
The Mitigation and Restoration Strategies for Habitat and Ecological Sustainability (MARSHES) Initiative

**UMBRELLA MITIGATION BANK
New York City, New York**

PROSPECTUS

Submitted to:

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

Submitted by:

New York City Economic Development Corporation
Agent to The New York City Department of Small Business Services, acting as
Sponsor
New York, New York

Prepared by:

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MARSHES UMBRELLA MITIGATION BANK PROSPECTUS

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INTRODUCTION

This Prospectus is submitted by the New York City Economic Development Corporation (NYCEDC) acting on behalf of and as agent to the New York City Department of Small Business Services (the Bank Sponsor). NYCEDC is a New York not-for-profit corporation that performs a variety of economic development, urban planning and other services for the City of New York (City) pursuant to an agreement with the City. As a part of these services, NYCEDC is acting as the agent of the Bank Sponsor of the Umbrella Bank described in this Prospectus. All references herein to actions to be taken by the Bank Sponsor may be taken by NYCEDC on its behalf.

NYCEDC has engaged in an initiative with the City and State of New York to protect and enhance the City's coastal resources while fostering a sustainable waterfront. As part of the Mitigation and Restoration Strategies for Habitat and Ecological Sustainability (MARSHEs) initiative, NYCEDC on behalf of the City of New York developed the Saw Mill Creek Pilot Wetland Mitigation Bank (Pilot Bank) – the first Mitigation Banking Instrument (MBI) in New York City - as a means to facilitate both the long term improvement and protection of critical coastal resources, and to provide a predictable, efficient and environmentally responsible process to serve the compensatory mitigation needs of federal and state permit applicants in the Pilot Bank's geographical service area.

Building off the success of the Pilot Bank, NYCEDC, supported by WSP USA Inc. (WSP), in association with Mogensen Mitigation, Inc. (MMI) and ENGenuity Infrastructure, has prepared this Prospectus for the MARSHEs Initiative Umbrella Mitigation Bank (Umbrella Bank) in accordance with the *Final Rule for Compensatory Mitigation for Losses of Aquatic Resources* (Federal Register, Vol. 73, No. 70, April 10, 2008) and *Compensatory Mitigation for Losses of Aquatic Resources* (33 CFR PART 332).

This Prospectus is submitted to the U.S. Army Corps of Engineers – New York District (Corps), Chair of the Interagency Review Team (IRT), to formally initiate the planning and agency review process for the proposed Umbrella Bank. Information provided in this Prospectus will serve as the basis for developing the Umbrella Mitigation Banking Instrument (UMBI). The UMBI will contain the final Site Restoration Plan for the initial restoration site and will include location maps, a summary of existing conditions and reference sites, hydrologic analysis, design criteria and success criteria, and plans for construction, operation, monitoring and maintenance of the Umbrella Bank.

If undertaken, the proposed Umbrella Bank will include a Bank Service Area that includes all of New York City jurisdictions comprised of three separate Service Areas (Exhibit A, Service Area Map for Umbrella Mitigation Bank). The proposed initial restoration site to be developed under the Umbrella Bank is the Bush Terminal Pier 7 site (the Site). The Site is located at the Bush Terminal along the Brooklyn waterfront in Kings County, New York as shown on the U.S. Geologic Survey (USGS) topographic map of Arthur Kill, NY 7.5-minute quadrangle (see Attachment A). This restoration site is located in the Lower Hudson/Staten Island Service Area (Hydrologic Unit Codes (HUCS) 02030101 - Lower Hudson and 02030104 - Sandy Hook-Staten Island). The Site is owned by the City and has a central location in New York's Upper Harbor that would provide in-kind open water and state littoral zone mitigation for authorized pile repairs and other authorized projects in New York Harbor that frequently require mitigation for open water and littoral zone impacts.

I. OBJECTIVES OF THE PROPOSED UMBRELLA BANK

The main goal of the Umbrella Bank is to improve mitigation opportunities throughout New York City for unavoidable impacts to waters of the U.S., including wetlands, which result from activities authorized under Sections 404 and 401 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, New York State ECL Article 15, Title 5 (Protection of Waters), New York State ECL Article 25 (Tidal Wetlands); New York State ECL Article 24 (Freshwater Wetlands); New York Department of State Coastal Consistency Concurrence; New York State Environmental Quality Review Act (SEQRA); New York City Uniform Land Use Review Procedure (ULURP); NYC Department of City Planning Local Waterfront Revitalization Plan Compliance; and/or City Environmental Quality Review (CEQR) provided such activities have met all applicable requirements and are authorized by the appropriate authorities.

In furtherance of this main goal, the Bank Sponsor's objectives seek to provide economically efficient, environmentally sustainable, and flexible off-site compensatory mitigation opportunities for public entities and private permittees seeking to develop in accordance with all relevant Federal, State and local regulations. The Umbrella Bank would be established to provide a source of mitigation credits to compensate for wetland, open water and other aquatic resource losses anticipated by an authorized development located within one of three Service Areas serviced by the Umbrella Bank.

Other goals of the Umbrella Bank are the restoration and enhancement of wetlands, open waters, and other aquatic resources to provide a positive contribution to water quality, fish and wildlife habitat, flood attenuation, and erosion control. Site-specific objectives will be included in the final Site Development Plans for each separate Umbrella Bank Site. In general, the improvement of aquatic functions will result from the removal of debris/fill that poses a physical hazard to wildlife, removal of invasive plants, and the restoration of appropriate aquatic hydrology and habitat that supports water-dependent species. Attachment A of this Prospectus describes how the restoration of the initial Site (Bush Terminal Pier 7) will have a positive contribution to water quality, fish and wildlife habitat, flood attenuation, and erosion control and describes how the proposed work will result in an improvement in the aquatic functions of the Site.

The Umbrella Bank will also provide additional benefits, such as:

- Greater flexibility – provides a venue to complete a number of individual wetland and open water restoration projects of various sizes around the City's immediate waterways, reclaiming unused and degraded sites to restore their ecological functions and services to the benefit of NYC residents.
- Expands mitigation credit availability throughout NYC, reducing timelines to provide compensatory mitigation for critical infrastructure projects.
- Assists other federal, state and NYC agencies in meeting project goals and serve as an important pathway to finance restoration projects across the City.
- Provides a further tool for federal and state regulators to systematically track available environmental uplift on NYC's waterfronts and ensure successful environmental restorations.

This Prospectus describes a Wetland Umbrella Mitigation Bank composed of three Service Areas supporting, when fully functional, multiple independent sites, each developed following its own specific mitigation plan. Having multiple sites will provide a better dispersal of mitigation benefits to each Service Area, target the highest of quality sites and provide for additional services on a watershed scale. Using multiple sites will help make mitigation benefits be more local to the impacts.

II. ESTABLISHMENT AND OPERATION OF THE PROPOSED UMBRELLA BANK

A. ESTABLISHMENT OF THE UMBRELLA BANK

As agent to the Bank Sponsor, NYCEDC on behalf of the City of New York will work either directly or with other city agencies to restore, enhance, maintain and preserve emergent wetlands, scrub-shrub wetlands, forested wetlands, open water, mudflat habitat, other aquatic resources and/or uplands in accordance with the provisions of the UMBI (to be developed) and regulatory permits (to be obtained).

The proposed initial restoration site to be developed under the Umbrella Bank is the Bush Terminal Pier 7 site (the Site). The Baseline Conditions, Ecological Suitability, and Conceptual Design Report, presented in Attachment A, describes the existing conditions of the degraded Site, depicts the plan to improve the ecological functions and services of the Site, and summarizes the work intended to accomplish site-specific restoration and enhancement.

The Bank Sponsor will improve aquatic habitat functions and services (such as water quality, flood storage, fish and wildlife habitat), through the re-establishment, rehabilitation, enhancement or preservation of aquatic

resources or functions on a site-by-site basis. Each new Umbrella Bank Site will be authorized under a separate Site Development Plan.

Upon executing the UMBI, the Bank Sponsor will perform (or cause to be performed) all necessary work, in accordance with the provisions of the UMBI, applicable Site Development Plan and federal and state permits, to restore, enhance, maintain and preserve emergent marsh and other aquatic habitats, freshwater forested wetland habitat, and/or upland habitat until it is demonstrated to the satisfaction of the Corps and New York State Department of Environmental Conservation (NYSDEC), in consultation with the IRT, that each Umbrella Bank Site complies with all applicable requirements, or until all mitigation credits are debited from an individual Umbrella Bank Site's ledger, whichever is later. For each Umbrella Bank Site, the exact acreages of these habitat types will be determined once the site survey and design are completed by the Bank Sponsor and approved by the IRT. The mitigation credits associated with an Umbrella Bank site will be released for debiting in accordance with the credit generation schedule specified in the UMBI.

The Bank Sponsor will obtain (or cause its agents, contractors or partner agencies to obtain) all appropriate environmental documentation, permits or other authorizations required to establish, operate and maintain the Umbrella Bank Sites. This Prospectus does not fulfill the requirements of such permits or other authorizations, nor is it a substitute for such permits or other authorizations.

The Bank Sponsor will provide customary and appropriate financial assurances, or alternate mechanisms the Corps and NYSDEC in consultation with the IRT determine to be acceptable, to ensure a high level of confidence that each Umbrella Bank Site established under the Umbrella Bank will be successfully completed and protected in perpetuity. The details of these financial assurances will be provided in the UMBI.

B. OPERATION OF THE UMBRELLA BANK

After establishment of the Umbrella Bank, the Bank Sponsor will operate each Umbrella Bank Site in accordance with the site-specific monitoring and maintenance plan in the UMBI, when and where appropriate, the bank closure provisions in the UMBI, the applicable Site Development Plan, and site-specific regulatory permits to be approved by the Corps and the NYSDEC in consultation with the IRT. Each Umbrella Bank Site will be closed at the end of its operational life, which is 5 years from the date of the completion of construction tasks (as documented by an approved As-Built Plan) as well as successful completion of all performance standards (as documented by approved annual monitoring reports), or the date when all mitigation credits generated by the Umbrella Bank Site have been debited, whichever comes later. Following the closure of an Umbrella Bank Site, the Umbrella Bank Site will be maintained by the Bank Sponsor, its designee, the City of New York, or the property owner in accordance with the Long-Term Management provisions of the UMBI, as required. Each Umbrella Bank Site will be protected in perpetuity by restrictive covenants (such as a restrictive declaration executed by the City of New York and recorded against the land which contains relevant restrictive covenants) or by other appropriate methods to protect the Umbrella Bank Site in perpetuity.

Compensatory mitigation credits will be available for use by public agencies, private property owners, and any other permittees with in-kind permitted wetland/open water impacts in the Umbrella Bank's Service Area. A mitigation 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 functions at the site. The measure of aquatic functions is based on the resources restored or enhanced as agreed to by the Bank Sponsor and the Corps and NYSDEC, in coordination with the IRT.

Projects proposed for utilization of mitigation credits provided by the Bank Sponsor will be submitted to the Corps and/or NYSDEC for consideration, and in conjunction with the permitting for such projects. The utilization of mitigation credits from the Umbrella Bank to compensate for in-kind project impacts will be determined on a site and project specific basis by the Corps and/or NYSDEC during the permit review process.

The UMBI will provide that the Bank Sponsor is responsible for assuring the success of each Umbrella Bank Site's establishment activities and goals. The success of each Umbrella Bank Site will be measured by performance standards approved by the Corps and NYSDEC in consultation with the IRT, as set forth in the

Corps and NYSDEC permits, UMBI and applicable Site Development Plan. The standards will define the conditions under which an Umbrella Bank Site will be determined to be successful and will provide monitoring and maintenance requirements to identify and correct any deficiencies. An Umbrella Bank Site will be considered successful if the Bank Sponsor demonstrates to the Corps and NYSDEC that the appropriate areas have been restored and/or enhanced and the goals of the Umbrella Bank Site have been met. The UMBI will provide that after successful completion of each Umbrella Bank Site's planning, construction and monitoring tasks, the Bank Sponsor will notify the Corps and NYSDEC in writing requesting the release of associated mitigation credits. The Corps and NYSDEC, in consultation with the IRT, will confirm whether the applicable tasks are successfully completed for purposes of releasing credits generated from the Umbrella Bank Site.

C. SITE SELECTION

Site Selection Criteria will include factors contained in 33 CFR 332.3 (d)(1)-(3) and the following identified characteristics. A candidate site will be assessed in relation to these conditions. A site will be more likely to be deemed suitable as an Umbrella Bank Site when more criteria are met.

- A. The site will have potential for wetland/open water restoration, enhancement, establishment and/or preservation as referenced by 33 CFR 332.3 (a)(2) and regulated under Sections 401 and 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, New York State ECL Article 15, Title 5 (Protection of Water), New York State ECL Article 25 (Tidal Wetlands), and/or New York State ECL Article 24 (Freshwater Wetlands).
- B. For preservation parcels, the site is under threat from degradation in the next 20 years and contains both aquatic resources and healthy upland buffers and is not currently protected by a conservation easement.
- C. The project relating to the site will replace or protect those wetland and open water types lost in the NYC biophysical region.
- D. The site supports regional conservation initiatives.
- E. The site is feasible with respect to acquisition of surface and subsurface rights, construction, cost, achieving success, and meeting regulatory bank requirements.
- F. The site provides a wide selection of wetland and open water types and related functions and values, including habitat diversity.
- G. The project relating to the site has local support from municipalities, residents, and abutting landowners.
- H. The site is connected to, or in close proximity with, protected lands held by a stewardship organization or government entity in the interest of maintaining and preserving habitat connectivity.

D. ESTABLISHMENT AND USE OF CREDITS

The exact number of mitigation credits to be generated by an individual Umbrella Bank Site will be determined once the site survey, design, and functional assessments are completed by the Bank Sponsor and approved by the IRT. The mitigation credits generated by Umbrella Bank Sites will be transferred by the Bank Sponsor to other public agencies, private property owners, and any other permittees in the corresponding Service Areas provided such entities have met all applicable regulatory requirements, including avoidance and minimization, and the use of mitigation credits has been authorized by the appropriate agencies.

The UMBI will provide that mitigation credits generated by an Umbrella Bank Site will not be released for debiting until specific milestones associated with the Umbrella Bank Site's protection and establishment are

achieved as specified within the UMBI's credit release schedule. Release of credits will be authorized by the Corps and NYSDEC in consultation with the IRT. Use of credits will be determined during the permit review process by the permitting agency.

E. ASSESSMENT METHODOLOGY

The credits will be determined by the Corps and/or NYSDEC, in consultation with the IRT, and informed using a functional assessment methodology that the Corps and NYSDEC, in consultation with the IRT, determine to be appropriate. The functional assessment methodology will be provided in the UMBI. The anticipated methodology is the Evaluation for Planned Wetlands (EPW) or other approved method. The EPW functional assessment is a semiquantitative method that utilizes a scoring system for key attributes that contribute to a specific wetland or open water function. The assessment compares the functional capacity of wetlands in their baseline conditions with their proposed post-mitigation conditions.

The available credits will reflect the difference between before and after Umbrella Bank Site restoration as informed by the approved functional assessment methodology and approved by the Corps and NYSDEC, in consultation with the IRT.

F. SUCCESS CRITERIA

The Bank Sponsor will be responsible for assuring the success of Umbrella Bank Site establishment activities and goals. The success of an Umbrella Bank Site will be measured by performance standards approved by the Corps and NYSDEC, in consultation with the IRT, as set forth in the Corps and NYSDEC permits and the UMBI. The performance standards to be defined in the UMBI will establish the conditions under which an Umbrella Bank Site will be determined successful and provide monitoring and maintenance requirements. As will be provided in the UMBI, an Umbrella Bank Site will be considered successful if the Bank Sponsor demonstrates to the Corps and NYSDEC that the appropriate areas have been restored or enhanced and the site-specific goals have been met. After successful completion of each planning, construction and monitoring task, the Bank Sponsor will notify the Corps and NYSDEC and request the appropriate credit release in writing. In addition to the written notice, the Bank Sponsor will submit photographs of the completed project task along with a photo location map. The Corps and NYSDEC, in consultation with the IRT, will confirm whether the tasks are successfully completed for purposes of releasing credits.

G. CONDITIONS ON DEBITING

The UMBI will provide that prior to the transfer of any credits associated with an Umbrella Bank Site by the Bank Sponsor, the following requirements will be met: (1) the UMBI will be approved by the Corps and NYSDEC, in consultation with the IRT; (2) the mitigation plans for the Umbrella Bank Site will be approved by the Corps and NYSDEC, in consultation with the IRT; (3) customary and appropriate financial assurances satisfactory to the Corps and NYSDEC will be obtained; (4) all applicable regulatory permits and approvals will be secured by the Bank Sponsor; (5) the Umbrella Bank Site will be protected in perpetuity by a restrictive covenant (such as a restrictive declaration executed by the City of New York and recorded against the land) or by other appropriate methods to protect the Umbrella Bank Site in perpetuity and, (6) the UMBI will be signed by the Bank Sponsor, Corps and NYSDEC and any members of the IRT who choose to sign the UMBI.

III. PROPOSED SERVICE AREA

The proposed Umbrella Bank Service Area includes all areas within the New York City Municipal limits divided into three Service Areas. These Service Areas are proposed to provide off-site compensatory mitigation for authorized unavoidable impacts to waters of the United States and/or State waters, including wetlands, within defined watershed areas. The three Service Areas as depicted on the Service Area Map (Exhibit A) include:

- 1) The Lower Hudson/Staten Island Service Area, which includes the portions of the Lower Hudson River Basin, also known as Hydrologic Unit Code 06 (HUC06) 020301, that are within the New York City Municipal limits and includes portions of the following HUC08 subbasins: Lower Hudson (02030101) and Sandy Hook-Staten Island (02030104);
- 2) the Bronx/Northern Long Island Service Area, which includes the portions of the following HUC08 subbasins that are within the New York City Municipal limits: Bronx River (02030102), Long Island Sound (02030203), and Northern Long Island (02030201); and,
- 3) the Jamaica Bay/Southern Long Island Service Area, which includes the portions of the following HUC08 subbasins that are within the New York City Municipal limits: Southern Long Island (02030202), Mullica-Toms (02040301), and Sandy Hook-Staten Island (02030104).

Typically, the UMBI will limit the use of a specific Umbrella Bank Site's mitigation credits to the same Service Area in which the authorized impacts occur. However, if no Umbrella Bank Site credits are available in the Service Area in which the impact occurs, the mitigation credits from an Umbrella Bank Site located in another Service Area may be considered, if the project impacts meet the following requirements:

1. No practical or more ecologically beneficial on-site mitigation alternatives are available that meet all of the mitigation requirements;
2. No practical or more ecologically beneficial off-site mitigation alternatives are available within the Service Area where impacts occur that meet all of the mitigation requirements; and
3. There are no other approved mitigation banks with available credits in the Service Area where the impacts occur.

Within the Service Area of each Umbrella Bank Site, any approved unused mitigation credits should be the preferred mitigation option for authorized impacts. Decisions authorizing use of mitigation credits generated by an Umbrella Bank Site will be made by the Corps and/or NYSDEC on a case-by-case basis during the permit review process. Mitigation credits will be used to compensate for lost, in-kind functions within the same service area as the impacts to the maximum extent practical.

IV. NEED FOR AND TECHNICAL FEASIBILITY

A. NEED FOR UMBRELLA BANK

At the current time, the Pilot Bank is the sole mitigation bank within New York City and has a limited supply of mitigation credits available, with the primary service area covering only a portion of New York City watersheds. In the context of climate change, the need for coastal resiliency infrastructure, emerging energy potentials such as offshore wind to mitigate climate change, and aging legacy waterfront infrastructure, there continues to be a strong need for compensatory wetland mitigation by public agencies, private property owners, and any other permittees both within and outside of the Pilot Bank's primary service area. In addition, there are multiple sites within New York City in need of restoration, enhancement and protection that have the potential to serve as Umbrella Bank Sites. These sites could generate some of the needed mitigation credits within each Service Area of New York City. Establishing an Umbrella Bank is the most efficient means to ensure sufficient mitigation credits are available to support future resiliency and waterfront infrastructure projects throughout New York City now and into the future. It also minimizes costly delays to waterfront infrastructure project implementation. Based on a detailed review of available data, there appears to be a sufficient need for wetland mitigation credits from projects within the proposed Service Areas to make the Umbrella Bank economically viable.

B. TECHNICAL FEASIBILITY OF UMBRELLA BANK

It is technically feasible and environmentally desirable to restore proposed sites in New York City under an Umbrella Bank. There are multiple sites in need of restoration within the Bank Service Area that support the development of the Umbrella Bank.

V. OWNERSHIP AND LONG-TERM MANAGEMENT OF UMBRELLA MITIGATION BANK SITES**A. OWNERSHIP**

NYCEDC, on behalf of the City of New York, will establish an umbrella wetland mitigation bank and act on behalf of the Bank Sponsor for the proposed Umbrella Bank Sites. For each Umbrella Bank Site, the Bank Sponsor will develop a conceptual plan to enhance and restore habitat on the site. Title to the site will be held by New York City and will remain in New York City's name after the Umbrella Bank Site is established.

Bank Sponsor's Agent Contact Information:

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With a copy to: New York City Economic Development Corporation, Attn: General Counsel, One Liberty Plaza, New York, NY 10006; Phone: 212-619-5000

With a copy to Sponsor: New York City Department of Small Business Services, Attn: Anthony Dell'Olio, One Liberty Plaza, New York, NY 10006; Phone: 212-513-6300, e-mail: Adellolio@sbs.nyc.gov

B. MAINTENANCE PROVISIONS

Sites within the Umbrella Bank will be designed to create natural aquatic and semi-aquatic ecosystems. Some active management and maintenance is anticipated to ensure the viability and sustainability of the Umbrella Bank Sites. The Bank Sponsor will perform all necessary work to maintain the Umbrella Bank Sites in a manner that is consistent with the maintenance criteria established in the UMBI until closure of the Umbrella Bank Site. Upon closure of an Umbrella Bank Site, the long-term land steward will implement the management requirements established in the long-term management plan. Deviation from the approved maintenance plan is subject to review and written approval by the Corps and NYSDEC following consultation with the IRT.

C. MONITORING PROVISIONS

The Bank Sponsor will perform necessary work to monitor the Umbrella Bank Sites to demonstrate compliance with the success criteria established in the UMBI, and any regulatory permits, for up to 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 mitigation credits are debited by the Bank Sponsor, whichever comes later. The monitoring period will begin one full calendar year after the completion of any planting activities (e.g., if the planting is completed in spring 2023, the first monitoring event would occur in spring 2024). The Bank Sponsor will provide annual monitoring reports to the Corps and NYSDEC on the long-term success of the Umbrella Bank Site and to identify any problems requiring corrective action by December 31st of each calendar year.

D. REPORTS

The UMBI will provide that the Bank Sponsor will submit to the Corps and NYSDEC, for distribution to the IRT, as-built grading and planting plans demonstrating establishment activities and a post-construction report within 60 days after the date of completion of construction activities for each Umbrella Bank Site. The as-built drawings and report will include all aspects of the final grading elevations and planting arrangements

of each Umbrella Bank Site. In addition, the Bank Sponsor will submit to the Corps and NYSDEC, for distribution to the IRT, an annual monitoring report on the status of the establishment activities, prepared during the growing season, no later than December 31st of each of the five years following completion of the restoration activities of such Umbrella Bank Site, in accordance with the permits.

E. ACCOUNTING PROCEDURE

The UMBI will provide that the Bank Sponsor will submit a Ledger statement to the Corps and NYSDEC each time mitigation credits are debited or additional credits are approved for release. If requested, the Corps may distribute the statement to other members of the IRT or the public. The Bank Sponsor will submit an annual ledger to the Corps and NYSDEC for distribution to all members of the IRT, showing all mitigation credit transactions relating to the Umbrella Bank for the previous year. All ledger submittals will include Corps and/or NYSDEC permit numbers as applicable.

F. CONTINGENCY PLANS/CORRECTIVE ACTIONS

The UMBI will provide that should any report submitted by the Bank Sponsor to the Corps and NYSDEC note conditions requiring corrective action, the Bank Sponsor will determine the cause of the condition, in consultation with the Corps and NYSDEC and the IRT. Prior to commencing corrective actions, the Bank Sponsor will submit a detailed Adaptive Management Plan (AMP) proposal for such a corrective action to the Corps, NYSDEC, and IRT for review and approval within 60 days of a determination by the Corps and NYSDEC, in consultation with the IRT, that corrective measures are warranted. Once the AMP is approved by the Corps and NYSDEC, in consultation with the IRT, the Bank Sponsor will undertake such corrective action and will, upon completion, submit to the Corps and NYSDEC a summary of the work performed. Should corrective actions not be implemented as determined by the Corps and NYSDEC, the release of mitigation credits may be withheld and/or mitigation credit sales may be suspended until the corrective action is implemented.

G. LONG-TERM MANAGEMENT

The UMBI will provide that the Bank Sponsor will conduct maintenance and monitoring of each Umbrella Bank Site for its operational life. Each Umbrella Bank Site will be closed at the end of its operational life, which is up to 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 debited by the Bank Sponsor, whichever comes later. The UMBI will include a long-term management plan that describes the long-term management activities to be conducted by the long-term land steward, and the maintenance financial surety for the management activities. Each Umbrella Bank Site will be protected in perpetuity by a restrictive covenant (such as a restrictive declaration executed by the City of New York and recorded against the land) or by other appropriate methods to protect the Umbrella Bank Site in perpetuity.

VI. BANK SPONSOR TEAM QUALIFICATIONS

The Bank Sponsor Team, including NYCEDC, has previously been involved in wetland restoration projects in New York City, such as the Saw Mill Creek Pilot Wetland Mitigation Bank, the Randall's Island Urban Salt Marsh and Freshwater Wetland Restoration Project, Jamaica Bay Marsh Island Restoration Projects (Elders Marsh and Yellow Bar Hassock), Ecology Park in Paerdegat Basin, Pugsley Creek Park, and Soundview Park. The City of New York, through NYCEDC, has retained consultant services from WSP USA, Inc. (WSP) and Mogensen Mitigation, Inc. (MMI) on this project to prepare a UMBI and to establish the first UMBI site at Bush Terminal Pier 7. Both WSP and MMI have successfully established mitigation banks and efficiently transferred credits to satisfy permit-related mitigation requirements.

VII. ECOLOGICAL SUITABILITY AND WATER RIGHTS**A. ECOLOGICAL SUITABILITY AND BASELINE CONDITIONS**

For each Umbrella Bank Site, NYCEDC will provide the IRT with an assessment of the ecological suitability and baseline conditions for the proposed mitigation site. Information on the first Umbrella Bank Site, Bush Terminal Pier 7, collected thus far documenting the baseline conditions for the Umbrella Bank Site, including physical, chemical, and biological characteristics, are presented in Attachment A: Site Development Concept Plan. All information collected to date indicates that the Bush Terminal Pier 7 site is ecologically suitable for establishing an Umbrella Bank Site.

B. WATER RIGHTS

For each Umbrella Bank Site, NYCEDC will provide the IRT with an assessment of the water rights for the proposed mitigation site. Additionally, for each Umbrella Bank Site, predicted hydrology will incorporate anticipated sea level rise (SLR) impacts into design plans to help ensure long-term success while minimizing adverse consequences of SLR.

Sufficient water rights exist to support the long-term sustainability of the first Umbrella Bank Site, Bush Terminal Pier 7. The Umbrella Bank Site will be supported by tidal waters primarily from the Upper New York Bay which are publicly owned. Details on the proposed hydrology of the first Umbrella Bank Site are provided in Attachment A.

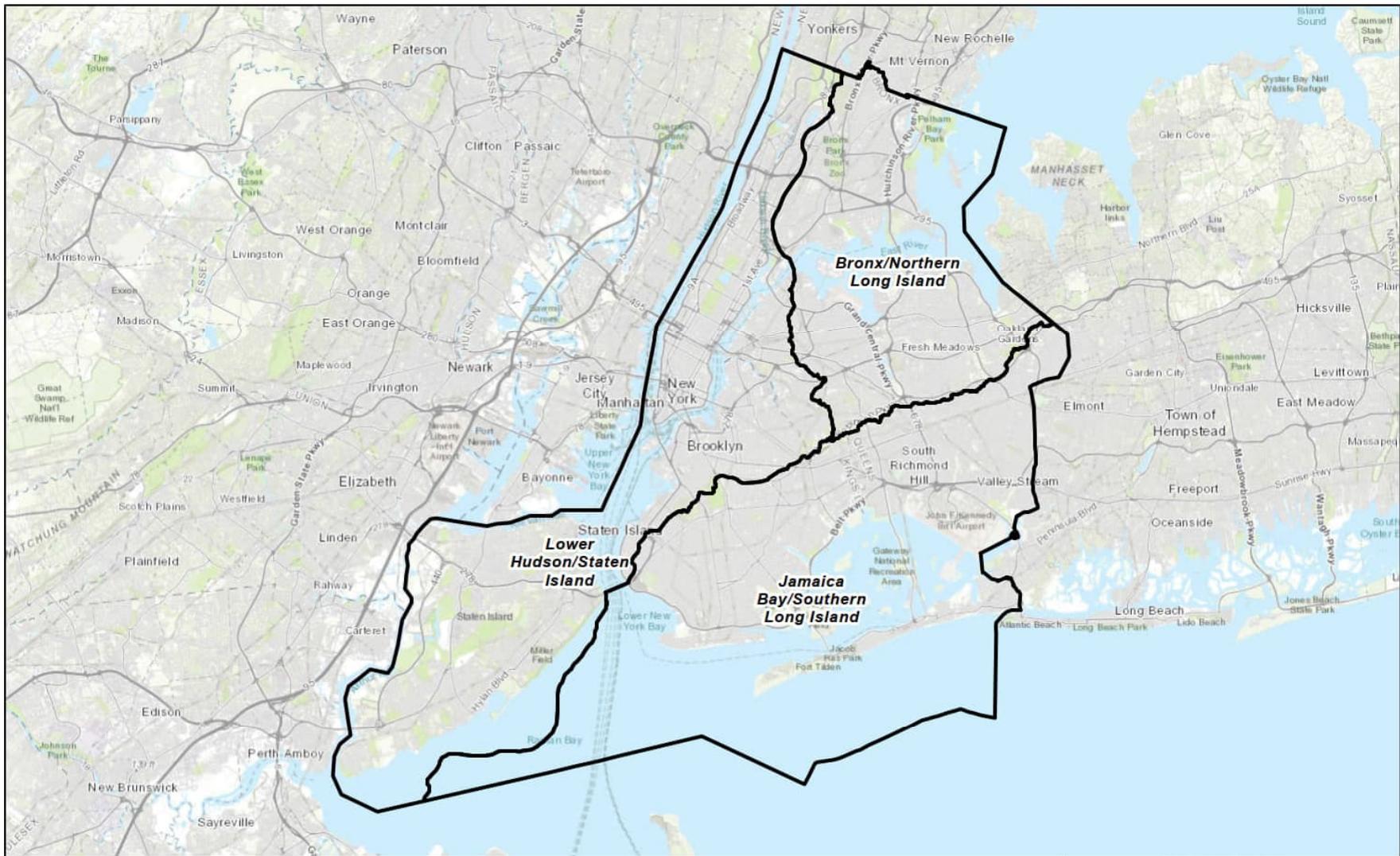
VIII. EXHIBITS

Exhibit A - Service Area Map for Umbrella Mitigation Bank, is included as an attachment to this Prospectus.

