SAW MILL CREEK
PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

MITIGATION BANKING INSTRUMENT

Submitted to:
The Interagency Review Team (IRT)
c/o U.S. Army Corps of Engineers, Chair
New York District
New York, New York

Submitted by:
New York City Economic Development Corporation
Agent to The New York City Department of Small Business Services
New York, New York

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MITIGATION BANKING INSTRUMENT

This Mitigation Banking Instrument (hereinafter, "Instrument"), which describes the establishment, use, operation, and maintenance of the Saw Mill Creek Pilot Wetland Mitigation Bank (hereinafter, the "Project") submitted by the New York City Economic Development Corporation acting on behalf of and as agent to the New York City Department of Small Business Services (hereinafter, "Sponsor"), to the U.S. Army Corps of Engineers - New York District ("Corps"), the U.S. Environmental Protection Agency ("EPA"), the U.S. Fish and Wildlife Service ("FWS"), the National Marine Fisheries Service ("NMFS"), the New York State Department of Environmental Conservation ("NYSDEC"), and the New York Department of State ("NYDOS"), as applicable. These federal and state agencies jointly form the Interagency Review Team ("IRT").

I. PREAMBLE

This Instrument was prepared in accordance with the Corps and EPA regulations set forth in the *Final Rule for Compensatory Mitigation for Losses of Aquatic Resources* (33 CFR Parts 325 and 332 and 40 CFR Part 230; Federal Register, Vol. 73, No. 70, April 10, 2008). The Instrument is submitted to the Corps, the NYSDEC, and the other members of the IRT. Capitalized terms are defined terms set forth in Section II hereof.

A. Purpose

The purpose of this Instrument is to establish guidelines and responsibilities for the establishment, use, operation, and maintenance of the Project. The Project will be used to provide Compensatory Mitigation for unavoidable impacts to waters of the United States, including wetlands, which result from activities authorized under Sections 401 and 404 of the Clean Water Act; Section 10 of the Rivers and Harbors Act; New York State ECL Article 15, Title 5 (Protection of Waters/Stream Disturbance); New York State ECL Article 25 (Tidal Wetlands); NYDOS Coastal Consistency Concurrence; New York State Environmental Quality Review Act ("SEQRA"); New York City Department of City Planning ("NYCDCP") Uniform Land Use Review Procedure ("ULURP"); NYCDCP Local Waterfront Revitalization Plan Compliance; and/or City Environmental Quality Review ("CEQR").

B. Goals and Objectives

A primary goal of the Bank is to create a self-sustaining natural aquatic ecosystem that achieves the intended level of functionality with minimal human intervention, including long-term site maintenance. As part of the Mitigation and Restoration Strategies for Habitat and Ecological Sustainability ("MARSHES") initiative, the New York City Economic Development Corporation ("NYCEDC") is establishing the Project in New York City as a means to facilitate both the long term improvement and protection of critical coastal resources, and providing a predictable, efficient and environmentally responsible process to serve the mitigation needs of permit applicants in the geographical Service Area. This Bank is viewed by the City as a small-scale pilot of the feasibility of operating and establishing mitigation banking in NYC. Specifically, the pilot is intended to provide insights into the feasibility, time, cost, and the effects of what *Compensatory Mitigation for Losses of Aquatic Resources; Final Rule* (40 CFR 230.98) means when employed as a regulatory option in the Nation's most urbanized counties. This pilot is an important opportunity to tailor federal enabling regulation to the local level, thus providing NYC the same benefit as enjoyed by other regions of the US that have the full range of waterfront regulatory tools available to them. NYCEDC is a New York not-for-profit corporation that performs a variety of economic development, urban planning and other services for the City of New York, a New York municipal corporation (the "City") pursuant to an agreement with the City (hereinafter, the "EDC Master Contract"). As a part of these services, NYCEDC is acting as the agent to the New York City Department of Small Business Services, the Sponsor of the Bank described in this Instrument.

As the City Agency tasked to support economic development, the Sponsor and City's objectives are to provide economically efficient, environmentally sustainable, and flexible off site Compensatory Mitigation opportunities for public agencies and private property owners seeking to develop in accordance with all applicable Federal, State and local regulations. The Bank will be established to compensate for wetland and other aquatic ecosystem losses anticipated by such authorized development within the Service Area in a manner that contributes to the long term ecological functioning of the New York Harbor Estuary. The goals of the Project include the restoration and preservation of tidal wetlands and streams to provide a positive contribution to water quality, fish and wildlife habitat, flood attenuation, social significance and erosion control. The Sponsor will improve wetland functions and services (water quality, tidal flood storage, and wildlife habitat), including re-establishment and improving hydrologic flow to the marsh plain, creating a meandering channel/emergent marsh complex, replacing uplands and Invasive Plants with a diversity of native wetland plants with improved wildlife value, and protecting the Bank from future dumping through fencing or a similar barrier. The primary wetland system will be a tidal emergent marsh, mudflat, open water ecosystem comprised of plant communities dominated by *Spartina* spp. These aquatic ecosystems will provide habitat for a wide variety of water-dependent and terrestrial wildlife species. Upland forest buffer will be rehabilitated.

C. Location and Ownership of Bank Lands

The property is located on Staten Island in Richmond County, New York as shown on the U.S. Geologic Survey ("USGS") topographic map of Arthur Kill, NY 7.5-minute quadrangle within a 68.94-acre site that is bisected by Chelsea Road (oriented north to south) into a western section and an eastern section. The 15.00-acre western section is bounded by railroad tracks to the west, open land to the north, Chelsea Road and privately-owned parcels to the east and by open land and Saw Mill Creek to the south. The 53.94-acre eastern section is bounded by Chelsea Road and privately-owned parcels to the west, Edward Curry Avenue and associated right-of-way to the north, tidal marsh followed by Route 440 to the east, and Chelsea Road and an off-ramp from Route 440 to the south. The property is located at Latitude 40.61006 and Longitude -74.18869 within the NYSDEC Atlantic Ocean/Long Island Sound Watershed and the 8-digit Hydrologic Unit Code ("HUC08") Sandy Hook-Staten Island subbasin (02030104). As of the Effective Date, the property is designated on the Tax Map for the Borough of Staten Island with the block and lot numbers set forth in Table 1.

Table 1. Project Area Parcel Summary

Block	Lot	Owner
1780	1	The City of New York
1780	69	The City of New York
1780	210	The City of New York
1780	260	The City of New York
1780	275	The City of New York
1780	300	The City of New York
1790	100	The City of New York
1815	74	The City of New York
1815	251	The City of New York
1815	300	The City of New York
1815	325	The City of New York

The legal description of the property (hereinafter, the "Property") is set forth in Exhibit B.

Title to the property is held by the City of New York and will remain in the City's name after the pilot Bank is established and closed. A legal description of the Property, the deed or deeds and the title search are provided in Exhibit B.

D. Project Description

In accordance with this Instrument, the Sponsor intends to establish and/or maintain aquatic habitats and upland buffers in compliance with the provisions of this Instrument, regulatory permits from the Corps, NYSDEC and NYSDOS, and the Development Plan (Exhibit D), and shall then maintain the Bank in such condition for five (5) years. The Sponsor shall comply with applicable City, Federal and State permit requirements and intends to comply with this Instrument, and the Development Plan, until the Bank is closed in accordance with the Bank Closure Procedures or until all Credits are sold, whichever is later. The Bank area will consist of a mixture of emergent wetlands, open water channels, mudflat habitat, scrub-shrub wetlands, forested wetlands, and uplands. The Baseline Conditions Report, presented in Exhibit C, describes the existing conditions of the degraded site and the Bank Development Plan, presented as Exhibit D, describes and depicts the plan to improve the ecological functions and services of the site.

The Sponsor will provide mitigation credits to authorized activities within the Service Area of the Bank (depicted in Exhibit F). The Sponsor will maintain the Bank in accordance with the

Maintenance and Monitoring Plan (Exhibit G) and Bank Closure Plan (Exhibit H). The pilot Bank will be closed at the end of its operational life, after five full growing seasons, successful completion of all performance standards as documented by approved monitoring reports, or until all Credits have been Debited, whichever is later. After that, the Property will be maintained in accordance with the Long-Term Stewardship Plan (Exhibit I). If ever transferred by the City of New York, the Bank will be protected in perpetuity by restrictive covenants in a legally sufficient instrument (such as a restrictive declaration which contains relevant restrictive covenants executed by the City of New York and recorded against the land) or by other appropriate methods to protect the Bank in perpetuity (Exhibit B).

E. Baseline Conditions

A review of historic aerials and topographic maps indicates that most of the Property was originally tidal marsh, but the topography of the Property has been significantly altered over the past century by filling and ditching. Chelsea Road appears on a 1857 map as running along the eastern side of a strip of land approximately 300 to 400 feet wide, north of Saw Mill Creek. Some mosquito control ditches are evident in eastern and western parcels in a 1924 aerial photo. By the 1943 aerial photo, the marsh had been ditched to its current extent. Mosquito ditches are very straight, narrow channels that were dug to drain the upper reaches of salt marshes, as it was formerly thought that ditching marshes would control mosquito breeding. The ditching often negatively impacted the hydrology and habitat of tidal marshes.

In the Property area east of Chelsea Road, the marsh formerly extended beyond the area now occupied by Edward Curry Avenue. An island surrounded by salt marsh appears on a 1857 map and is visible in a 1924 aerial photo. This area was filled by 1943 and Edward Curry Avenue now crosses this area. Two large berms were constructed in this area south of Edward Curry Avenue between the 1966 and 1970 aerial photos, possibly to begin filling for development. This effort appears to have been abandoned, as only portions of the areas within the berms have been filled. The fill associated with construction of Route 440 is seen in a 1970 aerial photo. A human-made channel has been excavated to connect the wetlands east of Route 440 with wetlands in the eastern parcel. This channel flows through a large box culvert beneath Route 440. Some fill appears immediately south of Saw Mill Creek, along the east side of Chelsea Road in the 1943 and

1954 aerial photos. By a 1966 aerial photo, a much larger area has been filled, and by 1970, the portion of this area within the project boundary has been filled to its current extent.

In the Property area west of Chelsea Road, railroad tracks were built on fill along the western parcel edge by 1957. There are no culverts under the railroad embankment along the project area boundary. The railroad tracks cross a bridge over Saw Mill Creek and over a tidal creek about 1,200 feet north of the northwest corner of the project boundary. The developed lots along the western side of Chelsea Road appear to remain confined to the original upland footprint until the 1960s. Available aerial imagery indicates that these lots were progressively filled westward into the marsh.

Saw Mill Creek, a tidally influenced tributary of Prall's Creek, and several tributaries and drainage channels are located within the Property. The confluence of Saw Mill Creek and Prall's Creek is located approximately 600 feet west of the Property. Prall's Creek is a tributary of the Arthur Kill. The Property is connected to the Staten Island Sound through a series of smaller tidal channels. Part of the Property experiences twice daily tidal inundation.

The wetland restoration portions of the Property are currently dominated by *Phragmites australis* and other non-native invasive or noxious species.

The Baseline Conditions Report, included as Exhibit C, provides additional details on the Baseline Conditions of the Property.

F. Establishment and Use of Credits

In accordance with the provisions of this Instrument and upon satisfaction of the success criteria contained herein, Mitigation Credits (or "Credits" and as defined further herein) determined in accordance with Exhibit E of this Instrument, will be available for use as Compensatory Mitigation in accordance with all applicable requirements for permits issued under Sections 401 and 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, the New York State ECL Article 15, Title 5 (Protection of Waters/Stream Disturbance), New York State

ECL Article 25 (Tidal Wetlands); NYDOS Coastal Consistency Concurrence; New York SEQRA; New York City Department of City Planning ("NYCDCP") ULURP; NYCDCP Local Waterfront Revitalization Plan Compliance; and/or City Environmental Quality Review provided such activities have met all applicable requirements and are authorized by the appropriate authorities. The sale, conveyance, Debiting or transfer of Credits includes all natural services, functions, and values associated with the resource from which Credits were derived. No Credit may be resold or used in any way in relation to another permit requirement, as compensation for another resource, or to satisfy the requirements of any other program.

As tabulated in Table 2, it is anticipated that a total of 18.64 credits will be generated from the Project and made available as mitigation in accordance with applicable requirements. The total area of restored aquatic ecosystems at the pilot Bank is 23.76 acres. As the restored area is greater than the proposed number of credits, the Bank meets the federal and state mitigation bank requirements.

Table 2. Anticipated Credit Generation

Mitigation Type	**Acres**	**Ratio**		**Credits**
Restoration (Re-establishment)	7.04	1.20	: 1	5.87
Restoration (Rehabilitation)[1]	16.72	2.14	: 1	7.81
Wetland Enhancement (Tidal)	33.72	10	: 1	3.37
Wetland Enhancement (Forest)	1.52	15	: 1	0.10
Buffer Rehabilitation	9.94	6.69	: 1	1.49
Total	**68.94**			Total Potential Credits: **18.64**

The credits will be sold to public agencies, private landowners, and other permittees, provided such permittees have met all applicable regulatory requirements, including avoidance and minimization, and Debiting has been authorized by the appropriate agencies. Bank credits will not be released for debiting until specific milestones (described in Section V. E.) associated with

[1] Credits for restoration (re-establishment and rehabilitation) are the two types accepted by the State of New York for offsetting impacts to wetlands and were used as the basis for assessing the Bank's "no net loss" requirements.

the pilot Bank's protection, establishment, and success have been achieved as determined by the Corps and NYSDEC. Use of credits will be established by the Corps and NYSDEC in consultation with the IRT.

G. Review Team

As of the date of this Instrument and subject to execution of this Instrument by a duly authorized representative of each of the participating agencies described below, the IRT consists of the following agencies, though the individual representatives may change:

1. U.S. Army Corps of Engineers, New York District, ("Corps"), Chair;
2. New York State Department of Environmental Conservation ("NYSDEC"), Co-Chair;
3. U.S. Environmental Protection Agency, Region II ("EPA");
4. U.S. Fish and Wildlife Service ("FWS");
5. National Marine Fisheries Service ("NMFS"); and
6. New York State Department of State ("NYSDOS").

H. Statement of Intent

This Instrument does not in any manner affect statutory authorities and responsibilities of the signatory Parties ("Parties") and/or the IRT. Further, all Parties acknowledge that the permitting and resource agencies have statutory responsibilities over trust resources that are independent and separate from the actions identified in this Instrument. The Parties understand that agency signature to this Instrument should not be construed to in any way eliminate the need for consultation between the Corps and resource agencies or to predetermine the nature and extent of recommendations made in any future project consultation. Nor should this Instrument be considered to circumscribe or to limit the extent of any potential consultative recommendation made by a resource agency in the future.

I. Exhibits

The following Exhibits are incorporated by reference into this Instrument:

Exhibit A	Vicinity Map
Exhibit B	Form of Restrictive Declaration and Form of Property Protection
Exhibit C	Baseline Conditions Report
Exhibit D	Bank Development Plan
Exhibit E	UMAM Functional Assessment
Exhibit F	Service Area Map
Exhibit G	Monitoring and Maintenance Plan
Exhibit H	Closure Plan
Exhibit I	Long Term Management Plan
Exhibit J	Form of Credit Ledger

II. DEFINITIONS

Except as otherwise provided, capitalized terms used in this Instrument shall have the meanings provided below.

"Adaptive Management" means the development of a management strategy that anticipates likely challenges associated with compensatory mitigation projects and provides for the implementation of actions to address those challenges, as well as unforeseen changes to those projects. It requires consideration of the risk, uncertainty, and dynamic nature of Compensatory Mitigation projects and guides modification of those projects to optimize performance. It includes the selection of appropriate measures that will ensure that the aquatic resource functions are provided and involves analysis of monitoring results to identify potential problems of a Compensatory Mitigation project and the identification and implementation of measures to rectify those problems.

"Adaptive Management Measures" means any adaptive management, corrective action and/or contingency measures undertaken, at any time, to address an actual or anticipated failure of the success criteria, or any portion thereof, where such adaptive management, corrective action and/or contingency measures involve the performance of any additional Mitigation Work beyond the Initial Mitigation Work or any other physical improvements, construction, landscaping or other work impacting the Property.

"Adaptive Management Plan" a plan developed by the Parties pursuant to which Adaptive Management Measures are to be implemented.

"Applicable Law" means the Banking Rules and all other applicable present and future statutes, laws, ordinances, codes, rules, regulations, orders or the like made by any Governmental Authority, now existing or hereafter created, which are applicable to Sponsor, the Project, the Property, this Instrument or the Credits.

"Aquatic Ecosystem" means Waters of the United States, including wetlands, which serve as habitat for interrelated and interacting communities and populations of plants and animals.

"Authorized Permittee" means any Person who is permitted and/or authorized by the Corps and/or New York State to undertake activities affecting streams, waterways, waterbodies, wetlands, coastal areas, or sources of water withdrawal.

"Bank" means this Project.

"Buffer Rehabilitation" means improvements to vegetated buffer areas including removal of invasive or noxious species, supplemental plantings, erosion control and associated measures such as fencing and posting.

"City" means the City of New York, a New York municipal corporation.

"Compensatory Mitigation" means the restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

"Cowardin Classification" is defined as the FWS wetland classification system, as described in the Classification of wetlands and deepwater habitats of the United States (Cowardin, et al., 1979). The descriptions illustrate the relationship between hydrology and wetland community type. The publication is available at: http://www.fws.gov/wetlands/documents/classification-of-wetlands-and-deepwater-habitats-of-the-united-states.pdf

"Credit" means a unit of measure (e.g., a functional or areal measure or other suitable metric) representing the accrual or attainment of aquatic Functions at the Property, as such unit of measure is delineated and created pursuant to this Instrument where the measure of such aquatic Functions is based on the resources restored, rehabilitated, established, enhanced, or preserved.

"Credit Account" The current accounting of Credits available at any given time for Debiting, as reflected in the Ledger maintained by Sponsor.

"Credit Purchase Closing" means the closing of a Credit Withdrawal transaction with a third-party that is not the City, or a component unit thereof, pursuant to a Credit PSA (if any) in which full and timely payment for Credits is made and a corresponding Debiting of Credits is made, all in accordance with such Credit PSA and this Instrument.

"Credit PSA" means a contract or other Purchase Sale Agreement ("PSA") between the Sponsor or its agent and another Person (other than the City or a component unit thereof) for the purchase and sale of Credits.

"Credit Withdrawal Instrument" means a letter or other written instrument executed by Sponsor and the City, among other things, (a) confirming the date as of which a Credit Purchase Closing or other Debit has occurred and that as of such date the Sponsor's agent NYCEDC has accepted the responsibility for providing required Compensatory Mitigation on behalf of the City pursuant to the NYCEDC Master Contract, and (b) stating the applicable permit number(s) of the City permit(s) pursuant to which such Compensatory Mitigation is required, the number of Credits purchased or Withdrawn by the City and the resource type(s) of such Credits.

"Debit" (as a verb) means the debit of Credits from the Credit Account and transfer thereof to or use thereof by an Authorized Permittee to satisfy the Authorized Permittee's Compensatory Mitigation obligations.

"Degraded Wetland" means a wetland in which there is impaired surface water flow or groundwater hydrology, or excessive drainage; which has been partially filled or excavated, contains contaminated soils and/or Invasive Plants, and which has an ecological value substantially less than that of undisturbed wetlands in the region.

"District Engineer" means, at any given time, the individual serving as the District Engineer for the New York District of the Corps of Engineers or any individual duly acting as or on behalf of such individual.

"Ecological Value" includes, but is not limited to the value of functions performed by uplands, wetlands, and other surface waters to the abundance, diversity, and habitats of fish, wildlife, and listed species. Included are functions such as providing cover and refuge; breeding, nesting, and nursery areas; corridors for wildlife movement; food chain support; natural water storage, natural flow attenuation, and water quality improvement which enhances fish, wildlife, and listed species utilization.

“Enhancement” means the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s), enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s) and does not result in a gain in aquatic resource area..

“First Withdrawal Date” means the date on which all of the following has occurred: (a) the first (1st) Credit Purchase Closing or the initial Debiting of Credits has occurred in accordance with this Instrument and the applicable Credit PSA (if any), and (b) authorized representatives of the District Engineer and NYSDEC have each acknowledged in writing to Sponsor that the District Engineer and NYSDEC have each received a fully executed copy of the Credit Withdrawal Instrument.

“Functional Assessment Methodology” means the methodology attached at Exhibit E used to determine the Ecological Value of the Bank and to calculate the amount of Credits to be awarded hereunder, and for other purposes.

"Functions" means the physical, chemical, and biological processes that occur in ecosystems.

“Governmental Authorities” means the United States of America, the State of New York, the City, and any agency, department, legislative body, commission, board, bureau, instrumentality or political subdivision of any of the foregoing, now existing or hereafter created, having or claiming jurisdiction over the Project, the Property or the Credits; provided, that the term Governmental Authority shall not include Sponsor or the City, to the extent the City is acting in its proprietary capacity in connection with the Project (and not in its official governmental capacity).

"Initial Mitigation Work" means the implementation of the Project Development Plan, including all construction, remediation, restoration, Preservation, Enhancement and other related work contemplated in the Project Permits.

"Instrument" means this Mitigation Banking Instrument, including all exhibits attached to this Instrument.

"Invasive Plants" means any species of plant or other vegetation commonly recognized as being invasive or noxious, including *Phragmites australis* (Common reed grass) and *Persicaria perfoliata* (Mile-a-minute) or as determined from time to time by the Corps and NYSDEC.

"IRT" means the interagency group of federal and state regulatory and resource agency representatives that reviews the documentation for, and advises the District Engineer on, the establishment and management of the Bank.

"Ledger" means the Credit ledger maintained by Sponsor or its designee in the form attached to this Instrument at Exhibit J (Form of Ledger).

"Long-Term Steward" means the City, acting through DPR.

"Long-Term Stewardship Agreement" means the agreement entered into substantially in the form attached to this Instrument at Exhibit I (Form of Long-Term Stewardship Agreement) [among DPR, Sponsor, NYCEDC, and the IRT Chairs] pursuant to which, among other things, DPR assumes the obligations of the Long-Term Steward and responsibility for the Project and the stewardship thereof in accordance with the Long-Term Stewardship Plan as attached to such agreement.

"Long-Term Stewardship Period" means the period of time that commences on the day of the Project Closure Date and continues in perpetuity.

"Long-Term Stewardship Plan" means the plan attached to this Instrument at Exhibit I.

"Mitigation" means compensating for permitted impacts to aquatic resources that could not be avoided or minimized (as determined by the applicable Governmental Authorities).

"Mitigation Bank" means a site, or suite of sites, where resources (e.g., wetlands, streams, riparian areas) are restored, established, enhanced, and/or preserved for the purpose of providing Compensatory Mitigation for impacts authorized by Department of the Army permits. In general, a mitigation bank sells Compensatory Mitigation credits to permittees whose obligation to provide Compensatory Mitigation is then transferred to the mitigation bank sponsor. The operation and use of a mitigation bank are governed by a mitigation banking instrument.

“Mitigation Plan” means the mitigation plan for the Project developed in accordance with 33 CFR 332.8(d)(6)(ii)(A) and 33 CFR 332.4(c)(2) through (14);

"Mitigation Work" means, as the case may be, the Initial Mitigation Work or any additional Mitigation Work that may be required hereunder from time to time following the completion of the Initial Mitigation Work.

"Mitigation Work Commencement Date" means the date on which the Initial Mitigation Work is commenced. As used in this definition, the term “commenced” means the date on which Sponsor and the IRT chairs reasonably determine that meaningful actual site clearance work and/or excavation work on the Property has commenced in accordance with this Instrument.

"Mitigation Work Completion Date" means the date the Sponsor and the IRT Chairs determine that all Initial Mitigation Work is substantially completed.

“M&M Period” means the period of time in which the active monitoring and maintenance of the Project will occur, as such period begins on and includes the Mitigation Work Completion Date and ends on and includes the Project Closure Date.

“M&M Plan” means the necessary work to monitor and maintain the Project to demonstrate compliance with the success criteria and any applicable permits, as such work is more fully described in the plan attached to this Instrument at Exhibit G.

“Monitoring Year” means a period of time that starts on the day after the last day of the previous monitoring year and ends on the first (1st) anniversary of such start date. A monitoring year should include a full growing season and a winter.

“Monitoring Year 1” means the period of time that starts on and includes March 20 in the calendar year after the year that the Mitigation Work Completion Date occurred and ends on the first (1st) anniversary of such start date; provided, that in any case, after the Mitigation Work Completion Date, the Project’s plants and other vegetation shall have overwintered before

Monitoring Year 1 begins.[2] Monitoring Year 1 includes one full growing season after planting is complete, including one winter. Year 1 monitoring will not be complete within the same calendar year as the initial planting.

"NYCEDC" means the New York City Economic Development Corporation, a New York not-for-profit corporation and component unit of the City of New York. For the purpose of this Instrument, NYCEDC is the agent to project Sponsor.

"Ordinary High Water Mark" means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

"Performance Surety" means the financial assurances for the construction of the mitigation project will be a bond or other assurance, such as a certificate or affidavit signed by a duly authorized representative of Sponsor demonstrating the City's budgetary allocations equal the estimated cost of completing the project.

"Performance Standards" means, with respect to any Mitigation Bank in general, observable or measureable physical (including hydrological), chemical, and/or biological attributes that are used to determine if a Compensatory Mitigation Project meets its objectives

"Person" means any individual, sole proprietorship, partnership, limited liability company, joint venture, trust, unincorporated organization, joint stock company, association, corporation, institution, entity, party or government (including any division, agency or department thereof) or any other legal entity, whether acting in an individual, fiduciary or other capacity, and, as applicable, the successors, heirs and assigns of each.

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[2] EXAMPLE: by way of example only - if the Mitigation Work Completion Date occurred in the spring or summer of 2016, then Monitoring Year 1 would start on March 20, 2017 and end on March 20, 2018.

“Preservation” means the removal of a threat to, or preventing the decline of, aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

“Primary Service Area” means waters (including wetlands) of the United States or New York State located within certain areas of the area known as the “Lower Hudson River Basin” (also known as Hydrologic Unit Code 06 HUC06 020301), that are within City municipal limits, including portions of the HUC08 subbasins known as “Lower Hudson River” and “Sandy Hook-Staten Island”, excluding the HUC12 subwatershed region known as “Raritan Bay-Lower Bay Deep” and including the Boroughs of Staten Island and Manhattan and portions of the Boroughs of the Bronx, Brooklyn and Queens, all as such the Primary Service Area is more fully depicted on the map provided in Exhibit F.

“Project Closure Date” means the date on which the Project shall be deemed to have closed in accordance with 33 CFR 332 shall be the date of the project closure certificate.

“Property” means the 68.94-acre area of land located on Staten Island in Richmond County, New York where the Mitigation Bank is to be constructed.

“Property Rights Agreement” means a memorandum of understanding, letter agreement, contract or other instrument between DPR, Sponsor, and NYCEDC, pursuant to which, as contemplated in 33 CFR 332, Sponsor has secured the right (for itself and its officers, employees, agents, contractors and other representatives) to access and use the Property during the Term for purposes of undertaking the Project.

"Rehabilitation" means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource, where such manipulation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

“Release” means a determination by the Corps and NYSDEC in consultation with the IRT, and evidenced by the applicable Release Approval Letter, that Credits associated with the

Mitigation Plan set forth in this Instrument are available and can be released into the Credit Account in accordance with this Instrument.

"Report" means any Annual Monitoring Report or other report to be delivered hereunder by Sponsor or by the Long-Term Steward, as the case may be.

"SBS" means the New York City Department of Small Business Services, a City Agency of the City of New York.

"Secondary Service Area" means is comprised of waters (including wetlands) of the United States or New York State located within certain areas of the area known as the "Long Island Basin" (also known as HUC06 020302), that are within the City municipal limits, including parts of the HUC08 subbasins known as "Bronx River", "Long Island Sound", "Northern Long Island" and "Southern Long Island" and includes the HUC12 subwatershed region known as "Raritan Bay-Lower Bay Deep" and includes portions of the Boroughs of the Bronx, Brooklyn and Queens, all as such Secondary Service Area is more fully depicted on the map provided in Exhibit F.

"Service Area" means the geographic area within which impacts of activities of Authorized Permittees may be mitigated under Applicable Law through the use of Credits from the Project.

"Services" means the benefits that human populations receive from functions that occur in ecosystems.

"Sponsor" means the New York City Department of Small Business Services, acting as the entity responsible for establishing and operating the Bank in accordance with this Instrument. All duties, obligations and responsibilities associated with the Bank are conveyed to NYCEDC the Sponsor's agent.

"Total Potential Credits" means the total number of Credits that may be Released in connection with the Project pursuant to this Instrument.

III. AUTHORITIES

The establishment, use, operation and maintenance of the Project shall be carried out in accordance with the following authorities:

A. Federal

1. Clean Water Act (33 USC 1251 et seq.)
2. Rivers and Harbors Act of 1899 (33 USC 403)
3. Fish and Wildlife Coordination Act (16 USC 661 et seq.)
4. Regulatory Programs of the Corps of Engineers, Final Rule (33 CFR Parts 320-332)
5. 33 CFR 332
6. Guidelines for Specification of Disposal Sites for Dredged and Fill Material (40 CFR Part 230)
7. Memorandum of Agreement between the Environmental Protection Agency and the Department of the Army concerning the Determination of Mitigation Under the Clean Water Act, Section 404 (b)(1) Guidelines (February 6, 1990)
8. FAA Advisory Circular 150/5200-33

B. State and Regional

1. New York State, Freshwater Wetlands Permits, Article 24, Environmental Conservation Law, 6NYCRR PART 663, Part 664, and Part 665
2. New York State, Tidal Wetlands Permit Program, Article 25, Environmental Conservation Law, 6 NYCRR PART 661
3. New York State Protection of Waters Program, Article 15, Environmental Conservation Law, 6NYCRR PART 608
4. NEW YORK LAW: EXECUTIVE
5. New York Law: Article 42: (910–923) Waterfront Revitalization of Coastal Areas and Inland Waterways. New York State Coastal Management Program
6. Environmental Conservation Law Sections 3-0301(1)(B), 3-0301(2)(M) and 8-0113; Section 617: New York State Environmental Quality Review Act (SEQRA)

7. New York City Department of City Planning (NYCDCP) Uniform Land Use Review Procedure (ULURP); adopted by the City Planning Commission on June 27, 1990, as amended
8. NYCDCP Local Waterfront Revitalization Plan Compliance; Council of the City of New York, September 2002, DCP# 02-14
9. City Environmental Quality Review (CEQR), Mayor of New York City, Executive Order 149 of 2011

IV. ESTABLISHMENT OF THE BANK

A. Term

This Instrument shall become effective as of the Effective Date and as of such date the Parties shall become subject to all provisions applicable to them. The term of this Instrument shall start on and include the Effective Date (unless terminated earlier in accordance with Section VI.F.), provided, that aside from any other provision set forth to the contrary, if by the fifth (5th) anniversary of the Effective Date, neither the First Withdrawal Date nor the Mitigation Work Commencement Date have occurred, then as of such anniversary this Instrument shall automatically terminate and be of no further force or effect; and provided further, that following the Effective Date, so long as the waters of the United States are not affected Sponsor shall have the right to terminate this Instrument at any time before the occurrence of the First Withdrawal Date by giving the IRT Parties no less than thirty (30) days' advance notice of Sponsor's election to exercise such right.

B. Effective Date

The rights and obligations of the Parties under this Instrument shall be conditional on the fulfillment of each of the following conditions:

(i) the Commissioner of Sponsor and/or Sponsor's agent's board of directors or executive committee has approved Sponsor's execution of this Instrument and the performance by Sponsor and Sponsor's agent of its obligations hereunder;

(ii) this Instrument (including the Mitigation Plan) has been approved, executed and delivered by the Sponsor and or Sponsor's agent and each of the IRT Chairs;

(iii) the Property Rights Agreement has been executed and delivered by each party thereto and has become effective;

(iv) an agreement among City Agencies between the Sponsor (SBS), the Spongsor's agent (NYCEDC), and the Long-Term Steward (DPR), pursuant to which the Long-Term Steward agrees to execute and deliver the Long-Term Stewardship Agreement in connection with the closure of the Bank, has been executed and delivered by each party thereto and shall have become effective;

(v) all construction or other contracts to be entered into by Sponsor or its agent with third-parties for the performance of the Initial Mitigation Work have been fully executed and delivered and have become, and remain, effective;

(vi) Sponsor shall promptly notify the members of the IRT of the date on which all of the conditions listed in this section have been fully satisfied or waived by the Parties (such date, the "Effective Date") by delivering a notice to the IRT members.

(vii) As of the Effective Date, this Instrument shall become an effective statement of the intention of the Parties whether or not any other Parties have executed and/or delivered counterparts to this Instrument as of such date.

C. Scope of Work

The execution of this Instrument does not impose on the Sponsor any obligation to undertake the Project and no provision hereof shall be deemed or construed to impose such an obligation. If Sponsor or the City undertakes a wetland mitigation bank on the Property, then such wetland mitigation bank shall be undertaken in accordance with this Instrument and Applicable Law.

Should the Sponsor undertake the Project, the Sponsor shall be responsible for the implementation and performance of the Project from the Effective Date until the Project Closure Date (including any Mitigation Work which may be required during the Term). Upon Project

Closure, the Long-Term Steward shall be responsible for the long-term management of the Project in perpetuity as more fully provided in below in Section H.

D. Commencement of Mitigation Work

Sponsor shall cause the Project to be established in a manner consistent with the Mitigation Plan and shall initiate the Mitigation Work no later than the first full growing season after the date of the first credit transaction.[3] As a condition-precedent to the commencement of the Initial Mitigation Work, Sponsor shall make the Performance Surety related to construction available in accordance with Section IV.G.

E. Project Permits

In a timely manner the Sponsor or its agent will obtain all appropriate licenses, permits and other approvals from Governmental Authorities necessary to undertake the Project as contemplated in this Instrument (collectively, the "Project Permits").

F. Consultations by IRT Parties

The Parties acknowledge that one or more of the IRT Parties may have consultation responsibilities under Federal statutes, including the Magnuson Stevens Act, the Fish and Wildlife Coordination Act and the Endangered Species Act, and that such consultations will be conducted as appropriate on a case by case basis. Any participation by any agency on the IRT, including an agency's signature to this Instrument, shall not be construed as a substitute for such consultations, nor shall an agency's participation on the IRT be considered to bind the agency to any future consultation recommendation or condition, or to circumscribe the nature and extent of any potential recommendations or conditions made as a result of that consultation. Nothing in this Instrument shall be construed as obligating the state or Federal government to expend funds in excess of appropriations made by the United States Congress or the State legislature allocated to

[3] EXAMPLE: by way of example only - if the First Withdrawal Date were to occur on July 1, 2015, then the Mitigation Work Commencement Date should occur before July 1, 2016.

that agency for the purpose of administering any statutory obligation that may relate to any project involving this Instrument.

G. Financial Assurances

1. The Sponsor agrees to provide the following financial assurances or alternate mechanism the IRT chairs determine to be acceptable, for the work described in this Instrument. The Sponsor will secure sufficient funds, financial assurances (performance bonds, casualty insurance or letters of credit), or provide an alternate mechanism to cover contingency actions in the event that the Sponsor fails to comply with the terms of this Instrument or to rectify damage to the Bank resulting from any unforeseen events, as determined by the Corps and NYSDEC, in consultation with the IRT. In the event that these contingency funds and/or financial assurances are not used, the unused funds will be returned to the Sponsor or released. As restoration work is undertaken, financial assurance will only be retained for elements of the restoration not yet complete (i.e. if the Sponsor removes soil from the site and the IRT Chairs agreed that the construction task is complete, financial assurances associated with that task will be released). Financial assurances will be in a form that ensures that the District Engineer will receive notification at least 120 days in advance of any termination or revocation. In addition, the Sponsor will also be responsible for providing adequate assurance of funding for monitoring and maintaining the Bank throughout its operational life, which is 5 years from the date of the construction tasks are completed or on the date that the last of the credits is sold, whichever is later.

2. Prior to the Debiting of any Credits, the Sponsor will provide adequate Financial Assurances (e.g. escrow agreement, performance bond, letter of credit, casualty insurance, or alternate mechanism), acceptable to the IRT Chairs that is sufficient to hire an independent contractor to complete the proposed restoration and rehabilitation should the Sponsor default. The financial assurances, a Performance Surety for the construction of the mitigation project will be a bond or be an alternative form of assurance, such as a certificate or affidavit signed by a duly authorized representative of Sponsor demonstrating the City’s budgetary allocations equal the estimated cost of completing the project.

3. After the Project has been successfully constructed and planted in conformance with the approved Bank Development Plan, and after as confirmed by a field inspection to be conducted by the Corps and NYSDEC, the Corps and NYSDEC will authorize the release of any remaining Performance Surety within 60 days of the date that written notice of completion of project construction and planting is received by the Corps and NYSDEC for distribution to the IRT.

4. Following the completion of construction, financial surety equal to the estimated cost of monitoring and maintaining the site will be retained to insure the successful maintenance of the Bank, including the cost to replant the mitigation area.

5. Release of appropriate funds from the maintenance Financial Assurance will be recommended by the Corps and NYSDEC in writing, in consultation with the IRT, once it has reviewed and approved the annual monitoring report which demonstrates that success criteria have been met for the type of credits previously released. Complete release of the financial assurance agreement may only occur if the submitted report demonstrates that sufficient area met the specific success criteria (as stated herein) to offset the release of Credits.

6. The Sponsor will establish financial assurances with a law firm, title company, surety company, or insurance company licensed to provide such services in New York and named in the current Department of the Treasury circular, “Companies holding certificates of authority as acceptable sureties on federal bonds and acceptable reinsuring companies”, who will act as specified under this Instrument. The Sponsor may, at its discretion, replace this escrow agent/surety company/insurance company with another similar company registered to do business in the State of New York and named in the then current Department of the Treasury circular AR 570. The Sponsor will provide the IRT with notice prior to replacement of the company and a draft of the new financial assurances for review. The provisions of the new financial assurances will conform with the provisions of the former financial assurances.

H. Long-Term Stewardship Fund

Upon closure of the Bank, the Long-Term Steward shall implement the management requirements established in the Long-Term Stewardship Plan (Exhibit I). The Long Term

Management Fund, defined in Exhibit I, will provide funds for maintenance requirements or repairs necessitated after Bank closure. The long-term stewardship plan contains a provision requiring 60-day advance notification to the district engineer before any action is taken to void or modify the long-term protection mechanism, including transfer of title to, or establishment of any other legal claims over, the Bank site.

I. Property Protection

The Property shall be protected in perpetuity through the execution and delivery, by the City, of one or more written, legally binding and enforceable instruments, undertakings, agreements, conservation easements, or restrictive declarations; or (ii) any other documents that comply with the requirements of 33 CFR 332 and are approved in advance by the IRT Chairs (in either case, the "Property Protection Instruments"). The Property Protection Instrument shall have been executed, delivered, and recorded (as applicable) by the date on which the first (1st) Release of Credits occurs under this Instrument. A Property Protection Instrument shall include provisions for the following:

(i) the long-term protection of the Property in perpetuity, ensuring that the Property will only be used for the purposes set forth in this Instrument;

(ii) if requested by the IRT Chairs, the right of a third-party to enforce the protections contemplated in the Property Protection Instrument against any entity (including the City) in violation of the provisions of the Property Protection Instrument;

(iii) if required by the IRT Chairs, the right of such third-party to receive applicable reports and inspect the Property from time to time to monitor the status thereof, and compliance with the protections contemplated in the Property Protection Instrument;

(iv) a 60-day advance notification to be made by the City to the IRT Chairs, and approval of the IRT Chairs, before any action is taken to modify the Property Protection Instrument or the long-term protection mechanisms, including transfer of title to, or establishment of any other legal claims over, the Property; and

(v) a requirement that Sponsor or the City shall not take any action to amend or modify a Property Protection Instrument without the prior written consent of the IRT Chairs.

The Property Protection Instrument for the Project (i) shall be substantially in the form of Property Protection Agreement attached to this Instrument at Exhibit B (the "Property Protection Agreement"), or (ii) shall be in the form of another document or instrument acceptable to the IRT Chairs. In any case, such Restrictive Declaration or other document or instrument shall be executed, delivered, and recorded (if applicable) on or prior to the first (1st) Release of Credits.

With respect to the Property, subject to the Sponsor's rights under the Property Rights Agreement and any other agreement between the City and Sponsor related to the Property (such other agreements [if any] shall be disclosed to the IRT Chairs) in detail by Sponsor and accepted by the IRT Chairs before the Effective Date of this Instrument, Sponsor shall not:

(i) grant additional easements, rights of way, or any other property interest in or to the Property without the written consent of the IRT Chairs; and

(ii) use or authorize the use of the Property for any purpose which materially interferes with its conservation purposes as stated in this Instrument;

Aside from the terms above, Sponsor may:

(i) monitor the vegetation, soils and water on the Property;

(ii) maintain wetlands, restored stream segments, Buffers, and other appurtenant facilities on the Property; and

(iii) allow any activities required by Applicable Law,.

J. Completion of Initial Mitigation Work

Sponsor shall cause the Mitigation Work Completion Date to occur by the first (1st) anniversary of the Mitigation Work Commencement Date.

K. As-Built Survey and Report

The Sponsor will submit an as-built report to the IRT within 60 days following completion of the construction activities for the Bank site. The as-built report, photographs and drawings will depict the completed portions of the Bank, including a survey showing finished grades, plantings (species, densities, etc.), and will describe in detail any substantial deviations from the requirements described in the Mitigation Site Plan submitted to the IRT in accordance with the Bank Development Plan (Exhibit D). Based on a review of the as-built reports, and a site inspection by the Corps and/or NYSDEC, the Corps and NYSDEC will confirm within 60 days of receipt of the reports and the site inspection whether or not the Sponsor's tasks have been performed in accordance with this Banking Instrument. Any deviations from the Mitigation Site Plan may result in a change in mitigation credits commensurate with the deviation.

V. OPERATION AND USE OF THE BANK

A. Service Area

A watershed approach was used as the basis for determining the boundaries of the Service Area, taking into consideration the locations of ecologically unique and special waterfront areas as well as areas within New York Harbor that face acute challenges in finding suitable compensatory mitigation for permitted impacts. The Service Area for the Project shall be composed of a Primary Service Area and a Secondary Service Area, as described below.

The Primary Service Area for the Project is comprised of waters (including wetlands) of the United States or New York State located within certain areas of the area known as the "Lower Hudson River Basin" (also known as Hydrologic Unit Code 06 ["HUC06"] 020301), that are within City municipal limits, including portions of the HUC08 subbasins known as "Lower Hudson River" and "Sandy Hook-Staten Island", excluding the HUC12 subwatershed region known as "Raritan Bay-Lower Bay Deep" and including the Boroughs of Staten Island and

Manhattan and portions of the Boroughs of the Bronx, Brooklyn and Queens, all as such the Primary Service Area is more fully depicted on the map provided in Exhibit F and Table 3.

The secondary Service Area for the Project is comprised of waters (including wetlands) of the United States or New York State located within certain areas of the area known as the "Long Island Basin" (also known as ["HUC06"] 020302), that are within the City municipal limits, including parts of the HUC08 subbasins known as "Bronx River", "Long Island Sound", "Northern Long Island" and "Southern Long Island" and includes", excludes the HUC12 subwatershed region known as "Raritan Bay-Lower Bay Deep" and includes portions of the Boroughs of the Bronx, Brooklyn and Queens, all as such Secondary Service Area is more fully depicted on the map provided in Exhibit F and Table 3.

The Bank shall be used primarily to provide off-site Compensatory Mitigation for authorized but unavoidable impacts to waters of the United States or State waters, including wetlands, occurring within the Primary Service Area. The Bank, secondarily, may be used to provide off-site Compensatory Mitigation for authorized but unavoidable impacts to waters of the United States or State waters, including wetlands, occurring within the Secondary Area.

The use of Credits should be the preferred method for providing off-site Mitigation for the authorized impacts of projects being undertaken with the Primary Service Area. Within the Secondary Service Area, decisions authorizing use of credits from the Bank will be made by the Corps and/or NYSDEC on a case-by-case basis in accordance with applicable permit requirements. Authorized Permittees with projects in the Secondary Service Area may use Credits from the Bank to satisfy their Compensatory Mitigation obligations only if, in the opinion of the applicable permitting authority:

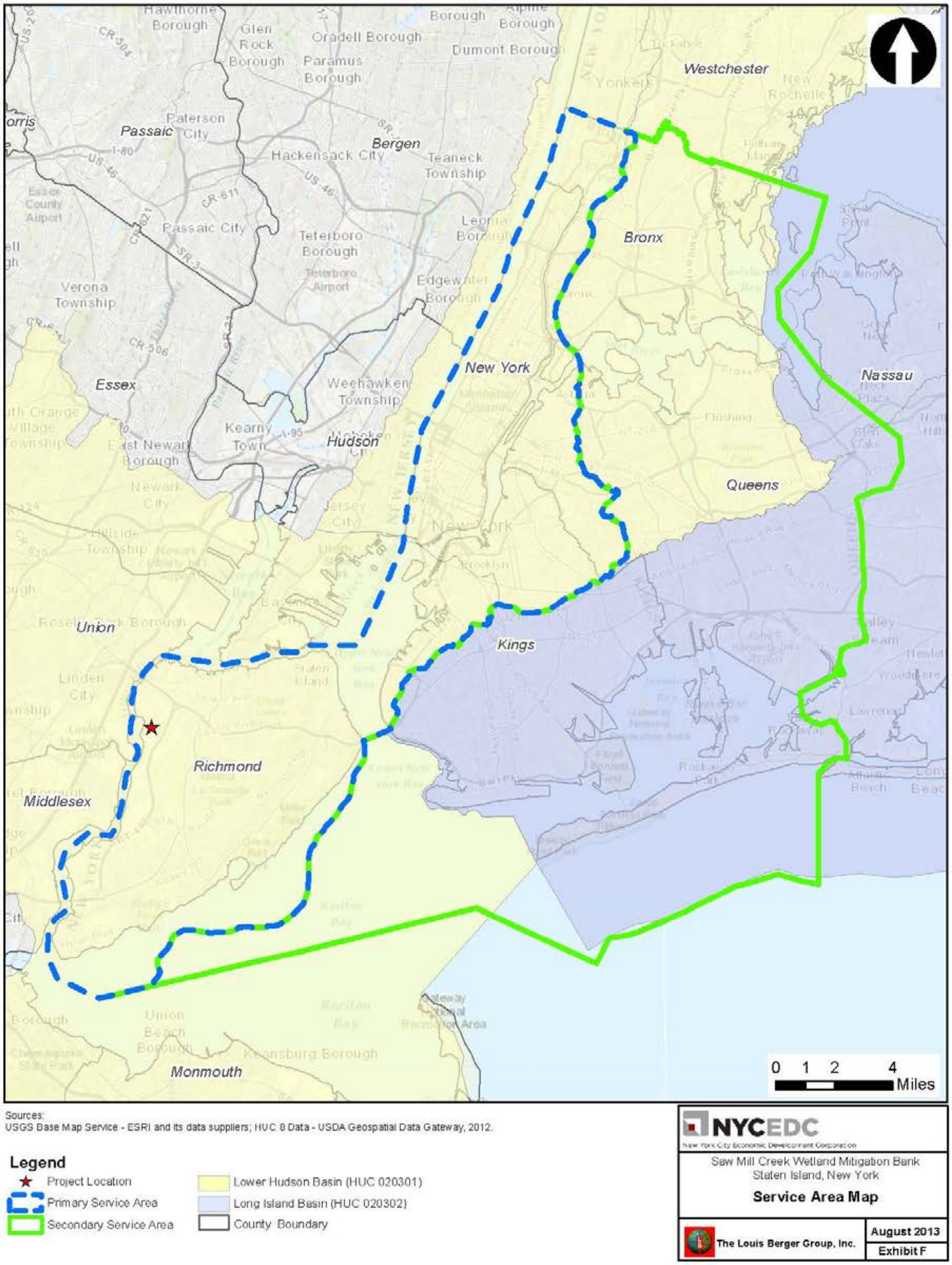
(i) no practical on-site Compensatory Mitigation alternatives are available to the Authorized Permittee that meet all of the mitigation requirements of the Authorized Permittee as required under the applicable permit(s);

(ii) no practical off-site Compensatory Mitigation alternatives, or combination of on-site and off-site Compensatory Mitigation alternatives, are available to the

Authorized Permittee within the Secondary Service Area that meet all of the mitigation requirements of the Authorized Permittee as required under the applicable permit(s); and

(iii) no credits are available to the Authorized Permittee from another wetland mitigation bank established under 33 CFR 332 that has a primary service area that includes the location of the Authorized Permittee's project.

Table 3: Overview of Primary and Secondary Service Area



B. Property Access

During the Term, the Sponsor shall allow or otherwise provide for access to the Property at any time for any IRT Party (or their agents or designees) as reasonably necessary for the purpose of inspecting the Property, compliance monitoring, and any other purposes consistent with the terms of this Instrument and Applicable Law; provided, that at the time the Property is so accessed, the Sponsor's rights to access and use the Property (as granted under the Property Rights Agreement) have not been terminated or suspended in any manner and the Property Rights Agreement is in full force and effect at such time. The IRT Parties will cause their employees, agents and designees accessing the Property to observe appropriate safety practices while on the Property. If an IRT Party wishes to access the Property without giving reasonable advance notice to Sponsor or at times that are not regular business hours, Sponsor will not be considered to be in breach of its obligations under this section if such IRT Party is unable to access the Property.

C. Projects Eligible to Use the Bank

Authorized Permittees seeking to undertake the following types of projects and/or activities may be eligible to use the Project to satisfy their Compensatory Mitigation obligations under Applicable Law by purchasing or otherwise acquiring Credits as contemplated below:

(i) all projects and/or activities by public agencies, private property owners, or any other permittees (regulated and authorized under Sections 401 and 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, New York State ECL Article 15, Title 5 [Protection of Waters/Stream Disturbance]; New York State ECL Article 25 [Tidal Wetlands] or any other Applicable Law) wishing to perform regulated and authorized activities within the Service Area; provided, that the adverse impacts of such projects and/or activities have been avoided and minimized to the maximum extent practicable, as determined under Applicable Law;

(ii) projects and/or activities authorized under New York State and/or Federal permits; provided, that Credits may not simultaneously be used by an Authorized Permittee to serve as Compensatory Mitigation for more than one (1) project/activity;[4]

Impacts resulting from Comprehensive Environmental Response, Compensation, and Liability Act remediation, Natural Resource Damage Assessments, and supplemental environmental projects that do not require permits from the Corps or NYSDEC are not eligible to purchase Credits to serve as Compensatory Mitigation.

The project and/or activity to be undertaken by an Authorized Permittees seeking to use the Project to satisfy Compensatory Mitigation obligations under Applicable Law by acquiring Credits must be located within the Service Area.

The mitigation credits from the Bank will be used to mitigate for impacts to estuarine and palustrine emergent, mudflat, scrub/shrub and open water wetlands and waters of the U.S and/or New York in the Service Area.

Decisions authorizing use of Credits from the Project by Authorized Permittees to satisfy their Compensatory Mitigation obligations shall be made by the applicable permitting authorities in accordance with Applicable Law.

D. Functional Assessment Methodology

The credits and debits for permittees utilizing the Bank will be determined by the Corps and NYSDEC, in consultation with the IRT, on a project-by-project basis. The number of credits created by establishment of this Bank is determined by a combination of land area, habitat type (e.g. Cowardin Classification), and functional assessment as provided in the Functional

[4] EXAMPLE - By way of example only: if a Credit is used to offset impacts pursuant to a Corps permit and/or NYSDEC Tidal Wetlands permit, that same Credit may not also be used to confer any type of compensation for other purposes in relation to other programs, such as environmental protection, etc.

Assessment (Exhibit E). The amount to be debited for each impact will depend upon the type, area and quality of wetlands, waters or buffers to be impacted as determined during the permitting process. The credits will be determined by the Corps and NYSDEC, in consultation with the IRT, and informed through the use of a functional assessment methodology that the Corps and NYSDEC, in consultation with the IRT, determine to be appropriate. The assessment methodology used is derived from the Uniform Mitigation Assessment Method ("UMAM") which was developed by the Florida Department of Environmental Protection (FDEP, 2004). UMAM tracks functional gains from mitigation projects and banks. This assessment methodology provides a standardized framework to assess functions for baseline and post-mitigation conditions for assessment areas using a qualitative description and quantitative scoring. It has been adopted and modified for use in other Corps Districts and State programs and was modified for this Project to tailor it to the NYC region and its habitats.

As tabulated in Table 2, the Sponsor anticipates that the Bank will provide 18.64 credits for Compensatory Mitigation for unavoidable impacts to aquatic ecosystems, waters or buffers at other locations. The available credits reflect the difference between before and after Bank establishment site conditions as informed by the approved functional assessment methodology and approved by the Corps and NYSDEC, in consultation with the IRT.

The use of mitigation credits from the Bank to compensate for project impacts will be determined on a site- and project-specific basis by the Corps and NYSDEC, in consultation with the IRT, and in conjunction with the permitting for such projects. Normally the following ratios are expected to apply to the number of Credits an Authorized Permittee will need to acquire to compensate for the impacts of their activity in the Primary Service Area:

(i) One (1) acre of impact to unvegetated aquatic resources (estuarine and palustrine mudflat and waters of the U.S and/or New York) in the Service Area will require one (1) Credit; and

(ii). One (1) acre of impact to vegetated aquatic resources (estuarine and palustrine emergent and scrub/shrub wetlands of the U.S and/or New York) in the Service Area will require One and One-half (1.5) Credits.

If the activity to be undertaken by an Authorized Permittee is located within the Secondary Service Area and if the Authorized Permittee seeks to acquire Credits to satisfy its Compensatory Mitigation obligations, then the number of Credits to be debited by the Sponsor will be determined by the best professional judgement of the IRT Chairs on a project-by-project basis and will generally be higher in the secondary service area.

E. Success Criteria

The Sponsor will be responsible for assuring the success of the Bank establishment activities and goals described in Exhibit D. The success of the Bank will be measured by performance standards approved by the Corps and NYSDEC, in consultation with the IRT, as set forth in the Corps and NYSDEC permits and this Instrument. The standards establish the conditions under which the Bank will be evaluated successful and provide monitoring and maintenance requirements. The Bank will be considered successful if the Sponsor demonstrates to the Corps and NYSDEC, in consultation with the IRT, that the appropriate areas have been restored or enhanced and the goals of the Bank have been met. After successful completion of each planning, construction and monitoring task described in the credit debiting schedule (provided in Table 4 below), the Sponsor will notify the Corps and NYSDEC in writing. In addition to the written notice, the Sponsor will submit photographs of the completed project task along with a photo location map. Necessary after any site inspection, the Corps and NYSDEC, in consultation with the IRT, will confirm within 60 days whether or not the tasks are successfully completed for purposes of releasing credits.

The following criteria will be used to assess project success.

1. Submittal of required documentation, including monitoring reports, annual ledgers, as-built drawings, proof of financial assurances in accordance with Section VI.

2. In Wetland Restoration (Re-establishment and Rehabilitation) areas, success shall be evaluated as follows:

a) Upon completion of grading, demonstrate that wetland hydrology, defined as a range of twice daily tidal flooding and draining of the lower marsh areas and twice monthly flooding and draining of the higher marsh, has been achieved via an as-built topographic map, tide gage data, and photographs of several locations across the site at high and low tide;

b) Upon completion of planting, demonstrate the establishment of the vegetative community, and that wetlands and open waters/mudflat have been created in the ratios provided in this Instrument and the Bank Development Plan, as approved by the Corps and NYSDEC in consultation with the IRT;

c) At the end of the first and second growing seasons, demonstrate at least 65 percent areal coverage of the mitigation plantings and/or target hydrophytes, which are species native to the area and similar to ones identified on the mitigation planting plan, and that all plant species in the mitigation area are healthy and thriving. Demonstrate that the site is less than 10 percent occupied by invasive or noxious species such as, but not limited to *Phalaris arundinacea* (Reed canary grass), *Phragmites australis* (Common reed grass), *Pueraria montana* (Kudzu), *Typha latifolia* (Broad-leaved cattail), *Typha augustifolia* (Narrow leaved cattail), *Lythrum salicaria* (Purple loosestrife), *Ailanthus altissima* (Tree-of-heaven), *Berberis thunbergi* (Japanese barberry), *Berberis vulgaris* (common barberry), *Elaeagnus augustifolia* (Russian olive), *Elaeagnus umbellate* (Autumn olive), *Ligustrum obtusifolium* (Japanese privet), *Ligustrum vulgare (*Common privet), *Rosa multiflora* (Multiflora rose), and *Persicaria perfoliata* (Mile-a-minute). Invasive or noxious species are identified in *New York State Prohibited and Regulated Invasive Plants (September 10, 2014)* which is available at http://www.dec.ny.gov/docs/lands_forests_pdf/isprohibitedplants2.pdf. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

d) At the end of the third and fourth growing seasons, demonstrate at least 75 percent areal coverage of the mitigation plantings and/or target hydrophytes and that all plant species in the mitigation area are healthy and thriving. Demonstrate that the site is less than

10 percent occupied by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

e) At the end of the fifth growing season, demonstrate

(i) at least 85 percent areal coverage of mitigation plantings and/or target hydrophytes and that all plant species in the mitigation area are healthy and thriving. Demonstrate that no more than 10 percent cover in the wetland is made up by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

(ii) the site contains hydric soils or there is evidence of reduction occurring in the soil;

(iii) the proposed hydrologic regime as specified in the Bank Development Plan, which proves the mitigation site is a wetland, has been satisfied; and

(iv) that the goals of the wetland mitigation project, including acreage as stated in the approved wetland mitigation proposal and the permit, have been satisfied.

3. In Wetland Enhancement (Tidal and Forest) areas, success shall be evaluated as follows:

a) For wetland enhancement areas demonstrate that invasive or noxious species have been controlled and debris has been removed. Upon completion of seeding and planting, demonstrate that the wetland enhancement areas have been established as detailed in this Instrument and the Bank Development Plan, as approved by the Corps and NYSDEC in consultation with the IRT;

b) At the end of the first and second growing seasons, demonstrate at least 65 percent areal coverage of the mitigation plantings and/or target hydrophytes, which are species native to the area and similar to ones identified on the mitigation planting plan.At the end of the first and second growing seasons demonstrate that the site is less than 10 percent occupied by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species invasive species exceed a 5 percent threshold;

c) At the end of the third and fourth growing seasons, demonstrate at least 75 percent areal coverage of the mitigation plantings and/or target hydrophytes. At the end of the third and fourth growing seasons, demonstrate that the site is less than 10 percent occupied by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species invasive species exceed a 5 percent threshold;

d) At the end of the fifth growing season, demonstrate at least 85 percent areal coverage of mitigation plantings and/or target hydrophytes and that plant species in the enhancement areas are healthy and thriving.At the end of the fifth growing season, demonstrate that the site is less than 10 percent occupied by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species invasive species exceed a 5 percent threshold;

e) That the goals of the wetland mitigation project, including acreage as stated in the approved wetland mitigation proposal and the permits, have been satisfied.

4. In Buffer Rehabilitation areas, success shall be evaluated as follows:

f) For buffer rehabilitation areas demonstrate that invasive and noxious species have been controlled as per the maintenance plan. Upon completion of seeding and planting, demonstrate that the buffer rehabilitation areas have been established as detailed in this Instrument and the Bank Development Plan, as approved by the Corps and NYSDEC in consultation with the IRT;

g) At the end of the first and second growing seasons, demonstrate 65 percent areal coverage of the mitigation seedlings and plantings or target native species, which are species native to the area and similar to ones identified on the mitigation planting plan, and that all plant species in the mitigation area are healthy and thriving. Demonstrate that the site is less than 10 percent occupied by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

h) At the end of the third and fourth growing seasons, demonstrate 75 percent areal coverage of the mitigation seedlings and plantings or target native species which are species native to the area and similar to ones identified on the mitigation planting plan, and that all plant species in the mitigation area are healthy and thriving. Demonstrate that the site is less than 10 percent occupied by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

i) At the end of the fifth growing season, demonstrate 85 percent areal coverage of the mitigation seedlings and plantings or target native species which are species native to the area and similar to ones identified on the mitigation planting plan, and that all plant species in the mitigation area are healthy and thriving. Demonstrate that the site is less than 10 percent occupied by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

j) That the goals of the wetland mitigation project, including acreage as stated in the approved wetland mitigation proposal and the permits, have been satisfied.

F. Schedule of Credit Availability

Upon submittal of all appropriate documentation by the Sponsor (or its designee), and subsequent recommended approval by the IRT, the Corps and NYSDEC will authorize in writing the release of Credits by the City in accordance with the following schedule, provided performance standards have been met:

2. First Credit release: Ten percent (10%) of anticipated Credits will be available for debiting upon implementation of the following: (a) approval of this Instrument and the Bank Development Plan described in Exhibit D by the Corps and NYSDEC, in consultation with the IRT; (b) implementing financial assurances (e,g. posting Performance Bonds or a signed affidavit providing proof of the alternate mechanism); (c) a schedule is submitted to the IRT that shows that the initial physical and biological

improvements will be completed no later than the first full growing season following initial debiting from the Bank; (d) all applicable regulatory permits and approvals will be secured by the Sponsor; (e) the site protection instrument recorded; and (f) an electronic version of this Instrument, the Bank Development Plan and associated exhibits are submitted to the Corps and NYSDEC;

3. Second Credit Release: Twenty percent (20%) of anticipated credits will be available for debiting upon successful establishment of the hydrologic regime described in the Bank Development Plan, Exhibit D , as demonstrated by the provision of grading plans, photos, and tide gauge data;

4. Third Credit Release: Ten percent (10%) of anticipated credits will be available for debiting upon successful establishment of the vegetative communities described in the Bank Development Plan, Exhibit D, as demonstrated by completion of planting;

5. Fourth Credit Release: Twenty percent (20%) of anticipated credits will be available for debiting following one full year of monitoring, provided that the monitoring indicates that the performance standards in the Instrument have been met at the end of one calendar year from completion of construction activities, including planting;

6. Fifth Credit Release: Twenty percent (20%) of anticipated credits will be available for debiting following three full years of monitoring, provided that the monitoring indicates that the performance standards in the Instrument have been met for three consecutive years;

7. Sixth Credit Release: Twenty percent (20%) of anticipated credits will be available for debiting following five full years of monitoring, provided that the monitoring indicates that the performance standards in the Instrument have been met for five consecutive years, and the Long Term Land Steward has signed the Long Term Management Plan;

8. Prior to granting any credit release requests, the IRT may request additional information following a site visit or after review of a monitoring report;

9. Credits can be released by the Corps and NYSDEC in consultation with the IRT, in accordance with the schedule in Table 4.

Table 4: Debiting Schedule of Available Credits

Task Completed	**Percent Credits Available**	**Credits Available**
MBI approved, Financial Assurance secured, schedule submitted, permits issued, property protection implemented, and electronic versions Instrument provided	10%	1.864
Successful establishment of the approved hydrologic regime	20%	3.728
Successful establishment of the vegetative community (completion of planting)	10%	1.864
Monitoring indicates that the performance standards in the Instrument have been met at the end of one calendar year from completion of construction activities, including planting.	20%	3.728
Monitoring indicates that the performance standards in the Instrument have been met for three consecutive years.	20%	3.728
Monitoring in accordance with the Instrument indicates that the performance standards in the Instrument have been met for five consecutive years and the Long Term Land Steward has signed the Long Term Management Plan.	20%	3.728
TOTAL	**100%**	**18.64**

G. Conditions on Debiting

Aside from the advance release of credits, if the number of credits debited equals the number of credits created and released, then no further credit Debits shall be permitted by the Corps and NYSDEC in consultation with IRT until additional credits are released by the IRT acting through the Corps and NYSDEC. Any release of credits will be authorized jointly in writing by the Corps and NYSDEC.

H. Provisions for Uses of the Mitigation Bank Area

The Sponsor will not use or authorize the use of areas within the Bank for any purpose that interferes with its conservation purposes. In addition to implementation of the terms of this Instrument, the following activities are permissible:

a) Monitoring of vegetation, soils and water;

b) Maintenance of wetlands, restored stream segments, buffers, and other appurtenant facilities;

c) Fishing and other passive recreational uses such as hiking and bird watching;

d) Ecological education; and

e) Compliance with applicable Federal, State, or local regulations or appropriate court orders.

VI. MONITORING AND MAINTENANCE

A. Maintenance Provisions

The Sponsor will perform necessary work to maintain the Bank consistent with the maintenance criteria established in the Bank Development Plan. The Sponsor will continue with such maintenance activities until completion of the monitoring period described in Section VI.B. Deviation from the monitoring and maintenance provisions in the approved Instrument and the Bank Development Plan is subject to review and written approval by the Corps and NYSDEC, in consultation with the IRT.

B. Monitoring Provisions

The Sponsor will perform necessary work to monitor the Bank to demonstrate compliance with the success criteria established in this Instrument, and any regulatory permits, as described in the Monitoring and Maintenance Plan (Exhibit G) for a period of 5 years or until success criteria are met, whichever is later. The first year monitoring will be conducted one year from the completion of construction activities and planting (i.e., if the planting is completed in spring 2016, the first monitoring event would occur in spring 2017). Monitoring may be terminated or the extent of monitoring may be reduced over part of the entire site at the discretion of the Corps and NYSDEC, in consultation with the IRT.

C. Reports

The Sponsor shall submit to the IRT Chairs (for distribution by the IRT Chairs to the other IRT Parties) the Reports and other documents describing the conditions of the Bank and relating those conditions to the success criteria as described in this Instrument. During the M&M Period Sponsor shall prepare and deliver to the IRT Chairs an Annual Monitoring Report. As soon as reasonably practicable following the last day of a given Monitoring Year, Sponsor shall deliver six (6) physical copies of the Annual Monitoring Report for such Monitoring Year to the Corps for further distribution, by the Corps, to the other IRT Parties and one (1) physical copy of such Report to NYSDEC; provided, that in any case Sponsor shall deliver such Annual Monitoring Report by December 31 of the year in which such Monitoring Year ended. Each Annual Monitoring Report shall include the following:

a) an executive summary;

b) a detailed explanation in detail of the ways in which the mitigation has or has not achieved progress towards the satisfaction of all applicable success criteria (and if the mitigation has not achieved such progress, the report will also identify all Adaptive Management Measures necessary do so);

c) ground level photographs showing in detail all representative areas of the Bank taken at least two (2) times a year during the period between June 1 and November 1;

d) a detailed narrative summarizing in detail the condition of the Bank and all regular Monitoring and Maintenance activities;

e) a drawing based upon the grading plans of the site that depicts in detail topography, sampling plots and transects, cross-section, and permanent photo stations;

f) the results in detail of vegetation monitoring, using a sufficient number of plots measuring one meter square, including visual estimates of percentage (%) of overall cover and percent cover by each vegetation layer, species diversity, percent non-native/invasive plants in each vegetation layer, percent of combined Facultative (FAC), Facultative Wetland (FACW), and Obligate Wetland (OBL) species in each vegetation layer, survival rate of planted vegetation, an estimate of natural revegetation, average height of woody species in each sample and percent change in height since previous monitoring event;

g) Vegetation cover maps of detail for each growing season; and

h) A year-by-year summary of all Releases and Debits of Credits to-date.

Sponsor shall retain all Project documents and records for the period of time required by Applicable Law and as required under the EDC Master Contract.

D. Accounting Procedures

The following accounting procedures shall be undertaken in connection with the Project:

i. The Sponsor shall establish and maintain the Ledger substantially in the form attached to this Instrument at Exhibit J (Form of Credit Ledger) to account for all transactions involving Releases and Debits of Credits.

ii. Sponsor shall promptly make entries into the Ledger that are necessary or appropriate in connection with all transactions involving Releases and Debits of Credits.

iii. Within Sixty (60) days after the end of each prior calendar year during the Term, the Sponsor shall compile and deliver an Annual Ledger Report to the District Engineer and NYSDEC.

iv. Each Annual Ledger Report shall provide the following information:

a. the beginning and ending balance of available credits and permitted impacts for each resource type;

b. all Additions, Releases and Debits of Credits that occurred during the prior calendar year;

c. a cumulative tabulation of all transactions involving Releases and Debits of Credits that, as of the date of the Annual Ledger Report, occurred since the Effective Date;

d. with respect to each Credit Purchase Closing that occurred in the prior calendar year: the identities of the Authorized Permittees; the applicable permit number(s) for such Authorized Permittees; the type of permit(s) held by such Authorized Permittees; the locality of the activity authorized by the permit; the type of impacted system (Cowardin Classification); amount of impacts; the amount of Credits Withdrawn from the Credit Account; the USGS HUC Catalog Unit; and the date on which the Credit Purchase Closing occurred;

e. any other changes in credit availability; and

f. any other information required under 33 CFR 332.8(q)(1) that is not included in <u>items (i)</u> through <u>(v)</u> above.

v. The IRT will review the Annual Ledger Report and adjust the credit composition. Annual Ledgers and transaction reports will be submitted to the IRT as long as Credits remain in the Bank and/or the Bank remains operational. If Sponsor defaults with respect to its obligations under this section (VI-Monitoring and Maintenance, Section D-Accounting Procedures) and such default is not remediated or cured by the end of the applicable cure period (if any), the Corps may request in writing that Sponsor promptly commence the process of retaining a third-party auditing firm or other consultant acceptable to the Corps in a manner consistent with Sponsor's customary procurement practices and the EDC Master Contract. The scope of any such audit shall be accepted by the Corps prior to audit; provided that in any case such scope is limited to a review of Sponsor's books and records pertaining to the Ledger, the Annual Ledger Report and the transactions involving the Debiting of Credits which gave rise to the applicable default. Sponsor shall cooperate in good faith with any such audit and shall be solely responsible for the documented reasonable costs and expenses thereof. The final results of any such audit shall be made available to the Corps.

E. Contingency/Adaptive Management Plans/Corrective Actions

The Sponsor shall promptly notify the IRT Chairs if (i) at any time after the Mitigation Work Commencement Date and prior to the Mitigation Work Completion Date, the Sponsor reasonably determines that the Initial Mitigation Work cannot be completed or that the Project cannot be completed in accordance with the Project Development Plan; or (ii) following the Mitigation Work Completion Date, any Report delivered by the Sponsor hereunder indicates that events, conditions or circumstances on or impacting the Project site are such that the Project will fail to satisfy one or more success criteria in accordance with this Instrument. Such notice, if given, shall include or attach a proposed Adaptive Management Plan developed by the Sponsor which shall be reasonably detailed and shall include a description of the means and methods by which Sponsor proposes to implement the Adaptive Management Measures. Upon IRT Chairs' approval of an Adaptive Management Plan, the Sponsor shall undertake all actions contemplated and complete the Adaptive Management Measures in a timely manner. Upon completion of such actions, Sponsor shall promptly notify the IRT Chairs that the Adaptive Management Measures covered in the Adaptive Management Plan have been completed and shall include with such notice a written description of all work undertaken in connection therewith.

As soon as practicable after receipt of the notice from Sponsor given under Section V.G. the IRT Chairs shall perform an inspection of the Property to evaluate the conditions of the Property or shall otherwise determine whether all the Adaptive Management Measures have been completed in a manner materially consistent with the Adaptive Management Plan. As soon as practicable following such inspection or determination, the IRT Chairs shall issue to Sponsor an approval notice or disapproval notice in accordance with the following:

a. if an approval notice is given, such notice will state that the IRT Chairs agree and confirm that the Adaptive Management Measures have been completed; and

b. if a disapproval notice is given, such notice shall state that the IRT Chairs have determined that the Adaptive Management Measures have not been completed and shall clearly describe the facts, circumstances or measures which caused the IRT Chairs to make such determination and the additional measures to be undertaken in order to complete any remaining Adaptive Management Measures, in which case the Sponsor shall satisfy such remaining Adaptive Management Measures and promptly following submission of evidence that such remaining measures have been completed, the IRT Chairs shall re-initiate the procedures set forth in this Instrument and issue an approval notice or a disapproval notice, as the case may be.

Except as set forth in this section, at no time during the Term shall Sponsor be required to undertake any Adaptive Management Measures unless otherwise agreed to in writing by Sponsor and the IRT Chairs.

F. Default

Should the Corps and NYSDEC, in consultation with the IRT determine that the Sponsor is in material default of any provision of this Instrument, the Corps and NYSDEC may notify the Sponsor that the Debiting, sale or transfer of any Credits is suspended until the appropriate deficiencies have been remedied. Upon notice of such suspension, the Sponsor agrees to immediately cease all Debits, sales or transfers of Mitigation Credits until the Corps and NYSDEC informs the Sponsor that Debits, sales or transfers may be resumed. If the Sponsor fails to submit one or more required monitoring reports, an additional year of monitoring and submittal of the associated report to the IRT will be required to document Bank compliance. Should the Sponsor remain in default, the Corps and NYSDEC, in consultation with the IRT, may terminate all future credit transactions. Upon termination, the Sponsor agrees to perform and fulfill all obligations under this document relating to Credits that were sold or transferred prior to termination

G. Bank Closure

As soon as practicable after the date Sponsor reasonably determines that all of the Project Closure Conditions (defined below) have been satisfied, Sponsor shall notify the other Parties and the Long-Term Steward of such determination. The Project Closure Conditions are the following:

a. all success criteria have been satisfied;

b. in accordance with this Instrument, all Authorized Credits have been Released into the Credit Account;

c. the Long-Term Stewardship Agreement (attaching the IRT-approved Long-Term Stewardship Plan) has been executed and delivered by each party thereto and has become effective;

d. the Sponsor has prepared and submitted to the IRT and the City a "GIS" shape file or similar file depicting the location and extent of the Bank;

e. the Fund has been fully capitalized at an amount at least equal to the Full Fund Amount and Sponsor has notified the IRT Chairs as such;

f. the Sponsor has confirmed to the IRT Chairs that pursuant to the terms of the Long-Term Stewardship Agreement, on or promptly following the Project Closure Date, all amounts maintained in or under the Fund shall be transferred to or be at the direction of the Long-Term Steward as described in the Long-Term Stewardship Plan

g. the Bank closure should not occur until after all of the credits are sold or after the end of the fifth year of monitoring, whichever comes last; and

h. The Bank materially complies with the terms of this Instrument and the requirements of 33 CFR 332.

The Sponsor shall cause such conditions to be satisfied within ninety (90) days of the last day of the fifth (5th) Monitoring Year.

As soon as practicable after receipt of the notice from Sponsor given under this section the IRT Chairs shall perform an inspection of the Property to evaluate the conditions of the Property or shall otherwise determine whether all applicable Project Closure Conditions have been satisfied to the IRT's satisfaction. As soon as practicable following such inspection or determination, the IRT Chairs shall issue to Sponsor an approval notice or disapproval notice in accordance with the following:

a. if an approval notice is given, such notice will state that the IRT Chairs agree and confirm that the Project Closure Conditions have been satisfied shall include a written certification project closure certificate jointly executed by the IRT Chairs stating that the Project Closure Conditions have been satisfied. The date on which the Project shall be deemed to have closed in accordance with 33 CFR 332 shall be the date of the project closure certificate and the Project Closure Date.

b. if a disapproval notice is given, such notice shall state that the IRT Chairs have determined that all Project Closure Conditions have not been satisfied and shall clearly describe the facts, circumstances or measures which caused the IRT Chairs to make such determination and the additional measures to be undertaken in order to satisfy all remaining Project Closure Conditions, in which case Sponsor shall satisfy such remaining Project Closure Conditions and promptly following submission of evidence that such remaining Project Closure Conditions have been satisfied, the IRT Chairs shall re-initiate the procedures set forth in this sub-section (b) and issue an approval notice and Project Closure Certificate or a disapproval notice, as the case may be.

From and after the Project Closure Date the Project will be considered "closed" for all purposes under this Instrument and 33 CFR 332, the Long-Term Stewardship Period shall have commenced and neither SBS nor its designated agent shall have further obligations as “Sponsor” under this Instrument or in connection with the Project except as otherwise set forth in this Instrument.

H. Long-Term Stewardship

Commencing as of the Project Closure Date, in accordance with the Long-Term Stewardship Agreement and at its sole cost and expense the Long-Term Steward shall be responsible for all additional work that is not part of the Initial Mitigation Work which may be required during the Long-Term Stewardship Period; shall perform its obligations set forth in the Long-Term Stewardship Agreement and the Long-Term Stewardship Plan (**Exhibit I**); and shall otherwise be responsible for the Property and the long-term stewardship of the Project for the duration of the Long-Term Stewardship Period. The Long-Term Steward will be financially responsible for the Bank in perpetuity.

To the extent not previously delivered, as soon as practicable following the Project Closure Date, the Sponsor shall deliver to the Long-Term Steward a copy of this Instrument and all amendments to this Instrument, if any and copies of all relevant Project records.

VII. RESPONSIBILITIES OF THE INTERAGENCY REVIEW TEAM

A. Oversight

To the extent that agency resources allow and that they are reasonably able to do so, the members of the IRT agree to review and provide comments to the Corps and NYSDEC on banking matters affecting their respective trust resources.

B. Review Procedures

To the extent that agency resources allow, the agencies represented on the IRT will review and provide comments on all project plans, proposed additions of land to the Bank, annual monitoring reports, credit review reports, contingency plans, and necessary permits for the Bank. The IRT members agree to provide comments, if any, on the final construction documents as described in Exhibit D. Project plans, proposed additions of land to the Bank, monitoring reports, credit review reports, contingency plans, will be reviewed by the IRT members within thirty (30) calendar days from the complete submittal to the members, or will comply with the timelines in

The Final Rule for Compensatory Mitigation for Losses of Aquatic Resources. The Corps as Chair of the IRT and NYSDEC shall coordinate such review with members of the IRT so that comments can be provided within the thirty (30) calendar day comment period.

C. Evaluation of Success Criteria

The agencies represented on the IRT will review and confirm reports on evaluation of success criteria prior to recommending approval of release of credits within the Bank within thirty (30) calendar days from the date of complete submittal, to the extent that agency resources allow and subject to a need for compliance inspection to verify success.

D. Compliance Inspections

The Corps and NYSDEC, in consultation with the IRT, will conduct compliance inspections, as necessary and as determined by the Corps and NYSDEC in consultation with the Sponsor, to verify credits available in the Mitigation Bank, assess site conditions, and to recommend corrective measures (if any) to the Sponsor, to the extent that agency resources allow.

VIII. OTHER PROVISIONS

A. Force Majeure

1. The sponsor shall be responsible for any corrective actions of any portion of the Bank except upon events of Force Majeure:

> Force Majeure shall mean, flood, drought, disease, regional pest infestation, tornado, hurricane, earthquake, fire, or other action which has an irreparable material and detrimental impact on much of the Bank over which the sponsor or any entity controlled by the sponsor has no control;

2. The sponsor shall bear the burden of demonstrating:

(a) That the Force Majeure event was caused by circumstances beyond the control of the sponsor and/or any entity controlled by the sponsor, including its contractors and consultants;

(b) That neither the sponsor nor any entity controlled by the sponsor, including its contractors and consultants, could have reasonably foreseen and prevented such an event; and

(c) The irreparable material, detrimental impact, or sponsor's inability to perform its obligations under this Instrument, was caused by such circumstances.

3. The Corps and NYSDEC, in consultation with the IRT, will determine whether the sponsor has adequately demonstrated the findings listed in paragraphs 2(a)-2(c) of this section;

4. However, if the Force Majeure events do not preclude the bank sponsor from resuming bank operations without unreasonable expense, then it shall not be relieved of its obligations under this document. Any impact to future credit releases or numbers of credits available for sale shall be discussed and determined by the IRT at that time.

B. Dispute Resolution

Resolution of disputes between IRT Parties about the application of this Instrument shall be in accordance with the Corps and EPA regulations entitled "Compensatory Mitigation for Aquatic Resources" (33 CFR Parts 325 and 332 and 40 CFR Part 230), as well as any other federal or state regulations governing Bank operation as applicable. The release of Credits shall be in accordance with 33 CFR 332.8(O) (9), as stipulated in the *Federal Compensatory Mitigation for Losses of Aquatic Resources; Final Rule*, dated April 10, 2008, or as may be hereafter amended.

C. Amendments

Except as otherwise set forth in this Instrument, no term or provision of this Instrument (including all exhibits attached to this Instrument) may be amended, amended and restated, modified or supplemented except in accordance with Applicable Law and by written instrument signed by Sponsor and the IRT Chairs. In the event Sponsor deems it necessary or appropriate to seek amendment or modification of any provision of this Instrument (including the Project Development Plan), the Sponsor shall submit a written request along with appropriate supporting documentation for such amendment or modification to the IRT Chairs for their approval.

Any proposed substantial change to the Project or Project site during the Term shall require an amendment to this Instrument prior to of such change becoming effective.

D. Specific Language of Instrument Shall Be Controlling

The language of any permit or authorization issued by an IRT Chair shall take precedence over the language of this Instrument. Otherwise, to the extent that specific language in this Instrument changes, modifies, or deletes terms and conditions contained in those documents that are incorporated into this Instrument by reference, and that are not legally binding, the specific language within this Instrument and the Project Development Plan shall be controlling.

E. Notices

Any notice required or permitted hereunder shall be deemed to have been given either (i) when delivered by hand, or (ii) five (5) business days following the date deposited in the United States mail, postage prepaid, by registered or certified mail, return receipt requested, or (iii) the day sent by Federal Express or similar next day nationwide delivery system, addressed as follows (or addressed in such other manner as the party being notified shall have requested by written notice to the other party):

To the Sponsor's Agent:

New York City Economic Development Corporation
110 William Street
New York, NY 10037
Phone: 212-312-3730
Fax: 212- 618-8898
Attention: Executive Vice President, Planning and Development

With a copy to Sponsor:

New York City Department of Small Business Services
110 William Street
New York, NY 10037
Phone: 212-513-6428
Attention: Deputy Commissioner, Legal and Regulatory Affairs

With a copy to:

New York City Economic Development Corporation
110 William Street
New York, NY 10037
Phone: 212-312-3730
Fax: 212- 618-8898
Attention: General Counsel

With a copy to:

New York City Department of Parks and Recreation
830 5th Ave
New York, NY 10065
Attention: Assistant Commissioner, Planning & Parklands

<u>To the IRT:</u>

C/O U.S. Army Corps of Engineers New York District
26 Federal Plaza
Regulatory Branch, Room 1937
New York, New York 10278 0090
Attention: Chief, Regulatory Branch

With a copy to:

New York State, Department of Environmental Conservation
1 Hunter's Point Plaza
47-40 21st Street
Long Island City, NY 11101-5407
Attention: Regional Director

F. Severability

In the event that one or more of the provisions contained in this Instrument are held to be invalid, unenforceable or illegal in any respect, such invalidity, unenforceability or illegality shall not affect the other provisions hereof, and this Instrument shall be construed as if such provision(s) were not contained in this Instrument. Should the essential understanding of the Parties to this Instrument be lost by the removal of such provision(s), then the Parties to this Instrument shall negotiate in good faith to amend this Instrument as necessary to avoid such invalidity, unenforceability or illegality, while still preserving the essential understanding of the Parties to this Instrument. It is the Parties intention and belief that this Instrument follows Federal law including Federal regulations published on April 10, 2008 (FR Vol .73 No. 70). To the extent that a section of this Instrument is ambiguous, or to the extent that a section of this Instrument is found by a non-appealable judicial body to be inconsistent with Federal law or Federal guidance, or to the extent that a section of this Instrument would require an action inconsistent with Federal law or guidance, then that section should be re-interpreted so as to be consistent with Federal law and/or Federal guidance, or if not possible, then stricken.

G. Assignment

Except as provided in this Section VIII.G, no Party may assign or transfer any of its rights or obligations hereunder without the prior written consent of the other Parties.

NYCEDC is the authorized agent to the Sponsor. The Sponsor shall have the right at any time during the Term to delegate to any contractor or other Person retained by or on behalf of Sponsor all or any portion of Sponsor's obligations; provided written approval of such delegation is received from the IRT Chairs and NYCEDC.

Aside from any other provision set forth in this Instrument, any assignment, transfer and/or delegation by Sponsor shall not relieve Sponsor of ultimate responsibility for performing or causing to be performed all of its obligations in accordance with the terms of this Instrument.

H. Successors and Assigns

This Instrument shall inure to the benefit of the respective successors and/or assigns of the Parties; provided, that any assignment hereunder shall be undertaken in accordance with **Section VIII.G**.

I. Liability of Regulatory Agencies

The responsibility for financial success and risk to the investment initiated by the Bank Sponsor rests solely with the Bank Sponsor. The regulatory agencies that are Parties to this document administer their regulatory programs to best protect and serve the public's interest in its waterways, and not to guarantee the financial success of Banks, specific individuals, or entities. Accordingly, there is no guarantee of profitability for any individual Mitigation Bank. Bank Sponsors should not construe this document as a guarantee in any way that the Agencies will ensure the Debiting of Credits from this Bank or that the Agencies will forgo other Mitigation options that may also serve the public interest. Since the Agencies do not control the number of Mitigation Banks proposed or the resulting market impacts upon success or failure of individual

Banks, in depth market studies of the potential and future demand for Bank Credits are the sole responsibility of the Bank Sponsor.

J. No Third Party Beneficiary

The terms of this Instrument are intended solely for the benefit of the Parties and their respective successors and permitted assigns and it is not the intention of the Parties to confer third-party beneficiary rights upon any other Person.

K. Governing Law

This Instrument shall be governed by and construed in accordance with the laws of the United States and the State of New York.

L. Entire Instrument

This Instrument, along with any related permits issued by the IRT Chairs, constitute the intentions of the the Parties and supersede any prior written and verbal agreements among them with respect to the subject matter hereof. This Instrument shall be deemed to have been jointly drafted, and no provision of it shall be interpreted or construed for or against a Party because such Party purportedly prepared or requested such provision, any other provision, or this Instrument as a whole.

M. Public Copies of Instrument

During the Term, Sponsor shall promptly make a true and complete copy of this Instrument available to any member of the public who has submitted a request to Sponsor for such copy.

N. Instrument Not a Contract

Corps approval of this Instrument constitutes the regulatory approval required for the Saw Mill Creek Wetland Mitigation Bank Project to be used to provide Compensatory Mitigation for Department of the Army permits pursuant to 33 CFR 332.8(a)(1). This Instrument is not a contract between the Sponsor and Corps or any other agency of the federal government or agency of the state of New York. Any dispute arising under this Instrument will not give rise to any claim by any Party for damages or other remedies. This provision is controlling notwithstanding any other provision or statement in the Instrument to the contrary.

(Remainder of page intentionally left blank)

IN WITNESS WHEREOF, the Parties have caused this Instrument to be executed by their proper and duly authorized representatives as of the Effective Date.

SPONSOR

New York City Department of Small Business Services, as Sponsor

By: ______________________
Name: **Andrew Schwartz**
Title: **Deputy Commissioner**

SPONSOR'S AGENT

New York City Economic Development Corporation, as Sponsor

By: ______________________
Name: Thomas McKnight
Title: Executive Vice President

(Remainder of page intentionally left blank)

NYSDEC

New York State Department of Environmental Conservation

By: ____________________

Name: Stephan M. Zahn

Title: Acting Regional Director

(Remainder of page intentionally left blank)

Signature Page to Instrument

CORPS

U.S. Army Corps of Engineers

By: ______________________

Name: David A. Caldwell
Title: Colonel, U.S. Army
Commander

(Remainder of page intentionally left blank)

<u>NYDOS</u>

New York State Department of State

By: ______________________

Name: Sandra Allen

Title: Deputy Secretary of State for Planning and Development

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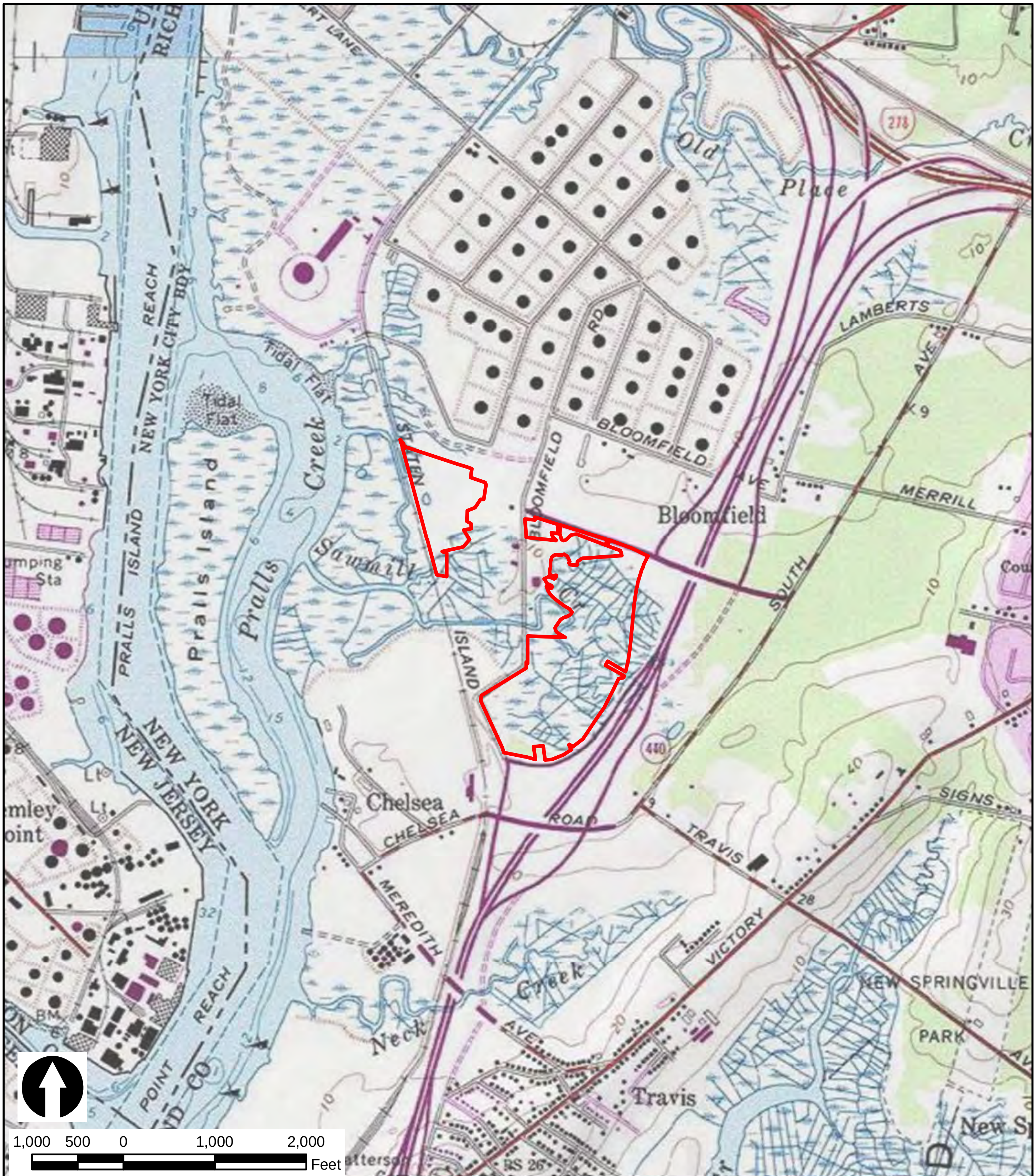
EXHIBIT A
VICINITY MAP



Project Site

Source: Copyright:© 2011 National Geographic Society, i-cubed

NYCEDC
New York City Economic Development Corporation

Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York

Vicinity Map

Louis Berger

April 2015

Exhibit A

EXHIBIT B
FORM OF RESTRICTIVE DECLARATION AND FORM OF PROPERTY PROTECTION

<u>Description of Property</u>

The Property is located on Staten Island in Richmond County, New York as shown on the U.S. Geologic Survey (USGS) topographic map of Arthur Kill, NY 7.5-minute quadrangle within a site that is bisected by Chelsea Road (oriented north to south) into a western section and an eastern section. The western section is bounded by railroad tracks to the west, open land to the north, Chelsea Road and privately-owned parcels to the east and by open land and Saw Mill Creek to the south. The eastern section is bounded by Chelsea Road and privately-owned parcels to the west, Edward Curry Avenue and associated right-of-way to the north, tidal marsh followed by Route 440 to the east, and Chelsea Road and an off-ramp from Route 440 to the south.

The total area for the Property is 68.94 acres. The western section is 15.00 acres and consists of one parcel (Pilot Site Parcel A). The eastern section is 53.94 acres and is comprised of three parcels: Pilot Site Parcel B (1.55 acres); Pilot Site Parcel C (0.83 acres); and Pilot Site Parcel D (51.56 acres).

The Property is located at Latitude 40.61006 and Longitude -74.18869 within the NYSDEC Atlantic Ocean/Long Island Sound Watershed and the 8-digit Hydrologic Unit Code (HUC08) Sandy Hook-Staten Island subbasin (02030104). As of the Effective Date, the Property is designated on the Tax Map for the Borough of Staten Island with the following block and lot numbers.

Block	**Lot**	**Owner**
1780	1	The City of New York
1780	69	The City of New York
1780	210	The City of New York
1780	260	The City of New York
1780	275	The City of New York
1780	300	The City of New York
1790	100	The City of New York
1815	74	The City of New York
1815	251	The City of New York
1815	300	The City of New York
1815	325	The City of New York

FORM OF RESTRICTIVE DECLARATION

Form of Restrictive Declaration

STATE OF NEW YORK
COUNTY OF _________

DECLARATION OF RESTRICTIVE COVENANTS

This DECLARATION OF RESTRICTIVE COVENANTS (this "Declaration") is made as of [_____________][__], 201[__] by The City of New York, ("Declarant"), a New York municipal corporation with offices at City Hall, New York, NY.

RECITALS

WHEREAS, Declarant is the owner in fee of certain real property (*"real property" includes wetlands, any interest in submerged lands, uplands, associated riparian/littoral rights*) (the "Property") comprising 68.94 acres and located in the Borough of Staten Island in the City of New York, as such Property is more particularly described on the Tax Map of the City of New York as Block 1780, Lots [●], [●] and [●], Block 1790, Lots [●], [●], and [●] and Block 1815, Lots [●], [●] and [●]. The Declarant's deed(s) to the Property is or are recorded at Book ______, page _______; and

WHEREAS, Declarant plans the development of a wetland mitigation bank on the Property to be known as the "Saw Mill Creek Wetland Mitigation Bank" (the "Project") which includes discharge of dredged or fill material in a manner authorized by Department of the Army Permit ("DA Permit") number [_____] issued on [____________][__], 201[__] by the United States Army Corps of Engineers, New York District ("Corps of Engineers", to include any successor agency) in accordance with the federal Clean Water Act, 33 U.S.C. § 1344; and

WHEREAS, Declarant also seeks to undertake the Project in a manner authorized by New York State Department of Environmental Conservation ("NYSDEC", to include any successor agency) Permit number _____ issued on _______, 200__ in accordance with __________________ ("NYSDEC Permit"); and

WHEREAS, the Declarant or its designee, the New York City Economic Development Corporation, a New York not-for-profit corporation ("NYCEDC") intends to undertake the Project in accordance with that certain Mitigation Banking Instrument, dated as of [___________][__], 201[5], among NYCEDC, the Corps of Engineers, NYSDEC and the other parties thereto (the "Instrument"), which is incorporated into the DA Permet, and it is a requirement under the Instrument and the DA Permit that this Declaration be delivered in connection with the Project; and

WHEREAS, as a portion of the compensatory mitigation required by the DA Permit and the NYSDEC Permit; in recognition of the continuing benefit to the Property; as contemplated in the Instrument; and for the protection of waters of the United States and scenic, resource, environmental, and general property values; Declarant agrees to place certain Restrictive Covenants on the Property (the "Restricted Property"), in order that the Restricted Property shall remain substantially in its natural condition forever; and

WHEREAS, the Restricted Property comprises a total of 68.94 acres of wetlands and adjacent uplands and is shown on the map entitled "______________ Map", dated ______ and filed with the plat described below; and

WHEREAS, a metes and bounds description of the Restricted Property is attached to this Declaration as Attachment 1 and made a part hereof; and a reduced copy of the "___________________Map" is attached to this Declaration as Attachment 2 and made a part hereof.

NOW THEREFORE, for good and valuable consideration as set forth above, Declarant hereby declares that the Restricted Property shall be held, occupied, and used, and shall be transferred, conveyed, leased, or otherwise disposed of subject to the following Restrictive Covenants, which shall run with the land and be binding on all heirs, successors, assigns lessees, other occupiers and users (they are included in the term, "Declarant," below).

PROHIBITIONS

The Declarant shall ensure that these Prohibitions shall run with the Restricted Property in perpetuity, and be binding on the Declarant and its successors, assigns, lessees, and other occupiers and users. These Restrictive Covenants are subject to Declarant's reserved rights, which follow, and to the requirements of the DA and NYSDEC Permits and of the Instrument.

1. General. There shall be no future filling, flooding, excavating, mining or drilling; no removal of natural materials; and no alteration of the topography which would materially affect the Restricted Property in any manner, except as authorized by the DA or NYSDEC Permit or the Instrument.

2. Waters and Wetlands. In addition to the general restrictions above, within the Restricted Property there shall be no draining, dredging, damming or impounding; no changing the grade or elevation, impairing the flow or circulation of waters, or reducing the reach of waters; and no other discharges or activity requiring a permit under applicable water pollution control laws or regulations, except as authorized by the DA or NYSDEC Permit or the Instrument.

3. Trees/Vegetation. On the Restricted Property there shall be no clearing, burning, cutting or destroying of trees or vegetation, except removal or trimming of vegetation hazardous to person or property, or of timber downed or damaged due to natural disaster, or as authorized by the DA or NYSDEC Permit or the Instrument. There shall be no planting or introduction of non-native or exotic species of trees or other vegetation.

4. Disposal: There shall be no dumping of trash, waste, garbage or toxic, unsightly, hazardous or offensive material on the Restricted Property.

5. Uses. No agricultural, animal husbandry, industrial, mining, logging or commercial activity shall be undertaken or allowed on the Restricted Property.

6. Structures/Utilities. There shall be no construction, erection, or placement of buildings, billboards, utilities components or any other structures, to include trailers, mobile homes or recreational vehicles, telecommunications towers or antennas, on the Restricted Property.

1. Roads. There shall be no construction of roads, rails, trails or walkways on the Restricted Property.

8. Pest Control. There shall be no application of pesticides or herbicides to control vegetation on the Restricted Property, without prior written approval of the Corps of Engineers or NYSDEC.

9. Vehicle Use. There shall be no driving or use of any mechanical conveyance which may alter or impair the natural contour of the Restricted Property or its natural vegetation, except that motor vehicles may be used in case of emergency, for law-enforcement purposes, or to perform mitigation activity as required by the DA or NYSDEC Permit or the Instrument.

10. Other Prohibitions. Any other use of, or activity on, the Restricted Property which is or may become inconsistent with the purposes of this Declaration, the preservation of the Restricted Property substantially in its natural condition, or the protection of its environmental systems, is prohibited.

GENERAL CONDITIONS

1. Other Restrictions. The Declarant represents and warrants that no restriction of record on the use of the Restricted Property, nor any presently existing future estate or interest in the Restricted Property, nor any lien, obligation, covenant, limitation, lease, mortgage or encumbrance of any kind precludes the imposition of the restrictions, covenants, obligations or agreements of this Declaration, or the maintenance of the Restricted Property in accordance herewith.

2. Existing Conditions. The Declarant represents and warrants that no structures of any kind, to include roads, trails or walkways, and that no violations of any these Restrictive Covenants exist on the Restricted Property at the time of execution of this Declaration.

3. Reserved Rights. The Restrictive Covenants set forth in this Declaration are created solely for the protection of the Restricted Property, and for the consideration and values set forth above, and Declarant reserves the ownership of the fee simple estate upon the Restricted Property and all rights appertaining thereto, including the right to engage in all acts or uses not prohibited by this Declaration and not inconsistent with the conservation purposes hereof. It is expressly understood and agreed that the terms of this Declaration do not grant or convey to members of the general public any rights of ownership, entry or use of the Restricted Property.

4. Marking. The Declarant shall mark the limits of the Restricted Property in a manner approved by the Corps of Engineers, and shall maintain the marking in place so as to notify the public that the Restricted Property is an area preserved for conservation purposes.

5. Recording. A plat depicting the boundaries of the Restricted Property is recorded with the ________County Clerk at Book ______, Page _____. The Declarant shall record this Declaration in the records of the ______County Clerk, shall insure that this Declaration is indexed against the Restricted Property, and shall provide the Corps of Engineers with a copy of this Declaration, as filed, within 30 days of execution hereof.

6. Compliance Inspections. The Corps of Engineers, NYSDEC and their authorized agents shall have the right to enter and go upon the lands of Declarant to inspect the Restricted Property and take actions necessary to verify compliance with the Restrictive Covenants set forth in this Declaration.

7. Enforcement. This Declaration is entered as a condition of the DA Permit identified above. The Declarant grants to the Corps of Engineers, the U.S. Department of Justice and NYSDEC a discretionary right to enforce the Restrictive Covenants set forth in this Declaration in a judicial action against any person or other entity violating or attempting to violate these Restrictive Covenants; provided, however, that no violation of these Restrictive Covenants shall result in a forfeiture or reversion of title. In any enforcement action, an enforcing agency shall be entitled to a complete restoration for any violation, as well as any other judicial remedy such as civil or criminal penalties or an award of agency attorneys' fees. Nothing herein shall limit the right of the Corps of Engineers or NYSDEC to modify, suspend or revoke their respective Permits.

8. Notice to Government. Any permit application or request made to any governmental entity and affecting the Restricted Property shall expressly reference and include a copy (with the recording stamp) of this Declaration.

9. Property Transfers. At least 30 days prior to conveyance of any interest in the Restricted Property, Declarant (to include any successor Declarant) shall notify the Corps of Engineers and NYSDEC of such intended conveyance, providing the full names and mailing addresses of all Grantees. Declarant shall include the following notice on all deeds, mortgages, plats, or any other legal instruments used to convey any interest in the Property (failure to comply with this paragraph does not impair the validity or enforceability of these Restrictive Covenants):

> NOTICE: This Property is Subject to Declaration of Restrictive Covenants Recorded at [*insert book and page references, county(ies), and date of recording*].

10. Amendment. This Declaration may only be amended by a recorded document signed by the Declarant after written approval by the Corps of Engineers and NYSDEC. Any amendment shall be consistent with the Corps of Engineers' model conservation restrictions at the time of amendment. Amendment shall be allowed at the discretion of the Corps of Engineers and NYSDEC, in consultation with resource agencies as appropriate, and then only in exceptional circumstances. Mitigation for amendment impacts will be required pursuant to Corps of Engineers and NYSDEC mitigation policy at the time of amendment. There shall be no obligation to allow an amendment.

