

LIGHTHOUSE POINT REDEVELOPMENT

5 BAY STREET
STATEN ISLAND, NEW YORK

Remedial Action Work Plan

NYC VCP Project Number: 15CVCP162R

Prepared For:

5 Bay Street, LLC
30-56 Whitestone Expressway, Whitestone, New York
(718) 463-5757

Prepared By:

Roux Associates, Inc.
Remedial Engineering, P.C.
209 Shafter Street, Islandia, New York
(631) 232-2600

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TABLE OF CONTENTS

LIST OF ACRONYMS	iii
CERTIFICATION	v
EXECUTIVE SUMMARY	1
COMMUNITY PROTECTION STATEMENT	9
1.0 REMEDIAL ACTION WORK PLAN	14
1.1 Project Background	14
1.2 Site Location and Background	14
1.3 Redevelopment Plan	14
1.4 Description of Surrounding Property	15
1.5 Summary of Past Site Uses and Areas of Concern	15
1.6 Summary of Work Performed under the Remedial Investigation	16
1.7 Summary of Findings of Remedial Investigation	17
2.0 REMEDIAL ACTION OBJECTIVES	19
3.0 REMEDIAL ALTERNATIVES ANALYSIS	21
3.1 Threshold Criteria	23
3.2 Balancing Criteria	24
4.0 REMEDIAL ACTION	31
4.1 Summary of Preferred Remedial Action	31
4.2 Soil Cleanup Objectives and Soil/ Fill Management	33
4.3 Engineering Controls	36
4.4 Institutional Controls	37
4.5 Site Management Plan	39
4.6 Qualitative Human Health Exposure Assessment	39
5.0 REMEDIAL ACTION MANAGEMENT	44
5.1 Project Organization and Oversight	44
5.2 Site Security	44
5.3 Work Hours	44
5.4 Construction Health and Safety Plan	44
5.5 Community Air Monitoring Plan	45
5.6 Agency Approvals	47
5.7 Site Preparation	47
5.8 Traffic Control	51
5.9 Demobilization	51
5.10 Reporting and Record Keeping	52
5.11 Complaint Management	53
5.12 Deviations from the Remedial Action Work Plan	53
6.0 REMEDIAL ACTION REPORT	54
7.0 SCHEDULE	58

FIGURES

1. Site Location Map
2. Site Plan
3. Redevelopment Plan
4. Surrounding Land Usage
5. Truck Route Map

APPENDICES

- A. Proposed Development Plans
- B. Citizen Participation Plan
- C. Sustainability Statement
- D. Soil/Materials Management Plan
- E. Manufacturer Specifications for Waterproofing / Vapor Barrier
- F. Construction Health and Safety Plan

LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C&D	Construction and Demolition
CEQR	City Environmental Quality Review
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering Controls and Institutional Controls
ELAP	Environmental Laboratory Accreditation Program
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations Emergency Response
IRM	Interim Remedial Measure
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYS DEC	New York State Department of Environmental Conservation
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYC OER	New York City Office of Environmental Remediation
NYC VCP	New York City Voluntary Cleanup Program
NYCRR	New York Codes Rules and Regulations
NYS DEC	New York State Department of Environmental Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation

Acronym	Definition
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
ORC	Oxygen-Release Compound
OSHA	United States Occupational Health and Safety Administration
PCBs	Polychlorinated Biphenyls
PE	Professional Engineer
PID	Photo Ionization Detector
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan or Plan
RCA	Recycled Concrete Aggregate
RD	Remedial Design
RI	Remedial Investigation
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SSDS	Sub-Slab Depressurization System
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
USGS	United States Geological Survey
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VOC	Volatile Organic Compound

CERTIFICATION

I, Charles McGuckin, am currently a registered professional engineer licensed by the State of New York. I performed professional engineering services and had primary direct responsibility for designing the remedial program for the Lighthouse Point Redevelopment site (5 Bay Street, Staten Island, New York), project number 15CVCP162R. I certify to the following:

- I have reviewed this document and the Stipulation List, to which my signature and seal are affixed.
- Engineering Controls developed for this remedial action were designed by me or a person under my direct supervision and designed to achieve the goals established in this Remedial Action Work Plan for this site.
- The Engineering Controls to be constructed during this remedial action are accurately reflected in the text and drawings of the Remedial Action Work Plan and are of sufficient detail to enable proper construction.
- This Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

Charles J. McGuckin, P.E.

Name

NYS Professional Engineer #069509

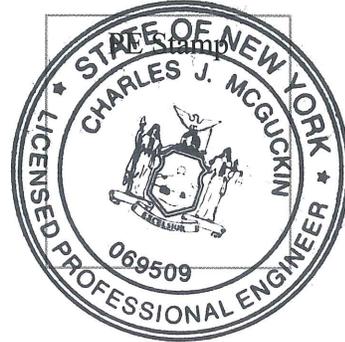
PE License Number



Signature

11/16/2015

Date



I, Sin Senh, am a qualified Environmental Professional. I will have primary direct responsibility for implementation of the remedial program for the Lighthouse Point Redevelopment site (5 Bay Street, Staten Island, New York), project number 15CVCP162R. I certify to the following:

- This Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

Sin Senh

QEP Name



QEP Signature

11/16/2015

Date

EXECUTIVE SUMMARY

5 Bay Street, LLC is working with the NYC Office of Environmental Remediation (OER) in the New York City Voluntary Cleanup Program to investigate and remediate a 135,000 square foot site located at 5 Bay Street, in Staten Island, New York. A Remedial Investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

Site Location and Background

The site is located at 5 Bay Street in the St. George section of Staten Island, New York and is identified as Block 1 and Lots 58 and 60 on the New York City Tax Map (Site). Figure 1 shows the Site location. The Site is approximately 135,000 square feet and is bounded by the Saint George Ferry Terminal and Saint George train station of the MTA Staten Island Railway to the north, the US Post Office along Bay Street and commercial buildings to the south, an esplanade, Borough Plaza, and New York City Department of Transportation Saint George ferry maintenance building immediately east, with piers and Upper New York Bay further east, and Bay Street, Staten Island Borough Hall, and the County Courthouse to the west. A map of the Site boundary is shown in Figure 2. Currently, the western portion of the Site is vacant and vegetated; the eastern portion of the Site contains four vacant historic buildings, and six historic underground vaults built into the hillside.

Summary of Redevelopment Plan

The proposed future use of the Site will consist of the restoration of four historic buildings, the historic underground vaults, as well as the construction of two new buildings. Phase 1 of the development consists of the leasing of a 44,813 square foot parcel of land located at 5 Bay Street (Lot 58), in Staten Island, New York; the construction and equipping of a new commercial building totaling approximately 66,295 square feet with an approximately 96,523 square foot parking structure and 117 apartment units in a 13 story tower over the commercial space. The commercial tenants will be a mix of restaurants, supermarket and office space. Phase 2 of the development consists of the leasing of a 101,361 square foot parcel of land located at 5 Bay

Street (Lot 60) in Staten Island; the restoration and equipping of four existing historic buildings totaling approximately 40,668 square feet and the construction and equipping of a new commercial building totaling approximately 108,055 with an approximately 46,590 square foot parking structure. The proposed development will serve as a waterfront destination for tourists and local residents and will include open space areas and retail, hotel, conference center and parking facilities. Layout of the proposed Site development is presented in Figure 3. The current zoning designation is C2-4/R7A and designates commercial and residential mixed use. The proposed use is consistent with existing zoning for the property.

Summary of Surrounding Property

The Site is approximately 135,000 square feet and is bounded by the Saint George Ferry Terminal and Saint George train station of the MTA Staten Island Railway to the north, the US Post Office along Bay Street and commercial buildings to the south, an esplanade, Borough Plaza, and New York City Department of Transportation Saint George ferry maintenance building immediately east, with piers and Upper New York Bay further east, and Bay Street, Staten Island Borough Hall, and the County Courthouse to the west.

Summary of Past Site Uses and Areas of Concern

In 1862, the U.S. Lighthouse Board (later U.S. Lighthouse Service), chose the Site to be part of a “super depot” of the Third District U.S. Lighthouse Depot. From 1862 to 1939, this lighthouse depot was the headquarters of the U.S. Lighthouse Service, supplying other District Depots along the East Coast and serving as the central headquarters for technological research. The buildings currently onsite were constructed during this period. This includes Building no. 5 (constructed in 1917), Building no. 6 (constructed in 1864), Building no. 7 (constructed in three phases between 1868 and 1918), and Building no. 8 (constructed in 1868). The vaults were constructed in 1886.

The Coast Guard took over duties of the Lighthouse Service in 1939 and remained onsite until about 1968. During the Coast Guard’s occupancy, Building no. 5 was used as a utility building; Building no. 6 was used as barracks and galley; Building no. 7 was used as an administration building; Building no. 8 was used as an industrial supply warehouse; and the vaults were used to store oil and supplies. The Site was subsequently occupied by the New York Harbor Pilot’s Association until 1982, when New York City purchased the Site, which has remained vacant to date. It is noted that two residential homes, two and three stories in height, were also present in

the western portion of the Site, north of the existing U.S.P.S. office. The buildings were constructed as early as 1917 and demolished between 1984 and 1991.

The AOCs identified for this Site include:

1. Historic fill: Historic fill, of an unknown origin, was identified in shallow soil near the historic buildings, in the eastern portion of the Site.
2. Historic Site use: The historic operation of the property as the headquarters of the United States Lighthouse Service, and subsequent Coast Guard operations.

Summary of Work Performed under the Remedial Investigation

Roux Associates, Inc., on behalf of 5 Bay Street, LLC., performed the following scope of work:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Installed four soil borings across the entire project Site, and collected eight soil samples for chemical analysis from the soil borings to evaluate soil quality;
3. Installed two temporary groundwater monitoring wells, and utilized an existing groundwater monitoring well to establish groundwater flow; and collected three groundwater samples for chemical analysis to evaluate groundwater quality; and
4. Installed five soil vapor probes around Site perimeter and collected five samples for chemical analysis.
5. Installed seven soil borings across the project Site during the 2007 Phase II investigation, and collected seven soil samples for chemical analysis to evaluate soil quality;
6. Installed six temporary groundwater monitoring wells during the 2007 Phase II investigation, and collected six groundwater samples for chemical analysis to evaluate groundwater quality.
7. Installed seventeen soil borings across the entire project Site, and collected 59 soil samples at a frequency of one per 1,000 cubic yards for waste characterization analysis in preparation of soil disposal.

Summary of Findings of Remedial Investigation

1. Elevation of the Site ranges from 50 feet above mean sea level on the west side to 20 feet above mean sea level on the east side .

2. The 2015 observed depth to groundwater from land surface ranges from 29 feet to 33 feet at the Site. During the 2007 Phase II, the depth of groundwater ranged from 8 to 25 ft bls.
3. Groundwater flow is generally from west to east beneath the Site.
4. Depth to bedrock is approximately 35 to 80 feet at the Site.
5. The stratigraphy of the Site, from the surface down, consists of zero to six feet of historic fill, ground moraine of Wisconsinan glacial drift. These unconsolidated deposits are mainly reddish-brown clayey till and consist of an unsorted mixture of clay, silt, sand, gravel, and sparse to abundant cobbles and boulders. Approximate depth to bedrock in the vicinity of the Site ranges from 35 to 80 feet below land surface (ft bls), according to the Geotechnical Engineering Study prepared by Langan Engineering, dated January 2015.
6. Soil samples collected during the 2007 Phase II were compared to New York State Department of Environmental Conservation (NYSDEC) Part 375 Table 375-6.8 Soil Cleanup Objectives (SCOs) for Unrestricted Use (UUSCO) and Restricted Residential Use (RRSCOs). The soil investigation detected concentrations of several volatile organic compounds (VOCs) including, acetone, carbon disulfide, chloromethane, methylene chloride, and toluene in the soil samples. Only one VOC, acetone (67 µg/kg), exceeded the UUSCO. Eleven semivolatile organic compounds (SVOC) were detected, with no SVOCs exceeding their respective UUSCO values. Nine metals were detected in soil samples, with six metals at concentrations above their respective UUSCOs, including chromium (52 mg/kg), copper (100 mg/kg), lead (330 mg/kg), mercury (2.7 mg/kg), nickel (650 mg/kg), and zinc (130 mg/kg). Of these metals, mercury and nickel also exceeded RRSCOs. Pesticides and PCBs were not detected in any sample.
7. Soil samples collected during the Remedial Investigation in June 2015 were compared to NYSDEC Part 375 Table 375-6.8(a) and (b) Soil Cleanup Objectives (SCOs) for Unrestricted Use and Restricted Residential Use. Soil results showed the presence of pesticides and metals. Samples collected from the top two feet of each boring exhibited detections of organochlorine pesticides including 4,4,DDE (44.6 µg/kg), 4,4,DDT (28.5 µg/kg), alpha-Chlordane (165 µg/kg), and dieldrin (155 µg/kg) that exceeded UUSCOs.

Three of the four samples collected from the 0 to 2 ft bls interval also exhibited detections of metals including arsenic (17 mg/kg), chromium (47 mg/kg), copper (70 mg/kg), lead (230 mg/kg), mercury (0.35 mg/kg), nickel (100 mg/kg) and zinc (120 mg/kg) at concentrations exceeding UUSCOs. Only one metal, arsenic, slightly exceeded RRSCOs. Four representative endpoint *in-situ* soil samples collected from the two foot interval beneath the proposed bottom of excavation did not exceed any standard with the exception of nickel at 100 mg/kg in one sample. Overall, soil chemistry is unremarkable and does not indicate any disposal of waste.

8. The 2007 groundwater sample were compared to the New York State 6NYCRR Part 703.5 Class GA Groundwater Quality Standards (GQS). No PCBs or pesticides were detected. Two VOCs, methylene chloride and trichloroethene, were detected in the groundwater samples, one of which, methylene chloride (5.2 µg/L), exceeded its GQSs. No SVOCs exceed there GQSs, however trace concentrations of one SVOC, bis(2-ethylhexyl)phthalate, was detected in one groundwater sample. Several metals were detected in the unfiltered groundwater samples at concentrations above their respective GQSs but only nickel (110 µg/L) exceeded its respective GQS in dissolved water sample.
9. The 2015 Remedial Investigation groundwater samples were compared to the New York State 6NYCRR Part 703.5 Class GA Groundwater Quality Standards (GQS). The groundwater results detected petroleum-related volatile organic compounds (VOCS) in one sample. These VOCs included benzene (17 µg/L), ethylbenzene (5.4 µg/L), o-xylene (5.8 µg/L), and toluene (46 µg/L), exceeding their respective GQSs. One pesticide, dieldrin, was detected in groundwater. Several metals were identified in groundwater and only magnesium, manganese and sodium exceeded their respective GQSs in dissolved water samples.
10. Soil vapor results collected during the 2015 Remedial Investigation were compared to the Vapor Intrusion Matrices in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion, dated October 2006. Total maximum concentrations of petroleum-related VOCs (BTEX) were 83.54 µg/m³. Overall, the highest reported total VOC concentrations were identified for 2-Butanone (9,820 µg/m³), acetone (5390 µg/m³) and ethanol (878 µg/m³). The chlorinated VOC trichloroethene

(TCE) was detected in one of five soil gas samples at a concentration of 434 $\mu\text{g}/\text{m}^3$ in SV-2, exceeding the Sub- Slab Vapor Concentration guidance value of the 2006 Soil Vapor/Indoor Air Matrix 1 at a level that requires mitigation. Tetrachloroethene (PCE) was also detected in two of five soil gas samples at 7.32 $\mu\text{g}/\text{m}^3$ and 56.4 $\mu\text{g}/\text{m}^3$ in SV-5 and SV-3, respectively. Elevated concentrations of TCE are in the monitoring range established by NYSDOH and requires mitigation.

Summary of the Remedial Action

The proposed remedial action achieves protection of public health and the environment for the intended use of the property. The proposed remedial action achieves all of the remedial action objectives established for the project and addresses applicable standards, criterion, and guidance; is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants; is cost effective and implementable; and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Selection of Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility(s), i.e., one sample per 1,000 cubic yards.
6. Excavation and removal of soil/fill exceeding Unrestricted Use (Track 1) SCOs. Based on the results of the Remedial Investigation, it is expected that this alternative would be

achieved by the excavation of approximately 18 to 33 ft to elevation 22 ft amsl in the western portion of Phase 1 of construction, 6 to 24 ft to elevation 12 ft amsl in the eastern portion of Phase 1; and excavation to a depth of 6 to 20 ft to elevation 12 ft amsl for Phase 2 of construction. The proposed excavation volume for both Phase 1 and Phase 2 of construction is approximately 59,000 cubic yards (CY) of soil which will be removed from the Site and properly disposed at an appropriately licensed or permitted facility.

7. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID. Appropriate segregation of excavated media on-Site.
8. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.
9. Registration of tanks and reporting of any petroleum spills associated with underground storage tanks (USTs) and appropriate closure of these petroleum spills in compliance with applicable local, State, and Federal laws and regulations.
10. Transportation and off-Site disposal of all soil/fill material at licensed or permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-Site.
11. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of Track 1 SCOs.
12. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
13. Performance of all activities required for the remedial action, including acquisition of required permits and attainment of pretreatment requirements, in compliance with applicable laws and regulations.

14. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
15. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, and lists any changes from this RAWP.

If Track 1 Unrestricted Use SCOs are not achieved, the following construction elements implemented as part of the new development will constitute Engineering and Institutional Controls:

16. As part of development, construction of an engineered composite cover system comprised of combination of 6 inches of reinforced concrete slab underlain by 8 inches of clean sub-base material in building areas; 4 inches of asphalt pavement underlain by 6 inches of clean sub-base material in parking areas, and 2 feet of clean soil in open space areas.
17. As part of development, installation of a vapor barrier system consisting of vapor barrier beneath the building slab and outside of sub-grade foundation sidewalls to mitigate soil vapor migration into the building. The vapor barrier system will consist of a 20-mil vapor barrier below the slab throughout the full building area and a Grace Bituthene (or equivalent) vapor barrier system outside all sub-grade foundation sidewalls. All welds, seams and penetrations will be properly sealed to prevent preferential pathways for vapor migration.
18. As part of new development, construction and operation of a cellar parking garage with high volume air exchange in conformance with NYC Building Code. The parking garage will also be completed at the location where concentration of TCE at $434 \mu\text{g}/\text{m}^3$ in SV-2 exceeded the Sub-Slab Vapor Concentration guidance value.

COMMUNITY PROTECTION STATEMENT

The NYC Office of Environmental Remediation (OER) provides governmental oversight for the cleanup of contaminated property in NYC. This Remedial Action Work Plan (“cleanup plan”) describes the findings of prior environmental studies, shows the location of identified contamination at the site, and describes the plans to clean up the site to protect public health and the environment.

This cleanup plan provides a very high level of protection for neighboring communities and also includes many other elements that address common community concerns, such as community air monitoring, odor, dust and noise controls, hours of operation, good housekeeping and cleanliness, truck management and routing, and opportunities for community participation. The purpose of this Community Protection Statement is to explain these community protection measures in non-technical language to simplify community review.

Project Information:

- Site Name: Lighthouse Point Redevelopment
- Site Address: 5 Bay Street, Staten Island, New York
- NYC Voluntary Cleanup Program Project Number: 15CVCP162R

Project Contacts:

- OER Project Manager: William Wong, 212-788-8841
- Site Project Manager: Jessica Collins, 631-232-2600
- Site Safety Officer: George Kokaliaris, 631-232-2600
- Online Document Repository:
http://www.nyc.gov/html/oer/html/repository/RStaten_Island.shtml

Remedial Investigation and Cleanup Plan: Under the oversight of the NYC OER, a thorough study of this property (called a Remedial Investigation) has been performed to identify past property usage, to sample and test soils, groundwater and soil vapor, and to identify contaminant sources present on the property. The cleanup plan has been designed to address all contaminant sources that have been identified during the study of this property.

Identification of Sensitive Land Uses: Prior to selecting a cleanup, the neighborhood was evaluated to identify sensitive land uses nearby, such as schools, day care facilities, hospitals and residential areas. The cleanup program was then tailored to address the special conditions of this community.

Qualitative Human Health Exposure Assessment: An important part of the cleanup planning for the Site is a study to find all of the ways that people might come in contact with contaminants at the Site now or in the future. This study is called a Qualitative Human Health Exposure Assessment (QHHEA). A QHHEA was performed for this project. This assessment has considered all known contamination at the Site and evaluated the potential for people to come in contact with this contamination. All identified public exposures will be addressed under this cleanup plan.

Health and Safety Plan: This cleanup plan includes a Construction Health and Safety Plan (CHASP) that is designed to protect community residents and on-Site workers. The elements of this RAWP are in compliance with applicable safety requirements of the United States Occupational Safety and Health Administration (OSHA). This RAWP includes many protective elements including those discussed below.

Site Safety Coordinator: This project has a designated Site safety coordinator to implement the CHASP. The safety coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site safety coordinator is identified at the beginning of this Community Protection Statement.

Worker Training: Workers participating in cleanup of contaminated material on this project are required to be trained in a 40-hour hazardous waste operators training course and to take annual refresher training. This pertains to workers performing specific tasks including removing contaminated material and installing cleanup systems in contaminated areas.

Community Air Monitoring Plan: Community air monitoring will be performed during this cleanup project to ensure that the community is properly protected from contaminants, dust and odors. Air samples will be tested in accordance with a detailed plan called the Community Air Monitoring Plan (CAMP). Results will be regularly reported to the NYC Office of

Environmental Remediation. This cleanup plan also has a plan to address any unforeseen problems that might occur during the cleanup (called a ‘Contingency Plan’).

Odor, Dust and Noise Control: This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and include steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with applicable NYC noise control standards. If you observe problems in these areas, please contact the onsite Project Manager or NYC Office of Environmental Remediation Project Manager listed on the first page of this Community Protection Statement document.

Quality Assurance: This cleanup plan requires that evidence be provided to illustrate that all cleanup work required under the plan has been completed properly. This evidence will be summarized in the final report, called the Remedial Action Report. This report will be submitted to the NYC Office of Environmental Remediation and will be thoroughly reviewed.

Stormwater Management: To limit the potential for soil erosion and discharge, this cleanup plan has provisions for stormwater management. The main elements of the stormwater management include physical barriers such as tarp covers and erosion fencing, and a program for frequent inspection.

Hours of Operation: The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency. For this cleanup project, the hours of operation will conform to requirements of the NYC Department of Buildings.

Signage: While the cleanup is in progress, a placard will be prominently posted at the main entrance of the property with a laminated project Fact Sheet that states that the project is in the NYC Voluntary Cleanup Program and provides project contact names and numbers, and a link to the document repository where project documents can be viewed.

Complaint Management: The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the facility Project Manager or the NYC Office of Environmental Remediation Project Manager listed on the first page of this Community Protection Statement document, or call 311 and mention the Site is in the NYC Voluntary Cleanup Program.

Utility Mark-outs: To promote safety during excavation in this cleanup, the contractor is required to first identify all utilities and must perform all excavation and construction work in compliance with NYC Department of Buildings regulations.

Soil and Liquid Disposal: All soil and liquid material removed from the Site as part of the cleanup will be transported and disposed of in accordance with all applicable City, State and Federal regulations, and required permits will be obtained.

Soil Chemical Testing and Screening: All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical testing of soils on the Site, excavated soil will be screened continuously using hand-held instruments, by sight, and by smell to ensure proper material handling and management, and community protection.

Stockpile Management: Soil stockpiles will be kept covered with tarps to prevent dust, odor and erosion. Stockpiles will be frequently inspected. Damaged tarp covers will be promptly replaced. Stockpiles will be protected with silt fences. Hay bales will be used, as needed, to protect storm water catch basins and other discharge points.

Trucks and Covers: Loaded trucks leaving the Site will be covered in compliance with applicable laws and regulations to prevent dust and odor. Trucks will be properly recorded in logs and records and placarded in compliance with applicable City, State and Federal laws, including those of the New York State Department of Transportation. If loads contain wet material that can leak, truck liners will be used. All transport of materials will be performed by licensed truckers and in compliance with applicable laws and regulations.

Imported Material: All fill materials proposed to be brought onto the Site will comply with rules outlined in this cleanup plan and will be inspected and approved by a qualified worker

located on the Site. Waste materials will not be brought onto the Site. Trucks entering the Site with imported clean materials will be covered in compliance with applicable laws and regulations.

Equipment Decontamination: All equipment used for cleanup work will be inspected and washed, if needed, before it leaves the Site. Trucks will be cleaned at a truck inspection station on the property before leaving the Site.

Housekeeping: Locations where trucks enter or leave the Site will be inspected every day and cleaned regularly to ensure that they are free of dirt and other materials from the Site.

Truck Routing: Truck routes have been selected to: (a) limit transport through residential areas and past sensitive nearby properties; (b) maximize use of city-mapped truck routes; (c) limit total distance to major highways; (d) promote safety in entry to highways; (e) promote overall safety in trucking; and (f) minimize off-Site line-ups (queuing) of trucks entering the property. Operators of loaded trucks leaving the Site will be instructed not to stop or idle in the local neighborhood.

Final Report: The results of all cleanup work will be fully documented in a final report (called the Remedial Action Report) that will be available for public review online. A link to the online document repository and the public library with Internet access nearest the Site are listed on the first page of this Community Protection Statement document

Long-Term Site Management: If long-term protection is needed after the cleanup is complete, the property owner will be required to comply with an ongoing Site Management Plan that calls for continued inspection of protective controls, such as Site covers. The Site Management Plan is evaluated and approved by the NYC Office of Environmental Remediation. Requirements that the property owner must comply with are defined either in the property's deed or established through a city environmental designation registered with the Department of Buildings. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

1.0 REMEDIAL ACTION WORK PLAN

1.1 Project Background

5 Bay Street, LLC is working with the NYC Office of Environmental Remediation (OER) in the New York City Voluntary Cleanup Program and/or in the “E” Designation Program to investigate and remediate a property located at 5 Bay Street in the St. George section of Staten Island, New York (the “Site”). A Remedial Investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. This RAWP establishes remedial action objectives, provides a remedial alternatives analysis that includes consideration of a permanent cleanup, and provides a description of the selected remedial action. The remedial action described in this document provides for the protection of public health and the environment, and complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

1.2 Site Location and Background

The Site is located at 5 Bay Street in the St. George section of Staten Island, New York and is identified as Block 1 and Lots 58 and 60 on the New York City Tax Map. Figure 1 shows the Site location. The Site is approximately 135,000 square feet and is bounded by the Saint George Ferry Terminal and Saint George train station of the MTA Staten Island Railway to the north, the US Post Office along Bay Street and commercial buildings to the south, an esplanade, Borough Plaza, and New York City Department of Transportation Saint George ferry maintenance building immediately east, with piers and Upper New York Bay further east, and Bay Street, Staten Island Borough Hall, and the County Courthouse to the west. A map of the Site boundary is shown in Figure 2. Currently, the western portion of the Site is vacant and vegetated; the eastern portion of the Site contains four vacant historic buildings, and six historic underground vaults built into the hillside.

1.3 Redevelopment Plan

The proposed future use of the Site will consist of the restoration of four historic buildings, the historic underground vaults, as well as the construction of new buildings. Redevelopment plans are included as Appendix A. Phase 1 of the development consists of the leasing of a 44,813

square foot parcel of land located at 5 Bay Street (Lot 58), in Staten Island, New York; the construction and equipping of a new commercial building totaling approximately 66,295 square feet with an approximately 96,523 square foot below-grade parking structure and 117 apartment units in a 13-story tower over the commercial space. The commercial tenants will be a mix of restaurants, supermarket and office space. Phase 2 of the development consists of the leasing of a 101,361 square foot parcel of land located at 5 Bay Street (Lot 60) in Staten Island; the restoration and equipping of four existing historic buildings totaling approximately 40,668 square feet and the construction and equipping of a new commercial building totaling approximately 108,055 with an approximately 46,590 square foot below-grade parking structure. The proposed development will serve as a waterfront destination for tourists and local residents and will include open space areas and retail, hotel, conference center and parking facilities. Layout of the proposed Site development is presented in Figure 3. The current zoning designation is C4-2 and designates commercial mixed use. The proposed use is consistent with existing zoning for the property.

1.4 Description of Surrounding Property

The Site is bounded by the Saint George Ferry Terminal and Saint George train station of the MTA Staten Island Railway to the north; the US Post Office along Bay Street and commercial buildings to the south; an esplanade, Borough Plaza, and New York City Department of Transportation Saint George ferry maintenance building immediately east, with piers and Upper New York Bay further east; and Bay Street, Staten Island Borough Hall, and the County Courthouse to the west. No schools or hospitals are within a 250 to 500- foot radius. However, there is a day care listed at 80 Bay Street, Staten Island, New York that is approximately 400 feet from the closest Site boundary; the remediation of the Site will have no adverse effects on this location.

Figure 4 shows the surrounding land usage.

1.5 Summary of Past Site Uses and Areas of Concern

In 1862, the U.S. Lighthouse Board (later U.S. Lighthouse Service), chose the Site to be part of a “super depot” of the Third District U.S. Lighthouse Depot. From 1862 to 1939, this lighthouse depot was the headquarters of the U.S. Lighthouse Service, supplying other District Depots along

the East Coast and serving as the central headquarters for technological research. The buildings currently onsite were constructed during this period. This includes Building No. 5 (constructed in 1917), Building No. 6 (constructed in 1864), Building No. 7 (constructed in three phases between 1868 and 1918), and Building No. 8 (constructed in 1868). The vaults were constructed in 1886.

The Coast Guard took over duties of the Lighthouse Service in 1939 and remained onsite until about 1968. During the Coast Guard's occupancy, Building No. 5 was used as a utility building; Building No. 6 was used as barracks and galley; Building No. 7 was used as an administration building; Building No. 8 was used as an industrial supply warehouse; and the vaults were used to store oil and supplies. The Site was subsequently occupied by the New York Harbor Pilot's Association until 1982, when New York City purchased the Site, which has remained vacant to date. It is noted that two residential homes, two and three stories in height, were also present in the western portion of the Site, north of the existing U.S.P.S. office. The buildings were constructed as early as 1917 and demolished between 1984 and 1991.

The AOCs identified for this Site include:

1. Historic fill: Historic fill, of an unknown origin, was identified in shallow soil near the historic buildings, in the eastern portion of the Site.
2. Historic Site use: The historic operation of the property as the headquarters of the United States Lighthouse Service, and subsequent Coast Guard operations.

1.6 Summary of Work Performed under the Remedial Investigation

Roux Associates, Inc., on behalf of 5 Bay Street, LLC., performed the following scope of work:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Installed four soil borings across the entire project Site, and collected eight soil samples for chemical analysis from the soil borings to evaluate soil quality;
3. Installed two temporary groundwater monitoring wells, and utilized an existing groundwater monitoring well to establish groundwater flow; and collected three groundwater samples for chemical analysis to evaluate groundwater quality; and
4. Installed five soil vapor probes around Site perimeter and collected five samples for chemical analysis.

5. Installed seven soil borings across the project Site during the 2007 Phase II investigation, and collected seven soil samples for chemical analysis to evaluate soil quality;
6. Installed six temporary groundwater monitoring wells during the 2007 Phase II investigation, and collected six groundwater samples for chemical analysis to evaluate groundwater quality.
7. Installed seventeen soil borings across the entire project Site, and collected 59 soil samples for waste characterization analysis in preparation of soil disposal.

1.7 Summary of Findings of Remedial Investigation

A Remedial Investigation was performed and the results are documented in a companion document called “Remedial Investigation Report, Lighthouse Point Redevelopment”, dated August 2015 (RIR).

1. Elevation of the property ranges from 50 feet above mean sea level on the west side to 20 feet above mean sea level on the east side .
2. The 2015 observed depth to groundwater ranges from 29 feet to 33 at the Site. During the 2007 Phase II, the depth of groundwater ranged from 8 to 25 ft bls.
3. Groundwater flow is generally from west to east beneath the Site.
4. Depth to bedrock is approximately 35 to 80 feet at the Site.
5. The stratigraphy of the Site, from the surface down, consists of zero to six feet of historic fill, ground moraine of Wisconsin glacial drift. These unconsolidated deposits are mainly reddish-brown clayey till and consist of an unsorted mixture of clay, silt, sand, gravel, and sparse to abundant cobbles and boulders. Approximate depth to bedrock in the vicinity of the Site ranges from 35 to 80 feet below land surface (ft bls), according to the Geotechnical Engineering Study prepared by Langan Engineering, dated January 2015.
6. Soil samples collected during the 2007 Phase II were compared to New York State Department of Environmental Conservation (NYSDEC) Part 375 Table 375-6.8(a) and (b) Soil Cleanup Objectives (SCOs) for Unrestricted Use (UUSCO) and Restricted Residential Use (RRSCOs). The soil investigation detected concentrations of several

volatile organic compounds (VOCs) including, acetone, carbon disulfide, chloromethane, methylene chloride, and toluene in the soil samples. Only one VOC, acetone (67 µg/kg), exceeded the UUSCO. Eleven semivolatile organic compounds (SVOC) were detected, with no SVOCs exceeding their respective UUSCO values. Nine metals were detected in soil samples, with six metals at concentrations above their respective UUSCOs, including chromium (52 mg/kg), copper (100 mg/kg), lead (330 mg/kg), mercury (2.7 mg/kg), nickel (650 mg/kg), and zinc (130 mg/kg). Of these metals, mercury and nickel also exceeded RRSCOs. Pesticides and PCBs were not detected in any sample.

7. Soil samples collected during the Remedial Investigation in June 2015 were compared to NYSDEC Part 375 Table 375-6.8(a) and (b) Soil Cleanup Objectives (SCOs) for Unrestricted Use and Restricted Residential Use. Soil results showed the presence of pesticides and metals. Samples collected from the top two feet of each boring exhibited detections of organochlorine pesticides including 4,4,DDE (44.6 µg/kg), 4,4,DDT (28.5 µg/kg), alpha-Chlordane (165 µg/kg), and dieldrin (155 µg/kg) that exceeded UUSCOs. Three of the four samples collected from the 0 to 2 ft bls interval also exhibited detections of metals including arsenic (17 mg/kg), chromium (47 mg/kg), copper (70 mg/kg), lead (230 mg/kg), mercury (0.35 mg/kg), nickel (100 mg/kg) and zinc (120 mg/kg) at concentrations exceeding UUSCOs. Only one metal, arsenic, slightly exceeded RRSCOs. Four representative endpoint soil samples collected from the two foot interval beneath the proposed bottom of excavation did not exceed any standard with the exception of nickel at 100 mg/kg in one sample.
8. The 2007 groundwater sample were compared to the New York State 6NYCRR Part 703.5 Class GA Groundwater Quality Standards (GQS). No PCBs or pesticides were detected. Two VOCs, methylene chloride and trichloroethene, were detected in the groundwater samples, one of which, methylene chloride (5.2 µg/L), exceeded its GQSs. No SVOCs exceed there GQSs, however trace concentrations of one SVOC, bis(2-ethylhexyl)phthalate, was detected in one groundwater sample. Several metals were detected in the unfiltered groundwater samples at concentrations above their respective GQSs including arsenic, barium, beryllium, chromium, copper, lead, and nickel. One dissolved metal, nickel (110 µg/L) exceeded its respective GQS.

9. The 2015 Remedial Investigation groundwater samples were compared to the New York State 6NYCRR Part 703.5 Class GA Groundwater Quality Standards (GQS). The groundwater results detected petroleum-related volatile organic compounds (VOCS) in one sample. These VOCs included benzene (17 µg/L), ethylbenzene (5.4 µg/L), o-xylene (5.8 µg/L), and toluene (46 µg/L), exceeding their respective GQSs. One pesticide, dieldrin, was detected in groundwater. Several metals were identified in groundwater and only magnesium, manganese and sodium exceeded their respective GQSs in dissolved water samples.
10. Soil vapor results collected during the 2015 Remedial Investigation were compared to the Vapor Intrusion Matrices in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion, dated October 2006. Total maximum concentrations of petroleum-related VOCs (BTEX) were 83.54 µg/m³. Overall, the highest reported total VOC concentrations were identified for 2-Butanone (9,820 µg/m³), acetone (5390 µg/m³) and ethanol (878 µg/m³). The chlorinated VOC trichloroethene (TCE) was detected in one of five soil gas samples at a concentration of 434 µg/m³ in SV-2, exceeding the Sub- Slab Vapor Concentration guidance value of the 2006 Soil Vapor/Indoor Air Matrix 1 at a level that requires mitigation. Tetrachloroethene (PCE) was also detected in two of five soil gas samples at 7.32 µg/m³ and 56.4 µg/m³ in SV-5 and SV-3, respectively.

For more detailed results, consult the RIR. Based on an evaluation of the data and information from the RIR and this RAWP, disposal of hazardous waste is not suspected at this site.

2.0 REMEDIAL ACTION OBJECTIVES

Based on the results of the RI, the following Remedial Action Objectives (RAOs) have been identified for this Site:

Soil

- Prevent direct contact with contaminated soil.
- Prevent exposure to contaminants volatilizing from contaminated soil.
- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Groundwater

- Remove contaminant sources causing impact to groundwater.
- Prevent direct exposure to contaminated groundwater.
- Prevent exposure to contaminants volatilizing from contaminated groundwater.

Soil Vapor

- Prevent exposure to contaminants in soil vapor.
- Prevent migration of soil vapor into dwelling and other occupied structures.

3.0 REMEDIAL ALTERNATIVES ANALYSIS

The goal of the remedy selection process is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of applicable standards, criteria and guidance values (SCGs). Remedial alternatives are then developed and evaluated based on the following ten criteria:

- Protection of human health and the environment;
- Compliance with SCGs;
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community acceptance;
- Land use; and
- Sustainability.

As required, a Track 1 Unrestricted Use scenario is evaluated for the remedial action. The following is a detailed description of the alternatives analyzed to address impacted media at the Site:

Alternative 1:

- Selection of NYSDEC 6NYCRR Part 375 Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
- Removal of all soil/fill exceeding Track 1 Unrestricted Use SCOs throughout the Site and confirmation that Track 1 Unrestricted Use SCOs have been achieved with post-excavation endpoint sampling. Based on the results of the Remedial Investigation, it is

expected that this alternative would be achieved by the excavation of approximately 18 to 33 ft to elevation 22 ft amsl in the western portion of Phase 1 of construction, 6 to 24 ft to elevation 12 ft amsl in the eastern portion of Phase 1; and excavation to a depth of 6 to 20 ft to elevation 12 ft amsl for Phase 2 of construction. According to the proposed development design, the proposed excavation volume for both Phase 1 and Phase 2 of construction is approximately 59,000 cubic yards (CY) of soil. If soil/fill containing analytes at concentrations above Unrestricted Use SCOs is still present at the base of the excavation after removal of all soil required for construction of the new building's cellar level is complete, additional excavation would be performed to ensure complete removal of soil/ fill that does not meet Track 1 Unrestricted Use SCOs.

- No Engineering or Institutional Controls are required for a Track 1 cleanup. However, as part of development, a vapor barrier and sub-grade ventilated parking would be installed to prevent potential exposures from soil vapor in the future.

Alternative 2:

- Establishment of Site Specific Track 4 SCOs.
- Removal of all soil/fill exceeding Track 4 Site-specific SCOs and confirmation that Track 4 Site-specific SCOs have been achieved with post-excavation end point sampling. Based on the results of the Remedial Investigation, it is expected that SCOs would be achieved by the excavation of approximately 18 to 33 ft to elevation 22 ft amsl in the western portion of Phase 1 of construction, 6 to 24 ft to elevation 12 ft amsl in the eastern portion of Phase 1; and excavation to a depth of 6 to 20 ft to elevation 12 ft amsl for Phase 2 of construction. According to the proposed development design, the proposed excavation volume for both Phase 1 and Phase 2 of construction is approximately 59,000 cubic yards (CY) of soil. If soil/fill containing analytes at concentrations above Track 4 Site-Specific SCOs is still present at the base of the excavation, additional excavation would be performed to meet Track 4 Site-Specific SCOs.
- Placement of a composite cover system over the entire Site to prevent exposure to remaining soil/fill;

- Installation of a vapor barrier and/or sub-grade ventilated parking system beneath the building slab and along foundation side walls to prevent potential exposures from soil vapor;
- Establishment of use restrictions including prohibitions on the use of groundwater from the Site; prohibitions of restricted Site uses, such as farming or vegetable gardening, to prevent future exposure pathways; and prohibition of a higher level of land use without OER approval;
- Establishment of an approved Site Management Plan (SMP) to ensure long-term management of these Engineering and Institutional Controls including the performance of periodic inspections and certification that the controls are performing as they were intended. The SMP will note that the property owner and property owner's successors and assigns must comply with the approved SMP; and
- Placement of a deed notice to record the ECs/ICs on the deed to ensure that future owners of the Site continue to comply with the SMP, as required.

3.1 Threshold Criteria

Protection of Public Health and the Environment

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, and implementation of Engineering Controls or Institutional Controls. Protection of public health and the environment must be achieved for all approved remedial actions.

Alternative 1 would be protective of human health and the environment by removing all soil/fill exceeding Track 1 Unrestricted Use SCO's and groundwater protection standards, thus eliminating potential for direct contact with contaminated soil/fill once construction is complete and eliminating the risk of contaminants leaching into groundwater.

Alternative 2 would achieve comparable protections of human health and the environment by excavation and removal of most of the historic fill at the Site and by ensuring that remaining

soil/fill on-Site meets Track 4 Site-Specific SCO's, as well as by placement of Institutional and Engineering Controls, including a composite cover system. The composite cover system would prevent direct contact with any remaining on-Site soil/fill. Implementing Institutional Controls including a Site Management Plan and instituting a deed notice on the property would ensure that the composite cover system remains intact and protective of public health. Establishment of Track 4 Site-Specific SCO's would minimize the risk of contamination leaching into groundwater.

For both Alternatives, potential exposure to contaminated soils or groundwater during construction would be minimized by implementing a Construction Health and Safety Plan (CHASP), an approved Soil/Materials Management Plan (SMMP), and Community Air Monitoring Plan (CAMP). Potential contact with contaminated groundwater would be prevented as its use is prohibited by city laws and regulations. Potential future migration of off-Site soil vapors into the new building would be prevented by installing a vapor barrier and sub-grade ventilated parking.

3.2 Balancing Criteria

Compliance with Standards, Criteria and Guidance (SCGs)

This evaluation criterion assesses the ability of the alternative to achieve applicable standards, criteria and guidance.

Alternative 1 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of soil to achieve Track 1 Unrestricted Use SCO's and Protection of Groundwater SCO's. Compliance with SCGs for soil vapor would also be achieved by installing a waterproofing/vapor barrier system below the new building's basement slab and continuing the vapor barrier outside of subgrade foundation walls, as part of development. In addition, the proposed building in the area of soil vapor concerns will contain an underground parking garage with high volume air exchange that conforms to the NYC Building Code.

Alternative 2 would achieve compliance with the remedial goals, chemical-specific SCG's and RAOs for soil through removal of soil to meet Track 4 Site-Specific SCO's. Compliance with SCG's for soil vapor would also be achieved by installing a waterproofing/vapor barrier system

below the new building's basement slab and continuing the vapor barrier outside of subgrade foundation walls. A Site Management Plan would ensure that these controls remained protective for the long term. In addition, the proposed building in the area of soil vapor concerns will contain an underground parking garage with high volume air exchange that conforms to the NYC Building Code and will mediate any potential accumulation of soil vapors inside the building.

Health and safety measures contained in the CHASP and CAMP will be implemented during Site redevelopment under this RAWP. For both Alternatives, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs. These measures will protect on-site workers and the surrounding community from exposure to Site-related contaminants.

Short-Term Effectiveness and Impacts

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial action objectives are met. Under this criterion, alternatives are evaluated with respect to their short term effects during the remedial action on public health and the environment during implementation of the remedial action, including protection of the community, protection of onsite workers and environmental impacts.

Both Alternative 1 and 2 have similar short-term effectiveness during their implementation, as each requires excavation of historic fill material. Both alternatives would result in short-term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Short-term impacts could potentially be higher for Alternative 1 since excavation of greater amounts of historical fill material would take place. However, focused attention to means and methods during a Track 1 removal action, including community air monitoring and appropriate truck routing, would minimize the overall impact of these activities.

An additional short-term adverse impact and risks to the community associated with both remedial alternatives is increased truck traffic. Truck traffic will be routed on the most direct course using major thoroughfares where possible and flag persons will be used to protect pedestrians at Site entrances and exits.

The potential adverse impact to the community, workers and the environment for both alternatives would be minimized through implementation of control plans including a CHASP, CAMP and SMMP, during all on-Site soil disturbance activities and would minimize the release of contaminants into the environment. Both alternatives provide short-term effectiveness in protecting the surrounding community by decreasing the risk of contact with on-Site contaminants. Construction workers operating under appropriate management procedures and a CHASP would provide protection from on-Site contaminants by using personal protective equipment would be worn consistent with the documented risks within the respective work zones.

Long-term effectiveness and permanence

This evaluation criterion addresses the results of a remedial action in terms of its permanence and quantity/nature of waste or residual contamination remaining at the Site after response objectives have been met, such as permanence of the remedial alternative, magnitude of remaining contamination, adequacy of controls including the adequacy and suitability of Engineering Controls/Institutional Controls (ECs/ICs) that may be used to manage contaminant residuals that remain at the Site and assessment of containment systems and ICs that are designed to eliminate exposures to contaminants, and long-term reliability of ECs.

Alternative 1 would achieve long-term effectiveness and permanence related to on-Site contamination by permanently removing all impacted soil/fill above Track 1 Unrestricted Use SCO's. Removal of on-Site contaminant sources will also prevent future groundwater contamination.

Alternative 2 would provide long-term effectiveness by removing most on-Site contamination and attaining Track 4 Site-Specific SCOs; installing a composite cover system across the Site; maintaining use restrictions; establishing an SMP to ensure long-term management of ICs and ECs; and instituting a restrictive declaration to memorialize these controls for the long term. The SMP would ensure long-term effectiveness of all ECs and ICs by requiring periodic inspection and certification that these controls and restrictions continue to be in place and are functioning as they were intended, assuring that protections designed into the remedy continue to provide the required level of protection.

Reduction of toxicity, mobility, or volume of contaminated material

Alternative 1 will permanently eliminate the toxicity, mobility, and volume of contaminants from on-Site soil by removing all soil in excess of Track 1 Unrestricted Use SCO's.

Alternative 2 would remove most of the historic fill at the Site, and all remaining on-Site soil/fill beneath the new building will meet Track 4 Site-Specific SCO's.

Alternative 1 would remove a greater total mass of contaminants from the Site. The removal of soil to a depth ranging from six to thirty feet for the new development in both scenarios would lessen the difference in contaminant mass removal between these two alternatives.

Implementability

The techniques, materials and equipment to implement both Alternatives 1 and 2 are readily available and have been proven to be effective in remediating the contaminants present on the Site. They use standard equipment and technologies that are well established in the industry. The reliability of each remedy is also high. There are no special difficulties associated with any of the activities proposed.

Cost effectiveness

Since historic fill at the Site was found to extend to a depth of up to six feet below grade during the RI, and the new building requires excavation of the entire Site to a depth ranging from six to thirty feet, the costs associated with both Alternative 1 and Alternative 2 will likely be comparable. Costs associated with Alternative 1 could potentially be higher than Alternative 2 if soil with analytes above Track 1 Unrestricted Use SCOs is encountered below the excavation depth required for development. Additional costs would include installation of additional shoring/underpinning, disposal of additional soil, and import of clean soil for backfill. However, long-term costs for Alternative 2 are likely higher than Alternative 1 based on implementation of a Site Management Plan as part of Alternative 2.

The remedial plan would couple the remedial action with the redevelopment of the Site, lowering total costs. The remedial plan will also consider the selection of the most appropriate disposal facilities to reduce transportation and disposal costs during cleanup and redevelopment of the Site.

Community Acceptance

This RAWP will be subject to a public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedy. This public comment will be considered by OER prior to approval of this plan. The Citizen Participation Plan for the project is provided in Appendix B. Observations here will be supplemented by public comment received on the RAWP. Under both alternatives, the overall goals of the remedial program, to protect public health and the environment and eliminate potential contaminant exposures, have been broadly supported by citizens in NYC communities.

Land use

The current, intended, and reasonably anticipated future land use of the Site and its surroundings are compatible with the selected remedy of soil remediation. The proposed future use of the Site includes the restoration of four historic buildings, the historic underground vaults, as well as the construction of two new buildings. Phase 1 of the development consists of the leasing of a 44,813 square foot parcel of land located at 5 Bay Street (Lot 58), in Staten Island, New York; the construction and equipping of a new commercial building totaling approximately 66,295 square feet with an approximately 96,523 square foot parking structure and 117 apartment units in a 13 story tower over the commercial space. The commercial tenants will be a mix of restaurants, supermarket and office space. Phase 2 of the development consists of the leasing of a 101,361 square foot parcel of land located at 5 Bay Street (Lot 60) in Staten Island; the restoration and equipping of four existing historic buildings totaling approximately 40,668 square feet and the construction and equipping of a new commercial building totaling approximately 108,055 with an approximately 46,590 square foot parking structure. The proposed development will serve as a waterfront destination for tourists and local residents and will include open space areas and retail, hotel, conference center and parking facilities..

Following remediation, the Site will meet either Track 1 Unrestricted Use or Track 4 Site-Specific SCOs, both of which are protective of public health and the environment for its planned residential use. The proposed use is compliant with the property's zoning and is consistent with recent development patterns. The Site is bounded by the Saint George Ferry Terminal and Saint George train station of the MTA Staten Island Railway to the north; the US Post Office along

Bay Street and commercial buildings to the south; an esplanade, Borough Plaza, and New York City Department of Transportation Saint George ferry maintenance building immediately east, with piers and Upper New York Bay further east; and Bay Street, Staten Island Borough Hall, and the County Courthouse to the west. No schools or hospitals are within a 250 to 500- foot radius. However, there is a daycare listed at 80 Bay Street, Staten Island, New York that is approximately 400 feet from the closest Site boundary; the remediation of the Site will have no adverse effects on this location.