EXHIBIT A

SERVICE AREA MAP

UMBRELLA MITIGATION BANK



 Service Area

Lower Hudson/Staten Island: HUC 02030101 - Lower Hudson, 02030104 - Sandy Hook-Staten Island
 Bronx/Northern Long Island: HUC 02030102 - Bronx, 02030201 - Northern Long Island, 02030203 - Long Island Sound
 Jamaica Bay/Southern Long Island: HUC: 02030202 - Southern Long Island, 02040301, Mullica-Toms - 02030104, Sandy Hook - Staten Island

Sources:
 ESRI, World Topography Imagery Service.
 USGS, Hydrologic Unit Code (HUC8).



NYC/EDC

Exhibit A
Service Areas
 MARCHES Umbrella Mitigation Bank



January 2024

**ATTACHMENT A:
SITE DEVELOPMENT CONCEPT PLAN**

**BUSH TERMINAL PIER 7
BASELINE CONDITIONS, ECOLOGICAL
SUITABILITY, AND CONCEPTUAL DESIGN
REPORT**

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APPENDICES

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BUSH TERMINAL PIER 7

BASELINE CONDITIONS, ECOLOGICAL SUITABILITY, AND CONCEPTUAL DESIGN REPORT

The purpose of the MARSHES Umbrella Mitigation Bank (the Umbrella Bank) is to provide aquatic ecosystem restoration at degraded sites in New York City while also providing viable mitigation options for public and private projects located within the Umbrella Bank's Geographic Service Area. The proposed initial restoration site to be developed under the Umbrella Bank is the Bush Terminal Pier 7 site (the Site) in Brooklyn, New York. Mitigation credits will be used to compensate for lost, in-kind functions within the same Service Area as the impacts to the maximum extent practical.

The approximately five-acre Site is the most northern of the Bush Terminal Piers located near 39th Street and 1st Avenue in Brooklyn, Kings County, New York (see **Figure 1** – Site Location). The Site is situated in Upper New York Bay, along the north end of the Bay Ridge Channel, near the mouth of Gowanus Bay. As depicted on **Figure 2**, the site is located in the Lower Hudson/Staten Island Service Area (Hydrologic Unit Codes (HUCS) 02030101 - Lower Hudson and 02030104 - Sandy Hook-Staten Island). **Figure 3** shows an aerial view of the Site. Pier 7 was constructed in 1905 as a steel sheet pile cutoff wall with a soil fill core topped by concrete decking and surrounded by a perimeter high-level pile-supported timber platform/apron. The pier appears to have been unused since the 1970s. The timber aprons and concrete decking on both sides of the pier have collapsed. Much of the sheet pile bulkhead has deteriorated and collapsed, resulting in erosion of the soil fill core between the bulkhead and the remaining earthen portions of the pier. In 2010, approximately 15,600 square feet of timber decking and concrete planks were removed to create or uncover littoral zone tidal habitat as part of mitigation for impacts from dredging activities at the New York City Police Department Harbor Unit's Randall's Island Repair Shop. The pier currently remains deteriorated and nonfunctional. Photographs documenting the current conditions at the Site are provided in **Appendix A**.

It is anticipated that the restored Site will provide the following functions and services:

- Improved water quality,
- Improved sediment quality and management,
- Increased littoral zone habitat,
- Improved shoreline protection, and
- Enhanced fish and wildlife habitat.

1.0 PHYSICAL CHARACTERISTICS

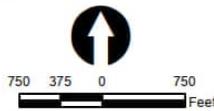
1.1 Geology and Geomorphology

The Site is located within the Atlantic Coastal Plain Physiographic Province. The Atlantic Coastal Plain is a very gently sloping land surface near the eastern edge of North America. It is part of a continuous surface which extends offshore; the underwater section is called the continental shelf (Isachsen et al 2000). Overall, gradients of the seabed are low (less than 10%), but locally steeper gradients may exist along the slopes of dredged navigation channels or other dredged areas in the harbor.

The last glacial period shaped the prominent landforms of the New York Harbor. In particular, the Harbor Hill Moraine, which forms the backbone of Long Island, extends westward to Staten Island; the moraine was later breached by The Narrows. North of the moraine, the melting ice sheet deposited glacial till, containing poorly sorted clay, silt, sand, gravel, rocks, and boulders. South of the moraine, thick layers of sand and gravel were



 Site Boundary



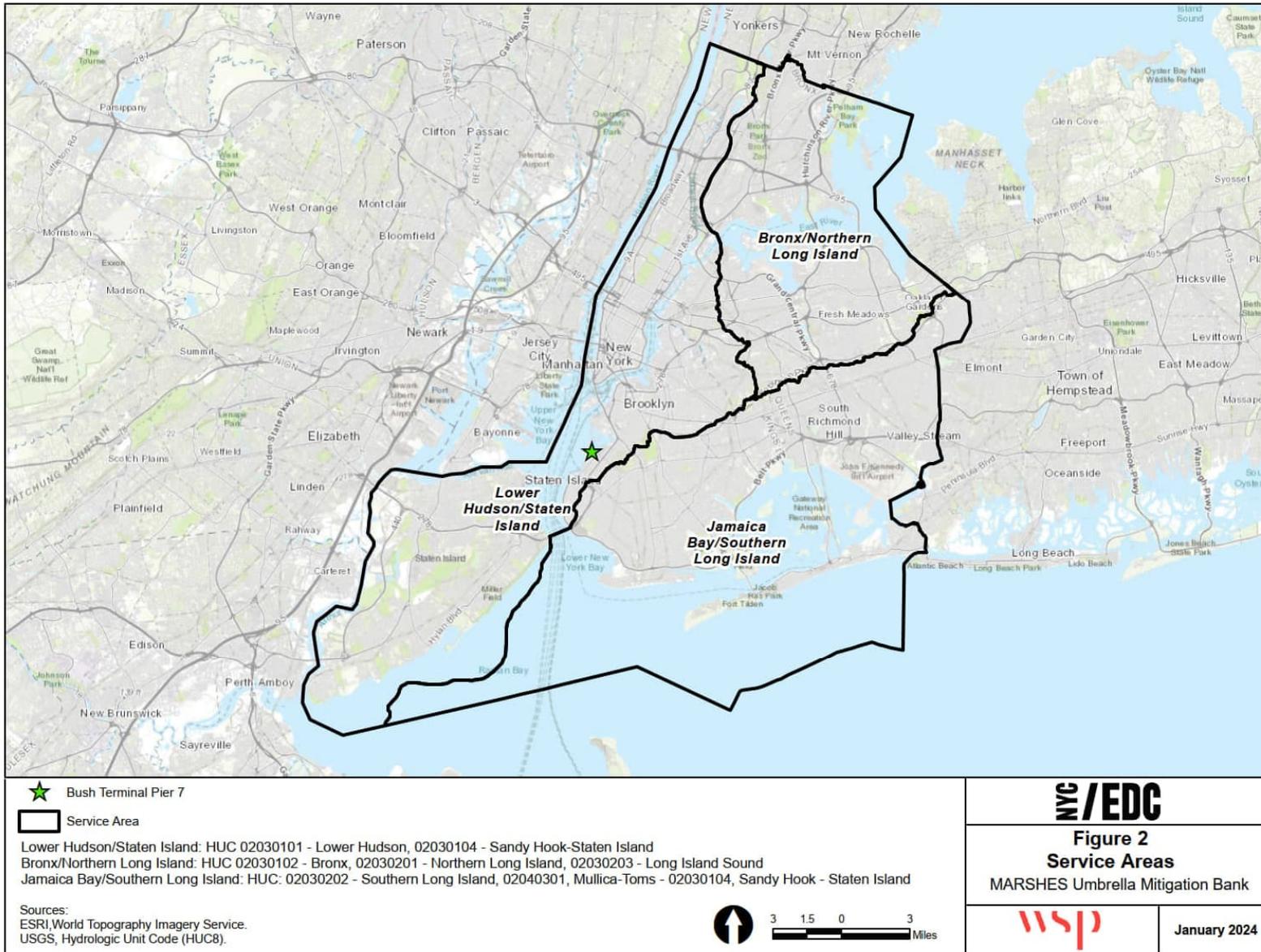
Sources:
ESRI, USGS Topo Map Service.
Site falls within Jersey City, NJ
Quadrangle.

NYC/EDC

Figure 1
Site Location
MARSHES Umbrella Mitigation Bank
Bush Terminal Pier 7



January 2024





deposited at least 65 feet thick (Bokuniewicz and Fray 1979). Following the retreat of the ice sheet, sea level rose, and tidal conditions were established in the harbor. The Hudson River formed, carrying fine-grained sediment into the harbor area. The Upper New York Bay contains sediments that are generally over 200 feet thick (USACE 2004). Sediment texture samples collected from benthic grabs along the Sunset Park Waterfront in the vicinity of the Site were composed predominantly of more than 93% silt and clay (NYSDEC 2015).

1.2 Hydrology

New York Harbor is flushed by tides from the Atlantic Ocean and from Long Island Sound as well as by flow from the Hudson River. Diurnal tides provide a 1 to 2 meter (3 to 6 feet) tidal range in the waters throughout the Upper Bay (O'Neil et al 2016). Tidal data was taken from the nearby NOAA The Battery, New York Harbor gauge (Station ID: 8518750) and adjusted for NAVD88 datums. Mean high water level at the site is 1.96 feet, with a mean higher high water level (spring high tide) of 2.28 feet above mean sea level. Mean low water is -2.57 feet and mean lower low water is -2.77 feet.

1.3 Soils

The U.S Department of Agriculture (USDA), Natural Resources Conservation Service, Web Soil Survey (USDA 2021) indicates that soils within the Site consist of two soil mapping units: Urban land, sandy substratum, 0 to 3 % slopes (UsA) and Water (see **Figure 4 – Soils**). The major component of the UsA mapping unit is Urban land, a miscellaneous category. Miscellaneous areas are map unit components that have little or no identifiable soil or are bodies of soil that are heavily disturbed and/or contaminated. Urban land is land covered by pavement, buildings, storage tanks, bridges and other impervious, human-manufactured surfaces, and structures. Minor components of the UsA mapping unit consist of Breeze (5%), Bigapple (1%), Hooksan (1%), and Verrazano (1%) components. None of the minor components are hydric soils. The Water map unit is a miscellaneous area that includes streams, lakes, ponds, and estuaries more than about 2.5 meters deep or less than 2.5 meters deep and lacks either distinguishable horizons or rooted vegetation in the bottom sediment.

2.0 CHEMICAL CHARACTERISTICS

2.1 Water Quality

The Upper New York Bay waters are classified by New York State as Class I (marine waters) which indicates a best usage for secondary contact recreation and fishing. Class I waters are suitable for fish, shellfish, and wildlife propagation and survival. The Upper New York Bay (waterbody segment 1701-0022) is listed as an Impaired Segment on the Final 2018 Section 303(d) List of Impaired/TMDL Waters. The segment is listed in Part 2b - Multiple Segment/Categorical Waterbody Segments Impaired due to Fish Consumption Advisories due to dioxin, PCBs, and other toxics resulting from contaminated sediments.

Salinity at the Site measured by WSP with a refractometer during low tide on March 30, 2022 was 21 ppt. Salinity measurements taken during fish surveys of the Upper Bay of New York Harbor/Hudson River estuary varied from 3 to 26 parts per thousand (ppt), temperature ranged from 2.0 to 25.5°C (35.6 to 77.9°F), and bottom dissolved oxygen levels ranged between 2.8 to 3.8 milligrams per liter (mg/l) during the stratified spring and summer periods (USFWS 1997).

According to the 2021 NY/NJ Harbor and Estuary Program Harbor-Wide Water Quality Monitoring Report dissolved oxygen (DO) measurements in both surface and bottom waters of the Lower Hudson River and Upper New York Bay varied between 5.4 milligrams per liter (mg/L) to 6.7 mg/L. All samples were observed to be higher than the NYSDEC (Water Class 6 CRR-NY 703.3 & 6 CRR-NY 703.4) minimum criteria for DO of less than 5.0 mg/L. In general, fish in both regions are not stressed by measured DO levels. In the Upper New York Bay, the geometric mean of sampled pathogenic bacteria, fecal coliform, showed compliance in NY Class 1 and



NJ Class SE2 waters ranging from 1 cfu/100mL to 14,000 cfu/100mL over the eight-year period between 2010-2017. The geometric mean of *Enterococcus* ranged from 1 cfu/100mL to 40.1 cfu/100mL, where the mean should not exceed 35 cfu/100mL. Overall, within the eight year period the average geomean was 4 cfu/100 mL. Measurements for total nitrogen in the Upper New York ranged between 0.56 and 1.15 mg/L. Observed nitrogen levels between 0.4 and 1.2 mg/L is indicative of fair conditions, and water quality would improve with nitrogen levels equal to or below 0.4 mg/L. Additionally, Chlorophyll-a in this region has shown decreasing values since 2010. Concentrations of 5 µg/L or below support healthier habitats for fish survival and propagation, while concentrations at or above 20 µg/L increase algal growth (NYNJHEP 2021).

2.2 Sediment Quality

A long history of pollution prior to the Clean Water Act resulted in contaminated sediments in the Upper New York Bay (NYNJHEP 2021). A Phase I Environmental Site Assessment (ESA) for the Site was conducted in March 2022. Based on the data obtained during a site inspection, interviews, historical resources review and regulatory agency records review, the ESA identified the following Recognized Environmental Conditions (RECs) in connection with the Site:

- The presence of potentially contaminated fill material across the Site;
- The historical industrial use of the Site, including the use as an oil refinery;
- The potential for contamination related to a historical rail spur along the norther boundary of the Site;
- The potential for impacts to the subsurface from releases from an underground storage tank reportedly present on the eastern portion of the Site;
- Petroleum staining and odor noted on the sand and riprap portions along the northern and southern sides of the former pier structure;
- The presence of known contamination on the east adjoining property historically operated as a Power House which included a coal pocket and ash pocket and incinerator with rail spur lines;
- Open spill case at adjoining property;
- Groundwater contamination at adjoining property;
- Historical gas station and industrial operations at adjoining properties.

A Phase II ESA will be conducted to investigate and identify the extent, depth, and physical characteristics of potentially contaminated soils or sediments associated with the RECs identified during the Phase I ESA.

3.0 BIOLOGICAL CHARACTERISTICS

A Biological Resources Survey of the Site and a nearby Reference Site was conducted to assist with the restoration design. The survey includes a literature review and on-site assessments to identify and document fish and wildlife species, habitat and natural communities; and evaluate the suitability of habitat for special status species. The Reference Site is an approximately five-acre area of open water and planted emergent marsh within the northern portion of Bush Terminal Piers Park, located approximately 1,500 feet south of the Site, at Marginal Street between 44th & 50th Street in Brooklyn. This park was formerly a port complex that was remediated and opened as a public park in 2014. Two tidal ponds were created between Pier 3 and Pier 4. *Spartina alterniflora*-dominated emergent marsh, planted in 2014, occurs along the southern shoreline of the tidal ponds. The remainder of the tidal pond shorelines are lined with riprap. The Reference Site was selected because it is near the Site, has a similar orientation within the same waterbody, and contains potential target habitats proposed for the restored Site. The Biological Resources Survey Report will be included in the UMBI. Information gathered during the Biological Resources Survey was used to inform the description of biological characteristics of the Site described below.

3.1 Wetlands and Waters of the U.S.

Figure 5 depicts United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) wetlands and NYSDEC Tidal Wetlands mapped within and adjacent to the Site. NWI maps the area surrounding the pier as Estuarine, Subtidal, Unconsolidated Bottom (E1UBL) based upon the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979). NYSDEC maps the entire Site as Littoral Zone. According to NYSDEC tidal wetland regulations, all lands permanently under tidal waters extending seaward from shore to a depth of 6 feet at mean low water are considered Littoral Zone. For design considerations, jurisdictional wetlands/waters within the Site were delineated using the mean higher high water (MHHW) line, which is 2.28 feet above mean sea level (NAVD 88). **Table 1** provides a summary of aquatic resources within the Site. Based on the MHHW line delineation depicted on **Figure 5**, there are approximately four acres of intertidal and subtidal waters on the site. Intertidal areas within the Site consist primarily of a substrate composed of rubble, including bricks, concrete of various sizes, and stone interspersed with sand and other materials in the lower and mid intertidal zone with sand in the upper intertidal zone. Subtidal areas surround the pier, below mean low water where the substrate is permanently flooded with tidal water.

Table 1. Aquatic Resource Summary

Site	Latitude (decimal degrees)	Longitude (decimal degrees)	Easting (NY State Plane ft)	Northing (NY State Plane ft)	Estimated Amount of Aquatic Resource in Review Area (acres)
Bush Terminal Pier 7	40.657776	-74.016807	979535.284158	178964.618301	4.04

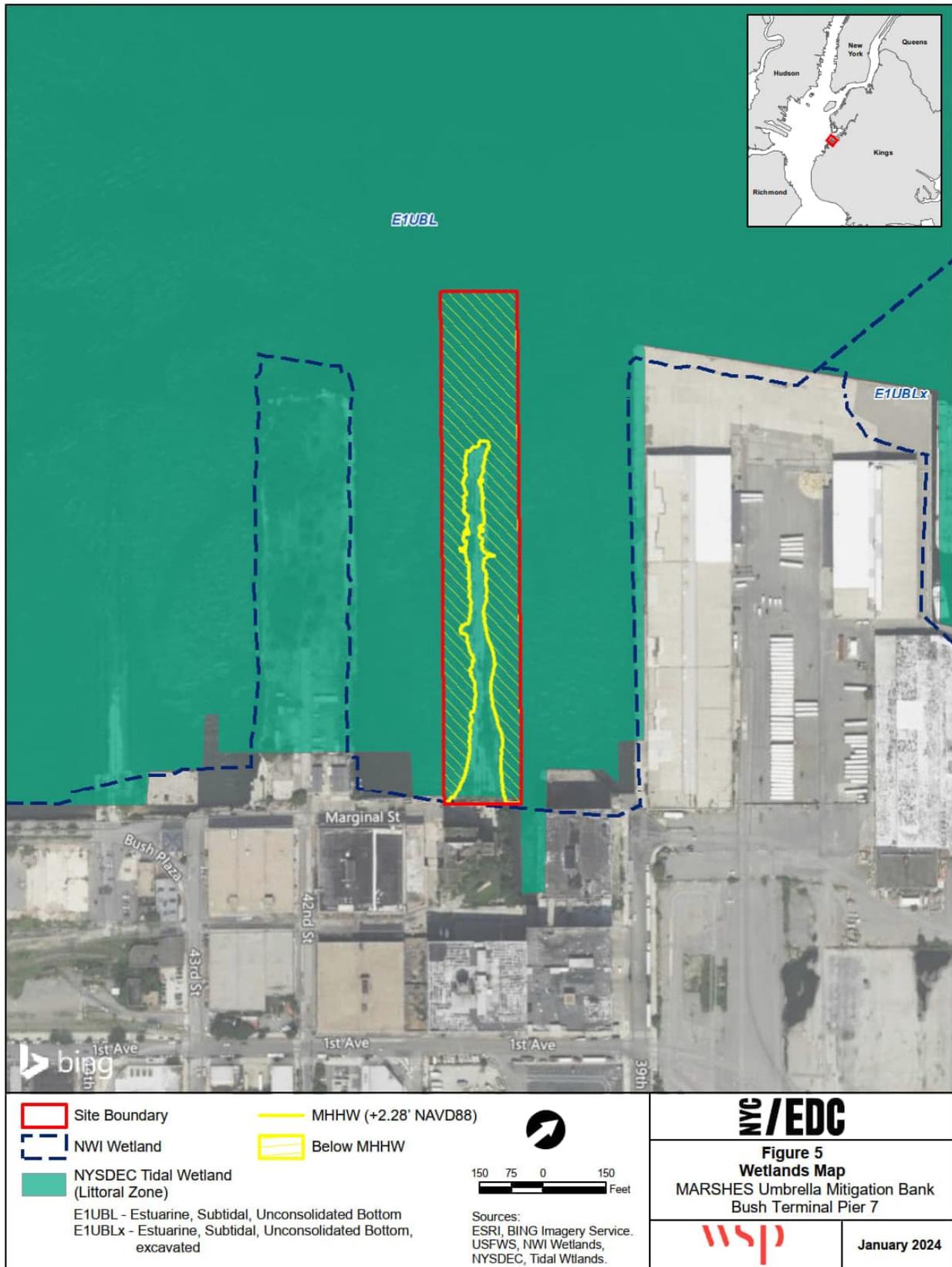
3.2 Vegetation

No rooted, vascular vegetation is present within the intertidal and subtidal areas. On October 7, 2022, biologists performed a survey for submerged aquatic vegetation (SAV) along the south shore of the pier in response to a NYCEDC overview map of the area that indicated the potential presence of SAV here. The source of the SAV polygon on the map is unknown at this time and no other known sources indicate the presence of SAV in this area. Based on visual and underwater video observations, there was no SAV present within the area surveyed. A memo documenting the SAV survey is included as **Appendix B**. Marine algal species, primarily rockweeds (*Fucus vesiculosus*, *F. spiralis*) are abundant in the lower and mid intertidal zone. Irish moss (*Chondrus crispus*), hollow green weed (*Enteromorpha intestinalis*), sea lettuce (*Ulva lactuca*), red weed (*Agardiella subulata*), and *Spermothamnion repens* were observed in the lowest elevations of the intertidal zone and in the shallow subtidal waters.

The upland portions of the pier that have gaps between concrete slabs contain opportunistic plant species including common reed (*Phragmites australis*), aster (*Symphyotrichum*), Whitlows grass (*Draba verna*), common mugwort (*Artemisia vulgaris*), poison ivy (*Toxicodendron radicans*), Japanese knotweed (*Polygonum cuspidatum*), sneezeweed (*Helenium*), seaside goldenrod (*Solidago sempervirens*), blackberry (*Rubus*), Virginia creeper (*Parthenocissus quinquefolia*), Japanese honeysuckle (*Lonicera japonica*), smooth sumac (*Rhus glabra*) and occasionally small trees (less than 6-inch DBH) consisting tree-of-heaven (*Ailanthus altissima*), black locust (*Robinia pseudoacacia*), black cherry (*Prunus serotina*) and a single cottonwood (*Populus deltoides*).

3.3 Fish and Wildlife Habitat

Wildlife species observed at the Site during field investigations include brant (*Branta bernicla*), Canada goose (*Branta canadensis*), gadwall (*Mareca strepera*), common merganser (*Mergus merganser*), bufflehead



(*Bucephala albeola*), and various gulls (*Larus* spp.) including ring-billed gull (*Larus delawarensis*) in the bay waters surrounding the former pier. Raccoon (*Procyon lotor*) tracks were observed and feral cats are expected to frequent the Site, as a colony is present nearby. Eastern mud snail (*Nassarius obsoletus*) and mud crab (*Rithropanopeus harrisi*) were observed on the substrate in the intertidal zone. Bryozoans and barnacles, likely northern rock barnacle (*Semibalanus balanoides*), were observed along the wooden pilings, rocks, and boulders. Eastern oysters (*Crassostrea virginica*), eastern oyster drill (*Urosalpinx cinerea*), and common slipper shells (*Crepidula crepidula*) were observed attached to a structures in the lower intertidal zone. Ribbed mussels (*Geukensia demissa*) were present in the center of several wooden pilings.

Other species not observed but expected to utilize the intertidal habitats include common blue mussel (*Mytilus edulis*) and periwinkles (*Littorina* spp.). Common invertebrate species found in estuarine subtidal habitats include grass shrimp (*Palaemonetes* spp.), and blue crab (*Callinectes sapidus*) (Edinger et al 2014). Other marine invertebrates found in the lower Hudson estuary on underwater rocks and walls include sand-builder worms (*Sabellaria vulgaris*), sea squirts (*Mogula manhattensis*), sand shrimp (*Crangon septemspinosa*), hermit crabs (*Pagurus longicarpus*), and rock crabs (*Cancer irroratus*). Piers and pilings provide substrate for barnacles, mussels, and other invertebrates such as crabs to attach to or perch on. (Kiviat, E. and E.A. Johnson. 2013).

Fish use in the Upper New York Bay includes year-round residents as well as seasonal migrants or anadromous species that enter the Hudson River as adults to spawn and return to the ocean afterwards. Common fish species include striped bass (*Morone saxatilis*), killifish (*Fundulus* spp.), bay anchovy (*Anchoa mitchilli*), white perch (*Morone americana*), American eel (*Anguilla rostrata*), Atlantic menhaden (*Brevoortia tyrannus*), bluefish (*Pomatomus saltatrix*), and weakfish (*Cynoscion regalis*). Fish surveys of the Upper Bay of New York Harbor/Hudson River estuary collected 23 fish species dominated by six species: bay anchovy, winter flounder, American shad (*Alosa sapidissima*), Atlantic tomcod (*Microgadus tomcod*), and alewife (*Alosa pseudoharengus*). Fish were most abundant in the spring and summer (USFWS 1997). More recent fish surveys by the Hudson River Park (HRP) Trust of the Upper Bay of New York Harbor/Hudson River estuary between 2013-2021 exhibited no significant change in the number of species observed in the estuary, ranging between 15 to 20 dominate species including black sea bass (*Centropristis striata*), silver perch (*Bidyanus bidyanus*), and winter flounder. HRP Trust observed a shift in the overall abundance in these dominate species with overall declines in population abundance (HRP Trust 2022).

Fish utilize the Upper Bay of New York Harbor/Hudson River estuary for shelter and reduced current velocities, and that adjacent shoal and pier structures may represent important juvenile feeding areas (USFWS 1997). Furthermore, with the degradation of piers in the Hudson River and estuary, the role of pile and sheet pile fields are key components in the Hudson River estuary and these structures are known for their dynamic habitat which supports resident and migratory fish species (HRP Trust 2022).

From 2015 to 2020, the NYSDEC Hudson River Estuary Program, along with the Atlantic States Marine Fisheries Commission (ASMFC), have made a concerted effort to recover migratory fish populations. ASMFC has reported increasing trends in abundance for alewife and blueback herring (*Alosa aestivalis*), an upward trend in juvenile Atlantic sturgeon (*Acipenser oxyrinchus*) abundance, while American shad populations exhibited few signs of recovery (NYSDEC 2020). Despite its highly industrialized and urbanized setting, the lower Hudson River Estuary is an important habitat for the anadromous striped bass, one of the most abundant and important recreational species in and around the New York/New Jersey Harbor Estuary. Besides their recreational value, striped bass are also important in the energy and nutrient transfer between the Harbor Estuary, its rivers, and the Atlantic Ocean. Due to a loss of natural habitat, the estuary's piers and pilings have become important wintering habitat for striped bass. This has led to better management of the New York/New Jersey Harbor Estuary's shoreline development (New Jersey Sea Grant 2014). Additionally, New York has required regulatory measures that include monitoring programs, recreational and commercial minimum size limits, recreational creel limits, and commercial quotas to manage and evaluate the condition of the striped bass stock (NYSDEC 2022).

Marine mammals known to occur in upper bay include harbor seals (*Phoca vitulina*), grey seal (*Halichoerus gryphus*), harbor porpoise (*Phocoena phocoena*), and humpback whale (*Megaptera novaeangliae*).

The USFWS Information for Planning and Consultation (IPaC) system lists 37 species of migratory birds with the potential to occur in the Site. The bay provides habitat for wintering waterfowl such as brant, bufflehead, red-breasted merganser (*Mergus serrator*), and common goldeneye (*Bucephala clangula*). The most frequently observed species documented by eBird, an online database of bird observations, from the intersection of 39th Street and 1st Avenue (Industry City, Sunset Park) in 2021 were Canada goose, house sparrow (*Passer domesticus*), rock pigeon (*Columba livia*), European starling (*Sturnus vulgaris*), American black duck (*Anas rubripes*), and turkey vulture (*Cathartes aura*) (eBird 2022). According to NYC Audubon, a colony of common terns (*Sternus hirundo*) has nested on three decommissioned piers on the southeast end of nearby Governor’s Island in Upper New York Bay since 2008 through at least 2016. Additionally, one pair of yellow-crowned night-herons is reported to have nested on Governors Island in 2016 (Winston 2016).

3.4 Essential Fish Habitat

Under the Magnuson-Stevens Fishery Conservation and Management Act, Essential Fish Habitat (EFH) is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.” According to NOAA’s EFH Mapper, the waters within the vicinity of the Site are designated as EFH for various life stages of 13 species. The species and life stages with designated EFH are listed in **Table 2**. There are no Habitat Areas of Particular Concern (HAPC) or EFH areas protected from fishing (EFHA) designated by NOAA’s EFH Mapper within the Site. However, summer flounder HAPC is defined as all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH. Therefore, intertidal areas of the Site that are covered with *Fucus* spp. may be considered a HAPC for summer flounder. Clearance for potential impacts to EFH and HAPC will be obtained from the NMFS prior to restoration activities. It is anticipated that temporary impacts to EFH would occur. However, adverse impacts would be minimized by implementing minimization and avoidance measures such as seasonal restrictions and best management practices during an in-water construction period of less than 6 months. As discussed in Section 7.0, the project would result in loss of degraded intertidal habitat while creating shallow subtidal habitat where upland fill currently exists. Various size rocks and cement rubble would be placed in the restored, shallow subtidal waters for structural diversity and to encourage macroalgal reestablishment following construction. Overall, a net increase in available EFH is anticipated.

Table 2. Designated Essential Fish Habitat within and Near the Site

Species	Eggs	Larvae	Juveniles	Adults
Atlantic butterfish (<i>Peprilus triacanthus</i>)		X		
Atlantic sea herring (<i>Clupea harengus</i>)		X	X	X
Bluefish (<i>Pomatomus saltatrix</i>)			X	X
Clearnose skate (<i>Raja eglanteria</i>)			X	X
Little skate (<i>Leucoraja erinacea</i>)			X	X
Longfin inshore squid (<i>Doryteuthis (Amerigo) pealeii</i>)	X			
Red hake (<i>Urophycis chuss</i>)	X	X	X	X
Silver hake (<i>Merluccius bilinearis</i>)	X	X		
Summer flounder (<i>Paralichthys dentatus</i>)		X	X	X
Windowpane flounder (<i>Scophthalmus aquosus</i>)	X	X	X	X

Species	Eggs	Larvae	Juveniles	Adults
Winter flounder (<i>Pseudopleuronectes americanus</i>)	X	X	X	X
Winter skate (<i>Leucoraja ocellata</i>)			X	X
Yellowtail flounder (<i>Limanda ferruginea</i>)			X	

3.5 Threatened and Endangered Species

Table 3 summarizes the threatened and endangered species that may occur within the Site according to USFWS and National Marine Fisheries Service (NMFS). The USFWS IPaC system was accessed to determine the potential presence of species under USFWS jurisdiction within the Site. IPaC indicates that four federally listed and one candidate species may occur: piping plover (*Charadrius melodus* - threatened); red knot (*Calidris canutus rufa* - threatened); roseate tern (*Sterna dougallii* - endangered); monarch butterfly (*Danaus plexippus* – candidate); and seabeach amaranth (*Amaranthus pumilus* - threatened). According to the NMFS ESA Section 7 Mapper, the Site is within the range of waters used by federally listed adult and subadult Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus* - endangered), adult shortnose sturgeon (*Acipenser brevirostrum* – endangered), and adult and juvenile green sea turtle (*Chelonia mydas* - threatened), Kemp’s Ridley sea turtle (*Lepidochelys kempii* - endangered), leatherback sea turtle (*Dermochelys coriacea* - endangered), and loggerhead sea turtle (*Caretta caretta* - threatened). The Site does not contain critical habitat for these or any other species. None of these species have been observed during the initial Site investigations. Descriptions of these species and their habitats, as well as the likelihood that they would occur within the Site, are summarized below from NYSDEC fact sheets and USFWS and NMFS species profiles unless otherwise referenced.

Table 3. Threatened and Endangered Species Summary

Agency		Common Name	Scientific Name	Federal Listing	State Listing
USFWS	Plant	Seabeach amaranth	<i>Amaranthus pumilus</i>	Threatened	Threatened
	Insect	Monarch butterfly	<i>Danaus plexippus</i>	Candidate	Not Listed
	Birds	Piping plover	<i>Charadrius melodus</i>	Threatened	Endangered
		Red knot	<i>Calidris canutus rufa</i>	Threatened	Threatened
		Roseate tern	<i>Sterna dougallii dougalli</i>	Endangered	Endangered
NMFS	Fish	Atlantic sturgeon	<i>Acipenser oxyrinchus</i>	Endangered	High Priority
		Shortnose sturgeon	<i>Acipenser brevirostrum</i>	Endangered	Endangered
	Sea Turtles	Green sea turtle	<i>Chelonia mydas</i>	Threatened	Threatened
		Kemp’s Ridley turtle	<i>Lepidochelys kempii</i>	Endangered	Endangered
		Leatherback turtle	<i>Dermochelys coriacea</i>	Endangered	Endangered
		Loggerhead turtle	<i>Caretta</i>	Threatened	Threatened

Piping plover: The piping plover is a small shorebird that is listed as federally threatened and state endangered. Habitat is only found at the shore and on barrier islands, sandy beaches, and dredged material

disposal islands. The piping plover diet consists principally of marine worms, insect larvae, beetles, crustaceans, and mollusks, which are obtained by foraging on beaches, dunes, and in tidal wrack. In New York, this species breeds on Long Island's sandy beaches, from Queens to the Hamptons, including on the nearby Rockaway peninsula and in the eastern bays and in the harbors of northern Suffolk County. Piping plovers nest on the oceanfront beaches of Long Island's barrier islands, not on the bayside or mainland beaches. Their home range commonly includes bayside flats and back-barrier storm overwash areas, which are important foraging habitats for adults and fledglings (Elias et al. 2000, McIntyre and Heath 2011). Piping plovers arrive to the New York area in early to mid-March and establish nesting territories by early April. Nests are usually placed well above the high tide line on open sandy beaches or in areas that have been filled with dredged sand, often near dunes in areas with little or no beach grass. By early September, most have departed for their wintering areas. Piping plover occur along the ocean beaches in Queens, but are not expected to be found in the vicinity of the Site since the preferred wide, open expanses of unvegetated or sparsely vegetated sandy beach is not present.

Red knot: The red knot is a large, bulky sandpiper that is listed as federally and state threatened. Red knots feed on invertebrates, especially small clams, mussels, and snails, but also crustaceans, marine worms, and horseshoe crab eggs. The red knot can fly more than 9,300 miles from south to north every spring and repeat the trip in reverse every autumn, making this bird one of the longest-distance migrants in the animal kingdom. Red knots need to encounter favorable habitat, food, and weather conditions within narrow seasonal windows because the birds stopover between wintering and breeding areas. Habitat in the northeastern U.S. includes Atlantic and bay beaches and mudflats. Red knot may forage along the bay and ocean beaches and/or marshes along the nearby coasts of Queens, but are not expected to be found in the vicinity of the Site due to lack of wide sandy beaches or mudflats with abundant horseshoe crab eggs.

Roseate tern: The roseate tern is a waterbird listed as federally and state endangered. Foraging habitat includes shallow coastal waters, inlets, and offshore seas. Roseate terns feed primarily on the American sand lance, a small marine fish. In the northeastern United States, roseate tern nest on beaches, barrier islands, and offshore islands. Open sandy beaches isolated from human activity and islands where predation pressure may be lower than on mainland sites are its optimal nesting habitat. In New York, this species breeds only at a few Long Island colonies and is always found nesting with common terns. The great majority of New York's birds nest on Great Gull Island, which is located east of Plum Island, north of the eastern tip of Long Island. The eastern tip of Long Island is an important staging area where birds collect for several weeks before migrating to South America (USFWS 1998). Roseate terns arrive on the breeding grounds in late April or early May and begin nesting one month later. The nest is usually placed in dense grass clumps or even under boulders or rip-rap and may be only a depression in sand, shell, or gravel and lined with bits of grass and other debris. Migration to wintering grounds begins in late summer. Roseate tern may occur nearby along the bay and ocean beaches and/or marshes along the nearby coasts of Queens and Staten Island but are not expected to be found in the vicinity of the Site due to lack of suitable breeding and foraging habitat.

Monarch butterfly: Monarch butterflies are a bright orange color with black and white markings and a wingspan between 3 1/2 and 4 inches. The caterpillars have many yellow, black and white bands and antenna-like appendages at each end of their body. Monarch caterpillars feed almost exclusively on milkweed and as adults feed on nectar from a wide range of flowers. They lay their eggs on milkweed; there are about 3 to 5 generations born each spring and summer and most of the offspring do not live beyond 5 weeks. The exception is the last generation born at the end of the summer that migrates to Mexico and southern California to overwinter. In the spring, summer and early fall, they can be found wherever there is milkweed. Monarch butterfly are not likely to utilize the Site as it does not contain areas abundant with milkweed or nectar-rich plants.

Seabeach amaranth: Seabeach amaranth is an annual plant grows on a nearly pure sand substrate above the high tide line and is intolerant of even occasional flooding during its growing season. It can be found

on open sand at the base of foredunes. The habitat of seabeach amaranth is sparsely vegetated with annual herbs and, less commonly, perennial herbs, and scattered shrubs. The plant does not compete well in areas of established growth but will potentially stabilize in disturbed areas. Flowering and seed production usually start in July and continue until the plants die in the fall. It is only known from Long Island, ranging from Coney Island to near the east end of the South Fork along the southern shore. Suitable habitat for seabeach amaranth does not occur within the Site as the plant only occurs within upper sandy beach zones.

Atlantic sturgeon: Atlantic sturgeon are anadromous fish, spending most of their lives in marine and estuarine waters and only using freshwater to spawn. Atlantic sturgeon occur year round in the waters of Upper New York Bay foraging and migrating between upstream spawning sites and the Atlantic Ocean. Mature males typically enter the Hudson estuary starting in April and at least some may remain as late as November. Adult females enter the estuary in mid-May and migrate directly to the spawning grounds upstream of the salt front before quickly returning to marine waters. Use of the Site by Atlantic sturgeon is likely to be limited to transient individuals that are passing through due to lack of breeding and optimal foraging habitat. The Upper New York Bay does not contain any known overwintering areas; thus, only sub-adult and adult Atlantic sturgeon would likely be present and are expected to occur in deeper waters than those within and adjacent to the site. Since the waters are in saline and tidally influenced, no eggs, larvae or juvenile Atlantic sturgeon would be present.

Shortnose sturgeon: The shortnose sturgeon is a long-lived, bottom feeding, anadromous fish that move up the Hudson River in April-May to spawn in freshwater sites north of Coxsackie. As they grow and mature, the fish move downriver into the most brackish parts of the lower Hudson. After spawning, adults distribute throughout the deepest channels of the estuary to forage on benthic invertebrates. As water temperatures decline in the late fall, adults typically concentrate in a few over-wintering areas near Kingston and Haverstraw Bay. Migrating and foraging adult shortnose sturgeon may occur in Upper New York Bay from April through November. Use of the Site by shortnose sturgeon is likely to be limited to individuals that are passing through due to lack of breeding and optimal foraging habitat. If present, transient individuals are more likely to occur in deeper waters of the Upper New York Bay than the shallow waters within and adjacent to the Site.

Sea turtles: Juvenile and adult sea turtle species may migrate through and forage in Upper New York Bay waters from May to December, with the highest concentrations of turtles occurring from June through October. Sea turtle occurrence in the waters adjacent to Site would be tied to the presence of suitable foraging habitat. Leatherback sea turtles are generally found in deeper offshore waters (USFWS 2018) and feed almost exclusively on jellyfish. Green sea turtles tend to frequent seagrass beds, while loggerhead and Kemp's ridley sea turtles feed on mollusks and crustaceans. If sea turtles were present within the vicinity of the Site, it would be a transient presence with a limited temporal duration.

According to a search of NYSDEC Environmental Resource Mapper and NY Nature Explorer, there are no records state listed threatened, endangered, or rare species within one mile of the Site. A request for records was not submitted to NYNHP since according to NYSDEC, if a site does not fall within an area displayed in the Rare Plants and Rare Animals layer or in the Significant Natural Communities layer on the Environmental Resource Mapper, then NYNHP has no records to report in the vicinity.

Clearance for potential impacts to listed species will be obtained from the USFWS and NMFS prior to restoration activities. As stated above, piping plover, red knot, roseate tern, monarch butterfly, and seabeach amaranth are not expected to occur at the Site. Adverse impacts to Atlantic sturgeon, shortnose sturgeon, and sea turtles are not anticipated. Temporary disturbance to foraging or migrating individuals would be minimized by implementing minimization and avoidance measures such as seasonal restrictions and best management practices during construction. As discussed in Section 7.0, the restored site would increase the mixture of open water and shallow water habitat accessible to sturgeon and sea turtles where upland fill and degraded intertidal habitat currently exists.

3.6 Significant Natural Communities

The New York Natural Heritage Program tracks locations of significant natural communities because they serve as habitat for a wide range of plants and animals, both rare and common, and because community occurrences in good condition support intact ecological processes and provide ecological value and services. Significant natural communities include rare or high-quality wetlands, forests, grasslands, ponds, streams, and other types of habitats, ecosystems, and natural areas. According to a search of NYSDEC Environmental Resource Mapper and NY Nature Explorer, there are no Significant Natural Communities within the immediate proximity of the Site. The nearest Significant Natural Community is the tidal Hudson River, approximately 3 miles north of the Site.

4.0 CULTURAL RESOURCES SURVEY

The Site is within the Bush Terminal Historic District, a historic property previously determined eligible for listing in the State and National Registers of Historic Places. The boundaries of the Bush Terminal Historic District include all of the existing piers between 51st Street and 39th Street and additional properties in Industry City from 51st Street to 32nd Street and from 2nd/3rd Avenue to the west. A preliminary review of the NYSHPO Cultural Resource Information System (NY CRIS) system found that there are no recorded archaeological surveys directly at Pier 7. However, there are several remote sensing surveys that have been conducted within one mile of the Site. According to the National Oceanic and Atmospheric Administration's Automated Wrecks and Obstructions Database (NOAA AWOIS), there are no charted wrecks or obstructions directly at or around Pier 7. However, there are four charted wrecks and two charted obstructions to the northwest, northeast, and southwest within one-mile of the Site. Additionally, a Phase IA Archaeological Documentary Study was completed in January 2019 as part of the Made in New York (MiNY) – North Campus Project (CEQR Reference Number: 19SBS002K) which is immediately adjacent to the Site (Dewberry 2019). The study included a review of the previously studied archaeological sites within a one-mile radius of the subject project area and noted that in *Final Report: Cultural Resources Investigations in Brooklyn Reach 2: New York Harbor Collection and Removal of Drift Project* (Raber et al 1985), Pier 7 was recommended as a significant resource. At the time of the study, Pier 7's original substructures and substantial portions of the original pier sheds were still intact. In the subsequent *Documentation for Determination of Eligibility for Bush Terminal Brooklyn Kings County, New York, Final Version* (Flagg et al 1986), NYSHPO notes in the Findings section that Pier 7 contributes to the terminal significance visually as architectural remnants, and as industrial archaeological components with undocumented details of original shed construction. NYSHPO further noted that "it is unlikely that removal of these piers can be avoided. We therefore recommend site recording as a mitigative action, to preserve the significant historic information embodied in the resources." In 1986, the National Register of Historic Places determined the eligibility of the entire Bush Terminal campus. The Sponsor intends to notify NYSHPO of the subsurface sampling events and the findings from those events, and to take steps to record the Site, as required.

5.0 FEDERAL AVIATION ADMINISTRATION COORDINATION

Per Advisory Circular 150/5200-33 *Hazardous Wildlife Attractants On or Near Airports*, the Federal Aviation Administration (FAA) recommends a separation distance of 10,000 feet for any potential hazardous wildlife attractant for airports that serve turbine-powered aircraft. The FAA also recommends a distance of five miles 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 Site is not within five miles of any airports. Coordination with the FAA is not anticipated.

6.0 ECOLOGICAL SUITABILITY

All information collected to date indicates that the Site is physically and ecologically suitable for establishing a mitigation bank. The Site offers the opportunity to remove a dilapidated structure within NYC and create a mixture of open water and shallow water habitats beneficial to fish, benthic species and water-dependent birds, while

providing shoreline protection from strong currents and wind generated waves. The restored habitat may allow for future additional ecological enhancements, such as establishment of oyster reefs and SAV beds.

7.0 CONCEPTUAL RESTORATION DESIGN PLAN

The Final Rule for Compensatory Mitigation for Losses of Aquatic Resources (33 CFR 332.2) defines “restoration” as the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning and /or improving natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: reestablishment and rehabilitation. Re-establishment means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former undisturbed aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions. Rehabilitation means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function but does not result in a gain in aquatic resource area. The Final Rule for Compensatory Mitigation for Losses of Aquatic Resources (33 CFR 332.2) defines “enhancement” as the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s).

The goal of the Bush Terminal Pier 7 restoration design is to remove a deteriorated and nonfunctional pier to re-establish functional littoral habitat, rehabilitate existing littoral habitat, and enhance subtidal habitat surrounding the former pier. **Figure 6** depicts the proposed re-establishment, rehabilitation, and enhancement areas within the Bush Terminal Pier 7 site. **Table 4** presents the acreage for each proposed mitigation activity at the site. The 1.19 acre re-establishment area includes all areas above MHHW as well as areas currently below MHHW that contain extensive fill or large structures that inhibit aquatic organism use and aquatic habitat function. Re-establishment activities would remove fill and debris to restore open water habitat to an area of fill that currently lacks wetland functions and has minimal value as upland habitat. The 2.74-acre rehabilitation area consists of disturbed intertidal and shallow subtidal habitat surrounding the upland remnants of the pier. Rehabilitation activities would include removal of failing, unstable structures and installation of a stone revetment and bottom habitat features, providing fish habitat and stable substrate for invertebrate and macroalgal attachment. Removal of the pier remnants through re-establishment and rehabilitation and activities would increase accessibility for aquatic species but at shallow depths relative to the surrounding deeper open waters, increasing structural diversity in habitat for fish, benthic invertebrates, and water-dependent birds. Approximately 1.14 acres of the surrounding waterway would be enhanced by joining it to a larger, restored littoral zone area, eliminating the potential for erosion of material from the former pier into the waterway and minimizing the potential for future illegal filling and dumping within the tidal waterbody by including the area as part of a mitigation bank. Additionally, removal of historic fill may locally improve sediment and water quality. The entire restored site would also form a shallow rise in the floor of the bay, creating a marine bathymetric feature that will support a diverse assemblage of marine organisms.

Table 4. Proposed Mitigation Activities at Bush Terminal Pier 7

Mitigation Type	Acres
Wetland Restoration (Rehabilitation)	2.74
Wetland Restoration (Re-establishment)	1.19
Wetland Enhancement	1.14
Total	5.07

The draft design plan is described below and depicted in **Appendix C – Site Development Plan**. The final restoration design will be developed based on the results of the ongoing studies and in coordination with the Interagency Review Team (IRT). As part of the design process, technical studies were undertaken to assess topography, tidal elevations, and other features. A New York State licensed land surveyor conducted a survey to develop a surface topographic map that was used as the basis of the design plans.



7.1 Conceptual Restoration Design Plan

The first objective is to remove the remnants of the dilapidated pier with the goal of restoring a stable littoral zone habitat. The littoral zone is defined by NYSDEC as a tidal wetland zone that includes all lands under tidal waters which are not included in any other category, extending seaward from shore to a depth of six feet at mean low water. As indicated on the site development plan (Appendix C), demolition of the pier will include excavation to remove remnant pier debris, including debris which has collapsed outside of the original pier footprint, down to elevation -8.6 NAVD88, which is the extent of the littoral zone based on tidal datum at the Site. The estimated amount of material to be removed below MHHW is 42,803.6 cubic yards. Debris to be removed includes concrete, earthen fill, timber, and steel/iron. To further enhance habitat, various sized rocks/cement rubble selected from the pier remnants would be scattered along the seafloor to provide structural habitat features for fish cover and attachment substrate for sessile fauna and macroalgae. The second objective for the restoration design is to install a stone revetment at the upland interface with the goal of providing stable, long-term shoreline stabilization and additional habitat structure for fish and macroinvertebrates. The revetment slope will be graded 2:1 or flatter, geotextile fabric will be installed, and riprap will be machine-placed along the slope at uniform gradation, with larger stone placed at the toe. The stone will create cavities and crevices that will be utilized by fish and sessile fauna. Construction is anticipated to last approximately eight months with an in-water construction duration of less than 6 months.

7.2 Sea Level Rise

It is important to plan for anticipated sea level rise (SLR) impacts when designing tidal wetland restoration projects. Sea level along the U.S. coastline is projected to rise, on average, 10 - 12 inches (0.25 - 0.30 meters) in the next 30 years (2020 - 2050), which will be as much as the rise measured over the last 100 years (1920 - 2020) (Sweet et al 2022). To support the project design, WSP will calculate the low, medium, and high rates of projected, relative SLR at the site at five-year intervals for a period of 50 years from the assumed 2023 project start date, under both build scenario and the no-build scenario. Predicted hydrology will be incorporated into project plans produced in the subsequent design tasks. Levels for mean low water, mean high water, and mean high water spring (with the sea level rates incorporated) will be calculated to provide the data for a subsequent impact analysis. Based on the results of the hydrological data, restoration design, operations and maintenance measures will help ensure long-term success while minimizing adverse consequences of SLR and maximizing beneficial effects.

8.0 BANK PROTECTION AND LONG TERM MANAGEMENT

Management, maintenance, and monitoring plans will be developed in coordination with the IRT during the permitting and UMBI phase of Bank development. The proposed site protection instrument, long-term stewardship, and financial means to maintain the Bush Terminal Pier 7 Site in perpetuity are described below.

8.1 Bank Protection

The title to the property is held by the City of New York and will remain in the City's name after the Bank Site is established and closed. According to the NYC Charter, the city's waterfront, land under water, wharves, docks, waters, and waterways are among public places that are declared inalienable and cannot be sold.

The Property shall be protected in perpetuity through the execution and delivery, by the City, of one or more written, legally binding and enforceable instruments, undertakings, agreements, conservation easements, or restrictive declarations; or any other documents that comply with the requirements of 33 CFR 332 and are approved in advance by the IRT Chairs (in either case, the "Property Protection Instruments"). If ever transferred by the City of New York the Site will be protected in perpetuity by restrictive covenants in a legally sufficient instrument (such as a restrictive declaration which contains relevant restrictive covenants executed by the City of New York and recorded against the land) or by other appropriate methods to protect the Site in perpetuity.

The Property Protection Agreement proposed for the Site shall be similar to the executed Property Protection Agreement and the Form of Restrictive Declaration provided for the Saw Mill Creek Pilot Wetland Mitigation Bank (attached) or shall be in the form of another document or instrument acceptable to the IRT Chairs.

8.2 Long Term Management

The City of New York will maintain ownership of the Site and there are no plans to dispose of it. Upon closure of the Site in accordance with the terms of the UMBI and site-specific restoration plan, the designated Long-Term Steward shall implement any management requirements established in a Long-Term Stewardship Plan.

A Long-Term Management Fund or other mechanism will be established to provide funds for maintenance requirements or repairs necessitated after Site closure. The Sponsor has previously established a Long-Term Management Fund to provide financial resources for projects conducted under the MARSHES initiative, which has thus far included the Saw Mill Creek Pilot Wetland Mitigation Bank. Alternatively, the Sponsor may provide documentation acceptable to the IRT to ensure a high degree of confidence that the mitigation project will be provided and maintained, in place of financial assurance. As a government agency, the Sponsor, the New York City Department of Small Business Services (NYCSBS), may be qualified for such an alternative arrangement, consistent with federal rules. NYCEDC manages NYCSBS sites through a Maritime Contract and leads planning, asset management, and construction projects for these waterfront assets, and will act as agent to the Sponsor under this contract.

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Appendix A
Site Photographs



Photo 1: View looking west along center of pier from mid-pier, March 2022.



Photo 2: View looking west along center of west end of pier, March 2022.



Photo 3: View looking east along center of pier, March 2022.



Photo 4: View looking west along northern shoreline, March 2022.



Photo 5: View looking north at Manhattan skyline within remnant pier structures in foreground, March 2022.



Photo 6: View looking east at rockweed covered rocky intertidal zone along northern shoreline, March 2022.



Photo 7: View looking west at sandy intertidal zone along southern shoreline, March 2022.

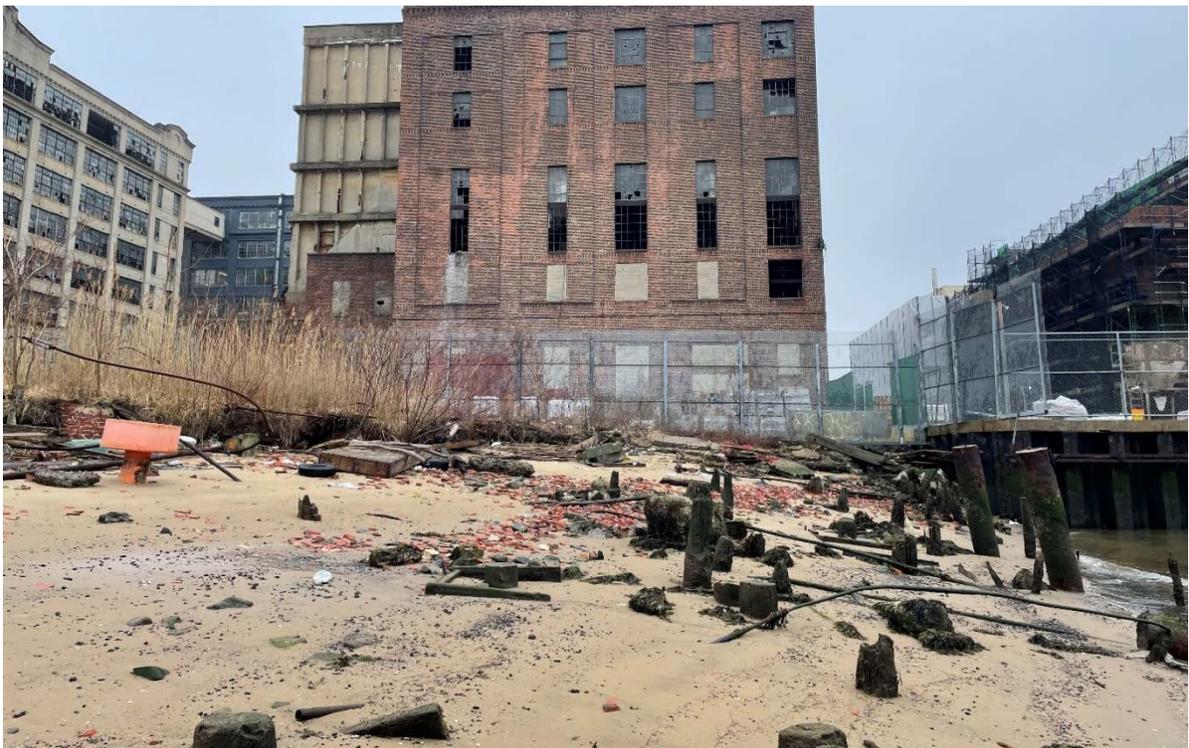


Photo 8: View looking east at sandy intertidal zone along east end of the southern shoreline, March 2022.



Photo 9: View looking northwest at Canada geese on west end of pier, March 2022.



Photo 10: View looking south from southern shoreline at immature gull perched on boulder, March 2022.



Photo 11: View looking west near west-end of pier showing brant foraging in shallow water among pier remnants exposed during low tide, March 2022.



Photo 12: View from above looking at interior of remnant pier piling in intertidal zone with attached ribbed mussels, barnacles, and rockweed, March 2022.

Appendix B
Submerged Aquatic Vegetation Survey Memo



MEMO

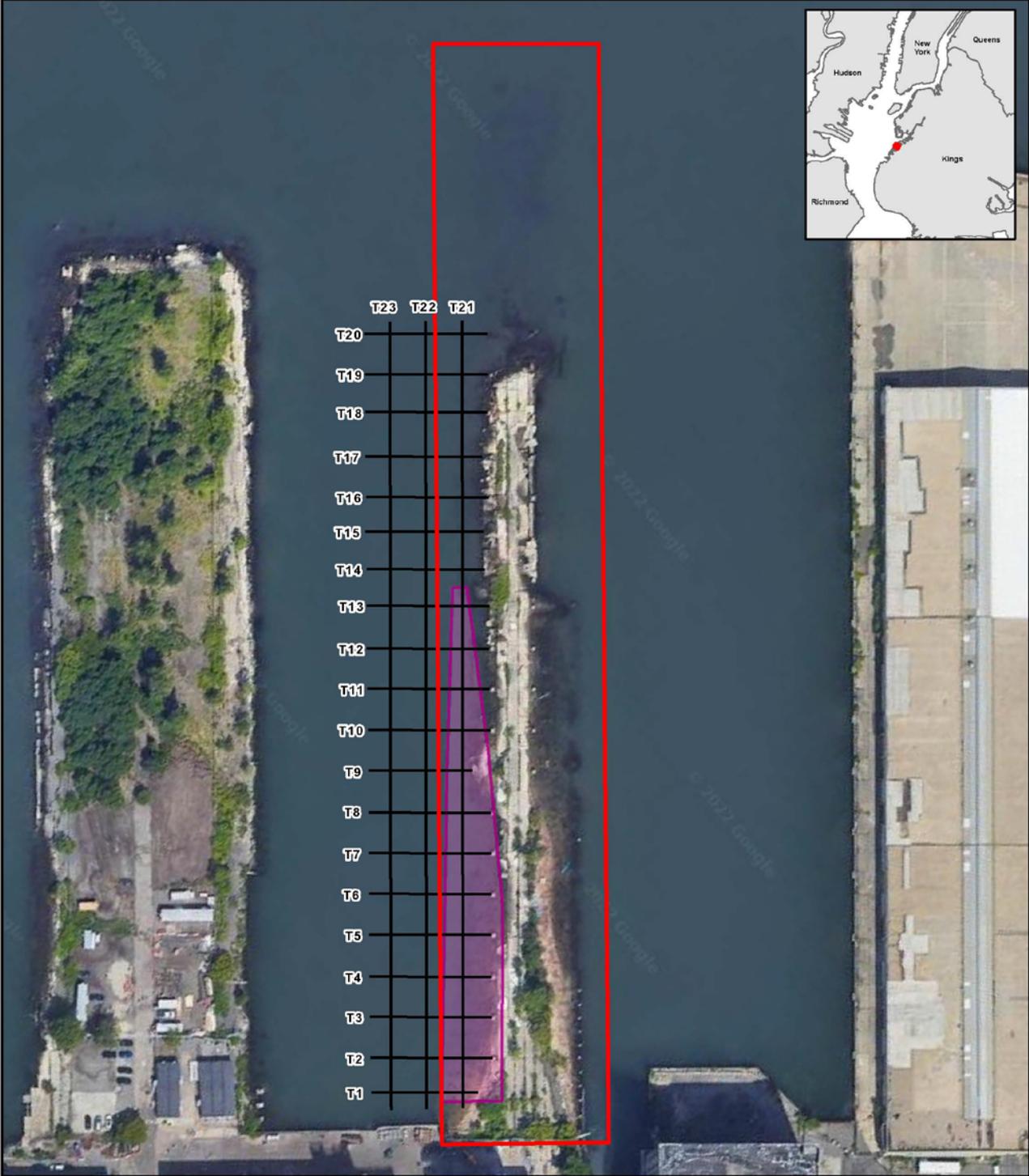
TO: Sarah Murphy and Max Taffet (NYCEDC)
FROM: Tara Stewart and Tom Shinsky (WSP)
SUBJECT: **Bush Terminal Pier 7 Submerged Aquatic Vegetation Survey**
DATE: **October 19, 2022**

WSP biologists performed a survey for submerged aquatic vegetation (SAV) along the south shore of Bush Terminal Pier 7 in response to IRT comments regarding a site map included in the September 22, 2022 IRT presentation that indicated the potential presence of SAV here. The source of the SAV polygon on the map is unknown at this time and no other known sources indicate the presence of SAV in this area. The area outlined as SAV on the map is predominantly intertidal habitat adjacent to the pier, with some shallow subtidal habitat with most of the substrate visible at low tide. Previous investigations indicated that macroalgae are common throughout this area. Macroalgae can occur with SAV species but alone is not considered to be SAV. SAV consists of rooted, vascular plants that grow underwater or just up to the water's surface,

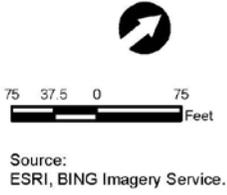
WSP biologists accessed the survey area by kayak during low tide (12:57) on Friday, October 7, 2022. The survey area included the area mapped as SAV on the slide at the end of the September 22, 2022 IRT presentation and extended deeper into the surrounding inter-pier area. Visual observations were made from the kayak and videos of substrate habitats were taken with a GoPro waterproof camera submerged approximately three feet below the water surface between 12:20 and 13:45. Video was obtained along 23 transects traversing the study area perpendicularly (Transects 1-20) and in parallel (Transects 21-23) to the pier. A map indicating the location of each numbered transect is attached. Representative still images of the habitat types across the study area are also attached while the videos are available upon request.

Conditions were sunny with good visibility from the kayak down to approximately six to eight feet below mean low water. SAV was not observed from the kayak. A diversity of macroalgae was observed attached to hard substrate in the intertidal and shallow subtidal zones such as old piles and concrete remnants from the pier. Rockweeds (*Fucus* spp.) are abundant in the intertidal zone. Red weed (*Agardiella subulata*), Irish moss (*Chondrus crispus*), red puffball (*Spermothamnion repens*), hollow green weed (*Enteromorpha intestinalis*), and sea lettuce (*Ulva lactuca*) were also observed in the lower intertidal zone and shallow subtidal waters. Underwater videos were carefully reviewed and there was no indication of SAV presence within the area surveyed.

If further investigation is required by the IRT, WSP will submit a detailed plan to survey for SAV in summer 2023 for IRT review and approval prior to implementation. WSP has a fully-equipped dive team that has conducted many SAV surveys including presence/absence surveys and delineations, as well as developing SAV mitigation strategies in compliance with New Jersey Department of Environmental Protection, National Marine Fisheries Service, and National Oceanic and Atmospheric Administration regulations regarding SAV. However, based on the results of this survey, SAV is not present in this area.



-  Site Boundary
-  Underwater Video Transect
-  SAV Mapped on 9-22 Pier 7 Area Context Slide



NYC/EDC	
SAV Survey	
MARSHES Umbrella Mitigation Bank Bush Terminal Pier 7	
	October 2022



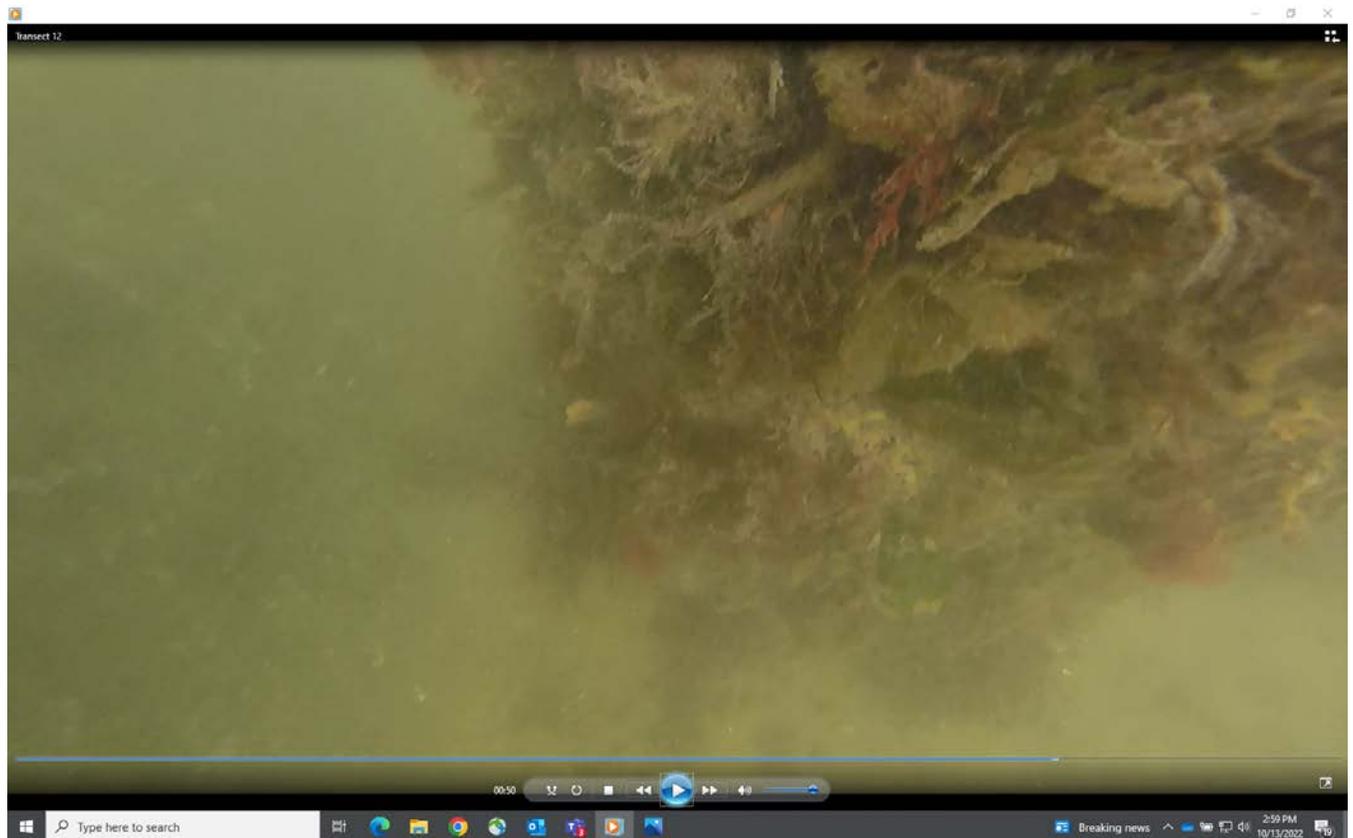
Still image along Transect 3 showing various species of macroalgae; no SAV present.



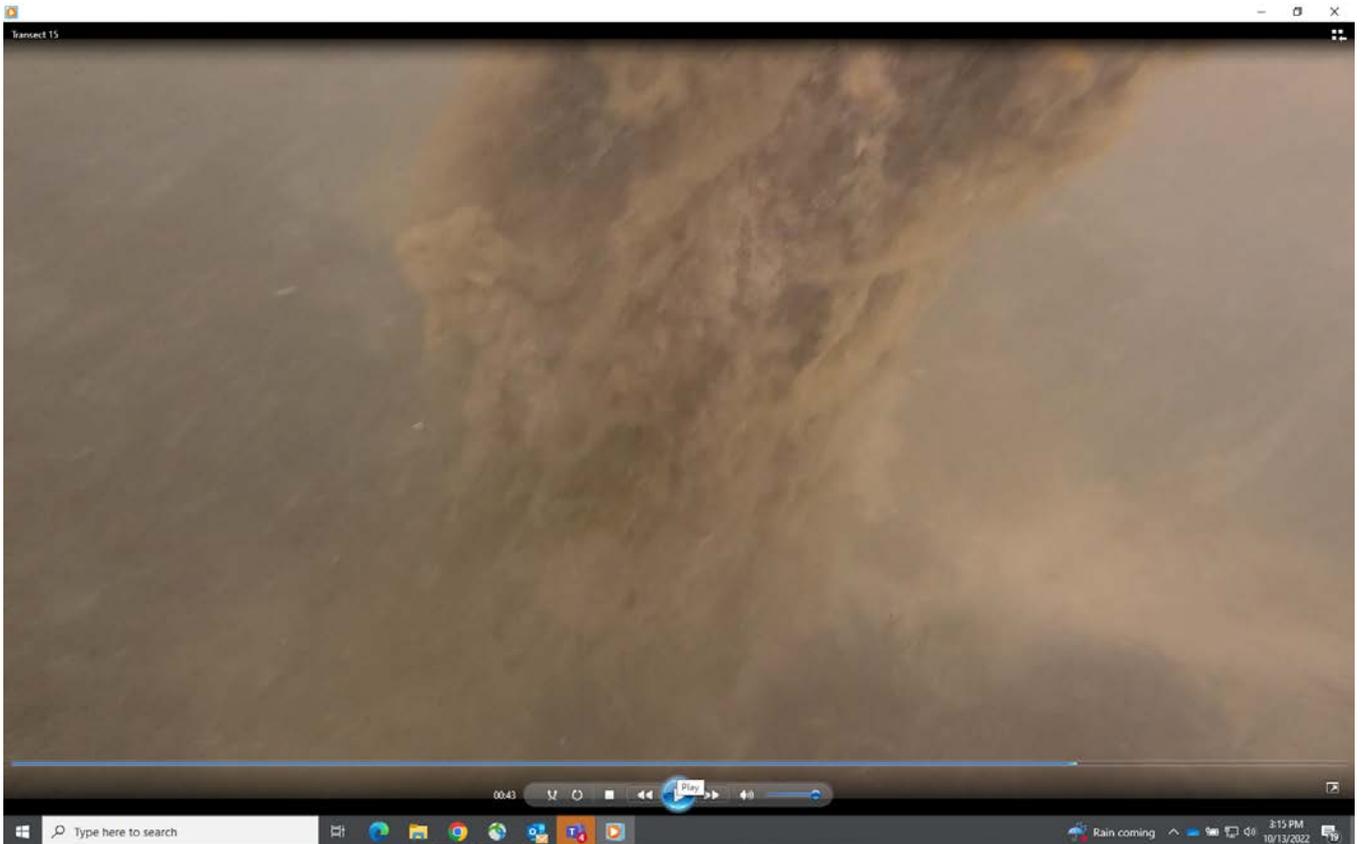
Still image along Transect 7 showing various species of macroalgae; no SAV present.



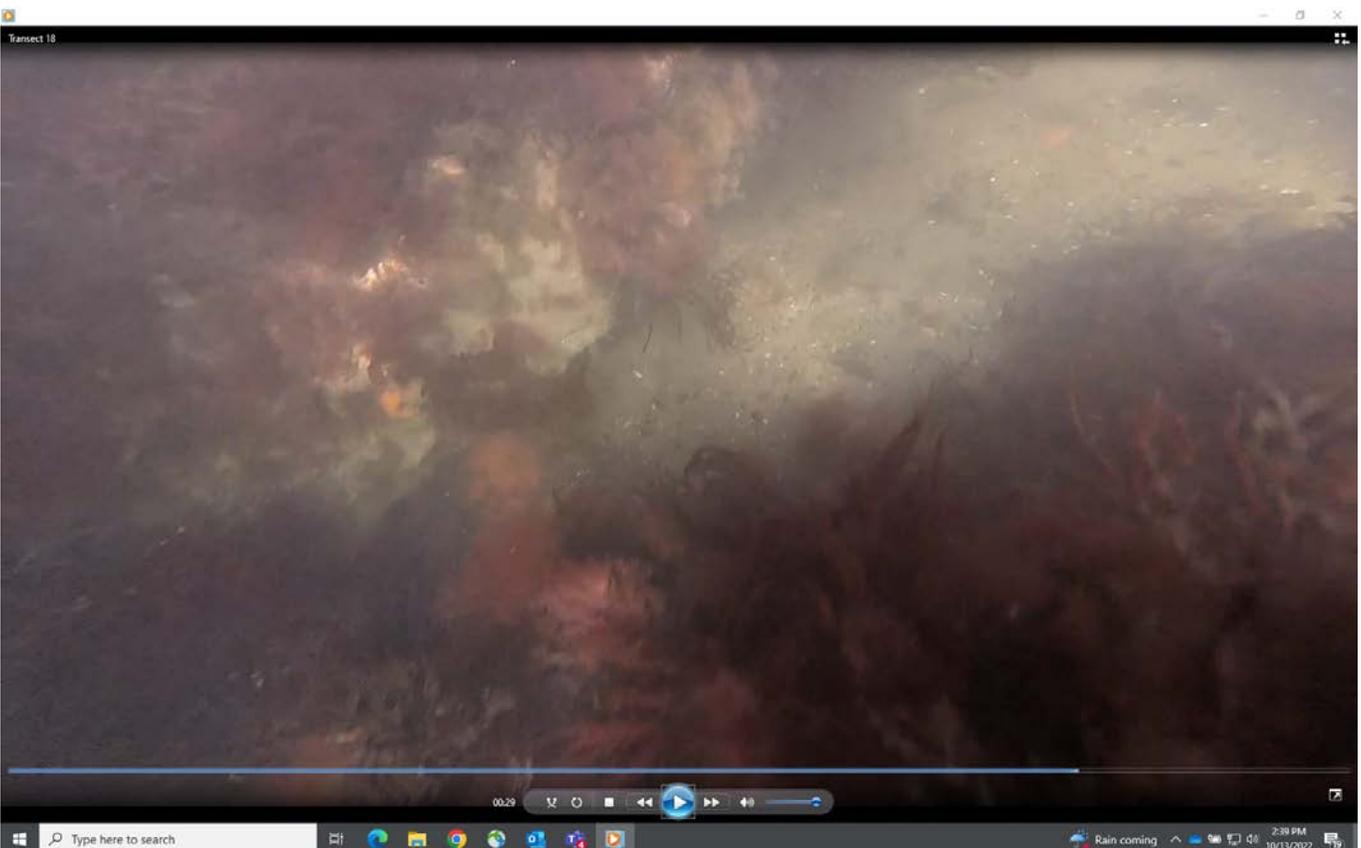
Still image along Transect 9 showing various species of macroalgae; no SAV present.



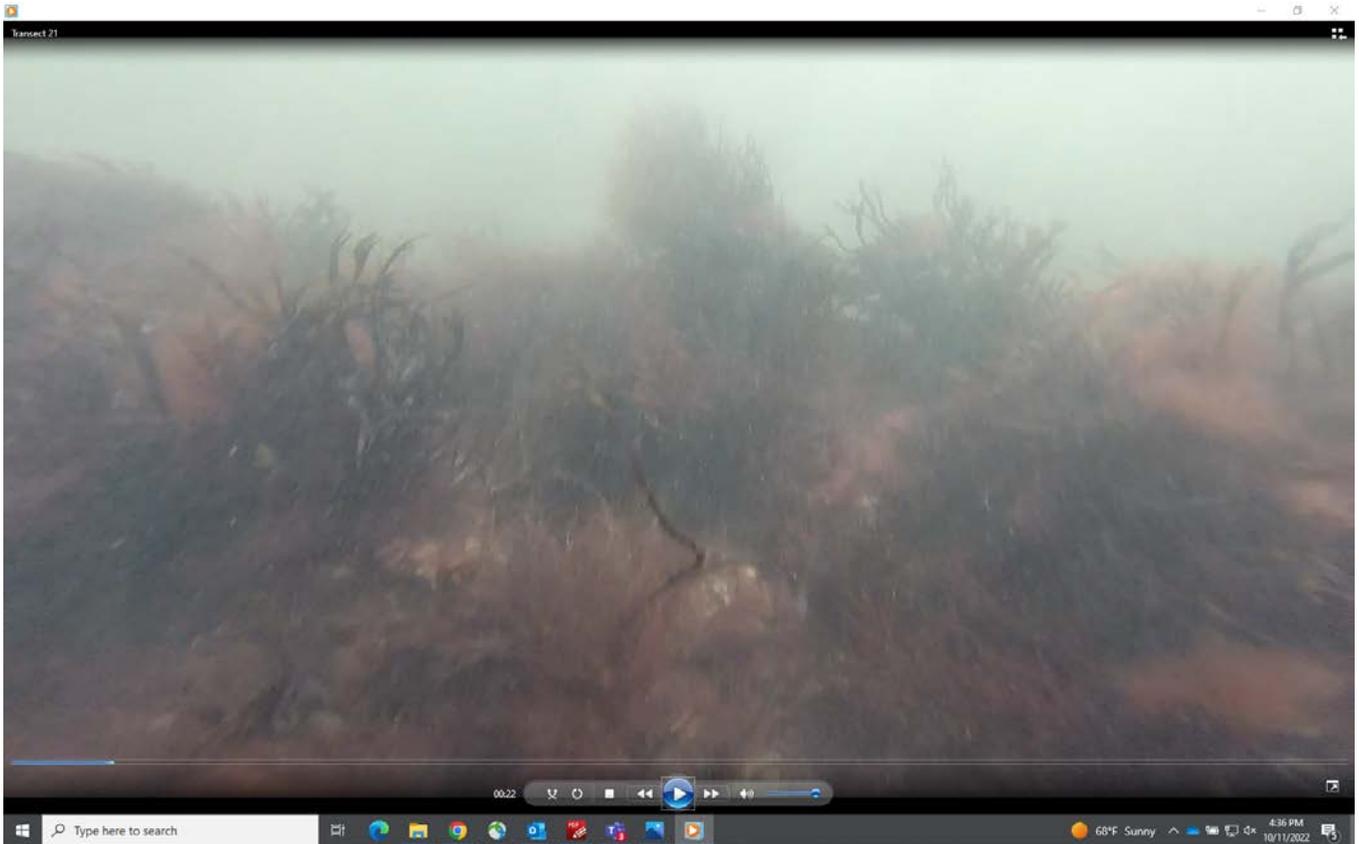
Still image along Transect 12 showing various species of macroalgae; no SAV present.



Still image along Transect 15 showing various species of macroalgae; no SAV present.



Still image along Transect 18 showing various species of macroalgae; no SAV present.



Still image along Transect 21 showing various species of macroalgae; no SAV present.



Still image showing mud snails along Transect 21; no SAV present.



Photograph taken from kayak of macroalgae in shallow subtidal area along Transect 5; no SAV present.

Author Qualifications

Tom Shinsky is a principal biologist with over 26 years of work experience in wetlands and aquatic environments. Tom holds a M.S. in biology has technical expertise in wetland restoration design, construction oversight, and monitoring of wetland restoration sites. His experience also includes fish, benthic, and SAV monitoring at tidal and riverine wetland restoration sites, and tissue, sediment, and water quality sampling in freshwater and marine environments. Relevant experience includes representing USEPA aboard contractors' vessels performing wetland and SAV restoration and post-construction monitoring. Tom also conducted biobenchmark studies, planting plan development, planting oversight, and post-construction monitoring of wetland and SAV habitats at a tidal mitigation site along the Delaware River.

Tara Stewart is a senior biologist with 24 years of experience working in estuarine, marine, and freshwater environments with an emphasis on aquatic resource impact assessment, ecological restoration, and evaluation of habitat restoration. Tara holds a B.S. in Marine Biology and is a Certified Ecologist. Relevant experience includes post-construction monitoring of SAV habitats at a tidal mitigation site along the Delaware River; providing review of federally funded Bulkhead Repair Initiative projects in Nassau and Suffolk counties to determine whether sensitive resources, including SAV, may be adversely impacted by repair activities; and preparing various environmental review and constraint analyses documents for coastal projects in New York which assessed the potential for impacts to SAV and provided minimization and mitigation measures.

Appendix C
Site Development Concept Plan

PLANS FOR UMBRELLA MITIGATION BANK AND PERMITTING BUSH TERMINAL PIER 7

1ST AVENUE & 43RD STREET BROOKLYN, NY 11232

DECEMBER 12, 2022



LOCATION MAP
SCALE 1"=200'

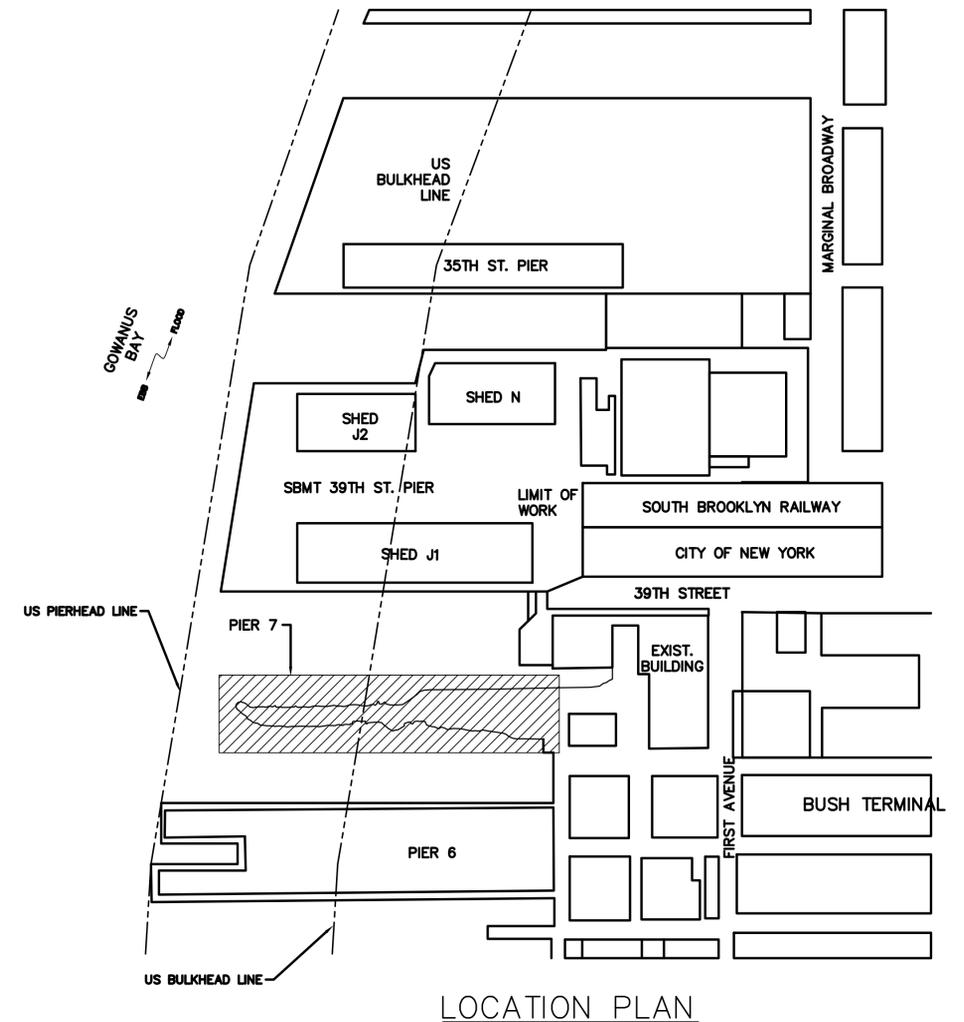
OWNER:
NEW YORK CITY ECONOMIC DEVELOPMENT CORP.
ONE LIBERTY PLAZA, 14TH FLOOR
NEW YORK, NY 10006

PREPARED BY
JACLYN J. FLOR, P.E., P.P., C.M.E.
CONSULTING ENGINEER

LICENSED PROFESSIONAL ENGINEER
STATE OF N.Y. LICENSE No. G101540
GENUITY INFRASTRUCTURE
CERTIFICATE OF AUTHORIZATION 0017153



GENUITY
INFRASTRUCTURE



LOCATION PLAN

LOCATION OF UTILITIES SHOWN ON THE PLANS ARE PLOTTED FROM AVAILABLE DATA ON FILE WITH THE UTILITY COMPANIES AND ARE NOT WARRANTED AS TO EXACTNESS. CONTRACTOR IS TO DETERMINE EXACT LOCATION AND DEPTH OF UTILITIES AT ALL CROSSINGS PRIOR TO CONSTRUCTION IN ACCORDANCE WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

PRIOR TO DIGGING CALL 1-800-962-7962

PLAN INDEX

SHEET NUMBER	SHEET TITLE	DRAWING NO
1	COVER SHEET	CVR
2	GENERAL NOTES AND LEGEND	GN
3	EXISTING CONDITIONS	EX
4	DEMOLITION AND REVETMENT PLAN	DEMO
5	CROSS SECTIONS - 1	CS-1
6	CROSS SECTIONS - 2	CS-2
7	CROSS SECTIONS - 3	CS-3
8	CROSS SECTIONS - 4	CS-4
9	CROSS SECTIONS - 5	CS-5
10	SESC DETAILS	SESC-1
11	SESC NOTES	SESC-2

PROJECT NO. WSPG-00020

DRAWING

CVR

SHEET NO.

1 OF 11

GENERAL NOTES:

- 1. VERTICAL DATUM - NAVD 1988 AND HORIZONTAL DATUM - NY LONG ISLAND STATE PLANE COORDINATE SYSTEM NAD83 (2011); BASED ON GPS OBSERVATIONS BY MATRIX NEW WORLD ON 05/12/2022 AND REFERRING TO LEICA SMARTNET CONTINUOUSLY OPERATING REFERENCE STATION (CORS) NETWORK, NATIONAL GEODETIC SURVEY MONUMENT: CORS STATION "NYCI, NYVH, NYBR".

SCHEDULE AND COORDINATION:

- 10. REGULAR WORKING HOURS IN THE BOROUGH OF BROOKLYN FOR THIS PROJECT ARE DEFINED AS MONDAY THROUGH FRIDAY: WORK HOURS: 7:00AM TO 6:00PM ROAD CLOSURE: NOT ANTICIPATED

PREPARATION:

- 17. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE EXISTENCE OF ALL ABOVE GROUND AND UNDERGROUND UTILITIES IN THE PROJECT AREA.

- 20. CONTRACTOR SHALL VIDEO AND TAKE PHOTOGRAPHS OF ALL AREAS WITHIN THE LIMIT OF WORK PRIOR TO BEGINNING CONSTRUCTION. THE VIDEO SHALL BE PROVIDED ON USB FLASH DRIVE. PHOTOGRAPHS SHALL BE DIGITAL, PRINTED AND ELECTRONIC COPIES TO BE PROVIDED. THE FLASH DRIVE AND PHOTOS WILL BE PROVIDED TO THE ENGINEER PRIOR TO CONSTRUCTION. THE COST FOR THE FLASH DRIVE AND PHOTOGRAPHS SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS SCHEDULED IN THE BID FORM.

GENERAL CONSTRUCTION:

- 25. THE CONTRACTOR SHALL LEGALLY REMOVE REMNANT PIER DEBRIS DOWN TO THE LITTORAL ZONE LOWER LIMIT TAKEN AT ELEVATION -8.61 FT (NAVDB8), INCLUDING DEBRIS WHICH HAS COLLAPSED OUTSIDE OF THE LIMITS OF THE ORIGINAL PIER OUTLINE AS INDICATED. DEBRIS TO BE REMOVED SHALL INCLUDE, BUT SHALL NOT BE LIMITED TO ALL MANNER OF REMNANT FILL INCLUDING: CONCRETE: DEBRIS, SLABS, GRADE BEAMS, PEDESTALS, PIERS, SEAWALLS, FOUNDATIONS, DEADMEN, DRAINAGE STRUCTURES, ETC.

- RECEIVE ALL DIRECTIONS OR INSTRUCTIONS IN WRITING. VERBAL DIRECTION FROM THE OWNER, OWNER'S REPRESENTATIVE, OR THE ENGINEER SHALL NOT RELIEVE THE CONTRACTOR OF THIS RESPONSIBILITY.

- EXCAVATION ON-SITE OR WITHIN R.O.W. (800) 962-7962

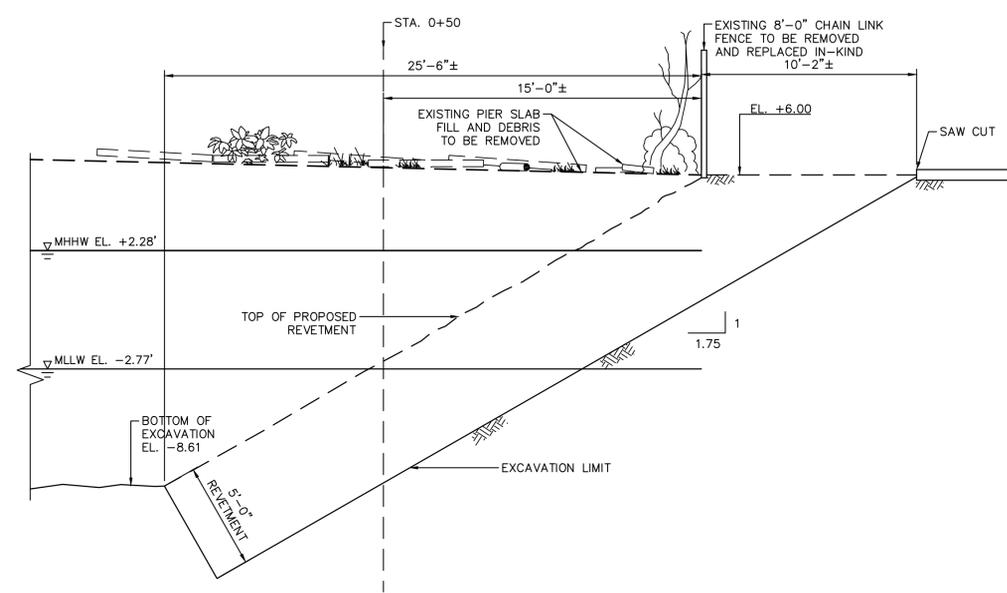
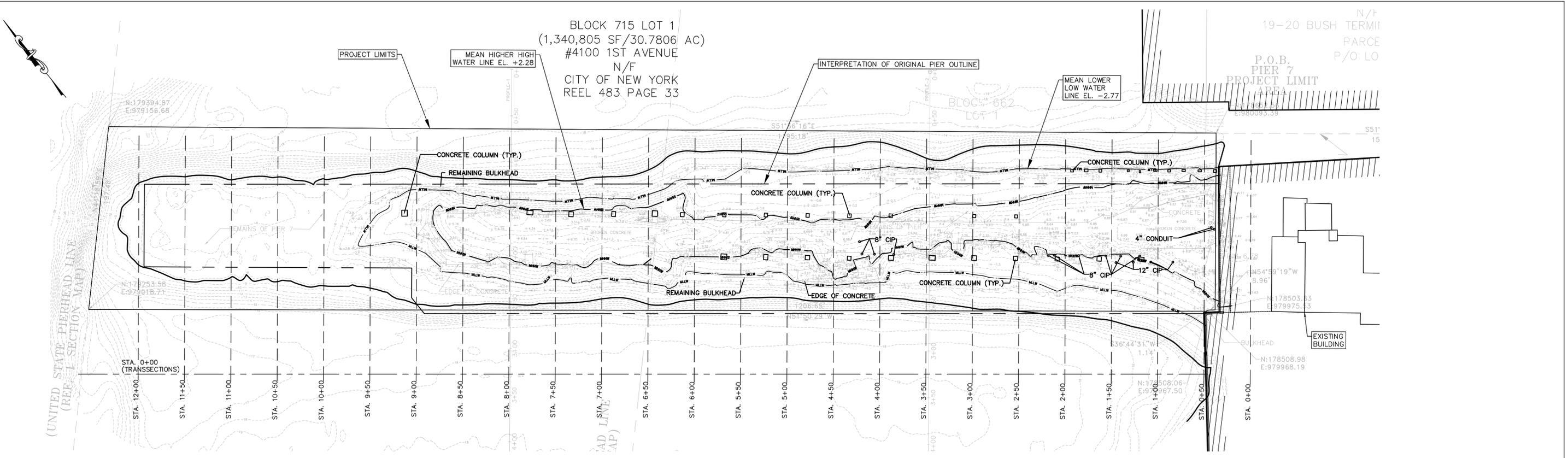
ARMOR STONE REVETMENT

- 50. BEDDING MATERIAL SHALL CONSIST OF WASHED CRUSHED STONE AND SHALL BE FREE OF ORGANIC MATTER, BITUMINOUS MATERIALS, AND OTHER DELETERIOUS PARTICLES.

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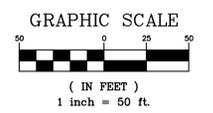
Table with columns: REV. NO., DATE, DRWN, CHKD, REMARKS, DESIGNED BY, DRAWN BY, SHEET CHK'D BY, CROSS CHK'D BY, APPROVED BY, DATE, ENGENUITY INFRASTRUCTURE logo, GENERAL NOTES AND LEGEND, BUSH TERMINAL PIER 7 NEW YORK ECONOMIC DEVELOPMENT CORP., one LIBERTY PLAZA, 14TH FLOOR NEW YORK, NY 10006, JACLYN J. FLOR, P.E., P.P., C.M.E. CONSULTING ENGINEER, DATE 11/2/2022, PROJECT NO. WSPG-00020, DRAWING GN, SHEET NO. 2 OF 11

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REFERENCE DATUM	
LEVEL	NAVD88
MHHW	+2.28
MHW	+1.96
MLW	-2.57
MLLW	-2.77
LOWER LITTORAL LIMIT	-8.61

SECTION AT INSHORE END OF PIER
SCALE: 1/4"=1'
0 2 4 6



REV. NO.	DATE	DRWN	CHKD	REMARKS
2	12/12/22	MPK	STA	REVISED NYEDC ADDRESS
1	11/2/22	MPK	STA	REVISED TIDAL DATUMS

DESIGNED BY: JJF
DRAWN BY: JWP
SHEET CHK'D BY: JJF
CROSS CHK'D BY: STA
APPROVED BY: JJF
DATE: NOVEMBER 2, 2022

ENGENUITY INFRASTRUCTURE
GALLERIA: 2 BRIDGE AVE., SUITE 323
RED BANK, NJ 07701
732.741.3176
ENGENUITYNJ.COM

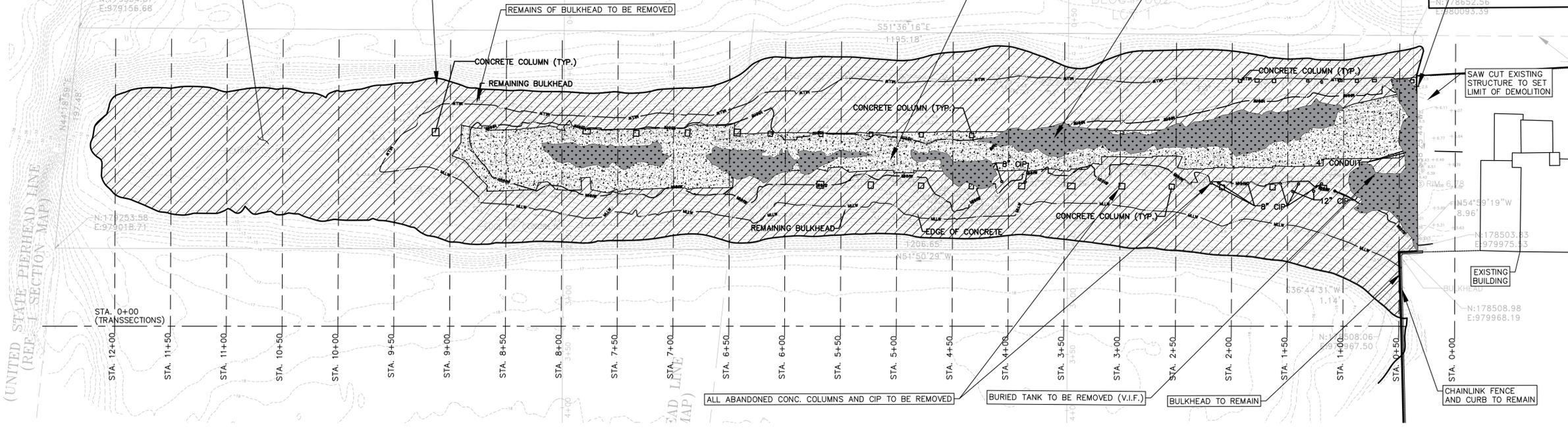
EXISTING CONDITIONS
BLOCK 715 LOT 1
1ST AVENUE & 43RD STREET
BROOKLYN, NY 11232

**BUSH TERMINAL PIER 7
NEW YORK ECONOMIC DEVELOPMENT CORP.
ONE LIBERTY PLAZA, 14TH FLOOR
NEW YORK, NY 10006**

JACLYN J. FLOR, P.E., P.P., C.M.E.
CONSULTING ENGINEER
Jaclyn J. Flor
LICENSED PROFESSIONAL ENGINEER
STATE OF NY LICENSE NO. G101540
CERTIFICATE OF AUTHORIZATION 0017153
DATE: 11/2/2022

PROJECT NO. WSPG-00020
DRAWING
EX
SHEET NO.
3 OF **11**

BLOCK 715 LOT 1
(1,340,805 SF/30.7806 AC)
#4100 1ST AVENUE
N/F
CITY OF NEW YORK
REEL 483 PAGE 33



- NOTES:**
- CONTRACTOR SHALL VISIT SITE AND EXPEND EFFORT TO BECOME THOROUGHLY KNOWLEDGABLE OF THE NATURE AND COMPOSITION OF REMNANT PIER DEBRIS AND FILL TO BE REMOVED WITHIN THE DEMOLITION LIMITS SHOWN. CONTRACTOR PRICING SHALL INCLUDE ALL COSTS ASSOCIATED WITH THE REMOVAL AND LEGAL DISPOSAL OF ALL DEBRIS AND FILL AT AN APPROVED OFF-SITE DISPOSAL FACILITY.
 - THE CONTRACTOR SHALL LEGALLY REMOVE REMNANT PIER DEBRIS DOWN TO THE LITTORAL ZONE LOWER LIMIT TAKEN AT ELEVATION -8.61 FT (NAVD88), INCLUDING DEBRIS WHICH HAS COLLAPSED OUTSIDE OF THE LIMITS OF THE ORIGINAL PIER OUTLINE AS INDICATED. DEBRIS TO BE REMOVED SHALL INCLUDE, BUT SHALL NOT BE LIMITED TO ALL MANNER OF REMNANT FILL INCLUDING
 CONCRETE: DEBRIS, SLABS, GRADE BEAMS, PEDESTALS, PIERS, SEAWALLS, FOUNDATIONS, DEADMEN, DRAINAGE STRUCTURES, ETC.
 FILL: EARTHEN FILL, ASPHALT, BRICKS, COBBLES, VEGETATION, ETC.
 TIMBER: REMNANT TIMBER CUT-OFF WALLS, SHEETING, WALES, BULKHEAD, PILES, STUBS, BRACES, DECKING, FENDER REMNANTS, ETC.
 STEEL/IRON: TIE-RODS, MOORING DEVICES, TRACK, RAILS, PILES, STUBS, SHEET PILES, FENDER COMPONENTS, UTILITY STRUCTURES, DRAINAGE STRUCTURES, CONDUIT, PIPES, ABANDONED BURIED FUEL OIL TANKS, FENCES, AND OTHER MISCELLANEOUS DEBRIS, AS THE CASE MAY BE.
 - OBSTRUCTIONS AND INTERFERENCES IN PERFORMANCE OF THE WORK SHALL BE REMOVED AND LEGALLY DISPOSED. BURIED REMNANT DEBRIS SHALL NOT BE DEEMED AS AN OBSTRUCTION. NO CONSIDERATION WILL BE GIVEN FOR ADDITIONAL COMPENSATION ON THIS ACCOUNT.
- THE WORK ALSO INCLUDES INSTALLATION OF AN ARMOR STONE REVETMENT AT THE INSHORE END OF PIER 7 IN ORDER TO STABILIZE THE SHORELINE.

LEGEND

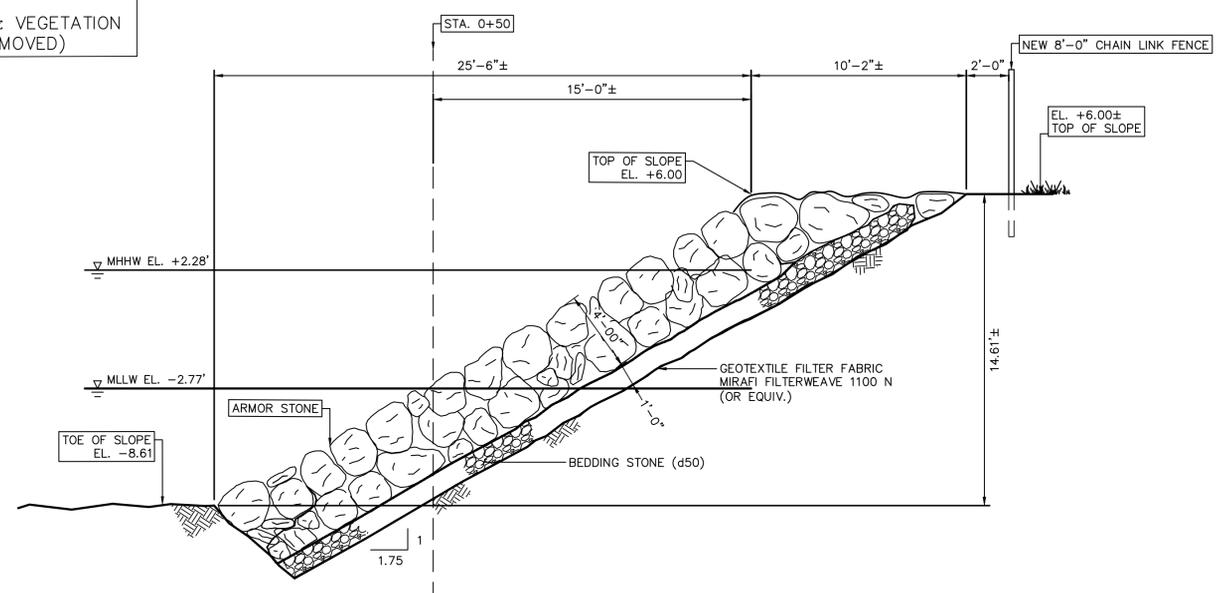
- CONCR. & MISC. PIER DEBRIS AND FILL BELOW MHHW EL. +2.28 (4.02 ACRES TO BE REMOVED)
- CONCR. & MISC. PIER DEBRIS AND FILL ABOVE MHHW EL. +2.28 (0.79 ACRES TO BE REMOVED)
- CONCR. & MISC. PIER DEBRIS MIXED WITH FILL & VEGETATION ABOVE MHHW EL. +2.28 (0.35 ACRES TO BE REMOVED)

REFERENCE DATUM

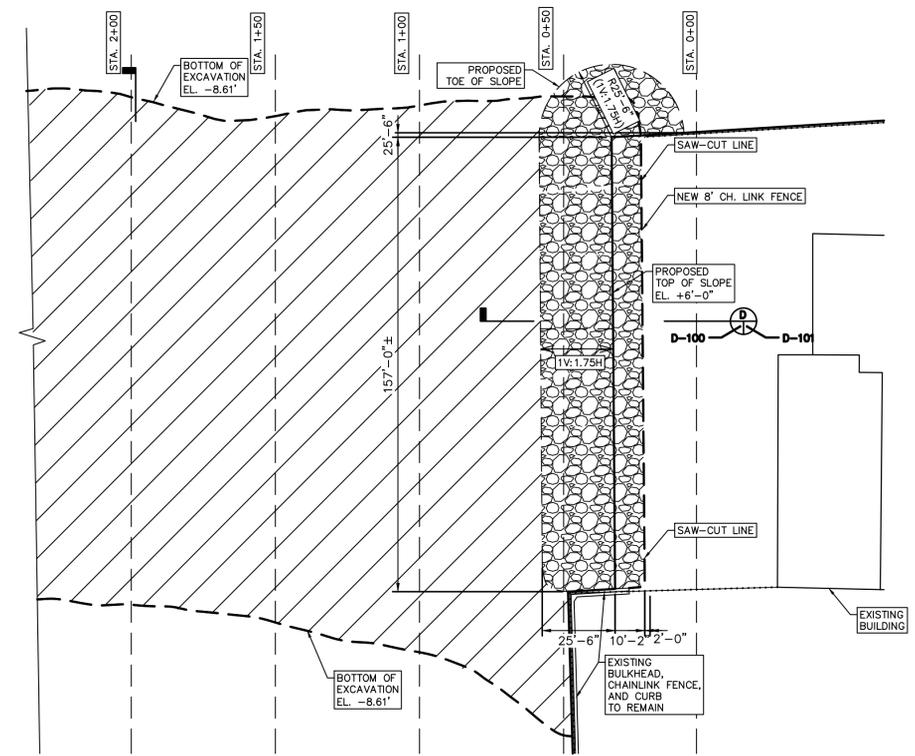
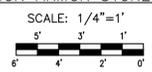
LEVEL	NAVD88
MHHW	+2.28
MHW	+1.96
MLW	-2.57
MLLW	-2.77
LOWER LITTORAL LIMIT	-8.61

STONE GRADATION REQUIREMENTS

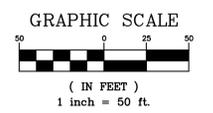
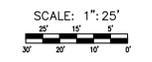
ARMOR & TOE STONE			BEDDING STONE	
PERCENT PASSING BY WEIGHT	ARMOR STONE SIZE { LBS }	TOE STONE SIZE { LBS }	PERCENT PASSING BY SIZE	EQUIV. STONE DIA. (IN.)
W15 (MIN.)	667 lbs	625 lbs	d15 (MIN.)	3"
W15 (MAX.)	1250 lbs	-	d15 (MAX.)	5"
W50 (MIN.)	1667 lbs	1250 lbs	d50	5"
W50 (MAX.)	2500 lbs	1875 lbs		
W85 (MIN.)			d85 (MIN.)	5"
W85 (MAX.)			d85 (MAX.)	6"
W100 (MIN.)	3334 lbs			
W100 (MAX.)	3900 lbs		d50	10"



TYPICAL SECTION ARMOR STONE REVETMENT



ARMOR STONE REVETMENT PLAN VIEW



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DESIGNED BY: J.J.F.
DRAWN BY: J.W.P.
SHEET CHK'D BY: J.J.F.
CROSS CHK'D BY: S.T.A.
APPROVED BY: J.J.F.
DATE: NOVEMBER 2, 2022



ENGENUITY INFRASTRUCTURE
GALLERIA: 2 BRIDGE AVE., SUITE 323
RED BANK, NJ 07701
732.741.3176
ENGENUITYNJ.COM

DEMOLITION AND REVETMENT PLAN
BLOCK 715 LOT 1
1ST AVENUE & 43RD STREET
BROOKLYN, NY 11232

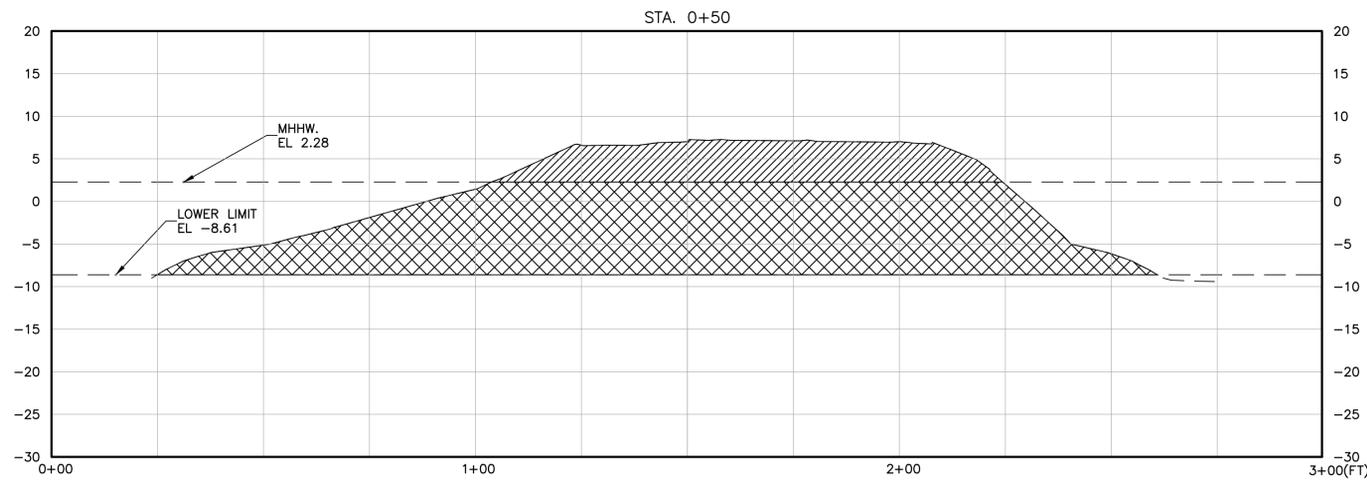
**BUSH TERMINAL PIER 7
NEW YORK ECONOMIC DEVELOPMENT CORP.
ONE LIBERTY PLAZA, 14TH FLOOR
NEW YORK, NY 10006**

JACLYN J. FLOR, P.E., P.P., C.M.E.
CONSULTING ENGINEER
Jaclyn J. Flor
LICENSED PROFESSIONAL ENGINEER
STATE OF NY LICENSE NO. G101540
CERTIFICATE OF AUTHORIZATION 0017153

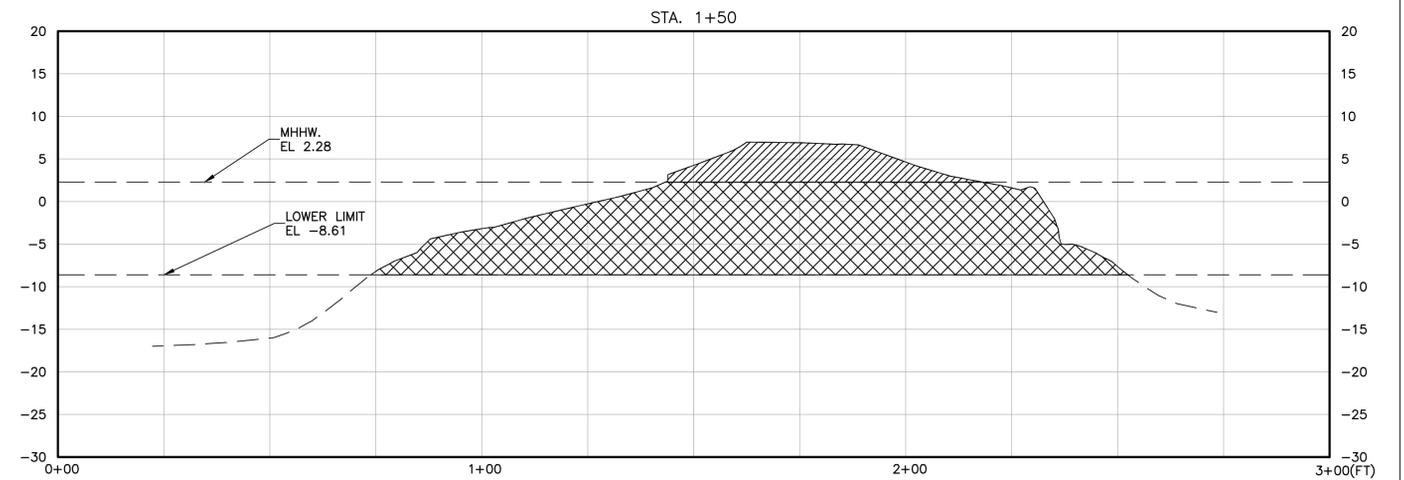
11/2/2022
DATE

PROJECT NO. WSPG-00020
DRAWING
DEMO
SHEET NO.
4 OF 11

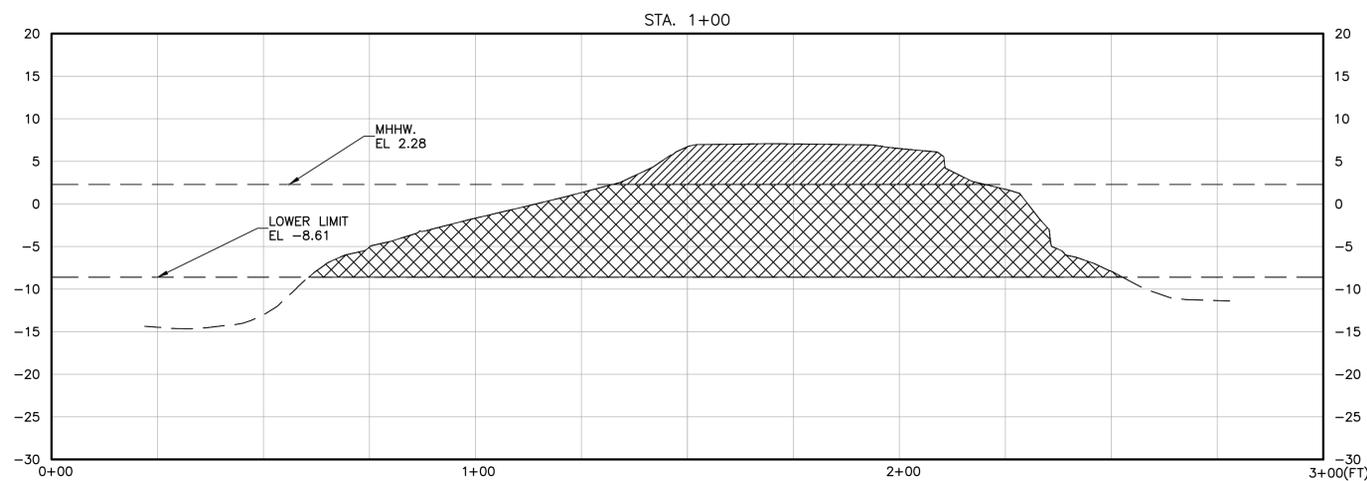
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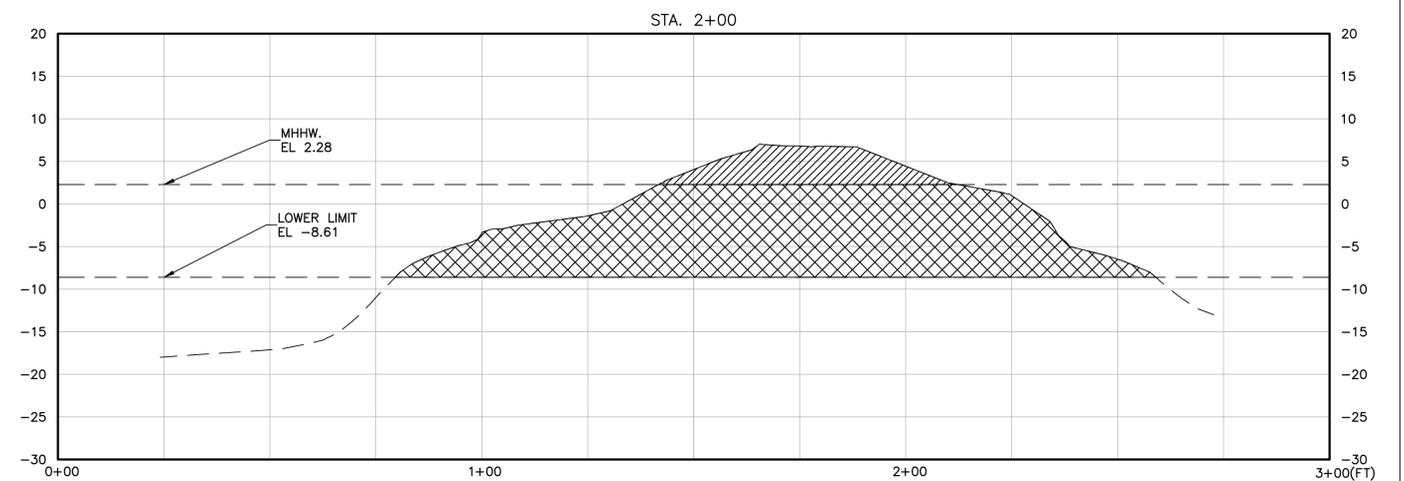
STA. 0+50	
AREA (SF)	VOLUME (CY)
2391.58	2214.42



STA. 1+50	
AREA (SF)	VOLUME (CY)
1682.83	3315.29



STA. 1+00	
AREA (SF)	VOLUME (CY)
1897.68	6185.96

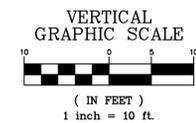


STA. 2+00	
AREA (SF)	VOLUME (CY)
1611.38	3050.20

REFERENCE DATUM	
LEVEL	NAVD88
MHHW	+2.28
MHW	+1.96
MLW	-2.57
MLLW	-2.77
LOWER LITTORAL LIMIT	-8.61

LEGEND

- AREA 1: PIER REMAINS ABOVE MHHW TO BE REMOVED
- AREA 2: PIER REMAINS BELOW MHHW TO BE REMOVED



REV. NO.	DATE	DRWN	CHKD	REMARKS
2	12/12/22	MPK	STA	REVISED NYEDC ADDRESS
1	11/2/22	MPK	STA	REVISED TIDAL DATUMS

DESIGNED BY: JJF
 DRAWN BY: JWP
 SHEET CHK'D BY: JJF
 CROSS CHK'D BY: STA
 APPROVED BY: JJF
 DATE: NOVEMBER 2, 2022



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 GALLERIA: 2 BRIDGE AVE., SUITE 323
 RED BANK, NJ 07701
 732.741.3176
 ENGENUITYNJ.COM

CROSS SECTIONS - 1
 BLOCK 715 LOT 1
 1ST AVENUE & 43RD STREET
 BROOKLYN, NY 11232

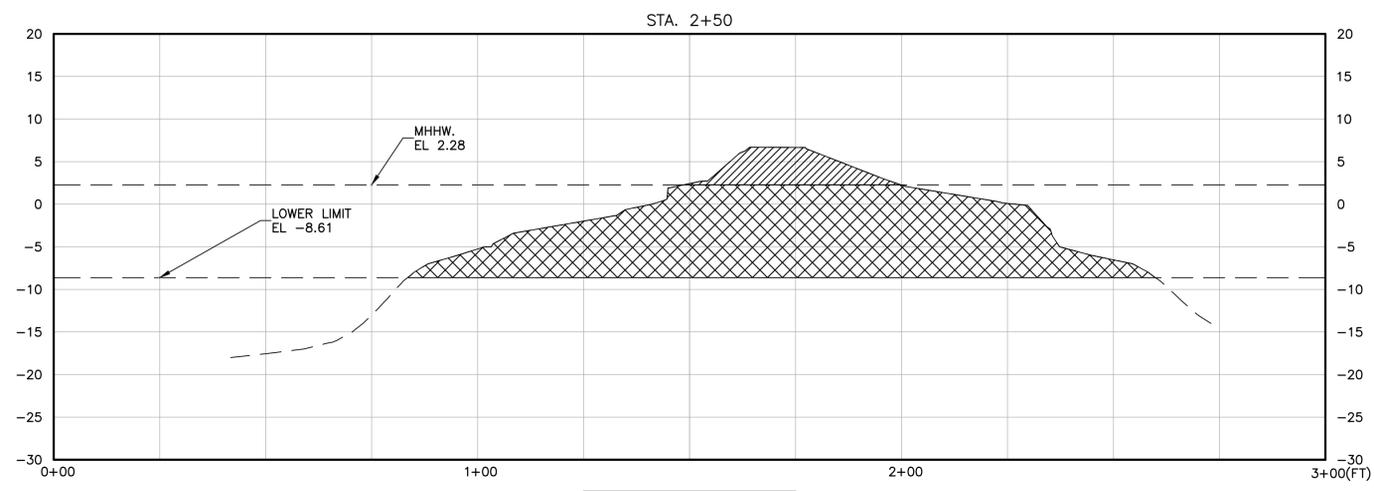
BUSH TERMINAL PIER 7
NEW YORK ECONOMIC DEVELOPMENT CORP.
 ONE LIBERTY PLAZA, 14TH FLOOR
 NEW YORK, NY 10006

JACLYN J. FLOR, P.E., P.P., C.M.E.
 CONSULTING ENGINEER

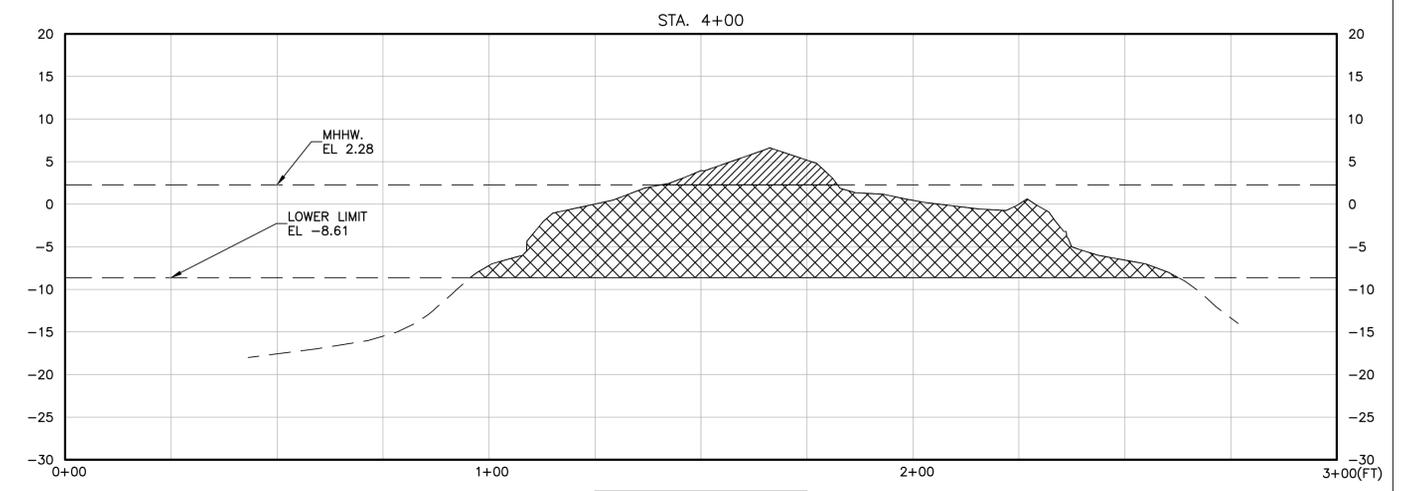
 LICENSED PROFESSIONAL ENGINEER
 STATE OF NY LICENSE NO. G101540
 CERTIFICATE OF AUTHORIZATION 0017153
 DATE: 12/13/2022

PROJECT NO. WSPG-00020
 DRAWING
CS-1
 SHEET NO.
5 OF **11**

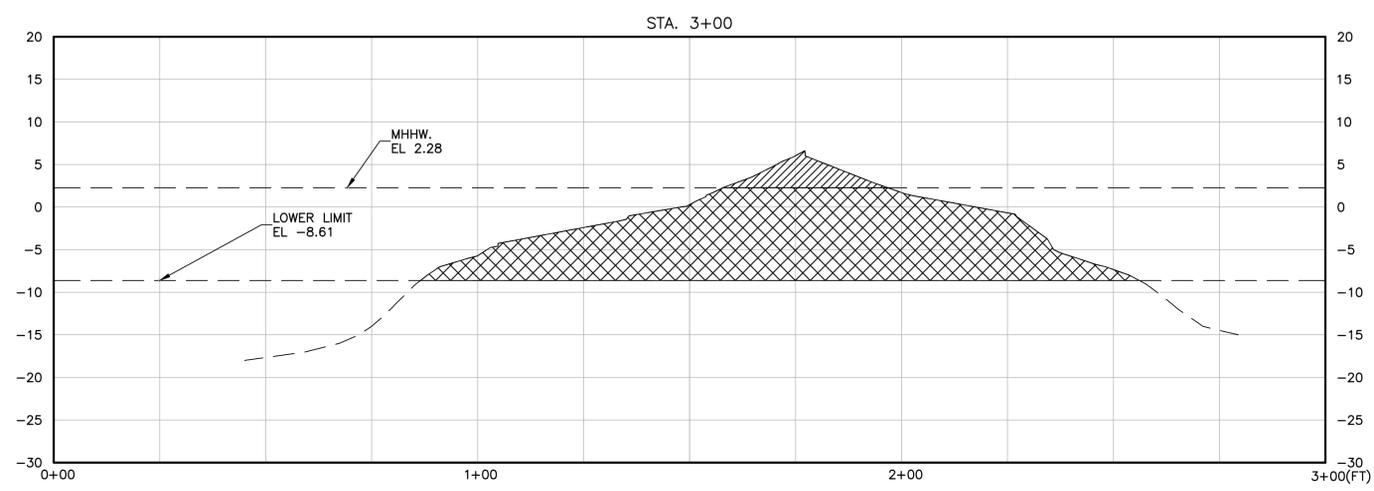
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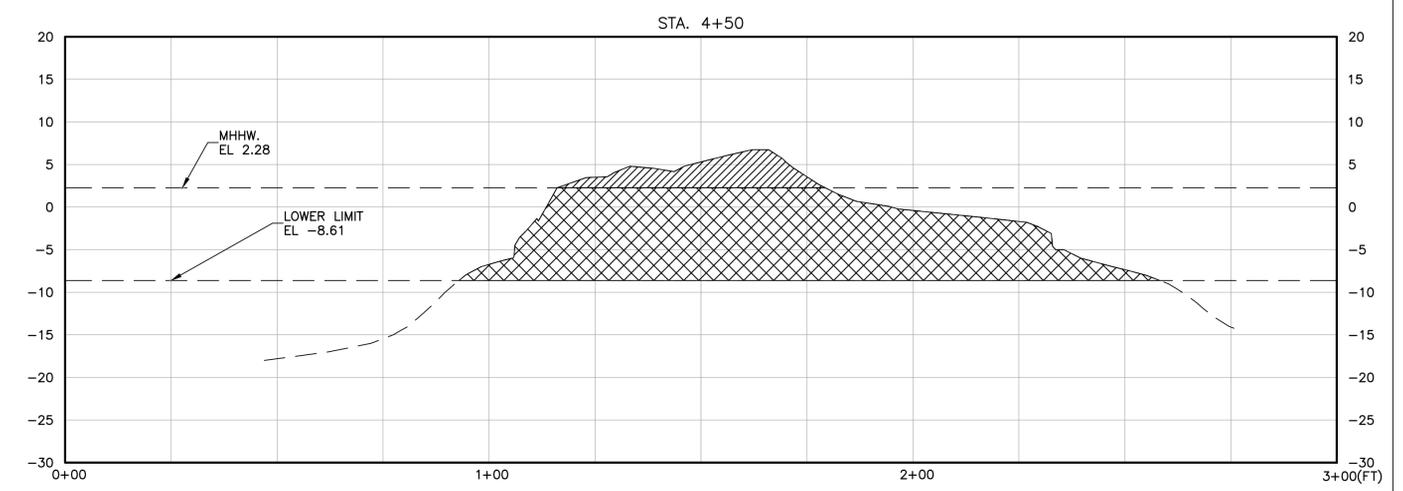
STA. 2+50	
AREA (SF)	VOLUME (CY)
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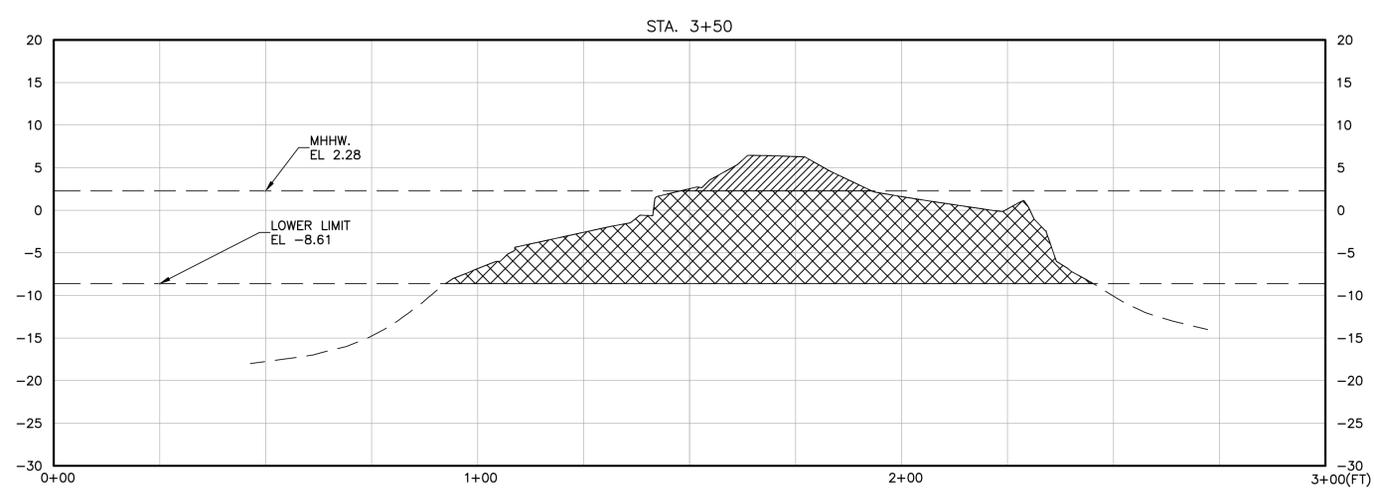
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AREA (SF)	VOLUME (CY)
1369.69	2475.13



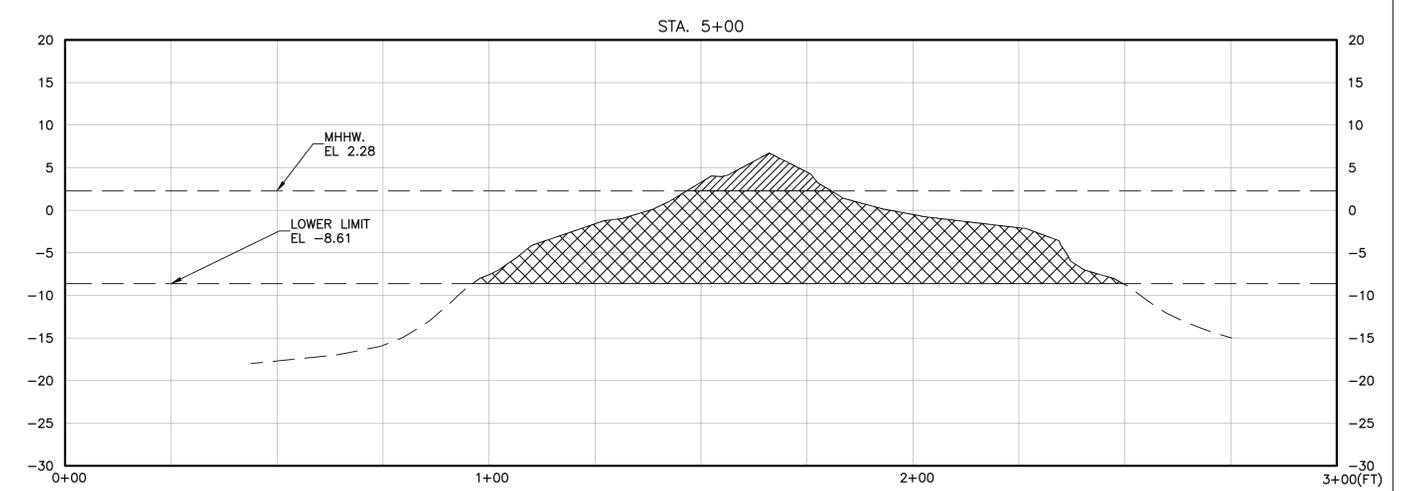
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AREA (SF)	VOLUME (CY)
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STA. 4+50	
AREA (SF)	VOLUME (CY)
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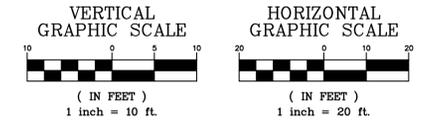


STA. 3+50	
AREA (SF)	VOLUME (CY)
1303.45	2392.84



STA. 5+00	
AREA (SF)	VOLUME (CY)
1189.44	2409.44

REFERENCE DATUM	
LEVEL	NAVD88
MHHW	+2.28
MHW	+1.96
MLW	-2.57
MLLW	-2.77
LOWER LITTORAL LIMIT	-8.61



LEGEND
 [Hatched Area] AREA 1: PIER REMAINS ABOVE MHHW TO BE REMOVED
 [Cross-hatched Area] AREA 2: PIER REMAINS BELOW MHHW TO BE REMOVED

REV. NO.	DATE	DRWN	CHKD	REMARKS
2	12/12/22	MPK	STA	REVISED NYEDC ADDRESS
1	11/2/22	MPK	STA	REVISED TIDAL DATUMS

DESIGNED BY: J.J.F.
 DRAWN BY: J.W.P.
 SHEET CHK'D BY: J.J.F.
 CROSS CHK'D BY: STA
 APPROVED BY: J.J.F.
 DATE: NOVEMBER 2, 2022

ENGENUITY INFRASTRUCTURE
 GALLERIA: 2 BRIDGE AVE., SUITE 323
 RED BANK, NJ 07701
 732.741.3176
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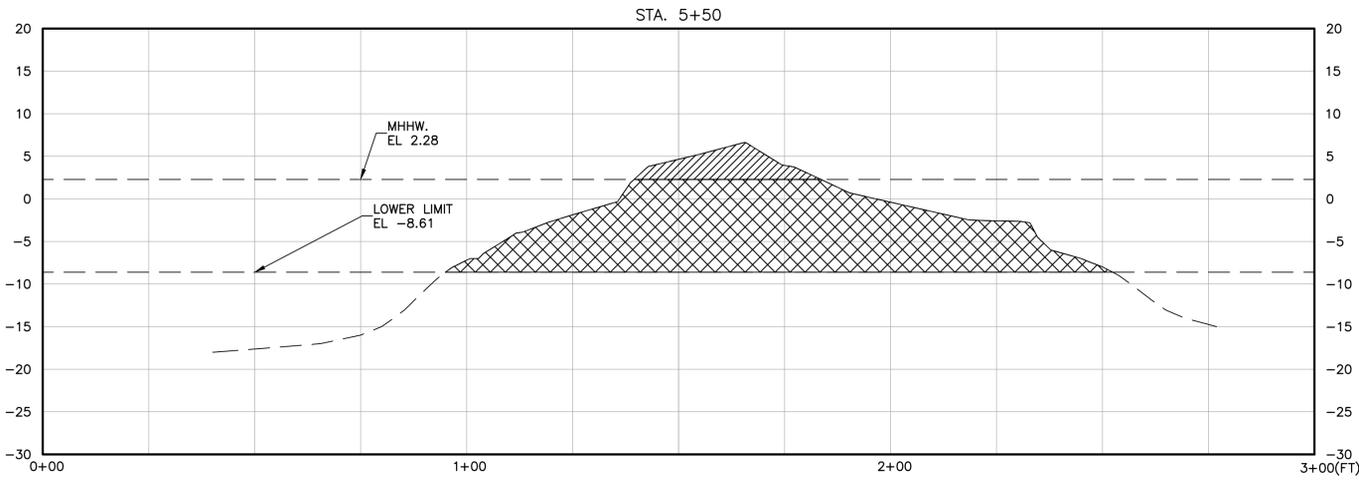
CROSS SECTIONS - 2
 BLOCK 715 LOT 1
 1ST AVENUE & 43RD STREET
 BROOKLYN, NY 11232

BUSH TERMINAL PIER 7
NEW YORK ECONOMIC DEVELOPMENT CORP.
 ONE LIBERTY PLAZA, 14TH FLOOR
 NEW YORK, NY 10006

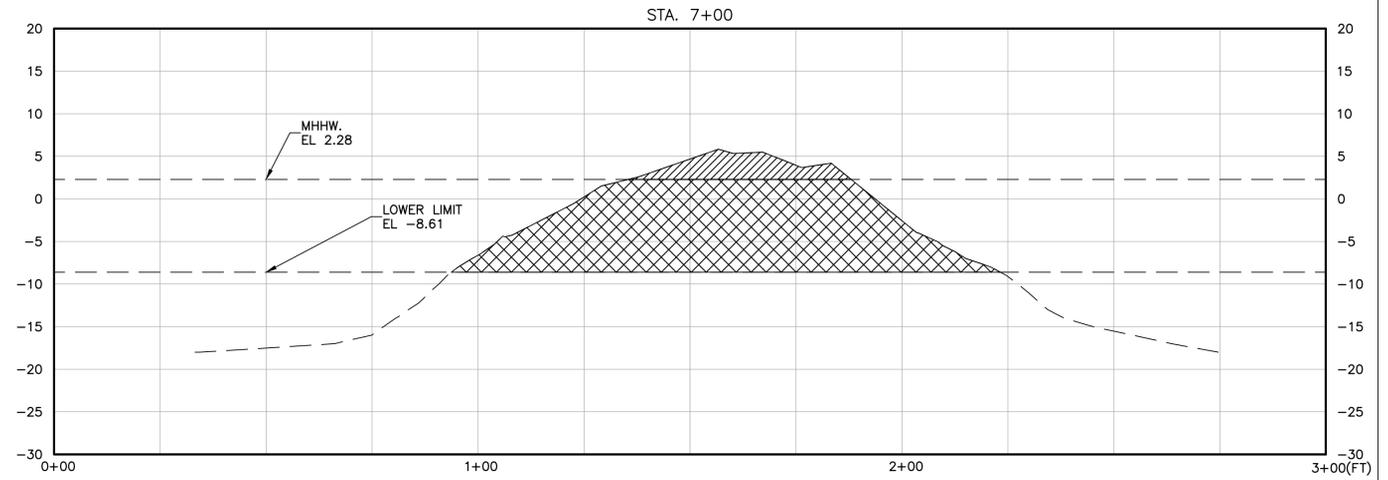
JACLYN J. FLOR, P.E., P.P., C.M.E.
 CONSULTING ENGINEER
 [Signature]
 LICENSED PROFESSIONAL ENGINEER
 STATE OF NY LICENSE NO. G101540
 CERTIFICATE OF AUTHORIZATION 0017153
 DATE: 11/2/2022

PROJECT NO. WSPG-00020
DRAWING
CS-2
SHEET NO.
6 OF 11

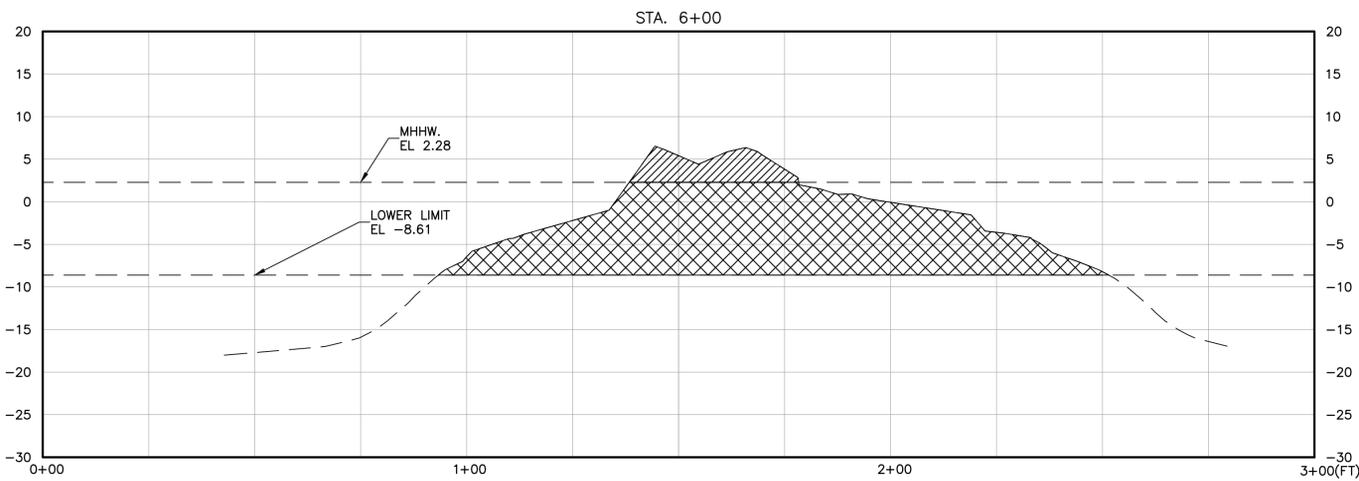
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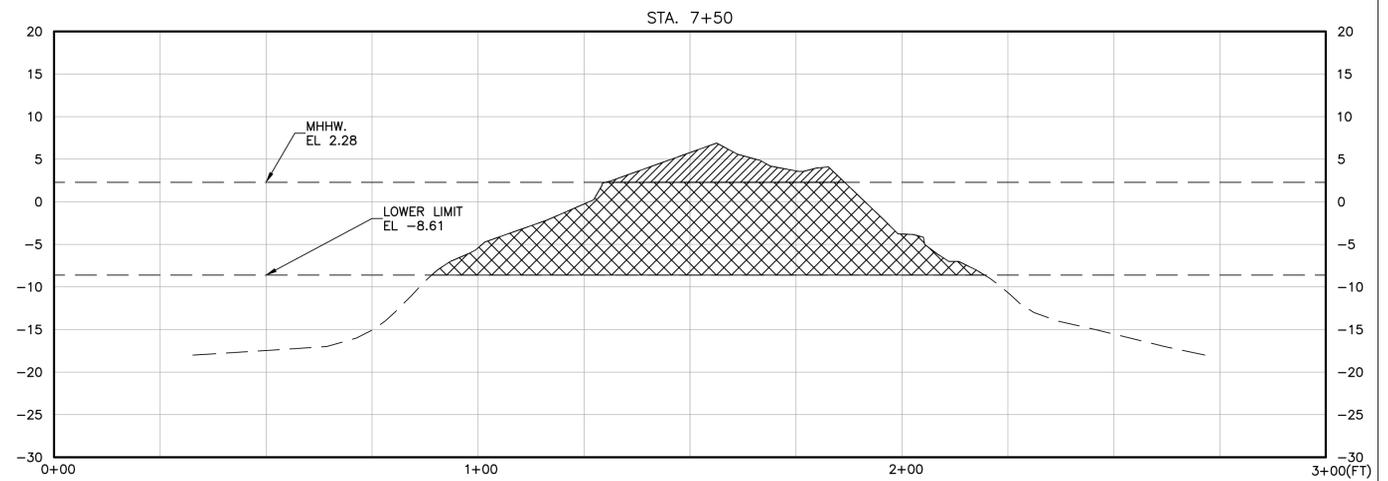
STA. 5+50	
AREA (SF)	VOLUME (CY)
1227.19	2237.62



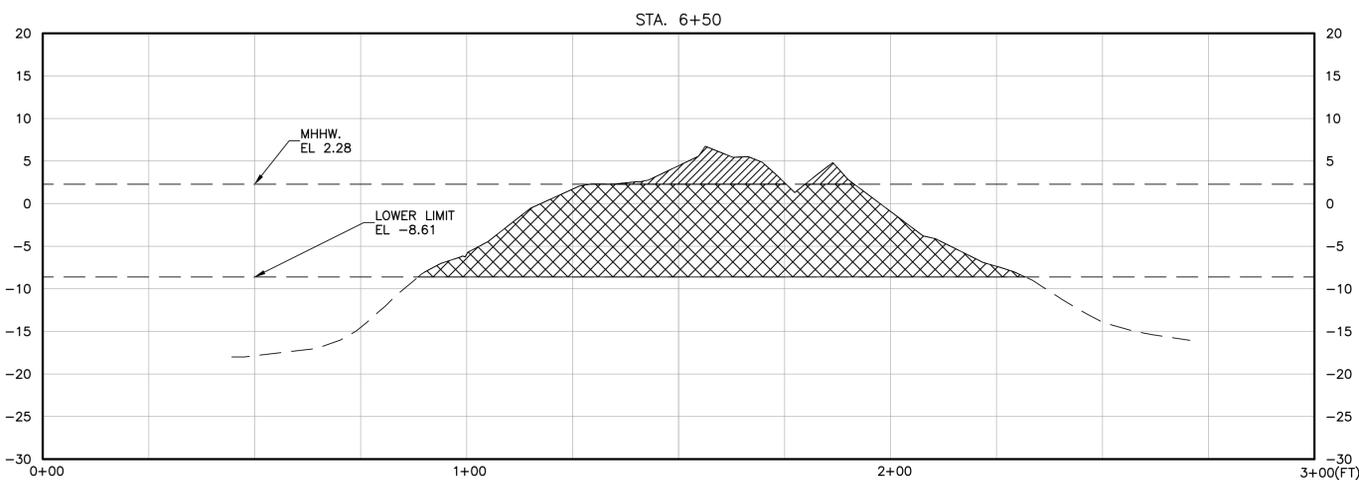
STA. 7+00	
AREA (SF)	VOLUME (CY)
1094.45	2116.80



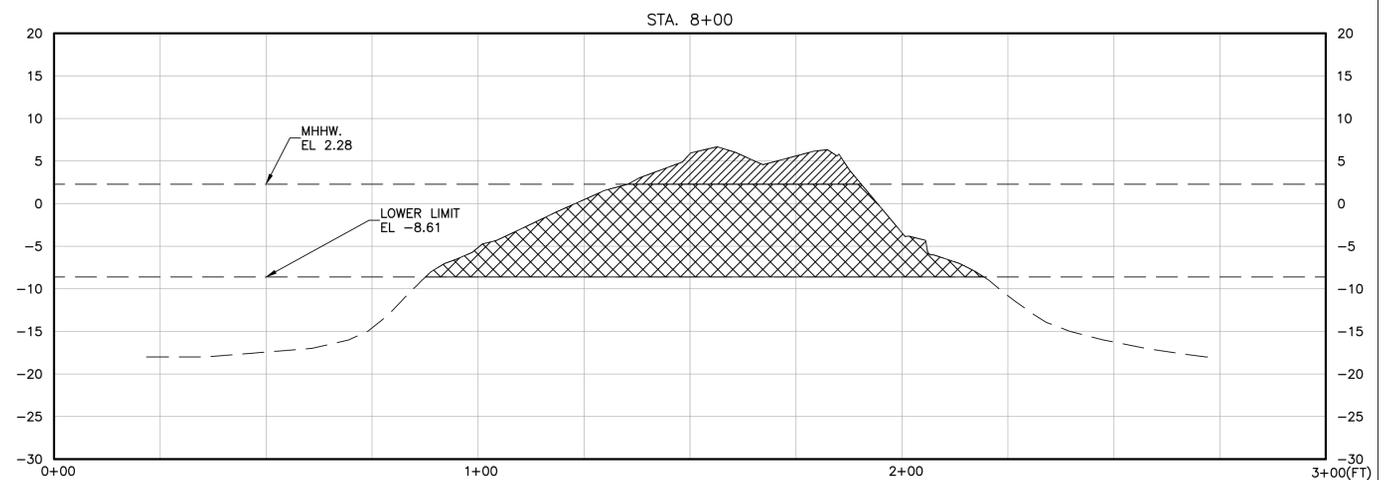
STA. 6+00	
AREA (SF)	VOLUME (CY)
1237.15	2281.80



STA. 7+50	
AREA (SF)	VOLUME (CY)
1104.71	2036.26

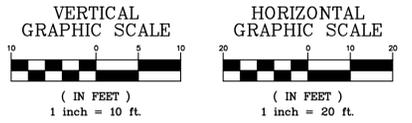


STA. 6+50	
AREA (SF)	VOLUME (CY)
1191.36	2248.62



STA. 8+00	
AREA (SF)	VOLUME (CY)
1163.62	2100.31

REFERENCE DATUM	
LEVEL	NAVD88
MHHW	+2.28
MHW	+1.96
MLW	-2.57
MLLW	-2.77
LOWER LITTORAL LIMIT	-8.61



LEGEND
 [Hatched Area] AREA 1: PIER REMAINS ABOVE MHHW TO BE REMOVED
 [Cross-hatched Area] AREA 2: PIER REMAINS BELOW MHHW TO BE REMOVED

REV. NO.	DATE	DRWN	CHKD	REMARKS
2	12/12/22	MPK	STA	REVISED NYEDC ADDRESS
1	11/2/22	MPK	STA	REVISED TIDAL DATUMS

DESIGNED BY: J.J.F.
 DRAWN BY: J.W.P.
 SHEET CHK'D BY: J.J.F.
 CROSS CHK'D BY: STA
 APPROVED BY: J.J.F.
 DATE: NOVEMBER 2, 2022

ENGENUITY INFRASTRUCTURE
 GALLERIA: 2 BRIDGE AVE., SUITE 323
 RED BANK, NJ 07701
 732.741.3176
 ENGENUITYNJ.COM

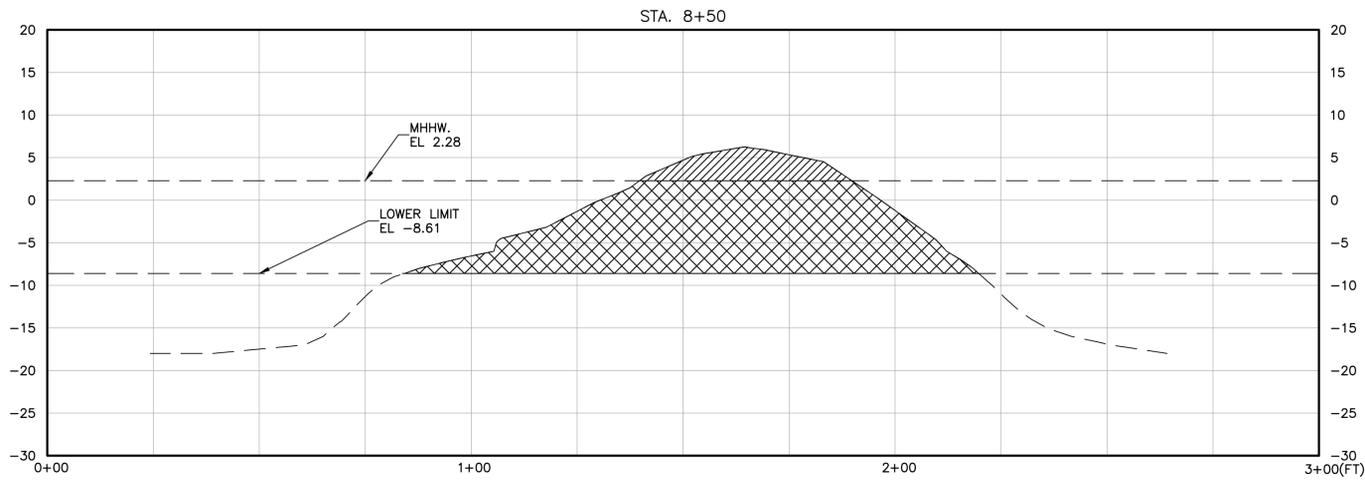
CROSS SECTIONS - 3
 BLOCK 715 LOT 1
 1ST AVENUE & 43RD STREET
 BROOKLYN, NY 11232

BUSH TERMINAL PIER 7
NEW YORK ECONOMIC DEVELOPMENT CORP.
 ONE LIBERTY PLAZA, 14TH FLOOR
 NEW YORK, NY 10006

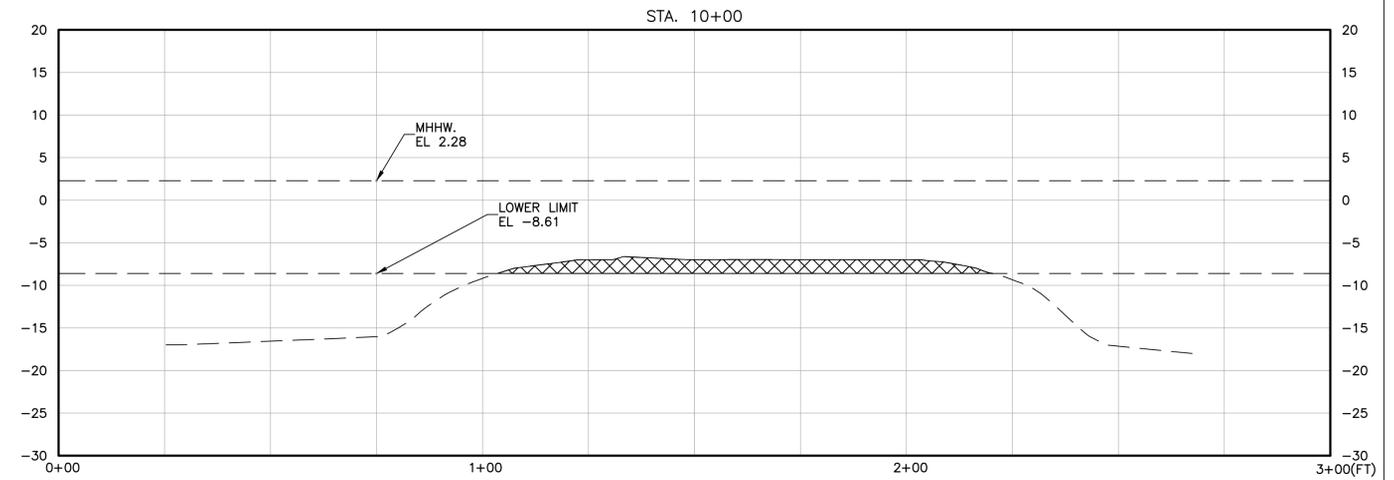
JACLYN J. FLOR, P.E., P.P., C.M.E.
 CONSULTING ENGINEER
 [Signature]
 LICENSED PROFESSIONAL ENGINEER
 STATE OF NY LICENSE NO. G101540
 CERTIFICATE OF AUTHORIZATION 0017153
 DATE: 11/2/2022

PROJECT NO. WSPG-00020
 DRAWING
CS-3
 SHEET NO.
7 OF 11

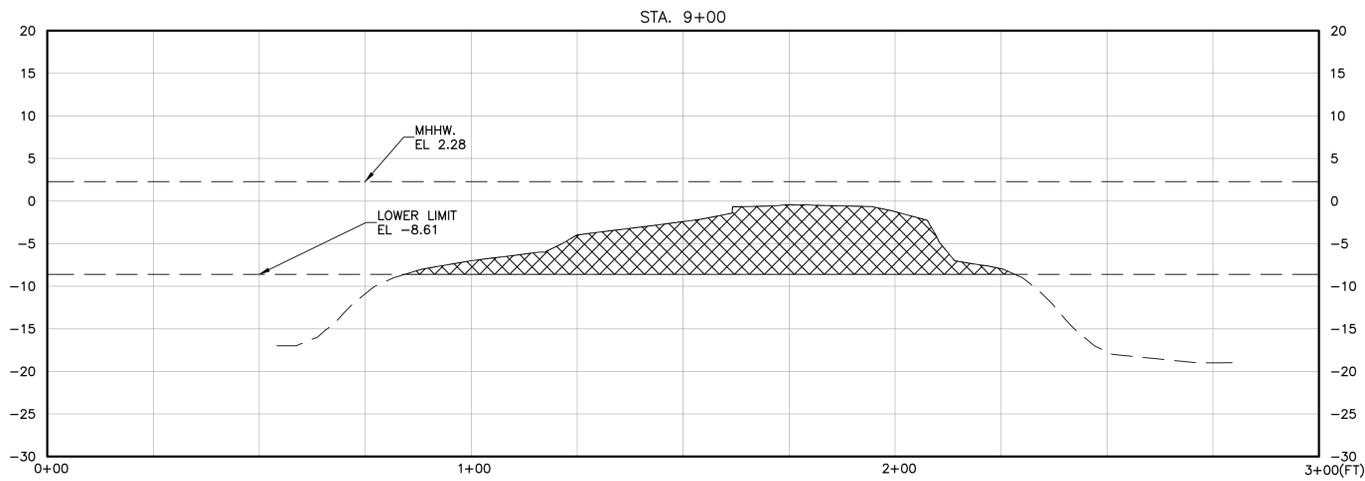
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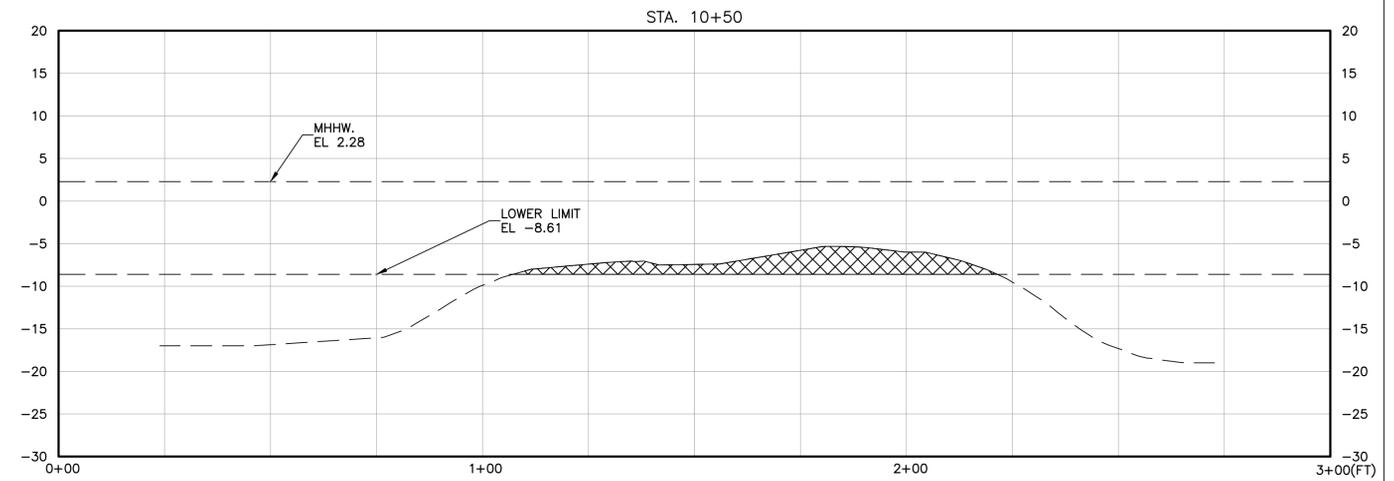
STA. 8+50	
AREA (SF)	VOLUME (CY)
1106.46	2101.93



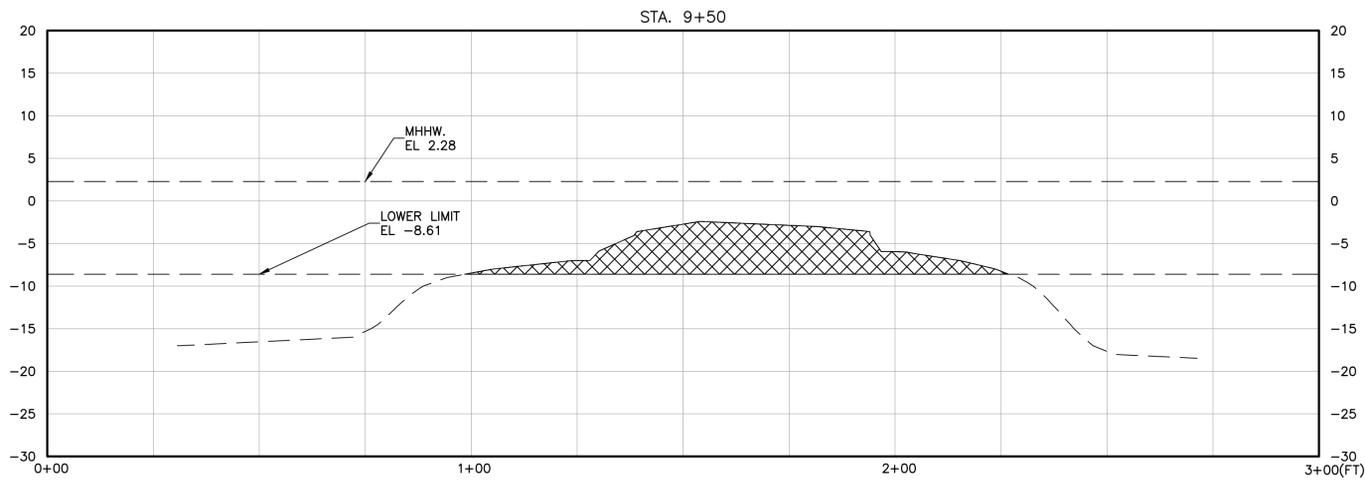
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AREA (SF)	VOLUME (CY)
168.44	564.85



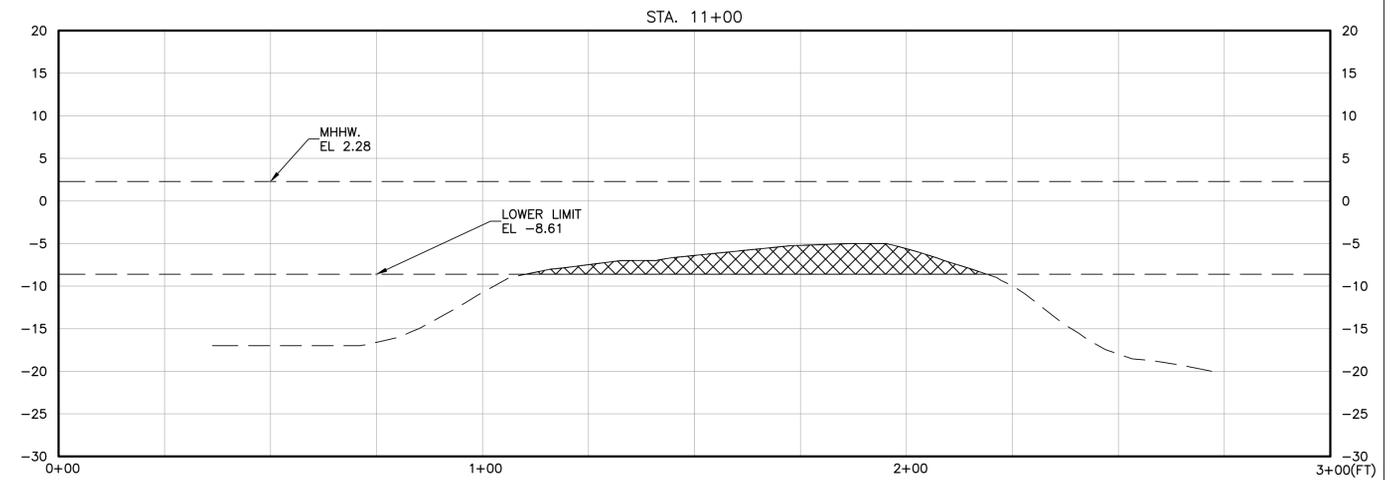
STA. 9+00	
AREA (SF)	VOLUME (CY)
688.03	1661.57



STA. 10+50	
AREA (SF)	VOLUME (CY)
205.19	345.95



STA. 9+50	
AREA (SF)	VOLUME (CY)
441.61	1045.97

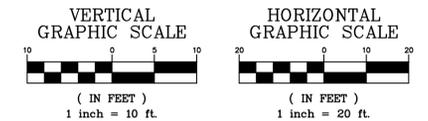


STA. 11+00	
AREA (SF)	VOLUME (CY)
238.08	410.43

REFERENCE DATUM	
LEVEL	NAVD88
MHHW	+2.28
MHW	+1.96
MLW	-2.57
MLLW	-2.77
LOWER LITTORAL LIMIT	-8.61

LEGEND

- AREA 1: PIER REMAINS ABOVE MHHW TO BE REMOVED
- AREA 2: PIER REMAINS BELOW MHHW TO BE REMOVED



REV. NO.	DATE	DRWN	CHKD	REMARKS
2	12/12/22	MPK	STA	REVISED NYEDC ADDRESS
1	11/2/22	MPK	STA	REVISED TIDAL DATUMS

DESIGNED BY: JJF
 DRAWN BY: JWP
 SHEET CHK'D BY: JJF
 CROSS CHK'D BY: STA
 APPROVED BY: JJF
 DATE: NOVEMBER 2, 2022



ENGENUITY INFRASTRUCTURE
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 RED BANK, NJ 07701
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CROSS SECTIONS - 4
 BLOCK 715 LOT 1
 1ST AVENUE & 43RD STREET
 BROOKLYN, NY 11232

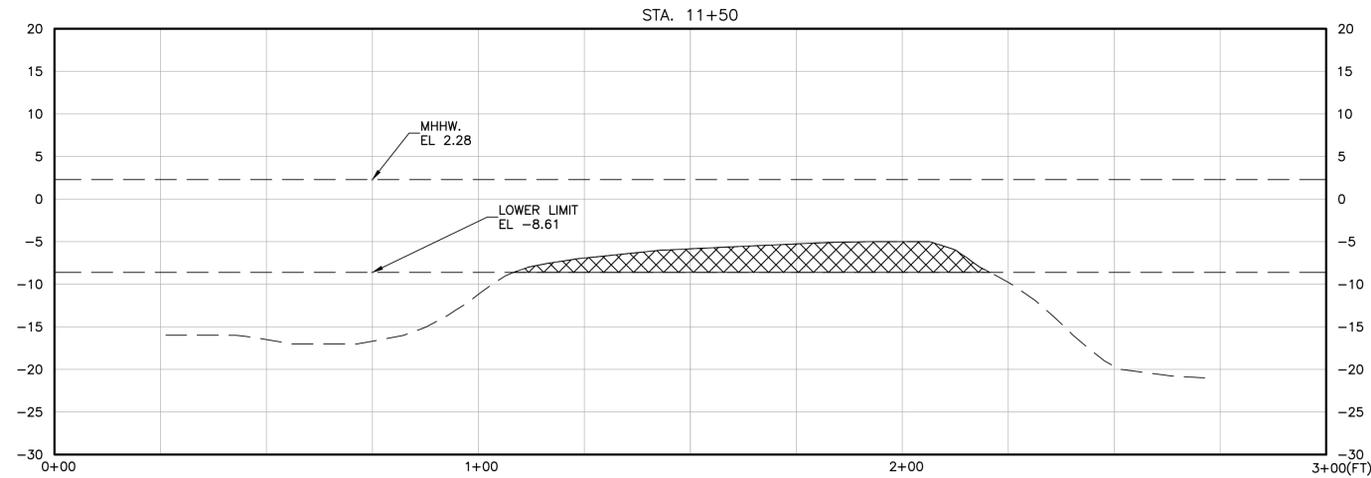
BUSH TERMINAL PIER 7
NEW YORK ECONOMIC DEVELOPMENT CORP.
 ONE LIBERTY PLAZA, 14TH FLOOR
 NEW YORK, NY 10006

JACLYN J. FLOR, P.E., P.P., C.M.E.
 CONSULTING ENGINEER

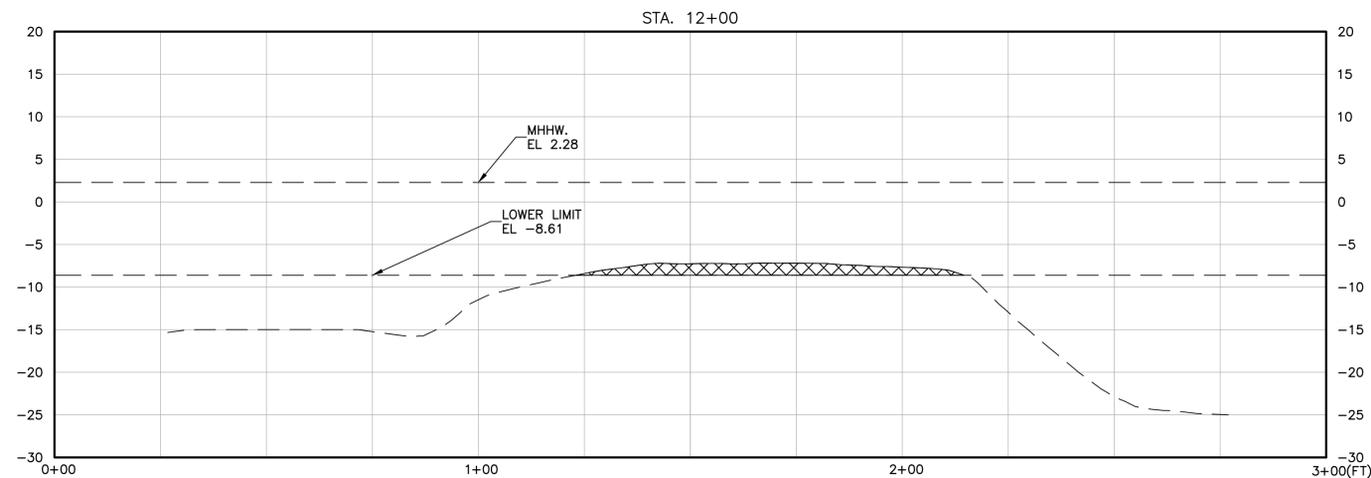
 LICENSED PROFESSIONAL ENGINEER
 STATE OF NY LICENSE NO. G101540
 CERTIFICATE OF AUTHORIZATION 0017153
 DATE: 11/2/2022

PROJECT NO. WSPG-00020
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STA. 11+50	
AREA (SF)	VOLUME (CY)
291.28	490.14



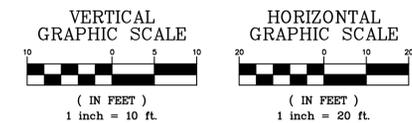
STA. 12+00	
AREA (SF)	VOLUME (CY)
100.40	362.66

Total Volume Table			
Station	Cut Area	Cut Vol	Cum Cut Vol
0+00.00	0.00	0.00	0.00
0+50.00	2391.58	2214.42	2214.42
1+00.00	1897.68	3971.53	6185.96
1+50.00	1682.83	3315.29	9501.24
2+00.00	1611.38	3050.20	12551.44
2+50.00	1433.52	2819.36	15370.79
3+00.00	1280.82	2513.28	17884.08
3+50.00	1303.45	2392.84	20276.92
4+00.00	1369.69	2475.13	22752.05
4+50.00	1412.76	2576.34	25328.39
5+00.00	1189.44	2409.44	27737.83
5+50.00	1227.19	2237.62	29975.45
6+00.00	1237.15	2281.80	32257.24
6+50.00	1191.36	2248.62	34505.87
7+00.00	1094.45	2116.49	36622.36
7+50.00	1104.71	2036.26	38658.61
8+00.00	1163.62	2100.31	40758.92
8+50.00	1106.46	2101.93	42860.86
9+00.00	688.03	1661.57	44522.43
9+50.00	441.61	1045.97	45568.40
10+00.00	168.44	564.86	46133.26
10+50.00	205.19	345.95	46479.21
11+00.00	238.08	410.43	46889.64
11+50.00	291.28	490.14	47379.78
12+00.00	100.40	362.66	47742.44
12+50.00	0.00	92.96	47835.40

LEGEND

- AREA 1: PIER REMAINS ABOVE MHHW TO BE REMOVED
- AREA 2: PIER REMAINS BELOW MHHW TO BE REMOVED

REFERENCE DATUM	
LEVEL	NAVD88
MHHW	+2.28
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DESIGNED BY: JJF
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 DATE: NOVEMBER 2, 2022

ENGENUITY INFRASTRUCTURE
 GALLERIA: 2 BRIDGE AVE., SUITE 323
 RED BANK, NJ 07701
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CROSS SECTIONS - 5
 BLOCK 715 LOT 1
 1ST AVENUE & 43RD STREET
 BROOKLYN, NY 11232

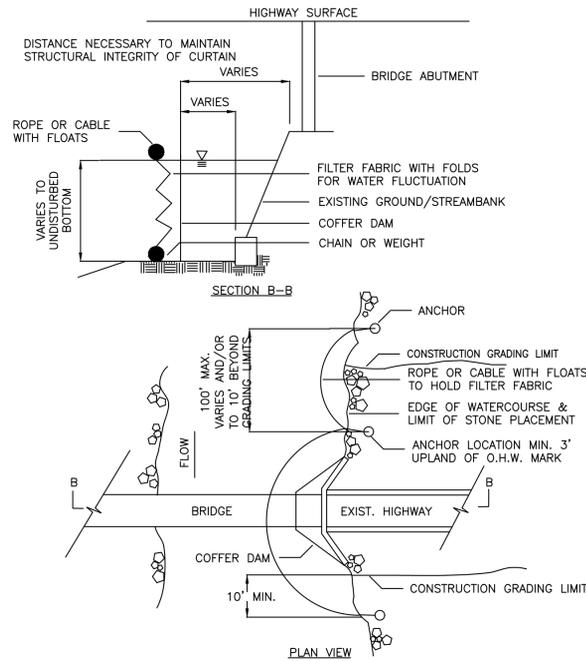
**BUSH TERMINAL PIER 7
 NEW YORK ECONOMIC DEVELOPMENT CORP.
 ONE LIBERTY PLAZA, 14TH FLOOR
 NEW YORK, NY 10006**

JACLYN J. FLOR, P.E., P.P., C.M.E.
 CONSULTING ENGINEER

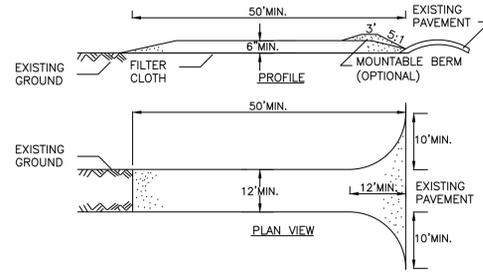
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 STATE OF NY LICENSE NO. G101540
 CERTIFICATE OF AUTHORIZATION 0017153
 DATE: 11/2/2022

PROJECT NO. WSPG-00020
 DRAWING
CS-5
 SHEET NO.
9 OF **11**

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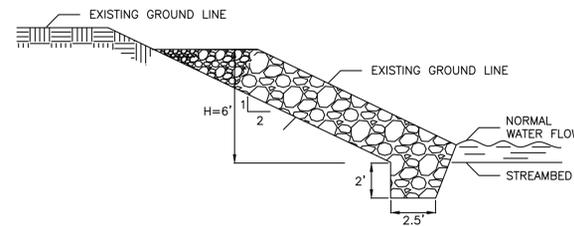
TURBIDITY CURTAIN
DETAIL **(A)**
NTS SESC



CONSTRUCTION SPECIFICATIONS

1. STONE SIZE - USE 1-4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ACCESS SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

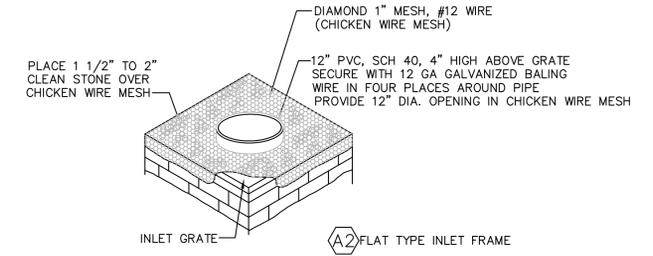
STABILIZED CONSTRUCTION ENTRANCE
DETAIL **(B)**
NTS SESC



CONSTRUCTION SPECIFICATIONS

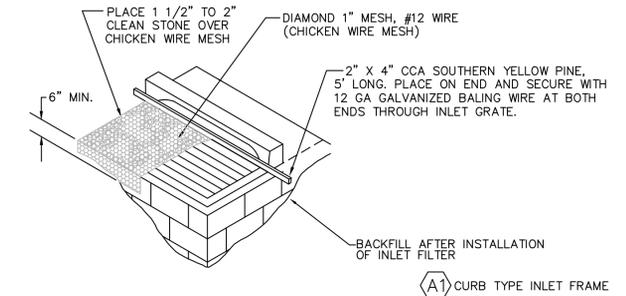
1. SLOPE SHALL BE GRADED TO 2:1 OR FLATTER PRIOR TO PLACING FILTER, FILTER FABRIC, OR RIPRAP.
2. RIPRAP SHALL BE PLACED TO MAINTAIN A UNIFORM GRADATION. LARGER STONE SHALL BE PLACED AT THE TOE.
3. ENDS OF THE RIPRAP SHALL BE KEYED INTO A STABLE BANK. WHEN TYING INTO OTHER STRUCTURES, LARGER RIPRAP CAN BE LAID IN STEPS OR STACKED AS NEEDED TO FIT. STONES LARGER THAN THOSE DESIGNED FOR FLOW SHALL BE USED FOR THIS PURPOSE.
4. REMAINING DISTURBED AREAS SHALL BE GRADED AND PERMANENTLY SEEDED AND MULCHED.

RIPRAP CHANNEL PROTECTION AND STABILIZATION
DETAIL **(D)**
NTS SESC



GENERAL NOTES:

1. CONTRACTOR TO CLEAN INLET FILTER AFTER EVERY STORM.
2. FILTER FABRIC, WOOD PIECE OR PVC PIPE TO BE REMOVED AFTER PAVING OR FINAL GRADING AND ESTABLISHMENT OF VEGETATION.



INLET FILTER PROTECTION
DETAIL **(C)**
NTS SESC

SOIL EROSION LEGEND

- (A1) INLET FILTER, CURB TYPE
- (A2) INLET FILTER, FLAT GRATE TYPE
- (E2) STABILIZED CONSTRUCTION ACCESS
- - - - - LIMIT OF DISTURBANCE

REV. NO.	DATE	DRWN	CHKD	REMARKS
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1	11/2/22	MPK	STA	REVISED TIDAL DATUMS

DESIGNED BY: JJF
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 RED BANK, NJ 07701
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SESC DETAILS
 BLOCK 715 LOT 1
 1ST AVENUE & 43RD STREET
 BROOKLYN, NY 11232

BUSH TERMINAL PIER 7
NEW YORK ECONOMIC DEVELOPMENT CORP.
 ONE LIBERTY PLAZA, 14TH FLOOR
 NEW YORK, NY 10006

JACLYN J. FLOR, P.E., P.P., C.M.E.
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 STATE OF NY LICENSE NO. G101540
 CERTIFICATE OF AUTHORIZATION 0017153

PROJECT NO. WSPG-00020
 DRAWING
SESC-1
 SHEET NO.
10 OF **11**

STANDARD FOR TEMPORARY VEGETATIVE COVER FOR SOIL STABILIZATION

DEFINITION

ESTABLISHMENT OF TEMPORARY VEGETATIVE COVER ON SOILS EXPOSED FOR PERIODS OF TWO TO 6 MONTHS WHICH ARE NOT BEING GRADED, NOT UNDER ACTIVE CONSTRUCTION OR NOT SCHEDULED FOR PERMANENT SEEDING WITHIN 60 DAYS.

PURPOSE

TO TEMPORARILY STABILIZE THE SOIL AND REDUCE DAMAGE FROM WIND AND WATER EROSION UNTIL PERMANENT STABILIZATION IS ACCOMPLISHED.

WATER QUALITY ENHANCEMENT

PROVIDES TEMPORARY PROTECTION AGAINST THE IMPACTS OF WIND AND RAIN, SLOWS THE OVERLAND MOVEMENT OF STORMWATER RUNOFF, INCREASES INFILTRATION AND RETAINS SOIL AND NUTRIENTS ON SITE, PROTECTING STREAMS OR OTHER STORMWATER CONVEYANCES.

WHERE APPLICABLE

ON EXPOSED SOILS THAT HAVE THE POTENTIAL FOR CAUSING OFF-SITE ENVIRONMENTAL DAMAGE.

- METHODS AND MATERIALS**
- I. SITE PREPARATION**
- GRADE AS NEEDED AND FEASIBLE TO PERMIT THE USE OF CONVENTIONAL EQUIPMENT FOR SEEDBED PREPARATION, SEEDING, MULCH APPLICATION, AND MULCH ANCHORING. ALL GRADING SHOULD BE DONE IN ACCORDANCE WITH STANDARDS FOR LAND GRADING, P. 19-1.
 - INSTALL NEEDED EROSION CONTROL PRACTICES OR FACILITIES SUCH AS DIVERSIONS, GRADE STABILIZATION STRUCTURES, CHANNEL STABILIZATION MEASURES, SEDIMENT BASINS, AND WATERWAYS. SEE STANDARDS 11 THROUGH 42.
 - IMMEDIATELY PRIOR TO SEEDING, THE SURFACE SHOULD BE SCARIFIED 6" TO 12" WHERE THERE HAS BEEN SOIL COMPACTION. THIS PRACTICE IS PERMISSIBLE ONLY WHERE THERE IS NO DANGER TO UNDERGROUND UTILITIES (CABLES, IRRIGATION SYSTEMS, ETC.).
- II. SEEDBED PREPARATION**
- APPLY GROUND LIMESTONE AND FERTILIZER ACCORDING TO SOIL TEST RECOMMENDATIONS SUCH AS THOSE OFFERED BY RUTGERS CO-OPERATIVE EXTENSION. SOIL SAMPLE MAILERS ARE AVAILABLE FROM THE LOCAL RUTGERS CO-OPERATIVE EXTENSION OFFICES. FERTILIZER SHALL BE APPLIED AT THE RATE OF 500 POUNDS PER ACRE OR 11 POUNDS PER 1,000 SQUARE FEET OF 10-20-10 OR EQUIVALENT WITH 50% WATER INSOLUBLE NITROGEN UNLESS A SOIL TEST INDICATES OTHERWISE. APPLY LIMESTONE AT THE RATE OF 2 TONS/ACRE UNLESS SOIL TEST INDICATES OTHERWISE. CALCIUM CARBONATE IS THE EQUIVALENT AND STANDARD FOR MEASURING THE ABILITY OF LIMING MATERIALS TO NEUTRALIZE SOIL ACIDITY AND SUPPLY CALCIUM AND MAGNESIUM TO GRASSES AND LEGUMES. TABLE BELOW IS A GENERAL GUIDELINE FOR LIMESTONE APPLICATION.

SOIL TEXTURE	TONS/ACRE	LBS./1,000 SQ. FT.
CLAY, CLAY LOAM, AND HIGH ORGANIC SOIL	3	135
SANDY LOAM, LOAM, SILT LOAM	2	90
LOAMY SAND, SAND	1	45

- PULVERIZED DOLOMITIC LIMESTONE IS PREFERRED FOR MOST SOILS SOUTH OF THE NEW BRUNSWICK-TRENTON LINE.
- WORK LIME AND FERTILIZER INTO THE SOIL AS NEARLY AS PRACTICAL TO A DEPTH OF 4 INCHES WITH A DISC, SPRINGTOOTH HARROW, OR OTHER SUITABLE EQUIPMENT. THE FINAL HARROWING OR DISCING OPERATION SHOULD BE ON THE GENERAL CONTOUR. CONTINUE TILLAGE UNTIL A REASONABLY UNIFORM SEEDBED IS PREPARED.
 - INSPECT SEEDBED JUST BEFORE SEEDING. IF TRAFFIC HAS LEFT THE SOIL COMPACTED, THE AREA MUST BE RETILLED AS ABOVE.
 - SOILS HIGH ON SULFIDES OR HAVING A PH OF 4 OR LESS REFER TO STANDARD FOR MANAGEMENT OF HIGH ACID PRODUCING SOILS, PG. 1-1 OF THE STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY.

SEEDING

- SELECT SEED FROM RECOMMENDATIONS IN TABLE.

SEED TYPES	SEEDING RATES 1/		OPTIMUM SEEDING DATE 2/			OPTIMUM SEED DEPTH 4/
	Per Acre	Per 1,000 Sq. Ft.	ZONE 5	ZONE 6	ZONE 7	
COOL SEASON GRASSES						
Perennial ryegrass	100	1.0	3/15-6/1 8/1-9/15	3/1-5/15 8/15-10/1	2/15-5/1 8/15-10/15	0.5
Spring Oats	86	2.0	3/15-6/1 8/1-9/15	3/1-5/15 8/15-10/1	2/15-5/1 8/15-10/15	1.0
Winter Barley	96	2.2	8/1-9/15	8/15-10/1	8/15-10/15	1.0
Winter Cereal Rye	112	2.8	8/1-11/1	8/1-11/15	8/1-12/15	1.0
WARM SEASON GRASSES						
Pearl millet	20	0.5	6/1-8/1	5/15-8/15	5/1-9/1	1.0
Millet (German or Hungarian)	30	0.7	6/1-8/1	5/15-8/15	5/1-9/1	1.0
Weeping lovegrass	5	0.2	6/1-8/1	5/15-8/15	5/1-9/1	0.25

1/ Seeding rate for warm season grass, shall be adjusted to reflect the amount of Pure Line Seed (PLS) as determined by a germination test result. No adjustment is required for cool season grasses.

