

MCKAY MASTER PLAN

An expansion of Robert W. Crown Memorial State Beach

East Bay 
Regional Park District

Final Concept
October 2022

Master Plan Project Area

City of Alameda

Central Ave.

**Park Expansion Area
(3.89ac)**

Glory of the Seas Building

Doug Siden Visitor Center at Crab Cove

McKay Ave

Central Ave.

Webster St.

Intertidal Ramp

Crown Beach

Crab Cove Marine Conservation Area



Project Introduction

The McKay Master Plan project includes proposed improvements in the northwestern end of Robert W. Crown Memorial State Beach (Crown Beach) in the City of Alameda. The project includes a design for the area surrounding the existing visitor center, including a newly acquired 3.89 park expansion area, formerly owned by U.S. General Services Administration (GSA). The expansion area is owned by the East Bay Regional Park District (the District) while the rest of Crown Beach is owned by the State, managed by the District, and guided by California State Park's 1966 General Plan. This planning effort focuses on District properties, including the expansion area and McKay Avenue, and the immediate vicinity.

While the park expansion area is not currently open to the public, the surrounding area is well-used area for shoreline recreation, interpretive and outdoor educational programming, and public events. The visitor center serves as a hub for activity at this end of Crown Beach and welcomes numerous field trips, group gatherings, and individual visitors throughout the year. Formerly known as the Crab Cove Visitor Center, it was renamed in June 2022 as the Doug Siden Visitor Center at Crab Cove. The McKay Master Plan provides a vision for park improvements that

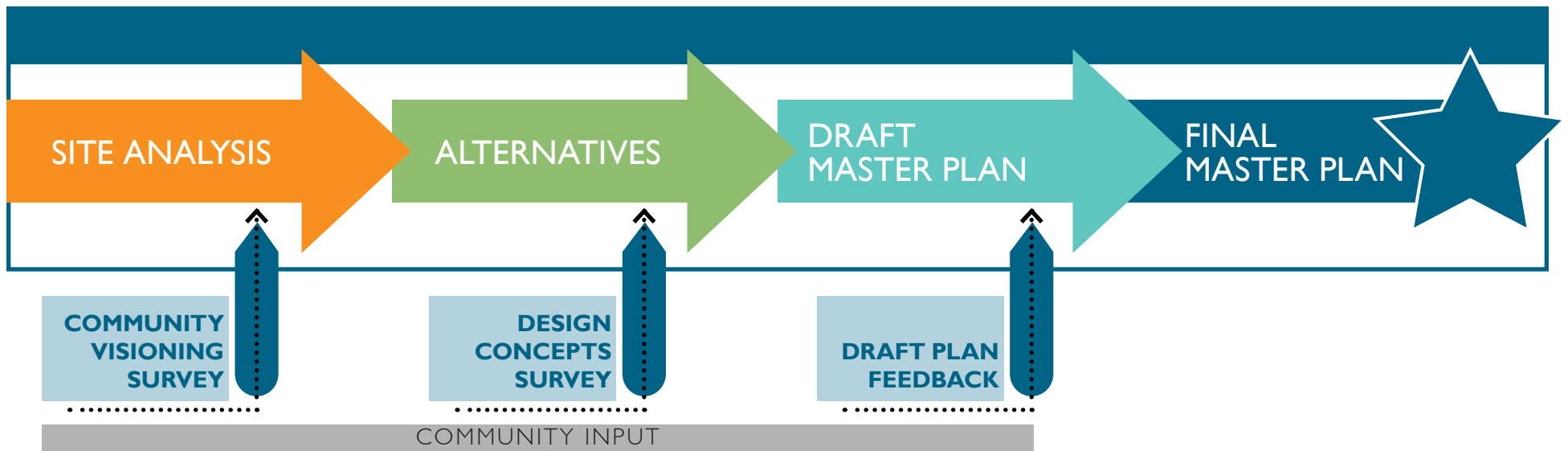
enhances existing uses, while also considering how the site will be impacted by rising sea levels and climate change.

The District engaged in a multi-year planning process to develop the McKay Master Plan. In addition to site analysis and design, this process included engaging the public through online surveys and pop-up events at the Park to solicit input on the overall vision for the area and give feedback about layout and program.

This document provides a summary of the key elements of the planning process and presents the final concept for the project. This concept builds on previous work presented in the Existing Conditions Report and Design Concept Alternatives and feedback received from the public. These materials, including summaries of all public comments, are compiled in the appendix.

While the McKay Master Plan is intended to provide a longterm vision for the area, implementation of the plan will take place over a number of years. The concept plan is presented in three phases and includes adaptation strategies consistent with anticipated levels of sea-level rise within the time frames associated with each phase. There is currently no timeline for implementation.

Planning Process



Existing Uses



Site Analysis | Existing Uses & Recreational Needs

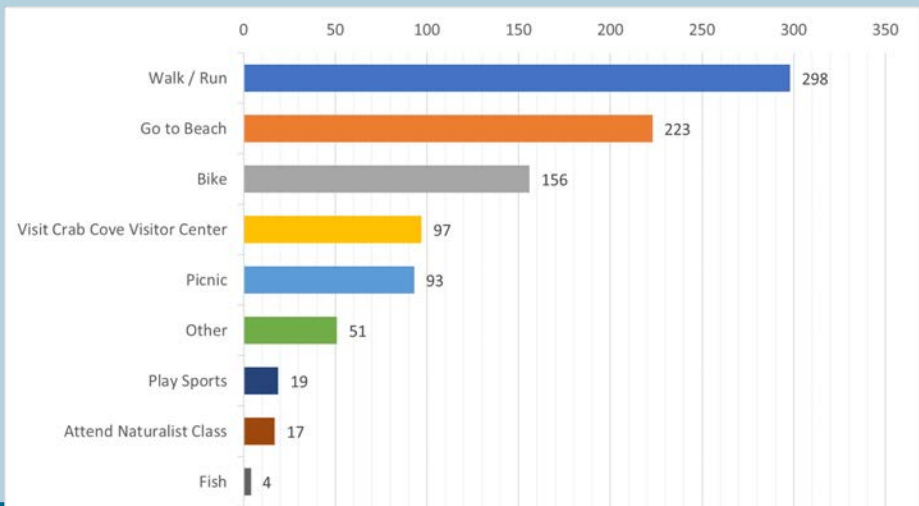
The visitor center is a popular visitor destination with exhibits and aquariums highlighting flora and fauna of the San Francisco Bay. The center is an interpretive museum and includes a large deck that is often used as an outdoor classroom. Programs at the Center also take advantage of coastal access to the mud flat and rocky shore area for wildlife habitat study and observation.

The Glory of the Seas building is currently used for offices for District Operations staff. The building and the fenced area surrounding it are closed to the public.

The shoreline is a major recreational asset with many people visiting the site to take in the views, swim in the water, sit on the beach, walk in the mudflats, or fish along the shore. The rock jetty that extends out in the Bay, commonly called “the spit,” is popular for fishing as it provides access to deeper water. People access the water from various points, including via the beach or climbing over the rip rap. While there is no boat launch, an existing intertidal ramp is integrated with the protected shoreline and offers ADA access to the water’s edge. There is currently no ADA access to the beach.

The site contains one large reservable picnic area located near the parking lot, and there are other large, reservable sites in neighboring areas of Crown Beach. Single, non-reservable picnic tables are also located west of the Glory of the Seas building near the jetty. There is a public restroom at the end of McKay Avenue and one at the northern end of the Visitor Center near the parking lot.

Community Survey Question | What are your favorite activities to do around the visitor center?



Future Recreational Needs



Outdoor Classrooms and Gathering Space

The visitor center is the interpretive hub of Crown Beach. While the recent renovation has provided more indoor space for interpretive features and staff offices, many of the programs still venture out into the project area for hands-on learning and demonstrations. While programming will likely still focus on the shoreline, District staff noted that designated outdoor classroom or gathering spaces would be helpful in facilitating the outdoor learning experience.



Picnic Areas

Outdoor picnics are a popular shoreline activity, with many of the group picnic areas regularly filling up. There is currently limited space to add new picnic areas that do not impede existing uses or block shoreline views. Reconfiguring existing picnic space or utilizing the expansion area for new picnic facilities could expand capacity without limiting the experience.



Expanded Parking and Bus Parking

During high demand times, like weekends and holidays, the current parking lot is not sufficient to meet the needs of the project area. In particular, the parking lot does not have space for bus parking, which is difficult for school groups traveling to the visitor center. Additionally, vehicular turnaround at the end of McKay Avenue can be problematic for larger vehicles. Reconfiguring the parking lot as a turnaround could alleviate some circulation issues and provide space for expanded parking.



Operations and Maintenance Facility

The Glory of the Seas building and the surrounding enclosed area is not an ideal setting for District Operation and Maintenance staff. Relocating this use to a new facility outside of the central use area of the park could open the space for recreational uses. A new facility could also be designed to fit staff needs more directly.

Site Analysis | Access and Circulation

Vehicular Access – McKay Avenue is open to cars (as well as cyclists and pedestrians) from Central Avenue to its terminus near the Glory of the Seas building. The current parking lot is located inland of the terminus and includes 45 parking spaces. At its terminus, there are open framed metal gates that prevents further public car access. District employees may drive trucks and off-road vehicles along trails as need to access park facilities. There is not a designated route for Operations staff to travel from their facility the Glory of the Seas building.

