



**SCAPE**

**ARCADIS**

**CONVEY**

**RE:FOCUS**

**SFEI**

# **HAYWARD REGIONAL SHORELINE MASTER PLAN**

**FOR THE HAYWARD AREA SHORELINE PLANNING  
AGENCY (HASPA)** PART OF A JOINT POWERS AGREEMENT OF COH, HARD AND EBRPD

**TASK 5**

**DRAFT DESIGN ALTERNATIVES**

**DRAFT SUBMITTED 03/31/2020**

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Bay Trail and Tidal Channel at Hayward Landing Canal

# EXECUTIVE SUMMARY

The Hayward Regional Shoreline Master Plan was commissioned in 2019 by the Hayward Area Shoreline Planning Agency. The Master Plan will serve as a guide to the protection of important features along the Hayward shoreline that are vulnerable to sea level rise. The shoreline is home to critical urban infrastructure, including wastewater treatment plants, the San Mateo-Hayward Bridge (State Route 92) approach, and landfills. The project area also supports ecological bayland resources, hosts recreational opportunities along the San Francisco Bay Trail, and facilitates educational programming for adjacent residential neighborhoods and businesses. The Master Plan will develop various multi-benefit strategies for the shoreline, its existing infrastructure, and the surrounding natural habitat.

In accordance with the scope of work outlined for Task 5 – Draft Master Plan, the Project Team has prepared a "Design Alternatives Report". The Project Team has considered the full project area of the Hayward Regional Shoreline Master Plan, stretching nearly four miles from San Lorenzo Creek south to State Route 92, to produce three comprehensive Design Alternatives to help the shoreline adapt to climate change.

Each Design Alternative proposes a suite of projects and interventions that would ultimately meet the project goals while reducing risk and enhancing the ecological value of the Hayward Shoreline. The Project Team does not assume that one of the alternatives will be selected for further analysis in the final Master Plan but rather anticipates that discrete elements and projects from each alternative will be combined into a hybrid preferred alternative.

This report provides HASPA and stakeholders with the opportunity to compare the design alternatives to one another in order to inform the preferred alternative selection process.

## Document Summary

### Introduction

This section summarizes the Design Alternatives Selection process. It also presents the Master Plan Assumptions that guide the design and planning process.

### Design Alternatives

Based on stakeholder and client feedback, three design alternatives were identified that combine a suite of adaptation strategies that were identified as part of Task 4. The spatial configuration and selection of strategies will be evaluated through these three alternatives and refined based on further client and stakeholder feedback. After the three alternatives are evaluated, a preferred hybrid Preferred Alternative will be selected based on the preferred combination and selection of adaptation strategies.

### Evaluation Points & Comments

This section outlines the evaluation criteria that help compare the three design alternatives. It also provides worksheets to record consolidated client and stakeholder feedback.

We invite you to use the worksheets to consolidate your feedback and comments on the three Design Alternatives.

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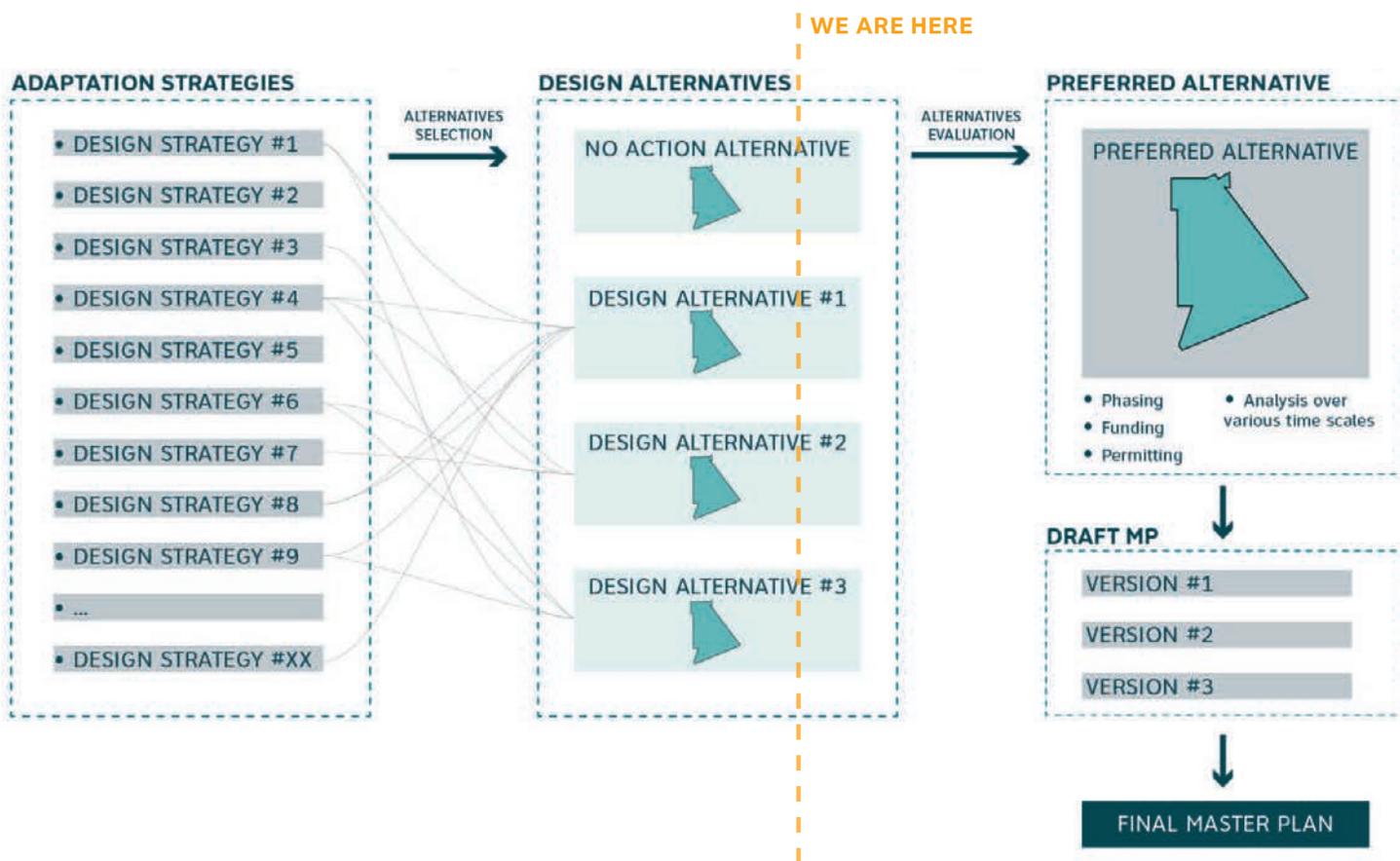
# INTRODUCTION

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# MASTER PLAN PROCESS

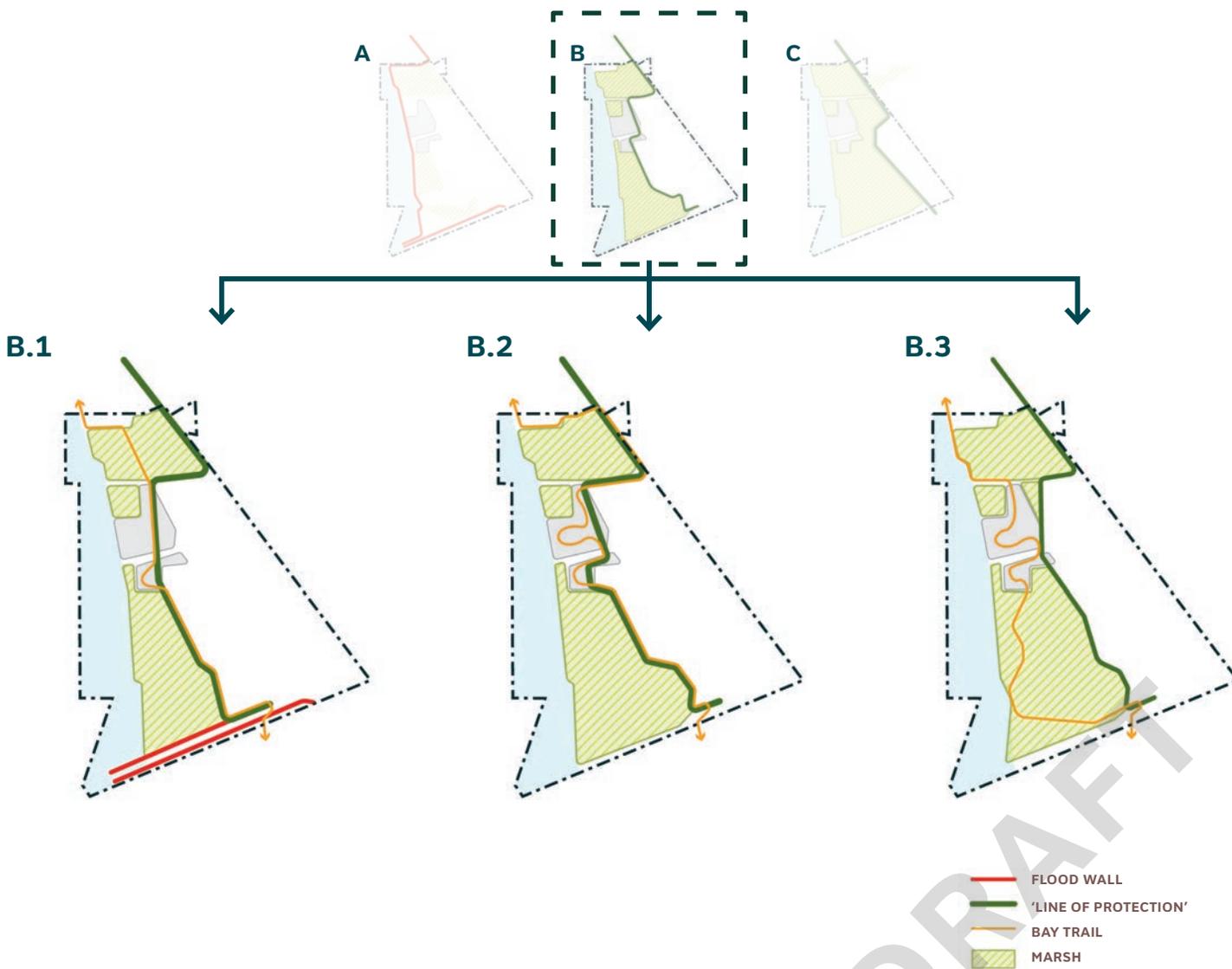
In accordance with the scope of work outlined for Task 4 – Goals and Policies and Adaptation Strategies and Implementation Actions, the Project Team has prepared an Adaptation Report for the study, producing a catalog of potential design strategies to help the shoreline adapt to climate change. The feasibility and applicability of these strategies as outlined in the report considered each strategy in isolation from every other strategy. As part of Task 5 - Design Alternatives, and based on client and stakeholder feedback, the strategies were combined into three comprehensive Design Alternatives. The Project Team does not assume that one of the alternatives will be selected for further analysis in the final Master Plan but rather anticipates that discrete elements and projects from each alternative will be combined into a hybrid preferred alternative. The Preferred Alternative will then be further analyzed and specific projects will be identified as part of the final Master Plan.

Design alternatives selection process:



# DESIGN ALTERNATIVES SELECTION PROCESS

Based on stakeholder and client feedback, the Project Team has identified three Design Alternatives that represent a balanced approach to mitigate the effects of Sea Level Rise to the Hayward Shoreline. Although considered, a full perimeter protection at the bay's edge and a full retreat scenarios were discarded because of cost implications, permitting and feasibility challenges, and lack of overall support. The Project Team focused on developing three balanced alternatives that were informed by a wide variety of client and stakeholder feedback. Those three alternatives are presented in this report.



# PROJECT GOALS

## PROJECT STATEMENT:

The Hayward Regional Shoreline Master Plan creates a framework for resilience to prepare for sea level rise (SLR), groundwater intrusion, and storm surge. The Master Plan is being managed by the Hayward Area Shoreline Planning Agency (HASPA), a joint power authority including the City of Hayward, Hayward Area Recreation and Park District (HARD), and East Bay Regional Park District (EBRPD).

The Hayward Regional Shoreline Master Plan project area is bounded on the north by the Bockman Channel (also called the Bockman Canal) and extends approximately 3.25 miles south to the State Route 92 San Mateo Bridge approach. The extent of the project area into the Bay was defined by the outermost limit of the Hayward Area Shoreline Planning Agency Jurisdictional boundary, and the inland extent of the project area are drawn at the Union Pacific Rail Corridor. In total, the project area covers six square miles of various land uses, including open space, urban infrastructure, industrial, and residential.

The project area supports ecological bayland resources, hosts recreational opportunities along the San Francisco Bay Trail, and facilitates educational programming for adjacent residential neighborhoods and businesses at the Hayward Shoreline Interpretive Center. The shoreline is also home to critical urban infrastructure, including wastewater treatment plants, the San Mateo-Hayward Bridge approach (State Route 92), and landfills. The Master Plan will develop various multi-benefit strategies for the shoreline, its existing infrastructure, and the surrounding natural habitat. The Master Plan will consider multiple planning time horizons and sea level rise scenarios. Additionally, it will consider a range of adaptation strategies that can evolve and respond over time to changing sea levels.

The Shoreline Master Plan encompasses four goals.

## **PROJECT GOALS**

### **Create a Resilient Shoreline Environment for People and Ecology**

- Enhance the shoreline’s ecological value and adapt to sea level rise
- Enhance recreational opportunities and adapt to climate change
- Create a management framework for adapting to sea level rise over time
- Provide refuge to help endangered shoreline species to adapt climate change

### **Enhance the Shoreline Environment to Reduce Risk to Critical Infrastructure and Built Assets**

- Align with and enhance existing management and capital improvement plans
- Reduce risk to regional critical utilities from sea level rise, groundwater intrusion, and flood events
- Reduce risk to transportation infrastructure from sea level rise, groundwater intrusion, and flood events
- Reduce risk to agency assets such as the San Francisco Bay Trail and marsh restoration project(s)

### **Build Social Resilience in the Community**

- Promote social equity, environmental justice, and public health
- Preserve the local economy and increase resilience to climate change
- Prevent the disruption of key community services

### **Build Capacity for Future Generations to Adapt to climate change**

- Build organizational and community capacity
- Provide a place for education, interpretation and understanding of the shoreline and climate change
- Foster stewardship of the shoreline’s cultural and ecological resources

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# MASTER PLAN ASSUMPTIONS

## Overarching Assumptions

The Master Plan Assumptions will help inform the planning process moving forward. They summarize client and stakeholder feedback and set a framework to generate and compare the Design Alternatives.

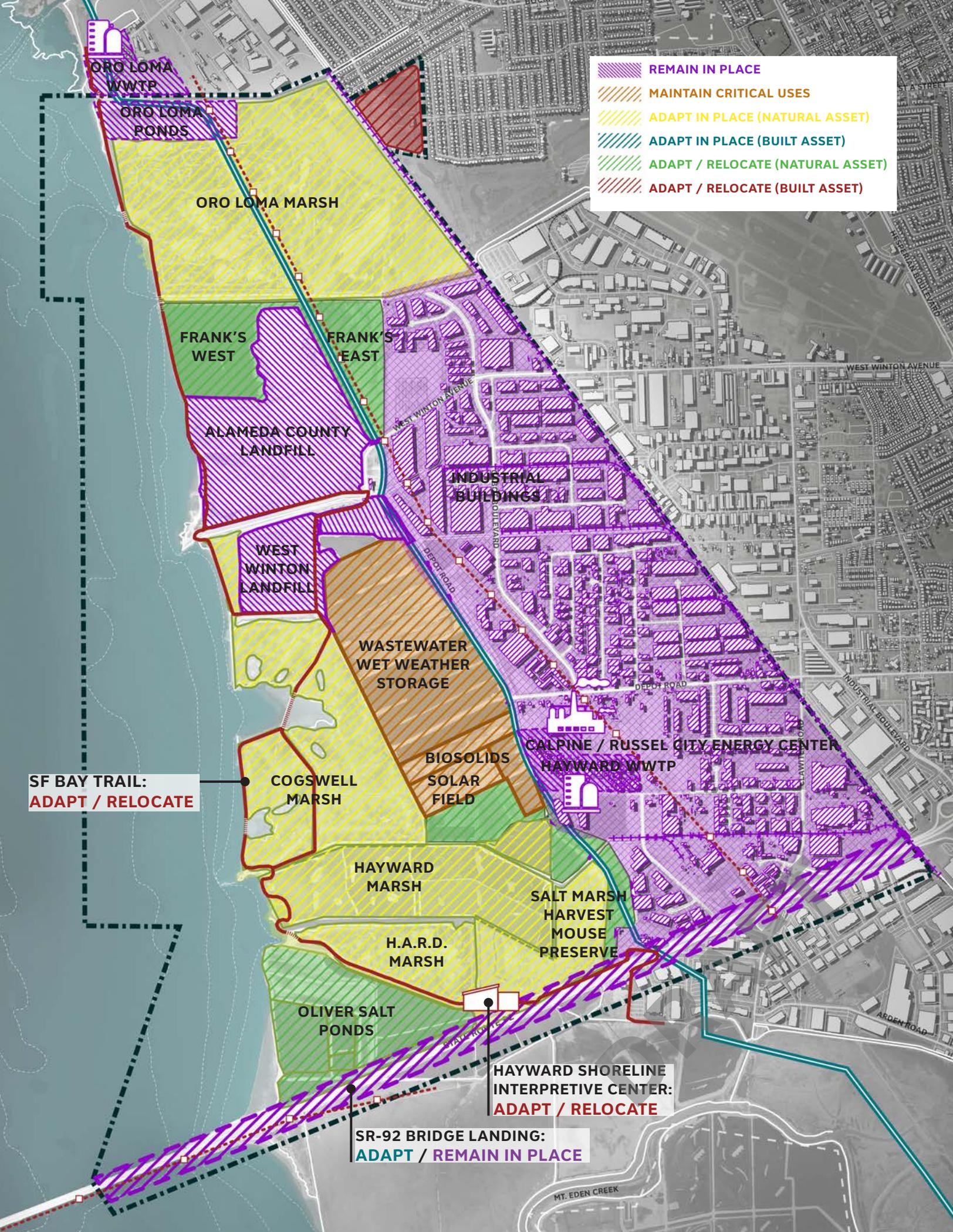
- The plan assumes **little change to the urban fabric** (streets, buildings), **economy, land use, and critical built infrastructure** on the site over the planning horizon.
- The plan is considering a **perimeter protection approach to critical assets** and an **adaptation approach to shoreline ecosystems**.
- Non-structural strategies, such as retreat and land elevation, are not articulated in this plan, although they will be layered on to further reduce risk, and would likely be required to adapt to a higher SLR scenario long-term.
- The intent is to **reduce risk to critical assets from daily tidal inundation up to 4' of SLR** on top of the current mean higher high tide.
- For evaluation purposes of the line of protection, the Design Alternatives consider at a **target elevation of 14.3"** (NAVD 88)

SLR	MHHW + SLR	MHHW + SLR + 100 YEAR STORM	MHHW + SLR + 100 YEAR STORM + 2' FREEBOARD	MHHW + SLR + 500 YEAR STORM
0'	7'	10.3'	12.3'	11.3'
2'	9'	12.3'	14.3'	13.3'
4'	11'	14.3'	16.3'	15.3'
7'	14'	17.3'	19.3'	18.3'

- The plan is based on adapting the project area over a **mid-range time frame**. Based on State guidance this time frame is estimated to be between 50 and 60 years long.

Table 8: Sea level rise increments by time horizon and level of risk aversion, based on the California Coastal Commission recommendations.

# Years from now	Year	Identifies areas that...	17% Prob. SLR meets or exceeds	5% Prob. SLR meets or exceeds	0.5% Prob. SLR meets or exceeds	
			Low Risk Aversion	Medium Risk Aversion	Medium High Risk Aversion	
10	2030	are at <b>immediate</b> flood risk	0.5	0.6	0.8	
20	2040		0.8	1.0	1.3	
30	2050		1.1	1.4	1.9	Up to 2 ft
40	2060	risk	1.5	2.0	2.6	
50	2070		1.9	2.4	3.5	
60	2080		2.4	3.0	4.5	Up to 4.5 ft
60	2080	Will be <b>potentially</b> flooded	2.4	3.0	4.5	Up to 4.5 ft
70	2090		2.9	3.6	5.6	
80	2100		3.4	4.4	6.9	Up to 7 ft
90	2110		3.5	4.5	7.3	
100	2120		4.1		8.6	



- REMAIN IN PLACE**
- MAINTAIN CRITICAL USES**
- ADAPT IN PLACE (NATURAL ASSET)**
- ADAPT IN PLACE (BUILT ASSET)**
- ADAPT / RELOCATE (NATURAL ASSET)**
- ADAPT / RELOCATE (BUILT ASSET)**

**SF BAY TRAIL:**  
**ADAPT / RELOCATE**

**HAYWARD SHORELINE INTERPRETIVE CENTER:**  
**ADAPT / RELOCATE**

**SR-92 BRIDGE LANDING:**  
**ADAPT / REMAIN IN PLACE**

**ORO LOMA WWTP**

**ORO LOMA PONDS**

**ORO LOMA MARSH**

**FRANK'S WEST**

**FRANK'S EAST**

**ALAMEDA COUNTY LANDFILL**

**INDUSTRIAL BUILDINGS**

**WEST WINTON LANDFILL**

**WASTEWATER WET WEATHER STORAGE**

**BIOSOLIDS SOLAR FIELD**

**CALPINE / RUSSEL CITY ENERGY CENTER  
HAYWARD WWTP**

**COGSWELL MARSH**

**HAYWARD MARSH**

**SALT MARSH HARVEST MOUSE PRESERVE**

**H.A.R.D. MARSH**

**OLIVER SALT PONDS**

WEST WINTON AVENUE

WEST WINTON AVENUE

OUTLETTARD

DEPOT ROAD

DEPOT ROAD

INDUSTRIAL BOULEVARD

ARDEN ROAD

MT. EDEN CREEK

# MASTER PLAN ASSUMPTIONS

## Site Assets & Planning Assumptions

This table summarizes Master Plan and planning assumptions for key shoreline assets.

	ASSET	PLANNING ASSUMPTION
WASTEWATER INFRASTRUCTURE	Oro Loma WWTP	<ul style="list-style-type: none"> <li>Remain in place</li> </ul>
	Hayward WWTP	<ul style="list-style-type: none"> <li>Remain in place</li> </ul>
	Wastewater Wet Weather Storage	<ul style="list-style-type: none"> <li>Maintain critical uses</li> </ul>
	Biosolids Management, Aging, Drying	<ul style="list-style-type: none"> <li>Maintain critical uses</li> </ul>
	Solar Field	<ul style="list-style-type: none"> <li>Maintain critical uses</li> </ul>
	EBDA Pipeline	<ul style="list-style-type: none"> <li>Adapt - decommission over time</li> </ul>
TRANSPORTATION INFRASTRUCTURE	SR-92 Bridge Landing	<ul style="list-style-type: none"> <li>Remain in place / adapt</li> </ul>
	Union Pacific Rail Corridor	<ul style="list-style-type: none"> <li>Remain in place</li> </ul>
	Street Grid	<ul style="list-style-type: none"> <li>Maintain access to industrial zone from inland roads</li> <li>Maintain ingress and egress to surrounding residential neighborhoods</li> </ul>
ENERGY INFRASTRUCTURE	Transmission Lines	<ul style="list-style-type: none"> <li>Adapt / Relocate</li> </ul>
	Jet Fuel Pipeline	<ul style="list-style-type: none"> <li>Remain in place - avoid disturbing function and use</li> </ul>
	Natural Gas Pipeline	<ul style="list-style-type: none"> <li>Remain in place - maintain access</li> </ul>
COMMUNICATION INFRASTRUCTURE	Fiber Optics	<ul style="list-style-type: none"> <li>Remain in place - avoid disturbing function and use</li> </ul>
BUILDINGS & LAND USE	Industrial Land Use	<ul style="list-style-type: none"> <li>Remain in place- reevaluate at 4' SLR</li> </ul>
RECREATIONAL INFRASTRUCTURE	Bay Trail	<ul style="list-style-type: none"> <li>Adapt / relocate</li> <li>Connect through the site north-south</li> <li>Access the Interpretive Center</li> <li>Connect to trail heads and parking areas</li> <li>Maximize blue water experience</li> </ul>
	Hayward Shoreline Interpretive Center	<ul style="list-style-type: none"> <li>Adapt and decommission over time</li> <li>Relocate</li> <li>Ensure vehicular and pedestrian access and parking</li> <li>Locate along the Bay Trail</li> <li>Locate in proximity to educational opportunities that won't be inundated</li> </ul>
	San Lorenzo Community Center Park	<ul style="list-style-type: none"> <li>Adapt and decommission over time</li> <li>Relocate</li> <li>Ensure vehicular and pedestrian access and parking</li> </ul>
HABITATS & ECOSYSTEMS	Existing Tidal habitat + Hayward Marsh Restoration	<ul style="list-style-type: none"> <li>Adapt to 4' SLR</li> </ul>
	Muted & Managed Marsh	<ul style="list-style-type: none"> <li>Adapt or preserve Salt Marsh Harvest Mouse preserve</li> <li>Adapt or preserve endangered species habitat</li> </ul>
	Salt Ponds	<ul style="list-style-type: none"> <li>Adapt / relocate</li> </ul>
	Seasonal Wetlands	<ul style="list-style-type: none"> <li>Adapt / relocate</li> </ul>
	Mudflats	<ul style="list-style-type: none"> <li>Enhance</li> </ul>
LANDFILLS	Alameda County & West Winton Landfills	<ul style="list-style-type: none"> <li>Remain in place</li> <li>Prevent erosion and seepage</li> </ul>

# EVALUATION POINTS

**In relation to the project goals and in order to help evaluate and compare the three Design Alternatives, the Project Team has defined a list of evaluation points that highlight key elements of the Shoreline Master Plan.**

## Line of Protection

- The line of protection includes a FEMA-certified levee that will reduce risk to inland communities by buffering the shoreline to the impacts of sea level rise and storm surge. The spatial alignment of this levee has multiple implications on cost, maintenance, and what is in or out of the new flood protection infrastructure.

## Tidal Habitat

- The future extent of tidal habitat encompasses tidal habitat and muted tidal habitat, which is a controlled system. The spatial extent of connective blocks of marsh and proportion of tidal versus muted tidal habitat varies amongst the three alternatives.

## Erosion Control

- A layered strategy of erosion control aims to reduce the risk of erosion and shelter inland marshes and ecosystems. Gravel beaches attenuate waves and provide shorebird nesting habitat and revetments provide a more conservative approach to edge stabilization for critical infrastructure.

## Stormwater Management

- Once a line of protection is established, the stormwater and groundwater management inland of the levee system is critical, especially with increased precipitation events and to mitigate impacts of any bathtub effects that are created. A system of detention ponds, tide gates and water control structures, and flood control channels are used to manage stormwater and move it away from inland communities.

## Wastewater Treatment

- The critical uses of wastewater treatment are maintained or enhanced with new multi-benefit infrastructure. Horizontal levees align with the First Mile project and possible future needs for local discharge.

## Bay Trail

- The future location of the Bay Trail prioritizes the blue water experience where possible, maintains a variety of experiences, and aligns with new infrastructure improvements. For all three alternatives, the current alignment of the Bay Trail will be maintained as long as possible (until it is inundated with sea level rise) and connect to the realignment.

## Hayward Shoreline Interpretive Center Relocation

- The future of the Hayward Shoreline Interpretive Center is connected to new infrastructure improvements. A variety of options are explored that locate the center in proximity to new educational opportunities. All three alternatives maintain a link to the Bay Trail.



# **NON- STRUCTURAL STRATEGIES**

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# NON-STRUCTURAL STRATEGIES

A suite of overarching non-structural adaptation strategies will layer onto the preferred Shoreline Master Plan scenario and are separate from the Design Alternatives Analysis. The non-structural strategies outlined below will be further developed in the Master Plan document once a preferred alternative has been defined.

## Groundwater Strategies

- Groundwater flooding has three general mitigation strategies- retreat, elevate land, or drain
- The three design alternatives will rely on drainage / pumping to manage groundwater
- A subsurface drainage network would help drain groundwater to collect in detention ponds where it can then be pumped to the Bay

## Educational Programs

- The Hayward Regional Shoreline has a unique diversity of ecosystems and built infrastructure that presents a variety of opportunities for education and stewardship
- With new infrastructure improvements, such as an ecotone levee, educational programs are a critical layer to engage people in their shoreline and recreational assets in the future

## Building Level Adaptation

- With new construction or retrofits, building scale strategies can be implemented to adapt to sea level rise
- Improving standards such as building codes and removing regulatory impediments
- The City can aid businesses and homeowners to assist them with understanding the resilience options available to them and with finding the funding to support these options

## Long-term Strategic Relocation

- The relocation of buildings and critical infrastructure from vulnerable coastal areas upland reduces flood hazard risk and provides the opportunity to restore natural areas along the shoreline that provide a buffer for inland communities
- Strategic relocation is not supported for the Master Plan mid-range time frame, however, if a greater extent of sea level rise is experienced, it will be explored in the future

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**3D  
VISUALIZATION  
EXISTING  
CONDITIONS**

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# EXISTING CONDITIONS

## ORO LOMA MARSH



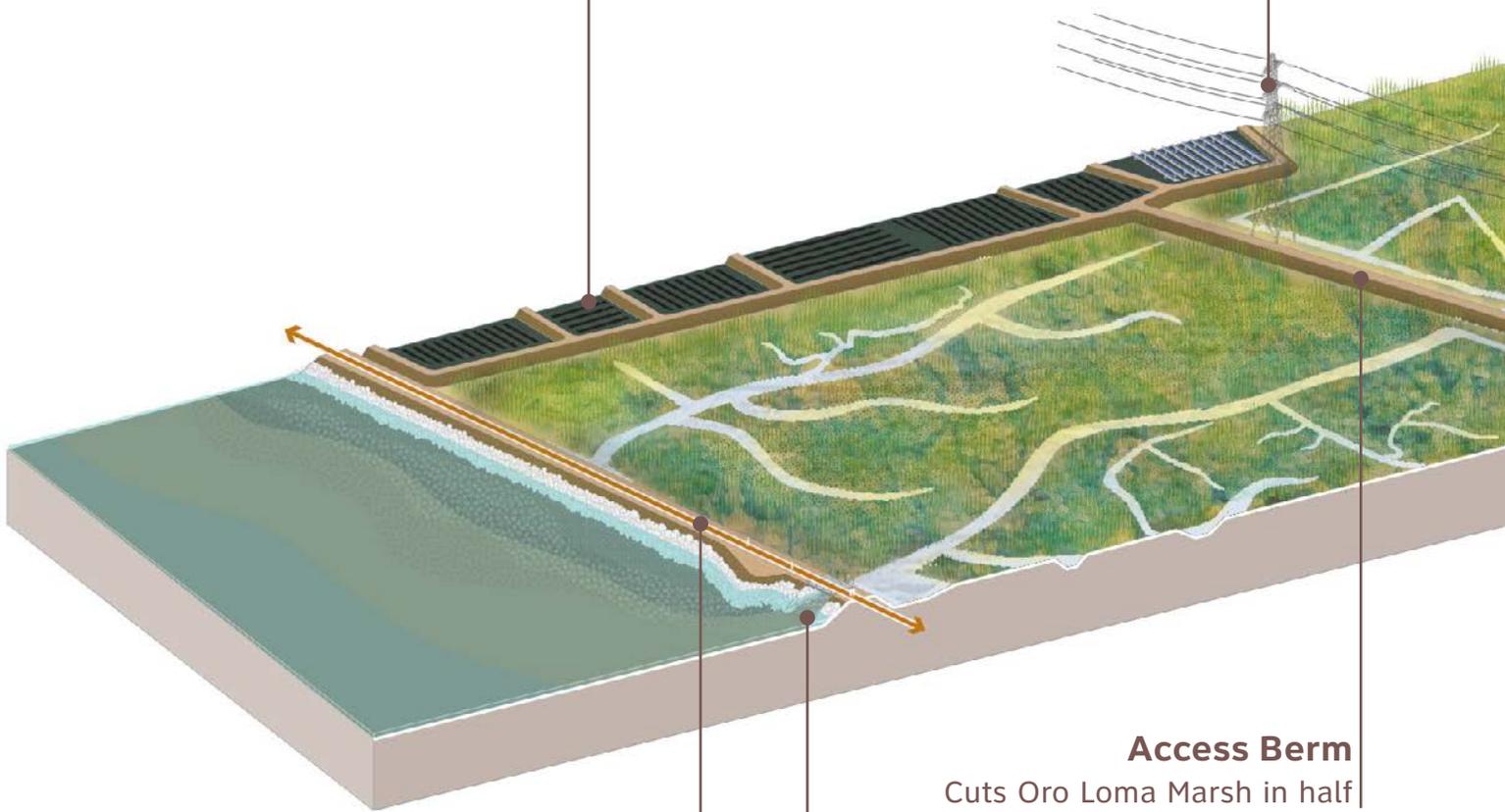
Key Map N 0 1M

### Oro Loma Diked Ponds

Biosolids management / drying and solar fields

### Transmission Towers

PG&E



Bay Trail

Levee Breach  
65' width

Access Berm  
Cuts Oro Loma Marsh in half

**San Lorenzo Community Center Park**

Recently improved. Phase 2 to start construction in 2020

**Oro Loma Marsh**

Existing tidal habitat



**Union Pacific Rail Corridor**

At risk of inundation

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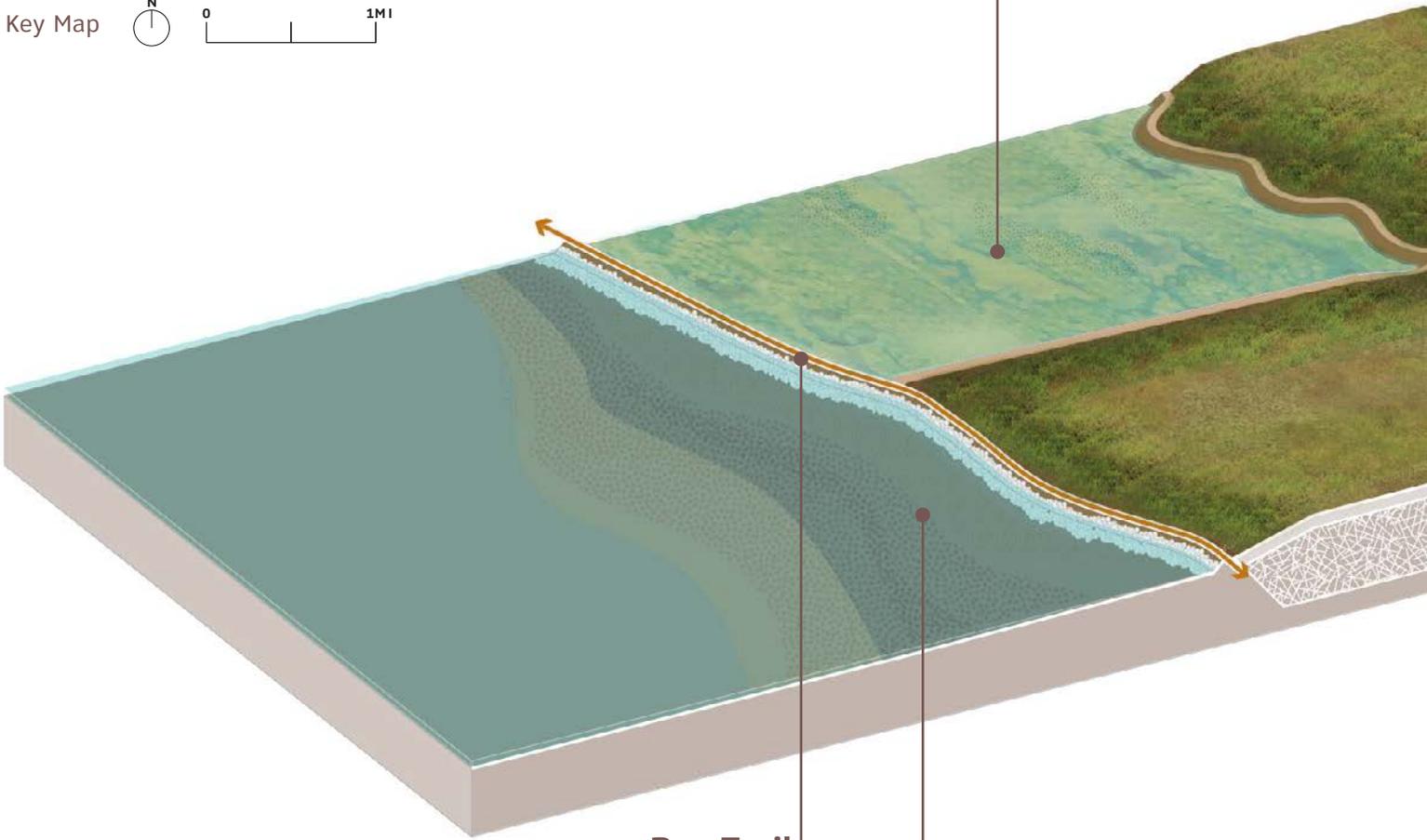
# EXISTING CONDITIONS