2/ May be planted throughout summer if soil moisture is adequate or can be irrigated

3/ Plant Hardness Zone (see below)

4/ Twice the depth for sandy soils

Zone 5b (-10 to -15)
Zone 6a (-5 to -10)
Zone 6b (0 to -5)
Zone 7a (5 to 0)
Zone 7b (10 to 5)

- CONVENTIONAL SEEDING - APPLY SEED UNIFORMITY BY HAND, CYCLONE (CENTRIFUGAL) SEEDER, DROP SEEDER, DRILL OR CULTPACKER SEEDER, EXCEPT FOR DRILLED, HYDROSEEDER OR CULTPACKED SEEDINGS, SEED SHALL BE INCORPORATED INTO THE SOIL, TO A DEPTH OF 1/4 TO 1/2 INCH, BY RAKING OR DRAGGING. DEPTH OF SEED PLACEMENT MAY BE 1/4 INCH DEEPER ON COARSE TEXTURED SOIL.
- HYDROSEEDING IS A BROADCAST SEEDING METHOD USUALLY INVOLVING A TRUCK OR TRAILER MOUNTED TANK, WITH AN AGITATION SYSTEM AND HYDRAULIC PUMP FOR MIXING SEED, WATER AND FERTILIZER AND SPRAYING THE MIX ONTO THE PREPARED SEEDBED. MULCH SHALL NOT BE INCLUDED IN THE TANK WITH SEED. SHORT FIBERED MULCH MAY BE APPLIED WITH A HYDROSEEDER FOLLOWING SEEDING. HYDROSEEDING IS NOT A PREFERRED SEEDING METHOD BECAUSE SEED AND FERTILIZER ARE APPLIED TO THE SURFACE AND NOT INCORPORATED INTO THE SOIL. POOR SEED TO SOIL CONTACT OCCURS REDUCING SEED GERMINATION AND GROWTH. HYDROSEEDING MAY BE USED FOR AREAS TOO STEEP FOR CONVENTIONAL EQUIPMENT TO TRAVERSE OR TOO OBSTRUCTED WITH ROCKS, STUMPS, ETC.
- AFTER SEEDING, FIRING THE SOIL WITH A CORRUGATED ROLLER WILL ASSURE GOOD SEED-TO-SOIL CONTACT, RESTORE CAPILLARITY, AND IMPROVE SEEDING EMERGENCE. THIS IS THE PREFERRED METHOD. WHEN PERFORMED ON THE CONTOUR, SHEET EROSION WILL BE MINIMIZED AND WATER CONSERVATION ON SITE WILL BE MAXIMIZED.

IV. MULCHING

MULCHING IS REQUIRED ON ALL SEEDING. MULCH WILL INSURE AGAINST EROSION BEFORE GRASS IS ESTABLISHED AND WILL PROMOTE FASTER AND EARLIER ESTABLISHMENT. (THE EXISTENCE OF VEGETATION SUFFICIENT TO CONTROL SOIL EROSION SHALL BE DEEMED COMPLIANCE WITH THIS MULCHING REQUIREMENT.)

- STRAW OR HAY, UNROTTED SMALL GRAIN STRAW, HAY FREE OF SEEDS, OR SALT HAY TO BE APPLIED AT THE RATE OF 1-1/2 TO 2 TONS PER ACRE (70 TO 90 POUNDS PER 1,000 SQUARE FEET), EXCEPT THAT WHERE A CRIMPER IS USED INSTEAD OF LIQUID MULCH-BINDER (TACKIFYING OR ADHESIVE AGENT), THE RATE OF APPLICATION IS 3 TONS PER ACRE. MULCH CHOPPER-BLOWERS MUST NOT GRIND THE MULCH. HAY MULCH IS NOT RECOMMENDED FOR ESTABLISHING FINE TURF OR LAWNS DUE TO THE PRESENCE OF WEED SEED.
- APPLICATION, SPREAD UNIFORMLY BY HAND MECHANICALLY SO THAT APPROXIMATELY 85% OF THE SOIL SURFACE WILL BE COVERED. FOR UNIFORM DISTRIBUTION OF HAND-SPREAD MULCH, DIVIDE AREA INTO APPROXIMATELY 1,000 SQUARE FEET SECTIONS AND DISTRIBUTE 70 TO 90 POUNDS WITHIN EACH SECTION.
- ANCHORING SHOULD BE ACCOMPLISHED IMMEDIATELY AFTER PLACEMENT TO MINIMIZE LOSS BY WIND OR WATER. THIS MAY BE DONE BY ONE OF THE FOLLOWING METHODS, DEPENDING UPON THE SIZE OF THE AREA, STEEPNESS OF SLOPES, AND COSTS.
 - PEG AND TWINE - DRIVE 8 TO 10 INCH WOODEN PEGS TO WITHIN 2 TO 3 INCHES OF THE SOIL SURFACE EVERY 4 FEET IN ALL DIRECTIONS. STAKES MAY BE DRIVEN BEFORE OR AFTER APPLYING MULCH. SECURE MULCH TO SOIL SURFACE BY STRETCHING TWINE BETWEEN PEGS IN A CRIS-CROSS AND A SQUARE PATTERN. SECURE TWINE AROUND EACH PEG WITH TWO OR MORE ROUND TURNS.
 - MULCH NETTINGS - STAPLE PAPER, JUTE, COTTON, OR PLASTIC NETTINGS TO THE SOIL SURFACE. USE A DEGRADABLE NETTING IN AREAS TO BE MOWED.
 - CRIMPER (MULCH ANCHORING TOOL) - A TRACTOR-DRAWN IMPLEMENT, SOMEWHAT LIKE A DISC-HARROW, ESPECIALLY DESIGNED TO PUSH OR CUT SOME OF THE BROADCAST LONG FIBER MULCH 3 TO 4 INCHES INTO THE SOIL SO AS TO ANCHOR IT AND LEAVE PART STANDING UPRIGHT. THIS TECHNIQUE IS LIMITED TO AREAS TRAVERSABLE BY A TRACTOR, WHICH MUST OPERATE ON THE CONTOUR OF SLOPES. STRAW MULCH RATE MUST BE 3 TONS PER ACRE. NO TACKIFYING OR ADHESIVE AGENT IS REQUIRED.
 - LIQUID MULCH-BINDERS - MAY BE USED TO ANCHOR SALT HAY OR STRAW MULCHES.
 - APPLICATIONS SHOULD BE HEAVIER AT EDGES WHERE WIND CATCHES THE MULCH, IN VALLEYS, AND AT CRESTS OF BANKS. REMAINDER OF AREA SHOULD BE UNIFORM IN APPEARANCE.
 - USE ONE OF THE FOLLOWING:
 - ORGANIC AND VEGETABLE BASED BINDERS - NATURALLY OCCURRING, POWDER BASED, HYDROPHILIC MATERIALS WHEN MIXED WITH WATER FORMULATES A GEL AND WHEN APPLIED TO MULCH UNDER SATISFACTORY CURING CONDITIONS WILL FORM MEMBRANED NETWORKS OF INSOLUBLE POLYMERS. THE VEGETABLE GEL SHALL BE PHYSIOLOGICALLY HARMLESS AND NOT RESULT IN A PHYTOXIC EFFECT OR IMPEDE GROWTH OF TURFGRASS. USE AT RATES AND WEATHER CONDITIONS AS RECOMMENDED BY THE MANUFACTURER TO ANCHOR MULCH MATERIALS. MANY NEW PRODUCTS ARE AVAILABLE, SOME OF WHICH MAY NEED FURTHER EVALUATION FOR USE IN THIS STATE.
 - SYNTHETIC BINDERS - HIGH POLYMER SYNTHETIC EMULSION, MISCIBLE WITH WATER WHEN DILUTED AND FOLLOWING APPLICATION TO MULCH, DRYING AND CURING SHALL NO LONGER BE SOLUBLE OR DISPERSIBLE IN WATER. IT SHALL BE APPLIED AT RATES RECOMMENDED BY THE MANUFACTURER AND REMAIN TACKY UNTIL GERMINATION OF GRASS.
- WOOD-FIBER OR PAPER-FIBER MULCH, SHALL BE MADE FROM WOOD, PLANT FIBERS OR PAPER CONTAINING NO GROWTH OR GERMINATION INHIBITING MATERIALS, USED AT THE RATE OF 1,500 POUNDS PER ACRE (OR AS RECOMMENDED BY THE PRODUCT MANUFACTURER) AND MAY BE APPLIED BY A HYDROSEEDER. THIS MULCH SHALL NOT BE MIXED IN THE TANK WITH THE SEED. USE IS LIMITED TO FLATTER SLOPES AND DURING OPTIMUM SEEDING PERIODS IN SPRING AND FALL.
- PELLETIZED MULCH, COMPRESSED AND EXTRUDED PAPER AND/OR WOOD FIBER PRODUCT, WHICH MAY CONTAIN CO-POLYMERS, TACKIFIERS, FERTILIZERS AND COLORING AGENTS, THE DRY PELLETS, WHEN APPLIED TO A SEEDBED AREA AND WATERED, FORM A MULCH MAT. PELLETIZED MULCH SHALL BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. MULCH MAY BE APPLIED BY HAND OR MECHANICAL SPREADER AT THE RATE OF 60-75 LBS./1,000 SQUARE FEET AND ACTIVATED WITH 0.2 TO 0.4 INCHES OF WATER. THIS MATERIAL HAS BEEN FOUND TO BE BENEFICIAL FOR USE ON SMALL LAWN OR RENOVATION AREAS, SEEDBED AREAS WHERE WEED-SEED FREE MULCH IS DESIRED OR ON SITES WHERE STRAW MULCH AND TACKIFIER AGENT ARE NOT PRACTICAL OR DESIRABLE.

APPLYING THE FULL 0.2 TO 0.4 INCHES OF WATER AFTER SPREADING PELLETIZED MULCH ON THE SEED BED IS EXTREMELY IMPORTANT FOR SUFFICIENT ACTIVATION AND EXPANSION OF THE MULCH TO PROVIDE SOIL COVERAGE.

- CONVENTIONAL SEEDING - APPLY SEED UNIFORMITY BY HAND, CYCLONE (CENTRIFUGAL) SEEDER, DROP SEEDER, DRILL OR CULTPACKER SEEDER, EXCEPT FOR DRILLED, HYDROSEEDER OR CULTPACKED SEEDINGS, SEED SHALL BE INCORPORATED INTO THE SOIL WITHIN 24 HOURS OF SEEDBED PREPARATION TO A DEPTH OF 1/4 TO 1/2 INCH, BY RAKING OR DRAGGING DEPTH OF SEED PLACEMENT MAY BE 1/4 INCH DEEPER ON COARSE TEXTURED SOIL.
- HYDROSEEDING IS A BROADCAST SEEDING METHOD USUALLY INVOLVING A TRUCK OR TRAILER MOUNTED TANK, WITH AN AGITATION SYSTEM AND HYDRAULIC PUMP FOR MIXING SEED, WATER AND FERTILIZER AND SPRAYING THE MIX ONTO THE PREPARED SEEDBED. MULCH SHALL NOT BE INCLUDED IN THE TANK WITH SEED. SHORT FIBERED MULCH MAY BE APPLIED WITH A HYDROSEEDER FOLLOWING SEEDING. HYDROSEEDING IS NOT A PREFERRED SEEDING METHOD BECAUSE SEED AND FERTILIZER ARE APPLIED TO THE SURFACE AND NOT INCORPORATED INTO THE SOIL. POOR SEED TO SOIL CONTACT OCCURS REDUCING SEED GERMINATION AND GROWTH. HYDROSEEDING MAY BE USED FOR AREAS TOO STEEP FOR CONVENTIONAL EQUIPMENT TO TRAVERSE OR TOO OBSTRUCTED WITH ROCKS, STUMPS, ETC.
- AFTER SEEDING, FIRING THE SOIL WITH A CORRUGATED ROLLER WILL ASSURE GOOD SEED-TO-SOIL CONTACT, RESTORE CAPILLARITY, AND IMPROVE SEEDING EMERGENCE. THIS IS THE PREFERRED METHOD. WHEN PERFORMED ON THE CONTOUR, SHEET EROSION WILL BE MINIMIZED AND WATER CONSERVATION ON SITE WILL BE MAXIMIZED.

III. SEEDING

SEED MIX SHALL BE AS FOLLOWS:

KIND OF SEED	Minimum Purity-%	Minimum Germination-%	% Of Total Weight of Mixture	Application Rate lb./acre
'Arid 3' Tall Fescue	95	80	20	40
'Jamestown 2' Chewing Fescue	95	85	20	40
'Award' Kentucky Bluegrass	95	85	50	100
'Monterey 2' Perennial Ryegrass	95	85	10	20

200 lb./acre

- CONVENTIONAL SEEDING - APPLY SEED UNIFORMITY BY HAND, CYCLONE (CENTRIFUGAL) SEEDER, DROP SEEDER, DRILL OR CULTPACKER SEEDER, EXCEPT FOR DRILLED, HYDROSEEDER OR CULTPACKED SEEDINGS, SEED SHALL BE INCORPORATED INTO THE SOIL WITHIN 24 HOURS OF SEEDBED PREPARATION TO A DEPTH OF 1/4 TO 1/2 INCH, BY RAKING OR DRAGGING DEPTH OF SEED PLACEMENT MAY BE 1/4 INCH DEEPER ON COARSE TEXTURED SOIL.
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II. PROTECTIVE MATERIALS

DEFINITION

STABILIZING EXPOSED SOILS WITH NON-VEGETATIVE MATERIAL.

PURPOSE

TO PROTECT EXPOSED SOIL SURFACES FROM EROSION DAMAGE AND TO REDUCE OFFSITE ENVIRONMENTAL DAMAGE.

WATER QUALITY ENHANCEMENT

PROVIDES TEMPORARY MECHANICAL PROTECTION AGAINST WIND OR RAINFALL INDUCED SOIL EROSION UNTIL PERMANENT VEGETATIVE COVER MAY BE ESTABLISHED.

WHERE APPLICABLE

THIS PRACTICE IS APPLICABLE TO AREAS SUBJECT TO EROSION, WHERE THE SEASON AND OTHER CONDITIONS MAY NOT BE SUITABLE FOR GROWING AN EROSION RESISTANT COVER OR WHERE STABILIZATION IS NEEDED FOR A SHORT PERIOD UNTIL MORE SUITABLE PROTECTION CAN BE APPLIED.

METHOD AND MATERIALS

1. SITE PREPARATION

- GRADE AS NEEDED AND FEASIBLE TO PERMIT THE USE OF CONVENTIONAL EQUIPMENT AND MULCH ANCHORING. ALL GRADING SHOULD BE DONE IN ACCORDANCE WITH STANDARDS FOR LAND GRADING, PG. 19-1.
- INSTALL NEEDED EROSION CONTROL PRACTICES OR FACILITIES SUCH AS DIVERSIONS, GRADE STABILIZATION STRUCTURES, CHANNEL STABILIZATION MEASURES, SEDIMENT BASINS, AND WATERWAYS. SEE STANDARDS 11 THROUGH 42.

- MULCH ANCHORING SHOULD BE ACCOMPLISHED IMMEDIATELY AFTER PLACEMENT OF HAY OR STRAW MULCH TO MINIMIZE LOSS BY WIND OR WATER. THIS MAY BE DONE BY ONE OF THE FOLLOWING METHODS, DEPENDING UPON THE SIZE OF THE AREA AND STEEPNESS OF SLOPES.
 - PEG AND DRIVE - DRIVE 8 TO 10 INCH PEG TO WITHIN 2 TO 3 INCHES OF THE SOIL SURFACE EVERY 4 FEET IN ALL DIRECTIONS. STAKES MAY BE DRIVEN BEFORE OR AFTER APPLYING MULCH. SECURE MULCH TO SOIL SURFACE BY STRETCHING TWINE BETWEEN PEGS IN A CRIS-CROSS AND SQUARE PATTERN. SECURE TWINE AROUND EACH PEG WITH TWO OR MORE ROUND TURNS.
 - MULCH NETTINGS - STAPLE PAPER, COTTON, AND PLASTIC NETTINGS OVER MULCH. USE A DEGRADABLE NETTING IN AREAS TO BE MOWED. NETTING IS USUALLY AVAILABLE IN ROLLS 4 FEET WIDE AND 300 FEET LONG.
 - CRIMPER MULCH ANCHORING COULTER TOOL - A TRACTOR-DRAWN IMPLEMENT ESPECIALLY DESIGNED TO PUNCH AND ANCHOR MULCH INTO THE SOIL SURFACE. THIS PRACTICE AFFORDS MAXIMUM EROSION CONTROL, BUT ITS USE IS LIMITED TO THOSE SLOPES UPON WHICH THE TRACTOR CAN OPERATE SAFELY. SOIL PENETRATION SHOULD BE ABOUT 3 TO 4 INCHES. ON SLOPING LAND, THE OPERATION SHOULD BE ON THE CONTOUR.
 - LIQUID MULCH - BINDERS
 - APPLICATION SHOULD BE HEAVIER AT EDGE WHERE WIND CATCHES THE MULCH, IN VALLEYS, AND AT CRESTS OF BANKS. REMAINDER OF AREA SHOULD BE UNIFORM IN APPEARANCE.
 - USE ONE OF THE FOLLOWING:
 - EMULSIFIED ASPHALT - (SS-1, CSS-1, CMS-2, MS-2, RS-1, RS-2, CRS-1, AND CRS-2). APPLY 0.04 GAL/SQ/YD OR 194 GAL/ACRE ON FLAT AREAS AND ON SLOPES LESS THAN 8FT OF MORE HIGH, USE 0.075 GAL/SQ/YD OR 363 GAL/ACRE. THESE MATERIALS MAY BE DIFFICULT TO APPLY UNIFORMLY AND WILL DISCOLOR SURFACES.
 - ORGANIC AND VEGETABLE BASED BINDERS - NATURALLY OCCURRING, POWDER BASED HYDROPHILIC MATERIAL THAT MIXED WITH WATER FORMULATES A GEL AND WHEN APPLIED TO MULCH UNDER SATISFACTORY CURING CONDITIONS WILL FORM MEMBRANE NETWORKS OF INSOLUBLE POLYMERS. THE VEGETABLE GEL SHALL BE PHYSIOLOGICALLY HARMLESS AND NOT RESULT IN A PHYTOXIC EFFECT OF IMPEDE GROWTH OF TURFGRASS. VEGETABLE BASED GELS SHALL BE APPLIED AT RATES AND WEATHER CONDITIONS RECOMMENDED BY THE MANUFACTURER.
 - SYNTHETIC BINDERS - HIGH POLYMER SYNTHETIC EMULSION, MISCIBLE WITH WATER WHEN DILUTED AND FOLLOWING APPLICATION TO MULCH, DRYING AND CURING SHALL NO LONGER BE SOLUBLE OR DISPERSIBLE IN WATER. IT SHALL BE APPLIED AT RATES AND WEATHER CONDITIONS RECOMMENDED BY THE MANUFACTURER AND REMAIN TACKY UNTIL GERMINATION OF GRASS.

STANDARD FOR PERMANENT VEGETATIVE COVER FOR SOIL STABILIZATION

DEFINITION

ESTABLISHMENT OF PERMANENT VEGETATIVE COVER ON EXPOSED SOILS WHERE PERENNIAL VEGETATION IS NEEDED FOR LONG TERM PROTECTION.

PURPOSE

TO PERMANENTLY STABILIZE THE SOIL, ASSURING CONSERVATION OF SOIL AND WATER, AND TO ENHANCE THE ENVIRONMENT.

WATER QUALITY ENHANCEMENT

SLOWS THE OVERLAND MOVEMENT OF STORMWATER RUNOFF, INCREASES INFILTRATION AND RETAINS SOIL AND NUTRIENTS ON SITE, PROTECTING STREAMS OR OTHER STORMWATER CONVEYANCES.

WHERE APPLICABLE

ON EXPOSED SOILS THAT HAVE A POTENTIAL FOR CAUSING OFF-SITE ENVIRONMENTAL DAMAGE.

- METHODS AND MATERIALS**
- I. SITE PREPARATION**
- GRADE AS NEEDED AND FEASIBLE TO PERMIT THE USE OF CONVENTIONAL EQUIPMENT FOR SEEDBED PREPARATION, SEEDING, MULCH APPLICATION, AND MULCH ANCHORING. ALL GRADING SHOULD BE DONE IN ACCORDANCE WITH STANDARDS FOR LAND GRADING, P. 19-1.
 - INSTALL NEEDED EROSION CONTROL PRACTICES OR FACILITIES SUCH AS DIVERSIONS, GRADE STABILIZATION STRUCTURES, CHANNEL STABILIZATION MEASURES, SEDIMENT BASINS, AND WATERWAYS. SEE STANDARDS 11 THROUGH 42.
 - IMMEDIATELY PRIOR TO SEEDING, THE SURFACE SHOULD BE SCARIFIED 6" TO 12" WHERE THERE HAS BEEN SOIL COMPACTION. THIS PRACTICE IS PERMISSIBLE ONLY WHERE THERE IS NO DANGER TO UNDERGROUND UTILITIES (CABLES, IRRIGATION SYSTEMS, ETC.).
- II. SEEDBED PREPARATION**
- APPLY GROUND LIMESTONE AND FERTILIZER ACCORDING TO SOIL TEST RECOMMENDATIONS SUCH AS THOSE OFFERED BY RUTGERS CO-OPERATIVE EXTENSION. SOIL SAMPLE MAILERS ARE AVAILABLE FROM THE LOCAL RUTGERS CO-OPERATIVE EXTENSION OFFICES. FERTILIZER SHALL BE APPLIED AT THE RATE OF 500 POUNDS PER ACRE OR 11 POUNDS PER 1,000 SQUARE FEET OF 10-20-10 OR EQUIVALENT WITH 50% WATER INSOLUBLE NITROGEN UNLESS A SOIL TEST INDICATES OTHERWISE. APPLY LIMESTONE IN ACCORDANCE WITH THE TABLE BELOW AND THE RESULTS OF SOIL TESTING. CALCIUM CARBONATE IS THE EQUIVALENT AND STANDARD FOR MEASURING THE ABILITY OF LIMING MATERIALS TO NEUTRALIZE SOIL ACIDITY AND SUPPLY CALCIUM AND MAGNESIUM TO GRASSES AND LEGUMES. TABLE BELOW IS A GENERAL GUIDELINE FOR LIMESTONE APPLICATION RATES.

SOIL TEXTURE	TONS/ACRE	LBS./1,000 SQ. FT.
CLAY, CLAY LOAM, AND HIGH ORGANIC SOIL	3	135
SANDY LOAM, LOAM, SILT LOAM	2	90
LOAMY SAND, SAND	1	45

- PULVERIZED DOLOMITIC LIMESTONE IS PREFERRED FOR MOST SOILS SOUTH OF THE NEW BRUNSWICK-TRENTON LINE.
- WORK LIME AND FERTILIZER INTO THE SOIL AS NEARLY AS PRACTICAL TO A DEPTH OF 4 INCHES WITH A DISC, SPRINGTOOTH HARROW, OR OTHER SUITABLE EQUIPMENT. THE FINAL HARROWING OR DISCING OPERATION SHOULD BE ON THE GENERAL CONTOUR. CONTINUE TILLAGE UNTIL A REASONABLY UNIFORM SEEDBED IS PREPARED.
 - INSPECT SEEDBED JUST BEFORE SEEDING. IF TRAFFIC HAS LEFT THE SOIL COMPACTED, THE AREA MUST BE RETILLED AS ABOVE.
 - SOILS HIGH ON SULFIDES OR HAVING A PH OF 4 OR LESS REFER TO STANDARD FOR MANAGEMENT OF HIGH ACID PRODUCING SOILS.

III. SEEDING

SEED MIX SHALL BE AS FOLLOWS:

KIND OF SEED	Minimum Purity-%	Minimum Germination-%	% Of Total Weight of Mixture	Application Rate lb./acre
'Arid 3' Tall Fescue	95	80	20	40
'Jamestown 2' Chewing Fescue	95	85	20	40
'Award' Kentucky Bluegrass	95	85	50	100
'Monterey 2' Perennial Ryegrass	95	85	10	20

200 lb./acre

- CONVENTIONAL SEEDING - APPLY SEED UNIFORMITY BY HAND, CYCLONE (CENTRIFUGAL) SEEDER, DROP SEEDER, DRILL OR CULTPACKER SEEDER, EXCEPT FOR DRILLED, HYDROSEEDER OR CULTPACKED SEEDINGS, SEED SHALL BE INCORPORATED INTO THE SOIL WITHIN 24 HOURS OF SEEDBED PREPARATION TO A DEPTH OF 1/4 TO 1/2 INCH, BY RAKING OR DRAGGING DEPTH OF SEED PLACEMENT MAY BE 1/4 INCH DEEPER ON COARSE TEXTURED SOIL.
- HYDROSEEDING IS A BROADCAST SEEDING METHOD USUALLY INVOLVING A TRUCK OR TRAILER MOUNTED TANK, WITH AN AGITATION SYSTEM AND HYDRAULIC PUMP FOR MIXING SEED, WATER AND FERTILIZER AND SPRAYING THE MIX ONTO THE PREPARED SEEDBED. MULCH SHALL NOT BE INCLUDED IN THE TANK WITH SEED. SHORT FIBERED MULCH MAY BE APPLIED WITH A HYDROSEEDER FOLLOWING SEEDING. HYDROSEEDING IS NOT A PREFERRED SEEDING METHOD BECAUSE SEED AND FERTILIZER ARE APPLIED TO THE SURFACE AND NOT INCORPORATED INTO THE SOIL. POOR SEED TO SOIL CONTACT OCCURS REDUCING SEED GERMINATION AND GROWTH. HYDROSEEDING MAY BE USED FOR AREAS TOO STEEP FOR CONVENTIONAL EQUIPMENT TO TRAVERSE OR TOO OBSTRUCTED WITH ROCKS, STUMPS, ETC.
- AFTER SEEDING, FIRING THE SOIL WITH A CORRUGATED ROLLER WILL ASSURE GOOD SEED-TO-SOIL CONTACT, RESTORE CAPILLARITY, AND IMPROVE SEEDING EMERGENCE. THIS IS THE PREFERRED METHOD. WHEN PERFORMED ON THE CONTOUR, SHEET EROSION WILL BE MINIMIZED AND WATER CONSERVATION ON SITE WILL BE MAXIMIZED.

IV. MULCHING

MULCHING IS REQUIRED ON ALL SEEDING. MULCH WILL INSURE AGAINST EROSION BEFORE GRASS IS ESTABLISHED AND WILL PROMOTE FASTER AND EARLIER ESTABLISHMENT. (THE EXISTENCE OF VEGETATION SUFFICIENT TO CONTROL SOIL EROSION SHALL BE DEEMED COMPLIANCE WITH THIS MULCHING REQUIREMENT.)

- STRAW OR HAY, UNROTTED SMALL GRAIN STRAW, HAY FREE OF SEEDS, OR SALT HAY TO BE APPLIED AT THE RATE OF 1-1/2 TO 2 TONS PER ACRE (70 TO 90 POUNDS PER 1,000 SQUARE FEET), EXCEPT THAT WHERE A CRIMPER IS USED INSTEAD OF LIQUID MULCH-BINDER (TACKIFYING OR ADHESIVE AGENT), THE RATE OF APPLICATION IS 3 TONS PER ACRE. MULCH CHOPPER-BLOWERS MUST NOT GRIND THE MULCH. HAY MULCH IS NOT RECOMMENDED FOR ESTABLISHING FINE TURF OR LAWNS DUE TO THE PRESENCE OF WEED SEED.
- APPLICATION, SPREAD UNIFORMLY BY HAND MECHANICALLY SO THAT APPROXIMATELY 85% OF THE SOIL SURFACE WILL BE COVERED. FOR UNIFORM DISTRIBUTION OF HAND-SPREAD MULCH, DIVIDE AREA INTO APPROXIMATELY 1,000 SQUARE FEET SECTIONS AND DISTRIBUTE 70 TO 90 POUNDS WITHIN EACH SECTION.
- ANCHORING SHOULD BE ACCOMPLISHED IMMEDIATELY AFTER PLACEMENT TO MINIMIZE LOSS BY WIND OR WATER. THIS MAY BE DONE BY ONE OF THE FOLLOWING METHODS, DEPENDING UPON THE SIZE OF THE AREA, STEEPNESS OF SLOPES, AND COSTS.
 - PEG AND TWINE - DRIVE 8 TO 10 INCH WOODEN PEGS TO WITHIN 2 TO 3 INCHES OF THE SOIL SURFACE EVERY 4 FEET IN ALL DIRECTIONS. STAKES MAY BE DRIVEN BEFORE OR AFTER APPLYING MULCH. SECURE MULCH TO SOIL SURFACE BY STRETCHING TWINE BETWEEN PEGS IN A CRIS-CROSS AND A SQUARE PATTERN. SECURE TWINE AROUND EACH PEG WITH TWO OR MORE ROUND TURNS.
 - MULCH NETTINGS - STAPLE PAPER, JUTE, COTTON, OR PLASTIC NETTINGS TO THE SOIL SURFACE. USE A DEGRADABLE NETTING IN AREAS TO BE MOWED.
 - CRIMPER (MULCH ANCHORING TOOL) - A TRACTOR-DRAWN IMPLEMENT, SOMEWHAT LIKE A DISC-HARROW, ESPECIALLY DESIGNED TO PUSH OR CUT SOME OF THE BROADCAST LONG FIBER MULCH 3 TO 4 INCHES INTO THE SOIL SO AS TO ANCHOR IT AND LEAVE PART STANDING UPRIGHT. THIS TECHNIQUE IS LIMITED TO AREAS TRAVERSABLE BY A TRACTOR, WHICH MUST OPERATE ON THE CONTOUR OF SLOPES. STRAW MULCH RATE MUST BE 3 TONS PER ACRE. NO TACKIFYING OR ADHESIVE AGENT IS REQUIRED.
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 - USE ONE OF THE FOLLOWING:
 - ORGANIC AND VEGETABLE BASED BINDERS - NATURALLY OCCURRING, POWDER BASED, HYDROPHILIC MATERIALS WHEN MIXED WITH WATER FORMULATES A GEL AND WHEN APPLIED TO MULCH UNDER SATISFACTORY CURING CONDITIONS WILL FORM MEMBRANED NETWORKS OF INSOLUBLE POLYMERS. THE VEGETABLE GEL SHALL BE PHYSIOLOGICALLY HARMLESS AND NOT RESULT IN A PHYTOXIC EFFECT OR IMPEDE GROWTH OF TURFGRASS. USE AT RATES AND WEATHER CONDITIONS AS RECOMMENDED BY THE MANUFACTURER TO ANCHOR MULCH MATERIALS. MANY NEW PRODUCTS ARE AVAILABLE, SOME OF WHICH MAY NEED FURTHER EVALUATION FOR USE IN THIS STATE.
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