

BAY FARM ISLAND ADAPTATION PROJECT

Oakland Alameda Adaptation Committee (OAAC ADAPT)

PROJECT OVERVIEW



Bay Trail bridge at Veterans Court



Fringe marsh at Veterans Court



Erosion in front of Harbor Bay Club



Tree fall at erosion in front of Harbor Bay Club



Bay Farm Island lagoon at pump station



Bay Trail and area of erosion along northern shoreline



Shoreline at Airport Channel



Fringe marsh at existing boardwalk in front of Harbor Bay Club

Overview

The Bay Farm Island Adaptation Project is near-term sea level rise adaptation project to address two feet of sea level rise over the coming decades. This project also will include long-term adaptation strategies for the project area (2080 and beyond).

Project Area

The project is located along Bay Farm Island's northern shoreline for the near-term project. The long term plan covers the entire Bay Farm Island in coordination with the OAAC Adapt Subregional Long-term Adaptation Plan, including Doolittle Drive/State Route 61, and a portion of east Oakland – Columbian Gardens.

Project Goals

To remove the lagoon area of Bay Farm Island from the FEMA 100-year floodplain; bolster the northern shoreline and Bay Trail from erosion; enhance shoreline habitat with nature-based solutions; enhance public recreation, including improvements to the San Francisco Bay Trail.

Funding

The project is funded through the Federal Emergency Management Agency (FEMA) with federal community project funding. This FEMA grant covers preliminary design and terminates fall 2025. Refinement, continued stakeholder review and construction will be done with future funding.

Beyond this initial grant, the City of Alameda – on behalf of OAAC – applied for a \$56 million FEMA Building Resilient Infrastructure and Communities (BRIC) grant to complete the design and to construct the project.



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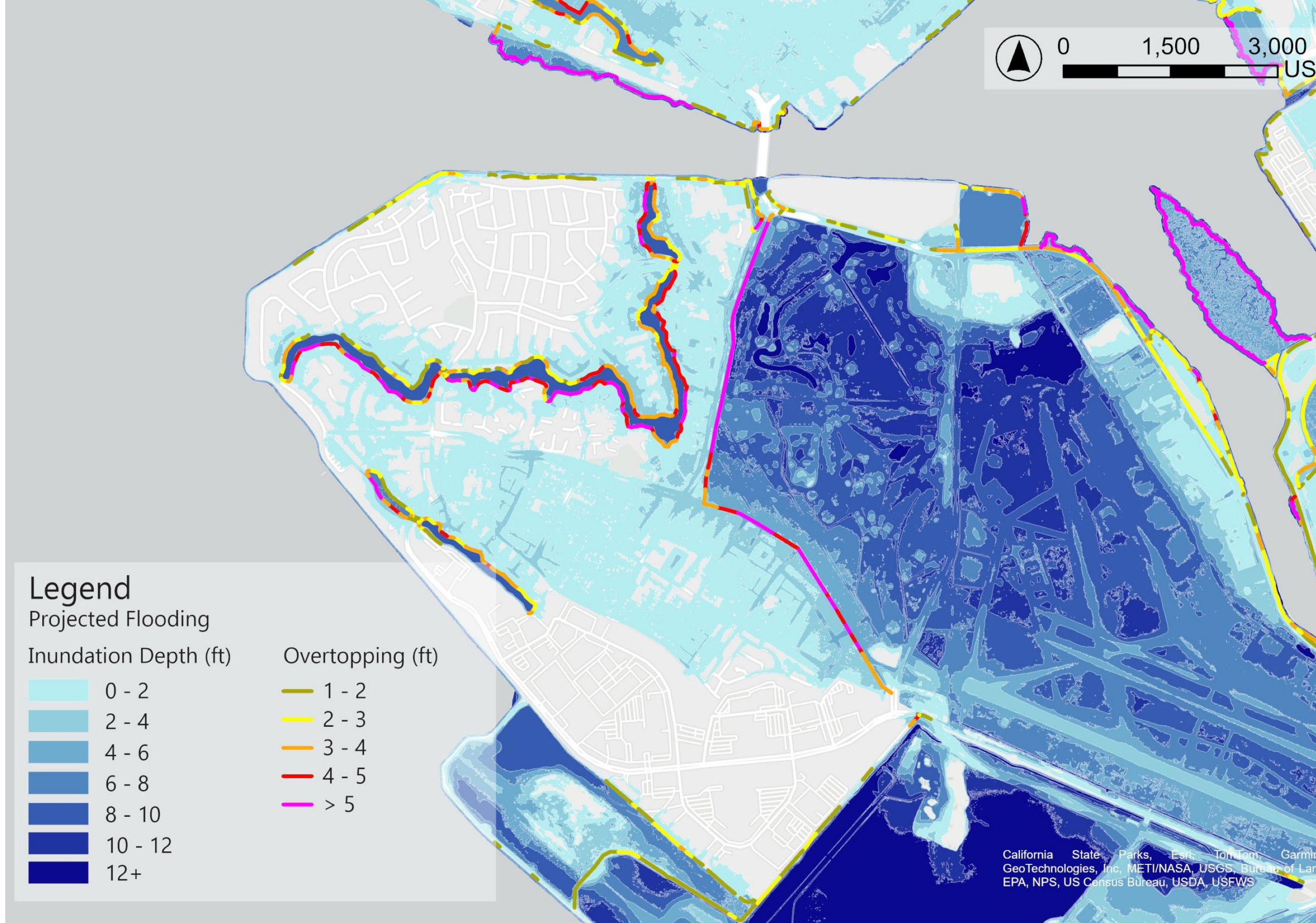


BAY FARM ISLAND SEA LEVEL RISE

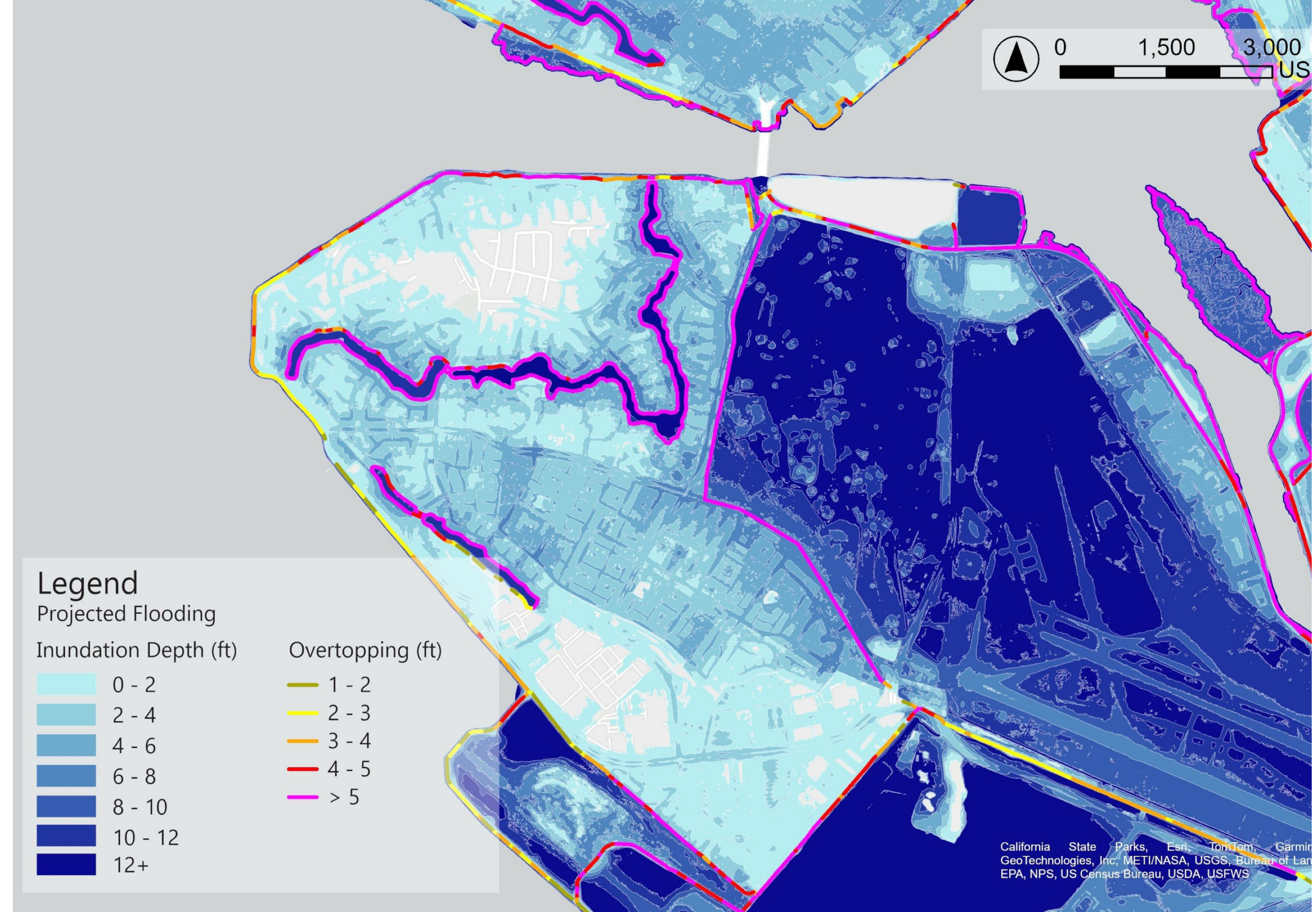
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SEA LEVEL RISE AND COASTAL FLOOD HAZARDS

