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13 January 2012

Ms. Elizabeth Palmer
Fisher Brothers Management
299 Park Avenue, Suite 42
New York, NY 10171

RE: Supplemental Geotechnical Recommendations
Proposed 111 Washington Street Development
New York, New York
Langan Project No.:1948405

Dear Liz:

In accordance with Tasks 1 and 2 of our 23 December 2011 proposal, and subsequent authorization by Fisher Brothers, we have performed an initial geotechnical review and prepared this report giving our supplemental geotechnical recommendations. In November 2004, we had performed one (1) drilled boring along the Carlisle Street sidewalk as part of a preliminary subsurface investigation at the 111 Washington Street site, and had provided our preliminary thoughts regarding foundation design to Term Washington Street Garage, LLC in our 10 January 2005 report. This report is attached as Appendix A. We subsequently performed three (3) additional borings at the site in June 2005. This report summarizes our understanding of the project conditions and the most current development plans, and presents our sub-surface investigation findings to date and our supplemental geotechnical recommendations for the proposed development.

PROJECT CONDITIONS

The project site consists of an approximately 11,164-square-foot lot (Tax Block 53, Lot 12) at the southwestern corner of the intersection of Washington and Carlisle Streets in downtown Manhattan; see Figures 1 and 2. The 6-level parking garage occupying the site at the time of our 2004 and 2005 subsurface investigations has since been demolished. The site is currently being used by the Port Authority of New York and New Jersey as a temporary office and equipment storage area for the reconstruction work associated with the World Trade Center site.

Based on a 21 June 2005 Architectural Survey prepared by True North Surveyors, Inc., the Washington and Carlisle Street sidewalk elevations adjacent to the site vary from about el 5 to about el 7 (Manhattan Borough President Datum, BMPD). Occupied five to nine story buildings, some with rear yards, border the east and south sides of the site. Foundation-related information about these buildings obtained from the NYCDOB Records Room was summarized

in our 10 January 2005 Report; see Appendix A. As indicated in this report, our review of the 1865 Sanitary and Topographic Map of the City of New York indicates the site is located about 175 feet to the west of Manhattan's historic shoreline; this map is attached as Figure 3. Our review of the MTA subway maps and the available site survey indicates the NYCTA subway tunnel structure located beneath Greenwich Street is within 200 feet of the site. Our review of the NYCDOB's web-based resources indicates the 103 Washington Street building located about 75 feet to the south of the site is a designated NYC Landmark. A historic lamppost is also indicated to be present to the south of the site along Washington Street sidewalk in front of the 105-107 Washington Street building.

PROPOSED DEVELOPMENT

Based on preliminary massing information provided by your office, we understand the current development plans are to construct a 46-story building at the site. The building will have one (1) level of below-grade garage occupying the entire site footprint; top of the basement floor slab is expected to be 18 feet below the existing site grade. No other development related or structural loading information is available to us at this time.

SUBSURFACE INVESTIGATIONS

As previously discussed, we performed a preliminary subsurface investigation at the site in November 2004 consisting of one (1) drilled boring, LB1, along the Carlisle Street sidewalk. Our work and results of this investigation were summarized in our 10 January 2005 report; see Appendix A.

Our subsequent subsurface investigation consisted of drilling three (3) additional borings, B1 through B3, at the site. The borings were drilled between 2 and 30 June 2005 by Warren George, Inc. using a portable electric drill rig from the ground floor level of the former parking garage building occupying the site at the time of the investigation; refer to Figure 2 for the approximate boring locations. A field engineer from our office was at the site on full-time basis to perform controlled inspection of the borings as required by the 1968 New York City Building Code (NYC Bldg Code); the investigation work and boring inspection was performed under the direct supervision of a NY State licensed Professional Engineer from our office.

In each additional boring, conventional drilling techniques were used and soil sampling was performed using Standard Penetration Test (SPT) procedure in general accordance with provisions of ASTM D1586. However, a reduced hammer drop height of 22 inches (in lieu of the standard drop height of 30 inches) was used while obtaining the SPT samples due to headroom constraints in the garage. After rock was encountered, each boring was advanced into rock using a 5-foot-long NX-size double-tube core barrel fitted with a diamond bit; conventional rock coring was performed in each boring. Rock core runs were typically retrieved in 5-foot lengths until the boring was advanced at least 10 feet into relatively good quality rock.

Our field engineer observed each soil and rock sample and recorded the following information on the field boring logs: soil sample description, rock type, Rock Core

Recovery (REC), Rock Quality Designation (RQD), and the NYC Bldg Code soil and rock classifications. This data was later confirmed in our Elmwood Park, New Jersey laboratory. The soil and rock classifications on the boring logs were recently revised for this report in accordance with the materials classification requirements of the 2008 NYC Bldg Code. The borings logs are attached as Appendix B.

Groundwater levels were recorded for each boring when first encountered, based on relative wetness of the soil samples. After completion of each boring, a groundwater level measurement was attempted prior to backfilling the boring. Our field engineer also periodically checked groundwater levels in the temporary groundwater level observation well, MW1, previously installed in the completed sidewalk boring LB1.

SUBSURFACE CONDITIONS

The boring data from the three additional borings is in general agreement with our findings from the preliminary investigation. The supplemental investigation confirms the site is generally underlain by successive layers of surficial fill, former river bottom deposits, and hardpan overlying bedrock; a boring profile is attached as Figure 4. The following paragraphs summarize the soil, rock, and groundwater conditions observed in the borings performed to date.

Fill

Surficial fill was observed in the top about 19 to 25 feet of the borings, and generally consisted of fine to coarse sand with varying proportions of silt, clay, gravel, and other miscellaneous debris such as brick, concrete, lumber/wood, glass, and root fibers. The fill was observed to be generally in a loose to medium dense condition, as evidenced by drop-height-corrected SPT N-values ranging from about 5 to about 28 blows/foot; occasional refusal blowcounts were inferred to be a result of occasional relatively larger pieces of debris or cobble within the fill. The fill is classified as 2008 NYC Bldg Code Class 7 material.

An environmental test pit extending into fill was excavated at the site on 11 January 2012. The results of this investigation are presented in separately transmitted reports prepared by our firm.

Former River Bottom Deposits

An about 15 to 19-foot-thick stratum of former river bottom deposits was observed beneath the surficial fill in all the borings. The bottom of this stratum was observed to vary from about el -31.5 to about el -34.5 in the borings. These deposits generally consisted of successive layers of silt or clay, fine to coarse sand, and peat. The silt and clay within this stratum were observed to be generally in a soft to stiff condition, as evidenced by drop-height-corrected SPT N-values ranging from about 4 to about 12 blows/foot. The sand was observed to be generally in a medium dense condition, as evidenced by drop-height-corrected SPT N-values ranging from about 16 to about 30 blows/foot. The peat was observed to be in a stiff to very stiff condition, as evidenced by drop-height-corrected SPT N-values ranging from about 14 to about 19 blows/foot. Considering the variable nature of the former river bottom deposits and the

presence of compressible material in this stratum, these materials are classified as 2008 NYC Bldg Code Class 7 materials.

Hardpan

An about 7 to 14-foot-thick stratum of hardpan was observed beneath the former river bottom deposits. This stratum was observed to consist of a very dense (drop-height-corrected SPT N-values of over 100 blows/foot) mixture of sand, silt, clay, gravel, and cobbles/boulders, and was classified as 2008 NYC Bldg Code Class 3a material.

Rock

Mica schist rock was observed beneath the hardpan stratum at elevations ranging from about el -41.5 to about el -46 in all the borings. The upper about 4 feet of rock encountered in the sidewalk boring, LB1, was observed to be in a weathered condition, as evidenced by a Rock Quality Designation (RQD) of 0%; the weathered rock is classified as 2008 NYC Bldg Code Class 1.d material. No weathered rock was observed in borings B1 through B3. Rock observed in these borings, and that observed in boring LB1 beneath the Class 1.d weathered rock, is classified as 2008 NYC Bldg Code Class 1.b or better rock, as evidenced by RQD ranging from 71% to 100%.

Groundwater

Groundwater was first encountered in the borings (as evidenced by wetness of the soil samples) at elevations ranging from about el 0.5 to about el -4. Water level readings taken by our field engineer in the temporary observation well installed in boring LB1 since well installation until our latest reading on 11 January 2012 ranged from about el -5.5 to about el -7.5. Although moist soil was observed below about el -6 in the environmental test pit excavated in the southern portion of the site on 11 January 2012, no groundwater accumulation was observed at the bottom of the test pit; the test pit extended to about 13 feet below existing site grade (i.e., to about el -7). Note these levels are lower than the level at which groundwater is typically encountered in mass excavations made in this part of Manhattan. We recommend the actual groundwater conditions at the site be further explored by means of deep test pits extending to verify the regional groundwater level.

We researched and reviewed a Flood Insurance Rate Map (FIRM Community Panel Number 3604970184F, effective date 5 September 2007); a portion of this map is reproduced as Figure 5. This map indicates the site is located in Zone AE: "Special flood hazard areas subject to inundation by the 1% annual chance flood – base flood elevations determined."; the 1% annual chance flood is also known as the 100-year flood.

SUPPLEMENTAL FOUNDATION RECOMMENDATIONS

Since the sub-surface conditions observed in the three on-site borings were generally consistent with those observed in the preliminary sidewalk boring, we maintain our preliminary recommendations given in the 10 January 2005 Report. The 18-foot-deep single basement

scheme currently under consideration is generally midway between the 1 and 2 below-grade-level schemes discussed in our 10 January 2005 report with respect to the anticipated foundation bearing level.

Therefore, our foundation design recommendations for the current development scheme, revised with respect to provisions of the 2008 NYC Bldg Code, can be summarized as follows:

- The concentrated tower footprint combined with anticipated high compressive, uplift, and lateral column loads and presence of nominally unsatisfactory foundation bearing materials (2008 NYC Bldg Code Class 7 materials) within several feet below proposed basement level will require a pile foundation system to be used to support the proposed building columns and walls. The piles will need to be installed to bear into the hardpan or rock underlying the former river bottom deposits. Considering the proximity of relatively old and sensitive buildings bordering the site and the NYCTA subway structure under Greenwich Street, we recommend drilled-in (rather than driven) piles be used to avoid pile driving induced vibrations that could potentially damage the neighboring structures. Due to the limited thickness of the hardpan stratum observed in the borings and the anticipated high compressive and uplift column loads, we anticipate caisson piles drilled and socketed into NYC Bldg Code Class 1.c or better rock would be the appropriate drilled pile foundation system.

- We anticipate a 12-inch-diameter caisson pile socketted a minimum of 7.5 feet into 2008 NYC Bldg Code Class 1.c or better rock and designed in accordance with the 2008 NYC Bldg Code allowable stress requirements can sustain a design compression load of 300 tons per caisson pile. A caisson pile constructed using a 12-inch outer diameter, 0.375-inch-thick, 36 ksi steel casing extending minimum 6 inches into NYC Bldg Code Class 1.c or better rock; filled with 5,000 psi grout; and reinforced with two #20 Grade 75 bars (one additional #18 bar in the rock socket) would satisfy the allowable stress requirements in the Code. An individual uplift capacity on the order of about 100 tons per element can be assumed for the above-mentioned rock-socketed caisson pile; additional analysis would be required to determine if higher individual caisson uplift capacities could be substantiated.

  Higher compression and uplift capacities can be achieved by using larger diameter caisson piles socketted deeper into rock; caisson diameters of 18 and 24 inches are common in the New York City. Once column loads are finalized, we can provide recommendations for higher capacity caissons, if necessary. The basic allowable lateral load carrying capacity of the caisson piles would be one (1) ton per element; field load tests would be required to substantiate higher load carrying capacities of individual elements. We would need to review the above recommendations after caisson layout and design capacity requirements are finalized.

Seismic Design

We reviewed the 2008 NYC Bldg Code seismic design requirements with respect to the available boring data and the proposed 18-foot-deep basement. Our review indicates the 2008 NYC Bldg Code would allow the use of the following seismic parameters:

IBC Seismic Parameter	Value
Seismic Site Class	Class C
Mapped Maximum Considered Earthquake Spectral Response Accelerations	S_s = 0.365 (short periods) S_1 = 0.071 (1-second period)
Site Coefficients as a function of Site Class and Mapped Spectral Response Acceleration	F_a = 1.2 (short periods) F_v = 1.7 (1 second period)

These initial seismic parameters should be confirmed after the basement depth is finalized and the remaining Code-required borings are completed as subsequently discussed.

Below Grade Walls and Floor Slabs

Below-grade walls are presumed to be fixed against rotation, and should therefore resist soil, hydrostatic, surcharge, and dynamic pressures. The site is located within the 100-year food zone. Therefore, foundation walls and the basement floor slab should be designed to resist hydrostatic pressure arising from the 100-year flood level (el 7.25 MBPD). With respect to the compressive loads, the basement slab should be designed as a structural slab supported on the caisson pile caps. Unless the neighboring building foundations bear or are underpinned to bear beneath a 1H:1V theoretical influence line extending upwards from the bottom of the new foundation walls, surcharge loads from the shallow-foundation-supported neighboring buildings should be considered in the new foundation wall design. Surcharge loading along Washington and Carlisle Streets, associated sidewalks, and neighboring building yards along the east side of the site would need to be considered in foundation wall design. A lateral pressure diagram recommending how to address the above loads is presented as Figure 6.

All building elements below el 7.25 should be fully flood-proofed. We recommend all below-grade walls and the basement slab be fully waterproofed using a continuous waterproofing membrane and the ground floor level slab be established above the 100-year flood level.

OTHER GEOTECHNICAL CONSIDERATIONS

NYCT Permitting

As previously discussed, the site is located within 200 feet of the NYCTA subway tunnel structure under Greenwich Street. For project sites located within 200 feet of the NYCTA facilities (NYCTA influence zone), NYCDOB requires that a project plan approval or a letter of "no impact" be obtained from NYCTA prior to issuance of building permits. NYCTA's submission requirements and the extent of their further involvement on a project with respect to mandating documentation and monitoring of their tunnel structure depends

upon several factors, such as the proximity of the site to their tunnel structure, the depth of proposed excavation, the foundation type, and the Contractor's means and methods of construction. We recommend the closest distance between the NYCTA subway tunnel structure and the site should be determined based on field survey and shown on the architectural survey drawing for future use. As the project moves through its schematic design and design development phases, and architectural and structural progress drawings become available, interaction with the NYCTA Outside Projects Group should be initiated as soon as possible to discuss NYCTA's project-specific review requirements.

Excavation, Dewatering, and Excavation Support

Under the current one-basement-level scheme, the site would be mass-excavated to about 18 to 20 feet below the existing site grade. Additional isolated deeper (i.e., an additional 3 to 6-foot-deep) excavations will be required at caisson pile cap, grade beam, and elevator pit locations. This excavation will therefore be within the fill. Former building foundation remnants, associated underground storage tanks, and former wharves / piers / debris associated with the historic shoreline may be present in the fill and will need to be removed and properly disposed off. We recommend test pits be excavated throughout the site to investigate the presence of the above elements. We also recommend elevator pits be located away from the adjacent structures to limit the extent of excavation immediately adjacent to these structures.

Mass excavation to about 2 feet above the groundwater level can be performed without the need for a dewatering system, with minor surface rain and / or perched water handled by isolated pumping, collection, and off-site discharge. Properly designed and constructed conventional soldier pile and lagging wall and concrete pier underpinning systems can be used above the groundwater level to support the sides of the excavation and the adjacent structures, respectively.

A significant dewatering system will be required to facilitate excavation and foundation construction below the groundwater level. In our experience, NYCDEP limits the amount of temporary dewatering effluent entering into the City sewer system. If the rate of dewatering effluent discharge from the site exceeds the initially approved and paid-for allowance, the City may require additional higher per gallon fees to be paid in order to discharge the additional effluent into the sewer system. To limit this exposure, a continuous closed sheeting system extending to top of the hardpan stratum can be installed as a groundwater cut-off along the north and west sides of the site and along the adjacent yards and pile-supported buildings along the east side of the site. We anticipate relatively stiffer cast-in-place excavation support systems, such as a continuous reinforced concrete slurry wall or a secant pile system, will be required to facilitate excavation below groundwater level along the adjacent shallow-foundation-supported buildings. Alternatively, the basement could be stepped back in areas of the site next to the neighboring buildings. The extent of dewatering and the associated excavation support system options can be further evaluated once the actual groundwater level is investigated by means of the previously discussed deep test pit.