San Francisco Bay Trail – The San Francisco Bay Trail is a paved pathway for bike and pedestrian travel. A segment of the 500-mile SF Bay Trail connects Crown Beach, Crab Cove, and continues on to the neighboring homes.

Internal Paved Pathways – McKay Avenue offers sidewalks on both sides of the street. There are a few driveways for apartments and access to other buildings along the street. The sidewalks continue and meet up with the San Francisco Bay Trail. There are two other primary paved paths within the project area. One path provides access to the Intertidal Ramp and the other passes through the lawn picnic area. These paved paths also serve visitors using bicycles, skateboards, roller blades, and scooters.

Internal Unpaved Pathways – Several unpaved routes extend from the paved trail to the rock jetty. These are primarily serving visitors that are fishing on the jetty or those looking for more expansive views of the Bay.



McKay Avenue Terminus

The current configuration does not provide sufficient space for vehicular turnaround.



San Francisco Bay Trail

The asphalt trail runs along the water's edge.

Site Access and Circulation



CENTRAL AVENUE

McKAY AVENUE

Bay Trail continues west on Central Ave

Bay Trail continues east along Crown Beach

- Project Area
- Vehicular Circulation
- Public Parking
- Staff Parking / Maintenance Yard
- SF Bay Trail
- Paved Bike Pedestrian Pathway
- Unpaved Pathway

200'

Sea-level Rise Projections

2070 Projection - Typical Tidal Range

The green area indicated along the bayfront demonstrates the anticipated tidal range for the year 2070 with existing topography and in the absence of shoreline adaptation. This represents a projected sea-level rise of 3.5 feet compared to 2020 levels.

2070 High Tide (MHHW)
+9.9 NAVD88

2070 Low Tide (MLLW)
+3.3 NAVD88

2070 King Tide
+11.2 NAVD88

Much of the site area will be vulnerable to tidal flooding and periodic inundation in the absence of shoreline adaptation.

2070 Projection - King Tide

Occasionally, there are tidal or storm surge events that cause sea levels to exceed the levels of typical high tide (MHHW). The area shown in brown indicates areas that are vulnerable to such events. King Tide in this projection is shown as an additional 1.3 feet compared to MHHW.

Site Analysis | Climate Change & Sea-level Rise

A sea-level rise **vulnerability assessment** was developed for the Master Plan area. The assessment identified factors that influence coastal flooding and summarized sea-level rise projections at the site. This full report, including methods for determining sea-level rise projections, can be found as an Appendix in the [Existing Conditions Report](#).

Key elements of risk associated with coastal flood hazards for any site include water levels and waves; the combination of these result in vulnerability to coastal flooding. Water levels are influenced by a wide range of factors, including astronomical tides, storm surges, and El Niño effects.

At the Master Plan project site, waves are typically wind-generated and associated with local storm events in the Bay. However, given the shallow water fronting the site, wave heights are significantly attenuated (or weakened) and the primary source of coastal inundation (persistent flooding over several hours) is tidally influenced water level (tides and storm surges).

Since water levels at the project site are dominated by a mixed semi-diurnal tide that has two unequal highs and lows each tidal day, reference water planes that are typically used for design of shoreline grades are described below.

- » **Mean Higher High Water (MHHW):** This is a significant tidal datum that represents an average of the higher high tide that occurs each day. It is representative of a water level that will occur almost every day and is a datum that is being used by regional agencies like the Bay Conservation and Development Commission (BCDC) to indicate the vulnerability of a site to daily flooding.
- » **King Tide:** King Tides, which are the approximate highest tides that occur in a given year (4 to 6 times a year on average) when lunar and solar gravitational effects coincide, are generally a good indicator for potential disruption of use in areas such as open space and park areas because they occur so infrequently and when they do, they last about 3 hours or so per episode.

Key Takeaways and Impacted Areas

In the **near term (2050)**, occasional flooding will occur during king tides on the southern tip of the of rip-rap peninsula and at the lawn area to southeast of the Visitors Center. More extensive flooding may also occur if tide events coincide with storm events. To ensure that temporary activities may continue in these areas they should be developed as floodable landscapes. Permanent facilities may be inappropriate to locate in these areas. New planting and infrastructure should be selected to be compatible with temporary flooding.

In the **medium term (2070)**, the shoreline is reshaped and the areas mentioned above are within the intertidal zone. Activities along the shoreline may continue, but they must adapt and retreat slightly upland. Access routes and Bay Trail connections may require adaptation or relocation. The Visitor Center and the Glory of Seas Buildings are threatened by occasional flooding and will require building adaptations if they are to remain in place.

In the **longer term (2100)**, the intertidal zone expands further into the site and nearly the entire project area is vulnerable to occasional flooding. Continued activities and facility operations on the site will require substantial grading to create areas above the flood risk zone. It may be prudent to coordinate grading activities with the City of Alameda to raise the upland area simultaneously with McKay Avenue and park facilities.

Preferred Design Concept Approach

The preferred design concept presented in this Master Plan is intended to improve park resiliency to 2070 King Tide sea levels (NAVD88 +11.2) with several shoreline adaptation strategies that will protect valuable assets, maintain recreational amenities at the site, and improve the park's ecological and educational value. Design strategies include a protective levee to NAVD +12 integrated with the Bay Trail, the construction of a wetland habitat zone along the Bayshore on the lowland areas on the site, and a passive retreat from some areas that are difficult to protect and are to be only accessible during low tide. All these shoreline adaptation strategies must be carefully coordinated with adjacent landowners and managers, most notably coordination with Crown Beach to the east of the project site.

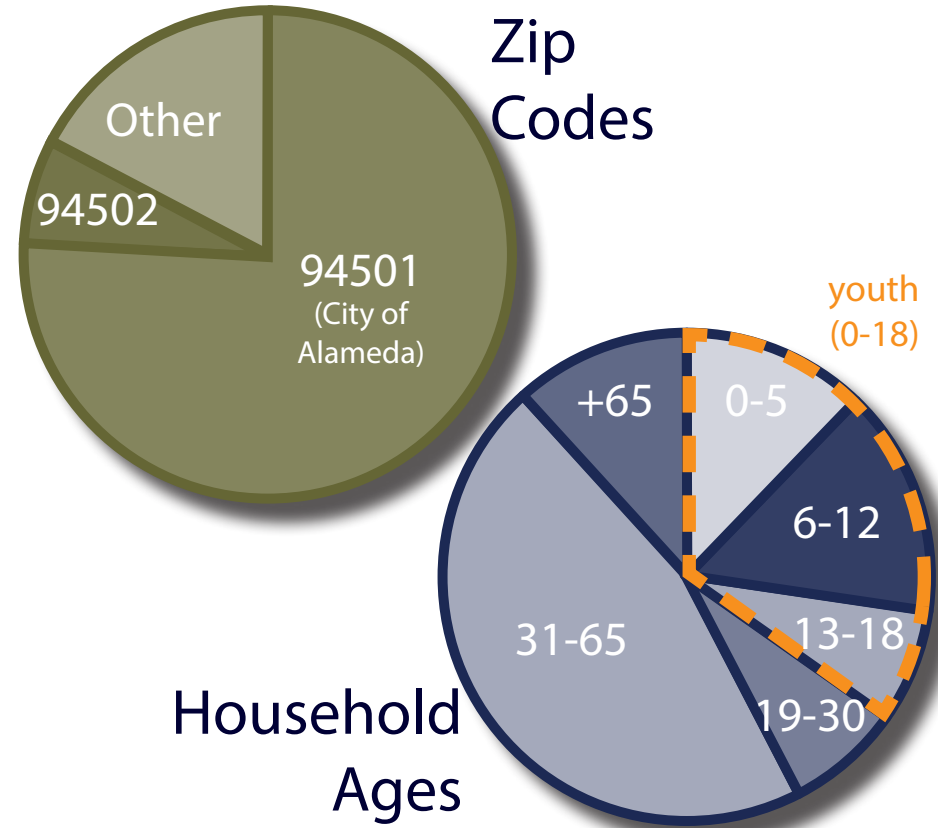
Community Feedback | Process & Who Participated

3 Online Surveys

595 Responses

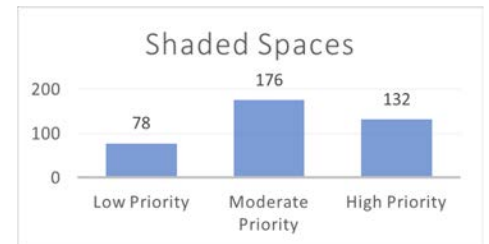
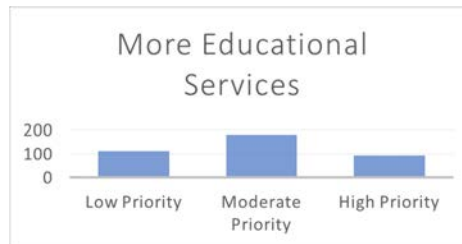
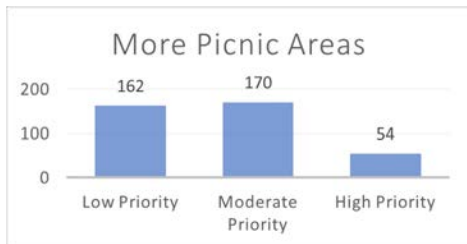
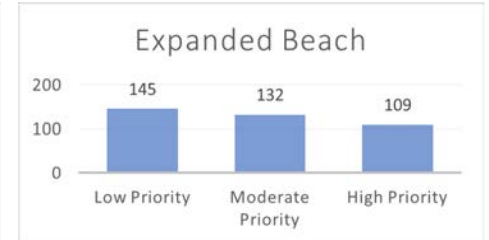
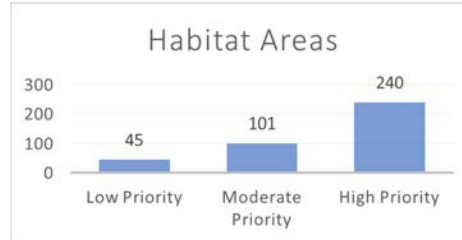
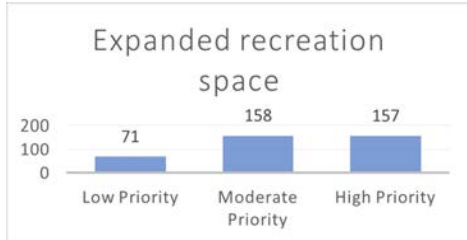
2 Pop-Up Events

150 Participants





Community Feedback | Design Ideas


What are your priorities for the McKay Master Plan, including the park expansion area? Rank each question from highest priority to lowest.