The lowest portions of this shoreline are already vulnerable to inundation during major coastal storms under current conditions. Without adaptation measures, rising seas and coastal flooding will overtop the shoreline more frequently. Areas of the shoreline at low elevations may allow floodwaters to enter and flood areas further inland. Within the Bay Farm Island project area, the lowest areas of shoreline are at Veterans Court, and at the Lagoon Pump outfall along the north shoreline, and along Doolittle Drive.



100-year Coastal Flood with 2' Sea Level Rise



100-year Coastal Flood with 5' Sea Level Rise

SEA LEVEL RISE ADAPTATION TARGETS

Adapting to sea level rise requires that we determine where our shoreline needs to be elevated, by how much, and when that change needs to occur. In order to determine this new elevation for the near-term time horizon (2080), we start with the current high tide level. Then we consider the current 100-year (1% annual chance) Bay water level, which is observed during severe storms. Some of the lowest areas of our shoreline already experience coastal flooding during these 100-year storm events. Adding projected sea level rise and freeboard (a buffer that accounts for uncertainty in our sea level rise water level estimates), brings us to our target design elevation of 14.0' NAVD88 (a standard reference datum for measuring elevation).

For the lower points of our shoreline (those close to the high tide line), **this means elevating the edge approximately 4.0 feet on average in the near term.** Higher areas will require less elevation with the goal of achieving a consistent level of protection around the shoreline.

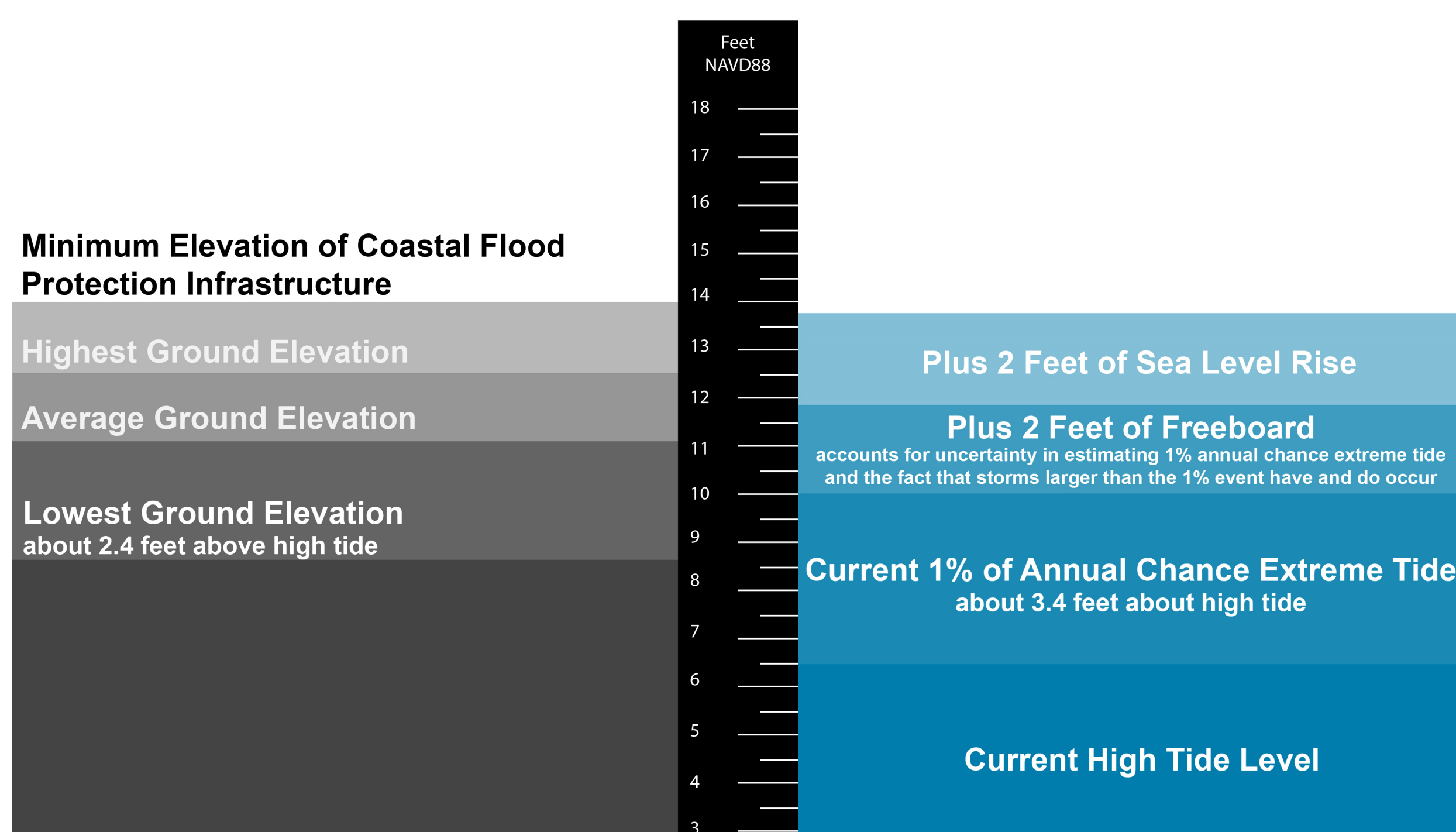
Near Term

2080

35 to 50-year adaptation project lifespan

2 feet of sea level rise

Protect to elevation +14.0



Near Term (2080, 30-50 Year Design Life, 2 feet of SLR) Protect to Elevation +14.0

