

FINAL ADOPTED BY THE CITY OF AMERICAN CANYON MAY 21, 2024

AMERICAN CANYON WETLANDS PROJECT

Restoration and Public Access Plan

Prepared for
City of American Canyon

April 2024



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AMERICAN CANYON WETLAND RESTORATION AND PUBLIC ACCESS PROJECT

Restoration and Public Access Plan

1 Introduction

The City of American Canyon (the City) is located in southern Napa County, east of the Napa River. Between the Napa River and residential development of the City are the American Canyon wetlands, which provide habitat for native fish and wildlife species and natural aesthetic value to the local community. A popularly used segment of the San Francisco Bay Trail is located along Wetlands Edge Road and Eucalyptus Drive and connects the community to the wetland ecosystem while allowing opportunity for recreation and education (**Figure 1**).

1.1 Purpose

With increasing sea levels and storm events, portions of the Bay Trail are being overtopped, resulting in erosion along the trail margins. Additionally, culverts under the Bay Trail on Eucalyptus Drive are undersized, which creates scour, safety hazards, and reduced water and habitat quality in North Slough Pond. There are also limited locations where the public can access the water and the marsh directly for in-water recreation and education. The American Canyon Wetland Restoration and Public Access Project (Project), led by the City of American Canyon (City), proposes improvements to nature-oriented public access, recreation, and educational opportunities and wetland habitats. Project planning is funded by Measure AA grant funding administered by the San Francisco Bay Restoration Authority.

This Wetland Restoration and Public Access Plan (Plan) provides conceptual level design for public access and ecological restoration at the American Canyon Wetlands. The recommended design addresses the Project goals and objectives as noted below. This is a planning document that can support subsequent environmental and design phases for shovel-ready projects that can compete for grant funding from the San Francisco Bay Restoration Authority and other state and federal agencies.

This report builds on three prior feasibility studies conducted for the Project. The three feasibility studies are: the Kayak Launch Recreational Feasibility Study (**Appendix A**), the North Slough Trail Resilience and Habitat Restoration Feasibility Study (**Appendix B**), and the Corporation Yard Feasibility Study (**Appendix C**).

1.2 Goals and Objectives

The Project goals are to restore and enhance a mix of wetland habitats and to provide nature-oriented public access, recreation, and educational opportunities along the North Slough and lower Napa River at the City. Project objectives are to:

- Restore or enhance wetland and associated upland habitats to:
 - Support increased abundance and diversity of native species in various Napa River wetlands aquatic and terrestrial ecosystems.
 - Benefit special status species that rely on the Napa River wetlands.
 - Maintain or increase habitat connectivity within wetlands and between wetlands and uplands to support species migration, refugia, and climate resiliency.
- Increase public access and recreational opportunities compatible with wildlife and habitat goals.
- Support the development of an educational facility that serves the community and fosters environmental stewardship.
- Increase the resilience of habitats and public access to sea level rise and flooding.
- Reduce long-term maintenance obligations.

The Project must also be feasible to fund, permit, and construct. Funding feasibility includes implementation and long-term maintenance activities.

1.3 Technical and Community Engagement

The Project planning team, led by the City with assistance from ESA, benefitted from input from a Technical Advisory Committee (TAC) comprised of representatives from the following:

- American Canyon Community and Parks Foundation.
- California Department of Fish and Wildlife.
- Napa County Flood Control and Water Conservation District.
- Napa County Regional Park and Open Space District.
- Napa County Resource Conservation District.
- American Canyon Open Space Advisory Committee.

In addition, the Project received input from the local community. Information about the Project has been included on the City's wetlands website (www.cityofamericancanyon.org/wetlands). Two public meetings were held to solicit community input – on October 25, 2022, and on November 1, 2023. These meetings were advertised through the City's newsletter, on the City's website, on social media, and through posted signage at the wetlands. The website also included a short questionnaire where the public was able to submit feedback on their interests in the wetland restoration and public access elements.



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SOURCE: ESA, 2023

American Canyon Wetland Restoration Project

Figure 1
Project Location and Existing Conditions

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The Project's Conceptual Design benefitted from feedback in following forms:

- The Bay Restoration Regulatory Integration Team site walk held on October 4, 2023, during which regulatory agencies asked questions and provided feedback on the Recommended Project Alternative in person (and on November 3 in writing).
- The City of American Canyon's Open Space, Active Transportation, and Sustainability Commission meeting held on November 1, 2023, during which members of the public, TAC, and City asked questions pertaining to the conceptual design.

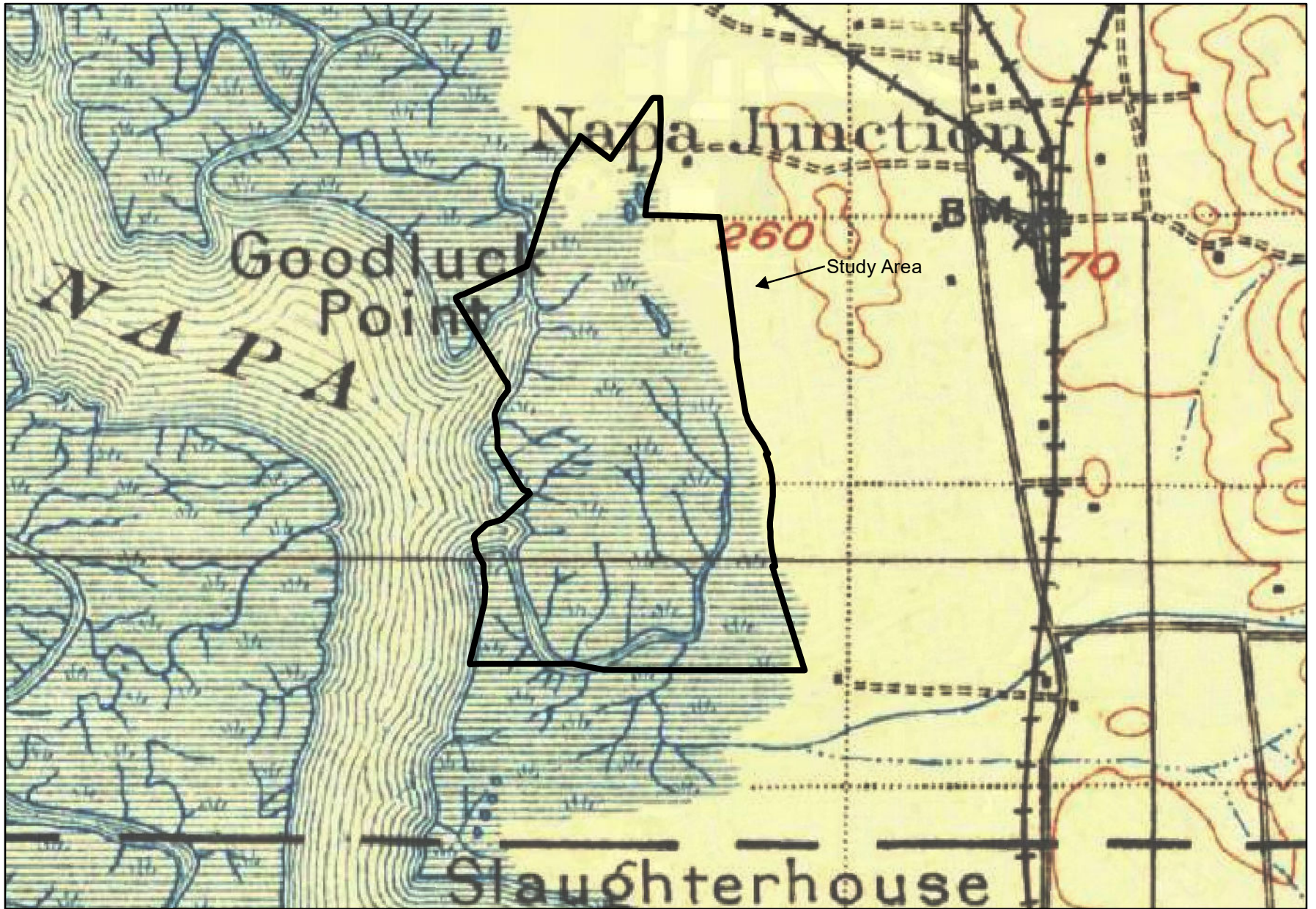
2 Site Conditions

The American Canyon Wetlands are located about 35 miles northeast of San Francisco at the southern end of Napa County (**Figure 1**). The wetlands are bordered by the Napa River to the west and urban development to the north and east. The City's current Wastewater Treatment Plant (WWTP) is at the northern end and just outside of the Project area. The Napa River flows south into San Pablo Bay, which is the northern end of San Francisco Bay, connecting to the Pacific Ocean through the Golden Gate Bridge. Within the wetlands is a closed landfill, and the San Francisco Bay Trail runs along the edge of the wetlands and around the landfill.

2.1 Site History

Historically, the Project area consisted of natural tidal wetlands along the margins of the Napa River and its sloughs (**Figure 2**). The Patwin, Coast Miwok, and Wappo tribes lived in the Napa Valley and along the lower Napa River for thousands of years. They used the abundant natural resources of the area, including the fish, wildlife, and plants of historic wetlands that are now part of the American Canyon Wetlands. Spanish and Mexican settlers colonized the area from the 1700s to 1800s. In the mid to late 1800s, the settlement that is now the City of American Canyon began to develop as a farming community (American Canyon 2023).

In the early 1900s, the natural wetlands were diked and used for agriculture (**Figure 3**). By the 1930s, Wetlands Edge Road and Eucalyptus Drive are visible in historic photographs. Residential development to the east increased through the 1940s to 2000s. By 1965, the City's WWTP was in operation in the southeastern portion of the wetlands, a landfill was under construction in the wetlands, and a culvert under the newly-extended access road to the landfill separated the North Slough Pond from the wetlands across Eucalyptus Drive. In 2002, the City relocated the WWTP to the north (just outside the Project area) and in 2006, many of the remaining wetlands were reopened to tidal inundation with the breaching of North Slough where it connects to the Napa River. Today, the remaining wetlands are used by a diversity of species and enjoyed by the local community for active and passive recreation.



SOURCE: ESRI (background imagery)

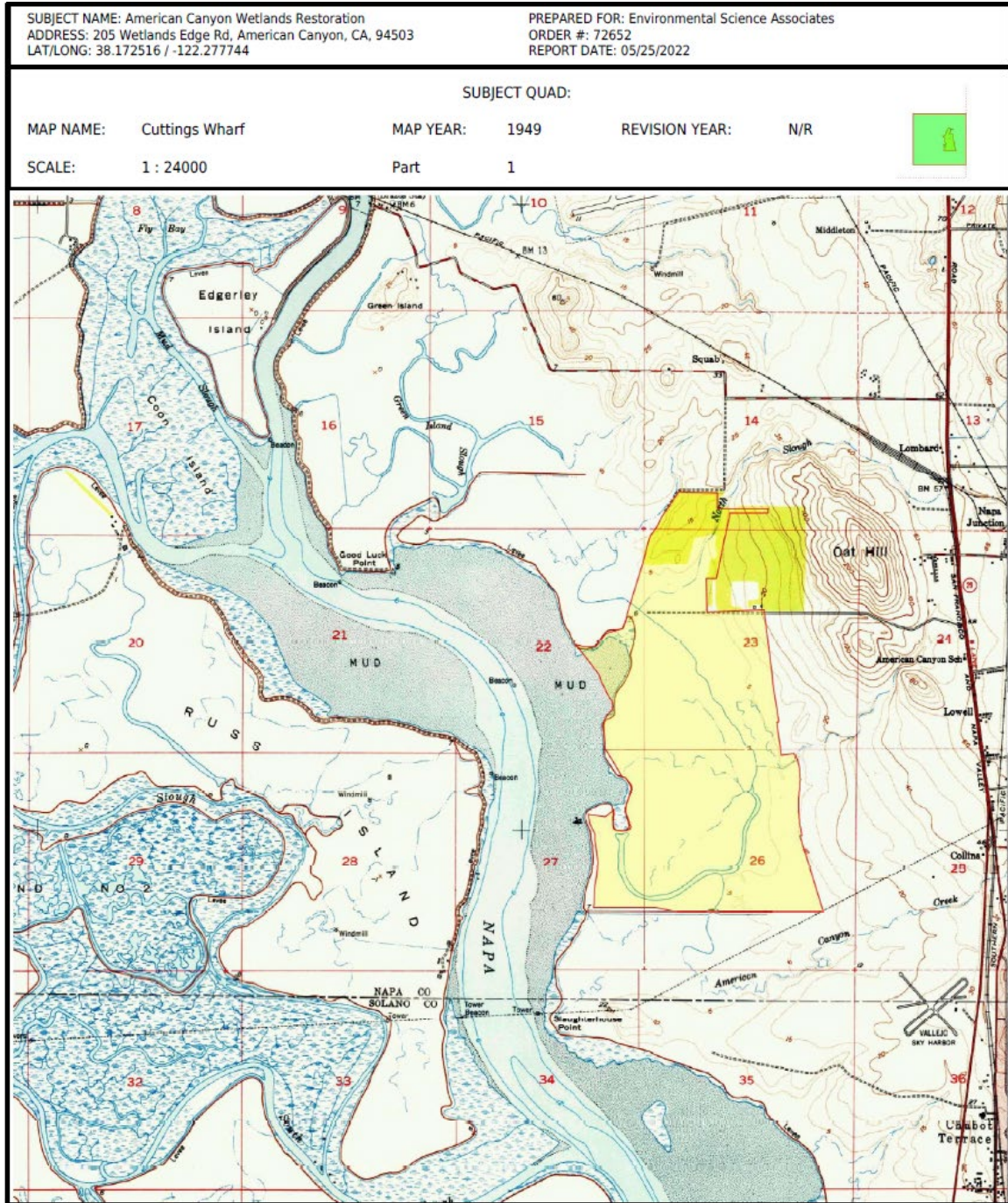
American Canyon Wetland Restoration Project

Figure 2

Historical Topographic Map, 1902

0 0.15 0.3 0.6 0.9 1.2
Miles





SOURCE: EnviroSite 2022

Figure 3
Historical Topographic Map, 1949

2.2 Land Ownership

Most of the wetlands are owned by the California Department of Fish and Wildlife (CDFW) and are part of the Napa-Sonoma Marshes Wildlife Area (**Figure 4**). Parcels at the east and north ends of the Project area, where the former and current WWTP are located, are owned by the City. The closed landfill within the wetlands is owned by the Napa-Vallejo Waste Management Authority.

Parcels outside of the Project area to the east and north are mostly privately held with the Napa Valley Unified School District owning one parcel adjacent to Eucalyptus Drive just east of the Project area.

2.3 Land Use and Infrastructure

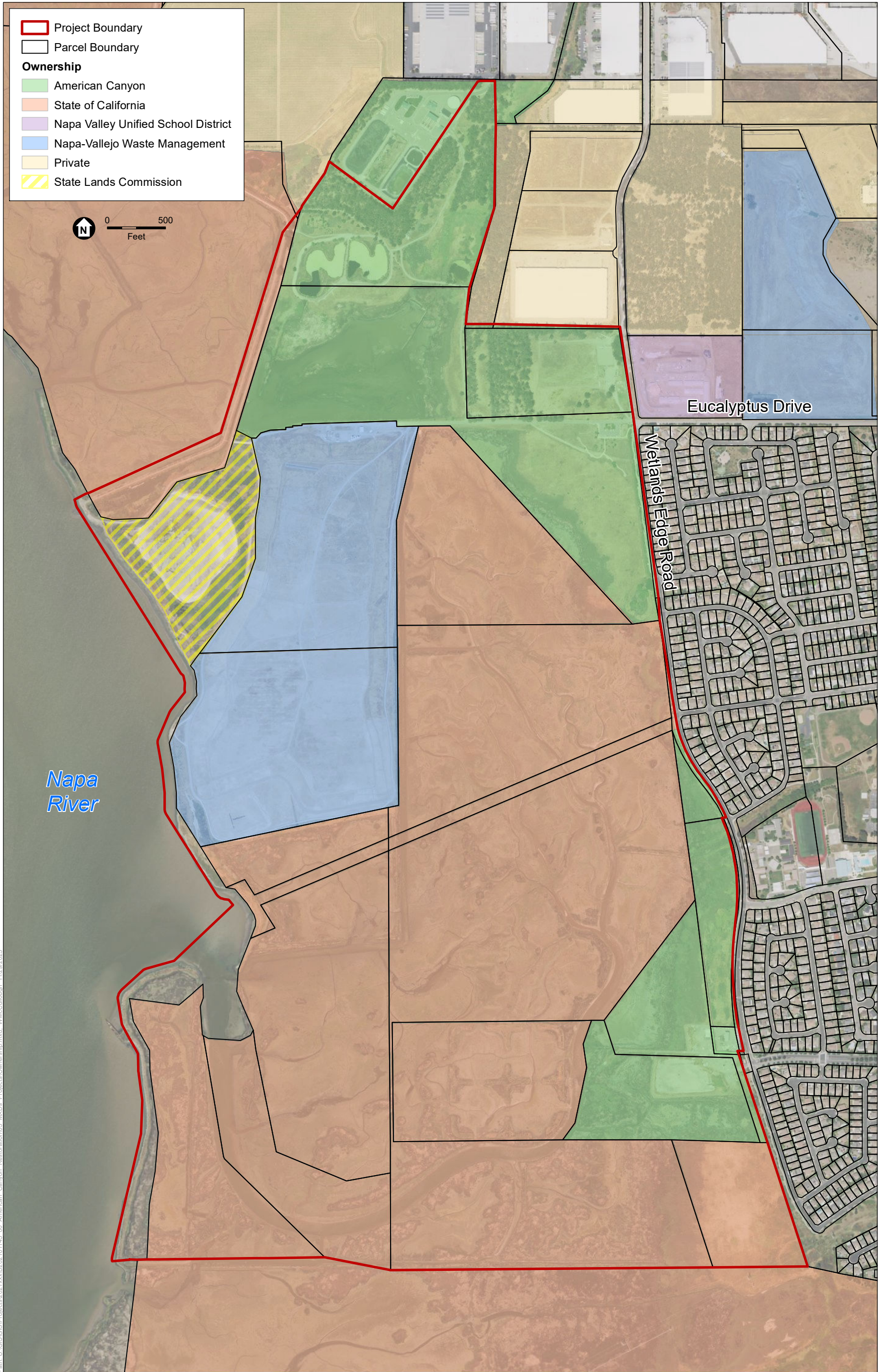
The Napa County General Plan Recreation and Open Space Element (2008) shows that much of the Project area is dedicated Open Space administered by the City of American Canyon. A Corporation Yard—formerly part of the City’s WWTP—in the southeast corner of the Project area, is currently in use by the City as a maintenance facility. In the northeast, west of the terminus of Eucalyptus Drive, is a closed landfill. Other land within the Project area is part of the Napa Sonoma Marshes and used as wildlife habitat and for recreation. Adjacent to the Project area to the east is a residential area and the City’s WWTP is located to the north.

Corporation Yard

The Corporation Yard is an approximately 2-acre developed site built on former wetlands. The facilities previously were part of the City’s WWTP infrastructure. With the relocation of the WWTP to the north, the facilities are currently used as a general maintenance yard.

