ADDENDUM

PHASE IA ARCHAEOLOGICAL SURVEY REPORT

LaGuardia Airport Central Terminal Building Redevelopment

Queens Borough

New York City

Prepared for
Port Authority of New York & New Jersey
225 Park Avenue South
New York, NY 10003

Prepared by
John W. Lawrence, Principal Investigator
Brian M. Albright, GIS Specialist/Field Director

AECOM
516 East State Street
Trenton, NJ 08609

August 2013

Management Summary

SHPO PROJECT REVIEW NUMBER:
12PR05127

INVOLVED STATE AND FEDERAL AGENCIES:
FAA
Port Authority of New York and New Jersey

PHASE OF SURVEY:
Addendum to IA Archaeological Survey, Definition of Vertical APE

LOCATION INFORMATION:
Location: New York City
Minor Civil Division: Queens Borough
County: Queens County

SURVEY AREA:
Length: 1.2 mi (2 km)
Width: width varies depending on location
Number of Acres Surveyed: 159 ac (64 ha)

USGS 7.5 MINUTE QUADRANGLE MAP:
Central Park, Flushing

SENSITIVITY ASSESSMENT:
N/A

ARCHAEOLOGICAL SURVEY METHODOLOGY:
Review of geotechnical data
GIS modeling of land surfaces

RESULTS OF ARCHITECTURAL SURVEY:
N/A

RESULTS OF ARCHAEOLOGICAL SURVEY:
Definition of Vertical APE

REPORT AUTHOR:
John Lawrence and Brian M. Albright

DATE OF REPORT:
August 2013

TABLE OF CONTENTS

APPENDICES

LIST OF ILLUSTRATIONS

FIGURES

TABLES

1.0 INTRODUCTION

This addendum report is in response to the 18 July, 2013 review letter from the New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP), Division of Historic Preservation (Appendix A). The letter was in turn a response to the submission of a draft Phase IA Archaeological Survey Report prepared by AECOM for the Port Authority of New York and New Jersey (Mikolic et al. 2013). The archaeological survey was conducted under Section 106 of the National Historic Preservation Act, which requires NYSOPRHP review the proposed LaGuardia Airport Central Terminal Building Redevelopment Project, sponsored by the Federal Air Administration (FAA) and the Port Authority of New York and New Jersey (PANYNJ).

The 18 July 2013 letter was in agreement with Mikolic et al.'s (2013) definition of an area of archaeological sensitivity ('Area 1') within the Area of Potential Effects (APE) for the proposed undertaking (Figure 2). However, the review letter requested specific information from PANYNJ when it was available. The information requested includes:

1) definition of the vertical APE within the area of archaeological sensitivity;
2) definition of the vertical APE in areas formerly pertaining to Flushing Bay, which were in-filled during the twentieth-century and;
3) the relationship of the vertical APE to a possibly intact, Early Holocene land surface with the potential to contain archaeological deposits.

This document presents all currently-available information requested by NYSOPRHP. Design specification for elements of proposed construction with the capacity to impact the existing land surface are presented to define the vertical APE as accurately as possible. The same design features have also been brought into GIS to compare the vertical APE with the elevation of the possible Early Holocene surface, as requested.

2.0 PROJECT DESCRIPTION

LaGuardia Airport ranks among the busiest airports in the nation and around the world. More than 23 million airline passengers use the airport annually and approximately half the passengers are processed through the Central Terminal Building (also known as Terminal B or the CTB). The CTB was designed and built in the 1960s. Renovation and expansion projects over the years have enhanced the appearance and capacity of the terminal building; however, these improvements have not been sufficient to keep pace with changes in the airline industry or growing passenger demand.

The Central Terminal Building Redevelopment Program is needed to improve the safety, security, and efficient flow of passengers through LaGuardia Airport. Over the next ten years, the Central Terminal Building, airside apron, landside roadways, and parking garage, are scheduled to be replaced in-kind with new facilities designed and constructed to meet the latest Federal standards for safety and security, and to enhance the overall level of service for passengers and visitor alike.

The CTB Redevelopment Program is divided into three functional elements: airside, terminal, and landside. There is also a list of support project needed to implement the Program. The project description is summarized below. A more detailed description of the project is included in the Draft Environmental Assessment.

- Airside – The terminal airside apron would be reconfigured to accommodate a 35-gate layout plan with dual (two-way) taxilanes for safer and more efficient aircraft movements within the limited space available. PANYNJ has determined that 35 gate positions must be provided to accommodate the proposed flight schedule for the airlines operating at the CTB.

- Terminal – The existing CTB would be demolished and replaced with a new 1.3 million square foot passenger terminal building with two double-loaded concourses and one single-loaded concourse connected to Terminal C. A three-level terminal headhouse provides ticketing on the upper level, baggage claim in the middle level, and ground transportation on the lower level. All interior spaces must meet the latest TSA requirements for screening passengers and bags.

- Landside Roadways and Parking – The terminal area roadway system would be redesigned to accommodate the new passenger terminal building and to provide free-flowing traffic movements through the central terminal area including Terminals C and D. To make way for the new terminal, the existing parking garage would be demolished and replaced with a new West Garage with 2,900 spaces.

- Support Projects. The following list of enabling projects or actions would be undertaken to make space or otherwise allow the above-referenced airside, terminal, and landside projects to proceed: remove Hangars 1, 2, and 4; relocate the Central Heating and Refrigeration Plant (CHRP); relocate the East Field Lighting Vault; relocate the Taxi Hold Lot; and, provide for new or relocated in-ground utilities.

3.0 AREA OF POTENTIAL EFFECTS (APE)

The horizontal APE was established in the Phase IA Archaeological Survey Report in accordance with 36 CFR 800.16(d) and is illustrated in Figure 1; it represents the total area extent in which impacts to ground surfaces may be anticipated. The vertical APE represents the anticipated depth below existing grade of all impacts within the horizontal APE.

3.1 Defining the Vertical APE

Three elements in the construction of the proposed CTB, parking garages and associated access roads will require moving, excavating or otherwise impacting the existing land surfaces within the horizontal APE and determine the definition of the vertical APE:

1. surface grading of the landside area;
2. subsurface utility installation;
3. installation of deep pilings for foundation support for proposed buildings.

3.1.1 Grading plans

The proposed grading plan is controlled by maximum allowable grades on the airside apron, minimum floor elevations within the terminal building, vertical geometry based on roadway grades and vertical clearance requirements, and a site plan that would not preclude providing future rail access to the new terminal building. In addition, flood hazard mitigation has been a priority for the CTB Redevelopment Program because of the geography of its location with elevations just above sea level.

The resulting grading plan is presented in Figure 2. The proposed grading lines are measured in feet above mean sea level. The grading plan was brought into GIS, the contours converted into a surface using the Interpolation geostatistical tool in ARCMap and the resulting surface compared with a digital elevation model (NCGS n.d.). The resulting comparison shows areas of both cutting and filling, although in neither case is the proposed change in elevation greater than one (1) meter and across the majority of area to be graded, it is within 50 centimeters (cm) of existing grade. As will be discussed in greater detail below, majority of the APE within 50 cm to one meter of the surface consists of fill (Figure 3).

3.1.2 Subsurface Utilities

Utility plans and corridors are closely aligned with the landside roadways. Existing utilities would be used to the degree practicable, although many utilities must be relocated to service new facilities. Various options for routing utilities were investigated. PANYNJ determined the best option is to preserve a utility corridor that does not conflict with construction of the proposed roadways. The corridor runs from east to west and includes utility services for Terminals C & D. Utility installation requires removal of existing pavements, trenching, excavation, and other earthwork activities.

The location of proposed utility installations is shown in Figure 4. The average depth of each type of new utility line below proposed grade is presented in Table 1. The available information regarding the utilities with potential to impact potentially intact soils (sanitary and storm sewer, water) is presented below.

Table 1. Average Depth of Utility Installation

Utility	Depth Below Proposed Grade
Storm Sewer	10 feet (72” line) others are 3-ft depth
Sanitary lines	5 feet
Water	4 feet
Electrical/Communications	2.5 feet
Gas/Steam	2.5 feet

Storm Drainage System

The existing storm drainage trunk line runs from west to east and drains the vast majority of the existing landside. The pipe varies in size and increases as it moves further east until it becomes a 78” reinforced concrete pipe. This trunk line conflicts with proposed construction and needs to be relocated further south. The proposed roadway system would drain into the relocated trunk line until it ties back into the existing system near Terminal C (Figure 5).

The existing drainage system will be retained and utilized to the degree practicable. The proposed storm drainage system connects to the existing main storm trunk lines and is designed with capacity to relieve overloaded conditions. All storm drainage pipes will be checked to verify that they can handle existing and proposed peak discharges. In addition, it is proposed to harvest storm water from on-site roof areas to reclaim water for non-potable uses such as toilet flushing. Existing storm drainage pipes will only be removed to accommodate the construction of either the terminal building or other permanent landside/airside facilities. Existing storm drainage pipes to be abandoned in place will be capped.

Sanitary Drainage System

The existing sanitary sewer is a force main that originates in a pump station located in Parking Lot 3. The system flows from east to west before connecting to a NYC system west of 94th street. This sanitary system is in conflict with proposed construction and needs to be relocated further south. The new pump station will be located in Parking Lot 4. The layout of the sanitary sewer shall be along the landside perimeter of site (parallel to Grand Central Parkway) with a connection to the existing 18”-DIP Force Main located near Hangars 3 and 5 (Figure 6). The location of the sanitary sewers lines in relationship with the water mains will adhere to the following criteria:

- Sanitary sewers shall be laid in a separate trench a minimum of 10 feet (horizontally) from any water main or a minimum of 18 inches in a separate trench with fully restrained joints. If field conditions prohibit this, the sanitary sewer shall be laid with full concrete encasement.

- Where sanitary sewers cross water mains, the sanitary sewer shall be a minimum of 10 feet below the water main or a minimum of 18 inches below the water main with fully restrained joints.

Water

Both high pressure (HP) and low pressure (LP) water lines currently exist in the APE. The existing high pressure water system originates at the pump station in the west side of the airport. The system then runs east and provides fire protection for Hangars 1/3/5, the central Terminal Building, Hangars 2/4, and Terminals C and D. (Figure 7). The high pressure system conflicts with proposed construction and needs to be relocated to the south. Layout of the new HP water main shall be along the landside perimeter of site (parallel to Grand Central Parkway) with water supply from a Pump Station located near the fuel farm via a connection to the existing 24”-DIP HP Water Main located near Hangars 3/5.

The LP water system is fed by two feeds from NYC, one west of 94th street and the other over the 102nd St bridge. The existing low pressure lines conflict with proposed construction and need to be relocated further south. The layout of the new LP main shall also be along the landside perimeter of site (parallel to Grand Central Parkway) with a connection to the existing 24”-DIP LP Water Main located near Hangars 3/5.

3.1.3 Pier Foundations

Poor subsurface soil conditions result in pier design challenges. The existing soils within the project limits include compressible clay layers and loose soils susceptible to liquefaction from a seismic event. The deep foundations must be designed to account for these poor soil conditions at both the service and extreme event limits. Further design and cost consideration must be given the large depth to suitable bearing type soils and the rock. Glacial till and bedrock are roughly 125 feet and 150 feet, respectively below existing grade.

- Bridge Piers and Abutments – Straight pile foundations consisting of 30” diameter pipe piles, driven to approximately 150 ft to rock. Drilled shaft foundations may be considered as the design progresses and a bridge specific geotechnical report is provided.

- Retaining Walls – Straight and battered pipe piles of 14” diameter, driven approximately 150 ft to rock. Drilled shaft foundations may be considered as the design progresses and a bridge specific geotechnical report is provided.

A graphic illustration of a pier foundation is presented in Figure 8, the proposed design for the CHRP. A similar array of pilings will be employed for the West Garage. A plan view of the proposed foundation piers for the CTB and elevated road approaches to the CTB is presented in Figure 9.

3.2 Vertical APE

The proposed vertical APE for the CTB Project combines the subsurface impacts of grading, utility installation and building foundation pilings. It is limited to the footprint of:

1. Areas of proposed cutting of the existing land surface for purposes of grading;
2. Footprint of the proposed CTB, CHRP, West Garage and elevated roadway pilings;
3. An area five feet from centerline from all proposed subsurface utilities.

The depth of impacts and resulting vertical limits of the APE are as follows:

1. Grading: 1.0 meter below existing grade
2. Foundation pilings: 150 feet below existing grade
3. Utilities: variable (see Table 1)

4.0 COMPARISON OF VERTICAL APE AND SUBSURFACE SOIL HORIZONS

NYSOPRHP has requested an analysis of the relationship of the vertical APE with soil horizons that may have the potential to contain archaeological deposits. Specific concern was expressed for the area of archaeological sensitivity defined in the Phase IA Archaeological and Survey Report and previously submerged portions of the APE and the “Organic Silts and Clays” horizon recorded by geotechnical borings presented in Appendix B of the Phase IA Archaeological Survey Report (Mikolic et al. 2013).

4.1 Archaeological Sensitivity Area 1

Area 1 has been characterized as moderately to highly sensitive for both prehistoric and historic archaeological resources. There are geotechnical data for approximately half of this area (Figure 10). Borings for the proposed West Garage have been conducted and their results are presented in Appendix C. According to those logs, fills across this area range from as little as six feet below current grade (3-228) to as much as 17 feet (3-221), the average being approximately 15 feet (Table 2). The integrity of the underlying surface is unknown; in most cases the logs record silts or sands. Only four of twenty tests in this area reported "slightly organic" clayey silt beneath fill (3-229; 3-231; 3-233; 3-239). These borings are discontinuous, suggesting isolated patches of possibly intact soils.

Table 2. Depth of Fill, West Garage

Boring	Depth of Fill (ft)	Boring	Depth of Fill (ft)
3-221	18	3-232	13
3-222	17	3-233	12
3-223	18	3-234	10
3-224	15	3-235	25
3-225	15	3-236	8
3-226	8	3-237	10
3-227	8	3-238	17
3-228	6	3-239	12
3-229	12	3-240	10
3-230	17	3-241	17
3-231	10		

The vertical APE in the area of the West Garage is 150 feet below grade. Gas, storm sewer and both HL and LP water lines run through the area of sensitivity, with vertical impacts of 2.5 feet, 4 feet and 10 feet respectively. Proposed grading in the archaeologically sensitive area will extend up to one (1.0) meter below the existing ground surface (Figure 3). Grading has little to no possibility of affecting potentially intact soils in this area.

4.1.1 Evaluation

The vertical APE for the foundation of the proposed West Garage extends through what may be areas of isolated, intact soils with the potential to contain archaeological deposits. The vertical APE for proposed storm sewers (10 feet) may intersect intact soils, although there are no data currently available to pinpoint where this may occur. As stated above, most geotechnical borings reported fill below the 10-foot level, though in some cases it was no deeper than six to eight feet. None of these tests are in or proximate to the proposed utilities.

The vertical APE for all other proposed impacts in the Sensitivity Area 1 (grading, water or gas utilities) do not appear to have the potential to impact possibly intact soils.

4.2 Organic Clays and Silts Horizon

An undulating surface of "Organic Silts and Clays" has been reported from geotechnical borings conducted by the PANYNJ (2010) for the CTB, which can be found in Appendix B of this addendum. The surface elevation of this stratum was modeled in GIS from the available geotechnical data using the same Interpolation tool in ARCMap that was used to model the proposed grading plan. The resulting surface was then compared with the depths of proposed impacts across the formerly submerged portion of the APE for which data are available.

The organic silt and clay horizon was recorded in all except three geotechnical borings near the eastern end of the area sampled (S-3; 2-539; 2-541) but is present in almost all areas to be impacted by the installation of pilings for the CTB and CHRP (Figure 11). The surface of the organic silt and clay horizon was then compared with the variable depth of utilities to be installed. The relatively surficial (2.5 ft) impacts of electrical, communications and gas utilities do not intersect with the relatively small areas where the organic stratum may rise to the same elevation (Figure 12). When compared with the deeper (5 ft) impact depth of the proposed sanitary sewer and the HL and LP water lines, a relatively short segment (50 meters [ ]) of these utilities may intersect the organic stratum (Figure 13). The proposed depth of installation of new storm sewers (10 ft) has the greatest potential to intersect the organic stratum where it lies within 10 feet of the ground surface (Figure 14).

4.2.1 Evaluation

Utility installation has the potential to intersect and impact the organic clay and silt stratum recorded in geotechnical borings, but this potential is limited primarily to the installation of storm sewers at 10 feet below grade; the installation of HP and LP water lines and sanitary sewer also has potential to intersect the stratum in question, although to limited extent.

Foundation piling installation for the CTB and CHRP will penetrate the entire package of organic clays and silts where they are present. However, it should be kept in mind that the same type of piling system was used in the construction of all existing buildings and elevated roadways at LaGuardia Airport. The organic clay and silt stratum within the vertical APE for proposed pilings, where it overlaps the footprint of existing buildings in the APE (Central Terminal Building, Garage P2; Concourse C; Hangar 2), has been compromised by existing pilings. A graphic illustration of the relationship between existing buildings and the proposed installation of new pilings is presented in Figure 15.

As requested in the 18 July 2013 NYSOPRHP review letter, a professional geomorphologist was consulted for their interpretation of the organic clay and silt horizon. Dr. Daniel Wagner of Geo-Sci Consultants was sent the relevant boring logs and illustrations of historic shoreline development of LaGuardia Airport. Dr. Wagner (personal communication, 2013) responded with two observations:

1) Generally, in topographic settings such as this, the original retreating upland is a little too sloping for preservative submergence. Landscapes like this tend to be laterally truncated by marine transgression rather than protectively inundated as sea levels rose during the Holocene;
2) The "Organic Clays and Silts" stratum recorded in the geotechnical borings is not a former land surface. Former surfaces are generally 20 to 30 ft thick, and would be typical for accreting estuarine deposits.

5.0 CONCLUSIONS

A proposed vertical APE for the LGA CTB Project has been established on the basis of all available information regarding the type and depth of impacts to ground surfaces within the horizontal APE. The vertical APE exhibits variable depths, ranging from approximately 150 feet below ground surface where pilings will be driven to 2.5 feet below ground surface where certain utilities will be installed. The vertical APE intersects soil horizons that may contain archaeological deposits in an archaeological sensitivity (Sensitivity Area 1). The vertical APE also intersects a stratum of organic clay and silt of interest to the NYSOPRHP, portions of which have been compromised by piling installation for existing buildings. In the opinion of a professional geomorphologist, the stratum of clay and silt does not represent a buried, intact early Holocene land surface.

Source: ESRI 2013a
Prepared by: AECOM

Figure 1

LaGuardia Airport
CTB Redevelopment Program

Horizontal APE

THE PORT AUTHORITY OF NY & NJ

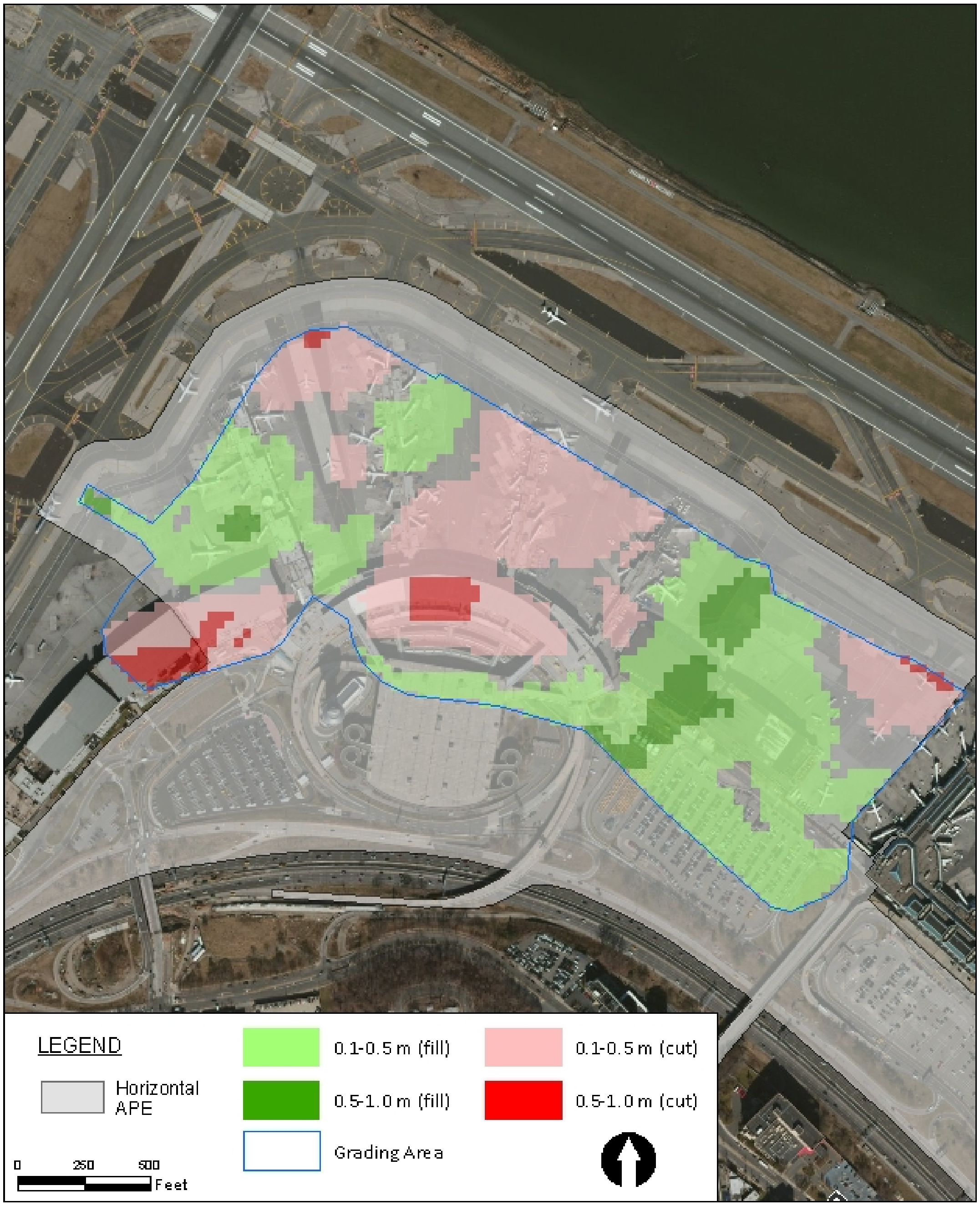
Source: ESRI 2013a; SOM 2013
Prepared by: AECOM

Figure 2

LaGuardia Airport
CTB Redevelopment Program

Proposed Grading Plan

THE PORT AUTHORITY OF NY & NJ



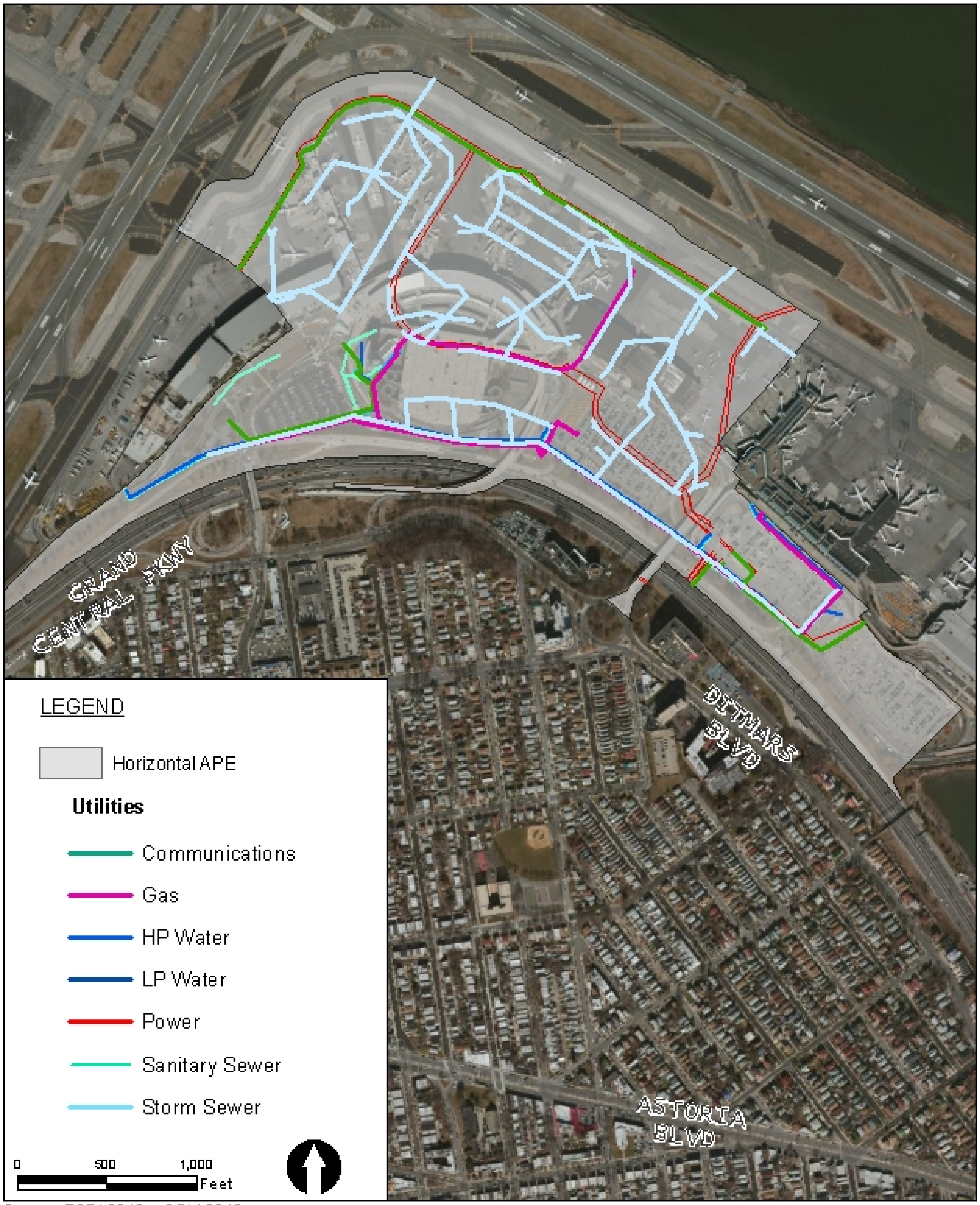
Source: ESRI 2013a
Prepared by: AECOM

Figure 3

LaGuardia Airport
CTB Redevelopment Program

Proposed Grading and Existing Elevations

THE PORT AUTHORITY OF NY & NJ



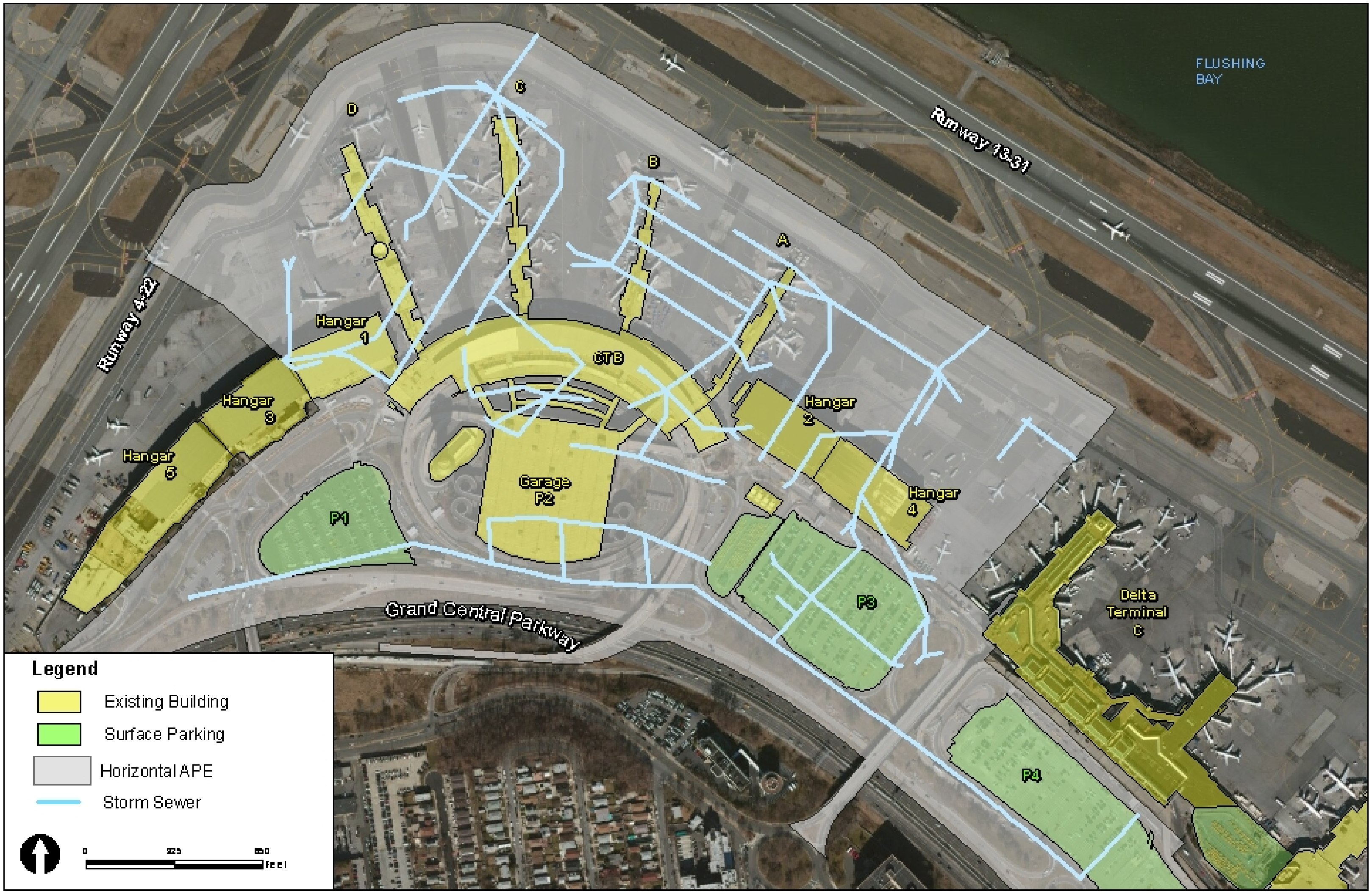
Source: ESRI 2013a; SOM 2013
Prepared by: AECOM

