

SAN FRANCISCO BAY RESTORATION AUTHORITY

Staff Recommendation  
October 14, 2022

**Heron's Head Park Shoreline Resilience Project, Phase Two**

Project No. RA-017  
Project Manager: Erica Johnson

**RECOMMENDED ACTION:** Authorization to disburse up to \$796,100 to the Port of San Francisco for Phase Two of the Heron's Head Park Shoreline Resilience Project, which consists of ten years of monitoring and reporting on project performance, in the City and County of San Francisco.

**LOCATION:** City and County of San Francisco; Measure AA Region: West Bay

**MEASURE AA PROGRAM CATEGORY:** Vital Fish, Bird and Wildlife Habitat Program.

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**EXHIBITS**

- Exhibit 1: Project Location and Site Map
  - Exhibit 2: July 17, 2020 Staff Recommendation
  - Exhibit 3: October 8, 2020 Monitoring & Adaptive Management Plan
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**RESOLUTION AND FINDINGS**

Staff recommends that the San Francisco Bay Restoration Authority adopt the following resolution and findings:

Resolution:

The San Francisco Bay Restoration Authority hereby authorizes the disbursement of an amount not to exceed seven hundred ninety-six thousand one hundred dollars (\$796,100) to the Port of San Francisco for Phase Two of the Heron's Head Park Shoreline Resilience Project, which consists of ten years of monitoring and reporting on Shoreline Resilience Project performance as described in the Monitoring & Adaptive Management Plan attached to the accompanying staff recommendation as Exhibit 3. Prior to commencement of the project, the grantee shall submit for the review and written approval of the Executive Officer of the Authority the following:

*HERON'S HEAD PARK SHORELINE RESILIENCE PROJECT, PHASE 2*

1. A detailed work program, schedule, and budget.
2. Names and qualifications of any contractors to be employed in carrying out the project.
3. A plan for acknowledgement of Authority funding.
4. Evidence that all permits and approvals required to implement the project have been obtained.

Findings:

Based on the accompanying staff recommendation and attached exhibits, the San Francisco Bay Restoration Authority hereby finds that:

1. The proposed authorization is consistent with The San Francisco Bay Restoration Authority Act, Gov. Code Sections 66700-66706.
2. The proposed authorization is consistent with The San Francisco Bay Clean Water, Pollution Prevention and Habitat Restoration Measure (Measure AA).

**STAFF RECOMMENDATION**

**PROJECT SUMMARY:**

Staff recommends that the Authority authorize a grant of up to seven hundred ninety-six thousand, one hundred dollars (\$796,100) to the Port of San Francisco (Port) for Phase Two of the Heron's Head Park Shoreline Resilience Project, which consists of ten years of post-construction monitoring and reporting on project performance. Heron's Head Park is in the City and County of San Francisco along the Bay shoreline (Exhibit 1).

Heron's Head Park (park) contains a mosaic of shoreline habitats including tidal marsh, mudflats, tidal ponds, rocky intertidal habitat, and various subtidal habitats that support a diversity of San Francisco Bay wildlife (see "Site Description" below). In addition, the park contains an environmental education center (EcoCenter) and a spur of Bay Trail, providing the adjacent communities a unique space for outdoor recreation along a highly industrialized shoreline. The park's shoreline is estimated to have retreated 50 feet since 1998, and one tidal pond is consistently flooded instead of tidally flushed. Tidally flushed ponds are important because they support a diversity of invertebrates, which also provide food for birds. The Heron's Head Shoreline Resilience Project (the project) as a whole will implement nature-based solutions along the Bay shoreline that are designed to prevent habitat loss due to erosion and sea level rise, enhance wetland habitat, provide ten paid internships to members of the adjacent communities, engage the adjacent communities in stewardship of the project area, and monitor and report on project performance for ten years.

Monitoring and reporting on the performance of the project is particularly important given its innovative nature-based design, which was developed in collaboration with staff of the Authority and the Bay Restoration Regulatory Integration Team (BRRIT). The design deviates from traditional shoreline armoring structures that disrupt natural processes. Instead, it implements

## *HERON'S HEAD PARK SHORELINE RESILIENCE PROJECT, PHASE 2*

“nature-based solutions,” which use natural and/or constructed materials to mimic natural features that stabilize and restore the ecological functions of the shoreline.

The project will place coarse sediment to create beaches at the bayward edge of the marshes, and use additional structures, such as rock groynes, large woody debris, and subtidal oyster reef balls, to protect and enhance shoreline habitat. This concept is being tested in several locations around San Francisco Bay. This project will provide information that will be useful to the Regionally Advancing Living Shorelines Project, a collaborative effort funded by the Authority in June 2022, in which the Port is one of the key landowners.

### **Project Phases**

Staff included the Heron's Head Shoreline Resilience Project in the Staff's Recommendation on Projects to be Considered for Funding through Grant Round 2, presented at the June 7, 2019 Governing Board meeting. Staff recommended that the Port receive partial funding of \$1,100,000 for habitat enhancement, community engagement, and post-construction monitoring and reporting, with the expectation that the construction of shoreline stabilization elements could be funded by other sources. Securing these additional funds from other grant programs took longer than expected, so staff worked with the Port to break the project into phases (Phase One and Phase Two) and begin Phase One to avoid any further delays.

### **Phase One: Habitat Enhancement, Community Engagement and Workforce Development**

At its June 17, 2020 meeting, the Board authorized \$297,000 to implement Phase One of the project (Exhibit 2), to enhance shoreline habitat, implement community workshops and stewardship days at the park, and provide paid environmental internships to ten young adults from the adjacent communities. To complete the work, the Port hired Literacy for Environmental Justice (LEJ), a community-based organization in the Bayview and Hunters Point communities adjacent to the park. LEJ recruited ten interns to participate in their Eco Apprentice internship program. As part of the program, Eco Apprentices are trained in native plant identification and cultivation and help LEJ staff remove invasive Algerian sea lavender and plant 13,220 out of the total 22,700 native marsh plants planned for this phase, including endangered California seablite. They are on track to complete Phase One in Spring of 2023.

By February 2022, the Port acquired all the permits and funds (see PROJECT FINANCING below) necessary to proceed with construction of the shoreline stabilization elements, which are as follows: coarse material beach with rock and cobble groynes; living shoreline elements, including large woody debris placement; and subtidal oyster reef balls. The Port completed a construction bidding process in March 2022, through which they received multiple bids within range of their construction estimate. The Port has selected a contractor from the submitted proposals and has begun construction as of September 2022. Construction is scheduled to finish in January 2023.

### **Phase Two: Post-Construction Monitoring and Reporting - Current Request**

The current request is for Phase Two of the project, which consists of project monitoring and reporting to evaluate project performance. The Monitoring & Adaptive Management Plan

*HERON'S HEAD PARK SHORELINE RESILIENCE PROJECT, PHASE 2*

(Exhibit 3), referenced in the Port's permits, requires monitoring, reporting, and adaptive management actions in consultation with permitting agencies for ten years following project completion. This proposed authorization will fund project monitoring and reporting and does not include potential adaptive management actions, which will be implemented by the Port should the need arise. The success criteria and specific monitoring protocols were developed in consultation with the BRRIT. Protocols consist of quantitative and qualitative habitat assessments, photo documentation, and topographic surveys. The specific project performance elements specified in the permits are as follows: performance of the coarse material beach and groynes at reducing shoreline erosion and preserving the tidal marsh and tidal ponds, recruitment of native oysters on subtidal oyster reef balls, establishment of native vegetation in enhanced areas, and evaluation of the habitat created and/or preserved by project elements for bird nesting and feeding. As noted above, monitoring and reporting are valuable components of the project because they will provide insights and lessons learned that can be applied to future projects involving implementation of nature-based solutions to sea-level rise and erosion along the Bay shoreline. Phase Two is anticipated to begin in Spring 2023.

**Site Description:** Heron's Head Park is owned and managed by the Port. It is a 21.5-acre open space located on a peninsula extending out into the San Francisco Bay from the eastern shoreline of San Francisco. The project area includes approximately 13.5 acres of shoreline habitat, including tidal marsh, mudflats, tidal ponds, rocky intertidal habitat, and various subtidal habitats. Together these shoreline habitats support over 200 resident and migratory birds, several federally or state listed special status species (such as the North American green sturgeon, steelhead, Chinook salmon, and longfin smelt), and federally listed endangered species (Ridgway's rail and California seablite).

