



# Port of San Francisco Waterfront Resilience Program

Mission Bay Citizens Advisory Committee

April 14, 2022



Waterfront Resilience Program

# TODAY'S AGENDA

## Overview



- Overview of the Waterfront Resilience Program (WRP)
- Embarcadero Early Projects
- Waterfront Wide Adaptation Strategies
- Questions

# Overview of the Waterfront Resilience Program



# WATERFRONT RESILIENCE PROGRAM (WRP)



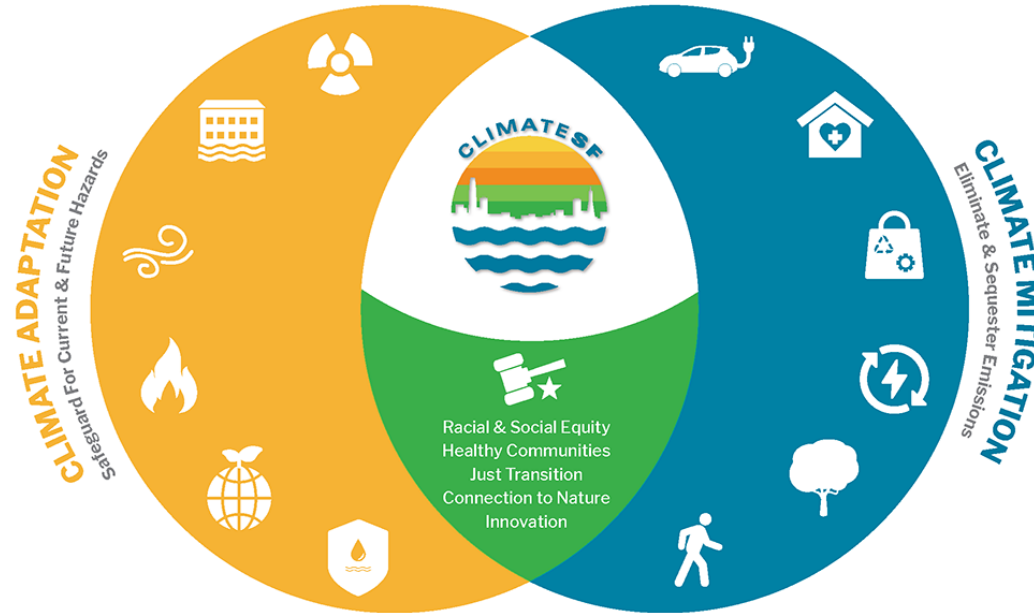
The Port's Waterfront Resilience Program efforts ensure the waterfront, and its important regional and citywide assets, are resilient in the face of hazards such as earthquakes, flooding, sea level rise due to climate change, shoreline erosion, and others.



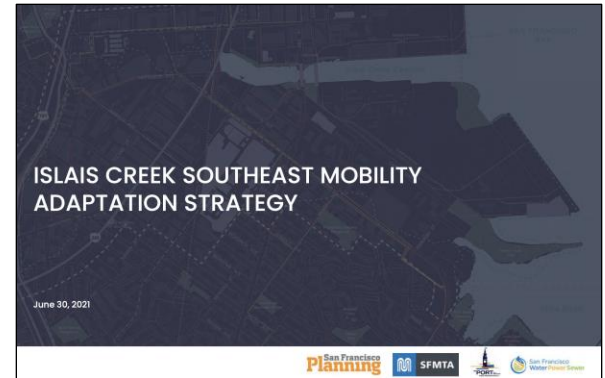
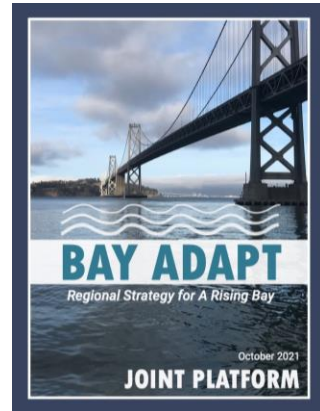
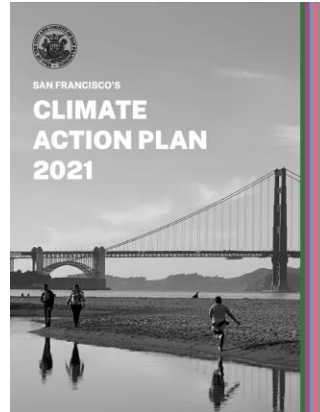
# CLIMATE SF FRAMEWORK