Figure 4

LaGuardia Airport
CTB Redevelopment Program

Proposed Utility Installations

THE PORT AUTHORITY OF NY & NJ



Source: ESRI 2013a; SOM 2013
Prepared by: AECOM

Figure 5

CTB Redevelopment Program
Environmental Assessment
LaGuardia Airport
THE PORT AUTHORITY OF NY & NJ

Proposed Storm Sewers

Source: ESRI 2013a; SOM 2013
Prepared by: AECOM

Figure 6

CTB Redevelopment Program
Environmental Assessment
LaGuardia Airport
THE PORT AUTHORITY OF NY & NJ

Proposed Sanitary Sewers

Source: ESRI 2013a; SOM 2013
Prepared by: AECOM

Figure 7

CTB Redevelopment Program
Environmental Assessment
LaGuardia Airport
THE PORT AUTHORITY OF NY & NJ

Proposed HP and LP Water Utilities

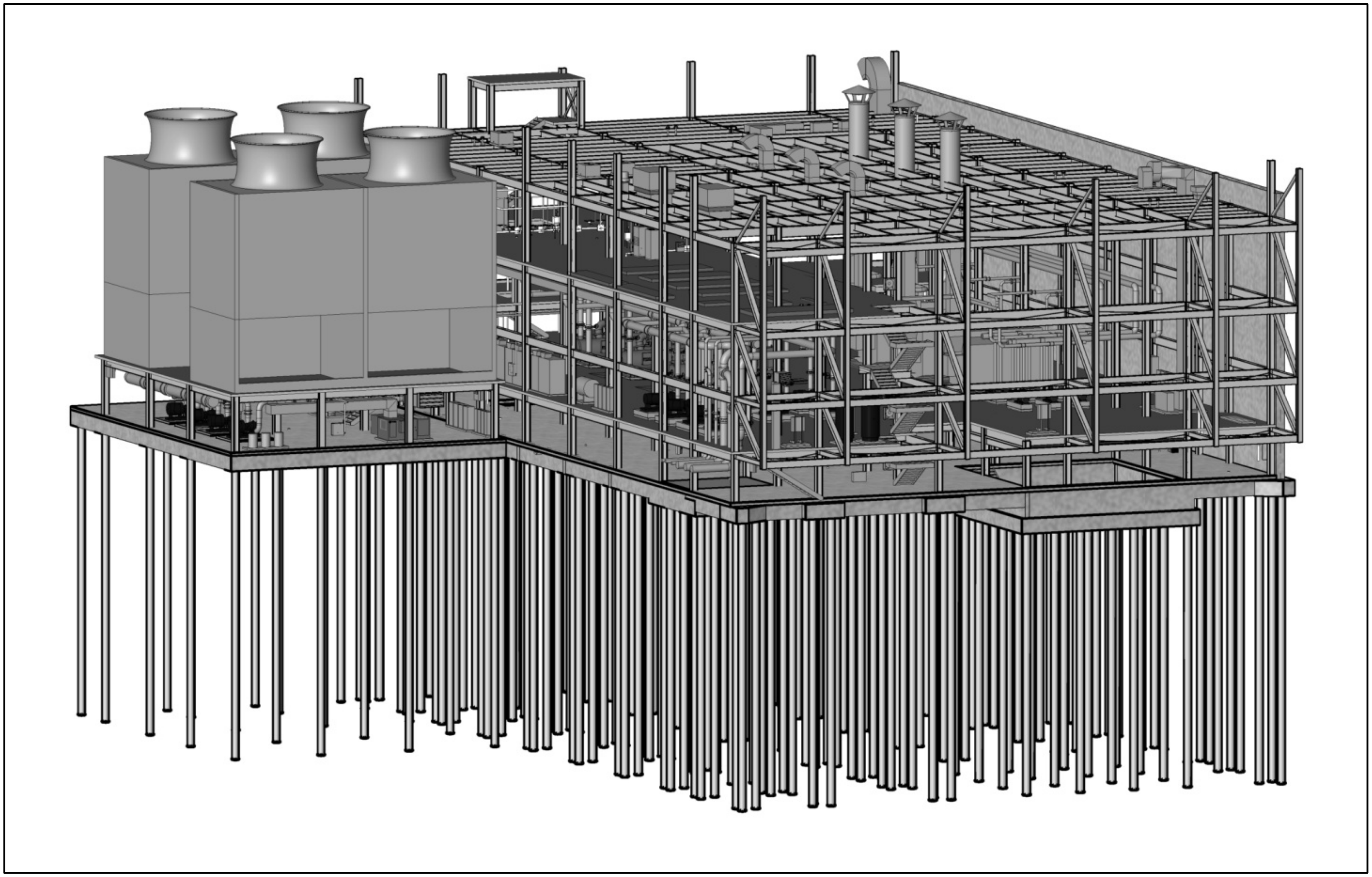


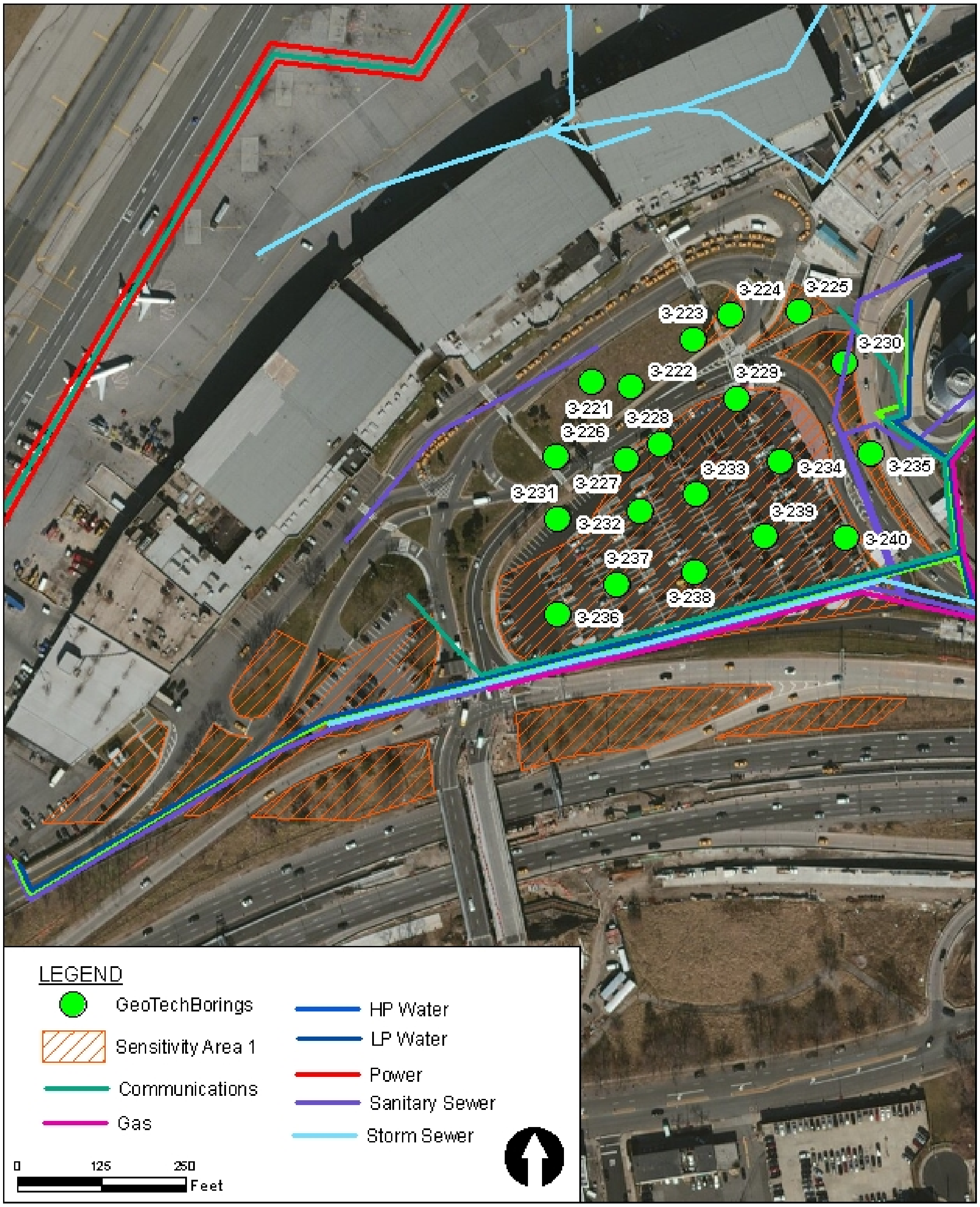
Figure 8. Piling Plan for CHRP (Source: SOM 2013)

Source: ESRI 2013a
Prepared by: AECOM

Figure 9

CTB Redevelopment Program
Environmental Assessment
LaGuardia Airport
THE PORT AUTHORITY OF NY & NJ

Proposed Piling Plan, CTB



Source: ESRI 2013a; SOM 2013
Prepared by: AECOM

Figure 10

LaGuardia Airport
CTB Redevelopment Program

Archaeological Sensitivity Area 1

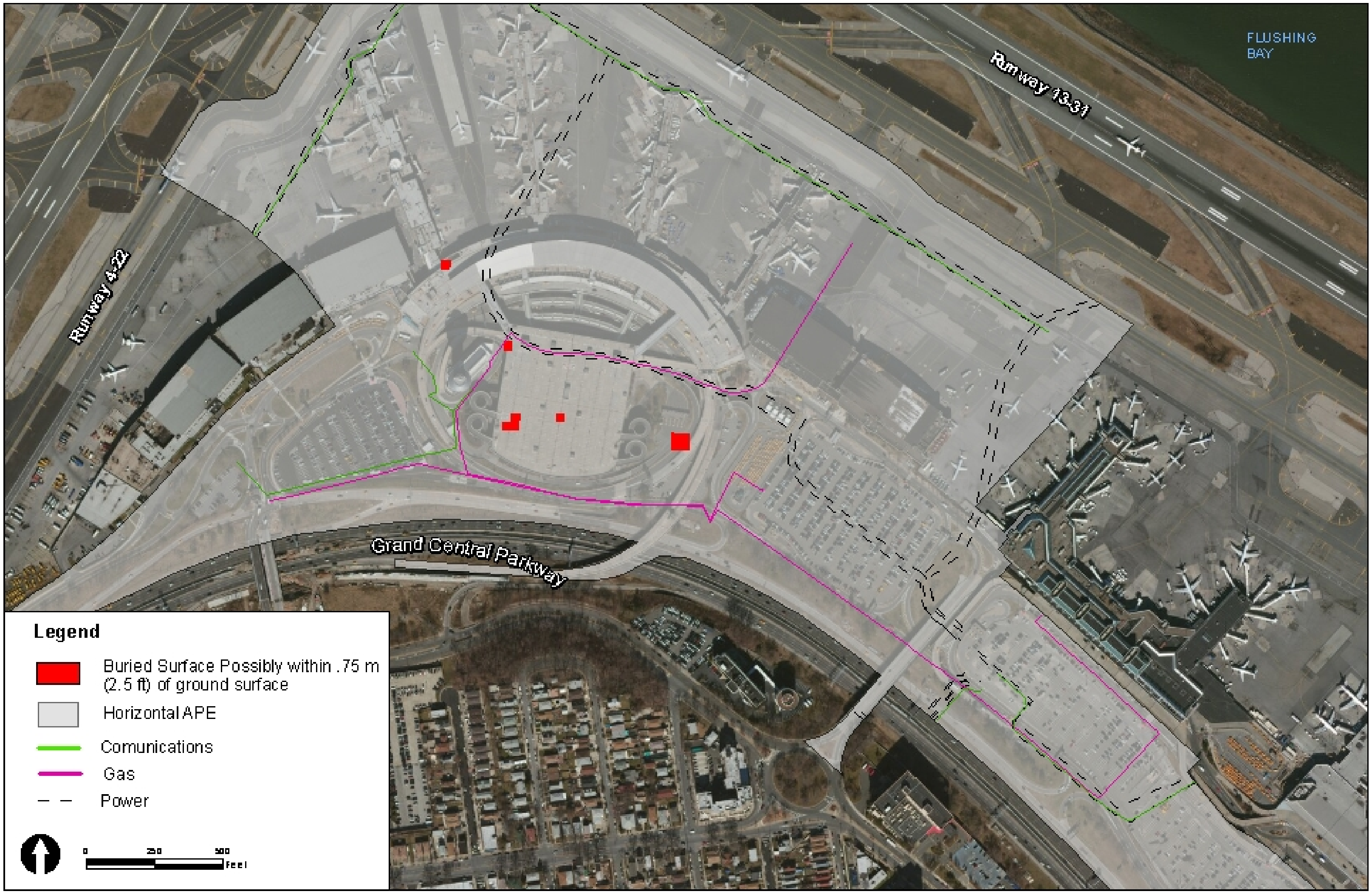
THE PORT AUTHORITY OF NY & NJ

Source: ESRI 2013a
Prepared by: AECOM

Figure 11

Boring Absent of Organic Clays and Silts

CTB Redevelopment Program
Environmental Assessment
LaGuardia Airport
THE PORT AUTHORITY OF NY & NJ

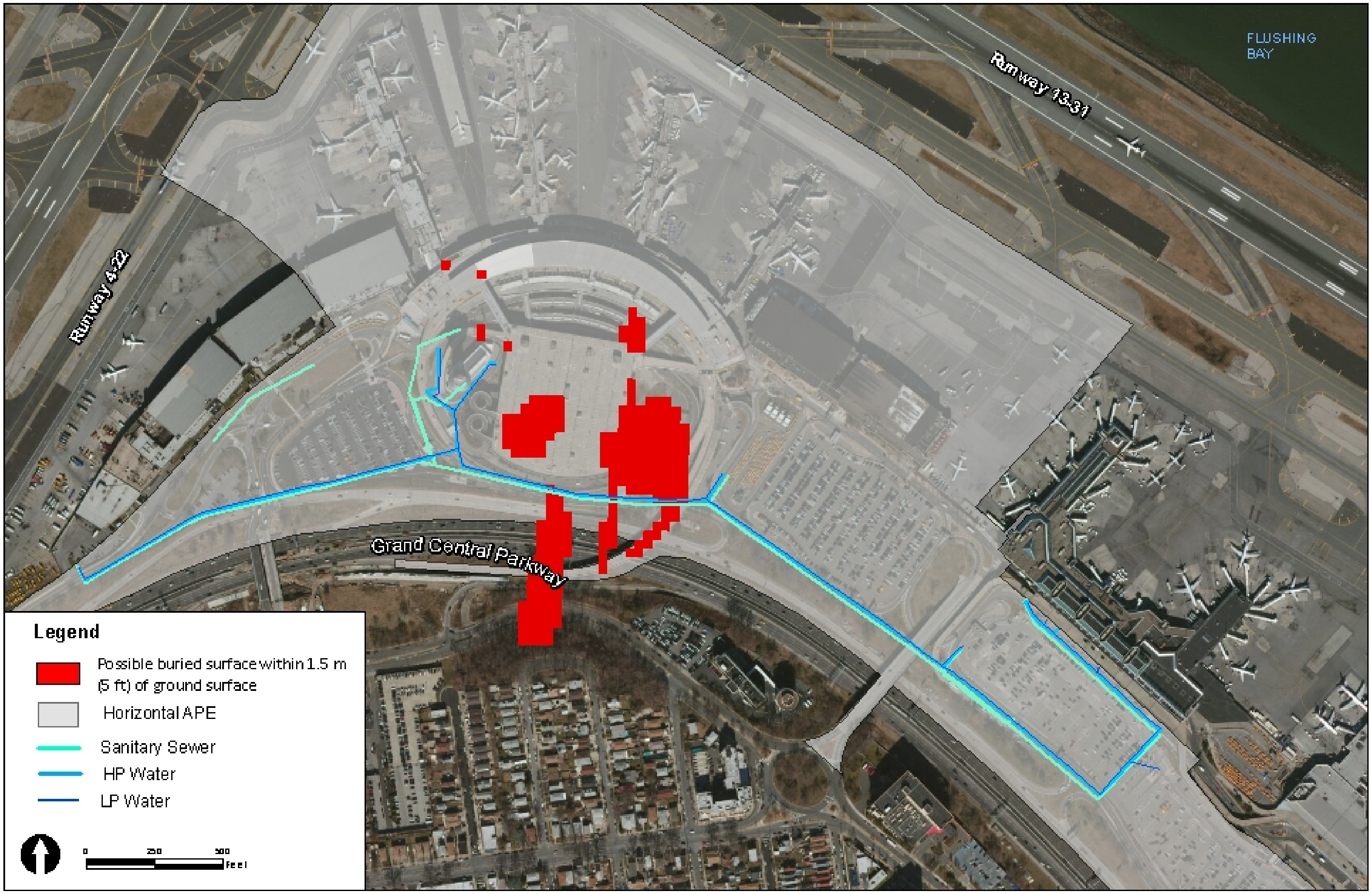


Source: ESRI 2013a; SOM 2013
Prepared by: AECOM

Figure 12

CTB Redevelopment Program
Environmental Assessment
LaGuardia Airport
THE PORT AUTHORITY OF NY & NJ

Comparison of Power, Communicaitons and Gas Utilities with Organic Horizon

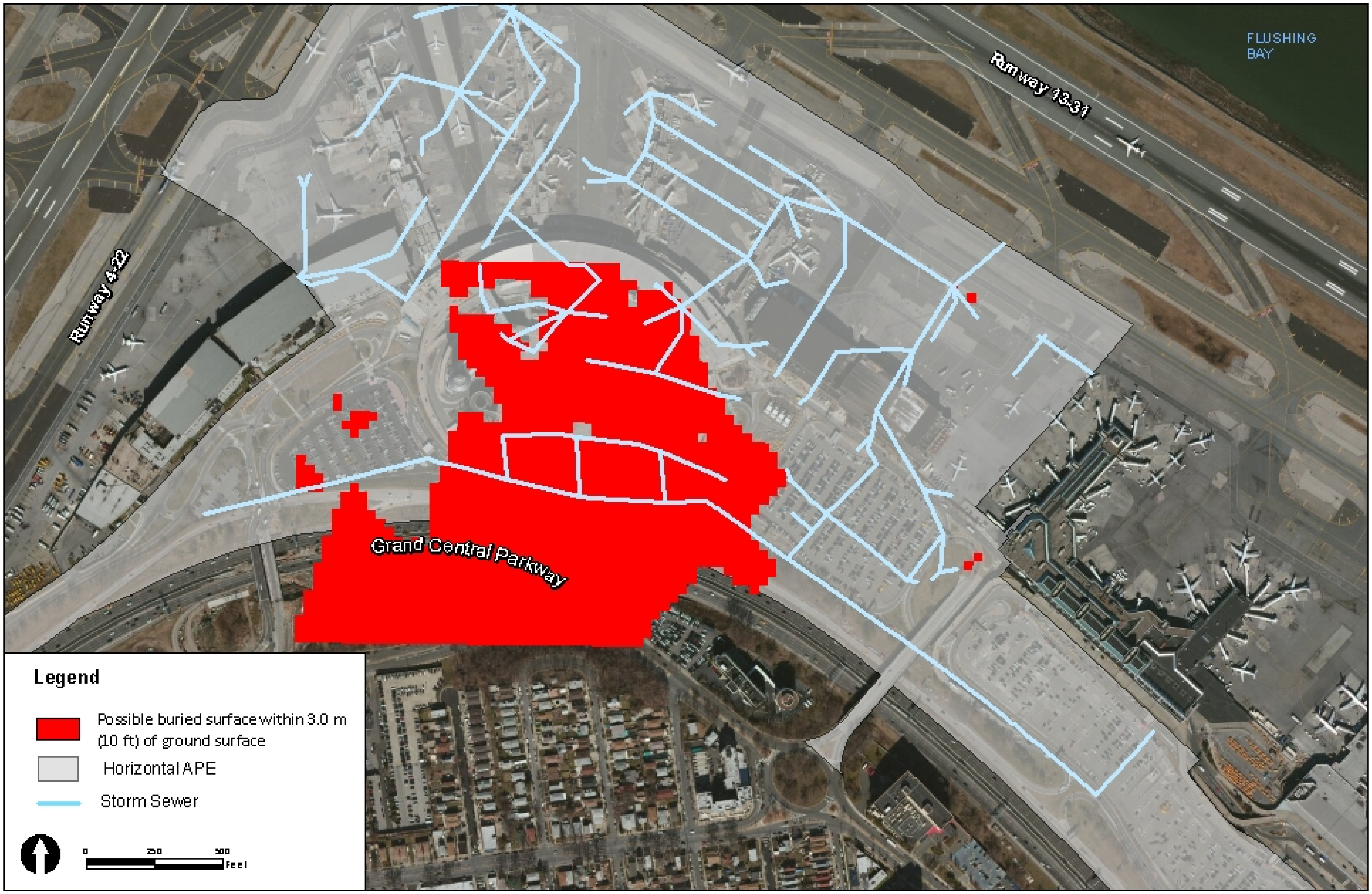


Source: ESRI 2013a; SOM 2013
Prepared by: AECOM

Figure 13

CTB Redevelopment Program
Environmental Assessment
LaGuardia Airport
THE PORT AUTHORITY OF NY & NJ

Comparison of Water and Santiary Sewer Utilities with Organic Horizon

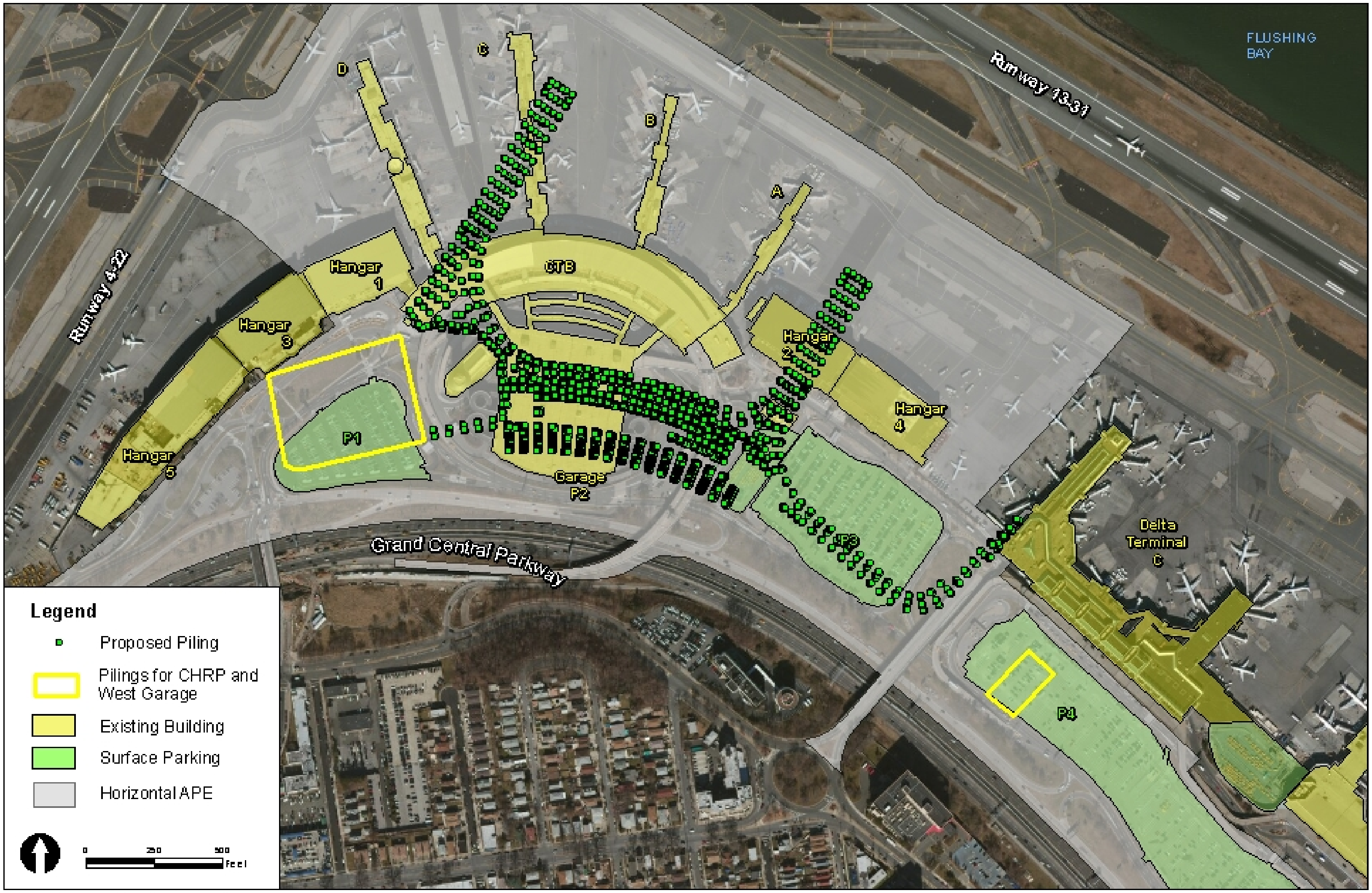


Source: ESRI 2013a; SOM 2013
Prepared by: AECOM

Figure 14

CTB Redevelopment Program
Environmental Assessment
LaGuardia Airport
THE PORT AUTHORITY OF NY & NJ

Comparison of Storm Sewer Utilities with Organic Horizon



Source: ESRI 2013a; SOM 2013
Prepared by: AECOM

Figure 15

CTB Redevelopment Program
Environmental Assessment
LaGuardia Airport
THE PORT AUTHORITY OF NY & NJ

Comparison of Proposed Pilings to Existing Piling Foundations

6.0 SOURCES

Mikolic, Frank, John Lawrence and Brian Albright
2013 *Phase IA Archaeological Survey Report*. Prepared by AECOM for FAA and PANYNJ for submittal to NYSOPRHP.

National Cartography & Geospatial Center (NCGS) – Natural Resources Conservation Service – United States Department of Agriculture
n.d. *National Elevation Dataset 10 Meter 7.5x7.5 minute quadrangles* [raster digital data]. National Cartography and Geospatial Center: Fort Worth, Texas. Available online at http://datagateway.nrcs.usda.gov/.

Port Authority of New York and New Jersey (PANYNJ)
2010 Central Terminal Building Modernization Geotechnbical Subsurface Data Review & Preliminary Foundation Design Alternatives. August 6, 2010/.

SOM
2013 LaGuardia Airport Development Program Central Terminal Building. CAD files. Prepared by SOM for FAA and PANYNJ.

Wagner, Daniel
2013 personal communication; August 2, 1013.

APPENDIX A

CORRESPONDENCE

OFFICE OF PARKS, RECREATION, HISTORIC PRESERVATION
NEW YORK STATE

New York State Office of Parks, Recreation and Historic Preservation

Division for Historic Preservation
P.O. Box 189, Waterford, New York 12188-0189
518-237-8643

Andrew M. Cuomo
Governor

Rose Harvey
Commissioner

18 July 2013

Mr. Edward Knoesel
Manager, Environmental Services
Aviation Department
Port Authority of NY & NJ
225 Park Avenue South
New York, NY 10003

Re: FAA, PA
Central Terminal Building at LaGuardia Airport
Borough of Queens, Queens County
12PR05127

Dear Mr. Knoesel:

The State Historic Preservation Office (SHPO) has reviewed the information submitted for this project (*Phase IA Archaeological Survey Report, LaGuardia Airport Central Terminal Building Redevelopment, Queens Borough, New York City*; dated June 2013; prepared by AECOM). Our review has been in accordance with Section 106 of the National Historic Preservation Act and relevant implementing regulations.

SHPO has the following comments and requests for additional information regarding this report.

