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November 22, 2021

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS  
ON THE  
ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME : Columbus Avenue Seawall Reconstruction  
PROJECT MUNICIPALITY : Salem  
PROJECT WATERSHED : Atlantic Ocean – Juniper Cove  
EEA NUMBER : 16445  
PROJECT PROPONENT : City of Salem  
DATE NOTICED IN MONITOR : September 22, 2021

Pursuant to the Massachusetts Environmental Policy Act (MEPA) (M.G. L. c. 30, ss. 61-62I) and Section 11.06 of the MEPA regulations (301 CMR 11.00), I hereby determine that this project **does not require** an Environmental Impact Report (EIR).

Project Description

As described in the Environmental Notification Form (ENF) and supplemental information, the City of Salem (City) proposes to remove an existing stone and masonry seawall that is in poor condition and replace it with a new cut granite stone wall  $\pm 466$  linear feet (lf) in length off Columbus Avenue in Salem. The project will include an increase of the height of the seawall (by 1.5 to 3 feet) to elevation 11.5 feet NAVD88<sup>1</sup> along the approximate existing wall alignment; installation of a new 8-foot-wide flood barrier gate at the seawall opening (decreasing the width of the existing 20-foot wide opening by 12 feet); replacement of the existing  $\pm 24$ -foot by  $\pm 19$ -foot granite block landing and access steps with a  $\pm 17$ -foot by 20-foot granite landing and steps with a reinforced concrete core and 30-foot-wide footing to a depth of  $\pm 1.5$  NAVD88; reconstruction of the five-foot-wide paved sidewalk along the landward side of the seawall including a 3- to 4-foot wide grass strip; and salt marsh restoration in the fronting salt marsh resource area including placing coir rolls along seaward edge of the existing marsh and adding

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<sup>1</sup> All elevations in this Certificate reference North American Vertical Datum of 1988 (NAVD88), unless otherwise noted.

new clean sand fill and supplemental salt marsh plantings. In addition, the project will reconstruct 10 lf of adjacent seawall at 44 Columbus Avenue and 30 Bay View Avenue to tie-in and match the proposed Columbus Avenue Seawall. The project is proposed to provide increased protection and coastal resiliency against wave effects, flooding, and sea level rise (SLR). Columbus Avenue is an evacuation route during storms and includes critical utilities for residences in the community. The project is anticipated to be constructed in a single phase between November 2022 and May 2023.

### Project Site

The 8.70-acre project site includes the Columbus Avenue seawall which is located along the northwestern portion of Juniper Cove in Salem between the properties of 44 Columbus Avenue and 30 Bay View Avenue. The seawall is a damaged and deteriorating older fieldstone and granite block masonry structure that is  $\pm 474$  lf long with a  $\pm 20$ -foot wide opening. The seawall provides foreshore protection to the public roadway (Columbus Avenue), sidewalk, utilities, and residential dwellings. It is fronted by the publicly accessible “Steps Beach” and an area of salt marsh vegetation along the southwest portion of the beach area. The top of the seawall is an uneven surface, consisting of vertically protruding stones. The seawall varies in elevation from  $\pm 10.1$  feet NAVD88 at the southwestern corner to 8.5 feet NAVD88 at the northeastern corner. Neighboring private walls on each end are at the same approximate elevation as the adjacent Columbus Avenue wall.

Wetland resource areas in the project area include Coastal Dune, Coastal Beach, Salt Marsh, Land Containing Shellfish (LCS), Land Under Ocean (LUO), and Land Subject to Coastal Storm Flowage (LSCSF). According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) (Panel No. 25009C0436G, effective July 16, 2014), the entire project site is located within the Special Flood Hazard Area Zone AE with a Base Flood Elevation (BFE) 11 ft NAVD88. The project site includes mapped habitat for soft-shell clam (*Mya arenaria*) within the intertidal mudflat.

### Environmental Impacts and Mitigation

Based on supplemental information, environmental impacts associated with the project include alteration of Coastal Dune (735 sf temporary)<sup>2</sup>, Coastal Beach (223 sf permanent and 2,670 sf temporary), Salt Marsh (2,870 sf permanent and 1,000 sf temporary), and LSCSF (5,800 sf permanent and 10,170 sf temporary). Measures to avoid, minimize and mitigate environmental impacts will include construction within the general footprint of the existing seawall, enhancement of salt marsh, and construction period best management practices (BMPs) including sediment and erosion controls measures.

### Jurisdiction and Permitting

The project is undergoing MEPA review and requires preparation of an ENF pursuant to 301 CMR 11.03(3)(b)(1)(a)<sup>3</sup>, 11.03(3)(b)(1)(c), 11.03(3)(b)(6), and 11.03(10)(b)(1)<sup>3</sup> because it requires Agency Actions and will result in the alteration of Coastal Dune and 1,000 or more sf of Salt Marsh, reconstruction of an existing solid fill structure of 1,000 or more sf base area, and demolition of all or any exterior part of any Historic Structure listed in or located in any Historic District listed in the State

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<sup>2</sup> Supplemental information, submitted on October 27, 2021, redefined Coastal Bank in the ENF as Coastal Dune.

<sup>3</sup> The ENF omits identifying exceedance of these thresholds, which are applicable.

Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth, respectively. The project requires a Section 401 Water Quality Certification (WQC) and a Chapter 91 (c. 91) License from the Massachusetts Department of Environmental Protection (MassDEP). The City received an initial grant from the Executive Office of Energy and Environmental Affairs (EEA) Dam and Seawall Repair or Removal Program for design and permitting and requested a second grant for the construction phase. The project is subject to Federal Consistency Review by the Massachusetts Office of Coastal Zone Management (CZM).

The project requires an Order of Conditions from the Salem Conservation Commission (or in the case of appeal, a Superseding Order of Conditions from MassDEP), submittal of a pre-construction notification (PCN) to the U.S. Army Corps of Engineers (ACOE) seeking authorization under the General Permits for Massachusetts in accordance with Section 404 of the Federal Clean Water Act, and review by the Massachusetts Historical Commission (MHC) pursuant to M.G.L. Chapter 9, sections 26-27C (950 CMR 71.00)<sup>4</sup>.

Because the City is seeking Financial Assistance, MEPA jurisdiction is broad in scope and extends to all aspects of the project that may cause Damage to the Environment, as defined in the MEPA regulations.

#### Review of the ENF

The ENF describes existing and proposed conditions and contains site plans and cross-sections. It provides an analysis of alternatives and describes measures to avoid, minimize and mitigate project-related impacts. The City provided supplemental information to the MEPA Office on October 27, 2021 to address questions and comments provided at the MEPA remote consultation session (held on October 8, 2021) and provide revised plans; and on November 22, 2021 to provide a response to comments on the ENF. For purposes of clarity, all supplemental materials are referred to herein as the “ENF” unless otherwise referenced. Comments do not request further analysis of impacts in an EIR; however, outstanding issues have been identified which must be addressed in permitting. The Proponent should consult with the MEPA Office if material changes to the design of the project are made during subsequent permitting to determine if further review is warranted in the form of a Notice of Project Change (NPC).

I acknowledge comments from the two abutters who reside at the opposite ends of the Columbus Avenue seawall where it is proposed to tie-in to adjacent walls (44 Columbus Avenue and 30 Bay View Avenue). These comments express concerns regarding potential future flooding and exacerbation of existing flooding during storm events onto these properties and further inland into the neighborhood based on the current proposed tie-in for a total of only 10 lf along each of the adjacent walls. I expect the City will continue to work with State Agencies and local residents to further refine the project design to avoid any flooding impacts on neighboring properties, particularly in light of the anticipated effects of climate change. I note that the issuance of this Certificate does not signify the conclusion of the public engagement process for this project. The Wetlands Protection Act (WPA), WQC and c. 91 review processes include additional opportunities for public review and comment and MassDEP has sufficient regulatory authority to address outstanding issues during permitting.

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<sup>4</sup> The ENF did not identify the requirement for MHC review.

*Alternatives Analysis*

The ENF includes a detailed evaluation of seven alternatives including: No-Build; Repair/Reconstruction; Sloped Stone Revetment; Reinforced Concrete Seawall; Hybrid Concrete and Stone Veneer Seawall; and the Preferred Alternative (as described herein). The latter four alternatives consider seawall replacement within the existing structure footprint.

The No-Build Alternative would leave in place a deteriorating seawall which is susceptible to failure due to its age, condition, lack of consistent maintenance, and lack of proper stone sizing and design. It is also vulnerable to the increasing severity of coastal storms and higher water levels; spot repairs were performed after damage occurred during the 2018 Nor'easters. The seawall is likely to experience additional degradation and potentially failure compromising the roadway, public access, utilities and residential dwellings. The relatively low wall elevation at the northeast end contributes to increased flooding and wall overtopping, and several sinkholes were observed landward of the wall along the sidewalk. In addition, the salt marsh area was observed to be partly desiccated and degraded with various 'pockmark' voids up to 2 feet deep, severe erosion along the seaward end with complete loss of salt marsh vegetation and substrate up to 2 feet deep, and erosion and undermining at the toe of the salt marsh substrate. The No-Build Alternative was dismissed because it would not provide adequate protection to existing infrastructure nor provide a resilient shoreline with minimal maintenance, and it would not address public safety and public access concerns due to the existing damaged and deteriorated seawall and beach access landing structure. Moreover, if the salt marsh area is left as-is, it will likely continue to degrade and erode.

The Repair/Reconstruction Alternative would repair and restore the existing stone masonry seawall in-kind. It would not address the potential for future compromise due to storm surge and flooding conditions, and it would require continuous future maintenance to repair and repoint the walls. The ENF estimates the cost to maintain the existing stone walls with mortar joints may be upwards of \$75,000 to \$105,000 every three to five years assuming 3,000 sf of wall. This alternative is not considered appropriate because it would not provide adequate long-term protection to existing infrastructure considering future compromise due to storm surge and flooding conditions, would not provide a resilient shoreline, would require additional frequent and costly maintenance, and would not adequately address public safety and public access concerns due to the existing damaged and deteriorated seawall.

The Sloped Stone Revetment Alternative would replace the existing seawall with a sloped stone revetment with a rough face which is generally preferred over vertical seawalls due to its ability to dissipate wave energy and prevent scour and erosion. The ENF indicates that a sloped revetment is not considered feasible at the project site because there are numerous site constraints such as the publicly accessible beach and area of salt marsh vegetation fronting the existing seawall; the inability to move the structure landward due to proximity to Columbus Avenue, sidewalk, utilities, and residential dwellings; and the inability to move the structure seaward due to proximity to existing salt marsh and potential loss of habitat, goal of maintaining continued public access and use of 'Steps Beach', and permitting implications (effort and costs) for the placement of stone seaward of existing structures.

The Reinforced Concrete Seawall Alternative would replace in-kind the existing stone masonry seawall with a cast-in-place reinforced concrete wall, which would be constructed within the same approximate footprint and alignment as the existing seawall and be founded on a cast-in-place reinforced

concrete footing that would extend a minimum of four feet below existing grade on a crushed stone base over compacted subgrade soils, or cast directly on existing bedrock if it was encountered above the proposed footing elevation. This alternative would improve the structure's longevity with new reinforced concrete wall, however, the City preferred to consider alternatives which would better match the existing aesthetics than concrete. The ENF does not provide information on the environmental impacts associated with this alternative.

The Hybrid Wall Alternative would replace in-kind the existing stone masonry seawall with a hybrid wall consisting of an inner concrete core wall and a stone block veneer, which would be constructed within the same approximate footprint and alignment as the existing wall structures. However, the overall structure would be larger in width than the existing walls and would extend further landward due to the added stone veneer. The hybrid wall would be founded on a concrete foundation or pinned directly to bedrock. The concrete inner core wall would be reinforced. The stone veneer would consist of dimensional stone blocks dowelled into the inner concrete core wall and mortar between the stone joints. The ENF estimates costs for repair/repointing of the stone veneer upwards of \$45,000 to \$75,000 every three to five years assuming 3,000 sf of wall. This alternative would improve the structure's longevity with new concrete inner core wall and stone veneer and eliminate emergency stabilization methods which can negatively impact environmental resources. However, it was not selected because it would have the highest upfront cost to construct ( $\pm 2.5$  times more than Repair Alternative and  $\pm 1.3$  times more than the Reinforced Concrete Seawall Alternative), concern for material availability for the dimensional stone block veneer, and the continuous maintenance requirement. The ENF does not provide information on the environmental impacts associated with this alternative.

According to the ENF, the Preferred Alternative proposes seawall reconstruction and salt marsh enhancement to increase shoreline stabilization and coastal storm/flood protection and resiliency, while minimizing the environmental impacts of construction. Project components include:

- Reconstructed seawall with large cut granite stone wall founded on a reinforced concrete footing to provide increased protection to Columbus Avenue, sidewalk, dwellings, utilities, and other landside features with the following design elements:
  - increase rugosity (wall friction) compared to existing flat-faced masonry wall
  - increase wall height from  $\pm 1.5$  feet to 3 feet to elevation 11.5 feet NAVD88, which is  $\pm 0.5$  feet above the current FEMA BFE, to reduce the overtopping of the walls
  - conformance to natural shape of the shoreline within the existing seawall footprint that will not extend further seaward
  - maintain top of wall width of  $\pm 2$  feet to allow for potential future increase in wall height
  - top three rows of stone block dowelled together for increased stability and resilience
  - reduce wall opening to 8-foot-wide and install a permanent hinged flood barrier gate
  - founded on a cast-in-place reinforced concrete footing extending a minimum of four feet below existing grade on a crushed stone base over compacted subgrade soils or cast directly on existing bedrock if it is encountered above the proposed footing elevation (minimum depth of four feet will be maintained to protect against scour and erosion)
  - granite capstone with a slight reveal on the front face of the seawall to provide some reduction in wave overtopping
  - tie-in with the existing adjacent stone masonry seawalls at each end by reconstructing 10 lf of existing adjacent seawalls to match the proposed Columbus Avenue wall type and

- height (in addition, a maximum  $\pm 10$ -lf of existing wall beyond the reconstructed portion may be temporarily removed and reset to facilitate the full depth reconstruction)
- o reconstruct the granite block topped landing and granite block steps with new  $\pm 18$ -feet by 20-feet granite block topped landing and concrete core infill with steps on all three sides for continued public access to the beach
  - Increased protection and public safety in terms of emergency response, public access, and direct protection of life, limb, and property
  - Inclusion of nature-based and natural elements to create a more resilient shoreline that can provide increased storm damage prevention and flood control including:
    - o Stabilize toe of existing marsh to reduce erosion and undermining with 222 lf of new coir rolls/fabric, clean sand fill and salt marsh plantings
    - o Fill and stabilize “pockmark” voids within the existing marsh with clean sand, biodegradable blankets and planting with vegetation as recommended by Agencies
    - o Enhance salt marsh with new and supplemental plantings (1000 plugs of *Spartina patens* and 2500 plugs of *Spartina alterniflora*)
    - o Protect and limit disturbance to existing salt marsh area by removal of timber posts used to secure boats, and installation of seasonal fencing/netting and new perimeter coir rolls
    - o Coastal dune enhancement with new salt tolerant plantings at southeastern corner
  - Minimized maintenance of the seawall and associated costs

Comments from MassDEP recommend that the City consider an alternative to relocate the seawall landward to avoid coastal wetland impacts (and reconfigure the vertical face of the granite block wall to reduce wave energy and deflection) based on available space associated with a 3-4-foot-wide grass swath proposed between Columbus Avenue and the sidewalk. The ENF indicates that relocating the wall landward is not appropriate due to the proximity of the wall to the roadway, sidewalk, utilities, and residential dwellings.

### *Environmental Justice*

The project site is located within one mile of Environmental Justice (EJ) populations that are designated based on Minority, Income, and Minority and Income. The ENF identifies four mapped EJ block groups within one mile of the project site which are located within the Cities of Salem and Beverly. According to the ENF, the project is not considered reasonably likely to negatively affect such EJ populations, since the project is intended to reconstruct an existing seawall and beach access landing with increased protection and coastal resiliency against wave effects, flooding, and SLR for the benefit of all populations. The EJ populations are not in the vicinity of the abutting properties where concerns of increased flooding have been raised.

### *Wetlands*

The project includes temporary and permanent impacts to coastal wetland resources including Coastal Dune, Coastal Beach, Salt Marsh and LSCSF. The Salem Conservation Commission will review the project for its consistency with the Wetland Protection Act, the Wetlands Regulations (310 CMR 10.00) and associated performance standards. MassDEP will also review the project for consistency with the c. 91 regulations (310 CMR 9.00) and with the 401 WQC regulations (314 CMR 9.00). The project may be subject to CZM federal consistency review, in which case it must be found to be consistent with

CZM's enforceable program policies. I refer the City to the detailed comments from CZM, MassDEP, and DMF which provide guidance and recommendation for further analysis and identify outstanding issues that must be addressed during permitting.

The project proposes to alter 2,870 sf of salt marsh area by filling voids and eroded areas with suitable clean sand fill and installing new salt marsh plugs. The proposed work will help enhance the existing salt marsh providing an improvement with increased shoreline stabilization. The City should avoid, if possible, additional alteration to salt marsh that will occur during the excavation for the placement of the 6.5-foot-wide concrete footing. The ENF states that clean sand fill will be added to unvegetated areas of the salt marsh as a substrate for new plantings with a maximum of four inches of clean sand allowed above existing vegetation. CZM comments indicate that it is unclear how placement of this fill over existing vegetation will support the restoration. Every effort should be taken to avoid placing sand over existing salt marsh vegetation because fill may cause impacts to the existing vegetation. The Massachusetts Division of Marine Fisheries (DMF) recommends that all boats be prohibited from mooring in the marsh because depressions and erosions may be caused by the storage of small boats. Removing the wooden posts from the marsh that have been used to secure boats in the past will reduce these impacts, and continued management of foot traffic and boat launching in this area will be important to the overall success of the restoration and plantings.

Comments from DMF indicate it supports the City's objective to restore and enhance the development of a resilient marsh. It also supports a targeted beach nourishment at points of erosion and where needed to increase the elevation for salt marsh restoration. Maintenance of a resilient shoreline would benefit from enhancement of the fringing marsh which functions to hold sediment and buffer the shoreline as well as serving as important habitat for fish and invertebrates. The City should provide a detailed fill/nourishment and planting plan, with methods and design supported by references, including source and species of plants, acclimation of plants to local salinity conditions, timing of planting, material storage, and soil amendments, if any, for the restoration area, in addition to irrigation and fencing needs, in permitting for review, along with a detailed overall monitoring and maintenance plan and standard operating procedures to avoid invasive species introduction and spread. The marsh restoration and living shoreline development work should be designed and created by a wetland scientist with proven experience in saltmarsh restoration. Supplemental information suggests an annual inspection, but CZM comments recommend a more robust and frequent monitoring plan that includes inspection for the need to tighten anchors for the coir rolls, identify and address scour issues, monitor the success of the salt marsh plantings, and any potential contingency options for implementation if the proposed approach is not successful because regular monitoring, maintenance, and design modifications are often needed to ensure the success of a salt marsh restoration project.

