

## *San Francisco Estuary Partnership*

### **Transforming Shorelines: Advancing nature-based solutions and building capacity for innovative approaches linked to wastewater treatment.**

Project Coordinates: 37.669516, -122.158449

Funding Information: \$1,481,109 (EPA) + \$1,481,109 (Required Nonfederal Match) = \$2,962,218 (Total Project Cost)



## Background

The Transforming Shorelines project will create critical linkages between wastewater treatment, resilience to sea level rise and water quality improvement. The project intends to foster collaboration among engineers, designers, regulators, planners, managers and researchers to support innovative, multi-benefit solutions. Transforming Shorelines will develop much-needed tools allowing audiences to use best available science to improve design, permitting and implementation of nature-based multi-benefit projects. It will also advance design, permitting and implementation of a suite of nutrient management, sea level protection, water quality improvement and habitat enhancement projects around the San Francisco Bay.

The resulting outputs of this 4 year project includes two “shovel ready” multi-benefit projects of regional importance, and feasibility and conceptual designs at an additional site. The implementation of a full-scale nitrification facility at the Oro Loma Sanitary District will result in 250,000 kg per year of Nitrogen not discharged into the San Francisco Bay. Long-term outcomes of Transforming Shorelines include implementation of three (3) nature-based wastewater treatment structures reducing the nitrogen load to the Bay by 15 million kg in the next 20 years. Long-term outcomes also include the creation of 19.5 acres of riparian scrub/wet meadow habitat along a mile-long Horizontal Levee, and 149 acres of treatment wetland habitat.

## Project Goals and Objectives

Transforming Shorelines will (1) build regional capacity for nature-based solutions (NBS) through technical support and analyses; (2) advance a suite of NBS projects through design, permitting and implementation, and; (3) advance state of the art water quality improvement approaches at the Oro Loma Horizontal Levee site.

## Deliverables and Work Products

### Task 1. Build Regional Capacity for Advancing Nature-based Solutions (NBS)

#### 1a Establish and Manage the Transforming Shorelines Collaborative (TSC)

Establish the Transforming Shorelines Collaborative (TSC), a forum for practitioners and experts on NBS, wastewater treatment, resiliency and nutrient management that may include regulators, landowners and stakeholders, individual POTWs, regional entities, designers and practitioners/experts involved in habitat restoration, treatment wetlands, or shoreline resilience. The TSC will meet twice a year to coordinate on project design, feasibility studies, monitoring, research findings, and implementation.

Deliverable: TSC meeting agendas and participant rosters. Completed by: February 2023

#### 1b Regional Roundtables

Regional roundtables will be part of the TSC meetings cycle and will be dedicated to working on focused topics of interest. These “workshop-type” events will provide a forum for the TSC and practitioners around the Bay to share ideas and lessons learned on challenges/opportunities associated with design, monitoring, funding, permitting, construction, and maintenance of NBS. The project team will host a minimum of two roundtables.

Deliverable: Roundtable meeting agendas and participant rosters. Completed by: February 2023

#### 1c Toolkit

Develop a toolkit synthesizing lessons learned and best practices for NBS projects, and provide technical analyses on topics of greatest interest to project proponents, including economic cost-benefit, social equity, regulatory challenges, maintenance costs and other considerations. Specific resources to be developed include: a Cost/Benefit Analysis Tool to analyze the short and long term costs and benefits of NBS as compared to “gray” infrastructure; equity analysis; and Best Management Practices for Design and Implementation of NBS. The final products will be accessible on a website.

Deliverable: Nature-based shoreline infrastructure toolkit. Completed by: December 2022

## Task 2. Design & Implementation at POTWs

### 2a Design: East Bay Dischargers Authority 1st Mile

Design and seek permits for the first full-scale application of a multi-benefit vegetated levee receiving nitrified secondary-treated wastewater. As the name suggests, the “First Mile” project is approximately one mile long, and in addition to providing water quality and habitat-related benefits, the project will enhance flood protections to inland communities. The project will result in a feasibility study and minimum 80% design as well as pursuit of full permitting of a mile long horizontal levee along the San Leandro Shoreline between San Lorenzo Creek and Estudillo Canal.

Deliverable: EBDA First Mile design and environmental documents. Completed by: January 2023

### 2b Design: Nature based solutions at San Leandro Water Quality Control Plant

The City of San Leandro is working to prepare detailed designs, permit applications, and environmental documentation for the restoration of a 4.3-acre wastewater storage basin to create a multi-benefit treatment wetland at the City of San Leandro’s Water Pollution Control Plant (WPCP), and develop a community-based shoreline resiliency and tidal marsh restoration vision for the surrounding area. The work to be completed will focus on the 80% design drawings, and will be contributed in the form of match from a project funded by the SF Bay Restoration Authority. The TSC will review and provide input at critical design phases.

