

DRAFT WATERFRONT ADAPTATION STRATEGIES

Capital Planning Committee

October 24, 2022



TODAY'S AGENDA

Presentation Overview



- Understanding the Risks
 - *What we're facing*
- Waterfront Resilience Program
 - *What we're doing*
- Range of Possibilities
 - *What we're considering*
- Draft Waterfront Adaptation Strategies
- Next Steps

TODAY'S AGENDA

Committee Questions



- Do the strategies address the current and future hazards we're facing?
- What are the implications of the strategies on key City capital assets and infrastructure?
- What investments would be required with each strategy to continue to operate City infrastructure systems?
- What opportunities do you see to use this project to advance infrastructure goals?

DRAFT WATERFRONT ADAPTATION STRATEGIES

Presentation Overview



The Port of San Francisco has developed seven high-level Draft Waterfront Adaptation Strategies through a collaborative interagency process and over five years of public engagement.

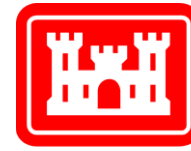
The draft Strategies are ready for public feedback, with a goal of reaching a Draft Waterfront Adaptation Plan by Summer 2023.

DRAFT WATERFRONT ADAPTATION STRATEGIES

Port-led, City of San Francisco Agencies, and USACE Partnered in Development Process



SAN FRANCISCO WATERFRONT COASTAL FLOOD STUDY



**US Army Corps
of Engineers®**

The Port and U.S. Army Corps of Engineers (USACE) are conducting a **waterfront coastal flood study** for San Francisco, which could result in **significant federal funding for flood risk reduction**.

This funding could also **improve shoreline stability** where USACE would fund coastal flood defenses and **provide other community benefits** that are part of a cost-effective plan. The Port and City have goals to further improve seismic resilience and provide other community benefits that will not be eligible for USACE funding.

Understanding the Risks

What We're Facing



RISING TO THE CHALLENGE

San Francisco Faces Urgent Seismic, Coastal, and Inland Flood Risks Today

SEISMIC RISKS



San Francisco, 1906



Marina, 1989

COASTAL FLOODING

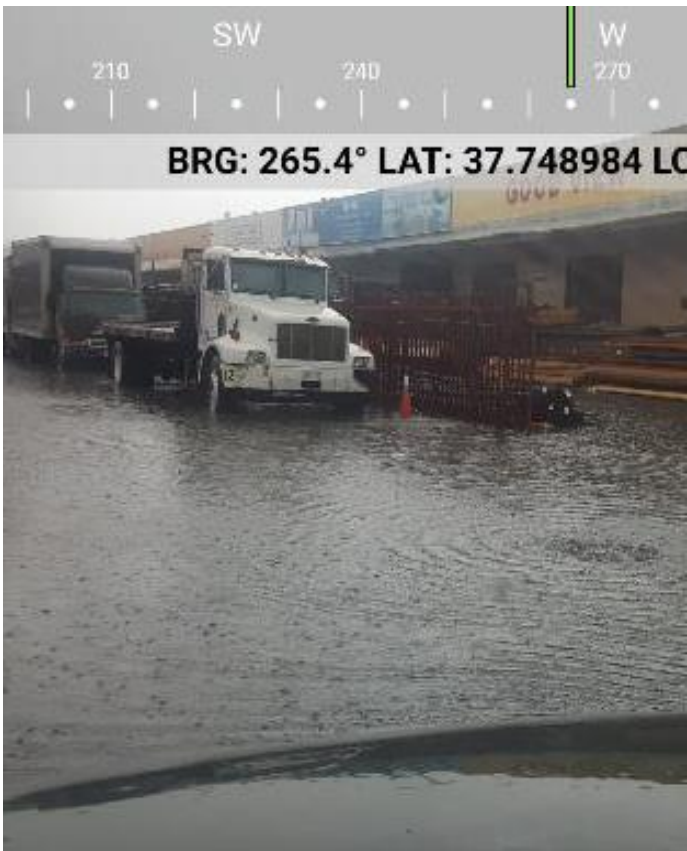


Recology



The Embarcadero

INLAND FLOODING



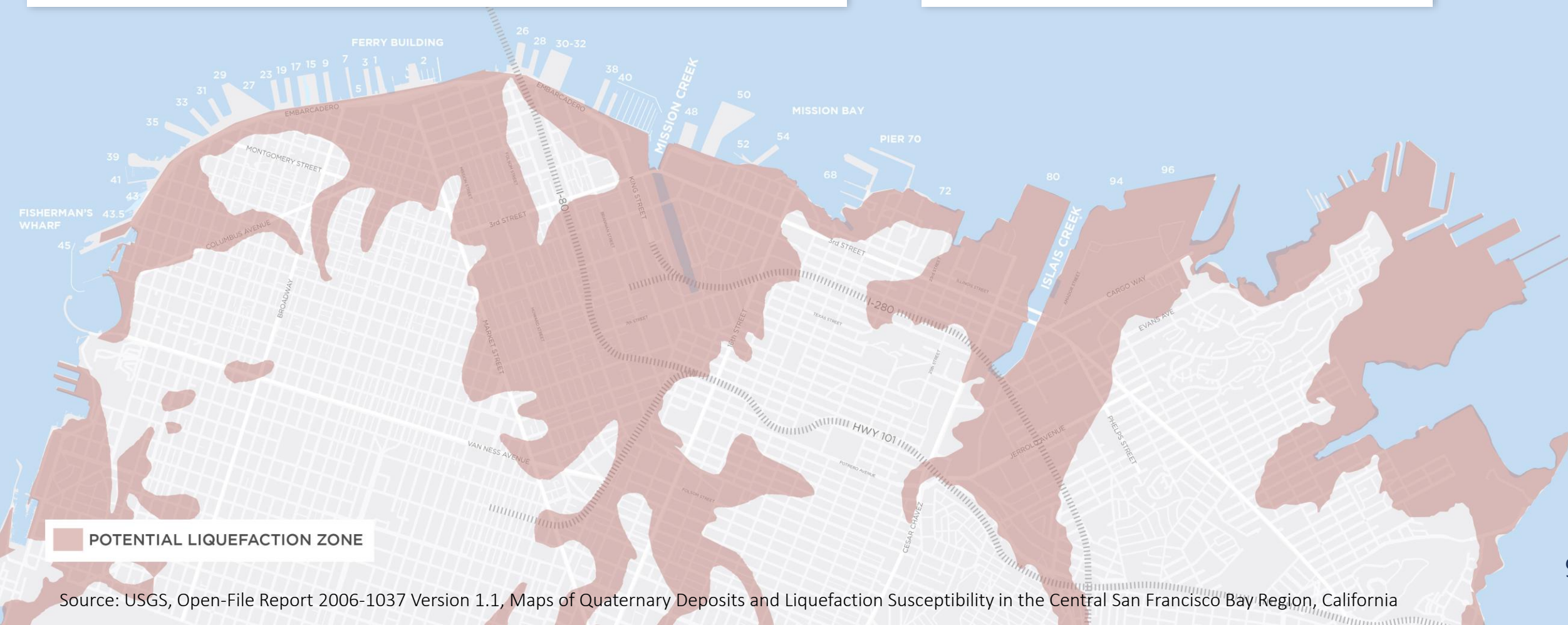
Islais Creek outfall and Marin St.

WATERFRONT WIDE EARTHQUAKE HAZARDS

Very High Earthquake “Liquefaction” Risk

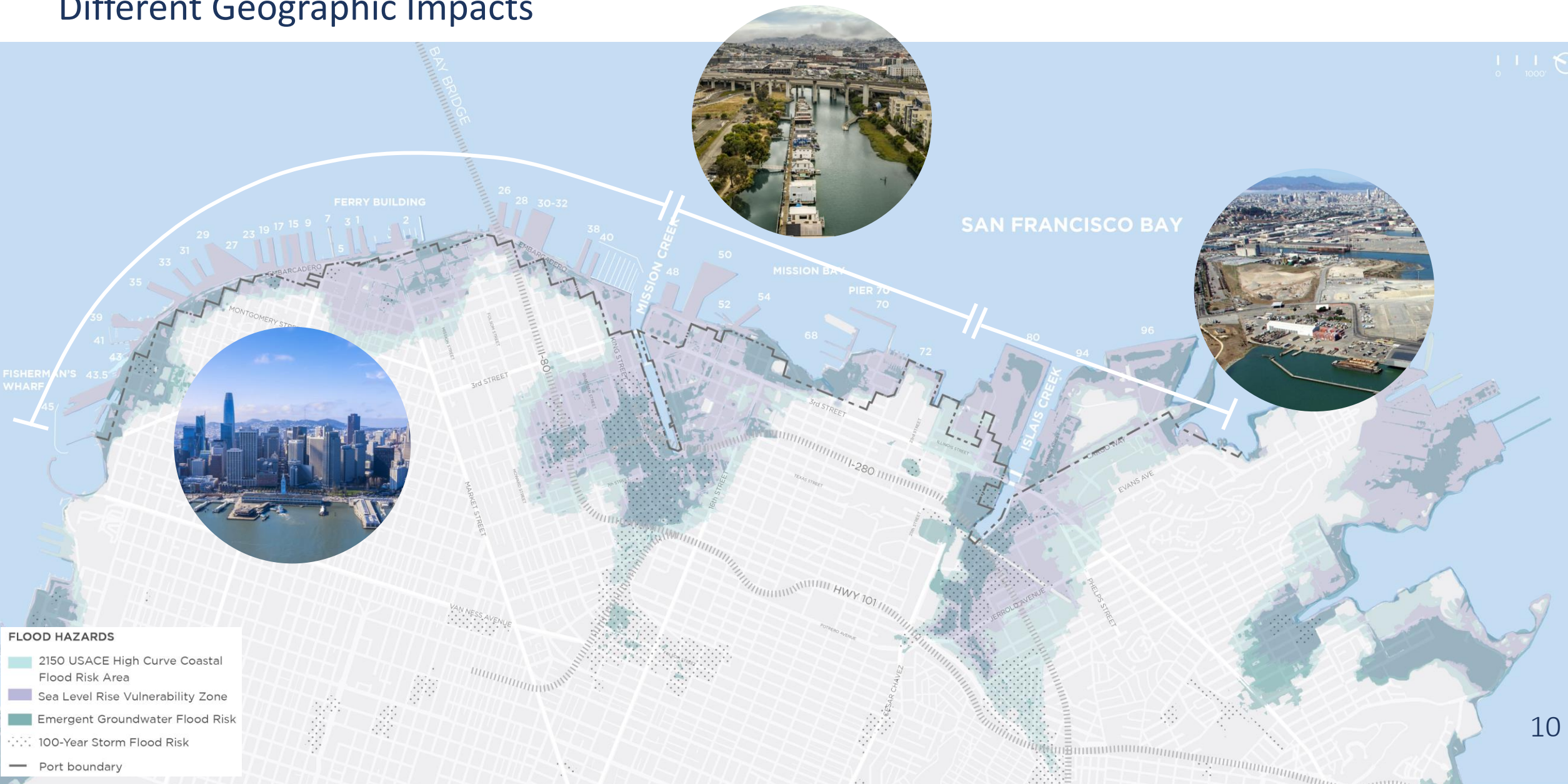
Liquefaction occurs when water-saturated sediment (like sand) temporarily loses strength and acts as a fluid

