2013-07-22	22

WELL DETAILS



SUMMARY SOIL CLASSIFICATION	DEPTH (FT)
FILL	0.0 19.0 20.0
SAND AND DECOMP BEDROCK	23.0
BEDROCK	29.0

LANGAN Engineering and Environmental Services, Inc.

21 Penn Plaza, 360 West 31st Street, Suite 900, New York, New York 10001-2727

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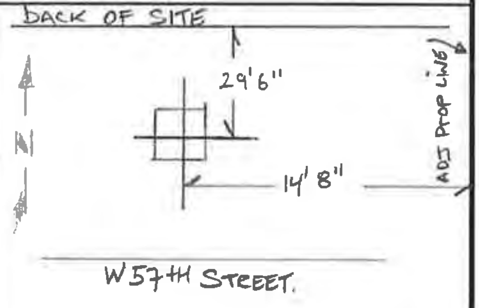
LOG OF BORING SV-1 **SHEET** 1 **OF** 2

PROJECT 107 W57TH STREET
PROJECT NO. 170173001
LOCATION NEW YORK, NEW YORK
ELEVATION AND DATUM
DRILLING AGENCY ADT
DATE STARTED 2013.07.22
DATE FINISHED 2013.07.22
DRILLING EQUIPMENT AMS COMPACT ROTO SONIC 17C
COMPLETION DEPTH 20'
ROCK DEPTH
SIZE AND TYPE OF BIT 6" SONIC BIT
NO. SAMPLES DIST. UNDIST. CORE
CASING
WATER LEVEL FIRST COMPL. 24 HR.
CASING HAMMER WEIGHT DROP
FOREMAN T. SHEERIN
SAMPLER 3.5" SONIC SAMPLING BIT
INSPECTOR D. CARRUS
SAMPLER HAMMER WEIGHT DROP

SYMBOL	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO. LOC.	SAMPLES TYPE	SAMPLES RECOV. FT.	SAMPLES ~~PENETR. RESIST BL/6 IN.~~ PID	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
	brown m-f SAND and BRICK tr. gravel tr. COAL (fill)		S-1	PLASTIC SAMPLE BAG	4'	0.0	
		1				0 0	
						0.0	
	brown m-f SAND some gravel (fill)	2					
						0.0	
	brown m-f SAND AND CONCRETE some gravel tr. brick (fill)	3					
						0.0	
		4					
	brown m-f SAND some gravel some brick (fill)	5	S-2	PLASTIC SAMPLE BAG	4'	0.0	
		6				0 0	
FILL						0.0	
		7					
						0.0	
		8					
						0.0	
		9					
	brown m-f SAND some gravel some coal tr. brick	10	S-3	PLASTIC SAMPLE BAG	3'	0.0	
		11				0.0	
						0.0	
	brown SAND and CONCRETE some gravel tr. brick tr. wood tr. concrete	12				0.0	
						0.0	
		13					
		14					



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JOB NO. 170173001
DATE 2013.07.22

LOG OF BORING NO. SV-1

SHEET 2 OF 2

Symbol	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	SAMPLES TYPE	SAMPLES RECOV. FT.	SAMPLES ~~PENETR. RESIST BL/6 IN.~~ PID	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
		14					
	Brown m-f SAND some gravel some brick	15	S-4	PLASTIC SAMPLE BAG	4'	0.0	
		16				0.0	
		17				0.0 0.0	
	brown m-f SAND and CONCRETE tr. wood	18				0.0	
	grey CONCRETE AND m-f SAND	19				0.0	
	SLAB? EOB@ 20'	20					10:45 - HIT CONCRETE

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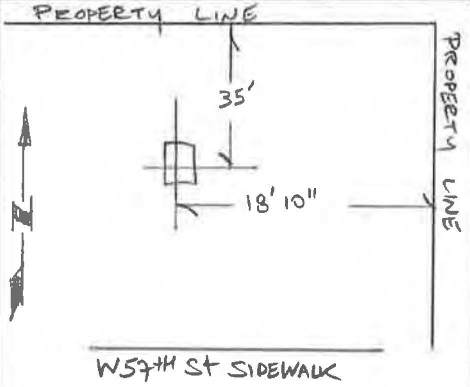
LOG OF BORING SV-1A **SHEET** 1 **OF** 2