1. We concur with the report's recommendations regarding the "Areas of Archaeological Potential" 1-4 (p. 32). Please provide details regarding the depth of planned excavation in Area 1 when these become available so that consideration may be given to the need for archaeological monitoring.
2. SHPO requests additional information regarding the portions of the Area of Potential Effects (APE) encompassing areas that were open water prior to filling (Figure 8). During the early to mid Holocene much or all of this area would have been dry land. Post-glacial sea level rise would have gradually inundated this area, depositing sediments which could contain archaeological materials. These sediments appear to be represented by the "Organic Clays and Silts" described in the geotechnical report (Appendix B). Please provide a comparison of the vertical APE in these areas with the documented depths of the organic deposits. If the vertical APE intersects the organic deposits, please provide a geoarchaeological assessment of whether archaeological sites might be preserved in this context.

SHPO will continue consultation regarding this project once the requested information has been received.

If you have any questions please don't hesitate to contact me.

Sincerely,

Philip A. Perazio, Historic Preservation Program Analyst – Archaeology Unit
Phone: 518-237-8643 x3276; FAX: 518-233-9049
Email: Philip.Perazio@parks.ny.gov

Cc: John Lawrence, AECOM (via email)
Brian Albright, AECOM (via email)

APPENDIX B

CTB MODERNIZATION GEOTECHNICAL SUBSURFACE REVIEW

LAGUARDIA AIRPORT

CENTRAL TERMINAL BUILDING MODERNIZATION

GEOTECHNICAL SUBSURFACE DATA REVIEW

& PRELIMINARY FOUNDATION DESIGN ALTERNATIVES

August 6, 2010

TABLE OF CONTENTS

LIST OF APPENDICES:

Appendix A – GEOTECHNICAL SUBSURFACE EXHIBITS

Appendix B – SUBSURFACE INVESTIGATIONS

LIST OF APPENDICES (Continued):

Appendix C – SEISMIC FIGURES

Appendix D – URS LETTER REPORT – SEISMIC GROUND MOTION DEVELOPMENT

Appendix E – COMPARISON OF FOUNDATION TYPES

Appendix F – PRESENTATION OF 3D SUBSURFACE VISUALIZATION (DVD)

1. Introduction

The Port Authority of New York and New Jersey is planning for the modernization of the Central Terminal Building (CTB) and other facilities at LaGuardia Airport. The construction cost of the overall program is expected to be between 3 and 4 billion dollars and is scheduled for project completion by the end of 2020. There are presently several modernization schemes under consideration. The approximate limit of the area within which the various schemes are located is shown by the outline in Exhibit 1 of Appendix A.

LaGuardia Airport has historically been one of the most difficult Port Authority facility sites in terms of foundation design and construction. The most significant reason for these difficulties is the presence of a deep deposit of soft organic clay and silt, which pervades the site. Most of the airport is constructed on land that has been reclaimed from the adjacent bay by placing up to 30 feet of incinerated refuse and miscellaneous fill over the tidal mud flats of the soft clay deposit. The result of this has been post-construction and continuing settlements of up to 8 feet in some areas. These settlements have caused significant structural and operational challenges over the years. These include some pile foundation issues due to "downdrag" loading (discussed in the Foundation Design section), flooding of portions of the airfield, buried utility ruptures due to differential settlements at building interfaces, and sidewalk and apron subsidence issues.

2. Scope of Geotechnical Effort and Report

The scope of this Pre-stage I Geotechnical effort was to compile and evaluate the existing subsurface information throughout the potential project areas of the facility, identify areas where additional Geotechnical data will be required, and provide some preliminary design criteria and foundation concepts consistent with the pre-Stage I planning state of the project design. A limited subsurface investigation was also conducted as described in a later section.

Also included in this Pre-stage I Geotechnical effort was an initiative for the development of a 2D cross-section generating tool and a 3D visualization instrument for presentation and analysis of selected subsurface geotechnical information residing in the EQUIS database.

3. Available Geotechnical Data

A review of all existing Geotechnical data was conducted, including the CAD database, the Soil Log (SL) Drawings, and the existing EQUIS database. The EQUIS database includes: a) test boring information, such as boring locations and subsurface stratigraphy and b) the results of field and laboratory tests. The SL drawings reviewed for this effort are listed in Table B, of Appendix B.

However, given the general similarity of soil strata across the entire airport, laboratory test data from borings from other areas of the airport was used to develop the general soil properties characterization of the subsurface strata presented herein. The results of laboratory tests available in the EQUIS database are also presented in the Consolidation Summary Report, Strength Summary Report and Index Property Summary Report included in Appendix B.

As a result of our review, we realized that many of the existing historic borings for the LaGuardia facility were not imported with full detail into the EQUIS data base. Some of the similar subsurface layers described on the actual field logs were combined into composite strata, losing continuity with the more recent boring entries. At the times of import this was done because of budgetary constraints. Therefore, the characterization of subsurface conditions based on the EQUIS data base must be supplemented with data from the original soil logs.

4. CAD 3D Visualization Effort

The effort undertaken in this initial phase of our pilot program was to develop the capability of connecting the AutoCAD Civil3D resource to the information contained in the existing EQUIS database and interrogating that database to drive the creation of Civil3D entities, such as points and surfaces. These products will be used to visualize the subsurface information from EQUIS in both a 2D cross-sectional and 3D visualization format.

As a result of this task completion, the ability now exists to select specific site boundaries, outlines, alignments, or series of borings and generate sets of "stick log" diagrams which are then used to produce the subsurface 2D cross-sectional profiles. From this subsurface profile base, the 3D visualizations and cutaway views can also be generated including the ability to rotate the subsurface model and also superimpose the proposed foundation outlines. The ability to generate contours of the top, bottom, or even the thickness values of any subsurface strata, within our selected site boundaries, is perhaps the most useful of the tools that have been developed as a result of this effort.

Some examples of the types of exhibits and design graphs or drawings that can be produced are included in Appendix A, entitled "Geotechnical Subsurface Exhibits". Exhibit 1 outlines the limits of the area within which the still active schemes are located, shows the locations of all previous borings drilled within the study area, and illustrates where our study cross-sections were taken in plan. Exhibits 2, 3, and 4, show the "stick log" diagrams of Cross Sections A, B, and C. Exhibits 5, 6, and 7, depict the subsurface soils profiles based on these same Cross Sections A, B, and C. Exhibit 8 is 3D visualization of the subsurface materials, based on Cross Sections B and C, and represents the CAD end product from the illustration point of view. Exhibits 9, 10, and 11, are contour maps which represent the Fill Materials Stratum thickness, the Organic Clay and Silt Stratum thickness, and the top of rock depth, respectively. These last three exhibits represent the most powerful of the AutoCAD development tools from a foundation design perspective. Additional, more specific profiles can easily be generated as required by the planning consultant.

These exhibits illustrate the general subsurface conditions within the limits of the project area and beyond. For example, review of Exhibit 10, Organic Clay and Silt Thickness Contours, indicates that the thickness of the organic stratum generally decreases from about 40 to 45 feet at the CTB to about 5 to 10 feet at the southern edge of the parking garage structure. Similarly, Exhibit 11, Top of Bedrock contours, indicates that the depth to the top of rock appears to vary vary from about 150 ft. at the western most extremity of the project outline, to about 190 ft. as we travel in a south-westerly direction.

An illustrative Presentation DVD has been provided, in Appendix F to this report to more completely demonstrate some of the capabilities of the 3D visualization tool that has been developed, to date.

5. Overview of Subsurface Conditions

LaGuardia Airport lies in a glaciated region north of the Harbor Hill Terminal Moraine. Pleistocene deposits consisting of glacial till, ground moraine, and glacial lake deposits directly overlie Precambrian crystalline rock (gneiss classification). The glacial soils were subsequently covered with a deposit of marine clay when the rise in sea level flooded the area and created the present bay environment. As previously stated, much of the airport resides on land which was reclaimed from the adjacent bays by filling with a partially incinerated refuse and miscellaneous fill.

The general idealized sequence of soil stratification at the LaGuardia site is as follows,

Stratum A – Fill Materials: This upper heterogeneous fill layer consists of coarse to fine sand, crushed rock and gravel, cinders, concrete, brick, glass, wood, and other forms of debris. This stratum extends essentially from existing grade to 10 to 30 feet below the surface. The compactness of this fill ranges from relatively dense within the top fifteen feet to loose, below that top zone.

Stratum B – Organic Clays and Silts: This layer immediately underlying the upper fill strata, consists of soft organic clay and silt materials with a thickness that varies mostly from 20 to 30 feet, with some isolated areas with as much as 50 feet. These strata component materials are still suspected to have significant consolidation potential in certain locations.

Stratum C – Sand Materials: This next layer consists of coarse to fine sand of medium density, ranging in thickness from about 10 to 20 feet.

Stratum D – Varved Silt and Clays: This approximately 50 to 60 feet thick deposit is composed primarily of varved silt and clay material, tending to be overconsolidated and stiff towards the upper portion of the strata and becoming softer with depth in some locations.

Stratum E – Sand / Glacial Till Materials: Below the varved silt and clay is a dense layer of glacial till, consisting primarily of sand, traces of inorganic silt, gravel, boulders and cobbles with thickness varying from 5 to 15 feet.

Stratum F – Decomposed Rock: There is a layer of decomposed or weathered rock, which generally consists of a very dense mixture of sand, silt and gravel. Its thickness can vary from 10 feet up to as much as 45 feet.

Stratum G – Bedrock: The bedrock is a sound quality gneiss, varying in depth from 150 to 190 feet below the ground surface within the project outline. This is as illustrated in the rock contour exhibit in Appendix A.

These layers occur typically in this order and these thicknesses, but with local gaps or intrusions occurring, depending on which geological area of the overall airport site is being considered. Note that there is a subtle delineation between the materials of Stratum E (Sand / Glacial Till Materials) and the decomposed rock classification of Stratum F.

As can be seen in the Subsurface Soils Profiles A and B in Appendix A, there are also significant intrusions of boulders at random depths, particularly in the upper sand strata just below the organic clays and silts, and in the sand / glacial till strata just above the decomposed rock. Red zones shown on the soil profiles indicate the presence of boulders. The presence of boulders in the upper strata would be considered more of a foundation issue from a standpoint of the installation of a pile foundation option.

The following table represents a summary of suggested average design parameters for the soil materials strata, based on the existing sample and testing information that resides in the Geotechnical database:

Stratum	Total Unit Weight (pcf)	Angle of Internal Friction (deg.)	Blow Counts (N)	CR	RR	p_c (psf)
Fill Materials	105	30	18	___		___
Organic Clays & Silts	100	___	4	.25	.03	*
Sand Materials	120	35	56	___		___
Varved Silt & Clays	125	___	35	.16	.04	*
Sand / Glacial Till Materials	135	38	70	___	___	___
Decomposed Rock	___	___	85	___	___	___

***** p_c or Pre-consolidation Pressure (see Consolidation Summary Report of Appendix B for test values)
Notes: CR or Compression Ratio = $C_c / (1 + e_0)$
RR or Recompression Ratio = $C_r / (1 + e_0)$

6. Subsurface Investigation

At this time, because of the early stage of the project, it was decided to perform only three borings along the existing Concourse A. That is where some of the thickest layers of the soft organic clay and silt deposits are found. The borings are numbered 3-177 through 3-179, and the drilling operations included obtaining some undisturbed Shelby tube samples of the compressible stratum. These undisturbed samples are currently undergoing consolidation testing in the Port Authority Materials Engineering Geotechnical Laboratory. The boring locations and soil logs are shown in Appendix B.

The laboratory test results will be used to begin an evaluation of the consolidation potential and resulting downdrag phenomena that will occur with the deep foundation alternatives (discussed in the Foundation Design section). Of particular interest, and most pronounced in the areas where these new borings were taken, is the possibility that the fill beneath the existing gate fingers is hanging up on the piles and that the underlying clays have not felt the full weight of the fill causing underconsolidation. Underconsolidated soils are those that have not yet been fully consolidated under the existing overburden pressures and, consequently, are susceptible to significant additional settlement.

7. Seismic Design Discussion

To develop the required parameters for determination of seismic loads imparted to the anticipated structures, a first step evaluation of the subsurface conditions was undertaken to establish the project site class. A copy of Table 1615.1.1 of the 2008 New York City Building Code (NYCBC) giving the definitions of the various site classes is presented in Figure 1, Appendix C. For site classes up to and including Class E, a site specific analysis is not required. Parameters given in the NYCBC for the base rock acceleration and the code procedures given for development of the response spectra, considering soil amplification, may be used for each of those classes. If the site is characterized as Class F, however, a site-specific dynamic response analysis must be performed.

7.1 Site characterization:

As described in the Subsurface Conditions section of this report, the project site is covered with a layer of fill that varies in thickness from 10 to 30 feet. Beneath the fill, alternating layers of medium dense silty sand and silty clay are encountered down to the top of bedrock. In many areas, the fill layer is underlain by a 20 to 30 feet thick layer of soft organic clays and silts. Bedrock is encountered at a depth of 150 to 190 feet below grade.

The code gives ranges of several parameters that may be used to determine the appropriate site classification (see Table 1615.1.1). At our site, the most readily available parameter is the Standard Penetration Test or N value (representing hammer blows per foot) from the borings. In order to characterize the site class, it is necessary to calculate the average N value for a depth of 100 feet. Based on the existing borings at the site, the calculated average N value is in the range of 11 to 13 blows per foot (bpf). Since the average N value is less than 15 bpf, the site should be categorized as Class E.

Layers of sandy materials, however, with N values in a range of 4 to 7 bpf were found in some borings in both the fill layers and the sand layers underneath the organic clay and silt stratum. Sandy materials with this range of blow count near the surface and below the water table are susceptible to liquefy during earthquakes. In Figure 2 of Appendix C, entitled “Liquefaction Potential Assessment”, the N values for boring 2-081 are plotted together with a liquefaction assessment diagram from the NYCBC (Figure

1813.1), indicating that the N values for the layers of sand above and below the organic clay will have the potential to be liquefied. Additionally, in most of the borings in which organic soils were encountered, the thickness of the organics was greater than 10 feet. The presence of liquefiable soils or organic soils having a thickness greater than ten feet, automatically defines the site as Class F and, consequently, a site specific analysis is required.

In order to perform a site-specific analysis, rock outcrop ground motions are required as input to a computer program, such as PROSHAKE. This program does a one dimensional wave propagation analysis to determine how the shears, accelerations, and ground motions are amplified in the selected soil profile. From this analysis, a site-specific response spectrum is developed.

7.2 Input ground motion:

The 2008 NYCBC only provides ground accelerations for Class B rock at 0.2 sec and 1 sec and the procedures to develop a response spectrum for soil Classes A to E. Since the site for the terminal is classified as Class F and is underlain by Class A rock, rock motions for Class A rock are required in order to develop the soil response spectrum needed by the Structural Engineering Discipline to calculate the seismic forces. Since the codes do not provide the ground motions for the rock, synthetic ground motions that match the Class A rock spectrum (Figure 3) which is obtained from the code, need to be developed. These synthetic motions were generated by our consultant, URS Corporation, and are shown in Figures 2 through 4 of their report. The procedures used to match the target spectrum are presented in the URS letter report and included as an Appendix D.

7.3 Selected soil profile:

Four generic soil profiles were used to represent the site, as shown in Figure 4 of Appendix C. Soil Profile A represents the area with all sands. Profile B and C represent the areas with a thick organic layer underlain by a layer of sand for B and silty clay for C. Profile D represents an area where the organic clay is underlain by a layer of sand over the clay and silt. The top layer of sand for both soil Profiles B and D and the layer below the organic clay for soil Profile D were changed to liquefiable sand for the ground softening analyses.

The PROSHAKE program requires input of shear wave velocity data for each of the soil strata. The shear wave velocity for each soil stratum was determined using empirical equations that relate the shear wave velocity to the N value, as shown below:

$G = \gamma/g\ Vs^2$ and $G = 120N^{0.8}$ Then $Vs = 2780(N^{0.8}/\gamma)^{0.5}$ ft/sec

The input soil parameters used to generate the site-specific spectrum for 5% damping are shown in Table 1 (Figure 5 of Appendix C). The site-specific response spectra for the selected profiles are shown on Figure 6, Appendix C.

The long period of the response spectra were modified to account for possible soil softening due to cyclic loading during the earthquake due to liquefaction. The approximate method for considering the effects of liquefaction on the response spectrum was provided to us by Dr. Ricardo Dobry of Rensselaer Polytechnic Institute for work on another project. The method involves reducing the shear wave velocity used in the PROSHAKE analysis for the liquefiable soils. To develop the response spectrum shown in Figure 7, Appendix C, we reduced the shear wave velocity for the liquefiable soils to 150 fps. The effect of the liquefaction is to reduce the spectral accelerations in the short period range and increase them in the long period range.

7.4 Conclusion:

The maximum points, i.e. the envelope that encompasses the spectral accelerations for all the analyses are shown in Figure 8, Appendix C, together with the NYCBC Soil Class D and E response spectra.. Figure 8 indicates that for a structural fundamental period between 0 to 1 second, the spectral accelerations are close to the NYCBC Soil Class E and for long period structures (T >1.0 second), the spectral accelerations were impacted by soil softening due to liquefaction and the values are close to those of Soil Class D. Therefore, for this preliminary design stage, we recommend using the Soil Class E spectrum of the NYCBC for the fundamental period of the structure at T <1.0 second and the Soil Class D spectrum for T >1.0 seconds.

7.5 Recommendations for Further Study:

As the project phases advance and design efforts continue, there is a need for additional subsurface investigation not only to support the foundation design alternatives which are described in the following sections, but also for better definition of this seismic design issue. While carrying out the prescribed boring and sampling program, cross-hole measurements would be recommended to determine actual site-specific shear wave velocities for the various soil strata.

8. Considerations for Foundation Design

The existing CTB is a six-block long structure consisting of a four-story central section, two three-story wings, and four radiating concourses with a total of 40 aircraft gates. The building was expanded in both the 1990’s and early 2000’s. For this primary airport structure, the foundation design was based on end-bearing steel pipe piles founded on either the glacial till or decomposed rock as the bearing layer. The Parking Garage, the other major structure at the terminal proper, utilizes the same foundation design.

The top Fill and upper organic Clay and Silt layers are considered either too loose or relatively too soft to ultimately support the column loads for either a new terminal or parking garage. These planned structures would most likely need to be founded on a deep seated foundation system, below the soft organics at about a probable minimum depth of about 50 feet. The 10 to 20 foot medium dense sand layer encountered at that point might be considered a capable bearing stratum, but is sometimes to thin and erratic in nature, particularly in the area near Parking Lot #3. Below the sand layer is a stiff varved silt and clay, which might have been an adequate bearing stratum but is inconsistent with interbeds and some softer zones with depth.

Ultimately, either the glacial till or decomposed rock layer or the bedrock surface at probable depths of from 150 to 190 feet, will be the founding strata for a steel pipe pile or deep caisson design. The medium dense sand stratum below the soft organics could be suitable bearing layer for a tapered type pile foundation. These foundation types are among those discussed in the following Section 9, entitled "Foundation Alternatives".

The deep pile foundation alternatives will be subject to a negative skin friction or "Downdrag" effect caused by the continued consolidation of the soft organic clay and silt stratum. While the soils move downward around the pile shaft, a downward force is transferred from the soil, through the shaft, and into the pile tip at the bearing elevation. Based on past experience at the LaGuardia site in this project area, as much as 50 to 250 tons of downdrag force per pile might be anticipated depending on the type, diameter, and length of the piles as well as the thickness of fill and organic soils at any particular location. There are some techniques such as bitumen coatings which can be explored to reduce this downdrag effect. However, there is relatively little data to support the long term effectiveness of these techniques. The ultimate solution is to design the foundation system to withstand and accommodate the anticipated dragdown forces.

9. Foundation Alternatives

Due to the presence of the compressible clay layer of significant thickness, deep foundation alternatives will be the primary foundation types considered for support of major structures. Based on our Pre-Stage I level of design considerations, the suitable foundation types and anticipated capacities that can be considered are:

Steel Pipe Piles (with straight shaft):
Driven concrete filled steel pipe piles of 10 to 14 inch diameter with a length of about 120 feet at a tip elevation of approximately -100. These can provide an anticipated load capacity of 80 to 120 tons which would then have to be reduced by the amount of downdrag quantified at specific locations.

Steel Tapered Tube / Monotube Piles:
Driven concrete filled steel tapered tube piles or monotube piles with 14 to 18 inch diameter tapering to a 8 to 12 inch diameter, for a length of about 60 to 120 feet. These may provide a greater anticipated load capacity of 120 to 150 tons due to additional resistance provided by the taper in the bearing stratum, and a higher potential set-up value that might develop. This set-up additional load capacity, if any, tends to be site specific and would have to be investigated before use in the final foundation design. In areas where the sand layer underlying the organic clays is sufficiently thick, it may be feasible to achieve capacities 60 to 100 tons at significantly shallower depths. However, an assessment of the potential settlement due to compression of the clays below the sand layer would be required.

Drilled Caissons (bearing on or socketed into bedrock):
Auger installed 18 to 36 inch diameter caissons resting on the top of bedrock at a depth of from 150 to 180 feet below grade, providing a large end bearing capacity. Each caisson might provide a load capacity of 180 to 400 tons depending on the caisson diameter, also then subject to a reduction due to downdrag.

Auger installed 18 to 36 inch diameter caissons socketed into the bedrock at the same depths of 150 to 180 feet below grade with an additional 5 to 10 feet for socketing. The same large end bearing capacity is provided along with an additional substantial value of side friction between the caisson shaft and the rock. Each of these socketed caissons might provide a load capacity of 400 to 750 tons or greater, depending on the caisson diameter, the length of the socket and the structural capacity of the caisson, also then subject to a reduction due to downdrag.

All pile and caisson capacities would need to be verified with pile load testing. The table presented in Appendix E, represents the results of a preliminary comparison between the foundation types considered to be most appropriate, at this stage of the project design, for the existing subsurface conditions at LaGuardia.

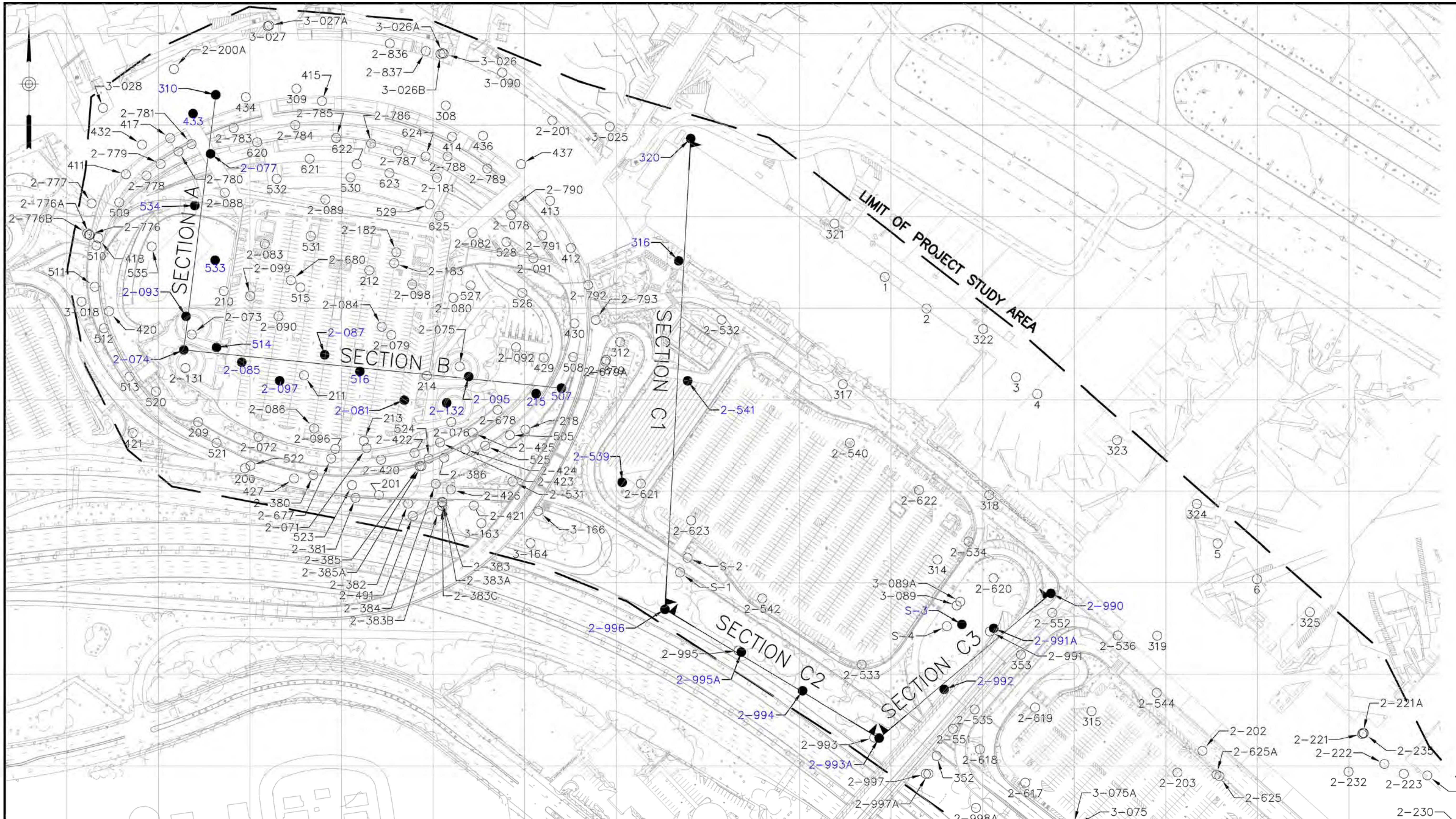
10. Conclusion

At this very preliminary stage in the LaGuardia Modernization Project, it is our recommendation, based on the existing subsurface data and our knowledge of past site foundation behaviors, to utilize the dense till/decomposed rock as the bearing stratum for a deep foundation system, thereby minimizing any potential settlement issues. Advancing the foundations deeper to the top and possibly even into the bedrock might be a preferred version of the deep foundation design, dependent on an analysis of the cost trade off between additional length and installation difficulty vs. increased capacity.

When a given design depth for optimum bearing has been more or less established, a further cost-benefit analysis will then need to be performed for the most effective diameter of the foundation elements (pile size vs. caisson). Ease of construction, amount of site disturbance, and relative reliability of the installations also need to be considered, along with the price. In view of the potentially large downdrag forces that are anticipated, it is likely that smaller diameter foundation elements may prove to be more economical.

ADDENDIX A

GEOTECHNICAL SUBSURFACE EXHIBITS



NOTE:
SOLID FILLED BOREHOLES ARE THOSE THAT HAVE BEEN INCLUDED IN THE STICK LOG CROSS SECTIONS.