All excavation support and underpinning systems should be designed by the Excavation Contractor's Professional Engineer licensed in the State of New York. The design should take into account all anticipated soil, groundwater, and temporary and permanent surcharge loads from streets, sidewalks, and adjacent structures. The 2008 NYC Bldg Code requires that site-specific plans and details be prepared for underpinning and temporary excavation support and submitted to the NYCDOB. We recommend exploratory test pits / probes be performed at the site to strategically expose the foundations of the bordering buildings at select locations, so that information about these foundations can be obtained and site specific plans and details can be prepared. These test excavations, along with the previously discussed deep test pit, should be observed to identify presence of large historic foundation remnants, demolition debris, any underground storage tanks (USTs), and any potentially impacted soil and groundwater at the site.

Excavation, excavation support and underpinning construction, and dewatering work should be performed with care so as not to cause damage or loss of support to the neighboring / bordering buildings and structures. The 103 Washington Street building is a designated NYC landmark located within 90 feet of the site. Therefore, this building should be protected and continuously monitored during on-site excavation and foundation construction activities per the requirements of NYCDOB Technical Policy and Protection Notice (TPPN) 10/88; the TPPN 10/88 monitoring threshold values are discussed in the subsequent section. Any existing vaults below adjacent sidewalks should be surveyed to determine if they might impact future excavation and construction work.

Demolition debris, fill, soil, and groundwater encountered during excavation would need to be classified and disposed off-site. These materials and any existing underground storage tanks (USTs) encountered during excavation should be removed and disposed of, along with any environmentally contaminated fill, soil, and groundwater, per the applicable NY State DEC and NYCDEP regulations. Formal recommendations regarding these aspects of the project are addressed in separate environmental reports prepared by our firm.

Protection of Neighboring Structures

Neighboring / bordering buildings, adjacent NYCT subway tunnel structures, and all utilities, sidewalks, and streets surrounding the site should be protected against loss of support or any other damage during on-site excavation and subsequent construction. Special care will be required during dewatering, soil excavation and removal, and excavation support and underpinning construction activities to ensure that loss of ground does not result from underneath the neighboring / bordering structures or excessive vibrations or movements are not induced in these structures that could result in their loss of support or instability. The provisions of the NYCDOB TPPN 10/88 will govern the documentation, monitoring, and protection requirements for the NYC-Landmarked 103 Washington Street building and the historic lamppost along Washington Street; see Appendix C.

Pre-construction conditions documentation should be performed to establish existing conditions of the neighboring / bordering buildings, and the NYC-Landmarked 103 Washington Street building and the historic Washington Street lamppost located to the south of the site. The pre-construction condition documentation work for the non-Landmarked buildings should consist of, as a minimum, a video (and supplemental photographic) documentation of accessible and visible portions of the select exterior and interior facades of the buildings within about 25 feet of the site. For the 103 Washington Street building, the portion within 90 feet of the site should be documented as a minimum. Ambient vibrations at the site and in the basements of the above buildings should be measured as part of the documentation work. Crack monitoring gauges and / or reference lines should also be established at select pre-existing cracks observed in these buildings during the documentation work.

The neighboring / bordering buildings and the NYC-Landmarked 103 Washington Street building should be continuously monitored during on-site excavation and below-grade construction activities using crack monitoring gauges and elevation and lateral position control points established over select façades to determine if these structures are adversely impacted by the on-site work. Laser scan surveys of the neighboring building facades can be done to supplement the elevation / lateral position control point and crack gauge monitoring. Adjacent sidewalks should be similarly monitored on a periodic basis during excavation and foundation construction activities. Vibration levels in the above buildings should also be continuously monitored during on-site activities using seismograph vibration monitors placed at strategic locations. As previously discussed, additional interaction with NYCTA is necessary to determine if they have any preconstruction conditions documentation and on-going monitoring requirements for their subway tunnel structure located under Greenwich Street.

NYCTA requires that vibration levels measured at their structures be limited to a maximum threshold peak particle velocity of 0.5 inch/second. Per the NYCDOB TPPN 10/88, vibration levels and movements recorded at the 103 Washington Street building should not exceed 0.5 inch/second and 0.25 inch, respectively. Since the site and the other neighboring / bordering buildings are not located in a designated NYC Historic District, at this time, we recommend a preliminary limiting peak particle velocity of 2 inches/second for the other non-Landmarked neighboring / bordering buildings; this is a tentative value and field conditions may require adjustments to lower threshold levels, if necessary.

ADDITIONAL SERVICES

At this time, we recommend the following additional services be performed for the proposed development:

1. As previously discussed, deep test pits should be performed in the central portion of the site as soon as possible to further investigate the actual groundwater level at the site, so supplemental recommendations regarding construction dewatering and excavation support systems to be installed below groundwater level can be made.

These test pits would also be useful for investigating the presence of former building foundation remnants and/or wharves or piers below the site.

2. For a pile-supported building occupying the entire about 11,164-square-foot site footprint, the NYC Bldg Code would require an additional two (2) drilled borings to be completed in order to satisfy the minimum boring investigation requirements in the Code. These borings will need to be completed and the associated NYCDOB TR-1 and TR-4 forms submitted before NYCDOB can approve the new building permit application.

3. Additional test pits / probes should be carefully performed at strategic locations along the site perimeter to obtain information regarding the neighboring building foundation types and details, so site-specific support of excavation and underpinning drawings can be prepared for submission to NYCDOB.

4. An environmental boring and test pit investigation should be performed at the site to properly characterize the fill, so material excavated during foundation excavation can be disposed of at a licensed disposal facility in accordance with the NY State DEC and NYCDEP requirements. Groundwater samples should also be obtained and tested for the NYCDEP sewer discharge parameters, so any pre-treatment requirements for groundwater disposal can be identified. We anticipate the environmental investigation can be performed in conjunction with the aforementioned confirmation geotechnical investigations.

5. Pre-construction conditions documentation of the neighboring / bordering buildings, and if necessary of the NYCTA subway structure, should be performed prior to commencing excavation activities at the site.

6. Technical specifications should be prepared for the geotechnical aspects of proposed construction. At this time, we anticipate the specification sections may include:

    - Sheeting, Bracing, and Underpinning
    - Excavation, Filling, and Grading
    - Drilled Caissons
    - Foundation Waterproofing

7. Special inspection of caisson pile installation and load testing should be performed per the requirements of the NYC Bldg Code.

To maintain the continuity of our responsibility on this project, and so we can develop any necessary supplemental design recommendations, and verify proper implementation of our recommendations during construction, we recommend the above work be performed by our firm.

CLOSURE

The conclusions and recommendations given in this report represent our best engineering judgment as to the appropriate foundation systems for the proposed construction, based on currently available development-related information. Recommendations given are contingent upon one another and no recommendation should be followed independent of the others. Once developed, the location, elevation, loading, and design drawings for the proposed structure should be provided to our office so we can review, confirm, or modify (if necessary) the recommendations provided herein.

This report has been prepared for Fisher Brothers Management. The recommendations given should be incorporated in the final design through inclusion in the Project Construction Drawings and foundation-related technical specifications. Our office should be provided with foundation drawings and details prepared by the Project Architect and Structural Engineer, so we can confirm our recommendations are properly incorporated in the construction documents. Our office should also review foundation-related contractor submittals and construction procedures related to the geotechnical aspects of construction. Langan cannot assume responsibility for use of this report for any areas beyond the limits of this study or for any projects not specifically discussed herein.

Recommendations for additional required investigations and studies are presented herein. Environmental concerns (such as potential presence of on-site tanks and potentially contaminated soil and groundwater) exist at the site, and are addressed in separately transmitted reports prepared by our firm.

We thank you for allowing us to assist Fisher Brothers Management on this project. If you have any questions regarding this report, please call.

Sincerely,
Langan Engineering and Environmental Services, Inc., PC

Satyajit A. Vaidya, P.E.
Senior Project Manager

Rudolph P. Frizzi, P.E., G.E., D. GE.
Senior Principal

Enclosures: Figures 1 through 6, and Appendices A, B, and C.

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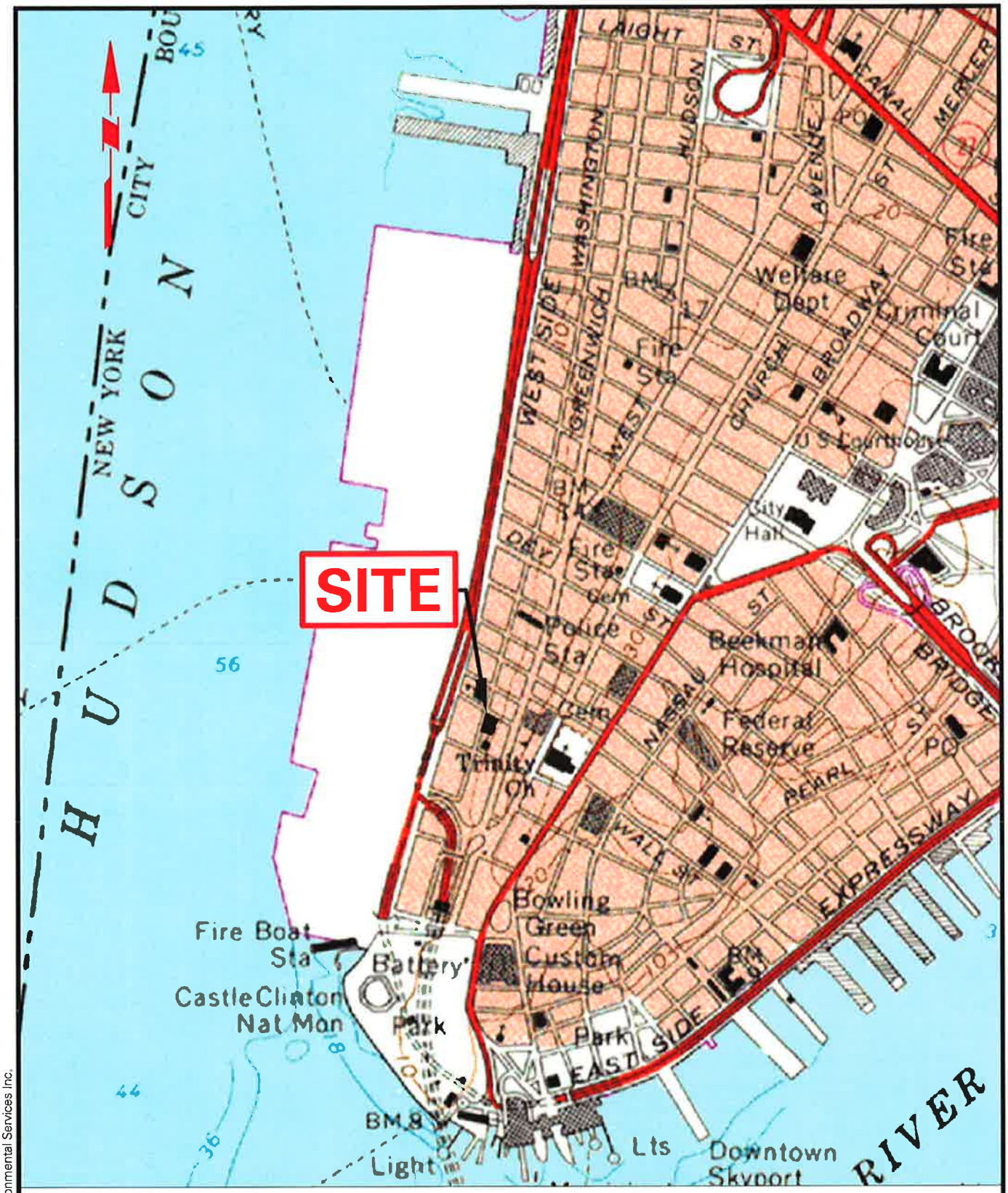
FIGURES



SOURCE - USGS TOPOGRAPHIC MAP: JERSEY CITY NJ QUADRANGLE, DATED 1967 (REVISED 1981)

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NJ Certificate of Authorization No: 24GA27996400

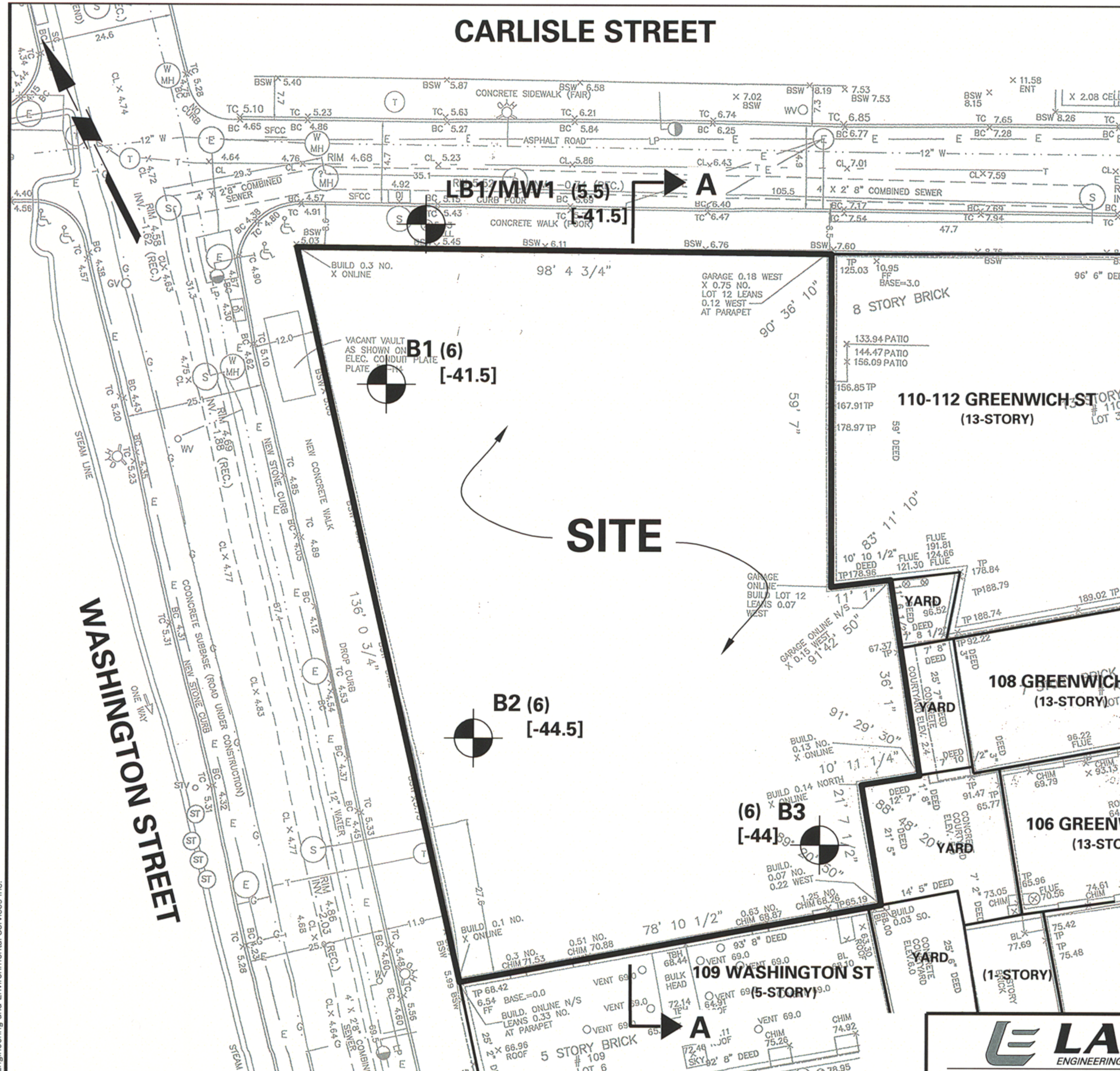
PROPOSED 111 WASHINGTON STREET DEVELOPMENT

SITE LOCATION PLAN

NEW YORK NEW YORK

Project No.	Date	Scale	Fig. No.
1948405	01/13/2012	1" = 1000'	1

Filename: \\langan.com\data\EP\data4\1948401\Cadd Data - 1948401\Dwg\Geotechnical Report\Figure 1 - USGS Site Location Map.dwg Date: 1/13/2012 Time: 15:56 User: kcharles Style Table: Langan.stb Layout: A Size Sheet (Bottom)



LEGEND:

B1 — APPROXIMATE LOCATION OF BORING & BORING IDENTIFICATION

(5.5) — APPROXIMATE GROUND SURFACE ELEVATION AT BORING LOCATION

[-41.5] — APPROXIMATE ELEVATION OF TOP OF NYCBC CLASS 1b OR BETTER ROCK OBSERVED IN THE BORING

NOTES:

1. BASE FIGURE REPRODUCED FROM A 21 JUNE 2005 ARCHITECTURAL SURVEY PREPARED BY TRUE NORTH SURVEYORS, INC.
2. ALL BORING LOCATIONS ARE APPROXIMATE. GROUND SURFACE ELEVATIONS AT THE BORING LOCATIONS ARE INFERRED FROM THE ABOVE-MENTIONED SURVEY.
3. ALL ELEVATIONS REFER TO MANHATTAN BOROUGH PRESIDENT DATUM (MBPD), WHICH IS 2.752 FEET ABOVE THE NATIONAL GEODETIC VERTICAL DATUM, NGVD (MEAN SEA LEVEL AT SANDY HOOK, NEW JERSEY) PER THE UNITED STATES GEOLOGIC SURVEY (USGS).
4. PRELIMINARY BORING LB1 AND GROUNDWATER MONITORING WELL MW1 INSTALLATION WERE PERFORMED BY WARREN GEORGE, INC. BETWEEN 17 AND 18 NOVEMBER 2004. BORINGS B1 THROUGH B3 WERE PERFORMED BY WARREN GEORGE, INC. BETWEEN 2 AND 30 JUNE 2005. ALL BORINGS WERE PERFORMED UNDER THE FULL-TIME INSPECTION OF LANGAN ENGINEERING & ENVIRONMENTAL SERVICES, INC PC.
5. FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED IN THE BORINGS, SEE BORING LOGS.