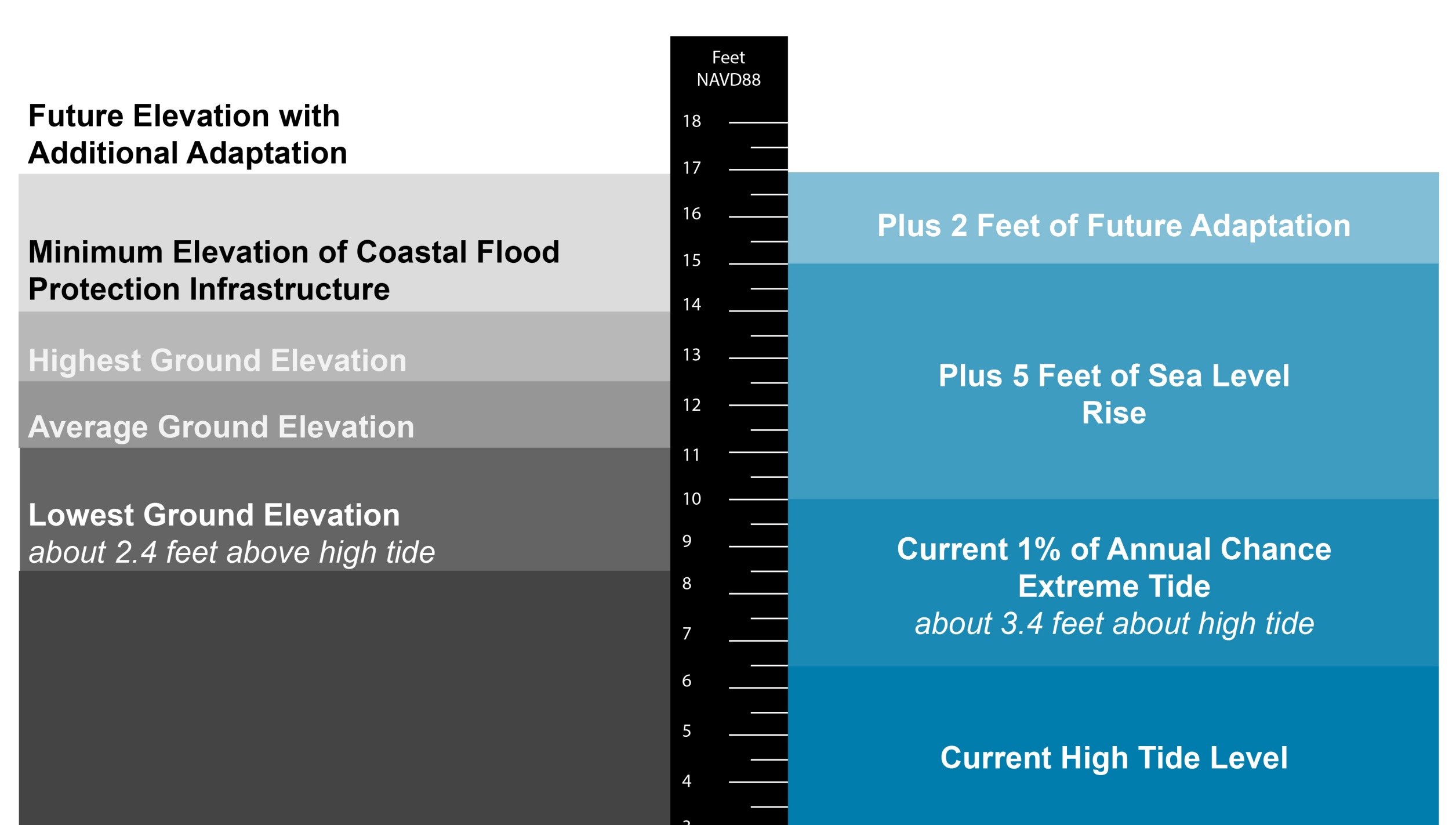
Long Term

2100+

Build upon near term project

5 feet of sea level rise

Protect to elevation +17.0



Long Term (2100+, 5 feet of SLR) Protect to Elevation +17.0



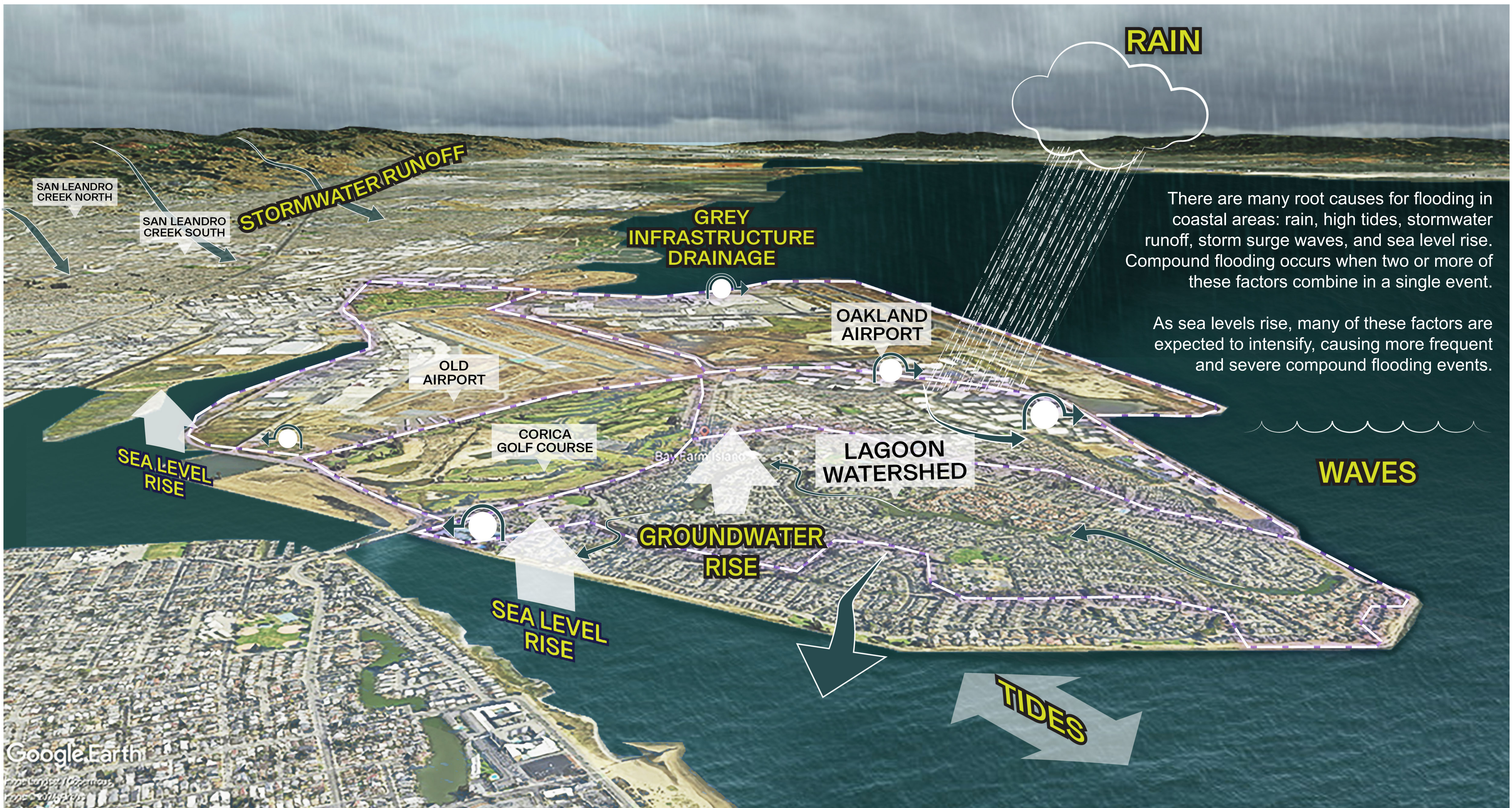
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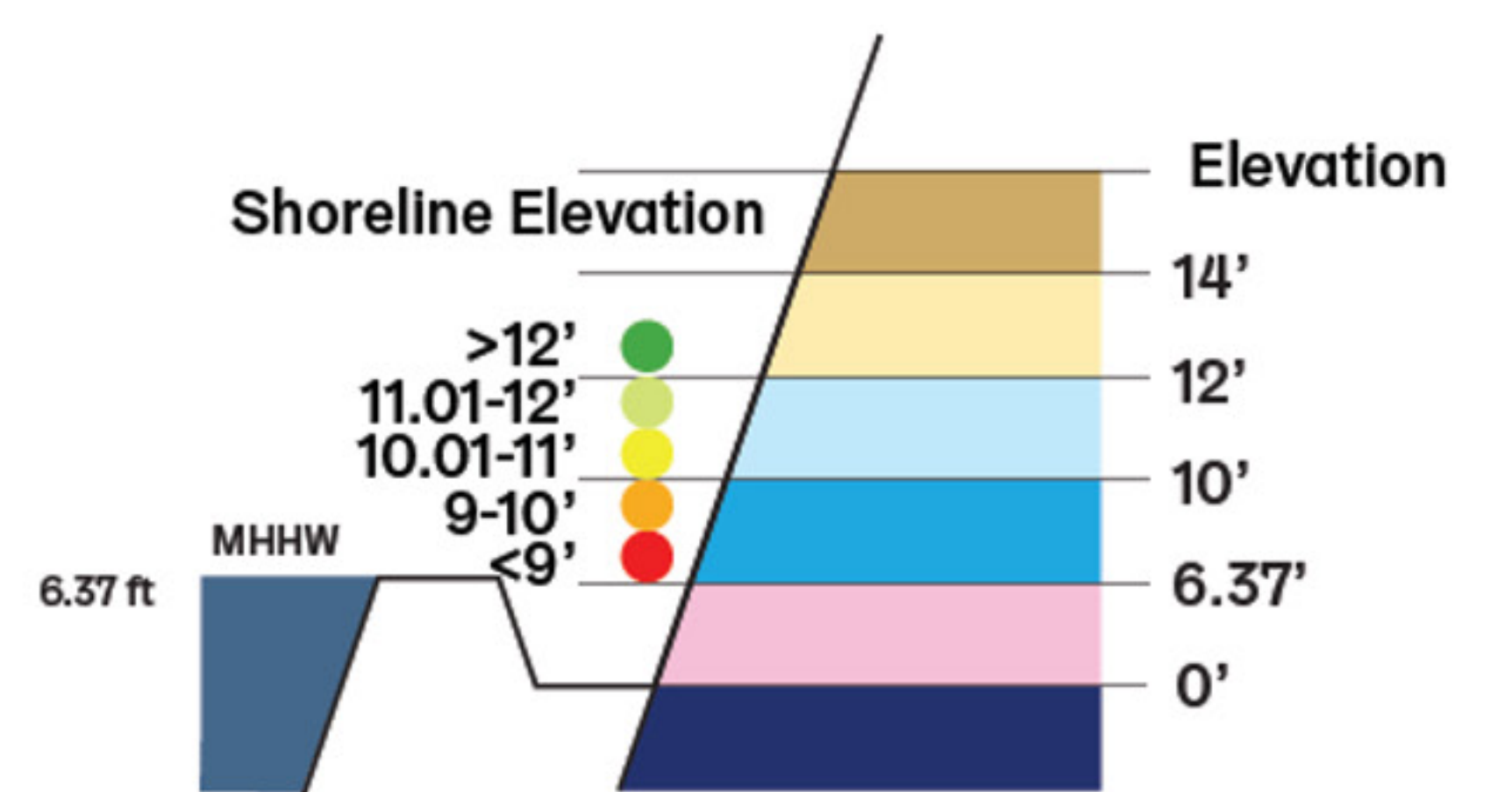
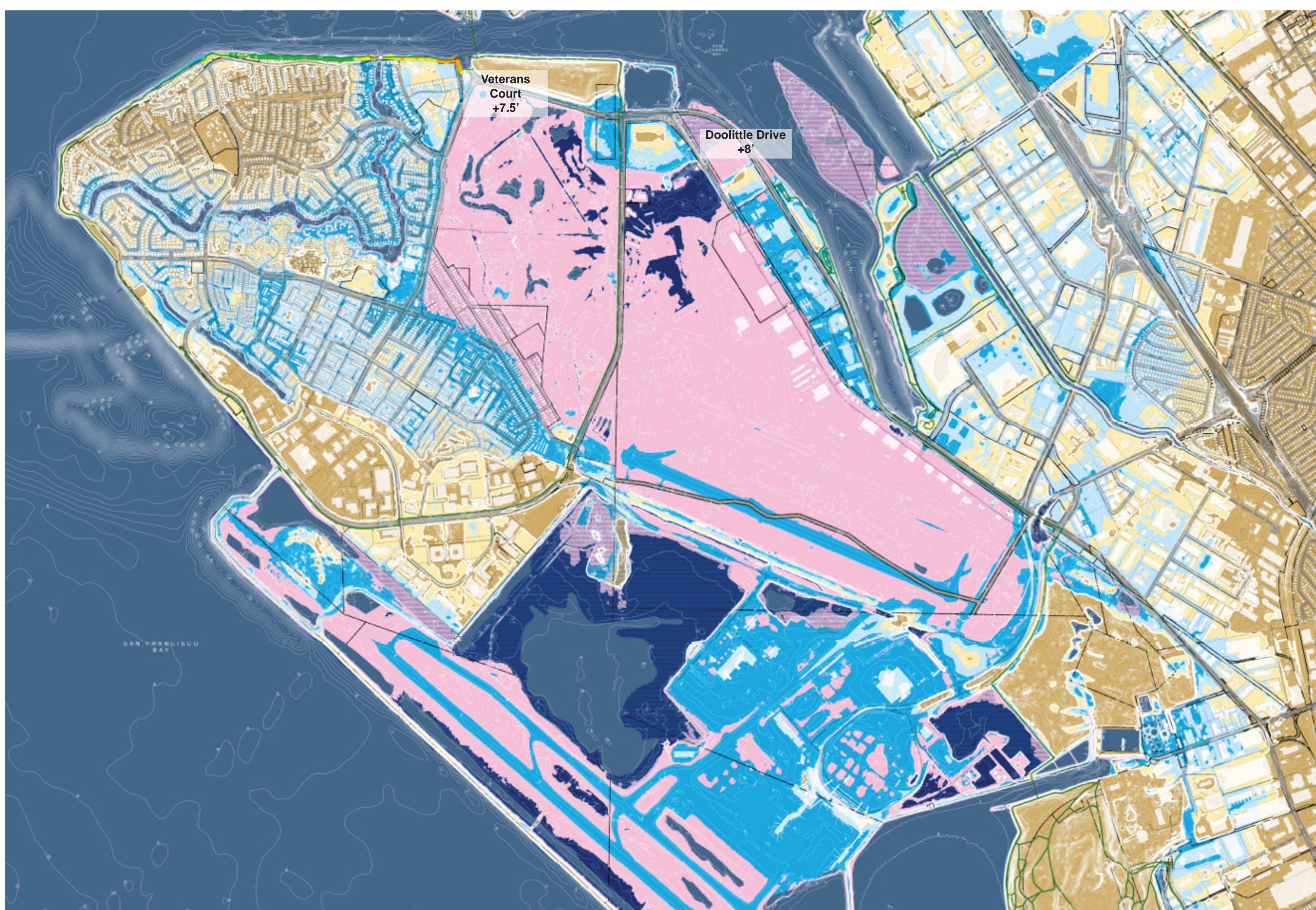
BAY FARM ISLAND FLOODING