0 200 400
HORIZ. SCALE IN FEET

THE PORT AUTHORITY OF NY & NJ			LAGUARDIA AIRPORT	Discipline: GEOTECHNICAL PROJECT SITE EXISTING BOREINGS AND SUBSURFACE SECTIONS	8/6/2010 Date Contract Number 09744000 PID Number	1 of 11 Workorder Number Drawing Number EXHIBIT 1
D.CAVALIERE Designed by	R.YIN Drawn by	S.LEIFER Checked by				

LEGEND:

310	BOREHOLE NUMBER
EL:16	BOREHOLE TOP ELEVAT
B/ft	SPT N VALUE
W%	WATER CONTENT (%)
HA	HAND AUGER

0 50 100

HORIZ. SCALE IN FEET

THE PORT AUTHORITY OF NY & NJ

D.CAVALIERE	R.YIN	S.LEIFER
Designed by	Drawn by	Checked by

LAGUARDIA AIRPORT

Discipline GEOTECHNICAL

BORING STICK LOG CROSS SECTION A

8/6/2010
Date

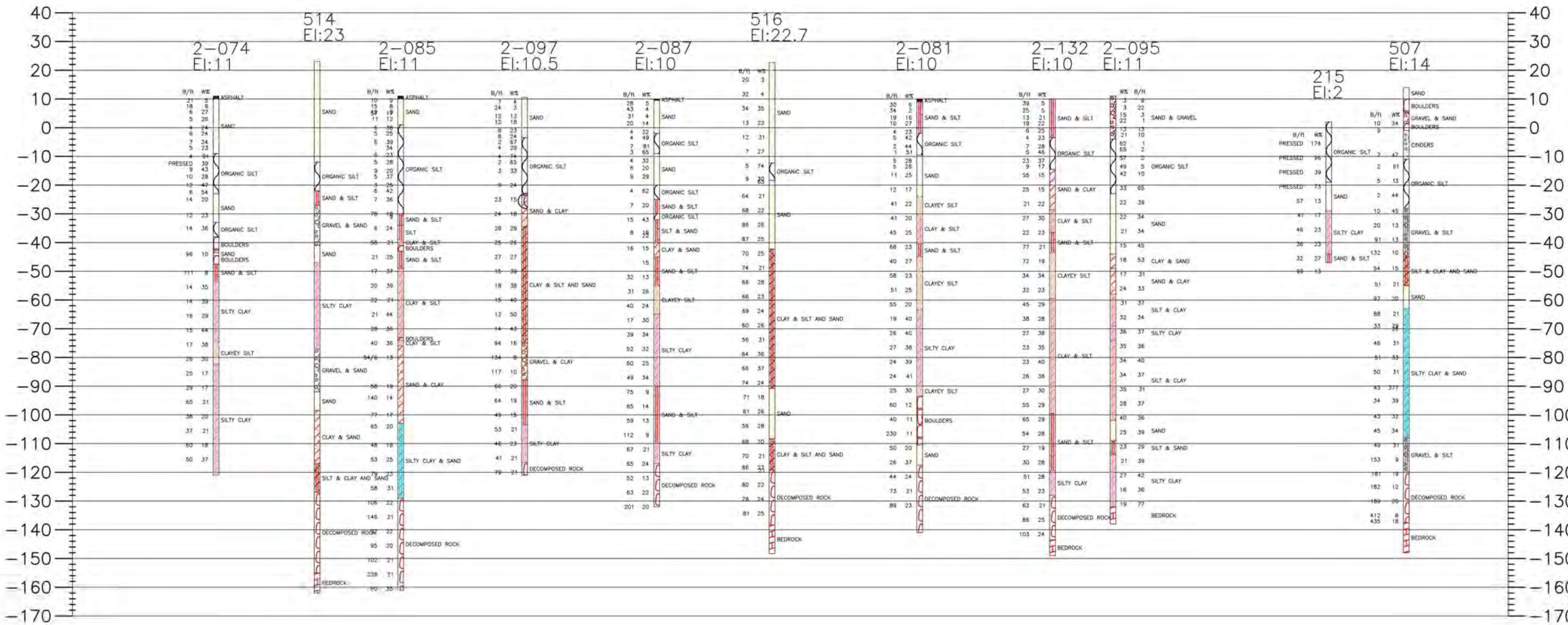
Contract Number

09744000
PID Number

2 of 11

Workorder Number

Drawing Number
EXHIBIT 2



LEGEND:

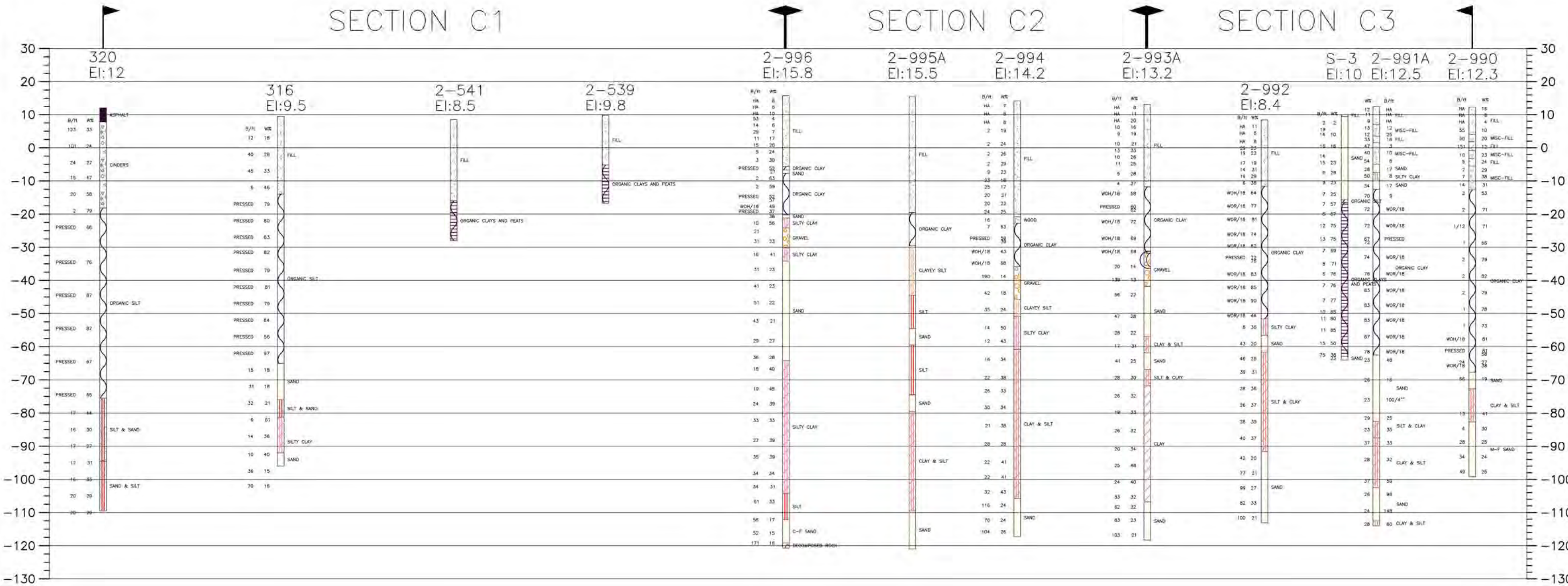
310	BOREHOLE NUMBER
EL:16	BOREHOLE TOP ELEVAT
B/ft	SPT N VALUE
W%	WATER CONTENT (%)
HA	HAND AUGER

0 80 160

HORIZ. SCALE IN FEET

THE PORT AUTHORITY OF NY & NJ

LAGUARDIA AIRPORT	Discipline: GEOTECHNICAL	8/6/2010 Date	3 of 11	Workorder Number
D.CAVALIERE (Designed by) / R.YIN (Drawn by) / S.LEIFER (Checked by)	BORING STICK LOG CROSS SECTION B	Contract Number	Drawing Number	EXHIBIT 3
		09744000 PID Number		

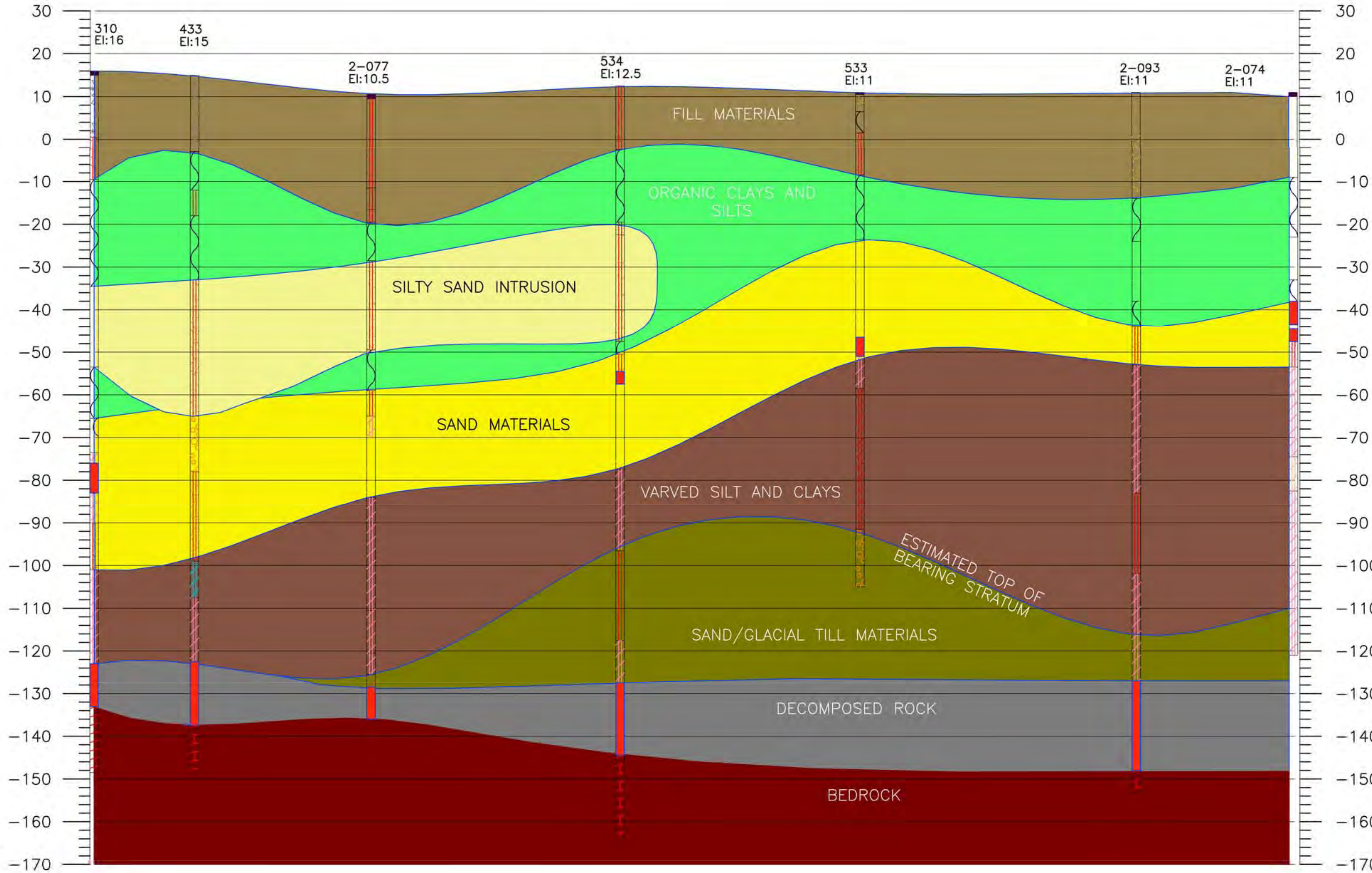


LEGEND:

310	BOREHOLE NUMBER
EL:16	BOREHOLE TOP ELEVAT
B/ft	SPT N VALUE
W%	WATER CONTENT (%)
HA	HAND AUGER

0 150 300
HORIZ. SCALE IN FEET

THE PORT AUTHORITY OF NY & NJ	LAGUARDIA AIRPORT	Discipline GEOTECHNICAL	8/6/2010 Date	4 of 11 Workorder Number
D.CAVALIERE Designed by / R.YIN Drawn by / S.LEIFER Checked by		BORING STICK LOG CROSS SECTION C	Contract Number / 09744000 PID Number	Drawing Number EXHIBIT 4



LEGEND:

- FILL MATERIALS
- CLAYS AND SILTS
- SAND MATERIALS
- VARVED SILT AND CLAYS
- SAND/GLACIAL TILL MATERIALS
- DECOMPOSED ROCK
- BEDROCK
- SILTY SAND INTRUSION
- BOULDERS

310 BOREHOLE NUMBER
EL:16 BOREHOLE TOP ELEVATION

0 50 100
HORIZ. SCALE IN FEET

THE PORT AUTHORITY OF NY & NJ

D.CAVALIERE	R.YIN	S.LEIFER	
Designed by	Drawn by	Checked by	

LAGUARDIA AIRPORT

Discipline: GEOTECHNICAL

SUBSURFACE SOILS PROFILE A

8/6/2010
Date

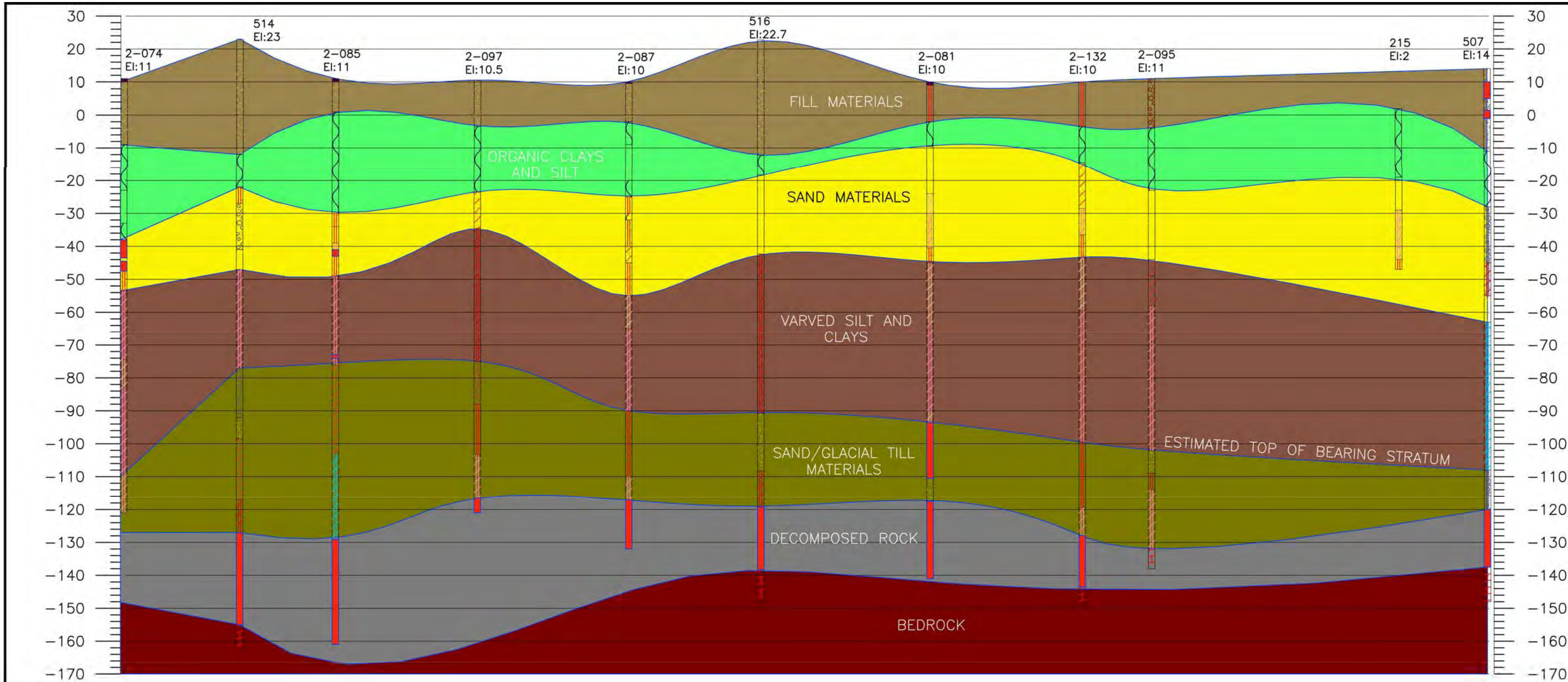
Contract Number

09744000
PID Number

5 of 11

Workorder Number

Drawing Number
EXHIBIT 5



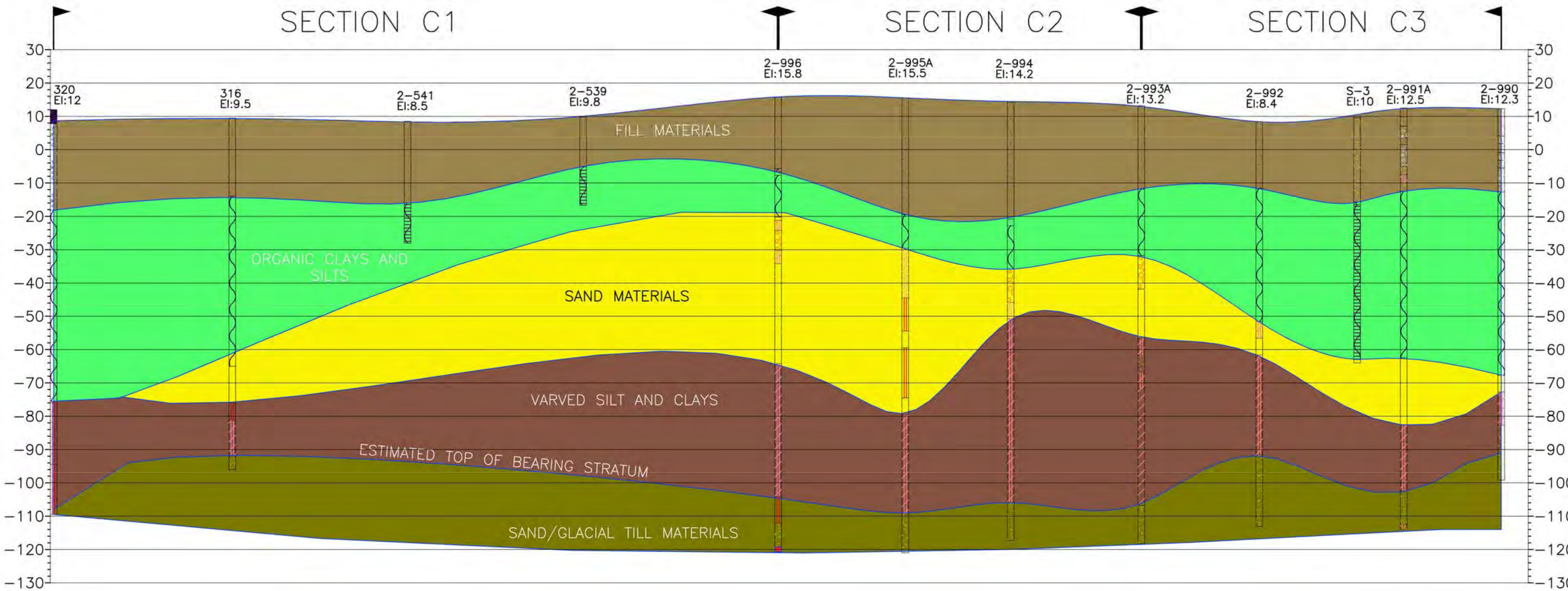
LEGEND:

- FILL MATERIALS
- CLAYS AND SILTS
- SAND MATERIALS
- VARVED SILT AND CLAYS
- SAND/GLACIAL TILL MATERIALS
- DECOMPOSED ROCK
- BEDROCK
- SILTY SAND INTRUSION
- BOULDERS

310 BOREHOLE NUMBER
EL:16 BOREHOLE TOP ELEVATION

0 60 100
HORIZ. SCALE IN FEET

THE PORT AUTHORITY OF NY & NJ	LAGUARDIA AIRPORT	Discipline GEOTECHNICAL	8/6/2010 Date	6 of 11 Workorder Number
D.CAVALIERE Designed by / R.YIN Drawn by / S.LEIFER Checked by		SUBSURFACE SOILS PROFILE B	Contract Number 09744000 PID Number	Drawing Number EXHIBIT 6



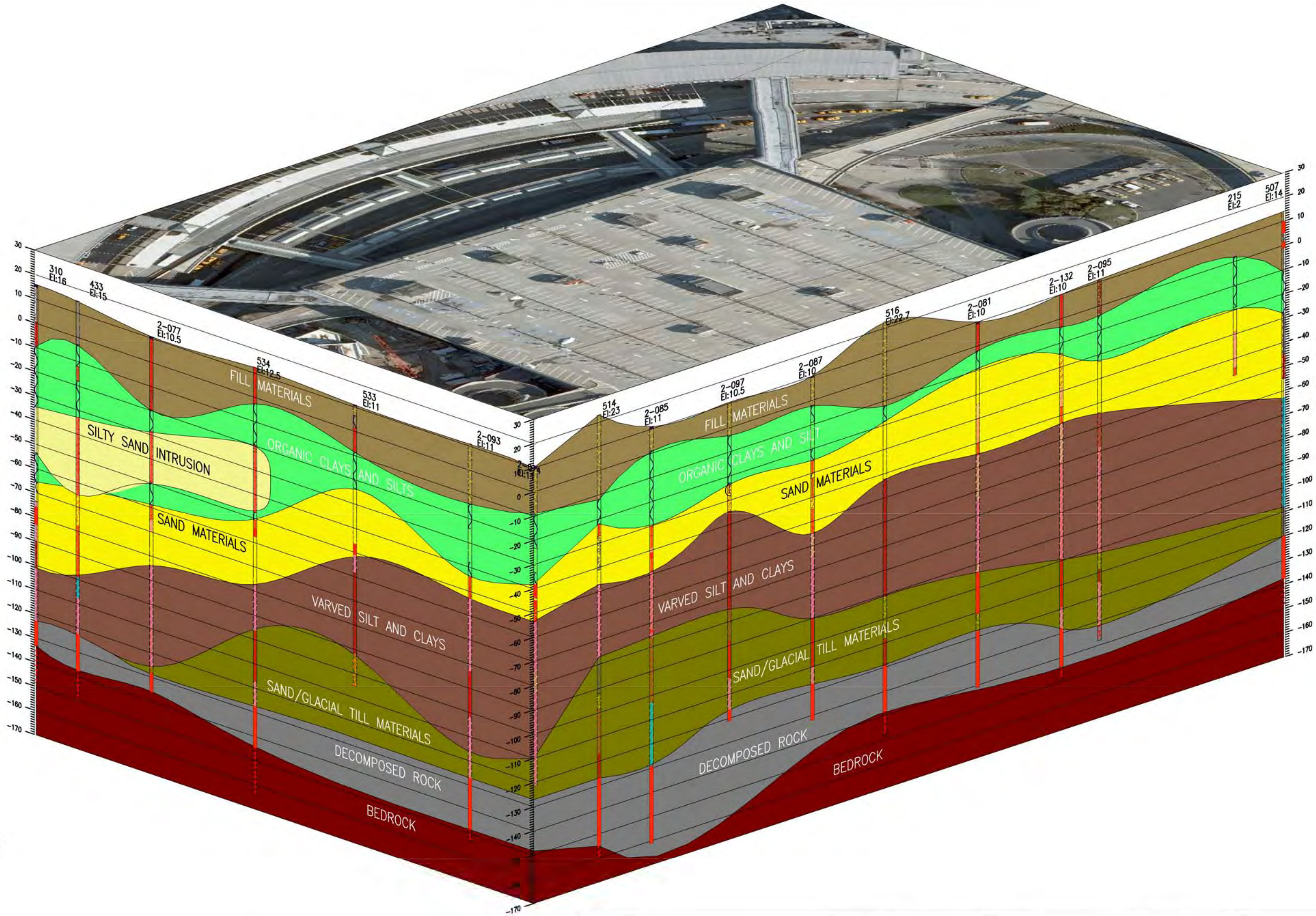
LEGEND:

- FILL MATERIALS
- CLAYS AND SILTS
- SAND MATERIALS
- VARVED SILT AND CLAYS
- SAND/GLACIAL TILL MATERIALS
- DECOMPOSED ROCK
- BEDROCK
- SILTY SAND INTRUSION
- BOULDERS

310 BOREHOLE NUMBER
EL:16 BOREHOLE TOP ELEVATION

0 150 300
HORIZ. SCALE IN FEET

THE PORT AUTHORITY OF NY & NJ	LAGUARDIA AIRPORT	Discipline: GEOTECHNICAL	8/6/2010 Date
D.CAVALIERE (Designed by) / R.YIN (Drawn by) / S.LEIFER (Checked by)		SUBSURFACE SOILS PROFILE C	Contract Number
			09744000 PID Number
7 of 11 Workorder Number			Drawing Number EXHIBIT 7



LEGEND:

- FILL MATERIALS
- CLAYS AND SILTS
- SAND MATERIALS
- VARVED SILT AND CLAYS
- SAND/GLACIAL TILL MATERIALS
- DECOMPOSED ROCK
- BEDROCK
- SILTY SAND INTRUSION
- BOULDERS

310 BOREHOLE NUMBER
EL:16 BOREHOLE TOP ELEVATION

0 80 160
HORIZ. SCALE IN FEET

THE PORT AUTHORITY OF NY & NJ	LAGUARDIA AIRPORT	Discipline GEOTECHNICAL	8/6/2010 Date	8 of 11 Workorder Number
D.CAVALIERE Designed by / R.YIN Drawn by / S.LEIFER Checked by		THREE-DIMENSIONAL SUBSURFACE SOILS PROFILE A + B	Contract Number 09744000 PID Number	Drawing Number EXHIBIT 8

STRATA THICKNESS TABLE

COLOR	THICKNESS RANGE (FEET)
(pale green)	0 TO 15
(bright green)	15 TO 30
(dark green)	30 TO 45
(darkest green)	45 TO 60

LEGEND:

(20) — — — THICKNESS OF FILL MATERIALS

NOTES:

1. HORIZONTAL CONTROL: ALL COORDINATES ARE REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83).
2. VERTICAL CONTROL: ALL ELEVATIONS SHOWN ARE IN FEET AND REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. CONTOURS AND STRATA THICKNESS MAPS ARE BASED ON EXISTING BORING DATA

0 200 400

HORIZ. SCALE IN FEET

THE PORT AUTHORITY OF NY & NJ

LAGUARDIA AIRPORT

Discipline: GEOTECHNICAL

FILL MATERIALS THICKNESS CONTOURS

D.CAVALIERE	R.YIN	S.LEIFER
Designed by	Drawn by	Checked by

8/6/2010
Date

Contract Number

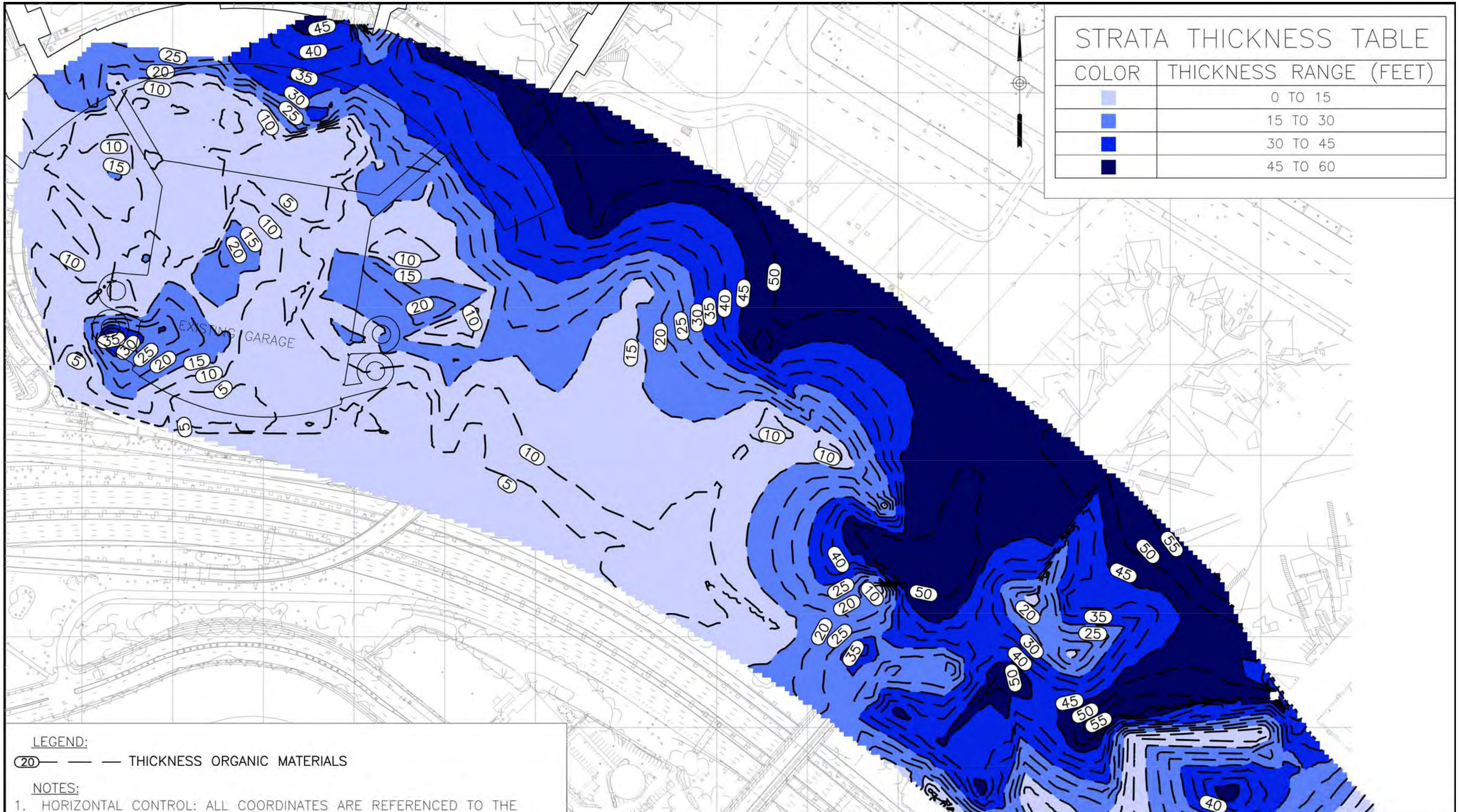
09744000
PID Number

9 of 11

Workorder Number

Drawing Number

EXHIBIT 9



STRATA THICKNESS TABLE

COLOR	THICKNESS RANGE (FEET)
(lightest blue)	0 TO 15
(light blue)	15 TO 30
(blue)	30 TO 45
(dark blue)	45 TO 60

LEGEND:

(20) — — — THICKNESS ORGANIC MATERIALS

NOTES:

1. HORIZONTAL CONTROL: ALL COORDINATES ARE REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83).
2. VERTICAL CONTROL: ALL ELEVATIONS SHOWN ARE IN FEET AND REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. CONTOURS AND STRATA THICKNESS MAPS ARE BASED ON EXISTING BORING DATA.