The proposed development would clean up the property and make it safer, create new employment opportunities, and other economic benefits from land revitalization.

Temporary short-term project impacts are being mitigated through site management controls and truck traffic controls during remediation activities. Following remediation, the Site will meet either Track 1 Unrestricted Use SCOs or Track 4 Site-Specific SCOs, both of which are protective of public health and the environmental for its planned use.

The Site is not in close proximity to important cultural resources, including federal or state historic or heritage sites or Native American religious sites, natural resources, wildlife refuges, wetlands, or critical habitats of endangered or threatened species. The Site is located in an urban area and not in proximity to fish or wildlife and neither alternative would result in any potential exposure pathways of contaminant migration affecting fish or wildlife. The remedial action is also protective of groundwater natural resources. The Site does not lie in a Federal Emergency Management Agency (FEMA)-designated flood plain. The Site is in close proximity to the Upper New York Bay, however, the remediation of the site will not adversely impact this waterway. Both alternatives are equally protective of natural resources and cultural resources. Improvements in the current environmental condition of the property achieved by both alternatives considered in this plan are consistent with the City's goals for cleanup of contaminated land.

Sustainability of the Remedial Action

While Alternative 2 would potentially result in lower energy usage based on reducing the volume of material transported off-Site, both remedial alternatives are comparable with respect to the opportunity to achieve sustainable remedial action. The remedial plan for either alternative

would take into consideration the shortest trucking routes during off-Site disposal of historic fill and other soils, which would reduce greenhouse gas emissions and conserve energy used to fuel trucks. The New York City Clean Soil Bank program is available for reuse of any clean native soils under either alternative. A complete list of green remedial activities considered as part of the NYC VCP is included in a Sustainability Statement.

4.0 REMEDIAL ACTION

4.1 Summary of Preferred Remedial Action

The preferred remedial action alternative is Alternative 1, the Track 1 remedial action. The preferred remedial action achieves protection of public health and the environment for the intended use of the property. The preferred remedial action will achieve all of the remedial action objectives established for the project and addresses applicable SCGs. The preferred remedial action is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants. The preferred remedial action alternative is cost effective and implementable and uses standard methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Selection of Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility(s), i.e., one sample per 1,000 cubic yards.
6. Excavation and removal of soil/fill exceeding Unrestricted Use (Track 1) SCOs. Based on the results of the Remedial Investigation, it is expected that this alternative would be achieved by the excavation of approximately 18 to 33 ft to elevation 22 ft amsl in the western portion of Phase 1 of construction, 6 to 24 ft to elevation 12 ft amsl in the eastern portion of Phase 1; and excavation to a depth of 6 to 20 ft to elevation 12 ft amsl for Phase 2 of construction. The proposed excavation volume for both Phase 1 and Phase 2

of construction is approximately 59,000 cubic yards (CY) of soil which will be removed from the Site and properly disposed at an appropriately licensed or permitted facility.

7. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID. Appropriate segregation of excavated media on-Site.
8. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.
9. Registration of tanks and reporting of any petroleum spills associated with underground storage tanks (USTs) and appropriate closure of these petroleum spills in compliance with applicable local, State, and Federal laws and regulations.
10. Transportation and off-Site disposal of all soil/fill material at licensed or permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-Site.
11. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of Track 1 SCOs.
12. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
13. Performance of all activities required for the remedial action, including acquisition of required permits and attainment of pretreatment requirements, in compliance with applicable laws and regulations.
14. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.

15. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, and lists any changes from this RAWP.

If Track 1 Unrestricted Use SCOs are not achieved, the following construction elements implemented as part of the new development will constitute Engineering and Institutional Controls:

16. As part of development, construction of an engineered composite cover system comprised of combination of 6 inches of reinforced concrete slab underlain by 8 inches of clean sub-base material in building areas; 4 inches of asphalt pavement underlain by 6 inches of clean sub-base material in parking areas, and 2 feet of clean soil in open space areas.
17. As part of development, installation of a vapor barrier system consisting of vapor barrier beneath the building slab and outside of sub-grade foundation sidewalls to mitigate soil vapor migration into the building. The vapor barrier system will consist of a 20-mil vapor barrier below the slab throughout the full building area and a Grace Bituthene (or equivalent) vapor barrier system outside all sub-grade foundation sidewalls. All welds, seams and penetrations will be properly sealed to prevent preferential pathways for vapor migration.
18. As part of new development, construction and operation of a cellar parking garage with high volume air exchange in conformance with NYC Building Code. The parking garage will also be completed at the location where concentration of TCE at $434 \mu\text{g}/\text{m}^3$ in SV-2 exceeded the Sub-Slab Vapor Concentration guidance value.

4.2 Soil Cleanup Objectives and Soil/ Fill Management

Track 1 SCOs are proposed for this project and SCO's are defined in 6 NYCRR Part 375, Table 6.8(a) Track 1 Unrestricted Use. If Track 1 SCO's are not achieved, the following Track 4 Site-Specific SCO's will be used for this project:

<u>Contaminant</u>	<u>Site-Specific SCO's</u>
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Lead	800 ppm
Mercury	1.5 ppm
Arsenic	23 ppm

Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in Appendix D. Discrete contaminant sources (such as hotspots) identified during the remedial action will be identified by GPS or surveyed. This information will be provided in the Remedial Action Report.

Soil/Fill Excavation and Removal

The location of planned excavations is shown in Figure 2. The total quantity of soil/fill expected to be excavated and disposed off-Site is approximately 88,000 tons (59,000 cubic yards). For each disposal facility to be used in the remedial action, a letter from the developer/QEP to the receiving facility requesting approval for disposal and a letter back to the developer/QEP providing approval for disposal will be submitted to OER prior to any transport and disposal of soil at a facility.

Disposal facilities will be reported to OER when they are identified and prior to the start of remedial action.

End-point Sampling

End-point samples will be analyzed for compounds and elements as described below utilizing the following methodology:

- VOCs by EPA Method 8260;
- SVOCs by EPA Method 8270;
- Target Analyte List (TAL) metals; and
- Pesticides/ Polychlorinated Biphenyls (PCBs) by EPA Method 8081/8082.

New York State Environmental Laboratory Accreditation Program (ELAP) certified labs will be used for all end-point sample analyses. Labs performing end-point sample analyses will be reported in the RAR. The RAR will provide a tabular and map summary of all end-point sample

results and will include all data including non-detects and applicable standards and/or guidance values.

Confirmation End-point Sampling

Removal actions for development purposes under this plan will be performed in conjunction with confirmation end-point soil sampling. Confirmation samples will be collected from the base of the excavation at locations to be determined by OER. To evaluate attainment of Track 1 SCOs, analytes will include those for which SCOs have been developed, including list SCO analytes (i.e. VOCs, SVOCs, metals, Pesticides and PCBs) according to analytical methods described above.

Post-remediation end-point sample locations and depth will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples should be biased toward locations and depths of the highest expected contamination. The number and specific locations of end point soil samples will be determined in the stipulation list at a later date.

If either LNAPL and/or DNAPL are detected, appropriate samples will be collected for characterization and “finger print analysis” and required regulatory reporting (i.e. spills hotline) will be performed.

Quality Assurance/Quality Control

QA/QC procedures will be used to provide performance information with regard to accuracy, precision, sensitivity, representation, completeness, and comparability associated with the sampling and analysis for this investigation. Field QA/QC procedures will be used to document that samples are representative of actual conditions at the Site and identify possible cross-contamination from field activities or sample transit. Laboratory QA/QC procedures and analyses will be used to demonstrate whether analytical results have been biased either by interfering compounds in the sample matrix, or by laboratory techniques that may have introduced systematic or random errors to the analytical process. QA/QC samples including field

blanks, and trip blanks, and duplicates, will be collected and analyzed at rates in accordance with DER-10.

Import of Soils

Soil import is not planned on this project.

Reuse of Onsite Soils

If necessary, reuse of soils already onsite will be performed in conformance with the Soil/Materials Management Plan in Appendix D. The estimated quantity of soil to be reused on this project is to be determined. Reuse soils will meet the SCO's established for this project. A map of soil backfill placement locations will be provided in the Remedial Action Report, if necessary.

4.3 Engineering Controls

The remedial action will achieve Track 1 Unrestricted Use SCOs and no Engineering Controls are required. However, the following design elements will be incorporated into the project as part of the development:

- (1) Composite Cover System
- (2) Soil Vapor Barrier System
- (3) Sub-grade ventilated parking garage

If Track 1 is not achieved, these elements will constitute Engineering Controls that will be employed in the remedial action to address residual contamination remaining at the Site.

Composite Cover System

Exposure to residual soil/fill will be prevented by an engineered, composite cover system to be built on the Site, if Track 1 Unrestricted Use SCOs are not achieved. This design of this composite cover system will be determined at a future date, if needed. An example of possible composite cover system is comprised of 6 inches of reinforced concrete slab underlain by 8 inches of clean sub-base material in building areas; 4 inches of asphalt pavement underlain by 6 inches of clean sub-base material in parking areas, and 2 feet of clean soil in open space areas.

The composite cover system will be a permanent engineering control. The system will be inspected and its performance certified at specified intervals as required by this RAWP and the Site Management Plan. A Soil and Materials Management Plan will be included in the Site Management Plan and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the Site Management Plan in the Remedial Action Report.

Vapor Barrier System

Migration of soil vapor from onsite or offsite sources into the building will be mitigated with a combination of building slab and vapor barrier. The vapor barrier will extend throughout the area occupied by the footprint of the new building and up the foundation sidewalls and will be installed in accordance with manufacturer specifications. The vapor barrier will be a minimum 20-mil vapor barrier that is American Society of Testing and Materials (ASTM) E 1745 Class A, B, and C compliant, resistant to puncturing and has high tensile strength. The performance of the vapor barrier is compliant with ASTM E 154 Sections 8, 11, 12, and 13. The vapor barrier will not deteriorate, decompose, or degrade below concrete slabs when buried and has an indefinite life expectancy. A Grace Bituthene (or equivalent) vapor barrier system will be installed for the subgrade walls according to manufacturer specifications and depending on foundation construction methods. The proposed vapor barrier specifications and details are provided in Appendix E. A plan view showing the location of the proposed vapor barrier, design sections for the vapor barrier on slab and sidewalls, and product specification sheets will be provided in the stipulation list at a later date. The RAR will include photographs of the installation process, PE/RA certified letter (on company letterhead) from primary contractor responsible for installation oversight and field inspections, and a copy of the manufacturer's certificate of warranty.

4.4 Institutional Controls

A Track 1 remedial action is proposed and Institutional Controls are not required. If a Track 1 remedial action is not achieved, Institutional Controls (IC's) will be incorporated in this remedial action to manage residual soil/fill and other media and render the Site protective of public health

and the environment. These IC's define the program to operate, maintain, inspect and certify the performance of Engineering Controls and Institutional Controls on this property. Institutional Controls would be implemented in accordance with a Site Management Plan included in the final Remedial Action Report (RAR). Institutional Controls would be:

- Recording of an OER-approved Declaration of Covenant and Restrictions (DCR) with the City Register or county clerk, as appropriate. The DCR will include a description of all ECs and ICs, will summarize the requirements of the SMP, and will note that the property owner and property owner's successors and assigns must comply with the DCR and the approved SMP. The recorded DCR will be submitted in the Remedial Action Report. The DCR will be recorded prior to OER issuance of the Notice of Completion;
- Submittal of a SMP in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, inspection, and certification of ECs and IC's. SMP will require that the property owner and property owner's successors and assigns will submit to OER a periodic written statement that certifies that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by OER; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. OER retains the right to enter the Site in order to evaluate the continued maintenance of any controls. This certification shall be submitted at a frequency to be determine by OER in the SMP and will comply with RCNY §43-1407(1)(3).
- Vegetable gardens and farming on the Site are prohibited in contact with residual soil materials;
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for its intended use;
- All future activities on the Site that will disturb residual material must be conducted pursuant to the soil management provisions in an approved SMP;

- The Site will be used for usage type residential and commercial and will not be used for a higher level of use without prior approval by OER.

4.5 Site Management Plan

A Track 1 remedial action is proposed and Site Management is not required. If a Track 1 remedial action is not achieved, Site Management will be required and will be the last phase of remediation. Site Management will begin with the approval of the Remedial Action Report and issuance of the Notice of Completion (NOC) for the Remedial Action. The Site Management Plan (SMP) describes appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by this RAWP. The Site Management Plan is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by OER. The property owner is responsible to ensure that all Site Management responsibilities defined in the Site Management Plan are implemented.

The SMP will provide a detailed description of the procedures required to manage residual soil/fill left in place following completion of the remedial action in accordance with the Voluntary Cleanup Agreement with OER. This includes a plan for: (1) implementation of EC's and ICs; (2) operation and maintenance of EC's; (3) inspection and certification of IC's and EC's.

Site management activities and EC/IC certification will be scheduled by OER on a periodic basis to be established in the RAR and the SMP and will be subject to review and modification by OER. The Site Management Plan will be based on a calendar year and certification reports will be due for submission to OER by July 30 of the year following the reporting period.

4.6 Qualitative Human Health Exposure Assessment

The objective of the qualitative exposure assessment is to identify potential receptors and pathways for human exposure to the contaminants of concern (COC) that are present at, or migrating from, the Site. The identification of exposure pathways describes the route that the

COC takes to travel from the source to the receptor. An identified pathway indicates that the potential for exposure exists; it does not imply that exposures actually occur.

Data and information reported in the Remedial Investigation Report (RIR) are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA) for this project. As part of the VCP process, a QHHEA was performed to determine whether the Site poses an existing or future health hazard to the Site's exposed or potentially exposed population. The sampling data from the RI were evaluated to determine whether there is any health risk under current and future conditions by characterizing the exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. This QHHEA was prepared in accordance with Appendix CB and Section 3.3 (b) 8 of the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation.

Known and Potential Contaminant Sources

Based on the results of the RIR, the contaminants of concern are:

Soil: The only exceedance of UUSCOs in the deep soil samples was for nickel, which ranges from 41 to 100 milligrams per kilogram (mg/kg) throughout the Site, and chromium, detected at 47 mg/kg in the duplicate sample (SB-10 DUP). In three of the four shallow sampling locations (SB-10, SB-11, and SB-12) metals, including arsenic, copper, lead, mercury, nickel, and zinc, were detected at concentrations exceeding the UUSCOs. One soil sample, SB-10/0-2' also exceeded RRSCOs for arsenic at 17 mg/kg.

All four shallow soil samples (SB-09, SB-10, SB-11 and SB-12) exceeded UUSCOs for multiple pesticides, including dieldrin (maximum detection of 155 micrograms per kilogram [$\mu\text{g}/\text{kg}$] in SB-12/0-2'), and 4,4'- DDE (maximum detection of 44.6 $\mu\text{g}/\text{kg}$ in SB-10/0-2'). Three out of four shallow soil samples (SB-10, SB-11, and SB-12) exceeded UUSCOs for the pesticide 4,4'- DDT. Additionally, there was one exceedance of the UUSCO for alpha-Chlordane, with a maximum concentration of 165 $\mu\text{g}/\text{kg}$ at SB-11/0-2'.

Groundwater: Analytical results showed the presence of the VOC chloroform at a level exceeding AWQSGVs (29 micrograms per liter [$\mu\text{g}/\text{L}$]) at one location (GW-9), and a range of VOCs typically associated with petroleum contamination (benzene at 17 $\mu\text{g}/\text{L}$, ethylbenzene at 5.4 $\mu\text{g}/\text{L}$, toluene at 46 $\mu\text{g}/\text{L}$, and total xylenes at 8 $\mu\text{g}/\text{L}$) exceeding AWQSGVs at GW-10.

Soil Vapor: TCE was detected in soil vapor sample SV-2 at a concentration of 434 µg/m³. PCE was detected two soil vapor samples at concentrations ranging from 7.32 µg/m³ in SV-5 to 56.4 µg/m³ in SV-3. Cis-1,2-DCE was detected in SV-2 at a concentration of 65.8 µg/m³.

Nature, Extent, Fate and Transport of Contaminants

Soil: The presence of metals and pesticides at shallow depths supports the field observations of a shallow layer of historic fill material throughout the Site. Additionally, due to the vegetated nature of the Site, pesticides were likely used as a method of historic Site maintenance. Based on the nature of these contaminants, migration into groundwater or volatilization into soil vapor is unlikely.

Groundwater: Groundwater samples were collected from the Site showed a range of VOCs typically associated with petroleum contamination (benzene, ethylbenzene, toluene, and total xylenes). However, due to the fact that no staining, odors, elevated PID readings, or petroleum-related VOC analytical results were encountered in the onsite soil samples, it can be inferred that the source of the groundwater contamination in GW-10 is coming from an off-site, hydraulically up-gradient source.

Numerous metals were detected in all groundwater samples at levels exceeding GQSs. However, the majority of these exceedances are not indicative of groundwater quality at the Site, but rather reflect the presence of sediment suspended within the groundwater sample. Once samples were laboratory filtered, only manganese and sodium were detected above GQSs, and is likely due to the close proximity of the Site to the Upper New York Bay, and associated salt-water intrusion.

Soil Vapor: TCE, PCE, and cis-1,2-DCE were detected soil vapor. Carbon tetrachloride, 1,1-DCE, 1,1,1-TCA and vinyl chloride were not detected in any soil vapor samples during this RI. Considering that there were no detections of these compounds in soil or groundwater, these detections may be indicative of an off-site source.

Receptor Populations

On-Site Receptors: The site is currently vacant and undeveloped and access to the Site is restricted by an 8 foot high, chained and locked, perimeter fence. Onsite receptors are limited to trespassers, site representatives and visitors granted access to the property. During construction, potential on-site receptors include construction workers, site representatives, and visitors. Under proposed future conditions, potential on-site receptors include adult and child building residents, workers and visitors.

Off-Site Receptors: Potential off-site receptors within a 500 foot radius of the Site include adult and child residents; commercial and construction workers; pedestrians; and trespassers based on the following land uses within 500 feet of the Site:

1. Commercial Businesses – existing and future
2. Residential Buildings – existing and future
3. Building Construction/ Renovation – existing and future
4. Pedestrians, Trespassers, Cyclists – existing and future
5. Schools and Daycare Facilities – existing and future

Potential Routes of Exposure

Three potential primary routes exist by which chemicals can enter the body: ingestion, inhalation, and dermal absorption. Exposure can occur based on the following potential media:

- Ingestion of groundwater or fill/ soil;
- Inhalation of vapors or particulates; and
- Dermal absorption of groundwater or fill/ soil.

Potential Exposure Points

Current Conditions: The site is currently capped with vegetation. Potential exposure pathways include ingestion, inhalation, or dermal absorption of soil/ fill Groundwater is not exposed at the site. The site is served by the public water supply and groundwater is not used at the site for potable supply and there is no potential for exposure. Because the site is currently undeveloped, there is no potential for soil vapor to accumulate on site

Construction/ Remediation Conditions: During the remedial action, onsite workers will come into direct contact with surface and subsurface soils as a result of on-Site construction and excavation activities. On-Site construction workers potentially could ingest, inhale or have dermal contact with exposed impacted soil and fill. Similarly, off-Site receptors could be exposed to dust and vapors from on-Site activities. Due to the depth of groundwater, direct contact with groundwater is not expected. During construction, on-Site and off-Site exposures to contaminated dust from on-Site will be addressed through the SMMP, dust controls, and through the implementation of the CAMP and a CHASP Plan.

Proposed Future Conditions: Under future remediated conditions, all soils in excess of Track 1 will be removed. The site will be fully capped, preventing potential direct exposure to soil and groundwater remaining in place, and engineering controls (vapor barrier/ventilated parking) will prevent any potential exposure due to inhalation by preventing soil vapor intrusion. The site is served by the public water supply, and groundwater is not used at the site. There are no plausible off-site pathways for oral, inhalation, or dermal exposure to contaminants derived from the site.

Overall Human Health Exposure Assessment

There are potential complete exposure pathways for the current site condition. There are potential complete exposure pathways that require mitigation during implementation of the remedy. There are no complete exposure pathways under future conditions after the site is developed. This assessment takes into consideration the reasonably anticipated use of the site, which includes a residential structure, site-wide surface cover, and a subsurface vapor barrier system for the building. Under current conditions, on-Site exposure pathways exist for those with access to the Site and trespassers. During remedial construction, on-Site and off-Site exposures to contaminated dust from historic fill material will be addressed through dust controls, and through the implementation of the CAMP, the SMMP, and a CHASP. Potential post-construction use of groundwater is not considered an option because groundwater in this area of New York City is not used as a potable water source. There are no surface waters in close proximity to the Site that could be impacted or threatened.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 Project Organization and Oversight

Principal personnel who will participate in the remedial action include Charles McGuckin (PE), Sin Senh (QEP), and Jessica Collins (Project Manager). The Professional Engineer (PE) and Qualified Environmental Professionals (QEP) for this project are Charles McGuckin (PE) and Sin Senh (QEP).

5.2 Site Security

Site access will be controlled by gated entrances to the fenced property. Site access will be controlled by DOB approved construction fence. For work areas of limited size, barrier tape will be sufficient to delineate and restrict access.

5.3 Work Hours

The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency. The hours of operation will be conveyed to OER during the pre-construction meeting.

5.4 Construction Health and Safety Plan

The Construction Health and Safety Plan is included in Appendix F. The Site Safety Coordinator is to be determined. Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that performance of work is in compliance with the CHASP and applicable laws and regulations. The CHASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Completion.

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, such as 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records.

Personnel entering any exclusion zone will be trained in the provisions of the HASP and will comply with all requirements of 29 CFR 1910.120. Site-specific training will be provided to

field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the site location before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log book or specific form.

An emergency contact sheet with names and phone numbers is included in the CHASP. That document will define the specific project contacts for use in case of emergency.

5.5 Community Air Monitoring Plan

Real-time air monitoring for volatile organic compounds (VOCs) and particulate levels at the perimeter of the exclusion zone or work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence. Exceedances of action levels observed during performance of the Community Air Monitoring Plan (CAMP) will be reported to the OER Project Manager and included in the Daily Report.

VOC Monitoring, Response Levels, and Actions

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be

measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

All 15-minute readings must be recorded and be available for OER personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a

period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m³) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m³ above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m³ above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m³ of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for OER personnel to review.

5.6 Agency Approvals

All permits or government approvals required for remedial construction have been or will be obtained prior to the start of remedial construction. Approval of this RAWP by OER does not constitute satisfaction of these requirements and will not be a substitute for any required permit.

5.7 Site Preparation

Pre-Construction Meeting

OER will be invited to attend the pre-construction meeting at the Site with all parties involved in the remedial process prior to the start of remedial construction activities.

Mobilization

Mobilization will be conducted as necessary for each phase of work at the Site. Mobilization includes field personnel orientation, equipment mobilization (including securing all sampling

equipment needed for the field investigation), marking/staking sampling locations and utility mark-outs. Each field team member will attend an orientation meeting to become familiar with the general operation of the Site, health and safety requirements, and field procedures.

Utility Marker Layouts, Easement Layouts

The presence of utilities and easements on the Site will be fully investigated prior to the performance of invasive work such as excavation or drilling under this plan by using, at a minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed in compliance with applicable laws and regulations including NYC Building Code to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the Mark-Out Ticket will be retained by the contractor prior to the start of drilling, excavation or other invasive subsurface operations. Overhead utilities may also be present within the anticipated work zones. Electrical hazards associated with drilling in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and drill rig masts.

Proper safety and protective measures pertaining to utilities and easements, and compliance with all laws and regulations will be employed during invasive and other work contemplated under this RAWP. The integrity and safety of on-Site and off-Site structures will be maintained during all invasive, excavation or other remedial activity performed under the RAWP.

Dewatering

Dewatering is not anticipated during remediation and construction.

Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations. The location of proposed equipment and material staging areas, truck inspection station, stockpile areas, and other pertinent remedial management features will be decided on and managed by the construction manager for the Site.

Stabilized Construction Entrance

Steps will be taken to ensure that trucks departing the site will not track soil, fill or debris off-Site. Such actions may include use of cleaned asphalt or concrete pads or use of stone or other aggregate-based egress paths between the truck inspection station and the property exit. Measures will be taken to ensure that adjacent roadways will be kept clean of project related soils, fill and debris.

Truck Inspection Station

An outbound-truck inspection station will be set up close to the Site exit. Before exiting the Site, trucks will be required to stop at the truck inspection station and will be examined for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed. Brooms, shovels and clean water will be utilized for the removal of soil from vehicles and equipment, as necessary.

Extreme Storm Preparedness and Response Contingency Plan

Damage from flooding or storm surge can include dislocation of soil and stockpiled materials, dislocation of site structures and construction materials and equipment, and dislocation of support of excavation structures. Damage from wind during an extreme storm event can create unsafe or unstable structures, damage safety structures and cause downed power lines creating dangerous site conditions and loss of power. In the event of emergency conditions caused by an extreme storm event, the enrollee will undertake the following steps for site preparedness prior to the event and response after the event.

Storm Preparedness

Preparations in advance of an extreme storm event will include the following: containerized hazardous materials and fuels will be removed from the property; loose materials will be secured to prevent dislocation and blowing by wind or water; heavy equipment such as excavators and generators will be removed from excavated areas, trenches and depressions on the property to high ground or removed from the property; an inventory of the property with photographs will be performed to establish conditions for the site and equipment prior to the event; stockpile covers for soil and fill will be secured by adding weights such as sandbags for added security and worn or ripped stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; stormwater management systems will be inspected and

fortified, including, as necessary: clean and reposition silt fences, hay bales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

Storm Response

At the conclusion of an extreme storm event, as soon as it is safe to access the property, a complete inspection of the property will be performed. A site inspection report will be submitted to OER at the completion of site inspection and after the site security is assessed. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. Damage from storm conditions that result in acute public safety threats, such as downed power lines or imminent collapse of buildings, structures or equipment will be reported to public safety authorities via appropriate means such as calling 911. Petroleum spills will be reported to NYS DEC within 2 hours of identification and consistent with State regulations. Emergency and spill conditions will also be reported to OER. Public safety structures, such as construction security fences will be repaired promptly to eliminate public safety threats. Debris will be collected and removed. Dewatering will be performed in compliance with existing laws and regulations and consistent with emergency notifications, if any, from proper authorities. Eroded areas of soil including unsafe slopes will be stabilized and fortified. Dislocated materials will be collected and appropriately managed. Support of excavation structure will be inspected and fortified as necessary. Impacted stockpiles will be contained and damaged stockpile covers will be replaced. Stormwater control systems and structures will be inspected and maintained as necessary. If soil or fill materials are discharged off site to adjacent properties, property owners and OER will be notified and corrective measure plan designed to remove and clean dislocated material will be submitted to OER and implemented following approval by OER and granting of site access by the property owner. Impacted offsite areas may require characterization based on site conditions, at the discretion of OER. If onsite petroleum spills are identified, a qualified environmental professional will determine the nature and extent of the spill and report to NYS DEC's spill hotline at DEC 800-457-7362 within statutory defined timelines. If the source of the spill is ongoing and can be identified, it should be stopped if this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by NYS DEC.

Storm Response Reporting

A site inspection report will be submitted to OER at the completion of site inspection. An inspection report established by OER is available on OER's website (www.nyc.gov/oer) and will be used for this purpose. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. The site inspection report will be sent to the OER project manager and will include the site name, address, tax block and lot, site primary and alternate contact name and phone number. Damage and soil release assessment will include: whether the project had stockpiles; whether stockpiles were damaged; photographs of damage and notice of plan for repair; report of whether soil from the site was dislocated and whether any of the soil left the site; estimates of the volume of soil that left the site, nature of impact, and photographs; description of erosion damage; description of equipment damage; description of damage to the remedial program or the construction program, such as damage to the support of excavation; presence of onsite or offsite exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYS DEC; description of corrective actions; schedule for corrective actions. This report should be completed and submitted to OER project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

5.8 Traffic Control

Drivers of trucks leaving the Site with soil/fill will be instructed to proceed without stopping in the vicinity of the Site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the site is shown on Figure 5.

5.9 Demobilization

Demobilization will include:

- As necessary, restoration of temporary access areas and areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management areas, and access area);
- Removal of sediment from erosion control measures and truck wash and disposal of materials in accordance with applicable laws and regulations;
- Equipment decontamination, and;

- General refuse disposal.

Equipment will be decontaminated and demobilized at the completion of all field activities. Investigation equipment and large equipment (e.g., soil excavators) will be washed at the truck inspection station as necessary. In addition, all investigation and remediation derived waste will be appropriately disposed.

5.10 Reporting and Record Keeping

Daily reports

Daily reports providing a general summary of activities for each day of active remedial work will be emailed to the OER Project Manager by the end of the following business day. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of excavation and other remedial work performed;
- Quantities of material imported and exported from the Site;
- Status of on-Site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP results noting all excursions. CAMP data may be reported;
- Photograph of notable Site conditions and activities.

The frequency of the reporting period may be revised in consultation with OER project manager based on planned project tasks. Daily email reports are not intended to be the primary mode of communication for notification to OER of emergencies (accidents, spills), requests for changes to the RAWP or other sensitive or time critical information. However, such information will be included in the daily reports. Emergency conditions and changes to the RAWP will be communicated directly to the OER project manager by personal communication. Daily reports will be included as an Appendix in the Remedial Action Report.

An alpha-numeric site map will be used to identify locations described in reports submitted to OER and is shown in Figure 2.

Record Keeping and Photo Documentation

Job-site record keeping for all remedial work will be performed. These records will be maintained on-Site during the project and will be available for inspection by OER staff. Representative photographs will be taken of the Site prior to any remedial activities and during major remedial activities to illustrate remedial program elements and contaminant source areas. Photographs will be submitted at the completion of the project in the RAR in digital format (i.e. jpeg files).

5.11 Complaint Management

All complaints from citizens will be promptly reported to OER. Complaints will be addressed and outcomes will also be reported to OER in daily reports. Notices to OER will include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

5.12 Deviations from the Remedial Action Work Plan

All changes to the RAWP will be reported to, and approved by, the OER Project Manager and will be documented in daily reports and reported in the Remedial Action Report. The process to be followed if there are any deviations from the RAWP will include a request for approval for the change from OER noting the following:

- Reasons for deviating from the approved RAWP;
- Effect of the deviations on overall remedy; and
- Determination with basis that the remedial action with the deviation(s) is protective of public health and the environment.

6.0 REMEDIAL ACTION REPORT

A Remedial Action Report (RAR) will be submitted to OER following implementation of the remedial action defined in this RAWP. The RAR will document that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The RAR will include:

- Information required by this RAWP;
- Text description with thorough detail of all engineering and institutional controls (if Track 1 remedial action is not achieved)
- As-built drawings for all constructed remedial elements;
- Manifests for all soil or fill disposal;
- Photographic documentation of remedial work performed under this remedy;
- Site Management Plan(if Track 1 remedial action is not achieved);
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents;
- Tabular summary of all end point sampling results (including all soil test results from the remedial investigation for soil that will remain on site) and all soil/fill waste characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all soil or fill material removed from the Site including a map showing the location of these excavations and hotspots, tanks or other contaminant source areas;
- Full accounting of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material;
- Account of the origin and required chemical quality testing for material imported onto the Site;

- Recorded Declaration of Covenants and Restrictions (if Track 1 remedial action is not achieved);
- The RAWP and Remedial Investigation Report will be included as appendices to the RAR;
- Reports and supporting material will be submitted in digital form and final PDF's will include bookmarks for each appendix.

Remedial Action Report Certification

I, Charles McGuckin, am currently a registered professional engineer licensed by the State of New York. I performed professional engineering services and had primary direct responsibility for implementation of the remedial program for the Lighthouse Point Redevelopment (5 Bay Street, LLC) Site, project number 15CVCP162R. I certify to the following:

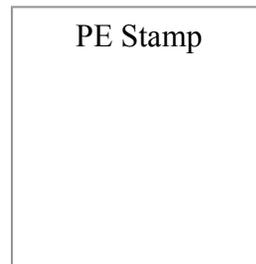
- I have reviewed this document, to which my signature and seal are affixed.
- Engineering Controls implemented during this remedial action were designed by me or a person under my direct supervision and achieve the goals established in the Remedial Action Work Plan for this site.
- The Engineering Controls constructed during this remedial action were professionally observed by me or by a person under my direct supervision and (1) are consistent with the Engineering Control design established in the Remedial action Work Plan and (2) are accurately reflected in the text and drawings for as-built design reported in this Remedial Action Report.
- The OER-approved Remedial Action Work Plan dated [date] and Stipulations in a letter dated [date] were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.

Name

PE License Number

Signature

Date



I, Sin Senh, am a Qualified Environmental Professional. I had primary direct responsibility for implementation of the remedial program for the Lighthouse Point Redevelopment (5 Bay Street) site, project number 15CVCP162R. I certify to the following:

- The OER-approved Remedial Action Work Plan dated [date] and Stipulations in a letter dated [date] were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.

QEP Name

QEP Signature

Date

7.0 SCHEDULE

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, a six month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	0	-
Mobilization	1	1
Remedial Excavation	2	16
Demobilization	18	1
Submit Remedial Action Report	26	8

LIGHTHOUSE POINT REDEVELOPMENT
Staten Island, New York
Remedial Action Work Plan

FIGURES

Figure 1: Site Location Map

Figure 2: Site Plan

Figure 3: Redevelopment Plan

Figure 4: Surrounding Land Usage

Figure 5: Truck Route Map



QUADRANGLE LOCATION



SOURCE:
USGS; 1995, Jersey City, NJ-NY
7.5 Minute Topographic Quadrangle

Title:

SITE LOCATION MAP

REMEDIAL ACTION WORK PLAN
LIGHTHOUSE POINT
STATEN ISLAND, NEW YORK

Prepared for:

TRIANGLE EQUITIES - 5 BAY STREET, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting
& Management

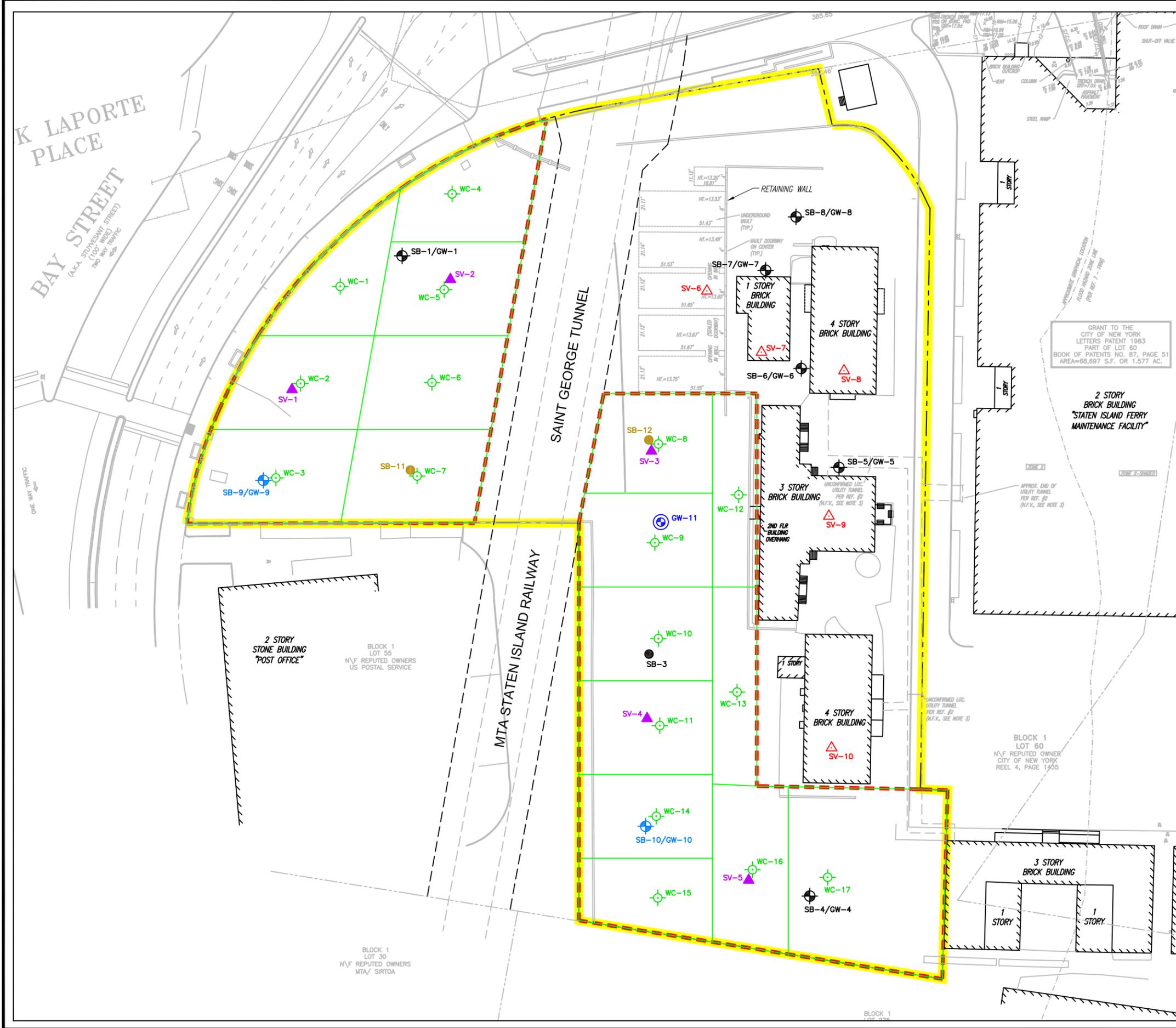
Compiled by: B.K.	Date: 28OCT15
Prepared by: B.H.C.	Scale: AS SHOWN
Project Mgr.: J.C.	Project No.: 1637.0001Y003
File: 1637.0001Y117.04.CDR	

FIGURE

1

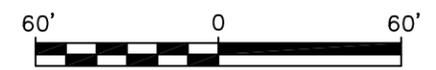
11637Y/0001Y/117/1637.0001Y117.04.CDR

V:\CAD\PROJECTS\1637\0001Y\117\1637.0001Y117.02.DWG

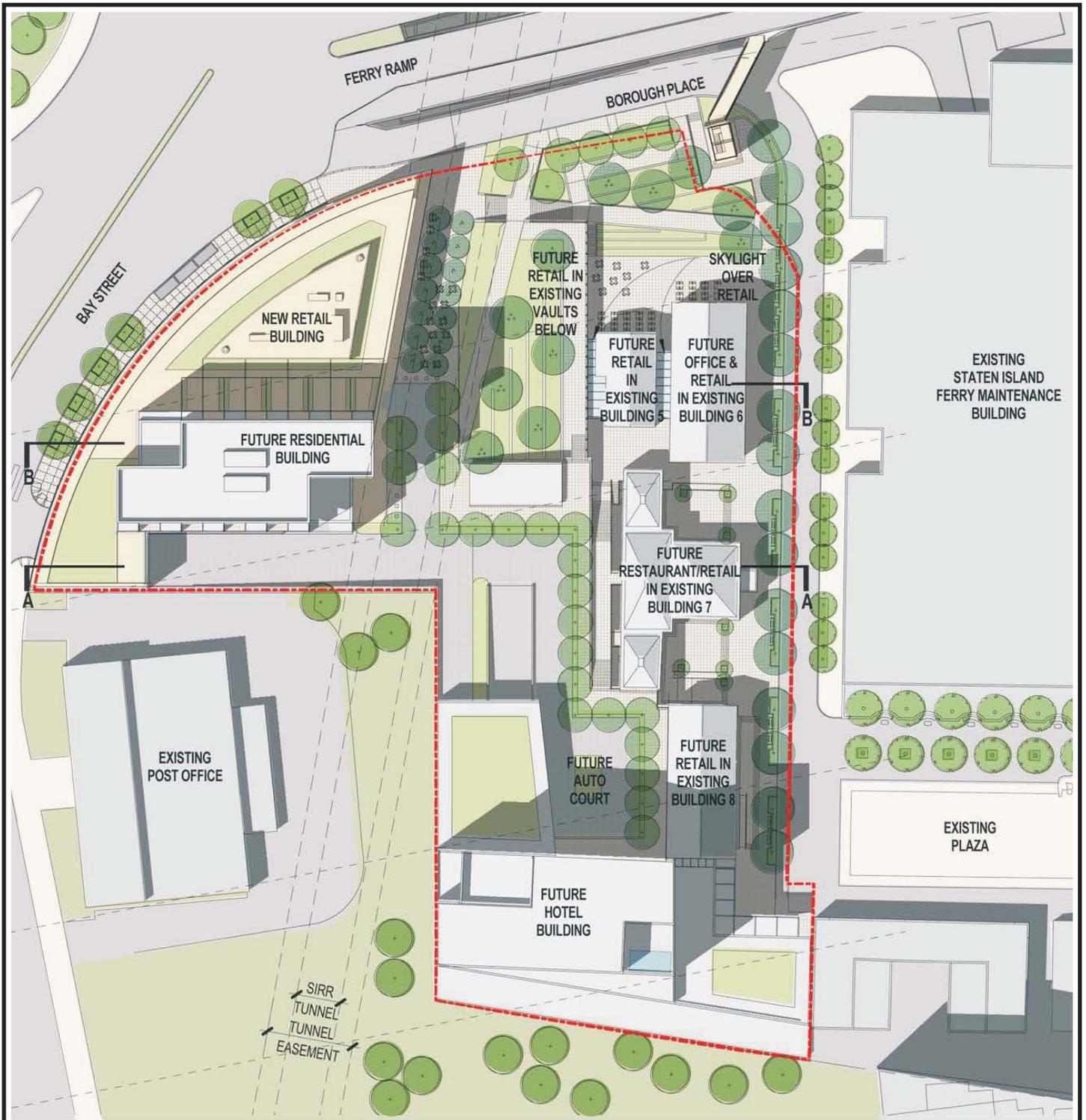


LEGEND

- PROJECT BOUNDARY
- PROPOSED SCOPE OF EXCAVATION BOUNDARY
- PROPOSED SOIL CHARACTERIZATION GRID
- IN SITU SOIL CHARACTERIZATION BORING LOCATION AND DESIGNATION
- SOIL SAMPLING LOCATION AND DESIGNATION
- SOIL AND GROUNDWATER SAMPLING LOCATION AND DESIGNATION
- SOIL VAPOR/SUB-SLAB VAPOR SAMPLING LOCATION AND DESIGNATION
- 2007 PHASE II SOIL SAMPLING LOCATION AND DESIGNATION
- 2007 PHASE II SOIL AND GROUNDWATER SAMPLING LOCATION AND DESIGNATION
- PROPOSED SUB-SLAB VAPOR SAMPLING LOCATION AND DESIGNATION
- EXISTING MONITORING WELL LOCATION AND DESIGNATION



Title:			
SITE PLAN			
REMEDIAL ACTION WORK PLAN LIGHTHOUSE POINT STATEN ISLAND, NEW YORK			
Prepared For:			
TRIANGLE EQUITIES – 5 BAY STREET, LLC			
 ROUX ASSOCIATES, INC. Environmental Consulting & Management	Compiled by: J.C.	Date: 28OCT15	FIGURE 2
	Prepared by: B.H.C.	Scale: AS SHOWN	
	Project Mgr: J.C.	Project: 1637.0001Y003	
	File: 1637.0001Y117.02.DWG		



LEGEND

--- PROJECT BOUNDARY



Title:			<h1>REDEVELOPMENT PLAN</h1> <p>REMEDIAL ACTION WORK PLAN LIGHTHOUSE POINT STATEN ISLAND, NEW YORK</p>
Prepared for:			
TRIANGLE EQUITIES - 5 BAY STREET, LLC			FIGURE 3
ROUX	Compiled by: B.K.	Date: 28OCT15	
ROUX ASSOCIATES, INC. <i>Environmental Consulting & Management</i>	Prepared by: B.H.C.	Scale: AS SHOWN	
	Project Mgr.: J.C.	Project No.: 1637.0001Y1003	
		File: 1637.0001Y117.03.CDR	



LEGEND

 PROJECT BOUNDARY



Title:

SURROUNDING LAND USAGE

REMEDIAL ACTION WORK PLAN
LIGHTHOUSE POINT
STATEN ISLAND, NEW YORK

Prepared for:

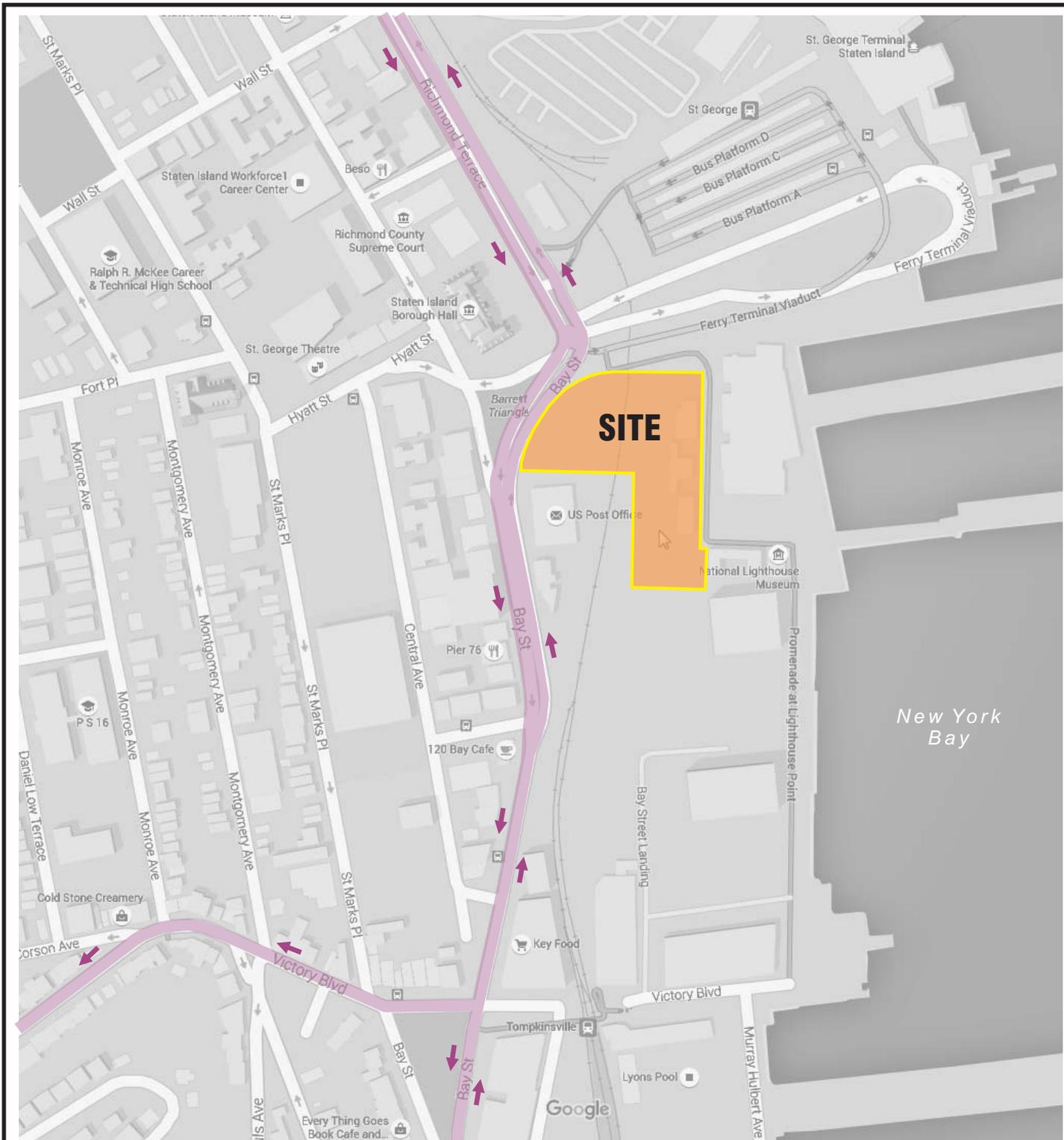
TRIANGLE EQUITIES - 5 BAY STREET, LLC

ROUX
ROUX ASSOCIATES, INC.
*Environmental Consulting
& Management*

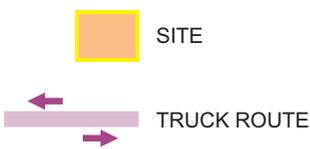
Compiled by: B.K.	Date: 28OCT15
Prepared by: B.H.C.	Scale: AS SHOWN
Project Mgr.: J.C.	Project No.: 1637.0001Y003
File: 1637.0001Y117.04.CDR	

FIGURE

4



LEGEND



Title:

TRUCK ROUTE

REMEDIAL ACTION WORK PLAN
LIGHTHOUSE POINT
STATEN ISLAND, NEW YORK

Prepared for:

TRIANGLE EQUITIES - 5 BAY STREET, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting
& Management

Compiled by: B.K.	Date: 28OCT15
Prepared by: B.H.C.	Scale: AS SHOWN
Project Mgr.: J.C.	Project No.: 1637.0001Y003
File: 1637.0001Y117.04.CDR	