The project area is located along a highly urbanized waterfront, adjacent to the Bayview and Hunters Point neighborhoods. The shoreline has experienced years of heavy industrial development, such as the establishment of a shipyard and powerplant. The residents of the Bayview and Hunters Point communities have suffered from the impacts of industrial pollution and racial and class discrimination. This park provides these communities much-needed access to the San Francisco Bay Trail, an environmental education center (EcoCenter), wildlife, and one of the few wetlands in the city.

**PROJECT FINANCING**

<b>San Francisco Bay Restoration Authority (Phase Two)</b>	<b>\$796,100</b>
San Francisco Bay Restoration Authority (Phase One)	\$297,000
U.S. Fish and Wildlife Service National Coastal Wetlands Conservation Grant Program (via a grant to the Conservancy)	\$987,000
California Ocean Protection Council	\$1,667,000
California Department of Fish and Wildlife	\$1,493,000
Port of San Francisco (the proposed grantee)	\$541,000
<b>Project Total</b>	<b>\$5,781,100</b>

Hanson Aggregates (Hanson) operates a sand and gravel processing facility at the Port's Pier 92, located approximately one mile from the project area. Hanson will donate sediment dredged from central San Francisco Bay to the Port for coarse beach construction. The coarse dredged material is a production byproduct of sifting for the finer, more commercially valuable sand. This is an in-kind donation with a commercial value estimated at \$417,000.

**CONSISTENCY WITH AUTHORITY'S ENABLING LEGISLATION, THE SAN FRANCISCO BAY RESTORATION AUTHORITY ACT:**

See the staff recommendation for Phase One of the project (Exhibit 2) for this information.

**CONSISTENCY WITH MEASURE AA PROGRAMS AND ACTIVITIES:**

The project will help achieve the *Vital Fish, Bird and Wildlife Habitat Program's* purpose to "significantly improve wildlife habitat that will support and increase vital populations of fish, birds, and other wildlife in and around the Bay" by enhancing shoreline habitat that supports over 200 resident and migratory birds, several federally or state listed special status species (such as the North American green sturgeon, steelhead, Chinook salmon, and longfin smelt), and federally listed endangered species (Ridgway's rail and California seablite). The project will also protect the shoreline habitat for the 30-year life of the project construction elements. Phase Two will consist of monitoring and reporting on these improvements for ten years after the project is completed to evaluate the project's success and develop information and data that can inform development of similar nature-based shoreline projects.

**CONSISTENCY WITH MEASURE AA PRIORITIZATION CRITERIA:**

1. **Greatest positive impact.** A direct impact of sea level rise in the San Francisco Bay Area is the loss of shoreline habitat due to erosion. A conventional response to shoreline erosion is armoring structures, which disrupt the natural, dynamic processes of the shoreline. The project implements "nature-based solutions" in its design and will protect valuable habitat for wildlife over the 30-year design life of the project. In particular, the project will provide additional habitat for the Ridgway's rail and will plant and monitor California seablite, both of which are federally listed endangered species.
2. **Greatest long-term impact.** The project will enable sea level rise adaptation for the 30-year design life of the shoreline stabilization elements. The reef ball component of the project is expected to provide habitat for fish larvae recruitment and growth of oysters beyond the 30-year design life. In addition, the ten years of monitoring and reporting in Phase Two of the project will benefit the scientific community and public agencies and ensure the lessons of the project can be shared widely for years to come.
3. **Leveraging resources and partnerships.** The project leverages in-kind support and funding from the California Ocean Protection Council, Hanson Aggregates, California Department of

*HERON'S HEAD PARK SHORELINE RESILIENCE PROJECT, PHASE 2*

Fish and Wildlife, United States Fish and Wildlife Service, and the Port's own funds (see "PROJECT FINANCING" section above). In addition, the Port has partnered with LEJ and other community organizations to lead community engagement and workforce development, and San Francisco State University's Estuary and Ocean Science Center to assist with workforce development and communication with the scientific community.

4. **Economically disadvantaged communities.** The project benefits the economically disadvantaged communities of Bayview and Hunters Point which are adjacent to the park. These communities are some of the most economically disadvantaged in the City and County of San Francisco and experience environmental burden due to the history of industrial pollution in the area. The residents will be able to enjoy continued access to park amenities and wildlife while using the trails and have opportunities to learn about nature-based adaptations, wildlife, and shoreline habitats as part of the programs at the EcoCenter located in the park.
5. **Benefits to economy.** The project benefits the region's economy by providing jobs in plant propagation at LEJ's Candlestick Point Native Plant Nursery and supporting ten young adults in the Eco Apprentice program, which provides a year-long field training on bay ecology, native plant restoration, invasive plant control, and project monitoring to residents of the Bayview and Hunters Point communities. Gaining these skills and network of professionals will allow the interns to compete for professional jobs in the growing field of habitat restoration.
6. **Engage youth and young adults.** The project is occurring during a period of park and community revitalization events planned for the Bayview and Hunters Point neighborhoods through a community outreach grant authorized by the State Coastal Conservancy on September 6, 2018. The grant currently engages the community in recently enhanced areas of the shoreline at Candlestick Point, India Basin, and eventually, Heron's Head. Also, with initial funding from the Authority (Phase One), the Port and LEJ have provided paid environmental internships to ten young adults from the adjacent communities via LEJ's Eco Apprentice program. Together, they have also engaged with the surrounding communities with the intent to inform, build trust, and receive input on the desired outcomes of the project. Stakeholder groups included in outreach and engagement include the following community-based organizations and committees:
  - a. Port Southern Waterfront Advisory Committee
  - b. San Francisco Recreation & Parks Department's EcoCenter Advisory Committee
  - c. Bayview Hunters Point Environmental Justice Taskforce
  - d. India Basin Neighborhood Association
  - e. Bayview Hunters Point Mobilization for Adolescent Growth in our Communities "BMAGIC" Parks Collaborative

7. **Monitoring, maintenance, and stewardship.** Phase Two will fund ten years of monitoring and reporting on the project's shoreline stabilization elements and habitat enhancement (see "Phase Two: Post-Construction Monitoring and Reporting - Current Request" above).
8. **Coastal Conservancy's San Francisco Bay Area Conservancy Program.**
  - a. The project is supported by adopted local and regional plans including the following: Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (USFWS 2013), North American Waterfowl Management Plan (2012), California State Wildlife Action Plan (2015 update), San Francisco Bay Subtidal Habitat Goals Report (2010), Baylands Ecosystem Habitat Goals (2015 update), San Francisco Estuary Blueprint (2022), The San Francisco Bay Shoreline Adaptation Atlas (2019), and Sediment for Survival: A Strategy for Resilience of Bay Wetlands in the Lower San Francisco Estuary (2021).
  - b. Phase Two must be implemented as soon as the construction of shoreline elements is complete, per the terms of the Port's permits. The Port will be ready to start the monitoring program in February 2023.
  - c. The project serves the Bayview and Hunters Point neighborhoods in San Francisco and will also share information with the scientific community and public agencies to encourage nature-based solutions at other locations in the San Francisco Bay region.
  - d. The project provides opportunities for benefits that could be lost if the project is not quickly implemented as sea level rise is an urgent threat facing San Francisco Bay.
  - e. The project leverages funds and in-kind support from multiple agencies (see "PROJECT FINANCING" above).
9. **San Francisco Bay Conservation and Development Commission's Coastal Management Program.** The project is consistent with BCDC's Management Program, including multiple policies of the San Francisco Bay Plan, including the following:
  - a. Tidal Marshes and Tidal Flats, Policy 6: The project design is based on analysis of localized sediment erosion and accretion, rates of vegetation colonization, potential for invasive species introduction and control, expected use of the site by fish and wildlife, and resilience to sea level rise and climate change. It includes clear and specific biological and physical goals, success criteria, a monitoring program, and an adaptive management plan.
  - b. Tidal Marshes and Tidal Flats, Policy 10: The project design relies on the use of fill, which has been authorized based on scientific ecological analysis and consultation with relevant state and federal agencies.
  - c. Tidal Marshes and Tidal Flats, Policy 11: The project is a demonstration project that addresses sea level rise adaptation of bay habitats. It includes appropriately detailed experimental design and monitoring to inform initial and future work.
10. **San Francisco Bay Joint Venture's Implementation Strategy.** The project advances the Habitat Goals listed by the Joint Venture by protecting and enhancing San Francisco Bay's tidal marsh and flats to benefit waterfowl, shorebirds, and other wildlife. The proposed project is listed as a Tier 1 priority project in the Joint Venture's 2019 Priority Projects List.