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COMPOUND FLOODING

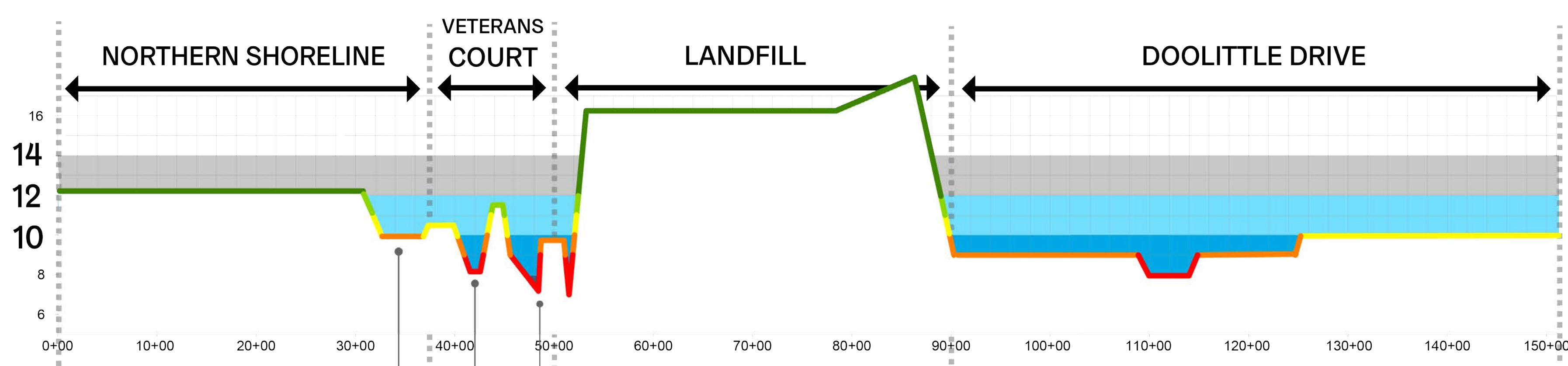


SHORELINE ANALYSIS AND COASTAL FLOOD RISK



The shoreline of Bay Farm Island has three major low areas where the current shoreline elevation is between 7.5 and the current base flood elevation of 10.0: the lagoon outfall, Veterans Court, and Doolittle Drive.

These areas are the places more vulnerable to coastal flooding as sea levels rise. Due to the relatively low inland elevation of Bay Farm Island, overtopping in these zones could cause more widespread flooding beyond the immediate shoreline.