Summary of Community Design Direction


- 


Maintain and protect key site features including the visitor center, Bay Trail connectivity, Glory of the Seas building with reimagined use, and Bayshore access.
- 

Balance and integrate recreational uses with ecological functions along the Bayshore. Increasing or maintaining beach access for recreational uses and improving shoreline habitat were both key priorities.
- 

Prepare for rising sea levels with a protective levee that integrates the Bay Trail and maintains permanent and uninterrupted access through the site.
- 

Incorporate a diversity of smaller recreational areas that provide a mix of views and wind protection, sun and shade, privacy and safety, facilities/furnishings, and vegetation.
- 

Enhance interaction with the Bayshore for recreational and educational purposes with infrastructure such as boardwalks, piers, and/or observation decks.
- 

Design around mature trees and incorporate additional vegetation with consideration for habitat creation as well as windbreaks and shade for the comfort of park users.
- 

Reduce emphasis on car parking and develop a forward-thinking strategy to enhance site access for all users.

Phase I | 2025-2030

Phase I primarily focuses on improving the expansion area for park use and District Operations. The plan illustrates that McKay Avenue will terminate just south of the existing parking, allowing for the Visitor Center to open to the park from both sides.

The design includes a variety of spaces for passive recreation and educational outings, including picnic areas of different sizes, open recreational meadows, and nature play elements. A dedicated water service and irrigation meter will be required to enable the development of Phase I.

The most intensive use area is between the Visitor Center and the Glory of the Seas building. This space could be used for outdoor classes, large group gatherings, or play for children. A new restroom will be located adjacent to this area expanding restroom capacity from the existing restrooms located at the end of the Visitor Center.

To the extent possible, existing trees will be retained at the park for shade. New trees will be appropriate for the coastal setting and selected to tolerate

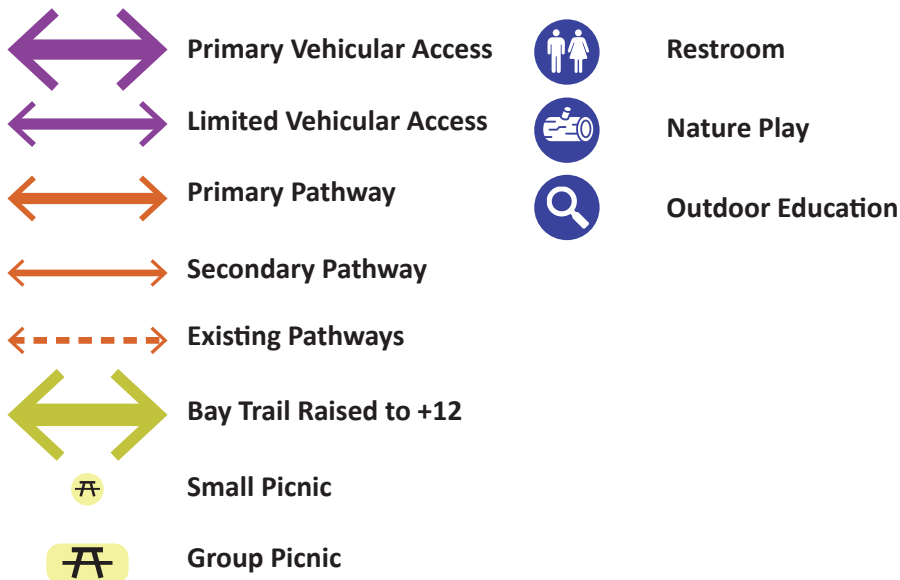
potential saltier groundwater as levels rises in the area. The lawns are surrounded by coastal scrub planting to create upland habitat areas and discourage foraging by geese.

As part of this phase, a section of the Bay Trail would be relocated and raised one to three feet to an elevation of approximately +12' (NAVD88). While the current Bay Trail is not in threat of inundation during this phase, raising it will allow the trail to serve as future levee preventing future inundation within the park.

Most of the spit, beach, and mudflat (intertidal) areas will still be available for shoreline exploration and naturalist programming during this phase.

While District Operations will be relocated out of the Glory of the Seas building, it will remain closed to the public in this phase.

PHASE I Circulation and Use



- 1 Operations Yard: Approximately 34,000 square feet (0.78 acres) reserved for District operations and storage.
- 2 Staff/Overflow Parking: A 12,480 square foot parking area connects to the Operations Yard and includes 33 spaces reserved primarily for staff parking or storage but available for the public during events. The area will be fenced to prevent day to day public use.
- 3 Recreational Meadows: Four meadow areas are located within the interior of the park. Trees and topography help to buffer these areas from the water creating protected spaces for picnics or recreational activities.
- 4 Coastal Scrub Planting Areas: Locally appropriate plants occupy large planting areas creating borders for recreational lawns and habitat areas throughout the project area.
- 5 Bay Trail: A new segment of the Bay Trail is constructed approximately 1-3 feet above current conditions to prepare for future inundation.
- 6 Outdoor Education and Group Picnic Space: Shade structures, large picnic tables, and natural play elements create a flexible space that can be used for outdoor education or naturalist presentations by District staff or as group picnic space when not needed for programs.



- 7 Entry Plaza & McKay Avenue Terminus: The terminus of McKay Avenue is reconfigured and new park space occupies the previous roadway. A curb and fence prevents cars from traveling into the park but allows for bicycle access. A new gateway is located here with wayfinding signage and bicycle parking. The existing parking lots remains open for cars.

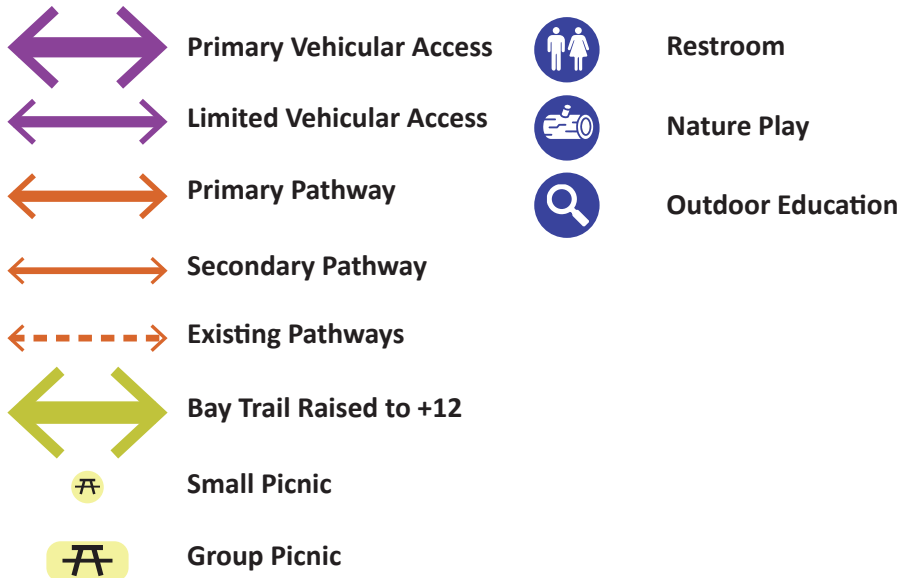
Phase 2 | 2030-2050

Phase 2 reconfigures the parking lot to moderately increase parking capacity and provide spaces for bus parking and electrical vehicle charging. New trees will be planted around the parking area to shade it. Completing the new parking area in Phase 2 allows for the existing parking lot to provide access to the other areas of Crown Beach while Phase 1 is under construction.

During this time frame, typical tidal ranges are not anticipated to move beyond the beach and coastal rip rap except during extreme flood or King Tide events; however, the intertidal range is reduced and less of the beach is available for recreational use during high tide. The shoreline activities will begin to adjust to accommodate these new conditions.

Based on a future study of the building, re-purposing of the Glory of the Seas building will also likely occur during this phase. Accessibility upgrades to the building will be likely be made including providing access to the second floor of the structure. Facade improvements along the inland side will allow for integration with the multi-use classroom and picnic area adjacent to the building and provide a primary sense of arrival.

PHASE 2 Circulation and Use



8

New Parking Lot: A new lot provides approximately 62 spaces for personal vehicles and four spaces for buses. ADA spaces are available and electric vehicle charging is provided. The terminus of McKay Avenue is further improved with a drop off area.