## A CLIMATE RESILIENT SAN FRANCISCO

Connecting People, Buildings, Infrastructure & Nature

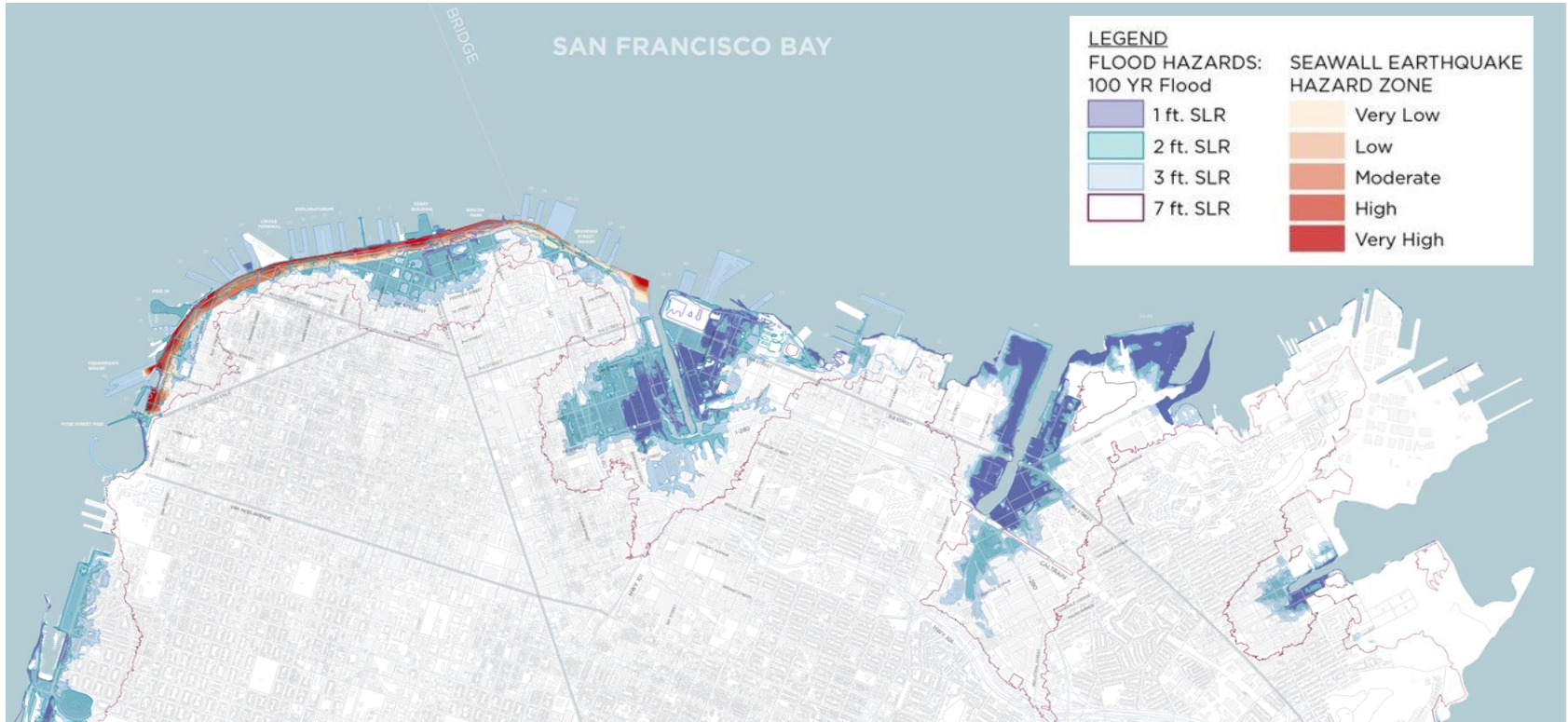


# BUILDING ON MULTI-AGENCY EFFORTS ON SLR AND CLIMATE RESILIENCE



# PORTWIDE RESILIENCE NEEDS

## Flood and seismic risk along the waterfront



# WATERFRONT RESILIENCE PROGRAM EFFORTS

## Program and City Resilience Projects and Efforts





# LEARNINGS FROM THE COMMUNITY (2017 – PRESENT)

Community Input Helped Define the WRP

1

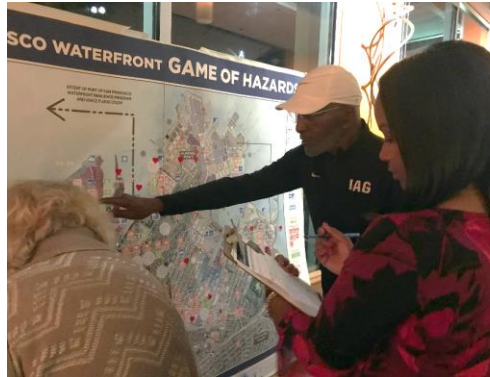
Focus on life safety & emergency response

