

DEPT OF BLDGS 420657079 Job Number
**Mueser Rutledge
Consulting Engineers**

14 Penn Plaza • 225 West 34th Street • New York, NY 10122

Tel: (917) 339-9300 • Fax: (917) 339-9400

www.mrce.com

David M. Cacoilo
Peter W. Deming
Roderic A. Ellman, Jr.
Francis J. Arland
David R. Good
Walter E. Kaeck
Partners

Tony D. Canale
Jan Cermak
Sitotaw Y. Fantaye
Associate Partners

Alfred H. Brand
James L. Kaufman
Hugh S. Lacy
Joel Moskowitz
George J. Tamaro
Elmer A. Richards
John W. Fowler
Consultants

Domenic D'Argenzio
Robert K. Radske
Ketan H. Trivedi
Hiren J. Shah
Alice Arana
Joel L. Volterra
Sissy Nikolaou
Anthony DeVito
Frederick C. Rhyner
Senior Associates

Douglas W. Christie
Gregg V. Piazza
Pablo V. Lopez
Steven R. Lowe
James M. Tantalla
Andrew R. Tognon
T. C. Michael Law
Andrew Pontecorvo
Renzo D. Verastegui
Alex Krutovskiy
Srinivas Yenamandra
Associates

Joseph N. Courtade
*Director of Finance
and Administration*

Martha J. Huguet
Director of Marketing

June 10, 2015

Brant Aidikoff, Vice President
The LiRo Group

Elizabeth Orsinger, Vice President
Tishman Construction Corporation of New York

William W. Sullivan, Principal
SLS

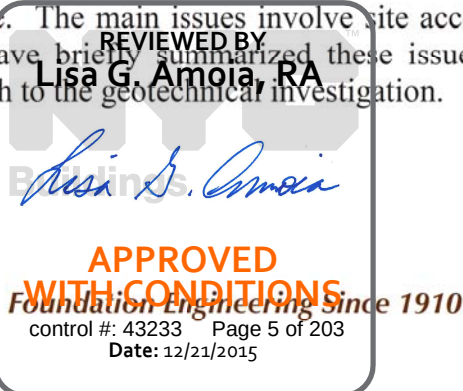
Re: MRCE Approach to Geotechnical Investigation
NYC Build It Back
MRCE File 12481

Greetings:

The Build it Back project involves the rehabilitation/rebuilding of hundreds of homes that were damaged or impacted by Super Storm Sandy. We are currently evaluating three sites; Gerritsen; Edgemere and Midland Beach. The reconstruction work is slated to start in early October and will continue at an accelerated pace.

In order to meet permit requirements, NYC Building Code requires one to two borings at each structure depending on the size of the home and foundation type. Given the number of homes in the program, thousands of borings will be needed to meet NYC Building Code Requirements. We do not believe that it will be possible to meet the boring requirements for this project given the time frame allotted for the design and construction. Therefore, we have outlined a more global geotechnical investigation that in our opinion will provide sufficient geotechnical information for the foundation design of the structures.

In a meeting attended by NYCDOB on June 3 2015, we presented several issues that would make meeting the NYC DOB requirements very difficult and in some cases not possible. The main issues involve site access/community impact and schedule. We have briefly summarized these issues below followed by our proposed approach to the geotechnical investigation.



Site Access and Community Impact

As discussed in the meeting, LIRO presented photographs and overhead maps showing the close proximity of the structures, narrow streets and alleyways that separate the houses in many of the neighborhoods within the project area. Exhibits that were presented to NYCDOB are included in Appendix A. It will be impractical to site one or two borings at each house due lack of access given the configuration of the houses and fencing. At a minimum, we would have to block off alleyways for extended periods of time and remove and replace private fencing to mobilize portable drilling equipment to complete the borings.

The Building Code also requires at least one boring to be made within the footprint of the structure. This in itself is not practical to do as the buildings are narrow wood framed houses that are not easily accessible and may not be able to support the weight of the drill rig. Furthermore, a number of homes in the program are inhabited and some modification to doors, and floors would have to be made to fit the drill rig into the house. Drilling with small equipment will also take longer and will inconvenience homeowners to a great extent. Access agreements would have to be negotiated with each homeowner and the subsequent work within each house will have a negative impact on the community.

Schedule

Due to the site access issues discussed in the previous section, limited access equipment will be required to make many of the borings to comply with Building Code requirements. In addition, extensive planning and coordination of access agreements with homeowners would be required in advance of starting the work. Once access agreements are made, preparation work such as removing and replacing fencing, retrofitting homes so they could support the drill rig and cleanup/repair will be required to complete the borings.

Given the scope of the work and the number of homes that are involved, we believe the schedule for investigations would have to be increased, and the work flow will likely be uncertain due to negotiated access agreements and preparatory work. This coordination work will seriously impact the geotechnical investigation schedule and subsequent foundation design and construction.

MRCE Approach

MRCE was asked to evaluate the current project and NYCDOB requirements and give a recommendation for an alternative boring investigation program that would satisfy the engineering needs of the project, maintain the schedule and would be acceptable to NYCDOB. Summarized below is our approach to an alternative geotechnical investigation program.

1. *Research Available Geotechnical Information*

MRCE has been practicing geotechnical engineering in the New York area for over 100 years. We rely heavily on gathered geotechnical information across the five boroughs. We propose to research our files in the each of the proposed redevelopment sites to determine if we have any useful geotechnical information. In addition to our files, we will reach out to NYC agencies such as the DDC and the NYCHA to research their records for borings. We will also reach out to the



parties involved with this project to obtain additional boring information they may have. We will plot all boring information we have and receive on boring plans for each work area to help identify areas where we need more borings.

2. *Research Geologic Maps*

The foundation design for the new structures will be impacted primarily by surficial geology of the region. We will overlay geologic and historic maps from our files on the project sites to identify areas of potential deep fills, marshes, made land, etc. These maps will be used to adjust the frequency of borings in a particular area to better define changes in stratigraphy. Examples of these maps for each of the three study sites are included in Appendix A.

3. *Perform Initial Boring Program*

Based on the results of Items 1 and 2, we will lay out a boring program that will provide coverage of the project site. The borings will be concentrated around areas where we have limited information or where transition areas in subsurface conditions exist. Although we haven't had time to fully complete Item 1, as we have not coordinated with NYC Agencies, we have provided sample boring layouts for representative portions of the three project sites. Shown on the plans are existing available boring locations, and our initial subsurface investigation. These plans are included in the exhibits.

The proposed borings have been located primarily on the wider streets in the neighborhoods to limit potential access issues. The borings cover the entire project area of each site and are concentrated around shorelines where transitional fill thickness could be expected.

The borings will include provisions for installing piezometers to measure groundwater levels in areas where this is a concern. Although we do not expect deep excavations to become part of the foundation solution, there could be areas of shallow groundwater that need to be investigated. We will coordinate the location of piezometers with each project team.

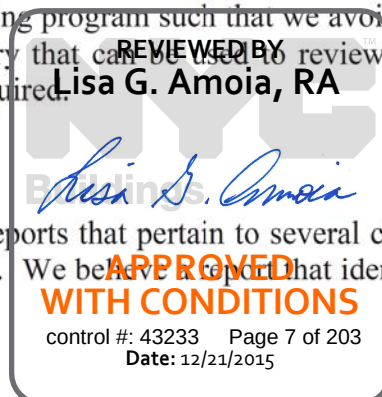
In addition, we understand that helical anchors will be a foundation solution for many of the structures. Therefore we propose to perform corrosion testing on soils in sufficient number of borings to characterize the effect of corrosion on helical piles from the soil.

4. *Identify Need for Additional Borings*

During the boring program, MRCE plans to have an oversight role to review drilling procedures, special inspectors' logs and soil samples recovered from the borings. If there are areas where we believe that additional subsurface information is needed, we will coordinate with the project teams to perform additional borings. Our intent is to be pro-active in this role and identify areas of concern during the initial boring program such that we avoid starts/stops of the program. We have an in-house soils laboratory that can be used to review sample descriptions and perform confirmatory index testing if required.

5. *Reporting*

We plan to issue geotechnical reports that pertain to several city blocks (study area) as opposed to a single report for each house. We believe a report that identifies the homes over a study area



that are currently in the program and provides foundation recommendations for those homes would be sufficient for this project. We intend to have some uniformity to the foundation recommendations and providing a limited number of reports will help achieve this goal. Spending time creating independent reports for each house will take resources away from addressing the design issues associated with the main goal of the BIB program.

If new homes are added after a geotechnical report is issued for that particular area, we would evaluate those homes independently and would issue an addendum to our report to include those homes.

Closing

We believe we have outlined a boring program that will provide sufficient geotechnical information to design the foundations for the project. Although having closely spaced borings at each house provides additional information, there are significant hardships in making those borings, and we do not believe they will provide significant engineering value. The residential structures that are being designed are lightly loaded and these structures already exist at the sites which indicates some level of bearing capacity of the soils. Given the nature of these structures, we believe appropriately designed foundations can be produced with the boring program we have outlined herein. There always exists the possibility of unanticipated discoveries during foundation work, but we believe given the regional geology and the lightly loaded structures to be constructed that the boring approach outlined herein will be sufficient to proceed with the foundation design of these structures.

We would be pleased to meet with the NYCDOB to discuss this matter further and welcome any review comments they may have with regards to this proposal.

Very truly yours,

MUESER RUTLEDGE CONSULTING ENGINEERS

By: 
Tony D. Canale, Associate Partner, P.E.



Pablo V. Lopez

From: Aidikoff, Brant <Aidikoffb@lir.com>
Sent: Tuesday, June 16, 2015 7:41 AM
To: Tony Canale; Pablo V. Lopez; Kenny, Michael (DDC); Romeo, Anthony (DDC); Ceden, Miguel (DDC); Flaherty, Christine (DDC); Scott, Starlene (DDC); Burton, Michael; Pestka, Joanna; Anderson, Thomas; Tormenta, Luis; Dorris, Michael; Orsinger, Elizabeth; Gerard, Bonnie (Recovery); Kelly Huck; William Sullivan (wsullivan@sco.com); Pavlakos, Yianna; Peterson, Amy (Recovery); Christo, Joe (Recovery)
Cc: Joseph Ackroyd (Buildings); Danielle Pemberton (Buildings); Theresa Do (Buildings)
Subject: DOB Response to MRCE Conceptual Boring Development Plan Report
Attachments: MRCE 12481 NYC BIB Rev FINAL.PDF
Importance: High

All

DOB has accepted the MRCE Conceptual Boring Plan (attached) with various requirements as indicated below. DOB also indicates that the meeting for Wednesday afternoon (6/17) is not needed.

On behalf of everyone involved, the DOB's timely attention to this matter is greatly appreciated.

Brant Aidikoff, PE

Vice President



The LiRo Group

Program/Construction Managers | Engineers | Architects
3 Aerial Way | Syosset, NY | 11791
516.214.8136 [T] | 917.854.7243 [M] | www.lir.com

This e-mail and any attachments may contain confidential information that may be proprietary or privileged to a LiRo Group company. If you receive this message in error or are not the intended recipient, you should not retain, distribute, disclose or use any of this information and you should destroy the e-mail and any attachments or copies.

From: Joseph Ackroyd (Buildings) [mailto:jackroyd@buildings.nyc.gov]
Sent: Monday, June 15, 2015 5:15 PM
To: Aidikoff, Brant
Cc: Danielle Pemberton (Buildings); Theresa Do (Buildings)
Subject: RE: Transmission of MRCE Conceptual Boring Development Plan Report

Brant,

DOB has reviewed the MRCE Conceptual Boring Development Plan Report submitted on Wednesday, June 10th.

The overall conceptual approach presented for various neighborhoods/blocks is acceptable to the Department provided the following requirements are either addressed or met:



1. A minimum of one MRCE field supervisor (assuming MRCE is the firm that will be taking responsibility for the boring locations in each neighborhood) shall be present during drilling operations to coordinate the subsurface investigation. If numerous drilling rigs are deployed it is acceptable that the MRCE field supervisor roam between numerous rigs.
2. Borings shall not be advanced in the bed of the street. All efforts shall be made to locate proposed borings within the properties within the program.
3. The number of proposed borings for the Gerritsen Beach area is not adequate when compared to the land area to boring ratio presented in the other two study areas. The number of borings should be increased in Gerritsen with an effort to locate the borings within areas serviced by the smaller streets.

In order to finalize approval, BiB will be required to submit an individual report for each neighborhood/block to DOB. These reports must be submitted and approved before job applications will be approved. The number of borings that will be required will vary depending on the neighborhood/block. Each submission should include the following:

1. CCD1 application listing all addresses impacted in the study zone and detailing the practical difficulty specific to this area. Attachments can be included to support these details and clearly identify the homes covered by the submission.
2. Map depicting location of all historic borings as well as planned borings to be done as part of BiB. We encourage you to conduct research on what is available and include as many historic borings as possible to support the determinations.
 - a. Please include all borings from HPD, HRO, DDC, MRCE and any other entity that might add to the available data
 - b. All parties also have access to DOB records via Virtual Job Folder or Records Room folders where you might find additional historic borings from previous projects on the same blocks
 - c. Map should also include total numbers of BiB homes that are impacted in the areas (how many elevations, Rebuild etc). The maps already provided depict these via color coding, but the final submissions for each neighborhood should include a clear number of homes in each pathway per neighborhood/block
3. Boring logs

The Department will review each CCD1 submission package and issue a specific decision for each neighborhood/area. In light of the above, we do not believe it is necessary to meet on Wednesday but look forward to receiving the first submission from BiB.

Joseph Ackroyd, PE, CFM
 Director of Engineering & Floodplain Administrator
 Technical Affairs and Code Development
 New York City Department of Buildings
 280 Broadway, 7th Floor
 New York, NY 10007
 Phone: 212.393.2031

-----Original Message-----

From: Aidikoff, Brant [<mailto:AidikoffB@liron.com>]
 Sent: Wednesday, June 10, 2015 8:25 PM
 To: Joseph Ackroyd (Buildings)
 Subject: FW: Transmission of MRCE Conceptual Boring Development Plan Report
 Importance: High



Pablo V. Lopez

From: Cohen, Jerrold <Cohenj@lir.com>
Sent: Wednesday, July 15, 2015 3:13 PM
To: Tony Canale; Pablo V. Lopez
Cc: Aidikoff, Brant; Steve Wolf CPG (swolf@aquiferdrilling.com)
Subject: FW: MRCE Gerritsen Beach Boring Location Plan

Importance: High

FYI see below

From: Joseph Ackroyd (Buildings) [<mailto:jackroyd@buildings.nyc.gov>]
Sent: Wednesday, July 15, 2015 11:59 AM
To: Aidikoff, Brant
Cc: Theresa Do (Buildings); Danielle Pemberton (Buildings); Kenny, Michael (DDC); Romeo, Anthony (DDC); swolf@aquiferdrilling.com; Cohen, Jerrold; Anderson, Thomas; Pestka, Joanna
Subject: RE: MRCE Gerritsen Beach Boring Location Plan

Brant,

DOB has reviewed your submittal and provides the following feedback:

Revised DOB response relevant
to locating borings in the field.

- The scope of the geotechnical investigation (existing and proposed borings) is adequate to support the CCD1 request. The department understands that the number of proposed borings may increase as field conditions dictate and at the discretion of MRCE.
- Amend note on Drawing number GB-2. Specifically note #2 under Boring Locations should be amended to read "All attempts will be made to locate borings within subject properties. If deemed necessary by the special inspector boring may be relocated to the sidewalk. If the special inspector deems it not feasible to advance the boring on either the subject property or the sidewalk, borings may be relocated to the street."
- DOB has no objection to drilling operations preceding submittal of the CCD1. When preparing the CCD1 used to satisfy the required item for soil borings be guided by the following:
 - CCD1 must include a description of the request being sought. This description must include:
 - Statement of hardship
 - Description of code sections for which a variation is being sought (1802.4.1 Items 2 and 7 for number of borings and 1802.4.2 for use for existing data).
 - Equally safe alternative being proposed
 - List of all addresses for which the CCD1 is applicable
 - CCD1 must include support documentation including:
 - Geotechnical report with addresses for which it is applicable
 - Soil borings

Should you have any questions or concerns do not hesitate to contact me.

Regards,
Joe

Joseph Ackroyd, PE, CFM
Director of Engineering & Floodplain Administration
Technical Affairs and Code Development

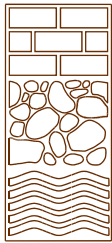


**GEOTECHNICAL ENGINEERING REPORT
NEW YORK CITY BUILD IT BACK PROGRAM
EDGEMERE
QUEENS, NY**

**AECOM
125 Broad Street
New York, NY 10004**

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





Mueser Rutledge Consulting Engineers

14 Penn Plaza • 225 West 34th Street • New York, NY 10122

Tel: (917) 339-9300 • Fax: (917) 339-9400

www.mrce.com

David M. Cacoilo
Peter W. Deming
Roderic A. Ellman, Jr.
Francis J. Arland
David R. Good
Walter E. Kaeck
Partners

Tony D. Canale
Jan Cermak
Sitotaw Y. Fantaye
Associate Partners

Alfred H. Brand
James L. Kaufman
Hugh S. Lacy
Joel Moskowitz
George J. Tamaro
Elmer A. Richards
John W. Fowler
Consultants

Domenic D'Argenzio
Robert K. Radske
Ketan H. Trivedi
Hiren J. Shah
Alice Arana
Joel L. Volterra
Sissy Nikolaou
Anthony DeVito
Frederick C. Rhyner
Senior Associates

Douglas W. Christie
Gregg V. Piazza
Pablo V. Lopez
Steven R. Lowe
James M. Tantalla
Andrew R. Tognon
T. C. Michael Law
Andrew Pontecorvo
Renzo D. Verastegui
Alex Krutovskiy
Srinivas Yenamandra
Associates

Joseph N. Courtade
**Director of Finance
and Administration**

Martha J. Huguet
Director of Marketing

November 25, 2015

AECOM
125 Broad Street
New York, NY 10004

Attn: Ehab Shehata, Vice President - Northeast Region

Re: Geotechnical Engineering Report
NYC Build It Back Program - Edgemere
Queens, NY
MRCE File No. 12481B

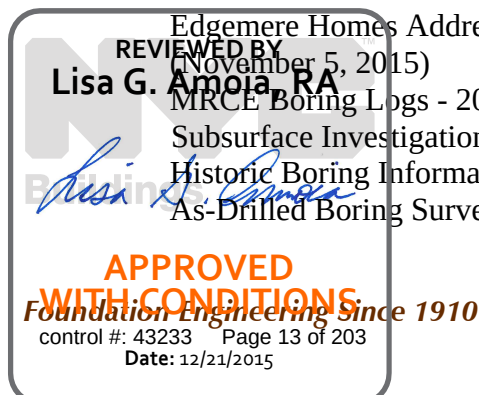
Dear Mr. Shehata:

In accordance with our agreement, Mueser Rutledge Consulting Engineers (MRCE) has completed a supplemental geotechnical subsurface investigation for Edgemere, Queens, New York. We summarize herein the results of our supplemental subsurface investigation, our interpretation of the subsurface conditions and our recommendations regarding foundation design and construction for the one to two story homes in the NYC Build It Back (BIB) program.

EXHIBITS

The following exhibits are attached:

<u>Exhibit</u>	<u>Description</u>
Figure No. 1	Geologic Map
Dwg Nos. EQ-1 to EQ-7	NYC Build It Back - Edgemere Boring Location Plan
Dwg No. EQ-8	Approximate Limits of Organic Strata
Drawing No. GS-R	MRCE Geotechnical Reference Standard
Figure No. 2	Groundwater Elevation Readings
Figure No. 3	Summary of Corrosion Testing
Figure No. 4	Gradation Curves
Table No. 1	Edgemere Homes Addressed in this Report
Appendix A	MRCE Boring Logs - 2015 Supplemental Subsurface Investigation
Appendix B	Historic Boring Information
Appendix C	As-Drilled Boring Survey



PROJECT DESCRIPTION

The NYC BIB project involves the reconstruction or rehabilitation by elevation of hundreds of homes damaged or impacted by Super Storm Sandy in late October 2012. In general, the project encompasses many neighborhoods of New York City including those located in southern Brooklyn and Queens, and parts of Staten Island.

MRCE's scope of geotechnical engineering services includes compiling and reviewing historic geotechnical data, performing supplemental subsurface investigations, preparing neighborhood specific geotechnical reports summarizing the new and historic subsurface data, and providing foundation design and construction recommendations for the one to two story homes that will require new foundations as part of their rehabilitation. The addresses of 69 homes located within Edgemere and covered under the foundation design and construction recommendations made in this report are attached as Table No. 1 entitled "Edgemere Homes Addressed in this Report (November 5, 2015)".

SITE DESCRIPTION

Edgemere is a neighborhood located on the Rockaway Peninsula in South Queens. The BIB project limits for Edgemere are bound by Beach 48th Street to the West, Rockaway Freeway to the South, Beach 35th Street to the East and Jamaica Bay to the North. The exact project limits are shown on the attached set of drawings titled "NYC Build It Back - Edgemere Boring Location Plan" (see Drawing Nos. EQ-1 through EQ-7).

Ground surface elevations within the project limits range from approximately Elev. +4.5 to Elev. +6.6 based on as-drilled survey elevations at boring locations. Historic boring information indicates that ground surface elevations range from approximately Elev. +0.5 to Elev. +8.9. All elevations referenced in this report refer to the North American Vertical Datum of 1988 (NAVD 88).

SITE HISTORY

The subsurface geology along the south shore of Brooklyn and Queens is the product of a series of Pleistocene glacial advances and subsequent retreats with sea-level rise. The near surface geology reflects how the older glacial sediments were reworked by the Holocene and recent sea-level rise.

Below the Rockaway Peninsula, the Cretaceous age Coastal Plains sediments were eroded down and covered with the Jameco Gravel outwash sand during an older glaciation. This sand and gravel stratum is encountered at elevations ranging approximately between Elev. -175 to Elev. -200 below the Rockaway Peninsula. When the last ice retreated, the sea-level rose during the interglacial and a marine clay, known as the Gardiners Clay, was deposited above the Jameco Gravel outwash. The Gardiners Clay is present at roughly Elev. -150. The next glaciation covered the Gardiners Clay with another layer of outwash sand known as the Merrick Formation. This outwash appears to be especially thick around the mouth of New York Harbor and thins eastward towards Suffolk County.

APPROVED
WITH CONDITIONS

control #: 43233 Page 14 of 203
Date: 12/21/2015

This glaciation was followed by another sea-level rise, which deposited a layer of marine clay commonly known as the 20-Foot Clay (or the Wantagh Formation) above the outwash sand. The 20-Foot Clay was officially mapped by the USGS in Nassau and Suffolk counties. Its presence was acknowledged in New York City, but never publicly mapped. The stratum is discontinuous along the south shore, but where present, it is typically encountered at elevations ranging between Elev. -40 and Elev. -100 below the barrier islands. On the mainland, its landward edge is found roughly around Elev. -20. The most recent late Wisconsin age glaciation covered the 20-Foot Clay with another layer of outwash sand known as the Bellmore Formation. In general, the older Merrick Formation tends to be denser, with higher N-values than the younger Bellmore Formation, even in locations where the 20-Foot Clay is not present between the two formations.

During the Holocene, the glacial ice retreated and the sea-level started to rise. Wave action reworked the glacial sediments into barrier islands that paralleled the mainland and migrated landward in-step with the rising sea-level. Over time, the coastal marshes were flooded and covered with back-bay organic clays, which in turn were buried under outwash and barrier beach sands that are currently being submerged and developed into modern marshes. In the near surface, this action of the barrier islands “rolling over” has led to deposits of more recent marsh and marine organics interlayered with beach sands.

As shown on the attached Figure No. 1 entitled “Topographic Site Map”, the northern section of Edgemere was originally a swamp and salt marsh located within Jamaica Bay. The southern section of Edgemere consists of beach and dune sand deposited by wind and wave action exposed to the ground surface. Glacial outwash deposits underlie the surficial deposits of swamp and marshes to the North and beach sand and gravel to the South. The area was covered with a layer of manmade fill to raise grades and create usable land for development.

AVAILABLE INFORMATION

Historic boring information for Edgemere, including approximate boring locations and soil sample information, was provided to MRCE by the New York City Department of Design and Construction (DDC). The borings were performed for previous DDC projects in the area. In addition, MRCE searched our in-house subsurface information database; however, no information in our database was available for Edgemere.

MRCE organized the available historic boring information by assigning a reference number to each of the previous projects where borings were made. The Existing Boring Summary Tables on attached Drawing Nos. EQ-2 through EQ-7 correlate the MRCE assigned reference numbers to the previous subsurface investigation work. All historic boring information used in preparation of this report is attached as Appendix B.

A total of 208 borings ranging in depth from 12 feet to 57 feet below grade were reviewed. One historic boring extended to a depth of 101 feet below ground surface. Borings were made using different types of drilling and sampling equipment. For most of the historic borings, samples were obtained at 5 foot intervals on center. Many of the soil samples were obtained by driving a 2 inch O.D. split spoon sampler 18 or 24 inches using a 140 pound hammer free falling 30 inches. In soft or loose soils, where the sampler was able to penetrate under the weight of the sampling hammer without being struck, the N-value is indicated as “P” for pushed by weight of hammer. Several undisturbed soil samples were obtained using a thin wall tube sampler.

Reviewed by
Lisa G. Amadio, RA
APPROVED
WITH CONDITIONS

control #: 43233 Page 15 of 203
Date: 12/21/2015

Many historic boring soil samples were classified in accordance with the Unified Soil Classification System (USCS).

2015 SUPPLEMENTAL SUBSURFACE INVESTIGATION

In late August to mid-September of 2015, MRCE performed a supplemental subsurface investigation program consisting of 21 borings with 7 observation wells. Two of the borings were made within the property limits of homes enrolled in the BIB program. The balance of the borings were made in the sidewalk or street. The as-drilled locations of the borings are shown on Drawing Nos. EQ-3 through EQ-7. Boring locations were selected to obtain subsurface data in the areas of structures that are currently enrolled in the BIB program and to provide an understanding of the general subsurface conditions within the Edgemere BIB project limits in the event that additional structures are added to the program in the future. The boring location plan was submitted to NYC Department of Buildings for review and approval prior to the start of the supplemental subsurface boring program.