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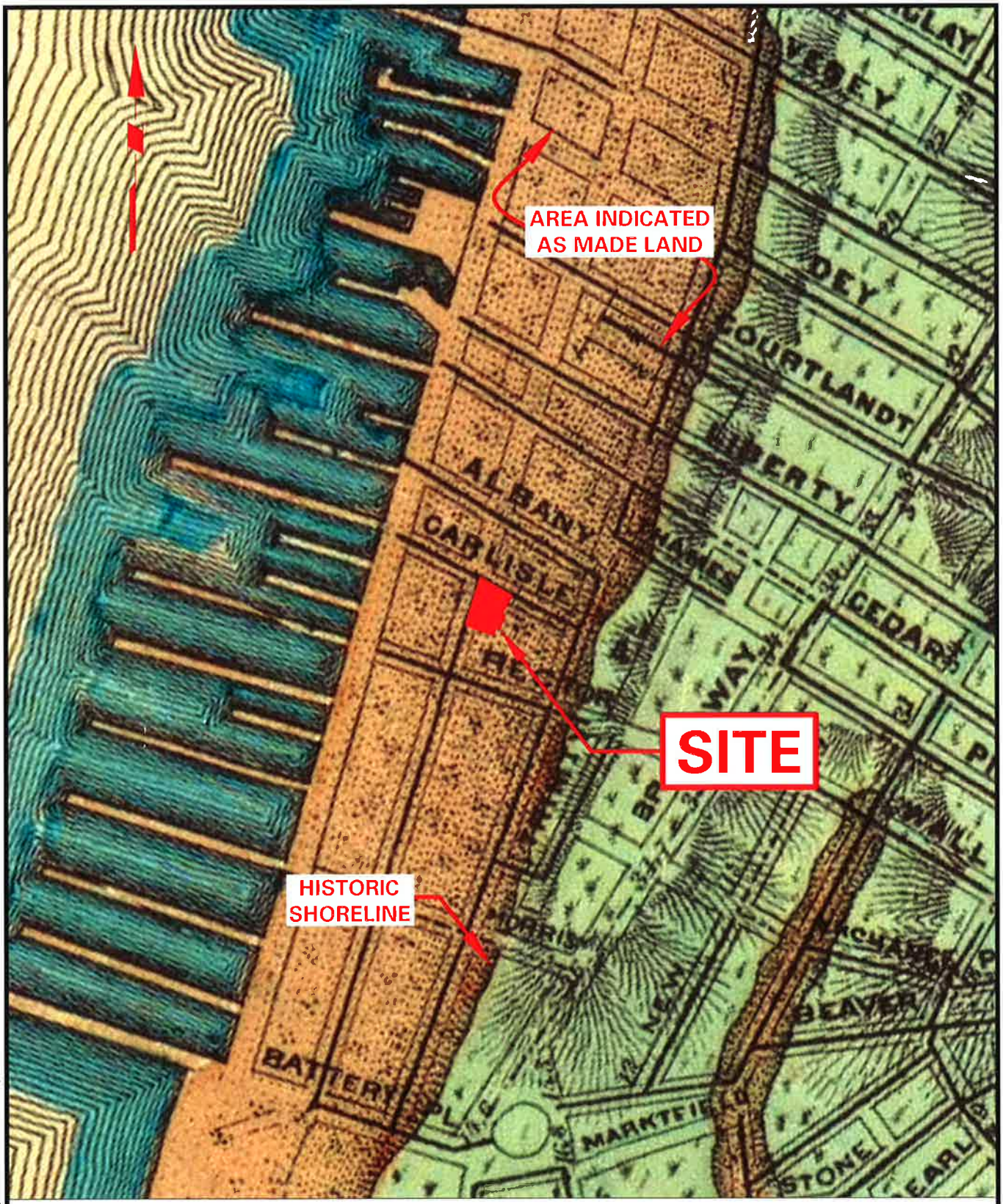
NJ Certificate of Authorization No: 24GA27996400

PROPOSED 111 WASHINGTON STREET DEVELOPMENT

BORING LOCATION PLAN

NEW YORK NEW YORK

Project No.	Date	Scale	Fig. No.
1948405	01/13/2012	1" = 20'	2



SOURCE: SANITARY & TOPOGRAPHICAL MAP OF THE CITY OF NEW YORK PREPARED FOR THE COUNCIL OF HYGIENE AND PUBLIC HEALTH OF THE CITIZENS ASSOCIATION (A.K.A. VIELE MAP), DATED 1865.

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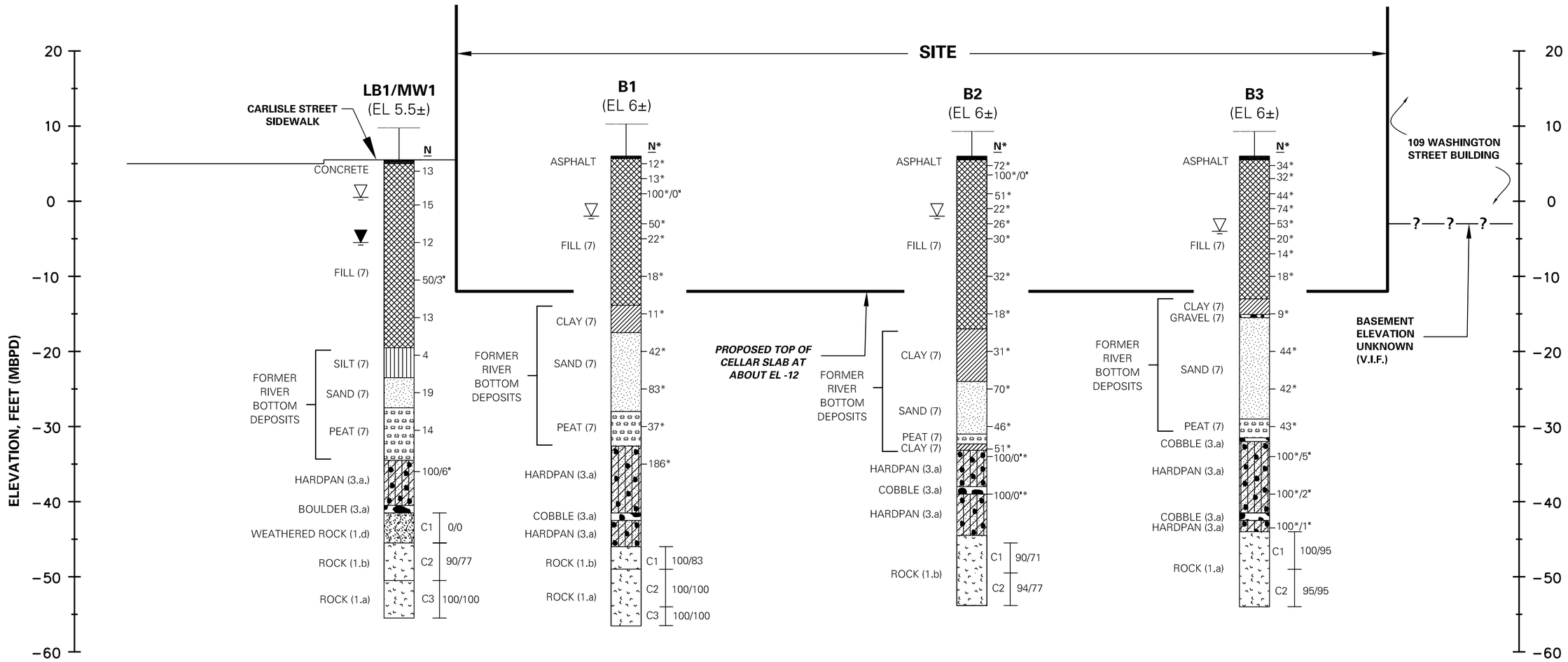
PROPOSED 111 WASHINGTON STREET DEVELOPMENT

SANITARY & TOPOGRAPHICAL HISTORIC MAP

NEW YORK NEW YORK

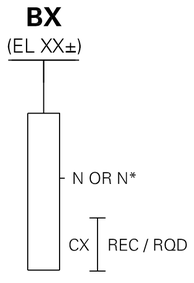
Project No.	Date	Scale	Fig. No.
1948405	01/13/2012	1" = 400'	3

Filename: \\langan.com\data\EP\data4\1948401\Cadd Data – 1948401\Dwg\Geotech\Figure 4 – Historic Topo Map.dwg Date: 1/12/2012 Time: 12:08 User: kcharles Style Table: Langan.stb Layout: A Size Sheet (Bottom)



SCALE:
HORIZONTAL: NTS
VERTICAL: 1" = 10'

BORING KEY:



LEGEND:

BX	BORING IDENTIFICATION
EL XX	INFERRED GROUND SURFACE ELEVATION AT TIME OF BORING (MBPD)
N	STANDARD PENETRATION RESISTANCE; NUMBER OF BLOWS OF A 140 LB DONUT HAMMER FREE FALLING 30 INCHES TO DRIVE A 2-INCH-O.D. SPLIT SPOON SAMPLER 12 INCHES AFTER 6 INCHES OF INITIAL PENETRATION.
N*	SPLIT SPOON SAMPLER PENETRATION RESISTANCE FOR A REDUCED HAMMER DROP HEIGHT OF 22 INCHES DUE TO HEADROOM CONSTRAINTS.
(X.X)	2008 NYC BUILDING CODE SOIL AND ROCK MATERIAL CLASSIFICATION
CX	ROCK CORE RUN IDENTIFICATION AND LENGTH
REC	ROCK CORE RECOVERY %
RQD	ROCK QUALITY DESIGNATION %
▽	GROUNDWATER LEVEL FIRST OBSERVED IN BORING
▼	GROUNDWATER LEVEL OBSERVED IN A MONITORING WELL

NOTES:

1. THIS PROFILE SHOWS GENERALIZED SUBSURFACE CONDITIONS AT THE RESPECTIVE BORING LOCATIONS. VARIATIONS IN CONDITIONS SHOULD BE EXPECTED BETWEEN BORINGS. FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED, SEE BORING LOGS.
2. ALL BORING LOCATIONS ARE APPROXIMATE. GROUND SURFACE ELEVATIONS AT THE BORING LOCATIONS ARE INFERRED FROM A 21 JUNE 2005 ARCHITECTURAL SURVEY PREPARED BY TRUE NORTH SURVEYORS, INC.
3. ALL ELEVATIONS REFER TO MANHATTAN BOROUGH PRESIDENT DATUM (MBPD), WHICH IS 2.752 FEET ABOVE THE NATIONAL GEODETIC VERTICAL DATUM, NGVD (MEAN SEA LEVEL AT SANDY HOOK, NEW JERSEY) PER THE UNITED STATES GEOLOGIC SURVEY (USGS).
4. PRELIMINARY BORING LB1 AND GROUNDWATER MONITORING WELL MW1 INSTALLATION WERE PERFORMED BY WARREN GEORGE, INC. BETWEEN 17 AND 18 NOVEMBER 2004. ALL SUBSEQUENT BORINGS WERE PERFORMED BY WARREN GEORGE, INC. BETWEEN 2 AND 30 JUNE 2005 UNDER THE FULL-TIME INSPECTION OF LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC PC.

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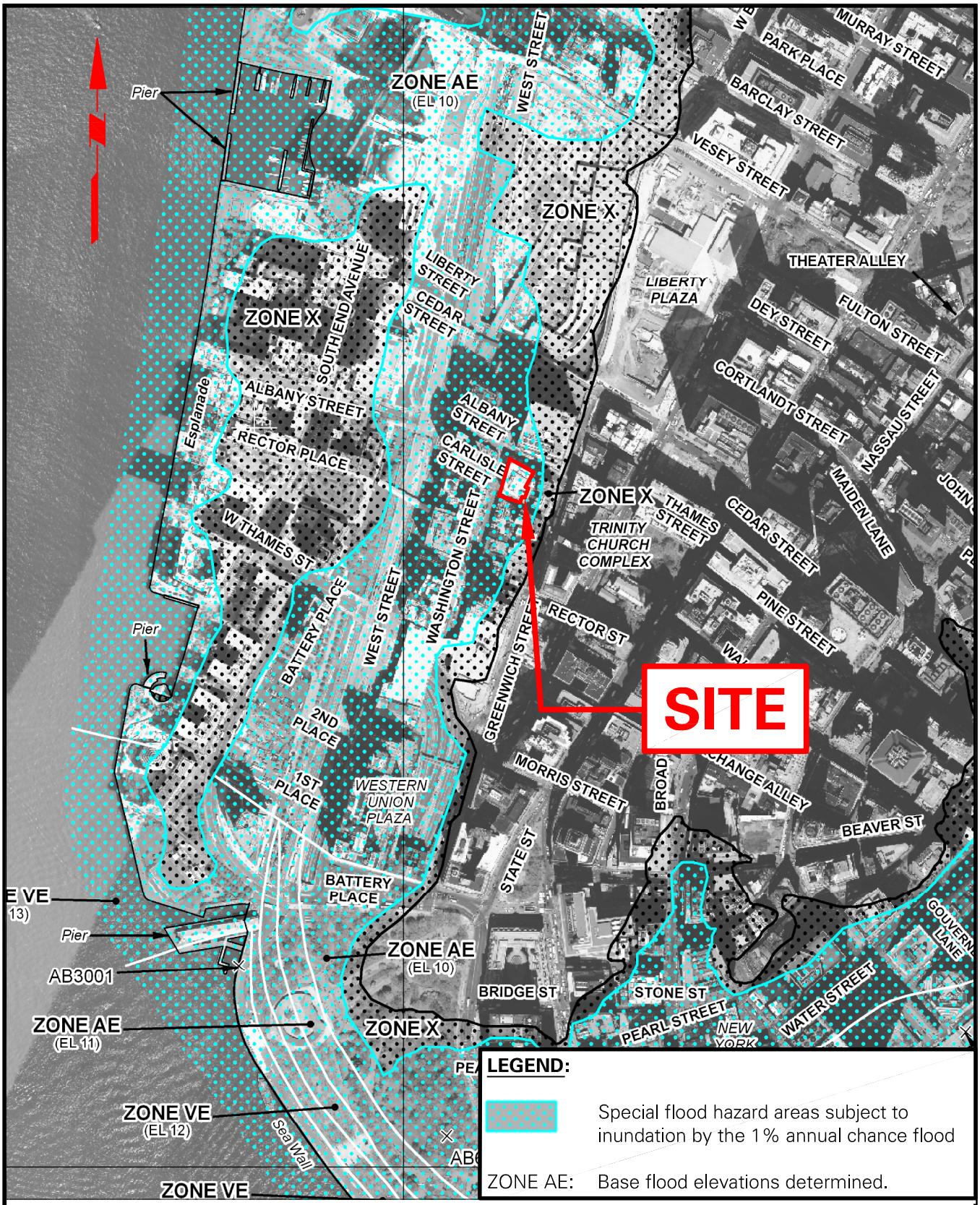
PROPOSED 111 WASHINGTON STREET DEVELOPMENT

BORING PROFILE A-A

NEW YORK NEW YORK

Project No.	Date	Scale	Dwg. No.
1948405	1/13/2012	AS SHOWN	4

Filename: \\langan.com\data\EP\data4\1948401\Cadd Data – 1948401\Dwg\Geotechnical Report\Figure 4 – Boring Profile A-A.dwg Date: 1/13/2012 Time: 15:44 User: kcharles Style Table: Langan.stb Layout: C Size Sheet (Bottom)



LEGEND:

Special flood hazard areas subject to inundation by the 1% annual chance flood

ZONE AE: Base flood elevations determined.