2

Prioritize assets most loved by the community and most important to the city

3

Put people first



# WRP WORK TO DATE: COMMUNITY OUTREACH

## "What Would You Like to See in a Future San Francisco Waterfront?"

### Events and Details:

22 events throughout the city

4,000 people contacted

2,500 pieces of collateral  
distributed

2,000 engagement activity  
participants

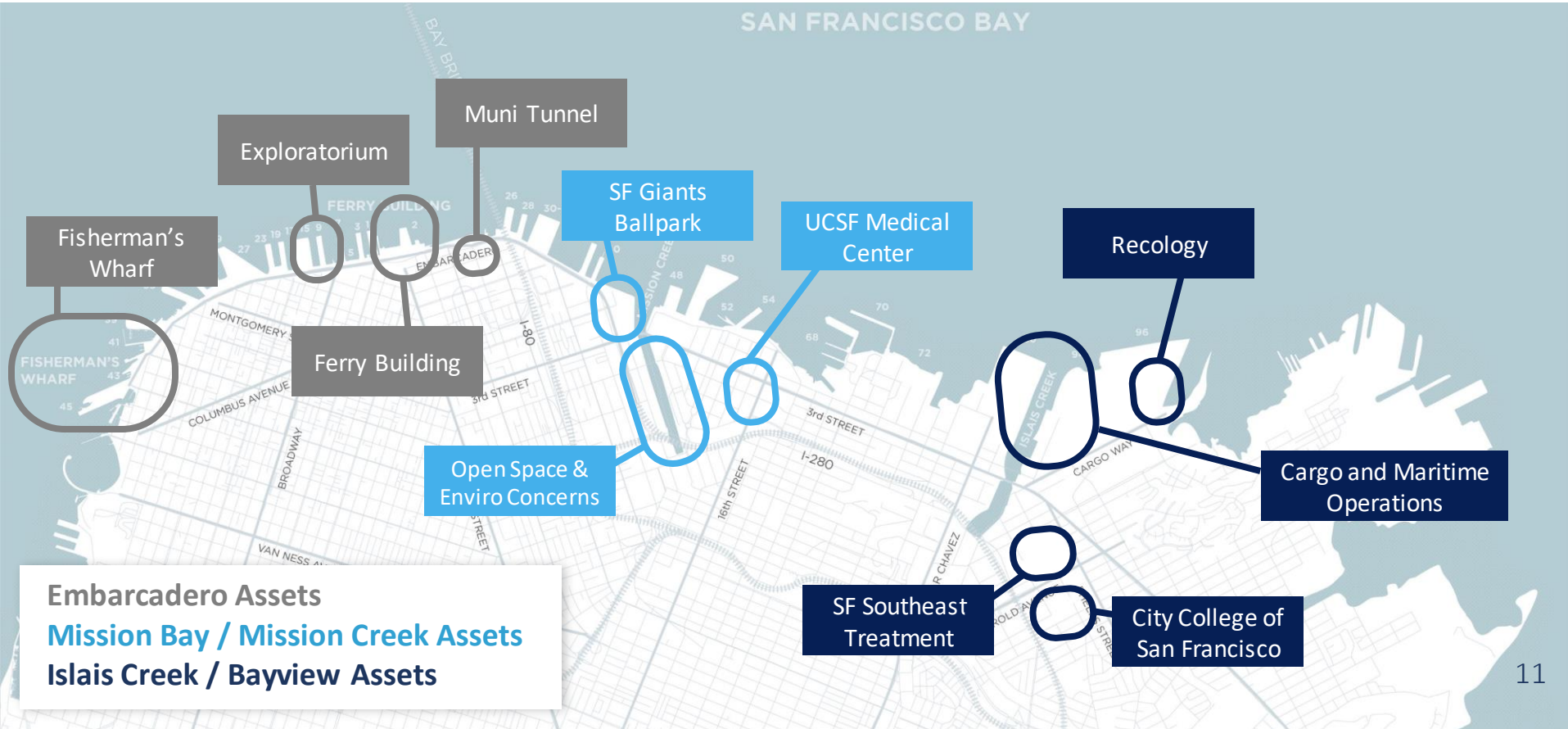
Source: WRP Outreach Recap 2017-2020 Memo (Civic Edge)

### We heard:

- A natural and environmentally sustainable waterfront
- Connecting the city with the waterfront
- Housing
- Maritime commerce and related jobs
- Increased transportation options
- Public space, recreation opportunities, and an accessible waterfront
- A vibrant and exciting waterfront
- Affordable activities and family-friendly activities
- Respite from the city
- Small things to improve the waterfront: public bathrooms, trees, lighting, benches, etc.

# WRP COMMUNITY AND STAKEHOLDER ENGAGEMENT

## Assets Communities Want to Protect



**Embarcadero Assets**

**Mission Bay / Mission Creek Assets**

**Islais Creek / Bayview Assets**

# WRP WORK TO DATE



**Waterfront  
Resilience Program  
is here!**

# Embarcadero Early Projects



# EARTHQUAKE RISKS FACING THE EMBARCADERO

## Embarcadero Multi-Hazard Risk Analysis (MHRA) Findings

**Up to \$30 billion** cost of damages and disruption from **combined seismic and flood risk by 2100**



Embarcadero Roadway and underground utilities vulnerable to ground shaking and liquefaction



