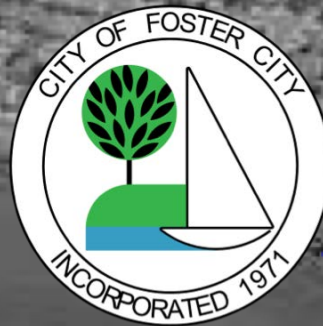




LEVEE PROTECTION PLANNING AND IMPROVEMENTS PROJECT

Improving Today and Preparing for Tomorrow

Progress Update
September 29, 2017



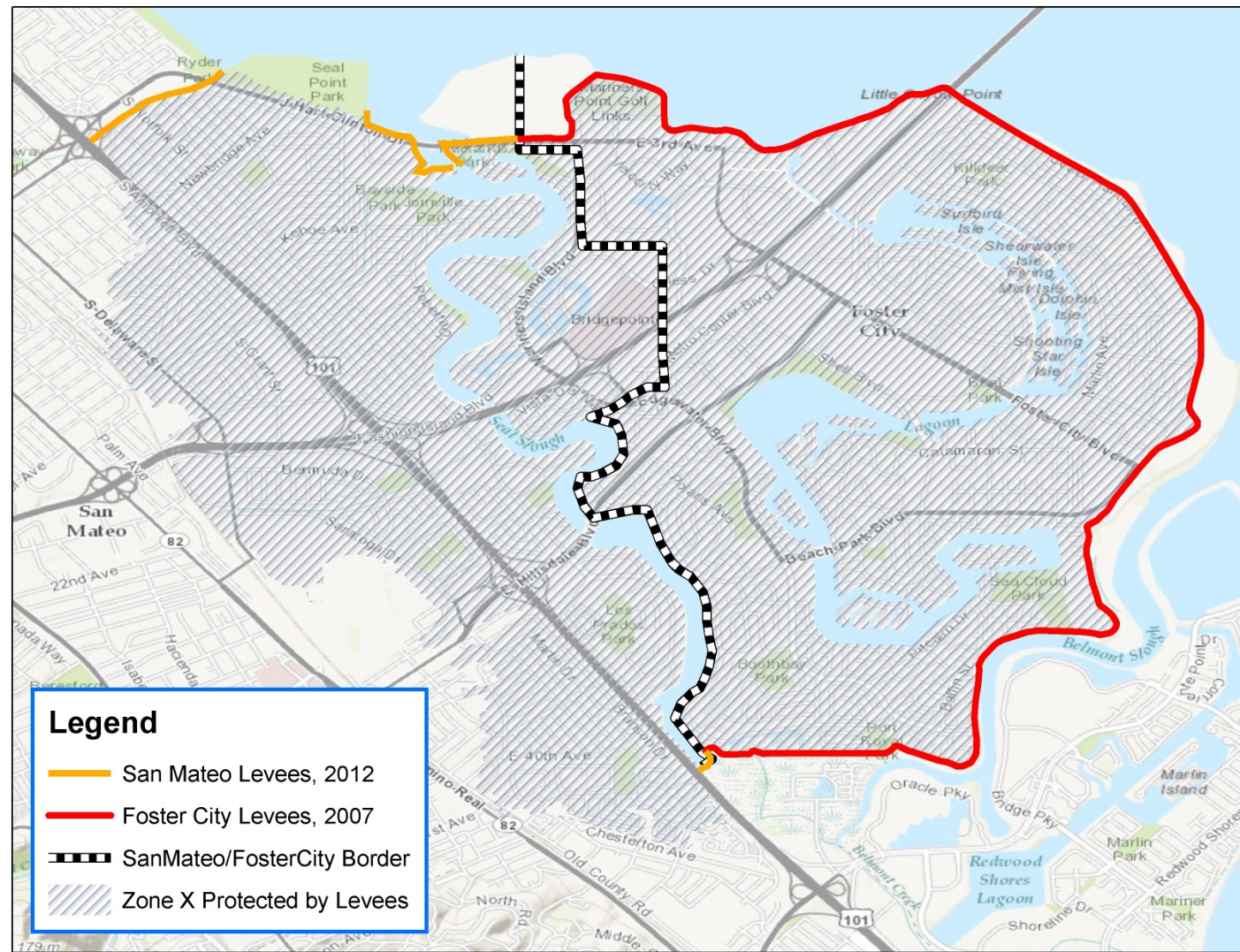
Schaaf & Wheeler
CONSULTING CIVIL ENGINEERS



Presentation

- ☐ Need for Levee Improvements
- ☐ City Council Direction
- ☐ Proposed Levee Improvements
- ☐ Accomplishments to Date
- ☐ Remaining Schedule

