

Basis of Design Overview

Foster City Levee Improvements
CIP 301-657

Presentation to Council
October 17, 2016

Schaaf & Wheeler
CONSULTING CIVIL ENGINEERS



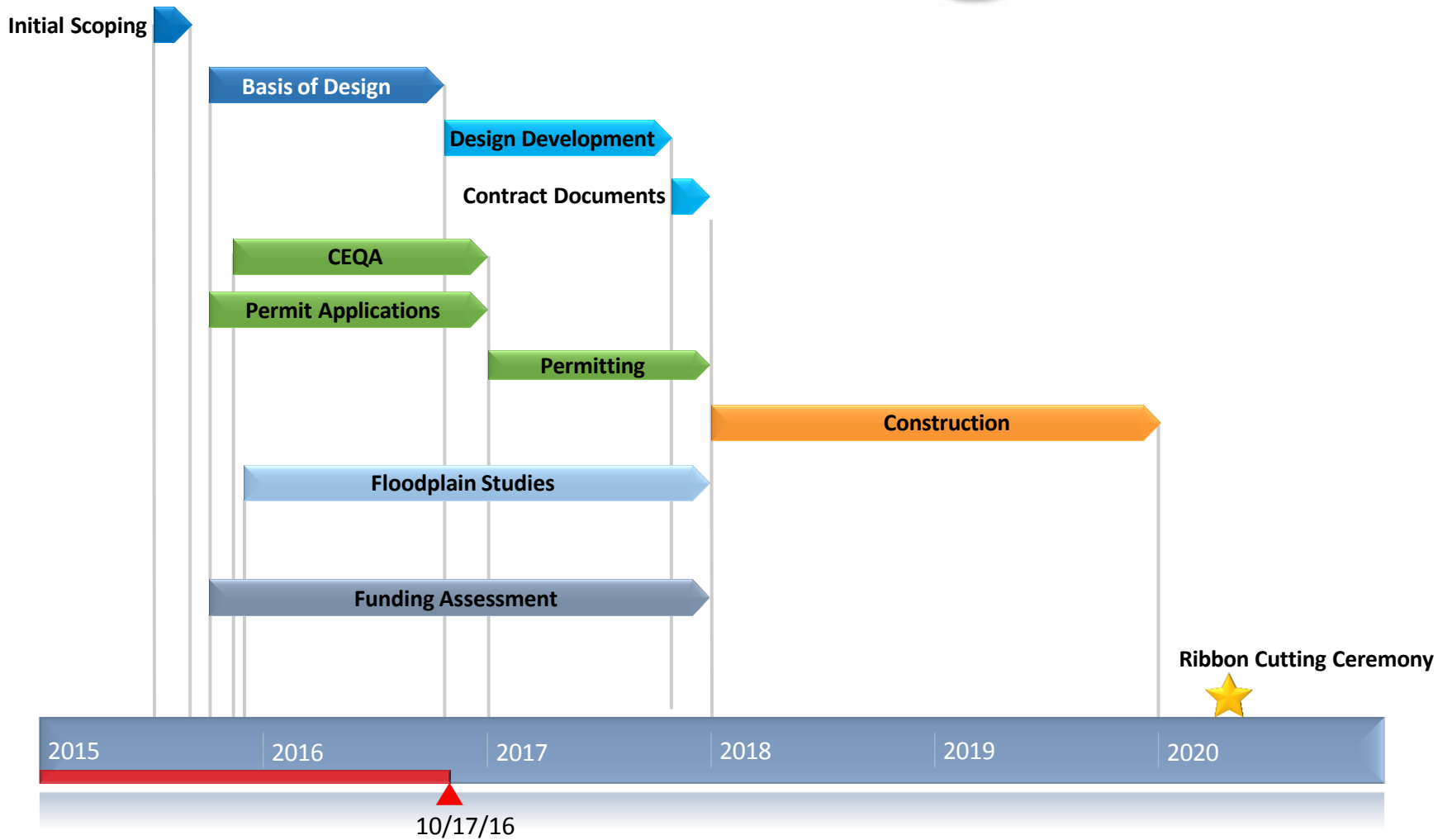
Foster City Levee Improvement Project

Milestone Schedule

Updated 10/17/16



City of
Foster City



Basis of Design

- Project Purpose
- Project Constraints
- Design Criteria
- Screen Project Alternatives
 - Environmental Impact
 - Feasibility
- Project Cost
- Project Schedule