While there may be benefits to restoring the "pockmark voids" and erosion in the salt marsh, the City should define what is considered a "void" versus a natural feature; explain possible reasons for the development of voids; and identify methods or actions to prevent them in the future in permitting documents. As voids within the marsh platform may be naturally occurring, fill to support re-vegetation should be limited to only those identified areas of erosion or scour directly adjacent to or behind the existing stone riprap seaward of the marsh. Small wooden stakes may be needed to hold the fabric in place while the vegetation roots get established. Because this can take several growing seasons, the maintenance plan for the project should include maintenance of this element.

Supplemental information provides details regarding how coir logs proposed along the seaward

side of the salt marsh will be anchored in place (four-foot-long, two-inch by four-inch boards). Final design of the coir roll toe protection and anchoring system will be determined and developed throughout the project permitting phase and for final design/preparation of project bid documents. The intent of the coir rolls will be to provide temporary toe protection while the new salt marsh vegetation is established. Upon successful growth of salt marsh, the coir rolls may be removed upon the recommendation of the wetland scientist. CZM comments recommend that the means of anchoring the coir rolls should be reconsidered to ensure that the system is adequate to maintain the rolls in place for the duration of the project life because the proposed approach is unlikely to effectively counteract the considerable buoyancy of the coir, particularly in those areas where the rolls are placed over rock and because of their size, they may exacerbate scour. Because coir rolls can become dislodged in large storm events, they should be tagged with the location and name of the project so that they can be retrieved if they are displaced to another area by high water or wave events. Coir rolls and their anchors should be monitored regularly to ensure minimal scour, identify any damage to the coir rolls, and ensure that they remain in place, which is particularly important immediately following a storm or significant wave event. A detailed construction sequence should be provided, along with a contingency plan in the event there is a storm or King Tide during construction.

Comments from CZM indicate that the base of the footings for the new wall appears to be shallower at the ends of the project versus the rest of the wall (elevation 6 and 4 feet NAVD 88, respectively) (current high tide line is at 6.4 feet NAVD88). Supplemental information indicates that the proposed wall footing is stepped to maintain a minimum 4-foot depth below existing grade to the bottom of the footing. Existing grade at the corners increases to approximate elevation 9.5 feet NAVD88 and 7 feet NAV88 at the west and east corners, respectively. The proposed seawall does not need to extend greater than 4 feet below existing grade. If the footing elevation was at a consistent elevation the seawall construction would require a nearly 10-foot-deep excavation at the west corner. The City should provide additional documentation to demonstrate that the tie-in design at the end of the structure will avoid end scour that may increase or exacerbate existing impacts to adjacent properties in permitting documents.

The ENF indicates that the existing upland vegetation seaward of the seawall will be replaced with native salt tolerant plantings. The City should develop a planting plan that includes details of the removal and replacement of the vegetation, species to be used, and maintenance of this element over time and submit it for review during permitting.

### *Waterways*

The MassDEP Waterways Regulation Program (WRP) has determined that most of the project site includes flowed and filled tidelands subject to c. 91 jurisdiction. WRP has determined that proposed work activities are a water-dependent use, pursuant to 310 CMR 9.12(2)(a)(9) and 310 CMR 9.12(2)(a)(11) and will require authorization through a c. 91 Waterways License and a Dredge Permit as it involves shoreline stabilization, dredging of aquatic sediments and associated fill in flowed and filled tidelands of Juniper Cove. WRP will perform a full technical review of the project once detailed plans are submitted with the c. 91 Waterways Application that meet the minimum filing standards set forth in 310 CMR 9.11(3). The City should consult with WRP to identify any specific technical issues prior to filing the c. 91 Waterways Application.

*Climate Change Adaptation and Resiliency*

As described in the ENF, the top of the existing seawall is below BFE and will be raised 1.5 to 3 feet to a uniform elevation of 11.5 feet NAVD88 ( $\pm 0.5$  feet above the current FEMA BFE). Given the vulnerability of this site, CZM comments recommend that the City consider alternatives that provide additional height to the seawall to further improve coastal resiliency while avoiding impacts to adjacent properties. Supplemental information indicates that the proposed wall design allows for the potential future increase in wall height to help protect against SLR. MassDEP comments express concern regarding the proposed height increase of the existing seawall. In many instances, increasing the height of the seawall may provide some additional flood protection; however, the design did not account for SLR or storm surge, and the overall proposed design may perpetuate wave reflection and associated erosion which could exacerbate coastal flooding. The City should provide additional information to explain how the increased wall elevation will not exacerbate existing wave reflection and refraction onto adjacent wetland resource areas, properties or roadways in permitting documents. The City should conduct outreach to ensure that the community understands the expected design life of the project regardless of the elevation of the final design.

I emphasize the importance of enhancing and maintaining coastal resource areas such as a fronting beach and salt marsh to dissipate wave energy because the frequency, duration, and intensity of this wave interaction will increase with rising sea levels. The City should consider mitigation strategies to reduce potential impacts from energy reflection on fronting resources and adjacent areas from the proposed additional height on the reconstructed seawall. CZM and MassDEP comments recommend maximizing the roughness of the new wall to better dissipate reflected energy, minimizing the size, altering the design of the landing to reduce energy reflection, and adding sediment to the beach front to further dissipate and absorb wave energy.

Supplemental information indicates that the proposed granite block seawall will have increased roughness compared to the existing wall, which will help to mitigate energy reflection by improving dissipation. The City should include additional information in permitting documents to demonstrate that the proposed granite block wall will provide this improvement to ensure that the new wall does not reflect more energy than the existing wall.

According to supplemental information, the existing landing and beach access steps will be replaced with a similar on grade structure with a slightly smaller footprint. Supplemental information indicates that a pile-supported structure was not chosen because of possible shallow depth to bedrock, aesthetics, and the more limited longevity of a timber structure versus a solid structure in a high energy environment. Because this reconstruction offers the opportunity for redesigning the existing structure, the new design should reduce the existing impacts of scour on the fronting salt marsh and beach. CZM comments indicate that pile-supported access structures can be constructed from more durable materials than wood, and piles and piers are often pinned to bedrock in this type of environment. Comments from MassDEP, CZM and DMF recommend that the City further analyze alternatives that reduce impacts to fronting resource areas and reduce reflected wave energy to adjacent areas such as a smaller size; use of pilings rather than solid support; a pile supported walkover design, that are more resilient to wave action and also eliminate the need for the opening in the seawall and associated flood barrier; and a removable design for the deck and stairs to allow their removal to avoid the most significant impacts during the winter season, or when the floodgate is installed before storm events.

According to Agency comments, a significant mitigation strategy to reduce additional wave energy reflection caused by the increased wall elevation and minimize impacts to adjacent properties is addition of sand to the beach to dissipate wave energy and reduce wave reflection off the wall. Supplemental information indicates that, while the City may consider this in the future, a challenge for implementation of beach nourishment is a local perception that flood waters currently overtop the wall in part because of the existing sand built up in the corners, which is believed to be causing a ramping effect and exacerbating flooding. CZM comments note that the elevation of coastal flood waters is determined by the elevation of the ocean, which is not affected by local nearshore topography, and additional sediment in front of a wall provides an important buffer to reduce the energy associated with the waves, which decreases the overtopping and reflection off the wall. The City should engage in continued public outreach and education regarding coastal processes and the benefits of nourishment to both storm damage prevention and recreation to address this issue and allow this mitigation strategy to be implemented as part of this project. A grain size analysis should be completed, and the results submitted with permitting documents to demonstrate that any fill brought in as part of the beach and/or salt marsh restoration is compatible with existing sediments.

The City should develop a comprehensive plan to assess, implement and track nature-based solutions that will aid in mitigating damage from SLR and storm surge in Juniper Cove. At a minimum, the City should monitor the profile of the beach face and identify specific nourishment thresholds and volumes needed to maintain the beach profile over time.

The City actively participates in the Commonwealth's Municipal Vulnerability Preparedness (MVP) Program, which is a community-driven process to define natural and climate-related hazards, identify existing and future vulnerabilities and strengths of infrastructure, environmental resources and vulnerable populations, and develop, prioritize and implement specific actions the City can take to reduce risk and build resilience. The City should maintain MVP certification and continue to prioritize and implement community-supported, nature-based resiliency projects based on MVP program core principles.

### *Historical Resources*

According to comments from MHC, the seawall and granite landing are listed in the State and National Registers of Historic Places as contributing elements to the Salem Willows Historic District. Demolition of the seawall and landing would constitute an "adverse effect" pursuant to 950 CMR 71.05(a) and 71.07(2)(b)(3) through the destruction or alteration of all or part of a State Register property. The City should consult with MHC to explore alternatives that would avoid, minimize, or mitigate the adverse effect of the proposed demolition pursuant to 950 CMR 71.07(3).

### *Construction Period*

Supplemental information describes general construction methods and procedures including sequencing; construction access, staging, and limits of work; and support of excavations and dewatering. Permitting plans should include the location of proposed staging area(s) for the excavated beach sand and other materials and explain how it will be stored for reuse. All construction and demolition (C&D) activities should be managed in accordance with applicable MassDEP's regulations regarding Air Pollution Control (310 CMR 7.01, 7.09-7.10), and Solid Waste Facilities (310 CMR 16.00 and 310 CMR 19.00, including the waste ban provision at 310 CMR 19.017). The City will install BMPs on the

project site to control erosion and sedimentation during the construction period. The project should include measures to reduce construction period impacts (e.g., noise, dust, odor, solid waste management) and emissions of air pollutants from equipment, including anti-idling measures in accordance with the Air Quality regulations (310 CMR 7.11).

I encourage the City to require contractors to use construction equipment with engines manufactured to Tier 4 federal emission standards or select project contractors that have installed retrofit emissions control devices or vehicles that use alternative fuels to reduce emissions of volatile organic compounds (VOCs), carbon monoxide (CO) and particulate matter (PM) from diesel-powered equipment. Off-road vehicles are required to use ultra-low sulfur diesel fuel (ULSD). If oil and/or hazardous materials are found during construction, the City should notify MassDEP in accordance with the Massachusetts Contingency Plan (310 CMR 40.0000). The City should develop a spills contingency plan. All C&D activities should be undertaken in compliance with the conditions of all State and local permits. I encourage the City to reuse/recycle C&D debris to the maximum extent.

### Conclusion

The ENF has adequately described and analyzed the project and its alternatives and assessed its potential environmental impacts and mitigation measures. Based on review of the ENF and comments received on it, and in consultation with State Agencies, I have determined that an EIR is not required. Remaining issues can be addressed through the local, State and federal permitting and review processes. I encourage the City to continue to consult with State Agencies during subsequent permitting to adequately consider climate change and flooding impacts in project design while balancing the need to protect coastal wetland resources. To the extent material changes to project design are made during permitting, the City is directed to consult with the MEPA Office to determine the need for further review.

November 22, 2021

Date



Kathleen A. Theoharides

### Comments Received:

|            |                                                                                                     |
|------------|-----------------------------------------------------------------------------------------------------|
| 10/08/2021 | Massachusetts Department of Environmental Protection (MassDEP) – Waterways Regulation Program (WRP) |
| 10/12/2021 | Massachusetts Historical Commission (MHC)                                                           |
| 10/18/2021 | Guy Ford                                                                                            |
| 10/18/2021 | Lewis Legon                                                                                         |
| 10/19/2021 | Massachusetts Division of Marine Fisheries (DMF)                                                    |
| 11/12/2021 | Massachusetts Office of Coastal Zone Management (CZM)                                               |
| 11/12/2021 | MassDEP – Northeast Regional Office (NERO)                                                          |

KAT/PPP/ppp



## Department of Environmental Protection

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Commissioner

### Memorandum

**To:** Purvi Patel, Environmental Analyst, MEPA/EEA

**From:** Ivan Morales, Waterways Regulation Program, MassDEP/Boston

**Cc:** Daniel J. Padien, WRP Program Chief

**Re:** **Comments from the Chapter 91 Waterways Regulation Program–  
ENF, Columbus Avenue Seawall Reconstruction, EEA #16445**

**Date:** October 8, 2021

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The Department of Environmental Protection Waterways Regulation Program (the “Department”) has reviewed the above referenced ENF (EEA #16445), submitted by GZA Geoenvironmental, Inc., on behalf of City of Salem, (the “Proponent”) to replace an existing deteriorated stone masonry seawall with a granite stone seawall, install a new flood barrier gate, reconstruct an existing granite block landing, and access steps and a sidewalk, , and salt marsh enhancement, located at 44 and 46 Columbus Avenue, and 30 Bayview Avenue, Salem, Essex County (the “project site”).

#### **Chapter 91 Jurisdiction:**

The Department has determined that most of the project site is located within Chapter 91 jurisdiction. The project site is in Juniper Cove (Salem Harbor). Pursuant 310 CMR 9.02, said jurisdictional area is considered flowed and filled tidelands.

#### **Water Dependency:**

The Department has determined that the proposed work activities are a water-dependent use, pursuant to 310 CMR 9.12(2)(a)(9) and 310 CMR 9.12(2)(a)(11).

#### **WRP Comments:**

In the ENF, the Proponent proposes to replace 476-linear feet of an existing deteriorated stone masonry seawall, along the Columbus Avenue and two (2) adjacent properties (44 Columbus Avenue and 30 Bay View Avenue), with a large cut granite stone seawall with a height increase

ranging from 1.5 to 3 feet (up to elevation 11.5 feet NAVD88), install a new 8-foot wide flood barrier gate at the seawall opening, reconstruct an existing 24-foot by 19-foot granite block landing and access steps, and a 5-foot wide paved sidewalk placed at 1.5% slope and located landward of the existing seawall. The project also includes a salt marsh enhancement and protection consisting of the installation of 222-linear feet of new coir logs seaward of the existing seawall, placement of clean sand fill within eroded areas to match the elevation of the adjacent marsh and riprap, and salt marsh plantings.

After review, the Department determines that the proposed activities will require authorization through a Chapter 91 Waterway License and a Dredge Permit as it involves shoreline stabilization, dredging of aquatic sediments and associated fill in flowed and filled tidelands of Juniper Cove (Salem Harbor).

The Waterways Program looks forward to receipt of a complete application meeting the requirements stipulated at 310 CMR 9.11(3). The applicant is invited to request a prefiling consultation to identify any specific technical issues prior to filing the application.

If you have any questions regarding the Department's comments, please contact Ivan Morales at (617) 292-5621 or [Ivan.Morales@mass.gov](mailto:Ivan.Morales@mass.gov)



October 8, 2021

## The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth

Secretary Kathleen A. Theoharides  
Executive Office of Energy and Environmental Affairs  
Massachusetts Historical Commission  
100 Cambridge Street, Suite 900  
Boston, MA 02114

ATTN: Purvi Patel, MEPA Unit

RE: Columbus Avenue Seawall Reconstruction, 46 Columbus Avenue, Salem, MA; MHC# RC.70369, **EEA#16445**

Dear Secretary Theoharides:

Staff of the Massachusetts Historical Commission (MHC) have reviewed the Environmental Notification Form (ENF) submitted for the above referenced project and have the following comments.

The proposed project consists of removal of the existing stone masonry seawall and construction of approximately 466 linear feet of new, large cut granite stone seawall along the existing seawall alignment, installation of a new 8-foot wide flood barrier gate at the seawall opening, reconstruction of the granite block landing and access steps, reconstruction of the 5-foot wide paved sidewalk along the landward side of the seawall, and salt marsh enhancements including new coir rolls along the seaward edge, new clean sand fill, and new supplemental salt marsh plantings. Additionally, 10 linear feet of adjacent seawall at 44 Columbus Avenue and 30 Bay View Avenue is proposed to be reconstructed to tie-in and match the proposed Columbus Avenue Seawall.

The ENF indicates that the project will require a Chapter 91 license from the Massachusetts Department of Environmental Protection (DEP). The information provided indicates that the proposed project may receive state funding from the Executive Office of Energy and Environmental Affairs Dam and Seawall Repair and Removal Program.

The ENF incorrectly notes that the seawall is not a historic resource. The seawall and granite ashlar landing are listed in the State and National Registers of Historic Places as contributing elements to the Salem Willows Historic District.

Demolition of the seawall and landing constitutes an "adverse effect" (950 CMR 71.05(a) and 950 CMR 71.07 (2)(b)(3)) through the destruction or alteration of all or part of a State Register property.

The MHC hereby initiates the MHC's consultation process pursuant to 950 CMR 71.07(3). The MHC looks forward to consulting with the City of Salem to explore alternatives that would eliminate, minimize, or mitigate the adverse effect of the proposed demolition.

These comments are offered to assist in compliance with M.G.L. Chapter 9, sections 26-27C (950 CMR 71.00) and MEPA (301 CMR 11.03(10)). Please do not hesitate to contact Elizabeth Sherva of my staff if you have any questions.

Sincerely,

A handwritten signature in blue ink that reads "Brona Simon".

Brona Simon  
State Historic Preservation Officer  
Executive Director  
Massachusetts Historical Commission

xc: David Knowlton, City of Salem  
Massachusetts Department of Environmental Protection NERO  
Patti Kelleher, City of Salem  
Historic Salem Inc. 220 Morrissey Boulevard, Boston, Massachusetts 02125  
(617) 727-8470 • Fax: (617) 727-5128  
[www.sec.state.ma.us/mhc](http://www.sec.state.ma.us/mhc)

**From:** [Ford, Guy](#)  
**To:** [Patel, Purvi \(EEA\)](#)  
**Cc:** [Lewis Legon](#); [Tucker, Paul - Rep. \(HOU\)](#); [Joan Lovely](#)  
**Subject:** Columbus Avenue Seawall Project in Salem MA  
**Date:** Monday, October 18, 2021 10:48:27 PM  
**Attachments:** [Draft ENF Application Columbus Ave Seawall - for comments to MEPA.pdf](#)

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**CAUTION:** This email originated from a sender outside of the Commonwealth of Massachusetts mail system. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Hello Purvi,

I understand that Lewis Legon has submitted comments to you regarding the Columbus Avenue Seawall Restoration project in Salem MA on behalf of Salem Willows Neighborhood Association Flood Advisory Committee. Lewis and I are co-chairs of this committee. But I am submitting the following comments to you on my own, as an individual resident and abutter to the Columbus Avenue Seawall project. I have also submitted these comments through the comments portal on the EEA website.