9

Glory of the Seas Building: A future study will determine the future use of the building. Likely renovation will include installation of an elevator and accessibility upgrades.



Phase 3 | 2050-2070

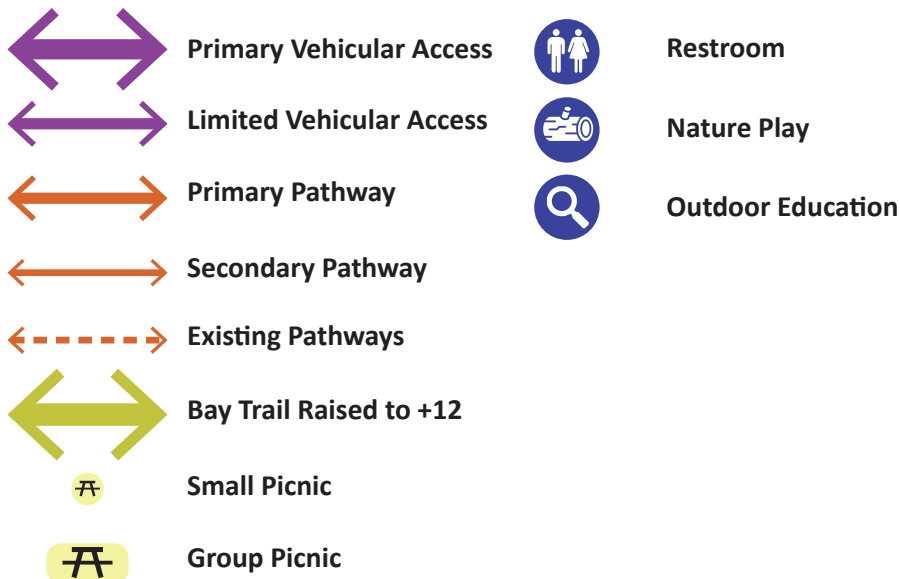
Phase 3 represents the most dramatic response to sea-level rise as it corresponds to the time frame when areas of the park beyond the shoreline are anticipated to become inundated on a regular basis with typical day to day tidal changes. The design includes the development of a substantial area of tidal marsh with a beach along the water and an upland transitional area along the inland edge. This creates new shoreline habitat, as well as an educational asset and birdwatching destination. The design of the marsh area could follow the example of Elsie Roemer marsh on the other end of Crown Memorial State Beach.

An additional segment of elevated Bay Trail will be constructed as part of this phase and serve as a levee at the back of the tidal marsh protecting inland areas from inundation.

As sea levels rise, many of the areas used for naturalist programming today, including the mudflats and the beach, will no longer be available. In this plan, an elevated boardwalk will bring people out into the tidal marsh area, creating a new space for shoreline education. During this time frame, much of the spit will be inundated during high tides. The spit is left in place as a remnant space to explore when tidal conditions allow, creating a contemplative space to reflect on the changing state of the shoreline.

The implementation of this Phase will require collaboration with California State Parks and adjacent neighbors to ensure a coordinated response to sea-level rise. The appropriate size and location of the tidal marsh will require future study.

PHASE 3 Circulation and Use



10 Bay Trail: The remaining segment of Bay Trail in the project area is raised and relocated inland to create a levee protecting inland areas from inundation during flood events.

11 Tidal Marsh: The areas most likely to flood are transformed into tidal marsh.

12 Educational Boardwalk: A boardwalk forms a loop with the Bay Trail to bring visitors out into the tidal marsh area. A lookout at the edge of the marsh provides views into the new habitat area, as well as out to the larger Bay.

13 Coordination with California State Parks: All features at the edge of the project area will require coordination to ensure coordinated response to sea-level rise.



The Baylands Ecosystem Habitat Goals update from 2015 recommends accelerating tidal marsh restoration around the Bay, stating that *tidal marshes that are established by 2030 are more likely to flourish and provide ongoing benefits when the sea-level rise accelerates in the middle of this century.* While the tidal marsh is illustrated as part of Phase 3, efforts to initiate the restoration can take place as funding for design and construction becomes available.





Gathering | Education

The space directly adjacent from the Visitor Center is imagined as a flexible gathering space capable of hosting classrooms of students on a field trip or multiple large group picnics. The space is anchored by two large shade structures covering groupings of picnic tables. These tables can be used collectively for one large group or separately for smaller groups. Students can spread out and do “experiments” or activities at the tables.

This internal space is intended to have higher use than the other areas of the park which are reserved for passive recreation and shoreline viewing. It will serve as a gateway for visitors passing into the park and central hub for coordination on park activities. It will include slightly more paved surfaces than other areas of but is intended to have more use by visitors.

The space between the picnic areas and the lawn includes a variety of nature play elements, such as boulders, logs, or playground equipment with natural materials. These play elements are intended to complement the outdoor education program without dominating the open space character of the site.

Site Access

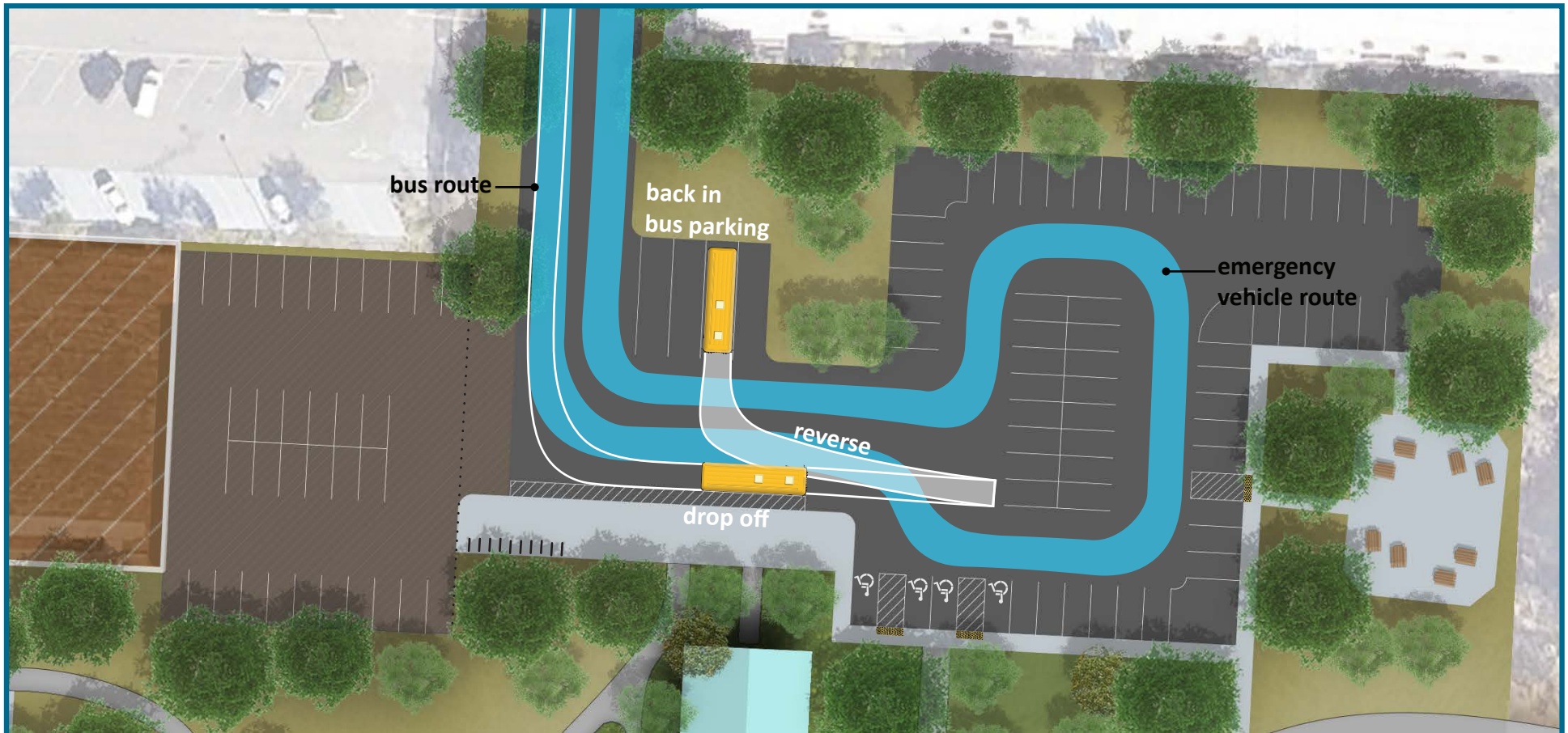
It is anticipated that the project area will continue to be a popular and well used destination in the future. In considering site access, many people who provided input urged for limited parking and increased focus on bicycle access and transit connections. District staff also noted the need for bus dedicated parking to allow for large groups to visit the park.

Upon completion of all phases of the project, the parking lot will be increased from 45 parking spaces to 62 spaces. It is assumed that street parking will remain on McKay Avenue; however, a segment of the street will be removed and integrated

into the park, reducing street parking by approximately 45 spaces. Staff parking includes 33 spaces that can be utilized by the public during events.

Primary bicycle access is anticipated to be from the Bay Trail and along McKay Avenue. The City of Alameda is implementing bicycle improvements along Central Avenue, which leads to the entrance to McKay Avenue. It is anticipated that this project, as well as other bike infrastructure projects within the City will increase comfort levels with visiting the park by bicycle.