PROJECT 107 W. 57th STREET		PROJECT NO 170173001	
LOCATION NEW YORK, NEW YORK		ELEVATION AND DATUM	
DRILLING AGENCY ADT, INC		DATE STARTED 2013·07·22	DATE FINISHED 2013·07·22
DRILLING EQUIPMENT AMS COMPACT ROTO SONIC 17C		COMPLETION DEPTH 15'	ROCK DEPTH
SIZE AND TYPE OF BIT 6" SONIC BIT		NO. SAMPLES DIST. UNDIST.	CORE
CASING		WATER LEVEL FIRST COMPL.	24 HR.
CASING HAMMER WEIGHT DROP		FOREMAN T. SHEERIN	
SAMPLER 3.5" SONIC SAMPLING BIT		INSPECTOR D. CARRUS	
SAMPLER HAMMER WEIGHT DROP			

SYMBOL	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO. LOC.	SAMPLES TYPE	SAMPLES RECOV. FT.	SAMPLES ~~PENETR. RESIST BL/6 in.~~ PID	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
	brown m-f SAND and GRAVEL some Concrete tr. brick	0	S-1	PLASTIC SAMPLE BAG	2.5'	0.0	
		1				0.0	
						0.0	
		2				0.0	
						0.0	
		3					
		4					
FILL	brown m-f SAND some gravel tr. concrete (moist)	5	S-2	PLASTIC SAMPLE BAG	2.5'	0.0	
		6				0.0	
						0.0	
	grey m-f SAND and GRAVEL some concrete (dry)	7				0.0	
		8					
		9					
	brown SAND AND GRAVEL tr. brick tr. coal	10	S-3	PLASTIC SAMPLE BAG	4'	0.0	
		11				0.0	
						0.0	
	brown SAND Some gravel tr. brick	12				0.0	
		13				0.0	
						0.0	
		14					



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JOB NO. 170173001
DATE 2013.07.22

LOG OF BORING NO. SV-1A

SHEET 2 OF 2

	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			NO.LOC.	TYPE	RECOV. FT.	~~PENETR. RESIST BL/6in.~~ PID	
		14					
	EOB @ 15'	15					

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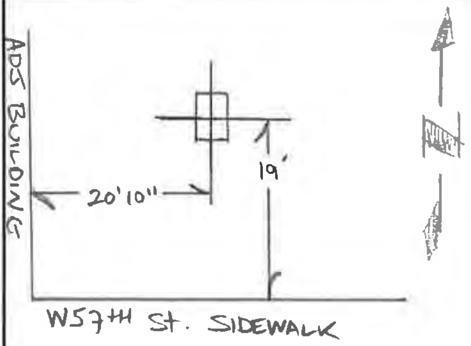
LOG OF BORING SV-2 **SHEET** 1 **OF** 2

PROJECT 107 W57th STREET	PROJECT NO. 170173001
LOCATION NEW YORK, NY	ELEVATION AND DATUM
DRILLING AGENCY ADT, INC	DATE STARTED 2013.07.22 / DATE FINISHED 2013.07.22
DRILLING EQUIPMENT SONIC 17C (AMS COMPACT ROTO SONIC)	COMPLETION DEPTH 15' / ROCK DEPTH
SIZE AND TYPE OF BIT 6" SONIC BIT	NO. SAMPLES / DIST. / UNDIST. / CORE
CASING	WATER LEVEL / FIRST / COMPL. / 24 HR.
CASING HAMMER / WEIGHT / DROP	FOREMAN T. SHEERIN
SAMPLER 3.5" SONIC SAMPLING BIT	INSPECTOR D. CARRUS
SAMPLER HAMMER / WEIGHT / DROP	

SYMBOL	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	SAMPLES TYPE	SAMPLES RECOV. FT.	SAMPLES ~~PENETR. RESIST BL/6 in~~	PID	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
	brown m-f SAND some brick some gravel tr. wood tr. Concrete		S-1	PLASTIC SAMPLE BAG	2'	0.0		
		1				0.0		
	brown m-f SAND some gravel tr. concrete	2				0.0		
		3						
		4						
FILL	brown m-f SAND some Concrete tr. brick tr coal tr. wood	5	S-2	PLASTIC SAMPLE BAG	4'	0.0		
		6				0.0		
		7				0 0		
		8				0.0		
		9				0.0		
	brown m-f SAND tr. brick tr. Concrete	10	S-3	PLASTIC SAMPLE BAG	4'	0.0		
		11				0.0		
		12				0.0		
		13				0.0		
	brown m-f SAND AND BRICK					0.0		
		14						

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JOB NO. 170173001
DATE 2013.07.22

LOG OF BORING NO. SV-2

SHEET 2 OF 2

SYMBOL	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES NO.LOC.	TYPE	RECOV. FT.	~~PENETR. RESIST BL/6 IN.~~ PID	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
		14					
		15					
	EOB @ 15'						