The Corporation Yard has a sliding access gate that restricts entrance (**Figure 5**). Facilities include storage and maintenance buildings, two underground diesel tanks, an active pump station building with a basement and generator, small accessory utility structures, a paved parking lot, and an unpaved overflow parking area (RIM et al. 2022; Atkinson, pers. comm., 2023). An active pump station transports sewage from residential areas east of the Project area to the WWTP. At the southeast corner of the Corporation Yard, a storm drain outfall from Wetlands Edge Road and a drainage swale from the Corporation Yard’s paved parking lot enter the surrounding wetlands (**Figure 6**). The City has plans to remove the underground tanks, accessory structures, and all other miscellaneous utility boxes, appurtenances, signage, and yard materials to clear the site for construction of the new Ecology Center. An existing PG&E transformer located west of the building will need to remain operational.

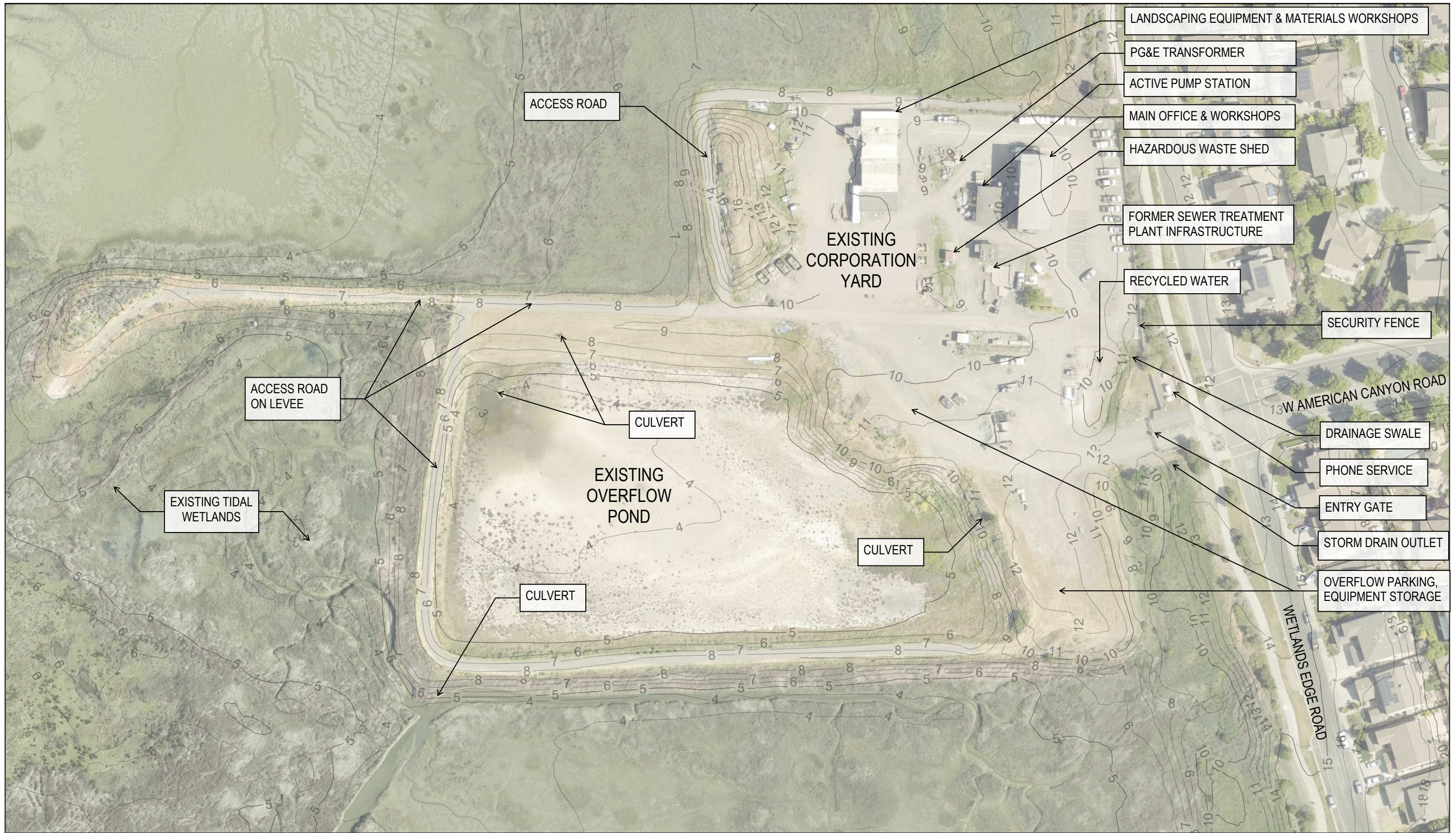
Separately, the City and the American Canyon Community and Parks Foundation have been advancing planning and design for the Eco Center, a regional environmental education hub and community center, proposed for construction at the Corporation Yard in the mid-2020s.



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American Canyon Wetlands Restoration Project

Figure 4
Land Ownership in the Project Area



American Canyon Wetlands Restoration Project



Figure 5
Existing Infrastructure: Corporation Yard and Overflow Pond Detail



Figure 6
Storm Drain Outfall and Drainage Swale at Corporation Yard

Overflow Pond

The Overflow Pond, located southwest of the Corporation Yard facilities, is an approximately 4-acre basin surrounded by a perimeter levee with an asphalt maintenance lane at its crest. The Overflow Pond is used as a containment area for emergency wastewater overflow from the City’s sanitary sewer system.¹ During large precipitation events, stormwater enters the City’s sewer lines, increasing the volume of flow to the Corporation Yard’s pump station. When inflow rates exceed pumping rates, water is routed to the Overflow Pond for temporary storage. Once inflow rates reduce sufficiently, sewage is carried in underground lines to the Corporation Yard, where it is then pumped to the WWTP to the north. The Overflow Pond was most recently used in October 2022 then again during record-breaking rainfall in January 2023 (Atkinson, pers. comm., 2023). Prior to these events, the pond had not been activated since 2008. It follows that the release of wastewater into the Overflow Pond typically happens once or twice per decade during exceptionally large stormwater events.

Landfill

The American Canyon Landfill is a closed landfill in the northern portion of the Project area that operated from 1966 to 1995. The landfill is closed to the public, has an operating landfill gas collection system that is used to generate electricity, and has public hiking trails around the fenced perimeter of the landfill.

2.4 Public Access

Existing public access at the site includes the Bay Trail and a handful of other levee trails connected to the Bay Trail (Figure 1). A parking lot, picnic areas, and an outdoor fitness equipment station (the Wetlands Edge Fitness Center) are located at Wetlands Edge Park, which is just west of the intersection of Eucalyptus Drive and Wetlands Edge Road. Additional street parking is located along Wetlands Edge Road. The site is accessible by boat from the Napa River via North Slough, but there currently are no boat launches in the City.

¹ Similar ponds are also known as wet weather equalization ponds.

San Francisco Bay Trail

The Bay Trail is located on the eastern and northern edges of the American Canyon wetlands (Figure 1). Many people use the Bay Trail for hiking, running, and biking. The trail provides the public with recreational opportunities as well as opportunities for environmental education programming, enjoying nature, and bird-watching.

Figure 7 provides details of trail elevations, widths, and surfacing. A 1.37-mile segment of concrete Bay Trail multi-use trail follows Wetlands Edge Road along the eastern side of the wetlands from Kensington Way in the south to Eucalyptus Drive in the north. From the intersection of Wetlands Edge Road and Eucalyptus Drive, the trail extends westward along a 24-foot-wide levee with asphalt surfacing. This levee separates the North Slough Pond from the American Canyon wetlands to the south. This trail segment is also the primary vehicle access to the landfill maintenance and parking areas.

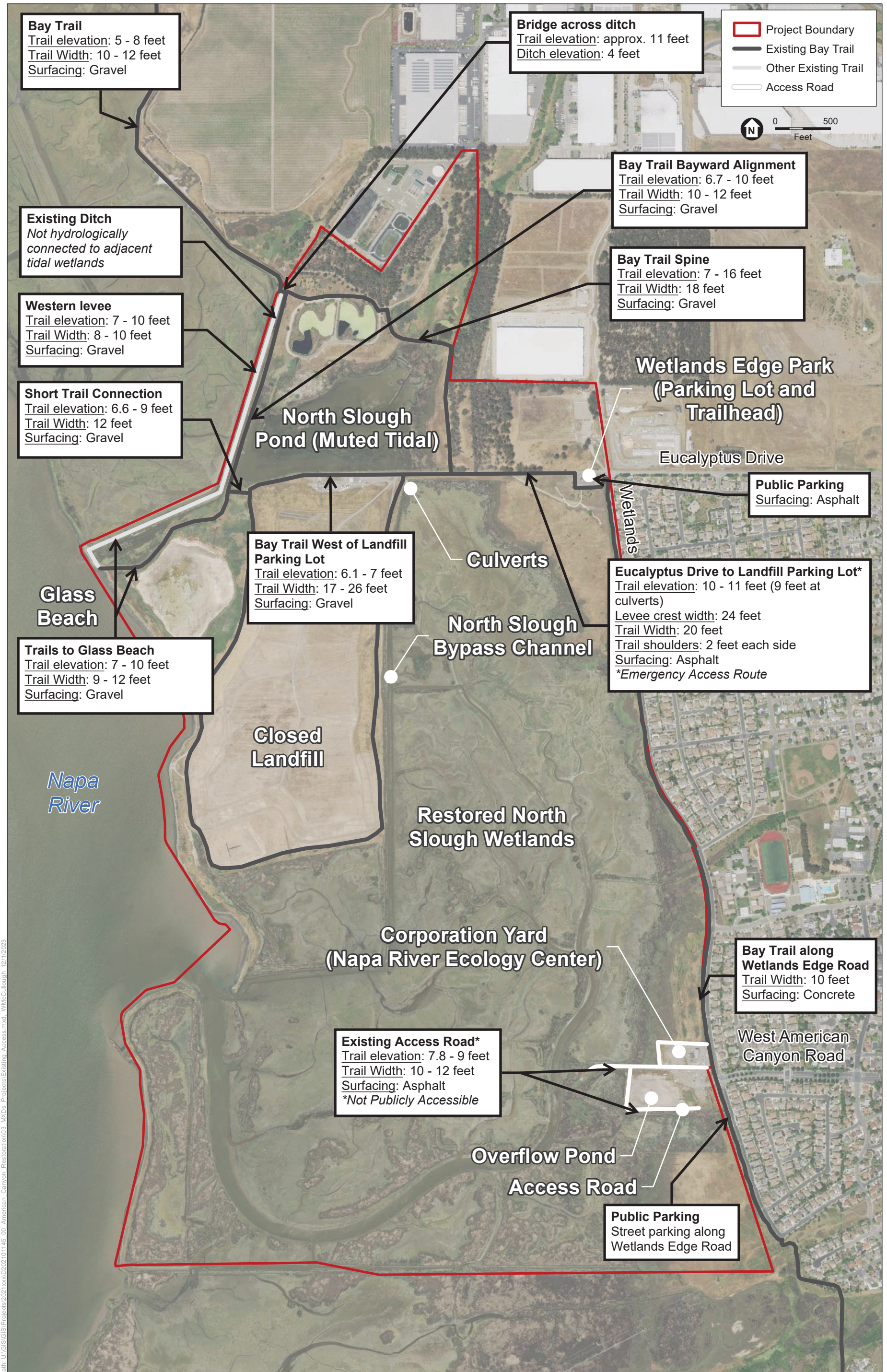
There is a 2-mile loop around the closed landfill, a spur trail out to Glass Beach, and a loop around the northeast side of the North Slough Pond. All of these segments are dirt/gravel. The trail continues north, connecting the American Canyon wetlands to other portions of the Napa-Sonoma Marshes Wildlife Area (MTC 2023).

San Francisco Bay Water Trail

The San Francisco Bay Water Trail is intended to provide shoreline access for small watercraft all around San Francisco Bay. There are no public kayak launches in the 11 miles between Vallejo and Cuttings Wharf; a kayak launch at the City would fill this gap in Bay Water Trail trailheads, providing more access opportunities for users of small watercraft. The Vallejo Launching Facility, Brinkman's Marina, is about 5.5 miles to the south; Cullinan Ranch Boat Launch (off Highway 37) is about 5 miles to the southwest; and Cuttings Wharf Boat Launch is just over 5 miles to the northwest (**Figure 8**). A less developed launch exists at Green Island Road on the Napa River, 3 miles to the north, but this water entry path/boat launch does not appear to be compliant with the Americans with Disabilities Act (ADA) and is not considered an official Bay Water Trail trailhead.

Napa River Ecology Center (Eco Center)

The American Canyon Community and Parks Foundation is leading an effort to renovate the Corporation Yard into a regional environmental education and community center as part of a separate project (**Figure 9**). The existing Main Office & Workshops building will be renovated into the primary visitor-facing Napa River Ecology Center (Eco Center) facility (**Figure 10**). The Foundation anticipates that the Eco Center will be built and open to the public by 2025. The Eco Center is expected to be a major destination in the region with over 12,000 visitors annually, not including kayak launch visitors (Sellick, pers. comm., 2022). Proposed Eco Center amenities include renovated existing structures, teaching gardens, wetland exhibits, environmental sculptures, informational signage, a wetland discovery trail, public parking, bicycle racks, and outdoor gathering areas adjacent to the Bay Trail (**Figure 11**). Public parking will make the Eco Center a primary access point for the Bay Trail within the City (RIM et al. 2022). Native plantings, gardens, and a demonstration wetland will contribute to improved habitat for migratory birds and pollinators. The Eco Center is a separate, but related, project that helps achieve the Project goals.



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SOURCE: ESA, 2023

American Canyon Wetlands Restoration Project

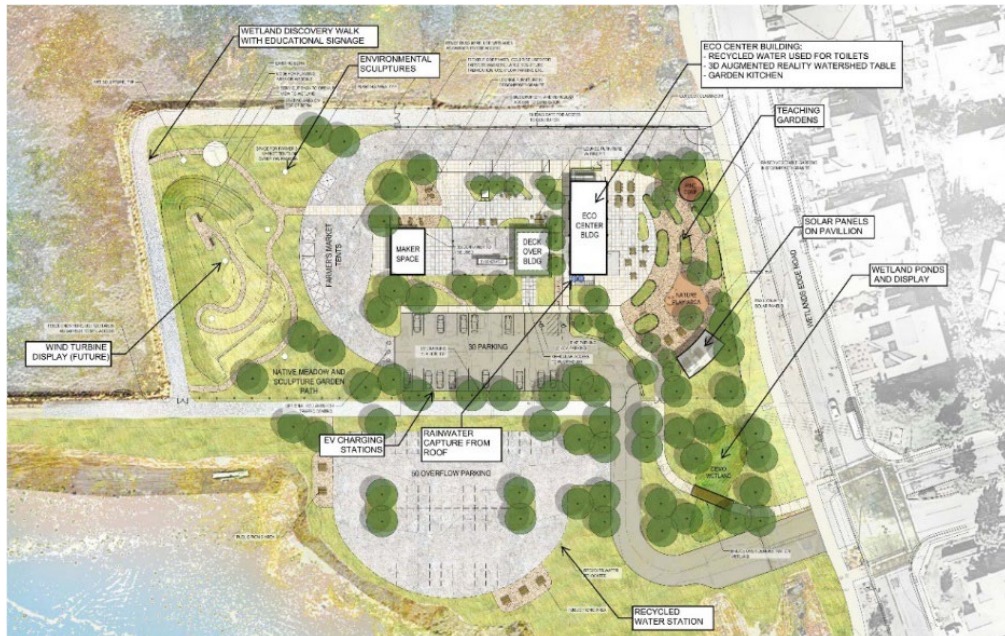
Figure 7
Existing Public Access

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SOURCE: San Francisco Bay Water Trail 2022

Figure 8
Nearby San Francisco Bay Water Trail Kayak Launches



SOURCE: RIM et al. 2022

Figure 9
Eco Center Illustrative Site Plan



SOURCE: RIM et al. 2022

Figure 10
Artist's Rendering of the Eco Center



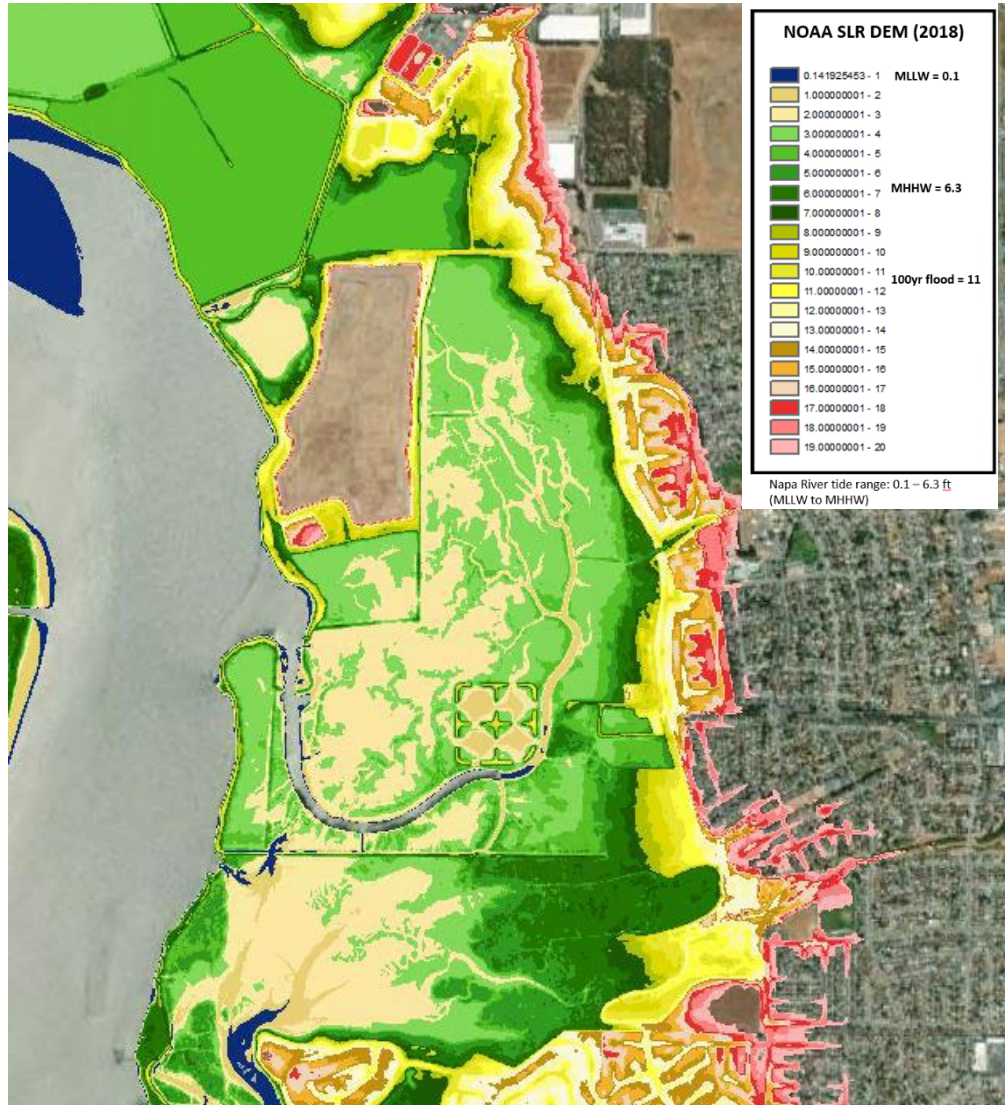
SOURCE: RIM et al. 2022

Figure 11
Artist's Bird's-Eye View of the Eco Center

2.5 Physical Processes

Topography

Elevations in the Project area range from 0 to 20 feet NAVD² as shown in **Figure 12**. Tidal wetlands within the Project area generally range in elevation from 0 to 8 feet, with higher areas (4.5 to 8 feet) supporting tidal emergent vegetation and lower, subsided areas (0 to 4.5 feet) supporting intertidal mudflat. These tidal wetlands gradually transition to higher ground towards the east, up to 11–16 feet at Wetlands Edge Road. The top of the landfill is approximately 50 feet NAVD 88.



SOURCE: NOAA (2022a)

Figure 12
Site Topography

² NAVD 88 is the North American Vertical Datum of 1988. It is used in this feasibility study unless otherwise noted.

The open water and muted³ tidal wetland areas of the North Slough Pond range in elevation from approximately 1 to 4 feet (mudflats and open water), 4 to 7 feet (emergent wetland vegetation), and transition to upland vegetation-dominated habitats at higher elevation areas to the north and east.

The bottom elevation of the Overflow Pond is similar to the elevation range of the surrounding tidal wetlands, generally about 3 to 6 feet. The Overflow Pond is separated from the wetlands by an earthen berm with a low point of approximately 8.4 feet. This is below 10-year storm event water levels (8.7 feet) (**Table 1**), indicating it is at risk of overtopping during storm events.

The Bay Trail segments in the northern Project area range in elevation from 6.1 to 22 feet NAVD. Some segments of trail are below the 100-year and even the 10-year coastal flood elevations (9.9 and 8.7 feet NAVD88, respectively). These trail segments are susceptible to overtopping during coastal flood events under present-day sea levels, and the risk of coastal flooding affecting trail segments in this region will increase with sea level rise.

Most of the Bay Trail from the Wetlands Edge Park at Eucalyptus Drive and Wetlands Edge Road to the landfill dirt parking area is above 10 feet NAVD 88 (**Figure 12**). This is 0.1 feet above 100-year storm event sea levels at 2023 sea levels. The exception is a localized area near the North Slough Pond culverts, which dips down to approximately 9 feet. The Bay Trail section west of the North Slough Pond ranges in elevation from approximately 7 to 9 feet. West of the landfill parking area to Glass Beach, the trail is lower in elevation, approximately 6.5 to 10 feet.

The Corporation Yard is located on upland fill between 9 and 16.7 feet NAVD88 (Figure 12). The proposed Eco Center main visitor facility (Main Office and Workshops) is located at 10.0 feet NAVD88. Surrounding the Corporation Yard and the Overflow Pond are levees with paved maintenance lanes. There is also a spur trail from the Overflow Pond that extends approximately 500 feet into the wetlands area.

Tides and Hydrology

The Project area is located along the east shore of the Napa River, a tidally influenced channel that flows into San Pablo Bay. ESA installed a set of temporary water level gauges at four locations within the Project area in May and June 2022 to measure local tide elevations. ESA calculated tidal datums for the Napa River near Glass Beach based on the water levels measured at the Napa River temporary gauge, with adjustments to account for the limited two-month duration of measurements, using the National Oceanic and Atmospheric Administration (NOAA) CO-OPS Tidal Analysis Datum Calculator (NOAA 2022b). The NOAA Richmond Tide Gauge was used as the long-term reference station. Table 1 lists the published flood levels and calculated tidal datums. Flood levels listed are for 100-year and 10-year storm events (FEMA 2016). Measured water levels show almost no difference between the Napa River, North Slough west of the Corporation Yard, and North Slough south of the Bay Trail culverts.

³ Muted tides have a smaller tide range—lower high tides and higher low tides—than a full tide range. The Napa River and wetlands south of the Bay Trail experience a full tide range. The North Slough Pond experiences muted tides.

TABLE 1
FLOOD LEVELS AND TIDAL DATUMS FOR THE PROJECT AREA AT THE NAPA RIVER

Datum	Napa River Water Levels (ft NAVD88)	North Slough Pond Water Levels (ft NAVD88)	Description
100-year water level	11.0	11.0	100-year Design Storm (FEMA 2016). Includes storm surge and wave runup. (9.9 feet excluding storm surge and wave runup.)
10-year water level	8.7	8.7	10-year Design Storm (FEMA 2016)
HOWL	7.22	5.5	Highest Observed Water Level from May–June 2022 (June King Tide)
MHHW	6.31	5.18	Mean Higher-High Water
MHW	5.78	4.93	Mean High Water
MSL	3.43	3.78	Mean Sea Level
MLW	1.04	2.25	Mean Low Water
MLLW	0.05	1.57	Mean Lower-Low Water
LOWL	-1.38	0.87	Lowest Observed Water Level (May–June 2022)

NOTES: ft = feet; NAVD88 = North American Vertical Datum of 1988; HOWL = highest observed water level; MHHW = mean higher-high water; MHW = mean high water; MSL = mean sea level; MLW = mean low water; MLLW = mean lower-low water; LOWL = lowest observed water level.

Federal Emergency Management Agency (FEMA) flood elevations include storm surge and wave runup.

SOURCES: FEMA 2016; water level observations and datum analysis conducted by Environmental Science Associates (ESA) in 2022.

Tides in the North Slough Pond are muted by restricted flow through the two undersized culverts that connect the North Slough Pond to the North Slough tidal marsh. As such, tidal datums for the North Slough Pond were calculated separately from the Napa River tidal datums. ESA calculated North Slough Pond tidal datums based on approximately two months of measured water levels from temporary gauges placed and the NOAA CO-OPS Tidal Analysis Datum Calculator (NOAA 2022b).

Figure 13 shows the culverts in the Bay Trail at North Slough during a low tide.



Figure 13
Existing Conditions: Culverts at the San Francisco Bay Trail at North Slough at Low Tide

Sea Level Rise

Currently, the Bay Trail in the Project area is at risk of periodic flooding and overtopping (**Figure 14a**). Parts of the trail flood at high spring tides. Based on mapping by San Francisco Bay Conservation and Development Commission (BCDC) (BCDC 2023), as little as 24 inches of sea level rise (SLR) above mean higher high water (MHHW) could cause overtopping of the Bay Trail in the southwest corner of the North Slough Pond.⁴ As sea levels rise, much of the Bay Trail around North Slough Pond will overtop during storm events if these levees are not raised (**Figures 14b and 14c**).

Towards the southern end of the Project area, the Corporation Yard buildings are currently within the 1% annual chance flood zone. And the low point of the Overflow Pond's levees is approximately 8.4 feet high, below the 10-year storm event at current sea level of 8.7 feet. Accordingly, the Corporation Yard buildings and the Overflow Pond will become increasingly at risk for flooding as sea levels rise (**Figures 14d through 14f**).

⁴ This amount of water level rise could result from other flood and sea level rise combinations, such as 12 inches of SLR and a king tide, or from no SLR and a five-year storm event (BCDC 2023)

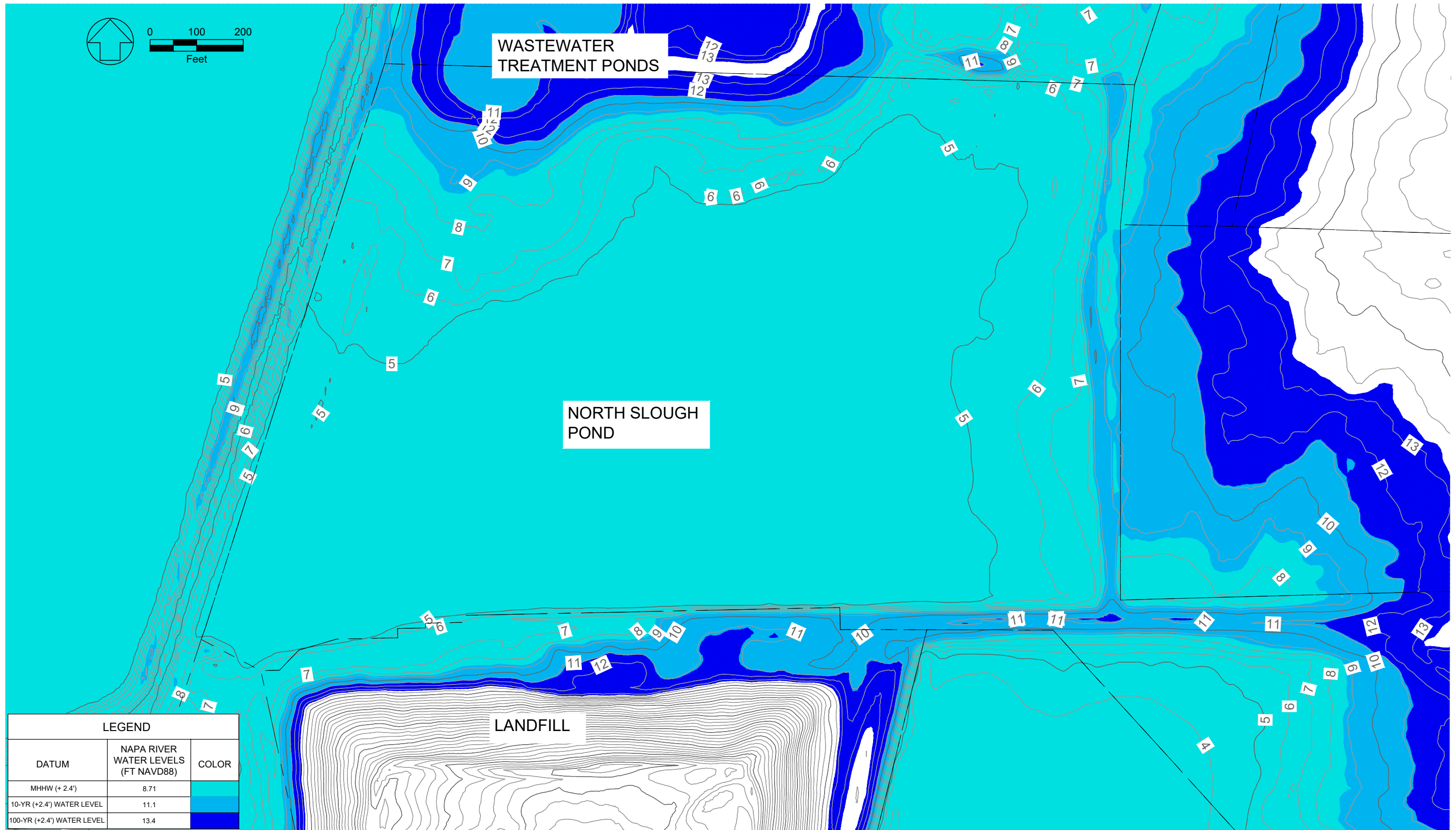


SOURCE: National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer, 2022.

American Canyon Wetland Restoration Project

Figure 14a
Sea Level Rise Scenarios: North Slough Pond Detail, Existing Flood Conditions



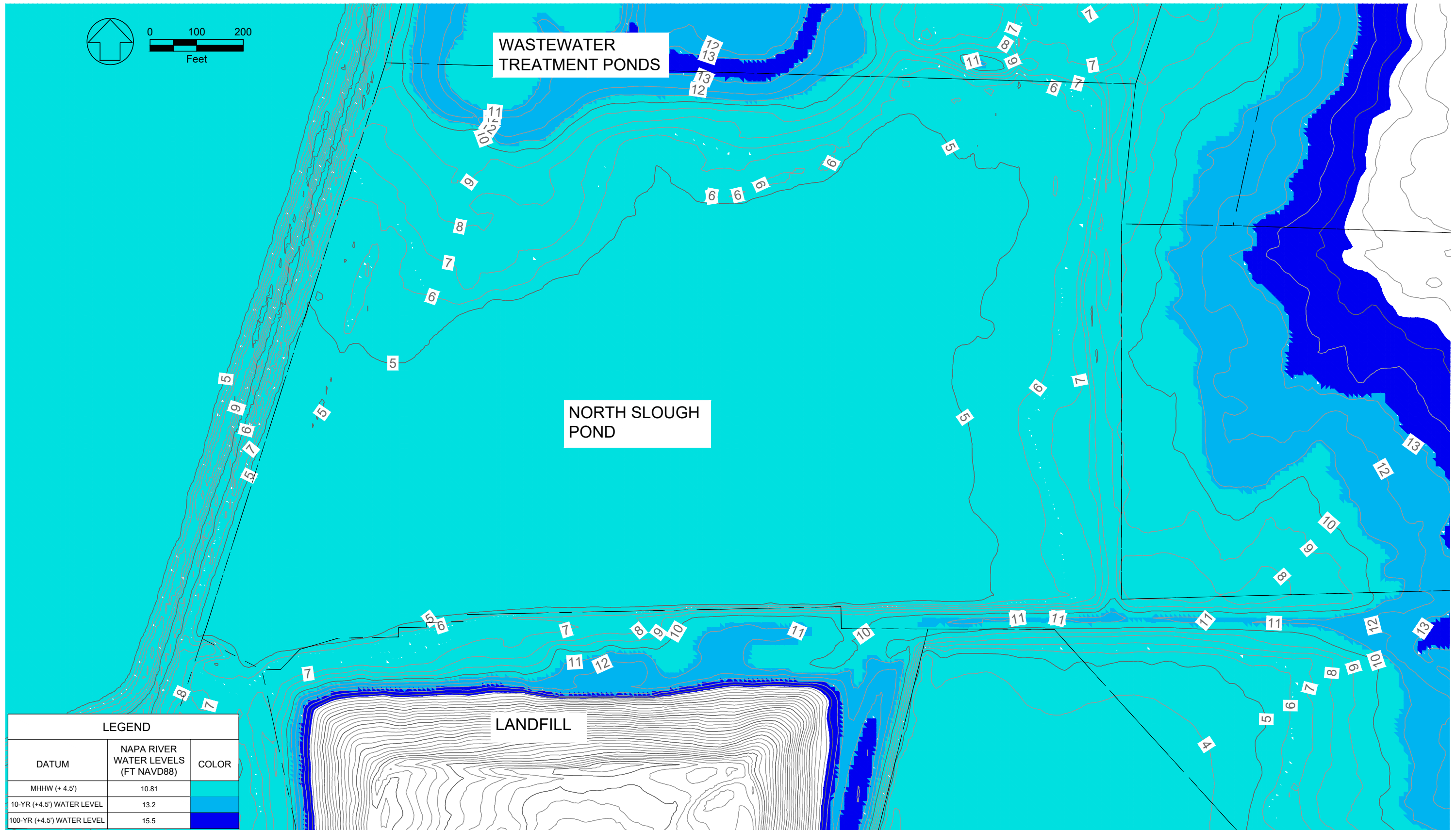


SOURCE: National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer, 2022.

American Canyon Wetland Restoration Project

Figure 14b
Sea Level Rise Scenarios: North Slough Pond Detail, 2080 Low Risk Aversion SLR (8.7 ft.) Flood Conditions



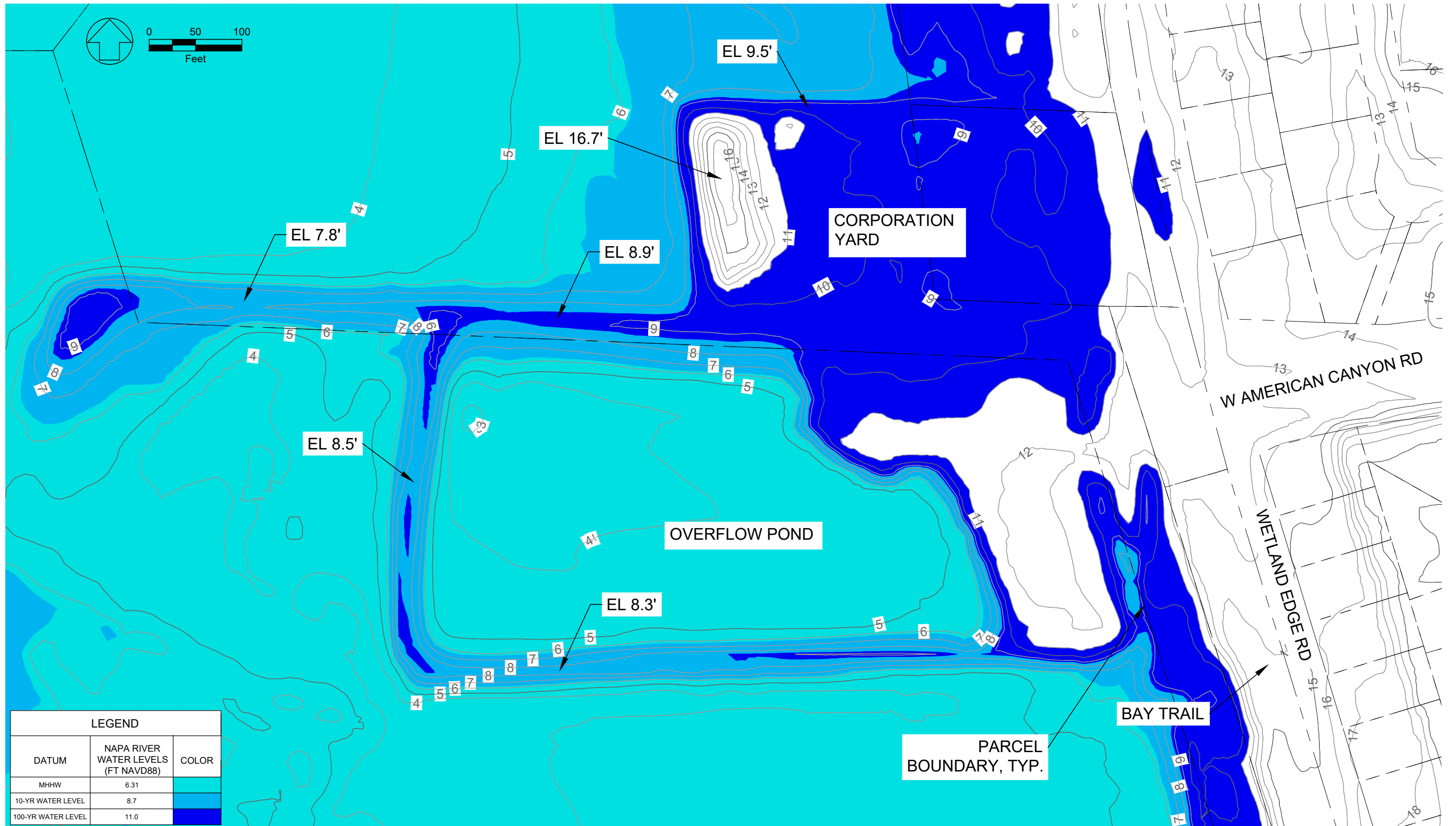


SOURCE: National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer, 2022.