## ALAMEDA COUNTY LANDFILL



Key Map

**Frank's West**  
Existing diked Bayland



**Bay Trail**

**Mudflats**

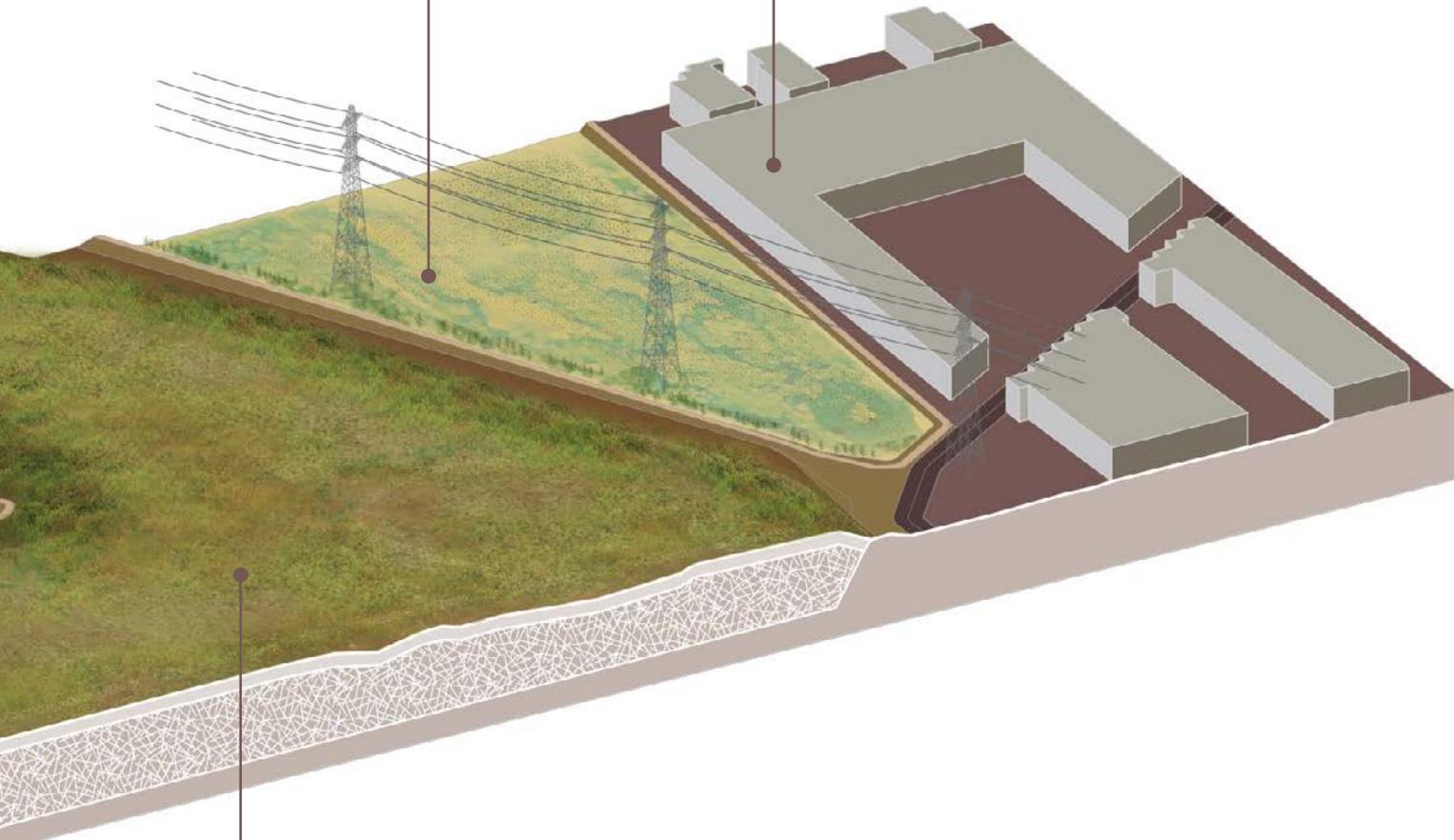
Existing shallow zone reduces wave action against the landfill

**Frank's East**

Existing diked Bayland

**Industrial Neighborhood**

Vulnerable to Bay inundation and groundwater emergence with SLR



**Alameda County Landfill**

In the process of being capped. Has a liner on the lower western and northern edges. Future use will be a solar field.

# EXISTING CONDITIONS

## COGSWELL MARSH



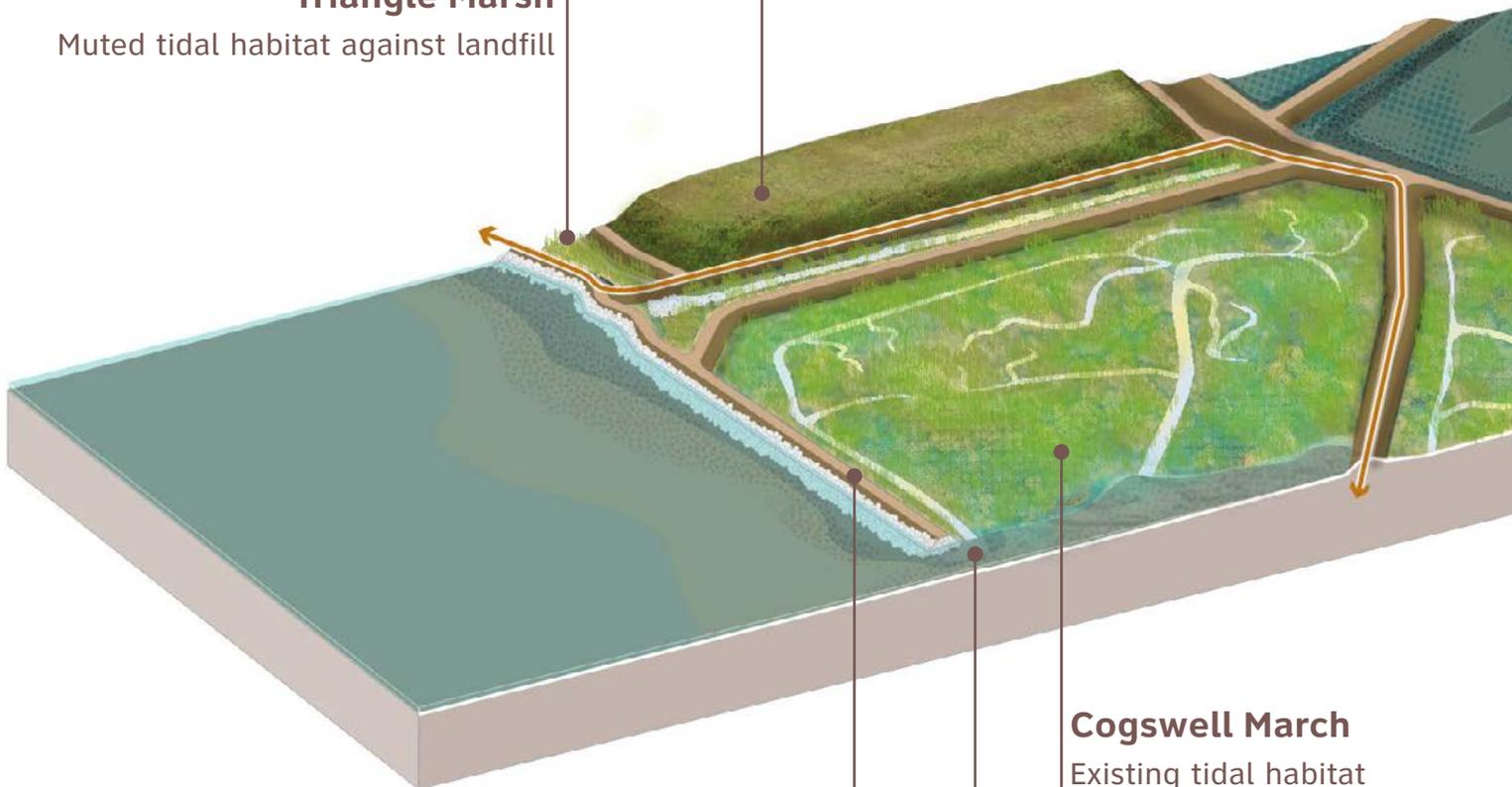
Key Map N 0 1M

### Triangle Marsh

Muted tidal habitat against landfill

### West Winton Landfill

Capped City landfill with a low permeable lined layer and vegetated layer on top



Bay Trail

### Cogswell March

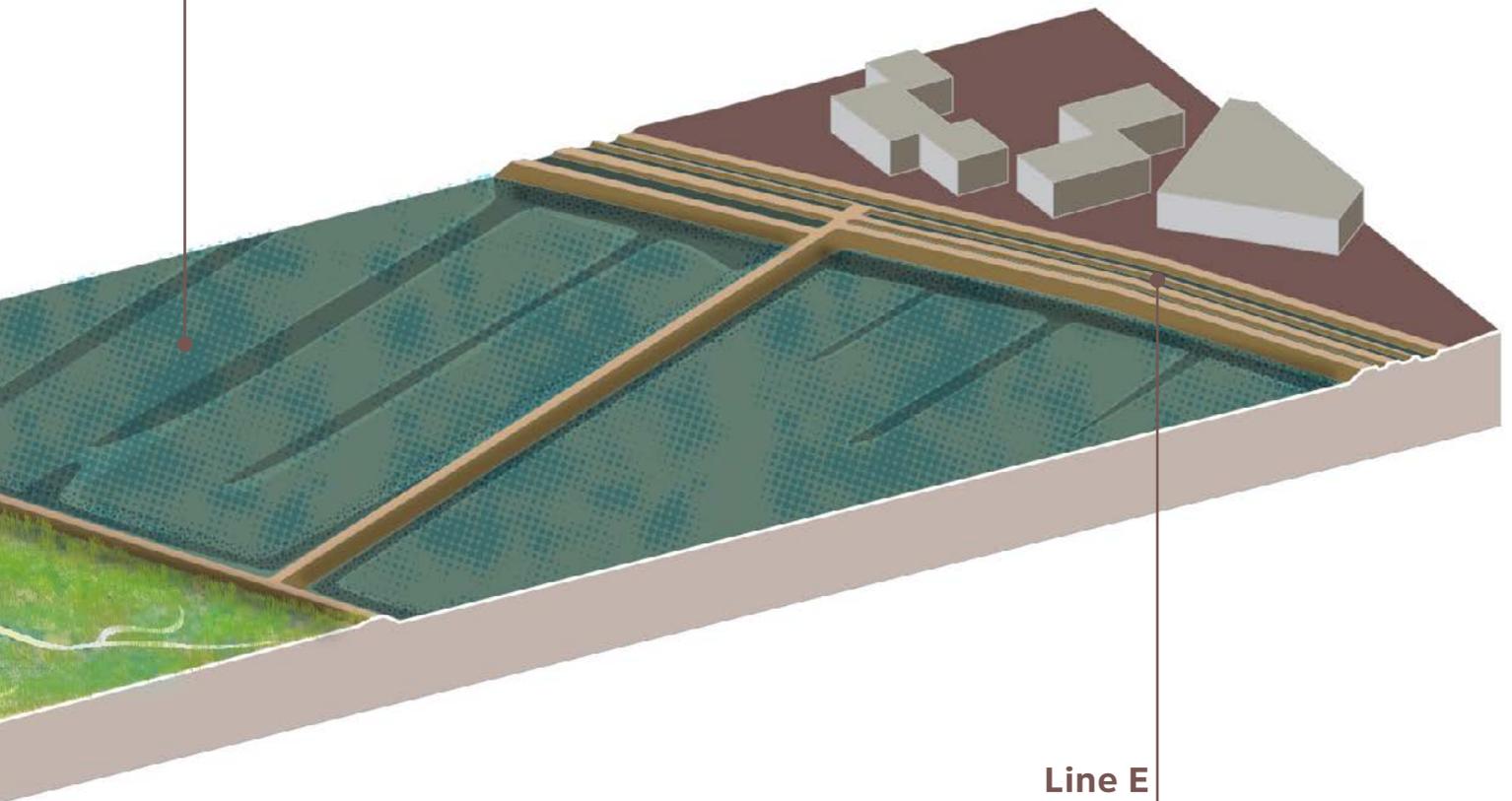
Existing tidal habitat

### Cogswell Marsh breach

800' width

## Wastewater Wet Weather Storage

Wet weather equalization ponds for Hayward WWTP



**Line E**

Flood control channel

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# EXISTING CONDITIONS

## HARD MARSH



Key Map



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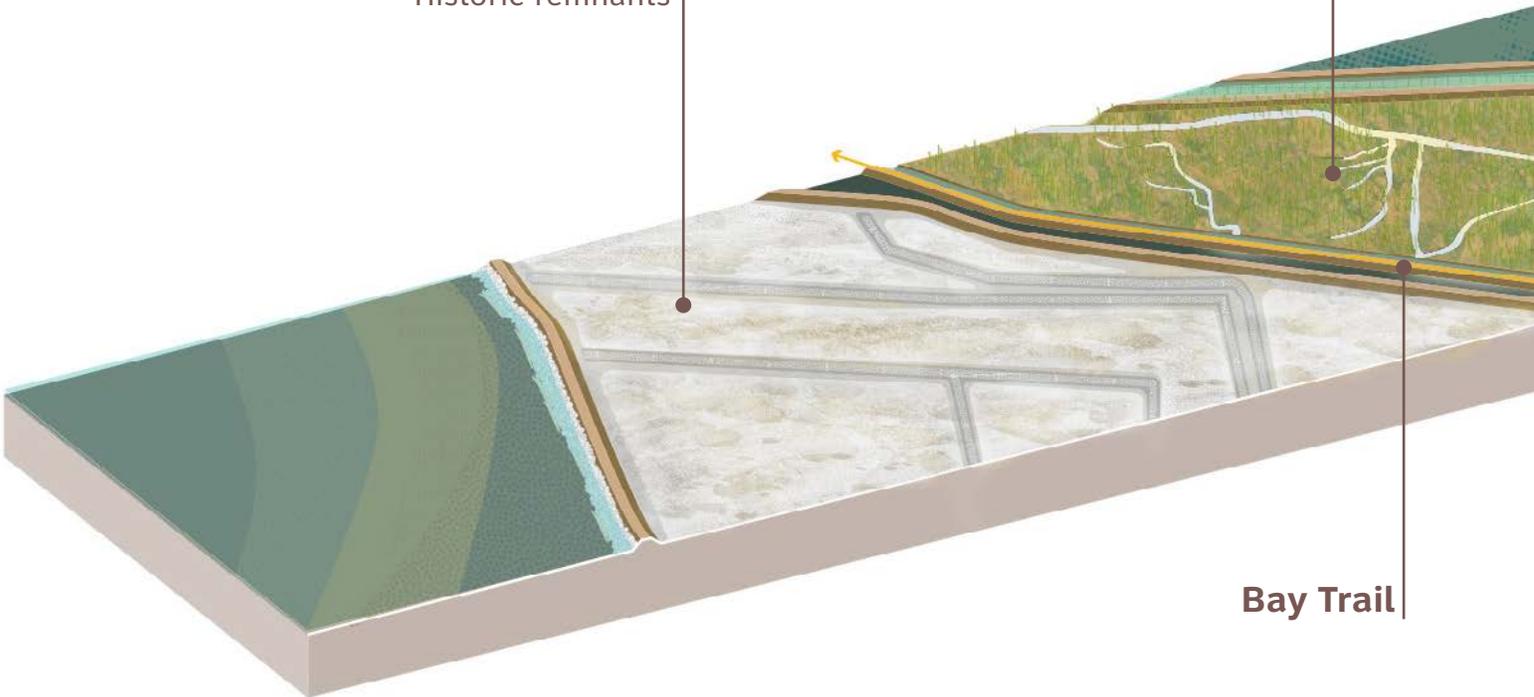
1M

### Oliver Salt Ponds

Salinas habitat for nesting shorebirds  
Historic remnants

### HARD Marsh

Tidal habitat



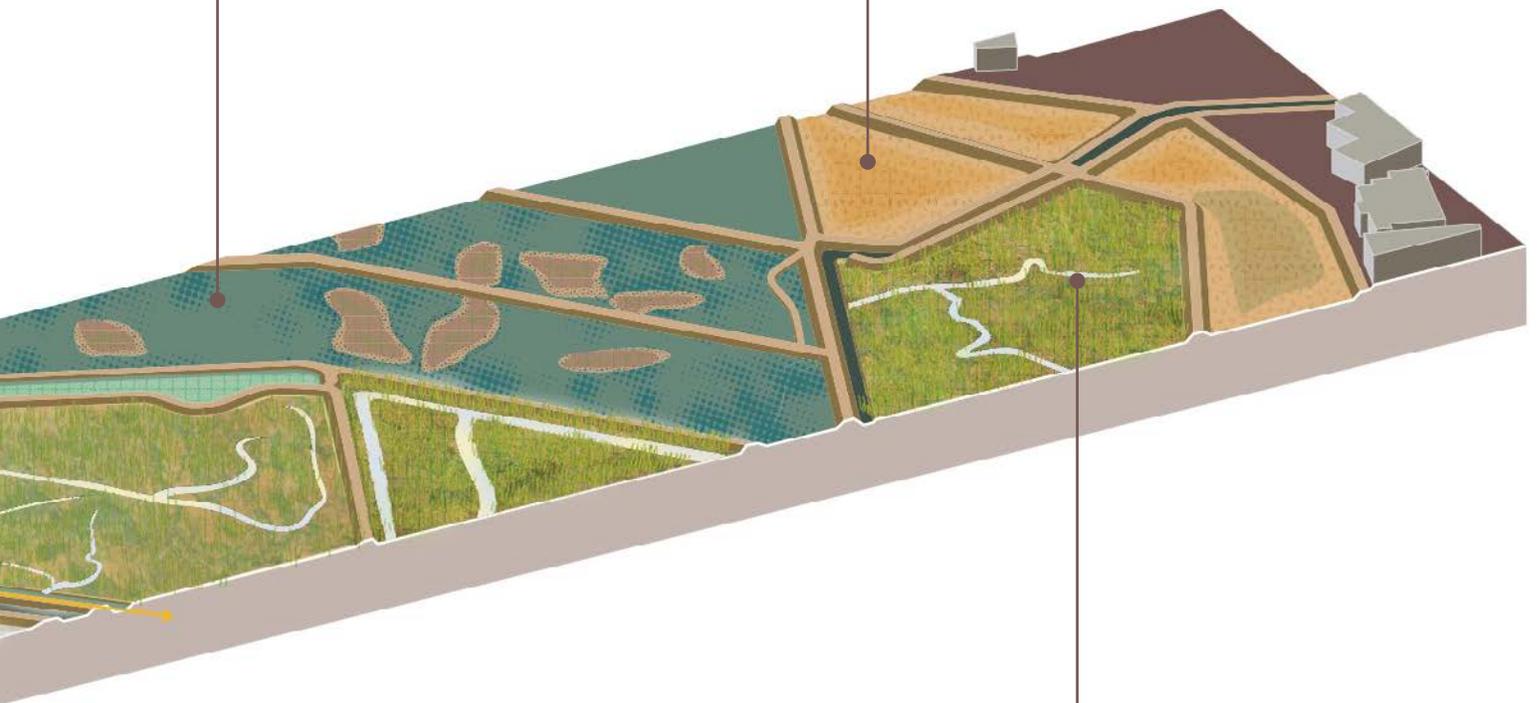
Bay Trail

**Hayward Marsh**

Diked Bayland with least tern nesting mounds

**Diked Baylands**

Seasonal wetlands



**Salt Marsh Harvest Mouse Preserve**

Muted tidal habitat

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# DESIGN ALTERNATIVES

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# **#1: CLOSER TO THE BAY**

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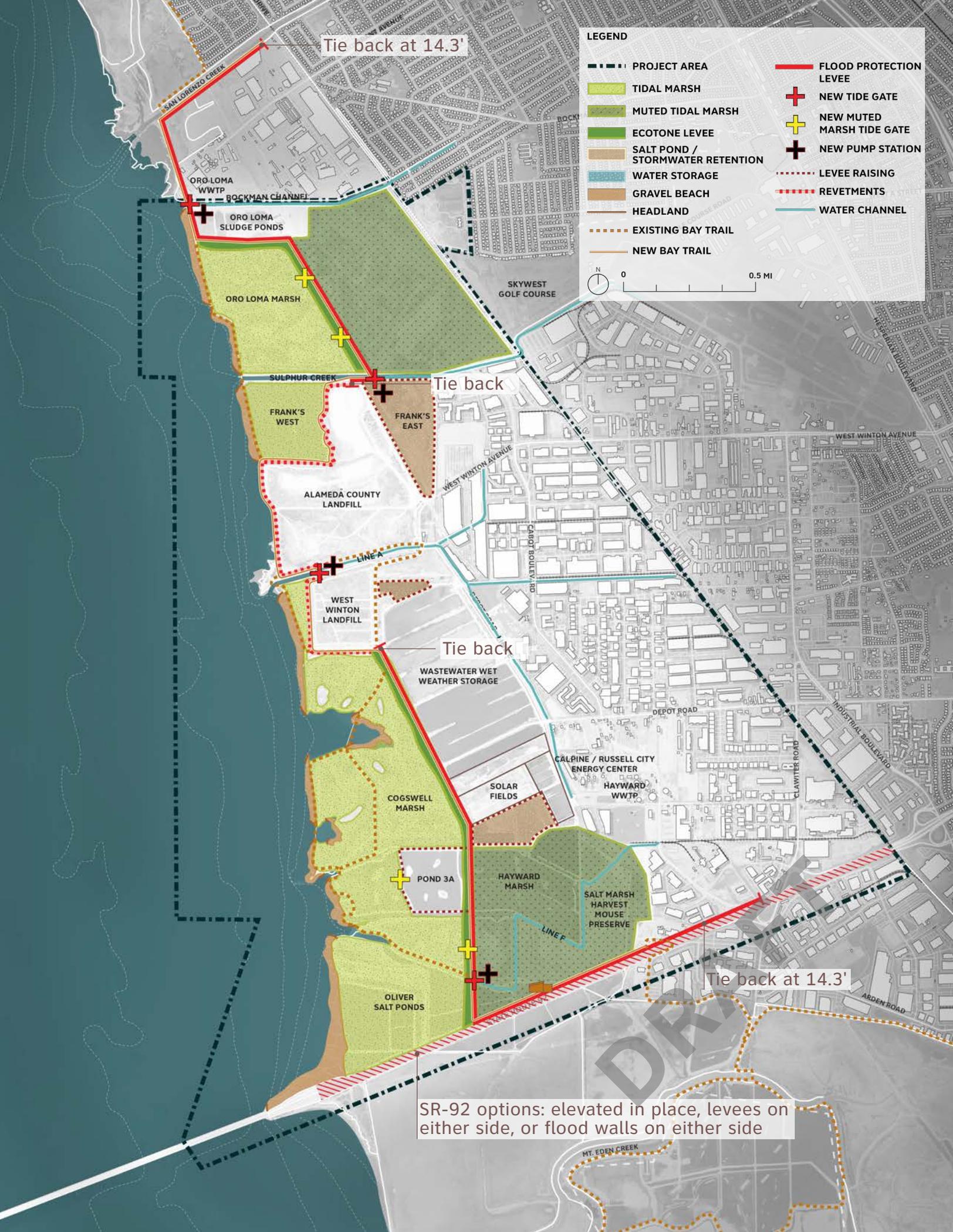
# #1: CLOSER TO THE BAY

This alternative looks at an alignment for the line of protection that reduces risk for a larger portion of the shoreline with a more conservative line of protection aligned closer to the Bay.

In the north end of the project area, the line of protection ties back along the San Lorenzo Creek channel and wraps in front of Oro Loma WWTP to protect it in place. It then cuts through the middle of Oro Loma Marsh and ties back to high ground at the two existing landfills. In the south, the alignment then follows the western edge of the oxidation ponds and cuts immediately south through Hayward and HARD Marsh. A raised access road along SR-92 ties back to high ground at the intersection of Clawiter Road.

This line of protection places a larger extent of marsh inland of the line of protection where it is less vulnerable to inundation with sea level rise.

The assumed planning elevation for the line of protection is 14.3' NAVD88. The final design flood elevation will require further study and cost analysis.



Tie back at 14.3'

LEGEND

- PROJECT AREA
- TIDAL MARSH
- MUTED TIDAL MARSH
- ECOTONE LEVEE
- SALT POND / STORMWATER RETENTION
- WATER STORAGE
- GRAVEL BEACH
- HEADLAND
- EXISTING BAY TRAIL
- NEW BAY TRAIL
- FLOOD PROTECTION LEVEE
- ⊕ NEW TIDE GATE
- ⊕ NEW MUTED MARSH TIDE GATE
- ⊕ NEW PUMP STATION
- LEVEE RAISING
- REVETMENTS
- WATER CHANNEL



Tie back

Tie back

Tie back at 14.3'

SR-92 options: elevated in place, levees on either side, or flood walls on either side

# #1: CLOSER TO THE BAY

## LINE OF PROTECTION

The line of protection aligns closer to the Bay's edge to reduce risk to a greater extent of inland assets and reduce the linear feet of levee and associated construction costs. The assumed planning elevation for the line of protection is 14.3' NAVD88. The final elevation will require further study and cost analysis- this elevation will be used for planning purposes only.

### Line of protection at the Bay's edge

---

#### PROS

- Shortest distance
- Cheapest

#### CONS

- Power Lines on top of a levee
- Cuts Oro Loma Marsh in half

### Ecotone Levee

---

#### PROS

- Shortest distance
- Cheapest cost
- Protect Hayward Shoreline Interpretive Center

#### CONS

- Cuts existing tidal habitat in half

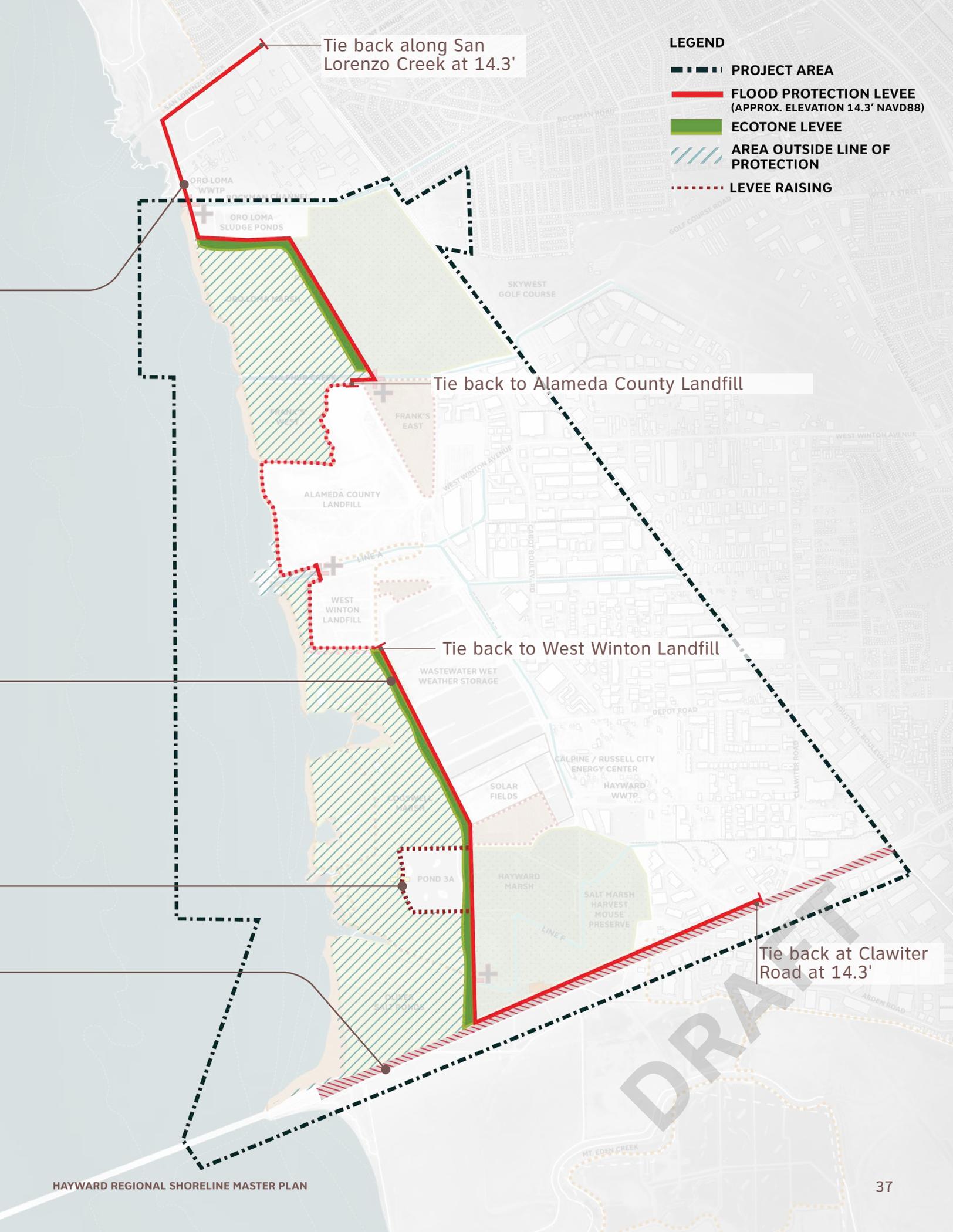
### Levee Raising

---

### SR-92 Options

---

- Elevate in place
- Levees on either side
- Flood walls on either side



# #1: CLOSER TO THE BAY

## TIDAL HABITAT

This tidal habitat configuration favors active management of ecosystems through the muting of marshes inland of the line of protection so they are less vulnerable to inundation. A band of tidal habitats exists outboard of the line of protection. Although, this option presents important permitting and regulatory challenges and would impact existing marsh habitat, it might help maintain high marsh habitat behind the line of protection. Habitat that could potentially be lost and transition to mudflat with a rapid and high sea level rise scenario.

### Half of Oro Loma Marsh becomes muted

---

#### PROS

- High marsh habitat, behind the line of protection, is maintained with SLR and at less risk of inundation

#### CONS

- Existing marsh becomes muted
- Impacts to existing habitat
- Regulatory issue

### Ecotone levee aligns within Cogswell Marsh

---

#### PROS

- Some high marsh habitat is maintained with SLR

#### CONS

- Existing marsh becomes muted
- Impacts to existing habitat
- Regulatory issue

### Expanded Salt Marsh Harvest Mouse Preserve

---

#### PROS

- Maximize muted tidal habitat that could be maintained with SLR

#### CONS

- HARD Marsh becomes muted-regulatory issue
- Impacts to existing tidal habitat

**LEGEND**

- PROJECT AREA** (dashed black line)
- TIDAL HABITAT** (light green hatched area)
- MUTED TIDAL HABITAT** (dark green hatched area)
- NEW MUTED MARSH TIDE GATE** (yellow cross symbol)
- ECOTONE LEVEL** (solid green line)
- POTENTIAL UPLAND SEDIMENT AUGMENTATION** (diagonal hatched area)



Restored tidal habitat

Restored tidal habitat

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# #1: CLOSER TO THE BAY

## EROSION CONTROL

This alternative proposes a layered system of erosion control measures using gravel beaches that reduce the risk of erosion to levees that shelter the marshes behind. Revetments along the two landfills help to reduce the risk of erosion and seepage.