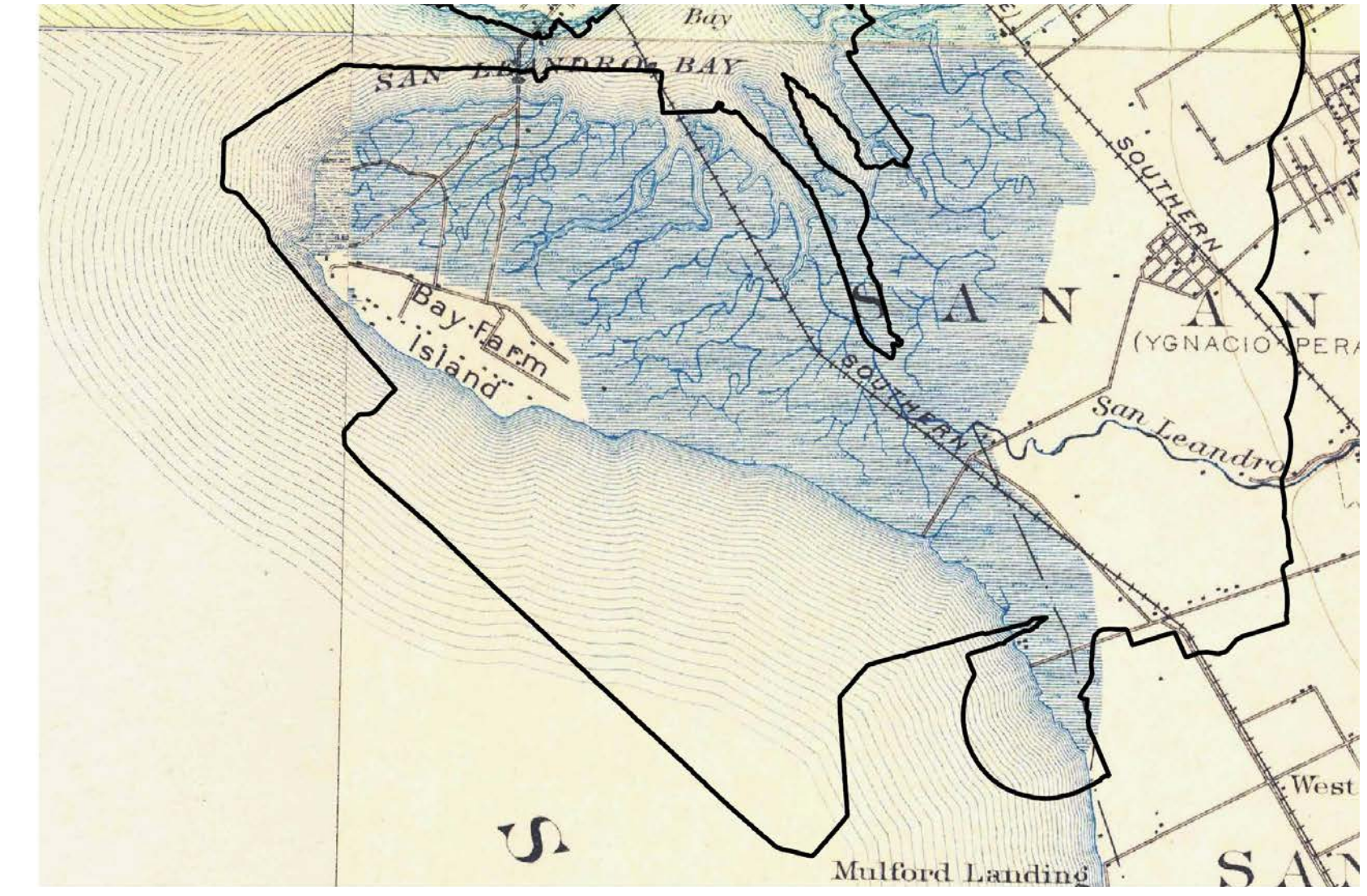
BAY FARM ISLAND FLOODING

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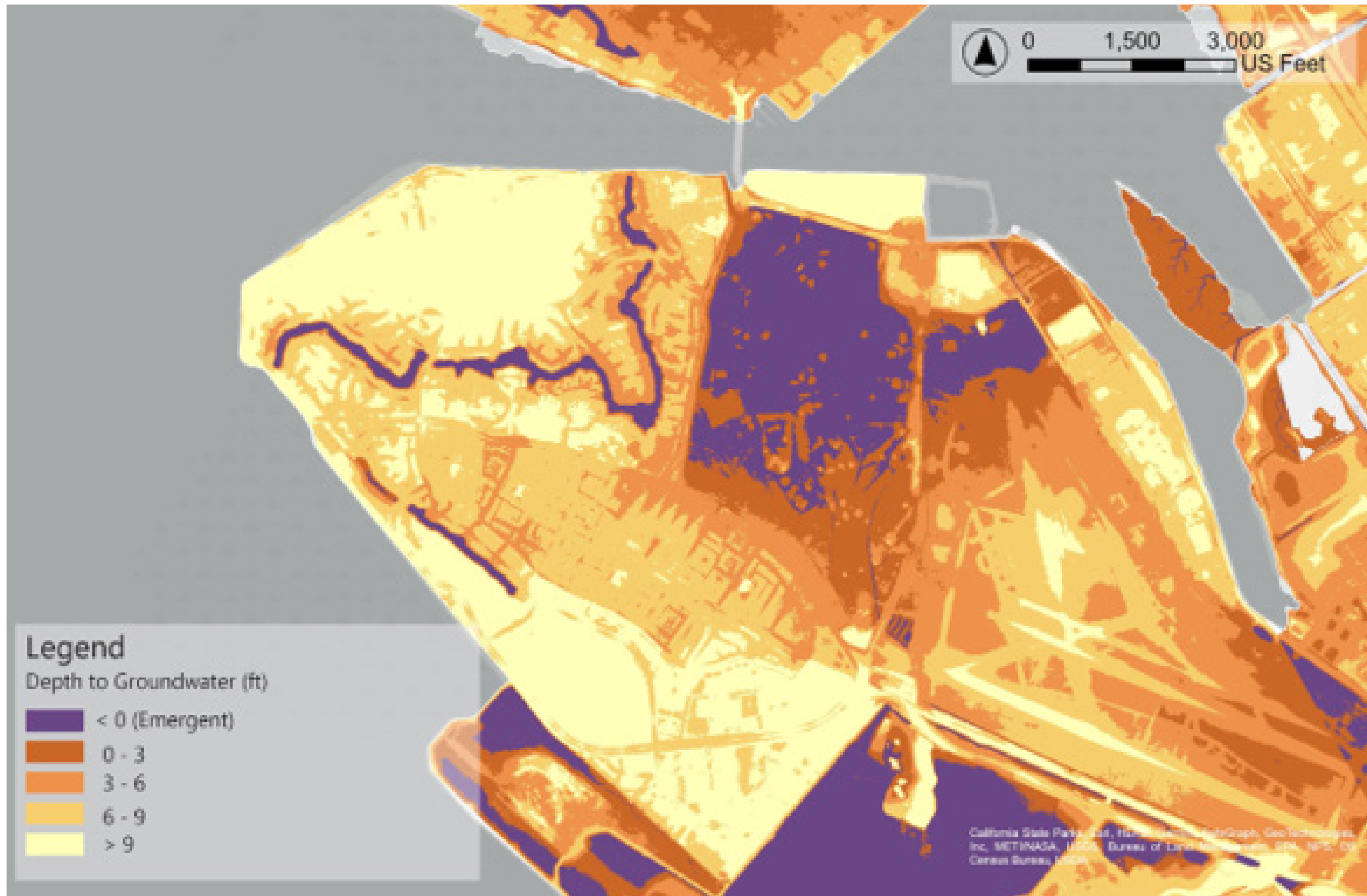
GROUNDWATER RISE

As our climate warms, the intensity of rainfall events is increasing and sea levels continue to rise. During rainfall events, precipitation infiltrates into the ground, reducing the capacity of the ground to absorb water from future storm events and temporarily raising the local groundwater table. As a result, localized flooding can occur and is more common with storms that happen back-to-back. Meanwhile, rising bay water gradually pushes the groundwater table closer to the surface. During a storm, this further limits the capacity of the ground to absorb rainwater. The groundwater table can also rise above the ground surface and create permanent ponding on the land in places that have historically remained dry, even long after storms have passed.