The borings were made by Aquifer Drilling and Testing, Inc. of Mineola, New York (ADT) from August 24 through September 11, 2015 under the continuous inspection of MRCE Resident Engineers. The borings were made using track and truck-mounted drilling equipment utilizing mud-rotary drilling techniques with casing and drilling mud to stabilize the boreholes. Boring depths ranged from 56.5 feet to 87 feet. As-drilled boring locations were surveyed by Hirani Engineering & Land Surveying, P.C. dated November 12, 2015 and are included as Appendix C in this report.

All borings were hand augered in the top 5.5 feet to 6 feet to clear utilities. Below the augered zone, continuous samples were obtained to a depth of 10 feet in each boring. Below 10 feet, soil samples were typically obtained at intervals of 5 feet on center. Soil samples were obtained using a 2-inch O.D. split-spoon sampler driven with a 140 pound automatic hammer falling freely 30 inches. The number of blows required to drive the sampler through each of four consecutive six-inch increments was recorded. The sum of the blows for the second and third six-inch interval is defined as the Standard Penetration Test (SPT) Resistance, or N-value. The N-value is an index of the in-situ density of the material and is reported in blows per foot (bpf). In soft or loose soils where the sampler is able to penetrate under the weight of the drilling rods or sampling hammer without being struck, the N-Value is recorded as Weight of Rods (WR) or Weight of Hammer (WH). Borings that did not receive observation well installations were backfilled with soil cuttings upon completion.

Observation wells were installed in the completed boreholes at Boring Nos. EQ-1P, EQ-2P, EQ-4P, EQ-8P, EQ-10P, EQ-16P and EQ-20P to monitor groundwater levels at the site. The piezometers consist of 2-inch PVC standpipe and slotted screen. The slotted screen section is surrounded by filter sand to allow free water flow without movement of soil particles. A steel cap set flush with the surrounding ground surface was installed to protect the observation well and facilitate future groundwater readings. All observation wells were flushed with water following installation to confirm proper function. Well construction details and water level readings are recorded on piezometer records accompanying the boring logs included as Appendix A in this report.

REVIEWED BY
Lisa G. Amadio, RA
APPROVED
WITH CONDITIONS

control #: 43233 Page 16 of 203
Date: 12/21/2015

LABORATORY TESTING

All soil samples were delivered to the MRCE soil mechanics laboratory in New York City. Samples were reviewed and field descriptions revised as necessary for conformance with MRCE's Geotechnical Reference Standards, described on Drawing No. GS-R. Individual sample descriptions are included in the typed logs in this report as Appendix A.

The following laboratory testing was performed on selected soil samples:

Water Contents: Natural water contents as a percent of dry weight were obtained for fine grained soil samples (silt, clay and peat) from Strata O1 and O2. Natural water contents are reported on the boring logs.

Mechanical Analysis of Grain Size: Mechanical analyses of grain size distribution were performed on selected samples of granular soil samples. Gradation results are shown on attached Figure No. 4.

Organic Content: The percent of organic material was determined for selected soil samples from Strata O1 and O2 in accordance with ASTM D2974.

Corrosion Testing: Soil resistivity, soil pH, sulfate and chloride concentration tests were performed on selected samples in accordance with ASTM G57, G51, D512 and D516 respectively. The corrosion testing was performed by TerraSense, LLC of Totowa, New Jersey, on samples selected by MRCE. A summary of corrosion testing results is shown on attached Figure No. 3.

GENERAL SUBSURFACE CONDITIONS

General descriptions of the subsurface materials encountered at the site and their classification in accordance with the 2014 NYC Building Code (the Code) are summarized below in order of their occurrence with depth. Unless otherwise noted, the descriptions below are based on the 2015 supplemental borings (2015 borings) and checked for general conformance with the historic data.

In general, the 2015 boring data confirms the subsurface conditions shown in the historic borings.

Stratum F - Fill (NYC Class 7): Miscellaneous manmade fill was encountered in 13 of the 24 2015 borings. The fill typically consists of loose to medium compact brown or gray fine to coarse sand, trace silt and gravel with traces of clay, vegetation and miscellaneous construction debris such as wood and asphalt. The thickness of Stratum F ranges from 6 feet to 8 feet in the 2015 borings and 1 foot to 13.5 feet in the historic borings. Several historic borings indicate that the fill could be as thick as 23 feet in some areas.

N-Values in Stratum F range from 5 to 11 in the 2015 borings, with an average N-Value of 5. N-Values are not available in the top 3 feet to 6 feet of Stratum F because the borings were hand augered to clear utilities. Historic boring N-values typically range from WH to 20, with an average N-Value of 10. Several historic borings encountered sampler refusal in the fill with an

APPROVED
WITH CONDITIONS

control #: 43233 Page 17 of 203
Date: 12/21/2015

N-value of 100.

The wide range of N-values and instances of sampler refusal indicate that larger materials not recovered with the sampler may be present within the fill. Several historic borings were offset and/or terminated due to obstructions and utilities in Stratum F.

Stratum PF - Possible Fill (NYC Class 6): This stratum was encountered in 7 of the 21, 2015 borings. This stratum ranges in thickness from 6 feet to 10 feet, with an average thickness of 7.5 feet. The possible fill stratum consists of loose to medium compact brown and gray fine to medium sand, some to trace coarse sand, silt and gravel. In contrast to Stratum F, this stratum is free of miscellaneous debris and overlies the natural sands of Stratum S. N-values in this stratum range from 1 to 16, with an average N-Value of 5. This stratum may consist of natural soils that were excavated from other areas of the neighborhood and re-used as a fill material.

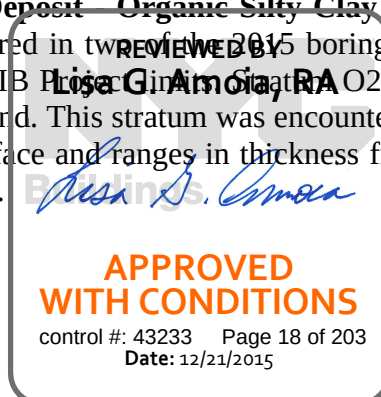
Stratum S1 - Shorefront Sand (NYC Class 3b): Underlying the fill is a layer of shorefront sand deposited by wind and wave action. This stratum consists of loose to compact gray, gray brown and brown fine to medium sand, trace silt, coarse sand, mica and gravel. This stratum typically extends to depths of approximately 35 feet to 50 feet below the ground surface. Boring Nos. EQ-3 and EQ-16P were terminated in this stratum at depths of 56.5 feet and 67 feet respectively. The N-Values in this stratum range from 1 to 50, with an average N-Value of 17.

Stratum O1 - Upper Marsh Deposit - Organic Silty Clay and Clayey Silt and Peat (NYC Class 6): Stratum O1 was encountered in all of the 2015 borings except for Boring No. EQ-17 at the south end of the project limits along Beach 42 Street. This stratum is typically interbedded within Stratum S1 to depths ranging up to 30 feet below the ground surface. Stratum O1 consists of soft gray organic silty clay and clayey silt, trace fine sand, vegetation and shells. Several samples from Stratum O1 consist of brown peat with varying quantities of gray organic silty clay. Where interbedded within Stratum O1, the thickness of this stratum ranges from 2 feet to 11 feet, with an average of 5 feet. In certain areas within the project limits, Stratum O1 directly underlies the fill and is relatively thick. In these areas, Stratum O1 ranges in thickness from 11 feet to 22 feet, with an average thickness of 16 feet. Drawing No. EQ-8 shows the approximate extents of Stratum O1.

N-Values in Stratum O1 range from WH to 12 in the 2015 borings, with an average N-Value of 4. Historic boring N-values range from WH to 31, with an average N-Value of 5.

Natural water contents of samples from Stratum O1 range from 34 to 335 percent. The wide range of water contents is due to the varying quantities of peat present in the samples. Organic contents ranged from approximately 1 to 5 percent.

Stratum O2 - Lower Marsh Deposit - Organic Silty Clay and Clayey Silt (NYC Class 6): This stratum was only encountered in two of the 2015 borings (Nos. EQ-12 and EQ-13) at the eastern edge of the Edgemere BIB Project limits. Stratum O2 consists of soft gray organic silty clay and clayey silt, trace fine sand. This stratum was encountered at depths ranging from 39 feet to 44 feet below the ground surface and ranges in thickness from 5 feet to 10 feet. N-Values in this stratum range from WH to 3.



Natural water contents of samples from Stratum O2 range from 32 to 55 percent. The organic content of one sample from Boring No. EQ-13 was 2 percent.

Stratum S2 - Outwash Sand (NYC Class 3b): Underlying Stratum S1 and Stratum O2 where present is a glacial outwash deposit consisting of compact to loose brown and gray fine to medium sand, trace silt, coarse sand and gravel. The depth to Stratum S2 ranges from 33 feet to 67 feet below the ground surface.

N-values in Stratum S range from 4 to 68, with an average N-Value of 24.

All 2015 borings, except Boring Nos. EQ-3 and EQ-16P, were terminated in Stratum S2.

Groundwater: Groundwater levels measured in the wells installed during the 2015 supplemental subsurface investigation range from 2 feet to 5 feet below the ground surface, which corresponds to approximately Elev. -0.3 to Elev. +2.9. In comparison, historic boring information indicates the groundwater table ranges in depth from 4 feet to 12 feet below the ground surface.

Data from historic groundwater observation wells indicate the groundwater table in the Edgemere area may be subject to tidal influences ranging up to 1.5 feet. On one occasion during the supplemental subsurface investigation, MRCE took two readings per day to determine if the groundwater levels were affected by the tide. We did not observe a tidal influence in the groundwater levels.

It is important to note that there was very little rainfall during the supplemental subsurface investigation period and it is likely that groundwater levels could rise during rainy periods.

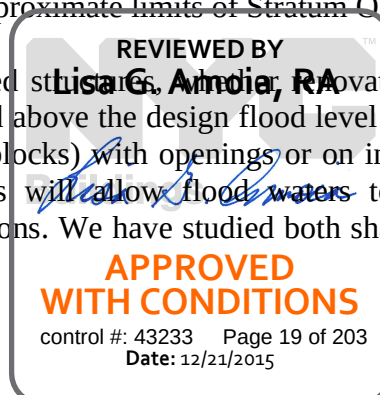
SEISMIC CONSIDERATIONS

Based on Sections 1613.1 and 1614.1 of the Code, one and two family dwellings, three stories or less in height, are exempt from design and construction for the effects of earthquake motions. Based on correspondence with the NYC Department of Buildings, this exception also applies to the assessment for liquefaction potential outlined in Section 1813 of the Code.

FOUNDATION RECOMMENDATIONS

The subsurface conditions at Edgemere consist of man-made fill overlying organic silty clay and peat marsh deposits interbedded within loose to compact natural shorefront sands. Underlying the shorefront sands is a deeper organic silty clay and peat marsh deposit at the eastern edge of the neighborhood. A deposit of glacial outwash sands underlies the deeper marsh deposit and shorefront sands. Drawing No. EQ-8 shows the approximate limits of Stratum O1 directly underlying Stratum F and the approximate limits of Stratum O2.

We understand that the proposed structure, if renovated or new, will be lightly loaded wood frame structures supported above the design flood level on a foundation wall consisting of concrete masonry units (CMU blocks) with openings or on individual columns in lieu of CMU walls. These support structures will allow flood waters to pass through the structures in accordance with FEMA regulations. We have studied both shallow and deep foundation options



for this project and results of our studies are summarized below. Recommended foundation types based on these studies are summarized in the conclusion section of this report.

Shallow Foundations

Based on the boring data, shallow foundations are expected to bear in the fill (Stratum F) or the possible fill (Stratum PF) strata. Shallow foundations, if used, should consist of continuous strip footings interconnected in order to perform as a single framed unit or a mat foundation.

The Code requires that all shallow foundations must extend a minimum of 4 feet below the final surface grade or must be designed against frost heave in accordance with ASCE-32. Stratum F is classified as an uncontrolled fill in accordance with the Code. The Code limits the allowable bearing pressure for uncontrolled fill to 2 tons per square foot (tsf) and outlines the following requirements that must be met in order to construct shallow foundations in uncontrolled fill:

1. Test pits must be excavated at each shallow foundation location to the base of fill or a minimum depth of 8 feet.
2. All deleterious material, soft zones or otherwise unsuitable soil must be removed and replaced with structural fill.

Due to the loose nature and expected thickness of Stratum F, the proximity of the soft compressible soils of Stratum O1 to the foundation underside and shallow groundwater levels, we recommend an allowable bearing pressure of 1 tsf be used in sizing shallow foundations in the fill.

Stratum PF is classified as a Class 6 nominally unsatisfactory bearing material in accordance with the Code. Based on the loose nature of the material and the shallow groundwater levels, we recommend that an allowable bearing pressure of 1 tsf be used for sizing shallow foundations bearing in Stratum PF. The soil subgrade will need to be inspected by a qualified Geotechnical Engineer to determine the nature of the soils. If the soil subgrade is determined to be Stratum F, the additional requirements outlined above will be required in accordance with the Code. If the subgrade soils are determined to be natural material, additional requirements may not be necessary.

MRCE bearing capacity calculations estimate that the Stratum O1 organic clays and silts have a reduced bearing capacity and are not suitable as bearing materials for shallow foundations. Based on the reduced bearing capacity of Stratum O1, the subgrade elevation for shallow foundations bearing in Strata F or PF must be a minimum of 3 feet above the top of Stratum O1 at the foundation location. Test pit excavations will be required to determine the depth from the subgrade elevation to the top of Stratum O1.

Deep Foundations

Although shallow foundations can be used, we investigated the use of deep foundations such as helical piles and drilled displacement micro-piles.



Helical Piles

Due to the limited space available to install pile foundations for the homes and the relatively light loads the piles will support, low capacity piles such as helical piles can be used for this project.

We recommend an allowable axial compression capacity of 10 tons (20 kips) for the helical piles. Although the Code criteria for helical piles includes a maximum allowable axial compression and tension capacity of 30 tons (60 kips), the reduced capacity of 10 tons (20 kips) will eliminate the need to perform Code required axial compression load tests provided the following conditions are satisfied:

1. The pile has a torque to capacity ratio approved in accordance with Section 28-113.2.1 of the Administrative Code.
2. The torque correlation shall demonstrate a factor of safety of 2.5 on the allowable load.

In addition, the relatively loose nature of shallow soil deposits would require significantly larger or longer helical piles to develop higher capacities.

The helical piles must extend through the fill and marsh deposit soils and bear in the natural sands (Strata S1 or S2). The depth of the helical piles will depend on the number of helices and their diameters. Based on discussions with several helical pile manufacturers, we estimate that a 10 ton allowable axial capacity can be achieved at depths on the order of 35 feet to 50 feet with three levels of helices having 10, 12 and 14 inch diameters. Shallower depths may be achievable by adding additional helices at shallower depths along the pile length. However, the borings indicate low N-Values in the shallow soils and it may not be feasible to achieve the required axial capacities at shallower depths.

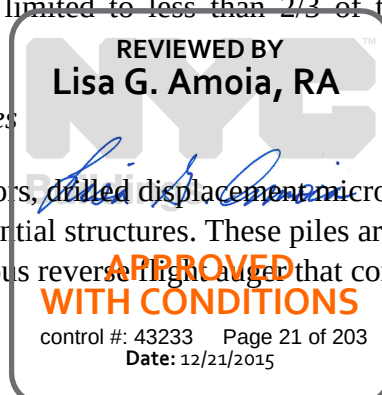
Based on the 2015 borings, Stratum O2 is only present within the project limits east of Beach 37 Street. Helical piles installed east of Beach 37 Street may extend to depths greater than 50 feet to extend through Stratum O2 and bear in the natural sands of Stratum S2.

Additional considerations for helical pile design include:

1. The minimum center-to-center spacing for helical piles is 4 times the diameter of the largest helix plate.
2. The helical pile design must address the abrasive action that occurs in the installation process when protective exterior treatments are used to mitigate pile corrosion.
3. Helical piles must be checked for buckling when embedded in nominally unsatisfactory bearing materials. Under these conditions, the allowable axial compression load is limited to less than 2/3 of the calculated axial load to cause buckling.

Drilled Displacement Micro-Piles

As an alternative to helical anchors, drilled displacement micro-piles could be used to provide foundation support for the residential structures. These piles are installed in similar fashion to helical piles, but have a continuous reverse flight auger that compacts the soil as the micro-pile is



installed. These piles are filled with grout and do not generate soil cuttings. The piles are typically 8 inches in diameter, and, because of the soil improvement occurring during installation, should require shorter depths to achieve the same axial load capacity as a helical pile. Due to the grout installed with the pile, the effective diameter of the drilled displacement pile may be greater than 8 inches. An example of this type of pile is the STELCOR pile manufactured by Ideal Group.

The Code allows micro-piles to be installed without an axial compression load test provided:

1. The allowable axial loads are less than 20 tons and
 - a. The maximum bond stress between the soil and grout is less than or equal to 4 psi.
 - b. The minimum bond zone diameter is greater than or equal to 9 inches.

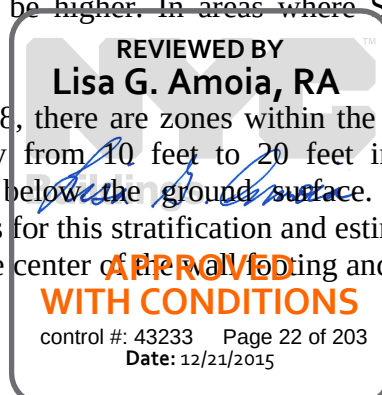
Based on the information above, we estimate that drilled displacement micro-piles penetrating to a depth of 40 feet to 50 feet could achieve a 10 ton allowable axial compression capacity, and avoid the need to perform axial compression load tests in accordance with the Code. As mentioned earlier, deep foundations installed east of Beach 37 Street may have to extend to depths of greater than 50 feet to extend beyond Stratum O2 and penetrate the Stratum S2 sands.

Settlement

For shallow foundations, MRCE performed a settlement analysis to estimate the consolidation settlement of the compressible soils resulting from the loading of new foundation wall footings. Stratum O1 is interbedded within Stratum S1 within the project limits of Edgemere and as a result the depth and thickness of the stratum varies across the site. Based on the subsurface profiles across the site, MRCE analyzed three different cases of stratification: a shallow O1 layer, a deeper O1 layer and O1 layers interbedded within Stratum S1. We used the WINSTRESS program to compute the increase in stress in Stratum O1 soils due to load from proposed wall footings. Consolidation properties of the organic silty clay were estimated based on a natural water content of 60 percent. The analysis assumed a 2 foot wide, 30 foot long strip load of 1 ton per square foot (1 tsf) below two exterior walls of a typical home. The footing bearing elevation was assumed to be 4 feet below ground surface. In the analyses, Stratum F and Stratum O1 were modeled with average thicknesses and depths corresponding to the different stratification cases noted above.

The results of our analyses indicate that long term consolidation settlements would be on the order of 1.5 to 3 inches at the center of the wall footing and 1.0 to 1.5 inches at the end of the wall footing (at the corner of the home). Corresponding to these results, differential settlements are estimated to range on the order of 0.5 to 1.5 inches across the foundations. These estimates are based on an average amount of peat in Stratum O. If a relatively thick layer of peat is present, consolidation settlements could be higher. In areas where Stratum O1 is relatively thin, less settlement can be expected.

As shown on Drawing No. EQ-8, there are zones within the project limits of Edgemere where Stratum O1 ranges consistently from 10 feet to 20 feet in thickness and is present at an approximate depth of 7 feet below the ground surface. MRCE performed a long term consolidation settlement analysis for this stratification and estimates that settlements would be on the order of 4.5 to 6 inches at the center of the wall footing and 2.5 to 3.5 inches at the end of the



wall footing (at the corner of the home). Differential settlements are estimated to on the order of 2.0 inches to 2.5 inches for this stratification.

For deep foundations, settlements will be negligible.

Corrosion Considerations

Attached Figure No. 3 depicts a summary of the corrosivity testing results that were obtained from selected samples from each soil stratum at the site. Results within the red shaded zones on the plots indicate a corrosive environment as defined by the limits in Section 1812.2.1 of the Code. Figure No. 3 shows that soils from Strata F, O1 and S1 are all potentially corrosive.

Due to the corrosive nature of the soils, pile corrosion must be considered in the design of deep foundations. We recommend that piles be double corrosion protected. For the helical piles, this can be accomplished by using galvanized steel to manufacture the piles then having a shop applied epoxy coating added to them. For the drilled displacement micro-piles, galvanized steel should be used in the pile manufacturing and the grout placed around the pile surface during installation will serve as a second level of corrosion protection. This is an advantage when compared to the helical piles that would require galvanization and shop applied epoxy coating since the epoxy coating can be damaged during pile installation.

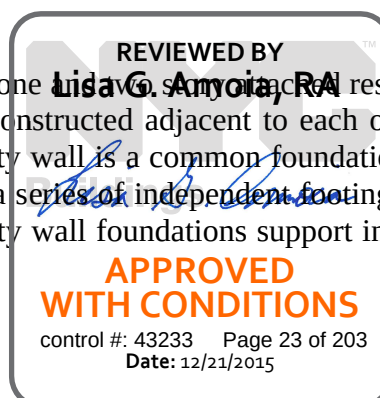
Lateral Loads

We understand that the rehabilitated residential structures will be required to support lateral loads due to both wind and possible floods. The recommended pile foundation types cannot support significant lateral loads; therefore, we recommend that wall footings or grade beams be cast above the piles to act as a pile cap and distribute the loads to the piles and provide a rigid frame for the pile foundations.

Depending on the type of foundation selected by the project designers (i.e, shallow or deep foundations), we recommend designing the grade beam pile cap or shallow strip footings to resist applied lateral loads. Either foundation type should be designed to withstand applied lateral loads by engaging the soil in passive resistance. We recommend using a total soil unit weight of 110 pounds per cubic foot and an internal angle of friction of 30 degrees to calculate earth pressures within the fill. We estimate the grade beams or shallow strip footings would have to extend about 2.5 feet to 3.0 feet below grade to develop enough passive pressure to support a lateral load of 1.0 kip per linear foot (klf) with an appropriate factor of safety. The soil around the grade beam or shallow strip footings would have to be compacted to minimize the movement needed to engage the soil's passive resistance.

Attached Homes

Several homes in Edgemere are one and a half attached residential structures. In other words, a minimum of two homes are constructed adjacent to each other and share a common interior wall (party wall). Below the party wall is a common foundation that may have been constructed as a continuous wall footing or a series of independent footings supporting columns built within the party wall. In any event, party wall foundations support interior loads from the two attached residential structures.



We understand that attached homes in the Edgemere BIB program that require “rehabilitation by elevation” will not necessarily be elevated, rather, an extra floor will be constructed above the structure’s existing upper floor. By adding a floor to the structure, the home’s lowest livable space will be relocated to the floor above, thereby preventing flooding of the home’s lowest livable space.

In order to re-use existing foundations, the project’s Architect/Engineer (A/E) will have to confirm the capacity of existing foundations to support additional loads. The quality and size of the footings can be determined by test pits and coring of the footings if required. In addition, the bearing capacity of the subgrade below the existing footings will have to be determined via test pits to evaluate if the subgrade can support additional loads.

Alternatively, new foundations will be required to augment or replace existing foundations of the affected homes. Test pits at a select number of locations within and outside the affected homes will be required to determine the type(s) of foundations currently supporting the home so that the new foundation type can be selected.

We understand that there are two possible scenarios for the rehabilitation of the attached or semi-detached homes. The first scenario is for two homes sharing a party wall are scheduled for rehabilitation and the second scenario is for the rehabilitation of only one home sharing a common party wall. In the case of the first scenario, new foundations can be installed at both homes and transfer beams used to transmit the loads from the existing party wall to the new foundations. For the second scenario, the new foundations would have to be installed inboard of the existing foundations which would reduce the interior space of the home’s first level as the structural framing for the added floor would extend to new foundations.

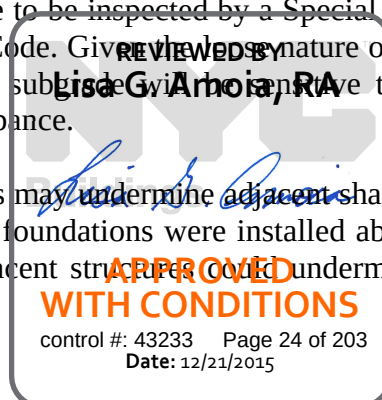
In addition, determination of the bottom elevation of shallow foundations must take into account the need to prevent load transfer from one shallow foundation to another adjacent shallow foundation by load distribution through the bearing stratum. Where ever possible, maintaining the bottom elevation of shallow foundations at a constant elevation would prevent the inadvertent loading of adjacent shallow foundations to occur.

CONSTRUCTION CONSIDERATIONS

Due to the shallow groundwater table within the project limits, construction dewatering may be required for construction of shallow foundations with a minimum 4 foot embedment. A dewatering system such as a wellpoint system would be required to lower the groundwater table a minimum of 2 feet below the final foundation subgrade elevation in advance of excavation.

Subgrades for footings will have to be inspected by a Special Inspector prior to constructing the footing in accordance with the Code. Given the nature of the shallow bearing soils and the shallow groundwater table, the subgrade will have to disturbance and may require a concrete mud mat to limit disturbance.

Excavations for new foundations may undermine adjacent shallow home foundations. It is likely that some of the adjacent home foundations were installed above the frost line and excavations for new structures near the adjacent structures could undermine these shallow foundations. In



addition, if the adjacent home structure is in poor condition, the foundations could be susceptible to damage. Where these conditions exist and excavations for new grade beams will be adjacent to or lower than the adjacent foundations, we recommend a pre-construction condition survey be performed to assess the structural stability of the adjacent homes. Excavations for the new foundations should also be made in tightly sheeted pits to minimize potential lateral and vertical movement of the adjacent homes and their foundations.

Installation of helical piles or drilled displacement micro-piles will have to be inspected by a Special Inspector in accordance with the Code.