Ferry Building Area: Significant seismic risk



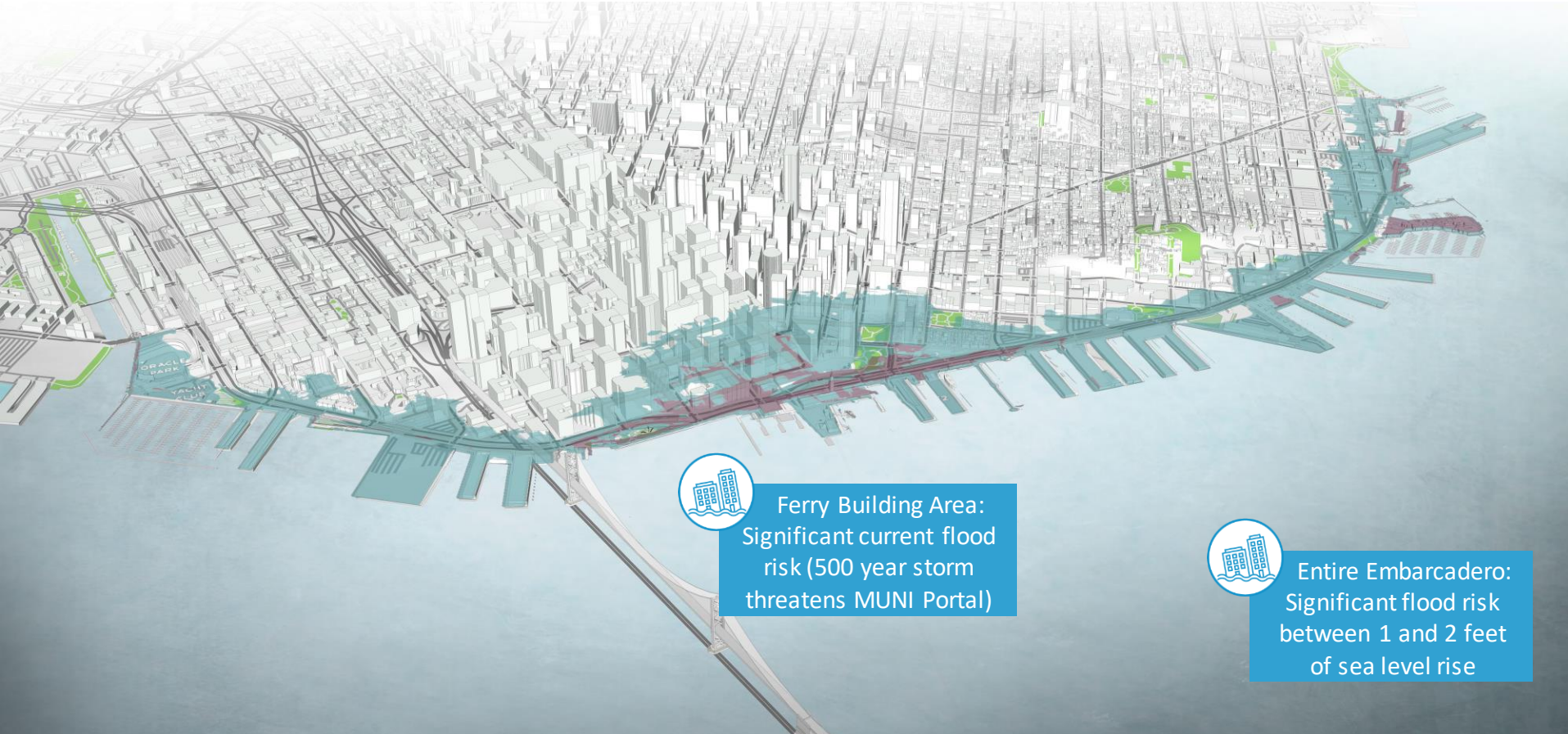
Bulkhead wharves and buildings at greatest seismic risk



Fisherman's Wharf aging pile supported structures vulnerable to ground shaking and liquefaction

# FLOOD HAZARDS FACING THE EMBARCADERO

## Embarcadero Multi-Hazard Risk Analysis (MHRA) Findings



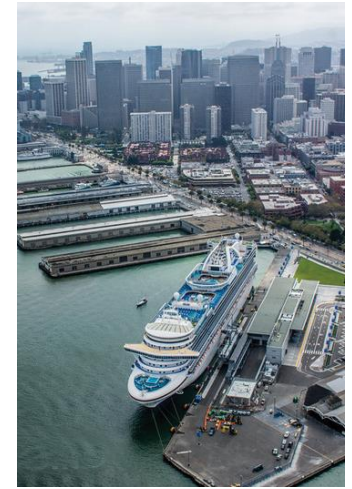
Ferry Building Area:  
Significant current flood  
risk (500 year storm  
threatens MUNI Portal)



Entire Embarcadero:  
Significant flood risk  
between 1 and 2 feet  
of sea level rise

# DISASTER RESPONSE EXERCISE

Summer 2021



**Confirmed need for Port's berths, piers and wharves for moving people and supplies, Port's role in waterfront recovery, and the importance of the Embarcadero Roadway**