**COMPLIANCE WITH CEQA:**

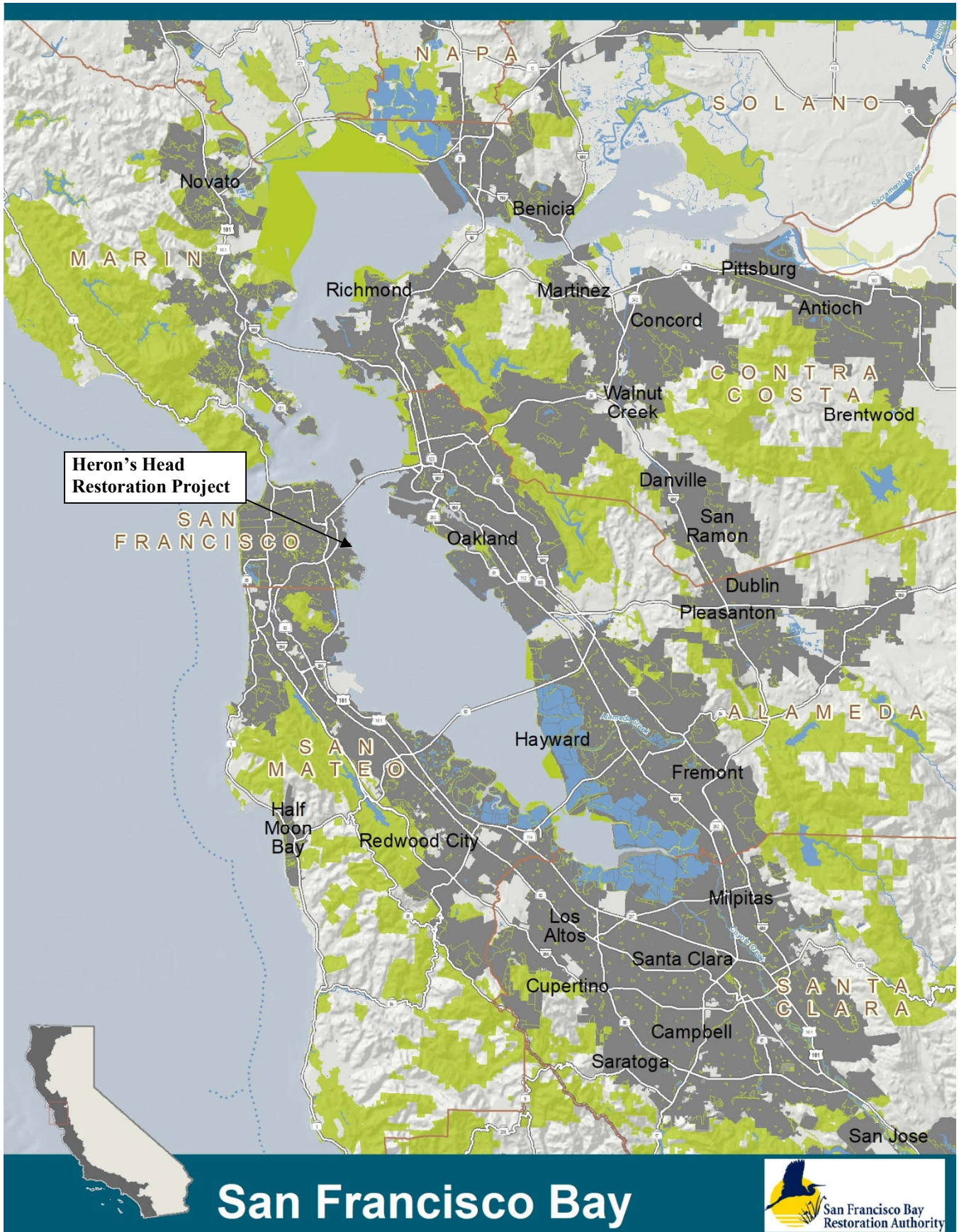
The project as whole (consisting of construction as well as the Authority's Phase One and Phase Two components) is categorically exempt from environmental review under 14 California Code of Regulations Section 15333 because it consists of habitat restoration activities in an area less than five acres, including nature-based shoreline stabilization and revegetation of disturbed areas with native plants. There will be no significant adverse impact on endangered, rare, or threatened species or their habitat, there are no known hazardous materials at or around the project site and, given the scale and methodology, there is no potential for cumulatively significant effects.

Removal of invasive plants and revegetation with native plants is also exempt under Section 15304 as a minor alteration to vegetation without the removal of healthy, mature, scenic trees.

Upon approval of the project, Authority staff will file a Notice of Exemption.



Exhibit 1: Project Location and Site Maps





SAN FRANCISCO BAY RESTORATION AUTHORITY

Staff Recommendation  
July 17, 2020

**HERON'S HEAD PARK SHORELINE RESILIENCE PROJECT: PHASE 1**

Project No. RA-017  
Project Manager: Marilyn Latta

**RECOMMENDED ACTION:** Authorization to disburse up to \$297,000 to the Port of San Francisco to implement native plant propagation, revegetation, invasive weed control, and community engagement and job training as part of the Heron's Head Park Shoreline Resilience Project in the City and County of San Francisco.

**LOCATION:** City and County of San Francisco; Measure AA Region: West Bay

**MEASURE AA PROGRAM CATEGORY:** Fish, Bird and Wildlife Habitat Program; Shoreline Public Access Program.

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**EXHIBITS**

- Exhibit 1: [Project Location and Site Map](#)  
Exhibit 2: [Project Designs and Photographs](#)  
Exhibit 3: [Project Letters](#)
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**RESOLUTION AND FINDINGS:**

Staff recommends that the San Francisco Bay Restoration Authority adopt the following resolution pursuant to The San Francisco Bay Restoration Authority Act, Gov. Code Sections 66700-66706:

“The San Francisco Bay Restoration Authority hereby authorizes the disbursement of an amount not to exceed two hundred ninety seven thousand dollars (\$297,000) to the Port of San Francisco for Phase One of the Heron's Head Park Shoreline Resilience Project. Prior to commencement of the project, the grantee shall submit for the review and written approval of the Executive Officer of the Authority the following:

1. A detailed work program, schedule, and budget.
2. Names and qualifications of any contractors to be employed in carrying out the project.
3. A plan for acknowledgement of Authority funding.

4. Evidence that all permits and approvals required to implement the project have been obtained.

Staff further recommends that the Authority adopt the following findings:

“Based on the accompanying staff report and attached exhibits, the San Francisco Bay Restoration Authority hereby finds that:

1. The proposed authorization is consistent with The San Francisco Bay Restoration Authority Act, Gov. Code Sections 66700-66706.
2. The proposed authorization is consistent with The San Francisco Bay Clean Water, Pollution Prevention and Habitat Restoration Measure (Measure AA).”

### **PROJECT SUMMARY:**

Staff recommends that the Authority authorize a grant of two hundred ninety seven thousand dollars (\$297,000) to the Port of San Francisco (Port) for Phase One of the Heron’s Head Park Shoreline Resilience Project (Exhibit 1, Location and Site Map).

The Heron’s Head Park Shoreline Resilience Project (project) consists of restoring and enhancing wetlands and upland habitat along the Bay shoreline in Bayview Hunters Point to stabilize the shoreline and improve habitat. The overall project will provide beneficial native habitat enhancement improvements to an urban shoreline park in the Bayview Hunters Point neighborhood, a diverse and economically disadvantaged community in southeast San Francisco. In addition to the habitat enhancement benefits, the project includes community engagement, local job training in green infrastructure activities, and workforce development.

To achieve the goals of the project, during Phase I, the Port and Literacy for Environmental Justice (LEJ) will hire a team of four “Eco-Apprentices” and an experienced crew leader. The Eco-Apprentices will be low income transitional age youth (18-25 years old) with a passion for conservation, habitat restoration, and community engagement. Leveraging long-standing connections with San Francisco government agencies, environmental stewardship groups, schools, and youth-serving organizations active in southeast San Francisco, LEJ will recruit young residents of the Bayview Hunters Point community to be Eco-Apprentices on the Heron’s Head Park Shoreline Resilience Project crew. These youth will be trained by LEJ and by researchers from San Francisco State University’s Estuary and Ocean Science (EOS) Center in bay ecology, invasive weed control, native plant propagation and outplantings, and project monitoring.