SOURCE: FEMA Flood Insurance Rate Map, Community Panel Number 3604970184F, Effective Date September 5, 2007.

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PROPOSED 111 WASHINGTON STREET DEVELOPMENT

FLOOD MAP

NEW YORK NEW YORK

Project No.	Date	Scale	Fig. No.
1948405	01/13/2012	1" = 500'	5

Filename: \\langan.com\data\EP\data4\1948401\Cadd Data - 1948401\Dwg\Geotech\Figure 5 - Flood Map.dwg Date: 1/13/2012 Time: 15:09 User: kcharles Style Table: Langan.stb Layout: A Size Sheet (Bottom)

NOTES:

1. Diagrams shown are a simplified representation of various lateral loads for use in initial design of the perimeter below-grade foundation walls.
2. Lateral pressure diagram for soil is based on a soil total unit weight of 125 pcf; and on lateral earth pressure coefficient (K_o) of 0.5.
3. The design groundwater level is at el. 7.25 (MBPD), which corresponds to the 100-year flood level.
4. The surcharge loading shown presumes the adjacent building foundations are underpinned to at least 1 foot below the proposed excavation level.

Warning: It is a violation of the NYS Education Law Article 145 for any person, unless he is acting under the direction of a licensed Professional Engineer, to alter this item in any way.

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PROPOSED 111 WASHINGTON STREET DEVELOPMENT

LATERAL PRESSURE DESIGN DIAGRAM

NEW YORK NEW YORK

Project No.	Date	Scale	Fig. No.
1948405	01/13/2012	NTS	6

Filename: \\langan.com\data\EP\data4\1948401\Cadd Data - 1948401\Dwg\Geotech\Figure 6 - Lateral Pressure Diagram.dwg Date: 1/13/2012 Time: 15:11 User: kchorles Style Table: Langan_OCE.stb Layout: A Size Sheet (Bottom)

APPENDIX A

10 JANUARY 2005
PRELIMINARY FOUNDATION
INVESTIGATION REPORT

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

FAX transmittal

River Drive Center 1 Elmwood Park, NJ 07407 T: 201.794.6900 F: 201.794.0366

TO:	COMPANY:	FAX:
Frank Graziadei	Term Washington Street Garage	(212) 785-2195
Garrett Gourlay	Garrett Gourlay Architect	(212) 367-8296

FROM:	DATE:	PAGE(S) WITH COVER:
Rudy Frizzi	10 January 2005	13

RE:

Preliminary Foundation Investigation
Proposed 111 Washington Street Development
New York, NY

LANGAN PROJ. NO: 1948401

HARD COPY TO FOLLOW: ☒ Yes ☐ No

NOTES/COMMENTS:

G:\Data4\1948401\Office Data\Graziadei fax 1.10.05.doc

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

10 January 2005

Mr. Frank Graziadei
Term Washington Street Garage
17 East 12th Street
New York, New York 10009

RE: Preliminary Foundation Investigation
Proposed 111 Washington Street Development
New York, New York
1948401

Dear Mr. Graziadei:

As requested, we have performed a preliminary foundation investigation for the above referenced development. This report summarizes our understanding of the currently proposed development, and presents: our review of available information, preliminary subsurface investigation and findings, and preliminary thoughts regarding foundation support and below-grade parking alternatives for the proposed development.

PROJECT DESCRIPTION

The project Site consists of a single lot at the southeastern corner of the intersection of Washington and Carlisle Streets in New York City; see Figure 1. The lot is currently occupied by an active 6-level parking garage. Occupied buildings border the east and south sides of the Site.

Based on preliminary building concepts prepared by Garrett Gourlay Architect PLLC, the proposed development is to include demolishing the existing parking garage, and constructing a 35-story tower having a ground floor footprint of about 11,255 ft^2. Alternatives of 1, 2, or 3 below-grade parking levels are presently being considered.

AVAILABLE INFORMATION REVIEW

Available mapping was researched to obtain relevant information regarding the Site development history, regional geology, and flood probability.

- Sanborn Maps indicate the existing parking structure that occupies the Site was constructed in 1962. Prior to this, maps dated 1950, 1923, and 1894 indicate eight, 1 to 5-story buildings with single-level basements formerly occupied the site.

- A historic map entitled "Sanitary and Topographical Map of the City and Island of New York" dated 1865 indicates the Site is located within land reclaimed from the Hudson River. The former River shoreline is indicated to be east of Greenwich Street, or approx 175 ft east of the east side of the Site.

- Based on available regional United States Geological Survey (USGS) topographic mapping, it appears the sidewalk elevation at the northwest corner of the site is at approx el 8 (USGS datum), or approx el 5 Borough of Manhattan President's Datum (BMPD); this elevation needs to be confirmed by a site-specific topographic survey.

- Regional geologic data was obtained from "Rock Data Map of Manhattan" dated 1944, and "Bedrock and Engineering Geologic Maps of New York" dated 1994. These maps indicate the bedrock below the Site consists of mica schist at depths ranging from approx el –40 to el –50 (BMPD).

- Based on FEMA National Flood Insurance Program, Flood Insurance Rate Map for New York, NY, Panel 54 of 131, Community Panel No. 3604970054B (effective date 16 November 1983), Washington Street and Carlisle Streets in front of the Site are inundated by the 100 year flood identified at el 10 (USGS), or approx el 7.25 (BMPD).

We visited the New York City Department of Buildings to obtain foundation related information for the on-site and neighboring buildings. Our findings are summarized as follows:

- No information identifying the existing parking garage's foundations was available. An undated plan prepared by Walter T. Gorman PE indicates a 4,000 gallon underground gasoline storage tank exists below the south central portion of the building.

- Three buildings border the east side of the Site. Documents dated 1932 indicate the 5-story building at 106 Greenwich Street has one basement level and is reportedly supported on footings designed for 2 tons/ft^2 bearing. Documents dated 1895 indicate the 7-story building with one basement located at 108 Greenwich Street is supported on piles. Documents dated 1928 and 1929 indicate the 9-story building with one basement located at 110-112 Greenwich Street is supported on steel piles on rock.

- A 5-story building with one basement located at 109 Washington Street borders the south side of the Site. Based on documents dated 1904, it appears this building is supported on footings.

- Two buildings are located across Washington Street west of the Site. A 16-story building with one basement level is located at 108-116 Washington Street. Drawings dated 1925 indicate this building was constructed in this year, and is supported on caissons bearing on hardpan, located at a depth of 44 ft below sidewalk level. An 18-story building with a basement is located at 94-106 Washington Street (also 40 Rector Street). Historic Sanborn maps indicate this building was constructed in 1920, with an annex added in 1971. Drawings associated with a ConEd vault construction in 1971 indicate the vault is supported on piles driven to el -45 to el –49; the adjacent portion of the building is identified to be supported on approx 6.5-ft-dia concrete filled steel caissons to rock at approx el –42 (BMPD), with the basement floor at approx el –4.5 (BMPD).

- An 8-story building is located at 4 Albany Street (across Carlisle Street north of the Site). No foundation was available for this building. It appears this building has one basement level. Based on historic Sanborn Maps, this building was constructed in 1921 and 1922.

- The 38-story New York Marriott Financial Hotel building is located at 122-130 Washington Street across Washington and Carlisle Streets northwest of the Site. Documents dated 1989 indicate this building is supported on 100-ton steel H-piles. The basement floor is typically at approx el –5.25 to el –6.25 (BMPD), with concrete walls and floors.

PRELIMINARY SUBSURFACE INVESTIGATION AND FINDINGS

Our preliminary subsurface investigation consisted of drilling one (1) boring on the Carlisle Street sidewalk in front of the Site at the approximate location shown on Figure 1. The boring was drilled by Warren George, Inc. on 17 and 18 November 2004 under the full time controlled inspection of a field engineer from our office as required by the NYC Bldg Dept.

The boring data indicates the site is underlain by about 40 feet of loose to medium dense fill and former river bottom deposit soils (NYC Bldg Code Class 11-65 material), a mixture of very dense sand / silt / clay / boulders (hardpan) (NYC Bldg Code Class 5-65 material), to 47 feet (approx el –42) where mica schist rock was encountered. The upper approx 4 feet of the rock was weathered (NYC Bldg Code Class 4-65 material), and then transitioned to hard sound rock (NYC Bldg Code Class 2-65 or better material). A boring profile is given in Figure 2.

Based on observation of SPT soil samples and measurement of water level inside the borehole at completion of drilling, groundwater was inferred to be first encountered approximately 5 feet below the sidewalk grade, i.e., at approx el 0 (BMPD). Based on measurements in a groundwater level monitoring well installed in the boring on 13 December 2004 and 5 January 2005, the water level was observed to be approximately 12 ft below the sidewalk level (inferred

approx el –7 BMPD). This level is lower than a typical range of approximately el 0 to el -2; continued monitoring is necessary to determine a representative range in ground water level for design and construction.

PRELIMINARY FOUNDATION AND BELOW-GRADE PARKING THOUGHTS

The concentrated Tower footprint combined with anticipated high compressive, lateral, and uplift loads will require a deep foundation system be used to support both the building columns and ground floor slab for a Tower having no below-grade levels. Piles installed to the hardpan or rock below the fill and former river bottom deposit soils could be used. Due to the proximity of existing bordering structures, at this time we recommend drilled-in (rather than driven) piles be considered to avoid pile driving induced ground vibrations that could potentially damage the neighboring structures. Due to the limited thickness of hardpan, and the anticipated high compressive and tensile loads, mini-caissons drilled and socketed into NYC Bldg Code Class 3-65 or better rock can be used; see the conceptual sketch given in Figure 3. We anticipate a properly reinforced and grouted 12-inch diameter drilled-in mini-caisson socketed a minimum of 7 feet into NYC Bldg Code Class 3-65 or better rock could provide preliminary compressive design capacity of 300 tons. Additional borings and full scale load tests are necessary to confirm this preliminary mini-caisson capacity and length. Additional analysis is needed to determine allowable uplift and lateral resistance for these elements. The ground floor level slab should be established above the 100 year flood level.

Excavation and construction dewatering will be required for construction of the proposed new foundations. Therefore, the environmental conditions of the subsurface soils and groundwater should be investigated and evaluated; this work is critical since an underground fuel storage tank is identified to be located below the site. In addition, test excavations should be made to determine if remnants of former building foundations exist below the site.

Alternate plans for 1, 2, and 3 below-grade levels are presently being considered. We have presumed a 12 ft floor-to-floor spacing should below-grade parking be contemplated below the site.

- The 1 and 2 below grade level schemes are expected to require the same foundation support system as is used for a building with no below-grade levels. Since the 3 below-grade level caps may result in the foundation caps bearing at or near hardpan, it may be possible to support the building on shallow foundations in this case. Conceptual sketches showing these alternatives are given in Figures 4, 5, and 6.

- For the 1, 2, and 3 below-grade level alternates, the below grade walls, and lowest floor slab would need to be fully waterproofed and designed to resist hydrostatic pressure with a design water level at the 100-year flood level of el 7.25 (BMPD).

- For the 1 below-grade level alternative, underpinning of buildings on the east and south side of the Site will be required. In addition, an excavation support system will be required to maintain Washington and Carlisle Streets. Construction dewatering will be required to lower the Site groundwater to a depth of about 15 to 20 ft below sidewalk levels so that the lowest floor, walls, and foundation caps can be constructed in the dry.

- For the 2 and 3 below-grade level alternatives, conventional sheeting, underpinning, and dewatering techniques are not expected to be practical. Cast-in-place excavation support systems, such as a continuous reinforced concrete slurry wall or a secant pile system are expected to be required. To utilize the structural capabilities of these systems, it should be considered to extend these elements into rock. Conceptual sketches are shown in Figures 5 and 6. Further analysis, evaluation, and discussion with specialty contractors to determine whether these systems can be used as both temporary and permanent walls for the below-grade walls.

- The seismic zone factor, Z, to be used in New York City is 0.15. Considering the on-grade, 1, and 2 below-grade level alternatives, the pile caps of the proposed Tower would likely bear within NYC Bldg Code Class 11-65 material; in this case the NYC Bldg Code requires a seismic site coefficient of $S_3 = 1.5$ be used. For the 3 below-grade level alternative, the foundation would be bearing essentially on the harpan; in this case, a site coefficient of $S_1 = 1.0$ could be used.

CLOSURE

This report summarizes our preliminary foundation investigation, and gives our preliminary thoughts regarding foundation support and below-grade parking alternatives for the currently proposed development based on very limited investigation and proposed development data. On-going discussions are necessary between our firm, the architect, and the structural engineer to refine the foundation concepts presented in this report. As the alternatives become more refined, we can discuss with foundation specialty constructors to obtain conceptual costs for the alternatives.