CONCLUSION

Although shallow foundations are feasible, we do not recommend that shallow foundations be used to support the one or two story residential structures due to the loose nature of Strata F and PF, the shallow groundwater table and the settlement that will result from the consolidation of Stratum O1. Depending on the soils (fill or natural sand) present at foundation bearing subgrade, the shallow foundation alternative may require additional investigations to be performed in the field during construction to verify the adequacy of the subgrade and the potential for over-excavation and replacement with structural fill.

We believe that deep foundations such as helical piles or drilled displacement micro-piles would provide a more robust foundation system that is less sensitive to settlement of the soft organic soils. The deep foundation alternatives described in this report will limit the potential for construction dewatering, over-excavation and long term consolidation settlement of the homes.

We trust that this report will allow the Queens BIB Design Team to continue the design and construction of the foundations for the homes currently enrolled in the Edgemere BIB program.

LIMITATIONS

The recommendations provided in this report are based in part on historical boring information and widely spaced supplemental borings made within Edgemere. Subsurface conditions at localized areas may vary from the conditions encountered in the borings and documented in this report. These variations may impact the foundation design and construction.

Recommendations provided herein are intended for the home addresses listed on the attached Table No. 1 entitled "Edgemere Home Addressed in this Report (November 5, 2015)". If at a later date additional Queens BIB Program homes are released to A/E's for design and construction work to follow, additional studies would be required to evaluate foundation recommendations for those homes.

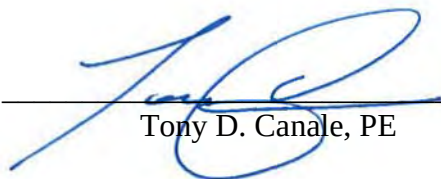
MRCE did not perform a scour analysis of this site or evaluate the potential for erosion. We expect that work will be performed by the Queens BIB Design Team members.



Very truly yours,

MUESER RUTLEDGE CONSULTING ENGINEERS

By: 
Pablo V. Lopez, PE

By: 
Tony D. Canale, PE

Attachments

MTM:PVL:TDC

F:\124\12481-NYC BIB\12481B-Tishman\1. Edgemere\Report\Final Report\12481B_EQ_Final Geotech Report.docx



EXHIBITS

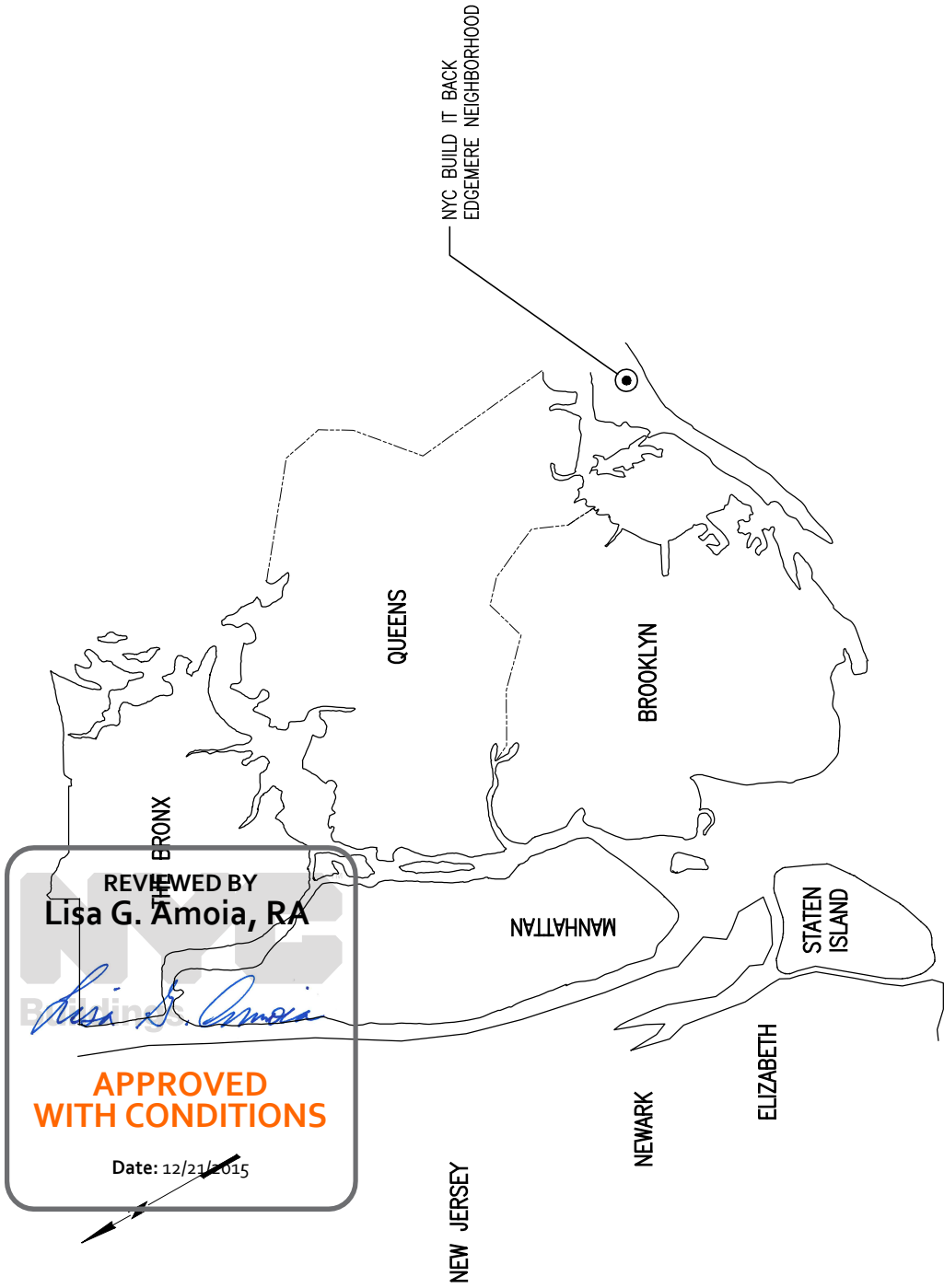




Geologic Map of Long Island, New York by Myron L. Fuller, Base Engraved from U.S. Geological Survey Topographic Sheets, 1913.

QUEENS		NEW YORK	
NYC BUILD IT BACK			
Mueser Rutledge Consulting Engineers 225 W. 34 th Street • New York, NY 10122			
GEOLOGICAL MAP		FIGURE NO.1	

NYC BUILD IT BACK EDGEMERE





REVIEWED BY
Lisa G. Amola, RA

APPROVED
WITH CONDITIONS

Date: 12/21/2015

NOTES:

1. FOR GENERAL NOTES, SEE DRAWING NO. EQ-2.

LEGEND:

--- PROJECT LIMITS

1	11-25-15	M.T.M.	ADDED AS-DRILLED BORING LOCATIONS
REV.	DATE	BY	DESCRIPTION
QUEENS			NYC BUILD IT BACK EDGEEMERE
NEW YORK			AECOM
NEW YORK			MUESER RUTLEDGE CONSULTING ENGINEERS 14 PENN PLAZA - 225 W. 34TH STREET, NY, NY 10122
SCALE GRAPHIC	MADE BY: L.R. CHKD BY: M.T.M.	DATE: 11-13-2015 DATE: 11-13-2015	FILE NUMBER 12481B
KEY PLAN			EQ-1

EXISTING BORING SUMMARY TABLE		
REFERENCE NUMBER	COMPANY	JOB NUMBER
1	DDC	SES 3809
2	DDC	SES 3809A
3	CMS	APP-019785
4	DDC	SES 2665
5	CMS	APP-006886
6	Soil Mech. Drilling Corp.	14R510.3
7	DDC	SES 3312
8	CMS	APP-006615
9	DDC	SES 2413
10	CMS	APP-006599
11	DDC	SES 3817
12	DDC	SES 746
13	DDC	SES 3013
14	DDC	SES 3160
15	CMS	APP-020392
16	DDC	SES 2845
17	CMS	APP-022676
18	DDC	SES 3283
19	EPA	0989
20	CMS	APP-007531
21	CMS	APP-003012
22	CMS	APP-000113
23	CMS	APP-024096

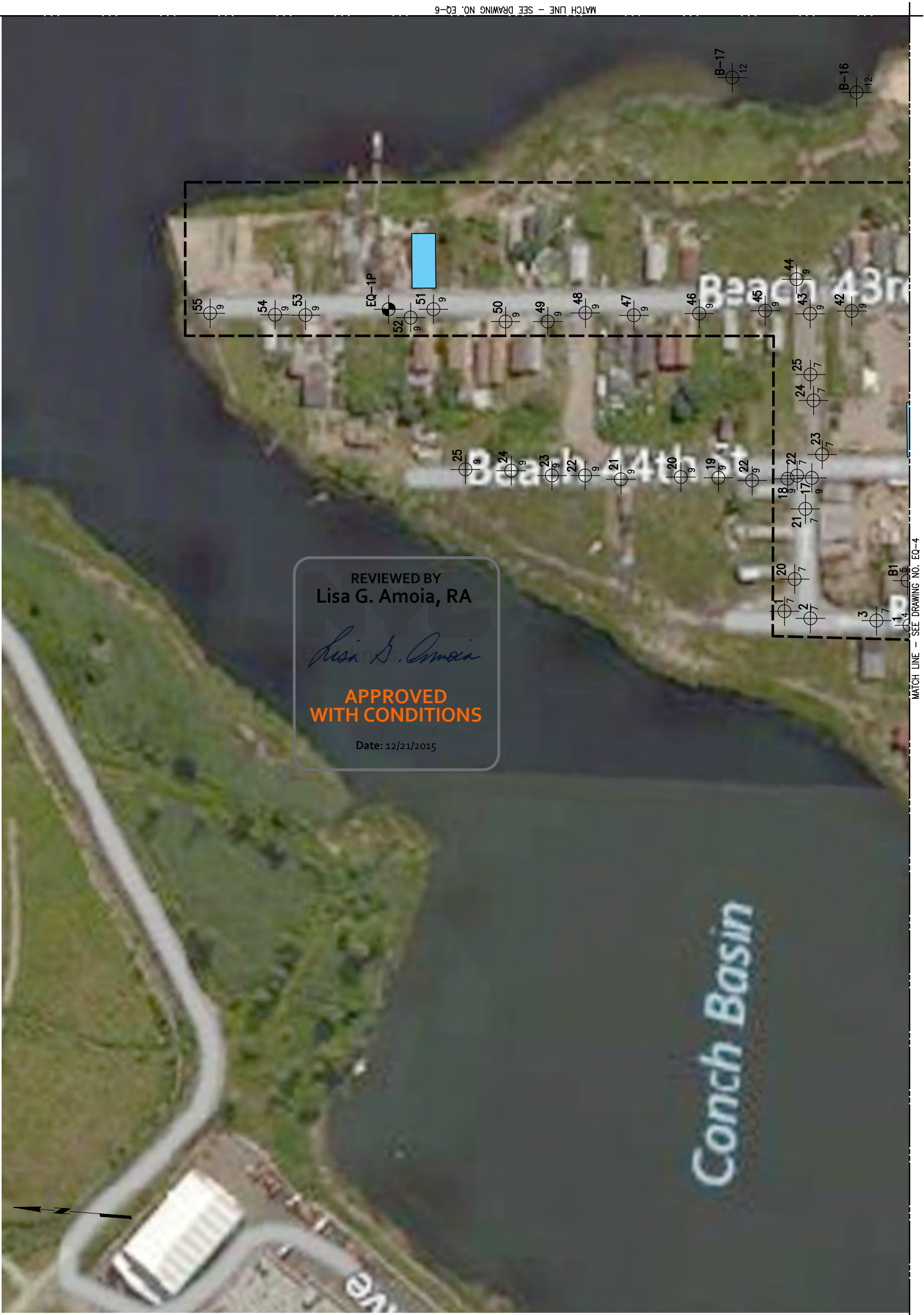
GENERAL NOTES:

1. BASE PLAN WAS CREATED BY MRCE.
2. HISTORIC BORING INFORMATION WAS OBTAINED FROM THE CITY OF NEW YORK DEPARTMENT OF DESIGN AND CONSTRUCTION, AND OTHERS. HISTORIC BORING LOCATIONS ARE APPROXIMATE BASED ON INFORMATION PROVIDED.
3. FOR DETAILS ON EXISTING BORINGS, SEE REFERENCE NUMBERS ON EXISTING BORING SUMMARY TABLE.
4. LOCATIONS FOR STRUCTURES ENROLLED IN BUILD IT BACK PROGRAM ARE APPROXIMATE BASED ON STREET ADDRESSES PROVIDED BY AECOM.
5. BORING NOS. EQ-1P THROUGH EQ-21 WERE MADE BY AQUIFER DRILLING AND TESTING INC. FROM AUGUST 24 TO SEPTEMBER 11, 2015 UNDER THE CONTINUOUS INSPECTION OF MRCE.
6. AS-DRILLED LOCATIONS AND GROUND SURFACE ELEVATIONS WERE SURVEYED BY HIRANI ENGINEERING AND LAND SURVEYING, P. C. DATED NOVEMBER 12, 2015.



BORING LOCATIONS:

1. ALL ATTEMPTS WERE MADE TO LOCATE THE BORINGS WITHIN SUBJECT PROPERTIES. IF DEEMED NECESSARY BY THE SPECIAL INSPECTOR, BORING LOCATIONS WERE RELOCATED TO THE SIDEWALK. IF THE SPECIAL INSPECTOR DEEMED IT NOT FEASIBLE TO ADVANCE THE BORING ON EITHER THE SUBJECT PROPERTY OR THE SIDEWALK DUE TO SITE RESTRICTIONS, BORINGS WERE RELOCATED TO THE STREET.



REVIEWED BY
Lisa G. Amoia, RA

Lisa G. Amoia

**APPROVED
WITH CONDITIONS**

Date: 12/21/2015



MATCH LINE - SEE DRAWING NO. EQ-4

MATCH LINE - SEE DRAWING NO. EQ-6

LEGEND:

- B-XX
-- EXISTING BORING,
REFERENCE NUMBER
- EQ-XP
-- 2015 MRCE BORING
P -- INDICATES PIEZOMETER
- PROJECT LIMITS
- STRUCTURE ENROLLED IN
BUILD IT BACK PROGRAM

EXISTING BORING SUMMARY TABLE		
REFERENCE NUMBER	COMPANY	JOB NUMBER
7	DDC	SES 3312
9	DDC	SES 2413
12	DDC	SES 746

NOTE:
1. FOR SITE PLAN SEE DRAWING EQ-1 AND FOR NOTES SEE DRAWING EQ-2.

1	11-25-15	M.T.M.	ADDED AS-DRILLED BORING LOCATIONS
REV.	DATE	BY	DESCRIPTION
NYC BUILD IT BACK EDGEEMERE			
QUEENS		NEW YORK	
NEW YORK		AECOM	
NEW YORK		NEW YORK	
MUESER RUTLEDGE CONSULTING ENGINEERS 14 PENN PLAZA – 225 W. 34TH STREET, NY, NY 10122			
SCALE GRAPHIC	MADE BY: L.R. CHKD BY: M.T.M.	DATE: 07-21-2015 DATE: 07-21-2015	FILE NUMBER 12481B
BORING LOCATION PLAN SHEET 1 OF 6			DRAWING NUMBER EQ-3

REVIEWED BY
Lisa G. Amadio, P.E.
Date: 12/23/2015

APPROVED
WITH CONDITIONS

Match Line - See Drawing Nos. EQ-6 and EQ-7

Beach 43rd St

Beach 44th St

Beach Channel Dr

Beach 45th St

Beach 46th St

Beach 47th St

Beach 48th St

Beach 49th St

Beach 50th St

Beach 51st St

Beach 52nd St

Beach 53rd St

Beach 54th St

Beach 55th St

Beach 56th St

Beach 57th St

Beach 58th St

Beach 59th St

Beach 60th St

Beach 61st St

Beach 62nd St

Beach 63rd St

Beach 64th St

Beach 65th St

Beach 66th St

Beach 67th St

Beach 68th St

Beach 69th St

Beach 70th St

Beach 71st St

Beach 72nd St

Beach 73rd St

Beach 74th St

Beach 75th St

Beach 76th St

Beach 77th St

Beach 78th St

Beach 79th St

Beach 80th St

Beach 81st St

Beach 82nd St

Beach 83rd St

Beach 84th St

Beach 85th St

Beach 86th St

Beach 87th St

Beach 88th St

Beach 89th St

Beach 90th St

Beach 91st St

Beach 92nd St

Beach 93rd St

Beach 94th St

Beach 95th St

Beach 96th St

Beach 97th St

Beach 98th St

Beach 99th St

Beach 100th St

Beach 101st St

Beach 102nd St

Beach 103rd St

Beach 104th St

Beach 105th St

Beach 106th St

Beach 107th St

Beach 108th St

Beach 109th St

Beach 110th St

Beach 111th St

Beach 112th St

Beach 113th St

Beach 114th St

Beach 115th St

Beach 116th St

Beach 117th St

Beach 118th St

Beach 119th St

Beach 120th St

Beach 121st St

Beach 122nd St

Beach 123rd St

Beach 124th St

Beach 125th St

Beach 126th St

Beach 127th St

Beach 128th St

Beach 129th St

Beach 130th St

Beach 131st St

Beach 132nd St

Beach 133rd St

Beach 134th St

Beach 135th St

Beach 136th St

Beach 137th St

Beach 138th St

Beach 139th St

Beach 140th St

Beach 141st St

Beach 142nd St

Beach 143rd St

Beach 144th St

Beach 145th St

Beach 146th St

Beach 147th St

Beach 148th St

Beach 149th St

Beach 150th St

Beach 151st St

Beach 152nd St

Beach 153rd St

Beach 154th St

Beach 155th St

Beach 156th St

Beach 157th St

Beach 158th St

Beach 159th St

Beach 160th St

Beach 161st St

Beach 162nd St

Beach 163rd St

Beach 164th St

Beach 165th St

Beach 166th St

Beach 167th St

Beach 168th St

Beach 169th St

Beach 170th St

Beach 171st St

Beach 172nd St

Beach 173rd St

Beach 174th St

Beach 175th St

Beach 176th St

Beach 177th St

Beach 178th St

Beach 179th St

Beach 180th St

Beach 181st St

Beach 182nd St

Beach 183rd St

Beach 184th St

Beach 185th St

Beach 186th St

Beach 187th St

Beach 188th St

Beach 189th St

Beach 190th St

Beach 191st St

Beach 192nd St

Beach 193rd St

Beach 194th St

Beach 195th St

Beach 196th St

Beach 197th St

Beach 198th St

Beach 199th St

Beach 200th St

Beach 201st St

Beach 202nd St

Beach 203rd St

Beach 204th St

Beach 205th St

Beach 206th St

Beach 207th St

Beach 208th St

Beach 209th St

Beach 210th St

Beach 211th St

Beach 212nd St

Beach 213rd St

Beach 214th St

Beach 215th St

Beach 216th St

Beach 217th St

Beach 218th St

Beach 219th St

Beach 220th St

Beach 221st St

Beach 222nd St

Beach 223rd St

Beach 224th St

Beach 225th St

Beach 226th St

Beach 227th St

Beach 228th St

Beach 229th St

Beach 230th St

Beach 231st St

Beach 232nd St

Beach 233rd St

Beach 234th St

Beach 235th St

Beach 236th St

Beach 237th St

Beach 238th St

Beach 239th St

Beach 240th St

Beach 241st St

Beach 242nd St

Beach 243rd St

Beach 244th St

Beach 245th St

Beach 246th St

Beach 247th St

Beach 248th St

Beach 249th St

Beach 250th St

Beach 251st St

Beach 252nd St

Beach 253rd St

Beach 254th St

Beach 255th St

Beach 256th St

Beach 257th St

Beach 258th St

Beach 259th St

Beach 260th St

Beach 261st St

Beach 262nd St

Beach 263rd St

Beach 264th St

Beach 265th St

Beach 266th St

Beach 267th St

Beach 268th St

Beach 269th St

Beach 270th St

Beach 271st St

Beach 272nd St

Beach 273rd St

Beach 274th St

Beach 275th St

Beach 276th St

Beach 277th St

Beach 278th St

Beach 279th St

Beach 280th St

Beach 281st St

Beach 282nd St

Beach 283rd St

Beach 284th St

Beach 285th St

Beach 286th St

Beach 287th St

Beach 288th St

Beach 289th St

Beach 290th St

Beach 291st St

Beach 292nd St

Beach 293rd St

Beach 294th St

Beach 295th St

Beach 296th St

Beach 297th St

Beach 298th St

Beach 299th St

Beach 300th St

Beach 301st St

Beach 302nd St

Beach 303rd St

Beach 304th St

Beach 305th St

Beach 306th St

Beach 307th St

Beach 308th St

Beach 309th St

Beach 310th St

Beach 311th St

Beach 312nd St

Beach 313rd St

Beach 314th St

Beach 315th St

Beach 316th St

Beach 317th St

Beach 318th St

Beach 319th St

Beach 320th St

Beach 321st St

Beach 322nd St

Beach 323rd St

Beach 324th St

Beach 325th St

Beach 326th St

Beach 327th St

Beach 328th St

Beach 329th St

Beach 330th St

Beach 331st St

Beach 33

PLAN

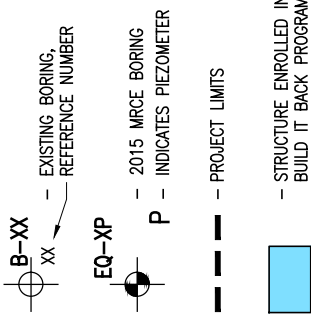
40' 0 80' 160'

NOTE:

1. FOR SITE PLAN SEE DRAWING EQ-1 AND FOR NOTES SEE DRAWING EQ-2.

EXISTING BORING SUMMARY TABLE		
REFERENCE NUMBER	COMPANY	JOB NUMBER
1	DDC	SES 3809
2	DDC	SES 3809A
3	CMS	APP-019785
4	DDC	SES 2665
6	SOIL MECH. DRILLING CORP	14R510.3
7	DDC	SES 3312
8	CMS	APP-006615
9	DDC	SES 2413
10	CMS	APP-006599
11	DDC	SES 3817
12	DDC	SES 746
13	DDC	SES 3013
15	CMS	APP-020392
16	DDC	SES 2845
17	CMS	APP-022676
18	DDC	SES 3283
19	EPA	0989
20	CMS	APP-0075331
21	CMS	APP-003012
22	CMS	APP-000113

LEGEND:



1	11-25-15	M.T.M.	ADDED AS-DRILLED BORING LOCATIONS
REV.	DATE	BY	DESCRIPTION
QUEENS NYC BUILD IT BACK EDGEEMERE NEW YORK			
NEW YORK AECOM NEW YORK			
MUESER RUTLEDGE CONSULTING ENGINEERS 14 PENN PLAZA – 225 W. 34TH STREET, NY, NY 10122			
SCALE GRAPHIC	MADE BY: L.R. CHKD BY: M.T.M.	DATE: 07-21-2015 DATE: 07-21-2015	FILE NUMBER 12481B DRAWING NUMBER
BORING LOCATION PLAN SHEET 2 OF 6			EQ-4



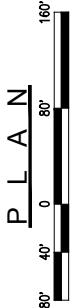
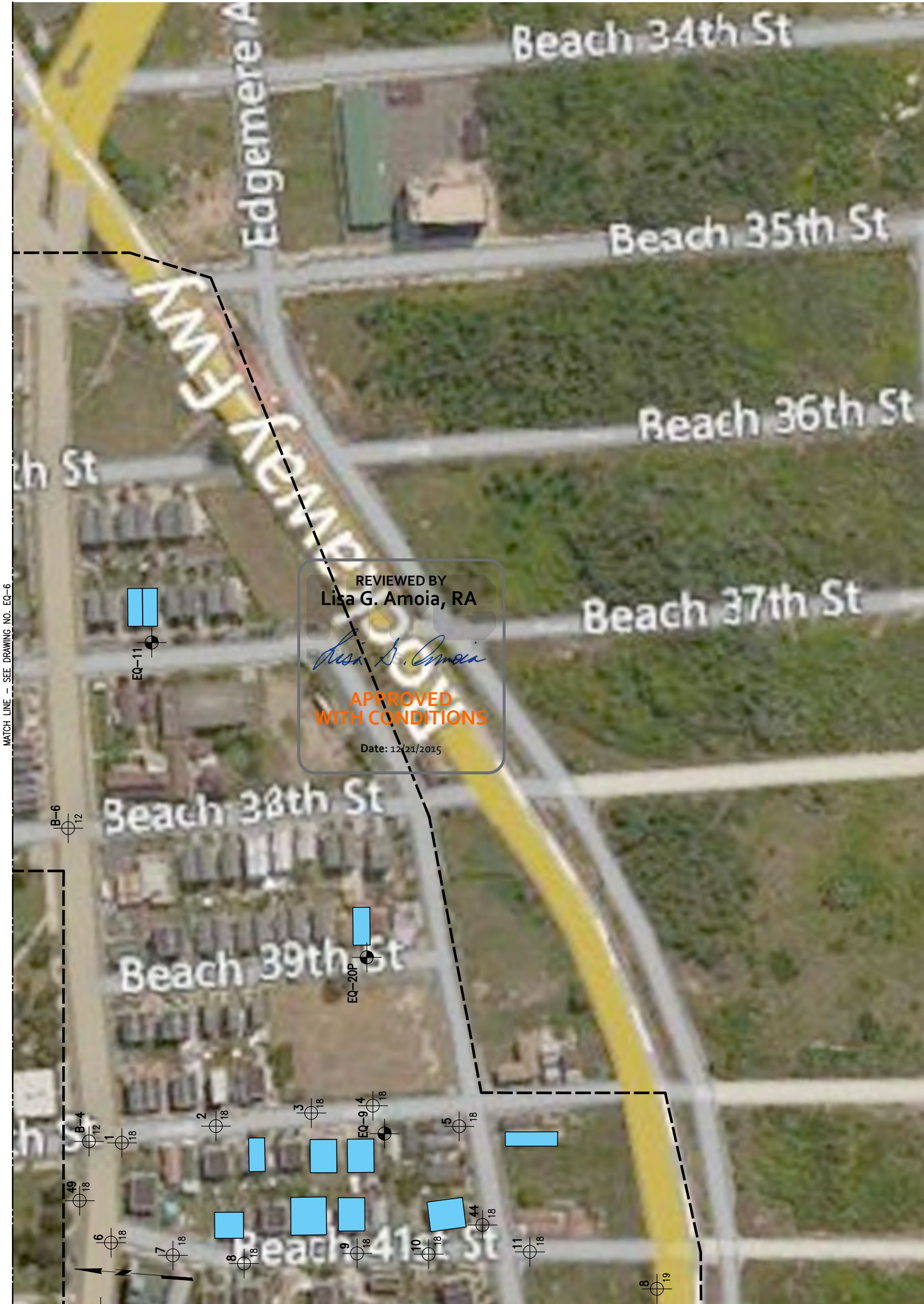
MATCH LINE - SEE DRAWING NO. EQ-4

MATCH LINE - SEE DRAWING NO. EQ-7

NOTE:
1. FOR SITE PLAN SEE DRAWING EQ-1 AND FOR NOTES SEE DRAWING EQ-2.

