San Francisco Bay Conservation and Development Commission
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February 1, 2019

TO: Design Review Board Members

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SUBJECT: **Foster City Levee Protection Planning and Improvement Project; First Review**
(For Design Review Board consideration February 11, 2019)

Project Summary

Project Proponents & Property Owners. City of Foster City ("City")

Project Representatives. Mr. Jeff Moneda, City of Foster City (City Manager/Project Manager); Charles D. Anderson, Schaaf and Wheeler Consulting Civil Engineers (Principal Engineer/Project Designer); Terry Huffman & Robert Perrera, Huffman-Broadway Group, Inc. (Environmental Consultants)

Project Site (Exhibit 2). The project site comprises approximately 31,190 linear feet (about 6 miles) of the 34,300 linear feet (about 6.5 miles) of existing levees that surround the City along the bayfront. The project site starts at the San Mateo city limit in the north and follows the shoreline to Belmont Slough to the east and southeast, and ends adjacent to U.S. Highway 101 (US 101) in the south at the San Mateo/Belmont city limit. The project site as shown in Figure 1, is bordered by San Francisco Bay to the north and east, Belmont Slough to the southeast and south, and O'Neill Slough to the south. The Marina Lagoon (Lagoon) is situated to the west of the two opposite ends of the Project site.

Figure 1: Project Area Map

Existing Conditions (Exhibits 8 and 12-17). The project site consists of parcels owned by the City, State Lands, and private ownership totaling approximately 52-acres along 31,190 linear feet of the levee. The entire project site is open to the public via the levee pathway and is part of the San Francisco Bay Trail (Bay Trail) which connects under the San Mateo-Hayward Bridge at its western touchdown. The trail provides both recreational opportunities and pedestrian/bicycle travel routes for the community. A water trail access site is located at Baywinds Park.

The existing levee consists of both raised earthen levees and berms with concrete floodwalls. The existing elevation of levee berms and concrete walls ranges from approximately 10 to 13 feet above the North American Vertical Datum of 1988 (NAVD88).

Land uses on the landward side of the levee system consist of streets, residential uses, office and commercial uses, landscaped open space and recreational uses, unimproved lots, muted tidal wetlands, and seasonal wetlands. The San Francisco Bay side of the City levee system consists mostly of fully tidal open water, slough channels, wetlands, and mud flats.

Approximately 9,000 individual properties in the City rely on the existing levee system for flood protection. An additional 8,000 individual properties within the City of San Mateo are also protected, in part, by the City levee system (i.e., if the City levee was not in place, San Francisco Bay could flow overland through the City, reaching San Mateo from the east and southeast). Similarly, properties in the City receive flood protection benefit from San Mateo's levee and floodwall systems south of San Mateo Creek.

The paved levee-top trail measures approximately 10-feet-wide with varied with unpaved shoulders. In addition to the trail, there are 39 benches, 20 paths to the water and approximately 90 formal and informal paths from adjacent streets to the trail, and 11 picnic areas adjacent to the trail (see Table 1, as follows). Several public parks with bathrooms and a variety of public parking areas are located next to the trail. The informal trails appear to have been formed at locations that connect intersections and parking areas with trail-top benches and/or water access sites. Elevations of the existing Bay Trail along the levee are illustrated in Exhibit 8. Locations of existing formal and informal landside and waterside access points, as well as amenities provided, are detailed in Exhibit 12-17. There are predominantly unobstructed views of the San Francisco Bay from the entire levee trail.

Levee Construction History. Construction of the levee was initially authorized by the U.S. Army Corps of Engineers (USACE) in February 1976 to protect properties interior of the levee from flooding and BCDC issued a permit to the Estero Municipal Improvement District at that time for a portion of the levee from the San Mateo-Hayward Bridge to the terminus at US 101, which included an authorization for a bicycle/pedestrian pathway. The City has continued to improve the levee over time to maintain Federal Emergency Management Agency (FEMA) levee accreditation. This included a number of smaller projects along various segments of the levee, as well as a significant project along the entire levee for which BCDC issued a permit in November 1991 (No. 1991.016) to the City, the Estero Municipal Improvement District, and the California Department of Transportation, to raise the elevation of the levee for flood protection and included extensive public access improvements.