Parking Layout, Bus Parking, and Emergency Vehicle Access



Bike Circulation and Parking

Central Avenue
protected bike lane

bike access along
McKay Avenue

bike connection to
McKay Avenue and
Central Avenue

dismount and walk
bikes on internal
park trails

sign directs cyclists
to Central Avenue

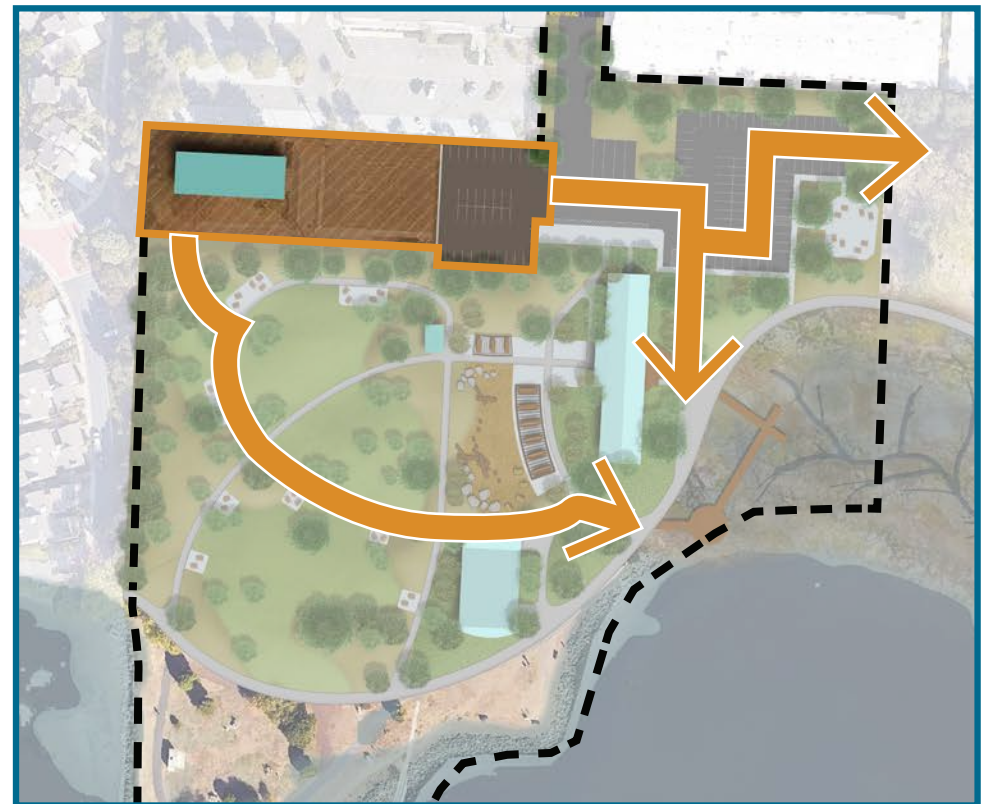
bike access along
Bay Trail

 bike parking

Operations

District Operations space will include a service building as well as storage space for District equipment. District Staff will be able to access the park trails directly from this space and connect to the Bay Trail to access other parts of Crown Beach. While the park's internal pathways will be primarily used for pedestrian use; they will be designed to be 8 feet wide and to accommodate service vehicle use.

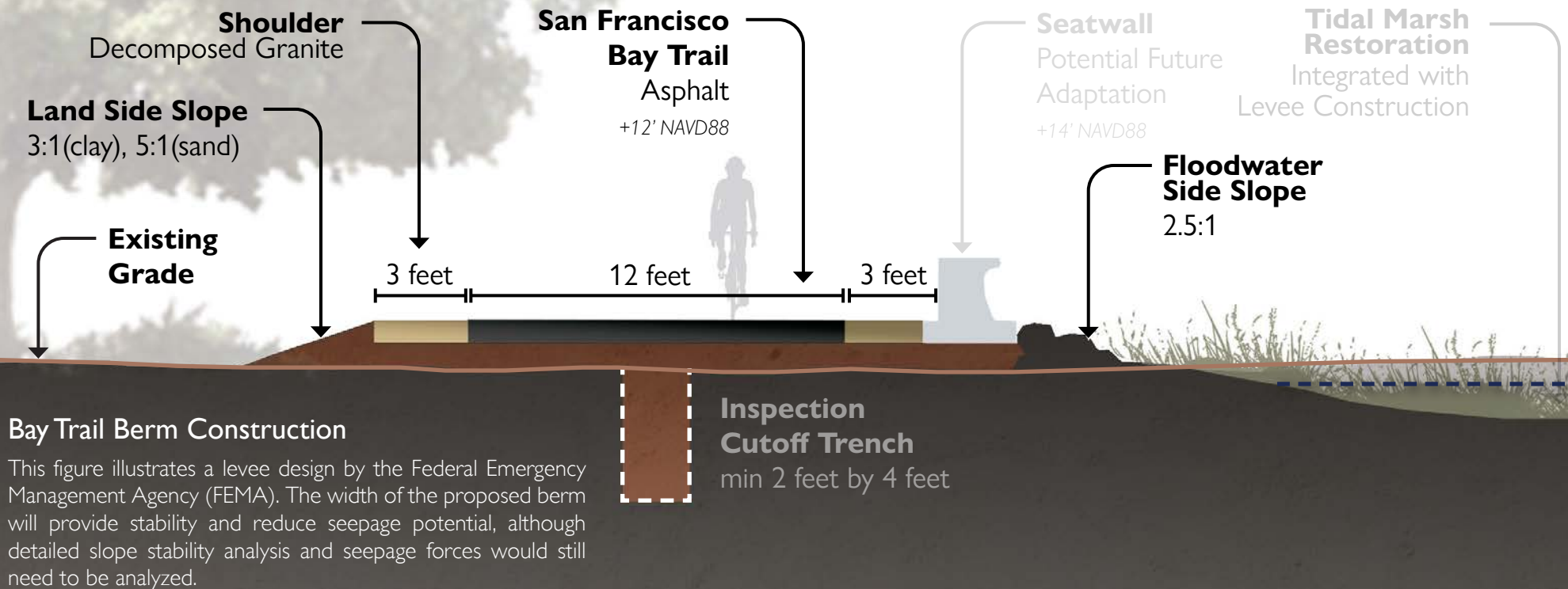
District Operations Primary Routes through Park



Bay Trail | Levee

Sea-level Rise Protection

The preferred design approach in response to rising sea levels includes the construction of a low berm integrated with the San Francisco Bay Trail. This strategy will maintain Bay Trail connectivity, protect recreational use of upland areas, and provide opportunities for the integration of tidal habitat restoration. The berm is conceptually illustrated below with a crest at approximately two feet above anticipated high tide levels in 2020. Potential future adaptation strategies, such as the addition of a concrete seat or flood wall could extend that height.



Bay Trail Berm Construction

This figure illustrates a levee design by the Federal Emergency Management Agency (FEMA). The width of the proposed berm will provide stability and reduce seepage potential, although detailed slope stability analysis and seepage forces would still need to be analyzed.

The table to the right describes sea-level rise variation over time and the level of protection provided by the proposed design approach. Each row describes water levels during various tidal and storm events commonly used in coastal adaptation planning and flood risk assessment. Columns indicate the projected increase in these levels in future years. The assessment utilizes projected sea-level rise estimates from the State of California's Sea Level Rise Guidance developed by the California Ocean Protection Council (OPC) in 2018. OPC's 1-in-200 Chance Projection is a sea-level rise scenario commonly reviewed by agencies as it provides a conservative sea-level rise projection that can be used for planning purposes.

Cells highlighted in blue indicate that raising the Bay Trail on a low berm (+12') would be sufficient to protect from tidal inundation. Green cells indicate levels that would require an additional seat wall (+13.5') for protection, and yellow cells indicate when a higher flood wall would be needed (+16'). The table illustrates:

- » The proposed raised berm and Bay Trail would provide protection in the event of a 100-year flood scenario out to 2050.
- » With the sea-level rise projected by 2070, the raised berm and Bay Trail would provide protection against tides year-round, including king tides – the highest tides occurring each year.
- » A seat wall would provide protection against a 100-year flood event through to 2070 and would keep out most tides through to the end of the century.
- » A full height flood wall could provide protection in a 100-year flood event through 2070 and protection against 10-year storms to the end of the century.