Levee System Overview

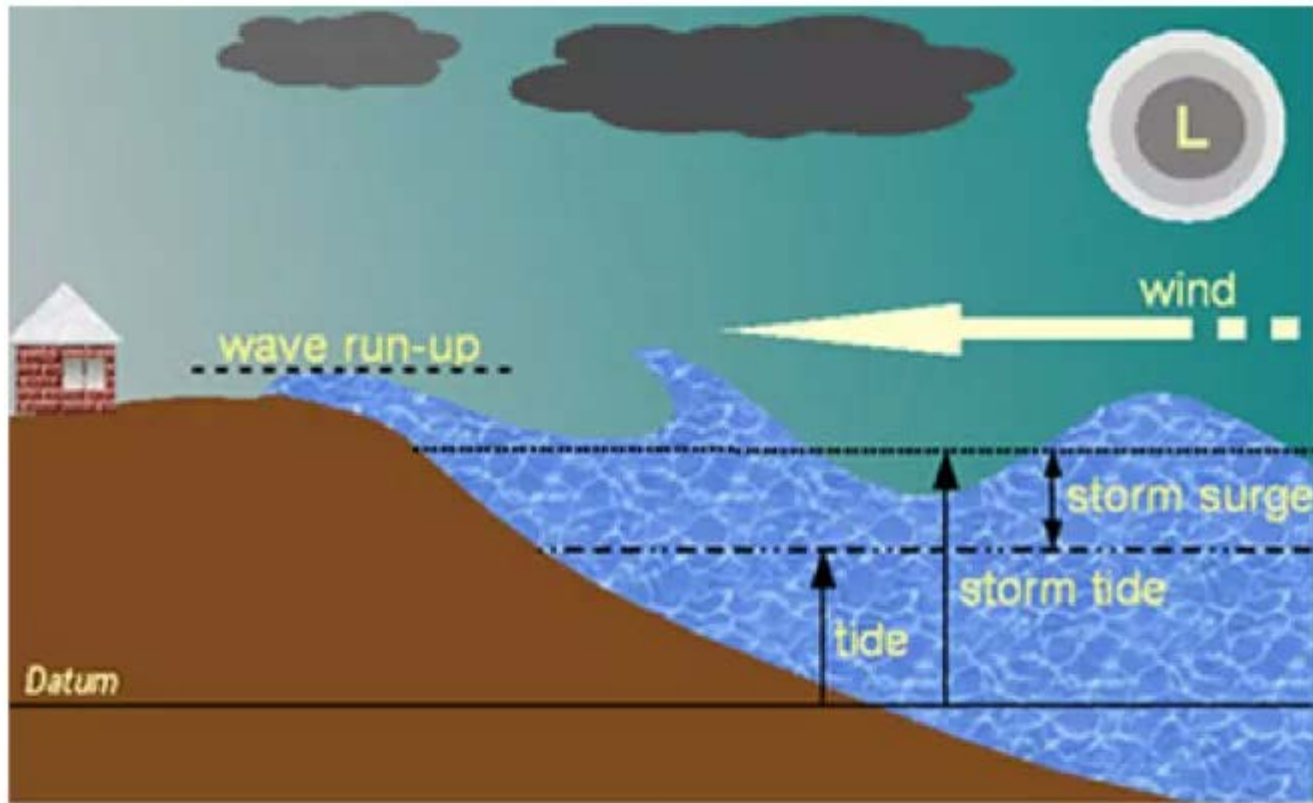


Typical Levee in Foster City

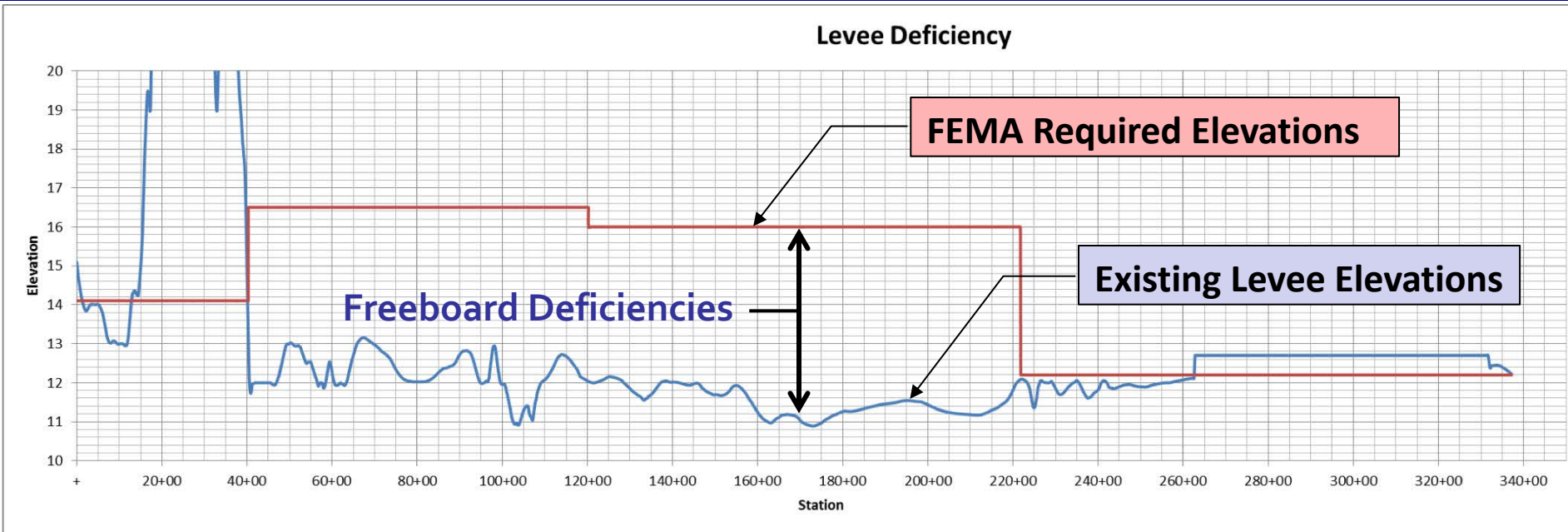


FEMA Coastal Flood Hazard Study (2014)

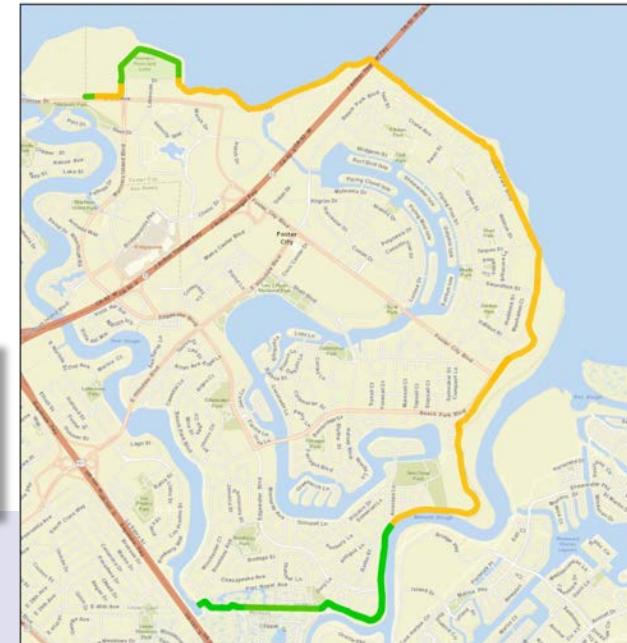
Maximum vertical elevation reached by the sea:
Combination of the wave set-up that is induced landward of the
wave breaking zone and wave run-up



Levees do not meet requirements for FEMA accreditation.



- No Deficiency
- Freeboard Deficient



What will happen if the levee is not improved?