Table 1: Amenity Types

Amenity Type	Pre-Project	Post-Project
Bench	27	23
Bench (Donor)	12	12
Bicycle Rack	10	7
Bicycle Repair Station	0	4
Information Kiosk	5	5
Pet Litter Station	6	12
Picnic Table	15	15
Recycle Bin	11	19
Trail Identity Sign	22	23
Shore Access Sign	12	17
Trash Receptacle	35	19

The current levee system was recertified and accredited by FEMA in 2007 designating land within the City as "Zone X low-risk area". FEMA conducted a coastal flood hazard study in 2014, which determined that roughly 85% of the City's levee system does not meet FEMA requirements. FEMA granted the City a temporary "seclusion mapping" designation in 2015 to remain classified as Zone X low-risk area, so long as progress was made to address the deficiencies of the levee.

To satisfy current FEMA requirements, the required freeboard elevation of the levee needs to be raised. Freeboard is additional height above the 100-year flood elevation that tends to compensate for the factors that could contribute to greater flood heights greater caused by factors such as wave action and the hydrological effect of urbanization of the watershed.

Proposed Project (Exhibits 6-69). The overall project purpose is to rehabilitate approximately 31,190 linear feet of the 34,300 linear feet (about 6.5 miles) of existing levees that surround the City to retain FEMA accreditation and account for sea level rise to 2050 with an adaptation strategy beyond 2050. The freeboard elevation required to meet current FEMA standards is between 12.2 – 16.5 feet NAVD88. The freeboard elevation to account for sea level rise to 2050 ranges between 13 – 19 feet NAVD88. To accomplish the this the levee is proposed to be raised utilizing a combination of three different construction approaches, depending on the location along the existing levee and the adjacent site constraints including: (1) Sheet Pile Floodwall; (2) Earthen Levee; and (3) Conventional Floodwall.

The hybrid approach (combining improvement types 1, 2 and 3) provides the most flexibility to meet current FEMA standards and would also achieve the following: (a) maintain public access and recreational opportunities; (b) provide safe access for emergency personnel; (c) avoid and/or minimize impacts to waters of the State as required by EPA's 404(b)(1) guidelines; (d) avoid and/or minimize impacts to habitats occupied by special-status species; (e) meet American Disability Act requirements for trail access; and (f) meet 2050 sea level rise predictions.

Specific project elements are as follows:

1. **Levee Rehabilitation Types (Exhibits 6 and 8-11).** A "Sheet Pile Floodwall" would be used along approximately 23,170 linear feet of the levee, an "Earthen Levee" along 4,590 linear feet of the levee, and a "Conventional Floodwall" along 3,450 linear feet of the levee. In certain sections where land are is constrained, a secondary retaining wall would be constructed on the landside of the trail to transition the elevated levee grade down to the existing grade.

   The improvement type(s) for each levee segment, and the current and proposed levee heights, are illustrated in Exhibits 6 and 8. Refer to Exhibits 33-69 for detailed plans and cross section views with elevations, BCDC jurisdiction lines, station locations, and proposed amenities, access points, and plantings.

   Construction of each levee type is described below along with the changes to the existing conditions.

   a. **Sheet Pile Flood Wall (Exhibits 9-11).** The sheet pile floodwall proposes to us sheet pile as a permanent flood protection structure where there is insufficient right-of-way width or where encroachment may occur into wetland areas with an earthen levee. The sheet pile floodwall would be 12–20 inches wide, and would create a wall along the bayside edge of the trail. The wall would measure 2 to 7 feet in height above the existing grade at the top of bank, and 3.5 feet above the improved trail, creating a linear site wall along the shoreline, thus altering visual and physical access to the bay.

   b. **Earthen Levee (Exhibits 9-11).** The earthen levee is designed to account for future settlement and would provide trail users with a similar experience to existing conditions albeit at a higher elevation. No guardrails or floodwalls are required in these segments allowing for expansive bay views.

   c. **Conventional Flood Wall (Exhibits 9-11).** The conventional floodwall design would be composed of an 8 to 12-inch-wide vertical concrete wall running along the bayside edge of the improved trail. Along the shore, the wall would vary in height from 4.5 to 10 feet above the existing grade at top of bank, and 3.5 feet above the improved trail. Where the trail crosses under the San Mateo Bridge, the wall would be taller and would transition to the landside of the trail. The wall is proposed for the landside of the trail to address safety and visibility concerns; however, this means the trail segment will be subject to intermittent flooding.

   d. **FloodBreak® Devices.** On the east side of the San Mateo Bridge (adjacent to Bridgeview Park) and adjacent to O'Neill Slough (at the proposed new bridge) automatic closure devices are proposed. The devices use hydrostatic force from flood waters to raise (close) a grade-flush gate to prevent water from entering certain areas.