EXISTING BORING SUMMARY TABLE		
REFERENCE NUMBER	COMPANY	JOB NUMBER
1	DDC	SES 3809
14	DDC	SES 3160
16	DDC	SES 2845
18	DDC	SES 3283
19	EPA	0989

1	11-25-15	M.T.M.	ADDED AS-DRILLED BORING LOCATIONS	
REV.	DATE	BY	DESCRIPTION	
QUEENS			NYC BUILD IT BACK EDGEMERE NEW YORK	
NEW YORK			AECOM NEW YORK	
MUESER RUTLEDGE CONSULTING ENGINEERS 14 PENN PLAZA – 225 W. 34TH STREET, NY, NY 10122				
SCALE GRAPHIC	MADE BY: L.R. CHKD BY: M.T.M.	DATE: 07-21-2015 DATE: 07-21-2015	FILE NUMBER 12481B	DRAWING NUMBER EQ-5
BORING LOCATION PLAN SHEET 3 OF 6				



NOTE:
1. FOR SITE PLAN SEE DRAWING EQ-1 AND FOR NOTES SEE DRAWING EQ-2.

EXISTING BORING SUMMARY TABLE			
REFERENCE NUMBER	COMPANY	JOB NUMBER	
12	DDC	SES 746	
18	DDC	SES 3283	
19	EPA	0989	

LEGEND:

B-XX
-- EXISTING BORING, --
XX -- REFERENCE NUMBER

EQ-XP
-- 2015 MRCE BORING
P -- INDICATES PIEZOMETER

-- PROJECT LIMITS

-- STRUCTURE ENROLLED IN
BUILD IT BACK PROGRAM

1	11-25-15	M.T.M.	ADDED AS-DRILLED BORING LOCATIONS	
REV.	DATE	BY	DESCRIPTION	
QUEENS			NYC BUILD IT BACK EDGEEMERE	
NEW YORK			NEW YORK	
NEW YORK			AECOM	
MUESER RUTLEDGE CONSULTING ENGINEERS				
14 PENN PLAZA – 225 W. 34TH STREET, NY, NY 10122				
SCALE	MADE BY: L.R.	DATE: 07-21-2015	FILE NUMBER	12481B
GRAPHIC	CHKD BY: M.T.M.	DATE: 07-21-2015	DRAWING NUMBER	
BORING LOCATION PLAN			EQ-7	
SHEET 5 OF 6				



REVIEWED BY
Lisa G. Ameia, RA
Lisa G. Ameia
APPROVED WITH CONDITIONS
Date: 12/21/2015

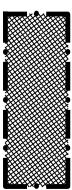
NOTES:

1. APPROXIMATE LIMITS OF STRATUM 01 AND 02 ARE BASED ON MRCE INTERPRETATION OF SUBSURFACE CONDITIONS ENCOUNTERED IN HISTORIC BORINGS AND 2015 SUPPLEMENTAL SUBSURFACE INVESTIGATION.

LEGEND:



APPROXIMATE LIMITS OF STRATUM 01 WITH AN AVERAGE THICKNESS OF 16 FEET UNDERLYING STRATUM F.



APPROXIMATE LIMITS OF BOTH STRATUM 01 WITH AN AVERAGE THICKNESS OF 16 FEET UNDERLYING STRATUM F AND STRATUM 02.



PROJECT LIMITS

P L A N
SCALE: NO SCALE

APPROXIMATE LIMITS OF ORGANIC STRATA		NEW YORK
QUEENS		
MUESER RUTLEDGE CONSULTING ENGINEERS		
14 PENN PLAZA - 225 WEST 34TH STREET, NEW YORK, NY 10122		
MADE BY: L.R.		CHECKED BY: M.T.M.
DATE: 11-25-2015		
FILE NUMBER:	12481B	DRAWING NUMBER: EQ-8

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 ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE	GRAVELS IS LARGER THAN NO. 4 SIEVE SIZE, 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)	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.	
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE, (FOR VISUAL CLASSIFICATION, THE 1/4 -IN. SIZE MAY BE USED AS EQUIVALENT TO THE NO. 4 SIEVE SIZE)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT-MIXTURES, (APPRECIABLE AMOUNT OF FINES)	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)	
FINE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE THE NO. 200 SIEVE SIZE IS	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)	
HIGHLY ORGANIC SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE THE NO. 200 SIEVE SIZE IS	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50	ML	INORGANIC SILTS, SANDY SILTS, ROCK FLOUR, OR CLAYEY SILTS WITH SLIGHT PLASTICITY.	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN NO. 40 SIEVE SIZE	
		CL	INORGANIC CLAYS, OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.		
		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.		
	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.	DRY STRENGTH (CRUSHING CHARACTERISTICS)	
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.		DILATANCY (REACTION TO SHAKING)
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.		TOUGHNESS (CONSISTENCY NEAR PL)
	PEAT AND OTHER HIGHLY ORGANIC SOILS.	Pt		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-SG POORLY GRADED SAND WITH CLAY BINDER.					
TERMINOLOGY USED IN MRCE SOIL DESCRIPTIONS					
DEGREE OF COMPACTION FOR NON-PLASTIC SOIL		CONSISTENCY OF CLAY AND CLAYEY SILT ⁺			
DEGREE OF COMPACTION	BLOWS* PER FOOT	CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (1SF)	IDENTIFICATION CHARACTERISTICS	
LOOSE	0 TO 10	SOFT	LESS THAN 0.5	EASILY REMOVED WITH SLIGHT FINGER PRESSURE	
MEDIUM COMPACT	11 TO 29	MEDIUM	0.5 TO 1.0	REQUIRES SUBSTANTIAL PRESSURE FOR REMOLDING	
COMPACT	30 TO 50	STIFF	1.0 TO 4.0	DIFFICULT TO REMOLD WITH FINGERS	
VERY COMPACT	GREATER THAN 50	HARD	GREATER THAN 4.0	CANNOT BE REMOVED WITH FINGERS	
* STANDARD PENETRATION RESISTANCE USING 140 LB. HAMMER FREE FALLING 30 INCHES TO DRIVE A 2 INCH O.D. SPLIT-SPOON SAMPLER.		+ 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)			

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 ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE	GRAVELS IS LARGER THAN NO. 4 SIEVE SIZE, 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)	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.	
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE, (FOR VISUAL CLASSIFICATION, THE 1/4 -IN. SIZE MAY BE USED AS EQUIVALENT TO THE NO. 4 SIEVE SIZE)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT-MIXTURES, (APPRECIABLE AMOUNT OF FINES)	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)	
FINE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE THE NO. 200 SIEVE SIZE IS	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)	
HIGHLY ORGANIC SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE THE NO. 200 SIEVE SIZE IS	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50	ML	INORGANIC SILTS, SANDY SILTS, ROCK FLOUR, OR CLAYEY SILTS WITH SLIGHT PLASTICITY.	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN NO. 40 SIEVE SIZE	
		CL	INORGANIC CLAYS, OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.		
		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.		
	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.	DRY STRENGTH (CRUSHING CHARACTERISTICS)	
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.		DILATANCY (REACTION TO SHAKING)
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.		TOUGHNESS (CONSISTENCY NEAR PL)
	PEAT AND OTHER HIGHLY ORGANIC SOILS.	Pt		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-SG POORLY GRADED SAND WITH CLAY BINDER.					
TERMINOLOGY USED IN MRCE SOIL DESCRIPTIONS					
DEGREE OF COMPACTION FOR NON-PLASTIC SOIL		CONSISTENCY OF CLAY AND CLAYEY SILT ⁺			
DEGREE OF COMPACTION	BLOWS* PER FOOT	CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (1SF)	IDENTIFICATION CHARACTERISTICS	
LOOSE	0 TO 10	SOFT	LESS THAN 0.5	EASILY REMOVED WITH SLIGHT FINGER PRESSURE	
MEDIUM COMPACT	11 TO 29	MEDIUM	0.5 TO 1.0	REQUIRES SUBSTANTIAL PRESSURE FOR REMOLDING	
COMPACT	30 TO 50	STIFF	1.0 TO 4.0	DIFFICULT TO REMOLD WITH FINGERS	
VERY COMPACT	GREATER THAN 50	HARD	GREATER THAN 4.0	CANNOT BE REMOVED WITH FINGERS	
* STANDARD PENETRATION RESISTANCE USING 140 LB. HAMMER FREE FALLING 30 INCHES TO DRIVE A 2 INCH O.D. SPLIT-SPOON SAMPLER.		+ 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)			

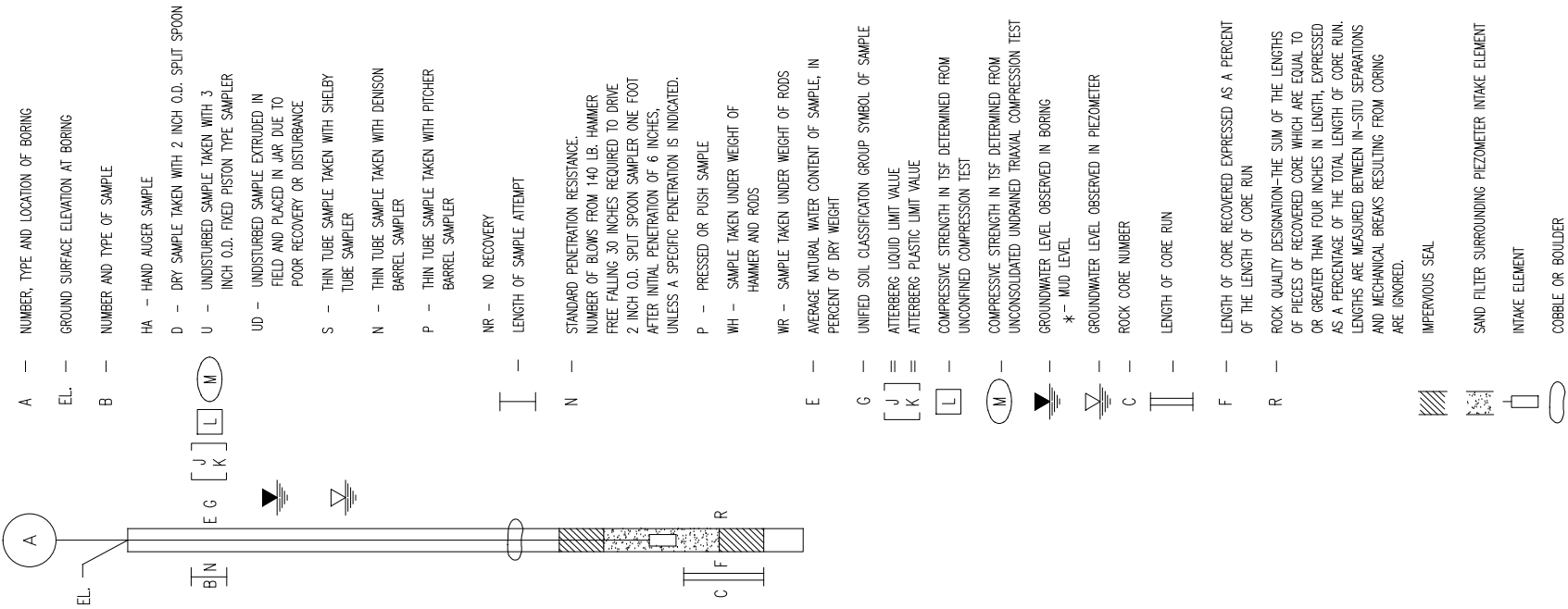
UNIFIED SOIL CLASSIFICATION (INCLUDING IDENTIFICATION AND DESCRIPTION)					
MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES	FIELD IDENTIFICATION PROCEDURES (EXCLUDING PARTICLES LARGER THAN 3 IN. AND BASING FRACTIONS ON ESTIMATED WEIGHTS)	
1	2	3	4	5	
COARSE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE	GRAVELS IS LARGER THAN NO. 4 SIEVE SIZE, 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)	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.	
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE, (FOR VISUAL CLASSIFICATION, THE 1/4 -IN. SIZE MAY BE USED AS EQUIVALENT TO THE NO. 4 SIEVE SIZE)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT-MIXTURES, (APPRECIABLE AMOUNT OF FINES)	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)	
FINE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE THE NO. 200 SIEVE SIZE IS	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)	
HIGHLY ORGANIC SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE THE NO. 200 SIEVE SIZE IS	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50	ML	INORGANIC SILTS, SANDY SILTS, ROCK FLOUR, OR CLAYEY SILTS WITH SLIGHT PLASTICITY.	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN NO. 40 SIEVE SIZE	
		CL	INORGANIC CLAYS, OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.		
		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.		
	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.	DRY STRENGTH (CRUSHING CHARACTERISTICS)	
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.		DILATANCY (REACTION TO SHAKING)
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.		TOUGHNESS (CONSISTENCY NEAR PL)
	PEAT AND OTHER HIGHLY ORGANIC SOILS.	Pt		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-SG POORLY GRADED SAND WITH CLAY BINDER.					
TERMINOLOGY USED IN MRCE SOIL DESCRIPTIONS					
DEGREE OF COMPACTION FOR NON-PLASTIC SOIL		CONSISTENCY OF CLAY AND CLAYEY SILT ⁺			
DEGREE OF COMPACTION	BLOWS* PER FOOT	CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (1SF)	IDENTIFICATION CHARACTERISTICS	
LOOSE	0 TO 10	SOFT	LESS THAN 0.5	EASILY REMOVED WITH SLIGHT FINGER PRESSURE	
MEDIUM COMPACT	11 TO 29	MEDIUM	0.5 TO 1.0	REQUIRES SUBSTANTIAL PRESSURE FOR REMOLDING	
COMPACT	30 TO 50	STIFF	1.0 TO 4.0	DIFFICULT TO REMOLD WITH FINGERS	
VERY COMPACT	GREATER THAN 50	HARD	GREATER THAN 4.0	CANNOT BE REMOVED WITH FINGERS	
* STANDARD PENETRATION RESISTANCE USING 140 LB. HAMMER FREE FALLING 30 INCHES TO DRIVE A 2 INCH O.D. SPLIT-SPOON SAMPLER.		+ 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)			

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 ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE	GRAVELS IS LARGER THAN NO. 4 SIEVE SIZE, 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)	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.	
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE, (FOR VISUAL CLASSIFICATION, THE 1/4 -IN. SIZE MAY BE USED AS EQUIVALENT TO THE NO. 4 SIEVE SIZE)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT-MIXTURES, (APPRECIABLE AMOUNT OF FINES)	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)	
FINE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE THE NO. 200 SIEVE SIZE IS	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)	
HIGHLY ORGANIC SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE THE NO. 200 SIEVE SIZE IS	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50	ML	INORGANIC SILTS, SANDY SILTS, ROCK FLOUR, OR CLAYEY SILTS WITH SLIGHT PLASTICITY.	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN NO. 40 SIEVE SIZE	
		CL	INORGANIC CLAYS, OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.		
		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.		
	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.	DRY STRENGTH (CRUSHING CHARACTERISTICS)	
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.		DILATANCY (REACTION TO SHAKING)
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.		TOUGHNESS (CONSISTENCY NEAR PL)
	PEAT AND OTHER HIGHLY ORGANIC SOILS.	Pt		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-SG POORLY GRADED SAND WITH CLAY BINDER.					
TERMINOLOGY USED IN MRCE SOIL DESCRIPTIONS					
DEGREE OF COMPACTION FOR NON-PLASTIC SOIL		CONSISTENCY OF CLAY AND CLAYEY SILT ⁺			
DEGREE OF COMPACTION	BLOWS* PER FOOT	CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (1SF)	IDENTIFICATION CHARACTERISTICS	
LOOSE	0 TO 10	SOFT	LESS THAN 0.5	EASILY REMOVED WITH SLIGHT FINGER PRESSURE	
MEDIUM COMPACT	11 TO 29	MEDIUM	0.5 TO 1.0	REQUIRES SUBSTANTIAL PRESSURE FOR REMOLDING	
COMPACT	30 TO 50	STIFF	1.0 TO 4.0	DIFFICULT TO REMOLD WITH FINGERS	
VERY COMPACT	GREATER THAN 50	HARD	GREATER THAN 4.0	CANNOT BE REMOVED WITH FINGERS	
* STANDARD PENETRATION RESISTANCE USING 140 LB. HAMMER FREE FALLING 30 INCHES TO DRIVE A 2 INCH O.D. SPLIT-SPOON SAMPLER.		+ 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)			

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 ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE	GRAVELS IS LARGER THAN NO. 4 SIEVE SIZE, 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)	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.	
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE, (FOR VISUAL CLASSIFICATION, THE 1/4 -IN. SIZE MAY BE USED AS EQUIVALENT TO THE NO. 4 SIEVE SIZE)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT-MIXTURES, (APPRECIABLE AMOUNT OF FINES)	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)	
FINE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE THE NO. 200 SIEVE SIZE IS	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)	
HIGHLY ORGANIC SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE THE NO. 200 SIEVE SIZE IS	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50	ML	INORGANIC SILTS, SANDY SILTS, ROCK FLOUR, OR CLAYEY SILTS WITH SLIGHT PLASTICITY.	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN NO. 40 SIEVE SIZE	
		CL	INORGANIC CLAYS, OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.		
		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.		
	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.	DRY STRENGTH (CRUSHING CHARACTERISTICS)	
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.		DILATANCY (REACTION TO SHAKING)
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.		TOUGHNESS (CONSISTENCY NEAR PL)
	PEAT AND OTHER HIGHLY ORGANIC SOILS.	Pt		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-SG POORLY GRADED SAND WITH CLAY BINDER.					
TERMINOLOGY USED IN MRCE SOIL DESCRIPTIONS					
DEGREE OF COMPACTION FOR NON-PLASTIC SOIL		CONSISTENCY OF CLAY AND CLAYEY SILT ⁺			
DEGREE OF COMPACTION	BLOWS* PER FOOT	CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (1SF)	IDENTIFICATION CHARACTERISTICS	
LOOSE	0 TO 10	SOFT	LESS THAN 0.5	EASILY REMOVED WITH SLIGHT FINGER PRESSURE	
MEDIUM COMPACT	11 TO 29	MEDIUM	0.5 TO 1.0	REQUIRES SUBSTANTIAL PRESSURE FOR REMOLDING	
COMPACT	30 TO 50	STIFF	1.0 TO 4.0	DIFFICULT TO REMOLD WITH FINGERS	
VERY COMPACT	GREATER THAN 50	HARD	GREATER THAN 4.0	CANNOT BE REMOVED WITH FINGERS	
* STANDARD PENETRATION RESISTANCE USING 140 LB. HAMMER FREE FALLING 30 INCHES TO DRIVE A 2 INCH O.D. SPLIT-SPOON SAMPLER.		+ 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)			

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 ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE	GRAVELS IS LARGER THAN NO. 4 SIEVE SIZE, 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)	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.	
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE, (FOR VISUAL CLASSIFICATION, THE 1/4 -IN. SIZE MAY BE USED AS EQUIVALENT TO THE NO. 4 SIEVE SIZE)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT-MIXTURES, (APPRECIABLE AMOUNT OF FINES)	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)	
FINE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE THE NO. 200 SIEVE SIZE IS	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)	
HIGHLY ORGANIC SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE THE NO. 200 SIEVE SIZE IS	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50	ML	INORGANIC SILTS, SANDY SILTS, ROCK FLOUR, OR CLAYEY SILTS WITH SLIGHT PLASTICITY.	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN NO. 40 SIEVE SIZE	
		CL	INORGANIC CLAYS, OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.		
		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.		
	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.	DRY STRENGTH (CRUSHING CHARACTERISTICS)	
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.		DILATANCY (REACTION TO SHAKING)
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.		TOUGHNESS (CONSISTENCY NEAR PL)
	PEAT AND OTHER HIGHLY ORGANIC SOILS.	Pt		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-SG POORLY GRADED SAND WITH CLAY BINDER.					
TERMINOLOGY USED IN MRCE SOIL DESCRIPTIONS					
DEGREE OF COMPACTION FOR NON-PLASTIC SOIL		CONSISTENCY OF CLAY AND CLAYEY SILT ⁺			
DEGREE OF COMPACTION	BLOWS* PER FOOT	CONSISTENCY</			

BORING LEGEND



REVISED 10-25-2012

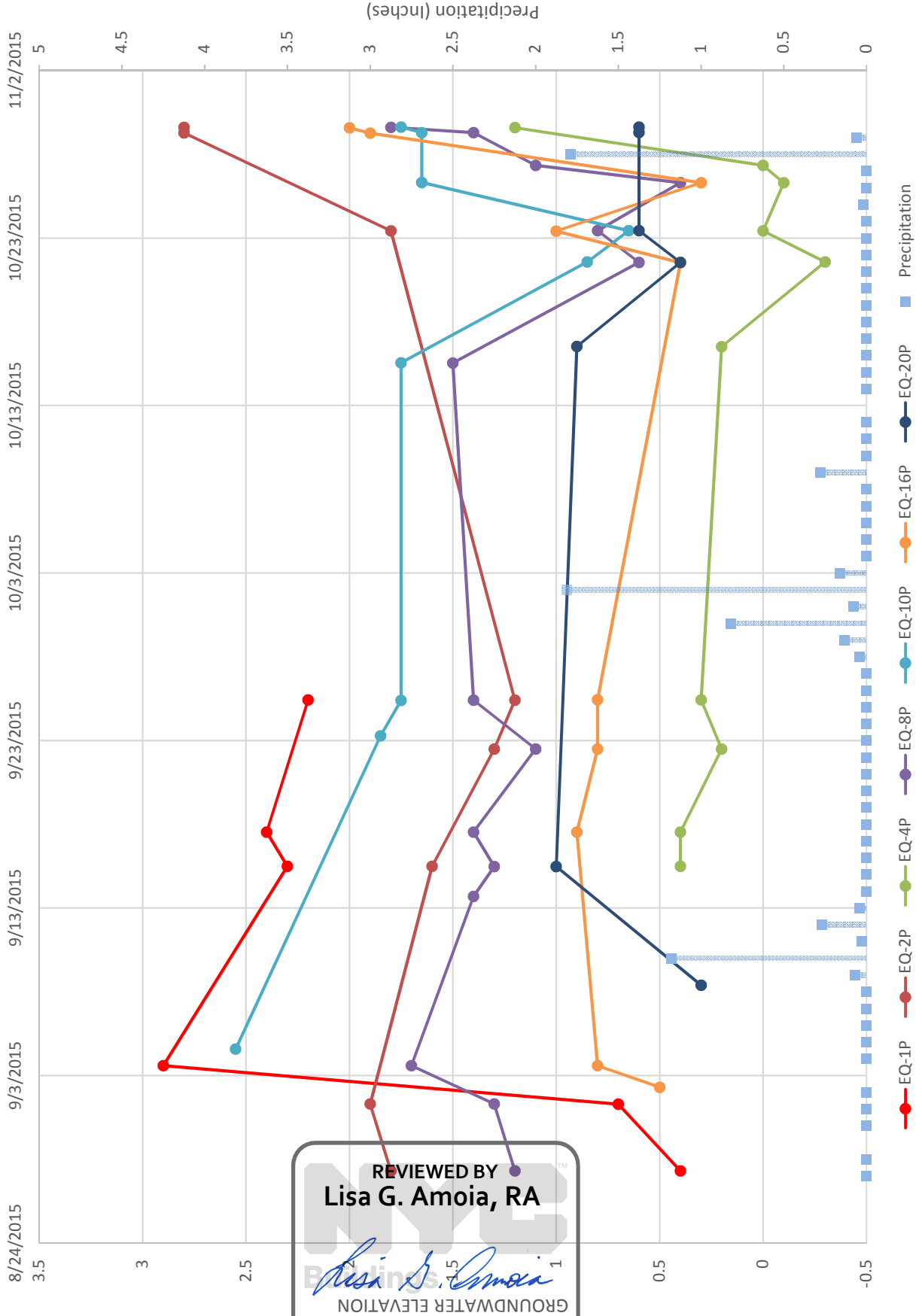
MUESER RUTLEDGE CONSULTING ENGINEERS
225 WEST 34th STREET - 14 PENN PLAZA
NEW YORK, NY 10122

GEOTECHNICAL REFERENCE STANDARDS

GS-R

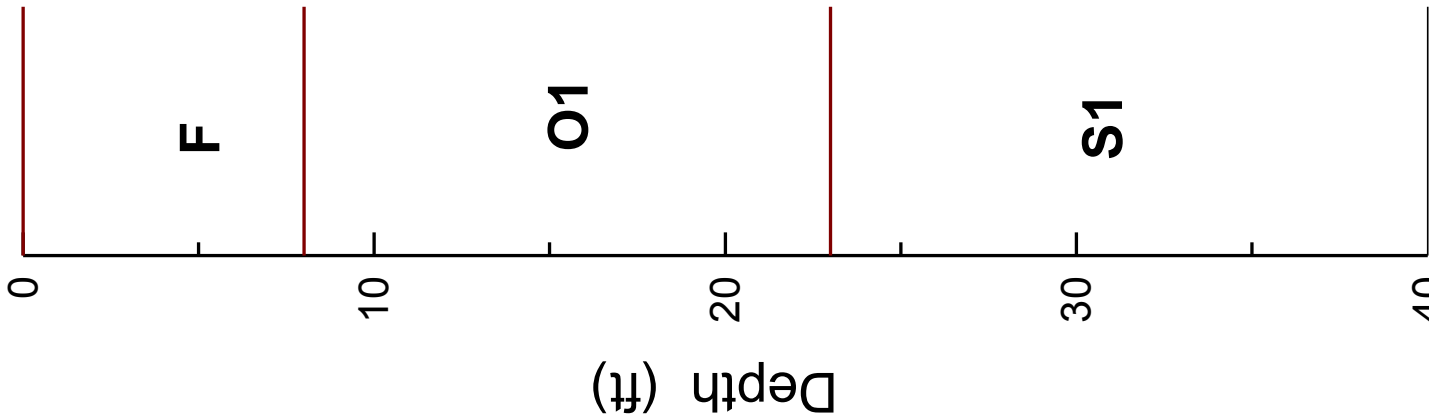
DRAWING NO.