FIGURE

5

LIGHTHOUSE POINT REDEVELOPMENT
Staten Island, New York
Remedial Action Work Plan

APPENDIX A

Proposed Development Plans

PDC PRELIMINARY PRESENTATION

January 6, 2014

ADDRESS: Staten Island Lighthouse Point
New York, NY

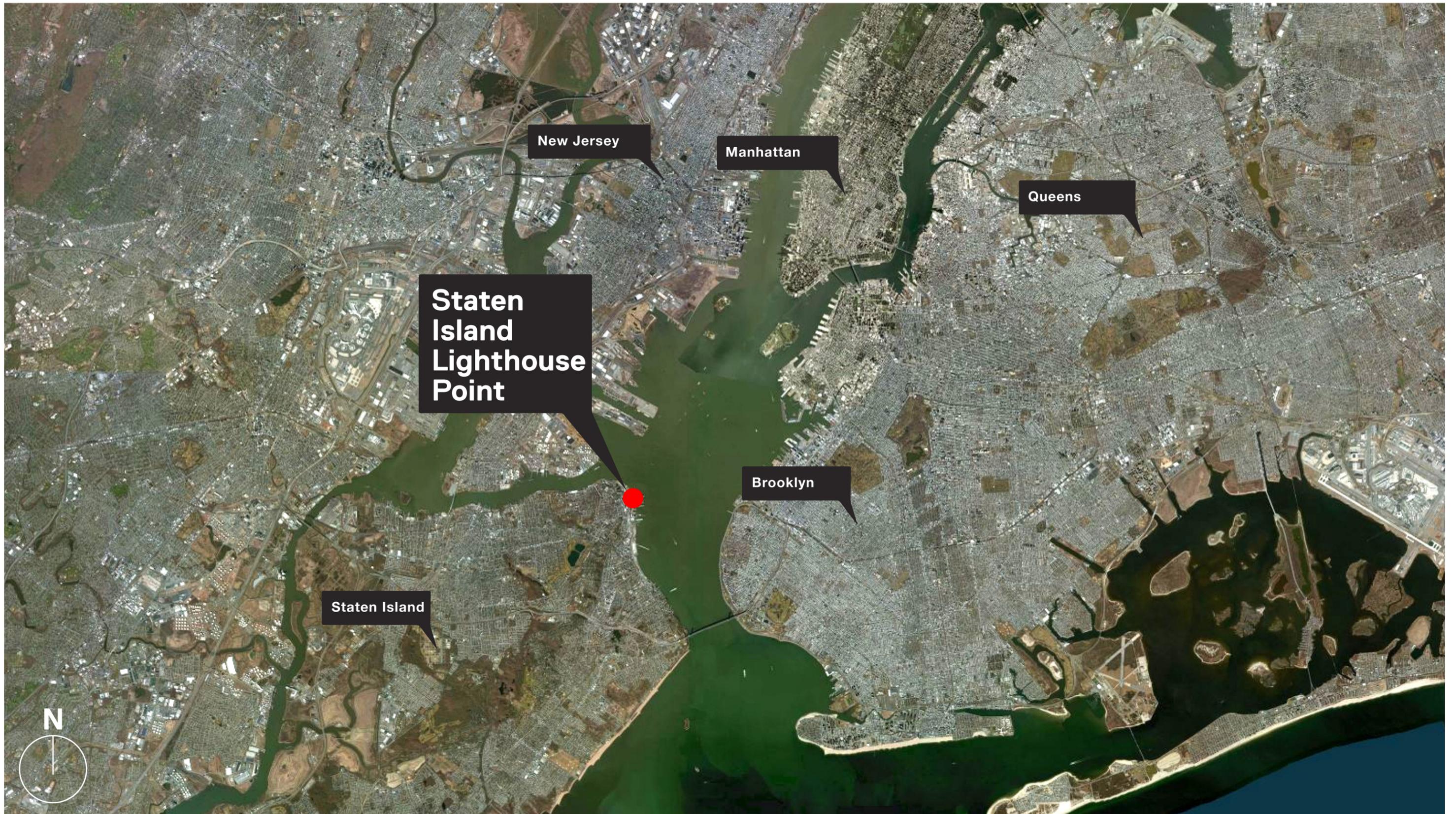
CLIENT: Triangle Equities
30-56 Whitestone Expressway
Whitestone, NY 11354

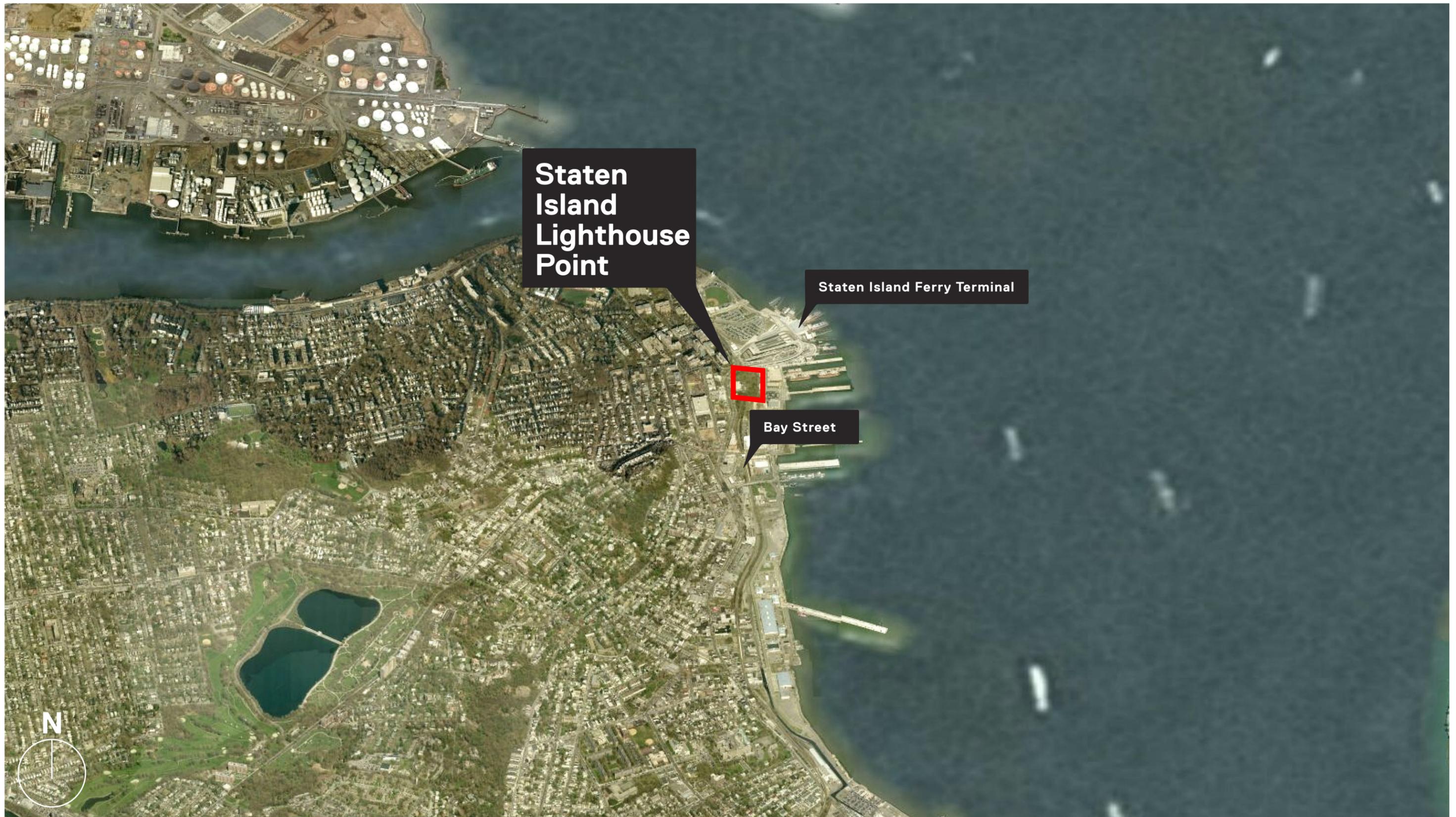
ARCHITECTS: Garrison Architects
45 Main Street #1026
New York, NY 11201

Cooper Carry
50 West 17th Street, 12th Floor
New York, NY 10011

LANDSCAPE ARCHITECT: MPFP
41 East 11th Street
New York, NY 10003

Staten Island Lighthouse Point









New York Wheel



Staten Island Ferry Terminal



Empire Outlets



Lighthouse Point Development



A
VIEW OF EXISTING WALL FROM BAY STREET



B
VIEW OF EXISTING WALL FROM SITE INTERIOR



C
ESPLANADE & BUILDINGS 8, 7 & 6 FROM SOUTH



E
VIEW OF BUILDING 7 FROM BETWEEN BUILDINGS 5 & 6



N
VIEW OF PIER 1 FROM WATERFRONT PLAZA



D
VIEW OF WATERFRONT PLAZA FROM BUILDING 8



F
VIEW OF BUILDING 5 FROM NORTH



G
EXISTING WALKWAY FROM FERRY TERMINAL RAMP



H
VIEW OF ESPLANADE FROM FERRY TERMINAL RAMP

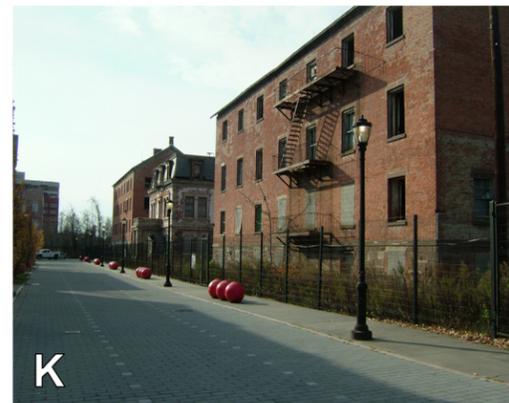


I
VIEW OF VAULTS FROM EAST



J
VIEW OF VAULTS FROM EAST

Key Plan:



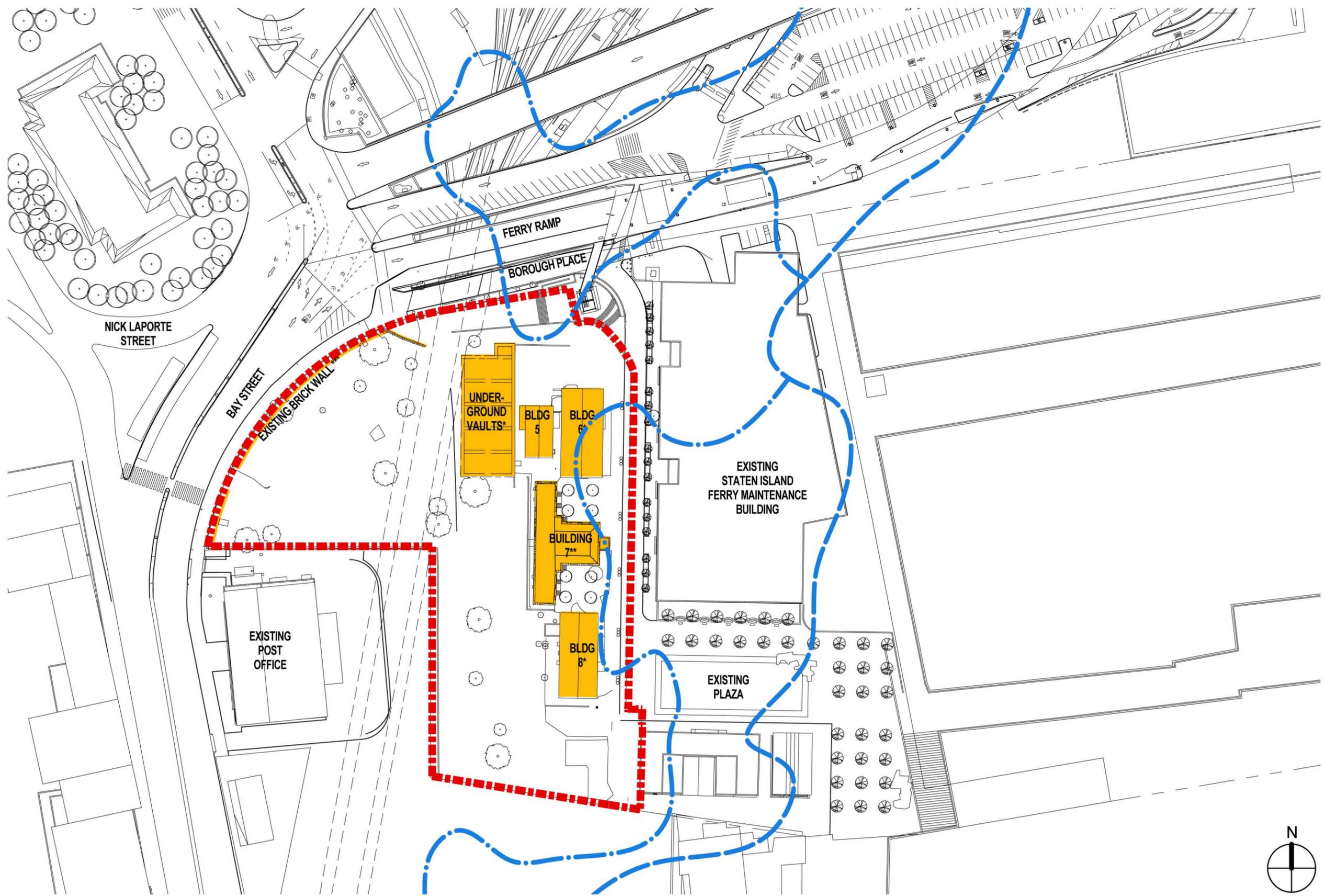
K
ESPLANADE & BUILDINGS 6, 7 & 8 FROM NORTH



L
BUILDING 8 (AT RIGHT) FROM WATERFRONT PLAZA



M
FERRY MAINTENANCE FACILITY WITH SITE BEYOND

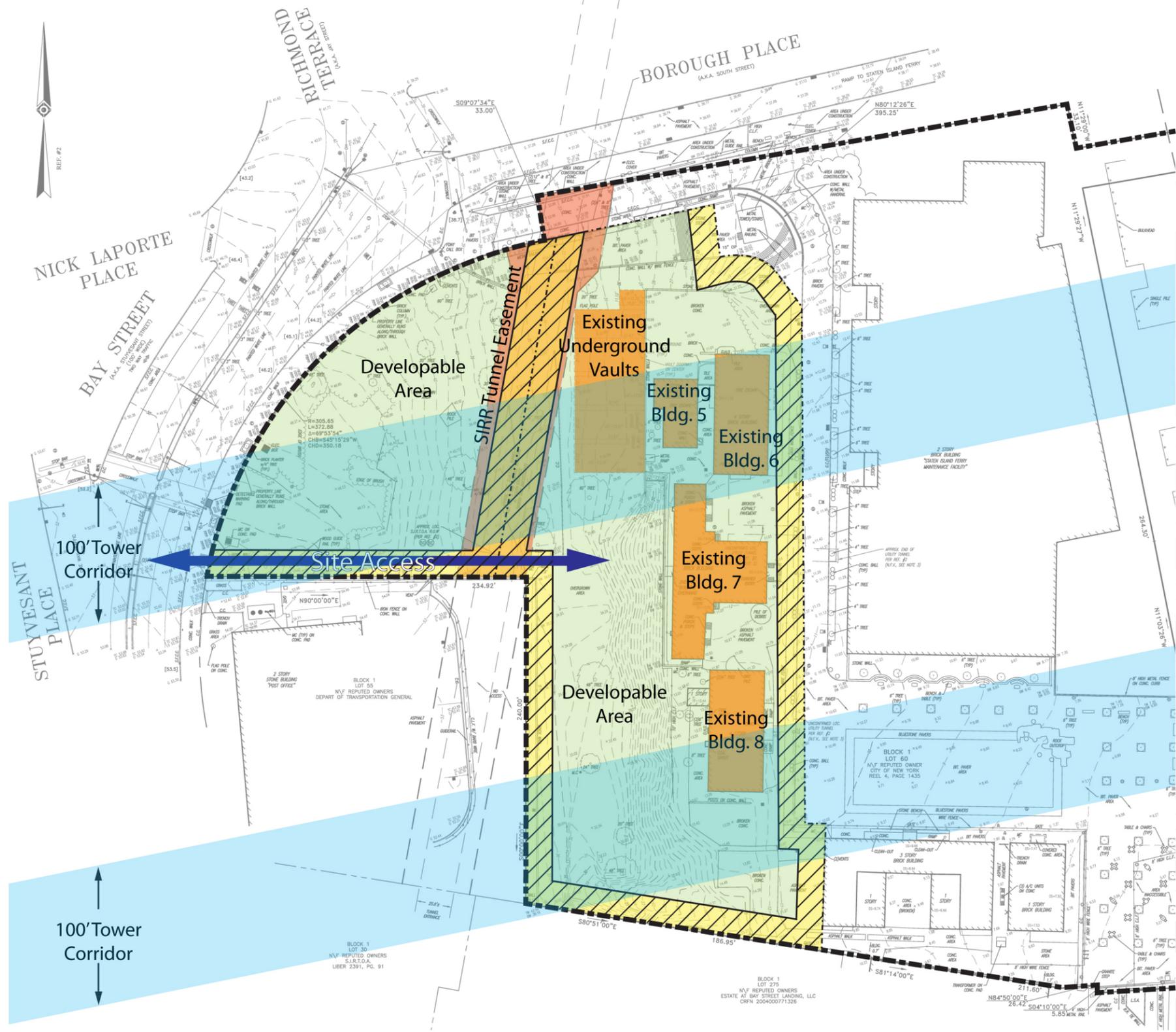


Legend:

- Project Boundary
- Existing Buildings/Wall
- 100-year Flood Plain
- 500-year Flood Plain

- * ASTERISK DENOTES BUILDING ON NATRIONAL REGISTRY OF HISTORIC BUILDINGS.
- ** TWO ASTERISKS DENOTE BUILDING ON NATIONAL REGISTRY OF HISTORIC BUILDINGS AND NEW YORK CITY LANDMARK
- ***THREE ASTERISKS DENOTE ELIGIBLE STRUCTURE





Legend:

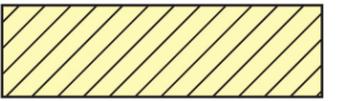
Existing Zoning Lot Line



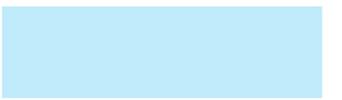
Proposed Zoning Lot Line



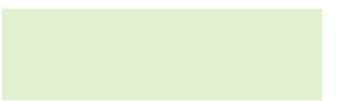
Code Required 30'-0" Lot Line Separation For Unlimited Windows



100'-0" View Corridor



Developable Area



Existing Buildings



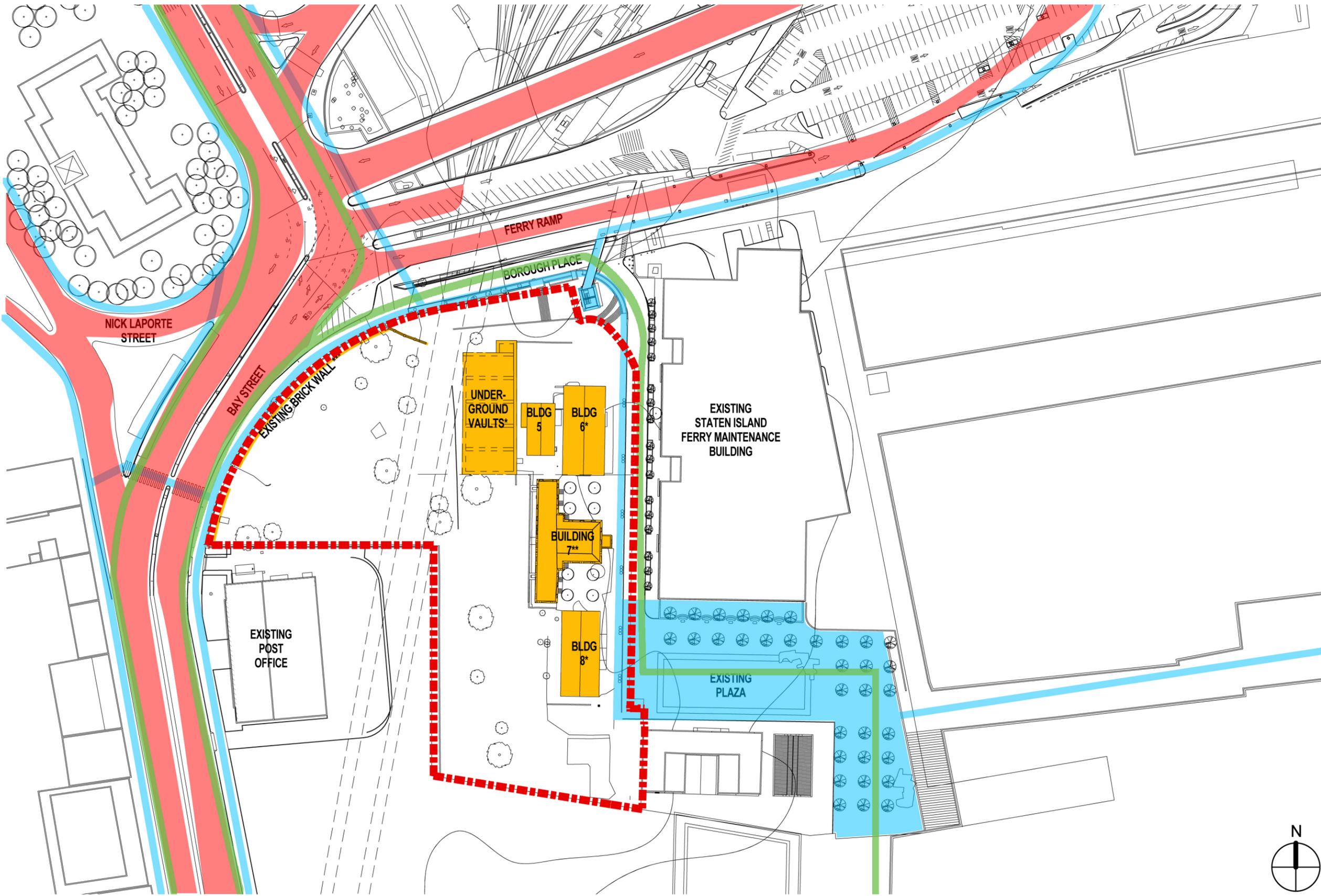
SIRR Tunnel Easement

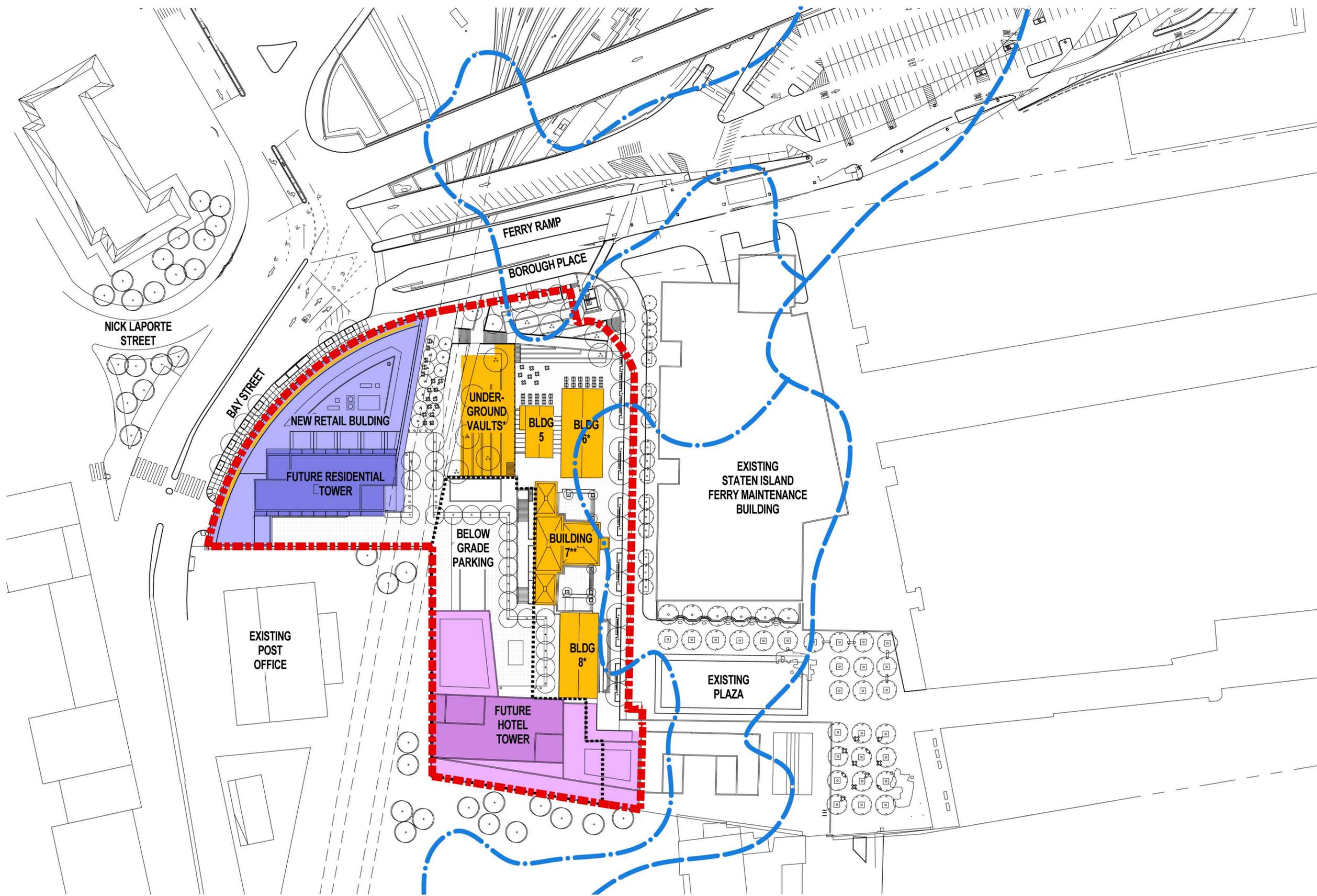


GRAPHIC SCALE
0 10 20 30 40 50 60 70 80 90 100
(IN FEET)
1 inch = 50 ft.
UNAUTHORIZED ALTERATION OR ADDITION TO A SURVEY MAP BEARING A LICENSED LAND SURVEYOR'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF THE NEW YORK STATE EDUCATION LAW. ONLY COPIES FROM THE ORIGINAL OF THIS SURVEY MARKED WITH AN ORIGINAL OF THE LAND SURVEYOR'S EXEMPTION SEAL SHALL BE PRODUCTION TO BE VALID FOR ALL PURPOSES.

Legend:

- Project Boundary
- Existing Buildings/Wall
- Pedestrian Circulation
- Vehicular Circulation
- Bicycle Circulation

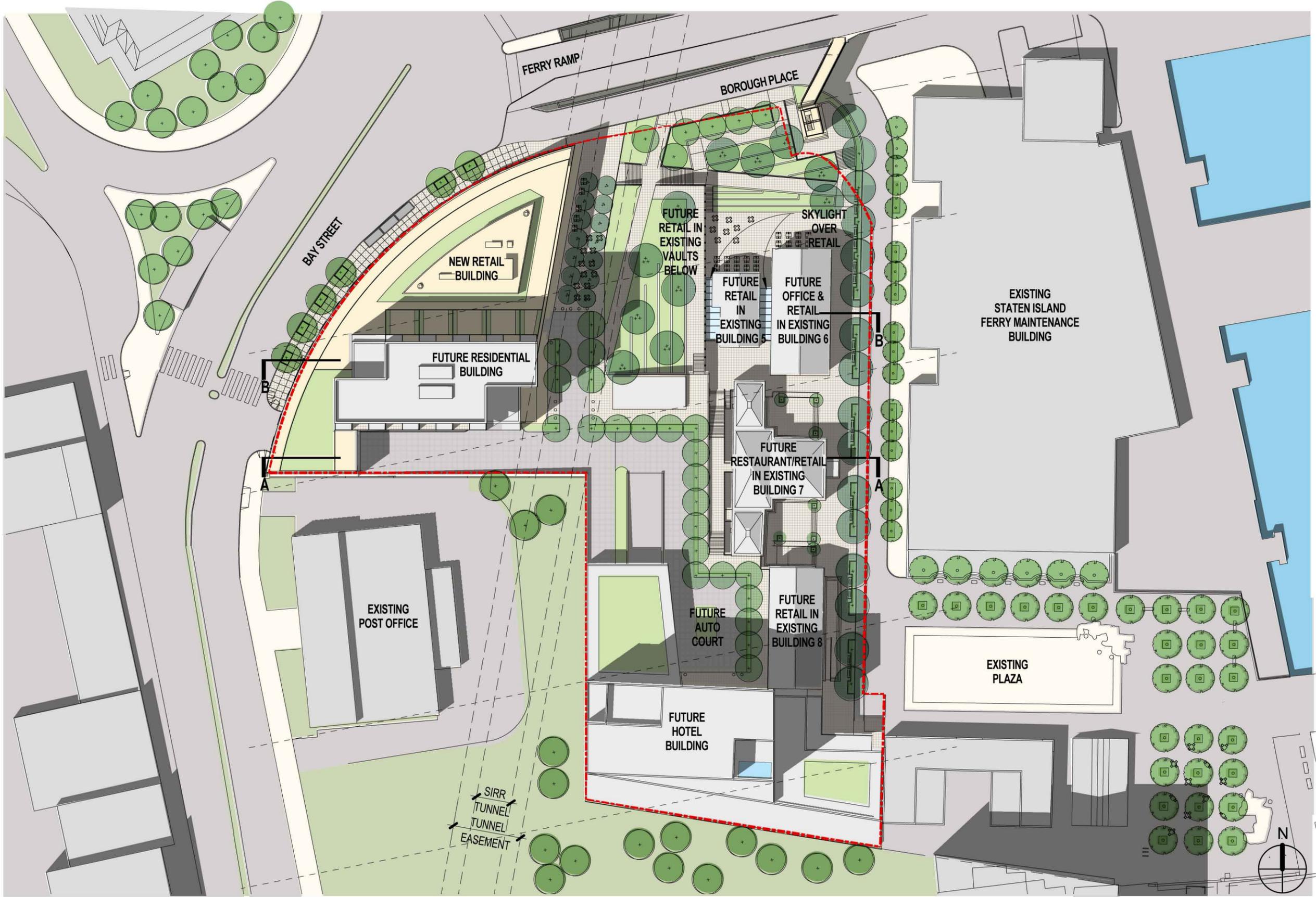




Legend:

- Project Boundary
[Red dashed line]
- Existing Buildings/Wall
[Yellow line]
- 100-year Flood Plain
[Solid blue line]
- 500-year Flood Plain
[Dashed blue line]
- Proposed Retail
[Light blue line]
- Proposed Residential
[Medium blue line]
- Proposed Hotel Services
[Light purple line]
- Proposed Hotel Suites
[Dark purple line]

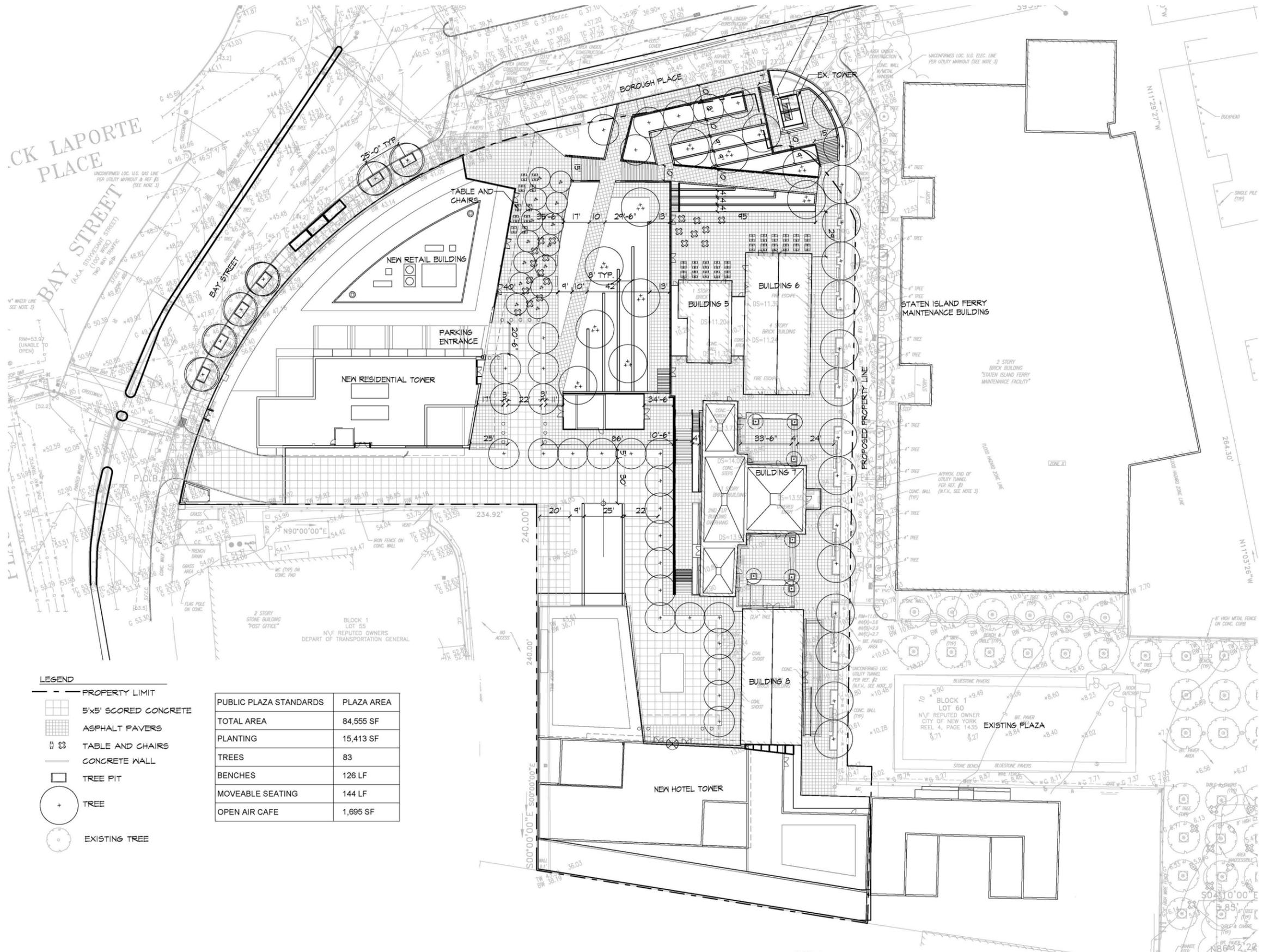
* ASTERISK DENOTES BUILDING ON NATRIONAL REGISTRY OF HISTORIC BUILDINGS.
 ** TWO ASTERISKS DENOTE BUILDING ON NATIONAL REGISTRY OF HISTORIC BUILDINGS AND NEW YORK CITY LANDMARK
 ***THREE ASTERISKS DENOTE ELIGIBLE STRUCTURE



- Legend:**
- Project Boundary - - - - -
 - Parking
 - Service
 - Hotel: Revenue-Generating
 - Hotel: Non-Revenue-Generating
 - Hotel: Assembly Space
 - Retail: Cinema
 - Retail: Other
 - Office
 - Residential

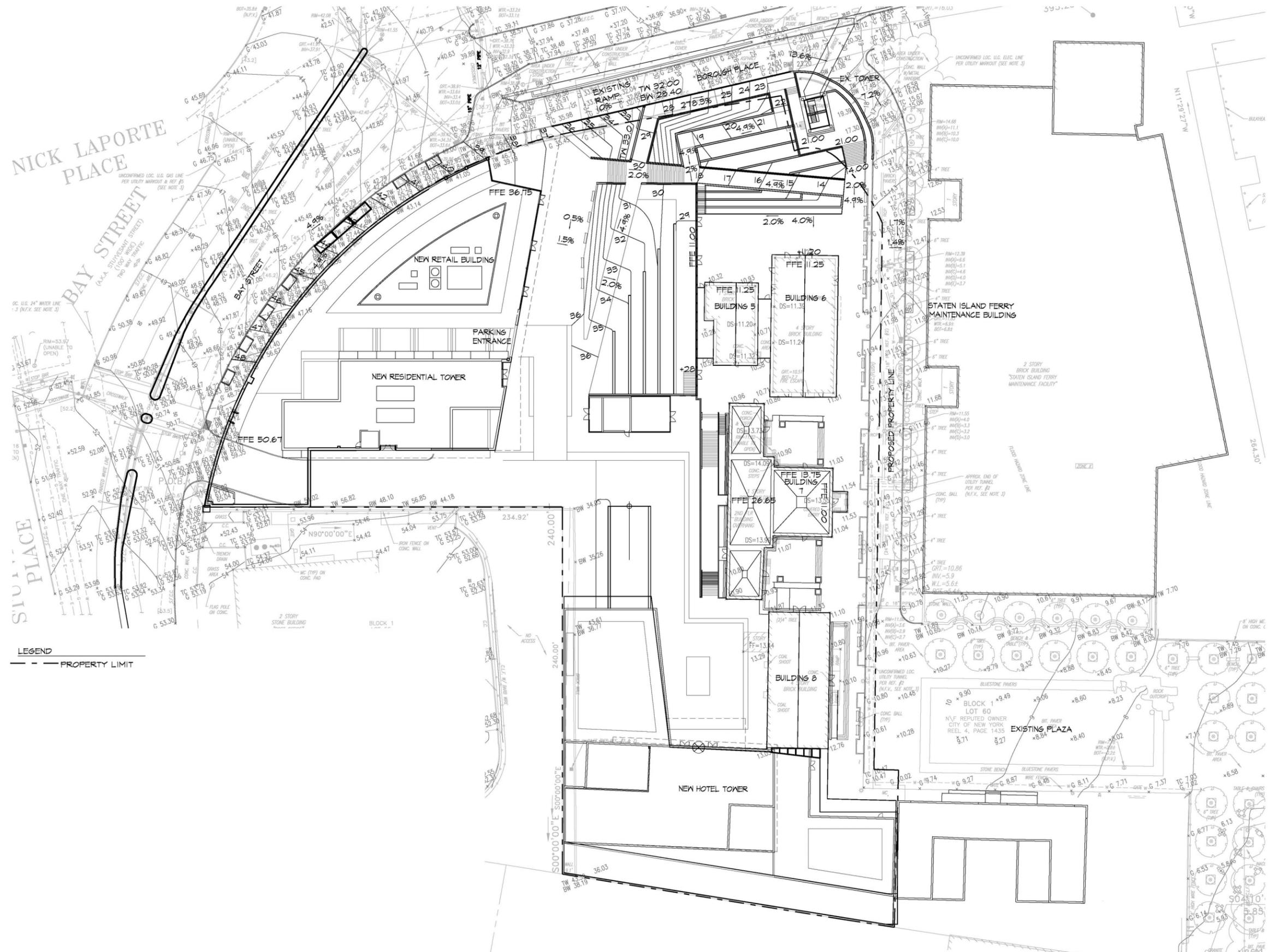


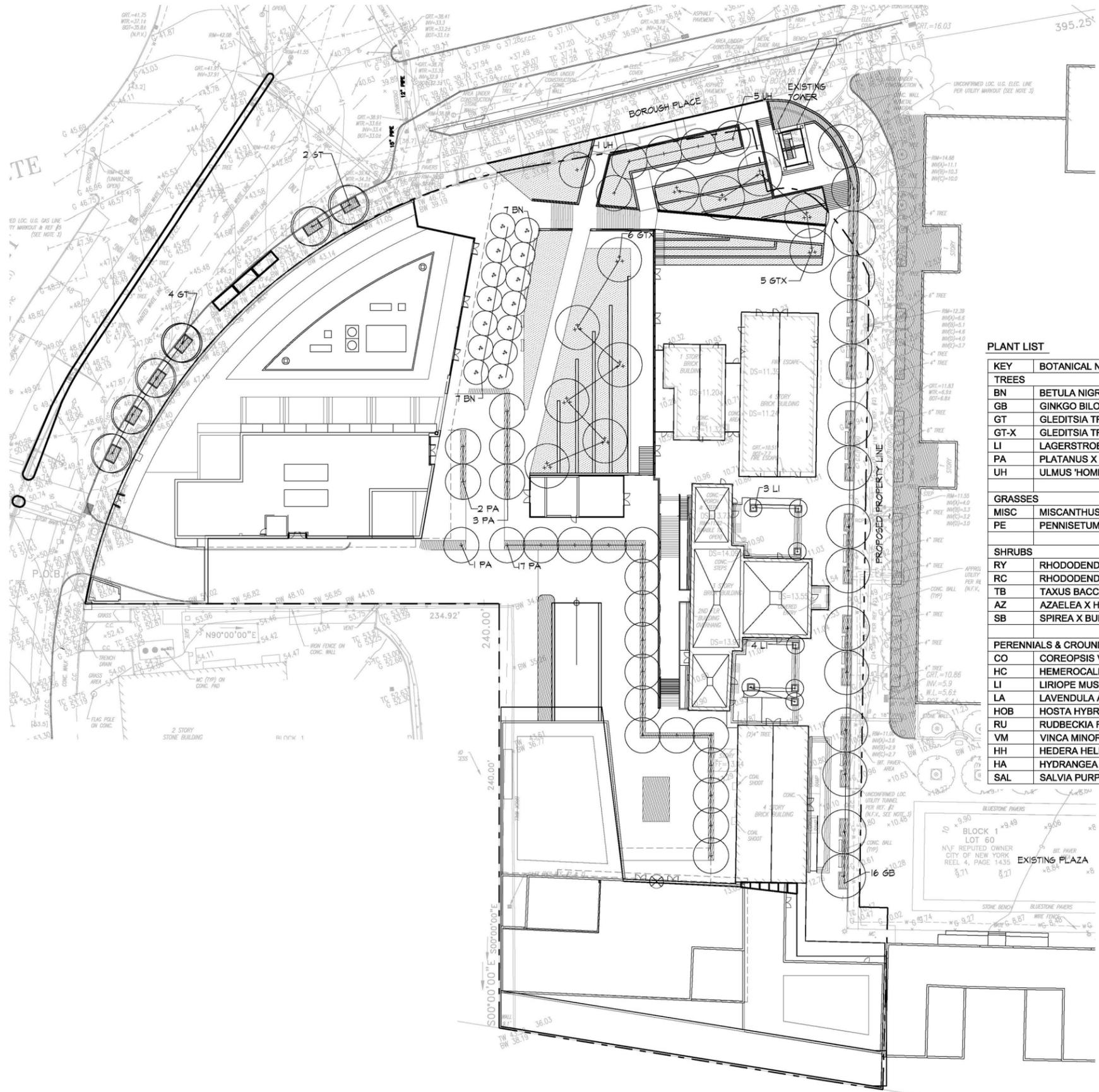




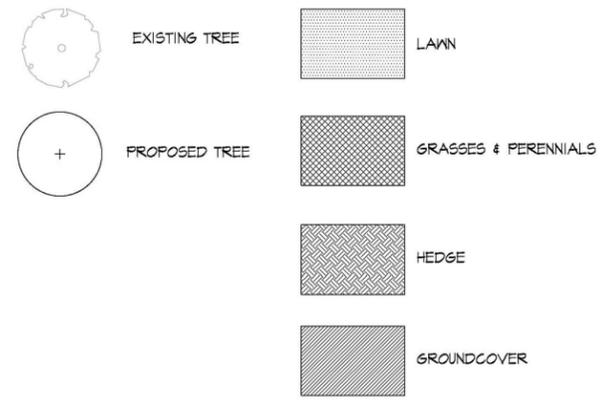
- LEGEND**
- - - PROPERTY LIMIT
 - 5'x5' SCORED CONCRETE
 - ASPHALT PAVERS
 - TABLE AND CHAIRS
 - CONCRETE WALL
 - TREE PIT
 - TREE
 - EXISTING TREE

PUBLIC PLAZA STANDARDS		PLAZA AREA
TOTAL AREA		84,555 SF
PLANTING		15,413 SF
TREES		83
BENCHES		126 LF
MOVEABLE SEATING		144 LF
OPEN AIR CAFE		1,695 SF



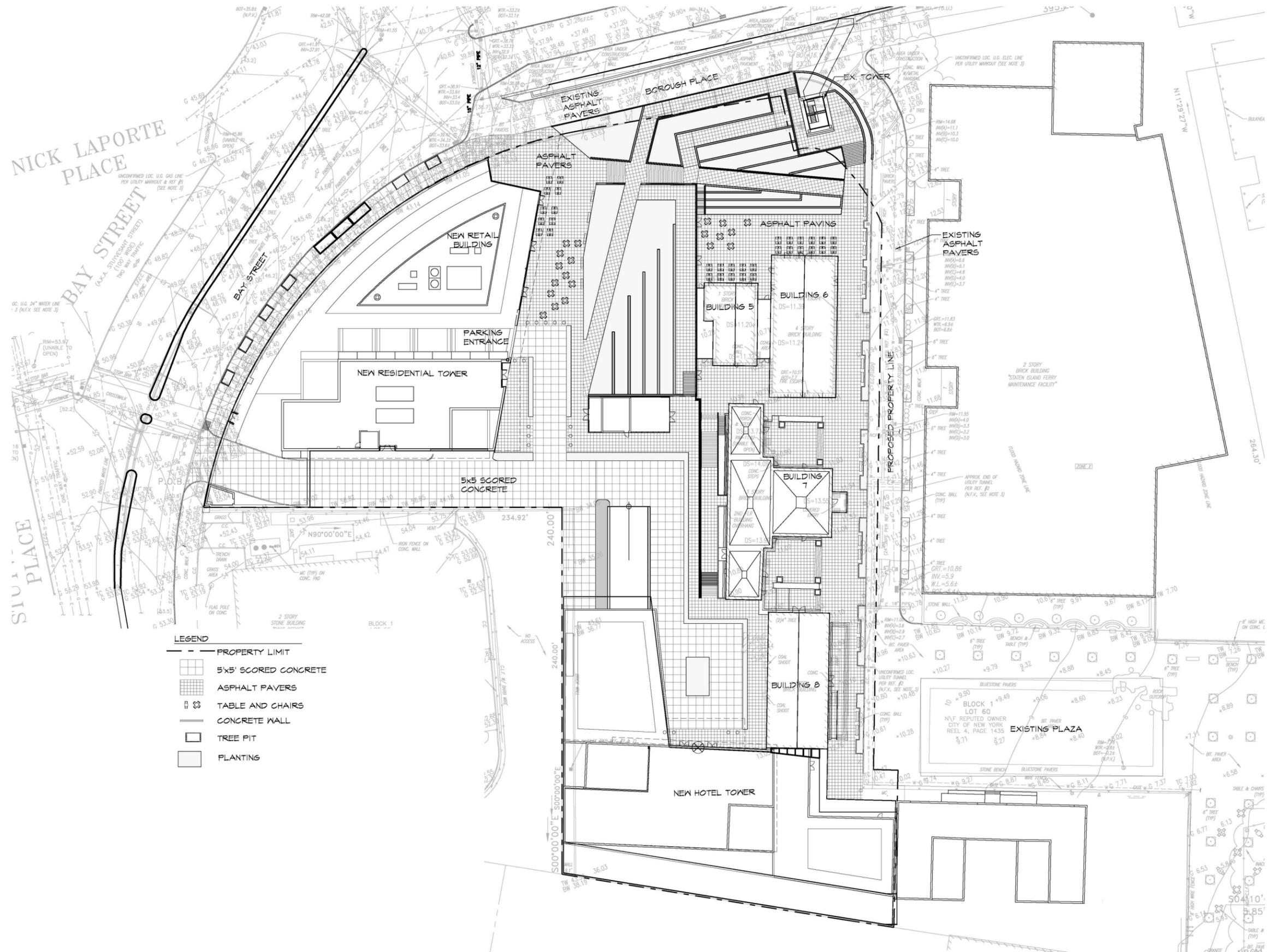


PLANTING LEGEND



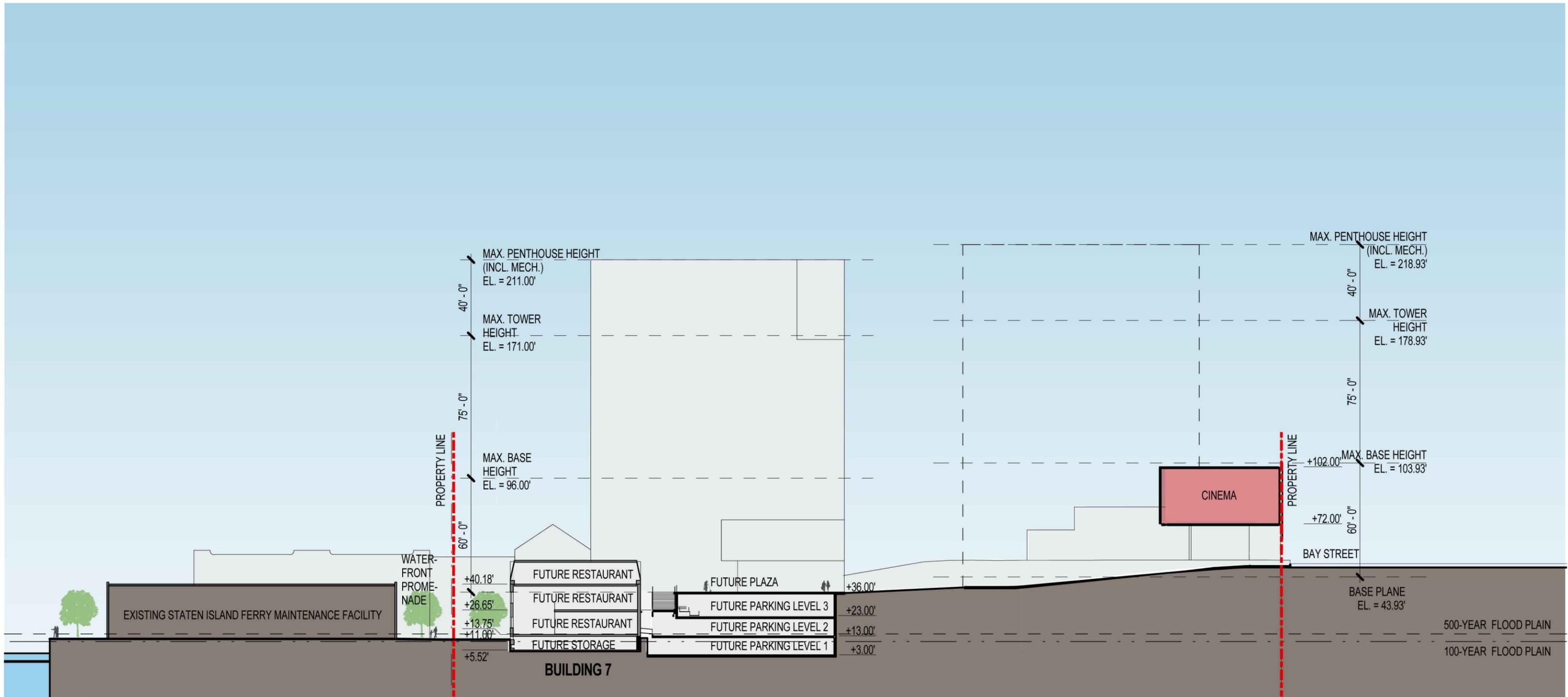
PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY	SIZE	ROOT	SPACING	COMMENTS
TREES							
BN	BETULA NIGRA	RIVER BIRCH	14	18'-20' HT.	B&B	AS SHOWN	3 STEM MIN. MATCHED 7' MIN. BRANCH HT.
GB	GINKGO BILOBA	GINKGO	16	3-3 1/2" CAL.	B&B	AS SHOWN	
GT	GLEDITSIA TRICANTHOS VAR. INERMA	HONEY LOCUST	6	16'-18' HT	B&B	AS SHOWN	6' MIN BRANCH HT.
GT-X	GLEDITSIA TRICANTHOS VAR. INERMA	MULTI STEM HONEY LOCUST	11	16'-18' HT	B&B	AS SHOWN	3 STEM MIN. MATCHED 6' MIN. BRANCH HT.
LI	LAGERSTROEMIA INDICA	CREPE MYRTLE	7	16' HT	B&B	AS SHOWN	3 STEM MIN. 6' MIN BRANCH HT.
PA	PLATANUS X ACERIFOLIA	LONDON PLANE	23	3-3 1/2" CAL.	B&B	AS SHOWN	
UH	ULMUS 'HOMESTEAD'	HOMESTEAD ELM	6	3-3 1/2" CAL.	B&B	AS SHOWN	
GRASSES							
MISC	MISCANTHUS SINENSIS 'VARIEGATUS'	JAPANESE SILVER GRASS	XX	3 GAL	CONT.	AS SHOWN	
PEN	PENNISETUM ALOPECUROIDES	ROSE FOUNTAIN GRASS	XX	3 GAL	CONT.	AS SHOWN	
SHRUBS							
RY	RHODODENDRON YEDOENSE	KOREAN AZALEA	XX	4'-5' HT	B&B	AS SHOWN	
RC	RHODODENDRON CHINOIDES	WHITE RHODODENDRON	XX	4'-5' HT	B&B	AS SHOWN	
TB	TAXUS BACCATA 'HICKS'	HICK'S YEW	XX	30"-36" HT	B&B	30" O.C.	
AZ	AZALEA X HINO CRIMSON	RED EVERGREEN AZALEA	XX	4'-5' HT	B&B	AS SHOWN	
SB	SPIREA X BUMALDA 'ANTHONY WATERER'	ANTHONY WATERER SPIREA	XX	30"-36" HT	B&B	AS SHOWN	
PERENNIALS & CROUNDCOVERS							
CO	COREOPSIS VERTICILLATA 'GOLDEN SHOWER'	THREADLEAF COREOPSIS	XX	1 GAL	CONT.	18" O.C.	
HC	HEMEROCALLIS STELLA DRORO	DAYLILY	XX	1 GAL	CONT.	18" O.C.	
LI	LIRIOPE MUSCARI 'VARIEGATA'	VARIEGATED LILY TURF	XX	#1 CAN	CONT.	18" O.C.	
LA	LAVENDULA ANGUSTIFOLIA	LAVENDER	XX	1 GAL	CONT.	24" O.C.	
HOB	HOSTA HYBRID 'BLUE MOUNTAIN'	'BLUE MOUNTAIN' HOSTA	XX	1 GAL	CONT.	AS SHOWN	
RU	RUDBECKIA FULGIDA 'GOLDSTURM'	BLACK-EYED SUSAN	XX	1 GAL	CONT.	18" O.C.	
VM	VINCA MINOR	PERIWINKLE	XX	2" POT	FLATS	8" O.C.	
HH	HEDERA HELIX	ENGLISH IVY	XX	2" POT	FLATS	8" O.C.	
HA	HYDRANGEA ANOMALA PETIOLARIS	CLIMBING HYDRANGEA	XX	1 GAL	CONT.	AS SHOWN	
SAL	SALVIA PURPLE	PURPLE SALVIA	XX	1 GAL	CONT.	24" O.C.	