Various levels of lateral spreading risk along the shoreline



COASTAL AND INLAND FLOOD RISK

Different Geographic Impacts

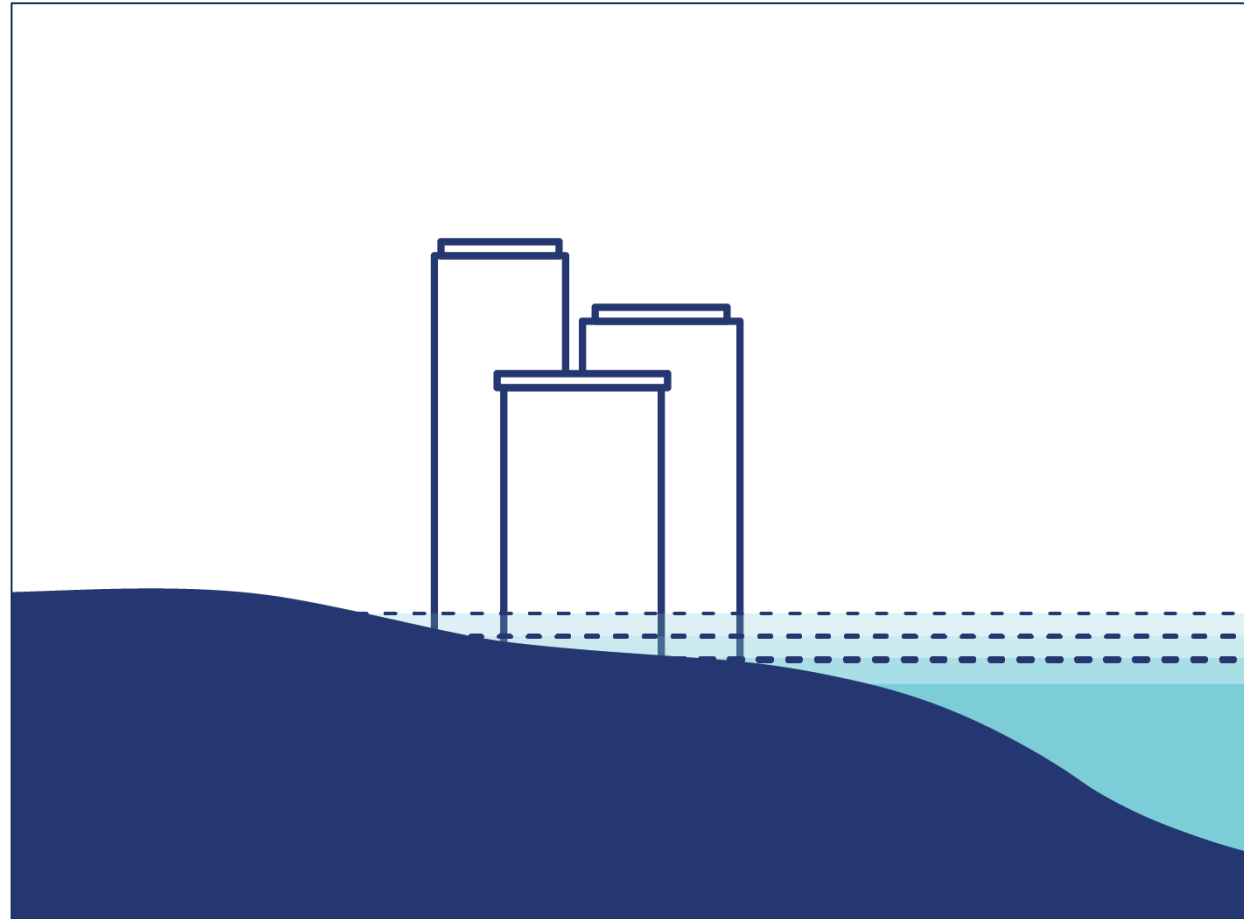


COASTAL AND INLAND FLOODING



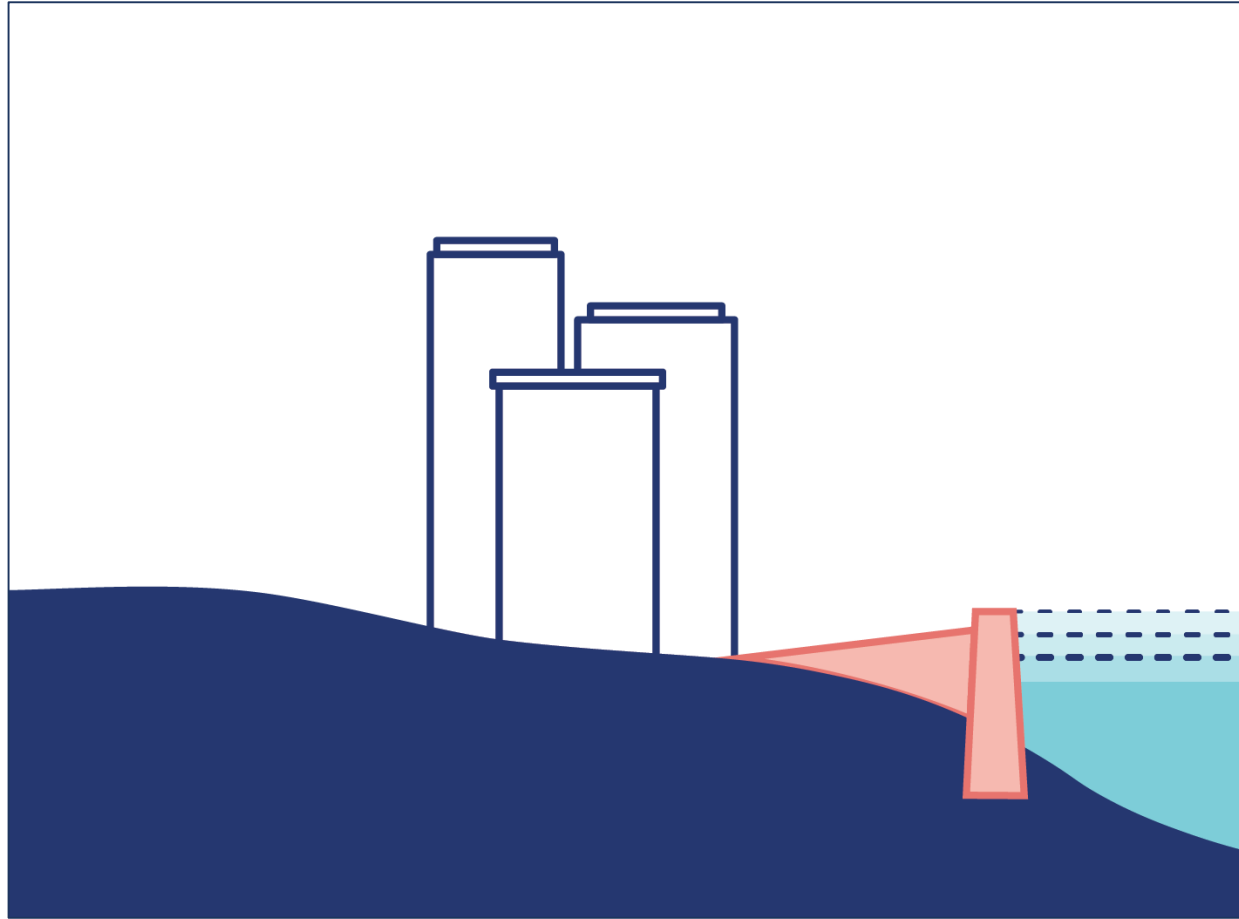
Existing conditions

COASTAL AND INLAND FLOOD RISK



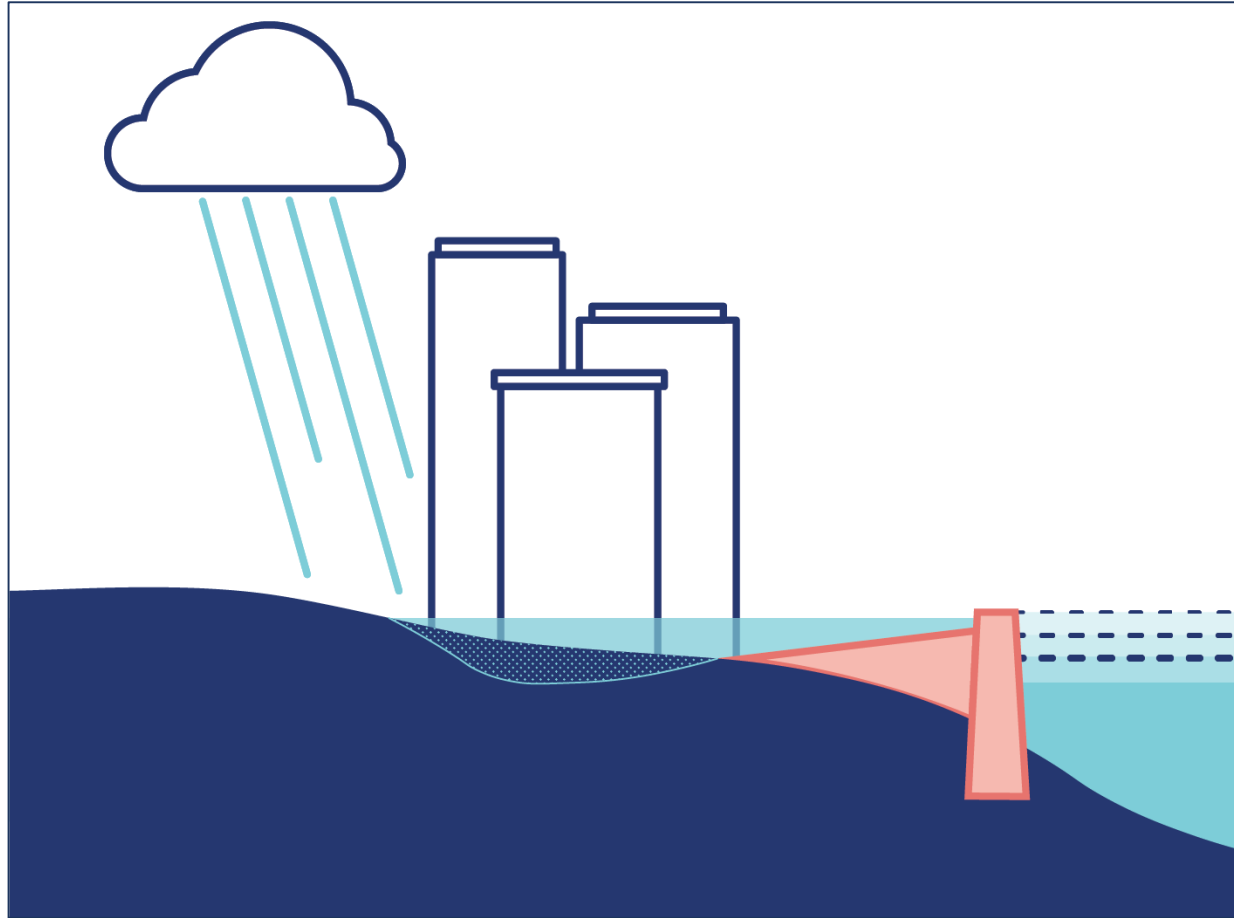
Sea levels rise

COASTAL AND INLAND FLOOD RISK



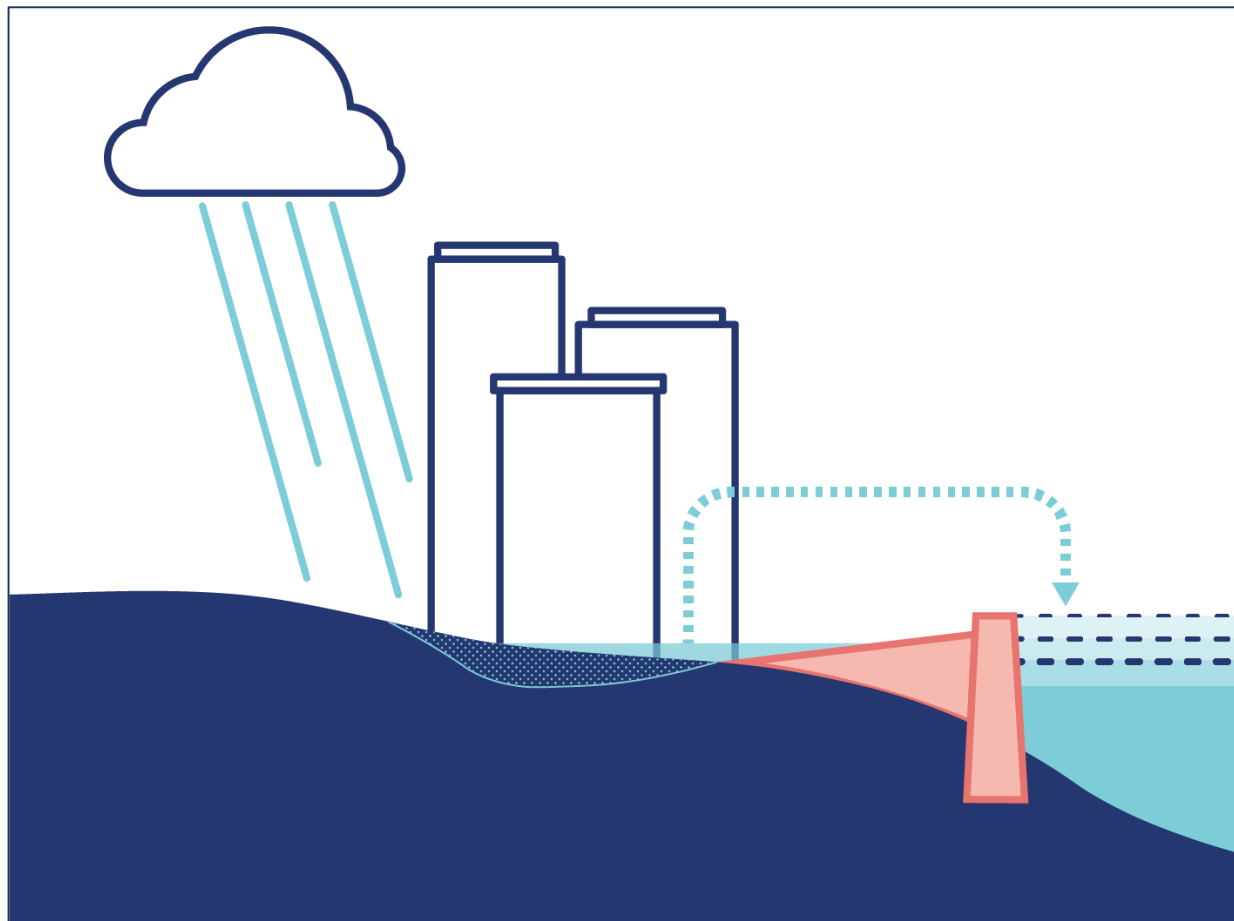
**Raise shoreline to
defend against sea
level rise**

COASTAL AND INLAND FLOOD RISK



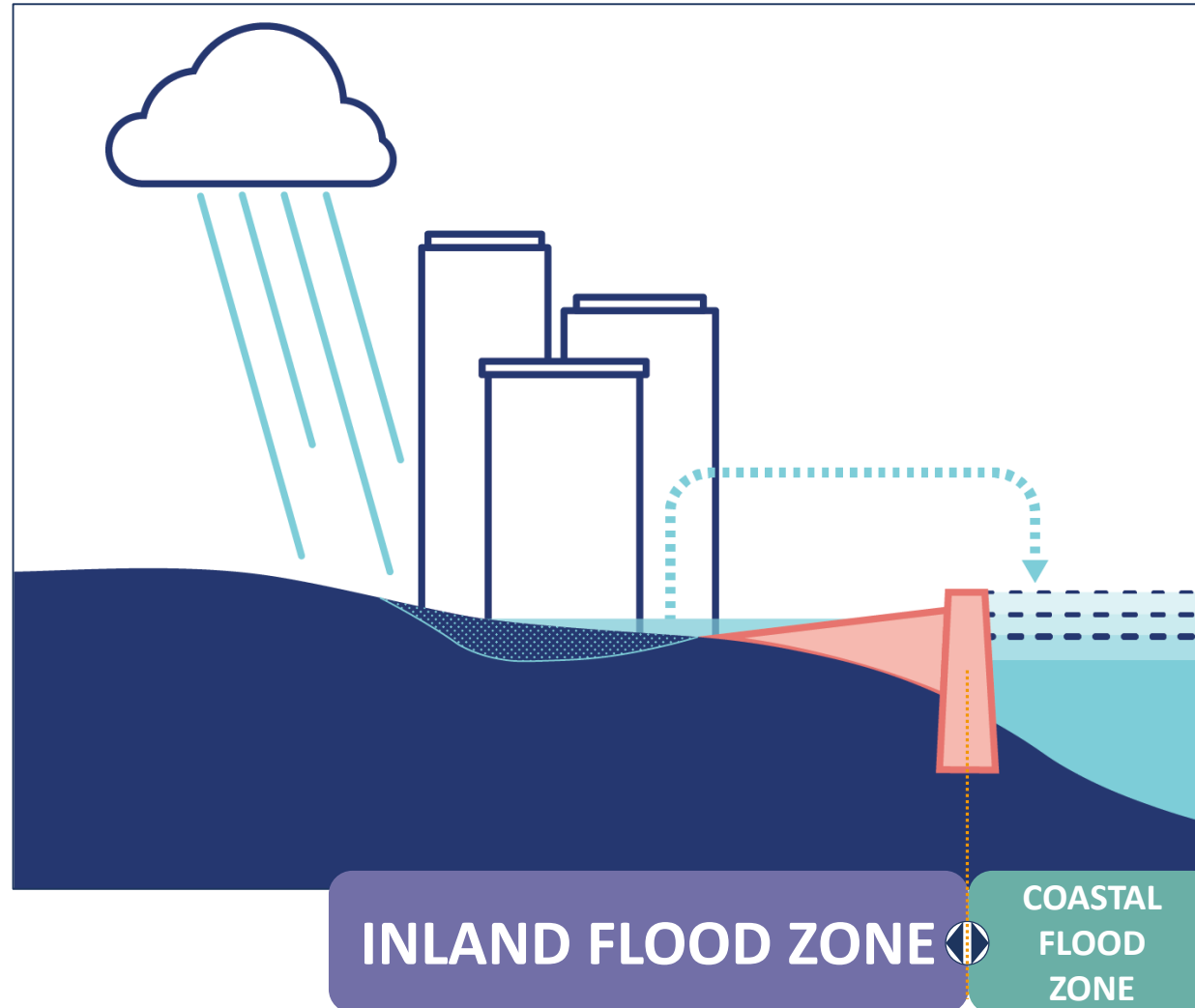
**Groundwater
and stormwater
flooding behind
raised shoreline**

COASTAL AND INLAND FLOOD RISK



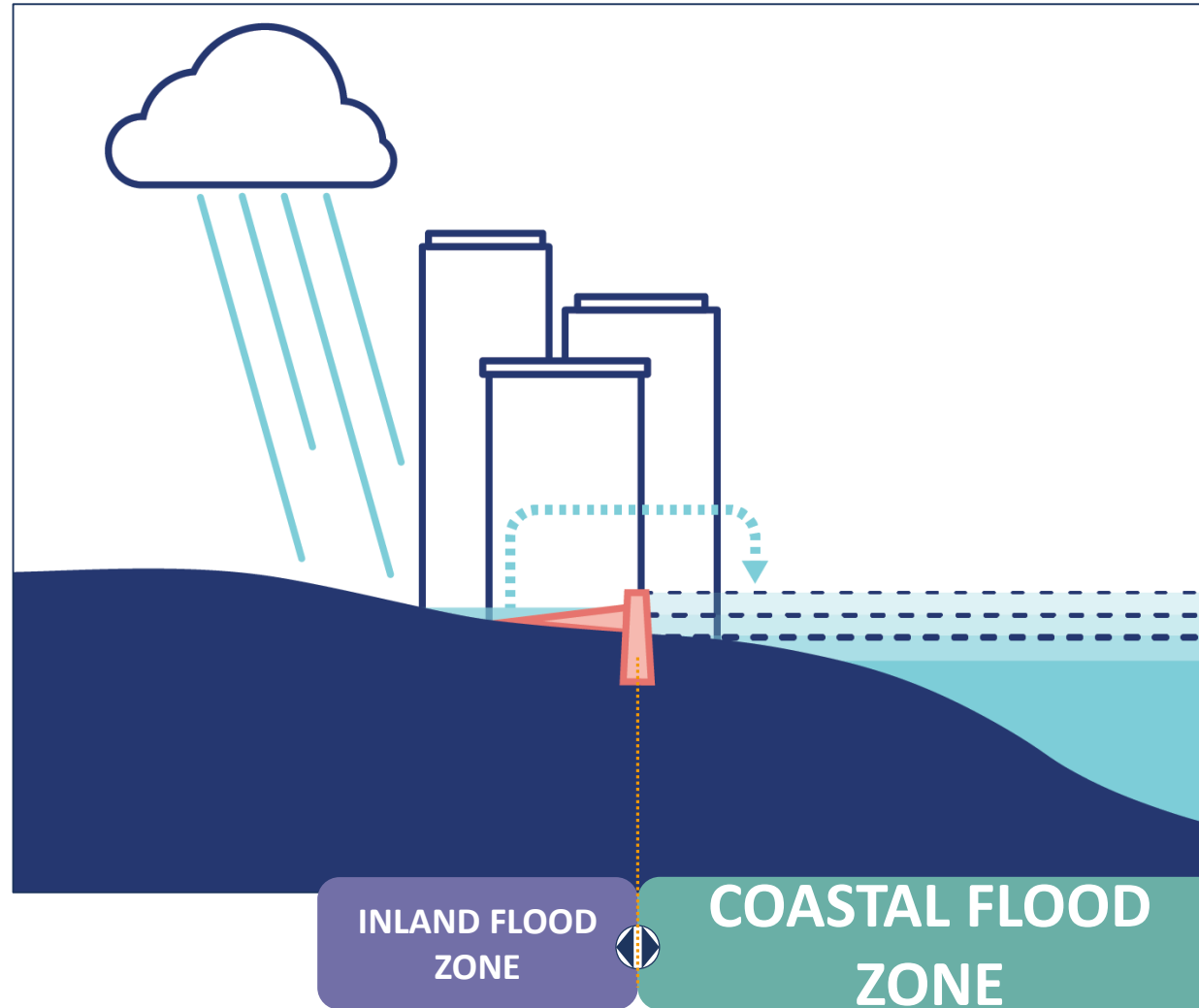
**Pumping reduces
flooding behind
raised shoreline**

COASTAL AND INLAND FLOOD RISK



Two related forms
of flooding

COASTAL AND INLAND FLOOD RISK



Shift based on the
location of flood
protection

Any solution endorsed by the City of San Francisco
will aim to address **all three risks:**
seismic risks, coastal flooding and inland flooding.