### Gravel beaches in front of all marshes

---

#### PROS

- Gravel beaches provide habitat

#### CONS

- Beaches in front of all marshes requires a numerous groins to preserve existing breaches
- Cost
- Maintenance / replenishment

### Revetment and sheet piles along landfill edge with the Bay Trail

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#### PROS

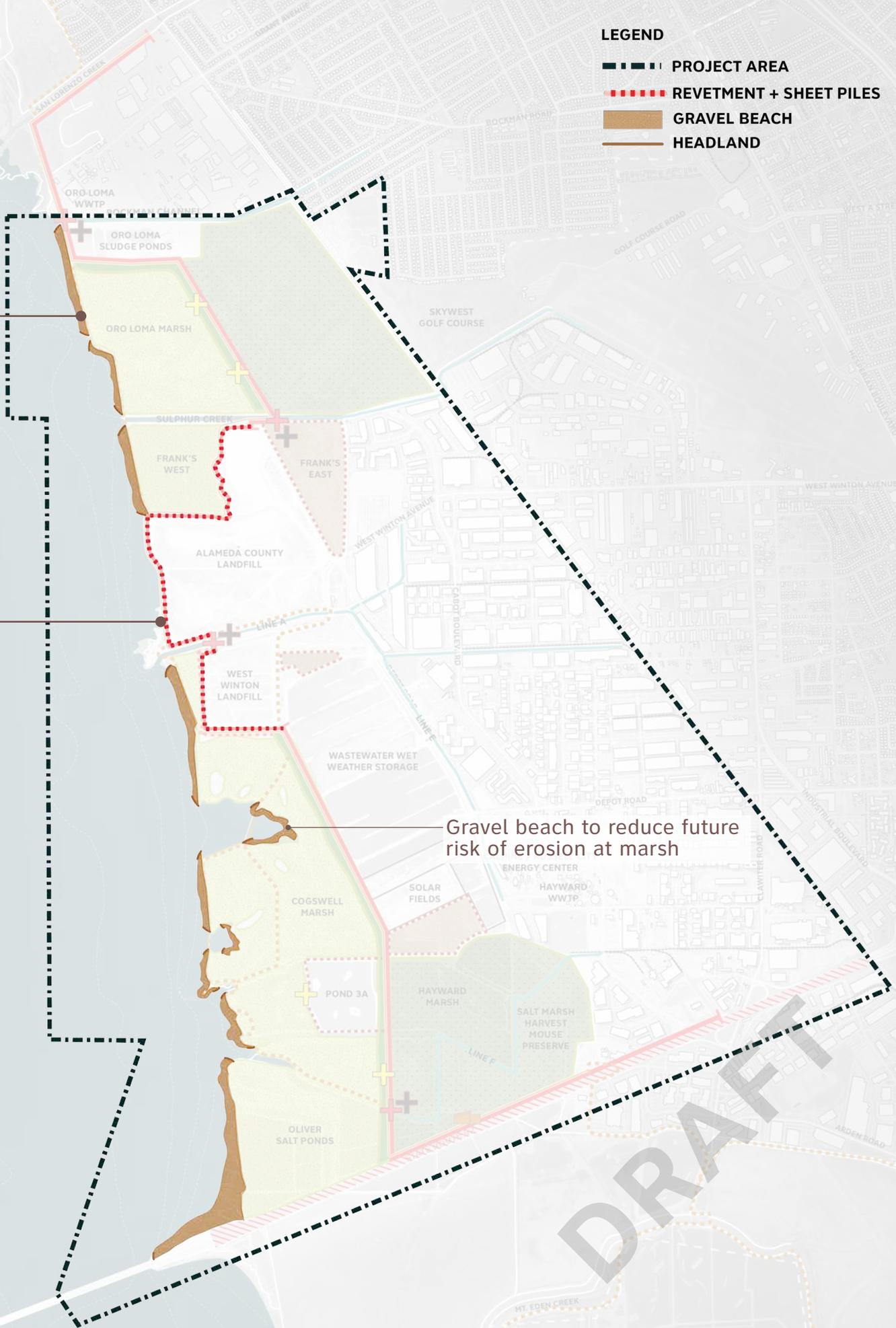
- Increased erosion protection to the landfill
- Possibility to incorporate rocky habitat to enhance ecological value

#### CONS

- Cost of sheet pile is a concern for the City

**LEGEND**

- PROJECT AREA
- REVETMENT + SHEET PILES
- GRAVEL BEACH
- HEADLAND



Gravel beach to reduce future risk of erosion at marsh

DRAFT

# #1: CLOSER TO THE BAY

## STORMWATER MANAGEMENT

There is a great need for stormwater and groundwater management inland of the new line of protection to reduce the risk of flooding with increased precipitation events and reduce any bathtub effect impacts. Providing storage capacity to temporarily hold large volumes of water before it is discharged into the Bay is an important aspect of the Master Plan. As the Plan moves forward, additional studies will be required to assess the volume needed in relation to the hydrology of the area. If gravity flow discharge is not feasible, pumping stations will be required, which can be extremely costly to maintain and operate.

This alternative presents inland detention ponds that collect and hold stormwater before it is discharged to the Bay. This alternative provides the greatest storage capacity.

### Dual Salt Pond / Stormwater Detention

---

#### PROS

- Provides salt pond habitat
- Large area for stormwater storage
- Along Sulphur Creek, a natural drainage area
- Enhances bird species habitat- the birds seem to prefer fresh water over salt water

#### CONS

- Stormwater may impact habitat

### Dual Salt Pond / Stormwater Detention

---

#### PROS

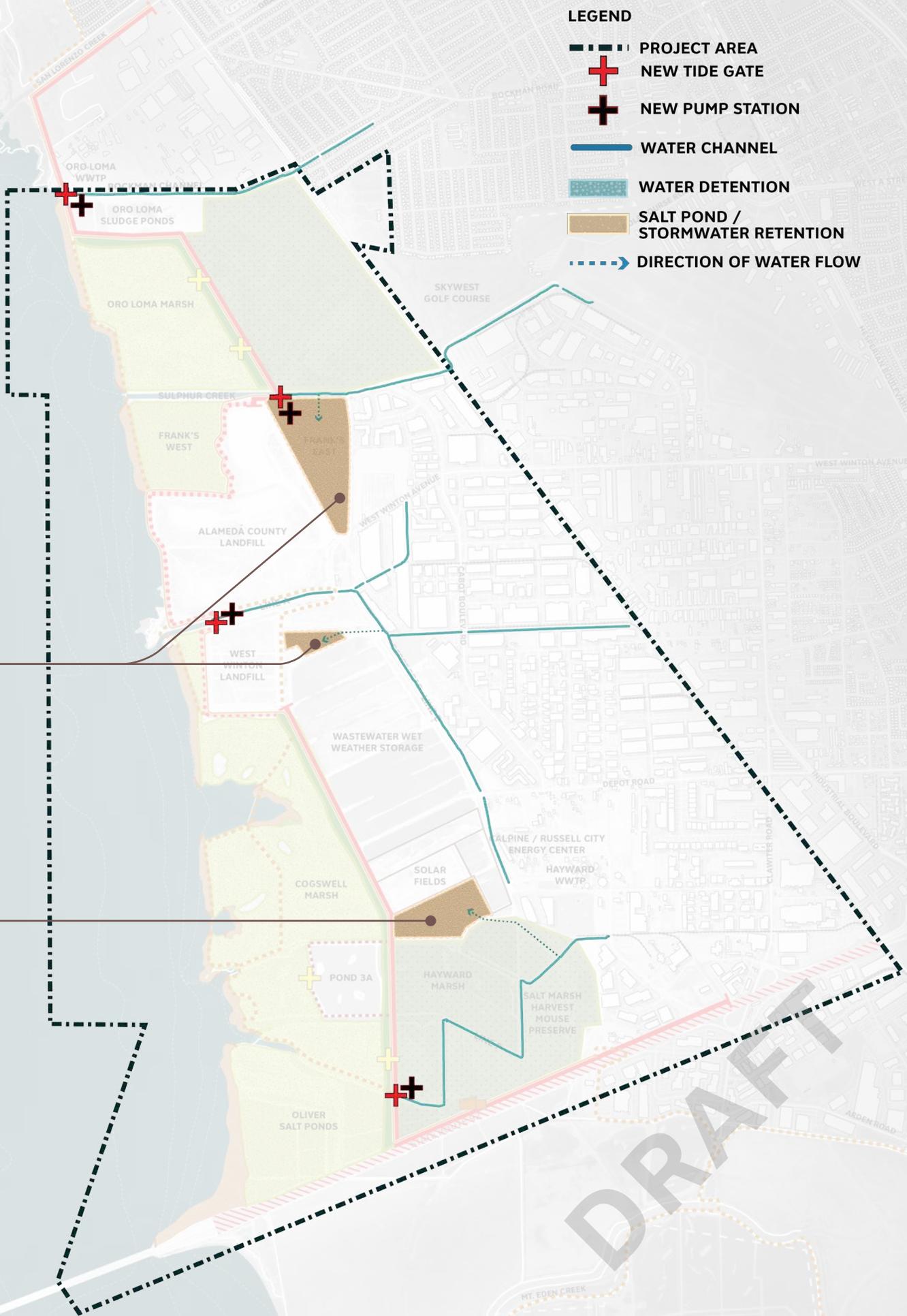
- Provides salt pond habitat
- Enhances bird species habitat- the birds seem to prefer fresh water over salt water

#### CONS

- Not directly adjacent to substantial flow from a flood control channel
- Stormwater may impact habitat

**LEGEND**

-  PROJECT AREA
-  NEW TIDE GATE
-  NEW PUMP STATION
-  WATER CHANNEL
-  WATER DETENTION
-  SALT POND / STORMWATER RETENTION
-  DIRECTION OF WATER FLOW



DRAFT

# #1: CLOSER TO THE BAY

## WASTEWATER TREATMENT

This Alternative presents the smallest local discharge opportunity. Critical wastewater treatment functions are maintained and enhanced at Oro Loma WWTP with a horizontal levee that outlets effluent to Oro Loma Marsh. All of Hayward WWTP's functions and storage capacity are maintained.

### Horizontal Levee

---

#### PROS

- Discharge some of Oro Loma WWTP's effluent
- Provides transition slope

#### CONS

- Potential impacts to current habitat
- Would require filling in part of Oro Loma Marsh
- Mosquito abatement regulatory issues

### Maintain current use and capacity of Wastewater Wet Weather Storage ponds

---

#### PROS

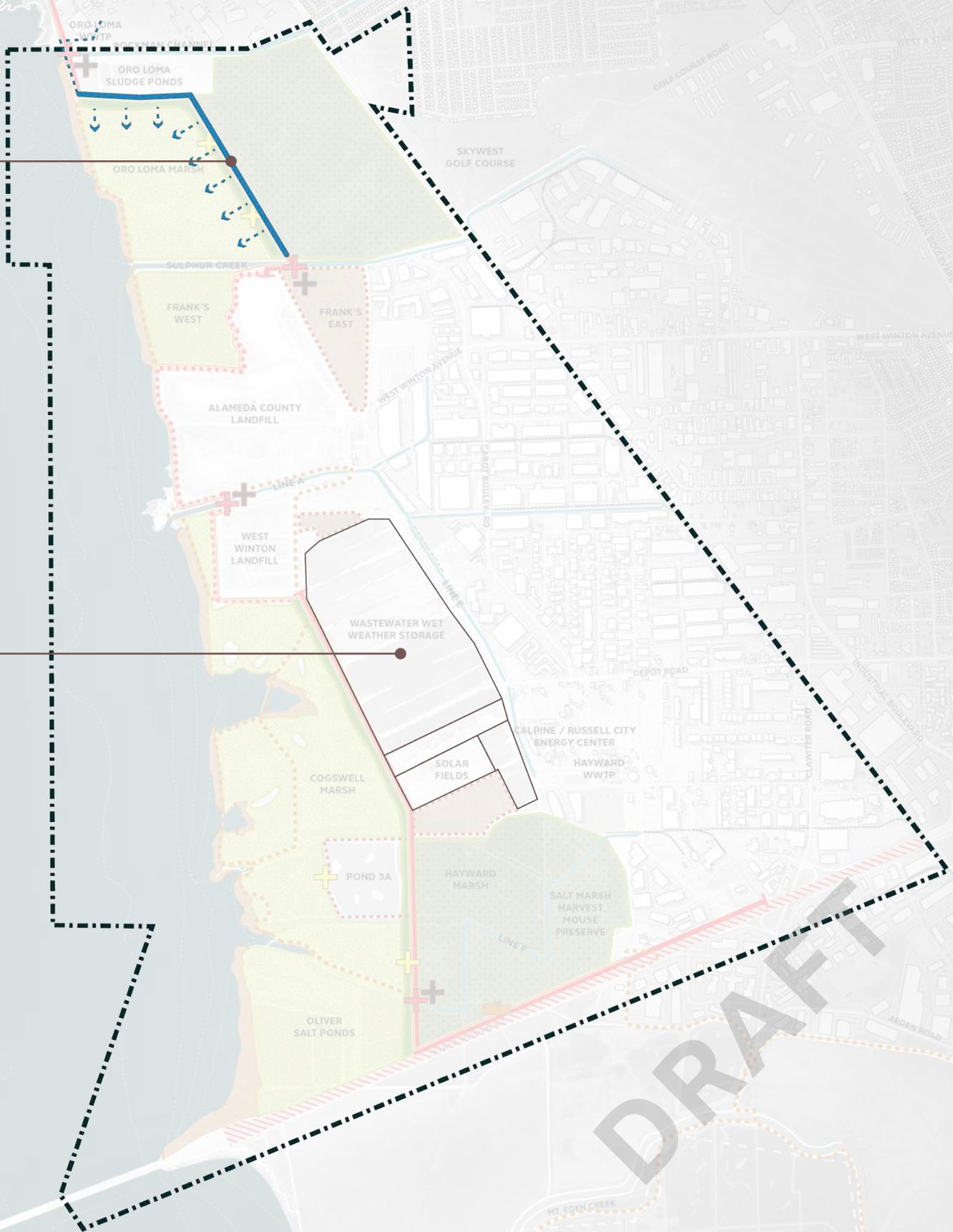
- Maintain wet weather equalization storage capacity
- Maintain biosolids drying / management
- Maintain solar fields

#### CONS

- Loss of potential space for other uses

**LEGEND**

- PROJECT AREA** (indicated by a thick black dashed line)
- DIRECTION OF WATER FLOW** (indicated by blue arrows)
- HORIZONTAL LEVEL** (indicated by a solid blue line)



**DRAFT**

# #1: CLOSER TO THE BAY

## BAY TRAIL

With this alternative, the Bay Trail is aligned closer to blue water where possible and connected to new infrastructure improvements. A phased realignment of the trail will maintain its existing alignment and connect to the new alignment until it is inundated.

### Bay Trail realigns through the middle of Oro Loma Marsh

---

#### PROS

- Closer to the Bay
- Marsh habitat experience

#### CONS

- Loss of blue water experience

### Living revetment education trail

---

#### PROS

- Along the Bay's edge
- Raised levee protects landfill
- Educational component

#### CONS

- Proximity to landfill

### Links to the Interpretive Center

---

#### PROS

- Raised along FEMA levee to decrease flood risk

#### CONS

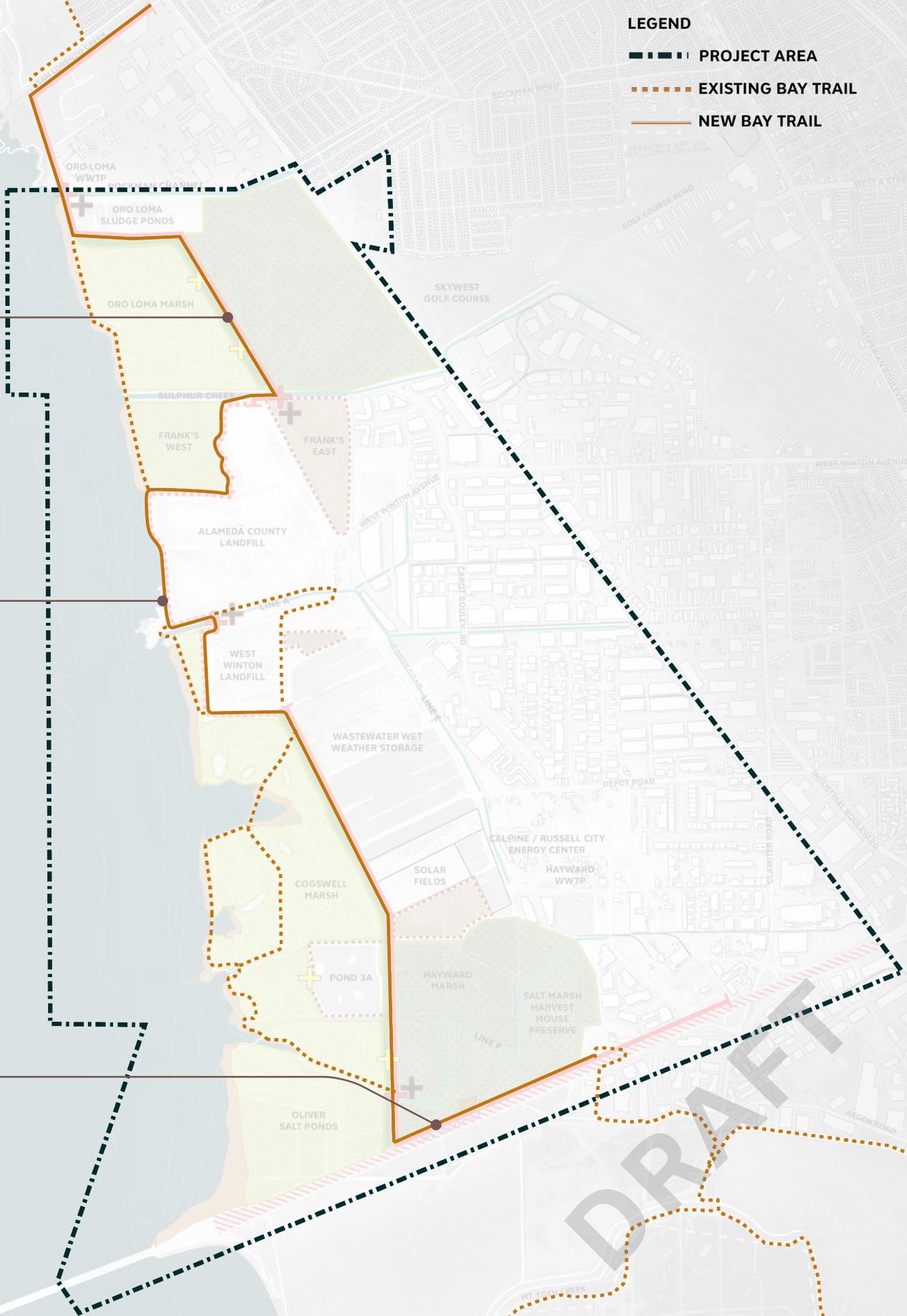
- Cuts off existing marsh

**LEGEND**

**PROJECT AREA**

**EXISTING BAY TRAIL**

**NEW BAY TRAIL**



# #1: CLOSER TO THE BAY

## HAYWARD SHORELINE INTERPRETIVE CENTER

Located behind the line of protection, the Hayward Shoreline Interpretive Center is protected in place. An ecotone levee in immediate adjacency to the center presents opportunities for education programming related to future restoration and adaptive management projects.

### Access road is elevated in place

---

#### PROS

- Reduced risk of flooding
- Potential to tie into CalTrans improvements

#### CONS

- May impact existing marsh habitat

### Interpretive Center is protected in place

---

#### PROS

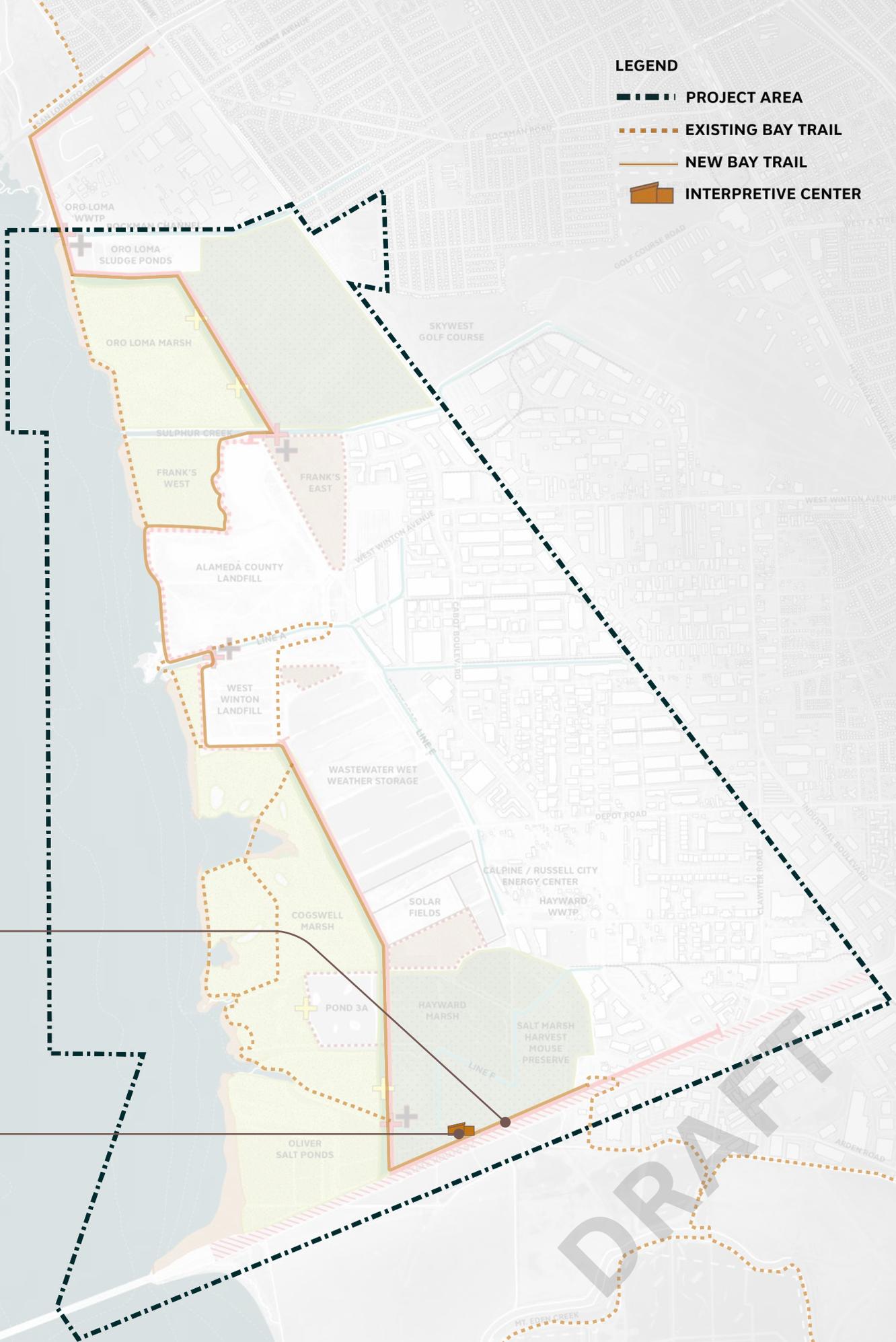
- Interpretive Center is protected in place
- Ecotone levee related educational opportunities