- LEGEND**
- — — — — PROPERTY LIMIT
 - 5x5' SCORED CONCRETE
 - ASPHALT PAVERS
 - TABLE AND CHAIRS
 - CONCRETE WALL
 - TREE PIT
 - PLANTING





Section A

Legend:

Project Boundary

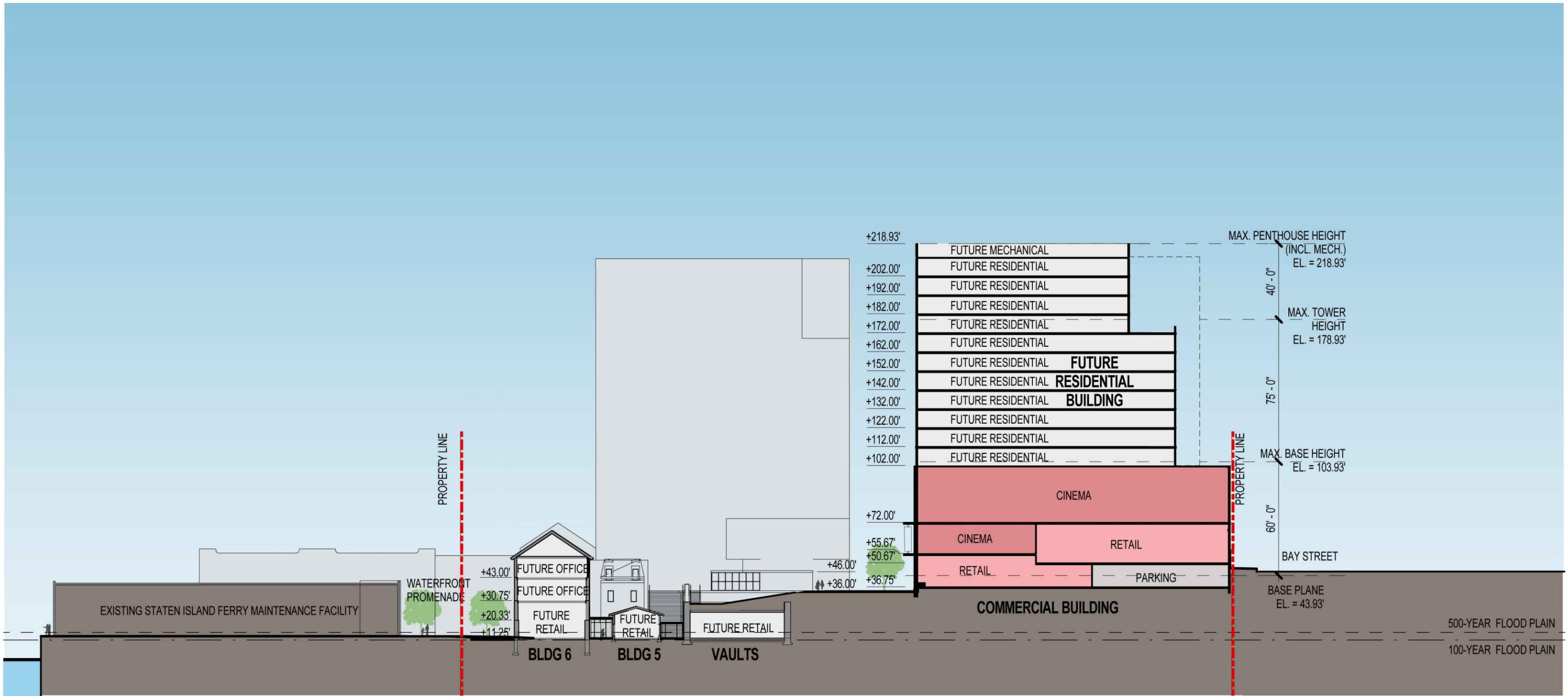


- Parking
- Service

- Hotel
- Hotel: Assembly Space

- Retail: Cinema
- Retail: Other

- Office
- Residential



Section B

Legend:

Project Boundary



Parking

Service

Hotel

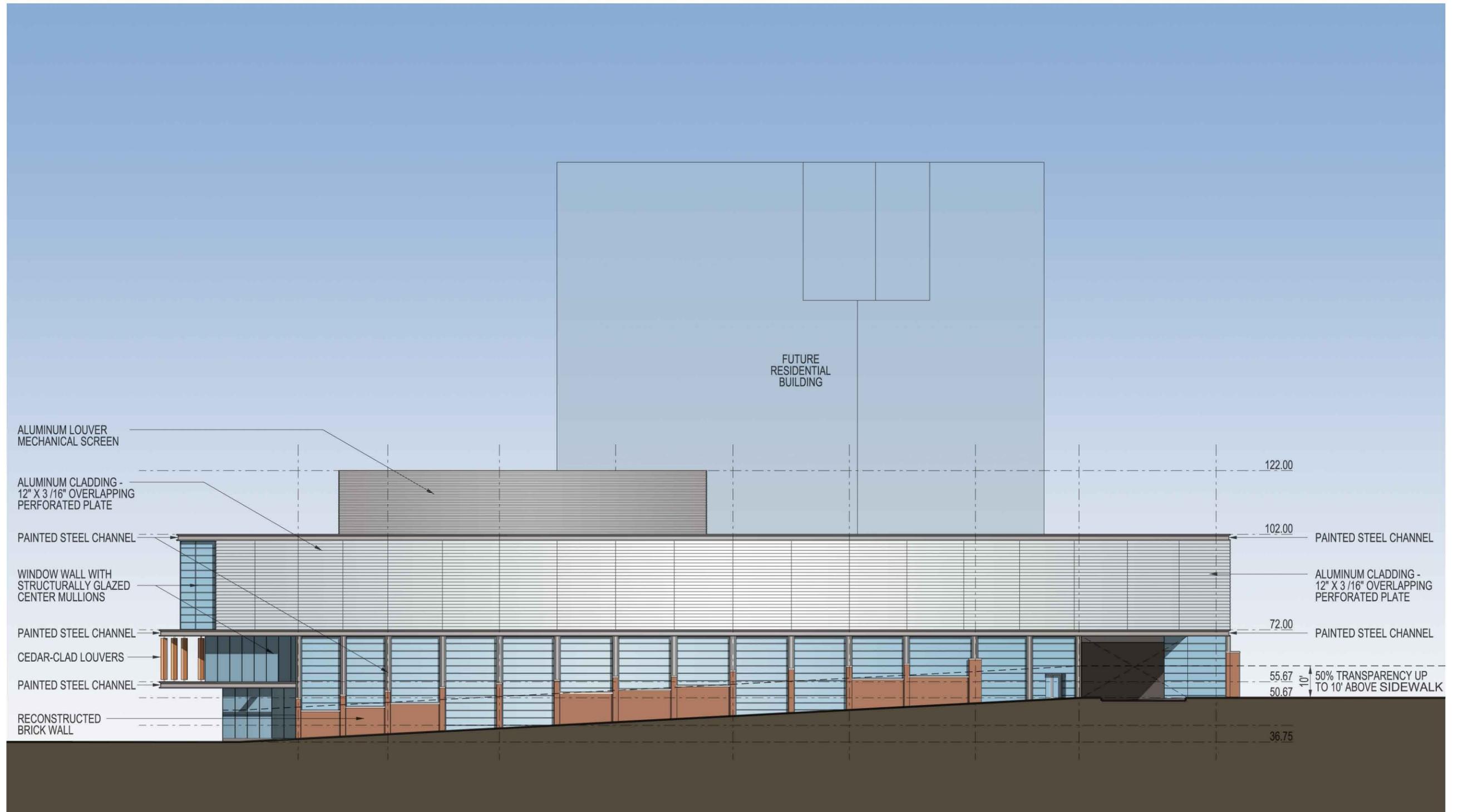
Hotel: Assembly Space

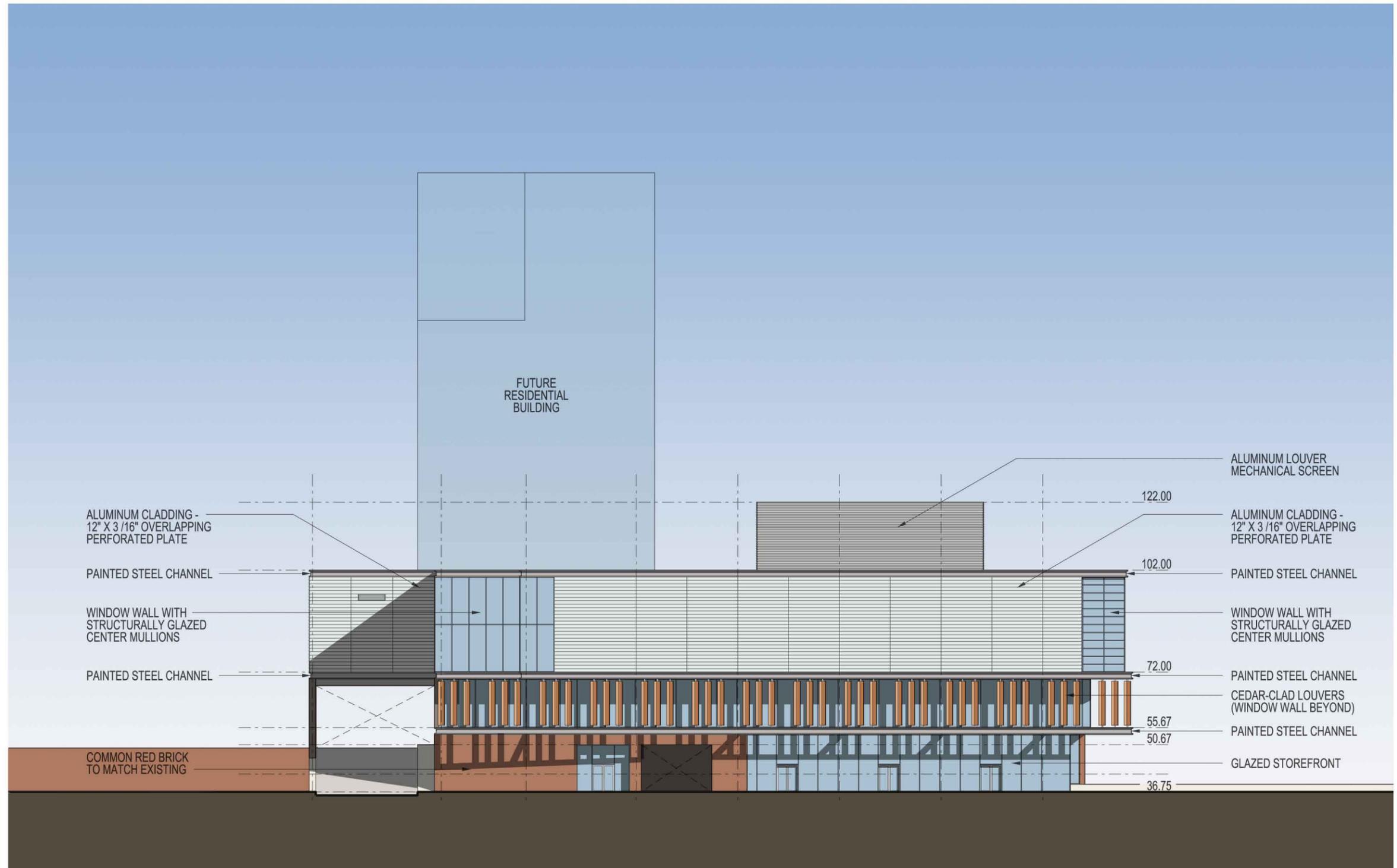
Retail: Cinema

Retail: Other

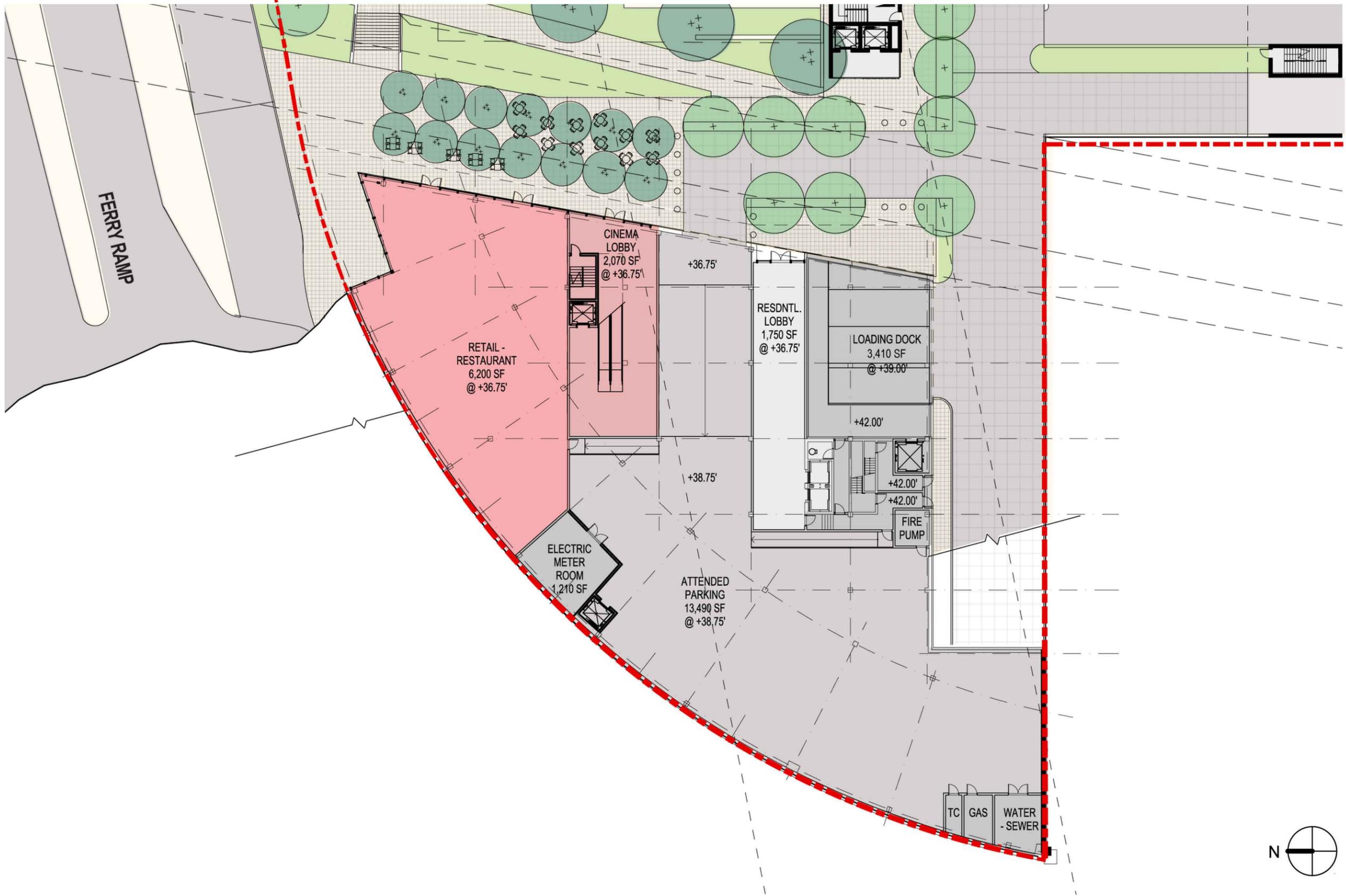
Office

Residential





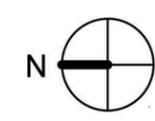


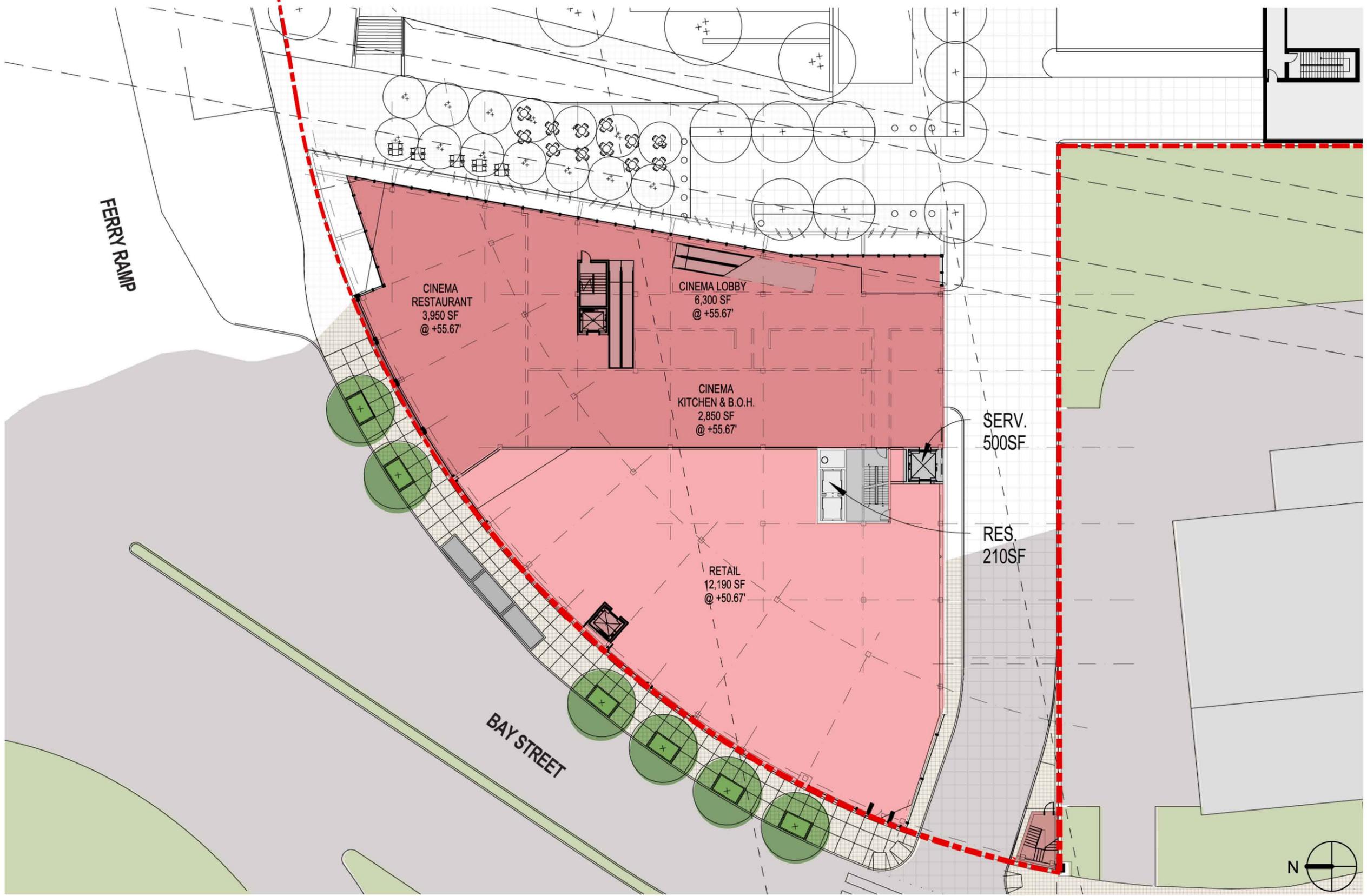


Legend:

Project Boundary

- Parking
- Service
- Hotel: Revenue-Generating
- Hotel: Non-Revenue-Generating
- Hotel: Assembly Space
- Retail: Cinema
- Retail: Other
- Office
- Residential





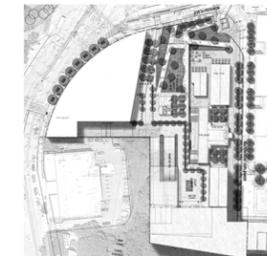
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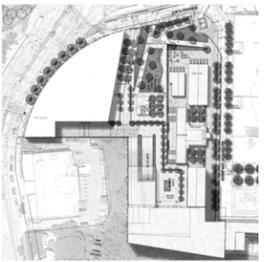
- Project Boundary
- Parking
- Service
- Hotel: Revenue-Generating
- Hotel: Non-Revenue-Generating
- Hotel: Assembly Space
- Retail: Cinema
- Retail: Other
- Office
- Residential

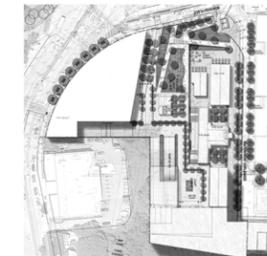


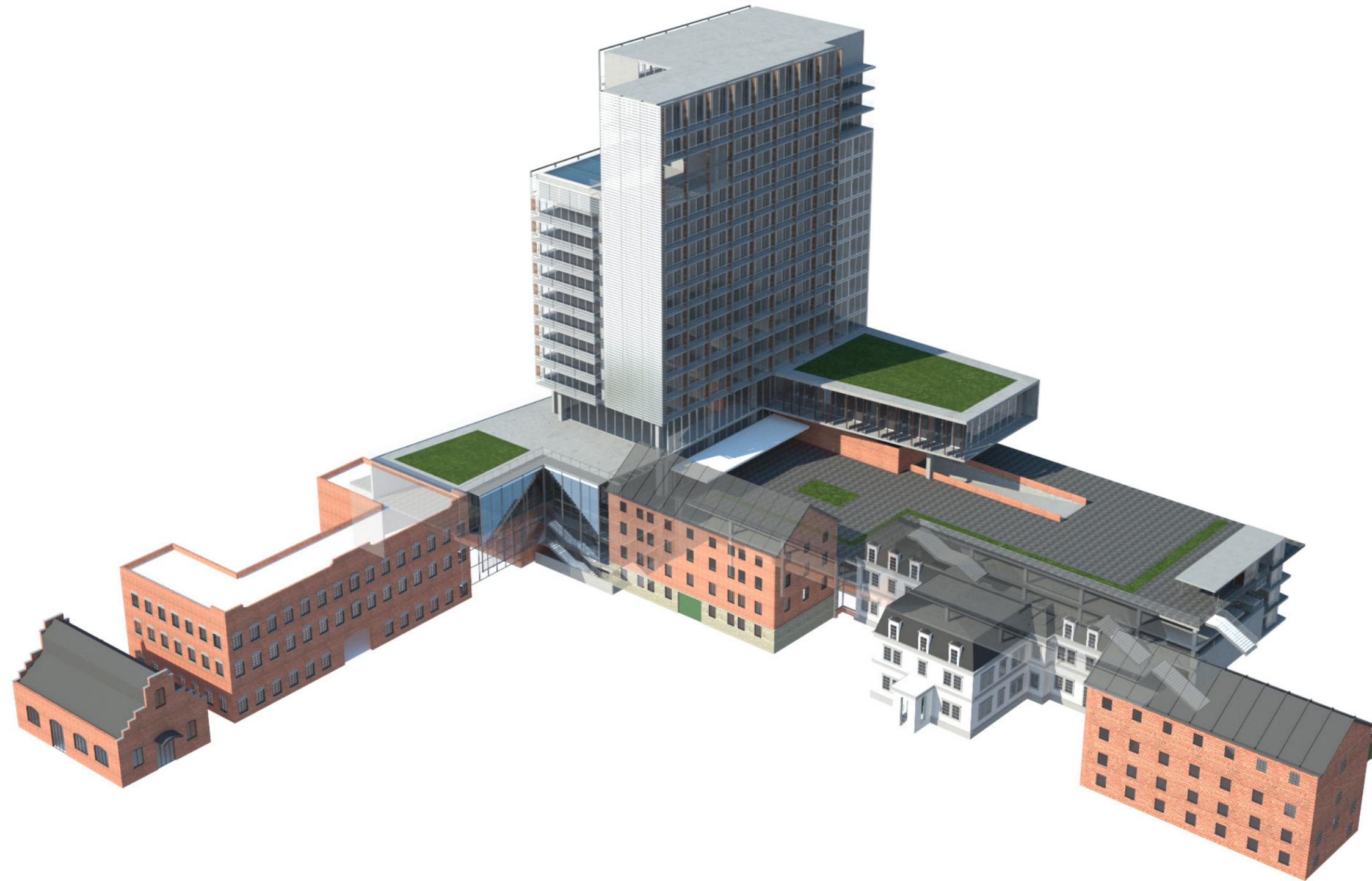
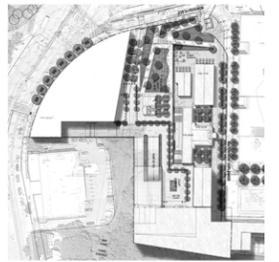
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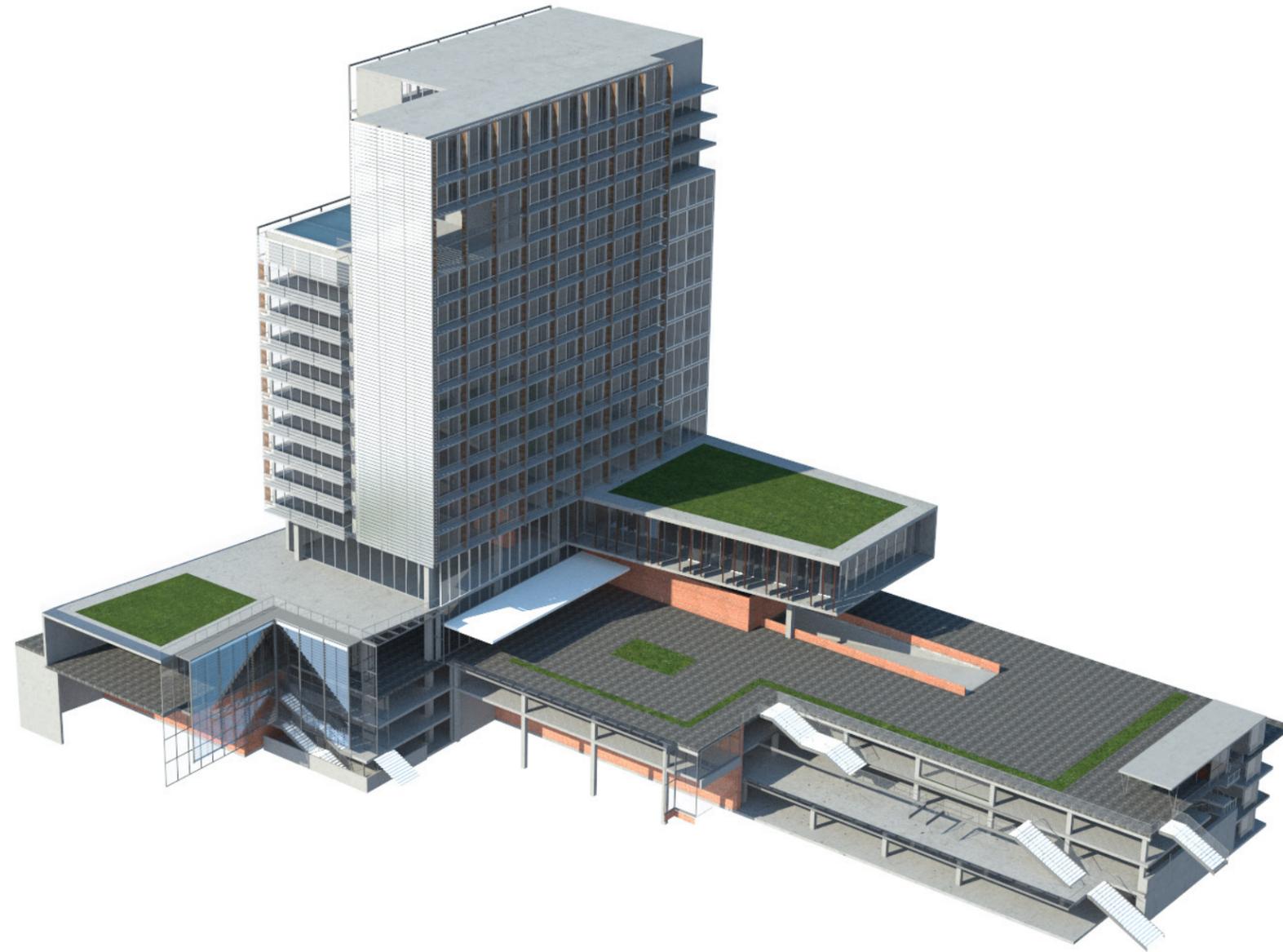
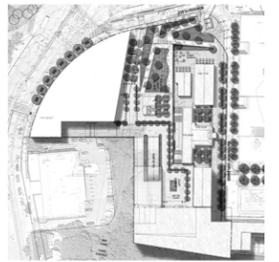
- Project Boundary - - - - -
- Parking
- Service
- Hotel: Revenue-Generating
- Hotel: Non-Revenue-Generating
- Hotel: Assembly Space
- Retail: Cinema
- Retail: Other
- Office
- Residential

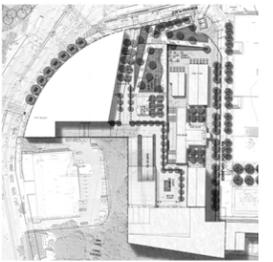


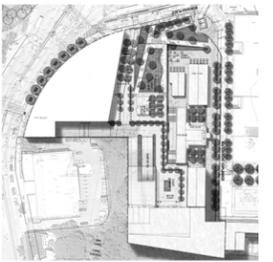


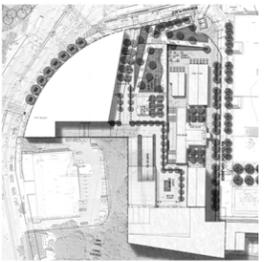


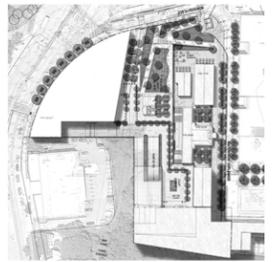




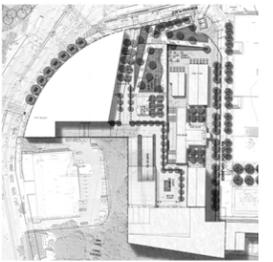


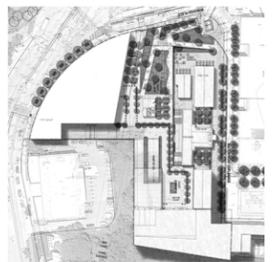


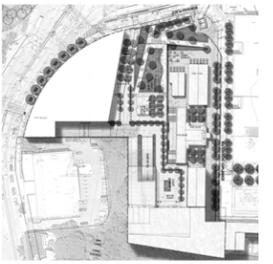


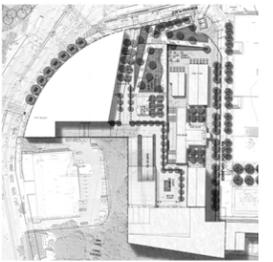


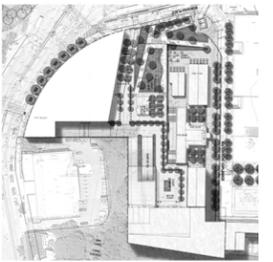


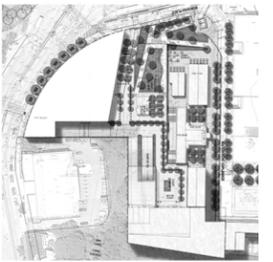
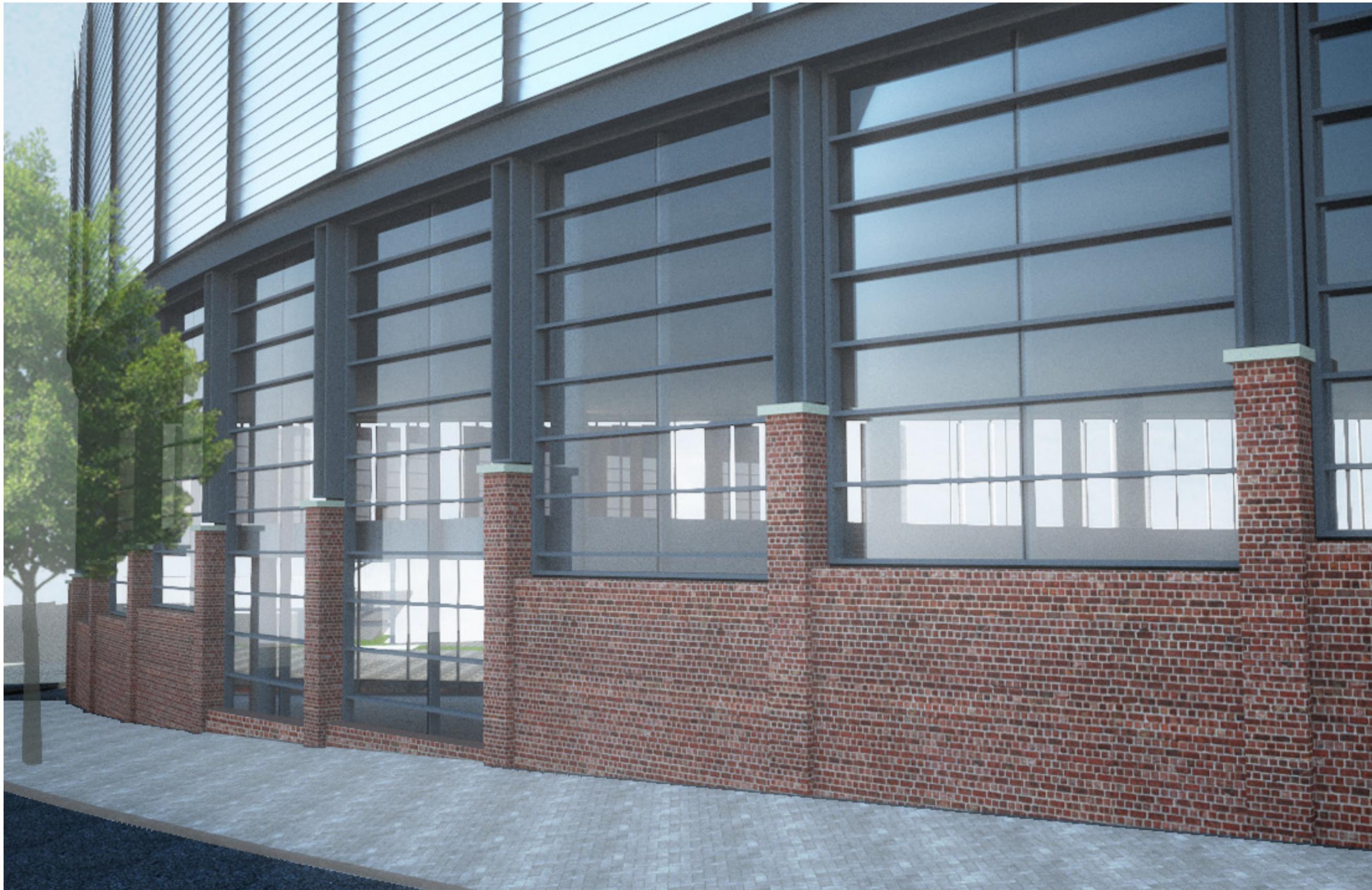


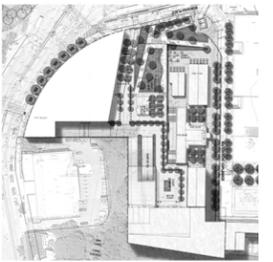


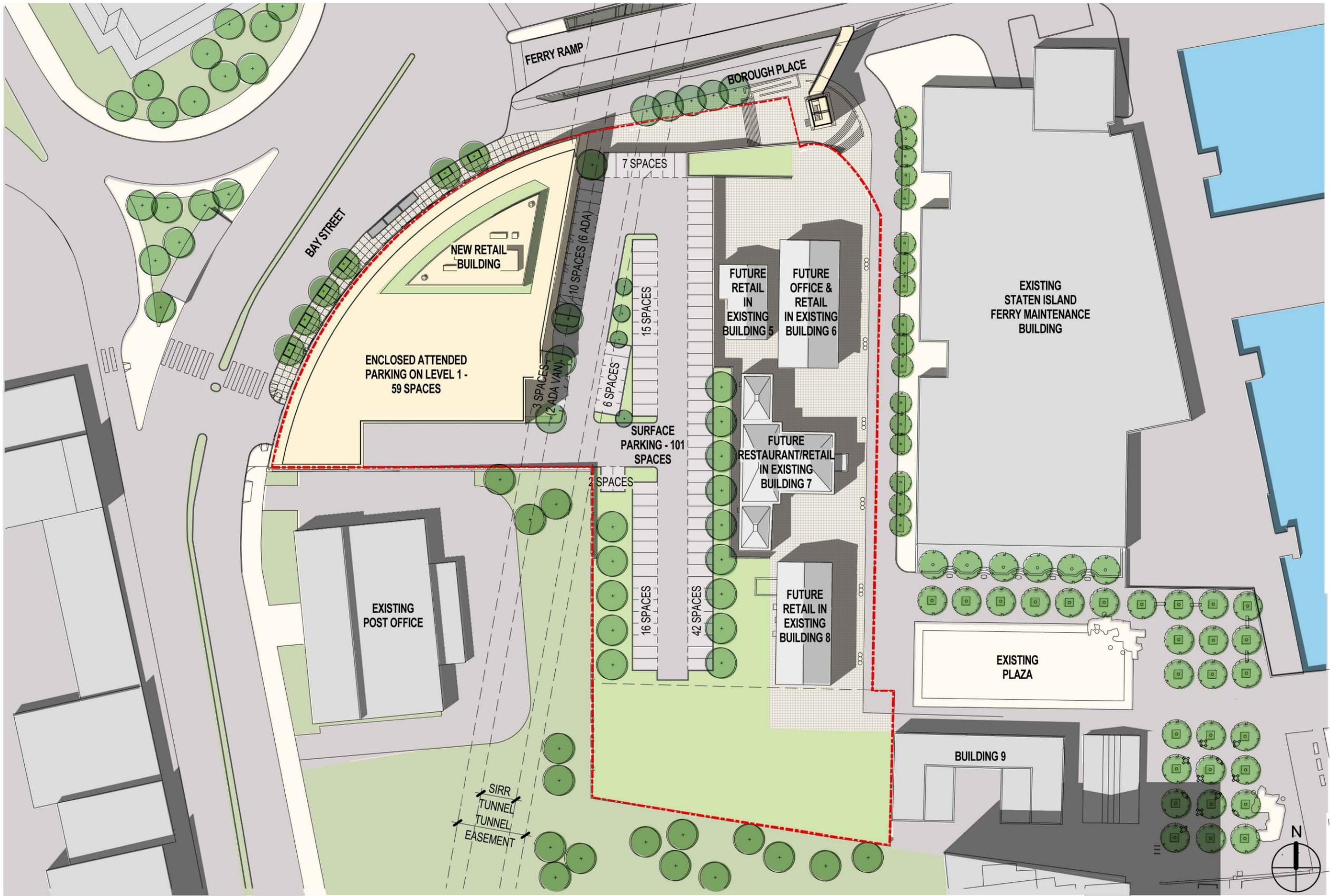










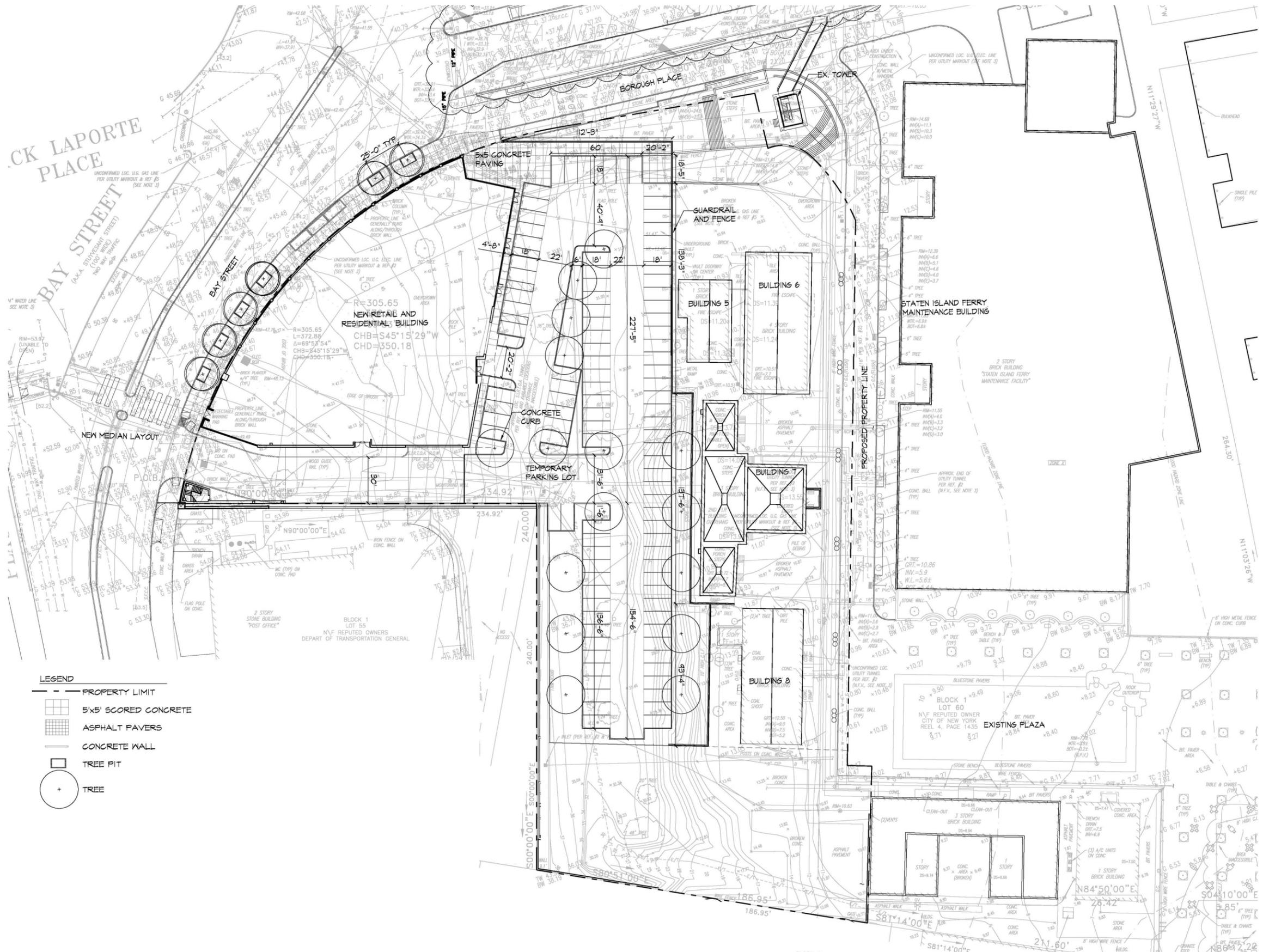


Legend:

- Project Boundary - - -
- Parking
- Service
- Hotel: Revenue-Generating
- Hotel: Non-Revenue-Generating
- Hotel: Assembly Space
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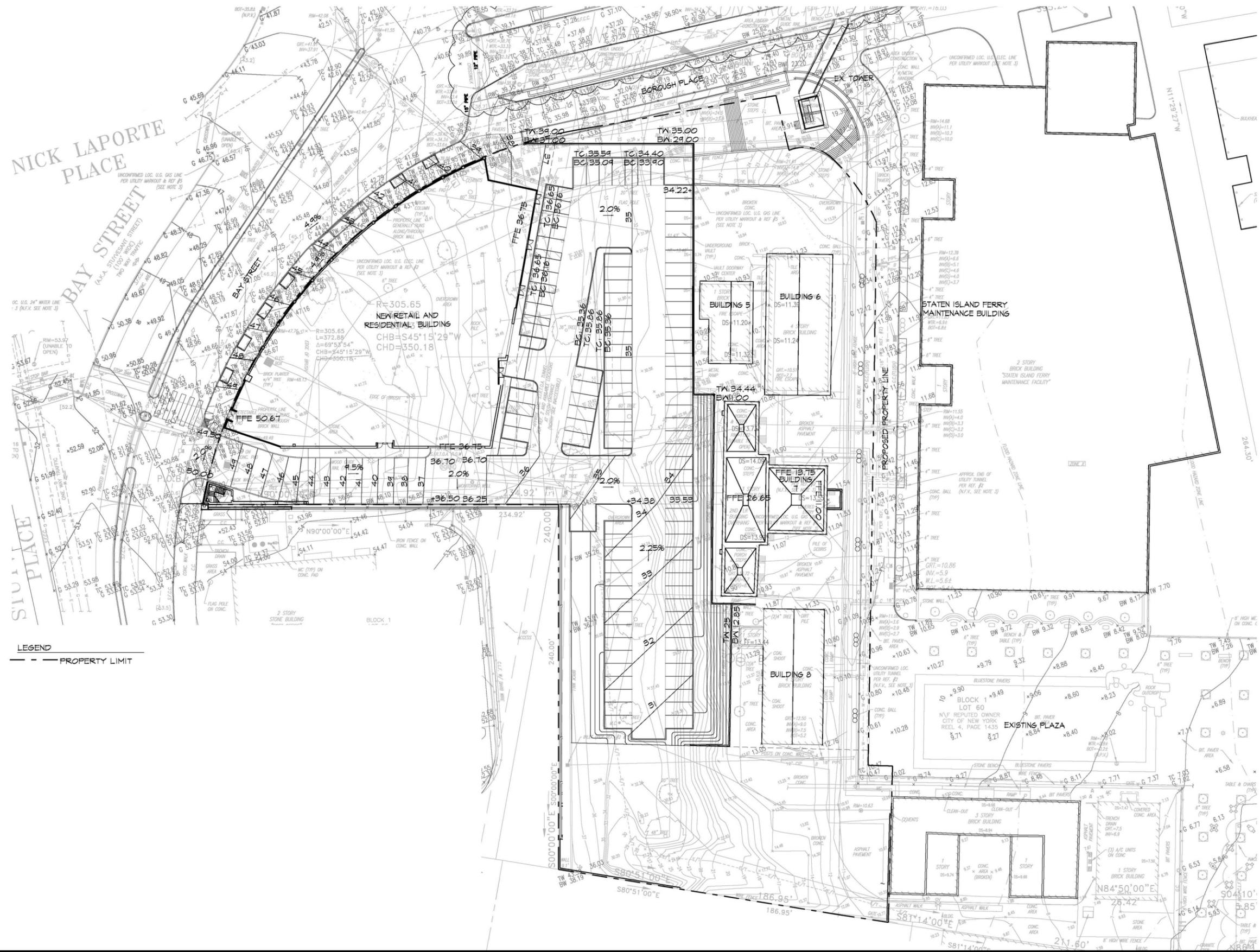