I've attached select pages from the Draft Environmental Notification Form Application prepared by GZA GeoEnvironmental, Inc., for reference (this file I've attached is labeled Draft. I do not have access to any more recent or final documents to help explain my comments). Please refer to Dwg. 2 of the attachment for the location of my property at 30 Bay View Avenue. Please refer to Dwg. 4 of the attachment for limits of the proposed wall reconstruction.

Note that the reconstructed wall will tie into the existing wall that runs along my property at 30 Bay View Ave. and will also tie into the existing wall at the opposite end, at 44 Columbus Ave, refer to Dwgs. 4 and 7. Note that the new wall will be roughly 3ft. higher and will only tie in a total of 10ft. into the wall that runs along my property. This is highly concerning and will have devastating adverse effects to my property. When a bad storm hits with high water levels, the water will pour directly into my property through the area from the end of the tie-in and above and over the existing wall that will remain along my property. The water will also continue to flow through my property and into the Bay View Ave./Columbus Ave. intersection with adverse effects to those properties as well.

Terminating the new wall with only 10ft. tie-ins to the adjacent properties is going to severely exacerbate the flooding problems at each end of the wall, and especially at my end since my end is about 2ft. lower than the opposite end at 44 Columbus Ave. In this sense the project is incomplete and again, will have devastating adverse effects to my property. The water will pour directly into my property in a much worse way than it does under the present conditions. The project should include not only the new wall along Columbus Avenue, but also improvements to the abutter's walls via betterments or other assistance from the City. Please also note that the existing Columbus Avenue wall and the wall that runs along my property are the same wall, see attached photos. The Columbus Avenue wall and the wall that runs along my property had to have been constructed under the same contract many years ago and were part of the same project. Some arrangement had to have been made at that time between the City and the previous owner of my property to extend the wall along my property. I've reached out the City Engineer, David Knowlton, asking if he can locate any old/original project documents that could help define the terms of the original contract. He has told me that he has not be able to locate original documents up to this point, but he is still looking. But this new project should not go forward until satisfactory arrangements are made with the abutter's walls, or at least with the wall that runs along my property at 30 Bay View Avenue as the proposed project will be most harmful to me and will have devastating consequences to my property.

Another concern relates to the sand level that has built up at the NE corner of the beach near my property at 30 Bay View. The sand has risen significantly at this location to be roughly at the same elevation as the adjacent sidewalk, if not higher. This has exacerbated the wave action at this corner. During storms the waves essentially roll up this sloping sand and come right over the wall, as if the sand provides a launching ramp for the wave. I know that removing sand is an environmentally sensitive issue, but in this case it seems clearly intuitive that reducing the sand elevation would help mitigate wave action and

reduce local flooding.

A third concern I have relates to the existing breakwater at the mouth of Juniper Cove. I know the breakwater is not part of the Columbus Ave. wall reconstruction project, but it does play a very important role in the wave action within the cove. The consensus from GZA and from the City is to leave the existing breakwater at the mouth of Juniper Cove "as-is", or the "do-nothing" approach for the breakwater. The existing breakwater is also in major disrepair. Many stones have been displaced, and the breakwater is completely submerged during high tides. GZA has said that from their wave-analysis study that improvements to the breakwater would have minimal beneficial effects to the wave action on the wall during storms, citing 1.4ft. wave reduction which GZA considers insignificant. As a Civil Engineer myself, and someone who lives at Juniper Cove and closely observes the waves action here first hand, I take issue with this assessment. It seems clearly intuitive that improvements to the breakwater would significantly help the wave-action and flooding issues we have during storms, and I don't consider 1.4ft. wave reduction as "insignificant". I understand that the existing breakwater is not considered part of the wall reconstruction project, but to me it seems misgiven that it is not.

In summary, these concerns are alarming and highly concerning, especially terminating the wall 10ft. into my driveway and causing devastating water problems for me as a direct result of the project. Without resolution of these issues the project appears incomplete. These issues should be addressed now, in the design phase, even if it extends the scope and length of the design phase. Constructing only the Columbus Avenue wall as presently shown on the design drawings is only a partial approach to correcting the current issues at Juniper Cove. Proper long-term results to reducing the severity of the issues at our cove requires a more comprehensive approach to this project, which addresses the concerns stated above.

Thank for your time.  
Guy Ford

**Guy Ford**

Senior Structural Engineer

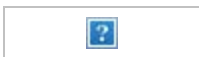
Direct: 781 221-1247

[Guy.Ford@stantec.com](mailto:Guy.Ford@stantec.com)

Stantec

65 Network Drive 2nd Floor

Burlington MA 01803-2767



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**View Comment**

### Comment Details

|                                                    |                   |                    |                         |
|----------------------------------------------------|-------------------|--------------------|-------------------------|
| EEA #/MEPA ID*                                     | First Name        | Address Line 1     | Organization            |
| 16445                                              | Lewis             | 44 Columbus Avenue | --                      |
| Comments Submit Date                               | Last Name         | Address Line 2     | Affiliation Description |
| 10-18-2021                                         | Legon             | --                 | Individual              |
| Certificate Action Date                            | Phone             | State              | Status                  |
| 10-19-2021                                         | --                | MASSACHUSETTS      | Accepted                |
| Reviewer                                           | Email             | Zip Code           |                         |
| Purvi Patel, 617-626-1029,<br>purvi.patel@mass.gov | lal1912@gmail.com | 01970              |                         |

## Comment Title or Subject

**Topic:** Concerns with the Columbus Avenue Seawall Project

## Comments

Please see comments in the Word doc submitted as an attachment.

## Attachments

DSCN7240 (Large).JPG(null).

Concerns with the Columbus Avenue Seawall Project.docx(null)

[Draft ENF Application Columbus Ave Seawall - for comments to MEPA.pdf\(null\)](#)

DSCN7241 (Large).JPG(null)

## Update Status

## Status

Accepted ▼

SUBMIT

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### Concerns with the Columbus Avenue Seawall Project

These comments are directed to the Columbus Avenue Seawall Reconstruction project in Salem MA. My name is Guy Ford. I live at 30 Bay View Avenue, Salem MA. I am co-chair of the Salem Willows Neighborhood Association Flood Advisory Committee. Lewis Legon at 44 Columbus Avenue is also a co-chair. We have submitted comments on behalf of Flood Advisory Committee, but I am submitting the following comments on my own, as an individual resident and abutter to the Columbus Avenue Seawall project.

I've attached select pages from the Draft Environmental Notification Form Application prepared by GZA GeoEnvironmental, Inc., for reference (this file I've attached is labeled Draft. I do not have access to any more recent or final documents to help explain my comments). Please refer to Dwg. 2 of the attachment for the location of my property at 30 Bay View Avenue. Please refer to Dwg. 4 of the attachment for limits of the proposed wall reconstruction.

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Thank for your time.

Guy Ford

Senior Structural Engineer with the firm Stantec



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## ENVIRONMENTAL NOTIFICATION FORM APPLICATION

### Columbus Avenue Seawall Reconstruction Project (EEA #258-2020-2-3)

46 Columbus Avenue, Salem, Massachusetts

August 2021

GZA File No. 18.0171674.04



#### PREPARED FOR:

City of Salem  
98 Washington Street, 2<sup>nd</sup> Floor  
Salem, Massachusetts

#### **GZA GeoEnvironmental, Inc.**

144 Elm Street | Amesbury, MA 01913  
781-278-4800

31 Offices Nationwide  
[www.gza.com](http://www.gza.com)

# COLUMBUS AVENUE SEAWALL RECONSTRUCTION PROJECT

## SALEM, MASSACHUSETTS

EEA #258-2020-2-3

PREPARED FOR

CITY OF SALEM  
98 WASHINGTON STREET, 2<sup>ND</sup> FLOOR  
SALEM, MA 01970

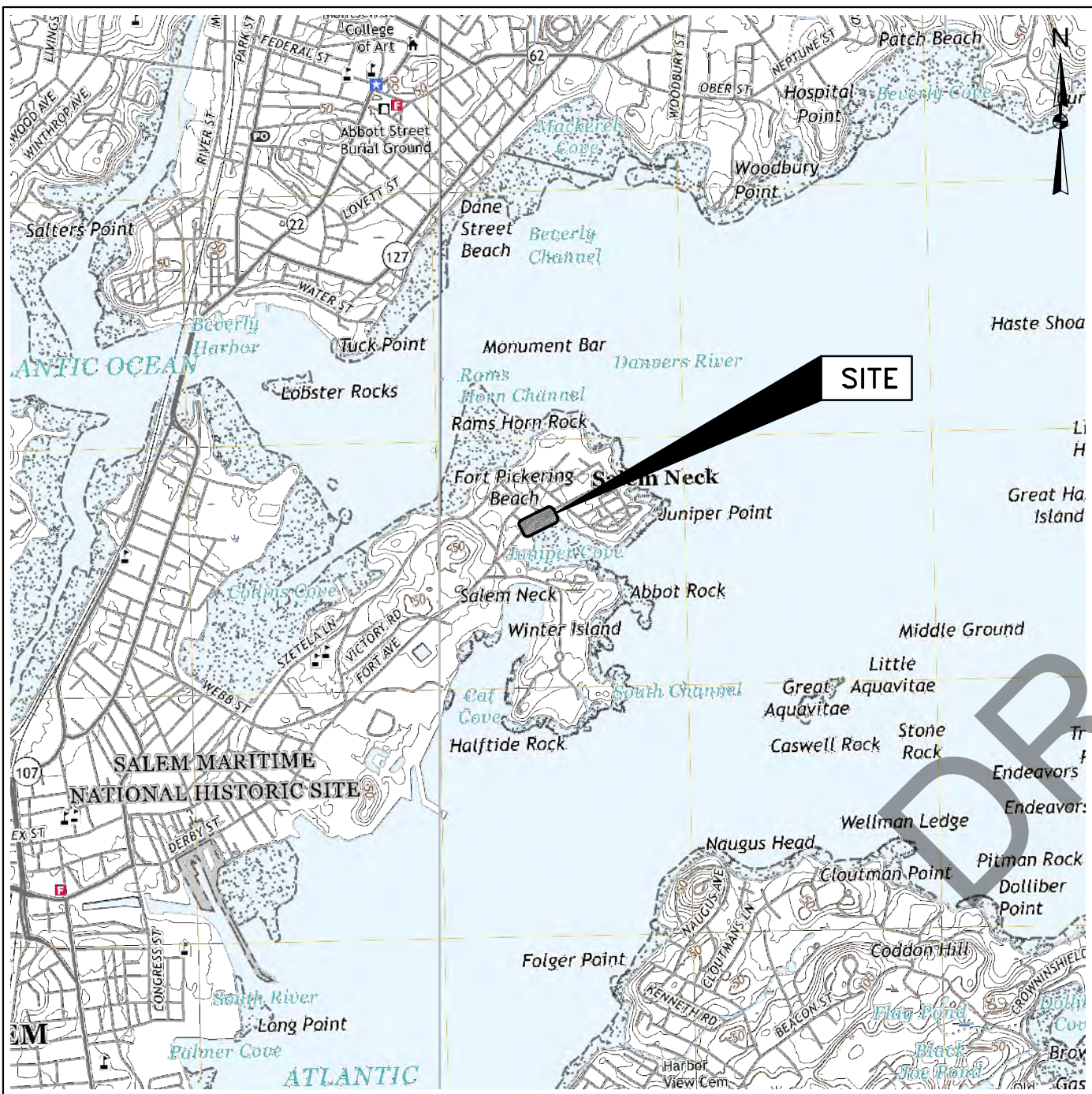
PREPARED BY



GZA GEOENVIRONMENTAL, INC.  
144 ELM STREET  
AMESBURY, MA 01913

INDEX OF DRAWINGS

- |   |                                      |
|---|--------------------------------------|
| 1 | COVER SHEET                          |
| 2 | EXISTING CONDITIONS PLAN AND PROFILE |
| 3 | EXISTING SECTIONS                    |
| 4 | PROPOSED CONDITIONS PLAN AND PROFILE |
| 5 | PROPOSED SECTIONS                    |
| 6 | PROPOSED DETAILS 1                   |
| 7 | PROPOSED DETAILS 2                   |



PROJECT LOCUS MAP

SOURCE: USGS TOPOGRAPHIC QUADRANGLES  
SCANNED BY MASSGIS AND DISTRIBUTED IN 2018

CONTOUR ELEVATIONS REFERENCE NAVD 88,  
CONTOURS AND ELEVATIONS ARE SHOWN IN FEET



SCALE: 1" = 2000 FEET



AERIAL ORTHO IMAGERY MAP

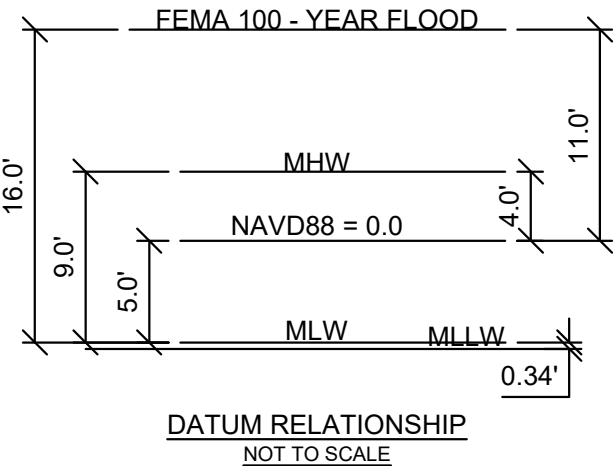
SOURCE: BING AERIAL MAP DOWNLOADED FROM  
AUTOCAD GEOLOCATION MAP SERVICES



SCALE: 1" = 2000 FEET

LEGEND

- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- MEAN HIGH WATER [ MHW ]
- HIGH TIDE LINE [ HTL ]
- APPROXIMATE PROPERTY LINE
- SHELLFISH SUITABILITY AREA LIMITS
- CHAPTER 91 HISTORIC HIGH WATER LINE
- EXISTING DRAIN LINE
- EXISTING WATER LINE
- EXISTING SEWER LINE
- SALT MARSH AREA
- POCKMARKS WITHIN SALT MARSH AREA
- GRASS
- EXISTING WATER GATE
- EXISTING HYDRANT
- EXISTING GAS UTILITY
- EXISTING DRAIN MANHOLE
- EXISTING SEWER MANHOLE
- EXISTING CATCH BASIN



DRAFT COPY  
FOR CLIENT REVIEW

GENERAL NOTES

- ELEVATIONS ARE IN FEET AND REFERENCE THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88): MLW=-4.99, NAVD88=0.0, MHW=3.95, HTL=6.36, FEMA 100-YEAR FLOOD ZONE AE=11.0.
- LIMITED TOPOGRAPHIC SURVEY PERFORMED BY GZA GEOENVIRONMENTAL, INC., ON MARCH 31, 2020 AND REPRESENTS CONDITIONS AT THE TIME OF THE SURVEY.
- APPROXIMATE SALT MARSH LIMITS SHOWN BASED ON SURVEY OBSERVATIONS BY GZA GEOENVIRONMENTAL, INC., ON MARCH 31, 2020.
- EXISTING UTILITIES SHOWN BASED ON ELECTRONIC FILES PROVIDED BY THE CITY OF SALEM.
- PROPERTY LINES ARE APPROXIMATE AND WERE SCALED FROM ONLINE AVAILABLE MASSGIS DATA LAYERS.
- SHELLFISH SUITABILITY AREA (SOFT-SHELLED CLAM) LIMITS AND CHAPTER 91 HISTORIC HIGH WATER LINE PROVIDED BY MASSGIS DATA LAYERS.

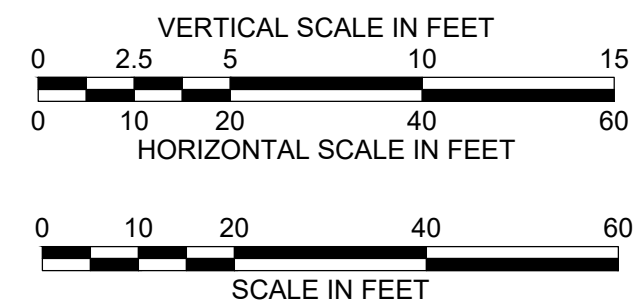
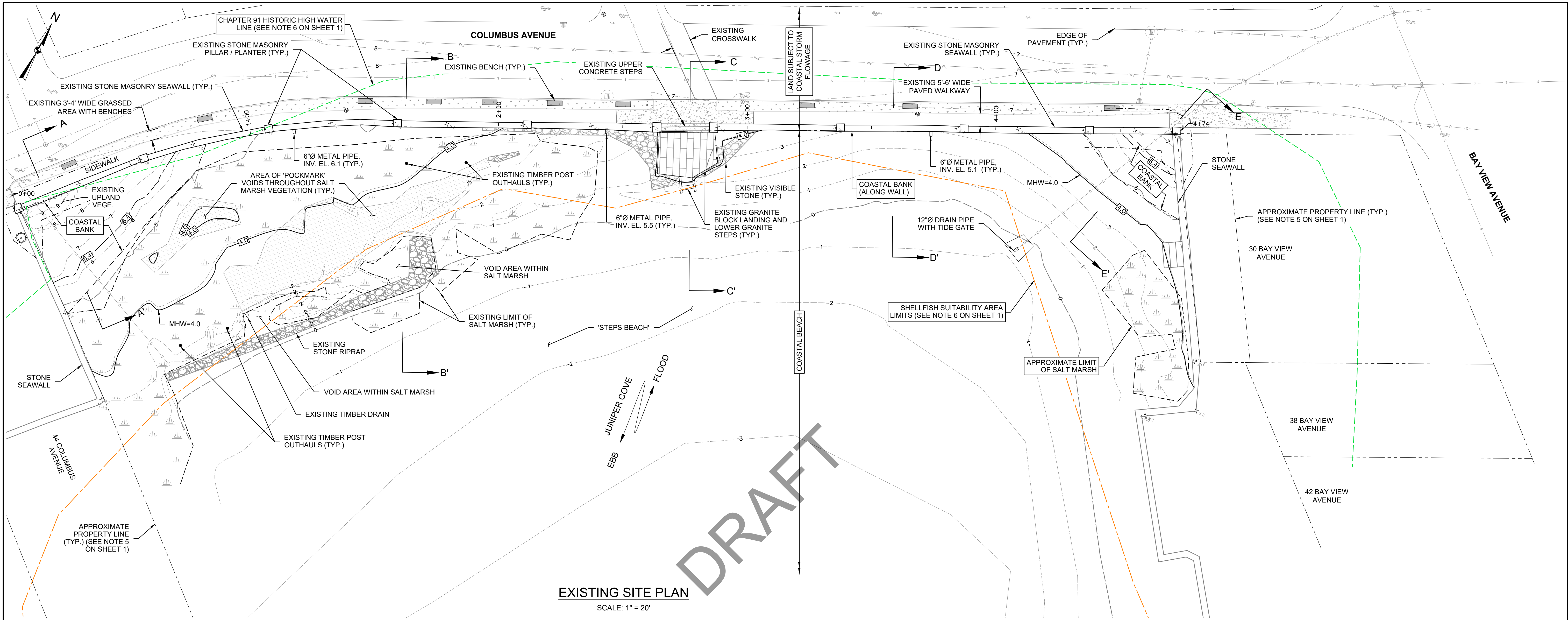
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COLUMBUS AVENUE SEAWALL RECONSTRUCTION  
SALEM, MASSACHUSETTS  
(EEA #258-2020-2-3)