11. Severability Provision. Should any separable part of these Restrictive Covenants be held contrary to law, the remainder shall continue in full force and effect.

(Remainder of page intentionally left blank)

IN WITNESS WHEREOF, the Declarant has duly executed this Declaration of Restrictive Covenants on the date written above.

IN THE PRESENCE OF:

____
Name:

THE CITY OF NEW YORK, Declarant

By: ________________________________
Name:
Title:

Approved as to form:

By: ____________________________
Acting Corporation Counsel

STATE OF NEW YORK)
) ss.:
COUNTY OF NEW YORK)

On this ____ day of _________________ in the year _________, before me personally appeared ____________________personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed in the within instrument and acknowledged to me that he executed the same in his capacity, and that by his signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

____
NOTARY PUBLIC
STATE OF NEW YORK

ATTACHMENT 1
METES AND BOUNDS DESCRIPTION

Borough of Staten Island – NYCEDC
Pilot Project Site "A"
Part of Block 1815, Lots 74, 251, 300 & 325

All that piece or parcel of land situate, lying and being in the Borough of Staten Island, County of Richmond, State of New York, being part of Tax Parcel Block 1815, Lots 74, 251 & 300, described as follows: herein

BEGINNING at a point, said point being the northeast corner of the parcel described herein, and lying south and west from the corner formed by the intersection of the westerly side of Chelsea Road with the southerly side of River Road, the following two courses and distances:

1. South 20 degrees 36 minutes 39 seconds West along the westerly line of Chelsea Road a distance of 299.11 feet to a point;

2. North 72 degrees 11 minutes 21 seconds West a distance of 581.97 feet to the point or place of beginning;

THENCE from said point of beginning in a southerly and easterly direction along the westerly and southerly sides of Tax Parcel Block 1815 Lot 375 the following two courses and distances:

1. South 10 degrees 57 minutes 25 seconds West a distance of 99.99 feet to a point;

2. South 72 degrees 11 minutes 21 seconds East a distance of 169.65 feet to a point in the southern boundary of Tax Parcel Block 1815 Lot 375;

THENCE in a southerly direction along the eastern boundary of the parcel described herein the following eight courses and distances:

1. South 16 degrees 03 minutes 52 seconds East a distance of 28.47 feet to a point;

2. South 07 degrees 07 minutes 32 seconds West a distance of 162.65 feet to a point;

3. North 89 degrees 35 minutes 50 seconds West a distance of 38.41 feet to a point;

4. South 33 degrees 36 minutes 35 seconds West a distance of 105.97 feet to a point;

5. South 66 degrees 51 minutes 48 seconds West a distance of 92.26 feet to a point;

6. South 02 degrees 07 minutes 11 seconds West a distance of 112.41 feet to a point;

7. South 58 degrees 27 minutes 13 seconds East a distance of 50.79 feet to a point;

8. South 06 degrees 04 minutes 36 seconds East a distance of 57.13 feet to a point on the northerly boundary of Tax Parcel Block 1815 Lot 180;

THENCE in a westerly and southerly direction along the northerly and westerly boundaries of Tax Parcels Block 1815 Lot 180 & Lot 260 the following four courses and distances:

1. South 81 degrees 49 minutes 51 seconds West a distance of 84.81 feet to a point;

2. South 30 degrees 41 minutes 28 seconds East a distance of 123.73 feet to a point;

3. South 41 degrees 12 minutes 46 seconds West a distance of 103.64 feet to a point;

4. South 77 degrees 08 minutes 27 seconds West a distance of 235.05 feet to a point formed by the intersection of the southern boundary of Tax Parcel Block 1815 Lot 300 with the southwest corner of Tax Parcel Block 1815 Lot 260;

THENCE South 72 degrees 06 minutes 10 seconds East along the southern boundary of Tax Parcel Block 1815 Lot 260 a distance of 50.37 feet to a point;

THENCE South 00 degrees 00 minutes 00 seconds East through Tax Parcel Block 1815 Lot 251 a distance of 259.82 feet to a point on the northern boundary of Tax Parcel Block 1815 Lot 235;

THENCE North 80 degrees 12 minutes 44 seconds West a distance of 112.94 feet to a point on the easterly line of a railroad right-of-way known as Tax Parcel Block 1815 Lot 70;

THENCE North 14 degrees 58 minutes 58 seconds West along the aforementioned railroad right-of-way a distance of 1,534.19 feet to a point, said point being the north corner of Tax Parcel Block 1815 Lot 74;

THENCE in a southerly direction along the easterly boundary of Tax Parcel Block 1815 Lot 74, as shown on tax map dated 2/05/2008, to a point on the western boundary of Tax Parcel 1815 Lot 300;

THENCE North 15 degrees 27 minutes 20 seconds East a distance of 17’ plus/minus to the northwest corner of Tax Parcel Block 1815 Lot 300;

THENCE South 72 degrees 11 minutes 21 seconds East a distance of 769.87 feet to the point and place of beginning.

Containing approximately 653,565 square feet (15.0038 acres).

Borough of Staten Island – NYCEDC
Pilot Project Site "B"
Part of Block 1780, Lot 69

All that piece or parcel of land situate, lying and being in the Borough of Staten Island, County of Richmond, State of New York, being part of Tax Parcel Block 1780, Lot 69, described as follows:

BEGINNING at a point on the proposed easterly side of Chelsea Road as adopted, said point being South 03 degrees 41 minutes 28 seconds East a distance of 73.81 feet from the corner formed by the intersection of the proposed new easterly side of Chelsea Road with the southerly side of Edward Curry Avenue;

THENCE from said point of beginning South 83 degrees 53 minutes 21 seconds East along the southerly line of Tax Parcel Block 1780 Lot 80 a distance of 109.78 feet to a point;

THENCE North 03 degrees 41 minutes 28 seconds West along the easterly line of Tax Parcel Block 1780 Lot 80 a distance of 31.00 feet to a point at the southwest corner of Easement E-222;

THENCE South 72 degrees 37 minutes 34 seconds East along the southerly line of Easement E-222 a distance of 267.24 feet to a point on the westerly line of Easement DE-222;

THENCE South 03 degrees 47 minutes 17 seconds West along the westerly line of Easement DE-222 a distance of 102.60 feet to the northwest corner of Easement DE-223;

THENCE in a generally westerly direction the following six (6) courses and distances along the northerly lines of Tax Parcels Block 1780 Lots 57, 250 & 270:

1. North 78 degrees 05 minutes 21 seconds West a distance of 66.95 feet to a point;

2. South 06 degrees 00 minutes 21 seconds East a distance of 28.61 feet to a point;

3. South 34 degrees 17 minutes 21 seconds East a distance of 26.42 feet to a point;

4. South 46 degrees 10 minutes 21 seconds East a distance of 45.55 feet to a point;

5. South 16 degrees 30 minutes 39 seconds West a distance of 4.35 feet to a point;

6. North 83 degrees 53 minutes 21 seconds West a distance of 328.38 feet to a point in the easterly side of Chelsea Road;

THENCE North 03 degrees 41 minutes 28 seconds West along the easterly side of Chelsea Road, a distance of 200.58 feet to the point and place of beginning.

Containing 67,339 square feet (1.5459 acres).

Borough of Staten Island – NYCEDC
Pilot Project Site “C”
Part of Block 1780, Lot 69

All that piece or parcel of land situate, lying and being in the Borough of Staten Island, County of Richmond, State of New York, being part of Tax Parcel Block 1780, Lot 69, described as follows:

BEGINNING at a point formed by the intersection of the south line of Easement E-222A with the east line of Easement DE-222, said point lying southeast from the corner formed by the intersection of the easterly adopted widening line of Chelsea Road with the southerly side of Edward Curry Avenue the following two courses and distances:

1. South 72 degrees 53 minutes 05 seconds East along the southerly side of Edward Curry Avenue a distance of 427.15 feet to a point at the intersection of the south line of Edward Curry Avenue with the east line of Easement DE-222;

2. South 03 degrees 47 minutes 17 seconds West along the easterly side of Easement DE-222 a distance of 20.96 feet to the point and place of beginning.

THENCE from said point of beginning South 72 degrees 37 minutes 34 seconds East along the southerly line of Easement E-222A a distance of 536.48 feet to a point on the westerly side of Easement DE-223A;

THENCE South 17 degrees 06 minutes 55 seconds West along the west line of Easement DE-222A a distance of 59.90 feet to the northwest corner of Easement DE-223A;

THENCE in a generally westerly direction the following seven (7) courses and distances along the northerly line of Tax Parcel Block 1780 Lot 250:

1. North 69 degrees 27 minutes 21 seconds West a distance of 337.57 feet to a point;

2. South 82 degrees 29 minutes 39 seconds West a distance of 64.00 feet to a point;

3. South 44 degrees 59 minutes 39 seconds West a distance of 79.04 feet to a point;

4. South 82 degrees 29 minutes 39 seconds West a distance of 27.07 feet to a point;

5. North 62 degrees 03 minutes 21 seconds West a distance of 23.70 feet to a point;

6. North 13 degrees 53 minutes 21 seconds West a distance of 56.52 feet to a point;

7. North 78 degrees 05 minutes 21 seconds a distance of 4.31 feet to the southeast corner of Easement DE-222;

THENCE North 03 degrees 47 minutes 17 seconds East along the easterly line of Easement DE-222 a distance of 100.13 feet to the point and place of beginning.
Containing 36,071 square feet (0.82807 acres).

Borough of Staten Island – NYCEDC
Pilot Project Site "D"
Part of Block 1780, Lots 1, 69, 210, 260, 275 & 300 & Block 1790 Lots 120 & 100

All that piece or parcel of land situate, lying and being in the Borough of Staten Island, County of Richmond, State of New York, being part of Tax Parcel Block 1780, Lots 1, 69, 210, 260, 275 & 300 & Block 1790 Lots 120 & 100, described as follows:

BEGINNING at a point formed by the intersection of the west line of West Shore Expressway with the south line of Easement E-139B, said point lying southwest, from the corner formed by the intersection of the westerly side of West Shore Expressway with the southerly side of Edward Curry Avenue, along the arc of a curve to the left having a central angle of 0 degrees 57 minutes 27 seconds, a radius of 1528.00 feet and an arc length of 25.53 feet;

THENCE from said point of beginning in a southerly direction along the westerly side of West Shore Expressway the following three courses and distances:

1. Along the arc of a curve to the left having a central angle of 20 degrees 33 minutes 37 seconds, a radius of 1528.00 feet and an arc length of 548.32 feet to a point;

2. South 05 degrees 30 minutes 52 seconds West a distance of 483.79 feet to a point;

3. Along the arc of a curve to the right having a central angle of 10 degrees 14 minutes 48 seconds, a radius of 1472.00 feet and an arc length of 263.25 feet to a point formed by the intersection of the north line of Easement DE-137 with the west line of West Shore Expressway;

THENCE along the perimeter of Easement DE-137 the following three courses:

1. North 60 degrees 28 minutes 49 seconds West a distance of 225.87 feet to a point;

2. South 29 degrees 31 minutes 11 seconds West a distance of 50.00 feet to a point;

3. South 60 degrees 28 minutes 49 seconds East a distance of 237.20 feet to a point on the west line of West Shore Expressway;

THENCE along the west line of West Shore Expressway in a southerly direction, along the arc of a curve to the right having a central angle of 00 degrees 43 minutes 24 seconds, a radius of 1472.00 feet and an arc length of 18.58 feet to a point formed by the intersection of the west line of West Shore Expressway with the north line of Easement E-137;

THENCE in a southwesterly direction along the westerly lines of Easements E-137, E-138 & E-134C the following 6 courses and distances:

1. South 77 degrees 22 minutes 43 seconds West a distance of 57.82 feet to a point;

2. South 25 degrees 05 minutes 02 seconds West a distance of 133.77 feet to a point;

3. South 27 degrees 34 minutes 48 seconds West a distance of 219.42 feet to a point;

4. South 34 degrees 34 minutes 40 seconds West a distance of 126.19 feet to a point;

5. South 33 degrees 57 minutes 25 seconds West a distance of 286.63 feet to a point;

6. South 51 degrees 50 minutes 14 seconds West a distance of 139.78 feet to a point on the northerly line of Easement DE-134;

THENCE along the perimeter of Easement DE-134 the following three courses and distances:

1. North 53 degrees 59 minutes 16 seconds West a distance of 46.70 feet to a point;

2. South 49 degrees 03 minutes 29 seconds West a distance of 7.21 feet to a point;

3. South 23 degrees 23 minutes 47 seconds East a distance of 60.05 feet to a point on the northwest line of West Shore Expressway;

THENCE in a southwesterly direction along the northwest line of Easement E-134B the following three courses and distances:

1. South 54 degrees 16 minutes 33 seconds West a distance of 100.64 feet to a point;

2. South 70 degrees 12 minutes 59 seconds West a distance of 135.44 feet to a point;

3. South 84 degrees 16 minutes 31 seconds West a distance of 75.03 feet to a point in the east line of Tax Parcel Block 1790 Lot 120;

THENCE along the perimeter of Tax Parcel Block 1790 Lot 120 the following three courses:

1. North 07 degrees 15 minutes 07 seconds West a distance of 158.65 feet to a point;

2. South 82 degrees 44 minutes 53 seconds West a distance of 105.00 feet to a point;

3. South 07 degrees 15 minutes 06 seconds East a distance of 142.21 feet to a point on the north line of Easement E-134A;

THENCE in a westerly direction along the northerly line of Easement E-134A the following two courses and distances:

1. North 73 degrees 43 minutes 46 seconds West a distance of 92.70 feet to a point;

2. North 78 degrees 14 minutes 39 seconds West a distance of 257.54 feet to a point on the easterly line of Bloomfield Road;

THENCE in a northerly direction along the easterly side of Bloomfield Road the following seven courses and distances:

1. North 21 degrees 23 minutes 59 seconds West a distance of 64.91 feet to a point;
2. North 24 degrees 30 minutes 13 seconds West a distance of 561.25 feet to a point;

3. North 10 degrees 05 minutes 30 seconds East a distance of 55.32 feet to a point;
4. North 58 degrees 41 minutes 58 seconds East a distance of 573.40 feet to a point;
5. North 00 degrees 20 minutes 08 seconds West a distance of 66.00 feet to a point;
6. South 52 degrees 13 minutes 15 seconds East a distance of 21.48 feet to a point;
7. North 00 degrees 20 minutes 08 seconds West a distance of 299.53 feet to the southerly side of Tax Parcel Block 1780 Lot 15;

THENCE South 87 degrees 42 minutes 08 seconds East along the southerly side of Tax Lot 15 a distance of 411.02 feet to a point;

THENCE in a northerly direction along the easterly side of Tax Lot 15 as reflected on the current NYC Tax Map, to a point on the dividing line between Tax Parcels Block 1780 Lot 275 and Block 1780 Lot 260;

THENCE in a northerly direction along the High Water Line of Maggie's Creek as located on 2/20/1969 as per Deed Document Number 292830 to a point;

THENCE in an easterly direction along the northerly side of Tax Parcel Block 1780 Lot 260 the following ten courses and distances:

1. South 85 degrees 20 minutes 21 seconds East a distance of 69.35 feet to a point;
2. North 72 degrees 16 minutes 39 seconds East a distance of 31.71 feet to a point;
3. South 56 degrees 38 minutes 21 seconds East a distance of 46.64 feet to a point;
4. South 20 degrees 57 minutes 21 seconds East a distance of 57.15 feet to a point;
5. South 15 degrees 37 minutes 39 seconds West a distance of 19.44 feet to a point;
6. South 30 degrees 41 minutes 21 seconds East a distance of 20.25 feet to a point;
7. South 85 degrees 38 minutes 21 seconds East a distance of 75.47 feet to a point;
8. North 11 degrees 57 minutes 39 seconds East a distance of 40.60 feet to a point;
9. North 53 degrees 17 minutes 39 seconds East a distance of 60.00 feet to a point;
10. North 85 degrees 49 minutes 39 seconds East a distance of 435.76 feet to a point on the westerly boundary of Tax Parcel Block 1780 Lot 210;

THENCE North 13 degrees 42 minutes 21 seconds West along the westerly side of Tax Parcel Block 1780 Lot 210 a distance of 53.38 feet to the southeast corner of Tax Parcel Block 1780 Lot 69;

THENCE North 69 degrees 27 minutes 21 seconds West along the southerly side of Tax Parcel Block 1780 Lot 69 a distance of 150.24 feet to a point in the easterly line of Easement DE-223A;

THENCE North 17 degrees 06 minutes 55 seconds East along the eastern boundary of Easement DE-222A a distance of 66.88 feet to a point at the southwest corner of Easement E-139B;

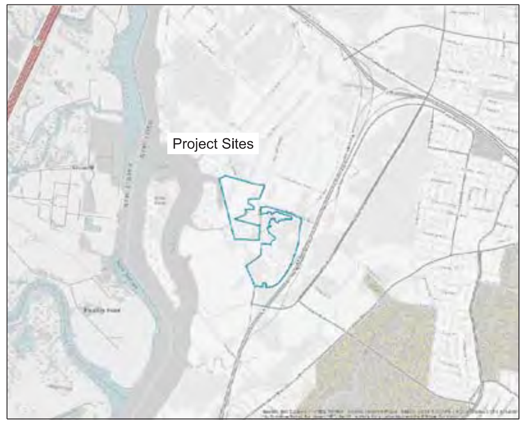
THENCE in an easterly direction along the south side of Easement E-139B the following two courses and distances:

1. South 69 degrees 54 minutes 35 seconds East a distance of 260.04 feet to a point;

2. South 64 degrees 01 minutes 58 seconds East a distance of 193.24 feet to the point and place of beginning.

Containing approximately 2,246,146 square feet (51.5644 acres).

ATTACHMENT 2
BOUNDARY SURVEY MAP



Key Map
(Not to Scale)

GREGORY J. de BRUIN, P.E. & L.S. — DATE 3/25/15
N.Y.S. L.S. No. 49945
gdebruin@gayrondebruin.com

The property lines shown on this plan are based upon an actual field survey completed by Gayron de Bruin Land Surveying and Engineering, PC in June 2013 and from deeds and plans of record.

The existing conditions shown on this plan are based upon an actual on-the-ground instrument survey completed by Gayron de Bruin Land Surveying and Engineering, PC on in June 2013 and supplemented by stock photogrammetry performed by Geomaps International, Inc. in 2010.

There is no guarantee that all easements have been shown.

Horizontal datum is North American Datum 1983 (2011) Epoch 2010.00 (New York State Plane Coordinate System, Long Island Zone). All linear measurements are in U.S. Survey Feet.

Unauthorized alteration or addition to this survey is a violation of section 7209 of the New York State Education Law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered valid true copies. Certifications indicated herein shall run only to the person for whom the survey map is prepared, and on his behalf to the title company, governmental agency and lending institution. Certifications are not transferrable to additional institutions or subsequent owners.

LEGEND

MANHOLES: CATV, DRAIN, ELECTRIC, GAS, SEWER, SEWER CLEANOUT, TRAFFIC, TELEPHONE, UNKNOWN, WATER

UTILITY HARDWARE: ELECTRIC VAULT, GAS MAIN VALVE, GAS METER, GAS SERVICE VALVE, GAS VENT, HYDRANT, HYDRANT VALVE, IRRIGATION VALVE, OIL FILLER VALVE, POLE RISER - ELECTRIC, MONITORING WELL, POLE RISER - TELEPHONE, ROOF DRAIN, SEWER VENT, TRAFFIC DETECTOR, TRAFFIC LOOP, UNIDENTIFIED VAULT, UNKNOWN VALVE, WATER MAIN VALVE, WATER METER, WATER SERVICE VALVE

UTILITY POLES: LIGHT POLE BASE, METAL POLE W/LIGHT, METAL POLE WITH TRAFFIC, WOODEN UTILITY POLE, WOODEN UTILITY POLE W/LIGHT

FENCES: GUARD RAIL, CHAIN LINK FENCE, WOODEN FENCE, METAL FENCE, VINYL FENCE

VEGETATION: BUSH, HEDGE, TREE (WITH SIZE), TREELINE

CATCH BASINS: TYPE "A", TYPE 1, FLUSH GRATE, ROUND GRATE

MISCELLANEOUS: CELLAR DOOR, GUARDPOST, GUYWIRE & ANCHOR, HANDICAP RAMP, MAILBOX, PARK BENCH, PARKING METER, RAILROAD TRACKS, SIGN - SINGLE POST, SIGN - DOUBLE POST, TELEPHONE BOOTH

ABBREVIATIONS

ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=18.30
ALUMINUM	ALUM	INVERT ELEVATION	I=1.6
BELGIAN BLOCK	B. BLK	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	C.L.F.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC.
FRAME	FR	WOOD	WD

Revision No.	Revision	Date
3	Add bearings and distances to Pilot Site Boundary Lines Add Tie Distances to Pilot Site Points of Beginning Create sheets 3 and 4 for Pilot Areas	03/20/2015
2	Update to show property corners set in field on 6/6/2014	07/01/2014
1	Revise as per LBG comments dated 08/05/2013	08/06/2013

Block 1815 - Lots 74, 75, 85, 125, 135, 150, 204, 220, 235, 251, 300, 325, 375

Boundary Survey of
Saw Mill Creek Park

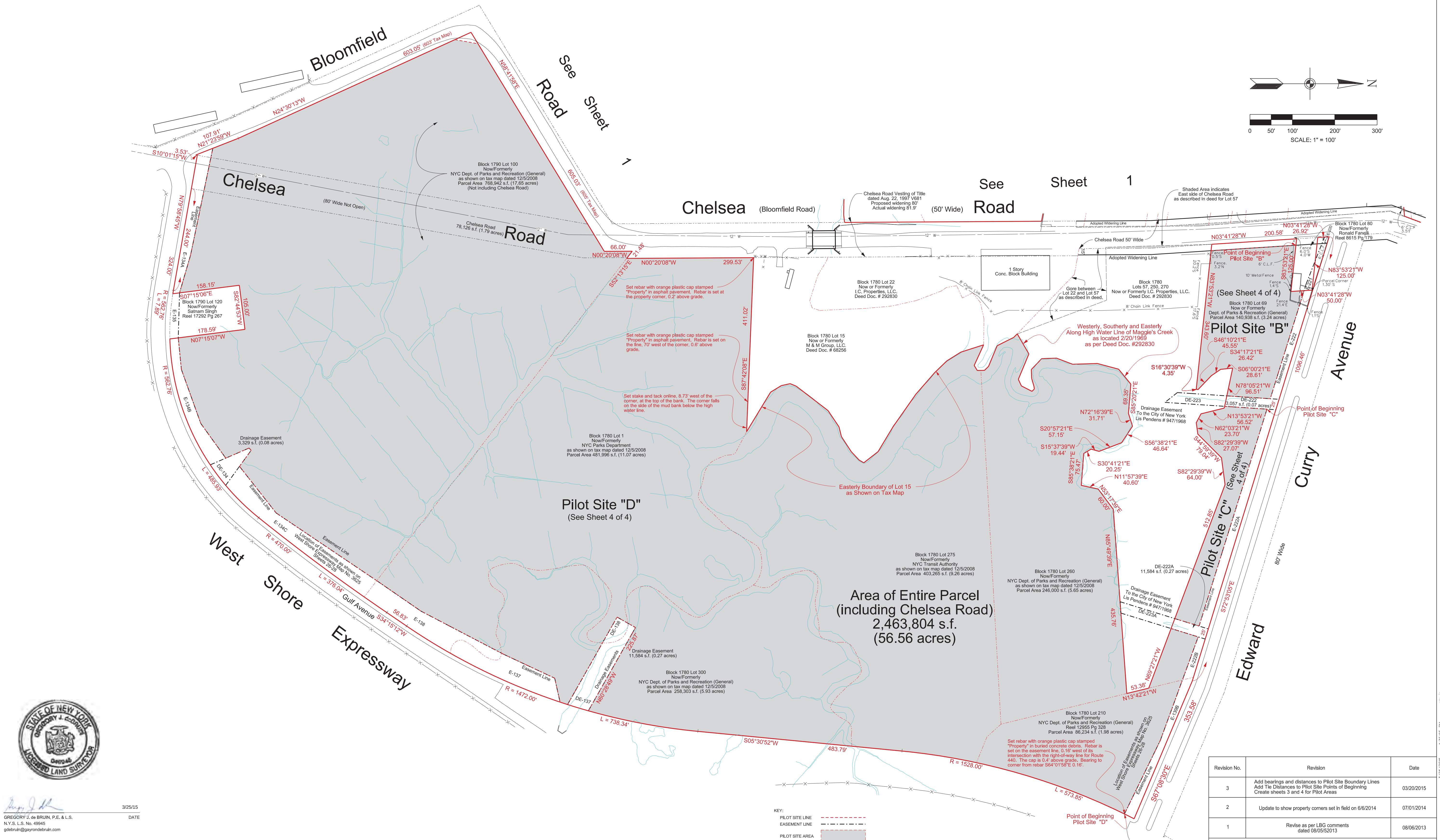
Borough of Staten Island, Richmond County, NY

JOB NO. 5830
DRAWING DATE 7/16/2013
FIELD WORK DATE May-June 2013

PREPARED BY
Gayron de Bruin Land Surveying and Engineering, P.C.
11 UNION AVENUE, BETHPAGE, NY 11714-5811
(516) 579-3111

DRAWING NO. D-10593
DRAWN/CHK MML/MA
SHEET 1 OF 4

P:\5830\Survey\CAD\5830 BOUNDARY.dgn 3/25/2015 4:34:43 PM mlew



GREGORY J. de BRUIN, P.E. & L.S. — 3/25/15 (DATE)
N.Y.S. L.S. No. 49945
gdebruin@gayrondebruin.com

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LEGEND

MANHOLES: CATV, DRAIN, ELECTRIC, GAS, SEWER, SEWER CLEANOUT, TRAFFIC, TELEPHONE, UNKNOWN, WATER

UTILITY HARDWARE: ELECTRIC VAULT, GAS MAIN VALVE, GAS METER, GAS SERVICE VALVE, GAS VENT, HYDRANT, HYDRANT VALVE, IRRIGATION VALVE, OIL FILLER VALVE, POLE RISER - ELECTRIC, MONITORING WELL, POLE RISER - TELEPHONE, ROOF DRAIN, SEWER VENT, TRAFFIC DETECTOR, TRAFFIC LOOP, UNIDENTIFIED VAULT, UNKNOWN VALVE, WATER MAIN VALVE, WATER METER, WATER SERVICE VALVE

UTILITY POLES: LIGHT POLE BASE, METAL POLE W/LIGHT, METAL POLE WITH TRAFFIC, WOODEN UTILITY POLE, WOODEN UTILITY POLE W/LIGHT

FENCES: GUARD RAIL, CHAIN LINK FENCE, WOODEN FENCE, METAL FENCE, VINYL FENCE

VEGETATION: BUSH, HEDGE, TREE (WITH SIZE), TREELINE

CATCH BASINS: TYPE "A", TYPE 1, FLUSH GRATE, ROUND GRATE

MISCELLANEOUS: CELLAR DOOR, GUARDPOST, GUYWIRE & ANCHOR, HANDICAP RAMP, MAILBOX, PARK BENCH, PARKING METER, RAILROAD TRACKS, SIGN - SINGLE POST, SIGN - DOUBLE POST, TELEPHONE BOOTH

ABBREVIATIONS

ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=18.30
ALUMINUM	ALUM	INVERT ELEVATION	I=1.6
BELGIAN BLOCK	B. BLK	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	C.L.F.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC.
FRAME	FR	WOOD	WD

Revision No.	Revision	Date
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2	Update to show property corners set in field on 6/6/2014	07/01/2014
1	Revise as per LBG comments dated 08/05/52013	08/06/2013

Block 1780 - Lots 1, 69, 210, 260, 275, 300
Block 1790 - Lot 100

Boundary Survey of Saw Mill Creek Park

Borough of Staten Island, Richmond County, NY

JOB NO. 5830
DRAWING DATE 7/16/2013
FIELD WORK DATE May-June 2013

PREPARED BY
Gayron de Bruin Land Surveying and Engineering, P.C.
11 UNION AVENUE, BETHPAGE, NY 11714-5811
(516) 579-3111

DRAWING NO. D-10593
DRAWN/CHK MML/MA
SHEET 2 OF 4

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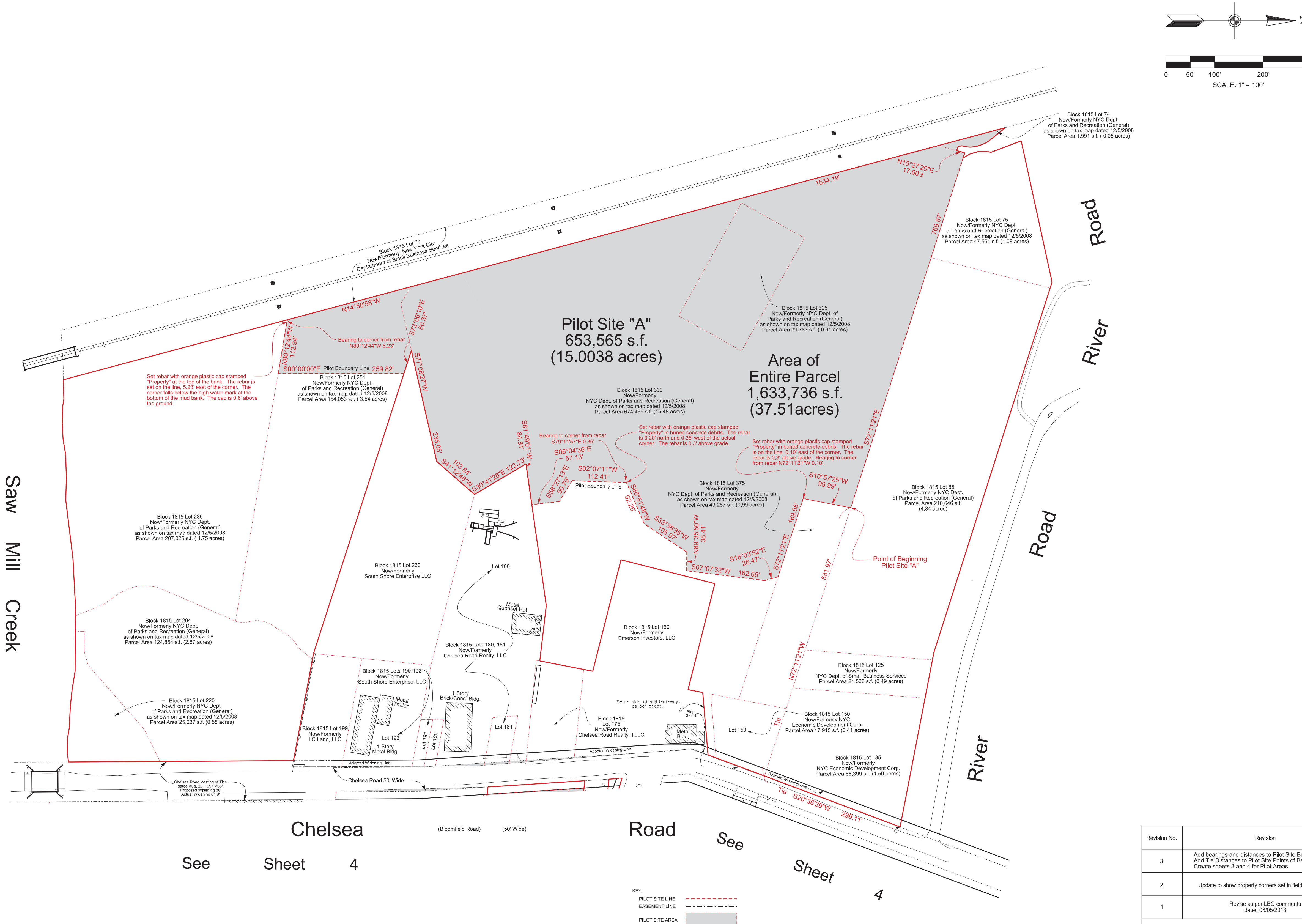

3/25/15

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LINE STYLES

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Block 1815 - Lots 74, 75, 85, 125, 135, 150, 204, 220, 235, 251, 300, 325, 375

Boundary Survey of Saw Mill Creek Park

Borough of Staten Island, Richmond County, NY

JOB NO. 5830	PREPARED BY	DRAWING NO. D-10593
DRAWING DATE 7/16/2013	Gayron de Bruin Land Surveying and Engineering, P.C. 11 UNION AVENUE, BETHPAGE, NY 11714-5811 (516) 579-3111	DRAWN/CHK MML/MA
FIELD WORK DATE May-June 2013		SHEET 3 OF 4

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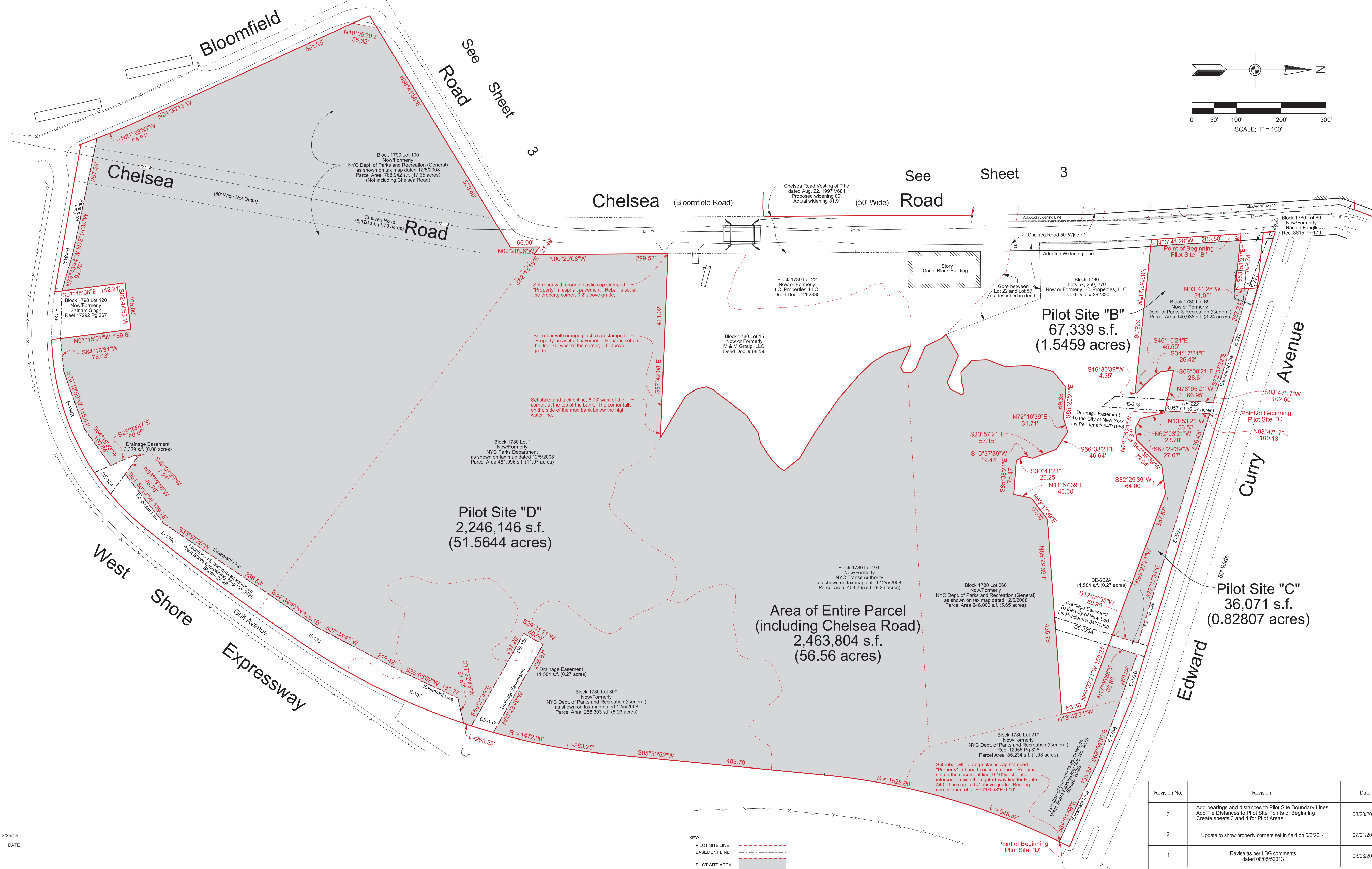

GREGORY J. de BRUIN, P.E. & L.S. 3/25/15
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Block 1780 - Lots 1, 69, 210, 260, 275, 300
Block 1790 - Lot 100

Boundary Survey of Saw Mill Creek Park

Borough of Staten Island, Richmond County, NY

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FIELD WORK DATE May-June 2013		SHEET 4 OF 4

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FORM OF PROPERTY PROTECTION AGREEMENT

The Property Protection Agreement will be inserted here upon approval by the IRT.

EXHIBIT C
BASELINE CONDITIONS REPORT

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ATTACHMENTS

This Baseline Conditions Report has been prepared as a result of baseline studies conducted within the 68.94-acre project area.

1.0 Project Location

The Saw Mill Creek Pilot Wetland Mitigation Bank (Bank) is located on Staten Island in Richmond County, New York as shown on the U.S. Geologic Survey (USGS) topographic map of Arthur Kill, NY 7.5-minute quadrangle (Figure C-1 of this Instrument). The geographic location of the project area is:

* Latitude: 40.61006
* Longitude: -74.18869

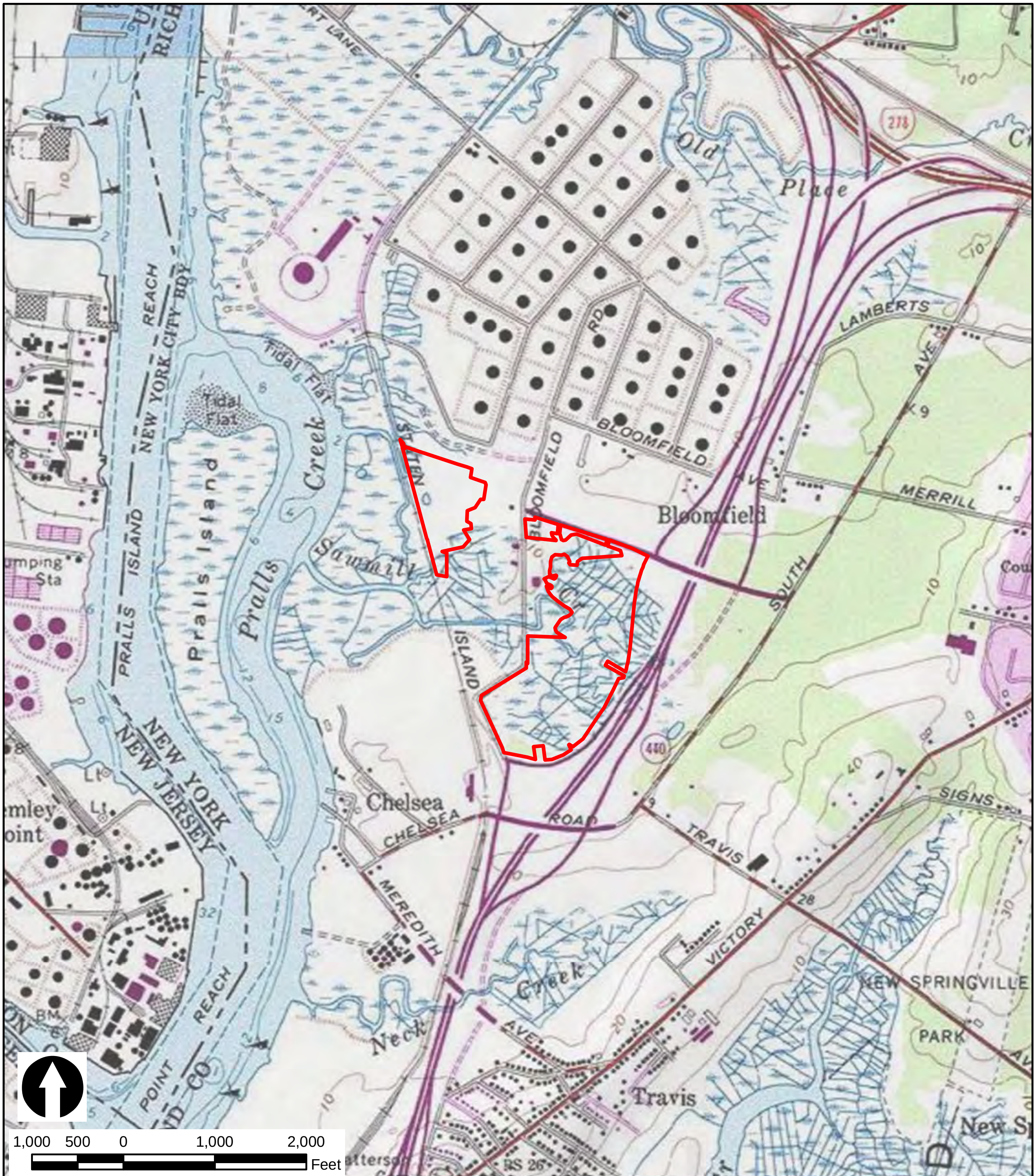
The project area encompasses 68.94 acres and is bisected by Chelsea Road (oriented north to south) into a western section (15.00 acres) and an eastern section (53.94 acres) as shown on Figure C-1. The western section is bounded by a railroad to the west, a Williams-Transco underground natural gas pipeline valve house access road to the north, Chelsea Road and privately-owned parcels to the east and by emergent marsh associated with Saw Mill Creek to the south. The eastern section is bounded by Chelsea Road and privately-owned parcels to the west, Edward Curry Avenue and associated right-of-way (ROW) to the north, followed by Route 440 to the east, and Chelsea Road and an off-ramp from Route 440 to the south.

The project area is comprised of 11 parcels owned by New York City as summarized in Table C-1 and consists mainly of undeveloped tidal marsh and upland areas with some areas of fill and development from adjoining parcels.

TABLE C-1.
PROJECT AREA PARCEL SUMMARY

Block	Lots
1780	1, 69, 210, 260, 275 and 300
1790	100 & 120
1815	74, 251, 300

Attachments C-1 and C-2 provide photographs of the project area and surrounding area.



Bank Boundary

Source: Copyright:© 2011 National Geographic Society, i-cubed

NYCEDC
New York City Economic Development Corporation

Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York

Louis Berger

April 2015

Figure C-1

2.0 Historic and Existing Conditions

A review of historic aerials and topographic maps (Attachment C-3) indicates that most of the project area was originally tidal marsh, but the topography of the area has been significantly altered over the past century by filling and ditching. Chelsea Road appears on a 1857 map as running along the eastern side of a strip of land approximately 300 to 400 feet wide, north of Saw Mill Creek. Some mosquito control ditches are evident in eastern and western parcels in a 1924 aerial photo. In a 1943 aerial photo the marsh had been ditched to its current extent. Mosquito ditches are very straight, narrow channels that were dug to drain the upper reaches of salt marshes, as it was formerly thought that ditching marshes would control mosquito breeding. The ditching often negatively impacted the hydrology and habitat of tidal marshes.

In the project area east of Chelsea Road, the marsh formerly extended beyond the area now occupied by Edward Curry Avenue. An island surrounded by salt marsh appears on a 1857 map and is visible in a 1924 aerial photo. This area was filled by 1943 and Edward Curry Avenue now crosses this area. Two large berms were constructed in this area south of Edward Curry Avenue between a 1966 and 1970 aerial photos, possibly to begin filling for development. This effort appears to have been abandoned, as only portions of the areas within the berms have been filled. The fill associated with construction of Route 440 is seen in a 1970 aerial photo. A human-made channel has been excavated to connect the wetlands east of Route 440 with wetlands in the eastern parcel. This channel flows through a large box culvert beneath Route 440. Some fill appears immediately south of Saw Mill Creek, along the east side of Chelsea Road in a 1943 and 1954 aerial photos. In a 1966 aerial photo, a much larger area has been filled, and by 1970, the portion of this area within the project boundary has been filled to its current extent.

In the project area west of Chelsea Road, railroad tracks were built on fill along the western parcel edge by 1957. There are no culverts under the railroad embankment along the project area boundary. The railroad tracks cross a bridge over Saw Mill Creek and over a tidal creek about 1,200 feet north of the northwest corner of the project boundary. The developed lots along the western side of Chelsea Road appear to remain confined to the original upland footprint until the 1960s. Available aerial imagery (Attachment C-3) indicates that these lots were progressively filled westward into the marsh.

Saw Mill Creek, a tidally influenced tributary of Pralls Creek and several tributaries and drainage ditches are located within the project area. The confluence of Saw Mill Creek and Pralls Creek is located approximately 600 feet west of the project area. Pralls Creek is a tributary of the Arthur Kill. The project area is connected to the Staten Island Sound through a series of smaller tidal channels. Part of the project area experiences daily tidal inundation.

3.0 Geology and Geomorphology

Duke Geological Laboratory, Trips on the Rocks, Guide 04: Staten Island and Vicinity, NY and NJ (Merguirian and Sanders, 2010) indicates the surficial geologic deposits beneath the organic material within the project area consist of glacial and Quaternary deposits of fine to coarse sand. These surficial deposits are underlain by the Newark Supergroup, a sequence of sedimentary rocks consisting of brownish and reddish shales and sandstones. Depth to bedrock in the vicinity of the project area is estimated to be approximately 30 to 50 feet below ground surface (bgs).

Much of the project area was originally tidal salt marsh, but the topography of the area has been significantly altered over the past century by filling and ditching. Chelsea Road appears on the 1857 map (based upon 1837 USGS Survey) as running along the eastern side of a strip of land approximately 300 to 400 feet wide, north of Saw Mill Creek. The road continues south, over a bridge and through bridged or filled marsh for about 500 feet to uplands located south of Saw Mill Creek. Some mosquito control ditches are evident in eastern and western parcels in the 1924 aerial photo. By the 1943 aerial photo the marsh had been ditched to its current extent. Mosquito ditches are very straight, narrow channels that were dug to drain the upper reaches of salt marshes, as it was formerly thought that ditching marshes would control mosquito breeding.

Project Area East of Chelsea Road

The marsh formerly extended beyond the area now occupied by Edward Curry Avenue. An island surrounded by salt marsh appears on the 1857 map and is visible in the 1924 aerial photo. This area was filled by 1943 and Edward Curry Avenue now crosses this area. Two large berms were constructed in this area between the 1966 and 1970 aerial photos, possibly to begin filling for development. This effort appears to have been abandoned, as only portions of the areas within the berms have been filled. The fill associated with construction of Route 440 is seen in the 1970 aerial photo. A man-made channel has been excavated to connect the wetlands east of Route 440 with wetlands in the eastern parcel. This channel flows through a large box culvert underneath Route 440 and its connecting ramps with Chelsea Road. Some fill appears immediately south of Saw Mill Creek, along the east side of Chelsea Road in the 1943 and 1954 aerial photos. By the 1966 aerial photo, a much larger area has been filled, and by 1970, the portion of this area within the project boundary has been filled to its current extent.

Project Area West of Chelsea Road

The forested area immediately north of Saw Mill Creek and east of Chelsea Road is portrayed as land on the 1857 and 1894 maps, though site inspection indicates that filling and dumping have also occurred there. By 1957, railroad tracks had been built on fill along the western parcel edge. There are no culverts under the railroad embankment along the project area boundary. The railroad tracks cross a bridge over Saw Mill Creek and over a tidal creek about 1,200 feet north of the northwest corner of the project boundary. The developed lots along the western side of Chelsea Road appear to remain confined to the original upland footprint until the 1960s. Available aerial imagery indicates that these lots were progressively filled westward into the marsh.

4.0 Topography

The Proposed Project is located in the Piedmont physiographic province, near its intersection with the Atlantic Coastal Plain and the Manhattan Prong of the New England Uplift. The topography of the Project Area is low lying, with ground-surface elevations ranging from 3 to 10 feet above mean sea level.

(see Figure C-1). The meandering courses of Saw Mill Creek indicate the low surface relief of the Saw Mill Creek Study Area.

5.0 Soils

The U.S Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), New York City Reconnaissance Soil Survey (2005) indicates that soils within the project area consist of four soil mapping units: Ipswich-Pawcatuck-Matunuck mucky peats (mapping unit 6); Laguardia-Ebbets-Pavement & Buildings, wet substratum complex, 0 to 8 percent slopes (mapping unit 7); Pavement & Buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes (mapping unit 101); and Windsor-Windsor, loamy substratum-Deerfield loamy sands, 0 to 8 percent slopes (mapping 238). Soil mapping units are described below and shown on Figure C-2.

Ipswich-Pawcatuck-Matunuck mucky peats (6): The majority of surficial soils throughout the project area consist of Ipswich-Pawcatuck-Matunuck mucky peat. These soils form in low-lying areas of tidal marsh that are inundated by salt water twice each day at high tide. These soils are a mixture of very poorly drained soils which vary in thickness of organic material over sand.

Laguardia-Ebbets-Pavement & buildings, wet substratum complex, 0 to 8 percent slopes (7): Surficial soils within the northern portion of the eastern project area consist of the Laguardia-Ebbets-Pavement & buildings, wet substratum complex. These soils form on nearly level to gently sloping areas filled with a mixture of natural soil materials and construction debris over swamp, tidal marsh, or water. This unit contains a mixture of anthropogenic soils which vary in coarse fragment content. At least 15 percent of the land surface is covered by impervious pavement and buildings.

Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes (101): Surficial soils within the eastern-central portion of the western project area consist of the Pavement & buildings, wet substratum-Laguardia-Ebbets complex. These soils are formed in nearly level to gently sloping urbanized areas filled with a mixture of natural soil materials and construction debris over swamp, tidal marsh, or water. This unit contains a mixture of anthropogenic soils which vary in coarse fragment content. Up to 80 percent of the land surface is covered by impervious pavement and buildings.

Windsor-Windsor, loamy substratum-Deerfield loamy sands, 0 to 8 percent slopes (238): Surficial soils in the southern-most portion of the eastern project area consist of Windsor-Windsor, loamy substratum-Deerfield loamy sands. These soils are formed in nearly level to gently sloping areas of sandy outwash plains and dunes that are relatively undisturbed and mostly wooded. This unit contains a mixture of excessively drained and moderately well drained sandy outwash soils.

Each mapping unit component includes soil series and miscellaneous areas. In general, soils in a series have the same parent material, drainage class, and sequence of major horizons. Characteristics of each soil series found within the project area mapping units are summarized in Table C-2. In addition to the soil series described in Table C-2, the miscellaneous area Pavement & Buildings is present within

Sources: ESRI BING Imagery Map Service, 2015.
Reconnaissance Soil Survey of New York City - USDA, NRCS, 2005.

Legend

General Project Area

Soils
6 - Ipswich-Pawcatuck-Matunuck mucky peats
7 - Laguardia-Ebbets-Pavement & buildings, wet substratum complex, 0 to 8 percent slopes
101 - Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes
238 - Windsor-Windsor, loamy substratum-Deerfield loamy sands, 0 to 8 percent slopes

NYCEDC
New York City Economic Development Corporation

Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York

Soils

Louis Berger & Assoc, PC

March 2015

Figure C-2

TABLE C-2. PROJECT AREA SOIL SERIES CHARACTERISTICS

Soil Series (map unit)	Parent Material	Landform	Depth to Bedrock	Drainage Class	Permeability	Soil Texture	Range in Soil pH	Hydrologic Soil Group*
Deerfield (238)	Sandy glaciofluvial deposits		Very deep	Moderately well drained	Moderately rapid to rapid in the solum, rapid to very rapid in the substratum	Fine sandy loam or coarser in the surface and upper subsoil; loamy fine sand or coarser below	Extremely acid to strongly acid	B
Ebbets (7 and 101)	Loamy fill, greater than 40 inches deep, with construction debris	Anthropogenic urban fill plains	Very deep	Well drained	Moderate, moderately slow where the surface has been compacted	Silt loam, loam, or sandy loam throughout	Very strongly acid to moderately alkaline	B
Ipswich (6)	Organic deposits	Tidal marsh	Very deep	Very poorly drained	Moderate to rapid	Greater than 51 inches organic	Strongly acid to slightly alkaline	D
Laguardia (7 and 101)	Loamy fill, greater than 40 inches deep, with construction debris	Anthropogenic urban fill plains	Very deep	Well drained	Moderate	Silt loam, loam, or sandy loam throughout	Very strongly acid to neutral	B
Matunuck (6)	Organic deposits overlying sandy marine sediments	Tidal marsh	Very deep	Very poorly drained	Rapid in the organic surface to very rapid in the substratum	8 to 16 inches organic; loamy sand or coarser beneath	Strongly acid to slightly alkaline	D
Pawcatuck (6)	Organic deposits overlying sandy marine sediments	Tidal marsh	Very deep	Very poorly drained	Moderate to rapid in the organic layers; very rapid in the underlying sandy sediments	16 to 51 inches organic; with predominantly loamy sand or coarser beneath	Strongly acid to slightly alkaline	D
Windsor (238)	Sandy glacial outwash	Outwash plains	Very deep	Excessively drained	Rapid to very rapid	Loamy fine sand in the surface; loamy sand, in the subsoil; loamy fine sand, loamy sand, fine sand/sand in the substratum.	Very strongly acid to slightly acid	A

Source: Reconnaissance Soil Survey of New York City - USDA, NRCS, 2005.
New York City Soil Survey Staff. 2005. New York City Reconnaissance Soil Survey. USDA, NRCS, Staten Island, NY.
***Hydrologic Soil Group** is a soil interpretation or rating system for runoff potential. The chief consideration is the inherent capacity of the bare soil to permit infiltration.*
***A** – Soils with low runoff potential and high infiltration rates even when thoroughly wet. Deep, well to excessively drained sand or gravel with very rapid and rapid permeability.*
***B** – Soils with moderate infiltration rates when thoroughly wet; moderately deep to deep, moderately well drained to well drained soils with moderately fine to moderately coarse textures, and moderately rapid to moderate permeability.*
***C** – Soils with low infiltration rates when thoroughly wet; soils with a layer that impedes downward movement of water and soils with moderately fine to fine textures and moderately slow and slow permeability. **D** – Soils with high runoff potential and very low infiltration rates when thoroughly wet. Clayey soils with a high swelling potential, soils with a high water table, soils with a claypan or clay layer near the surface, and shallow soils over nearly impermeable materials.*

the project area (mapping units 7 and 101). Pavement & Buildings consist of those areas in which 80 percent or more of the surface is covered by asphalt, concrete, buildings or other impervious materials. The wet substratum and wet subsoil phases refers to areas of tidal marsh, swamp, or water that were filled for development and indicates a high probability of a water table between 40 and 80 inches.

6.0 Hydrology

6.1 Surface Water Classification

Saw Mill Creek, a tidally influenced tributary of Pralls Creek, and several tributaries and drainage ditches are located within the project area. Average annual rainfall/snowfall is 48.6 inches. The confluence of Saw Mill Creek and Pralls Creek is located approximately 600 feet west of the project area. Pralls Creek is a tributary of the Arthur Kill. The project is 0.8 aerial miles from the Arthur Kill (closest Traditional Navigable Water [TNW]) to the Chelsea Road Bridge over Saw Mill Creek in the center of the project area. The project area is connected to the Staten Island Sound through a series of smaller tidal channels. Part of the project area experiences twice daily tidal inundation. Groundwater within the project area is expected to be present within the glacial and overlying organic material at depths influenced by the tide. At high tide, the low-lying marsh is saturated and inundated in the lower lying areas. At low tide, groundwater is estimated to be present at less than 6 feet bgs. Groundwater flow is anticipated to be to the west towards Pralls Creek. Saw Mill creek and its tributaries can be classified as Relatively Permanent Waters (RPW) as they flood twice daily with the tide cycle. According to the environmental database report (EDR, 2013a), the project area is located within the Federal Emergency Management Agency (FEMA) 100-year flood zone, but outside of the 500-year flood zone.

6.2 Tides and Tidal Circulations

The hydrology of Saw Mill Creek is dominated by semidiurnal tides from Newark Bay. Tides in the Arthur Kill generally flood from Raritan Bay to Newark Bay and ebb in the reverse direction. Mean high water level at the project area is 2.39 feet (NAVD 88), with a mean higher high water level (spring high tidal) of 2.62 feet (NAVD88). Mean low water is -2.82 feet (NAVD88), with a mean lower low water level of -3.05 feet (NAVD88). Table C-3 shows tide heights at the Saw Mill Creek gauge from tide gauges place within the project area during the summer of 2013.

TABLE C-3.
SAW MILL CREEK TIDAL DATA

Mean High Water (MWH)	Mean Low Water (MLW)	Mean High High Water (MHHW)	Mean Low Low Water (MLLW)
2.39	-2.82	2.62	-3.05

Source: Tide elevations in feet developed by Louis Berger & Assoc., 2013 (NAVD 88)

6.3 Proposed Bank's Landscape Position in the Watershed and Sources of Watershed Impairment

The Bank site is identified in the *Comprehensive Restoration Plan for the New York-New Jersey Harbor Estuary* which was developed as part of the Hudson-Raritan Estuary (HRE) Ecosystem Restoration Study by the U.S. Army Corps of Engineers - New York District and The Port Authority of New York & New Jersey in partnership with the New York-New Jersey Harbor & Estuary Program and other federal, state and local resource agencies. The 2009 Comprehensive Restoration Plan (CRP) for the HRE states that it "is a master plan to guide ecosystem restoration efforts throughout the estuary. It is intended to be used by all stakeholders, thus allowing the whole region to work towards a series of common restoration goals providing benefits to the estuary. This effort was initiated in 1988, when Congress recognized the New York-New Jersey Harbor as an estuary of national importance and accepted it into the National Estuary Program (NEP). Following this designation, the Harbor Estuary Program (HEP) completed a Comprehensive Conservation and Management Plan (CCMP) in March of 1996. Included among the CCMP's recommendations was the development of a comprehensive strategy for habitat protection and restoration. The US Army Corps of Engineers (USACE), in partnership with their non-Federal sponsor, The Port Authority of New York & New Jersey, joined the process of developing the strategy in 1999 with the initiation of the HRE Ecosystem Restoration Feasibility Study. To enhance the scientific credibility of the project, beginning in 2005 the Hudson River Foundation and Cornell University led a series of workshops to craft a strategy to develop a restoration plan for this highly urbanized estuary. From the beginning, the scientists agreed that the restoration program should be focused on creating and restoring a mosaic of habitats within the human-dominated landscape. To achieve this goal, a team of estuarine scientists identified 11 measurable objectives for restoration, termed Target Ecosystem Characteristics (TECs), each of which defines specific goals for an important ecosystem property or feature that is of ecological and/or societal value. The TECs reflect the broad interest of HRE stakeholders and address habitat and degradation issues. Achieving the objectives in the TECs will increase the sustainability and resiliency of the HRE. Each TEC has established short- and long-term objectives for each of eight planning regions within the estuary. For example, the short-term objective for the Coastal Wetlands TEC is to create or restore 1,200 acres of wetlands by 2015, while the longterm objective is to create or restore a total of 15,200 acres by 2050."

Information from the *Comprehensive Restoration Plan for the New York-New Jersey Harbor Estuary* (USACE and others, 2009) is excerpted in the following paragraphs discussing the watershed of the proposed mitigation bank. The HRE study area is located within one of the largest estuaries on the east coast of the United States, comprising over 1,600 square miles and almost 1,000 linear miles of shoreline. The actual borders of the HRE study area and its planning regions were delineated based on a combination of watershed boundaries and physical landmarks, creating ecologically and historically distinct areas that are all tidally influenced. The HRE study area was delineated into eight planning regions to facilitate stakeholders' identification of restoration needs and opportunities specific to each region.

The proposed Saw Mill Creek Pilot Wetland Mitigation Bank is located in the Arthur Kill/Kill Van Kull HRE region. This HRE planning region is joined to Upper New York Bay via the Kill Van Kull and mixes waters with Newark Bay. The Arthur Kill is also the water body connecting Newark Bay with Raritan Bay. The Arthur Kill/Kill Van Kull planning region has a dynamic hydrology due to the variation in tidal velocity, amount of freshwater flow, and bathymetry among the three connecting bays (i.e., Upper New York, Newark, and Raritan bays).

The Arthur Kill/Kill Van Kull complex has been designated as a Significant Habitat Complex of the New York Bight Watershed by the USFWS (USFWS, 1997). The extensive tributary system of Arthur Kill provides major blocks of tidal and freshwater wetlands, marshlands, mudflats, and intact riparian habitat. According to the HRE CRP, "this HRE planning region contains over 30,000 acres (>120 kilometers^2) of open space, these sites have the potential of being important for future habitat restoration programs." However, these waterways exist within a heavily industrialized and developed corridor, with an average population density of almost 5,000 people per square mile. The Arthur Kill and Kill Van Kull also have deepwater navigation channels that allow transport of cargo into and out of the ports of New York and New Jersey. Abandoned industrial areas are also common, which are typically littered with debris.

The CRP also states, "The Arthur Kill and Kill Van Kull Planning Region appears to offer substantial opportunities to restore coastal wetlands, shorelines and shallows, tributary connections, public access, and waterbird habitat. There are large expanses of coastal wetlands along the tributaries to the Arthur Kill that could benefit from restoration activities, and adjacent areas may be appropriate for the creation of additional acreage. The islands of this planning region once supported large colonies of waterbirds, but today do not support any nesting activities. **There are also opportunities within this planning region to reverse human-induced alterations that have led to habitat degradation** (*emphasis added*). There are 54 CRP Restoration Sites in this planning region, which is one of the largest number of identified acquisition and restoration sites per planning region in the HRE study area"

The proposed mitigation bank site is one of those 54 CRP Sites and once constructed it will restore and enhance 68.94-acres of degraded habitat within the Saw Mill Creek watershed, including the creation of 24-acres of tidal wetland from filled and vacant land. The site is currently littered with tons of debris and illegal dumping is an almost daily occurrence. Portions of the site are covered by over ten feet of fill material and paved with asphalt, and earthen berms have significantly impaired the site's tidal hydrology. Large areas of wetland and upland within the proposed Bank have been overrun by non-native, invasive vegetation that compromises the site's ecological functions. The clean-up, enhancement, and restoration of the site will significantly increase the acreage of tidal wetlands in the Saw Mill Creek watershed, improving the watershed's water quality, sediment quality, and flood attenuation while also increasing plant diversity and wildlife species abundance and diversity. The restoration of large, contiguous wetland habitats is a singular feature of wetland banks. By providing comprehensive restoration of a large site, there is a much greater chance of realizing long-term gains in ecological functions and services. Portions of the site are adjacent to existing healthy saltmarsh that will maximize habitat.

Restoration of the Saw Mill Creek Pilot Wetland Mitigation Bank is expected to achieve the following 7 of the 11 HRE CRP Target Ecosystem Characteristics (measurable objectives for restoration, each of which defines specific goals for an important ecosystem property or feature that is of ecological and/or societal value): Tributary Connections; Shorelines and Shallows; Sediment Quality; Coastal Wetlands; Coastal and Maritime Forests; Habitat for Waterbirds; and Habitat for Fish, Crab and Lobsters.

6.4 Specific Waterbodies, Their Characteristics, and Specific Improvements That Could Occur at the Wetland Mitigation Bank

Table C-4 provides the following information on each waterbody/tributary currently on the Site:

- Description of each tributary substance composition;
- Potential pollutants in tributaries;
- Potential habitat for species;
- Average width, depth and side slopes of the tributary;
- Condition of the tributary; tributary sinuosity;
- Whether the tributary is natural, artificial or manipulated; and
- Characterization of the water quality

Attachment C-2 provides photographs for each waterbody/tributary, including the connection between the tributary and Saw Mill Creek and a key map with photo locations.

Table C-5 provides Water Depths and Tributary Widths' for the dimensions of the proposed tributaries to Saw Mill Creek as part of the proposed project. The table is referencing the stationing on the profiles within sheet 12 of the Design Plans in Schedule 8 of this Instrument.

Table C-4. Saw Mill Creek Tributary Information

Tributary	Substance Composition	Potential Pollutants	Habitat for Species
1	Silt	Railroad runoff; River Road runoff;	Aquatic Species: Windowpane flounder, Winter flounder, summer flounder, bluefish, grass shrimp, Atlantic silverside, mummichog, ribbed muscles, fiddler crabs, striped killifish, blue crab. Terrestrial Species: great blue heron, great egret, belted kingfisher, osprey, glossy ibis,
2	Silt	Railroad runoff	
3	Silt	Railroad runoff;	
4	Silt	Chelsea Road & Edward Curry Ave. runoff; bus parking lot runoff	
5	Silt with sand	Route 440 runoff	
6	Silt	Route 440 runoff	
7	Silt	Route 440 runoff; historic fill (heavy metals, hydro carbons, PCBs, pesticides)	
8	Silt	Historic fill (heavy metals, hydro carbons, PCBs, pesticides)	
9	Silt	Historic fill (heavy metals, hydro carbons, PCBs, pesticides)	
10	Silt	None observed	
11	Silt	None observed	
12	Silt	Route 440 runoff	
13	Silt	None observed	
14	Silt	Route 440 runoff	

Tributary	Average Width from top of bank to top of bank (feet)	Average Depth from bottom to top of bank (feet)	Average Side Slopes (Horiz:Vert)	Condition	Sinuosity	State (Natural, Artificial, Manipulated)	Water Quality
1	12	5	1.5/1	Stable	Straight	Artificial (mosquito ditch)	Water color muddy
2	4	1	3/1	Stable	Straight	Artificial (mosquito ditch)	Water color muddy
3	3	1	2/1	Stable	Straight	Artificial (mosquito ditch)	Water color muddy
4	7	5	3/1	Eroding	Meandering	Natural with minor mosquito ditching	Water color muddy
5	18	6	3/1	Eroding	Straight	Manipulated (culverted under Rt. 440)	Water color muddy, some sheen
6	4	3	2/1	Stable	Meandering	Natural with minor mosquito ditching	Water color muddy
7	21	5	2/1	Stable	Straight	Artificial (mosquito ditch)	Water color muddy, some sheen
8	4	2	3/1	Stable	Straight	Artificial (mosquito ditch)	Water color muddy, some sheen
9	3	1	3/1	Stable	Straight	Artificial (mosquito ditch)	Water color muddy
10	3	1	3/1	Stable	Straight	Artificial (mosquito ditch)	Water color muddy
11	2	1	3/1	Stable	Straight	Artificial (mosquito ditch)	Water color muddy
12	8	3	3/1	Stable	Straight	Artificial (mosquito ditch)	Water color muddy
13	4	2	3/1	Stable	Straight	Artificial (mosquito ditch)	Water color muddy
14	3	2	3/1	Stable	Straight	Artificial (mosquito ditch)	Water color muddy

Table C-5. Proposed Water Depths and Tributary Widths

Station referencing is as identified on Sheet 12, Surface Profiles, in Schedule 8 of this Instrument; Existing/Proposed Water depths are from Mean High Water level.

East Side of Chelsea Road

Station	Proposed Stream Width (ft.)	Existing Water Depths (ft.)	Proposed Water Depths (ft.)	Comment
1+55	32’	N/A	3.8’	Area currently filled 0.8’ above MHW
2+55	26’	1.1’	1.1’	
8+00	48’	1.1’	1.1’	
8+80	27’	1.1’	1.1’	
10+55	38’	1.1’	1.1’	
11+60	37	N/A	4.0’	Area currently filled 2.8’ above MHW
12+80	52’	7+’	7+’	Saw Mill Creek
14+10	98’	1.0’	1.0’	
15+60	152’	N/A	3.0’	Area currently filled 1.1’ above MHW
18+25	160’	N/A	4.1’	Area currently filled 2.0’ above MHW
23+25	78’	N/A	4/1’	Area currently filled 3.1’ above MHW

West Side of Chelsea Road

Station	Proposed Stream Width (ft.)	Existing Water Depths (ft.)	Proposed Water Depths (ft.)	Comment
3+25	48’	N/A	2.4’	Area currently filled 4’ above MHW

7.0 Habitat Types and Vegetative Communities

Over the last 200 years, the vegetation of the project area has been altered by human activities, including upland clearing, wetland ditching and filling, residential and industrial development, introduction and spread of invasive species (including common reed, poison ivy, and Japanese knotweed), obstructions of surface water movement, and other less physically intrusive disturbances such as noise from airports and automobile traffic. Industrial development has increased the potential for spills of industrial fuels and chemicals and illegal dumping, which can damage the environment by causing destruction of habitat and loss of species. These actions have directly or indirectly changed and shaped the historical ecological communities to their present state. The defined community types, although influenced by human development and/or invasion by non-native plant species, support a variety of plant species and provide habitat for area wildlife. Figure C-3 depicts habitat cover type maps within the project area. Each community type and its dominant vegetation is described below.

7.1 Wetlands and Open Waters

The majority of the project area consists of wetland habitats. The presence of wetland indicators (i.e., hydric soils, prevalence of hydrophytic vegetation, and hydrologic regime) was verified during field studies, including during performance of a wetland delineation. Figure C-4 depicts National Wetlands Inventory (NWI) mapping within the project area. Based on NWI mapping and field delineation, two wetland areas composed of (10) different classes of wetlands/watercourses were identified within the project area in accordance with *The Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin *et al.* 1979). These wetlands are summarized below in Table C-6 and depicted on Sheets 4 and 5 of the Design plans in Schedule 8 of this Instrument. On March 31, 2014, the Corps of Engineers issued a Jurisdictional Determination, concurring with the boundaries of these wetlands and stating that these wetlands are considered to be below the headwaters.

TABLE C-6.
SUMMARY OF DELINEATED WETLANDS

Wetland	Size (Acres)	Wetland Cover Type[1]	Comments
A	22.10	E1UBL, E2EM1N, E2EM5P, E2EM1Pd, E2EM1P, E2SS1P, E2US3P1	West of Chelsea Road
B	43.30	E1UBL, E2EM1N, E2EM5P, E2EM1Pd, E2EM1P, E2EM5Pd, E2SS1P, PFO1C, PFO1E	East of Chelsea Road

(1) Classification of wetlands based on field examination.

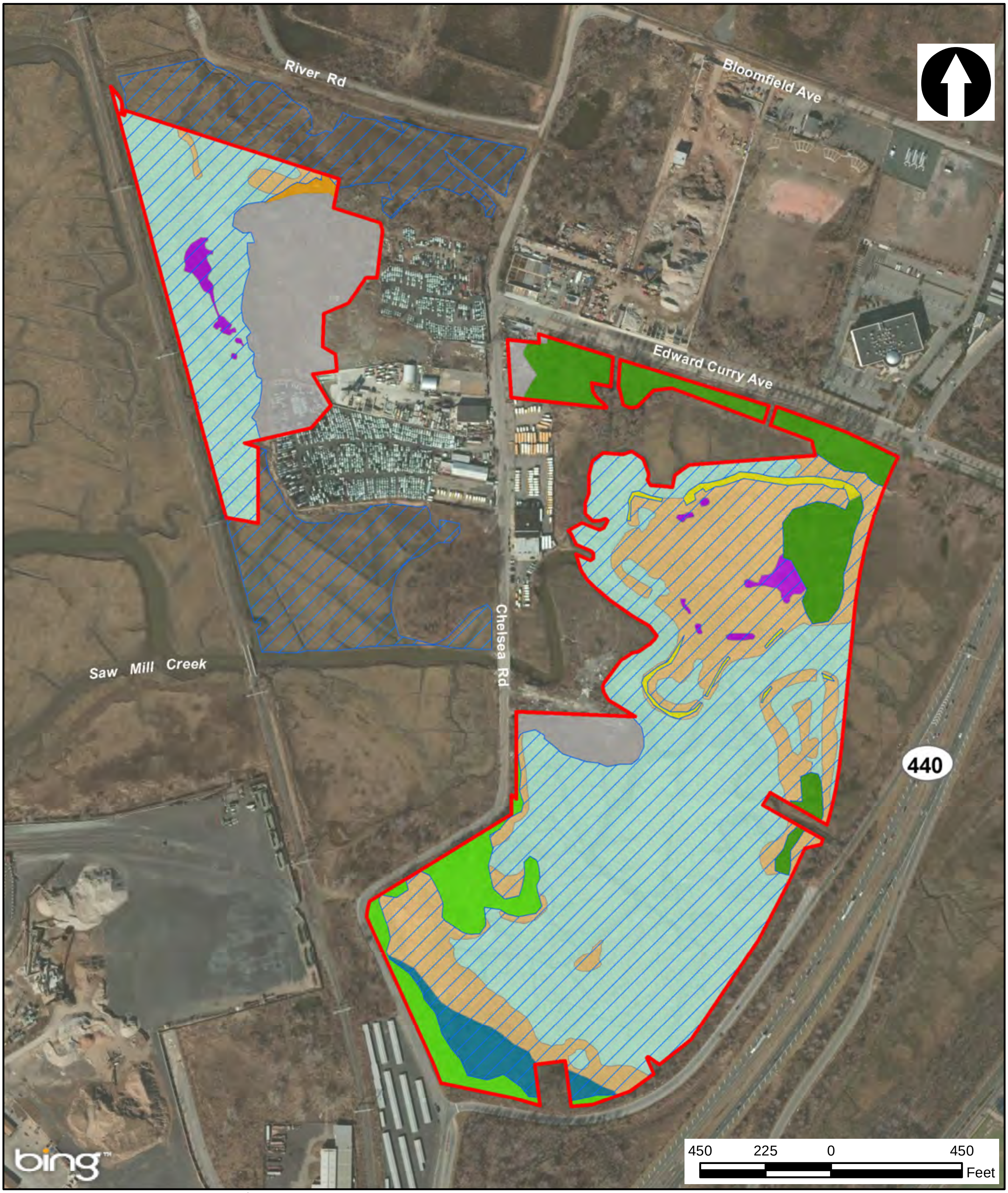
Classification under Cowardin 1979:

E1UBL	Estuarine, Subtidal, Unconsolidated Bottom, Subtidal
E2EM1N	Estuarine, Intertidal, Emergent, Persistent, Regularly flooded
E2EM1Pd	Estuarine, Intertidal, Emergent, Persistent, Irregularly flooded, partially drained/ditched
E2EM1P	Estuarine, Intertidal, Emergent, Persistent, Irregularly flooded
E2EM5P	Estuarine, Intertidal, Emergent, Narrow-leaved Persistent
E2SS1P	Estuarine, Intertidal, Scrub-Shrub, Broad Leaved Deciduous, Irregularly Flooded
E2US3P1	Estuarine, Intertidal, Unconsolidated Shore, Mud, Irregularly Flooded, Hyperhaline
E2EM5Pd	Estuarine, Intertidal, Emergent, Narrow-leaved Persistent, Partially Drained/Ditched
PFO1C	Palustrine, Forested, Broad-leaved Deciduous, Seasonally Flooded
PFO1E	Palustrine, Forested, Broad-leaved Deciduous, Seasonally Flooded/Saturated

7.1.1 Tidal Wetlands

The majority of the project area and the adjacent area west of the railroad tracks consist of estuarine tidal wetland associated with Saw Mill Creek and its tributaries. Saw Mill Creek is a steep-banked tidal creek that enters the project area from west of the CSX rail line at the western project area boundary, flows east under the Chelsea Road bridge, and meanders through the eastern portion of the project area towards Route 440. As per NWI mapping, Saw Mill Creek is classified as Estuarine, Subtidal, Unconsolidated Bottom, Subtidal water regime (E1UBL). Portions of the tidal marsh have been filled in the past for roadways and commercial properties, and the remaining tidal marsh habitat contains linear ditches and remnants of filled areas and related berms. The majority of the ditches are completely exposed at low tide, while the bed of Saw Mill Creek remains inundated. Remnants of former berms were located east of Chelsea Road. Portions of the remnant berms remain high enough in elevation that they have been delineated as upland. However, much of the remnant berms have reverted to disturbed wetlands.

Intertidal marsh constitutes most of the tidal wetlands located in the project area. The majority of the intertidal marsh is irregularly flooded high marsh habitat. Vegetation in the high marsh community includes spike grass *(Distichlis spicata*), saltmeadow cordgrass *(Spartina patens)*, smooth cordgrass *(Spartina alterniflora*), black grass (*Juncus gerardii*), and common reed. The low marsh community is dominated by smooth cordgrass along creek edges, in shallow ditches, and where lower elevations allow regular tidal flooding. Intertidal scrub-shrub habitat, consisting primarily of high tide bush (*Iva frutescens*), is scattered throughout the high marsh on both sides of Chelsea Road. Salt pannes are also present in depressions and pools of the high marsh surface. Vegetation associated with the pannes includes the short form of smooth cordgrass and glassworts (*Salicornia* spp.).



Sources: ESRI BING Imagery Map Service, 2015;
Approximate Delineation and Cover Types, Berger 2013.

Legend

- Project Site
- Wetland Delineation
- Tidal marsh
- Red maple-sweetgum swamp
- Phragmites wetland
- Panne
- Successional shrubland
- Successional southern hardwood
- Chestnut oak forest
- Phragmites upland
- Urban vacant lot

NYCEDC
New York City Economic Development Corporation

Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York
Habitat Cover Types

Louis Berger & Assoc, PC

March 2015

Figure C-3

Sources: ESRI BING Imagery Map Service, 2015; National Wetlands Inventory, 2012.

Legend

General Project Area

NWI Wetlands

New York City Economic Development Corporation

Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York

NWI Wetlands

Louis Berger & Assoc, PC

March 2015

Figure C-4

Common reed, high tide bush, and sea myrtle (*Baccharis halimifolia*) are common within transition areas between wetlands and uplands. Common reed is dominant in the upper reaches of the marsh adjacent to roadways, uplands, and freshwater wetlands, and in some areas forms a dense monoculture.

7.1.2 Freshwater Wetlands

A NWI mapped palustrine forested freshwater wetland (PFO1C) is present between the upper tidal limits and upland area along the exit ramp of Route 440/West Shore Expressway in the southern section of the project area. This wetland is dominated by pin oak *(Quercus palustris*) and red maple (*Acer rubrum*). Other species observed include sweetgum (*Liquidambar styraciflua),* skunk cabbage (*Symplocarpus foetidus),* sweet pepperbush (*Clethra alnifolia*), poison ivy (*Toxicodendron radicans),* northern arrowwood (*Viburnum recognitum*), and common reed.

As depicted on Figure C-4, NYSDEC has mapped both freshwater and tidal wetlands within the project area. The majority of this mapping was conducted in the 1970's via aerial photography, and has since been updated periodically. After decades of fill, erosion and climate change, some of these mapped freshwater wetlands have been filled, or naturally converted to tidal wetlands. In review of each wetland mapping component in GIS (NYSDEC Freshwater Wetlands, 2008; NYSDEC Tidal Wetlands - NYC and Long Island, 1974), some areas of the project area are overlaid with both mapped freshwater and tidal wetlands. This is true for NYSDEC freshwater wetland AR-49 in the northeast corner and eastern side of the project area, adjacent to Rt. 440 where most of the mapped freshwater wetland is a tidal wetland. Similar NYSDEC freshwater wetland AR-48 in the northwestern portion of the project area contains tidal wetlands. It will become necessary at some point in time to have the NYSDEC freshwater wetlands mapping updated to reflect current site conditions in the project area.

7.2 Upland Areas

Successional upland forest habitat is present within the project area along roadway embankments and previously filled areas that were not developed. Vegetation in these uplands consists largely of early successional non-native, disturbed plant communities. Dominant species include tree of heaven *(Ailanthus altissima*), white mulberry (*Morus alba*), red maple, black cherry (*Prunus serotina*), sassafrass (*Sassafras albidum*), poison ivy, oriental bittersweet (*Celastrus orbiculatus*), Japanese honeysuckle (*Lonicera japonica*), mugwort (*Artemisia vulgaris*) and Japanese knotweed (*Polygonum cuspidatum*). Upland/wetland edges are dominated by common reed.

A disturbed hardwood forest is located immediately adjacent to Edward Curry Avenue. This upland forested area is primarily dominated by invasive species, including Japanese knotweed,

Sources: ESRI BING Imagery Map Service, 2015; NYSDEC FWW Wetlands, 2008.

Legend

General Project Area

NYSDEC Freshwater Wetlands

NYCEDC
New York City Economic Development Corporation

Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York

NYSDEC Freshwater Wetlands

Louis Berger & Assoc, PC

March 2015

Figure C-5

tree-of-heaven, black locust (*Robinia pseudoacacia*), white mulberry, and oriental bittersweet. Black cherry, poison ivy, and grape (*Vitis* sp.) are also present. Another upland hardwood forest area is located along Chelsea Road and the Route 440 exit ramp in the extreme southern part of the Project Site and is predominantly a white oak (*Quercus alba)*, chestnut oak (*Quercus prinus*), and red oak (*Quercus rubrum*) forest with some Japanese knotweed. A portion of the forested upland in this area (north of the intersection of Chelsea Road and the Route 44 exit ramp), is essentially a narrow peninsula projecting out into the marsh, and is reportedly the site of a previous restoration planting that took place in the 1990s. This area is a predominantly oak forest with some lowbush blueberry (*Vaccinium angustifolium*).

Three "island" areas are located along the eastern margin of the eastern side of the project area. Historic maps and imagery indicate that these upland areas are filled wetlands. These areas are dominated by grey birch (*Betula populifolia*), with some black cherry, tree-of-heaven and pin oaks. Highbush blueberry (*Vaccinium corymbosum*), northern bayberry (*Myrica pensylvanica*), sea myrtle, common reed, and Japanese knotweed are present along the edges of these areas. These upland areas are encircled by a remnant berm, apparently as part of an abandoned effort to fill large portions of the eastern side of the project area. Portions of the berms are uplands dominated by common reed, with some live and dead tree-of-heaven, pokeweed (*Phytolacca americana*), Virginia creeper *(Parthenocissus quinquefolia*), and poison ivy.

Table C-7 presents a list of vegetation observed within the project area.

TABLE C-7.
VEGETATION OBSERVED WITHIN THE PROJECT AREA

Scientific Name	Common Name	Indicator Status
Trees		
*Acer platanoides**	Norway maple	UPL
Acer rubrum	red maple	FAC
Ailanthus altissima	tree-of-heaven	UPL
Betula alba	white birch	UPL
Betula populifolia	gray birch	FAC
Liquidambar styraciflua	sweetgum	FAC
Morus sp.	mulberry	--
Prunus serotina	black cherry	FACU
Quercus alba	white oak	FACU
Quercus palustris	pin oak	FACW
Quercus prinus	chestnut oak	UPL
Quercus rubra	red oak	FACU
Rhus copallinum	winged sumac	UPL
*Robinia pseudoacacia**	black locust	FACU
Salix sp.	willow	--
Sassafras albidum	sassafras	FACU
Ulmus rubra	slippery elm	FAC
Shrubs/Vines		
*Ampelopsis brevipedunculata**	porcelainberry	UPL
Baccharis halimifolia	groundsel tree	FACW

*Berberis thunbergii**	Japanese barberry	FACU
*Celastrus orbiculatus**	Oriental bittersweet	UPL
Clethra alnifolia	sweet pepperbush	FAC
Lonicera sp.	bush honeysuckle	--
Elaeagnus angustifolium	Russian olive	FACU
Iva frutescens	high tide bush	FACW
*Lonicera japonica**	Japanese honeysuckle	FAC
Myrica pensylvanica	northern bayberry	FAC
Parthenocissus quinquefolia	Virginia creeper	FACU
Rhus typhina	staghorn sumac	UPL
*Rosa multiflora**	multi-flora rose	FACU
Sambucus canadensis	elderberry	FACW
Smilax rotundifolia	greenbriar	FAC
Toxicodendron radicans	poison ivy	FAC
Vaccinium angustifolium	lowbush blueberry	FACU
Vaccinium corymbosum	highbush blueberry	FACW
Viburnum dentatum	northern arrowwood	FACW
Herbaceous		
*Alliaria petiolata**	garlic mustard	FACU
Allium vineale	field garlic	FACU
Schizachyrium scoparium	little bluestem	FACU
Andropogon virginicus	broomsedge	FACU
Apocynum cannabinum	dogbane	FACU
*Artemisia vulgaris**	mugwort	NI
Aster sp.	aster	--
Atriplex patula	common orach	FACW
Carex sp.	sedge	--
Coronilla varia	crown vetch	UPL
Dactylic glomerata	orchard grass	FACU
Digitaria sp.	crabgrass	--
Distichlis spicata	spike grass	FACW
Impatiens capsensis	jewelweed	FACW
Juncus gerardii	black grass	FACW
Lotus corniculatus	birdsfoot trefoil	FACU
Osmunda cinnamomea	cinnamon fern	FACW
Panicum virgatum	switchgrass	FAC
*Phragmites australis**	common reed	FACW
Phytolacca americana	pokeweed	FACU
Pluchea odorata	saltmarsh fleabane	OBL
Phleum pratense	timothy	FACU
*Polygonum cuspidatum**	Japanese knotweed	FACU
Rumex cripus	curly dock	FAC
Salicornia sp.	glasswort	OBL
Solidago sempervirens	seaside goldenrod	FACW
Solidago sp.	goldenrod	--
Spartina alterniflora	smooth cordgrass	OBL
Spartina patens	saltmeadow cordgrass	OBL
Symplocarpus foetidus	skunk cabbage	OBL
Taraxacum officinale	dandelion	FACU
Verbascum thapsus	common mullein	UPL
Vicia sp.	vetch	--
Xanthium pensylvanicum	cocklebur	FAC

** Invasive Species. Source: NYSDEC Revised Interim list of Invasive Plant Species in New York State, 14 May 2012;*

Key to indicator categories

OBL:	Obligate Wetland, occur almost always (estimated probability >99%) under natural conditions in wetlands.
FACW:	Facultative Wetland, usually occur in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
FAC:	Facultative, equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).
FACU:	Facultative Upland, usually occur in non-wetlands (estimated probability 67%-99%), but occasionally found in wetlands (estimated probability 1%-33%).
NI:	No Indicator, on national listings of plants occurring in wetlands.
NA:	Not Applicable, only vascular plants are assigned indicator statuses.

Sources: 2012 National Wetlands Plant List : Northcentral-Northeast, US Army Corps of Engineers.
Louis Berger & Associates, P.C. 2013.

8.0 Faunal Communities

The primary habitat available to fish and wildlife within the project area consists of estuarine tidal wetland habitat associated with Saw Mill Creek and its tributaries. The existing intertidal marsh is predominantly irregularly flooded high marsh habitat. Smaller areas of low marsh, intertidal scrub-shrub, and salt panne habitat are present within the project area. A small palustrine forested freshwater wetland is also present in the southern section of the project area. Upland forest habitat is also present along roadway embankments and previously filled areas that were not developed. Historical fill, ditching, dumping, and invasion by nuisance plant species has degraded existing habitat quality within the project area, limiting habitat diversity and, therefore, decreasing wildlife species diversity. Common reed dominated wetland habitats like those found within the project area are usually considered to have low wildlife and waterfowl value because they can form dense, impenetrable monocultures. These areas contain minimal or no surface water for aquatic species. Utilization of these areas by waterfowl and wading birds is limited due to the dense stands of common reed that cannot be traversed by these groups of birds.

Species expected to utilize the estuarine tidal wetland habitats present within the project area listed in Table C-8.

Table C-8.
ANTICIPATED WILDLIFE UTILIZATION IN TIDAL WETLAND COMMUNITIES

Tidal Wetland Community	Common Name	Scientific Name
High marsh	salt marsh mosquitoes	*Aedes* spp.
	greenhead flies	*Tabanidae*
	grasshoppers	Suborder Caelifera
	spiders	Order Araneae
	salt marsh snail	*Melampus bidentatus*
	clapper rail	*Rallus longirostris*
	sharp-tailed sparrow	*Ammodramus caudacutus*
	marsh wren	*Cistothorus palustris*
	eastern meadowlark	*Sturnella magna*
	American black duck	*Anas rubripes*
	Northern harrier	*Circus cyaneus*
	muskrat	*Ondatra zibethicus*
Low marsh	clapper rail	*Rallus longirostris*
	willet	*Catoptrophorus semipalmatus*
	marsh wren	*Cistothorus palustris*
	seaside sparrow	*Ammodramus maritimus*
	Wading birds (egrets, herons)	Family Ardeidae
	fiddler crabs	*Uca* spp.
	ribbed mussel	*Geukensia demissa*
	mummichog	*Fundulus heteroclitus*
	sheepshead minnow	*Cyprinodon variegatus*
	Atlantic silverside	*Menidia menidia*
	Winter flounder (juvenile and larvae)	*Pleuronectes americanus*
	Bluefish (juvenile and larvae)	*Pomatomus saltatrix*
Salt shrub	marsh wren	*Cistothorus palustris*
Salt panne	mummichog	*Fundulus heteroclitus*
	sheepshead minnow	*Cyprinodon variegatus*
	Wading birds (egrets, herons)	Family Ardeidae

Source: Edinger, et al., 2002.; Niedowski 2000. Louis Berger & Assoc., P.C., 2013

The salt marsh and tidal creek habitats within the project area provide critical foraging habitat for long-legged wading bird species (herons, egrets, ibises) that make up the population known as the New York City Harbor Herons. Within the Arthur Kill/Staten Island wetland complex, Prall's Island, Shooter's Island, and the Isle of Meadows had previously been popular breeding areas for wading bird species (Craig, 2010). No wader-nesting activity has been observed on these islands since the late 1990s, but they are still used by a wide variety of bird guilds including waterfowl, birds of prey, songbirds, crows and blackbirds (Craig 2010, Harbor Herons Subcommittee 2010).

According to correspondence from National Marine Fisheries Service the project area provides habitat for a variety of resident, migratory, and forage species such as bluefish (*Pomatomus saltatrix*), striped bass (*Morone saxatalis*), menhaden (*Brevoortia tyrannus),* killifish (*Fundulus* spp.), bay anchovies (*Anchoa mitchilli*), and blue crabs (*Callinectes sapidus*).

Wildlife species observed at the project area during field investigations include fish, most likely mummichog (*Fundulus heteroclitus*), marsh snail (*Melampus bidentatus*), mud snail (*Ilyanassa obsoletus*), ribbed mussel (*Geukensia demissa),* fiddler crabs (*Uca minax* and *Uca pugnax*), and diamondback terrapin (*Malaclemys terrapin*) within the tidal marsh habitat.

Feral cats (*Felis catus*) were observed within the high marsh and the upland areas. White-tailed deer (*Odocoileus virginianus*) were observed within upland and wetland areas.

Dragonflies (Order *Odonata*) and mosquitoes, including the tiger mosquito (*Aedes albopictus*) were present throughout the project area. Spicebush swallowtail butterflies were observed in upland areas.

Bird species observed during field investigation included great egret (*Ardea alba*), marsh wren (*Cistothorus palustris*), swamp sparrow (*Melospiza georgiana*), red-winged blackbird (*Agelaius phoeniceus*), red-tailed hawk (*Buteo jamaicensis*), Canada goose (*Branta canadensis*), osprey (*Pandion haliaetus),* yellow crowned night heron (*Nyctanassa violacea*), mallard (*Anas platyrhynchos*), and turkey vulture (*Cathartes aura).*

9.0 Sensitive Species

Louis Berger conducted a literature review and Natural Heritage Program database records search to identify the existence or potential occurrence of special status species and significant communities on or in the vicinity of the project area. Louis Berger requested information from NYSDEC Natural Heritage Program (DEC NHP) and the United States Fish and Wildlife Service (USFWS) regarding the potential presence of any federal and/or state threatened, endangered, proposed or candidate species in the vicinity of the project area, as well as any other species or habitats of special concern. Species information received from DEC NHP and USFWS is summarized in Table C-9.

TABLE C-9.
SUMMARY OF STATE AND FEDERAL LISTED SPECIES

DEC NHP	Common Name	Scientific Name	NY State Listing	Heritage Conservation Status
T&E documented at or near the site, generally within 0.5 mile	Least bittern	*Ixobrychus exilis*	Threatened	
	Pied-billed grebe	*Podilymbus podiceps*	Threatened	
Rare animals documented at or in vicinity of site	Cattle egret	*Bubulcus ibis*	Protected bird	Imperiled in NYS
	Glossy ibis	*Plegadis falcinellus*	Protected bird	Imperiled in NYS
	Little blue heron	*Egretta caerulea*	Protected bird	Imperiled in NYS
	Snowy egret	*Egretta thula*	Protected bird	Imperiled in NYS
	Yellow-crowned night-heron	*Nyctanassa violacea*	Protected bird	Imperiled in NYS
	Southern leopard frog	*Lithobates sphenocephalus*	Special concern	Critically imperiled in NYS
Plants listed as Endangered or Threatened	Nantucket juneberry	*Amelanchier nantucketensis*	Endangered	Critically imperiled in NYS
	Persimmon	*Diospyros virginiana*	Threatened	Imperiled in NYS
	Rose pink	*Sabatia angularis*	Endangered	Critically imperiled in NYS
	Sweetbay magnolia	*Magnolia virginiana*	Endangered	Critically imperiled in NYS
Rare species with historical records at the site or in the vicinity	Eastern mud turtle	*Kinosternum subrubrum*	Endangered	Critically imperiled in NYS
	Log fern	*Dryopteris celsa*	Endangered	Critically imperiled in NYS
	Orange fringed orchid	*Platanthera ciliaris*	Endangered	Critically imperiled in NYS
USFWS	**Common Name**	**Scientific Name**	**Federal Listing**	
Species may occur within the project boundary and/or may be affected by project	Piping plover	*Charadrius melodus*	Threatened	
	Roseate tern	*Sterna dougallii dougalli*	Endangered	

9.1 Threatened and Endangered Species

The USFWS Long Island Ecological Services Office was contacted through the Information, Planning, and Conservation System (IPac) regarding the potential presence of species under the jurisdiction of the USFWS within the project area. The USFWS list indicates that the following threatened and endangered species may occur within the project area: piping plover (*Charadrius melodus* – threatened) and roseate tern (*Sterna dougallii dougallii* – endangered).

Piping plover: The piping plover is a small shorebird weighing 1.5 to 2.25 ounces and is 5.5 inches long. The piping plover is light beige with orange legs. In spring and summer, it has a single black neck band and a narrow black band across its forehead. The rump is white and the bill is yellowish with a black tip. Piping plover forage on beaches, dunes and in tidal wrack. Piping plovers breed on dry sandy beaches or in areas that have been filled with dredged sand, often near dunes in areas with little or no beach grass. They occur along the Atlantic Coast from southwestern Newfoundland and southeastern Quebec south to North Carolina. In New York, this species breeds on Long Island's sandy beaches, from Queens to the Hamptons, in the eastern bays and in the harbors of northern Suffolk County. Habitat is only found at the shoreline, on barrier islands, sandy beaches and dredged material disposal islands. Potential suitable habitat for piping plover was not observed within the project area.

Roseate tern: The roseate tern is 14 to 17 inches long, with a wingspan of about 30 inches. Its back and upper wings are a light pearly-grey, while its underparts are white. The tip of the white tail extends well beyond its wing tips when at rest. In the summer it has a black cap, nape and bill. Roseate terns feed primarily on American sand lance, a small marine fish. In New York, roseate terns are found nesting with common terns. The nest may be only a depression in sand, shell or gravel, and may be lined with bits of grass and other debris. The roseate tern breeds along the coasts of the Atlantic, Pacific and Indian Oceans on salt marsh islands and beaches with sparse vegetation. In eastern North America, it breeds from the Canadian Maritime Provinces south to Long Island. In New York, this species breeds only at a few Long Island colonies. Potential suitable habitat for roseate tern was not observed within the project area.

The NYSDEC Natural Heritage Program (DEC NHP) regarding the potential presence of rare or state-listed animals and plant species and significant natural communitieswithin the project area. DEC NHP indicates that the following threatened species have been documented at or near the project area, generally within 0.5 miles: Least Bittern *(Ixobrychus exilis*-state threatened*)* and Pied-billed grebe *(Podilymbus podiceps*-state threatened*).*

The **Least Bittern** is the smallest member of the *Ardeidae* (heron) family in North America at just 13 inches in length, a wingspan of 17 inches, and an average weight of just three ounces. It has yellow eyes and a thin yellow bill placed atop a long, chestnut and buff-striped throat. The slightly-crested crown, nape, back, and tail are blackish-green and the neck, sides, and undersides are chestnut and white. The wings are black, chestnut, and buff which when folded against the body appear as light-colored streaks along the back. They are extremely secretive birds. Least bitterns initiate nesting in New York in late May to early June. In prime marsh habitat, least bitterns may nest in small groups of up to 15 pairs per hectare (≈ 2.5 acres). Least bitterns feed primarily on small fish, such as minnows, sunfish and perch. Additionally, they rely upon insects (such as dragonflies and beetles), snakes, frogs, tadpoles, salamanders, crayfish and some small mammals. Least bitterns occur in freshwater and brackish marshes with tall, dense emergent vegetation such as cattails, sedges, and rushes that are interspersed with clumps of woody shrubs and open water. In New York, least bitterns thrive in the large, expansive cattail marshes associated with the Great Lakes, the Finger Lakes, Lake

Champlain, and the St. Lawrence and Hudson River Valleys. There is potential habitat for the least bittern in the project area.

The **pied-billed grebe** is a small waterbird measuring approximately 11 to 15 inches in total length, with a 20 to 22.5 inch wingspan and average weight of just 0.75 to 1.0 pound. Their name comes from their most distinguishing characteristic: the pied, or two-colored, bill which is bluish-white with a distinct black vertical bar on either side. The bill is short, laterally compressed, and slightly hooked downward. They return to New York between late March and mid-April. In New York, pied-billed grebe breeding records are scattered across the state but are most abundant in marshes associated with the St. Lawrence River Valley and Lake Ontario. Pied-billed grebes nest in freshwater marshes associated with ponds, bogs, lakes, reservoirs, or slow-moving rivers. Breeding sites typically contain fairly deep open water at depths 0.8 – 6.6 ft interspersed with submerged or floating aquatic vegetation and dense emergent vegetation. Pied-billed grebes occupy a greater diversity of habitats during the non-breeding season including freshwater ponds, impoundments, lakes, rivers, brackish marshes, estuaries, inlets and coastal bays. There is potential non-breeding habitat for the pied billed grebe in the project area, but breeding habitat is not found in the project area.

The following plants are listed as Endangered or Threatened by New York State, and/or are considered rare by DEC NHP: Nantucket juneberry (*Amelanchier nantucketensis*), rose-pink (*Sabatia angularis*), and sweetbay magnolia (*Magnolia virginiana*) are listed as Endangered; and persimmon (*Diospyros virginiana*) is listed as Threatened. According to DEC NHP, persimmon was documented in 1997 within the southwestern portion of the Project Site in the red maple swamp along Chelsea Road. However, Louis Berger biologists did not observe permission during the 2013 field studies.

DEC NHP reports that the eastern mud turtle (*Kinosternon subrubrum*), and two vascular plants, log fern (*Dryopteris celsa*) and orange fringed orchid (*Platanthera ciliaris*), all listed as Endangered in New York State, have been documented in the vicinity of the project area at one time, but have not been documented since 1979 or earlier, and/or there is uncertainty regarding their continued presence.

NMFS reported that no threatened or endangered species under their jurisdiction are known to occur within the project area.

9.2 Rare Species

DEC NHP also reported that the following animals, while not listed by New York State as Endangered or Threatened, are of conservation concern to the state, and are considered rare by DEC NHP: cattle egret (*Bubulcus ibis*), glossy ibis (*Plegadis falcinellus*), little blue heron

(*Egretta caerulea*), snowy egret (*Egretta thula*), yellow-crowned night-heron (*Nyctanassa violacea*), and southern leopard frog (*Lithobates sphenocephalus).*

Jeremy Feinberg (Rutgers University Doctoral Candidate) was contacted regarding the likelihood that the palustrine forested freshwater wetland within the Project Site may provide habitat for leopard frogs, a NY State species of special concern. Until recently, leopard frogs in the New York City region were believed to be southern leopard frogs. A new genetic analysis found this entity to be a new, as yet undescribed, species (Kiviat 2013). Mr. Fienberg stated that based on his surveys leopard frogs have not been observed within the project area and he did not expect that they would occur there (Jeremy Fienberg, personal communication, July 2013).

According to NYSDEC Environmental Resource Mapper, old or potential records exist of rare plants and animals within 0.5 mile of the project area. Rare plant species recorded include orange fringed orchid (*Platanthera ciliaris*), Hyssop-skullcap (*Scutellaria integrifolia*), slender crabgrass (*Digitaria filiformis*), wild comfrey (*Cynoglossum virginianum var. virginianum*), Collin's sedge (*Carex collinsii*), and log fern (*Dryopteris celsa*). Rare animal species recorded include the eastern mud turtle (*Kinosternon subrubrum*), northern cricket frog (*Acris crepitans*), the American burying beetle (*Nicrophorus americanus*), and the three following species of dragonfly: the mocha emerald (*Somatochlora linearis*); the Rambur's forktail (*Ischnura ramburii*); and the Needham's skimmer (*Libellula needhami*). The records listed are only potential areas for rare animals or rare plants. For these historical records, it is not known whether the rare plant or animal still exists at these locations. However, the rare plant or animal listed in the record may still occur in the area if habitat and site conditions are favorable.

Louis Berger conducted biological field surveys in July 2013 to determine the presence of any special status species and conducted habitat suitability assessments to determine the potential for special status flora and fauna to occur within the project area. Special attention was focused on special status flora and fauna identified through the literature review conducted prior to the field surveys. Bayberry (*Myrica pensylvanica*), ostrich fern (*Matteuccia struthiopteris*) and cinnamon fern (*Osmunda cinnamomea*) were observed within the project area. In New York State, these four plant species are considered "exploitably vulnerable," and are protected from collecting or harvesting without the landowner's permission, as they are likely to become threatened in the near future (USDA 2013). Osprey, a New York State species of special concern, was observed within the projects area. Three birds considered imperiled in New York State by DEC NHP were observed during field surveys: glossy ibis, snowy egret, and yellow-crowned night-heron. No other special status flora and fauna were encountered or detected by sign within the project area.

9.3 Significant Natural Communities

The New York Natural Heritage Program (NHP) tracks locations of significant natural communities because they serve as habitat for a wide range of plants and animals, both rare and common, and because community occurrences in good condition support intact ecological processes and provide ecological value and services. Significant natural communities include rare or high-quality wetlands, forests, grasslands, ponds, streams, and other types of habitats, ecosystems, and natural areas. Two significant natural communities within the vicinity of the project area are recorded in the NHP's Biodiversity Database. A red maple-sweetgum swamp is located approximately 0.25 mile east of the project area and a maritime post oak forest is located approximately 0.5 mile north east of the project area.

10.0 Essential Fish Habitat

The Arthur Kill area is designated as providing Essential Fish Habitat (EFH) for 17 federally managed species. EFH is defined as waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Based on the water quality parameters and sediment types present in the vicinity of the project area, three of these species have potential to occur within the project area: winter flounder, windowpane flounder, and bluefish. The project area also supports forage species which are an important resource for EFH-designated fish species.