Major Decisions

← BACK TO CITY

PUBLIC WORKS
HOME

WATER
DISTRIBUTION

WASTEWATER
COLLECTION

LAGOON
& LEVEE

STREETS &
STORM DRAINS

ENGINEERING &
CONSTRUCTION

RECYCLING
& GARBAGE



Contact Us

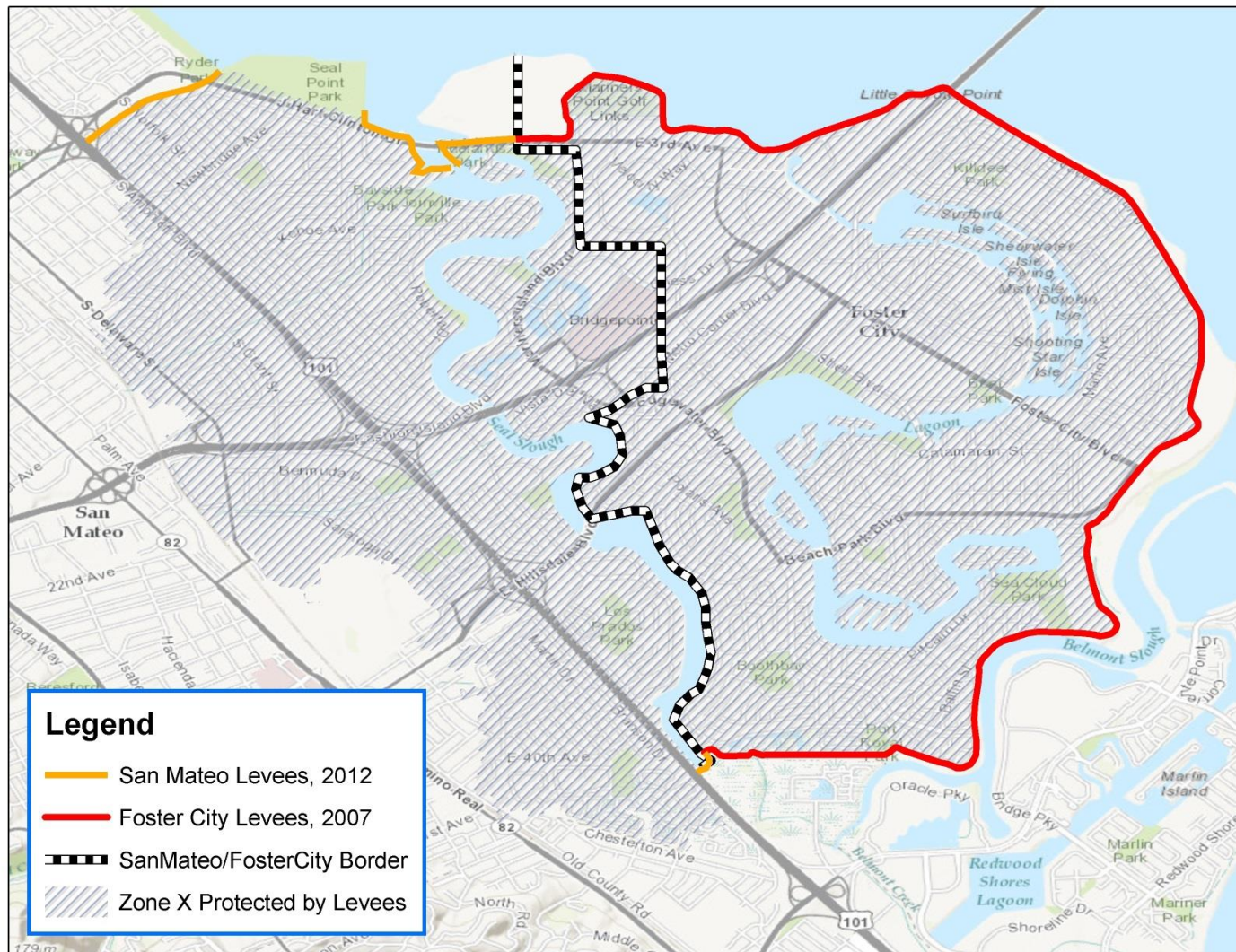
Search

- 1. Initial Levee Elevations**
- 2. Adaptive Resiliency**

Google earth

1 mi

Project Purpose

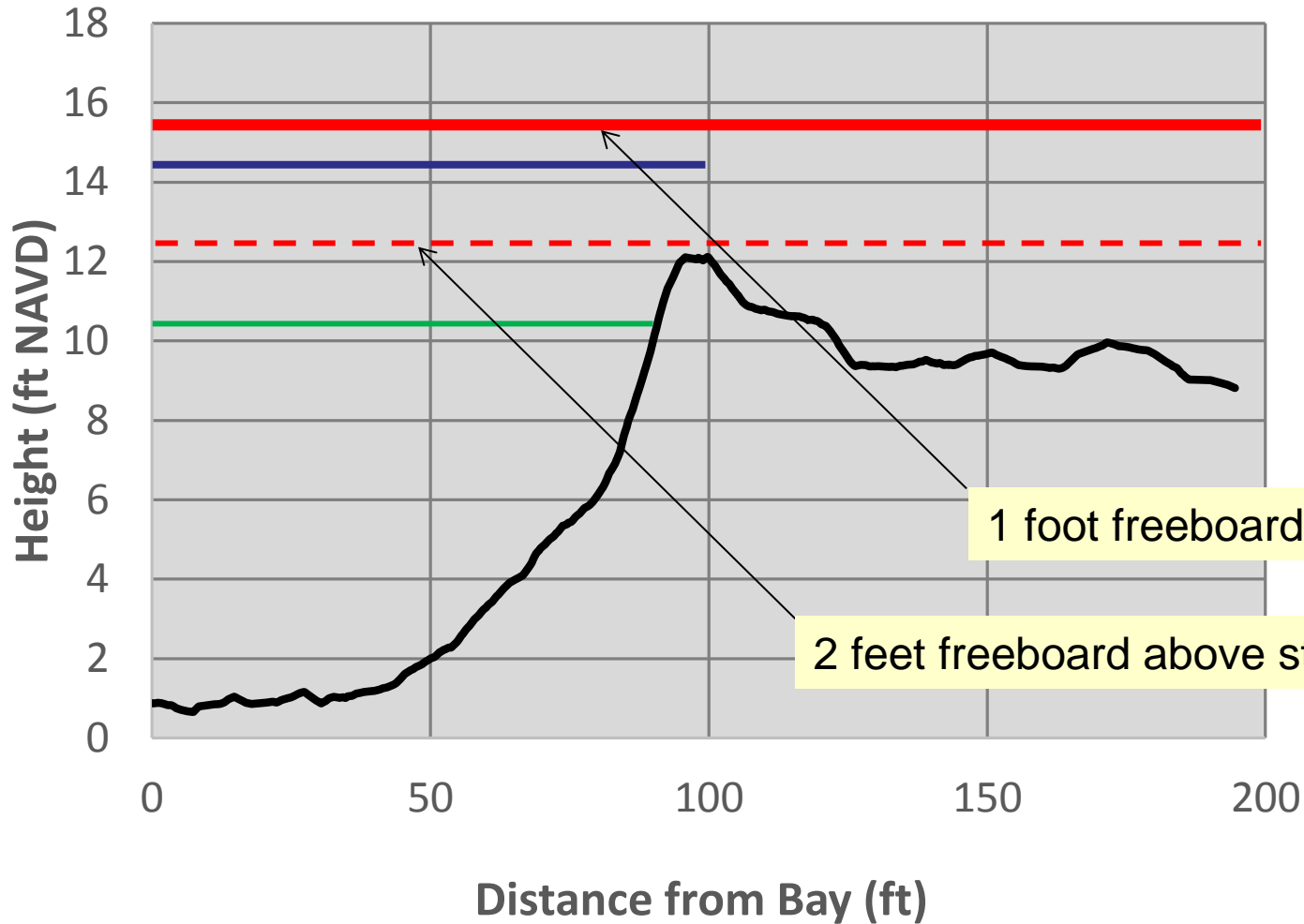


Google earth

1 mi

Regain FEMA Accreditation

Station 81+00



Existing Ground

1 foot freeboard above wave runup

2 feet freeboard above storm surge

Project Constraints

- Bay trail
- Views
- Environmental impact (9 major regulatory permits)
- Available public right-of-way
- Public access to trail and Bay
- SFO glide path and ILS marker
- San Mateo Bridge
- Schedule
- Birds, mice, fish, stray cats.....
- **FEMA Accreditation**