During the first year of Phase I of the project, preliminary methods for weed control and plantings will occur in two test plots. This area is impacted by the invasive Algerian sea lavender which can degrade habitat values and reduce biodiversity. The test plots will enable the project team to refine planting plans with respect to native species representation and placement by soil type and marsh elevation. At the end of this assessment of the test plots, LEJ will use insights gained from test plantings to strategically propagate and plant approximately an additional 22,700 marsh plants grown over 20,000 – 30,000 square feet of intertidal zone. Habitat stewardship during this phase will include manual removal of invasive species and strategic replacement of native plants in cleared areas.

With intent to inform, build trust, and make the project culturally relevant to the surrounding communities, the Port and LEJ propose to present at up to four community meetings during the first year of the project. The Eco-Apprentice team will work with the Port to develop content and presentation materials and present the purpose, potential beneficial and adverse impacts, and desired outcomes of the project. They will give presentations to key stakeholders for the project, such as the following:

- Port Southern Waterfront Advisory Committee
- City and County of San Francisco Recreation & Parks Department's EcoCenter Advisory Committee
- Bayview Hunters Point Environmental Justice Taskforce
- India Basin Neighborhood Association
- Bayview Hunters Point Mobilization for Adolescent Growth in our Communities (BMAGIC) Parks Collaborative

These community outreach efforts will not only foster broader awareness of the project, they will also offer LEJ Eco-Apprentices the opportunity to develop their understanding of the scientific basis for the work they are doing and practice professional presentation skills. Additionally, these presentations may offer a vision to communities in southeast San Francisco of how nature-based shorelines may serve as an option for sea level rise adaptation.

The project's Measure AA application focused on stabilizing the shoreline using nature-based features, noting that, without shoreline protection, the wetlands are expected to erode significantly over the next 30 years. Authority staff's overview of Round 2 grant recommendations, presented at the June 2019 Governing Board meeting, included an initial recommendation of partial funding in the amount of \$1,100,000 toward a total cost of \$4,254,200. As the Port continues to seek additional funds to implement the full project, Authority staff and the Port have agreed to divide the project into two phases in order to reduce delay.

The board authorization requested now is for Phase I of the total project. Phase I, which will cost \$297,000, consists of initial site preparation activities including invasive weed control, planting native plants in weeded areas, native plant propagation, and initial community engagement including workforce development. Phase Two is expected to include habitat treatments in the intertidal and adjacent subtidal areas to protect the 7 acre wetland, including construction of a coarse grain cobble beach, installation of 5 rock groynes, and placement of approximately 80-100 oyster reef elements offshore. Phase I has independent value, regardless of whether Phase 2 is implemented.

The Port has submitted permit applications to all agencies through the Bay Restoration Regulatory Integration Team (BRRIT). The Port and the BRRIT held a site meeting in November 2019 and have held several coordination meetings to discuss BRRIT input to the design, which has been incorporated into the 65% design plans that have been completed. The Port is actively working to fundraise to complete the designs and implement the full restoration project from a variety of sources, including a \$1 million grant application that the Port and State Coastal Conservancy will submit in July 2020 to the USFWS National Coastal Wetlands Grant

Program. The Phase 1 funding requested now will start native plant habitat enhancements and community engagement that is planned to continue with the larger full project.

The Port owns and manages property along the southern San Francisco waterfront, including this parcel at Heron's Head Park. The Port has a strong track record of successfully managing projects that include community involvement and environmental enhancement, and has built multiple long-standing partnerships with local, state, and federal partners to accomplish these goals.

LEJ is a non-profit environmental education and youth empowerment organization created specifically to address the ecological and health concerns of Bayview Hunters Point and the surrounding communities of southeast San Francisco. LEJ trains youth for rewarding green careers, supports transformation of underutilized "brownfields" into public parks, and engages community volunteers to care for their open spaces. LEJ's native plant nursery, located in Hunters Point, specializes in growing locally adapted native species for shoreline and coastal upland habitats. The Port will purchase native wetland and transition zone plants from LEJ and hire LEJ's Eco-Apprentices (each crew comprised of four interns and one Crew Leader, described further below), to remove invasive species, plant natives, and maintain native marsh vegetation in the Project area.

The Estuary and Ocean Science Center (EOS) is housed at the Romberg Tiburon Campus of San Francisco State University. Senior Scientist Kathy Boyer and Staff Scientist Melissa Patten from the EOS Center will lead the effort to collect seeds and cuttings of the endangered California sea-blite (*Suaeda californica*, "Suaeda"), train and advise LEJ staff in Suaeda cultivation, planting, and arboring, and monitor and report on the success of Suaeda establishment. LEJ and EOS Center staff will work together to train LEJ's nursery staff and Eco-Apprentices to propagate Suaeda in their nursery and plant it at Heron's Head Park. Working alongside EOS Center staff will offer LEJ staff and interns meaningful work experience and exposure to careers in the field of ecological restoration.

The project includes a substantial education and outreach component, building on existing education and public engagement programs that have operated at the project site for over 20 years. Port partners in community engagement include the San Francisco Recreation & Parks Department, Golden Gate Audubon Society, San Francisco K-12 schools, and City College of San Francisco. These and many other community-based organizations have created and/or participated in programs that engage the public in volunteering, studying and enjoying the project site. The Port has sought input from its Southern Waterfront Citizens' Advisory Committee, Golden Gate Audubon's Conservation Committee, and the EcoCenter Advisory Committee and will continue to broaden its community engagement in the project.

**Site Description:** Heron's Head Park is the result of never completed construction of Pier 98 in the 1970's. In 1998 the Port completed a wetland creation/enhancement project at the site to provide a variety of habitat types, including high intertidal/transition zone vegetation, tidal salt marsh, refugial islands, and tidal ponds. Improvements in the adjacent uplands include a 1/3-mile spur of the San Francisco Bay Trail, native plant landscapes, and the EcoCenter, an educational community center.

Heron's Head Park today is an approximately 21-acre peninsula, comprised of seven acres of

jurisdictional wetlands and tidal ponds, and 14 acres of public open space on San Francisco Bay. Restoration work will occur on fewer than five acres but will benefit the entire seven acre wetland. The site is owned and managed by the Port, located at the southern end of the Port's jurisdiction in the Bayview Hunters Point neighborhood (**Exhibit 2**). The waterfront here and extending through San Francisco and San Mateo counties is highly urbanized, forming a lengthy shoreline with limited habitat for resident or migratory wildlife. Heron's Head Park is one of the few tidal marsh habitats along the San Francisco waterfront.

In the 20 years since the wetlands and park were created, the shoreline at Heron's Head Park has experienced subsidence of the fill soils, erosion from wind-waves and tidal flows, and a low supply of suspended sediment. These forces have caused a loss of both habitat acreage and ecological function. In the most impacted area, the shoreline has retreated up to 50 feet from its 1998 location, and one of the tidal ponds is consistently flooded rather than tidally flushed. The Port intends to address shoreline erosion through Phase 2 of this project.

The project site is a highly valued resource both for wildlife and public access and education. Federally or state-listed special status species that are present in the vicinity include North American green sturgeon, steelhead, Chinook salmon, and longfin smelt. The proposed activities will enhance native plant communities in the intertidal and upland areas of the site, which provide valuable habitat cover, nesting substrate, and food resources for a variety of birds and wildlife. The site has a significant infestation by invasive Algerian sea lavender, which will be addressed by Phase 1 of the project.

#### **PROJECT FINANCING**

<b>San Francisco Bay Restoration Authority</b>	<b>\$297,000</b>
Others	\$0
<b>Project Total</b>	<b>\$297,000</b>

The Port will provide \$38,000 in in-kind staff time to manage the project.

#### **CONSISTENCY WITH AUTHORITY'S ENABLING LEGISLATION, THE SAN FRANCISCO BAY RESTORATION AUTHORITY ACT:**

The San Francisco Bay Restoration Authority Act (SFBRA Act), Government Code section 66704.5, authorizes the Authority to grant funds for eligible projects. Consistent with Section 66704.5(a), the project is located in San Francisco City and County in the Central Bay, outside of the Delta primary zone.

The project is eligible for a grant under section 66704.5(b), which provides that an eligible project shall: "(1) Restore, protect, or enhance tidal wetlands, managed ponds, or natural habitats on the shoreline in the San Francisco Bay area, excluding the Delta primary zone". Both the Phase 1 and the overall project will restore tidal wetlands and natural habitats along the shoreline.

Funding the native plant propagation, invasive weed control, native outplantings, and monitoring for the project is consistent with SFBRA Act section 66704.5(e), which provides that the Authority may award grants for “all phases of planning, construction, monitoring, operation, and maintenance” of eligible projects.