Waterfront Resilience Program

What We're Doing

WATERFRONT RESILIENCE PROGRAM VISION STATEMENT

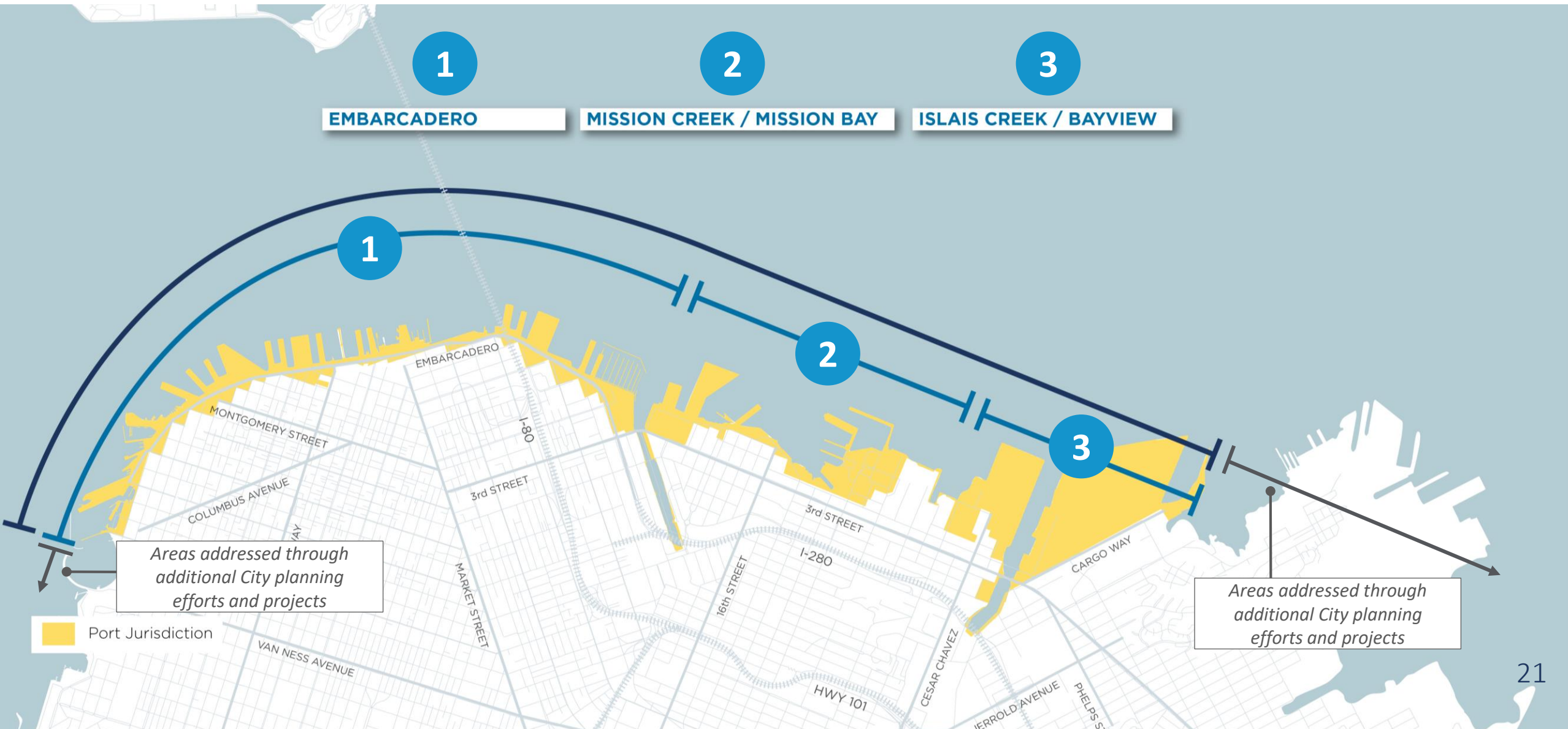
Affirmed through Robust Community Engagement

The Port's Waterfront Resilience Program will take actions to **reduce seismic and climate change risks** that support a safe, equitable, sustainable, and vibrant waterfront.



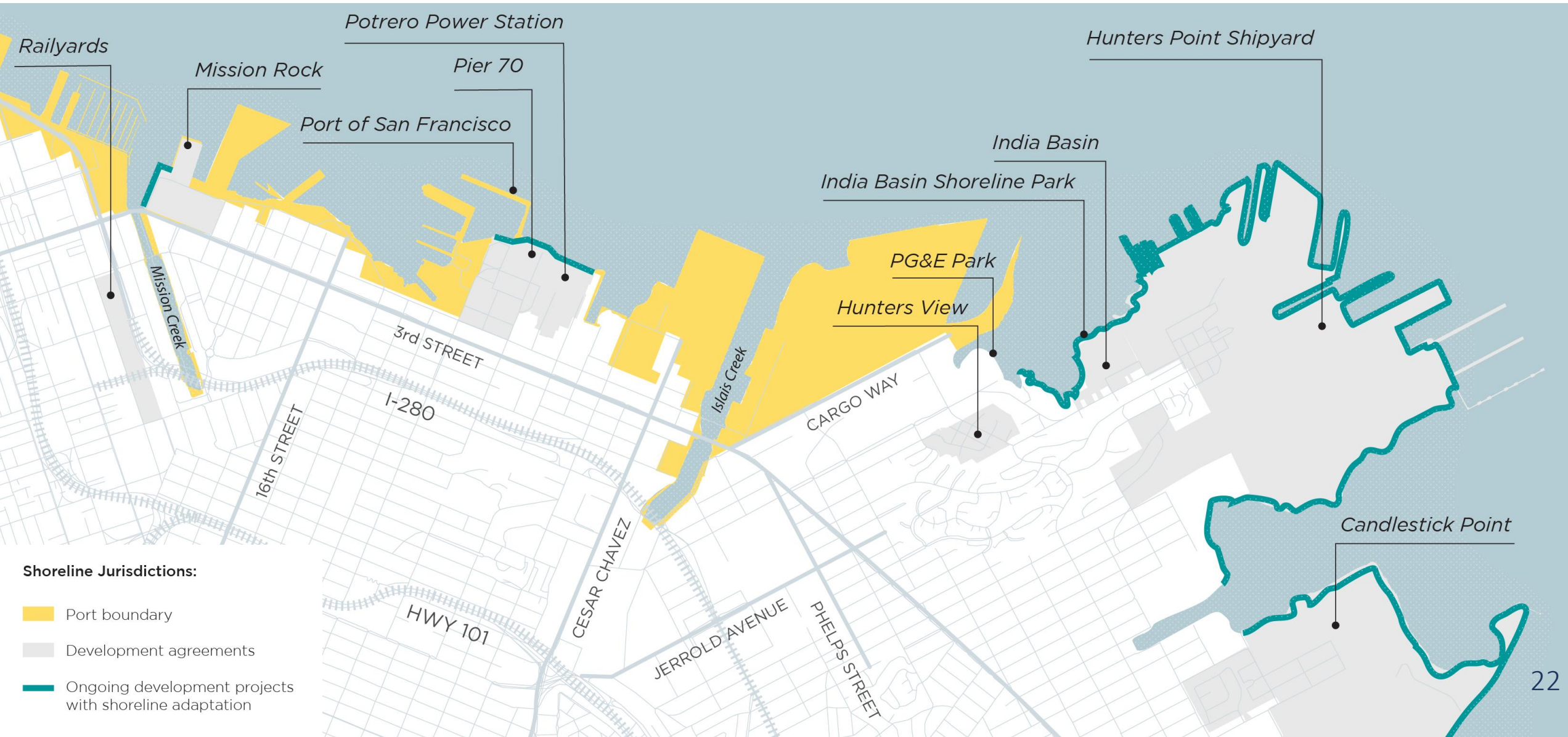
PROGRAM AREA

Focus is Conceptual-Level Strategies Within the Port's Jurisdiction



OTHER CITY ADAPTATION PROJECTS

Outside Port jurisdiction



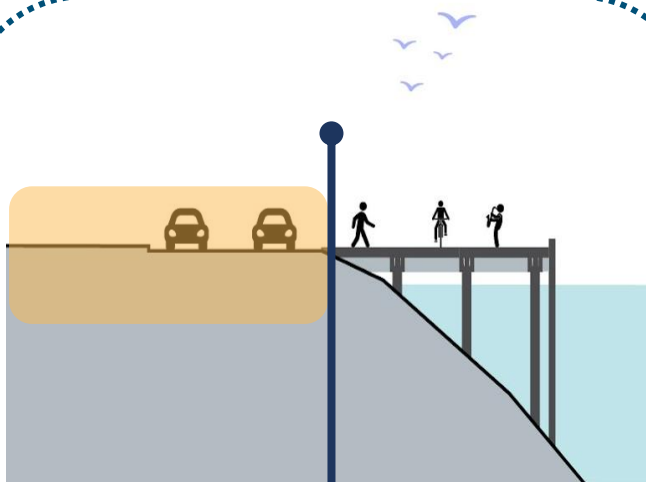


Range of Possible Solutions

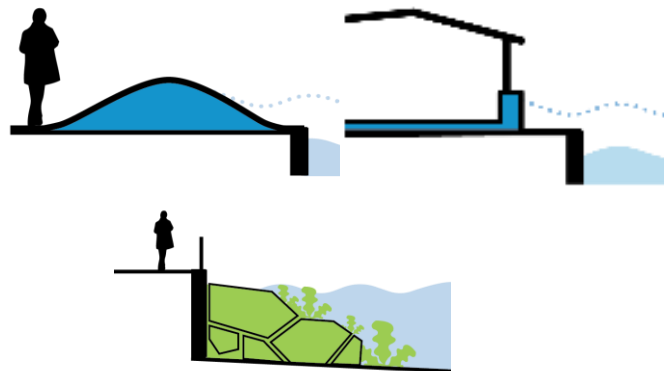
What We're Considering

DRAFT WATERFRONT ADAPTATION STRATEGIES

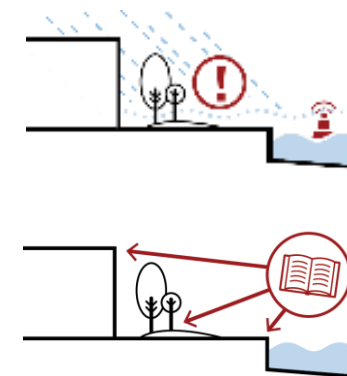
Key Components



Coastal Flood Defense
Location + Height
And area of elevation change



Physical Changes
Such as earthquake-resilient berms, floodproofing, and nature-based features



Policy Changes
Such as resilient codes, warning systems, and land use changes

USACE SAN FRANCISCO WATERFRONT COASTAL FLOOD STUDY

Driving Questions

What if...

we **did not adapt** to mitigate the risks?

What if...

we adapted by **floodproofing** and **moving** buildings and assets, *without* coastal flood structures?

What if...

we address flooding at a **lower rate** of sea level rise?

What if...

we address flooding at a **higher rate** of sea level rise, as recommended by **CA and SF guidance?**

USACE SAN FRANCISCO WATERFRONT COASTAL FLOOD STUDY

Draft Waterfront Adaptation Strategies

What if...

we **did not adapt**
to mitigate the
risks?

STRATEGY A

What if...

we adapted by
floodproofing
and **moving**
buildings and assets,
without coastal flood
structures?

STRATEGY B

What if...

we address flooding
at a **lower rate** of
sea level rise?

STRATEGY C

STRATEGY D

What if...

we address flooding
at a **higher rate** of
sea level rise,
as recommended by
CA and SF guidance?