- ❑ Properties will be placed within Special Flood Hazard Area.
 - 9,000 parcels in Foster City
 - 8,000 parcels in San Mateo
- ❑ Those with federally backed mortgages, and other at the discretion of their lender, would be required to carry flood insurance.
 - Premiums could be thousands of dollars per year.
- ❑ Substantial property improvements are prohibited in high-risk flood areas without elevating above base flood elevation, which would be as much as 5 feet deep in some locations.
- ❑ Property values could substantially drop.

City Council Direction

- ❑ City Council direction is to not let this happen.
- ❑ The levee is Foster City's most important asset.
 - Protects city from flooding
 - Access to regional recreational amenity
- ❑ On May 8, 2017 Council directed City staff to:
 - Further develop and analyze the **“2050 sea level rise and future adaptation strategy [levee] design.”**
 - Submit design to the appropriate regulatory agencies for processing.
 - Proceed with a 30-Year General Obligation Bond for the Levee Protection Planning and Improvements Project. (CIP 301-657)

Regulatory Environment

- ❑ Levee improvement project requires numerous permits.
- ❑ The State recognizes that Sea Level Rise (SLR) is a significant threat.
- ❑ BCDC requires resilience through design to the high range of 2050 SLR.
- ❑ Both RWQCB and BCDC require risk assessments and adaptation strategies to address 2100 SLR.



Policies for a Rising Bay Project Final Report

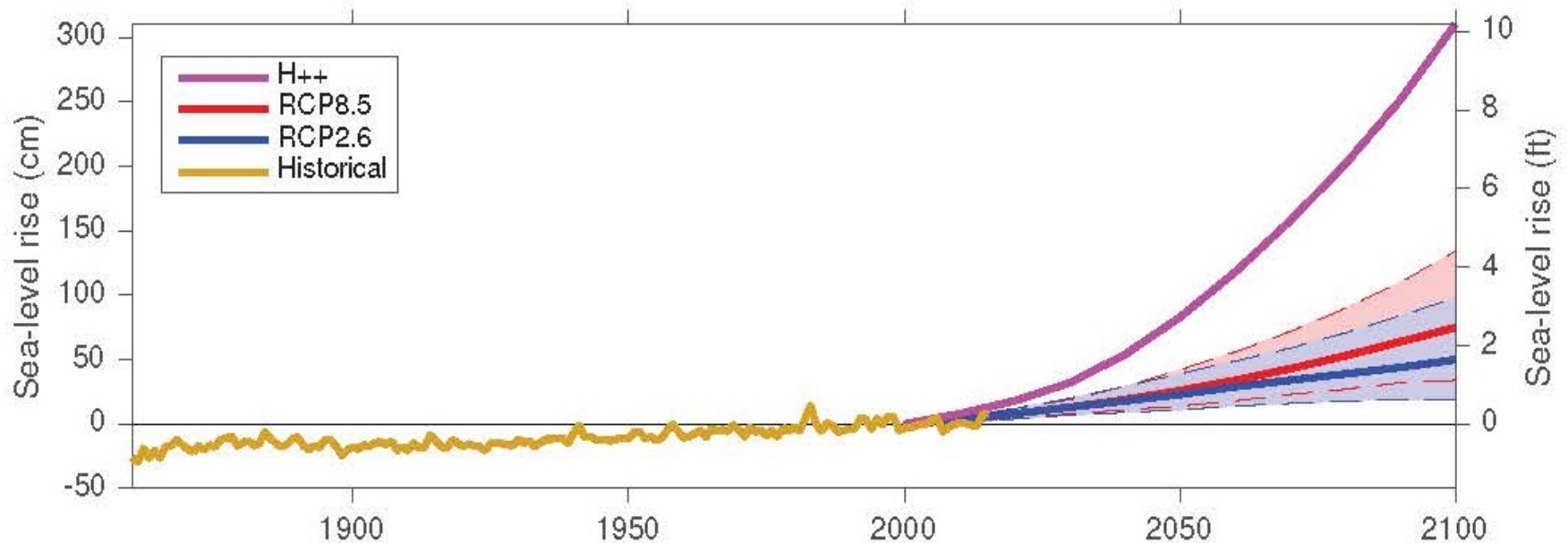
SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION

NOVEMBER 1, 2016



Current Sea Level Rise Predictions

(b) Relative sea level in San Francisco, California



California Ocean Protection Council, Rising Seas in California: An Update on Sea-Level Rise Science, April 2017.

Sea Level Rise Predictions – April 26, 2017

Year	“Likely Projection” Published in 2012 (feet)	Range of SLR Published in 2012 (feet)	Sea Level Rise Predictions April 26, 2017			
			67% Confident “Likely” (feet)	95% Confident (feet)	99.5% Confident (feet)	Extreme “H++” (feet)
2030	0.5	0.2 – 1.0	0.3 – 0.5	0.6	0.8	---
2050	0.9	0.4 – 2.0	0.6 – 1.1	1.4	1.9	---
2100	3.0	1.4 – 5.5	1.6 – 3.4	4.4	6.9	10.0
2150	---	---	2.8 – 5.8	7.7	13.0	22.0

2017 SLR estimates presented in the table reflect a future in which there are no significant global efforts to limit or reduce emissions.

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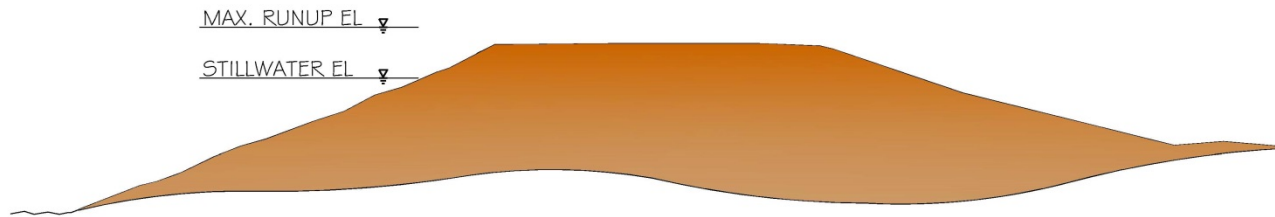
2017 SLR estimates presented in the table reflect a future in which there are no significant global efforts to limit or reduce emissions.

The proposed improvement project assumes 2 feet of sea level rise and provides resilience through 2050 with 99.5 percent confidence.