As the project moves forward, and more definite development and structural loading information becomes available, a final site geotechnical investigation (including borings required to satisfy the NYC Building Code minimum subsurface investigation requirements) and environmental sampling and testing of the subsurface soil and ground water should be performed. These investigations are necessary to develop final foundation recommendations for the proposed development. In addition, interaction with the project team during design development, preparation or review of appropriate foundation related Plans and Technical Specifications; performing a pre-construction conditions survey of the neighboring buildings prior to demolition / construction at the site, reviewing foundation related contractor submittals;

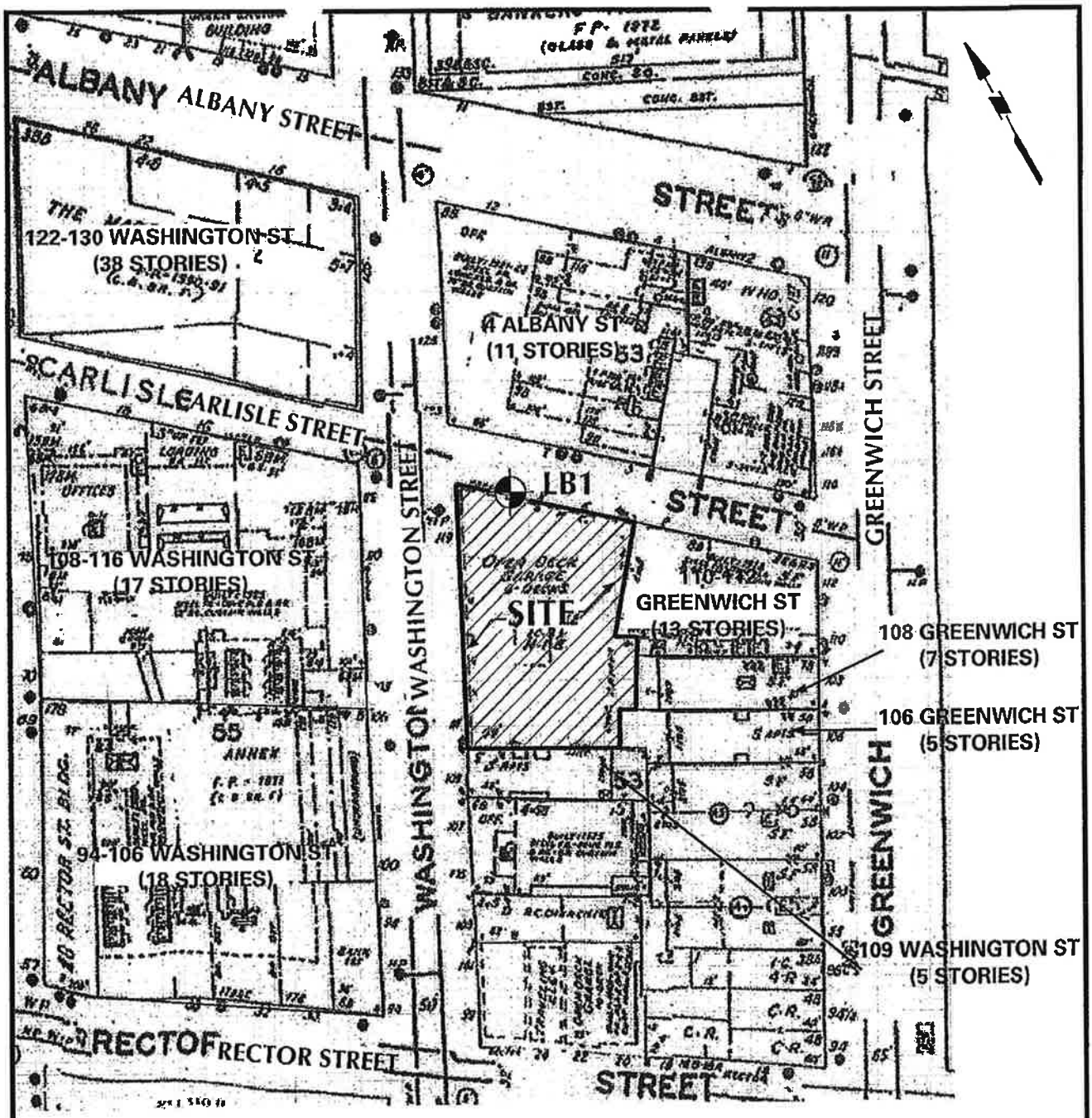
and performing controlled engineering inspection and monitoring during construction as required by the NYC Bldg Code will be required.

We thank you for the opportunity to assist you on this initial stage of this project. We look forward to continuing to assist you as the project moves forward. If you have any questions regarding this report, please call.

Sincerely,
Langan Engineering and Environmental Services, Inc.

Rudolph P. Frizzi, P.E.

RPF:csm
cc: Garrett Gourlay / Garrett Gourlay Architect PLLC



NOTES:

1. BORING LOCATION IS APPROXIMATE.
2. BORING WAS COMPLETED BY WARREN GEORGE, INC ON 17 AND 18 NOVEMBER 2004, UNDER THE CONTROLLED INSPECTION OF LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES.

LEGEND:

LB1 — BORING LOCATION

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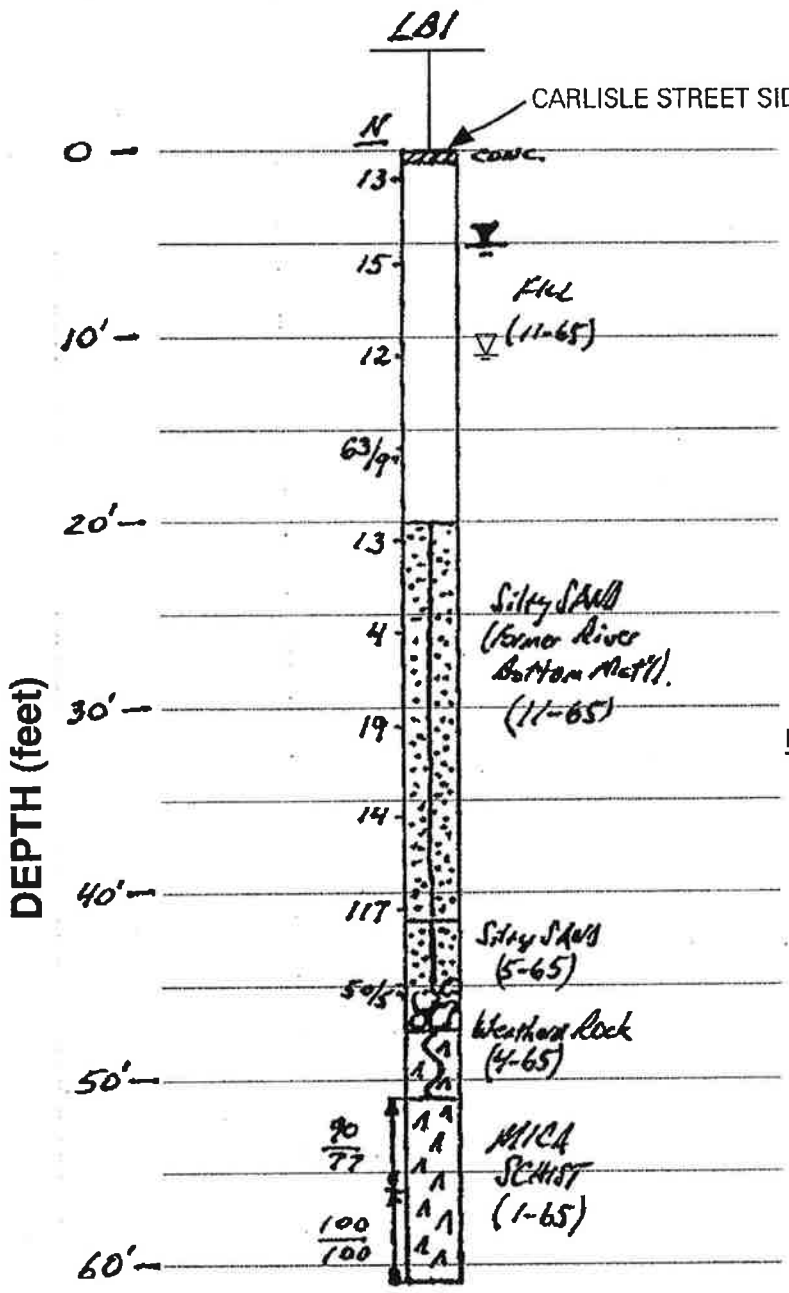
Project 111 WASHINGTON STREET

LOCATION PLAN

NEW YORK NEW YORK

Project No.	Date	Scale	Dwg. No.
1948401	1/10/05	1 in = 80 ft	1

Filename: G:\Data4\1948401\Cadd Data - 1948401\Dwg\1948401 Location Plan 12-22.dwg Date: 1/10/2005 Time: 15:05 User: lnguyen Style Table: Langan.stb Layout: 80 (2)



LEGEND:

▼	WATER LEVEL READING AT TIME OF DRILLING
▽	WATER LEVEL IN MONITORING WELL ON 12/13/04 AND 1/5/05
N	STANDARD PENETRATION TEST (SPT) BLOW COUNTS (N-VALUE) IN BLOWS / FT
(XX-65)	NYC BUILDING CODE MATERIAL CLASSIFICATION
90 / 77	ROCK CORE RECOVERY / ROCK QUALITY DESIGNATION

NOTES:

1. THIS PROFILE SHOWS SUBSURFACE CONDITIONS AND NYC BUILDING CODE CLASSIFICATIONS AT THE BORING LOCATION. VARIATIONS IN SUBSURFACE CONDITIONS SHOULD BE EXPECTED AT OTHER LOCATIONS.
2. BORING WAS COMPLETED BY WARREN GEORGE, INC ON 17 AND 18 NOVEMBER 2004, UNDER THE CONTROLLED INSPECTION OF LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES.

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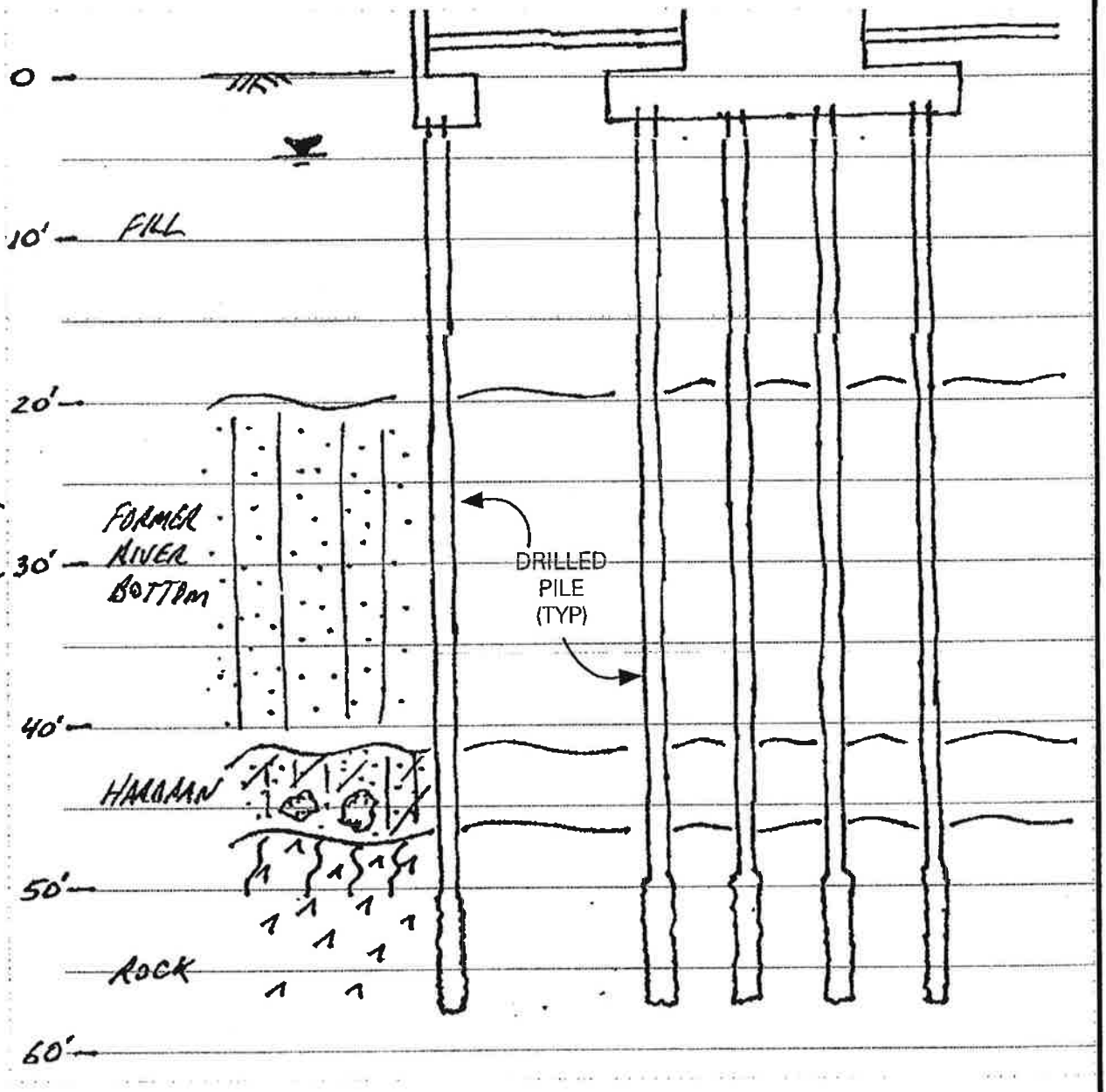
Project 111 WASHINGTON STREET

BORING PROFILE

NEW YORK NEW YORK

Project No.	Date	Scale	Dwg. No.
1948401	1/10/05	1 in = 10 ft	2

Filename: G:\Data4\1948401\Cadd Data – 1948401\Dwg\1948401 Figures.dwg Date: 1/10/2005 Time: 15:14 User: tnguyen Style Table: Langan.stb Layout: Profile



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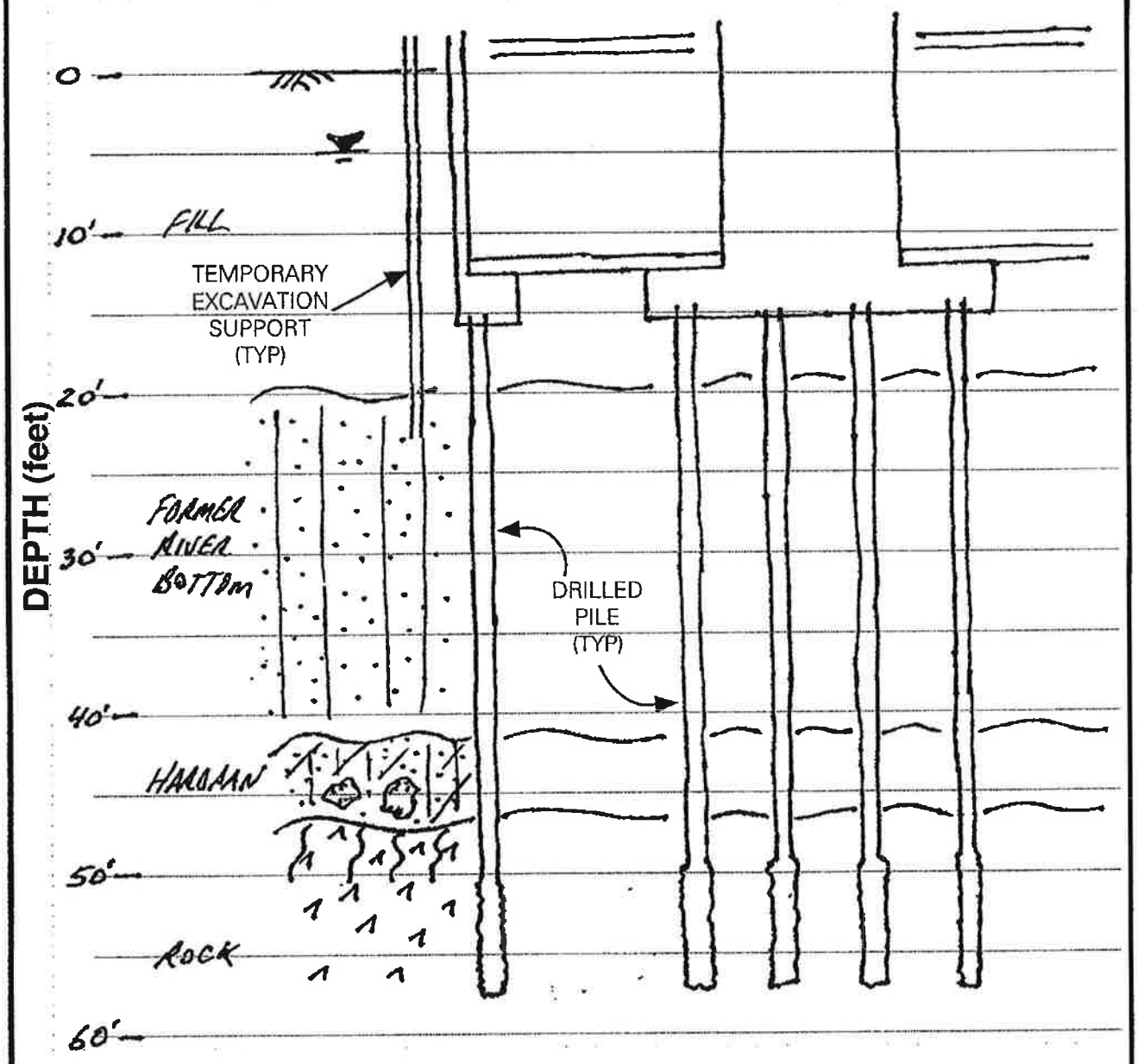
Project 111 WASHINGTON STREET