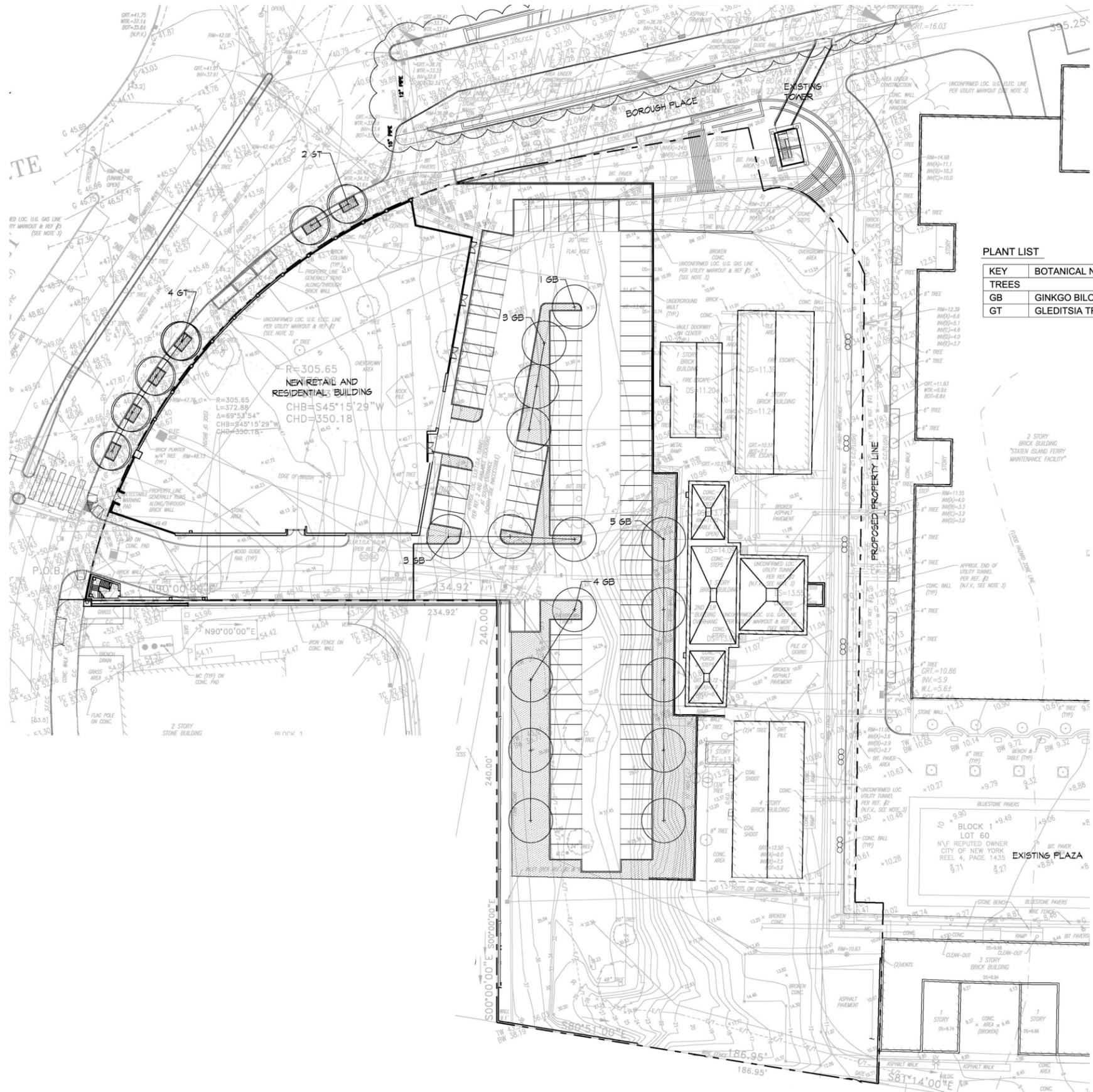
- LEGEND**
- PROPERTY LIMIT
 - 5'x5' SCORED CONCRETE
 - ASPHALT PAVERS
 - CONCRETE WALL
 - TREE PIT
 - TREE



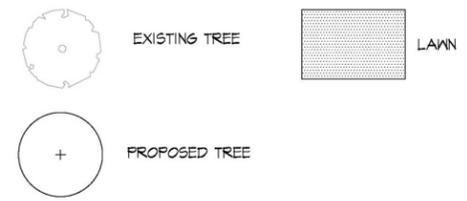


LEGEND
 - - - PROPERTY LIMIT





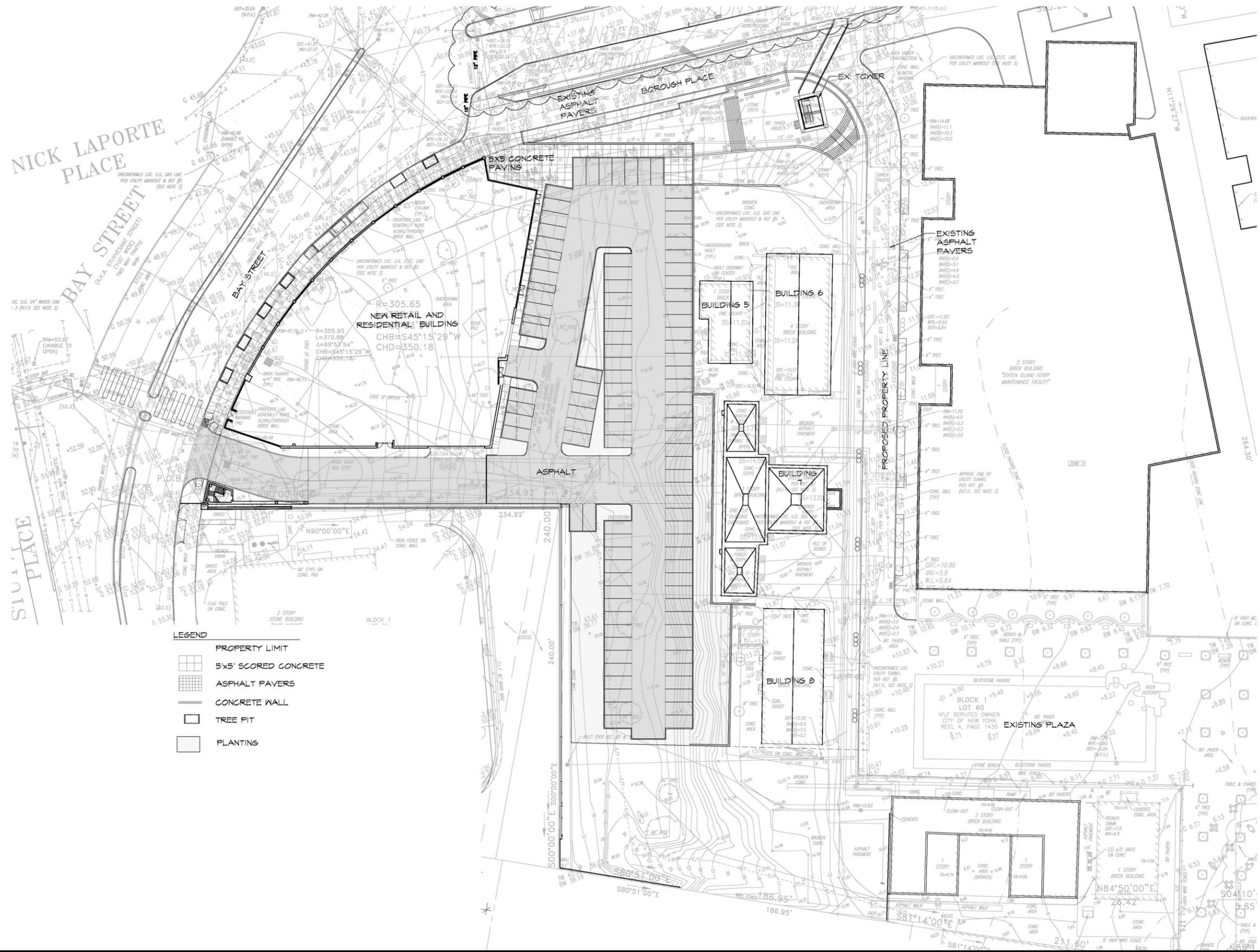
PLANTING LEGEND



PLANT LIST

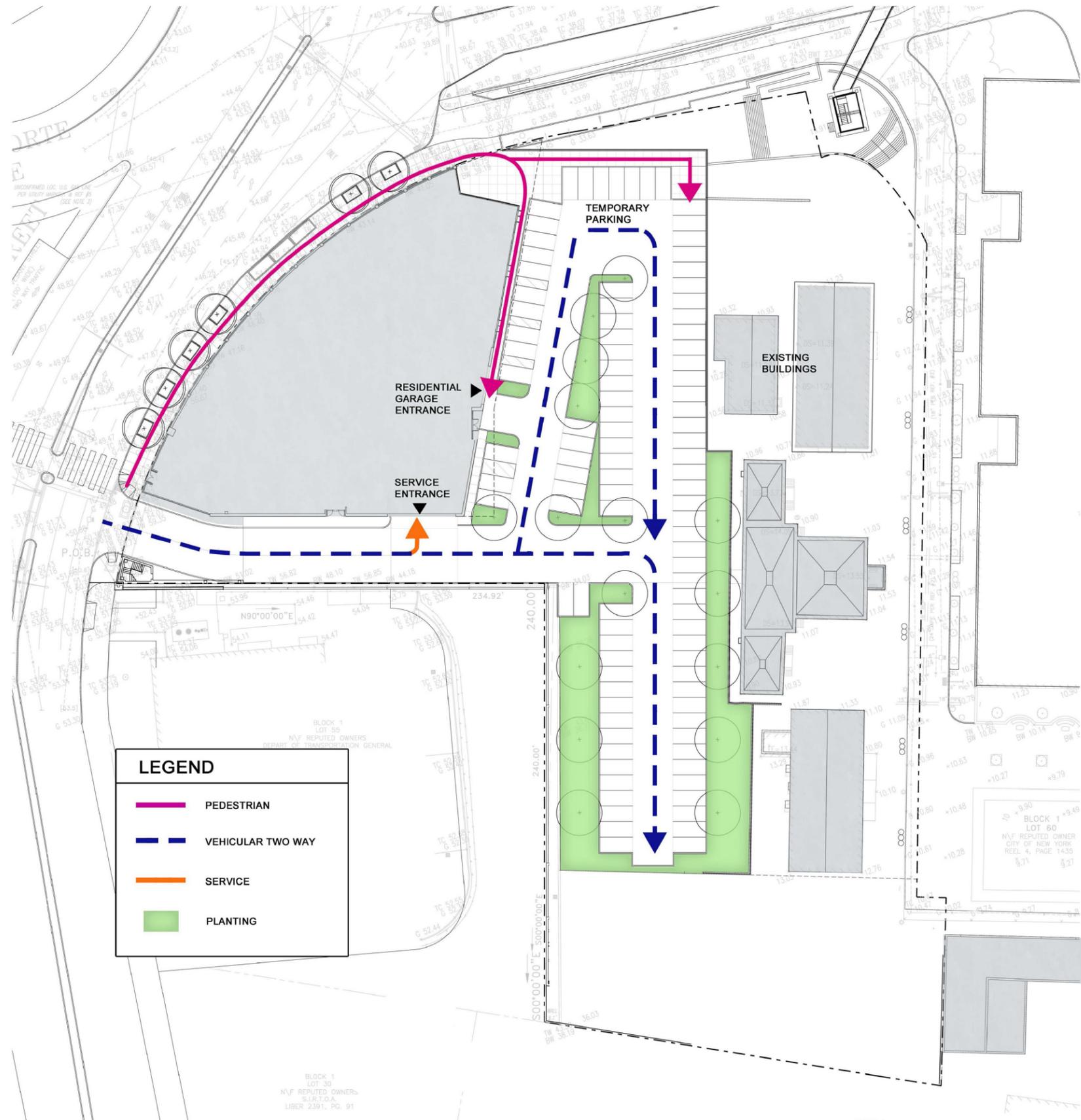
KEY	BOTANICAL NAME	COMMON NAME	QTY	SIZE	ROOT	SPACING	COMMENTS
TREES							
GB	GINKGO BILOBA	GINKGO	16	3-3 1/2" CAL.	B&B	AS SHOWN	TO BE TRANSPLANTED IN FUTURE PHASE
GT	GLEDITSIA TRICANTHOS VAR. INERMA	HONEY LOCUST	6	16'-18' HT	B&B	AS SHOWN	6" MIN BRANCH HT.





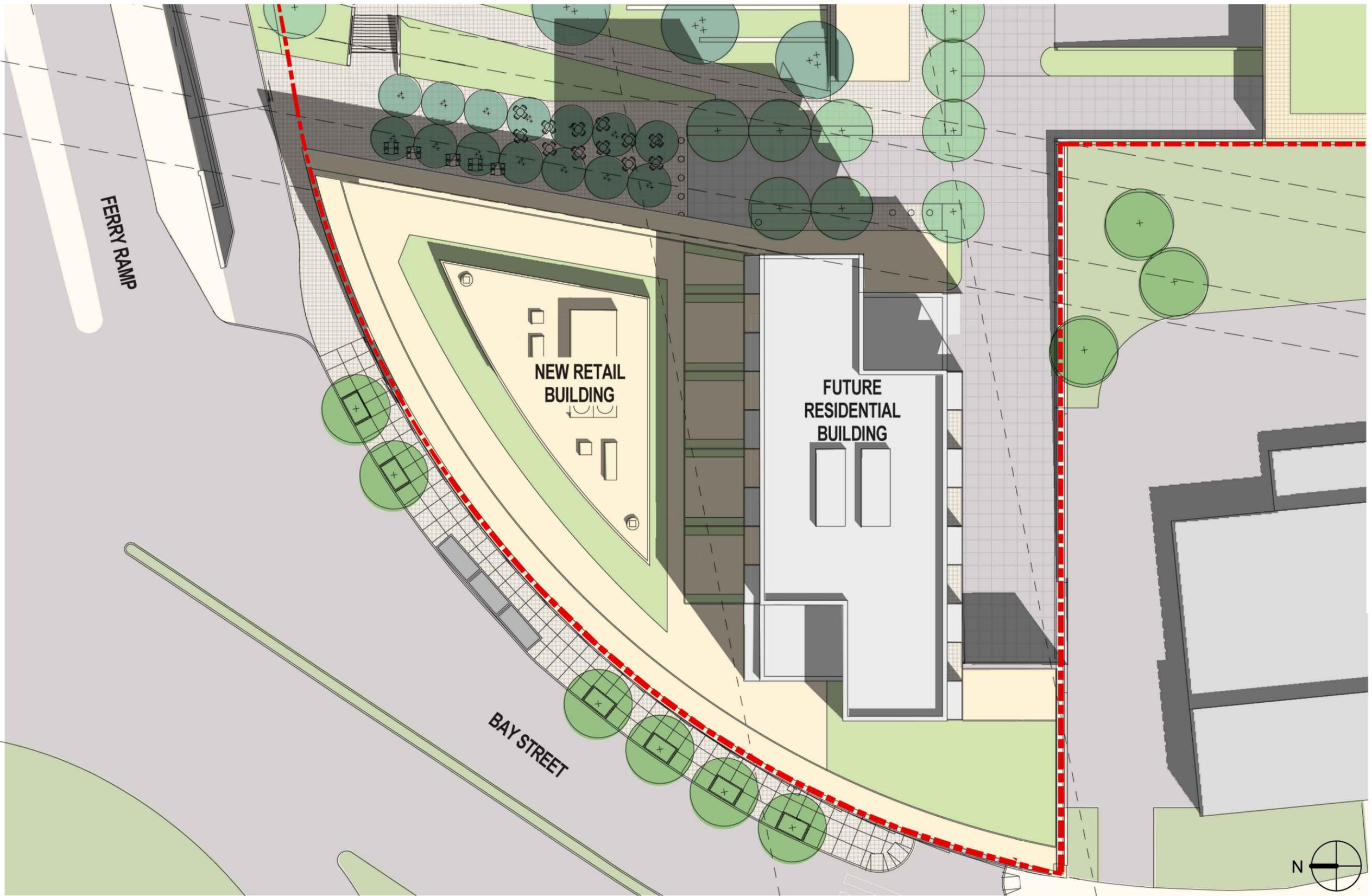
- LEGEND**
- PROPERTY LIMIT
 - 5x5' SCORED CONCRETE
 - ASPHALT PAVERS
 - CONCRETE WALL
 - TREE PIT
 - PLANTING





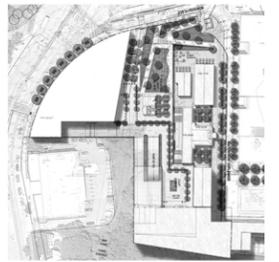
LEGEND	
	PEDESTRIAN
	VEHICULAR TWO WAY
	SERVICE
	PLANTING

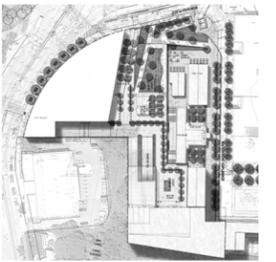
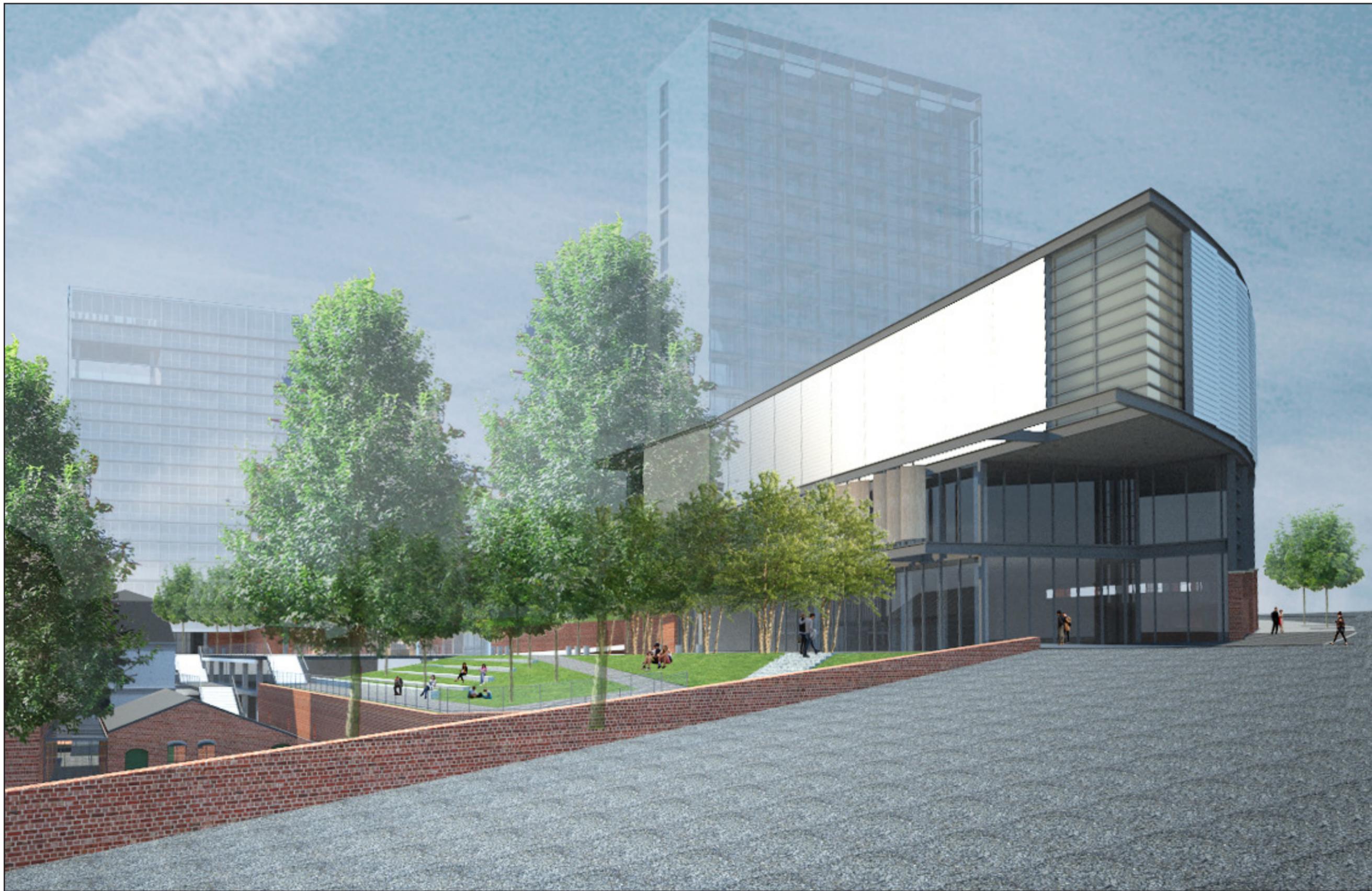


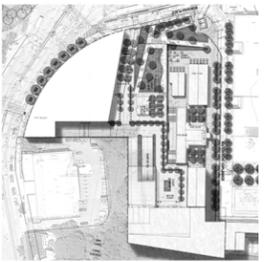


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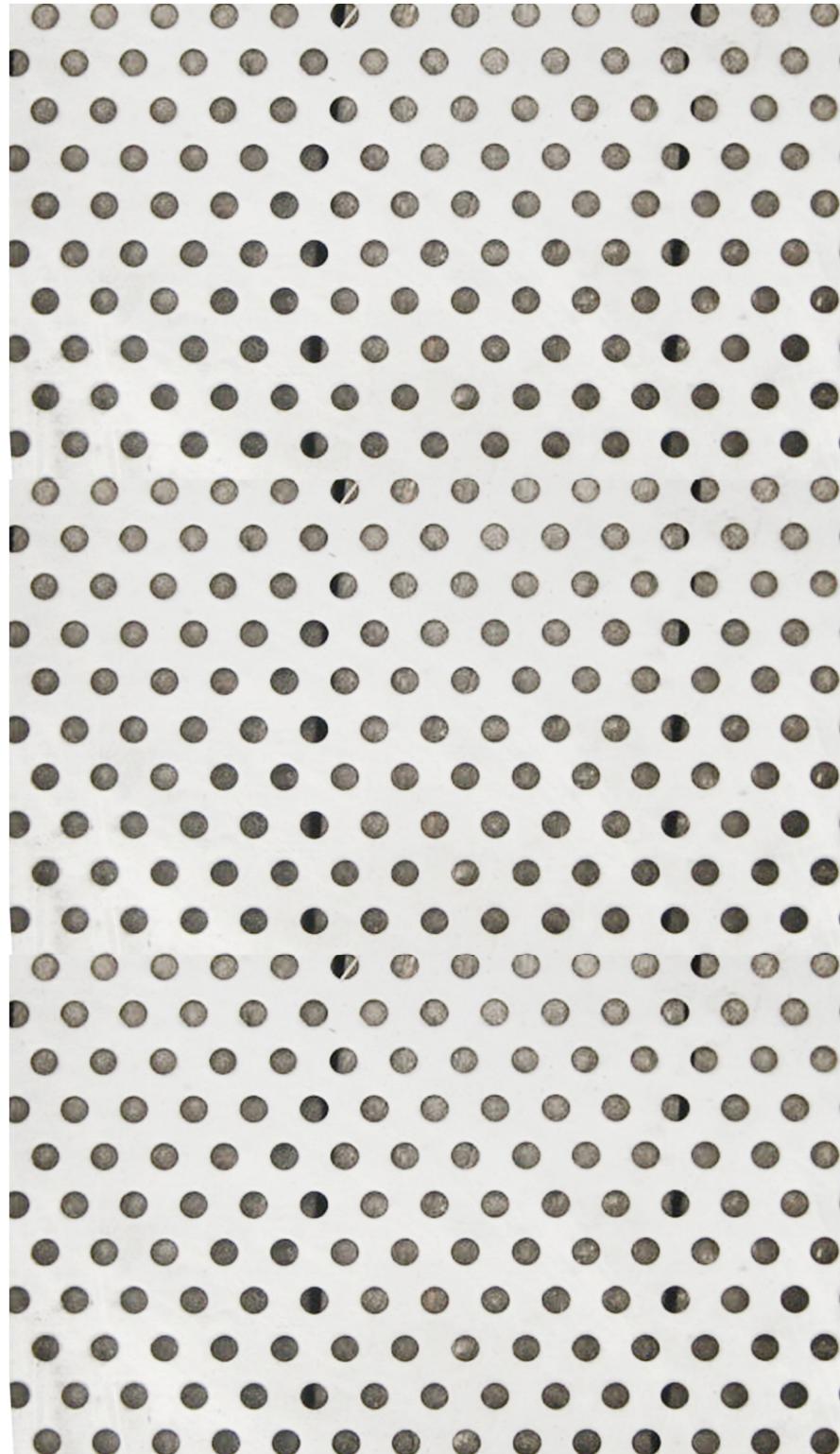






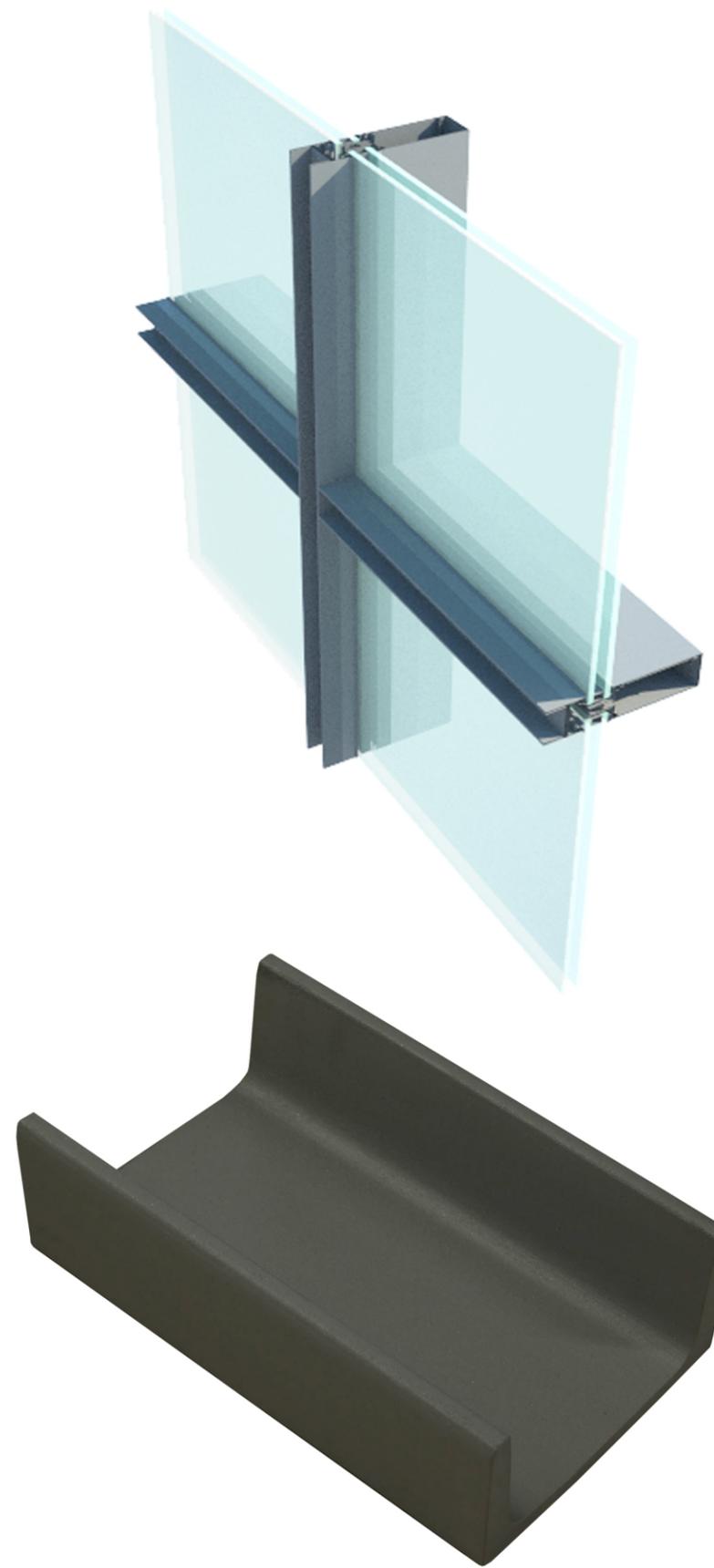


Perforated Aluminum clapboard
cladding





Painted steel channel between storefront window system on Bay St.





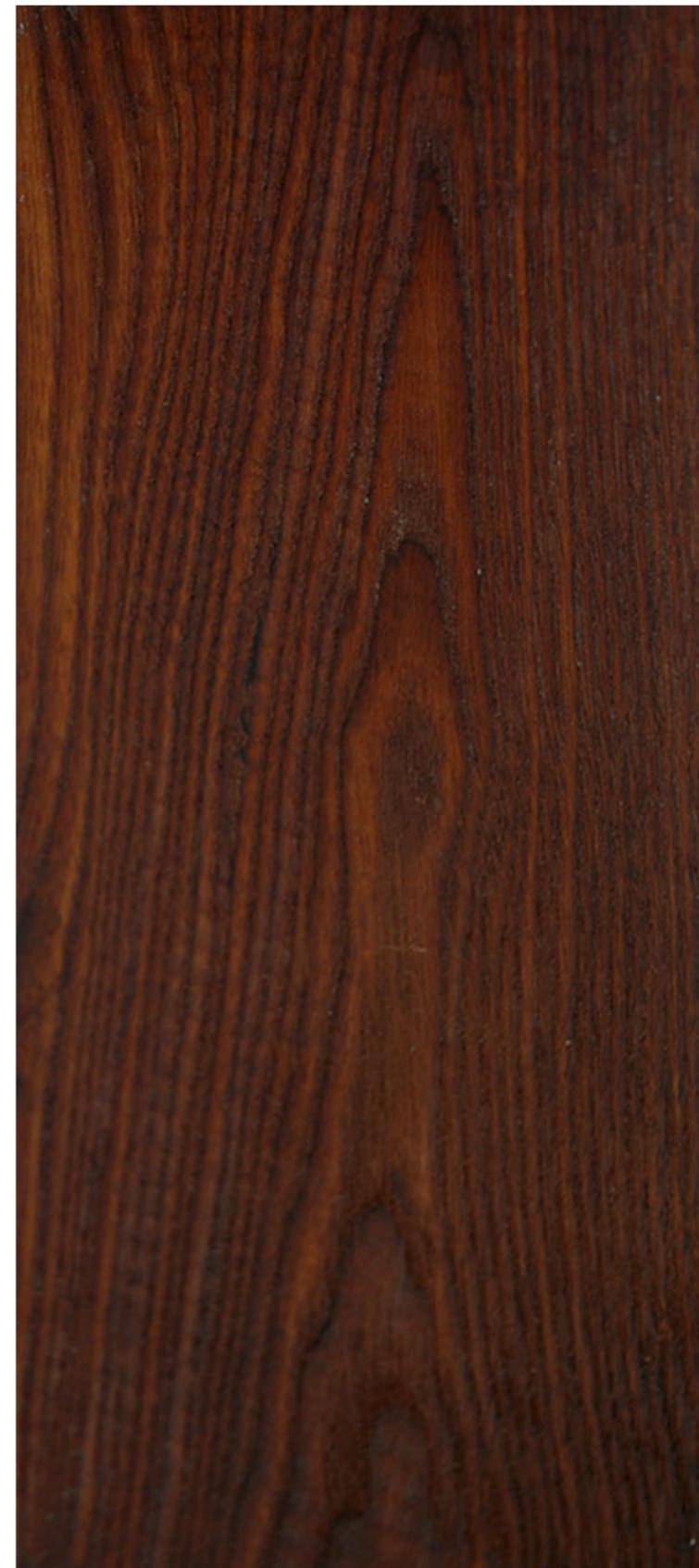
Common Brick at base of building to match existing at Bay Street

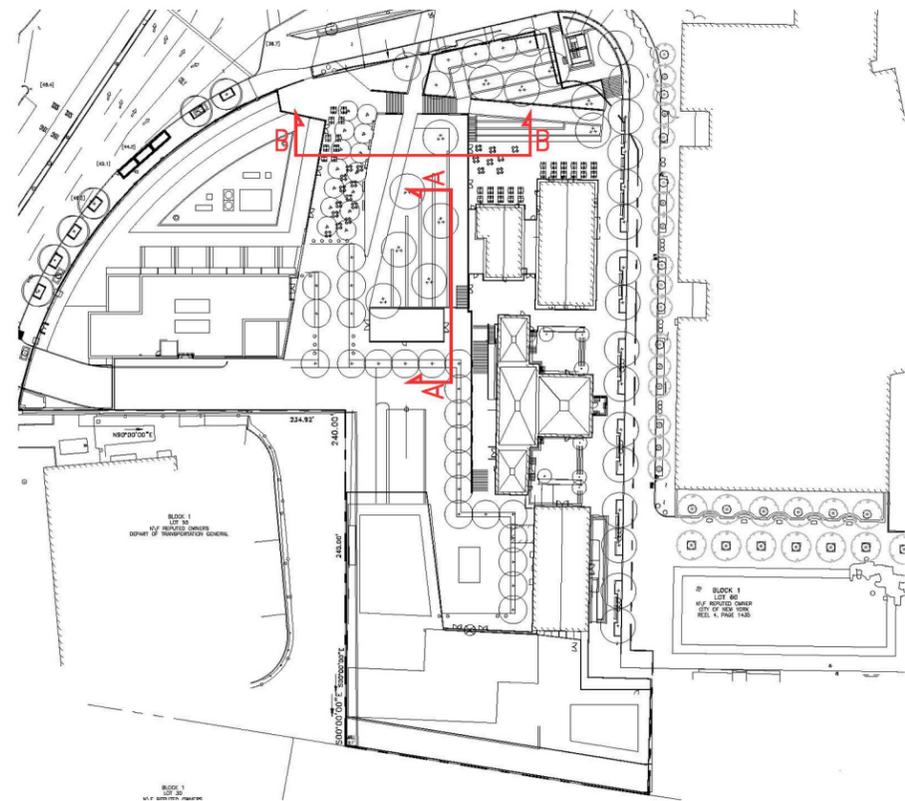




Sunshade System

Height: 13'-0"
Weidth: 4'-0"
Thickness: 3"-7"





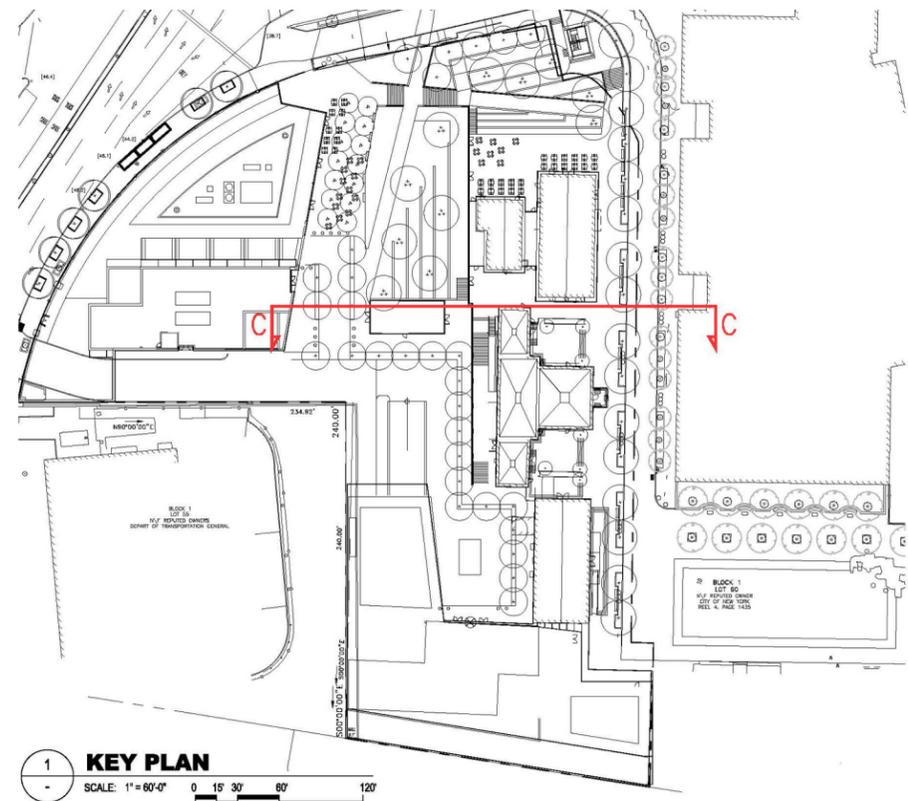
1 KEY PLAN
SCALE: 1" = 60'-0" 0 15' 30' 60' 120'



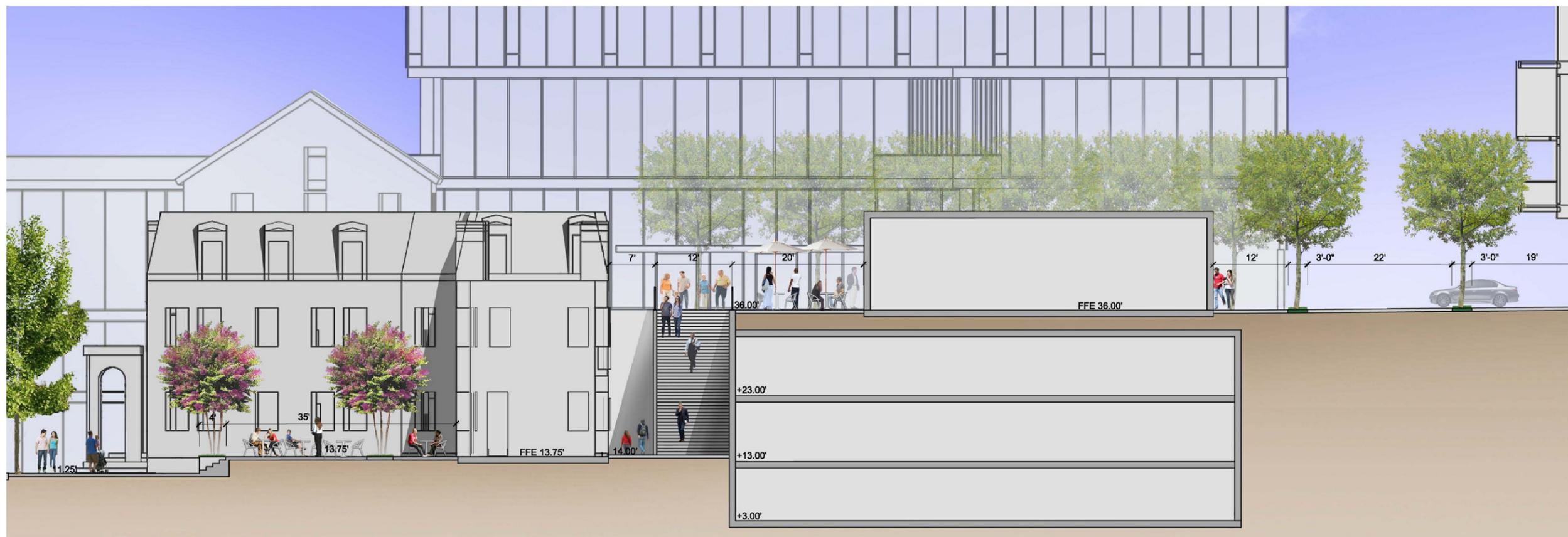
2 SECTION A-A
SCALE: 1/8" = 1'-0" 0 2' 4' 8' 16'



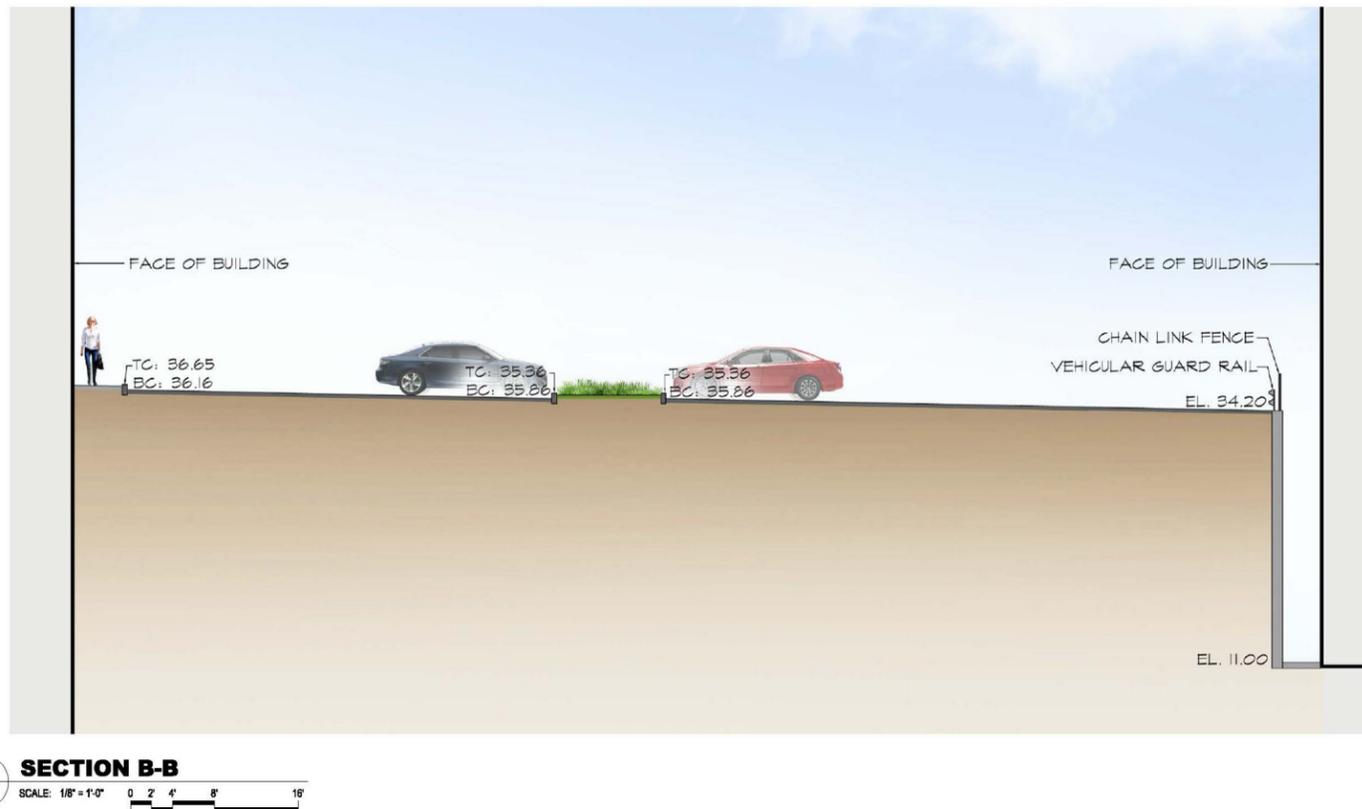
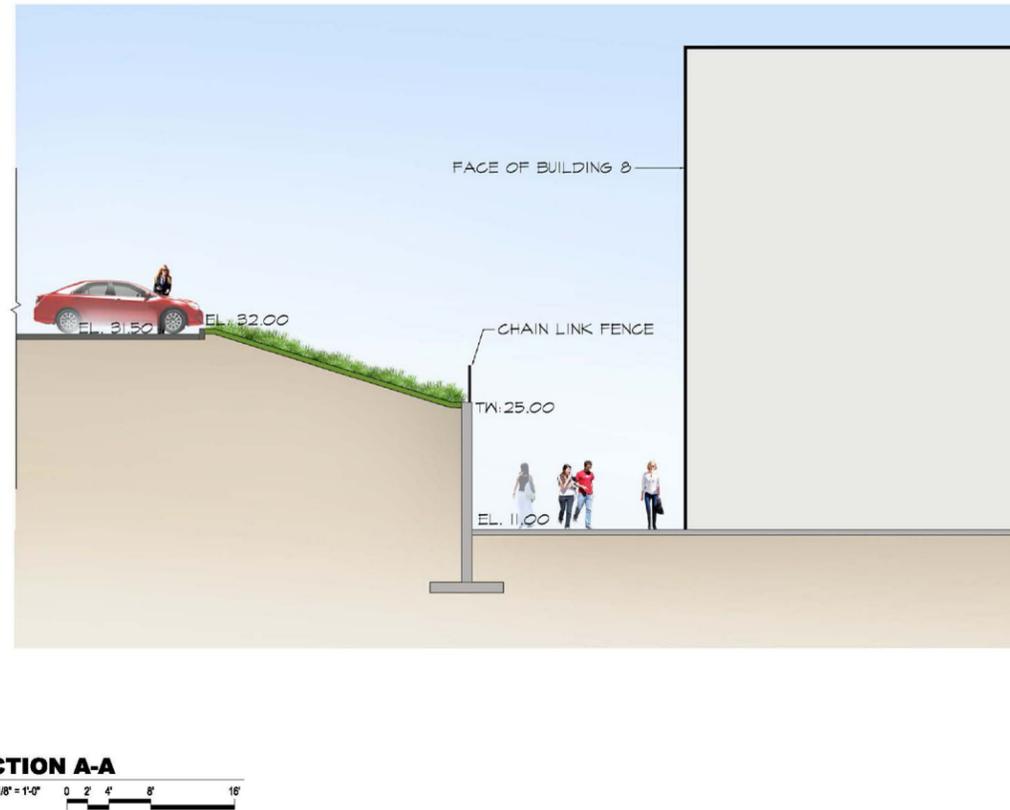
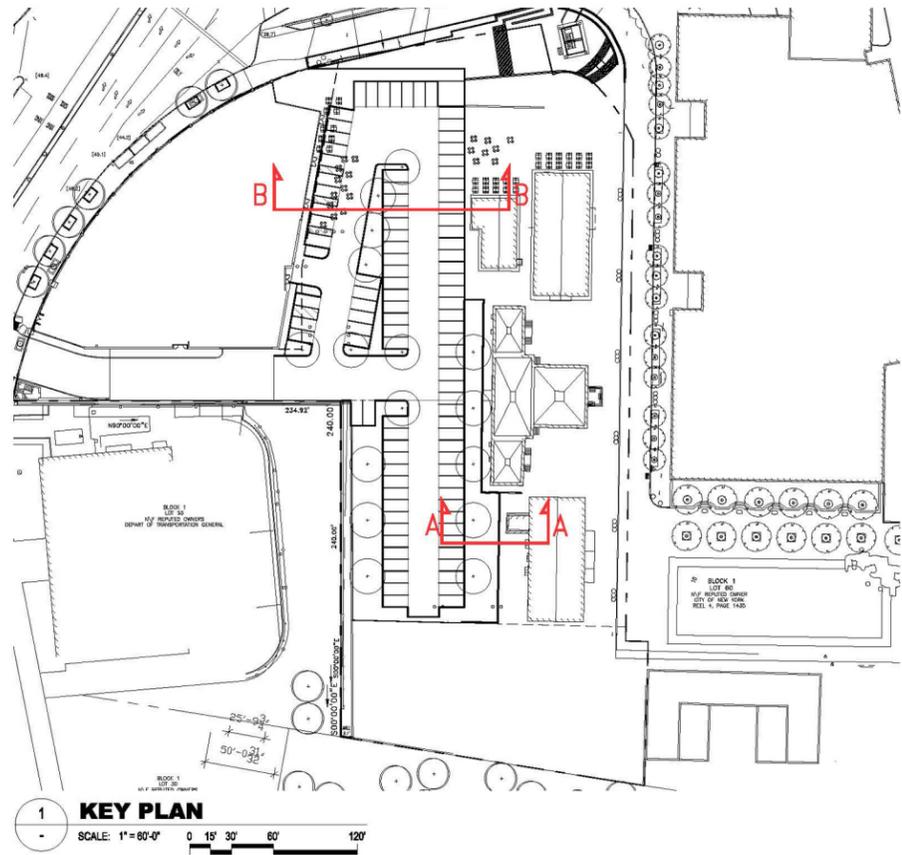
3 SECTION B-B
SCALE: 1/8" = 1'-0" 0 2' 4' 8' 16'