0 200 400

HORIZ. SCALE IN FEET

THE PORT AUTHORITY OF NY & NJ	LAGUARDIA AIRPORT	Discipline: GEOTECHNICAL	8/6/2010 Date	10 of 11 Workorder Number	
D.CAVALIERE (Designed by) · R.YIN (Drawn by) · S.LEIFER (Checked by)		ORGANIC CLAYS AND SILT THICKNESS CONTOURS	Contract Number 09744000 PID Number	Drawing Number EXHIBIT 10	

LEGEND:

(+5) — — — — — EXISTING SURFACE ELEVATION

(−5) ————— TOP OF BEDROCK ELEVATION

NOTES:

1. HORIZONTAL CONTROL: ALL COORDINATES ARE REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83).
2. VERTICAL CONTROL: ALL ELEVATIONS SHOWN ARE IN FEET AND REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. CONTOURS AND STRATA THICKNESS MAPS ARE BASED ON EXISTING BORING DATA.

0 200 400

HORIZ. SCALE IN FEET

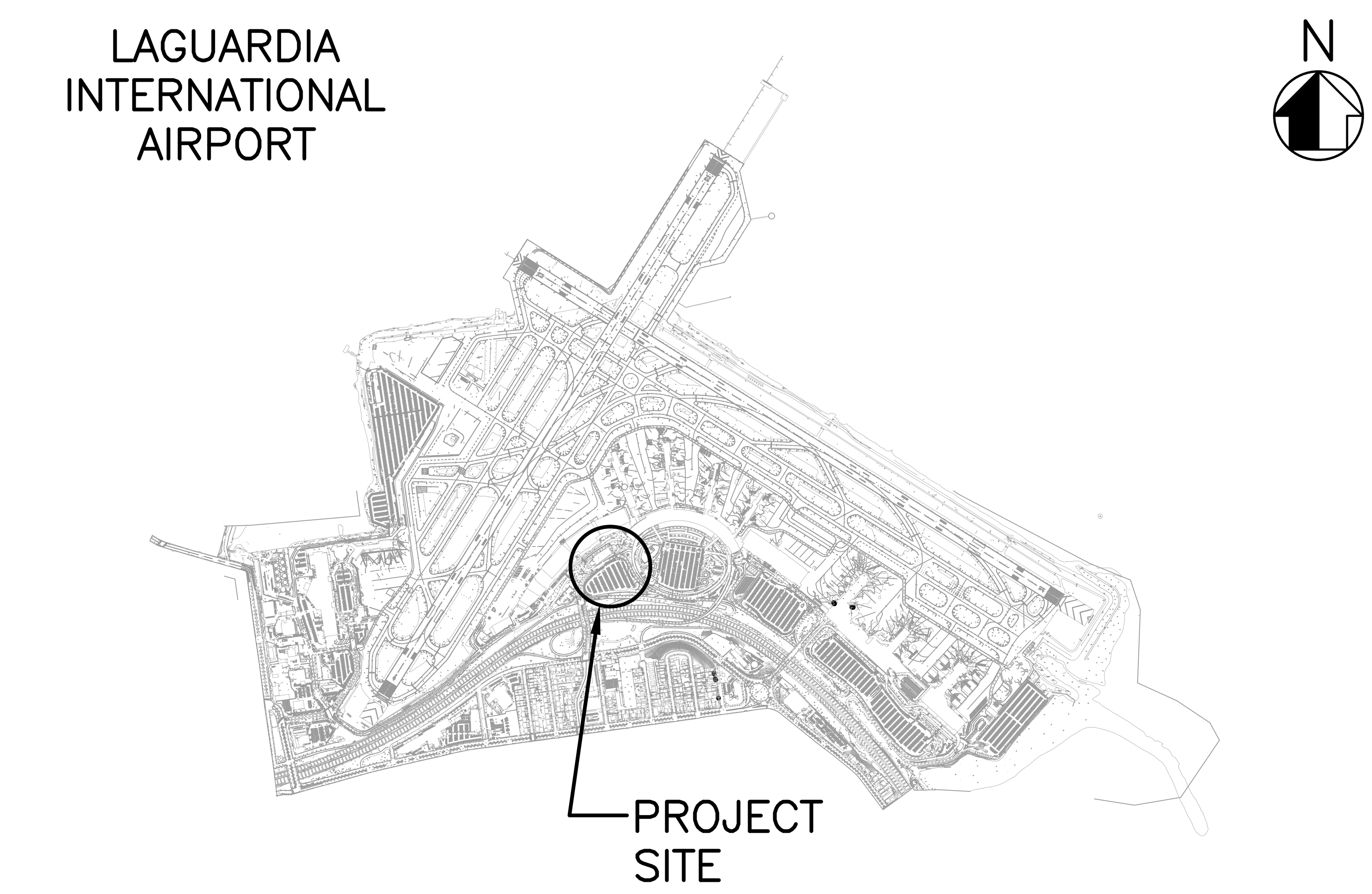
THE PORT AUTHORITY OF NY & NJ	LAGUARDIA AIRPORT	Discipline: GEOTECHNICAL	8/6/2010 Date
D.CAVALIERE (Designed by)	R.YIN (Drawn by)	S.LEIFER (Checked by)	TOP OF BEDROCK CONTOURS
Contract Number	09744000 PID Number	11 of 11 Workorder Number	Drawing Number EXHIBIT 11

APPENDIX C

WEST END GARAGE
GEOTECHNICAL BORING LOGS

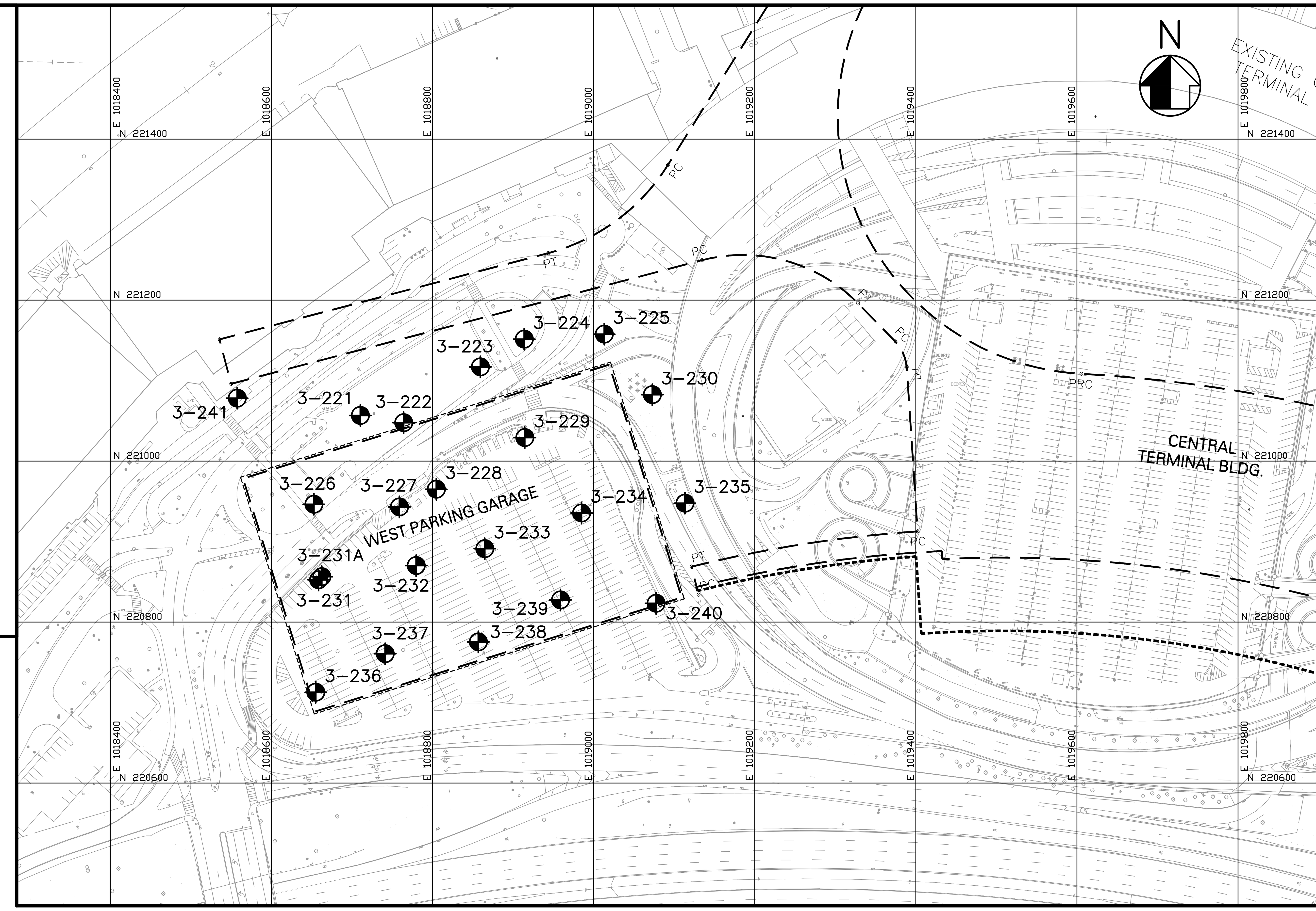
THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER



PROJECT SITE MAP

0 1300 2600
SCALE IN FEET



BORING LOCATION PLAN

0 100 200
SCALE IN FEET

SOILS CLASSIFICATION TERMINOLOGY

COMPONENT PROPORTIONS

AND	35% TO 50%
SOME	20% TO 35%
LITTLE	10% TO 20%
TRACE	1% TO 10%

FINE GRAINED SOILS

TERM	PLASTICITY INDEX
SILT	NON PLASTIC
CLAYEY SILT	1 TO 5
SILT & CLAY	5 TO 10
CLAY & SILT	10 TO 20
SILTY CLAY	20 TO 40
CLAY	40 PLUS

ABBREVIATIONS AND SYMBOLS

A	AUGER	LV	LABORATORY VANE TEST
AL	ATTERBERG LIMITS	M	MEDIUM
BLK	BLACK	NE	NOT ENCOUNTERED/RECORDED
BR	BROWN	OER	OPEN END ROD
C	COARSE	PI	PLASTICITY INDEX
CBR	CBR TEST	PL	PLASTIC LIMIT
CD	CONSOLIDATED DRAINED	REC	RECOVERY
CM	TRIAXIAL SHEAR TEST LABORATORY COMPACTION TEST	RQD	ROCK QUALITY DESIGNATION
		T	TRAP USED
CO	CONSOLIDATION TEST	TR	TRACE
CU	CONSOLIDATED UNDRAINED TRIAXIAL SHEAR TEST	U	UNDISTURBED SAMPLE
		UC	UNCONFINED COMPRESSION TEST
DK	DARK	UU	UNCONSOLIDATED UNDRAINED TRIAXIAL SHEAR TEST
DS	DIRECT SHEAR TEST		
F	FINE	V	FIELD VANE TEST
GR	GRAY	WOH	WEIGHT OF HAMMER
GS	GRAIN SIZE TEST	WOR	WEIGHT OF ROD
GVL	GRAVEL		
LL	LIQUID LIMIT		
LT	LIGHT, LITTLE		

LA GUARDIA INTERNATIONAL AIRPORT

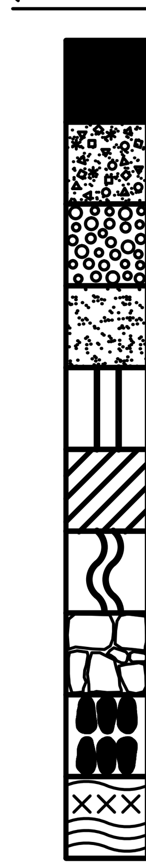
HORIZONTAL CONTROL

COORDINATES ARE BASED ON THE STATE PLANE NAD 83 LONG ISLAND.

VERTICAL CONTROL

ELEVATIONS REFER TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), ELEVATION 0.00' IS EQUAL TO NAVD88.

LEGEND
(FOR PRESENTATION OF BORINGS ONLY)



ASPHALT
MISCELLANEOUS AND MANMADE FILL
GRAVEL OR CRUSHED STONE
SAND
SILT
CLAY
ORGANIC SILTS AND CLAYS
BOULDERS, COBBLES OR ROCK FILL
DECOMPOSED ROCK
GNEISS

LEGEND:

3-221 BORING NUMBER
AS-DRILLED BORING LOCATION

AS-DRILLED BORING LOCATIONS

BORING NO.	NORTHERLY	EASTERLY	SURFACE ELEV.
3-221	221056.7	1018710.3	12.9
3-222	221047.6	1018764.1	13.0
3-223	221117.0	1018859.4	12.6
3-224	221151.5	1018913.9	12.7
3-225	221157.7	1019013.2	12.6
3-226	220946.4	1018652.7	14.3
3-227	220943.1	1018758.9	12.5
3-228	220964.9	1018804.7	12.5
3-229	221029.1	1018914.6	11.7
3-230	221082.4	1019072.9	13.0
3-231	220852.4	1018658.6	14.9
3-231A	220856.4	1018662.5	14.8
3-232	220870.1	1018779.7	14.0
3-233	220891.1	1018864.9	13.4
3-234	220935.6	1018985.0	12.2
3-235	220947.7	1019113.3	10.4
3-236	220712.8	1018655.1	18.4
3-237	220760.6	1018741.3	16.2
3-238	220775.3	1018856.9	14.1
3-239	220827.4	1018958.8	12.9
3-240	220823.3	1019077.6	11.6
3-241	221078.2	1018557.5	12.8

GENERAL NOTES

1. OVERBURDEN MATERIALS ARE CLASSIFIED IN ACCORDANCE WITH P.A. SOILS CLASSIFICATION SYSTEM (SF-92). SYMBOLS INDICATE MAJOR MATERIAL COMPONENTS ONLY (I.E., GENERALLY MORE THAN 35%).
2. THE DESCRIPTIVE TERM "SAME" REFERS TO THE SAMPLE DESCRIPTION LISTED IMMEDIATELY ABOVE (I.E., THE NUMERICALLY PRECEDING SAMPLE NUMBER). EXCEPTIONS TO THIS DESCRIPTION, IF ANY, ARE NOTED FOLLOWING A COMMA.
3. W.L. – INDICATES THE LEVEL OF FREE WATER SURFACE IN THE GROUND AT THE TIME BORING WAS MADE AND WAS DETERMINED BY OBSERVATION IN THE BORING HOLE OR IN A WELLPOINT. SEE BORING REPORT FOR METHOD OF OBSERVATION AND ADDITIONAL INFORMATION. THE INDICATED WATER LEVELS MAY OR MAY NOT HAVE STABILIZED AT THE TIME OF THE REPORTED OBSERVATIONS AND ALSO MAY NOT REFLECT SEASONAL CHANGES, TIDAL INFLUENCES OR THE EFFECTS OF INTENSE RAINFALL OR RUNOFF. THE OBSERVED DATA MAY NOT REFLECT PERCHED OR ARTESIAN WATER LEVELS THAT MAY BE PRESENT IN THE VARIOUS STRATA ENCOUNTERED.
4. THE BORINGS SHOWN ON THE PRESENTATION OF BORINGS DRAWINGS WERE MADE BY A DRILLING CONTRACTOR AND WERE INSPECTED BY PERSONNEL (INSPECTORS) OF THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY. CERTAIN INFORMATION ON THESE DRAWINGS WAS OBTAINED FROM OBSERVATIONS BY THE INSPECTOR THAT ARE RECORDED ON FORMS ENTITLED BORING REPORT, DRILLING REPORT AND UNDISTURBED SAMPLES. SAMPLES HAVE ALSO BEEN EXAMINED AND CLASSIFIED IN THE LABORATORY. THE DESCRIPTIONS SHOWN ON THE PRESENTATION OF BORINGS DRAWINGS MAY NOT AGREE WITH THE DESCRIPTIONS SHOWN ON THE FORMS PREPARED BY THE INSPECTOR. THESE FORMS SHOULD BE CONSULTED FOR ADDITIONAL DETAILS REGARDING BORING OPERATIONS AND THE NATURE OF THE MATERIALS ENCOUNTERED. THESE FORMS AND A DESCRIPTION OF THE P.A. SOILS CLASSIFICATION SYSTEM (SF-92) ARE AVAILABLE FOR REFERENCE AND EXAMINATION IN THE DESIGN DIVISION OFFICES OF THE ENGINEERING DEPARTMENT.
5. THE SURFACE DATA REPORTED ON THE PRESENTATION OF BORINGS DRAWINGS AND THE FORMS ENTITLED BORING REPORT, DRILLING REPORT AND UNDISTURBED SAMPLES SHOW CONDITIONS ENCOUNTERED AND OBSERVED ONLY AT THE PARTICULAR POINTS FROM WHICH SOIL SAMPLES, ROCK CORE AND SUBSURFACE DATA WERE OBTAINED AT THE TIME THE TEST BORING WAS MADE.
6. SAMPLE NUMBERS DESIGNATED AS 'UA' AND 'UB' REPRESENT SHELBY TUBE TOP (UTOP) AND SHELBY TUBE BOTTOM (UBOT) RESPECTIVELY.
7. BORINGS NUMBERED 3-221 THROUGH 3-241 WERE COMPLETED IN CONJUNCTION WITH CHARGE CODE NUMBER CA02-121.201, "WEST END GARAGE".

NOTE: FOR PRESENTATION OF BORINGS, SEE DRAWINGS LGA-SL-316 THROUGH LGA-SL-323.

No.	Date	Revision	Approved
1	7/9/13	Revised Scale for BLP	N.Y.

ENGINEERING DEPARTMENT

LAGUARDIA AIRPORT

GEOTECHNICAL

Title

WEST END GARAGE

PROJECT SITE MAP, BORING LOCATION PLAN, GENERAL NOTES, LEGEND, ABBREVIATIONS & SYMBOLS, SOIL CLASSIFICATIONS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.
All recipients of Contract documents, including bidders and those who do not bid and their prospective subcontractors and suppliers who may receive all or a part of the Contract documents or copies thereof, shall make every effort to ensure the secure and appropriate disposal of the Contract documents to prevent further disclosure of the information contained in the documents. Secure and appropriate disposal includes methods of document destruction such as shredding or arrangements with refuse handlers that ensure that third persons will not have access to the documents' contents either before, during, or after disposal. Documents may also be returned for disposal purposes to the Contract Desk on the 3rd Floor, 3 Gateway Center, Newark NJ 07102 or the office of the Director of Procurement, One Madison Avenue, 7th Floor, New York NY 10010.
It is a violation of law for any person to alter a document in any way, unless acting under the direction of a licensed professional engineer or registered architect. If this document bearing the seal of an engineer/architect is altered, the altering engineer/architect shall affix to the document their seal and the notation "altered by" followed by their signature and the date of such alteration, and a specific description of the alteration.

N. YAKUBOV	A. COFRANCESCO	N. YAKUBOV
Designed by	Drawn by	Checked by

Date JUNE 19, 2013

Contract Number

Drawing Number LGA-SL-315

PID# NUMBER

BORING NO. 3-221

BORING NO.	DATE	PROJECT
3-221	01-23-13	WEST END GARAGE

LOCATION: N 221056.7 E 1018710.3
SURFACE ELEVATION: 12.9 | WL ELEVATION: 4.7 | BY: K.L. CHECKED BY: N.Y.

Blows per 6 in.: 1 3/8"ID spoon, 140 lb. hammer, 30" fall

SAMPLE NUMBER	WATER CONTENT (%)	BLOWS PER 6 IN. / ROCK CORE REPORT	SAMPLE CLASSIFICATION	ELEVATION (FEET)	LABORATORY TESTING
				12.9	
01	9	POST HOLE DIGGER	FILL-BROWN M-F SAND, LITTLE GRAVEL, TRACE SILT, ROOT FIBERS		
02	10	POST HOLE DIGGER	FILL-BROWN M-F SAND, LITTLE GRAVEL, SILT		
03	10	POST HOLE DIGGER	FILL-TAN FINE SAND		
04	14	3-2-2-2	FILL-TAN FINE SAND, LITTLE SILT		
05	33	4-2-2-2	FILL-TAN FINE SAND AND SILT		
06	30	2-2-2	FILL-TAN FINE SAND		
07	37	2-2-2	SAME		
08	25	2-1-3	SAME	-4.6	
09	22	8-9-5	GRAY SILT, TRACE FINE SAND		
10	31	6-6-6	SAME		
11	20	7-18-13	GRAY BROWN SILT, TRACE FINE SAND	-12.1	
12	13	5-6-9	TAN M-F SAND, SOME SILT, LITTLE GRAVEL	-17.1	
13	11	26-31-29	BROWN GRAVEL, LITTLE M-F SAND, SILT	-22.1	
14	12	20-37-31	BROWN FINE SAND, LITTLE SILT, TRACE GRAVEL		
15	17	16-20-18	GRAY M-F SAND, TRACE SILT	-32.1	
16	21	21-22-22	RED SILT		
17	22	11-10-15	GRAY SILT, LITTLE FINE SAND		
18	24	14-18-24	RED BROWN SILT, TRACE FINE SAND		
19	18	16-14-18	GRAY SILT, LITTLE TAN M-F SAND		
20	21	17-21-23	RED GRAY SILT		
21	32	8-10-16	GRAY CLAYEY SILT, TRACE FINE SAND	-62.1	
22	17	15-26-40	BROWN M-F SAND, LITTLE SILT, TRACE GRAVEL		
23	18	23-32-33	BROWN M-F SAND, TRACE GRAVEL		
24	12	24-30-33	BROWN M-F SAND, LITTLE GRAVEL	-77.1	
25	26	8-16-17	GRAY CLAYEY SILT, TRACE FINE SAND		
26	32	15-16-21	SAME		
27	31	10-14-18	SAME		
28	37	11-15-19	SAME	-97.1	
29	31	14-15-21	GRAY SILTY CLAY	-102.1	
30	31	8-12-17	GRAY CLAYEY SILT, TRACE FINE SAND		
31	32	12-15-19	SAME	-112.1	
32	31	9-14-17	GRAY SILTY CLAY, TRACE FINE SAND	-117.1	
33	24	13-20-27	GRAY FINE SAND, TRACE SILT		
34	16	19-27-30	GRAY GREEN C-F SAND, LITTLE SILT, GRAVEL		
35	16	29-44-50/0"	GRAY GREEN C-F SAND, SOME GRAVEL, LITTLE SILT	-131.1	
R1		REC=100% RQD=100%	GRAY GNEISS	-136.1	

BORING NO. 3-222

BORING NO.	DATE	PROJECT
3-222	01-25-13	LGA WEST END GARAGE

LOCATION: N 221047.6 E 1018764.1
SURFACE ELEVATION: 13.0 | WL ELEVATION: 2.8 | BY: K.L. CHECKED BY: N.Y.

Blows per 6 in.: 1 3/8"ID spoon, 140 lb. hammer, 30" fall

SAMPLE NUMBER	WATER CONTENT (%)	BLOWS PER 6 IN. / ROCK CORE REPORT	SAMPLE CLASSIFICATION	ELEVATION (FEET)	LABORATORY TESTING
				13.0	
01	3	POST HOLE DIGGER	FILL-TAN BROWN M-F SAND, LITTLE GRAVEL, TRACE SILT		
02	3	POST HOLE DIGGER	FILL-TAN BROWN M-F SAND, LITTLE GRAVEL, TRACE SILT		
03	6	POST HOLE DIGGER	FILL-TAN BROWN M-F SAND, TRACE GRAVEL, SILT		
04	14	1-2-1-2	FILL-TAN BROWN M-F SAND, TRACE SILT		
05	28	2-1-3-4	FILL-TAN BROWN M-F SAND, TRACE SILT (STRONG PETROLEUM ODOR)		
06	31	2-1-2	FILL-TAN GRAY FINE SAND, SOME SILT		
07	29	2-1-2	FILL-TAN FINE SAND, TRACE SILT		
08	30	2-1-2	FILL-TAN FINE SAND, LITTLE SILT	-4.5	
09	34	2-2-2	GRAY TAN SILT, TRACE FINE SAND	-7.0	
10	41	2-4-6	GRAY SILT AND SLIGHTLY ORGANIC CLAY, TRACE FINE SAND	-9.5	
11	11	40-25-11	TAN M-F SAND, LITTLE GRAVEL, TRACE SILT		
12	7	11-20-19	TAN C-F SAND, SOME GRAVEL, LITTLE SILT		
13	11	12-11-11	BROWN M-F SAND, LITTLE SILT, GRAVEL		
14	19	13-19-22	RED GRAY FINE SAND, SOME SILT		
15	21	22-31-32	SAME		
16	20	20-32-37	SAME		
17	18	19-28-37	SAME		
18	20	21-28-23	RED GRAY FINE SAND, LITTLE SILT	-47.0	
19	19	18-26-29	RED GRAY SILT, SOME FINE SAND		
20	23	17-30-19	SAME	-55.0	
21	32	5-9-11	GRAY SLIGHTLY ORGANIC CLAYEY SILT		
22	39	8-12-15	GRAY SILT AND SLIGHTLY ORGANIC CLAY	-67.0	
23	14	19-21-21	GRAY M-F SAND, TRACE SILT		
24	12	36-46-48	BROWN C-F SAND, LITTLE GRAVEL, TRACE SILT		
25	10	27-34-37	BROWN C-F SAND, TRACE GRAVEL, SILT	-82.0	
26	28	4-11-15	GRAY CLAYEY SILT, TRACE FINE SAND		
27U		PRESSED	NO RECOVERY	-87.0	
28	16	16-25-30	BROWN C-F SAND, TRACE GRAVEL, CLAYEY SILT		
29	15	20-22-28	BROWN C-F SAND, TRACE GRAVEL, SILT		
30	9	22-24-27	BROWN C-F SAND, LITTLE GRAVEL, TRACE SILT		
31	15	16-21-26	GRAY BROWN C-F SAND, TRACE GRAVEL, SILT		
32	15	19-20-22	SAME	-112.0	
33	31	20-23-28	GRAY SILT AND CLAY, TRACE GRAVEL	-117.0	
34	24	13-16-24	GRAY FINE SAND, TRACE SILT		
35	19	12-20-27	GRAY FINE SAND, TRACE GRAVEL, SILT		
36	9	17-25-25	GRAY C-F SAND, SOME GRAVEL, LITTLE SILT		
37	10	13-21-22	BROWN C-F SAND, SOME GRAVEL, LITTLE CLAY AND SILT		
38		100/4"	NO RECOVERY		
39	17	38-100/3"	BROWN M-F SAND, SOME SILT, LITTLE GRAVEL	-145.0	

BORING NO. 3-223

BORING NO.	DATE	PROJECT
3-223	02-01-13	WEST END GARAGE

LOCATION: N 221117.0 E 1018859.4
SURFACE ELEVATION: 12.6 | WL ELEVATION: 1.5 | BY: K.L. CHECKED BY: N.Y.

Blows per 6 in.: 1 3/8"ID spoon, 140 lb. hammer, 30" fall

SAMPLE NUMBER	WATER CONTENT (%)	BLOWS PER 6 IN. / ROCK CORE REPORT	SAMPLE CLASSIFICATION	ELEVATION (FEET)	LABORATORY TESTING
				12.6	
01	12	POST HOLE DIGGER	FILL-BROWN M-F SAND, LITTLE GRAVEL, TRACE SILT, ROOT FIBERS		
02	9	POST HOLE DIGGER	FILL-TAN M-F SAND, LITTLE GRAVEL, TRACE SILT		
03	8	POST HOLE DIGGER	SAME		
04	21	6-6-7-8	FILL-TAN C-F SAND, LITTLE WOOD, TRACE GRAVEL, SILT		
05	26	7-5-4-4	FILL-TAN M-F SAND, TRACE SILT		
06	44	2-2-3	FILL-TAN M-F SAND, LITTLE SILT		
07	30	4-4-4	FILL-TAN M-F SAND, TRACE SILT		
08	30	5-6-6	FILL-TAN M-F SAND, LITTLE SILT	-4.9	
09	24	2-7-6	TAN SILT, LITTLE FINE SAND		
10U	24	PRESSED	BROWN CLAY AND SILT	-9.9	AL,UU,CO,SG
11	11	6-15-13	TAN M-F SAND, LITTLE GRAVEL, TRACE SILT	-12.4	
12	10	8-12-29	GRAY GRAVEL, SOME C-F SAND, TRACE SILT	-17.4	
13	19	13-17-19	TAN C-F SAND, TRACE GRAVEL		
14	18	15-13-16	BROWN M-F SAND, TRACE GRAVEL		
15	14	21-14-27	BROWN M-F SAND, TRACE SEA SHELLS	-32.4	
16	20	14-14-15	RED GRAY SILT, TRACE FINE SAND		
17	20	14-17-24	SAME	-42.4	
18	18	16-22-30	RED BROWN C-F SAND	-47.4	
19	21	19-19-30	RED GRAY SILT, TRACE FINE SAND		
20	20	22-29-34	SAME	-57.4	
21	31	7-10-15	GRAY SILTY CLAY		
22	30	6-10-19	SAME		
23	30	6-9-17	SAME	-74.4	
24	15	22-22-35	GRAY C-F SAND, SOME GRAVEL, TRACE SILT		
25	24	17-16-25	GRAY M-F SAND, TRACE GRAVEL	-82.4	
26	16	12-23-28	GRAY CLAYEY SILT, LITTLE GRAVEL, C-F SAND		
27	10	14-17-32	TAN SILT, SOME GRAVEL, LITTLE C-F SAND		
28	14	17-22-42	TAN CLAYEY SILT, LITTLE GRAVEL, C-F SAND		
29	16	17-17-30	GRAY BROWN SILT, SOME GRAVEL, LITTLE C-F SAND		
30	14	88-100/3	GRAY BROWN CLAYEY SILT, SOME GRAVEL, LITTLE C-F SAND	-107.4	
31	14	25-29-34	TAN C-F SAND, TRACE GRAVEL	-112.4	
32	28	16-31-41	GRAY CLAYEY SILT, TRACE FINE SAND	-117.4	
33	22	17-23-25	GRAY M-F SAND, LITTLE SILT		
34	24	18-25-31	GRAY M-F SAND, TRACE SILT	-127.4	
35	11	18-21-34	GRAY BROWN GRAVEL, LITTLE C-F SAND, TRACE SILT		
36	13	31-21-33	SAME	-137.4	
R1		REC=13% RQD=13%	GRAY GNEISS, BOULDER	-140.4	
37	20	24-27-31	GRAY GREEN C-F SAND, LITTLE GRAVEL, TRACE SILT		
38	12	25-22-34	TAN GRAY C-F SAND, LITTLE GRAVEL, TRACE SILT		
39	11	52-72-51	TAN GRAY M-F SAND, LITTLE GRAVEL, ROCK FRAGMENTS, TRACE SILT		
40	13	38-43-52	GRAY C-F SAND, LITTLE GRAVEL	-156.4	
R2		REC=94% RQD=70%	GRAY GNEISS	-161.4	

NOTE: FOR PROJECT SITE MAP, BORING LOCATION PLAN, LEGEND, GENERAL NOTES, ABBREVIATIONS, AND SOIL CLASSIFICATIONS, SEE DRAWINGS LGA-SL-315.

PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

LAGUARDIA AIRPORT

GEOTECHNICAL

Title: WEST END GARAGE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.
All recipients of Contract documents, including bidders and those who do not bid and their prospective subcontractors and suppliers who may receive all or a part of the Contract documents or copies thereof, shall make every effort to ensure the secure and appropriate disposal of the Contract documents to prevent further disclosure of the information contained in the documents. Secure and appropriate disposal includes methods of document destruction such as shredding or arrangements with refuse handlers that ensure that third persons will not have access to the documents' contents either before, during, or after disposal. Documents may also be returned for disposal purposes to the Contract Desk on the 3rd Floor, 3 Gateway Center, Newark NJ 07102 or the office of the Director of Procurement, One Madison Avenue, 7th Floor, New York NY 10010.
It is a violation of law for any person to alter a document in any way, unless acting under the direction of a licensed professional engineer or registered architect. If this document bearing the seal of an engineer/architect is altered, the altering engineer/architect shall affix to the document their seal and the notation "altered by" followed by their signature and the date of such alteration, and a specific description of the alteration.

N. YAKUBOV	A. COFRANCESCO	N. YAKUBOV
Designed by	Drawn by	Checked by

Date: JUNE 19, 2013

Contract Number:

Drawing Number: LGA-SL-316

PID# NUMBER

Sheet 3 of 9

BORING NO. 3-224 — DATE 03-26-13 — PROJECT: WEST END GARAGE

LOCATION: N 221151.5 E 1018913.9
SURFACE ELEVATION: 12.7 | WL ELEVATION: 3.9 | BY: M.O. | CHECKED BY: N.Y.

BLOWS PER 6 IN. — 1 3/8"ID SPOON, 140 LB. HAMMER, 30" FALL / ROCK CORE REPORT

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
12.7	18	HAND AUGER	01	FILL-BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL, GRASS ROOTS, TOPSOIL	
	14	HAND AUGER	02	FILL-BROWN C-F SAND, TRACE SILT, GRAVEL	
	9	HAND AUGER	03	SAME	
	15	3-2-9-49	04	SAME	
	12	WL 51-24-8-6	05	FILL-BROWN C-F SAND, LITTLE CRUSHED ROCK, GRAVEL, TRACE SILT	
	23	3-4-3	06	FILL-GRAY BROWN C-F SAND, LITTLE CRUSHED ROCK, GRAVEL, SILT, TRACE WOOD	
	20	3-5-5	07	FILL-BROWN C-F SAND, TRACE SILT, GRAVEL	
-2.3	23	2-2-2	08	GRAY BROWN M-F SAND, SOME SILT	
	27	3-2-4	09	BROWN M-F SAND, SOME SILT, TRACE SHELLS	
	13	5-2-2	10	BROWN M-F SAND, LITTLE SILT, GRAVEL	
	13	8-4-11	11	SAME	
	21	13-15-10	12	BROWN C-F SAND, SOME GRAVEL, TRACE SILT	
	12	12-16-22	13	BROWN M-F SAND, LITTLE SILT, TRACE GRAVEL	
	10	15-19-21	14	BROWN M-F SAND, LITTLE SILT, FRAGMENTED ROCK, GRAVEL	
	24	14-19-23	15	BROWN M-F SAND, LITTLE SILT	
	25	17-23-31	16	BROWN M-F SAND, TRACE SILT	
	19	17-30-39	17	SAME	
	15	27-33-39	18	BROWN C-F SAND, TRACE GRAVEL, SILT	
	20	8-11-14	19	RED BROWN M-F SAND, SOME SILT	
-52.3	31	3-3-5	20	BROWN GRAY VARVED SLIGHTLY ORGANIC SILTY CLAY, TRACE FINE SAND SEAMS	
	34	3-4-8	21	SAME	
	48	PRESSED	22UA	BROWN GRAY VARVED SILTY CLAY, TRACE FINE SAND SEAMS	AL
	33		22UB	SAME	UU,SG
	36	3-6-11	23	BROWN GRAY VARVED SLIGHTLY ORGANIC SILTY CLAY, TRACE FINE SAND SEAMS	
	47	6-10-14	24	SAME	
	49	6-9-15	25	SAME	
-77.3	31	10-12-24	26	GRAY BROWN VARVED SILTY CLAY, LITTLE FINE SAND SEAMS	
	17	35-41-46	27	GRAY BROWN VARVED SILTY CLAY, LITTLE FINE SAND SEAMS, 1 PIECE GRAVEL	
-87.3	17	46-43-55	28	BROWN GRAY FRAGMENTED ROCK, GRAVEL, SOME SILTY CLAY, LITTLE C-F SAND	
-92.3	11	32-35-54	29	BROWN GRAY C-F SAND, LITTLE SILT, GRAVEL	
	12	33-40-85	30	SAME	
		26-38-50/3"	31	SAME	
	13	44-41-43	32	SAME	
-112.3	31	23-39-47	33	GRAY BROWN VARVED SILTY CLAY, TRACE FINE SAND SEAMS	
-117.3	26	19-31-38	34	GRAY BROWN M-F SAND, LITTLE SILTY CLAY SEAMS	
-118.8					

BORING NO. 3-225 — DATE 03-26-13 — PROJECT: LGA WEST END GARAGE

LOCATION: N 221157.7 E 1019013.2
SURFACE ELEVATION: 12.6 | WL ELEVATION: 7.1 | BY: K.L. | CHECKED BY: N.Y.

BLOWS PER 6 IN. — 1 3/8"ID SPOON, 140 LB. HAMMER, 30" FALL / ROCK CORE REPORT

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
12.6	13	HAND AUGER	01	FILL-BROWN SILT, LITTLE GRAVEL, M-F SAND	
	9	HAND AUGER	02	FILL-BROWN SILT, SOME F SAND, LITTLE GRAVEL	
	15	WL HAND AUGER	03	FILL-TAN SILT, SOME FINE SAND, TRACE GRAVEL	
	15	1-1-1-2	04	FILL-TAN SILT, LITTLE FINE SAND, TRACE GRAVEL	
	23	1-1-2-3	05	FILL-TAN SILT AND FINE SAND, TRACE GRAVEL	
	21	2-2-4	06	FILL-TAN M-F SAND, SOME CLAYEY SILT, TRACE GRAVEL	
	20	1-1-1	07	FILL-TAN M-F SAND, SOME SILT, TRACE GRAVEL	
-2.4	25	2-2-3	08	GRAY M-F SAND, LITTLE SILT	
-4.9	34	1-1-2	09	GRAY SILT, LITTLE, TRACE GRAVEL, FINE SAND	
-7.4	33	1-1-2	10	GRAY SLIGHTLY ORGANIC CLAYEY SILT, TRACE GRAVEL, FINE SAND	
	29	2-2-5	11	SAME	
	24	1-2-1	12	BROWN SILT & SLIGHTLY ORGANIC CLAY & M-F SAND, LITTLE GRAVEL	
-17.4	12	12-6-4	13	BROWN GRAVEL, SOME C-F SAND, TRACE SILT	
	5	6-5-7	14	BROWN GRAVEL, LITTLE C-F SAND, TRACE SILT	
-27.4	21	5-7-8	15	BROWN M-F SAND, TRACE SILT	
	17	9-11-11	16	BROWN M-F SAND, TRACE GRAVEL, SILT	
-37.4	21	10-9-10	17	RED BROWN SILT, TRACE FINE SAND	
-42.4	34	5-6-8	18	GRAY SILT AND SLIGHTLY ORGANIC CLAY	
	35	PRESSED	19UA	GRAY SLIGHTLY ORGANIC CLAY AND SILT	UU,SG
	16		19UB	GRAY BROWN SILT AND CLAY, TRACE FINE SAND	AL
	34	4-5-11	20	SAME	
	35	4-9-13	21	SAME	
	32	6-12-16	22	SAME	
	39	4-8-12	23	SAME	
	35	5-9-14	24	SAME	
	34	8-12-16	25	SAME	
	36	5-9-14	26	GRAY SLIGHTLY ORGANIC CLAY AND SILT, TRACE FINE SAND	
-82.4	12	14-16-17	27	GRAY M-F SAND, SOME GRAVEL, LITTLE CLAYEY SILT	
-87.4	14	26-8-9	28	GRAY TAN GRAVEL, TRACE M-F SAND, SILT	
-92.4	20	16-12-14	29	GRAY TAN C-F SAND, LITTLE GRAVEL, TRACE SILT	
	21	11-12-16	30	GRAY TAN C-F SAND, TRACE GRAVEL, SILT	
	18	17-17-21	31	SAME	
-107.4	19	22-50/4"	32	GRAY CLAYEY SILT, LITTLE FINE SAND, TRACE GRAVEL	
-112.4	10	66-50/3"	33	GRAY M-F SAND, SOME SILT, LITTLE GRAVEL	
	21	23-51-44	34	GRAY M-F SAND, LITTLE CLAY AND SILT, TRACE GRAVEL	
	13	28-29-32	35	GRAY C-F SAND, LITTLE GRAVEL, TRACE SILT	
	16	47-46-49	36	SAME	
	24	65-55-50	37	SAME	
	15	21-19-19	38	GRAY C-F SAND, LITTLE SILT AND CLAY, TRACE GRAVEL	
	14	65-50/3"	39	GRAY FINE SAND, LITTLE CLAYEY SILT	
-146.4		REC=98% RQD=98%	R1	GRAY GNEISS	
-151.4					

BORING NO. 3-226 — DATE 01-30-13 — PROJECT: WEST END GARAGE

LOCATION: N 220946.4 E 1018652.7
SURFACE ELEVATION: 14.3 | WL ELEVATION: 5.1 | BY: K.L. | CHECKED BY: N.Y.

BLOWS PER 6 IN. — 1 3/8"ID SPOON, 140 LB. HAMMER, 30" FALL / ROCK CORE REPORT

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
14.3	17	POST HOLE DIGGER	01	FILL-BROWN M-F SAND, LITTLE GRAVEL, TRACE SILT, ROOT FIBERS	
	10	POST HOLE DIGGER	02	FILL-BROWN M-F SAND, SOME GRAVEL, TRACE SILT	
	11	POST HOLE DIGGER	03	FILL-BROWN TAN M-F SAND, LITTLE GRAVEL, TRACE SILT	
	23	3-3-4-4	04	FILL-GRAY TAN SILT, TRACE FINE SAND	
6.3	21	WL 3-4-5-5	05	GRAY TAN CLAYEY SILT, TRACE FINE SAND	
	21	3-3-3	06	TAN GRAY CLAYEY SILT	
	21	PRESSED	07UA	SAME	
1.3	17		07UB	GRAY C-F SAND, LITTLE GRAVEL, TRACE SILT	GS
	33	3-3-3	08	TAN M-F SAND AND SILT	
	12	10-9-8	09	TAN C-F SAND, SOME GRAVEL, LITTLE SILT	
	13	6-13-13	10	TAN RED M-F SAND AND GRAVEL, TRACE SILT	
-8.2	25	5-9-8	11	GRAY SILTY CLAY, LITTLE M-F SAND	
-10.7	33	5-6-9	12	GRAY CLAYEY SILT	
	35	4-5-8	13	GRAY CLAYEY SILT, TRACE FINE SAND	
-20.7	29	3-8-15	14	GRAY SILTY CLAY, TRACE GRAVEL	
-25.7	17	19-25-25	15	GRAY C-F SAND, TRACE GRAVEL	
	14	16-25-36	16	GRAY C-F SAND, LITTLE GRAVEL	
-35.7	32	6-13-17	17	GRAY SILTY CLAY, TRACE FINE SAND	
	35	7-9-15	18	GRAY SILTY CLAY, TRACE FINE SAND, GRAVEL	
	24	8-13-20	19	SAME	
	41	11-16-20	20	GRAY SILTY CLAY, LITTLE FINE SAND	
-55.7	14	18-55-51	21	BROWN GRAY M-F SAND AND CLAYEY SILT, SOME GRAVEL (TILL)	
	15	25-53-99	22	TAN GRAY C-F SAND, SOME GRAVEL, LITTLE SILTY CLAY	
	14	47-60-55	23	TAN BROWN C-F SAND AND GRAVEL, LITTLE SILTY CLAY	
-70.7	26	14-21-29	24	GRAY CLAYEY SILT, TRACE FINE SAND	
-75.7	14	30-22-31	25	BROWN C-F SAND, SOME GRAVEL, LITTLE SILT	
	17	21-22-23	26	BROWN C-F SAND, LITTLE GRAVEL	
	17	20-24-25	27	BROWN C-F SAND, TRACE GRAVEL	
	13	18-29-36	28	GRAY C-F SAND, LITTLE GRAVEL	
-95.7	32	6-11-16	29	GRAY CLAYEY SILT, TRACE FINE SAND	
	32	11-17-22	30	SAME	
	35	11-15-19	31	SAME	
-110.7	30	6-14-25	32	BROWN GRAY SILTY CLAY	
-115.7	29	18-27-28	33	GRAY M-F SAND, TRACE GRAVEL	
	12	18-24-28	34	GRAY GREEN C-F SAND, SOME GRAVEL, TRACE SILT	
	16	17-15-16	35	SAME	
	19	41-47-54	36	GRAY C-F SAND, SOME GRAVEL, LITTLE SILT	
-133.7					

NOTE: FOR PROJECT SITE MAP, BORING LOCATION PLAN, LEGEND, GENERAL NOTES, ABBREVIATIONS, AND SOIL CLASSIFICATIONS, SEE DRAWINGS LGA-SL-315.

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

LAGUARDIA AIRPORT

GEOTECHNICAL

Title: WEST END GARAGE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.
All recipients of Contract documents, including bidders and those who do not bid and their prospective subcontractors and suppliers who may receive all or a part of the Contract documents or copies thereof, shall make every effort to ensure the secure and appropriate disposal of the Contract documents to prevent further disclosure of the information contained in the documents. Secure and appropriate disposal includes methods of document destruction such as shredding or arrangements with refuse handlers that ensure that third persons will not have access to the documents' contents either before, during, or after disposal. Documents may also be returned for disposal purposes to the Contract Desk on the 3rd Floor, 3 Gateway Center, Newark NJ 07102 or the office of the Director of Procurement, One Madison Avenue, 7th Floor, New York NY 10010.
It is a violation of law for any person to alter a document in any way, unless acting under the direction of a licensed professional engineer or registered architect. If this document bearing the seal of an engineer/architect is altered, the altering engineer/architect shall affix to the document their seal and the notation "altered by" followed by their signature and the date of such alteration, and a specific description of the alteration.

N. YAKUBOV	A. COFRANCESCO	N. YAKUBOV
Designed by	Drawn by	Checked by

Date: JUNE 19, 2013

Contract Number

Drawing Number: LGA-SL-317

PID# NUMBER

BORING NO. 3-227	DATE 03-13-13	PROJECT	WEST END GARAGE		
LOCATION	N 220943.0	E 1018758.9	SURFACE ELEVATION 12.5	WL ELEVATION 5.0	BY: K.L. CHECKED BY: N.Y.

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
12.5 / 12.1				0.0'-0.4' ASPHALT	
	14	HAND AUGER	01	FILL-BROWN SILT, SOME GRAVEL, TRACE FINE SAND	
	13	HAND AUGER	02	FILL-TAN GRAY M-F SAND, LITTLE GRAVEL, SILT	
	18	HAND AUGER	03	FILL-TAN GRAY SILT, LITTLE M-F SAND, GRAVEL	
4.5	14	WL 5-3-2-3	04	FILL-TAN GRAY CLAYEY SILT AND M-F SAND, TRACE GRAVEL	
2.5	26	2-2-2-2	05	GRAY TAN SILTY CLAY, LITTLE FINE SAND	
0.0	22	2-2-4	06	TAN GRAY CLAYEY SILT, TRACE FINE SAND	
-2.5	21	3-6-8	07	BROWN M-F SAND, LITTLE GRAVEL, SILT	
	24	5-4-3	08	TAN SILT AND CLAY, LITTLE GRAVEL, M-F SAND	
-7.5	23	3-3-6	09	BROWN CLAYEY SILT, LITTLE GRAVEL, FINE SAND	
-10.0	13	8-13-17	10	BROWN GRAVEL, SOME SILT, LITTLE M-F SAND	
	11	8-9-10	11	BROWN M-F SAND, LITTLE GRAVEL, SILT	
-17.5	12	6-12-19	12	BROWN M-F SAND, SOME SILT, LITTLE GRAVEL	
-22.5	19	7-10-16	13	BROWN RED SLIGHTLY ORGANIC CLAYEY SILT, TRACE GRAVEL, FINE SAND	
	27	8-14-23	14	GRAY TAN SILT, TRACE FINE SAND	
	20	13-18-20	15	BROWN RED SILT, TRACE FINE SAND	
-37.5	36	18-21-24	16	GRAY SILT, TRACE FINE SAND	
	12	23-23-16	17	GRAY C-F SAND, SOME GRAVEL, TRACE SILT	
-47.5	13	16-19-21	18	GRAY C-F SAND, TRACE SILT	
-52.5	16	11-9-14	19	GRAY SLIGHTLY ORGANIC CLAY AND SILT, SOME C-F SAND	
	30	6-12-17	20	GRAY SILT, TRACE FINE SAND	
-62.5	16	12-21-36	21	GRAY TAN SILT AND CLAY, LITTLE GRAVEL, TRACE FINE SAND	
-67.5	24	50/1"	22	BROWN GRAVEL, TRACE GRAVEL, FINE SAND	
	17	20-22-25	23	BROWN C-F SAND, TRACE GRAVEL, SILT	
	16	18-23-23	24	BROWN C-F SAND, LITTLE GRAVEL,TRACE SILT	
	18	18-25-26	25	SAME	
	13	16-21-28	26	SAME	
-92.5	16	14-21-25	27	GRAY BROWN C-F SAND, LITTLE CLAYEY SILT,GRAVEL	
	32	4-8-14	28	GRAY SILTY CLAY, TRACE FINE SAND	
	43	PRESSED	29UA	SAME	AL,UU,SG
	39		29UB	SAME	
-102.5	36	6-12-16	30	SAME	
-107.5	32	30-33-39	31	GRAY CLAYEY SILT, SOME M-F SAND	
-112.5	39	23-31-36	32	GRAY CLAY, SOME GRAVEL, TRACE FINE SAND	
-117.5	27	22-28-35	33	GRAY SILT, SOME FINE SAND	
	24	14-19-37	34	GRAY FINE SAND, TRACE SILT	
	19	20-28-28	35	GRAY M-F SAND, LITTLE GRAVEL, SILT	
-128.5		50/0"	36	NO RECOVERY	
-133.5		REC=100% RQD=100%	R1	GRAY GNEISS	

BORING NO. 3-228	DATE 03-06-13	PROJECT	WEST END GARAGE		
LOCATION	N 220964.9	E 1018804.7	SURFACE ELEVATION 12.5	WL ELEVATION 7.4	BY: M.O. CHECKED BY: N.Y.

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
12.5 / 12.0				0.0'-0.5' ASPHALT	
	6	HAND AUGER	01	FILL-GRAY BROWN C-F SAND, SOME CRUSHED ROCK, GRAVEL, TRACE SILT, BRICK, ASPHALT, RECYCLED CONCRETE AGGREGATE	
	12	HAND AUGER	02	FILL-BROWN C-F SAND, TRACE SILT, GRAVEL	
6.5	14	WL HAND AUGER	03	SAME	
	18	4-3-4-5	04	BROWN GRAY M-F SAND, SOME SILT	
	19	5-4-6-6	05	BROWN GRAY M-F SAND, SOME CLAYEY SILT	
	18	2-3-2	06	BROWN GRAY C-F SAND, SOME CLAYEY SILT, TRACE GRAVEL	
	16	6-7-7	07	BROWN GRAY C-F SAND, LITTLE SILT, TRACE GRAVEL	
	17	3-2-4	08	BROWN M-F SAND, SOME CLAY & SILT	
	13	9-8-13	09	BROWN GRAY C-F SAND, LITTLE SILT, TRACE GRAVEL	
	15	5-3-3	10	BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
	13	8-13-14	11	SAME	
	14	13-13-13	12	BROWN C-F SAND, TRACE SILT, GRAVEL	
	19	10-15-17	13	RED BROWN M-F SAND, SOME SILT	
	19	11-14-17	14	RED BROWN M-F SAND, LITTLE SILT	
	19	9-10-13	15	SAME	
	19	20-24-31	16	SAME	
	20	20-22-28	17	SAME	
-47.5	20	19-22-32	18	SAME	
	25	7-9-15	19	GRAY SLIGHTLY ORGANIC CLAY & SILT, TRACE FINE SAND	
	45	PRESSED	20UA	GRAY BROWN SLIGHTLY ORGANIC SILTY CLAY, TRACE FINE SAND	AL,UU,SG
	22		20UB	GRAY BROWN VARVED SLIGHTLY ORGANIC CLAY & SILT, TRACE FINE SAND	
	35	8-8-9	21	SAME	
-62.5	30	7-10-15	22	SAME	
	17	12-20-25	23	GRAY BROWN C-F SAND, LITTLE SILT, GRAVEL	
	14	12-26-37	24	BROWN C-F SAND, SOME CLAY & SILT, GRAVEL	
	16	20-28-39	25	BROWN C-F SAND, TRACE GRAVEL, SILT	
	15	13-24-25	26	BROWN C-F SAND, SOME SILT, GRAVEL	
	12	29-26-32	27	BROWN C-F SAND, SOME GRAVEL, TRACE SILT	
	18	21-25-33	28	SAME	
	16	21-24-33	29	SAME	
-102.5	16	19-24-31	30	SAME	
	31	20-15-18	31	GRAY SILTY CLAY	
	29	10-12-19	32	SAME	
-117.5	25	19-25-28	33	GRAY SILTY CLAY, LITTLE BROWN M-F SAND	
	21	18-25-29	34	BROWN GRAY M-F SAND, LITTLE SILT	
	14	25-22-28	35	BROWN GRAY C-F SAND, LITTLE SILT, GRAVEL	
	14	25-28-29	36	BROWN GRAY C-F SAND, SOME GRAVEL, LITTLE SILT	
	13	32-33-30	37	SAME	
	22	45-67-75	38	DARK BROWN GRAY M-F SAND, LITTLE SILT	
-143.5		50/0"	39	NO RECOVERY	

NOTE: FOR PROJECT SITE MAP, BORING LOCATION PLAN, LEGEND, GENERAL NOTES, ABBREVIATIONS, AND SOIL CLASSIFICATIONS, SEE DRAWING LGA-SL-315.

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

LAGUARDIA AIRPORT

GEOTECHNICAL

Title
WEST END GARAGE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.
All recipients of Contract documents, including bidders and those who do not bid and their prospective subcontractors and suppliers who may receive all or a part of the Contract documents or copies thereof, shall make every effort to ensure the secure and appropriate disposal of the Contract documents to prevent further disclosure of the information contained in the documents. Secure and appropriate disposal includes methods of document destruction such as shredding or arrangements with refuse handlers that ensure that third persons will not have access to the documents' contents either before, during, or after disposal. Documents may also be returned for disposal purposes to the Contract Desk on the 3rd Floor, 3 Gateway Center, Newark NJ 07102 or the office of the Director of Procurement, One Madison Avenue, 7th Floor, New York NY 10010.
It is a violation of law for any person to alter a document in any way, unless acting under the direction of a licensed professional engineer or registered architect. If this document bearing the seal of an engineer/architect is altered, the altering engineer/architect shall affix to the document their seal and the notation "altered by" followed by their signature and the date of such alteration, and a specific description of the alteration.

N. YAKUBOV	A. COFRANCESCO	N. YAKUBOV
Designed by	Drawn by	Checked by

Date JUNE 19, 2013

Contract Number

Drawing Number LGA-SL-318

PID# NUMBER

PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

BORING NO.	DATE	PROJECT
3-229	02-20-13	WEST END GARAGE

LOCATION N 221029.1 E 1018914.6 — SURFACE ELEVATION 11.7 — WL ELEVATION NE — BY: K.L.O. CHECKED BY: N.Y.

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
11.7 / 11.2				0.0'-0.5' ASPHALT	
	12	POST HOLE DIGGER	01	FILL-BROWN M-F SAND, SOME GRAVEL, LITTLE SILT	
	9	POST HOLE DIGGER	02	FILL-TAN C-F SAND, LITTLE GRAVEL, TRACE SILT	
	18	POST HOLE DIGGER	03	FILL-GRAY TAN M-F SAND, LITTLE GRAVEL, TRACE SILT	
	15	5-11-14-13	04	FILL-BROWN TAN M-F SAND, LITTLE GRAVEL, SILT	
	27	15-10-10-11	05	FILL-GRAY FINE SAND, SOME GRAVEL, TRACE SILT	
-0.8	30	2-3-5	06	FILL-GRAY FINE SAND, LITTLE SILT	
	29	2-3-5	07	GRAY SLIGHTLY ORGANIC CLAYEY SILT, LITTLE FINE SAND	
	43	2-4-5	08	SAME	
-8.3	37	3-6-7	09	GRAY SILT & SLIGHTLY ORGANC CLAY, LITTLE GRAVEL, TRACE FINE SAND	
	17	14-12-14	10	BROWN M-F SAND, TRACE SILT	
	13	13-8-7	11	BROWN M-F SAND, SOME GRAVEL, TRACE SILT	
	20	4-7-10	12	BROWN C-F SAND, TRACE SILT	
	14	17-31-34	13	BROWN M-F SAND, LITTLE SILT	
	9	26-35-41	14	BROWN M-F SAND, LITTLE SILT, GRAVEL	
-33.3	9	29-31-29	15	BROWN M-F SAND, LITTLE GRAVEL, TRACE SILT	
	33	4-6-9	16	GRAY SLIGHTLY ORGANC CLAYEY SILT	
	33	4-7-9	17	BROWN GRAY VARVED SLIGHTLY ORGANIC SILTY CLAY, TRACE FINE SAND	
	35	4-6-11	18	SAME	
	34	3-4-8	19	SAME	
	33	6-7-9	20	SAME	
	34	8-11-14	21	SAME	
	48	PRESSED	22UA	SAME	
	24		22UB	GRAY SILTY CLAY, TRACE FINE SAND, GRAVEL	UU,SG
	31	6-6-8	23	SAME	
-73.3	35	9-10-12	24	GRAY BROWN SLIGHTLY ORGANIC SILTY CLAY, TRACE FINE SAND	
	16	18-22-30	25	BROWN C-F SAND, TRACE GRAY SILTY CLAY, GRAVEL, SILT	
-83.3	14	36-59-76	26	BROWN C-F SAND AND BROKEN ROCK, GRAVEL, LITTLE SILT	
-88.3		100/5"	27	GRAY FRAGMENTED ROCK, GRAVEL	
	10	24-35-63	28	BROWN C-F SAND, SOME GRAVEL, SILT, GLACIAL TILL	
	13	30-41-38	29	BROWN C-F SAND, SOME GRAVEL, LITTLE SILT	
	18	16-20-17	30	BROWN C-F SAND, TRACE GRAVEL, SILT	
-108.3	15	17-20-25	31	SAME	
-113.3	25	19-15-23	32	GRAY CLAY & SILT, TRACE FINE SAND	
-118.3	22	25-32-34	33	GRAY BROWN M-F SAND, LITTLE SILT	
	11	16-25-26	34	GRAY FRAGMENTED ROCK, GRAVEL, SOME BROWN C-F SAND, TRACE SILT	
	10	47-50/2"	35	GRAY DECOMPOSED FRAGMENTED ROCK, GRAVEL, TRACE CLAYEY SILT	
-133.3	19	50/4"	36	GRAY BROWN DECOMPOSED ROCK, SAND, GRAVEL, SILT SIZE	
-138.3	23	38-36-44	37	BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	

CONTINUED ...