Proposed Levee Improvements

Raise the Existing Earthen Levee

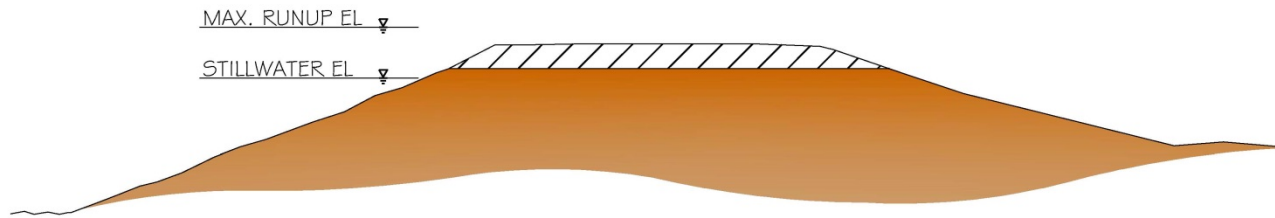
Used for roughly 15 percent of the improved six miles



Proposed Levee Improvements

Raise the Existing Earthen Levee

Used for roughly 15 percent of the improved six miles

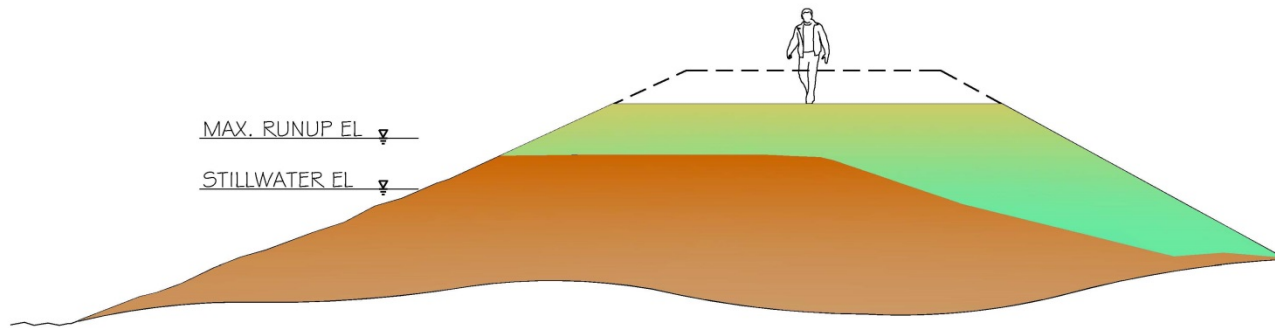


Top foot of soil (plus or minus) is removed.

Proposed Levee Improvements

Raise the Existing Earthen Levee

Used for roughly 15 percent of the improved six miles

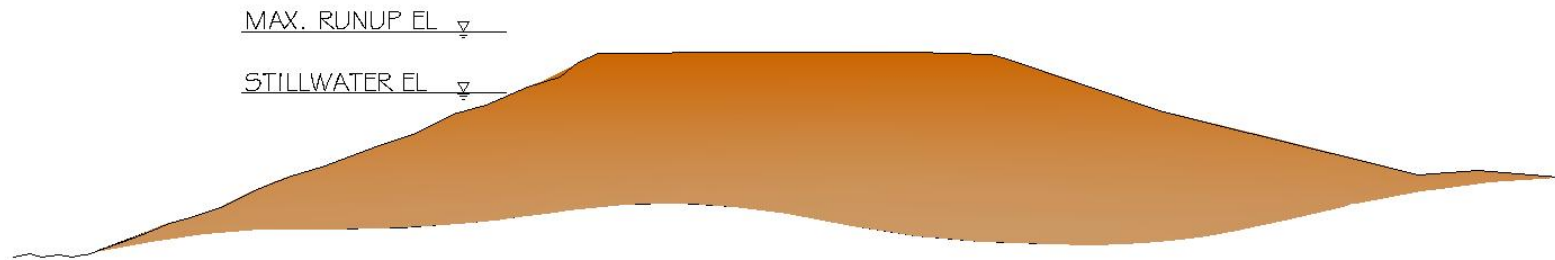


Engineered fill added to levee to meet FEMA requirements plus 2 feet of sea level rise with allowance for settlement.

Proposed Levee Improvements

Add or Replace Structural Floodwall

Used for roughly 15 percent of the improved six miles



Used in constrained rights-of-way where sheet pile cannot be driven and the existing level of flood protection is not compromised during construction.

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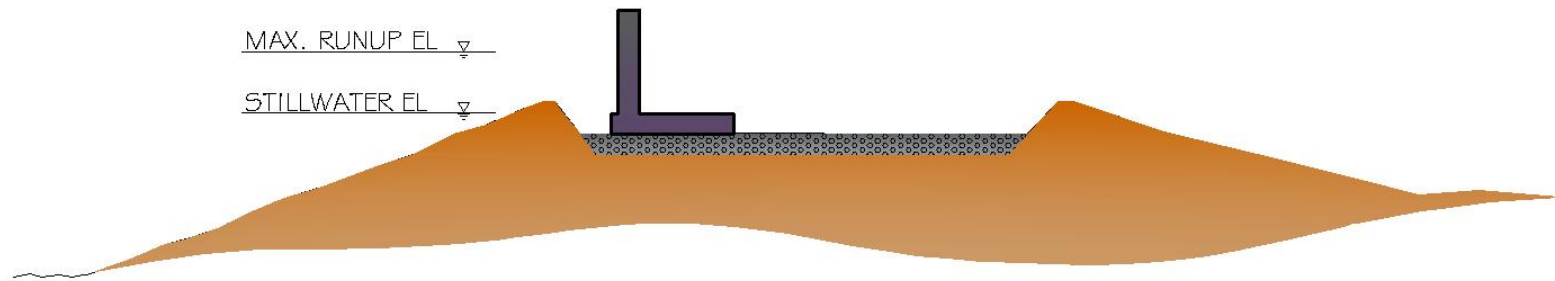