ON-GRADE CONCEPT

NEW YORK NEW YORK

Project No.	Date	Scale	Dwg. No.
1948401	1/10/05	1 in = 10 ft	3

Filename: G:\Data1\1948401\Cadd Data - 1948401\Dwg\1948401 Figures.dwg Date: 1/10/2005 Time: 15:26 User: tnguyen Style Table: Langan.stb Layout: 3



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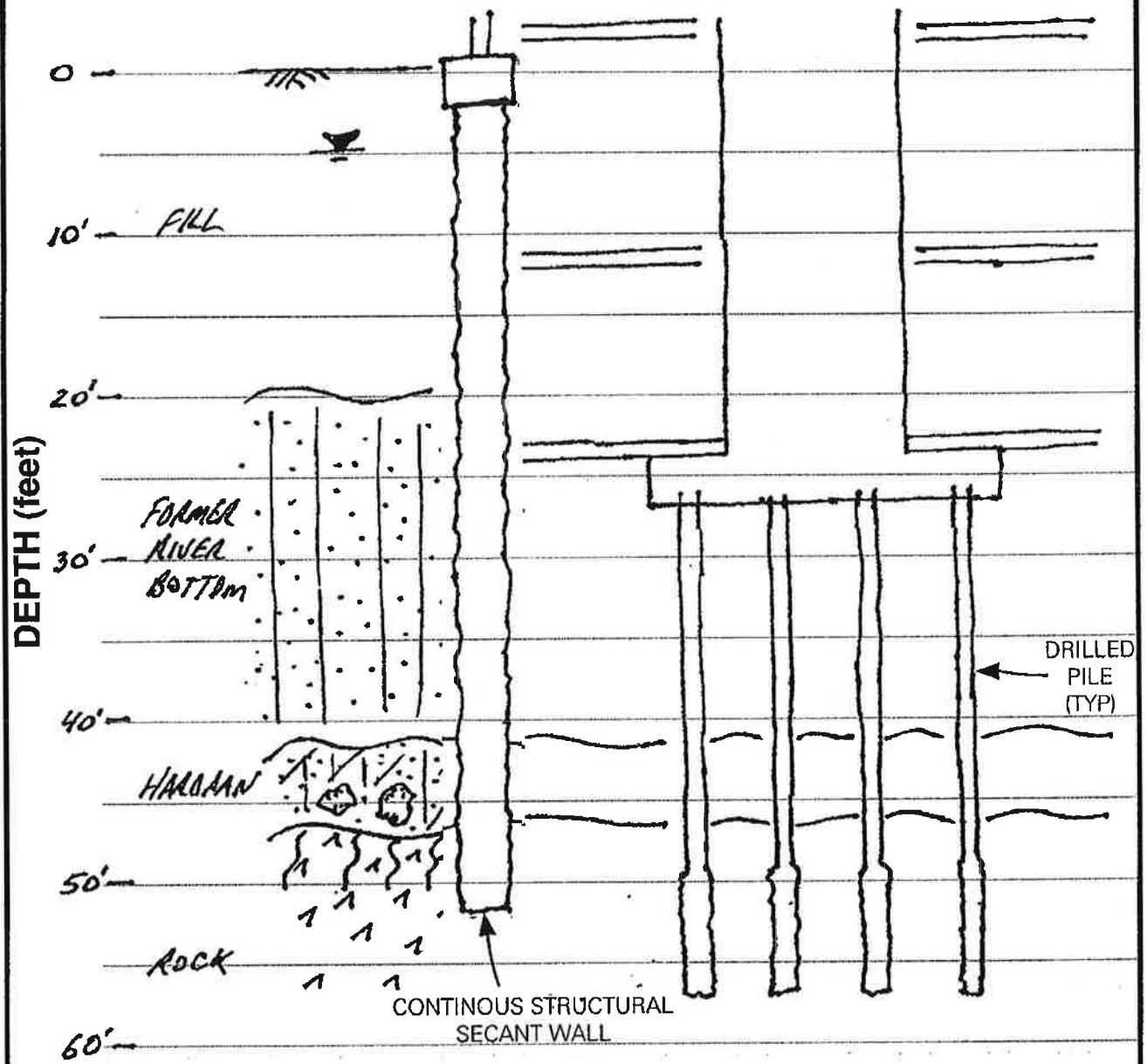
Project 111 WASHINGTON STREET

ONE BELOW-GRADE PARKING CONCEPT

NEW YORK NEW YORK

Project No.	Date	Scale	Dwg. No.
1948401	1/10/05	1 in = 10 ft	4

Filename: G:\Data4\1948401\Cadd Data – 1948401\Dwg\1948401 Figures.dwg Date: 1/10/2005 Time: 15:26 User: tnguyen Style Table: Langan.stb Layout: 4



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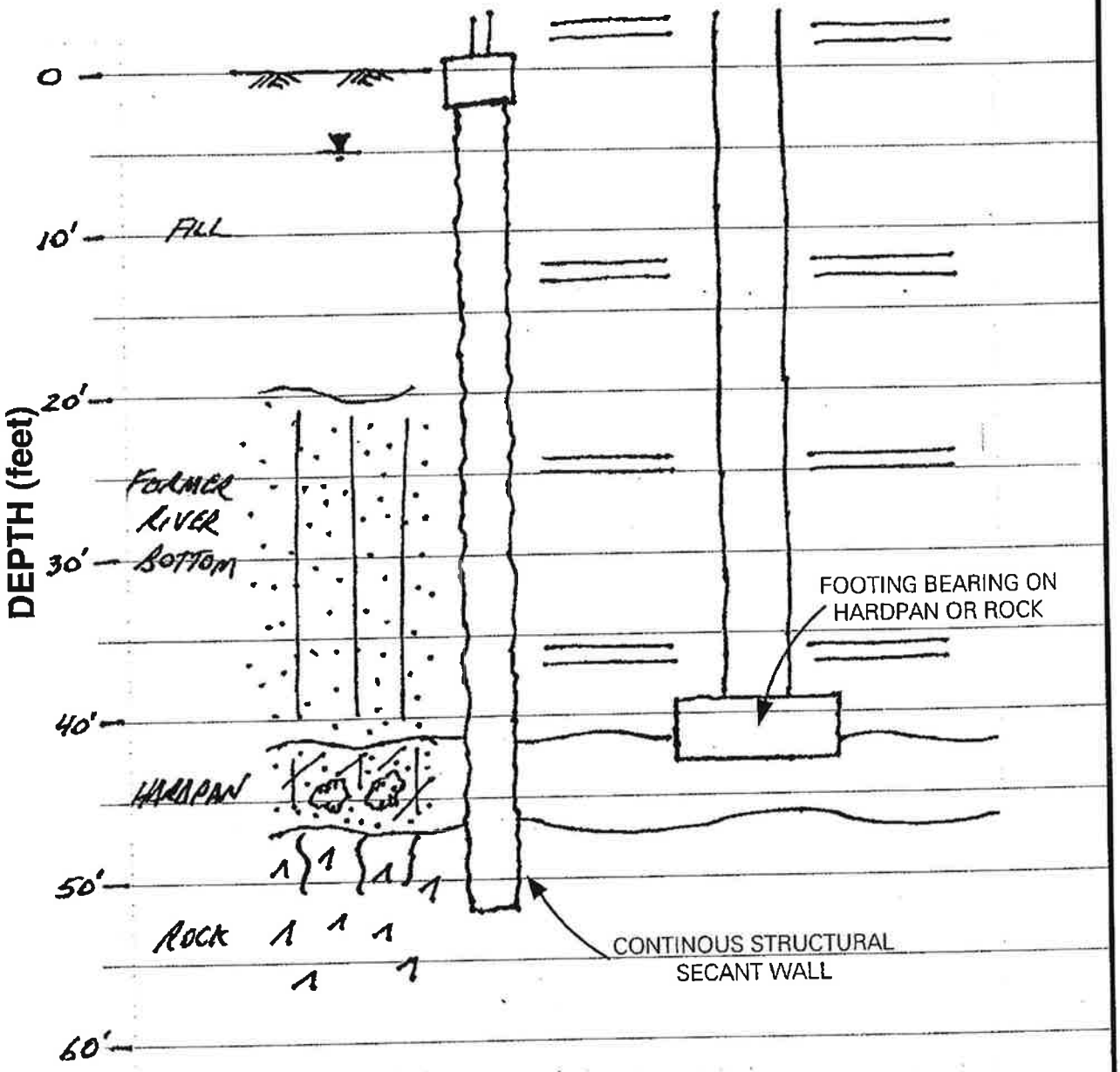
Project 111 WASHINGTON STREET

TWO BELOW-GRADE PARKING CONCEPT

NEW YORK NEW YORK

Project No.	Date	Scale	Dwg. No.
1948401	1/10/05	1 in = 10 ft	5

Filename: G:\Data4\1948401\Cadd Data - 1948401\Dwg\1948401 Figures.dwg Date: 1/10/2005 Time: 15:27 User: tnguyen Style Table: Langan.stb Layout: S



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Project 111 WASHINGTON STREET

THREE BELOW-GRADE PARKING CONCEPT

NEW YORK NEW YORK

Project No.	Date	Scale	Dwg. No.
1948401	1/10/05	1 in = 10 ft	6

Filename: G:\Data4\1948401\Cadd Data - 1948401\Dwg\1948401 Figures.dwg Date: 1/10/2005 Time: 15:28 User: lnguyen Style Table: Langan.stb Layout: 6

APPENDIX B

BORING LOGS

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

Log of Boring **LB1** Sheet 1 of 3

Project: 111 Washington Street Development	Project No.: 1948405
Location: 111 Washington Street, NY, NY	Elevation and Datum: Approx el 5.5
Drilling Company: Warren George, Inc.	Date Started: 11/17/04 — Date Finished: 11/18/04
Drilling Equipment: Acker DK50A Track-mounted Rig	Completion Depth: 61 ft — Rock Depth: 51 ft
Size and Type of Bit: 3 7/8" & 4 7/8" Tricone roller bit	Number of Samples: Disturbed 11 — Undisturbed 0 — Core 3
Casing Diameter (in): 4" & 3" I.D. — Casing Depth (ft): 24	Water Level (ft.): First ▽ 5 — Completion ▼ — 24 HR. ▼
Casing Hammer: Donut — Weight (lbs): 300 lbs. — Drop (in): 24"	Drilling Foreman: Robert Ware
Sampler: 2" O.D. Splitspoon	Inspecting Engineer: Amber Noll
Sampler Hammer: Donut — Weight (lbs): 140 lbs. — Drop (in): 30"	

Material Symbol	Elev. (ft)	Building Code	Sample Description
	+5.5		
	+5.0		6" CONCRETE sidewalk
			Brown f-c SAND, tr. f-c gravel, tr. silt, tr. brick & glass fragments [FILL] (moist)
			White, Light Brown and Gray f-c SAND, some f-c gravel, some brick fragments, tr. silt [FILL] (wet)
		Class 7	Dark Brown WOOD/LUMBER, tr. silt [FILL] (wet)
			Dark Brown f-c GRAVEL, tr. silt [FILL] (wet)

Coring min/ ft

Depth Scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Sample Data

Number	Type	Recov	Penetr resist BL/6in	N-Value (Blows/ft) 10 20 30 40
S1	SS	14	7 7 6 8	13
S2	SS	6	9 7 8 8	15
S3	SS	5	11 10 2 2	12
S4	SS	5	12 13 50/3"	Refusal

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

Started time 1:50 pm
Drilled through concrete.

SS 0.5'-2.5'

Drilled to 5' with water, Brown colored wash.

SS 5'-7'
Spun casing to 5'
Drove casing to 8', casing refusal.

Drilled to 10', hard drilling 8'-9', wood fragments in wash.

SS 10'-12'

Installed casing to 15'
Drilled to 15'

SS 15'-17'

Drilled to 20', no wash return.

Rig lightly chattering at 16', rig broke through at 16'. Drill bit dropped with slight resistance to 20'.

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Log of Boring **LB1** Sheet 2 of 3

Project	Project No.
111 Washington Street Development	1948405
Location	**Elevation and Datum**
111 Washington Street, NY, NY	Approx el 5.5

Material Symbol	Elev. (ft)	Building Code	Sample Description	Coring min/ ft	Depth Scale	Sample Data: Number	Type	Recov.	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
			Reddish Brown f-m SAND, tr. c. sand, tr. silt, tr. brick and glass fragments [FILL] (wet)		20	S5	SS	14	7 8 5 7	13	SS 20'-22'
		Class 7			21						Installed casing to 20'. Drilled to 25'. Mixed REVERT to drilling fluid.
	-19.5				22						
			Dark Gray Sandy SILT, tr. clay, tr. sea shells (slight organic ordor) [FORMER RIVER BOTTOM DEPOSITS] (wet)		23						
					24						
					25	S6	SS	19	3 1 3 9	4	SS 25'-27'
		Class 7			26						Drilled to 30', Dark brown colored wash.
	-23.5				27						
					28						Inferred transition at 29'
			Dark Gray f-m SAND, tr. c. sand, tr. silt [FORMER RIVER BOTTOM DEPOSITS](wet)		29						
					30	S7	SS	15	9 9 10 13	19	SS 30'-32' Drilled to 35'
		Class 7			31						
	-27.5				32						Inferred transition at 33'
					33						
			Dark Gray and Greenish Brown PEAT, tr. clay, tr. f-m sand (organic ordor) [FORMER RIVER BOTTOM DEPOSITS] (wet)		34						
					35						SS 35'-37'
		Class 7			36	S8	SS	22	3 5 9 12	14	
					37						Drilled to 40'
	-34.5				38						
					39						
			Gray f-m SAND, SILT and CLAY, tr. f. gravel, tr. mica fragments [HARDPAN] (wet)		40						
					41	S9	SS	19	10 17 100/6"	Refusal	SS 40-42'
		Class 3a			42						Drilled to 45'
					43						
					44						
					45						

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Log of Boring **LB1** Sheet 3 of 3

Project	Project No.
111 Washington Street Development	1948405
Location	**Elevation and Datum**
111 Washington Street, NY, NY	Approx el 5.5

Material Symbol	Elev. (ft)	Building Code	Sample Description	Coring min/ ft	Depth Scale	Sample Data: Number	Type	Recov.	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Class 3a	Gray f-m SAND, SILT and CLAY, tr. f. gravel, tr. mica fragments [HARDPAN] (wet)		45	S10	SS	5	50/5"	Refusal	SS 45-47'
	-40.5	Class 3a	BOULDER	6	46						Drove 3" casing to 46', Roller bit refusal at 46', Switched to NX Core Barrel, Run #1: 47' - 51', Gray colored wash.
	-41.5	Class 1d	Inferred weathered MICA SCHIST	3 5 6 5	47 48 49 50 51	C1	NX CORE BARREL	REC=0"/48" =0%	RQD=0"/48" =0%		1' Boulder 46'-47' and no recovery 47'-51' Attempted Split Spoon SS11: 50.5' - 51.17' Blows: 85/6", 50/2"; Rec=4" Continued NX Core
	-45.5	Class 1b	Dark Gray MICA SCHIST	2 4 6 7 7	52 53 54 55 56	C2	NX CORE BARREL	REC=54"/60" =90%	RQD=46"/60" =77%		Run #2: 51'-56' Gray wash
	-50.5	Class 1a	Dark Gray MICA SCHIST	4 5 5 5 5	57 58 59 60 61	C3	NX CORE BARREL	REC=60"/60" =100%	RQD=60"/60" =100%		Run #3: 56'-61' Gray wash
	-55.5		END OF BORING AT 61' ON 11/17/04 AT 11:00 PM		62 63 64 65 66 67 68 69 70						Boring completed at 11pm on 11/17/04 A 35-foot-long ground water monitoring well was installed on 11/18/04 15-foot screen, 1-inch dia. Sand filter placed around screen and bentonite seal placed on top.