American Canyon Wetland Restoration Project

Figure 14c
Sea Level Rise Scenarios: North Slough Pond Detail, 2080 Moderate-High Risk Aversion SLR (10.8 ft.) Flood Conditions





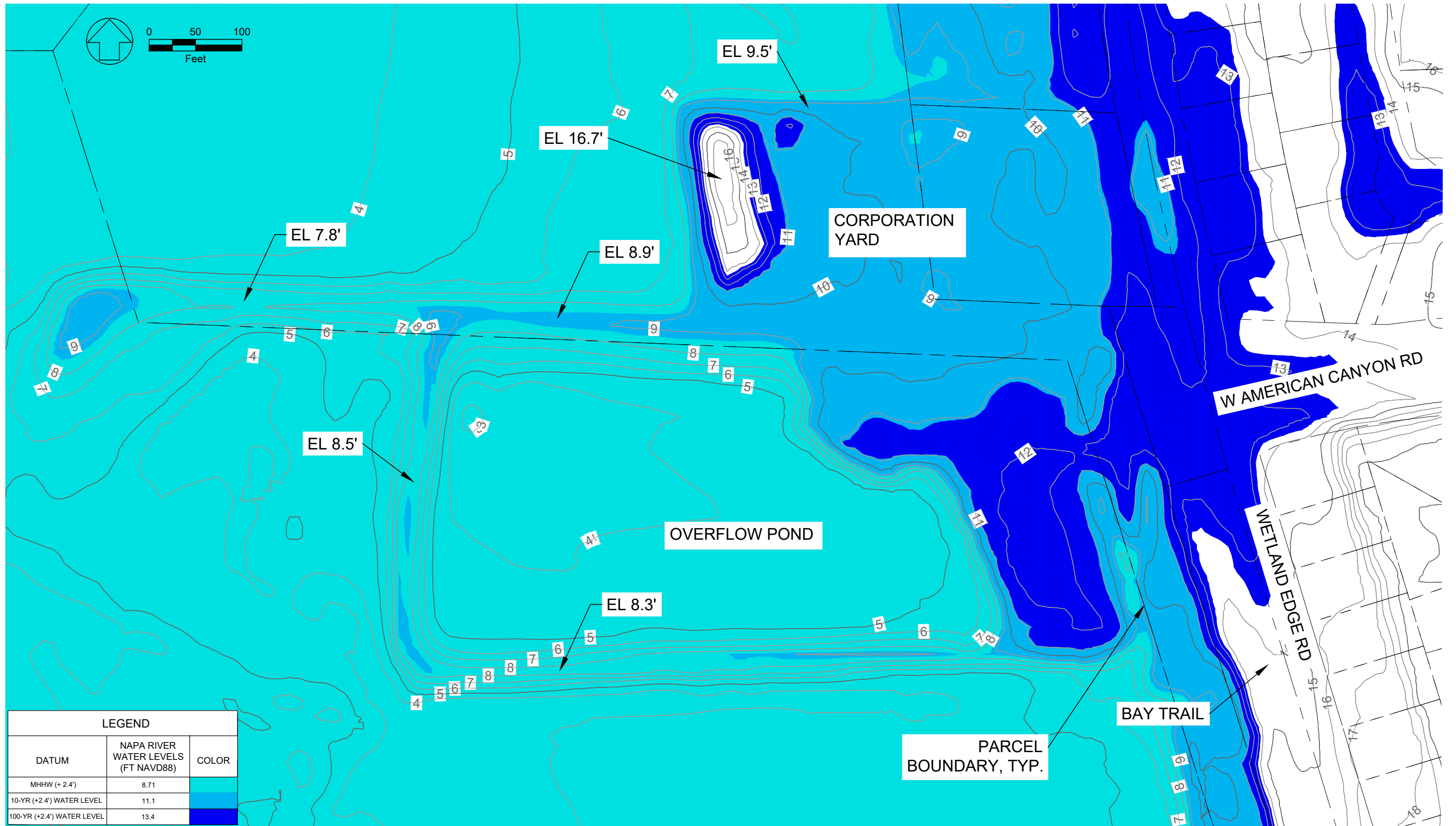
SOURCE: National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer, 2022.

American Canyon Wetland Restoration Project

Figure 14d

Sea Level Rise Scenarios: Corporation Yard Detail, Existing Flood Conditions





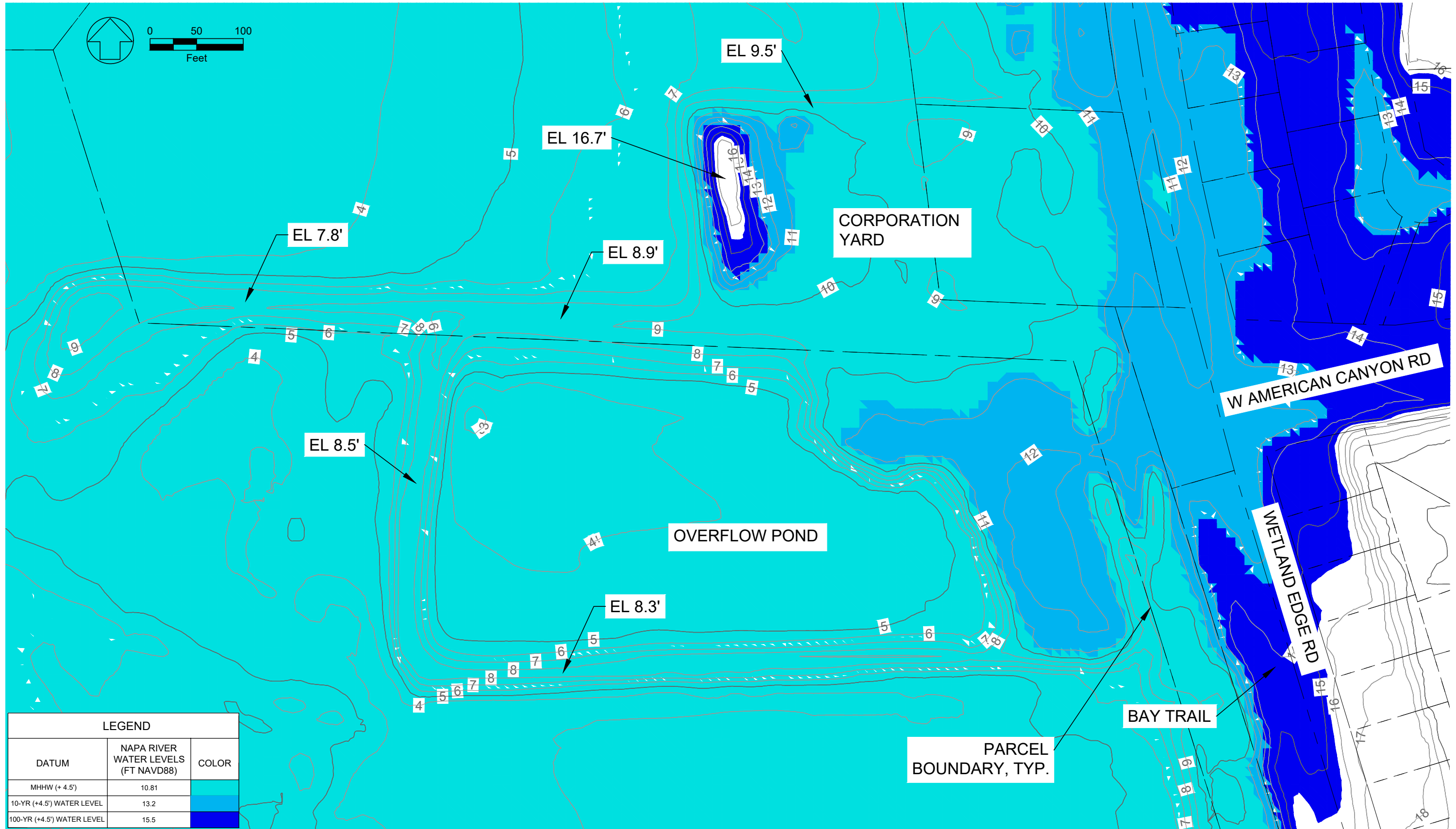
SOURCE: National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer, 2022.

American Canyon Wetland Restoration Project

Figure 14e

Sea Level Rise Scenarios: Corporation Yard Detail, 2080 Low Risk Aversion (8.7 ft.) SLR Flood Conditions





SOURCE: National Oceanic and Atmospheric Administration (NOAA) Digital Coast Data Access Viewer, 2022.

American Canyon Wetland Restoration Project

Figure 14f

Sea Level Rise Scenarios: Corporation Yard Detail, 2080 Moderate-High Risk Aversion (10.8 ft.) SLR Flood Conditions



Soils

The Project area contains three soil types (USDA 2023), described as follows:

- **Reyes silty clay loam:** This soil is present in the bay flat and low marsh portions of the Project area south of Eucalyptus Drive and west of the Bay Trail Spur.⁵
- **Haire clay loam and Haire loam, 2 to 9 percent slopes:** These soils are present in upper marsh locations in the vicinity of North Slough Pond and along the western edge of Wetlands Edge Road.
- **Clear Lake clay, drained, 0 to 2 percent slopes:** This soil is present in the developed portions of the Project area along Wetlands Edge Road, including the Corporation Yard site. The water table is approximately 3 feet below the soil surface.

Hazardous Materials

A Phase I Environmental Site Assessment was conducted for the Project area to identify recognized environmental conditions (RECs), historical recognized environmental conditions (HRECs), and controlled recognized environmental conditions (CRECs) in the Project area (see **Appendix D**, Phase I Environmental Site Assessment, Section 2.1, for definitions of terms). The Project area was inspected on June 2 and July 1, 2022. The assessment provided the following observations and conclusions:

- The closed American Canyon Landfill is entirely capped and vegetated. No areas of erosion into the landfill cap or exposed waste were observed. The landfill is considered a CREC because it contains buried municipal waste that is in a controlled, sealed condition; is controlled by the cap and leachate and landfill gas collection systems; and is subject to land use restrictions that prohibit disturbing the buried waste.
- The Corporation Yard serves as the City’s maintenance and landscaping facility, which stores and uses fuels and motor oils, antifreeze, pesticides, and herbicides. No RECs, CRECs, or HRECs were observed relative to hazardous materials, hazardous waste, or chemical use, storage, or disposal.
- The wetland areas did not have any observed chemical containers or tanks, chemical spills, stained soil, or stressed vegetation. No RECs, CRECs, or HRECs were observed relative to hazardous materials, hazardous waste, or chemical use, storage, or disposal.
- With regard to the Overflow Pond:
 - As of the summer of 2022, the Overflow Pond had not been used for raw sewage overflow since 2008 and its bottom appeared to have a thin cover of dried sewage sludge (**Appendix D**). Dried sludge is mostly dried organic matter and grit and is not considered a hazardous material. No spills, stained soil, stressed vegetation, unusual odors, or chemical containers were noted.
 - Flows to the Overflow Pond, when they occur, consist of raw sewage. Continued intermittent use of the Overflow Pond poses a contamination risk to adjacent wetlands, uplands, and proposed publicly accessible trails associated with the renovation of the Corporation Yard into a regional environmental education center. Untreated wastewater

⁵ The Bay Trail Spur is the segment of existing Bay Trail west of North Slough Pond (**Figure 7**).

- that enters the Overflow Pond is a public health risk, and the introduction of pathogens in untreated wastewater can transmit disease to marsh wildlife.
- Birds and small mammals that enter the Overflow Pond during overflow events could be vectors for the spread of disease to surrounding areas (USEPA 2003).
 - Members of the public should not be near untreated wastewater during active overflows.
 - Per- and Polyfluorinated Substances (PFAS) are a potential concern with regards to potential effects on people (CDC 2023). These water-resistant, non-biodegradable chemicals from industrial manufacturing are commonly found in people, drinking water, and soil (USEPA 2023). Their impacts on people range from harmful to unknown. PFAS are likely present in the Overflow Pond from previous wastewater overflow events.
- The search of government regulatory records conducted in 2022 did not reveal any RECs that would adversely affect the Project area or prevent restoration activities.
 - The Project area contains five listings that are considered HRECs. These consist of historical spills of sewage or wine/spirits that are considered no longer able to adversely affect the Project area or restoration activities.

2.6 Biology

Natural Communities

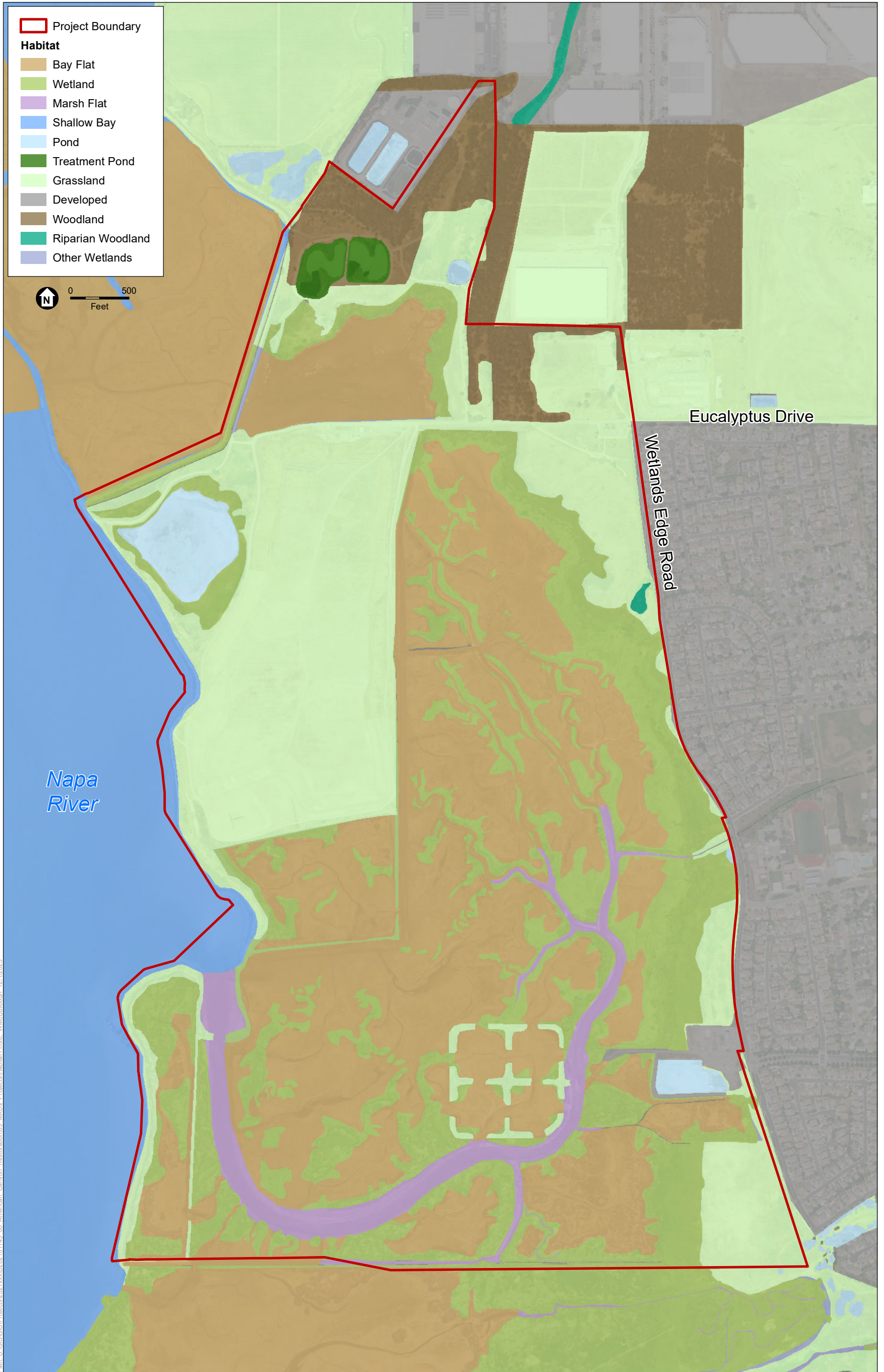
The American Canyon wetlands have a diverse assemblage of native tidal marsh species with some sloped transition zones that connect wetlands with neighboring upland habitat. Natural communities in the study area are shown in **Figure 15**. These communities were compiled using a combination of Napa County’s fine scale vegetation map (Napa County 2016) and the Bay Area Aquatic Resource Inventory (BAARI) datasets (San Francisco Estuary Institute and Aquatic Sciences Center 2017). Habitats consist of shallow bay (Napa River), bay flat (tidal flat), tidal marsh (pickleweed marsh, tidal nascent marsh), marsh flat (tidal slough/channel), depression (open water), grassland, eucalyptus, and riparian and are described in the Biological Resources Memo (**Appendix E**).

Overall, the habitat quality in the restored tidal wetland areas is good, with a mosaic of habitats and elevational gradients. Levee margins throughout the Project area contain an assortment of non-native ruderal species such as fennel (*Foeniculum vulgare*) and black mustard (*Brassica nigra*).

Special-Status Plants and Wildlife

Table 2 provides a listing of special-status species with moderate or high potential to occur in the Project area. Species that are protected under state or federal endangered species acts may require consultation with regulatory agencies prior to implementing projects that could negatively affect them or their habitat. A complete record search⁶ of all special status species documented in the vicinity along with their potential to occur can be found in **Appendix E**. This evaluation of species’ potential to occur can be used as part of environmental documentation for future phases of the Project.

⁶ Records were obtained and compiled from the California Natural Diversity Database, the California Native Plant Society, and the U.S. Fish and Wildlife Service’s iPaC resource list for the Project area (see **Appendix E**).