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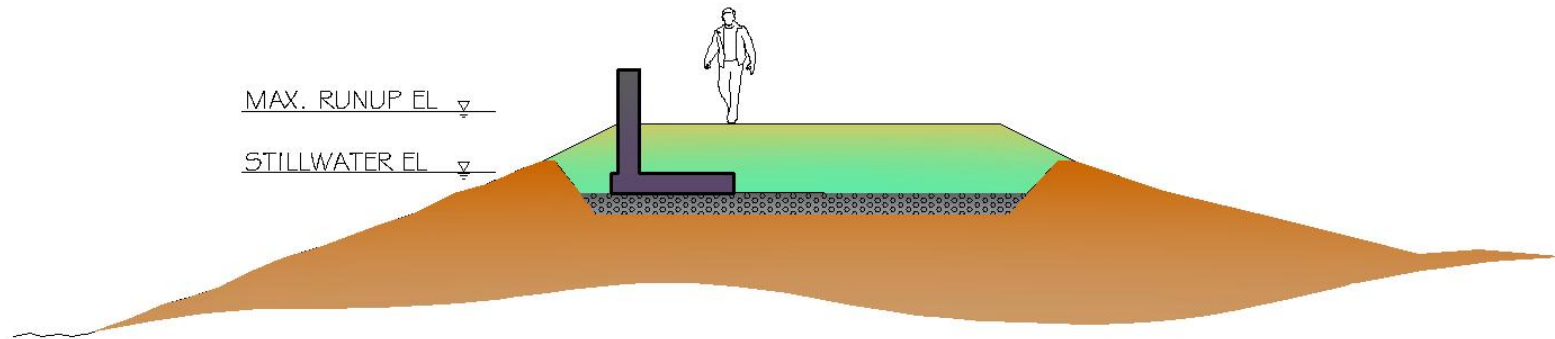


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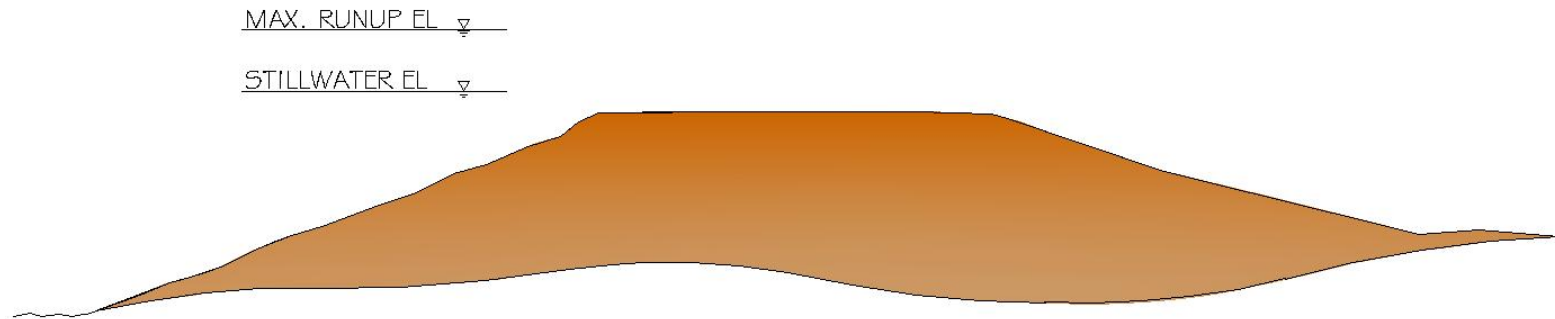


Used in constrained rights-of-way where sheet pile cannot be driven and the existing level of flood protection is not compromised during construction.

Proposed Levee Improvements

Hybrid Design

Used for roughly 70 percent of the improved six miles

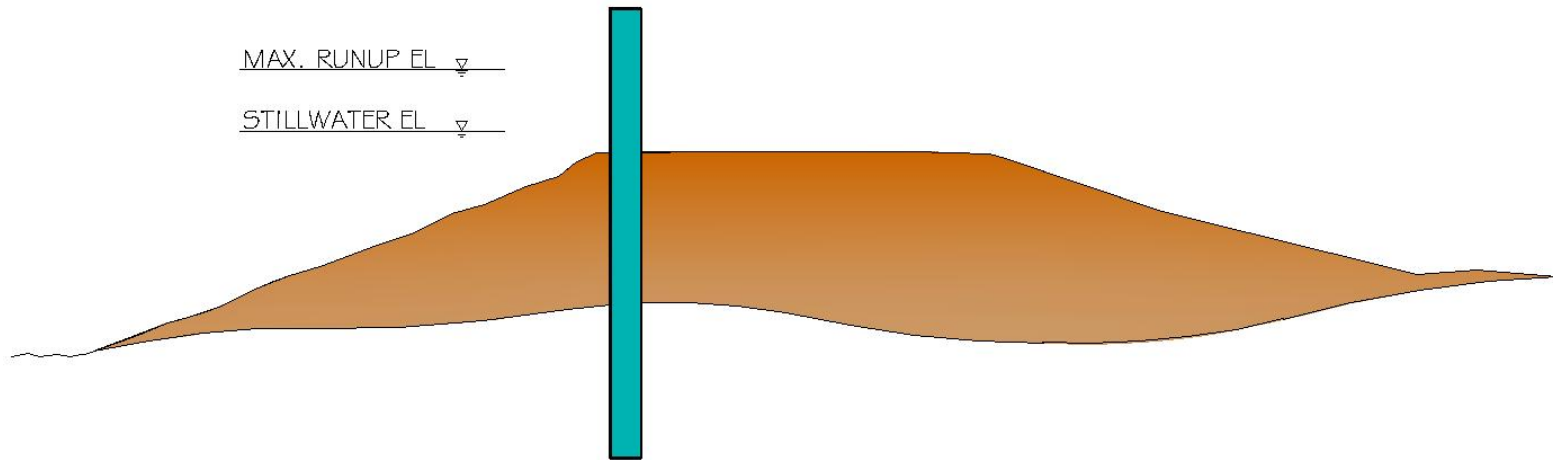


Used in constrained rights-of-way where sheet pile can be driven and the existing level of flood protection would be compromised during construction by building a conventional flood wall.