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Log of Boring **B1** Sheet 1 of 3

Project: 111 Washington Street Development	Project No.: 1948405
Location: 111 Washington Street, NY, NY	Elevation and Datum: Approx el 6
Drilling Company: Warren George Inc.	Date Started: 6/2/05 / Date Finished: 6/10/05
Drilling Equipment: Electric Skid Rig	Completion Depth: 62.5 ft / Rock Depth: 52 ft
Size and Type of Bit: 2" Chopbit	Number of Samples: Disturbed 11 / Undisturbed 0 / Core 5
Casing Diameter (in): 3" O.D. / Casing Depth (ft): 43	Water Level (ft.): First ▽ 8 / Completion ▼ - / 24 HR. ▼ -
Casing Hammer: Donut / Weight (lbs): 300 lbs. / Drop (in): 22"	Drilling Foreman: Dariusz Derrick
Sampler: 2" O.D. Splitspoon	Inspecting Engineer: Rey Clavel
Sampler Hammer: Donut / Weight (lbs): 140 lbs / Drop (in): 22"	

Material Symbol	Elev. (ft)	Building Code	Sample Description	Casing blws/ ft Coring min/ ft	Depth Scale	Sample Data: Number	Type	Recov	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+6.0				0						Started drilling (1:30 PM, 6/2/2005)
	+5.7		ASPHALT								SS 4"-2'
			Dark Brown f-c SAND, tr-sm fine gravel, trace silt, trace concrete pieces, trace brick [FILL] (dry)		1	S-1	SS	3	12 5 7 5	12	PID=0.0 ppm
											Concrete piece stuck inside spoon tip.
			Brown f-m SAND, tr-sm silt, trace clay, trace fine gravel, trace miscellaneous debris (shell, metal, and concrete fragments, root fibers) [FILL] (dry)		2	S-2	SS	9	9 6 7 6	13	SS 2'-4'
					3						PID = 0.0 ppm
											Casing driven to 4' (casing cleaned with chopbit wash)
			Dark Brown f-c SAND, some coarse gravel (stuck in spoon tip), trace silt, trace concrete, trace mortar [FILL] (dry)		4	S-3	SS	<1	96 120 (100/0")	Refusal	SS 4'-6'
					5						PID = 0.0 ppm
				58							Spoon refusal @ 5' (spoon bouncing observed)
				29	6						Casing driven to 5' (casing bouncing observed)
				25	7						Casing driven to refusal at 5'
											Started drilling @ 5'
					8						Wash water light gray to clear
			Brown f-c SAND, tr-sm f-c gravel, trace brick, shell, wood, and glass fragments [FILL] (wet)								Cobble inferred
					9	S-4	SS	7	58 27 23 20	50	Wash water turned brownish @ 7'-7"
		Class 7									Casing driven to 8' (casing cleaned with chopbit wash)
			Dark Brown f-m SAND, trace coarse sand, trace silt, trace fine gravel [FILL] (wet)		10	S-5	SS	6	8 11 11 12	22	SS 8'-10'
											PID = 0.0 ppm
					11						Casing driven to 10' (casing cleaned with chopbit wash)
											SS 10'-12'
					12						PID = 0.0 ppm
											Casing driven to 15' (casing cleaned with chopbit wash)
					13						
					14						
					15						
			Brown f-c SAND, tr-sm fine gravel, trace silt, trace shells [FILL] (wet)								SS 15'-17'
					16	S-6	SS	4	5 9 9 14	18	1" diameter gravel stuck @ spoon tip
											PID = 0.0 ppm
				13	17						
				12							Casing driven to 20' (casing cleaned with chopbit wash)
				10	18						Wash water brownish
				12							Wash water turns grayish @ 19'-8"
				12	19						
				12							
	-13.7				20						

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Log of Boring **B1** Sheet 2 of 3

Project	Project No.
111 Washington Street Development	1948405
Location	**Elevation and Datum**
111 Washington Street, NY, NY	Approx el 6

Material Symbol	Elev. (ft)	Building Code	Sample Description	Casng blws/ ft Coring min/ ft	Depth Scale	Sample Data: Number	Type	Recov.	Penetr. resist Bl/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Class 7	Gray Organic CLAY, some coarse gravel (stuck in spoon tip), trace decomposed wood, trace fine sand, trace mica flakes [FORMER RIVER BOTTOM DEPOSITS] (wet)		20	S-7	SS	2	3 4 7 11	11	SS 20'-22' PID = 0.0 ppm Gravel stuck in spoon tip
				12 12 12	22 23						Casing driven to 25' Wash water grayish Wash water grayish with f-c sand in wash @ 23'-6"
	-17.5			12 15 26	24 25	S-8	SS	2	10 18 24 25	42	SS 25'-27' PID = 0.0 ppm
		Class 7	Gray f-c SAND, some coral pieces (stuck in spoon tip), tr-sm silty clay, trace medium gravel [FORMER RIVER BOTTOM DEPOSITS] (wet)	37 40 48 40 40 37	26 27 28 29						Casing driven to 30' PID = 0.0 ppm Wash water grayish
			Gray Silty f-c SAND, tr-sm clay, trace fine gravel [FORMER RIVER BOTTOM DEPOSITS] (wet)		30 31	S-9	SS	1	31 30 53 28	83	SS 30'-32' PID = 0.0 ppm
	-28.0			48 59 78 68	32 33 34						Casing driven to 35' (casing cleaned with chopbit wash) Wash water grayish Wash water turned dark gray to dark brown @ 34'
		Class 7	Dark Brown PEAT [FORMER RIVER BOTTOM DEPOSITS] (moist)	47 48	35 36	S-10	SS	22	18 18 19 15	37	SS 35'-37' PID = 0.0 ppm
	-32.6			65 69 73 70 70 75	37 38 39 40						Casing driven to 40' (casing cleaned with chopbit wash) Wash water dark greenish brown Wash water turned grayish to light gray @ 38'-6" SS 40'-42' PID = 0.0 ppm Spoon refusal @ 41'-7"
		Class 3a	Gray f-c SAND, SILT, and CLAY, trace fine gravel, trace mica fragments [HARDPAN] (wet)		41	S-11	SS	12	42 45 141 100/1"	186	Casing driven to 43' Casing refusal @ 43' Casing chopbit washed to 43' Chopbit refusal @ 43' Wash water grayish to light gray Started coring through obstructions @ 43' (11:00 AM, 6/7/2005). Wash water grayish to greenish gray.
				9 10	42 43 44 45				N/A		

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Log of Boring **B1** Sheet 3 of 3

Project	Project No.
111 Washington Street Development	1948405
Location	**Elevation and Datum**
111 Washington Street, NY, NY	Approx el 6

Material Symbol	Elev. (ft)	Building Code	Sample Description	Casing blws/ ft Coring min/ ft	Depth Scale	Sample Data: Number	Type	Recov.	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40
		Class 3a	[HARDPAN inferred]	16 / 13 / 30	45 / 46 / 47 / 48		NX CORE BARREL	REC=1"/60" =2%	N/A	
	-41.5	Class 3a	COBBLE	30						
	-42.5	Class 3a	[HARDPAN inferred]	30 / 12 / 15 / 45	48 / 49 / 50 / 51		NX CORE BARREL	REC=10"/48" =21%	N/A	
	-46.0	Class 1b	Gray MICA SCHIST rock	45 / 33 / 40	52 / 53 / 54	C1	NX CORE BARREL	REC=100%	RQD=83%	
	-49.0	Class 1a	Gray MICA SCHIST rock	35 / 20 / 35 / 35 / 40	55 / 56 / 57 / 58 / 59	C2	NX CORE BARREL	REC=60"/60" =100%	RQD=60"/60" =100%	
		Class 1a	Gray MICA SCHIST rock	40 / 30	60 / 61 / 62	C3	NX CORE BARREL	REC=100%	RQD=100%	
	-56.5		END OF BORING AT 62'-6" ON 6/10/2005		63 / 64 / 65 / 66 / 67 / 68 / 69 / 70					

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

Drill rig chattering@ 45'.
Inferred cobble at 47'-6".
Cored to 48'-6". Taped depth of hole to only 47'. Pieces of cobble in barrel.
Hole collapsed, bottom @ 47'. Recored 47' to 48', cored 48' to 52'. Hole collapsed 3 times, WGI drillers cleaned hole. Inferred cobble based on drilling. Stopped drilling (2:42 PM, 6/7/2005). Pieces of cobble in barrel.
Started coring @ 52' (9:45 AM, 6/9/2005). Wash water gray to light gray.
Stopped coring @ 55' (1:13 PM, 6/9/2005)

REC=36"/36" =100%
RQD=30"/36" =83%

Started coring @ 55' (9:00 AM, 6/10/2005)
Wash water gray to light gray
Stopped coring @ 60' (11:05 AM, 6/10/2005)

Started coring @ 60' (12:00 PM, 6-10-2005)
Wash water gray to light gray
Stopped coring @ 62.5' (1:10 PM, 6-10-2005)

REC=30"/30" =100%
RQD=30"/30" =100%

EOB B-1
Hole grouted with sand/cement mix and patched with quikcrete.

NOTE:
Split spoon driven with a 140 lb hammer falling from a drop height of 22 inches due to headroom constraints.

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Log of Boring **B2** Sheet 1 of 3

Project: 111 Washington Street Development	Project No.: 1948405
Location: 111 Washington Street, NY, NY	Elevation and Datum: Approx el 6
Drilling Company: Warren George Inc.	Date Started: 6/15/05 — Date Finished: 6/22/05
Drilling Equipment: Portable Electric Skid Rig (New)	Completion Depth: 59.8 ft — Rock Depth: 50.5 ft
Size and Type of Bit: 3-7/8" Rotary Bit, 2-7/8" Rotary Bit	Number of Samples: Disturbed 14 — Undisturbed 0 — Core 2
Casing Diameter (in): 4" O.D., 3" O.D. — Casing Depth (ft): 43	Water Level (ft.): First ▽ 8 — Completion ▼ - — 24 HR. ▼ -
Casing Hammer: Donut — Weight (lbs): 300 lbs. — Drop (in): 22"	Drilling Foreman: Desmond/Walter
Sampler: 2" O.D. Splitspoon	Inspecting Engineer: Rey Clavel
Sampler Hammer: Donut — Weight (lbs): 140 lbs. — Drop (in): 22"	

Material Symbol	Elev. (ft)	Building Code	Sample Description	Casing blws/ ft Coring min/ ft	Depth Scale	Sample Data: Number	Type	Recov	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40
	+6.0									
	+5.8		ASPHALT							
	+5.5	Class 7	GRAVEL AGGREGATE							
			Brown SILT, tr-sm fine sand, trace fine gravel, trace brick (brick fragment stuck in spoon tip) [FILL] (dry)		0	S1	SS	10	57 37 35	72
					1					
					2	S2	SS	0	90 100/0"	Refusal
			Inferred GRAVEL [FILL]		3					
			Brown f-c GRAVEL, trace f-m sand, tr. brick fragments [FILL] (moist)		4	S3	SS	4	57 13 38 27	51
					5					
			Dark Brown f-c SAND, tr-sm fine gravel, tr. brick and cinder, tr. silt [FILL] (moist)		6	S4	SS	4	10 10 12 13	22
					7					
			Dark Brown to Black pieces of WOOD, trace pieces of brick, trace f-c gravel, trace shell and roof fibers [FILL] (wet)		8	S5	SS	15	37 13 13 20	26
		Class 7	Dark Brown to Black f-c SAND, trace pieces of wood, trace brick, trace f-c gravel, trace shell and root fibers [FILL] (wet)		9					
					10	S6	SS	10	24 14 16 14	30
					11					
					12					
					13					
					14					
			Dark Brown to Black f-c SAND, tr-sm f-c gravel, trace silt, trace wood [FILL] (wet)		15	S7	SS	4	23 18 14 15	32
					16					
				5	17					
				8	18					
				8	19					
					20					

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

Started drilling (10:00 am, 6/15//05)
Drilled through asphalt and gravel subbase.
SS 6"-2'
PID = 0.0 ppm
Brick stuck at spoon tip.
SS 2'-4'
Spoon refusal at 2'-6"
Drilled through obstructions
Heavy loss of water during drilling.
Drill rig chattering.
SS 4'-6'
PID = 0.0 ppm
Drilled to 6', heavy loss of water, drill rig chattering
Casing driven to 6'.
Casing roller bit washed to 6'.
SS 6'-8'
PID = 0.0 ppm
Hole roller bit washed to 8'
SS 8'-10'
PID = 0.0 ppm

Casing driven to 10'
Casing roller bit washed to 10'
SS 10'-12'
PID = 0.0 ppm
Roller bit advanced to 15' (wash water dark brown).
Casing driven to 15'
Casing cleaned to 15'

SS 15'-17'
PID = 0.0 ppm

Roller bit wash to 20'
Casing driven to 20'
Casing cleaned to 20'
Wash water dark brown

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Log of Boring **B2** Sheet 2 of 3

Project	Project No.
111 Washington Street Development	1948405
Location	**Elevation and Datum**
111 Washington Street, NY, NY	Approx el 6

Elev. (ft)	Building Code	Sample Description
	Class 7	Dark Brown f-c SAND, tr-sm fine gravel, tr-sm brick, trace silt, trace shells [FILL] (wet)
-17.0	Class 7	Gray Organic CLAY, tr-sm fine sand, trace silt, trace shells [FORMER RIVER BOTTOM DEPOSITS] (wet)
-24.0	Class 7	Gray f-c SAND, trace shells [FORMER RIVER BOTTOM DEPOSITS] (wet) Light Gray f-c SAND [FORMER RIVER BOTTOM DEPOSITS] (wet)
-31.0	Class 7	Dark Brown to Black PEAT @ tip of roller bit [FORMER RIVER BOTTOM DEPOSITS] (moist)
-32.3	Class 7	Black Organic CLAY, trace decomposed plant stems [FORMER RIVER BOTTOM DEPOSITS] (moist)
-33.2	Class 3a	Black to Dark Gray f-m SAND tr-sm clay, trace silt [HARDPAN] (wet) [HARDPAN inferred]
-38.0	Class 3a	COBBLE
-39.0		

Casing blws/ft / Coring min/ft:

Depth (ft)	Casing blws/ ft / Coring min/ ft
27-28	7
27.5-28	12
28-28.5	18
28.5-29	17
29-29.5	26
29.5-30	32
37-37.5	10
37.5-38	8
41-42	8
42-43	7
43-44	8
44-45	>30

Sample Data

Depth (ft)	Number	Type	Recov.	Penetr. resist BL/6in	N-Value (Blows/ft)
20-22	S8	SS	4	30 / 9 / 9 / 15	18
25-27	S9	SS	22	21 / 19 / 12 / 17	31
30-32	S10	SS	8	34 / 35 / 35 / 35	70
35-37	S11	SS	5	14 / 23 / 23 / 29	46
38-40	S12	SS	18	10 / 23 / 28 / 100/1"	51
40	S13	SS	0	100/0"	Refusal

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

SS 20'-22'
PID = 5.0 ppm

Roller bit wash to 25'.
Casing driven to 25'
Casing cleaned to 25'

Wash water turns grayish @ 23'

SS 25'-27'
PID = 0.0 ppm

Casing driven to 30'
Roller bit wash to 30'
Wash water grayish.