Path: U:\GIS\Projects\2021\0022\01145_00_American_Canyon_Restoration\03_MXDs_Projects\Habitat.mxd, W:\McCullough_12/1/2023

SOURCE: ESA, 2023; ESRI 2023; SFEI ASC 2017; Thorne et al. 2019

American Canyon Wetlands Restoration Project

Figure 15
Existing Habitats

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TABLE 2
SPECIAL STATUS SPECIES WITH MODERATE TO HIGH POTENTIAL TO OCCUR WITHIN THE PROJECT AREA

Common Name	Scientific Name	Listing Status
Fish		
Longfin smelt	<i>Spirinchus thaleichthys</i>	FC/ST/--
Central California Coast steelhead DPS	<i>Oncorhynchus mykiss</i>	FT/--/--
North American green sturgeon southern DPS	<i>Acipenser medirostris</i>	FT/SSC/--
Birds		
Great egret	<i>Ardea alba</i>	--/*/--
Snowy egret	<i>Egretta thula</i>	--/*/--
Northern harrier	<i>Circus hudsonius</i>	--/SSC/--
White-tailed kite	<i>Elanus leucurus</i>	--/FP/--
California black rail	<i>Laterallus jamaicensis coturniculus</i>	--/ST, FP/--
California Ridgway's (formerly: clapper) rail	<i>Rallus obsoletus obsoletus</i>	FE/SE, FP/--
Burrowing owl	<i>Athene cunicularia</i>	--/SSC/--
San Pablo song sparrow	<i>Melospiza melodia samuelis</i>	--/SSC/--
Saltmarsh common yellowthroat	<i>Geothlypis trichas sinuosa</i>	--/SSC/--
Tricolored blackbird	<i>Agelaius tricolor</i>	--/SSC/--
Mammals		
Salt marsh harvest mouse	<i>Reithrodontomys raviventris</i>	FE/SE, FP/--
Suisun shrew	<i>Sorex ornatus sinuosus</i>	--/SSC/--
Plants		
Johnny-nip	<i>Castilleja ambigua</i> var. <i>ambigua</i>	--/--/4.2
Lyngbye's sedge	<i>Carex lyngbyei</i>	--/--/2B.2
Soft bird's beak	<i>Chloropyron molle</i> ssp. <i>molle</i>	FE/SR/1B.2
Bolander's water-hemlock	<i>Cicuta maculata</i> var. <i>bolanderi</i>	--/--/2B.1
Small spikerush	<i>Eleocharis parvula</i>	--/--/4.3
San Joaquin spearscale	<i>Extriplex joaquinana</i>	--/--/1B.2
Congested-headed hayfield	<i>Hemizonia congesta</i> ssp. <i>congesta</i>	--/--/1B.2
Delta tule pea	<i>Lathyrus jepsonii</i> var. <i>jepsonii</i>	--/--/1B.2
Mason's lilaeopsis	<i>Lilaeopsis masonii</i>	--/SR/1B.1
Suisun marsh aster	<i>Symphotrichum lentum</i>	--/--/1B.2
Saline clover	<i>Trifolium hydrophilum</i>	--/--/1B.2

STATUS CODES:FEDERAL: U.S. Fish and Wildlife Service (USFWS)

FE = Federally Endangered
 FT = Federally Threatened
 FC = Federal Candidate Species

STATE: California Department of Fish and Wildlife (CDFW)

SE = State Endangered
 ST = State Threatened
 SR = State Rare
 FP = Fully Protected
 SSC = California Species of Special Concern
 * = Special animal present on CDFW's Special Animal List

Other

VU = Listed as Vulnerable by Xerces Society for Invertebrate Conservation

California Rare Plant Ranks (CRPR):

List 1B = Plants rare, threatened, or endangered in California and elsewhere

List 4 = Plants with limited distribution or infrequent throughout a broader area in California, and their status should be monitored regularly

An extension reflecting the level of threat to each species is appended to each rarity category as follows:

- .1 – Seriously threatened in California
- .2 – Fairly threatened in California
- .3 – Not very threatened in California

In particular, federally or state-listed species such as the longfin smelt (*Spirinchus thaleichthys*), Central California Coast steelhead Distinct Population Segment (DPS, *Oncorhynchus mykiss*), North American green sturgeon southern DPS (*Acipenser medirostris*), California Ridgway's rail (*Rallus obsoletus obsoletus*), salt marsh harvest mouse (*Reithrodontomys raviventris*), California black rail (*Laterallus coturniculus jamaicensis*), and soft bird's beak (*Chloropyron molle* ssp. *molle*) have potential to occur in or near the American Canyon wetlands. The Project area is located within an area identified as Essential Fish Habitat for various life stages of fish species managed under the Pacific Groundfish Fishery Management Plan (FMP), the Coastal Pelagic Species FMP, and the Pacific Coast Salmon FMP. San Francisco Bay, including the Project area, is also designated as an estuary habitat area of particular concern for various federally-managed fish species as defined in the Pacific Salmon and Groundfish FMPs.

Habitat enhancements should help to improve conditions for these species. Any proposed projects would need to consider impacts to these and other potentially sensitive species in the area, such as nesting birds. Activities determined to impact listed species or their habitats protected under the California Fish and Game Code and the federal and California endangered species acts, may require permits from the California Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, and/or the National Marine Fisheries Service.

Aquatic Resources

Much of the Project area consists of aquatic resources, such as tidal marshes, tidal channel, and seasonal wetlands. Aquatic resources are considered sensitive and are regulated under several laws, such as the Clean Water Act, the Porter-Cologne Water Quality Control Act, the Rivers and Harbors Act, the National Environmental Policy Act, the California Environmental Quality Act (CEQA), and the McAtteer-Petris Act. Activities resulting in unavoidable impacts to aquatic resources may require permitting by the relevant agencies with regulatory authority, including the United States Army Corps of Engineers, Regional Water Quality Control Board, and California Department of Fish and Wildlife, and the Bay Conservation and Development Commission (BCDC).

2.7 Cultural Resources

Background research identified one previously recorded cultural resource, P-28-000602, in the Project area. P-28-000602 was first recorded in 1986 (Baker et al. 1986) as an historic-era farmstead in the northeast portion of the Project area. The resource was determined not eligible for the National Register of Historic Places (National Register) in 1987 (OHP 2012) and appears to have been demolished around 2006. Therefore, it does not appear that there are any previously recorded cultural resources still present in the Project area.

Research on historic-era maps and aerial photography identified the following six potential features of historic age (50 years of age or greater) in the Project area: the Corporation Yard, the former sewage treatment ponds (in the south portion of the Project area), two berms/levees (one at the mouth of Green Island Slough, one northwest of the former landfill), and two ditches (one at the south edge of the Project area, one northwest of the former landfill west of the WWTP). These should be considered potential cultural (architectural) resources, for National Historic

Preservation Act (NHPA) and CEQA purposes. Additional research identified a shipwreck (naval destroyer) 100 feet west of the west-central portion of the Project area, just southwest of the confluence of North Slough and the Napa River. **Table 3** summarizes these resources.

TABLE 3
ARCHITECTURAL RESOURCES (ALL PREVIOUSLY UNRECORDED) IDENTIFIED IN OR ADJACENT TO THE PROJECT AREA THROUGH HISTORICAL RESEARCH

Description	Location	Specific Restoration Concept
Ditch with berms/levees, east-west-aligned	South edge of Project area	[none]
Berm/levee, east-west-aligned	Mouth of Green Island Slough mouth, in Southwest portion of Project area	[none]
Berm/levee, west southwest-east northeast-aligned	Northwest of former landfill and along northern edge of former bay/inlet in northwest portion of Project area	North Slough Levee Flood Protection and Habitat Restoration
Ditch with berms/levees, north northeast-south southwest-aligned	Northwest of former landfill and west of sewage treatment plant, in northwest portion of Project area	North Slough Levee Flood Protection and Habitat Restoration
Corporation Yard, buildings/facilities	Southeast portion of Project area	Corporation Yard Wastewater Overflow Pond and Environmental Education Facilities
Sewage treatment ponds	Southeast portion of Project area	[none]
Shipwreck, destroyer	100 feet west of Project area, southwest of Green Island Slough mouth	[none]

Based on the archaeological sensitivity analysis conducted for this study, the Project area has the following archaeological sensitivity:

- Pre-contact archaeological material:
 - Buried deposits—High.
 - Surficial deposits:
 - Previously undisturbed portions of the northernmost Project area—Moderate.
 - Remainder of Project area—Low.
- Historic-era archaeological material:
 - Buried deposits—Low.
 - Surficial deposits—Low.

ESA recommends that, upon completion of preliminary Project design, a qualified cultural resources consultant carry out the following to support Project compliance with the NHPA and CEQA:

1. Establish a Project area, for CEQA purposes, and an Area of Potential Effect (APE), for NHPA purposes, for analysis of cultural resources-related impacts/effects that could result from the Project. Likely, the Project area /APE would include all areas of proposed Project-

related ground-disturbance, development, staging/laydown areas, management, recreation. The Project area /APE should also consider any potential visual and vibratory impacts.

2. Conduct a cultural resources pedestrian survey of the Project area /APE.
3. Conduct an archaeological subsurface survey of portions of the Project area /APE where ground disturbance would occur and that are considered to have a high sensitivity for buried archaeological material.
4. Conduct an architectural resources field survey to verify the presence of the potential historic-era architectural resources identified through historical research, and any other potential architectural resources 50 years of age or older in the Project area /APE, and formally record any such resources confirmed through the field survey as present in the Project area/APE.
5. Evaluate the National Register- and California Register-eligibility of any archaeological and architectural resources identified in the Project area /APE through this study and the studies recommended above (field survey and resource recordation). This may entail additional archival research and/or field investigations.

ESA also recommends that consultation with potentially interested Native American Tribes, as required under the NHPA and CEQA, be conducted by the lead federal agency and lead CEQA agency to support cultural resources and tribal cultural resource identification efforts for NHPA and CEQA purposes.

Finally, because the Project would involve ground-disturbing activities, there is the chance that previously unrecorded archaeological material, including human remains, could be encountered during Project construction activities. To address the potential for such materials to be encountered during Project construction, ESA recommends that unanticipated discovery protocol for archaeological resources and human remains be established prior to commencement of any Project construction.

3 Restoration and Public Access Constraints and Design Criteria

Site constraints related to habitat restoration and improved public access at the site are described below. Additional detail is available in the three prior feasibility studies conducted for the Project (the Kayak Launch Recreational Feasibility Study, the North Slough Trail Resilience and Habitat Restoration Feasibility Study, and the Corporation Yard Feasibility Study) and in associated background studies. Background studies for the Project include a Biological Resources Memorandum, a Phase 1 Environmental Site Assessment, and a Cultural Resources Constraints Analysis. Overall, constraints pertaining to the feasibility of implementing the Project include hazardous materials, cultural resources, biological resources, and infrastructure. All Project alternatives were developed to accommodate these constraints.

3.1 Hazardous Materials

The Phase 1 Environmental Site Assessment for the Project (**Appendix D**) did not identify any hazardous materials that would preclude the appropriately designed use of the site for wetland restoration or public access, including use as an ecology education center. However, exposure to

raw sewage in the Overflow Pond during large storm events is a public safety concern that must be addressed by the project design if public access is extended into this area. The Phase I Environmental Site Assessment did not include “non-scope issues” as specified by ASTM E2247-16, such as surveys for the presence of the following items on or in the vicinity of the subject property: asbestos-containing materials, polychlorinated biphenyls (PCBs), radon, effects on indoor air quality, lead-based paint, lead in drinking water, industrial hygiene, health and safety, regulatory compliance, and high-voltage lines. These additional studies are recommended for prior to repurposing existing buildings at the Corporation Yard.

3.2 Cultural Resources

The Cultural Resources Constraints Analysis concluded that there are no extant previously recorded cultural resources in the Study area, but there are several features that are potentially 50 years of age or older and may be considered architectural resources for National Historic Preservation Act (NHPA) Section 106 and CEQA purposes. This includes the Corporation Yard as well as some of the ponds, ditches, and levees. Generally, the site has low to moderate sensitivity for surficial pre-contact archaeological resources, high sensitivity for buried pre-contact archaeological artifacts, and low sensitivity for historic-era archaeological resources (buried and surficial). As part of the permitting and design phase of work, it is recommended that a cultural resources pedestrian survey, architectural resources field survey, and archaeological subsurface survey (where ground disturbance would occur in high sensitivity areas) be conducted in addition to outreach with potentially interested Native American Tribes.

3.3 Biological Resources

There are several sensitive environmental resources within the Project area (**Figure 15**); therefore, efforts will be needed to avoid and minimize impacts to these species and habitats. Should impacts be unavoidable, habitat preservation, restoration, or enhancement actions would be needed on or off-site to offset any habitat loss. The sensitive resources primarily consist of tidal wetland and waters habitat as well as wildlife and fish species listed by the state and federal Endangered Species Acts (**Appendix E**). Design alternatives should consider, avoid, and minimize potential impacts on sensitive aquatic resources and potential suitable habitat for special-status species. Limiting impacts would facilitate Project permitting and reduce the need for compensatory mitigation that may be required to offset impacts of the Project.

Protection measures will be developed during the permitting phase in consultation with regulatory agencies and may include actions such as work window restrictions, personnel training, biological monitoring during construction, exclusion buffers, and erosion control placement.

3.4 Infrastructure

Several remnant pieces of infrastructure are currently in use at the Corporation Yard and will need to remain operational even after the City relocates their Corporation Yard functions offsite. These include the existing PG&E transformer and a building housing the active pump station that pumps sewage to the WWTP. These constraints are already factored into the conceptual design for the Eco Center (RIM et al. 2022).

In addition, the City of American Canyon has indicated that the existing emergency Overflow Pond at the Corporation Yard will need to be maintained for the immediate future in order to maintain adequate retention capacity for the city's storm sewer system. The City is actively investigating alternative retention facilities and expects that it will be possible to decommission and restore this pond to wetlands at some future date. In the interim, fencing will be required to avoid access by humans and pets.

Other important infrastructure around the site includes The San Francisco Bay Trail and the American Canyon landfill. All Project designs must maintain functionality and access to these features.

3.5 Flood Design Criteria for Recreational Trails and Project Infrastructure

The design elevation for trails and other Project elements is calculated as follows:

$$\text{Design Elevation} = \text{Present Day Design Flood Elevation} + \text{Freeboard} + \text{Projected SLR}$$

Table 8 in Section 5 provides a summary of the selected elevations for each trail segment. The selected design flood elevation and design elevations for the various Project elements will be discussed further with BCDC during subsequent planning and permitting. Projected SLR is discussed in the next subsection.

Design Flood Event

The City of American Canyon identified a 1-in-10% chance (10-year) coastal flood event as the design flood event for trail segments managed by the City. This corresponds to a water surface elevation of 8.7 feet NAVD under present-day sea-levels. The design flood event was selected by balancing the desire to protect public access with the desire to protect ecological resources. While raising the trail higher would provide improved flood performance for the trail, it would require additional fill, negatively affecting adjacent wetlands and sensitive habitats.

Freeboard

Freeboard is an additional design factor that increases the elevation above the selected design flood event. Freeboard might be added to a design to accommodate further increases in water levels due to waves or other localized hydraulic phenomena and to provide an additional factor of safety. In some situations, regulations or design guidelines require a certain minimum amount of freeboard. This is common for the design of flood protection levees and bridges. ESA is not aware of any regulatory requirements for freeboard for recreational trails.

After considering the hydrologic setting and the risks associated with potential inundation of the various Project elements, the Project used the following freeboard amounts:

- Landfill Access Road and Bay Trail: +0 feet.
- Other Project elements, including all other trails: +0 feet.

Functionality

The design of the improved trail segments is based on guidance from the *San Francisco Bay Trail Design Guidelines and Toolkit* (2M Associates et al. 2016). Design considerations associated with the Project's functionality include providing sufficient trail widths and stable levee slopes, and installation of a firm and durable surface material.

Trail Width

The Project's improved and new trails need sufficient trail width to support the expected variety of trail users, including pedestrians, cyclists, and equestrian riders.

Levee Slopes

The Project's levee slopes need to be sufficiently stable to allow designed public access, including vehicle access for emergencies and maintenance. A geotechnical study has not yet been conducted. In absence of a geotechnical study, 3:1 embankment slopes are a typical maximum allowable slope steepness for fill on soft soils. Actual allowable slopes can vary based on specific site conditions and should be selected based on geotechnical analysis. Future design phases should be supported by a geotechnical analysis to determine whether even gentler slopes are necessary, or whether steeper slopes might be allowable.

3.6 Sea Level Rise Scenarios

The Project accounts for anticipated future SLR based on the *State of California Sea-Level Rise Guidance, 2018 Update* (CNRA and OPC 2018).⁷ The guidance specifies selecting a SLR scenario based on the design life and the flood sensitivity of the Project element being designed. For planning purposes, ESA assumes that the majority of the Phase I Project improvements will be constructed by 2030 or earlier, and would have a design life of 50 years, or through Year 2080. Project elements that can tolerate flooding with minor consequences and are readily adaptable to higher rates of SLR are considered to have a "low risk aversion." Project elements that are more sensitive to flooding, but are not considered critical infrastructure, and are less adaptable to SLR are considered to have "med/high risk aversion." The guidance provides SLR values associated with an appropriate level of risk aversion and planned design life span (**Table 4**).

The low risk aversion projections (+2.4 feet for 2080) are used here for the design of new public access trails (except for the Bay Trail Spine) and used for design of new parking areas.⁸ The medium/high risk aversion projections (+4.5 feet for 2080) are used for the Bay Trail Spine and the Landfill Access Road.

⁷ OPC recently released a *California Sea Level Rise Guidance: 2024 Science and Policy Update* in draft form. Subsequent iterations of the design will incorporate the new California guidance.

⁸ The California Natural Resources Agency and California Ocean Protection Council (CNRA and OPC 2018) identify an unpaved trail as an example of a "low risk aversion" land use, as recreational trails can be inaccessible during large flood events and the trail surface would likely tolerate occasional inundation during large floods with minimal damage. The risk of severe consequences from flooding, such as property damage and threats to health and safety, is much lower for a recreational trail than for a roadway or developed land use. More typical consequences of trail flooding include potential damage to the trail surface from erosion or deposition of sediments, and disruption of public access for the duration of the flood event and subsequent clean-up/repairs (if needed).

TABLE 4
PROBABILISTIC PROJECTIONS (IN FEET) FOR SEA LEVEL RISE, SAN FRANCISCO

Year	Upper limit of “likely range” (less than 34% probability SLR exceeds): Low Risk Aversion	1-in-200 chance (0.5% probability SLR exceeds): Medium/High Risk Aversion
2030	0.5	0.8
2040	0.8	1.3
2050	1.1	1.9
2060	1.5	2.6
2070	1.9	3.5
2080	2.4	4.5
2090	2.9	5.6
2100	3.4	6.9
2110	3.5	7.3
2120	4.1	8.6
2130	4.6	10.0
2140	5.2	11.4
2150	5.8	13.0

NOTES: SLR = sea level rise.

High emissions scenario.

SOURCES: CNRA and OPC (2018), Table G-5.

3.7 Integration with the Eco Center Project

The conceptual design prepared as part of this Project integrates with the design work proposed as part of the Eco Center project. Integrating this Project with the Eco Center project will reduce costs and impacts by consolidating infrastructure investments at a facility serving multiple uses. Improvements to the Eco Center as a result of the integration will make it an even more attractive regional destination. Specific design interventions that tie in with the Eco Center are described in detail in Section 5, *Conceptual Design*.

4 Alternatives Considered

The City and ESA, in consultation with the Project’s technical advisors, developed a set of habitat restoration and public access alternatives. To evaluate the alternatives and select the preferred alternatives, the Project Team developed a set of criteria to assess how well each alternative performs with respect to the Project objectives. This section summarizes the alternatives development and evaluation results. Detailed discussion is provided in the three Project Feasibility Studies: Kayak Launch Feasibility Study (**Appendix A**), North Slough Trail Resilience and Habitat Restoration Feasibility Study (**Appendix B**), and Corporation Yard Feasibility Study (**Appendix C**).

4.1 Alternatives Development

Design alternatives included a combination of habitat restoration and public access improvements. The Project improvements recommended for integration into the final conceptual design are identified within the discussion of alternatives below.

Habitat Restoration Alternatives

North Slough Restoration Alternatives

The following North Slough Pond restoration alternatives were considered as part of the North Slough Trail Resilience and Habitat Restoration Feasibility Study. The alternatives are shown in **Appendix B: Figures 9** through **11**, and summarized below.

- **No-Project Alternative:** No-Project would be implemented, and the current infrastructure would remain (**Appendix B: Figure 9**).
- **Alternative 1, Muted Tidal:** Culverts in North Slough at the Bay Trail would be replaced and sized to maintain current muted tidal marsh conditions (**Appendix B: Figure 10**). Areas of existing erosion would be repaired and revegetated, and the culverts realigned to reduce future erosion.
- **Alternative 2, Full Tidal (Recommended):** Culverts in North Slough at the Bay Trail would be replaced with larger culverts or an open channel to allow full tidal exchange into the North Slough Pond (**Appendix B: Figure 11**). Continued trail access over the channel would be provided via an earthen berm or bridge. As in Alternative 1, areas of existing erosion would be repaired and revegetated, and the culverts or open channel realigned to reduce future erosion. Tidal marsh acreage would increase, and mudflat acreage would decrease.