Proposed Levee Improvements

Hybrid Design

Used for roughly 70 percent of the improved six miles

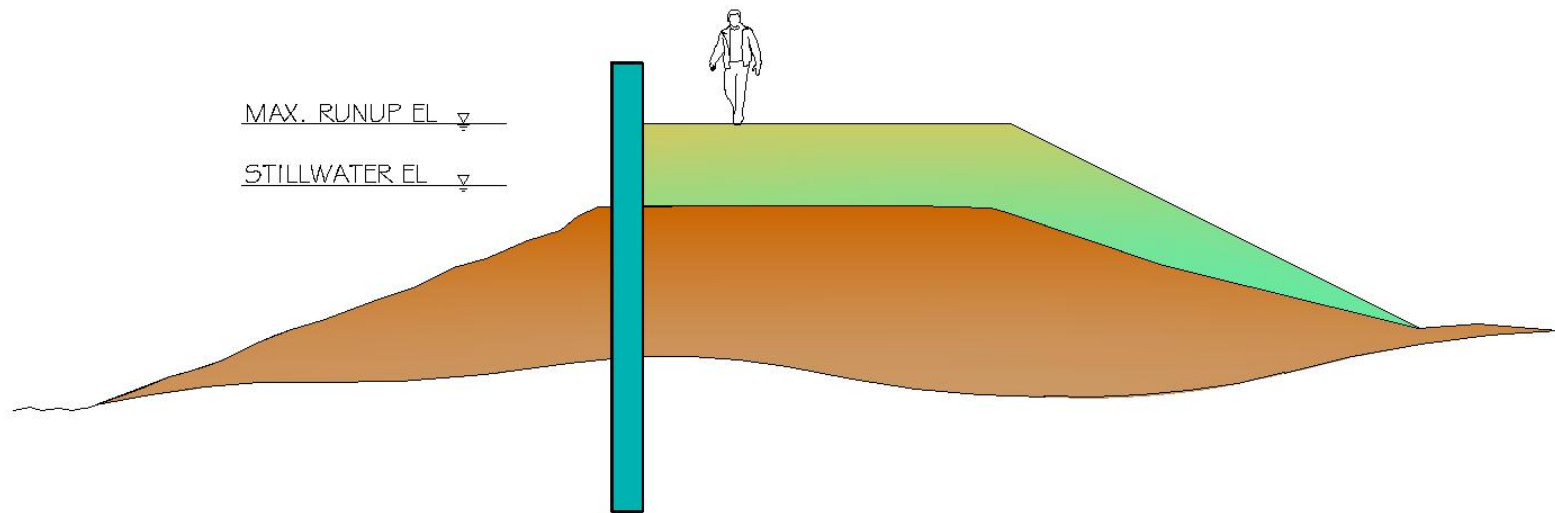


Flood protection is provided once sheet pile is driven to structurally-required depth.

Proposed Levee Improvements

Hybrid Design

Used for roughly 70 percent of the improved six miles



Fill to widen Bay Trail and maintain relatively short adjacent wall.

How much will this cost?

Project Alternative	Estimated Cost
1. FEMA Accreditation Only ¹	\$60 million
2. 2050 SLR ²	\$90 million
3. 2100 SLR ³	\$170 million

1. Does not meet regulatory requirements for permitting.
2. Assumes 80-year project life, possibly with future adaptation.
3. Not selected.

Project Impacts



Project Impacts

2050 SLR Project Scenario



Project Benefits

☐ FEMA Accreditation!

- 9,000 parcels in Foster City
- 8,000 parcels in San Mateo

☐ Bay Trail Improvements

- Widened to meet current Bay Trail Guidelines (18 feet)
- Better access to Trail and Bay (ADA-compliant)

☐ New Native Landscaping

☐ New Trail Amenities

Ongoing Design Concerns

❑ Aesthetics

- Views from adjacent properties and streets
- View from Bay and across Belmont Slough

❑ Graffiti

- Sheet piling fascia
- Coatings

❑ Disruption During Construction

- Bay Trail detour
- Noise and vibration (potential for “silent press” method)
- Existing utilities within levee footprint

Adaptation to Future Sea Level Rise

The project as designed is resilient to predicted sea level rise through 2050 with 99.5 percent confidence. How can it be adapted to possibly higher sea level rise beyond 2050?

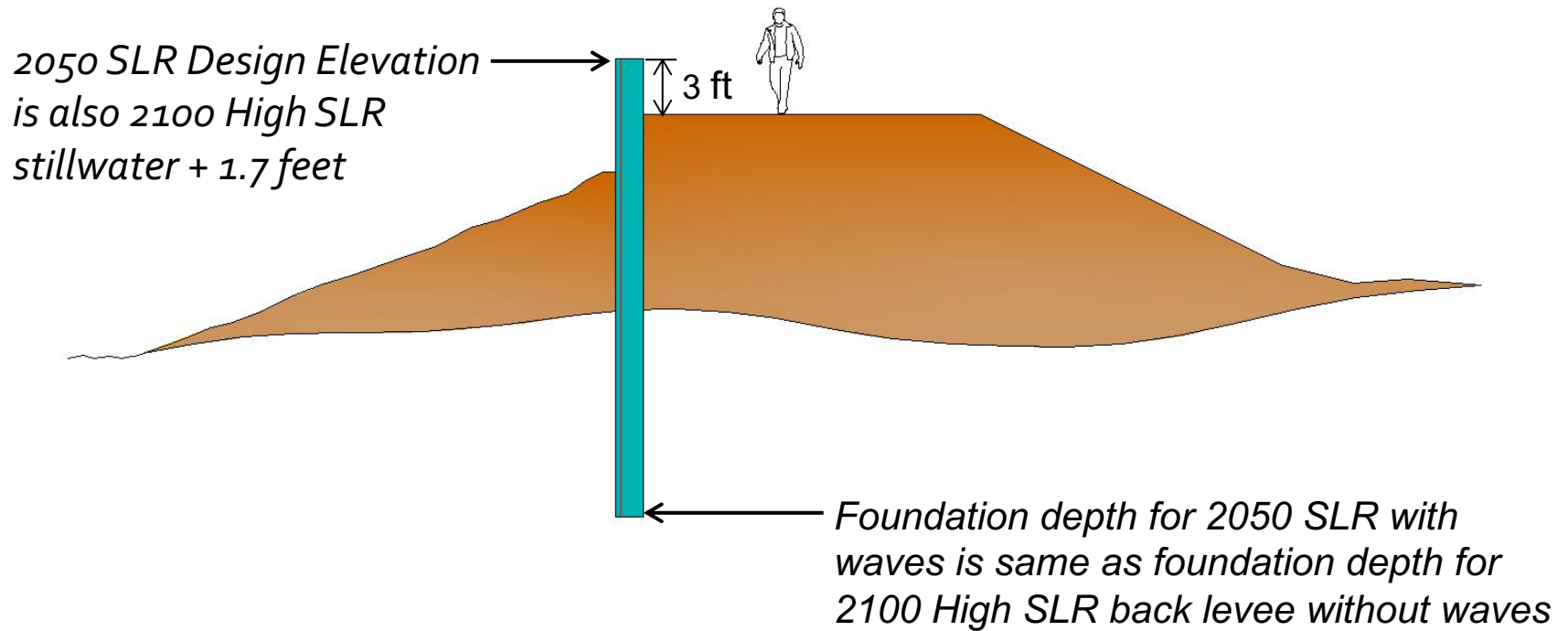
- ☐ Build another project in the future if and when it is needed
- ☐ Build a project designed for 2100 high range SLR now
- ☐ Adapt to rising sea level over time
 - Foundation depth for 2100 SLR now; add wall height later
 - Future anchor walls
 - Future offshore solutions