# EMBARCADERO EARLY PROJECTS LIST



- **11** advancing straight to pre-design (needs assessment) using Proposition A funding
- **5** advancing through a geographic strategy for the stretch between Piers 19 and 41
- **7** advancing through coordination with long-term Port tenants, capital programs, and City agency coordination

● Proposition A Predisign

● Coordination with Long-term Tenants, Capital Programs and City Agencies

● Advance through Geographic Strategy

## PROJECT LIST:

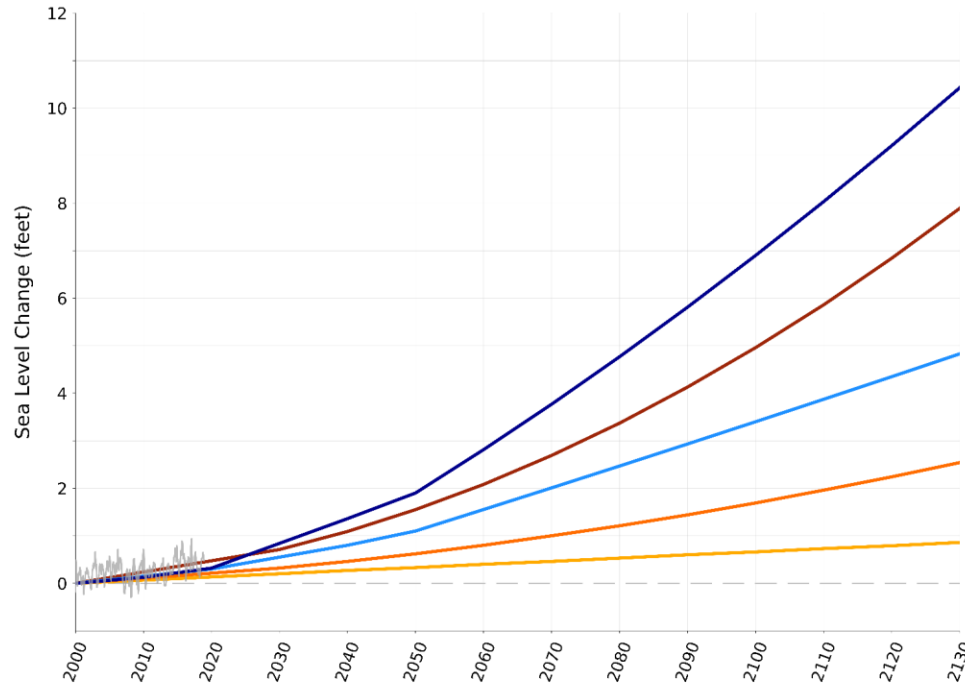
- 1 Joint Operations Security Center and Fuel Dock Reliability Project
- 2 Wharf J9 Replacement and Resilient Shoreline Project
- 3 Taylor Street Seawall Earthquake Stabilization Project
- 4 Pier 45 Apron Earthquake Safety Retrofit and Flood Risk Reduction
- 5 Pier 43-1/2 Seawall and Wharf Earthquake Safety Project
- 6 Pier 41 Seawall Earthquake Stabilization and Wharf Retrofit
- 7 Pier 39 Seawall Earthquake Stabilization & Wharf Retrofit/Replacement
- 8 Pier 33 to 35 Seawall and Wharf Earthquake Reliability Project
- 9 Pier 31-1/2 Bulkhead Wall and Wharf Earthquake Safety Retrofit
- 10 Pier 27 Seawall and Wharf Earthquake Reliability Project
- 11 Pier 15 Bulkhead Wall and Wharf Earthquake Safety Retrofit
- 12 Pier 9 Bulkhead Wall and Wharf Earthquake Safety Retrofit
- 13 Pier 9 Historic Shed Building Earthquake Safety Retrofit Project
- 14 Pier 1 Bulkhead Wall and Wharf Earthquake Reliability Project
- 15 Ferry Building Seawall & Substructure Earthquake Reliability
- 16 Agriculture Building Bulkhead Wall and Wharf Earthquake Safety
- 17 Pier 5 to Pier 22-1/2 Near-Term Coastal Flood Risk Reduction Project
- 18 Pier 24 to Pier 28-1/2 Bulkhead Wall and Wharf Earthquake Safety
- 19 EFWS, Intake Tunnel #1 Earthquake Reliability Project
- 20 Giants Seals Plaza Seawall Earthquake Stabilization Project
- 21 Pier Fire Suppression & Waterside Evacuation Improvements
- 22 EFWS, Fireboat Manifold Earthquake Reliability Projects
- 23 Pier Utility Connection Earthquake Retrofits at Seawall

# Waterfront Wide Adaptation Strategies



# SEA LEVEL RISE PROJECTIONS

U.S. Army Corps of Engineers (USACE) and California Ocean Protection Council (OPC)



OPC 1:200 (Plausible, High Impact)