#### CONS

- Direct visual connection to the Bay is lost

**LEGEND**

- PROJECT AREA
- EXISTING BAY TRAIL
- NEW BAY TRAIL
- INTERPRETIVE CENTER



DRAFT

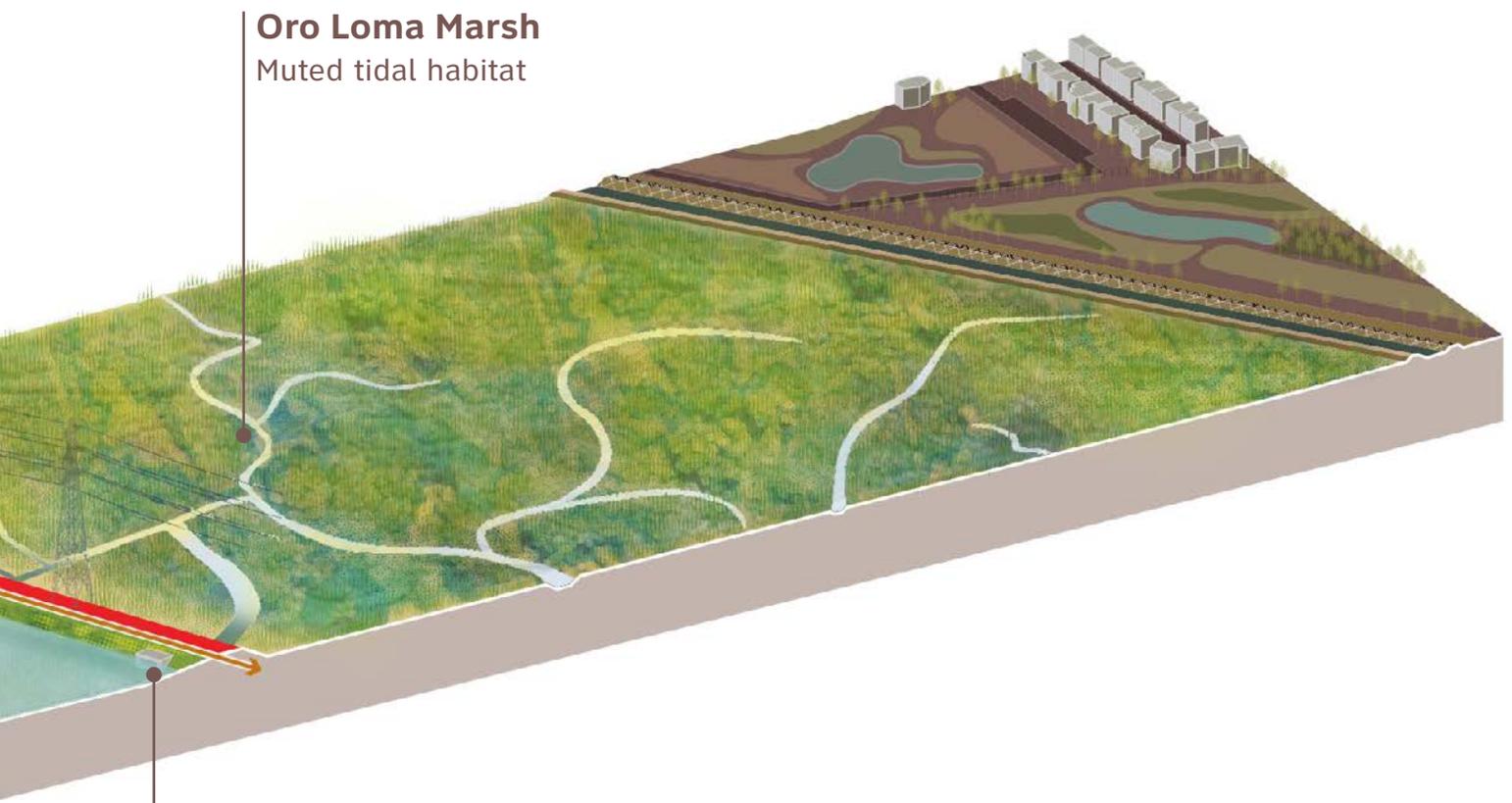
# #1: CLOSER TO THE BAY

## ORO LOMA MARSH



Key Map  0 1M





**Oro Loma Marsh**  
Muted tidal habitat

**Tide Gate**  
Controls tidal flow to muted tidal habitat inland of the line of protection

DRAFT

# #1: CLOSER TO THE BAY

## ALAMEDA COUNTY LANDFILL



Key Map  0 1M

### Gravel Beach

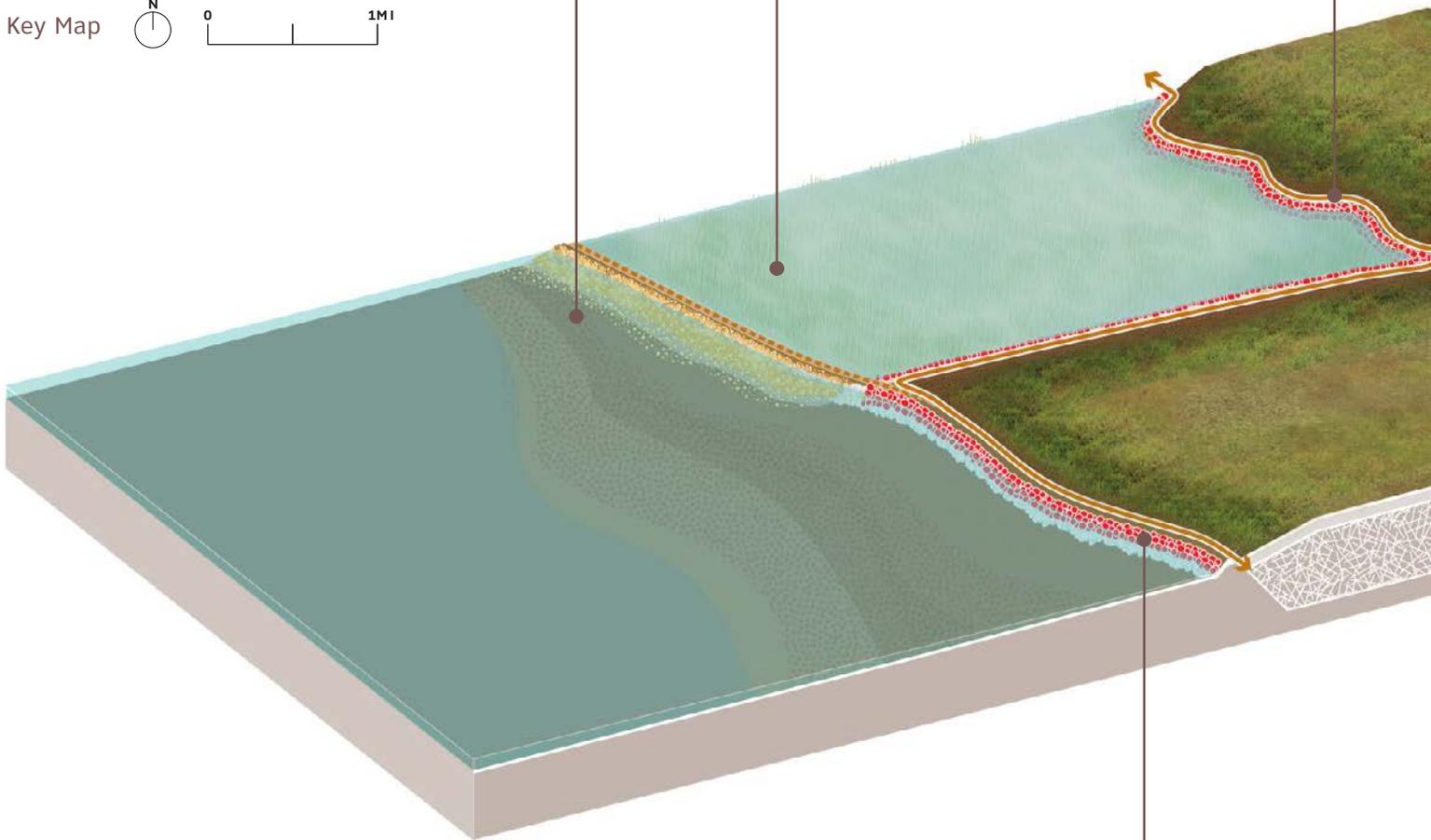
Outboard of existing levee

### Frank's West

Tidal habitat

### Sheet Pile around landfill

Acts as line of protection

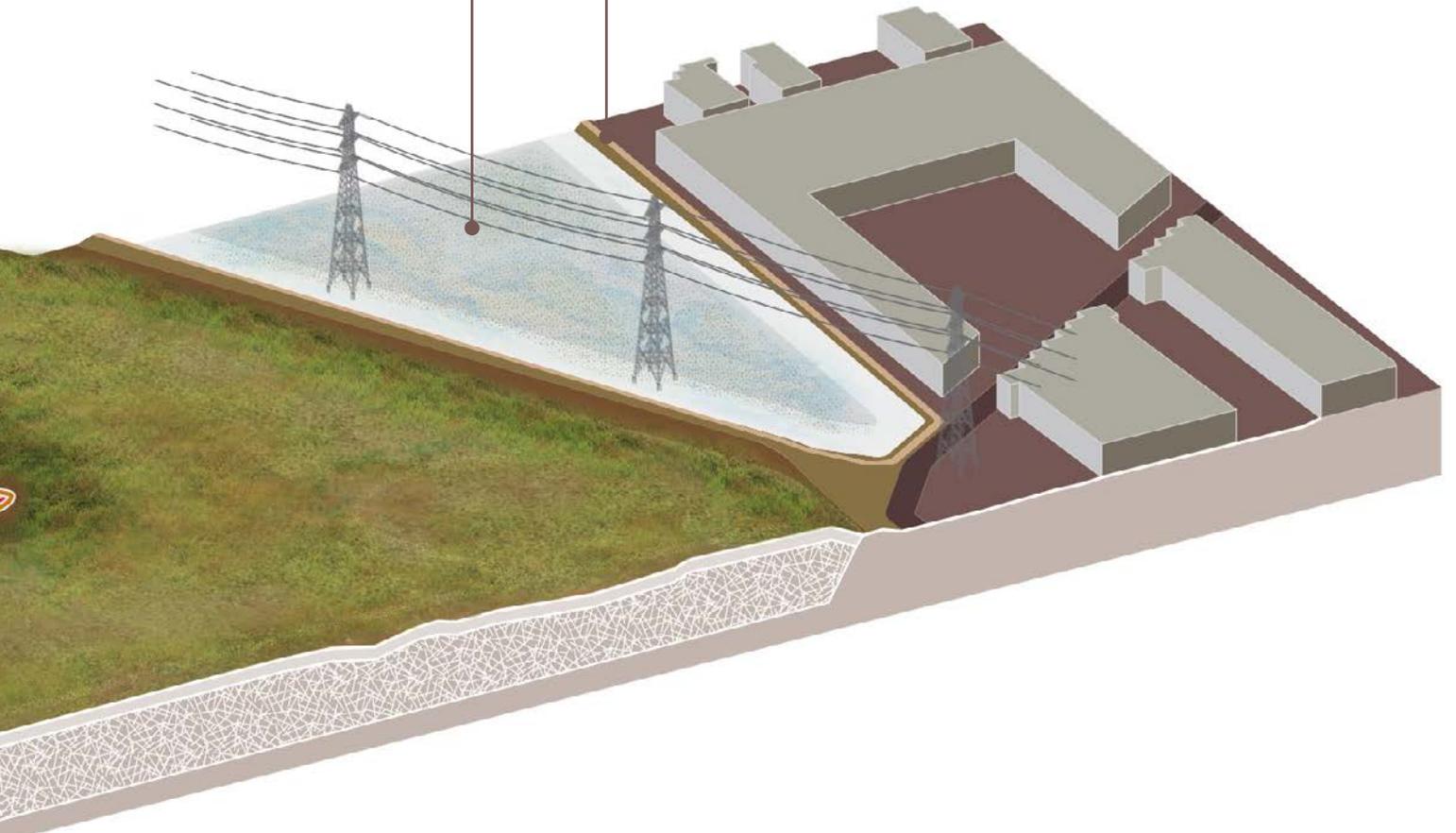


**Living Revetment / Bay Trail**  
Outboard levee of Alameda County landfill

**Frank's East**

Salt Pond / Stormwater Detention pond

**Levee raising**



DRAFT

# #1: CLOSER TO THE BAY

## COGSWELL MARSH



Key Map  0 1M

### Gravel Beach

Outboard of existing levee

### Sheet Pile

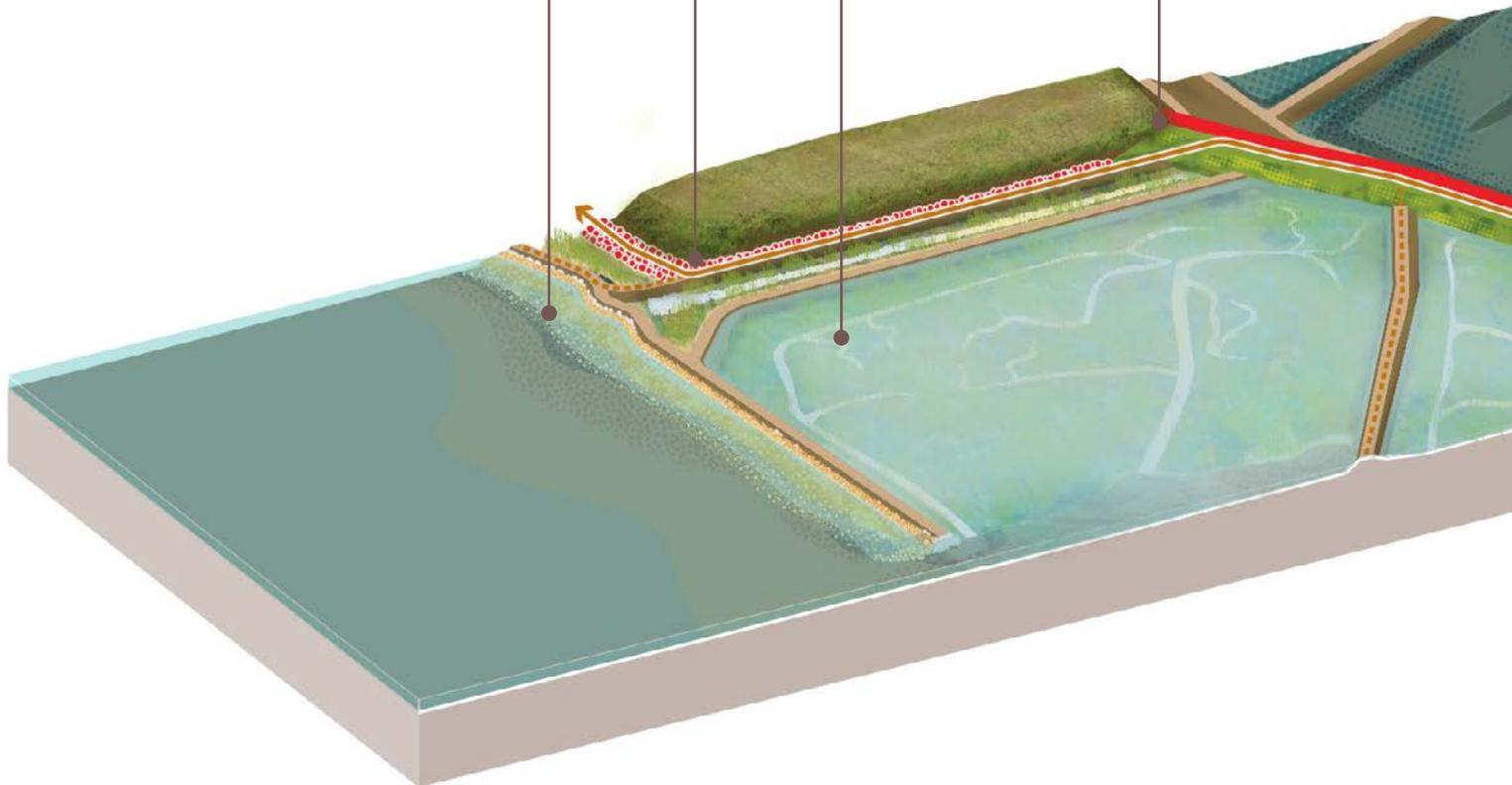
Acts as line of protection

### Cogswell Marsh

Tidal habitat

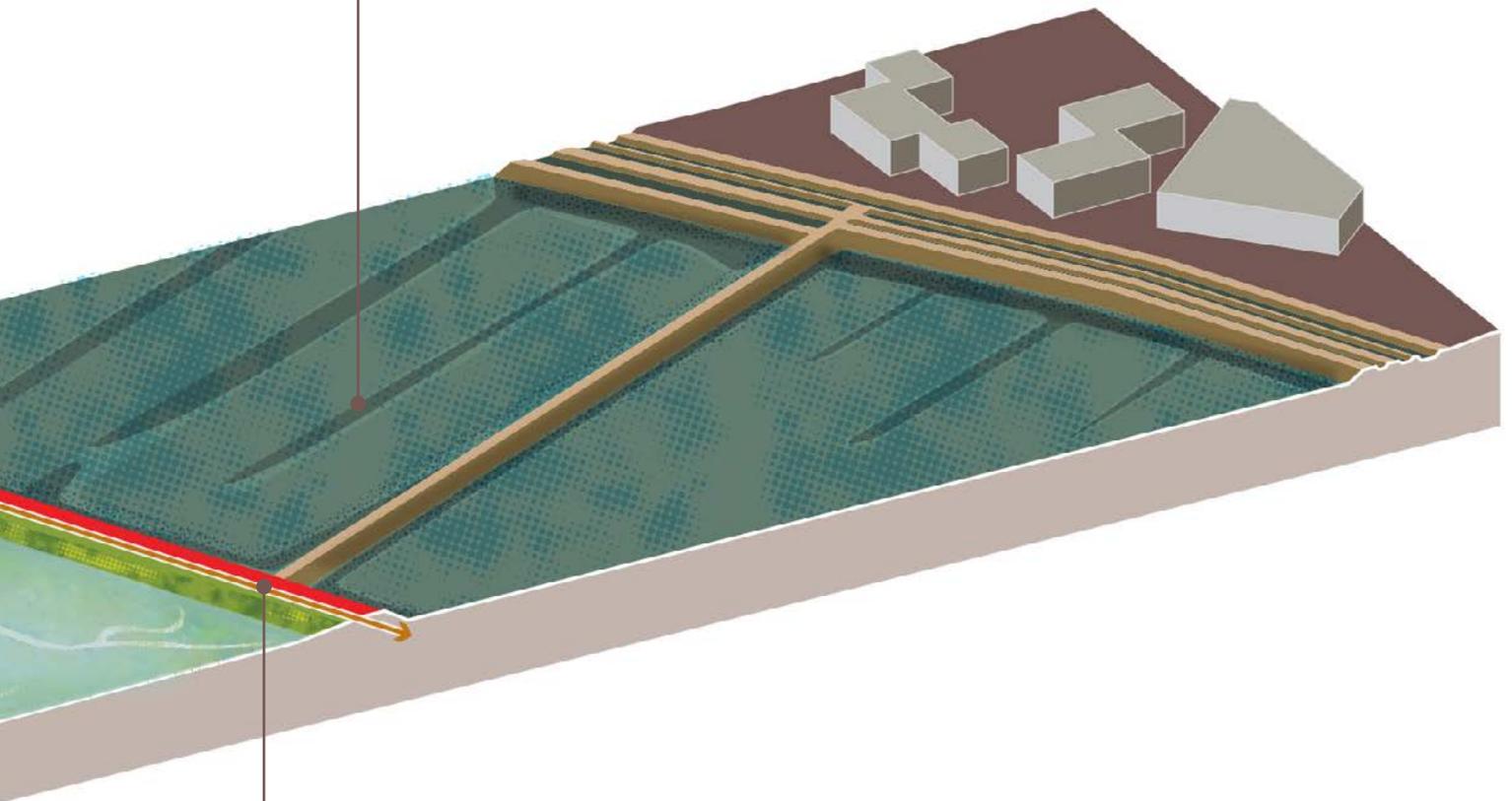
### Levee Tie Back

High ground at West Winton landfill



**Wastewater Wet Weather Storage**

Storage capacity is maintained



**Line of Protection / Ecotone Levee / Bay Trail**

Built outboard of existing oxidation pond levee into Cogswell Marsh

DRAFT

# #1: CLOSER TO THE BAY

## HARD MARSH



Key Map



0

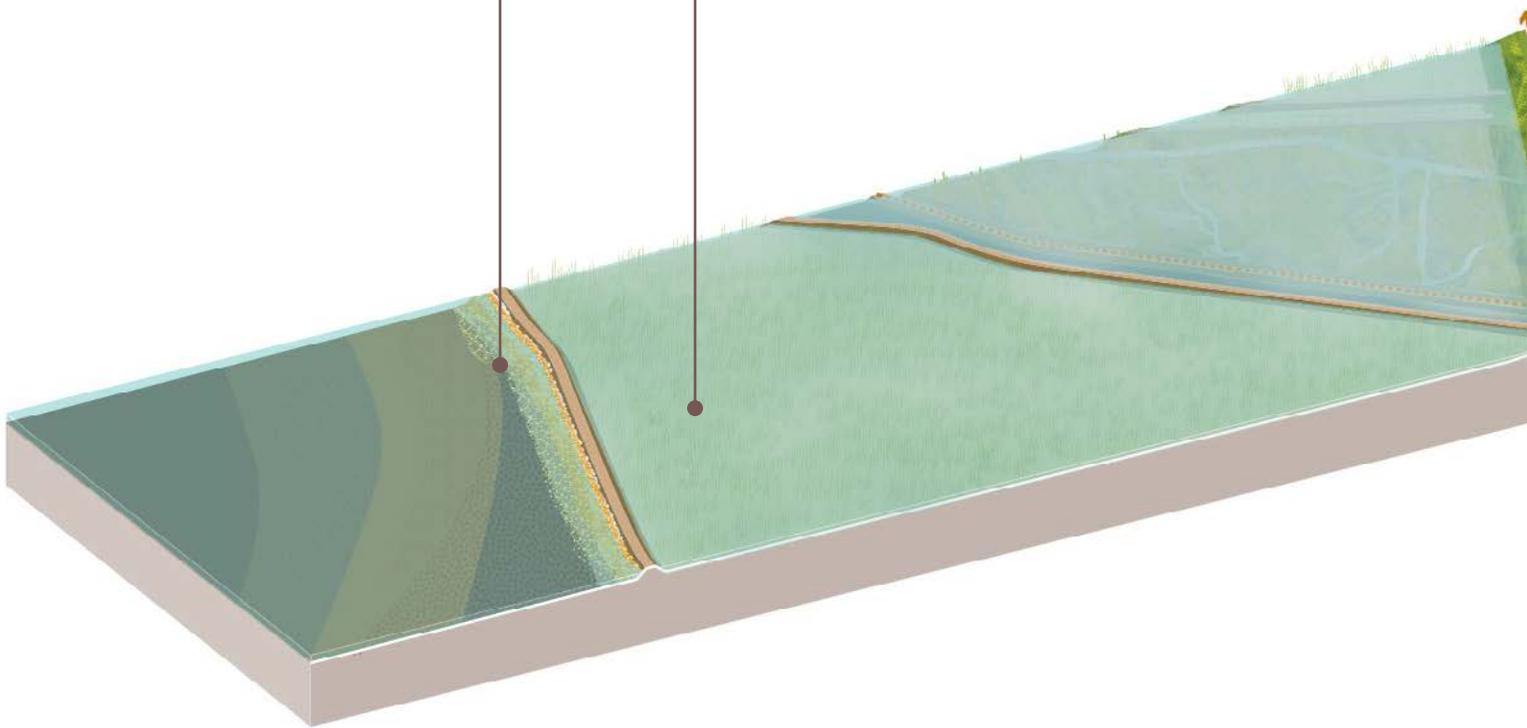
1M

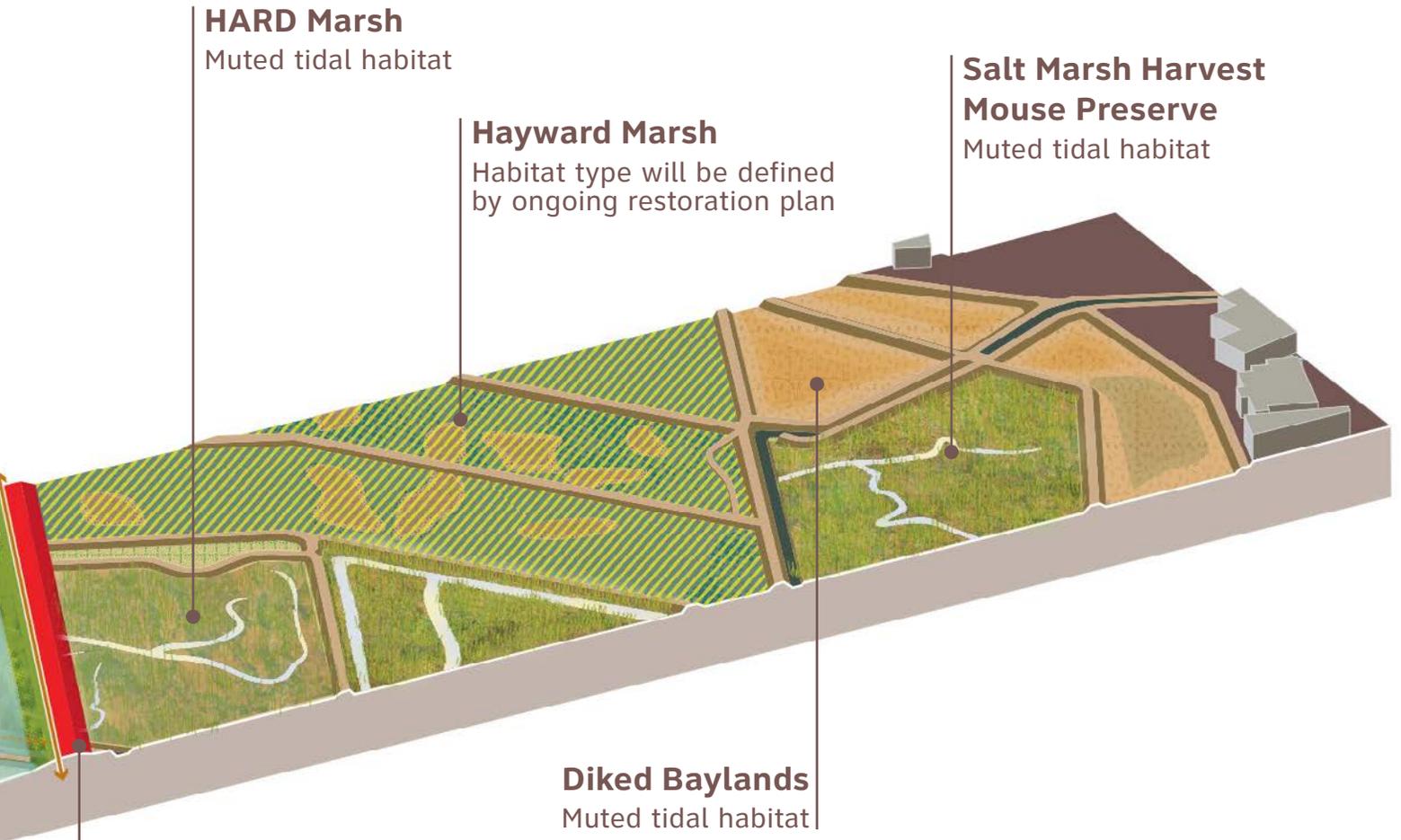
### Gravel Beach

Outboard of existing levee

### Oliver Salt Ponds

Tidal habitat





**HARD Marsh**  
Muted tidal habitat

**Hayward Marsh**  
Habitat type will be defined by ongoing restoration plan

**Salt Marsh Harvest Mouse Preserve**  
Muted tidal habitat

**Diked Baylands**  
Muted tidal habitat

**Line of Protection / Ecotone Levee / Bay Trail**  
Aligns through the middle of HARD and Hayward Marsh

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**DRAFT**

# **#2: DOWN THE MIDDLE**

**DRAFT**

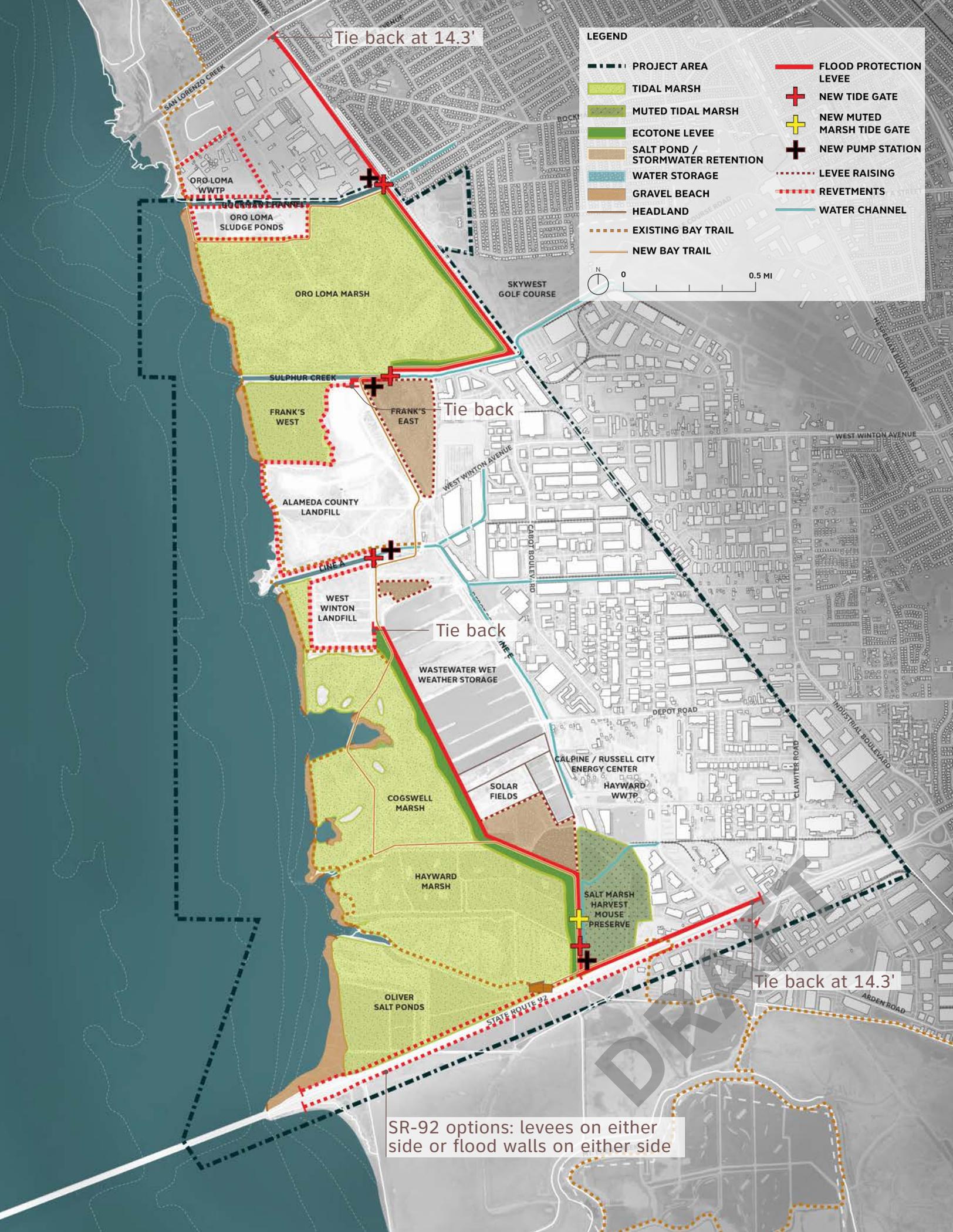
## **#2: DOWN THE MIDDLE**

This alternative looks at an alignment that balances risk reduction and ecological enhancement with a line of protection that runs through the middle of the shoreline area.

The line of protection is pulled back in the north along the Union Pacific Rail Corridor and ties back to high ground at the San Lorenzo Creek channel. It then ties back to high ground at the two existing landfills and follows the western extent of the oxidation ponds to the south. The alignment pulls back in the southern portion of the site and cuts through the middle of the Salt Marsh Harvest Mouse Preserve, then ties back along a new levee along the access road for SR-92.

This alternative maintains a larger extent of tidal habitat, while still reducing risk to critical infrastructure.

The assumed planning elevation for the line of protection is 14.3' NAVD88. The final design flood elevation will require further study and cost analysis.



Tie back at 14.3'

**LEGEND**

	PROJECT AREA		FLOOD PROTECTION LEVEE
	TIDAL MARSH		NEW TIDE GATE
	MUTED TIDAL MARSH		NEW MUTED MARSH TIDE GATE
	ECOTONE LEVEE		NEW PUMP STATION
	SALT POND / STORMWATER RETENTION		LEVEE RAISING
	WATER STORAGE		REVETMENTS
	GRAVEL BEACH		WATER CHANNEL
	HEADLAND		
	EXISTING BAY TRAIL		
	NEW BAY TRAIL		

0 0.5 MI

Tie back

Tie back

Tie back at 14.3'

SR-92 options: levees on either side or flood walls on either side

# #2: DOWN THE MIDDLE

## LINE OF PROTECTION

In this alternative, the line of protection balances risk reduction and ecological enhancement through an alignment that follows the middle of the shoreline. The assumed planning elevation for the line of protection is 14.3' NAVD88. The final elevation will require further study and cost analysis- this elevation will be used for planning purposes only.

### Oro Loma perimeter protection

---

#### PROS

- Protects existing sludge ponds and WWTP infrastructure

#### CONS

- Oro Loma WWTP not protected with line of protection
- Access to Oro Loma WWTP will be inundated

### Ecotone Levee

---

#### PROS

- Medium distance ecotone levee
- Aligns with First Mile project

#### CONS

- Mosquito abatement issues
- Footprint of levee may impact existing marsh habitat

### Ecotone Levee aligns within the oxidation ponds

---

#### PROS

- Ecotone levee aligned within the oxidation ponds preserves marsh habitat

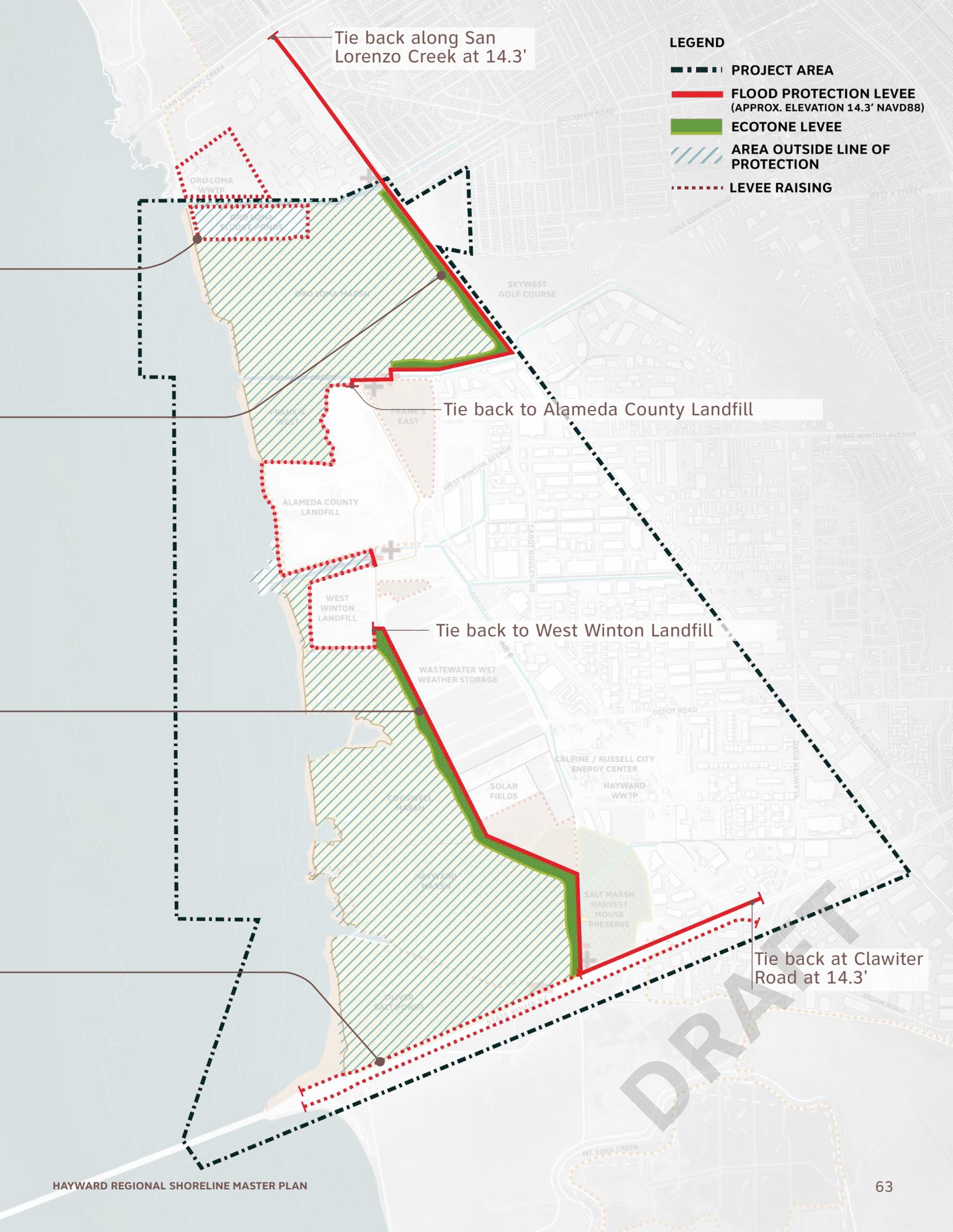
#### CONS

- Ecotone levee aligned within the oxidation ponds leads to a loss of wastewater wet weather storage capacity
- Mosquito abatement issues
- Footprint of levee may impact existing marsh habitat

### SR-92 Options

---

- Levees on either side
- Flood walls on either side



**LEGEND**

- PROJECT AREA
- FLOOD PROTECTION LEVEL (APPROX. ELEVATION 14.3' NAVD88)
- ECOTONE LEVEL
- AREA OUTSIDE LINE OF PROTECTION
- LEVEE RAISING

Tie back along San Lorenzo Creek at 14.3'

Tie back to Alameda County Landfill

Tie back to West Winton Landfill

Tie back at Clawiter Road at 14.3'

# #2: DOWN THE MIDDLE

## TIDAL HABITAT

A larger extent of tidal habitat is enhanced outboard of the line of protection. Through marsh management and sediment placement, the shoreline's ability to accrete sediment is increased

### Ecotone levee is aligned within the oxidation ponds

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#### PROS

- Preserves Cogswell Marsh habitat

#### CONS

- Reduces storage capacity at Wastewater Wet Weather Storage ponds

### Maximize amount of connected tidal habitat

---

### Salt Marsh Harvest Mouse Preserve is cut in half

---

#### PROS

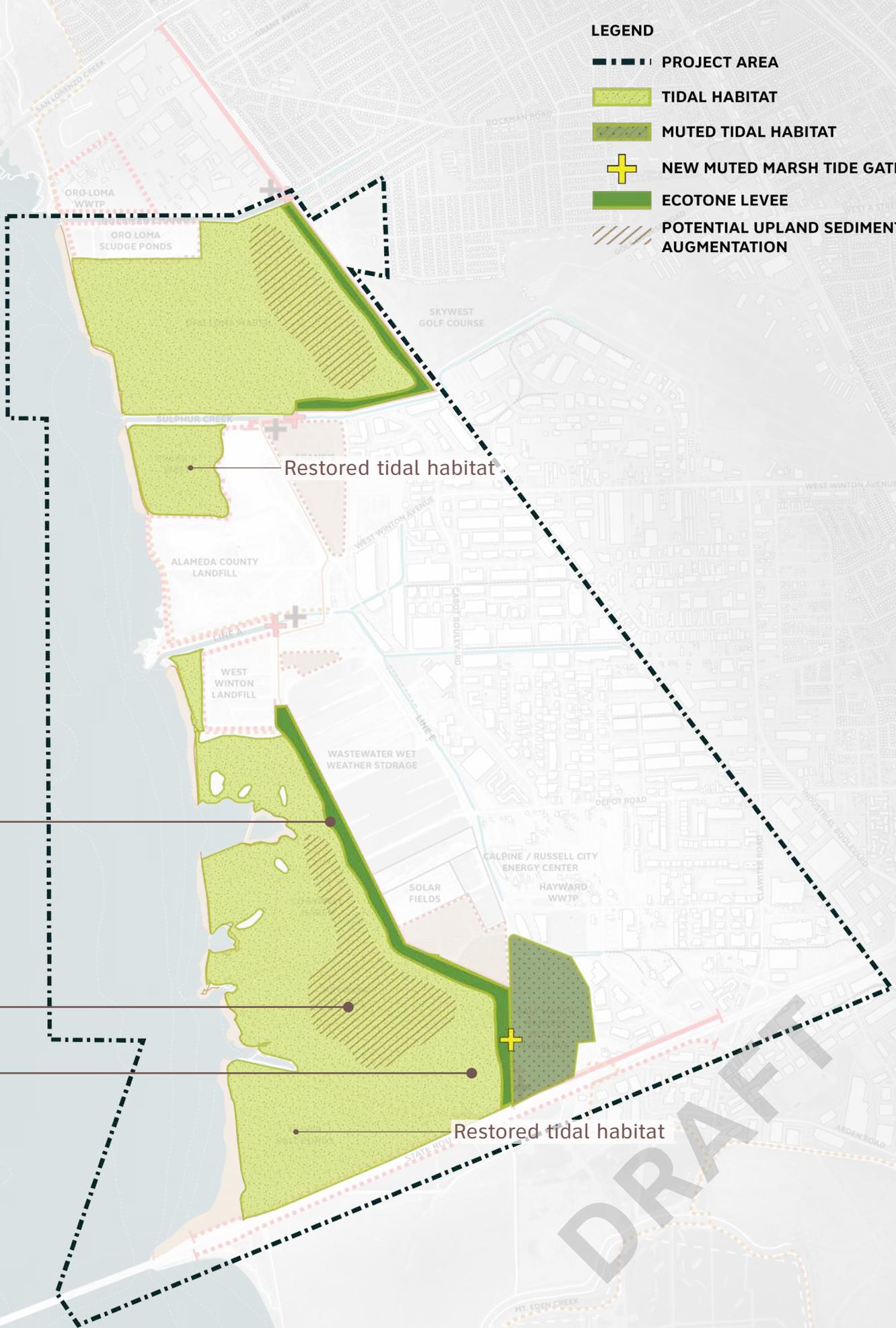
- May help half of the Salt Marsh Harvest Mouse Preserve to accrete more tidal sediment

#### CONS

- Impacts to existing tidal habitat
- Regulatory issue

**LEGEND**

- PROJECT AREA
- TIDAL HABITAT
- MUTED TIDAL HABITAT
- NEW MUTED MARSH TIDE GATE
- ECOTONE LEVEL
- POTENTIAL UPLAND SEDIMENT AUGMENTATION



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# #2: DOWN THE MIDDLE

## EROSION CONTROL

This alternative presents a layered system of erosion control measures using gravel beaches that reduce the risk of erosion to levees that shelter the marshes behind. Revetments along the two landfills to reduces the risk of erosion and seepage.

### Revetment and sheet pile along landfill edge

---

#### PROS

- Increased erosion protection for the landfill
- Possibility to incorporate rocky habitat

#### CONS

- Cost of sheet pile is a concern for the City

### Gravel beaches in front of all marshes

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#### PROS

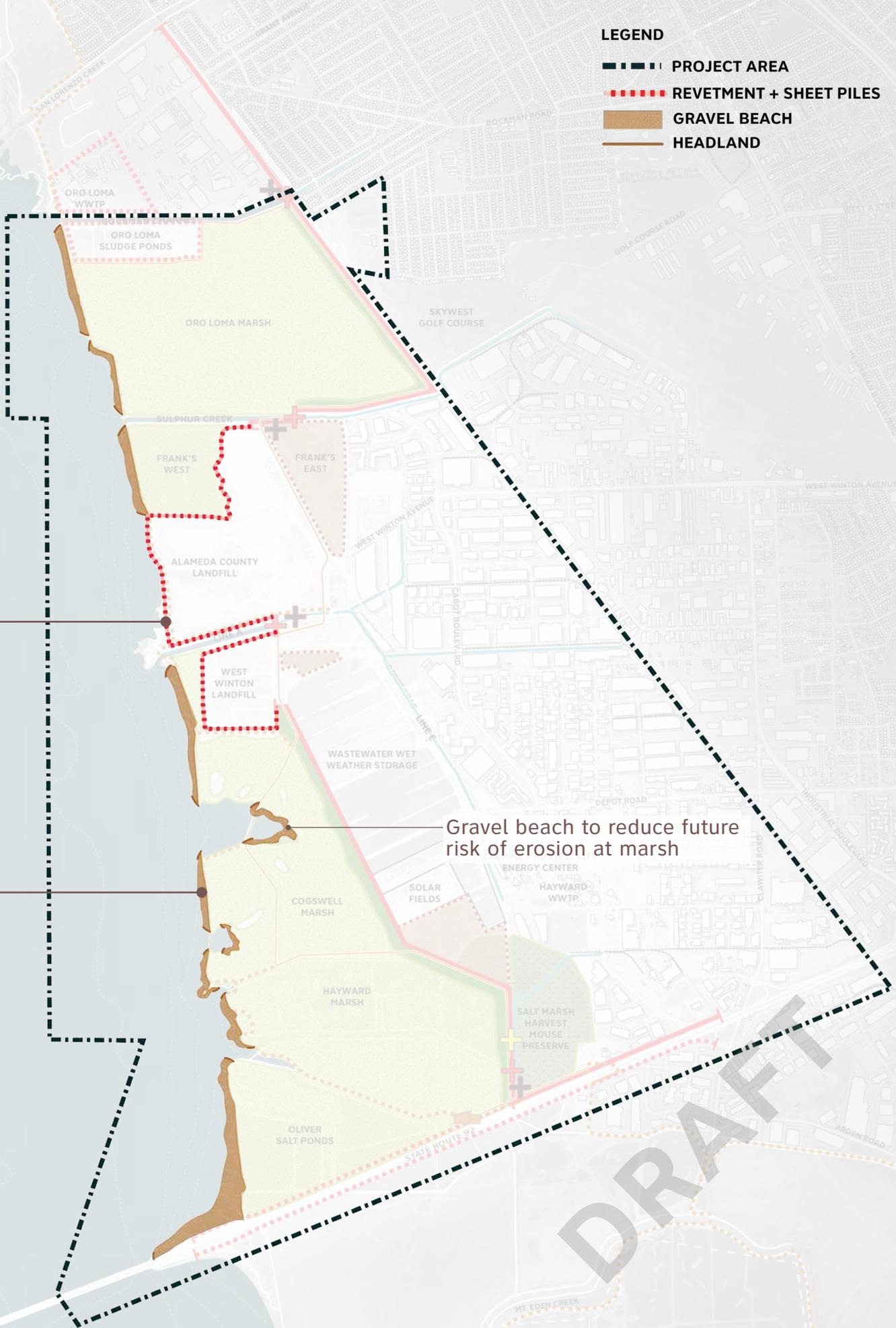
- Gravel beaches provide habitat

#### CONS

- Beaches in front of all marshes requires a numerous groins to preserve existing breaches
- Cost
- Maintenance / replenishment

**LEGEND**

- PROJECT AREA
- REVETMENT + SHEET PILES
- GRAVEL BEACH
- HEADLAND



Gravel beach to reduce future risk of erosion at marsh

DRAFT

# #2: DOWN THE MIDDLE

## STORMWATER MANAGEMENT

There is a great need for stormwater and groundwater management inland of the new line of protection to reduce the risk of flooding with increased precipitation events and reduce any bathtub effect impacts. Providing storage capacity to temporarily hold large volumes of water before it is discharged into the Bay is an important aspect of the Master Plan. As the Plan moves forward, additional studies will be required to assess the volume needed in relation to the hydrology of the area. If gravity flow discharge is not feasible, pumping stations will be required, which can be extremely costly to maintain and operate.