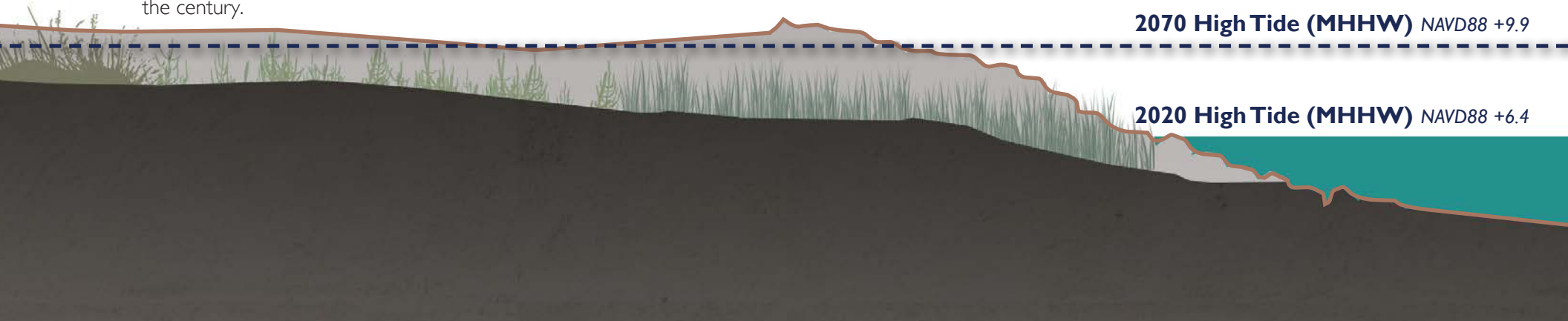
Tidal Datums and Extreme Water Levels with Sea-level Rise

Datum	Year:	2022	2030	2050	2070	2100
	Sea-level Rise (feet):	0.16	0.8	1.9	3.5	6.9
BFE	+10.0	+10.2	+10.8	+11.9	+13.5	+16.9
50-yr RP	+9.6	+9.8	+10.4	+11.5	+13.1	+16.5
25-yr RP	+9.3	+9.5	+10.1	+11.2	+12.8	+16.2
10-yr RP	+8.8	+9.0	+9.6	+10.7	+12.3	+15.7
King Tide	+7.7	+7.9	+8.5	+9.6	+11.2	+14.6
MHHW	+6.4	+6.6	+7.2	+8.3	+9.9	+13.3
MHW	+5.8	+6.0	+6.6	+7.7	+9.3	+12.7
MTL	+3.3	+3.5	+4.1	+5.2	+6.8	+10.2
MLW	+0.9	+1.1	+1.7	+2.8	+4.4	+7.8
NAVD88	+0.0	+0.2	+0.8	+1.9	+3.5	+6.9

Notes:

RP = Return Period or Average Recurrence Interval.

NAVD88 = North American Vertical Datum of 1988.



What makes up a Tidal Marsh?

The tidal marsh system is typically broken up into several components, often determined by their elevation range relative to tidal levels. Below is a general description of each component.

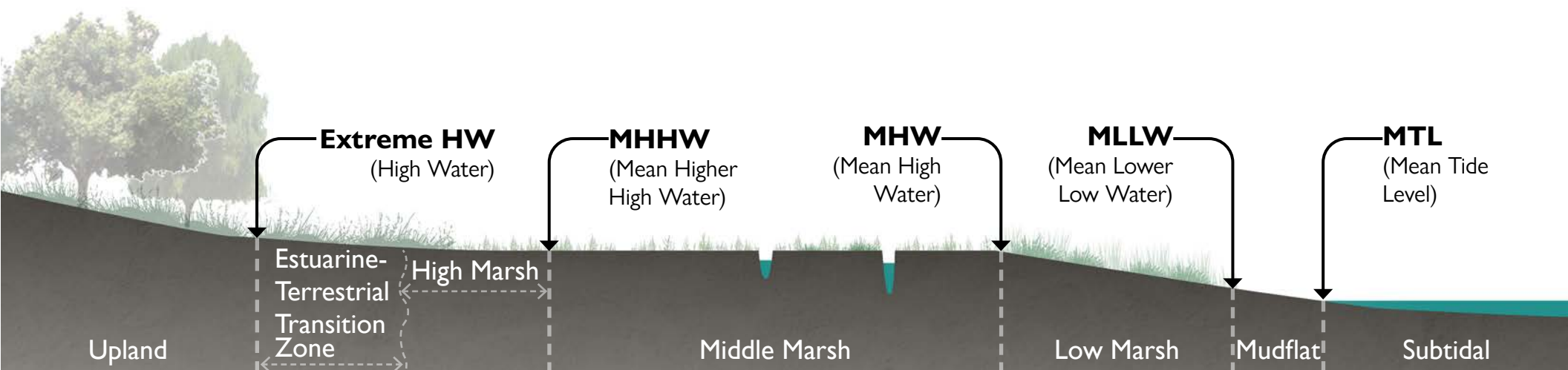
TIDAL MARSH | Tidal marshes are vegetated habitats adjacent to the Bay that exist between mean tide level and mean higher high water. The lowest parts of the marsh (below mean high water) occur along the channel banks and mudflat edges and are vegetated with species such as California cordgrass and annual pickleweed. Midmarsh is found between mean high water and mean higher high water and is typically vegetated with pickleweed. The high marsh generally occurs above mean higher high water and is vegetated by plants such as marsh gumplant, saltgrass, pickleweed, and alkali heath. A tidal marsh provides habitat for wildlife such as Ridgway Rail and Salt Marsh Harvest Mouse, is a nursery ground, and is an important feeding ground. Tidal marshes also provide a buffer from storm surges, act as an important storage for carbon, and can help improve water quality.

MUDFLATS | Unvegetated mudflats typically exist between mean lower low water and mean tide level. The area is typically comprised of silts and clay where water depth and wave energy inhibits plant growth but allows for sediment deposition. Mudflats can be a sediment source for adjacent tidal marshes, and can provide habitat for wildlife. Furthermore, biofilm (a collection of small photosynthetic organisms) grows on mudflats which is an important part of the food web.

CHANNELS | Within the marsh are typically a sinuous network of branched channels. These channels allow for water from the Bay to flow in and out of the marsh. The channels help deliver sediment within the marsh, thus allowing for sediment accretion, and helps flush the system, limiting hypersalinity and limiting toxin accumulation such as hydrogen sulfide.

TRANSITION ZONE | The area between a tidal marsh and the adjacent terrestrial habitat is called a transitional zone or a tidal marsh-upland ecotone. This zone features a gentle slope between the intertidal and terrestrial environment. This space is important for future marsh migration with sea-level rise as well as a refuge area for wildlife during high tides and a habitat for niche species.

BEACH SPIT | Beaches occur across the intertidal zone where waves or currents deposit sand or shell fragments. Beach spits often build up where the coastline changes direction. Beaches provide habitat for wildlife and recreational opportunities. Natural beaches are not common within the San Francisco Bay but can be found in regions with higher wave energy. In some places they protect the marsh edge from wave action.



Section adapted from Corte Madera Baylands: Conceptual Sea Level Rise Adaptation Strategy, The San Francisco Bay Conservation and Development Commission and ESA PWA. (2013).

Tidal Marsh Restoration | Design Considerations

Marsh extent considerations

The extent of a functional marsh will depend upon several factors.

PATCH SIZE | different species need different patch sizes.

TIDAL PRISM | the amount of water entering and leaving the site on each tide (tidal prism) is determined by the elevation and area of the site and, in turn, will determine the size of the marsh channels.

WAVE ENERGY | waves will tend to close marsh channels. Tidal prism will tend to keep channels open. There is a size of marsh (and hence tidal prism) that will keep a channel open for a given location and wave climate.

MIGRATION SPACE | to accommodate future sea-level rise, space needs to be left for the marsh to migrate landward, in addition to any transition zone that will provide high tide refuge and buffer from adjacent trails.

Restoration design considerations

Design guidance has been developed from monitoring and experience of restorations over the past four decades. A key lesson is that establishing a functioning marsh can take a decade or more. With sea-level rise projected to accelerate over the century, the general guidance is to establish new marshes by 2030.

FUNCTIONAL PATCH SIZE | Small marshes may not provide enough marsh habitat, particularly high marsh habitat, which is an essential space for wildlife refuge during high tides. Larger marshes also increase hiding spaces for wildlife and have a larger buffer from upland predators. Larger marshes also provide more habitat for wildlife and generally result in increased biodiversity. Birds such as the Ridgway rail require at least 100 ha of marsh.

MARSH MIGRATION | As sea level rises, marshes will gain elevation to keep pace with sea level. However, in the absence of sufficient sediment, marshes must migrate upland, or the marsh may drown. Ensuring there is sufficient migration space and a transition zone around the marsh will better ensure its survival into the future. Knowing the current mean tidal level, tidal range, and how this will change in the future is vital to knowing how a marsh will establish and persist into the future.

GRADING | Grading of the landscape to an elevation 1 foot below mean higher high water will allow for estuarine sediment deposition. Fill sediment (such as the sediment found at the project site) is not always suitable for tidal wetland plants due to incorrect grain size, bulk density and soil chemistry. Removing more fill than necessary will allow for suitable substrate to accumulate. However, if the site is exposed to large amounts of wind, wind wave action can stop or inhibit estuarine sediment deposition. The waves will transport the sediment out of the site. If this is the case, suitable sediment will need to be brought in so estuarine plants can establish. Or a wind wave break needs to be constructed to reduce wave action within the site, allowing for estuarine sediment to be deposited. The wave break is only needed until vegetation is established along the edges and estuarine sediment has accreted.

CHANNEL NETWORK | Tidal marsh channels should be excavated to allow for natural tidal action and drainage within the marsh. Channel density and sinuosity should be determined from nearby reference marshes. The channel network can also provide flood protection through flood control channels.

COLONIZATION ELEVATIONS | Typically, tidal wetland restoration and construction sites rely on natural seed and colonization of plants from nearby tidal marshes. The lower marsh typically colonizes first and the higher marsh later. The elevation within the marsh dictates the types of plants that will likely be established and is briefly described in the “What makes up a tidal marsh” section. Once established, the vegetation will reduce wave energy and provide some protection for upland areas.