Deliverable: San Leandro case study. Completed by: July 2020

### 2c Feasibility Study: Hayward

The City of Hayward owns 145-acre of wet weather effluent storage ponds and 4,000-ft of levee adjacent to the Bay at the City’s Water Pollution Control Facility (WPCF). The City is evaluating the feasibility of seasonally converting the existing ponds and levee into a multi-benefit NBS shoreline infrastructure capable of removing wastewater-borne nitrogen, heavy metals, and contaminants of emerging concern while maintaining the current storage function during wet weather flows. The TSC will review and provide input at critical phases.

Deliverable: Completed feasibility study. Completed by: December 2021

### 2d Implementation: Nutrient reduction to facilitate nature-based solutions at Oro Loma

The Oro Loma Sanitary District will achieve nutrient management goals in part through implementation of a new treatment process to convert close to 80% of the ammonia received by the treatment plant into nitrate. After the nitrification system is installed, internal recycle pumps will be used to recycle a portion of the flow to the treatment plant’s existing anaerobic chamber. This will result in conversion of about half of the total nitrogen to nitrogen gas, thus reducing this POTW’s nitrogen loads to the Bay by ~50%, assuming a 20-year planning period, a 1% annual growth rate, and that influent ammonia concentrations remain constant.

Deliverable: Construction memo with photos. Completed by: December 2021

## Task 3: Oro Loma Outdoor Laboratory Implementation of Additional Strategies

### 3a Water Quality Monitoring

Further water quality monitoring samples will be collected at the Oro Loma Experimental Horizontal Levee to assess the performance of the mature plants to continue to provide organic carbon to the subsurface as the woodchips added during construction are consumed by microbes. Monitoring data will also be used to elucidate the importance of operational variables (e.g., flow rate) on contaminant removal and to identify appropriate maintenance strategies. In addition, water samples will be collected from other locations within the wetland to evaluate changes in biogeochemistry and to identify transformation mechanisms of contaminants.

Deliverable: Water quality results and recommendations. Completed by: January 2023

### 3b Optimization and Monitoring of New Horizontal Levee Configurations

Monitoring will be expanded to test a number of different strategies to pursue optimization of the horizontal levee. This research will be led by Dr. David Sedlak (UC Berkeley) and his graduate students, who will work in conjunction with Oro Loma staff members and the project Core Team. This task may study the input of Reverse Osmosis Concentrate in the system and monitor progress of the wetland transition to higher strength effluent. This task will include budget resources allocated to development of a Quality Assurance Project Plan (QAPP) if required by EPA.

Deliverable: Summary of findings and recommendations; QAPP. Completed by: October 2022

## Task 4: Project Management and Reporting

The San Francisco Estuary Partnership will take the lead on project management, administration, and reporting for this project.

Deliverable: Semi-annual reports, final report, contracting and invoicing. Completed by: Ongoing

## Match Funding

Sources of match for this project include: \$50,000 from the San Francisco Estuary Institute in funding from the Spitzer Trust (a national philanthropic foundation) for coordination of Task 1, including integration of the OLU work, \$80,000 from the City of San Leandro from the SF Bay Restoration Authority for the San Leandro Treatment Wetland project, \$50,000 from the City of Hayward in the form of staff support and participation in the TSC and Feasibility Study, and \$1,301,109 provided by the Oro Loma Sanitary District, which comes from funding for construction of Task 2d.

Reporting Requirements: Semi-annual reports

## Budget Detail and Timeline

<b>Budget Detail Table</b>					
<b>Completion Date</b>	<b>Task</b>	<b>Implementing Entity</b>	<b>Grant Amount</b>	<b>Match</b>	<b>Outputs/Deliverables</b>
<b>Task 1: Build Regional Capacity for Advancing NBS</b>					
Feb 2023	1a Establish the Transforming Shorelines Collaborative (TSC)	SFEP, in partnership with entities listed in Task 1a.	\$ 163,087	\$ 50,000	TSC meeting agendas and participant rosters
Feb 2023	1b Regional Roundtables	SFEP, SFEI, Consultants	\$ 73,624	\$ -	Roundtable meeting agendas and participant rosters
Dec 2022	1c Toolkit	SFEP, Consultants	\$ 264,247	\$ -	Nature-based shoreline infrastructure toolkit
<b>Task 2: Design &amp; Implementation at POTWs</b>					
Jan 2023	2a Design: East Bay Dischargers Authority 1st Mile	EBDA, City of San Leandro, OLSD, SFEP	\$ 637,538	\$ -	EBDA First Mile design and environmental documents
Jul 2020	2b Design: Nature based solutions at San Leandro Water Quality Control Plant	City of San Leandro	\$ -	\$ 80,000	San Leandro case study
Dec 2021	2c Feasibility Study: Hayward	City of Hayward	\$ 50,000	\$ 50,000	Completed feasibility study
Dec 2021	2d Implementation: Nutrient reduction to facilitate nature-based solutions at Oro Loma	OLSD	\$ -	\$ 1,301,109	Construction memo with photos
<b>Task 3: Oro Loma Outdoor Laboratory Implementation of Additional Strategies</b>					
Jan 2023	3a Water Quality Monitoring	ReNUWit, UC Berkeley, OLSD	\$ 9,793		Water quality results and recommendations
Oct 2022	3b Optimization and Monitoring of New Horizontal Levee Configurations	ReNUWit, UC Berkeley, OLSD, SFEI, SFEP	\$ 132,642	\$ -	Summary of findings and recommendations; QAPP
<b>Task 4: Project Management and Reporting</b>					
Ongoing	4a Project management, administration, and reporting	SFEP	\$ 150,179	\$ -	Semi-annual reports, final report, contracting and invoicing
<b>Grand Total</b>			<b>1,481,109</b>	<b>1,481,109</b>	