In this alternative, inland detention ponds are utilized to hold stormwater before it is pumped to the Bay.

### Dual Salt Pond / Stormwater Detention

---

#### PROS

- Provides salt pond habitat
- Large area for stormwater storage
- Along Sulphur Creek
- Enhances bird species habitat- the birds seem to prefer fresh water over salt water

#### CONS

- Stormwater may impact habitat

### Dual Salt Pond / Stormwater Detention

---

#### PROS

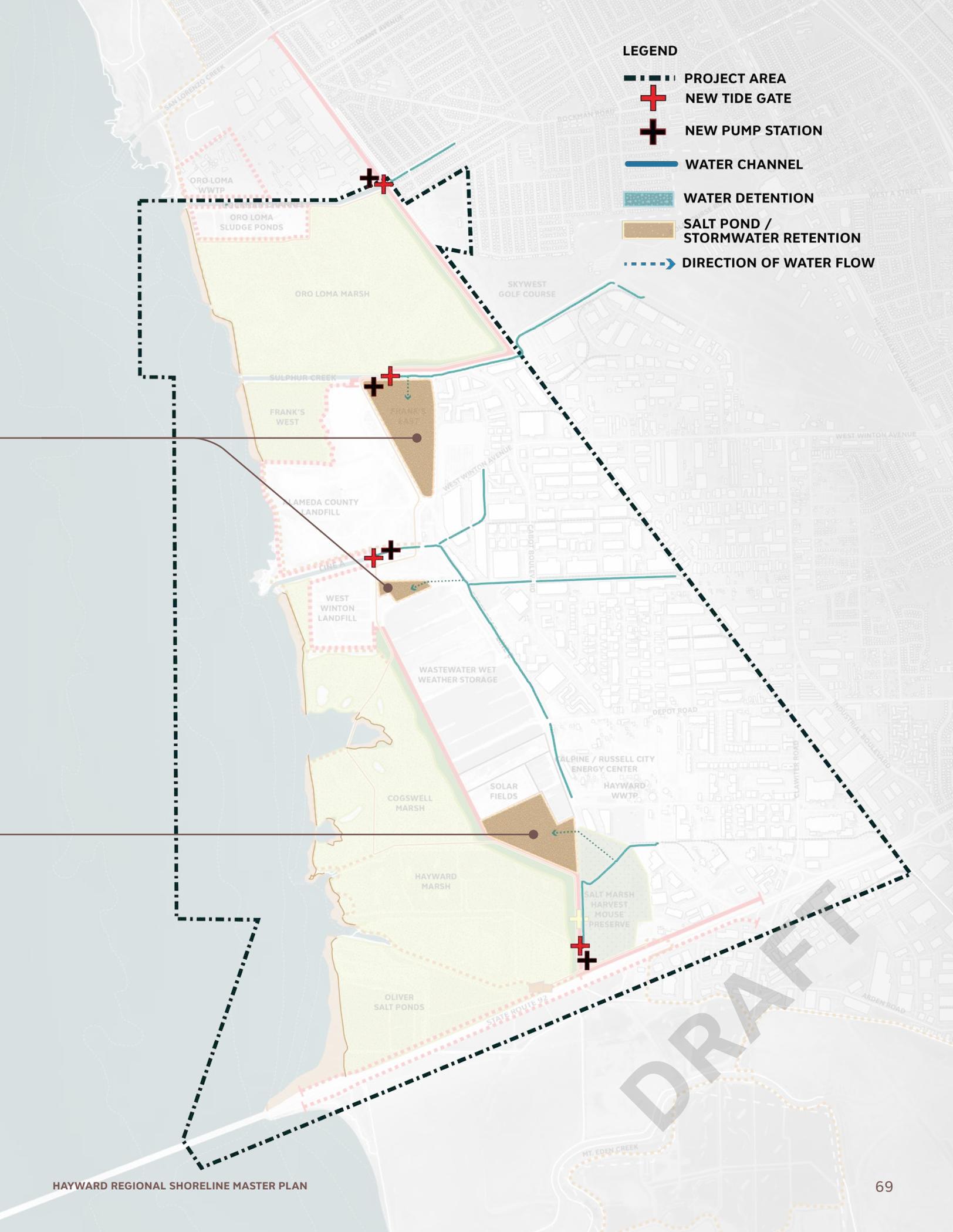
- Provides salt pond habitat
- Large area for stormwater storage
- Along Sulphur Creek
- Enhances bird species habitat- the birds seem to prefer fresh water over salt water

#### CONS

- Stormwater may impact habitat
- Not directly adjacent to a flood control channel

**LEGEND**

-  PROJECT AREA
-  NEW TIDE GATE
-  NEW PUMP STATION
-  WATER CHANNEL
-  WATER DETENTION
-  SALT POND / STORMWATER RETENTION
-  DIRECTION OF WATER FLOW



# #2: DOWN THE MIDDLE

## WASTEWATER TREATMENT

Critical wastewater treatment functions are maintained and enhanced at Oro Loma and Hayward WWTP's with horizontal levees that outlet effluent to Oro Loma and Cogswell Marsh. Most of Hayward WWTP's existing function and storage capacity is maintained.

### Horizontal Levee only along Union Pacific Rail Corridor

---

#### PROS

- Discharge some effluent from Oro Loma
- Aligns with First Mile project
- Provides transition slope

#### CONS

- Potential impacts to current habitat
- Would require filling in part of Oro Loma Marsh
- Mosquito abatement regulatory issues

### Most of the Wastewater Wet Weather Storage ponds to remain

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### Horizontal Levee built into the oxidation ponds for Hayward WWTP local discharge

---

#### PROS

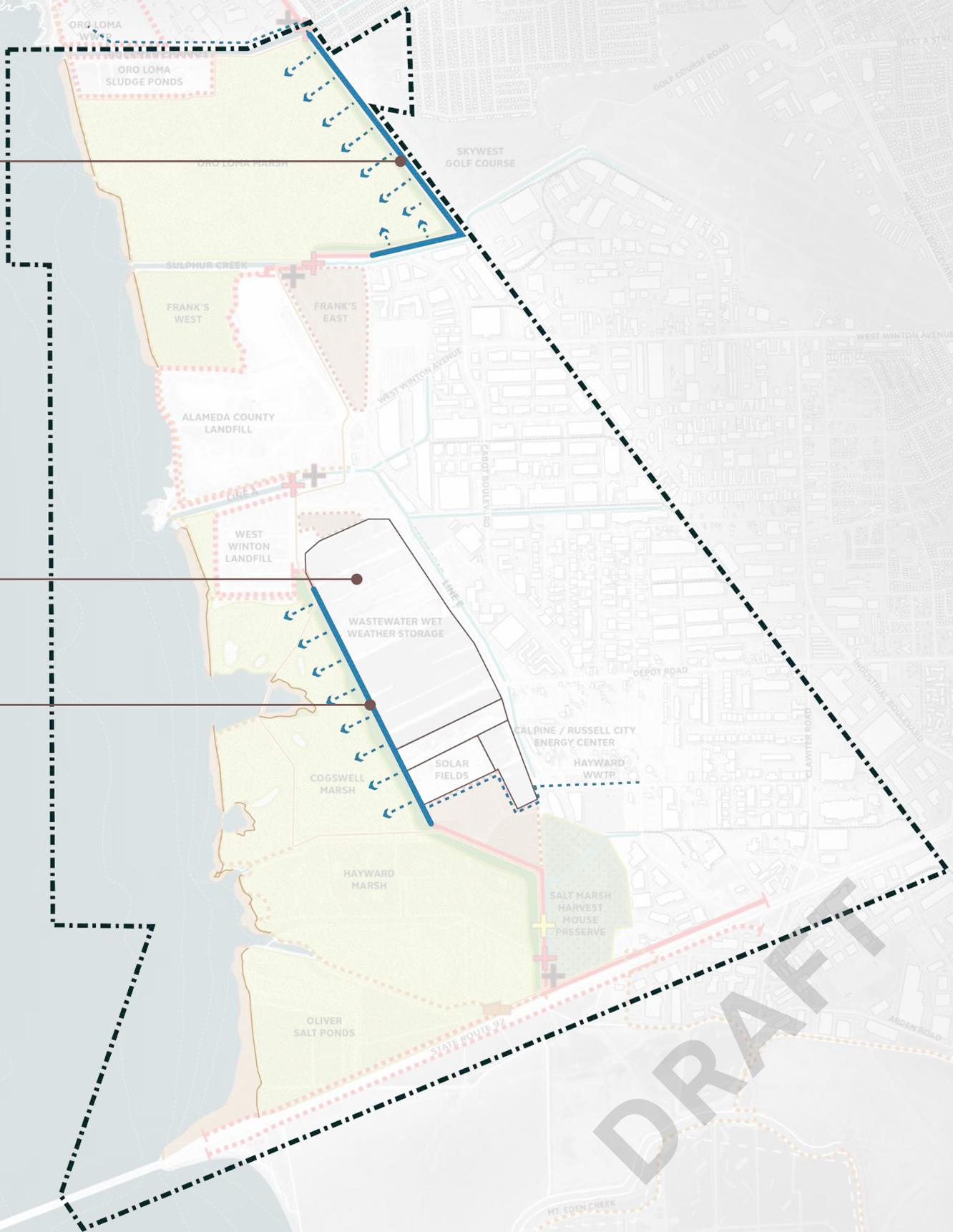
- Local Discharge for Hayward WWTP

#### CONS

- Loss of Wastewater Wet Weather Storage space with ecotone slope built into them
- Mosquito abatement regulatory issues
- Hayward WWTP is not currently planning for the level of treatment that may be required to discharge into protected species habitat

**LEGEND**

- PROJECT AREA**
- DIRECTION OF WATER FLOW**
- HORIZONTAL LEVEL**



# #2: DOWN THE MIDDLE

## BAY TRAIL

The Bay Trail is aligned to promote a diversity of experiences while reducing the risk of flooding. A phased realignment of the trail will maintain its existing alignment and connect to the new alignment until it is inundated.

### Aligns to the back of Oro Loma Marsh and Alameda County Landfill

---

#### CONS

- Further from the Bay
- No blue water experience

### Bay Trail is elevated on structure

---

#### PROS

- Alignment is closer to the Bay
- Pulled away from wastewater treatment uses

#### CONS

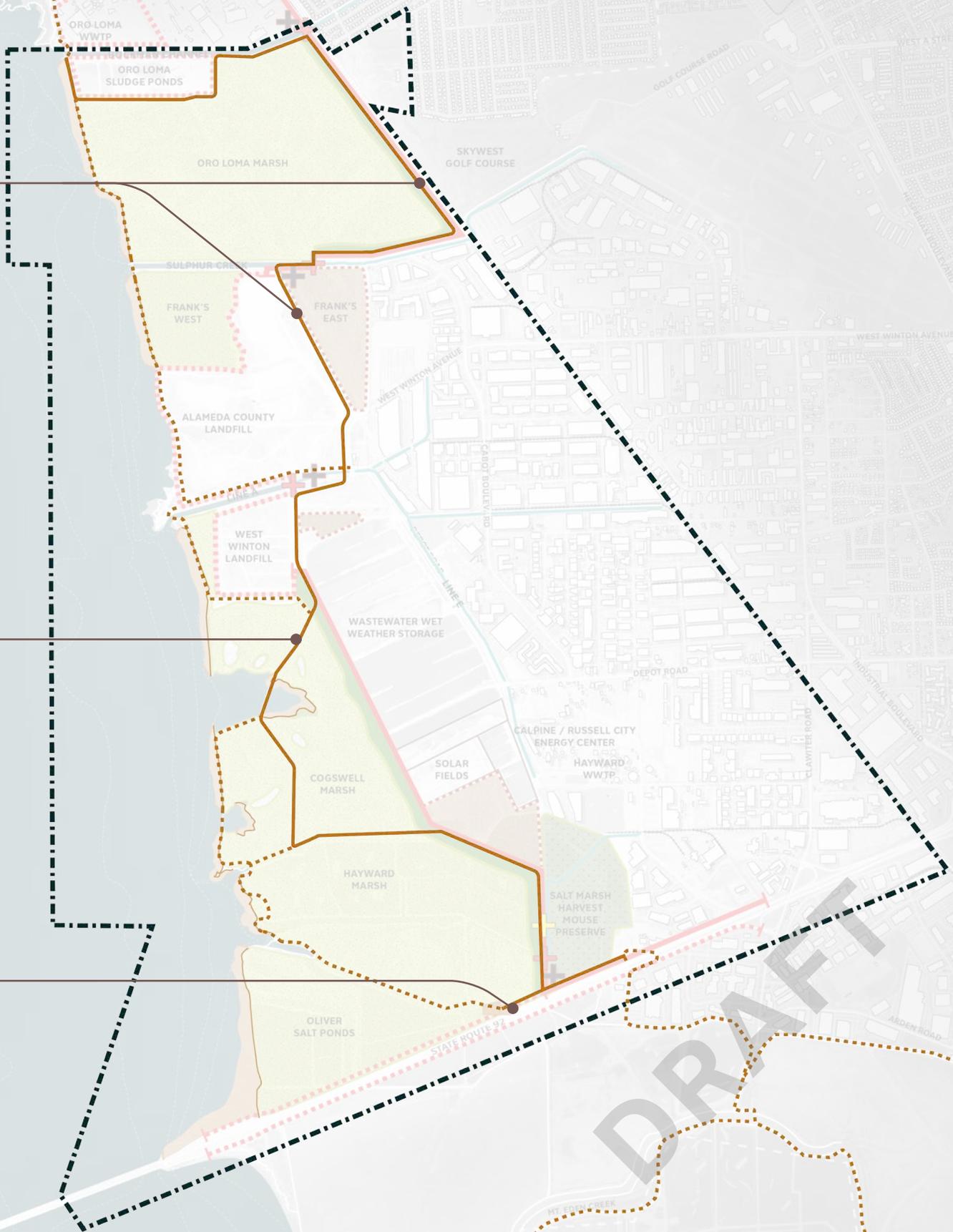
- Costly to maintain bridges outside the line of protection
- Existing bridge is only at 9.75' elevation

### Spur to the Interpretive Center

---

**LEGEND**

- PROJECT AREA**
- EXISTING BAY TRAIL**
- NEW BAY TRAIL**



# #2: DOWN THE MIDDLE

## HAYWARD SHORELINE INTERPRETIVE CENTER

The Hayward Shoreline Interpretive Center is adapted in place through the elevation of the building itself or retrofit to a floating structure. Its location within a marsh maintains direct connection to shoreline ecosystems.

### Access road is elevated in place

---

#### PROS

- Reduced risk of flooding
- Potential to tie into CalTrans improvements

### Interpretive Center becomes elevated / floating in place

---

#### PROS

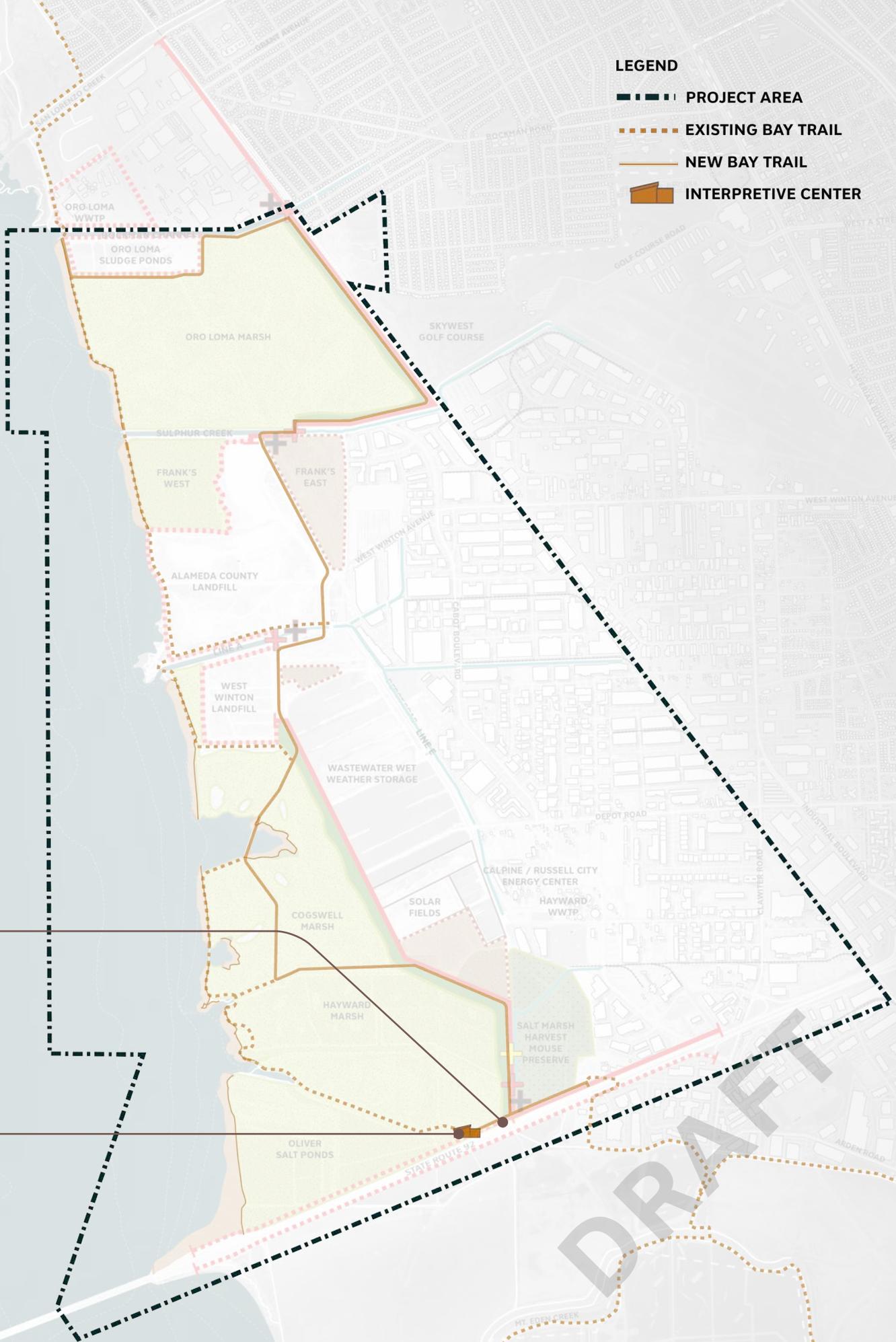
- Closer to the Bay- maintain marsh connection

#### CONS

- Building elevation may be costly

**LEGEND**

- PROJECT AREA
- EXISTING BAY TRAIL
- NEW BAY TRAIL
- INTERPRETIVE CENTER



# #2: DOWN THE MIDDLE

## ORO LOMA MARSH



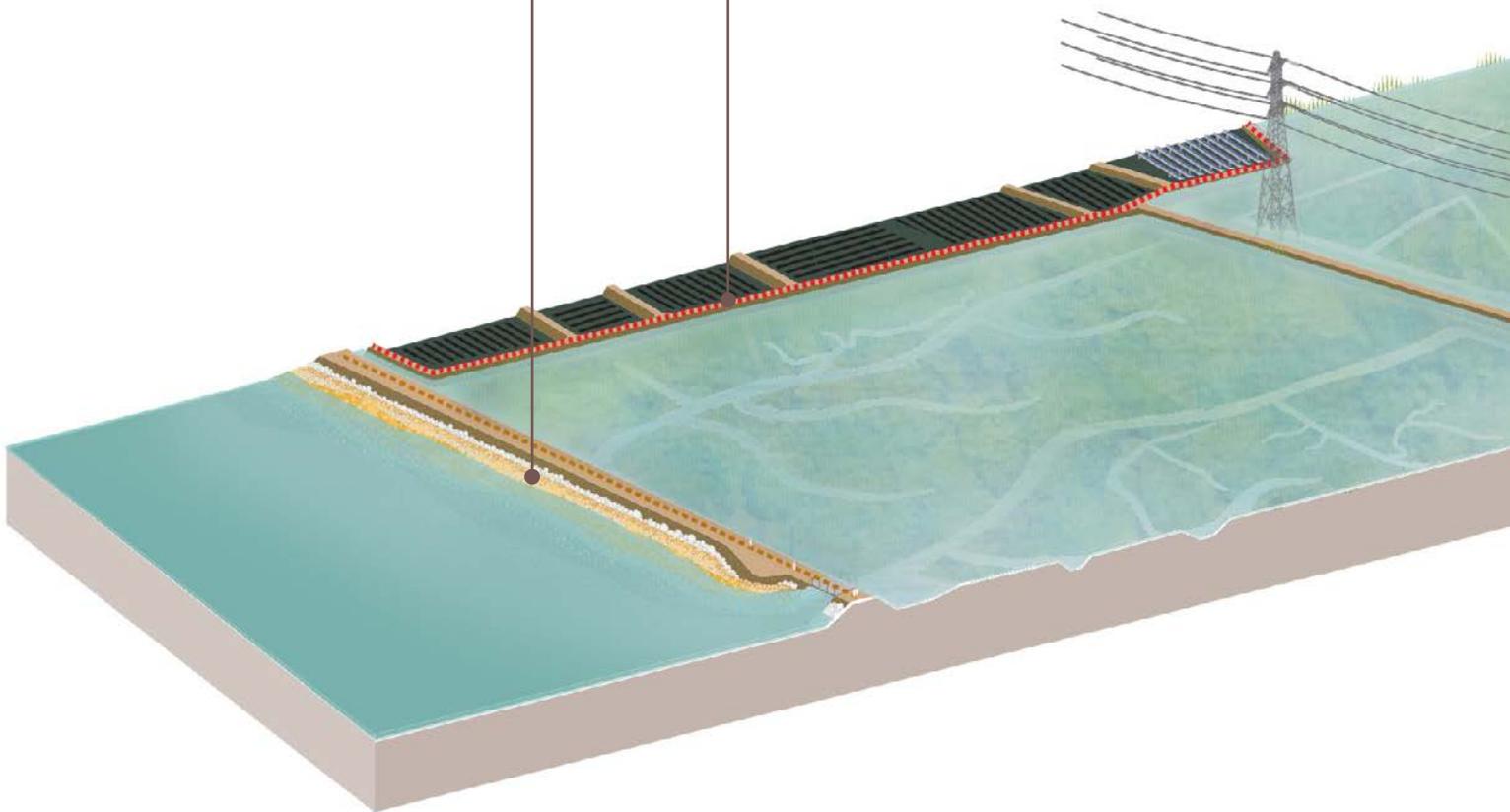
Key Map  0 1M

### Gravel Beach

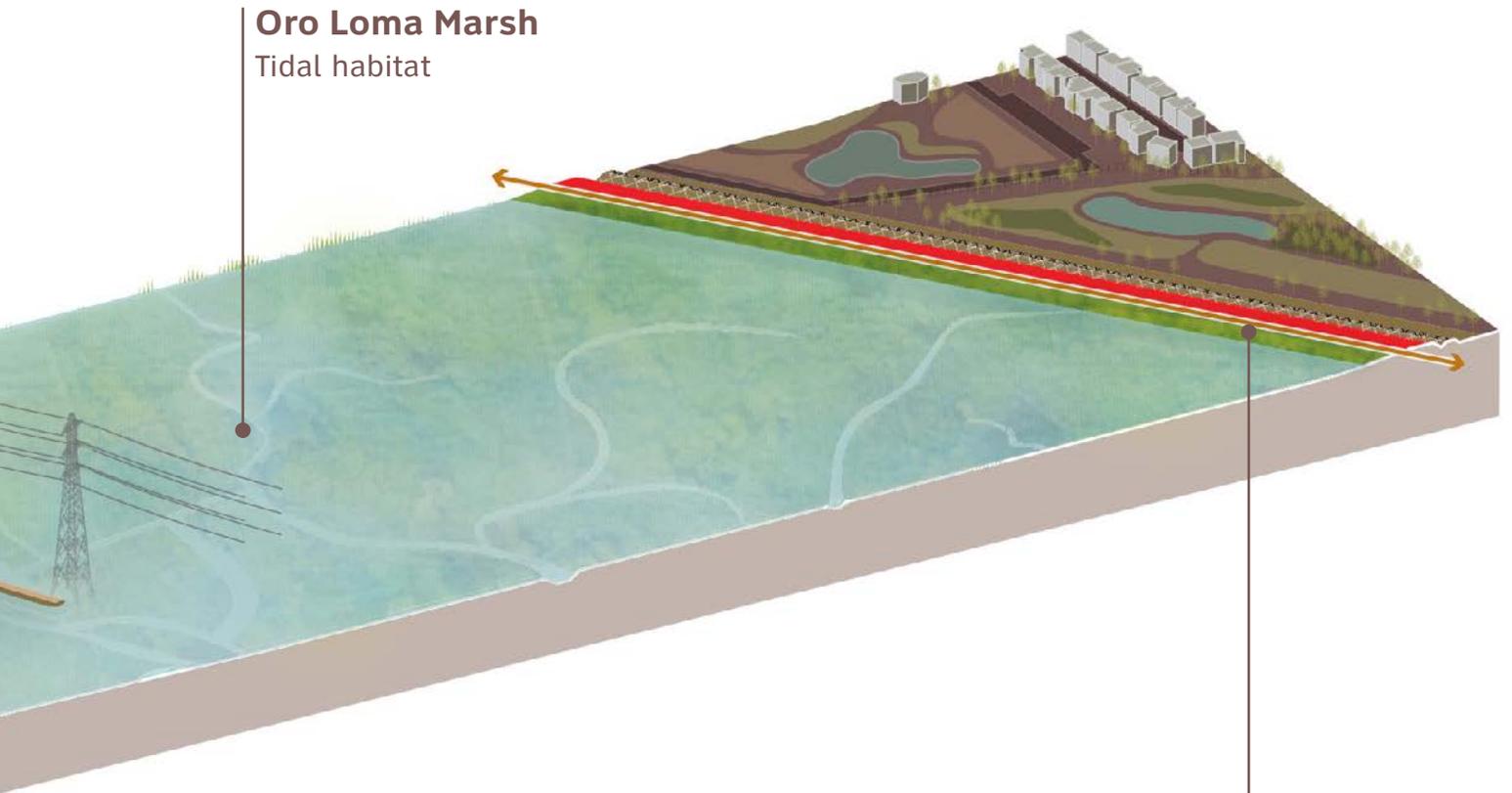
Outboard of existing levee

### Oro Loma Sludge Ponds

Perimeter protection in place



**Oro Loma Marsh**  
Tidal habitat



**Line of Protection / Ecotone Levee / Bay Trail**  
Aligns along the Union Pacific Rail Corridor  
in the back of Oro Loma Marsh