Appendix B describes in detail additional design interventions that were considered but excluded from the alternatives, such as:

- Installing marsh mounds.
- Increasing the overall marsh plain elevation.
- Installing nesting islands.

Corporation Yard Restoration Alternatives

A number of habitat enhancement and restoration alternatives for the Corporation Yard were considered (**Table 5**). **Appendix C**, the Corporation Yard Feasibility Study, contains detailed descriptions, figures, and evaluation for each alternative. Alternative 2 is the recommended habitat restoration alternative for this part of the Project area.

TABLE 5
CORPORATION YARD RESTORATION ALTERNATIVES CONSIDERED

Alternative #	Phase 1 – With Overflow Pond in Place	Phase 2 – Without Overflow Pond
No Project	None (Appendix C: Figure 13)	None (Appendix C: Figure 13)
Alternative 1: Upland Habitat Enhancement	Upland habitat enhancement and stormwater wetland. (Appendix C: Figure 14)	Restore tidal habitat by breaching the Overflow Pond levee. (Appendix C: Figure 16)
Alternative 2: Habitat Restoration (Recommended)	A small amount of restored tidal marsh at the existing Corporation Yard dirt parking area, integrated with a stormwater wetland capturing stormwater runoff from the adjacent stormwater outfall. (Appendix C: Figure 15)	Levee removal with tidal and wetland-upland transition habitat restoration. (Appendix C: Figure 17)

Public Access and Bay Trail Resilience Alternatives

North Slough Bay Trail Resilience Alternatives

The following Bay Trail Resilience alternatives were considered. The alternatives are shown in **Appendix B: Figure 12**, and are summarized below.

- **No-Project Alternative:** No improvements would be made to raise or resurface the Bay Trail near North Slough. In the long term, both the Bay Trail loop trail around the North Slough Pond and the spur trail to Glass Beach would be overtopped and degraded.
- **Alternative 1, Spine Trail:** This alternative would raise the trail on the northern and eastern sides of the North Slough Pond to elevation 11.1 feet to provide a resilient Bay Trail spine connection set back from the marsh. In the long term, the spur trail to Glass Beach and the southern and western segments of trail around the North Slough Pond would be overtopped.
- **Alternative 2, Loop Trail:** This alternative would raise the trail around the north and east of the North Slough Pond (as in Alternative 1) and around the southern and western sides of the pond to elevation 11.1 feet to provide a resilient Bay Trail loop. In this alternative, the spur trail to Glass Beach would not be raised and would likely be overtopped and degraded over time. There are two parallel trails along the west side of the North Slough Pond. The Bay Trail is located on the eastern levee; an unofficial trail is on the western levee. The feasibility study proposed raising the western levee (and realigning the Bay Trail) because it is currently at a higher elevation.
- **Alternative 3, Loop and Spur Trail:** This alternative would raise the Bay Trail to retain both a resilient Bay Trail loop around the North Slough Pond (as in Alternative 2) and access to Glass Beach.

Appendix B describes in detail additional public access design interventions considered but excluded from the alternatives, such as adding signage for trails in the vicinity of the North Slough Pond.

Corporation Yard Public Access Alternatives

Because the timing of improvements to the Overflow Pond is not known, public access improvements at the Corporation Yard are designed to be implemented in Phases, where Phase 1 can advance with the Overflow Pond still in operation, plus the proposed Eco Center in place, and

Phase 2 can advance from presumed future conditions if/when the Overflow Pond is no longer needed for emergency wastewater storage. **Table 6** summarizes how these alternatives relate to each other.

Kayak Launch Alternatives

The City identified three possible locations for installation of a kayak launch: (1) North Slough at the Corporation Yard, (2) North Slough at the Bay Trail, and (3) Glass Beach (**Appendix A**). These locations are shown in **Appendix A: Figure 2**.⁹ The Project team developed boat launch concepts to define kayak launch alternatives at these three locations. The kayak launch at North Slough at the Corporation Yard performed best with regards to the evaluation criteria and, ultimately, was the only alternative considered feasible for reliable site access and safety. North Slough at the Bay Trail crossing was eliminated as an entry point due to lack of sufficient open water channel to access at low astronomical tide, while the Glass Beach location had site hazards, such as broken metal and glass.

TABLE 6
CORPORATION YARD PUBLIC ACCESS ALTERNATIVES CONSIDERED

Alternative #	Phase 1 – With Overflow Pond in Place	Phase 2 – Without Overflow Pond
No Project	No public access around Overflow Pond. Assumes Eco Center is in place.	None
Alternative 1: Levee Loop Trail, Spur Trail	Recreation enhancement with levee loop trail around Overflow Pond and spur trail towards North Slough. Other smaller recreation enhancements.	Recreation enhancement with levee loop trail around Overflow Pond and spur trail towards North Slough. Pedestrian crossing across Overflow Pond levee breach. Other smaller recreation enhancements.
Alternative 2: No Levee Loop Trail (Recommended)	New picnic areas adjacent to Overflow Parking Lot. No new trails.	Recreational boardwalk through restored marsh. New picnic areas adjacent to Overflow Parking Lot.

4.2 Recommended Combination of Project Alternatives

The Project team consolidated the habitat enhancement and public access alternatives that best met the Project objectives for each of the feasibility studies into the Recommended Project Alternative. The conceptual design described in Section 5 reflects the recommended combination of alternatives plus refinements per City, agency, and public feedback.

5 Conceptual Design

The Recommended Concept is a more detailed version of the Recommended Project Alternative identified for each of the three feasibility studies, incorporating more refined site programming, engineering analysis, and vetting by agencies, the City, and members of the public.

⁹ A fourth location at a side channel at the Corporation Yard was also considered initially but was eliminated early in the evaluation process due to too-shallow and too-narrow channel conditions.

5.1 Overview

Project actions included in the Recommended Concept are habitat restoration and enhancement, new and improved trails, and a kayak launch integrated with the Eco Center. These are summarized below and shown in more detail in **Appendix F**.

The Recommended Concept (**Figure 16**) will:

- Enhance tidal wetlands by increasing tidal exchange between the Napa River and the North Slough Pond. The Project will replace the undersized culverts where North Slough crosses the Bay Trail with a large box culvert or an open channel with a bridge.
- Raise Bay Trail segments around North Slough Pond to decrease flood risk to inland infrastructure and increase the Bay Trail’s resilience to sea level rise.
- Construct a kayak launch, a raised spur trail to the kayak launch, and related recreational amenities near the proposed Eco Center.
- Create new wetland and transitional ecotone habitat around the proposed Eco Center and near the kayak launch.
- Enhance habitat throughout the Project area through native plant restoration and invasive weed management.

In total, the Recommended Concept will restore and enhance 60 acres of tidal wetland and other Bay habitats (**Table 7**), raise and improve approximately 1.2 miles of Bay Trail, and add 0.5 miles of new public trails. The conceptual design will provide a balance of benefits for ecosystem restoration and public access.

**TABLE 7
HABITAT ESTABLISHMENT AND RESTORATION OF AQUATIC RESOURCES IN THE PROJECT AREA**

Location	Enhanced	Restored/ Re-establishment	Established	Total
Wetland/Marsh	5.12	8.18	0.37	13.67
Bay Flat/Playa/Tidal Unnatural/ Shallow Bay (acre)	26.35			26.35
Ecotone Transition ^a	up to 18.67		0.64	Up to 19.31
Upland	1.0			1.0
Total	50.14	8.18	0.81	60.33

NOTES:

a. Optional invasive plant removal is proposed in the upland transition area.

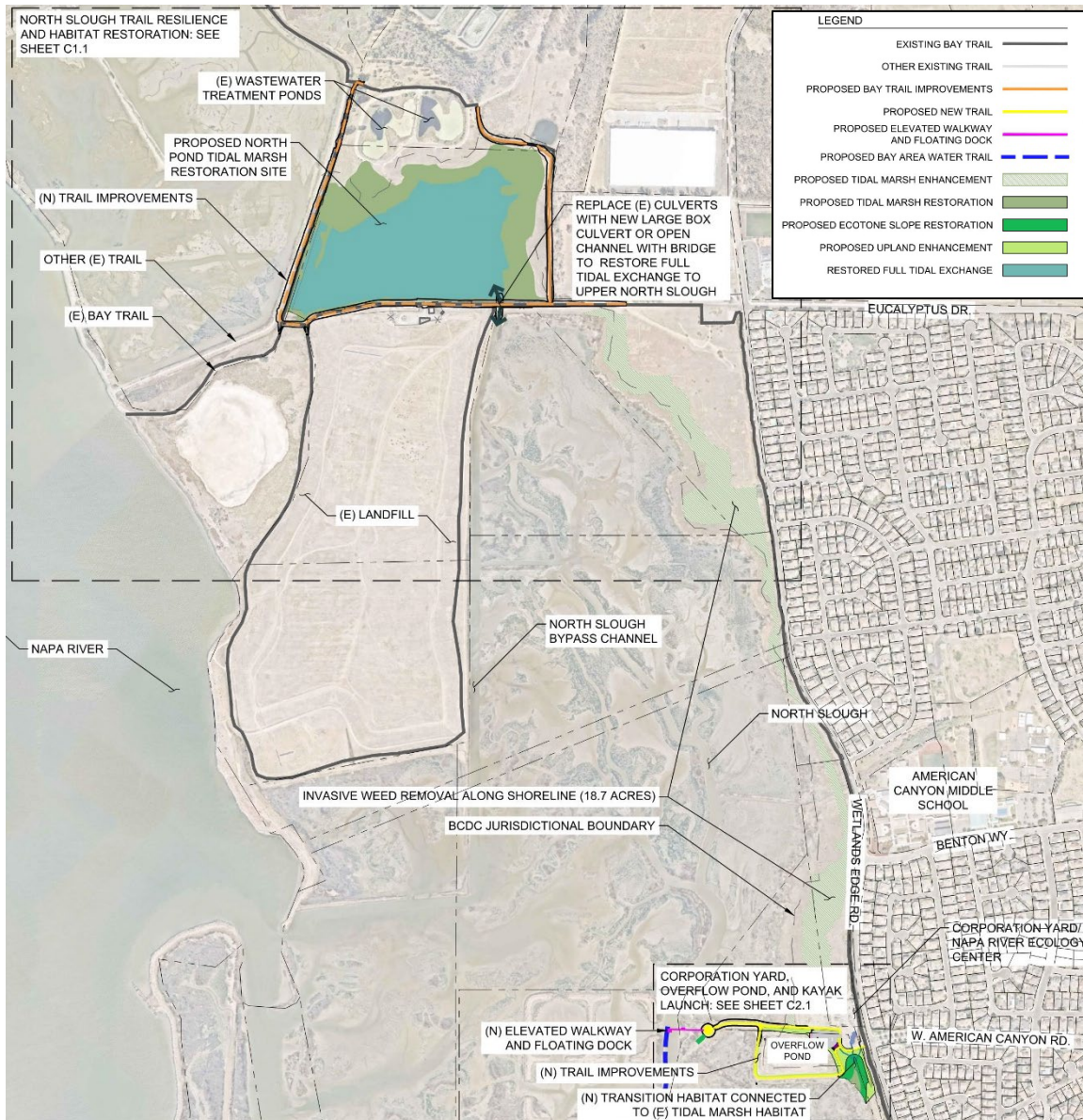


Figure 16
Concept Design Overview

The proposed habitat enhancements will support diverse native species, particularly special-status species with potential to occur in the region, and will support habitat connectivity. Habitat enhancements will provide a mix of open water, mudflat, low marsh, high marsh, ecotone transition, and upland habitats, which will benefit a diverse array of species. Diverse habitats support different types of species, different life stages for individual species, and different habitat functions. Enhanced wetland-to-upland transitional slopes will provide high-tide and storm refugia and migration space as sea levels rise. Water quality in North Slough Pond will be improved with increased tidal exchange.

Habitat enhancements will benefit special-status species by increasing the habitat types that special-status species need for survival. Three special-status species have high potential to occur

in the area: San Pablo song sparrow, salt marsh common yellow-throat, and salt marsh harvest mouse. Many other species have moderate potential to occur. These species are dependent on tidal marsh habitats, although they differ in their preferred vegetation community. Developing low and high marsh habitats will benefit a diversity of special-status species.

Habitat connectivity will be enhanced by restoring continuous tidal marsh and adjacent transition zone habitats along the eastern side of the Napa River, by supporting the north-south gene flow of marsh-dependent species, and by reducing passage barriers to fish and wildlife species. Increasing the conveyance capacity of the culverts along North Slough will allow fish and other aquatic species to move between North Slough Pond and the American Canyon tidal marshes more easily.

The Recommended Concept includes enhancements to public access and recreational amenities at both the Corporation Yard and in the vicinity of North Slough Pond. The Bay Trail in the project vicinity is heavily used for hiking, running, and biking. The Recommended Concept will raise the elevation of the Bay Trail Spine, the Landfill Access Road, and the North Slough Pond Loop Trail segments to reduce the risk of inundation during extreme high tides and to provide an appropriate level of resilience to coastal floods and SLR. The trail design is based on a risk-based approach that balances resilience with costs, long-term maintenance, and ecological impacts of trail fill.

The Project proposes new trails near the Corporation Yard and Overflow Pond, including a spur trail to the new kayak launch. These new trails will offer users a way to safely interact with the natural environment. The design aims to maximize visibility across the site with low-profile fencing and plantings and includes gates and fencing to manage access to trails, the Eco Center, and the Overflow Pond vicinity as needed. Proposed screening vegetation will improve aesthetics and the user experience.

The Project's improved and new trails will be constructed with sufficient trail width and surfacing to support the expected variety of trail users, including pedestrians, cyclists, and equestrian riders¹⁰. All project improvements meet accessibility requirements for people with special mobility needs.

The proposed kayak launch on North Slough will be located at the end of the existing path leading west from the Eco Center, providing nearby parking, easy access, and a strong visual connection to the Eco Center's recreational and educational programs. The proposed kayak launch is located where vessels will have access during a wide tidal range with sufficiently slow currents for safe water entry and sufficient space for boaters to pass and turn around within North Slough. The kayak launch will be a part of the San Francisco Bay Water Trail, which provides shoreline access for small watercraft all around San Francisco Bay. There are no public kayak launches in the 11 miles between Vallejo and Cuttings Wharf; a kayak launch at the City of American Canyon will fill this gap in Bay Water Trail trailheads.

The Recommended Concept presented in this section can be implemented in the near term. In addition, the Project team proposed design elements that are compatible with future opportunities,

¹⁰ Equestrian use is anticipated around North Slough Pond, but not at the Corporation Yard.

such as the future decommissioning and restoration of the Overflow Pond (see Phasing Discussion below).

5.2 Habitat Restoration and Enhancement

Habitat restoration and enhancement elements included in the conceptual design are summarized below and shown in **Figures 17** and **18**.

Tidal Habitat Improvements at North Slough Pond

The Project will provide for restoration of fully tidal conditions to North Slough Pond. Full tidal exchange will be provided by replacing the undersized culverts at North Slough with a large box culvert or an open channel with a bridge¹¹. This expansion will establish more open water and wetland habitat, reduce current shading of culverted habitat, and improve passage for fish and other organisms into and out of North Slough Pond. Existing erosion near the North Slough culverts will be repaired using nature-based bank stabilization.

The Project will reestablish full tidal exchange at North Slough Pond to expand vegetated tidal marsh extent, increase habitat diversity and resilience, and improve water quality. Restoring full tides will increase the range of elevations in which tidal marsh could develop. Based on survey data from the surrounding marsh, it is estimated that existing tidal marsh habitat will migrate upslope to approximately 7-foot NAVD elevation by the end of the century, resulting in the net increase of approximately 2.1 acres of new tidal marsh habitat (16.7 acres compared to the existing 14.6 acres). Marsh may also expand into lower mudflat areas due to improved low tide drainage. It is anticipated that with the expanded tidal prism a more pronounced tidal channel will naturally scour in North Slough Pond, creating more topographic variation and deeper water habitat suitable for some aquatic species.

Full tidal exchange will improve water quality in North Slough Pond, specifically dissolved oxygen concentration, pH, temperature, and nutrient concentrations. Increased water exchange tends to keep ponded waters cooler in the summer and less stagnant, which is beneficial to aquatic organisms. Poor water quality can deter or kill aquatic organisms, affecting the larger food chain. Poor water quality can also result in algae blooms that can affect public recreation by causing visual and odor impacts.

Restoring full tidal exchange will improve the ability of North Slough Pond habitats to adapt to SLR by increasing sediment supply and allowing for more rapid expansion of tidal marsh vegetation. Sediment deposition and accumulation of organic material will both allow the marsh plain to rise with SLR. Marsh modeling indicates that North Slough Pond marshes will require high sedimentation and possibly high organic materials to sustain its marsh through the end of the century in a high SLR scenario (+ 6.9 feet) (Stralberg et al. 2011, Point Blue 2023).

Installing larger culverts will reduce water velocities through North Slough adjacent to the Bay Trail, improving safety and reducing bank erosion. Appendix D of the North Slough Trail

¹¹ Geotechnical and structural engineering is needed to determine whether a large box culvert or open channel with a bridge is preferred. Both design elements would be built with a natural channel bottom for optimal habitat value.

Resilience and Habitat Restoration Feasibility Study (**Appendix B**) presents several culvert and open channel configurations that will result in an increase in the tidal range. The Project assumes the opening will be a concrete box culvert. However, other possible options are large, corrugated metal pipes or an open channel with a full-span bridge. A bridge would be more expensive than culvert options, but using a prefabricated design could reduce costs. Regardless of the opening type, the Project team and TAC recommend a natural channel bottom to encourage wildlife migration and support habitat connectivity goals.

Modeling conducted for the project suggests that an open channel or equivalent set of culverts will reduce water velocities in North Slough through the Bay Trail from the existing 7.9 feet per second to 3.4 feet per second. This is similar to velocities in natural tidal channels in San Francisco Bay and meets the design criteria for safety should people or animals enter the water at this location.

Habitat Enhancements at the Corporation Yard/Proposed Eco Center

The Project will restore two upland areas to tidal marsh and ecotone transitional habitat at the Corporation Yard (**Figure 18**). At the southeastern corner of the Corporation Yard, existing upland fill will be regraded to create a new ecotone slope with new tidal wetland habitat at its toe. Similarly, a former road segment at the end of the spur trail to the proposed kayak launch will be removed and the elevation lowered to create a new area of tidal marsh. Regraded areas will be revegetated with appropriate native plants.

The Project also will include new stormwater wetlands (bioswales) or rain gardens to clean stormwater from adjacent paved areas prior to that stormwater entering North Slough. These bioswales will originate from the Overflow Parking lot, from the demonstration wetland proposed for the Eco Center project, and from the existing storm drain outlet at the intersection of Wetlands Edge Road and West American Canyon Boulevard. These bioswales will tie into the proposed ecotone slope in the southeast corner of the Corporation Yard.