Construction of the Saw Mill Creek Pilot Wetland Mitigation Bank will result in primarily beneficial impacts to habitat for aquatic biota in the Arthur Kill region. Construction activities may result in short-term increases in erosion and delivery of sediment to nearby wetlands and waters. Most EFH-designated species likely to occur in the Arthur Kill region are typically found in the often turbid conditions of estuaries and can avoid temporary increases in suspended sediments. Impacts will be mitigated by measures including performing the majority of earthwork during low tide, avoiding in-water work from January through June to protect winter flounder and anadromous fish, employing turbidity barriers to minimize migration of turbidity off-site, and re-stabilizing soils with plants after construction is completed. Additionally, best management practices for soil erosion and sediment control will be used to minimize sediment entering waterways.

For these reasons, no long-term adverse impacts to EFH-designated species or habitat, or forage species are expected from construction and operation of the Saw Mill Creek Pilot Wetland Mitigation Bank.

11.0 Phase 1 ESA

In May 2013, a Phase I Environmental Site Assessment (ESA) for the 91.1-acre general project area was conducted. The general project area, which includes the 68.94-acre pilot bank project area, consists almost entirely of undeveloped tidal marsh and upland areas with some areas of fill and development from adjoining parcels. Based on the data obtained during the inspection, interviews, historical resources review and regulatory agency records review, the ESA recommends action and/or additional investigation of the Recognized Environmental Conditions (RECs) identified at the Project Area. Finding of the ESA are summarized below.

Nonindigenous Fill Material

Nonindigenous fill material should be removed from the general project area and properly disposed of at an off-site location in accordance with all applicable laws and regulations during marsh restoration activities. It is recommended that prior to and/or during removal activities, an investigation of the fill material should be conducted in order to identify the extent, depth and physical characteristics of the fill. Investigation should be done in accordance with the NYSDEC DER-10-Technical Guidance for Site Investigation and Remediation (May 2010) (DER-10), which may include a geophysical investigation, test pits, and/or soil borings. If, during the course of removal or investigative activities, a release is encountered, additional investigation in accordance with the DER-10 may be warranted.

Widespread dumping was observed at the general project area, some of which consisted of:

- General Dumping
- Bulk Storage Tank
- Suspected Bulk Storage Tank
- Discarded Electrical Equipment
- Discarded Vehicle Battery Casings
- 55-gallon Drum Dump Area
- Discarded 55-gallon Drum and Approximate 30-gallon Drum (Eastern Section)
- Discarded 55-gallon Drum and Approximate 30-gallon Drum (Western Section)
- Discarded 55-gallon Drums in Fill Berm (Western Section)
- Discarded 55-gallon Drum in Fill Area (Western Section)
- Discarded 1-gallon Pails of Petroleum Product (Western Section)

All discarded and dumped items, and general project area-wide debris should be removed from the general project area and properly disposed of at an off-site location in accordance with all applicable laws and regulations during marsh restoration activities. If, during the course of removal, a release is encountered, additional investigation in accordance with the DER-10 may be warranted. Other RECs that were noted in the general project area and require action and/or further investigation are:

- Potential Off-Site Impacts
- Suspected Pesticide Application
- Conrail Rail Road Along Western General Project Area Boundary

The Phase I ESA indicated that an area-wide characterization plan be developed and implemented at the general project area in order to investigate potential impacts caused by adjacent property uses, recent and/or historic spills, investigate suspected wide-spread pesticide application during the early- and mid-20th century to reduce mosquito populations, and to investigate any potential impacts caused by the adjacent active railroad.

Based on the results of the Phase I ESA, Louis Berger prepared a Site Characterization Work Plan to investigate and identify the extent, depth and physical characteristics of the RECs associated with the project areas identified during the Phase I ESA.

12.0 Soil and Sediment Contamination Screening

The proposed restoration activities may include, but are not limited to, modifications to existing project area topography and the construction of meandering channels. These activities will require excavation of on-site soils. In accordance with Louis Berger's Preliminary Site Screening Work Plan dated June 2013, soil, sediment and groundwater sampling was performed at areas of nonindigenous fill and widespread dumping, as identified in Louis Berger's May 2013 Draft *Phase I Environmental Site Assessment Report*, as well as in areas of undisturbed sediments which may have been impacted from nearby filling and dumping. The purpose of the Site Screening was to investigate and identify the extent, depth and physical characteristics of the nonindigenous fill material. In accordance with the June 2013 work plan, the following tasks were conducted from July to September 2013:

- Soil and Sediment Borings;
- Soil, Sediment and Groundwater Sampling and Analysis;
- Soil and Sediment Logging; and
- Sieve analysis (grain size distribution) analysis.

Soil sampling was targeted to two distinct environmental conditions; areas of nonindigenous fill and widespread dumping. The sediment samples were targeted to areas of anticipated excavation and areas with direct exposure to dumping. Soil analysis for samples located within the fill included Total Petroleum Hydrocarbon Content (TPHC), Target Analyte List (TAL) Metals, Polycyclic Aromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs) on 25% of samples exhibiting the highest TPHC results, and Target Compound List (TCL) Volatile Organic Compounds (VOC+15) at any location where readings from a properly calibrated photoionization detector (PID) were in excess of 5 times background levels (5 ppm). In addition, Total Organic Carbon (TOC), grain size distribution and pH analyses were performed on deeper samples collected from the native material at each location.

Soil analysis for samples collected within the areas of widespread dumping associated with a specific AOC as indicated above, included sampling for TPHC and TCL+30/TAL. Grain Size Distribution, TOC and pH analyses were performed on deeper samples collected from the native material at each location.

The analytical results for the soil samples collected were compared to the Soil Cleanup Objectives as per the NYSDEC Regulations 6 NYCRR Subpart 375-6 Remedial Program Soil Cleanup Objectives (December 14, 2006) (SCOs) for Unrestricted Use (Track 1) and Protection of Ecological Resources (Track 2). It should be noted that these guidelines are not cleanup standards, but screening guidelines.

Sediment analysis included sampling for TPHC, TCL+30/TAL, grain size distribution, TOC and pH analysis at each location. The analytical results for the sediment samples collected were compared to the Salt Water Sediment Criteria, Technical Guidance for Screening Contaminated Sediment, NYSDEC, January 1999 for Human Health (bioaccumulation), Benthic Aquatic Life (acute toxicity and chronic toxicity), and Wildlife (bioaccumulation) (SCSs). Furthermore, the sediment results were also compared to the Effects Range-Low (ERL) and the Effects Range-Median (ERM) in accordance with the Technical Guidance for Screening Contaminated Sediment, NYSDEC, January 1999.

Soil and sediment borings were visually classified in the field using the Burmister Classification System (Burmister, 1949) and Unified Soil Classification System (USCS). Munsell® Rock-Color Charts (GSA, 1995) were used for the color identification. All borings were backfilled with on-site soil or sediment.

Following completion of the field work per the June 2013 workplan and the submittal of Louis Berger's December 13, 2013 *Preliminary Site Screening Letter Results Report* to the IRT, it was determined that select soil and sediment borings would need to be reoccupied and resampled for the deeper B-interval. This resampling event was due to a dynamic final design plan that was altered with regards to the final elevation depths following the submittal of the report. This additional sampling was proposed in Louis Berger's January 2014 *Addendum to the Preliminary Site Screening Work Plan*. Following a review of this proposed addendum, the NYSDEC requested additional sampling. Following subsequent meetings with the New York City Department of Environmental Protection (NYCDEP), the NYSDEC, the USEPA, the USFWS and other members of the IRT and multiple revisions of the revised sampling plan, the final revised *Addendum Site Screening Work Plan Revision 4*, was submitted on May 7, 2014.

This revised work plan included the comparison of results (proposed and existing) to the Protection of Health Residential (Track 2) Soil Cleanup Objectives (SCOs), the Protection of Ecological Resources, (Track 2) SCOs, and the Protection of Groundwater (Track 2) SCOs and the addition of six soil borings on the western section and two soil borings on the eastern section. Additional proposed soil sampling also included the reoccupation of select soil borings to collect samples from revised depths or for additional analytical parameters. At the request of the USFWS, select samples were analyzed for dioxins and furans. Finally, six additional sediment borings were added to the eastern section, and one sediment boring in the eastern section was reoccupied based on the final design elevation depth. No additional water samples were conducted. Upon approval of the revised scope of work, Louis Berger personnel mobilized to the Site in June 2014. The sampling results from both 2013 and 2014 were provided to the IRT in September 2015 in the following two letter reports.

- DRAFT Revised Site Screening Letter Results Report (Western Section) Mitigation and Restoration Strategies for Habitat and Ecological Sustainability Saw Mill Creek Pilot

Wetland Mitigation Bank Blocks 1780, 1790, and 1815, Multiple Lots (September 15, 2015).

- DRAFT Revised Site Screening Letter Results Report (Eastern Section) Mitigation and Restoration Strategies for Habitat and Ecological Sustainability Saw Mill Creek Pilot Wetland Mitigation Bank Blocks 1780, 1790, and 1815, Multiple Lots (September 15, 2015).

12.1 Eastern Section

Some areas of fill are located within the Eastern Section, primarily concentrated along Chelsea Road and Edward Curry Avenue around the perimeter of the project area. In general, storm-driven debris consisting of, but not limited to, plastic materials, tires and household garbage is located throughout the project area, primarily concentrated along the areas of topographic highs. Purposeful dumping of a variety of items including construction and demolition debris, scrap metal, tires, garbage, drums and vehicle parts are also prevalent throughout the project area, primarily within the areas of fill.

- *2013 Sampling*

Nine soil boring locations were advanced to investigate fill and widespread dumping within the eastern section of the project area. Each soil boring was advanced to a depth great enough to reach the native material below the fill (if present) or to the maximum depth that could be achieved. From each soil boring, two samples were collected (an A-interval sample and a B-interval sample). The A-interval sample was collected at the 6-inch interval most representative of the fill material and the deeper B-interval sample was collected from the first 6-inches of native material. Fill material encountered at the project area consisted of brick, concrete, glass, metal, porcelain, fabric, coal, wood. Native soils were found to consist of greenish black to dark yellowish brown organic clays and silty clays with some organic root material. In addition, medium to fine sand exhibiting a mottled texture was observed underlying the organic clays at one location. Groundwater was encountered between 0.5 and 4.5 feet below ground surface (bgs).

Three sediment borings were completed to investigate sediments within the eastern section of the project area. Sediments were found to consist of gray to black to dark yellowish orange organic clays and silt with trace amounts of sand. At each sediment location, groundwater was encountered at the surface or within 1 foot of the surface. An A-interval sample was collected at 0.0 to 0.5 feet bgs and a deeper B-interval sample was collected from 2.0 to 2.5 feet bgs.

- *2014 Sampling*

One additional soil boring was completed to collect additional analytical samples and one additional soil boring was completed for the purpose of soil logging. In addition, two previous soil borings were reoccupied and resampled. Finally, six additional sediment borings were completed and one sediment boring was reoccupied and resampled.

Fill material encountered at the Site consisted of asphalt and concrete overlying reworked soils. Natural soils were found to consist of dark yellowish brown organic clays and silty clays with some organic root material with blackish red sands underlying the silty clays. Groundwater was encountered at 1 foot bgs in the northern portion of the eastern section and 10 feet bgs in the filled areas (western side) of the eastern section. Sediments were found to consist of gray to black to dark yellowish orange organic clays and silt with trace amounts of sand. At each sediment location, groundwater was encountered at the surface or within one foot of the surface

One toxicity characteristic leaching procedure (TCLP) lead sample was collected from the A interval (1.5 - 2.0 feet bgs) of a location which exhibited highly elevated lead levels in 2013. All analytical data from the original scope as well as the addendum scope were compared to the Protection of Ecological Resources (Track 2) SCOs, the Protection of Human Health (Track 2) SCOs, and the Protection of Groundwater (Track 2) SCOs. As stated above, it should be noted that these guidelines are not cleanup standards, but screening guidelines.

From each of the sediment borings, with the exception the reoccupied location, two samples were collected. The A-interval sample was collected at 0.0 - 0.5 feet bgs and the deeper B-interval sample was collected from the 6-inch interval below the proposed cut depth. The proposed cut depths ranged from 2.0 - 6.5 feet bgs. All sediment samples were analyzed for TPHC, TAL Metals, PAHs and TOC. The analytical results were compared to the same criteria as those collected during 2013 as described above.

Based on the results of analytical sampling within the eastern section of the project area, the conclusions and recommendations are as follows:

- Fill material was placed in wetlands and uplands throughout many areas, mostly adjacent to privately held parcels of land. Fill material consist of brick, concrete, glass, metal, porcelain, fabric, coal, wood.
- Contaminants identified with the fill material include various metals, PCBs, pesticides, VOCs and SVOCs. With the exception of the PCBs, the contaminants detected are typically associated with fill material.
- In most cases contaminant concentrations decrease with depth.
- Due to the presence of PCBs greater than (>) 50 ppm in soils near the discarded electrical transformer at one location (SB-14), requirements of the Toxic Substances Control Act (TSCA) are triggered. Disposal of soils with PCBs > 50 ppm will need to be in accordance with applicable TSCA regulations. The area shall be restored to existing elevations by the placement of clean sand. The proposed TSCA remediation measures are expected to remove the contaminants of ecological concern at this location.

- Several metals were detected in all sediment samples at concentrations above the ERL. Mercury, arsenic and lead were the only metals detected in excess of the ERM standards. One sediment sample exhibited no exceedance. In general, contaminant concentrations were found to decrease with depth.
- Dioxin and furan concentrations were detected in both the A and the B interval of the sampled sediment location. For the protection of human health, toxic equivalency factors (TEFs) have been published in 6 NYCRR Part 703.5 that can be used to equate the toxicity for mixtures of dioxins and furans to the equivalent concentration of 2,3,7,8-TCDD. The calculated total Toxicity Equivalent Quotient (TEQ) was 3.6 parts per trillion (ppt) from the A sample and 4.8 parts ppt from the B sample. The total TEQ action level as established by the Center for Disease Control is 1,000 ppt. Therefore, the samples are well below the action level for human health.
- To protect piscivorous wildlife from 2,3,7,8-TCDD or its TEQs in sediment, NYSDEC has established a sediment guidance value (SGV) of 0.5 ppt (0.0005 ppb) for 2,3,7,8-TCDD. This bioaccumulation based, equilibrium partitioning SGV is provided in Table 6 (Saltwater Sediment Guidance Values) of "Assessment of Contaminated Sediment", NYSDEC Division of Fish, Wildlife and Marine Resources, Bureau of Habitat (June 24, 2014) which states that "if this Class A SGV is not exceeded, then the total 2,3,7,8-TCDD equivalent concentration of PCDD/PCDFs in sediment is unlikely to be harmful to aquatic life or terrestrial organisms that consume aquatic organisms." The calculated total TEQ using the TEF and the Bioaccumulation Equivalency Factor (BEF) were 1.38 ppt for the A interval and 0.29 for the B interval. The A interval sample exceeds the SGV, but this material (0 to 0.5 interval of existing soil profile) will be removed from the site. The sediment that will be exposed by the restoration of the wetland (B interval) is below the SGV and is unlikely to be harmful to aquatic life or terrestrial organisms that consume aquatic organisms.
- The one sample collected for TCLP analysis indicated a concentration of 0.12 ppm. This is below the RCRA criteria of 5 ppm.

12.2 Western Section

Significant areas of fill are located within this area, primarily concentrated along roadways and around the perimeter of the privately-owned parcels that abut the project area. However, filling has occurred outside of the privately held parcels. In general, storm-driven debris consisting of, but not limited to, plastic materials, tires and household garbage is located throughout project area, primarily concentrated along the areas of topographic highs. Purposeful dumping of a variety of items including construction and demolition debris, scrap metal, tires, garbage, and drums is also prevalent throughout the project area, primarily within the areas of fill.

- *2013 Sampling*

Four soil boring locations were sampled to investigate nonindigenous fill and widespread dumping within the western section of the project area. Each soil boring was advanced to a depth great enough to reach the native material below the fill (if present) or to the maximum depth that could be achieved. From each soil boring, an A-interval sample was collected at the 6-inch interval most representative of the fill material and the deeper B-interval sample was collected from the first 6-inches of native material. Fill material encountered at the project area consisted of brick, wood, concrete, fiberglass, floor tile, stone (schist block fragments), metal, glass, plastic, rope and plywood. Native soils were found to consist of dark yellowish brown coarse to fine sand exhibiting a mottled texture overlain in some places by black to greenish black organic silt with roots. Based on this lithology it is possible that the majority of the filled areas may have been an upland dune environment. Groundwater was encountered at a minimum depth of 1 foot bgs and always within 6 feet of the ground surface at each of the soil boring locations.

Four sediment boring locations were completed to investigate sediments within the western section of the project area. Sediment borings were advanced to a depth of 2.5 feet bgs. Sediments were found to consist of black to dark yellowish orange sands and organic clayey silty sands. At each sediment location, groundwater was encountered at the surface or within 1 foot of the surface.

- *2014 Sampling*

Three additional soil borings were completed for the purpose of collecting additional analytical samples and three soil borings were completed for the purpose of soil logging only. In addition, four previously advanced soil borings were reoccupied to collect samples from a different depth interval based on the changing final elevation and to collect a TCLP sample from a location which exhibited an elevated lead level in 2013.

Soil analysis of previous boring locations was for compounds detected during the original sampling event. TPHC, TAL metals, PAHs, and TOCs was analyzed from new soil borings. In addition, at the request of the USFWS, dioxin and furan were analyzed in samples from one location. All analytical data from the original scope as well as the addendum scope were compared to the Protection of Ecological Resources (Track 2) SCOs, the Protection of Human Health (Track 2) SCOs, and the Protection of Groundwater (Track 2) SCOs. As stated above, it should be noted that these guidelines are not cleanup standards, but screening guidelines.

Fill material encountered at the Site consisted of wood, brick, fiberglass, tile flooring, schist blocks, metal, plywood, asphalt and concrete overlying reworked soils. Natural soils were found to consist of coarse to fine sand with gravel, slit and clay to brown to greenish black organic silt and organic clayey silt with varying amounts of sand. Groundwater was encountered at 1 foot bgs in the western section and 7.5 feet bgs in the filled areas (eastern side) of the western section.
Based on the results of analytical sampling within the western section of the project area, the conclusions and recommendations are as follows.

- Fill material was placed in historic wetlands and uplands throughout many areas, mostly adjacent to privately held parcels of land. Fill material consists of brick, wood, concrete, fiberglass, floor tile, stone (schist block fragments), metal, glass, plastic, rope and plywood.

- Contaminants identified with the fill material include various metals, PCBs, VOCs and SVOCs/PAHs. These contaminants are typically associated with fill material.
- In almost all cases contaminant concentrations are found to decrease with depth.
- While soil PCB concentrations > 50 ppm were not identified, detections approaching this concentration were identified within two soil samples. If PCB concentrations > 50 ppm are present, those excavated soils will be managed in accordance with TCSA regulations.
- The depth to groundwater varies between 1 foot bgs to 7.5 feet bgs across the western parcel.
- The TCLP data did not exhibit an exceedance of the RCRA hazardous waste level. The TCLP data exhibited a concentration of 0.05 parts per million and the RCRA criteria is 5 parts per million.
- Dioxin and Furans are well below the human health action level of 1,000 ppt and the NYSDEC Sediment Guidance Value of 0.5 ppt. Therefore, the sediment is unlikely to be harmful to aquatic life or terrestrial organisms that consume aquatic organisms.

13.0 Fish and Wildlife Resource Impact Analysis

Louis Berger performed an ecological evaluation of the General Project Area. A Resource Characterization (Part 1 of a Fish and Wildlife Resources Impact Analysis) was conducted based on the New York State Department of Environmental Conservation (NYSDEC) DER-10 Technical Guidance for Site Investigation and Remediation in order to evaluate the actual or potential impacts to fish and wildlife resources from project area contaminants of ecological concern under existing and proposed conditions. The Fish and Wildlife Resources Impact Analysis Report was submitted to the IRT in December 2013.

Environmentally sensitive areas identified on and immediately adjacent to the project area include wetlands and surface water. Fish and wildlife resources are present within and adjacent to the project area and have been observed utilizing these resources. Evidence of dumping of trash/debris was observed throughout the project area, predominately in the forested portions of the project area, adjacent to private parcels, and along perimeter roads. Observed debris included concrete, automobiles and parts, scrap metal, drums, and household garbage. Additionally, portions of the project area's historic wetlands have been filled. There were no signs of ecological stress or absence of biota observed within or adjacent to the project area, and all investigated vegetated areas appeared healthy.

There are known contaminants of ecological concern within the project area's surficial soils and sediments. A review of soil and sediment samples collected from the project area indicates that the following known contaminants of ecological concern occur within the project area:

- metals (arsenic, barium, cadmium, chromium, copper, lead, nickel, mercury, selenium, silver, and zinc);
- pesticides (4,4-DDD, 4,4-DDE, 4,4-DDT);
- PCBs
- VOCs (xylene); and
- SVOCs (benzo[a]pyrene).

Based on the data collected during this investigation, the project area does currently appear to pose an ecological risk. There are known contaminants of ecological concern present in sediments and soils within the project area boundaries. Environmentally sensitive areas were identified on and immediately adjacent to the project area. Contaminant migration pathways are present within the project area in the form of direct exposure to wildlife via contaminated soils and sediments and the flow of contaminated sediments to other sensitive areas. Although no apparent ecological impacts were observed, project area contaminants of ecological concern could potentially impact fish and wildlife resources.

However, current conditions will be significantly improved through the planned restoration of wetlands within the project area. The Saw Mill Creek Pilot Wetland Mitigation Bank will remove contaminated soils and debris from the project area, thereby reducing contaminants of ecological concern within the Bank boundary.

Similar contaminants of ecological concern were identified on the Brooklyn Union Gas (BUG) Salt Marsh Mitigation Site located approximately 4,000 feet northeast of the Saw Mill Creek Pilot Bank on Staten Island, New York. The USACE New York District restored the BUG (now KeySpan) site in 2006/2007 to mitigate for unavoidable impacts resulting from the dredging and deepening of the Arthur Kill Channel. The 9-acre restoration effort included: the removal and grading of approximately 36,200 cubic yards of materials to create tidal channels and marshland; the removal of *Phragmites* and debris; re-grading the marsh surface to promote the growth of *Spartina* grass; and planting native wetland vegetation. The NYSDEC currently maintains the BUG mitigation site. Prior to construction, elevated concentrations of arsenic and mercury were found to be ubiquitous, and a range of PAHs were detected at approximately half of the sampling locations. The USACE BUG sampling report (provided as Attachment 4 to the NYCEDC's December 2013 Fish and Wildlife Resources Impact Analysis report) concluded that the elevated PAH and metals concentrations are typical of historic fill associated with urbanized areas.

At the BUG site, soils were excavated to appropriate grades and the exposed soil was either planted with tidal marsh vegetation or left unplanted to provide mudflat/open water habitat. A similar restoration approach is proposed at the Saw Mill Creek Pilot Wetland Mitigation Bank. In most locations existing fill and debris (tires, cement, asphalt, etc.) will be removed to create elevations that will support tidal salt marsh and tidal creeks. The exposed marsh plain will be planted with native salt marsh grasses and shrubs.

Thus, the proposed restoration will remove contaminated soils, exposing cleaner soils. Areas where clean soil horizons have not been discovered through sampling will be over-excavated and covered with two feet of clean sand to minimize risk of exposure to remaining contamination.
No such over excavation was conducted at the BUG site.

14.0 Cultural Resource Summary

On behalf of NYCEDC, Louis Berger submitted a description of the project to the New York City Landmarks Preservation Commission (LPC) in June 2013. LPC completed an initial environmental review of the proposed project area's lots and indicated the following.

- There are no Properties with Architectural significance on site.
- All lots possess archaeological significance and will require the completion of an archaeological documentary study for project area.

In October 2013, NYCEDC's consultants submitted a Phase IA Archaeological Documentary Study to LPC. The Phase IA study indicated that there are a few areas of archaeological sensitivity and recommended Phase IB archaeological testing be undertaken if there will be ground disturbance in these areas. On the east side, all sensitive areas are located in upland forests, where no earthwork (ground disturbance) is proposed. On the west side, there is one area of "historic period sensitivity" that will be excavated during wetland restoration activities.

In November 2013, the LPC agreed there is limited sensitivity within the project area. LPC requested that NYCEDC provide a scope of work for archaeological fieldwork in areas of proposed ground disturbance on the west side. NYCEDC completed an archaeological fieldwork protocol for the sensitive area on the west side for approval by LPC. LPC accepted the archaeological monitoring protocol on February 10, 2014.

In accordance with Section 106 of the National Historic Preservation Act, the New York State Office of Parks, Recreation and Historic Preservation (SHPO) also requested that a Phase I archaeological survey be completed to determine the presence or absence of archaeological resources within the project area. In a March 27, 2014 letter, based on a review of the Phase IA Study, SHPO concurred that a substantial portion of the project's Area of Potential Effects (APE) has been disturbed by the truncation of higher elevations and that in these areas the archaeological potential is negligible. However, SHPO did not concur that lower-lying, wetland areas without buried peat have low archaeological potential. SHPO stated that if any such areas are to be subjected to ground-disturbing activities, SHPO recommends that a geomorphological investigation be conducted by a qualified specialist with experience in studying archaeological contexts in order to assess their archaeological potential.

During a May 2, 2014 conference call with SHPO, NYCEDC noted that the lower-lying wetland areas without buried peat will <u>not</u> be disturbed by the proposed wetland restoration project as those areas are already functioning wetlands. In a subsequent letter to SHPO, dated May 23, 2014, NYCEDC also noted that the proposed ground-disturbing activities will only occur in 7.04 acres of uplands and 16.72 acres of filled/disturbed wetlands. The purpose of the restoration is to remove fill material from these degraded areas. The May 2014 letter provided the following recommendations.

- On the west portion of the project, almost all of the earthwork will be conducted in upland areas. Only 0.34 acres of existing wetlands will be disturbed to remove 686 cubic yards of soil. The disturbance to existing wetlands will be less than 6 inches in depth and is only required to connect the restored wetlands to the existing wetlands. Due to the extremely shallow nature and small area of the excavation of the western wetlands, the archaeological potential is negligible. Therefore, NYCEDC recommended no geomorphological investigation on the portion of the site west of Chelsea Road.

- On the east portion of the project, there are three areas of excavation in wetlands: southern; central and northern. All of these areas contain fill material that raised them above the adjacent functioning tidal marshes (enhancement areas) and above the Spring High Water Line. For the southern section, most of the excavation will be shallow (0 to 2 feet) and would impact fill material that is not of archaeological importance. A small area will be cut deeper (2 to 4 feet) and will extend into native soils to provide a tidal stream. Therefore, NYCEDC recommended that any geomorphological investigation on the southern section of the east portion of the project focus solely on the area of the proposed stream.

- For the central section, almost all of the earthwork will be conducted in upland areas. Only a small area of existing wetlands will be disturbed. The disturbance to existing wetlands will be less than 6 inches in depth and is only required to connect the restored wetlands to the existing wetlands. Due to the extremely shallow nature and small area of the excavation of the central section of the eastern wetlands, the archaeological potential is negligible. Therefore, NYCEDC recommended no geomorphological investigation on this portion of the site.

- For the northern section, most of the excavation in existing wetlands will be shallow (0 to 2 feet) and would impact fill material that is not of archaeological importance. A small area will be cut deeper (2 to 8 feet) and will extend into native soils to provide tidal streams. Therefore, NYCEDC recommended that any geomorphological investigation on the northern section of the east portion of the project focus solely on the area of the proposed stream.

In summary, NYCEDC recommended the focused areas of geomorphological investigation as follows: the proposed stream on the southern section of the east portion of the project and the proposed stream in the northern section of the east portion of the project. NYCEDC also noted that these areas are currently wetlands and any geomorphological work in these areas will be logistically difficult and potentially damaging to the wetlands. As part of the proposed restoration of the site, the area will remain open space that is preserved in perpetuity. NYCEDC provided a protocol to SHPO for implementing this focused geomorphological investigation on the east side. In an August 14, 2014 letter, SHPO concurred with the archaeological testing protocol dated 18 July 2014.

As archaeological fieldwork requires excavation of fill from the western and eastern wetlands, it makes sense to conduct fieldwork during construction. All archaeological testing will be conducted according to OSHA regulations and applicable archaeological standards (New York Archaeological Council 1994, NYSOPRHP 2005; LPC 2002; CEQR 2012). Professional archaeologists, with an understanding of and experience in urban archaeological excavation techniques, would be required to be part of the archaeological team during construction.

Therefore, the U.S. Army Corps of Engineers, New York State Office of Parks, Recreation & Historic Preservation, New York City Economic Development Corporation, and the New York City Landmarks Preservation Commission are developing a Memorandum of Agreement regarding the archaeological protocols to be implemented during construction of the Saw Mill Creek Pilot Wetland Mitigation Bank. With the implementation of the archaeological fieldwork protocols, no significant adverse impacts to archaeological resources would occur.

15.0 Federal Aviation Administration Coordination

Per the 1996 Federal Aviation Administration (FAA) Wetland Banking Mitigation Strategy (FAA Banking Strategy) and Advisory Circular 150/5200-33 *Hazardous Wildlife Attractants On or Near Airports,* the FAA recommends a separation distance of 10,000 feet for any potential hazardous wildlife attractant for airports that serve turbine-powered aircraft. The FAA Banking Strategy states that "*to minimize wetland-related risk to aviation safety, FAA program offices and airport sponsors are strongly encouraged not to establish a bank or purchase credits from banks that are located within*

- *5,000 feet of a runway that serves piston-powered aircraft; or*
- *10,000 feet of a runway that serves turbine-powered aircraft……*

FAA program offices and airport sponsors may consider using a wetland bank not meeting these distance criteria only when the bank provides special ecological functions such as:

- *maintaining habitat essential to Federally-listed endangered or threatened species; or*
- *maintaining unique wetland functions (e.g., aquifer recharge, flood control, filtration).*"

The proposed Saw Mill Creek Pilot Wetland Mitigation Bank is located well beyond the 10,000 foot separation distance. The Bank is over 12,000 feet (2.4 miles) from Linden Airport (LDJ) and over 22,000 feet (4.2 miles) from Newark Liberty International Airport (EWR).

According to the FAA Banking Strategy, "Written verification that the bank is not within the 5,000 or 10,000-foot criteria…shows that the bank providing the credits should not pose hazardous conditions to aviation."

Therefore, NYCEDC believes the Bank is in compliance with the FAA Banking Strategy and that there is no need to demonstrate that the proposed bank meets the special ecological function noted in the FAA Banking Strategy. NYCEDC does note that the area has been designated as a Significant Habitat Complex of the New York Bight Watershed by the U.S. Fish and Wildlife Service (US FWS).

On January 23, 2014, FAA issued a determination that the "FAA has no objections at this time."

16.0 Development Trends

The Sandy-Hook-Staten Island Watershed (HUC 02030104) is currently under significant development pressure. Activities include the development of currently undeveloped lands and the redevelopment, expansion, and maintenance of existing infrastructure. There are currently trends and initiatives on Staten Island and the greater NYC area that will shape development in the region for years to come. Richmond County has been one of the fastest developing counties in New York State. The demand for wetland mitigation does not directly come from construction of new housing; rather, it is the expansion and/or construction of infrastructures to support the incoming population which would generate the need for wetland mitigation and potential credit sales. While at this time it is not possible to determine acreages of wetland impacts that come as a result of these trends, it is reasonable to assume that some wetland impacts will occur as a result, particularly on Staten Island.

A market analysis was conducted for the proposed Saw Mill Creek Pilot Wetland Mitigation Bank in order to determine where there is a need for bank credits within the Bank's service area. Agencies and organizations that operate within the expected service area of the Bank that were contacted include: The New York State Department of Transportation (NYSDOT) Region 11, The Brooklyn Bridge Park, The Hudson River Park, New York City Department of Parks and Recreation, The New York City Department of Environmental Protection, and other entities. Agencies and organizations that operate in the NYC area were surveyed to determine what (if any) future projects they are planning that could potentially involve wetland impacts needing mitigation credits. Sources of information include: City Environmental Quality Review applications, available on the webpage of the Mayor's Office of Environmental Coordination: the Land Use and CEQR Application Tracking System (LUCATS) maintained by the Department of City Planning; personal communications with individuals; and the websites of the various organizations.

The NYSDOT Region 11 has numerous upcoming projects that require wetland mitigation, particularly within Staten Island. Many of their proposed projects on Staten Island are currently on-hold because of wetland issues. Overall, approximately 30-50% of transportation projects in Region 11 need a wetland permit and associated mitigation, an estimated 5-10 acres of impact over a 3-5 year period. The following projects/organizations could also impact wetlands and/or waterways in the vicinity of the project: Brooklyn Bridge Park; Hudson River Park; NYC Department of Parks and Recreation; NYC Department of Environmental Protection; NYC Economic Development Corporation; and the Metropolitan Transportation Authority (MTA) capitol program which allocates funding to the following Core Capital programs: New York City Transit, Long Island Railroad, Metro-North Railroad, MTA Bus, MTA-wide Security Program, Staten Island Rapid Transit and MTA Interagency. The MTA Capital Construction Company manages the mega-projects-system expansion and Lower Manhattan transit infrastructure projects. The *MTA Capital Program 2010-2014* was amended in December 2021 to include $4.75 billion in additional repair and restoration to MTA assets damaged by Hurricane Sandy.

In addition, the Port Authority of New York & New Jersey conceives, builds, operates and maintains infrastructure critical to the trade and transportation network within the service area of the Bank. The PANYNJ has numerous capital projects in development, and advancing projects to the construction phase is dependent on funding, which varies from year to year. Within the next 2 or 3 years, the PANYNJ may begin construction of a new ramp off Route 278 which would result in a maximum of 2 acres of wetland impact. Additionally, there will be substantial wetland mitigation needs if the NYCT Berth 4 project goes forward, although it is uncertain what the timeframe would be. In addition, the Staten Island Economic Development Corporation (SIEDC) serves the needs of Staten Island's business community through implementation of large development projects. Several of the projects on the SIEDC website are in the planning and developments stages, but are located in areas where wetland impacts would be likely to occur. Additionally, the Phase II Study for the West Shore light rail indicates that wetlands may be impacted for this project.

The Department of City Planning has four active studies and proposals for the development of Staten Island's neighborhoods and transportation networks over the next 20 years. There are Brownfield Opportunity Area studies for the West Brighton and Port Richmond areas, which involve evaluating existing conditions and identifying opportunities for improvements to transportation networks and waterfront access. The result of the studies will be a proposed zoning and infrastructure framework to support long-term goals for Staten Island's North Shore. The **Working West Shore 2030** report lays the framework for future investment in development and land use decisions on the West Shore of Staten Island. Physical challenges that hinder opportunities on the West Shore include: industrial properties lacking adequate connections to infrastructure; wetlands and environmental challenges constraining reuse; transportation connections left incomplete; and historic communities with limited local services. The final report identifies strategies that will help create jobs, upgrade infrastructure, preserve open space and manage growth over the next twenty years. The **North Shore 2030** report describes how this area of Staten Island can reach its potential through four strategies: promoting quality jobs and workplaces, reconnecting people with the working waterfront, supporting and creating neighborhood centers, and improving connections and mobility. This effort builds upon current and planned investments being made in Staten Island, including the expansion of the New York Container Terminal, the Goethals Bridge expansion, redevelopment at the Stapleton Waterfront and the former Coast Guard site, new public open space at the former Blissenbach Marina, expanded cultural uses at Snug Harbor, improvements to the St. George Ferry Terminal, and individual investments by the area's maritime businesses.

With the aftermath of Hurricane Sandy (the most destructive hurricane of the Atlantic 2012 hurricane season, and the second costliest hurricane in U.S. history), efforts are underway to secure the area from the possible direct and indirect effects of future storms. The USACE New York District is considering levees, sea walls, and hurricane gates for storm surge protection on the south shore of Staten Island (Schuerman 2013). While many of these efforts also have the goal of preserving wetlands for flood storage, it is conceivable that some flood control measures may result in unavoidable impacts to wetlands and therefore require mitigation. In addition to shoreline hardening, after Hurricane Sandy, it became obvious that there are many improvements that need to be made to the City’s stormwater infrastructure. For example, the Environmental Protection Agency will award $569 million to repair and upgrade water treatment plants damaged by Hurricane Sandy in New York and New Jersey. Construction and maintenance of stormwater outfalls involves in-water work, which can result in impacts to wetlands and waters of the U.S., which would require mitigation.

In addition, two major energy infrastructure initiatives are being advanced in the State of New York. The New York Energy Highway, launched in 2012, is intended to enhance electric system reliability and efficiency. Additionally, the initiative will encourage economic growth, and create jobs primarily through the construction of an improved transmission link between the generation capacity in upstate and western New York and the demand for electric power downstate. The second initiative is to identify priority projects for improving electric power infrastructure to withstand severe weather events such as Hurricane Sandy. These initiatives could result in a significant amount of infrastructure construction within the State of New York and presumably New York City. Such construction would likely impact some wetland areas and require mitigation of the impacts. In addition, there is the potential for new natural gas infrastructure projects due to the ongoing boom with directional drilling in the nearby Marcellous shale.

17.0 Site Selection Criteria

The Saw Mill Creek site was selected by NYCEDC for the pilot New York City wetland mitigation bank project through a consultation process with state agency representatives as well as discussions with representatives from the New York City agencies that currently steward the City’s open spaces. The Saw Mill Creek site was selected as the preferred alternative for the Pilot Bank based on the following criteria: (**i)** location; **(ii)** the ecological suitability and services resultant from restoration; and **(iii)** technical and physical design considerations. Attachment D-1 presents the site selection analysis that resulted in the selection of the Saw Mill Creek site as the preferred alternative for the Pilot Bank project.

18.0 Alternatives Considered

The objective of this alternatives analysis is to demonstrate that the proposed Bank conforms to relevant laws, directives, regulations, and policies that govern such construction, especially as it affects wetland resources. Compliance with these regulations requires an assessment of reasonable alternatives to the proposed action that will avoid or minimize adverse effects.

In evaluating the alternatives, the preferred alternative must meet project goals, demonstrate utility, and represent a reasonable and practicable alternative, taking into consideration cost, existing technology and logistics, in light of project purposes. Alternatives were also evaluated to determine the environmental consequences associated with implementation. The selected preferred alternative was identified as the scheme that is practicable, meets project goals, and avoids and minimizes environmental impacts to the greatest extent practicable.

The Bank will provide compensatory mitigation for unavoidable impacts to waters of the US, including wetlands, that result from construction impacts including transportation, residential and commercial buildings, and utility-related activities authorized under the applicable state and federal rules and provided such use has met all applicable requirements. The need for the Bank is based on an understanding of mitigation demand by these entities in the New York City area for the foreseeable future. At the current time, there are no wetland mitigation bank credits available within NYC, or within the USGS Hydrologic Unit Codes (HUCs) that could potentially be serviced by a wetland mitigation bank.

Part of the Saw Mill Creek project area is currently degraded and contains the invasive *Phragmites* that has outcompeted native plant species. Sections of the site were historically altered from the tidal influence of Saw Mill Creek by the creation of multiple berms, and the construction of a human-made mosquito ditch network. All of these actions have severely degraded the site and have altered the functions and services provided by the wetlands and waterways of the Saw Mill Creek project area. The establishment of the Bank represents an opportunity to ecologically restore, enhance and preserve a large tract of land within NYC, while providing compensatory mitigation for public and private construction and transportation projects.

18.1 Regulatory Compliance

Prior to public and private entities utilizing the Bank, applicants will be required to obtain necessary permits, which may include: USACE Section 404 & 10 Permits for the placement of fill materials into waters of the United States; NYSDEC Section 401 Water Quality Certification, Protection of Waters, Tidal Wetlands permits; and NYSDOS Coastal Consistency Concurrence. As part of this permitting process, these applicants will have to satisfy the requirements of and provide justification for the placement of fill materials into wetlands according to the Clean Water Act's Section 404(b)(1) Guidelines, in addition to satisfying state requirements. Therefore, the existence of the Bank will not diminish or lower the standards for fill placement under the Section 404(b)(1) Guidelines. Only when an applicant can satisfy the requirements of the Section 404(b)(1) Guidelines will that applicant have potential access to the Bank. Projects that satisfy the Section 404(b)(1) Guidelines should be permitted. Projects that do not satisfy the requirements of the Section 404(b)(1) Guidelines should not be permitted. The Bank offers a means of providing quality mitigation to public and private entities for unavoidable wetland losses, but only after an applicant satisfies the guidelines prepared for administering the Clean Water Act. As such, the Bank will provide quality mitigation in the New York City including, Manhattan, Staten Island and portions of the Boroughs of the Bronx, Brooklyn and Queens.

Federal agencies involved with the environmental review and permit process include the USACE, U.S. Environmental Protection Agency (EPA), National Marine Fisheries Service (NMFS), and USFWS, while the State agencies are the NYSDEC and the NYSDOS. In addition, each of these agencies has a wetland mitigation specialist representative on the IRT. The IRT is tasked with reviewing all wetland mitigation proposals located within the Lower Hudson River watershed.

Wetland mitigation bank development requiring discharges within waters of the U.S. is governed by a number of laws, directives, regulations and policies. Applicable regulations are described below. It is the intent of this section to demonstrate that the proposed Bank conforms with all existing relevant regulatory requirements.

18.2 Section 404(b)(1) Guidelines

EPA has developed criteria to be used in the evaluation of discharges of dredged or fill material into waters of the United States under Section 404 of the Clean Water Act. *The Guidelines for Specification of Disposal Sites for Dredged or Fill Material* (40 CFR Part 230, December 24, 1980) are commonly known as the Section 404(b)(1) Guidelines. These guidelines indicate that dredged or fill material should not be discharged into the aquatic system unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact. Compliance with the guidelines requires an analysis of alternatives. Specifically, the guidelines state that no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. An alternative is defined as practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

The USACE regulates the issuance of permits to fill waters of the United States, including wetlands, pursuant to Section 404 of the Clean Water Act. However, the issuance of a Section 404 permit must be done in compliance with the EPA guidelines described above, pursuant to

Section 404(b)(1) of the Clean Water Act, unless the USACE concludes that the economics of navigation and anchorage warrant permit issuance.

Further elaboration and clarification of the application of the Section 404(b)(1) Guidelines was provided in the Memorandum of Agreement (MOA) between the EPA and the USACE on the Clean Water Act, Section 404(b)(1) Guidelines (55 FR 9211, March 12, 1990). This MOA indicates that the EPA and USACE will strive to achieve a goal of no overall net loss of functions and services for wetlands. To achieve this goal the EPA and the USACE have established a sequence by which proposed projects in wetlands are to be evaluated. First, it must be determined that potential impacts have been avoided to the maximum extent practicable. Remaining impacts are to be minimized through appropriate and practicable steps including project modifications, followed by mitigation.

18.3 Methodology

Alternatives investigated for the Bank include the No-Build Alternative and the Build Alternative, as discussed below. The No-Build Alternative was evaluated assuming the Bank would not be implemented. This alternative provides the baseline against which the Build Alternative was evaluated.

18.3.1 No-Build Alternative

Public and private entities and agencies have an acute need for mitigation of anticipated impacts to wetlands in the New York City area. Wetland mitigation is necessary to adhere to the no net loss of wetland functions and services provision. Although no wetland impacts would result from the No-Build Alternative, this alternative would not serve to meet an existing and projected demand for wetland mitigation.

The No-Build Alternative would result in no restoration of the existing degraded, *Phragmites* wetland complex and areas of previous fill resulting in historic berms and illegal dumping. The 68.94 acres of the Saw Mill Creek project area would remain in the same degraded condition. The *Phragmites* and fills would remain as relatively low quality habitat. Therefore, due to the need for better mitigation options within New York City and the environmental benefits of wetland restoration, enhancement and preservation at the Bank site, it has been determined that the No-Build Alternative does not meet the Project Purpose and Need and has not been advanced for further consideration.

18.3.2 Build Alternative

The Bank Project is proposed within a parcel of land (Saw Mill Creek) owned by the City of New York. Based on the desired removal of *Phragmites* and fill, and to provide reestablishment of tidal flow to portions of the Bank area, it was determined that a channels would need to be established to provide tidal flooding of areas historically filled. For this reason, new channel locations were investigated. Suitable channel design was dependent upon the completion of several baseline studies including Hydrologic and Hydraulic analyses. The channels are designed based on local data, including surveyed cross sections, from on-site functioning tidal wetlands (reference wetlands). The proposed channels are similar to the length, width, sinuosity, and density of channels within the reference wetlands. To ensure the proposed channels adequately convey tidal water to/from the proposed marsh, the cross-sectional area of the channels were designed in accordance with *Design Guidelines for Tidal Channels in Coastal Wetlands* (U.S. Army Corps of Engineers, Waterways Experiment Station, 1995).

18.4 Conclusion of Alternatives Analysis

This Alternatives Analysis assessed the No-Build and the Build Alternative pursuant to Section 404 (b)(1) Guidelines. Each alternative was first assessed to determine whether the alternative met project objectives. If an alternative did not meet project objectives it was not advanced for further consideration. Each alternative assessed to meet project objectives was evaluated in terms of impacts to waters of the U.S. including wetlands.

Although the No-Build Alternative would not result in any temporary wetland impacts, it was determined that this alternative was not feasible and did not satisfy the project purpose and need. The No-Build Alternative would not result in restoration of the existing degraded, *Phragmites* dominated wetland complex, nor removal of the historic fill. The *Phragmites* monoculture would remain as relatively low quality habitat. The need for better mitigation options within NYC would not be met. Therefore, the No-Build Alternative was rejected.

In summary, the Build Alternative would allow for the establishment of the Bank, and provide NYC private and public agencies with a viable compensatory wetland mitigation option. Hydrologic and Hydraulic analyses indicated tidal influence from Saw Mill Creek, through new channels would be adequate to provide the appropriate tidal regime.

Removal of fill material and restoration of the existing degraded, *Phragmites* dominated wetland complex would occur, the *Phragmites* monoculture would be replaced with a thriving, healthy tidal marsh complex providing improved habitat, and private entities/public agencies would be provided with a viable compensatory wetland mitigation option.

Avoidance, minimization, and reduction components were incorporated into the Build Alternative to minimize wetland and open water impacts to the maximum extent practicable and feasible. It is anticipated that no permanent impacts to wetlands or open waters will occur. Temporary impacts to wetlands would result from construction equipment on timber mats or equivalent will be used to excavate the channels, and removal of nonindigenous fill.

In conclusion, the Build Alternative meets project objectives and achieves the intended purpose of meeting the existing and projected demand for compensatory mitigation in the New York City area. The design alternative avoids, minimizes, and reduces wetland impacts to the maximum extent practicable and feasible. Therefore, this alternatives analysis demonstrates that the proposed Bank conforms to relevant laws, directives, regulations, and policies that govern such actions, especially as it affects wetland resources. The Build Alternative was identified as the scheme that is practicable, meets project goals, and avoids and minimizes wetland and environmental impacts.

19.0 Conclusions

All information collected to date indicates that the project area is ecologically suited to be established as a wetland mitigation bank.

20.0 References

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ATTACHMENT C-1
PROJECT AREA PHOTOGRAPHS

Photo 1: Salt meadow hay and high tide bush in high marsh - east of Chelsea Road.

Photo 2: Salt meadow hay, black grass, and dense stand of high tide bush - west of Chelsea Road.

Photo 3: Looking west along Saw Mill Creek from Chelsea Road bridge.

Photo 4: Smooth cordgrass along channel in foreground, with high marsh transitioning to common reed in background - east of Chelsea Road.

Photo 5: Salt panne - west of Chelsea Road.

Photo 6: Upland oak forest - east of Chelsea Road.

Photo 7: Japanese knotweed and common reed, edge of upland south of Edward Curry Avenue - east of Chelsea Road.

Photo 8: Fiddler crab within the high marsh - west of Chelsea Road.

Photo 9: Marsh wren nest in common reed on remnant berm – east of Chelsea Road.

Photo 10: Deer observed in the palustrine forested wetland - east of Chelsea Road.

Photo 11: Wood and metal debris dumped near wetland/upland boundary – west of Chelsea Road.

Photo 12: Tires, wood, and metal debris dumped near wetland/upland boundary – west of Chelsea Road.

Photo 13: Asphalt dumped in wetland – west of Chelsea Road.

Photo 14: Scrap metal, boulders, concrete debris along boundary of adjacent privately owned industrial land – west of Chelsea Road.

Photo 15: Dumping within emergent marsh – west of Chelsea Road.

Photo 16: Storm surge debris – west of Chelsea Road.

Photo 17: Previously filled wetland, central portion of Site – west of Chelsea Road.

Photo 18: Tires dumped in palustrine forested wetland – east of Chelsea Road.

Photo 19: Tire in low marsh habitat – east of Chelsea Road.

Photo 20: Tires dumped in upland forested area adjacent to Chelsea Road and Route 440 ramp – east of Chelsea Road.

Photo 21: Scattered tires and other debris dumped in upland - east of Chelsea Road.

ATTACHMENT C-2
TRIBUTARY PHOTOGRAPHS AND KEY MAP

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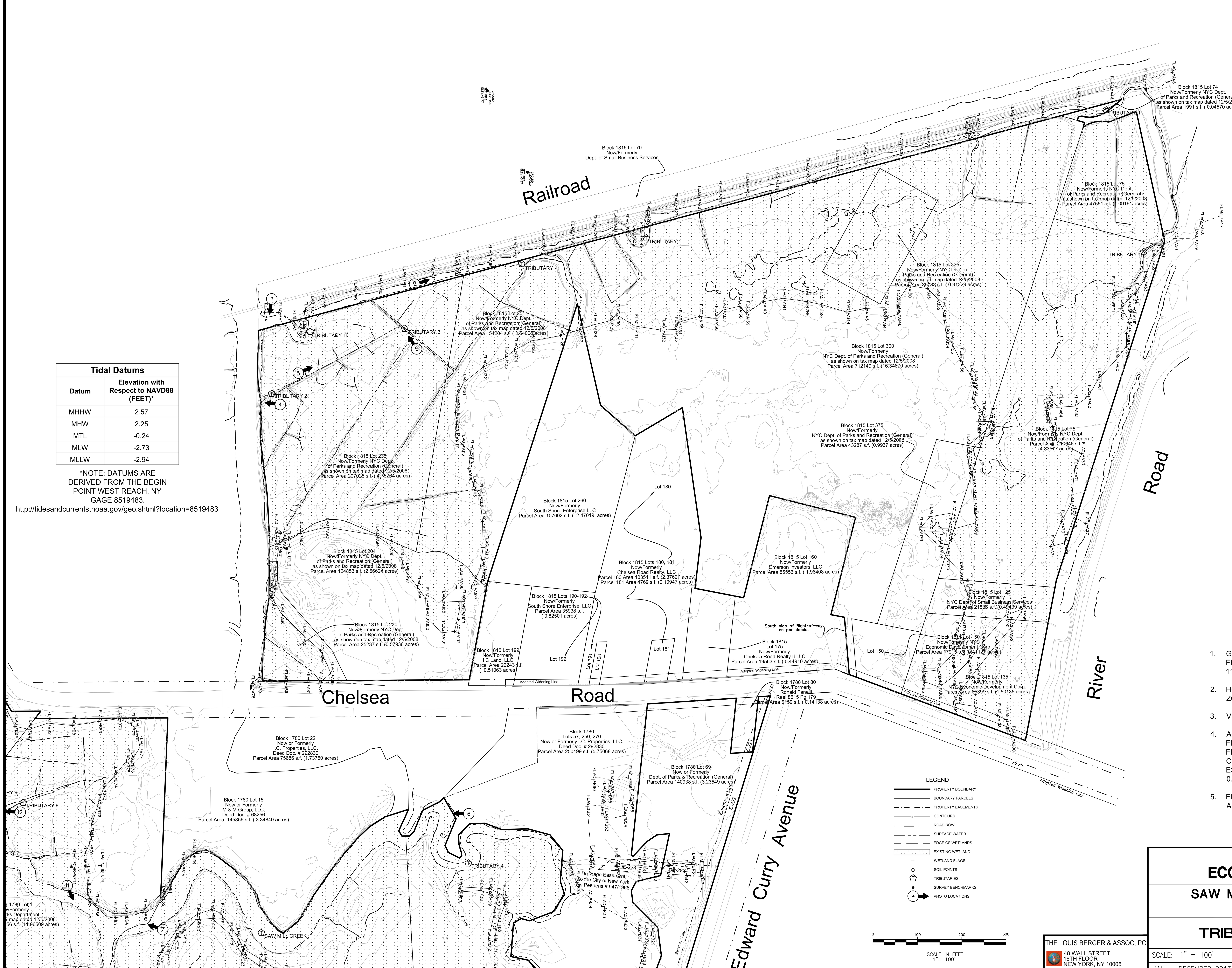

Tidal Datums	
Datum	Elevation with Respect to NAVD88 (FEET)*
MHHW	2.57
MHW	2.25
MTL	-0.24
MLW	-2.73
MLLW	-2.94

*NOTE: DATUMS ARE DERIVED FROM THE BEGIN POINT WEST REACH, NY GAGE 8519483.
http://tidesandcurrents.noaa.gov/geo.shtml?location=8519483

Jurisdictional Wetland Areas	
Wetland	Area (ACRES)
A	22.100
B	43.304

Upland Inclusionary Areas	
Upland	Area (ACRES)
C	2.115
D	0.055
E	0.144
F	0.029
G	0.018
H	0.152
I	0.255
J	0.009
K	0.012

Tributary Lengths within Site Boundary	
Waters of the US	Sum of Length within Project Boundaries (FEET)
Saw Mill Creek	2272.6
Jurisdictional Tributaries	Sum of Length within Project Boundaries (FEET)
Tributary 1	498.7
Tributary 2	105.5
Tributary 3	246.7
Tributary 4	996.4
Tributary 5	689.9
Tributary 6	450.6
Tributary 7	1019.5
Tributary 8	280.8
Tributary 9	163.5
Tributary 10	139.2
Tributary 11	203.4
Tributary 12	564.1
Tributary 13	96.5
Tributary 14	283.7

1. GPS SURVEY, PROPERTY LINES AND TOPOGRAPHIC DATA RECEIVED FROM GAYRON DE BRUIN LAND SURVEYING AND ENGINEERING, P.C., 11 UNION AVENUE, BETHPAGE, NY 11714 IN JULY 2013.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM 1983 LONG ISLAND ZONE. ALL LINEAR MEASUREMENTS ARE IN U.S. SURVEY FEET.
3. VERTICAL DATUM IS NAVD 1988.
4. A LEICA GS15 GPS ROVER WAS USED TO LOCATE THE WETLAND FLAGS. THE ROVER UNIT RECEIVED IT'S COORDINATE CORRECTION FROM A GPS BASE STATION, COMMUNICATING THROUGH A RADIO CONNECTION, OCCUPYING A SURVEY CONTROL POINT PREVIOUSLY ESTABLISHED. THE HORIZONTAL ACCURACY OF THE ROVER IS 0.1'+/-.
5. FLAGS LOCATED IN THE FORESTED AREAS WERE SURVEYED USING A LEICA TS15 TOTAL STATION WITH AN ACCURACY OF UNDER 0.05'

NEW YORK CITY ECONOMICAL DEVELOPMENT CORP.

SAW MILL CREEK WETLAND MITIGATION BANK STATEN ISLAND, NEW YORK

TRIBUTARY PHOTO KEY MAP -1-

THE LOUIS BERGER & ASSOC, PC
48 WALL STREET
16TH FLOOR
NEW YORK, NY 10005

SCALE: 1" = 100'	DRAWN BY: MH	PROJECT NO.	2001984	SHEET 1 OF 2
DATE: DECEMBER 2013	CHECKED BY: CH			

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Tributary Lengths within Site Boundary	
Waters of the US	Sum of Length within Project Boundaries (FEET)
Saw Mill Creek	2272.6
Jurisdictional Tributaries	Sum of Length within Project Boundaries (FEET)
Tributary 1	498.7
Tributary 2	105.5
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Tributary 4	996.4
Tributary 5	689.9
Tributary 6	450.6
Tributary 7	1019.5
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Tributary 9	163.5
Tributary 10	139.2
Tributary 11	203.4
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Tributary 13	96.5
Tributary 14	283.7

Jurisdictional Wetland Areas	
Wetland	Area (ACRES)
A	22.100
B	43.304

Upland Inclusionary Areas	
Upland	Area (ACRES)
C	2.115
D	0.055
E	0.144
F	0.029
G	0.018
H	0.152
I	0.255
J	0.009
K	0.012

Tidal Datums	
Datum	Elevation with Respect to NAVD88 (FEET)*
MHHW	2.57
MHW	2.25
MTL	-0.24
MLW	-2.73
MLLW	-2.94

*NOTE: DATUMS ARE DERIVED FROM THE BEGIN POINT WEST REACH, NY GAGE 8519483.
http://tidesandcurrents.noaa.gov/geo.shtml?location=8519483

LEGEND

- PROPERTY BOUNDARY
- BOUNDARY PARCELS
- PROPERTY EASEMENTS
- CONTOURS
- ROAD ROW
- SURFACE WATER
- EDGE OF WETLANDS
- EXISTING WETLAND
- WETLAND FLAGS
- SOIL POINTS
- TRIBUTARIES
- SURVEY BENCHMARKS
- PHOTO LOCATIONS

0 100 200 300
SCALE IN FEET
1" = 100'

1. GPS SURVEY, PROPERTY LINES AND TOPOGRAPHIC DATA RECEIVED FROM GAYRON DE BRUIN LAND SURVEYING AND ENGINEERING, P.C., 11 UNION AVENUE, BETHPAGE, NY 11714 IN JULY 2013.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM 1983 LONG ISLAND ZONE. ALL LINEAR MEASUREMENTS ARE IN U.S. SURVEY FEET.
3. VERTICAL DATUM IS NAVD 1988.
4. A LEICA GS15 GPS ROVER WAS USED TO LOCATE THE WETLAND FLAGS. THE ROVER UNIT RECEIVED IT'S COORDINATE CORRECTION FROM A GPS BASE STATION, COMMUNICATING THROUGH A RADIO CONNECTION, OCCUPYING A SURVEY CONTROL POINT PREVIOUSLY ESTABLISHED. THE HORIZONTAL ACCURACY OF THE ROVER IS 0.1'+/-.
5. FLAGS LOCATED IN THE FORESTED AREAS WERE SURVEYED USING A LEICA TS15 TOTAL STATION WITH AN ACCURACY OF UNDER 0.05'

NEW YORK CITY ECONOMICAL DEVELOPMENT CORP.

SAW MILL CREEK WETLAND MITIGATION BANK STATEN ISLAND, NEW YORK

TRIBUTARY PHOTO KEY MAP -2-

THE LOUIS BERGER & ASSOC, PC
48 WALL STREET
16TH FLOOR
NEW YORK, NY 10005

SCALE: 1" = 100'	DRAWN BY: MH	PROJECT NO.	2001984	SHEET 2 OF 2
DATE: DECEMBER 2013	CHECKED BY: CH			

FILE NAME: Tributary Photo Key Map.dwg

PROJECT PATH: V:\Operations\09111004_MARSHES\4 Deliverables\Drawings\30% Design\JD App Drawing\Plot

Photo 1 – Tributary 1 on left with connection to Saw Mill Creek on right. May 6, 2013

Photo 2 - Tributary 1 facing north along rail road in left of photo. May 6, 2013

Photo 3 – Tributary 2 facing north, upstream. May 6, 2013

Photo 4 – Tributary 2, connection with Saw Mill Creek, facing south, downstream. December 19, 2013

Photo 5 – Tributary 3 facing south west, downstream. May 6, 2013

Photo 6 – Tributary 4 facing south, downstream. May 15, 2013

Photo 7 – Tributary 4 at connection with Saw Mill Creek, facing south, downstream. May 15, 2013

Photo 8 – Tributary 5, facing east, upstream at culvert under Route 440. May 15, 2013

Photo 9 – Tributary 5, facing east, downstream. May 15, 2013

Photo 10 – Tributary 6, facing northeast, downstream. December 19, 2013

Photo 11 – Tributary 7 at connection to Saw Mill Creek, facing northeast, downstream. December 19, 2013

Photo 12 – Tributary 8, facing southeast, downstream. December 19, 2013

Photo 13 – Tributary 9, facing southeast, downstream. December 19, 2013

Photo 14 – Tributary 10, facing southeast, downstream. December 19, 2013


Photo 15 – Tributary 11, facing west, downstream. December 19, 2013

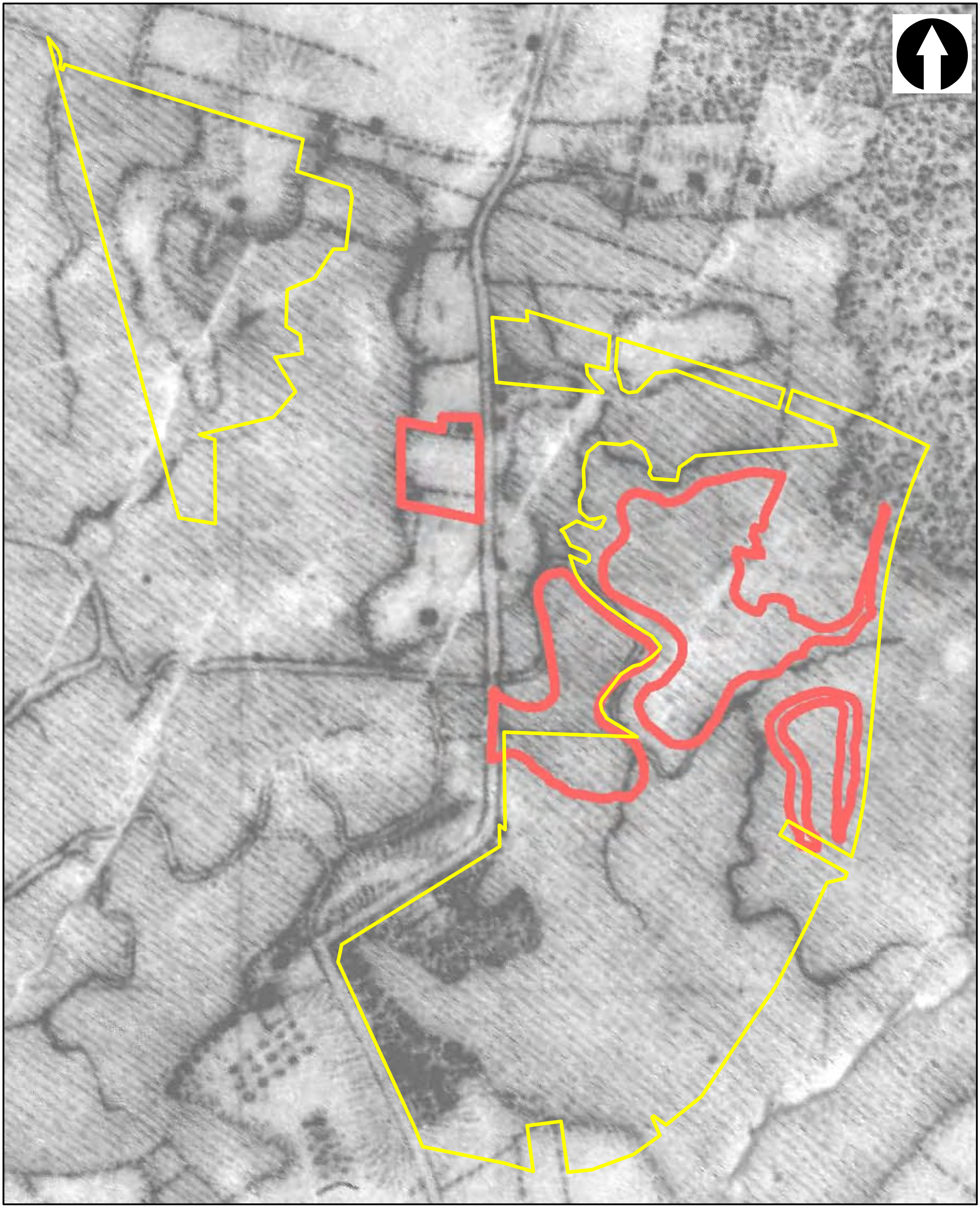

Photo 16 – Tributary 12, facing northeast, downstream. December 19, 2013

Photo 17 – Tributary 13, facing southeast, downstream. December 19, 2013

Photo 18 – Tributary 14, facing south, downstream. May 15, 2013

Photo 19 – Tributary 5 at connection to Saw Mill Creek, facing north, downstream. December 19, 2013

ATTACHMENT C-3
HISTORIC AERIALS



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Project Area

Dark pink lines are remnant lines and not applicable to this project.

1857

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Legend

Project Area

1924

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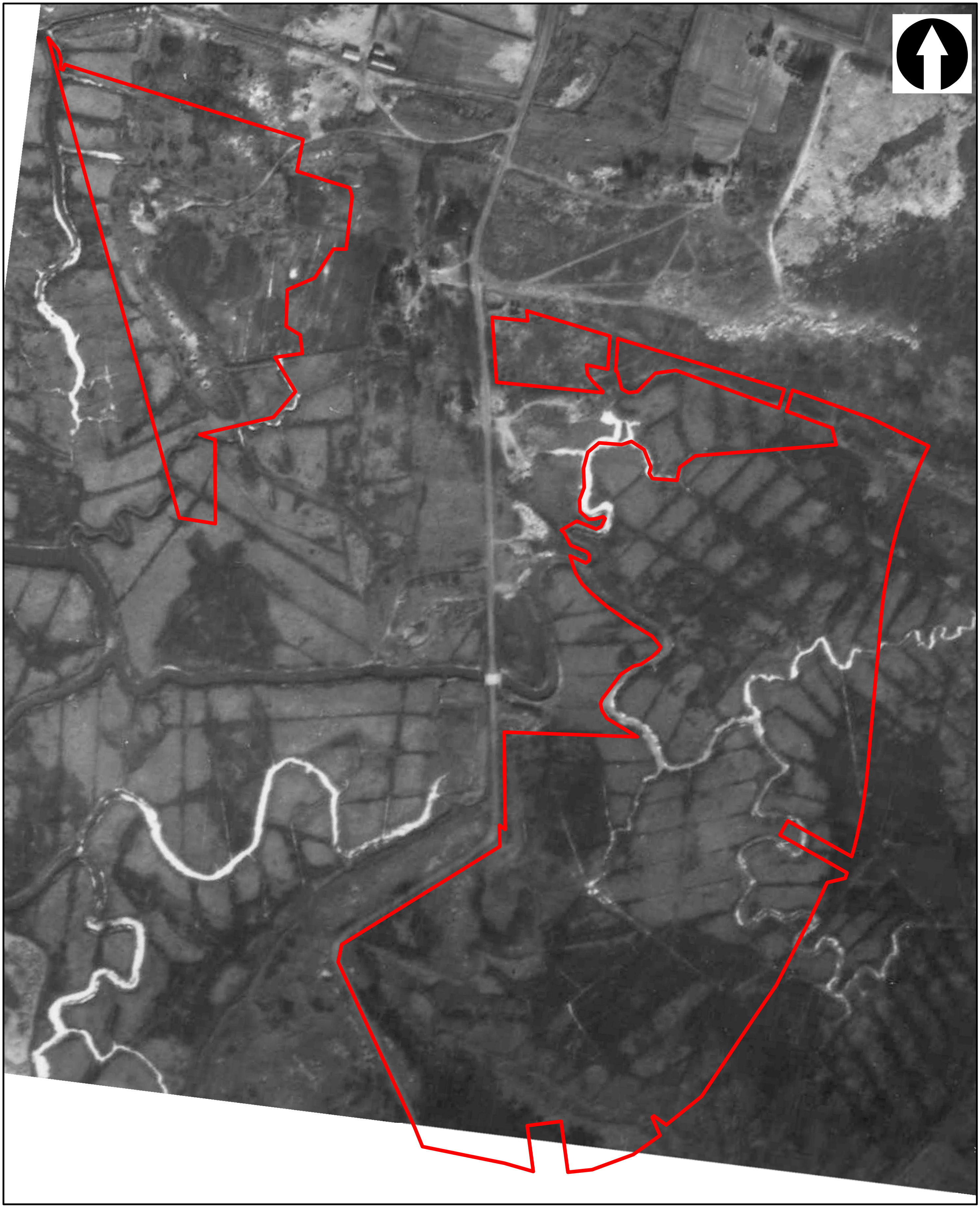
Feet



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Project Area

1943

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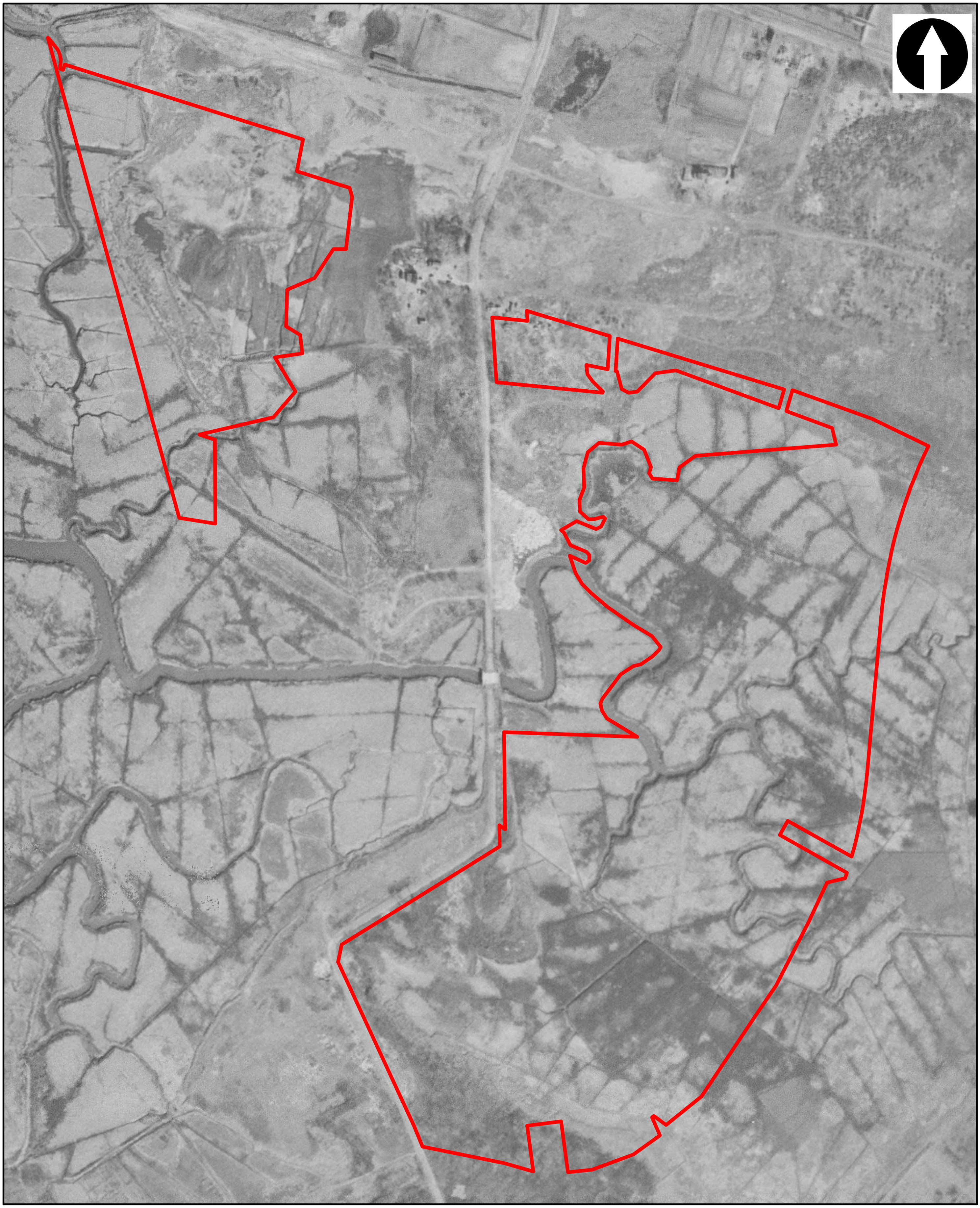
Feet



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Project Area

1954

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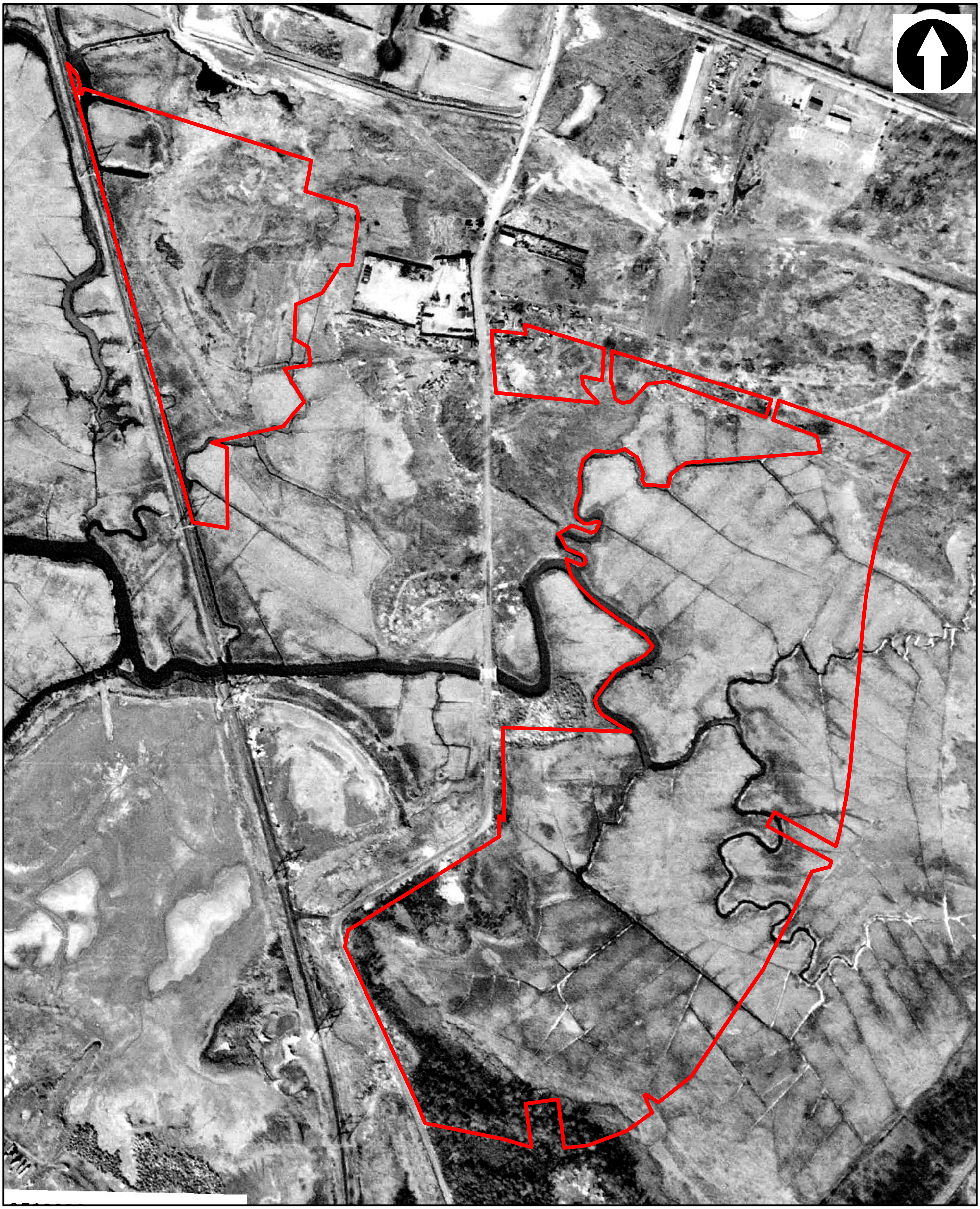
Feet



Legend

Project Area

1966

400 200 0 400

Feet

Legend

Project Area

1970

400 200 0 400
Feet

Legend

Project Area

1975

400 200 0 400
Feet

Legend

Project Area

1991

400 200 0 400

Feet

ATTACHMENT C-4
SITE SELECTION ANALYSIS

Site Selection Analysis

1. Introduction

To protect and enhance New York City's (NYC's) waterfront, in 2010, the City initiated the Waterfront Vision and Enhancement Strategy (WAVES). This initiative led to the publication of *Vision 2020: Comprehensive Waterfront Plan* and the *WAVES Action Agenda.* A key objective was advancing more predictable mitigation policies and tools to compensate for impacts to coastal resources. Facing billions of dollars in infrastructure damage in the wake of several large storms and challenged with the task of rebuilding, the City focused on wetlands enhancement as an important facet in its approach to recovery and resiliency against future events.

This document memorializes the process through which the Saw Mill Creek wetland mitigation bank pilot site was selected by NYCEDC as the preferred location for piloting New York City's wetland mitigation bank. This report documents why the Saw Mill Creek wetland mitigation bank pilot site is the most appropriate starting point for applying the federal compensatory wetlands banking process in New York.

2. Project Purpose and Need

Over the past decade, the City Of New York invested over $9 billion to improve water quality in New York Harbor[1]. As a result, the harbor is cleaner now than at any time in the last century. This investment in water quality set the stage for ecological recovery of the City's 15,500 acres of wetlands. Since 2002, the City invested over $100 million in restoring and protecting more than 250 acres of coastal and freshwater wetlands[2]. Notwithstanding such actions to date, thousands of acres of wetlands in and around the City remain degraded and in need of resources for restoration and rehabilitation.

In 2012, the *New York City Wetlands Strategy* report was released, establishing several initiatives for increasing the quantity of wetlands in NYC as well as improving their quality by maximizing ecological functions and values to the greatest extent possible. This overarching goal aligns with Federal, State, and local environmental policies of "no net loss of wetlands" by establishing a process of first avoiding, and then minimizing impacts to wetlands prior to considering mitigation alternatives[3].

Nonetheless, today there remains a strong need for compensatory wetland mitigation by public agencies and private property owners. As discussed below, paramount among the criteria used to assess locations for the proposed mitigation bank is the fact that, in the coming decade, there are myriad public and private projects proposed for Manhattan's waterfronts on the Hudson River and East River, the East River waterfronts of the boroughs of Brooklyn and Queens, and the Upper New York Bay. Many of these

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[1] *See page 3*, *New York City Wetlands Strategy*, May 20 12, available (as of the date hereof) at: http://www.nyc.gov/html/p lanyc2030/downloads/pdf/nyc wetlands strategy.pdf [herein after NYC Wetlands Strategy].
[2] *See page 30, NYC Wetlands Strategy*.
[3] *See page 3, NYC Wetlands Strategy*.

projects will require compensatory wetland mitigation, which typically includes remediating, restoring, enhancing, and protecting wetland, stream, or other aquatic resource functions to offset their loss as a result of construction projects. Traditionally, compensatory mitigation in New York City takes the form of on- and/or off-site mitigation by individual permittees and/or payment-in-lieu methods, in which permittees fund restoration and enhancement projects planned by public agencies and not-for-profits. Wetland mitigation banking has emerged as another option that allows not only the long-term improvement and protection of critical coastal resources, but provides a predictable, efficient and environmentally responsible process to serve the mitigation needs of permit applicants in the geographical service area.

2.1 Saw Mill Creek Wetland Mitigation Bank as a Pilot Project:

Mitigation banking is available as a regulatory tool and option in 28 States and has been employed on more than one million acres of land nationwide; however, the scale and long history of NYC's harbor makes the implementation of such a bank especially significant and nuanced. NYC encompasses more coastline than the next three largest US cities combined. Therefore, having all of the regulatory tools available for managing and protecting natural resources is critical. To this end, the Saw Mill Creek wetland mitigation bank pilot is under the Mitigation and Restoration Strategies for Habitat and Environmental Sustainability (MARSHES) initiative, intended as a small-scale preliminary study of the feasibility of operating and establishing mitigation banking in NYC. Specifically, the pilot is intended to provide insights into the feasibility, time, cost, and the effects of what *Compensatory Mitigation for Losses of Aquatic Resources; Final Rule* (40 CFR 230.98) means when employed as a regulatory option in the Nation's most urbanized counties. This pilot is an important opportunity to tailor federal enabling regulation to the local level, thus providing NYC the same benefit as enjoyed by other regions of the US that have the full range of waterfront regulatory tools available to them. This pilot project is intended to inform normative baselines and provide technical standards for how the banking of compensatory mitigation can operate in NYC. Because of these considerations at the outset of the pilot project, it was recognized that the program be sufficiently groundbreaking while also not being an outlier when compared against typical degraded wetland systems found across the City.

2.2 Community Development Block Grant Disaster Recovery:

In addition to serving as an essential strategy and regulatory tool, mitigation banking in NYC represents a nexus between the harbor's hard infrastructure and green infrastructure. Healthy wetlands buffer communities adjacent to floodplains. Recognizing these benefits, in December of 2014, the City's Mayor's Office of Recovery and Resiliency (ORR) selected the Saw Mill Creek wetland mitigation bank pilot to receive Community Development Block Grant Disaster Recover (CDBG-DR) funds. The City intends to pursue the restoration of Saw Mill Creek marsh to provide a resiliency buffer from future storms – a buffer that would have protected many Sandy-impacted businesses and homes in the area had it existed prior to Superstorm Sandy's landfall in New York City. Ultimately, the intervention to restore Saw Mill Creek is not just intended to return the marsh (nor the surrounding area) to pre-disaster conditions (an important criterion under CDBG-DR funding); but, additionally, to transform the Sandy-damaged marsh into a fully-functioning tidal wetland, thereby bolstering wetland resources and increasing the protection of locally impacted communities during future weather events.

3. CRITERIA FOR SELECTING SITES FOR THE PROPOSED WETLAND MITIGATION BANK

In late 2012 following Hurricane Sandy and early 2013, the Saw Mill Creek site was selected by NYCEDC for the pilot New York City wetland mitigation bank project through a consultation process with state agency representatives currently serving on the Interagency Review Team (IRT), as well as discussions with representatives from the New York City agencies that currently steward the City's open spaces. In advance of the start of the IRT process in May 2013, numerous pre-consultations occurred with NYCEDC's partner City agencies. Conversations centered on identifying sites and assessing current conditions at these sites. Of high importance in the early review was screening sites for the likelihood of their being able to provide conditions to sustain the target ecological community as intended by restoration and rehabilitation.

From early on, NYCEDC worked in collaboration with the City's Department of Parks and Recreation (NYCDPR) and with the City's Department of Environmental Protection (NYCDEP). Ultimately, Saw Mill Creek was chosen due to (1) its ability to serve the chosen service area, (2) site ownership and control, (3) the ecological suitability and services that would result from restoration, and (4) technical design considerations, with a special focus on site contamination. Each criterion used to screen out alternative sites is expanded on below.

3.1 Service Area

The Service Area for a given bank, pilot or otherwise, is varied and determined through a negotiated process with resource agencies. Considerations during the delineation of the primary and secondary Service Area for a proposed bank are the area's watershed boundaries, the ecological unit boundaries of surrounding hydrologic basins, and the existence of practical on-site regional mitigation alternatives. Saw Mill Creek's wetland mitigation bank location is foremost driven by the need to have the form of the Bank's primary Service Area cover projects in New York City's critically adapting geographic areas: the Manhattan waterfront on the Hudson River and the Manhattan, Bronx, Brooklyn, and Queens waterfronts on the East River. These coastlines are of special significance because existing urban density results nearly always in permitted projects being required to locate off-site mitigation. The reality of how waterfront development is implemented today in NYC makes the banking site an ideal solution to these challenging sites.

The preeminence of location in guiding the sites to be restored and serve as the mitigation banks is due to the role of "Service Area" as defined in in US EPA's guidelines establishing standards for the use of compensatory mitigation (40 CFR 230.92): "the geographic area within which impacts can be mitigated at a specific mitigation bank or an in-lieu fee program, as designated in [a project] instrument." Most fundamentally, the location of the bank would determine whether sites likely requiring mitigation would have access to mitigation credits. In determining NYCEDC preferred service area, numerous assessments of the city's mitigation need were conducted that identified the Hudson River and East River waterfronts as being locations with critical deficiencies of mitigation options.

In 2012, NYCEDC while performing its primary contractual services to the City of New York of providing economic development programs was instructed by the Mayor's Office to "Develop wetlands mitigation bank and/or in-lieu fee program to promote more effective mitigation projects."[4] NYCEDC undertook the implementation of the proposed Bank with the full authority of and on behalf of the City of New York to fill an unmet need for mitigation options. At the time that the proposed bank's prospectus was being composed, the projects listed below in **Table 1** were identified as priority projects whose possible mitigation needs should be served by the propose bank's service area.

Table 1: Priority Projects with Potential Wetland Mitigation Needs	
City Projects Requiring Mitigation	**Waterway Geography**
Hunters Point South	East River, Queens Side
Skyport Marina	East River, Manhattan Side
North Shore Marine Transfer Station	Upper East River, Queens
East 91st Street Marine Transfer Station	East River, Manhattan Side
Stormwater/outfall projects	Citywide
Staten Island Bluebelt	Arthur Kill and Raritan Bay, Staten Island
Ferry Landings	Citywide concentrated on East River
Newtown Creek Tidal Barrier	East River, Queens Side
Gowanus Canal Tidal Barrier	Upper New York Bay, Brooklyn Side
39th Street South Bulkhead Rehabilitation	East River, Manhattan Side
Manhattan Cruise Terminal Upgrade	Hudson River, Manhattan Side
St. George Ferry	Upper New York Bay, Staten Island
East Midtown Waterfront Esplanade	East River, Manhattan Side
Brooklyn Bridge Park, Piers 3 and 6	East River, Brooklyn Side

In order for credits created by a mitigation bank to be viable for these projects, the primary Service Area needed to cover all of Manhattan, Queens, and Brooklyn's East River waterfront and Manhattan and Staten Island's Upper New York Bay, the Arthur Kill and Kill van Kull, and Raritan Bay waterfronts.

3.2 Site Ownership and Control

In identifying sites for the wetland mitigation bank pilot, the status of sites' ownership and control were critical selection determinants. NYCEDC, acting on behalf of the City of New York, required a site where it was possible for NYCEDC to have full access and control of the site during restoration and rehabilitation work, but where post-construction access and control aligned with long term stewardship requirements required by 40 CFR 230.98. As is the case with many mitigation banks, from the beginning of the pilot, the intention was to have separate entities serve as bank Sponsor and the Long Term Steward.

In light of the 2012 findings described in the *NYC Wetland Strategy* report, it is known that the vast majority of mapped wetlands in NYC are publicly owned. *NYC Wetland Strategy* states, "Many wetland parcels have been significantly degraded due to human modifications to natural systems, industrial pollution, and changes to water and sediment quality"[5]. Given the existence of degraded wetlands already

[4] *See page 7, WAVES Action Agenda* available [as of date hereof] at http://www.nycedc.com/sites/default/files/filemanager/Projects/WAVES/WAVESActionAgenda.pdf
[5] *See page 12, NYC Wetlands Strategy*.

within City owned jurisdiction that need restoration, the acquisition of private wetlands for restoration and rehabilitation was ruled out from the beginning of the process.

The specific jurisdictional control of these wetlands was a fundamental criterion in selecting a site. Currently, control and stewardship of more than 50 percent of publicly owned freshwater and tidal wetlands in NYC at the local level belongs to NYCDPR and NYCDEP. The majority of the rest of the wetlands in public ownership are controlled at the State level by the NYSDEC and at the federal level by the United States National Parks Service (NPS). As one of the first steps in selecting a site for the Saw Mill Creek wetland mitigation bank pilot, the full list of sites was screened to select those with local ownership and access. This ruled out sites that involved State or federal jurisdictional interests. Much of Jamaica Bay and Staten Island’s South Shore have elements of federal and State site ownership.

Another fundamental criterion for screening appropriate sites early on in the selection process was the establishment of the Long Term Steward. The Long Term Steward needed to be an entity guaranteed to be in a position to provide stewardship in perpetuity on City owned land, since title to all parcels included in the bank property are required to be held by New York City and forever remain in New York City's name after the Bank is established. This prioritized siting the mitigation bank on land under NYCDPR jurisdictional control, where NYCDPR would be able to serve formally as Long Term Steward.

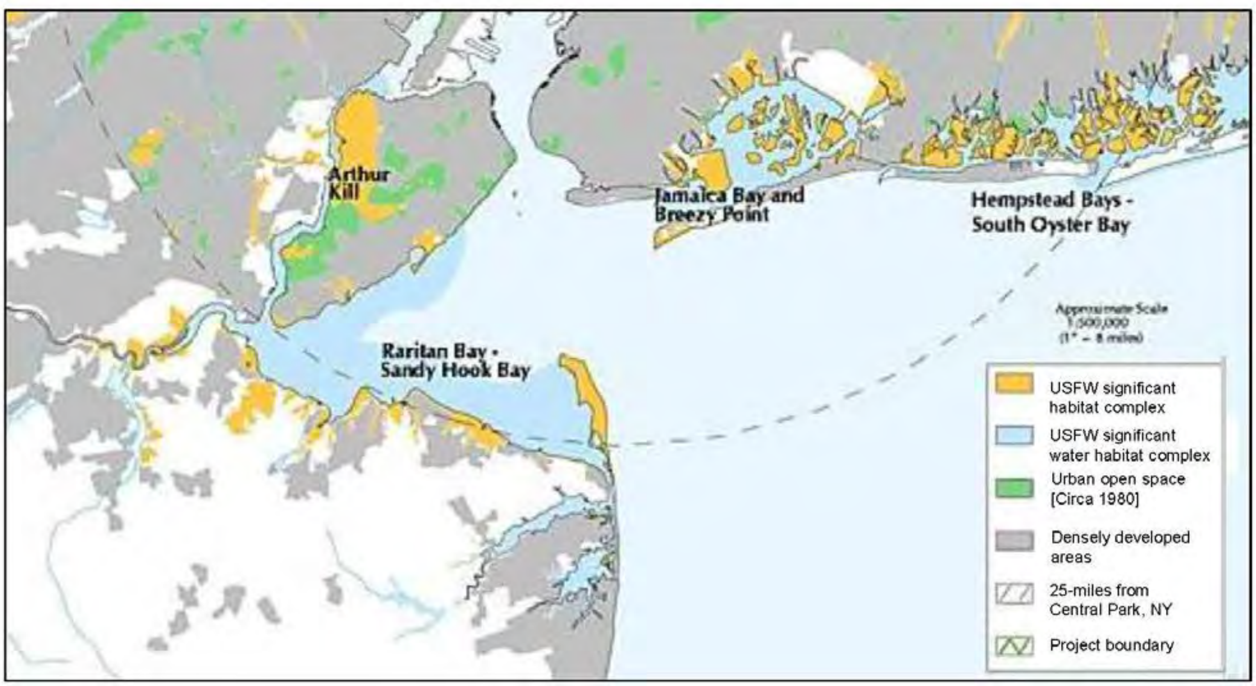
Finally, jurisdictional considerations in the broader vicinity of the site played into deciding between preferred restoration sites proposed by NYCDPR and NYCDEP to serve as the pilot mitigation bank. Among the degraded sites appropriate for wetland restoration, site history and the history of surrounding land uses are important factors for not only an appropriate restoration design, but also protection from future wetland losses. Where wetland losses have occurred previously, on what is now City owned land, illegal filling and or dumping were major contributors to the degradation of these sites. Critical in the selection of a site for restoration is the assurance that future illegal dumping or filling, as well as trespassing during site restoration and beyond, can be prevented to the maximum extent practicable.

3.3 Ecological Suitability and Services Resultant from Restoration

To inform the broad site screening process, the following geo-informational resources were employed: NYC's Primary Land Use Tax Lot Output; City GIS hydrology mapping; the NYC Waterfront Revitalization Plan; NYS DEC Tidal Wetland Regulations; USFWS National Wetlands Inventory; the NYCDEP and Office of Long Term Planning and Sustainability's Wetlands Mapping; the USACE Wetland Delineation Manual; NYCDEP Watershed Plans; NYCDEP Stormwater Management Plans; and USFWS federally-listed endangered species and reports.

A review of primary reports was also undertaken. The reports reviewed included the *Significant Habitat Complex of the New York Bight Watershed* (USFWS, 1997). This report details the ecological significance and uniqueness of the Arthur Kill complex (see **Figure 1**). It states "Protection of the heronries, wetland foraging areas, and rare plants and communities of this regionally significant habitat complex should be accorded high priority and sought through a multitude of appropriate land protection mechanisms." *The New York and New Jersey Harbor Deepening Project Habitat Mitigation Report* (USACE, 2004) identifies several potential wetland mitigation sites in the Arthur Kill area that the USACE proposed as mitigation for channel dredging in the area. *The Hudson – Raritan Estuary Comprehensive Restoration Plan* (USACE, 2009) identified this site among the preferred restoration sites.

Figure 1: Significant Habitat Complex of the New York Bight Watershed[6]

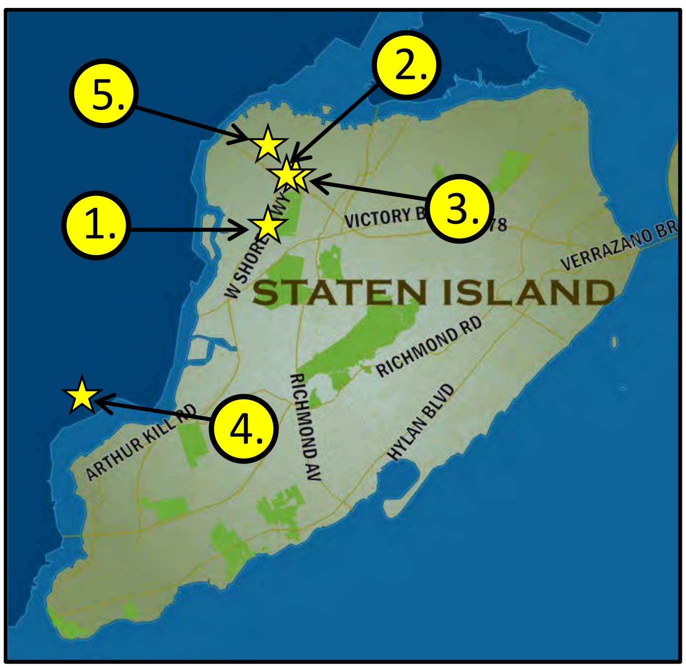


[6] Larger map from *Significant Habitat Complex of the New York Bight Watershed* , USFWS, 1997, available at [as of date hereof] *at* http://nctc.fws.gov/resources/knowledge-resources/pubs5/web_link/text/urb_core.htm

A major driver in the selection of a preferred site for the proposed wetland mitigation bank was extensive consultations with NYCDPR's Natural Resources Group (NRG), which provides recommendations for restoration decision making on NYC properties under NYCDPR jurisdiction. A top priority for NRG is a consideration of the ultimate long-term benefit of the restoration and rehabilitation actions. Siting decisions are made on the ability of each site to contribute to a large connected ecosystem, support previously identified ecological needs, and adjacencies to surviving or thriving marsh. One of the main reasons for locating the proposed wetland mitigation bank at Saw Mill Creek is its location near other nearby wetland restoration sites (see **Figure 2**):

1. NYCDPR restoration of a portion of Saw Mill Creek (1998 to 2001)
2. Bridge Creek Marsh
3. Brooklyn Union Gas wetland restoration (2007)
4. Port Reading mitigation bank, Township of Woodbridge, Middlesex County, NJ. (2008)
5. Port Authority Mitigation for Goethals Bridge (2009-2013)

Figure 2: Nearby Wetland Restoration Sites



Another major consideration for NRG is long-term site viability. NRG identifies less than ideal sites for a salt marsh restoration as allocations where there is a low likelihood of successfully changing the ecological community, or where the habitat conditions are less than ideal but not particularly poor. NRG avoids allocating or steering restoration work toward sites with low salinity or other factors that strongly favor invasive species, where historically it has not been possible to control such factors. Further, there are degraded locations that already offer some positive function (e.g. *Phragmites* providing sediment trapping or wave attenuation), and where adjacent areas appear to have the appropriate tidal or elevation for salt marsh but are not supporting healthy salt marsh vegetation communities. As the long-term steward of the chosen wetland mitigation bank site, NRG has a low maintenance objective: a successful mitigation bank is a site where little maintenance is required. This post restoration outcome aligns with the intended operation of wetland mitigations banks as federally regulated.

3.4 Technical Design Considerations

In addition to reviewing sites for ecological suitability and expected restoration goals, baseline conditions of the site at Saw Mill Creek were assessed. This process assessed criteria typical to wetland mitigation bank design, generally relating to physical characteristics (i.e. extent of restoration opportunities available on the site), chemical characteristics, biological characteristics, cultural resources surveys, and coordination with the Federal Aviation Administration[7]. This process is document in depth in the Baseline Conditions Report for the Saw Mill Creek wetland mitigation bank pilot.

As a starting criteria looking more broadly at other NYC restoration opportunities an important determinant in selecting a restoration site was the opportunity to remove contaminated sediments during the restoration, a policy goal guided by the *Comprehensive Restoration Plan (CRP) for the New York-New Jersey Harbor Estuary* (USACE and others, 2014)[8]. Comprising over 1,600 square miles and almost 1,000 linear miles of shoreline, the Hudson-Raritan Estuary (HRE) study area is located within one of the largest estuaries on the east coast of the United States. The HRE, located within one of the most urbanized regions in the United States, has undergone centuries of industrial and residential development. Coincident with extensive navigation and infrastructure improvements, urbanization and industrialization within the HRE have resulted in extensive degradation of aquatic and terrestrial ecosystems, including wetlands, stream corridors, island rookeries, and shellfish beds.

The HRE study area was delineated into eight planning regions to facilitate stakeholders' identification of restoration needs and opportunities specific to each region. The proposed Saw Mill Creek Pilot Wetland Mitigation Bank is located in the Arthur Kill/Kill Van Kull HRE region. The CRP Program Goal is to develop a mosaic of habitats that provides society with renewed and increased benefits from the estuary environment. To achieve this goal, the CRP identified Target Ecosystem Characteristics (TECs), each of which defines specific goals for an important ecosystem property or feature of ecological and or societal value.

The TECs were designed to reflect the broad interest of HRE stakeholders and address habitat and degradation issues in order to increase the sustainability and ecological value of the HRE. One of the TECs is to remove sediment contamination, which is pervasive in the HRE. The following Table 2, adapted from the 2014 CRP, indicates that most of the proposed restoration sites (202 of 287 sites)

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[7] Per FAA guidance document No. 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports* (October 28, 2007) the FAA recommends a minimum separation distance from wetland mitigation sites and airports of a minimum of 5,000 feet for piston-powered aircraft, and 10,000 feet for turbine-powered aircraft.

[8] *Comprehensive Restoration Plan (CRP) for the New York-New Jersey Harbor Estuary* , USACE and others, 2014, report is available [as of date herof] at http://www.nan.usace.army.mil/Portals/37/docs/harbor/CRP%20Planning%20Regions/Exec_Sum_2014_Aug.pdf

include removal of sediment contamination as a goal. Regarding contaminated sediments, the CRP states, "due to the urban nature of the HRE, it is highly unlikely that the HRE would be cleaned up to acceptable risk guidance benchmarks."

Table 2: Total Number of HRE Restoration Sites (by Planning Regions) Requiring Sediment Removal to Achieve Target Ecosystem Characteristics[9]							
Jamaica Bay	**Lower Bay**	**Lower Raritan Bay**	**Arthur Kill/Kill Van Kull**	**Newark Bay Hackensack River Passaic River**	**Lower Hudson River**	**Harlem River/East River/W. Long Island Sound**	**Upper Bay**
40	37	9	24	62	5	20	5
Total CRP Sites Requiring Removal of Sediment Contamination							**202**
Total CRP Sites in the HRE							**287**

Of the 202 CRP restoration sites, there are different sources of known sediment contamination within the 180 sites located in NYC. Some of the locations are affected by municipal landfills, formal and informal construction and demolition dumps, and contaminants resulting from industrial users. Each type of contamination presents different challenges. In the case of fill and construction and demolition material, soil sampling is able to identify point sources of contamination. This makes such locations preferred for restoration and rehabilitation work in the form of mitigation banks. The area of the Arthur Kill waterbody closest to Saw Mill Creek is in the 50th percentile for contamination levels when compared to other coastal areas of the New York and New Jersey Estuary[10].

Other base technical considerations determining site selection were ease of implementation and the scale of restoration and rehabilitation opportunities. Tidal wetlands are often in less accessible parts of the city and are often bounded by water. Location can present technical implementation challenges concerning access for heavy machinery that is required to perform earthworks and remove fill material in a cost effective manner. When identifying the most appropriate location for NYC's first pilot, access and keeping associated logistics simple was considered. In parallel with access for mobilized construction resources, was the question of what restoration opportunities represent as sufficient scale to meaningfully demonstration of the viability of mitigation banking.

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[9] *Extracted from: Comprehensive Restoration Plan (CRP) for the New York-New Jersey Harbor Estuary*, USACE and others, 2014, "Table 5- Type and quantity of restoration opportunities among planning region".

[10] *See maps on pages 86 and 88, The Hudson – Raritan Estuary Comprehensive Restoration Plan,* USACE, March 2009, available (as of the date hereof) at:http://www.nan.usace.army.mil/Portals/37/docs/harbor/Harbor%20Program%20Images/CRP%20vol1.pdf

4. ALTERNATIVE SITES CONSIDERED BUT ELIMINATED FOR PILOT PROJECT

Table 3 represents other sites considered as locations for the proposed wetland mitigation bank; some key characteristics of each site (e.g., size) are also listed. The rationale for the elimination of the alternate sites from further consideration is summarized below for each site, which is compared to the four criteria outlined earlier in this document: (1) the site's ability to serve the chosen service area, (2) site ownership and control, (3) the ecological suitability and services that would result from restoration, and (4) technical design considerations. **Table 4** provides a summary for all sites.

Table 3 and Figure 3: Alternative Sites and Mapped Location		
Site Description	**Size Acreage**	**Average Excavation Depth (ft.)**
Staten Island		
Brookfield (OU 1)	7.5	4
Brookfield (OU 2)	108	4
Saw Mill Creek*	68.94	6
Fresh Kills Springville Creek 1	17	3.5
Fresh Kills Springville Creek 2	40	3.5
Oakwood Beach	50	4
Queens		
Alley Creek 1	5.5	6
Alley Creek 2	11.5	5
Sunset Cove	10	5
Brooklyn		
Penn Landfill	5	4.5

*** Reflects final acrage**

Brookfield Avenue Landfill Wetlands (OU 1 and 2)

1. Without an existing IRT approved primary and secondary Service Area for this location along the Arthur Kill, it is not possible to know definitively whether this site meets the primary and secondary Service Area requirements of NYC's pilot mitigation bank. However, the proximity of Brookfield to the existing agreed primary and secondary Service Area map for Saw Mill Creek infers that Brookfield's location along the Arthur Kill would likely meet the selection criterion of being able to provide compensatory mitigation to Manhattan, Queens, and Brooklyn's East River waterfront and Manhattan and Staten Island's Upper New York Bay, Arthur Kill and Kill van Kull, and Raritan Bay.