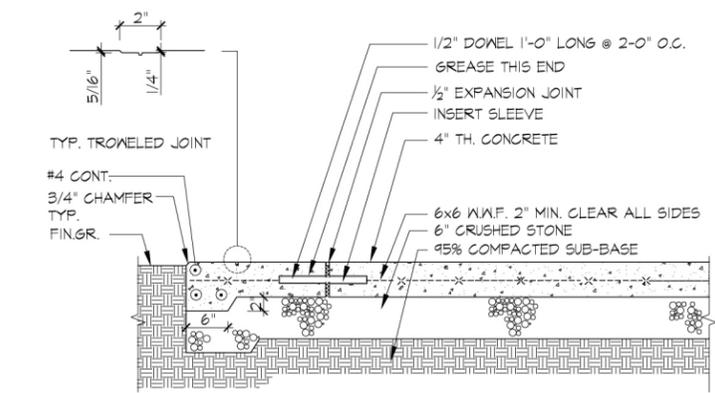


1 KEY PLAN
SCALE: 1" = 60'-0" 0 15 30 60 120'

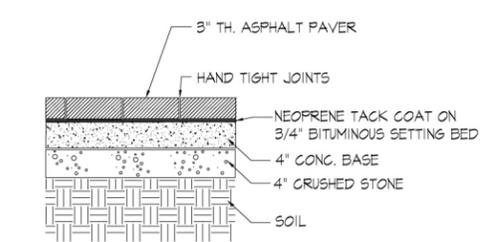


2 SECTION C-C
SCALE: 1/8" = 1'-0" 0 2 4 8 16'

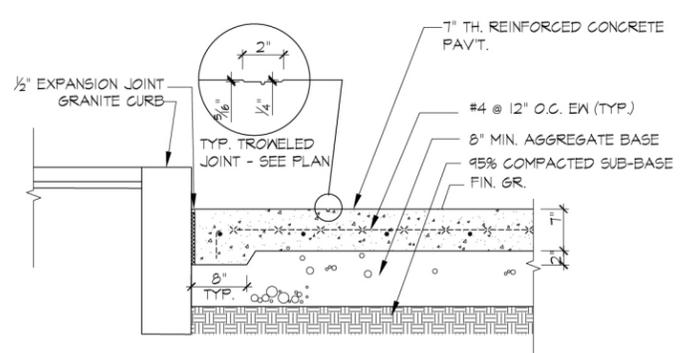




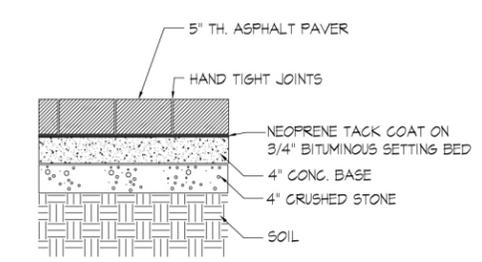
1 PEDESTRIAN CONCRETE PAVING
SCALE: 1"=1'-0"



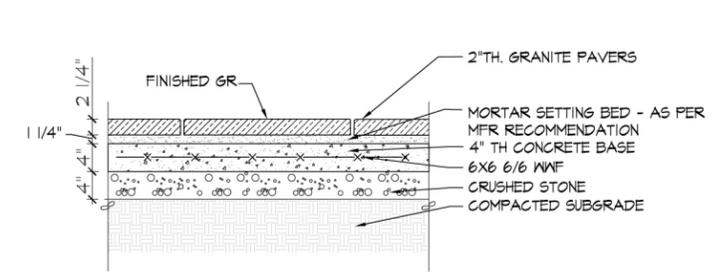
4 PEDESTRIAN ASPHALT PAVERS
SCALE: 1"=1'-0"



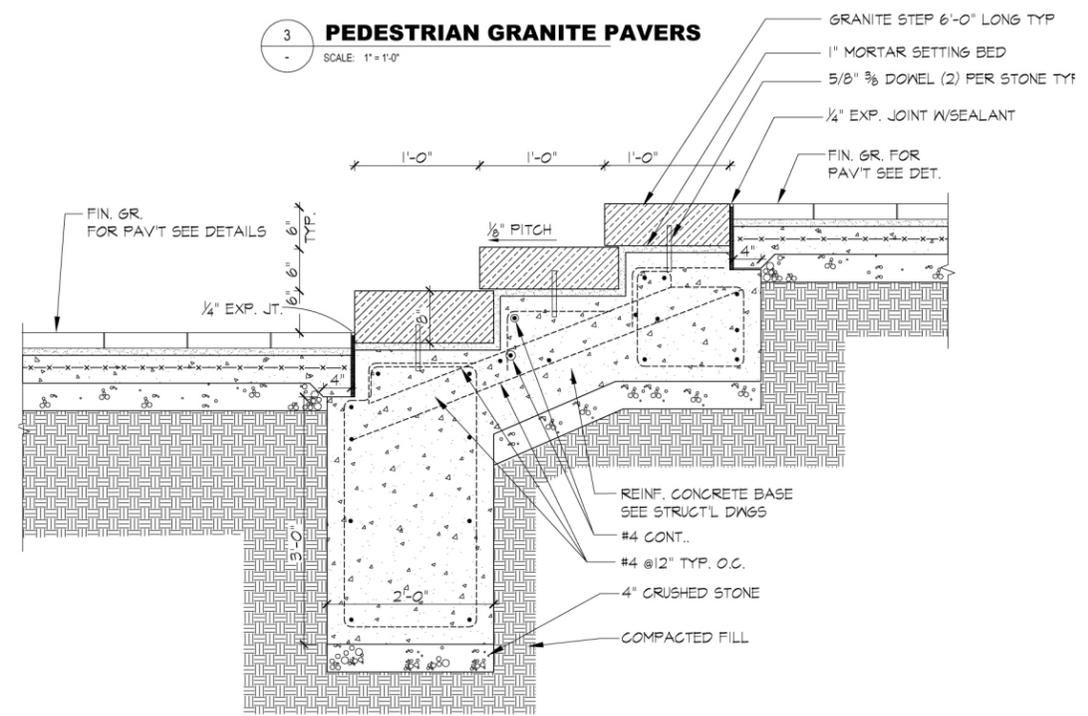
2 VEHICULAR CONCRETE PAVING
SCALE: 1"=1'-0"



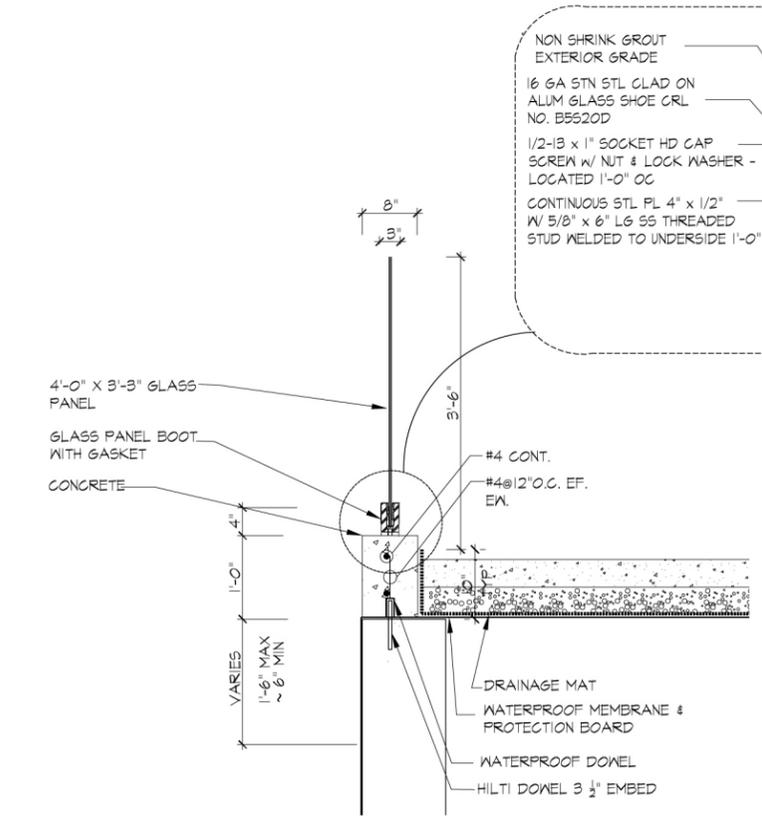
5 VEHICULAR ASPHALT PAVERS
SCALE: 1"=1'-0"



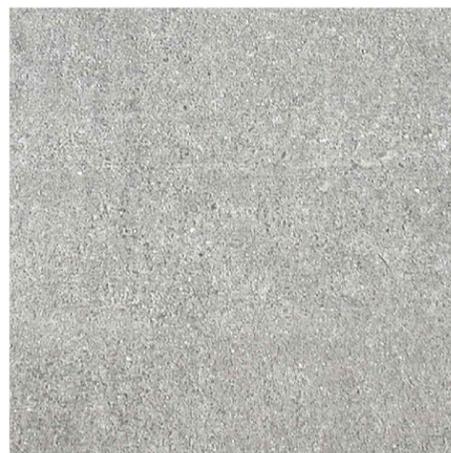
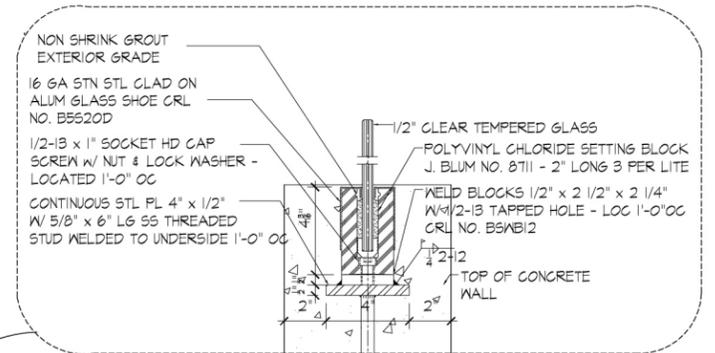
3 PEDESTRIAN GRANITE PAVERS
SCALE: 1"=1'-0"



6 GRANITE STEP DETAIL
SCALE: 1"=1'-0"



7 GLASS GUARDRAIL
SCALE: 1"=1'-0"



8 CONCRETE
SCALE: NTS



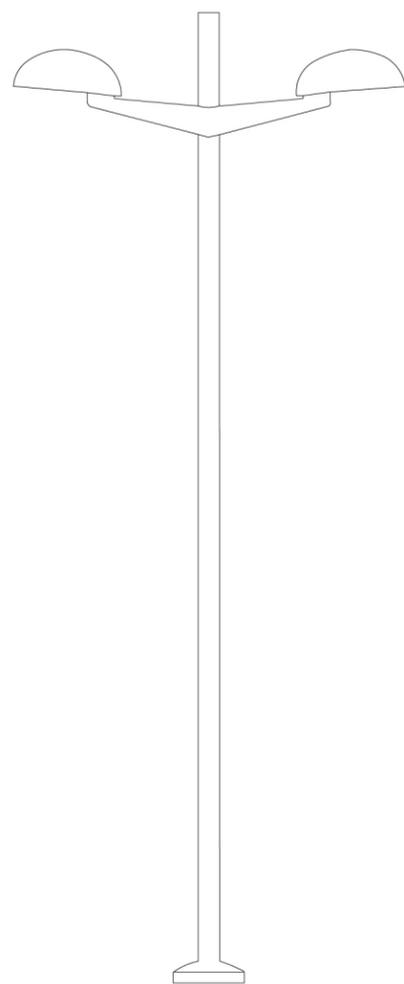
9 GRANITE
SCALE: NTS



10 ASPHALT PAVER
SCALE: NTS



1 **DECORATIVE POLE LIGHT**
SCALE: 3/4"-1'-0"



2 **NYC DOT STANDARD BIKE RACK**
SCALE: NTS



3 **NYC 2030 DRINKING FOUNTAIN**
SCALE: NTS



4 **PARC VUE TRASH RECEPTACLE**
SCALE: NTS



1 **SANTA & COLE BANCAL BENCH**
SCALE: NTS



3 **TABLE AND CHAIRS**
SCALE: NTS



2 **SANTA & COLE NEOROMANTICO BENCH REMOVABLE**
SCALE: NTS



LIGHTHOUSE POINT REDEVELOPMENT
Staten Island, New York
Remedial Action Work Plan

APPENDIX B

Citizen Participation Plan

APPENDIX B - CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and 5 Bay Street, LLC have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Voluntary Cleanup Program. This Citizen Participation Plan describes how information about the project will be disseminated to the Community during the remedial process. As part of its obligations under the NYC VCP, 5 Bay Street, LLC will maintain a repository for project documents and provide public notice at specified times throughout the remedial program. This Plan also takes into account potential environmental justice concerns in the community that surrounds the project Site. Under this Citizen Participation Plan, project documents and work plans are made available to the public in a timely manner. Public comment on work plans is strongly encouraged during public comment periods. Work plans are not approved by the NYC Office of Environmental Remediation (OER) until public comment periods have expired and all comments are formally reviewed. An explanation of cleanup plans in the form of a public meeting or informational session is available upon request to OER's project manager assigned to this Site, William Wong, who can be contacted about these issues or any others questions, comments or concerns that arise during the remedial process at (212) 788-8841.

PROJECT CONTACT LIST: OER has established a Site Contact List for this project to provide public notices in the form of fact sheets to interested members of the Community. Communications will include updates on important information relating to the progress of the cleanup program at the Site as well as to request public comments on the cleanup plan. The Project Contact List includes owners and occupants of adjacent buildings and homes, principal administrators of nearby schools, hospitals and day care centers, the public water supplier that serves the area, established document repositories, the representative Community Board, City Council members, other elected representatives and any local Brownfield Opportunity Area (BOA) grantee organizations. Any member of the public or organization will be added to the Site Contact List on request. A copy of the Site Contact List is maintained by OER's project manager. If you would like to be added to the Project Contact List, contact NYC OER at (212) 788-8841 or by email at brownfields@cityhall.nyc.gov.

REPOSITORIES: A document repository is maintained online. Internet access to view OER's document repositories is available at public libraries. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. The library nearest the Site is:

St. George Public Library

5 Central Ave, Staten Island, NY 10301 (718)442-8560

Monday- 8:00 am- 8:00 pm

Tuesday- 8:00 am- 8:00 pm

Wednesday- 8:00 am- 8:00 pm

Thursday- 8:00 am- 8:00 pm

Friday- 10:00 am- 5:00 pm

Saturday- 10:00 am- 5:00 pm

Sunday-Closed

DIGITAL DOCUMENTATION: NYC OER requires the use of digital documents in our repository as a means of minimizing paper use while also increasing convenience in access and ease of use.

ISSUES OF PUBLIC CONCERN: There are no specific issues of concern to stakeholders proximate to the project Site.

PUBLIC NOTICE AND PUBLIC COMMENT: Public notice to all members of the Project Contact List is required at three major steps during the performance of the cleanup program (listed below) and at other points that may be required by OER. Notices will include Fact Sheets with descriptive project summaries, updates on recent and upcoming project activities, repository information, and important phone and email contact information. All notices will be reviewed and approved by OER prior to distribution and mailed by the Enrollee. Public comment is solicited in public notices for all work plans developed under the NYC Voluntary Cleanup Program. Final review of all work plans by OER will consider all public comments. Approval will not be granted until the public comment period has been completed.

CITIZEN PARTICIPATION MILESTONES: Public notice and public comment activities occur at several steps during a typical NYC VCP project. These steps include:

- **Public Notice of the availability of the Remedial Investigation Report and Remedial Action Work Plan and a 30-day public comment period on the Remedial Action Work Plan:** Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the Remedial Investigation Report and Remedial Action Work Plan and the initiation of a 30-day public comment period on the Remedial Action Work Plan. The Fact Sheet summarizes the findings of the RIR and provides details of the RAWP. The public comment period will be extended an additional 15 days upon public request. A public meeting or informational session will be conducted by OER upon request.
- **Public Notice announcing the approval of the RAWP and the start of remediation:** Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the approval of the RAWP and the start of remediation.
- **Public Notice announcing the completion of remediation, designation of Institutional and Engineering Controls and issuance of the Notice of Completion:** Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the completion of remediation, providing a list of all Institutional and Engineering Controls implemented for to the Site and announcing the issuance of the Notice of Completion.

LIGHTHOUSE POINT REDEVELOPMENT
Staten Island, New York
Remedial Action Work Plan

APPENDIX C

Sustainability Statement

APPENDIX C - SUSTAINABILITY STATEMENT

This Sustainability Statement documents sustainable activities and green remediation efforts planned under this remedial action.

REUSE OF CLEAN, RECYCLABLE MATERIALS AND REDUCED CONSUMPTION OF NON-RENEWABLE RESOURCES: Reuse of clean, locally-derived recyclable materials reduces consumption of non-renewable virgin resources and can provide energy savings and greenhouse gas reduction.

An estimate of the quantity (in tons) of clean, non-virgin materials (reported by type of material) reused under this plan will be quantified and reported in the RAR.

REDUCED ENERGY CONSUMPTION AND PROMOTION OF GREATER ENERGY EFFICIENCY: Reduced energy consumption lowers greenhouse gas emissions, improves local air quality, lessens in-city power generation requirements, can lower traffic congestion, and provides substantial cost savings.

Best efforts will be made to quantify energy efficiencies achieved during the remediation and will be reported in the Remedial Action Report (RAR). Where energy savings cannot be easily quantified, a gross indicator of the amount of energy saved or the means by which energy savings was achieved will be reported.

CONVERSION TO CLEAN FUELS: Use of clean fuel improves NYC's air quality by reducing harmful emissions.

Natural gas will be utilized for fuel in the new building.

An estimate of the volume of clean fuels used during remedial activities will be quantified and reported in the RAR.

RECONTAMINATION CONTROL: Recontamination after cleanup and redevelopment is completed undermines the value of work performed, may result in a property that is less protective of public health or the environment, and may necessitate additional cleanup work later or impede future redevelopment. Recontamination can arise from future releases that occur within the property or by influx of contamination from off-Site.

An estimate of the area of the Site that utilizes recontamination controls under this plan will be reported in the RAR in square feet.

STORMWATER RETENTION: Stormwater retention improves water quality by lowering the rate of combined stormwater and sewer discharges to NYC's sewage treatment plants during periods of precipitation, and reduces the volume of untreated influent to local surface waters.

An estimate of the enhanced stormwater retention capability of the redevelopment project will be included in the RAR.

LINKAGE WITH GREEN BUILDING: Green buildings provide a multitude of benefits to the city across a broad range of areas, such as reduction of energy consumption, conservation of resources, and reduction in toxic materials use.

The number of Green Buildings that are associated with this brownfield redevelopment property will be reported in the RAR. The total square footage of green building space created as a function of this brownfield redevelopment will be quantified for residential, commercial and industrial/manufacturing uses.

PAPERLESS VOLUNTARY CLEANUP PROGRAM: 5 Bay Street, LLC is participating in OER's Paperless Voluntary Cleanup Program. Under this program, submission of electronic documents will replace submission of hard copies for the review of project documents, communications and milestone reports.

LOW-ENERGY PROJECT MANAGEMENT PROGRAM: 5 Bay Street, LLC is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as videoconferencing and teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

TREES AND PLANTINGS: Trees and other plantings provide habitat and add to NYC's environmental quality in a wide variety of ways. Native plant species and native habitat provide optimal support to local fauna, promote local biodiversity, and require less maintenance.

An estimate of the land area that will be vegetated, including the number of trees planted or preserved, will be reported in square feet in the RAR.

LIGHTHOUSE POINT REDEVELOPMENT
Staten Island, New York
Remedial Action Work Plan

APPENDIX D

Soil/Materials Management Plan

APPENDIX D - SOIL/MATERIALS MANAGEMENT PLAN

1.1 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment will be performed under the supervision of a Qualified Environmental Professional and will be reported in the final remedial report. Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of final signoff by OER.

1.2 Stockpile Methods

Excavated soil from suspected areas of contamination (e.g., hot spots, USTs, drains, etc.) will be stockpiled separately and will be segregated from clean soil and construction materials. Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. Excavated soils will be stockpiled on, at minimum, double layers of 8-mil minimum sheeting, will be kept covered at all times with appropriately anchored plastic tarps, and will be routinely inspected. Broken or ripped tarps will be promptly replaced.

All stockpile activities will be compliant with applicable laws and regulations. Soil stockpile areas will be appropriately graded to control run-off in accordance with applicable laws and regulations. Stockpiles of excavated soils and other materials shall be located at least of 50 feet from the property boundaries, where possible. Hay bales or equivalent will surround soil stockpiles except for areas where access by equipment is required. Silt fencing and hay bales will be used as needed near catch basins, surface waters and other discharge points.

1.3 Characterization of Excavated Materials

Soil/fill or other excavated media that is transported off-Site for disposal will be sampled in a manner required by the receiving facility, and in compliance with applicable laws and regulations. Soils proposed for reuse on-Site will be managed as defined in this plan.

1.4 Materials Excavation, Load-Out, and Departure

The PE/QEP overseeing the remedial action will:

- oversee remedial work and the excavation and load-out of excavated material;
- ensure that there is a party responsible for the safe execution of invasive and other work performed under this work plan;
- ensure that Site development activities and development-related grading cuts will not interfere with, or otherwise impair or compromise the remedial activities proposed in this RAWP;
- ensure that the presence of utilities and easements on the Site has been investigated and that any identified risks from work proposed under this plan are properly addressed by appropriate parties;
- ensure that all loaded outbound trucks are inspected and cleaned if necessary before leaving the Site;
- ensure that all egress points for truck and equipment transport from the Site will be kept clean of Site-derived materials during Site remediation.

Locations where vehicles exit the Site shall be inspected daily for evidence of soil tracking off premises. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

Open and uncontrolled mechanical processing of historical fill and contaminated soil on-Site will not be performed without prior OER approval.

1.5 Off-Site Materials Transport

Loaded vehicles leaving the Site will comply with all applicable materials transportation requirements (including appropriate covering, manifests, and placards) in accordance with applicable laws and regulations, including use of licensed haulers in accordance with 6 NYCRR Part 364. If loads contain wet material capable of causing leakage from trucks, truck liners will be

used. Queuing of trucks will be performed on-Site, when possible in order to minimize off Site disturbance. Off-Site queuing will be minimized.

Outbound truck transport routes are described in the remedial report. This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

1.6 Materials Disposal Off-Site

The following documentation will be established and reported by the PE/QEP for each disposal destination used in this project to document that the disposal of regulated material exported from the Site conforms with applicable laws and regulations: (1) a letter from the PE/QEP or Enrollee to each disposal facility describing the material to be disposed and requesting written acceptance of the material. This letter will state that material to be disposed is regulated material generated at an environmental remediation Site in New York City under a governmental remediation program. The letter will provide the project identity and the name and phone number of the PE/QEP or Enrollee. The letter will include as an attachment a summary of all chemical data for the material being transported; and (2) a letter from each disposal facility stating it is in receipt of the correspondence (1, above) and is approved to accept the material. These documents will be included in the final remedial report.

The Remedial Action Report will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with disposal of all material will include records and approvals for receipt of the material. This information will be presented in the final remedial report.

All impacted soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed in accordance with applicable laws and regulations.

Historic fill and contaminated soils taken off-Site will be handled as solid waste and will not be disposed at a Part 360-16 Registration Facility (also known as a Soil Recycling Facility).

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the final remedial report. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the final remedial report. Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), including transport to a Part 360-16 Registration Facility, a formal request will be made for approval by OER with an associated plan compliant with 6NYCRR Part 360-16. This request and plan will include the location, volume and a description of the material to be recycled, including verification that the material is not impacted by site uses and that the material complies with receipt requirements for recycling under 6NYCRR Part 360. This material will be appropriately handled on-Site to prevent mixing with impacted material.

1.7 Materials Reuse On-Site

Soil and fill that is derived from the property that meets the Soil Cleanup Objectives (SCOs) established in this plan may be reused on-Site. The SCOs for on-Site reuse are listed in Section 4.2 of this cleanup plan. ‘Reuse on-Site’ means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on land with comparable levels of contaminants in soil/fill material, compliant with applicable laws and regulations, and addressed pursuant to the NYC VCP agreement subject to Engineering and Institutional Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site and that procedures defined for material reuse in this remedial plan are followed. The expected location for placement of reused material is shown in Section 4.2.

Organic matter (wood, roots, stumps, etc.) or other waste derived from clearing and grubbing of the Site will not be buried on-Site. Soil or fill excavated from the site for grading or other purposes will not be reused within a cover soil layer or within landscaping berms.

1.8 Demarcation

After completion of hotspot removal and any other invasive remedial activities, and prior to backfilling, the top of the residual soil/fill will be defined by one of three methods: (1) placement of a demarcation layer. The demarcation layer will consist of geosynthetic fencing or equivalent material to be placed on the surface of residual soil/fill to provide an observable reference layer. A description or map of the approximate depth of the demarcation layer will be provided in the SMP; or (2) a land survey of the top elevation of residual soil/fill before the placement of cover soils, pavement and associated sub-soils, or other materials or structures or, (3) all materials beneath the approved cover will be considered impacted and subject to site management after the remedy is complete. Demarcation may be established by one or any combination of these three methods. As appropriate, a map showing the method of demarcation for the Site and all associated documentation will be presented in the RAR.

This demarcation will constitute the top of the site management horizon. Materials within this horizon require adherence to special conditions during future invasive activities as defined in the Site Management Plan.

1.9 Import of Backfill Soil from Off-Site Sources

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site. Imported soils will not exceed groundwater protection standards established in Part 375. Imported soils for Track 1 remedial action projects will not exceed Track 1 SCO's.

A process will be established to evaluate sources of backfill and cover soil to be imported to the Site, and will include an examination of source location, current and historical use(s), and any applicable documentation. Material from industrial sites, spill sites, environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

The following potential sources may be used pending attainment of backfill and cover soil quality objectives:

- Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;
- Clean soil from roadway or other transportation-related projects in compliance with applicable laws and regulations;
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by the regulations of NYS DEC.
- All materials received for import to the Site will be approved by a PE/QEP and will be in compliance with provisions in this remedial plan. The final remedial report will report the source of the fill, evidence that an inspection was performed on the source, chemical sampling results, frequency of testing, and a Site map indicating the locations where backfill or soil cover was placed.
- All material will be subject to source screening and chemical testing.
- Inspection of imported fill material will include visual, olfactory and PID screening for evidence of contamination. Materials imported to the Site will be subject to inspection, as follows:
 - Trucks with imported fill material will be in compliance with applicable laws and regulations and will enter the Site at designated locations;
 - The PE/QEP is responsible to ensure that every truck load of imported material is inspected for evidence of contamination; and
 - Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

Composite samples of imported material will be taken at a minimum frequency of one sample for every 500 cubic yards of material. Once it is determined that the fill material meets imported

backfill or cover soil chemical requirements and is non-hazardous, and lacks petroleum contamination, the material will be loaded onto trucks for delivery to the Site.

Recycled concrete aggregate (RCA) will be imported from facilities permitted or registered by NYSDEC. Facilities will be identified in the final remedial report. A PE/QEP is responsible to ensure that the facility is compliant with 6NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require additional testing, unless required by NYSDEC under its terms for operation of the facility. RCA imported to the Site must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material.

1.10 Fluids Management

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

Discharge of water generated during remedial construction to surface waters (i.e. a stream or river) is prohibited without a SPDES permit issued by New York State Department of Environmental Conservation.

1.11 Stormwater Pollution Prevention

Applicable laws and regulations pertaining to stormwater pollution prevention will be addressed during the remedial program. Erosion and sediment control measures identified in this remedial plan (silt fences and barriers, and hay bale checks) will be installed around the entire perimeter of the remedial construction area and inspected once a week and after every storm event to ensure

that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

1.12 Contingency Plan for Unknown Contamination Sources

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive Site work will be promptly communicated to OER's Project Manager. Petroleum spills will be reported to the NYS DEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contaminant sources are found during on-Site remedial excavation or development-related excavation, sampling will be performed on contaminated source material and surrounding soils and reported to OER. Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

1.13 Odor, Dust, and Nuisance Control

ODOR CONTROL

All necessary means will be employed to prevent on- and off-Site odor nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) use of foams to cover exposed odorous soils. If odors develop and cannot otherwise be controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; and (e) use of chemical odorants in spray or misting systems.

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will

not resume until all nuisance odors have been abated. OER will be notified of all odor complaint events. Implementation of all odor controls, including halt of work, will be the responsibility of the PE/QEP's certifying this remedial plan.

DUST CONTROL

Dust management during invasive on-Site work will include, at a minimum:

- Use of a dedicated water spray methodology for roads, excavation areas and stockpiles.
- Use of properly anchored tarps to cover stockpiles.
- Exercise extra care during dry and high-wind periods.
- Use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and corrected. Work will not resume until all nuisance dust emissions have been abated. OER will be notified of all dust complaint events. Implementation of all dust controls, including halt of work, will be the responsibility of the PE/QEP's responsible for certifying this remedial plan.

OTHER NUISANCES

Noise control will be exercised during the remedial program. All remedial work will conform, at a minimum, to NYC noise control standards.

Rodent control will be provided during Site clearing and grubbing and during the remedial program, as necessary, to prevent nuisances.

LIGHTHOUSE POINT REDEVELOPMENT
Staten Island, New York
Remedial Action Work Plan

APPENDIX E

Manufacturer Specifications for Waterproofing/Vapor Barrier

Grace Below Grade Waterproofing

BITUTHENE® SYSTEM 4000

Self-adhesive HDPE waterproofing membrane with super tacky compound for use with patented, water-based Bituthene® System 4000 Surface Conditioner

Description

Bituthene® System 4000 Waterproofing Membrane is a 1.5 mm (1/16 in.) flexible, pre-formed membrane which combines a high performance, cross laminated, HDPE carrier film with a unique, super tacky, self-adhesive rubberized asphalt compound.

Bituthene® System 4000 Surface Conditioner is a water-based, latex surface treatment which imparts an aggressive, high tack finish to the treated substrate. It is specifically formulated to bind site dust and concrete efflorescence, thereby providing a suitable surface for the Bituthene® System 4000 Waterproofing Membrane.

Conveniently packaged in each roll of membrane, Bituthene® System 4000 Surface Conditioner promotes good initial adhesion and, more importantly, excellent permanent adhesion of the Bituthene® System 4000 Waterproofing Membrane. The VOC (Volatile Organic Compound) content of this product is 100 g/L.

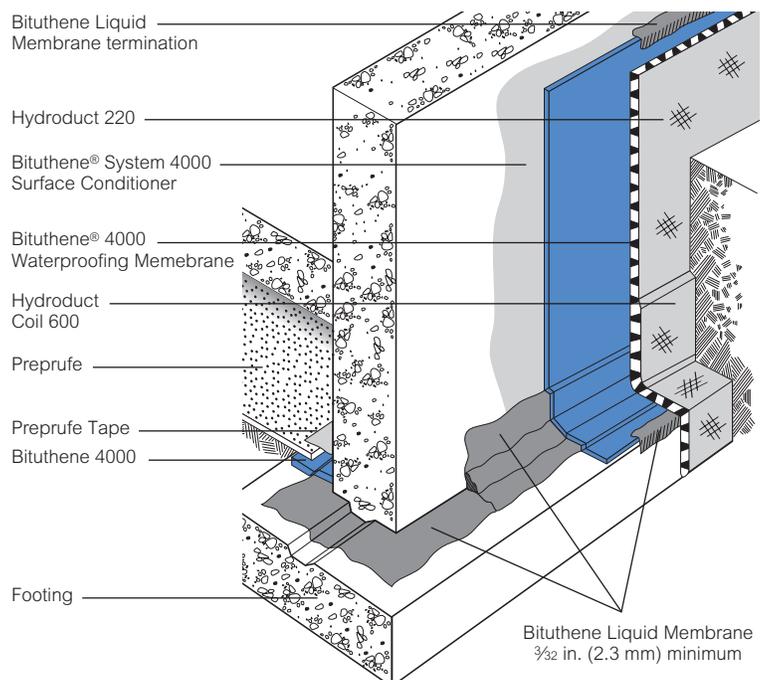
Architectural and Industrial Maintenance Regulations limit the VOC content in products classified as Architectural Coatings. Refer to Technical Letters at graceconstruction.com for most current list of allowable limits.

Advantages

- **Excellent adhesion**—special adhesive compound engineered to work with high tack System 4000 Surface Conditioner
- **Cold applied**—simple application to substrates, especially at low temperatures
- **Reduced inventory and handling costs**—System 4000 Surface Conditioner is included with each roll of membrane
- **Wide application temperature range**—excellent bond to self and substrate from 25°F (-4°C) and above

Product Advantages

- Excellent adhesion
- Cold applied
- Reduced inventory and handling costs
- Wide application temperature range
- Overlap security
- Cross laminated, high density polyethylene carrier film
- Flexible
- Ripcord®



Drawings are for illustration purposes only. Please refer to graceconstruction.com for specific application details.

- **Overlap security**—minimizes margin for error under site conditions
- **Cross laminated, high density polyethylene carrier film**—provides high tear strength, puncture and impact resistance
- **Flexible**—accommodates minor structural movements and will bridge shrinkage cracks
- **Ripcord**[®]—this split release on demand feature allows the splitting of the release paper into two (2) pieces for ease of installation in detailed areas

Use

Bituthene[®] membrane is ideal for waterproofing concrete, masonry and wood surfaces where in-service temperatures will not exceed 135°F (57°C). It can be applied to foundation walls, tunnels, earth sheltered structures and split slab construction, both above and below grade. (For above grade applications, see *Above Grade Waterproofing Bituthene[®] System 4000.*)

Bituthene[®] waterproofing membrane is 1/16 in. (1.5 mm) thick, 3 ft (0.9 m) wide and 66.7 ft (20 m) long and is supplied in rolls. It is unrolled sticky side down onto concrete slabs or applied onto vertical concrete faces primed with Bituthene[®] System 4000 Surface Conditioner. Continuity is achieved by overlapping a minimum 2 in. (50 mm) and firmly rolling the joint.

Bituthene[®] membrane is extremely flexible. It is capable of bridging shrinkage cracks in the concrete and will accommodate minor differential movement throughout the service life of the structure.

Application Procedures

Safety, Storage and Handling Information

Bituthene[®] products must be handled properly. Vapors from solvent-based primers and mastic are harmful and flammable.

For these products, the best available information on safe handling, storage, personal protection, health and environmental considerations has been gathered. Material Safety Data Sheets (MSDS) are available at graceconstruction.com and users should acquaint themselves with this information. Carefully read detailed precaution statements on product labels and the MSDS before use.

Surface Preparation

Surfaces should be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Concrete must be properly dried (minimum 7 days for normal structural concrete and 14 days for lightweight structural concrete).

If time is critical, Bituthene[®] Primer B2 or Bituthene[®] Primer B2 LVC may be used to allow priming and installation of membrane on damp surfaces or green concrete. Priming may begin in this case as soon as the concrete will maintain structural integrity. Use form release agents which will not transfer to the concrete. Remove forms as soon as possible from below horizontal slabs to prevent entrapment of excess moisture. Excess moisture may lead to blistering of the membrane. Cure concrete with clear, resin-based curing compounds which do not contain oil, wax or pigment. Except with Bituthene[®] Primer B2 or Bituthene[®] Primer B2 LVC, allow concrete to thoroughly dry following rain. Do not apply any products to frozen concrete.

Repair defects such as spalled or poorly consolidated areas. Remove sharp protrusions and form match lines. On masonry surfaces, apply a parge coat to rough concrete block and brick walls or trowel cut mortar joints flush to the face of the concrete blocks.

Temperature

- Apply Bituthene[®] System 4000 Membrane and Conditioner only in dry weather and when air and surface temperatures are 25°F (-4°C) or above.
- Apply Bituthene[®] Primer B2 or Bituthene[®] Primer B2 LVC in dry weather above 25°F (-4°C). (See separate product information sheet.)

Conditioning

Bituthene[®] System 4000 Surface Conditioner is ready to use and can be applied by spray or roller. For best results, use a pump-type air sprayer with fan tip nozzle, like the Bituthene[®] System 4000 Surface Conditioner Sprayer, to apply the surface conditioner.

Apply Bituthene[®] System 4000 Surface Conditioner to clean, dry, frost-free surfaces at a coverage rate of 300 ft²/gal (7.4 m²/L). Coverage should be uniform. Surface conditioner should not be applied so heavily that it puddles or runs. **Do not apply conditioner to Bituthene[®] membrane.**

Allow Bituthene[®] System 4000 Surface Conditioner to dry one hour or until substrate returns to its original color. At low temperatures or in high humidity conditions, dry time may be longer.

Bituthene[®] System 4000 Surface Conditioner is clear when dry and may be slightly tacky. In general, conditioning should be limited to what can be covered within 24 hours. In situations where long dry times may prevail, substrates may be conditioned in advance. Substrates should be reconditioned if significant dirt or dust accumulates.

Before surface conditioner dries, tools should be cleaned with water. After surface conditioner dries, tools should be cleaned with mineral spirits. Mineral spirits is a combustible liquid which should be used only in accordance with manufacturer's recommendations. **Do not use solvents to clean hands or skin.**

Corner Details

The treatment of corners varies depending on the location of the corner. For detailed information on Bituthene® Liquid Membrane, see separate product information sheet.

- At wall to footing inside corners—
Option 1: Apply membrane to within 1 in. (25 mm) of base of wall. Treat the inside corner by installing a ¾ in. (20 mm) fillet of Bituthene® Liquid Membrane. Extend Bituthene® Liquid Membrane at least 2½ in. (65 mm) onto footing, and 2½ in. (65 mm) onto wall membrane.
Option 2: Treat the inside corner by installing a ¾ in. (20 mm) fillet of Bituthene® Liquid Membrane. Apply 12 in. (300 mm) wide strip of sheet membrane centered over fillet. Apply wall membrane over inside corner and extend 6 in. (150 mm) onto footing. Apply 1 in. (25 mm) wide troweling of Bituthene® Liquid Membrane over all terminations and seams within 12 in. (300 mm) of corner.
- At footings where the elevation of the floor slab is 6 in. (150 mm) or more above the footing, treat the inside corner either by the above two methods or terminate the membrane at the base of the wall. Seal the termination with Bituthene® Liquid Membrane.

Joints

Properly seal all joints with waterstop, joint filler and sealant as required. Bituthene® membranes are not intended to function as the primary joint seal. Allow sealants to fully cure. Pre-strip all slab and wall cracks over ¼ in. (1.5 mm) wide and all construction and control joints with 9 in. (230 mm) wide sheet membrane strip.

Application on Horizontal Surfaces

(Note: Preprufe® pre-applied membranes are strongly recommended for below slab or for any application where the membrane is applied before concreting. See Preprufe® waterproofing membrane product information sheets.)

Apply membrane from the low point to the high point so that laps shed water. Overlap all seams at least 2 in. (50 mm). Stagger all end laps. Roll the entire membrane firmly and completely as soon as possible. Use a linoleum roller or standard water-filled garden roller less than 30 in. (760 mm) wide, weighing a minimum of 75 lbs (34 kg) when filled. Cover the

face of the roller with a resilient material such as a ½ in. (13 mm) plastic foam or two wraps of indoor-outdoor carpet to allow the membrane to fully contact the primed substrate. Seal all T-joints and membrane terminations with Bituthene® Liquid Membrane at the end of the day.

Protrusions and Drains

Apply membrane to within 1 in. (25 mm) of the base of the protrusion. Apply Bituthene® Liquid Membrane 0.1 in. (2.5 mm) thick around protrusion. Bituthene® Liquid Membrane should extend over the membrane a minimum of 2½ in. (65 mm) and up the penetration to just below the finished height of the wearing course.

Vertical Surfaces

Apply membrane in lengths up to 8 ft (2.5 m). Overlap all seams at least 2 in. (50 mm). On higher walls apply membrane in two or more sections with the upper overlapping the lower by at least 2 in. (50 mm). Roll all membrane with a hand roller.

Terminate the membrane at grade level. Press the membrane firmly to the wall with the butt end of a hardwood tool such as a hammer handle or secure into a reglet. Failure to use heavy pressure at terminations can result in a poor seal. A termination bar may be used to ensure a tight seal. Terminate the membrane at the base of the wall if the bottom of the interior floor slab is at least 6 in. (150 mm) above the footing. Otherwise, use appropriate inside corner detail where the wall and footing meet.

Membrane Repairs

Patch tears and inadequately lapped seams with membrane. Clean membrane with a damp cloth and dry. Slit fishmouths and repair with a patch extending 6 in. (150 mm) in all directions from the slit and seal edges of the patch with Bituthene® Liquid Membrane. Inspect the membrane thoroughly before covering and make any repairs.

Drainage

Hydroduct® drainage composites are recommended for both active drainage and protection of the membrane. See Hydroduct® product information sheets.

Protection of Membrane

Protect Bituthene® membranes to avoid damage from other trades, construction materials or backfill. Place protection immediately in temperatures above 77°F (25°C) to avoid potential for blisters.

- On vertical applications, use Hydroduct® 220 Drainage Composite. Adhere Hydroduct® 220 Drainage Composite to membrane with Preprufe® Detail Tape. Alternative methods of protection are to use 1 in. (25 mm) expanded polystyrene or ¼ in. (6 mm) extruded

polystyrene that has a minimum compressive strength of 8 lbs/in.² (55 kN/m²). Such alternatives do not provide positive drainage to the system. If ¼ in. (6 mm) extruded polystyrene protection board is used, backfill should not contain sharp rock or aggregate over 2 in. (50 mm) in diameter. Adhere polystyrene protection board with Preprufe® Detail Tape.

- In mud slab waterproofing, or other applications where positive drainage is not desired and where reinforced concrete slabs are placed over the membrane, the use of ¼ in. (6 mm) hardboard or 2 layers of ⅛ in. (3 mm) hardboard is recommended.

Insulation

Always apply Bituthene® membrane directly to primed or conditioned structural substrates. Insulation, if used, must be applied over the membrane. Do not apply Bituthene® membranes over lightweight insulating concrete.

Backfill

Place backfill as soon as possible. Use care during backfill operation to avoid damage to the waterproofing

system. Follow generally accepted practices for backfilling and compaction. Backfill should be added and compacted in 6 in. (150 mm) to 12 in. (300 mm) lifts.

For areas which cannot be fully compacted, a termination bar is recommended across the top termination of the membrane.

Placing Steel

When placing steel over properly protected membrane, use concrete bar supports (dobies) or chairs with plastic tips or rolled feet to prevent damage from sharp edges. Use special care when using wire mesh, especially if the mesh is curled.

Approvals

- City of Los Angeles Research Report RR 24386
- Miami-Dade County Code Report NOA 04-0114.03
- U.S. Department of Housing and Urban Development (HUD) HUD Materials Release 628E

Bituthene System 4000 Surface Conditioner Sprayer

The Bituthene® System 4000 Surface Conditioner Sprayer is a professional grade, polyethylene, pump-type, compressed air sprayer with a brass fan tip nozzle. It has a 2 gal (7.6 L) capacity. The nozzle orifice and spray pattern have been specifically engineered for the optimum application of Bituthene® System 4000 Surface Conditioner.

Hold nozzle 18 in. (450 mm) from substrate and squeeze handle to spray. Spray in a sweeping motion until substrate is uniformly covered.

Sprayer should be repressurized by pumping as needed. For best results, sprayer should be maintained at high pressure during spraying.

To release pressure, invert the sprayer and spray until all compressed air is released.



Maintenance

The Bituthene® System 4000 Surface Conditioner Sprayer should perform without trouble for an extended period if maintained properly.

Sprayer should not be used to store Bituthene® System 4000 Surface Conditioner. The sprayer should be flushed with clean water immediately after spraying. For breaks in the spray operation of one hour or less, invert the sprayer and squeeze the spray handle until only air comes from the nozzle. This will avoid clogging.

Should the sprayer need repairs or parts, call the maintenance telephone number on the sprayer tank (800-323-0620).

- Bituthene® 4000 Membranes carry a Underwriters' Laboratory Class A Fire Rating (Building Materials Directory, File #R7910) when used in either of the following constructions:

—Limited to noncombustible decks at inclines not exceeding ¼ in. (6 mm) to the horizontal 1 ft (0.3 m). One layer of Bituthene® waterproofing membrane, followed by one layer of ⅛ in. (3 mm) protection board, encased in 2 in. (50 mm) minimum concrete monolithic pour.

—Limited to noncombustible decks at inclines not exceeding ¼ in. (6 mm) to the horizontal 1 ft (0.3 m). One layer of Bituthene® waterproofing membrane, followed by one layer of DOW Styrofoam PD Insulation Board [2 in. (50 mm) thick]. This is covered with one layer of 2 ft x 2 ft x 2 in. (0.6 m x 0.6 m x 50 mm) of concrete paver topping.

Warranty

Five year material warranties covering Bituthene® and Hydroduct® products are available upon request. Contact your Grace sales representative for details.

Technical Services

Support is provided by full time, technically trained Grace representatives and technical service personnel, backed by a central research and development staff.

Supply

Bituthene® System 4000	3 ft x 66.7 ft roll (200 ft ²) [0.9 m x 20 m (18.6 m ²)]
Roll weight	83 lbs (38 kg) gross
Palletization	25 rolls per pallet
Storage	Store upright in dry conditions below 95°F (+35°C).
System 4000 Surface Conditioner	1 x 0.625 gal (2.3 L) bottle in each roll of System 4000 Membrane
Ancillary Products	
Surface Conditioner Sprayer	2 gal (7.6 L) capacity professional grade sprayer with specially engineered nozzle
Bituthene® Liquid Membrane	1.5 gal (5.7 L) pail/125 pails per pallet or 4 gal (15.1 L) pail/48 pails per pallet
Preprufe® Detail Tape	2 in. x 50 ft (50 mm x 15 m) roll/16 rolls per carton
Bituthene® Mastic	Twelve 30 oz (0.9 L) tubes/carton or 5 gal (18.9 L) pail/36 pails per pallet
Complementary Material	
Hydroduct®	See separate data sheets

Equipment by others: Soft broom, utility knife, brush or roller for priming

Physical Properties for Bituthene® System 4000 Waterproofing Membrane

Property	Typical Value	Test Method
Color	Dark gray-black	
Thickness	1/16 in. (1.5 mm) nominal	ASTM D3767—method A
Flexibility, 180° bend over 1 in. (25 mm) mandrel at -25°F (-32°C)	Unaffected	ASTM D1970
Tensile strength, membrane, die C	325 lbs/in. ² (2240 kPa) minimum	ASTM D412 modified ¹
Tensile strength, film	5,000 lbs/in. ² (34.5 MPa) minimum	ASTM D882 modified ¹
Elongation, ultimate failure of rubberized asphalt	300% minimum	ASTM D412 modified ¹
Crack cycling at -25°F (-32°C), 100 cycles	Unaffected	ASTM C836
Lap adhesion at minimum application temperature	5 lbs/in. (880 N/m)	ASTM D1876 modified ²
Peel strength	9 lbs/in. (1576 N/m)	ASTM D903 modified ³
Puncture resistance, membrane	50 lbs (222 N) minimum	ASTM E154
Resistance to hydrostatic head	231 ft (71 m) of water	ASTM D5385
Permeance	0.05 perms (2.9 ng/m ² sPa) maximum	ASTM E96, section 12—water method
Water absorption	0.1% maximum	ASTM D570

Footnotes:

1. The test is run at a rate of 2 in. (50 mm) per minute.
2. The test is conducted 15 minutes after the lap is formed and run at a rate of 2 in. (50 mm) per minute at 40°F (5°C).
3. The 180° peel strength is run at a rate of 12 in. (300 mm) per minute.

Physical Properties for Bituthene® System 4000 Surface Conditioner

Property	Typical Value
Solvent type	Water
Flash point	>140°F (>60°C)
VOC* content	91 g/L
Application temperature	25°F (-4°C) and above
Freeze thaw stability	5 cycles (minimum)
Freezing point (as packaged)	14°F (-10°C)
Dry time (hours)	1 hour**

* Volatile Organic Compound

** Dry time will vary with weather conditions

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For technical assistance call toll free at 866-333-3SBM (3726)

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Grace Below Grade Waterproofing

PREPRUFE® 300R PLUS & 160R PLUS

Pre-applied waterproofing membranes that bond integrally to poured concrete for use below slabs or behind basement walls on confined sites

Description

Preprufe® 300R Plus & 160R Plus membranes are unique composite sheets comprised of a thick HDPE film, pressure sensitive adhesive and weather resistant protective coating. Designed with Advanced Bond Technology™ and a dual adhesive ZipLap™, Preprufe Plus membranes form a unique, integral bond to poured concrete, preventing both the ingress and lateral migration of water while providing a robust barrier to water, moisture and gas.

Release liner free and designed for efficient, reliable installation, the Preprufe Plus ZipLap allows for an adhesive to adhesive bond at seam overlaps and delivers superior performance in harsh conditions without the need for specialized equipment, heat or power.