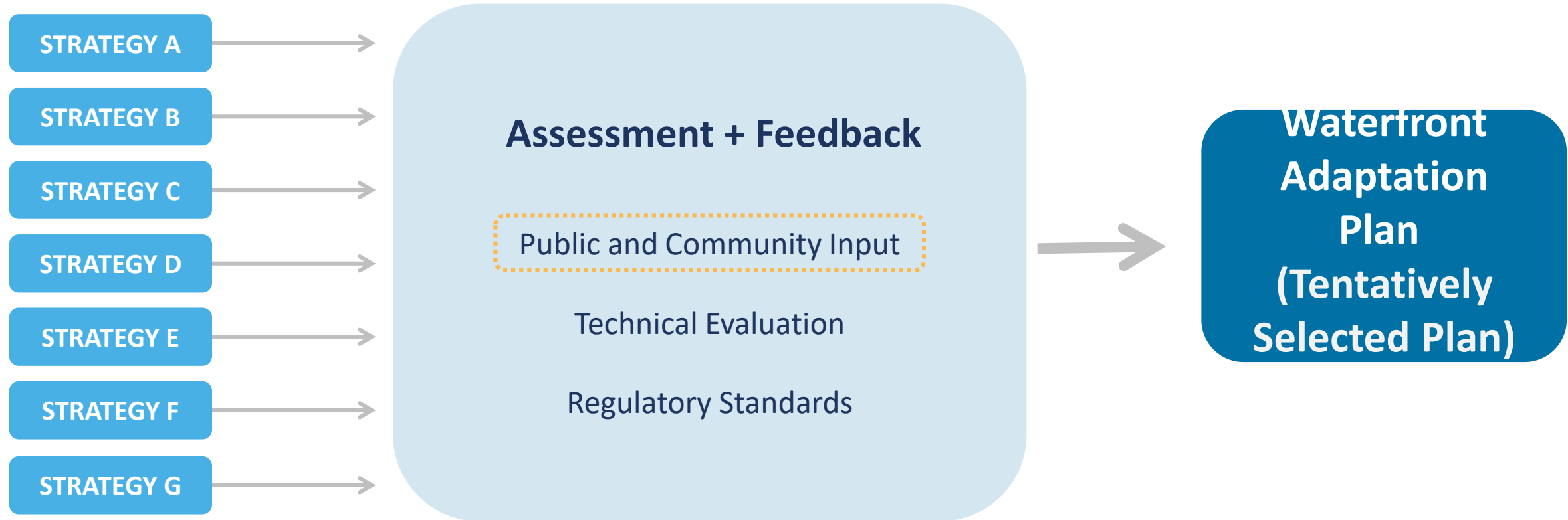
STRATEGY E

STRATEGY F

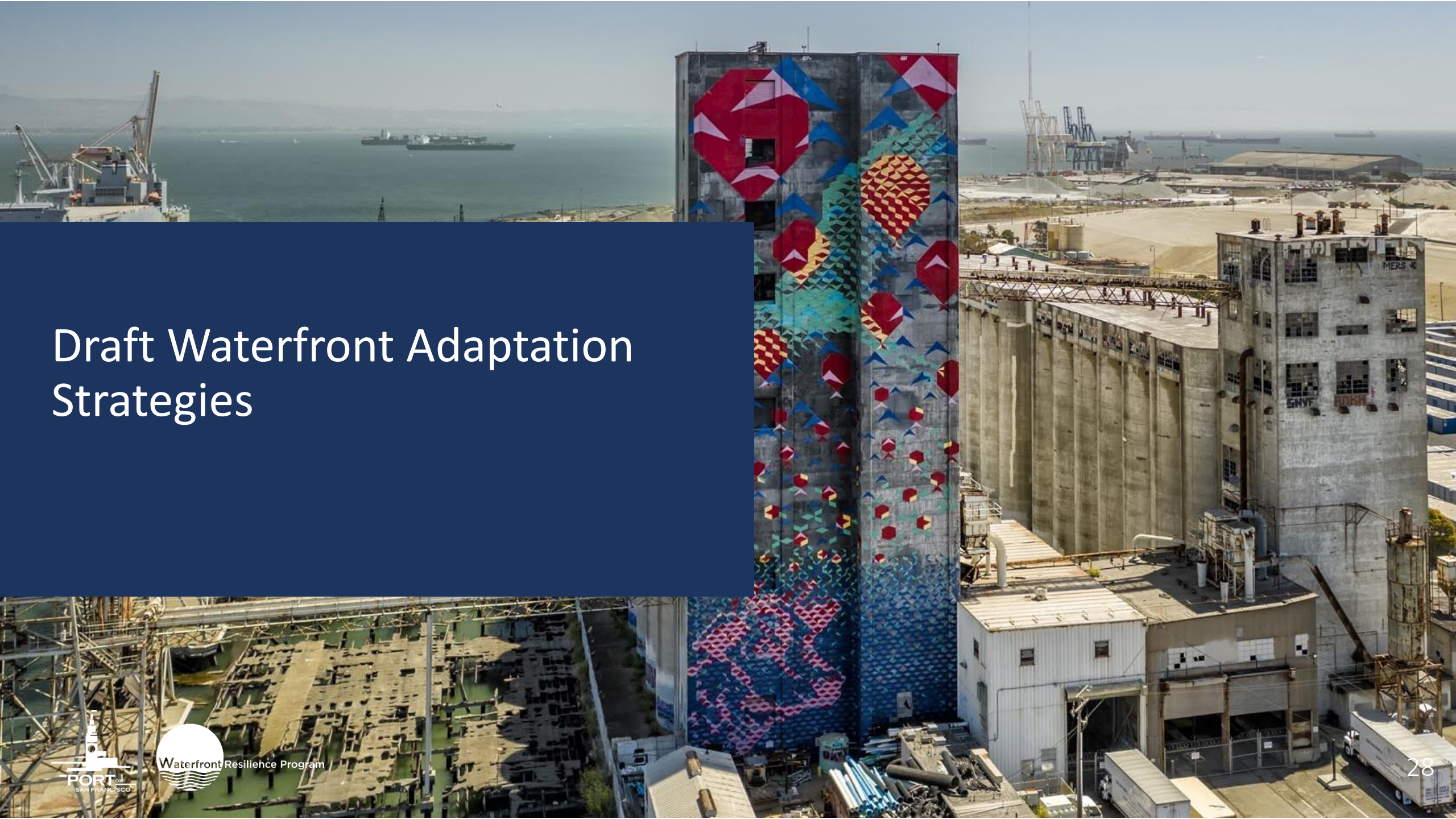
STRATEGY G

THE ROLE OF COMMUNITY FEEDBACK

Pathway to the Draft Waterfront Adaptation Plan



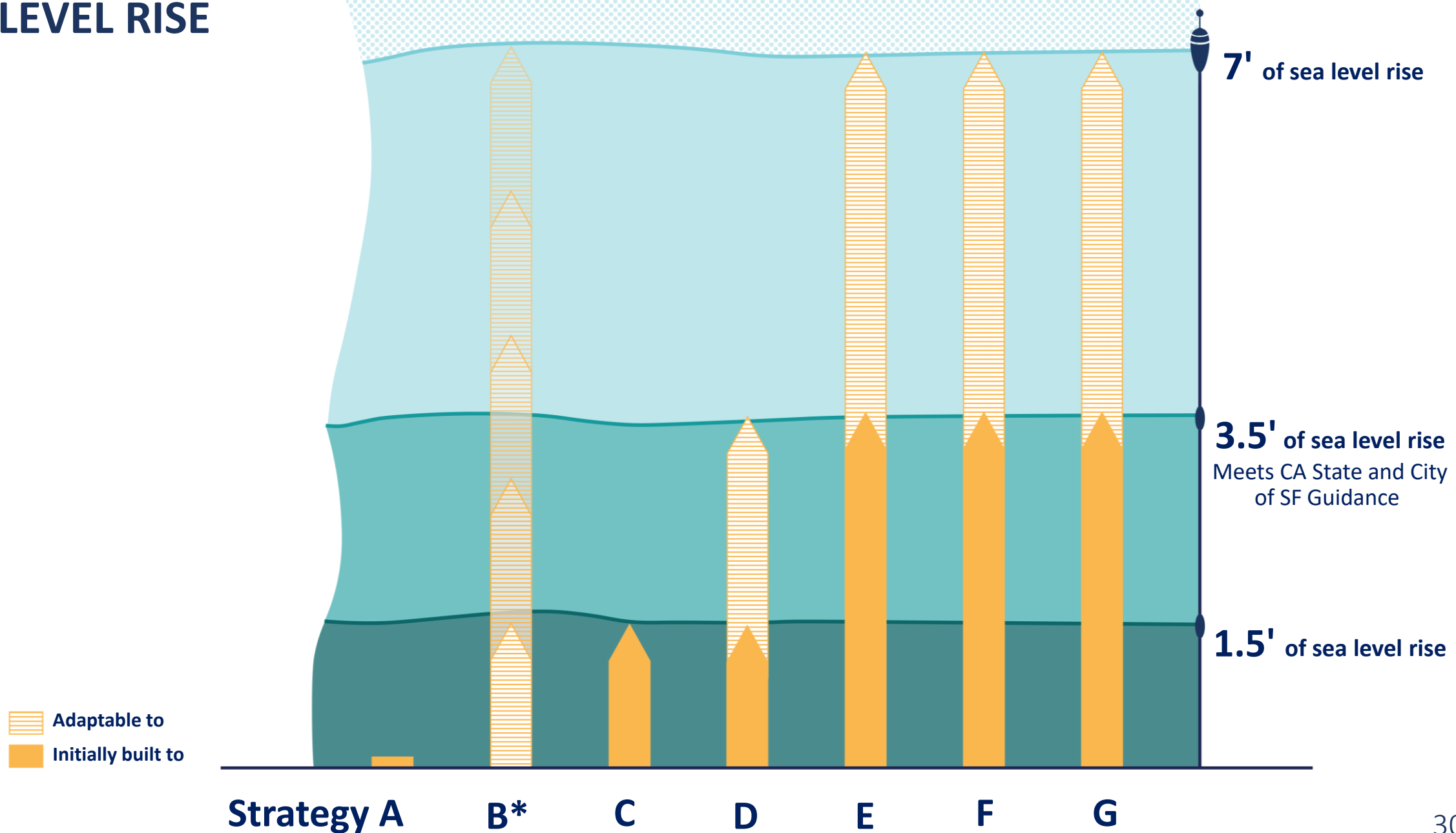
Draft Waterfront Adaptation Strategies



TIME HORIZONS



SEA LEVEL RISE



* Strategy involves phased floodproofing and relocation of assets



USACE SAN FRANCISCO WATERFRONT COASTAL FLOOD STUDY

Focused on Strategies A-D

What if...

we **did not adapt** to mitigate the risks?

STRATEGY A

What if...

we adapted by **floodproofing** and **moving** buildings and assets, *without* coastal flood structures?

STRATEGY B

What if...

we address flooding at a **lower rate** of sea level rise?

STRATEGY C

STRATEGY D

What if...

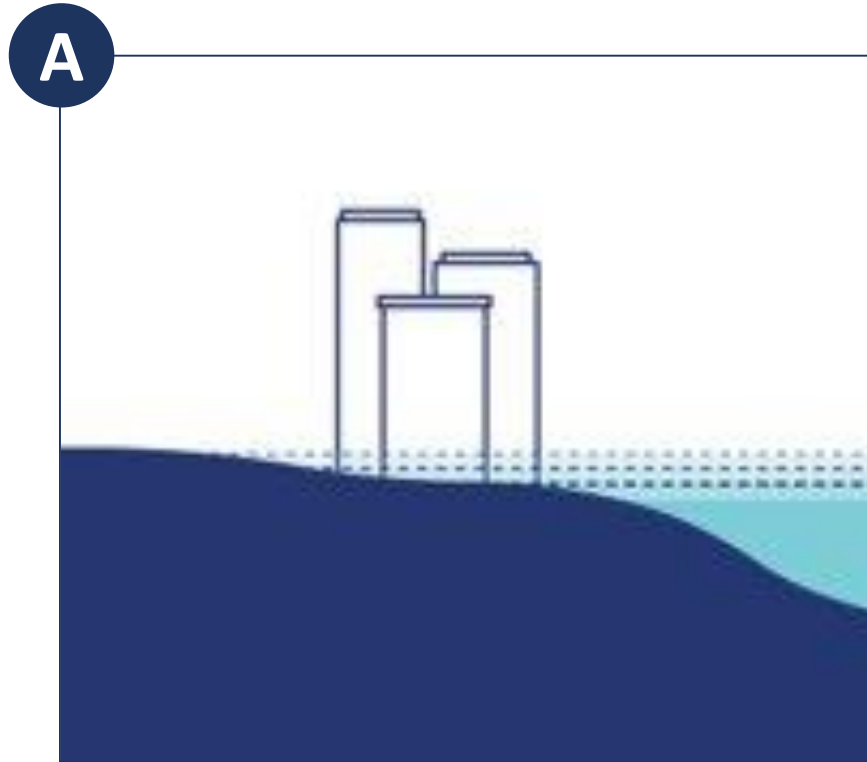
we address flooding at a **higher rate** of sea level rise, as recommended by **CA and SF guidance?**

STRATEGY E

STRATEGY F

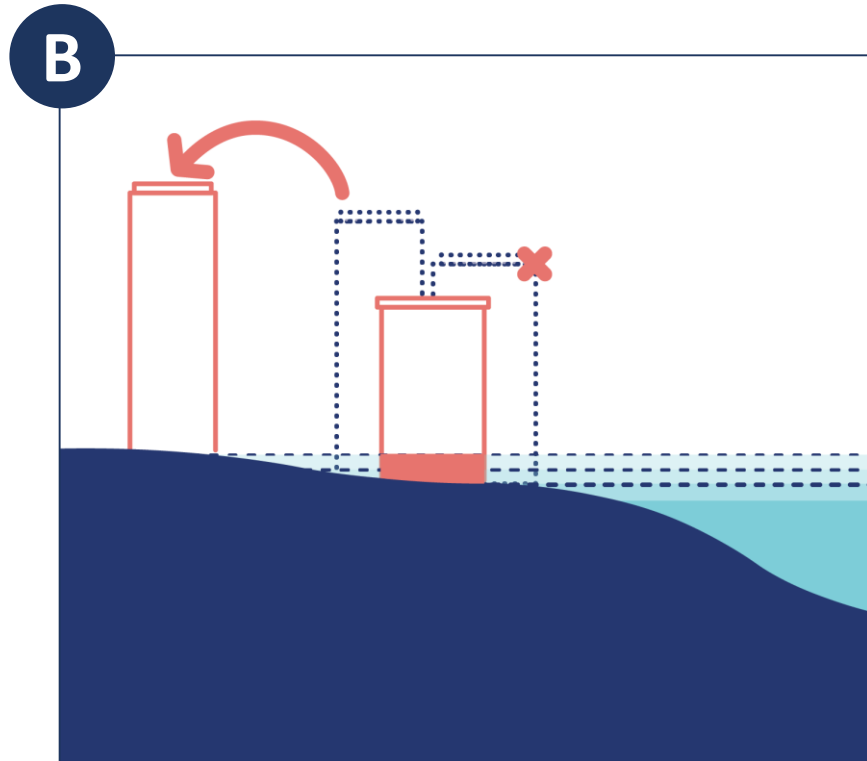
STRATEGY G

STRATEGY A – NO ACTION



This strategy takes no actions to reduce flood risks beyond projects that are already approved

STRATEGY B – NONSTRUCTURAL OPTION



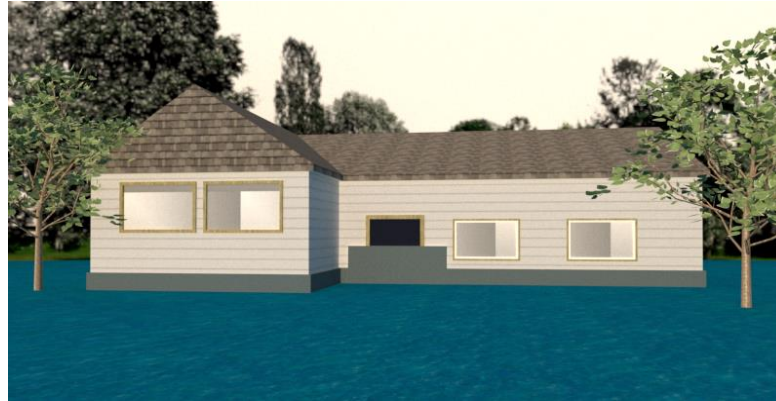
Moves people and assets away from the risk, uses nonstructural measures (such as floodproofing) to reduce risks, and allows water to go where it wants rather than constructing traditional structural solutions

STRATEGY B – NONSTRUCTURAL OPTION

Examples



Warning systems



Floodproofing

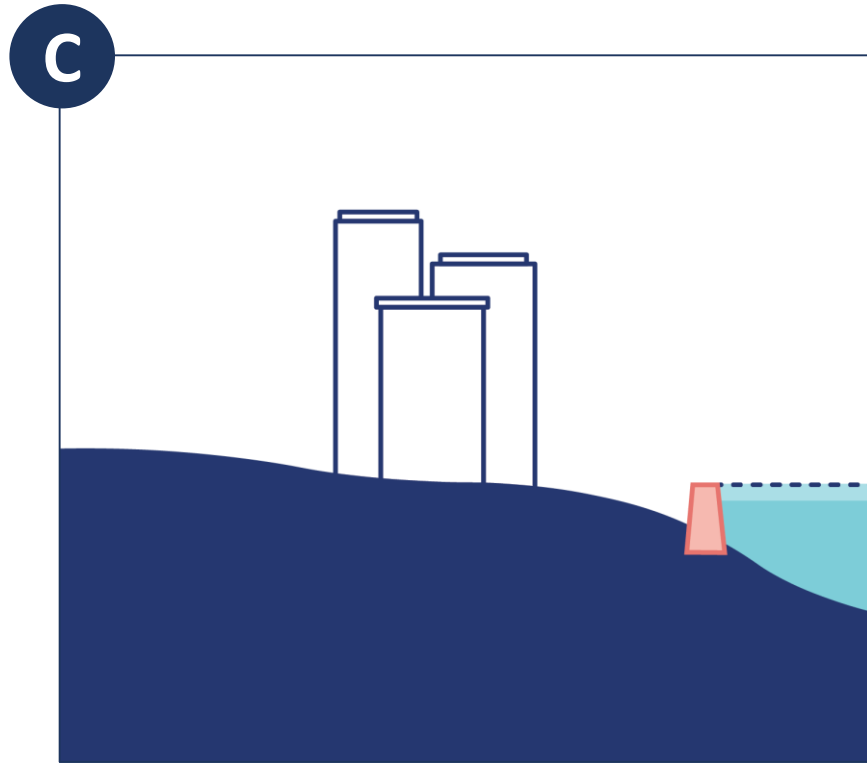


Raise structure in place



Buyouts

STRATEGY C – LOWER SEA LEVEL RISE



**Adapts the shoreline to
withstand 1.5' of sea level rise
by 2040 using a combination
of structural and
nonstructural measures**