**CONSISTENCY WITH MEASURE AA PROGRAMS AND ACTIVITIES:**

The project will help achieve the *Vital Fish, Bird and Wildlife Habitat Program*’s goal to “significantly improve wildlife habitat that will support and increase vital populations of fish, birds, and other wildlife in and around the Bay.” This restoration project will enhance wetlands and provide upland transition zone for a number of important fish, bird, and mammal species of concern, including the salt marsh harvest mouse, Ridgway’s rail, and numerous other shorebirds and songbirds. Upon completion of the invasive weed control and plantings of the project, the Port will provide for stewardship, maintenance and monitoring of the restored areas. The Port is committed to maintaining the marsh and parkland to ensure its benefits for future generations.

**CONSISTENCY WITH MEASURE AA PRIORITIZATION CRITERIA:**

1. **Leveraging resources and partnerships.** The restoration Project will leverage public/private partnerships that have been started by the Port, including the construction of the EcoCenter at Heron’s Head park which was funded by the State Coastal Conservancy and other partners, and is operated by the San Francisco Recreation & Parks Department.
2. **Economically disadvantaged communities.** The Project will benefit the economically disadvantaged community of Bayview Hunters Point in San Francisco. The community will benefit from visiting the enhanced habitat while using the trails and enjoying open space at the site; and through opportunities to learn about the native plantings and invasive weed control as part of educational programs at the EcoCenter.
3. **Benefits to economy.** The project will benefit the region’s economy by providing jobs in plant propagation at LEJ’s Candlestick Point Native Plant Nursery, and supporting green infrastructure job training and workforce development to four youth Eco-Apprentices in Bayview Hunters Point.
4. **Engage youth and young adults.** The project will provide field training on bay ecology, native plant restoration, invasive plant control, and project monitoring to four youth Eco-Apprentices from the Bayview Hunters Point neighborhood. Gaining these skills will enable the apprentices to build their resumes and help them compete for professional jobs in the growing field of habitat restoration.
5. **Monitoring, maintenance, and stewardship.** The Eco-Apprentices will work with a crew leader from LEJ and with researchers from the Estuary and Ocean Science Center to monitor and maintain the native plantings and invasive weed control. They will implement two test plots to assess a variety of plant sizes, planting methods, and planting timing, in order to define the best practices for the full planting approach.



6. **Coastal Conservancy's San Francisco Bay Area Conservancy Program.** The project is consistent with the Conservancy's San Francisco Bay Area Conservancy Program's Criteria:
  - a. The project is supported by the Port Master Plan and by actions recommended in the Baylands Habitat Goals Science Update (2015) and San Francisco Estuary Institute's Adaptation Atlas (2018), which both recommend nature-based approaches to help wetlands adapt to sea level rise and other climate changes;
  - b. The project serves a regional constituency in the Bayview Hunters Point neighborhood in San Francisco, and is also a pilot demonstration project that will share information with other entities to encourage invasive weed control and native plant revegetation at other locations in San Francisco Bay;
  - c. The project can be implemented in a timely way- all partners are ready to start work in August 2020 if funding is approved;
  - d. The project provide opportunities for benefits that could be lost if the project is not quickly implemented as sea level rise is an urgent threat facing San Francisco Bay and these actions help to enhance native plant habitats that can continue to grow and become more robust over time; and
  - e. Includes in-kind staff time from the Port staff who will manage the project.
  
7. **San Francisco Bay Conservation and Development Commission's Coastal Management Program.** The project is consistent with San Francisco Bay Conservation and Development Commission's Coastal Management Program as it enhances native tidal wetland and upland transition zone habitats, and controls invasive species that impact wetlands in San Francisco Bay.
  
8. **San Francisco Bay Joint Venture's Implementation Strategy.** The project is consistent with the Joint Venture's Implementation Strategy as it includes actions to control invasive species and enhance native wetland and upland ecotone vegetation. The project is included on the Joint Venture's Priority Projects List, and the Port received a positive confirmation of support after consultation with Joint Venture staff prior to applying for funding.

#### **COMPLIANCE WITH CEQA:**

The project is categorically exempt from review under CEQA Guidelines Section 15333 (14 Cal. Code Regs. §15333) as a small habitat restoration project, not exceeding five acres, to assure the restoration and enhancement of habitat for fish, plants, or wildlife and with no significant adverse impact on endangered, rare or threatened species or their habitat, no known hazardous materials at or around the project site and, given the scale and methodology, no potential for cumulatively significant effects.

Upon approval of the project, staff will file a Notice of Exemption.



# Heron's Head Shoreline Resilience Project **Monitoring & Adaptive Management Plan**

Prepared by Acta Environmental  
With contributions from Environmental Science Associates

For the Port of San Francisco

July 6, 2020  
Revised: October 8, 2020



acta environmental, inc.



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## 1.0 INTRODUCTION

This document describes the long-term monitoring and adaptive management plan for the proposed Heron’s Head Shoreline Resilience Project (“the project”), located at Heron’s Head Park (“the site”), in the City and County of San Francisco (**Figure 1**). The project would install shoreline protection and habitat enhancement features at the site to protect existing shoreline and wetland habitat from ongoing erosion, enhance intertidal and subtidal aquatic habitat, enhance biodiversity, and enable the wetlands and park to adapt to sea level rise (**Figure 2**). The project would place coarse sand, gravel and rock to construct a gravel beach berm and rock groynes along the site’s south-facing shoreline. Integrated with these features would be fabricated reef elements to provide habitat for native oysters, rock/earth sills to stabilize the tidal pond edges, and plantings of native marsh species including California seablite (*Suaeda californica*).

This monitoring plan describes performance criteria, metrics, and methods that will be used to evaluate the performance of the constructed beach and headlands, the dynamics of beach nourishment, recovery of marsh vegetation and tidal ponds in areas formerly impacted by erosion and by temporary construction access, ecological function of the oyster reefs and other new habitat elements, and the success of native plant restoration.

## 2.0 MONITORING OBJECTIVES

The monitoring program’s objectives are defined in light of the overall project purpose: to enhance and preserve aquatic resources and tidal wetlands by stabilizing the southern shoreline; to preserve existing habitat and recreational features; and to enable the wetlands and park to adapt to a moderate level of sea level rise over an approximately 30-year project life. The monitoring program objectives are as follows:

- Evaluate the performance of the beach berm and groynes
- Assess project success at reducing shoreline erosion and preserving the tidal marsh and ponds
- Assess colonization of the reef structures by native oysters
- Measure the areal extent of California seablite onsite
- Assess vegetation characteristics in the tidal marsh, replanted temporary impact areas, and native plant restoration areas
- Qualitatively evaluate habitat functions for avian species

## 3.0 PROJECT EVALUATION

The proposed project is designed to create new habitat types at the site, protect existing habitat, increase diversity and complexity of the shoreline habitat, and achieve a net increase in aquatic habitat function. Performance criteria for critical aspects of the project will be used to determine project success (see Section 3.1). If performance criteria are not met, the Port will evaluate the reasons why they are not being met and implement corrective actions if needed in consultation with appropriate agencies. In addition to required performance criteria, the project has a set of goals for the intended

biological responses and physical processes (see Section 3.2). If these goals are not met, the Port will consider whether corrective actions are appropriate and feasible.

### **3.1 PERFORMANCE CRITERIA**

The project will be considered successful if the following criteria are met by Year 5 of the monitoring period. If these criteria are not met, the Port will evaluate the reasons why they are not being met and implement corrective actions if needed in consultation with appropriate agencies:

#### *Beach and groyne physical characteristics:*

- Elevations of the beach berm crest remain above elevation 5.5 feet NAVD where the beach is adjacent to sensitive habitats (no elevation criteria are proposed at the channel mouth where the beach is deliberately lower or at the feeder beach where beach material is expected to move westward onto other segments of the beach).
- No significant horizontal movement of the large rocks or significant failures of groyne structures as qualitatively assessed by observation.
- Crest elevation of at least 75% of the groyne structures (by length) remains within 1 foot of initial elevation.
- No significant horizontal movement of the oyster reef elements.
- No obstruction of tidal flow in and out of the main tidal channel

#### *Marsh Vegetation:*

- Replanted temporary impact areas will support at least 10% absolute cover of tidal marsh vegetation by Year 1, at least 50% absolute cover of tidal marsh vegetation by Year 3, and at least 70% absolute cover of tidal marsh vegetation by Year 5.
- In any monitoring year, absolute percent cover of invasive species in replanted temporary impact areas will be the same or less than absolute percent cover of invasive species in unimpacted areas of the tidal marsh.