2. The Brookfield landfill site is under NYCDEP management during capping, maritime forest and grassland restoration and closure with NYCDPR and the New York City Department of Sanitation (NYCDOS) as the property owners, including all adjacent wetlands. Since all of the land within the bank is owned by the City of New York, the site meets this criterion. The site's history as a former construction and demolition dump and NYCDPR's long-term commitment to the property put NYCDPR in an ideal position to serve as Long Term Steward.

3. Ecological suitability and resulting services of restoration as criteria are partially met at Brookfield. The restoration underway at Fresh Kills Park aligns Brookfield with a broader restoration initiative; however, this restoration is not yet complete.

4. Regarding technical design considerations, the Brookfield site meets the selection criteria. Much of the project area was originally tidal marsh but the topography of the area was altered as the local area was filled. However, the recent upland restoration improvements would complement future wetland restoration efforts.

Fresh Kills Landfill (Springville Creek 1 and 2)

1. Without an existing IRT approved primary and secondary Service Area for this location along the Arthur Kill, it is not possible to know definitively whether this site meets the primary and secondary Service Area requirements of NYC's pilot mitigation bank. However, the proximity of Fresh Kills to the existing agreed upon primary and secondary Service Area map for Saw Mill Creek infers that Fresh Kills' location along the Arthur Kill likely would meet the selection criterion of being able to provide compensatory mitigation to Manhattan, Queens, and Brooklyn's East River waterfronts and Staten Island's Upper New York Bay, Arthur Kill and Kill van Kull, and Raritan Bay waterfronts.
2. Site ownership and control criteria, the area surrounding Springville Creek in Fresh Kills does meet this requirement as the entire site is under NYCDPR jurisdiction. All of the land within the bank is owned by the City of New York. As the area is being repurposed as a public recreation area, NYCDPR is increasingly engaged in property management. Existing oversight puts NYCDPR in an ideal position to serves as Long Term Steward.
3. Ecological suitability and resulting services of restoration as criteria are partially met at Fresh Kills. The restoration underway more broadly at Fresh Kills Park makes the restoration and rehabilitation in the subarea of Springville Creek desirable; however, the broader Fresh Kills restoration is not yet complete.
4. Regarding technical design considerations, the Fresh Kills Springville Creek sites partially meet the requirements of the MARSHES pilot. Much of the project area was originally tidal marsh but the topography of the area was altered as the nearby area served as a municipal landfill. However,

mobilizing construction equipment at the site now that the adjacent landfill is closed requires additional technical considerations, as the landfill cap at Fresh Kills cannot be disturbed. This additional technical consideration detracts from the Springville Creek being ideal pilot mitigation bank location.

Oakwood Beach

1. Without an existing IRT approved primary and secondary Service Area for this location on Raritan Bay, it is not possible to know definitively whether this site meets the primary and secondary Service Area requirements of NYC's pilot mitigation bank. While Oakwood Beach lies within the primary Service Area for Saw Mill Creek, its location on the outer edge of Saw Mill Creek's primary Service Area leaves a question as to whether a mitigation bank at this location would have a primary Service Area needed to meet the selection criterion of being able to provide compensatory mitigation to Manhattan, Queens, and Brooklyn's East River waterfronts and Staten Island's Upper New York Bay, Arthur Kill and Kill van Kull, and Raritan Bay waterfronts.

2. Site ownership and control criteria, Oakwood Beach only partially meets this requirement as the site is under a mixture of NPS, NYS DEC, and NYCDPR jurisdiction. The existence of multiple jurisdictions complicates usage of the site and the establishment of Long Term Stewardship responsibilities.

3. Ecological suitability and resulting services of restoration criteria are met at Oakwood Beach. This site is comprised of large amounts of Phragmites. While not a highly functioning wetland, at present the site does provide some function in providing sediment retention and wave attenuation.

4. Regarding technical design considerations, the Oakwood Beach site partially meets the requirements of the MARSHES pilot. The site is comprised of an expansive degraded freshwater wetlands comprised almost entirely of *Phragmite*s behind a shoreline rock enforce berm[11]. A small section of the site along the creek near the mouth of the creek where it discharges to Raritan Bay is sufficiently saline to support salt marsh. However, the tide gates may limit the tide regime and the expansion of salt marsh upstream.

Alley Creek (1 and 2)

1. Without an existing IRT approved primary and secondary Service Area for this location along Little Neck Bay, it is not possible to know definitively whether this site meets the primary and secondary Service Area requirements of NYC's pilot mitigation bank. However, Alley Creek's location in what is the agreed upon secondary Service Area for Saw Mill Creek infers that Alley Creek, as a tributary to the Upper East River, would not meet the selection criterion of being able to provide compensatory mitigation to Manhattan, Queens, and Brooklyn's East River waterfront and Manhattan and Staten Island's Upper New York Bay, Arthur Kill and Kill van Kull, and Raritan Bay.

2. Site ownership and control criteria, the area surrounding Alley Creek does meet the requirement that entire site is under NYCDPR jurisdiction. All of the land within the bank is owned by the City of New York. Existing oversight puts NYCDPR in an ideal position to serves as Long Term Steward.

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[11] *See pages 39-42, Comprehensive Restoration Plan (CRP) Potential Restoration Opportunities Project Summary Sheets Lower Bay* report is available [as of date herof] at http://www.nan.usace.army.mil/Portals/37/docs/harbor/CRP%20Planning%20Regions/PR_Lower%20Bay_8_2014.pdf

3. Meeting ecological suitability and services criteria is partially met at Alley Creek. The upper tidal reach of Alley Creek along the Cross-Island Parkway is a degraded location that already offers some function (e.g. *Phragmites* provide sediment trapping and wave attenuation), where adjacent areas appear to have the appropriate tidal or elevation for salt marsh. However, even where the hydrologic regime appears appropriate for salt marsh, fresh water inputs favor *Phragmites* and does not support healthy salt marsh vegetation communities..

4. Regarding technical design considerations, Alley does not meet the requirements of the MARSHES pilot. Much of the project area has always been a moderately functioning tidal marsh. The site does not meet the goals of the pilot mitigation bank, as the location does not reflect the restoration and rehabilitation challenges that are broadly characteristic of likely mitigation bank locations in NYC.

Sunset Cove

1. Without an existing agreed upon primary and secondary Service Area for Sunset Cove located at the geographic center of Jamaica Bay, it is not possible to know definitively whether this site meets the primary and secondary Service Area requirements of NYC's pilot mitigation bank. However, Sunset Cove's location in what is the agreed upon secondary Service Area for Saw Mill Creek infers that Sunset Cove would not meet the selection criterion of being able to provide compensatory mitigation to Manhattan, Queens, and Brooklyn's East River waterfront and Manhattan and Staten Island's Upper New York Bay, Arthur Kill and Kill van Kull, and Raritan Bay.
2. Site ownership and control criteria, Sunset Cove only partially meets this requirement as the site is under a mixture of NPS and NYCDPR jurisdiction. The existence of multiple jurisdictions complicates usage of the site and the establishment of Long Term Stewardship responsibilities.
3. Ecological suitability and resulting services of restoration as criteria are met at Sunset Cove. This site is comprised of barren fill and *Phragmites*. Ecological improvements at this site would be benefited by surrounding wetlands.
4. Regarding technical design considerations, the Sunset Cove site meets the requirements of the MARSHES pilot. Much of the project area was originally tidal marsh, but the topography of the area was altered as the local area was filled and served as parking and dry storage for marina operations. Broadly, contamination at the site was thought to be similar to much of the fill land across NYC, however higher levels of contaminants have been found in recent testing.

Pennsylvania Avenue Landfill Fringe Wetland

1. Without an existing agreed upon primary and secondary Service Area for Pennsylvania Avenue Landfill Fringe Wetland (Penn Landfill), located on the south Brooklyn shore of Jamaica Bay, it is not possible to definitively know definitively whether this site meets the primary and secondary Service Area requirements of NYC's pilot mitigation bank. However, the Penn Landfill's location in what is the agreed upon secondary Service Area for Saw Mill Creek infers Penn Landfill would not meet the pilot requirement of being able to provide compensatory mitigation to Manhattan, Queens, and Brooklyn's East River waterfront and Manhattan and Staten Island's Upper New York Bay, Arthur Kill and Kill van Kull, and Raritan Bay.
2. Site ownership and control criteria, Penn Landfill only partially meets this requirement. At present, the fringe wetlands surrounding the landfill are mostly under NPS jurisdiction. Now, the landfill itself is under NYCDEP management jurisdiction, however the long-term vision is for the site to be transferred to NPS control. While all of the land within the possible bank would be publicly owned, the restoration of fringe wetlands is not in City jurisdiction thereby presenting a

more complicated Long Term Stewardship agreement. Overall jurisdiction makes the Penn Landfill Fringe Wetland restoration opportunity not ideal for the pilot due to the local and federal jurisdictions involved.

3. Ecological suitability and resulting services of restoration as criteria are met at Penn Landfill. The restorations underway surrounding Penn Landfill and in the greater Jamaica Bay make the restoration and rehabilitation of fringing wetlands surrounding Penn Landfill desirable.

4. Regarding technical design considerations, the Penn Landfill site partially meets the requirements of the MARSHES pilot. Much of the project area was originally tidal marsh but the topography of the area was altered as the area served as a municipal landfill. At five acres, the size of pilot bank would be too small to provide a financially viable proof-of-concept project site.

TABLE 4: SITE ABILITY TO MEET SELECTION CRITERIA

Site Description	**Selection Criteria**			
	1) Ability to Serve Needed Service Area	*2) Site Ownership and Control*	*3) Ecological Suitability and Services Resultant from Restoration*	*4) Technical and Physical design*
Staten Island				
Brookfield (OU 1) Brookfield (OU 2)	Meets	Meets	Partially Meets	Meets
Saw Mill Creek	Meets	Meets	Meets	Meets
Fresh Kills Springville Creek 1 Fresh Kills Springville Creek 2	Meets	Meets	Partially Meets	Partially Meets
Oakwood Beach	Partially Meets	Partially Meets	Meets	Partially Meets
Queens				
Alley Creek 1 Alley Creek 2	Does Not Meet	Meets	Partially Meets	Does Not Meet
Sunset Cove	Does Not Meet	Partially Meets	Meets	Meets
Brooklyn				
Penn Landfill	Does Not Meet	Partially Meets	Meets	Partially Meets

5. Preferred Site at Saw Mill Creek

As presented in the preceding section, Saw Mill Creek has been selected as the preferred site. Because of alignment with the purpose and need for NYC's first mitigation bank and directly meeting the four criteria required of a pilot, Saw Mill Creek is the preferred location.

1. The agreed upon primary and secondary service area, approved by the IRT, meets the requirements of the pilot MARSHES initiative. The most likely sites requiring compensatory mitigation that line Manhattan, Queens, and Brooklyn's East River waterfront and Staten Island's Upper New York Bay, Arthur Kill and Kill van Kull, and Raritan Bay waterfronts are within Saw Mill Creek's primary Service Area.
2. Site ownership and control criteria at the Saw Mill Creek site are met. All of the land within the bank is owned by the City of New York. The Citywide initiative to transfer wetland jurisdiction to NYCDPR, as described in *NYC Wetland Strategy*, places NYCDPR in an ideal position to serves as Long Term Steward.
3. The criteria of meeting ecological suitability and services resulting from restoration of a mitigation bank site are met at the Saw Mill Creek. Saw Mill Creek's adjacency to healthy wetlands provides a high likelihood the restoration will succeed. Furthermore, Saw Mill Creek's location and limited physical access, as well as the site controls that will be installed at the site after restoration, mean the location is not likely to be trespassed thereby allow restoration to succeed.
4. In terms of technical design considerations, the Saw Mill Creek site meets the requirements of the MARSHES pilot. Much of the project area was originally tidal marsh but the topography of the area has been significantly altered over the past century by filling and ditching. Fill material encountered at the Site consisted of wood, brick, fiberglass, tile flooring, schist blocks, metal, plywood, asphalt and concrete overlying reworked soils. Natural soils were found to consist of coarse to fine sand with gravel, silt and clay to brown to greenish black organic silt and organic clayey silt with varying amounts of sand. An assessment of chemical characteristics involved an examination of water salinity and sediment quality of the potential project area. For Saw Mill Creek, the history of wetland loss caused by fill and dumping is readily understood. Where contamination exists, it is point source and can be handled appropriately.

EXHIBIT D
PROJECT DEVELOPMENT PLAN

Exhibit D
to the Instrument

Project Development Plan

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1.0 Overview

The purpose of the project is to pilot a Wetland Mitigation Bank (Bank) in New York City. As the Bank Sponsor, the City of New York will restore, enhance, and maintain 68.94 acres of emergent wetlands, scrub shrub wetlands, forested wetlands, open water channels/pools, mudflat habitat, and uplands on Staten Island in accordance with the provisions of this MBI and regulatory permits. The City of New York has developed a Bank Development Plan for the Bank which is described below. Upon construction completion, signed and sealed as-built drawings will be submitted to the IRT for review and approval in accordance with Section IV.K of the Instrument.

The proposed site provides a significant tidal wetland restoration opportunity in New York City and in the NYSDEC Atlantic Ocean/Long Island Sound Watershed and the HUC08 Sandy Hook-Staten Island subbasin (02030104). It is anticipated that the pilot bank will provide the following wetland functions and services:

- Improved water quality,
- Improved flood attenuation;
- Improved sediment quality,
- Increased plant diversity, and
- Increased wildlife species abundance and diversity.

The first goal for the Bank Development Plan is to restore and maintain targeted tidal hydrology by restoring tidal flow with new tidal creeks. The second goal for the restoration design is to provide the correct site topography to support the desired tidal marsh vegetation and features. Once appropriate tidal hydrology and topography are established on the site, the next goal is to establish native vegetation and habitat. To encourage native plants, an invasive species control plan will be implemented, followed by the planting of native saltmarsh species. In addition to the proposed plantings, additional native species, such as salt marsh fleabane (*Pluchea odorata*, *P. purpurescens)*, are anticipated to colonize the site. The growth of these native species will be encouraged, while the growth of invasive species, such as *Phragmites*, will be discouraged.

The final goal for the restoration design is to maximize wetland functions and services, particularly for wildlife habitat and water quality improvement. The site's location designates it as part of the Atlantic Flyway, providing a crucial stopover site for birds during their southbound migration in late summer and fall. It also serves as an oasis for wildlife in a predominantly urban watershed, offering natural habitat in a watershed limited with such resources. The dominance of *Phragmites* throughout portions of the site has created a monoculture of habitat, which limits habitat and decreases wildlife species diversity. *Phragmites* has replaced native plant species and its dense cover has adversely affected hydrology and the use of open water and marsh surface by aquatic species. By restoring the marsh to contain heterogeneity of habitats, wildlife species diversity will improve. Avian species, in particular, are found to be attracted to a variety of habitats in comparison to a single habitat type. The combination of mud flat, open water, low marsh, high marsh, scrub-shrub and forest proposed for the site would provide the diversity of habitat types needed to support a variety of wildlife species, whether on a migratory stopover or as a resident. Restoring tidal flow allows fish, shellfish, and aquatic invertebrate species to use the tidal channels and provide valuable foraging opportunities for bird species along mudflats during low tide.

2.0 Restoration Design Plan

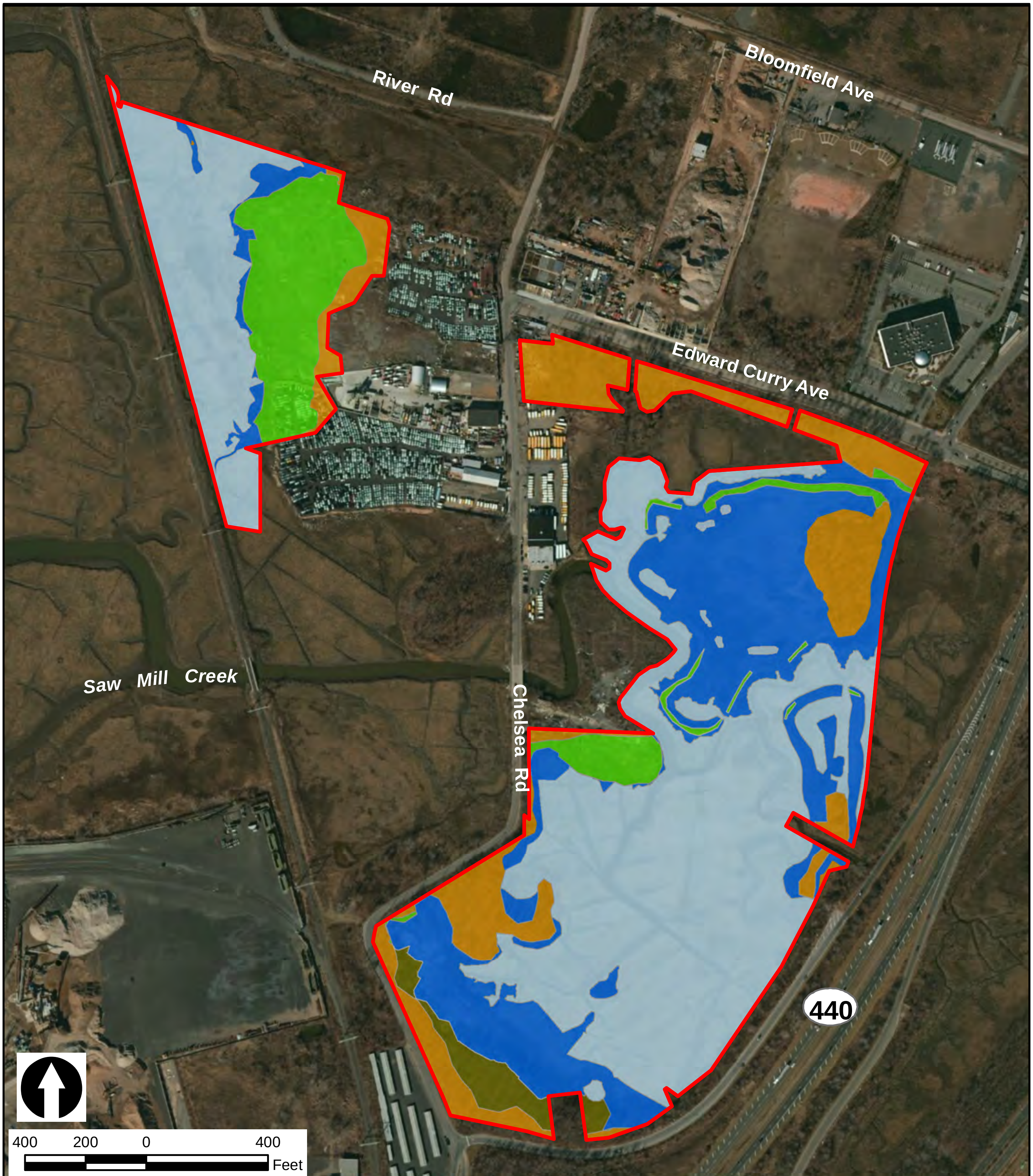
The Final Rule for Compensatory Mitigation for Losses of Aquatic Resources (33 CFR 332.2) defines "restoration" as the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: reestablishment and rehabilitation.

Based on the mitigation definitions from the NYSDEC *Guidelines on Compensatory Mitigation*, "restoration" means reclaiming a degraded wetland to bring back one or more functions that have been partially or completely lost by such actions as filling or draining. It is the preferred form of mitigation because it typically has the greatest chance of successfully establishing natural wetland functions.

In accordance with the federal and state definitions, the proposed Bank will restore former and degraded wetlands to natural/historic functions. The wetland Bank Development plan proposes to restore tidal hydrology to previously filled, hydrologically impaired, and *Phragmites*-dominated portions of the project area. The restoration design strives to maximize ecological restoration and avoid indirect impacts to adjacent properties. As part of the design process, technical studies were undertaken to assess topography, tidal elevations, and other features. A New York State licensed land surveyor conducted a survey to develop a surface topographic map that wasused as the basis of the design plans. Bio-benchmark surveys of key vegetative communities were performed to aid in determining target wetland planting elevations, which dictate design grades. Hydrologic and hydraulic analyses were conducted, including the installation of tide gages to measure site specific tidal fluctuations at the proposed Bank site (see Attachment D-1, Tidal Data Analysis Report). Final design elevations and optimal habitat ranges were determined through integration of the bio-benchmark and hydrology data and incorporation of project goals and site/constructability constraints.

Restoration of ditched, filled, and/or degraded wetland and upland areas to a high level of function shall be accomplished by a combination of practices, including removal of remnant berms and other fill material, regrading to suitable tidal marsh elevations, restoration of tidal creeks, treating non-native invasive species with an EPA-approved herbicide for use in aquatic habitats, and replanting with native vegetation similar to those listed in Table D-1. The design will be conducted in accordance with the *New York State Salt Marsh Restoration and Monitoring Guidelines* and the *Native Species Planting Guide for New York City and Vicinity*. Additional tidal creeks will be constructed to convey tidal flows to support native low and high marsh vegetation and to serve as a barrier to *Phragmites* invasion from surrounding areas.

Portions of the site will also be enhanced. *The Final Rule for Compensatory Mitigation for Losses of Aquatic Resources* (33 CFR 332.2) defines “enhancement” as the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). The Bank Development restoration and enhancement plan is described in the following sections and the proposed habitats are depicted on Figure D-1. Design Plans are provided as Attachment D-2.



Project Site

Proposed Habitat Areas

Forested Wetland Enhancement

Upland Buffer Rehabilitation

Tidal Wetlands Enhancement

Tidal Marsh/Wetland Restoration (Rehabilitation)

Tidal Marsh/Wetland Restoration (Re-Establishment)

Sources: Image courtesy of USGS, Microsoft Corporation 2013; Concept Plan, Louis Berger & Assoc, PC, 2013.

NYCEDC
New York City Economic Development Corporation

Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York

Bank Development Plan

Louis Berger

March 2015

Figure D-1

Table D-1. Anticipated Species to be Planted at Bank

Planting Zone	Scientific Name (Common Name)
Low Marsh	*Spartina alterniflora* (smooth cordgrass)
High Marsh	*Distichlis spicata* (spike grass)
	Spartina patens (saltmeadow cordgrass)
	Spartina alterniflora (smooth cordgrass)
	Juncus gerardii (black grass)
Scrub-Shrub Wetland	*Baccharis halimifolia* (groundsel tree)
	Iva frutescens (high tide bush)

2.1 Project Area West of Chelsea Road

Wetland Restoration (Re-Establishment)

Much of the central portion of the western section consists of construction/demolition debris and other fill material over former marshlands. This material will be removed and the area graded to low and high marsh elevations, tidal creeks will be excavated to restore tidal flow and circulation, and the marsh plain will be planted with appropriate native salt marsh grasses and shrubs.

Wetland Restoration (Rehabilitation)

The northeast and southern portions of the western parcel are dominated by fill and invasive *Phragmites*. Survey data indicates that elevations in this area are too high to support salt marsh species and this area will be excavated to achieve suitable elevations to support a tidal salt marsh. Debris and fill material will be removed and the area graded to low and high marsh elevations, tidal creeks will be excavated to restore tidal flow and circulation, and the marsh plain will be planted with appropriate native salt marsh grasses and shrubs.

Wetland Enhancement

Parts of the project area consist of low and high marsh, as well as several pannes. Based on conditions within the proposed Bank boundary, it is expected that *Phragmites* will continue to be the primary invasive species threatening wetland habitats. To prevent the decline of these aquatic resources, *Phragmites* will be managed during the life of the Bank in low and high marsh habitats through spot applications of an EPA-approved herbicide. In addition, these marshes are threatened by the pervasive dumping in the area. Existing debris in these areas will be removed. By enhancing these wetlands as part of a mitigation bank, the threat of illegal filling and dumping is minimized. The design will include impediments to dumping to the maximum extent possible, including permanent fencing. Subsequent to site construction and planting, the site will be posted and frequently inspected.

2.2 Project Area East of Chelsea Road

Wetland Restoration (Re-Establishment)

The Bank Development plan for the former junkyard area located south of Saw Mill Creek and east of Chelsea Road (urban vacant lot) consists of removing existing debris (tires, cement, asphalt, etc.) and excavating the fill to a target elevation that will support low and high marsh. Portions of remnant berms located in this area consist of *Phragmites* and tree of heaven dominated uplands. These berms will be removed and the area will be graded to an appropriate marsh plain elevation and planted with native salt marsh species.

Wetland Restoration (Rehabilitation)

This area consists of *Phragmites*-dominated remnant berms and elevations that are too high to support salt marsh species. Restoration of this area will consist of excavating and grading the area to achieve proper tidal marsh elevations and excavating tidal creeks to provide hydrology. The marsh plain will be planted with appropriate native salt marsh grasses and shrubs.

A barren panne located east of an island in the northeast corner of the eastern section only holds water at its western extremity. The Bank Development Plan includes improvements to the habitat and function of this area by excavating and grading the area to establish appropriate depth for fish species occurring in pannes (i.e. mummichogs – *Fundulus heteroclitus*) and establishing connections with tidal creeks at elevations that would allow flooding of the panne only during spring tides.

Areas dominated by *Phragmites* in the southern portion of the eastern section will be graded to proper salt marsh elevations and natural creeks reestablished, and the marsh plain planted with appropriate native salt marsh grasses and shrubs. This area will be managed for any reinvasion by *Phragmites* through select application of an EPA-approved herbicide for use in aquatic habitats.

Wetland Enhancement

Parts of the project area consist of low and high marsh, as well as several pannes. Based on conditions within the proposed Bank boundary, it is expected that *Phragmites* will continue to be the primary invasive species threatening wetland habitats, especially in the eastern section where there are several freshwater inputs. To prevent the decline of these aquatic resources, *Phragmites* will be managed during the life of the Bank in low and high marsh habitats by spot applications of an EPA-approved herbicide. Existing debris will be removed.

A red maple-sweetgum swamp located within the southern portion of the eastern section contains some storm surge debris that will be removed to enhance habitat quality and function. To prevent the decline of this aquatic resource, *Phragmites* encroachment into this area will be managed through select application of an EPA-approved herbicide.

In addition, these marshes are threatened by the pervasive dumping in the area. By enhancing these wetlands as part of a mitigation bank, the threat of illegal filling and dumping is minimized. The design will include impediments to dumping to the maximum extent possible, including permanent fencing. Subsequent to site construction and planting, the site will be posted and frequently inspected.

Buffer Rehabilitation

Forested buffers within the eastern section will be rehabilitated through removal of debris and non-native, invasive species that compromise native diversity and wildlife usage. Target invasive species include, but are not limited to, Japanese knotweed, oriental bittersweet, and tree-of-heaven. These and other dominant non-native invasive species will be managed through the application of an EPA-approved herbicide for use in aquatic habitats and by the seeding and/or planting of select native species. Subsequent to site construction and planting, the site will be posted, fenced, and frequently inspected to discourage dumping.

2.3 Channel Design

Based on the desired removal of *Phragmites* and fill, and to provide reestablishment of tidal flow to portions of the Bank area, it was determined that a channels would need to be established to provide tidal flooding of areas historically filled. The channels were designed based on local data, including surveyed cross sections, from on-site functioning tidal wetlands (reference wetlands). The proposed channels are similar to the length, width, sinuosity, and density of channels within the reference wetlands. To ensure the proposed channels adequately convey tidal water to/from the proposed marsh, the cross-sectional areas of the channels were designed in accordance with *Design Guidelines or Tidal Channels in Coastal Wetlands* (U.S. Army Corps of Engineers, Waterways Experiment Station, 1995)." The Channel Design Report is included as Attachment D-3.

2.4 Habitat Improvements

The proposed project would improve fish and wildlife habitat by removing existing soils containing metals and other harmful substances, exposing cleaner soils. Portions of the site which have been found to contain levels of contamination above appropriate ecological effect thresholds would be over-excavated and covered with sand; this remediation method has been found to be effective on other projects to control the re-introduction of contaminants to the aquatic environment.[1] As such, there is no reason to believe that the remaining soils and sediments would adversely affect benthic organisms and the upper trophic-level life for which they serve as a food base. In terms of interaction with the nearby impaired Arthur Kill, the site would continue to be subject to tidal exchange with the Arthur Kill. While there is a small risk that metals and other substances from the Arthur Kill may re-enter the

[1] Example regional tidal wetland restoration projects that involved the placement of a clean sand substrate include the Lincoln Park Wetland Restoration Site in Jersey City, NJ (constructed 2010); the Randall's Island Wetland Restoration Site in New York, NY (constructed 2008); and Jamaica Bay Marsh Islands Restoration Projects, Brooklyn, NY (ongoing). The Lincoln Park Wetland Restoration Project received a 2011 Coastal America Partnership Award for outstanding efforts to restore and protect the coastal environment.

restored wetland, it would likely to be much lower concentrations than currently exist on the site. There is no long-term, sustainable design solution for eliminating this risk, aside from undertaking the cleanup of the Arthur Kill itself. EDC has committed to an annual post-construction sediment sampling and analysis for the presence of metals throughout the project site. Such a sampling plan would allow the Bank to determine whether sediment contaminant concentrations are increasing post-construction. Finally, while restoration of the site would not in and of itself address regional water quality issues associated with the Arthur Kill, it would contribute to regional improvements in water quality.

3.0 Sea Level Rise

In the aftermath of Hurricane Sandy, it is important to plan for sea level rise (SLR) impacts in designing tidal wetland restoration projects. One of the main goals the project is to create not only resilient communities and infrastructure, but also resilient tidal wetlands in the face of sea level rise. To support the project design, Louis Berger projected future impacts of sea level rise at the Bank site (see Attachment D-4). In simulating future impacts of sea level rise at the Bank site, the most recent version of the USACE sea level change projection methodology summarized in *United States Army Corps of Engineers Engineering Circular* (USACE EC) 1165-2-212 was used (USACE, 2011). Louis Berger calculated the low, medium, and high rates of relative SLR at the site at five-year intervals for a period of 50 years from the assumed 2014 project start date, under both build scenario and the no-build scenario. Levels for mean low water (MLW), mean high water (MHW), and mean high water spring (MHWS) (with the sea level rates incorporated) were calculated to provide the data for the impact analysis. An examination of the existing site topography and proposed grading indicate that under all three sea level rise scenarios, there would be no apparent effects to roads, parking, facilities or facility access. However, higher tides from spring tide and storm surge events would rise beyond the mapped low sea level rise MHW line, possibly affecting roads and parking lots, on occasion. The potential impacts of future sea level rise will not change the amount of credits generated by the Bank. The target aquatic and upland buffer habitats established during construction and the five year monitoring period are the basis for the bank credits.

4.0 Construction Activities

4.1 Construction Sequence

Construction will be undertaken with the following sequence:

- Site Clearing of upland areas that are designated as Wetland Restoration (reestablishment) on the Bank Development Plan.
- Temporary -Turbidity Curtain will be used in the existing channels adjacent to proposed channels.
- Temporary -Silt Fence is proposed around the project site boundary.
- Temporary -Construction Entrance - the placement of temporary construction entrances on the project site.
- Chain Link Fencing and Gates will be installed along the project site boundary.
- Debris Removal consists of the handling, separation, stockpiling, compaction, removal, transportation and disposal of all human-made debris from the bank mitigation property, including items seen on the surface and debris encountered during excavation.
- Unclassified Excavation & Disposal of non-contaminated soils.
- Phase 1B archaeological testing will be conducted concurrent with excavation, in accordance with the protocol established in the Programmatic Agreement.
- Laboratory Analysis will involve all work to take site samples and test soils in order to separate and properly dispose of contaminated soils.
- Segregation and Storage of Contaminated Soil involves the removal and stockpile of contaminated soils from non-contaminated soils during excavation.
- Disposal of Contaminated Non-Hazardous Waste Soil involves the disposal of all excavation deemed as a contaminated soil .
- Sand Backfill consists of furnishing, installing, inspecting, and maintaining a depth of 2 feet of Sand Backfill in areas marked for over excavation on the Construction Plans to bring the area to proposed grades.
- Temporary Seed & Mulch is proposed during construction on the upland grass areas.
- Herbivory Fencing will be placed on areas designated as Wetland Restoration.

- Herbaceous Planting: Smooth cordgrass, spike grass, saltmeadow hay, and black grass are proposed to be planted on 2-foot centers in the Wetland Restoration areas.
- Shrub Planting: Groundsel tree and high tide bush are proposed to be planted on 5-foot centers in the Wetland Restoration areas.
- Herbaceous Seed Mix will be spread in the area designated as Buffer Rehabilitation. The seed mix is comprised of *Echinochloa walteri* (coast cockspur grass), *Andropogon gerardii* (big bluestem), *Hordeum jubatum* (foxtail barley), *Lolium multiflorum* (ryegrass), and *Panicum virgatum* (switchgrass).
- Controlling Invasive Plant Species by Herbicide application following five annual growing seasons to control invasive plant species from encroaching into the project area.

4.2 Anticipated Construction Phases and Schedule

Assuming the longest construction Schedule for the channel excavation and planting, construction activities would take approximately eight (8) months, from Fall 2015 to Spring 2016. As of the date the Instrument is entered into by the Parties, the anticipated timelines are outlined below, (while detailed descriptions of each phase are provided thereafter):

Month 1

Construction Entrance - Temporary
Turbidity Curtain – Temporary
Silt Fence – Temporary
Clearing and Grubbing
Temporary Chain Link Fencing and Gates
Invasive Species Control

Month 2 – Month 5

Excavation & Disposal
Wetland Restoration (Re-establishment)
Wetland Restoration (Rehabilitation)
Tidal Channels

Month 6 - Month 8

Herbivory Fencing

Planting

Herbaceous Seed Mix

Permanent Fencing

ATTACHMENT D-1
TIDAL DATA ANALYSIS REPORT

Attachment 1
to Exhibit D

Tidal Data Analysis Report

During the design phase of the Marshes Mitigation Site, four tide measurement gages (solinst leveloggers) were installed on-site to measure site specific tidal fluctuations at the proposed project site. One solinst barologger was also installed on-site. The solinst levelogger measured-water levels are displayed as temperature compensated pressure readings, and these readings were barometrically compensated with the aid of the Solinst Barologger which measures atmospheric pressure. Tide data monitoring started on May 4, 2013 and monitoring is ongoing. Tidal fluctuations were recorded at 15-minute intervals. Tide gage locations are shown in Figure 1. As shown in Figure 1, one tide gage (gage 4) was installed in Saw Mill Creek just outside of the project boundary and on the western side of the Chelsea Road Bride. Gage 4 location was chosen to help address whether or not the Chelsea Road Bride significantly constrict tidal flows to the proposed site East of Chelsea Road. Gage 4 is also used to compute site tidal datums since this part of the creek captures the entire envelope of the tidal range.

Figure 1: Tide gage locations

Figure 2 shows the time series plot of the measured tide data for all four gages on-site. The tide data monitored over the three month period provide on-site data regarding tidal amplitude. The analysis demonstrates a clear documentation of the tidal range and duration at the Marshes site. From Figure 2, gage 4 which is west of Chelsea Road Bridge measured high tide peaks which are not significantly different from the high peaks of gages 1 and 2 on the east side of the bridge and gage 3 northwest of gage 4. In fact a comparison of the Mean High Water (MHW) elevations for gages 1, 2, 3 and 4 shows that the elevations are 2.89, 2.92, 2.83 and 2.97 ft. NAVD88 respectively and with an average tide lag time of 11, 12, and 17 minutes between gage 4 and gages 1, 2 and 3 respectively. Thus, it can be concluded that that the Chelsea Bridge constriction has little to no impact on the upstream tidal prism. The truncation of the tide at gages 1, 2 and 3 at low tide is likely the due to the fact that the gage sensors were unable to read water levels below those elevations. The only rational explanation for this anomaly is that the bottom elevation of the creek at these locations are higher than the low tide elevation and the gages went dry as water level recedes from these locations. Because of the truncation of gages 1, 2 and 3, the measured tide data at these locations could not be used to develop tidal datums as such a process will require low tide elevations for the analysis. As such, gage 4 which measures the full tidal range was used for the site tidal datum computation.

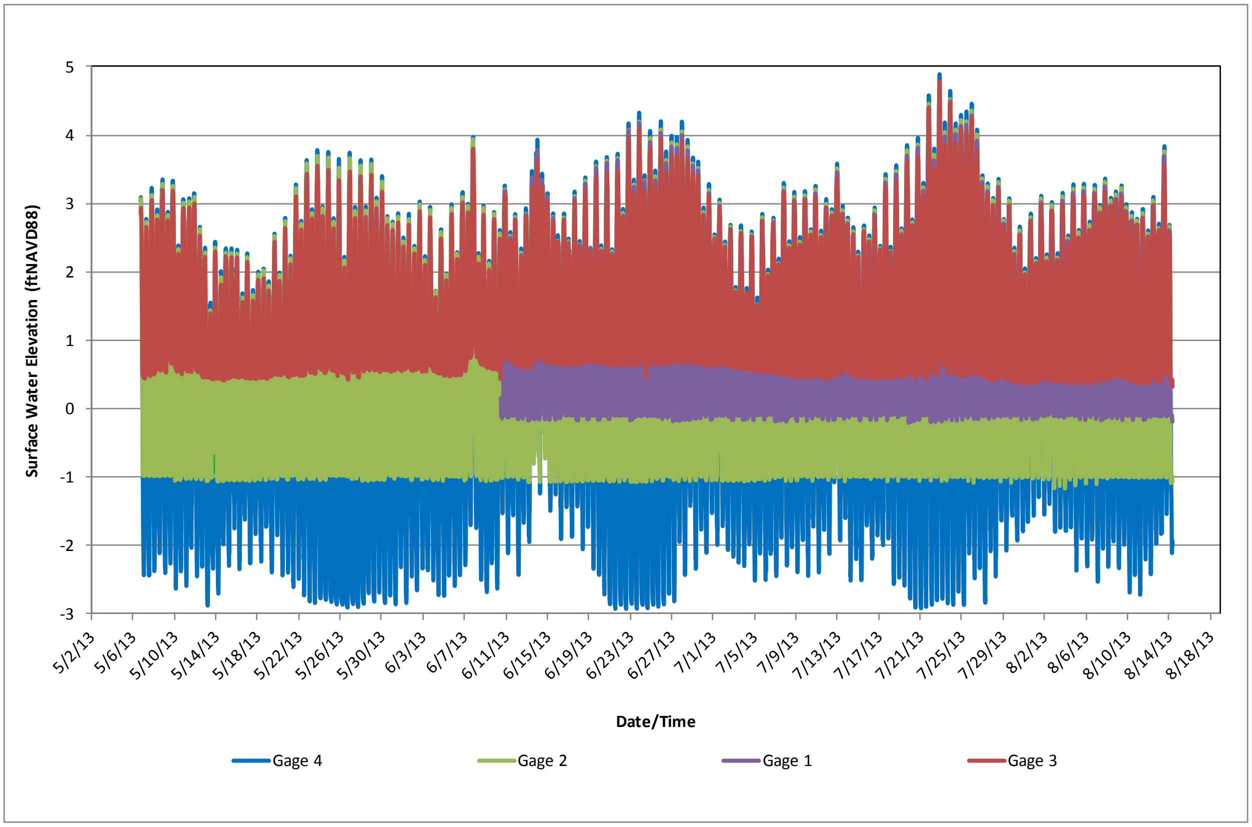


Figure 2: Marshes tide gage locations.

A set of local tidal elevations were estimated using the Saw Mill Creek tide gage (gage 4) data. Unlike gages 1, 2 and 3 which measures the high tides but not the lows, (gage locations dry out at low tide) gage 4 captures the full tidal range (Figure 2) and was chosen to estimate the site-specific tidal datums. The following tidal datums were determined relative to North American Vertical Datum of 1988 (NAVD88), and later compared to the tidal datum of Old Place Creek tide gage (USACE, 2005), Rahway River tide gage (USACE, 2005) and the 19-year epoch-based tidal datums of Bergen Point West Reach, NY (Station ID: 8519483).

- Mean High Water Spring(MHWS)
- Mean Higher High Water (MHHW)
- Mean High Water (MHW)
- Mean Tide Level (MTL)
- Mean Low Water (MLW)
- Mean Lower Low Water (MLLW)
- Diurnal Tide Level (DTL)
- Mean Range (Mn),
- Great Diurnal Range (Gt)

For tidal datums reflective of current conditions, the MHW and MLW were computed from the observed water level data by averaging the highest water level and lowest water level, respectively, in a tidal cycle. MTL was computed by averaging the MHW and MLW. MHHW was computed by averaging the highest of the high tides within a tidal cycle. MLLW was computed by averaging the lowest of the low tides within a tidal cycle. DTL was computed by averaging the MHHW and the MLLW. Mn was computed by taking the difference between the MHW and MLW. Gt was computed by taking the difference between the MHHW and the MLLW

The values of tidal datums reflective of Saw Mill Creek (gage 4) conditions are presented in Table 1. Tidal datums calculated for Saw Mill Creek were compared to those observed at Old Place Creek, Rahway River and epoch-based tidal datums of Bergen Point West Reach. The Bergen Point West Reach, the Rahway River and the Old Place Creek tide gages are located approximately 5 miles, 2.5 miles and 1 mile respectively from the project site. The locations of these gages are depicted on Figure 3.

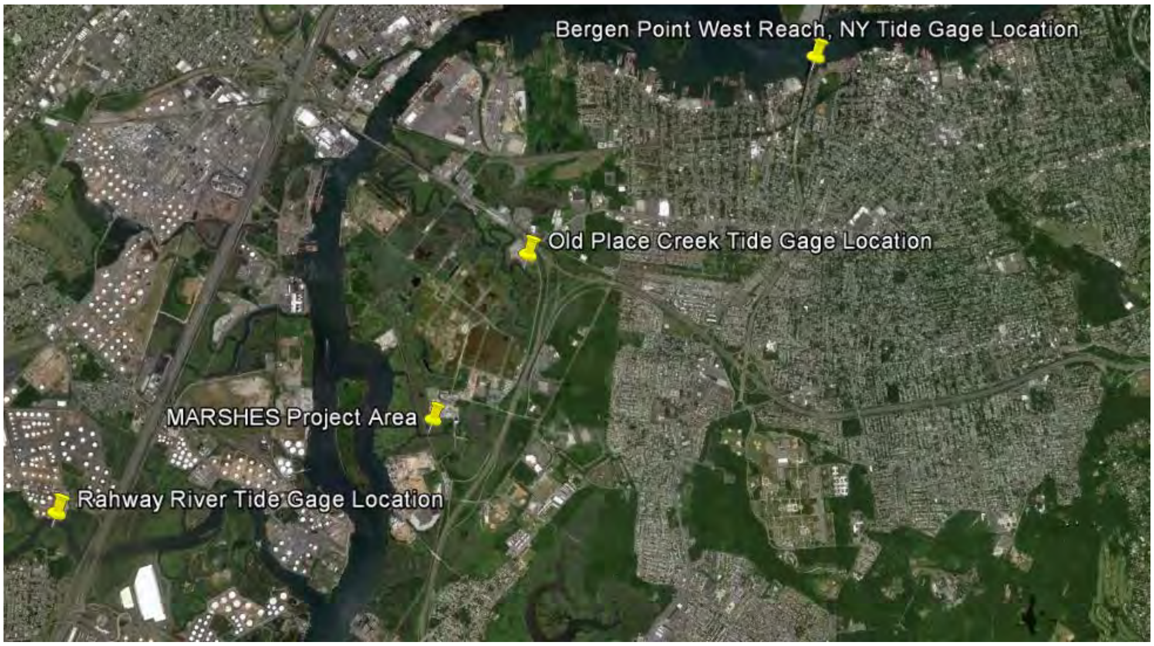


Figure 3: Neighboring Tide Gage Locations

Epoch based tidal datums for the project site were estimated by reconstructing the Saw Mill Creek gage data using tidal epoch datums reported from the nearest control tide station, Bergen Point West Reach Tide Gage, New York (Station ID: 8519483) using the Modified Range Ratio Method of the "Computational Techniques for Tidal Datums Handbook" published by NOAA (NOAA Special Publication NOS CO-OPS 2, September 2003). The Saw Mill Creek data series was reduced to equivalent 19-year epoch based tidal datums by comparison with simultaneous observations from Bergen Point West Reach tide station. Use of the data reduction method by using the Modified Range Ratio Method resulted in tidal datums that correspond to the best estimate of what would have been observed from 1983 to 2001 which is the current National Tidal Datum Epoch (NTDE) established by the National Ocean Service.

In the reduction process, the monthly MTL, DTL, Mn and Gt of the Saw Mill Creek gage data for the months of May, June and July 2013 were first computed. Next, the corresponding monthly values for the Bergen Point tide gage (control station) were obtained from the NOAA website. In correcting the Saw Mill Creek MTL to 19 year NTDE equivalent value, the monthly MTL differences between the two gages were calculated and averaged. The corrected MTL at Saw Mill Creek was computed by adding the accepted MTL of Bergen Point to the three month average discussed above. A similar approach of MTL correction was also performed for DTL. In correcting the Saw Mill Creek Mn tide data to 19 year NTDE equivalent value, the monthly Mn ratio of the two gages was calculated and averaged. The corrected Mn at Saw Mill Creek was computed by multiplying the accepted Mn at Bergen Point by the average. A similar approach of Mn correction was also performed for Gt. The correction steps for MTL, DTL, Mn and Gt are shown in Table 1

Table 1: Correction procedure for MTL, DTL, Mn and Gt

Month	Mean Tide Level (MTL)			Diurnal Tide Level (DTL)			Mean Range (MN)			Great Diurnal Range (GT)		
	(A)	(B)	(A-B)	(A)	(B)	(A-B)	(A)	(B)	(A/B)	(A)	(B)	(A/B)
May-13	0.17	0.15	0.02	0.26	0.12	0.14	5.24	5.12	1.02	5.55	5.59	0.99
Jun-13	0.52	0.48	0.04	0.48	0.47	0.01	5.32	5.07	1.05	5.85	5.62	1.04
Jul-13	0.52	0.51	0.01	0.47	0.52	-0.04	5.28	4.95	1.07	5.72	5.43	1.05
Sums			0.079			0.109			3.14			3.09
Means			0.026			0.036			1.05			1.03
Accepted Values for (B)			-0.24			-0.19			4.98			5.51
Correct Values for (A)			-0.21			-0.16			5.21			5.67

Note:

Surbordinate Station (A): Marshes Gage 4, NY

Control Station (B); Bergen Point West Gage, NY

After the correction of the Saw Mill Creek MTL, DTL, Mn and Gt gage data as discussed in the preceding paragraph, the 19 year equivalent epoch based datums for the Saw Mill Creek gage were determined as follows:

$MLW_{\text{corrected for A}} = MTL_{\text{corrected for A}} - ½\ Mn_{\text{corrected for A}}$
$MHW_{\text{corrected for A}} = MLW_{A} + Mn_{\text{corrected for A}}$
$MLLW_{\text{corrected for A}} = DTL_{\text{corrected for A}} - ½\ Gt_{\text{corrected for A}}$
$MHHW_{\text{corrected for A}} = MLLW_{A} + Gt_{\text{corrected for A}}$

The values of the observed tidal datums and reconstructed (epoch-based) tidal datums estimated from the three months tidal data (May, June and July 2013) at the Saw Mill Creek site gage 4 are presented in 2. This table also includes comparisons to tidal datums with other previously computed data of neighboring Old Place Creek gage, Rahway River gage and the NOAA tide gage station at Bergen Point West Reach, NY. Site specific reconstructed Epoch based MHWS, MHHW, MHW, MTL, MLW and MLLW are 2.91, 2.62, 2.39, -0.2, -2.82, and -3.05 feet NAVD 1988, respectively. Tidal elevations determined from observed data for all gages are relatively similar.

Tidal datums based on the May to July 2013 observations may be best used to represent current physical processes, whereas epoch based datums are used for long term considerations and for legal delineation (NOAA special Publication NOS CO-OPS 1, June 2000).

Table 2: Tidal Datums

Datum	Marshes Saw Mill Creek gage (Gage 4) Observed May-June 2013	Marshes Saw Mill Creek gage (Gage 4) Reconstructed Epoch Based (1983-2001)	Old Place Creek Tide Gage Observed 2005	Rahway River Tide Gage Observed 2005	Bergen Point West Reach Tide Gage (Primary NOAA Gage) Epoch based (1983-2001)
MHHWS	-	2.91***	-	-	-
MHHW	3.27	2.62	2.98	2.52	2.57
MHW	2.97	2.39	2.36	2.19	2.25
MTL	0.42	-0.21	-	-	-0.24
MLW	-2.31	-2.82	-2.28	-3.18	-2.73
MLLW	-2.44	-3.05	-2.42	-3.4	-2.94

*** Computed BY adding the Bergen Point station's principal lunar and solar semidiurnal constituents (Marmer, p.130).

The Saw Mill Creek tide data was also used to estimate the inundation time for the mitigation site for anticipated marsh elevations. Table 3 lists both the percentage of time the Saw Mill Creek tidal gage was above selected site elevations and the inundation time for these elevations over a tidal day (24.8 hours).

Table 3: Marsh Inundation Data

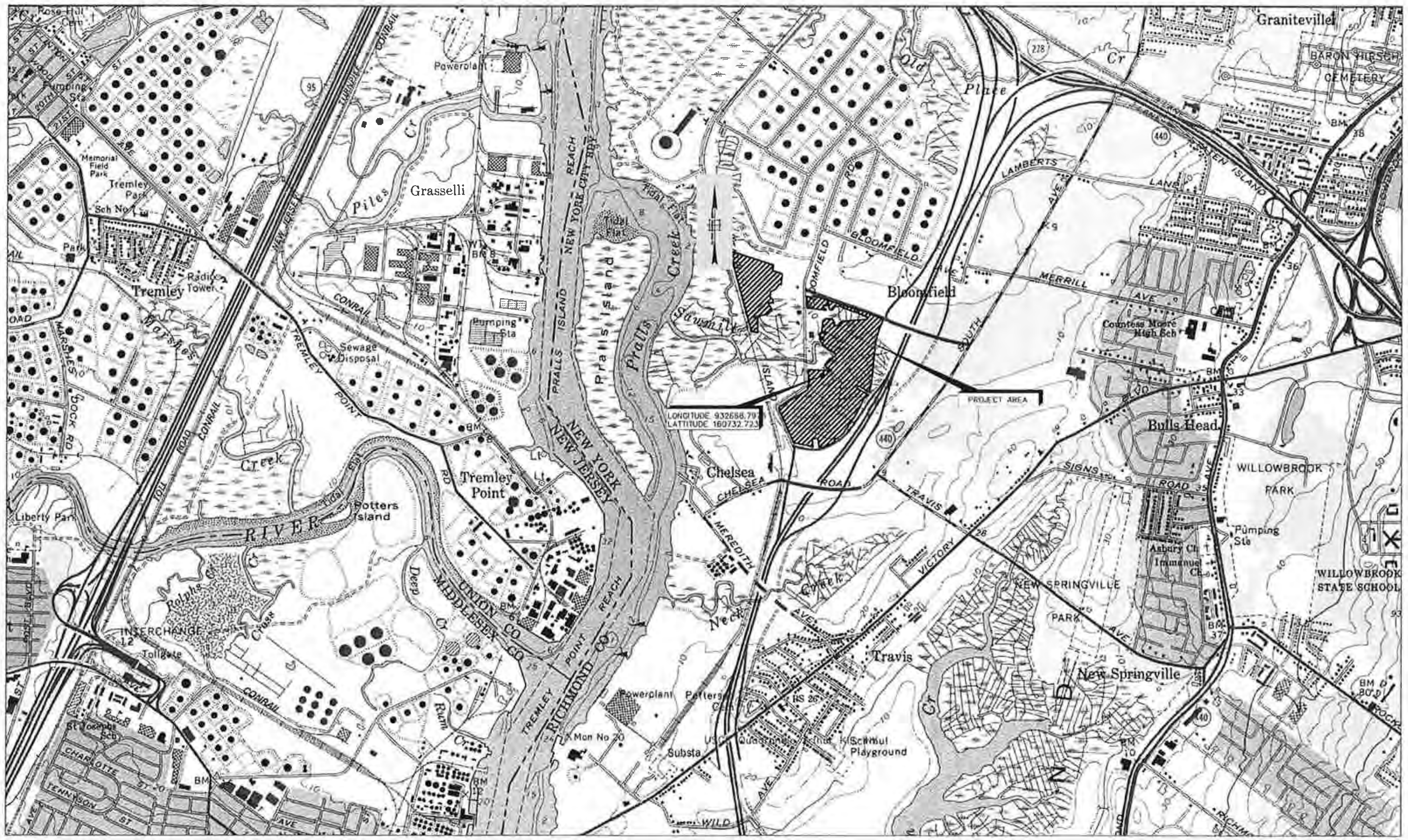
Elevation, ft NAVD'88	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
Inundation Time (hours/day)	13.9	12.3	10.8	9.0	6.8	4.3	2.2	0.9	0.3
Percentage of time above gage elevation during lunar day (24.8 hours)	56 %	50 %	43 %	36 %	28 %	17 %	9%	4%	1%

ATTACHMENT D-2
DESIGN PLANS

SAW MILL CREEK PILOT WETLAND MITIGATION BANK

STATEN ISLAND, NEW YORK

NEW YORK CITY ECONOMIC DEVELOPMENT CORPORATION



SITE LOCATION MAP

SCALE IN FEET 1" = 1000'

INDEX OF DRAWINGS

SHEET NUMBER	SHEET DESCRIPTION
1	TITLE SHEET
2	GENERAL NOTES AND LEGEND
3	KEY PLAN
4	EXISTING CONDITIONS -WEST-
5	EXISTING CONDITIONS -EAST-
6	EXISTING CHANNEL SECTIONS -1-
7	EXISTING CHANNEL SECTIONS -2-
8	EXISTING CHANNEL SECTIONS -3-
9	PROPOSED GRADING -WEST-
10	PROPOSED GRADING -EAST-
11	PROJECT AREAS OF INTEREST
12	SURFACE PROFILES
13	PROPOSED TYPICAL SECTIONS
14	PLANTING PLAN -WEST-
15	PLANTING PLAN -EAST-
16	PLANTING -NOTES & DETAILS-
17	SOIL EROSION AND SEDIMENT CONTROL -WEST-
18	SOIL EROSION AND SEDIMENT CONTROL -EAST-
19	SOIL EROSION AND SEDIMENT CONTROL -NOTES AND DETAILS-
20	SOIL EROSION AND SEDIMENT CONTROL -NOTES AND DETAILS-
21	SOIL EROSION AND SEDIMENT CONTROL -NOTES AND DETAILS-

APPENDIX DRAWINGS

SHEET NUMBER	SHEET DESCRIPTION
1	BOUNDARY SURVEY OF SAW MILL CREEK PARK
2	BOUNDARY SURVEY OF SAW MILL CREEK PARK
3	BOUNDARY SURVEY OF SAW MILL CREEK PARK
4	BOUNDARY SURVEY OF SAW MILL CREEK PARK

NO	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID
	5/14/14	EXPANDED MAP SIZE

LOUIS BERGER & ASSOC, PC
48 WALL STREET
16TH FLOOR
NEW YORK, NY 10005

BETHANY M. BEARMORE
N.Y. PROFESSIONAL ENGINEER
N.Y. P.E. LIC. NO. 082892

NYCEDC NEW YORK CITY ECONOMIC DEVELOPMENT CORP.

SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

TITLE SHEET

DRAWN BY: MH	APPROVALS			PROJECT NO	2001984
CHECKED BY: SA	APPROVED BY:	TITLE	DATE	SHEET 1 OF 21	
SCALE:					
DATE: NOVEMBER 2013				DWG. NO.	

FILE NAME: 1_TITLE_LEGEND.dwg

PROJECT PATH: V:\Operations\09111004_MARSHES\4 Deliverables\Drawings\95% Design\Plot

PLOT TIME: 2015-03-27 10:39:36 36

PLOT TIME: 2015-03-25 14:24:12

LEGEND

	EXISTING	PROPOSED
BANK BOUNDARY		
PROPERTY EASEMENTS		
DRAINAGE EASEMENTS		
MAJOR CONTOURS		
MINOR CONTOURS		
ROAD RIGHT OF WAY		
SURFACE WATER		
UNDERGROUND WATER LINE		
UNDERGROUND GAS LINE		
EDGE OF WETLANDS		
EXISTING CROSS-SECTIONS		
MEAN HIGH WATER		
MEAN LOW WATER		
SPRING HIGH WATER		
SEA LEVEL RISE		
SPOT ELEVATIONS		× 2.8
BIOBENCHMARKS		
TIDE GAGES		
WETLAND FLAGS		
SOIL POINTS		
SURVEY BENCHMARKS		
2013 GROUND WATER SAMPLING POINTS		
2013 SOIL BORING POINTS		
2013 SEDIMENT SAMPLING POINTS		
2014 SOIL BORING LOCATION		
2014 SOIL SAMPLE LOCATION		
2014 SEDIMENT SAMPLE LOCATION		
VEGETATION TREE LINE		
VEGETATION BUSH		
VEGETATION TREE		
DEBRIS TO BE REMOVED		
PHOTO LOCATIONS		
LIMIT OF DISTURBANCE		LOD
PLANTING LIMIT AREA-NO HEAVY EQUIPMENT ALLOWED		PL
CONSTRUCTION VEHICLE ACCESS TO BE APPROVED BY DESIGN ENGINEER		CVR
INVASIVE PLANT TREATMENT AREA		
FLOATING TURBIDITY BARRIER		
PERMANENT CHAIN-LINK FENCE AND GATES		
SILT FENCE		
CONSTRUCTION FENCE		
HAY BALE		
HABITAT – LOW MARSH		
HABITAT – HIGH MARSH		
HABITAT – SCRUB SHRUB		
HABITAT – UPLAND SLOPE		
AREA OF OVER EXCAVATION		

GENERAL NOTES

1. THE HORIZONTAL COORDINATE SYSTEM IS THE NEW YORK STATE PLANE, NORTH AMERICAN DATUM OF 1983, U.S SURVEY FEET (NAD83, FT).
2. ALL ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988, FEET (NAVD88, FT)
3. THE TOPOGRAPHIC BASE SURVEY (SHORELINE AND UPLAND AREAS SURROUNDING SAW MILL CREEK) WAS CONDUCTED BY GAYRON DE BRUIN LAND SURVEYING AND ENGINEERING, P.C. IN JUNE 2013.
4. THE INFORMATION SHOWN ON THESE PLANS CONCERNING TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATIONS AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO. ANY DAMAGE TO UTILITIES WILL BE REPAIRED IMMEDIATELY AT THE CONTRACTOR'S EXPENSE.
5. SOIL CLASSIFICATION AND BORING LOG DATA PERFORMED BY LOUIS BERGER GROUP & ASSOC., PC IS AVAILABLE IN APPENDIX A OF THE PROJECT SPECIFICATIONS.
6. THE CONTRACTOR SHALL, DURING CONTRACT OPERATIONS, ADHERE TO ALL CONDITIONS SET FORTH IN THE PERMITS
7. CONSTRUCTION VEHICLES AND STOCKPILE/STORAGE AREAS ARE NOT PERMITTED BEYOND THE LIMITS OF PROPOSED WORK.
8. ANY AREAS DISTURBED OUTSIDE THE DESIGNATED LIMITS OF DISTURBANCE SHALL BE RESTORED TO EXISTING CONDITIONS AT THE CONTRACTOR'S EXPENSE.
9. UNLESS OTHERWISE SPECIFIED IN THIS DOCUMENT, OR BY THE DESIGN ENGINEER, ALL EXCAVATED SOILS MUST BE HANDLED AND DISPOSED OF IN ACCORDANCE WITH PROJECT SPECIFICATION ITEM 2, 2A AND 5.
10. THE CONTRACTOR SHALL REMOVE ALL DEBRIS IN ACCORDANCE WITH PROJECT SPECIFICATION ITEM 15.
11. HEAVY EQUIPMENT USED IN GRADING OPERATIONS IN WETLANDS MUST OPERATE ON TIMBER MARSH MATS OR EQUIVALENT. NO CONSTRUCTION EQUIPMENT (INCLUDING EXCAVATORS, MARSHMASTERS, ROLLIGONS, MARSH BUGGIES, ARGOS, OR SIMILAR EQUIPMENT) SHALL BE ALLOWED TO TRAVERSE THE GRADED MARSH AND ANY AREA TO BE PLANTED UNDER THIS PROJECT.
12. EXISTING TREES WITHIN THE LIMITS OF DISTURBANCE WHICH MIGHT BE DAMAGED DURING CONSTRUCTION SHALL BE PROTECTED BY A 6 FOOT HIGH ORANGE CONSTRUCTION FENCE, SECURELY ERECTED A MINIMUM OF 5 FEET FROM THE TRUNK OF THE INDIVIDUAL TREE OR FOLLOW THE OUTER PERIMETER OF BRANCHES OR CLUMPS OF TREES. ANY TREE THAT IS DAMAGED DURING THE WORK UNDER THIS CONTRACT SHALL BE REPLACED IN KIND OR AS APPROVED BY THE DESIGN ENGINEER.
13. THE PROJECT SITE IS SUBJECT TO TIDAL FLOW. THE CONTRACTOR MUST TAKE THIS UNDER CONSIDERATION WHEN PLANNING CONSTRUCTION ACTIVITIES TO ACCOUNT FOR THE VARIATION IN TIDE CYCLES ON A DAILY AND MONTHLY BASIS.
14. THE CONTRACTOR SHALL PROVIDE A TIDAL ENVELOPE PLAN FOR APPROVAL, ADHERING TO ALL DEWATERING MEASURES SET BY THESE PLANS AND BY NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION.
15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING WITH THE DESIGN ENGINEER THE TEMPORARY PLACEMENT AND STORAGE OF STOCKPILED MATERIALS, EQUIPMENT AND VEHICLES WITHIN THE CONSTRUCTION AREA. THE STAGING AREA SHALL NOT EXCEED THE LIMITS SHOWN WITHIN THESE PLANS, UNLESS APPROVED BY THE DESIGN ENGINEER.
16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING PROPOSED WORK WITH THE DESIGN ENGINEER, PROVIDING ADEQUATE CONTROLS FOR SITE SAFETY, AND MINIMIZING IMPACTS TO ADJACENT PROPERTY OWNERS. UNDER NO CIRCUMSTANCES WILL THE CONTRACTOR INITIATE ACTIVITIES THAT WILL RESTRICT ACCESS OF EMERGENCY VEHICLES.
17. ALL PHASING AND SEQUENCING SHALL BE COORDINATED WITH THE DESIGN ENGINEER AND NYCEDC.
18. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND EXISTING CONDITIONS RELATED TO THIS PROJECT PRIOR TO SHOP DRAWING PRODUCTION.
19. CONTRACTOR SHALL SUBMIT COMPLETE SHOP DRAWINGS FOR ALL PARTS OF THE WORK, CONSTRUCTION METHODS AND SEQUENCING WHERE APPLICABLE. NO PERFORMANCE OF THE WORK SHALL COMMENCE WITHOUT PRIOR REVIEW AND APPROVAL OF THE SHOP DRAWINGS BY THE DESIGN ENGINEER.

TIDAL DATA AT SITE (NAVD88)	
MEAN LOWER WATER	-3.10 FT
MEAN LOW WATER	-2.84 FT
MEAN TIDE LEVEL	-0.21 FT
MEAN HIGH WATER	2.42 FT
MEAN HIGHER HIGH WATER	2.67 FT
FEMA 100 YEAR FLOOD ELEVATION	9.00 FT

NOTE:

NORMAL TIDE ELEVATIONS CAN BE AS HIGH AS 5 FT (NAVD88)

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SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

GENERAL NOTES AND LEGEND

LOUIS BERGER & ASSOC, PC
48 WALL STREET
16TH FLOOR
NEW YORK, NY 10005

BETHANY M. BEARMORE
N.Y. PROFESSIONAL ENGINEER
N.Y. P.E. LIC. NO. 082892

NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID

DRAWN BY: MH
CHECKED BY: SA
SCALE:
DATE: NOVEMBER 2013

APPROVALS		
APPROVED BY:	TITLE	DATE

PROJECT NO. 2001984
SHEET 2 OF 21
DWG. NO.

FILE NAME: 1_TITLE_LEGEND.dwg

PROJECT PATH: V:\Operations\09111004_MARSHES\4 Deliverables\Drawings\95% Design\Plot

HABITAT AREAS

TYPE	SYMBOLS	WEST	EAST	TOTAL
WETLAND RESTORATION (REHABILITATION)		1.02 ACRES	15.70 ACRES	16.72 ACRES
WETLAND RESTORATION (RE-ESTABLISHMENT)		5.17 ACRES	1.87 ACRES	7.04 ACRES
TIDAL WETLAND ENHANCEMENT		7.69 ACRES	26.03 ACRES	33.72 ACRES
FORESTED WETLAND ENHANCEMENT		0.00 ACRES	1.52 ACRES	1.52 ACRES
UPLAND SLOPE		1.12 ACRES	0.33 ACRES	1.45 ACRES
BUFFER REHABILITATION		0.00 ACRES	8.49 ACRES	8.49 ACRES
	TOTAL	15.00 ACRES	53.94 ACRES	68.94 ACRES

LEGEND

SPRING HIGH WATER	2.62'
MEAN HIGH WATER	2.39'
MEAN LOW WATER	-2.82'

SCALE IN FEET
1" = 175'

NYCEDC NEW YORK CITY ECONOMIC DEVELOPMENT CORP.

SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

KEY PLAN

LOUIS BERGER & ASSOC, PC
48 WALL STREET
16TH FLOOR
NEW YORK, NY 10005

BETHANY M BEARMORE
N.Y. PROFESSIONAL ENGINEER
N.Y. P.E. LIC. NO. 082892

NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID
	5/14/14	ADDED SHW AND MLW

DRAWN BY: MH	APPROVALS			PROJECT NO.	2001984
CHECKED BY: SA	APPROVED BY:	TITLE	DATE	SHEET 3 OF 21	
SCALE:					
DATE: NOVEMBER 2013				DWG. NO.	

FILE NAME: 2_KEY MAP dwg

PLOT TIME: 2015-03-25 14:26:16.16

PROJECT PATH: V:\Operations\09111004_MARSHES\4 Deliverables\Drawings\95% Design\Plot

CONTROL POINT		
X	Y	Z (NAVD88)
930509.35	161453.63	2.8 FT

NOTES

1. VERTICAL DATUM IN NAVD88
2. HORIZONTAL DATUM IN NAD83
3. SEE APPENDIX DRAWINGS: BOUNDARY SURVEY OF SAW MILL CREEK PARK SHEET 1 OF 2 FOR BOUNDARY SURVEY INFORMATION

LEGEND

SPRING HIGH WATER 2.62'
MEAN HIGH WATER 2.39'
MEAN LOW WATER −2.82'

EXISTING CHANNEL SECTIONS				
SECTION	START SECTION		END SECTION	
	NORTHING	EASTING	NORTHING	EASTING
1W	162846.18	930494.25	162893.87	930665.79
2W	162660.84	930893.75	162659.63	930725.40
3W	162582.96	930656.52	162491.31	930565.60
4W	162288.11	930655.59	162322.20	930738.02
5W	162198.95	930758.15	162260.48	930922.99
6W	162089.04	930953.45	162036.74	930886.30
7W	161840.31	930765.46	161875.12	930828.86
8W	161572.44	930951.77	161686.91	930927.16
9W	161235.09	931241.72	161323.13	931351.50
10W	161078.03	930982.29	161107.81	931078.62
11W	160986.52	931150.53	161047.91	931223.25
12W	160862.92	931429.42	160990.13	931417.28

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SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

EXISTING CONDITIONS —WEST—

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48 WALL STREET
16TH FLOOR
NEW YORK, NY 10005

BETHANY M. BEARMORE
N.Y. PROFESSIONAL ENGINEER
N.Y. P.E. LIC. NO. 082892

NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID
	5/16/14	ADDED SHW AND MLW

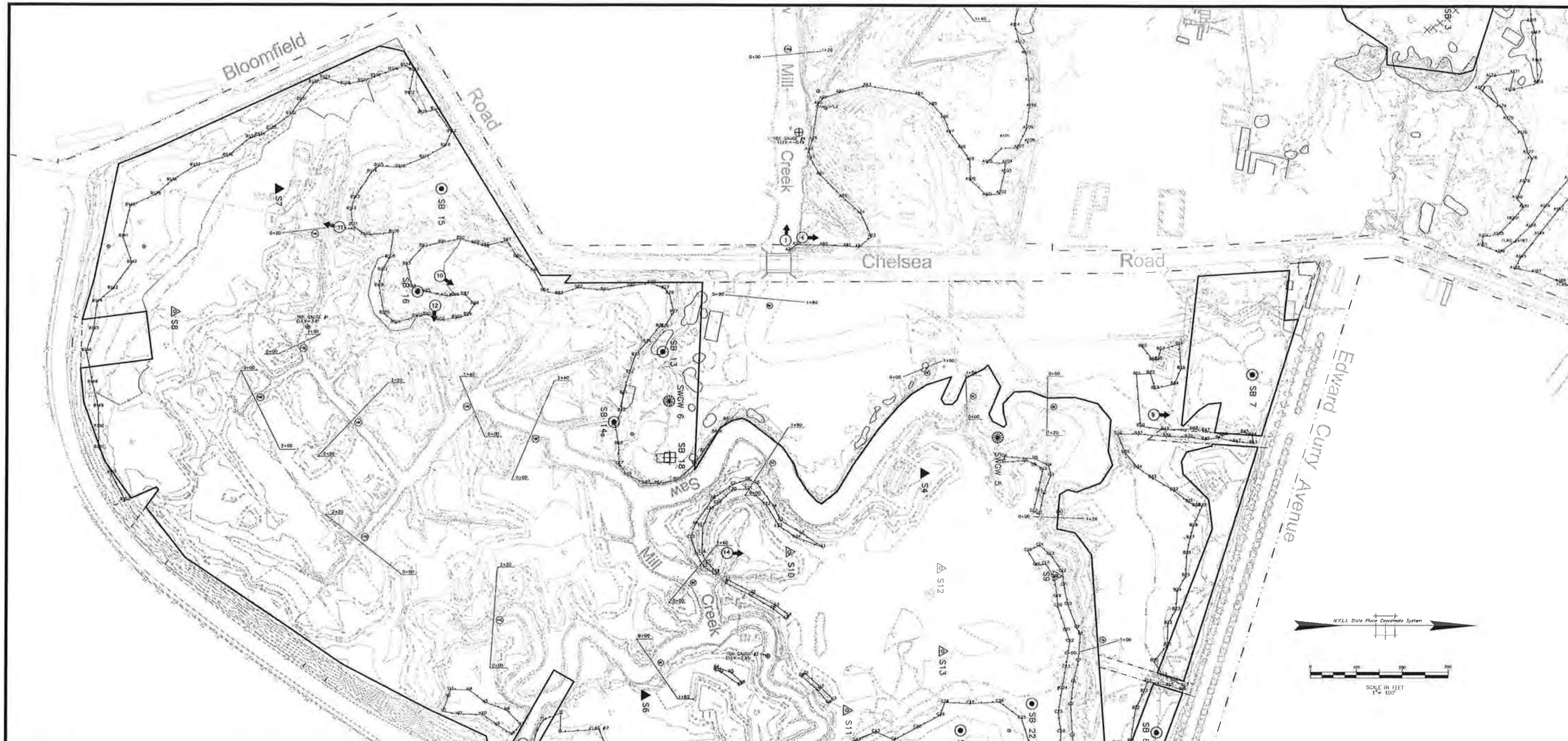
DRAWN BY: MH
CHECKED BY: SA
SCALE: AS SHOWN
DATE: NOVEMBER 2013

APPROVALS		
APPROVED BY:	TITLE	DATE

PROJECT NO. 2001984
SHEET 4 OF 21
DWG. NO.

FILE NAME: 3_EXISTING CONDITIONS.dwg

PLOT TIME: 2015-03-25 14:26:29:29



EXISTING CHANNEL SECTIONS				
SECTION	START SECTION		END SECTION	
	NORTHING	EASTING	NORTHING	EASTING
1E	161553.71	932728.86	161641.04	932702.99
2E	161453.64	932432.80	161564.21	932436.67
3E	161484.87	932125.61	161483.03	932255.01
4E	161309.28	932220.52	161306.13	932122.99
5E	161169.79	932127.81	161254.36	932093.32
6E	160781.93	931948.89	160954.42	931964.90
7E	160825.65	932387.71	160920.30	932238.96
8E	160659.52	932623.12	160763.77	932497.31
9E	160590.37	932701.98	160680.93	932833.04
10E	160317.91	932354.17	160410.59	932137.33
11E	160271.45	932765.49	160287.14	932545.02
12E	160286.26	932953.27	160373.27	932962.02
13E	160259.43	932260.28	160204.01	932128.79
14E	159816.13	931814.59	159949.74	931798.76
15E	159808.66	932079.28	159899.95	932036.70
16E	159894.92	932303.53	160048.94	932142.35
17E	160079.90	932561.40	159911.83	932430.04
18E	159726.62	932115.59	159812.16	932288.04

PROJECT PATH: V:\Operations\09111004_MARSHES\4 Deliverables\Drawings\95% Design\Plot

NOTES

1. VERTICAL DATUM IN NAVD88
2. HORIZONTAL DATUM IN NAD83
3. SEE APPENDIX DRAWINGS: BOUNDARY SURVEY OF SAW MILL CREEK PARK SHEET 1 OF 2 FOR BOUNDARY SURVEY INFORMATION.

LEGEND

	SPRING HIGH WATER	2.62'
	MEAN HIGH WATER	2.39'
	MEAN LOW WATER	-2.82'

NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID
	5/16/14	ADDED SHW AND MLW

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BETHANY M. BEARMORE
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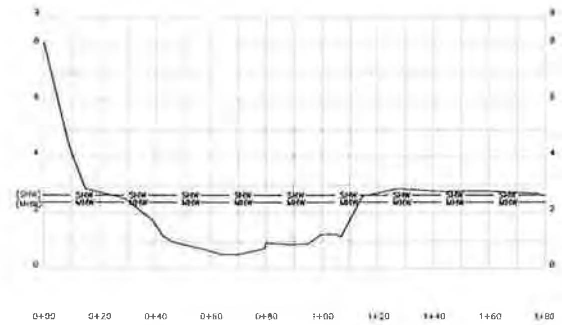
SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

EXISTING CONDITIONS –EAST–

DRAWN BY: MH	APPROVALS			PROJECT NO. 2001984
CHECKED BY: SA	APPROVED BY:	TITLE	DATE	SHEET 5 OF 21
SCALE: AS SHOWN				
DATE: NOVEMBER 2013				DWG. NO.

FILE NAME: 3_EXISTING CONDITIONS.dwg



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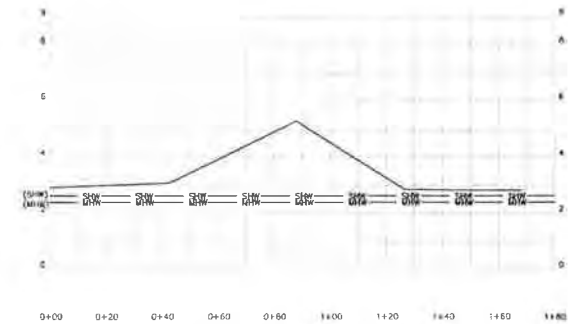

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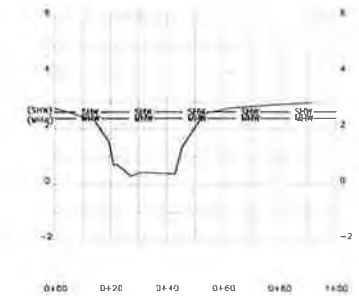

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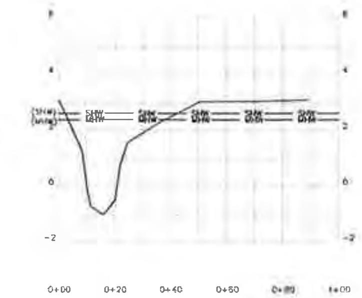

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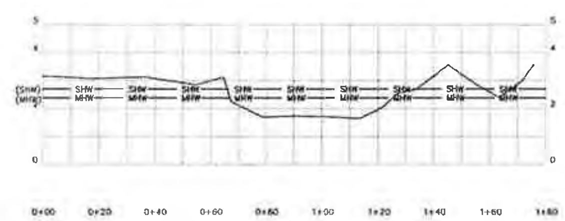

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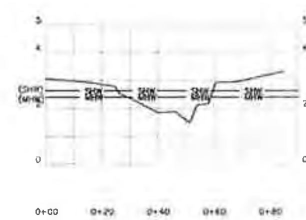

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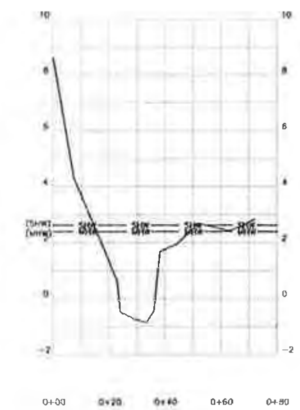

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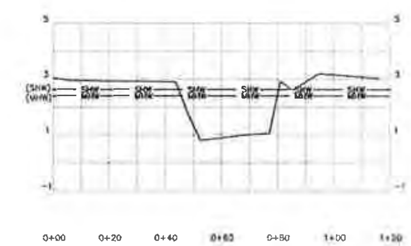

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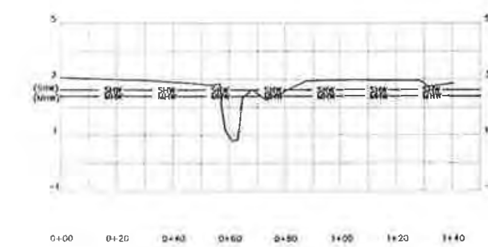

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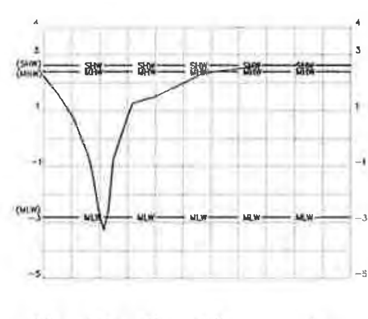

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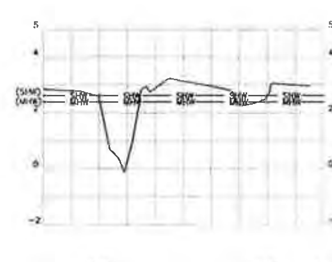

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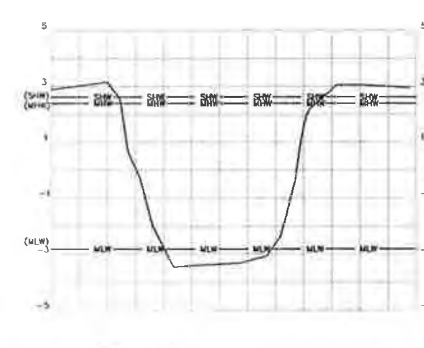

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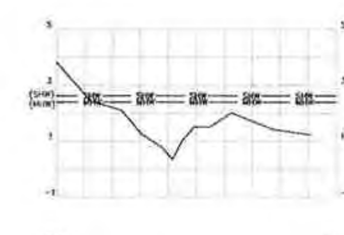

Section 1E

SCALE IN FEET
1" = 30' HORIZONTAL

SCALE IN FEET
1" = 3' VERTICAL

NOTE

1. VERTICAL DATUM IN NAVD88

LEGEND

SHW	SPRING HIGH WATER	2.62' (SHW)
MHW	MEAN HIGH WATER	2.39' (MHW)
MLW	MEAN LOW WATER	−2.82' (MLW)

NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID
	5/16/14	ADDED SHW, MHW AND MLW

LOUIS BERGER & ASSOC, PC
48 WALL STREET
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NEW YORK, NY 10005

BETHANY M. BEARMORE
N.Y. PROFESSIONAL ENGINEER
N.Y. P.E. LIC. NO. 082892

NYCEDC NEW YORK CITY ECONOMIC DEVELOPMENT CORP.

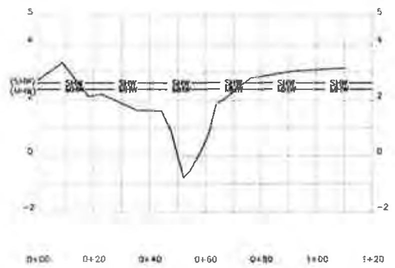
SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

EXISTING CHANNEL SECTIONS −1−

	APPROVALS				
DRAWN BY: MH	APPROVED BY:	TITLE	DATE	PROJECT NO.	2001984
CHECKED BY: SA				SHEET 6 OF 21	
SCALE: AS SHOWN					
DATE: NOVEMBER 2013				DWG. NO.	

FILE NAME: 4_EXISTING CHANNEL CROSS-SECTIONS.dwg

PLOT TIME: 2015-03-25 14:26:52.52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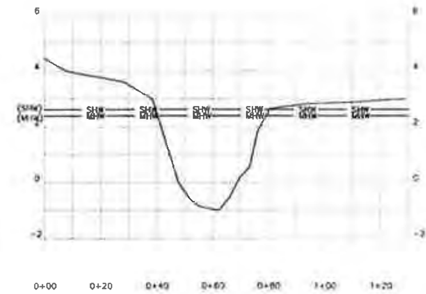
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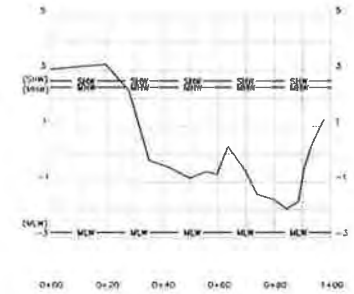
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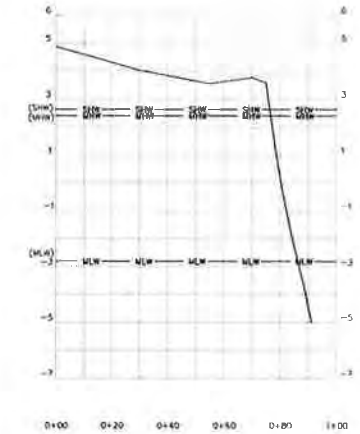
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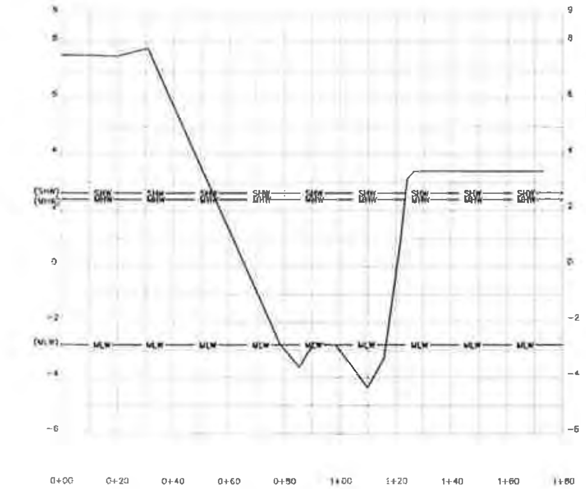
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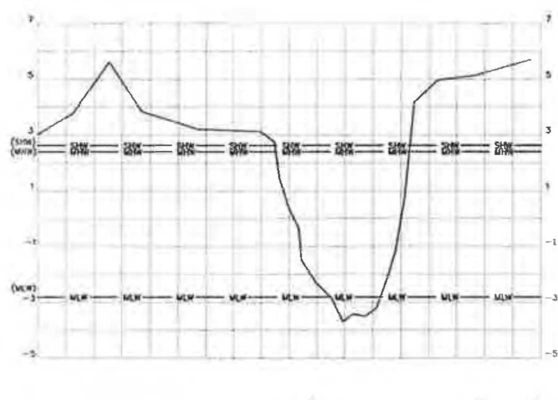
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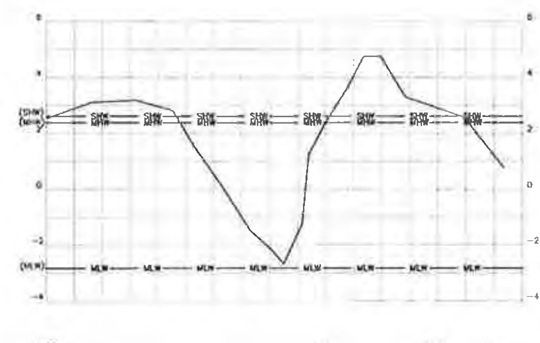
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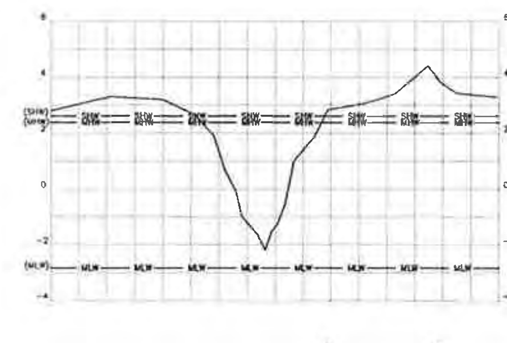
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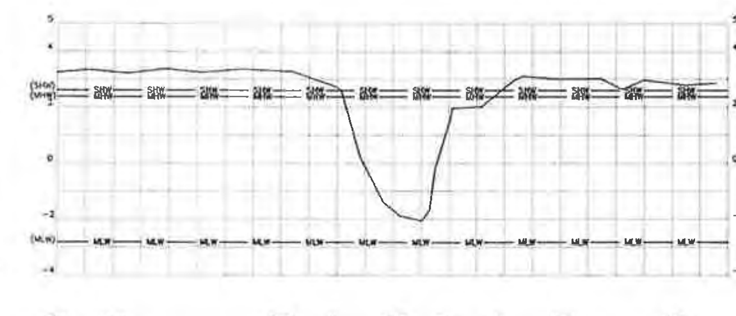
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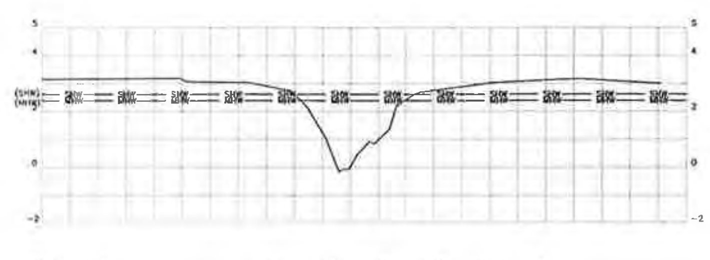
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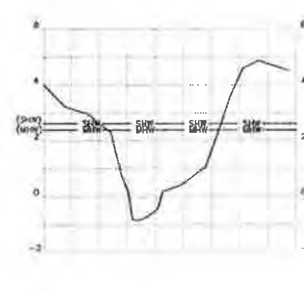
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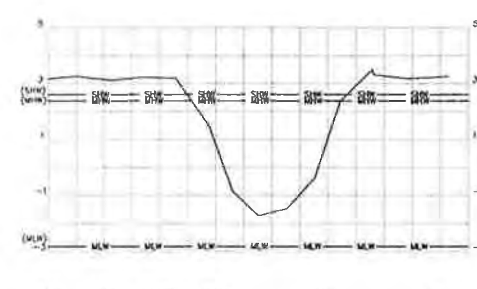
Section 13E

SCALE IN FEET
1" = 30' HORIZONTAL

SCALE IN FEET
1" = 3' VERTICAL

NOTE
1. VERTICAL DATUM IN NAVD88.

LEGEND

SHW	SPRING HIGH WATER	2.62' (SHW)
MHW	MEAN HIGH WATER	2.39' (MHW)
MLW	MEAN LOW WATER	-2.82' (MLW)

NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID
	5/16/14	ADDED SHW, MHW AND MLW

LOUIS BERGER & ASSOC, PC
48 WALL STREET
15TH FLOOR
NEW YORK, NY 10005

BETHANY M. BEARMORE
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NYCEDC NEW YORK CITY ECONOMIC DEVELOPMENT CORP.

SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

EXISTING CHANNEL SECTIONS -2-

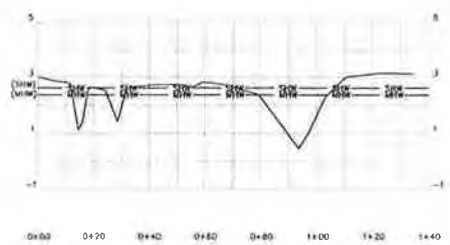
DRAWN BY: MH
CHECKED BY: SA
SCALE: AS SHOWN
DATE: NOVEMBER 2013

APPROVALS
APPROVED BY: | TITLE | DATE

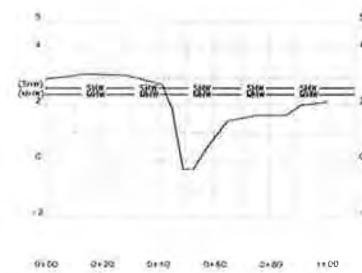
PROJECT NO. 2001984
SHEET 7 OF 21
DWG. NO.

FILE NAME: 4_EXISTING CHANNEL CROSS-SECTIONS.dwg

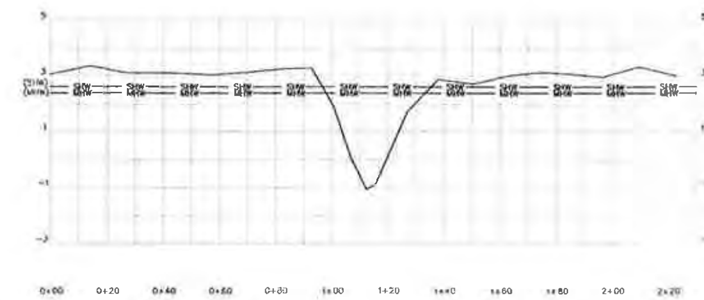
PROJECT PATH: V:\Operations\0911004_MARSHES\4 Deliverables\Drawings\95% Design\Plot



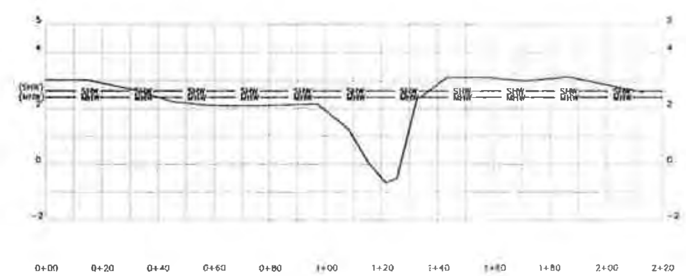
Section 14E



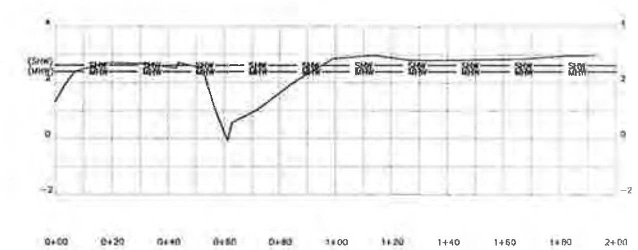
Section 15E



Section 16E



Section 17E



Section 18E

SCALE IN FEET 1" = 30' HORIZONTAL

SCALE IN FEET 1" = 3' VERTICAL

NOTE

1. VERTICAL DATUM IN NAVD88.

LEGEND

SHW	SPRING HIGH WATER	2.62' (SHW)
MHW	MEAN HIGH WATER	2.39' (MHW)
MLW	MEAN LOW WATER	-2.82' (MLW)

NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID
	5/16/14	ADDED SHW, MHW AND MLW

LOUIS BERGER & ASSOC, PC
48 WALL STREET
16TH FLOOR
NEW YORK, NY 10005

BETHANY M. BEARMORE
N.Y. PROFESSIONAL ENGINEER
N.Y. P.E. LIC. NO. 082692

NYCEDC NEW YORK CITY ECONOMIC DEVELOPMENT CORP.

SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

EXISTING CHANNEL SECTIONS -3-

DRAWN BY: MH
CHECKED BY: SA
SCALE: AS SHOWN
DATE: NOVEMBER 2013

APPROVALS — APPROVED BY: | TITLE | DATE

PROJECT NO. 2001984
SHEET 8 OF 21
DWG. NO.

FILE NAME: 4_EXISTING CHANNEL CROSS-SECTIONS.dwg

PLOT TIME: 2015-03-25 14:26:57

PROJECT PATH: V:\Operations\09111004_MARSHES\4 Deliverables\Drawings\95% Design\Plot

PLOT TIME: 2015-03-25 14:27:25

EXCAVATION BY HABITAT AREAS			
TYPE	WEST	EAST	TOTAL
WETLAND RESTORATION (REHABILITATION)	686 CY	29,395 CY	30,081 CY
WETLAND RESTORATION (RE-ESTABLISHMENT)	24,297 CY	9,905 CY	34,202 CY
UPLAND SLOPE	375 CY	149 CY	524 CY
TOTAL	25,358 CY	39,449 CY	64,807 CY

NOTES

1. VERTICAL DATUM IN NAVD88
2. HORIZONTAL DATUM IN NAD83
3. REFER TO SOIL EROSION AND SEDIMENT CONTROL -WEST- (SHEET 17 OF 21) FOR CONSTRUCTION ACCESS ENTRANCES, STAGING AREAS, STOCKPILE LOCATIONS, AND ALL OTHER SOIL AND TREE PROTECTION MEASURES.

LEGEND

SHW	SPRING HIGH WATER	2.62' (SHW)
MHW	MEAN HIGH WATER	2.39' (MHW)
MLW	MEAN LOW WATER	-2.82' (MLW)
	WETLAND DISTURBANCE AREA	

NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID
	5/16/14	ADDED SHW, MHW, MLW & WETLAND DISTURBANCE AREA

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NYCEDC NEW YORK CITY ECONOMIC DEVELOPMENT CORP.

SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

PROPOSED GRADING -WEST-

DRAWN BY: MH
CHECKED BY: SA
SCALE: AS SHOWN
DATE: NOVEMBER 2013

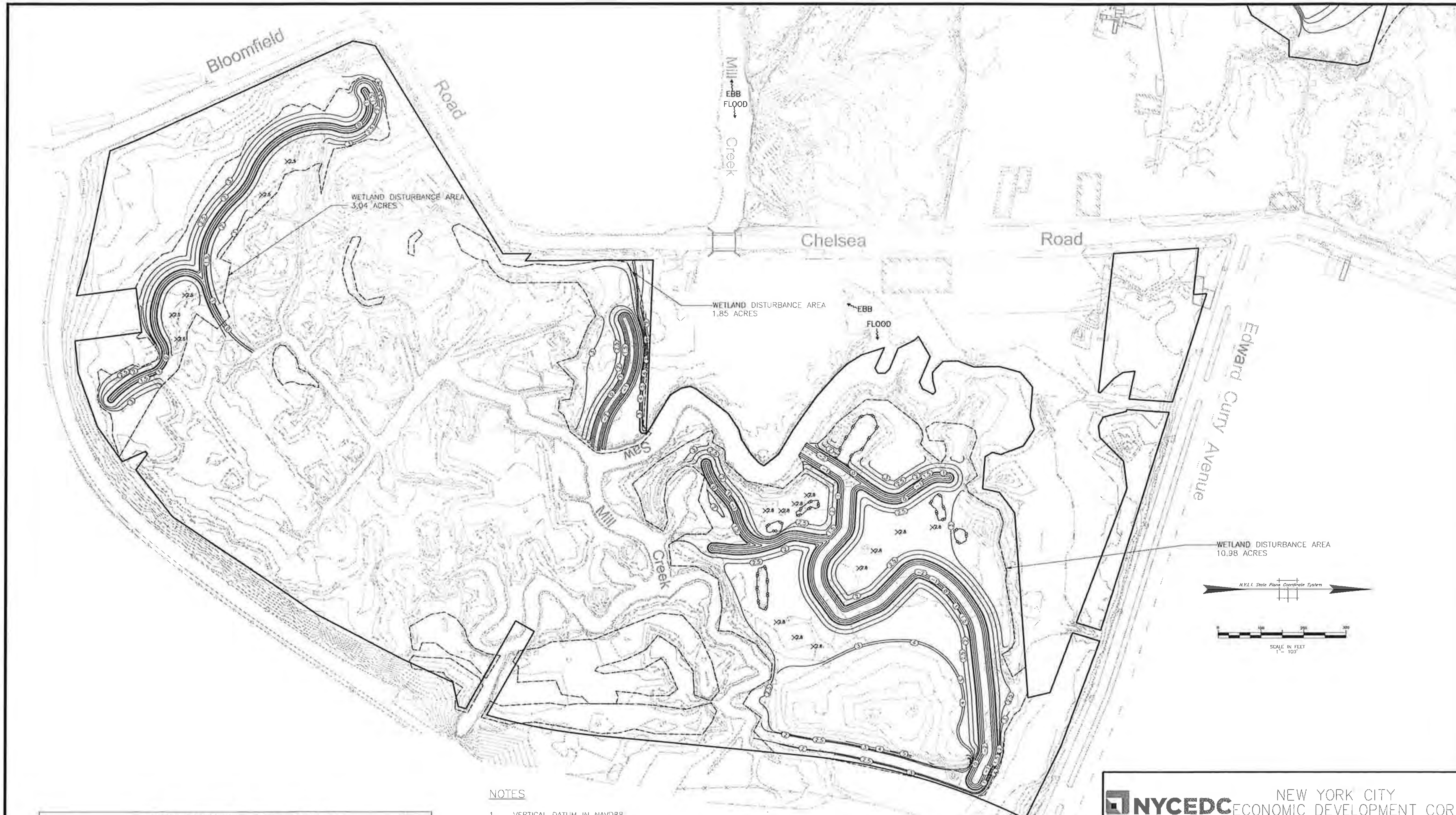
APPROVALS: APPROVED BY: | TITLE | DATE

PROJECT NO. 2001984
SHEET 9 OF 21
DWG. NO.

FILE NAME: 6_PROPOSED GRADING.dwg

PROJECT PATH: V:\Operations\09111004_MARSHES\4 Deliverables\Drawings\95% Design\Plot

PLOT TIME: 2015-03-25 14:27:38.38



EXCAVATION BY HABITAT AREAS

TYPE	WEST	EAST	TOTAL
WETLAND RESTORATION (REHABILITATION)	686 CY	29,395 CY	30,081 CY
WETLAND RESTORATION (RE-ESTABLISHMENT)	24,297 CY	9,905 CY	34,202 CY
UPLAND SLOPE	375 CY	149 CY	524 CY
TOTAL	25,358 CY	39,449 CY	64,807 CY

NOTES

1. VERTICAL DATUM IN NAVD88.
2. HORIZONTAL DATUM IN NAD83.
3. REFER TO SOIL EROSION AND SEDIMENT CONTROL -EAST- (SHEET 18 OF 21) FOR CONSTRUCTION ACCESS ENTRANCES, STAGING AREAS, STOCKPILE LOCATIONS, AND ALL OTHER SOIL AND TREE PROTECTION MEASURES
4. AREAS MARKED BY CONSTRUCTION FENCE ON THIS SHEET ARE AREAS OF NO ACCESS/DISTURBING BY FOOT OR EQUIPMENT.

LEGEND

SPRING HIGH WATER 2.62' (SHW)
MEAN HIGH WATER 2.39' (MHW)
MEAN LOW WATER -2.82' (MLW)
WETLAND DISTURBANCE AREA

NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID
	5/16/14	ADDED SHW, MHW, MLW & WETLAND DISTURBANCE AREA

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SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

PROPOSED GRADING -EAST-

DRAWN BY: MH	APPROVALS: APPROVED BY:	TITLE	DATE	PROJECT NO.	2001984
CHECKED BY: SA				SHEET	10 OF 21
SCALE: AS SHOWN					
DATE: NOVEMBER 2013				DWG. NO.	

FILE NAME: 6_PROPOSED GRADING.dwg

PROJECT PATH: V:\Operations\09111004_MARSHES\4 Deliverables\Drawings\95% Design\Plot

PLOT TIME: 2015-04-17 14:35:16.16

LEGEND

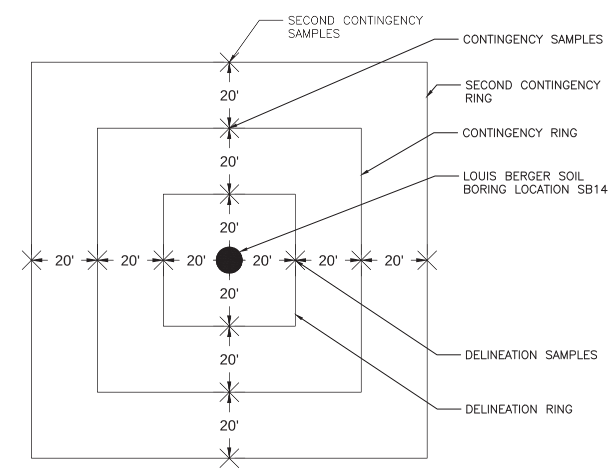
SHW	SPRING HIGH WATER	2.62' (SHW)
MHW	MEAN HIGH WATER	2.39' (MHW)
MLW	MEAN LOW WATER	−2.82' (MLW)

0 175 350 525

SCALE IN FEET
1"= 175'

NOTES FOR HAZARDOUS SOIL REMOVAL:

1. DUE TO THE PRESENCE OF PCBs GREATER THAN (>) 50 PPM IN SOILS NEAR THE DISCARDED ELECTRICAL TRANSFORMER AT SB 14, REQUIREMENTS OF THE TOXIC SUBSTANCES CONTROL ACT (TSCA) ARE TRIGGERED. DISPOSAL OF SOILS WITH PCBs > 50 PPM MUST BE IN ACCORDANCE WITH APPLICABLE TSCA REGULATIONS. THE CONTRACTOR IS RESPONSIBLE FOR ALL NECESSARY SAMPLING TO COMPLY WITH TSCA REGULATIONS.
2. SAMPLE SB14 INDICATED A PCB CONCENTRATION OF 5,300 MG/KG. THE PROTECTION OF ECOLOGICAL RESOURCES STANDARD FOR PCBs IS LISTED AT 1.0 MG/KG.
3. ALL SAMPLES WITH THE (*) SYMBOL WILL BE COLLECTED, EXTRACTED AND HELD FOR CONTINGENT ANALYSIS BASED ON THE PRELIMINARY RESULTS OF THE SAMPLES TO BE ANALYZED INITIALLY.
4. SAMPLES ENDING IN "1" WILL BE COLLECTED 20 FEET FROM ORIGINAL BORING LOCATION SB14 IN EACH CARDINAL DIRECTION; SAMPLES ENDING IN "2" WILL BE COLLECTED AN ADDITIONAL 20 FEET AWAY (FOR A TOTAL OF 40 FEET IN EACH DIRECTION FROM SB14); SAMPLES ENDING IN "3" WILL BE COLLECTED AN ADDITIONAL 20 FEET AWAY (FOR A TOTAL OF 60 FEET IN EACH DIRECTION FROM SB14).
5. THE N SAMPLES MAY BE COLLECTED VIA DIRECT–PUSH DRILLING METHODS PRIOR TO EXCAVATION ACTIVITIES (IN–SITU) OR CONCURRENT WITH EXCAVATION ACTIVITIES, WHEREIN SOILS WOULD BE PROPERLY STOCKPILED ON SHEETING UNTIL ANALYTICAL RESULTS ARE RECEIVED AND A DETERMINATION OF THE ACCEPTABLE USE OF THE EXCAVATED SOILS CAN BE MADE. ALL OTHER SAMPLES MUST BE COLLECTED VIA HAND AUGER AS THESE SAMPLE LOCATIONS ARE IN A TIDAL MARSH.
6. ALL SAMPLES WILL BE SUBMITTED FOR ANALYSIS OF PCBs ONLY, THE PARAMETER FOR WHICH CONCENTRATIONS WERE PREVIOUSLY DETECTED ABOVE APPLICABLE CRITERIA.
7. THE SAMPLES WILL BE SUBMITTED TO A NY–CERTIFIED LABORATORY UNDER SIGNED CHAIN–OF–CUSTODY FOR PCBs ANALYSIS.
8. ALL SOIL REMOVED FROM WITHIN THE DELINEATION RING WILL BE PROPERLY DISPOSED IN AN OFF–SITE LOCATION.
9. IF PCBs ARE DETECTED OUTSIDE OF THE DELINEATION RING, THE SOIL WITHIN THE CONTINGENCY RING SHALL ALSO BE PROPERLY DISPOSED IN AN OFF–SITE LOCATION.
10. THE CONTRACTOR SHALL RESTORE THE AREAS WHERE HAZARDOUS SOIL WAS REMOVED TO DESIGN ELEVATIONS BY THE PLACEMENT OF CLEAN SAND, AS DIRECTED BY THE ENGINEER.