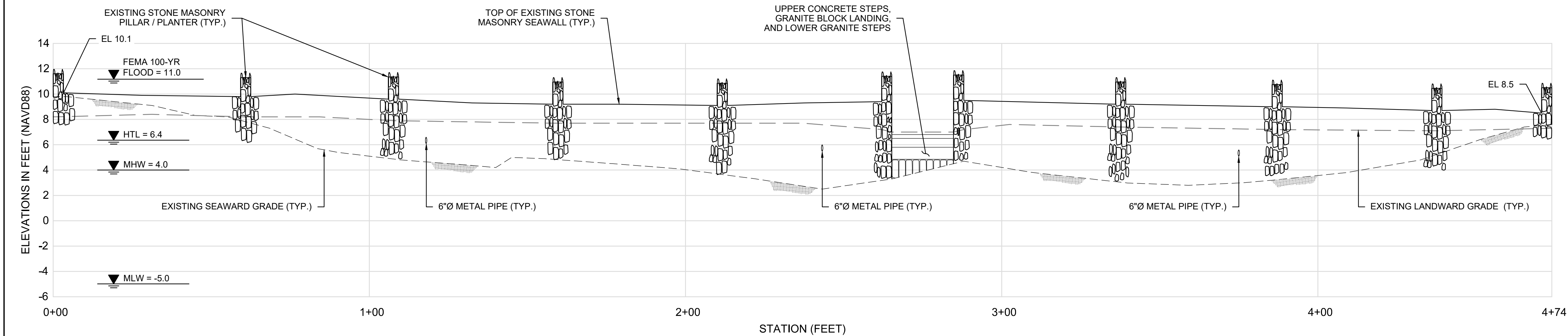
COVER SHEET

|                                                                                       |                  |                           |                                                                                           |                                         |
|---------------------------------------------------------------------------------------|------------------|---------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------|
| PREPARED BY:<br>GZA GeoEnvironmental, Inc.<br>Engineers and Scientists<br>www.gza.com |                  |                           | PREPARED FOR:<br>CITY OF SALEM<br>98 WASHINGTON STREET, 2ND FLOOR<br>SALEM, MASSACHUSETTS |                                         |
| PROJ MGR: DAS                                                                         | DESIGNED BY: DAS | REVIEWED BY: DAS          | CHECKED BY: -                                                                             | DRAWING<br><b>1</b><br>SHEET NO. 1 OF 7 |
| DATE: AUGUST 2021                                                                     | DRAWN BY: AJP    | PROJECT NO. 18.0171674.04 | SCALE: AS SHOWN                                                                           |                                         |
|                                                                                       |                  |                           | REVISION NO. -                                                                            |                                         |

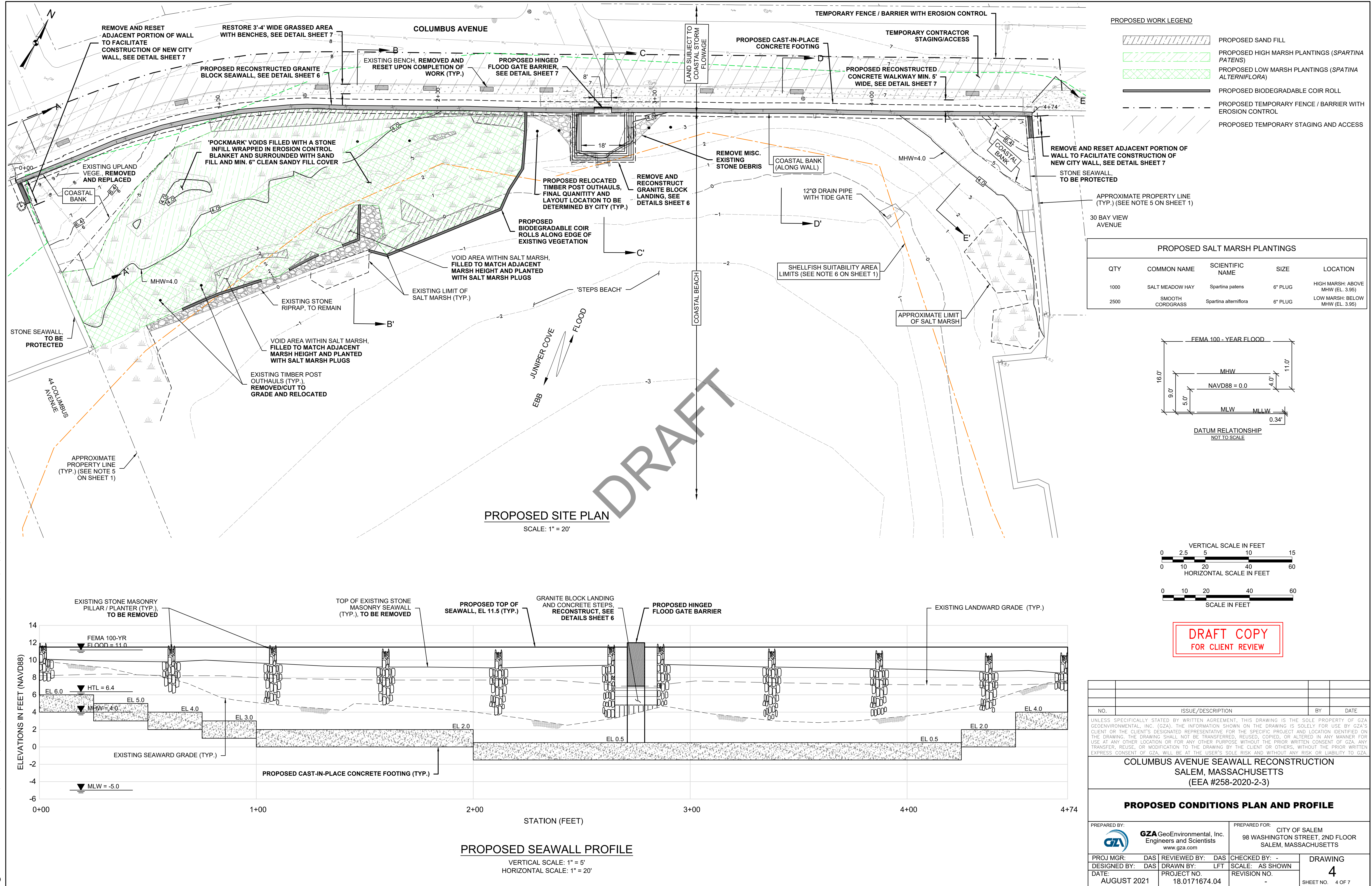
© 2021 - GZA GeoEnvironmental, Inc. GZA--\\171600\S\18.0171674\04 SALEM COLUMBUS AVE SEAWALL RECONSTRUCTION.DWG (DWG) 18.0171674.04 COLUMBUS AVE SEAWALL RECONSTRUCTION.DWG EXISTING PLAN--PROFILE AUGUST 9, 2021 10:51AM LUCAS TAYLOR

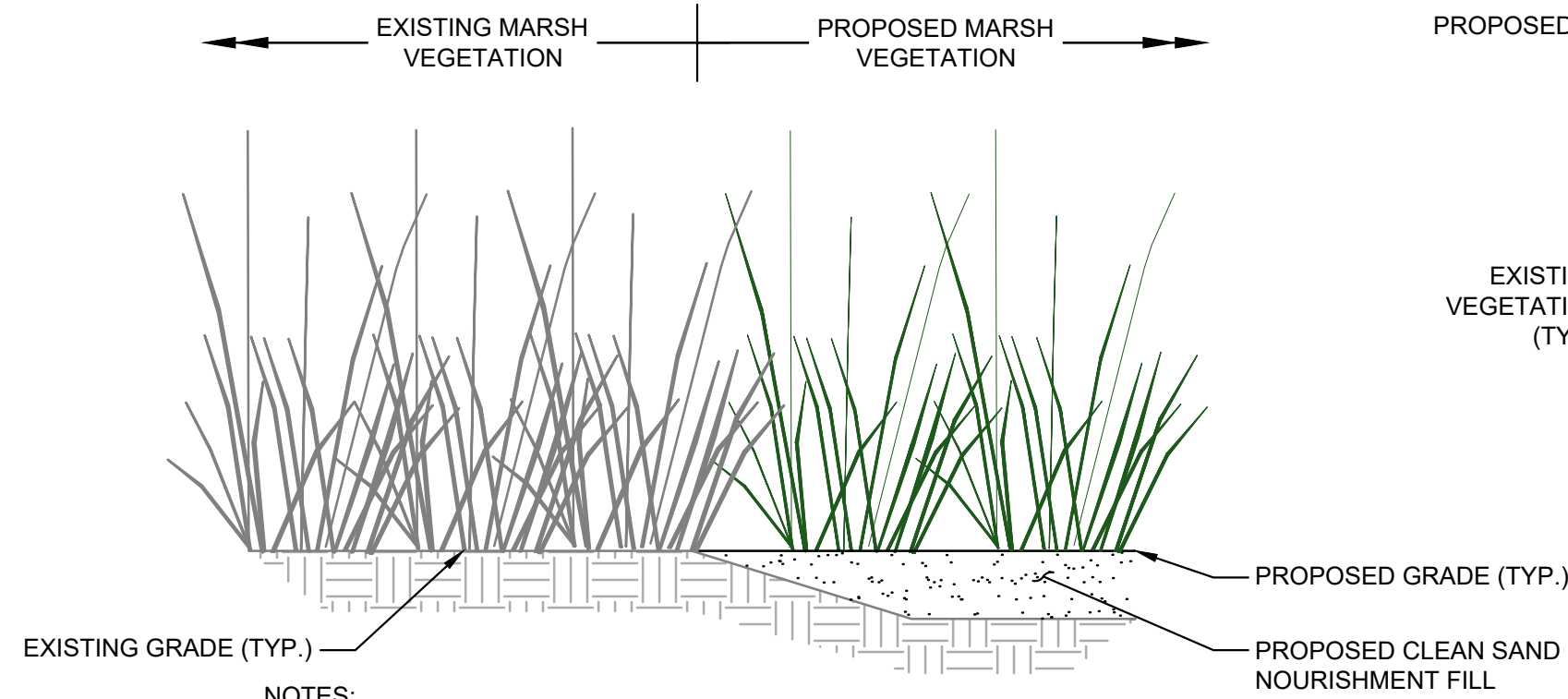


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FOR CLIENT REVIEW



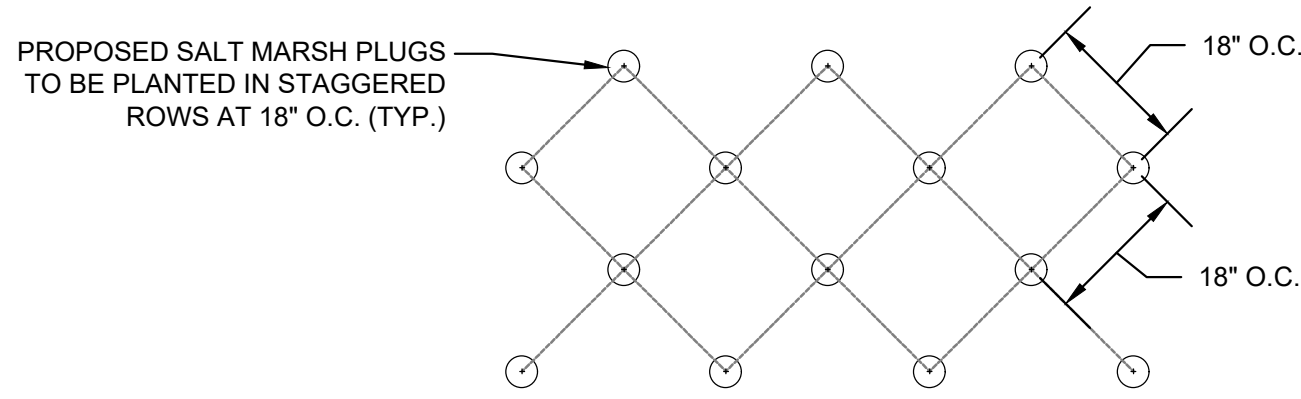
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| NO.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ISSUE/DESCRIPTION         | BY                                                                                        | DATE             |
| UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA. |                           |                                                                                           |                  |
| COLUMBUS AVENUE SEAWALL RECONSTRUCTION<br>SALEM, MASSACHUSETTS<br>(EEA #258-2020-2-3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                           |                                                                                           |                  |
| <b>EXISTING CONDITIONS PLAN AND PROFILE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                           |                                                                                           |                  |
| PREPARED BY:<br><b>GZA</b> GeoEnvironmental, Inc.<br>Engineers and Scientists<br>www.gza.com                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                           | PREPARED FOR:<br>CITY OF SALEM<br>98 WASHINGTON STREET, 2ND FLOOR<br>SALEM, MASSACHUSETTS |                  |
| PROJ MGR: DAS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DESIGNED BY: DAS          | REVIEWED BY: DAS                                                                          | CHECKED BY: -    |
| DATE: AUGUST 2021                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | PROJECT NO. 18.0171674.04 | SCALE: AS SHOWN                                                                           | REVISION NO. -   |
| DRAWING<br><b>2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           |                                                                                           | SHEET NO. 2 OF 7 |





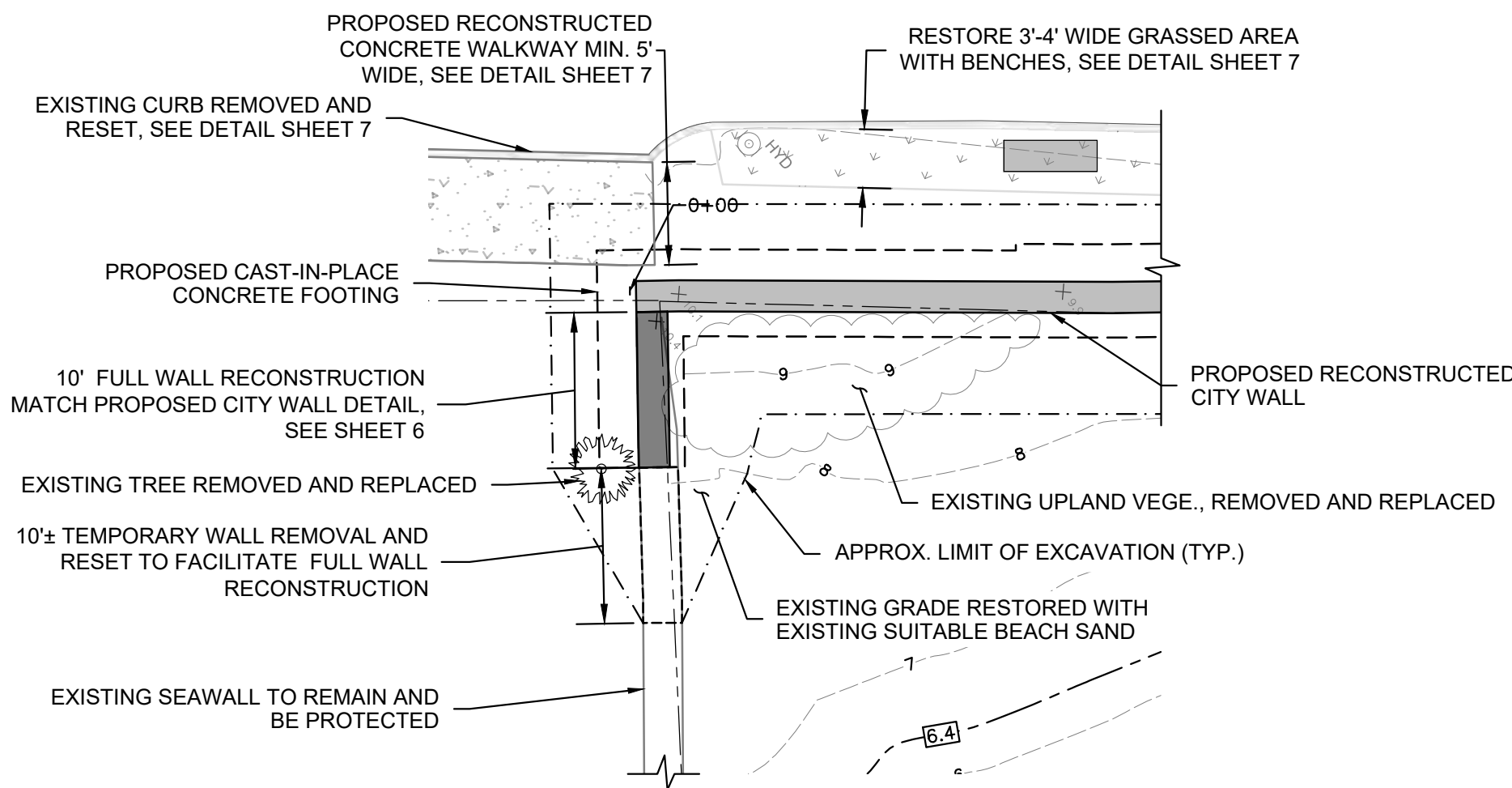
TIE-IN WITH EXISTING MARSH DETAIL

SCALE: N.T.S.



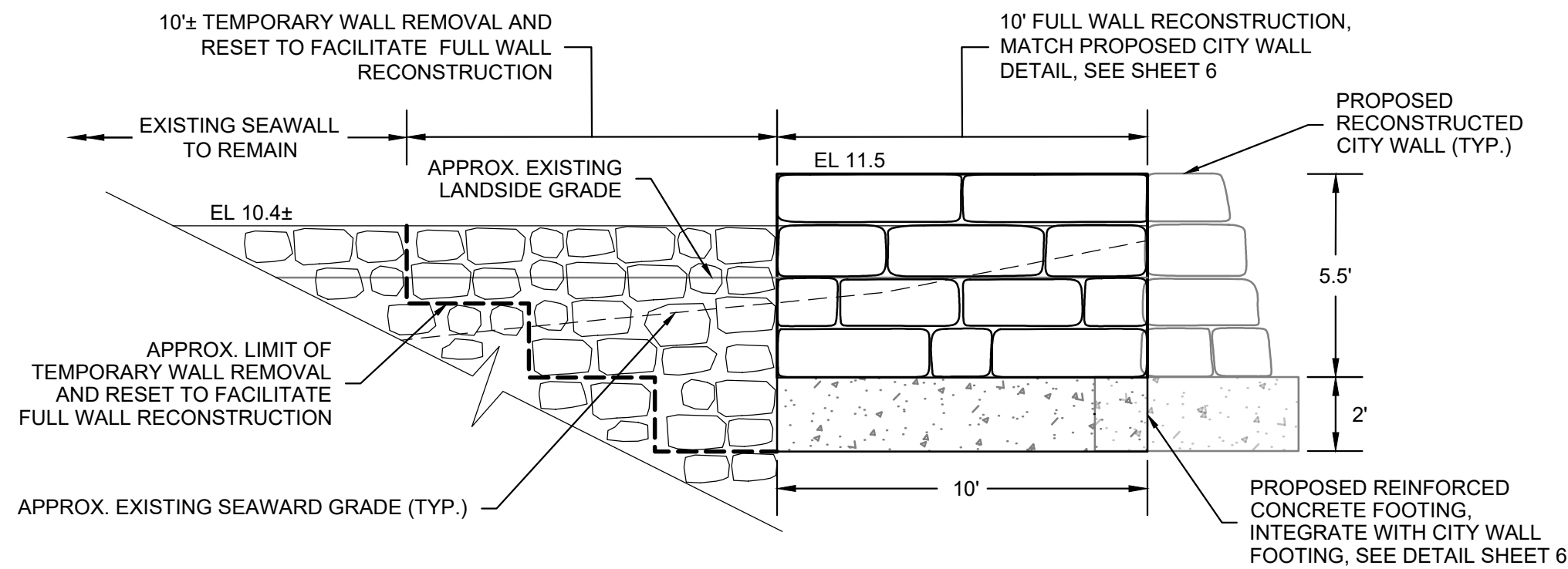
TYPICAL SALT MARSH PLANTING SPACING

SCALE: N.T.S.



44 COLUMBUS AVE WALL TIE-IN PLAN

SCALE: 1"=10'

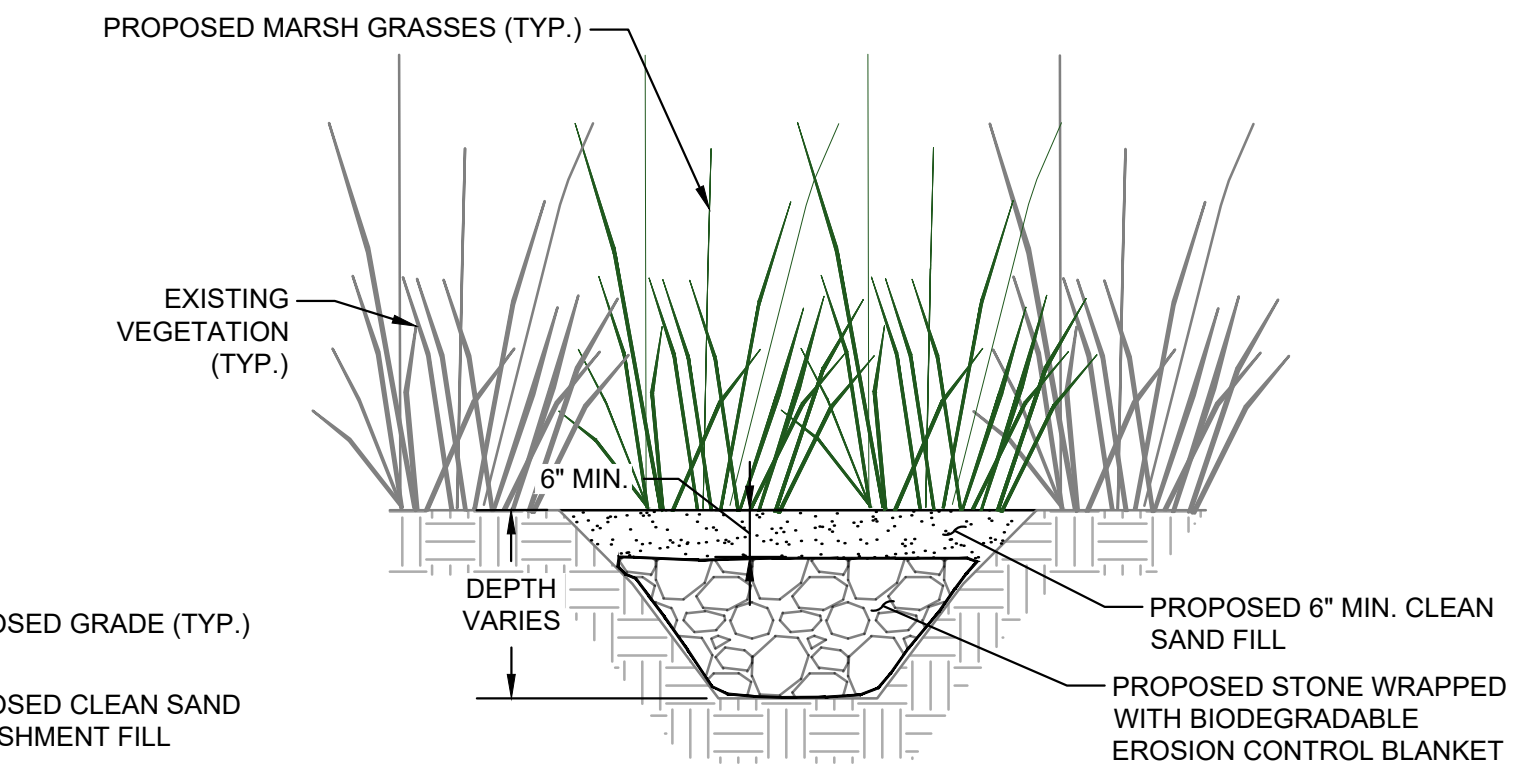


44 COLUMBUS AVE WALL TIE-IN DETAIL

SCALE: 1"=4'

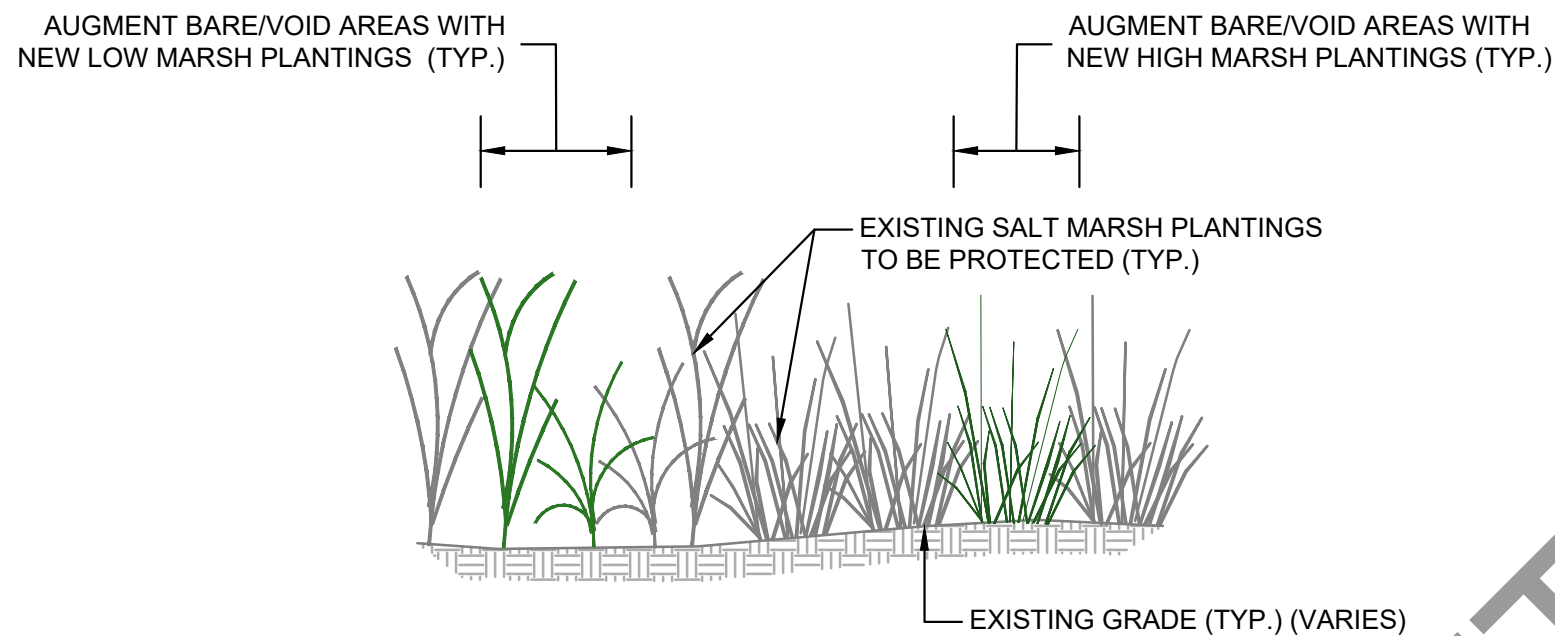
NOTE:

1. DEPTH OF EXISTING WALL UNKNOWN, PROVIDE SHORING/SUPPORT OF EXCAVATION AS NEEDED.



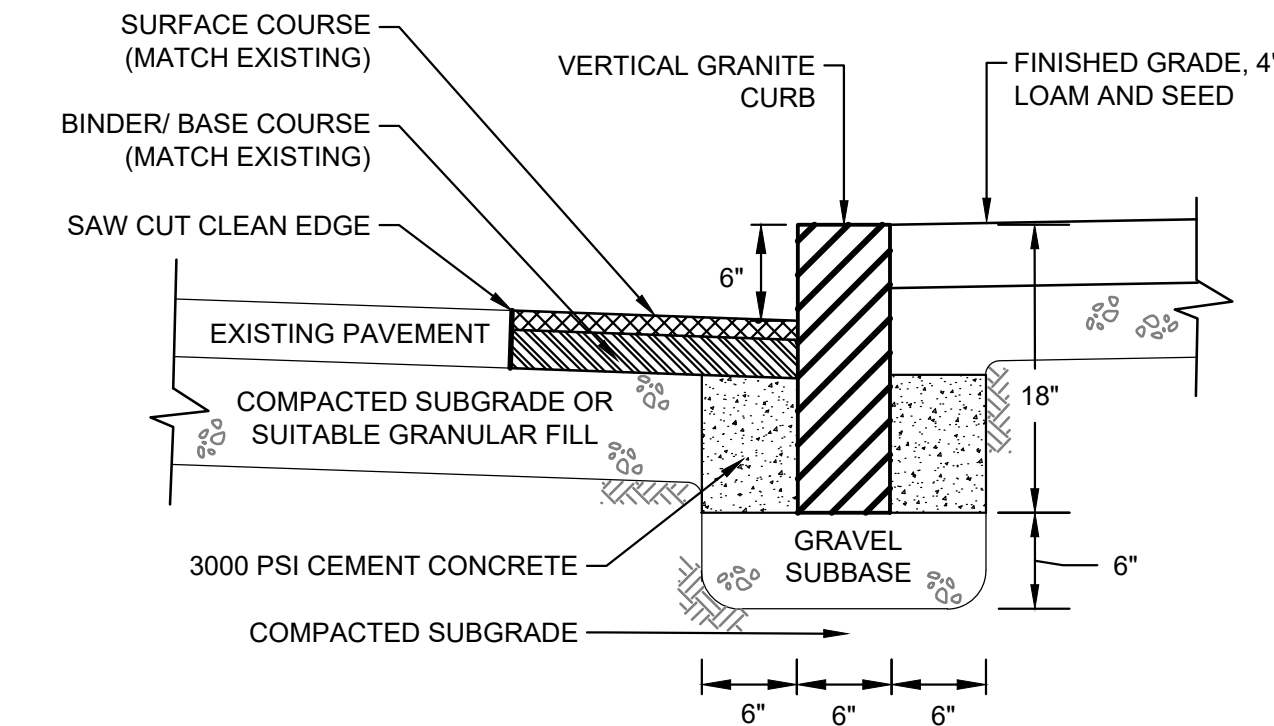
SALT MARSH VOID DETAIL

SCALE: N.T.S.



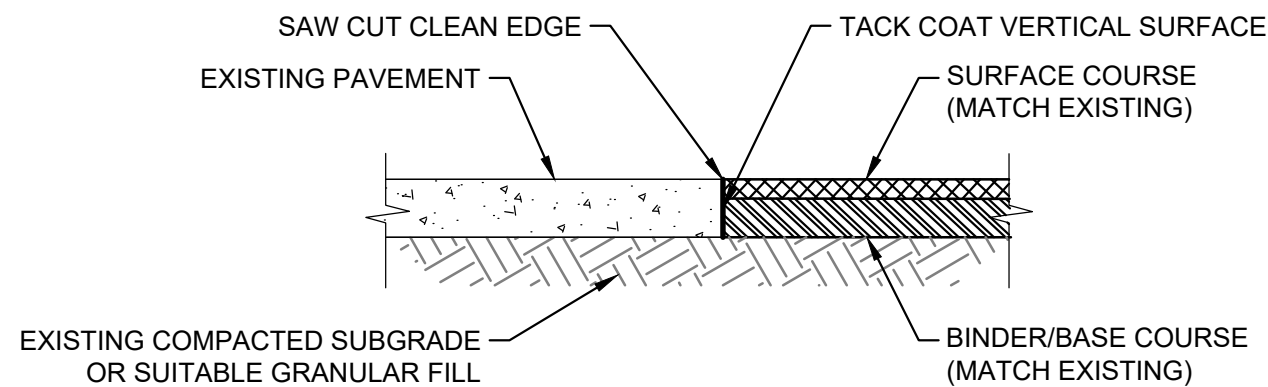
SALT MARSH PLANTING DETAIL

SCALE: N.T.S.



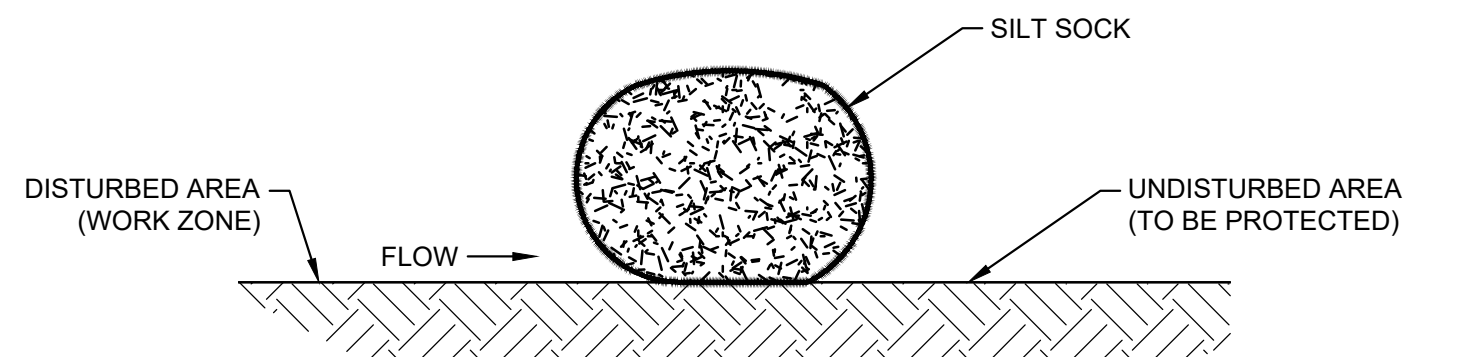
GRANITE CURB DETAIL

SCALE: N.T.S.



PAVEMENT PATCHING DETAIL

SCALE: N.T.S.

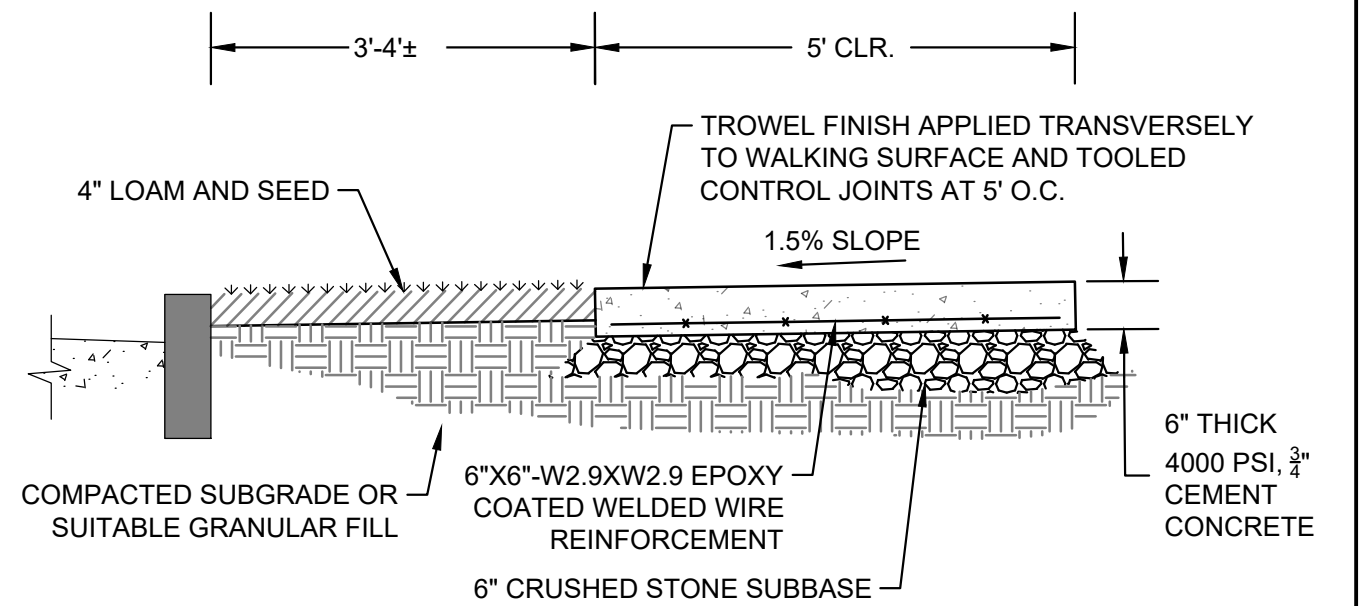


TEMPORARY EROSION CONTROL - SILT SOCK DETAIL

SCALE: N.T.S.

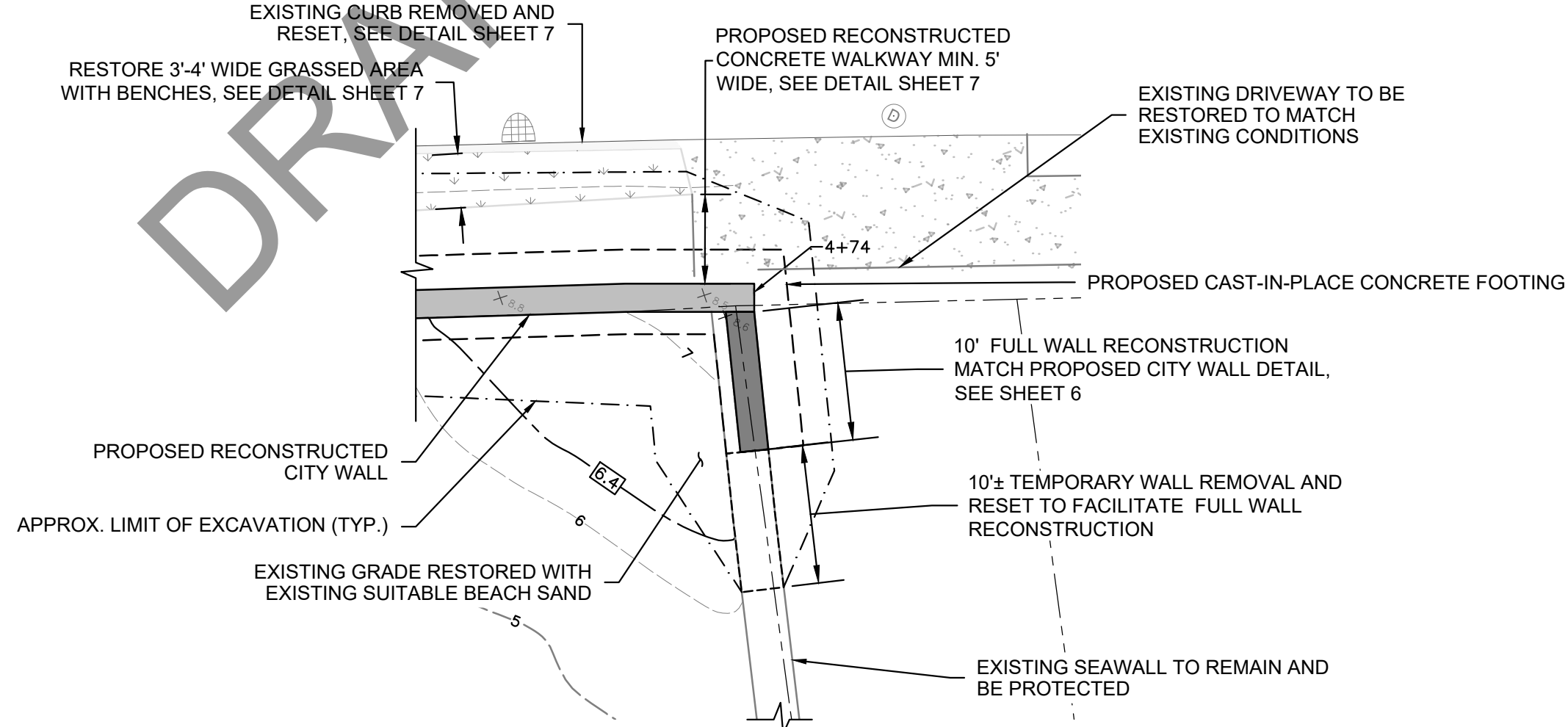
EROSION CONTROL NOTES:

1. EROSION CONTROLS SHALL BE INSPECTED DURING WORK AND MAINTAINED IN GOOD REPAIR.
2. EROSION CONTROLS SHALL REMAIN IN PROPER FUNCTIONING CONDITION UNTIL ALL DISTURBED AREAS HAVE BEEN STABILIZED WITH VEGETATION OR OTHER MEANS.
3. SILT SOCKS OR COMPOST FILTER TUBES MAY BE PLACED DIRECTLY ON EXISTING PAVEMENT WHEN NECESSARY.



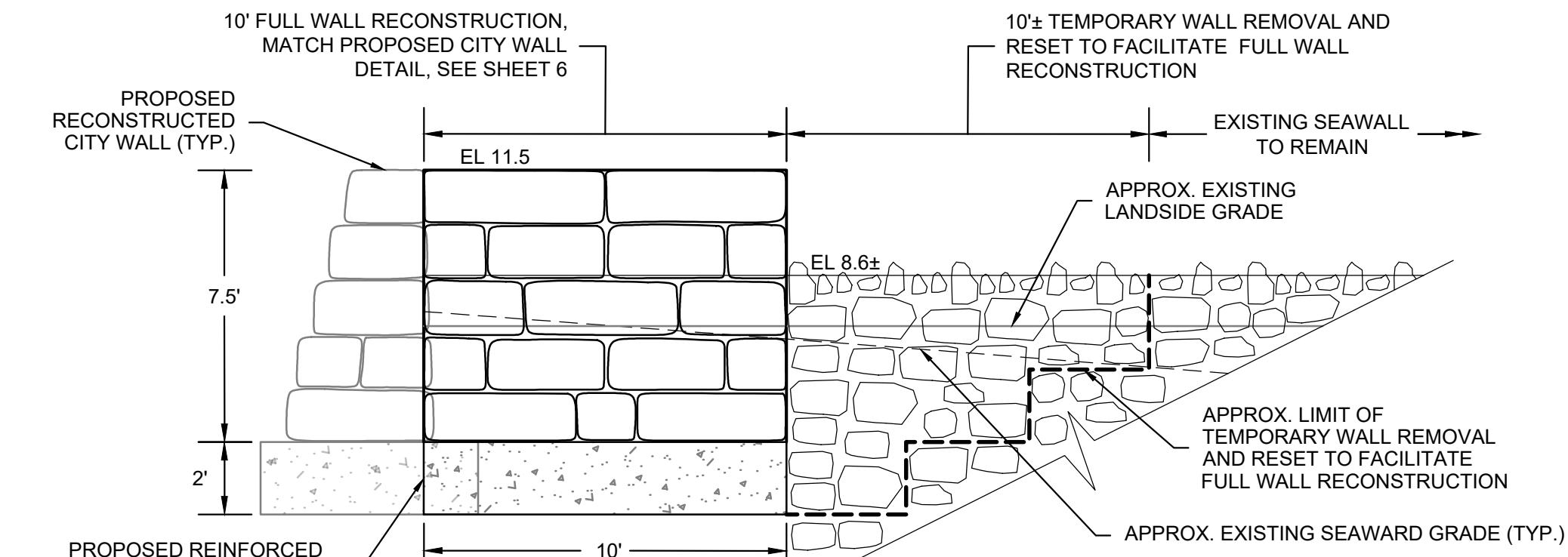
TYPICAL WALKWAY AND GRASS AREA DETAIL

SCALE: 1"=2'



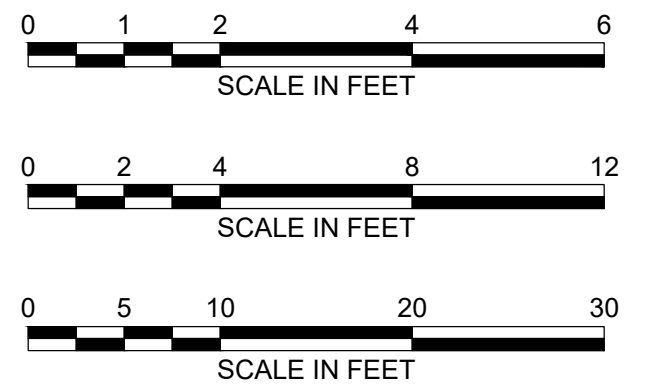
30 BAY VIEW AVE WALL TIE-IN PLAN

SCALE: 1"=10'



30 BAY VIEW AVE WALL TIE-IN DETAIL

SCALE: 1"=2'



DRAFT COPY  
FOR CLIENT REVIEW

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                              |                                                                                        |                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|----------------------------------------------------------------------------------------|---------------------|
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| NO.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ISSUE/DESCRIPTION            | BY                                                                                     | DATE                |
| UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA. |                              |                                                                                        |                     |
| COLUMBUS AVENUE SEAWALL RECONSTRUCTION<br>SALEM, MASSACHUSETTS<br>(EEA #258-2020-2-3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                              |                                                                                        |                     |
| PROPOSED DETAILS 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                              |                                                                                        |                     |
| PREPARED BY:<br><br><b>GZA</b> GeoEnvironmental, Inc.<br>Engineers and Scientists<br>www.gza.com                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                              | PREPARED FOR: CITY OF SALEM<br>98 WASHINGTON STREET, 2ND FLOOR<br>SALEM, MASSACHUSETTS |                     |
| PROJ MGR: DAS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | REVIEWED BY: DAS             | CHECKED BY: -                                                                          | DRAWING<br><b>7</b> |
| DESIGNED BY: DAS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | DRAWN BY: LFT                | SCALE: AS SHOWN                                                                        |                     |
| DATE:<br>AUGUST 2021                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | PROJECT NO.<br>18.0171674.04 | REVISION NO.<br>-                                                                      | SHEET NO. 7 OF 7    |







My name is Lewis Legon and I live at 44 Columbus Ave, Salem, MA 01970.

I am the co-chair of the Willows Neighborhood Association Flood Advisory Committee. Guy Ford, also a co-chair, attended the MEPA meeting you conducted on October 8th. Thank you for soliciting our feedback. Here it is:

1-We are very excited about the new sea wall being constructed as the existing wall is badly deteriorated. However we have some concerns and want things to be done correctly and have it not adversely impact any resident of the area.

2-We are concerned that in light of the new sea wall having only 10' tie-ins at each end (Dave Smith shared the drawings) there is reason to be concerned with potential future flooding in the neighborhood.

With the new wall being raised approximately 2' with added strength, we are concerned that deflection from storm surge will flood at each corner. We are imagining this new and taller wall generating significant 'bounce' and causing flooding at each end. During the 2018 storms, the northeast corner of the wall at Columbus Ave and Bayview experienced severe flooding. Some residents had to evacuate their homes for many months to reconstruct. At the northwest corner at 44 Columbus Ave as well as 40, 38, 36 and 34 Columbus Ave all had their backyards flooded in knee deep water. If it were not for efficient sump pumps there could have been serious damage..we barely escaped.

Furthermore, if fire safety apparatus or ambulances needed to get through it would have been impossible as Columbus Ave was completely flooded. It was a safety hazard. The new wall we feel may exacerbate the situation in recurring storm events. Previously, water poured over the existing wall almost as a safety valve but now it will be kept in the Cove. With strong wave surge, we are concerned about deflection impacting abutters.

3-The remedy is to build up the abutter's walls to meet the height of the new sea wall. We think the flooding could be worse with only 10'

tie-ins. There are several issues related to this. The first is finding some financial solutions/tools to assist abutters to raise their sea walls to match the height of the new wall. So far we have not had any success. Secondly, if we were to find funding to assist abutters, does the sea wall at the northwest corner have the structural integrity to handle significant added weight as the wall gets built up? Thirdly, how far down do we need to extend the new height of the sea wall? Do we go all away to 30 Columbus Ave? What about on the northeast side? Building up these walls will go a long way in providing safety and water containment. We need more information on this.

4-The northeast corner as previously mentioned had severe flooding and damage during the 2 big storms in 2018. At 30 Bayview Ave, the tie-in wall that is there currently is the exact same wall that exists now which we think was built in the 1930's. In a similar event, with only a 10' tie-in of the new wall, water will pour into 30 Bayview Ave and throughout that entire corner where several homes were severely impacted. We don't think this project plan is complete until these abutter issues and potential flood events are addressed and thought through.

5-FYI there is a unique situation at 30 Bayview Ave. As previously mentioned, that the abutter wall is the exact wall as the Columbus Ave wall and it was clearly done at the same time. So who really is responsible for this wall if it's the same exact wall. There is a dispute currently on this and it needs resolution. Dave Knowlton, Salem City engineer, is digging into historical records to see if we can find out more information.

6-The project plan calls for a new landing at the entrance to Step's Beach. We are thrilled about this as the current landing is composed of disintegrating stone and boulders. It's unsafe. There was some discussion on October 8th to reduce the size of the landing. This would cause great upset to the neighborhood as this is a central gathering spot for the community. There was discussion on whether to pour a new slab or use footings. We leave that to the experts but strongly encourage you that the size of the landing remains as is drawn.

7-One last point.. At both the northeast and west corners there has been significant sand build up. The height of the sand is just about at the height of the existing top of the sea wall. This sand acts as a

superhighway for water to just run over the wall. It is very clear to see. We have made our pleas to reduce the sand in the corners with EPA

(?) but to no avail. Fyi, residents who have lived here for a long time clearly remember having to 'jump off the wall and onto the beach'. These sand build ups have some sea grasses growing which seems to be the impediment to removing them and changing the elevations.

Preserving the sea grasses or flooding the neighborhood; which is the priority?

Purvi, thank you again for leading this effort by MEPA. We observed you are a strong project leader. If Guy or I can provide any more information to you please don't hesitate to call on us. We just are hoping on behalf of this Salem neighborhood that this project is approached in a holistic manner. Again we are very happy that this new wall is being built. We just want all the pieces to fit together well for generations to come.

Regards,  
Lewis Legon  
Salem Willows Flood Advisory Committee



# The Commonwealth of Massachusetts

## Division of Marine Fisheries

251 Causeway Street, Suite 400, Boston, MA 02114  
p: (617) 626-1520 | f: (617) 626-1509  
[www.mass.gov/marinefisheries](http://www.mass.gov/marinefisheries)



CHARLES D. BAKER  
Governor

KARYN E. POLITO  
Lt. Governor

KATHLEEN A. THEOHARIDES  
Secretary

RONALD S. AMIDON  
Commissioner

DANIEL J. MCKIERNAN  
Director

October 19, 2021

Secretary Kathleen Theoharides  
Executive Office of Energy and Environmental Affairs (EEA)  
Attn: MEPA Office  
Purvi Patel, EEA No. 16445  
100 Cambridge Street, Suite 900  
Boston, MA 02114  
Sent via email

Dear Secretary Theoharides:

The Massachusetts Division of Marine Fisheries (DMF) has reviewed the Environmental Notification Form for the Columbus Avenue Seawall Reconstruction Project in Salem, MA, proposed by the City of Salem.

The proposal is for the reconstruction of the stone seawall to improve flood protection and resilience. The wall height would be increased, a new flood barrier gate would be installed, and the existing degraded fringing marsh would be restored as a "living shoreline" with coir rolls, sand fill and marsh plantings.

The project site includes mapped habitat for soft-shell clam (*Mya arenaria*) within the intertidal mudflat. MA DMF does not support a broad beach nourishment over the mudflat, but instead would support a targeted beach nourishment at points of erosion and where needed to increase the elevation for salt marsh restoration.

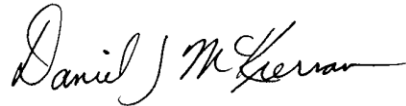
MA DMF supports the City's objective to restore and enhance the development of a resilient marsh and coastal bank. Maintenance of a resilient shoreline would benefit from the enhancement of the fringing marsh. The marsh functions to hold sediment and buffer the shoreline as well as serving as important habitat for fish and invertebrates. We recommend that the City develop a fill/nourishment and planting plan with methods and design that is supported by references and includes a monitoring plan. The marsh restoration and living shoreline development work should be designed and created by a wetland scientist with proven experience in saltmarsh restoration. Finally, the depressions and erosions in the marsh may be caused by the storage of small boats on the marsh on outhauls that are clearly visible in

pictures of the beach. MA DMF recommends that all boats be prohibited from mooring in the marsh. Continued use of the marsh by boats is contrary to the efforts to maintain a resilient shoreline.

MA DMF recommends considering alternative designs for the beach access landing that would not increase the footprint.

Thank you for considering our comments. Please direct questions about this review to Tay Evans at [tay.evans@mass.gov](mailto:tay.evans@mass.gov).

Sincerely,

A handwritten signature in black ink, reading "Daniel J. McKiernan". The signature is written in a cursive style with a large, stylized "D" and "M".

Daniel J. McKiernan

Director

DM/te/sd

cc.

K. Glenn, CZM

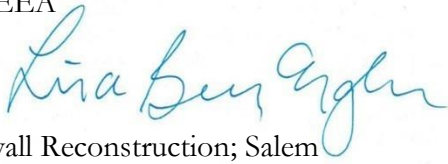
D. Smith, GZA

D. Knowlton, City of Salem



THE COMMONWEALTH OF MASSACHUSETTS  
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS  
OFFICE OF COASTAL ZONE MANAGEMENT  
251 Causeway Street, Suite 800, Boston, MA 02114-2136  
(617) 626-1200 FAX: (617) 626-1240

## MEMORANDUM

TO: Kathleen A. Theoharides, Secretary, EEA  
ATTN: Purvi Patel, MEPA Office  
FROM: Lisa Berry Engler, Director, CZM   
DATE: November 12, 2021  
RE: EEA-16445, Columbus Avenue Seawall Reconstruction; Salem

---

The Massachusetts Office of Coastal Zone Management (CZM) has completed its review of the above-referenced Environmental Notification Form (ENF), noticed in the *Environmental Monitor* dated September 22, 2021, and offers the following comments.

### Project Description

The ENF proposes removal of an existing stone and masonry seawall that is in poor condition and replacement with a new cut granite stone wall approximately 466 linear feet in length with a height increase of 1.5 to 3 feet, to elevation 11.5 feet NAVD88, along the approximate existing wall alignment. The project proposal also includes installation of a new flood barrier gate at the sea wall opening, which will be decreased in width from the current twenty feet to eight feet. An existing granite landing seaward of the wall opening is proposed to be replaced with an approximately 17 by 20-foot granite landing and steps with a reinforced concrete core and 30-foot-wide footing to a depth of approximately -1.5 NAVD88. A five-foot-wide paved sidewalk with a 3-4-foot-wide grass strip is proposed on the landward side of the seawall. Salt marsh restoration efforts in the fronting salt marsh resource area include placing coir rolls along the seaward edge of the existing marsh and adding new fill and supplemental marsh plantings. Ten linear feet of seawall is proposed to be reconstructed on the adjacent seawall at 44 Columbus Avenue and 30 Bay View Avenue to tie in and match the proposed Columbus Avenue Seawall. The entire site is within a FEMA Zone AE elevation 11 feet NAVD88 and will permanently alter 5,800 square feet (SF) of Land Subject to Coastal Storm Flowage (LSCSF), 223 SF of coastal beach, and 2870 SF of salt marsh. In addition, the ENF states that there will be temporary impact to 10,170 SF of LSCSF, 2670 SF of coastal beach, 735 SF of coastal dune, and 1000 SF of salt marsh.

### Project Comments

#### *Impact Reduction*

According to the ENF, the top of the seawall will be raised to elevation 11.5 feet NAVD88, which is approximately 0.5 feet above the current FEMA Base Flood Elevation, to reduce the overtopping of the walls. Given the vulnerability of this site, the city should consider alternatives that provide additional height to the wall to further improve coastal resiliency in this location, with the goal of maximizing resiliency while avoiding impacts to adjacent properties. Regardless of the elevation of the final design, the city should include outreach to ensure that the community understands the expected design life of the project.

While raising the elevation of the wall is a reasonable strategy to reduce the stated impacts of flooding on the infrastructure and property on the landward side of the wall, the city should consider mitigation strategies to reduce potential impacts from energy reflection on fronting



resources and adjacent areas from the additional height on the reconstructed seawall. Approaches recommended during the MEPA consultation session include maximizing the roughness of the new wall to better dissipate reflected energy, minimizing the size, altering the design of the landing to reduce energy reflection, and adding sediment to the beach front to further dissipate and absorb wave energy. The ENF and supplemental information submitted during the MEPA review period state that the proposed granite block seawall will have the same or increased roughness as the existing wall, which will help to mitigate energy reflection by improving dissipation. More information should be included in permitting documents to demonstrate that the proposed granite block wall will provide this improvement to ensure that the new wall does not reflect more energy than the existing wall.

The ENF states that the existing landing and steps on the beach will be replaced with a twenty-four-foot by nineteen-foot granite block landing and granite steps. Because the solid granite landing and steps will reflect waves and may increase erosion of the adjacent beach and marsh, the city should consider alternatives that include a smaller size and use pilings rather than solid support to minimize impacts to the coastal beach and reduce reflected wave energy. The supplemental information provided during MEPA review states that this approach was not chosen because of possible shallow depth to bedrock, aesthetics, and the more limited longevity of a timber structure versus a solid structure in a high energy environment. Because this reconstruction offers the opportunity for redesigning the existing structure, the new design should reduce the existing impacts of scour on the fronting salt marsh and beach. Pile-supported access structures can be constructed from more durable materials than wood, and piles and piers are often pinned to bedrock in this type of environment. Further analysis of alternatives that reduce the impacts to the fronting resource areas and reduce reflected wave energy to adjacent areas should be considered. The city should also consider a removable design for the deck and stairs so that these can be removed to avoid the most significant impacts during the winter season, or when the floodgate is installed before storm events.

A significant mitigation strategy to reduce additional wave energy reflection caused by the increased wall elevation and the minimization of impacts to adjacent properties is the addition of sand to the beach to dissipate wave energy and reduce wave reflection off the wall. The supplemental information submitted by the city indicated that, while the city may consider this in the future, a main challenge for the implementation of nourishment on this beach at this time is a local perception that flood waters currently overtop the wall in part because of the existing sand built up in the corners, which is believed to be causing a ramping effect and exacerbating the flooding. It is important to note that the elevation of coastal flood waters is determined by the elevation of the ocean, which is not affected by local nearshore topography. In fact, additional sediment in front of a wall provides an important buffer to reduce the energy associated with the waves. As wave energy is dissipated by the additional sand, the overtopping and reflection off the wall is also decreased. Continued public outreach and education regarding coastal processes and the benefits of nourishment to both storm damage prevention and recreation may be helpful to address this issue and allow this important mitigation strategy to be implemented as part of this project. A grain size analysis should be completed and the results submitted with permitting documents to demonstrate that any fill brought in as part of the beach and/or salt marsh restoration is compatible with the existing sediments.

The base of the footings for the new wall appears to be shallower at the ends of the project versus the rest of the wall (elevation 6 and 4 feet NAVD 88, respectively). As the current high tide line is at 6.4 feet NAVD88, permitting documentation should clearly explain this difference and how

these footings are deep enough to ensure the integrity of the wall over the design life of the project without undermining. Additional documentation to demonstrate that the tie-in design at the end of the structure will avoid end scour that may increase or exacerbate existing impacts to adjacent properties should also be provided.

The ENF indicates that the existing upland vegetation seaward of the seawall will be replaced with native salt tolerant plantings. A planting plan that includes details of the removal and replacement of the vegetation, species to be used, and maintenance of this element over time should be developed and submitted for review in permitting.

### *Salt Marsh Restoration*

A detailed planting plan including source and species of plants, acclimation of plants to local salinity conditions, timing of planting, material storage, and soil amendments, if any, for the restoration area, in addition to irrigation and fencing needs, should be provided in permitting along with a monitoring and maintenance plan and standard operating procedures to avoid invasive species introduction and spread.

Since the initial filing of the ENF, the city consulted with permitting agencies and revised the original plan for filling the “pockmark voids” in the marsh, so that the design now includes filling these areas with clean sand, biodegradable blankets and planting with vegetation as recommended. However, distinguishing between the voids that are assumed to be a result of human activity and the natural topographic features of this marsh will be difficult. As voids within the marsh platform may be naturally occurring, fill to support re-vegetation should be limited to only those identified areas of erosion or scour directly adjacent to or behind the existing stone riprap seaward of the marsh. Small wooden stakes may be needed to hold the fabric in place while the vegetation roots get established. Because this can take several growing seasons, the maintenance plan for the project should include maintenance of this element.

The ENF states that clean sand fill will be added to unvegetated areas of the salt marsh as a substrate for new plantings, and that four inches of clean sand will be the maximum allowed above existing vegetation. It is not clear from the filing how placement of this fill over existing vegetation will support the restoration. Fill may cause impacts to the existing vegetation. Every effort should be taken to avoid placing sand over existing salt marsh vegetation.

The four-foot-long, two-inch by four-inch boards that are proposed to anchor the coir rolls in place are unlikely to effectively counteract the considerable buoyancy of the coir, particularly in those areas where the rolls are placed over rock (as shown in cross-section B-B), and because of their size, they may exacerbate scour. The means of anchoring the coir rolls should be reconsidered to ensure that the system is adequate to maintain the rolls in place for the duration of the proposed project life. Because coir rolls can become dislodged in large storm events, they should be tagged with the location and name of the project so that they can be retrieved if they are displaced to another area by high water or wave events. Regardless of the anchoring system chosen, the coir rolls and their anchors should be monitored regularly to ensure minimal scour, identify any damage to the coir rolls, and ensure that they remain in place. This is particularly important immediately following a storm or significant wave event.

For permitting, a detailed overall monitoring and maintenance plan for the salt marsh restoration area should be developed and submitted for review. The supplemental information

submitted during the MEPA review period suggests an annual inspection, but a more robust and frequent monitoring plan should include inspection for the need to tighten anchors for the coir rolls, identify and address scour issues, monitor the success of the salt marsh plantings, and any potential contingency options for implementation if the proposed approach is not successful. As demonstrated in the implementation of the Collins Cove salt marsh restoration project, regular monitoring, maintenance, and design modifications are often needed to ensure the success of a salt marsh restoration project.

At an earlier pre-application meeting, the city identified significant recreational use of the marsh on this project site for boat storage and foot traffic as an issue contributing to degradation of the existing resource areas. Removing the wooden posts from the marsh that have been used to secure boats in the past will reduce these impacts, and continued management of foot traffic and boat launching in this area will be important to the overall success of the restoration and plantings.

### **Federal Consistency Review**

The proposed project may be subject to CZM federal consistency review and if so must be found to be consistent with CZM's enforceable program policies. For further information on this process, please contact Robert Boeri, Project Review Coordinator, at [robert.boeri@mass.gov](mailto:robert.boeri@mass.gov), or visit the CZM web site at [www.mass.gov/czm](http://www.mass.gov/czm).

LE/kg/rh/ap

cc: Kathryn Glenn, Rebecca Haney, Adrienne Pappal, CZM  
Rachel Freed, Jill Provencal, DEP NERO  
Frank Taormina, DEP Waterways  
Joy Duperault, Eric Carlson, DCR  
Kate Kennedy, Salem Conservation Commission Agent



Commonwealth of Massachusetts  
Executive Office of Energy & Environmental Affairs

## Department of Environmental Protection

Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

Charles D. Baker  
Governor

Karyn E. Polito  
Lieutenant Governor

Kathleen A. Theoharides  
Secretary

Martin Suuberg  
Commissioner

November 12, 2021

Kathleen A. Theoharides, Secretary  
Executive Office of  
Energy & Environmental Affairs  
100 Cambridge Street  
Boston MA, 02114

RE: Salem  
Columbus Avenue Seawall Reconstruction  
EEA # 16445

Attn: MEPA Unit

Dear Secretary Theoharides:

The Massachusetts Department of Environmental Protection Northeast Regional Office (MassDEP-NERO) has reviewed the Environmental Notification Form (ENF) for the proposed Columbus Avenue Seawall Reconstruction in Salem. MassDEP provides the following comments.

### **Wetlands**

The site plans should be revised to show the amount of proposed wetland alteration (both temporary and permanent), as well as the amount of the wetland restoration and replication that is proposed. Based on the supplemental information, it is MassDEP's opinion that the full extent of the coastal dune has not been delineated and shown on the plan. In addition, MassDEP believes that the coastal bank shown on the plan is actually either coastal beach or coastal dune; the proponent should reevaluate the delineation and revise the plan accordingly. If it is determined to be coastal bank, the details of the delineation method should be provided in accordance with MassDEP's Coastal Bank Policy (92-1), including showing transects along the coastal bank and cross sections.

MassDEP has concerns with the proposal to raise the height of the existing seawall between 1.5 and 3 feet to elevation 11.5. Additional information should be provided to explain how the increased wall elevation will not exacerbate the existing wave reflection and refraction onto adjacent wetland resource areas (coastal bank, coastal beach and salt marsh), properties or public ways. In addition, the proponent should incorporate a beach nourishment component as

This information is available in alternate format. Contact Michelle Waters-Ekanem, Director of Diversity/Civil Rights at 617-292-5751.

TTY# MassRelay Service 1-800-439-2370

MassDEP Website: [www.mass.gov/dep](http://www.mass.gov/dep)

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part of the overall project to restore and create more beach that will help to dissipate wave energy and wave deflection. Additional information is also needed to support the claim that the granite blocks will have the same or better energy dissipation (“rugosity”) as the existing fieldstone mortared wall and explain how this will improve existing conditions. Given there is a 3 - 4 foot wide grass swath proposed between Columbus Avenue and the sidewalk, consideration should be given to relocating the seawall landward and reconfiguring the vertical face of the granite block wall to reduce wave energy and deflection. There appears to be additional alteration to salt marsh that will occur during the excavation for and placement of the 6.5 foot wide concrete footing, which should be avoided if possible. If temporary or permanent impacts are proposed, they must be shown on the plan. MassDEP strongly recommends that the 18’ x 20’ granite landing with granite steps on 3 sides be eliminated from the project and replaced with an open pile-supported deck (or equivalent) to reduce alteration of the coastal beach and salt marsh.

While there may be benefits to restoring the “pockmark voids” and erosion in the salt marsh, the proponent should define what is considered a “void” versus a natural feature; explain possible reasons for the development of voids; and identify methods or actions to prevent them in the future. Instead of using cobble to fill the voids, only compatible sand (based on a sieve analysis) should be used. Although coir logs are proposed along the seaward side of the salt marsh, there is no information about how the coir logs will be anchored in place. The plan details should be revised to include the number of anchors proposed per roll and how much tension is needed so that they are not dislodged during the tide cycles or storm events. Lastly, a detailed construction sequence should be provided, along with a contingency plan in the event there is a storm or King Tide during construction. The plans should include the location of proposed staging area(s) for the excavated beach sand and other materials and explain how it will be stored for reuse.

The MassDEP appreciates the opportunity to comment on this proposed project. Please contact [Rachel.Freed@mass.gov](mailto:Rachel.Freed@mass.gov) at (978) 694-3258 for further information on wetlands issues. If you have any general questions regarding these comments, please contact me at [John.D.Viola@mass.gov](mailto:John.D.Viola@mass.gov) or at (978) 694-3304.

Sincerely,

This final document copy is being provided to you electronically by the Department of Environmental Protection. A signed copy of this document is on file at the DEP office listed on the letterhead.

John D. Viola  
Deputy Regional Director

cc: Brona Simon, Massachusetts Historical Commission  
Eric Worrall, Rachel Freed, Jill Provencal, Pam Merrill, MassDEP-NERO



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SENT VIA ELECTRONIC MAIL NOVEMBER 22, 2021  
November 22, 2021  
GZA File No. 18.0171674.04

Secretary Kathleen A. Theoharides  
Executive Office of Energy and Environmental Affairs  
Attn: Purvi Patel, MEPA Office  
100 Cambridge Street, Suite 900  
Boston, Massachusetts 02114

Re: Response to Comments – EEA 16445  
Columbus Avenue Seawall Reconstruction Project  
46 Columbus Avenue, Salem, Massachusetts

Dear Ms. Patel:

On behalf of the City of Salem (the City), GZA GeoEnvironmental, Inc. (GZA) is providing the following responses to comments received by the MEPA office during the public comment period for the Environmental Notification Form (ENF) Application submitted on September 15, 2021, and the follow-up Supplemental Information Memorandum submitted on October 27, 2021, for the Columbus Avenue Seawall Reconstruction Project. The following paragraphs describe the comments received and the responses to the comments.

THE MASSACHUSETTS OFFICE OF COASTAL ZONE MANAGEMENT (CZM) DATED NOVEMBER 12, 2021

A comment letter dated November 12, 2021, signed by Lisa Berry Engler, Director of CZM was received by the MEPA office. A copy of this letter is included in **Attachment 1**. It provided a brief overview of the proposed project and included the following comments:

*1. Given the vulnerability of this site, the city should consider alternatives that provide additional height to the wall to further improve coastal resiliency in this location, with the goal of maximizing resiliency while avoiding impacts to adjacent properties. Regardless of the elevation of the final design, the city should include outreach to ensure that the community understands the expected design life of the project.*

The proposed wall elevation at 11.5 feet NAVD88 was chosen based on a limited review of the surrounding neighborhood elevations related to flood inundation elevations with the goal to provide some improvement of flood protection relative to the existing wall while balancing cost, practicality, and aesthetics. The proposed wall design allows for the potential future increase in wall height to help protect against sea level rise.



In referencing the FEMA Flood Insurance Rate Maps for the area, the Columbus Avenue neighborhood floods during coastal storms from several flood source areas including areas to the south and north of the proposed wall improvement and hydraulic connectivity with flooding from Dead House Beach, coves south of Winter Island Road and north of Beach Avenue. Therefore, the proposed wall improvements constitute only a component of what would be required for coastal flood protection of the area.

2. *While raising the elevation of the wall is a reasonable strategy to reduce the stated impacts of flooding on the infrastructure and property on the landward side of the wall, the city should consider mitigation strategies to reduce potential impacts from energy reflection on fronting resources and adjacent areas from the additional height on the reconstructed seawall.*

Refer to Section No. 2 of the Supplemental Information to the MEPA ENF Application for design measures. The wall reconstruction will be within the same general footprint of the existing structure and not extend seaward. The new wall will have increased rugosity (wall friction) relative to the existing wall. The improved wall will be a more resilient structure (resistant to wave impacts) which will reduce impacts due to debris from failed wall sections entering resource areas and required wall maintenance construction disturbance. Other construction measures will include measures to reduce erosion and loss of marsh including: stabilizing the toe of the existing marsh, filling of eroded marsh areas, and new supplemental salt marsh plantings. Existing timber post outhauls and stabilization of coastal dune sand area with new salt-spray tolerant plantings are also proposed.

Wave reflection off vertical walls can result in scour near the toe of the wall, which can adversely affect natural coastal resources. This scour is the result of increased wave orbital velocities due to the incident and reflected waves. The proposed wall improvements include increasing the wall height from approximately one foot on the west side to about three feet on the east side. The improved wall will also have a granite capstone with a slight reveal on the front face of the seawall which will provide some reduction in wave overtopping.

GZA completed detailed numerical wave modeling and the results have been presented previously. The proposed increase in wall height will result in some increase in reflected wave heights. However, with the proposed wall elevation of 11.5 feet NAVD88 and a 100-year recurrence interval peak flood stillwater elevation of 10 feet NAVD88, the incident waves impacting the wall will be relatively small (about 1 to 2.5 feet in height), non-breaking waves in deep water. This will result in wave runup and overtopping, which will significantly dissipate reflected wave energy at peak flood. Therefore, the reflected wave energy at peak flood levels is expected to generally result in low orbital velocities and relatively small bottom stresses and result in minor increased erosion risk of the existing sand beach and marsh area. During lower flood elevations (e.g., the 10-year recurrence interval peak flood elevation of 8.4 feet NAVD), the proposed wall will reflect most of the incident wave energy. This condition may result in coastal beach erosion of 1 to 2 feet, within an estimated intertidal area about 40 to 80 feet seaward of the wall, representing some increase in erosion risk relative to the existing condition. Potential mitigation strategies that were considered during project design include beach nourishment within the intertidal zone, a living shoreline feature (expanded low marsh with stone sill) and other coastal structural erosion mitigation measures to absorb wave energy at the toe of wall. Structural measures and living shorelines were eliminated based on pre-permit application regulatory feedback.

3. *More information should be included in permitting documents to demonstrate that the proposed granite block wall will provide this improvement to ensure that the new wall does not reflect more energy than the existing wall.*



The existing fieldstone masonry wall is generally flat faced, with smooth mortared joints whereas the proposed wall will have a slight batter with rough faced granite stone with open joints. These new wall features will provide some benefit in reducing wave runup and reflection. As noted above, under certain flood conditions (e.g., the 10-year recurrence interval flood) some increase in reflected wave energy may occur due to an increased wall height.

4. *Further analysis of alternatives that reduce the impacts to the fronting resource areas and reduce reflected wave energy to adjacent areas should be considered. The city should also consider a removable design for the deck and stairs so that these can be removed to avoid the most significant impacts during the winter season, or when the floodgate is installed before storms.*

Refer to Section No. 3 of the Supplemental Information to the MEPA ENF Application for commentary and analysis for the landing and beach access steps.

5. *A significant mitigation strategy to reduce additional wave energy reflection caused by the increased wall elevation and the minimization of impacts to adjacent properties is the addition of sand to the beach to dissipate wave energy and reduce wave reflection off the wall.*

Refer to Section No. 2 of the Supplemental Information to the MEPA ENF Application for commentary on beach nourishment.

6. *A grain size analysis should be completed and the results submitted with permitting documents to demonstrate that any fill brought in as part of the beach and/or salt marsh restoration is compatible with the existing sediments.*

GZA is working with the City to coordinate sand sediment sampling and testing for use in future nourishment efforts.

7. *The base of the footings for the new wall appears to be shallower at the ends of the project versus the rest of the wall. As the current high tide line is at 6.4 feet NAVD88, permitting documentation should clearly explain this difference and how these footings are deep enough to ensure the integrity of the wall over the design life.*

The proposed wall footing is stepped so that a minimum 4-foot depth below existing grade to the bottom of the footing is maintained. Existing grade at the corners increases to approximate elevation 9.5 feet NAVD88 and 7 feet NAV88 at the west and east corners, respectively. The seawall, as designed, does not need to extend greater than 4 feet below existing grade. If the footing elevation was at a consistent elevation the seawall construction would require a nearly 10-foot-deep excavation at the west corner to facilitate the wall construction.

8. *Additional documentation to demonstrate that the tie-in design at the end of the structure will avoid end scour that may increase or exacerbate existing impacts to adjacent properties should also be provided.*

GZA will evaluate potential wall scour with the increase in height prior to submission of additional permit applications.

9. *A planting plan that includes details of the removal and replacement of the vegetation, species to be used, and maintenance of the element over time should be developed and submitted for review in permitting.*



Refer to Section No. 7 of the Supplemental Information to the MEPA ENF Application for commentary on the planting plan for vegetation at the southwest corner.

10. *Salt Marsh Restoration: A detailed planting plan including source and species of plants, acclimation of plants to local salinity conditions, timing of planting, material storage, and soil amendments, if any, for the restoration area, in addition to irrigation and fencing needs, should be provided in permitting along with a monitoring and maintenance plan and standard operating procedures to avoid invasive species introduction and spread.*

A planting plan with details will be developed and provided throughout the project permitting phase and for final design/preparation of project bid documents.

11. *As voids within the marsh platform may be naturally occurring, fill to support re-vegetation should be limited to only those identified areas of erosion or scour directly adjacent to or behind the existing stone riprap seaward of the marsh.*

At void locations that appear to be preferential drainage paths no alterations or filling is proposed. The existing drainage paths will be left as-is to maintain the hydrology and drainage of the marsh.

12. *It is not clear from the filing how placement of this fill over existing vegetation will support the restoration. Fill may cause impacts to the existing vegetation. Every effort should be taken to avoid placing sand over existing salt marsh vegetation.*

Filling over existing vegetation will be kept to a minimum (less than 4 inches of depth) only at edge limit locations where salt marsh substrate has sloughed off.

13. *The means of anchoring coir rolls should be reconsidered to ensure that the system is adequate to maintain the rolls in place for the duration of the proposed project life. Regardless of the anchoring system chosen, the coir rolls and their anchors should be monitored regularly to ensure minimal scour, identify and damage to the coir rolls, and ensure that they remain in place.*

Refer to Section No. 6 of the Supplemental Information to the MEPA ENF Application for commentary on the coir rolls anchoring, monitoring and maintenance. Final design of the coir roll toe protection and anchoring system will be determined and developed throughout the project permitting phase and for final design/preparation of project bid documents. The intent of the coir rolls will be to provide temporary toe protection while the new salt marsh vegetation is established. Upon successful growth of salt marsh, the coir rolls may be removed upon the recommendation of the wetland scientist.

14. *For permitting, a detailed overall monitoring and maintenance plan for the salt marsh restoration area should be developed and submitted for review.*

An overall monitoring and maintenance plan for the salt marsh restoration area will be developed throughout the project permitting phase and for final design/preparation of project bid documents.



MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION (MASSDEP) DATED NOVEMBER 12, 2021

A comment letter dated November 12, 2021, signed by John D. Viola, Deputy Regional Director was received by the MEPA office. A copy of this letter is included in **Attachment 1**. It provided a brief overview of the proposed project and included the following comments:

1. *The site plans should be revised to show the amount of proposed wetland alteration (both temporary and permanent), as well as the amount of wetland restoration and replication that is proposed.*

Refer to Section No. 1 of the Supplemental Information to the MEPA ENF Application for revised resource area values and refer to Attachment A in the Supplemental Information for revised ENF Permit Plans, Sheet Nos. 4 and 5.

2. *Additional information should be provided to explain how the increased wall elevation will not exacerbate the existing wave reflection and refraction onto adjacent wetland resource areas, properties, or public ways.*

(This is addressed above in this letter)

3. *In addition, the proponent should incorporate a beach nourishment component as part of the overall project to restore and create more beach that will help dissipate wave energy and wave deflection.*

Refer to Section No. 2 of the Supplemental Information to the MEPA ENF Application for commentary and analysis on beach nourishment.

4. *Additional information is needed to support the claim that granite blocks will have the same or better energy dissipation as the existing fieldstone mortared wall and explain how this will improve existing conditions.*

Refer to Section No. 2 of the Supplemental Information to the MEPA ENF Application for information on comparison of the existing wall face and the proposed wall.

5. *Consideration should be given to relocating the seawall landward and reconfiguring the vertical face of the granite block wall to reduce wave energy and deflection.*

Refer to Appendix D – Alternatives Analysis of the ENF Application for commentary on inability to move structure landward due to proximity to the public roadway, public walkway, utilities, and residential dwellings.

6. *There appears to be additional alteration to salt marsh that will occur during the excavation for and placement of the 6.5-foot-wide concrete footing, which should be avoided if possible.*

Existing salt marsh vegetation will be protected throughout the duration of the construction. Refer to Section No. 4 of the Supplemental Information to the MEPA ENF Application for information regarding support of excavation and protection of existing site features and the existing salt marsh. Refer to Proposed Section B – B' on Sheet 5 of the Permit Plans showing the temporary shoring to protect the existing salt marsh.



7. *MassDEP strongly recommends that the 18' by 20' granite landing with granite steps on three sides be eliminated from the project and replaced with an open pile-supported deck (or equivalent) to reduce alteration of the coastal beach and salt marsh.*

Refer to Section No. 3 of the Supplemental Information to the MEPA ENF Application for commentary and analysis for the landing and beach access steps.

8. *While there may be benefits to restoring the "pockmark voids" and erosion in the salt marsh, the proponent should define what is considered a "void" versus a natural feature; explain possible reasons for the development of the voids; and identify methods or actions to prevent them in the future. Instead of using cobble to fill the voids, only compatible sand (based on sieve analysis) should be used.*

Refer to Section No. 5 and No. 6 of the Supplemental Information to the MEPA ENF Application for commentary and analysis for salt marsh planting and filling and coir rolls (anchoring, monitoring and maintenance).

9. *Although coir logs are proposed along the seaward side of the salt marsh, there is no information about how the coir logs will be anchored in place.*

Refer to Section No. 6 of the Supplemental Information to the MEPA ENF Application for commentary and analysis for coir rolls (anchoring, monitoring and maintenance).

10. *Lastly, a detailed construction sequence should be provided, along with a contingency plan in the event there is a storm or King Tide during construction. The plans should include the location of the proposed staging area(s) for the excavated beach sand and other materials and explain how it will be stored for reuse.*

Refer to Section No. No. 4 of the Supplemental Information to the MEPA ENF Application for general construction methods and procedures and construction access, staging, and limits of work.



MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION WATERWAYS REGULATION PROGRAM DATED OCTOBER 8, 2021

A comment letter dated October 8, 2021, signed by Ivan Morales, was received by the MEPA office. A copy of this letter is included in **Attachment 1**. It provided a brief overview of the proposed project and included the following comments:

1. *After review, the Department determines that the proposed activities will require authorization through a Chapter 91 Waterway License and a Dredge Permit as it involves shoreline stabilization, dredging of aquatic sediments and associated fill in flowed and filled tidelands of Juniper Cove (Salem Harbor).*

The proponent will pursue the required authorizations.

MASSACHUSETTS HISTORICAL COMMISSION DATED OCTOBER 8, 2021

A comment letter dated October 8, 2021, signed by Brona Simon, State Historic Preservation Officer, was received by the MEPA office. A copy of this letter is included in **Attachment 1**. It provided a brief overview of the proposed project and included the following comments:

1. *The ENF Incorrectly notes that the seawall is not a historic resource. The seawall and granite ashlar landing are listed in the State and National Registers of Historic Places as contributing elements to the Salem Willows Historic District. Demolition of the seawall and landing constitutes an “adverse effect” (950 CMR 71.05(a) and 950 CMR 71.07 (2)(b)(3)) through the destruction or alteration of all or part of a State Register property. The MHC hereby initiates the MHC’s consultation process pursuant to 950 CMR 71.07(3). The MHC looks forward to consulting with the City of Salem to explore alternatives that would eliminate, minimize, or mitigate the adverse effect of the proposed demolition.*

The proponent will pursue the MHC consultation process pursuant to 950 CMR 71.07(3).

MASSACHUSETTS DIVISION OF MARINE FISHERIES (MA DMF) DATED OCTOBER 19, 2021

A comment letter dated October 19, 2021, signed by Daniel J. McKiernan, Director, was received by the MEPA office. A copy of this letter is included in **Attachment 1**. It provided a brief overview of the proposed project and included the following comments:

1. *The project site includes mapped habitat for soft-shell clam (Mya arenaria) within the intertidal mudflat. MA DMF does not support a broad beach nourishment over the mudflat, but instead would support a targeted beach nourishment at points of erosion and where needed to increase the elevation for salt marsh restoration.*

The project proposes targeted filling of erosion at the salt marsh with clean compatible sand and the installation of new salt marsh plugs. Refer to the Permit Plans and Project Narrative in the ENF Application for information and details regarding the proposed salt marsh enhancements. Also refer to Section No. 2 of the Supplemental Information to the MEPA ENF Application for commentary on beach nourishment.

2. *MA DMF supports the City’s objective to restore and enhance the development of a resilient marsh and coastal bank. Maintenance of a resilient shoreline would benefit from the enhancement of the fringing marsh. The marsh functions to hold sediment and buffer the shoreline as well as serving as important habitat for fish and invertebrates. We recommend that the City develop a fill/nourishment and planting plan with methods and design that is supported by references and includes a monitoring plan. The marsh*



*restoration and living shoreline development work should be designed and created by a wetland scientist with proven experience in saltmarsh restoration.*

Refer to Section No. 2 of the Supplemental Information to the MEPA ENF Application for commentary on beach nourishment. Also refer to Section Nos. 5, 6, and 7 of the Supplemental Information to the MEPA ENF Application for commentary on the salt marsh filling and planting, coir roll anchoring, monitoring and maintenance, and planting plan for vegetation at the southwest corner.

3. *The depressions and erosions in the marsh may be caused by the storage of small boats on the marsh on outhauls that are clearly visible in pictures of the beach. MA DMF recommends that all boats be prohibited from mooring in the marsh.*

The project proposes to remove and relocate the existing outhauls out of the existing salt marsh area.

4. *MA DMF recommends considering alternative designs for the beach access landing that would not increase the footprint.*

Refer to Section No. 3 of the Supplemental Information to the MEPA ENF Application for commentary and analysis for the landing and beach access steps.

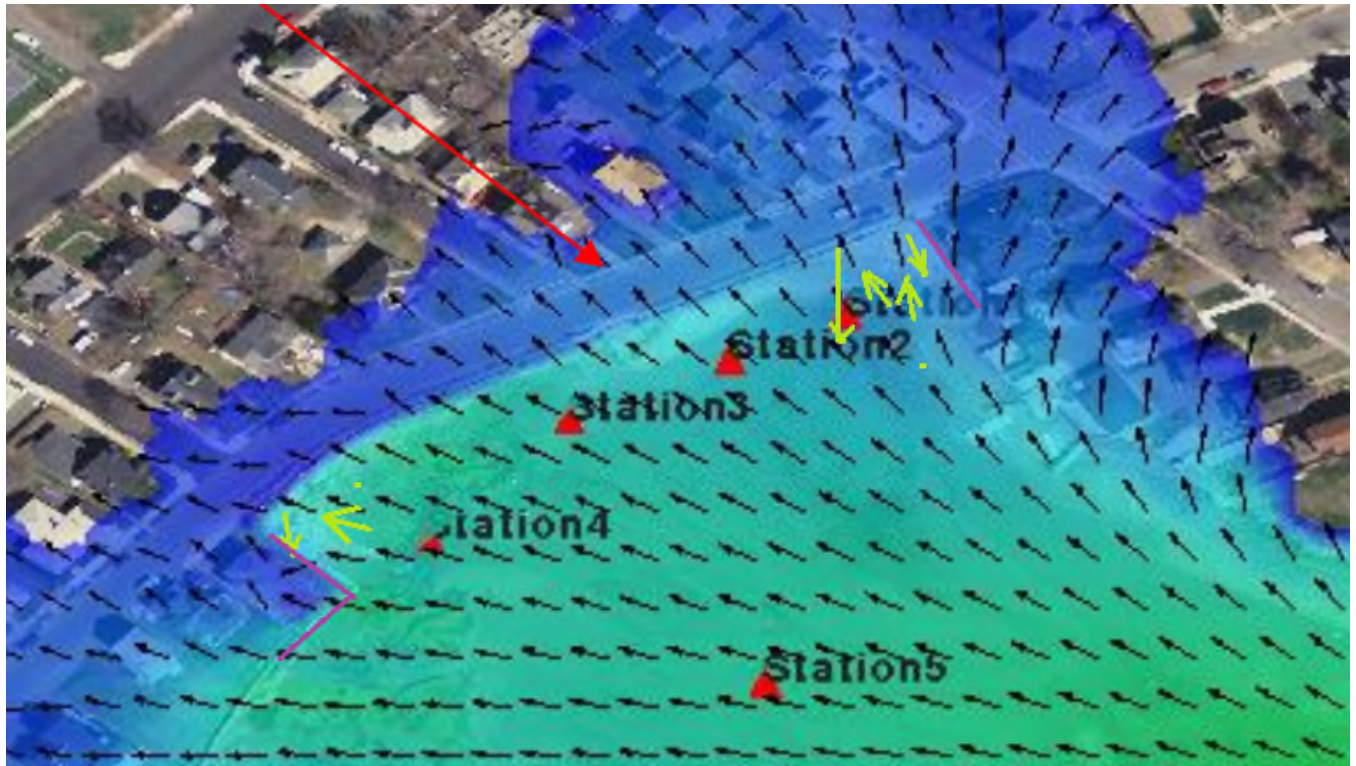
GUY FORD AND LEWIS LEGON, CO-CHAIRS OF THE SALEM WILLOWS NEIGHBORHOOD ASSOCIATION FLOOD ADVISORY COMMITTEE DATED OCTOBER 18, 2021

Comments dated October 18, 2021, by Guy Ford and Lewis Legon, Co-Chairs, were received by the MEPA Office. A copy of the comments are included in **Attachment 1**. Comments are generally summarized in the following categories:

1. *Wall height and tie-ins*

The following includes a summary of the qualitative analysis for the wave reflection/redirection caused by an increased seawall height on adjacent structures. Relative to flood inundation (i.e., flooding due to storm surge and tides but not including wave effects), raising the seawall is unlikely to increase the flood inundation of the adjacent properties, since flooding can enter this area by overtopping the existing residential seawalls. Similarly, elevating the seawall is not expected to affect the flood depth or flood limits along Columbus Avenue (currently both categorized as AE zone) since these areas are flooded from other flood entry points.

Elevating the seawall could increase the reflected wave heights (see yellow arrows in **Figure 1**). The influence of the reflected waves on the adjacent properties is uncertain.



**Figure 1: Schematic Analysis of Wave Reflection from the Columbus Avenue Seawall**

At the southwest corner, current ground elevation close to the toe of the seawall is approximately 8 to 10 feet NAVD88, indicating a breaking wave condition during the 100-year storm event. The breaking wave condition is highly turbulent, so the influence of reflected waves and wave rundown is difficult to predict.

2. *Sand build-up at corners*

Removal of sand at the corners is not proposed as part of this project.

3. *Breakwater*

Significant wave heights were estimated for increased breakwater heights. **Table 1** presents the estimated wave height reductions along the seawall for the 10-year, 50-year, and 100-year recurrence interval flood events.

| Table 1: Summary of Wave Height Reductions along Seawall <sup>1</sup> |                                            |                                            |                                              |
|-----------------------------------------------------------------------|--------------------------------------------|--------------------------------------------|----------------------------------------------|
| Storm Event Return Period                                             | Breakwater Height 5 feet (El. 5 ft-NAVD88) | Breakwater Height 8 feet (El. 8 ft-NAVD88) | Breakwater Height 10 feet (El. 10 ft-NAVD88) |
| 10-year (10-percent)                                                  | 0 to 0.5 feet                              | 0 to 1.4 feet                              | 0 to 1.2 feet                                |
| 50-year (2-percent)                                                   | 0.1 to 0.3 feet                            | 0.4 to 0.7 feet                            | 0.5 to 0.7 feet                              |
| 100-year (1-percent)                                                  | 0 to 0.4 feet                              | 0.4 to 1.3 feet                            | 0.5 to 1.4 feet                              |

<sup>1</sup>Significant wave heights were estimated using the SWAN (Simulating WAVes Nearshore) model

If the breakwater crest was raised 5 feet, the wave heights at the seawall would be reduced by less than approximately 0.5 feet for the 10-year, 50-year, and 100-year recurrence interval flood events. If the



breakwater crest was raised 10 feet, the wave heights at the seawall would be reduced by less than approximately 1.5 feet for the 10-year, 50-year, and 100-year recurrence interval flood events.

The City of Salem is currently requesting the US Army Corps of Engineers to provide a further evaluation of the existing breakwater and explore alternative design and layouts to minimize flooding events in Juniper Cove.

We trust the above responses address the various agency and abutter comments that had been submitted to the MEPA Office. If any additional information is required, please let us know, or alternatively additional responses could be addressed during the required state and local permitting processes.

Sincerely,

**GZA GEOENVIRONMENTAL, INC.**

A handwritten signature in blue ink that reads 'Lucas Taylor'.

Lucas Taylor  
Project Engineer

A handwritten signature in blue ink that reads 'David A. Smith'.

David Smith  
Senior Project Manager

Attachments:

Attachment 1 – Copies of submitted Comment Letters

Cc: MEPA Distribution List



## **ATTACHMENT 1 – Copies of Submitted Comment Letters**