REFERENCES

Collins, J. and Grossinger, R. (2004). *Syntheses of Scientific Knowledge for Maintaining and Improving Functioning of the South Bay Ecosystem and Restoring Tidal Salt Marsh and Associated Habitats over the Next 50 Years at Pond and Pond-Complex Scales*. South Bay Salt Pond Restoration Project

Philip Williams & Associates, Ltd, & Faber, P. M. (2004). *Design Guidelines for Tidal Wetland Restoration in San Francisco Bay*. The Bay Institute and California State Coastal Conservancy, Oakland, CA.

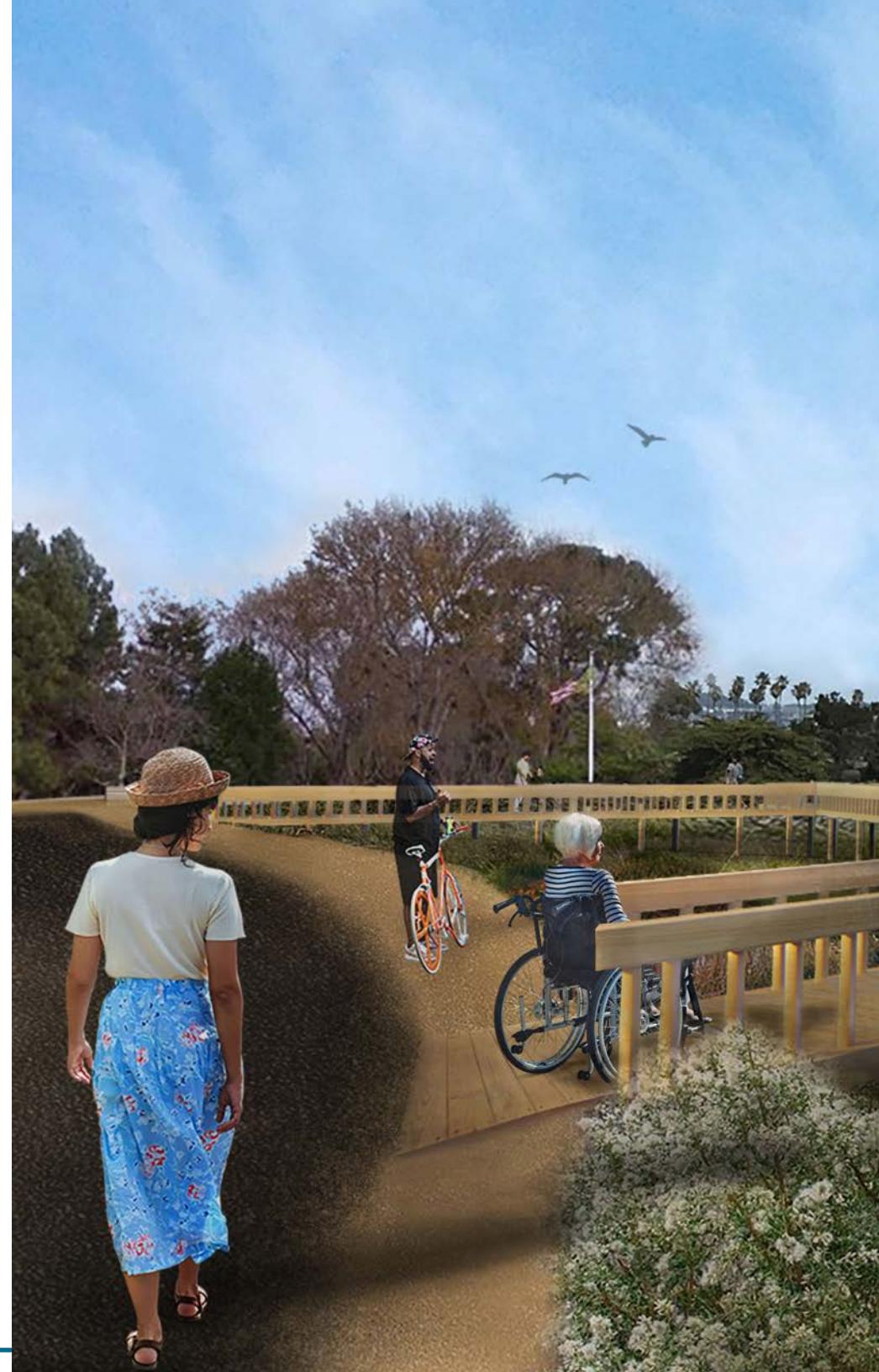
The San Francisco Bay Conservation and Development Commission and ESA PWA. (2013). *Corte Madera Baylands: Conceptual Sea Level Rise Adaptation Strategy*

Boardwalk | Tidal Marsh

The existing lawn area to the east of the Visitor Center is vulnerable to sea-level rise. The proposed use for this area responds directly to input from the public to balance habitat restoration with continued recreational access and educational programming.

The design approach includes the initial construction of a low berm that includes a realignment on the San Francisco Bay Trail to serve as a protective levee and to maintain connectivity of this regional multi-use trail through the site. Following the construction of the berm, tidal wetland restoration on the existing lawn is executed concurrently with the construction of a boardwalk. The boardwalk will include interpretive elements, spaces for educational programming, an overlook with bay views, as well as opportunities to observe and engage with a diversity of microhabitats and distinctive plant and animal communities provided the low, middle, and high tidal marsh, as well as in the transition zones to upland areas.

The concurrent construction of the boardwalk with the tidal marsh restoration allows for compatible design between the two uses and for a single BCDC permit for construction. Once the marsh is established, integrating public access becomes more challenging for both habitat protection and permitting.





Channel

Beach spit

Tidal Marsh

Planting Zones

In planning projects that include restoration, it is important to connect plant assemblages to their geomorphic position in the landscape, the existing soil type, and their ability to successfully establish given those conditions. Also important is their ecological function in the landscape and habitat potential for animal species such as small mammals and pollinators such as insects and butterflies. Plants that are found in any given habitat are typically adapted to the conditions of those habitats such as soils, water regime, salinity and nutrients, and microclimate. This is especially important in considering species to be planted near the edge of the Bay or in terrestrial habitats near the shore where they may need to survive in conditions of fluctuating salinity, inundation, and windy conditions influenced by the Bay. The following recommendations are made with those considerations in mind.

Recreational Meadow

Native perennial grasses can be an effective replacement for non-native grasses in areas where habitat is desired. Grasses like creeping wildrye have creeping below-ground stems that can grow and spread even in slightly saline conditions. The plant's clonal growth also helps to stabilize soils to minimize erosion and the rhizomatous root system allows it to spread laterally and help crowd out non-native weedy species. While creeping wildrye is taller than a mowed lawn, it can be used as a lawn alternative in areas where foot traffic is anticipated to be low.

Trees

The project will retain existing trees to the extent possible to provide shade and to plant new trees appropriate for the coastal setting. In the Shoreline Plants: Landscape Guide for San Francisco Bay, BCDC notes that, "historically trees did not exist along the Bay Shoreline;" however, as a recreational asset they provide important value. BCDC also recommends not planting trees closer than 200 feet from tidal marshes to avoiding providing perches for raptors that prey upon species that live in the marshes. General locations of new trees are suggested in the plans; however, species selection will need to consider the trees ability to:

- » Provide shade
- » Survive rising sea levels and increased salinity in the groundwater
- » Support the establishment of shoreline plant communities

Coastal Scrub

The Plan lists the inclusion of coastal scrub plantings to create upland habitat areas and discourage foraging by geese. Coastal scrub is typically defined as a habitat type that is found along the Pacific Coast in drought-tolerant conditions on coastal hillslopes. Plants in this habitat persist in areas with little rain, blowing salt spray, high winds, and poor soils. California sage and coyote brush are often dominant species. Shrub species typical of Coastal Scrub habitats that could be included are:



California Sagebrush
Artemisia californica



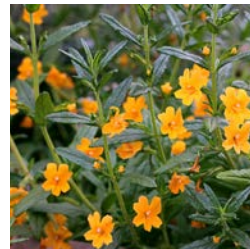
Coyote Brush
Baccharis pilularis



California Buckwheat
Eriogonum fasciculatum



Mugwort
Artemisia douglasiana



Sticky Monkeyflower
Mimulus aurantiacus



California Poppy
Eschscholzia californica



Black Sage
Salvia mellifera



California Coffeeberry
Rhamnus californica



Toyon
Heteromeles arbutifolia



Blue Elderberry
Sambucus mexicana



Golden Yarrow
Eriophyllum confertiflorum



Hummingbird Sage
Salvia spathacea

Transition Zone

To consider sea-level rise adaptation and future habitats it is important to plan for such distinct habitats in advance of sea-level rise, so that plants can establish well in advance of rising waters and more saline conditions. To plan for this adaptation, it would also be appropriate for the inclusion of a suite of transition zone species. Important plant species found in transition zones include perennial grasses, sedges, and forbs that provide habitat for important mammals, birds, and pollinators. Most of these transition zones around the edges of the Bay have been lost due to the construction of barriers such as roads, concrete channels, levees, and other infrastructure. While it is desirable to have attractive flowering plants for the public to see, many native plants that provide ecological function especially in transition zones are often not very showy. However, if ecological function is desired, these species can provide valuable habitat for plants and animals that live near the shore or marshes. Some of these species, while functioning well in more saline soils, also function well in upland habitats. Planting these species would also provide educational opportunities to inform the public about species that will inhabit these areas over time as sea levels rise. Transition zone species recommended for consideration include:



Pacific Aster
Symphyotrichum chilense



Heliotrope
Heliotropium curassavicum



California sagebrush
Artemisia californica



California Bee Plant
Scrophularia californica



Meadow Barley
Hordeum brachyantherum



Red Fescue
Festuca rubra



Coyote Brush
Baccharis pilularis



Alkali Heath
Frankenia salina



Saltgrass
Distichlis spicata



Fiddleneck
Amsinckia menziesii



Creeping Wildrye
Elymus triticoides

ADDITIONAL RESOURCES

Baye, P. 2007. *Selected Tidal Marsh Plant Species of the San Francisco Estuary. A Field Identification Guide.* Prepared for the San Francisco Estuary Invasive *Spartina* Project.

https://spartina.org/project_documents/field_guide_tide_plants_low-res_200703.pdf

BCDC. 2007. *Shoreline Plants A Landscape Guide For The San Francisco Bay March 2007 San Francisco Bay Conservation and Development Commission* <https://bcdc.ca.gov/planning/SPLG.pdf>

CNPS. [2022]. *A Manual of California Vegetation, Online Edition.*

See photo credits at the end of the document.