### **3.2 PROJECT GOALS**

The project is intended to achieve the following biological and physical conditions. If these goals are not met, the Port will consider whether corrective actions are appropriate and feasible. The Port will discuss corrective actions with the appropriate agencies before taking such actions.

#### *Beach and groyne physical characteristics:*

- Crest elevation of at least 75% of the oyster reef elements (by number of elements) remains within 1 foot of initial elevation.

#### *Shoreline erosion and habitat preservation:*

- Area of vegetated tidal marsh remains stable or increases over the monitoring period.

- No continued erosion of existing marsh scarps and no formation of new eroding scarps along section of shoreline where beach is installed.
- Tidal ponds continue to pond water during low tides.

Oyster Reef Elements:

- Native oyster recruitment observed with densities of >5 adult oysters per square meter of oyster reef structure.
- Native marine flora or native sessile epifauna colonize >50% of the surface area of >75% of the oyster reef elements.

California Seablite:

- Square footage of existing California seablite assemblages will be the same or greater than pre-project conditions as determined by preconstruction mapping.

## **4.0 METRICS, METHODS, AND EQUIPMENT**

The following sections describe monitoring metrics, methods, and equipment for each element of the project’s monitoring program

### **4.1 BEACH PERFORMANCE, SHORELINE EROSION, AND PRESERVATION OF TIDAL MARSH AND POND HABITAT**

Metrics

- Top elevations of beach berm, groynes, and oyster reef elements
- Occurrence of new eroding marsh scarps
- Change in volume of beach (cubic yards per linear foot) along the length of shoreline
- Quantitative estimate of longshore and cross-shore transport of beach sediment rates (to the extent supported by survey data and observed site conditions)
- Areal extent of beach, tidal marsh, and mudflats
- Observed water levels in ponds at low tide
- Physical condition of project elements

Methods

Post-construction monitoring of beach performance, shoreline erosion, and marsh/pond habitat preservation will be performed within 3 months of completion of fill placement (year 0). Thereafter, visual surveys and photo-documentation of the project elements will be conducted annually and quantitative surveys will be conducted in years 2, 4, 6, 8 and 10. If a significant wave event occurs in an off year, quantitative surveys will be conducted in that year and that event will replace another future planned survey event.

Photo-documentation of readily observed field markers will be used to document both bulk and small-scale movement of beach material due to large wave events. The field markers will include be painted rocks or landscape rocks of a color that contrasts with the beach material, of a size and density similar to

the bulk beach material. The marker rocks will be placed along the shoreline to form one or more distinct stripes extending from the beach crest to approximately MLLW with a large enough width, thickness and contrast to be visible from the ground and in low-elevation aerial photos. The groyne structures will also act as field markers. The large rocks provide will provide a stationary reference against which it will be possible to observe movement (e.g., accretion or erosion) of the beach material. Significant disturbance of the marker stripe (e.g., visible signs of longshore transport of either a large number of individual marker rocks, or the stripe in bulk), or a significant change in burial or exposure of the groyne rocks is apparent, will be interpreted as an indication that a significant wave event has occurred, triggering a review of recent wind events to characterize the estimated wind and wave conditions that cause the observed movement of beach material. Depending on the scale of observed movement, the project team may choose to adjust the timing of the next scheduled quantitative beach survey in order to better document the impact of a significant wave event.

The following physical process monitoring actions will be conducted **annually (years 0 through 10)**:

- Photo-documentation of groyne structures, oyster reef elements, beach sections, tidal marsh, and tidal ponds.
- Visual survey for new eroding marsh scarps. New scarp features will be photo documented and mapped using GPS.
- Photo-documentation of field markers to detect significant wave events.

The following physical process monitoring actions will be conducted in **years 0, 2, 4, 6, 8, and 10** (unless monitoring years are adjusted in response to significant wave events as described above):

- An aerial photo and aerial topographic survey performed at low tide. Aerial imagery will be used to map the areal extent of beach material and location/movement of the marker stripe(s). Digital Elevation Model (DEM) differencing analysis will be performed to document changes in beach elevation relative to the post-construction (year 0) baseline survey and trends in beach material transport
- Ground-based survey (e.g., using total-station or RTK GPS) and of rock groyne crests, beach crests, and cross sections extending from existing trail, across the tidal marsh, and beyond the toe of the new beach.
- Ground-based survey of the top of each oyster reef element.
- Photo documentation of ponded water in tidal ponds at low tide with a coincident water surface elevation survey.

#### Equipment

- Drone or aircraft-based aerial photography and aerial topographic survey
- RTK GPS or Total Station for ground surveys
- Camera for photo documentation
- Field markers (e.g., painted or colored landscape rocks)



## 4.2 COLONIZATION OF OYSTER REEF ELEMENTS

### Metrics

- Density of adult and juvenile oysters
- Size-distribution of adult oysters
- Percent cover of oysters
- Percent cover of other sessile epifauna
- Percent cover of marine flora
- Percent native/non-native taxa

### Methods

Oyster monitoring will be conducted once a year in June or July. Monitoring will be conducted annually in years 1 through 5 and then twice more in years 7 and 10. Oyster reef elements will be accessed on foot along the shoreline or by water using small non-motorized craft such as kayaks to avoid disturbance to the marsh during nesting seasons for Ridgway's Rail and migratory birds. A randomly selected subset of approximately 25% of the oyster reef elements will be monitored each year. One sample shell bag (1/4-size shell bags deployed during the initial installation) will be collected from each selected reef element. Density of oysters, both juvenile and adult, will be counted and size of oysters (longest shell dimension measured in mm) will be measured on 10 shells per bag. Percent cover of oysters and percent cover of other sessile organisms will be estimated on sampled shells, and the number of mobile epifauna per bag will be counted.

Reef elements will be sampled in situ once a year in June or July during extreme low tides in the same low tide series. One vertical surface above the waterline will be selected on both east and west sides of the same reef elements from which sample shell bags were collected. On each selected surface the total number of oysters, both juvenile and adult, in 10 cm<sup>2</sup> quadrats will be counted and the size of 10 individual oysters will be measured (longest shell dimension measured in mm). In the same quadrats, the cover of oysters and percent cover of other sessile epifauna will be estimated using a 10 cm<sup>2</sup> acetate sheet with 25 uniform points. To the extent practicable, taxa will be identified as native or non-native. The total percent cover of native marine flora and native sessile epifauna on all of the oyster reef elements will be visually estimated.

### Equipment

- 10 cm<sup>2</sup> quadrat
- 10 cm<sup>2</sup> acetate sheet with 25 uniform points
- Removable sample shell bags
- Digital caliper

## 4.3 CALIFORNIA SEABLITE

### Metrics

- Location of seablite assemblages
- Areal extent (per assemblage and total for site)

- Height of plants
- Percent survival of plantings
- Proportion of flowering branches
- Overall condition

#### Methods

All existing seablite assemblages onsite (determined by preconstruction survey) and planted seablite will be monitored. The first monitoring event will be conducted in the fall, after planting. In subsequent years the plants will be monitored twice yearly in late winter and fall of years 1 through 5. The location of each assemblage will be recorded using GPS. The areal extent (longest dimension x perpendicular dimension) and height of each assemblage will be measured using a meter stick. The proportion of the plant that has flowering/fruited branches will be visually estimated. Percent survival of planted seablite will be recorded. If plants are arbored, the status of the arbors will be assessed (presence, sturdiness, need for increased height relative to plant as it grows). Each assemblage will be photo documented from a set position during each monitoring event.

#### Equipment

- Mapping grade GPS
- Meter stick
- Camera

### **4.4 AVIAN SPECIES**

#### Metrics

- Abundance and species richness
- Behavioral observations

#### Methods

Use of the site by seabirds, waterfowl, shorebirds and wading birds will be qualitatively assessed. Surveys will be conducted quarterly in years 1 through 5 and will consist of visual observations at high and low tide for set time periods. Four observation points will be established (one each in tidal marsh, tidal ponds, gravel beach, and tidal flats) and the locations recorded using GPS. Observations will be recorded for 15 minutes at each point using binoculars and a spotting scope.

Biologists will record the number of species, the number of individuals of each species, and their behavior (e.g., nesting, foraging, roosting). Monitors will also note any observed associations of species or taxonomic groups with sub-habitats (e.g., preferential foraging substrates, use of trellises/woody debris).