2. **Public Access (Exhibits 7 and 12-18).** The proposed project would widen the majority of the levee-top Bay Trail and replace and/or add various public access amenities along the trail. Proposed amenities along the levee trail are detailed in Exhibits 12-18 and summarized above in Table 1. Public parking along the street exists along most of the trail, with additional parking at connected public parks, however no new parking is proposed. Planting areas that will be impacted by the improved levee work will be replanted with native species or replaced in-kind. Existing required public access areas that currently

connect to the levee-top trail will need to be adjusted to maintain the required connections subject to other permits. See Appendix A for an overview of the existing permits and public access areas.

a. **Bay Trail.** The Bay Trail is proposed to increase approximately from 10 feet to 12 feet wide with unpaved paths for a total width of 15-18 feet. Widths and elevations of the proposed new Bay Trail along the levee are illustrated in Exhibit 7 and detailed in Table 2, below, with the proposed configuration of the trail shoulder.

Table 2: Improved Trail Widths and Locations

Start Station	End Station	Bay/Slough Side Shoulder Width (feet)	Paved Path Width (feet)	Opposite Shoulder Width (feet)	Total Trail Width (feet)	Segment Length (feet)
0+00	13+17	4	10	4	18	1,317
13+17	45+75	No Trail Improvements				3,258
45+75	311+00	3	12	3	18	26,525
311+00	342+20	3	12	0	15	3,120

b. **Waterside Access.** Access to the majority of the existing access pathways from the Bay Trail to the shoreline, both formal and informal, would be maintained by creating breaks at various locations in the proposed flood wall. These breaks would provide access to the margin of the existing levee-top between the new flood protection and the existing riprap (or other shoreline types). In addition to these breaks, six ADA ramps and two stair cases are proposed to provide access from the new levee-top to the shoreline as described below. Locations of proposed and existing waterside access locations are shown in Exhibits 7 and 12-17.

Six of the existing access ramps leading to the bay are proposed to be widened and the slopes modified to allow for ADA compliance at the following locations: (1) northwest of Baywinds Park parking lot (Station 36+72), (2) north of Baywinds Park parking lot (Station 38+38), (3) southeast of Baywinds Park parking lot (Station 46+82), (4) at the SFO ILS Outer Marker East of Bridgeview Park (Station 110+43), (5) north of Beach Park Boulevard between Sanderling Street and Gull Avenue (Station 135+83), and (6) at the intersection of Beach Park Boulevard and Marlin Avenue (Station 153+20). The access ramp at station 36+72 is proposed to be designed to also accommodate emergency rescue watercraft when needed.

At two locations, 5-foot-wide staircases are proposed to be built within the concrete flood walls to provide access: (1) from northeast of the roundabout at the terminus of East 3rd Avenue (Station 82+82) to the shoreline at a public picnic area, and (2) from the Werder Pier east of the San Mateo Bridge (Station 102+79) to the shoreline.

c. **Landside Access.** Since the levee height is proposed to be raised several feet, new landside access ramps and stairs are proposed to be constructed at the locations shown in Exhibit 7. Most landside access exists in formal or informal access, but the proposed improvements would provide improved, ADA compliant access points with crosswalks at the intersections to facilitate access from the adjacent community to the public access.

3. **Other Project Components**

   a. **Lagoon Intake/outfall.** The proposed project would also modify the Lagoon intake (Station 229+50) and outfall (Station 69+50) structures to accommodate the levee rehabilitation and would include handrails and fencing.

   b. **Bridges.** The proposed project would also involve the construction of two free-spanning bridges to improve emergency access between Redwood City and Foster City and increase the hydrological connection between Belmont Slough and O'Neil Slough. Adjacent to Baffin Street (Station 306+00), the proposal is to replace a culvert (under an existing emergency access roadway for which existing BCDC Permit No. M1987.014.02, City of Foster City & Estero Municipal Improvement District, includes public access requirements) with a free-spanning bridge to provide safe emergency vehicle access from Redwood City to Foster City. This bridge would replace. Near the west terminus of the project site (Station 331+00), the proposal is to excavate a levee segment that includes a dirt trail and construct another free-spanning bridge for emergency access.