USACE High

OPC Likely

USACE Intermediate

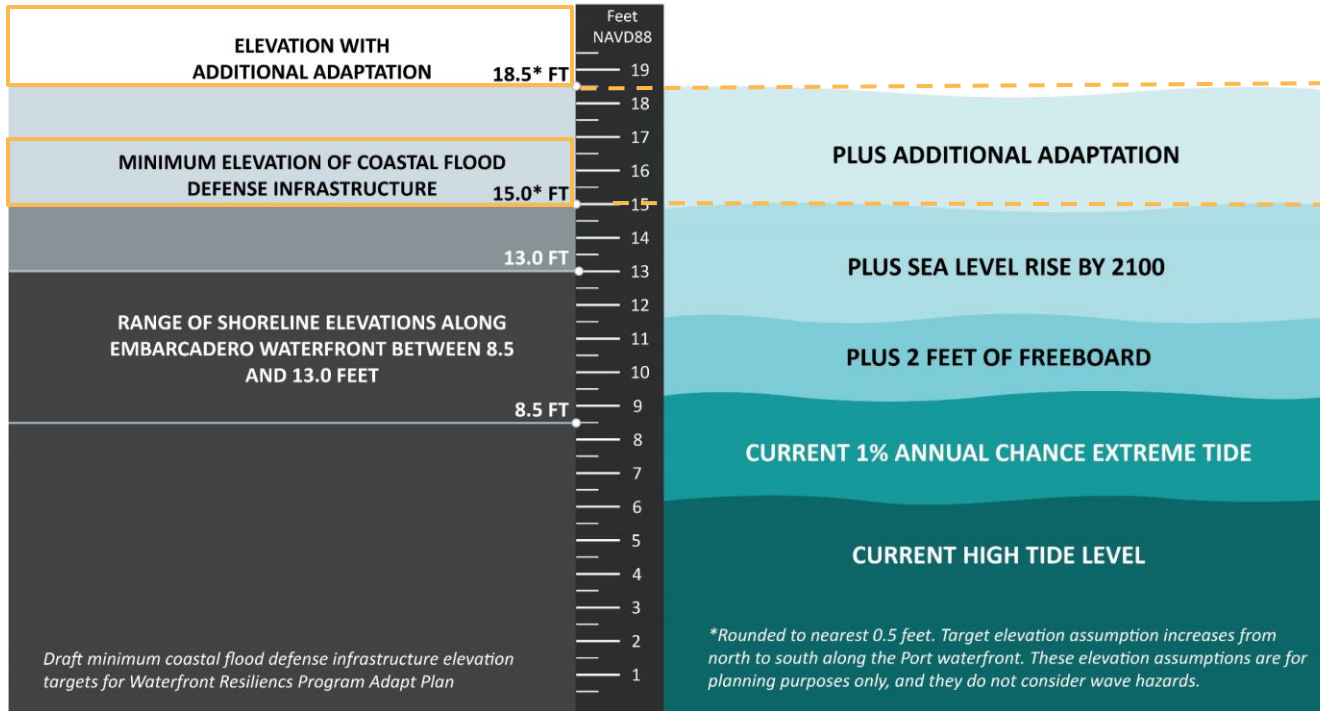
USACE Low

Mean Sea Level

Our  
planning  
horizon:  
~2140

*\*Note: Plan to update G2CRM to use the new Federal Sea Level Rise Curves after tentative February 2022 release*

# STUDY RANGE FOR ADAPTATION TO TWO SEA LEVEL RISE PROJECTIONS



*Adapting the shoreline to 7' of SLR @ 2100*  
*Adapting the shoreline to 3.5' of SLR @ 2100*

## SHORELINE ELEVATIONS

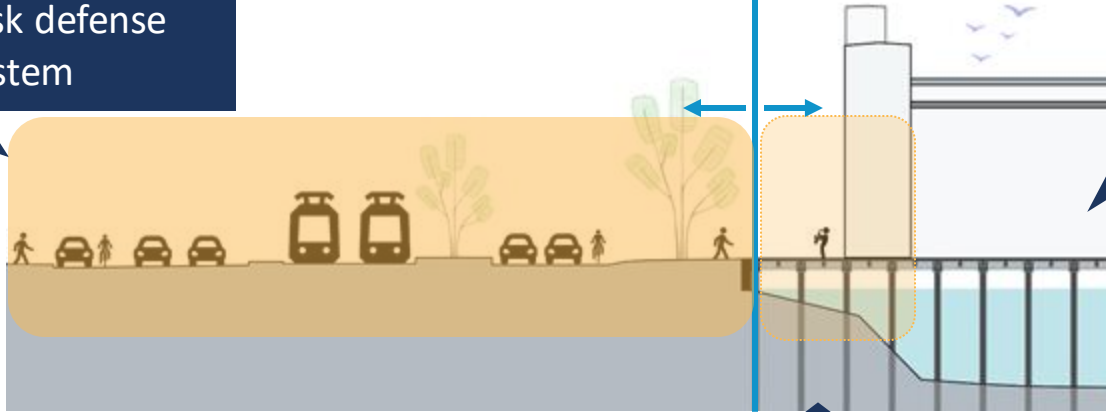
## WATER ELEVATIONS

# TERMINOLOGY

**ADAPTATION ZONE:**  
Space needed to raise or otherwise *substantially* alter in order to create a city flood risk defense system