STRATEGY C – LOWER SEA LEVEL RISE

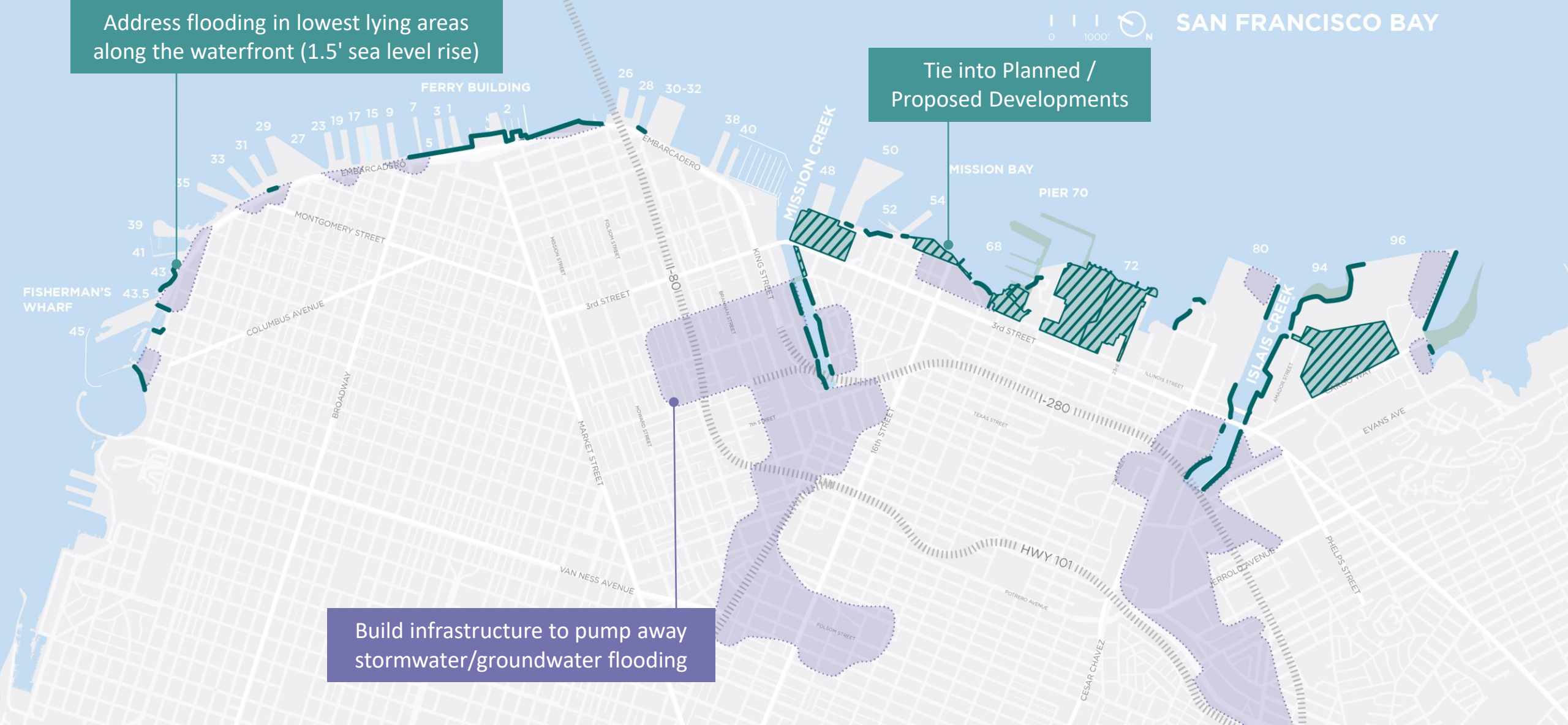
2040

- Coastal Flood Defense
- Coastal Adaptation Zone
- Inland Adaptation Zone
- Planned / Proposed Developments

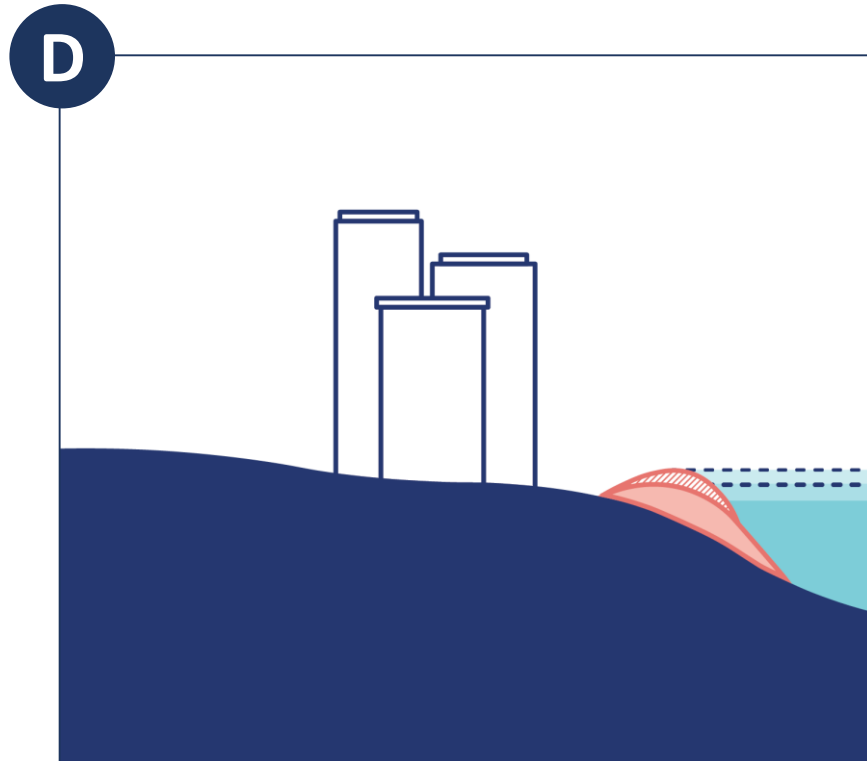
Address flooding in lowest lying areas along the waterfront (1.5' sea level rise)

Tie into Planned / Proposed Developments

Build infrastructure to pump away stormwater/groundwater flooding



STRATEGY D – LOWER SEA LEVEL RISE – ADAPTABLE

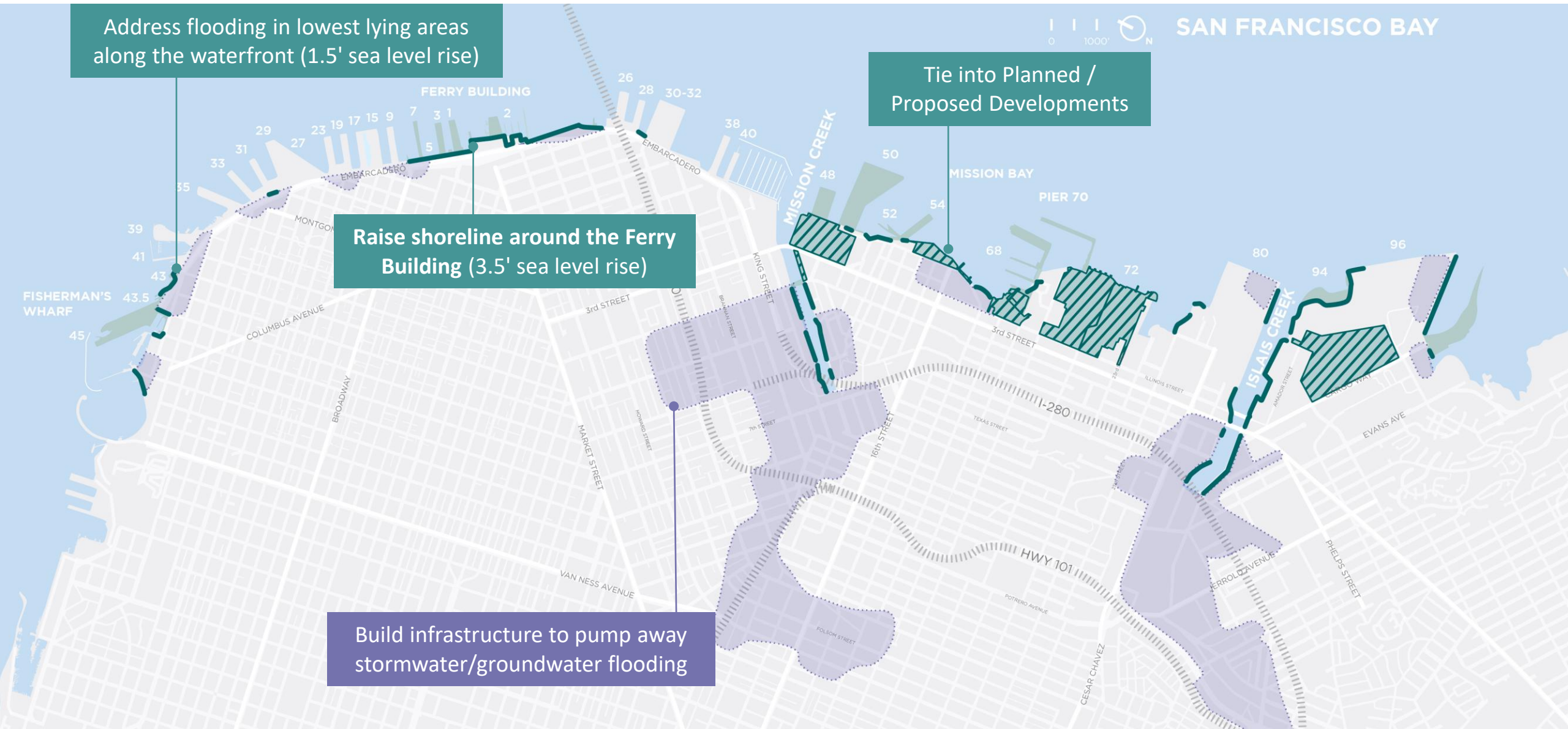


Adapts the shoreline to withstand 1.5' of sea level rise by 2040, with the possibility of building higher by 2090

STRATEGY D – LOWER SEA LEVEL RISE – ADAPTABLE

2040

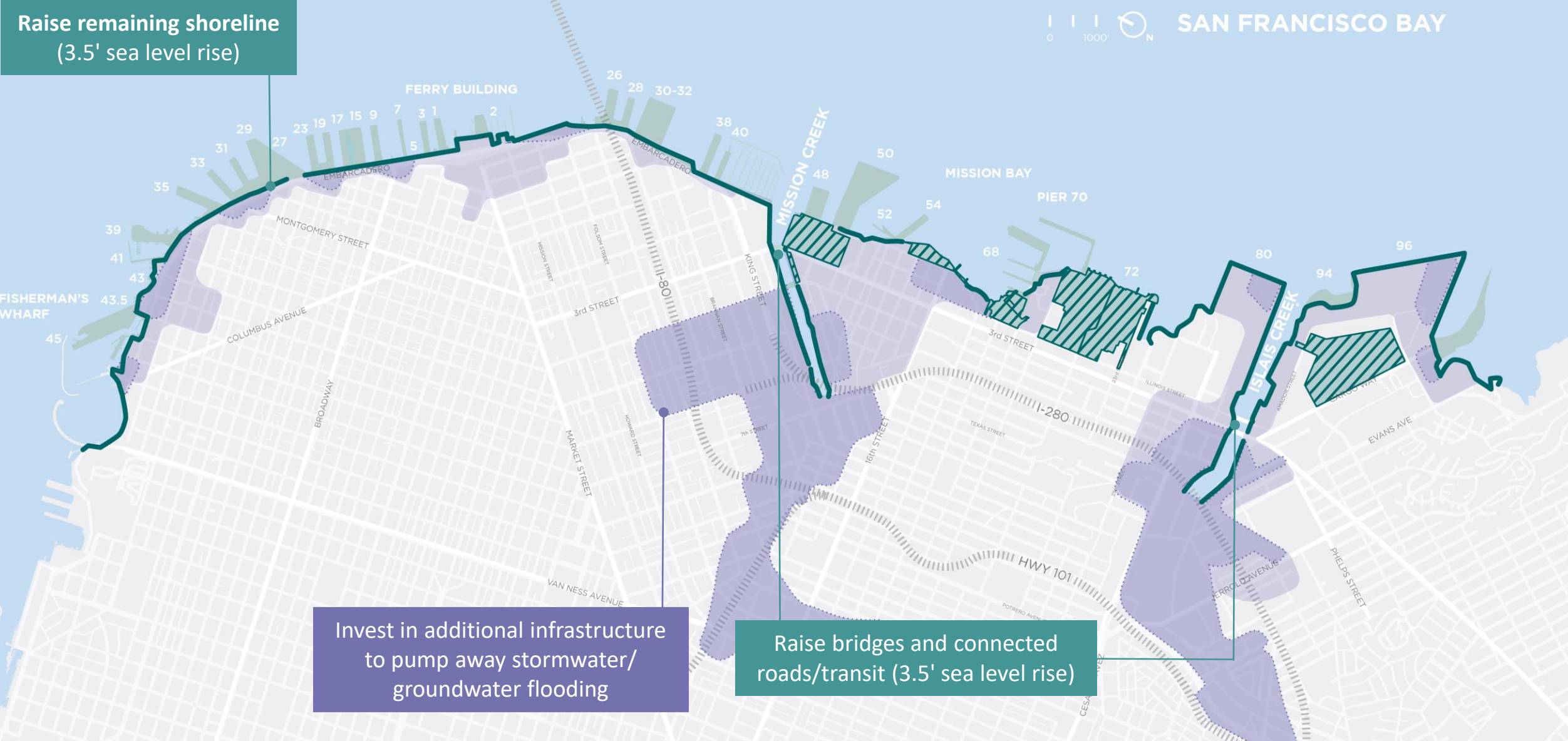
- Coastal Flood Defense
- Coastal Adaptation Zone
- Inland Adaptation Zone
- Planned / Proposed Developments



STRATEGY D – LOWER SEA LEVEL RISE – ADAPTABLE

2090

- Coastal Flood Defense
- Coastal Adaptation Zone
- Inland Adaptation Zone
- Planned / Proposed Developments



USACE SAN FRANCISCO WATERFRONT COASTAL FLOOD STUDY

Focused on Strategies E, F, and G

What if...

we **did not adapt** to mitigate the risks?

STRATEGY A

What if...

we adapted by **floodproofing** and **moving** buildings and assets, *without* coastal flood structures?

STRATEGY B

What if...

we address flooding at a **lower rate** of sea level rise?

STRATEGY C

STRATEGY D

What if...

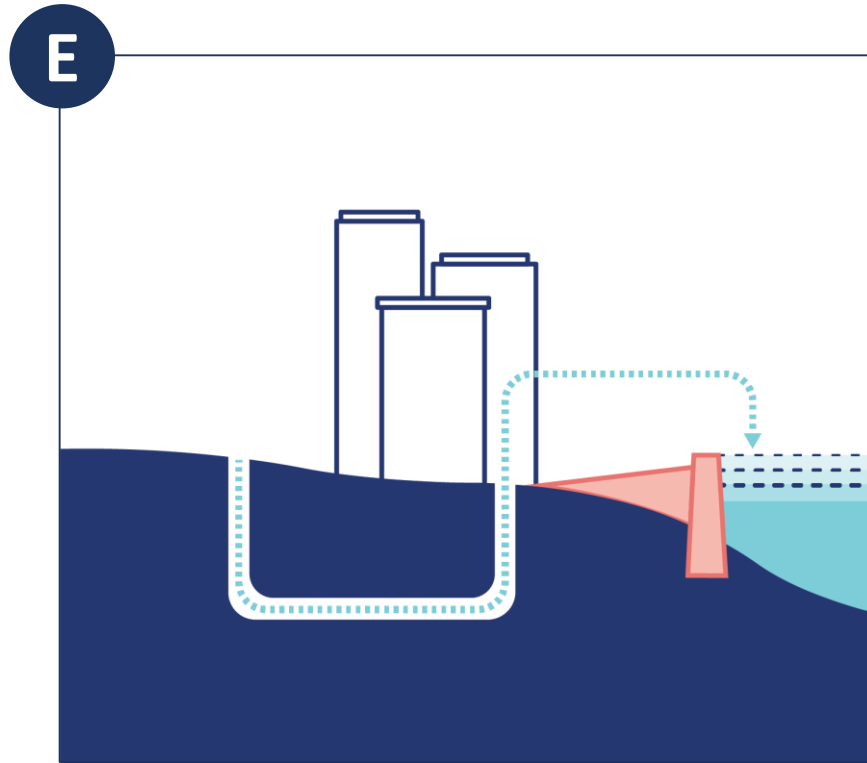
we address flooding at a **higher rate** of sea level rise, as recommended by **CA and SF guidance?**