PROPOSED DELINEATION SOIL SAMPLES
N.T.S.

PROPOSED DELINEATION SOIL SAMPLES	
SAMPLE NAME	TARGET DEPTH BELOW EXISTING GROUND SURFACE
SB14V	2.5 – 3.0
SB14DN1	0.0 – 1.0
SB14DN2*	1.5 – 2.5
SB14DN3*	2.0 – 3.0
SB14DS1	0.0 – 1.0
SB14DS2*	0.0 – 1.0
SB14DS3*	0.0 – 1.0
SB14DW1	0.0 – 1.0
SB14DW2*	0.0 – 1.0
SB14DW3*	0.0 – 1.0
SB14DE1	0.0 – 1.0
SB14DE2*	0.0 – 1.0
SB14DE3*	0.0 – 1.0

NOTES FOR OTHER OVER EXCAVATION AREAS:

1. EXISTING SOILS IN SOME OF THE PROPOSED WETLAND RESTORATION AREAS CONTAIN METALS AND OTHER COMPOUNDS THAT ARE HARMFUL TO FISH AND WILDLIFE. THE INTENT OF THE PROPOSED PROJECT IS TO REMOVE THOSE SOILS AND IMPROVE FISH AND WILDLIFE HABITAT. IN MOST LOCATIONS, THE PROPOSED RESTORATION WILL REMOVE ECOLOGICALLY–HARMFUL SOILS, EXPOSING CLEANER SOILS. AREAS WHERE CLEAN SOIL HORIZONS HAVE NOT BEEN DISCOVERED THROUGH SAMPLING WILL BE OVER–EXCAVATED AND COVERED WITH CLEAN SAND TO MINIMIZE RISK OF FISH AND WILDLIFE EXPOSURE.
2. OVER EXCAVATION AREAS SHALL HAVE A RADIUS OF 50 FEET.
3. THE CONTRACTOR SHALL RESTORE THE OVER EXCAVATION AREAS TO DESIGN ELEVATIONS BY THE PLACEMENT OF CLEAN SAND, AS DIRECTED BY THE ENGINEER.

OVER EXCAVATION	
(hatch)	AREAS FOR 2 FOOT OVER EXCAVATION AND CLEAN SAND FILL

OVER EXCAVATION AREAS		
LOCATION	NORTHING	EASTING
SB 3	162357.54	931300.14
SB 24	161978.10	931141.10
S 9	161496.57	932549.40
SWGW 6	160660.61	932182.00

NOTE:
ALL COORDINATES LISTED ARE AT THE CENTER OF THE 50 FOOT RADIUS OVER EXCAVATION AREAS.

NOTES ARCHEOLOGICAL TESTING AREAS:

1. KEY AREAS ON BOTH THE WEST AND EAST SIDES OF THE PIOLET BOUNDARY HAVE BEEN IDENTIFIED AS POTENTIALLY SENSITIVE AREAS FOR ARCHEOLOGICAL RESOURCES. ARCHEOLOGICAL TESTING IS REQUIRED FOR THESE AREAS DURING CONSTRUCTION. REFER TO THE PROJECT SPECIFICATIONS FOR WORK DETAILS.

ARCHEOLOGICAL TESTING	
(hatch)	AREAS OF INTEREST REQUIRING ARCHEOLOGICAL TESTING DURING CONSTRUCTION

NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID
	5/16/14	ADDED SHW AND MLW

LOUIS BERGER & ASSOC, PC
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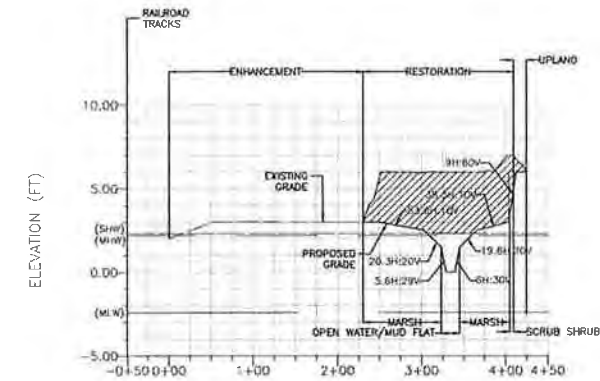
SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

PROJECT AREAS OF INTEREST

	APPROVALS			
DRAWN BY: MH	APPROVED BY:	TITLE	DATE	PROJECT NO. 2001984
CHECKED BY: SA				SHEET 11 OF 21
SCALE:				
DATE: NOVEMBER 2013				DWG. NO.

FILE NAME: 11_OVER EXCAVATION AND PROFILE MAP.dwg

PROJECT PATH: V:\Operations\0911004_MARSHES\4 Deliverables\Drawings\95% Design\Plot

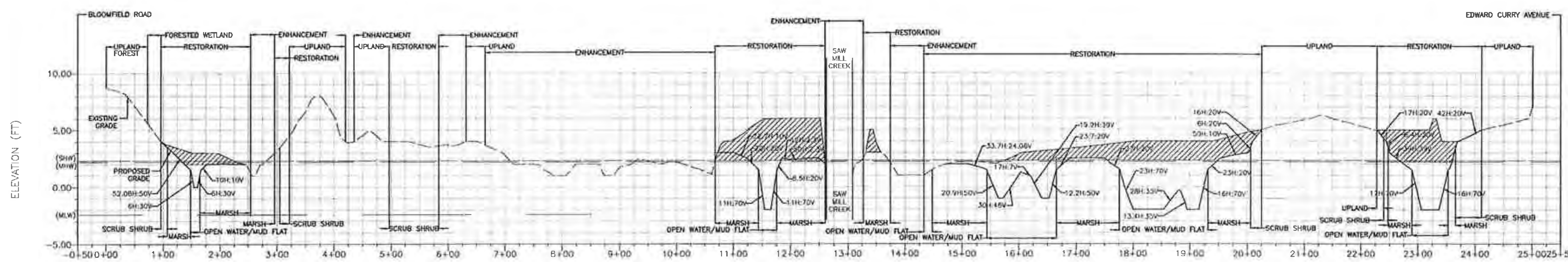


LEGEND

FILL TO BE REMOVED

STATION (FT)

Profile View of –WEST– A–A'



STATION (FT)

Profile View of –EAST– B–B'

NOTE

1. REFER TO PROJECT AREAS OF INTEREST (SHEET 11 OF 21) FOR PROFILE LOCATIONS

LEGEND

SPRING HIGH WATER	2.62'	(SHW)
MEAN HIGH WATER	2.39'	(MHW)
MEAN LOW WATER	–2.82'	(MLW)

SCALE IN FEET 1" = 100' HORIZONTAL

SCALE IN FEET 1" = 5' VERTICAL

NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID
	5/16/14	ADDED SHW AND MLW

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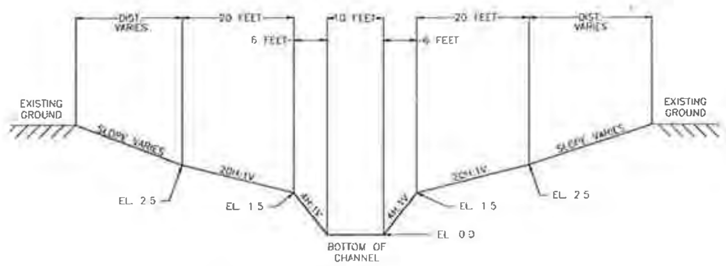
STATEN ISLAND, NEW YORK

SURFACE PROFILES

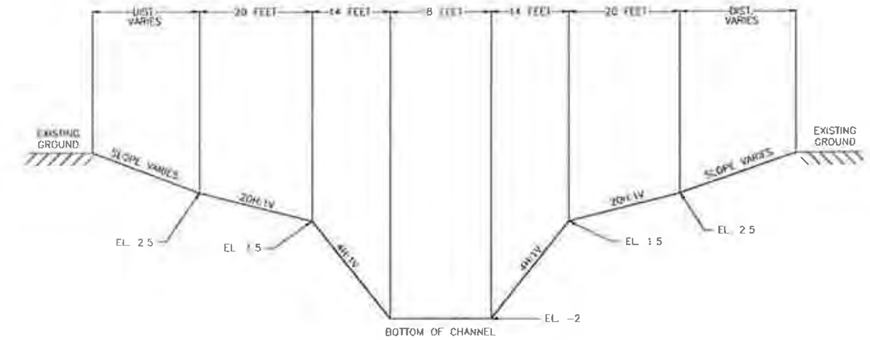
DRAWN BY: MH	APPROVALS: APPROVED BY:	TITLE	DATE	PROJECT NO. 2001984
CHECKED BY: SA				SHEET 12 OF 21
SCALE:				
DATE: NOVEMBER 2013				DWG. NO.

FILE NAME: 11_OVER EXCAVATION AND PROFILE MAP.dwg

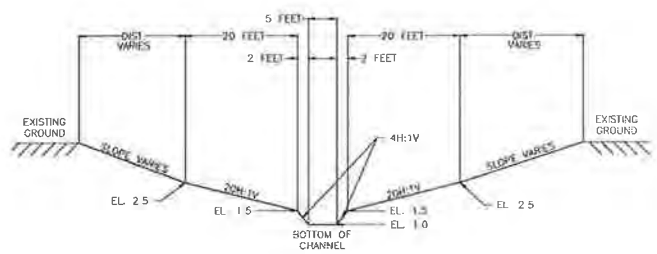
PLOT TIME: 2015-03-25 14:28:41.41



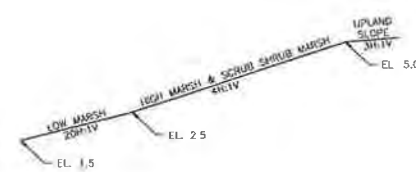
TYPICAL SECTION –WEST–
PRIMARY CHANNEL
N.T.S



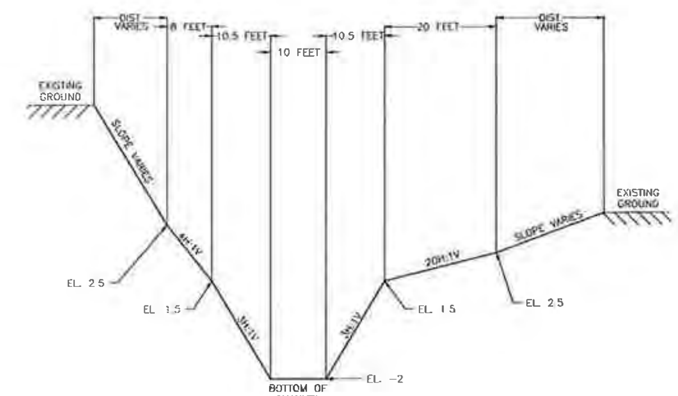
TYPICAL SECTION –EAST–
WETLAND REHABILITATION
PRIMARY CHANNEL
N.T.S



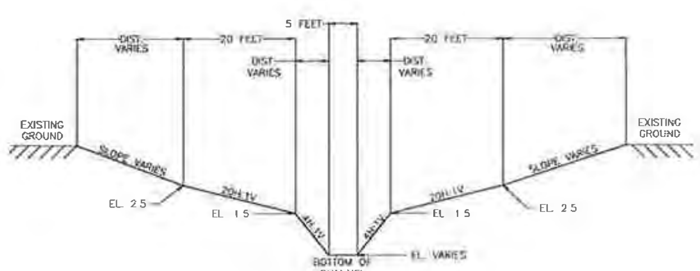
TYPICAL SECTION –WEST–
SECONDARY CHANNEL
N.T.S



TYPICAL WETLAND SECTION
N.T.S.



TYPICAL SECTION –EAST–
WETLAND REESTABLISHMENT
PRIMARY CHANNEL
N.T.S



TYPICAL SECTION –EAST–
SECONDARY CHANNEL
N.T.S

NOTE
1. PROPOSED TYPICAL SECTIONS ARE NOT TO SCALE, AND SHALL ONLY BE USED FOR GENERAL CHANNEL SLOPES, ELEVATIONS, AND WIDTHS ACTUAL WIDTHS, SLOPES, AND ELEVATIONS WILL VARY IN FIELD AND BY CROSS SECTION.

NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID
	5/16/14	ADDED WETLAND SECTION

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STATEN ISLAND, NEW YORK

PROPOSED TYPICAL SECTIONS

DRAWN BY: MH	APPROVALS			PROJECT NO. 2001984
CHECKED BY: SA	APPROVED BY:	TITLE	DATE	SHEET 13 OF 21
SCALE: AS SHOWN				
DATE: NOVEMBER 2013				DWG. NO.

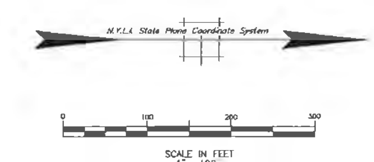
FILE NAME: 7_PROPOSED TYPICAL SECTIONS.dwg

PROJECT PATH: V:\Operations\2011004_MARSHES\4 Deliverables\Drawings\95% Design\Plot

HABITAT ZONES					
HABITAT ZONE	HABITAT ELEVATION RANGE	HATCHING	WEST	EAST	TOTAL
WETLAND RESTORATION OPEN WATER/MUDFLAT	< 1.5 FEET		0.26 AC	2.79 AC	3.05 AC
WETLAND RESTORATION LOW MARSH	1.5 FEET – 2.5 FEET		0.58 AC	5.21 AC	5.79 AC
WETLAND RESTORATION HIGH MARSH	2.5 FEET – 3.5 FEET		3.41 AC	7.95 AC	11.36 AC
WETLAND RESTORATION SCRUB SHRUB	3.5 FEET – 5.0 FEET		1.94 AC	1.62 AC	3.56 AC
UPLAND SLOPE	> 5.0 FEET		1.12 AC	0.33 AC	1.45 AC
BUFFER REHABILITATION	NO SPECIFIC ELEVATION		0.00 AC	8.49 AC	8.49 AC
TIDAL WETLAND ENHANCEMENT	NO SPECIFIC ELEVATION		7.69 AC	26.03 AC	33.72 AC
FORESTED WETLAND ENHANCEMENT	NO SPECIFIC ELEVATION		0.00 AC	1.52 AC	1.52 AC
		TOTAL	15.00 AC	53.94 AC	68.94 AC

NOTES

1. VERTICAL DATUM IN NAVD88
2. HORIZONTAL DATUM IN NAD83



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SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

PLANTING PLAN –WEST–

LOUIS BERGER & ASSOC, PC
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16TH FLOOR
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BETHANY M. BEARMORE
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NO	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID

DRAWN BY: MH	APPROVALS			PROJECT NO. 2001984
CHECKED BY: SA	APPROVED BY:	TITLE	DATE	SHEET 14 OF 21
SCALE: AS SHOWN				
DATE: NOVEMBER 2013				DWG. NO.

FILE NAME: 8_PLANTING PLAN.dwg

PLOT TIME: 2015-03-25 14:29:07.07

PROJECT PATH: V:\Operations\0911004_MARSHES\4 Deliverables\Drawings\95% Design\Plot

HABITAT ZONES

HABITAT ZONE	HABITAT ELEVATION RANGE	HATCHING	WEST	EAST	TOTAL
WETLAND RESTORATION OPEN WATER/MUDFLAT	< 1.5 FEET		0.26 AC	2.79 AC	3.05 AC
WETLAND RESTORATION LOW MARSH	1.5 FEET – 2.5 FEET		0.58 AC	5.21 AC	5.79 AC
WETLAND RESTORATION HIGH MARSH	2.5 FEET – 3.5 FEET		3.41 AC	7.95 AC	11.36 AC
WETLAND RESTORATION SCRUB SHRUB	3.5 FEET – 5.0 FEET		1.94 AC	1.62 AC	3.56 AC
UPLAND SLOPE	> 5.0 FEET		1.12 AC	0.33 AC	1.45 AC
BUFFER REHABILITATION	NO SPECIFIC ELEVATION		0.00 AC	8.49 AC	8.49 AC
TIDAL WETLAND ENHANCEMENT	NO SPECIFIC ELEVATION		7.69 AC	26.03 AC	33.72 AC
FORESTED WETLAND ENHANCEMENT	NO SPECIFIC ELEVATION		0.00 AC	1.52 AC	1.52 AC
		TOTAL	15.00 AC	53.94 AC	68.94 AC

NOTES

1. VERTICAL DATUM IN NAVD88
2. HORIZONTAL DATUM IN NAD83.

NO	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID

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16TH FLOOR
NEW YORK, NY 10005

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STATEN ISLAND, NEW YORK

PLANTING PLAN –EAST–

	APPROVALS				
DRAWN BY: MH	APPROVED BY:	TITLE	DATE	PROJECT NO.	2001984
CHECKED BY: SA				SHEET 15 OF 21	
SCALE: AS SHOWN					
DATE: NOVEMBER 2013				DWG. NO.	

FILE NAME: 6_PLANTING PLAN dwg

PLOT TIME: 2015-03-25 14:29:26 26

PLANTING TABLE: TIDAL WETLANDS

Planting Zone/Elevation	Area (acres)	Species Name - % of Area (Common Name)	Height	Root	Spacing	Units	Quantity
Low Marsh Elevation 1.5 - 2.5	5.79	Spartina alterniflora - 100% (Smooth Cordgrass)	6 IN Minimum	2 IN x 2 IN Minimum Plug	2 FT. O.C.	Each	63,053
High Marsh Elevation 2.5 - 3.5	11.36	Distichlis spicata - 35% (Spike Grass)	6 IN Minimum	2 IN x 2 IN Minimum Plug	2 FT. O.C.	Each	43,299
		Spartina patens - 35% (Saltmeadow Cordgrass)				Each	43,299
		Spartina alterniflora - 10% (Smooth Cordgrass)				Each	12,371
		Juncus gerardii - 20% (Black Grass)				Each	24,742
Scrub Shrub Elevation 3.5 - 5.0	3.56	Iva Frutescens - 50% (High Tide Bush)	24 IN - 30 IN Minimum	Container No. 2	5 FT. O.C.	Each	3,101
		Baccharis halimifolia - 50% (Sea Myrtle)				Each	3,101
Upland Slope Shrub Elevation 5.0 and above	1.45	Baccharis halimifolia - 20% (Sea Myrtle)	24 IN - 30 IN Minimum	Container No. 2	5 FT. O.C.	Each	505
		Myrica pensylvanica - 20% (Bayberry)				Each	505
		Rosa carolina - 15% (Pasture Rose)				Each	379
		Rhus copallinum - 15% (Shining Sumac)				Each	379
		Prunus maritima - 10% (Beach Plum)				Each	253
		Sambucus canadensis - 20% (Common Elderberry)				Each	505
Upland Slope Warm Native Seed Mix Elevation 5.0 and above & Upland Buffer Rehabilitation Areas	9.94	*Panicum virgatum* (Switchgrass) - 3 lbs PLS/ac	N/A	Seed	25 LBS of PLS/AC	Lbs	29.8
		Sorghastrum nutans (Indian Grass) - 3 lbs PLS/ac				Lbs	29.8
		Schizachyrium scoparium (Little Bluestem) - 3 lbs PLS/ac				Lbs	29.8
		Symphyotrichum novae-angliae (New England Aster) - 0.5 lbs PLS/ac				Lbs	5.0
		Solidago sempervirens (Seaside Goldenrod) - 0.5 lbs PLS/ac				Lbs	5.0
		Hordeum jubatum (Oats) - 15 lbs PLS/ac				Lbs	149.1

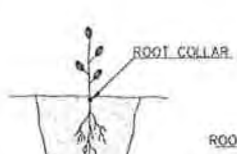
NOTES:

1. OPEN WATER/MUDFLAT AREA FOR THE WEST EQUALS 0.3 ACRES AND FOR THE EAST EQUALS 2.8 ACRES. NO PLANTING WILL OCCUR IN THESE AREAS.

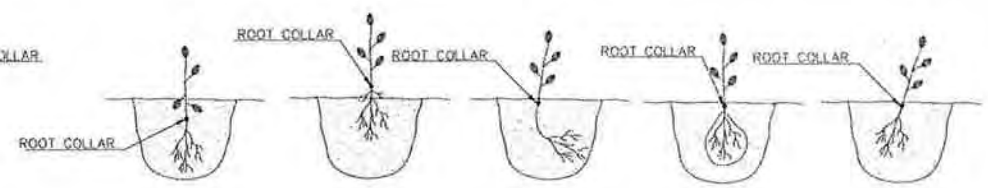
PLANTING NOTES

GENERAL

1. THE CONTRACTOR SHALL SUBMIT COPIES OF THE PLANT MATERIAL ORDERS TO THE ENGINEER AT LEAST THREE MONTHS PRIOR TO THE PROPOSED PLANTING DATE.
2. ALL PROPOSED CHANGES TO THE PLANTING PLAN SHALL BE MADE IN WRITING TO THE ENGINEER AT LEAST THREE MONTHS PRIOR TO ALL PLANTING. ALL PROPOSED CHANGES MUST BE APPROVED IN WRITING.
3. ALL PLANT STOCK WILL BE INSPECTED ON-SITE PRIOR TO INSTALLATION. PLANTING STOCK NOT MEETING SPECIFICATIONS WILL NOT BE PLANTED AND SHALL BE REPLACED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE.
4. ALL SHRUBS PLANT MATERIAL SHALL BE INOCULATED WITH MYCORRHIZAE FUNGI EITHER AT THE NURSERY OR ON-SITE AT THE TIME OF PLANTING. THE METHOD OF INOCULATION SHALL BE APPROVED IN ADVANCE BY THE ENGINEER.
5. THE HANDLING AND CARE OF ALL PLANT MATERIAL SHALL FOLLOW APPROPRIATE PROCEDURES TO PROTECT STEMS AND ROOT SYSTEMS FROM EXPOSURE TO FREEZING TEMPERATURES, EXCESSIVE HEAT, AND DESICCATION DUE TO SUN AND WIND. PLANT MATERIAL THAT IS NOT PROTECTED FROM THESE CONDITIONS SHALL BE REJECTED BY THE ENGINEER AND SHALL BE REPLACED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE.
6. ALL PLANT MATERIAL SHALL BE INSTALLED WITHIN 48 HOURS OF DELIVERY TO THE SITE. PLANT MATERIAL NOT INSTALLED WITHIN THIS TIME FRAME MAY BE REJECTED BY THE ENGINEER AND SHALL BE REPLACED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE.



PROPER PLANTING
N.T.S.



UNACCEPTABLE PLANTING
N.T.S.

PLANTING NOTES, CONTINUED

EMERGENT PLANTINGS – PLUGS : LOW MARSH AND HIGH MARSH

1. NO AREA SHALL BE PLANTED UNTIL IT HAS BEEN CLEARED OF PHRAGMITES WRACK AND OTHER DEBRIS, PROTECTED BY HERBIVORY FENCING POSTS AND FENCING, AND APPROVED BY THE ENGINEER. IMMEDIATELY AFTER PLANTING A 50' X 50' GRID, INSTALL MYLAR TAPE AND TWINE.
2. LOW MARSH AND HIGH MARSH PLANTING WINDOW IS FROM APRIL 1 TO JUNE 15.
3. THE PLUGS SHALL BE PLANTED IN THE SOIL NO MORE THAN ONE INCH (1") DEEPER THAN GROWN IN THE NURSERY AND TO A DEPTH THAT WILL ENSURE THAT THE TOP OF THE ROOTSTOCK MASS LIES NO MORE THAN ONE INCH (1") BELOW THE SOIL SURFACE.
4. PRIOR TO PLACEMENT OF THE PLANT IN THE PLANTING HOLE, FERTILIZER SHALL BE PLACED IN THE BOTTOM OF THE PLANTING HOLE (18-6-12 ANALYSIS) AT THE RATE OF THIRTY (30) GRAMS PER PLANT. THE PLANTS SHALL THEN BE PLACED AT THE APPROPRIATE DEPTH WITH THE ROOT SYSTEM ORIENTED DOWNWARD. WHILE THE PLANT IS IN THIS POSITION, THE SOIL PROFILE OR SECTION SHALL BE FULLY AND FIRMLY CLOSED. IF A SOIL DEPRESSION IS FORMED ABOVE OR IMMEDIATELY ADJACENT TO THE PLANTING LOCATION, ENOUGH SOIL SHALL BE SLOUGHED FROM THE SURROUNDING AREA AND FIRMLY TAMPED INTO THE DEPRESSION TO LEAVE THE PLANTING AREA AT THE SAME ELEVATION AS THE SURROUNDING SOIL OR SLIGHTLY HIGHER.
5. JUNCUS GERARDII SHALL BE PLANTED IN THE HIGHER ELEVATION RANGE OF THE HIGH MARSH (EL. 3 TO 3.5) AND SPARTINA ALTERNIFLORA SHALL BE PLANTED IN THE LOWER RANGE (EL. 2.5 TO 3.0). ALL OTHER HIGH MARSH SPECIES WILL BE PLANTED THROUGHOUT THE ENTIRE HIGH MARSH (EL. 2.5 TO 3.5)

SALT TOLERANT SCRUB SHRUB PLANTINGS

1. THE SCRUB SHRUB AREAS SHALL BE PLANTED AT A COMBINED DENSITY OF 1,750 TO 1,760 SHRUBS PER ACRE AND SPACED AT 5-FOOT ON CENTER. THE PLANTING WINDOW IS MARCH 15 TO MAY 15.
2. ALL SHRUBS SHALL CONFORM TO THE MATERIAL SPECIFICATION REQUIREMENTS OF THE AMERICAN STANDARD FOR NURSERY STOCK (1986 OR LATER EDITION). THE BACCHARIS SHALL CONFORM TO TYPE 4 STOCK, TWO- TO THREE-FOOT (2'-3') TALL, MINIMUM OF TWO CANES.
3. PLANT PITS SHALL BE DUG APPROXIMATELY FOUR INCHES (4") WIDER THAN THE STOCK SIZE. PRIOR TO PLACEMENT OF THE PLANT IN THE PLANTING HOLE, A 20-GRAM FERTILIZER TABLET (20-10-5 ANALYSIS) SHALL BE PLACED IN THE BOTTOM OF THE PLANTING HOLE. BACKFILL SOIL MATERIALS SHALL BE THE SAME AS EXCAVATED FOR THE PLANTING PITS.

SHRUB PLANTING: UPLAND SLOPE

1. THE UPLAND SLOPE SHALL BE PLANTED WITH SHRUBS. THE PLANTING PERIOD IS FROM MARCH 15 TO MAY 15. PLANTING SHALL ONLY OCCUR WHEN THE SOLUBLE SALT LEVEL OF THE SOIL MEASURES LESS THAN 1.0 MMHOS/CM.
2. ALL SHRUBS SHALL CONFORM TO THE MATERIAL SPECIFICATION REQUIREMENTS OF THE AMERICAN STANDARD FOR NURSERY STOCK (1986 OR LATER EDITION). THE BACCHARIS SHALL CONFORM TO TYPE 4 STOCK, TWO- TO THREE-FOOT (2'-3') TALL, MINIMUM OF TWO CANES.
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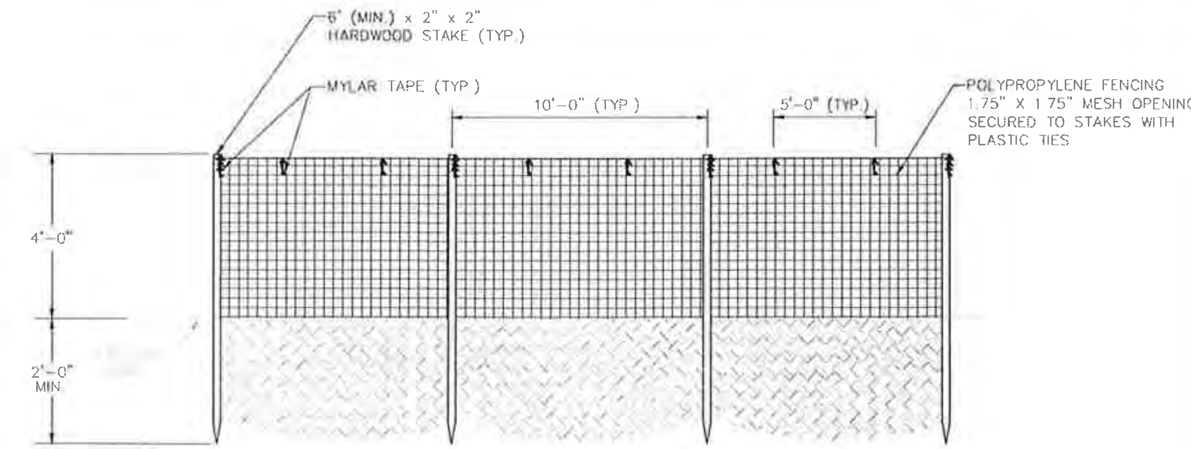
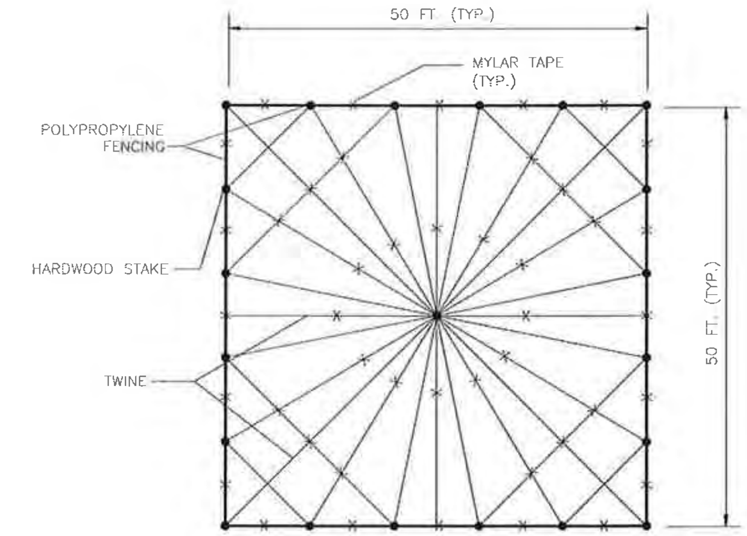
SEEDING: UPLAND SLOPE

1. THE WARM SEASON SEEDING MIXTURE SHALL BE AS SHOWN IN THE PLANTING TABLE, IN POUNDS OF PURE LIVE SEED PER ACRE.
2. WARM SEASON SEEDING SHALL OCCUR AFTER MARCH 15 AND BEFORE JUNE 1.
3. NO EARLIER THAN ONE-WEEK PRIOR TO THE SEEDING, THE SEEDED AREA SHALL BE DISKED TO A MINIMUM DEPTH OF SIX INCHES (6") AND FIRMED TO FORM A GOOD SEED BED. IF DIRECTED BY THE ENGINEER, DISKING MAY BE OMITTED IN FAVOR OF A SHALLOW HARROW OPERATION PRIOR TO THE PLACEMENT OF THE SEED.
4. NITROGEN FERTILIZER SHALL NOT BE APPLIED AT THE TIME OF THE SEEDING.
5. SEED MAY BE BROADCAST OR DRILL SEEDED. IF BROADCAST SEEDING IS USED, THE SEEDED AREA SHALL BE DRAGGED WITH A CHAIN OR TINE HARROW AND FIRMED THE SAME DAY AS SEEDED TO ENSURE GOOD SOIL TO SEED CONTACT IS ESTABLISHED. THE SEED MIX SHALL BE MULCHED AT THE RATE OF 4,000 POUNDS OF STRAW MULCH PER ACRE. THE MULCH SHALL BE BOUND IN PLACE WITH AN APPROVED BINDER.



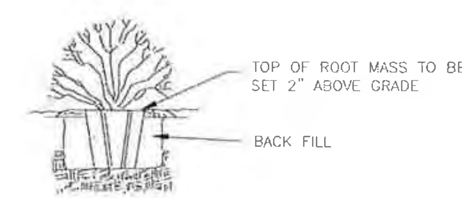
PROFILE

NOTE:
MAX. 50'x50' GRID, TYPICAL. GRID MAY VARY, BASED ON SITE CONTOURS AND WATERWAY LOCATIONS



PLAN VIEW

HERBIVORY FENCING, TYPICAL
N.T.S.



NOTES:
1. REMOVE PLANT BY CUTTING OR INVERTING CONTAINER
2. USE A KNIFE OR SHARP BLADE TO MAKE (4 OR 5) 1" CUTS THE LENGTH OF THE ROOT BALL

CONTAINERIZED SHRUB PLANTING
N.T.S.

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SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

PLANTING –NOTES & DETAILS–

LOUIS BERGER & ASSOC, PC
48 WALL STREET
16TH FLOOR
NEW YORK, NY 10005

BETHANY M. BEARMORE
N.Y. PROFESSIONAL ENGINEER
N.Y. P.E. LIC. NO. 082892

NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID
	10/1/14	REVISED MARSH PLANT SPACING

	APPROVALS			
DRAWN BY: MH	APPROVED BY:	TITLE	DATE	PROJECT NO. 2001984
CHECKED BY: SA				SHEET 18 OF 21
SCALE: AS SHOWN				
DATE: NOVEMBER 2013				DWG. NO.

FILE NAME: 9_PLANTING NOTES AND DETAILS.dwg

PROJECT PATH: V:\Operations\09111004_MARSHES\4 Deliverables\Drawings\95% Design\Plot

LEGEND

—— PL —— ONLY FOOT TRAFFIC ALLOWED WITHIN PLANTING LIMITS

—— CVR —— CONSTRUCTION VEHICLE ACCESS TO BE APPROVED BY DESIGN ENGINEER

INVASIVE PLANT TREATMENT AREA

NOTES

1. VERTICAL DATUM IN NAVD88.
2. HORIZONTAL DATUM IN NAD83.
3. ONLY ACCESS BY FOOT IS ALLOWED IN AREAS BEYOND LIMIT OF DISTURBANCE AND WITHIN THE PLANTING LIMIT ZONES.

N.Y.L.I. State Plane Coordinate System

SCALE IN FEET 1" = 100'

NYCEDC NEW YORK CITY ECONOMIC DEVELOPMENT CORP.

SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

SOIL EROSION AND SEDIMENT CONTROL —WEST—

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16TH FLOOR
NEW YORK, NY 10005

BETHANY M. BEARMORE
N.Y. PROFESSIONAL ENGINEER
N.Y. P.E. LIC. NO. 082892

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	3/20/15	PREPARATION FOR CONSTRUCTION BID

DRAWN BY: MH
CHECKED BY: SA
SCALE: AS SHOWN
DATE: NOVEMBER 2013

APPROVALS

APPROVED BY:	TITLE	DATE

PROJECT NO. 2001984
SHEET 17 OF 21
DWG. NO.

FILE NAME: 10_SESC PLAN N&D.dwg

PLOT TIME: 2015-03-25 14:30:20.20

PROJECT PATH: V:\Operations\09111004_MARSHES\4 Deliverables\Drawings\95% Design\Plot

PLOT TIME: 2015-03-25 14:30:41

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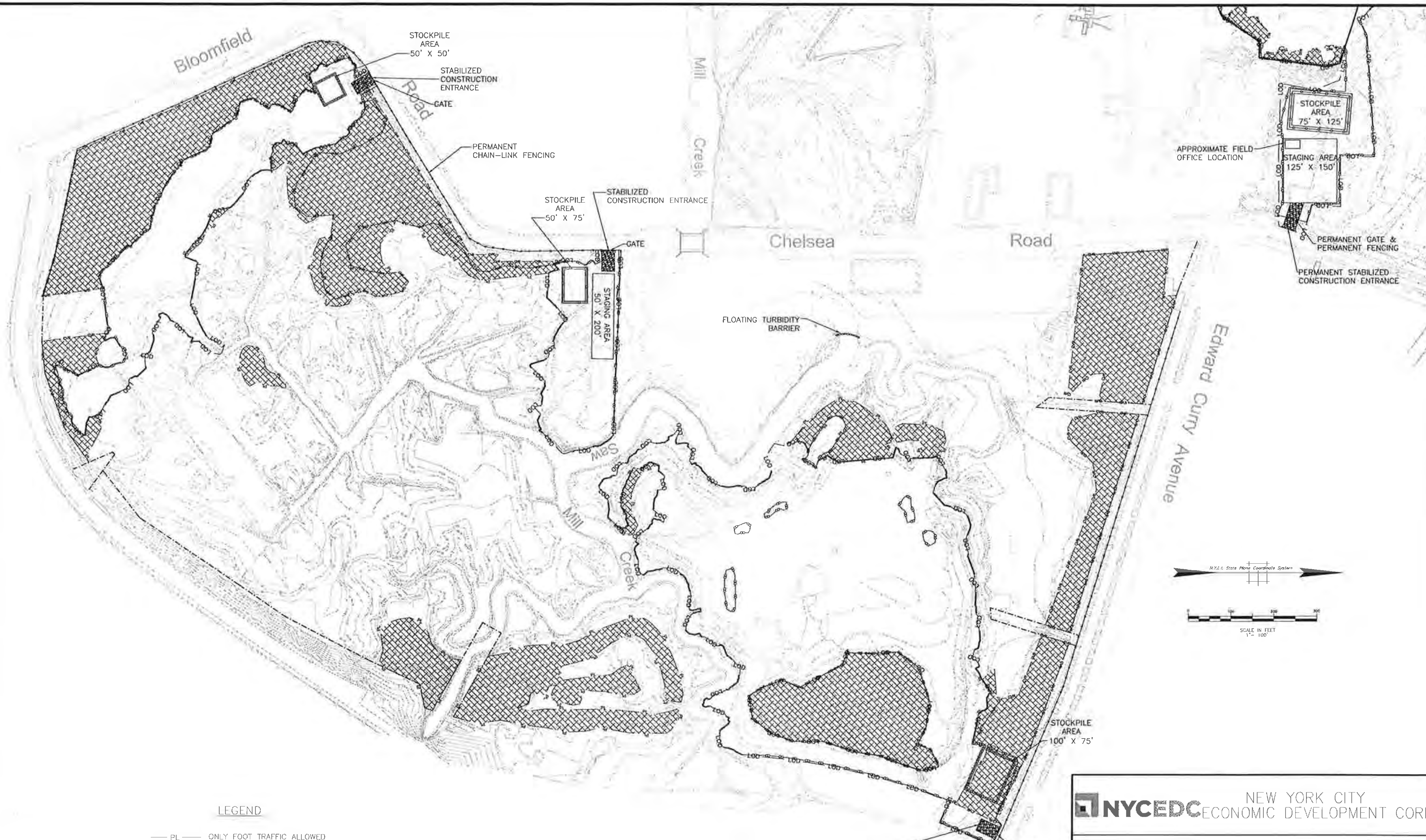

LEGEND

—— PL —— ONLY FOOT TRAFFIC ALLOWED WITHIN PLANTING LIMITS

—— CVR —— CONSTRUCTION VEHICLE ACCESS TO BE APPROVED BY DESIGN ENGINEER

INVASIVE PLANT TREATMENT AREA

NOTES

1. VERTICAL DATUM IN NAVD88
2. HORIZONTAL DATUM IN NAD83
3. ONLY ACCESS BY FOOT IS ALLOWED IN AREAS BEYOND LIMIT OF DISTURBANCE AND WITHIN THE PLANTING LIMIT ZONES

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STATEN ISLAND, NEW YORK

SOIL EROSION AND SEDIMENT CONTROL -EAST-

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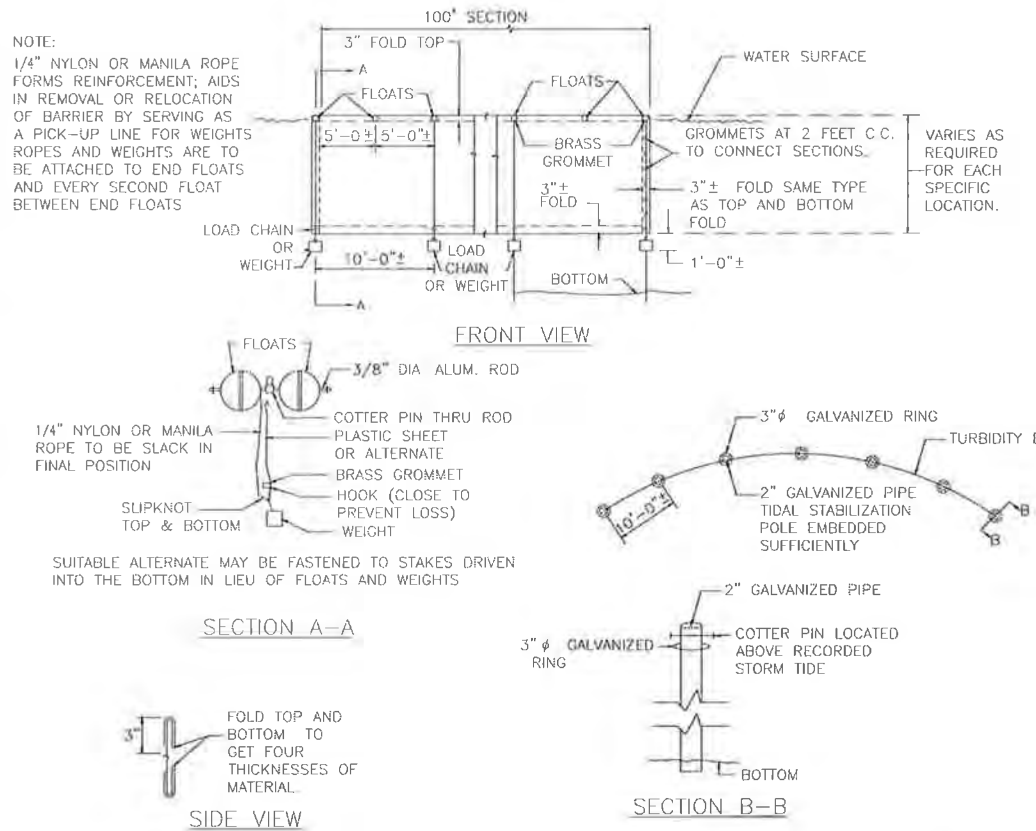
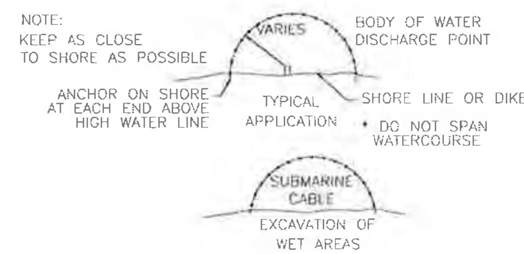
DRAWN BY: MH	APPROVED BY:	TITLE	DATE	PROJECT NO. 2001984
CHECKED BY: SA				SHEET 18 OF 21
SCALE: AS SHOWN				
DATE: NOVEMBER 2013				DWG. NO.

FILE NAME: 10_SESC PLAN N&D dwg



FLOATING TURBIDITY BARRIER, TYPE 2
N.T.S.



NOTES:

1. INSTALL TURBIDITY BARRIER TO PREVENT DRIFTING OF SILT CAUSED BY DISCHARGE OF STORM SEWERS, DEWATERING BASINS, CONSTRUCTION, DREDGING OR FILLING OPERATIONS, OR OTHER ACTIVITIES THAT COULD CAUSE TURBIDITY
2. EXACT PLACEMENT OF TURBIDITY BARRIER SHALL BE SO AS TO EFFECTIVELY CONTROL SILT DISPERSION UNDER THE CONDITIONS PRESENT ON A PARTICULAR PROJECT
3. THE DETAILS SHOWN ON THIS SHEET ARE SUGGESTED METHODS ONLY. ALTERNATE SOLUTION AND USAGE OF MATERIALS MAY BE USED AS APPROVED
4. USE APPROPRIATE NAVIGATIONAL WARNING LIGHTS WHEN USED NEXT TO NAVIGATIONAL CHANNEL

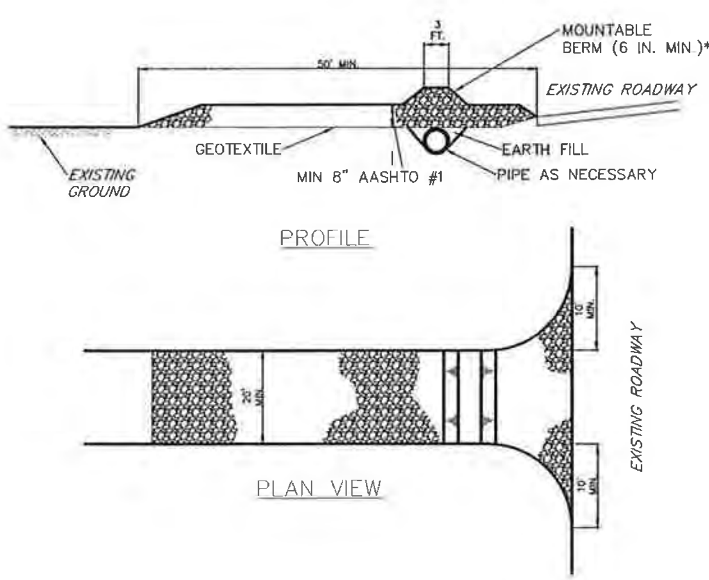
SOIL EROSION AND SEDIMENT CONTROL NOTES

1. ALL SOIL EROSION AND SEDIMENT CONTROL (SESC) PRACTICES WILL BE INSTALLED PRIOR TO ANY SOIL DISTURBANCE OR IN THEIR PROPER SEQUENCE, AND MAINTAINED UNTIL PERMANENT PROTECTION IS ESTABLISHED.
2. ANY DISTURBED AREAS ABOVE ELEVATION 2.42 FT (MEAN HIGH WATER) LEFT EXPOSED FOR MORE THAN 30 DAYS THAT ARE NOT SUBJECT TO CONSTRUCTION TRAFFIC WILL IMMEDIATELY RECEIVE TEMPORARY SEEDING. IF THE SEASON PREVENTS THE ESTABLISHMENT OF TEMPORARY COVER, THESE AREAS WILL BE MULCHED WITH STRAW OR EQUIVALENT MATERIAL AT A RATE OF 2 TONS PER ACRE, ACCORDING TO NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL.
3. PERMANENT VEGETATION WILL BE ESTABLISHED ON ALL EXPOSED AREAS WITHIN 10 DAYS AFTER FINAL GRADING.
4. UNFILTERED DEWATERING IS NOT PERMITTED. TAKE ALL NECESSARY PRECAUTIONS DURING ALL DEWATERING OPERATIONS TO MINIMIZE SEDIMENT TRANSFER. ANY DEWATERING METHODS USED WILL BE IN ACCORDANCE WITH STATE STANDARDS
5. SHOULD THE CONTROL OF DUST AT THE SITE BE NECESSARY, THE SITE WILL BE SPRINKLED WITH FRESHWATER UNTIL THE SURFACE IS WET, IN ACCORDANCE WITH THE STATE STANDARDS FOR EROSION CONTROL
6. ALL SOIL WASHED, DROPPED, SPILLED OR TRACKED OUTSIDE THE LIMIT OF DISTURBANCE OR ONTO PUBLIC RIGHTS-OF-WAYS WILL BE REMOVED IMMEDIATELY.
7. THE CONTRACTOR WILL BE RESPONSIBLE FOR ANY EROSION OR SEDIMENTATION THAT MAY OCCUR BELOW STORMWATER OUTFALLS OR OFFSITE AS A RESULT OF CONSTRUCTION OF THE PROJECT.
8. STOCKPILE LOCATIONS DETERMINED IN THE FIELD WILL BE PLACED WITHIN THE PROJECT SITE LIMITS IN ACCORDANCE WITH THE NYSDEC SPDES PERMIT.

CONSTRUCTION SEQUENCE:

1. MOBILIZE TO THE SITE.
2. INSTALL ALL SITE SOIL EROSION AND SEDIMENT CONTROL MEASURES AND TREE PROTECTION.
3. PERFORM INVASIVE SPECIES CONTROL.
4. ESTABLISH VEHICULAR/PEDESTRIAN TRAFFIC CONTROL MEASURES
5. LOCATE AND MARK ALL UNDERGROUND UTILITIES WITHIN AREAS OF EXCAVATION.
6. SET UP AND INSTALL TEMPORARY WATER DIVERSION MEASURES (INCLUDING DEWATERING CONTROLS AND MEASURES).
7. CLEAR PROPOSED WORK AREA AND REMOVE AND DISPOSE OF ALL DEBRIS ON SITE.
8. EXCAVATE AND GRADE SITE TO SUB-GRADE ELEVATIONS
9. REPLANT SUB-GRADE ELEVATIONS ACCORDING TO PLANTING PLAN.
10. RESTORE ALL DISTURBED AREAS TO MATCH EXISTING CONDITIONS AND CLEANUP SITE
11. DEMOBILIZE

NOTE: THIS IS A GENERAL CONSTRUCTION SEQUENCE ONLY; THE CONTRACTOR SHALL PROVIDE A DETAILED CONSTRUCTION SEQUENCE PRIOR TO THE START OF CONSTRUCTION.

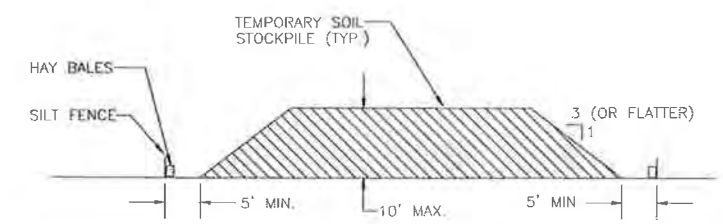


* MOUNTABLE BERM USED TO PROVIDE PROPER COVER FOR PIPE

NOTES:

1. REMOVE TOPSOIL PRIOR TO INSTALLATION OF ROCK CONSTRUCTION ENTRANCE. EXTEND ROCK OVER FULL WIDTH OF ENTRANCE
2. RUNOFF SHALL BE DIVERTED FROM ROADWAY TO A SUITABLE SEDIMENT REMOVAL BMP PRIOR TO ENTERING ROCK CONSTRUCTION ENTRANCE
3. MOUNTABLE BERM SHALL BE INSTALLED WHEREVER OPTIONAL CULVERT PIPE IS USED AND PROPER PIPE COVER AS SPECIFIED BY MANUFACTURER IS NOT OTHERWISE PROVIDED. PIPE SHALL BE SIZED APPROPRIATELY FOR SIZE OF DITCH BEING CROSSED.
4. MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY IF EXCESSIVE AMOUNTS OF SEDIMENT ARE BEING DEPOSITED ON ROADWAY, EXTEND LENGTH OF ROCK CONSTRUCTION ENTRANCE BY 50 FOOT INCREMENTS UNTIL CONDITION IS ALLEVIATED OR INSTALL WASH RACK. WASHING THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.

CONSTRUCTION ENTRANCE
N.T.S.



SOIL STOCKPILE DETAIL
N.T.S.

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STATEN ISLAND, NEW YORK

SOIL EROSION AND SEDIMENT CONTROL -NOTES AND DETAILS-

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NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID

DRAWN BY: MH
CHECKED BY: SA
SCALE:
DATE: NOVEMBER 2013

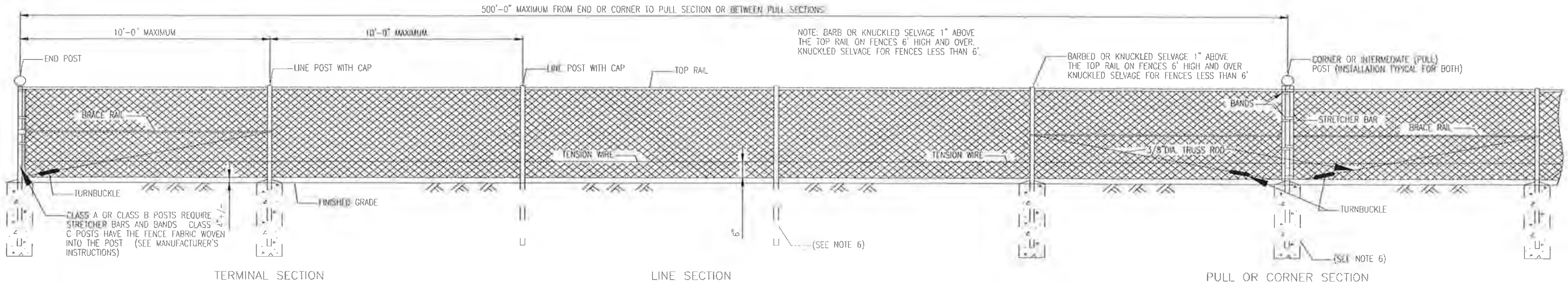
APPROVALS: APPROVED BY: | TITLE | DATE

PROJECT NO. 2001984
SHEET 19 OF 21
DWG. NO.

FILE NAME: 10_SESC PLAN N&D.dwg

PLOT TIME: 2015-03-25 14:30:59

PROJECT PATH: V:\Operations\2011004_MARSHES\4 Deliverables\Drawings\95% Design\Plot

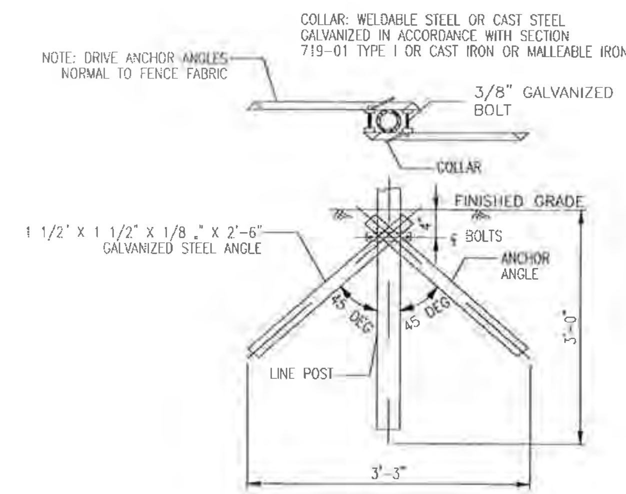


POST AND RAIL SECTION				
USE	SECTION	STEEL		
		NPS DESIGNATOR	O.D.	WEIGHT LBS/FT
TOP RAIL	CLASS B STEEL TUBING	1 1/4	1 11/16"	1.84
LINE POSTS FOR FENCES 6' AND UNDER	CLASS B STEEL TUBING	1 1/2	1 7/8"	2.28
LINE POSTS FOR FENCES GREATER THAN 6' AND EQUAL TO OR LESS THAN 8'	CLASS B STEEL TUBING	2	2 3/8"	3.12
LINE POSTS FOR FENCES GREATER THAN 8' AND EQUAL TO OR LESS THAN 10'	CLASS B STEEL TUBING	2	2 3/8"	3.12
LINE POSTS FOR FENCES OVER 10'	CLASS B STEEL TUBING	2 1/2	2 7/8"	4.64

ACCESSORY	STEEL
FABRIC TIES FOR TOP AND BRACE	6 GA. ALUMINUM WIRE AT 24" C.C. MAX.
FABRIC TIES FOR LINE POSTS	6 GA. ALUMINUM WIRE AT 14" C.C. MAX.
FABRIC TIES FOR TENSION WIRE	11 GA. ALUMINUM WIRE AT 12" O.C.
BOTTOM TENSION WIRE	7 GA. GALVANIZED STEEL

PERMANENT CHAIN LINK FENCE

N.T.S



DRIVE ANCHOR

NOTES:

1 POSTS, INCLUDING ENCASEMENT, SHALL BE SET INSIDE THE R O W LINE SO THAT FENCING PLACED ON THE R O W SIDE OF POSTS WILL BE AS NEARLY ON THE R O W LINE AS POSSIBLE WHEN DIRECTED BY THE ENGINEER THE FABRIC SHALL BE PLACED ON THE OPPOSITE SIDE OF THE POSTS SO THAT THE FABRIC CAN BE PULLED TIGHT AGAINST THE POST

2 POSTS IN ROCK – WHERE SUBSTANTIAL ROCK IS ENCOUNTERED A HOLE 1" LARGER IN DIAMETER THAN THE POST, AND OF 12" MIN DEPTH FOR LINE POSTS, AND 18" MIN DEPTH FOR ALL OTHER POSTS SHALL BE MADE AFTER INSERTING THE POSTS THE HOLES SHALL BE BACKFILLED WITH A HANDMIXED 1:2 MORTAR CONSISTING OF ONE PART PORTLAND CEMENT TWO PARTS FINE AGGREGATE MIXED TO A PLASTIC CONSISTENCY SHOWING NO SIGNS OF FREE WATER THE HAND MIXING AND CONSOLIDATION OF THE MORTAR SHALL BE PERFORMED IN A MANNER APPROVED BY THE ENGINEER

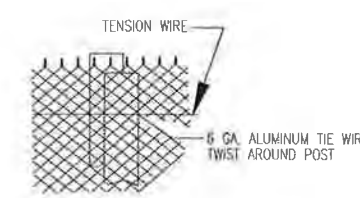
3 CORNER POSTS SHALL BE USED AT SHARP BREAKS IN VERTICAL GRADE, AND CHANGES IN HORIZONTAL ALIGNMENT OF 15 DEGREES AND OVER PULL POSTS SHALL BE USED EVERY 500' ON STRAIGHT RUNS OF CHAINLINK FENCE OR AS DIRECTED BY THE ENGINEER

4. THE CONTRACTOR SHALL SUBMIT THE DETAILS FOR THE CHAIN LINK FENCE IT PLANS TO ERECT TO THE ENGINEER NO FENCE SHALL BE ERECTED PRIOR TO THE APPROVAL OF THE VARIOUS DETAILS

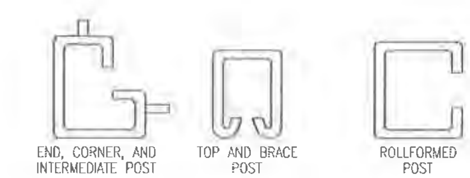
5. STEEL PIPES AND SHAPES SHALL WEIGH AT LEAST 95% OF THE WEIGHT SPECIFIED ON THIS SHEET THEY MAY EXCEED THE SPECIFIED WEIGHT

6 THE CONTRACTOR SHALL HAVE THE OPTION OF SETTING THE LINE POSTS IN 10" DIA BY 3' DEEP CONCRETE BASES WITH THE POSTS EMBEDDED 2'-5" OR USING METHODS OF DRIVING AND ANCHORING SPECIFIED BY THE MANUFACTURER EXCEPT THAT THE LINE POSTS WITH TRUSS RODS ATTACHED AND ALL END, CORNER AND INTERMEDIATE POSTS SHALL BE SET IN CONCRETE BASES THE CONCRETE BASES SHALL BE A MINIMUM OF 10" DIA BY 3' DEEP WITH THE POST EMBEDDED 2'-6" FOR FENCES 6' HIGH OR LESS AND 12"DIA BY 3'-6" DEEP WITH THE POST EMBEDDED 3' FOR FENCES OVER 6' HIGH FOR GATE POSTS SEE THE CURRENT STANDARD SHEET TITLED "GATES AND CHAINLINK FENCE ADJACENT TO GATES"

7 CHAINLINK FENCE WITH TOP RAIL SHALL NOT BE USED WITHIN 29'-6" OF TRAVELED WAY.



SUGGESTED METHOD OF TYING TENSION WIRE TO LINE POST



CLASS "C" ROLLFORMED SECTIONS
(SEE POST AND RAIL SCHEDULE FOR DIMENSIONS)

NYCEDC NEW YORK CITY ECONOMIC DEVELOPMENT CORP.

SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

SOIL EROSION AND SEDIMENT CONTROL –NOTES AND DETAILS–

LOUIS BERGER & ASSOC, PC
48 WALL STREET
16TH FLOOR
NEW YORK, NY 10005

NO.	DATE	REVISION
	3/20/15	PREPARATION FOR CONSTRUCTION BID

BETHANY M. BEARMORE
N.Y. PROFESSIONAL ENGINEER
N.Y. P.E. LIC. NO. 082892

	APPROVALS				
DRAWN BY: MH	APPROVED BY:	TITLE	DATE	PROJECT NO.	2001984
CHECKED BY: SA				SHEET	20 OF 21
SCALE:					
DATE NOVEMBER 2013				DWG. NO	

FILE NAME: 10_SESC PLAN N&D dwg

NOTES:

1 GATES POSTS IN ROCK WHERE SUBSTANTIAL ROCK IS ENCOUNTERED A HOLE 1" LARGER THAN THE GATE POST AND A MINIMUM DEPTH OF 1'-6" FOR SINGLE LEAF GATES UP TO 12' SPAN AND DOUBLE LEAF GATES UP TO 36' SPAN, AND 2' IN DEPTH FOR DOUBLE LEAF GATES 40' SPAN TO 44' SPAN SHALL BE MADE AFTER INSERTING THE POSTS, THE HOLES SHALL BE BACKFILLED WITH A HANDMIXED 1:2 MORTAR CONSISTING OF ONE PART PORTLAND CEMENT AND TWO PARTS FINE AGGREGATE MIXED TO A PLASTIC CONSISTENCY SHOWING NO SIGN OF FREE WATER THE HANDMIXING AND CONSOLIDATION OF THE MORTAR SHALL BE PREFORMED IN A MANNER APPROVED BY THE ENGINEER

2 THE CONTRACTOR SHALL SUBMIT THE DETAILS FOR GATES AND CHAINLINK FENCE ADJACENT TO THEM TO THE ENGINEER NO FENCE OR GATES SHALL BE ERECTED PRIOR TO THE APPROVAL OF THE VARIOUS DETAILS

3 STEEL PIPES AND SHAPES SHALL WEIGH AT LEAST 95% OF THE WEIGHT SPECIFIED ON THIS SHEET THEY MAY EXCEED THE SPECIFIED WEIGHT

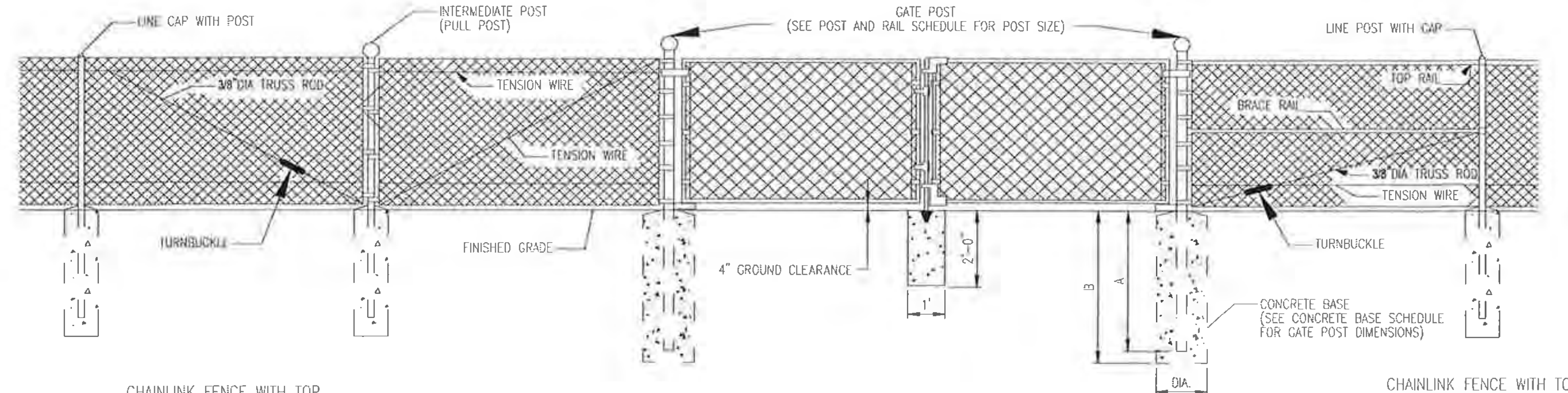
GATE POST CONCRETE BASE SCHEDULE

USE	DIA.	A	B
GATE POST FOR DOUBLE LEAF GATES UP TO 24' SPAN	14"	3'-0"	3'-6"

(SEE NOTE 1) *FROM ANSI – H35.2(M)

POST AND RAIL SCHEDULE

USE	SECTION	STEEL			
		NPS DESIGNATOR	ROLLFORMED	O.D SIZE	WEIGHT LBS/FT
GATE POSTS FOR DOUBLE LEAF GATES, 10' – 24' SPAN	SCHEDULE 40 PIPE	3 1/2		4"	9.11
	ROLLFORMED		3 1/2 X 3 1/2		5.10
GATE FRAME FOR GATES GREATER THAN 8' IN WIDTH	SCHEDULE 40 PIPE	2		2 3/8"	3.65

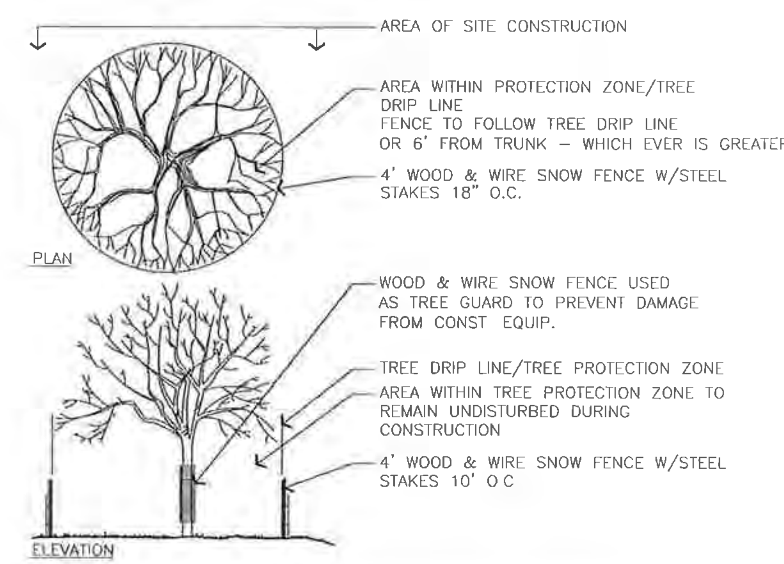


CHAINLINK FENCE WITH TOP TENSION WIRE ADJACENT TO DOUBLE LEAF GATE

DOUBLE LEAF GATE
(SHOWN WITH WELDED FRAME)

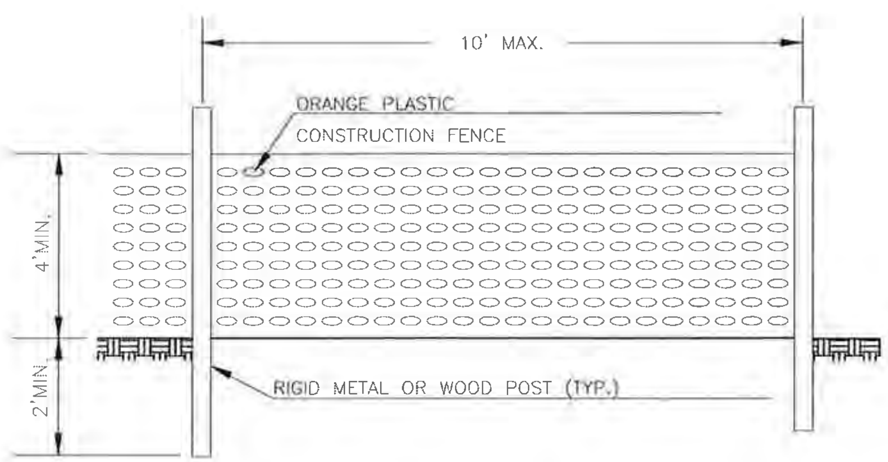
CHAINLINK FENCE WITH TOP RAIL ADJACENT TO DOUBLE LEAF GATE

PERMANENT FENCE GATE
N.T.S.



TREE PROTECTION DURING SITE CONSTRUCTION
N.T.S

NOTE: TREE PROTECTION SHALL BE USED AT THE DISCRETION OF THE ENGINEER DURING CONSTRUCTION ON SITE.



ORANGE CONSTRUCTION FENCE DETAIL
N.T.S.

NYCEDC NEW YORK CITY ECONOMIC DEVELOPMENT CORP.

SAW MILL CREEK PILOT WETLAND MITIGATION BANK
STATEN ISLAND, NEW YORK

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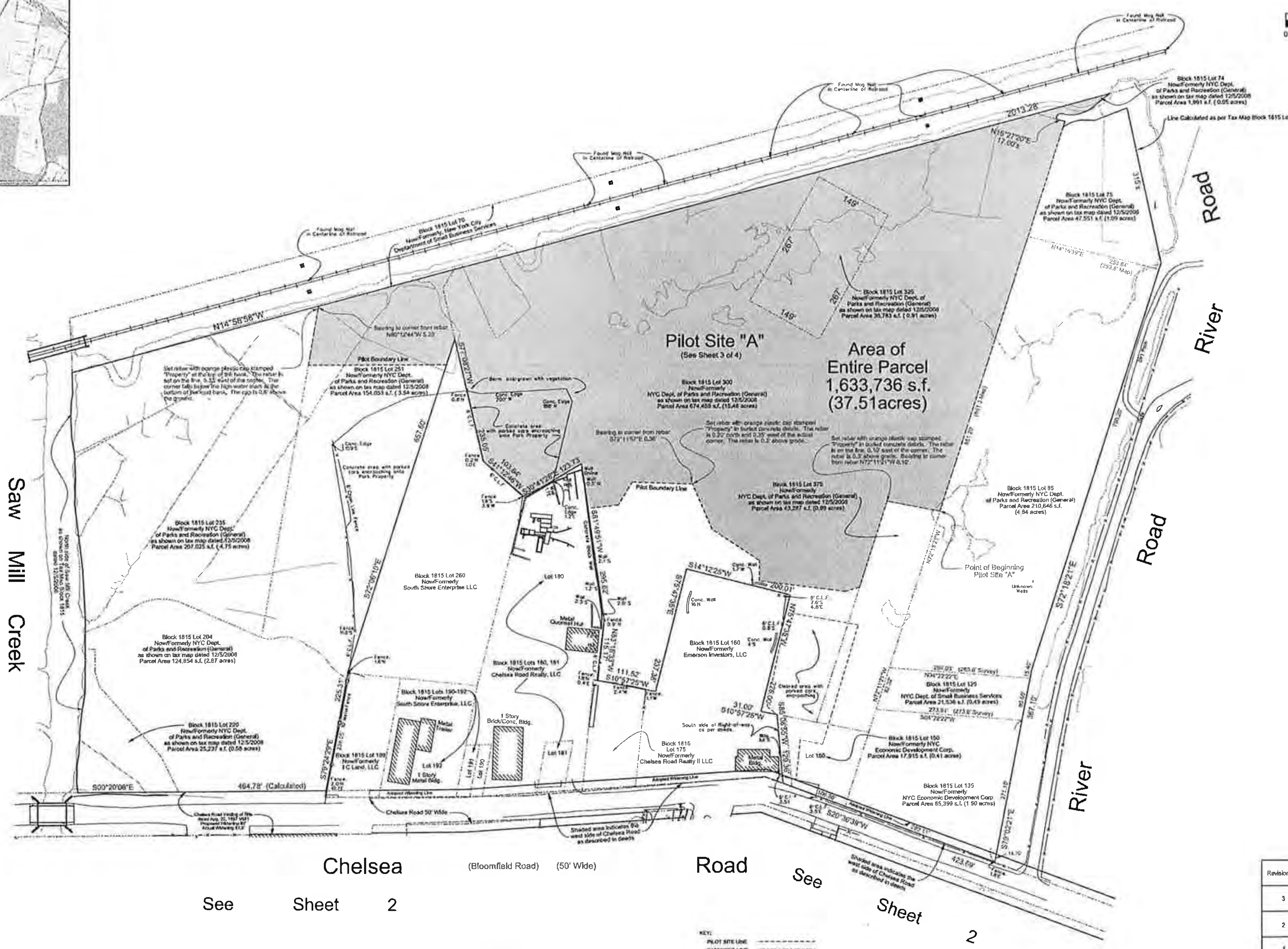
DRAWN BY: MH
CHECKED BY: SA
SCALE:
DATE: NOVEMBER 2013

APPROVALS: APPROVED BY: | TITLE | DATE

PROJECT NO. 2001984
SHEET 21 OF 21
DWG. NO.

FILE NAME: 10_SESC PLAN N&D dwg

Key Map
(Not to Scale)



STATE OF NEW YORK · LICENSED LAND SURVEYOR

3/25/15

GREGORY J. de BRUIN P.E. & L.S. — DATE
N.Y.S. L.S. No. 49945
gdebruin@gayrondebruin.com

The property lines shown on this plan are based upon an actual field survey completed by Gayron de Bruin Land Surveying and Engineering PC in June 2013 and from deeds and plans of record.

The existing conditions shown on this plan are based upon an actual on-the-ground instrument survey completed by Gayron de Bruin Land Surveying and Engineering, PC on in June 2013 and supplemented by stock photogrammetry performed by Geomaps International, Inc. in 2010.

There is no guarantee that all easements have been shown

Horizontal datum is North American Datum 1983 (2011) Epoch 2010.00 (New York State Plane Coordinate System, Long Island Zone). All linear measurements are in U.S. Survey Feet

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KEY:
PILOT SITE LINE
EASEMENT LINE
PILOT SITE AREA

LEGEND

MANHOLES: CATV, DRAIN, ELECTRIC, GAS, SEWER, SEWER CLEANOUT, TRAFFIC, TELEPHONE, UNKNOWN, WATER

UTILITY HARDWARE: ELECTRIC VAULT, GAS MAIN VALVE, GAS METER, GAS SERVICE VALVE, GAS VENT, HYDRANT, HYDRANT VALVE, IRRIGATION VALVE, OIL FILLER VALVE, POLE RISER - ELECTRIC, MONITORING WELL, POLE RISER - TELEPHONE, ROOF DRAIN, SEWER VENT, TRAFFIC DETECTOR, TRAFFIC LOOP, UNIDENTIFIED VAULT, UNKNOWN VALVE, WATER MAIN VALVE, WATER METER, WATER SERVICE VALVE

UTILITY POLES: LIGHT POLE BASE, METAL POLE W/LIGHT, METAL POLE WITH TRAFFIC, WOODEN UTILITY POLE, WOODEN UTILITY POLE W/LIGHT

FENCES: GUARD RAIL, CHAIN LINK FENCE, WOODEN FENCE, METAL FENCE, VINYL FENCE

VEGETATION: BUSH, HEDGE, TREE (WITH SIZE), TREELINE

CATCH BASINS: TYPE "A", TYPE 1, FLUSH GRATE, ROUND GRATE

MISCELLANEOUS: CELLAR DOOR, GUARDPOST, GUYWIRE & ANCHOR, HANDICAP RAMP, MAILBOX, PARK BENCH, PARKING METER, RAILROAD TRACKS, SIGN - SINGLE POST, SIGN - DOUBLE POST, TELEPHONE BOOTH

ABBREVIATIONS			
ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=16.30
ALUMINUM	ALUM.	INVERT ELEVATION	I=1.6
BELGIAN BLOCK	B. BLK	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	C.L.F.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC
FRAME	FR	WOOD	WD

Revision No.	Revision	Date
3	Add bearings and distances to Pilot Site Boundary Lines Add Tie Distances to Pilot Site Points of Beginning Create sheets 3 and 4 for Pilot Areas	03/20/2015
2	Update to show property corners set in field on 6/6/2014	07/01/2014
1	Revise as per LBG comments dated 08/05/2013	08/06/2013

Block 1815 - Lots 74, 75, 85, 125, 135, 150, 204, 220, 235, 251, 300, 325, 375

Boundary Survey of Saw Mill Creek Park

Borough of Staten Island, Richmond County, NY

JOB NO. 5830
DRAWING DATE 7/16/2013
FIELD WORK DATE May-June 2013

PREPARED BY
Gayron de Bruin Land Surveying and Engineering, P.C.
11 UNION AVENUE, BETHPAGE, NY 11714-5811
(516) 579-3111

DRAWING NO. D-10593
DRAWN/CHK MML/MA
SHEET 1 OF 4

GREGORY J. de BRUIN, P.E. & L.S. — DATE 3/25/15
N.Y.S. L.S. No. 49945
gdebruin@gayrondebruin.com

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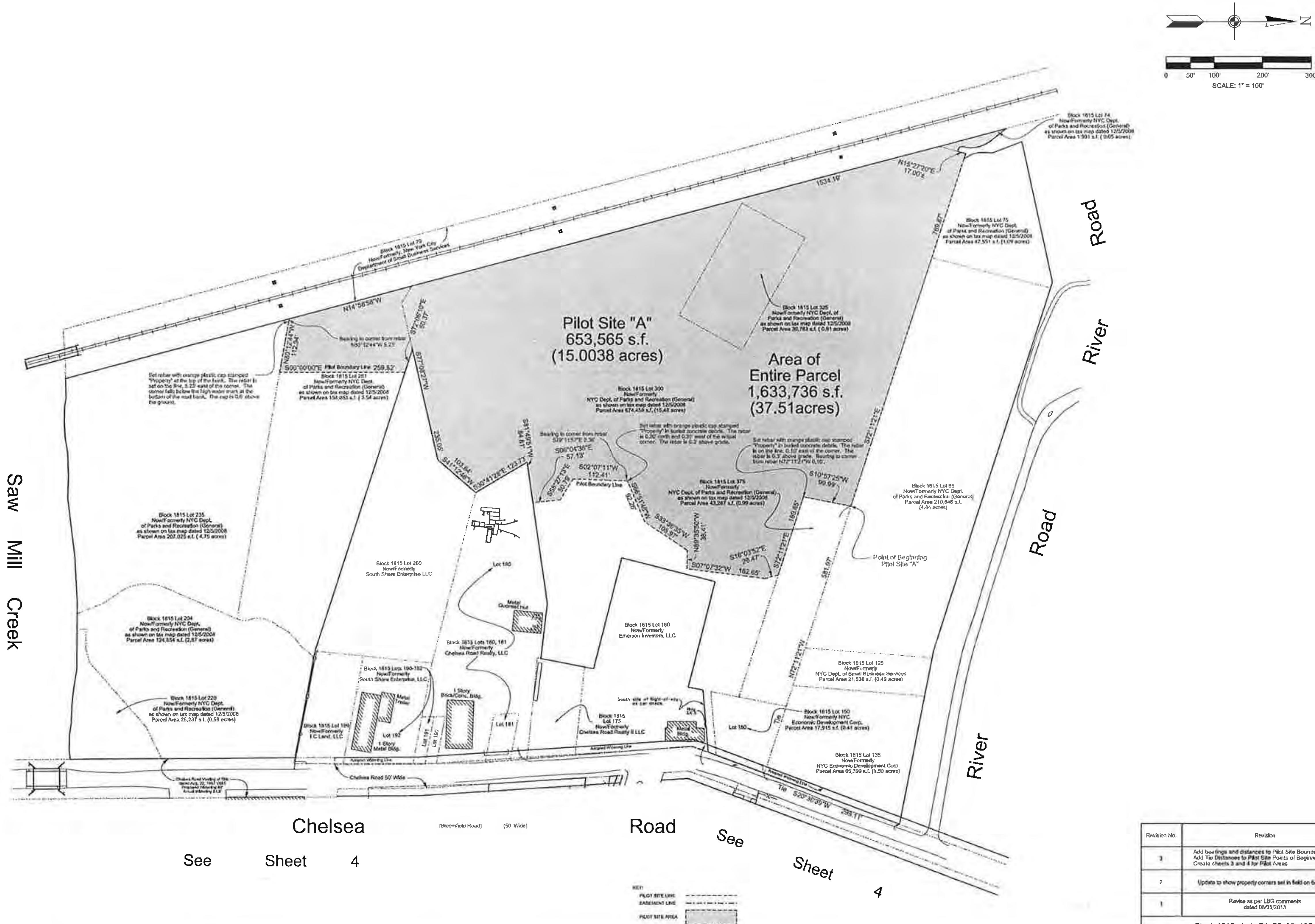
Block 1780 - Lots 1, 69, 210, 260, 275, 300
Block 1790 - Lot 100

Boundary Survey of
Saw Mill Creek Park

Borough of Staten Island, Richmond County, NY

JOB NO.	PREPARED BY	DRAWING NO.
5630	Gayron de Bruin Land Surveying and Engineering, P.C. 11 UNION AVENUE BETHPAGE, NY 11714-5811 (516) 579-3111	D-10593
DRAWING DATE 7/16/2013		DRAWN/CHK MML/MA
FIELD WORK DATE May-June 2013		SHEET 2 OF 4



3/25/15

GREGORY J. de BRUIN, P.E. & L.S. — DATE

gdebruin@gayrondebruin.com

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BLACKTOP	B.T.	OVER ALL	O.A.
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BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC	STOCKADE FENCE	STOCK FE
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FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC
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LINE STYLES

Revision No.	Revision	Date
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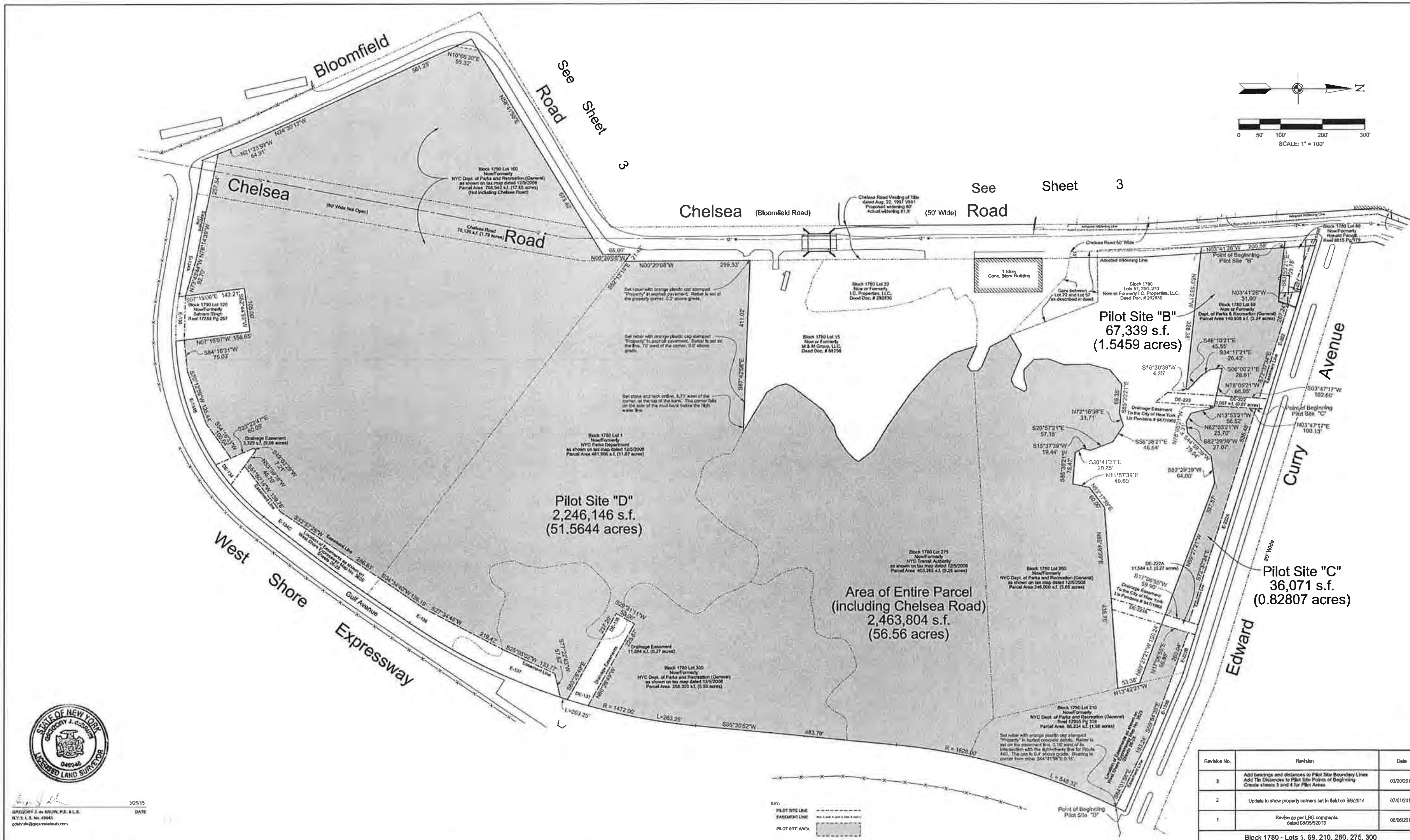
Block 1815 - Lots 74, 75, 85, 125, 135, 150, 204, 220, 235, 251, 300, 325, 375

Boundary Survey of Saw Mill Creek Park

Borough of Staten Island, Richmond County, NY

JOB NO.	PREPARED BY	DRAWING NO.
5830	Gayron de Bruin Land Surveying and Engineering, P.C. 11 UNION AVENUE, BETHPAGE, NY 11714-5811	D-10593
DRAWING DATE: 7/16/2013		DRAWN/CHK: MML/MA
FIELD WORK DATE: May-June 2013		SHEET: 3 OF 4



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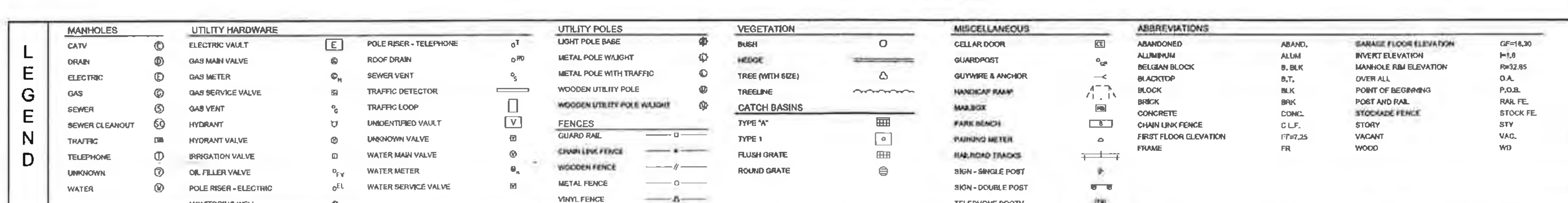

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Block 1780 - Lots 1, 69, 210, 260, 275, 300
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Boundary Survey of Saw Mill Creek Park

Borough of Staten Island, Richmond County, NY

JOB NO.	PREPARED BY	DRAWING NO.
5830	Gayron de Bruin Land Surveying and Engineering, P.C. 11 UNION AVENUE, BETHPAGE, NY 11714-5611 (516) 579-3111	D-10593
DRAWING DATE: 7/16/2013		DRAWN/CHK: MML/MA
FIELD WORK DATE: May-June 2013		SHEET: 4 OF 4

ATTACHMENT D-3
CHANNEL DESIGN REPORT

SAW MILL CREEK PILOT WETLAND MITIGATION BANK (MARSHES)

CHANNEL DESIGN REPORT

The design of MARSHES channels utilized two items. The first, and primary design, was based off of the existing channel cross sections surveyed in current marsh, as close to the outlet of the proposed channel as possible. The second, and in order to insure that the channel cross sectional area is sufficiently large enough to allow enough tidal flow into the proposed marsh through the primary inlet, is the U.S. Army Corps of Engineers (USACE) Design Guidelines for Tidal Channels in Coastal Wetlands prepared by Philip Williams & Associates, LTD.

Existing channel cross sections were observed to determine channel bottom elevations and widths, as well as possible channel bank slopes. The existing cross section 7W was selected as the basis for the proposed channel of the west mitigation bank, as it is the best representation of a working channel in the existing established marsh and is just upstream of the proposed connection point. Cross section 7E was selected for the larger proposed channel on the east mitigation site for the same defined reasons. Observed existing slopes range from less than a 1H:1V ratio to a 4H:1V ratio. Channel slopes for the proposed channels on both sides of the mitigation bank were chosen as a 4H:1V to provide a greater bankfull top width and cross sectional area. On the west side of the mitigation bank, a channel bottom depth of 0 NAVD88 was selected, as this was slightly higher than the existing cross section 7W bottom elevation. This allows for two benefits: 1) it decreases the depth of excavation needed to reach the bottom elevation, and 2) it will allow the channel to establish its own gradual slope at the mouth into the existing channel. An elevation of -2 NAVD88 was selected for the primary channels on the east side of the mitigation bank for the same reasons as the west side, but based on the cross section 7E. Sinuosity of the channels was not modeled, and the observed proposed sinuosity was designed by a "bird's eye view" to match the existing sinuosity of Saw Mill Creek.

As already presented in other submissions to the mitigation bank project, the established low marsh elevation was determined to be at elevation 1.5 FTNAVD88, and high marsh at elevation 2.5 FTNAVD88 through the use of Bio Benchmarks. The USACE Design Guidelines utilizes established studies between a tidal datum and stable marsh channel geometry. For the purposes of this project, it was deemed necessary to insure that the inlets to the proposed marsh areas were designed to provide a large enough cross sectional area to support the proposed habitats. The Potential Diurnal Tidal Prism (PDTP) (in acre-ft.) is the relative storage capacity of the marsh plain. For this bank project specifically, the PDTP is equal to the result of the Mean Higher High Water (MHHW) (2.6 FTNAVD88 for the site) minus the proposed marsh elevation multiplied by the proposed marsh area (in acres).

$$PDTP\ (acre - ft) = (MHHW - Marsh\ Elevation)\ X\ (Marsh\ Area) \qquad \text{EQ. 1}$$

As shown on ***Attachment A***, the calculations for the PDTP on the west side of the mitigation bank were determined to be 0.61, with an area of 6.1 acres of proposed marsh habitat that is supported by this channel and using the elevation for high marsh. The resulting cross section area required for this channel is approximately 24 SQFT, as seen on ***Attachment B***, and is less than what the calculated proposed cross sectional area provides, establishing it as more than sufficient to provide a tidal flow to the marsh habitat. This leads to the thought of reducing the size of the channel; however, after examining the bottom depth and width of cross section 8W (a mosquito ditch that the proposed channel will need to connect to in order to reach the major establish channel on the west side) it was determined that dredging would be needed to reach the elevation of 0 FTNAVD88 for the proposed channel to open the area to the tidal flow. The dredging of this channel to the desired elevation with a 4H:1V slope, as the proposed channel, will provide and equal channel bottom width and side slope through this existing ditch. This lead to the conclusion to leave the west proposed channel as designed.

The PDTP for the major channel on the east side of the mitigation bank was determined to be 11.22 acre-ft., as seen in ***Attachment A***. This was determined with a proposed marsh area of 10.2 acres (for the north east proposed habitat restoration area) and using the low marsh elevation. The low marsh elevation was selected in this calculation as a more conservative manner due to the larger habitat area that is being sought to establish. As seen on ***Attachment B***, the cross sectional area required is approximately 110 SQFT, which is just under the proposed cross sectional area of 112 SQFT. The resulting conclusion is that the desired channel size should not be changed as it matches existing established channels, and meets desired cross sectional areas to provide for the tidal flow to establish the proposed habitat areas.

It is important to also note that many considerations went into the design of the proposed tidal marsh and stream channel restoration site, such as providing open water and some channels that hold water at low tide for fish habitat, providing a wide enough area of tidal water to discourage invasive plants from intruding onto the site, and limiting site access (a wide channel prevents the need to erecting fence across a marsh).

The proposed channel design is very similar to the typical channels Louis Berger has designed at other successful tidal restoration sites such as the Marsh Resources, Inc. (MRI) Mitigation Bank channels that were constructed ~15 years ago and are functioning well. Louis Berger's design plan for the Lincoln Park wetland restoration site in Jersey City includes a similar (slightly larger) primary channel design with a bottom width of 20 feet and a top width of ~54 feet for the approximately 22-acre vegetated marsh. Lincoln Park was constructed in 2010 and the attached recent photo depicts a stable channel with healthy salt marsh vegetation.


Figure 1. Lincoln Park Tidal Wetland Restoration Project, 3 years after construction.

It has been Louis Berger's experience that the constructed channels will eventually reach equilibrium. One of our design goals is to ensure the tidal water reaches the far end of the marsh in the beginning to establish the marsh. For this site, with the encroaching invasive *Phragmites* in the back areas, increasing tidal influence and/or excavation provide a more permanent means to discourage *Phragmites*. Over time these channels may fill in slightly, creating more mud flats and/or low marsh plain. The proposed primary channel on the east side is similar, but smaller than Saw Mill Creek. On both the east and west side of Chelsea Road, Saw Mill Creek appears to be a stable creek that supports the adjacent tidal marshes – Louis Berger did not observe any marsh erosion or subsidence along Saw Mill Creek during our field work.

Figure 2. 2013 photograph of the Marsh Resources, Inc (MRI) Wetland Mitigation Bank that was constructed in 1999 and 2002. The photo shows the tidal channels and marsh 10+ years after construction (and after Hurricanes Irene & Sandy).

ATTACHMENTS

ATTACHMENT A

CHANNEL CROSS SECTION CALCULATION

SUBJECT: SAW MILL CREEK PILOT WETLAND MITIGATION BANK

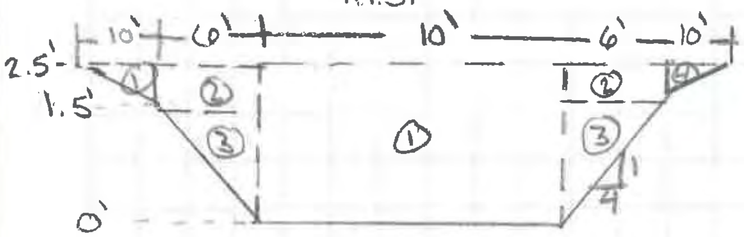
CHANNEL CROSS SECTIONAL AREA CALCULATIONS

P.D.T.P. = (MHHW − MARSH EL.) × MARSH AREA

DESIGNED CHANNELS CROSS SECTION AREAS

WEST

N.T.S.

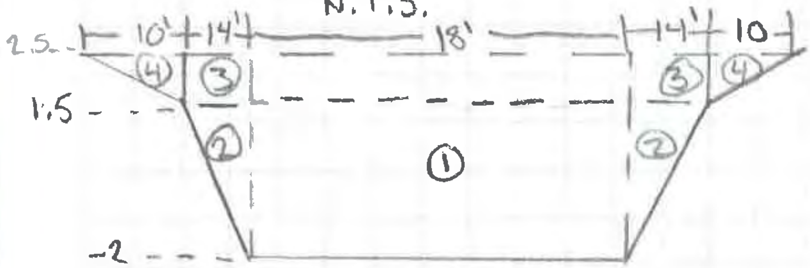


$XS_{AW} = 10(2.5) + 6(1)(2) + \frac{1}{2}(6)(1.5)2 + \frac{1}{2}(1)(10)2$

$= 25 + 12 + 9 + 10 = 56$ sq. ft.

EAST

N.T.S.



$XS_{AE} = ① + 2② = 18(1.5) + \frac{1}{2}(14)(1.5+2)2$

$= 112$ sq. ft.

USACE P.D.T.P. CALC

MHHW = 2.6 FT NAVD88
LOW MARSH ≈ 1.5 FT NAVD88
HIGH MARSH ≈ 2.5 FT NAVD 88

PROPOSED WEST MARSH = 6.1 AC
PROPOSED EAST MARSH = 10.2 AC

WEST

(High Marsh Elevation used)

P.D.T.P. = (2.6 − 2.5) × 6.1
= 0.61 AC-FT

ACE_{AW} = CROSS-SECTION AREA NEEDED ≈ 24 sq. ft

$XS_{AW} > ACE_A$ ✓

EAST

(Low Marsh Elevation used to be more concervative for larger Area)

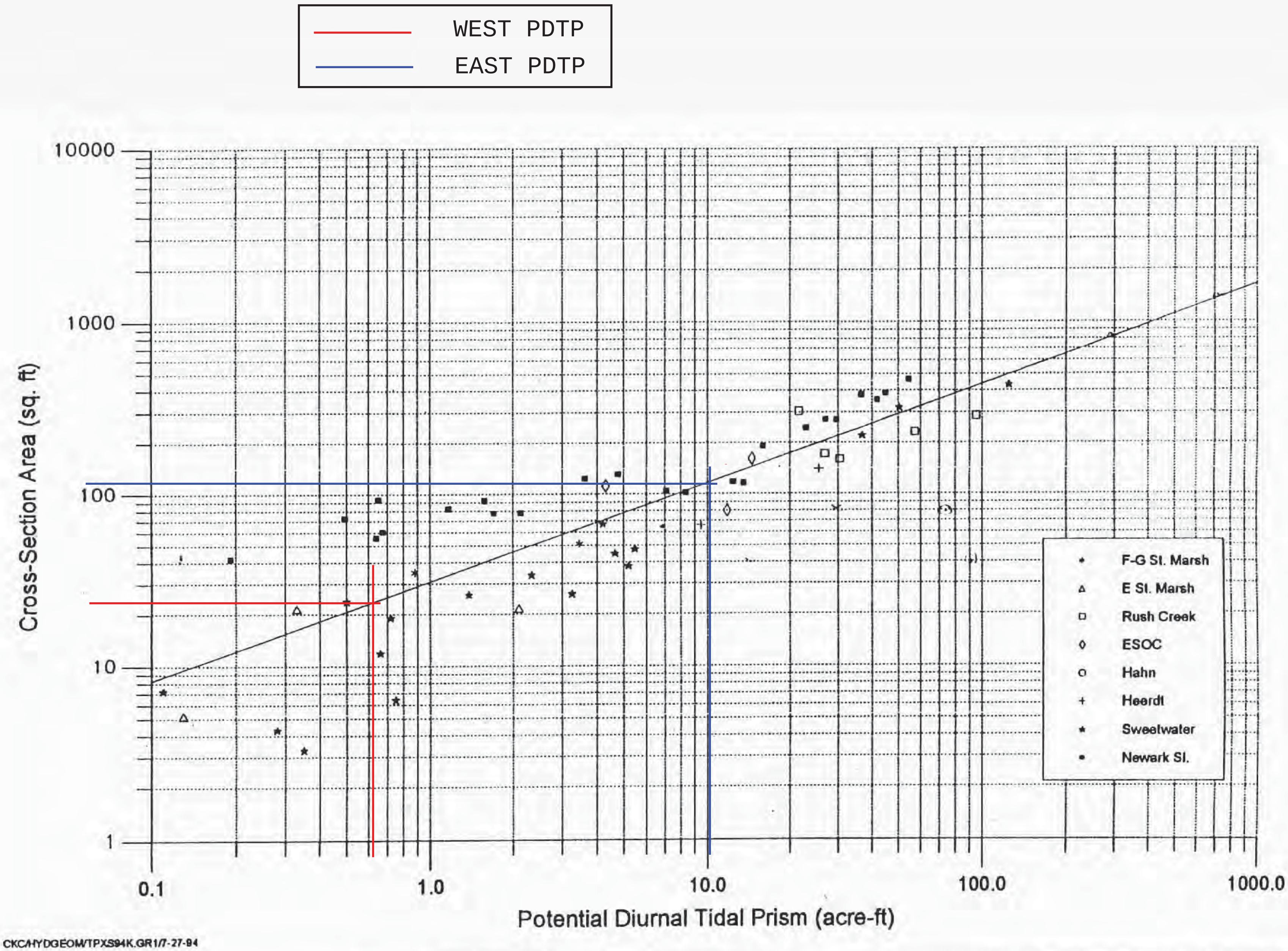
P.D.T.P. = (2.6 − 1.5) × 10.2 = 11.22 AC-FT

$ACE_{AE} \approx 110$ sq. ft.

$XS_{AE} > ACE_{AE}$ ✓

ATTACHMENT B

USACE PDTP CHART



Department of the Army
Waterways Experiment Station
US Army Corps of Engineers
PO Box 631
Vicksburg, Mississippi 39180

CHANNEL CROSS-SECTIONAL AREA VS. TIDAL PRISM IN TIDAL SLOUGHS

FIGURE 5.2-3

ATTACHMENT D-4
SIMULATING THE IMPACT OF SEA LEVEL RISE AT THE MARSHES WETLAND COMPLEX

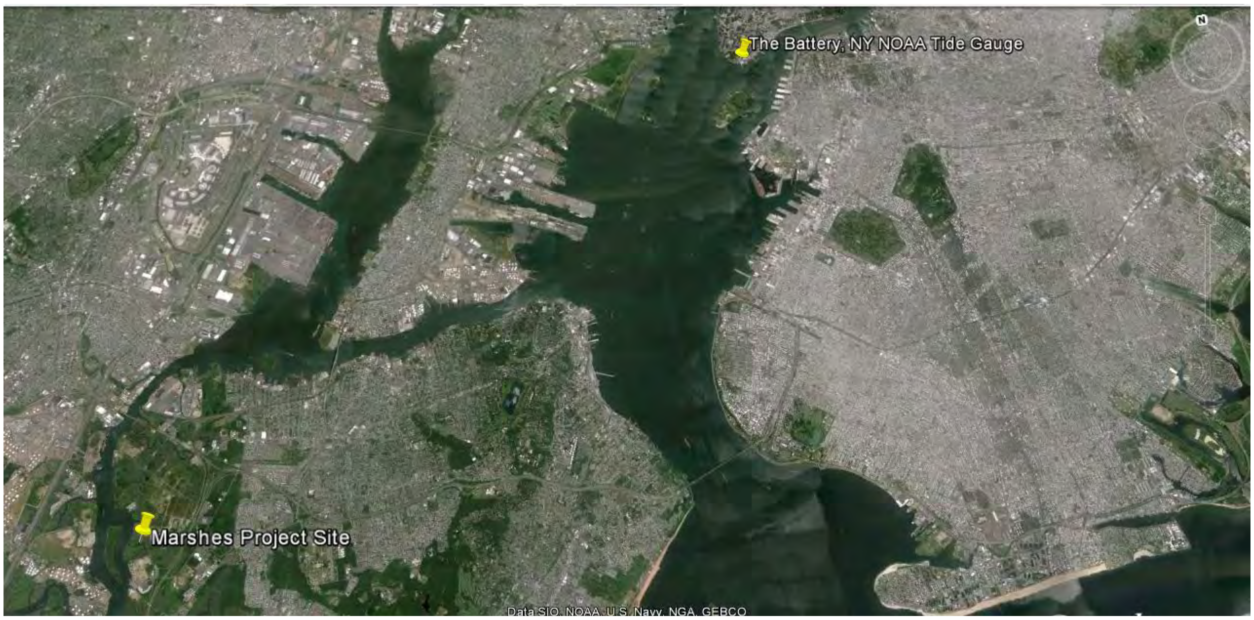
Sea Level Rise Simulation

SIMULATING FUTURE IMPACTS OF SEA LEVEL RISE ON THE SAW MILL CREEK PILOT WETLAND MITIGATION BANK WETLAND COMPLEX

In simulating future impacts of sea level rise on the Pilot Bank, the most recent version of the USACE sea level change projection methodology summarized in United States Army Corps of Engineers Engineering Circular (USACE EC) 1165-2-212 was used (USACE, 2011). One of the main goals of the project is to create not only resilient communities and infrastructure, but also resilient tidal wetlands in the face of sea level rise.

The Pilot Bank design calls for a considerable increase in the portion of the site that is tidally influenced from the Arthur Kill through a network of small tidal channels. Because of this improved tidal connectivity, the project site may be affected by continued or accelerated rate of local relative sea level change. This report provides guidance for incorporating the direct and indirect physical effects of projected future sea-level change across the project life cycle (50 years) in managing, planning, engineering, designing, constructing, operating, and maintaining the Pilot Bank.

Historic trends in local Mean Sea Level are best determined from tide gauge records. The Center for Operational Oceanographic Products and Services, National Oceanographic and Atmospheric Administration (NOAA) provides historic information and local Mean Sea Level trends for tidal stations operated by NOAA/NOS in the US (see http://www.coops.nos.noaa.gov/sltrends/slmap.htm). The USACE EC recommends that stations used for sea level rise projections should have at least 40 years of historic tidal data. The nearest NOAA tide gauge to the project site with at least 40 years of historic tidal record is the Battery, NY gauge (Station ID 8518750) as shown in Figure 1. This gauge has 151 years of data, well above the minimum recommended. The Battery gauge station shares similar characteristics with the project site including coastal/estuarine location, bathymetry, topography, shoreline geometry, and hydrodynamic conditions. Because of this reason, coupled with the fact that the computed tidal datums on the project site are similar to the recorded tidal datums at the Battery, this gauge was used to project the sea level rise at the project site.

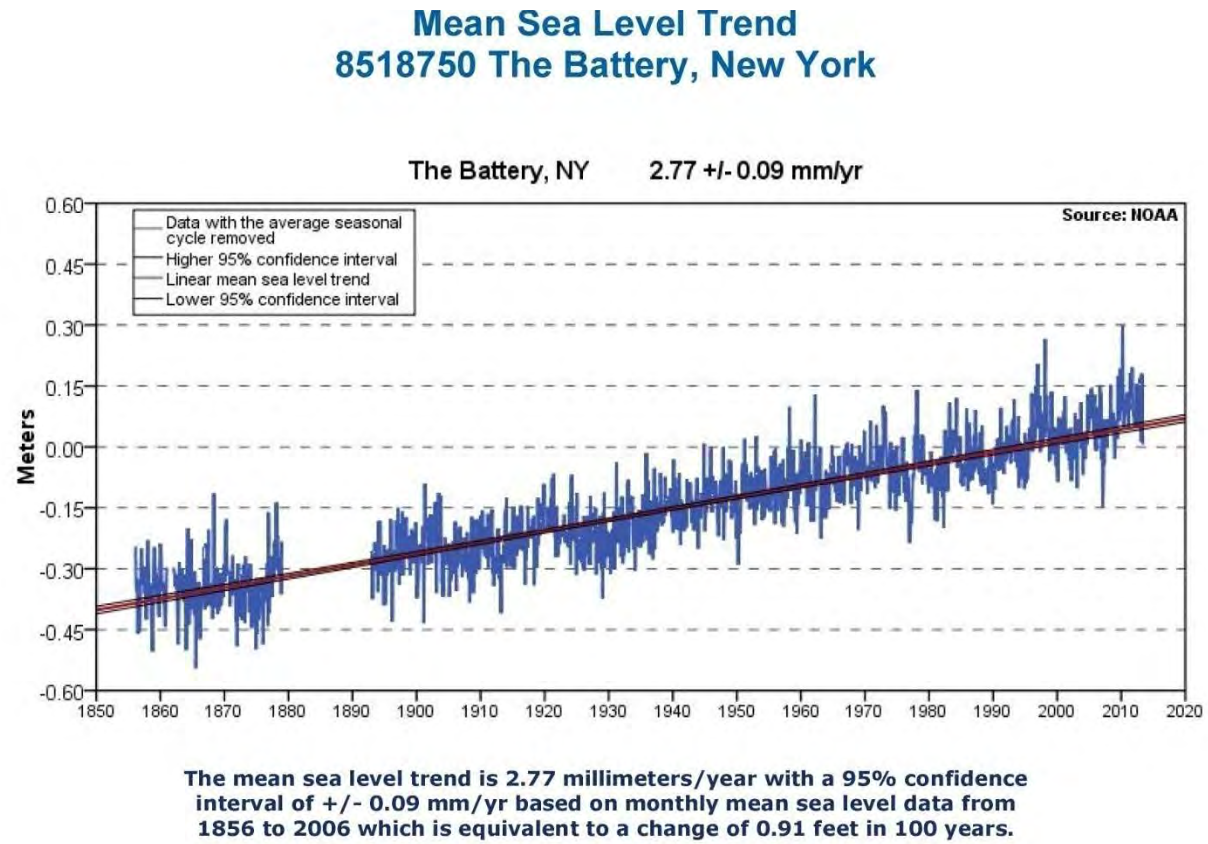


Source: Google Earth

Figure 1: Pilot Bank project location with reference to closest NOAA tide gauges

According to the USACE EC, sea level change projections should be produced in a multiple scenario format with three projections: a high rate projection, an intermediate projection, and a projection of the historically measured rate (or low rate) as a baseline comparison. The USACE EC manual considers the entire range of possible future rates of sea-level change for planning studies and engineering designs. The upper rate projection assumes that in addition to the historic rate of sea level rise, there is a major acceleration in the rate over the 21st century. This high rate exceeds the upper bounds of the Intergovernmental Panel on Climate Change (IPCC) estimates from both 2001 and 2007, which many scientists agree did not adequately address the potential rapid loss of ice from Antarctica and Greenland (USACE, 2011). The lower rate projection assumes that in addition to the historic rate of sea level rise, there is a moderate acceleration in the rate over the next century. The historic projection uses a locally derived historic rate of sea level rise (The Battery, NY) that is extrapolated into the future without any change in the existing rate of sea level rise.

The data required for calculation of a sea level rise projection using the USACE EC are the relative sea level change rate at the location of the desired projection, construction start date and the project life span. For the purposes of the Pilot Bank projection, the relative sea level rise rate at The Battery, NY of 2.77mm/year (Figure 2), construction start date of 2014 and project life span of 50 years were used as the low rate sea level rise scenario.



Source NOAA

Figure 2: Relative sea level change rate at the Battery, NY tide gauge station

Following the USACE EC manual procedure, the three scenarios of sea level rise at the project site are shown in Figure 3.

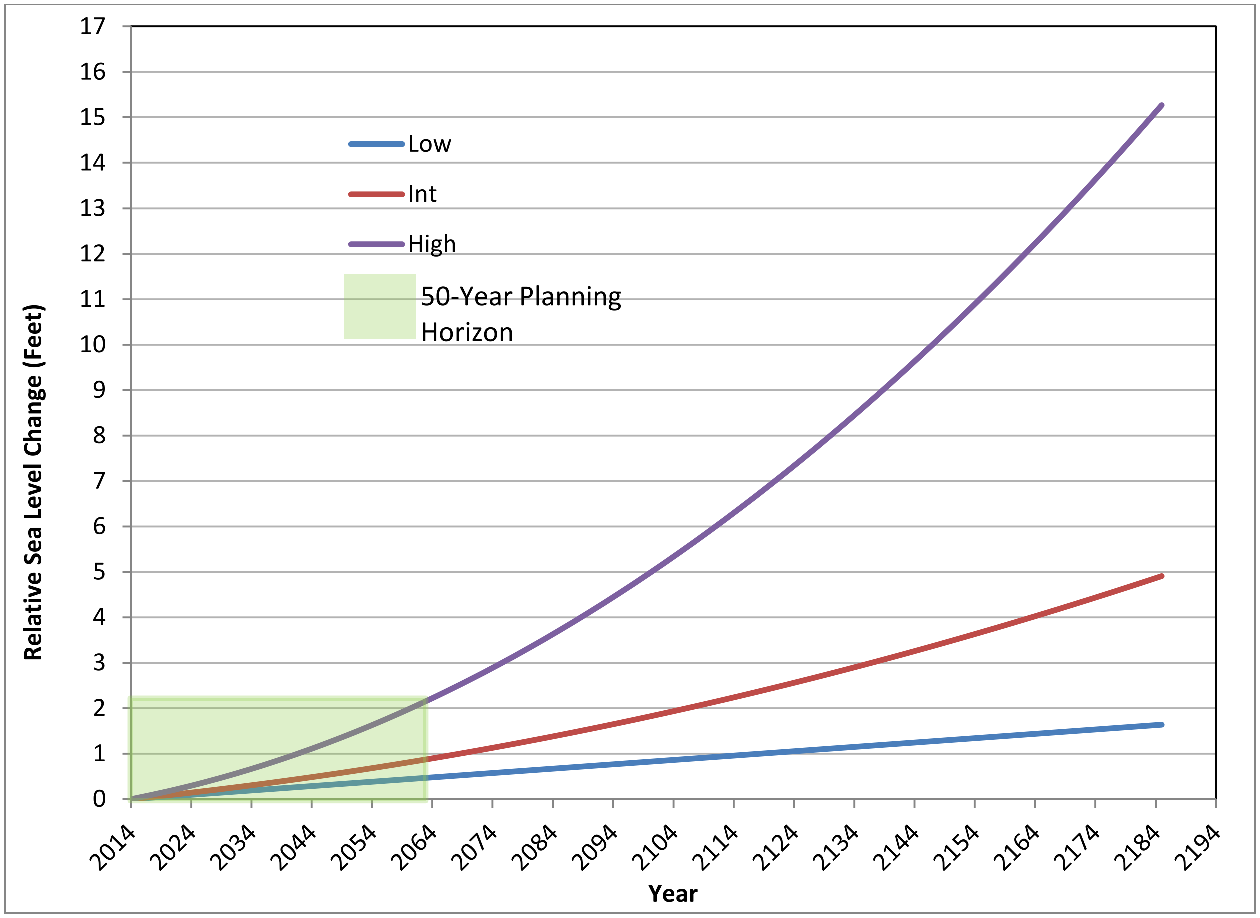


Figure 3: Projected relative sea level change (rise) following construction at the Pilot Bank

In order to analyze the potential impacts of sea level rise on existing and proposed features such as bridges, existing marsh surfaces, and other existing infrastructure, projected sea level rise values under the three scenarios need to be added to the current mean high water elevation. Under the low rate sea level rise scenario, 0.5 feet of sea level rise should be added to the current Mean High Water (MHW) elevation of 2.4 feet NAVD88, bringing MHW elevation up to 2.9 feet in NAVD88 at the end of the project expected 50 year life. Under the intermediate rate sea level rise scenario, 0.95 feet of sea level rise should be added, bringing MHW elevation up to 3.4 feet NAVD88 by the end of the expected project 50 year life. Under the high rate sea level rise scenario, 2.2 feet of sea level rise should be added; bringing MHW elevation up to 4.6 feet in NAVD88 at the end of the project expected 50 year life.

For the Pilot Bank, no new structures are proposed at the project site. The existing structures in the vicinity of the project are all above elevation 7 feet NAVD88, which is well above the three projected sea level rise elevations of 2.9-, 3.4-, and 4.6-feet NAVD88.

Figures 4 and 5 show the extent of expected flooding under the low rate (yellow shading), intermediate rate (green+yellow shading) and high rate (magenta+green+yellow shading) sea level rise scenarios.

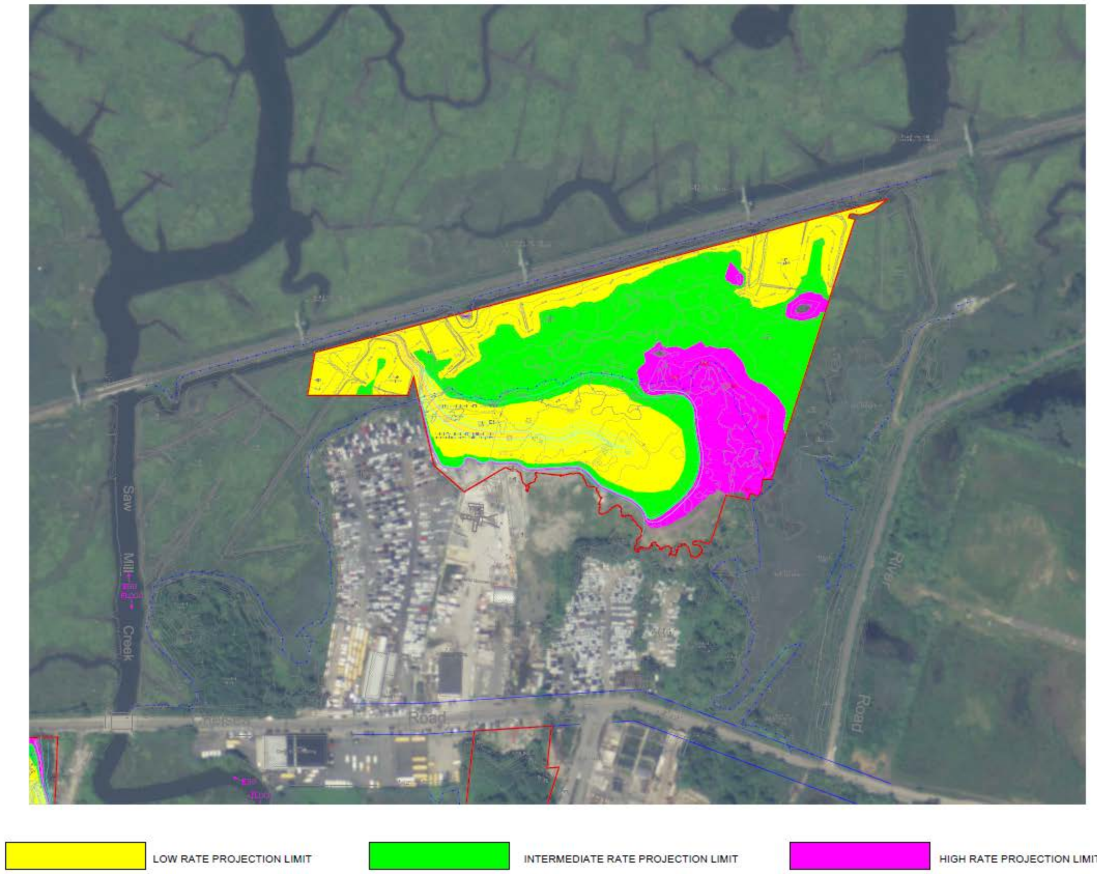


Figure 4: Projected sea level rise extent in western marsh

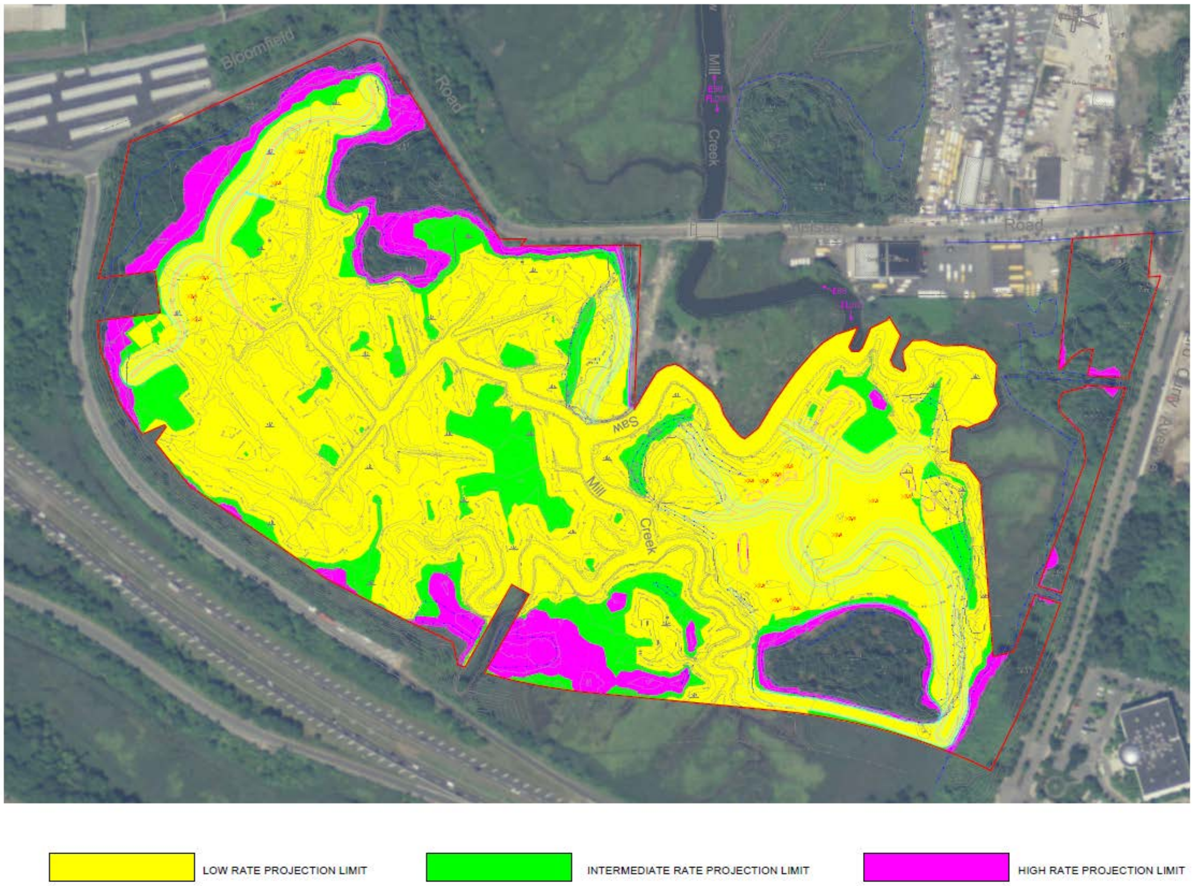


Figure 5: Projected sea level rise extent in eastern marsh

To determine the impact of sea level rise on the proposed Pilot Bank habitats, comparisons can be made between the designed low and high marsh elevations of the site in 2014 to the forecasted low and high marsh elevations in 2064 (50 years after construction) as a result of sea level rise as discussed below:

Low Rate Sea Level Rise

The designed low marsh elevations are approximately 1.5 to 2.5 feet NAVD88 in 2014. Under the low sea level rise scenario with a projected 0.5 feet of sea level rise by 2064, low marsh is expected to occur between elevations 2.0 and 3.0 feet NAVD88. Based on this projected sea level rise scenario, the designed east side eastern low marsh area of 5.2 acres in 2014 will increase to 7.4 acres by 2064 due to additional high marsh and scrub/shrub areas being inundated. The area of high marsh is projected to decrease from 8.0 acres in 2014 to 4.4 acres by 2064 under low rate scenario due to increased frequency of inundation. Also, the mudflat area would increase from 2.8 acres to 4.9 acres under this scenario. This is a conservative assumption, however, as over time sediment will accrete and the marsh should mature to adapt and maintain its surface area and aquatic habitat features.

A similar pattern is expected to occur in the western marsh. The area of low marsh is forecasted to increase from 0.6 acres in 2014 to 3.1 acres by 2064. The area of high marsh is forecasted to decrease from 3.4 acres to 0.8 acres by 2064. The area of mudflat is expected to increase from 0.3 acres in 2014 to 0.6 acres in 2064.

Intermediate Rate Sea Level Rise

Under the intermediate sea level rise scenario with a projected 0.95 feet of sea level rise in 2064, low marsh is expected to occur between elevations 2.5 and 3.5 feet NAVD88. Based on this projected sea level rise scenario, the designed eastern low marsh area of 5.2 acres in 2014 will increase to 7.2 acres by 2064 due to additional high marsh and scrub/shrub areas being inundated. The area of high marsh is projected to decrease from 8.0 acres in 2014 to 2.3 acres by 2064. The area of mudflat would increase from 2.8 acres to 7.7 acres under this scenario.

In the western marsh, the low marsh area is projected to increase from 0.6 acres in 2014 to 3.4 acres by 2064. The area of high marsh is projected to decrease from 3.4 acres to 1.8 acres by 2064. The area of mudflat is expected to increase from 0.3 acres in 2014 to 0.8 acres by 2064.

High Rate Sea Level Rise

Under the high rate sea level rise scenario with a projected 2.2 feet of sea level rise in 2064, low marsh is expected to occur between elevations 3.7 and 4.7 feet NAVD88. Based on this projected sea level rise elevations, the designed eastern low marsh area of 5.2 acres in 2014 will decrease to 1.9 acres. The area of high marsh is projected to decrease from 8.0 acres in 2014 to 0.7 acres by 2064. The area of mudflat would increase from 2.8 acres to 15.6 acres under this scenario. Thus at the end of the design life (50 year) of the Pilot Bank, 87% of the 17.9 acre eastern portion of the project would become mudflat.

In the western marsh, the low marsh area is projected to increase from 0.6 acres in 2014 to 1.8 acres by 2064. The area of high marsh is projected to decrease from 3.4 acres to 0.1 acres by 2064. The area of mudflat is expected to increase from 0.3 acres in 2014 to 4.3 acres by 2064. This means 62% of the 6.9 acre western portion of the project would turn into mudflat by the end of the project life in 2064.

Summary

Under all three sea level rise scenarios, there would be no apparent effects to roads, parking, facilities or facility access. However, higher tides from spring tide and storm surge events would rise beyond the mapped low sea level rise MHW line, possibly affecting roads and parking lots, on occasion. The potential impacts of future sea level rise will not change the amount of credits generated by the Bank. The target aquatic and upland buffer habitats established during construction and the five year monitoring period are the basis for the bank credits.

EXHIBIT E
UMAM FUNCTIONAL ASSESSMENT

The Mitigation and Restoration Strategies for Habitat and Ecological Sustainability (MARSHES) Initiative

Saw Mill Creek Pilot Wetland Mitigation Bank
Staten Island, New York

Functional (Ecological) Assessment

Submitted to:
The Interagency Review Team (IRT)
U.S. Army Corps of Engineers, Chair
New York, NY
Application Number NAN-2013-00259-EHA

Submitted by:
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October 2014

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APPENDICES

1.0 INTRODUCTION

To support the establishment of the Saw Mill Creek Pilot Wetland Mitigation Bank (Pilot Bank), the New York City Economic Development Corporation (NYCEDC) is employing a functional assessment methodology to propose wetland mitigation credits generated by the ecological improvements. This approach is consistent with the *Final Rule for Compensatory Mitigation for Losses of Aquatic Resources* (33 CFR Parts 325 and 332 and 40 CFR Part 230) which encourages the use of functional assessment metrics as a basis to establish bank credits.

Specifically, 33 CFR 332.8(o)(3) states that "The number of credits must reflect the difference between pre- and post-compensatory mitigation project site conditions, as determined by a functional or condition assessment." This report provides:

- the basis and justification for the use of the functional (ecological) assessment methodology, Uniform Mitigation Assessment Method (UMAM), at the Pilot Bank,
- a detailed description of UMAM,
- the findings of an initial application of the method,
- a discussion of how UMAM was adapted for use within tidal areas of New York City; and,
- the findings from the application of UMAM to the Pilot Bank.

UMAM was developed with the purpose of providing a standardized methodology to assess functions of wetlands and surface waters for baseline conditions, the measurable reduction of functions due to impacts, and the amount of mitigation required to offset the impacts. The method also allows for the determination of functional uplift and the number of mitigation bank credits that could be generated for a proposed bank project.

2.0 MITIGATION BANK CREDIT GENERATION

The overall goal of compensatory wetland mitigation is to provide suitable compensation that will meet the federal policy of No-Net-Loss of wetland functions and services first established by Executive Order 11990 under President George H.W. Bush in 1990 and supported in subsequent administrations. Compensatory mitigation is typically provided in the form of wetland restoration, establishment (creation), enhancement or preservation, or a combination of these approaches. The expected outcome is a net increase in wetland functions and services.

The National Research Council published guidelines for the improvement of wetland mitigation (NRC, 2001) which included the use of wetland functional assessments to determine appropriate wetland mitigation ratios; this was further supported by the 2008 *Final Rule for Compensatory Mitigation for Losses of Aquatic Resources* (2008 Mitigation Rule). While there are many different models and approaches nationally, presently there are few models appropriate for use in the New York City region. In addition, the models or assessment methods are typically not designed to estimate the amount of mitigation required or bank credit generation.

For each mitigation approach, some U.S. Army Corps of Engineers (USACE) Regulatory Districts' and State agencies have employed the use of mitigation ratios to determine the amount of mitigation area required to offset a certain area of impact. This practice has also been extended to mitigation banks. The New York State Department of Environmental Conservation (NYSDEC) does not have set mitigation ratios for different mitigation approaches, but addresses each mitigation project on a case by case basis.

With the implementation of the 2008 Mitigation Rule, the USACE and the United States Environmental Protection Agency (USEPA) clearly set a preference for the use of ecological assessments as the means to establish the number of credits generated from a mitigation bank. As stated in the §332.8(o)(3) of the Rule:

> "Credit production. The number of credits must reflect the difference between pre- and post-compensatory mitigation project site conditions, as determined by a functional or condition assessment or other suitable metric".

Presently, functional assessment tools have been used within the USACE New York District to demonstrate that a proposed mitigation approach would result in an ecological uplift if implemented, and provided the justification to regulatory agencies to issue permits. The methods used have limitations in that the results are not quantifiable into a single unit and easily translated into mitigation credits. The use of UMAM as an ecological assessment method to determine the credits generated from a wetland mitigation bank offers several advantages over the alternative approach of using a more arbitrary and less scientific approach of applying negotiated mitigation ratios. The advantages include:

- Practical process that relies on reasonable scientific judgment;
- Can be applied within typical permit and bank development timeframes;
- The credit generation process is linked to a measurement of ecological uplift obtained from proposed actions;
- Method assesses both existing conditions and post-restoration conditions to generate an overall score or measurement of ecological uplift for a single assessment area, which is then converted to credits; and
- Provides consistent determination process and encourages collaboration between regulatory agencies and bank sponsors.

Based on these advantages, the use of UMAM was determined to be the preferred approach for defining the ecological uplift and credit generation for the Pilot Bank.

3.0 DESCRIPTION AND APPLICATION OF THE UNIFIED MITIGATION ASSESSMENT METHOD

3.1 Description of Methodology

The Uniform Mitigation Assessment Method (UMAM) was developed in 2004 by the Florida Department of Environmental Protection (FDEP) and various Water Management Districts

(WMDs) in response to the need to better track wetland functional losses and gains from impacts and mitigation projects and banks. The methodology provides a standardized framework to assess wetland functions for baseline and post-mitigation conditions for assessment areas using a qualitative description and quantitative scoring.

Part I of the assessment method is a qualitative characterization process that summarizes available descriptive information of the assessment area and surrounding features. Information sources include online databases, wetland field guides or other relevant publications, and information gained from a field visit. The purpose of the qualitative assessment is to provide a sufficient amount of detail about the assessment area to evaluate and identify the functions and wildlife resources associated with the site. This “frame of reference” informs the second part of the assessment method, the quantitative assessment.

Part II of the assessment method is a quantitative assessment of three broad Functional Assessment categories: Location and Landscape Support, Water Environment, and Community Structure. Each of these sections are characterized using a series of guidance statements defining the attributes or functions of the assessment area that are each scored on a scale of 0 to 10. A score of 10 indicates that the function or attribute is optimal within the assessment area, and a score of 0 indicates the function or attribute is absent. This portion of the assessment method relies on best professional judgment, site knowledge of the evaluator(s) and the interpretation of guidance statements.

For each of the three functional assessment categories, an overall score of the assessment area for current and proposed conditions is estimated (not averaged) based on the evaluators’ interpretation of the individual attribute score assignments. The scores are then used to calculate mitigation ratios or mitigation bank credits for the assessment areas. The UMAM also includes score adjustments or modifiers for preservation, time lag, and risk factors.

While the methodology was originally prepared for use in Florida, it has since been used in other states. The qualitative assessment process in Part I is sufficiently general to be applicable to New York wetland systems since it relies on information obtained from State and local sources as well as a site visit. The field procedures and data collection conducted during the site visit corresponds to the same approach typically employed for a wetland mitigation site selection evaluation.

The quantitative assessment in Part II utilizes specific guidance statements that define attributes or functions of the assessment area. Since the method was developed for use in freshwater and tidal wetlands in Florida, certain aspects of the guidance statements and supporting documentation and examples are not applicable to tidal wetlands in the NYC region; however, the majority of the guidance statements are appropriate for use. In addition, the functional assessment categories of Location and Landscape Support, Water Environment, and Community Structure each encompass a range of attributes that cover tidal wetland functions and services associated with tidal wetlands in New York City. Table 1 depicts the correlation between UMAM functional assessment categories and corresponding tidal wetland functions and services described in the *New York State Salt Marsh Restoration and Monitoring Guidelines* (NYSDOS and NYSDEC, 2000).

Table 1: UMAM Functional Assessment Categories with Attribute Guidance Correlated to Tidal Wetland Functions and Services

UMAM Functional Assessment Category	Tidal Wetland Functions and Services, NY
Location and Landscape Support	Provision of Habitat
	Support of Food Web Dynamics
	Storage of Floodwater
Water Environment	Provision of Habitat
	Support of Food Web Dynamics
	Cycling of Nutrients
	Export of Organic Matter
	Attenuation of Wave Energy
	Enhancement of Sedimentation/Accretion
Community Structure	Provision of Habitat
	Primary Production
	Support of Food Web Dynamics
	Cycling of Nutrients
	Enhancement of Sedimentation/Accretion

3.2 Evaluation and Application of UMAM to the Pilot Mitigation Bank

3.2.1 Potential Credit Generation

The potential credit generation using the UMAM methodology was first evaluated using a subset of the Pilot Bank area that represents potential wetland enhancement, restoration, and buffer enhancement mitigation approaches.

The procedure as outlined above was followed beginning with Part I – Qualitative Characterization, which required the team to identify information sources that served the equivalent purpose and provided similar information to that required by the UMAM. Equivalent information was readily available from several sources, including the *New York State Salt Marsh Restoration and Monitoring Guidelines* (NYSDOS and NYSDEC, 2000), the *Ecological Communities of New York State, 2nd Edition* (NYNHP 2002), and various online data sources. Aerial photographs and *Bing* Birds-Eye View imagery was used to assess site conditions during the initial evaluation of UMAM procedures.

Part II of the methodology was completed utilizing a team approach to evaluate each attribute and assign scores following the guidelines included in the methodology. In the absence of detailed site knowledge, a conservative approach was taken when selecting attribute scores. Also as part of this process, each question was evaluated for its relevance to tidal wetlands, particularly in the northeast and New York City region. This UMAM evaluation process was useful in evaluating functional category attributes that required rewording or removal to create a UMAM procedure that was more appropriate to the Pilot Bank site and region.

3.2.2 Modifications to UMAM

As noted, the UMAM process was evaluated during this preliminary application to identify areas where potential changes to the method may be required to adapt the procedure to use for coastal wetlands in the NYC area. Through the review the following items were noted:

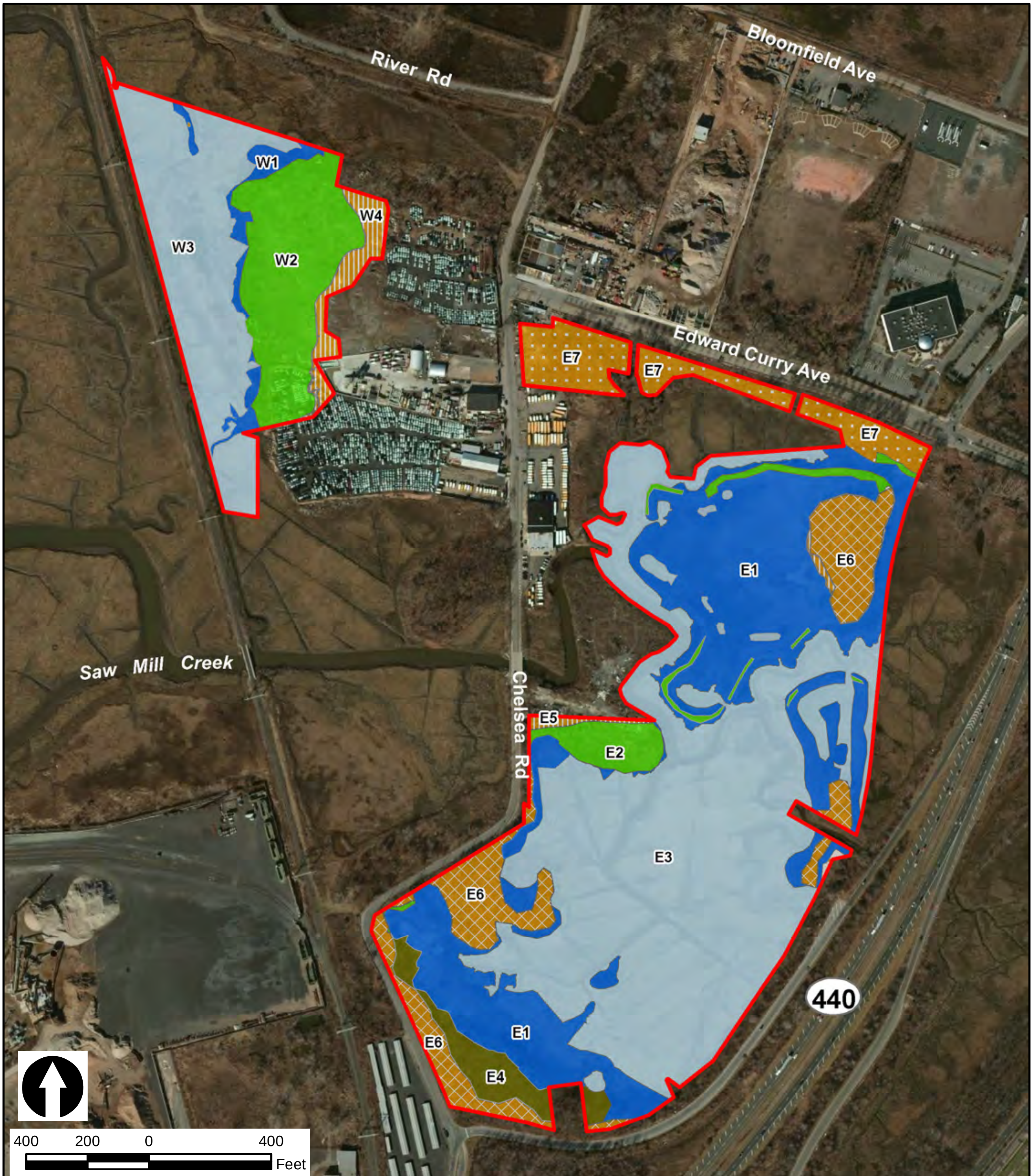
- The main format, structure and scoring process of UMAM is appropriate for use with tidal wetlands and can be adopted for application in the NYC region.
- Some of the attribute statements could be reworded to clarify their intent and strengthen the overall assessment.
- Some attribute statements (three) can either be removed entirely due to their Florida-specific nature or incorporated into other subject-linked attribute statements.
- Additional attribute statements can be added to the Location and Landscape Support category to address societal or recreational benefits of coastal wetlands.
- The method should incorporate a comment section for each attribute to record the evaluator's justification for score selection.
- The guidance document requires revision to provide appropriate regional examples and further clarity on the evaluation and scoring of certain attributes.
- The score adjustments or modifiers for preservation, time lag, and risk factors did not affect the outcome for wetland mitigation banks.

Based on the evaluation of the UMAM procedure, several improvements and additions to the UMAM process were made. The changes range from items as simple as numbering each box on the assessment forms to correlate with the guidance text, to providing summary tables of descriptive information to facilitate completion of the site characterization. The modified UMAM Guidance Documents are provided as follows: Appendix A-Standardized Field Protocol; Appendix B-Location and Landscape Support Guidance Module; Appendix C-Water Environment Guidance Module; Appendix D-Community Structure Guidance Module; Appendix E-Expected Variation Guidance Module; and Appendix F-Adjustment Factors Guidance.

3.2.3 Application of Modified UMAM to Pilot Bank

The modified UMAM procedure was applied to the proposed 68.94-acre Pilot Bank. Figure 1 outlines the Assessment Areas used in this evaluation. Representative photographs of the Assessment Areas are provided in Appendix G and the completed Part I and Part II information and score sheets are presented in Appendix H. The mitigation approaches applied to the assessment areas consist of wetland enhancement, wetland restoration (rehabilitation), wetland restoration (re-establishment) and upland buffer rehabilitation. These mitigation approaches follow the definitions provided in the 2008 Mitigation Rule and the NYSDEC Mitigation Guidance.

A similar procedure as outlined above for the initial UMAM assessment was followed. The Team began with Part I – Qualitative Characterization, which utilized readily available information from several sources, including the *New York State Salt Marsh Restoration and Monitoring Guidelines* (NYSDOS and NYSDEC, 2000), the *Ecological Communities of New York State, 2nd Edition* (NYNHP 2002), aerial imagery, and recent site visits and site observations.



Project Site

Assessment Areas

- W1 - Wetland Rehabilitation (1.02 ac)
- W2 - Wetland Reestablishment (5.17 ac)
- W3 - Tidal Wetlands Enhancement (7.69 ac)
- W4 - Upland Buffer Rehabilitation Slope (1.12 ac)
- E1 - Wetland Rehabilitation (15.70 ac)
- E2 - Wetland Reestablishment (1.87 ac)
- E3 - Tidal Wetlands Enhancement (26.03 ac)
- E4 - Forested Wetland Enhancement (1.52 ac)
- E5 - Upland Buffer Rehabilitation Slope (0.33 ac)
- E6 - Upland Buffer Rehabilitation Forest (5.19 ac)
- E7 - Upland Buffer Rehabilitation Edward Curry Road Area (3.3 ac)

NYCEDC
New York City Economic Development Corporation

Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York

Assessment Areas

Louis Berger & Assoc, PC

March 2015

Figure 1

Sources: ESRI BING Imagery Map Service, 2015; Concept Plan, Louis Berger & Assoc, PC, 2013.

Part II of the methodology was completed utilizing a team approach to evaluate each attribute and assign scores following the methods described in Part 4.0 and the functional category guidelines included in the Appendices. The results of the assessment are summarized in Table 2.

The credit generation for each mitigation approach was converted to a ratio. Overall, the method provides a credit generation ratio that is generally consistent with previously applied ratios for rehabilitation (~2:1), re-establishment (~1:1) and enhancement (10:1). A main advantage of the credit generation ratio with the UMAM procedure is that it is based on an ecological assessment process that is sensitive to the attributes of an individual site assessment area and not the static application of a set of ratios.

The ecological uplift obtained for each mitigation approach varied by assessment area and was tied to key drivers that affected some attributes more than others, leading to a net increase in the functional category scores. The following sections summarize the general assessment area conditions, the proposed mitigation actions, and the factors affecting the functional improvements and attribute scoring.

Reference Standard Wetland

Reference standard wetlands provide examples of healthy ecosystems and indicate the potential for restoration of nearby disturbed sites. The functions and services of reference standard wetlands are characteristic of the least-altered wetlands. They provide a physical representation of functioning wetland ecosystems that can be observed and measured. Application of the UMAM to a Reference Standard Wetland provides an indication of the possible functional uplift that could be obtained by a nearby Mitigation Site or Bank.

An approximately 7-acre Reference Standard Wetland is located north of the Pilot Bank, on the west side of Chelsea Road. The Reference Wetland is bounded by the Williams-Transco underground natural gas pipeline to the south, railroad tracks to the west, and River Road to the north and east. While the Reference Site is near the Pilot Bank, the Reference Site is functionally superior to the Project Site as it generally lacks historic fill and non-native vegetation. The UMAM assessment of the Reference Standard Wetland generated a score of 0.87, which is likely the highest score that a wetland could obtain in this geographic area.

Location and Landscape Support attributes and related functions are fairly high due to the presence of a native plant community but are limited by surrounding land uses (railroad, pipeline road) as is typical in this urban environment.

Water Environment attributes and functions are high due to the open tidal circulation in the wetland.

The Community Structure attributes and functions are high due to the diverse native plant community and the lack of invasive species.

Wetland Restoration (Rehabilitation) Assessment Areas

As defined by the 2008 Federal Rules for wetland mitigation (33 CFR 332.2), wetland restoration (rehabilitation) means the manipulation of the physical, chemical, or biological characteristics of

Table 2: Summary of UMAM mitigation bank credit generation

	Functional Assessment Category	W1 - Tidal Wetland Restoration (Rehabilitation)		W2 - Wetland Restoration (Re-establishment)		W3 - Tidal Wetland Enhancement		W4 - Upland Buffer Rehabilitation$_{SLOPE}$		Wetland Reference Site
		Current Condition	With Rehabilitation	Current Condition	With Re-establishment	Current Condition	With Enhancement	Current Condition	With Rehabilitation	Current Condition
West	Location & Landscape	4	7	0	7	6	7	4	6	8
	Water Environment	4	9	0	9	8	9	0	0	9
	Community Structure	3	9	0	9	9	9	5	8	9
	Score	*0.367*	*0.833*	*0.00*	*0.83*	*0.77*	*0.87*	*0.45*	*0.70*	*0.87*
	Functional Uplift (Delta)	0.467		0.83		0.10		0.25		n/a
	Acres	1.02		5.17		7.69		1.12		7
	Mit. Credits (relative functional gain x acres)	0.48		4.31		0.77		0.28		n/a
	Mit. Ratio (Acres/credits)	**2.14**		**1.20**		**10.00**		**4.00**		**n/a**

	Functional Assessment Category	E1 - Tidal Wetland Restoration (Rehabilitation)		E2 - Wetland Restoration (Re-establishment)		E3 - Tidal Wetland Enhancement		E4 - Forested Wetland Enhancement	
		Current Condition	With Rehabilitation	Current Condition	With Re-establishment	Current Condition	With Enhancement	Current Condition	With Enhancement
East	Location & Landscape	4	7	0	7	6	7	6	7
	Water Environment	4	9	0	9	8	9	9	9
	Community Structure	3	9	0	9	9	10	8	9
	Score	*0.37*	*0.83*	*0.00*	*0.83*	*0.77*	*0.87*	*0.77*	*0.83*
	Functional Uplift (Delta)	0.47		0.83		0.10		0.07	
	Acres	15.70		1.87		26.03		1.52	
	Mit. Credits (relative functional gain x acres)	7.33		1.56		2.60		0.10	
	Mit. Ratio (Acres/credits)	**2.14**		**1.20**		**10.00**		**15.00**	

	Functional Assessment Category	E5 - Upland Buffer Rehabilitation SLOPE		E6 - Upland Buffer Rehabilitation Forest		E7 - Upland Buffer Rehabilitation EDWARD CURRY AVE		UPLAND BUFFER TOTALS (East and West)
		Current Condition	With Rehabilitation	Current Condition	With Rehabilitation	Current Condition	With Rehabilitation	
East	Location & Landscape	5	6	6	7	4	5	
	Water Environment	0	0	0	0	0	0	
	Community Structure	5	8	8	9	4	7	
	Score	*0.5*	*0.7*	*0.7*	*0.8*	*0.4*	*0.6*	
	Functional Uplift (Delta)	0.20		0.10		0.20		
	Acres	0.33		5.19		3.30		9.54
	Mit. Credits (relative functional gain x acres)	0.07		0.52		0.66		1.43
	Mit. Ratio (Acres/credits)	**5.00**		**10.00**		**5.00**		**6.69**

The proposed credit ratios for the Pilot Bank are highlighted in blue.

a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Assessment Area W1, approximately 1.02 acres within the northeast and southern portions of the western section of the site, is currently wetland dominated by fill and invasive *Phragmites*. Survey data indicates that elevations in this area are too high to support salt marsh species due to the past placement of fill material.

Assessment Area E1, approximately 15.70 acres within the eastern section of the site, consists of *Phragmites*-dominated remnant berms and wetlands at elevations that are too high to support salt marsh species, as well as a barren panne located east of an island in the northeast that only holds water at its western extremity.

The rehabilitation assessment areas have very little connectivity to tidal flow, little microtopography, extremely low plant species diversity, and supports few wildlife species. These areas would be restored through removal of debris, herbicide treatment and mowing/cutting of *Phragmites*, excavation of historic fill material to provide suitable tidal marsh elevations, excavation of tidal channels, and replanting with native salt marsh grasses and shrubs. These areas would be managed for any reinvasion by *Phragmites* through herbicide treatment under a long term management plan and protected in perpetuity.

Rehabilitation activities would restore tidal hydrology, create appropriate microtopography, establish a native salt marsh plant community, and promote greater wildlife use, significantly improving Location and Landscape Support attributes and related functions. Additionally, improved connectivity would reduce the adverse effects of adjacent land condition and use. Rehabilitation activities of the adjacent, invasive-dominated upland buffer areas would further improve Location and Landscape Support functions.

Water Environment attributes and related functions would be much improved by proposed rehabilitation activities. Rehabilitation of tidal hydrology and microtopography would establish native salt marsh plant community zonation, restore appropriate tidal soil moisture conditions, increase use by tidally-dependent wildlife species, and improve flushing of runoff from adjacent land uses and overall water quality.

Rehabilitation activities would dramatically improve the assessment area's plant community structure. The resulting plant community would be a healthy, thriving salt marsh characterized by a diversity of native species with abundant seed production and recruitment, and a high degree of plant cover. Any reinvasion by *Phragmites* would be minimal and managed under a long term management plan.

Wetland Restoration (Re-establishment) Assessment Areas

As defined by the 2008 Federal Rules for wetland mitigation (33 CFR 332.2), wetland restoration (re-establishment) means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

Approximately 5.17 acres of wetland will be re-established within the western section of the site (Assessment Area W2). This AA consists of construction/demolition debris and other fill material over former marshlands. This material will be removed and the area graded to marsh elevations, tidal creeks will be excavated to restore tidal flow and circulation, and the marsh plain will be planted with appropriate native salt marsh grasses and shrubs.

Approximately 1.87 acres of wetlands will be re-established within the eastern section of the site (Assessment Area E2). This AA consists of a former junkyard area located south of Saw Mill Creek and east of Chelsea Road. The area will be restored through the removal of existing debris (tires, cement, asphalt, etc.) and excavating the fill to target elevations that will support tidal hydrology and planted with native salt marsh species. The AA also includes portions of remnant berms that consist of uplands dominated by invasive species. These berms will be removed and the area will be graded to an appropriate marsh plain elevation and planted with native salt marsh species.

These assessment areas currently lack wetland functions and have minimal value as upland habitat. Restoration activities include the removal of upland fill and existing debris to create elevations that will support tidal salt marsh habitat. The areas will be graded to suitable tidal marsh elevations, tidal creeks will be excavated to restore tidal flow, microtopography will be established, and the marsh plain will be replanted with native salt marsh grasses and shrubs.

For re-establishment areas, the baseline scores for functional assessment categories reflect the non-wetland condition of the site and are scored with a 0 for each attribute. Restoration activities would restore tidal hydrology, create appropriate microtopography, establish a native salt marsh plant community, and promote greater wildlife use, significantly improving Location and Landscape Support attributes and related functions. Additionally, improved connectivity with other marsh habitats would reduce the adverse effects of adjacent land condition and use. Rehabilitation activities within the adjacent, invasive-dominated upland buffer areas would further improve Location and Landscape Support functions.

Water Environment attributes and related functions would be re-established by proposed restoration activities. Re-establishment of tidal hydrology and microtopography would facilitate native salt marsh plant community zonation, restore appropriate tidal soil moisture conditions, allow use of habitat by tidally-dependent wildlife species, and establish tidal flushing of runoff from adjacent land uses to improve overall water quality.

Restoration activities would re-establish the assessment area plant community structure. The resulting plant community would be a healthy, thriving salt marsh characterized by a diversity of native species with abundant seed production and recruitment, and a high degree of plant cover. Any reinvasion by *Phragmites* would be minimal and managed under a long term management plan.

Wetland Enhancement Assessment Areas

The Final Rule for Compensatory Mitigation for Losses of Aquatic Resources (33 CFR 332.2) defines enhancement as the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Tidal wetland enhancement areas consist of functioning low and high marsh dominated by native plant species, as well as several pannes. Within the western section of the site, approximately 7.69 acres of tidal wetland (Assessment Area W3) will be enhanced. Within the eastern section of the site, approximately 26.03 acres of tidal wetland (Assessment Area E3) will be enhanced. Based on conditions within the site, it is expected that *Phragmites* will continue to spread, threatening wetland habitats and degrading functions over time, especially in the eastern section where there are several freshwater inputs. In addition, these marshes are threatened by pervasive dumping in the area. Existing debris will be removed and *Phragmites* will be managed during the life of the Bank to prevent future decline of these wetlands.

An approximately 1.52 acre red maple-sweetgum swamp located within the southern portion of the eastern section of the site (Assessment Area E4) contains storm surge debris that will be removed to enhance habitat quality and function. To prevent the decline of this wetland, encroachment of invasive species (*Phragmites*, Japanese knotweed, etc.) into this area will be managed through select herbicide application and/or cutting.

By enhancing these wetlands as part of a mitigation bank, the threat of illegal filling and dumping within the tidal and forested wetlands is minimized. The design will include impediments to dumping to the maximum extent possible. Subsequent to site construction and planting, the site will be posted and frequently inspected.

Location and Landscape Support attributes and related functions would be improved through the protection of the native plant community. Restoration of the adjacent, invasive-dominated wetland areas would further improve habitat connectivity to adjacent natural plant communities.

Water Environment attributes and functions would be slightly improved due to the restoration of adjacent wetland areas and rehabilitation of upland buffers.

The Community Structure attributes and functions would also be improved through prevention of invasive species encroachment and maintaining a sustainable native plant community. The assessment area would be managed for invasive species under a long term management plan and protected in perpetuity.

Upland Buffer Rehabilitation Assessment Areas

As defined by the 2008 Federal Rules for wetland mitigation (33 CFR 332.2), buffer means an upland, wetland, and/or riparian area that protects and/or enhances aquatic resource functions associated with wetlands, rivers, streams, lakes, marine, and estuarine systems from disturbances associated with adjacent land uses. Upland buffers within the site will be rehabilitated to further protect and enhance adjacent wetlands and their associated functions.

On the west side, Assessment Area W4 is an approximately 1.12 acre upland slope currently dominated by invasive species and debris. This area contains Hurricane Sandy storm surge-driven debris as well as historic debris such as tires, plastic containers, and other floatable debris. Upland buffer rehabilitation Assessment Areas within the eastern section (E5 – 0.33 acres, E6 – 5.19 acres, and E7 -3.3 acres) consists of upland slope and upland forest containing debris and non-native, invasive species that compromise native diversity and wildlife usage. These upland areas will be rehabilitated through removal of debris and non-native, invasive species. Invasive species include, but are not limited to, *Polygonum cuspidatum* (Japanese knotweed), *Celastrus orbiculatus* (Oriental bittersweet), and tree-of-heaven. These and other dominant non-native invasive species will be managed through herbicide application and/or cutting, and by the seeding and/or planting of native species. Subsequent to site construction and planting, the site will be posted and frequently inspected to discourage dumping.

Location and Landscape Support attributes and related functions would be improved through the establishment of a native plant community, promoting greater wildlife use and improving functions as a buffer to wetlands. Additionally, improved connectivity would reduce the adverse effects of adjacent land condition and use. Restoration of the adjacent, invasive-dominated wetland areas would further improve habitat connectivity.

The upland assessment area was not scored for Water Environment attributes per the methodology.

The Community Structure attributes and functions would also be improved through the replacement of an invasive species dominated community with a sustainable native plant community. The assessment area would also be managed for invasive species under a long term management plan.

3.2.4 Proposed Mitigation Credits at the Pilot Bank

Based on the application of the Modified UMAM to the site, the following credit ratios and credits are proposed at the Saw Mill Creek Tidal Wetland Mitigation Bank.

Table 3: Proposed Credits Based on UMAM results

Mitigation Type	Acres	Ratio	Credits
Wetland Restoration (Re-establishment)	7.04	1.20 : 1	5.87
Wetland Restoration (Rehabilitation)	16.72	2.14 : 1	7.81
Wetland Enhancement (Tidal)	33.72	10 : 1	3.37
Wetland Enhancement (Forest)	1.52	15 : 1	0.10
Buffer Rehabiliation	9.94	6.69 : 1	1.49
Total	**68.94**		**18.64**

Note: Buffer rehabilitation ratio is averaged among the total credit generation from each buffer assessment area.

4.0 MODIFIED UNIFIED MITIGATION ASSESSMENT METHOD

4.1 INTRODUCTION

Following the careful review and testing of the Uniform Mitigation Assessment Method, the methodology was adopted and modified slightly for use with the Pilot Bank. The modifications do not substantially change the procedures originally developed and tested by the University of Florida Howard T. Odum Center for Wetlands (UF-CFW) and the Florida Department of Environmental Protection (FDEP) in compliance with Chapter 62-345, Florida. The intent of the slight modifications is to increase the method's applicability to coastal wetlands in the New York City region. Additional minor modifications were also made to references and data sources. In general, the modifications consist of:

- Rewording of the attribute statements to clarify their intent and strengthen the overall assessment.
- Removal of attribute statements (three) specific to Florida wetland systems, and combining one related subject-linked attribute statements.
- Adding attribute statements to the Location and Landscape Support functional assessment category to address societal or recreational benefits of coastal wetlands.
- Incorporating a comment section on the Part II data form for each attribute to record the evaluator's justification for score selection.
- Developing a revised guidance document to provide appropriate regional examples and further clarity on the evaluation and scoring of certain attributes.

The intent of the following sections is to provide instruction and guidance to the evaluator in the proper use of the assessment method to evaluate coastal wetlands, surface waters, as well as upland mitigation areas. This method provides a standardized procedure for assessing the functions provided by wetlands and other surface waters, the amount that those functions are reduced by a proposed impact, and the amount of mitigation required offsetting those losses, or the relative amount of wetland bank credits that could be generated.

4.2 BACKGROUND

As the result of a report in 2000 (Report No. 99-40) by the Office of Program Policy Analysis and Governmental Accountability (OPPAGA) that highlighted shortcomings in the State of Florida's mitigation process, the FDEP and water management districts (WMDs) jointly developed the Uniform Mitigation Assessment Method (UMAM) rule (Chapter 62-345, F.A.C.), which became effective in February 2004. Implementation of the Rule led to establishment of the UMAM procedures upon which this assessment methodology is based.

As stated in the background section of the UMAM procedure, UMAM "is designed to assess any type of impact and mitigation, including the preservation, enhancement, restoration, and creation of wetlands, as well as the evaluation and use of mitigation banks, and it provides a framework for statewide standardized wetland assessment across community type and assessor".

Each assessment area is evaluated based a qualitative description and a quantification of the assessment area. Part I of the assessment method is a qualitative characterization process that summarizes available descriptive information of the assessment area and surrounding features. Information sources include online databases, wetland field guides or other relevant publications, and information gained from a field visit. The purpose of the qualitative assessment is to provide a sufficient amount of detail about the assessment area to evaluate and identify the functions and wildlife resources associated with the site. This "frame of reference" informs the second part of the assessment method, the quantitative assessment.

Part II of the assessment method is a quantitative assessment of three broad Functional Assessment categories: Location and Landscape Support, Water Environment, and Community Structure. Each of these sections are characterized using a series of guidance statements defining the attributes or functions of the assessment area that are each scored on a scale of 0 to 10. A score of 10 indicates that the function or attribute is optimal within the assessment area, and a score of 0 indicates the function or attribute is absent. This portion of the assessment method relies on best professional judgment, site knowledge of the evaluator(s) and the interpretation of guidance statements.

For each of the three functional assessment categories, an overall score of the assessment area for current and proposed conditions is estimated (not averaged) based on the evaluators' interpretation of the individual attribute score assignments. The scores are then used to calculate mitigation ratios or mitigation bank credits for the assessment areas, with score adjustments for preservation, time lag, and risk.

4.3 DEFINITIONS

(1) "Assessment area" means all or part of a wetland or surface water impact site, or a mitigation site, that is sufficiently homogeneous in character, impact, or mitigation benefits to be assessed as a single unit.
(2) "Reviewing agency" means the New York State Department of Environmental Conservation and the U.S. Army Corps of Engineers.
(3) "Ecological value" means the value of functions performed by uplands, wetlands, and other surface waters to the abundance, diversity, and habitats of fish, wildlife, and listed species. Included are functions such as providing cover and refuge; breeding, nesting, denning, and nursery areas; corridors for wildlife movement; food chain support; natural water storage, natural flow attenuation, and water quality improvement which enhances fish, wildlife, and listed species utilization.
(4) "Impact site" means wetlands and other surface waters as delineated pursuant to the 1987 Wetland Delineation Manual and applicable Supplements that would be impacted by the project. Uplands shall not be included as part of the impact site.
(5) "Indicators" means physical, chemical, or biological indications of wetland or other surface waters function.
(6) "Invasive Species" for purposes of this methodology means animal and plant species that are outside of their natural range or zone of dispersal and have or are able to form self-sustaining and expanding populations in communities in which they did not previously occur, and consisting of those species listed by NYSDEC as Invasive, available online at

http://www.dec.ny.gov/animals/265.html. Additional information on invasive species as listed on the New York Invasive Species Clearinghouse website, which is incorporated by reference herein, may be found online at http://www.nyis.info/index.php.

(7) "Listed species" means those animal or plant species that are endangered, threatened, or of special concern and are listed by the USFWS or NYSDEC.

(8) "Mitigation credit" or "credit" means a standard unit of measure which represents the increase in ecological value resulting from restoration, enhancement, preservation, or creation activities.

(9) "Mitigation site" means wetlands and other surface waters, or uplands, that are proposed to be created, restored, enhanced, or preserved by the mitigation project.

(10) "With impact assessment" means the reasonably anticipated outcome at an assessment area assuming the proposed impact is conducted.

(11) "With mitigation assessment" means the outcome at an assessment area assuming the proposed mitigation is successfully conducted.

(12) "Without preservation assessment" means the reasonably anticipated outcome at an assessment area assuming the area is not preserved.

(13) "Reference Standard Wetland" means a wetland that is considered good quality and is surrounded by natural land uses, with no external anthropogenic influences.

(14) "Frame of Reference" means when a frame of reference is used as a benchmark for comparing the historical or expected functions of an assessment area with the current functions.

4.4 METHODOLOGY

4.4.1 PART I QUALITATIVE CHARACTERIZATION

An impact or mitigation assessment area must be described with sufficient detail to provide a frame of reference for the type of community being evaluated and to identify the functions that will be evaluated. Part I must be completed before scoring the assessment area in Part II, since this frame of reference will be used to determine the degree to which the assessment area provides those functions and the amount of function lost or gained by the project.

Much of the information in Part I can be compiled in the office using desktop tools, including the NYSDEC Environmental Resource Mapper (ERM) (www.dec.ny.gov/imsmaps/ERM/viewer.htm), and aerial photographs, topographic and other maps, scientific literature, technical reports, and similar information. Other portions should be completed during the site visit, such as the "Assessment Area Description" and "Observed Evidence of Wildlife Utilization."

The last two sections of UMAM Part I are best filled out in the field during the field visit.

PART I – Qualitative Description
(See Section 4.4.1)

(1) Site/Project Name	(2) Application Number	(3) Assessment Area Name or Number	
(4) Habitat Code	(5) Further classification (optional)	(6) Impact or Mitigation Site?	(7) Assessment Area Size
(8) Basin/Watershed Name/Number	(9) Affected Waterbody (Class)	(10) Special Classification (local/state/federal designation of importance)	
(11) Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands Can be filled out in office…………..			
(12) Assessment area description			
(13) Significant nearby features	(14) Uniqueness (considering the relative rarity in relation to the regional landscape.)		
(15) Functions	(16) Mitigation for previous permit/other historic use		
(17) Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found) Use Wetland summary Table & Published Sources	(18) Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)		
(19) Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):			
(20) Additional relevant factors: Can be filled out in office…………..			
(21) Assessment conducted by:	(22) Assessment date(s):		

Form 62-345.900(1), F.A.C. [effective date 02-04-2004]

- Steps For Completing Part 1

1. Identify the assessment areas. For a proposed wetland bank, the assessment areas can be defined by different areas within the project boundary that correspond to different mitigation approaches. For project-specific mitigation actions, the assessment areas are defined by proposed wetland/surface water impact area(s) and proposed mitigation area(s).

2. Compile information for Part I -Qualitative Characterization. Table 4 provides a list of information sources that can be used to complete the information in the corresponding box on the form.

    - Use Environmental Resource Mapper (ERM) to identify wetlands, sensitive natural communities, threatened and endangered species, and water quality classifications for the assessment area and surrounding areas;
    - Identify the ecological communities and land cover of the site and adjacent parcels;
    - Calculate the size of the Assessment area;
    - Determine the basin/watershed name/number;
    - Identify water bodies and their classification;
    - Review maps and aerial photos of the assessment area and surrounding area;
    - Develop Wetland Summary Tables;
    - Print aerial maps (300 feet and 1 mile buffer) of assessment area and locate possible sampling sites based on surrounding landscape and land uses, vegetation signature within sampling area, and size of assessment area.

3. Complete the office portions of Part 1 - Qualitative Characterization for each type of assessment area identified.

4. Conduct Field Visit of the project site and surrounding landscape.

    - Prior to going into the field, obtain regional tidal data and weather data to become familiar with hydrologic influences on the site.
    - In the field, complete Observed Evidence of Wildlife Utilization and Additional Relevant Factors.

        - Observed Evidence of Wildlife Utilization: List species directly observed or other signs such as tracks, droppings, casings, nests, burrows, etc.

        - Additional Relevant Factors: Some additional factors may be identified in the office, for instance recent reports documenting wildlife observations at the site or presence of invasive species. Others may become evident upon a site visit, i.e., changes in surrounding land use since the most recent aerial photographs.

Table 4: UMAM Part 1 Potential Sources of Information

Box	UMAM Box	Guidance and Sources of Information
1	Site/ Project Name	User defined
2	Application Number	N/A
3	Assessment Area Name or Number	Applicant defined Local stream/creek name
4	Habitat Code (community type classification)	Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/wetlands/classwet/index.htm (Version 04DEC1998).
		Edinger, G.J., D.J. Evans, S. Gebauer, T.G. Howard, D.M. Hunt, and A.M. Olivero (editors). 2002. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. (Draft for review). New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY. (http://www.dec.ny.gov/animals/29392.html)
5	Further Classification (Optional)	community type, mitigation approach (restoration, creation, enhancement, preservation, etc.)
6	Impact or Mitigation Site?	User defined
7	Assessment Area Size	Acres
8	Basin/ Watershed Name/Number	Watershed Name, 8-digit HUC Code (USGS Base Map Service - ESRI and its data suppliers; HUC 8 Data - USDA Geospatial Data Gateway, 2012)
9	Affected Waterbody (class)	New York State Section 303 (d) list (http://www.dec.ny.gov/chemical/31290.html),
		NYSDEC's Waterbody Inventory/Priority Waterbodies List for Atlantic Ocean/ Long Island Sound (http://www.dec.ny.gov/chemical/36748.html)
10	Special Classification	(i.e., DEC Wetlands, EPA Priority Wetlands) NYSDEC Geodata Inventory (http://www.dec.ny.gov/geodata/), NYSDEC Interactive online maps
11	Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands	NYSDEC Geodata Inventory (http://www.dec.ny.gov/geodata/), NYSDEC Interactive online maps
12	Assessment Area Description	field visit, professional judgment
13	Significant Nearby features	(national, state, or city parks, forests, reserves, major industry, commercial airports, etc.) NYSDEC Geodata Inventory (http://www.dec.ny.gov/geodata/), NYSDEC Interactive online maps, http://www.nycgovparks.org/maps
14	Uniqueness	aerial photos, scientific literature, professional judgment
15	Functions	Functions performed by the assessment area's native community type: providing cover, substrate, and refuge, breeding, nesting, denning, nursery, wildlife corridors, food chain support, natural water storage, flow attenuation, water quality improvement. Must be related to the benefits provided to fish and wildlife
		Niedowski, Nancy L. 2000. New York State Salt Marsh Restoration and Monitoring Guidelines. New York State Department of State Division of Coastal Resources and New York State Department of Environmental Conservation Division of Fish, Wildlife, and Marine Resources. (http://www.dos.ny.gov/communitieswaterfronts/pdfs/SALTMARSH.PDF)
16	Mitigation for previous permit/ other historic use	aerial photos, scientific literature, NYSDEC and USACE agency contacts
17	Anticipated Wildlife Utilization based on Literature Review	aerial photos, field visit, scientific literature (see supplementary table)
18	Anticipated Utilization by listed species	aerial photos, field visit, scientific literature

4.4.2 PART II QUANTIFICATION OF ASSESSMENT AREA

Part II of the UMAM procedure must be conducted in the field at the Assessment Area. A Standardized Field Protocol (SFP) for conducting the site assessment is provided in Appendix A and should be reviewed and implemented prior to conducting the scoring of the UMAM Part II functional assessment categories described below.

- Steps for completing Part II

The generalized sequence for completing Part II of UMAM is outlined below:

1. Review UMAM Part I -Qualitative Characterization, and make any necessary adjustments to Geographic Relationships/Hydrologic Connections, Description, and Significant Nearby Features.

2. Consult maps and aerial photographs obtained in Part I -Qualitative Characterization to verify the correct Assessment Area.

3. Consult other information obtained in Part I, such as weather data, tidal conditions, Field Guides etc. to become familiar with conditions, species, etc. that are likely to be encountered.

4. On aerial photographs, determine locations of wetland/water body edge and tentative locations of walking transects based on Standardized Field Protocol.

5. Conduct the Standardized Field Protocol.

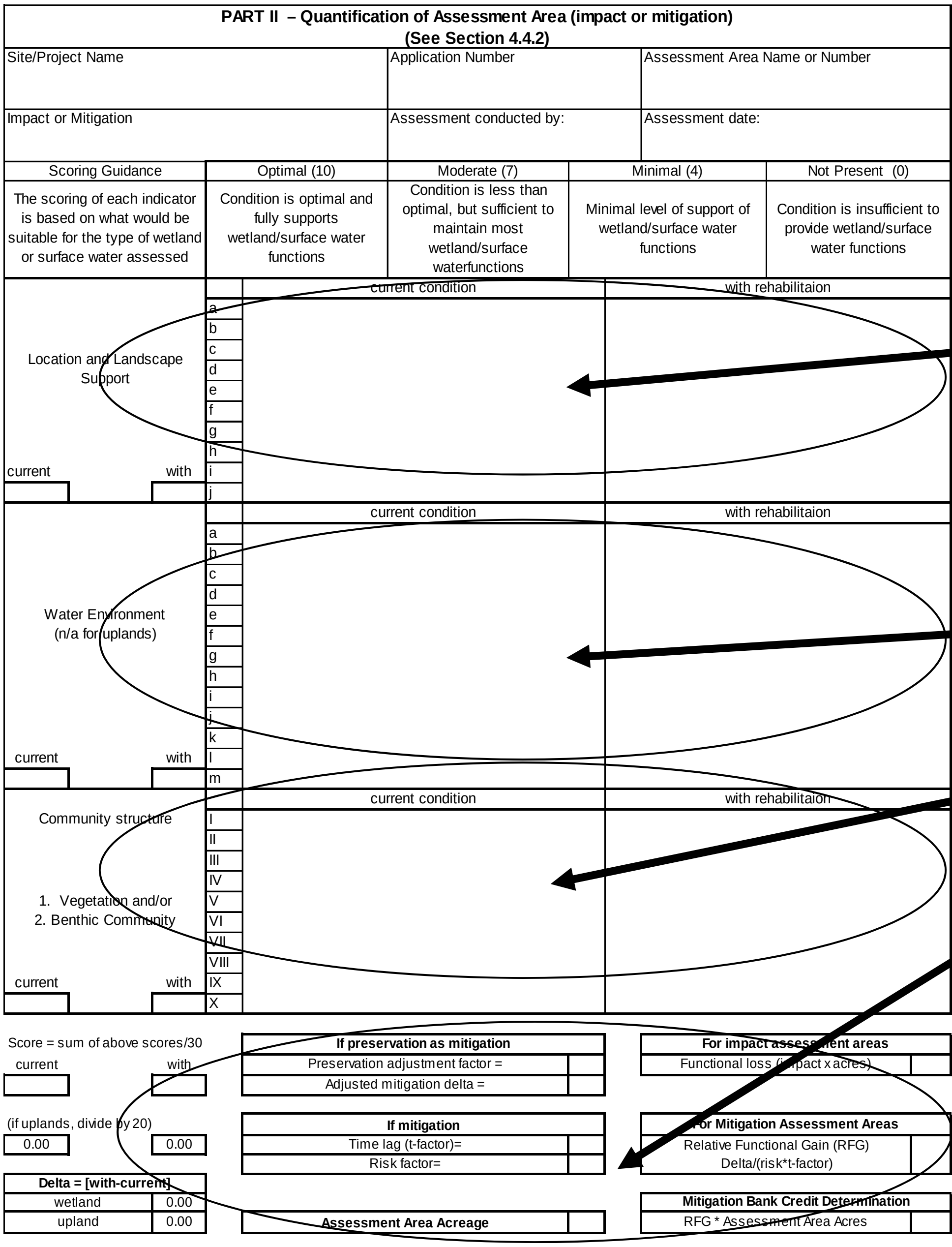
6. Score the three Functional Assessment Categories and record attribute score justification:

    - Location and Landscape Support
    - Water Environment
    - Community Structure

7. Calculate final overall score with adjustments.

- **Scoring UMAM Part II**

There are three sections for scoring:



PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Impact or Mitigation	Assessment conducted by:	Assessment date:

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

		current condition	with rehabilitaion
Location and Landscape Support	a, b, c, d, e, f, g, h, i, j		
current / with			
Water Environment (n/a for uplands)	a, b, c, d, e, f, g, h, i, j, k, l, m		
current / with			
Community structure 1. Vegetation and/or 2. Benthic Community	I, II, III, IV, V, VI, VII, VIII, IX, X		
current / with			

Score = sum of above scores/30
current with

(if uplands, divide by 20)
0.00 0.00

Delta = [with-current]	
wetland	0.00
upland	0.00

If preservation as mitigation
Preservation adjustment factor =
Adjusted mitigation delta =

If mitigation
Time lag (t-factor)=
Risk factor=

Assessment Area Acreage

For impact assessment areas
Functional loss (impact x acres)

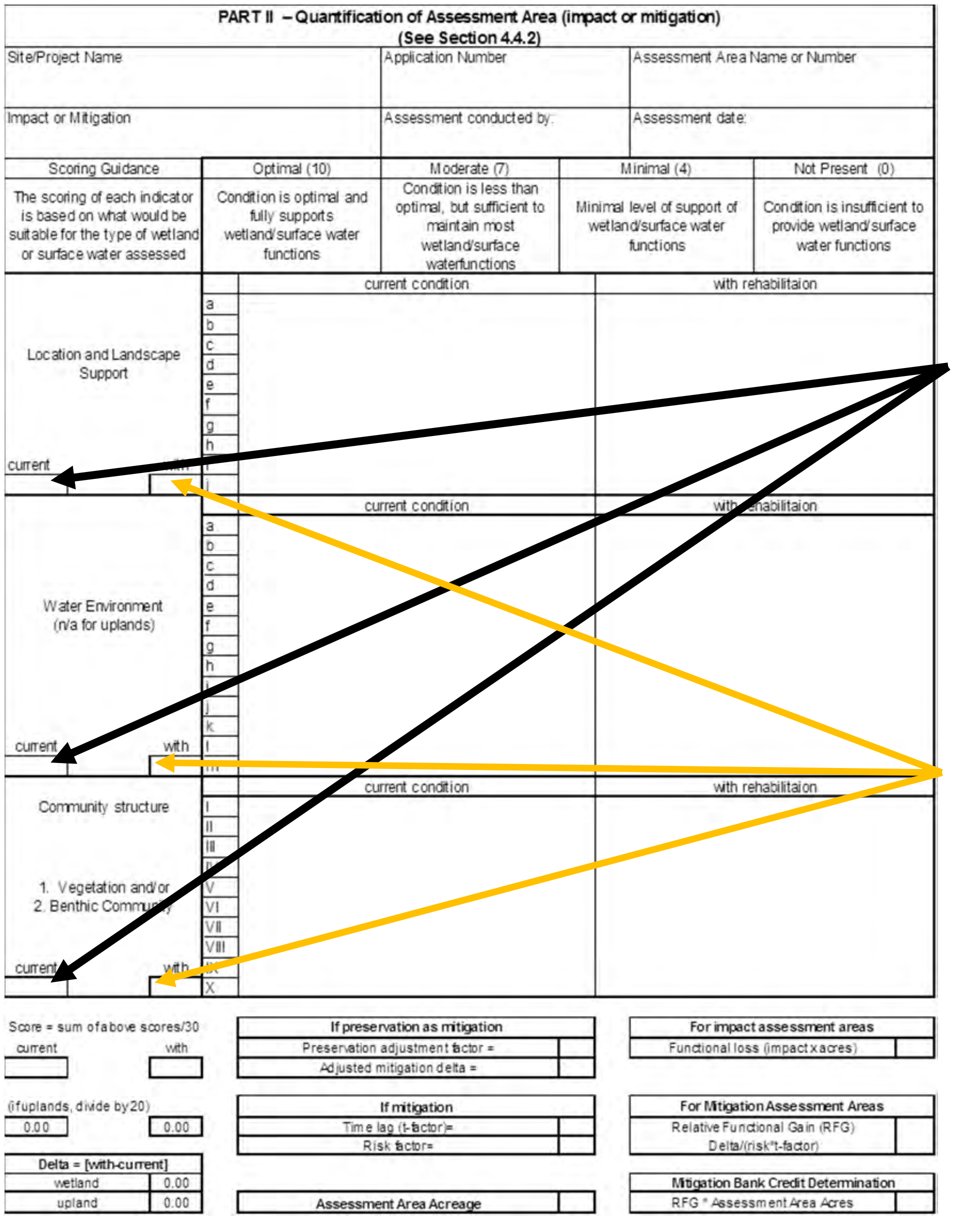
For Mitigation Assessment Areas
Relative Functional Gain (RFG)
Delta/(risk*t-factor)

Mitigation Bank Credit Determination
RFG * Assessment Area Acres

- Location and Landscape Support;
- Water Environment;
- Community Structure;

and a final section to calculate relative functional loss or gain of assessment area as adjusted by preservation, time lag, and risk.

Each impact assessment and each mitigation assessment area must be evaluated under two conditions:



PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Impact or Mitigation	Assessment conducted by:	Assessment date:

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

		current condition	with rehabilitaion
Location and Landscape Support (current / with)	a, b, c, d, e, f, g, h, i, j		
Water Environment (n/a for uplands) (current / with)	a, b, c, d, e, f, g, h, i, j, k, l, m		
Community structure 1. Vegetation and/or 2. Benthic Community (current / with)	I, II, III, IV, V, VI, VII, VIII, IX, X		

Score = sum of above scores/30
current | with

(if uplands, divide by 20)
0.00 | 0.00

Delta = [with-current]	
wetland	0.00
upland	0.00

If preservation as mitigation
Preservation adjustment factor =
Adjusted mitigation delta =

If mitigation
Time lag (t-factor)=
Risk factor=

Assessment Area Acreage

For impact assessment areas
Functional loss (impact x acres)

For Mitigation Assessment Areas
Relative Functional Gain (RFG)
Delta/(risk*t-factor)

Mitigation Bank Credit Determination
RFG * Assessment Area Acres

a) Current condition (or without preservation in the case of preservation mitigation);

b) "With impact" or "With mitigation". These assessments are based on the reasonably expected outcome, which may represent an increase, decrease, or no change in value relative to the current condition.

Location and Landscape Support

The value of functions provided by an assessment area to fish and wildlife are influenced by the landscape position of the assessment area and its relationship with surrounding areas. If surrounding habitats are unavailable, poorly connected, or degraded, then the value of functions provided by the assessment area to the fish and wildlife identified in Part I is reduced. The availability, connectivity, and quality of offsite habitats, and offsite land uses which might adversely impact fish and wildlife utilizing these habitats, are factors to be considered in assessing the location of the assessment area.

Refer to Appendix B- Location and Landscape Support Guidance Module, for a complete description of this indicator category.

Ten attributes are identified to evaluate this category. To provide guidance, examples that depict variation in conditions for each of the attributes are included.

- Support to wildlife by outside habitats
- Invasive exotics or other invasive plant species in proximity of the assessment area
- Wildlife access to and from outside – distance and barriers
- Functions that benefit fish and wildlife downstream – distance or barriers
- Impacts of land uses outside assessment area to fish and wildlife
- Benefits to downstream or other hydrologically connected areas
- Benefits to downstream habitats from discharges
- Protection of wetland functions by upland mitigation assessment areas.
- Protection for uplands from flooding and storm surge
- Site elevations sufficient to adapt to effects of sea level rise.

Users are cautioned that not all attributes are applicable to all assessment areas, and in some cases some attributes may be more relevant than others.

The final score for the Location and Landscape Support category is a reflection of the overall condition of an assessment area, taking into consideration all applicable attributes (do not score each attribute and average them in the end, but rather think of this in terms of what final score best fits the overall conditions of the assessment area). Any whole number score between 0-10 may be used.

The method provides a list of descriptors of attributes for 4 categories of scores as guidance:

- A score of (10) means the assessment area is ideally located and the surrounding landscape provides full opportunity for the assessment area to perform beneficial functions at an optimal level.

- A score of (7) means that, compared to the ideal location, the location of the assessment area limits its opportunity to perform beneficial functions to 70% of the optimal ecological value.

- A score of (4) means that, compared to the ideal location, the assessment area location limits its opportunity to perform beneficial functions to 40% of the optimal ecological value.

- A score of (0) means that the location of the assessment area provides no habitat support for wildlife utilizing the assessment area and no opportunity for the assessment area to provide benefits to fish and wildlife outside the assessment area.

A Summary Worksheet for Location and Landscape Support is included to help in the field assessment scoring.

- **Water Environment**

The quantity of water in an assessment area, including the timing, frequency, depth and duration of inundation or saturation, flow characteristics, and the quality of that water, may facilitate or preclude its ability to perform certain functions and may benefit or adversely impact its capacity to support certain wildlife. If the water environment is degraded, then the value of functions provided by the assessment area to the fish and wildlife identified in Part I is reduced.

Refer to Appendix C-Water Environment Guidance Module for a complete description of this indicator category.

Fourteen attributes are identified to evaluate this category. To provide guidance, examples that depict variation in conditions for each of the attributes are included.

- Tidal Regime
- Water level indicators/ hydroperiod
- Soil moisture
- Soil erosion or deposition
- Vegetation -community zonation
- Vegetation – hydrologic stress
- Use by animal species with specific hydrological requirements
- Plant community composition – species tolerant of and associated with water quality degradation or flow alteration
- Direct observation of standing water
- Existing water quality data
- Water depth, currents and light penetration
- Wave energy, fetch
- Tidal marsh stability

Users are cautioned that not all attributes are applicable to all assessment areas, and in some cases some attributes may be more relevant than others.

The final score for the Water Environment category is a reflection of the overall condition of an assessment area, taking into consideration all applicable attributes (<u>do not score each attribute</u>

and average them in the end, but rather think of this in terms of what final score best fits the overall conditions of the assessment area). Any whole number score between 0-10 may be used.

The rule lists descriptors of attributes for 4 categories of scores as guidance:

- A score of (10) means that the hydrology and water quality fully supports the functions and provides benefits to fish and wildlife at optimal capacity for the assessment area.
- A score of (7) means that the hydrology and water quality supports the functions and provides benefits to fish and wildlife at 70% of the optimal capacity for the assessment area.
- A score of (4) means that the hydrology and water quality supports the functions and provides benefits to fish and wildlife at 40% of the optimal capacity for the assessment area.
- A score of (0) means that the hydrology and water quality does not support the functions and provides no benefits to fish and wildlife.

A Summary Worksheet for the Water Environment is included to help in the field assessment scoring.

- **Community Structure**

Each impact and mitigation assessment area is evaluated with regard to its characteristic community structure. In general, a wetland or other surface water is characterized either by plant cover or by open water with a submerged benthic community.

When an Assessment Area has plant cover present, the area is assessed using the "Vegetation and Structural Habitat" section. Non-vegetated areas with a benthic community are assessed using the "Benthic Communities" section. If the assessment area includes both plant cover and submerged benthic communities, then both of these indicators are scored and the resulting scores are averaged to obtain a single community score. Refer to Appendix D for a complete description of this indicator category.

1. Vegetation and Structural Habitat

The presence, abundance, health, condition, appropriateness, and distribution of plant communities in surface waters, wetlands, and uplands can be used as indicators to determine the degree to which the functions of the community type are provided. Human activities such as groundwater withdrawal, ditching, and diking or the construction of conveyance canals, or other permanent structures such as seawalls in an aquatic system can permanently damage vegetation and structural habitat. Environmental factors such as excessive rainfall, drought, and fire can have temporary short-term impacts on vegetation. If the community structure is degraded, then the value of functions provided by the assessment area to the fish and wildlife identified in Part I is reduced.

Ten attributes are identified in the UMAM Rule to evaluate the "Vegetation and Structural Habitat" section of this category. To provide guidance, examples are given that depict variation in conditions for each of the attributes.

- Plant species in the canopy, shrub, or ground stratum
- Invasive exotics or other invasive plant species
- Regeneration & recruitment
- Age & size distribution
- Density and quality of coarse woody debris, snag, den, and cavity
- Plant condition
- Land management practices
- Topographic features such as refugia ponds, creek channels, flats or hummocks
- Siltation or algal growth in submerged aquatic plant communities
- Upland mitigation area - level of habitat and support for fish and wildlife in the associated wetlands or surface waters

Users are cautioned that not all attributes are applicable to all assessment areas, and in some cases some attributes may be more relevant than others.

The final score for the Community Structure – Vegetation and Structural Habitat category is a reflection of the overall condition of an assessment area, taking into consideration all applicable attributes (do not score each attribute and average them in the end, but rather think of this in terms of what final score best fits the overall conditions of the assessment area). Any whole number score between 0-10 may be used that best represents the level of function of the assessment area.

The rule lists descriptors of attributes for 4 categories of scores as guidance:

- A score of (10) means that the vegetation community and physical structure provide conditions which support an optimal level of function to benefit fish and wildlife utilizing the assessment area as listed in Part I.

- A score of (7) means that the level of function provided by plant community and physical structure is limited to 70% of the optimal level.

- A score of (4) means that the level of function provided by the plant community and physical structure is limited to 40% of the optimal level.

- A score of (0) means that the vegetation communities and structural habitat do not provide functions to benefit fish and wildlife.

A Summary Worksheet for Vegetation and Structural Habitat is included to help in the field assessment scoring.

2. Benthic and Sessile Communities

This indicator is intended to be used in marine or freshwater aquatic systems that are not characterized by a terrestrial or emergent plant community. These systems include live hard bottom communities, such as oyster bars and beds, reefs, and soft-bottom systems such as riverine systems.

- Oyster bars and beds in nearshore habitats and estuaries filter large amounts of particulate matter and provide food and habitat for a variety of species, such as boring sponges, mollusks, and polycheate worms.

- The distribution and quality of seagrass beds reflect a balance of water temperature, salinity, nutrients, and water quality.

- Benthic infauna of soft-bottom systems stabilize the substrate, provide a food source, and serve as useful indicators of water quality.

All of these communities are susceptible to human disturbance through direct physical damage, such as dredging, filling, or boating impacts, and indirect damage through changes in water quality, currents, and sedimentation.

Seven attributes are identified in UMAM to evaluate the "Benthic and Sessile Communities" section of this category. To provide guidance, examples that depict variation in conditions for each of the attributes are included.

- Species number and diversity of benthic organisms
- Non-native or inappropriate species
- Regeneration, recruitment and age distribution
- Condition of appropriate species
- Structural features
- Topographic features such as relief, stability, and interstitial spaces (hard bottom and reef communities) or snags and coarse woody debris (riverine systems)
- Spawning or nesting habitats

Users are cautioned that not all attributes are applicable to all assessment areas, and in some cases some attributes may be more relevant than others.

Implementing a sampling program may be necessary in some environments to adequately assess benthic communities in order to address the attributes above.

The final score for the Community Structure – Benthic and Sessile Communities category is a reflection of the overall condition of an assessment area, taking into consideration all applicable attributes (<u>do not score each attribute and average them in the end, but rather think of this in terms of what final score best fits the overall conditions of the assessment</u>

area). Any whole number score between 0-10 may be used that best represents the level of function of the assessment area.

The rule lists descriptors of attributes for 4 categories of scores as guidance:

- A score of (10) means that the benthic communities are indicative of conditions that provide optimal support for all of the functions typical of the assessment area and provide optimal benefit to fish and wildlife.
- A score of (7) means that, relative to ideal habitat; the benthic communities of the assessment area provide functions at 70% of the optimal level.
- A score of (4) means that, relative to ideal habitat; the benthic communities of the assessment area provide functions to 40% of the optimal level.
- A score of (0) means that the benthic communities do not support the functions identified and do not provide benefits to fish and wildlife.

A Summary Worksheet for Benthic and Sessile Communities is included to help in the field assessment scoring.

4.5 MITIGATION CREDIT DETERMINATION

This section describes step by step procedures for incorporating the Preservation, Time Lag, and Risk Factors to determine the amount of mitigation required or the corresponding bank credit yield.

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Impact or Mitigation	Assessment conducted by:	Assessment date:

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

		current condition	with rehabilitaion
Location and Landscape Support	a, b, c, d, e, f, g, h, i, j		
current / with			
Water Environment (n/a for uplands)	a, b, c, d, e, f, g, h, i, j, k, l, m		
current / with			
Community structure 1. Vegetation and/or 2. Benthic Community	I, II, III, IV, V, VI, VII, VIII, IX, X		
current / with			

Score = sum of above scores/30		If preservation as mitigation		For impact assessment areas	
current	with	Preservation adjustment factor =		Functional loss (impact x acres)	
		Adjusted mitigation delta =			
(if uplands, divide by 20)		**If mitigation**		**For Mitigation Assessment Areas**	
0.00	0.00	Time lag (t-factor)=		Relative Functional Gain (RFG) Delta/(risk*t-factor)	
		Risk factor=			
Delta = [with-current]				**Mitigation Bank Credit Determination**	
wetland	0.00				
upland	0.00	**Assessment Area Acreage**		RFG * Assessment Area Acres	

The Part II score for an impact, wetland, or surface water mitigation assessment area is determined by summing the scores for each of the indicators and dividing that value by 30 to yield a number between 0 and 1.

For upland mitigation assessment areas, the Part II score is determined by summing the scores for the location and community structure indicators and dividing that value by 20 to yield a number between 0 and 1.

The mathematical difference between the current condition and with-impact condition assessment, and between the current condition or without preservation and the with mitigation condition assessments is termed the "delta."

- PRESERVATION ADJUSTMENT FACTOR

When assessing preservation, the gain in ecological value is determined by multiplying the delta by a preservation adjustment factor. The preservation adjustment factor is scored on a scale from 0 (no preservation value) to 1 (optimal preservation value), on one-tenth increments.
The score is based on:

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Impact or Mitigation	Assessment conducted by:	Assessment date:

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

		current condition	with rehabilitaion
Location and Landscape Support	a		
	b		
	c		
	d		
	e		
	f		
	g		
	h		
current / with	i		
	j		

		current condition	with rehabilitaion
Water Environment (n/a for uplands)	a		
	b		
	c		
	d		
	e		
	f		
	g		
	h		
	i		
	j		
	k		
current / with	l		
	m		

		current condition	with rehabilitaion
Community structure	I		
	II		
	III		
	IV		
1. Vegetation and/or 2. Benthic Community	V		
	VI		
	VII		
	VIII		
current / with	IX		
	X		

Score = sum of above scores/30 (current / with)	**If preservation as mitigation**	**For impact assessment areas**
	Preservation adjustment factor =	Functional loss (impact x acres)
	Adjusted mitigation delta =	
(if uplands, divide by 20)	**If mitigation**	**For Mitigation Assessment Areas**
0.00 / 0.00	Time lag (t-factor)=	Relative Functional Gain (RFG)
	Risk factor=	Delta/(risk*t-factor)
Delta = [with-current]		**Mitigation Bank Credit Determination**
wetland 0.00		
upland 0.00	**Assessment Area Acreage**	RFG * Assessment Area Acres

1. The extent the preserved area will promote natural ecological conditions such as fire patterns or the exclusion of invasive exotic species.

2. The ecological and hydrological relationship between wetlands, other surface waters, and uplands to be preserved.

3. The scarcity of the habitat provided by the proposed preservation area and the level of use by listed species.

4. The proximity of the preserved area to areas of national, state, or regional ecological significance, and whether the areas to be preserved include corridors between these habitats.

5. The extent and likelihood of potential adverse impacts if the assessment area were not preserved.

- TIME LAG

The time lag associated with mitigation means the period of time between when the functions are lost at an impact site and when those functions are replaced by the mitigation.

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Impact or Mitigation	Assessment conducted by:	Assessment date:

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

		current condition	with rehabilitaion
Location and Landscape Support	a		
	b		
	c		
	d		
	e		
	f		
	g		
	h		
current with	i		
	j		

		current condition	with rehabilitaion
Water Environment (n/a for uplands)	a		
	b		
	c		
	d		
	e		
	f		
	g		
	h		
	i		
	j		
	k		
current with	l		
	m		

		current condition	with rehabilitaion
Community structure	I		
	II		
	III		
	IV		
1. Vegetation and/or 2. Benthic Community	V		
	VI		
	VII		
	VIII		
current with	IX		
	X		

Score = sum of above scores/30		**If preservation as mitigation**	**For impact assessment areas**
current	with	Preservation adjustment factor =	Functional loss (impact x acres)
		Adjusted mitigation delta =	
(if uplands, divide by 20)		**If mitigation**	**For Mitigation Assessment Areas**
0.00	0.00	Time lag (t-factor)=	Relative Functional Gain (RFG) Delta/(risk*t-factor)
		Risk factor=	
Delta = [with-current]			**Mitigation Bank Credit Determination**
wetland	0.00		RFG * Assessment Area Acres
upland	0.00	**Assessment Area Acreage**	

The time lag, in years, is related to a factor (T-factor) as established in the table below, to reflect the additional mitigation needed to account for the deferred replacement of wetland or surface water functions.

Year	T-factor
< or = 1	1
2	1.03
3	1.07
4	1.10
5	1.14
6 – 10	1.25
11 – 15	1.46
16 – 20	1.68
21 – 25	1.92
26 – 30	2.18
31 – 35	2.45
36 – 40	2.73
41 – 45	3.03
46 – 50	3.34
51 – 55	3.65
>55	3.91

- RISK

For mitigation assessment areas, mitigation risk shall be evaluated to account for the degree of uncertainty that the proposed conditions will be achieved, resulting in a reduction in the ecological value of the mitigation assessment area.

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Impact or Mitigation	Assessment conducted by:	Assessment date:

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

		current condition	with rehabilitaion
Location and Landscape Support	a		
	b		
	c		
	d		
	e		
	f		
	g		
	h		
current with	i		
	j		

		current condition	with rehabilitaion
Water Environment (n/a for uplands)	a		
	b		
	c		
	d		
	e		
	f		
	g		
	h		
	i		
	j		
	k		
current with	l		
	m		

		current condition	with rehabilitaion
Community structure	I		
	II		
	III		
	IV		
1. Vegetation and/or	V		
2. Benthic Community	VI		
	VII		
	VIII		
current with	IX		
	X		

Score = sum of above scores/30		
current	with	
(if uplands, divide by 20)		
0.00	0.00	

Delta = [with-current]	
wetland	0.00
upland	0.00

If preservation as mitigation	
Preservation adjustment factor =	
Adjusted mitigation delta =	

If mitigation	
Time lag (t-factor)=	
Risk factor=	

Assessment Area Acreage	

For impact assessment areas	
Functional loss (impact x acres)	

For Mitigation Assessment Areas	
Relative Functional Gain (RFG) Delta/(risk*t-factor)	

Mitigation Bank Credit Determination	
RFG * Assessment Area Acres	

The assessment area shall be scored on a scale from 1 (for no for de minimus risk) to 3 (high risk), on quarter-point (0.25) increments. A score of one would most often be applied to mitigation conducted in an ecologically viable landscape and deemed successful or clearly trending towards success prior to impacts (such as in a wetland bank), whereas a score of three would indicate an extremely low likelihood of success based on a number of ecological factors.

- **Functional Loss (FL) and Relative Functional Gain (RFG)**

The quantification of functional loss and relative functional gain for assessment areas are used to support the determination of the amount of mitigation that may be required, or the total potential credits generated for a Bank.

PART II – Quantification of Assessment Area (impact or mitigation) (See Section 4.4.2)				
Site/Project Name		Application Number	Assessment Area Name or Number	
Impact or Mitigation		Assessment conducted by:	Assessment date:	
Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

		current condition	with rehabilitaion
Location and Landscape Support	a		
	b		
	c		
	d		
	e		
	f		
	g		
	h		
current / with	i		
	j		
		current condition	with rehabilitaion
Water Environment (n/a for uplands)	a		
	b		
	c		
	d		
	e		
	f		
	g		
	h		
	i		
	j		
	k		
current / with	l		
	m		
		current condition	with rehabilitaion
Community structure	I		
	II		
	III		
	IV		
1. Vegetation and/or 2. Benthic Community	V		
	VI		
	VII		
	VIII		
current / with	IX		
	X		

Score = sum of above scores/30		If preservation as mitigation		For impact assessment areas	
current	with	Preservation adjustment factor =		Functional loss (impact x acres)	
		Adjusted mitigation delta =			
(if uplands, divide by 20)		If mitigation		For Mitigation Assessment Areas	
0.00	0.00	Time lag (t-factor)=		Relative Functional Gain (RFG) Delta/(risk*t-factor)	
		Risk factor=			
Delta = [with-current]				Mitigation Bank Credit Determination	
wetland	0.00				
upland	0.00	Assessment Area Acreage		RFG * Assessment Area Acres	

Functional Loss

The loss of functions provided by impact assessment area is determined using the following formula:

FL = Impact Delta x Impact Acres

Relative Functional Gain

The relative gain of functions provided by a mitigation assessment area must be adjusted using the following formula:

RFG= Mitigation Delta (or adjusted mitigation delta for preservation / (Risk x T-factor).

Mitigation Determination Formulas

After calculating the FL and RFG, the Mitigation Determination Formulas can be used to determine:

1. Total Potential credits for a mitigation bank
2. Mitigation needed to offset impacts

Mitigation Determination Formulas

For each Impact Assessment Area:
(FL) Functional Loss = Impact Delta X Impact Area

For each Mitigation Assessment Area:
(RFG) Relative Functional Gain = Mitigation Delta (adjusted for preservation, if applicable) / ((t-factor)x(risk factor))

Mitigation Bank Credit Determination

The total potential credits for a mitigation bank is the sum of the credits for each assessment area where assessment area credits equal the RFG times the acres of the assessment area.

Bank Assessment Area

Example	RFG	X	Acres	=	Credits
a.a.1					
a.a.2					
Total					

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U.S. Army Corps of Engineers (USACE) Circular EC 1165-2-212, Sea-Level Change Considerations for Civil Works Programs provides guidance on estimating low, intermediate, and high rates of sea level rise for a locality, which can assist in determining how a site may respond to sea level change. (http://planning.usace.army.mil/toolbox/library/ECs/EC11652212Nov2011.pdf)

Appendix A
Standardized Field Protocol

Appendix A Standardized Field Protocol

Review of UMAM Part I -Qualitative Characterization

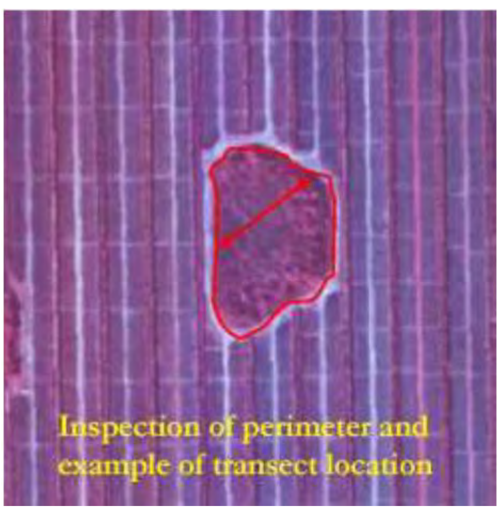
The Geographic Relationships/Hydrologic Connections, Description, and Significant Nearby Features of **Part I – Qualitative Characterization** should be evaluated in light of the information obtained during the field survey; and, during the field assessment, observations of wildlife use or signs of use as well as listed species should be documented in the section related to wildlife utilization in **Part I – Qualitative Characterization.** Finally, the last section of Part I should be updated based on observation of the assessment area and its immediately surrounding area.

Guidance: To fill out Part II, it is necessary to conduct a field survey of the assessment area and the areas immediately adjacent to the assessment area. A standardized protocol is necessary to insure reproducibility of results as well as defensibility should the assessment be challenged. The following Standardized Field Protocol (SFP) is the minimum necessary to adequately assess an area. If time allows, a more detailed field evaluation should be employed.

A SFP is part of a Quality Assurance/Quality Control program which results in assessments that are conducted in such a way as to insure that they are comprehensive, repeatable, and defensible.

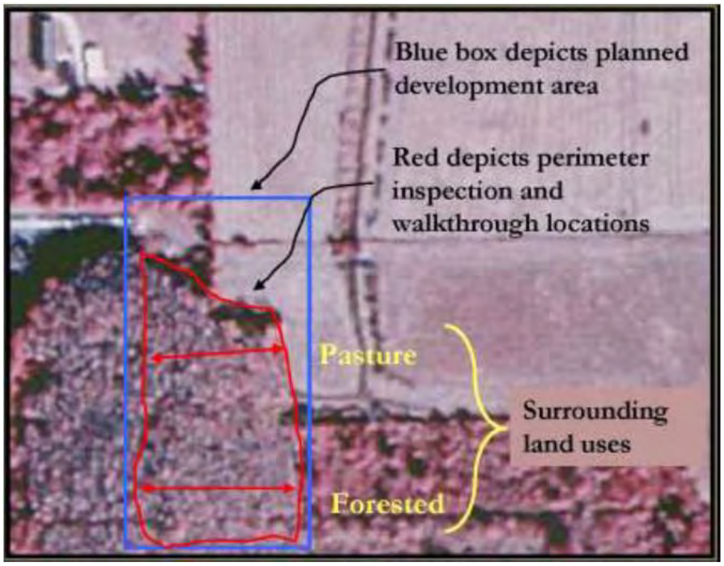
In addition to a SFP, training and standard scientific precautions are necessary to insure that staff is capable of producing unbiased sampling of the assessment area. The field methods should be calibrated on sites whose ecological functions are known, and duplications conducted where members of the field team assess the same areas and achieve the same results.

Field Surveys



Field surveys should include an inspection of the entire perimeter of the assessment area (i.e. the area that receives direct impacts from the proposed activity; the inspection can be done in conjunction with the examination of the wetland delineation line). In addition to the perimeter, an examination of the wetland interior to the fullest extent possible should be conducted, based on time availability and site requirements. These guidelines can be adjusted to account for site accessibility, (both physical and legal), and depending on the homogeneity and size of the site.

- The transects are located from the wetland or water body edge towards the interior of the assessment area, perpendicular to the edge, for a distance of 30 meters or until the limit of the proposed activity, whichever is greater. Depending on the homogeneity of the site, these minimum requirements can be adjusted. For instance, when sampling a *Juncus* spp. marsh where there is ample visibility of the entire site, it may not be necessary to repeat the transects.



- When assessing an area that is surrounded by different land uses, make sure to divide your efforts equally among the portions of the assessment area that are surrounded by different land uses, so that they can be equally represented. For instance, in the image below, complete a walk -through of each portion of the site, as depicted below.

Secondary Impacts

NYSDEC regulates activities within 150-ft wide upland buffers adjacent to tidal wetlands, and 100 wide buffers adjacent to freshwater wetlands. When buffers are present and remain intact, the wetland is assumed to receive no secondary impacts. However, when an upland buffer requirement cannot be provided, as in the case of a road or a driveway that bisects a wetland, potential secondary impacts must be assessed. In this case, the area of anticipated secondary impacts needs to be defined, based on the proposed activity, before being scored as a separate assessment area.

Appendix B
Location and Landscape Support Guidance Module

Appendix B Location and Landscape Support Guidance Module

The value of functions provided by an assessment area to fish and wildlife are influenced by the landscape position of the assessment area and its relationship with surrounding areas. If surrounding habitats are unavailable, poorly connected, or degraded, then the value of functions provided by the assessment area to the fish and wildlife identified in Part I is reduced. The availability, connectivity, and quality of offsite habitats, and offsite land uses which might adversely impact fish and wildlife utilizing these habitats, are factors to be considered in assessing the location of the assessment area.

The following ten (10) attributes are identified to evaluate location and landscape support of the assessment area. To provide guidance, examples that depict variation in conditions for each of the attributes are included.

- Support to wildlife by outside habitats
- Invasive exotics or other invasive plant species in proximity of the assessment area
- Wildlife access to and from outside – distance and barriers
- Functions that benefit fish and wildlife downstream – distance or barriers
- Impacts of land uses outside assessment area to fish and wildlife
- Benefits to downstream or other hydrologically connected areas
- Benefits to downstream habitats from discharges
- Protection of wetland functions by upland mitigation assessment areas
- Protects uplands from flooding and storm surge
- Site elevations sufficient to adapt to sea level rise

The user is cautioned that not all attributes are applicable to all assessment areas, and in some cases, some attributes may be more relevant than others. The final score for the Location and Landscape Support category is a reflection of the overall condition of an assessment area, taking into consideration all applicable attributes (<u>do not score each attribute and average them in the end, but rather think of this in terms of what final score best fits the overall conditions of the assessment area</u>). Any whole number score between 0-10 may be used.

The following are descriptors of attributes for 4 categories of scores as guidance:

- A score of (10) means the assessment area is ideally located and the surrounding landscape provides full opportunity for the assessment area to perform beneficial functions at an optimal level.

- A score of (7) means that, compared to the ideal location, the location of the assessment area limits its opportunity to perform beneficial functions to 70% of the optimal ecological value.

- A score of (4) means that, compared to the ideal location, the assessment area location limits its opportunity to perform beneficial functions to 40% of the optimal ecological value.

- A score of (0) means that the location of the assessment area provides no habitat support for wildlife utilizing the assessment area and no opportunity for the assessment area to provide benefits to fish and wildlife outside the assessment area.

A Summary Worksheet for **Location and Landscape Support** is included as Table B.1 to help in the field assessment scoring.

LOCATION AND LANDSCAPE SUPPORT ATTRIBUTES

a. Support to wildlife by outside habitats

Guidance: This attribute assesses the extent to which habitats outside the assessment area represent the full range of habitats needed to fulfill the life history requirements of all wildlife listed in Part I, and the extent to which these habitats are available in sufficient quantity to provide optimal support for wildlife. Evaluate an area surrounding the assessment area that is appropriate for the species listed in Part I.

Many species that nest, feed, or find cover in a specific habitat or habitat type are also dependent in varying degrees upon other habitats, including upland, wetland, and surface waters, that are present in the regional landscape. Depending on the wildlife species listed in Part I, an area of outside habitats up to 1 mile in radius may be appropriate. Further distances may be appropriate for colony nesting bird species that may travel greater distances to feeding sites.

Example of outside habitats providing optimal support conditions with a mix of habitats in close proximity to wetland assessment area that could support target wildlife species.

Example of outside habitats providing limited support to some, or minimal support to many wildlife species due to extensive urban development that limits access to diverse habitats in close proximity to the assessment area.

TABLE B.1	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
Location and Landscape Support	full opportunity to perform beneficial functions at optimal level	opportunity to perform beneficial functions is limited to 70% of optimal ecological value	opportunity to perform beneficial functions is limited to 40% of optimal ecological value	provides no habitat support or opportunity to provide benefits to fish and wildlife
a. Support to wildlife by outside habitats	full range of habitats needed to support all wildlife species	optimal support for most, but not all wildlife species	fail to provide support for some, or minimal support for many wildlife species	no habitat support for wildlife
b. Invasive exotics or other invasive plant species in proximity of the assessment area	not present	present but cover is minimal and has minimal adverse effects	majority of plant cover consists of invasive exotics that adversely affect functions	predominance of plant cover consists of invasive exotics so that little or no function is provided
c. Wildlife access to and from outside – distance and barriers	not limited by distance or barriers	partially limited by distance or barriers	substantially limited by distance or barriers	precluded by distance or barriers
d. Functions that benefit fish & wildlife downstream – distance or barriers	not limited by distance or barriers	somewhat limited by distance or barriers that reduce opportunity to provide benefits	limited by distance or barriers that substantially reduce opportunity to provide benefits	functions not present
e. Impacts of land uses outside assessment area to fish and wildlife	no adverse impacts on wildlife	minimal adverse impacts on wildlife	significant adverse impacts on wildlife	severe adverse impacts on wildlife
f. Benefits to downstream or other hydrologically connected areas	opportunity is not limited by hydrologic impediments or flow restrictions	limited by hydrologic impediments or flow restrictions so that benefits are provided with lesser freq. or magnitude	limited by hydrologic impediments so that benefits are rarely provided or are provided at greatly reduced levels	no opportunity to provide benefits due to hydrologic impediments or flow restrictions
g. Benefits to downstream habitats from discharges	downstream habitats are critically or solely dependent on discharges	downstream habitats derive significant benefits from discharges	downstream habitats derive minimal benefits from discharges	downstream habitats derive negligible or no benefits from discharges
h. Protection of wetland functions by upland mitigation assessment areas	optimal protection of wetland functions	significant, but suboptimal, protection of wetland functions	minimal protection to wetland functions	no protection of wetland function
i. Protection for uplands from flooding and storm surge	Wetlands are horizontally extensive and contain vertical relief that buffers storm surges	Wetlands are moderately extensive, with some vertical relief, providing some buffering functions	Wetlands are minimally extensive, with little vertical relief, providing minor buffering function	Wetlands not horizontally or vertically extensive, provide little to no buffering ability
j. Site elevations sufficient to adapt to effects of sea level rise	Scrub-shrub and high marsh habitats abundant, allowing for habitat migration	Some scrub-shrub and high marsh habitats present, providing for habitat migration	Low marsh abundant, little high marsh available for habitat migration	Site consists of low marsh and mudflat, no onsite areas available for habitat migration

Source: FDEP, 2004. Uniform Mitigation Assessment Method Training Manual; Louis Berger & Assoc., P.C. 2013.

b. Invasive exotics or other invasive plant species in proximity to the assessment area

Guidance: The value of functions provided by an assessment area to fish and wildlife are influenced by the condition of surrounding areas. If surrounding habitats (i.e., habitats within the range of expected fish and wildlife species that utilize the assessment area) are degraded due to the presence, and especially dominance, of invasive or exotic plant species, then the value of functions provided by the assessment area to the fish and wildlife identified in Part I is reduced.

Under optimal conditions, less than 5 percent of the site and adjacent habitats would be dominated by invasive plant species. Consistent with regulatory guidance for mitigation actions, 10 to 15 percent cover by invasive plant species would be consistent with a more moderate condition that would require management intervention to attain a more optimal condition. A predominance of invasive plant species cover of over 85 percent or more of the assessment area would be consistent with a score of not present.

c. Wildlife access to and from outside – distance and barriers

Guidance: The value of functions provided by an assessment area to fish and wildlife are influenced by wildlife access (both to and from outside areas). Access may be influenced by distance to other natural habitats, or by landscape barriers such as roads, walls, canals, and other human-made structures. Avian fauna are probably least affected by distance and barriers. Mammals are more affected, but can obviously cover greater distances than can herpetofauna. The degree of influence is highly dependent on type and amount of cover in the intervening area and the types of barriers. Fauna traversing open fields are more susceptible to predators than if traveling through dense shrubs. Well-traveled roads offer greater hazards to ground dwelling fauna than seldom traveled “two-track” dirt roads.

This variable reflects that availability of habitat that an animal is likely to be able to traverse during its daily movements without encountering significant barriers. The primary reason for this is that wildlife will utilize the entire habitat complex and will not be confined to or deterred by project boundaries. A single habitat patch rarely supplies all of the needs of a particular wildlife species throughout the year. A yearly home range may consist of one large habitat block but often consists of a collection of habitat patches. Predatory wildlife requires larger home ranges to avoid depleting prey populations. In addition, wildlife must access adjoining home ranges when breeding or dispersing. Therefore, the contribution of nearby habitats is weighted according to the ability of different classes of wildlife (highly mobile and less mobile) to traverse between patches. The more classes of wildlife that are blocked by lack of an effective corridor, the lower the attribute score.

In assessing habitat connectivity of tidal wetlands, the needs and abilities of the following four wildlife classes can be considered in evaluating this variable:

- A highly mobile animal (e.g., river otter (*Lutra canadensis*)) with a large home range.
- A moderately mobile animal (e.g., clapper rail (*Rallus longirostris*)) with a moderate home range.

- A weakly mobile animal (e.g., marsh wren (*Cistothorus palustris*)) with a small home range.
- A highly mobile animal that uses the wetland subclass only as one of several possible foraging habitats (e.g., great egret (*Casmerodius albus*)).

In assessing this attribute, consider the perimeter of the assessment area and visually estimate the percentage of the perimeter that borders habitats accessible to wildlife that could use the assessment area, and those land uses that are unsuitable (developed land, highways, construction sites, landscaped areas). Also consider the distance accessible habitats extend up to 0.5 miles beyond the assessment area boundary. Are continuous corridors present between the assessment area and natural habitats? The following list provides a guide to assessing the quality of the habitat connections.

Attribute Score	Corridor Type	Corridor Description
10 to 8	Contiguous	**1)** Open water stretches <150 feet wide (regardless of depth), and/or, **2)** Continuous stretch of undeveloped wetland habitat.
7 to 5	Partially Impeded	**1)** Open water stretches from 150-500 feet (regardless of depth) and/or, **2)** Continuous stretch of undeveloped wetland and upland habitat, and/or, **3)** Railways and dirt roads with little traffic.
4 to 3	Impeded	**1)** Open water stretches from 500–1,000 feet (regardless of depth), and/or, **2)** Stretches of developed land <300 feet in width, and/or, **3)** Railroads and paved roads with <100 vehicle crossings per day that are unbridged or have a bridge opening < 10 feet wide.
2 - 0	Absent or barrier present	**1)** Open water stretches >1000 feet in width, and/or, **2)** Highly developed urban, residential, or industrial areas (>300 feet 0 – wide), and/or, **3)** Roadways with >100 vehicle crossings per day that are unbridged or have a bridge opening < 10 feet wide.

d. Functions that benefit fish and wildlife downstream – distance or barriers

Guidance: The functions provided by an assessment area to fish and wildlife in "downstream locations" are influenced by distance or barriers that reduce the opportunity for the assessment area to provide these benefits. Are there physical barriers to hydrologic connections (for instance, dams, elevated culverts, berms, or shallow ditches or channels mostly less than 1 foot deep)? Is the distance so great that little influence to downstream fish and wildlife populations is possible? Are there intervening conditions that make a connection with downstream habitats unlikely (for instance waters with zero dissolved oxygen, or highly contaminated)? If the assessment area were to serve as a nursery or breeding area for a species, can the young disperse to downstream habitats? Do predatory fish have access to portions of the site? In assessing potential barriers, the information provided in c. above can be used for guidance.

Scoring this attribute for isolated wetlands: It is recognized that isolated wetlands generally lack surface water connections to downstream waters except in seasonally high waters, and as a result, this attribute should be evaluated in light of potential connections rather than existing connections.

e. Impacts of land uses outside assessment area to fish and wildlife

Guidance: The functions provided by an assessment area to fish and wildlife are influenced by the intensity and types of land uses in the surrounding areas. Some land uses, by the presence of associated attributes like noise, people, domesticated animals, industrial activities, and runoff of pollutants, can have deleterious effects on habitat quality. Do surrounding land uses have noise levels that might reduce habitat quality? Are there other disturbances such as potential for humans or domesticated animals to affect habitat quality? Is the assessment area situated in such a way as to receive direct runoff from parking lots, roads, or buildings? Are there adjacent land uses that may adversely affect habitat quality because of night lighting, or activity?

Reference tidal wetland with adjacent commercial, residential and transportation corridor land uses that collectively may have moderate adverse impacts to fish and wildlife.

Reference tidal wetland with high density industrial, commercial, and transportation land uses that collectively may have significant adverse impacts to fish and wildlife use of the assessment area.

f. Benefits to downstream or other hydrologically connected areas

Guidance: The assessment area may provide water quantity and quality benefits to downstream habitats based on the degree of hydrologic connectivity, which in turn can be impaired by roads, ditches, channels, and other water barriers. Are there hydrologic impediments or flow restrictions that may limit the opportunity of the assessment area to provide benefits to downstream or other hydrologically connected areas?

Scoring this attribute for isolated wetlands: It is recognized that isolated wetlands generally lack surface water connections to downstream waters except in seasonally high waters, and as a result, this attribute should be evaluated in light of potential connections during the wet season rather than existing connections.

g. Benefits to downstream habitats from discharges

Guidance: This attribute evaluates the extent to which downstream habitats are affected by surface water or groundwater discharges from the assessment areas. If a downstream system is critically or solely dependent on hydrologic discharges from the assessment area, then the benefits to downstream habitats would be very high.

Scoring this attribute for isolated wetlands: It is recognized that isolated wetlands generally lack surface water connections to downstream waters except in seasonally high waters, and as a result, this attribute should be evaluated in light of potential connections during the wet season rather than existing connections.

h. Protection of wetland functions by upland mitigation assessment areas

Guidance: This factor applies to upland mitigation areas only. It assesses the level of protection of wetland functions by the upland mitigation areas. Does the proposed upland mitigation area adequately protect wetland functions through adjacency? Is it connected? Does it provide some measure of water quality improvement or sediment control? Does it act as a buffer to surrounding land uses or other adverse activities? Does the upland mitigation area provide some measure of habitat enhancement through interconnection with wetland areas?

i. Protects uplands from flooding and storm surge

Guidance: This attribute assesses the extent to which onsite wetlands function to protect adjacent and nearby upland properties, including developed properties, from the effects of storm surges and resultant coastal flooding, as well as minor flooding associated with spring tide events. Many areas immediately landward of the shoreline in NYC are filled former wetlands or open water habitats and are only minimally elevated and/or are within the 100 year flood zone. Horizontally extensive wetlands (> 100 feet wide) can absorb a portion of the wave energy and help to store floodwaters, thereby protecting nearby uplands environments from shoreline erosion. However, based on studies conducted in the aftermath of Hurricane Katrina (Wamsley, et al. 2009) the width of wetlands required to have a notable effect on storm surge suppression is over >10,000 linear feet in width. Therefore, narrow, fringing wetlands have little to no ability to reduce storm surges and store floodwaters.

j. Site elevations sufficient to adapt to sea level rise

Guidance: This attribute assesses the ability of a tidal wetland site to adapt to sea level rise by migrating landward. As sea level rises, the hydroperiod of low marsh elevations may become too long to support vascular salt marsh vegetation such as *Spartina alterniflora*, and may become mudflat. Likewise, the hydroperiod of high marsh elevations presently dominated by species including *Spartina patens*, *Distichlis spicata*, and *Juncus gerardii* may become too long to support these species, and these elevations may become low marsh habitat. Similarly, sea level rise may cause the scrub-shrub zone often vegetated with *Iva frutescens* and *Baccharis hamilifolia* to become high marsh over time. Nearshore upland areas may also be subjected to some tidal hydrology and become coastal scrub-shrub habitat over time. The ability of the abovementioned tidal wetland habitat types to migrate landward as a result of sea level rise depends on the availability of suitable elevations. A tidal wetland site has little to no ability to migrate in response to sea level rise if it is bordered by a seawall or other hardened development, or if it only consists of low marsh, or has a narrow vertical elevation range. However, a site with a diversity of elevations and habitat types and abundant horizontal expanse is more likely to successfully adapt to rising sea level.

Appendix C
Water Environment Guidance Module

Appendix C Water Environment Guidance Module

The quantity of water in an assessment area, including the timing, frequency, depth and duration of inundation or saturation, flow characteristics, and the quality of that water, may facilitate or preclude its ability to perform certain functions and may benefit or adversely impact its capacity to support certain wildlife. If the water environment is degraded, then the value of functions provided by the assessment area to the fish and wildlife identified in Part I is reduced.

The following thirteen (13) attributes are identified to evaluate this category. To provide guidance, examples that depict variation in conditions for each of the attributes are included.

- Tidal regime
- Water level indicators
- Soil moisture
- Soil erosion or deposition
- Vegetation -community zonation
- Vegetation – hydrologic stress
- Use by animal species with specific hydrological requirements
- Plant community composition – species tolerant of and associated with water quality degradation or flow alteration
- Direct observation of standing water
- Existing water quality data
- Water depth, currents, and light penetration
- Wave energy/ fetch
- Tidal marsh stability

Be aware that not all attributes are applicable to all assessment areas and in some cases, some attributes may be more relevant than others. The final score for the Water Environment category is a reflection of the overall condition of an assessment area, taking into consideration all applicable attributes (do not score each attribute and average them in the end, but rather think of this in terms of what final score best fits the overall conditions of the assessment area). Any whole number score between 0-10 may be used.

The following are descriptors of attributes for 4 categories of scores as guidance:

- A score of (10) means that the hydrology and water quality fully supports the functions and provides benefits to fish and wildlife at optimal capacity for the assessment area.

- A score of (7) means that the hydrology and water quality supports the functions and provides benefits to fish and wildlife at 70% of the optimal capacity for the assessment area.

- A score of (4) means that the hydrology and water quality supports the functions and provides benefits to fish and wildlife at 40% of the optimal capacity for the assessment area.

- A score of (0) means that the hydrology and water quality does not support the functions and provides no benefits to fish and wildlife.

A Summary Worksheet for the **Water Environment** is included as Table C.1 to help in the field assessment scoring.

WATER ENVIRONMENT ATTRIBUTES

a. Tidal regime

Guidance: Tidal wetlands in the New York City region have been significantly altered by hydrologic manipulations, mosquito-ditching, excavation, filling, channel dredging and constrictions and other alterations. Tidal influence is restricted by the presence of bridges, culverts, berms and other manipulations to tidal channels. The effects of changes in the hydrologic regime affect physical, chemical, and biological processes occurring within a tidal marsh. Wetlands with the least alterations exhibit the closest conditions to that of a natural tidal wetland.

Sites open to the free exchange of tidal waters during normal tidal cycles with no significant hydrologic alterations or restrictions present represent the optimal condition.

The presence of restrictions such as low-elevation berms which are frequently overtopped by high tide events or have multiple breaches, or culverts or narrow bridges that alter the free exchange of tidal flow represent a moderate restriction. Typically in these instances a tidal marsh will retain the requisite plant species.

The presence of restrictions such as a high-elevation berm which is infrequently overtopped by high-tide events or has a single opening or breach, or small, undersized culverts or bridge which restrict tidal flow represent severe hydrologic restriction. Typically in these instances the site receives full tidal inundation only during extreme storm tide events and a functional tidal marsh may no longer be present or the requisite plant species are not dominant.

Sites isolated from tidal exchange except during extreme events such as storm surges are lacking this attribute.

b. Water level indicators/Hydroperiod

Guidance: Several hydrologic indicators exist in tidal and nontidal wetlands that can help assess water conditions at a site and determine the type of wetland hydroperiod associated with the assessment area wetland. This section focuses on those indicators that give insight into typical water levels experienced within the assessment area, and the predominant wetland hydroperiod within the assessment area.

Wetland hydroperiods are defined as water regime modifiers within the U.S. Fish and Wildlife Service (USFWS) wetland classification system, as described in the *Classification of wetlands and deepwater habitats of the United States* (Cowardin, et al., 1979). The descriptions are informative and can be useful in further illustrating the relationship between hydroperiod and wetland community type. The publication is available at:
http://www.fws.gov/wetlands/documents/classification-of-wetlands-and-deepwater-habitats-of-the-united-states.pdf.

Water levels and wetland hydroperiod indicators for tidal and nontidal wetland systems are described below to provide further information useful in assessing this attribute.

Tidal Systems

Factors influencing the hydroperiod of a tidal marsh include astronomical tides, metrological/climatological events, vertical movements of the land surface, and coastal geomorphology (Rozas 1995). Field indicators of a tidal hydroperiod include:

- presence/absence of standing water
- presence/absence of high tide water line
- presence/absence of a wrack line
- presence/absence of plant species adapted to specific hydrologic conditions.

The presence of plant species in specific salt marsh zones (low marsh, high marsh, shrub zone) is determined by factors such as the duration, frequency, and depth of flooding. Salt marsh vegetation typically occurs in well-defined zones determined by elevation and the resultant effect on the tidal flooding regime. The following table presents tidal wetland hydroperiods and typical field indicators (Cowardin et al. 1979). It should be noted that the absence of the indicators can be informative and suggest a reduced or absent condition.

Table C-1	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
Water Environment	hydrology and water quality fully supports functions and provides benefits to fish and wildlife at optimal capacity	hydrology and water quality supports functions and provides benefits at 70% of optimal capacity	hydrology and water quality supports functions and provides benefits at 40% of optimal capacity	hydrology and water quality does not support functions and provides no benefits to fish and wildlife
a. Tidal regime	Site is open to free exchange of tidal waters, water depths appropriate to wetland community type	Moderate hydrologic restriction present	Severe hydrologic restriction present	Site is isolated from tidal exchange
b. Water level indicators/Hydroperiod	Appropriate, water depths/soil saturation and duration is appropriate to wetland community type	Slight deviation	Moderate deviation	Extreme degree of deviation
c. Soil moisture	appropriate with no evidence of soil desiccation, oxidation or subsidence	minimal soil oxidation or subsidence; soils are drier than expected	strong evidence of soil desiccation, oxidation or subsidence	strong evidence of substantial soil desiccation, oxidation or subsidence
d. Soil erosion or deposition	not atypical or indicative of altered flow rates	minor alteration in flow rates or points of discharge	atypical and indicative of alterations in flow rates or points of discharge	greatly atypical and indicative of greatly altered flow rates or points of discharge
e. Vegetation -community zonation	appropriate in all strata	inappropriate in some strata	inappropriate in most strata	inappropriate in all strata
f. Vegetation – hydrologic stress	no signs of hydrologic stress such as excessive mortality, leaning or fallen trees, thinning canopy, insect damage or disease associated with hydrologic stress	slightly greater than normal mortality, leaning or fallen trees, thinning canopy, or signs of insect damage or disease associated with hydrologic stress	strong evidence of greater than normal mortality, leaning or fallen trees, thinning canopy, or signs of insect damage or disease associated with hydrologic stress	strong evidence of much greater than normal mortality, leaning or fallen trees, thinning of canopy, or signs of insect damage or disease associated with hydrologic stress
g. Use by animal species with specific hydrological requirements	consistent with expected hydrological conditions	less than expected	greatly reduced	lacking
h. Plant community composition – species tolerant of and associated with water quality degradation or flow alteration	Plant community composition is not characterized by species tolerant of and associated with water quality degradation or flow alteration	some species tolerant of and associated with water quality degradation or flow alteration	much of the community consists of species tolerant of and associated with water quality degradation or flow alteration	community consists predominantly of species tolerant of and associated with water quality degradation or flow alteration
i. Direct observation of standing water	no water quality degradation such as discoloration, turbidity, or oil sheen	slight water quality degradation such as discoloration, turbidity, or oil sheen	moderate water quality degradation such as discoloration, turbidity, or oil sheen	significant water quality degradation such as obvious discoloration, turbidity, or oil sheen
j. Existing water quality data	conditions are optimal for community type	slight deviation from normal, with minimal ecological effects	moderate deviation from normal, with expected ecological effects	large deviation from normal, with expected adverse ecological effects
k. Water depth, currents and light penetration	optimal for community type	generally sufficient but expected to cause some changes in species, age classes and densities	not well suited for and expected to cause significant changes in species, age classes and densities	inappropriate for community type
l. Wave energy/fetch	No potential for shoreline erosion due to wave energy	Minimal shoreline erosion due to wave energy	Moderate shoreline erosion due to wave energy	Severe shoreline erosion due to wave energy
m. Tidal marsh stability	Marsh elevation is stable	Minor accretion or subsidence is occurring; minimal change in marsh area.	Moderate accretion or subsidence is occurring; marsh area has decreased notably or plant community has been partially altered.	Severe accretion or subsidence is occurring; significant loss or marsh area over time observed, or significant conversion of marsh community to non-native plant species.

Tidal Hydroperiod	Definition (USFWS)	Indicators
Subtidal	The substrate is permanently flooded with tidal water.	Presence of water throughout all tidal cycles Presence of *Ruppia maritime*, *Zostera maritima*
Irregularly Exposed	The land surface is exposed by receding tides less often than daily.	Presence of water during most tidal cycles Absence of vegetation
Regularly Flooded	Tidal water alternately floods and exposes the land surface at least once daily.	High tide water line visible on vegetation/structures Wrack line evident at upper limit Presence of near monoculture of *Spartina alterniflora*
Irregularly Flooded	Tidal water floods the land surface less often than daily.	Presence of *Spartina patens*, *Distichlis spicata*, *Juncus gerardii*, *Salicornia* spp.

Nontidal Systems

Nontidal wetland hydrology indicators for water levels and wetland hydroperiods are presented in the USACE's 2012 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (Version 2.0). This reference can be used to assist in identifying and documenting field indicators of the predominant

Examples of field indicators include:

- presence of standing water or shallow groundwater
- presence/absence of high water line
- presence/absence of a wrack line
- presence/absence plant species adapted to specific hydrologic conditions.

For nontidal wetlands, vegetation present in wetland communities is determined by factors such as the duration, frequency, and depth of flooding. The following table presents nontidal wetland hydroperiods and typical field indicators (Cowardin et al. 1979).

Nontidal Hydroperiod	Definition (USFWS)	Indicators
Permanently Flooded	Water covers the land surface throughout the year in all years.	Presence of water throughout all seasons. Presence of aquatic plants such as *Nymphea odorata, Nuphar lutea* or *Potomogeton* spp.
Intermittently Exposed	Surface water is present throughout the year except in extreme drought.	Presence of aquatic plants such as *Nymphea odorata, Nuphar lutea* or *Potomogeton* spp.

Semi-permanently Flooded	Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface.	Presence of non-persistent emergent plants such as *Alisma-plantago aquatica, Polygonum* spp*.,* or *Pontederia*.
Seasonally Flooded	Surface water is present for extended periods especially early in the growing season, but is absent by the end of the season in most years. When surface water is absent, the water table is often near the land surface.	Presence of woody plants tolerant of prolonged flooding such as *Nyssa sylvatica* or *Cephalanthus occidentalis*, and presence of persistent emergent plants such as *Typha* spp. or *Scirpus* spp. Thick (=> 12 inches) accumulation of organic matter is upper soil layer.
Saturated	The substrate is saturated to the surface for extended periods during the growing season, but surface water is seldom present.	Presence of hydrophytic vegetation Soil indicators of reducing conditions.
Temporarily Flooded	Surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface for most of the season. Plants that grow both in uplands and wetlands are characteristic of the temporarily flooded regime.	Presence of hydrophytic vegetation Soil indicators of reducing conditions.

Additional field indicators of hydrologic conditions include the following:

<u>Mosses or liverworts.</u> These are in a group of plants called bryophytes, which lack true roots and leaves, and are found in moist environments. When water levels fall, they appear as a dark greenish-brown growth on the bark of trees or on hard substrates such as rocks.

<u>Drift lines and rafted debris.</u> These are composed of vegetation, litter, and other materials that have been carried by water and have been deposited, usually in distinct lines or locations, directly on the ground or sometimes entangled within vegetation. They can be indicative of high water levels. This indicator will typically be found in coastal wetlands as well as floodplains or any wetland exhibiting high water levels fluctuations.

<u>Elevated lichen lines.</u> Lichens are an association of a fungus and an alga, and appear as flattened film on the bark of trees. They are not tolerant of inundation, therefore high standing water around the trunks of trees impedes their growth, thus producing a distinct line which is indicative of ordinary or seasonal high water levels. In wetlands that do not have prolonged inundation, lichens can grow on the trunks at ground level.

<u>Morphological Plant Adaptations.</u> These refer to special structures or features developed by plants under water logged conditions, which are not normally present in dry conditions. They include adventitious roots and lenticels. The former are usually developed on the stem or trunk of certain plants, and they aid the plant's aerobic respiration during anoxic periods. When the inundation period ends, these roots stop developing. Lenticels are another mechanism for aerobic respiration, and they appear as blister-like breaks on the outer bark of stems and roots.

Many species of bottomland hardwood trees develop adventitious roots and lenticels, as well as shrub species such as wax myrtle (*Myrica cerifera*), water-primrose (*Ludwigia* spp.), and St. John's wort (*Hypericum* spp.).

Other examples of morphological plant adaptations to water logged conditions include the buttressed trunks of swamp tupelo (*Nyssa sylvatica* var. biflora), American elm (*Ulmus americana*), and pin oak (*Quercus palustris*).

Water Marks. Water marks are the result of sustained water levels and appear as distinct stain lines on fixed objects and vegetation. These are usually related to the elevated lichen lines, and can be used to evaluate ordinary or seasonal high water levels.

In assessing this attribute, hydrologic indicators can be used to document the water conditions within the assessment area. The evaluator should examine the site for distinct water lines and other indicators to determine if they are indicative of reasonable water levels for the wetland community type. Optimal conditions within an assessment area would occur when indicators are distinct and consistent with those expected for the community type. The absence of expected indicators or indicators inconsistent with expected hydrologic conditions would indicate the attribute was not present.

c. Soil moisture

Guidance: Most wetlands exhibit moist or saturated soils throughout the year. In some cases, practices such as ditching, loss of groundwater recharge from land use changes, or excessive well water pumping result in lowered groundwater tables and consequent drainage of wetlands. Dry soils oxidize rapidly and this can result in soil subsidence, which is defined as the lowering of the soil level caused by the shrinkage of organic layers due to desiccation, consolidation, and biological oxidation. When scoring this indicator criterion, you must determine whether the soil moisture is appropriate for the particular system you are evaluating, taking into consideration seasonal variation, antecedent weather, and other climatic effects. The following hydric soil indicators identify soils with a high water table capable of providing saturation to the soil surface for extended periods of time. Further elaboration regarding technical hydric soil criteria can be found in *Field Indicators of Hydric Soils in the United States* (USDA, NRCS, 1996 and 1998).

All Soils	Sandy Soils	Loamy and Clayey Soils
Stratified Layers	Sandy Redox	Depleted Matrix
Organic Bodies	Stripped Matrix	Marl
	Dark Surface	Umbric Surface
	Polyvalue Below Surface	Thick Dark Surface
	Thin Dark Surface	Fe/Mn Masses
		Depleted Dark Surface
		Redox Dark Surface

Generally, in sandy textured soils, if the soils are wetland/hydric soils, the hydric soil indicators should be prevalent within 6 inches of the soil surface. In loamy and clayey textured soils, the hydric soil indicators should be prevalent within 12 inches of the soil surface.

d. Soil erosion or deposition

Guidance: Evidence of soil erosion and deposition is usually found in flowing systems such as floodplain swamps. When the river or stream overflows its banks, it deposits its sediment load in the floodplain. Water flowing through the system can also carry away some of the topsoil, and this is more prominent when water levels and velocity are excessively high. It is important to make the distinction between natural erosion/deposition and one indicative of deviation from that normal state (i.e., bends in a river versus a delta at the mouth of a canal). Anthropogenic sources of erosion and sediments should also be considered if it is leading to untypical rates of sediment deposition within the wetland. Additional sources of sediment deposition can include bank erosion from adjacent fill areas and stormwater discharges.

e. Vegetation – community zonation

Guidance: This attribute assesses whether the community zonation is appropriate for the ecosystem type. Many wetland types exhibit distinct community zonation. For instance, isolated freshwater marshes may have distinct rings of vegetation from the edge towards the interior. Tidal marshes also have distinct zonation along an elevation gradient that is tied to variations in tidal inundation frequency and duration.

When a wetland becomes hydrologically impaired, this community zonation can be disrupted. For instance, the presence of *Phragmites australis* (common reed) in a tidal marsh can be indicative of a tidal restriction or a change in surface elevations. Similarly, upland species encroachment into a wetland is also indicative of wetland drainage. On the other hand, community zonation can also be disrupted by water impoundment. For instance, cattails (*Typha* spp.) are adapted to high water levels in marshes, while in forested systems water impoundment results in the lack of an herbaceous layer.

f. Vegetation – hydrologic stress

Guidance: This attribute assesses the extent of hydrologic stress on vegetation. Hydrologic stress can manifest itself in many different ways, including increased mortality, leaning or fallen trees, thinning canopy, as well as susceptibility to insect damage or disease. Do you see a large number of leaning or fallen trees? Is there increased plant mortality at the site? Is there evidence of insect damage or disease?

g. Use by animal species with specific hydrological requirements

Guidance: This attribute assesses the presence or evidence of use by certain animal species with specific hydrologic requirements. However, when scoring this factor keep in mind that many species will not be seen during a brief site investigation, so the mere absence of sightings should not be counted against the particular site.

Many amphibians, such as grey tree frog, wood frog and spotted salamander, can only reproduce in isolated, ephemeral or vernal pool wetlands that lack predatory fish. In tidal systems, crabs and shellfish require cyclic tidal inundation.

h. Plant community composition

Guidance*:* The presence of tolerant wetland plant species can be an indication of degraded water quality. For instance, cattails (*Typha* spp.), duckweeds (*Lemna* spp.), common reed (*Phragmites australis*) are usually associated with high levels of nutrients. Species typical of low nutrient conditions include bladderwort (*Utricularia* spp.), and pitcher plants (*Sarracenia* spp.).

i. Direct observation of standing water

Guidance: When standing water is present, observations of water discoloration, turbidity, and oil sheen can help assess the water quality conditions at a site. It is extremely important, however, not to confuse what is a normal discoloration and turbidity from an atypical situation. For instance, even natural ecosystems exhibit an oil sheen on the water surface, but its appearance is very different from anthropogenic sources of oil.

j. Existing water quality data

Guidance: When water quality data exist for a particular site, it is important to compare them with expected values for the same ecosystem type. Studies have been conducted over the years that show typical values for nutrients and oxygen levels in different types of wetlands. However, the natural variability can be high, so caution needs to be used when interpreting water quality data, especially if the information was collected only once and does not represent long-term collection and analysis. Dissolved oxygen, pH and salinity are biologically important parameters that are easily measured in the field.

Dissolved Oxygen - Optimal oxygen levels are those where fish utilization of the site is not restricted and fish growth potential and survival are highest. Concentrations of less than 4 mg/l and 60% saturation are limiting (Adamus et al. 1987), and lower concentrations which are lethal are considered unsuitable. Water oxygen content is considered optimal when oxygen levels are usually greater than 5 mg/l and unsuitable when oxygen levels are frequently less than 2 mg/l. Intermediate oxygen levels are considered suboptimal, but not lethal (Bartoldus, et al. 1994). Direct observation of fish, especially younger stages, can indicate regular presence and/or successful reproduction of fish.

pH -The pH level of water affects fish survival, growth, and larval development. The pH is considered optimal when levels are between 6.5 to 8.5 and unsuitable when pH levels are ≤5.0 or ≥9.5. Intermediate levels are considered suboptimal, but not lethal (Bartoldus, et al. 1994).

pH Modifiers from Cowardin classification system.

Modifier	**pH of Water**
Acid	<5.5
Circumneutral	5.5-7.4
Alkaline	>7.4

Source: Cowardin et al. 1979.

Salinity – The salinity levels of surface waters have a direct influence on the plant and wildlife composition of a wetland community. Observed salinities can vary due to the dilution of sea water with fresh water inputs and the concentration of sea water by evaporation. Salinities can also vary in both surface water and interstitial (soil) water.

Salinity Modifiers used in the Cowardin classification system.

Coastal Modifiers[a]	**Inland Modifiers[b]**	**Salinity (parts per thousand)**	**Approximate specific conductance (µMhos at 25°C)**
Hyperhaline	Hypersaline	>40	>60,000
Euhaline	Eusaline	30.0-40	45,000-60,000
Mixohaline (Brackish)	Mixosaline	0.5-30	800-45,000
Polyhaline	Polysaline	18.0-30	30,000-45,000
Mesohaline	Mesosaline	5.0-18	8,000-30,000
Oligohaline	Oligosaline	0.5-5	800-8,000
Fresh	Fresh	<0.5	<800

[a]Coastal Modifiers are used in the Marine and Estuarine Systems.
[b]Inland Modifiers are used in the Riverine, Lacustrine, and Palustrine Systems.
[c]The term Brackish should not be used for inland wetlands or deepwater habitats.
Source: Cowardin et al. 1979.

k. Water depth, currents, and light penetration

Guidance: This attribute assesses the appropriateness of water depth, currents, and light penetration in the particular type of wetland or surface water. For instance, seagrasses or other submerged aquatic vegetation are more likely found in clear water versus turbid water, where instead the submerged vegetation is usually sparse. While currents do not generally apply to isolated systems, they can be quite important to streams and coastal systems.

l. Wave Energy and Fetch

Guidance: One of the most common causes of erosion and sediment release into waterways is wind borne waves. This attribute is applicable to assessment areas with exposure to wind generated waves due to a fetch distance greater than 100 feet, and boat wakes that occur on a regular basis. Assessment areas with high exposure will be subject to greater wave energy and have a higher potential for shoreline erosion. Fetch is the maximum distance over which wind can blow unimpeded across open water to create waves. When the fetch distance is large, wave energy increases and there is greater potential for shoreline erosion.

The presence of salt marsh grasses such as *Spartina alterniflora* reduces the energy of waves moving shoreward. At the seaward edge of salt marshes, a wave energy reduction of 26% per m-1 of vegetation has been reported (Fonseca & Cahalan, 1992). Wave energy reduction decreases with distance into the marsh. The ability of salt marsh vegetation to reduce wave energy in this manner helps prevent shoreline erosion (Niedowski, et al. 2000). A fetch distance greater than one mile presents a condition where the potential for shoreline erosion due to wave energy is significantly increased (Bartoldus, et al. 1994).

The optimal attribute condition reflects an assessment area where the shoreline is stable and there is limited potential for shoreline erosion due to wind-generated wave energy due to a fetch distance under one mile. Assessment areas with fetch distances over 1 mile and with evidence of severe shoreline erosion would be indicative of severe shoreline erosion due to wave energy.

m. Tidal Marsh Stability

Guidance: Tidal marshes maintain their vertical and horizontal position in the coastal landscape by achieving a balance between two processes: 1) the accretion of mineral and organic materials, and 2) coastal submergence due to the combined effects of sea-level rise, subsidence, and erosion. The vertical position of the marsh surface relative to mean sea level is determined by sediment and organic matter supply and the frequency of tidal flooding events. Deposition occurs when the marsh surface is inundated, and suspended materials settle onto the marsh surface. Most material settles out in the low marsh and along tidal creeks; the least amount of material settles out in the high marsh. Removal of excess material can occur during receding tides, particularly during spring tides and storm surges.

Several factors may potentially affect the process of sediment and organic matter accumulation in tidal marshes including elevation, flooding duration, suspended solid concentration, flow baffling by vegetation, and proximity to source (DeLaune, Baumann, and Gosselink 1983; Cahoon and Reed 1995; Leonard and Luther 1995; Leonard 1997).

Tidal marshes accrete vertically and expand horizontally across the coastal landscape by accumulating sediments and organic matter. If sediment availability is reduced, or if accretion rates are insufficient to maintain pace with relative sea-level rise or storm-induced erosion, marsh loss will result. High levels of function are associated with low elevation, high concentration of suspended sediment in floodwaters, low organic content of the suspended sediments and high coverage of native vegetation. A review of historical aerials can be used to assess is the marsh area receding over time.

When scoring this attribute, an optimal condition means the marsh is not receding and is maintaining a stable elevation that supports tidal marsh hydrology and vegetation. Assessment areas that are accreting sediments at a more rapid rate may elicit changes in vegetation patterns over time, including the establishment of common reed. Assessment areas that are losing vegetated marsh over time due to low rates of accretion or subsidence should be scored lower based on the apparent rate of change.

Appendix D
Community Structure Guidance Module

Appendix D Community Structure Guidance Module

Community Structure - Vegetation Introduction

Each impact and mitigation assessment area is evaluated with regard to its characteristic community structure. In general, a wetland or other surface water is characterized either by plant cover or by open water with a submerged benthic community.

When a plant cover is present, the area is assessed using the “Vegetation and Structural Habitat” section. When the Assessment area is almost entirely a benthic habitat, then the benthic communities are assessed using the “Benthic Communities” section. <u>If the assessment area includes a mosaic of plant cover and submerged benthic communities, then both of these indicators are scored and the resulting scores will be averaged to obtain a single community score.</u>

The presence, abundance, health, condition, appropriateness, and distribution of plant communities in surface waters, wetlands, and uplands can be used as indicators to determine the degree to which the functions of the community type are provided. Human activities such as groundwater withdrawal, ditching, and diking or the construction of conveyance canals, or other permanent structures such as seawalls in an aquatic system can permanently damage vegetation and structural habitat. Environmental factors such as excessive rainfall, drought, and fire can have temporary short-term impacts on vegetation. If the community structure is degraded, then the value of functions provided by the assessment area to the fish and wildlife identified in Part I is reduced.

Ten (10) attributes are used to evaluate the “Vegetation and Structural Habitat” section of this category. To provide guidance, examples are given that depict variation in conditions for each of the attributes.

- Plant species in the canopy, shrub, or ground stratum
- Invasive exotics or other invasive plant species
- Regeneration & recruitment
- Age & size distribution
- Density and quality of coarse woody debris, snag, den, and cavity
- Plant condition
- Land management practices
- Topographic features such as refugia ponds, creek channels, pannes, flats or hummocks
- Siltation or algal growth in submerged aquatic plant communities
- Upland mitigation area -level of habitat and support for fish and wildlife in the associated wetlands or surface waters

Be aware that not all attributes are applicable to all assessment areas, and in some cases, some attributes may be more relevant than others. The final score for the Community Structure – Vegetation and Structural Habitat category is a reflection of the overall condition of an assessment area, taking into consideration all applicable attributes (do not score each attribute and average them in the end, but rather think of this in terms of what final score best fits the overall conditions of the assessment area). Any whole number score between 0-10 may be used that best represents the level of function of the assessment area.

The following are descriptors of attributes for 4 categories of scores as guidance:

- A score of (10) means that the vegetation community and physical structure provide conditions which support an optimal level of function to benefit fish and wildlife utilizing the assessment area as listed in Part I.
- A score of (7) means that the level of function provided by plant community and physical structure is limited to 70% of the optimal level.
- A score of (4) means that the level of function provided by the plant community and physical structure is limited to 40% of the optimal level.
- A score of (0) means that the vegetation communities and structural habitat do not provide functions to benefit fish and wildlife.

A Summary Worksheet for **Vegetation and Structural Habitat** is included as Table D.1 to help in the field assessment scoring.

VEGETATION AND STRUCTURAL HABITAT ATTRIBUTE GUIDANCE

I. Plant cover and species in the canopy, shrub, or ground stratum

Guidance: This attribute evaluates the appropriateness of the plant composition in the canopy, shrub, and ground stratum of the wetland type being evaluated. Refer to the *Ecological Communities of New York State* (Edinger et al. 2002) to identify appropriate and desirable species based on the wetland type. All three strata should be evaluated when present. In forested wetlands, often the herbaceous community (ground stratum) will exhibit changes in species composition resulting from degraded environment conditions long before the species composition of the shrub or canopy stratum.

The plant species composition and its relative dominance by native species appropriate to the wetland community type should be used to guide the scoring of this attribute.

II. Invasive exotics or other invasive plant species

Guidance: Identify any invasive exotic species within the assessment area, and estimate their cover with respect to desirable vegetation. Become familiar with the NYSDEC *Interim List of Invasive Plant Species in New York State* and refer to the wetland field guides for identification of the most common exotic wetland herbaceous and hardwood species.

The estimated percent cover of invasive plant species within the assessment area should be used to guide the scoring of this attribute. Under optimal conditions, less than 5 percent of the site and adjacent habitats would be dominated by invasive plant species. Consistent with regulatory guidance for mitigation actions, 10 to 15 percent cover by invasive plant species would be consistent with a more moderate condition that would require management intervention to attain a more optimal condition. A predominance of invasive plant species cover of over 85 percent or more of the assessment area would be consistent with a score of not present.

III. Regeneration and recruitment

Guidance: Regeneration and recruitment should be noted, since evidence of seed production can provide insight into the health of an ecosystem. Is there evidence of tree recruitment or seed production? Recruitment is not always evenly spaced throughout a wetland. For instance, a higher density of seedlings is typical in open canopy areas, where canopy cover is reduced either due to natural causes (tree fall or fire), or anthropogenic disturbance (harvest).

The relative amount of observable recruitment throughout the assessment area should be used to guide the scoring of this attribute.

IV. Age and size distribution

Guidance: Forested wetland ecosystems should exhibit a wide range of age and size distribution that includes several cohorts of mature trees, younger trees, and a variety of seedlings and saplings. This ensures that when the mature tree dies and/or falls, there will be quick recruitment by younger trees to fill the open space. Age and size distributions that lack young (small) trees may be indicative of environmental conditions that preclude germination.

The observable amount of trees within different age classes, or the absence of age classes, should be used to guide the scoring of this attribute.

V. Density and quality of coarse woody debris, snag, den and cavity

Guidance: Woody debris, snags, dens and tree cavities provide cover habitat for wildlife, as well as offering a diversity of forage and nesting sites. Fallen tree logs also increase the microtopographic diversity within sites, thus allowing a diverse assemblage of plant species and providing microhabitats for various wildlife. Does the density and quality of coarse woody debris, snags, dens and cavities within the wetland appear to provide appropriate structural habitat for the type of system being evaluated? How's does the overall health of the forest reflect the quantity of density and quality of coarse woody debris?

The observable amount of coarse woody debris, snags, dens and cavity trees paired with the structural health of the forest should be used to guide the scoring of this attribute.

VI. Plant condition

Guidance: The overall condition of the plant community can be an indication of disturbance and can be evaluated by observing dead or dying vegetation, chlorotic (yellowing or bleaching) or spindly growth, and damage caused by insects. Often herbaceous vegetation and tree seedlings will exhibit chronic conditions before more mature vegetation. Careful attention should be given to seasonality effects on plant communities.

Table D.1 Community Structure	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
1. Vegetation and Structural Habitat	vegetation community and physical structure provide conditions which support an optimal level of function to benefit fish and wildlife	vegetation community and physical structure limited to 70% of optimal level of function to benefit fish and wildlife in Part I	vegetation community and physical structure limited to 40% of optimal level of function to benefit fish and wildlife in Part I	vegetation community and physical structure do not provide function to benefit fish and wildlife in Part I
I. Plant species in the canopy, shrub, or ground stratum	all or nearly all appropriate and desirable	majority appropriate and desirable	majority inappropriate or undesirable	no appropriate or desirable species
II. Invasive exotics or other invasive plant species	not present	present, but cover is minimal	majority of plant cover	high presence and cover
III. Regeneration & recruitment	normal and natural	near-normal	minimal evidence	no evidence
IV. Age & size distribution	typical of type of system with no deviation from normal patterns of succession or mortality	no indication of permanent deviation, but may have had temporary deviations or impacts to age and size distribution	atypical and indicative of permanent deviation from normal successional pattern, with greater than expected mortality	high percentage of dead and dying vegetation, with no typical age and size distribution
V. Density and quality of coarse woody debris, snag, den, and cavity	optimal structural habitat	slightly lower or slightly greater than normal quantity	not present or greater than normal because vegetation is dead or dying	not present or exist only because native vegetation is dead or dying
VI. Plant condition	good condition, with very little to no evidence of chlorotic or spindly growth or insect damage	generally good, with little evidence of chlorotic or spindly growth or insect damage	generally poor, with evidence of chlorotic or spindly growth or insect damage	overall very poor, with strong evidence of chlorotic or spindly growth or insect damage
VII. Land management practices	optimal for long term viability of plant community	generally appropriate some possible fire suppression or water control features that have caused a shift in plant community	partial removal or alteration of natural structure, or introduction or artificial features, such as mosquito ditches or drainage ditches	removal or alteration of natural structure, or introduction or artificial features, such as furrow or ditches
VIII. Microtopographic features	present and normal	slightly less than optimal	reduction in extent of topographic features from what is normal	lack of topographic features that are normal for the area being assessed
IX. Siltation or algal growth in submerged aquatic plant communities	no evidence	minor degree of siltation or algal growth	moderate degree of siltation or algal growth	high degree of siltation or algal growth
X. Upland mitigation area -level of habitat and support for fish and wildlife in the associated wetlands or surface waters	optimal level of habitat and life history support	high, but less than optimal level of habitat and life history support	moderate level of habitat and life history support	little or no habitat and life history support

The absence of disturbance or the extent of disturbance across the assessment area should be used to guide the scoring of this attribute.

VII. Land management practices

Guidance: This attribute includes observations of land management practices in and around the wetland. Mowing, grazing, water control features (furrows or ditches), as well as logging operations, can affect the condition of the plant community. Is there evidence of the management practices that will affect the plant community either in a positive (enhancing long term sustainability of the community) or negative manner? For tidal marshes, are functioning mosquito ditches present that alter marsh hydrology and avian populations (Tonjes, 2013)?

In assessing the future condition of the assessment area, the establishment of a long term management plan and the placement of a conservation easement on the site should also be considered for the long term benefits that are conveyed to the site by these measures.

The degree of alteration of the wetland and plant community across the assessment area due to land management practices should be used to guide the scoring of this attribute.

VIII. Microtopographic features

Guidance: Slight elevation differences control many marsh functions, from flooding and nutrient cycling to draining of the marsh interior. This microtopography is critical for development and maintenance of foraging habitat for invertebrates, fish, and birds. Microtopographic features typically present in salt marshes include hummocks, pannes, pools, and shallow channels.

The presence and extent of microtopographic features within the assessment area should be used to guide the scoring of this attribute. An optimal score means that microtopographic features are present and typical for the community type. Lower scores should represent conditions that reflect the reduced frequency or absence of these features.

IX. Siltation or algal growth in submerged aquatic plant communities

Guidance: Applicable only to submerged aquatic plant communities, this attribute evaluates the degree of siltation and algal growth, and the degree that it can impede normal aquatic plant growth. Waters dominated by algae or that have high silt loads and turbidity impedes photosynthesis of submerged vegetation. Secchi depth is a long-accepted methods for evaluating the transparency of water in lakes. However, care must be used in interpreting secchi data because of the potential influence of non-algal or silt particulate material, such as the tea color of some lakes that's due to dissolved organic matter and organic tannins.

X. Upland mitigation area

Guidance: This indicator assesses the level of habitat and life history support provided by adjoining uplands for the fish and wildlife in the associated wetlands and surface water. Applicable to upland mitigation area only, this attribute assesses whether the plant community and physical structure of the upland provides an optimal level of habitat and life history support for fish and wildlife associated with the nearby wetlands and other surface waters.

The scoring of this attribute should reflect the quality and level of disturbance within the upland habitat. High quality, fully functioning upland plant communities represent the optimal condition, whereas disturbed habitats or those dominated by non-native species would score as providing little or no habitat and life history support.

Community Structure- Benthic Introduction

This indicator is intended to be used in marine or freshwater aquatic systems that are not characterized by a terrestrial or emergent plant community. These systems include live hardbottom communities, such as oyster bars and beds, reefs, and soft-bottom systems such as riverine systems. The benthic communities within nearshore, inshore, marine and freshwater aquatic systems are analogous to the vascular plant communities of terrestrial wetland systems in that they provide food and habitat for other biotic components of the system and function in the maintenance of water quality. If the assessment area is a mosaic of relatively equal parts of submerged plant cover and submerged benthic community as defined above, then both of these indicators will be scored and those scores averaged to obtain a single community structure score.

Oyster bars and beds in nearshore habitats and estuaries filter large amounts of particulate matter and provide food and habitat for a variety of species, such as boring sponges, mollusks, and polycheate worms. The distribution and quality of coral reefs reflect a balance of water temperature, salinity, nutrients, water quality, and presence of nearby productive mangrove and seagrass communities. Benthic infauna of soft-bottom systems stabilize the substrate, provide a food source, and serve as useful indicators of water quality.

All of these communities are susceptible to human disturbance through direct physical damage, such as dredging, filling, or boating impacts, and indirect damage through changes in water quality, currents, and sedimentation.

Seven attributes are identified in the UMAM Rule to evaluate the “Benthic and Sessile Communities” section of this category. To provide guidance, examples that depict variation in conditions for each of the attributes are included.

- Species number and diversity of benthic organisms
- Non-native or inappropriate species
- Regeneration, recruitment and age distribution
- Condition of appropriate species
- Structural features
- Topographic features such as relief, stability, and interstitial spaces (hardbottom and reef communities) or snags and coarse woody debris (riverine systems)
- Spawning or nesting habitats

Be aware that not all attributes are applicable to all assessment areas and in some cases, some attributes may be more relevant than others. The final score for the Community Structure – Benthic and Sessile Communities category is a reflection of the overall condition of an assessment area, taking into consideration all applicable attributes (do not score each attribute and average them in the end, but rather think of this in terms of what final score best fits the overall conditions of the assessment area). Any whole number score between 0-10 may be used that best represents the level of function of the assessment area.

The following are descriptors of attributes for 4 categories of scores as guidance:

- A score of (10) means that the benthic communities are indicative of conditions that provide optimal support for all of the functions typical of the assessment area and provide optimal benefit to fish and wildlife.
- A score of (7) means that, relative to ideal habitat, the benthic communities of the assessment area provide functions at 70% of the optimal level.
- A score of (4) means that, relative to ideal habitat, the benthic communities of the assessment area provide functions to 40% of the optimal level.
- A score of (0) means that the benthic communities do not support the functions identified and do not provide benefits to fish and wildlife.

A Summary Worksheet for **Benthic and Sessile Communities** is included as Table D.2 to help in the field assessment scoring.

BENTHIC COMMUNITIES ATTRIBUTE GUIDANCE

Appropriate levels of benthic species richness, diversity, and abundance can be derived from available scientific literature for specific habitat types such as intertidal mudflat, subtidal creek bed, etc. Differences between site conditions and literature-based community metric values for an unaffected site would indicate the degree of benthic community impairment. Depending on site conditions, grab sampling, Sediment Profile Imagery (SPI) or other methods could be used to characterize the infaunal benthic macroinvertebrate community; however, these studies require a high level of effort. A rapid benthic community assessment approach such as a benthic species checklist may be useful to support benthic and sessile species community characterization.

I. Species number and diversity of benthic organisms

Guidance: This attribute evaluates the appropriateness, number and diversity of benthic organisms.

II. Non-native and inappropriate species

Guidance: This attribute evaluates the presence or absence of non-native benthic organisms.

III. Regeneration, recruitment and age distribution

Guidance: Natural regeneration and recruitment should be noted, as well as evidence of appropriate age distribution.

IV. Condition of appropriate species

Guidance: This attribute evaluates the health and biomass of appropriate species.

Table D.2 Community Structure	**Optimal (10)**	**Moderate (7)**	**Minimal (4)**	**Not Present (0)**
2. Benthic and Sessile Communities	benthic and sessile communities provide optimal support for all functions typical of the assessment area and provide optimal benefit to fish and wildlife	benthic and sessile communities provide functions at 70% of optimal level	benthic and sessile communities provide functions at 40% of optimal level	benthic and sessile communities do not support functions or provide benefits
I. Species number and diversity of benthic organisms	appropriate species number and diversity optimal for type of system	majority of species are appropriate with number and diversity slightly less than normal	appropriate species greatly decreased	lack of appropriate species, any appropriate species in poor condition
II. Non-native or inappropriate species	not present	represent a minority	majority	dominant
III. Regeneration, recruitment and age distribution	optimal	slightly less than expected	minimal	no indication
IV. Condition of appropriate species	good, with typical biomass	generally good	substantial number dying or in poor condition	not present
V. Structural features	typical with no evidence of past physical damage	typical, or with little evidence of past physical damage	atypical	structural integrity very low or non-existent, evidence or serious physical damage
VI. Topographic features such as relief, stability, and interstitial spaces (hard bottom and reef communities) or snags and coarse woody debris (riverine systems)	typical and optimal	slight deviation from expected	greatly reduced	lacking
VII. Spawning or nesting habitats	optimal	less than expected	few are available	none

V. Structural features

Guidance: This attribute evaluates whether the structural features are appropriate for the system or whether there is evidence of physical damage.

VI. Topographic features

Guidance: This attribute evaluates the appropriateness and condition of topographic features such as relief, stability, and interstitial spaces for hardbottom and reef communities, or snags and coarse woody debris for riverine systems.

VII. Spawning or nesting habitats

Guidance: This attribute assesses the condition and number of spawning and nesting habitats such as rocky or sandy bottoms.

Appendix E
Expected Variation Guidance Module

Appendix E Expected Variation Guidance Module

- Natural wetland communities may exhibit seasonal and regional variability in vegetation community structure and hydrology. For example, many wetland communities will be inundated during the wetter winter and spring season but may have no standing water during the summer dry season.

- Deciduous wetland communities will appear green and lush in the summer months, while they will be bare of leaves in the winter. The lack of lush vegetation during the winter months should not be taken as a sign of diseased or stressed vegetation.

- Forested wetland communities may completely lack an understory depending on time of year and water depths, while at other times they may be heavily vegetated.

- Tidally influenced wetlands may exhibit daily tidal fluctuations, while other wetlands like hydric hammocks exhibit little change seasonally.

- Similar hydrologic conditions may result in very different vegetative communities and standing biomass. From year to year a wetland may be dominated by different vegetation depending on depths of inundation, fire history, or time of year.

- Nutrient availability has a significant effect on the vegetative community. Oligotrophic (low nutrient) environments result in relatively sparse vegetation, small in stature, and often very slow growing, while eutrophic (high nutrient) environments are often dominated by thick vegetation, robust in stature, and relatively fast growing.

Appendix F
Adjustment Factors Guidance

Appendix F Adjustment Factors Guidance

Preservation Adjustment Factor

When assessing preservation, the gain in ecological value is determined by multiplying the delta by a preservation adjustment factor. The preservation adjustment factor is scored on a scale from 0 (no preservation value) to 1 (optimal preservation value), on one-tenth increments. The score is based on:

1. The extent the preserved area will promote natural ecological conditions such as biodiversity, hydrologic patterns or the exclusion of invasive exotic species.
2. The ecological and hydrological relationship between wetlands, other surface waters, and uplands to be preserved.
3. The scarcity of the habitat provided by the proposed preservation area and the level of use by listed species.
4. The proximity of the preserved area to areas of national, state, or regional ecological significance, and whether the areas to be preserved include corridors between these habitats.
5. The extent and likelihood of potential adverse impacts if the assessment area were not preserved.

Time Lag Adjustment Factor

The time lag associated with mitigation means the period of time between when the functions are lost at an impact site and when those functions are replaced by the mitigation. The time lag, in years, is related to a factor (T-factor) as established in the adjacent Table, to reflect the additional mitigation needed to account for the deferred replacement of wetland or surface water functions. For wetland mitigation banks, Time Lag should be considered to be less than or equal to one since the functional uplifts will be realized prior to project impacts, in some cases for one or more years before a credit is used to offset impacts.

Year	T-factor
< or = 1	1
2	1.03
3	1.07
4	1.10
5	1.14
6 – 10	1.25
11 – 15	1.46
16 – 20	1.68
21 – 25	1.92
26 – 30	2.18
31 – 35	2.45
36 – 40	2.73
41 – 45	3.03
46 – 50	3.34
51 – 55	3.65
>55	3.91

Risk Adjustment Factor

For mitigation assessment areas, mitigation risk shall be evaluated to account for the degree of uncertainty that the proposed conditions will be achieved, resulting in a reduction in the ecological value of the mitigation assessment area. The assessment area shall be scored on a scale from 1 (for no or de minimus risk) to 3 (high risk), on quarter-point (0.25) increments. A score of one would most often be applied to mitigation conducted in an ecologically viable landscape and deemed successful or clearly trending towards success prior to impacts, whereas a score of three would indicate an extremely low likelihood of success based on a number of ecological factors.

For wetland mitigation banks, the risk factor should be scored as a 1 since there is a high level of scrutiny and review of the project resulting in a high level of assurance that the proposed mitigation approaches will be successful. In addition, the release of credits is dependent upon the project components meeting specific success and performance criteria; therefore, the degree of uncertainty that proposed conditions are achieved resulting in the release of mitigation credits is greatly minimized.

Appendix G
Assessment Area Photographs

Photo 1: Tires, wood, and metal debris dumped in wetland –Assessment Area W1.

Photo 2: Filled wetland, central portion of western section – Assessment Area W2.

Photo 3: Asphalt dumped in wetland – Assessment Area W2.

Photo 4: Dumping within emergent marsh – Assessment Area W3.

Photo 5: Salt panne – Assessment Area W3.

Photo 6: Scrap metal, boulders, concrete debris along upland slope – Assessment Area W4.

Photo 7: Storm surge debris along upland slope– Assessment Area W4.

Photo 8: Tire in low marsh habitat with *Phragmites* encroachment the in background – Assessment Areas E3 (foreground) and E1 (background).

Photo 9: Filled wetland east of Chelsea Road, south of Saw Mill Creek – Assessment Areas E2.

Photo 10: Remnant berm in northeastern section of site – Assessment Area E2.

Photo 11: Deer within the palustrine forested wetland – Assessment Area E4.

Photo 12: *Phragmites* cover and tires dumped in palustrine forested wetland – Assessment Area E4.

Photo 13: Tires dumped in upland forested area adjacent to Chelsea Road and Route 440 ramp – Assessment Area E6.

Photo 14: Upland oak forest – Assessment Area E6.

Photo 15: Scattered tires and other debris dumped in upland forest- Assessment Area E6.

Photo 16: Japanese knotweed and *Phragmites*, upland south of Edward Curry Avenue – Assessment Area E7.

Appendix H
Completed Assessment Area Data Forms

PART I – Qualitative Description
(See Section 4.4.1)

(1) Site/Project Name	(2) Application Number	(3) Assessment Area Name or Number
Sawmill Creek Bank	NAN-2013-00259-EHA	W1 - West Tidal Wetland Restoration (Rehabilitation)

(4) Habitat Code	(5) Further classification (optional)	(6) Impact or Mitigation Site?	(7) Assessment Area Size
II.C. 4 Estuarine Cultural	Estuarine Impoundment Marsh	Mitigation	1.02

(8) Basin/Watershed Name/Number	(9) Affected Waterbody (Class)	(10) Special Classification (local/state/federal designation of importance)
HUC 02030104	Sawmill Creek, Class SD (impaired: floatables and Oxy demand)	DEC HM (high marsh) wetlands

(11) Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

AA hydrologically connected to Sawmill Creek and Arthur Kill, geographically adjacent to Sawmill Creek and Arthur Kill Complex(No. 18) (USFWS,NY Bight Study, 1997)

(12) Assessment area description

Phragmites marsh. Adjacent to past fill/development activities.

(13) Significant nearby features	(14) Uniqueness (considering the relative rarity in relation to the regional landscape.)
Pralls Island; Sawmill Creek wetland complex; Sarnelli Brothers, Inc Trucking and Demolition, storage lot	AA is part of a unique natural system within the highly urbanized NY/NJ region

(15) Functions	(16) Mitigation for previous permit/other historic use
Habitat; Primary Production; Nutrient Cycling; Removal Contaminents; flood storage; (NYSDOS and NYSDEC 2000)	Bank credit development

(17) Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	(18) Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Red-winged blackbird, marsh wren. See also: Ecological Communities of NY State (NYNHP 2002); Salt Marsh Restoration and Monitoring Guidelines (NYSDOSand NYSDEC 2000)	Not expected to be present.

(19) Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

No evidence observed during site visits conducted between May and June, 2013.

(20) Additional relevant factors:

Sources of stormwater runoff from adjacent land uses; connectivity to adjacent tidal marsh restricted by rail line and box culvert; adjacent invasive species present (Phragmites); potential for further encroachment from adajcent land use; potential for tide driven debris accumulation. Under five miles from Newark Airport (FAA coordination required). The estimated construction cost for this publicly funded wetland rehabilitation is ~$280,000 per acre.

(21) Assessment conducted by:	(22) Assessment date(s):
LBA PC	10/30/2013

Table I.1: Anticipated Wildlife Utilization in Tidal Wetland Communities

Tidal Wetland Community	Common Name	Scientific Name
High marsh	salt marsh mosquitoes	*Aedes* spp.
	greenhead flies	*Tabanidae*
	coffeebean snail	*Melampus bidentatus*
	clapper rail	*Rallus longirostris*
	sharp-tailed sparrow	*Ammodramus caudacutus*
	marsh wren	*Cistothorus palustris*
	eastern meadowlark	*Sturnella magna*
	American black duck	*Anas rubripes*
Low marsh	clapper rail	*Rallus longirostris*
	willet	*Catoptrophorus semipalmatus*
	marsh wren	*Cistothorus palustris*
	seaside sparrow	*Ammodramus maritimus*
	fiddler crabs	*Uca* spp.
	ribbed mussel	*Geukensia demissa*
	mummichog	*Fundulus heteroclitus*
Salt shrub	marsh wren	*Cistothorus palustris*
Salt panne	mummichog	*Fundulus heteroclitus*
	sheepshead minnow	*Cyprinodon variegatus*

Source: Edinger, et al., 2002.; Louis Berger & Assoc., P.C., 2013

Table I.1: Summary of State and Federal Listed Species

NEW YORK NATURAL HERITAGE DATA	Common Name	Scientific Name	NY State Listing	Heritage Conservation Status	Type of Use/Occurrence
T&E documented at or near the site, generally within 0.5 mile	Least bittern	*Ixobrychus exilis*	Threatened		documented near site
	Pied-billed grebe	*Podilymbus podiceps*	Threatened		documented near site
Rare animals documented at or in vicinity of site	Cattle egret	*Bubulcus ibis*	Protected bird	Imperiled in NYS	foraging/breeding offsite
	Glossy ibis	*Plegadis falcinellus*	Protected bird	Imperiled in NYS	foraging/breeding offsite
	Little blue heron	*Egretta caerulea*	Protected bird	Imperiled in NYS	foraging/breeding offsite
	Snowy egret	*Egretta thula*	Protected bird	Imperiled in NYS	foraging/breeding offsite
	Yellow-crowned night-heron	*Nyctanassa violacea*	Protected bird	Imperiled in NYS	foraging/breeding offsite
	Southern leopard frog	*Lithobates sphenocephalus*	Special concern	Critically imperiled in NYS	foraging/breeding offsite
Plants listed as Endangered or Threatened	Nantucket juneberry	*Amelanchier nantucketensis*	Endangered	Critically imperiled in NYS	
	Persimmon	*Diospyros virginiana*	Threatened	Imperiled in NYS	documented at site
	Rose pink	*Sabatia angularis*	Endangered	Critically imperiled in NYS	
	Sweetbay magnolia	*Magnolia virginiana*	Endangered	Critically imperiled in NYS	
Rare species with historical records at the site or in the vicinity	Eastern mud turtle	*Kinosternum subrubrum*	Endangered	Critically imperiled in NYS	Historical occurrence
	Log fern	*Dryopteris celsa*	Endangered	Critically imperiled in NYS	Historical occurrence
	Orange fringed orchid	*Platanthera ciliaris*	Endangered	Critically imperiled in NYS	Historical occurrence
USFWS	**Common Name**	**Scientific Name**	**Federal Listing**		
Species may occur within the project boundary and/or may be affected by project	Piping plover	*Charadrius melodus*	Threatened		
	Roseate tern	*Sterna dougallii dougalli*	Endangered		

Source: USFWS, 2013; NYSDEC, NHP 2013; Louis Berger & Assoc., P.C., 2013

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Sawmill Creek Bank	NAN-2013-00259-EHA	W1 - West Tidal Wetland Restoration (Rehabilitation)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	LBA PC	10/30/2013

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Location and Landscape Support		current condition	with rehabilitation
	a	6 - adjacent areas support some wildlife species	7 - restoration of adjacent areas will improve wildlife support
	b	6 - Phragmites is present within and adjacent to site	8 - Invasives management will reduce Phrgamites cover
	c	4 -adjacent development and hydrological impairment are barriers	7 - improved hydrology & Phragmites removal will improve wildlife access
	d	4 - hydrology of area is impaired, area is somewhat impounded	8- restoration to tidal conditions will improve connectivity
	e	3 - effects of adjacent fill and development (industry/roads) impact habitat	4 - restoration of tidal flushing will reduce adverse effects from outside land use
	f	3 - poor connectivity with downstream areas impairs function	7 - hydrologic improvements will provide greater benefits to surrounding areas
	g	3 - provides minimal downstream benefits	5 - improved connectivity provides more effective functions (nutrient cycling, sediment trapping)
	h	N/A to wetland areas	N/A to wetland areas
current / with	i	2 - area not horizontally or vertically extensive, little buffering ability	3 - hydrologic restoration would slightly improve buffering/storage functions
4 / 7	j	7 - elevation appears suitable for high marsh & scrub-shrub habitats	7 - negligible change of elevation with restoration

Water Environment (n/a for uplands)		current condition	with rehabilitation
	a	5 - significant hydrologic restriction present	9 - tidal hydrology will be restored
	b	7 - water level indicators not apparent in dense Phragmites	9 - water level indicators will be distinct and consistent with expected
	c	8 - soil moisture sufficient to support wetland vegetation (Phragmites)	10 - hydrologic improvement will restore appropriate tidal soil moisture conditions
	d	4 - atypical flow in Phragmites-dominated area	8 - tidal ebb and flow will be improved
	e	2 - area is dominated by Phragmites	9 - grading to tidal elevations will improve target strata
	f	4 - hydrologic stress indicated by Phragmites monoculture	9 - reconnection with tidal hydrology will allieviate hydrologic stress
	g	4 - wildlife with specific hydrologic requirement (i.e. fiddler crab) not expected to be abundant in Phragmites monoculture	10 - restoration of tidal hydrology will increase use by tidally-dependent wildlife species
	h	3 - Phragmites monoculture typical of water quality degradation/flow alteration	9 - native tidal marsh plant community indicative of good water quality and proper flows
	i	8 - none observed, but potential for slight degradation from surrounding land use	9 - restoration will reduce potential for degradation from surrounding land use
	j	3 - water quality impairment from adjacent land uses; tidal flow from estuary is listed as impaired for floatables and oxygen demand; poor hydrologic connectivity	7 - improved flows will assist cycling of contaminants from uplands; restoration will divert/educe runoff from adjacent industrial site
	k	2 - depths, currents and light penetration not well suited for salt marsh community	9 - improvements will establish proper depth and currrents for high marsh; improved tidal marsh functions will improve water quality
current / with	l	10 - nearby shorelines are stable; shoreline erosion due to wind-generated wave energy not expected	10 - no change expected
4 / 9	m	9 - elevation appears stable	9 - restored marsh expected to maintain stable elevation

Community structure 1. Vegetation and/or 2. Benthic Community		current condition	with rehabilitation
	I	1 - area is dominated by Phragmites	9 - area will be vegetated with native salt marsh species
	II	1 - Phragmites comprises nearly all plant cover	8 - Phragmites cover will be minimal and managed
	III	3 - minimal evidence of seed production and recruitment	10 - high degree of native plant seed production and recruitment expected
	IV	N/A - no woody debris in assessment area	N/A - no woody debris in assessment area
	V	N/A - no woody debris in assessment area	N/A - no woody debris in assessment area
	VI	9 - Phragmites appears in good condition	9 - native tidal marsh plant species expected to be in good condition as in adjacent areas
	VII	2 -ditching, disturbance, and lack of management resulted in Phragmites dominance	10 - long term management plan and conservation easement will support viable native salt marsh community
	VIII	3 - poor microtopography and lack of channels in Phragmites dominated area	9 - excavation of channels and grading to tidal elevations will establish proper tidal topography
current / with	IX	N/A, no SAV in region	N/A, no SAV in region
3 / 9	X	N/A to wetland areas	N/A to wetland areas

Score = sum of above scores/30

current	with
0.37	0.83

If Preservation as mitigation	
Preservation adjustment factor =	
Adjusted mitigation delta =	

For impact assessment areas	
Functional loss (impact x acres)	

(if uplands, divide by 20)

If mitigation	
Time lag (t-factor) =	1.00
Risk factor =	1.00

For Mitigation Assessment Areas	
Relative Functional Gain (RFG) Delta/(risk*t-factor)	0.47

Delta = [with-current]	
wetland	0.47
upland	0.00

Assessment Area Acreage	1.02

Mitigation Bank Credit Generation	
RFG * Assessment Area Acreage	**0.48**

PART I – Qualitative Description
(See Section 4.4.1)

(1) Site/Project Name	(2) Application Number	(3) Assessment Area Name or Number
Sawmill Creek Bank		E1 - East Tidal Wetland Restoration (Rehabilitation)

(4) Habitat Code	(5) Further classification (optional)	(6) Impact or Mitigation Site?	(7) Assessment Area Size
II.C. 4 Estuarine Cultural	Estuarine Impoundment Marsh	Mitigation	15.70

(8) Basin/Watershed Name/Number	(9) Affected Waterbody (Class)	(10) Special Classification (local/state/federal designation of importance)
HUC 02030104	Sawmill Creek, Class SD (impaired: floatables and Oxy demand)	DEC HM (high marsh) wetlands

(11) Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

AA hydrologically connected to Sawmill Creek and Arthur Kill, geographically adjacent to Sawmill Creek and Arthur Kill Complex(No. 18) (USFWS,NY Bight Study, 1997)

(12) Assessment area description

Phragmites marsh. Adjacent to past fill/development activities. Includes 0.31 acre unvegetated area with clay substrate that is potential panne habitat.

(13) Significant nearby features	(14) Uniqueness (considering the relative rarity in relation to the regional landscape.)
Pralls Island; Sawmill Creek wetland complex	AA is part of a unique natural system within the highly urbanized NY/NJ region

(15) Functions	(16) Mitigation for previous permit/other historic use
Habitat; Primary Production; Nutrient Cycling; Removal Contaminents; flood storage; (NYSDOS and NYSDEC 2000)	Bank credit development

(17) Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	(18) Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Red-winged blackbird, marsh wren. See also: Ecological Communities of NY State (NYNHP 2002); Salt Marsh Restoration and Monitoring Guidelines (NYSDOSand NYSDEC 2000)	Not expected to be present.

(19) Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

No evidence observed during site visits conducted between May and June, 2013.

(20) Additional relevant factors:

Sources of stormwater runoff from adjacent land uses; adjacent invasive species present (Phragmites); potential for further encroachment from adajcent land use; potential for tide driven debris accumulation. Under five miles from Newark Airport (FAA coordination required). The estimated construction cost for this publicly funded wetland rehabilitation is ~$280,000 per acre.

(21) Assessment conducted by:	(22) Assessment date(s):
LBA PC	10/30/2013

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Sawmill Creek Bank	NAN-2013-00259-EHA	E1 - East Tidal Wetland Restoration (Rehabilitation)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	LBA PC	10/30/2013

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Location and Landscape Support (current: 4; with: 7)

	current condition	with rehabilitation
a	6 - adjacent areas support some wildlife species	7 - restoration of adjacent areas will improve wildlife support
b	6 - Phragmites is present within and adjacent to site	8 - Invasives management will reduce Phrgamites cover
c	4 -adjacent development and hydrological impairment are barriers	7 - improved hydrology & Phragmites removal will improve wildlife access
d	4 - hydrology of area is impaired, area is somewhat impounded	8- restoration to tidal conditions will improve connectivity
e	3 - effects of adjacent development (industry/roads) impact habitat	4 - restoration of tidal flushing will reduce adverse effects from outside land use
f	3 - poor connectivity with downstream areas impairs function	7 - hydrologic improvements will provide greater benefits to surrounding areas
g	3 - provides minimal downstream benefits	5 - improved connectivity provides more effective functions (nutrient cycling, sediment trapping)
h	N/A to wetland areas	N/A to wetland areas
i	2 - area not horizontally or vertically extensive, little buffering ability	3 - hydrologic restoration would slightly improve buffering/storage functions
j	7 - elevation appears suitable for high marsh & scrub-shrub habitats	7 - negligible change of elevation with restoration

Water Environment (n/a for uplands) (current: 4; with: 9)

	current condition	with rehabilitation
a	5 - significant hydrologic restriction present	9 - tidal hydrology will be restored
b	7 - water level indicators not apparent in dense Phragmites	9 - water level indicators will be distinct and consistent with expected
c	8 - soil moisture sufficient to support wetland vegetation (Phragmites)	10 - hydrologic improvement will restore appropriate tidal soil moisture conditions
d	4 - atypical flow in Phragmites-dominated area	8 - tidal ebb and flow will be improved
e	2 - area is dominated by Phragmites	9 - grading to tidal elevations will improve target strata
f	4 - hydrologic stress indicated by Phragmites monoculture	9 - reconnection with tidal hydrology will allieviate hydrologic stress
g	4 - wildlife with specific hydrologic requirement (i.e. fiddler crab) not expected to be abundant in Phragmites monoculture	10 - restoration of tidal hydrology will increase use by tidally-dependent wildlife species
h	3 - Phragmites monoculture typical of water quality degradation/flow alteration	9 - native tidal marsh plant community indicative of good water quality and proper flows
i	8 - none observed, but potential for slight degradation from surrounding land use	9 - restoration will reduce potential for degradation from surrounding land use
j	3 - assumed water quality impairment from adjacent land use runoff, poor hydrologic connectivity; tidal flow from estuary is listed as impaired for floatables and oxygen demand	7 - improved flows will assist cycling of contaminants from uplands, eliminate standing water
k	2 - depths, currents and light penetration not well suited for salt marsh community	9 - improvements will establish proper depth and currrents for high marsh; improved tidal marsh functions will improve water quality
l	10 - nearby shorelines are stable; shoreline erosion due to wind-generated wave energy not expected	10 - no change expected
m	9 - elevation appears stable	9 - restored marsh expected to maintain stable elevation

Community structure — 1. Vegetation and/or 2. Benthic Community (current: 3; with: 9)

	current condition	with rehabilitation
I	1 - area is dominated by Phragmites	9 - area will be vegetated with native salt marsh species
II	1 - Phragmites comprises nearly all plant cover	8 - Phragmites cover will be minimal and managed
III	3 - minimal evidence of seed production and recruitment	10 - high degree of native plant seed production and recruitment expected
IV	N/A - no woody debris in assessment area	N/A - no woody debris in assessment area
V	N/A - no woody debris in assessment area	N/A - no woody debris in assessment area
VI	9 - Phragmites appears in good condition	9 - native tidal marsh plant species expected to be in good condition as in adjacent areas
VII	2 -ditching, disturbance, and lack of management resulted in Phragmites dominance	10 - long term management plan and conservation easement will support viable native salt marsh community
VIII	3 - poor microtopography and lack of channels in Phragmites dominated area	9 - excavation of channels and grading to tidal elevations will establish proper tidal topography
IX	N/A, no SAV in region	N/A, no SAV in region
X	N/A to wetland areas	N/A to wetland areas

Score = sum of above scores/30

current	with
0.37	0.83

(if uplands, divide by 20)

Delta = [with-current]	
wetland	0.47
upland	0

If Preservation as mitigation	
Preservation adjustment factor =	
Adjusted mitigation delta =	

If mitigation	
Time lag (t-factor) =	1
Risk factor =	1

Assessment Area Acreage	15.7

For impact assessment areas	
Functional loss (impacts x acres)	

For Mitigation Assessment Areas	
Relative Functional Gain (RFG) Delta/(risk*t-factor)	0.47

Mitigation Bank Credit Determination	
RFG * Assessment Area Acreage	**7.33**

PART I – Qualitative Description
(See Section 4.4.1)

(1) Site/Project Name	(2) Application Number	(3) Assessment Area Name or Number
Saw Mill Creek Bank	NAN-2013-00259-EHA	W2 - West Tidal Wetland Restoration (Re-establishment)

(4) Habitat Code	(5) Further classification (optional)	(6) Impact or Mitigation Site?	(7) Assessment Area Size
VI. D. 32 Urban Vacant lot	Sparsely vegetated historic fill	Mitigation	5.17

(8) Basin/Watershed Name/Number	(9) Affected Waterbody (Class)	(10) Special Classification (local/state/federal designation of importance)
HUC 02030104	Sawmill Creek, Class SD (impaired: floatables and Oxy demand)	DEC HM (high marsh) wetlands

(11) Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

AA hydrologically connected to Sawmill Creek and Arthur Kill, geographically adjacent to Sawmill Creek and Arthur Kill Complex (No. 18) (USFWS NY Bight Study, 1997)

(12) Assessment area description

Formet tidal wetland, filled and used as vehicle storage, construction/demolition debris disposal, and junkyard

(13) Significant nearby features	(14) Uniqueness (considering the relative rarity in relation to the regional landscape.)
Pralls Island; Sawmill Creek wetland complex; Sarnelli Brothers Inc. vehicle storage, trucking and demolition debris disposal	AA is part of a unique natural system within the highly urbanized NY/NJ region

(15) Functions	(16) Mitigation for previous permit/other historic use
The AA is an upland area and does not provide wetland functions, but does minimally provide/support: Habitat; Food Web; Nutr. Cycling; OM export (leaf litter).	Bank credit development

(17) Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	(18) Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Feral cats, mice, common bird species such as starlings and sparrows. See also: Ecological Communities of NY State (NYNHP 2002)	Not expected to be present.

(19) Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

No evidence observed during site visits conducted between May and June 2013.

(20) Additional relevant factors:

Historic fill area. The estimated construction cost for this publicly funded wetland re-establishment is ~$690,000 per acre.

(21) Assessment conducted by:	(22) Assessment date(s):
LBA PC	10/30/13

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Saw Mill Creek Bank	NAN-2013-00259-EHA	W2 - West Tidal Wetland Restoration (Re-establishment)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	LBA PC	10/30/13

Scoring Guidance	**Optimal (10)**	**Moderate (7)**	**Minimal (4)**	**Not Present (0)**
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Location and Landscape Support		**current condition**	**with re-establishment**
	a	0	7 - adjacent land use and partial connectivity limits wildlife support; restoration expands existing marsh size
	b	0	8 - minimal invasive cover expected in restoration areas; invasives expected to persist in adjacent areas
	c	0	7 - corridor partially impeded; most expected species are highly mobile and not severly limited by barriers that remain
	d	0	7 - assessment area will be accessible to fish with some barriers still present
	e	0	4 - surrounding land uses will remain, however associated attributes like noise and industrial activities will be reduced
	f	0	7 - hydrologic connection will be restored; nearby impairments remain (railroad, ditching in downstream wetlands)
	g	0	5 - assessment area will provide contaminant buffering from adjacent uplands
	h	0	N/A to wetland areas
current / with	i	0	3 - wetlands in assessment area will have minimal vertical relief and width to provide minor buffering
0 / 7	j	0	7 - high marsh will be abundant and diversity of elevation/habitat types will be present. Adjacent land use limits habitat migration.

Water Environment (n/a for uplands)		**current condition**	**with re-establishment**
	a	0	7 - hydrologic connection will be restored; nearby impairments (railroad, ditching in downstream wetlands) persist
	b	0	9 - most indicators expected to be present and consistent with proposed hydroperiod
	c	0	10 - soil moisture expected to be appropriate for the tidal marsh system
	d	0	8 - tidal flow will be restored; downstream ditching and railroad tracks present minor alterations of flow/discharge
	e	0	9 - communitiy zonation expected to be appropriate
	f	0	9 - restored wetland will support target vegetation; slight stress due to downstream ditching and flow constriction
	g	0	10 - animals with specific hydrologic requirements (heron, terrapin, fiddler crab, mummichog) expected to be present
	h	0	9 - species tolerant of or associated with water quality degradation or flow alteration not expected
	i	0	9 - potential for slight degradation from immediately adjacent upland industrialized area
	j	0	7 - estuary is listed as impaired for floatables and oxygen demand; improved flows will assist cycling of contaminants from uplands
	k	0	9 - depths, currents and light penetration expected to be sufficient for salt marsh habitat
current / with	l	0	10 - shoreline is stable; shoreline erosion due to wind-generated wave energy not expected
0 / 9	m	0	9 - marsh expected to maintain stable elevation

Community structure 1. Vegetation and/or 2. Benthic Community		**current condition**	**with re-establishment**
	I	0	9 - plant species composition expected to be appropriate to habitat type; native species expected to be dominant
	II	0	9 - minimal cover by invasive species expected
	III	0	10 - high degree of native plant seed production and recruitment expected
	IV	0	9 - age and size distribution expected to be typical of system
	V	0	N/A - no woody debris in assessment area
	VI	0	9 - plants expected to be in good condition
	VII	0	10 - restored wetland will be managed/maintained per Banking Instrument/conservation easement
	VIII	0	9 - microtopographic features are expected to be present and typical for the proposed habitat type
current / with	IX	0	N/A, no SAV in region
0 / 9	X	0	N/A to wetland areas

Score = sum of above scores/30

current	with
0.00	0.83

(if uplands, divide by 20)

Delta = [with-current]	
wetland	0.83
upland	0

If preservation as mitigation	
Enhancement adjustment factor =	
Adjusted mitigation delta =	

If mitigation	
Time lag (t-factor) =	1
Risk factor =	1

Assessment Area Acreage	5.17

For impact assessment areas	
Functional loss (impact x acres)	

For Mitigation Assessment Areas	
Relative Functional Gain (RFG) Delta/(risk*t-factor)	0.83

Mitigation Bank Credit Determination	
RFG * Assessment Area Acres	**4.31**

PART I – Qualitative Description
(See Section 4.4.1)

(1) Site/Project Name	(2) Application Number	(3) Assessment Area Name or Number
Saw Mill Creek Bank	NAN-2013-00259-EHA	E2 - East Tidal Wetland Restoration (Re-establishment)

(4) Habitat Code	(5) Further classification (optional)	(6) Impact or Mitigation Site?	(7) Assessment Area Size
VI. D.	Phragmites-vegetated manmade berm	Mitigation	1.87

(8) Basin/Watershed Name/Number	(9) Affected Waterbody (Class)	(10) Special Classification (local/state/federal designation of importance)
HUC 02030104	Sawmill Creek, Class SD (impaired: floatables and Oxy demand)	

(11) Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

AA hydrologically connected to Sawmill Creek and Arthur Kill, geographically adjacent to Sawmill Creek and Arthur Kill Complex (No. 18) (USFWS NY Bight Study, 1997)

(12) Assessment area description

Former earthen containment berm, primarily vegetated with Phragmites and Ailanthus altissima

(13) Significant nearby features	(14) Uniqueness (considering the relative rarity in relation to the regional landscape.)
Pralls Island; Sawmill Creek wetland complex	AA is part of a unique natural system within the highly urbanized NY/NJ region

(15) Functions	(16) Mitigation for previous permit/other historic use
The AA is an upland area and does not provide wetland functions, but does provide/support: Habitat; Food Web; Nutr. Cycling; OM export (leaf litter).	Bank credit development

(17) Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	(18) Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Marsh wren, redwing blackbird, small mammals	Not expected to be present.

(19) Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Marsh wren nesting observed in May 2013.

(20) Additional relevant factors:

Dominated by invasive species, primarily Phragmites and Ailanthus altissima. Berm is a barrier to tidal hydrology for wetland areas.The estimated construction cost for this publicly funded wetland re-establishment is ~$690,000 per acre.

(21) Assessment conducted by:	(22) Assessment date(s):
LBA PC	10/30/13

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Saw Mill Creek Bank	NAN-2013-00259-EHA	E2 - East Tidal Wetland Restoration (Re-establishment)
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	LBA PC	10/30/13

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Location and Landscape Support		current condition	with re-establishment
	a	0	9 - adjacent wetland habitats would be fully connected; expands overall tidal marsh acreage
	b	0	9 - minimal invasive cover expected in restoration areas
	c	0	7 - corridor partially impeded; most expected species are highly mobile and not severly limited by barriers that remain
	d	0	7 - assessment area will be accessible to fish with some barriers still present
	e	0	7 - surrounding land uses would remain but have minimal adverse impacts on fish and wildlife
	f	0	8 - hydrologic connection will be restored; nearby impairments will remain (railroad, ditching in downstream wetlands)
	g	0	3 - assessment area will provide some contaminant buffering from adjacent uplands
	h	0	N/A to wetland areas
current: 0 / with: 7	i	0	3 - wetlands in assessment area have minimal vertical relief and width to provide buffering
	j	0	6 - assessment area would be restored to high marsh, allowing for habitat migration with sea level rise

Water Environment (n/a for uplands)		current condition	with re-establishment
	a	0	10 - hydrologic connection will be restored; nearby hydrologic impairments would remain (railroad, ditching in downstream wetlands)
	b	0	9 - most indicators expected to be present and consistent with proposed hydroperiod
	c	0	10 - soil moisture expected to be appropriate for the tidal marsh system
	d	0	8 - flow will be restored; downstream ditching present minor alterations of flow/discharge
	e	0	9 - communitiy zonation expected to be appropriate
	f	0	9 - restored wetland will support target vegetation; slight impacts due to downstream ditching and flow constriction
	g	0	10 - animals with specific hydrologic requirements (heron, terrapin, fiddler crab, mummichog) expected to be present
	h	0	9 - species tolerant of or associated with water quality degradation or flow alteration not expected
	i	0	9 - potential for slight degradation from surrounding land use
	j	0	7 - estuary is listed as impaired for floatables and oxygen demand; improved flows will assist cycling of contaminants from uplands
	k	0	9 - depths, currents and light penetration sufficient for a salt marsh
current: 0 / with: 9	l	0	10 - nearby shorelines are stable; shoreline erosion due to wind-generated wave energy not expected
	m	0	9 - marsh expected to maintain stable elevation

Community structure 1. Vegetation and/or 2. Benthic Community		current condition	with re-establishment
	I	0	9 - plant species composition expected to be appropriate to habitat type; native species expected to be dominant
	II	0	9 - minimal cover by invasive species expected
	III	0	10 - high degree of native plant seed production and recruitment expected
	IV	0	9 - age and size distribution expected to be typical of system
	V	0	N/A - no woody debris in assessment area
	VI	0	9 - plants expected to be in good condition
	VII	0	10 - restored wetland will be managed/maintained per Banking Instrument/conservation easement
	VIII	0	9 - microtopographic features are expected to be present and typical for the proposed habitat type
current: 0 / with: 9	IX	0	N/A, no SAV in region
	X	0	N/A to wetland areas

Score = sum of above scores/30	
current	with
0.00	0.83

If preservation as mitigation	
Enhancement adjustment factor =	
Adjusted mitigation delta =	

For impact assessment areas	
Functional loss (impact x acre)	

(if uplands, divide by 20)

If mitigation	
Time lag (t-factor)=	1
Risk factor=	1

For Mitigation Assessment Areas	
Relative Functional Gain (RFG) Delta/(risk*t-factor)	0.83

Delta = [with-current]	
wetland	0.83
upland	0

Assessment Area Acreage	1.87

Mitigation Bank Credit Determination	
RFG * Assessment Area Acres	**1.56**

PART I – Qualitative Description
(See Section 4.4.1)

NAN-

(1) Site/Project Name	(2) Application Number	(3) Assessment Area Name or Number
Sawmill Creek Bank	NAN-2013-00259-EHA	W3 - West Tidal Wetland Enhancement

(4) Habitat Code	(5) Further classification (optional)	(6) Impact or Mitigation Site?	(7) Assessment Area Size
II.B.8 Estuarine Brackish Tidal Marsh	Estuarine Brackish Tidal Marsh	Mitigation	7.68

(8) Basin/Watershed Name/Number	(9) Affected Waterbody (Class)	(10) Special Classification (local/state/federal designation of importance)
HUC 02030104	Sawmill Creek, Class SD (impaired: floatables and Oxy demand)	DEC HM (high marsh)and IM (intertidal marsh) wetlands

(11) Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

AA hydrologically connected to Sawmill Creek and Arthur Kill, geographically adjacent to Sawmill Creek and Arthur Kill Complex (No. 18) (USFWS NY Bight Study, 1997)

(12) Assessment area description

Brackish high and low marsh, altered by mosquito ditching. Adjacent to railroad tracks, Chelsea Road and Rt 440. and filled wetlands.

(13) Significant nearby features	(14) Uniqueness (considering the relative rarity in relation to the regional landscape.)
Pralls Island; Saw Mill Creek wetland complex; former auto salvage yard, commercial and industrial development	AA is part of a unique natural system within the highly urbanized NY/NJ region

(15) Functions	(16) Mitigation for previous permit/other historic use
Habitat;Prim. Production; Food Web; Nutr. Cycling; OM export; Removal Contam; wave energy attenuation; flood storage;sedimentation/accretion (NYSDOS and NYSDEC 2000)	Bank credit development

(17) Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	(18) Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
See Attached Table I.1: See also:Ecological Communities of NY State (NYNHP 2002); Salt Marsh Restoration and Monitoring Guidelines(NYSDOSand NYSDEC 2000)	See Attached Table I.2

(19) Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Based on site visits conducted between May and June, 2013: fiddler crabs, ribbed mussels, mummichogs, marsh snails, diamondback terrapin; yellow crowned and snowy egrets; osprey, mallard; clapper rail.

(20) Additional relevant factors:

Sources of stormwater runoff from adjacent land uses; connectivity to adjacent tidal marsh restricted by rail line and box culvert; adjacent invasive species present (Phragmites); potential for further encroachment from adajcent land use; potential for tide driven debris accumulation. Under five miles from Newark Airport (FAA coordination required).

(21) Assessment conducted by:	(22) Assessment date(s):
LBA PC	10/30/13

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Sawmill Creek Bank	NAN-2013-00259-EHA	W3 - West Tidal Wetland Enhancement
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	LBA PC	10/30/13

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Location and Landscape Support		current condition	with enhancement
	a	8 - adjacenct areas support wildlife species; reduced connectivity and adjacent land uses are slightly limiting	8 - no change
	b	6 - Phrag is present within/adjacent to AA, has potential to invade site in future as surface elevation increases	9 - invasives would be removed/regularly treated to maintain condition
	c	7 - type of fauna in tidal marsh dominant sites are less affected by the existing barriers. Tidal channel is present.	7 - no change
	d	7 - some potential for contamination; impaired for oxygen levels in creek	7 - no change
	e	5 - disturbance from adjacent development (industry/railroad) impacts habitat	6 - no additional fill in future, slightly less magnitude of adjacent land use
	f	7 - fill in adjacent areas, railroad embankment and tidal ditching impair function	8 - hydrologic connection will be restored to adjacent formerly filled wetlands; nearby impairments would remain
	g	4 - provides contaminant buffering from adjacent uplands	4 - no change
	h	N/A to wetland areas	N/A to wetland areas
current: 6 / with: 7	i	4 - more than 100 ft. width provide minimal support	4 - width will not change significantly
	j	8 - large area of high marsh and some scrub shrub areas	9 - expansion of adjacent high marsh

Water Environment (n/a for uplands)		current condition	with enhancement
	a	7 -site has been ditched and overmarsh flow affected by railroad tracks	7 - no change expected
	b	9 - water level not significantly affected by manmade barriers	9 - no change expected
	c	10 - no apparent soil moisture issues	10 - no change expected
	d	8 - Ditching and railroad tracks cause minor alterations of flows/discharges	8 -- no change expected
	e	9 - nearly optimal community zonation	9 - no change expected
	f	9 - appropriate for all strata, though mild effects due to ditching and constricted flow in Sawmill Creek	9 - no change expected
	g	10 - animals with specific hydrologic requirement (i.e, muskrat, heron, terrapin, fiddler crab) expected to be present	10 - no change expected
	h	9 - no sign of hydrologic stress	9 - no change expected
	i	9 - none observed evidence in assessment area	9 - no change expected
	j	4 - water quality impairment from adjacent land uses; tidal flow from estuary is listed as impaired for floatables and oxygen demand	6 - restoration of adjacent marsh will divert/educe runoff from adjacent industrial site
	k	8 - depths, currents and light penetration sufficient for a salt marsh	9 - improved marsh health will slighlty improve water quality
current: 8 / with: 9	l	10 - wave energy and fetch appropriate for community type	10 - no change expected
	m	9 - marsh appears stable	9 - no change expected

Community structure 1. Vegetation and/or 2. Benthic Community		current condition	with enhancement
	I	9 - some Phragmites presence (< 2%)	9 - treatment would control any Phragmites expansion
	II	9 - Phragmites present in small patches	10 - treatment would remove Phragmites cover/prevent future degradation.
	III	10 - Plant cover appears total	10 - no change expected
	IV	9 - age and size distribution typical of system	9 - no change expected
	V	N/A - no woody debris in assessment area	N/A - no woody debris in assessment area
	VI	9 - plant condition is good	9 - no change expected
	VII	7 - ditching has affected original high marsh community	10 -long term management plan, conservation easement will support viable native salt marsh community
	VIII	7 -microtopography present; ditching present throughout marsh	7 - no change proposed
current: 9 / with: 10	IX	N/A, no SAV in region	N/A, no SAV in region
	X	N/A to wetland areas	N/A to wetland areas

Score = sum of above scores/30

current	with
0.77	0.87

(if uplands, divide by 20)

Delta = [with-current]	
wetland	0.10
upland	0

If preservation as mitigation	
Preservation adjustment factor =	
Adjusted mitigation delta =	

If mitigation	
Time lag (t-factor)=	1
Risk factor=	1

Assessment Area Acreage	7.69

For impact assessment areas	
Functional loss (impact x area)	

For Mitigation Assessment Areas	
Relative Functional Gain (RFG) Delta/(risk*t-factor)	0.10

Mitigation Bank Credit Determination	
RFG * Assessment Area Ac.	**0.769**

PART I – Qualitative Description
(See Section 4.4.1)

(1) Site/Project Name	(2) Application Number	(3) Assessment Area Name or Number
Sawmill Creek Bank	NAN-2013-00259-EHA	E3 - East Tidal Wetland Enhancement

(4) Habitat Code	(5) Further classification (optional)	(6) Impact or Mitigation Site?	(7) Assessment Area Size
II.B.8 Estuarine Brackish Tidal Marsh	Estuarine Brackish Tidal Marsh	Mitigation	25.47

(8) Basin/Watershed Name/Number	(9) Affected Waterbody (Class)	(10) Special Classification (local/state/federal designation of importance)
HUC 02030104	Sawmill Creek, Class SD (impaired: floatables and Oxy demand)	DEC HM (high marsh)and IM (intertidal marsh) wetlands

(11) Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

AA hydrologically connected to Sawmill Creek and Arthur Kill, geographically adjacent to Sawmill Creek and Arthur Kill Complex (No. 18) (USFWS NY Bight Study, 1997)

(12) Assessment area description

Brackish high and low marsh, altered by mosquito ditching. Adjacent to Chelsea Road, Rt 440., and filled wetlands.

(13) Significant nearby features	(14) Uniqueness (considering the relative rarity in relation to the regional landscape.)
Pralls Island; Saw Mill Creek wetland complex; former auto salvage yard, commercial and industrial development	AA is part of a unique natural system within the highly urbanized NY/NJ region
(15) Functions	**(16) Mitigation for previous permit/other historic use**
Habitat;Prim. Production; Food Web; Nutr. Cycling; OM export; Removal Contam; wave energy attenuation; flood storage;sedimentation/accretion (NYSDOS and NYSDEC 2000)	Bank credit development
(17) Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	**(18) Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)**
See Attached Table I.1: See also:Ecological Communities of NY State (NYNHP 2002); Salt Marsh Restoration and Monitoring Guidelines(NYSDOSand NYSDEC 2000)	See Attached Table I.2

(19) Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Based on site visits conducted between May and June, 2013: fiddler crabs, ribbed mussels, mummichogs, marsh snails, yellow crowned and snowy egrets; osprey, mallard; clapper rail.

(20) Additional relevant factors:

Sources of stormwater runoff from adjacent land uses; connectivity to adjacent tidal marsh restricted by rail line and box culvert; adjacent invasive species present (Phragmites); potential for further encroachment from adajcent land use; potential for tide driven debris accumulation. Under five miles from Newark Airport (FAA coordination required).

(21) Assessment conducted by:	(22) Assessment date(s):
LBA PC	10/30/13

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Sawmill Creek Bank	NAN-2013-00259-EHA	E3 - East Tidal Wetland Enhancement
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	LBA PC	10/30/13

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Location and Landscape Support		current condition	with enhancement
	a	8 - adjacenct areas support wildlife species; reduced connectivity and adjacent land uses are slightly limiting	8 - no change
	b	6 - Phrag is present within/adjacent to AA, has potential to invade site in future as surface elevation increases	9 - invasives would be removed/regularly treated to maintain condition.
	c	7 - type of fauna in tidal marsh dominant sites are less affected by the existing barriers. Tidal channel is present.	7 - no change
	d	7 - some potential for contamination; impaired for oxygen levels in creek	7 - no change
	e	5 - disturbance from adjacent development (industry/roadways) impacts habitat	6 - no additional fill in future
	f	7 - fill inadjacent areas, tidal ditching, and roadways impair function	8 - hydrologic connection will be restored to adjacent formerly filled wetlands; nearby impairments would remain
	g	4 - provides contaminant buffering from adjacent uplands	4 - no change
	h	N/A to wetland areas	N/A to wetland areas
current / with	i	4 - more than 100 ft. width provide minimal support	4 - width will not change significantly
6 / 7	j	8 - large area of high marsh and some scrub shrub areas	9 - expansion of adjacent high marsh

Water Environment (n/a for uplands)		current condition	with enhancement
	a	7 -site has been ditched and overmarsh flow affected by roadway/culverts	7 - no change expected
	b	9 - water level not significantly affected by manmade barriers	9 - no change expected
	c	10 - no apparent soil moisture issues	10 - no change expected
	d	8 - Ditching and roadway/culverts cause minor alterations of flows/discharges	8 -- no change expected
	e	9 - nearly optimal community zonation	9 - no change expected
	f	9 - appropriate for all strata, though mild effects due to ditching and constricted flow in Sawmill Creek	9 - no change expected
	g	10 - animals with specific hydrologic requirement (i.e, muskrat, heron, terrapin, fiddler crab) expected to be present	10 - no change expected
	h	9 - no sign of hydrologic stress	9 - no change expected
	i	9 - none observed evidence in assessment area	9 - no change expected
	j	4 - water quality impairment from adjacent land uses; tidal flow from estuary listed as impaired for floatables and oxygen demand	6 -restoration of adjacent marsh will divert/educe runoff from adjacent industrial site
	k	8 - depths, currents and light penetration sufficient for a salt marsh	9 - improved marsh health will slighlty improve water quality
current / with	l	10 - wave energy and fetch appropriate for community type	10 - no change expected
8 / 9	m	9 - marsh appears stable	9 - no change expected

Community structure 1. Vegetation and/or 2. Benthic Community		current condition	with enhancement
	I	9 - some Phragmites presence (< 2%)	9 - treatment would control any Phragmites expansion
	II	9 - Phragmites present in small patches	10 - treatment would remove Phragmites cover/prevent future degradation.
	III	10 - Plant cover appears total	10 - no change expected
	IV	9 - age and size distribution typical of system	9 - no change expected
	V	N/A - no woody debris in assessment area	N/A - no woody debris in assessment area
	VI	9 - plant condition is good	9 - no change expected
	VII	7 - ditching has affected original high marsh community	10 -long term management plan, conservation easement will support viable native salt marsh community
	VIII	7 -microtopography present; ditching present throughout marsh	7 - no change proposed
current / with	IX	N/A, no SAV in region	N/A, no SAV in region
9 / 10	X	N/A to wetland areas	N/A to wetland areas

Score = sum of above scores/30

current	with
0.77	0.87

(if uplands, divide by 20)

If preservation as mitigation	
Preservation adjustment factor =	
Adjusted mitigation delta =	

For impact assessment areas	
Functional loss (impact x acres)	

If mitigation	
Time lag (t-factor)=	1
Risk factor=	1

For Mitigation Assessment Areas	
Relative Functional Gain (RFG) Delta/(risk*t-factor)	0.10

Delta = [with-current]	
wetland	0.10

Mitigation Bank Credit Determination

PART I – Qualitative Description
(See Section 4.4.1)

(1) Site/Project Name	(2) Application Number	(3) Assessment Area Name or Number
Saw Mill Creek Bank	NAN-2013-00259-EHA	E4 - East Forested Wetland Enhancement

(4) Habitat Code	(5) Further classification (optional)	(6) Impact or Mitigation Site?	(7) Assessment Area Size
V.C.4. Red Maple-Sweetgum Swamp		Mitigation	1.52

(8) Basin/Watershed Name/Number	(9) Affected Waterbody (Class)	(10) Special Classification (local/state/federal designation of importance)
HUC 02030104	Sawmill Creek, Class SD (impaired: floatables and Oxy demand)	NYSDEC Freshwater Wetlands (AR-49)

(11) Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

AA hydrologically connected to Sawmill Creek and Arthur Kill, geographically adjacent to Sawmill Creek and Arthur Kill Complex (No. 18) (USFWS NY Bight Study, 1997)

(12) Assessment area description

Red maple-sweetgum swamp located between Phragmites-dominated edge of tidal marsh and uplands.

(13) Significant nearby features	(14) Uniqueness (considering the relative rarity in relation to the regional landscape.)
Pralls Island; Sawmill Creek wetland complex, Rt 440 and Chelsea Road	AA is part of a unique natural system within the highly urbanized NY/NJ region

(15) Functions	(16) Mitigation for previous permit/other historic use
Habitat; Primary Production; Food Web; Nutr. Cycling; OM export; Removal Contam; flood storage; (NYSDOS and NYSDEC 2000)	Bank credit development

(17) Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	(18) Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Neotropical migrants, small mammals, deer. See also: Ecological Communities of NY State (NYNHP 2002)	Most species not expected to be present; Persimmon is listed by NYSDEC as present within AA.

(19) Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

No wildlife observed in May and June, 2013.

(20) Additional relevant factors:

Sources of stormwater runoff from adjacent land uses; Phragmites in/adjacent to area, potential for tide driven debris accumulation. Under five miles from Newark Airport (FAA coordination required).

(21) Assessment conducted by:	(22) Assessment date(s):
LBA PC	10/30/13

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Saw Mill Creek Bank	NAN-2013-00259-EHA	E4 - East Forested Wetland Enhancement
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	LBA PC	10/30/13

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Location and Landscape Support		current condition	with enhancement
	a	7 - site provides habitats for many species	8 - removal of invasive species and debris will improve habitat quality
	b	7 - Phragmites encroaching from marsh edge	8 - invasives management will reduce adverse effects
	c	5 -wildlife access limited by roads and other land use	5 - barriers to wildlife use would remain
	d	7 - functional connection limited due to habitat fragmentation and barriers	7 - no proposed changes to fragmentation or barriers
	e	5 - roads and other land use, runoff, storm debris and noise sources impact wildlife	6 - removal of debris would slightly reduce impacts
	f	5 - assessment area provides some beneficial discharges to adjacent wetlands	5 - no changes to hydrology of assessment area
	g	3 - provides minimal surface or groundwater benefit to downstream habitats	3 - no changes to hydrology of assessment area
	h	N/A to wetland areas	N/A to wetland areas
current / with	i	5 - wetland is moderately wide and contains some vertical relief	5 - no proposed changes to width or elevation
6 / 7	j	6 - elevations within wetland would allow for limited landward salt marsh migration	6 - no proposed changes to wetland topography

Water Environment (n/a for uplands)		current condition	with enhancement
	a	N/A, as assessment area is nontidal wetland	N/A, as assessment area is nontidal wetland
	b	10 - water depths, saturation, and duration are appropriate for a forested wetland	10 - no proposed changes to water levels
	c	10 - soil moisture is appropriate	10 - no proposed changes to soil moisture
	d	10 - no indications of altered flows	10 - no proposed changes to flows
	e	8 - zonation adversely affected by Phragmites encroachment	9 - Phragmites management will improve zonation
	f	10 - no evidence of hydrologic stress	10 - no proposed changes to hydrology
	g	9 - use is consistent with expected hydrological conditons	9 - no proposed changes to hydrology
	h	8 - presence of Phragmites along lower edge of wetland	9 - Phragmites management will allow for improved community composition
	i	N/A - no standing water present	N/A - no standing water present
	j	N/A - no water quality data for this forested wetland	N/A - no water quality data for this forested wetland
	k	N/A - no standing water present	N/A - no standing water present
current / with	l	9 - little potential for shoreline erosion	9 - no proposed changes to shoreline erosion potential
9 / 9	m	N/A - assessment area is nontidal	N/A - assessment area is nontidal

Community structure 1. Vegetation and/or 2. Benthic Community		current condition	with enhancement
	I	8 - some Phragmites encroachment from marsh edge	9 - Phragmites management would improve plant strata
	II	8 - Phragmites present along marsh edge	9 - Phragmites treatment would increase native cover
	III	8 - native recruitment is near normal and natural	9 - removal of invasives and debris would improve native recruitment
	IV	8- age and size distribution near typical	9 - removal of invasives will improve age and size distribution of native plant species
	V	9 - density and quality of coarse woody debris sufficient for wildlife	9 - no expected changes to woody debris conditions
	VI	8 - exisitng plant condition generally good	8 - native plant condition expected to be generally good
	VII	7 - lack of land management led to debris acumulation and invasive establishment	9 - long term management, conservation easement will support viable forested wetland forest community
	VIII	8 - microtopographic features present and near normal	8 - no proposed changes to microtopography
current / with	IX	N/A for this forested wetland site	N/A for this forested wetland site
8 / 9	X	N/A to wetland areas	N/A to wetland areas

Score = sum of above scores/30

current	with
0.77	0.83

(if uplands, divide by 20)

If preservation as mitigation	
Preservation adjustment factor =	
Adjusted mitigation delta =	

For impact assessment areas	
Functional loss (impact x acres)	

If mitigation	
Time lag (t-factor)=	1
Risk factor=	1

For Mitigation Assessment Areas	
Relative Functional Gain (RFG) Delta/(risk*t-factor)	0.07

Delta = [with-current]	
wetland	0.07

Mitigation Bank Credit Determination

PART I – Qualitative Description
(See Section 4.4.1)

(1) Site/Project Name	(2) Application Number	(3) Assessment Area Name or Number
Saw Mill Creek Bank	NAN-2013-00259-EHA	W4 - West Upland Buffer Rehabiliation$_{SLOPE}$

(4) Habitat Code	(5) Further classification (optional)	(6) Impact or Mitigation Site?	(7) Assessment Area Size
	Phragmites-dominated upland slope	Mitigation	1.12

(8) Basin/Watershed Name/Number	(9) Affected Waterbody (Class)	(10) Special Classification (local/state/federal designation of importance)
HUC 02030104	Sawmill Creek, Class SD (impaired: floatables and Oxy demand)	None

(11) Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

AA hydrologically connected to Sawmill Creek and Arthur Kill, geographically adjacent to Sawmill Creek and Arthur Kill Complex (No. 18) (USFWS NY Bight Study, 1997)

(12) Assessment area description

Upland slopes are primarily Phragmites-dominated. Illegal dumping and storm surge debris is present.

(13) Significant nearby features	(14) Uniqueness (considering the relative rarity in relation to the regional landscape.)
Pralls Island, Sawmill Creek wetland complex, Rt 440, Chelsea Road	AA is part of a unique natural system within the highly urbanized NY/NJ region

(15) Functions	(16) Mitigation for previous permit/other historic use
The AA is an upland area and does not provide wtland functions, but does provide/support: Habitat; Food Web; Nutr. Cycling; OM export (leaf litter).	Bank credit development

(17) Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	(18) Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Neotropical migrants, small mammals, deer. See also: Ecological Communities of NY State (NYNHP 2002)	Consultation with NYNHP indicates none present.

(19) Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Red-winged blackbird.

(20) Additional relevant factors:

Potential for further encroachment from adajcent land use; potential for tide driven debris accumulation

(21) Assessment conducted by:	(22) Assessment date(s):
LBA PC	10/30/13

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Saw Mill Creek Bank	NAN-2013-00259-EHA	W4 - West Upland Buffer Rehabilitation$_{SLOPE}$
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	LBA PC	10/30/13

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Location and Landscape Support — current: 4, with: 6

	current condition	with rehabilitation
a	4 -supports primarily disturbance-tolerant species	7 - removal of invasive species and illegal dumping will improve habitat quality
b	4 - invasive cover is high, adversely affecting functions	8 - invasives management will remove invasive plant cover
c	5 -wildlife access limited by adjacent land use	5 - barriers to wildlife use would remain
d	7 - functional connection somewhat limited; barriers present	6 - functional connection somewhat limited; barriers still present
e	5 - roads and other land use, runoff, illegal dumping and noise sources impact wildlife	6 - removal of debris and prevention of additional of illegal dumping would reduce impacts slightly
f	4 - assessment area provides little in beneficial discharges to adjacent wetlands.	4 - no changes to hydrology of upland area
g	3 - provides minimal surface or groundwater benefit to downstream habitats	3 - no changes to hydrology of upland area
h	4 - upland area is an important buffer between adjacent land use and wetlands	7 - removal of illegal dumping would improve buffer function
i	N/A - assessment area is not a wetland	N/A - assessment area is not a wetland
j	7 - upland slope capable of supporting tidal scrub shrub development.	7 - no change to elevations proposed

Water Environment (n/a for uplands) — current: , with:

	current condition	with rehabilitation
a	N/A	N/A
b	N/A	N/A
c	N/A	N/A
d	N/A	N/A
e	N/A	N/A
f	N/A	N/A
g	N/A	N/A
h	N/A	N/A
i	N/A	N/A
j	N/A	N/A
k	N/A	N/A
l	N/A	N/A
m	N/A	N/A

Community structure

1. Vegetation and/or 2. Benthic Community — current: 5, with: 8

	current condition	with rehabilitation
I	4 - majority of plant community is non-native	9 - removal of invasives will improve plant community stratification
II	4 - majority of plant species is non- native	9- site will be enhanced through establishment of native species; long term manangent plan implemented
III	4 - native recruitment minimal and long term viability diminished by invasive species cover	9 - removal of invasives would improve native recruitment
IV	5- deviation from normal successonal patterns - recruitment limited by invasive species cover	9 - removal of invasives will improve age and size distribution of native plant species
V	N/A - no woody debris in assessment area	N/A - no woody debris in assessment area
VI	8 - exisitng plant condition generally good	8 - native plant condition expected to be generally good
VII	5 - lack of land management led to dumping and invasive establishment	8 - long term management, conservation easement will support viable scrub shrub community
VIII	7 - microtopography typical	7 - no proposed changes to microtopography
IX	N/A to uplands	N/A to uplands
X	4 - provides moderate level of habitat/life history support	8 -removal of invasives and dumping will improve habitat and life history support

Score = sum of above scores/30

current	with

(if uplands, divide by 20)

current	with
0.45	0.70

If preservation as mitigation	
Preservation adjustment factor =	
Adjusted mitigation delta =	

For impact assessment areas	
Functional loss (impact x acres)	

If mitigation	
Time lag (t-factor)=	1
Risk factor=	1

For Mitigation Assessment Areas	
Relative Functional Gain (RFG) Delta/(risk*t-factor)	0.25

Delta = [with-current]	
wetland	0.00
upland	0.25

Assessment Area Acreage	1.12

Mitigation Bank Credit Determination	
RFG * Assessment Area Ac.	0.28

PART I – Qualitative Description
(See Section 4.4.1)

(1) Site/Project Name	(2) Application Number	(3) Assessment Area Name or Number
Saw Mill Creek Bank	NAN-2013-00259-EHA	E5 - East Upland Buffer Rehabiliation$_{SLOPE}$

(4) Habitat Code	(5) Further classification (optional)	(6) Impact or Mitigation Site?	(7) Assessment Area Size
	Phragmites-dominated upland slope	Mitigation	0.33

(8) Basin/Watershed Name/Number	(9) Affected Waterbody (Class)	(10) Special Classification (local/state/federal designation of importance)
HUC 02030104	Sawmill Creek, Class SD (impaired: floatables and Oxy demand)	None

(11) Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

AA hydrologically connected to Sawmill Creek and Arthur Kill, geographically adjacent to Sawmill Creek and Arthur Kill Complex (No. 18) (USFWS NY Bight Study, 1997)

(12) Assessment area description

Upland slopes are primarily Phragmites-dominated.

(13) Significant nearby features	(14) Uniqueness (considering the relative rarity in relation to the regional landscape.)
Pralls Island, Sawmill Creek wetland complex, Rt 440, Chelsea Road	AA is part of a unique natural system within the highly urbanized NY/NJ region

(15) Functions	(16) Mitigation for previous permit/other historic use
The AA is an upland area and does not provide wtland functions, but does provide/support: Habitat; Food Web; Nutr. Cycling; OM export (leaf litter).	Bank credit development

(17) Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	(18) Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Neotropical migrants, small mammals, deer. See also: Ecological Communities of NY State (NYNHP 2002)	Consultation with NYNHP indicates none present.

(19) Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

None observed

(20) Additional relevant factors:

(21) Assessment conducted by:	(22) Assessment date(s):
LBA PC	10/30/13

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Saw Mill Creek Bank	NAN-2013-00259-EHA	E5 - East Upland Buffer Rehabilitation$_{SLOPE}$
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	LBA PC	10/30/13

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Location and Landscape Support		current condition	with rehabilitation
	a	4 -supports primarily disturbance-tolerant species	7 - removal of invasive species will improve habitat quality
	b	4 - invasive cover is high, adversely affecting functions	8 - invasives management will remove invasive plant cover
	c	5 -wildlife access limited by adjacent land use	5 - barriers to wildlife use would remain
	d	7 - functional connection somewhat limited; barriers present	6 - functional connection somewhat limited; barriers still present
	e	5 - roads and other land use, runoff, and noise sources impact wildlife	6 - removal of debris and prevention of additional of illegal dumping would reduce impacts slightly
	f	4 - assessment area provides little in beneficial discharges to adjacent wetlands.	4 - no changes to hydrology of upland area
	g	3 - provides minimal surface or groundwater benefit to downstream habitats	3 - no changes to hydrology of upland area
	h	6 - upland area is an important buffer between adjacent land use and wetlands	8 - removal of invasives would improve buffer function
current / with	i	N/A - assessment area is not a wetland	N/A - assessment area is not a wetland
5 / 6	j	7 - upland slope capable of supporting tidal scrub shrub development.	7 - no change to elevations proposed

Water Environment (n/a for uplands)		current condition	with rehabilitation
	a	N/A	N/A
	b	N/A	N/A
	c	N/A	N/A
	d	N/A	N/A
	e	N/A	N/A
	f	N/A	N/A
	g	N/A	N/A
	h	N/A	N/A
	i	N/A	N/A
	j	N/A	N/A
	k	N/A	N/A
current / with	l	N/A	N/A
	m	N/A	N/A

Community structure 1. Vegetation and/or 2. Benthic Community		current condition	with rehabilitation
	I	4 - majority of plant community is non-native	9 - removal of invasives will improve plant community stratification
	II	4 - majority of plant species is non- native	9- site will be enhanced through establishment of native species; long term manangent plan implemented
	III	4 - native recruitment minimal and long term viability diminished by invasive species cover	9 - removal of invasives would improve native recruitment
	IV	5- deviation from normal successonal patterns - recruitment limited by invasive species cover	9 - removal of invasives will improve age and size distribution of native plant species
	V	N/A - no woody debris in assessment area	N/A - no woody debris in assessment area
	VI	8 - exisitng plant condition generally good	8 - native plant condition expected to be generally good
	VII	5 - lack of land management led to dumping and invasive establishment	8 - long term management, conservation easement will support viable scrub shrub community
	VIII	7 - microtopography typical	7 - no proposed changes to microtopography
current / with	IX	N/A to uplands	N/A to uplands
5 / 8	X	4 - provides moderate level of habitat/life history support	8 -removal of invasives and dumping will improve habitat and life history support

Score = sum of above scores/30

current	with

(if uplands, divide by 20)

current	with
0.50	0.70

Delta = [with-current]	
wetland	0.00
upland	0.20

If preservation as mitigation	
Preservation adjustment factor =	
Adjusted mitigation delta =	

If mitigation	
Time lag (t-factor)=	1
Risk factor=	1

Assessment Area Acreage	0.33

For impact assessment areas	
Functional loss (impact x acres)	

For Mitigation Assessment Areas	
Relative Functional Gain (RFG) Delta/(risk*t-factor)	0.20

Mitigation Bank Credit Determination	
RFG * Assessment Area Ac.	**0.07**

PART I – Qualitative Description
(See Section 4.4.1)

(1) Site/Project Name	(2) Application Number	(3) Assessment Area Name or Number
Saw Mill Creek Bank	NAN-2013-00259-EHA	E6 - East Upland Buffer Rehabilitation FOREST

(4) Habitat Code	(5) Further classification (optional)	(6) Impact or Mitigation Site?	(7) Assessment Area Size
VI. C. 27 - Successional southern hardwood		Mitigation	5.19

(8) Basin/Watershed Name/Number	(9) Affected Waterbody (Class)	(10) Special Classification (local/state/federal designation of importance)
HUC 02030104	Sawmill Creek, Class SD (impaired: floatables and Oxy demand)	None

(11) Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

AA hydrologically connected to Sawmill Creek and Arthur Kill, geographically adjacent to Sawmill Creek and Arthur Kill Complex (No. 18) (USFWS NY Bight Study, 1997)

(12) Assessment area description

Upland areas are primarily native-dominated forest. Few invasive species are present (primarily Japanese knotweed). Storm surge debris is present (plastic, tires, wood debris).

(13) Significant nearby features	(14) Uniqueness (considering the relative rarity in relation to the regional landscape.)
Pralls Island, Sawmill Creek wetland complex, Rt 440, Chelsea Road	AA is part of a unique natural system within the highly urbanized NY/NJ region

(15) Functions	(16) Mitigation for previous permit/other historic use
The AA is an upland area and does not provide wtland functions, but does provide/support: Habitat; Food Web; Nutr. Cycling; OM export (leaf litter).	Bank credit development

(17) Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	(18) Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Neotropical migrants, small mammals, deer. See also: Ecological Communities of NY State (NYNHP 2002)	Consultation with NYNHP indicates none present.

(19) Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Deer and deer tracks observed in May and June, 2013.

(20) Additional relevant factors:

(21) Assessment conducted by:	(22) Assessment date(s):
LBA PC	10/30/13

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Saw Mill Creek Bank	NAN-2013-00259-EHA	E6 - East Upland Buffer Rehabilitation FOREST
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	LBA PC	10/30/13

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Location and Landscape Support		current condition	with rehabilitation
	a	7 - site provides habitats for many species	8 - removal of invasive species and illegal dumping will improve habitat quality
	b	7 - invasive cover is low	8 - invasives management will remove invasive plant cover
	c	5 -wildlife access limited by roads and other land use	5 - barriers to wildlife use would remain
	d	7 - functional connection somewhat limited; barriers present	7 - functional connection somewhat limited; barriers still present
	e	5 - roads and other land use, runoff, illegal dumping and noise sources impact wildlife	6 - removal of illegal dumping would reduce impacts slightly
	f	4 - assessment area provides little in beneficial discharges to adjacent wetlands.	4 - no changes to hydrology of upland area
	g	3 - provides minimal surface or groundwater benefit to downstream habitats	3 - no changes to hydrology of upland area
	h	5 - upland area is an important buffer between adjacent land use and wetlands	7 - removal of illegal dumping would improve buffer function
current / with	i	N/A - assessment area is not a wetland	N/A - assessment area is not a wetland
6 / 7	j	8 - upland area has relatively low elevation; capable of supporting tidal scrub shrub development.	8 - no change to elevations proposed

Water Environment (n/a for uplands)		current condition	with rehabilitation
	a	N/A	N/A
	b	N/A	N/A
	c	N/A	N/A
	d	N/A	N/A
	e	N/A	N/A
	f	N/A	N/A
	g	N/A	N/A
	h	N/A	N/A
	i	N/A	N/A
	j	N/A	N/A
	k	N/A	N/A
current / w/enh	l	N/A	N/A
	m	N/A	N/A

Community structure 1. Vegetation and/or 2. Benthic Community		current condition	with rehabilitation
	I	8 - majority of plant community is native, appropriate and desireable	9 - removal of invasives will improve plant community stratification
	II	8 - majority of plant species are native	9- site will be enhanced through establishment of native species; long term manangent plan implemented
	III	8 - native recruitment is near normal and natural	9 - removal of invasives would improve native recruitment
	IV	8- age and size distribution near typical	9 - removal of invasives will improve age and size distribution of native plant species
	V	8 -density and quality of coarse woody debris slightly less than optimal	9 -removal of invasives and illegal dumping will improve density/quality of woody debris
	VI	8 - exisitng plant condition generally good	8 - native plant condition expected to be generally good
	VII	6 - lack of land management led to dumping and invasive establishment	8 - long term management, conservation easement will support viable upland community
	VIII	8 - microtopographic features present and near normal, even in fill	8 - no proposed changes to microtopography
current / with	IX	N/A to uplands	N/A to uplands
8 / 9	X	7 - provides high level of habitat/life history support	8 -removal of invasives and dumping will improve habitat and life history support

Score = sum of above scores/30

current	with

(if uplands, divide by 20)

current	with
0.70	0.80

Delta = [with-current]	
wetland	0.00
upland	0.10

If preservation as mitigation	
Preservation adjustment factor =	
Adjusted mitigation delta =	

If mitigation	
Time lag (t-factor)=	1
Risk factor=	1

Assessment Area Acreage	5.19

For impact assessment areas	
Functional loss (impact x acres)	

For Mitigation Assessment Areas	
Relative Functional Gain (RFG) Delta/(risk*t-factor)	0.10

Mitigation Bank Credit Determination	
RFG * Assessment Area Ac.	**0.52**

PART I – Qualitative Description
(See Section 4.4.1)

(1) Site/Project Name	(2) Application Number	(3) Assessment Area Name or Number
Saw Mill Creek Bank	NAN-2013-00259-EHA	E7 - East Upland Buffer Rehabiliation EDWARD CURRY AVE AREA

(4) Habitat Code	(5) Further classification (optional)	(6) Impact or Mitigation Site?	(7) Assessment Area Size
VI. C. 27- Succesional southern hardwood/invasive dominated	Invasive hardwoods and herbaceous	Mitigation	3.30

(8) Basin/Watershed Name/Number	(9) Affected Waterbody (Class)	(10) Special Classification (local/state/federal designation of importance)
HUC 02030104	Sawmill Creek, Class SD (impaired: floatables and Oxy demand)	None

(11) Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

AA hydrologically connected to Sawmill Creek and Arthur Kill, geographically adjacent to Sawmill Creek and Arthur Kill Complex (No. 18) (USFWS NY Bight Study, 1997)

(12) Assessment area description

Upland area is filled wetland, largely dominated by invasive plants and with evidence of llegal dumping.

(13) Significant nearby features	(14) Uniqueness (considering the relative rarity in relation to the regional landscape.)
Pralls Island; Sawmill Creek wetland complex, Rt 440, Edward Curry Ave, Chelsea Road	AA is part of a unique natural system within the highly urbanized NY/NJ region

(15) Functions	(16) Mitigation for previous permit/other historic use
The AA is an upland area and does not provide wtland functions, but does provide/support: Habitat; Food Web; Nutr. Cycling; OM export (leaf litter).	Bank credit development

(17) Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	(18) Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
Feral cats, mice, common bird species such as starlings and sparrows. See also: Ecological Communities of NY State (NYNHP 2002)	Consultation with NYNHP indicates none present.

(19) Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

No wildlife observed in May and June, 2013.

(20) Additional relevant factors:

(21) Assessment conducted by:	(22) Assessment date(s):
LBA PC	10/30/13

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Saw Mill Creek Bank	NAN-2013-00259-EHA	E7 - East Upland Buffer Rehabiliation EDWARD CURRY AVE AREA
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	LBA PC	10/30/13

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

Location and Landscape Support		current condition	with rehabilitaion
	a	4 -supports primarily disturbance-tolerant species	7 - removal of invasive species and illegal dumping will improve habitat quality
	b	4 - invasive cover is high, adversely affecting functions	7 - invasives management will improve functions
	c	5 -wildlife access limited by roads and other land use	5 - barriers to wildlife use would remain
	d	6 - functional connections partially limited; barriers present	6 - functional connections partially limited; barriers still present
	e	5 - roads and other land use, runoff, illegal dumping and noise sources impact wildlife	6 - removal of debris and prevention of additional of illegal dumping would reduce impacts slightly
	f	4 - assessment area provides little in beneficial discharges to adjacent wetlands.	4 - no changes to hydrology of upland area
	g	3 - provides minimal surface or groundwater benefit to downstream habitats	3 - no changes to hydrology of upland area
	h	4 - upland area is a buffer between adjacent land use and wetlands	6 - removal of illegal dumping would improve buffer function
current: 4 / with: 5	i	N/A - assessment area is not a wetland	N/A - assessment area is not a wetland
	j	3 - upland area is relatively steep filled slope	3 - no change to elevations proposed

Water Environment (n/a for uplands)		current condition	with rehabilitaion
	a	N/A	N/A
	b	N/A	N/A
	c	N/A	N/A
	d	N/A	N/A
	e	N/A	N/A
	f	N/A	N/A
	g	N/A	N/A
	h	N/A	N/A
	i	N/A	N/A
	j	N/A	N/A
	k	N/A	N/A
current: / with:	l	N/A	N/A
	m	N/A	N/A

Community structure 1. Vegetation and/or 2. Benthic Community		current condition	with rehabilitaion
	I	4 - majority of woody and herbaceous plant species are non-native	8 - removal of invasives will improve plant community stratification
	II	4 - majority of plant species are non-native	8- site will be enhanced through establishment of native species; long term manangent plan implemented
	III	4 - native recruitment minimal and long term viability diminished by extensive invasive species cover	8 - removal of invasives would improve native recruitment
	IV	5- deviation from normal successonal patterns - recruitment limited by invasive species cover	6 - removal of invasives will improve age and size distribution of native plant species
	V	5- minimal structural habitat in form of cavities or logs present	7 -removal of invasives and illegal dumping will improve density/quality of woody debris
	VI	8 - exisitng plant condition generally good	8 - native plant condition expected to be generally good
	VII	5 - lack of land management led to dumping and invasive establishment	8 - long term management plan, conservation easement will support viable upland forest community
	VIII	2 - area is filled wetland/roadway embankment	2 - no proposed changes to microtopography
current: 4 / w/enh: 7	IX	N/A to uplands	N/A to uplands
	X	3 - woodland dominated by non-native, invasive species; minimal habitat/life history support	7 -removal of invasives and dumping will improve habitat and life history support

Score = sum of above scores/30

current	with

(if uplands, divide by 20)

current	with
0.40	0.60

Delta = [with-current]	
wetland	0.00
upland	0.20

If preservation as mitigation	
Preservation adjustment factor =	
Adjusted mitigation delta =	

If mitigation	
Time lag (t-factor)=	1
Risk factor=	1

Assessment Area Acreage	3.3

For impact assessment areas	
Functional loss (impact x acres)	

For Mitigation Assessment Areas	
Relative Functional Gain (RFG) Delta/(risk*t-factor)	0.20

Mitigation Bank Credit Determination	
RFG * Assessment Area Acres	**0.66**

PART I – Qualitative Description
(See Section 4.4.1)

(1) Site/Project Name	(2) Application Number	(3) Assessment Area Name or Number
Sawmill Creek Bank	NAN-2013-00259-EHA	Tidal Wetland Reference Site

(4) Habitat Code	(5) Further classification (optional)	(6) Impact or Mitigation Site?	(7) Assessment Area Size
II.B.8 Estuarine Brackish Tidal Marsh	Estuarine Brackish Tidal Marsh	Mitigation	7.00

(8) Basin/Watershed Name/Number	(9) Affected Waterbody (Class)	(10) Special Classification (local/state/federal designation of importance)
HUC 02030104	Sawmill Creek, Class SD (impaired: floatables and Oxy demand)	DEC HM (high marsh)and IM (intertidal marsh) wetlands

(11) Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

AA hydrologically connected to Sawmill Creek and Arthur Kill, geographically adjacent to Sawmill Creek and Arthur Kill Complex (No. 18) (USFWS NY Bight Study, 1997)

(12) Assessment area description

Brackish high and low marsh.

(13) Significant nearby features	(14) Uniqueness (considering the relative rarity in relation to the regional landscape.)
Pralls Island; Saw Mill Creek wetland complex;	AA is part of a unique natural system within the highly urbanized NY/NJ region

(15) Functions	(16) Mitigation for previous permit/other historic use
Habitat;Prim. Production; Food Web; Nutr. Cycling; OM export; Removal Contam; wave energy attenuation; flood storage;sedimentation/accretion (NYSDOS and NYSDEC 2000)	None

(17) Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	(18) Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)
See Attached Table I.1: See also:Ecological Communities of NY State (NYNHP 2002); Salt Marsh Restoration and Monitoring Guidelines(NYSDOSand NYSDEC 2000)	See Attached Table I.2

(19) Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Based on site visits conducted between May and July, 2013: fiddler crabs, ribbed mussels, mummichogs, marsh snails, yellow crowned and snowy egrets; osprey, mallard; clapper rail.

(20) Additional relevant factors:

Sources of stormwater runoff from adjacent land uses; connectivity to adjacent tidal marsh restricted by rail line and box culvert;

(21) Assessment conducted by:	(22) Assessment date(s):
LBA PC	8/21/13

PART II – Quantification of Assessment Area (impact or mitigation)
(See Section 4.4.2)

Site/Project Name	Application Number	Assessment Area Name or Number
Sawmill Creek Bank	NAN-2013-00259-EHA	Tidal Wetland Reference Site
Impact or Mitigation	**Assessment conducted by:**	**Assessment date:**
Mitigation	LBA PC	8/21/13

Scoring Guidance	Optimal (10)	Moderate (7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

		current condition	with enhancement
Location and Landscape Support	a	9 - difference from ideal is the size of AA, minimal connectivity reduction, and adjacent land uses	
	b	7 - Phrag is present within/adjacent to site, limited potential for invasion/expansion into site.	
	c	8 - type of fauna in TM dominant. sites w/ few existing barriers. Wide tidal channel is present.	
	d	8 - minimal potential for contamination (stormwater runoff only, upland buffer); impaired for oxygen levels in creek	
	e	8 - no additional fill in future, slightly less disruptive magnitude of adj. land use	
	f	9 - railroad embankment separate marsh from A. Kill marsh; tidal access non restrictive.	
	g	4 - provides contaminant buffering from adjacent uplands	
	h	N/A to wetland areas	
current: 8 / with:	i	6 - more than 100 ft. wide, provides storage, min. surge protection	
	j	7 -areas of high marsh, less scrub shrub areas, periphery mostly hardened edges (road, rail)	
		current condition	
Water Environment (n/a for uplands)	a	10 -site is not ditched, and overmarsh flow minimally affected by railroad berm	
	b	10 - water level not significantly affected by manmade barriers	
	c	10 - no apparent soil moisture issues	
	d	9 - Railroad berm may cause minor alterations of flows/discharges	
	e	9 - nearly optimal community zonation	
	f	9 - appropriate for all strata, though mild effects due to ditching and constricted flow in Sawmill Creek	
	g	10 - animals with specific hydrologic requirement (i.e, muskrat, heron, terrapin, fiddler crab) expected to be present	
	h	9, no sign of hydrologic stress	
	i	9 - no observed evidence in assessment area	
	j	7 - water quality impairment from adjacent land use minimal (stormwater runoff)	
	k	4 - listed as impaired for floatables and oxygen demand	
current: 9 / with:	l	9 - wave energy and fetch appropriate for community type	
	m	9 - marsh appears stable	
		current condition	
Community structure	I	9 - some Phragmites presence (< 2%)	
	II	9 - Phragmites present in small patches	
	III	10 - Plant cover appears total	
1. Vegetation and/or 2. Benthic Community	IV	9 - age and size distribution typical of system	
	V	N/A - no woody debris in assessment area	
	VI	10 - plant condition is good	
	VII	8 - no ditching, Nat. gas line through high marsh	
	VIII	10 -microtopography present; no ditching	
current: 9 / with:	IX	N/A, no SAV in region	
	X	N/A to wetland areas	

Score = sum of above scores/30

current	with
0.87	

(if uplands, divide by 20)

Delta = [with-current]	
wetland	0
upland	0

If preservation as mitigation	
Preservation adjustment factor =	
Adjusted mitigation delta =	

If mitigation	
Time lag (t-factor)=	1
Risk factor=	1

Assessment Area Acreage	7

For impact assessment areas	
Functional loss (impact x acres)	

For Mitigation Assessment Areas	
Relative Functional Gain (RFG) Delta/(risk*t-factor)	0.00

Mitigation Bank Credit Determination	
RFG * Assessment Area Ac.	0

Appendix I
List of Preparers

List of Preparers

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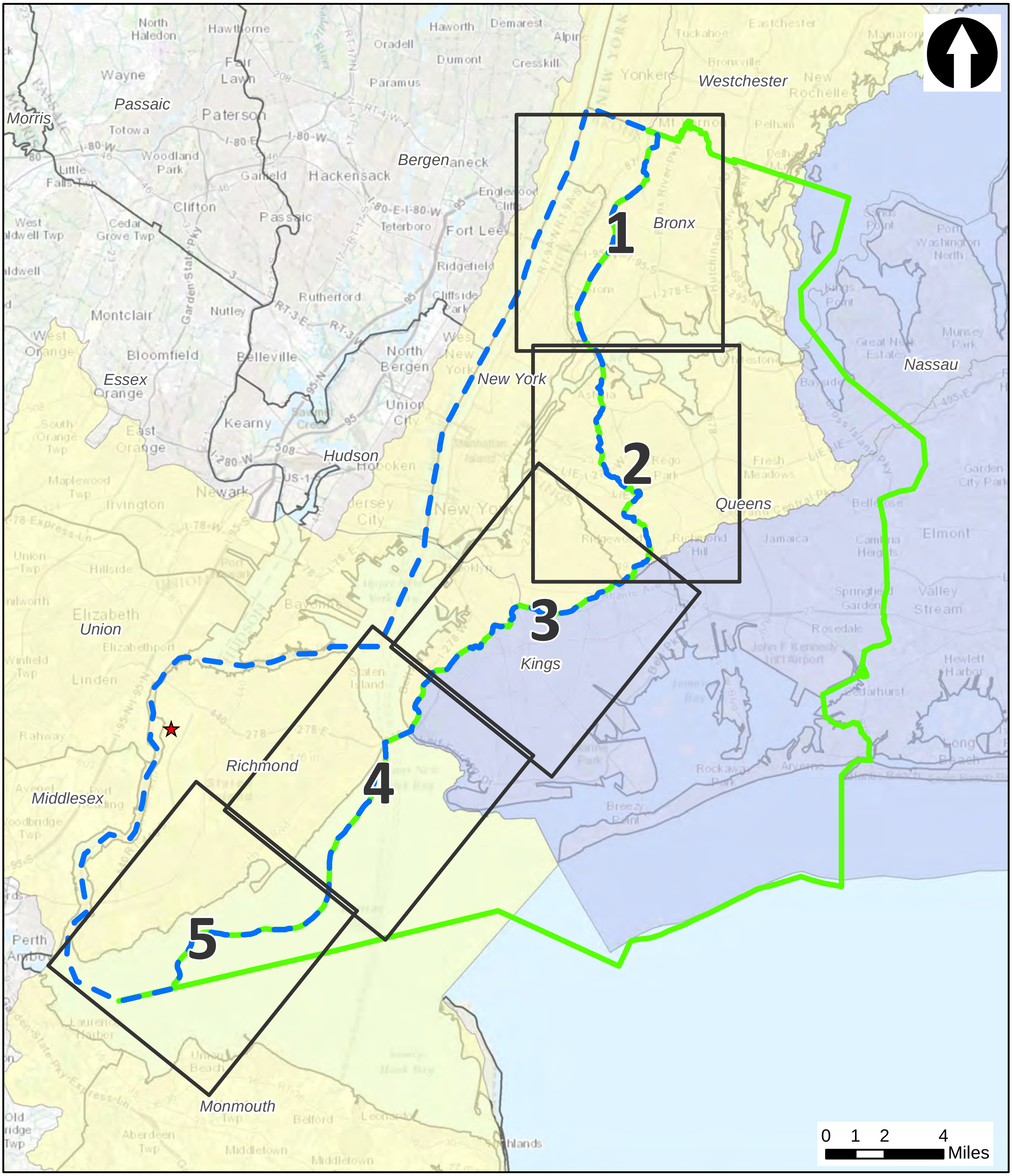
B.S., Environmental Sciences, Wesley College, 2000

EXHIBIT F
SERVICE AREA MAP



Sources:
USGS Base Map Service - ESRI and its data suppliers; HUC 8 Data - USDA Geospatial Data Gateway, 2012.

Legend

- ★ Project Location
- Primary Service Area
- Secondary Service Area
- Service Area Section
- Lower Hudson Basin (HUC 020301)
- Long Island Basin (HUC 020302)
- County Boundary

NYCEDC
New York City Economic Development Corporation

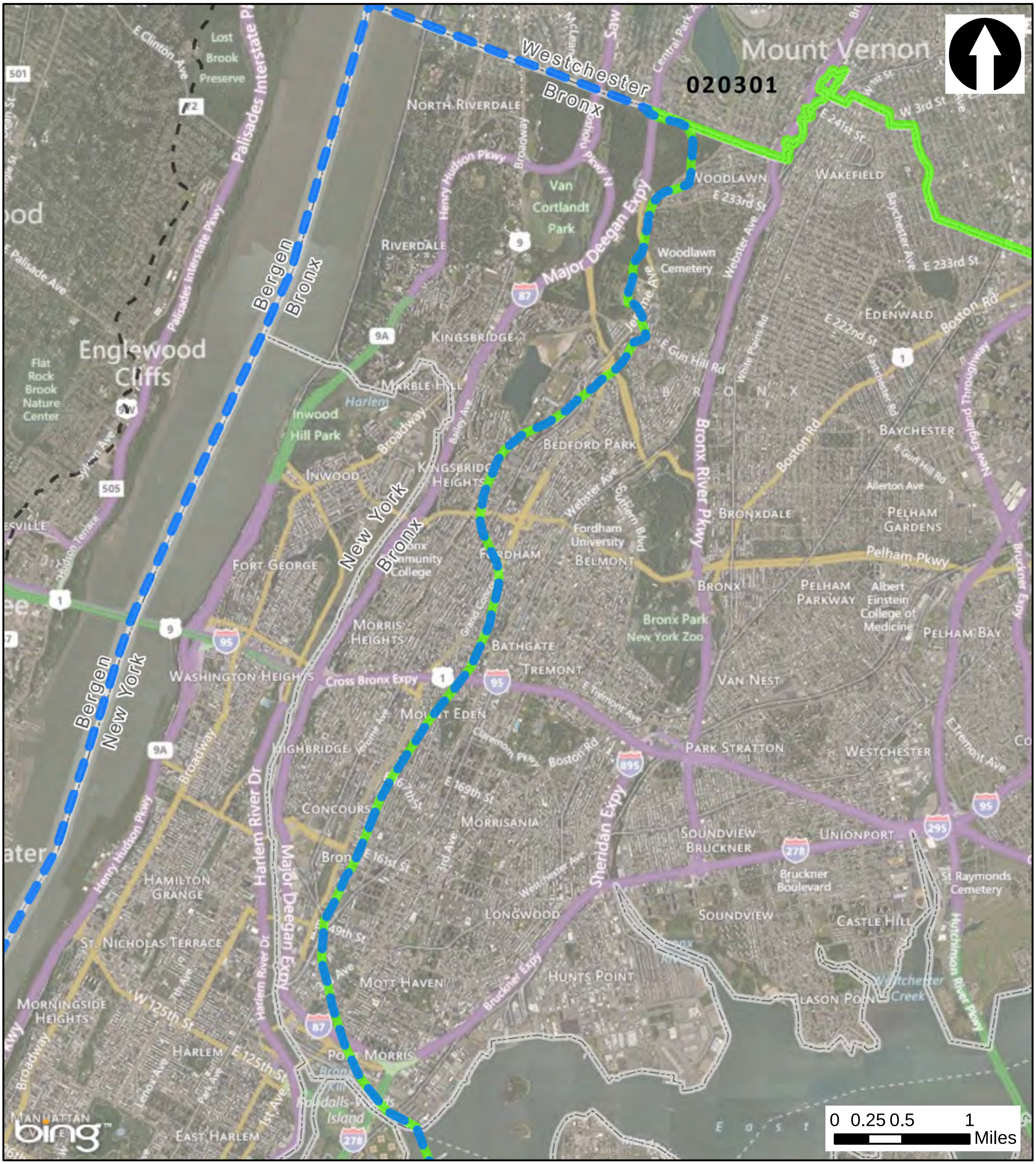
Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York

Service Area Index Map

The Louis Berger Group, Inc.

March 2015

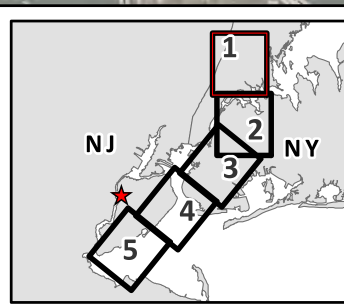
Figure F-1



Sources:
ESRI BING Imagery Map Service, 2015; HUC 8 Data - USDA Geospatial Data Gateway, 2012.

Legend

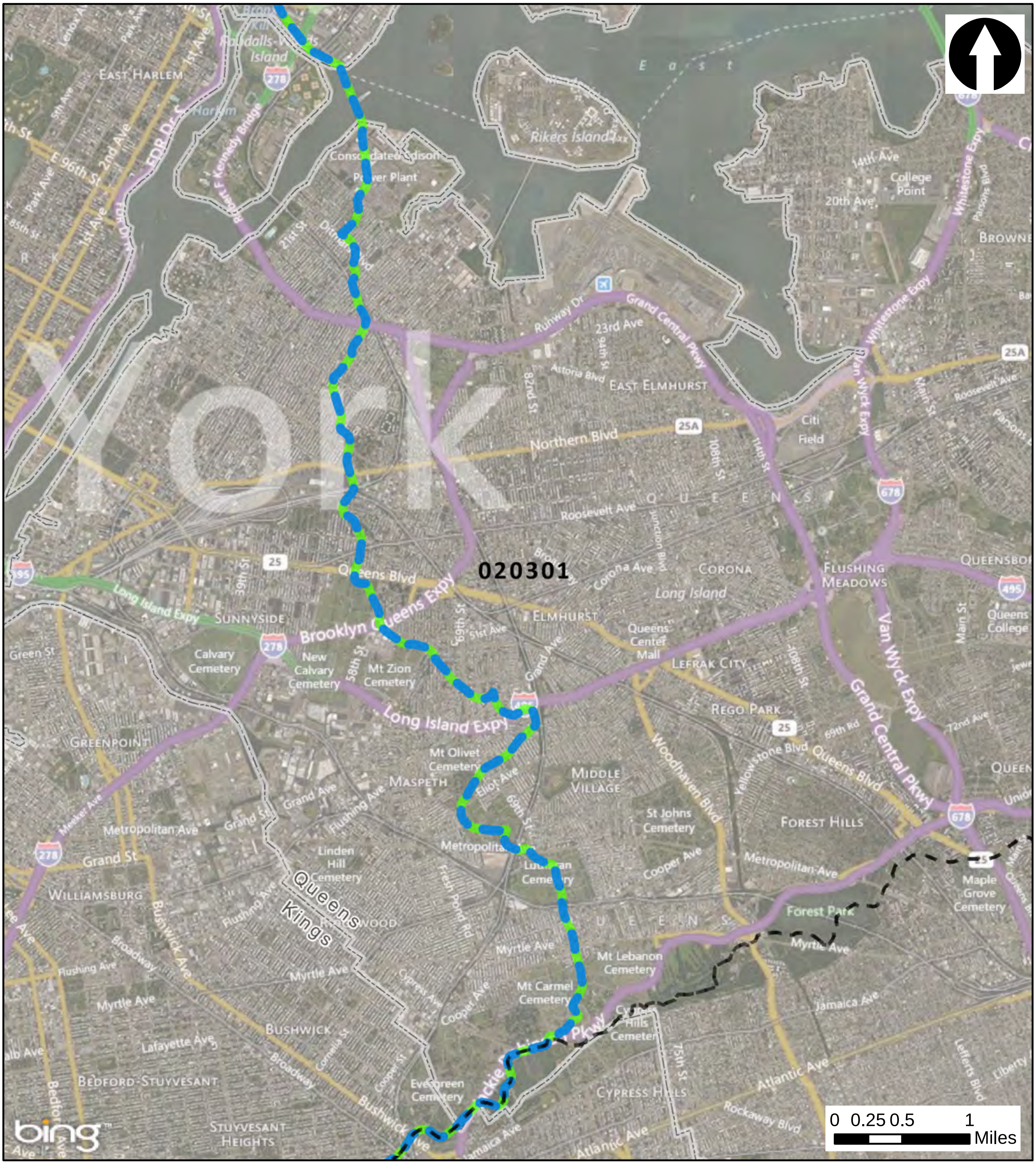
- Project Location
- County Boundary
- Service Area Section
- Primary Service Area
- Secondary Service Area
- Basin



NYCEDC
New York City Economic Development Corporation

Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York
Service Area Map
Section 1

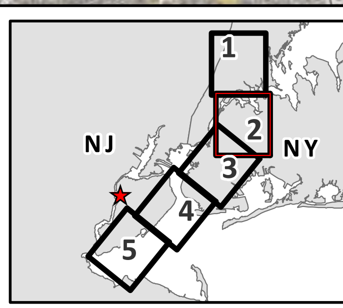
The Louis Berger Group, Inc.
March 2015
Figure F-2



Sources:
ESRI BING Imagery Map Service, 2015; HUC 8 Data - USDA Geospatial Data Gateway, 2012.

Legend

- Project Location
- County Boundary
- Service Area Section
- Primary Service Area
- Secondary Service Area
- Basin



NYCEDC
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Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York

Service Area Map
Section 2

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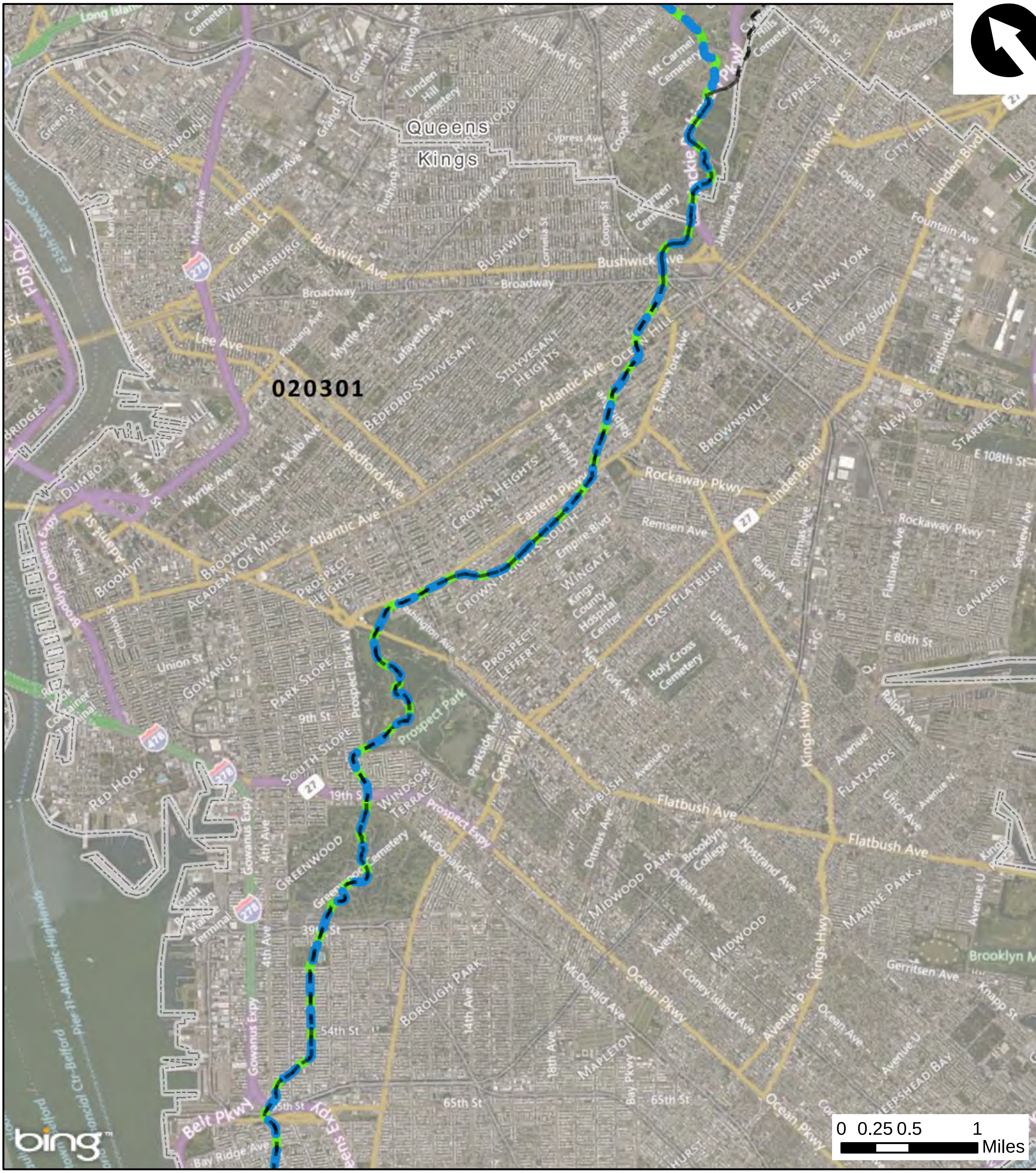
March 2015

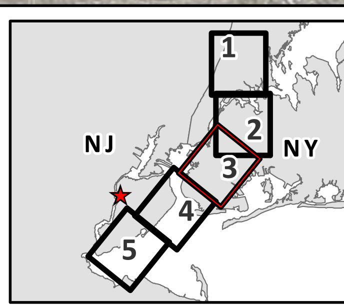
Figure F-3



Sources:
ESRI BING Imagery Map Service, 2015; HUC 8 Data - USDA Geospatial Data Gateway, 2012.

Legend

- ★ Project Location
- County Boundary
- Service Area Section
- Primary Service Area
- Secondary Service Area
- Basin



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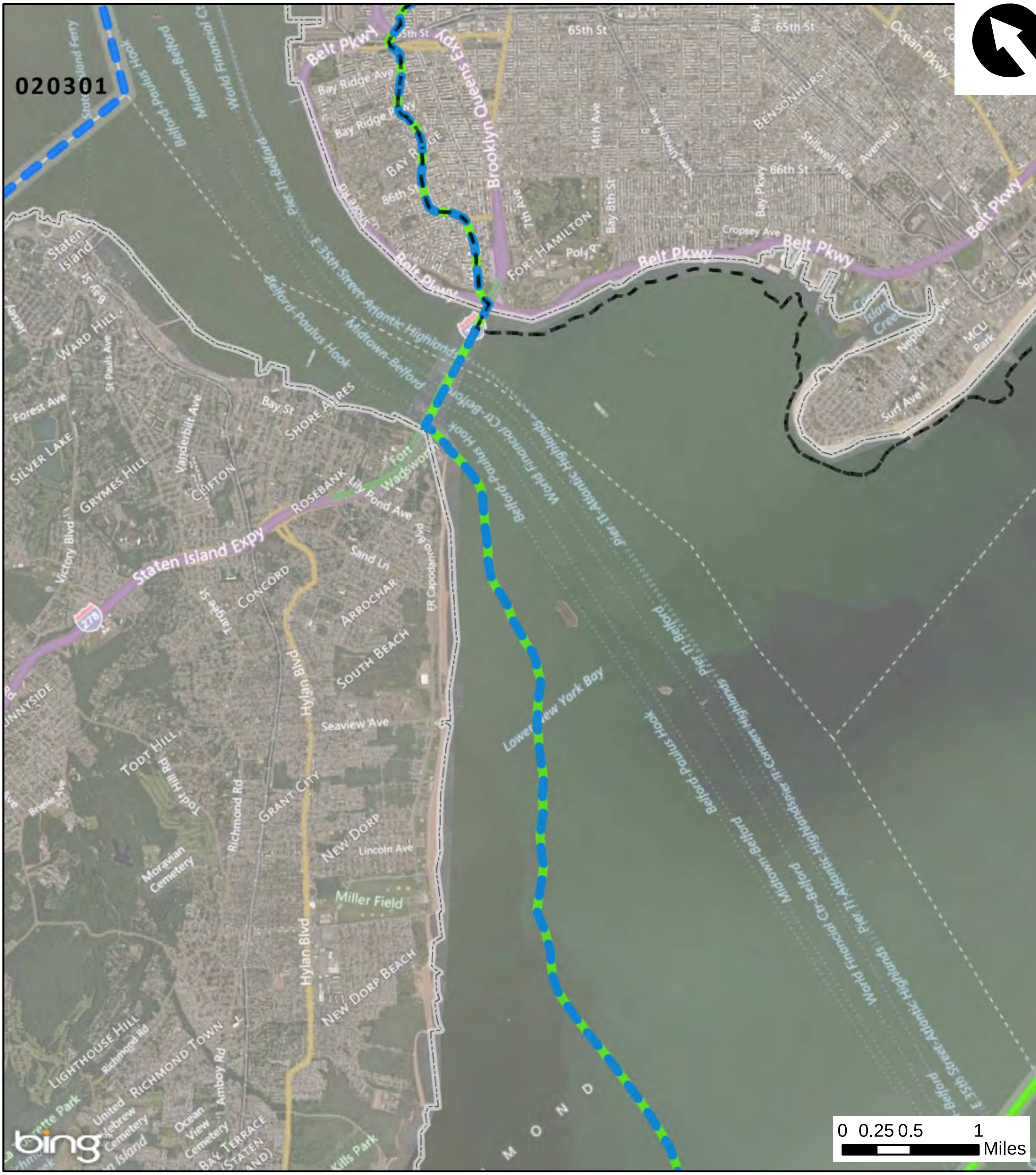
Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York

Service Area Map
Section 3

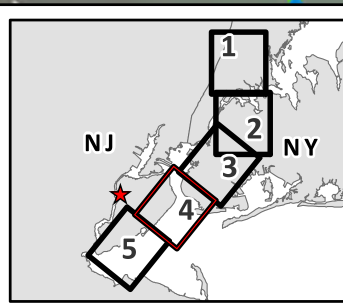
The Louis Berger Group, Inc.	March 2015
	Figure F-4



Sources:
ESRI BING Imagery Map Service, 2015; HUC 8 Data - USDA Geospatial Data Gateway, 2012.

Legend

- Project Location
- County Boundary
- Service Area Section
- Primary Service Area
- Secondary Service Area
- Basin



NYCEDC
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Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York

Service Area Map
Section 4

The Louis Berger Group, Inc.

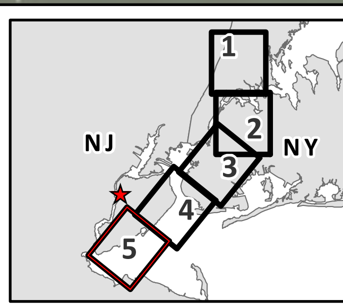
March 2015

Figure F-5

Sources:
ESRI BING Imagery Map Service, 2015; HUC 8 Data - USDA Geospatial Data Gateway, 2012.

Legend

- Project Location
- County Boundary
- Service Area Section
- Primary Service Area
- Secondary Service Area
- Basin



NYCEDC
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Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York

Service Area Map
Section 5

The Louis Berger Group, Inc.

March 2015

Figure F-6

EXHIBIT G
MONITORING AND MAINTENANCE PLAN

Exhibit G
to Instrument

Monitoring and Maintenance Plan

1.0 Introduction

Subject to the terms of the Instrument (excluding the Schedules and Exhibits thereto):

- The Bank Sponsor agrees to perform all necessary work to monitor the Bank to demonstrate compliance with the Success Criteria established in the Instrument. Monitoring may be terminated or the extent of monitoring may be reduced over part or the entire site at the discretion of the Corps and NYSDEC. All monitoring and maintenance will be performed in accordance with Federal and State standards. The goal of the monitoring and maintenance program will be to accurately determine the Bank's success relative to the Success Criteria and to identify any problems requiring corrective action or adaptive management.
- The success of the Bank will be measured by the Success Criteria set forth in the Instrument as the conditions under which the Bank will be considered to be successful. Post-construction monitoring and maintenance will be performed for a minimum of five (5) consecutive years, according to standards set by the Corps and NYSDEC. The monitoring will begin at near the end of the growing season of the first year following completion of construction/planting (i.e., if the planting is completed in spring 2016, the first monitoring event would occur in late 2017).
- The following M&M Plan establishes guidelines to measure success of the Bank relative to the Success Criteria. The plan also includes monitoring and maintenance requirements to uncover and correct deficiencies.

2.0 Monitoring Plan

Monitoring will be conducted until such time that the Corps and NYSDEC are confident that success is being achieved (i.e., Success Criteria are attained). The period for monitoring is estimated at five years; however, it may be necessary to extend this monitoring period if the Bank does not meet Success Criteria as indicated in the Banking Instrument within those periods or if remedial activities have been undertaken. If all performance criteria have not been met in the 5th year, then a monitoring Report shall be required for each consecutive year until two sequential annual Reports indicate that all criteria have been successfully satisfied.

The five year monitoring period will begin one year after completion of construction as described in the preceding section, and all monitoring activities shall occur during the growing season. Throughout the monitoring period, the Sponsor shall submit to the Corps and NYSDEC, for distribution to the IRT, five copies of the annual report on the status of wetland plantings and hydrology, as observed during the growing season. The Reports will serve to evaluate the success of the Bank and identify any problems requiring remedial action. Annual Reports will be submitted to the Corps and NYSDEC no later than by December 31 of each year.

In accordance with 33 CFR 332 and the requirements of NYSDEC, annual reports shall include:

1. A site plan showing the grading, hydrologic and planting changes made during the year that is the subject of the report. The site plan will be based on the as-built plans and will be conducted in consultation with the Property owner (the City of New York, acting through DPR) so that features can be surveyed that may be of concern so that they can be adequately monitored in the future;
2. A detailed narrative summarizing the condition of the Bank and regular maintenance activities;
3. A summary of vegetation monitoring parameters measured at both the Bank site and the reference site, including the identification of plant species, along with their estimated relative percent cover, stem density, plant height, and signs of disease, predation, or disturbance;
4. Soil property analysis, including soil organic matter and soil salinity at the Bank site;
5. An assessment of Bank site utilization by benthic invertebrates, including the number of ribbed mussels and fiddler crab burrows observed as well as the presence of any additional species;

6. A summary of macrofauna observed at the Bank site, including saltwater-fish-feeding birds, benthic-invertebrate-feeding birds, other salt marsh associated bird species, and any other macrofauna;
7. Vegetation cover maps for each growing season;
8. An assessment of the presence and level of occurrence of invasive species;
9. Photographs from established fixed-point photo stations taken during monitoring activities and visual descriptions in narrative form along with photographs showing representative areas of the Bank taken at least once each year during the period between June 1 and November 1;
10. The findings of any contingency inspections conducted subsequent to storms or other destructive events; and
11. Any corrective measures to be taken if Success Criteria are not met and a timeline for implementation of those measures.

Monitoring of the Bank will be conducted in accordance with the *New York State Salt Marsh Restoration and Monitoring Guidelines* (Niedowski 2000) or other latest relevant guidance, which provide the recommended components of a monitoring program for salt marsh restoration projects in the estuarine waters of New York State.

Monitoring shall be conducted at the Bank site and, where indicated above and below for specific parameters, at a nearby reference site. The purpose of including a reference site is to help discern background environmental effects from the effects attributable to the restoration project. The suggested reference site is an approximately 7-acre marsh located north of the Bank site, bounded by the Williams-Transco underground natural gas pipeline to the south, the railroad tracks to the west, and River Road to the north and east. The reference site is in close proximity to the Bank site, is hydrologically and ecologically similar to the Bank site, and contains similar vegetation zonation. The reference site is lacking historic fill and *Phragmites* invasion, and is therefore functionally superior to the Bank site. Additionally, the reference site was utilized during previous studies associated with development of the Bank, including the Biological Resource Survey and the functional assessment. This reference site will consist of, at a minimum, three control transects (including 3 quadrats each).

2.1 Pre-Restoration Monitoring Activities

A complete set of color photographs shall be taken, including all permanent, fixed point stations (transect ends and elevated overview) upon completion of the design phase and prior to any construction activities. Photographs should also be taken at the reference site.

In areas where marsh habitat already exists and no planting is planned (e.g., wetland enhancement areas), all parameters described below under "Post-Construction Monitoring (Annual for 5 Years)" shall be monitored at least once prior to the restoration at both the Bank site and the reference site. At a minimum, all parameters should be monitored once during the last August prior to the restoration. May, August and/or December parameters specified below can be included in pre-restoration monitoring during the year prior to the restoration if applicable.

2.2 Post-Construction Monitoring (Four-Five Weeks Post-Construction)

The Bank site should be walked by the Sponsor, DPR, and the IRT 4 to 5 weeks post construction to assess compliance with submitted design plans. Color photographs should be taken at permanent, fixed-point photo stations articulated below at both the Bank site and the reference site. Photographs shall be taken at low tide (avoiding spring tide and full moon periods) in the manner articulated below. Label photographs with the location, direction of view, date, time, and the tide. Based on the 4 to 5 week post-construction assessment, a determination shall be made whether any additional work is required to achieve design plan compliance, and above and beyond any standard regulatory review associated with the project.

2.2.1 As-Built drawings

Subject to the requirements of Section IV.K of the Instrument, within 60 days of completion of construction, an "as-built" drawing will be prepared that depicts final grading elevations and planting arrangements of the Bank. Vegetation cover type maps at a scale of 1 inch equals 80 feet or larger will be prepared for subsequent Monitoring Years.

2.2.2 Monitoring Transects

Permanent transects shall be established within the Bank site, evenly spaced across the site and representing all vegetation zones present. Transects shall run perpendicular to channels and/or parallel with the elevation gradient, across the restoration site approximately from the seaward edge of the *Spartina alterniflora* zone to the landward extent of the project. Transect locations shall be permanently marked at the landward and seaward ends using four-inch capped PVC pipe. Transects will span from the mean high water line to the top of the channels, with the transect orientation perpendicular to the nearest main channel. During monitoring visits, a tape measure will be used to mark the transect line between the landward and seaward stakes. Noteworthy features occurring along each transect shall be recorded relative to the distance marked on the tape measure at the point of occurrence.

2.2.3 Monitoring Quadrats

Quadrats (1.0 m^2) shall be placed along the transects at a minimum of three different elevations (i.e., a minimum of three quadrats per transect) between the seaward edge and the landward extent of the project, including, as applicable, all vegetation zones present. The number of quadrats along each transect will vary depending on transect length. The number of quadrats to be established will be determined by statistical analysis to assure an adequate sample size. Within a single vegetation zone, quadrats shall be located at least 3.0 m apart along the length of the transect. Quadrats will be placed semi-randomly within an area 2.0 meters to either side of the measuring tape transect line. A length of PVC pipe 4.0 meters in length, carried or placed on the ground with 2.0 meters length extending on either side of the centerline, shall be used to demarcate this area during monitoring visits. Placement of quadrats shall be accomplished by walking in a zig-zag pattern back and forth across the demarcated area along the entire length of the transect line, dropping quadrats at random. After placement, the quadrats shall be oriented so that one side is parallel to the transect line and the location of upper and lower quadrat boundaries shall be recorded with respect to the tape measure.

2.2.4 Permanent fixed-point photo stations

The transect marker stakes (seaward end and landward end) for all transects on the site shall be used as permanent photo stations for photographic monitoring. Photographs of each transect shall be taken facing the seaward transect marker from the landward transect marker, and facing the landward transect marker from the seaward transect marker. Photographs shall be taken at low tide (avoiding spring tide and full moon periods) and labeled with the location, the direction of view, the date, the time, and the tide.

2.2.5 Hydric Soils

By definition, a hydric soil is one that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (*Federal Register, Volume 59, Number 133, dated July 13, 1994*). Wetland hydrology is the key driving force for the formation of hydric soils. Soils on the Property will be analyzed for indicators of wetland conditions along each monitoring transect. A sharpshooter shovel with an 18-inch blade or a hand held auger will be used by Sponsor to obtain samples of the upper soil horizons to determine if hydric soils are present. Soil texture will be assessed based on the USDA classification system. Standardized notations from MunselI Soil Color Charts (*GretagMacbeth, 2009*) will be used for soil color descriptions. Characteristics such as evidence of soil saturation, inundation, redoximorphic features, and structure will be noted. In addition to the soils criteria established in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (U.S. Army Corps of Engineers, 2011), criteria defined in *Field Indicators of Hydric Soils in the United States*, Version 7. 0 (*USDA-NRCS, 2010*) will be used.

2.3 Post-Construction Monitoring (Annual for 5 Years)

2.3.1 Vegetation

The following parameters shall be monitored once annually for 5 years, during the last week in August or the first three weeks in September, at the Bank site and the reference site.

- **Plant species occurring:** All plant species occurring in each quadrat along the transect shall be recorded.
- **Relative Percent Cover**: For each quadrat, a visual estimate of the total percent cover of live vegetation will be made, as well as a visual estimate of the relative cover by individual species. Using these data, the following statistics will be generated: the total percent cover of live vegetation and relative percent cover by individual species for each transect; the arithmetic mean, variance, standard deviation and coefficient of variance for the total percent cover of emergent vegetation by transect; and the mean total percent cover of emergent vegetation for all transects.
- **Stem Density:** All live stems of any plant species found within a 0.25 m^2 section of the quadrat shall be counted. Divide each 1.0 m_2 quadrat into four 0.25 m^2 sections and randomly select one 0.25 m^2 section for the stem density count.
- **Plant Height:** All live stems of any plant species within a 0.25 m^2 section of the quadrat shall be measured from the base of the plant to the top of the stem in meters. The same 0.25 m^2 section of the quadrat as was used for stem density count shall be used for plant height measurements.
- **Signs of disease, predation, or other disturbance** shall be monitored in each quadrat and along the length of each transect.
- **Vegetation Zones:** Walking along the measuring tape that demarcates the transect line starting at the seaward transect end, note the distance marked on tape measure at the transition between different vegetation zones, and the dominant species composition of these zones.

2.3.2 Fixed-point photo stations

Color photographs shall be taken from all designated locations twice annually, in June and November, for 5 years at the time of vegetation monitoring for at the Bank site and the reference site. The permanent transect marker stakes (seaward end and landward end) should be used as photo stations for the photographic monitoring.

An overview photograph or photographs of the Bank site shall also be included in the annual photo monitoring. Additionally, one color aerial photograph (8" x 10" or larger) depicting the entire Bank site shall be taken once the site has been graded, planted, and stabilized in the 5th growing season as directed by the Corps and NYSDEC.

2.3.3 Soil Properties

The following parameters shall be monitored once annually for 5 years, at the time of vegetation monitoring. Each soil property parameter shall be measure at least twice in each quadrat placed along the transect line.

- **Soil organic matter:** Sediment cores (2 cores per quadrat) shall be sampled to 10 cm depth using a cylindrical push corer ~5 cm in diameter. Soil organic matter from marsh substrates may be measured by loss on combustion.
- **Soil salinity:** The salinity of the soil may be determined in the field using a refractometer or conductivity meter.

2.3.4 Benthic Invertebrates in quadrats

The following parameters should be monitored annually for 5 years at the time of vegetation monitoring at the Bank site and the reference site.

- **Ribbed mussels:** Ribbed mussels in each quadrat shall be counted and recorded. Two to six mussels per quadrat, as appropriate, should be measured lengthwise.

- **Fiddler crab burrows:** Fiddler crab burrows in each quadrat shall be counted and recorded. The presence of live fiddler crabs shall also be recorded, where applicable.
- **Other benthic invertebrates:** The presence of any additional species and the number of individuals (when practical), shall be recorded both within quadrats and along the length of the transect line, as applicable.

2.3.5 Macrofauna

The following parameters should be monitored at the Bank site once monthly in June and August for 5 years. Birds shall be observed from an obscured location on the landward side of the Bank site, unless site-specific characteristics require otherwise (in this case, a location that will minimize disturbance to bird species at the site when the monitor approaches will be identified). The location shall be easily locatable by monitors in subsequent years. Observations shall be recorded as described below for a 3 to 4 hour period surrounding mid-tide (1.5 to 2 hours before and 1.5 to 2 hours after mid-tide). Time of day, tide, weather conditions (temperature, wind strength, precipitation), location, direction of view from the chosen viewing station shall be recorded on all observation sheets. Bird monitoring shall not be conducted on days when there is high wind, rain, or low barometric pressure.

- **Saltwater-fish-feeding birds:** Presence, duration of stay, general location, and activity for wading birds, e.g., great egret, snowy egret, tricolor heron, black-crowned night heron, and other species, shall be recorded if observed.
- **Benthic-invertebrate-feeding birds:** Record presence, general location, duration of stay, and activity for wading birds, e.g., little blue heron, yellow-crowned night heron, and other species, shall be recorded if observed.
- **Other salt marsh associated bird species:** Numbers of species and individuals, general location, activities, and duration of stay shall be recorded.
- **Other macrofauna:** Presence, or reasonable evidence of presence, for any other macrofauna (small mammals, horseshoe crabs, terrapin) observed during any site visit shall be recorded.

2.4 Hydrology Establishment

Field observations and photographic documentation of the establishment of tidal flow, including vegetative response to hydrology, will be made during the monitoring period. During the first year monitoring period, time lapse photographs will be taken of the movement of the tide through channels and across the marsh plain throughout one complete tidal cycle to illustrate that tidewaters flood and ebb unimpeded on a typical day. Additionally, for the first year monitoring period, field observations will be augmented by the placement of two calibrated gauges at representative locations within the tidal marsh portions of the Bank to monitor tidal inundations and tide heights.

2.5 Contingency Inspections

The Bank site and the reference site shall be inspected for damage in the event of winter storms or other destructive events. These visits shall be conducted subsequent to such events, and at a minimum once annually in late March/early April to ensure that damage is documented and plans for repair and debris removal are made at the earliest possible opportunity. If repair, debris removal, or other action is indicated, photo monitoring as described previously shall be conducted during the contingency inspection.

2.6 Functional Assessment

During the fifth and final monitoring event, the Bank will be assessed through the use of the functional assessment methodology derived from the Uniform Mitigation Assessment Method (UMAM). UMAM tracks wetland functional gains from mitigation projects and banks. This assessment methodology provides a standardized framework to assess wetland functions for baseline and post-mitigation conditions for assessment areas using a qualitative description and quantitative scoring. It has been adopted and modified for use in other Corps Districts and State programs and was used on the Bank, with some modifications to tailor it to the NYC region and its habitats, to determine the available credits for the Bank.

The final monitoring event will include an analysis of the difference between before and after Bank establishment site conditions as informed by the modified UMAM functional assessment methodology.

2.7 Monitoring Reports

Annual monitoring reports shall be written and submitted by December 31 to the IRT. Reporting will begin after the first post-construction growing season. All data and photographs shall be included in the reports, as well as a brief summary of the collected data. Each monitoring report will include an invasive/noxious species assessment including relative percent cover by species. All data sheets will be included in the annual monitoring reports as an appendix. Each monitoring report will include a conclusions and recommendations section consisting of professional observations and judgments. This section will allow for the identification of Bank elements that are successful and those elements that are not achieving the desired result. Observations of wildlife utilization of the Bank will be made, as well as observations of herbivory pressures and effectiveness of anti-herbivory measures. Statistical data developed from monitoring activities will be evaluated and discussed relative to specific Success Criteria describe below. Recommendations for maintenance and corrective measures relative to specific Success Criteria will be included in this section of each monitoring report. This section will also include a timeline for implementation of any corrective measures.

The following criteria will be used to assess project success:

1. Submittal of required documentation, including monitoring reports, annual ledgers, as-built drawings, proof of financial assurances in accordance with Section VI.

2. In Wetland Restoration (Re-establishment and Rehabilitation) areas, success shall be evaluated as follows:

(a) Upon completion of grading, demonstrate that wetland hydrology, defined as a range of twice daily tidal flooding and draining of the lower marsh areas and twice monthly flooding and draining of the higher marsh, has been achieved via an as-built topographic map, tide gage data, and photographs of several locations across the site at high and low tide;

(b) Upon completion of planting, demonstrate the establishment of the vegetative community, and that wetlands and open waters/mudflat have been created in the ratios provided in this Banking Instrument and the Bank Development Plan, as approved by the Corps and NYSDEC in consultation with the IRT;

(c) At the end of the first and second growing seasons, demonstrate at least 65 percent areal coverage of the mitigation plantings and/or target hydrophytes, which are species native to the area and similar to ones identified on the mitigation planting plan, and that all plant species in the mitigation area are healthy and thriving. Demonstrate that the site is less than 10 percent occupied by invasive or noxious species such as, but not limited to *Phalaris arundinacea* (reed canary grass), *Phragmites australis* (common reed grass), *Pueraria montana* (kudzu), *Typha latifolia* (broad-leaved cattail), *Typha augustifolia* (narrow leaved cattail), *Lythrum salicaria* (purple loosestrife), *Ailanthus altissima* (tree-of-heaven), *Berberis thunbergi* (Japanese barberry), *Berberis vulgaris* (common barberry), *Elaeagnus augustifolia* (Russian olive), *Elaeagnus umbellate* (autumn olive), *Ligustrum obtusifolium* (Japanese privet), *Ligustrum vulgare (*common privet), *Rosa multiflora* (multiflora rose), and *Persicaria perfoliata* (mile-a-minute). Invasive and noxious species are identified in *New York State Prohibited and Regulated Invasive Plants (September 10, 2014, NYSDEC)* which is available at http://www.dec.ny.gov/docs/lands_forests_pdf/isprohibitedplants2.pdf. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

(d) At the end of the third and fourth growing seasons, demonstrate at least 75 percent areal coverage of the mitigation plantings and/or target hydrophytes and that all plant species in the mitigation area are healthy and thriving. Demonstrate that the site is less than 10 percent occupied by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

(e) At the end of the fifth growing season, demonstrate

(i) at least 85 percent areal coverage of mitigation plantings and/or target hydrophytes and that all plant species in the mitigation area are healthy and thriving. Demonstrate that no more than 10 percent cover in the wetland is made up by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

(ii) the site contains hydric soils or there is evidence of reduction occurring in the soil;

(iii) the proposed hydrologic regime as specified in the Bank Development Plan, which proves the mitigation site is a wetland, has been satisfied; and

(iv) that the goals of the wetland mitigation project including acreage as stated in the approved wetland mitigation proposal and the permit, have been satisfied.

3. In Wetland Enhancement (Tidal and Forest) areas, success shall be evaluated as follows:

(a) For wetland enhancement areas demonstrate that invasive or noxious species have been controlled and debris has been removed. Upon completion of seeding and planting, demonstrate that the wetland enhancement areas have been established as detailed in this Banking Instrument and the Bank Development Plan, as approved by the Corps and NYSDEC in consultation with the IRT;

(b) At the end of the first and second growing seasons demonstrate at least 65 percent areal coverage of the mitigation plantings and/or target hydrophytes, which are species native to the area and similar to ones identified on the mitigation planting plan. At the end of the first and second growing seasons demonstrate that the site is less than 10 percent occupied by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

(c) At the end of the third and fourth growing seasons demonstrate at least 75 percent areal coverage of the mitigation plantings and/or target hydrophytes. At the end of the third and fourth growing seasons, demonstrate that the site is less than 10 percent occupied by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

(d) At the end of the fifth growing season demonstrate at least 85 percent areal coverage of the mitigation plantings and/or target hydrophytes and that plant species in the enhancement areas are healthy and thriving. At the end of the fifth growing season, demonstrate that the site is less than 10 percent occupied by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

(e) That the goals of the wetland mitigation project including acreage as stated in the approved wetland mitigation proposal and the permits, have been satisfied.

4. In Buffer Rehabilitation areas, success shall be evaluated as follows:

(a) For buffer rehabilitation areas demonstrate that invasive and noxious species have been controlled as per the maintenance plan. Upon completion of seeding and planting, demonstrate that the buffer rehabilitation areas have been established as detailed in this Banking Instrument and the Bank Development Plan, as approved by the Corps and NYSDEC in consultation with the IRT;

(b) At the end of the first and second growing seasons, demonstrate 65 percent areal coverage of the mitigation seedlings and plantings or target native species, which are species native to the area and similar to ones identified on the mitigation planting plan, and that all plant species in the mitigation area are healthy and thriving. Demonstrate that the site is less than 10 percent occupied by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

(c) At the end of the third and fourth growing seasons, demonstrate 75 percent areal coverage of the mitigation seedlings and plantings or target native species which are species native to the area and similar to ones identified on the mitigation planting plan, and that all plant species in the mitigation area are healthy and thriving. Demonstrate that the site is less than 10 percent occupied by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

(d) At the end of the fifth growing season, demonstrate 85 percent areal coverage of the mitigation seedlings and plantings or target native species which are species native to the area and similar to ones identified on the mitigation planting plan, and that all plant species in the mitigation area are healthy and thriving. Demonstrate that the site is less than 10 percent occupied by invasive or noxious species. Aggressive management efforts will be implemented should invasive or noxious species exceed a 5 percent threshold;

(e) That the goals of the wetland mitigation project including acreage as stated in the approved wetland mitigation proposal and the permits, have been satisfied.

3.0 Maintenance and Corrective Action Plan

The Bank is designed to be a low-maintenance, self-sustaining system. It is anticipated that it will function effectively and achieve the desired long-term goals. However, to minimize anticipated and unanticipated problems, this section addresses potential areas of concern and the proposed maintenance measures and corrective actions.

The primary focus of the maintenance plan will be to initiate management and corrective actions necessary to achieve the applicable Success Criteria. Maintenance efforts will be designed to ensure establishment of the target vegetation types, the prevention of invasive species encroachment, and curtailment of herbivory until a dense vegetative cover has become established. Maintenance tasks detailed in the following sections will be undertaken as determined by the results of the monitoring program.

3.1 Control of Invasive Plants

All Invasive Plants will be targeted during maintenance of the Bank. If Invasive Plants on the Project site exceed the level of [five percent (5%)] of the total area of the Project site, Sponsor shall take action to control such plants as contemplated in this Instrument. Based on conditions within the Bank boundary, it is expected that the invasive *Phragmites australis* will be the primary species of concern, although other Invasive Plants may also be present. During construction, portions of the Bank will be graded to establish elevations that allow for tidal inundation of a sufficient period to support native *Spartina* spp. plant communities, as confirmed by bio-benchmarks studies. It is believed that the elevation range established for the emergent marsh will not be conducive to *Phragmites* establishment. Shoreline slopes will also be planted with native vegetation to minimize *Phragmites* invasion. Species including *Baccharis halimifolia* (groundsel-tree) and *Iva frutescens* (marsh-elder), both salt tolerant species typical of brackish marshes in New York, will be planted at higher elevations along slopes to minimize *Phragmites* invasion. Despite these efforts, *Phragmites* remains dominant in many brackish water regimes and may require on-going control.

During the M&M Period, the Sponsor will control Invasive Plants as deemed necessary by monitoring data. This program will consist of cutting, mowing and/or herbicide spot treatment applications within affected areas of the Property at appropriate times during the spring and fall. In the forested wetland, cutting / mowing and/or spot applications of herbicide will be used to control Invasive Plants during the maintenance period until tree and shrub growth is sufficient to out-compete and provide shade control of invasive plants.

3.2 Stream Channels

Stream channels shall be inspected to ensure water is freely flowing. Any stream channel repair after the Project Closure Date will be the financial responsibility of the Long-Term Steward through the use of the funds available in the Fund and/or other necessary funds obtained by the Long-Term Steward.

3.3 Erosion

If an area erodes and affects the integrity of the restored habitat or other structure it shall be repaired immediately. The IRT will be notified immediately of any significant repairs and courses of action.

3.4 Site Management, Signage and Fence Repair

During Bank Construction, security fencing will be installed to prevent unlawful dumping, and other trespassing and signs identifying the site as a mitigation bank will be posted along the perimeter of the site. The fence and signs will be maintained, and replaced as necessary, during the M&M Period by the Bank Sponsor. Loss of fence, even temporarily, may result in dumping on site, thus the corrective action may involve removal of debris and site cleanup from the site as needed.

3.5 Floods

If there is a damaging flood that significantly increases water levels in the Bank, some corrective measures may be necessary. Once the water recedes, the system shall be closely inspected for erosion damage and structure damage. Damaged areas shall be repaired as quickly as possible. Once repairs are complete, the wetland shall be restored to pre-flood conditions and monitored closely for two months to ensure there is no long-term damage to the system or the plants. A detailed Report will be submitted to the Corps and IRT for each significant incident that occurs and will include, but not be limited to, the following; cost, time frame, when and what work was completed.

4.0 Sediment and Tissue Monitoring Plan

The tissue and sediment monitoring plan recognizes that baseline soil and sediment sampling of the MARSHES site was performed in 2013 (*Preliminary Site Screening Letter Results Report*) and 2014 (*Revised Site Screening Letter Result Report*). Based on these sampling results, certain areas within the restoration site will be overexcavated and backfilled with clean fill. Within other areas of the restoration site, excavation to final grade will result in the removal of contaminated sediments/soil. Sampling of biota has not yet been performed at the MARSHES site.

4.1 Post-Construction Sediment Sampling

A subset of the on-site soil and sediment sample locations sampled during the 2013 and 2014 baseline characterizations of the MARSHES site will be sampled post-construction. Locations to be sampled are the East stations S7, SB14, and S4, and West stations SB23, SB4, and SB 17. Sample locations are depicted on the enclosed figures. As pre-construction sediment samples have already been collected from the MARSHES site, the first post-construction monitoring is expected to occur in the summer of 2016, with the final event conducted in the summer of 2020 (assuming that the Bank is constructed in 2015/2016 and will close after five years of operation). Sediment samples will be collected, analyzed, and reported as follows.

All field sampling techniques and analysis will be conducted based on guidance provided by the NYSDEC DER-10- (May 2010), and the NYSDEC Sampling Guidelines and Protocols (March 2011). Sediment samples will be analyzed for a reduced metal suite (RMS) of mercury, arsenic, copper, zinc, lead, cadmium, nickel and chromium, pH, Total Organic Carbon (TOC), and Grain Size. Sediment samples will be collected from the biotic zone (0" – 6" interval) using a stainless steel hand trowel and a stainless steel bowl. Each 6" sample will be homogenized prior to collection. Appropriate Quality Control and Quality Assurance (QA/QC) samples including one duplicate per 20 samples, and one filed blank per 20 samples a will be completed during this effort to meet NYSDEC requirements. All samples will be shipped via an iced cooler under signed chain of custody to a New York certified laboratory for analysis. The following methodologies will be employed: Priority Pollutant (PP) Metals by United States Environmental Protection Agency (USEPA) method 6010B and method 7471A for Mercury;

TOC by USEPA Region II/Kahn ; Grain Size by American Society for Testing and Materials (ASTM) D422; and pH by USEPA method 9040.

The analytical results for the sediment samples will be compared to the Salt Water Sediment Guidance Values (Table 6), in *Screening and Assessment of Contaminated Sediment* (NYSCEC, June 2014). It should be noted that these guidelines are not cleanup standards, but screening guidelines for use in ecological evaluations that indicate the potential for adverse impacts to benthic communities. The analytical results from the post-construction sediment samples will also be compared to baseline results collected in 2013 and 2014, to evaluate if there are any trends in contamination over time. The results will be reported in each annual monitoring report.

4.2 Tissue Sampling

Fish and invertebrate tissue samples will be collected annually between July 21 and September 21 (i.e., in late summer) when the lipid content of many species is generally highest after a full, active season of consumption and potential contaminant accumulation.

The first event will be conducted in the summer of 2015, prior to construction, and would be conducted annually thereafter for five additional years. Tissue samples will be collected at six stations within the Bank and one reference station in the adjacent Saw Mill Creek.

The locations for the on-site samples are the East stations S7, SB14, and S4, and West stations SB23, SB4, and SB 17. These sample locations are depicted on the enclosed figures. Biological samples (e.g., fish, spiders, crabs, and amphipods) will be collected within a 30-meter radius of the collocated sediment sampling point, if available. According to USFWS comments on the Kane wetland mitigation bank, the 30-meter radius represents the linear-home range of the mummichog during its breeding season and would allow for an ample sampling area for invertebrates in proximity to the collocated sediment sampling point. Suitable habitat for aquatic biota appears to exist within 30 meters of the abovementioned East sampling stations. However, for the West stations, suitable habitat for aquatic biota appears to be no nearer than

30 meters from any previously sampled sediment station at present, due to the extent of historic fill placement (i.e., most of the west area is currently upland). Station SB4 appears to be relatively close to suitable habitat for aquatic biota (approximately 30 meters), so a pre-construction sample will be collected west of that station. Station SB17 appears to be within 30 meters of areas that will not be graded during construction, but there is no nearby waterway, so fish tissue is unlikely to be available, though crab tissue may be and a pre-construction sample will be attempted. The remaining West station SB23 is approximately 40 meters from an existing tidal creek and so tissue samples will be collected at this station following construction.

Three replicate 20 to 50 gram composite samples of fish tissue at each sample location and three replicate 20 to 50 gram composite samples of epifaunal invertebrate tissue will be collected at each location. Spider and amphipod sample volumes, if available, would be much smaller. A Scientific Collection License will be obtained from the New York State Department of Environmental Conservation’s Division of Fish, Wildlife & Marine Resources – Special Licenses Unit. Fish and crab samples will be analyzed for a reduced metal suite (RMS) of mercury, arsenic, copper, zinc, lead, cadmium, nickel and chromium. Spider and amphipod samples will be analyzed for total mercury.

For fish, mummichog (*Fundulus heteroclitus*) tissue will be collected using baited biconical minnow traps. Mummichog composite tissue samples will be whole-body, as the entire fish would be consumed by likely piscivorous receptors at the MARSHES site. Mummichogs feed largely on benthic macroinvertebrates and are a significant prey item for wading birds in marshes in the Saw Mill Creek area. The number of individuals in each composite mummichog sample will be recorded and the length and sex of each individual within the composite will be recorded.

For invertebrates, the mud fiddler crab (*Uca pugnax*) will be the targeted epifaunal species. Fiddler crab samples will be collected by hand. The number of individuals in each crab composite and the number of males and females in each composite will recorded.

Three (3) replicate spider samples and 3 replicate amphipod samples will be collected at the six biological tissue sampling locations. All invertebrates will be identified to the family level, and to genus when possible. The taxonomic work will be completed by trained technicians using a library of invertebrate taxonomic keys and reference collections. As identified by USFWS, due to sample mass limitations, whole body/composite spider samples and whole body/composite amphipod samples will be analyzed by a qualified trace element laboratory approved by USFWS. Trace element laboratories can report mercury concentrations to three significant figures as long as the samples are at least 1 mg in mass (on a dry weight basis).

The analytical results from the post-construction tissue samples will be compared to baseline results collected in 2015 to evaluate if there are any trends in biota contamination over time. The results will be reported in each annual monitoring report.

Spiders and amphipods may not be present in the proximity of sediment sampling stations at the MARSHES Bank in sufficient quantities (if at all) for tissue analysis. It may take several years before some invertebrate species populations are well enough established in restored areas to provide adequate sample volumes for contaminant analyses. Therefore, it may be necessary to eliminate the invertebrate samples in the first few years of marsh development until the targeted invertebrates are present in sufficient quantities to sample. The Sponsor respectfully requests the presence of a USFWS biologist during the initial sampling event to assist with identifying and locating appropriate invertebrate samples.

4.3 Annual Reports

Sediment and tissue sampling analysis and results will be summarized for inclusion in each of the five annual monitoring reports to be provided to the Corps of Engineers, the NYSDEC and the IRT. Each year, the results of the various monitoring tasks will be synthesized into one annual MARSHES Wetland Mitigation Bank Monitoring Report. Each monitoring report will include an executive summary; a complete listing of the requirements and goals of the approved mitigation plan; a detailed explanation of the ways in which the mitigation has or has not achieved progress towards those goals, and a description of monitoring results, including the sediment and tissue sampling results.

All monitoring reports will include documentation that it is anticipated, based on field data, that the goals of the wetland mitigation project will be satisfied. If any problems are identified, then the report will include recommendations on how to rectify the problem and a time frame in which they will be completed. Each monitoring report will include a conclusions and recommendations section consisting of professional observations and judgments. This section will allow for the identification of elements that are successful and those elements that are not achieving the desired result**.**

Legend

Project Area

Sediment Sampling Location

Biota Sampling Location (Pre and Post Construction)

Biota Sampling Location (Post Construction only)

Sources: ESRI, BING Imagery Map Service, 2015.

NYCEDC
New York City Economic Development Corporation

Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York

Sediment & Tissue Monitoring Plan
Western Section

Louis Berger

April 2015

Legend

Project Area

Sediment Sampling Location

Biota Sampling Location (Pre and Post Construction)

Sources: ESRI, BING Imagery Map Service, 2015.

NYCEDC
New York City Economic Development Corporation

Saw Mill Creek Wetland Mitigation Bank
Staten Island, New York

Sediment & Tissue Monitoring Plan
Eastern Section

Louis Berger

April 2015

EXHIBIT H
BANK CLOSURE PLAN

EXHIBIT H
to Instrument

Bank Closure Plan

Post-construction monitoring and maintenance of the Bank will be performed for a minimum of five consecutive years, beginning at the end of the first full growing season following completion of construction (i.e., if the planting is completed in spring 2016, the first monitoring event would occur in spring 2017), according to standards anticipated to be set by the Corps, NYSDEC and the IRT.

The Bank will be closed at the end of its operational life, which is after five full growing seasons, successful completion of all performance standards as documented by approved monitoring reports, or until the sale of all credits, whichever is later. As described in Section VI. G. "Bank Closure" of this Banking Instrument, at the end of the 5-year monitoring period, upon satisfaction of the Success Criteria, or upon the sale of all credits, whichever is later, the Sponsor shall send letters to the Corps and NYSDEC requesting closure of the Bank. The Corps and NYSDEC shall issue a written certification of satisfaction to the Sponsor and any remaining financial assurances will be released to the Sponsor. Prior to closure of the Bank, the IRT will perform a final compliance inspection to evaluate whether all success criteria have been achieved. Upon the Corps and NYSDEC determining, that the Sponsor has completed the following:

(1) All applicable success criteria prescribed in Section V.E. of this Banking Instrument have been achieved;

(2) All available credits for the Bank have been debited;

(3) The Sponsor has prepared a Long-Term Stewardship (Management and Maintenance) Plan, that has been approved by the IRT, pursuant to Section VI.H of this Banking Instrument;

(4) The Sponsor has prepared and submitted to the IRT a GIS shape file or similar exhibit depicting the location and extent of the Bank;

(5) The Sponsor, acting through its Department of Parks and Recreation, has either: (i) assumed responsibilities for accomplishing the Long-Term Stewardship

Plan and fulfills the role of Long-Term Steward, or (ii) has assigned those responsibilities, in a binding, signed legal agreement, to another Long-Term Steward pursuant to Section VI. H. of this Banking Instrument;

(6) The Long-Term Stewardship Fund has been funded pursuant to Section IV. H. of this Banking Instrument;

(7) The contents of the Long-Term Stewardship Fund have been transferred to the dedicated endowment fund described in the Long-Term Stewardship Plan (Exhibit I); and

(8) The Bank has complied with the terms of this Banking Instrument.

Then the Bank will close and the period of Long-Term Stewardship will commence.

EXHIBIT I
LONG TERM
STEWARDSHIP PLAN

EXHIBIT I
to Instrument

Long-Term Stewardship Plan

1. Introduction

(a) In accordance with Section VI.H) of the Instrument, commencing as of the Project Closure Date, in accordance with the Long-Term Stewardship Agreement at its sole cost and expense the Long-Term Steward shall be responsible for the Property and the long-term stewardship of the Project for the duration of the Long-Term Stewardship Period and shall perform its obligations set forth in the Long-Term Stewardship Agreement and the terms of this Exhibit I (the "Plan").

(a) Subject to the terms of the Instrument, a goal of this Plan is to specify and plan for any potential problems that may require the undertaking of Adaptive Management Measures during the Long-Term Stewardship Period, as well as defining the funding mechanism to be utilized for undertaking such Adaptive Management Measures. The Mitigation Plan and the Project Development Plan have been developed in collaboration with the Long-Term Steward to require minimal maintenance. However, the Bank must be monitored by the Long-Term Steward, as described in Paragraph 2 below, to verify, among other things, its ecological health.

(b) As applicable, the Property Protection Instrument shall have been provided and/or executed, delivered and maintained and shall be in full force and effect for the purpose of protecting the Property in perpetuity in accordance with the Instrument.

(c) In accordance with 33 CFR 332.7(d)(1) and 33 CFR 332.8(u)(2), the City of New York (acting by and through its Department of Parks and Recreation) has been identified by the Parties as the Person responsible for ownership of the Property and shall assume the responsibilities as the Long-Term Steward.

(d) In accordance with 33 CFR 332.7(d)(2) and 33 CFR 332.8(u)(1), this Plan constitutes the required long-term management plan for the Project and includes a description of the Project's long-term management needs.

(e) Annual cost estimates to meet such needs and the funding mechanism that will be used to meet such needs have been identified and agreed upon by the Parties and the Long-Term Steward. Such funding mechanism being the Fund specified in Section IV.H of the Instrument and Paragraph 4 of this Plan.

(f) All long-term management conducted for the Bank by the Long-Term Steward shall be performed in accordance with Applicable Law and in a manner consistent with the Instrument, the Long-Term Stewardship Agreement and any other agreements, MOUs or other binding instruments related to the Project.

(g) The Long-Term Steward will be financially responsible for the Bank in perpetuity.

2. Long-Term Periodic Inspections

(h) After Bank Closure, the Long-Term Steward will manage and maintain the Bank in perpetuity. The Long-Term Steward will inspect the Bank biannually beginning immediately after Bank Closure. The purpose of the inspections is to observe and note any changes from the condition of the Project as it existed on the Project Closure Date, so that corrective actions can be planned and carried out promptly by the Long-Term Steward. Inspections shall also be made whenever the Property is subjected to higher than normal flooding conditions or storm events with high speed wind.

(i) Inspections shall be made by qualified personnel. For a period of five (5) years starting on the Project Closure Date and ending on the Fifth (5th) anniversary of the Project Closure Date, a brief written annual Report prepared by the Long-Term Steward and delivered to the IRT shall document the results of the inspections. Sketches and photographs shall document the inspection and will be filed with the Reports. The Reports shall contain any minor corrective actions that may be necessary as noted by the inspection (minor corrective actions are those that do not require a state or federal permit). No remedial Report submittals to the IRT will be required unless significant corrective actions are necessary. Any significant corrective actions, those that require a state or federal permit, will need to be approved in writing by the Corps and NYSDEC.

(j) The following areas shall be inspected during each site visit by the Long-Term Steward.

<u>(i). Vegetation</u>

The types of vegetation present, Invasive Plants present, general condition of vegetation and results of any completed Invasive Plants management activities shall be noted. Maintenance of the vegetation including Invasive Plants is explained in more detail in <u>Paragraph 3(d)</u> of this Plan.

<u>(ii). Stream Channels</u>

Stream channels shall be inspected to ensure water is freely flowing. Any stream channel repair after the Project Closure Date will be the financial responsibility of the Long-Term Steward through the use of the funds available in the Fund and/or other necessary funds obtained by the Long-Term Steward.

<u>(iii). Photodocumentation</u>

Photographs showing representative areas of the Bank shall be taken at least twice each year during the period between June 1 and November 1. The photographs shall be representative of all vegetation zones. Photographs will also be taken of the stream/tidal channels to document any signs of erosion, and/or any blockage and sedimentation build-up. Long-term fixed photo reference points will be established during the initial monitoring year of the Long-Term Stewardship Period and will be maintained during the five-year monitoring period specified in this Plan to ensure appropriate progression can be documented and changes in condition of the Project can be visually monitored. A long-term photo log will be maintained by the Long-Term Steward and made available upon request from the IRT.

(iv).   Wildlife

Species of wildlife, or their signs, observed on the Property shall be noted and recorded annually. This will include birds, amphibians, reptiles and mammals. If any mammals such as muskrats or beavers become destructive, a herbivore control plan will be implemented.

3. Adaptive Management/Corrective Measures

The Parties, in consultation with the Long-Term Steward, intend for the Bank design to provide for a low-maintenance, self-sustaining system. It is anticipated that it will function effectively and achieve the desired long-term goals. However, to minimize anticipated and unanticipated problems, this section addresses potential areas of concern and the proposed adaptive/corrective measures.

(k)   Erosion

If, during the Long-Term Stewardship Period, an area erodes and affects the integrity of the restored habitat or other structure it shall be repaired immediately. The IRT will be notified immediately of all significant repairs and courses of action.

(l)   Site Management, Signage and Fence Repair

During the Long-Term Stewardship Period, security fencing will be maintained to prevent unlawful dumping, and other trespassing and signs identifying the Property as a mitigation bank will be posted along the perimeter of the Property. Fence and sign maintenance and replacement, as necessary, will be the responsibility of the Long-Term Steward after the Project Closure Date. The Parties acknowledge and agree that loss of fence, even temporarily, may result in dumping on the Property, thus the corrective action may involve removal of debris from the Property as needed.

(m) Floods

If there is a damaging flood that significantly increases water levels in the Bank during the Long-Term Stewardship Period, some adaptive/corrective measures may be necessary. Once the water recedes, the system shall be closely inspected by the Long-Term Steward for erosion damage and structure damage. Damaged areas shall be repaired as quickly as possible by the Long-Term Steward. Once such repairs are complete, the Property shall be restored to pre-flood conditions and monitored closely by the Long-Term Steward for two months to ensure there is no long-term damage to the system or the plants. Following the Project Closure Date, any flood damage repair will be the responsibility of the Long-Term Steward. A detailed Report will be submitted to the Corps and IRT by the Long-Term Steward for each significant event that occurs and will include the following; cost, time frame, when and what work was completed. A significant event is defined as an event listed by the Flood Emergency Management Agency (FEMA) as a "significant flood event" (as of the Effective Date of the Instrument, see http://www.fema.gov/significant-flood-events).

(n) Control Invasive Plants

After the Project Closure Date, the Long-Term Steward will assume responsibility for and treatment of Invasive Plants around the perimeter of the Property to insure that these problem species do not re-colonize the Bank. Any Invasive Plants discovered on the Property and occupying more than [ten] percent ([10]%) cover of the total Project area or any area of One-Quarter (¼) acre in size or larger must be controlled. In the event the IRT determines that the watershed or drainage basin within which the Property is located becomes infested with these species in the future, so that its effective control on the Property is either no longer practicable or unreasonably expensive, the IRT will consider appropriate changes to this Plan.

4. Long-Term Management Fund.

(o) Any accrued interest earned during the Long-Term Stewardship Period on amounts standing to the credit of the Fund shall be used in the operation, maintenance or other purpose that directly benefit the Bank.

(p) In accordance with Section IV.H of the Instrument, on or promptly following the Project Closure Date, an amount equal to 100% of the funds standing to the credit of the Fund, including funds in the Fund Account, shall be paid by check, wire transfer (or other means acceptable to Sponsor and the Long-Term Steward) to or at the direction of the Long-Term Steward.

(q) Upon such payment, the Long-Term Steward shall be responsible for the management of such funds in a manner consistent with the Long-Term Stewardship Agreement, the Long-Term Steward's policies and procedures and Applicable Law.

(r) During the Long-Term Stewardship Period, the Fund shall be used by the Long-Term Steward solely for the purpose of provide adequate funding for the operation, maintenance, and long-term management of the Property.

(s) During the Long-Term Stewardship Period, from time to time the Long-Term Steward may withdraw funds (including principal and interest) from the Fund as necessary to pay for the costs of performing the long-term stewardship of the Project

5. Review of Plan.

Promptly following the Mitigation Work Completion Date, the Sponsor (in consultation with the Long-Term Steward) shall review this Plan based on the conditions of the Project "as-built" and determine whether, in Sponsor's reasonable opinion, amendments or modifications to this Plan are necessary or appropriate to conform this Plan to the Project as-built. If Sponsor determines that such amendments or modifications are necessary or appropriate, Sponsor shall notify the IRT Chairs of such determination in the Mitigation Work Completion Report and the Parties shall work together in good faith to modify or amend this Plan in accordance with the Instrument (including Section VII.C).

6. Amendments.

Prior to the end of the Project Closure Date (corresponding to the end of the Term of the Instrument) this Plan may only be amended, modified or supplemented in accordance with Section VIII.C of the Instrument. After the Project Closure Date, the terms of the Long-Term Stewardship Agreement shall provide terms by which this Plan may be amended, modified or supplemented from time to time.

EXHIBIT J
FORM OF CREDIT LEDGER

CREDIT LEDGER
for
Saw Mill Creek Wetland Mitigation Bank

Transaction Date	Transaction Type	Permittee Name	Permit Number(s) (Permit type)	Locality	USGS HUC	Credit Type	Amount of Impacts	Credits Released	Credits Debited	Remaining Available Credits	
	☐ Release ☐ Debit										
	☐ Release ☐ Debit										
	☐ Release ☐ Debit										
	☐ Release ☐ Debit										
	☐ Release ☐ Debit										
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							TOTALS AT BANK CLOSURE:				

CREDIT LEDGER
for
Saw Mill Creek Wetland Mitigation Bank

EXAMPLE OF CREDIT LEDGER (completed through 1st Release and two Withdrawals)

Transaction Date	Transaction Type	Permittee Name	Permit Number(s) (Permit type)	Locality	USGS HUC	Credit Type	Amount of Impacts	Credits Released	Credits Debited	Available Credits Remaining	
Jan 20, 2015	☒ Release ☐ Debit	n/a	n/a	n/a	n/a	n/a	n/a	2.781	n/a	2.781	
Feb. 15, 2015	☐ Release ☒ Debit	City of New York	NAN-2015-XXXXX-XXX NYSDEC #X-XXXXX-XXX/XXXX	Bronx	020301	vegetated wetland aquatic habitat	1.00 0.50	n/a	[1.5] 0.5	1.281	
Mar. 1, 2015	☐ Release ☒ Debit	Developer Co.	NAN-2015-XXXXX-XXX NYSDEC #X-XXXXX-XXX/XXXX	Brooklyn	020301	vegetated wetland aquatic habitat	0.20 0.00	n/a	[0.30] 0.00	0.981	
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TOTALS AT BANK CLOSURE:											