McKay Avenue | Streetscape Improvements

Improvements to McKay Avenue will prioritize creating a welcoming entry experience to Crown Beach. Roadway repair will be considered in conjunction with District projects. The existing sidewalk is narrow and has areas that need repair. These repairs and potential expansion of the sidewalk can be incorporated into new development taking place along McKay Avenue within the other former GSA-owned properties. These properties are located along the west side of McKay Avenue and coordination on these efforts offers the greatest opportunity for streetscape improvements.

The existing trees along McKay Avenue create an excellent canopy along the entry road; however, they have damaged the existing sidewalk in many areas. Additionally, the existing trees may make sidewalk expansion less feasible. Future design efforts will examine strategies to improve walkability and bikability while minimizing the removal of street trees.



Next Steps | Approximate Costs

PHASE I DESIGN AND PERMITTING

- Geotechnical Study for Bay Trail Levee and Park Improvements
- Construction Drawings for Park and Service Yard
- Environmental Review
- BCDC Permit
- City of Alameda Building Permits

\$2M

**FUNDRAISING FOR PHASE I
CONSTRUCTION**

**PHASE I
CONSTRUCTION**

\$8M

COORDINATION WITH CALIFORNIA STATE PARKS

- McKay Avenue
- Project Elements Outside of Expansion Area

PHASE 2 DESIGN AND PERMITTING

- Architectural Study of Glory of the Seas building Reuse
- Construction Drawings for Park Improvements
- Environmental Review
- BCDC Permit
- City of Alameda Building Permits

+/- \$200K

**FUNDRAISING FOR PHASE 2
CONSTRUCTION**

**PHASE 2
CONSTRUCTION**

\$1-2M

PHASE 3 DESIGN AND PERMITTING

- Tidal Marsh Restoration Plan
- Geotechnical Study
- Construction Drawings for Tidal Marsh and Park Improvements
- Environmental Review
- BCDC Permit
- City of Alameda Building Permits

\$1M

**FUNDRAISING FOR PHASE 3
CONSTRUCTION**

**PHASE 3
CONSTRUCTION**

\$4M

Based on indications that tidal marsh restoration completed prior to 2030 have the greatest capacity to help offset impacts of sea-level rise, tidal marsh restoration within the project area may be prioritized earlier in the project implementation.

Phase I | Concept Costs

CONSTRUCTION COSTS	\$6,129,000
MOBILIZATION AND SITE PREPARATION	\$865,800
Contractor mobilization, survey staking and layout, traffic and pedestrian control, erosion control, site clearing, demolition of McKay Avenue	
BAY TRAIL LEVEE	\$641,900
Demolish existing trail, prepare trail site, build levee, build trail with 12' asphalt pathway and 2' decomposed granite shoulders	
INTERNAL PATHWAYS	\$205,000
Asphalt pathways connecting from parking lot to Bay Trail and to park amenities.	
STAFF/OVERFLOW PARKING	\$255,800
Asphalt parking lot with striping, curb and gutter, construction of fee kiosk	
LARGE GROUP PICNIC AND PLAY AREA	\$878,500
Two shade structures, picnic tables, concrete paving, nature play equipment, wood fiber surfacing	
OTHER PICNIC AREAS	\$405,000
Picnic areas throughout site with picnic tables on concrete pads and recycling/trash receptacles	
RESTROOM AND OTHER SITE FURNISHINGS	\$287,200
4 stall restroom, benches, bike racks, drinking fountain and bottle filler	
SITE UTILITIES	\$320,000
Allowance for site electrical (restroom and minimal pedestrian lighting in parking area) and wet utilities	
STORM DRAINAGE	\$14,000
Allowance for storm drain replacement (assumes no new outfall to the Bay)	
EARTH MOVING	\$780,000
Site grading, imported topsoil in area currently paved	
IRRIGATION	\$730,800
Allowance for irrigation system, including new meter and new point of connection equipment	
PLANTS AND TREES	\$745,000
Plants, trees, soil amendment, and mulch in all planting areas	
SERVICE YARD	TBD
Service Building (Rehab or New Construction)	TBD
Surface Paving	TBD
ESTIMATE CONTINGENCY (30%)	\$1,838,700
SOFT COSTS (35%)	\$2,145,100
Engineering studies, design, environmental review, permits, construction management	
TOTAL ANTICIPATED COSTS: PHASE I	\$10,112,800

Phase 2 & 3 | Concept Costs

CONSTRUCTION COSTS	\$525,000
MOBILIZATION AND SITE PREPARATION	\$134,700
Contractor mobilization, survey staking and layout, traffic and pedestrian control, erosion control, site clearing, demolition of existing parking lot	
PARKING LOT	\$390,300
Asphalt parking lot with striping, curb and gutter, and sidewalk	
GLORY OF THE SEAS BUILDING RENOVATION	TBD
ESTIMATE CONTINGENCY (30%)	\$157,500
SOFT COSTS (35%)	\$183,800
Engineering studies, design, environmental review, permits, construction management	
TOTAL ANTICIPATED COSTS: PHASE 2	\$866,300

CONSTRUCTION COSTS	\$2,590,500
MOBILIZATION	\$90,000
Contractor mobilization, survey staking and layout	
BAY TRAIL LEVEE	\$908,500
Assumption based on conceptual extent of tidal marsh restoration. Site demolition, build levee, build trail with 12' asphalt pathway and 2' decomposed granite shoulders	
TIDAL MARSH	\$1,260,000
Assumption based on conceptual extent.	
EDUCATIONAL BOARDWALK	\$332,000
Wooden boardwalk construction prior to tidal marsh with site amenities, including benches and binoculars	
ESTIMATE CONTINGENCY (30%)	\$777,200
SOFT COSTS (35%)	\$906,700
Engineering studies, design, environmental review, permits, construction management	
TOTAL ANTICIPATED COSTS: PHASE 3	\$4,274,400

Planting Zones Photo Credits

CALIFORNIA SAGEBRUSH: USDA NRCS PLANTS National Database, J.L., Reveal

COYOTE BRUSH: <https://www.calfloranursery.com/plants/baccharis-pilularis-male-flowers>

CALIFORNIA BUCKWHEAT: Adobe Stock

MUGWORT: <https://www.plantflowerseeds.com/products/artemisia-douglasiana-california-mugwort-douglas-sagewort-10-seeds>

STICKY MONKEYFLOWER: <https://www.anniesannuals.com/plants/view/?id=2916>

CALIFORNIA POPPY: Wikimedia Commons, Midimacman

BLACK SAGE: <https://www.laspilitas.com/nature-of-california/plants/612--salvia-mellifera>

CALIFORNIA COFFEEBERRY: <https://www.calfloranursery.com/plants/rhamnus-californica-seaview>

TOYON: California Native Plant Society

BLUE ELDERBERRY: <https://conserveopenspace.org/photo-field-guide-to-cypress-ridge-birds-etc/>

GOLDEN YARROW: <https://www.calfloranursery.com/plants/eriophyllum-confe>

HUMMINGBIRD SAGE: [https://calscape.org/Salvia-spathacea-\(Hummingbird-Sage\)?srchcr=sc5fc9d853e86c0](https://calscape.org/Salvia-spathacea-(Hummingbird-Sage)?srchcr=sc5fc9d853e86c0)

PACIFIC ASTER: <https://www.anniesannuals.com/plants/view/?id=4803>

HELIOTROPE: <https://www.gardenia.net/plant/heliotropium-curassavicum>

CALIFORNIA BEE PLANT: <https://www.anniesannuals.com/plants/view/?id=4580>

MEADOW BARLEY: <https://www.hedgerowfarms.com/online-store/Hordeum-brachyantherum-meadow-barley-p89316414>

RED FESCUE: <https://www.shutterstock.com/image-photo/red-fescue-spikelets-on-blurred-background-642504583>

ALKALI HEATH: <https://www.flickr.com/photos/openspacer/43263897642>

SALT GRASS: <https://greatbasinseeds.com/product/inland-saltgrass/>

FIDDLENECK: <https://nathistoc.bio.uci.edu/plants/Boraginaceae/Amsinckia%20menziesii/Amsinckia%20menziesii.htm>

CREEPING WILDRYE: <https://www.calflora.org/app/taxon?cm=11648>