FIGURE NO. 2 - GROUNDWATER ELEVATION READINGS

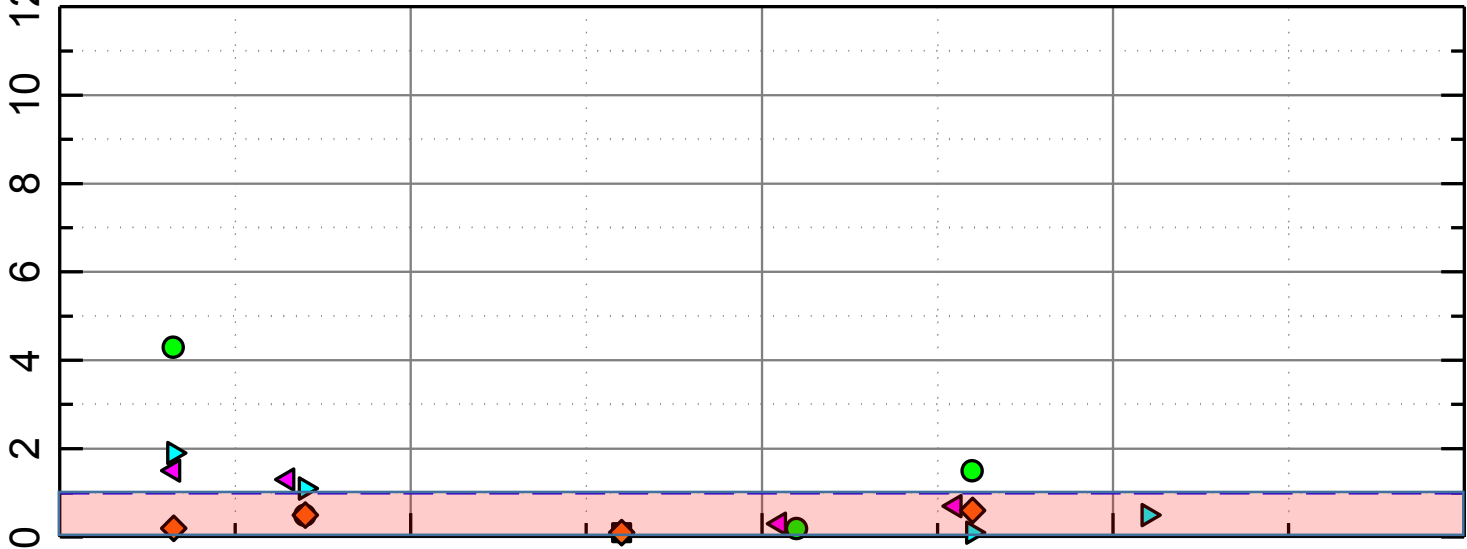


REVIEWED BY
Lisa G. Amoia, RA
Lisa G. Amoia
 APPROVED
 WITH CONDITIONS
 control #: 43233 Page 39 of 203
 Date: 12/21/2015

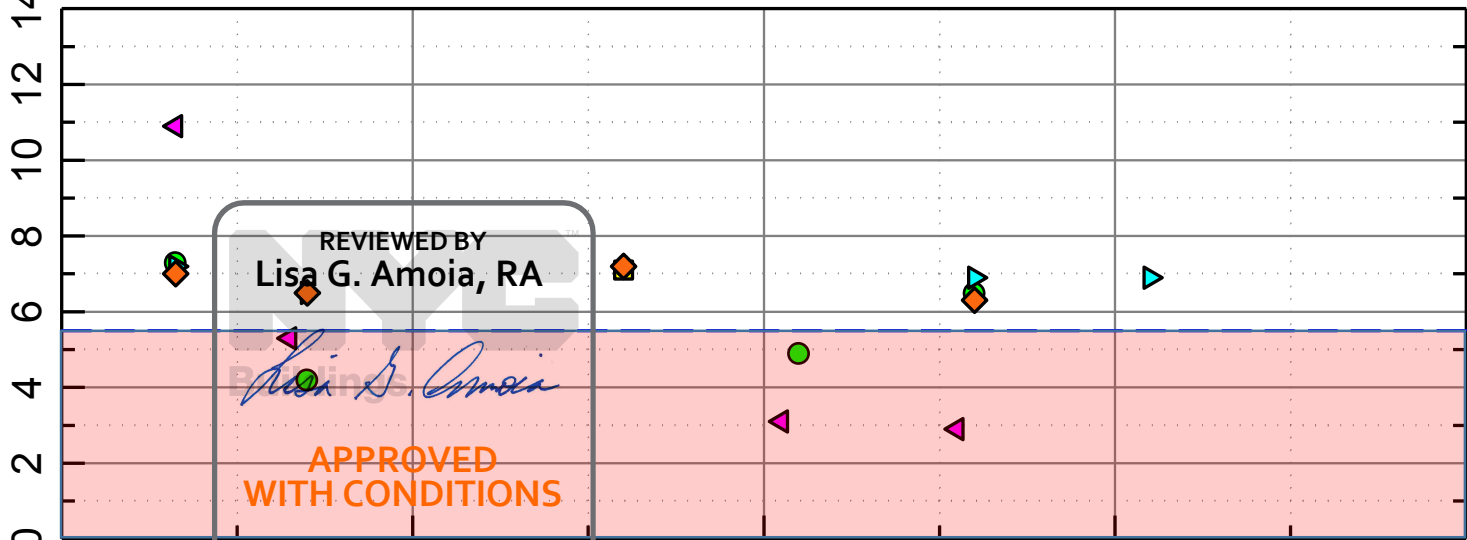
Site
General
Stratigraphy



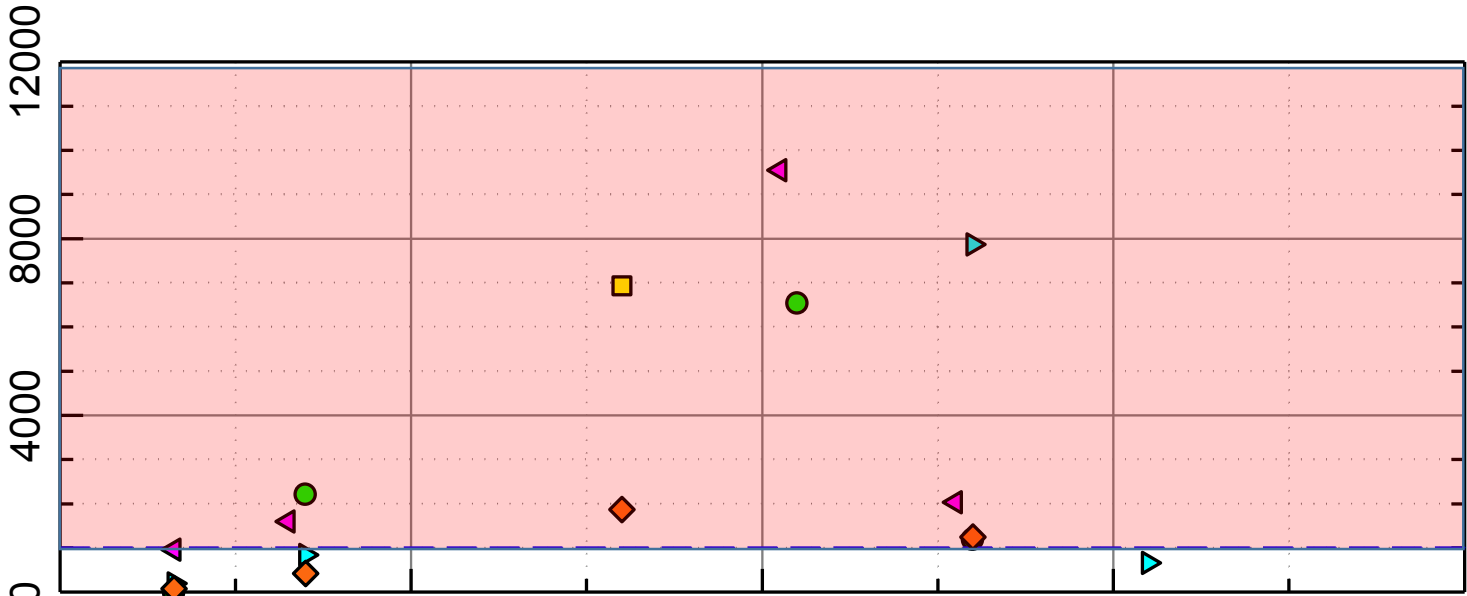
Resistivity
ASTM G57
(kΩ - cm)



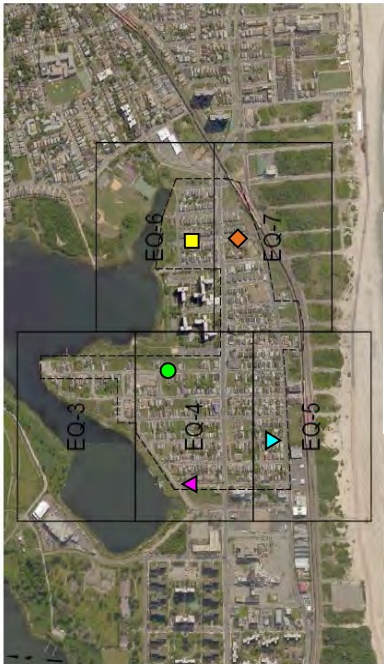
pH
ASTM G51
(pH)



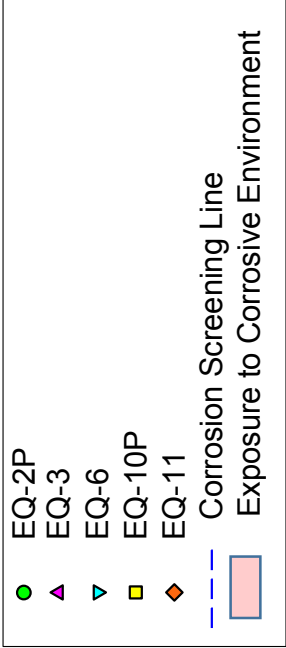
Leachable Sulfate
ASTM D516
(ppm)



KEY PLAN



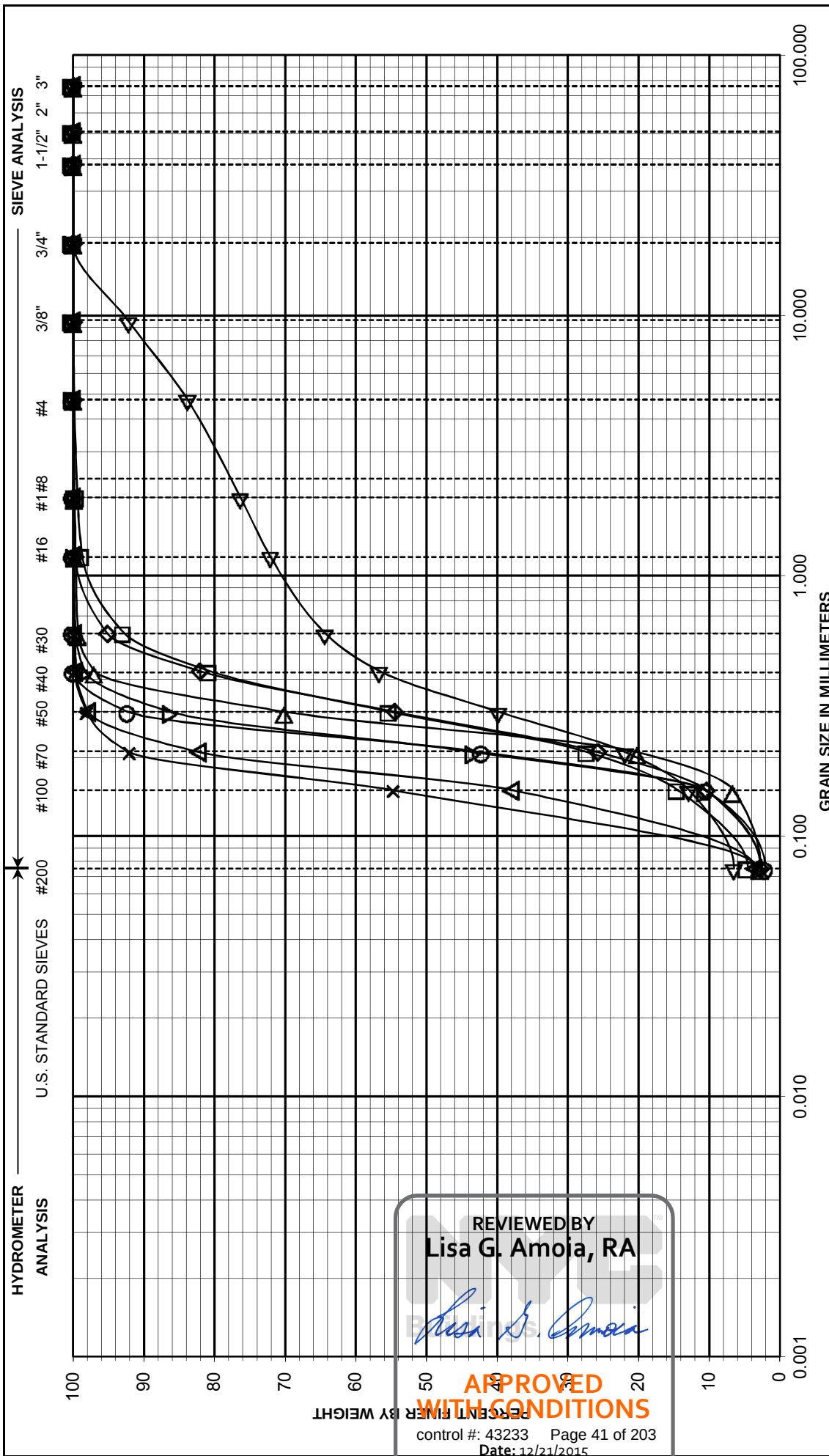
LEGEND



Notes:

1. Key Plan prepared by MRCE on 07/21/15.
2. Corrosion screening lines defined as per NYCBC 1812.2.1, for which resistivity < 1.0 kΩ-cm, pH < 5.5 and leachable sulfate > 1000 ppm indicate the existence of a corrosive environment.
3. The site general stratigraphy is based on the average soil profile encountered in the 2015 borings. Stratum O1 is typically interbedded within Stratum S1.
4. Samples within the red shaded zone indicate exposure to corrosive environment.

QUEENS			NYC BUILD IT BACK		NY	
MUESER RUTLEDGE CONSULTING ENGINEERS						
14 PENN PLAZA – 225 W 34 TH STREET, NEW YORK NY 10122						
SCALE	MADE BY: GDF	DATE: 10-13-2015	FILE NO.			
-AS NOTED-	CH'KD BY: MTM	DATE: 10-28-2015	12481B			
SUMMARY OF CORROSION TESTING			FIGURE 3			
EDGMERE						



UNIFIED SOILS CLASSIFICATION		CLAY OR SILT		SAND			GRAVEL		COBBLES		
				FINE	MEDIUM	COARSE	FINE	COARSE			
SYMBOL		BORING	SAMPLE	DESCRIPTION OF SAMPLE			NYC BUILD IT BACK				
○	EQ-15	12D		LIGHT BROWN FINE SAND, TRACE SILT (SP)			QUEENS		NEW YORK		
□	EQ-15	1HA		LIGHT BROWN FINE TO MEDIUM SAND, TRACE SILT (SP)			MUESER RUTLEDGE CONSULTING ENGINEERS				
△	EQ-15	7D		GRAY FINE SAND, TRACE SILT (SP)			225 WEST 34TH STREET, NEW YORK, N.Y. 10122				
◇	EQ-17	10D		LIGHT BROWN FINE TO MEDIUM SAND, TRACE SILT (SP)			MADE BY: FW		DATE: 10-21-15		
▽	EQ-17	3D		GRAY FINE SAND, TRACE SILT, MEDIUM SAND (SP)			CHKD BY: MTM		DATE: 10-28-15		
△	EQ-20P	11D		TAN FINE SAND, TRACE MEDIUM SAND, SILT (SP)			FILE NO. 12481B				
▽	EQ-20P	1HA		BROWN FINE TO COARSE SAND, SOME GRAVEL, TRACE SILT (SP-SM)			FIGURE NO.				
×	EQ-20P	6D		GRAY FINE SAND, TRACE SILT (SP)			GRADATION CURVES				
						4					

FIGURE NO. 4

NEW YORK

QUEENS
MUESER RUTLEDGE CONSULTING ENGINEERS
225 WEST 34TH STREET, NEW YORK, N.Y. 10122

MADE BY: FW
CH'KD BY: MTM

DATE: 10-21-15
DATE: 10-28-15

FILE NO.
12481B

FIGURE NO.
4

GRADATION CURVES

FIGURE NO. 4

Table No. 1

Edgemere Homes Addressed in this Report (11-5-15)

BIB Application No.	Home Address
000374	455 BEACH 46 STREET
024464	407 BEACH 46 STREET
002621	362 BEACH 45 STREET
007320	338 BEACH 45 STREET
007328	310 BEACH 39 STREET
009423	431 BEACH 47 STREET
001949	428 BEACH 47 STREET
003663	442 BEACH 46 STREET
024469	350 BEACH 46 STREET
018445	441 BEACH 46 STREET
024509	428 BEACH 36 STREET
010904	360 BEACH 45 STREET
021343	300 BEACH 46 STREET
019834	42-14 ROCKAWAY BEACH BOULEVARD
010290	353 BEACH 47 STREET
022432	443 BEACH 47 STREET
017886	442 BEACH 48 STREET
003031	323 BEACH 40 STREET
023614	434 BEACH 37 STREET
024695	326 BEACH 37 STREET
019664	440 BEACH 48 STREET
012615	321 BEACH 40 STREET
014364	354 BEACH 48 STREET
004948	410 BEACH 48 STREET
019120	338 BEACH 41 STREET
015965	40-18 ROCKAWAY BEACH BOULEVARD
000835	338 BEACH 48 STREET
016546	57-39 ARVERNE BOULEVARD
014631	406 BEACH 36 STREET
010052	320 BEACH 41 STREET
010537	326 BEACH 42 STREET
024132	326 BEACH 41 STREET
019759	342 BEACH 48 STREET
023234	440 BEACH 38 STREET
007092	41-11 BEACH CHANNEL DRIVE

BIB Application No.	Home Address
017394	334 BEACH 43 STREET
009432	40-03 ROCKAWAY BEACH BOULEVARD
009528	327 BEACH 40 STREET
020316	415 BEACH 35 STREET
010376	44-18 ROCKAWAY BEACH BOULEVARD
013516	333 BEACH 40 STREET
009010	318 BEACH 42 STREET
025412	338 BEACH 43 STREET
021132	334 BEACH 47 STREET
011197	420 BEACH 48 STREET
011220	424 BEACH 48 STREET
005415	25-06 BROOKHAVEN AVENUE
014178	336 BEACH 41 STREET
020159	324 BEACH 37 STREET
019539	492 BEACH 44 STREET
015542	462 BEACH 43 STREET
002823	333 BEACH 43 STREET
017784	512 BEACH 32 STREET
024783	30-12 BROOKHAVEN AVENUE
020279	329 BEACH 43 STREET
021465	41-19 BEACH CHANNEL DRIVE
007370	422 BEACH 37 STREET
004160	41-15 BEACH CHANNEL DRIVE
007204	327 BEACH 43 STREET
002656	439 BEACH 45 STREET
024412	325 BEACH 36 STREET
011489	419 BEACH 37 STREET
015668	40-05 BEACH CHANNEL DRIVE
016725	466A BEACH 43 STREET
007324	331 BEACH 39 STREET
024614	452 BEACH 45 STREET
024721	429 BEACH 37 STREET
002976	304 BEACH 42 STREET
003615	432 BEACH 47 STREET



APPENDIX A



MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-2P
SHEET 1 OF 4
FILE NO. 12481B
SURFACE ELEV. 5.1
RES. ENGR. SEONG HWANG

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	CASING		REMARKS
	NO.	DEPTH	BLOWS/6"			DEPTH	BLOWS	
12:00 08-25-15 Tuesday Sunny 85°F	1HA	0.5	HAND AUGER	Brown fine to coarse sand, trace gravel, silt (Fill) (SP-SM)	PF		DRILLED	Asphalt at surface. Borehole hand cleared to 6'.
		6.0					AHEAD	
							4"	
						5		
	2D*	6.0	11-9	Gray fine sand, some silt, trace clay pockets (Fill) (SM)	S1			*Used 3" O. D. split spoon. WC=74
		8.0	7-6			8		
	3D	8.0	1-1		O1			
		10.0	1-2			10		
	4D	10.0	6-12	Gray fine sand, trace silt (SP-SM)	S1			
		12.0	13-14					
						12.5		
	5D	15.0	2-3	Gray organic clayey silt, some fine sand layers, trace silty clay layers (OL)	O1			WC=38
		17.0	1-1					
						20		
	6D	20.0	WR-WH	Gray organic clayey silt, some fine sand layers, trace silty clay layers, vegetation (OL)				WC=48
		22.0	WH-2					
						23.5		
14:30 08-26-15 Wednesday Sunny 80°F	7D	25.0	3-7	Light brown fine to medium sand, trace silt, trace coarse sand (SP-SM)		25		
		27.0	14-19					
						30		
	8D	30.0	8-12	Light brown fine sand, trace silt, coarse to fine sand layer (SP-SM)				
		32.0	15-18					
						35		
	9D	35.0	3-5	Light brown fine to medium sand, trace silt (SP-SM)	S1			
		37.0	6-9					
						40		
	10D	40.0	7-11	Light brown fine to coarse sand, trace silt (SP-SM)				
		42.0	15-15					
						45		
	11D	45.0	5-6	Gray fine to medium sand, trace silt (SP-SM)				
		47.0	15-16					
						48.5		
	12D	50.0	6-6	Light brown fine to medium sand, trace silt (SP-SM)	S2	50		
		52.0	5-7					



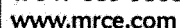
BORING LOG

BORING NO.	EQ-2P
SHEET 2 OF	4
FILE NO.	12481B
SURFACE ELEV.	5.1
RES. ENGR.	SEONG HWANG

[illegible]

**APPROVED
WITH CONDITIONS**
control #: 43233 Page 45 of 203
Date: 12/21/2015

BORING NO. EQ-2P

PIEZOMETER NO. EQ-2P

MUESER RUTLEDGE CONSULTING ENGINEERS

	BORING NO. <u>EQ-2P</u>
PROJECT <u>NYC BUILD IT BACK</u>	SHEET <u>4</u> OF <u>4</u>
LOCATION <u>QUEENS, NEW YORK</u>	FILE NO. <u>12481B</u>
BORING LOCATION <u>SEE BORING LOCATION PLAN</u>	SURFACE ELEV. <u>5.1</u>
	DATUM <u>NAVD 88</u>

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	☒ YES	☐ NO	
TRUCK <u>X</u>	DURING CORING	DIA., IN. <u>4</u>			DEPTH, FT. FROM <u>0</u> TO <u>14</u>
SKID	MECHANICAL	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>
BARGE	HYDRAULIC	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>
OTHER	OTHER	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>

TYPE AND SIZE OF:	DRILLING MUD USED	☒ YES	☐ NO	
D-SAMPLER <u>2" O. D. SPLIT SPOON</u>	DIAMETER OF ROTARY BIT, IN.			<u>3-7/8</u>
U-SAMPLER	TYPE OF DRILLING MUD			<u>QUICK GEL</u>
S-SAMPLER				
CORE BARREL	AUGER USED	☒ YES	☐ NO	
CORE BIT	TYPE AND DIAMETER, IN.			<u>HAND AUGER</u>
DRILL RODS <u>NWJ</u>				

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
					NO WATER LEVEL OBSERVATIONS MADE

PIEZOMETER INSTALLED	☒ YES	☐ NO	SKETCH SHOWN ON	SEE SHEET NO. 3
----------------------	---	-----------------------------	-----------------	-----------------

STANDPIPE:	TYPE	PVC	ID, IN.	2	LENGTH, FT.	3	TOP ELEV.
INTAKE ELEMENT:	TYPE	SLOTTED PVC	OD, IN.	2	LENGTH, FT.	5	TIP ELEV.
FILTER:	MATERIAL	SAND	OD, IN.	4	LENGTH, FT.	6	BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	56	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.		OTHER: HAND AUGER	6'

BORING CONTRACTOR	GLEN STRINGHAM	HELPERS	ANTHONY KAPPAL
DRILLER			
REMARKS	PVC STANDPIPE PIEZOMETER INSTALLED WITH FLUSH MOUNT COVER.		
RESIDENT ENGINEER	SEONG HWANG	DATE	08-26-15
CLASSIFICATION CHECK:	CHERYL J. MOSS	TYPING CHECK:	GUILLERMO DIAZ-FANAS



MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-3
SHEET 1 OF 3
FILE NO. 12481B
SURFACE ELEV. 6.6
RES. ENGR. HAMED KESHMIRI