DRAFT

# #2: DOWN THE MIDDLE

## ALAMEDA COUNTY LANDFILL



Key Map



0

1M

### Gravel Beach

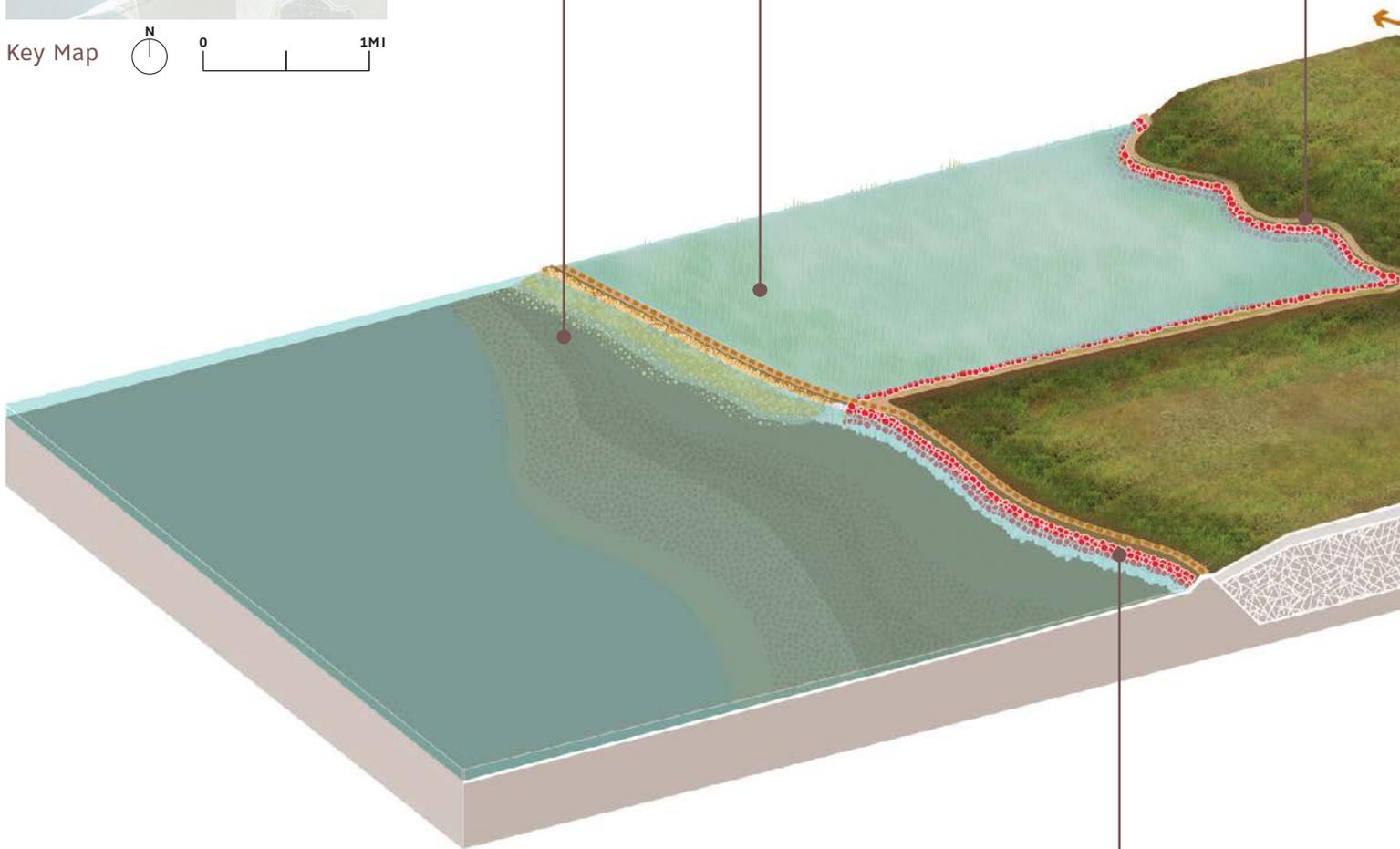
Outboard of existing levee

### Frank's West

Tidal habitat

### Sheet Pile around landfill

Acts as line of protection



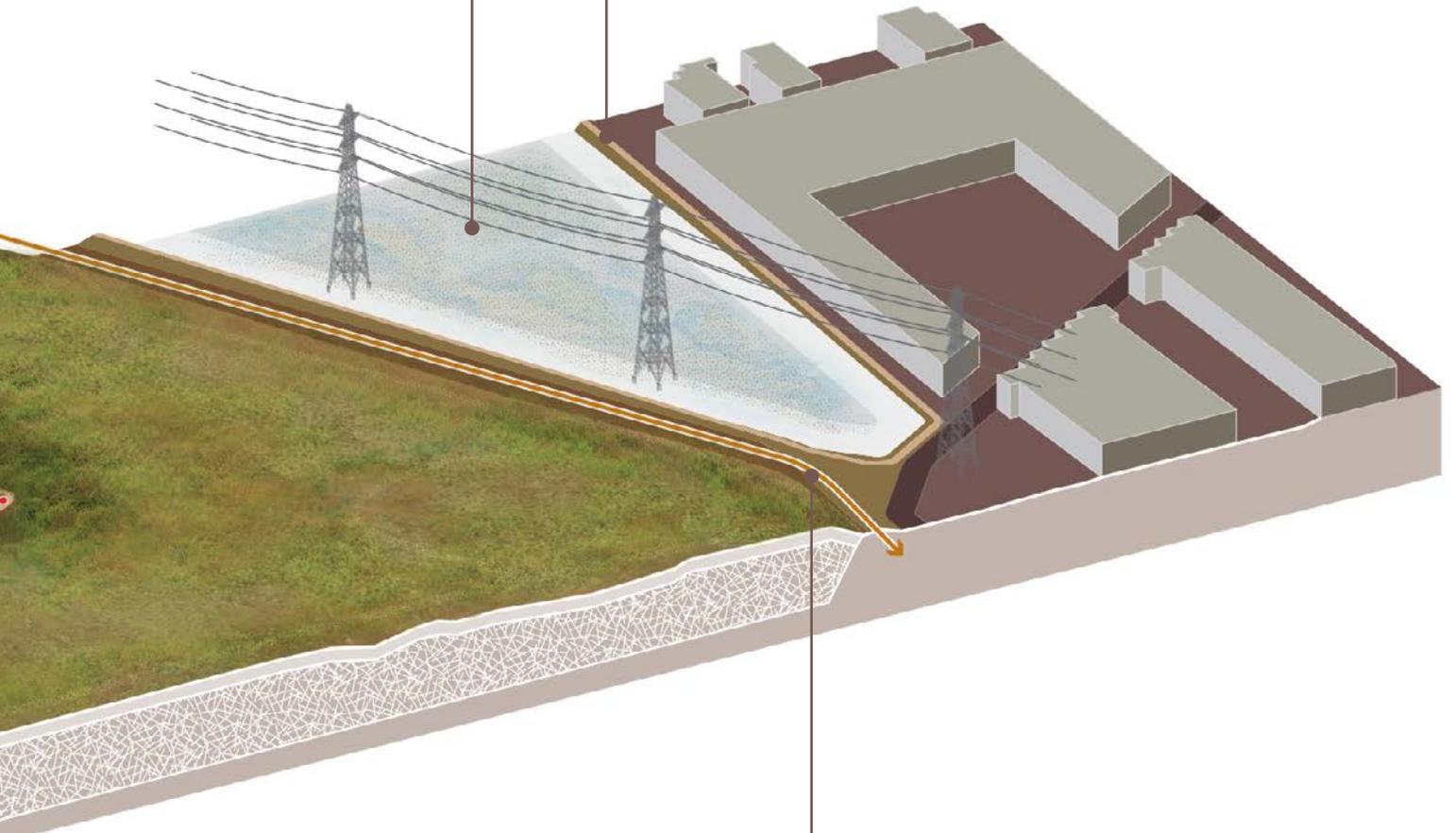
### Revetment

Outboard of Alameda County landfill to reduce erosion

**Frank's East**

Salt Pond / Stormwater Detention pond

**Levee raising**



**Bay Trail**

Aligns behind Alameda County Landfill

DRAFT

# #2: DOWN THE MIDDLE

## COGSWELL MARSH



Key Map



0

1M

### Gravel Beach

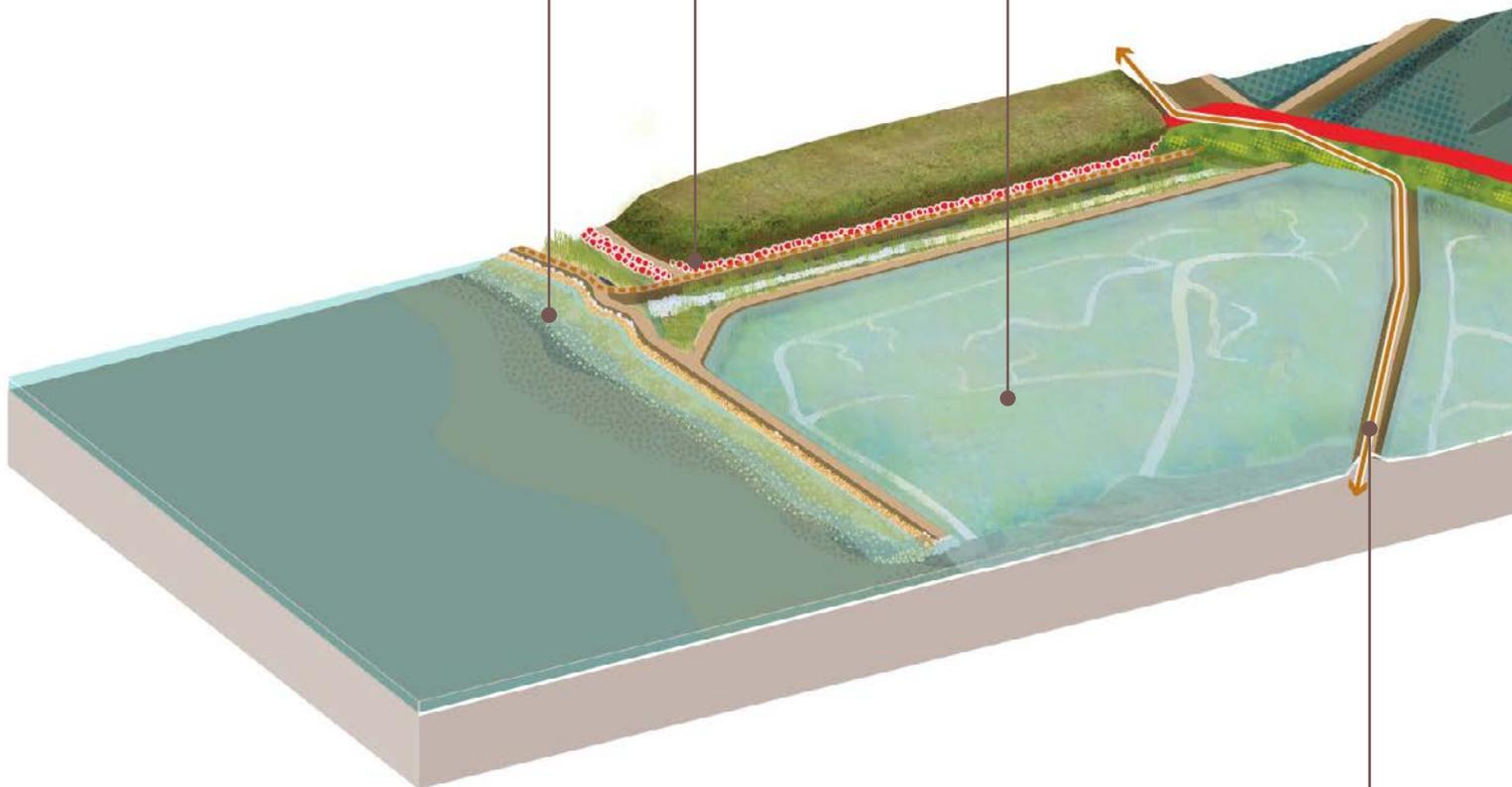
Outboard of existing levee

### Sheet Pile

Acts as line of protection

### Cogswell Marsh

Tidal habitat

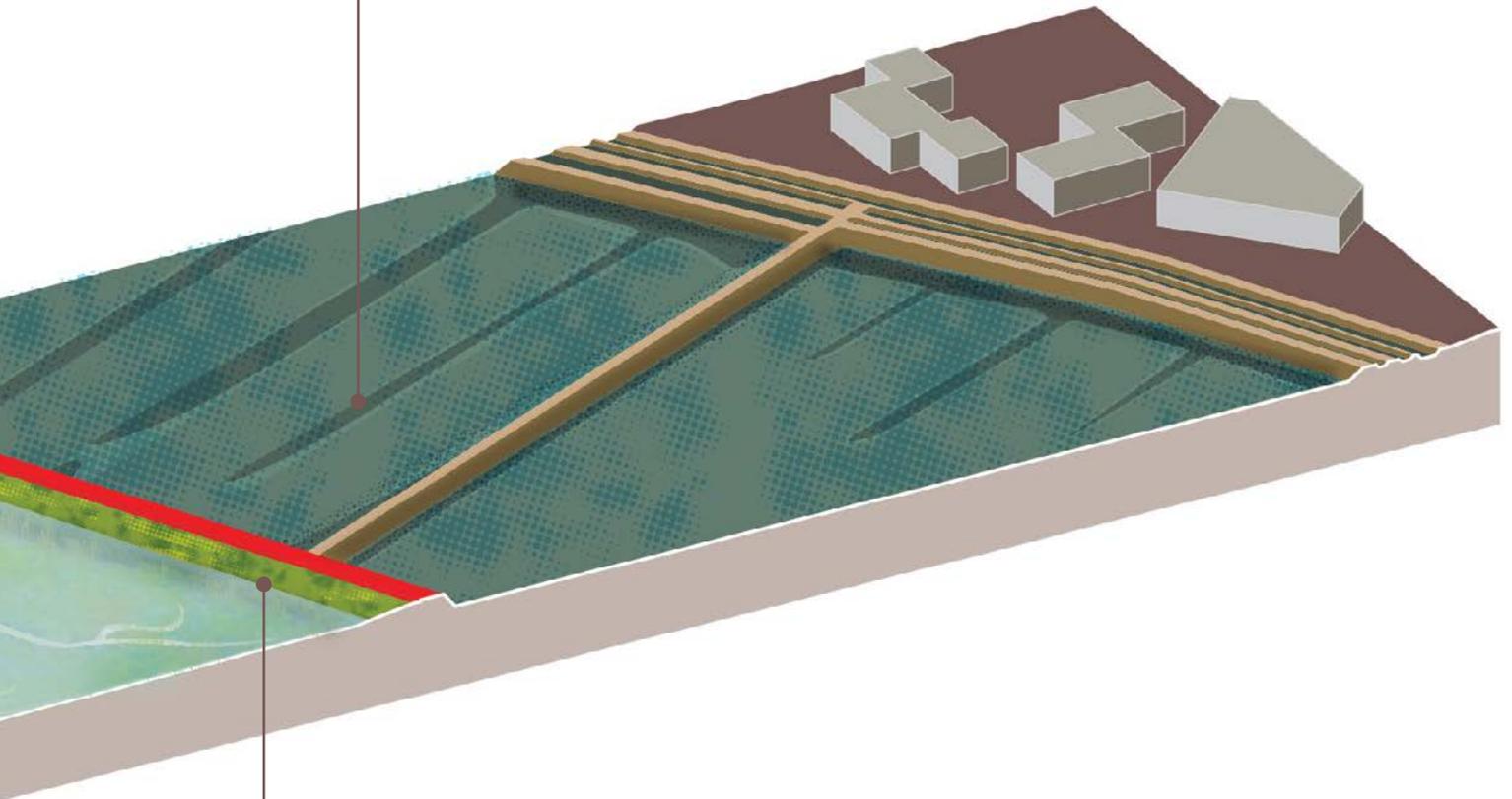


### Bay Trail

Raised on piles in existing alignment

**Wastewater Wet Weather Storage**

Storage capacity is reduced with levee construction



**Line of Protection / Ecotone Levee / Bay Trail**

Built inland of existing oxidation pond levee into the oxidation ponds

DRAFT

# #2: DOWN THE MIDDLE

## HARD MARSH



Key Map



0

1M

### Gravel Beach

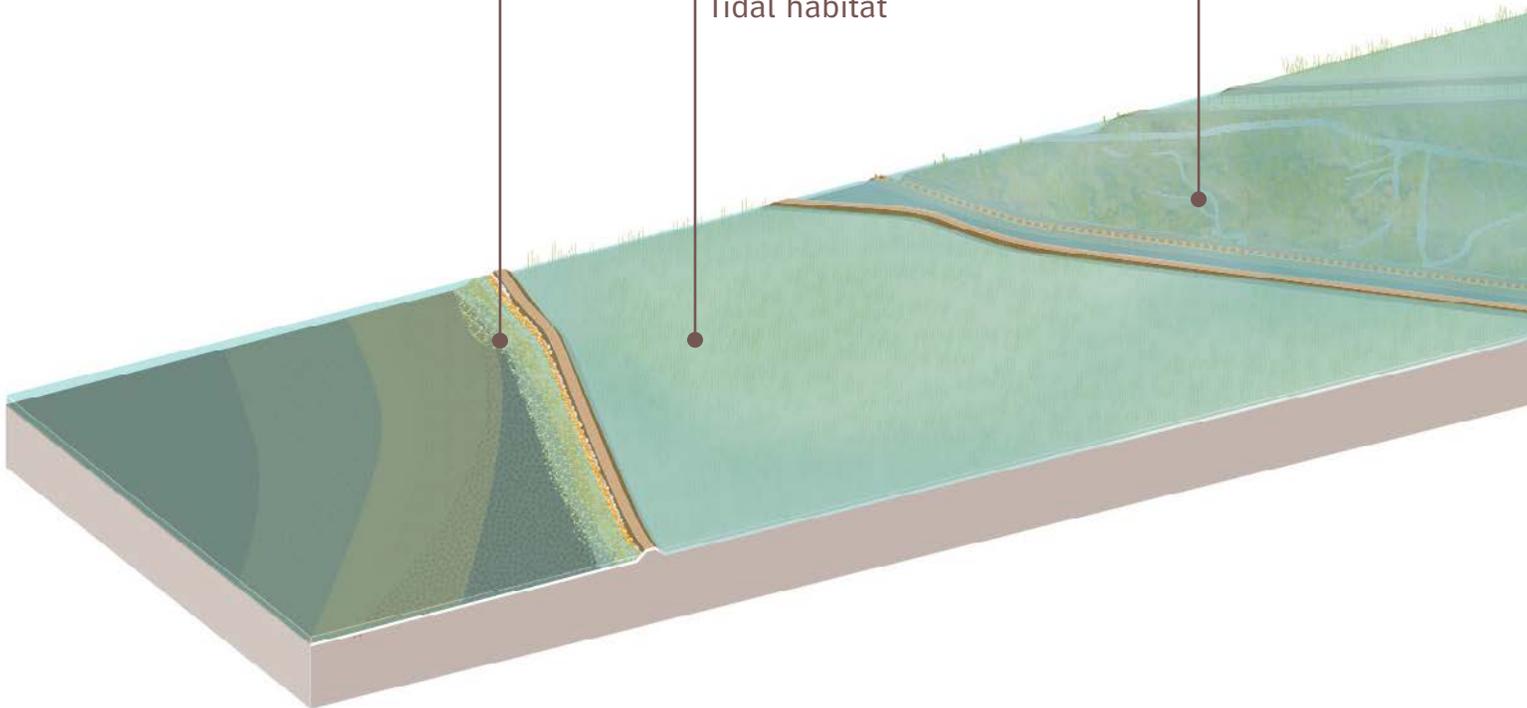
Outboard of existing levee

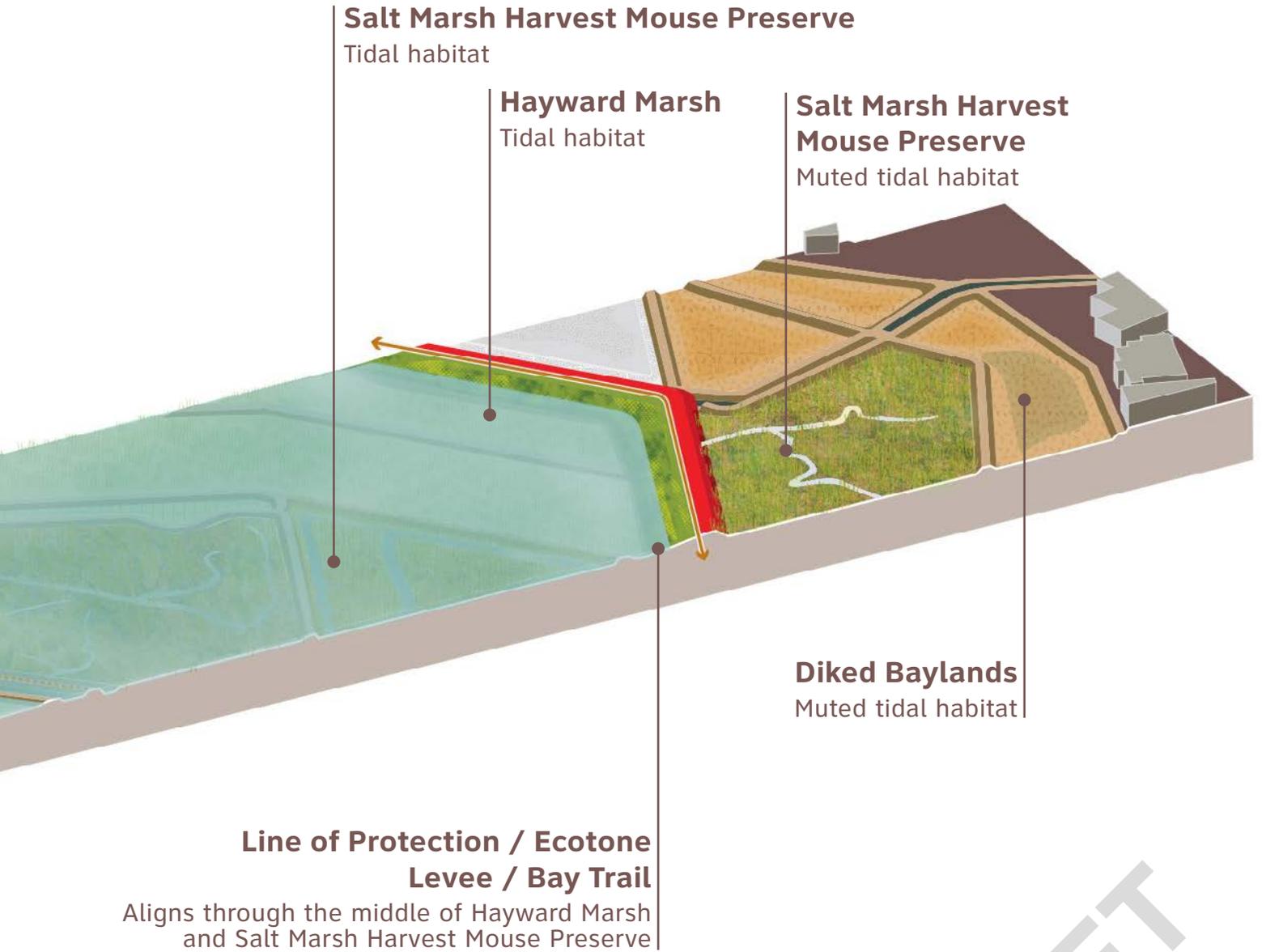
### Oliver Salt Ponds

Tidal habitat

### HARD Marsh

Tidal habitat





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**DRAFT**

# **#3: FURTHER INLAND**

DRAFT

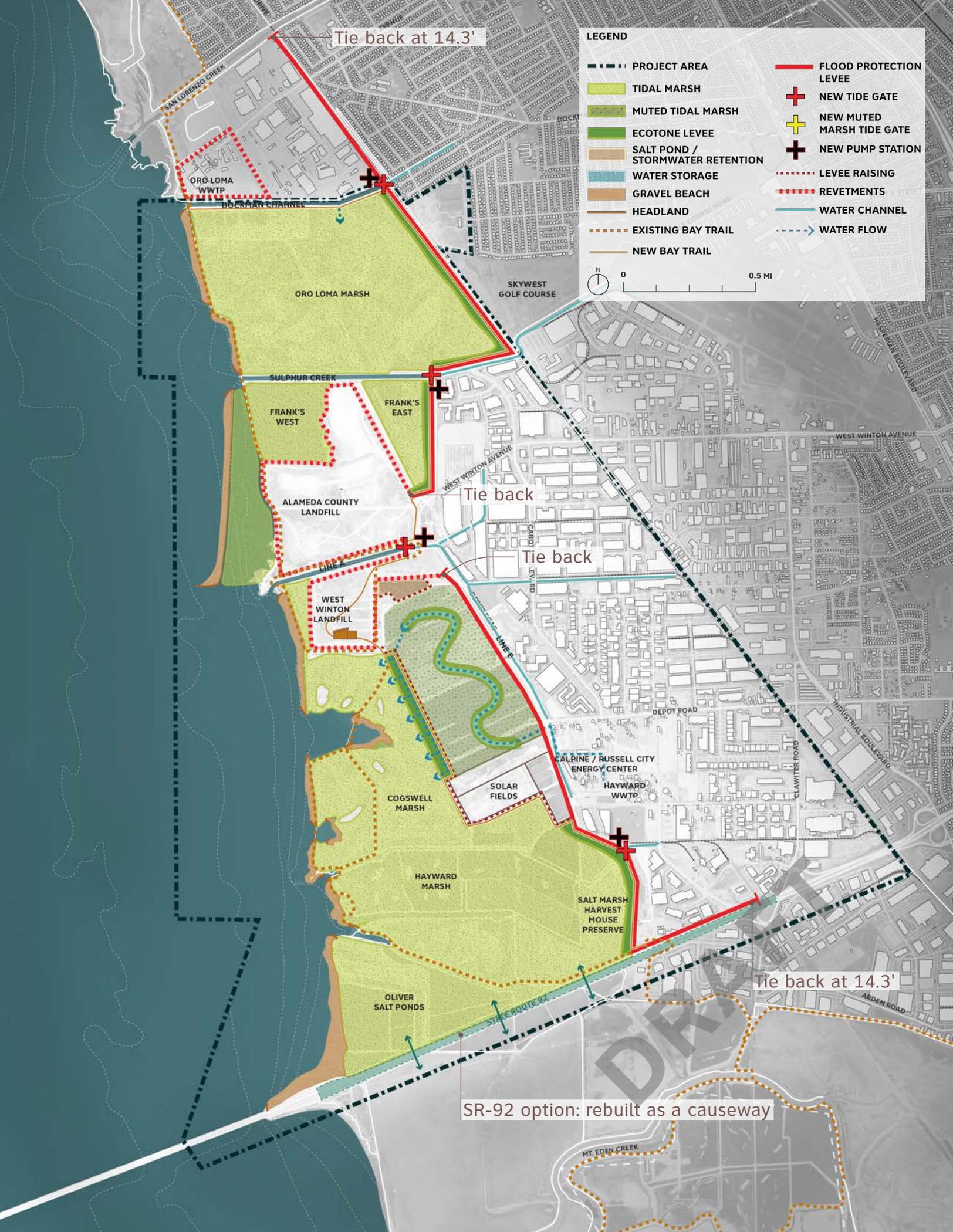
## **#3: FURTHER INLAND**

**This alternative explores an alignment that is pulled the furthest inland to maximize ecological restoration along the shoreline and layer risk reduction infrastructure.**

**In the north, the line of protection is pulled back along the Union Pacific Rail Corridor and ties back to high ground at the San Lorenzo Creek channel. It then aligns to the eastern edge of Frank's East and ties back to high ground at the two existing landfills. It is pulled to the east of the oxidation ponds and follows the eastern extent of the diked Baylands to the south before tying back to high ground with a levee parallel to SR-92 along Clawiter Road.**

**This alternative prioritizes a larger extent of connected tidal habitat that is Bayward of the line of protection and incorporates ecological and risk reduction infrastructure along a wider extent of Baylands.**

**The assumed planning elevation for the line of protection is 14.3' NAVD88. The final design flood elevation will require further study and cost analysis.**



Tie back at 14.3'

**LEGEND**

	PROJECT AREA		FLOOD PROTECTION LEVEE
	TIDAL MARSH		NEW TIDE GATE
	MUTED TIDAL MARSH		NEW MUTED MARSH TIDE GATE
	ECOTONE LEVEE		NEW PUMP STATION
	SALT POND / STORMWATER RETENTION		LEVEE RAISING
	WATER STORAGE		REVETMENTS
	GRAVEL BEACH		WATER CHANNEL
	HEADLAND		WATER FLOW
	EXISTING BAY TRAIL		
	NEW BAY TRAIL		

0 0.5 MI

Tie back

Tie back

Tie back at 14.3'

SR-92 option: rebuilt as a causeway

DRY

# #3: FURTHER INLAND

## LINE OF PROTECTION

In this alternative, the line of protection moves inland, opening a larger extent of shoreline for ecological restoration. The assumed planning elevation for the line of protection is 14.3' NAVD88. The final elevation will require further study and cost analysis- this elevation will be used for planning purposes only.

### Oro Loma perimeter protection

---

#### PROS

- Protects existing sludge ponds and WWTP infrastructure

#### CONS

- Oro Loma WWTP not protected with line of protection
- Access will be inundated

### Oro Loma sludge ponds restored to marsh

---

### Ecotone Levee wraps the east of Oro Loma Marsh and Frank's East

---

#### PROS

- Increase effluent discharge

#### CONS

- Longer distance
- More cost

### Levee raising

---

#### PROS

- Multi-step layered protection
- Solar fields were raised

#### CONS

- Building 2 levees costs more

### Line of protection moves to the east of the oxidation ponds

---

#### PROS

- Line of protection further inland

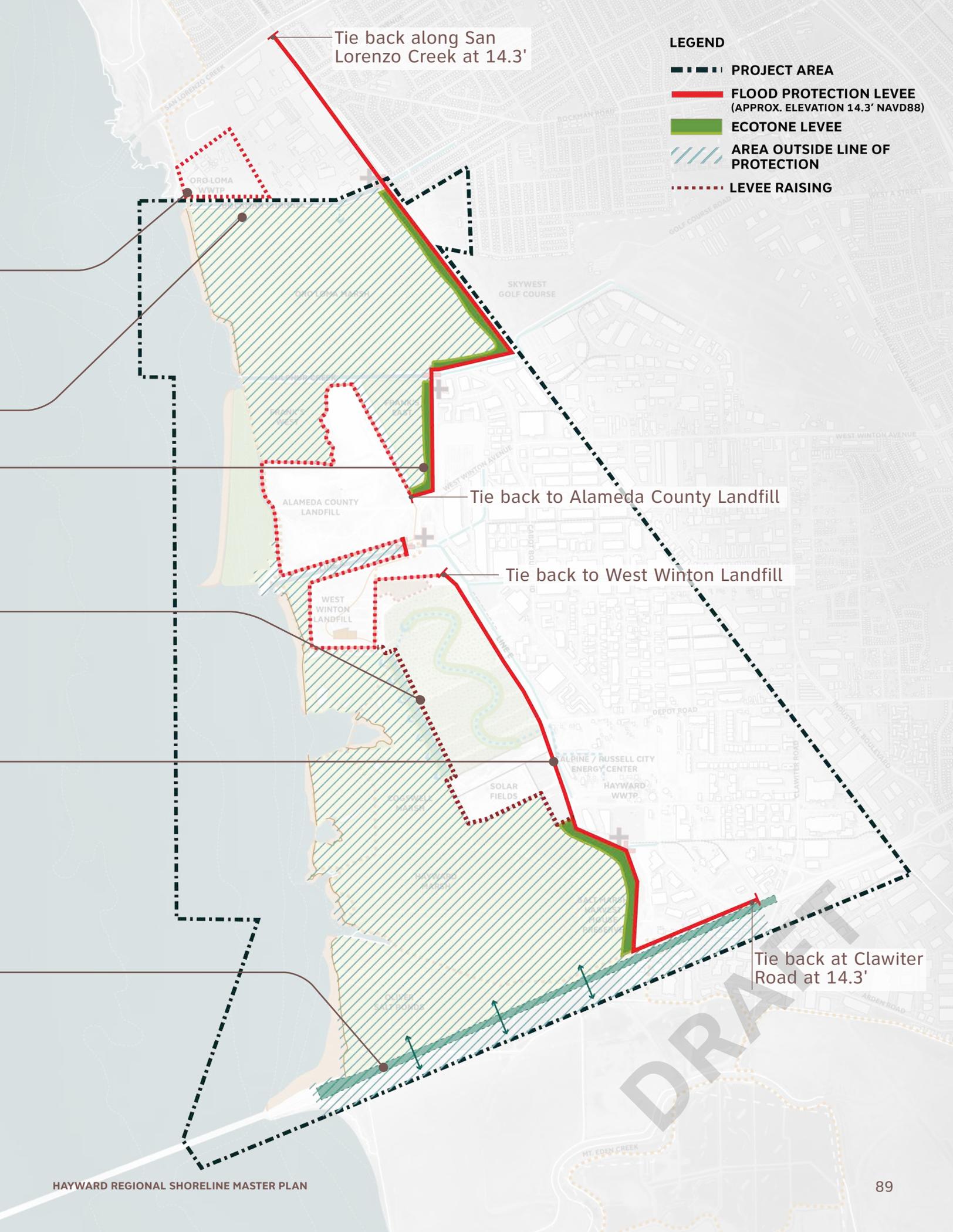
#### CONS

- Minimal space between Line E and the oxidation ponds for levee construction

### SR-92 Option

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- Rebuilt as a causeway



Tie back along San Lorenzo Creek at 14.3'

**LEGEND**

- PROJECT AREA
- FLOOD PROTECTION LEVEL (APPROX. ELEVATION 14.3' NAVD88)
- ECOTONE LEVEL
- AREA OUTSIDE LINE OF PROTECTION
- LEVEE RAISING

Tie back to Alameda County Landfill

Tie back to West Winton Landfill

Tie back at Clawiter Road at 14.3'

# #3: FURTHER INLAND

## TIDAL HABITAT

In the most expansive tidal habitat system, connectivity is restored between existing and restored marshes. Through marsh management and sediment placement, the shoreline's ability to accrete sediment is also increased.

### Breach at Bockman Channel

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#### PROS

- Tributary connection to Baylands

#### CONS

- Bockman water quality may impact marsh health

### Fringe marsh restoration

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#### PROS

- Fringe marsh may buffer landfill

#### CONS

- May be hard to restore fringe marsh

### Breach into Triangle Marsh

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#### PROS

- Breaching into Triangle Marsh may help it accrete more tidal sediment

#### CONS

- Breaching into Triangle Marsh may impact landfill protection
- Impacts to existing habitat

### Transition Salt Marsh Harvest Mouse Preserve to tidal habitat

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#### PROS

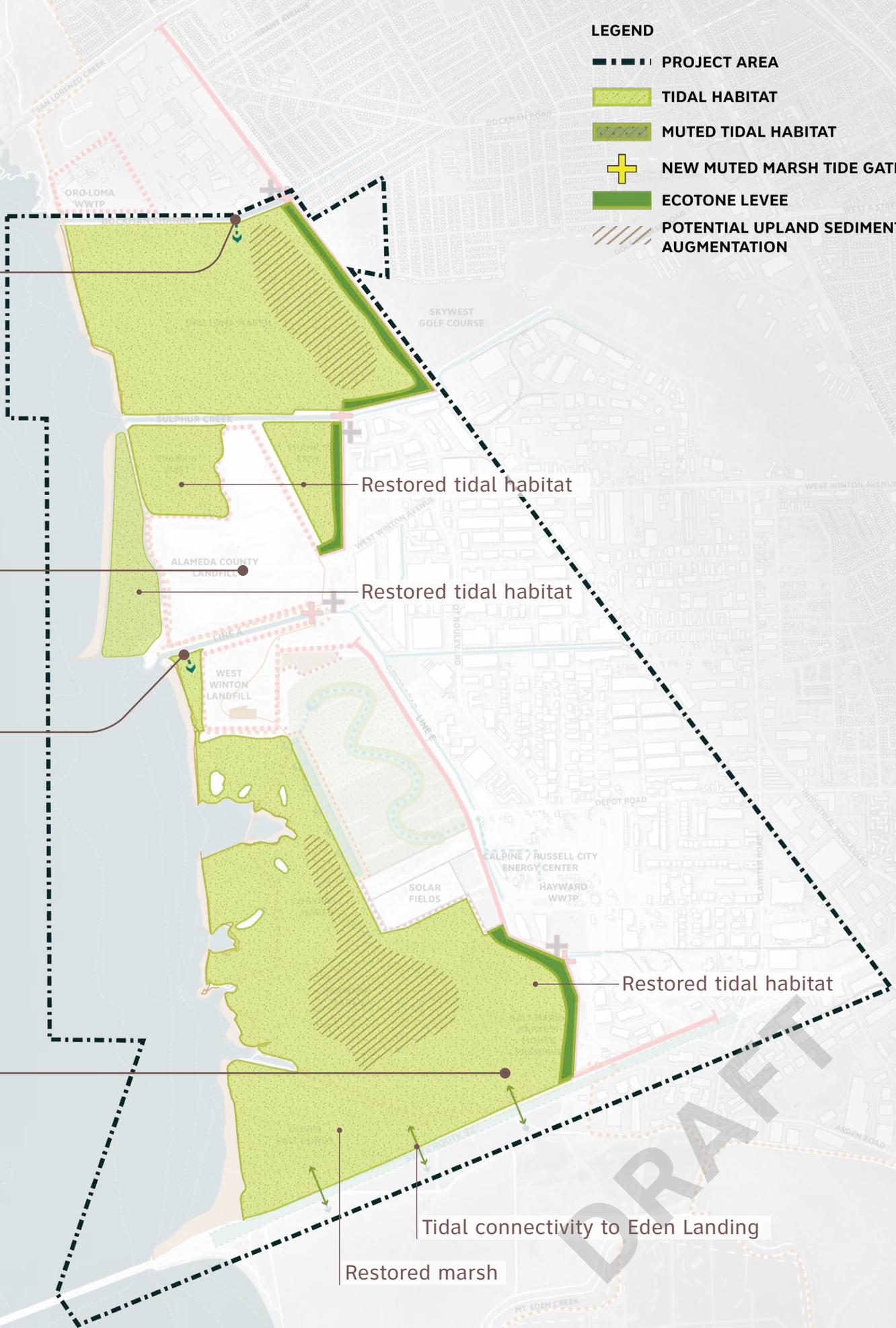
- Maximize muted tidal habitat that could be maintained with SLR
- Large, connected tidal habitat system
- Connection to Eden Landing through causeway

#### CONS

- Impacts to existing Salt Marsh Harvest Mouse Preserve habitat
- May be a regulatory issue

**LEGEND**

- PROJECT AREA** (dashed black line)
- TIDAL HABITAT** (green stippled pattern)
- MUTED TIDAL HABITAT** (green diagonal lines pattern)
- NEW MUTED MARSH TIDE GATE** (yellow cross symbol)
- ECOTONE LEVEL** (solid green line)
- POTENTIAL UPLAND SEDIMENT AUGMENTATION** (diagonal hatching pattern)



Restored tidal habitat

Restored tidal habitat

Restored tidal habitat

Tidal connectivity to Eden Landing

Restored marsh

# #3: FURTHER INLAND

## EROSION CONTROL

A layered system of erosion control measures utilizes gravel beaches that reduce the risk of erosion to levees that shelter the marshes behind. Revetments along the two landfills to reduces the risk of erosion and seepage.

### Gravel beaches in front of all marshes

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#### PROS

- Gravel beaches provide habitat

#### CONS

- Beaches in front of all marshes requires a numerous groins to preserve existing breaches
- Cost
- Maintenance / replenishment

### Gravel beach and fringe marsh restoration to reduce risk to landfill

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#### PROS

- Gravel beach provides an additional layer of protection for the landfill

### Revetments and sheet pile along landfill edges

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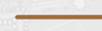
#### PROS

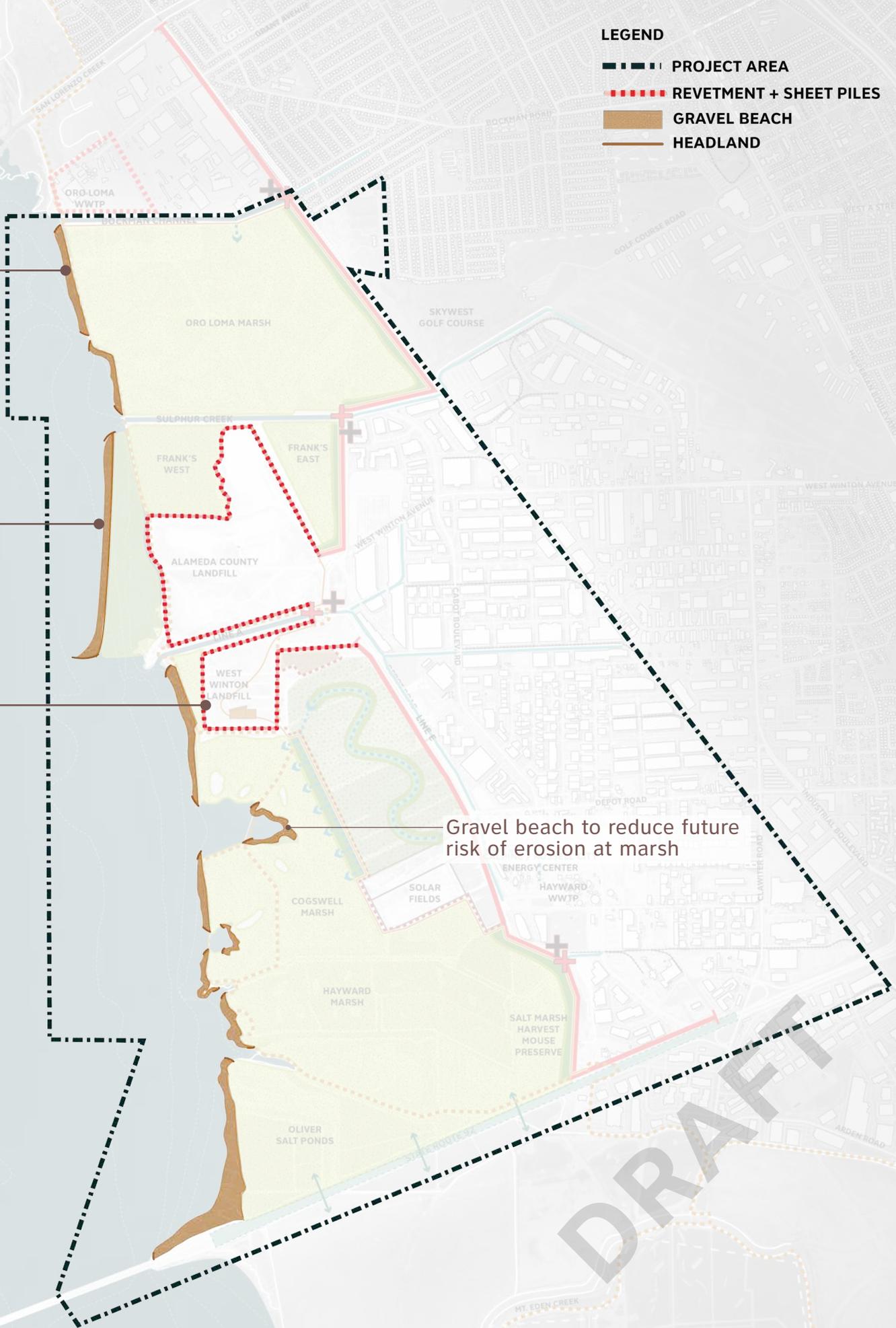
- Increased erosion protection to the landfill
- Possibility to incorporate rocky habitat

#### CONS

- Full perimeter protection is more expensive
- Cost of sheet pile is a concern for the City

**LEGEND**

-  PROJECT AREA
-  REVETMENT + SHEET PILES
-  GRAVEL BEACH
-  HEADLAND



Gravel beach to reduce future risk of erosion at marsh

**DRAFT**

# #3: FURTHER INLAND

## STORMWATER MANAGEMENT

There is a great need for stormwater and groundwater management inland of the new line of protection to reduce the risk of flooding with increased precipitation events and reduce any bathtub effect impacts.