#### Equipment

- Spotting scope
- Binoculars
- Mapping grade GPS for mapping observation points

## 4.5 MARSH VEGETATION

### Metrics

- Areal extent of tidal marsh vegetation categorized by cover class
- Total percent cover
- Relative percent cover by species
- Percent native/non-native species
- Species richness
- Mean cover height
- Cover density
- Percent cover of *Limonium ramosissimum* and other invasive plant species

### Methods

Vegetation characteristics and the areal extent of vegetated tidal marsh will be monitored to assess project success at reducing shoreline erosion and preserving the tidal marsh and recovery of areas impacted by previous shoreline erosion and by temporary construction access. Vegetation monitoring will also include native plant restoration efforts undertaken by the Port as part of a coordinated but separate project. Qualitative monitoring of vegetation will be conducted annually to identify any problems with the revegetated areas and to guide corrective actions. Quantitative measurement of vegetation parameters will be performed every two years to map the areal extent of tidal marsh as part of the assessment of beach performance and to quantitatively document recovery of impact areas and success of native plantings. Existing, unimpacted areas of the tidal marsh will be used as reference areas for comparison with replanted impact areas. Ground surveys of vegetation within and adjacent to tidal marsh will be conducted outside Ridgway's rail breeding season.

**Annual** vegetation monitoring (years 1, 2, 3, 4, and 5) will comprise:

- Photo documentation of the vegetated gravel beach, tidal marsh, replanted temporary impact areas, and native plant restoration areas
- Qualitative vegetation survey documenting any new populations of invasive plants and qualitatively evaluating performance of new plantings

**Bi-annual** vegetation monitoring (years 1, 3, and 5) will comprise:

- Interpretation of aerial imagery (collected as described in Section 4.1) to map the extent of tidal marsh vegetation. Mapping will categorize vegetation across the entire tidal marsh by cover class ("full cover", 50%-100% cover, 10-50% cover, <10% cover). Ground-truthing will be performed as needed to verify plant patch types
- Measurement of vegetation metrics in 10 randomly placed 1 m<sup>2</sup> quadrats within the tidal marsh
- Measurement of vegetation metrics in 1 m<sup>2</sup> quadrats located every 100 feet along the length of the beach crest
- Measurement of vegetation metrics in 1 m<sup>2</sup> quadrats located at 20- to 50-foot intervals along revegetated construction access corridors

- Measurement of vegetation metrics in 1 m<sup>2</sup> quadrats within native plant restoration areas; quadrats will be randomly placed within native plant restoration areas at a frequency of one per approximately 100 square feet of restored area

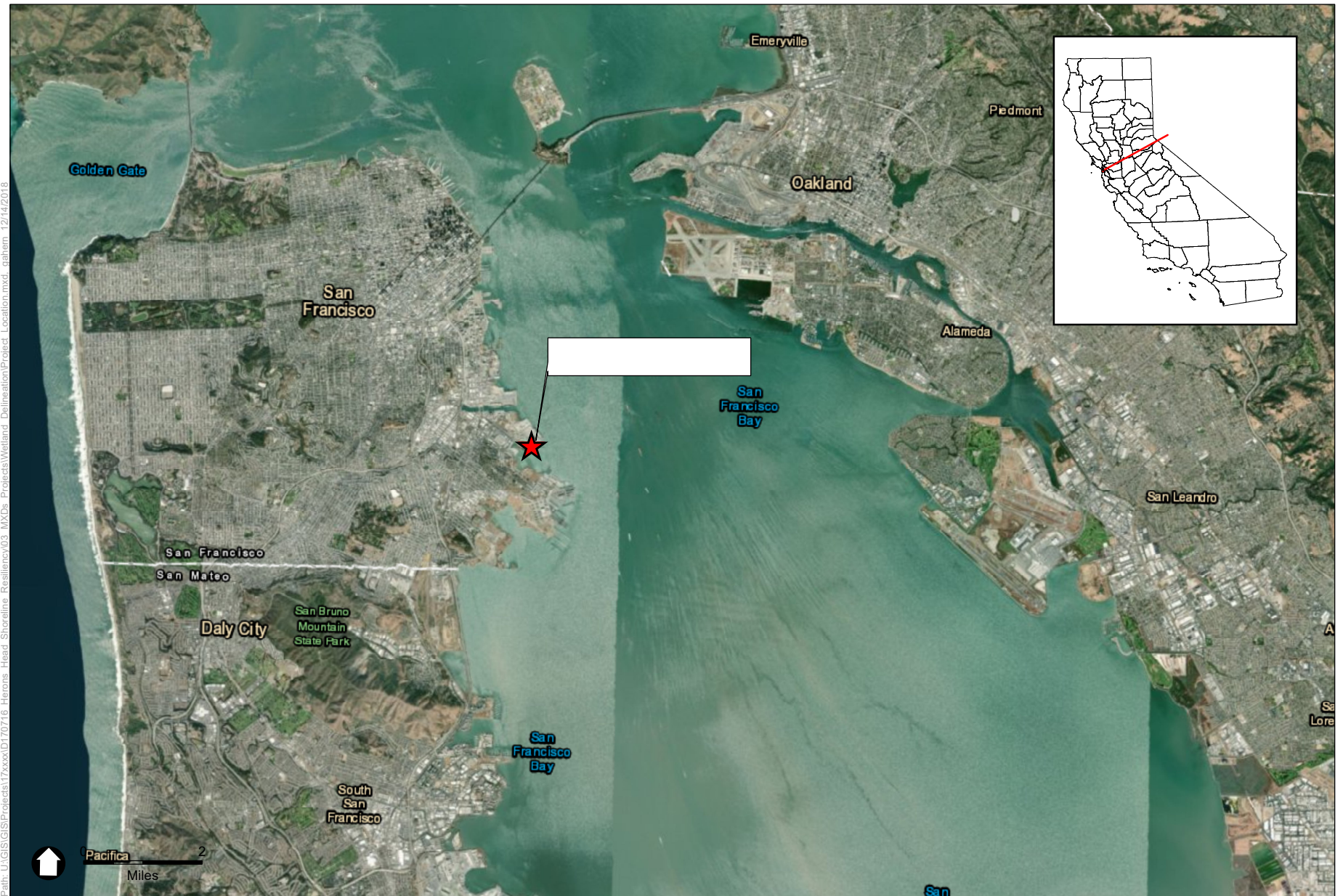
#### Equipment

- Drone or aircraft based aerial photography (as described in Section 4.1)
- Mapping grade GPS for mapping vegetation quadrat locations and for ground-truthing aerial imagery
- 1 m<sup>2</sup> quadrat
- Camera for photo documentation

## **5.0 ADAPTIVE MANAGEMENT ACTIONS**

If monitoring data indicate that performance criteria are not being met, adaptive management actions will be identified and implemented as appropriate and in consultation with the project's Technical Advisory Committee and the applicable resource and regulatory agencies. The actions taken will depend on the specific circumstances and objectives and may include modification of physical features or substrates, measures to limit invasive species, measures to enhance target vegetation, or other interventions deemed appropriate and necessary. Examples of these measures include, but are not limited to, actions such as those below:

- Lowering the beach berm at the tidal channel inlet if the berm impedes tidal flow. Hand-labor or other non-mechanized means would be used to minimize disturbance
- Adding gravel if appropriate to increase the level of shoreline protection, if this can be done using water-based access
- Replacement of California seablite (and/or other native wetland vegetation) plantings that die within the 5-year monitoring period
- Control of invasive plants in planted areas during the 5-year monitoring period. Invasive plant control actions will be guided by a long-term shoreline vegetation plan being developed as part of a separate but coordinated native plant restoration effort undertaken by the Port.