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
	NO.	DEPTH	BLOWS/6"					
08:00 08-31-15 Monday Partly Cloudy 80°F				Light brown to yellow fine to coarse sand, trace fine gravel, silt (Fill) (SP-SM)	PF	0.6	DRILLED AHEAD 4"	**Concrete from 0' to 0.6'. Borehole hand cleared to 5.5'. 1HA: 2 Jars obtained for corrosion testing. 2D: 2 Jars obtained for corrosion testing. 3D Top: 5 Jars obtained for corrosion testing. 3D Bot: WC=144, pp=0.25 4D Top: WC=84, pp<0.25 4D Bot: 2 Jars obtained for corrosion testing. 5D Top: WC=52, pp<0.25 5D Bot: 3 Jars obtained for corrosion testing. 6D Top: 3 Jars obtained for corrosion testing. 6D Bot: WC=50, pp=0.25 2 Jars obtained for corrosion testing.
	1HA	1.0	HAND AUGER					
		5.5				5		
	2D	5.5	3-4	Gray fine to medium sand, trace silt, coarse sand, gravel (Fill) (SP-SM)	S1	5.5		
		7.5	3-2					
	3D	7.5	WH-2	Top 6": Gray f-m sa, tr c sa, si, org cl, veg (Fill) (SP-SM)	O1	8		
		9.5	4-9	Bot 18": Soft gray org si cl & pt, tr f sa lys (OH&Pt)				
	4D	9.5	3-6	Top 6": Soft gray organic silty clay, trace fine sand, vegetation (OH)	S1	10		
		11.5	4-2	Bot 7": Gray fine sand, trace silt (SP-SM)				
					O1	13		
	5D	14.5	WH/12"	Top 8": Soft gray organic silty clay, trace fine sand (OH)	S1	15		
		16.5	3-2	Bot 6": Gray fine sand, some silt (SM)				
					O1			
	6D	19.5	6-4	Top 7": Gray fine to medium sand, trace silt (SP-SM)	O1	20		
		21.5	2-2	Bot 8": Soft gray organic silty clay, trace fine sand, vegetation (OH)		20.1		
					S1	22.3		
	7D	24.5	7-13	Light gray fine to medium sand, trace silt (SP-SM)	S1	25		
		26.5	15-17					
					S1			
	8D	29.5	10-14	Do 7D (SP-SM)	S1	30		
		31.5	15-15					
					S1			
	9D	34.5	9-10	Light gray to gray fine to medium sand, trace silt (SP-SM)	S1	35		
		36.5	11-18					
					S1			
	10D	39.5	9-20	Do 9D (SP-SM)	S1	40		
		41.5	25-29					
					S1			
	11D	44.5	11-15	Light gray fine to medium sand, trace silt, mica (SP-SM)	S1	45		
		46.5	20-26					
					S1			
	12D	49.5	10-8	Do 11D (SP-SM)	S1	50		
		51.5	6-9					

REVIEWED BY
Lisa G. Amoia, RA

APPROVED
WITH CONDITIONS

control #: 43233 Page 48 of 203
Date: 12/21/2015

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-3
SHEET 2 OF 3
FILE NO. 12481B
SURFACE ELEV. 6.6
RES. ENGR. HAMED KESHMIRI

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	CASING		REMARKS
	NO.	DEPTH	BLOWS/6"			DEPTH	BLOWS	
Cont'd								
08-31-15								
Monday								
Partly Cloudy								
80°F	13D	54.5	8-9	Do 11D (SP-SM)	S1	55		
13:30		56.5	9-14			56.5		End of Boring at 56.5'.
						60		WC=Water Content in percent of dry weight.
								pp=Pocket Penetrometer
						65		Unconfined Compres- sive Strength in tsf.
						70		
						75		
						80		
						85		
						90		
						95		
						100		



MUESER RUTLEDGE CONSULTING ENGINEERS

	BORING NO. <u>EQ-3</u>
PROJECT <u>NYC BUILD IT BACK</u>	SHEET <u>3</u> OF <u>3</u>
LOCATION <u>QUEENS, NEW YORK</u>	FILE NO. <u>12481B</u>
BORING LOCATION <u>SEE BORING LOCATION PLAN</u>	SURFACE ELEV. <u>6.6</u>
	DATUM <u>NAVD 88</u>

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	☒ YES	☐ NO	
TRUCK	DURING CORING	DIA., IN. <u>4</u>			DEPTH, FT. FROM <u>0</u> TO <u>15</u>
SKID	MECHANICAL	DIA., IN. _____			DEPTH, FT. FROM _____ TO _____
BARGE	HYDRAULIC	DIA., IN. _____			DEPTH, FT. FROM _____ TO _____
OTHER	OTHER	DIA., IN. _____			DEPTH, FT. FROM _____ TO _____
	TRACK				

TYPE AND SIZE OF:	DRILLING MUD USED	☒ YES	☐ NO	
D-SAMPLER <u>2" O. D. SPLIT SPOON</u>	DIAMETER OF ROTARY BIT, IN. <u>3-7/8</u>			
U-SAMPLER _____	TYPE OF DRILLING MUD <u>QUIK GEL</u>			
S-SAMPLER _____				
CORE BARREL _____	AUGER USED	☒ YES	☐ NO	
CORE BIT _____	TYPE AND DIAMETER, IN. <u>4" HAND AUGER</u>			
DRILL RODS <u>NWJ</u>				

*CASING HAMMER, LBS. <u>140</u>	AVERAGE FALL, IN. <u>30</u>
*SAMPLER HAMMER, LBS. <u>140</u>	AVERAGE FALL, IN. <u>30</u>
*USED AUTOMATIC HAMMER.	

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO WATER LEVEL OBSERVATIONS MADE.

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. <u>51</u>	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. _____	OTHER: HAND AUGER <u>5.5'</u>	

BORING CONTRACTOR	REVIEWED BY <u>Lisa G. Amico, RA</u>	QUALITY DRILLING & TESTING CO., INC.
DRILLER <u>MICHAEL BEVERIDGE</u>	HELPERS <u>JOHN ZUMMO</u>	
REMARKS <u>BOREHOLE BACKFILLED WITH CUTTINGS & SURFACE PATCHED WITH CONCRETE UPON COMPLETION.</u>		
RESIDENT ENGINEER <u>HAMED KESHMIRI</u>	DATE <u>08-31-15</u>	
CLASSIFICATION CHECK: <u>CHERYL J. MOSS</u>	TYPING CHECK: <u>GUILLERMO DIAZ-FANAS</u>	

**APPROVED
WITH CONDITIONS**
control #: 43233 Page 50 of 203
Date: 12/21/2015

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-4P
SHEET 1 OF 4
FILE NO. 12481B
SURFACE ELEV. 4.8
RES. ENGR. SEONG HWANG

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
	NO.	DEPTH	BLOWS/6"					
10:00 09-04-15 Friday Sunny 80°F	1HA	0.5	HAND	Top 8": Soft gray organic silty clay, tr veg (OH) Bot 6": Brn peat, some organic silty clay (Pt&OH) Top 18": Brn peat, sm org si clay, tr f sa (Pt&OH) Bot 4": Gray f sand, sm silt, tr vegetation (SM) Gray fine sand, trace silt (SP-SM)	F		DRILLED	Asphalt at surface.
		6.0	AUGER				AHEAD	Borehole hand cleared to 6'.
							4"	Augered soil sample not obtained.
						5		
						6		
	2D	6.0	1-1/12"	Top 8": Soft gray organic silty clay (OH) Bot 6": Brn peat, some organic silty clay (Pt&OH) Top 18": Brn peat, sm org si clay, tr f sa (Pt&OH) Bot 4": Gray f sand, sm silt, tr vegetation (SM) Gray fine sand, trace silt (SP-SM)	O1			2D Top: WC=74
		8.0	2					2D Bot: WC=205
	3D	8.0	2-2					
		10.0	4-10			9.5		3D Bot: WC=89
	4D	10.0	4-6					
		12.0	4-5	Gray fine sand, trace silt (SP-SM)	S1			Borehole hand cleared to 6'.
						15		
	5D	15.0	5-6					
		17.0	6-8					
						18.5		
				Top 8": Soft gray organic silty clay (OH) Bot 16": Gray clayey fine sand (SC)	O1	20		6D Top: WC=54
	6D	20.0	WH/18"					6D Bot: WC=35
		22.0	3					
						23.5		
						25		
	7D	25.0	4-3	Gray fine to medium sand, trace silt (SP-SM)	S1			
		27.0	4-5					
						30		
	8D	30.0	10-12					
		32.0	16-14					
				Gray fine sand, trace silt, coarse sand, gravel (SP-SM)	S1			
						35		
	9D	35.0	8-11					
		37.0	9-12					
						38.5		
				Light brown fine to medium sand, some silt, trace mica seams (SM)	S2	40		
	10D	40.0	3-3					
		42.0	4-7					
						45		
	11D	45.0	4-6	Light brown fine sand, trace silt (SP-SM)	S2			
		47.0	6-9					
						50		
	12D	50.0	6-6	Light brown fine sand, trace silt, gravel (SP-SM)	S2			
		52.0	5-6					



BORING LOG

BORING NO.	EQ-4P
SHEET 2 OF	4
FILE NO.	12481B
SURFACE ELEV.	4.8
RES. ENGR.	SEONG HWANG

[illegible]

**APPROVED
WITH CONDITIONS**
control #: 43233 Page 52 of 203
Date: 12/21/2015

BORING NO. EQ-4P



PIEZOMETER NO. EQ-4P

MUESER RUTLEDGE CONSULTING ENGINEERS

	BORING NO. <u>EQ-4P</u>
	SHEET <u>4</u> OF <u>4</u>
PROJECT <u>NYC BUILD IT BACK</u>	FILE NO. <u>12481B</u>
LOCATION <u>QUEENS, NEW YORK</u>	SURFACE ELEV. <u>4.8</u>
BORING LOCATION <u>SEE BORING LOCATION PLAN</u>	DATUM <u>NAVD 88</u>

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	☒ YES	☐ NO	
TRUCK <u>X</u>	DURING CORING	DIA., IN. <u>4</u>			DEPTH, FT. FROM <u>0</u> TO <u>19</u>
SKID	MECHANICAL	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>
BARGE	HYDRAULIC	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>
OTHER	OTHER	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>

TYPE AND SIZE OF:	DRILLING MUD USED	☒ YES	☐ NO	
D-SAMPLER <u>2" O. D. SPLIT SPOON</u>	DIAMETER OF ROTARY BIT, IN.			<u>3-7/8</u>
U-SAMPLER	TYPE OF DRILLING MUD			<u>EZ GEL</u>
S-SAMPLER				
CORE BARREL	AUGER USED	☒ YES	☐ NO	
CORE BIT	TYPE AND DIAMETER, IN.			<u>HAND AUGER</u>
DRILL RODS <u>NWJ</u>				

*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
					NO WATER LEVEL OBSERVATIONS MADE

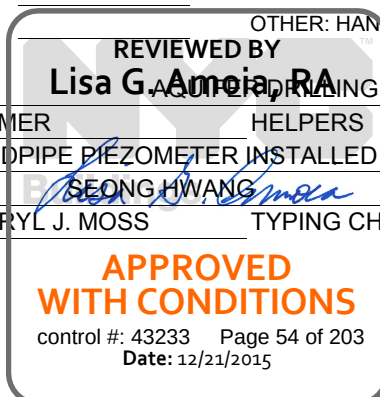
PIEZOMETER INSTALLED ☒ YES ☐ NO SKETCH SHOWN ON SEE SHEET NO. 3

STANDPIPE:	TYPE	PVC	ID, IN.	2	LENGTH, FT.	12	TOP ELEV.
INTAKE ELEMENT:	TYPE	SLOTTED PVC	OD, IN.	2	LENGTH, FT.	5	TIP ELEV.
FILTER:	MATERIAL	SAND	OD, IN.	4	LENGTH, FT.	11	BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	71	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.		OTHER: HAND AUGER	<u>6'</u>

BORING CONTRACTOR	DRILLER	JOSH SOMMER	HELPERS	NICK BRINSON
REMARKS	PVC STANDPIPE PIEZOMETER INSTALLED WITH FLUSH MOUNT COVER.			
RESIDENT ENGINEER	SEONG HWANG		DATE	09-04-15
CLASSIFICATION CHECK:	CHERYL J. MOSS	TYPING CHECK:	GUILLERMO DIAZ-FANAS	



MUESER RUTLEDGE CONSULTING ENGINEERS

	BORING NO. <u>EQ-4P</u>
PROJECT <u>NYC BUILD IT BACK</u>	SHEET <u>4</u> OF <u>4</u>
LOCATION <u>QUEENS, NEW YORK</u>	FILE NO. <u>12481B</u>
BORING LOCATION <u>SEE BORING LOCATION PLAN</u>	SURFACE ELEV. <u>4.8</u>
	DATUM <u>NAVD 88</u>

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	☒ YES	☐ NO	
TRUCK <u>X</u>	DURING CORING	DIA., IN. <u>4</u>			DEPTH, FT. FROM <u>0</u> TO <u>19</u>
SKID	MECHANICAL	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>
BARGE	HYDRAULIC	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>
OTHER	OTHER	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>

TYPE AND SIZE OF:	DRILLING MUD USED	☒ YES	☐ NO	
D-SAMPLER <u>2" O. D. SPLIT SPOON</u>	DIAMETER OF ROTARY BIT, IN.			<u>3-7/8</u>
U-SAMPLER	TYPE OF DRILLING MUD			<u>EZ GEL</u>
S-SAMPLER				
CORE BARREL	AUGER USED	☒ YES	☐ NO	
CORE BIT	TYPE AND DIAMETER, IN.			<u>HAND AUGER</u>
DRILL RODS <u>NWJ</u>				

*CASING HAMMER, LBS.	<u>140</u>	AVERAGE FALL, IN.	<u>30</u>
*SAMPLER HAMMER, LBS.	<u>140</u>	AVERAGE FALL, IN.	<u>30</u>
*USED AUTOMATIC HAMMER.			

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO WATER LEVEL OBSERVATIONS MADE

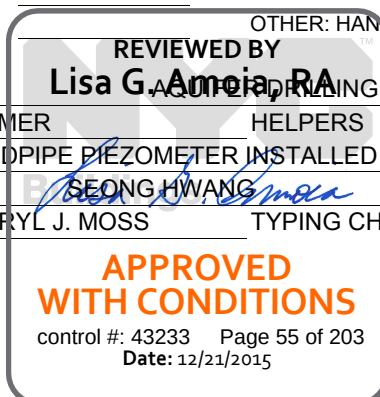
PIEZOMETER INSTALLED ☒ YES ☐ NO SKETCH SHOWN ON SEE SHEET NO. 3

STANDPIPE:	TYPE	PVC	ID, IN.	2	LENGTH, FT.	12	TOP ELEV.	
INTAKE ELEMENT:	TYPE	SLOTTED PVC	OD, IN.	2	LENGTH, FT.	5	TIP ELEV.	
FILTER:	MATERIAL	SAND	OD, IN.	4	LENGTH, FT.	11	BOT. ELEV.	

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	71	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.		OTHER: HAND AUGER	<u>6'</u>

BORING CONTRACTOR	DRILLER	JOSH SOMMER	HELPERS	NICK BRINSON
REMARKS	PVC STANDPIPE PIEZOMETER INSTALLED WITH FLUSH MOUNT COVER.			
RESIDENT ENGINEER	SEONG HWANG		DATE	09-04-15
CLASSIFICATION CHECK:	CHERYL J. MOSS	TYPING CHECK:	GUILLERMO DIAZ-FANAS	



MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-5
SHEET 1 OF 3
FILE NO. 12481B
SURFACE ELEV. 4.7
RES. ENGR. TERESA SANDIFORD

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING	REMARKS	
NO.	DEPTH	BLOWS/6"	BLOWS						
08:00 09-01-15 Tuesday Sunny 90°F	1HA	0.5	HAND	Brown fine to medium sand, trace coarse sand, silt, fine gravel, vegetation, roots (SP-SM)	F		DRILLED	Borehole hand cleared to 6'.	
		6.0	AUGER				AHEAD		
							4"		
	2D	6.0	WR-1	Top 5": Dark gray f-c sand, some silt, gravel (SM)	O1			2D Bot: WC=122	
		8.0	1-3	Bot 12": Soft dark gray organic si clay, tr veg (OH)					
	3D	8.0	5-4	Top 2": Dk gray gravelly f-c sand, some silt (SM)					
		10.0	4-5	Bot 12": M dk gray org si clay, sm f-m sa, tr shells (OH)					
				Gray fine to medium sand, trace silt (SP-SM)					3D Bot: WC=51
	4D	10.0	5-4						
		12.0	2-2						



MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-5
SHEET 2 OF 3
FILE NO. 12481B
SURFACE ELEV. 4.7
RES. ENGR. TERESA SANDIFORD

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	CASING		REMARKS
	NO.	DEPTH	BLOWS/6"			DEPTH	BLOWS	
Cont'd								
09-01-15								
Tuesday								
Sunny								
90°F								
	13D	55.0	15-16	Do 12D (SP-SM)	S2	55		
09:45		57.0	13-19			57		End of Boring at 57'.
								WC=Water Content in percent of dry weight.
						60		
						65		
						70		
						75		
						80		
						85		
						90		
						95		
						100		



MUESER RUTLEDGE CONSULTING ENGINEERS

	BORING NO. <u>EQ-5</u>
PROJECT <u>NYC BUILD IT BACK</u>	SHEET <u>3</u> OF <u>3</u>
LOCATION <u>QUEENS, NEW YORK</u>	FILE NO. <u>12481B</u>
BORING LOCATION <u>SEE BORING LOCATION PLAN</u>	SURFACE ELEV. <u>4.7</u>
	DATUM <u>NAVD 88</u>

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	☒ YES	☐ NO	
TRUCK	DURING CORING	DIA., IN. <u>4</u>			DEPTH, FT. FROM <u>0</u> TO <u>20</u>
SKID	MECHANICAL	DIA., IN. <u> </u>			DEPTH, FT. FROM <u> </u> TO <u> </u>
BARGE	HYDRAULIC ☒	DIA., IN. <u> </u>			DEPTH, FT. FROM <u> </u> TO <u> </u>
OTHER	OTHER	DIA., IN. <u> </u>			DEPTH, FT. FROM <u> </u> TO <u> </u>
	TRACK				

TYPE AND SIZE OF:	DRILLING MUD USED	☒ YES	☐ NO	
D-SAMPLER <u>2" O. D. SPLIT SPOON</u>	DIAMETER OF ROTARY BIT, IN. <u>3-7/8</u>			
U-SAMPLER <u> </u>	TYPE OF DRILLING MUD <u>QUIK GEL</u>			
S-SAMPLER <u> </u>				
CORE BARREL <u> </u>	AUGER USED	☒ YES	☐ NO	
CORE BIT <u> </u>	TYPE AND DIAMETER, IN. <u>HAND AUGER</u>			
DRILL RODS <u>NWJ</u>				

CASING HAMMER, LBS. <u>140</u>	AVERAGE FALL, IN. <u>30</u>
SAMPLER HAMMER, LBS. <u>140</u>	AVERAGE FALL, IN. <u>30</u>

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO WATER LEVEL OBSERVATIONS MADE.

PIEZOMETER INSTALLED ☐ YES ☒ NO SKETCH SHOWN ON

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

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT. <u>51</u>	NO. OF 3" SHELBY TUBE SAMPLES <u> </u>	
3.5" DIA. U-SAMPLE BORING	LIN. FT. <u> </u>	NO. OF 3" UNDISTURBED SAMPLES <u> </u>	
CORE DRILLING IN ROCK	LIN. FT. <u> </u>	OTHER: HAND AUGER <u>6'</u>	

BORING CONTRACTOR <u>MIKE BEVERIDGE</u>	DRILLER <u>MIKE BEVERIDGE</u>	HELPERS <u>JOHN ZUMMO</u>	
REMARKS <u>BOREHOLE BACKFILLED WITH CUTTINGS AND SURFACE PATCHED UPON COMPLETION.</u>			
RESIDENT ENGINEER <u>TERESA SANDIFORD</u>	DATE <u>09-01-15</u>		
CLASSIFICATION CHECK: <u>CHERYL J. MOSS</u>	TYPING CHECK: <u>GUILLERMO DIAZ-FANAS</u>		



MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-6
SHEET 1 OF 3
FILE NO. 12481B
SURFACE ELEV. 5.5
RES. ENGR. TERESA SANDIFORD

DAILY	SAMPLE			SAMPLE DESCRIPTION	STRATA	CASING	REMARKS		
PROGRESS	NO.	DEPTH	BLOWS/6"			DEPTH		BLOWS	
09:00 09-21-15 Wednesday Sunny 90°F	1HA	0.5	HAND AUGER	Tan fine to medium sand, trace coarse sand, fine gravel, silt (SP-SM)	F		DRILLED	Borehole hand cleared to 6'.	
		6.0					AHEAD		
							4"		
	2D	6.0	3-3	Top 7": Do 1HA, trace asphalt fragments (SP-SM)	S1	6.5		3D Bot: WC=141 4D Top: WC=49	
		8.0	3-5	Bot 12": Gray fine to medium sand (SP-SM)					
	3D	8.0	3-5	Top 15": Do 2D Bottom (SP-SM)					
		10.0	9-10	Bot 9": Gray org si clay, some veg, tr f sand (OH)		9.2			
	4D	10.0	WR-WH	Top 11": Gray fine to medium sand, some organic clay (SC)					
		12.0	1-8	Bot 7": Soft gray organic silty clay, trace fine sand, vegetation (OH)					
	5D	15.0	1/12"	Soft gray organic silty clay, trace fine sand (OH)	O1	15	↓	WC=49	
		17.0	1/12"						
	6D	20.0	WR	Do 5D (OH)		20		WC=69	
		22.0	WH/18"						
	7D	25.0	WH-WH	Top 17": Do 5D (OH)		25		7D Top: WC=88	
	27.0	WH-2	Bot 7": Gray fine sand, some organic silt (SM)	26.5					
8D	30.0	6-10	Gray brown fine to medium sand, trace silt (SP-SM)		30				
	32.0	15-19							
9D	35.0	9-16	Do 8D (SP-SM)	S1	35				
	37.0	21-24							
10D	40.0	8-12	Do 8D (SP-SM)		40				
	42.0	17-15							
11D	45.0	11-18	Do 8D (SP-SM)	S2	43.5				
	47.0	18-18			45				
12D	50.0	12-21	Gray fine sand, trace silt, mica (SP-SM)		50				
	52.0	22-17							

REVIEWED BY

Lisa G. Amoia, RA



APPROVED



MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-6
SHEET 2 OF 3
FILE NO. 12481B
SURFACE ELEV. 5.5
RES. ENGR. TERESA SANDIFORD

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	CASING	REMARKS
NO.	DEPTH	BLOWS/6"	DEPTH			BLOWS	
Cont'd 09-21-15 Wednesday Sunny 90°F			10-13 12-13	Do 12D (SP-SM)	S2		End of Boring at 62'. WC=Water Content in percent of dry weight.
	13D	55.0					
		57.0					
		14-18 21-22	Do 12D (SP-SM)				
14D	60.0						
	62.0						
		</					



MUESER RUTLEDGE CONSULTING ENGINEERS

	BORING NO. <u>EQ-6</u>
PROJECT <u>NYC BUILD IT BACK</u>	SHEET <u>3</u> OF <u>3</u>
LOCATION <u>QUEENS, NEW YORK</u>	FILE NO. <u>12481B</u>
BORING LOCATION <u>SEE BORING LOCATION PLAN</u>	SURFACE ELEV. <u>5.5</u>
	DATUM <u>NAVD 88</u>

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	☒ YES	☐ NO	
TRUCK	DURING CORING	DIA., IN. <u>4</u>			DEPTH, FT. FROM <u>0</u> TO <u>15</u>
SKID	MECHANICAL	DIA., IN. <u>X</u>			DEPTH, FT. FROM <u> </u> TO <u> </u>
BARGE	HYDRAULIC	DIA., IN. <u> </u>			DEPTH, FT. FROM <u> </u> TO <u> </u>
OTHER	OTHER	DIA., IN. <u> </u>			DEPTH, FT. FROM <u> </u> TO <u> </u>
	TRACK				

TYPE AND SIZE OF:	DRILLING MUD USED
D-SAMPLER <u>2" O. D. SPLIT SPOON</u>	DIAMETER OF ROTARY BIT, IN. <u>3 7/8"</u>
U-SAMPLER <u> </u>	TYPE OF DRILLING MUD <u>QUIK GEL</u>
S-SAMPLER <u> </u>	
CORE BARREL <u> </u>	AUGER USED
CORE BIT <u> </u>	TYPE AND DIAMETER, IN. <u>HAND AUGER</u>
DRILL RODS <u>NWJ</u>	

*CASING HAMMER, LBS. <u>140</u>	AVERAGE FALL, IN. <u>30</u>
*SAMPLER HAMMER, LBS. <u>140</u>	AVERAGE FALL, IN. <u>30</u>
*USED AUTOMATIC HAMMER.	

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO WATER LEVEL OBSERVATIONS MADE.

PIEZOMETER INSTALLED ☐ YES ☒ NO SKETCH SHOWN ON

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

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT. <u>56</u>	NO. OF 3" SHELBY TUBE SAMPLES <u> </u>	
3.5" DIA. U-SAMPLE BORING	LIN. FT. <u> </u>	NO. OF 3" UNDISTURBED SAMPLES <u> </u>	
CORE DRILLING IN ROCK	LIN. FT. <u> </u>	OTHER: HAND AUGER	<u>6'</u>

BORING CONTRACTOR	REVIEWED BY <u>Lisa G. Amadio, RA</u>	QUALITY DRILLING & TESTING CO., INC.
DRILLER <u>MIKE BEVERIDGE</u>	HELPERS <u>JOHN ZUMMO</u>	
REMARKS <u>BOREHOLE BACKFILLED WITH CUTTINGS AND SURFACE PATCHED UPON COMPLETION.</u>		
RESIDENT ENGINEER <u>TERESA SANDIFORD</u>	DATE <u>09-02-15</u>	
CLASSIFICATION CHECK: <u>CHERYL J. MOSS</u>	TYPING CHECK: <u>GUILLERMO DIAZ-FANAS</u>	



MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-7
SHEET 1 OF 3
FILE NO. 12481B
SURFACE ELEV. 4.7
RES. ENGR. SEONG HWANG

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING	REMARKS	
NO.	DEPTH	BLOWS/6"	BLOWS						
11:30 08-31-15 Monday Partly Cloudy 90°F	1HA	0.5	HAND AUGER	Light brown fine to coarse sand, trace gravel, silt (Fill) (SP-SM)	F		DRILLED	Asphalt at surface. Borehole hand cleared to 6'.	
		6.0					AHEAD		
							4"		
	2NR	6.0	3-3	No recovery	O1			*Used 3" O. D. diameter spilt spoon. 3D: WC=47	
		8.0	1-1						
	3D*	8.0	1-1	Soft gray organic silty clay, trace shells, fine sand (OH)					
		10.0	1-1						
	4D	10.0	5-10	Gray fine to medium sand, trace silt (SP-SM)					
		12.0	15-16						
						</			



MUESER RUTLEDGE CONSULTING ENGINEERS

		BORING NO.	EQ-7
		SHEET	3 OF 3
PROJECT	NYC BUILD IT BACK	FILE NO.	12481B
LOCATION	QUEENS, NEW YORK	SURFACE ELEV.	4.7
BORING LOCATION	SEE BORING LOCATION PLAN	DATUM	NAVD 88

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

[illegible]

TYPE AND SIZE OF:		DRILLING MUD USED		☒ YES	☐ NO
D-SAMPLER	2" O. D. SPLIT SPOON	DIAMETER OF ROTARY BIT, IN.		3-7/8	
U-SAMPLER		TYPE OF DRILLING MUD		QUIK GEL	
S-SAMPLER		AUGER USED		☒ YES	☐ NO
CORE BARREL		TYPE AND DIAMETER, IN.		HAND AUGER	
CORE BIT		CASING HAMMER, LBS.		140	AVERAGE FALL, IN. 30
DRILL RODS	NWJ	*SAMPLER HAMMER, LBS.		140	AVERAGE FALL, IN. 30
		*USED AUTOMATIC HAMMER.			