4. **Public Outreach.** The City held three Community Informational meetings about the project between April and October 2016, and a Business Community Forum in February 2018. Additionally, the City has held over twenty City Council and Planning Commission meetings related to the project since the summer of 2015. In 2018, the City's voters approved a 90 million dollar bond to finance the levee improvement project.

5. **Existing Approvals, Proposed Construction Timeline & Maintenance.** On May 8, 2017, the City certified the Final Environmental Impact Report for the project. The City has applied for a major permit to BCDC, which is currently pending. Construction is anticipated to occur from 2020 and 2022 with three general phases of the project. The City will be in charge of maintenance of the levee trail and public access amenities associated with the project.

Resilience and Adaptation to Rising Sea Level . While the project would be designed to tolerate periodic flooding, occasional inundation is anticipated on parts of the project site as sea levels rise. Based on Sea Level Rise (SLR) projections for medium-to-high risk aversion scenarios from the Ocean Protection Council (OPC) State Guidance, the levee trail (except under the San Mateo Bridge, Exhibit 24) and public access areas landward of the levee would be resilient to a 100-year flood event in the year 2050 (SLR projection of 1.9 feet). The elevations necessary to provide flood protection proposed by the project design (Exhibit 8) are higher along the open water portions of the levee than the areas along Belmont Slough due to larger wave fetches along the northern areas of the project site than the sheltered areas along the southern reaches of the levee.

Some of the existing waterside shoreline access that is not being elevated, would be inundated by the 100-year flood event in the year 2050. Additionally, the segment of the Bay Trail under the San Mateo Bridge would be inundated under those conditions. The flood wall was chosen to be constructed on the landside of that portion of trail to preserve views from the Bay Trail and reduce public safety concerns that could arise from locating the flood wall on the waterside and creating a "tunneling effect".

At 2100 with a projected 6.9 feet of sea level rise (based on OPC Guidance medium-to-high risk aversion and high emissions), the levee trail, under stillwater conditions, would potentially experience inundation during a 25-year storm at the section along Belmont Slough, but would be resilient to a 100-year storm along the open-water northern reaches of the levee. However, accounting for waves in a 100-year storm, the open-water section of the levee would begin experiencing inundation as soon as 2060 with 2.6 feet of sea level rise. The relatively soft foundational soil characteristics make the levee improvements built for the projected 2050 sea level rise scenario near the limit of safe engineering standards for the amount of soil retention along the shoreline. Therefore, building higher walls is not a practical adaptation measure for the end of the century. The OPC Guidance recommends a medium-to-high risk aversion for projects with limited future flexibility to adapt the infrastructure, such as this project given the engineering limitations of the levee. As noted in the existing conditions, the proposed levee improvement project represents the third time the levees would be raised in the past forty years.

Adaptation measures to account for a 100-year flood with 6.9 feet of SLR include offshore breakwaters to reduce incident wave heights. This strategy is not applicable within the wave-protected waters of Belmont Slough. Future adaptation measures in these areas would require building a higher floodwall, likely using cast-in-place concrete walls built behind the new concrete and hybrid sheet pile flood walls that would then act as a shoring system to maintain flood protection during future construction. Given the already constrained rights-of-way some narrowing of the Bay Trail corridor would likely prove necessary. Also, at some point regional solutions may be more prevalent than having individual jurisdictions provide separate adaptation measures.

Commission Findings, Policies & Guidelines

Physical and Visual Access*.* The San Francisco Bay Plan (Bay Plan) policies on Public Access state, in part, that "maximum feasible access to and along the waterfront and on any permitted fills should be provided in and through every new development in the Bay or on the shoreline…" Bay Plan policies on Appearance, Design, and Scenic Views state, in part: "All bayfront development should be designed to enhance the pleasure of the user or viewer of the Bay..." The Commission's Public Access Design Guidelines state, in part: "View opportunities, shoreline configuration and access points are factors that determine a site's inherent public access opportunities." The guidelines also state that viewing the Bay is the "most widely enjoyed 'use' and projects should be designed to "enhance and dramatize views of the Bay."