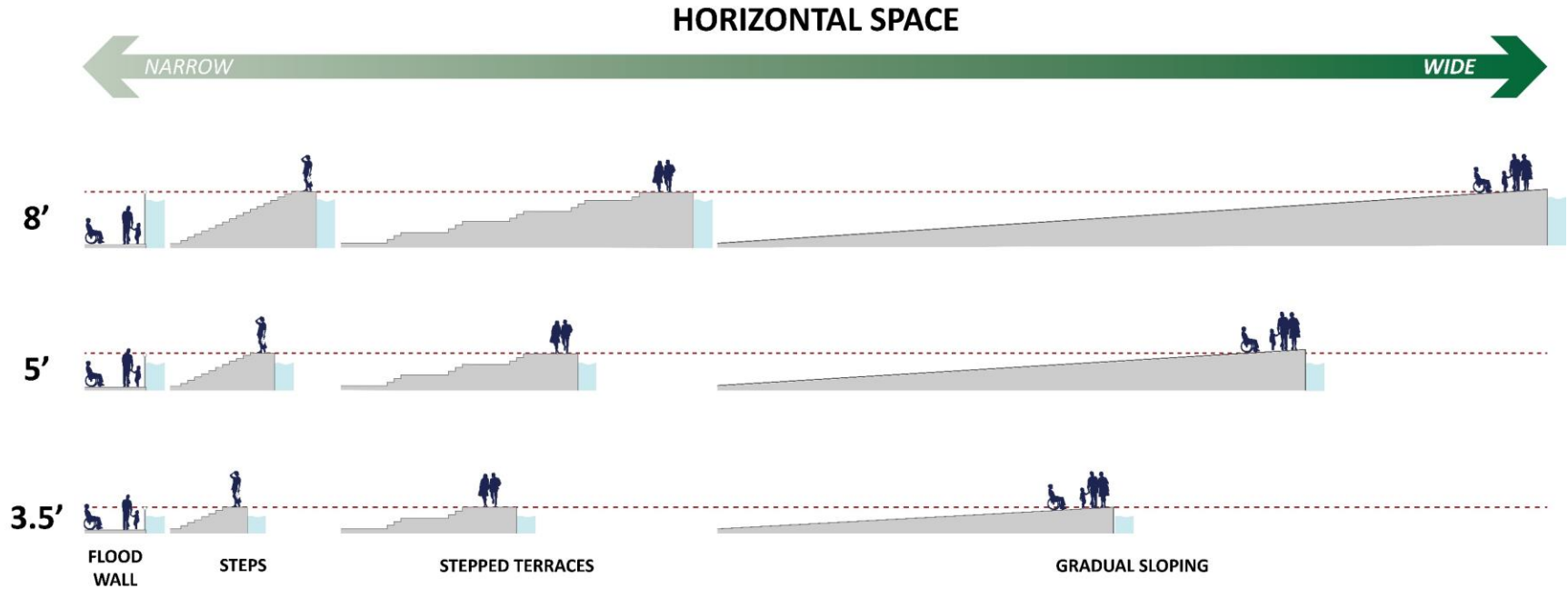
**LINE OF DEFENSE:**  
Highest point of the city flood risk defense system

**PIERS:**  
Addressed through the Pier Adaptation Toolkit, Historic District Integrity Memo, and the Historic Piers Rehabilitation Program