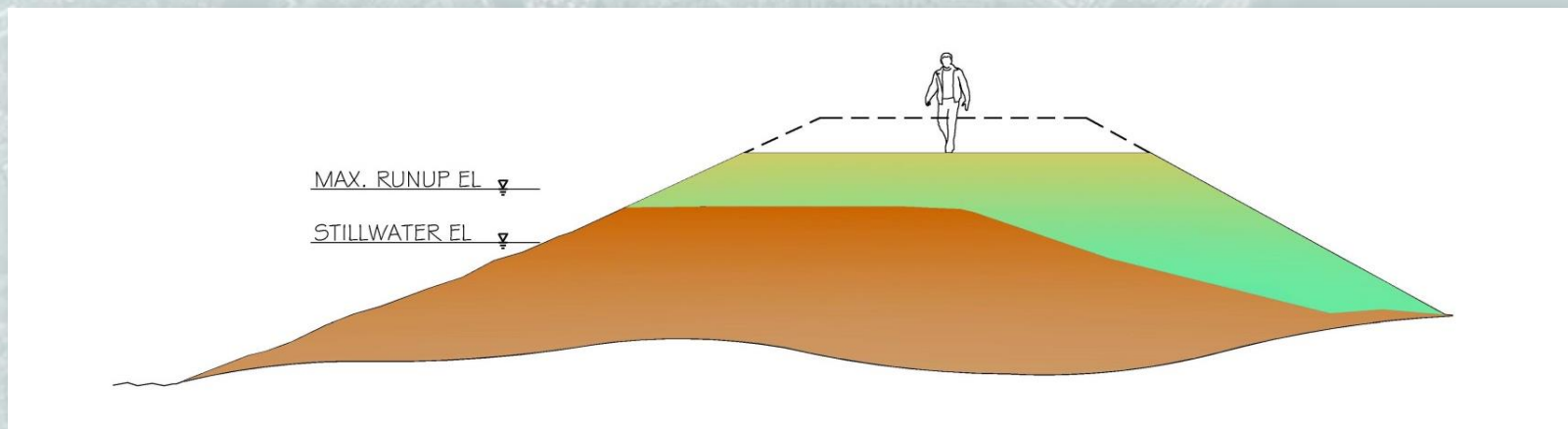
Google earth

1 mi



Project Alternatives

- Earthen Levees



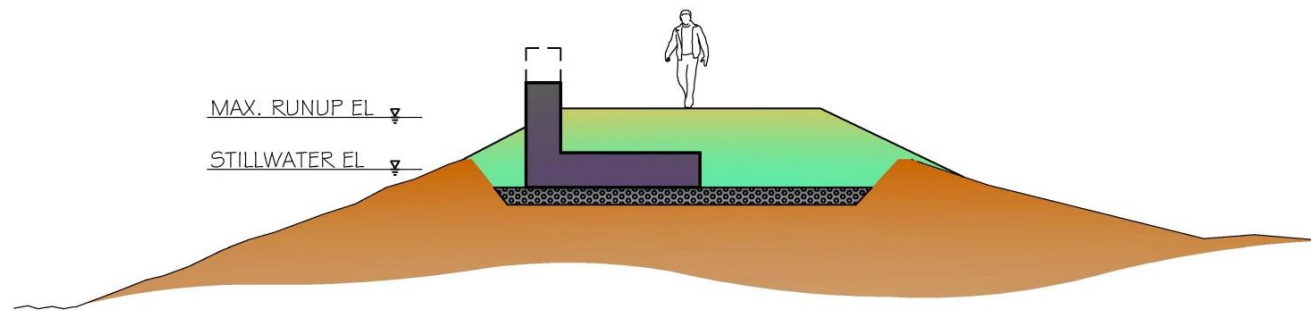
Google earth

1 mi



Project Alternatives

- Earthen Levees
- **Flood Walls**

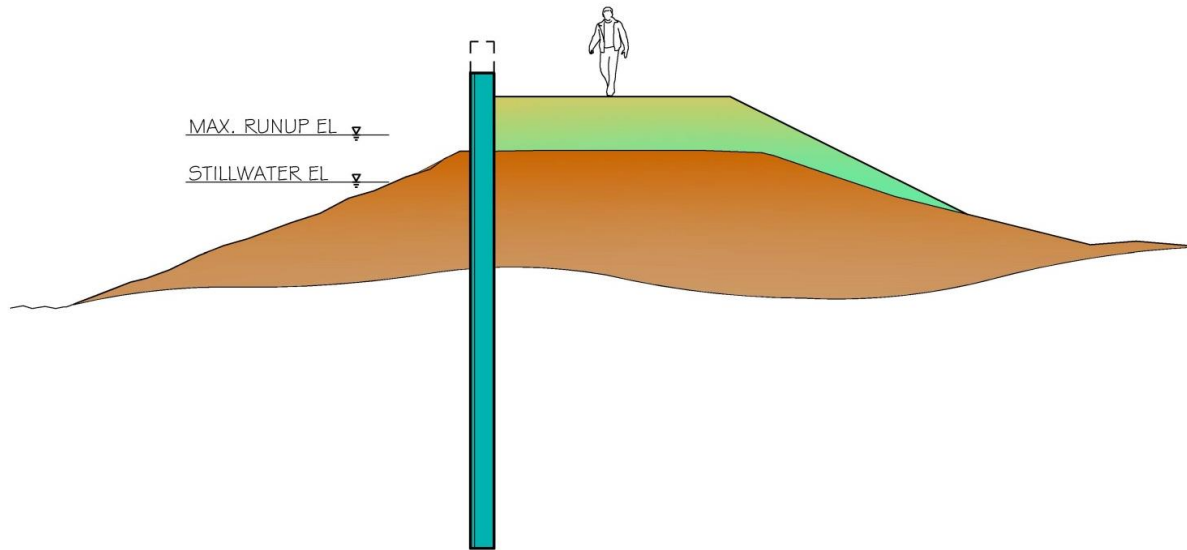


Google e



Alternatives

- Earthen Levees
- Flood Walls
- Hybrid Sheet Pile Walls



Project Alternatives

- Earthen Levees
- Flood Walls
- Hybrid Sheet Pile Walls
- **Horizontal Levee**



Google earth

1 mi

Levee Improvement Types

- Earthen Levee
- Conventional Floodwall
- Hybrid Sheet Pile Wall



Subsurface Exploration

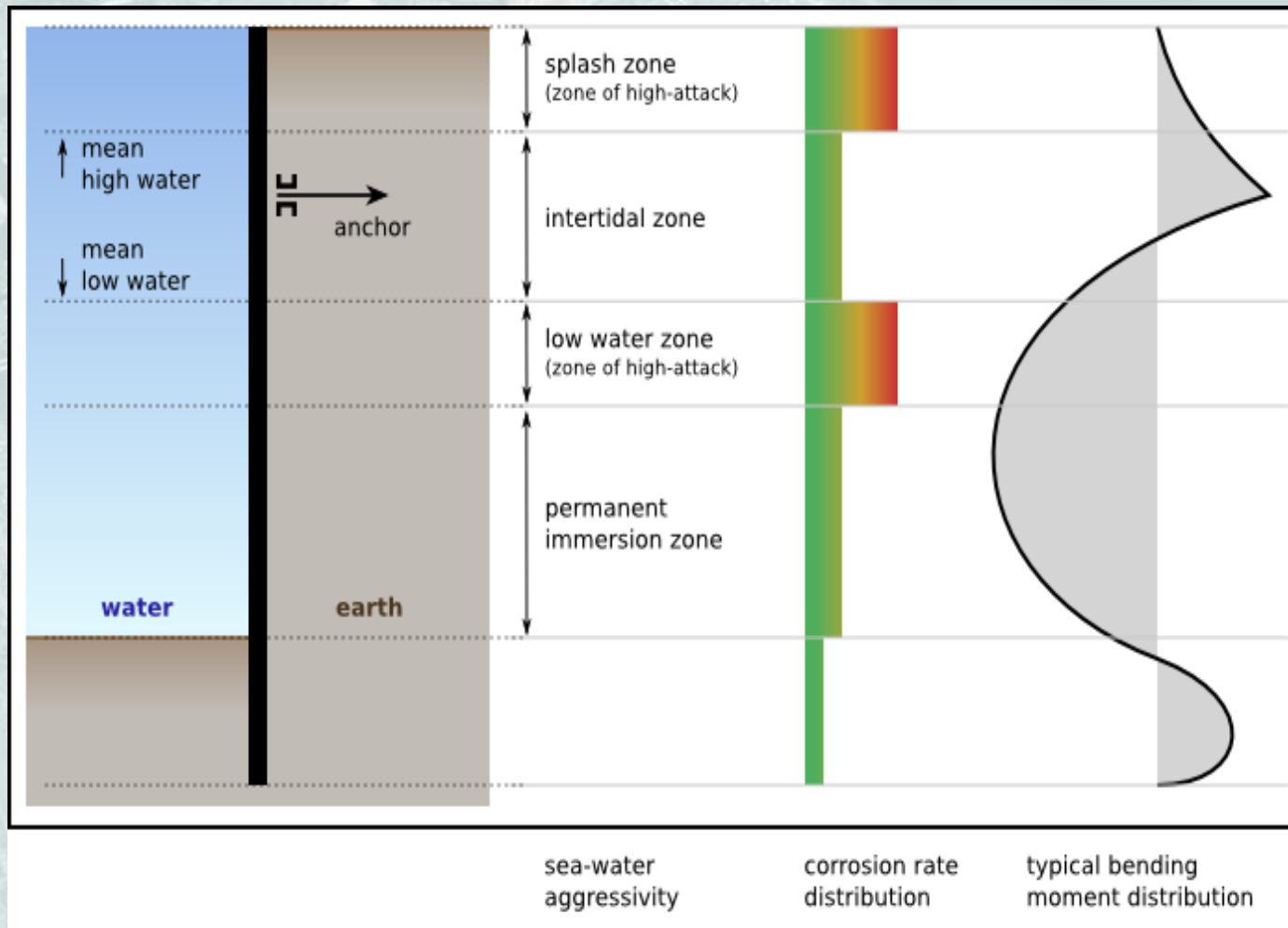
Minimum Pile Embedment (Slough)

Minimum Pile Embedment (Bay)

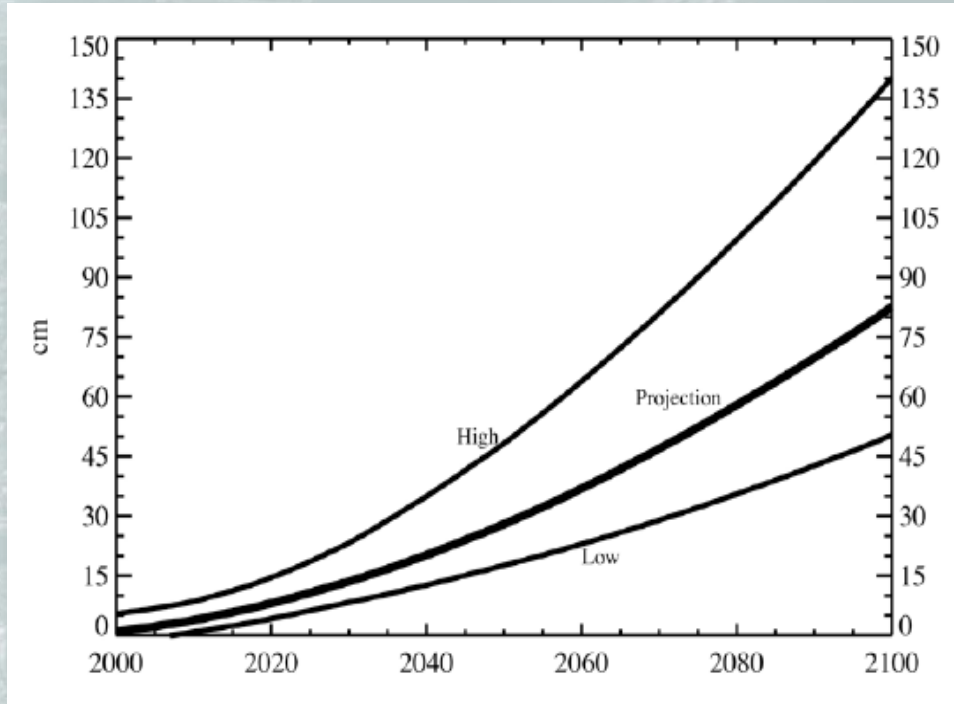
ENGEO INCORPORATED		LOG OF BORING 2-B1													
Geotechnical Exploration Levee Improvements Project Foster City, California 8602.001.000				DATE DRILLED: 3/22/2016 HOLE DEPTH: Approx. 66½ ft. HOLE DIAMETER: 7.0 in. SURF ELEV (NAVD 88): Approx. 12 ft.			LOGGED / REVIEWED BY: M. Clark / A. Firmin DRILLING CONTRACTOR: Pitcher Drilling DRILLING METHOD: HSA/Mud Rotary HAMMER TYPE: 140 lb. Auto Trip								
Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits								
							Liquid Limit	Plastic Limit	Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (pcf) field approximation	Uncorrected Strength (tsf) field approximation	Strength Test Type
			Gravel shoulder on waterside of pedestrian trail. Hollow stem auger drilling used to start boring.												
10			CLAYEY SAND (SC), dark brown, medium dense, moist, with fine gravel (FILL)												
			POORLY GRADED SAND (SP), yellowish brown, medium dense, moist, with fine to coarse gravel (FILL)			25			0						
5			FAT CLAY WITH SAND (CH), dark grayish brown, stiff, moist, some shell fragments (FILL)			12	65	25	40	81	45.6	74.9	1.25'	0.45'	PF UC
5			LEAN CLAY WITH SAND (CL), dark reddish brown, stiff, moist (FILL)												
10			FAT CLAY (CH), grayish green mottled with very dark brown, soft, wet (YOUNG BAY MUD) Switch to mud rotary drilling at approximately 9.5 feet below existing grade.			7					52.8	67.3	1.00'		PF
10			FAT CLAY (CH), grayish green mottled with very dark brown, soft, wet, trace organics								74.9	54.3	410*		LVS TV
						100 psi									