## Environmental Outcomes

Outputs	Short-Term Outcomes: 1-5 years	Long-Term Outcomes: 5-20+ years
<p>EBDA First Mile Horizontal Levee “shovel ready” (Conceptual &amp; final design, CEQA &amp; permitting)</p> <p>San Leandro Treatment Wetland “shovel ready” (Conceptual &amp; final design, CEQA &amp; permitting)</p> <p><b>Construction</b> of a nitrification facility for nutrient reduction at Oro Loma</p> <p>Placement of <b>Reverse Osmosis concentrate</b> on up to 3 experimental cells at the Oro Loma Horizontal Levee</p> <p>Monitoring data &amp; <b>impacts</b> of RO concentrate on water quality, soils, and vegetation cover over 4-years</p> <p><b>Presentation of monitoring results</b>, findings and recommendations in at least 2 forums and/or conferences</p> <p><b>Water Quality Benefits Report</b> from advanced monitoring and study at Oro Loma</p> <p>Hayward Treatment Wetlands Feasibility analysis, <b>conceptual design</b>, hydraulic calculations &amp; estimated cost</p> <p>Transforming Shorelines Toolkit including: Design, Implementation &amp; Long-term Maintenance <b>BMP Manual, Cost-Benefit Analysis, Social Equity Analysis, Website</b></p> <p>Transforming Shoreline Multi-Stakeholder <b>Collaborative</b></p> <p>2+ <b>Regional Roundtables</b></p> <p>QAPP, QA/QC (as needed)</p> <p>Quarterly Progress Reports</p> <p>Final Project Report</p>	<p><b>Reduce</b> Oro Loma’s ammonia load by 80% and total nitrogen load to the Bay by ~40% (min.)</p> <p>Convert 1.280 kg of ammonia to nitrate per day from Oro Loma, or <b>~2.5 million kg in five years</b></p> <p>Reduce total nitrogen load by 675 kg per day from Oro Loma, or <b>~1.2 million kg in five years</b></p> <p>Five years of <b>water quality data</b>, leading to improved design and operation of future NBS, including application of RO concentrate for beneficial uses on a larger scale</p> <p>Wider and more frequent interactions among stakeholders during a minimum of <b>six (6) Collaborative roundtable events</b> to address challenges of implementing NBS for shoreline resilience (i.e. permitting, fundraising, governance)</p> <p>Designs and permitting for <b>two (2) NBS projects</b> suitable for subsequent implementation, and feasibility analyses for <b>one (1) project for evaluation</b>, design and permitting</p> <p>Establishment of integrated permitting strategy for a minimum of <b>two (2) site-specific NBS projects</b> that achieve multiple environmental priorities more rapidly and cost-effectively, while ensuring project implementation &amp; deliver appropriate oversight</p>	<p>Creation of <b>19.5 acres</b> of riparian scrub/wet meadow habitat along a mile-long horizontal levee, and <b>149 acres</b> of treatment wetland habitat.</p> <p>Remove pollutants from <b>up to 16.5 mgd</b> of treated wastewater effluent</p> <p>By year 20, reduction in Nitrogen loads to the San Francisco Bay totaling approximately <b>15 million kg of nitrogen</b></p> <p>Transfer results to other POTW for <b>treatment of higher strength effluent and RO concentrate</b></p> <p><b>Minimized impacts</b> of discharging RO concentrate to the Bay</p> <p><b>Monitoring program</b> to quantify environmental, economic &amp; social outcomes (e.g. habitat, water quality, jobs, project costs, cost sharing)</p> <p><b>Flood protection</b> for the Mission Bay mobile home park and other surrounding areas of San Leandro (641 people, based on Hazus modeling, with <b>\$21.5 million</b> in potential economic losses, assuming 1 meter of SLR and 100-year storm event)</p>

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