WATER LEVEL OBSERVATIONS IN BOREHOLE

[illegible]

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.	56	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.		OTHER: HAND AUGER	6'

BORING CONTRACTOR		Lisa G. Amorja, RA		ACQUERED DRILLING & TESTING CO., INC.	
DRILLER	GLEN STRINGHAM	HELPERS	ANTHONY KAPPAL		
REMARKS	BOREHOLE BACKFILLED WITH CUTTINGS AND SURFACE PATCHED UPON COMPLETION.				
RESIDENT ENGINEER	SEONG HWANG	DATE	08-31-15		
CLASSIFICATION CHECK:	CHERYL J. MOSS	TYPING CHECK:	GUILLERMO DIAZ-FANAS		

MRCE Form BS-1

REVIEWED BY
Lisa G. Amey, RA
ACQUITTAL
AM HELPERS
ED WITH CUTTINGS AND S
SEONG HWANG
L J. MOSS TYPING C
**APPROVED
WITH CONDITIONS**
control #: 43233 Page 64 of 203
Date: 8/21/2015

BORING NO. EQ-7

BORING LOG

BORING NO.	EQ-8P
SHEET 1 OF	4
FILE NO.	12481B
SURFACE ELEV.	5.3
RES. ENGR.	SEONG HWANG

[illegible]



PIEZOMETER NO. EQ - 817

MUESER RUTLEDGE CONSULTING ENGINEERS

	BORING NO. <u>EQ-8P</u>
PROJECT <u>NYC BUILD IT BACK</u>	SHEET <u>4</u> OF <u>4</u>
LOCATION <u>QUEENS, NEW YORK</u>	FILE NO. <u>12481B</u>
BORING LOCATION <u>SEE BORING LOCATION PLAN</u>	SURFACE ELEV. <u>5.3</u>
	DATUM <u>NAVD 88</u>

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	☒ YES	☐ NO	
TRUCK <u>X</u>	DURING CORING	DIA., IN. <u>4</u>			DEPTH, FT. FROM <u>0</u> TO <u>19</u>
SKID	MECHANICAL	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>
BARGE	HYDRAULIC	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>
OTHER	OTHER	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>

TYPE AND SIZE OF:	DRILLING MUD USED	☒ YES	☐ NO	
D-SAMPLER <u>2" O. D. SPLIT SPOON</u>	DIAMETER OF ROTARY BIT, IN.			<u>3-7/8</u>
U-SAMPLER	TYPE OF DRILLING MUD			<u>QUIK GEL</u>
S-SAMPLER				
CORE BARREL	AUGER USED	☒ YES	☐ NO	
CORE BIT	TYPE AND DIAMETER, IN.			<u>HAND AUGER</u>
DRILL RODS <u>NWJ</u>				

CASING HAMMER, LBS.	<u>140</u>	AVERAGE FALL, IN.	<u>30</u>
*SAMPLER HAMMER, LBS.	<u>140</u>	AVERAGE FALL, IN.	<u>30</u>

*USED AUTOMATIC HAMMER.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO WATER LEVEL OBSERVATIONS MADE

PIEZOMETER INSTALLED	☒ YES	☐ NO	SKETCH SHOWN ON	SEE SHEET NO. 3
----------------------	---	-----------------------------	-----------------	-----------------

STANDPIPE:	TYPE	PVC	ID, IN.	2	LENGTH, FT.	8	TOP ELEV.
INTAKE ELEMENT:	TYPE	SLOTTED PVC	OD, IN.	2	LENGTH, FT.	10	TIP ELEV.
FILTER:	MATERIAL	SAND	OD, IN.	4	LENGTH, FT.	11	BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	<u>61</u>	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.		OTHER: HAND AUGER	<u>6'</u>

BORING CONTRACTOR	DRILLER	GLEN STRINGHAM	HELPERS	ANTHONY KAPPAL
REMARKS	PVC STANDPIPE PIEZOMETER INSTALLED WITH FLUSH MOUNT COVER.			
RESIDENT ENGINEER	SEONG HWANG		DATE	08-27-15
CLASSIFICATION CHECK:	CHERYL J. MOSS	TYPING CHECK:	GUILLERMO DIAZ-FANAS	



MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-9
SHEET 1 OF 3
FILE NO. 12481B
SURFACE ELEV. 6.7
RES. ENGR. TERESA SANDIFORD

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS	
	NO.	DEPTH	BLOWS/6"						
10:15 09-03-15 Thursday Sunny 92°F	1HA	0.5	HAND	Brown, tan fine to medium sand, some silt, trace fine gravel (SM)	PF		DRILLED	Borehole hand cleared to 6'.	
		6.0	AUGER				AHEAD		
							4"		
		2D	6.0	6-2	Brown fine to coarse sand, trace to some organic clay (SC) Gray fine to coarse sand, trace to some organic clay (SC) Gray fine to medium sand, trace coarse sand, silt (SP-SM)	S1		REC=6". Dark gray organic clay in tip of spoon.	
			8.0	3-4					
		3D	8.0	2-3					
			10.0	8-11					
		4D	10.0	5-12					
			12.0	10-8					
		5D	15.0	WR	Soft dark gray organic silty clay, trace vegetation (OH)	O1		↓	WC=89
			17.0	WH/18"					

MRCE Form BL-1

BORING NO. EQ-9

REVIEWED BY
Lisa G. Amoia, RA

APPROVED
WITH CONDITIONS

control #: 43233 Page 69 of 203
Date: 12/21/2015

MUESER RUTLEDGE CONSULTING ENGINEERS

	BORING NO. <u>EQ-9</u>
	SHEET <u>3</u> OF <u>3</u>
PROJECT <u>NYC BUILD IT BACK</u>	FILE NO. <u>12481B</u>
LOCATION <u>QUEENS, NEW YORK</u>	SURFACE ELEV. <u>6.7</u>
BORING LOCATION <u>SEE BORING LOCATION PLAN</u>	DATUM <u>NAVD 88</u>

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	☒ YES	☐ NO	
TRUCK	DURING CORING	DIA., IN. <u>4</u>			DEPTH, FT. FROM <u>0</u> TO <u>15</u>
SKID	MECHANICAL	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>
BARGE	HYDRAULIC ☒	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>
OTHER <u>TRACK</u>	OTHER	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>

TYPE AND SIZE OF:	DRILLING MUD USED ☒ YES ☐ NO
D-SAMPLER <u>2" O. D. SPLIT SPOON</u>	DIAMETER OF ROTARY BIT, IN. <u>3-7/8</u>
U-SAMPLER <u> </u>	TYPE OF DRILLING MUD <u>QUIK GEL</u>
S-SAMPLER <u> </u>	
CORE BARREL <u> </u>	AUGER USED ☒ YES ☐ NO
CORE BIT <u> </u>	TYPE AND DIAMETER, IN. <u>HAND AUGER</u>
DRILL RODS <u>NWJ</u>	
	*CASING HAMMER, LBS. <u>140</u> AVERAGE FALL, IN. <u>30</u>
	*SAMPLER HAMMER, LBS. <u>140</u> AVERAGE FALL, IN. <u>30</u>
	*USED AUTOMATIC HAMMER.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO WATER LEVEL OBSERVATIONS MADE.

PIEZOMETER INSTALLED ☐ YES ☒ NO SKETCH SHOWN ON

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

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT. <u>56</u>	NO. OF 3" SHELBY TUBE SAMPLES <u> </u>	
3.5" DIA. U-SAMPLE BORING	LIN. FT. <u> </u>	NO. OF 3" UNDISTURBED SAMPLES <u> </u>	
CORE DRILLING IN ROCK	LIN. FT. <u> </u>	OTHER: HAND AUGER <u>6'</u>	

BORING CONTRACTOR	GLEN STRINGHAM	HELPERS	ANTHONY KAPPAL
DRILLER			
REMARKS	BOREHOLE BACKFILLED WITH CUTTINGS AND SURFACE PATCHED UPON COMPLETION.		
RESIDENT ENGINEER	TERESA SANDIFORD		
CLASSIFICATION CHECK:	CHERYL J. MOSS	TYPING CHECK:	GUILLERMO DIAZ-FANAS



MUESER RUTLEDGE CONSULTING ENGINEERS

	BORING NO. <u>EQ-9</u>
PROJECT <u>NYC BUILD IT BACK</u>	SHEET <u>3</u> OF <u>3</u>
LOCATION <u>QUEENS, NEW YORK</u>	FILE NO. <u>12481B</u>
BORING LOCATION <u>SEE BORING LOCATION PLAN</u>	SURFACE ELEV. _____
	DATUM <u>NAVD 88</u>

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	☒ YES	☐ NO	
TRUCK	DURING CORING	DIA., IN. <u>4</u>			DEPTH, FT. FROM <u>0</u> TO <u>15</u>
SKID	MECHANICAL	DIA., IN. _____			DEPTH, FT. FROM _____ TO _____
BARGE	HYDRAULIC ☒	DIA., IN. _____			DEPTH, FT. FROM _____ TO _____
OTHER	OTHER	DIA., IN. _____			DEPTH, FT. FROM _____ TO _____
	TRACK				

TYPE AND SIZE OF:	DRILLING MUD USED
D-SAMPLER <u>2" O. D. SPLIT SPOON</u>	☒ YES ☐ NO
U-SAMPLER _____	DIAMETER OF ROTARY BIT, IN. <u>3-7/8</u>
S-SAMPLER _____	TYPE OF DRILLING MUD <u>QUIK GEL</u>
CORE BARREL _____	
CORE BIT _____	AUGER USED
DRILL RODS <u>NWJ</u>	☒ YES ☐ NO
	TYPE AND DIAMETER, IN. <u>HAND AUGER</u>
	*CASING HAMMER, LBS. <u>140</u> AVERAGE FALL, IN. <u>30</u>
	*SAMPLER HAMMER, LBS. <u>140</u> AVERAGE FALL, IN. <u>30</u>
	*USED AUTOMATIC HAMMER.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO WATER LEVEL OBSERVATIONS MADE.

PIEZOMETER INSTALLED ☐ YES ☒ NO SKETCH SHOWN ON _____

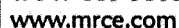
STANDPIPE:	TYPE _____	ID, IN. _____	LENGTH, FT. _____	TOP ELEV. _____
INTAKE ELEMENT:	TYPE _____	OD, IN. _____	LENGTH, FT. _____	TIP ELEV. _____
FILTER:	MATERIAL _____	OD, IN. _____	LENGTH, FT. _____	BOT. ELEV. _____

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT. <u>56</u>	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. _____	OTHER: HAND AUGER	<u>6'</u>

BORING CONTRACTOR	GLEN STRINGHAM	HELPERS
DRILLER	ANTHONY KAPPAL	
REMARKS	BOREHOLE BACKFILLED WITH CUTTINGS AND SURFACE PATCHED UPON COMPLETION.	
RESIDENT ENGINEER	TERESA SANDIFORD	DATE <u>09-03-15</u>
CLASSIFICATION CHECK:	CHERYL J. MOSS	TYPING CHECK: GUILLERMO DIAZ-FANAS





control #: 43233 Page 75 of 203
Date: 12/21/2015

PIEZOMETER NO. EQ-10P

MUESER RUTLEDGE CONSULTING ENGINEERS

	BORING NO. <u>EQ-10P</u>
	SHEET <u>4</u> OF <u>4</u>
PROJECT <u>NYC BUILD IT BACK</u>	FILE NO. <u>12481B</u>
LOCATION <u>QUEENS, NEW YORK</u>	SURFACE ELEV. <u>4.9</u>
BORING LOCATION <u>SEE BORING LOCATION PLAN</u>	DATUM <u>NAVD 88</u>

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	☒ YES	☐ NO	
TRUCK <u>X</u>	DURING CORING	DIA., IN. <u>4</u>			DEPTH, FT. FROM <u>0</u> TO <u>9</u>
SKID	MECHANICAL	DIA., IN.			DEPTH, FT. FROM TO
BARGE	HYDRAULIC	DIA., IN.			DEPTH, FT. FROM TO
OTHER	OTHER	DIA., IN.			DEPTH, FT. FROM TO

TYPE AND SIZE OF:	DRILLING MUD USED	☒ YES	☐ NO	
D-SAMPLER <u>2" O. D. SPLIT SPOON</u>	DIAMETER OF ROTARY BIT, IN.			<u>3-7/8</u>
U-SAMPLER	TYPE OF DRILLING MUD			<u>REVERT</u>
S-SAMPLER				
CORE BARREL	AUGER USED	☒ YES	☐ NO	
CORE BIT	TYPE AND DIAMETER, IN.			<u>HAND AUGER</u>
DRILL RODS <u>NWJ</u>				
	CASING HAMMER, LBS.			AVERAGE FALL, IN. <u>30</u>
	*SAMPLER HAMMER, LBS. <u>140</u>			AVERAGE FALL, IN. <u>30</u>
	*USED AUTOMATIC HAMMER.			

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO WATER LEVEL OBSERVATIONS MADE

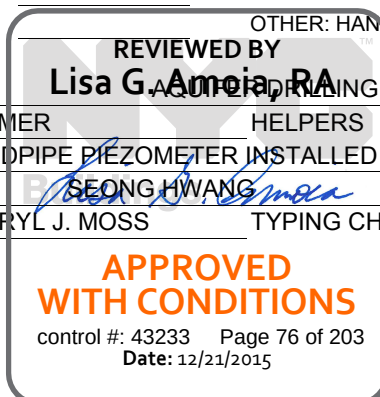
PIEZOMETER INSTALLED	☒ YES	☐ NO	SKETCH SHOWN ON	SEE SHEET NO. 3
----------------------	---	-----------------------------	-----------------	-----------------

STANDPIPE:	TYPE	PVC	ID, IN.	2	LENGTH, FT.	25	TOP ELEV.	
INTAKE ELEMENT:	TYPE	SLOTTED PVC	OD, IN.	2	LENGTH, FT.	5	TIP ELEV.	
FILTER:	MATERIAL	SAND	OD, IN.	4	LENGTH, FT.	7	BOT. ELEV.	

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	61	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.		OTHER: HAND AUGER	<u>6'</u>

BORING CONTRACTOR	DRILLER	JOSH SOMMER	HELPERS	NICK BRINSON
REMARKS	PVC STANDPIPE PIEZOMETER INSTALLED WITH FLUSH MOUNT COVER.			
RESIDENT ENGINEER	SEONG HWANG		DATE	09-03-15
CLASSIFICATION CHECK:	CHERYL J. MOSS	TYPING CHECK:	GUILLERMO DIAZ-FANAS	



MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-11
SHEET 1 OF 3
FILE NO. 12481B
SURFACE ELEV. 5.0
RES. ENGR. SEONG HWANG

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	CASING		REMARKS
	NO.	DEPTH	BLOWS/6"			DEPTH	BLOWS	
10:15 09-02-15 Wednesday Sunny 70°F	1HA	0.5	HAND	Light brown fine to medium sand, trace silt, coarse sand, gravel (Fill) (SP-SM)	F		DRILLED	Asphalt at surface.
		6.0	AUGER				AHEAD	Borehole hand cleared to 6'.
							4"	
						5		
	2D	6.0	4-1					2D Top: WC=107
		8.0	9-8			7.1		
	3D	8.0	1/12"					WC=73
		10.0	1/12"			10		
	4D	10.0	WH/24"					WC=45
		12.0						
				Gray organic clayey fine sand, trace vegetation (SC)	O1			
	5D	15.0	WH/24"			15		Mixed mud.
		17.0						
						20		
	6D	20.0	WR-WH/12"					6D Top: WC=38
		22.0	2					6D Bot: WC=120
						23.5		
						25		
	7D	25.0	4-3	Top 6": Gray silty fine sand (SM) Bot 8": Light brown fine to coarse sand, some gravel, trace silt (SP-SM)	S1			
		27.0	8-9					
						30		
	8D	30.0	7-9					
		32.0	11-13					
						33		
						35		
	9D	35.0	8-13	Light brown fine to medium sand, trace silt (SP-SM)	S2			
		37.0	18-23					
						40		
	10D	40.0	12-21					
		42.0	24-25					
						45		
	11D	45.0	8-7	Light brown fine to coarse sand, trace gravel silt (SP-SM)				
		47.0	12-9					
						50		
	12D	50.0	3-5	Light brown fine to coarse sand, trace gravel silt (SP-SM)				
		52.0	9-9					



MUESER RUTLEDGE CONSULTING ENGINEERS

PROJECT		BORING NO.	EQ-11
LOCATION		SHEET	3 OF 3
		FILE NO.	12481B
BORING LOCATION		SURFACE ELEV.	5
SEE BORING LOCATION PLAN		DATUM	NAVD 88

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

		TYPE OF FEED						
TYPE OF BORING RIG		DURING CORING		CASING USED		☒ YES	☐ NO	
TRUCK	X	MECHANICAL	DIA., IN.	4	DEPTH, FT. FROM	0	TO	24
SKID		HYDRAULIC	DIA., IN.		DEPTH, FT. FROM		TO	
BARGE		OTHER	DIA., IN.		DEPTH, FT. FROM		TO	
OTHER								

TYPE AND SIZE OF:		DRILLING MUD USED	☒ YES	☐ NO
D-SAMPLER	2" O. D. SPLIT SPOON	DIAMETER OF ROTARY BIT, IN.	3-7/8	
U-SAMPLER		TYPE OF DRILLING MUD	QUIK GEL	
S-SAMPLER				
CORE BARREL		AUGER USED	☒ YES	☐ NO
CORE BIT		TYPE AND DIAMETER, IN.	HAND AUGER	
DRILL RODS	NWJ			

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

WATER LEVEL OBSERVATIONS IN BOREHOLE

[illegible]

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.	54	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.		OTHER: HAND AUGER	6'

BORING CONTRACTOR		Lisa G. Amorin, RA		ACQUERRE DRILLING & TESTING CO., INC.	
DRILLER	GLEN STRINGHAM	HELPERS	ANTHONY KAPPAL		
REMARKS	BOREHOLE BACKFILLED WITH CUTTINGS AND SURFACE PATCHED UPON COMPLETION.				
RESIDENT ENGINEER	SEONG HWANG	DATE	09-02-15		
CLASSIFICATION CHECK:	CHERYL J. MOSS	TYPING CHECK:	GUILLERMO DIAZ-FANAS		

MRCE Form BS-1

REVIEWED BY
Lisa G. Amey, RA
ACQUITTAL
AM HELPERS
ED WITH CUTTINGS AND SU
Lisa G. Amey
SEONG HWANG
L J. MOSS TYPING C

**APPROVED
WITH CONDITIONS**

control #: 43233 Page 79 of 203
Date: 8/21/2015

BORING NO. EQ-11

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-12
SHEET 1 OF 3
FILE NO. 12481B
SURFACE ELEV. 4.5
RES. ENGR. SEONG HWANG

DAILY	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING	REMARKS	
PROGRESS	NO.	DEPTH	BLOWS/6"				BLOWS		
07:15				Gray silty clay, some fine sand (Fill) (CL)	F		DRILLED	Asphalt at surface.	
09-09-15							AHEAD	Borehole hand cleared to 6'.	
Wednesday							4"		
Cloudy	1HA	3.0	HAND						
80°F		3.5	AUGER				5		
	2HA	5.5	HAND			Light brown fine to medium sand, trace silt (Fill) (SP-SM)			
		6.0	AUGER				6.5		
	3D	6.0	WH/24"			Top 6": Gray f-m sand, some silt, trace clay (SM)			
		8.0				Bot 12": Soft gray organic silty clay, tr veg (OH)			
	4D	8.0	1-2			Soft gray organic silty clay, trace shells, vegetation (OH)		10	3D Bot: WC=93 WC=66
		10.0	1-2						
	5D	10.0	WH/24"	Do 4D (OH)				WC=62	
		12.0							
	6D	15.0	WH/12"	Do 4D (OH)	O1	15		WC=68	
		17.0	1-1						
							20		
	7D	20.0	WH-1	Top 6": Brown fine to medium sandy peat (Pt)					7D Top: WC=42
		22.0	1-1	Bot 18": Gray organic clayey fine to medium sand, some gravel, trace vegetation (SC)					
	8D	25.0	5-6	Light brown fine to medium sand, trace silt (SP-SM)					
		27.0	6-7						
	9D	30.0	3-3	Gray fine sand, trace silt, gravel (SP-SM)	S1				
		32.0	4-4						
	10D	35.0	7-10	Light brown fine to medium sand, trace silt (SP-SM)					
		37.0	12-12						
						40			
	11D	40.0	8-10	Light brown fine to coarse sand, trace gravel, silt (SP-SM)					
		42.0	11-12						
						43.5			
						45			
	12D	45.0	2-2	Soft gray organic silty clay, some fine sand, trace fine sand seams (OH)	O2			WC=32	
		47.0	1-2						
						48.5			
	13NR	50.0	9-12	No recovery	S2	50			
		52.0	24-43						

REVIEWED BY
Lisa G. Amola, RA



APPROVED



MUESER RUTLEDGE CONSULTING ENGINEERS

		BORING NO.	EQ-12
		SHEET	3 OF 3
PROJECT	NYC BUILD IT BACK	FILE NO.	12481B
LOCATION	QUEENS, NEW YORK	SURFACE ELEV.	4.5
BORING LOCATION	SEE BORING LOCATION PLAN	DATUM	NAVD 88

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

		TYPE OF FEED							
TYPE OF BORING RIG		DURING CORING		CASING USED		☒ YES	☐ NO		
TRUCK	X	MECHANICAL		DIA., IN.	4	DEPTH, FT. FROM	0	TO	9
SKID		HYDRAULIC		DIA., IN.		DEPTH, FT. FROM		TO	
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM		TO	
OTHER									

TYPE AND SIZE OF:		DRILLING MUD USED	☒ YES	☐ NO
D-SAMPLER	2" O. D. SPLIT SPOON	DIAMETER OF ROTARY BIT, IN.	3-7/8	
U-SAMPLER		TYPE OF DRILLING MUD	EZ GEL	
S-SAMPLER				
CORE BARREL		AUGER USED	☒ YES	☐ NO
CORE BIT		TYPE AND DIAMETER, IN.	HAND AUGER	
DRILL RODS	NWJ			

*CASING HAMMER, LBS.	<u>140</u>	AVERAGE FALL, IN.	<u>30</u>
*SAMPLER HAMMER, LBS.	<u>140</u>	AVERAGE FALL, IN.	<u>30</u>
*USED AUTOMATIC HAMMER.			