Design Life of Sheet Piles



Sea Level Rise Criterion



FEMA

FEMA + 2050 SLR

FEMA + 2100 SLR

Time Period	Projection (inches)	Range (inches)	Adopted (inches)
2000 – 2030	6±2	2 to 12	---
2000 – 2050	11±4	5 to 24	15
2000 – 2100	36±10	17 to 66	46

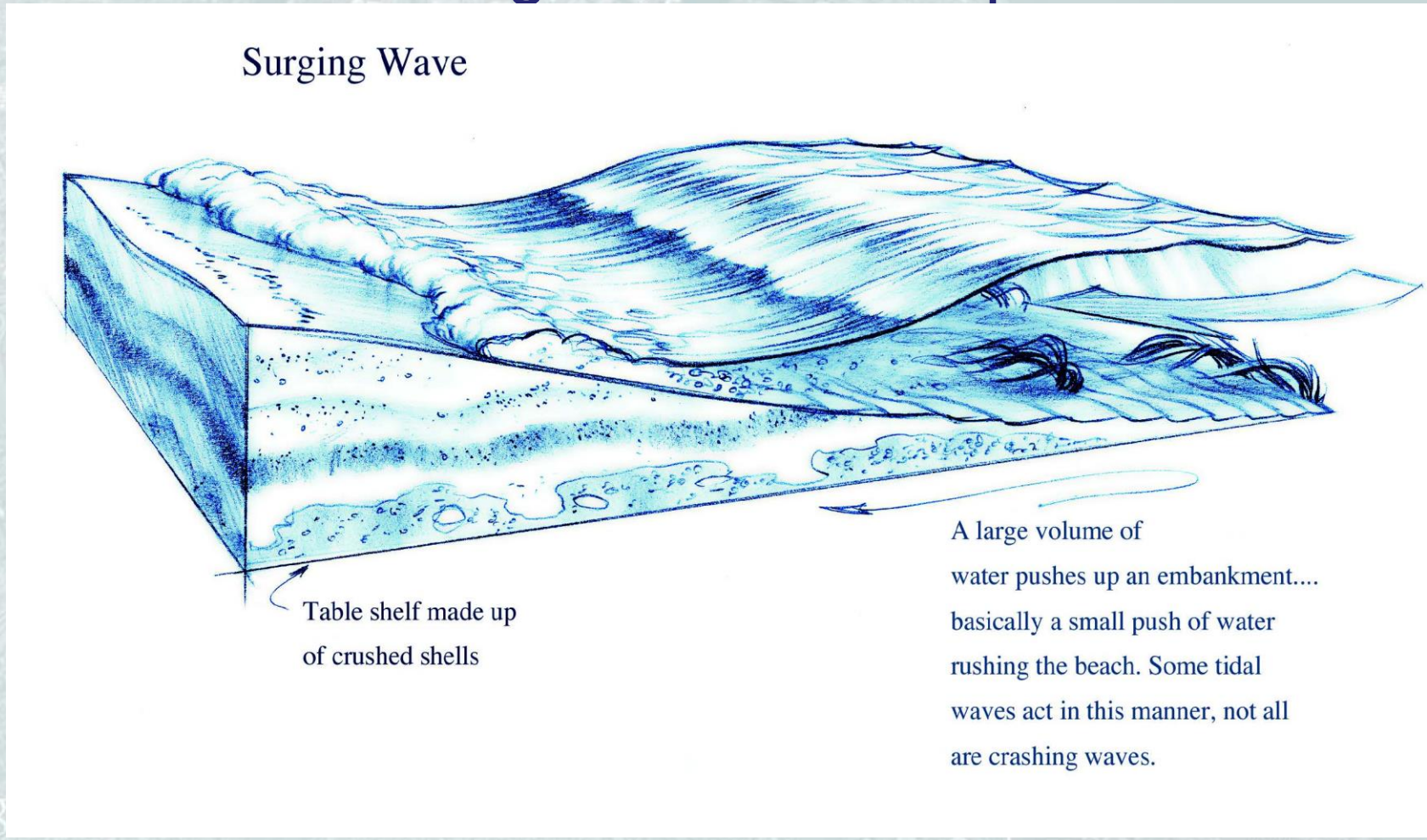
Google earth

1 mi



Horizontal Levee Concept

- Wave Shoaling on a Mild Slope



Horizontal Levee Concept

- The proposed Marina Project developer presented to the City their concept of the “Hybrid Horizontal Levee”, which consists of the concept shown on the website “stopthemonsterwall.org”
- The Project Team met with SFEI, Mark Holmes, on 5/26/16, to hear the concept and explore the potential applicability of using a horizontal levee system as part of our project
 - Typically for Salt Marsh Restoration
 - Does not appear to be practical for Foster City
- The horizontal levee is still being considered as an alternative in the EIR
- The public will have an opportunity to review and comment on the analysis of each option. The Council will consider the impacts identified in the EIR and the public input before making a decision on how to proceed.
- Horizontal Levee – Historically has not been accredited by FEMA
- EIR will explore impacts to alternatives presented (Adopt Jan 2017)
- February 2017 – Council will provide direction on height and method of providing flood protection