The Preprufe R Plus System includes:

- **Preprufe® 300R Plus**—heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
- **Preprufe® 160R Plus**—thinner grade for blindside, zero property line applications against soil retention systems. Vertical use only.
- **Preprufe® Tape LT**—for covering cut edges, roll ends, penetrations and detailing (temperatures between 25°F (-4°C) and 86°F (+30°C)).
- **Preprufe® Tape HC**—for covering cut edges, roll ends, penetrations and detailing (minimum 50°F (10°C)).
- **Preprufe® CJ Tape LT**— for construction joints, and detailing (temperatures between 25°F (-4°C) and 86°F (+30°C)).
- **Preprufe® CJ Tape HC**— for construction joints, and detailing (minimum 50°F (10°C)).
- **Bituthene® Liquid Membrane**—for sealing around penetrations, etc.
- **Adcor™ ES**—waterstop for joints in concrete walls and floors
- **Preprufe® Tieback Covers**—preformed cover for soil retention wall tieback heads
- **Preprufe® Preformed Corners**—preformed inside and outside corners

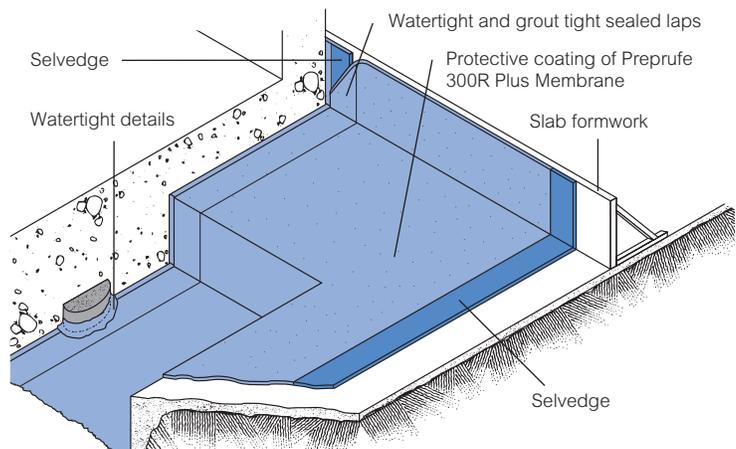
Preprufe® 300R Plus & 160R Plus membranes are applied either horizontally to smooth prepared concrete, carton forms or well rolled and compacted earth or crushed stone substrate; or vertically to permanent formwork or adjoining structures. Concrete is then cast

directly against the adhesive side of the membranes. The specially developed Preprufe adhesive layers work together to form a continuous and integral seal to the structure.

Preprufe can be turned up the inside face of slab formwork but is not recommended for conventional twin-sided formwork on walls, etc. Use Bituthene® self-adhesive membrane or Procor® fluid-applied membrane to walls after removal of formwork for a fully bonded system to all structural surfaces.

Advantages

- **Forms a unique continuous adhesive bond to concrete poured against it**—prevents water migration and makes it unaffected by ground settlement beneath slabs
- **Fully-adhered adhesive to adhesive watertight ZipLaps** and easy to execute detailing
- **Provides a barrier to water, moisture and gas**—physically isolates the structure from the surrounding ground
- **Easy roll/kick out installation**—reduces installation time and cost
- **Release liner free**—expedites installation and reduces construction site waste
- **Solar reflective**—reduced temperature gain
- **Simple and quick to install**—requiring no priming or fillets
- **Can be applied to permanent formwork**—allows maximum use of confined sites
- **Self protecting**—can be trafficked immediately after application and ready for immediate placing of reinforcement



Drawings are for illustration purposes only. Please refer to graceconstruction.com for specific application details.

- **Unaffected by wet conditions**—cannot activate prematurely
- **Inherently waterproof, non-reactive system:**
 - not reliant on confining pressures or hydration
 - unaffected by freeze/thaw, wet/dry cycling
- **Chemical resistant**—effective in most types of soils and waters, protects structure from salt or sulphate attack

Installation

The most current application instructions, detail drawings and technical letters can be viewed at graceconstruction.com. For other technical information contact your local Grace representative.

Preprufe® Plus membranes have colored zip strips at the top and bottom of the seam area on the edge of the roll. Both zip strips cover an aggressive adhesive. Once the yellow zip strip on the top of the membrane and the blue zip strip on the bottom of the membrane are removed, a strong adhesive bond is achieved in the overlap area. This Preprufe® ZipLap™ provides an enhanced sealing of the overlaps in harsh conditions combined with a fast and easy way of execution without specialized equipment, heat or power.

Substrate Preparation

All surfaces—It is essential to create a sound and solid substrate to eliminate movement during the concrete pour. Substrates must be regular and smooth with no gaps or voids greater than 0.5 in. (12 mm). Grout around all penetrations such as utility conduits, etc. for stability (see Figure 1).

Horizontal—The substrate must be free of loose aggregate and sharp protrusions. Avoid curved or rounded substrates. When installing over earth or crushed stone, ensure substrate is well compacted to avoid displacement of substrate due to traffic or concrete pour. The surface does not need to be dry, but standing water must be removed.

Vertical—Use concrete, plywood, insulation or other approved facing to sheet piling to provide support to the membrane. Board systems such as timber lagging must be close butted to provide support and not more than 0.5 in. (12 mm) out of alignment.

Membrane Installation

Preprufe® Plus membranes can be applied at temperatures of 25°F (-4°C) or above. When installing Preprufe Plus product in cold or marginal weather conditions <40°F (<4°C) the use of Preprufe Tape LT is recommended at all laps and detailing. Preprufe Tape LT should be applied to clean, dry surfaces and the release liner must be removed immediately after application. Alternatively, Preprufe Plus Low Temperature (LT) membrane is available for low temperature applications. Refer to Preprufe Plus LT data sheet and Grace Tech Letter 16 for more information.

Horizontal substrates—Kick out or roll out the membrane HDPE film side to the substrate with the yellow zip strip facing towards the concrete pour. End laps should be staggered to avoid a build up of layers. Leave yellow and blue zip strips on the membrane until overlap procedure is completed.

Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvedge with the blue zip strip on top of the yellow zip strip. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back and remove both the yellow and blue zip strips in the overlap area to achieve an adhesive to adhesive bond at the overlap. Ensure a

continuous bond is achieved without creases and roll firmly with a heavy roller.

Refer to Grace Tech Letter 15 for information on suitable rebar chairs for Preprufe products.

Vertical substrates—Mechanically fasten the membrane vertically using fasteners appropriate for the substrate with the yellow zip strip facing towards the concrete pour. The membrane may be installed in any convenient length. Fastening can be made through the selvedge using a small and low profile head fastener so that the membrane lays flat and allows firmly rolled overlaps. Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvedge with the blue zip strip on top of the yellow zip strip.

Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back and remove both the yellow and blue zip strips in the overlap area to achieve an adhesive to adhesive bond at the overlap. Roll firmly to ensure a watertight seal.

Roll ends and cut edges—Overlap all roll ends and cut edges by a minimum 3 in. (75 mm) and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary. Allow to dry and apply Preprufe Tape LT (or HC in hot climates) centered over the lap edges and roll firmly (see Figure 2). Immediately remove tinted plastic release liner from the tape.

Details

Detail drawings are available at graceconstruction.com.

Membrane Repair

Inspect the membrane before installation of reinforcement steel, formwork and final placement of concrete. The membrane can be easily cleaned by power washing if required. Repair damage by wiping the area with a damp cloth to ensure the area is clean and free from dust, and allow to dry. Repair small punctures (0.5 in. (12 mm) or less) and slices by applying Preprufe Tape centered over the damaged area. Repair holes and large punctures by applying a patch of Preprufe® Plus membrane, which extends 6 in. (150 mm) beyond the damaged area. Seal all edges of the patch with Preprufe Tape. Any areas of damaged adhesive should be covered with Preprufe Tape. Where exposed selvedge has lost adhesion or laps have not been sealed, ensure the area is clean and dry and cover with fresh Preprufe Tape. All Preprufe Tape must be rolled firmly and the tinted release liner removed. Alternatively, use a hot air gun or similar to activate the adhesive using caution not to damage the membranes and firmly roll lap to achieve continuity.

Pouring of Concrete

Ensure the plastic release liner is removed from all areas of Preprufe® Tape.

It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane. Following proper ACI guidelines, concrete must be placed carefully and consolidated properly to avoid damage to the membrane. Never use a sharp object to consolidate the concrete. Provide temporary protection from concrete over splash for areas of the Preprufe membrane that are adjacent to a concrete pour.

Figure 1

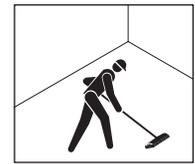
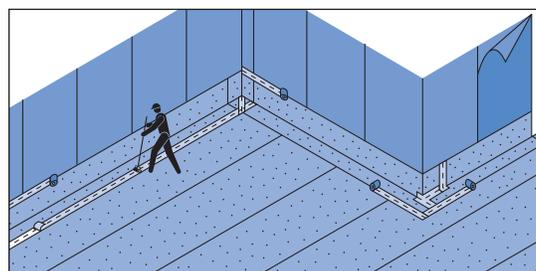
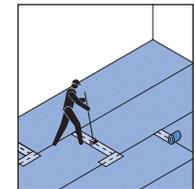


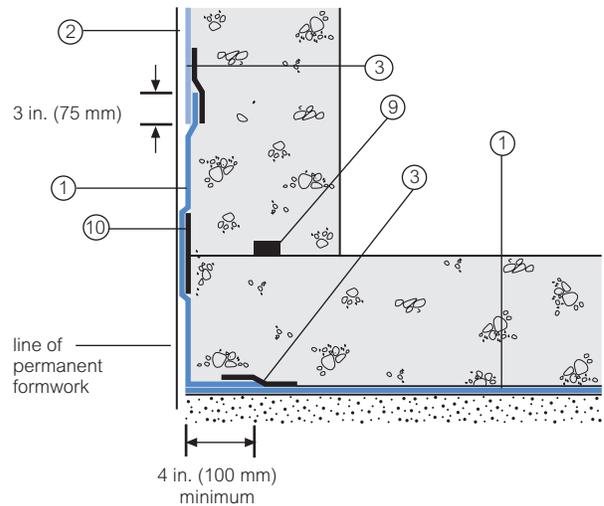
Figure 2



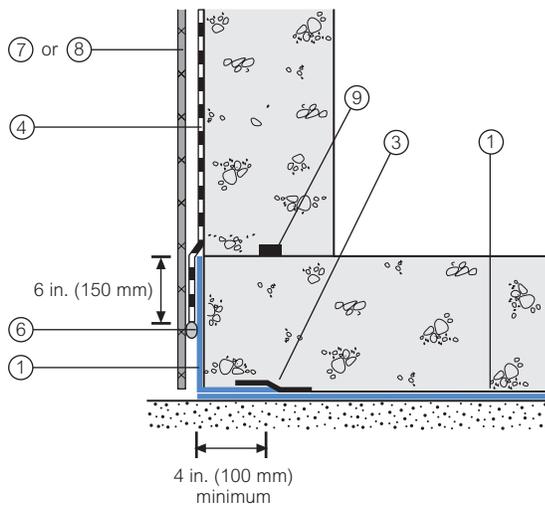
Detail Drawings

Details shown are typical illustrations and not working details. For a list of the most current details, visit us at graceconstruction.com.
For technical assistance with detailing and problem solving please call toll free at 866-333-3SBM (3726).

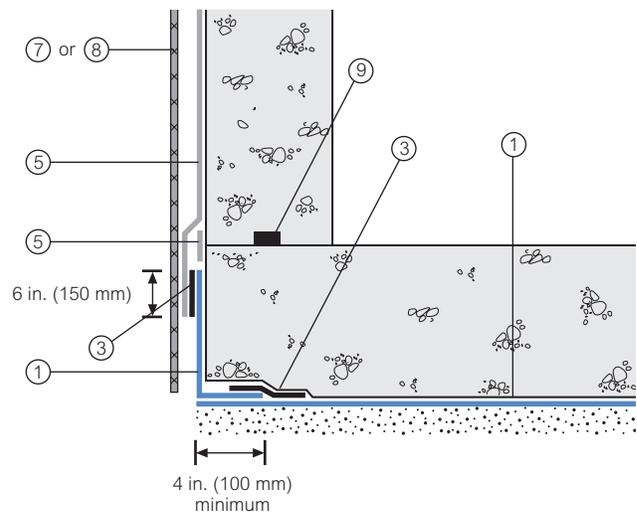
Wall base detail against permanent shutter



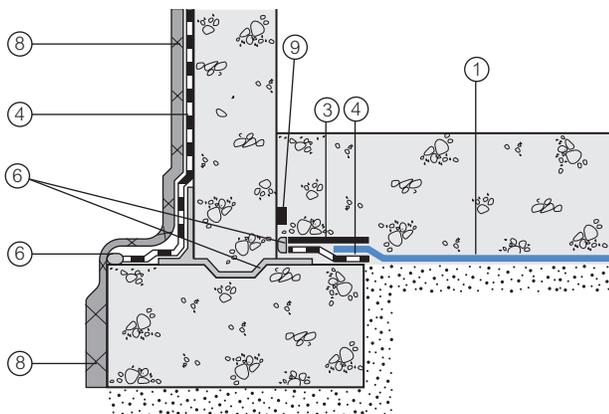
Bituthene® wall base detail (Option 1)



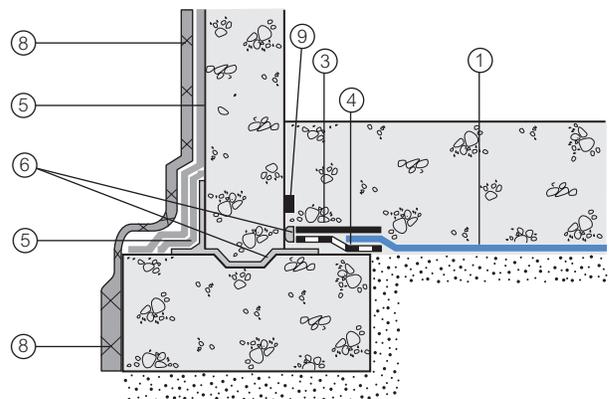
Procor® wall base detail (Option 1)



Bituthene® wall base detail (Option 2)



Procor® wall base detail (Option 2)



- 1 Preprufe® 300R Plus
- 2 Preprufe® 160R Plus
- 3 Preprufe® Tape
- 4 Bituthene®

- 5 Procor®
- 6 Bituthene® Liquid Membrane
- 7 Approved Protection Course

- 8 Hydroduct®
- 9 Adcor™ ES
- 10 Preprufe® CJ Tape

Supply

Dimensions (Nominal)	Preprufe 300R Plus Membrane	Preprufe 160R Plus Membrane	Preprufe Tape (LT or HC*)
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	
Roll size	3 ft. 10 in. x 102 ft. (1.17m x 31.15m)	3 ft. 10 in. x 120 ft. (1.17m x 36.6m)	4 in. x 49 ft (100 mm x 15 m)
Roll area	392 ft ² (36 m ²)	460 ft ² (42 m ²)	
Roll weight	108 lbs (50 kg)	92 lbs (42 kg)	4.3 lbs (2 kg)
Minimum side/end laps	3 in. (75 mm)	3 in. (75 mm)	3 in. (75 mm)

Physical Properties

Property	Typical Value 300R Plus	Typical Value 160R Plus	Test Method
Color	white	white	
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	ASTM D3767
Lateral Water Migration Resistance	Pass at 231 ft (71 m) of hydrostatic head pressure	Pass at 231 ft (71 m) of hydrostatic head pressure	ASTM D5385, modified ¹
Low temperature flexibility	Unaffected at -20°F (-29°C)	Unaffected at -20°F (-29°C)	ASTM D1970
Resistance to hydrostatic head	231 ft (71 m)	231 ft (71 m)	ASTM D5385, modified ²
Elongation	500%	500%	ASTM D412, modified ³
Tensile strength, film	4000 psi (27.6 MPa)	4000 psi (27.6 MPa)	ASTM D412
Crack cycling at -9.4°F (-23°C), 100 cycles	Unaffected, Pass	Unaffected, Pass	ASTM C836 ⁴
Puncture resistance	221 lbs (990 N)	100 lbs (445 N)	ASTM E154
Peel adhesion to concrete	5 lbs/in. (880 N/m)	5 lbs/in. (880 N/m)	ASTM D903, modified ⁵
Lap peel adhesion at 72°F (22°C)	8 lbs/in. (1408 N/m)	8 lbs/in. (1408 N/m)	ASTM D1876, modified ⁶
Lap peel adhesion at 40°F (4°C)	8 lbs/in. (1408 N/m)	8 lbs/in. (1408 N/m)	ASTM D1876, modified ⁶
Permeance to water vapor transmission	0.01 perms (0.6 ng/(Pa x s x m ²))	0.01 perms (0.6 ng/(Pa x s x m ²))	ASTM E96, method B

Footnotes:

- Lateral water migration resistance is tested by casting concrete against membrane with a hole and subjecting the membrane to hydrostatic head pressure with water. The test measures the resistance of lateral water migration between the concrete and the membrane.
- Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 0.125 in. (3 mm) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface up to the head indicated.
- Elongation of membrane is run at a rate of 2 in. (50 mm) per minute.
- Concrete is cast against the Preprufe membrane and allowed to cure (7 days minimum)
- Concrete is cast against the protective coating surface of the membrane and allowed to properly dry (7 days minimum). Peel adhesion of membrane to concrete is measured at a rate of 2 in. (50 mm) per minute at room temperature.
- The test is conducted 15 minutes after the lap is formed (per Grace published recommendations) and run at a rate of 2 in. (50 mm) per minute at 72°F (22°C).

Removal of Formwork

Preprufe® membranes can be applied to removable formwork, such as slab perimeters, elevator and lift pits, etc. Once the concrete is poured the formwork must remain in place until the concrete has gained sufficient compressive strength to develop the surface bond. Preprufe membranes are not recommended for conventional twin-sided wall forming systems, see Grace Tech Letter 13 for information on forming systems used with Preprufe products.

A minimum concrete compressive strength of 3000 psi (20 N/mm²) is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in displacement of the membrane and/or spalling of the concrete.

Refer to Grace Tech Letter 17 for information on removal of formwork for Preprufe products.

Specification Clauses

Preprufe® 300R Plus or 160R Plus membranes shall be applied with its protective coating presented to receive fresh concrete to which it will integrally bond. Only Grace Construction Products approved membranes shall be bonded to Preprufe® products. All Preprufe system materials shall be supplied by Grace Construction Products, and applied strictly in accordance with their instructions. Specimen performance and formatted clauses are also available.

NOTE: Use Preprufe Tape to tie-in Procor® fluid-applied membrane with Preprufe product.

Health and Safety

Refer to relevant Material Safety data sheet. Complete rolls should be lifted and carried by a minimum of two persons.

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For technical assistance call toll free at 866-333-3SBM (3726)

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GRACE

VAPORBLOCK® PLUS™ VBP20

Under-Slab Vapor / Gas Barrier



Product Description

VaporBlock® Plus™ 20 is a seven-layer co-extruded barrier made from state-of-the-art polyethylene and EVOH resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission. VaporBlock® Plus™ 20 is a highly resilient underslab / vertical wall barrier designed to restrict naturally occurring gases such as radon and/or methane from migrating through the ground and concrete slab. VaporBlock® Plus™ 20 is more than 100 times less permeable than typical high-performance polyethylene vapor retarders against Methane, Radon and other harmful VOCs.

VaporBlock® Plus™ 20 is one of the most effective underslab gas barriers in the building industry today far exceeding ASTM E-1745 (Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs) Class A, B and C requirements. Available in a 20 (Class A) mil thicknesses designed to meet the most stringent requirements. VaporBlock® Plus™ 20 is produced within the strict guidelines of our ISO 9001:2008 Certified Management System.

Product Use

VaporBlock® Plus™ 20 resists gas and moisture migration into the building envelop when properly installed to provide protection from toxic/harmful chemicals. It can be installed as part of a passive or active control system extending across the entire building including floors, walls and crawl spaces. When installed as a passive system it is recommended to also include a ventilated system with sump(s) that could be converted to an active control system with properly designed ventilation fans.

VaporBlock® Plus™ 20 works to protect your flooring and other moisture-sensitive furnishings in the building's interior from moisture and water vapor migration, greatly reducing condensation, mold and degradation.

Size & Packaging

VaporBlock® Plus™ 20 is available in 10' x 150' rolls to maximize coverage. All rolls are folded on heavy-duty cores for ease in handling and installation. Other custom sizes with factory welded seams are available based on minimum volume requirements. Installation instructions and ASTM E-1745 classifications accompany each roll.



Under-Slab Vapor/Gas Retarder

Product

Part

VaporBlock Plus 20 VBP20

APPLICATIONS

Radon Barrier	Under-Slab Vapor Retarder
Methane Barrier	Foundation Wall Vapor Retarder
VOC Barrier	

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

VAPORBLOCK® PLUS™ VBP20

Under-Slab Vapor / Gas Barrier

PROPERTIES	TEST METHOD	VAPORBLOCK PLUS 20	
		IMPERIAL	METRIC
APPEARANCE		White/Gold	
THICKNESS, NOMINAL		20 mil	0.51 mm
WEIGHT		102 lbs/MSF	498 g/m ²
CLASSIFICATION	ASTM E 1745	CLASS A, B & C	
TENSILE STRENGTH LBF/IN (N/CM) AVERAGE MD & TD (NEW MATERIAL)	ASTM E 154 Section 9 (D-882)	58 lbf	102 N
IMPACT RESISTANCE	ASTM D 1709	2600 g	
MAXIMUM USE TEMPERATURE		180° F	82° C
MINIMUM USE TEMPERATURE		-70° F	-57° C
PERMEANCE (NEW MATERIAL)	ASTM E 154 Section 7 ASTM E 96 Procedure B	0.0098 Perms grains/(ft ² ·hr·in·Hg)	0.0064 Perms g/(24hr·m ² ·mm Hg)
(AFTER CONDITIONING) PERMS (SAME MEASUREMENT AS ABOVE PERMEANCE)	ASTM E 154 Section 8, E96 Section 11, E96 Section 12, E96 Section 13, E96	0.0079 0.0079 0.0097 0.0113	0.0052 0.0052 0.0064 0.0074
WVTR	ASTM E 96 Procedure B	0.0040 grains/hr-ft ²	0.0028 gm/hr-m ²
RADON DIFFUSION COEFFICIENT	K124/02/95	< 1.1 x 10 ⁻¹³ m ² /s	
METHANE PERMEANCE	ASTM D 1434	< 1.7 x 10 ⁻¹⁰ m ² /d·atm 0.32 GTR (Gas Transmission Rate) ml/m ² ·D·ATM	

VaporBlock® Plus™ Placement

All instructions on architectural or structural drawings should be reviewed and followed.

Detailed installation instructions accompany each roll of VaporBlock® Plus™ and can also be located on our website.

ASTM E-1643 also provides general installation information for vapor retarders.

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

VaporBlock® Plus™ is a seven-layer co-extruded barrier made using high quality virgin-grade polyethylene and EVOH resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission.

Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. Chemical resistance, odor transmission, longevity as well as other performance criteria is not implied or given and actual testing must be performed for applicability in specific applications and/or conditions. RAVEN INDUSTRIES MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage. Limited Warranty available at www.RavenEFD.com



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RAVEN
INDUSTRIES

Engineered Films Division

P.O. Box 5107
Sioux Falls, SD 57117-5107
Ph: (605) 335-0174 • Fx: (605) 331-0333

Toll Free: 800-635-3456
Email: efdsales@ravenind.com
www.ravenefd.com
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LIGHTHOUSE POINT REDEVELOPMENT
Staten Island, New York
Remedial Action Work Plan

APPENDIX F

Construction Health and Safety Plan

November 6, 2015

CONSTRUCTION HEALTH AND SAFETY PLAN

**Lighthouse Point Redevelopment
5 Bay Street
Staten Island, New York**

Prepared for

**5 BAY STREET, LLC
TRIANGLE EQUITIES, INC.
30-56 White Stone Expressway
Whitestone, New York 11354**

Prepared by

**REMEDIAL ENGINEERING, P.C. AND
ROUX ASSOCIATES, INC.
209 Shafter Street
Islandia, New York 11749**

ROUX ASSOCIATES, INC.

Environmental Consulting & Management



209 Shafter Street, Islandia, New York 11749 ♦ 631-232-2600

TABLE OF CONTENTS

1.0 INTRODUCTION3
 1.1 Scope of Work3
 1.2 Emergency and Project Management Contact Information.....3
 1.3 Address of Richmond University Medical Center.....4
 1.4 Emergency Equipment.....5
 1.5 Spills5
2.0 HEALTH AND SAFETY STAFF7
 2.1 General/Site Superintendent (GSS) – TBD7
 2.2 Corporate Safety Supervisor (CSS) – Joseph Gentile.....7
 2.3 Site Health and Safety Officer (SHSO) – TBD7
 2.4 Site Workers.....8
3.0 SITE DESCRIPTION AND BACKGROUND9
 3.1 Summary of Environmental Conditions10
4.0 POTENTIAL HAZARDS RELATED TO FILL/SOIL.....13
 4.1 General.....13
 4.2 Compounds of Concern.....13
 4.3 Hazard Assessment14
 4.4 Exposure Pathways and Assessment14
 4.5 Additional Precautions.....15
 4.6 Hazard Assessment and Mitigation15
5.0 TRAINING16
 5.1 Site-Specific Training16
 5.2 Onsite Safety Meetings16
 5.3 First Aid and CPR.....17
6.0 SITE CONTROL AND PERSONAL PROTECTIVE EQUIPMENT18
 6.1 Site Control18
 6.2 Personal Protective Equipment18
 6.3 Site Control for Unexpected Conditions.....19
 6.3.1 Exclusion Zone19
 6.3.2 Contamination Reduction Zone20
 6.3.3 Remediated Zone20
 6.3.4 Support Zone.....21
7.0 MONITORING PROCEDURES.....22
 7.1 Instrumentation22
 7.2 Action Levels.....23
8.0 VEHICLE/SITE WORKER CLEANING AREAS AND DISPOSAL PROCEDURES24
 8.1 Contamination Prevention24
 8.2 Site Worker Cleaning Procedures.....24
 8.3 Vehicle Cleaning Area/Stabilized Construction Entrances25
 8.4 Disposal Procedures25
9.0 HANDLING OF POTENTIAL HAZARDOUS MATERIALS.....26

10.0 EMERGENCY PLAN	27
10.1 Emergency Response Numbers	27
10.2 Emergency Evacuation	27
10.3 Injury to Site Workers	28
10.4 Site Worker Exposure	28
11.0 FIELD TEAM REVIEW	29
SHSO CERTIFICATION OF HOSPITAL DIRECTIONS	31

TABLES

1. Toxicological, Physical and Chemical Properties of Compounds Potentially Present at the Site

FIGURE

1. Hospital Route Map

1.0 INTRODUCTION

This Site-specific construction Health and Safety Plan (construction HASP) has been prepared to address activities to be performed during the implementation of the Remedial Investigation (RI) at the property identified as the western portion of New York City tax map Block 1, Lot 60 with the street address 5 Bay Street in Staten Island (Richmond County), New York (Site). Relevant portions of Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120 and 1926.62 were used as guidance while preparing this construction HASP.

The designated Site Health and Safety Officer (SHSO) will be responsible for implementing the construction HASP. Compliance with this construction HASP is required of all workers who may potentially encounter soil at the Site (hereinafter referred to as Site Workers), including the Contractor's employees, subcontractors to the Contractor, subcontractors to the Owner's representative, and onsite workers for the Construction Manager. In the event that a Site Worker does not follow these procedures, he or she will be required to leave the Site immediately. The content of this construction HASP may change or undergo revisions based upon changes in the technical scope of work, the results of monitoring, and/or additional information made available to health and safety personnel. Any proposed changes must be reviewed and approved by the Corporate Safety Supervisor, and the SHSO implementing the changes to the construction HASP. As of the date of this construction HASP the Contractor has not been selected; the name and contact information for the Contractor will be provided to New York City Office of Environmental Remediation (NYCOER) once selected.

Upon entering the Site, all visitors will be required to sign in and read and comply with the provisions of this construction HASP. In the event that a visitor does not follow these procedures, he or she will be required to leave the Site immediately.

1.1 Scope of Work

The planned redevelopment of the Site entails the construction of a mixed-use development that includes a hotel, a residential building, a restaurant/catering hall and retail spaces.

1.2 Emergency and Project Management Contact Information

Provided below is a list of telephone numbers for use in the event of an emergency onsite.

Emergency Medical Service911
Police: New York City Police Department (NYPD)911
Hospital: Richmond University Medical Center(718)-818-1234
National Response Center(800) 424-8802
Poison Control Center(800) 222-1222
Chemtrec(800) 262-8200
Fire: New York City Fire Department (FDNY)911
New York City Office of Emergency Management911
Center for Disease Control(800) 311-3435
USEPA (Region II)(212) 637-5000
NYSDEC Emergency Spill Response(800) 457-7362

The following table includes the contact information for Site management and health and safety personnel.

Title	Contact	Company Name	Business Phone	Cellular Phone
General Superintendent	TBD	TBD	TBD	TBD
Site Superintendent	TBD	TBD	TBD	TBD
Assistant Site Superintendent	TBD	TBD	TBD	TBD
Corporate Safety Supervisor	Joseph Gentile	Roux Associate, Inc.	(856)832-3768	(610)423-3220
Site Health and Safety Officer	TBD	TBD	TBD	TBD
Construction Manager	TBD	TBD	TBD	TBD
Owner's Onsite Representative	TBD	TBD	TBD	TBD
Owner's Representative	TBD	TBD	TBD	TBD

1.3 Address of Richmond University Medical Center

355 Bard Ave

Staten Island, New York 10310

(718) 818-1234

Directions from Site to Richmond University Medical Center

- Head northeast on Bay St toward Ferry Terminal Viaduct for 30 ft.
- Bay St turns left and becomes Richmond Terrace
- Go 1.5 miles and turn left onto Clinton Ave
- Go 0.3 miles and turn right onto Henderson Ave
- Go 0.3 miles and turn left onto Brentwood Ave
- Go 0.2 miles and turn left onto Conyningham Ave
- Go 0.2 miles and turn right onto Castleton Ave
- Go 0.2 miles and turn right onto Bard Ave
- Go 262 feet and Richmond University Medical Center will be on your right.

Directions to the hospital are included in Figure 1.

1.4 Emergency Equipment

The following is a list of emergency equipment to be kept onsite at all times:

- First Aid Kit
- ABC Fire Extinguisher
- Absorbent Pads
- Air Horns
- Oil Dry
- Eye Wash

1.5 Spills

Spills associated with site activities may be attributed to project-specific heavy equipment and include gasoline, diesel and hydraulic oil. In the event of a leak or a release, site personnel will inform their supervisor immediately, locate the source of spillage and stop the flow if it can be done safely. A spill containment kit including absorbent pads, booms and/or granulated speedy dry absorbent material will be available to Site personnel to facilitate the immediate recovery of the spilled material. Daily inspections of Site equipment components including hydraulic lines, fuel tanks, etc. will be performed by their respective operators as a preventative measure for equipment

leaks and to ensure that equipment is functioning properly. In the event of a spill, Site personnel will immediately notify the NYSDEC (1-800-457-7362) and a spill number will be generated.

2.0 HEALTH AND SAFETY STAFF

This section briefly describes the health and safety responsibilities for the excavation work to be implemented at the Site. The following staff is responsible for ensuring compliance with the HASP.

2.1 General/Site Superintendent (GSS) – TBD

- Has the overall responsibility for the health and safety of Site Workers.
- Ensures that adequate resources are provided to the field health and safety staff to carry out their responsibilities as outlined below.

2.2 Corporate Safety Supervisor (CSS) – Joseph Gentile

- Implements the HASP.
- Performs or oversees Site-specific training and approves revised or new safety protocols or field operations.
- Coordinates revisions of this HASP with GSS.
- Responsible for the development of new task safety protocols and procedures and resolution of any outstanding safety issues which may arise during the completion of Site work.

2.3 Site Health and Safety Officer (SHSO) – TBD

- Directs and coordinates health and safety monitoring activities.
- Ensures that field teams utilize proper personal protective equipment (PPE).
- Conducts initial onsite specific training prior to Site Workers commencing work.
- Conducts and documents daily and periodic safety briefings.
- Ensures that field team members comply with this HASP.
- Immediately notifies the GSS and CSS of all accident/incidents.
- At the end of each day, communicates the tasks completed to the designated representatives, the next day's planned activities, any third party issues, changes of work plans, and/or changes in level of PPE.
- Determines upgrading or downgrading of PPE based on Site conditions and/or real time monitoring results.

- Ensures that monitoring instruments are calibrated daily or as the manufacturer's instructions determine.
- Reports to the GSS and CSS to provide summaries of field operations and progress.
- Submits and maintains all documentation required in this HASP and any other pertinent health and safety documentation.

2.4 Site Workers

- Reports any unsafe or potentially hazardous conditions to the SHSO.
- Maintains knowledge of the information, instructions, and emergency response actions contained in the HASP.
- Complies with rules, regulations, and procedures as set forth in this HASP, including any revisions that are instituted.
- Prevents admittance to work Site by unauthorized personnel.

3.0 SITE DESCRIPTION AND BACKGROUND

The Site is located at the east side of Bay Street, just south of the Staten Island Ferry Terminal in the Borough of Staten Island and City of Manhattan. The Site is comprised of the western portion of Block 1, lots 58 and 60, is approximately three acres and is improved with four buildings and six underground vaults built into the hillside. The Site buildings (previously designated as building nos. 5 through 8) are currently vacant and have been since 1992, according to the Sanborn fire insurance maps for the area.

The topography of the Site is uneven. The eastern part of the Site is approximately 20 feet above mean sea level and the western part is approximately 50 ft above mean sea level. A retaining wall is present west of the Site building, which is where the entrances to the vaults are located. The vaults extend westward, abutting the Saint George Tunnel, a right-of-way of the Metropolitan Transportation Authority (MTA) Staten Island Railway that runs beneath the Site on a north-south axis.

There are no surface water bodies or regulated wetlands on or adjacent to the Site. The nearest surface water body is the Upper New York Bay, approximately 250 feet east of the Site. The Site is not located in a 100-year or 500-year flood zone. Based on the subsurface investigation conducted in 2007, depth to groundwater ranged from approximately 37 ft bls (on the northwest portion of the Site) to approximately 5 ft bls (along the east side of the Site). According to this data, groundwater is flowing easterly towards the Upper New York Bay. Groundwater flow direction may also be influenced by subsurface structures and impediments such as building foundations, sewer lines, utility vaults, and sump pumping from the nearby subway.

From 1862 to 1939, the Site was the headquarters of the U.S. Lighthouse Service, supplying other District Depots along the East Coast and serving as the central headquarters for technological research. The buildings and the vaults, currently onsite, were constructed during this period (building no. 5 - 1917, building no. 6 - 1864, building no. 7 - 1868 and 1918 additions, building no. 8 - 1868, and the vaults - 1886). Building 5 was used as a laboratory by engineers at the lighthouse depot to test fuels and to experiment with lamp design. Building no. 6 was used as a warehouse and building no. 7 housed the offices of the Superintendent and Engineer of the Lighthouse Depot and their staffs. The addition of the north, south and west wings to building no.

7 were added in 1918. Building no. 8 was constructed as a lamp shop to assemble and repair lighthouse lenses. The vaults were utilized for storage of volatile lighthouse fuels used for experimental purposes as an alternative to whale oil. Building nos. 6, 7, 8 and the vaults are listed on the National Register of Historic Places or as a New York City Historic Landmark (building no. 5 is not listed).

The Coast Guard took over duties of the Lighthouse Service in 1939 and remained onsite until circa 1968. During the Coast Guard's occupancy, building no. 5 was used as a utility building; building no. 6 was used as barracks and galley; building no. 7 was used as an administration building; building no. 8 was used as an industrial supply warehouse; and the vaults were used to store oil and supplies. The Site was subsequently occupied by the New York Harbor Pilot's Association until 1982, when New York City purchased the Site, which has remained vacant to date. It is noted that two residential homes, two and three stories in height, were also present in the upland area north of the existing U.S.P.S. office. The buildings were constructed as early as 1917 and demolished between 1984 and 1991.

As described previously, the planned redevelopment of the Site entails the construction of a mixed-use development that includes a hotel, a residential building, a restaurant/catering hall and retail spaces.

3.1 Summary of Environmental Conditions

A Phase I ESA was performed at the Site in 1999 by Sandstone Environmental Associates, Inc. (Sandstone). Sandstone concluded in their Phase I ESA report dated October 8, 1999 that no recognized environmental conditions (RECs) were identified with respect to the use of the Site at the time. However, several areas of concern were identified. Asbestos and Lead Based Paints (LBP) surveys confirmed asbestos containing material (ACM) and LBP to be present in various buildings. Fluorescent light ballasts, potentially containing PCBs were noted throughout the buildings. Lastly, the Sandstone Phase I ESA report recommends soil sampling if odors, discoloration or suspicious subsurface materials are encountered during soil excavation.

In December 2007, Roux Associates performed a Phase II ESA based on potential environmental concerns (or areas of concern identified in the Sandstone Phase I ESA), which may influence redevelopment construction. The scope of work included an electromagnetic and ground

penetrating radar (GPR) survey; an asbestos and LBP survey; the advancement of eight soil borings – three of which were converted into temporary monitoring wells; and subsequent collection and laboratory analysis of soil and groundwater samples.

The geophysical survey conducted at the Site did not indicate any substantial geophysical anomalies that would suggest the presence of any remnant heating oil storage tanks beneath the Site. The geophysical survey results did not suggest the presence of storage tanks that would impede future excavation/construction activities planned for the Site, or when viewed in conjunction with soil and groundwater sample results represent potential sources of contamination.

The soil analytical results revealed VOCs, SVOCs, Pesticide and PCB concentrations which were either non-detect (ND) or below New York State Department of Environmental Conservation (NYSDEC) Technical and Administrative Guidance Memorandum (TAGM) 4046 guidance levels. Several metals exceeded TAGM 4046 guidance levels. The groundwater analytical results revealed several metals also exceeded NYSDEC Groundwater quality standards. ACM and LBP were found throughout the historical buildings on site.

In December 2012, Roux Associates performed a Phase I ESA at the Site, since the previous Phase I ESA, conducted by Sandstone had expired. Roux Associates did not identify any RECs in connection with the Site. However, a potential environmental concern, regarding the potential for the site to be underlain by historical urban fill material from an unknown origin was noted. It appeared that the Site buildings had not altered or renovated since the ACM and LBP surveys conducted in 2007. Therefore, this Phase I ESA documented ACM and LBP to be environmental issues that warrant attention and that an abatement plan is required prior to renovation of the buildings.

In June, 2015, Roux Associates performed a Phase II ESA at the site, which included the advancement of soil borings, soil sampling, groundwater sampling, and soil vapor sampling. The soil analytical results revealed the presence of the metals and pesticides in soil at levels exceeding NYSDEC Part 375 Unrestricted Use and NYSDEC Part 375 Restricted Residential Standards. Groundwater analytical results included the detection of metals, VOCs, SVOCs, and pesticides at

levels exceeding NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGV).
Soil Vapor analytical results found VOCs present in soil vapor.

4.0 POTENTIAL HAZARDS RELATED TO FILL/SOIL

This section provides a brief summary of the potential Compounds of Concern and related hazards at the Site.

4.1 General

The following information is presented in order to identify the types of materials that may be encountered at the Site. The detailed information on these materials was obtained from:

- SAX's Dangerous Properties of Industrial Materials – Lewis Eight Edition
- Chemical Hazards of the Workplace – Proctor/Hughes
- Condensed Chemical Dictionary – Hawley
- Rapid Guide to Hazardous Chemical in the Workplace – Lewis 1990
- NIOSH Pocket Guide to Chemical Hazards – 2005
- ACGIH TLV Values and Biological Exposure Indices
- OSHA 29 CFR 1910.1000

Several chemicals may potentially be present in soils and groundwater at the Site, based on previous soil and groundwater sampling results and historic operations conducted at the Site that have been identified. The Summary of Toxicological Data is found in Table 1 and is provided for review of chemicals that may be encountered. The Summary of Toxicological Data Sheets provides information such as the chemicals characteristics, health hazards, protection, and exposure limits.

4.2 Compounds of Concern

Based on the sampling results, eleven metals (arsenic, chromium, copper, lead, mercury, nickel, and zinc) were detected at elevated concentrations above regulatory standards, mainly in shallow soils. Several pesticides (4,4'-DDE, 4,4'-DDT, alpha-chlordane, and dieldrin) were detected in shallow soil samples. In groundwater, various metals (arsenic, barium, beryllium, chromium, copper, iron, lead, manganese, nickel, sodium and thallium) were detected in samples, as well as several VOCs including (benzene, chloroform, ethylbenzene, xylene, and toluene). SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and

indeno[1,2,3-cd]pyrene) were also detected in a duplicate groundwater sample. The toxicological, physical, and chemical properties of potential contaminants are presented in Table 1.

4.3 Hazard Assessment

The potential to encounter hazards related to surficial soil and groundwater is dependent upon the type of work activity performed and the duration and location of the work activity. Such hazards could include ingestion, inhalation and/or skin contact with chemicals that could cause: dermatitis, skin burns, or asphyxiation.

Physical hazards that may be encountered during Site work include; heat and cold stress, exposure to excessive noise, loss of limbs, being crushed, head injuries, punctures, cuts, falls, electrocution, bruises, structural integrity of buildings, asbestos and lead paint exposure, and other physical hazards due to motor vehicle operation, heavy equipment and power tools. The potential for Site Workers to be exposed to chemical hazards may occur during excavation, truck, and equipment cleaning activities.

Biological hazards may exist during Site activities. These hazards include exposure to insect bites/stings, animals and animal wastes, mold and bloodborne pathogens.

Prior to the beginning of each new phase of work, an activity hazard analysis will be prepared by the SHSO with assistance from the GSS/CSS. The analysis will address the hazards for each activity performed in the phase and will present the procedures and safeguards necessary to eliminate the hazards or reduce the risk.

4.4 Exposure Pathways and Assessment

Exposure to these compounds during ongoing activities may occur through inhalation of dust particles and by way of dermal absorption and accidental ingestion by either direct or indirect cross-contamination activities.

For groundwater, the most common exposure may occur via accidental ingestion or dermal absorption. Inhalation of dust particles can occur during adverse weather conditions (high or changing wind directions) or during operations that may generate airborne dust such as excavation and loading of Fill or Site grading. Dust control measures such as applying water to roadways and excavations

will be implemented when visible dust is generated, in accordance with this construction HASP. Where dust control measures are not feasible or effective, respiratory protection will be used (see Section 7.0 for monitoring procedures and action levels).

4.5 Additional Precautions

Inhalation and dermal absorption contact with ACM and LBP materials is possible during demolition activities at the Site. In addition, dermal absorption or skin contact with Site soils is possible during intrusive activities. The use of PPE and proper vehicle and Site Worker cleaning procedures should significantly reduce the risk of skin contact. The potential for accidental ingestion of Site soils/groundwater is expected to be remote when good hygiene practices are used.

4.6 Hazard Assessment and Mitigation

Task	Hazards	Risk of Exposure	Action Taken
Mobilization/Demobilization	Inhalation/Skin Contact	Low	Proper PPE will be worn. No eating or drinking will be permitted in active work areas.
Site Building Demolition	Inhalation/Skin Contact	Low	Proper PPE will be worn. No eating or drinking will be permitted in active work areas.
Excavation and Loading of Soil	Inhalation/Skin Contact	Low	Proper PPE will be worn and Site Workers will remain upwind of excavation or loading areas, if possible. No eating or drinking will be permitted in active work areas.
Dewatering	Skin Contact	Low	Proper PPE will be worn. No eating or drinking will be permitted in active work areas.
Vehicle/Equipment Cleaning	Inhalation/Skin Contact	Low	Proper PPE will be worn during vehicle cleaning and worker shall remain upwind, if possible. No eating or drinking will be permitted in active work areas.

5.0 TRAINING

This section details the training requirement for Site Workers.

5.1 Site-Specific Training

Prior to the commencement of field activities, the SHSO, GSS, or CSS will provide Site-specific training to all Site Workers. Site Workers will receive training that will specifically address the activities, procedures, monitoring, and equipment for Site operations. It will include Site layout, hazards, fire prevention and response, first aid equipment locations and emergency services at the Site, and will highlight all provisions contained within this construction HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity. This training may be conducted in conjunction with other Site training or meetings.

5.2 Onsite Safety Meetings

Safety meetings will take place to discuss potential safety concerns for the upcoming activities. At a minimum, the appropriate field supervisors or foremen for all workers will conduct at least one formal daily safety meeting in the morning; however, additional meetings or briefings may be necessary as a result of changing conditions or modifying tasks. Copies of the daily safety meeting sign in sheet and a description of items discussed will be provided to the CSS and will be kept at the Site.

The meetings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety audits by the Contractor or other involved parties. These meetings may be conducted in conjunction with other Site training or meetings.

Visitors onsite must be made aware of the hazards onsite in a Site-specific safety briefing and sign a statement indicating that they will comply with the applicable requirements of this HASP.

5.3 First Aid and CPR

The SHSO will identify those individuals having first aid and CPR training to assist with emergency medical treatment during field activities, if necessary. The training will be consistent with the requirements of the American Red Cross. Certification and appropriate training documentation will be kept with the Site Workers' records by the SHSO.

6.0 SITE CONTROL AND PERSONAL PROTECTIVE EQUIPMENT

This section provides a detailed description of the Site control measures and personal PPE procedures to be implemented at the Site. It is important to note that this construction HASP has been drafted to apply to work in Level D or modified Level D only. If the monitoring results require Level C protection or higher, all Site work will immediately cease until activities can be completed with workers trained in accordance with 29 CFR 1910.120.

6.1 Site Control

Based on the Site history and results of Roux Associates' investigations, metals have been identified in surficial soil onsite. In addition, ACM and LBP have been positively identified in various areas of the Site buildings. As such, the Site, from land surface down to the native soil, will be considered the work area with respect to this construction HASP.

6.2 Personal Protective Equipment

The level of protection worn by Site Workers will be enforced by the SHSO. The level of protection may be upgraded at the discretion of the SHSO. All decisions on the level of protection will be based upon a conservative interpretation by the SHSO of the information provided by air monitoring results and/or other appropriate information. Any changes in the level of protection shall be recorded in the health and safety field logbook. If the level of respiratory protection needs to be upgraded, the Contractor will immediately contact the Construction Manager and Owner's Representative.

The level of PPE for work on the Site is Level D PPE, which includes the following:

- Work uniform (long pants, sleeved shirt)
- Hard hat
- Steel-toed, steel-shanked work boots
- Safety glasses
- Boot covers (as needed)
- Hearing protection (as needed)
- Reflective safety vest

If required by the SHSO, modified Level D PPE may also be used at the Site during specific activities, consisting of the following:

- Regular Tyvek coveralls (Poly-coated Tyvek as required)
- Outer gloves: leather, cotton, neoprene or nitrile (as required)
- Inner gloves: latex or nitrile (doubled) as required
- Chemical resistant boots over work boots (as required)
- Steel-toed, steel-shanked work boots
- Hard hat
- Safety glasses
- Hearing protection, as needed
- Reflective safety vest

6.3 Site Control for Unexpected Conditions

In the event that unexpected conditions or hazardous waste is encountered, thereby requiring workers trained in accordance with 29 CFR 1910.120, the following four-zone approach will be employed in order to prevent the spread of the contamination from the area containing the unexpected condition and to protect Site Workers. The four-zones include the Exclusion Zone, the Contamination Reduction Zone, the Remediated Zone, and the Support Zone. A stepped remedial approach will be managed and the zones modified as the work progresses. Each of the areas will be defined through the use of control barricades and/or construction/hazard fencing. A clearly marked delineation between the zones will be maintained. Signage will be posted to further identify and delineate these areas.

The following subsections describe the four zones that will be utilized in the event that unexpected conditions or contamination is discovered at the Site.

6.3.1 Exclusion Zone

The area where the unexpected condition is discovered would be considered the Exclusion Zone (EZ). All excavation and handling of contaminated materials generated as a result of the discovery of an unexpected condition would take place within the EZ. This zone will be clearly

delineated by hay bales, jersey barriers, and/or similar methods. Safety tape may be used as secondary delineation within the EZ. The zone delineation markings may be opened in areas for varying lengths of time to accommodate equipment operation or specific construction activities. The SHSO may establish more than one EZ where different levels of protection may be employed or where different hazards exist. Site Workers will not be allowed in the EZ without:

- A buddy (co-worker)
- Appropriate PPE
- Medical authorization
- Training certification

6.3.2 Contamination Reduction Zone

A Contamination Reduction Zone (CRZ) will be established between the EZ and the property limits. The CRZ contains the Contamination Reduction Corridor (CRC) and provides an area for decontamination of Site Workers and equipment. The CRZ will be used for general Site entry and egress, in addition to access for heavy equipment and emergency support services. Site Workers will not be allowed in the CRZ without:

- A buddy (co-worker)
- Appropriate PPE
- Medical authorization
- Training certification

6.3.3 Remediated Zone

A Remediated Zone (RZ) will be established in portions of the Site where the remediation has been completed and only general construction work will be performed. Setup of the RZ will consist of implementing several measures designed to reduce the risk of workers' exposure and prevent non-trained workers from entering the non-remediated zone. Non-trained workers will work only in areas where the potential for exposure has been minimized by removal of all hazardous materials. The remediated zone will then be separated from the non-remediated zone by installing and maintaining temporary plywood or other construction fences along the boundary between the two zones. If potentially impacted material is uncovered in the RZ, all non-trained workers will be removed and the SHSO will assess the potential risks. If, at any other time, the

risk of exposure increases while non-trained workers are present in the RZ, the non-trained workers will be removed. At all times, when non-trained workers are present in the RZ, air monitoring for the presence of VOCs will be conducted in the RZ, as well as at the fence line of the non-remediated zone.

6.3.4 Support Zone

The Support Zone (SZ) will be an uncontaminated area that will be the field support area for the Site operations. The SZ will contain the temporary project trailers and provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated Site Workers or materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples. Meteorological conditions will be observed and noted from this zone, as well as those factors pertinent to heat and cold stress.

7.0 MONITORING PROCEDURES

A Community Air Monitoring Plan (CAMP) will be conducted in the active work areas by Roux Associates during all excavation/truck loading activities, or as mandated by the SHSO.