In this alternative, no detention space is proposed, which could lead to flooding impacts or require constant pumping from the flood control channels to the bay.

### No additional stormwater storage space

#### CONS

- No capacity to mitigate increased precipitation and groundwater impacts
- Need to manage stormwater inland of a line of protection

### Dual Salt Pond / Stormwater Detention

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#### PROS

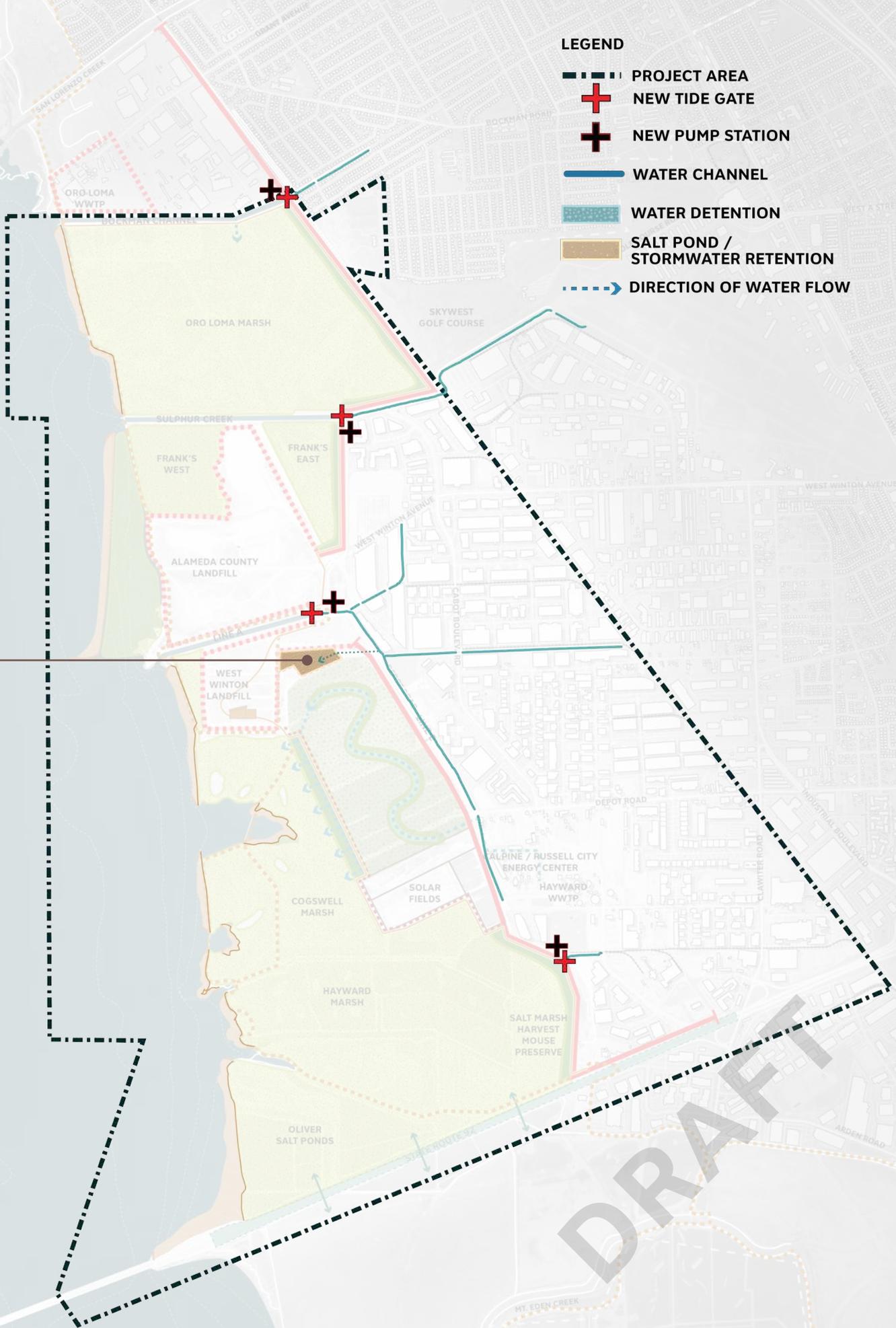
- Provides salt pond habitat
- Enhances bird species habitat- the birds seem to prefer fresh water over salt water

#### CONS

- Very small area in comparison to future need
- Stormwater may impact habitat

**LEGEND**

-  PROJECT AREA
-  NEW TIDE GATE
-  NEW PUMP STATION
-  WATER CHANNEL
-  WATER DETENTION
-  SALT POND / STORMWATER RETENTION
-  DIRECTION OF WATER FLOW



**DRAFT**

# #3: FURTHER INLAND

## WASTEWATER TREATMENT

Critical wastewater treatment functions are maintained and enhanced at Oro Loma and Hayward WWTP's with horizontal levees that outlet effluent to Oro Loma and Cogswell Marsh. This alternative assumes that EBDA is decommissioned. This allows for a freshwater treatment marsh in the former wet weather equalization ponds at Hayward WWTP to facilitate local discharge to Cogswell marsh. The level of protection for the open water treatment wetland, solar fields, and biosolids ponds is not addressed at this time and will be investigated as part of the preferred alternative.

### Horizontal Levee wraps the back of Oro Loma Marsh and Frank's East

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#### PROS

- Discharge a larger amount of Oro Loma's effluent
- Provides transition slope
- Aligns with First Mile project

#### CONS

- Potential impacts to current habitat
- Would require filling in part of Oro Loma Marsh
- Mosquito abatement regulatory issues

### Horizontal Levee built into the oxidation ponds for Hayward WWTP local discharge

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#### PROS

- Local Discharge for Hayward WWTP

#### CONS

- Loss of Wastewater Wet Weather Storage space with ecotone slope built into them
- Mosquito abatement regulatory issues
- Hayward WWTP is not currently planning for the level of treatment that may be required to discharge into protected species habitat

### Open water treatment wetland for Hayward WWTP

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#### PROS

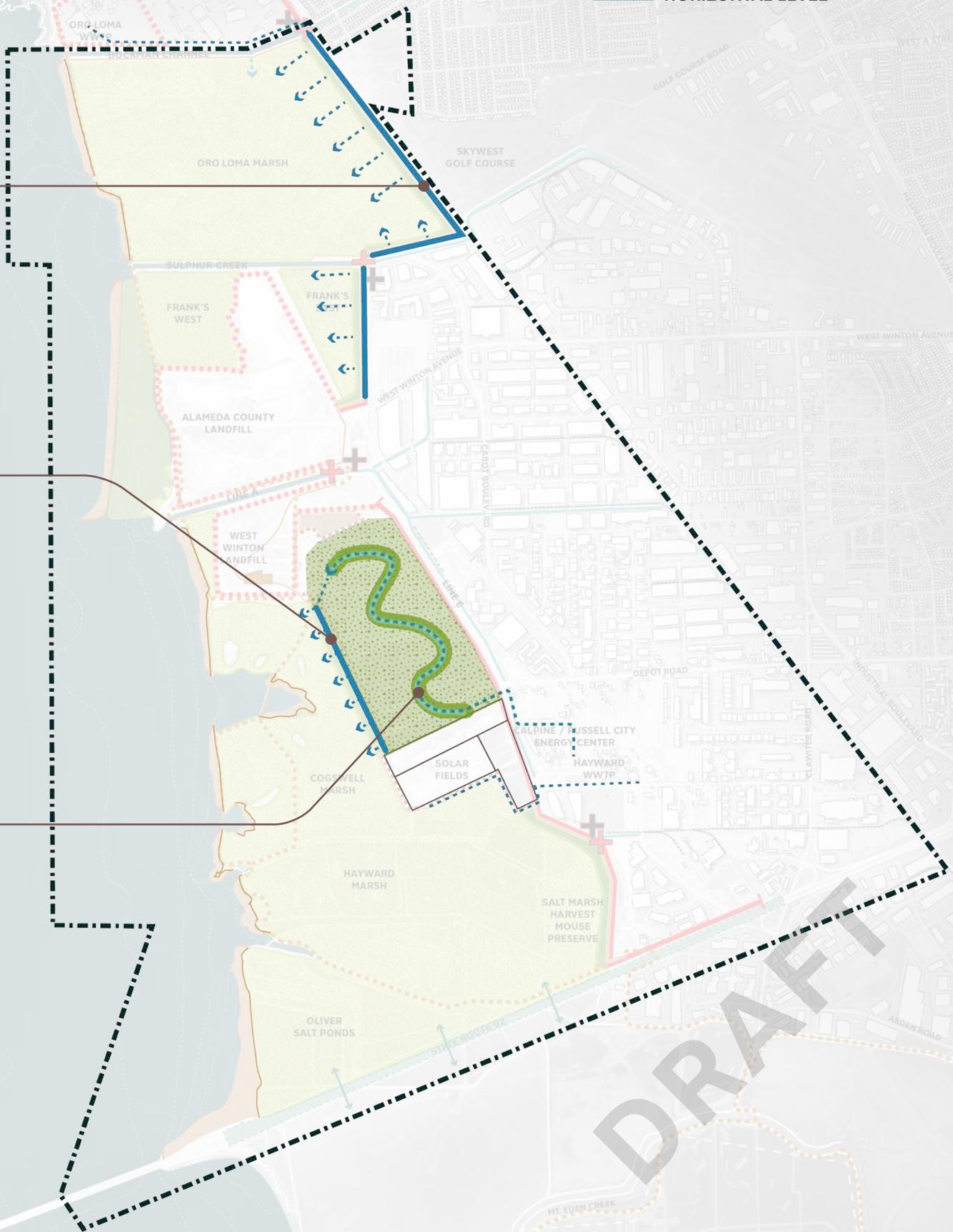
- May facilitate local Discharge for Hayward WWTP

#### CONS

- Loss of Wastewater Wet Weather Storage ponds
- Only feasible if EBDA pipeline is decommissioned
- Hayward WWTP is not currently planning for the level of treatment that may be required to discharge into protected species habitat

**LEGEND**

- PROJECT AREA**
- FRESHWATER TREATMENT MARSH**
- DIRECTION OF WATER FLOW**
- HORIZONTAL LEVEL**



**DRAFT**

# #3: FURTHER INLAND

## BAY TRAIL

The Bay Trail is pulled back to a higher inland elevation to reduce the risk of flooding with sea level rise. A phased realignment of the trail will maintain its existing alignment and connect to the new alignment until it is inundated.

### Aligns to the back of Oro Loma Marsh and Frank's East

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#### CONS

- Further from the Bay
- No blue water experience

### Links to the Interpretive Center

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#### PROS

- Landfill provides expansive Bay views

### Aligns along the western extent of the oxidation ponds

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#### PROS

- Higher elevation leads to risk reduction with sea level rise

#### CONS

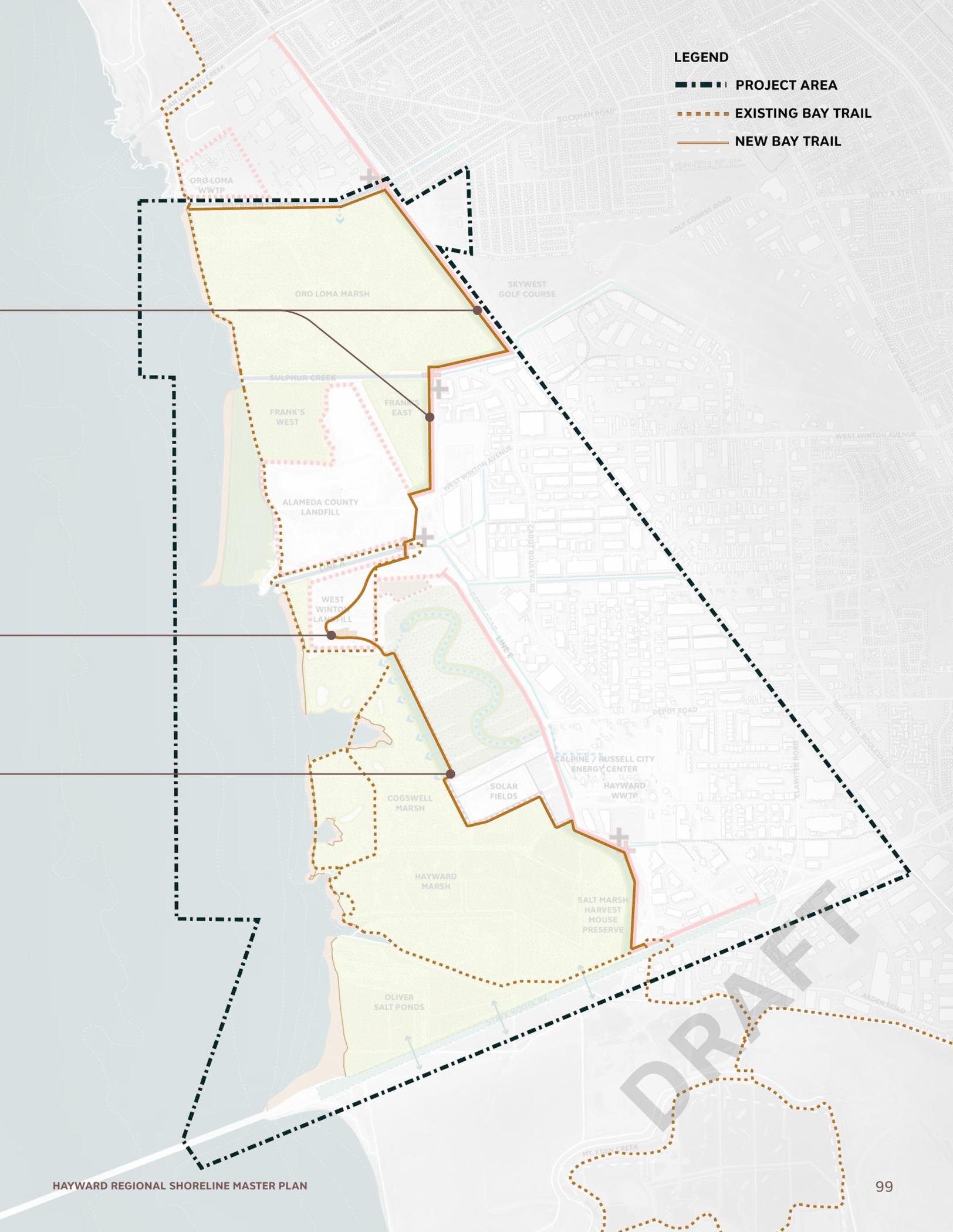
- Proximity to wastewater uses

**LEGEND**

**PROJECT AREA**

**EXISTING BAY TRAIL**

**NEW BAY TRAIL**



# #3: FURTHER INLAND

## HAYWARD SHORELINE INTERPRETIVE CENTER

The Hayward Shoreline Interpretive Center is relocated to the West Winton landfill where it is protected from flooding. The high point maintains visibility of the structure and offers expansive views of the Bay.

### Interpretive Center is relocated to the West Winton landfill

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#### PROS

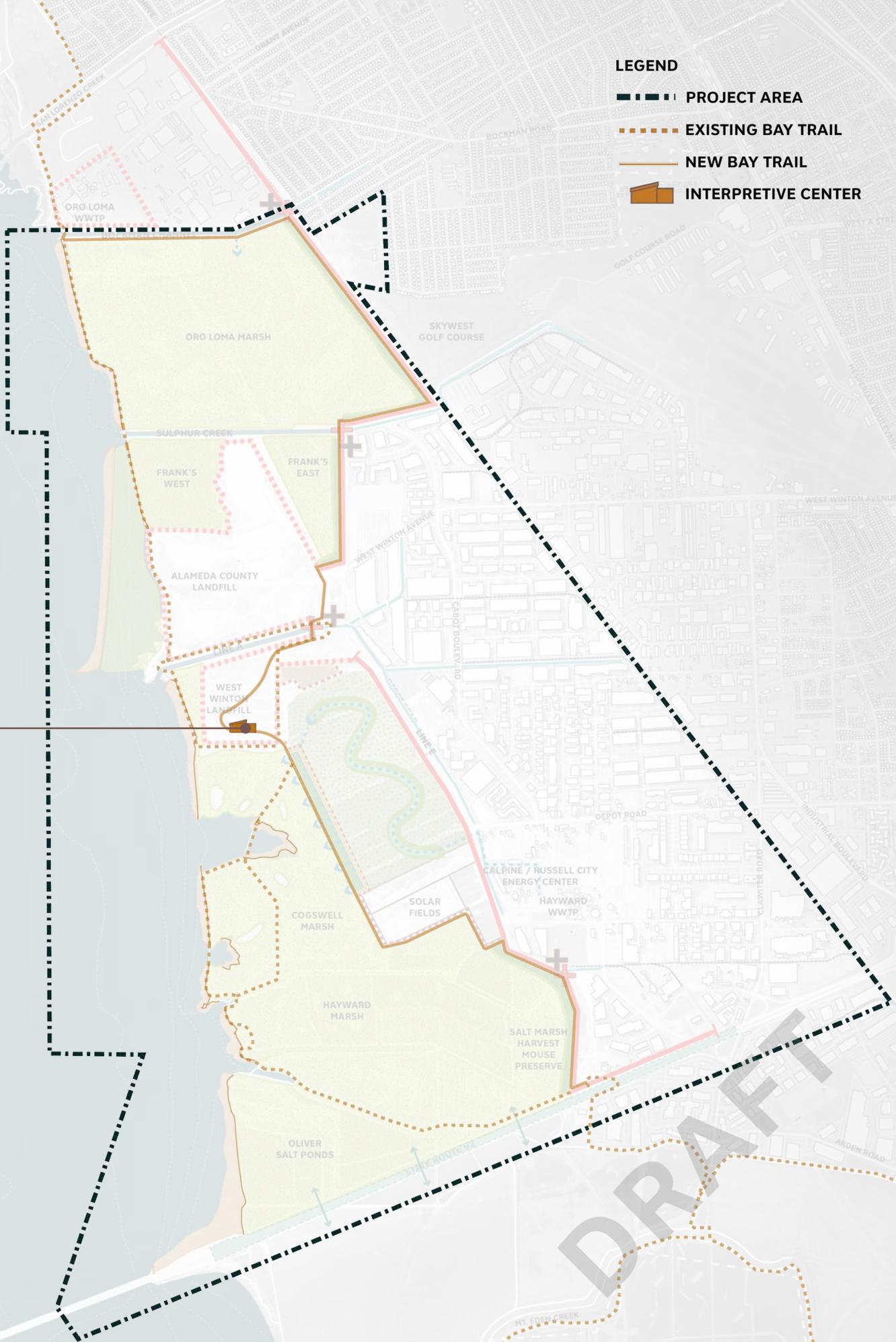
- Access and parking is protected
- High view point
- Increased visibility

#### CONS

- Costly to construct on the landfill

**LEGEND**

- PROJECT AREA
- EXISTING BAY TRAIL
- NEW BAY TRAIL
- INTERPRETIVE CENTER



# #3: FURTHER INLAND

## ORO LOMA MARSH



Key Map



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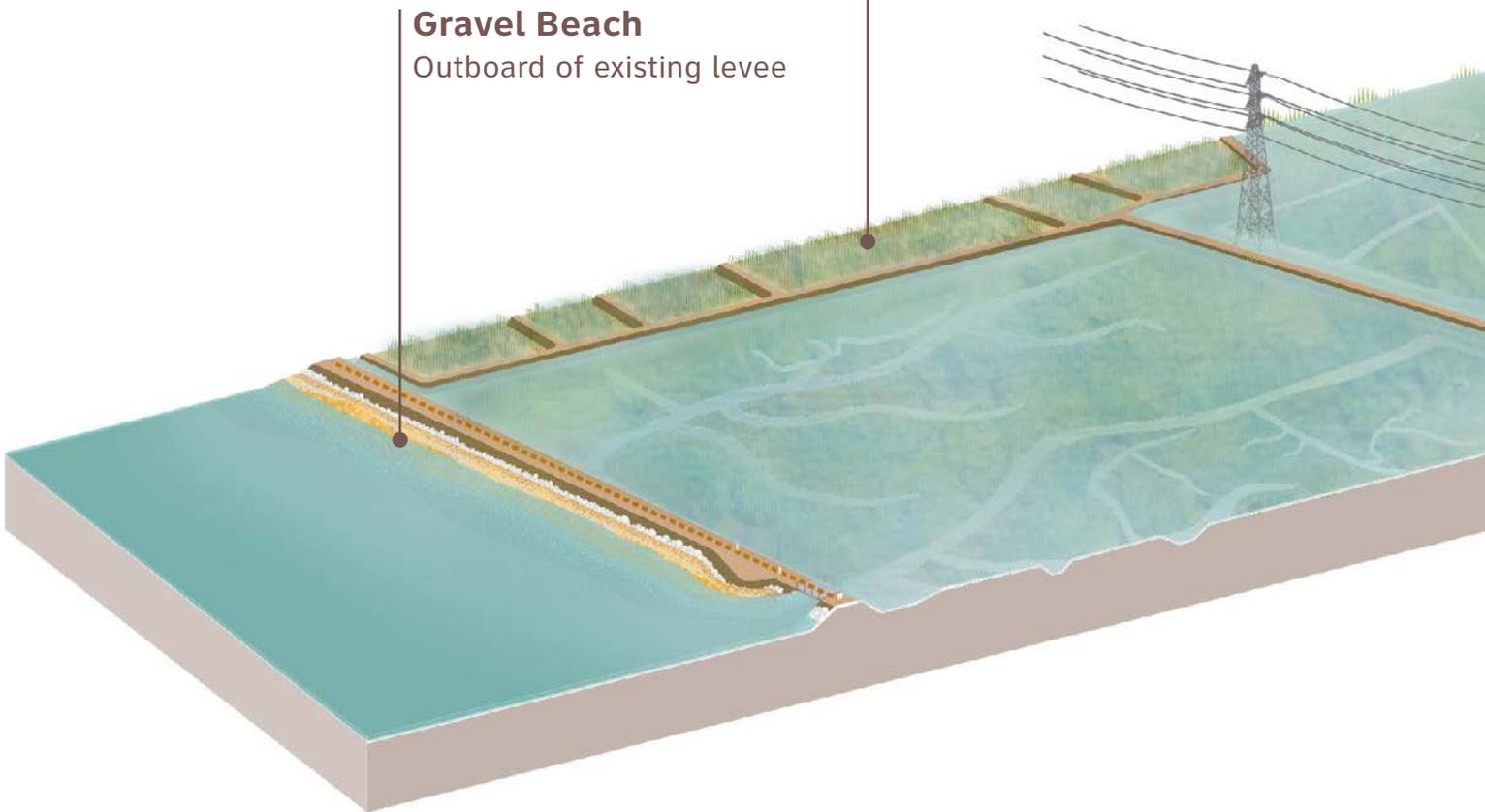
1M

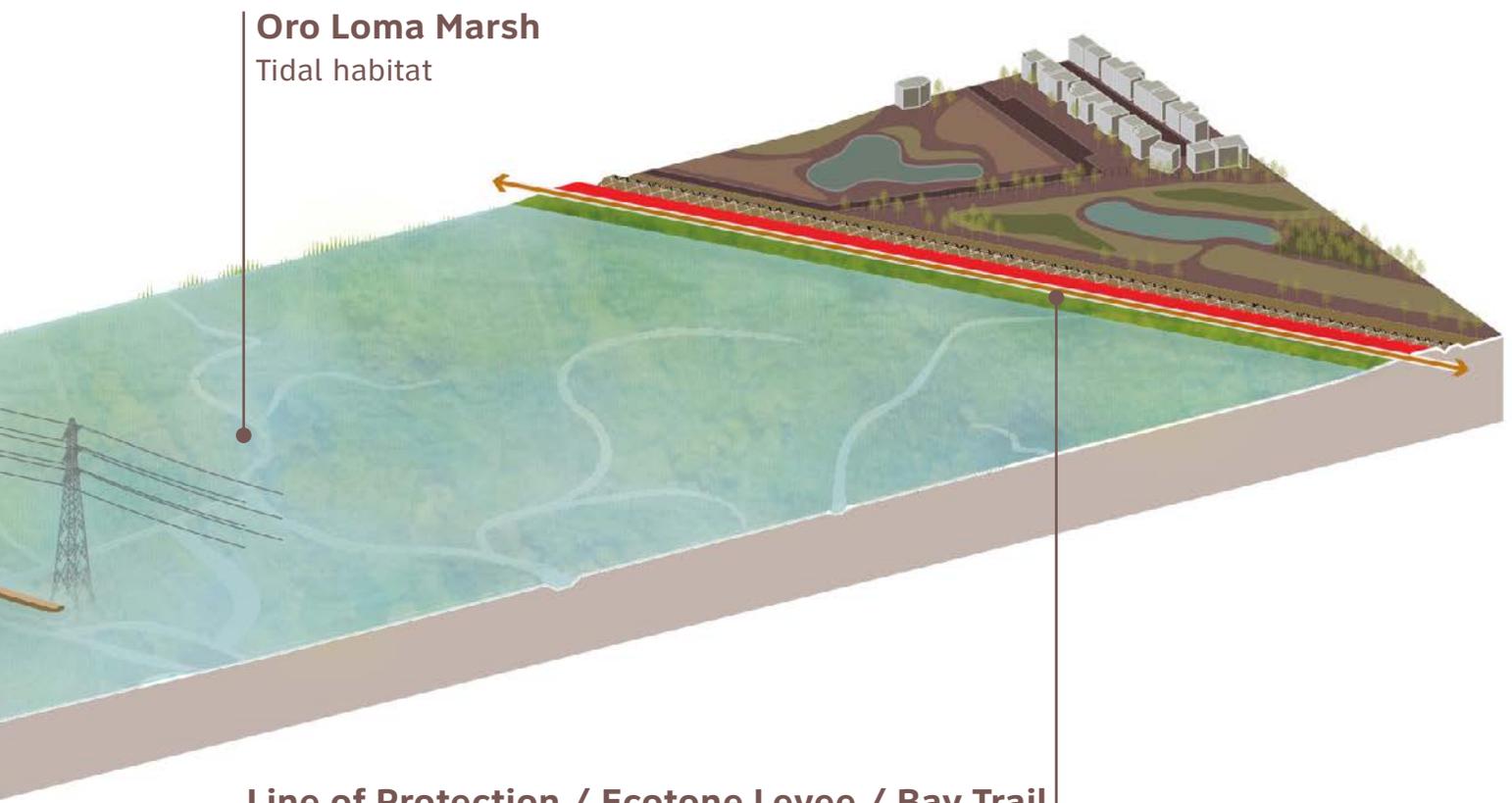
### Gravel Beach

Outboard of existing levee

### Oro Loma Sludge Ponds

Tidal habitat





**Oro Loma Marsh**  
Tidal habitat

**Line of Protection / Ecotone Levee / Bay Trail**  
Aligns along the Union Pacific Rail Corridor  
in the back of Oro Loma Marsh

# #3: FURTHER INLAND

## ALAMEDA COUNTY LANDFILL



Key Map

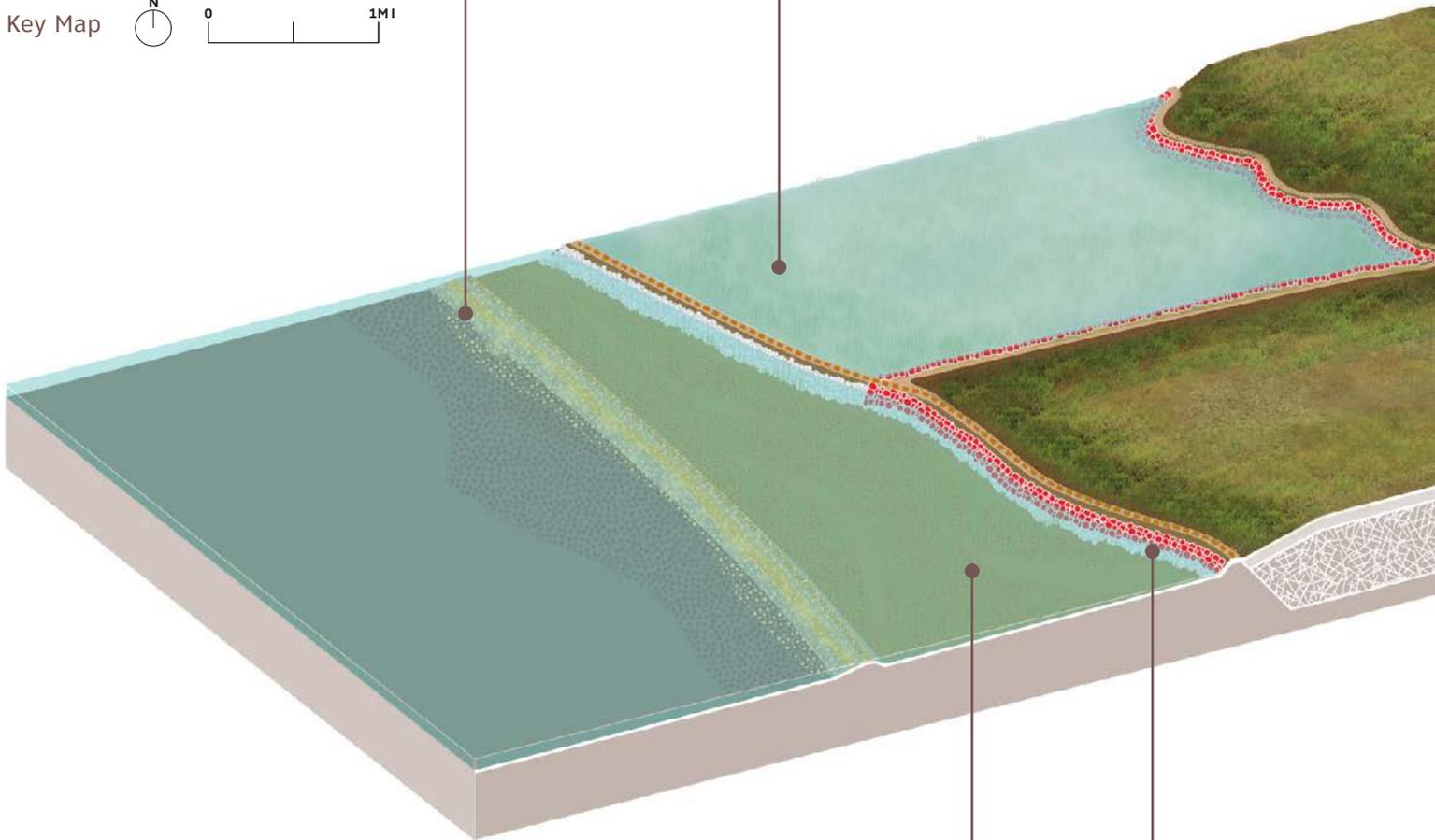
A north arrow pointing upwards and a scale bar showing 0 to 1 mile.