In addition, areas around the Overflow Pond and overflow parking lot¹² will be landscaped with native plants that provide habitat benefits in addition to shading and aesthetic benefits for visitors.

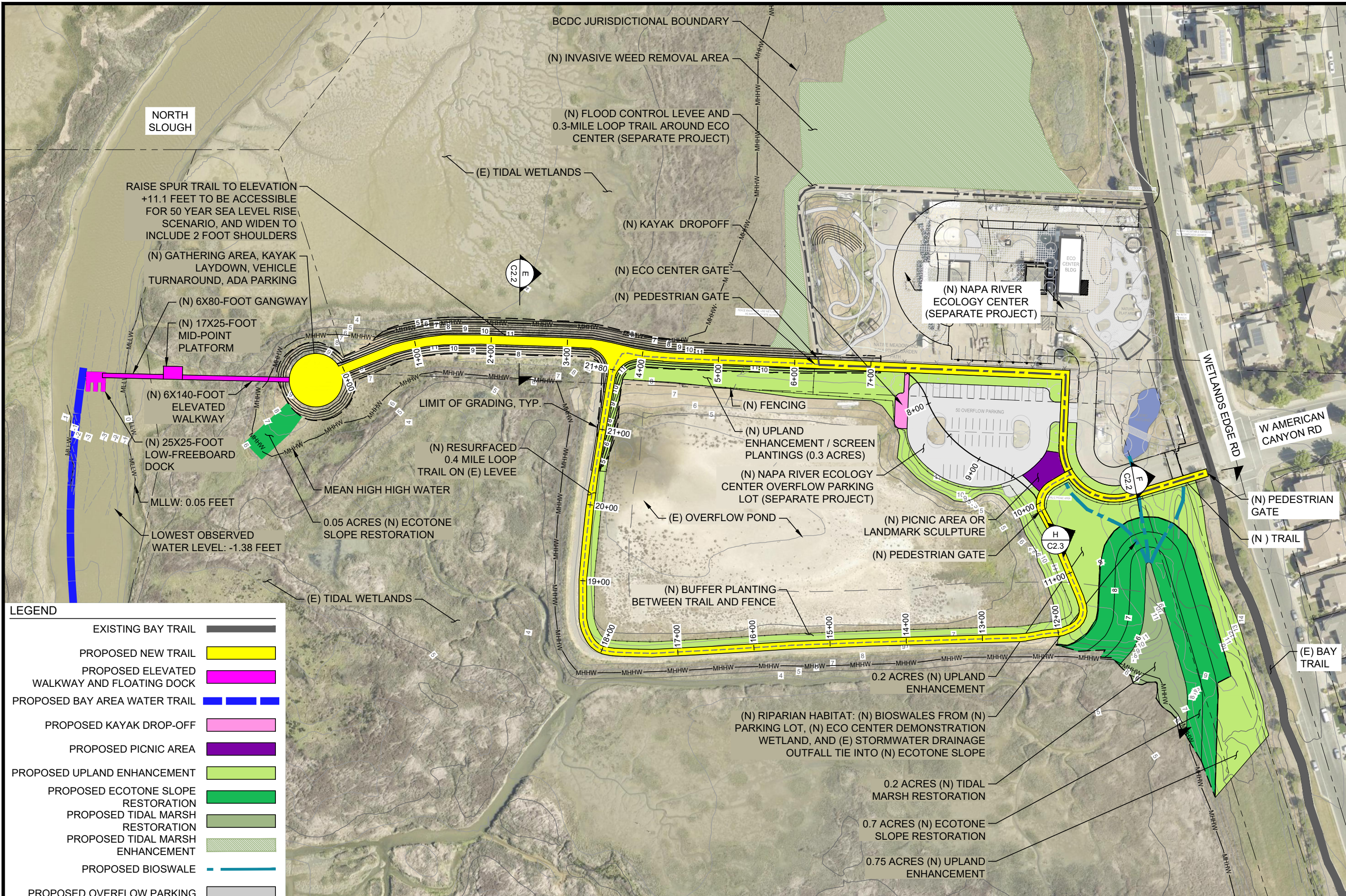
Project Area-wide Weed Management and Installation of Native Plants

Due to the high-quality transitional habitat along the shoreline from the Corporation Yard to Wetlands Edge Park, there is little need for grading to improve habitat features. However, the Project will include weed removal with replacement native plantings along the shoreline as funding allows. This work will provide the dual benefits of improving species habitat and engaging with the community in weeding and revegetation activities.

¹² The overflow parking lot is part of the separate Eco Center project, but the landscaped areas around the overflow parking lot are part of the Recommended Concept described herein.



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NORTH SLOUGH

BCDC JURISDICTIONAL BOUNDARY
(N) INVASIVE WEED REMOVAL AREA
(N) FLOOD CONTROL LEVEE AND 0.3-MILE LOOP TRAIL AROUND ECO CENTER (SEPARATE PROJECT)

RAISE SPUR TRAIL TO ELEVATION +11.1 FEET TO BE ACCESSIBLE FOR 50 YEAR SEA LEVEL RISE SCENARIO, AND WIDEN TO INCLUDE 2 FOOT SHOULDERS
(N) GATHERING AREA, KAYAK LAYDOWN, VEHICLE TURNAROUND, ADA PARKING

(E) TIDAL WETLANDS

(N) KAYAK DROPOFF
(N) ECO CENTER GATE
(N) PEDESTRIAN GATE

(N) NAPA RIVER ECOLOGY CENTER (SEPARATE PROJECT)

(N) 6X80-FOOT GANGWAY
(N) 17X25-FOOT MID-POINT PLATFORM

(N) 6X140-FOOT ELEVATED WALKWAY
(N) 25X25-FOOT LOW-FREEBOARD DOCK

LIMIT OF GRADING, TYP.

(N) RESURFACED 0.4 MILE LOOP TRAIL ON (E) LEVEE

MEAN HIGH HIGH WATER
MLLW: 0.05 FEET
LOWEST OBSERVED WATER LEVEL: -1.38 FEET

0.05 ACRES (N) ECOTONE SLOPE RESTORATION

(N) FENCING
(N) UPLAND ENHANCEMENT / SCREEN PLANTINGS (0.3 ACRES)
(N) NAPA RIVER ECOLOGY CENTER OVERFLOW PARKING LOT (SEPARATE PROJECT)

(E) OVERFLOW POND

(N) PICNIC AREA OR LANDMARK SCULPTURE
(N) PEDESTRIAN GATE

WETLANDS EDGE RD
W AMERICAN CANYON RD

(N) PEDESTRIAN GATE
(N) TRAIL

(N) BUFFER PLANTING BETWEEN TRAIL AND FENCE

0.2 ACRES (N) UPLAND ENHANCEMENT

(N) RIPARIAN HABITAT: (N) BIOSWALES FROM (N) PARKING LOT, (N) ECO CENTER DEMONSTRATION WETLAND, AND (E) STORMWATER DRAINAGE OUTFALL TIE INTO (N) ECOTONE SLOPE

0.2 ACRES (N) TIDAL MARSH RESTORATION

0.7 ACRES (N) ECOTONE SLOPE RESTORATION

0.75 ACRES (N) UPLAND ENHANCEMENT

(E) BAY TRAIL

LEGEND

EXISTING BAY TRAIL	
PROPOSED NEW TRAIL	
PROPOSED ELEVATED WALKWAY AND FLOATING DOCK	
PROPOSED BAY AREA WATER TRAIL	
PROPOSED KAYAK DROP-OFF	
PROPOSED PICNIC AREA	
PROPOSED UPLAND ENHANCEMENT	
PROPOSED ECOTONE SLOPE RESTORATION	
PROPOSED TIDAL MARSH RESTORATION	
PROPOSED TIDAL MARSH ENHANCEMENT	
PROPOSED BIOSWALE	
PROPOSED OVERFLOW PARKING	
BCDC JURISDICTIONAL BOUNDARY	

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CONSULTANT

PROJECT NAME
AMERICAN CANYON WETLAND RESTORATION PLAN
205 WETLANDS EDGE ROAD
AMERICAN CANYON, CA 94503

REVISIONS

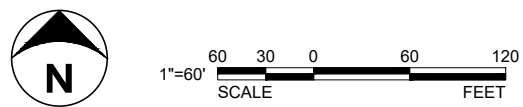
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PROJECT NUMBER D202101145
ISSUE DATE MM/DD/YY

SCALE IS AS SHOWN WHEN PLOTTED TO FULL SIZE (22"x34")
1" = 60'
PHASE
CONCEPTUAL DESIGN

SHEET TITLE
CORPORATION YARD, OVERFLOW POND, AND KAYAK LAUNCH ENLARGEMENT
SHEET NUMBER
C2.1
SHEET 16 OF 18



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5.3 New Trails and Picnic Area

The Recommended Concept proposes new trails and a small picnic area in the Corporation Yard area (**Figure 19**). New Project trails will include:

- A 2,160-linear-foot loop trail around the Corporation Yard’s Overflow Pond (a resurfaced 8-foot-wide trail at the existing levee crest elevation of approximately 8.5 feet).
- An 800-linear-foot spur trail (a raised trail as specified in **Table 8**) from the Corporation Yard to the new kayak launch in the approximate footprint of an existing levee spur towards North Slough.

**TABLE 8
PROPOSED TRAIL DESIGN CRITERIA**

Trail Classification	Min Trail Width (ft.)	Shoulder Width (ft.)	Total Width (ft.)	Design Flood Event	Present Day Flood Elevation (ft. NAVD)	SLR (ft.)	Freeboard (ft.)	Design Elevation (ft. NAVD)
New Trails								
Spur Trail to Kayak Launch	12	2	16	10-yr.	8.7	2.4	0	11.1
Improved Trails								
North Slough Pond Loop Trail	8	3	14	10-yr.	8.7	2.4	0	11.1
Bay Trail Spine	12	3	18	10-yr.	8.7	4.5	0	13.2
Landfill Access Road	20	2	24	10-yr.	8.7	4.5	0	13.2

NOTES: ft = feet; NAVD88 = North American Vertical Datum of 1988; SLR = sea level rise; yr = year.

Federal Emergency Management Agency (FEMA) flood elevations include storm surge and wave runoff.

SOURCES: FEMA 2016; water level observations and datum analysis conducted by Environmental Science Associates (ESA) in 2022

These new trails will create increased recreational opportunities adjacent to the proposed Eco Center and will be valuable for educational programming in addition to recreation. The trails will be easily accessed from the Eco Center’s proposed primary and overflow parking lots as well as via existing street parking along Wetlands Edge Road. The New Kayak Launch section (below) includes additional information about the proposed spur trail.

New landscaping and a picnic area adjacent to the overflow parking lot will be installed to improve the visitor experience for trail users. A picnic area at the southern end of the overflow parking lot will connect to the proposed loop trail around the Overflow Pond and to the Bay Trail via a 300-foot path across the 3 proposed bioswales. Gates and fencing will control access to the Corporation Yard outside of park opening hours. Fencing will also be installed around the Overflow Pond for public safety. Drawings in **Appendix F** show where such gates and fences will be located.

The raised spur trail to the proposed kayak launch could be built irrespective of the kayak launch being constructed. It will include a circular terminus where vehicles could turn around and groups could gather for educational programming about the wetlands. A raised perimeter trail/levee around the Eco Center could be built as well as part of a separate project.

5.4 Improved Bay Trail

The Project proposes to raise the Bay Trail in the North Slough Pond Area to reduce the frequency of tidal inundation and improve SLR resilience. The design elevation of these raised trails was selected to balance tradeoffs between improving SLR resilience for trails and limiting the amount of fill in adjacent sensitive habitats and other potential adverse ecological impacts from the trail improvements (Figure 19).

Improved (elevated and resurfaced) Bay Trails segments associated with the Project include:

- Bay Trail Spine. Approximately 1,770 linear feet of Bay Trail Spine along the eastern and northern sides of North Slough Pond.
- North Slough Pond Loop Trail. Approximately 3,600 linear feet of Bay Trail¹³ from the landfill along the southern and western sides of North Slough Pond.
- Landfill Access Road: Approximately 950 linear feet of trail along the Eucalyptus Road trail alignment extending from North Slough halfway towards Wetlands Edge Park. Part of the Landfill Access Road overlaps with the existing Bay Trail Spine. For cost efficiency, the Project team recommends that the City consider raising the Landfill Access Road when the existing road is due to be repaved. The levee for the Landfill Access Road can be raised following replacement of the existing culverts with a large box culvert or open channel with a bridge. The Project team recommends designing the Landfill Access Road and the associated box culvert or bridge to be resilient in a medium/high risk SLR scenario because the box culvert or bridge are not as readily adaptable (as easy to raise in elevation) as other sections of Bay Trail, and because they provide access to the Landfill Loop Trail, which is adaptable to SLR because it is adjacent to higher ground.

These elevated and resurfaced trails will reduce maintenance obligations and will provide long-term sea level resilience for a trail system that is already heavily used and enjoyed by the public. Currently, Bay Trail users enjoy running, biking, bird watching and other recreational activities along these existing trails.

Table 8 shows the design elevations for proposed Project improvements based upon the 10-year design storm and SLR scenario used. The Glass Beach Spur Trail will remain at its current elevation to avoid impacting adjacent wetlands.

¹³ This trail was originally proposed on the western most levee of two parallel levees west of North Slough Pond in the feasibility study. Based on City and agency feedback, the trail has been realigned on the eastern most levee in order to remain on City property.

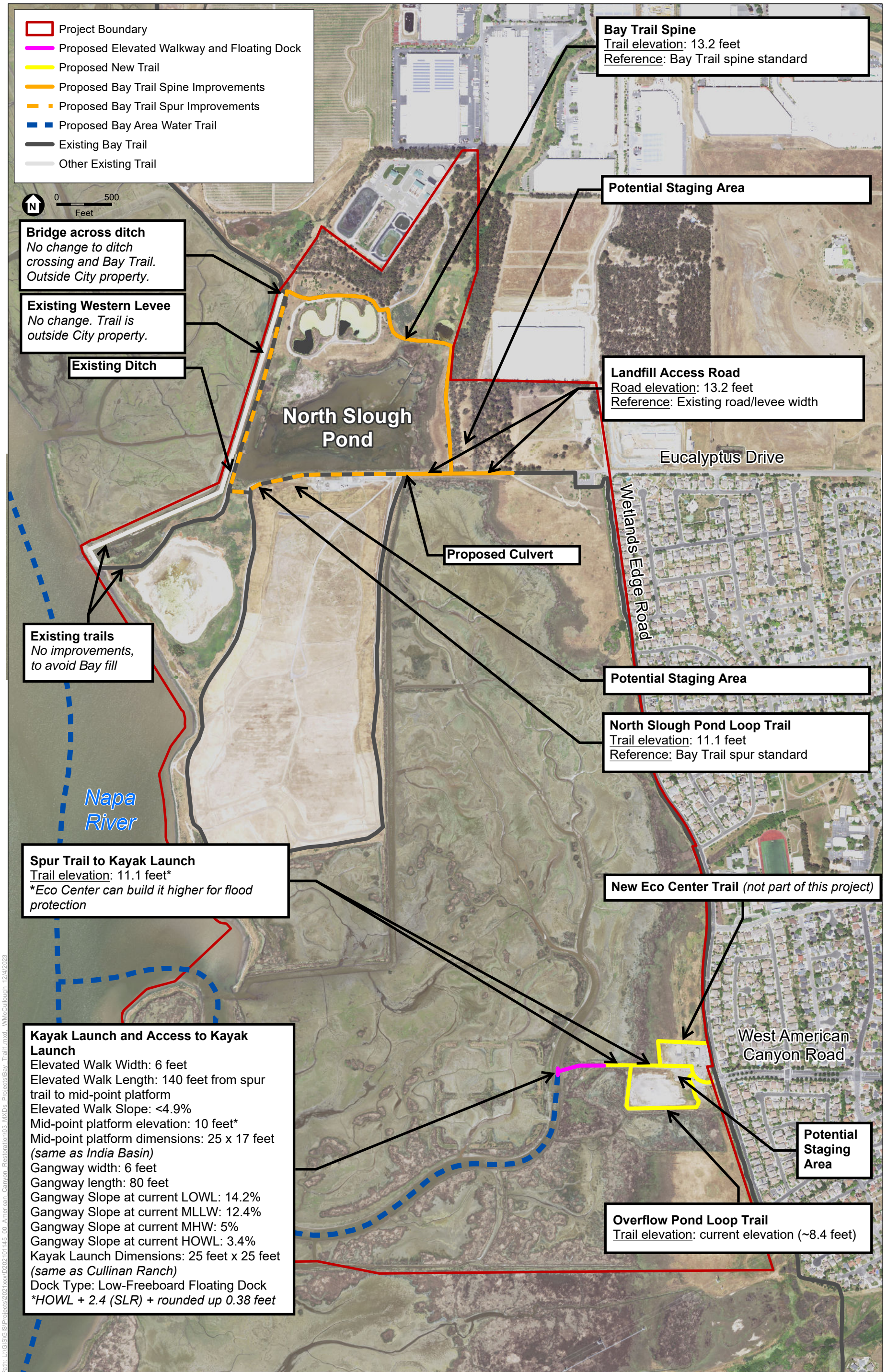


Figure 19
Proposed Public Access

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5.5 New Kayak Launch

The Project proposes a new kayak launch west of the Eco Center on North Slough (Figure 18 and **Figure 20**) that would be part of the San Francisco Bay Water Trail. The kayak launch dock will be approximately 600 square feet and will accommodate 6-8 boaters and groups of up to 15 people, subject to final engineering design. The kayak launch will be owned, operated, and maintained by the City.



Figure 20

Approximate Location of Kayak Launch Gangway and Dock on North Slough

The kayak launch will consist of a floating low-freeboard dock accessible via a 6 x 80-foot prefabricated gangway from an elevated walkway leading to the Spur Trail. The dock will be approximately 600 feet square with 2 finger docks for accessible water access and several piles to secure the dock, similar to the kayak launch a few miles to the west at Cullinan Ranch (**Figures 21 and 22**). The dock surfacing will have minimum 40% light transmittance, such as with a molded fiberglass reinforced plastic (FRP) grating, to minimize potential adverse impacts to fish habitat.

The kayak launch will be accessible from parking areas associated with the Eco Center via an approximately 800-foot-long renovated spur trail with resting areas at regular intervals. The spur trail will be wide enough for limited emergency vehicle access and vehicle access by people with special accessibility needs. The trail could also be made available by vehicle to pre-approved groups who check-out a key providing vehicle access to the kayak launch from the Eco Center. The terminus will include a gathering area with seating, interpretive signage, a kayak laydown area, and ADA parking that is sufficiently large for school groups and for vehicles to turn around. Otherwise, parking for the kayak launch will be at the Overflow Parking Lot proposed as part of the Eco Center. Associated with the Overflow Parking Lot will be a passenger drop-off and kayak laydown area adjacent to the spur trail.