According to the December 2007, Roux Associates Phase II ESA, results indicate that inorganic compounds (metals) are present in soil and groundwater across the Site. Since the site redevelopment includes excavation, soil stockpiling, and backfill activities, particulates will be monitored. Although VOCs were either non-detect (ND) or below NYSDEC TAGM 4046 guidance levels, limited VOC monitoring is included as part of the CAMP.

The monitoring program will monitor for particulates at the upwind and downwind perimeters of the work area during ground intrusive activities. The design of the CAMP is intended to provide a measure of protection for the downwind community and onsite workers not directly involved with the subject work activities from potential airborne contaminant releases as a direct result of remedial work and demolition activities.

Monitoring will be performed to verify the adequacy of the Level D respiratory protection, to aid in Site layout, and to document monitoring results. If air monitoring in these areas indicates the presence of potentially hazardous materials, control measures will be implemented. All monitoring instruments shall be operated by qualified personnel only and will be calibrated prior to use daily or more often, as necessary. No excavation or truck loading activities will be performed without the presence of the SHSO or designated approved substitute at the Site, and without air monitoring. The SHSO is responsible for ensuring that appropriate monitoring, levels of protection, and safety procedures are followed.

7.1 Instrumentation

The following monitoring instruments will be available for use during field operations, as necessary. There will be a minimum of two of each piece of equipment on the Site at all times:

- Photoionization Detector (PID) with 10.6 EV probe, Flame Ionization Detector (FID), or equivalent.
- Dust/Particulate Monitor DustTrak 8530, or equivalent.

A PID and/or FID equipped organic vapor meter shall be used to monitor VOCs in and around active work areas during excavation and truck loading activities. VOCs shall also be measured upwind of the work areas to determine background concentrations.

A particulate monitor shall be used to measure concentrations of dust and particulate matter in and around the active work areas. Particulates shall also be measured upwind of the work areas to determine background concentrations.

All instruments shall be calibrated daily prior to use in accordance with the manufacturer's procedures. Calibration records shall be documented and recorded daily.

The frequency of monitoring should be determined by the SHSO after consultation with the CSS/GSS. The rationale for any modification must be documented and maintained by the SHSO in the onsite health and safety files.

7.2 Action Levels

Action levels for the upgrading of PPE requirements in the construction HASP will apply to all Site work during excavation and truck loading activities at the Site. These action levels are for known contaminants measured using direct reading instruments in the Breathing Zone (BZ) for VOCs and particulates. The BZ will be determined by the SHSO, but is typically 4 to 5 feet above the work area surface or elevation.

An air horn will be readily available in the Site trailer. An additional air horn will be located in the work area to alert Site Workers to an emergency situation. In the event of an emergency or the need to upgrade the level of personal protection, sharp blasts of the air horn will be sounded. If the level of respiratory protection needs to be upgraded, the Contractor will immediately contact the Construction Manager and Owner's Representative.

8.0 VEHICLE/SITE WORKER CLEANING AREAS AND DISPOSAL PROCEDURES

This section details the specific vehicle/Site Worker cleaning and waste disposal procedures to be implemented at the Site during the excavation and truck loading activities.

8.1 Contamination Prevention

Contamination prevention should minimize worker exposure and help to avoid spreading Site derived soil onto the public roadways. Procedures for prevention include:

Site Workers

- Do not walk through areas of soil.
- Do not directly handle or touch soil.
- No eating or drinking in the soil areas.
- Particular care should be taken to protect any skin injuries.
- Stay upwind of dust.
- Do not use cigarettes, cosmetics, gum, etc., in areas of soil.

Heavy Equipment

- Care should be taken to limit the amount of soil that comes in contact with heavy equipment (tires).
- If tools used in soil are to be placed on equipment for transport to an area where all soil has been removed or to be cleaned, plastic should be used to keep the equipment clean.
- Dust control measures, including water misting, will be used on roads inside the Site boundaries.

8.2 Site Worker Cleaning Procedures

All Site Workers shall pass through a cleaning procedure when exiting the active work areas in the Fill; including washing their hands and removing any loose soil from their clothing and boots. This will be accomplished in the designated Site Worker Cleaning Area to be located adjacent to active work areas in the soil. A field wash station for Site Workers, equipment, and PPE shall be set up and maintained by the Contractor. This will include a gross wash and rinse for boots worn in soil areas and, as necessary, equipment and facilities for Site Workers to wash their hands, arms, neck, and face after exiting areas of soil.

8.3 Vehicle Cleaning Area/Stabilized Construction Entrances

One or more temporary vehicle cleaning areas will be constructed to clean disposal trucks and other vehicles and equipment prior to leaving the Site. This area will reduce the amount of soil that disposal trucks and other vehicles spread onto the public roadway. The vehicle cleaning area will be constructed of gravel and will be of sufficient size to prevent vehicles from spreading Fill/Soils onto the public roads and/or previously excavated areas of the Site where all soil has been removed. Before any disposal truck or other vehicle leaves the Site, the sides and wheels will be inspected. If any soils are observed on the wheels or body of the truck, they will be removed and collected for disposal using a shovel, broom, and/or other hand tools in the designated vehicle cleaning area. This will reduce the potential for disposal trucks to spread Site-derived material onto the public streets. This vehicle cleaning area may be upgraded to include wet vehicle cleaning procedures (i.e., power washing or steam cleaning), if deemed necessary by the SHSO, CSS, and/or GSS.

In addition, all equipment used for excavation and other earthwork activities (i.e., excavators, bulldozers, backhoes, etc.) which comes in contact with Fill shall be cleaned at the vehicle cleaning area prior to:

- Crossing into areas of the Site where no soil is present; and
- Leaving the Site.

No equipment will be allowed to leave the Site prior to the SHSO or Site Superintendent's inspection and verification that the equipment was properly cleaned.

8.4 Disposal Procedures

A system of segregating all waste will be developed by the SHSO. All discarded materials, waste materials, or other objects shall be handled in such a way as to preclude the potential for spreading Fill, creating a sanitary hazard, or causing litter to be left onsite. If any potentially contaminated materials (e.g., clothing, gloves, etc.) are generated, they will be bagged or drummed, as necessary, labeled, and segregated for disposal. All non-contaminated materials shall be collected and bagged for appropriate disposal as domestic waste.

9.0 HANDLING OF POTENTIAL HAZARDOUS MATERIALS

Based on the results of previously-conducted soil and groundwater investigations, hazardous materials are not expected to be encountered.

10.0 EMERGENCY PLAN

The emergency plan outlined in this section will be understood by all Site Workers prior to the start of work so that, should an emergency occur, all parties will know how to respond. During an emergency, the SHSO will perform air monitoring as needed and will assist responding emergency personnel with health and safety information related to the Site. Site Workers will endeavor to keep non-essential personnel away from the incident until the appropriate emergency personnel arrive. At that time, the emergency personnel will take control of the Site. Site Workers may be asked to lend assistance to emergency personnel such as during evacuations, help with the injured, etc.

10.1 Emergency Response Numbers

The following sections provide emergency response and project management phone numbers. Emergencies encountered on this Site will be responded to via offsite emergency services personnel and Site Workers. The following master phone list will be prominently posted at the Contractor's construction trailer designated as the Site command post.

Emergency Medical Service	911
<u>Police</u> : New York City Police Department (NYPD)	911
<u>Hospital</u> : Richmond University Medical Center	(718) 818-1234
National Response Center	(800) 424-8802
Poison Control Center	(800) 222-1222
Chemtrec	(800) 262-8200
<u>Fire</u> : New York City Fire Department (FDNY)	911
New York City Office of Emergency Management	911
Center for Disease Control	(800) 311-3435
USEPA (Region II)	(212) 637-5000
NYSDEC Emergency Spill Response	(800) 457-7362

The table in Section 1.2 provides the contact information for Project Management and Health and Safety Personnel.

10.2 Emergency Evacuation

Evacuation procedures will be discussed prior to the start of work and periodically during safety meetings. In the event of an emergency situation, such as fire or an explosion, an air horn or other

appropriate device will be sounded for three (3) sharp blasts, indicating the initiation of evacuation procedures. The emergency evacuation route shall be clearly posted in the appropriate Site trailers. Under no circumstances will incoming Site Workers or visitors be allowed to proceed into the area once the emergency signal has been given. Once the alarm has been sounded, the SHSO or GSS must ensure that access for emergency equipment is provided and that all combustion apparatuses have been shut down. All Site Workers will assemble outside of the active work areas and away from the area of danger and the fire department and other emergency response personnel will be notified by telephone of the emergency.

10.3 Injury to Site Workers

Emergency first aid shall be applied onsite as appropriate. In the event that additional medical attention is necessary, the injured worker should be brought to the emergency room at the hospital. If the Site worker is unable to be brought to the hospital, 911 should be called and an ambulance sent to the Site.

10.4 Site Worker Exposure

The following describes the appropriate mitigation measures to be followed in the event that Site Workers are exposed to contaminants.

<u>Skin Contact:</u>	Use copious amounts of soap and water. Wash/rinse affected area thoroughly, then clean or remove PPE and provide appropriate medical attention, if necessary. Eyes should be rinsed for 15 minutes upon chemical contamination.
<u>Inhalation:</u>	Move to fresh air and/or, if necessary, clean or remove PPE and transport to emergency medical facility.
<u>Ingestion:</u>	Clean or remove PPE and transport to emergency medical facility, if necessary.
<u>Puncture Wound or Laceration:</u>	Clean or remove PPE and transport to emergency medical facility, if necessary.

SHSO CERTIFICATION OF HOSPITAL DIRECTIONS

Name of SHSO: _____

Date: _____

This is to certify that on _____, I personally drove the route to Richmond University Medical Center as listed in the HASP. The Map Routing and Directions were/were not as listed in the plan. Listed below were conditions that resulted in different directions.

Site Health and Safety Officer

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at The Lighthouse Redevelopment Project, 5 Bay Street, Staten Island, NY

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
1,1,1-Trichloroethane	71-55-6	TWA 350 ppm STEL 440 ppm C 440 ppm	C 350 ppm (1900 mg/m ³) [15-minute]	TWA 350 ppm (1900 mg/m ³)	700 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage	Eyes, skin, central nervous system, cardiovascular system, liver	Colorless liquid with a mild, chloroform-like odor. BP: 165°F UEL: 12.5% LEL: 7.5%
1,1,2-Trichloroethane	79-00-5	TWA 10 ppm	Ca TWA 10 ppm (45 mg/m ³) [skin]	TWA 10 ppm (45 mg/m ³) [skin]	Ca [100 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; central nervous system depression; liver, kidney damage; dermatitis; [potential occupational carcinogen]	Eyes, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a sweet, chloroform-like odor. BP: 237°F UEL: 15.5% LEL: 6%
1,1-Dichloroethane	75-34-3	TWA 100 ppm	TWA 100 ppm (400 mg/m ³)	TWA 100 ppm (400 mg/m ³)	3000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation skin; central nervous system depression; liver, kidney, lung damage	Skin, liver, kidneys, lungs, central nervous system	Colorless, oily liquid with a chloroform-like odor. BP: 135°F FLP: 2°F UEL: 11.4% LEL: 5.4%
1,1-Dichloroethene	75-35-4	TWA 5 ppm	Ca (lowest feasible concentration)	TWA 1ppm	Ca [N.D.]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid or gas (above 89°F) with a mild, sweet, chloroform-like odor. BP: 89°F FLP: -2°F UEL: 15.5% LEL: 6.5% Class IA Flammable Liquid
1,2,4-Trimethylbenzene	95-63-6	None established	TWA 25 ppm (125mg/m ³)	None established	N.D.	Inhalation; ingestion; skin and/or eye contact	Eye, skin, nose, and throat, resp syst irritation; bronchitis; hypochromic anemia; headache, drowsiness, weakness, dizziness, nausea, incoordination, vomit, confusion; chemical pneumonitis	Eyes, skin, resp sys, CNS, blood	Clear, colorless liquid with a distinctive, aromatic odor BP: 337°F FLP: 112°F UEL: 6.4% LEL: 0.9% Class II Flammable liquid
1,2,4-Trimethylbenzene	95-63-6	TWA 25 ppm (125 mg/n	TWA 25 ppm (125 mg/m ³)	None established	N.D.	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, fatigue, dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eyes, skin, respiratory system, central nervous system, blood	Clear, colorless liquid with a distinctive, aromatic odor. BP: 337°F FLP: 112°F UEL: 6.4% LEL: 0.9% Class II Flammable Liquid
1,2-Dichlorobenzene	95-50-1	TWA 25 ppm STEL 50 ppm	C 50 ppm (300 mg/m ³)	C 50 ppm (300 mg/m ³)	200 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; liver, kidney damage; skin blisters	Eyes, skin, respiratory system, liver, kidneys	Colorless to pale-yellow liquid with a pleasant, aromatic odor. [herbicide] BP: 357°F FLP: 151°F UEL: 9.2% LEL: 2.2% Class IIIA Combustible Liquid
1,2-Dichloroethane	107-06-2	TWA 10 ppm	Ca TWA 1 ppm (4 mg/m ³) STEL 2 ppm (8 mg/m ³)	TWA 50 ppm C 100 ppm 200 ppm [5-minute maximum peak in any 3 hours]	Ca [50 ppm]	inhalation, ingestion, skin absorption, skin and/or eye contact	Irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]	Eyes, skin, kidneys, liver, central nervous system, cardiovascular system	Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.] BP: 182°F FLP: 56°F UEL: 16% LEL: 6.2% Class IB Flammable Liquid

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at The Lighthouse Redevelopment Project, 5 Bay Street, Staten Island, NY

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
1,2-Dichloroethene (total)	540-59-0	TWA 200 ppm (790 mg/	TWA 200 ppm (790 mg/m ³)	TWA 200 ppm (790 mg/m ³)	1000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; central nervous system depression	Eyes, respiratory system, central nervous system	Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor BP: 118-140°F FL.P: 36-39°F UEL: 12.8% LEL: 5.6% Class IB Flammable Liquid
1,3,5-Trimethylbenzene	108-67-8	None established	TWA 25 ppm (125mg/m ³)	None established	N.D.	Inhalation; ingestion; skin and/or eye contact	Eye, skin, nose, and throat, resp syst irritation; bronchitis; hypochromic anemia; headache, drowsiness, weakness, dizziness, nausea, incoordination, vomit, confusion; chemical pneumonitis	Eyes, skin, resp sys, CNS, blood	Clear, colorless liquid with a distinctive, aromatic odor BP: 329°F FL.P: 122°F Class II Flammable liquid
1,3,5-Trimethylbenzene	108-67-8	TWA 25 ppm (125 mg/n	TWA 25 ppm (125 mg/m ³)	None established	N.D	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eyes, skin, respiratory system, central nervous system, blood	Clear, colorless liquid with a distinctive, aromatic odor. BP: 329°F FL.P: 122°F Class II Flammable Liquid
1,4-Dichlorobenzene	106-46-7	TWA 10 ppm	Ca	TWA 75 ppm (450 mg/m ³)	Ca [150 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Eye irritation, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Liver, respiratory system, eyes, kidneys, skin	Colorless or white crystalline solid with a mothball-like odor. [insecticide] BP: 345°F FL.P: 150°F LEL: 2.5% Combustible Solid
2,4-Dimethylphenol	105-67-9	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system, mouth, throat, stomach; dizziness, weakness, fatigue, nausea, headache; systemic damage; moderate to severe eye injury.	Skin, CVS, eyes, CNS	Clear, colorless liquid with a faint ether or chloroform-like odor BP: 178°F
2-Butanone (MEK)	78-93-3	TWA 200 ppm (590 mg/m ³) STEL 300 ppm (885 mg/m ³)	TWA 200 ppm (590 mg/m ³) STEL 300 ppm (885 mg/m ³)	TWA 200 ppm (590 mg/m ³)	3000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; headache; dizziness; vomiting; dermatitis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor. BP: 175°F FL.P: 16°F UEL(200°F): 11.4% LEL(200°F): 1.4% Class IB Flammable Liquid
Acenaphthene	83-32-9	None established	None established	None established	None established	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	Brown solid
Acetone	67-64-1	TWA 500 ppm STEL 50 ppm	TWA 250 ppm (590 mg/m ³)	TWA 1000 ppm (2400 mg/m ³)	2500 ppm [10%LEL]	inhalation, ingestion, skin and/or eye contact	Irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a fragrant, mint-like odor BP: 133°F FL.P: 0°F UEL: 12.8% LEL: 2.5% Class IB Flammable Liquid

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Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Anthracene	65996-93-2	TWA 0.2 mg/m ³	Ca TWA 0.1 mg/m ³ (cyclohexane-extractable fraction)	TWA 0.2 mg/m ³ (benzene-soluble fraction)	Ca [80 mg/m ³]	inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue. Combustible Solids
Antimony	7440-36-0	TWA 0.5 mg/m ³	TWA 0.5 mg/m ³	TWA 0.5 mg/m ³	50 mg/m ³ (as Sb)	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly	Eyes, skin, respiratory system, cardiovascular system	Silver-white, lustrous, hard, brittle solid; scale-like crystals; or a dark-gray, lustrous powder. BP: 2975°F
Arsenic (inorganic)	7440-38-2 (metal)	TWA 0.01 mg/m ³	Ca C 0.002 mg/m ³ [15-min]	TWA 0.010 mg/m ³	Ca [5 mg/m ³ (as As)]	Inhalation; ingestion; skin absorption; skin and/or eye contact	Ulceration of nasal septum, dermatitis, GI disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]	Liver, kidneys, skin, lungs, lymphatic sys	Metal: silver-gray or tin-white, brittle, odorless solid BP: sublimes
Asbestos	1332-21-4	TWA 0.1 f/cc	Ca 100,000 fibers/m ³	TWA 0.1 fiber/cm ³	Ca [IDLH value has not been determined]	Inhalation; ingestion; skin and/or eye contact	Asbestosis (chronic exposure), dyspnea, interstitial fibrosis, restricted pulmonary function, finger clubbing, irritation eyes, [potential occupational carcinogen]	Respiratory system, eyes,	White or greenish (chrysotile), blue (crocidolite), or gray-green (amosite), fibrous, odorless solids. BP: decomposes
Asphalt fumes	8052-42-4	TWA 0.5 mg/m ³ (fumes)	Ca C 5 mg/m ³ [15 min]	None established	Ca [IDLH value has not been determined]	Skin absorption; inhalation; skin and/or eye contact	Irritation eyes, resp sys	Eyes, respiratory system	Black or dark brown cement-like substance Combustible solid
Barium	7440-39-3	TWA 0.5 mg/m ³	None established	TWA 0.5 mg/m ³	None established	Inhalation, ingestion, skin contact	Irritation skin, respiratory system, digestive system	Skin, eyes, respiratory system	Yellow white powder BP: 1640 C
Benzene	71-43-2	TWA 0.5 ppm STEL 2.5 ppm	Ca TWA 0.1 ppm STEL 1 ppm	TWA 1 ppm STEL 5 ppm	Ca [500 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow	Colorless to light yellow liquid with an aromatic odor [Note: Solid below 42 °F] BP: 176°F FLPt = 12°F LEL: 1.2% UEL: 7.8% Class B Flammable liquid
Benzo[a]anthracene	56-55-3	None established	None established	None established	None established	Inhalation; ingestion; skin absorption; skin and/or eye contact	Irritation eyes, skin, respiratory system, CNS	Skin	Pale Yellow crystal, solid BP: 438 C
Benzo[a]pyrene	50-32-8	None established	TWA 0.1 mg/m ³	TWA 0.2 mg/m ³	None established	Inhalation; ingestion; skin absorption; skin and/or eye contact	POISON. This material is an experimental carcinogen, mutagen, tumorigen, neoplastigen and teratogen. It is a probable carcinogen in humans and a known human mutagen. IARC Group 2A carcinogen. It is believed to cause bladder, skin and lung cancer. Exposure to it may damage the developing foetus. May cause reproductive damage. Skin, respiratory and eye irritant or burns.	Skin, eye, bladder, lung, reproductive	Yellow crystals or powder [found in cigarette smoke, coal tar, fuel exhaust gas and in many other sources] BP: 495 C

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Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Benzo[b]fluoranthene	205-99-2	None established	TWA 0.1 mg/m ³	TWA 0.2 mg/m ³	None established	Inhalation; ingestion; skin and/or eye contact	No data were identified on the toxicity of benzo[b]fluoranthene to humans. Based on results of studies in animals, IARC concluded that benzo[b]fluoranthene is possibly carcinogenic to humans	Respiratory system, skin, bladder, kidneys	Off-white to tan powder
Benzo[k]fluoranthene	207-08-9	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory tract, gastrointestinal; fatal if swallowed, inhaled, absorbed through the skin; vomiting, nausea, diarrhea	Lungs, respiratory system	Yellow crystals BP: 480 C
Beryllium	7440-41-7 (metal)	TWA 0.002 mg/m ³	Ca C 0.0005 mg/m ³	TWA 0.002 mg/m ³ C 0.005 mg/m ³ (30 minutes) with a maximum peak of 0.025 mg/m ³	Ca [4 mg/m ³ (as Be)]	inhalation, skin and/or eye contact	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]	Eyes, skin, respiratory system	Metal: A hard, brittle, gray-white solid. BP: 4532°F
Bis(2-ethylhexyl) phthalate	117-81-7	TWA 5 mg/m ³	TWA 5 mg/m ³ STEL 10 mg/m ³ (do not exceed during any 15-minute work period)	TWA 5 mg/m ³	None established	inhalation, skin and/or eye contact	Irritation eyes, skin, nose, throat; affect the nervous system and liver; damage to male reproductive glands	Eyes, skin, nose, respiratory system, nervous system, reproductive system, liver	Colorless to light colored, thick liquid with slight odor
Butane	106-97-8	TWA 1000 ppm	TWA 800 ppm (1900 mg/m ³)	None established	None established	inhalation, skin and/or eye contact (liquid)	Drowsiness, narcosis, asphyxia; liquid: frostbite	central nervous system	Colorless gas with a gasoline-like or natural gas odor. BP: 31°F UEL: 8.4% LEL: 1.6% Flammable Gas
Cadmium	7440-43-9 (metal)	TWA 0.01 mg/m ³	Ca	TWA 0.005 mg/m ³	Ca [9 mg/m ³ (as Cd)]	inhalation, ingestion	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	respiratory system, kidneys, prostate, blood	Metal: Silver-white, blue-tinged lustrous, odorless solid. BP: 1409°F
Carbon Disulfide	75-15-0	TWA 1 ppm	TWA 1 ppm (3 mg/m ³) STEL 10 ppm (30 mg/m ³) [skin]	TWA 20 ppm C 30 ppm 100 ppm (30-minute maximum peak)	500 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Dizziness, headache, poor sleep, lassitude (weakness, exhaustion), anxiety, anorexia, weight loss; psychosis; polyneuropathy; Parkinson-like syndrome; ocular changes; coronary heart disease; gastritis; kidney, liver injury; eye, skin burns; dermatitis; reproductive effects	central nervous system, peripheral nervous system, cardiovascular system, eyes, kidneys, liver, skin, reproductive system	Colorless to faint-yellow liquid with a sweet ether-like odor. BP: 116°F F.P.: -22°F UEL: 50.0% LEL: 1.3% Class IB Flammable Liquid
Chlorobenzene	108-90-7	TWA 10 ppm	None established	TWA 75 ppm (350 mg/m ³)	1000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; drowsiness, incoordination; central nervous system depression; in animals: liver, lung, kidney injury	Eyes, skin, respiratory system, central nervous system, liver	Colorless liquid with an almond-like odor BP: 270°F F.P.: 82°F UEL: 9.6% LEL: 1.3%

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Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Chloroethane	75-00-3	TWA 100ppm	Handle with caution in the workplace	TWA 1000 ppm (2600 mg/m ³)	3800 ppm [10%LEL]	inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact	Incoordination, inebriation; abdominal cramps; cardiac arrhythmias, cardiac arrest; liver, kidney damage	Liver, kidneys, respiratory system, cardiovascular system, central nervous system	Colorless gas or liquid (below 54°F) with a pungent, ether-like odor. BP: 54°F FLP: NA (Gas) -58°F (Liquid) UEL: 15.4% LEL: 3.8% Flammable Gas
Chloroform	67-66-3	TWA 10 ppm	Ca STEL 2 ppm (9.78 mg/m ³) [60-minute]	C 50 ppm (240 mg/m ³)	Ca [500 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]	Liver, kidneys, heart, eyes, skin, central nervous system	Colorless liquid with a pleasant odor BP: 143°F
Chromium	7440-47-3	TWA 0.5 mg/m ³ (metal and Cr III compounds) TWA 0.05 mg/m ³ (water-soluble Cr IV compounds) TWA 0.01 mg/m ³ (insoluble Cr IV compounds)	TWA 0.5 mg/m ³	TWA 1 mg/m ³	250 mg/m ³ (as Cr)	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; lung fibrosis (histologic)	Eyes, skin, respiratory system	Blue-white to steel-gray, lustrous, brittle, hard, odorless solid. BP: 4788°F
Chrysene; Phenanthrene; Pyrene; Coal tar pitch volatiles	65996-93-2	TWA 0.2 mg/m ³	Ca TWA 0.1 mg/m ³ (cyclohexane-extractable fraction)	TWA 0.2 mg/m ³ (benzene-soluble fraction)	Ca [80 mg/m ³]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue. Combustible Solids
cis-1,2-Dichloroethene	158-59-2	TWA 200 ppm	TWA 200 ppm	TWA 200 ppm	None established	inhalation, skin absorption, ingestion	Harmful if swallowed, inhaled, or absorbed through skin. Irritant. Narcotic. Suspected carcinogen	Skin	Colorless liquid BP: 60 C FLP: 4 C UEL: 12.8% LEL: 9.7 %
Copper	7440-50-8	TWA 0.2mg/m ³ (fume) 1 mg/m ³ (dusts and mists)	TWA 1 mg/m ³	TWA 1 mg/m ³	100 mg/m ³ (as Cu)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; cough, dyspnea (breathing difficulty), wheezing	Eyes, skin, respiratory system, liver, kidneys (increase(d) risk with Wilson's disease)	Noncombustible Solid in bulk form, but powdered form may ignite. BP: 4703°F
Dibenzo[a,h]anthracene	53-70-3	None established	None established	None established	None established	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin	Eyes, skin; skin photosensitization.	Colorless crystalline powder BP: 524°C
Diesel Fuel #2	68476-34-6	None established	None established	Designated as an OSHA Select Carcinogen	None established	ingestion, skin and/or eye contact	Kidney damage; potential lung damage; suspected carcinogen; irritation of eyes, skin, respiratory tract; dizziness, headache, nausea; chemical pneumonitis (from aspiration of liquid); dry, red skin; irritant contact dermatitis; eye redness, pain.	Eyes, skin, kidneys	Clear yellow brown combustible liquid; floats on water; distinct diesel petroleum hydrocarbon odor. BP: 356-716°F FLP: 154.4-165.2°F LEL: 0.6% UEL: 7.0%

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Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Ethylbenzene	100-41-4	TWA 100 ppm STEL 125 ppm	TWA 100 ppm (435 mg/m ³) STEL 125 ppm (545 mg/m ³)	TWA 100 ppm (435 mg/m ³)	800 ppm [10%LEL]	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcois, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with an aromatic odor. BP: 277°F FLP: 55°F UEL: 6.7% LEL: 0.8% Class IB Flammable Liquid
Fluoranthene	206-44-0	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; possible burns; heart and liver injury, pulmonary edema, respiratory arrest, gastrointestinal disturbances.	Heart, liver, lungs.	Yellow needles.
Fluorene	86-73-7	None established	None established	None established	None established	inhalation, ingestion, skin and/or eye contact	Irritation skin, digestive tract	Skin	White crystals BP: 563°F
Fuel Oil #2	68476-30-2	TWA 100mg/m ³ (aerosol and vapor, as total hydrocarbons)	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; CNS effects; nausea, vomiting, headache, cramping, dizziness, weakness, loss of coordination,, drowsiness; kidney, liver damage	Eyes, skin, CNS	Clear or yellow to red oily liquid, kerosene-like odor BP: 347 - 689 °F UEL:5-6% LEL: 0.7-1.0%
Gasoline	8006-61-9	TWA 300 ppm STEL 500 ppm	Carcinogen	None established	Ca [IDLH value has not been determined]	Skin absorption; inhalation; ingestion; skin and/or eye contact	Eyes and skin irritation, mucous membrane; dermatitis; headache; listlessness, blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis; possible liver, kidney damage [Potential occupational carcinogen]	Eyes, skin, respiratory system, CNS, Liver, Kidneys	Clear liquid with a characteristic odor, aromatic FLPt = -45°F LEL = 1.4% UEL = 7.6% Class 1B Flammable Liquid
Hexachlorobutadiene	87-68-3	TWA 0.02 ppm	Ca TWA 0.02 ppm (0.24 mg/m ³) [skin]	None established	Ca [N.D.]	inhalation, skin absorption, ingestion, skin and/or eye contact	In animals: irritation eyes, skin, respiratory system; kidney damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, kidneys	Clear, colorless liquid with a mild, turpentine-like odor. BP: 419°F
Hydrogen Sulfide	7783-06-4	TWA (10 ppm) STEL (15 ppm) (adopted values for which changes are proposed in the NIC)	C 10 ppm (15 mg/m ³) [10-minute]	C 20 ppm 50 ppm [10-minute maximum peak]	100 ppm	inhalation, skin and/or eye contact	Irritation eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light), corneal vesiculation; dizziness, headache, lassitude (weakness, exhaustion), irritability, insomnia; gastrointestinal disturbance; liquid: frostbite	Eyes, respiratory system, central nervous system	Colorless gas with a strong odor of rotten eggs. BP: -77°F UEL: 44.0% LEL: 4.0% Flammable Gas
Indeno[1,2,3-cd]pyrene	193-39-5	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; possible human carcinogen (skin); weakness; affect liver, lung tissue, renal tissue; impairment of blood forming tissue	Skin	Fluorescent green-yellow crystalline solid BP: 536 C
Indeno[1,2,3-cd]pyrene	193-39-5	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; possible human carcinogen (skin); weakness; affect liver, lung tissue, renal tissue; impairment of blood forming tissue	Skin	Yellowish crystal solid BP: 536 C

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at The Lighthouse Redevelopment Project, 5 Bay Street, Staten Island, NY

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Isopropylbenzene	98-82-8	TWA 50 ppm	TWA 50 ppm (245 mg/m ³) [skin]	TWA 50 ppm (245 mg/m ³) [skin]	900 ppm [10%LEL]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a sharp, penetrating, aromatic odor. BP: 306°F FLP: 96°F UEL: 6.5% LEL: 0.9%
Kerosene	8008-20-6	TWA 200 mg/m ³	TWA 100 mg/m ³	None established	IDLH value has not been determined	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eyes, skin, respiratory system, central nervous system	Colorless to yellowish, oily liquid with a strong, characteristic odor. BP: 347-617°F FLP: 100-162°F UEL: 5% LEL: 0.7% Class II Combustible Liquid
Lead	7439-92-1	TWA 0.05 mg/m ³	TWA (8-hour) 0.050 mg/m ³	TWA 0.050 mg/m ³	100 mg/m ³ (as Pb)	inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue	A heavy, ductile, soft, gray solid. BP: 3164°F Noncombustible Solid in bulk form
Manganese	7439-96-5 (metal)	TWA 0.2 mg/m ³	TWA 1 mg/m ³ STEL 3 mg/m ³	C 5 mg/m ³	500 mg/m ³ (as Mn)	inhalation, ingestion	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage	respiratory system, central nervous system, blood, kidneys	A lustrous, brittle, silvery solid. BP: 3564°F
Mercury (organo) alkyl compounds (as Hg)	7439-97-6	TWA 0.01 mg/m ³ STEL 0.03 mg/m ³ [skin]	TWA 0.01 mg/m ³ STEL 0.03 mg/m ³ [skin]	TWA 0.01 mg/m ³ C 0.04 mg/m ³	2 mg/m ³ (as Hg)	inhalation, skin absorption, ingestion, skin and/or eye contact	Paresthesia; ataxia, dysarthria; vision, hearing disturbance; spasticity, jerking limbs; dizziness; salivation; lacrimation (discharge of tears); nausea, vomiting, diarrhea, constipation; skin burns; emotional disturbance; kidney injury; possible teratogenic effects	Eyes, skin, central nervous system, peripheral nervous system, kidneys	Appearance and odor vary depending upon the specific (organo) alkyl mercury compound
Mercury compounds [except (organo) alkyls] (as Hg) Mercury	7439-97-6	TWA 0.025 mg/m ³ (elemental and inorganic forms)	Hg Vapor: TWA 0.05 mg/m ³ [skin] Other: C 0.1 mg/m ³ [skin]	TWA 0.1 mg/m ³	10 mg/m ³ (as Hg)	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	Eyes, skin, respiratory system, central nervous system, kidneys	Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.] BP: 674°F
Methyl tert-butyl ether (MTBE)	1634-04-4	TWA 50 ppm	No established REL	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, mucous membrane, respiratory; dizziness, nausea, headache, intoxication	Eyes, skin, mucous membrane, respiratory system, central nervous system	Colorless liquid BP: 55.2 C

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at The Lighthouse Redevelopment Project, 5 Bay Street, Staten Island, NY

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Methylene Chloride	75-09-2	TWA 50 ppm, A3 - suspected human carcinogen	Ca	TWA 25 ppm STEL 125 ppm	Ca [2300 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numbness, tingle limbs; nausea; [potential occupational carcinogen]	Eyes, skin, cardiovascular system, central nervous system	Colorless liquid with a chloroform-like odor BP: 104°F UEL: 23% LEL: 13%
Naphtha (coal tar)	8030-30-6	None established	TWA 100 ppm (400 mg/m ³)	TWA 100 ppm (400 mg/m ³)	1000 ppm [10%LEL]	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; dizziness, drowsiness; dermatitis; in animals: liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Reddish-brown, mobile liquid with an aromatic odor BP: 320-428°F F.P.: 100-109°F Class II Combustible Liquid
Naphthalene	91-20-3	TWA 10 ppm STEL 15 ppm	TWA 10 ppm (50 mg/m ³) STEL 15 ppm (75 mg/m ³)	TWA 10 ppm (50 mg/m ³)	250 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage	Eyes, skin, blood, liver, kidneys, central nervous system	Colorless to brown solid with an odor of mothballs. BP: 424°F F.P.: 174°F UEL: 5.9% LEL: 0.9%
n-Butylbenzene	104-51-8	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; CNS depression, lung damage; nausea, vomiting, headache, dizziness, weakness, loss of coordination, blurred vision, drowsiness, confusion, disorientation	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a sweet odor BP: 183 C F.P.: 59 C UEL: 5.8% LEL: 0.8%
Nickel	7440-02-0 (Metal)	TWA 1.5 mg/m ³ (elemental) TWA 0.1 mg/m ³ (soluble inorganic compounds) TWA 0.2 mg/m ³ (insoluble inorganic compounds) TWA 0.1 mg/m ³ (Nickel subsulfide)	Ca TWA 0.015 mg/m ³	TWA 1 mg/m ³	Ca [10 mg/m ³ (as Ni)]	inhalation, ingestion, skin and/or eye contact	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Nasal cavities, lungs, skin	Metal: Lustrous, silvery, odorless solid. BP: 5139°F
Nitrobenzene	98-95-3	TWA 1 ppm	TWA 1 ppm (5 mg/m ³) [skin]	TWA 1 ppm (5 mg/m ³) [skin]	200 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; anoxia; dermatitis; anemia; methemoglobinemia; in animals: liver, kidney damage; testicular effects	Eyes, skin, blood, liver, kidneys, cardiovascular system, reproductive system	Yellow, oily liquid with a pungent odor like paste shoe polish. BP: 411°F F.P.: 190°F LEL(200°F): 1.8%
n-Propylbenzene	103-65-1	None established	None established	None established	None established	inhalation, ingestion, skin and/or eye contact	Harmful if swallowed, Irritation eyes, skin, digestive tract, respiratory tract, central nervous system	Eyes, skin, central nervous system, respiratory system	colorless or light yellow liquid BP: 159 C F.P.: 47 C UEL: 6% LEL: 0.8%
Petroleum hydrocarbons(Petroleum distillates)	8002-05-9	None established	TWA 350 mg/m ³ C 1800 mg/m ³ [15 min]	TWA 500 ppm (2000 mg/m ³)	1,100 [10% LEL]	Inhalation; ingestion; skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, drowsiness, headache, nausea; dried/cracked skin; chemical pneumonitis	CNS, eyes, respiratory system, skin	Colorless liquid with a gasoline or kerosene-like odor BP: 86-460°F Fl. Pt = -40 to -86°F UEL: 5.9% LEL: 1.1% Flammable liquid

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at The Lighthouse Redevelopment Project, 5 Bay Street, Staten Island, NY

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Phenol	108-95-2	TWA 5 ppm	TWA 5 ppm (19 mg/m ³) C 15.6 ppm (60 mg/m ³) [15-minute] [skin]	TWA 5 ppm (19 mg/m ³) [skin]	250 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose, throat; anorexia, weight loss; lassitude (weakness, exhaustion), muscle ache, pain; dark urine; cyanosis; liver, kidney damage; skin burns; dermatitis; ochronosis; tremor, convulsions, twitching	Eyes, skin, respiratory system, liver, kidneys	Colorless to light-pink, crystalline solid with a sweet, acrid odor. BP: 359°F UEL: 8.6% LEL: 1.8%
p-Isopropyltoluene	99-87-6	None established	None established	None established	None established	inhalation, skin absorption, eye contact	Irritation skin	CNS, skin	Colorless, clear liquid, sweetish aromatic odor BP: 350.8°F Class III Flammable liquid
sec-Butylbenzene	135-98-8	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, upper airway; central nervous system, headache, dizziness; gastrointestinal disturbance	Respiratory system, central nervous system, eyes, skin;	Colorless liquid BP: 344°F FLP: 126 °F UEL: 6.9% LEL: 0.8% Combustible liquid
Selenium	7782-49-2	TWA 0.2 mg/m ³	TWA 0.2 mg/m ³	TWA 0.2 mg/m ³	1 mg/m ³ (as Se)	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eyes, skin, respiratory system, liver, kidneys, blood, spleen	Amorphous or crystalline, red to gray solid. [Note: Occurs as an impurity in most sulfide ores.] BP: 1265°F
Silver	7440-22-4 (metal)	TWA 0.1 mg/m ³ (metal, dust, fumes) TWA 0.01 mg/m ³ (Soluble compounds, as Ag)		TWA 0.01 mg/m ³	10 mg/m ³ (as Ag)	inhalation, ingestion, skin and/or eye contact	Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance	Nasal septum, skin, eyes	Metal: White, lustrous solid BP: 3632°F
Slop Oil	69029-75-0	None established	None established	None established	None established	Inhalation; ingestion	Irritation eyes, skin, gastrointestinal tract	Eyes, skin, gastrointestinal tract	Clear light to dark amber liquid, with mild hydrocarbon odor. BP: >500°F FLP: 250°F
Sulfuric Acid	7664-93-9	TWA 0.2 mg/m ³	TWA 1 mg/m ³	TWA 1 mg/m ³	15 mg/m ³	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; pulmonary edema, bronchitis; emphysema; conjunctivitis; stomatis; dental erosion; eye, skin burns; dermatitis	Eyes, skin, respiratory system, teeth	Colorless to dark-brown, oily, odorless liquid. BP: 554°F Noncombustible Liquid
tert-Butylbenzene	98-06-6	None established	None established	None established	None established	inhalation, skin absorption, ingestion,	Eye and respiratory irritant; CNS depression; liver or kidney damage	Respiratory system, central nervous system, eyes, liver, kidney	Colorless liquid with an aromatic odor BP: 168 - 169 C FLP: 34 C UEL:5.6 % LEL: 0.8 %
Tetrachloroethene	127-18-4	TWA 25 ppm STEL 100 ppm (STEL) listed as A3, animal carcinogen	Ca Minimize workplace exposure concentrations listed as A3, animal carcinogen	TWA 100 ppm C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm	Ca [150 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Colorless liquid with a mild, chloroform-like odor. BP: 250°F Noncombustible Liquid

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at The Lighthouse Redevelopment Project, 5 Bay Street, Staten Island, NY

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Toluene	108-88-3	TWA 20 ppm	TWA 100 ppm (375 mg/m ³) STEL 150 ppm (560 mg/m ³)	TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)	500 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a sweet, pungent, benzene-like odor. BP: 232°F FLP: 40°F UEL: 7.1% LEL: 1.1% Class IB Flammable Liquid
trans-1,2-Dichloroethene	156-60-5	TWA 200 ppm	None established	TWA 200 ppm STEL 250 ppm (skin)	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Narcotic. Irritation eyes, skin, respiratory tract, mucous membrane; CNS depression.	Respiratory tract, mucous membrane, eyes, skin, CNS	Colorless liquid with a fruity pleasant odor BP: 48°C FLP 6C UEL: 12.8% LEL: 9.7%
Trichloroethene	79-01-6	TWA 10 ppm STEL 25 ppm	Ca	TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)	Ca [1000 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system	Colorless liquid (unless dyed blue) with a chloroform-like odor. BP: 189°F UEL(77°F): 10.5% LEL(77°F): 8%
Vinyl Chloride	75-01-4	TWA 1 ppm	Carcinogen	TWA 1 ppm C 5 ppm [15-minute]	Ca [IDLH value has not been determined]	inhalation, skin, and/or eye contact (liquid)	Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]	Liver, central nervous system, blood, respiratory system, lymphatic system	Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations. BP: 7°F UEL: 33.0% LEL: 3.6% Flammable Gas
Xylene (m, o & p isomers)	108-38-3, 95-47-6, 106-42-3	TWA 100 ppm (435 mg/m ³) STEL 150 ppm	TWA 100 ppm (435 mg/m ³)	TWA 100 ppm (435 mg/m ³)	900 ppm	Skin absorption, inhalation, ingestion, skin, and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	Colorless liquid with an aromatic odor BP: 282°F, 292°F, 281°F Fl. Pt. 82°F, 90°F, 81°F LEL: 1.1%, 0.9%, 1.1% UEL: 7.0%, 6.7%, 7.0% Class C Flammable Liquid
Zinc	7440-66-6	TWA 10 mg/m ³ (Inhalable fraction)	None established	TWA 10 mg/m ³ (for zinc oxide fume)	None established	skin and/or eye contact, inhalation, ingestion	Irritation eyes, skin, respiratory tract; gastrointestinal disturbances	Eyes, skin, respiratory system	Bluish gray solid BP: 1664.6°F Flammable

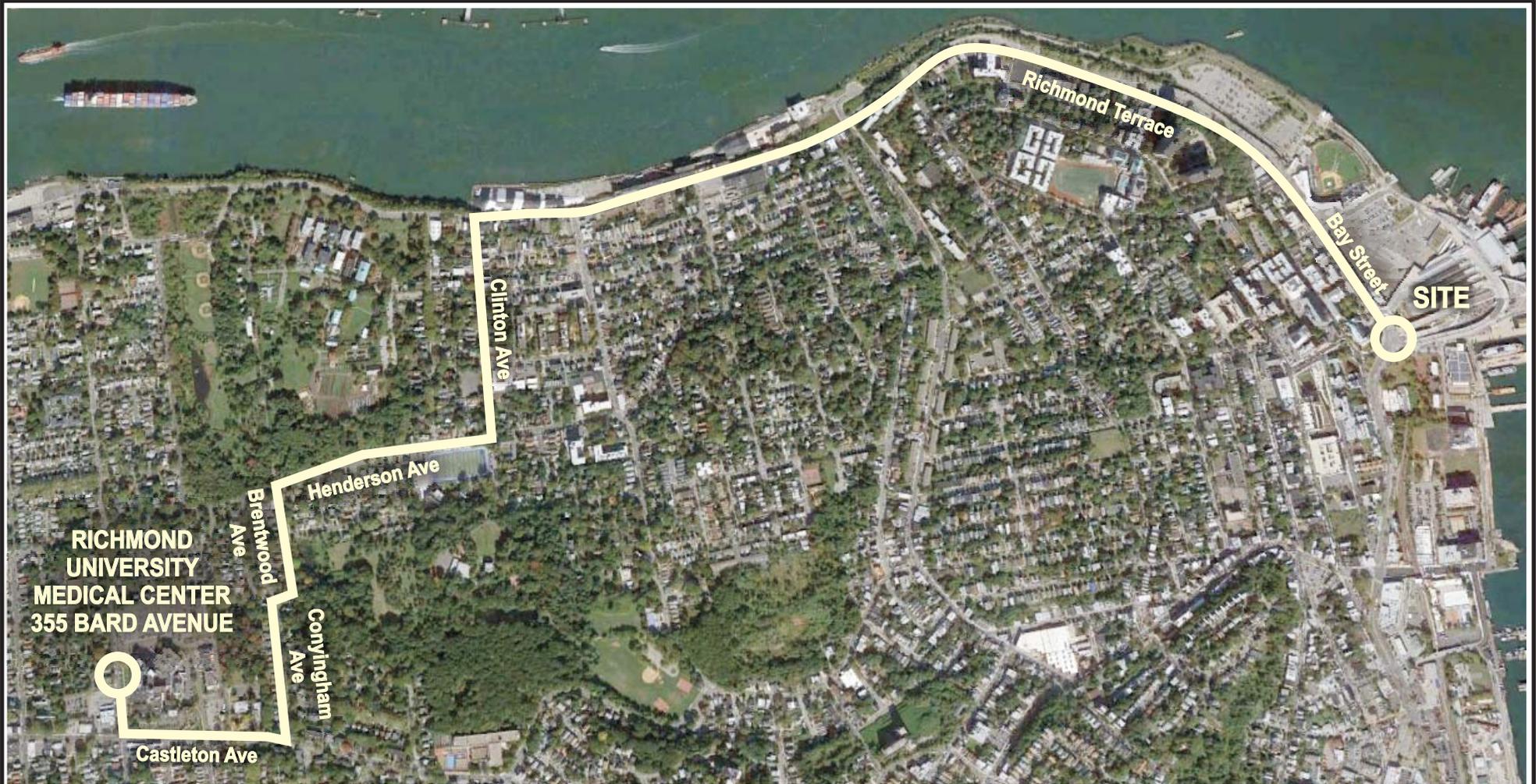
Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at The Lighthouse Redevelopment Project, 5 Bay Street, Staten Island, NY

References

U.S. Department of Labor. 1990. OSHA Regulated Hazardous Substances, industrial Exposure and Control Technologies Government Institutes, Inc.
Hawley's Condensed Chemical Dictionary, Sax, N. Van Nostrand and Reinhold Company, 11th Edition, 1987.
Proctor, N.H., J.P. Hughes and M.L. Fischman, 1989. Chemical Hazards of the Workplace. Van Nostrand Reinhold. New York.
Sax, N.I. and R.J. Lewis. 1989. Dangerous Properties of Industrial Materials. 7th Edition. Van Nostrand Reinhold. New York.
Guide to Occupational Exposure Values. 2008. American Conference of Governmental Industrial Hygienists (ACGIH).
NIOSH Pocket Guide to Chemical Hazards. 2005. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health

Abbreviations:

ACGIH – American Conference of Governmental Industrial Hygienists.
BP – boiling point at 1 atmosphere, °F
C – Ceiling, is a concentration that should not be exceeded during and part of the working exposure.
Ca - considered by NIOSH to be a potential occupational carcinogen
CAS# Chemical Abstracts Service registry number which is unique for each chemical.
Fl. Pt. – Flash point
concentrations represent the maximum concentration
LEL – Lower explosive (flammable) limit in air, % by volume (at room temperature)
mg/m³ – Milligrams of substance per cubic meter of air
NIOSH -National Institute for Occupational Safety and Health.
OSHA – Occupational Safety and Health Administration
PEL - OSHA Permissible Exposure Limit (usually) a time weighted average concentration that must not be exceeded during any 8 hour work shift of a 40 hr work week.
ppm – parts per million
REL – NIOSH Recommended Limit indicated a time weighted average concentration that must not be exceeded during any 10 hour work shift of a 40 hr work week
STEL – Short-term exposure limit
TLV -ACGIH Threshold Limit Values (usually 8 hour time weighted average concentrations).
TWA – 8-hour, time-weighted average
UEL – Upper explosive (flammable) limit in air, % by volume (at room temperature)



DIRECTIONS FROM SITE TO RICHMOND UNIVERSITY MEDICAL CENTER

- HEAD NORTHEAST ON BAY ST. TOWARDS FERRY TERMINAL VIADUCT FOR 30 FEET
- GO 0.2 MI. AND TURN LEFT ONTO CONYINGHAM AVE.
- BAY ST. TURNS LEFT AND BECOMES RICHMOND TERRACE
- GO 0.2 MI. AND TURN RIGHT ONTO CASTLETON AVE.
- GO 1.5 MI. AND TURN LEFT ONTO CLINTON AVE.
- GO 0.2 MI. AND TURN RIGHT ONTO BARD AVE.
- GO 0.3 MI. AND TURN RIGHT ONTO HENDERSON AVE.
- GO 262 FEET AND RICHMOND UNIVERSITY MEDICAL CENTER WILL BE ON RIGHT ADDRESS IS 355 BARD AVENUE.
- GO 0.3 MI. AND TURN LEFT ONTO BRENTWOOD AVE.



Title:

HOSPITAL ROUTE MAP

LIGHTHOUSE POINT
STATEN ISLAND, NEW YORK

Prepared for:

5 BAY STREET, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting
& Management

Compiled by: M.L.	Date: 20AUG15	FIGURE 1
Prepared by: G.M.	Scale: AS SHOWN	
Project Mgr.: J.C.	Project No.: 1637.0001Y003	
File: 1637.0007Y112.02.CDR		