### Gravel Beach

Outboard of existing levee- aligns to historic breakwater

### Frank's West

Tidal habitat



### Fringe Marsh

Outboard of Alameda County landfill and Frank's West

### Revetment

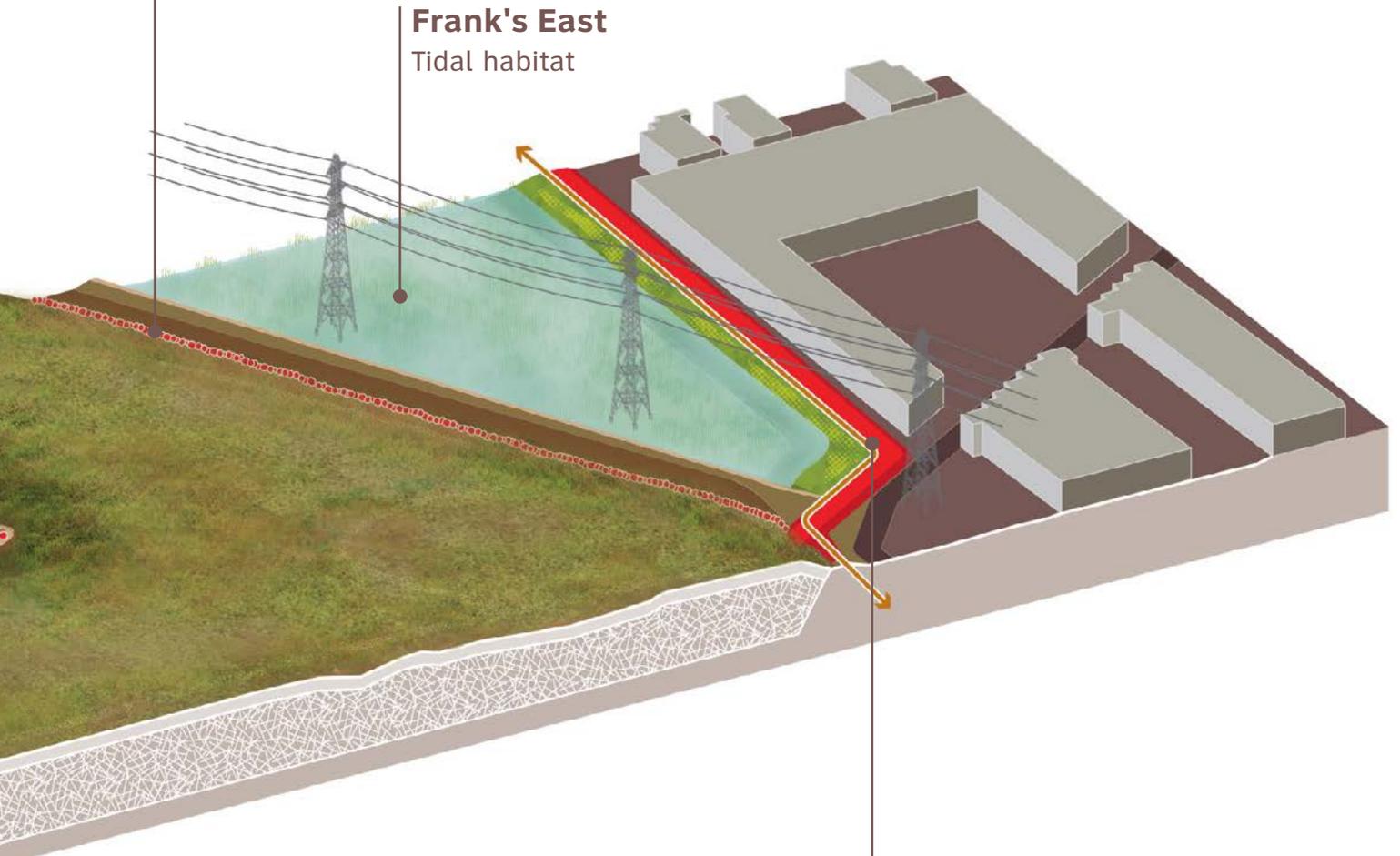
Outboard of Alameda County landfill to reduce erosion

**Sheet Pile around landfill**

Reduce risk of seepage

**Frank's East**

Tidal habitat



**Line of Protection / Ecotone Levee / Bay Trail**

Aligns along the back of Frank's East

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# #3: FURTHER INLAND

## COGSWELL MARSH



Key Map



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1M

### Gravel Beach

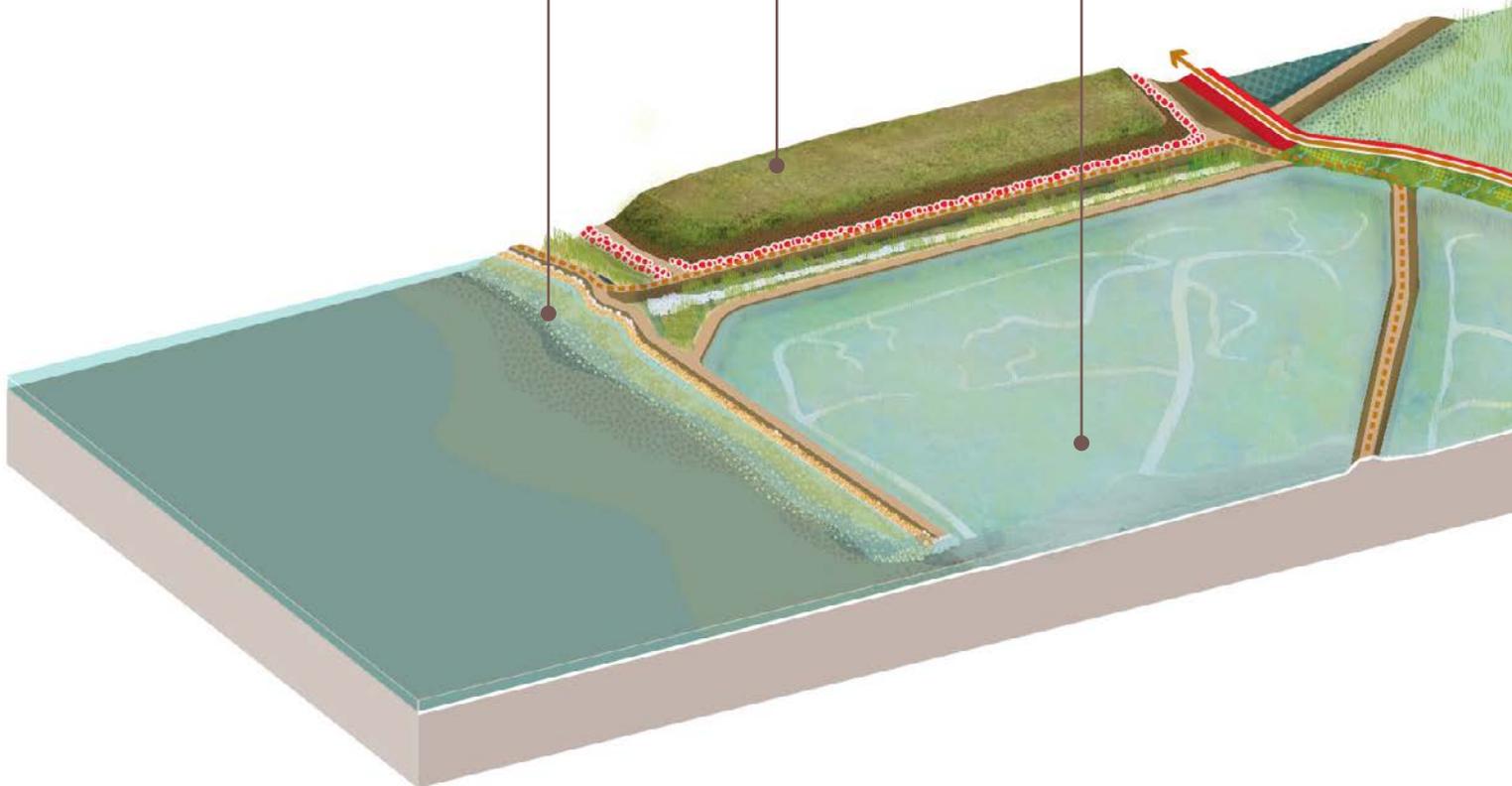
Outboard of existing levee

### Hayward Shoreline Interpretive Center

Relocated on top of West Winton Landfill

### Cogswell Marsh

Tidal habitat

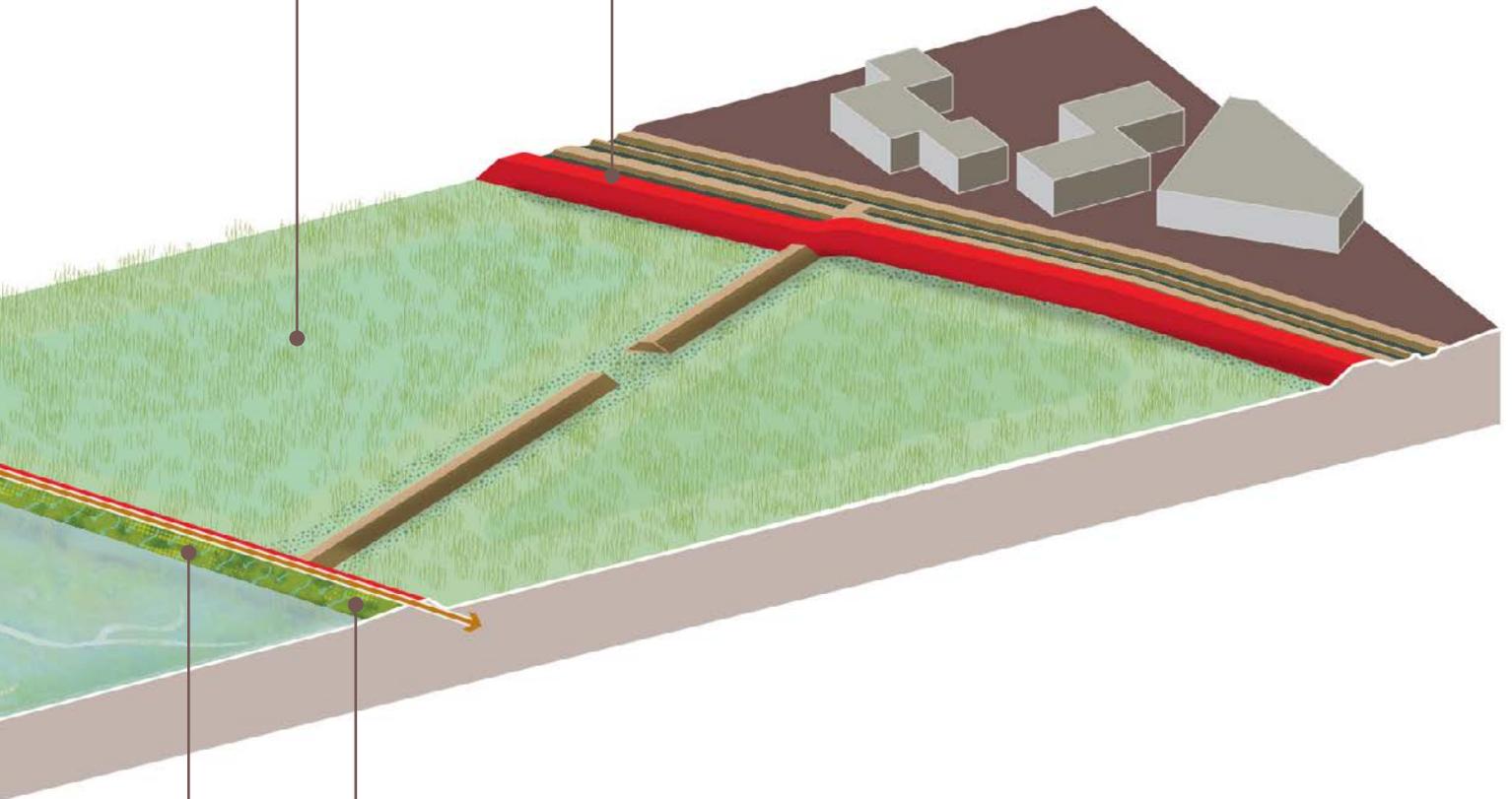


**Former Wastewater Wet Weather Storage ponds**

Transitions to a freshwater treatment marsh

**Line of Protection**

Along the eastern extent of the oxidation ponds



**Levee Raising / Bay Trail**

Built inboard of the oxidation pond levee

**Horizontal Levee**

Discharges effluent from Hayward WWTP

DRAFT

# #3: FURTHER INLAND

## HARD MARSH



Key Map



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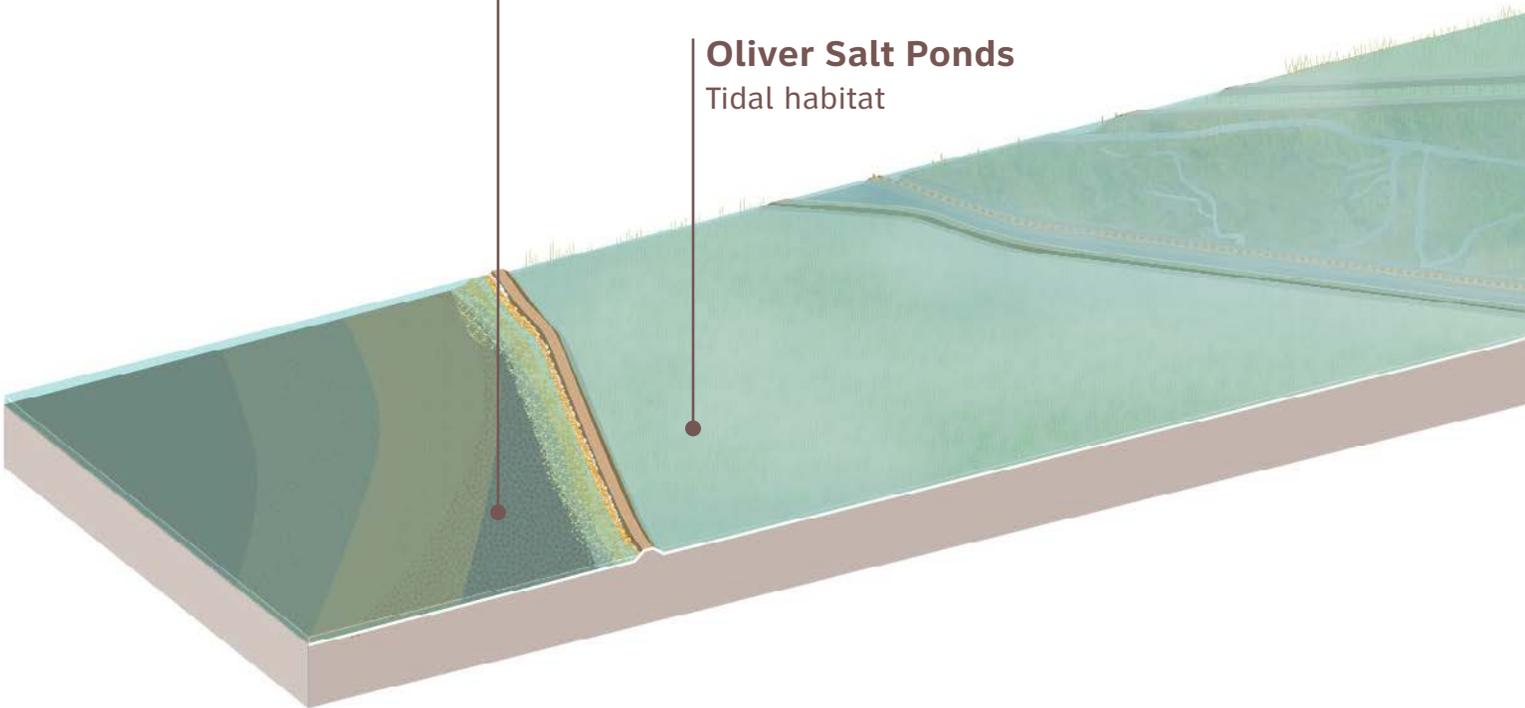
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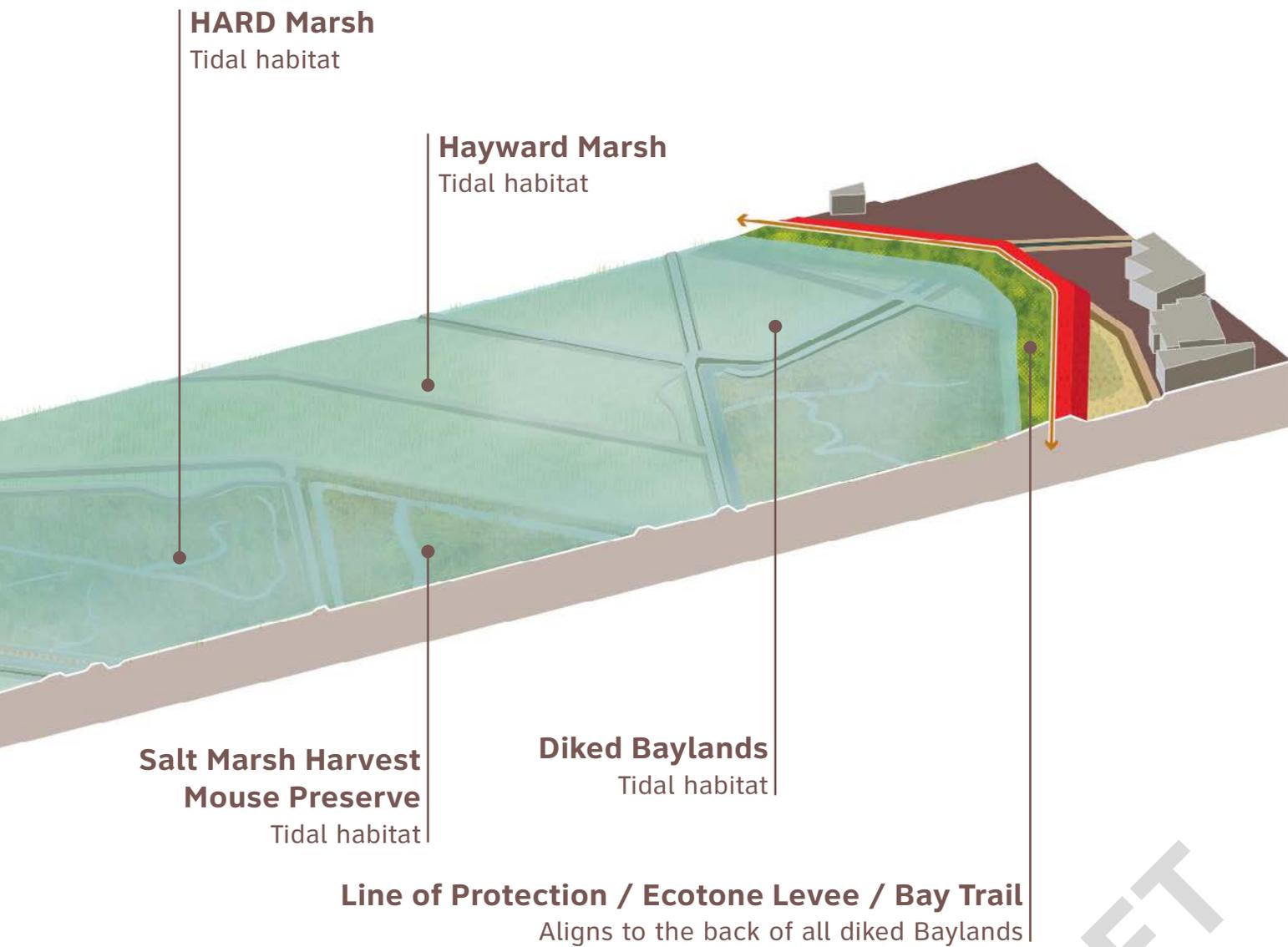
### Gravel Beach

Outboard of existing levee

### Oliver Salt Ponds

Tidal habitat





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# **EVALUATION POINTS & COMMENTS**

**DRAFT**

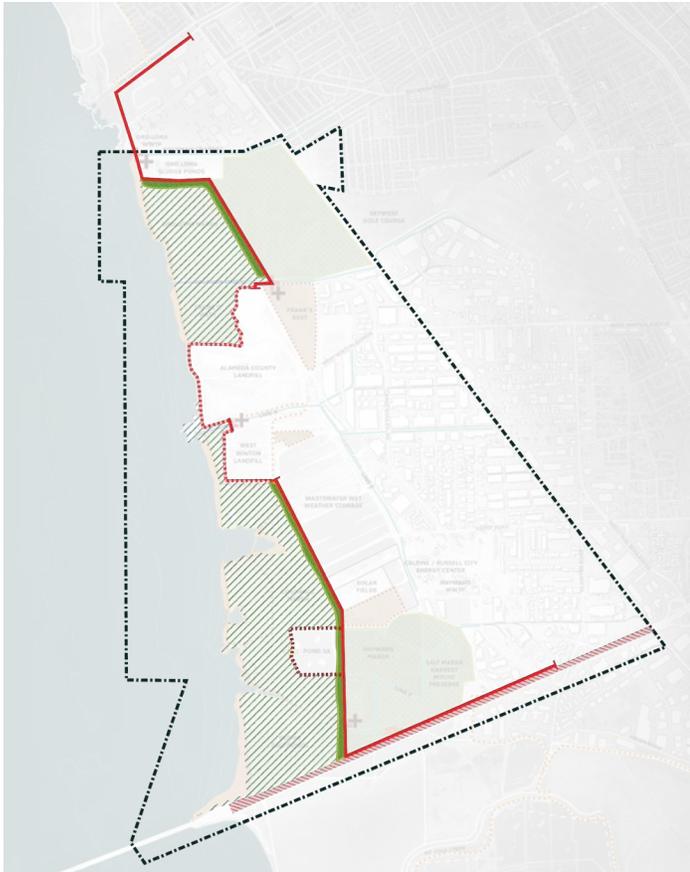




# LINE OF PROTECTION

The line of protection includes a FEMA-certified levee that will reduce risk to inland communities by buffering the shoreline to the impacts of sea level rise and storm surge. The spatial alignment of this levee has multiple implications on cost, maintenance, and what is in or out of the new flood protection infrastructure.

## 1. Closer to the Bay



### COMMENTS

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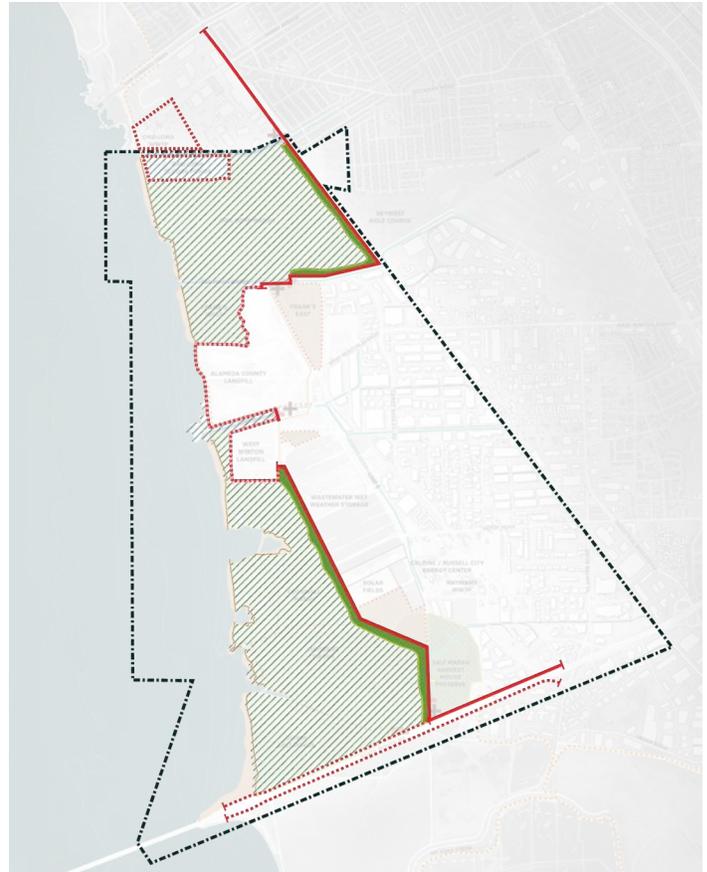
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## 1. Down the Middle



### COMMENTS

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# TIDAL HABITAT

The future extent of tidal habitat encompasses tidal habitat and muted tidal habitat, which is a controlled system. The spatial extent of connective blocks of marsh and proportion of tidal versus muted tidal habitat varies amongst the three alternatives.

## 1. Active Management of Ecosystems



### COMMENTS

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## 1. Adaptive Management of Ecosystems



### COMMENTS

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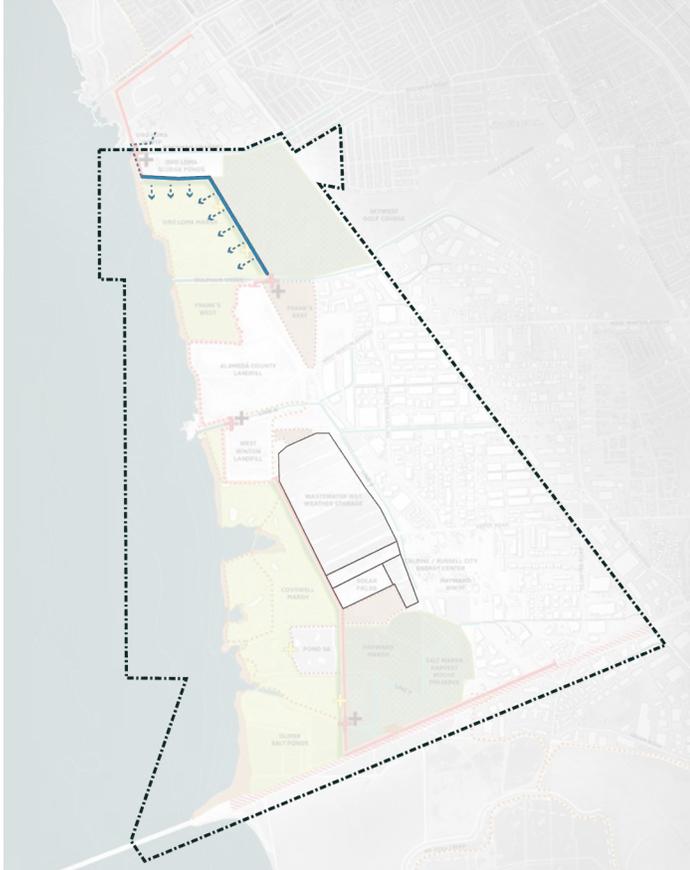




# WASTEWATER TREATMENT

The critical uses of wastewater treatment are maintained or enhanced with new multi-benefit infrastructure. Horizontal levees align with the First Mile project and possible future needs for local discharge.

## 1. Local discharge for Oro Loma WWTP



### COMMENTS

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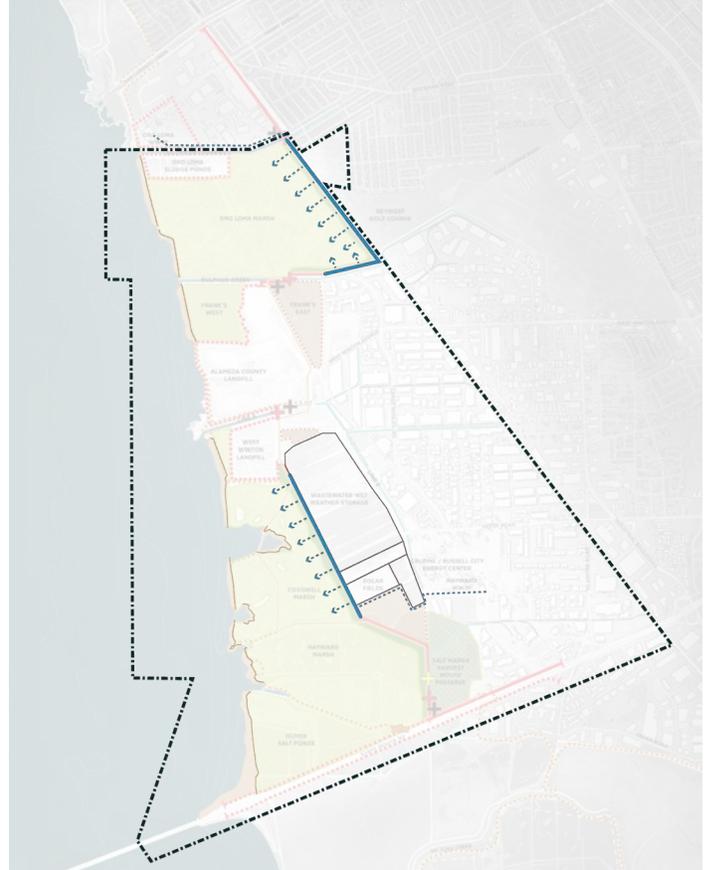
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## 2. Local discharge for Oro Loma and Hayward WWTP



### COMMENTS

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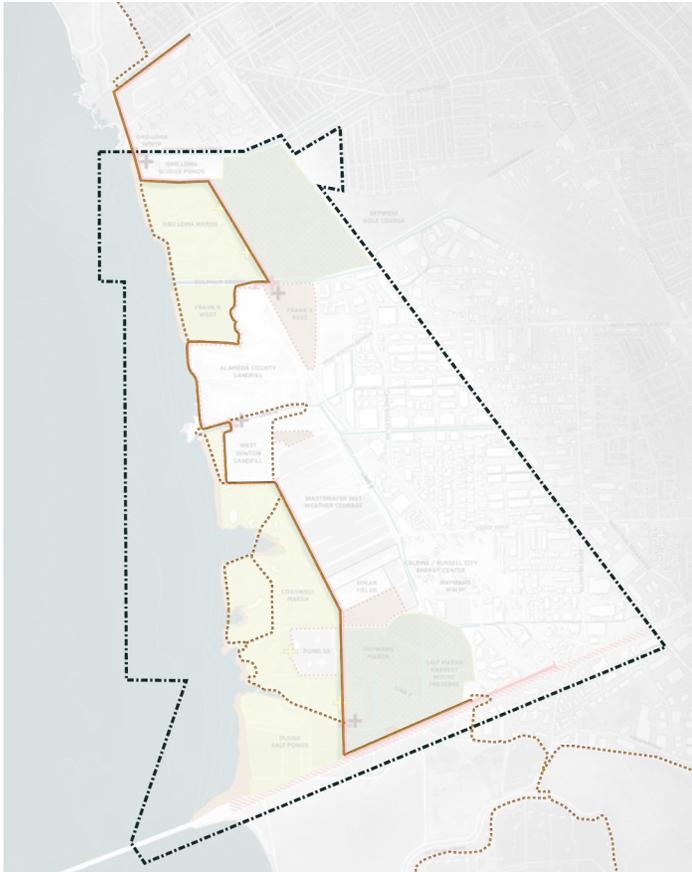
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# BAY TRAIL

The future location of the Bay Trail prioritizes the blue water experience where possible, maintains a variety of experiences, and aligns with new infrastructure improvements. For all three alternatives, the current alignment of the Bay Trail will be maintained as long as possible (until it is inundated with sea level rise) and connect to the realignment.

## 1. Prioritize blue water experience



### COMMENTS

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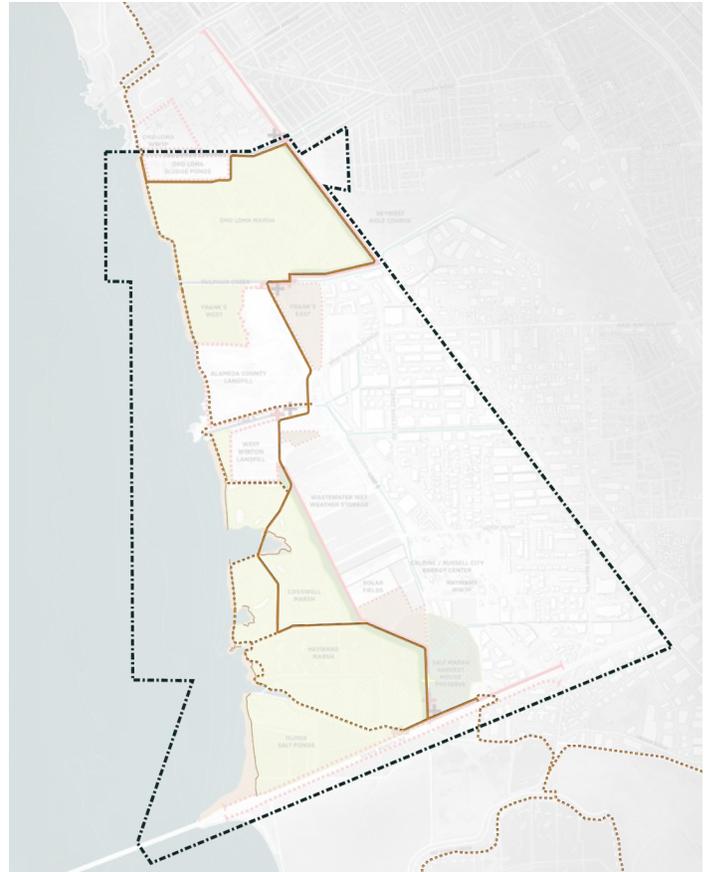
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## 2. Prioritize marsh habitat experience



### COMMENTS

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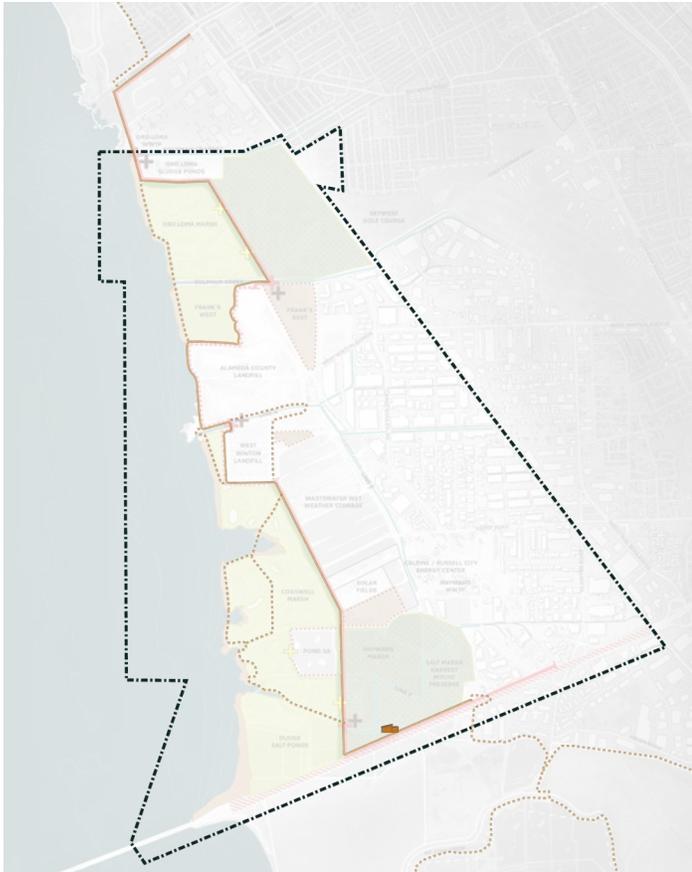
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# HAYWARD SHORELINE INTERPRETIVE CENTER

The future of the Hayward Shoreline Interpretive Center is connected to new infrastructure improvements. A variety of options are explored that are located in proximity to new educational opportunities. All three alternatives maintain the link to the Bay Trail.

## 1. Remain in place / protected behind ecotone levee



### COMMENTS

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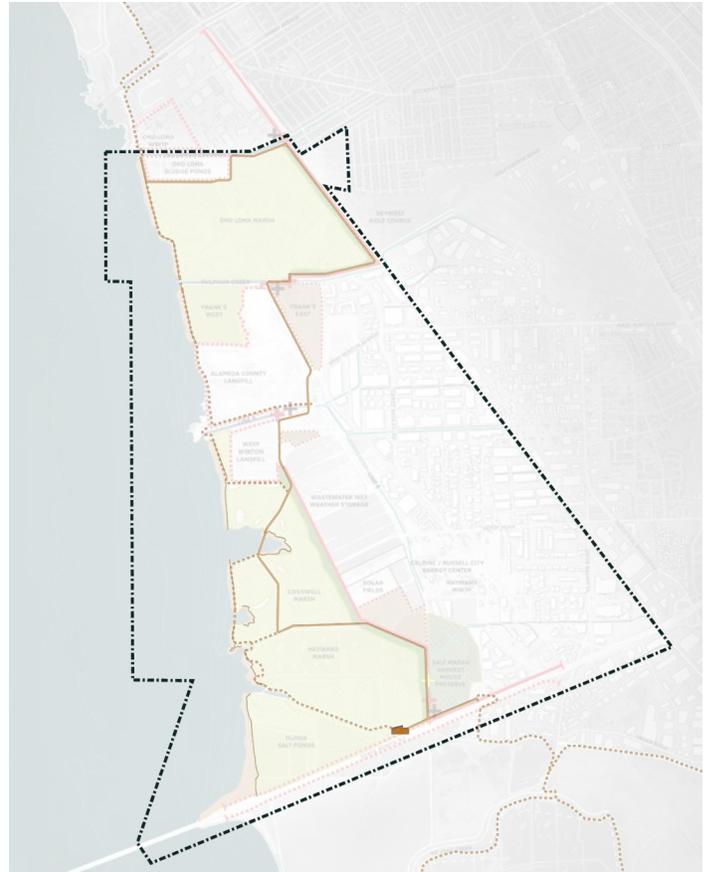
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## 2. Remain in place / elevate or float



### COMMENTS

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