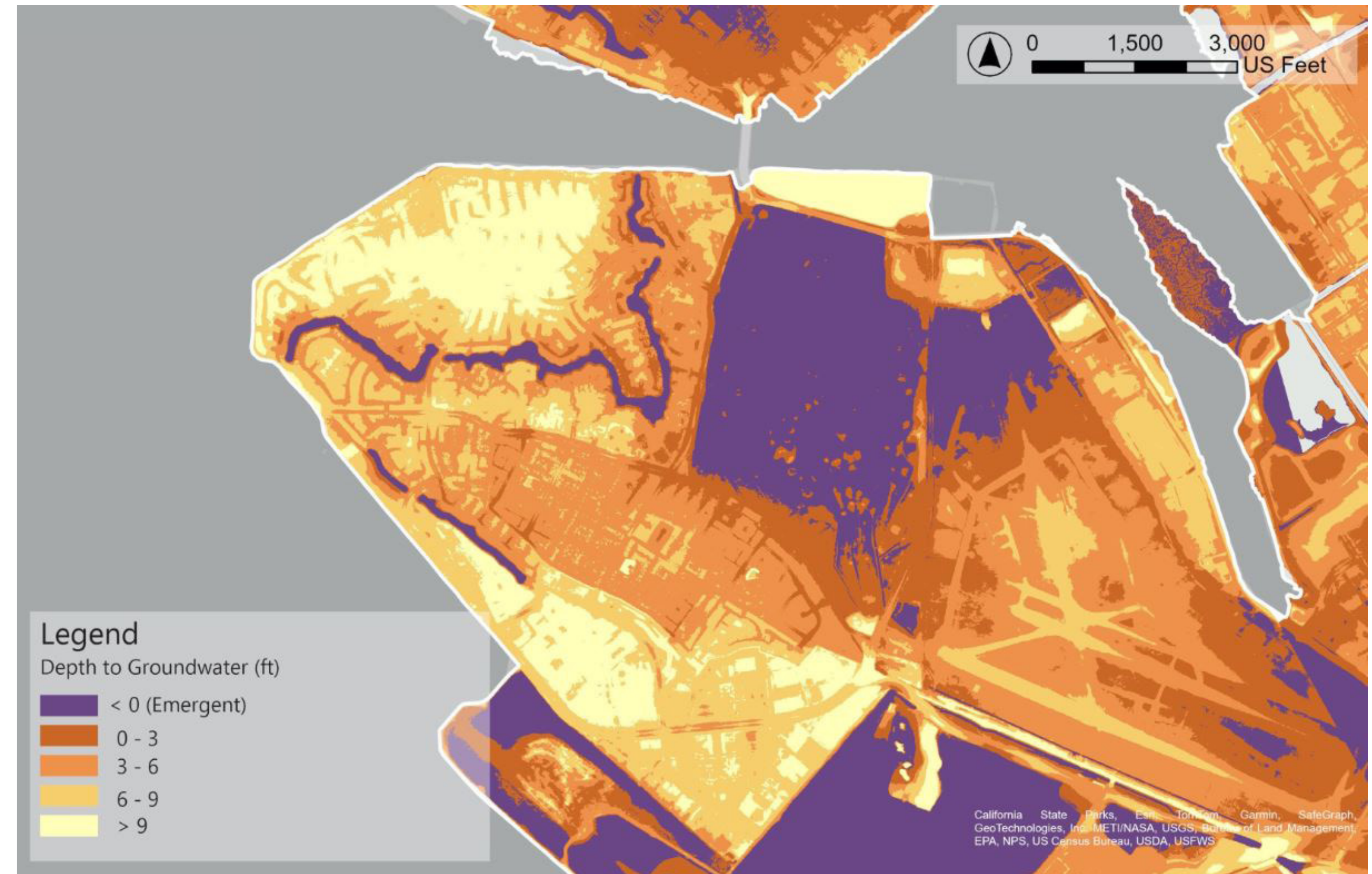
On Bay Farm Island, the groundwater is shallow. Most of Bay Farm Island is made up of reclaimed land (formerly wetland) or "fill", and protected from tidal flooding by levees and pumps. As sea levels rise, so does the level of the groundwater, potentially causing flooding as it breaches the surface.



USGS 1895 Map of Bay Farm Island



Existing Depth to Groundwater

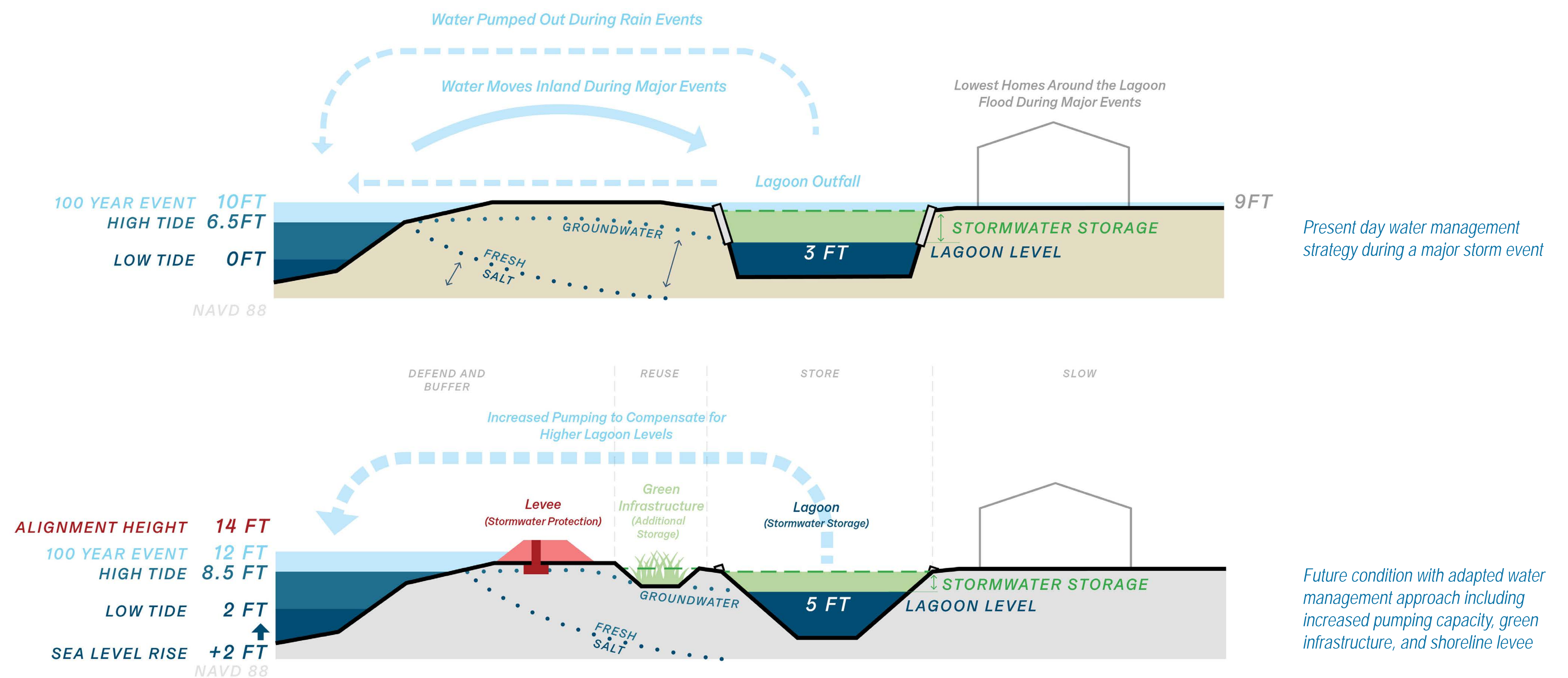


Depth to Groundwater with 2' Sea Level Rise

INLAND FLOODING

Inland flooding can occur during and after storm events due to precipitation, upstream stormwater runoff, and saturated soils. Presently, the Bay Farm Island lagoon and pump system manages this water and keeps most of the island dry when there is a storm. As our climate warms, the frequency and intensity of storms will increase leading to an increased likelihood of inland flooding. In order to address this flooding, our stormwater management systems will need to be adapted.

The Bay Farm Island lagoon is part of the stormwater system. Before a forecasted storm, lagoon water is pumped into the bay to make space for additional runoff. The lagoon's pump, pipe system, and back up power need upgrading to address growing stormwater management issues. A strategy of slow, store, and re-use stormwater using green infrastructure will additionally reduce the burden on the drainage system to meet future water storage capacity needs.