**WHARF:**  
Constructed surface over water, parallel to shore

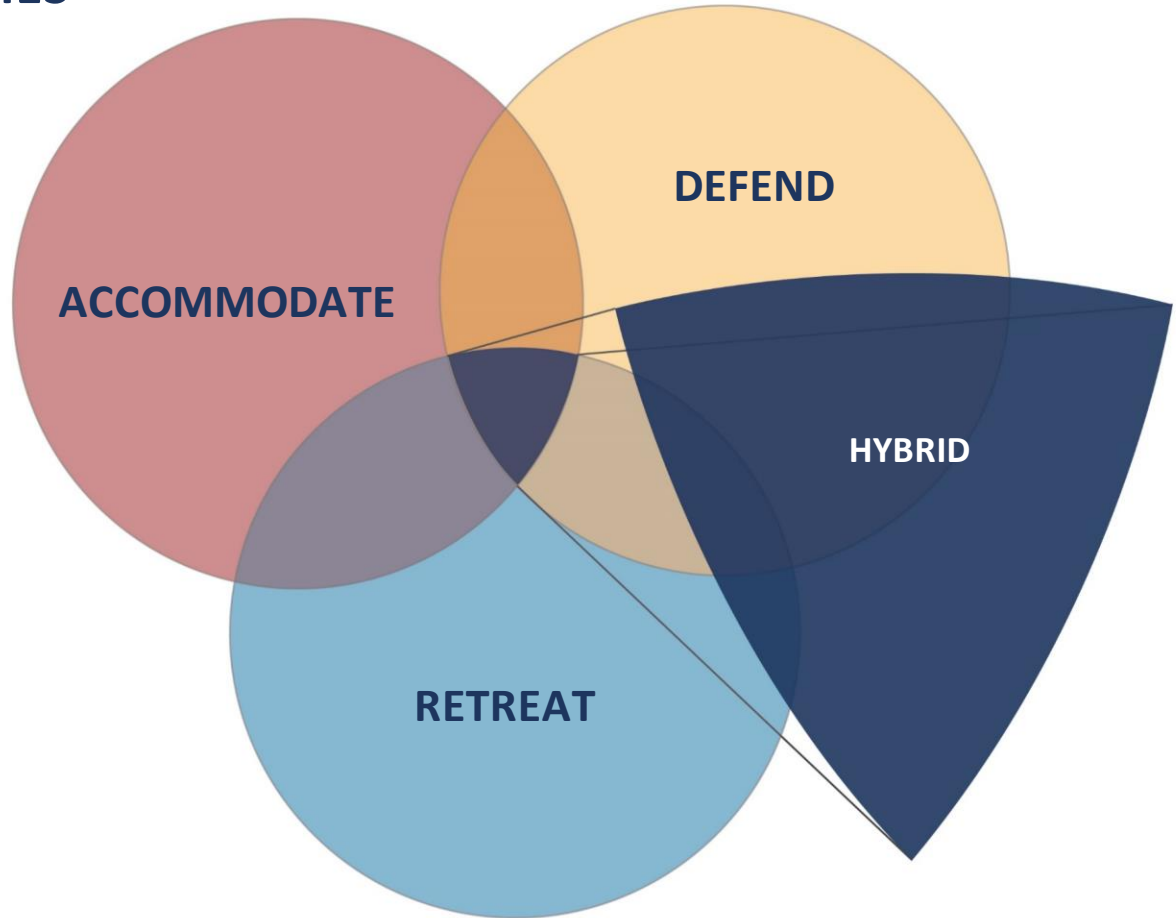
# PUBLIC REALM STUDIES



*\*CITY IS REPRESENTED TO THE LEFT AND BAY IS REPRESENTED TO THE RIGHT*

# HIGH-LEVEL APPROACHES

## Hybridization



# ECOLOGICAL PRECEDENTS

## From Around the World



Hudson River Park, NYC



Seattle, WA



Aker Brygge Beach, Oslo



Vancouver, B.C.



East Riverfront, NYC



Heron's Head Park, SF



California Coast



Brooklyn Bridge Park, NYC



# AGENCY ENGAGEMENT PROCESS



# BY END OF PHASE B: LEVEL OF DETAIL EXAMPLE

Charleston, SC

## Perimeter Strategies

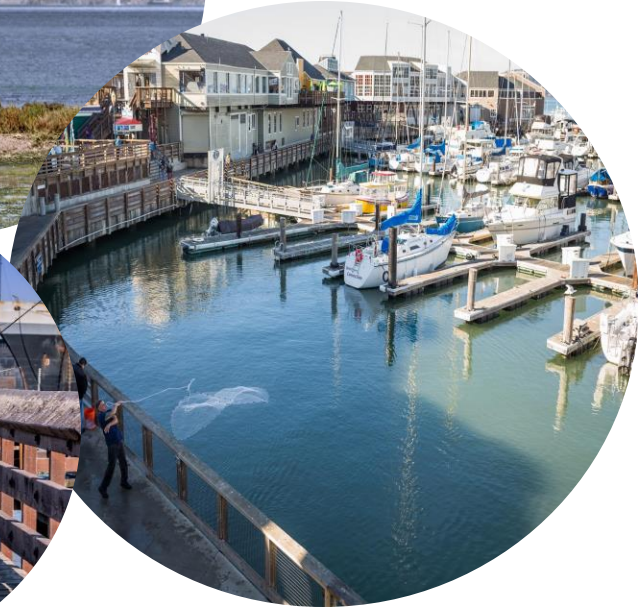
This plan identifies an array of nature-based strategies embedded within engineered structures to provide perimeter storm surge protection and sea level rise adaptation, along with interior flood control management. A description of each strategy is found on proceeding pages.

### KEY

-  PUMP STATION
-  WATER CONTROL STRUCTURE
-  PORT CANAL GREENWAY
-  BATTERY WALL
-  ELEVATED ROAD
-  RAISED PARK PROMENADE
-  HORIZONTAL LEVEE
-  LIVING SHORELINE
-  LIVING BREAKWATER ARCHIPELAGO
-  STORMWATER CORRIDORS
-  MARSH - Existing
-  PARK SPACE - Existing and Planned
-  GREEN ROOFS - Potential



# QUESTIONS?



# Thank You

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