WATER LEVEL OBSERVATIONS IN BOREHOLE

[illegible]

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.	71	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.		OTHER: HAND AUGER	6'

BORING CONTRACTOR		Lisa G. Amera, RA		ACQUITT DRILLING & TESTING CO., INC.	
DRILLER	JOSH SOMMER	HELPERS	NICK BRINSON		
REMARKS	BOREHOLE BACKFILLED WITH CUTTINGS AND SURFACE PATCHED UPON COMPLETION.				
RESIDENT ENGINEER	SEONGHWANG			DATE	09-09-15
CLASSIFICATION CHECK:	CHERYL J. MOSS	TYPING CHECK:	GUILLERMO DIAZ-FANAS		

MRCE Form BS-1

REVIEWED BY
Lisa G. Amoa, RA
ACQUITTAL
ER HELPER
ED WITH CUTTINGS AND S
SEONG HWANG
L J. MOSS TYPING C

**APPROVED
WITH CONDITIONS**

control #: 43233 Page 82 of 20
Date: 8/21/2015

BORING NO. EQ-12

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-13
SHEET 1 OF 3
FILE NO. 12481B
SURFACE ELEV. 4.7
RES. ENGR. SEONG HWANG

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
	NO.	DEPTH	BLOWS/6"					
12:00 09-09-15 Wednesday Partly Cloudy 90°F	1HA	0.5	HAND	Top 3": Brown f-c sand, tr gravel, silt (SP-SM) Bot 6": Soft gray organic silty clay, tr veg (OH) Soft gray organic silty clay, trace shells, vegetation (OH) Do 3D (OH)	F		DRILLED	Topsoil at surface.
		6.0	AUGER				AHEAD	Borehole hand cleared to 6'.
							4"	Augered soil sample not obtained.
						5		
	2D	6.0	2-1			6.5		2D Top: WC=96
		8.0	1-1					
	3D	8.0	WH/12"					WC=68
		10.0	1-1			10		
	4D	10.0	WR-WH/18"					WC=76
		12.0						
13:45 07:15 09-10-15 Thursday Cloudy 70°F	5D	15.0	WR-WH/18"	Do 3D (OH) Top 6": Brown peat, some fine to medium sand, silt (Pt&SM) Bot 18": Brown fine to coarse sand, some gravel, silt (SM) Light brown fine to coarse sand, trace gravel, silt (SP-SM) Do 7D (SP-SM)	O1			WC=69
		17.0						
						20		
	6D	20.0	WH/18"-4			20.5		6D Top: WC=32 Mixed mud.
		22.0						
						25		
	7D	25.0	7-6					
		27.0	8-9					
	8D	30.0	4-3	Do 7D (SP-SM) Light brown fine to medium sand, trace gravel, coarse sand, silt (SP-SM) Soft gray organic silty clay (OH) Soft green gray organic clayey silt (OL) Light brown fine sand, some green gray silty fine sand layers, trace silt (SP, SM&SM)	S1	30		
		32.0	3-6					
						35		
	9D	35.0	6-6					
		37.0	7-8					
						38.5		
	10D	40.0	WR/12"			40		WC=55
		42.0	WH/12"					
				Soft green gray organic clayey silt (OL) Light brown fine sand, some green gray silty fine sand layers, trace silt (SP, SM&SM)	O2			
						45		
	11D	45.0	WR-WH					WC=34
		47.0	2-2					
						48.5		
	12D	50.0	7-11			50		
		52.0	19-27					



MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-13
SHEET 2 OF 3
FILE NO. 12481B
SURFACE ELEV. 4.7
RES. ENGR. SEONG HWANG

DAILY	SAMPLE			SAMPLE DESCRIPTION	STRATA	CASING		REMARKS		
PROGRESS	NO.	DEPTH	BLOWS/6"			DEPTH	BLOWS			
Cont'd 09-10-15 Thursday Cloudy 70°F			16-13 14-15	Light brown fine sand, trace silt, yellow fine sand pockets (SP-SM)	S2			Borehole collapsed to 55' prior to attempting sample 16D.		
		13D	55.0						55	
			57.0							
		14D	60.0	10-12 13-14		Light brown fine sand, trace silt (SP-SM)			60	
			62.0							
08:30			11-13 14-13	Light brown fine sand, trace silt, yellow fine sand seams (SP-SM)			End of Boring at 72'.			
		15D	65.0					65		
			67.0							
		16D	70.0	7-10 9-11	Light brown fine to medium sand, trace silt (SP-SM)			70		
			72.0					72		
								WC=Water Content in percent of dry weight.		
						75				
						</				



MUESER RUTLEDGE CONSULTING ENGINEERS

	BORING NO. <u>EQ-13</u>
PROJECT <u>NYC BUILD IT BACK</u>	SHEET <u>3</u> OF <u>3</u>
LOCATION <u>QUEENS, NEW YORK</u>	FILE NO. <u>12481B</u>
BORING LOCATION <u>SEE BORING LOCATION PLAN</u>	SURFACE ELEV. <u>4.7</u>
	DATUM <u>NAVD 88</u>

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	☒ YES	☐ NO	
TRUCK <u>X</u>	DURING CORING	DIA., IN. <u>4</u>			DEPTH, FT. FROM <u>0</u> TO <u>9</u>
SKID	MECHANICAL	DIA., IN.			DEPTH, FT. FROM TO
BARGE	HYDRAULIC	DIA., IN.			DEPTH, FT. FROM TO
OTHER	OTHER	DIA., IN.			DEPTH, FT. FROM TO

TYPE AND SIZE OF:	DRILLING MUD USED	☒ YES	☐ NO	
D-SAMPLER <u>2" O. D. SPLIT SPOON</u>	DIAMETER OF ROTARY BIT, IN.			<u>3-7/8</u>
U-SAMPLER	TYPE OF DRILLING MUD			<u>EZ GEL</u>
S-SAMPLER				
CORE BARREL	AUGER USED	☒ YES	☐ NO	
CORE BIT	TYPE AND DIAMETER, IN.			<u>HAND AUGER</u>
DRILL RODS <u>NWJ</u>				

*CASING HAMMER, LBS.	<u>140</u>	AVERAGE FALL, IN.	<u>30</u>
*SAMPLER HAMMER, LBS.	<u>140</u>	AVERAGE FALL, IN.	<u>30</u>
*USED AUTOMATIC HAMMER.			

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO WATER LEVEL OBSERVATIONS MADE.

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.	<u>66</u>	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.		OTHER: HAND AUGER	<u>6'</u>

BORING CONTRACTOR	REVIEWED BY	DATE
DRILLER <u>JOSH SOMMER</u>	<u>Lisa G. Amadio, RA</u>	<u>09-10-15</u>
REMARKS <u>BOREHOLE BACKFILLED WITH CUTTINGS AND SURFACE PATCHED UPON COMPLETION.</u>	ASSISTANT DRILLING & TESTING CO., INC.	
RESIDENT ENGINEER <u>SEONG HWANG</u>	HELPERS <u>NICK BRINSON</u>	
CLASSIFICATION CHECK: <u>CHERYL J. MOSS</u>	TYPING CHECK: <u>GUILLERMO DIAZ-FANAS</u>	

**APPROVED
WITH CONDITIONS**
control #: 43233 Page 85 of 203
Date: 12/21/2015

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-14
SHEET 1 OF 3
FILE NO. 12481B
SURFACE ELEV. 5.6
RES. ENGR. SEONG HWANG

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	CASING		REMARKS	
	NO.	DEPTH	BLOWS/6"			DEPTH	BLOWS		
12:00 09-03-15 Thursday Sunny 90°F	1HA	0.5	HAND AUGER	Light brown fine sand, trace silt, gravel (Fill) (SP-SM)	F		DRILLED	Asphalt at surface. Borehole hand cleared to 6'.	
		6.0					AHEAD		
							4"		
		2D	6.0	11-10	Do 1HA (Fill) (SP-SM)	O1			REC=2" 3D Top: WC=60 Mixed mud.
			8.0	1-1				8	
		3D	8.0	WR/12"					
			10.0	3-6				9.5	
		4D	10.0	4-4					
		12.0	6-7						
						15			
	5D	15.0	3-4	Do 4D (SP-SM)	S1				
		17.0	3-2						
							20		
	6D	20.0	3-5	Gray fine sand, trace silt, vegetation (SP-SM)	O1			7D Top: WC=48	
		22.0	7-9						
							23.5		
							25		
	7D	25.0	WH/12"	Top 18": Soft gray organic silty clay, some clayey fine sand layers (OH&SC) Bot 6": Gray fine sand, some silt (SM)	O1				
		27.0	1-2				26.5		
							30		
	8D	30.0	3-3	Gray brown fine to medium sand, trace silt, gravel, vegetation (SP-SM)	S1				
		32.0	5-7						
							35		
	9D	35.0	5-5	Gray fine sand, some silt, fine sandy silt seams (SM&ML)	S1				
		37.0	5-9						
							40		
	10D	40.0	5-7	Gray fine to medium sand, trace silt (SP-SM)	S1				
		42.0	9-10						
							45		
14:00									
07:15									
09-04-15									
Friday									
Sunny	11D	45.0	7-9	Do 10D (SP-SM)	S2				
75°F		47.0	9-10						
							48		
	12D	50.0	4-4	Light brown fine to medium sand, trace silt (SP-SM)	S2		50		
		52.0	3-3						

REVIEWED BY

Lisa G. Amoia, RA

APPROVED



MUESER RUTLEDGE CONSULTING ENGINEERS

		BORING NO.	EQ-14
		SHEET	3 OF 3
PROJECT	NYC BUILD IT BACK	FILE NO.	12481B
LOCATION	QUEENS, NEW YORK	SURFACE ELEV.	5.6
BORING LOCATION	SEE BORING LOCATION PLAN	DATUM	NAVD 88

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED		CASING USED		DEPTH, FT. FROM	
DURING CORING							
TRUCK	X	MECHANICAL		DIA., IN.	4	DEPTH, FT. FROM	0 TO 9
SKID		HYDRAULIC		DIA., IN.		DEPTH, FT. FROM	TO
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM	TO
OTHER							

TYPE AND SIZE OF:		DRILLING MUD USED	☒ YES	☐ NO
D-SAMPLER	2" O. D. SPLIT SPOON	DIAMETER OF ROTARY BIT, IN.		3-7/8
U-SAMPLER		TYPE OF DRILLING MUD		EZ GEL
S-SAMPLER				
CORE BARREL		AUGER USED	☒ YES	☐ NO
CORE BIT		TYPE AND DIAMETER, IN.		HAND AUGER
DRILL RODS	NWJ			

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

WATER LEVEL OBSERVATIONS IN BOREHOLE

[illegible]

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.	<u>71</u>	NO. OF 3" SHELBY TUBE SAMPLES	<u> </u>
3.5" DIA. U-SAMPLE BORING	LIN. FT.	<u> </u>	NO. OF 3" UNDISTURBED SAMPLES	<u> </u>
CORE DRILLING IN ROCK	LIN. FT.	<u> </u>	OTHER: HAND AUGER	<u>6'</u>

BORING CONTRACTOR		Lisa G. Amorin, RA		ACQUER DRILLING & TESTING CO., INC.	
DRILLER		JOSH SOMMER		HELPERS	
REMARKS		BOREHOLE BACKFILLED WITH CUTTINGS AND SURFACE PATCHED UPON COMPLETION.			
RESIDENT ENGINEER		SEONG HWANG		DATE 09-04-15	
CLASSIFICATION CHECK:		CHERYL J. MOSS		TYPING CHECK: GUILLERMO DIAZ-FANAS	

MRCE Form BS-1

REVIEWED BY
Lisa G. Amoia, RA

Lisa G. Amoia, RA

ER	HELPERS	NICK BRINSON
----	---------	--------------

LED WITH CUTTINGS AND SURFACE PATCHED UPON COMPLETION.

SEONG HWANG	DATE	09-04-15
-------------	------	----------

L J. MOSS TYPING CHECK: GUILLERMO DIAZ-FANAS

**APPROVED
WITH CONDITIONS**
control #: 43233 Page 88 of 203
Date: 12/21/2015

BORING NO. EQ-14

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-15
SHEET 1 OF 3
FILE NO. 12481B
SURFACE ELEV. 6.6
RES. ENGR. SEONG HWANG

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	CASING		REMARKS
	NO.	DEPTH	BLOWS/6"			DEPTH	BLOWS	
08:00 09-11-15 Friday Cloudy 65°F	1HA	0.8	HAND AUGER	Light brown fine to medium sand, trace silt (Fill) (SP)	F	0.75	DRILLED	**Asphalt from 0' to 0.75'. Borehole hand cleared to 6'.
		6.0					AHEAD	
							4"	
						5		
	2D	6.0	WH/18"	Top 3": Gray fine sand, tr silt, clay seams (SP-SM) Bot 16": Brown peat (Pt)	O1	6.2		2D Bot: WC=140 WC=66 Mixed mud. 4D Top: WC=71
		8.0						
	3D	8.0	WH/12"	Soft gray organic silty clay, trace fine sand, vegetation (OH)	O1	10		
		10.0				10.5		
	4D	10.0	1-12"	Top 6": Soft gray organic silty clay, trace vegetation (OH) Bot 8": Gray fine sand, some silt (SM)	S1			
		12.0						
			5-7	Gray fine sand, trace silt (SP-SM)	S1	15		
	5D	15.0						
		17.0	8-14		O1	20		6D Bot: WC=64
						21		
	6D	20.0	7-2	Top 11": Do 5D (SP-SM) Bot 9": Soft gray organic silty clay, trace fine sand (OH)	O1	23.5		
		22.0				25		
			11-10	Gray fine sand, trace silt (SP-SM)	S1			
	7D	25.0				30		
		27.0	13-9		S1			
	8D	30.0	2-2	Gray fine sand, some silt (SP-SM)	S2	33.5		
		32.0				35		
			8-10	Light brown fine to medium sand, trace silt (SP-SM)	S2	40		
	9D	35.0	13-14		S2	45		
		37.0				50		
			7-7	Do 9D (SP-SM)	S2			
	10D	40.0						
		42.0	7-10		S2			
	11D	45.0	7-9	Do 9D (SP-SM)	S2			
		47.0						
			7-8	Light brown fine sand, trace silt (SP)	S2			
	12D	50.0						
		52.0	6-10					



MUESER RUTLEDGE CONSULTING ENGINEERS

PROJECT NYC BUILD IT BACK
LOCATION QUEENS, NEW YORK
BORING LOCATION SEE BORING LOCATION PLAN

BORING NO. EQ-15
SHEET 3 OF 3
FILE NO. 12481B
SURFACE ELEV. 6.6
DATUM NAVD 88

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG TRUCK ☒ X
TYPE OF FEED DURING CORING MECHANICAL
CASING USED ☒ YES ☐ NO
TRUCK ☒ X **MECHANICAL** ☐ **DIA., IN.** 4 **DEPTH, FT. FROM** 0 **TO** 9
SKID ☐ **HYDRAULIC** ☐ **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
CORE BIT
DRILL RODS NWJ

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

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

CASING HAMMER, LBS. **AVERAGE FALL, IN.**
***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
					NO WATER LEVEL OBSERVATIONS MADE.

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.** 76 **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.** **OTHER: HAND AUGER** 6'

BORING CONTRACTOR **DRILLER** JOSH SOMMON **HELPERS** NICK BRINSON
REMARKS BOREHOLE BACK FILLED WITH CUTTINGS & SURFACE PATCHED UPON COMPLETION.
RESIDENT ENGINEER SEONG HWANG **DATE** 09-11-15
CLASSIFICATION CHECK: CHERYL J. MOSS **TYPING CHECK:** MTM



MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-16P
SHEET 1 OF 4
FILE NO. 12481B
SURFACE ELEV. 5.0
RES. ENGR. SEONG HWANG

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS	
NO.	DEPTH	BLOWS/6"							
08:30 09-01-15 Tuesday Sunny 90°F	1HA	0.5	HAND AUGER	Brown fine to medium sand, some silt, trace gravel, coarse sand (Fill) (SM)	PF		DRILLED	Asphalt at surface.	
		6.0					AHEAD	Borehole hand cleared to 6'.	
							4"		
	2D	6.0	4-3				REC=2"		
		8.0	3-1			8			
	3D*	8.0	7-3	Top 3": Gry si f sand, sm org cl lys, tr gvl, veg (SM&OH) Bot 4": Gray fine sand, trace silt (SP-SM)		S1			*Used 3" O. D. SPLIT spoon.
		10.0	5-21					10	
	4D	10.0	4-8						
		12.0	12-13						
							13.5		
					15				
	5D	15.0	1/24"	Soft gray organic silty clay, some silty fine sand layers, trace shells, vegetation (OH&SM)	O1			WC=63	
		17.0						Mixed mud.	
						20			
	6D	20.0	WR-WH/18"	Soft gray organic silty clay, trace silty fine sand seams, shells, vegetation (OH)		S1			WC=85
		22.0							
					23.5				
				25					
7D	25.0	1-3	Gray fine sand, trace silt, silty clay seams (SP-SM)	S1					
	27.0	6-3							
					30				
8D	30.0	7-8	Gray fine to medium sand, trace silt (SP-SM)		S1				
	32.0	9-7							
				35					
9D	35.0	2-3	Gray fine to medium sand, some silt (SM)	S1					
	37.0	4-4							
					40				
10D	40.0	6-14	Light brown fine to medium sand, trace gravel, silt, coarse sand (SP-SM)		S1				
	42.0	20-27							
				45					
11D	45.0	5-10	Light brown fine to medium sand, trace silt (SP-SM)	S1					
	47.0	11-11							
					50				
12D	50.0	8-10	Light gray fine sand, trace silt (SP-SM)		S1				
	52.0	10-9							





PIEZOMETER NO. EQ-16P

MUESER RUTLEDGE CONSULTING ENGINEERS

	BORING NO. <u>EQ-16P</u>
	SHEET <u>4</u> OF <u>4</u>
PROJECT <u>NYC BUILD IT BACK</u>	FILE NO. <u>12481B</u>
LOCATION <u>QUEENS, NEW YORK</u>	SURFACE ELEV. <u>5</u>
BORING LOCATION <u>SEE BORING LOCATION PLAN</u>	DATUM <u>NAVD 88</u>

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	☒ YES	☐ NO	
TRUCK <u>X</u>	DURING CORING	DIA., IN. <u>4</u>			DEPTH, FT. FROM <u>0</u> TO <u>19</u>
SKID	MECHANICAL	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>
BARGE	HYDRAULIC	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>
OTHER	OTHER	DIA., IN.			DEPTH, FT. FROM <u> </u> TO <u> </u>

TYPE AND SIZE OF:	DRILLING MUD USED	☒ YES	☐ NO	
D-SAMPLER <u>2" O. D. SPLIT SPOON</u>	DIAMETER OF ROTARY BIT, IN.			<u>3-7/8</u>
U-SAMPLER	TYPE OF DRILLING MUD			<u>QUICK GEL</u>
S-SAMPLER				
CORE BARREL	AUGER USED	☒ YES	☐ NO	
CORE BIT	TYPE AND DIAMETER, IN.			<u>HAND AUGER</u>
DRILL RODS <u>NWJ</u>				

*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
					NO WATER LEVEL OBSERVATIONS MADE

PIEZOMETER INSTALLED	☒ YES	☐ NO	SKETCH SHOWN ON	SEE SHEET NO. 3
----------------------	---	-----------------------------	-----------------	-----------------

STANDPIPE:	TYPE	PVC	ID, IN.	2	LENGTH, FT.	5	TOP ELEV.	
INTAKE ELEMENT:	TYPE	SLOTTED PVC	OD, IN.	2	LENGTH, FT.	10	TIP ELEV.	
FILTER:	MATERIAL	SAND	OD, IN.	4	LENGTH, FT.	13	BOT. ELEV.	

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	81	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.		OTHER: HAND AUGER	6'

BORING CONTRACTOR	GLEN STRINGHAM	HELPERS	ANTHONY KAPPAL
DRILLER			
REMARKS	PVC STANDPIPE PIEZOMETER INSTALLED WITH FLUSH MOUNT COVER.		
RESIDENT ENGINEER	SEONG HWANG		
CLASSIFICATION CHECK:	CHERYL J. MOSS	TYPING CHECK:	GUILLERMO DIAZ-FANAS



MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-17
SHEET 1 OF 3
FILE NO. 12481B
SURFACE ELEV. 6.1
RES. ENGR. SEONG HWANG

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
	NO.	DEPTH	BLOWS/6"					
09:30	1HA	0.5	HAND	Light brown fine sand, trace gravel, silt, vegetation (Fill) (SP-SM) Gray fine sand, trace medium sand, silt (SP) Do 3D (SP-SM)	PF		DRILLED	Asphalt at surface.
09-10-15		6.0	AUGER				AHEAD	Borehole hand cleared to 6'.
Thursday							4"	Augered soil sample not obtained.
Cloudy,						5		
Rain								
70°F								
	2D	6.0	2-1/12"					REC=1"
		8.0	1			8		
	3D	8.0	2-4					Mixed mud.
		10.0	5-6			10		
	4D	10.0	2-4					
		12.0	5-5					
				Top 12": Gray fine sand, some organic silty clay (SC) Bot 10": Gray fine sand, some silt (SM) Gray fine to medium sand, trace silt (SP-SM) Do 6D (SP-SM) Do 6D (SP-SM)	S1			
	5D	15.0	1-2					5D Top: WC=32
		17.0	3-4					
						15		
	6D	20.0	5-4					
		22.0	4-7					
						20		
	7D	25.0	5-6	Light brown fine to coarse sand, trace gravel, silt (SP-SM) Light brown fine to medium sand, trace silt (SP) Do 10D (SP-SM) Light brown fine to medium sand, trace silt (SP-SM)	S2			
		27.0	6-6					
						25		
	8D	30.0	5-4					
		32.0	5-4					
						30		
	9D	35.0	7-9					
		37.0	12-15					
						40		
	10D	40.0	10-9					
		42.0	10-10					
						45		
	11D	45.0	7-7					
		47.0	8-15					
						50		
	12D	50.0	9-15					
		52.0	16-20					



MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-17
SHEET 2 OF 3
FILE NO. 12481B
SURFACE ELEV. 6.1
RES. ENGR. SEONG HWANG

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	CASING		REMARKS
	NO.	DEPTH	BLOWS/6"			DEPTH	BLOWS	
Cont'd								
09-10-15								
Thursday								
Cloudy,								
Rain								
70°F	13D	55.0	10-10	Do 12D (SP-SM)	S2	55		
10:45		57.0	12-12			57		End of Boring at 57'.
								WC=Water Content in percent of dry weight.
						60		
						65		
						70		
						75		
						80		
						85		
						90		
						95		
						100		



MUESER RUTLEDGE CONSULTING ENGINEERS

	BORING NO. <u>EQ-17</u>
	SHEET <u>3</u> OF <u>3</u>
PROJECT <u>NYC BUILD IT BACK</u>	FILE NO. <u>12481B</u>
LOCATION <u>QUEENS, NEW YORK</u>	SURFACE ELEV. <u>6.1</u>
BORING LOCATION <u>SEE BORING LOCATION PLAN</u>	DATUM <u>NAVD 88</u>

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG	TYPE OF FEED	CASING USED	☒ YES	☐ NO	
TRUCK <u>X</u>	DURING CORING	DIA., IN. <u>4</u>			DEPTH, FT. FROM <u>0</u> TO <u>9</u>
SKID	MECHANICAL	DIA., IN.			DEPTH, FT. FROM TO
BARGE	HYDRAULIC	DIA., IN.			DEPTH, FT. FROM TO
OTHER	OTHER	DIA., IN.			DEPTH, FT. FROM TO

TYPE AND SIZE OF:	DRILLING MUD USED	☒ YES	☐ NO	
D-SAMPLER <u>2" O. D. SPLIT SPOON</u>	DIAMETER OF ROTARY BIT, IN.			<u>3-7/8</u>
U-SAMPLER	TYPE OF DRILLING MUD			<u>EZ GEL</u>
S-SAMPLER				
CORE BARREL	AUGER USED	☒ YES	☐ NO	
CORE BIT	TYPE AND DIAMETER, IN.			<u>HAND AUGER</u>
DRILL RODS <u>NWJ</u>				

*CASING HAMMER, LBS.	<u>140</u>	AVERAGE FALL, IN.	<u>30</u>
*SAMPLER HAMMER, LBS.	<u>140</u>	AVERAGE FALL, IN.	<u>30</u>

*USED AUTOMATIC HAMMER.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE	DEPTH OF CASING	DEPTH TO WATER	CONDITIONS OF OBSERVATION
					NO WATER LEVEL OBSERVATIONS MADE.

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.	<u>51</u>	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.		OTHER: HAND AUGER	<u>6'</u>

BORING CONTRACTOR	REVIEWED BY Lisa G. Amico, RA	MUESER RUTLEDGE CONSULTING & TESTING CO., INC.
DRILLER <u>JOSH SOMMER</u>	HELPERS <u>NICK BRINSON</u>	
REMARKS <u>BOREHOLE BACKFILLED WITH CUTTINGS AND SURFACE PATCHED UPON COMPLETION.</u>		
RESIDENT ENGINEER <u>SEONG HWANG</u>	DATE <u>09-10-15</u>	
CLASSIFICATION CHECK: <u>CHERYL J. MOSS</u>	TYPING CHECK: <u>GUILLERMO DIAZ-FANAS</u>	

**APPROVED
WITH CONDITIONS**
 control #: 43233 Page 98 of 203
 Date: 12/21/2015

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING LOG

PROJECT: NYC BUILD IT BACK
LOCATION: QUEENS, NEW YORK

BORING NO. EQ-18
SHEET 1 OF 3
FILE NO. 12481B
SURFACE ELEV. 5.1
RES. ENGR. SEONG HWANG

DAILY PROGRESS	SAMPLE			SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
	NO.	DEPTH	BLOWS/6"					
10:30 08-28-15 Friday Sunny 80°F	1HA	0.5	HAND AUGER	Brown fine to coarse sand, trace gravel, silt (SP-SM)	F		DRILLED	Asphalt at surface.
		6.0					AHEAD	Borehole hand cleared to 6'.
							4"	
						5		
						6		
	2D	6.0	WH/24"	Soft gray organic silty clay, some fine sand, trace vegetation (OH)	O1			REC=2"
		8.0						
	3D	8.0	WH-5 9-5	Top 6": Soft gray org si clay, tr veg, f sand (OH) Mid 4": Gray f-m sand, sm org si, tr veg (SM) Bot 8": Gray fine sand, trace silt (SP-SM)	S1	8.5		3D Top: WC=53
		10.0				10		
						10.5		
	4D	10.0	2-1 2-2	Top 4": Gray fine sand, trace silt (SP-SM) Bot 8": Gray fine sandy organic clay (OL)	O1			4D Bot: WC=34
		12.0						
						13.5		
						15		Mixed mud.
	5D	15.0	2-1 6-11	Top 4": Gray fine sand, trace silt (SP-SM) Mid 5": Gray organic silty fine sand, some organic silty clay layers (SM&OH) Bot 11": Gray fine sand, some silt (SM)	S1			
		17.0						
						20		
	6D	20.0	8-10 13-18	Gray fine sand, trace silt (SP-SM)				
		22.0						
						23.5		
						25		
	7D	25.0	WR/12" WH/12"	Soft gray organic silty clay, trace shell layers, vegetation (OH)	O1			WC=81
		27.0						
						28.5		
						30		
	8D	30.0	WH/18" 3	Top 18": Brown fine to medium sand, some organic silt, trace clay, gravel, vegetation (SM) Bot 6": Brown fine to medium sand, some silt, trace gravel, coarse sand (SM)	S1			
		32.0						
						33.5		
						35		
	9D	35.0	4-9 10-11	Light brown fine to medium sand, trace silt, coarse sand (SP-SM)				
		37.0						
						40		
	10D	40.0	6-8 12-14	Do 9D (SP-SM)	S2			
		42.0						
						45		
	11D	45.0	9-9 12-16	Light brown fine to medium sand, trace gravel layers, coarse sand, silt (SP-SM)				
		47.0						
						50		
	12D	50.0	7-13 24-19	Light brown fine to medium sand, trace silt (SP-SM)				
		52.0						



BORING LOG

BORING NO.	EQ-18
SHEET 2 OF	3
FILE NO.	12481B
SURFACE ELEV.	5.1
RES. ENGR.	SEONG HWANG

[illegible]

**APPROVED
WITH CONDITIONS**

control #: 43233 Page 100 of 203
Date: 12/21/2015

BORING NO. EQ-18