NOTE: FOR PROJECT SITE MAP, BORING LOCATION PLAN, LEGEND, GENERAL NOTES, ABBREVIATIONS, AND SOIL CLASSIFICATIONS, SEE DRAWING LGA-SL-315.

CONTINUING ...

BORING NO.	DATE	PROJECT
3-229	02-20-13	WEST END GARAGE

LOCATION N 221029.1 E 1018914.6 — SURFACE ELEVATION 11.7 — WL ELEVATION NE — BY: K.L.O. CHECKED BY: N.Y.

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
-138.3	19	47-50/3"	38	BROWN GRAY C-F SAND, LITTLE SILT, TRACE GRAVEL	
	19	67-65-70	39	SAME	
	23	21-27-32	40	SAME	
	13	27-22-34	41	BROWN GRAY M-F SAND, LITTLE SILT, TRACE DECOMPOSED ROCK, GRAVEL	
	15	45-100/4"	42	SAME	
-166.3	14	81-100/3"	43	SAME	
		REC=62% RQD=26%	R1	GRAY GNEISS	
		REC=93% RQD=77%	R2	SAME	
-179.3		REC=93% RQD=90%	R3	SAME	

BORING NO.	DATE	PROJECT
3-230	04-04-13	WEST END GARAGE

LOCATION N 221082.4 E 1019072.9 — SURFACE ELEVATION 13.0 — WL ELEVATION 2.2 — BY: M.O. CHECKED BY: N.Y.

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
13.0					
	12	POST HOLE	01	FILL-BROWN C-F SAND, LITTLE GRAVEL, SILT, TRACE BRICK, ASPHALT	
	14	POST HOLE	02	SAME	
	13	POST HOLE	03	SAME	
	13	4-5-5-5	04	SAME	
	12	3-6-6-7	05	SAME	
	16	WL 2-2-2	06	SAME	
	30	2-3-3	07	FILL-GRAY BROWN C-F SAND, LITTLE GRAVEL, SILT, TRACE BRICK, ASPHALT	
-4.5	31	1-2-5	08	FILL-BLACK GRAY C-F SAND, LITTLE CLAY & SILT, TRACE GRAVEL, SILT	
	33	2-2-3	09	BROWN CLAY & SILT, TRACE FINE SAND	
-9.5	35	2-3-4	10	BROWN VARVED CLAY & SILT, SOME FINE SAND	
	20	2-1-2	11	BROWN C-F SAND, LITTLE SILT, FRAGMENTED ROCK, GRAVEL	
	13	2-1-3	12	SAME	
	16	5-4-6	13	SAME	
	19	4-3-4	14	BROWN C-F SAND, TRACE SILT, GRAVEL	
	18	6-10-13	15	RED BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
	20	11-11-15	16	RED BROWN FINE SAND, SOME SILT	
	22	15-18-22	17	BROWN C-F SAND, TRACE SILT, GRAVEL	
	24	17-23-21	18	BROWN M-F SAND, LITTLE SILT	
	16	14-22-26	19	BROWN M-F SAND, TRACE SILT, GRAVEL	
	21	17-22-25	20	RED BROWN M-F SAND, TRACE SILT, GRAVEL	
	20	12-19-30	21	RED BROWN FINE SAND, SOME SILT	
-67.0	21	10-16-22	22	RED BROWN FINE SAND AND SILT	
	33	6-11-16	23	GRAY BROWN SLIGHTLY ORGANIC VARVED CLAY & SILT, LITTLE FINE SAND	
	58	PRESSED	24UA	SAME	
	34		24UB	SAME	
	38	15-50/3"	25	GRAY BROWN VARVED SLIGHTLY ORGANIC CLAY & SILT, TRACE FINE SAND	
-82.0	22	9-8-7	26	GRAY BROWN SLIGHTLY ORGANIC CLAY & SILT, SOME GRAVEL, LITTLE C-F SAND	

CONTINUED ...

CONTINUING ...

BORING NO.	DATE	PROJECT
3-230	04-04-13	WEST END GARAGE

LOCATION 221082.4 E 1019072.9 — SURFACE ELEVATION 13.0 — WL ELEVATION 2.2 — BY: M.O. CHECKED BY: N.Y.

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
-82.0	17	10-15-17	27	BROWN C-F SAND, TRACE GRAVEL, SILT	
	20	12-15-20	28	BROWN GRAY C-F SAND, TRACE GRAVEL, SILT	
-93.0	17	14-13-12	29A	SAME	
	36		29B	GRAY BLACK SILTY CLAY	
	30	5-7-12	30	GRAY SILTY CLAY	
-107.0	24	12-17-20	31	SAME	
-112.0	18	12-14-21	32	BROWN GRAY C-F SAND, TRACE GRAVEL, SILT	
-117.0	21	13-26-42	33	GRAY BROWN VARVED SILTY CLAY, TRACE FINE SAND	
	11	47-41-34	34	GRAY BROWN C-F SAND AND FRAGMENTED ROCK, GRAVEL, LITTLE SILT	
	9	34-39-45	35	SAME	
	50	23-27-29	36	BROWN GRAY M-F SAND, LITTLE SILT	
-137.0	19	25-35-37	37	BROWN GRAY C-F SAND, TRACE SILT, GRAVEL	
-138.5	27	15-23-35	38	GRAY SILTY CLAY, SOME BROWN M-F SAND, FRAGMENTED ROCK	

BORING NO.	DATE	PROJECT
3-231	02-12-13	WEST END GARAGE

LOCATION N 220852.4 E 1018658.6 — SURFACE ELEVATION 14.9 — WL ELEVATION NE — BY: M.O. CHECKED BY: N.Y.

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
14.9 / 13.9				ASPHALT	
	6	POST HOLE DIGGER	01	FILL-BROWN GRAY C-F SAND, SOME CRUSHED ROCK, GRAVEL, TRACE SILT, ASPHALT, RECYCLED CONCRETE AGGREGATE	
	9	POST HOLE DIGGER	02	FILL-BROWN C-F SAND, TRACE SILT, GRAVEL	
	11	POST HOLE DIGGER	03	SAME	
	9	7-7-5-6	04	FILL-BROWN C-F SAND, SOME CRUSHED ROCK, GRAVEL, TRACE SILT	
4.9	12	6-5-4-5	05	FILL-BROWN M-F SAND, TRACE SILT	
	40	2-1-2	06	BROWN GRAY SLIGHTLY ORGANIC SILTY CLAY, SOME M-F SAND, TRACE SHELLS	
	22	PRESSED	07UA	BROWN SLIGHTLY ORGANIC SILTY CLAY, TRACE FINE SAND	
-0.1	21		07UB	GRAY BROWN SLIGHTLY ORGANIC CLAYEY SILT (BROWN SLIGHTLY ORGANIC SILTY CLAY, TRACE FINE SAND 4/19/13 M.O.)	UU,CO,SG
	15	11-12-10	08	BROWN C-F SAND, SOME SILT, TRACE GRAVEL	
	12	12-10-10	09	SAME	
	18	17-17-14	10	BROWN C-F SAND, SOME FRAGMENTED ROCK, GRAVEL, TRACE SILT	
	15	15-14-20	11	SAME	
-15.1	10	14-12-15	12	SAME	
-20.1	25	7-11-15	13	GRAY SLIGHTLY ORGANIC CLAY & SILT, TRACE FINE SAND	
-25.1	17	10-15-18	14	BROWN GRAY C-F SAND, TRACE SILT, GRAVEL	
	37	3-4-8	15	GRAY SLIGHTLY ORGANIC CLAY & SILT, TRACE FINE SAND	
-35.1	21	10-12-14	16	GRAY SLIGHTLY ORGANIC SILTY CLAY, SOME BROWN C-F SAND, TRACE GRAVEL	
	14	14-18-23	17	BROWN GRAY C-F SAND, TRACE SILT, GRAVEL	
-45.1	15	7-7-7	18	SAME	
-50.1	32	7-9-13	19	BROWN GRAY VARVED SLIGHTLY ORGANIC CLAY & SILT, TRACE FINE SAND	
	15	15-15-15	20	BROWN C-F SAND, SOME GRAY SLIGHTLY ORGANIC SILTY CLAY, TRACE GRAVEL, SILT	
	11	12-66-49	21	BROWN C-F SAND, SOME GRAVEL, SILT	
	9	29-55-46	22	SAME	
	7	37-55-68	23	BROWN C-F SAND AND FRAGMENTED ROCK, GRAVEL, LITTLE SILT	
-75.1	12	28-37-40	24	BROWN C-F SAND, FRAGMENTED ROCK, GRAVEL, TRACE SILT	
-80.1	32	11-17-26	25	GRAY SLIGHTLY ORGANIC SILTY CLAY, TRACE FINE SAND	
-81.6	22	15-26-27	26	BROWN C-F SAND, TRACE GRAVEL, SILT	

THE PORT AUTHORITY
OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

LAGUARDIA AIRPORT

GEOTECHNICAL

Title
WEST END GARAGE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.
All recipients of Contract documents, including bidders and those who do not bid and their prospective subcontractors and suppliers who may receive all or a part of the Contract documents or copies thereof, shall make every effort to ensure the secure and appropriate disposal of the Contract documents to prevent further disclosure of the information contained in the documents. Secure and appropriate disposal includes methods of document destruction such as shredding or arrangements with refuse handlers that ensure that third persons will not have access to the documents' contents either before, during, or after disposal. Documents may also be returned for disposal purposes to the Contract Desk on the 3rd Floor, 3 Gateway Center, Newark NJ 07102 or the office of the Director of Procurement, One Madison Avenue, 7th Floor, New York NY 10010.
It is a violation of law for any person to alter a document in any way, unless acting under the direction of a licensed professional engineer or registered architect. If this document bearing the seal of an engineer/architect is altered, the altering engineer/architect shall affix to the document their seal and the notation "altered by" followed by their signature and the date of such alteration, and a specific description of the alteration.

N. YAKUBOV	A. COFRANCESCO	N. YAKUBOV
Designed by	Drawn by	Checked by

Date JUNE 19, 2013

Contract Number

Drawing Number LGA-SL-319

PID# NUMBER

PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

BORING NO. 3-231A — DATE 02-12-13 — PROJECT: WEST END GARAGE

LOCATION: N 220856.4 E 1018662.5
SURFACE ELEVATION: 14.8 | WL ELEVATION: NE | BY: M.O. | CHECKED BY: N.Y.

Blows per 6 in., 1 3/8"ID spoon, 140 lb. hammer, 30" fall

Depth (meters)	Elevation (feet)	Water content (%)	Blows per 6 in. / Rock core report	Sample number	Sample classification	Laboratory testing
0	14.8				SEE BORING 3-231 FOR SOIL STRATA DESCRIPTION	
27	-75.2	27	8-11-21	01	GRAY CLAY & SILT, TRACE FINE SAND	
29	-80.2	15	15-18-21	02	BROWN C-F SAND, TRACE SILT, GRAVEL	
		14	16-22-24	03	SAME	
		12	15-19-25	04	SAME	
33	-95.2	33	7-12-18	05	GRAY CLAY & SILT, TRACE FINE SAND	
		29	10-15-21	06	SAME	
		33	7-13-17	07	SAME	
38	-110.2	20	11-16-25	08	BROWN C-F SAND, SOME GRAY RED BROWN CLAY & SILT, TRACE GRAVEL	
		21	15-17-24	09	BROWN GRAY M-F SAND, LITTLE SILT	
		14	23-26-25	10	BROWN GRAY C-F SAND AND FRAGMENTED ROCK, GRAVEL, LITTLE SILT	
		18	17-17-23	11	SAME	
		14	17-20-18	12	SAME	
		16	10-11-15	13	SAME	
47	-140.2	9	100/2"	14	GRAY DECOMPOSED ROCK, GRAVEL, SAND, SILT SIZE	
	-140.7		REC=100% RQD=93%	R1	GRAY GNEISS	
	-145.7					

BORING NO. 3-232 — DATE 03-08-13 — PROJECT: WEST END GARAGE

LOCATION: N 220870.1 E 1018779.7
SURFACE ELEVATION: 14.0 | WL ELEVATION: NE | BY: KL-AW-MO | CHECKED BY: N.Y.

Blows per 6 in., 1 3/8"ID spoon, 140 lb. hammer, 30" fall

Depth (meters)	Elevation (feet)	Water content (%)	Blows per 6 in. / Rock core report	Sample number	Sample classification	Laboratory testing
0	14.0 / 13.5				0.0'-0.5' ASPHALT	
		13	HAND AUGER	01	FILL-GRAY SILT, LITTLE GRAVEL, M-F SAND	
		13	HAND AUGER	02	FILL-BROWN SILT, LITTLE GRAVEL, M-F SAND	
		5	HAND AUGER	03	FILL-BROWN C-F SAND, TRACE GRAVEL, SILT	
		9	3-4-3-2	04	SAME	
		18	6-5-8-6	05	SAME	
		24	3-2-3	06	FILL-BROWN BLACK M-F SAND, SOME SILT	
4	1.5	22	1-2-2	07	BROWN SILT, TRACE FINE SAND	
	-1.0	14	6-7-10	08	BROWN C-F SAND AND GRAVEL, TRACE SILT	
		12	6-9-9	09	SAME	
		17	2-4-6	10	BROWN C-F SAND, LITTLE GRAVEL, SILT	
		22	9-12-16	11	BROWN M-F SAND, LITTLE SILT	
		21	14-17-20	12	SAME	
		20	18-19-22	13	BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
		21	14-15-17	14	RED BROWN FINE SAND AND SILT	
		13	6-24-22	15	GRAY C-F SAND, SOME GRAVEL, LITTLE SILT	
		16	14-18-22	16	BROWN C-F SAND, TRACE FINE GRAVEL, TRACE SILT	
		13	24-25-26	17	BROWN C-F SAND, TRACE FINE SAND, GRAVEL	
17	-41.0	23	8-5-8	18	GRAY SLIGHTLY ORGANIC SILTY CLAY, SOME BROWN M-F SAND	
		34	4-6-9	19	GRAY BROWN VARVED SLIGHTLY ORGANIC SILTY CLAY, TRACE FINE SAND	
		27	6-9-16	20	BROWN GRAY VARVED SLIGHTLY ORGANIC SILTY CLAY, LITTLE FINE SAND	
		30	6-7-14	21	SAME	
23	-61.0	20	100/5"	22	BROWN C-F SAND, LITTLE SLIGHTLY ORGANIC SILTY CLAY, TRACE GRAVEL	
		15	13-11-10	23	BROWN C-F SAND, LITTLE GRAVEL, SILT	
		13	24-18-10	24	BROWN GRAY C-F SAND, SOME FRAMENTED ROCK, GRAVEL, LITTLE SILT	
		15	18-21-22	25	BROWN GRAY C-F SAND, TRACE GRAVEL, SILT	
		17	14-18-25	26	SAME	
		19	15-10-14	27	BROWN GRAY C-F SAND, TRACE GRAVEL, SILT, GRAY SLIGHTLY ORGANIC SILTY CLAY	
32	-91.0	33	3-9-13	28	GRAY SLIGHTLY ORGANIC SILTY CLAY, TRACE FINE SAND	
	-93.0	32	PRESSED	29UA	GRAY CLAYEY SILT, TRACE FINE SAND	
		33		29UB	SAME	
		35	8-11-16	30	SAME	
		36	7-11-16	31	SAME	
		46	6-11-16	32	SAME	
38	-111.0	26	12-18-22	33	GRAY FINE SAND, TRACE SILT	
		17	18-22-25	34	GRAY M-F SAND, TRACE SILT	
		16	34-29-40	35	GRAY C-F SAND, LITTLE GRAVEL, TRACE SILT, DECOMPOSED ROCK	
		15	20-19-23	36	GRAY C-F SAND, LITTLE GRAVEL, SILT, DECOMPOSED ROCK	
		12	16-14-12	37	SAME	
45	-135.5					

BORING NO. 3-233 — DATE 03-18-13 — PROJECT: WEST END GARAGE

LOCATION: N 220891.1 E 1018864.9
SURFACE ELEVATION: 13.4 | WL ELEVATION: 5.3 | BY: K.L. | CHECKED BY: N.Y.

Blows per 6 in., 1 3/8"ID spoon, 140 lb. hammer, 30" fall

Depth (meters)	Elevation (feet)	Water content (%)	Blows per 6 in. / Rock core report	Sample number	Sample classification	Laboratory testing
0	13.4 / 12.9				0.0'-0.5' ASPHALT	
		8	POST HOLE	01	FILL-BROWN M-F SAND, LITTLE GRAVEL, SILT	
		10	POST HOLE	02	FILL-BROWN SILT, LITTLE M-F SAND, GRAVEL,	
		6	POST HOLE	03	FILL-BROWN M-F SAND, LITTLE GRAVEL, TRACE SILT	
		13	WL 5-8-6-5	04	FILL-BROWN M-F SAND, SOME GRAVEL, LITTLE SILT	
		14	4-5-6-4	05	FILL-BROWN SILT, LITTLE M-F SAND, GRAVEL	
		25	5-4-2	06	FILL-GRAY FINE SAND, TRACE SILT	
	1.4	33	1-1-1	07	DARK GRAY SLIGHTLY ORGANIC CLAYEY SILT, LITTLE M-F SAND, TRACE SHELLS	
		23	2-3-7	08	TAN SLIGHTLY ORGANIC CLAY AND SILT, LITTLE FINE SAND	
5	-4.1		4-4-3	09	GRAVEL	
6	-6.6	19	4-5-9	10	TAN SILT & M-F SAND, LITTLE GRAVEL	
	-8.4				LIKELY BOULDER ENCOUNTERED AT 21.8'. ADVANCED WITH ROLLER BIT	
7	-10.1	14	6-9-10	11	TAN M-F SAND, SOME GRAVEL, LITTLE SILT	
		19	8-11-11	12	TAN M-F SAND, LITTLE GRAVEL, TRACE SILT	
		23	17-20-22	13	TAN M-F SAND, TRACE SILT	
		24	11-14-18	14	SAME	
		20	8-14-16	15	SAME	
		19	6-6-6	16	SAME	
14	-34.6	17	5-9-9	17	GRAY SLIGHTLY ORGANIC CLAYEY SILT, LITTLE SHELLS, TRACE FINE SAND	
16	-39.6	22	16-19-25	18	BROWN RED SILT, TRACE FINE SAND	
		25	17-18-19	19	BROWN RED SILT, SOME FINE SAND	
19	-49.6	34	4-7-12	20	GRAY SLIGHTLY ORGANIC SILT AND CLAY, TRACE FINE SAND	
		37	4-8-10	21	SAME	
		58	PRESSED	22UA	SAME	
		29		22UB	BROWN GRAY CLAY AND SILT, TRACE FINE SAND	AL,UU
22	-61.1	17	6-6-9	23	GRAY M-F SAND, LITTLE SILTY CLAY, GRAVEL	
24	-66.6	21	7-13-11	24	GRAY SLIGHTLY ORGANIC CLAYEY SILT, SOME GRAVEL, LITTLE C-F SAND	
26	-71.6	12	11-18-23	25	TAN CLAYEY SILT, SOME C-F SAND, LITTLE GRAVEL	
		13	21-21-35	26	TAN CLAYEY SILT, SOME GRAVEL, LITTLE FINE SAND	
29	-81.6	26	17-20-27	27	BROWN M-F SAND, TRACE GRAVEL, SILT	
		19	17-22-26	28	SAME	
		20	19-24-31	29	SAME	
		19	20-24-29	30	SAME	
		16	26-28-34	31	BROWN M-F SAND, LITTLE GRAVEL, TRACE SILT	
36	-106.6	23	15-12-13	32	GRAY TAN SILTY CLAY, SOME M-F SAND, TRACE SILT	
38	-111.6	23	16-19-24	33	GRAY FINE SAND, SOME SILT	
		19	13-22-54	34	GRAY C-F SAND, SOME GRAVEL, LITTLE SILT	
		13	22-22-41	35	GRAY C-F SAND, LITTLE GRAVEL, SILT	
42	-126.6	30	50/3"	36	TAN CLAYEY SILT, LITTLE M-F SAND, GRAVEL	
44	-131.6	21	20-29-40	37	BROWN GRAY M-F SAND, LITTLE GRAVEL, TRACE SILT	
		16	21-30-44	38	BROWN GRAY M-F SAND, TRACE GRAVEL, SILT	
		16	27-24-32	39	BROWN GRAY M-F SAND, LITTLE GRAVEL, TRACE SILT	
		16	25-29-49	40	SAME	
50	-151.6		50/0"	41	NO RECOVERY	
51			REC=78% RQD=69%	R1	GRAY GNEISS	
	-156.6					

NOTE: FOR PROJECT SITE MAP, BORING LOCATION PLAN, LEGEND, GENERAL NOTES, ABBREVIATIONS, AND SOIL CLASSIFICATIONS, SEE DRAWING LGA-SL-315.

PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

LAGUARDIA AIRPORT

GEOTECHNICAL

Title: WEST END GARAGE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent. All recipients of Contract documents, including bidders and those who do not bid and their prospective subcontractors and suppliers who may receive all or a part of the Contract documents or copies thereof, shall make every effort to ensure the secure and appropriate disposal of the Contract documents to prevent further disclosure of the information contained in the documents. Secure and appropriate disposal includes methods of document destruction such as shredding or arrangements with refuse handlers that ensure that third persons will not have access to the documents' contents either before, during, or after disposal. Documents may also be returned for disposal purposes to the Contract Desk on the 3rd Floor, 3 Gateway Center, Newark NJ 07102 or the office of the Director of Procurement, One Madison Avenue, 7th Floor, New York NY 10010. It is a violation of law for any person to alter a document in any way, unless acting under the direction of a licensed professional engineer or registered architect. If this document bearing the seal of an engineer/architect is altered, the altering engineer/architect shall affix to the document their seal and the notation "altered by" followed by their signature and the date of such alteration, and a specific description of the alteration.

N. YAKUBOV	A. COFRANCESCO	N. YAKUBOV
Designed by	Drawn by	Checked by

Date: JUNE 19, 2013

Contract Number:

Drawing Number: LGA-SL-320

PID# NUMBER

BORING NO. 3-234 — DATE 03-22-13 — PROJECT: LGA WEST END GARAGE

LOCATION N 220935.5 E 1018985.0
SURFACE ELEVATION 12.2 — WL ELEVATION NE — BY: M.O. CHECKED BY: N.Y.

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
12.2 / 11.9					
	10	HAND AUGER	01	FILL-BROWN GRAY C-F SAND, SOME GRAVEL, CRUSHED ROCK, TRACE SILT	
	11	HAND AUGER	02	FILL-BROWN C-F SAND, TRACE GRAVEL, SILT	
	10	HAND AUGER	03	FILL-BROWN C-F SAND, TRACE GRAVEL, CRUSHED ROCK, SILT, BRICK, WOOD, RECYCLED CONCRETE AGGREGATE	
	12	3-5-5-5	04	FILL-BROWN C-F SAND, SOME CRUSHED ROCK, CONCRETE, GRAVEL, TRACE SILT, BRICK, ASPHALT, RECYCLED CONCRETE AGGREGATE	
2.2	17	3-1-4-3	05	FILL-BROWN M-F SAND, LITTLE SILT, TRACE CONCRETE, GRAVEL, CRUSHED ROCK	
-0.3	26	2-2-4	06	BROWN CLAYEY SILT, LITTLE FINE SAND	
	29	1-2-1	07	BROWN M-F SAND, LITTLE SILT	
	15	18-13-19	08	BROWN C-F SAND, SOME GRAVEL, LITTLE SILT	
	10	1-1-1	09	SAME	
	16	15-9-5	10	BROWN C-F SAND, TRACE GRAVEL, SILT	
	14	10-10-14	11	BROWN C-F SAND, LITTLE GRAVEL, TRACE SILT	
	18	6-6-9	12	BROWN C-F SAND, TRACE GRAVEL, SILT	
	16	6-10-14	13	SAME	
	19	8-12-14	14	SAME	
	18	12-15-19	15	BROWN C-F SAND, TRACE GRAVEL, SILT, RED BROWN CLAY & SILT SEAMS	
	17	11-14-18	16	BROWN C-F SAND, TRACE GRAVEL, SILT	
-42.8	23	13-16-16	17	RED BROWN M-F SAND, LITTLE SILT & CLAY SEAMS	
	38	5-7-11	18	GRAY VARVED SLIGHTLY ORGANIC SILTY CLAY, TRACE BROWN M-F SAND	
	57	PRESSED	19UA	SAME	
	37		19UB	GRAY VARVED SILTY CLAY, TRACE BROWN M-F SAND	AL,UU
-52.8	36	6-7-11	20	GRAY VARVED SLIGHTLY ORGANIC SILTY CLAY, SOME BROWN M-F SAND	
	31	4-6-12	21	GRAY VARVED CLAYEY SILT	
	34	3-5-8	22	SAME	
	41	4-5-11	23	GRAY CLAY AND SILT, TRACE FINE SAND	
	32	6-9-50/3"	24	GRAY SILT AND CLAY, TRACE FINE SAND	
	22	13-15-29	25	GRAY SILT AND CLAY, LITTLE GRAVEL, M-F SAND	
	2	19-23-29	26	GRAY CLAYEY SILT AND M-F SAND, LITTLE GRAVEL	
-87.8	9	50-30-52	27	GRAY CLAYEY SILT, SOME M-F SAND, LITTLE GRAVEL	
	12	15-18-46	28	GRAY C-F SAND, SOME CLAYEY SILT, LITTLE GRAVEL	
	12	23-30-47	29	SAME	
	12	22-50/3"	30	BROWN GRAY C-F SAND, SOME GRAVEL, LITTLE SILT, GLACIAL TILL	
	16	22-40-46	31	BROWN GRAY C-F SAND, SOME GRAVEL, LITTLE SILT	
	11	21-29-31	32	SAME	
	12	23-29-30	33	GRAY BROWN C-F SAND AND GRAVEL, LITTLE SILT	
	13	21-21-25	34	SAME	
	17	25-32-24	35	GRAY BROWN C-F SAND, LITTLE SILT, GRAVEL	
	23	38-56-50/0"	36	DARK BROWN GRAY C-F SAND, LITTLE SILT, TRACE GRAVEL	
	19	28-26-25	37	GRAY BROWN M-F SAND, LITTLE SILT	
	17	6-18-20	38	GRAY BROWN C-F SAND, SOME CLAYEY SILT, LITTLE GRAVEL	
-147.6	14	14-18-18	39	BR. GR. C-F SAND, LITTLE GRAVEL, SILT, DECOMPOSED FRAGMENTED ROCK	

BORING NO. 3-235 — DATE 04-17-13 — PROJECT: WEST END GARAGE

LOCATION N 220947.7 E 1019113.3
SURFACE ELEVATION 10.4 — WL ELEVATION 2.3 — BY: M.O. CHECKED BY: N.Y.

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
10.4					
	21	HAND AUGER	01	FILL-BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL, TOP SOIL	
	12	HAND AUGER	02	FILL-BROWN C-F SAND, TRACE SILT, GRAVEL	
	10	HAND AUGER	03	FILL-BROWN C-F SAND, TRACE GRAVEL, CRUSHED ROCK, SILT	
	11	WL 2-2-2-3	04	SAME	
	12	2-2-3-2	05	SAME	
	18	2-2-1	06	FILL-BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
	16	5-4-4	07	FILL-GRAY BROWN C-F SAND, SOME CRUSHED ROCK, GRAVEL, LITTLE SILT	
	15	3-7-8	08	FILL-BROWN GRAY C-F SAND, LITTLE CRUSHED ROCK, GRAVEL, TRACE SILT	
	16	2--1-4	09	FILL-BROWN GRAY C-F SAND & CRUSHED ROCK, GRAVEL, TRACE SILT	
	15	17-40-47	10	FILL-BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
-14.6	9	8-7-21	11	FILL-FRAGMENTED ROCK, GRAVEL, LITTLE BROWN C-F SAND, TRACE SILT	
	17	6-4-2	12	BROWN C-F SAND, LITTLE GRAVEL, SILT	
	24	4-7-8	13	BROWN M-F SAND, TRACE SILT	
	16	5-8-12	14	YELLOW TAN C-F SAND, TRACE GRAVEL, SILT	
	21	4-6-5	15	BROWN YELLOW C-F SAND, TRACE GRAVEL, SILT	
	25	5-9-15	16	BROWN M-F SAND, LITTLE SILT	
	23	9-13-17	17	BROWN M-F SAND, TRACE SILT	
	17	27-29-32	18	BROWN M-F SAND, TRACE SILT, GRAVEL	
	20	7-8-22	19	BROWN YELLOW C-F SAND, TRACE SILT, GRAVEL	
-59.6	22	7-12-17	20	BROWN C-F SAND, TRACE SILT, GRAVEL	
	27	13-20-21	21	RED BROWN CLAYEY SILT AND FINE SAND	
	35	4-6-12	22	BROWN GRAY VARVED CLAY & SILT, TRACE FINE SAND	
	62	PRESSED	23UA	SAME	
	36		23UB	SAME	
-74.6	36	2-3-6	24	SAME	
-79.6	14	19-25-40	25	BROWN C-F SAND, LITTLE GRAVEL, SILT	
-84.6	14	20-20-21	26	BROWN GRAY FRAGMENTED ROCK, GRAVEL, LITTLE C-F SAND, CLAY & SILT	
	14	19-10-11	27	BROWN GRAY C-F SAND, SOME SILT, GRAVEL	
	13	12-19-21	28	SAME	
	13	14-23-22	29	SAME	
	15	14-18-15	30	GRAY BROWN C-F SAND, SOME SILT, GRAVEL	
-105.6	10	20-41-42	31A	GRAY BROWN C-F SAND, SOME FRAMENTED ROCK, GRAVEL, SILT	
	16		31B	GRAY SILTY CLAY	
	23	29-39-31	32	GRAY SILTY CLAY, LITTLE BROWN M-F SAND, FRAGMENTED ROCK	
	30	8-12-17	33	GRAY SILTY CLAY	
	26	6-11-16	34	SAME	
	27	12-19-27	35	GRAY RED BROWN CLAY & SILT	
-134.6	22	12-21-33	36	SAME	
-139.6	18	22-30-33	37	BROWN GRAY M-F SAND, LITTLE CLAY & SILT	
		50/0"	38	NO RECOVERY	
-144.6		REC=98% RQD=83%	R1	GRAY GNEISS	

BORING NO. 3-236 — DATE 02-18-13 — PROJECT: WEST END GARAGE

LOCATION N 220712.8 E 1018655.1
SURFACE ELEVATION 18.4 — WL ELEVATION NE — BY: M.O. CHECKED BY: N.Y.