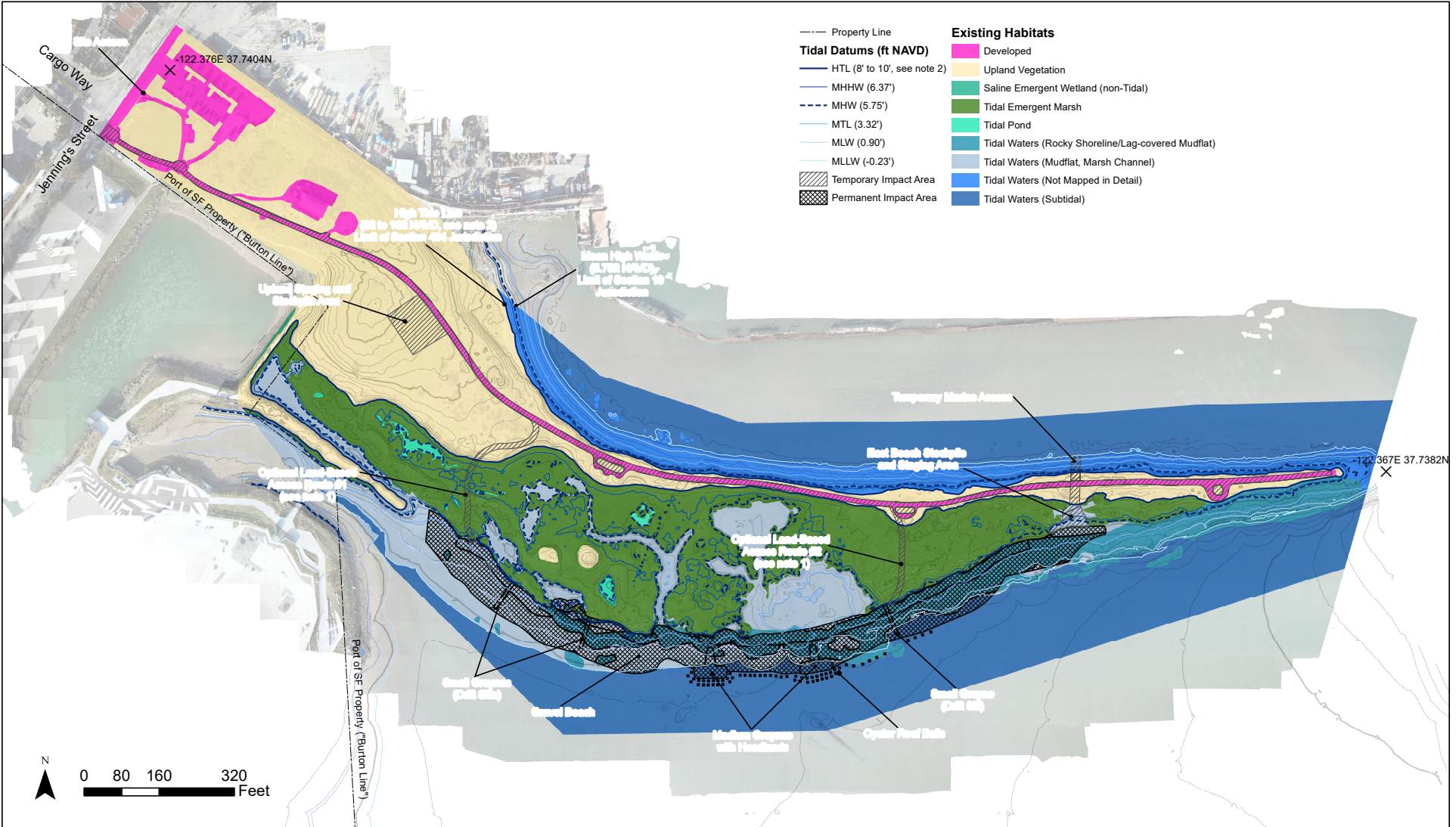


SOURCE: aerial (ESRI), study area (ESA 2018)

NOTE: project site located within USGS Hunters Point and San Francisco South Quads

Heron's Head Shoreline Resiliency Project

**Figure 1**  
Project Location



Path: \\sra-01\01\www\data\project\_2017\01\01\00 - Heron's Head Shoreline Resilience Project\05\_Graphics-CB-Monitoring\GIB\Monitoring\Part\Figure\_2\_Existing Habitats and Project Elements\_v2.mxd, advised 4/29/2020

SOURCE: ESRI (background imagery)  
 Prepared by E. Divita (ESA) on April 8, 2020. Based on Wetland Delineation Prepared by ESA (2019)  
 NOTES:  
 1) Contractor may use up to one of the two optional land-based access routes marked on this drawing.  
 2) High Tide Line (HTL) varies from approximately elevation 8ft to 10ft NAVD due to variation in wave exposure and tidal connectivity across the site.

Heron's Head Shoreline Resilience Project Name



**Figure 2**  
 Existing Habitats  
 and Project Elements

**Table 1: Monitoring Schedule**

<b>Monitoring Element</b>	<b>Year 0<sup>1</sup></b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Year 6</b>	<b>Year 7</b>	<b>Year 8</b>	<b>Year 9</b>	<b>Year 10</b>
Physical condition and processes (visual/photo-documentation)	X	X	X	X	X	X	X	X	X	X	X
Physical condition and processes (mapping, quantitative)	X		X		X		X		X		X
Oyster colonization		X	X	X	X	X		X			X
California seablite	X	X	X	X	X	X					
Avian species		X	X	X	X	X					
Marsh vegetation (qualitative)		X	X	X	X	X					
Marsh vegetation (mapping, quantitative)		X		X		X					

<sup>1</sup> Year of construction/installation

**Table 2: Monitoring Program Summary**

<b>METRICS</b>	<b>METHODS</b>	<b>EQUIPMENT</b>	<b>TIMING</b>
<b>Beach Performance, Shoreline Erosion, Tidal Marsh/Pond Preservation</b>			
Physical condition of tidal marsh, tidal ponds, beach, groynes, oyster reef elements	Visual observation/photo documentation	Camera	Post-construction (Year 0, w/in 3 months of completion)  Annual (years 1 through 10)
Occurrence of new eroding marsh scarp formation	Visual survey, mapping, photodocumentation	Mapping grade GPS, camera	Annual (years 1 through 10)
Photo-documentation of field markers to detect significant wave events	Visual observation/photo documentation	Field markers, camera	
Elevations of beach berm, groynes, and oyster reef elements	Ground survey	RTK GPS or Total Station	Post-construction (Year 0, w/in 3 months of completion)
Change in volume of beach (cubic yards per linear foot) along the length of shoreline	DEM differencing analysis	Drone or aircraft-based photography and topographic survey, CAD and/or GIS software	Years 2, 4, 6, 8 and 10 (unless off-year monitoring is triggered by a significant wave event)
Estimated rates of longshore and cross-shore transport of beach sediment	Interpretation of DEM differencing analysis and site observations		
Areal extent of beach, tidal marsh, and tidal flats; location/movement of field markers	Aerial photo and topographic survey		
Water levels in ponds at low tide	Photo documentation with coincident water surface elevation survey	RTK GPS or Total Station, camera	
<b>Colonization of Oyster Reef Elements</b>			
Density of adult and juvenile oysters	Count on 10 shells per bag and w/in quadrats	Sample shell bags, 10 cm <sup>2</sup> quadrats	June or July of years 1, 2, 3, 4, 5, 7 and 10
Size distribution of adult oysters	Measure longest shell dimension in mm	Digital caliper	
Percent cover of oysters, percent cover of other sessile epifauna	Estimate on 10 shells per bag and w/in quadrats	Sample shell bags, 10 cm <sup>2</sup> quadrat, 10 cm <sup>2</sup> point-intercept grid	
Percent cover of marine flora	Visual estimate	Visual observation	
Percent native/non-native taxa	Count on 10 shells per bag and w/in quadrats	Sample shell bags, 10 cm <sup>2</sup> quadrats	



**Table 2: Monitoring Program Summary**

<b>METRICS</b>	<b>METHODS</b>	<b>EQUIPMENT</b>	<b>TIMING</b>
<b>California Seablite</b>			
Location of assemblages	Record locations	Mapping grade GPS	Initial survey in fall after planting
Areal extent of seablite	Measure length/width in cm	Meter stick	Twice annually in late winter and fall (years 1, 2, 3, 4, and 5)
Height of plants	Measure height in cm	Meter stick	
Percent survival of plantings	Count live/dead plants w/in planted areas	Visual observation	
Proportion of flowering branches	Visual estimate	Visual observation	
Condition of arbors	Visual assessment	Visual observation	
Overall condition	Photo documentation	Camera	
<b>Avian Species</b>			
Abundance and species richness	Record number of individuals of each species observed	Spotting scope, binoculars, mapping grade GPS for mapping observation points	Quarterly (years 1, 2, 3, 4 and 5)
Behavioral observations	Record all behaviors observed; note observed species/taxonomic group associations with sub-habitats		
<b>Marsh Vegetation</b>			
Overall condition	Visual survey, photo documentation	Camera	Annual (years 1, 2, 3, 4 and 5)
Areal extent of tidal marsh vegetation by cover class	Aerial photo interpretation, ground truthing	Drone or aircraft-based aerial photography; ground survey	Bi-annual (years 1, 3 and 5)
Total percent cover	Measure in quadrats along beach crest, and w/in tidal marsh, revegetated areas, restoration plantings	1 m <sup>2</sup> quadrat	
Relative percent cover by species			
Percent native/non-native species			
Species richness			
Mean cover height			
Cover density			
Percent cover of invasive <i>Limonium</i> and other invasive plant species			