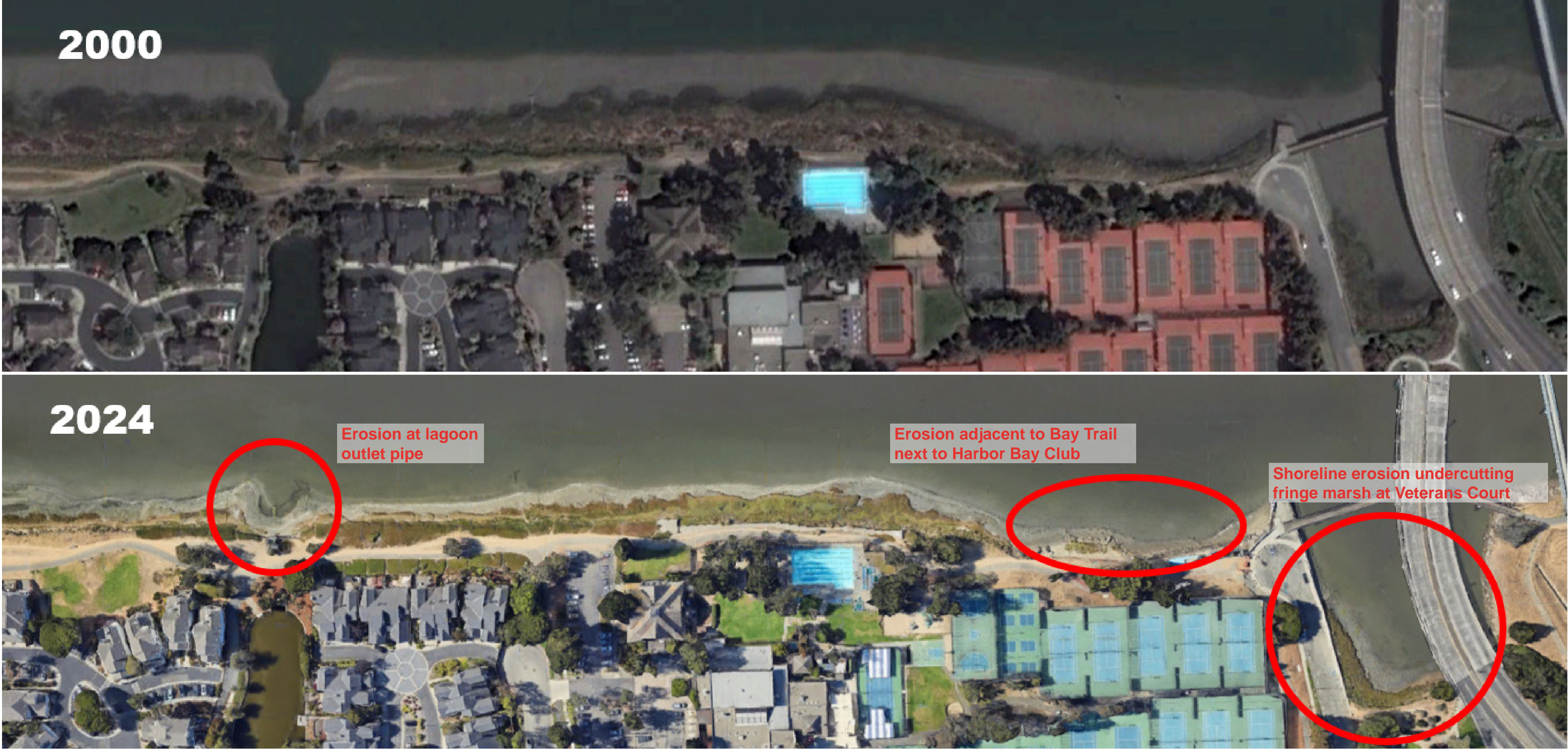


BAY FARM ISLAND EROSION

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SITE CONDITIONS AND CAUSES OF EROSION

Coastal erosion is caused by wave action and rising water levels. Boat wakes contribute to this as well. Wind-driven waves and those from significant coastal storms are the major hazard for this northern shoreline reach. Currently, there are visible erosion hotspots at historic slough outfalls which are now piped drainage outfalls. In addition to raising the shoreline elevation to protect from coastal flooding, the near term project will incorporate nature-based erosion protection features to ensure stability of the shoreline.



Erosion adjacent to Bay Trail next to Harbor Bay Club



Erosion at stormwater runoff outlet pipe



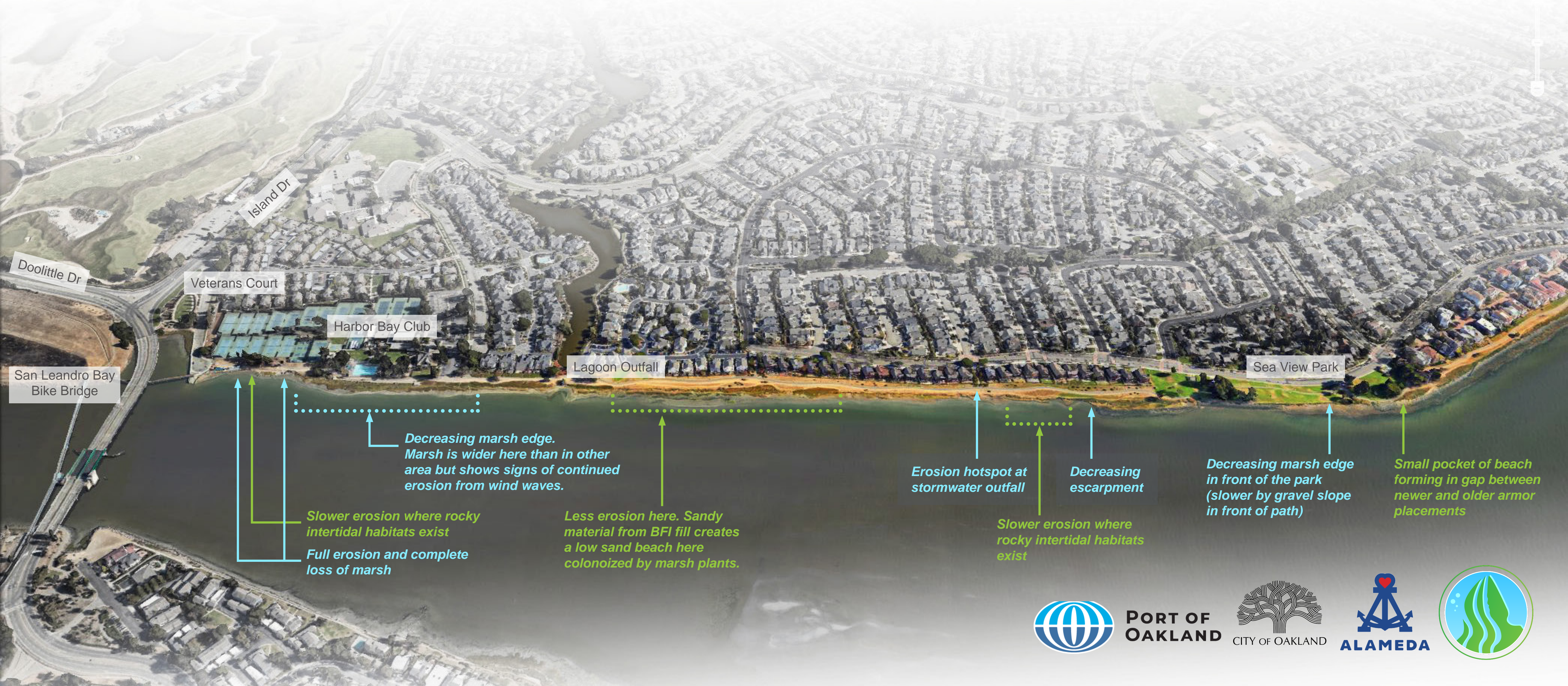
Shoreline erosion undercutting fringe marsh



Erosion of fringe marsh at Sea View Park

Site Review

Shoreline erosion analysis conducted July 23, 2024 largely found a stable shoreline, with some areas of erosion. Where the shoreline is rocky it tends to be relatively stable. Unprotected areas along the shoreline, and areas of collected stormwater runoff, show signs of erosion, with some erosion approaching the Bay Trail.



Decreasing marsh edge. Marsh is wider here than in other area but shows signs of continued erosion from wind waves.

Slower erosion where rocky intertidal habitats exist
Full erosion and complete loss of marsh

Less erosion here. Sandy material from BFI fill creates a low sand beach here colonized by marsh plants.

Erosion hotspot at stormwater outfall

Slower erosion where rocky intertidal habitats exist

Decreasing escarpment

Decreasing marsh edge in front of the park (slower by gravel slope in front of path)

Small pocket of beach forming in gap between newer and older armor placements



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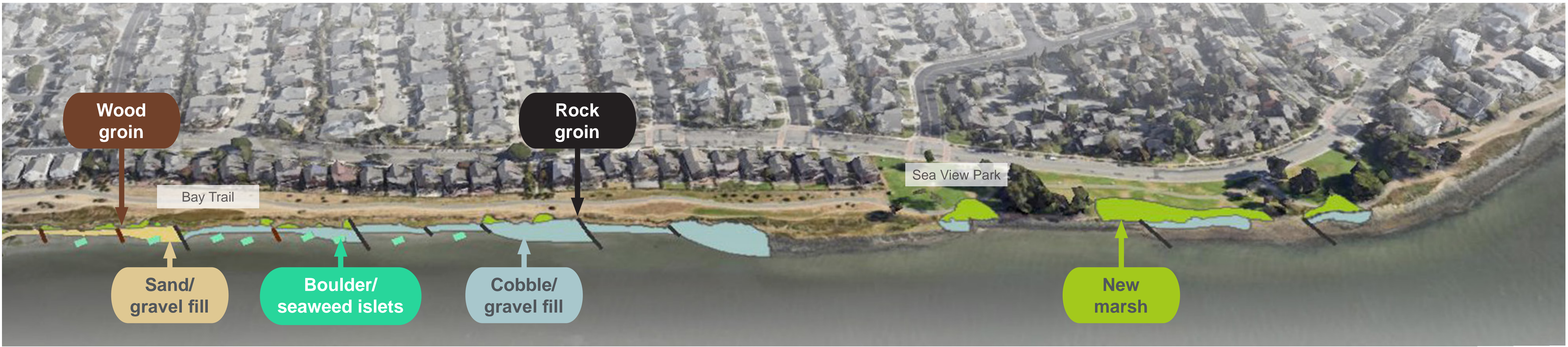


BAY FARM ISLAND NATURE BASED FEATURES

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PROPOSED NATURE BASED FEATURES

The Bay Farm Island northern shoreline near term project proposes a number of natural and nature based features that will increase of the stability of the shoreline, improve connectivity between existing habitat patches, and create new upland and intertidal habitat zones in areas that have experienced habitat loss to due erosion. These nature-based features consist of groins, gravel beaches, cobble edges, and boulder islets, and restored marshes.

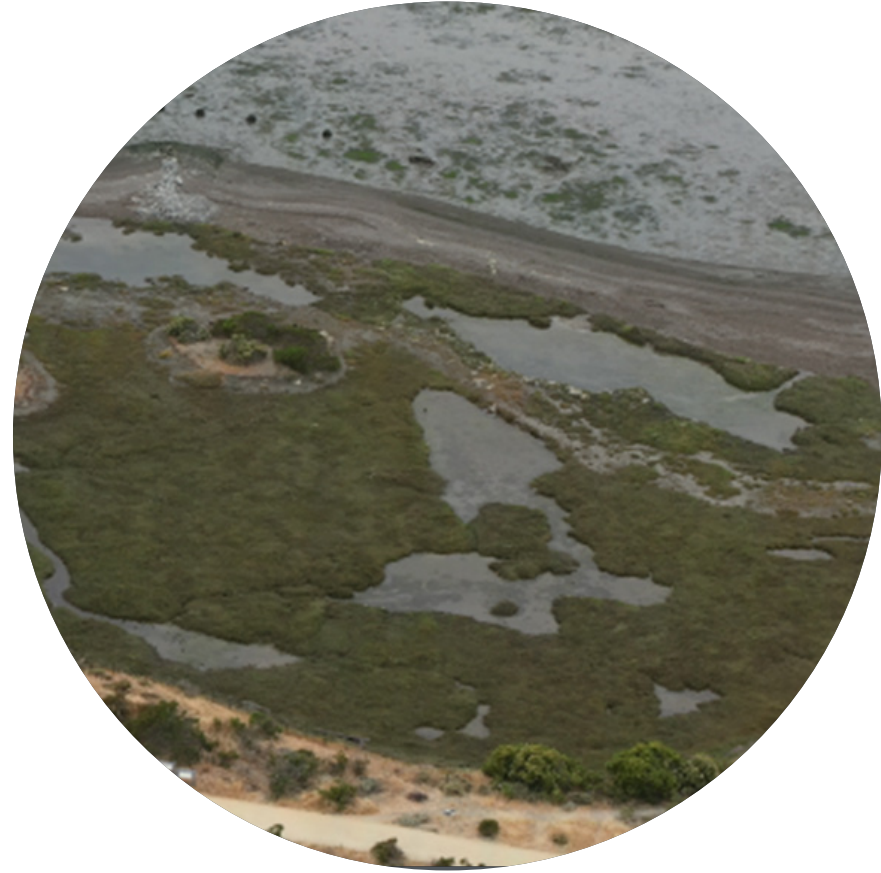


Integration of Nature Based Features into Open Space

Bay Farm Island historically hosted extensive tidal marshes, sandy bay beach habitats, and upland transition areas. Natural and nature based features are intended to preserve and expand existing habitats while limiting erosion and wave run-up on the shore. The selection and placement of these features will take into account shoreline elevations, wave exposure, sediment availability for placement, horizontal and lateral space for placing features, and suitability for native species.



Upland Habitat:
Planting including *Suaeda californica* (California Sea-blite), a species that formerly thrived at the historical Bay Farm Island.



Marsh and Pond Habitat:
Constructed beach and rocky intertidal habitat protect marsh and pond habitat at Heron's Head Park



Sand Beach:
Sand Beach protecting marsh from erosion at Elsie Roemer Bird Sanctuary.



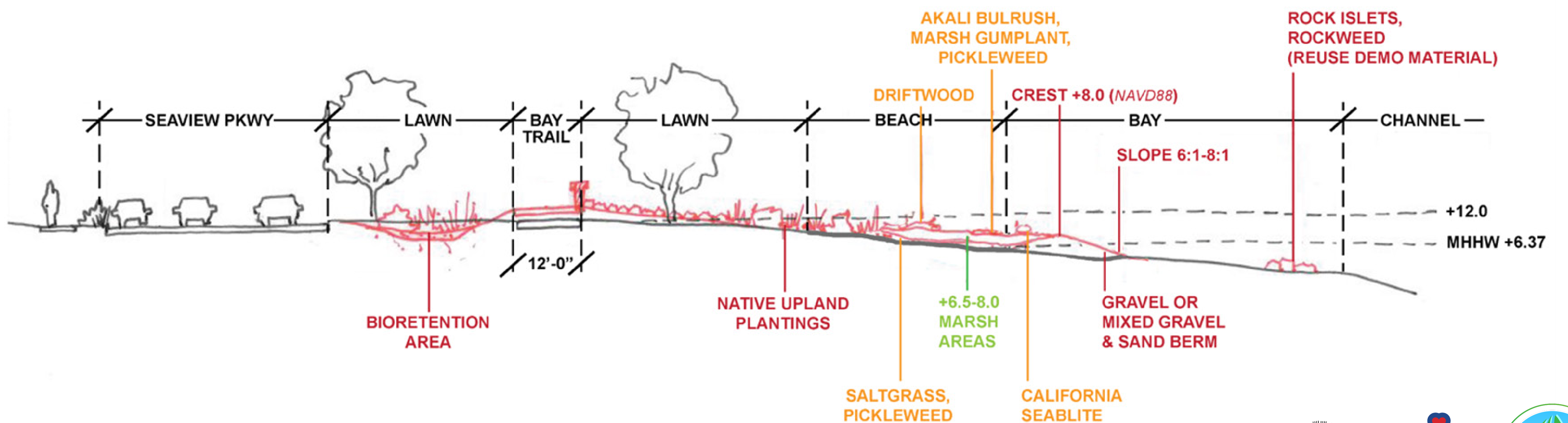
Gravel & Cobble Beaches:
Gravel beach protecting marsh and pond areas immediately behind it at Schoolhouse Creek in Berkeley.



Rock and Wood Groins:
Rock, cobble, and large woody debris shaped into 'groins' help to catch drifting beach material at Aramburu Island in Richardson Bay.



Rocky Intertidal Habitat:
Rocky surfaces in the tidal zone recruit a variety of species and create food web benefits.



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