Figure 21
Example Gangway at Cullinan Ranch Boat Launch, Napa County



Figure 22
Example Finger dock with grab bar and toe boards at Cullinan Ranch Boat Launch, Napa County

The elevated walkway to the kayak launch will include a mid-point platform (gathering area) and a linear walk. The elevated mid-point platform will be at 10 feet elevation and 25 x 17 feet in size, similar to the mid-point platform proposed for India Basin Shoreline Park in San Francisco. The 6-foot-wide, 140-foot-long elevated walk will be made of structural steel with a walking surface up to 6 feet above the ground, similar to the Nurim Circuit elevated boardwalk in Queensland, Australia (**Figure 23**). Most of the elevated walkway will be at elevation 11.1 feet. Specific construction details will be developed in subsequent design with the input of a structural engineer. To avoid impact to fish species, neither the dock nor the elevated walkway will have artificial lighting.



SOURCE: Leighton Smith 2018

Figure 23
Elevated Walkway Example

The dock will be located in the approximate center of the North Slough channel (thalweg is approximately -3 feet NAVD88) to keep the bottom of the dock off of the channel bed during extreme low tide events (-1.38 feet NAVD88), maintain water access at low tide, and prevent adverse grounding impacts to benthic habitat while still providing adequate space for kayakers to pass and maneuver around the dock (16 feet passing space on either side of the dock at astronomical low tides).

5.6 Phasing

The Recommended Concept described above and shown in **Appendix F** is Phase 1 for the Project. The Project team recommends a second phase to restore the Overflow Pond to tidal marsh. Phase 2 will include moving the Overflow storage under West American Canyon Boulevard and related Overflow Pond habitat improvements (**Appendix C**). ESA evaluated the wastewater overflow storage capacity needs, potential alternative storage locations and designs, and range of magnitude costs anticipated for relocating the sewage overflow. Restoring tidal

marsh under Phase 2 will be more expensive per acre than Phase 1 improvements, but it will reduce public health and environmental risks associated with occasional sewage overflow events.

Because Phase 2 will be more capital-intensive and the timing of improvements to the Overflow Pond is not known, public access improvements at the Corporation Yard are designed to be implemented in Phases. Phase 1 can advance with the Overflow Pond still in operation, plus the proposed Eco Center in place, and Phase 2 can advance from presumed future conditions if/when the Overflow Pond is no longer needed for emergency wastewater storage. A full analysis of proposed Phase 2 improvements can be found in the Corporation Yard Feasibility Study included as **Appendix C**.

6 Construction Methods and Engineering Quantities

This section provides preliminary notes on anticipated construct methods and considerations associated with the construction sequence and logistics. This section also provides preliminary estimates of construction quantities and costs.

6.1 Construction Access

Construction will require mobilization of heavy equipment including cranes, large earthmoving equipment, and haul trucks. There are a number of potential access routes to the Project Area and locations for stockpiles during construction. Future phases of design will refine construction vehicle access routes and staging areas.

It is generally preferable to control which nearby roads are used by the construction contractor to minimize noise and traffic impacts to nearby communities. In this conceptual plan, the Project proposes to utilize existing access roads for construction.

- The Corporation Yard site can be readily accessed via West American Canyon Road. This road supports two-lane traffic in both directions and appears suitable as a primary construction access route for the Corporation Yard work.
- The typical public vehicle access route to the North Slough Pond site is via Eucalyptus Drive. However, this route requires driving on a one-lane road through residential neighborhoods and next to Napa Junction Magnet Elementary School. This route might not be suitable for heavy vehicles. Alternate routes might reduce potential conflicts with residential and school-related traffic.
- Alternate access routes to North Slough Pond are via Commerce Boulevard and via the WWTP. These routes might require agreements with private landowners and/or City agencies. It is unclear whether the segment of Commerce Boulevard at Paintball Jungle is suitable for heavy vehicle loads. Access via the WWTP would require travel along the inland branch of the Bay Trail. It is unclear whether this segment of Bay Trail is suitable for heavy vehicle loads. However, this trail segment will be re-graded as part of the Project and that work could include repair of any damage due to vehicle access.

Staging areas will be needed for equipment storage, material stockpiles, and construction offices. Separate staging areas will be provided at the Corporation Yard and North Slough Pond. This conceptual design assumes a minimum of ¼ acre for each staging area. Large staging areas may

be needed if it is necessary to stockpile large quantities of imported soils or other construction materials (preferably imported materials would be stockpiled off-site and placed directly at the time of delivery). Potential staging areas have been identified for the purpose of estimating impacts but are subject to change. The Project will use developed and disturbed upland areas for staging:

- At the Corporation Yard, the Eco Center's proposed overflow parking area, which is currently disturbed upland, is proposed for use as a staging area.
- At North Slough Pond, staging areas are proposed in upland areas west of the landfill parking lot and near the northwest corner of the intersection of the Bay Trail Spine and the Landfill Access Road. The City may consider exploring opportunities for staging and stockpiling material further east and north along Eucalyptus Drive where future development is planned.

6.2 Construction Timing

The timing of construction will likely be limited to specific seasonal work windows in order to minimize adverse effects on sensitive species—including protected birds and fish—and to avoid work during the winter, when there is a greater risk of rain and other adverse weather conditions.

ESA recommends sequencing the Project so that the majority of construction occurs in September, October and November. Initial mobilization and site preparation might be allowed to begin in August, but work during these months will be restricted to limit potential impacts to nesting protected bird species. Work extending into and beyond November will have a higher risk of delays due to adverse weather.

Bird Nesting

The nearby tidal marsh habitats have the potential to support nesting Ridgway's Rail and California Black Rail between February 1st and August 30th. These protected species are highly sensitive to noise and visual disturbances and permitting agencies are likely to put strict restrictions on construction activities in the vicinity of tidal marsh habitats where these birds are nesting.

Pre-construction surveys and construction-period monitoring will help verify whether these birds are present and nesting in the marshes. However, agencies might still place restrictions on work in the vicinity of the marshes during the nesting season even if nesting individuals are not observed.

ESA recommends assuming that the majority of the construction work will not begin until September 1, after the end of the bird nesting season. Some initial low-impact site preparation activities like staging and stockpiling materials, vegetation management, and other activities not requiring heavy equipment might be allowable in August.

Fish Migration and Spawning

ESA anticipates that the permitting agencies will require restrictive environmental protection measures for any in-water work occurring during fish migration and spawning seasons (December – April). Typical measures include daily monitoring to observe potential fish

spawning within the work area, and installation of turbidity curtains or coffer dams to isolate the work area from nearby tidal waters during activities that might generate excessive turbidity.

Weather and Seasonal Hydrology

To the extent feasible, ESA recommends prioritizing completion of the majority of the construction work prior to December 1st in order to avoid work during the peak rainy season. Work in the rainy season has a higher risk of delays due to inclement weather and will have more burdensome requirements for stormwater management and erosion control.

It is generally acceptable for restoration planting and vegetation management activities to extend into the winter months.

6.3 Construction Activities

The following is a summary of the anticipated construction activities. Activities are listed in the approximate sequence of work; however, the exact sequence of work will be determined by the construction contractor. Work may be able to be conducted simultaneously at the North Slough Pond and Corporation Yard areas by separate crews or contractors.

- **Mobilization:** Contractor will establish staging areas and temporary construction facilities, including temporary power, restrooms, construction office, equipment storage, and temporary stockpile locations.
- **Site Preparation:** Contractor will prepare the work areas, including installation of fencing and gates as required for safety and security of the work area, demolition, clearing and grubbing, and temporary improvements to allow for construction vehicle access. The City or the Contractor may also be required to install temporary signage and fencing to notify trail users of the trail closures and to identify potential details (if available). It may be desirable to do some invasive species management to reduce potential seed sources into restoration areas.
- **Environmental Protection:** Contractor will install environmental protection measures required by the Project permits and Stormwater Pollution Prevention Plan (SWPPP). Typical protection measures include installation of environmental protection fencing where work is to occur in close proximity to sensitive habitats, and stormwater management and erosion control measures.
- **North Slough Pond Area Work:**
 - Remove Existing North Slough Pond culverts
 - Install new North Slough Pond box culvert. Will likely require a large crane to deliver and place the pre-fabricated box culvert.
 - Improve trails at North Slough Pond, including raising levees, installing signage, and re-surfacing of trails, including re-paving raised portions of the Landfill Access Road.
- **Corporation Yard Area Work:**
 - Raise the Corporation Yard spur trail, which will provide construction vehicle access to the kayak launch location.

- Grade the kayak launch turnaround area and nearby tidal marsh restoration transition slope.
 - Install dock piles and elevated walkway piles. Pile drivers may need to be floated into North Slough via boat or installed using a long-reach excavator from the turnaround location.
 - Install the kayak launch elevated walkway, gangway, and dock.
 - Grade the ecotone slope and bioswales east of the Overflow Pond.
 - Complete trail improvements, including installing signage and re-surfacing of trails.
 - Install picnic area amenities.
- **Invasive Plant Management:** The City, potentially with support from a contractor or community volunteer support, will remove invasive plants along levees and in the wetland transition slope along West American Canyon Road. The timing of this work is flexible and can be scheduled to accommodate community participation.
 - **Revegetation:** Contractor will revegetate disturbed areas and plant habitat enhancement plantings around the North Slough Pond culvert construction area and in the upland and transitional slope areas around the Corporation Yard.
 - **Site Stabilization and Winterization:** Contractor will install any necessary erosion control to stabilize the site for winter storm events. This could include hydroseeding or installing erosion blankets or straw wattles to reduce erosion and turbidity impacts. Winterization and demobilization activities may vary depending on whether construction can be completed in one season (anticipated) or if it will extend into a second construction season.
 - **Demobilization:** Following completion of major construction activities, construction equipment will be removed from site, and any staging areas and temporary access areas will be restored.
 - **Ongoing Maintenance and Monitoring:** The City, potentially with the support of contractors or consultants, will conduct on-going maintenance and monitoring activities necessary to ensure the restoration meets its success criteria and regulatory compliance requirements.

6.4 Environmental Impacts

Impacts to existing habitats will be minimized to the extent possible. However, some impacts will occur in the locations of the proposed trail and habitat improvements. Additional temporary impacts will occur during construction, for access. **Table 9** depicts the anticipated impacts and benefits to aquatic habitats at the American Canyon site (Figure 15).¹⁴ On-site aquatic habitat improvements (40.02 acres) more than offset temporary and permanent impacts (5.09 acres) resulting from Project construction. Including ecotone transition and uplands, total restored and enhanced habitat will be 60.33 acres.

¹⁴ A formal wetland delineation has not been conducted for the site. A U.S. Army Corps of Engineers–verified delineation along with revised impact numbers will be developed as part of future design and permitting phases.

**TABLE 9
TEMPORARY AND PERMANENT IMPACTS, BENEFITS, AND NET BENEFITS TO EXISTING AQUATIC RESOURCES
IN THE PROJECT AREA**

Location	Temporary Impacts/Benefits (acres)		Permanent Impacts/Benefits (acres)	
	Wetland/ Marsh	Bay Flat/ Playa/ Tidal Unnatural/ Shallow Bay	Wetland/ Marsh	Bay Flat/ Playa/ Tidal Unnatural/ Shallow Bay
Impact				
North Slough Pond	1.69	0.46	2.36	0.24
Corporation Yard (excluding Eco Center project) ^a	0.84	0.013	0.47	0.005
Floating Dock and Elevated Walkway	0.08	0.08	0.03	0.024
Total Impacts	2.61	0.553	2.86	0.269
Benefit				
Habitat Established			0.37	0
Habitat Enhanced/Restored			13.30	26.35
Total Benefits^b			13.67	26.35
Net Benefit			10.81	26.08

NOTES: Impacts are estimated based on existing vegetation maps and design concepts. A U.S. Army Corps of Engineers–verified wetland delineation will be needed along with more advanced designs to finalize impact numbers.

- a. Acreage does not include impacts to the interior of the Overflow Pond, which is managed for sewage overflow and provides minimal habitat value. This area will likely have the soils, vegetation, and hydrology to delineate as a wetland, but is isolated from the tidal marsh by berms. 0.58 acres of temporary impacts and 0.22 acres of permanent impacts are estimated for inside the Overflow Pond as a result of raising trail elevations.
- b. In addition, ecotone transition and upland enhancements are proposed near the Corporation Yard.

6.5 Earthwork Volumes

The conceptual design involves raising trails within the Project area and creating an Ecotone Slope transition habitat area east of the Overflow Pond. **Table 10** estimates the earthwork needed. Earthwork estimates will be refined in subsequent phases of design.

**TABLE 10
EARTHWORK ESTIMATES FOR CONCEPTUAL DESIGN**

Project Element	Excavation Needed (cubic yards)	Fill Needed (cubic yards)
North Slough Pond Trail Improvements	<100	26,300
Corporation Yard Trail Improvements	<100	3,700
Corporation Yard Ecotone Slope	3,100	<100
Total	3,300	30,100

6.6 Cost Estimate

ESA prepared a preliminary estimate of costs to build the Recommended Concept. Since the cost of fill material can vary greatly depending on when and where it is sourced, we provide a cost range, in 2024 dollars. ESA also prepared costs for a variation of North Slough Bay Trail Resilience Alternative 1 to provide a lower cost option for comparison. Costs are detailed in **Appendix G**.

Appendix G provides preliminary estimates of costs for Scenario 1, representing the cost to construct the Recommended Concept (Base Project) and three lower cost scenarios. 2, 3, and 4 reduce costs by adjusting the extent of trail improvements that are included in the project (Scenario 2), by assuming that the fill material required to construct the trail improvements can be acquired and from a nearby local source and stockpiled (Scenario 3), or both (Scenario 4).

- **Scenario 1 - Base Project with Imported Fill:** This scenario represents an estimate for constructing the Recommended Concept project elements as described in this report. It assumes that fill material will not be able to be sourced locally or in advance of the Project and therefore will be subject to potentially unfavorable market conditions at the time of bidding. Costs for importing large volumes of fill material can be highly variable but recent bids for projects in the San Francisco Bay Area have exceeded \$120/CY. This scenario assumes a unit cost of \$125/CY for imported fill material. Total Phase 1 construction costs are estimated at \$13,725,500.
- **Scenario 2 – Reduced Trail Improvements with Imported Fill:** This scenario represents a variation of North Slough Bay Trail Resilience Alternative 1. This scenario raises the Bay Trail Spine trail, the Landfill Access Road (including installation of the large box culvert or bridge across North Slough), and the spur trail to the kayak launch at the Corporation Yard. The North Slough Pond Loop Trail would not be improved under this scenario. Additionally, the trail surfacing material is changed from decomposed granite to gravel. Total Phase 1 construction costs are estimated at \$10,158,700.
- **Scenario 3 Base Project with Stockpiled Local Fill:** This scenario represents that same design as the Scenario 1 Base Project, however under Scenario 3 it is assumed that a local source of fill material will be identified and that the material will be stockpiled by the City nearby until ready for use. The combination of local source and local stockpiling greatly reduces the potential range of costs for fill material import, justifying a much lower assumed unit cost for the material. Assumed fill material costs are reduced from \$125/cubic yard to \$15/cubic yard. This scenario will require more intensive contracting and construction management effort on the part of the City as the material stockpiling will likely need to be conducted a year or more prior to the overall project construction, and consequently construction management costs are increased slightly. Scenarios 1 and 3 together represent a range of potential costs that may be expected for the Recommended Concept depending on fill material costs. Total Phase 1 construction costs are estimated at \$8,962,500.
- **Scenario 4 – Reduced Trail Improvements with Stockpiled Local Fill:** combines the cost savings from both Scenarios 2 and 3. It assumes the less expensive fill material costs of \$15/cubic yard and additionally reduces the extent of improved trails and changes the surfacing material to less expensive gravel. Scenarios 2 and 4 together represent a range of potential costs that may be expected for this variation of North Slough Bay Trail Resilience Alternative 1, depending on fill material costs. Total Phase 1 construction costs are estimated at \$7,396,700.

The cost estimate additionally breaks down the costs by component: North Pond Culvert Replacement, North Slough Pond Loop Trail Improvements, Other North Slough Pond Trail and Levee Improvements and Public Access Infrastructure, Kayak Launch, and Corporation Yard Enhancements. Costs are also shown separately for Phases 1 and 2 of the project. The allowance for potential Phase 2 wastewater infrastructure relocation costs is based upon a reference project in Washington State built in 2023 (see **Appendix C**). The Phase 2 allowance has a high level of uncertainty, and additional engineering and design development would be required to provide a more detailed estimate of Phase 2 construction costs.

All costs presented in this report are considered order of magnitude opinions of probable construction costs. These costs are based on the conceptual design alternatives described in this report, and have been informed by market information at the time this report was prepared. These costs are intended to inform ongoing project planning, and should be revised and updated during future phases of design. Given the conceptual level of design development, these costs are considered to be approximately -30% to +50% accurate, and the costs include a 35% contingency to account for project uncertainties. ESA has no control of the actual costs at the time of construction.

The City may elect to implement the project in phases or implement some of the work with City staff. Constructing the project in phases could affect the overall costs of the project, potentially affecting costs associated with mobilization, environmental protection, construction management, and others.

All costs are presented in 2024 (Quarter 1) dollars, and should be adjusted to account for anticipated price excavation once the anticipated timing of construction is known with more certainty.

7 Monitoring and Maintenance Plan

The Project's detailed Monitoring and Maintenance Plan (MMP) can be found in **Appendix H**. It describes monitoring and maintenance actions that will be conducted to evaluate and manage Project progress toward desired outcomes.

7.1 Plant Establishment Maintenance

Plantings installed as part of Phase 1 construction will be maintained during the Project's 3-year maintenance period by the Project's contractor. This includes temporary irrigation (where applicable) and replacing any plants that die during the Plant Establishment Maintenance Period. More information about the Project's Plant Establishment Maintenance Period is described in **Appendix H** and will be determined during the preparation of construction documents.

7.2 Routine Maintenance Activities

The Project has been designed to minimize the need for active operations and ongoing maintenance. Raising existing trails and access roads to current Bay Trail standard heights will minimize long-term maintenance obligations by reducing erosion and damage caused by trail inundation. The Project design considered the minimum levee height needed to provide cost-

saving and accessibility benefits without causing excessive adverse effects on adjacent protected ecological resources.

Routine maintenance activities will be limited to areas within the Project area. The City will continue to maintain the Bay Trail in the North Slough Pond vicinity as it currently does. The City would run the Corporation Yard site like a City park, with routine repairs and maintenance like trash collection, trail inspection and repair, and vandalism damage repair. The native plantings used at the Corporation Yard site will require a lower level of maintenance than a typical a City park. The MMP (**Appendix H**) contains a detailed summary of expected maintenance activities.

7.3 Monitoring

The Project's MMP will support initial Project planning and outreach to regulatory agencies, and ensure the constructed Project meets the Project objectives. Detailed information about monitoring is described in **Appendix H**.

8 Next Steps

The Restoration Plan provides a conceptual design that can be used for subsequent phases of the Project, which include preliminary design, CEQA compliance, permitting, final design, construction, and performance monitoring. Design, CEQA compliance and permitting should continue in coordination with the development of the Eco Center. The next phase of design will also require geotechnical recommendations and evaluation of whether overbuild is needed for levee raising, and structural engineering design for the kayak launch's elevated walkway and dock. Installation of the kayak launch and work around North Pond should be done in coordination with CDFW, who owns adjacent property.

The City is committed to pursuing grants and funding for subsequent phases of project development. **Appendix I** provides a preliminary list of potential grant funding sources and implementation schedule.

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