SS 30'-32'
PID = 0.0 ppm

Casing driven to 35'
Casing rollerbit washed to 35'
Wash water grayish

SS 35'-37'
PID = 8.0 ppm

Casing driven to 37'
Ran out of 4" OD casing, 3" OD casing used
3" OD casing driven to 38'
Peat @ tip of roller bit after washing to 38'
q_u=0.75 tsf
SS 38'-40'
PID = 0.0 ppm
Spoon bouncing observed at @ 39'-6"
Casing driven to 40' (casing refusal @ 40')
Roller bit washed to 40', drill hard to advance
SS 40'-42'
Roller bit refusal at 41'
Start coring obstructions in hardpan @ 41'
Drill rig chattering
Wash water grayish
Encountered obstacle @ 44 (cobble)

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Log of Boring **B2** Sheet 3 of 3

Project	Project No.
111 Washington Street Development	1948405
Location	**Elevation and Datum**
111 Washington Street, NY, NY	Approx el 6

Material Symbol	Elev. (ft)	Building Code	Sample Description	Casng blws/ ft Coring min/ ft	Depth Scale	Sample Data: Number	Type	Recov.	Penetr resist Bl./6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Class 3a	[HARDPAN inferred]	4 34 13 8 8	45 46 47 48 49 50	S14	SS	0	100/0"	Refusal	Stopped coring @ 45' Pieces of cobble in core barrel SS attempted at 45' Casing driven to 43' (cleaned casing, wash water grayish) Drilled to 46'-6" Refusal to drill at 46'-6" Drill rig chattering @ 47.6' Started coring @ 46'-6" Stopped coring @ 51'-6" Pieces of cobbles in core barrel
	-44.5										
			Gray MICA SCHIST rock	20 20 16 9 10	51 52 53 54 55	C1 NX CORE BARREL		REC=43"/48" =90%	RQD=34"/48" =71%		Hole collapsed @ 50'-6" Cleaned hole and started coring @ 51'-6" (9:35 AM, 6/22/05) Wash water gray to light gray
		Class 1b	Gray MICA SCHIST rock	18 8 10 18	56 57 58 59	C2 NX CORE BARREL		REC=49"/52" =94%	RQD=40"/52" =77%		Stopped coring @ 55'-6" (10:42 AM, 6/22/05) Started coring @ 55'-6" (12:22 PM, 6/22/05) Wash water gray to light gray Core barrel not advancing @ 59'-10" (core tip jammed). Stopped coring @ 59'-10" (2:52 PM, 6/22/2005)
	-53.8			30							
			END OF BORING AT 59'-10" ON 6/22/2005		60 61 62 63 64 65 66 67 68 69 70						EOB B-2 Hole grouted with sand/cement/soil cuttings to 3" below floor. Top of hole patched with quickcrete. NOTE: Split spoon driven with a 140 lb hammer falling from a drop height of 22 inches due to headroom constraints.

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Log of Boring **B3** Sheet 1 of 3

Project: 111 Washington Street Development	Project No.: 1948405
Location: 111 Washington Street, NY, NY	Elevation and Datum: Approx el 6
Drilling Company: Warren George Inc.	Date Started: 6/23/05 — Date Finished: 6/30/05
Drilling Equipment: Portable Electric Skid Rig	Completion Depth: 60 ft — Rock Depth: 49.5 ft
Size and Type of Bit: 3-7/8" Rotary Bit, 2-7/8" Rotary Bit	Number of Samples: Disturbed 15 — Undisturbed 0 — Core 2
Casing Diameter (in): 4" O.D., 3" O.D. — Casing Depth (ft): 37.6	Water Level (ft.): First ▽ 10 — Completion ▼ - — 24 HR. ▼ -
Casing Hammer: Donut — Weight (lbs): 300 lbs. — Drop (in): 22"	Drilling Foreman: Desmond/Walter
Sampler: 2" O.D. Splitspoon	Inspecting Engineer: Rey Clavel
Sampler Hammer: Donut — Weight (lbs): 140 lbs. — Drop (in): 22"	

Material Symbol	Elev. (ft)	Building Code	Sample Description
	+6.0		
	+5.8		ASPHALT
			GRAVEL AGGREGATE
			Brown f-c SAND, trace silt, trace f-c gravel, tr. mica flakes [FILL] (dry)
		Class 7	Brown fine SAND, trace silt, tr. f-c gravel, tr. mica flakes, tr. brick [FILL] (dry)
			Black CINDER, trace brick [FILL] (dry)
	+1.2		
	+0.8	Class 7	Light brown f-m SAND [FILL] (dry)
			Brown f. SAND, sm. silt, trace f. gravel [FILL] (dry)
			Brown f. SAND, tr. to sm. silt, tr. f-c gravel, tr. cinder [FILL] (dry)
			Dark Brown f-c SAND, tr-sm silt, tr-sm f-c gravel, trace brick, trace mortar [FILL] (moist)
		Class 7	Dark brown f-c SAND, tr-sm f-c gravel, trace silt [FILL] (wet)
			Dark Brown f-m SAND, trace silt, trace mica flakes [FILL] (wet) (foul odor)
	-13.0	Class 7	

Coring min/ ft

Depth Scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Sample Data

Number	Type	Recov	Penetr. resist BL/6in	N-Value (Blows/ft)
S-1	SS	4	19 19 15	34
S-2	SS	7	9 12 20 15	32
S-3	SS	6	25 22 22 20	44
S-4	SS	8	10 50 24 22	74
S-5	SS	6	20 38 15 18	53
S-6	SS	0	6 10 10 10	20
S-7	SS	8	17 6 8 8	14
S-8	SS	22	19 9 9 9	18

N-Value (Blows/ft) 10 20 30 40

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

Started drilling (1:15 PM, 6/23/05)
Drilled through asphalt cover and gravel subbase
SS 6"-2'
PID = 0.0 ppm
SS 2'-4'
PID = 0.0 ppm
Coarse gravel and coarse brick found inside spoon
Casing driven to 4' (casing cleaned to 4')
SS 4'-6'
PID = 0.0 ppm

Hole cleaned to 6 ft.

SS 6'-8'
2" layer of cemented silty sand @ 6'-7'
Casing driven to 8' (casing cleaned to 8 ft)

SS= 8-10 ft
PID = 5.0 ppm

Casing driven to 10' (casing cleaned to 10')
SS 10'-12'
No recovery
Hole cleaned to 12'
Soil sample from washing
Brown wood in wash
PID = 210.0 ppm
SS 12'-14'
PID = 70.0 ppm
Hole cleaned to 15'

SS 15'-17'
PID = 20 ppm

Hole cleaned to 20' (roller bit wash)

Wash water turns grayish @ 19'
Casing driven to 20'

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Log of Boring **B3** Sheet 2 of 3

Project	Project No.
111 Washington Street Development	1948405
Location	**Elevation and Datum**
111 Washington Street, NY, NY	Approx el 6

Material Symbol	Elev. (ft)	Building Code	Sample Description	Coring min/ ft	Depth Scale	Sample Data: Number	Type	Recov.	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Class 7	Gray organic CLAY, tr-sm shells [FORMER RIVER BOTTOM DEPOSITS] (wet) (foul odor)		20						Hole cleaned to 20'
	-15.1										
	-15.5	Class 7	Gray f-c GRAVEL, trace clay [FORMER RIVER BOTTOM DEPOSITS] (wet)		21	S-9	SS	18	5 2 7 18	9	SS 20'-22' PID = 0.0 ppm Hole cleaned to 25' (roller bit wash)
			Gray f-m SAND, trace clay, trace shells [FORMER RIVER BOTTOM DEPOSITS] (wet) (foul odor)		22						
					23						
					24						Wash water grayish Casing driven to 25' Casing cleaned to 25'
			Gray f-c SAND, trace fine gravel, trace silt, trace shells [FORMER RIVER BOTTOM DEPOSITS] (wet)		25	S-10	SS	12	11 17 27 58		SS 25'-27' PID = 0.0 ppm
					26					44	Hole cleaned to 30' (roller bit washed) Casing driven to 30' Casing cleaned to 30'
					27						
		Class 7			28						
					29						
			Gray to Dark Gray f-m SAND, tr-sm silt, trace fine gravel [FORMER RIVER BOTTOM DEPOSITS] (wet)		30	S-11	SS	6	14 19 23 23		SS 30'-32' PID = 5.0 ppm
					31					42	Hole cleaned to 35' (roller bit wash)
					32						
					33						
					34						Casing driven to 35' Casing cleaned to 35'
	-29.0				35						
			Black PEAT [FORMER RIVER BOTTOM DEPOSITS] (moist)		36	S-12	SS	20	10 17 26 26	43	SS 35'-37' PID = 0.0 ppm Wash water turned dark brown to dark grayish brown @ 36'
		Class 7			37						Roller bit washed to 37'-6" (hard drilling)
	-31.5										
	-32.0	Class 3a	COBBLE (4" dia)	8	38						Wash water dark brown Roller bit refusal @ 37'-6" Started coring through obstructions @ 37'-6"
				8	39						Wash water dark gray to gray
				5							
			Dark Gray Silty/Clayey f-c SAND and GRAVEL [HARDPAN] (wet)	5	40	S-13	SS	5	30 100/5"	Refusal	Stopped coring at 40' SS attempted at 40' PID = 0.0 ppm Hole collapsed @ 40' Roller bit from 40'-45' Wash water grayish
		Class 3a		2	41						
				4	42						
				7	43						
				3	44						
					45						Stopped drilling at 45'

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Log of Boring **B3** Sheet 3 of 3

Project	Project No.
111 Washington Street Development	1948405
Location	**Elevation and Datum**
111 Washington Street, NY, NY	Approx el 6

Material Symbol	Elev. (ft)	Building Code	Sample Description	Coring min/ ft	Depth Scale	Sample Data: Number	Type	Recov.	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
			Dark Brown Silty f-c SAND, tr-sm f-c gravel, trace clay [HARDPAN] (wet)	8	45	S-14	SS	2	100/2"	Refusal	SS 45'-47' Roller bit started @ 45' Hard drilling, drill rig chattering Roller bit hard to advance @ 46'
		Class 3a		17	46						
	-41.5				47						
		Class 3a	COBBLE (8" dia)	19							Started coring thorugh obstructions @ 46' Wash water turned light gray @ 47'-6"
	-42.5				48						
		Class 3a	[HARDPAN inferred]	8	49						Hard coring 8" piece of cobble in core barrel
	-43.5										
	-44.0	class 3a	Brown f-c SAND, trace silt, tr-sm mica flakes [HARDPAN] (moist)	6	50	S-15	SS	0	100/1"	Refusal	Easy coring @ 49'-6" SS 49.50'-49.58' (49'-6" to 49'-7") PID = 0.0 ppm
			Gray MICA SCHIST rock	13	51	C1	NX CORE	REC=60"/60" =100%	RQD=57"/60" =95%		Core from 49'-7" to 50' Wash water light gray Started coring @ 50' (9:47 AM, 6/30/05)
				8	52						
				13	53						
				8	54						
				10	55						Stopped coring @ 55' (11:13 AM, 6/30/05) Started coring @ 55' (12:50 AM, 6/30/05)
		Class 1a	Gray MICA SCHIST rock	12	56	C2	NX CORE	REC=57"/60" =95%	RQD=57"/60" =95%		
				13	57						
				13	58						
				12	59						
				15	60						Stopped coring @ 60' (2:30 PM, 6/30/05) Hole grouted with sand/cement/soil cuttings to 3" below floor slab. Top of boring patched with quickcrete.
	-54.0		END OF BORING AT 60' ON 6/30/2005		61						
					62						<u>NOTE:</u> Split spoon driven with a 140 lb hammer falling from a drop height of 22 inches due to headroom constraints.
					63						
					64						
					65						
					66						
					67						
					68						
					69						
					70						

APPENDIX C

NYCDOB TPPN 10/88

The City of New York

DEPARTMENT OF BUILDINGS

EXECUTIVE OFFICES
60 HUDSON STREET, NEW YORK, NY 10013

CHARLES M. SMITH, Jr., R.A., Commissioner
312-8100

Issuance #109

TECHNICAL
POLICY AND PROCEDURE NOTICE # 10/88

TO: Borough Superintendents

FROM: Irving Polsky, P.E., Executive Engineer

DATE: June 6, 1988

SUBJECT: Procedures for the Avoidance of Damage to Historic Structures Resulting from Adjacent Construction When Subject to Controlled Inspection by Section 27-724 and for Any Existing Structure Designated by the Commissioner.

BACKGROUND: Approval of the Landmarks Preservation Commission is required before any changes may be made to protected features of any individually designated landmark or properties within historic districts. A listing of these was furnished to each Borough. Building Code Section 27-166 (C26-112.4) serves to protect historic structures by requiring that all lots, buildings and service facilities adjacent to foundation and earthwork areas shall be protected and supported in accordance with the requirements of Building Construction Subchapter 7 (Article) and Building Code Subchapters 11 and 19 (Article). The intent of these procedures is to supplement the latter and require a monitoring program to reduce the likelihood of construction damages to adjacent historic structures and to detect at an early stage the beginnings of damage so that construction procedures can be changed.

It is also intended that these procedures shall be used to safeguard any existing structure in accordance with Section 27-127 (C26-105.1) if deemed necessary by the Commissioner.

DEFINITION: ADJACENT HISTORIC STRUCTURE. A structure which is a designated New York City Landmark or located within an historic district, or listed on the National Register of Historic Places and is contiguous to or within a lateral distance of ninety feet from a lot under development or alteration.

SUPPLEMENTARY PROCEDURES: The architect or engineer designated for Controlled Inspection of Construction Required for or Affecting the Support of Adjacent Properties or Buildings required by Section 27-724 (C26-1112.6) shall institute a monitoring program for adjacent historic structures and for any existing structure designated by the Commissioner. The following supplementary procedures shall be considered and adhered to:

1.0. Subsurface conditions and effects that might influence performance of structures.

Subsurface Conditions		Effect that Might Influence Performance of Structures
1.1.	Large obstructions in the fill	Vibrations during excavating and pile driving operations
1.2.	Shallow water table	Drawdown of water table and loss of ground during excavation operations
1.3.	Previous layers within and under the hardpan stratum	Loss of ground during excavation operations
1.4.	Dense nature of hardpan	Vibrations during excavating and pile driving operations
1.5.	Boulders	Vibrations during pile driving and/or blasting operations
1.6.	Bedrock	Vibrations during pile driving and/or blasting operations

2.0. Construction vehicular traffic and construction equipment movement which might increase existent vibration levels.

3.0. Establishment of a peak particle velocity design criteria during the driving of sheeting or blasting operations.

3.1. The maximum permissible peak particle velocity shall be 0.5 in./sec. (13mm/sec.) with no distance criterion.

3.2. The maximum permissible peak velocity shall be reduced if movements or cracking is detected.

3.3. Maintaining accurate records, including the location of the blast, total explosive weight in the blast, maximum explosive weight per delay (or the explosive weight in each blast hole and the designation of the delay cap used in each hole).

4.0. Establishment of criteria for any temporary retaining wall structure.

4.1. The maximum permissible horizontal and vertical movement of the temporary retaining wall system shall be designed in accordance with generally accepted engineering practice.

5.0. Establishment of movement criteria for the historic building.

5.1. The maximum permissible vertical and horizontal movement shall be ½in. (6mm.).

6.0. Establishment of criteria for ground water.

6.1. The lowest water level shall be determined by periodic ground water monitoring at observation wells, seasonably adjusted and designated as the "low datum" prior to the start of excavation operations.

6.2. Limitation on water drawdown shall be considered in the criteria for the retaining system.

7.0. Establishment of a monitoring program.

8.1. A licensed surveyor shall be retained to monitor movements and tilting of the historic buildings and the temporary retaining system.

8.1.1. Settlements of the street and of selected points on the ground are to be monitored.

8.1.2. Survey measurements shall be made a minimum of two times per week.

8.1.3. Optical survey readings shall be taken to an accuracy of ±0.01 ft. (3mm.).

8.2. "Telltales" shall be installed across existing cracks and in other sensitive areas to permit changes in crack width to be measured.

8.2.1. A micrometer sensitive to 0.001 in. (0.003mm.) shall be used to monitor crack widths at least once a day.

8.3. Water levels in observation wells are to be monitored at least twice a day for the period that active dewatering is in progress.

8.4. Requirements for seismographic test data. -

8.4.1. Obtain seismographic test data showing the vibration transmission characteristics of the area around the blasting site.

8.4.2. Vibrations from the driving of sheet piles, from excavating and blasting, shall be monitored with a portable seismograph placed adjacent to or within the historic structure closest to the vibration source.

8.5. Requirements for photographs. -

8.5.1. Photographs of the affected historic buildings of sufficient clarity to view the "telltales" shall be taken weekly during construction.

8.5.2. The photographs shall be identified on the back with the building address, direction, date, time and photographer.

9.0. Controlled Inspection Report. -

9.1. Records of the monitoring program shall be retained.

9.2. Controlled inspection reports as to the monitoring program shall be submitted to the department per amendment on B Form 10E within thirty days of completion of the excavation.

9.2.1. The report shall include a set of photographs taken pursuant to Item 8.8.

REFERENCES: "The Avoidance of Damage to Historic Structures Resulting from Adjacent Construction", Melvin I. Esrig and Andrew J. Ciancia, American Society of Civil Engineers, Preprint 81-052; "Effects of Blasting Vibrations on Buildings and People", John F. Wiss, P.E., Civil Engineering-ASCE - July 1968.

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