Google earth

1 mi



Most Applicable
Potentially Applicable
Not Applicable
Already Wetland



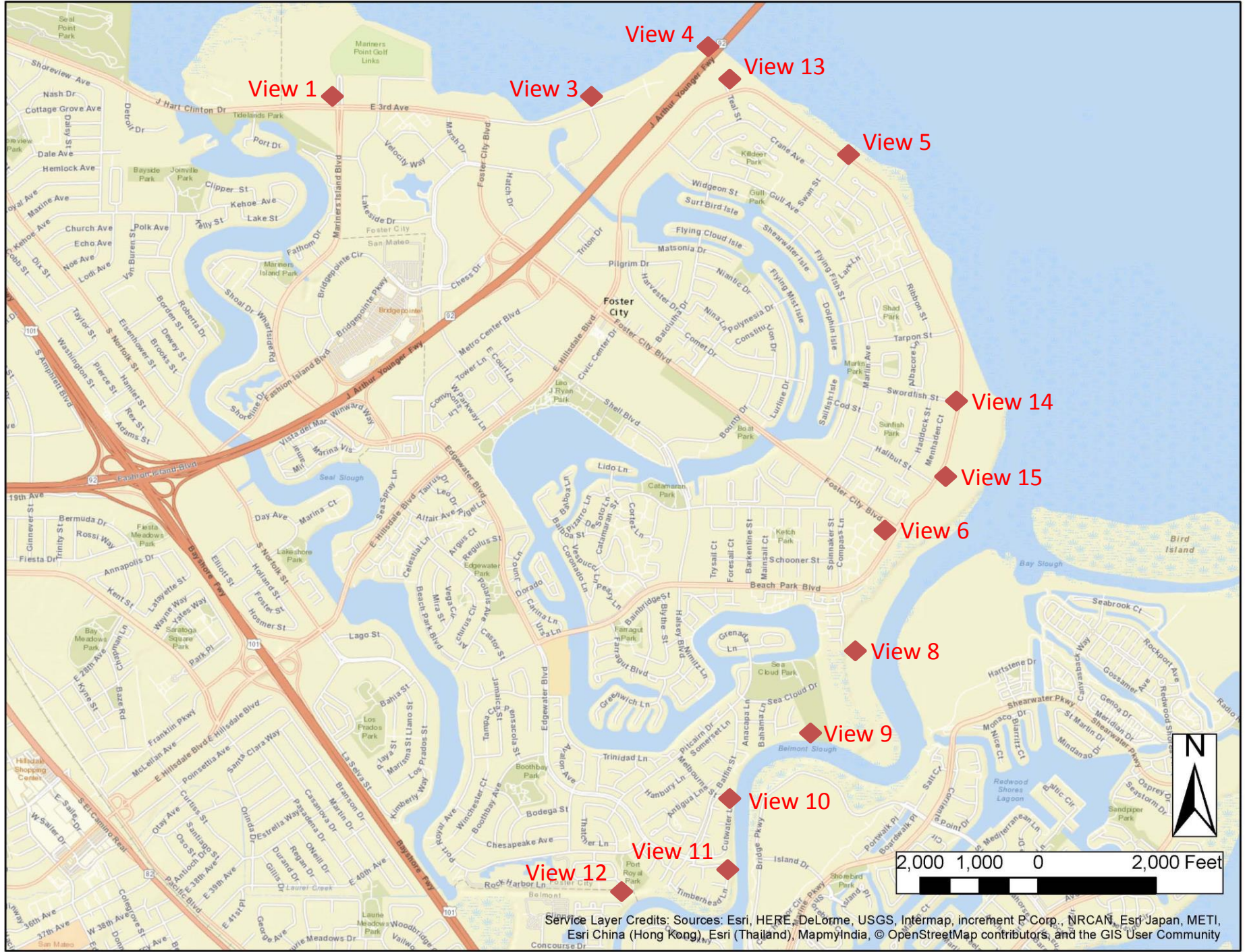
First Big Decision

- Set Initial Levee Elevation
 - FEMA Accreditation (minimum)
 - 2050 Sea Level Rise (30-year design life)
 - 2100 Sea Level Rise (80-year design life)
 - TBD February 2017 by City Council
- Views

Google earth

1 mi





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View 1 (East Third Avenue)



EXISTING VIEW
TRAIL: EXISTING
TRAIL: EXISTING

Existing View

View 1 (East Third Avenue)



2050 SLR

View 1 (East Third Avenue)



2100 SLR

View 3 (Lincoln Center)



Existing View



View 3 (Lincoln Center)



2050 SLR



View 3 (Lincoln Center)



2100 SLR



View 4 (San Mateo Bridge)



Existing View

NAVD 88.22.0

EXISTING LEVEL
TRAIL 2050 SLR

16.0
15.0
14.0
13.0
12.0
11.0
10.0
09.0
08.0

View 4 (San Mateo Bridge)



Land Side Wall – 2050 SLR

View 4 (San Mateo Bridge)



Land Side Wall – 2100 SLR

View 13 (Bridgeview Park)



Existing View

View 13 (Bridgeview Park)



2050 SLR

View 13 (Bridgeview Park)



2100 SLR

View 5 (Sanderling Street)



Existing View

Google Earth

1 mi

View 5 (Sanderling Street)



22.0 NWD 88
21.0
20.0 TRAIL 2100
19.0
18.0
17.0
16.0 TRAIL 2050
15.0 TRAIL EXISTING

NWD 88 22.0
21.0
20.0 TRAIL 2100
19.0
18.0
17.0
16.0 TRAIL 2050
15.0 TRAIL EXISTING

2050 SLR

Google earth

1 mi

View 5 (Sanderling Street)



2100 SLR

Google earth

1 mi

View 5 (Sanderling Street)



Existing View from Second Story

View 5 (Sanderling Street)



2050 SLR from Second Story

View 5 (Sanderling Street)