STRATEGY E

STRATEGY F

STRATEGY G

STRATEGY E – HIGHER SEA LEVEL RISE – HOLD THE LINE

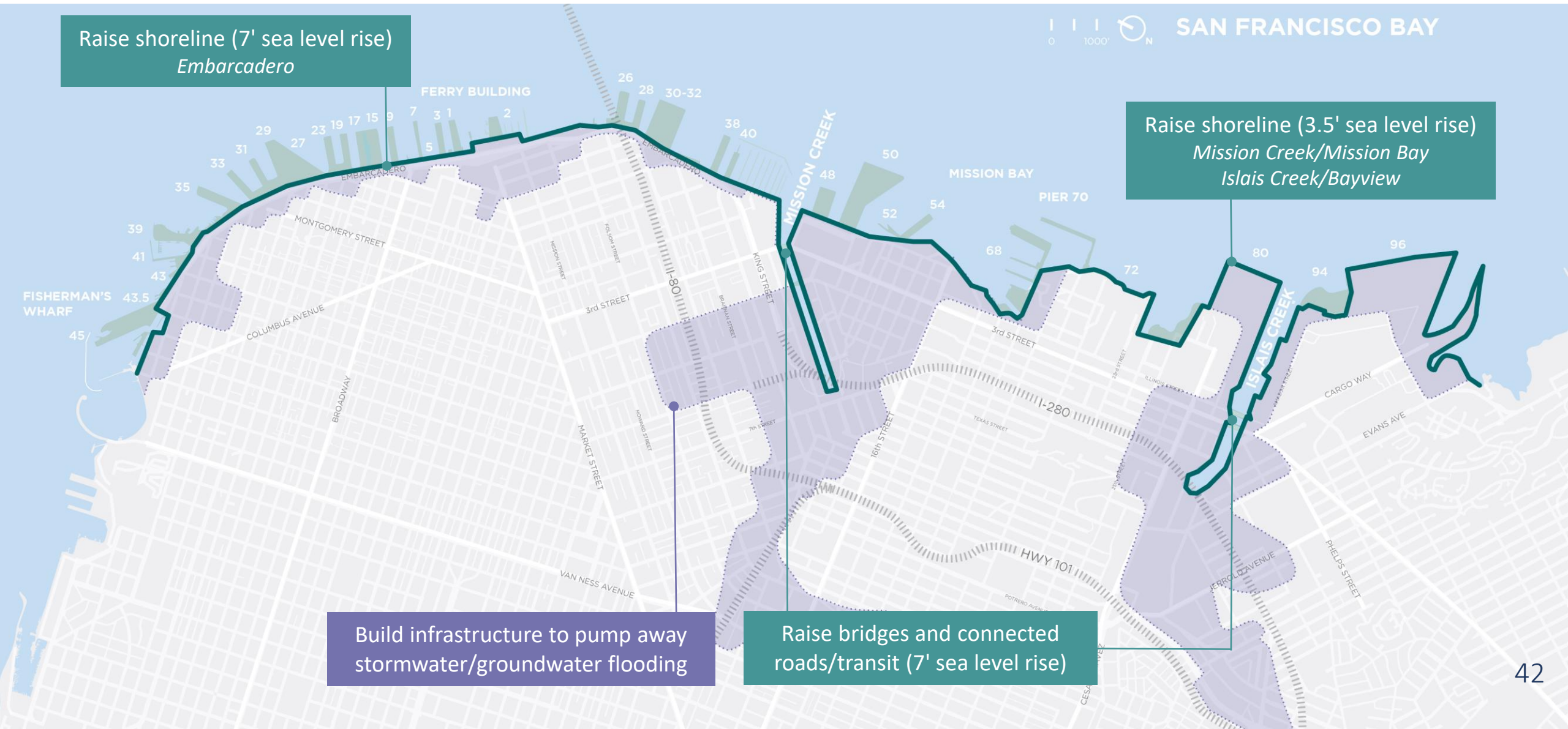


Preserves a waterfront that looks and functions much as it does today by adapting the shoreline

STRATEGY E – HIGHER SEA LEVEL RISE – HOLD THE LINE

2040

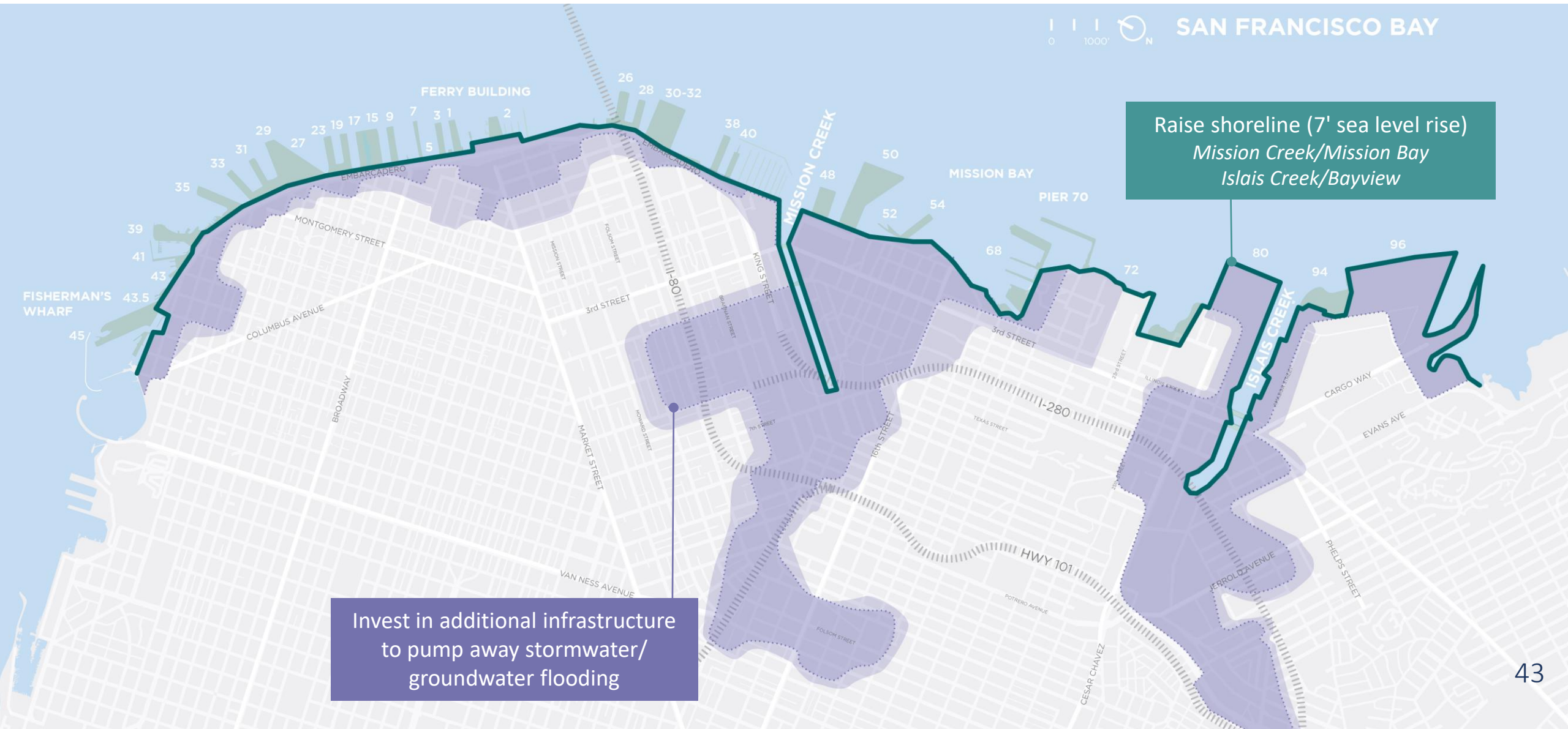
- Coastal Flood Defense
- Coastal Adaptation Zone
- Inland Adaptation Zone



STRATEGY E – HIGHER SEA LEVEL RISE – HOLD THE LINE

2090

- Coastal Flood Defense
- Coastal Adaptation Zone
- Inland Adaptation Zone



STRATEGY E – HIGHER SEA LEVEL RISE – HOLD THE LINE

Islais Creek / Bayview in 2090



Water access
and
recreational
activities

2090 Shoreline Adaptation

2040 Shoreline Adaptation

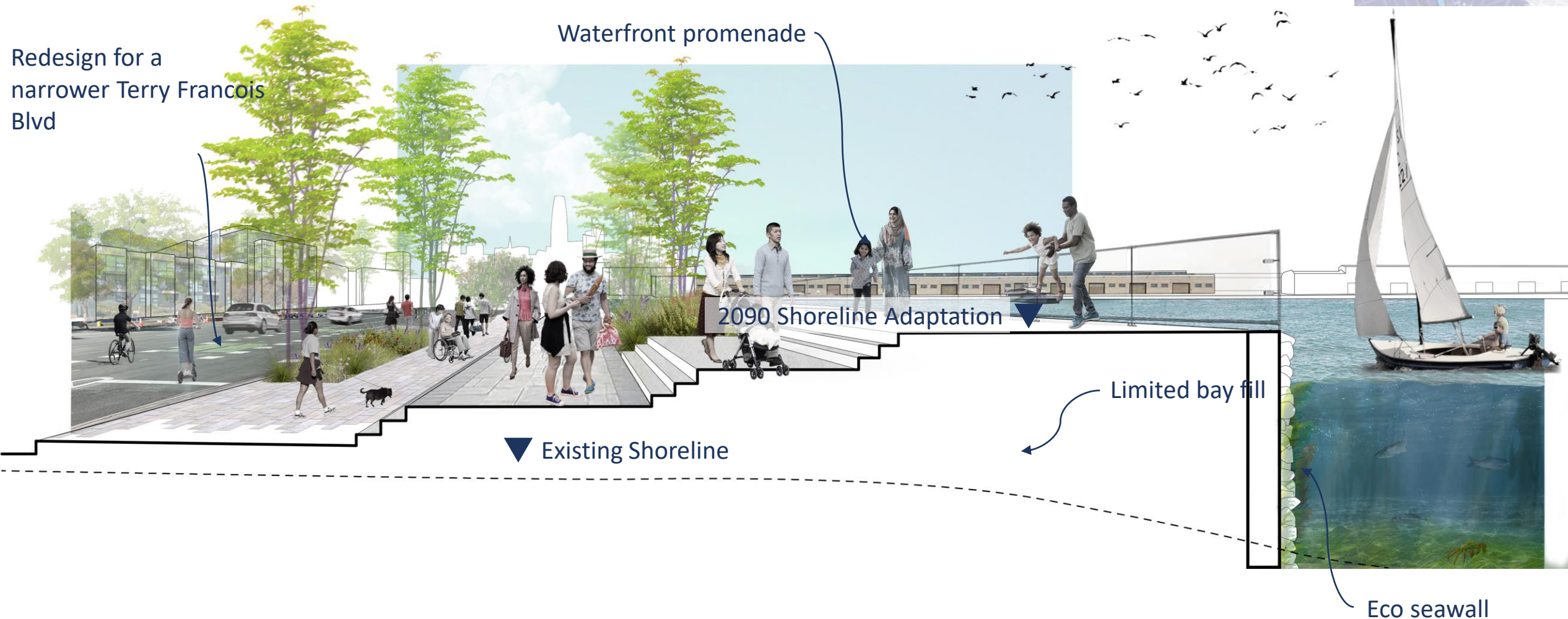
Existing Shoreline

Improved public
access

Living
shoreline

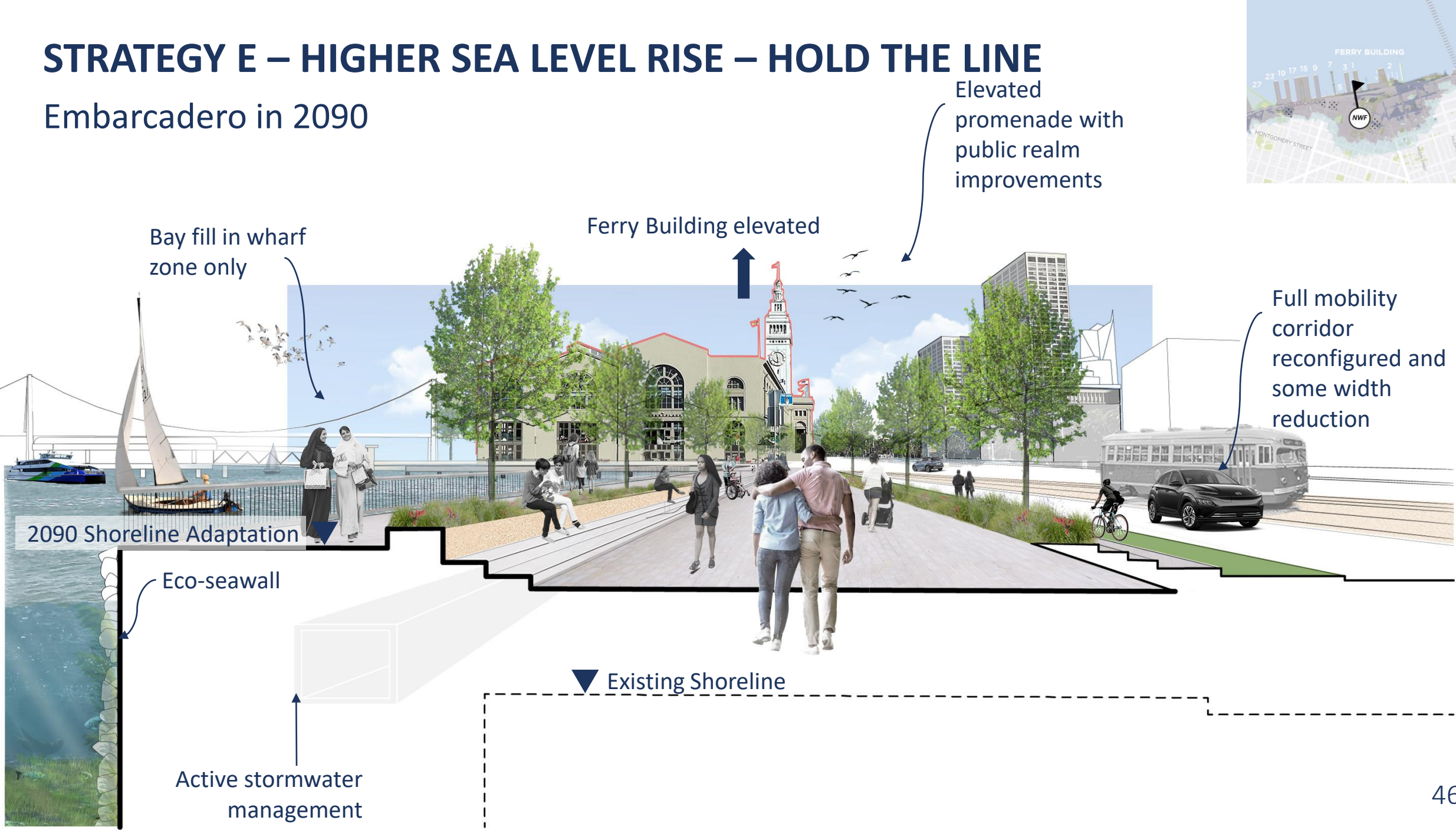
STRATEGY E – HIGHER SEA LEVEL RISE – HOLD THE LINE