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
18.4 / 17.9				0.0'-0.5' ASPHALT	
	9	POST HOLE DIGGER	01	FILL-BROWN GRAY C-F SAND, SOME CRUSHED ROCK, GRAVEL, TRACE SILT	
	12	POST HOLE DIGGER	02	FILL-BROWN C-F SAND, LITTLE CRUSHED ROCK, GRAVEL, TRACE SILT	
	13	POST HOLE DIGGER	03	SAME	
10.4	15	1-2-2-2	04	FILL-BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL, WOOD	
	20	3-6-6-9	05	BROWN GRAY SILT, SOME FINE SAND, TRACE GRAVEL	
5.9	19	2-4-6	06	BROWN GRAY SILT, LITTLE FINE SAND	
3.4	15	4-6-7	07	BROWN GRAY C-F SAND, SOME CLAYEY SILT, LITTLE GRAVEL	
1.9	27	5-6-8	08	BROWN GRAY CLAY & SILT, TRACE FINE SAND	
	17	5-9-14	09	BROWN C-F SAND, SOME CLAYEY SILT, TRACE GRAVEL	
	16	5-12-33	10	BROWN GRAY C-F SAND, LITTLE SILT, GRAVEL	
	12	14-22-16	11	BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
	11	17-30-41	12	SAME	
	10	24-32-84	13	SAME	
	10	21-26-36	14	SAME	
	14	12-14-15	15	BROWN C-F SAND, TRACE SILT, TRACE GRAVEL	
	15	15-20-24	16	SAME	
-33.1	16	18-19-15	17	BROWN C-F SAND, LITTLE GRAVEL, SILT	
-41.6	32	6-11-13	18	GRAY SLIGHTLY ORGANIC CLAY & SILT, TRACE FINE SAND	
-46.6	25	10-12-16	19	TAN CLAYEY SILT, SOME M-F SAND	
	10	22-33-34	20	BROWN C-F SAND, SOME GRAVEL, TRACE SILT	
	12	13-20-21	21	SAME	
	15	12-16-14	22	BROWN C-F SAND, TRACE SILT, GRAVEL	
	18	8-12-13	23	SAME	
	19	9-10-12	24	SAME	
	16	7-10-12	25	SAME	
-81.6	17	12-13-13	26	BROWN GRAY M-F SAND, TRACE SILT	
	40	4-5-6	27	GRAY CLAY & SILT, TRACE FINE SAND	
	32	7-10-16	28	SAME	
	32	8-12-16	29	SAME	
	33	13-10-13	30	SAME	
-106.6	27	8-15-17	31	SAME	
	23	20-28-32	32	BROWN GRAY M-F SAND, LITTLE SILTY CLAY	
-116.6	23	15-18-23	33	BROWN GRAY M-F SAND, LITTLE SILT	
	16	16-19-28	34	BROWN GRAY DECOMPOSED ROCK, GRAVEL, SAND, SILT SIZE	
	15	15-19-16	35	SAME	
	17	18-21-27	36	SAME	
	14	21-21-20	37	SAME	
-137.6	15	17-95-100/0"	38	SAME	

NOTE: FOR PROJECT SITE MAP, BORING LOCATION PLAN, LEGEND, GENERAL NOTES, ABBREVIATIONS, AND SOIL CLASSIFICATIONS, SEE DRAWING LGA-SL-315.

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

LAGUARDIA AIRPORT

GEOTECHNICAL

Title: WEST END GARAGE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.
All recipients of Contract documents, including bidders and those who do not bid and their prospective subcontractors and suppliers who may receive all or a part of the Contract documents or copies thereof, shall make every effort to ensure the secure and appropriate disposal of the Contract documents to prevent further disclosure of the information contained in the documents. Secure and appropriate disposal includes methods of document destruction such as shredding or arrangements with refuse handlers that ensure that third persons will not have access to the documents' contents either before, during, or after disposal. Documents may also be returned for disposal purposes to the Contract Desk on the 3rd Floor, 3 Gateway Center, Newark NJ 07102 or the office of the Director of Procurement, One Madison Avenue, 7th Floor, New York NY 10010.
It is a violation of law for any person to alter a document in any way, unless acting under the direction of a licensed professional engineer or registered architect. If this document bearing the seal of an engineer/architect is altered, the altering engineer/architect shall affix to the document their seal and the notation "altered by" followed by their signature and the date of such alteration, and a specific description of the alteration.

N. YAKUBOV	A. COFRANCESCO	N. YAKUBOV
Designed by	Drawn by	Checked by

Date: JUNE 19, 2013

Contract Number

Drawing Number: LGA-SL-321

PID# NUMBER

BORING NO. 3-237 — DATE 02-06-13 — PROJECT: WEST END GARAGE

LOCATION: N 220760.6 E 1018741.3
SURFACE ELEVATION: 16.2 — WL ELEVATION: 3.8 — BY: M.O. — CHECKED BY: N.Y.

BLOWS PER 6 IN.: 1 3/8"ID SPOON, 140 LB. HAMMER, 30" FALL

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
16.2				ASPHALT	
15.0	5	POST HOLE DIGGER	01	FILL-GRAY C-F SAND, LITTLE CRUSHED ROCK, GRAVEL, TRACE SILT	
	8	POST HOLE DIGGER	02	FILL-BROWN C-F SAND, LITTLE GRAVEL, TRACE SILT	
	7	POST HOLE DIGGER	03	FILL-BROWN C-F SAND, TRACE GRAVEL, SILT	
	9	10-5-4-3	04	FILL-BROWN C-F SAND, SOME CRUSHED ROCK GRAVEL, LITTLE SILT	
6.2	4	5-4-3-3	05	SAME	
	20	3-2-2	06	BROWN M-F SAND, LITTLE SILT	
	14	4-2-1	07	BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
	17	2-1-1	08	GRAY BROWN C-F SAND, LITTLE SILT, GRAVEL, TRACE SHELLS	
	18	4-2-2	09	GRAY BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
	18	3-5-6	10	BROWN C-F SAND, TRACE SILT, GRAVEL	
	18	10-14-19	11	SAME	
-11.8	18	12-13-13	12	SAME	
	26	6-6-8	13	BROWN VARVED SLIGHTLY ORGANIC SILTY CLAY, TR. FINE SAND SEAMS	
-16.8	40	PRESSED	14UA	GRAY BROWN VARVED SLIGHTLY ORGANIC SILTY CLAY, TRACE FINE SAND	
	27		14UB	GRAY C-F SAND, SOME GRAVEL, LITTLE SILT	GS,UU,SG
	12	12-19-27	15	BROWN C-F SAND, SOME GRAVEL, TRACE SILT	
	12	15-9-30	16	SAME	
	16	15-16-18	17	BROWN C-F SAND, TRACE GRAVEL, SILT	
	11	13-16-19	18	SAME	
-41.8	11	11-13-18	19	BROWN C-F SAND, SOME GRAVEL, SILT, GLACIAL TILL	
-46.3	1	22-100/1"	20	FRAGMENTED ROCK, GRAVEL, TRACE BROWN C-F SAND, SILT	
	12	15-14-21	21	BROWN C-F SAND, TRACE GRAVEL, SILT	
	16	13-17-22	22	SAME	
	13	15-21-28	23	SAME	
	18	13-19-24	24	SAME	
	14	16-18-18	25	SAME	
	15	19-21-31	26	SAME	
-81.8	15	16-19-23	27	SAME	
-85.8	34	10-11-13	28	GRAY SILTY CLAY, TRACE FINE SAND	
-88.8		PRESSED	29U	GRAY GRAVEL, LITTLE C-F SAND, SILT	GS
	35	10-12-17	30	GRAY SILTY CLAY, TRACE FINE SAND	
	24	8-11-17	31	SAME	
	62	12-17-32	32	SAME	
-106.8	21	10-13-19	33	GRAY SILTY CLAY, SOME FINE SAND	
	23	14-22-32	34	GRAY BROWN M-F SAND, SOME SILTY CLAY	
	20	18-28-32	35	BROWN GRAY M-F SAND, LITTLE SILT	
-122.8	13	24-22-59	36	BROWN GRAY C-F SAND, SOME GRAVEL, LITTLE SILT	
-127.8		REC=92% RQD=78%	R1	GRAY GNEISS	

BORING NO. 3-238 — DATE 02-28-13 — PROJECT: WEST END GARAGE

LOCATION: N 220775.3 E 1018856.9
SURFACE ELEVATION: 14.1 — WL ELEVATION: NE — BY: M.O. — CHECKED BY: N.Y.

BLOWS PER 6 IN.: 1 3/8"ID SPOON, 140 LB. HAMMER, 30" FALL

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
14.1 / 13.8					
	7	HAND AUGER	01	FILL-BROWN GRAY C-F SAND, LITTLE GRAVEL, SILT	
	3	HAND AUGER	02	FILL-BROWN GRAY C-F SAND, TRACE SILT, GRAVEL	
	5	HAND AUGER	03	FILL-BROWN C-F SAND, TRACE SILT, GRAVEL	
	9	4-5-7-7	04	SAME	
	19	5-3-2-2	05	FILL-BROWN GRAY M-F SAND, SOME CLAYEY SILT, TRACE GRAVEL	
	16	WOH-WOH-WOH	06	FILL-BROWN GRAY C-F SAND, SOME CLAYEY SILT, TRACE GRAVEL	
	54	2-1-1	07	MISC-FILL-BROWN M-F SAND, LITTLE BLACK CLAYEY SILT, TRACE GRAVEL, GLASS, WOOD, BROWN PEAT	
-3.4	84	7-2-4	08	MISC-FILL-BROWN GRAY M-F SAND, SOME GRAY SILTY CLAY, TRACE BROWN PEAT, GRAVEL, WOOD	
	87	6-3-4	09	BROWN PEAT AND GRAY SLIGHTLY ORGANIC SILTY CLAY	
-8.4	31	2-1-1	10	GRAY SLIGHTLY ORGANIC SILTY CLAY, SOME M-F SAND, TRACE GRAVEL	
	14	4-12-16	11	BROWN C-F SAND, SOME FRAGMENTED ROCK, GRAVEL, SILT	
	11	14-16-17	12	BROWN C-F SAND, SOME FRAGMENTED ROCK, GRAVEL, LITTLE SILT	
-17.9	17	6-9-13	13	BROWN M-F SAND, SOME CLAY & SILT	
	24	PRESSED	14UA	BROWN GRAY CLAY AND SILT, TRACE M-F SAND	AL
	19		14UB	BROWN GRAY SLIGHTLY ORGANIC CLAY & SILT, TRACE M-F SAND	UU,SG
	20	6-8-11	15	BROWN GRAY SLIGHTLY ORGANIC CLAY & SILT AND M-F SAND	
	23	6-10-13	16	SAME	
	28	5-7-9	17	GRAY BROWN VARVED SLIGHTLY ORGANIC CLAY & SILT, TRACE FINE SAND	
	36	4-4-7	18	SAME	
	35	3-6-9	19	SAME	
	36	5-7-13	20	SAME	
	37	4-6-9	21	SAME	
	34	3-5-8	22	SAME	
-65.9	20	4-9-17	23	GRAY BROWN VARVED SLIGHTLY CLAY & SILT, SOME M-F SAND	
	15	18-21-31	24	BROWN GRAY C-F SAND, LITTLE SILT, FRAGMENTED ROCK, GRAVEL	
	17	19-18-21	25	BROWN C-F SAND, TRACE GRAVEL, SILT	
	17	12-15-18	26	SAME	
	15	12-16-20	27	SAME	
-90.9	16	14-18-24	28	SAME	
	29	8-11-17	29	GRAY CLAY & SILT, TRACE FINE SAND	
	33	9-10-17	30	SAME	
	38	8-10-14	31	GRAY CLAY & SILT, SOME M-F SAND, TRACE SHELLS	
	28	9-9-13	32	GRAY CLAY & SILT, TRACE FINE SAND	
-115.9	21	10-14-20	33	GRAY CLAY & SILT, LITTLE FINE SAND	
	25	13-15-29	34	BROWN C-F SAND, SOME GRAY SILTY CLAY, TRACE GRAVEL	
	16	32-68-62	35	GRAY BROWN C-F SAND, SOME SILT, LITTLE GRAVEL	
	22	69-48-58	36	BROWN GRAY C-F SAND, LITTLE SILT, TRACE GRAVEL	
-132.4	14	100/3"	37	GRAY C-F SAND, LITTLE SILT, FRAGMENTED ROCK, GRAVEL	

BORING NO. 3-239 — DATE 02-28-13 — PROJECT: WEST END GARAGE

LOCATION: N 220827.4 E 1018958.8
SURFACE ELEVATION: 12.9 — WL ELEVATION: 4.1 — BY: M.O. — CHECKED BY: N.Y.

BLOWS PER 6 IN.: 1 3/8"ID SPOON, 140 LB. HAMMER, 30" FALL

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
12.9 / 12.6				0.0'-0.3' ASPHALT	
	4	HAND AUGER	01	FILL-BROWN GRAY C-F SAND, LITTLE GRAVEL, TRACE SILT	
	2	HAND AUGER	02	FILL-BROWN C-F SAND, TRACE GRAVEL, SILT	
	2	HAND AUGER	03	SAME	
	13	6-5-5-12	04	FILL-BROWN GRAY C-F SAND, LITTLE SILT, GRAVEL	
	13	21-23-15-16	05	MISC-FILL-BROWN GRAY C-F SAND, LITTLE SILT, TRACE GRAVEL, CINDERS	
0.9	20	6-6-6	06	SAME	
	25	2-2-2	07	GRAY BROWN M-F SAND, LITTLE SLIGHTLY ORGANIC SILTY CLAY, TRACE SHELL FRAGEMENTS	
-4.1	42	1-1-1	08	GRAY BROWN M-F SAND, SOME SLIGHTLY ORGANIC SILTY CLAY, TRACE SHELL FRAGEMENTS	
-6.6	72	WOH-WOH-WOH	09	GRAY SLIGHTLY ORGANIC SILTY CLAY, TRACE M-F SAND, SHELLS	
	29	WOR-WOR-WOR	10	GRAY C-F SAND & SLIGHTLY ORGANIC SILTY CLAY, TRACE SHELL FRAGEMENTS	
-11.6	31	1-2-1	11	GRAY C-F SAND, LITTLE SLIGHTLY ORGANIC SILTY CLAY, TRACE SHELL FRAGEMENTS	
	22	2-3-4	12	BROWN SILT & SLIGHTLY ORGANIC CLAY, SOME FINE SAND, TRACE FINE SAND	
-15.1	43	PRESSED	13UA	BROWN GRAY SILT & CLAY, LITTLE FINE SAND	AL
	22		13UB	TAN GRAY M-F SAND, SOME SLIGHTLY ORGANIC CLAYEY SILT	UU,CO,SG
	24	5-8-7	14	RED BROWN FINE SAND, SOME SILT	
	20	5-4-6	15	SAME	
-30.1	21	9-11-14	16	SAME	
	34	2-5-6	17	GRAY SLIGHTLY ORGANIC CLAY & SILT	
	62	PRESSED	18UA	GRAY BROWN SILTY CLAY	AL
	37		18UB	GRAY BROWN SLIGHTLY ORGANIC SILTY CLAY	UU
	35	3-4-7	19	GRAY BROWN VARVED SLIGHTLY ORGANIC CLAY & SILT	
	35	4-6-9	20	SAME	
	39	4-4-7	21	SAME	
	33	4-5-10	22	SAME	
	33	4-5-10	23	SAME	
-63.1	39	5-14-17	24A	SAME	
	17		24B	BROWN C-F SAND, SOME SILT, LITTLE FRAGMENTED ROCK, GRAVEL	
	13	16-44-32	25	BROWN C-F SAND, SOME FRAGMENTED ROCK, GRAVEL, SILT	
	16	13-19-22	26	BROWN C-F SAND, TRACE GRAVEL, SILT	
	19	14-22-29	27	SAME	
	21	15-24-32	28	SAME	
	16	17-25-26	29	SAME	
	16	21-27-36	30	SAME	
-100.1	16	23-22-25	31	SAME	
-107.1	25	10-14-42	32	GRAY CLAY & SILT, LITTLE BROWN FINE SAND	
	13	20-19-24	33	BROWN GRAY C-F SAND, LITTLE GRAVEL, TRACE SILT	
	12	35-40-65	34	BROWN GRAY C-F SAND AND FRAGMENTED ROCK, GRAVEL, LITTLE SILT	
	14	22-22-35	35	GRAY BROWN C-F SAND, LITTLE FRAGMENTED ROCK, GRAVEL, SILT	
	18	47-41-52	36	BROWN C-F SAND, TRACE SILT, GRAVEL	
	27	18-21-32	37	BROWN GRAY C-F SAND, LITTLE SILT	
	20	12-21-29	38	BROWN GRAY M-F SAND, SOME SILT	
-140.1	14	37-22-56	39	BROWN GRAY C-F SAND, SOME CLAYEY SILT, FRAGMENTED ROCK, GRAVEL	
-145.1		REC=80% RQD=62%	R1	GRAY GNEISS	

NOTE: FOR PROJECT SITE MAP, BORING LOCATION PLAN, LEGEND, GENERAL NOTES, ABBREVIATIONS, AND SOIL CLASSIFICATIONS, SEE DRAWING LGA-SL-315.

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

LAGUARDIA AIRPORT

GEOTECHNICAL

Title: WEST END GARAGE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.
All recipients of Contract documents, including bidders and those who do not bid and their prospective subcontractors and suppliers who may receive all or a part of the Contract documents or copies thereof, shall make every effort to ensure the secure and appropriate disposal of the Contract documents to prevent further disclosure of the information contained in the documents. Secure and appropriate disposal includes methods of document destruction such as shredding or arrangements with refuse handlers that ensure that third persons will not have access to the documents' contents either before, during, or after disposal. Documents may also be returned for disposal purposes to the Contract Desk on the 3rd Floor, 3 Gateway Center, Newark NJ 07102 or the office of the Director of Procurement, One Madison Avenue, 7th Floor, New York NY 10010.
It is a violation of law for any person to alter a document in any way, unless acting under the direction of a licensed professional engineer or registered architect. If this document bearing the seal of an engineer/architect is altered, the altering engineer/architect shall affix to the document their seal and the notation "altered by" followed by their signature and the date of such alteration, and a specific description of the alteration.

N. YAKUBOV	A. COFRANCESCO	N. YAKUBOV
Designed by	Drawn by	Checked by

Date: JUNE 19, 2013

Contract Number

Drawing Number: LGA-SL-322

PID# NUMBER

BORING NO. 3-240 — PROJECT: WEST END GARAGE

DATE: 03-18-13
LOCATION: N 220823.3 E 1019077.6
SURFACE ELEVATION: 11.6 | WL ELEVATION: 3.1 | BY: K.L. | CHECKED BY: N.Y.

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
11.6 / 11.2				0.0'-0.4' ASPHALT	
	6	POST HOLE	01	FILL-BROWN M-F SAND, LITTLE GRAVEL, TRACE SILT	
	10	POST HOLE	02	SAME	
	12	POST HOLE	03	SAME	
	9	5-2-2-2	04	FILL-BROWN M-F SAND, LITTLE GRAVEL, SILT	
	18	WL 3-3-4-4	05	FILL-BROWN C-F SAND, LITTLE GRAVEL, TRACE SILT	
1.6	18	8-6-5	06	DARK GRAY C-F SAND, TRACE SILT	
-0.9	35	2-1-1	07	DARK GRAY SLIGHTLY ORGANIC SILTY CLAY, LITTLE F SAND	
-3.4	23	1-1-2	08	DARK GRAY C-F SAND, TRACE SILT	
	19	2-2-1	09	DARK GRAY C-F SAND, LITTLE GRAVEL, TRACE SILT	
	22	2-1-1	10	DARK GRAY C-F SAND, TRACE SILT, GRAVEL	
-10.9	63	1-1-1	11	DARK GRAY SILT & SLIGHTLY ORGANIC CLAY, LITTLE M-F SAND, TRACE PEAT FIBERS	
	55	WOH-WOH-WOH	12	GRAY SLIGHTLY ORGANIC CLAY AND SILT, LITTLE F SAND, TRACE SHELLS	
	62	PRESSED	13UA	GRAY SLIGHTLY ORGANIC CLAY & SILT, LITTLE SHELLS, TRACE FINE SAND	UU,CO,SG
	38		13UB	GRAY CLAY AND SILT, LITTLE SHELLS, TRACE FINE SAND	
	20	3-3-6	14	GRAY SLIGHTLY ORGANIC CLAYEY SILT, TRACE SHELLS	
	23	5-5-9	15	TAN SLIGHTLY ORGANIC CLAYEY SILT, TRACE FINE SAND	
	35	3-5-7	16	SAME	
	41	2-2-5	17	GRAY TAN SLIGHTLY ORGANIC SILTY CLAY	
	40	1-3-3	18	SAME	
	39	1-3-5	19	SAME	
	48	2-2-4	20	SAME	
	42	2-1-2	21	SAME	
	27	3-6-11	22	GRAY SLIGHTLY ORGANIC CLAYEY SILT, TRACE FINE SAND	
-63.4	14	9-11-24	23	GRAY M-F SAND AND GRAVEL, LITTLE SILT	
-69.4	13	12-41-29	24	GRAY CLAYEY SILT AND GRAVEL, SOME M-F SAND (TILL)	
	11	10-15-17	25	GRAY CLAYEY SILT AND GRAVEL, LITTLE M-F SAND (TILL)	
	15	19-18-24	26	SAME	
	15	15-20-38	27	SAME	
	14	12-18-24	28	SAME	
-93.4	13	37-49-52	29	GRAY C-F SAND AND GRAVEL, LITTLE SILT (TILL)	
	16	52-41-35	30	SAME	
	14	21-23-26	31	GRAY GREEN C-F SAND, LITTLE GRAVEL, SILT	
	13	70-81-69	32	GRAY GREEN C-F SAND, SOME GRAVEL, LITTLE SILT	
	23	17-24-40	33	GRAY GREEN C-F SAND, LITTLE GRAVEL, TRACE SILT	
	22	50/4"	34	SAME	
	20	19-22-24	35	SAME	
	22	17-22-25	36	GRAY M-F SAND, TRACE GRAVEL, SILT	
-138.2					

BORING NO. 3-241 — PROJECT: WEST END GARAGE

DATE: 04-19-13
LOCATION: N 221078.2 E 1018557.5
SURFACE ELEVATION: 12.8 | WL ELEVATION: 4.9 | BY: M.O. | CHECKED BY: N.Y.

ELEVATION (FEET)	WATER CONTENT (%)	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
12.8	11	HAND AUGER	01	FILL-BROWN C-F SAND, LITTLE GRAVEL, SILT	
	13	HAND AUGER	02	FILL-BROWN C-F SAND, TRACE GRAVEL, SILT	
	15	HAND AUGER	03	FILL-BROWN M-F SAND, TRACE SILT	
	24	WL 3-2-2-2	04	FILL-BROWN M-F SAND, LITTLE SILT	
	22	2-1-1-1	05	SAME	
	27	1-1-1	06	SAME	
	29	2-2-2	07	SAME	
	30	2-3-3	08	FILL-BROWN M-F SAND, LITTLE SILT, TRACE GRAVEL	
-4.7	42	2-2-3	09	BROWN CLAY & SILT, SOME M-F SAND	
-7.2	15	3-3-3	10	BROWN RED C-F SAND, SOME CLAYEY SILT, TRACE GRAVEL	
	13	6-14-18	11	BROWN RED C-F SAND, LITTLE SILT, TRACE GRAVEL	
	12	14-18-19	12	BROWN C-F SAND, LITTLE SILT, GRAVEL	
	12	11-8-10	13	BROWN C-F SAND, SOME GRAVEL, SILT	
	15	14-22-32	14	BROWN RED TAN C-F SAND, LITTLE SILT, TRACE GRAVEL	
	17	11-18-14	15	BROWN RED TAN C-F SAND, TRACE SILT, GRAVEL	
	17	19-27-28	16	GRAY BROWN C-F SAND, TRACE SILT, GRAVEL	
	16	19-26-28	17	SAME	
	18	18-26-27	18	SAME	
	20	53-47-37	19	GRAY BROWN C-F SAND, LITTLE FRAGMENTED ROCK, TRACE SILT	
	16	22-27-25	20	GRAY BROWN C-F SAND, TRACE SILT, GRAVEL	
-57.2	33	6-16-22	21	GRAY SLIGHTLY ORGANIC CLAY & SILT, TRACE FINE SAND	
	45	7-14-24	22	GRAY BROWN SLIGHTLY ORGANIC SILTY CLAY, TRACE FINE SAND	
	47	PRESSED	23UA	GRAY BROWN SLIGHTLY ORGANIC SILTY CLAY, TRACE FINE SAND, GRAVEL	
	33		23UB	GRAY BROWN SLIGHTLY ORGANIC SILTY CLAY, TRACE FINE SAND	
	32	9-11-15	24	SAME	
-72.2	14	24-33-37	25	BROWN GRAY C-F SAND, TRACE SILT, GRAVEL	
	15	29-50/4"	26	BROWN GRAY C-F SAND, SOME CLAYEY SILT, GRAVEL, GLACIAL TILL	
-82.2	17	26-43-51	27	BROWN CLAY & SILT, SOME BROKEN ROCK, GRAVEL, C-F SAND	
-87.2	13	24-35-34	28	BROWN GRAY C-F SAND, TRACE GRAVEL, SILT	
	15	20-26-28	29	SAME	
	18	27-32-31	30	SAME	
-102.2	30	6-16-24	31	GRAY CLAY & SILT, TRACE FINE SAND	
	35	9-16-19	32	RED BROWN GRAY SILTY CLAY	
-112.2	20	13-24-26	33	GRAY BROWN C-F SAND, SOME GRAVEL, LITTLE SILT	
-117.2	20	57-50/3"	34	DARK BROWN GRAY DECOMPOSED ROCK, GRAVEL, SAND, SILT SIZE	
	26	46-50/2"	35	SAME	
-124.2		REC=100% RQD=100%	R1	GRAY GNEISS	
-129.7					

NOTE: FOR PROJECT SITE MAP, BORING LOCATION PLAN, LEGEND, GENERAL NOTES, ABBREVIATIONS, AND SOIL CLASSIFICATIONS, SEE DRAWING LGA-SL-315.

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

LAGUARDIA AIRPORT

GEOTECHNICAL

Title: WEST END GARAGE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.
All recipients of Contract documents, including bidders and those who do not bid and their prospective subcontractors and suppliers who may receive all or a part of the Contract documents or copies thereof, shall make every effort to ensure the secure and appropriate disposal of the Contract documents to prevent further disclosure of the information contained in the documents. Secure and appropriate disposal includes methods of document destruction such as shredding or arrangements with refuse handlers that ensure that third persons will not have access to the documents' contents either before, during, or after disposal. Documents may also be returned for disposal purposes to the Contract Desk on the 3rd Floor, 3 Gateway Center, Newark NJ 07102 or the office of the Director of Procurement, One Madison Avenue, 7th Floor, New York NY 10010.
It is a violation of law for any person to alter a document in any way, unless acting under the direction of a licensed professional engineer or registered architect. If this document bearing the seal of an engineer/architect is altered, the altering engineer/architect shall affix to the document their seal and the notation "altered by" followed by their signature and the date of such alteration, and a specific description of the alteration.

N. YAKUBOV	A. COFRANCESCO	N. YAKUBOV
Designed by	Drawn by	Checked by

Date: JUNE 19, 2013

Contract Number

Drawing Number: LGA-SL-323

PID# NUMBER

PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC.