Arthur Kill Wetland Mitigation Bank Prospectus

Submitted to:

U.S. Arny Corps of Engineers
NY Regulatory District
Jacob K. Javits Federal Building
Attn: Mitigation
26 Federal Plaza
New York, New York
USACE ID: NAN-2024-01024

Submitted by:
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Date: December 2024

CONTENTS

LIST OF FIGURES

LIST OF EXHIBITS

1 Introduction

This Prospectus is submitted by Arthur Kill Power, LLC[1] (Arthur Kill Power) to the United States Army Corps of Engineers (USACE) – New York (NY) District, the Chair of the Interagency Review Team (IRT) to support development of the proposed Arthur Kill Wetland Mitigation Bank (Bank). This Prospectus has been prepared in accordance with the Final Rule for Compensatory Mitigation for Losses of Aquatic Resources (Federal Register Vol. 73, No. 70, April 10, 2008), and is intended to formally initiate the planning and agency review process for the proposed Bank. The proposed Bank is located on Staten Island, in Richmond County, NY. A Site Location Map as shown on the United States Geologic Survey (USGS) 7.5-minute series topographic map is included as Figure 1.

Information provided within this Prospectus is intended to serve as the basis for formal development of a Mitigation Bank Instrument (MBI) for the proposed Arthur Kill Wetland Mitigation Bank. The MBI will provide formal documentation for how the proposed Bank will be established, operated, and maintained in accordance with the Final Rule for Compensatory Mitigation for Losses of Aquatic Resources. The applicant and Bank Sponsor is Arthur Kill Power.

The Bank will be established within a portion of a 113-acre (ac) parent property identified as Staten Island Borough, Block 2705, Lot 1 and owned by Arthur Kill Power. The Bank is proposed to occur on approximately 47 ac of ruderal woodlands and wetlands to the north of the Arthur Kill Generating Station (AKGS) and shown on the Project Area Map included as Figure 2. The proposed Bank site is bounded by the Arthur Kill to the west, Neck Creek to the North, an active rail line to the east, and the AKGS to the south. The coordinates for the center of the proposed Bank are 40.5943, -74.19654 State Plane 83 NY Long Island North American Datum 1983 (NAD83) within the NY State Department of Environmental Conservation (NYSDEC) Atlantic Ocean/Long Island Sound Watershed and the USGS 8-digit Hydrologic Unit Code (HUC) Sandy Hook-Staten Island subbasin (02030104).

1.1 Objectives of Proposed Bank

The objective of the proposed Bank is to provide compensatory mitigation for unavoidable impacts to waters of the US, including wetlands that may result from activities authorized under Section 404 and 401 of the Clean Water Act, Section 10 of the Rivers and Harbors Act and within a subset of the USACE New York District's regulatory boundary. Additionally, the Bank will service activities permitted under NY State Environmental Conservation Law (ECL) Article 15 Title 5 (Protection of Waters/Stream Disturbance) and NY State ECL Article 25 (Tidal Wetlands) within NYSDEC Region 2 (i.e., 5 boroughs of New York City) regulatory boundaries.

The proposed Bank will develop a MBI that defines how ecologically sustainable and resilient habitat restoration within New York City (NYC) will provide a regulatory framework, consistent with federal, state and local regulations, to provide off-site compensatory mitigation opportunities for interested third parties with federal- and/or state-authorized projects within the defined service area (as defined in Section 3). The Bank recognizes the continuing demand for off-site compensatory mitigation within NYC to address continued development and resiliency projects (as discussed in Section 4).

The Bank proposes to restore native tidal marsh habitats (i.e., low and high salt marsh) along the Arthur Kill by restoring tidal hydrology, regrading a tidal marsh platform to appropriate elevations, and restoring native plant communities that are supported by tidal hydrology. The proposed Bank targets a highly urbanized area proximate to the Arthur Kill where the majority of coastal wetland habitats have been filled, and remaining habitats

[1] Arthur Kill Power LLC (Arthur Kill) is managed by Alpha Generation, LLC (AlphaGen) which is a strategic partnership formed and owned by an affiliate of ArcLight Capital Partners, LLC (ArcLight). AlphaGen manages over 13,000 megawatts of power infrastructure across four Regional Transmission Organizations (RTO) markets, including Arthur Kill and other ArcLight investments. For more information, please visit www.alphagen.com.

significantly impacted by past and current anthropogenic disturbances. Through these actions, the project will have direct benefits on hydrologic, biogeochemical, plant community, and wildlife support ecosystem functions as further described herein. Specific to the Hudson-Raritan Estuary (HRE) Comprehensive Restoration Plan (USACE 2014), the proposed Bank will also directly benefit the following target ecosystem characteristics: wetlands, habitat for waterbirds, coastal and maritime communities, shorelines and shallows, fish, crabs and lobster habitat, tributary connections, and acquisition. Finally, the proposed actions will also provide enhancement to ecological services, which are the benefits that surrounding human populations obtain from the natural resources and associated functions.

2 Establishment and Operation of Proposed Bank

2.1 Establishment of the Bank

As the Bank Sponsor, Arthur Kill Power will create, restore, enhance, and/or preserve native estuarine and coastal habitats over an approximate 47 ac project area in accordance with the provisions of a MBI (to be developed following publication of this Prospectus) and associated environmental regulatory permit approvals. Targeted native estuarine habitats include tidal creek, low salt marsh, high salt marsh, salt scrub, and adjacent coastal upland habitats (i.e., coastal forest, meadow). The Site Development Concept Plan (Conceptual Report; Exhibit A) is included to document existing physical, chemical, biological, and cultural conditions at the proposed Bank site, as well as detail both the suitability and conceptual restoration plan to improve ecological functioning.

The Conceptual Report provides a characterization of degraded habitats that are a result of historic disturbances and land uses at the Bank site. The project area is currently dominated by large, monotypic stands of non-native, invasive plant species (i.e., common reed [*Phragmites australis*]; Japanese knotweed [*Reynoutria japonica*]) associated with freshwater open water habitats. These freshwater habitats are hydrologically isolated from tidal influence associated with both the Arthur Kill and Neck Creek and provide limited ecological functions and services to the Arthur Kill watershed.

The conceptual restoration approach targets these large freshwater wetlands that have resulted from past anthropogenic disturbances (i.e., land filling, construction of berms). This Bank proposes to restore native tidal marsh habitats (i.e., low and high salt marsh) by reintroducing tidal hydrology via new tidal channels, regrading a tidal marsh platform to appropriate elevations, and restoring native plant communities that are supported by restored tidal hydrology. Of note, the restoration of these coastal habitats is anticipated to attract and support suitable habitat for a wide variety of aquatic and terrestrial wildlife species, many of which are federal- and state-protected species of conservation concern. The Conceptual Report discusses how the Bank will enhance ecosystem functions and services important to both natural resources as well as surrounding communities.

Upon execution of the MBI, the Sponsor will perform all necessary work in accordance with the provisions of the MBI and associated federal, state and local permits to restore native habitats to the Bank site until such time that it is demonstrated to the satisfaction of USACE and NYSDEC, in consultation with the IRT, that the Bank complies with all requirements, or until all credits are sold, whichever is later. The exact acreages of these habitat types will be determined as part of the MBI and determined once the site survey and restoration design are completed. The availability of Bank credits associated with project milestones will be in accordance with the credit generation schedule to be developed as part of the MBI.

The Sponsor will obtain (or work with the Contractor(s) to obtain) all appropriate environmental documentation, permits, or other authorizations needed to establish, operate, and maintain the Bank. This Prospectus does not fulfill or substitute for such authorizations. The Sponsor will provide appropriate financial assurances, as established by the MBI, to ensure a high level of confidence that the Bank will be successfully completed and maintained in perpetuity.

2.2 Operation of the Bank

The Sponsor will operate the Bank in accordance with a monitoring and maintenance plan and bank closure provisions as provided in the MBI, as well as associated regulatory permits required to support construction of the Bank. The Bank will be closed at the end of its operational life, which for purposes of this Prospectus is assumed to be:

- Five (5) years from the date of the completion of the restoration grading and planting;
- Successful completion of all performance standards to be defined in the MBI; and/or
- The date when all credits have been debited, whichever comes later.

Compensatory mitigation credits will be available for use by public agencies, private property owners, and any other permittees with in-kind federal- and/or state-permitted wetland impacts in the defined service area (as defined in Section 3). A credit is defined as a unit of measure (e.g., a functional or areal measure or other suitable metric) representing the accrual or attainment of aquatic ecosystem functions at the Bank site. The measure of aquatic functions is based on the resources restored or enhanced as agreed to by the Bank Sponsor and USACE and NYSDEC, in coordination with the IRT.

Projects proposed for utilization of credits purchased from the Bank will be submitted to USACE and/or NYSDEC for consideration, in conjunction with the permitting for such projects. The utilization of mitigation credits from the Bank to compensate for project impacts will be determined on a site- and project-specific basis by USACE and/or NYSDEC during the permit review process. The MBI will provide that the Sponsor is responsible for assuring the success of the Bank and that is assumed by this Prospectus to be measured by performance standards as set forth in the MBI, and further discussed in Section 2.5. The performance standards will define the conditions under which the Bank would be judged successful and provide monitoring and maintenance requirements to identify and correct any deficiencies. The Bank will be considered successful when the Sponsor, Arthur Kill Power, demonstrates to USACE and NYSDEC that the appropriate site areas have been restored, enhanced, and/or preserved consistent with the site restoration plan and that the goals of the Bank as defined in the MBI have been met. The MBI will provide that after successful completion of each defined milestone, the Sponsor will notify USACE and NYSDEC in writing. Following review, USACE and NYSDEC, in consultation with the IRT, will confirm whether the relevant milestones have been successfully completed for purposes of credit release or closure of the Bank.

Following the closure of the Bank, the Bank site will be maintained in perpetuity in accordance with the long-term management provisions to be developed as part of the MBI. A responsible party to oversee long term management will be identified in the MBI. The Bank will also be protected by restrictive covenants or by other appropriate methods to protect the Bank in perpetuity.

2.3 Establishment and Use of Credits

The exact number of credits to be generated by the Bank will be determined once the site survey, site restoration design, and ecological functional assessments are completed by the Sponsor and approved by USACE and NYSDEC, in coordination with the IRT. The exact number of credits to be generated by the Bank will be reported in the MBI. The credits will be sold by the Sponsor to public agencies, private property owners, and any other permittees in the service area (as defined in Section 3), provided such entities have met all applicable regulatory requirements, including avoidance and minimization, and the use of credits has been authorized by the appropriate regulatory agencies.

The MBI will provide that Bank credits are not released for debiting until specific milestones associated with the Bank’s protection and establishment are achieved. Release of credits will be authorized by USACE and NYSDEC,

in consultation with the IRT. Use of credits will be determined during the permit review process by the respective permitting agency.

2.4 Assessment Methodology

The calculation for the Bank's total generated credits will be done in accordance with the prevailing USACE and NYSDEC regulatory guidance or, in the absence of established guidance, through a method deemed acceptable by USACE and NYSDEC, in coordination with the IRT. In the northeastern US, common methods to estimate credit generation for support of a mitigation bank include attaining minimum performance indices over a specified credit-producing area. For instance, the acreage of each habitat type benefiting from a specific type of activity (e.g., establishment, reestablishment, enhancement, rehabilitation, or preservation), will have defined credit ratios – thereby releasing credits on an area basis, provided specific performance standards are met for those credit producing areas.

It is anticipated that Arthur Kill Power will work collaboratively with USACE, NYSDEC, and the IRT as necessary during development of the MBI to develop and integrate credit determination assessment methodologies. This process is assumed to include ecological functional assessment methodologies where appropriate and applicable. The anticipated functional assessment models are anticipated to include the *Evaluation for Planned Wetlands: A Procedure for Assessing Wetland Functions and a Guide to Functional Design* (EPW; Bartoldus et al. 1994) and the *Salt Marsh Rapid Assessment Method* (MarshRAM; Kutcher 2019). Both methodologies provide a quantitative assessment of the functional capacity of wetland habitats in current condition as well as their projected future condition following site restoration.

2.5 Success Criteria

The MBI will provide that the Sponsor is responsible for assuring the success of the Bank, and that is assumed by this Prospectus to be measured by attaining performance standards approved by USACE and NYSDEC, in consultation with the IRT. These performance standards (to be defined in the MBI) will establish the conditions under which the Bank will be evaluated successful and provide monitoring and maintenance requirements. As will be provided in the MBI, the Bank will be considered successful if the Sponsor demonstrates to USACE and NYSDEC that the appropriate areas have been restored, enhanced, and/or preserved, and the goals of the Bank have been met. After successful completion of each project milestone, as defined in the MBI, the Sponsor will notify USACE and NYSDEC in writing to request release of appropriate credits. A written request for credit release will include site photographs of the completed tasks, and a map of photograph locations. For milestones following planting activities, a written request for credit release will also include annual monitoring reports as described in Section 5.2. USACE and NYSDEC, in consultation with the IRT, will respond to annual monitoring reports with respect to confirmation of whether or not the tasks are successfully completed for purposes of releasing credits. Performances milestones for a credit-producing area may include interim and final performance standards for metrics such as:

- MarshRAM Index of Marsh integrity (IMI) (Kutcher 2019)
- Maintenance of tidal channel morphological dimensions
- Maintenance of marsh platform elevation necessary to support target plant communities
- Restoration of tidal hydrology and salinity with respect to target plant communities
- Percent cover of native target plant species
- Percent cover of invasive plant species

2.6 Conditions on Debiting Credits

The MBI will provide that prior to the sale and transfer of any credits by the Sponsor, the following requirements will be met:

- The MBI and associated site restoration plans and drawings will be approved by USACE and NYSDEC, in consultation with the IRT.
- Customary and appropriate financial assurances satisfactory to USACE and NYSDEC will be obtained.
- All applicable regulatory permits and approvals will be secured by the Sponsor.
- The Bank will be protected in perpetuity by a restrictive covenant or by other appropriate methods to protect the Bank in perpetuity.
- The MBI will be signed by the Sponsor, USACE, NYSDEC, and any members of the IRT who choose to sign the MBI.

3 Service Areas

The Bank will primarily be established to provide off-site compensatory mitigation for authorized unavoidable impacts to waters of the US and/or NY state waters, including wetlands, within the primary service area. The primary service area is defined as portions of the Sandy Hook-Staten Island and Lower Hudson Subbasins (HUC 02030104 and 02030101, respectively), in the Lower Hudson Basin (HUC 020301) that occur within the NYC Municipal limits. The primary service area encompasses the entirety of the Boroughs of Staten Island and Manhattan as well as portions of the Boroughs of the Bronx, Brooklyn, and Queens. Figure 3 depicts the primary service area.

The secondary objective of the Bank will be to provide off-site compensatory mitigation for authorized unavoidable impacts to waters of the US and/or NY state waters, including wetlands, within the secondary service area. The secondary service area is defined as the entirely of the NYC Municipal limits. The secondary service area includes portions of the Lower Hudson Basin (HUC 020301), Long Island Basin (HUC 020302), and Mid-Atlantic Coastal Basin (HUC 020403). Within these basins, portions of the following subbasins are included within the secondary service area: Sandy Hook-Staten Island (HUC 02030104), Lower Hudson (HUC 02030101), Bronx (HUC 02030102), Northern Long Island (HUC 02030201), Southern Long Island (HUC 02030202), and Mullica-Toms (HUC 02040301). Figure 3 depicts the secondary service area.

It is anticipated that the MBI will restrict the use of this secondary service area to authorized projects that meet the following requirements:

- No practical or more ecologically beneficial on-site mitigation alternatives are available that meet all of the mitigation requirements;
- No practical or more ecologically beneficial off-site mitigation alternatives are available within the primary service area where impacts occur that meet all of the mitigation requirements; and
- There are no other approved mitigation banks with available credits servicing the primary service area where the impacts occur.

Within the primary service area, the Bank will be the preference for providing mitigation for authorized impacts. Within the secondary service area, decisions authorizing use of credits from the Bank will be made by USACE and/or NYSDEC on a case-by-case basis in accordance with applicable permit requirements.

4 Need and Technical Feasibility of Bank

4.1 Need

There continues to be a strong need for compensatory mitigation by both public agencies and private landowners within the NYC municipal area (i.e. primary and secondary service areas). At the time of this Prospectus, there is a limited supply of mitigation credits available within the NYC municipal area.

Based on an analysis of both current and future compensatory mitigation needs within NYC, there appears to be sufficient need for additional wetland mitigation credits from projects within the defined service areas. Current and future projects with compensatory mitigation needs are anticipated to be driven by coastal resiliency infrastructure, emerging energy development (e.g., offshore wind), continued shoreline development, as well as restoration and/or repairs of aging infrastructure. Based on this detailed review and understanding of current and future projects with mitigation needs in NYC, there appears to be sufficient need for additional wetland mitigation credits to make the proposed Bank site economically viable.

4.2 Feasibility

Consistent with the past approved Mitigation Bank in NYC, it is technically feasible and ecologically desirable to restore native habitats in NYC under an approved MBI and associated regulatory permits. The proposed Bank site is indicative of regional conditions along the Arthur Kill that are highly urbanized, where the majority of coastal wetland habitats have been filled, ditched, or degraded by past and current anthropogenic disturbances. The Conceptual Report (Exhibit A) is included to document the existing physical, chemical, biological, and cultural conditions at the proposed Bank site, as well as detail both the suitability and conceptual site restoration plan to improve ecological functioning.

The conceptual site restoration plan (as detailed in the Conceptual Report) focuses on ecological restoration strategies that have proved successful throughout the region, including:

- Removal of historic fill, as necessary, to regrade a salt marsh platform at suitable elevations to support salt marsh vegetation. Restoration areas will focus on known previous locations of salt marsh plant communities. The restoration design is anticipated to be supported by ecological benchmark studies to identify appropriate elevations to support target plant communities and associated native species. It is also noted that final site restoration will include an evaluation of anticipated sea level rise to promote long term resiliency of the restored native habitats.
- Restoration of tidal hydrology and salinities within regraded marsh platforms through construction of tidal channel(s). Proposed tidal channels will likely focus on the historic location of an oxbow channel associated with Neck Creek. Hydrologic and hydraulic modeling will be included in future site restoration design to address (1) long term shoreline stabilization of existing shorelines and graded channels, and (2) effective restoration of tidal flows throughout the targeted salt marsh communities.
- Planting of the restored areas with regionally sourced, native plant species characteristic of regional salt marsh plant communities. As noted above, plant species diversity will be based on the biological benchmark studies from identified reference sites within the Arthur Kill watershed.

5 Ownership and Long-term Stewardship of Proposed Bank

5.1 Ownership

The applicant and Bank Sponsor is Arthur Kill Power and owns the 113 ac parent property identified as Staten Island Borough, Block 2705, Lot 1. The proposed Bank site will occur on 47 ac of undeveloped woodland and wetland habitat to the north of the AKGS. A formal property survey, as well as location of any existing easements, will be surveyed by a NY state-licensed surveyor as part of the development of the MBI. Title of the property is assumed to remain with Arthur Kill Power through completion of the Bank.

A responsible party to oversee long term management of the Bank will be identified in the MBI and discussed further in Section 5.7. The Bank will be protected by restrictive covenants or by other appropriate methods to protect the Bank in perpetuity.

Sponsor Contact Information: Arthur Kill Power, LLC. 4401 Victory Boulevard, Staten Island, NY 10314. Attn: John Kenny, Plant Manager. (718) 390-2775. jkenny@alphagen.com

5.2 Maintenance Provisions

The proposed Bank will be designed to restore native habitats throughout the proposed 47 ac site to enhance ecological functions and services within the Arthur Kill watershed. The MBI will include a monitoring and adaptive management plan that will outline anticipated adaptive management activities and framework for correcting any deficiencies. The Sponsor will adaptively manage the Bank through for a period of five (5) years, until performance standards are met, or until all credits are debited, whichever is later. Deviation from this approved plan is subject to review and written approval by USACE and NYSDEC, and in coordination with the IRT.

The monitoring and adaptive management plan to be included as part of the MBI is assumed to include:

- Monitoring protocols to evaluate progress towards, or deviation from, defined performance standards.
- Anticipated adaptive management activities, and framework for correcting any deficiencies.
- Annual reporting requirements.
- Outline for additional coordination, as required, with USACE, NYCDEC, and the IRT prior to implementing corrective actions.

Upon closure of the Bank, the long-term land steward will implement the management requirements established in a long-term management plan (to be included in MBI). A responsible party to oversee long term management of the Bank will be identified in the MBI. The Bank will be protected by restrictive covenants or by other appropriate methods to protect the Bank in perpetuity.

5.3 Monitoring Provisions

The Sponsor will perform necessary work to monitor the Bank to demonstrate compliance with the performance standards to be established in the MBI, and any pertinent regulatory permits. For purposes of this Prospectus, it is assumed that monitoring will occur for a period of five (5) years, until performance standards are met, or until all credits are debited, whichever is later. The monitoring period will begin one (1) calendar year after completion of all construction and planting activities. For example, if planting is completed in spring of 2025, then the first monitoring year will begin in the spring of 2026. Annual monitoring reports will be submitted to USACE and

NYSDEC to document progress towards achieving performance standards and identification of any problems requiring corrective actions. The MBI will require annual monitoring reports for a minimum of five (5) years following completion of planting activities.

5.4 Reports

The MBI will require the Sponsor to submit a post-construction report to USACE and NYSDEC within sixty (60) days after the completion of grading and planting activities, and to include as-built grading and planting plans of the Bank establishment activities. The as-built plans will include all aspects of the final grading elevations and final planting quantities and locations.

As noted in Section 5.3, the monitoring period will begin one (1) full calendar year after completion of all construction and planting activities. The MBI will require annual monitoring reports for a minimum of five (5) years following completion of planting activities. Annual reports will be submitted to USACE and NYSDEC by December 31 of each calendar year. The objectives for an annual monitoring report include the following:

- Assessment and characterization of the restored plant communities throughout the Bank site.
- Assessment of invasive species establishment and identified potential short and long term risk to restored plant communities.
- Assessment of site hydrology, channel morphology, and marsh platform elevation necessary to support restored plant communities.
- Illustrate progress toward, or deviation from, defined performance standards.
- If necessary, identify and implement adaptive management actions to move or maintain progress toward stipulated performance standards.
- Formal request of release of Bank credits, as necessary, based on achievement of specific milestones associated with the Bank's protection and establishment.

It is assumed that USACE and NYSDEC, in consultation with the IRT, will respond to each annual monitoring reports with respect to:

- Coordination of recommended adaptive management actions.
- Confirmation of whether or not the specific milestones are successfully achieved for the purposes of credit release.

5.5 Accounting Procedures

The MBI will provide that the Sponsor will submit a ledger statement to USACE and NYSDEC each time credits are debited, or additional credits are approved for release. If requested, USACE may distribute the statement to other members of the IRT or the public. The Sponsor will submit an annual ledger to USACE and NYSDEC for distribution to all members of the IRT, showing all transactions at the Bank for the previous year. All ledger submittals will include USACE and NYSDEC permit numbers.

5.6 Contingency Plans/Corrective Actions

The MBI will provide that should any report submitted by the Sponsor to USACE and NYSDEC note conditions requiring corrective action, the Sponsor will determine the cause of the condition, in consultation with USACE, NYSDEC, and the IRT. Prior to commencing corrective actions, the Sponsor will submit a detailed Adaptive Management Plan (AMP) proposal for the required corrective action. The USACE and NYSDEC, in coordination

with the IRT, will review and make a determination of whether corrective actions are warranted within sixty (60) days or receipt of an AMP.

Once an AMP is approved by USACE and NYSDEC, the Bank Sponsor will undertake such corrective action and will, upon completion, submit a summary of the work performed. Should corrective actions not be implemented as determined necessary by USACE and NYSDEC, then the release of credits may be withheld and/or credit sales may be suspended until the corrective action is implemented.

5.7 Long term Management and Stewardship

The MBI will provide that the Sponsor will conduct Bank maintenance and monitoring for the operational life of the Bank. The Bank will be closed at the end of the operational life, which is five (5) years from the date of the completion of the grading and planting tasks, successful completion of all performance standards, or the date when all credits are sold by the Sponsor, whichever comes later. The MBI will include a long-term management plan that describes the long term management activities to be conducted by a selected land steward and the maintenance surety for the management activities. The Bank will be protected in perpetuity by a restrictive covenant or by other appropriate methods to protect the Bank in perpetuity.

6 Sponsors Qualifications

The Bank Sponsor has not established a mitigation bank previously, but has retained the consultation services of Arcadis U.S., Inc. (Arcadis) and Ducks Unlimited (DU) on this project that bring a wealth of experience establishing mitigation banks in NY and throughout the US. Specifically, Arcadis and DU have successfully collaborated to establish mitigation banks through USACE's In Lieu Fee (ILF) Program and efficiently transferred credits to satisfy permit-related mitigation requirements in NY, as well as other portions of the US. With respect to restoring salt marsh habitats in the NYC region, the project team has been, or is currently involved in, wetland restoration projects in Jamaica Bay, Hudson River, East River, Passaic River, Raritan River, Hempstead Bay, and greater Long Island.

7 Ecological Suitability and Water Rights

7.1 Suitability and Baseline Conditions

As documented in the Conceptual Report (Exhibit A), all information collected to date indicates that the proposed Bank is ecologically suited to be established as a wetland mitigation bank based on the current physical, chemical, biological, and cultural characteristics. Through the proposed restoration activities, the Bank will have direct benefits on hydrologic, biogeochemical, plant community, and wildlife ecosystem functions. Specific to the HRE Comprehensive Restoration Plan (USACE 2014), the proposed Bank will also directly benefit the following target ecosystem characteristics: wetlands, habitat for waterbirds, coastal and maritime communities, shorelines and shallows, fish, crabs and lobster habitat, tributary connections, and acquisition. In turn, the proposed actions will also provide enhancement to ecological services, which are the benefits that surrounding human populations obtain from the natural resources and associated functions.

7.2 Surrounding Land Use

The proposed Bank site is bounded by the following land uses:

- North – Neck Creek and public lands associated with Meredith Woods open space managed by New York City Department of Parks and Recreation.
- West – Arthur Kill.
- East – Existing rail line. It is noted that beyond this rail line includes vacant land that includes both wetland and upland habitats.
- South – The proposed bank site occurs in the northern portion of the 113-acre (ac) parent property identified as Staten Island Borough, Block 2705, Lot 1 and owned by Arthur Kill Power. Vacant land similar to that within the proposed Bank Site occurs immediately to the south of the proposed Bank site. This additional vacant land provides a buffer to industrial land uses further to the south that includes the active Arthur Kill Generating Station and other utility-based land uses

Considering the adjacent parcel ownership and surrounding land uses, future development immediately adjacent to the proposed Bank site is not expected. The northern and western boundaries are bounded by the Arthur Kill, Neck Creek, and publicly managed open space. The eastern boundary is bounded by an active rail line that is not expected to change and continue to service the neighboring industrial land uses. Development immediately along the southern boundary within the same parcel owned by Arthur Kill Power is not planned or expected in the future.

If the proposed Bank site were not constructed, it is anticipated that this land would remain vacant and hydrologically isolated from the Arthur Kill and Neck Creek. Habitats within the proposed Bank site would continue to provide limited ecological functions and services to the Arthur Kill watershed. The proposed Bank site provides a unique opportunity in this urban environment to both enhance the ecology of the Arthur Kill watershed, as well as address the strong need for compensatory mitigation by both public agencies and private landowners within the NYC municipal area (i.e. primary and secondary service areas).

7.3 Water Rights

Sufficient water rights exist to support the long term sustainability of the Bank. Tidal wetlands will be supported by tidal waters primarily from Neck Creek and the associated Arthur Kill. Details of the proposed hydrology of the Bank are provided in the Conceptual Report (**Exhibit A**).

8 Attachments and Exhibits

The following figures, exhibit, and attachments are included in this Prospectus.

Figures

Figure 1. USGS Site Location Map

Figure 2. Project Area Map

Figure 3. Service Area Map

Exhibit A. Site Development Concept Plan

Figure A-1. FEMA Flood Map

Figure A-2. Soils Map

Figure A-3. Wetland Delineation Map

Figure A-4. Existing Habitats Map

Figure A-5. Conceptual Restoration Design Plan

Attachment A-1. Historic Aerial Photographs

Attachment A-2. NYSDEC Tidal Wetlands Maps

9 References

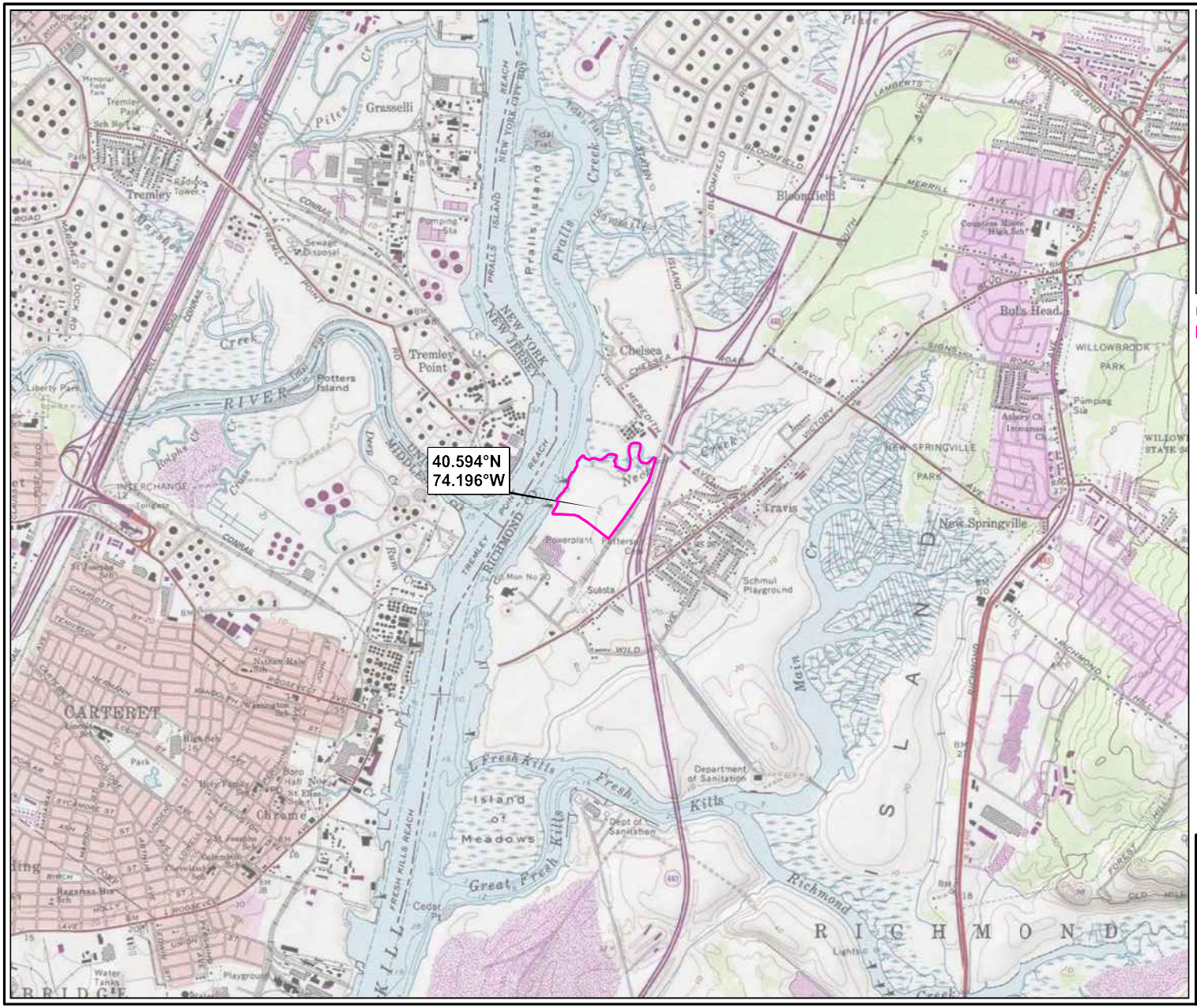
Bartoldus C.C., E.W. Garbisch, and M.L. Kraus. 1994. Evaluation for Planned Wetlands (EPW): A Procedure for Assessing Wetland Functions and a Guide to Functional Design. Environmental Concern Inc., St. Michaels, Maryland. 327 pp. and appendices.

Kutcher, T.E. 2019. Salt Marsh Rapid Assessment Method, MarshRAM: Analysis and Application. A technical report prepared for the Rhode Island Department of Environmental Management. 34pp.

USACE and The Port Authority of New York and New Jersey. 2014. Hudson-Raritan Estuary Comprehensive Restoration Plan.

USACE. 2008. Compensatory Mitigation for Losses of Aquatic Resources. 73 FR 19670. A Rule by the Defense Department, the Engineers Corps, and the Environmental Protection Agency.

Figures



LEGEND:

PROPOSED MITIGATION BANK BOUNDARY

0 2,000 4,000 Feet

GRAPHIC SCALE

NOTE:
1. USGS TOPOGRAPHIC QUADRANGLE FOR ARTHUR KILL NEW YORK/NEW JERSEY, OBTAINED FROM ESRI IMAGE SERVICE.

ARTHUR KILL POWER, LLC
ARTHUR KILL FACILITY
STATEN ISLAND, NY
WETLAND MITIGATION BANK PROSPECTUS

UNITED STATES (US) GEOLOGICAL SURVEY (USGS) SITE LOCATION MAP

ARCADIS

FIGURE **1**

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LEGEND:

PROPOSED MITIGATION BANK BOUNDARY

0 250 500 Feet

GRAPHIC SCALE

NOTES:
1. IMAGERY OBTAINED FROM ESRI WORLD IMAGERY.

ARTHUR KILL POWER, LLC
ARTHUR KILL FACILITY
STATEN ISLAND, NY

WETLAND MITIGATION BANK PROSPECTUS

PROJECT AREA MAP

ARCADIS

FIGURE
2

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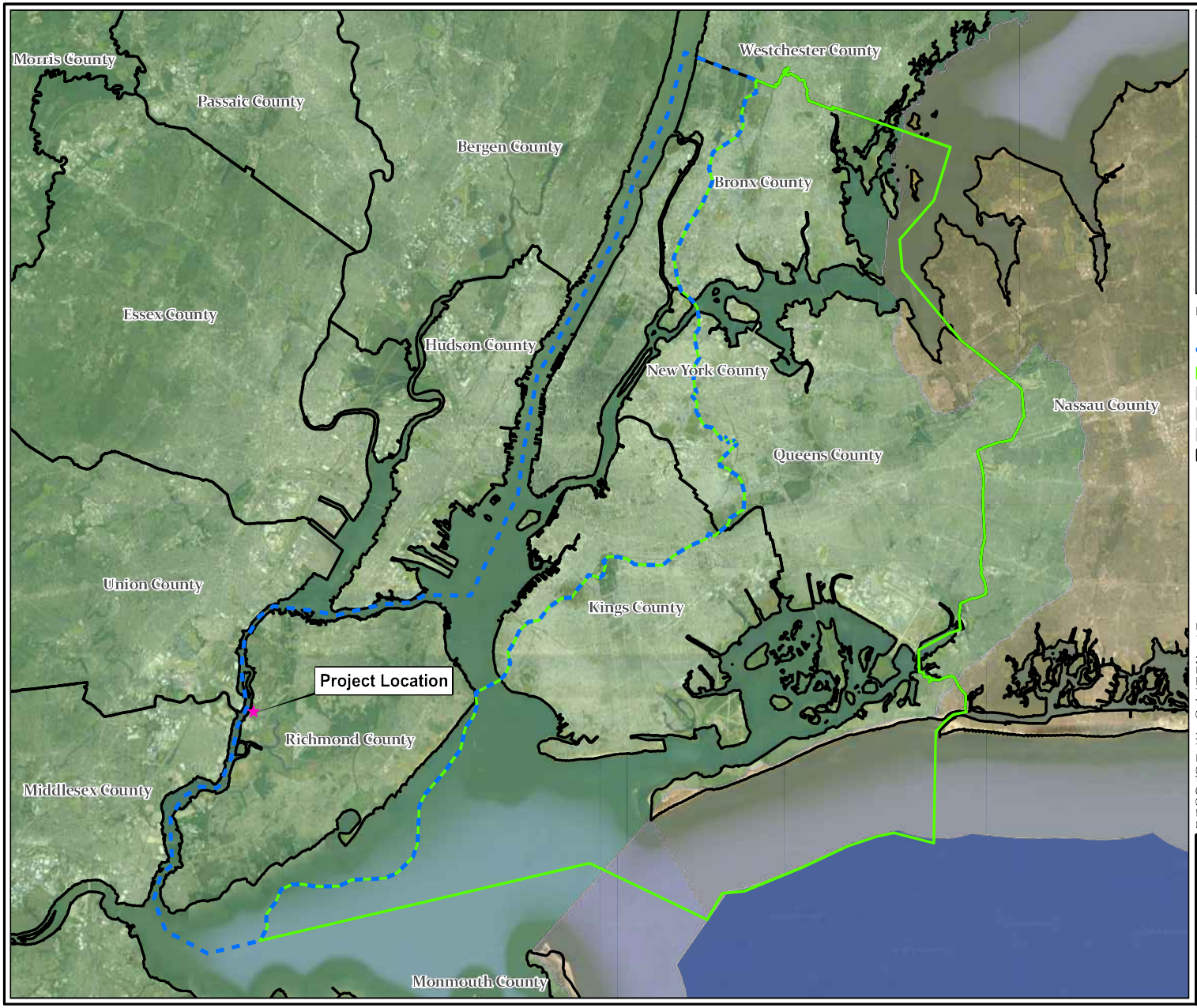

LEGEND:

- PROJECT LOCATION
- PRIMARY SERVICE AREA
- SECONDARY SERVICE AREA
- LONG ISLAND (HUC 020302)
- LOWER HUDSON (HUC 020301)
- MID ATLANTIC COASTAL (HUC 020403)
- COUNTY BOUNDARY

0 3 6 Miles

GRAPHIC SCALE

NOTES:

1. AERIAL IMAGERY ACCESSED VIA GOOGLE EARTH IMAGERY.
2. THE PRIMARY SERVICE AREA OCCURS WITHIN PORTIONS OF THE LOWER HUDSON BASIN (HYDROLOGIC UNIT CODE (HUC) 020301) BOUNDED BY THE NEW YORK CITY (NYC) MUNICIPAL LIMITS. WITHIN THIS BASIN, THE PRIMARY SERVICE AREA INCLUDES PORTIONS OF THE FOLLOW SUBBASINS: SANDY HOOK-STATEN ISLAND (HUC 02030104) AND LOWER HUDSON (HUC 02030101).
3. THE SECONDARY SERVICE AREA ENCOMPASSES THE ENTIRETY OF THE NYC MUNICIPAL LIMITS AND INCLUDES PORTIONS OF THE FOLLOWING BASINS: LOWER HUDSON (HUC 020301), LONG ISLAND (HUC 020302), AND MID-ATLANTIC COASTAL (HUC 020403). WITHIN THESE BASINS, THE SECONDARY SERVICE AREA INCLUDES PORTIONS OF THE FOLLOWING SUBBASINS: SANDY HOOK-STATEN ISLAND (HUC 02030104), LOWER HUDSON (HUC 02030101), BRONX (HUC 02030102), NORTHERN LONG ISLAND (02030201), SOUTHERN LONG ISLAND (02030202), AND MULLICA-TOMS (02040301)

ARTHUR KILL POWER, LLC
ARTHUR KILL FACILITY
STATEN ISLAND, NY
WETLAND MITIGATION BANK PROSPECTUS

SERVICE AREA MAP

ARCADIS

FIGURE 3

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Exhibit A

EXHIBIT A

Site Development Concept Plan - Baseline Conditions Report, Ecological Suitability, and Conceptual Design Report

Arthur Kill Wetland Mitigation Bank

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

1 Introduction

This Site Development Concept Plan - Baseline Conditions, Ecological Suitability, and Conceptual Design Report (Conceptual Report) has been developed in support of the Prospectus for the proposed Arthur Kill Wetland Mitigation Bank (Bank) in accordance with the Final Rule for Compensatory Mitigation for Losses of Aquatic Resources (Federal Register Vol. 73, No. 70, April 10, 2008). The proposed Bank is located on Staten Island, in Richmond County, New York (NY). A Site Location Map as shown on the United States (US) Geologic Survey (USGS) 7.5-minute series topographic map included as Figure 1 as part of the Prospectus. The approximate center of the Bank is located at 40.5943, -74.19654 State Plane 83 NY Long Island North American Datum 1983 (NAD83). The Bank is proposed to occur on 47 acres (ac) of disturbed freshwater wetland and upland habitats to the north of the Arthur Kill Generating Station (AKGS) and shown on the Project Area Map, included as Figure 2 as part of the Prospectus.

The proposed Bank targets a highly urbanized area proximate to the Arthur Kill where the majority of tidal marsh habitat has been historically filled and/or disturbed. Specifically, the Bank site targets a large area of freshwater wetlands that have resulted from past anthropogenic disturbances (i.e., land filling, construction of berms) which has restricted tidal influence and subsequently led to establishment of monocultures of invasive, non-native species. This Bank proposes to restore native tidal marsh habitats (i.e., low and high salt marsh) along the Arthur Kill and Neck Creek by reintroducing tidal hydrology via new tidal channels, regrading a tidal marsh platform to appropriate elevations, and restoring native plant communities that are supported by the restored tidal hydrology. Through these proposed actions, the Bank will have direct benefits on hydrologic, biogeochemical, plant community, and wildlife support ecosystem functions as further described below. In turn, the proposed actions will also provide enhancement to ecological services, which are the benefits that surrounding human populations obtain from the natural resources and associated functions.

This Conceptual Report serves to document the existing physical, chemical, biological, and cultural conditions at the Bank, as well as detail both the suitability and conceptual restoration plan to restore native tidal wetlands throughout the proposed Bank site.

2 Physical Characteristics

2.1 Geology and Geomorphology

The Bank is located within the Piedmont Lowlands (Northern Triassic Lowlands) Physiographic Province. Sediments and soils within the Bank originate from the Triassic System of the Mesozoic Era. Within the NY Bight watershed[1], the Piedmont Lowlands represents the northern extension of an almost continuous formation of reddish shales, mudstones, and sandstones that stretches nearly 1,600 miles (mi) from NY and south to Virginia (National Oceanic and Atmospheric Agency [NOAA] 1981). This province within the NY Bight watershed is known as a relatively low-lying area of broad valleys and low hills that slope gently in a southeastern direction. The province lies between the Piedmont Highlands to the west, and the Atlantic Coastal Plan to the east and south.

[1] The NY Bight is a coastal embayment part of the Middle Atlantic Bight. The NY Bight encompasses an area that extends from the NY – New Jersey (NJ) shoreline to the eastern tip of Long Island and down to the southern tip of NJ. The apex of the Bight is the Hudson-Raritan Estuary.

The Piedmont's fertile, arable soils on relatively flat surfaces generally led to dense urbanization in the northern portion of the province and extensive agriculture in southwestern portion (NOAA 1981).

2.2 Historic Mapping and Land Use

USGS topographic maps dating back to 1898 indicate significant tidal wetlands across the Bank site and associated with the Arthur Kill and Neck Creek. A secondary oxbow tidal channel historically occurred along with southern banks of Neck Creek. This oxbow channel can be seen in the earliest reviewed aerial photograph from 1954 (Attachment A-1). This photograph from 1954 also illustrates how most of the Bank site had already been filled and/or disturbed. The AKGS had not yet been built in 1954, and the areas to the south of the proposed Bank site appear to be ditched tidal wetlands.

A sequence of aerial photographs from 1954 through 2021 are included as Attachment A-1. The following describes the primary land changes over this duration. The Richmond County Airport that utilized a portion of the Bank site as a runway was abandoned by the late-1950s, and the development of the Arthur Kill Generating Station occurred between 1954 and 1963. Historic aerial photographs from 1963 and 1972 indicate continued land disturbance throughout the proposed Bank site. A berm was constructed around the perimeter of the proposed Bank site in order to hydrologically isolate the Bank site from hydrologic influences from the Arthur Kill (west) and Neck Creek (north). A rail spur that provides the eastern boundary to the Bank site was developed during this time. Aerial photographs from 1963 and 1972 indicate the filling of the tidal oxbow channel in the northern portions of the proposed Bank site. The New York State Department of Environmental Conservation (NYSDEC) statewide mapping of tidal wetlands that are based on 1974 aerial photographs map significant areas of the Bank site as "Formerly Connected Tidal Wetlands." NYSDEC tidal wetland mapping of the Bank site is presented in Attachment A-2.

Significant land disturbances within the Bank site appear to have ceased by the late 1970's. Historical photographs from 1972 to current day demonstrate the development of three primary open water features within the Bank site surrounded by large, monotypical stands of common reed (*Phragmites australis*). All three open water features appear to correspond to areas that were once salt marsh habitats, which is supported by both review of historic aerial photography and the NYSDEC tidal wetlands mapping (Attachments A-1 and A-2, respectively).

2.3 Hydrology

The Bank site is located within the Hudson-Raritan Estuary (HRE) that is one of the largest estuaries on the east coast of the US, encompassing over 1,600 square mi and almost 1,600 linear mi of shoreline (US Army Corps of Engineers [USACE] 2014). The HRE is situated in the northwestern boundary of the NY Bight and consists of ocean, coastal, and estuarine waters associated with the Atlantic Ocean lying south of Long Island, NY from New York City (NYC) south to Sandy Hook, NJ and including the Raritan Bay and its tributaries. The Bank site is located within the NYSDEC Atlantic Ocean/Long Island Sound Watershed and the USGS 8-digit Hydrologic Unit Code (HUC) Sandy Hook-Staten Island subbasin (02030104).

The Bank site is bounded by the Arthur Kill to the east and Neck Creek to the north. The Arthur Kill is a tidal straight along the western shoreline of Staten Island that connects to Newark Bay and the Upper NY Bay to the north via the Kill Van Kull and then connects to Raritan Bay to the south. The Arthur Kill and Kill Van Kull have deepwater navigation channels that allow transport of cargo into and out of the Ports of NY and NJ.

Historic land uses described in Section 2.2 have hydrologically isolated the majority of the Bank site from both the Arthur Kill and Neck Creek. Existing freshwater wetland habitats, as further described in Section 4.1, are primarily influenced by precipitation and a seasonally shallow groundwater table.

Existing tidal datums at the Bank were obtained from the nearest NOAA station, Bergen Point West Station (ID 8519483). Diurnal tides within the Arthur Kill provide an approximate 5-foot tidal range. The North American Vertical Datum of 1988 (NAVD88) elevation related to the Mean Lower Low Water (MLLW) was computed using the NOAA VDatum Online Vertical Transformation Tool. Table 1 contains the resulting tidal datums.

Table 1. Tidal Datums Associated with Bergen Point West Station (ID 8419483)

Tidal Datum	Elevation (feet (ft) NAVD88)
Mean Higher High Water (MHHW)	+3.364
Mean High Water (MHW)	+3.044
Mean Sea Level (MSL)	+0.624
Mean Low Water (MLW)	-1.936
Mean Lower Low Water (MLLW)	-2.146

2.3.1 Flood Hazard Area

The Bank is located within the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) numbers 3604970304F and 3604970302F, both effective September 5, 2007. The majority of the Bank is mapped as Zone AE (1 percent (%) Annual Chance Flood), with a base flood elevation of nine (9) ft. Small portions of the Bank are located within Zone X (0.2% Annual Chance Flood). FEMA flood mapping is depicted on Figure A-1.

2.4 Soils

The US Department of Agriculture (USDA) classifies eleven (11) soils within the Bank site. A summary of each soil series is provided below and depicted on Figure A-2.

- Ipswich mucky peat, 0 to 2% slopes, very frequently flooded (IwA): Found in tidal marshes in dips with a parent material of partially decomposed herbaceous organic material. Texture is mucky peat to a depth of 42 inches, then muck to a depth of 59 inches. This soil is classified as hydric.
- Matunuck mucky peat, 0 to 2% slopes, very frequently flooded (MaA): Found in tidal marshes in dips with a parent material of partially decomposed herbaceous organic material over glaciofluvial deposits and/or sandy marine deposits. Texture is mucky peat to a depth of 12 inches, then sand to a depth of 72 inches. This soil is classified as hydric.
- North Meadow sandy loam, 0 to 3% slopes (NoA): Found on backslopes, footslopes, and toeslopes, with a parent material of loamy human-transported material over till. Texture is highly decomposed plant material to a depth of 1 inch, fine sandy loam from 1 to 2 inches, stony fine sandy loam from 2 to 20 inches, sandy loam from 20 to 28 inches, and silt loam from 28 to 72 inches. This soil is classified as not hydric.

- Oil-waste land (Oi): Found on talfs, dips, and rises with a parent material of barren human-transported material. Texture is not characterized, and the hydric soil rating is unranked.
- Preakness mucky silt loam, 0 to 3% slopes (PkA): Found on drainageways and depressions with a parent material of coarse-loamy outwash over gravelly outwash and/or sandy outwash. Texture is slightly decomposed plant material to a depth of 3 inches, mucky silt loam from 3 to 5 inches, silt loam from 5 to 15 inches, sandy loam from 15 to 25 inches, and loamy sand from 25 to 72 inches. The soil is classified as hydric.
- Preakness silt loam, 0 to 3% slopes, frequently ponded (PvA): Found on drainageways and depressions with a parent material of coarse-loamy outwash over gravelly outwash and/or sandy outwash. Texture is slightly decomposed plant material to a depth of 3 inches, mucky silt loam from 3 to 5 inches, silt loam from 5 to 15 inches, sandy loam from 15 to 25 inches, and loamy sand from 25 to 72 inches. The soil is classified as hydric.
- Sandyhook mucky fine sand, 0 to 2% slopes, very frequently flooded (SaA): Found on back-barrier beaches and back-barrier flats with a parent material of sandy marine deposits. Texture is mucky peat to a depth of 4 inches, sand from 4 to 8 inches, mucky coarse sand from 8 to 11 inches, sand from 11 to 51 inches, and coarse sand from 51 to 59 inches. This soil is classified as hydric.
- Timakwa muck, 0 to 2% slopes, frequently flooded (TkA): Found on flood plains with a parent material of herbaceous and woody organic material over sandy and gravelly glaciofluvial deposits. Texture is muck to a depth of 37 inches, very gravelly loamy coarse sand from 37 to 47 inches, and gravelly loamy very fine sand from 47 to 60 inches. This soil is classified as hydric.
- Urban land, sandy substratum, 0 to 3% slopes (UsA): Found on summits with a parent material of asphalt over human transported material. Texture is cemented material to a depth of 20 inches and coarse sand from 20 to 72 inches. This soil is classified as not hydric.
- Verrazano sandy loam, 0 to 3% slopes (VzA): Found on backslopes, summits, footslopes, and toeslopes with a parent material of loamy human-transported material over beach sand and/or sandy outwash and/or dredge spoils. Texture is sandy loam to a depth of 17 inches, loam from 17 to 24 inches, and sand from 24 to 72 inches. This soil is classified as not hydric.
- Westbrook mucky peat, sandy substratum, 0 to 1% slopes, very frequently flooded (WbA): Found in tidal marshes with a parent material of herbaceous organic material over loamy fluviomarine deposits over sandy fluviomarine deposits. Texture is mucky peat to a depth of 36 inches, fine sandy loam from 36 to 56 inches, and loamy sand from 56 to 72 inches. This soil is classified as hydric.

3 Chemical Characteristics

3.1 Water Salinity

The nearest NYC Department of Environmental Protection (NYCDEP) Water Quality Survey Station is located just south of the Bank and identified as the Fresh Kills (K4) sampling location of the Staten Island Transect. Data obtained from this station indicates that within the past few years, water salinity in the Arthur Kill has fluctuated from between 16.02 points per thousand (ppt) and 25.38 ppt at the top of the water column and between 18.10 ppt and 25.53 ppt at the bottom of the water column. Salinity typically varies by season, with slightly higher salinity observed during summer months (NYCDEP 2022).

Arcadis has evaluated the salinity of surface waters in mapped freshwater wetlands dominated by common reed. Surface water salinity measured using a refractometer were less than 2 ppt. Groundwater monitoring will be initiated as part of future phases of work associated with site restoration design.

3.2 Sediment Quality

A Phase 1 Environmental Assessment (ESA) was completed on January 6, 2024 and in general accordance with the ASTM International (ASTM) Standard E1527-21, Standard Practice for Environmental Assessments: Phase 1 Environmental Site Assessment Process (ASTM E1527-21) (Arcadis 2024). The ESA evaluated an initial 54-ac portion of the property. Based on the data obtained during the site inspection, interviews, historical resources review and regulatory agency records review, the ESA identified one Recognized Environmental Concern (REC). This REC included portions of the parent property that were historically used associated with the AKGS facility operations.

To address findings of the ESA, the currently proposed Bank site (Figure 2 included as part of Prospectus) reduced the initial surveyed area to 47 ac. Based on the results of the ESA, it is anticipated that a Site Screening Work Plan (SSWP) for the Bank site will be completed as part of future phases of Bank development and will specifically address materials used to fill the tidal oxbow channel associated with Neck Creek. The objective of a SSWP is assumed to identify the extent, depth and physical characteristics of the REC associated with the Bank site.

4 Biological Characteristics

4.1 Waters and Wetlands

Arcadis completed a routine wetland and waterbody delineation of the Bank site in June and July 2023. The wetland and waterbody delineation was conducted in accordance with methodology described in the Technical Report Y-87-1 Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) and the subsequent guidance document, the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region Version 2.0 (USACE 2012). The United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) was also reviewed for mapped wetlands at the Bank site.

Mapped waters and wetland boundaries are illustrated on Figure A-3 and include freshwater wetlands, tidal waterbodies, and tidal wetlands. Waterbodies include the Arthur Kill and Neck Creek. Four wetland complexes are mapped within the Bank site and summarized in Table 2.

Table 2. Summary of Mapped Waterbodies and Wetlands within Proposed Bank Site

Wetland ID	Size (ac)	Wetland Cover Types	Comments
1	2.91	Palustrine persistent emergent wetland – monoculture of common reed. Freshwater Pond	Freshwater wetland complex, including freshwater pond, isolated from the Arthur Kill; historically influenced by land movement activities.
2	22.78	Palustrine persistent emergent wetland – monoculture of common reed. Freshwater Pond Estuarine persistent emergent wetland – native low marsh, native high marsh, non-native salt marsh.	Northern portions of complex not impacted by historical activities - native and non-native salt marsh. Majority of wetland complex, including freshwater pond, isolated from Neck Creek and the Arthur Kill by berms and historic activities. Historic oxbow channel no longer present.
3	0.02	Palustrine persistent emergent wetland – monoculture of common reed.	Isolated wetland depression area.
4	4.27	Estuarine persistent emergent wetland – native low marsh.	Remaining salt marsh habitat along the Arthur Kill.

4.1.1 Tidal Waters

The Arthur Kill occurs west of the Bank site, and Neck Creek to the north. The MHW and MHHW associated with these tidal waters are assumed to be +3.044 ft and +3.364 NAVD88, respectively. A site-specific tidal study is anticipated to be completed in future phases of work. The diurnal tidal range is expected to be approximately five (5) feet. It is noted that the current condition of the Bank site is predominantly hydrologically isolated from both tidal waterbodies due to historic site activities (i.e., perimeter berm, filling of tidal channel).

4.1.2 Tidal Wetlands

Tidal salt marsh habitats are found in the northern portion of the Bank site along Neck Creek and generally north of historic man-made berms (Wetland 2), as well as along the Arthur Kill and west of historic man-made berms (Wetland 4). They consist of a mixture of subtidal creeks and/or ditches, intertidal marsh (both low and high salt marsh), mudflats, and sandy habitats (only along the Arthur Kill). These wetlands are associated with a larger tidal wetland complex associated with the Meredith Woods managed by the NYC Department of Parks and Recreation (NYCDPR) and immediately opposite of Neck Creek. A further description of the vegetative communities is summarized in Section 4.2.

4.1.3 Freshwater Wetlands

The focus of this Bank site is on the freshwater wetlands that have developed on the Bank site as the result of anthropogenic disturbances on the Bank site. Wetlands 1 and 2 are inclusive of the mapped freshwater wetlands, and each include a freshwater pond as part of the larger wetland complex. Soils within Wetland 2 exhibit redox dark surface, hydrogen sulfide, and sandy mucky mineral as the hydric soil indicators. The wetland receives hydrologic input primarily from precipitation and groundwater. Each wetland is primarily dominated by dense monocultures of common reed.

4.2 Vegetation

Six (6) vegetative community types occur within the Bank site and are summarized below. Vegetation community types are consistent with Ecological Communities of New York State (Edinger, et al. 2014). A map of existing habitats is included as Figure A-4.

4.2.1 Estuarine Salt Marsh (Native)

Habitat mapping (Figure A-4) of native estuarine salt marsh is inclusive of both low salt marsh and high salt marsh communities. Further delineation of these habitats will be completed in future phases of work associated with site restoration design. The low salt marsh community, which generally occurs between Mean Tide Level (MTL) and MHW, is dominated by both the tall and short form smooth cordgrass (*Spartina alterniflora*), depending on the tidal range. The tall form of smooth cordgrass occurs in habitats with large tidal ranges (i.e., banks of tidal channel), while the short form occurs in areas with a more restricted tidal range (i.e., inland from tidal channel). Glassworts (*Salicornia* spp.) are also present throughout low salt marshes. This community is found along the Arthur Kill shoreline (Wetland 4) and within the Neck Creek salt marsh complex (Wetland 2).

The high salt marsh community which generally occurs from MHW to the limit of spring tides or MHHW is dominated by salt meadow cordgrass (*Spartina patens*), saltgrass (*Distichlis spicata*), short form smooth cordgrass, and marsh elder (*Iva* frutescens). Other species include perennial saltmarsh aster *(Aster tunuifolius*), seaside goldenrod (*Solidago sempervirens*), and glassworts. This community is found within the Neck Creek salt marsh complex along the northern boundary of the Bank site.

4.2.2 Common Reed Marsh (Persistent Emergent)

This wetland community type is commonly the result of historic anthropogenic disturbances and is characterized by dense monocultures of the European common reed. This community includes both monocultures associated with freshwater open water habitat (e.g., ponds) developed within each of the delineated freshwater wetland complexes (i.e., Wetland 1 and 2), as well as areas of historic high salt marsh that have been invaded by common reed.

While it was previously believed that common reed was limited from invading salt marshes by high soil salinities (Chambers et al. 1999), it has now been demonstrated that this species can invade lower marshes through clonal integration (Minchinton & Bertness 2003; Amesberry et al. 2000).

4.2.3 Palustrine Red Maple Hardwood Swamp

This palustrine wetland community type occurs in poorly drained depressions and is present geographically between the common reed persistent emergent and successional hardwood forest. Typical tree species identified include grey birch (*Betula populifolia*), red maple (*Acer rubrum*), American elm (*Ulmus americana*), and black gum (*Nyssa sylcatica*). Common shrub species observed include highbush blueberry (*Vaccinium corymbosum*), arrowwood (*Viburnum denatum*), and sassafras (*Sassafras albidum*). Understory species identified include poison ivy (*Toxicodendron radicans)*, sensitive fern (*Onoclea sensibilis*), cinnamon fern (*Osmunda cinnamomea*), and various sedges (*Carex* spp.).

4.2.4 Successional Harwood Forest

This upland community type is found on upland areas that were previously cleared but which subsequently have re-established after these areas were abandoned by site activities. Common tree species observed in this community include grey birch, red maple, pin oak *(Quercus palustris*), black cherry (*Prunus serotina*), and tree of heaven (*Ailanthus altissima*). Identified shrubs include lowbush blueberry (*Vaccinium angustifolium*) and sassafras. Understory species include, but not limited to, common reed, rice cutgrass (*Leersia oryzoides*), poison ivy, mile-a-minute (*Persicaria perfoliata*), Japanese knotweed (*Reynoutria japonica*), Pennsylvania sedge (*Carex pensylvanica*), yellow foxtail (*Setaria pumila*), and wild oats (*Avena fatua*).

4.2.5 Shrub Swamp

This wetland community is dominated by tall shrubs and occurs in depressional areas across the Bank site. Characteristic shrubs include arrowwood, highbush blueberry, and red osier dogwood (*Cornus sericea*). Understory species include a mixture of sensitive fern, sedges, and soft rush (*Juncus effusus*).

4.2.6 Ruderal Upland

This upland community type is primarily associated with past anthropogenic disturbances that have led to the establishment of a dense monoculture of Japanese knotweed.

4.2.7 Additional Communities

In addition to the above-listed plant communities, it is worth recognizing additional non-vegetated habitat types present at the site:

- Freshwater open water habitats associated with Wetlands 1 and 2
- Intertidal channel associated with salt marsh habitats along Neck Creek
- Intertidal mudflats associated with salt marsh habitats along Neck Creek

While these habitat types typically support no vegetation, they represent habitat diversity to be considered and factored into future site restoration design.

4.2.8 Significant Natural Communities

The NYSDEC Environmental Resource Mapper (ERM) was queried to determine if any Significant Natural Communities (SNC) are located on or in the vicinity of the Bank. The ERM did not identify any SNC on the Bank

site. In the vicinity of the Bank, the ERM identified one SNC listed as red maple-sweetgum swamp with high quality occurrence of rare community type. This SNC is located approximately 0.75 mi northeast of the Bank site.

4.3 Fish and Wildlife Habitat

Coastal wetland complexes have historically supported a diverse range of resident or migratory wildlife within the Arthur Kill tributary system. However, the significant reduction and/or degradation of these coastal wetlands has had direct effects on wildlife populations that rely on these habitats.

This section summarizes the wildlife species that can be expected to still utilize the Arthur Kill and associated intertidal habitats (i.e., native salt marsh, mudflats, tidal channels). While many of these intertidal habitat types occur along the boundaries of the Bank site associated with both the Arthur Kill and Neck Creek, it is recognized that the freshwater wetland and adjacent upland habitats that are dominated by non-native species provide a reduced level of support to these wildlife species. Specifically, fish and crustacean species are prevented from utilizing portions of the Bank site that were historically accessible through the tidal channels. In turn, these monocultures of non-native species (i.e., common reed) provide sub-optimal foraging and resting habitat for resident and migratory birds, mammals, and/or reptiles.

4.3.1 Invertebrates

Terrestrial and marine invertebrates have many important functions as key lower food web components in the HRE coastal and marine ecosystems. Terrestrial and benthic invertebrates serve as food resources for birds, mammals, and fish (Waldman 2008). Invertebrate species that are expected to utilize intertidal habitats include, but are not limited to, fiddler crabs (*Uca minax* and *Uca pugnax*), ribbed mussels (*Geukensia demissa*), periwinkles (*Littorina* spp.), eastern mud snail (*Nassarius obsoletus*), mud crab (*Rithropanopeus harrisii*), blue crab (*Callinectes sapidus*), and glass shrimp (*Palaemonetes* spp.). Both mussel species are important food resources for fish and birds and, as filter-feeders, they improve water quality (Bain et al. 2007; Waldman 2008; USACE 2014; NYCDEP 2018)

4.3.2 Fish

The Arthur Kill intertidal and subtidal habitats support a large number of resident and migratory fish species that serve as key resources for other ecosystem components. Forage fish (*Fundulus* spp.) are important middle food web components and function as food resources for birds and predatory fish including resident (e.g., flounder [*Paralichthys* spp.]) and anadromous (e.g., shad [*Alosa* spp.], herring [*Clupea* spp.], Atlantic sturgeon [*Acipenser oxyrinchus oxyrinchus*], and striped bass [*Morone saxatilis*]) species (USFWS 1997; Waldman 2008; USACE 2014). Sections 4.3.6 and 4.3.7 provide further description of potential essential fish habitats as well as federal- and state-listed fish species.

4.3.3 Avian

Several different groups of bird species use the Arthur Kill and associated habitats. Wading birds (herons, stilts), seabirds (terns, cormorants), waterfowl (ducks, geese), shorebirds (sandpipers), and passerines (terrestrial songbirds) are dependent upon the different types of coastal and upland habitats found along the Arthur Kill. The osprey (*Pandion haliaetus*) is a unique class of raptor species based on their diet (exclusively fish) and use the Arthur Kill for foraging and breeding. The HRE Coastal Restoration Plan (USACE 2014) also recognizes the

historical importance of uninhabited islands within the Arthur Kill, immediately upgradient from the Bank site, to support large breeding populations of herons, egrets, and ibises. While these islands and nearby marshes and mudflats are not known to currently support active wading bird rookeries, they are thought to provide an important habitat that could be recolonized in the future (Bernick 2006).

Bird species observed and/or expected to utilize wetland habitats along the Arthur Kill include, but are not limited to egrets (*Egretta* spp.), marsh wren (*Cistothorus palustris*), glossy ibis (*Plegadis falcinellus*), least tern (*Sternula antillarum*), American bittern (*Botaurus lentiginosus*), red-shouldered hawk (*Buteo lineatus*), night herons (*Nycticorax* spp.) clapper rail (*Rallus longirostris),* red winged blackbird (*Agelaius phoenicueus*), red-tailed hawk (*Buteo jamaicensis*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhrnchos*), and seaside sparrow (*Ammodramus maritimus)*.

A review of the USFWS Information for Planning and Consultation (IPaC) identified nine migratory birds of "particular concern either because they occur on the USFWS Birds of Conservation Concern list or warrant special attention in your project location." They include bald eagle (*Haliaeetus leucocephalus*), black-billed cuckoo (*Coccyzus erythropthalmus*), chimney swift (*Chaetura pelagica*), grasshopper sparrow (*Ammodramus savannarum perpallidus*), prairie warbler (*Setophaga discolor*), prothonotary warbler (*Protonotaria citrea*), red-headed woodpecker (*Melanerpes erythrocephalus*), rusty blackbird (*Euphagus carolinus*), and wood thrush (*Hyloccichla mustelina*).

4.3.4 Reptiles

Intertidal habitats in this portion of the Arthur Kill may also provide important habitat for the northern diamondback terrapin (*Malaclemys terrapin*). Native salt marsh habitats dominated by cordgrass species (*Spartina* spp.) are critical foraging and nursery habitats for the terrapin. The terrapin have been recently observed to nest within the Fresh Kills Park and specifically in salt marsh habitats associated with Richmond Creek and Main Creek. The Bank site is approximately 1.25 mi upstream of the confluence of Fresh Kills and the Arthur Kill.

4.3.5 Mammals

The Arthur Kill and associated habitats still serve as an important resource for a diversity of mammals. They include, but are not limited to, white-tailed deer (*Odocoileus virginianus*) and a diversity of potential bat species like hoary bat (*Lasiurus cinereus*), red bat (*Lasiurus borealis*), little brown bat (*Myotis lucifugus*), and silver-haired bat (*Lasionycteris noctivagans*). In addition, Section 4.3.7 discusses federal- and state-protected bat species as identified by the USFWS IPaC database.

4.3.6 Essential Fish Habitat

Essential Fish Habitat (EFH) is defined by the Magnuson-Stevens Fishery Conservation and Management Act As "those waters and substrate necessary for fish for spawning, breeding, feeding, and growth to maturity." The NOAA National Marine Fisheries Service (NMFS) was queried for EFH at or proximate to the Bank site. NMFS identified eleven (11) species with potential to occur at or in the vicinity of the Bank site, as listed below.

- Summer flounder (*Paralichthys dentatus*) – Larvae, Juvenile, Adult
- Winter flounder (*Pseudopleuronectes americanus*) – Eggs, Juvenile, Larvae/Adult
- Windowpane flounder (*Scophthalmus aquosus*) – Eggs, Larvae, Juvenile, Adult
- Little skate (*Leucoraja erinacea*) – Juvenile, Adult

- Winter skate (*Leucoraja ocellata*) – Adult, Juvenile
- Clearnose skate (*Rostroraja eglanteria*) – Juvenile, Adult
- Atlantic herring (*Clupea harengus*) – Larvae, Juvenile, Adult
- Red hake (*Urophycis chuss*) –Eggs/Larvae/Juvenile, Adult
- Longfin inshore squid (*Doryteuthis pealeii*) - Eggs
- Bluefish (*Pomatomus saltatrix*) – Juvenile, Adult
- Atlantic butterfish (*Peprilus triacanthus*) – Larvae

NMFS is required to make EFH conservation recommendations to both federal and state agencies when proposed actions have the potential to adversely affect EFH. Future phases of work will evaluate habitat characteristics of the Bank site to determine if EFH occurs within the proposed action area. It is anticipated that most site restoration activities as described below will occur in freshwater wetlands that are not accessible to fish.

4.3.7 Threatened and Endangered Species

Federal

The USFWS IPaC was queried for federally-listed threatened, endangered, candidate, and otherwise protected terrestrial species. Four (4) species were identified with potential to occur on or proximate to the Bank as listed below. No critical habitats were identified within the Bank.

- Piping Plover (*Charadrius melodus*) – Threatened
- Northern long-eared bat (*Myotis septentroinalis*) – Endangered
- Tricolored bat (*Perimyotis subflavus*) – Proposed Endangered
- Monarch butterfly (*Danaus plexippus*) – Candidate

The NOAA Section 7 Mapper was queried for federally-listed aquatic species. One (1) species was identified with potential to occur proximate to the Bank as listed below. No critical habitats were identified.

- Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) – Endangered – Sub-adult and Adult

Future phases of work are anticipated to include an evaluation of potential impact, direct coordination with USACE, USFWS, and NMFS, identification of best management practices (BMPs), and/or habitat design components as part of the Bank site restoration design.

New York State

A review of the NYSDEC ERM and the NYSDEC Environmental Assessment Form (EAF) Mapper was conducted to determine if any state-listed threatened or endangered species are located on or in the vicinity of the Bank. Three (3) state-listed species were identified with the potential to occur on or proximate to the Bank site:

- Bald eagle (*Haliaeetus leucocephalus*) – Threatened
- Pied-billed grebe (*Podilymbus podiceps*) – Threatened
- Least bittern (*Ixobrychus exilis*) – Threatened

Future phases of work are anticipated to include an evaluation of potential impact, direct coordination with NYSDEC (as necessary), identification of best management practices (BMPs), and/or habitat design components as part of the Bank site restoration design.

5 Cultural Characteristics

5.1 Cultural Resources Survey

The NYSDEC EAF Mapper identifies the Bank as a location that may contain, or is substantially contiguous to, a building, archaeological site, or district which is listed on the National or State Register of Historic Places, or that has been determined by the Commissioner of the NY State Office of Parks, Recreation, and Historic Preservation (NYSOPRHP) to be eligible for listing on the State Register of Historic Places. Additionally, the EAF Mapper identifies the Bank as located in an area in or adjacent to an area designated as sensitive for archaeological sites on the NY State Historic Preservation Office (SHPO) archaeological site inventory.

The NYSOPRHP Cultural Resource Information System (CRIS) Mapper identifies two archeological surveys that have been completed at the Bank, as listed below.

- Phase IA Cultural Resource Survey, Arthur Kill Power Plant Lateral, Staten Island, NY (01SR51737)
- Phase IB Archaeological Survey, Arthur Kill Power Plant Lateral, Staten Island, NY (03SR54148)

Future phases of work will include the review of these past cultural surveys, as well as coordination with the NYC Landmarks Preservation Commission (LPC). As required, additional archaeological documentary studies will be completed in future phases of work to determine whether intact archaeological resources might exist on the site and provide a recommendation for whether future field work is required.

5.2 Federal Aviation Administration Coordination

The Federal Aviation Administration (FAA) recommends a separation distance of 10,000 ft for any potential hazardous wildlife attractant for airports that serve turbine-powered aircraft. The FAA also recommends a minimum distance of 5 mi between the farthest edge of the airport's air operations area and the hazardous wildlife attractant if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace. The Bank is located approximately 2.60 mi (13,728 ft) from Linden Airport and 5.18 mi (27,350 ft) from Newark Liberty International Airport. Therefore, the Bank is located outside of the 10,000 ft separation criteria for both airports but is located within 5 mi of Linden Airport. Coordination with the FAA is ongoing to ensure that the Bank does not affect airport safety by creating a hazardous wildlife attractant or increasing the wildlife hazards for the airport.

6 Ecological Suitability

All information collected to date indicates that the proposed Bank is ecologically suited to be established as a wetland mitigation bank based on the current physical, chemical, biological, and cultural characteristics. Through the proposed restoration activities discussed further in Section 7, the project will have direct benefits on hydrologic, biogeochemical, plant community, and wildlife ecosystem functions. Specific to the HRE Comprehensive Restoration Plan (USACE 2014), the project will also directly benefit the following target ecosystem characteristics: wetlands, habitat for waterbirds, coastal and maritime communities, shorelines and shallows, fish, crabs and lobster habitat, tributary connections, and acquisition. In turn, the proposed actions will also provide enhancement to ecological services, which are the benefits that surrounding human populations obtain from the natural resources and associated functions.

7 Conceptual Restoration Design

7.1 Regulatory Background

The fundamental objective of compensatory mitigation as defined in the Final Rule for Compensatory Mitigation for Losses of Aquatic Resources (33 CFR 332.2) is “to offset environmental losses resulting from unavoidable impacts to waters of the United States authorized by DA (Department of the Army) permits.” Further, compensatory mitigation “may be performed using the methods of restoration, enhancement, establishment, and in certain circumstances preservation.” Restoration is identified as the priority when considering compensatory mitigation due to likelihood of success being greater when compared to establishment, or ecological gains associated with enhancement and preservation. For the purpose of tracking net gains in aquatic resource areas, restoration is divided into two categories: reestablishment and rehabilitation. Table 3 provides a definition of each category as identified by the Final Rule for Compensatory Mitigation for Losses of Aquatic Resources and which will be followed as part of future Mitigation Bank Instrument development.

Table 3. Categories of Compensatory Mitigation as Defined in the Final Rule for Compensatory Mitigation for Losses of Aquatic Resources

Category	Definition
Establishment (Creation)	The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area and function.
Re-establishment (Restoration)	The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former undisturbed aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and function.
Rehabilitation (Restoration)	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. Rehabilitation results in a gain in aquatic resource function but does not result in a gain in aquatic resource area.
Enhancement	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). Enhancement does not result in a gain in aquatic resource area.
Preservation	The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those 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 function.

7.2 Objective of Conceptual Restoration

The objective of the proposed conceptual site restoration plan is to restore native tidal salt marsh habitats throughout the Bank through re-grading and re-introduction of tidal hydrology. The conceptual restoration design targets habitat conversion from freshwater wetlands dominated by common reed as well as an upland habitat dominated by Japanese knotweed to estuarine salt marsh habitat. These existing habitats have been historically impacted by anthropogenic disturbances, isolated from tidal influence, and in turn promoted establishment of non-native, invasive plant species. Given the lack of hydrologic connectivity to the Arthur Kill and Neck Creek, in addition to the dense monocultures of invasive, non-native species, these targeted habitats provide a reduced level of ecological functions and services to the Arthur Kill watershed and associated wildlife.

The restoration of native tidal salt marsh habitats, and consideration of enhancement and preservation of surrounding habitats (both salt marsh and successional woodland uplands) targets enhancement of multiple ecological functions:

- Improved water quality;
- Improved flood attenuation;
- Improved habitat resiliency to sea level rise;
- Improved native plant community abundance and diversity;
- Improved shoreline protection and sediment stabilization; and
- Improved fish and wildlife habitats.

In addition, the proposed Bank will also directly benefit the following target ecosystem characteristics as identified by the HRE Comprehensive Restoration Plan (USACE 2014):

- Wetlands,
- Habitat for waterbirds,
- Coastal and maritime communities,
- Shorelines and shallows,
- Fish, crabs and lobster habitat,
- Tributary connections, and
- Acquisition.

7.3 Conceptual Plan

The conceptual restoration design plan is described in the following sections and presented as Figure A-5. Table 4 includes the approximate acreage for each proposed compensatory mitigation action within the proposed Bank.

Table 4. Proposed Compensatory Mitigation Activities and Approximate Acreages

Compensatory Mitigation Category	Area (ac)
Wetland Restoration (Rehabilitation)	23.60
Wetland Restoration (Re-establishment)	1.30
Wetland Enhancement	7.39
Buffer (Upland) Enhancement	15.02

7.3.1 Wetland Restoration (Rehabilitation)

The majority of the Bank consists of existing freshwater wetlands that are dominated by common reed and hydrologically isolated from tidal influence associated with either the Arthur Kill or Neck Creek. Review of historic mapping and aerial photography indicates that these areas were previously native salt marsh communities (Attachments A-1 and A-2).

The conceptual restoration approach will lower the elevation of existing ground surfaces to appropriate elevations necessary to support native tidal salt marsh communities (both low and high salt marsh). Grading will include sinuous tidal channel(s) to restore tidal flow and circulation. The conceptual area for a new tidal channel will be based upon the historic location for the tidal oxbow channel. The restored marsh platform will be planted with appropriate native species specific to targeted communities (discussed below). Final grading will be based on regional biological benchmarking of both target native species and invasive species of concern.

It is recognized that future phases of the project will include sediment/soil sampling of known fill areas (i.e., oxbow channel). If areas of concern are identified, then the site restoration plan will evaluate over-excavation and backfilling with a clean sand cap prior to planting with native species.

7.3.2 Wetland Restoration (Re-establishment)

A portion of the Bank site has been filled and is currently upland habitat dominated by Japanese knotweed. Review of historic mapping and aerial photography indicates these areas were previously native salt marsh habitats (Attachments A-1 and A-2).

The conceptual restoration approach will lower the elevation of existing ground surfaces to appropriate elevations necessary to support native tidal salt marsh communities (both low and high salt marsh) and directly tie into adjacent rehabilitation efforts discussed above. Similar to rehabilitation efforts, grading will include extending the tidal channel to restore tidal flow and circulation in these areas. The restored marsh platform will be planted with appropriate native species specific to targeted communities (discussed below). Final grading will be based on regional biological benchmarking.

It is recognized that future phases of the project will include sediment/soil sampling of known fill areas. If areas of concern are identified, then the site restoration plan will evaluate over-excavation and backfilling with a clean sand cap prior to planting with native species.

7.3.3 Wetland Enhancement

The northern and western boundary of the Bank site consist of low and high salt marsh communities. Based upon an understanding of existing conditions, these wetlands are threatened by both continued shoreline erosion as well as establishment and threat of common reed.

Wetland enhancement activities to promote sustainability of these native habitats could include (1) adaptive management of common reed; (2) reducing width of secondary tidal channels; (3) shoreline stabilization utilizing bioengineering methods. These efforts will promote habitat continuity with both proposed rehabilitation and re-establishment efforts discussed above, and greater resilience to future conditions such as sea level rise.

7.3.4 Buffer Enhancement

Forested upland buffer habitats could be enhanced through removal of debris and non-native, invasive plant species that threaten plant diversity and ecological functioning of these habitats. Target invasive species include common reed, Japanese knotweed, oriental bittersweet (*Celastrus orbiculatus*), tree-of-heaven, and mugwort (*Artemisia vulgaris*). It is anticipated that invasive species could be managed through chemical and/or mechanical methods, and dependent upon species and site conditions.

7.4 Target Vegetative Communities

The conceptual restoration plan targets restoration of three (3) native coastal vegetative communities that are summarized in Table 5.

Table 5. Target Vegetative Communities and Species to be Considered for Planting

Planting Zone	Species to be Considered for Planted	
	Scientific Name	**Common Name**
Low Marsh	*Spartina alterniflora*	Smooth cordgrass
High Marsh	*Spartina patens*	Salt meadow cordgrass
	Distichlis spicata	Saltgrass
	Juncus gerardii	Saltmarsh rush
	Iva frutescens	Bigleaf marsh-elder
Salt Scrub	*Baccharis halimifolia*	Groundselbush
	Iva frutescens	Bigleaf marsh-elder
	Spartina patens	Salt meadow cordgrass
	Distichlis spicata	Saltgrass

All plants will target native plant nurseries within the region (i.e., within approximately 250 mi of the Bank site). Nursery stock sizes are anticipated to be 2-inch plugs for herbaceous species, and 1- to 3-gallon containers for shrubs.

7.5 Design Optimization

7.5.1 Ecological Function Modelling

Future site restoration design will be furthered by incorporating the *Evaluation for Planned Wetlands: A Procedure for Assessing Wetland Functions and a Guide to Functional Design* (EPW; Bartoldus et al. 1994) and the Salt Marsh Rapid Assessment Method (MarshRAM; Kutcher 2019), developed by the Rhode Island Natural History Survey. The EPW and MarshRAM will be used to assess and optimize the site restoration design in order to maximize marsh ecosystem functions. Expected ecosystem functions to be enhanced by the proposed Bank are discussed in Section 7.2.

7.5.2 Hydrologic and Hydraulic Modeling

Hydrologic and hydraulic modeling will be included in future site restoration designs to address (1) long term shoreline stabilization of existing shorelines and graded channels, and (2) effective restoration of tidal flows throughout the targeted salt marsh communities.

It is anticipated that future site restoration design will also include site specific water level measurements to facilitate site specific tidal datums representing current conditions.

7.5.3 Sea Level Rise

The site restoration design plan will incorporate anticipated sea level rise as a result of global climate change in order to ensure the long term success of the Bank and resiliency of targeted intertidal salt marsh communities. Anticipated sea level rise poses a threat to inundate intertidal salt marsh communities and cause future conversation to intertidal mudflats.

Sea level along the US coastline is projected to rise, on average, 10-12 inches in the next 30 years (2020-2059), which will be as much as the rise measured over the last 100 years (1920-2020) (Sweet et al. 2022). The most current regional projections for sea level rise as well as tidal marsh accretion rates[2] will be incorporated into future site restoration design. Anticipated increases to tidal datums (MLW, MHW, MHHW) will be calculated at established intervals (i.e., every 10 years) throughout a projected 50-year design life to support analysis of potential impacts to planned tidal salt marsh communities.

8 References

Amesberry, L., M. A. Baker, P. Ewanchuk, and M. D. Bertness. 2000. Clonal integration and the expansion of Phragmites australis. Ecological Applications 10:1110–1118.

Arcadis U.S., Inc. (Arcadis). 2024. Phase I Environmental Site Assessment Report. A Portion of 4401 Victory Boulevard. Staten Island, New York.

Bain, M., J. Lodge, D.J. Suszkowski, D. Botkin, A. Brash, C. Craft, R. Diaz, k. Farley, Y. Gelb, J.S. Levinton, W. Matuszeski, F. Steimle and P. Wilber. 2007. Target Ecosystem Characteristics for the Hudson Raritan Estuary: Technical Guidance for Developing a Comprehensive Ecosystem Restoration Plan. A report to the Port Authority of NY/NJ. Hudson River Foundation, New York, NY. 106 pp.

Bartoldus C.C., E.W. Garbisch, and M.L. Kraus. 1994. Evaluation for Planned Wetlands (EPW): A Procedure for Assessing Wetland Functions and a Guide to Functional Design. Environmental Concern Inc., St. Michaels, Maryland. 327 pp. and appendices.

Bernick, A.J. 2006. New York City Audubon's Harbor Herons Project: 2006 Interim Nesting Survey, New York, NY: New York City Audubon Society.

Chambers, R. M., L. A. Meyerson, and K. Saltonstall. 1999. Expansion of Phragmites australis into tidal wetlands of North America. Aquatic Botany 64:261–273.

Edinger, G. J., D. J. Evans, S. Gebauer, T. G. Howard, D. M. Hunt, and A. M. Olivero (editors). 2014. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's

[2] Accretion is a natural process in marsh ecosystems that collects sediment and plant biomass on the marsh platform and allows a salt marsh to naturally increase elevation as water level rises.

Ecological Communities of New York State. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.

Environmental Laboratory. 1987. “Corps of Engineers Wetlands Delineation Manual,” Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Kutcher, T.E. 2019. Salt Marsh Rapid Assessment Method, MarshRAM: Analysis and Application. A technical report prepared for the Rhode Island Department of Environmental Management. 34pp.

Minchinton, T. E., and M.D. Bertness. 2003. Disturbance–mediated competition and the spread of Phragmites australis in a coastal marsh. Ecological Applications 13:1400–1416.

NOAA. 1981. Geomorphic Provinces and Sections of the New York Bight Watershed. https://www.nodc.noaa.gov/archive/arc0034/0071981/1.1/data/1-data/disc_contents/document/wp/geolsect.pdf. [Accessed May 2024].

NYCDEP. 2022. New York City Harbor Water Quality Survey Stations. https://data.cityofnewyork.us/widgets/5uug-f49n?mobile_redirect=true. [Accessed May 2024].

NYCDEP. 2018. Jamaica Bay Watershed Protection Plan Update 2018. http://www.nyc.gov/html/dep/pdf/jamaica_bay/jbwpp_update_10012014.pdf. [Accessed May 2024].

Sweet, W.V., B.D. Hamlington, R.E. Kopp, C.P. Weaver, P.L. Barnard, D. Bekaert, W. Brooks, M. Craghan, G. Dusek, T. Frederikse, G. Garner, A.S. Genz, J.P. Krasting, E. Larour, D. Marcy, J.J. Marra, J. Obeysekera, M. Osler, M. Pendleton, D. Roman, L. Schmied, W. Veatch, K.D. White, and C. Zuzak, 2022: Global and Regional Sea Level Rise Scenarios for the United States: Updated Mean Projections and Extreme Water Level Probabilities Along U.S. Coastlines. NOAA Technical Report NOS 01. National Oceanic and Atmospheric Administration, National Ocean Service, Silver Spring, MD, 111 pp. https://oceanservice.noaa.gov/hazards/sealevelrise/noaa-nostechrpt01-global-regional-SLR-scenarios-US.pdf

USACE and The Port Authority of New York and New Jersey. 2014. Hudson-Raritan Estuary Comprehensive Restoration Plan.

USACE. 2008. Compensatory Mitigation for Losses of Aquatic Resources. 73 FR 19670. A Rule by the Defense Department, the Engineers Corps, and the Environmental Protection Agency.

USACE. 2012. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0). ERDC\EL TR-12-1. January.

USFWS. 1997. Significant habitats and habitat complexes of the New York bight watershed: Jamaica Bay and Breezy Point. https://www.nodc.noaa.gov/archive/arc0034/0071981/1.1/data/0-data/disc_contents/web_link/text/jb_form.htm. [Accessed May 2024].

Waldman, J. 2008. Research opportunities in the natural and social sciences at the Jamaica bay Unit of Gateway National Recreation Area. Prepared for the National Park Service Jamaica Bay Institute.

Figures

LEGEND:

- PROPOSED MITIGATION BANK BOUNDARY
- ZONE X 0.2% ANNUAL CHANCE FLOOD HAZARD
- ZONE AE 1% ANNUAL CHANCE FLOOD HAZARD (ELEVATION 9)

0 250 500 Feet

GRAPHIC SCALE

NOTES:

1. AERIAL IMAGERY ACCESSED VIA ARCGIS ONLINE.
2. FLOODPLAIN MAPPING FROM THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) NATIONAL FLOOD HAZARD LAYER (NFHL) OBTAINED AT HTTPS://WWW.FEMA.GOV/FLOOD-MAPS/NATIONAL-FLOOD-HAZARD-LAYER.
3. FEMA FLOOD HAZARD AREAS SHOWN ARE BASED ON FEMA FIRM MAP NUMBERS 3604970302F AND 3604970304F EFFECTIVE 9/5/2007.

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FEMA FLOOD MAP

ARCADIS

FIGURE
A-1

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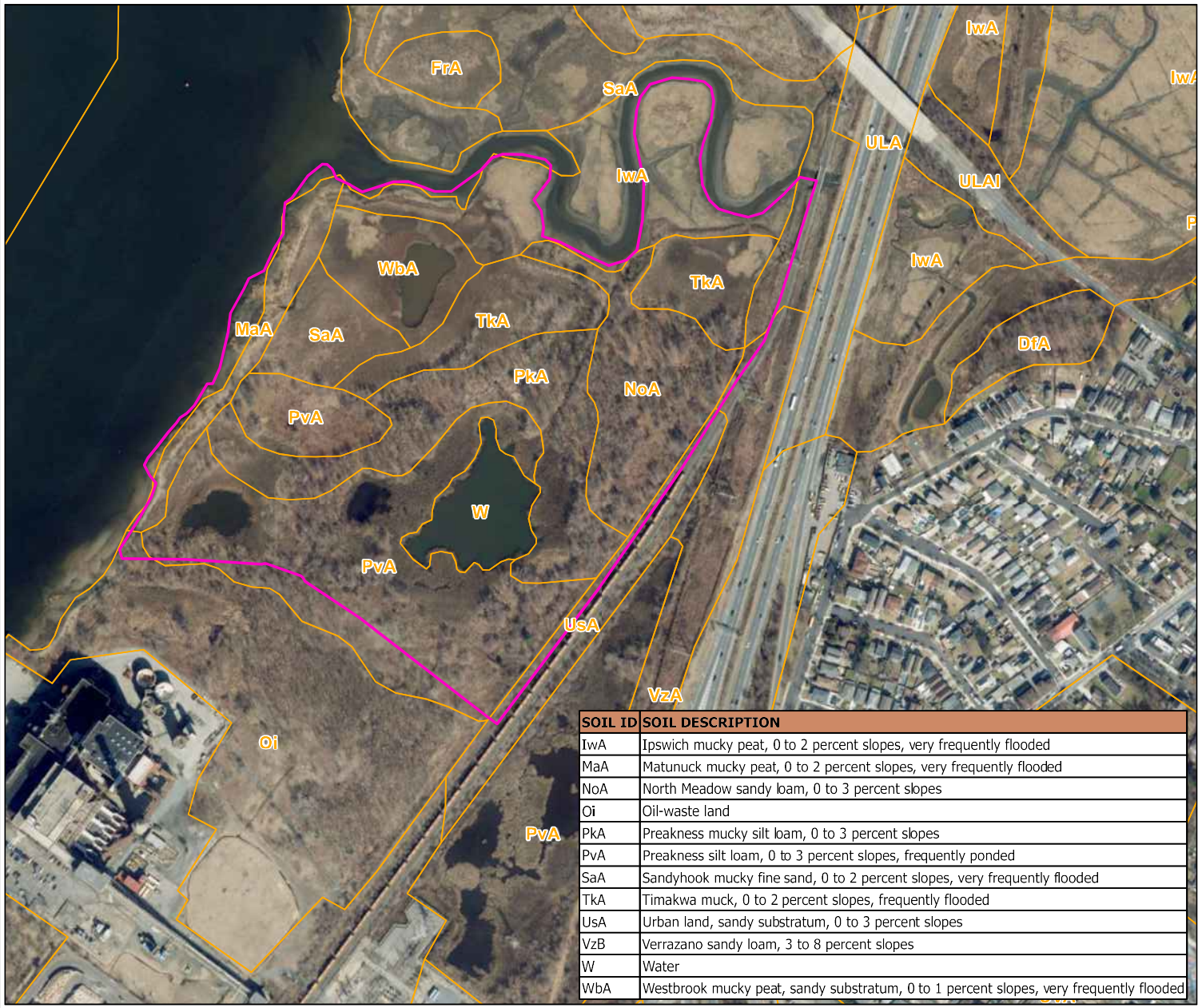

LEGEND:

PROPOSED MITIGATION BANK BOUNDARY

SOIL CLASS BOUNDARY

SOIL ID	SOIL DESCRIPTION
IwA	Ipswich mucky peat, 0 to 2 percent slopes, very frequently flooded
MaA	Matunuck mucky peat, 0 to 2 percent slopes, very frequently flooded
NoA	North Meadow sandy loam, 0 to 3 percent slopes
Oi	Oil-waste land
PkA	Preakness mucky silt loam, 0 to 3 percent slopes
PvA	Preakness silt loam, 0 to 3 percent slopes, frequently ponded
SaA	Sandyhook mucky fine sand, 0 to 2 percent slopes, very frequently flooded
TkA	Timakwa muck, 0 to 2 percent slopes, frequently flooded
UsA	Urban land, sandy substratum, 0 to 3 percent slopes
VzB	Verrazano sandy loam, 3 to 8 percent slopes
W	Water
WbA	Westbrook mucky peat, sandy substratum, 0 to 1 percent slopes, very frequently flooded

0 250 500 Feet

GRAPHIC SCALE

NOTES:
1. IMAGERY OBTAINED FROM ESRI WORLD IMAGERY.

2. SOIL DATA OBTAINED FROM THE UNITED STATE DEPARTMENT OF AGRICULTURE (USDA) NATURAL RESOURCES CONSERVATION SERVICES (NRCS) AT: HTTPS://WEBSOILSURVEY.NRCS.USDA.GOV

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SOILS MAP

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FIGURE
A-2

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LEGEND:

- WETLAND DELINEATION FLAG
- 2-FOOT CONTOUR
- MEAN HIGHER HIGH WATER (+3.364 FEET)
- PROPOSED MITIGATION BANK BOUNDARY
- DELINEATED WETLAND

0 250 500 Feet

GRAPHIC SCALE

NOTES:

1. AERIAL IMAGERY ACCESSED ESRI WORLD IMAGERY SERVICE.

2. WETLAND DELINEATION CONDUCTED BY ARCADIS ECOLOGISTS IN JUNE AND JULY 2023. WETLANDS DELINEATED IN ACCORDANCE WITH THE MULTI-PARAMETER APPROACH DEVELOPED BY THE ENVIRONMENTAL LABORATORY (EL) OF THE UNITED STATES ARMY ENGINEERING WATERWAYS EXPERIMENTAL STATION, PUBLISHED IN THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL (EL 1987), AND THE INTERIM REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL : NORTHEAST AND NORTH CENTRAL REGION (UNITED STATES ARMY CORPS OF ENGINEERS 2008).

3. 2 FOOT CONTOURS ACCESSED VIA NEW YORK STATE GIS CLEARINGHOUSE.

4. MEAN HIGHER HIGH WATER DATUM BASED ON TIDAL DATUMS FROM THE NATIONAL OCEANIC AND ATMOSPHERIC AGENCY (NOAA) BERGEN POINT WEST STATION (ID 8519483). THE NAVD88 ELEVATION RELATED TO MLLW WAS COMPUTED USING THE NOAA VDATUM ONLINE VERTICAL DATUM TRANSFORMATION TOOL. MEAN HIGHER HIGH WATER = +3.364 FEET, MEAN HIGH WATER = +3.044 FEET, MEAN SEA LEVEL = +0.624 FEET, MEAN LOW WATER = -1.936, MEAN LOWER LOW WATER = -2.146. MEAN HIGHER HIGH WATER IS DEPICTED ALONG THE 3' CONTOUR.

5. DUE TO THE SCALE OF THE DRAWINGS A CONTOUR INTERVAL OF 2-FEET IS SHOWN.

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WETLAND DELINEATION MAP

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FIGURE A-3

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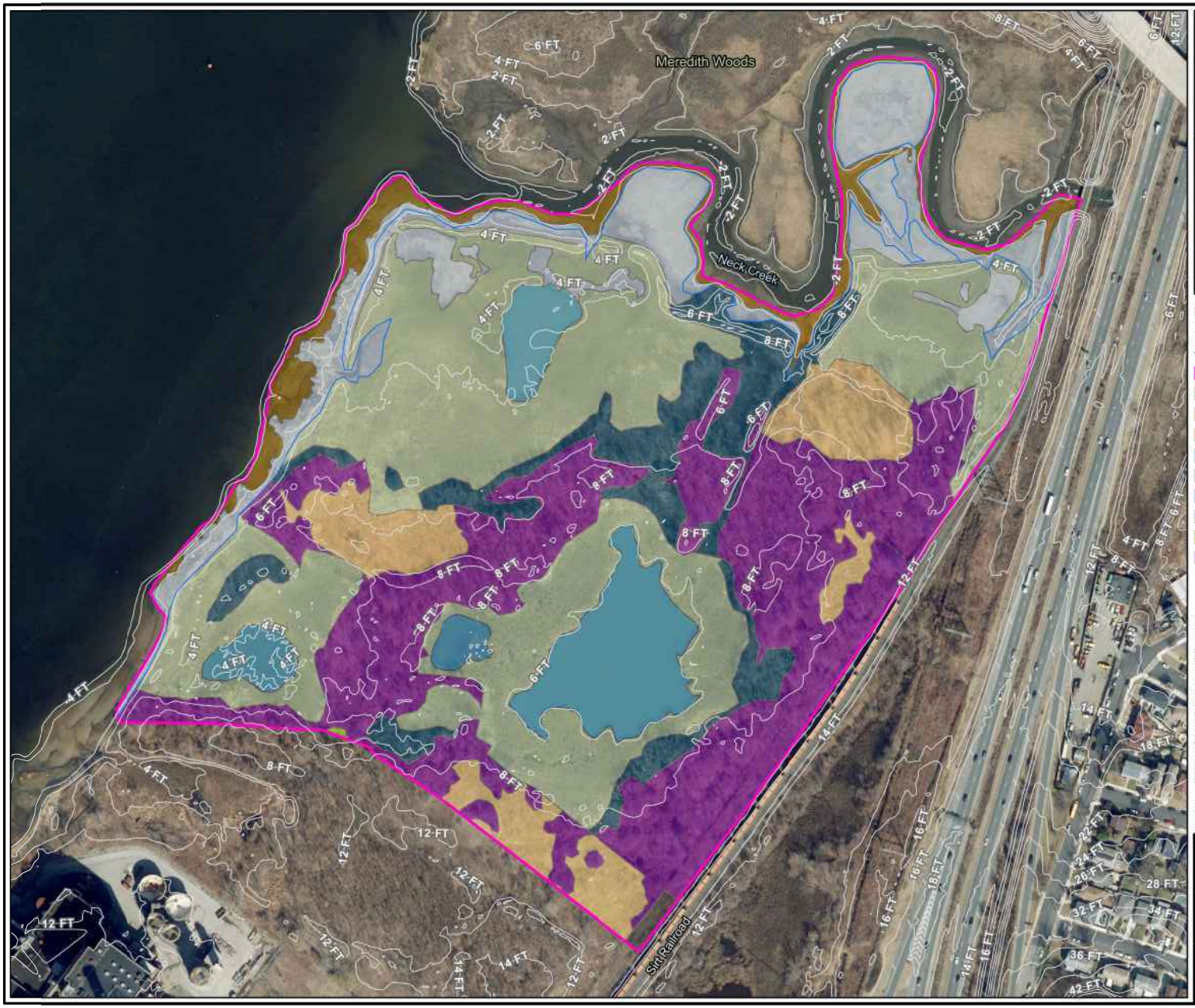

LEGEND:

- 2-FOOT CONTOUR
- MEAN HIGHER HIGH WATER (+3.364 FEET)
- PROPOSED MITIGATION BANK BOUNDARY
- COMMON REED MARSH (PERSISTENT EMERGENT)
- RUDERAL UPLAND
- MUD FLAT
- FRESHWATER POND
- MANAGED PATH
- RED MAPLE SWAMP
- ESTUARINE SALT MARSH
- SHRUB SWAMP
- SUCCESSIONAL HARDWOOD FOREST

0 250 500 Feet

GRAPHIC SCALE

NOTES:

1. AERIAL IMAGERY ACCESSED ESRI WORLD IMAGERY SERVICE.
2. HABITAT CLASSIFICATION CONDUCTED BY ARCADIS ECOLOGISTS DURING SITE VISITS IN JUNE AND JULY 2023 AND VIA DESKTOP ANALYSIS.
3. 2 FOOT CONTOURS ACCESSED VIA NEW YORK STATE GIS CLEARINGHOUSE.
4. MEAN HIGHER HIGH WATER DATUM BASED ON TIDAL DATUMS FROM THE NATIONAL OCEANIC AND ATMOSPHERIC AGENCY (NOAA) BERGEN POINT WEST STATION (ID 8519483). THE NAVD88 ELEVATION RELATED TO MLLW WAS COMPUTED USING THE NOAA VDATUM ONLINE VERTICAL DATUM TRANSFORMATION TOOL. MEAN HIGHER HIGH WATER = +3.364 FEET, MEAN HIGH WATER = +3.044 FEET, MEAN SEA LEVEL = +0.624 FEET, MEAN LOW WATER = -1.936, MEAN LOWER LOW WATER = -2.146. MEAN HIGHER HIGH WATER IS DEPICTED ALONG THE 3' CONTOUR.
5. DUE TO THE SCALE OF THE DRAWINGS A CONTOUR INTERVAL OF 2-FEET IS SHOWN, AS SUCH, MEAN HIGHER HIGH WATER AND MEAN HIGH WATER ARE BOTH DEPICTED AT THE SAME ELEVATION CONTOUR.

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EXISTING HABITATS MAP

ARCADIS

FIGURE
A-4

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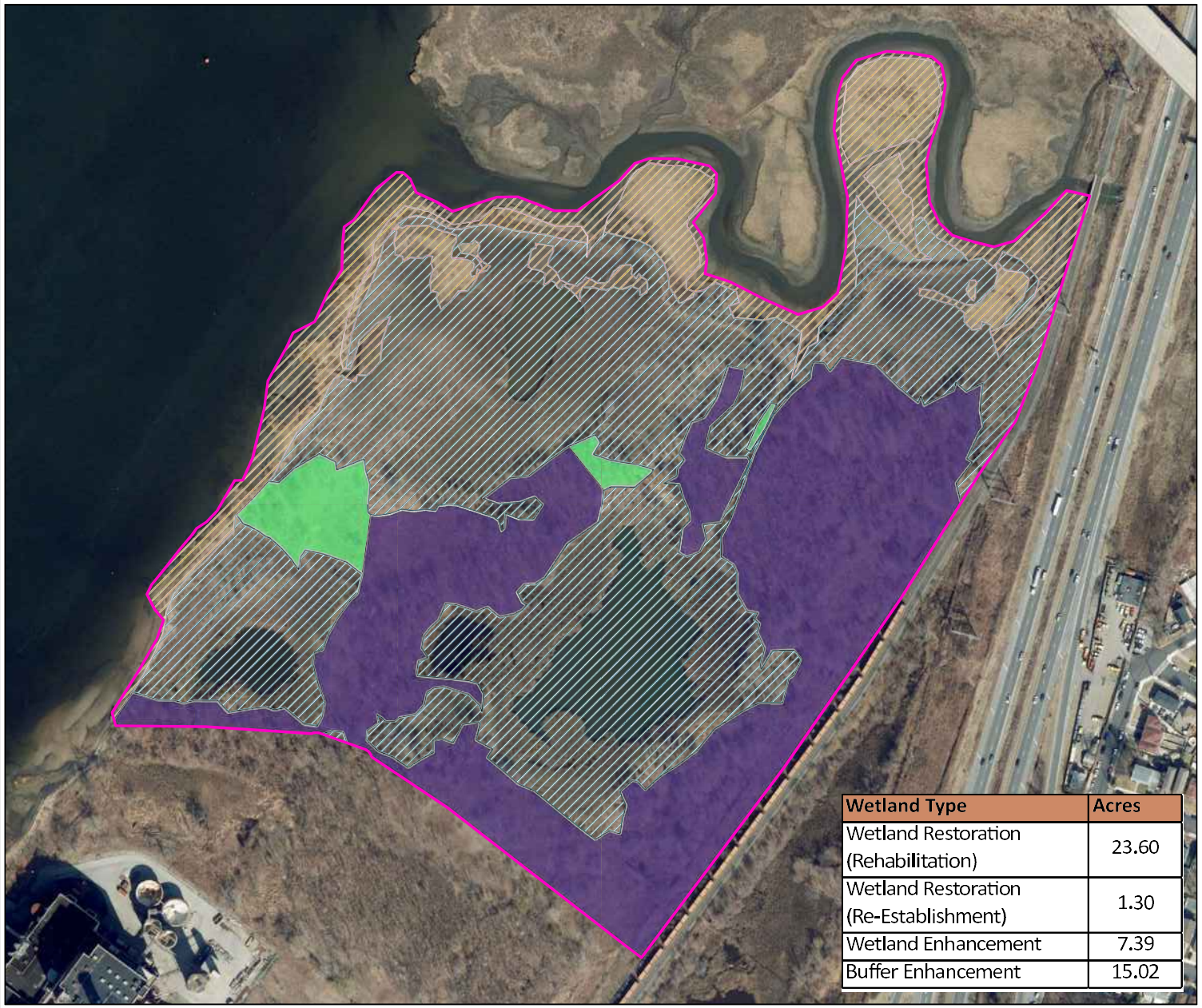

LEGEND:

- PROPOSED MITIGATION BANK BOUNDARY
- WETLAND RESTORATION (REHABILITATION)
- WETLAND RESTORATION (RE-ESTABLISHMENT)
- WETLAND ENHANCEMENT
- BUFFER ENHANCEMENT

Wetland Type	Acres
Wetland Restoration (Rehabilitation)	23.60
Wetland Restoration (Re-Establishment)	1.30
Wetland Enhancement	7.39
Buffer Enhancement	15.02

0 250 500 Feet

GRAPHIC SCALE

NOTES:
1.AERIAL IMAGERY ACCESSED VIA ESRI WORLD IMAGERY.

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CONCEPTUAL RESTORATION DESIGN PLAN

ARCADIS | FIGURE **A-5**

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Attachment A-1

Historic Aerial Photographs

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WETLAND MITIGATION BANK PROSPECTUS

HISTORICAL AERIALS

ARCADIS | ATTACHMENT A-1

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STATEN ISLAND, NY

WETLAND MITIGATION BANK PROSPECTUS

HISTORICAL AERIALS

ARCADIS | ATTACHMENT A-1

ARTHUR KILL POWER, LLC
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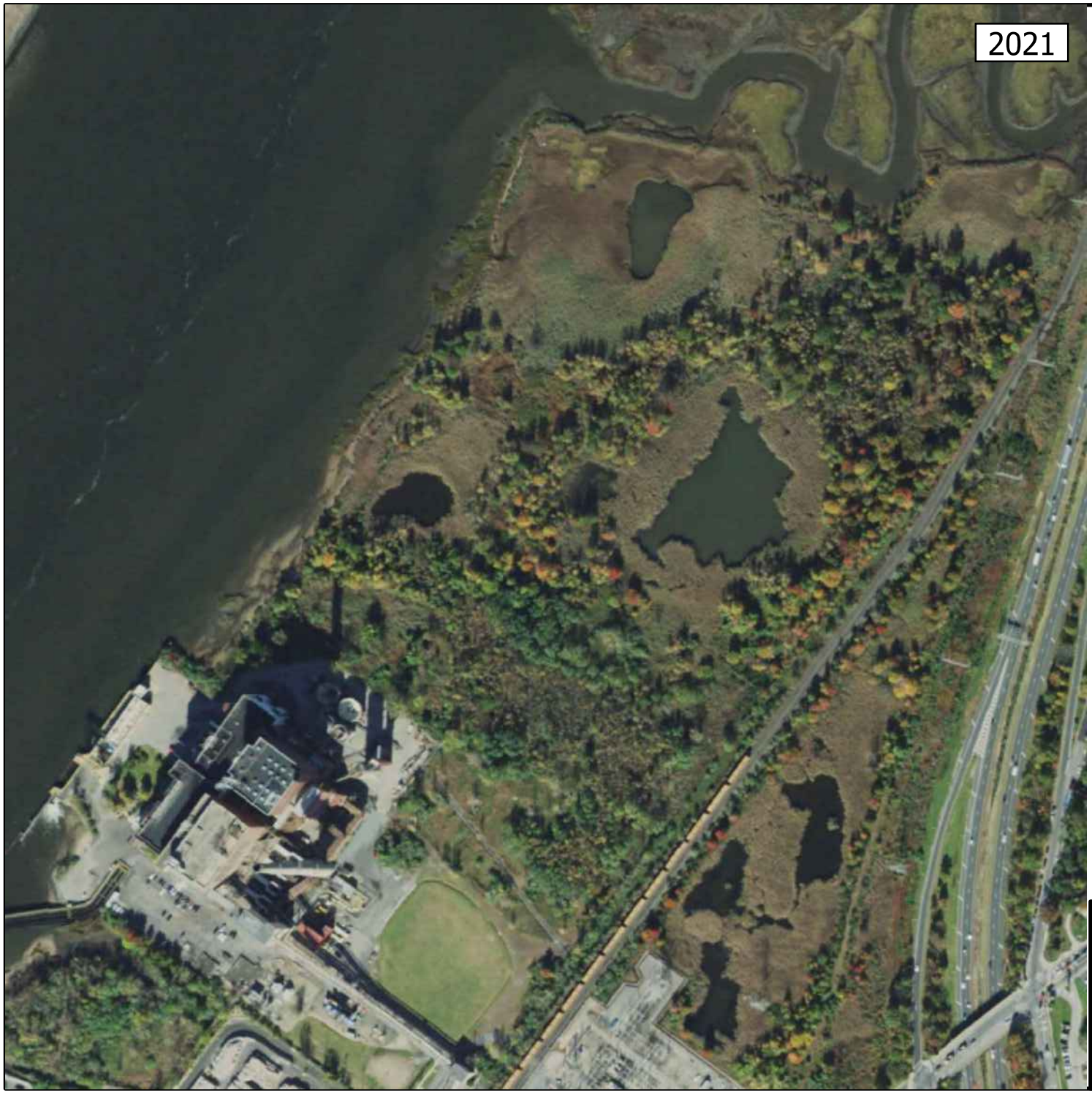
STATEN ISLAND, NY

WETLAND MITIGATION BANK PROSPECTUS

HISTORICAL AERIALS

ARCADIS

ATTACHMENT
A-1



ARTHUR KILL POWER, LLC
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STATEN ISLAND, NY

WETLAND MITIGATION BANK PROSPECTUS

HISTORICAL AERIALS

ARCADIS | ATTACHMENT **A-1**

Attachment A-2

NYSDEC Tidal Wetlands Maps

TIDAL WETLANDS MAP

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

MAP 556-494

INDEX MAP NUMBER 1

SCALE 1:2400

LEGEND

POLITICAL BOUNDARIES

WETLANDS CATEGORIES

Original Issue Date: 9/4/77.
Amended per Order of Robert F. Flacke, Commissioner
on 3/9/79
Deleted on FC

Original Date ... Issued 9/4/77
By Board of Commissioners ... Matthew J. Zagata

TIDAL WETLANDS MAP

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

MAP 506-494

INDEX MAP NUMBER 1

COPIES OF TIDAL WETLANDS MAPS AND INDEX MAPS ARE AVAILABLE FROM:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
9TH FLOOR, 2 WORLD TRADE CENTER
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POLITICAL BOUNDARIES

WETLANDS CATAGORIES:

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TIDAL WETLANDS MAP

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

MAP 566-453

INDEX MAP NUMBER 1

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POLITICAL BOUNDARIES

WETLANDS CATEGORIES

TIDAL WETLANDS MAP

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

MAP 568-492

INDEX MAP NUMBER 1

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LEGEND

POLITICAL BOUNDARIES

WETLANDS CATEGORIES