Mission Creek / Mission Bay in 2090

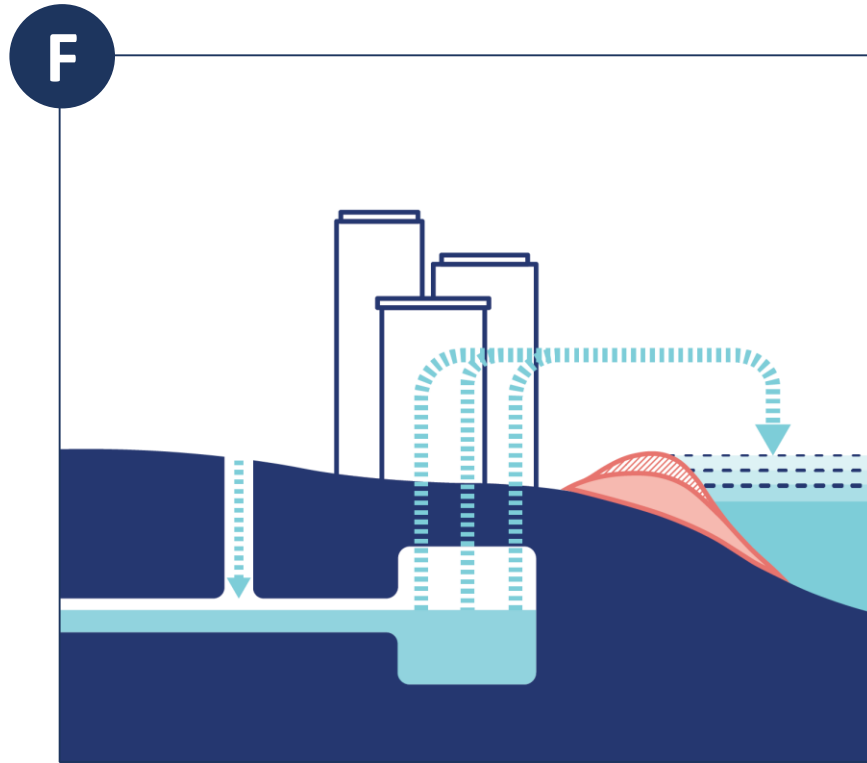


STRATEGY E – HIGHER SEA LEVEL RISE – HOLD THE LINE

Embarcadero in 2090



STRATEGY F – HIGHER SEA LEVEL RISE – MANAGE THE WATER

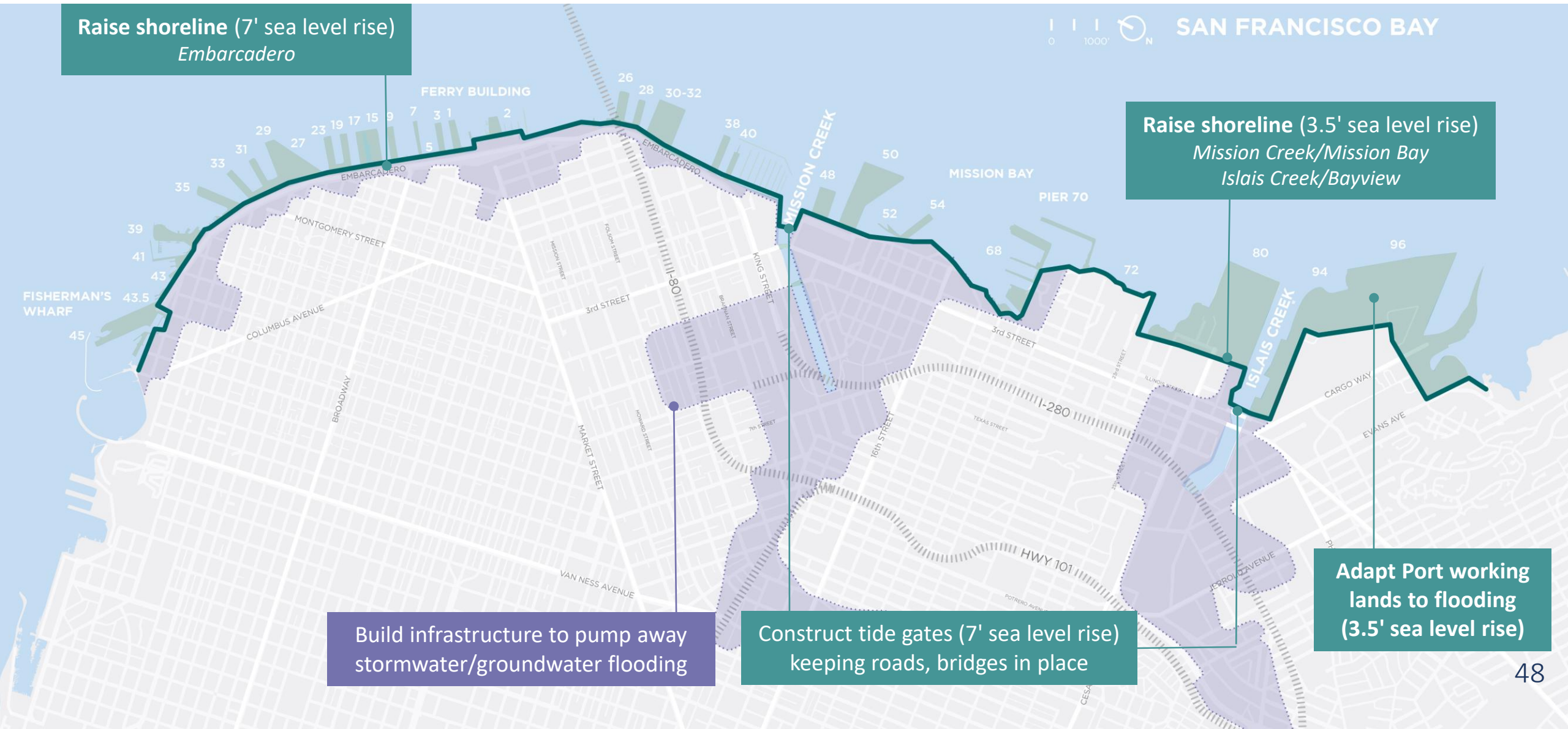


Creates an active system for managing flooding by heavily relying on machinery

STRATEGY F – HIGHER SEA LEVEL RISE – MANAGE THE WATER

2040

- Coastal Flood Defense
- Coastal Adaptation Zone
- Inland Adaptation Zone



STRATEGY F – HIGHER SEA LEVEL RISE – MANAGE THE WATER

2090

- Coastal Flood Defense
- Coastal Adaptation Zone
- Inland Adaptation Zone



STRATEGY F – HIGHER SEA LEVEL RISE – MANAGE THE WATER

Islais Creek / Bayview in 2090



Industrial uses and jobs stay in place

Water access and recreational activities

Improved public access

2040 and 2090 Coastal Defense at Existing Shoreline

Eco seawall

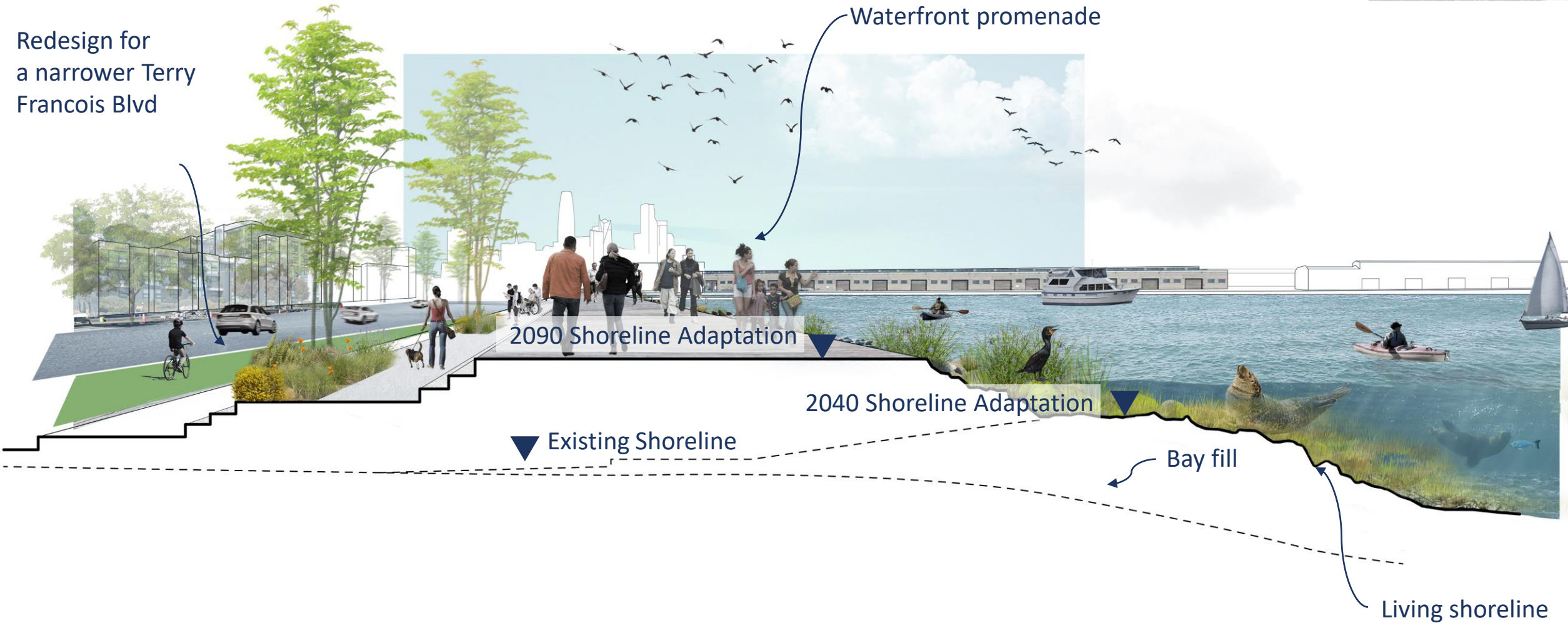
STRATEGY F – HIGHER SEA LEVEL RISE – MANAGE THE WATER

Mission Creek / Mission Bay in 2090



Redesign for
a narrower Terry
Francois Blvd

Waterfront promenade

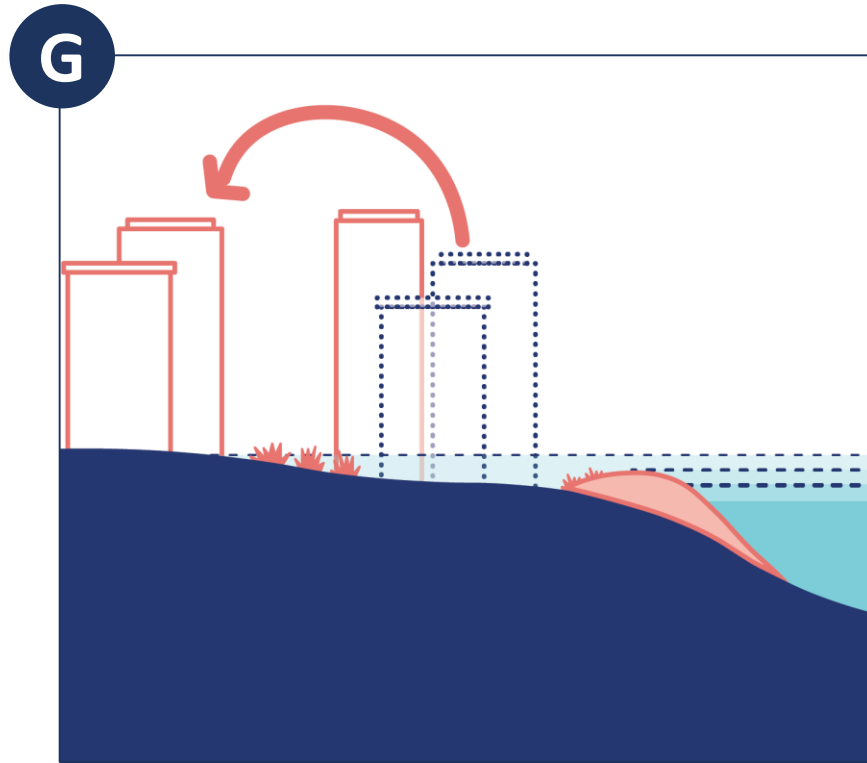


STRATEGY F – HIGHER SEA LEVEL RISE – MANAGE THE WATER

Embarcadero in 2090



STRATEGY G – HIGHER SEA LEVEL RISE – ALIGN WITH WATERSHEDS

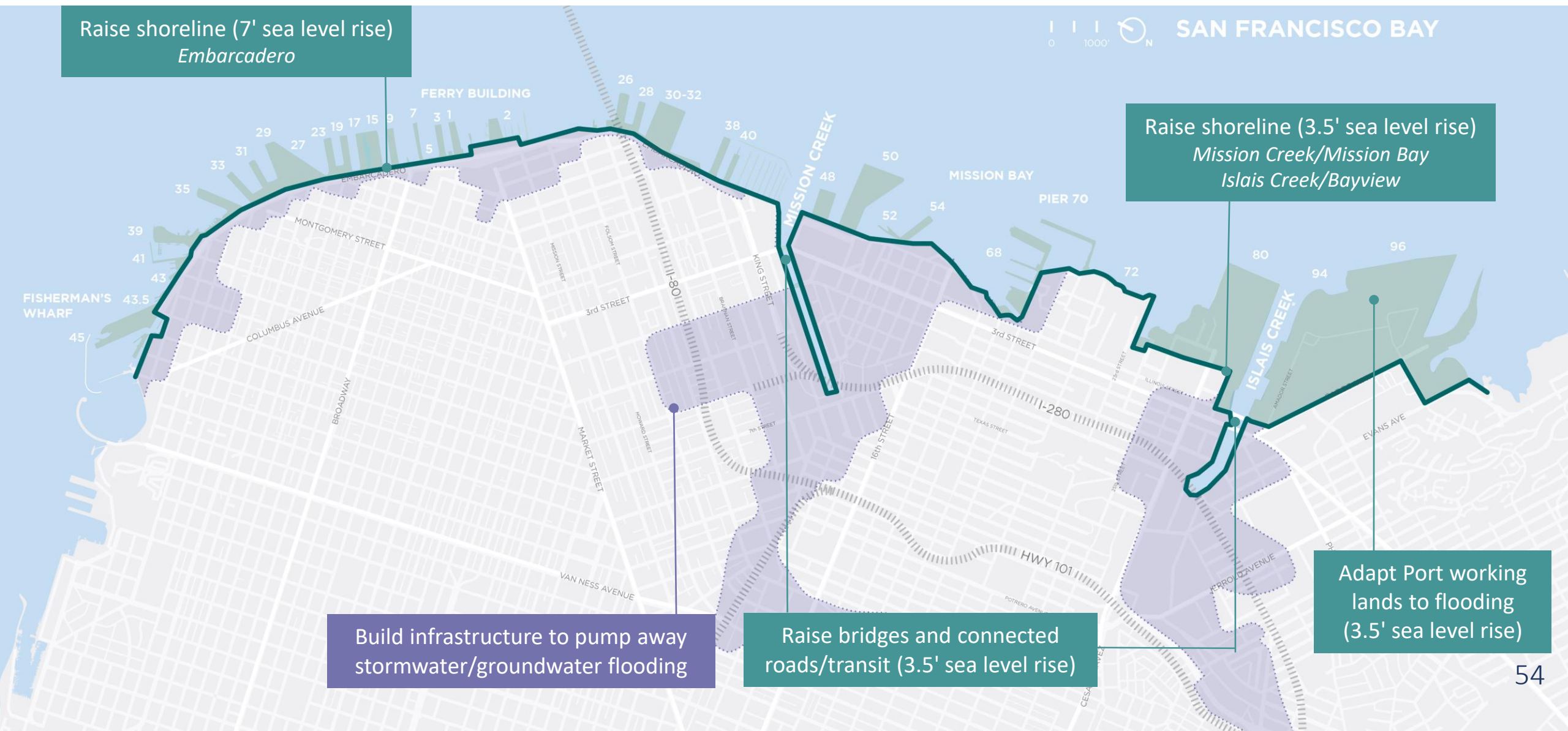


Advances shoreline adaptation while working with natural inland flooding patterns to floodproof some buildings and infrastructure and move others away from the highest risk areas