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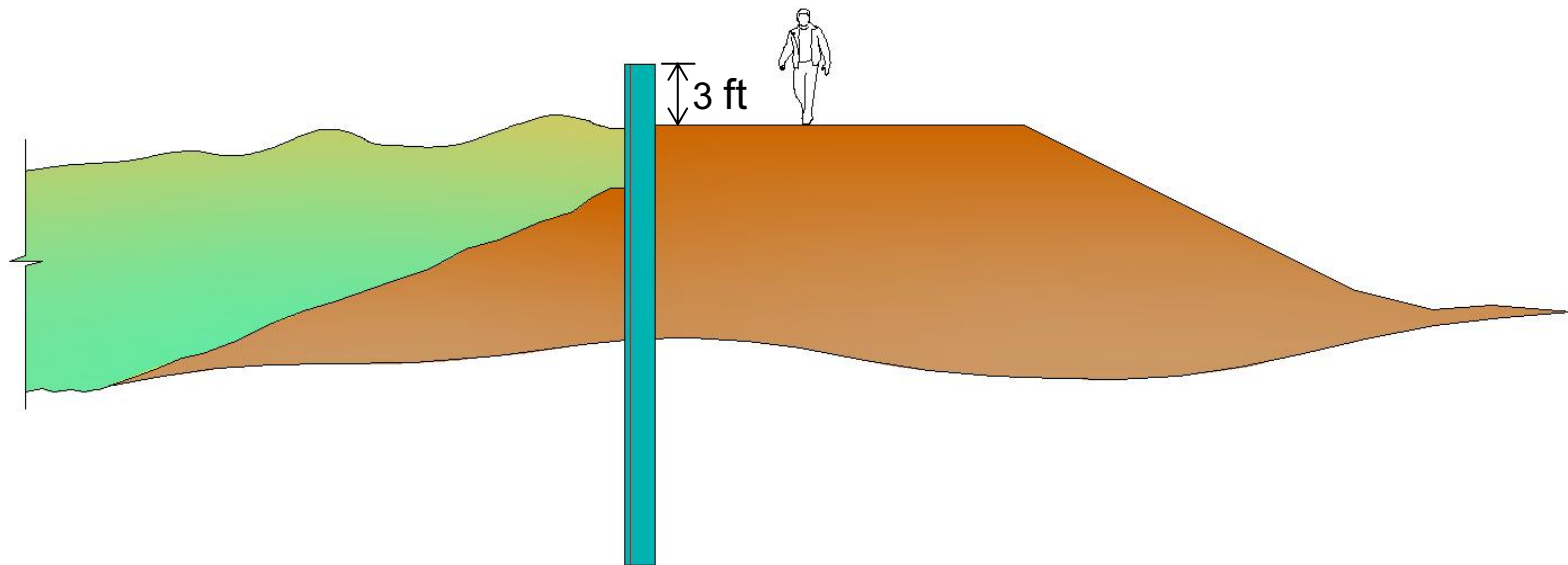
- ☒ ~~Build another project in the future if and when it is needed~~
- ☒ ~~Build a project designed for 2100 high range SLR now~~
- ☐ Adapt to rising sea level over time
 - Foundation depth for 2100 SLR now; add wall height later
 - ~~• Future anchor walls~~
 - Future offshore solutions

Those Darn Waves....



Adaptive Construction in Future

Adaptively build up offshore breakwater and beach forms



Future Adaptation to Rising Sea Levels



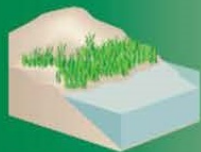
Future Adaptation

Source: NOAA

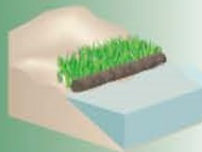


GREEN - SOFTER TECHNIQUES

Living Shorelines



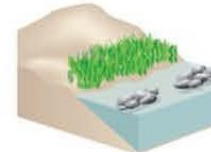
VEGETATION ONLY -
Provides a buffer to upland areas and breaks small waves. Suitable for low wave energy environments.



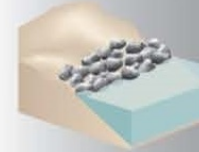
EDGING -
Added structure holds the toe of existing or vegetated slope in place. Suitable for most areas except high wave energy environments.



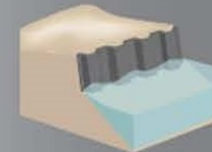
SILLS -
Parallel to vegetated shoreline, reduces wave energy, and prevents erosion. Suitable for most areas except high wave energy environments.



BREAKWATER -
(vegetation optional) - Offshore structures intended to break waves, reducing the force of wave action, and encourage sediment accretion. Suitable for most areas.



REVETMENT -
Lays over the slope of the shoreline and protects it from erosion and waves. Suitable for sites with existing hardened shoreline structures.



BULKHEAD -
Vertical wall parallel to the shoreline intended to hold soil in place. Suitable for high energy settings and sites with existing hard shoreline structures.

GRAY - HARDER TECHNIQUES

Coastal Structures

Future Adaptation

Why don't we pursue constructing a living shoreline (LS) now?

Regulatory Challenges

- Lack of LS data
- Beneficial Fill
- Suitable Materials
- Construction Methods/ Timing
- Sequential permits
- Long timeframes
- High cost



Source: California Coastal Conservancy

Environmental Regulatory Authorizations

State

- **San Francisco Bay Regional Water Quality Control Board:** 401 Water Quality Certification and Porter Cologne Act Waste Discharge Requirements
- **San Francisco Bay Conservation and Development Commission:** Development Permit
- **State Lands Commission:** Development Permit

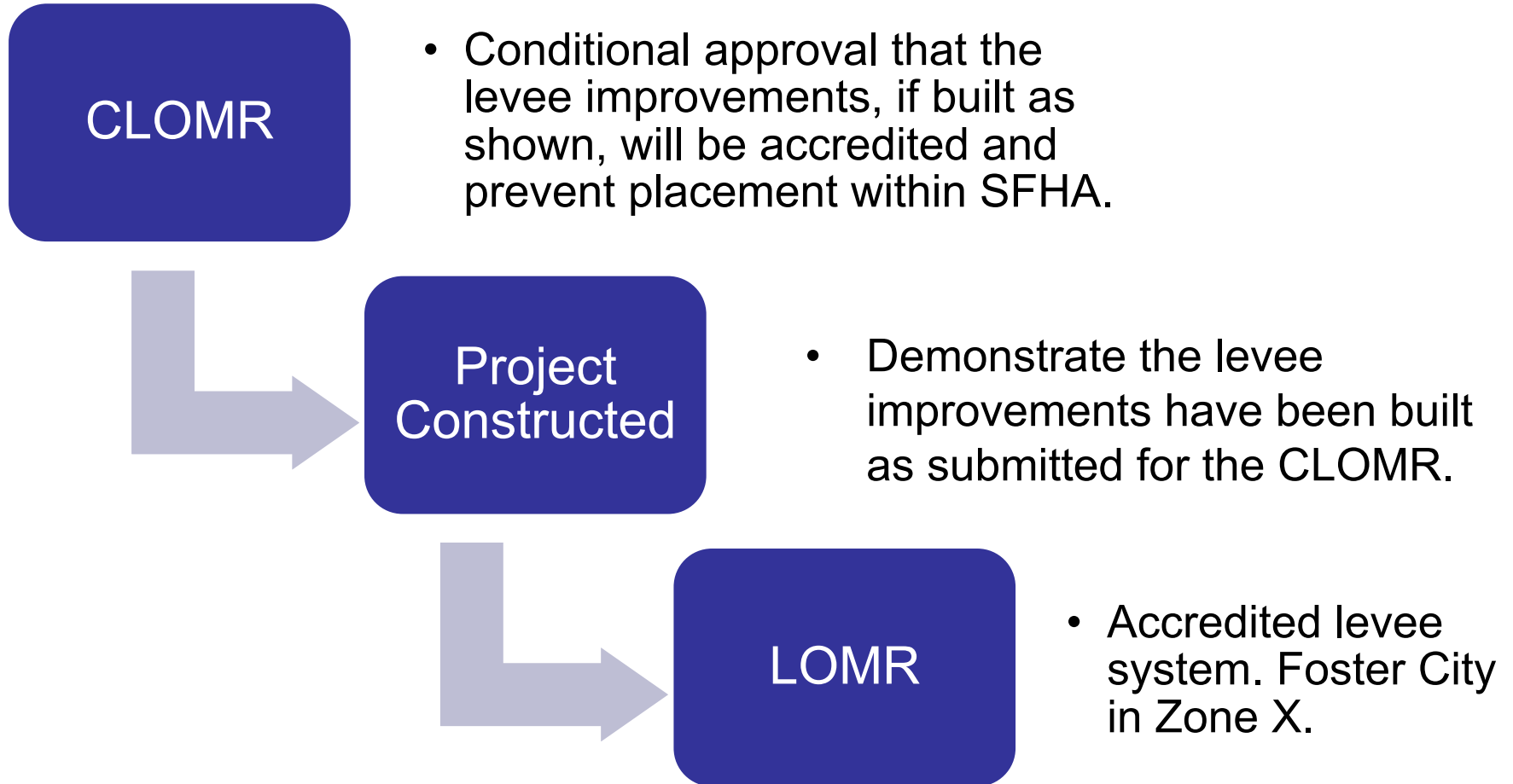
Federal

- **US Army Corps of Engineers San Francisco District:** Clean Water Act Section 404 and Rivers and Harbors Act Section 10 Permits

USACE Authorization Cannot be Obtained Without

1. Selecting the Least Environmentally Damaging Practicable Alternative
2. Providing adequate mitigation for unavoidable impacts
3. 401 Water Quality Certification from RWQCB
4. Compliance with the Coastal Zone Management Act from BCDC
5. Endangered Species Act Section 7 Biological Opinion from the US Fish and Wildlife Service
6. Endangered Species Act Section 7 Biological Opinion from NOAA Fisheries
7. Compliance with Magnuson-Steven Fisheries Management and Conservation Act
8. Compliance with Section 106 of the National Historic Preservation Act

FEMA Approval Process



Project Accomplishments to Date

July 2014	FEMA Completes Coastal Flood Study (CCAMP)
August 2014	City Surveys Existing Levees
March 2015	Detailed Evaluation of CCAMP Results
July 2015	Levee Protection Planning Study
August 2015	Presentation to Regulatory Agencies and Government Officials
October 2016	Basis of Levee Design
November 2016	Draft Environmental Impact Report
April 2017	Final Environmental Impact Report
May 2017	Council Directs Staff to Proceed with Design
July 2017	Begin Ballot Measure Polling
August 2017	60% Design Documents
September 2017	Ballot Measure Polling Completed

Remaining Schedule

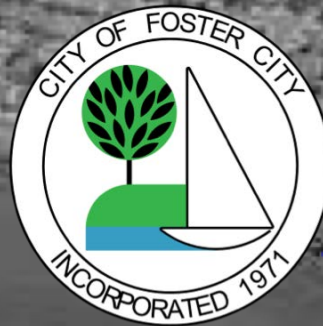
September 2017	Update Regulatory Agencies and Government Officials
Fall 2017	Submit Regulatory Permit Applications
Fall 2017	Obtain FEMA Approval of Design
March 2018	Complete 90% Design Documents
February 2018	Ballot Measure Resolution of Necessity
March 2018	Adopt Ordinance for Ballot Measure
June 2018	Ballot Measure for Voter Approval
August 2018	Advertise for Bid
October 2018	Award Construction Contract
January 2019	Begin Construction
Summer 2021	Project Completion



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