2100 SLR from Second Story

View 14 (Swordfish Street)



Existing View



Google earth

1 mi

View 14 (Swordfish Street)



2050 SLR



Google earth

1 mi

View 14 (Swordfish Street)



2100 SLR

Google earth

1 mi

View 14 (Swordfish Street)



Existing View from Second Floor

View 14 (Swordfish Street)



2050 SLR from Second Floor

View 14 (Swordfish Street)



2100 SLR from Second Floor

View 15 (Shorebird Park)



Existing View

View 15 (Shorebird Park)



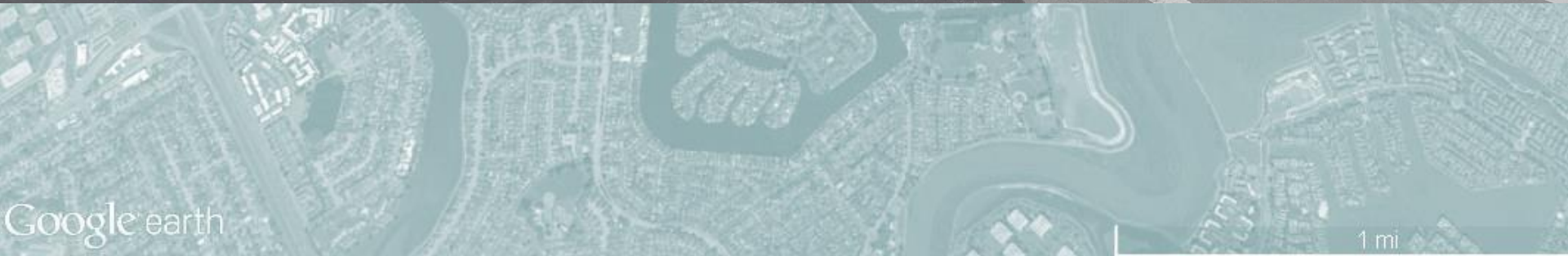
2050 SLR

View 15 (Shorebird Park)

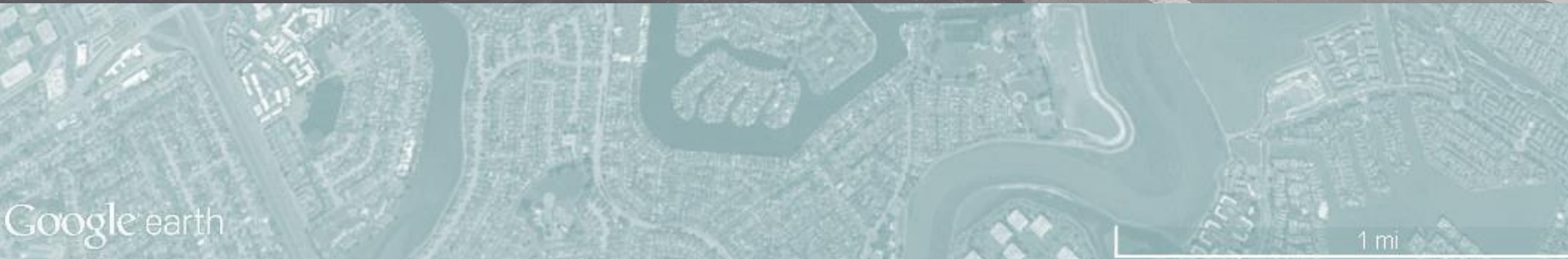


2100 SLR

View 6 (Foster City Boulevard)



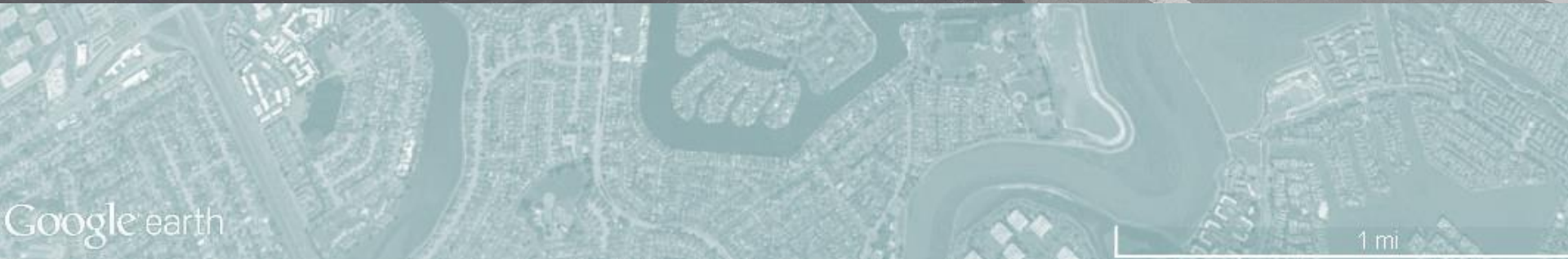
View 6 (Foster City Boulevard)



View 6 (Foster City Boulevard)



2100 SLR



View 8 (Wheel House Lane)



Existing View

View 8 (Wheel House Lane)



2050 SLR

NO PARKING FIRE LANE
NO PARKING FIRE LANE

View 8 (Wheel House Lane)



2100 SLR

View 9 (Sea Cloud Park)



Existing View

View 9 (Sea Cloud Park)



22.0 NAVD 88
21.0
20.0
19.0
18.0
17.0
16.0
15.0
14.0
13.0
12.0
11.0
10.0
09.0
08.0

EXISTING LEVEL
TRAIL EXISTING
TRAIL 2050 SLR

2050 SLR

View 9 (Sea Cloud Park)



2100 SLR

View 10 (Cutwater Lane)



Existing View from Second Floor

View 10 (Cutwater Lane)



2050 SLR from Second Floor

View 10 (Cutwater Lane)



2100 SLR from Second Floor

View 11 (Between Cutwater Ln and Timberland Ln)



Existing View



Google earth

1 mi

View 11 (Between Cutwater Ln and Timberland Ln)



2050 SLR



View 11 (Between Cutwater Ln and Timberland Ln)



2100 SLR

NAD 88 22.0
21.0
20.0
19.0
18.0
EXISTING LEVEL
TRAIL 2100 SLR
TRAIL EXISTING 17.0
TRAIL 2050 SLR
10.0
09.0
08.0



Google earth

1 mi

View 12 (Port Royal Park)



NAVD 88 22.0

21.0

20.0

19.0

18.0

17.0

16.0

15.0

14.0

13.0

12.0

11.0

10.0

09.0

08.0

EXISTING LEVEL

TRAIL EXISTING

TRAIL 2050 SLR

Existing View

View 12 (Port Royal Park)



NAVD 88 22.0

21.0

20.0

19.0

18.0

17.0

16.0

15.0

14.0

13.0

EXISTING LEVEL

12.0

11.0

TRAIL EXISTING

TRAIL 2050 SLR

10.0

09.0

08.0

2050 SLR

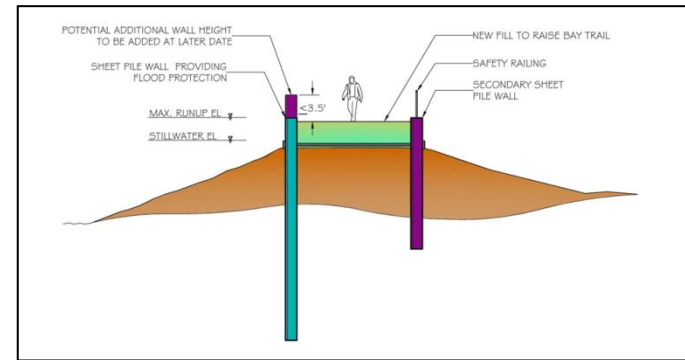
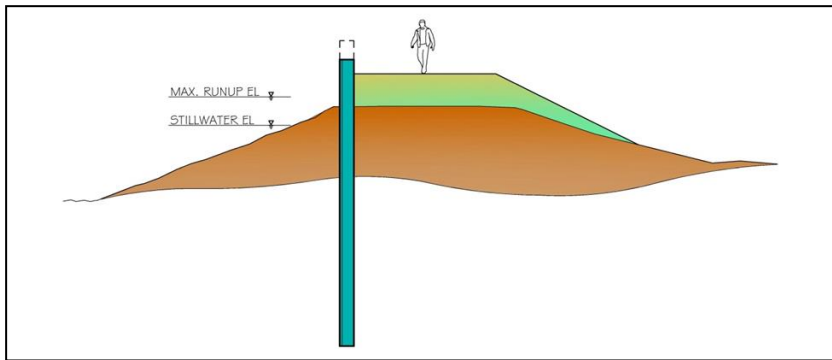
View 12 (Port Royal Park)



2100 SLR

Second Big Decision

- Resiliency
 - Adapt to Sea Level Rise over 80 years



Horizontal levees are not easily adaptable to changing sea level.

Project Alternatives Matrix

Set Levee Elevation for	Increase in Levee Height (feet)	Project Cost for Hybrid Design	Project Cost for Horizontal Levee
FEMA Accreditation	0 - 4	\$60,000,000	\$145,000,000 plus land acquisition
2050 SLR (15 inches)	2 - 7	\$70,000,000	\$150,000,000 plus land acquisition
2050 SLR plus Adaptability	2 - 7	\$90,000,000	\$150,000,000 plus land acquisition
2100 SLR (46 inches)	5 - 10	\$170,000,000	\$290,000,000

Milestone Schedule

DRAFT LEVEE WORK PLAN SCHEDULE

<u>Item</u>	<u>Date</u>
Present Basis of Design (informational) to City Council <ul style="list-style-type: none">Draft Public Survey on Financial Options to CC	10/17/16
Meet with Marina frontage residents	October 2016
EIR Adopted by City Council	January 2017
Approval of Vertical Height by City Council	February 2017
Meet with Community on 60% Design, X-Sections, and Survey	March 2017
Send out Public Survey on Financial Options	April 2017
Meet with Community on 85% Design and Aesthetics	May 2017
Present results of Public Survey on Financial Options to CC	May 2017
Approval of Final Design by CC	June 2017
Ballot Measure on Financing Options	November 2017
Authorize Advertisement of Project for Construction by CC	January 2018
Permitting Completed	February 2018
Award of Contract for Construction by CC	March 2018
Commencement of Construction of Levee	April 2018
Assessment to Property Owners (if approved)	August 2018
Project Completion (approx. 2 years duration)	Summer 2020
Notice of Completion by CC	Summer 2020

Notes

Community Meetings

Council Meetings

Misinformation

- **Foster City Islander**
- **Article** - “the new City Levee/seawall will be about twelve feet along the Foster City’s southern border with Belmont increasing to a height of 16 feet high for most of the rest of the levee until just past the golf course, where the height would be about 13 feet.”
 - Clarification – Reference should have been made to elevation relative to Mean Sea Level
 - The existing levee is already 13 feet at the location referenced where the FEMA requirement is 16 feet = 3 feet increase
 - The existing levee is 12 to 13 feet at the reference levee area at the southern border where the FEMA requirement is approximately 12.5 feet = 0.5-1.0 foot increase in this area.
- **Letter to the Editor** – “My understanding is that they plan to use a steel structure that could reach 10 or more feet above the ground in some places.”
 - Clarification – Reference should have been made to elevation relative to Mean Sea Level. Exposed wall will be approximately 3 feet tall

Misinformation

- **Stopthemonsterwall.org**
- Website – “the City plans to build a wall approximately 12-16 foot tall around the shoreline. There is no doubt that something must be done to address the levee... But a 12-16 Foot Wall is NOT the Only Option!”
 - Clarification – The wall will not be 12-16 feet tall. The exposed wall will be approximately 3 feet tall as shown on the Power Point Renderings.
- Website - One very disturbing thing is that during a planning meeting some environmentalists from the San Francisco Bay Institute had attended to explain the Hybrid Horizontal Levee including information about the one that they have built in the SF Bay and the Planning Board said that it was not pertinent and were not allowed to speak they were cut off. In a public meeting, this type of action is not permissible and may even be illegal. Why wouldn't a Horizontal Levee be considered where it is possible to do? Why would the Planning Board not even listen to that possibility?
 - the project team met with Mark Holmes of the San Francisco Bay Institute on May 26, 2016 to hear his presentation and explore the potential applicability of using a horizontal levee system as part of the Foster City Levee Protection Planning and Improvement Project (CIP 301-657).

How High Do They Need to Be?

9

Required Top of Levee Elevations to meet
Current FEMA Freeboard Requirements

All Elevations in
Feet NAVD



QUESTIONS?

Schaaf & Wheeler
Consulting Civil Engineers