STRATEGY G – HIGHER SEA LEVEL RISE – ALIGN WITH WATERSHEDS

2040

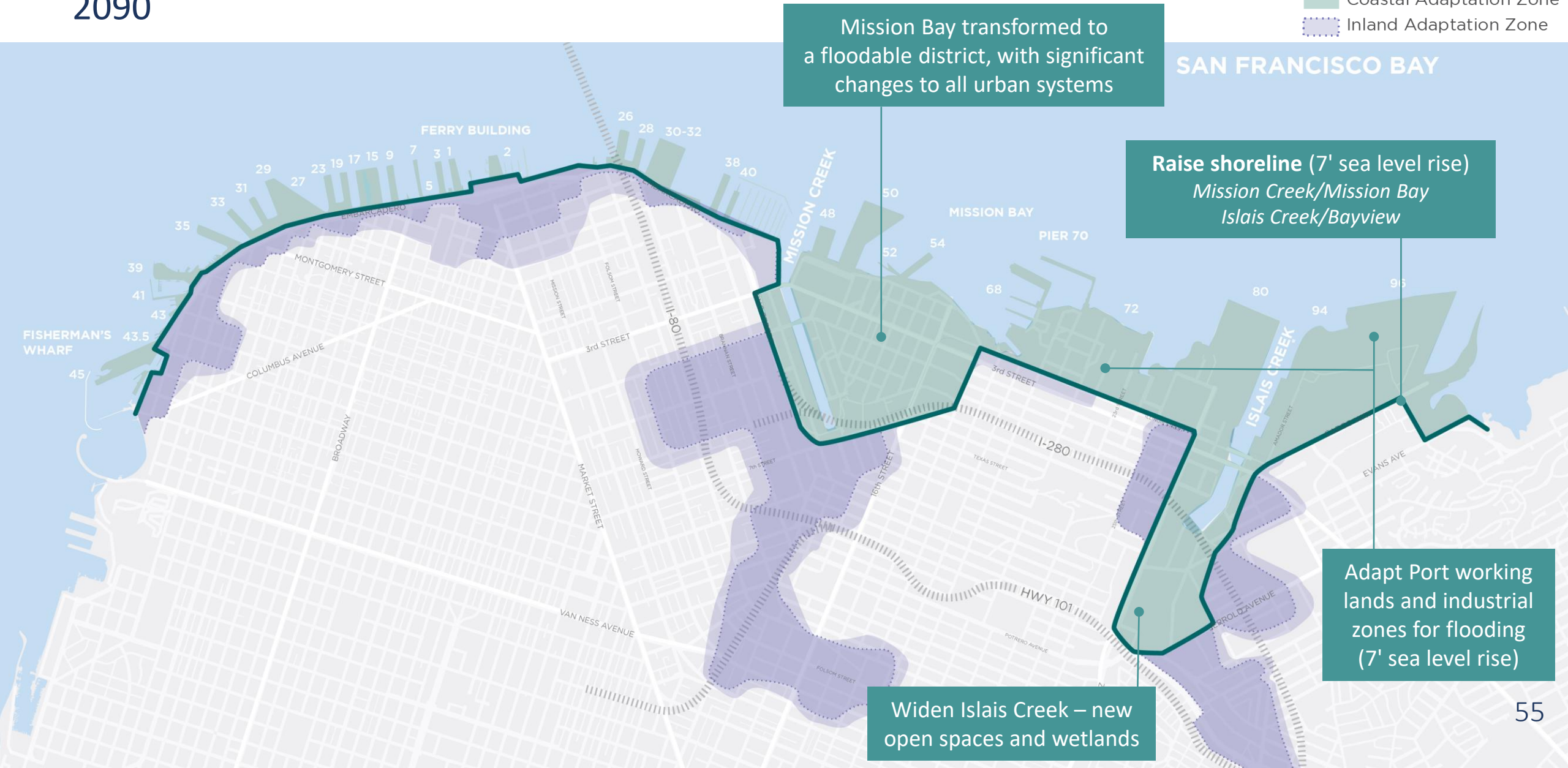
- Coastal Flood Defense
- Coastal Adaptation Zone
- Inland Adaptation Zone



STRATEGY G – HIGHER SEA LEVEL RISE – ALIGN WITH WATERSHEDS

2090

- Coastal Flood Defense
- Coastal Adaptation Zone
- Inland Adaptation Zone



Mission Bay transformed to a floodable district, with significant changes to all urban systems

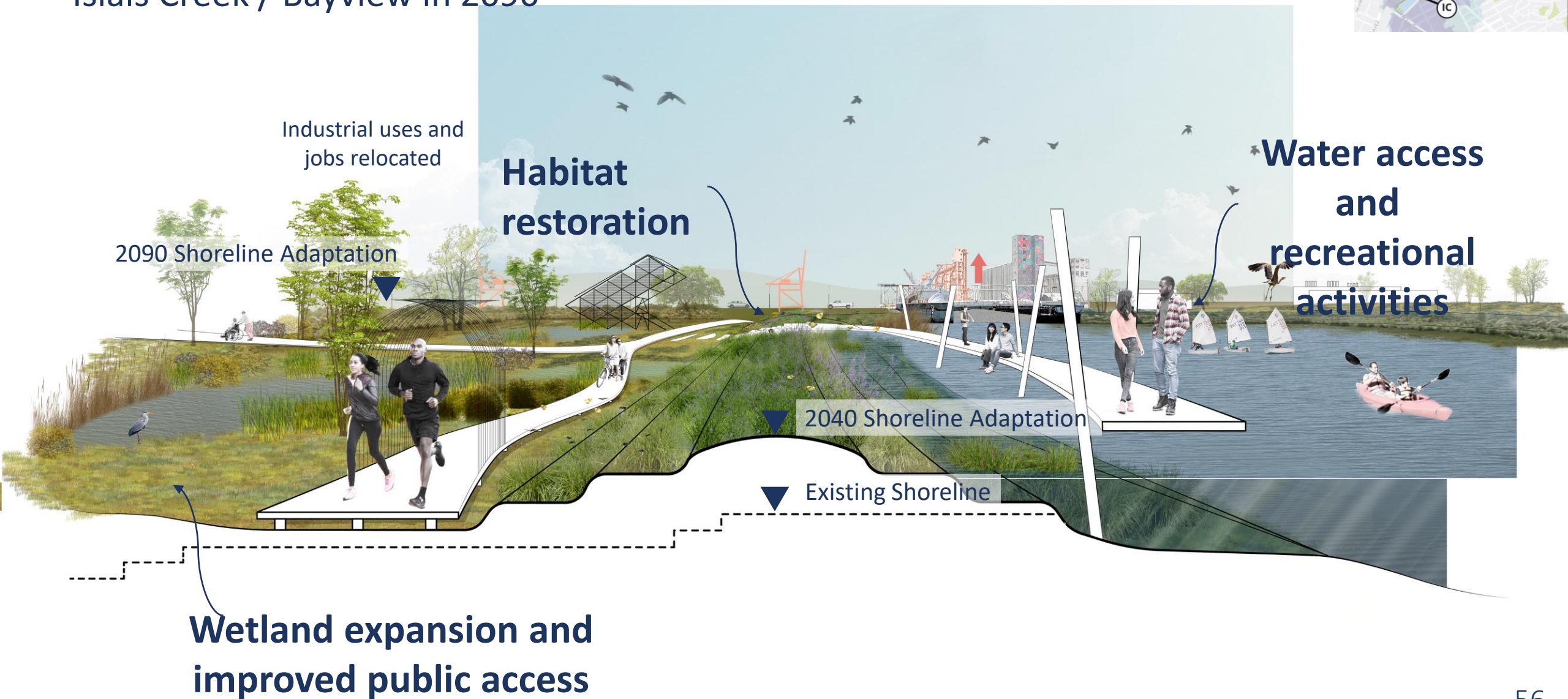
Raise shoreline (7' sea level rise)
*Mission Creek/Mission Bay
Islais Creek/Bayview*

Adapt Port working lands and industrial zones for flooding (7' sea level rise)

Widen Islais Creek – new open spaces and wetlands

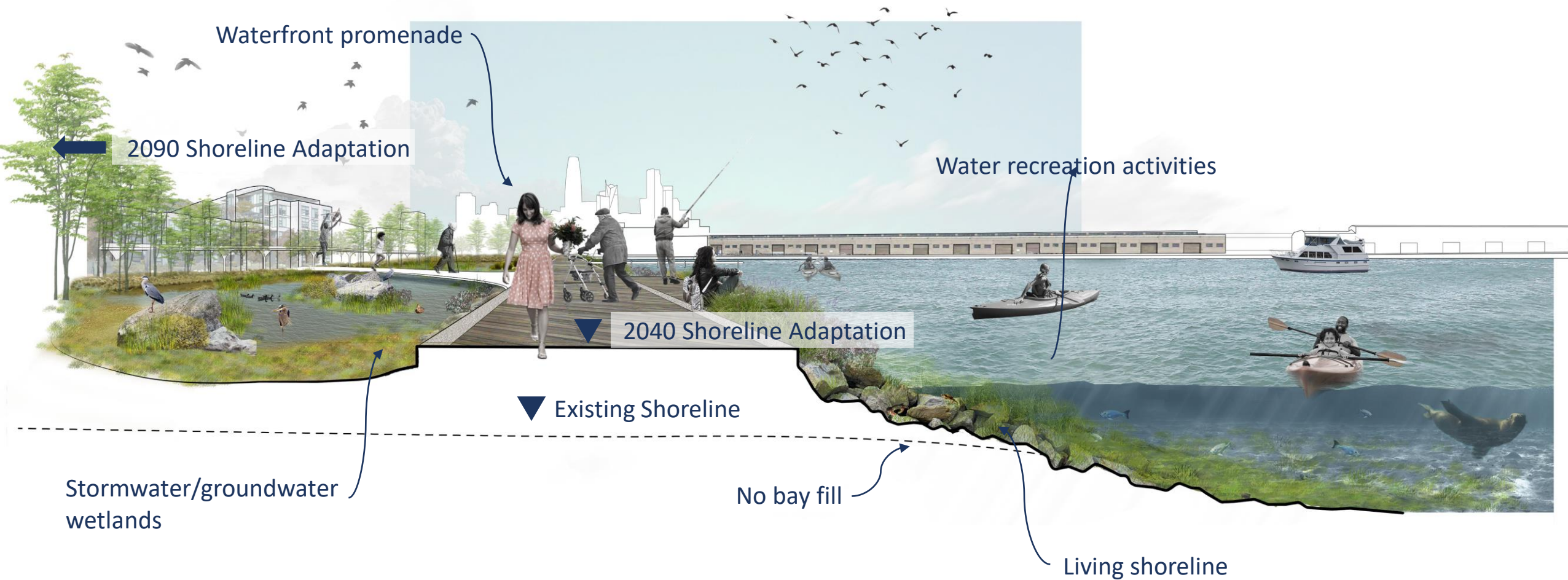
STRATEGY G – HIGHER SEA LEVEL RISE – ALIGN WITH WATERSHEDS

Islais Creek / Bayview in 2090



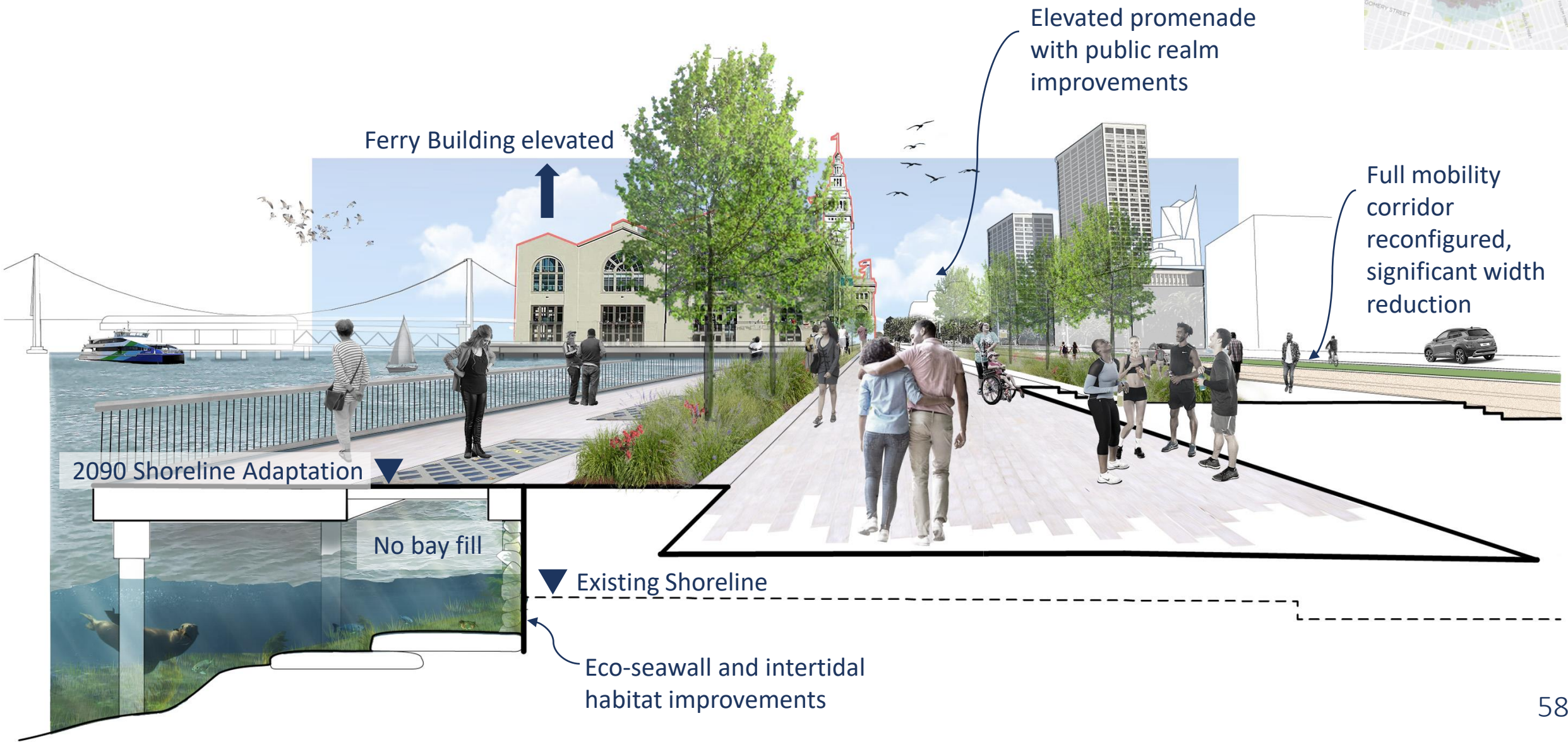
STRATEGY G – HIGHER SEA LEVEL RISE – ALIGN WITH WATERSHEDS

Mission Creek / Mission Bay in 2090



STRATEGY G – HIGHER SEA LEVEL RISE – ALIGN WITH WATERSHEDS

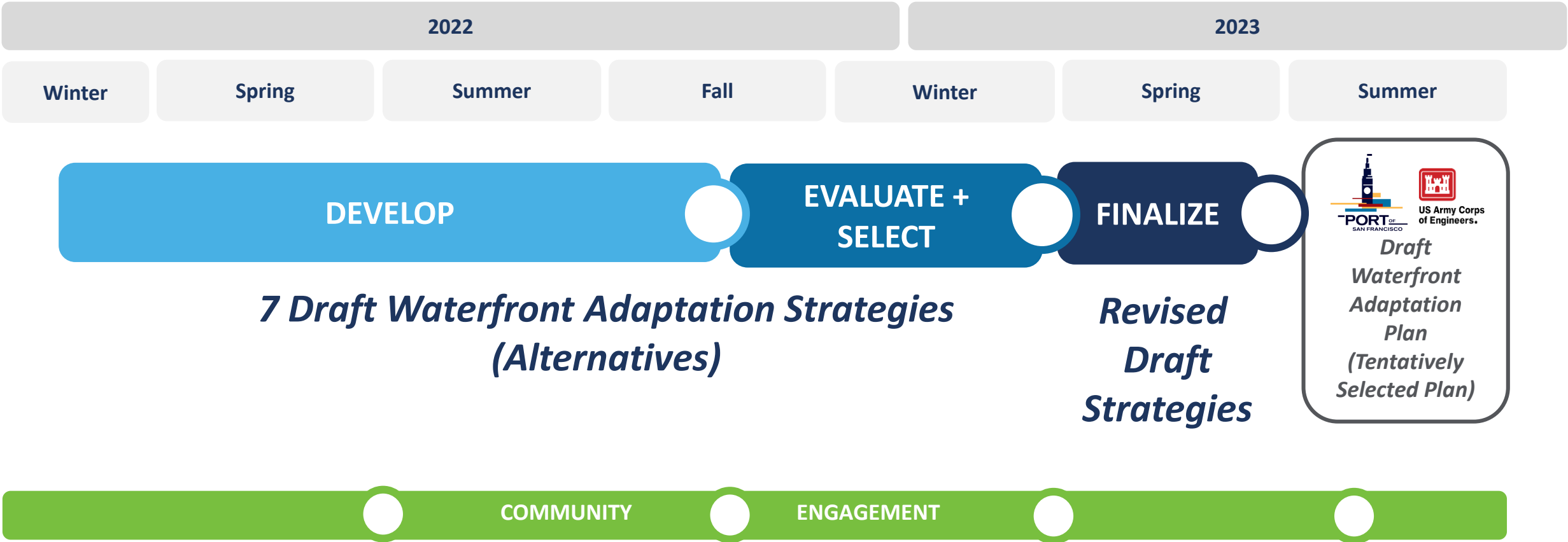
Embarcadero in 2090



Next Steps



DRAFT WATERFRONT ADAPTATION STRATEGIES DEVELOPMENT SCHEDULE



JOIN THE CONVERSATION

Different Options for Engaging



- Join us at an upcoming meeting – online or digital
- Forward the digital engagement tool to your friends and colleagues
- Join us at the upcoming Waterfront Community Mixer
- More information here: sfport.com/wrp

A photograph of two children riding bicycles on a dirt path. The child in the foreground is wearing a red jersey and a yellow helmet. The child in the background is wearing a black jersey with the number 30 and a black helmet. They are riding away from the camera towards the ocean. In the background, there are some trees and a large ship on the water.

Thank You

Adam Varat | adam.varat@sfport.com