The Bay Plan Recreation policies state, in part, that "[d]iverse and accessible water-oriented recreational facilities…should be provided," and that waterfront parks "should emphasize hiking, bicycling, riding trails, picnic facilities, swimming, environmental, historical and cultural education and interpretation, viewpoints, beaches, and fishing facilities." Where practicable,

the policies state that "access facilities for non-motorized small boats should be incorporated into waterfront parks." Additionally, parking that accommodates expected use should be provided, as well as "launching facilities, restrooms, rigging areas, equipment storage" and should be accessible to ensure boaters can easily launch their watercraft.

The proposed project would raise the levee and Bay Trail and provide flood protection for the City with a combination of infrastructure types. While physical access will be maintained through formalized access paths from the landside and to the shoreline, the quantity and distribution of access locations will be limited from the existing network of formal and informal access paths. Additionally, walls and guardrails proposed along stretches of the trail and will affect views. Views from Beach Park Boulevard and East 3rd Avenue and some parks and other publicly accessible areas landward of the levee would also be impacted. Proposed modifications to public access amenities are detailed in Table 1, above.

Circulation. The Bay Plan policies on Public Access state, in part that "[i]mprovements should be designed and built to encourage…movement to and along the shoreline…" and that "[a]ccess to and along the waterfront should be provided by walkways, trails, or other appropriate means and connect to the nearest public thoroughfare where convenient parking or public transportation may be available. Diverse and interesting public access experiences should be provided…." The Commission's Public Access Design Guidelines state, in part, that a shoreline development should "…provide a clear and continuous transition to adjacent developments," "use local public street networks to inform shoreline site design and to extend the public realm to the Bay," and "provide connections perpendicular to the shoreline."

The proposed project features a wide variety of improved access points and connections with roads, parks, and residential areas along the shoreline. Beach Park Boulevard parallels the Bay Trail for a long stretch of the levee and includes shoulder parking that will be maintained, although the informal access points from the road will not be part of this project and would take time to be re-established by incidental pedestrian traffic through landscaped areas. Each roadway intersection along Beach Park Boulevard will include an access point to the trail. Other significant thoroughfares that intersect with the Bay Trail include East 3rd Avenue and Foster City Boulevard. Additionally, there are Bay Trail connections to Redwood City to the south.

Sea Level Rise. The Bay Plan policies on Public Access state, in part, that "…public access should be sited, designed, managed, and maintained to avoid significant adverse impacts from sea level rise and shoreline flooding," and that "[a]ny public access provided as a condition of development should either be required to remain viable in the event of future sea level rise or flooding, or equivalent access consistent with the project should be provided nearby."

As discussed above, the proposed project would elevate the majority of the Bay Trail to be resilient to SLR of 1.9 feet including storm events. Some existing shoreline public access areas and the portion of the Bay Trail below the San Mateo Bridge could already be inundated during storm events with wave action during present conditions, creating gaps in Bay Trail connectivity. The project site is proposed to be adaptable to SLR past 2050 using adaptive strategies that may include offshore breakwaters that include bay fill and further increasing floodwall heights.

Board Questions

Public Access Design Guidelines. The seven public access objectives are:

1. Make public access **public**.
2. Make public access **usable**.
3. Provide, maintain and enhance **visual access** to the Bay and the shoreline.
4. Maintain and enhance **visual quality** of the Bay, shoreline and adjacent developments.
5. Provide **connections** to and **continuity** along the shoreline.
6. Take advantage of the **Bay setting**.
7. Ensure that public access is **compatible with wildlife** through siting, design and management strategies.

Considering these Objectives, the Board's Advice and Recommendations are Sought on the Following Issues Regarding the Design of the Proposed Public Access:

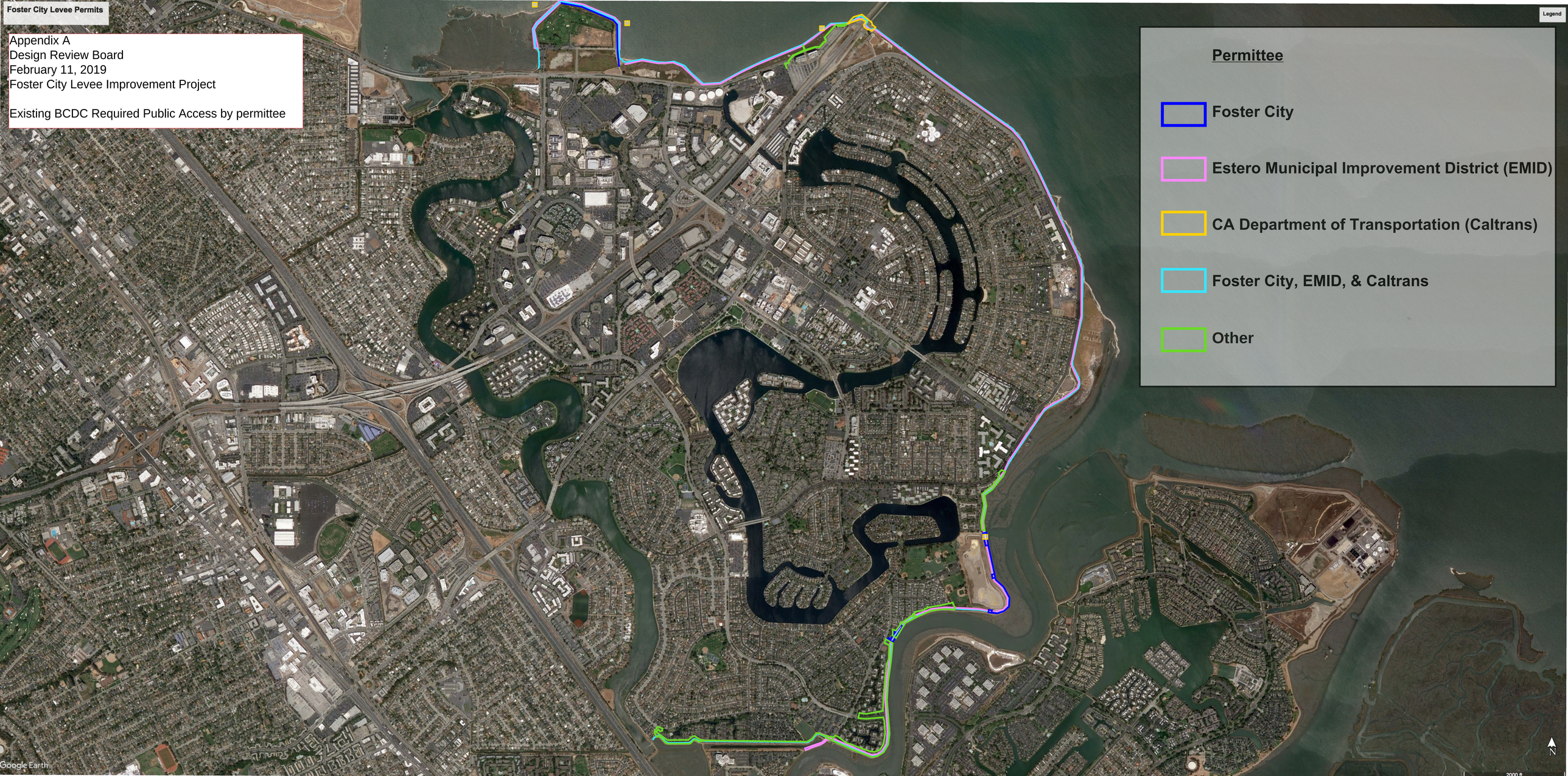
Physical and Visual Access:

1. Visual access to the Bay and view impacts from the proposed levee raising project
2. Physical shoreline access
   a. Low-lying public access areas on the water side of the floodwall
   b. The oyster shell bar with wildlife viewing opportunities
   c. The "Runco" property and associated public trails
3. Trail configuration for public's enjoyment of the Bay setting
   a. Configuration of pedestrian and bicycle lanes on the trail
   b. Railings and floodwalls
4. Trail access points
   a. Formal access
   b. Informal access
5. Appropriateness of site amenities, signage, planting, railings, interpretive elements, and lighting such that the public spaces are inviting and enjoyable to the greatest amount of the public
6. Adequacy of shoreline public parking
7. Maintenance and management of the public access areas

Sea Level Rise:

8. Resilient design and signage strategies for public access areas subject to storm-based flooding

Foster City Levee Permits

Appendix A
Design Review Board
February 11, 2019
Foster City Levee Improvement Project

Existing BCDC Required Public Access by permittee